October 30, 2008

Final
Program Environmental Impact Report
Volume 1 of 8

For the San Francisco Public Utilities Commission's
WATER SYSTEM IMPROVEMENT PROGRAM

San Francisco Planning Department File No. 2005.0159E
State Clearinghouse No. 2005092026

Draft PEIR Publication Date: June 29, 2007

Draft PEIR Public Hearing Dates:
September 5, 2007 in Sonora
September 6, 2007 in Modesto
September 18, 2007 in Fremont
September 19, 2007 in Palo Alto
September 20, 2007 in San Francisco
October 11, 2007 in San Francisco

Draft PEIR Public Comment Period: June 29, 2007 through October 15, 2007
Comments and Responses Publication Date: September 30, 2008
Final PEIR Certification Date: October 30, 2008

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DATE: June 12, 2009

TO: Interested Parties

FROM: Bill Wycko, Environmental Review Officer

SUBJECT: Final Program Environmental Impact Report on the San Francisco Public Utilities Commission's Water System Improvement Program (Case No. 2005.0159E)

The Final Program Environmental Impact Report (PEIR) on the San Francisco Public Utilities Commission's (SFPUC) Water System Improvement Program (WSIP) was certified by the San Francisco Planning Commission as adequately fulfilling the requirements of the California Environmental Quality Act (CEQA) on October 30, 2008. Subsequent to the certification action, the SFPUC approved the Phased WSIP and adopted the CEQA Findings, including a statement of overriding considerations and the WSIP Mitigation Monitoring and Reporting Program. Copies of the certification motion and CEQA Findings are attached to this memorandum.

This document is the consolidated Final PEIR; it consists of eight volumes that contain the full Draft PEIR (Volumes 1 through 5) and the Comments and Responses document (Volumes 6 through 8), but also incorporates text revisions described in the Comments and Responses document. This consolidated Final PEIR does not contain any new information from that presented in the Draft PEIR (published on June 29, 2007) and the Comments and Responses document (published on September 30, 2008). The text revisions include those prepared in response to comments received on the Draft PEIR as well as corrections and relevant updates. The document also provides cross-references to information in the Comments and Responses document, updates information on the CEQA process, and consolidates the tables of contents for the eight volumes. This document is intended to facilitate use of the Final PEIR as a reference document, which should be cited based on the certification date of October 30, 2008 and referenced as follows:

> San Francisco Planning Department, 2008. *Final Program Environmental Impact Report on the San Francisco Public Utilities Commission's Water System Improvement Program*. State Clearinghouse No. 2005092026. Certified October 30, 2008.

To assist the reader in identifying the text changes that were incorporated subsequent to publication of the Draft PEIR, this consolidated Final PEIR includes a vertical line along the outside margin of the pages where changes have been made; new and revised figures are labeled as *New* or *Revised*, respectively, in the figure title. Other than the vertical line along the margin, deleted text is not shown, except where an entire paragraph was deleted, in which case the deletion is noted in square brackets and italics. The consolidated Final PEIR preserves the same pagination as was used in the Draft PEIR so that any cross-references remain accurate; thus, where the text changes involved inserting lengthy new text, the new page numbers are labeled with *a, b, c*, etc. following the original page number (e.g., pp. 4.7-24a and 4.7-24b follow p. 4.7-24 and come before p. 4.7-25).

In response to some comments on the Draft PEIR, it was necessary to provide supplemental discussion of certain issues to confirm and validate the original analysis or discussion presented in the Draft PEIR, but in these instances the comments did not warrant a change or correction in the text of the Draft PEIR. In these cases, the consolidated Final PEIR includes cross-references and explanatory notes, which are called out in square brackets and italics in the revised text in Volumes 1 through 5 to refer the reader to the additional information presented in the Comments and Responses document (Volumes 6 though 8).

This consolidated Final PEIR also provides guidance for the reader in locating the description of the Phased WSIP and its environmental effects. The Phased WSIP is a variation of the proposed program described and analyzed in the Draft PEIR, and, as indicated in the Comments and Responses document, its potential environmental effects fall within the range of impacts previously evaluated in the Draft PEIR for the originally proposed program and alternatives. The SFPUC ultimately adopted the Phased WSIP, as described above.

The user's guide below is intended to help the reader navigate through the Final PEIR and to find relevant cross-references between the Draft PEIR and Comments and Responses document. It indicates where changes were made to the Draft PEIR as part of the Comments and Responses document, provides cross-references for information on the Phased WSIP, and shows the interrelationships among the various sections of the PEIR.

USER'S GUIDE TO CHANGES IN THE WSIP FINAL PEIR

Section	Name	Description	Changes from the Draft PEIR?	Other Relevant PEIR Sections
VOLUME 1				
Summary	**Summary**	Summary of the proposed program, impacts, mitigation measures, variants, and alternatives	Yes, changes made due to project description updates, updates to impacts and mitigation measures, and introduction of the Phased WSIP Variant	Refer to all chapters of the PEIR for full discussions
Chapter 1	**Introduction**	Purpose of proposed program and CEQA process	Yes, changes made to correct editorial errors	Refer to Chapter 11 for updates to the CEQA process for the PEIR
Chapter 2	**Existing Regional Water System**	Existing facilities, operations, regulatory requirements	Yes, changes made to update information on existing facilities and SFPUC policies	
Chapter 3	**Program Description**	Location, objectives, background, proposed water supply strategy and facilities, required actions and approvals	Yes, changes made due to revisions in some facility project descriptions and to include cross-reference to information on the Phased WSIP Variant	Refer to the following sections for supplemental discussions: Section 13.2 for project revisions; Section 13.4 for the Phased WSIP; Section 14.1 for the need for the program; Section 14.2 for demand projections, conservation, and recycling assumptions; and Section 14.3 for the dry-year water transfer
VOLUME 2				
Chapter 4	**WSIP Facility Projects – Setting and Impacts**			
Section 4.1	Overview	Approach used to analyze program-level impacts and to develop programmatic mitigations for key regional facility improvement projects	No changes	Refer to Appendix C for the assumptions used for facility improvement projects and Section 14.4 for additional discussion of the appropriate level of detail for the program-level analysis
Section 4.2	Plans and Policies	Plans and policies relevant to facility projects and plan consistency evaluation	Yes, changes made to update the setting to include the San Francisco Municipal Green Building Program	
Section 4.3	Land Use and Visual Quality	Setting and impacts	No changes	Refer to Section 6.3 for mitigation measures
Section 4.4	Geology, Soils, and Seismicity	Setting and impacts	No changes	Refer to Section 6.3 for mitigation measures
Section 4.5	Hydrology and Water Quality	Setting and impacts	Yes, changes made to update the regulatory framework to clarify three impacts	Refer to Section 6.3 for mitigation measures
Section 4.6	Biological Resources	Setting and impacts	Yes, changes made to clarify the setting and two impacts	Refer to Section 6.3 for mitigation measures, to Section 14.4 for supplemental discussion, and to Appendix D for supporting details

USER'S GUIDE TO CHANGES IN THE WSIP FINAL PEIR (Continued)

Section	Name	Description	Changes from the Draft PEIR?	Other Relevant PEIR Sections
VOLUME 2 (cont.)				
Section 4.7	Cultural Resources	Setting and impacts	Yes, changes made to clarify and refine the historical resources analysis	Refer to Section 6.3 for mitigation measures and to Section 15.3 for supplemental discussion
Section 4.8	Traffic, Transportation, and Circulation	Setting and impacts	Yes, changes made to clarify one impact	Refer to Section 6.3 for mitigation measures and to Appendix F for supporting details
Section 4.9	Air Quality	Setting and impacts	Yes, changes made to update setting to include the Greenhouse Gas Reduction Ordinance	Refer to Section 6.3 for mitigation measures
Section 4.10	Noise and Vibration	Setting and impacts	No changes	Refer to Section 6.3 for mitigation measures and to Appendix F for supporting details
Section 4.11	Public Services and Utilities	Setting and impacts	Yes, changes made to update the setting	Refer to Section 6.3 for mitigation measures
Section 4.12	Recreational Resources	Setting and impacts	Yes, changes made to update the setting, clarify one impact, and augment the references	Refer to Section 6.3 for mitigation measures
Section 4.13	Agricultural Resources	Setting and impacts	No changes	Refer to Section 6.3 for mitigation measures
Section 4.14	Hazards	Setting and impacts	No changes	Refer to Section 6.3 for mitigation measures and to Appendix G for supporting details
Section 4.15	Energy Resources	Setting and impacts	No changes	Refer to Section 6.3 for mitigation measures
Section 4.16	Collective Impacts of WSIP Facilities	Combined impacts of multiple facility projects under the proposed program	No changes	Refer to Section 6.3 for mitigation measures
Section 4.17	Cumulative Effects	Impacts of the proposed program in combination with other projects	No changes	Refer to Section 6.3 for mitigation measures
VOLUME 3				
Chapter 5	**WSIP Water Supply and System Operations – Setting and Impacts**			
Section 5.1	Overview	Approach used to analyze water supply impacts and mitigation measures; includes a description of hydrologic modeling	Yes, changes made due to refinement and update of hydrologic modeling	Refer to Sections 13.3 and 14.5 for supplemental discussion of hydrologic modeling and to Appendices H and O for supporting details
Section 5.2	Plans and Policies	Plans and policies relevant to water supply system operations and plan consistency	Yes, changes made to clarify applicability of plans and policies	

USER'S GUIDE TO CHANGES IN THE WSIP FINAL PEIR (Continued)

Section	Name	Description	Changes from the Draft PEIR?	Other Relevant PEIR Sections
		evaluation		
VOLUME 3 (cont.)				
Section 5.3	**Tuolumne River System and Downstream Water Bodies** – Setting and impacts on the Tuolumne River, the San Joaquin River, and the Sacramento–San Joaquin Delta watersheds and associated resources			
Section 5.3.1	Stream Flow and Reservoir Water Levels	Setting and impacts on stream flow and reservoir levels along the Tuolumne River, San Joaquin River, and Sacramento–San Joaquin Delta	Yes, changes made to clarify impact analysis	Refer to Section 13.3 for supplemental discussion of hydrologic modeling and to Sections 14.6, 14.7, and 14.8 for supplemental discussion of stream flow in the Tuolumne River and downstream water bodies
Section 5.3.2	Geomorphology	Setting and impacts on the geomorphology of the Tuolumne River	No changes	Refer to Sections 14.6 and 14.7 for supplemental discussion of the geomorphology along the Tuolumne River
Section 5.3.3	Surface Water Quality	Setting and impacts on surface water quality in the Tuolumne River, the San Joaquin River, and the Sacramento–San Joaquin Delta	Yes, changes made to clarify regulatory framework	Refer to Sections 14.6, 14.7, and 14.8 for supplemental discussion of surface water quality in the Tuolumne River and downstream water bodies
Section 5.3.4	Surface Water Supplies	Setting and impacts on surface water supplies along the lower Tuolumne River, the San Joaquin River, and the Sacramento–San Joaquin Delta	Yes, changes made to clarify one impact	Refer to Section 14.8 for supplemental discussion of issues related to the San Joaquin River and Delta
Section 5.3.5	Groundwater	Setting and impacts on groundwater resources in the Tuolumne River watershed	Yes, changes made to clarify the regulatory setting	
Section 5.3.6	Fisheries	Setting and impacts on fishery resources along the Tuolumne River, the San Joaquin River, and the Sacramento–San Joaquin Delta and	Yes, changes made to clarify two impacts	Refer to Section 6.4 for mitigation measures and to Section 14.7 for supplemental discussion of fisheries in the lower Tuolumne River
Section 5.3.7	Terrestrial Biological Resources	Setting and impacts on terrestrial biological resources along the Tuolumne River, the San Joaquin River, and the Sacramento–San Joaquin Delta	No changes	Refer to Section 6.4 for mitigation measures and to Section 14.6 for supplemental discussion of biological resources along the upper Tuolumne River
Section 5.3.8	Recreational and Visual Resources	Setting and impacts on recreational and visual resources along the Tuolumne River	Yes, changes made to clarify the setting and one impact	
Section 5.3.9	Energy Resources	Setting and impacts on energy resources related to water supply and	No changes	

USER'S GUIDE TO CHANGES IN THE WSIP FINAL PEIR (Continued)

Section	Name	Description	Changes from the Draft PEIR?	Other Relevant PEIR Sections
		system operations		
VOLUME 3 (cont.)				
Section 5.4	**Alameda Creek Watershed Streams and Reservoirs** – Setting and impacts on the Alameda Creek watershed and associated resources			
Section 5.4.1	Stream Flow and Reservoir Water Levels	Setting and impacts on stream flow and reservoir levels in the Alameda Creek watershed	Yes, changes made due to revisions in some facility project descriptions, updated modeling, and refined impact analysis	Refer to Section 6.3 for mitigation measures and to Section 14.9 for supplemental discussion of revisions to facility project descriptions and refined analysis; refer to Appendices H, N, and O for supporting details of the hydrologic analysis
Section 5.4.2	Geomorphology	Setting and impacts on the geomorphology of Alameda Creek	Yes, changes made to clarify impact analysis	
Section 5.4.3	Surface Water Quality	Setting and impacts on surface water quality in the Alameda Creek watershed	Yes, changes made to clarify the setting and one impact	
Section 5.4.4	Groundwater	Setting and impacts on groundwater resources in the Alameda Creek watershed	Yes, changes made to clarify one impact	
Section 5.4.5	Fisheries	Setting and impacts on fishery resources in the Alameda Creek watershed	Yes, changes made due to revisions in some facility project descriptions, updated modeling, and refined impact analysis	Refer to Section 6.3 for mitigation measures, to Section 14.9 for supplemental discussion of Alameda Creek watershed fishery issues, and to Appendix N for supporting details
Section 5.4.6	Terrestrial and Biological Resources	Setting and impacts on terrestrial biological resources in the Alameda Creek watershed	Yes, changes made to clarify three impacts	Refer to Section 6.3 for mitigation measures
Section 5.4.7	Recreational and Visual Resources	Setting and impacts on recreational and visual resources in the Alameda Creek watershed	Yes, changes made to clarify the setting and to refine the impact analysis due to revisions in some facility project descriptions	Refer to Section 13.2 for revisions to facility project descriptions
Section 5.5	**San Francisco Peninsula Streams and Reservoirs** – Setting and impacts on the Peninsula watershed (San Mateo and Pilarcitos Creek watersheds) and associated resources			
Section 5.5.1	Stream Flow and Reservoir Water Levels	Setting and impacts on stream flow and reservoir levels in the watersheds of San Mateo and Pilarcitos Creeks	Yes, changes made due to updated hydrologic modeling and refined Pilarcitos watershed impact analysis	Refer to Section 13.3 for a description of the updated hydrologic modeling and refined Pilarcitos watershed impact analysis
Section 5.5.2	Geomorphology	Setting and impacts on the geomorphology of San Mateo and Pilarcitos Creeks	No changes	
Section 5.5.3	Surface Water Quality	Setting and impacts on surface water quality in the San Mateo and Pilarcitos Creek watersheds	Yes, changes made due to updated hydrologic modeling and refined Pilarcitos watershed impact analysis	Refer to Section 6.4 for mitigation measures and to Section 13.3 for a description of the updated hydrologic modeling and refined Pilarcitos watershed impact analysis

USER'S GUIDE TO CHANGES IN THE WSIP FINAL PEIR (Continued)

Section	Name	Description	Changes from the Draft PEIR?	Other Relevant PEIR Sections
VOLUME 3 (cont.)				
Section 5.5.4	Groundwater	Setting and impacts on groundwater resources in the San Mateo and Pilarcitos Creek watersheds	No changes	
Section 5.5.5	Fisheries	Setting and impacts on fishery resources along San Mateo and Pilarcitos Creeks	Yes, changes made due to updated hydrologic modeling and refined Pilarcitos watershed impact analysis	Refer to Section 6.4 for mitigation measures and to Section 13.3 for a description of the updated hydrologic modeling and refined Pilarcitos watershed impact analysis
Section 5.5.6	Terrestrial Biological Resources	Setting and impacts on terrestrial biological resources in the San Mateo and Pilarcitos Creek watersheds	Yes, changes made due to updated hydrologic modeling and refined Pilarcitos watershed impact analysis	Refer to Section 6.4 for mitigation measures and to Section 13.3 for a description of the updated hydrologic modeling and refined Pilarcitos watershed impact analysis
Section 5.5.7	Recreational and Visual Resources	Setting and impacts on recreational and visual resources along San Mateo and Pilarcitos Creeks	Yes, changes made to clarify the setting	
Section 5.6	Westside Groundwater Basin Resources	Setting and impacts on the north and south portions of the groundwater basin	Yes, changes made to clarify and update the setting and to clarify one impact	Refer to Section 6.4 for mitigation measures
Section 5.7	Cumulative Effects	Cumulative impacts on affected water resources and a discussion of global climate change on the water supply sources	Yes, changes made to update information on cumulative projects and to refine the cumulative analysis of Alameda Creek watershed resources	Refer to Section 14.9 for supplemental discussion of the cumulative analysis of Alameda Creek fisheries and to Section 14.11 for supplemental discussion of global climate change
VOLUME 4				
Chapter 6	**Mitigation Measures**	Detailed description of mitigation measures and discussion of the impacts of mitigation measures	Yes, changes made to refine and clarify several mitigation measures	Refer to Sections 14.7, 14.9, 14.10, 15.2, and 15.4 for supplemental discussion related to clarification and refinement of mitigation measures
Chapter 7	**Growth-Inducement Potential and Indirect Effects of Growth**	Water demand projections and analyses of growth-inducement impacts and secondary effects of growth	Yes, changes made to correct editorial errors and to clarify the discussion	Refer to Appendix E for supporting details
Chapter 8	**WSIP Variants and Impact Analysis**	Description and analysis of variants requested by the SFPUC	Yes, changes made to introduce the Phased WSIP Variant	Refer to Section 13.4 for supplemental discussion of the Phased WSIP Variant
Chapter 9	**CEQA Alternatives**	Description, analysis, and comparison of CEQA alternatives, the alternatives screening process, and the	Yes, changes made due to refined analysis of Pilarcitos watershed resources and to clarify the Modified WSIP	Refer to Section 13.3 for refined Pilarcitos watershed impact analysis and to Section 14.10 for supplemental discussion of the Modified

USER'S GUIDE TO CHANGES IN THE WSIP FINAL PEIR (Continued)

Section	Name	Description	Changes from the Draft PEIR?	Other Relevant PEIR Sections
		alternatives rejected	Alternative	WSIP Alternative
VOLUME 4 (cont.)				
Chapter 10	**Impact Overview**	Significant unavoidable effects and irreversible environmental changes	No changes	
VOLUME 5				
Appendix A	Notice of Preparation / Scoping Report	Copy of Notice of Preparation and Scoping Report	No changes	Supporting information for Chapter 1
Appendix B	WSIP Initial Study Checklist	CEQA checklist of environmental effects	No changes	Refer to Chapters 4, 5, 6, and 7 for complete descriptions of impacts and mitigation measures
Appendix C	WSIP Facility Project Information	WSIP facility improvement project information: facilities; operations; locations; construction; affected roads and construction traffic; and permits, approvals and agency coordination that may be required	Yes, changes made due to revisions in some facility project descriptions	Supporting details for Chapter 4; refer to Section 13.2 for revisions to facility project descriptions
Appendix D	Biological Resources, Special-Status Species	Special-status species in the Alameda and Peninsula watersheds	No changes	Supporting details for Section 4.6
Appendix E	Growth-Inducement Potential and Supporting Information	Supplemental information on water supply assurances, methodology for demand projections, growth trends, and indirect effects of growth	Yes, changes made to correct minor errors	Supporting details for Chapter 7
Appendix F	Noise and Traffic Background Data	Typical maximum construction noise levels, estimated maximum truck noise levels, and background traffic volumes	No changes	Supporting details for Sections 4.8 and 4.10
Appendix G	Hazardous Materials	Regulatory framework for hazardous materials	No changes	Supporting details for Section 4.14
Appendix H	Modeling Analysis – Water Supply and System Operations	Supporting information on the hydrologic modeling used in the Draft PEIR for water supply and system operations impacts	Yes, changes made to include reference citation	Refer to Appendix O for updated modeling results
Appendix I	Report Preparers	EIR authors and consultants	Yes, changes to update information	
VOLUME 6				
Chapter 11	**Introduction to Comments and Responses**	Update of CEQA process, list of commenters, and guide	Yes, editorial changes made from Comments and Responses	Supplements information in Chapter 1; refer to Appendices K, L, and M for

USER'S GUIDE TO CHANGES IN THE WSIP FINAL PEIR (Continued)

Section	Name	Description	Changes from the Draft PEIR?	Other Relevant PEIR Sections
		to responses	document to reflect updated CEQA process for the PEIR	additional supporting details
VOLUME 6 (cont.)				
Chapter 12	**Comment Letters**			
Section 12.1	Federal Agencies	Comments from federal agencies	No changes	Refer to Section 15.1 for responses
Section 12.2	State Agencies	Comments from state agencies	No changes	Refer to Section 15.2 for responses
Section 12.3	Local and Regional Agencies	Comments from local and regional agencies	No changes	Refer to Section 15.3 for responses
Section 12.4	Groups	Comments from groups	No changes	Refer to Section 15.4 for responses
Section 12.5	Citizens	Comments from citizens	No changes	Refer to Section 15.5 for responses
Section 12.6	Public Hearing Transcripts	Copies of transcripts from public hearings	No changes	Refer to Chapter 15 for responses
Section 12.7	Form Letters	Form letter comments	No changes	Refer to Section 15.6 for responses
VOLUME 7a				
Chapter 13	**Introduction to Responses and WSIP Revisions**			
Section 13.1	Overview of Responses	Organization of responses	No changes	
Section 13.2	Program Description Changes	Revisions to the proposed program since publication of the Draft PEIR	No changes	Supplements information in Chapter 3
Section 13.3	Updated Water System Assumptions	Updated information on hydrologic modeling	No changes	Supplements information in Sections 5.1, 5.4, and 5.5
Section 13.4	Phased WSIP Variant	Description and environmental impacts of the Phased WSIP	Yes, changes made from Comments and Responses document to correct errors that were previously published in an errata	Supplements information in Chapters 3 and 8
Chapter 14	**Master Responses** – Comprehensive responses to issues that received numerous comments			
Section 14.1	Purpose and Need	Master response	No changes	Supplements information in Chapter 3
Section 14.2	Demand Projections, Conservation, and Recycling	Master response	No changes	Supplements information in Chapter 3
Section 14.3	Proposed Dry-Year Transfer	Master response	No changes	Supplements information in Chapter 3

USER'S GUIDE TO CHANGES IN THE WSIP FINAL PEIR (Continued)

Section	Name	Description	Changes from the Draft PEIR?	Other Relevant PEIR Sections
Section 14.4	PEIR Appropriate Level of Analysis	Master response	No changes	Supplements information in Chapter 4
VOLUME 7a (cont.)				
Section 14.5	Water Resources Modeling	Master response	No changes	Supplements information in Section 5.1
Section 14.6	Upper Tuolumne River Issues	Master response	No changes	Supplements information in Section 5.3
Section 14.7	Lower Tuolumne River Issues	Master response	No changes	Supplements information in Section 5.3
Section 14.8	Delta and San Joaquin River Issues	Master response	No changes	Supplements information in Section 5.3
Section 14.9	Alameda Creek Fishery Issues	Master response	No changes	Supplements information in Sections 5.4 and 5.7; refer also to Appendix N
Section 14.10	Modified WSIP Alternative	Master response	No changes	Supplements information in Chapter 9
Section 14.11	Climate Change	Master response	No changes	Supplements information in Section 5.7
Chapter 15	**Responses to Individual Comments**			
Section 15.1	Federal Agencies	Responses to comments from federal agencies	No changes	See Section 12.1 for comments
Section 15.2	State Agencies	Responses to comments from state agencies	No changes	See Section 12.2 for comments
Section 15.3	Local and Regional Agencies	Responses to comments from local and regional agencies	No changes	See Section 12.3 for comments
VOLUME 7b				
Chapter 15	**Responses to Individual Comments (cont.)**			
Section 15.4	Groups	Responses to comments from groups	No changes	See Section 12.4 for comments
Section 15.5	Citizens	Responses to comments from citizens	No changes	See Section 12.5 for comments
Section 15.6	Form Letters	Responses to form letter comments	No changes	See Section 12.7 and Appendix L for comments
Chapter 16	**Staff-Initiated Text Changes**	Revisions to Draft PEIR	No changes	Refer to all chapters with changes from the Draft PEIR
VOLUME 8				
Appendix J	Draft PEIR Notification	Draft PEIR notification, mailing list, and public hearing materials	No changes	Provides supplemental information to Chapter 11
Appendix K	Attachment Log	Summary of attachments	No changes	Provides supplemental

USER'S GUIDE TO CHANGES IN THE WSIP FINAL PEIR (Continued)

Section	Name	Description	Changes from the Draft PEIR?	Other Relevant PEIR Sections
		to comments		information to Chapter 12
Appendix L	Form Letter 1 Submittals	Copies of form letters	No changes	Refer to Section 12.7 for responses
VOLUME 8 (cont.)				
Appendix M	Comment Letters Received After December 31, 2007	Copies of comment letters received after December 31, 2007 and cross-references to pertinent responses	No changes	Provides supplemental information to Chapter 12
Appendix N	Technical Memorandum – Estimation of Flow Changes in Lower Alameda Creek	Supporting analysis of flows in lower Alameda Creek	No changes	Provides supporting information for Sections 5.4 and 14.9
Appendix O	Hydrologic Modeling – Additional Supporting Information	Updated hydrologic modeling results prepared for the Comments and Responses document	No changes	Refer to Appendix H for modeling results used in the Draft PEIR

Attachments:

1. Planning Commission Motion No. 17734, October 30, 2008
2. Water System Improvement Program, California Environmental Quality Act Findings

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Subject to: (Select only if applicable)

☐ Inclusionary Housing (Sec. 315)
☐ Jobs Housing Linkage Program (Sec. 313)
☐ Downtown Park Fee (Sec. 139)
☐ First Source Hiring (Admin. Code)
☐ Child Care Requirement (Sec. 314)
☐ Other

Planning Commission Motion No. 17734

HEARING DATE: October 30, 2008

Hearing Date:	October 30, 2008
Case No.:	**2005.0159E**
Project:	**Water System Improvement Program**
Zoning:	N/A
Block/Lot:	N/A
Project Sponsor:	San Francisco Public Utilities Commission 1155 Market Street, 11th Floor San Francisco, CA 94103
Staff Contact:	Diana Sokolove - (415) 575-9046 diana.sokolove@sfgov.org

ADOPTING FINDINGS RELATED TO THE CERTIFICATION OF A FINAL PROGRAM ENVIRONMENTAL IMPACT REPORT FOR A PROPOSED WATER SYSTEM IMPROVEMENT PROGRAM FOR THE SAN FRANCISCO PUBLIC UTILITIES COMMISSION.

MOVED, that the San Francisco Planning Commission (hereinafter "Commission") hereby CERTIFIES the Final Program Environmental Impact Report identified as Case No. 2005.0159E for the Water System Improvement Program (WSIP), including a series of facilities improvement projects, in Alameda, Santa Clara, San Francisco, San Joaquin, San Mateo, Stanislaus, and Tuolumne Counties (hereinafter "Project"), based upon the following findings:

1. The City and County of San Francisco, acting through the Planning Department (hereinafter "Department") fulfilled all procedural requirements of the California Environmental Quality Act (Cal. Pub. Res. Code Section 21000 *et seq.*, hereinafter "CEQA"), the State CEQA Guidelines (Cal. Admin. Code Title 14, Section 15000 *et*

seq., (hereinafter "CEQA Guidelines") and Chapter 31 of the San Francisco Administrative Code (hereinafter "Chapter 31").

A. The Department determined that a Program Environmental Impact Report (hereinafter "PEIR") was required and in accordance with Sections 15063 and 15082 of the CEQA Guidelines, the Department prepared a Notice of Preparation (NOP) of an EIR and conducted scoping meetings (see Draft PEIR, Appendix A). The NOP was circulated to local, state, and federal agencies and to other interested parties on September 6, 2005, initiating a public comment period that extended through October 24, 2005. Pursuant to CEQA Guidelines Section 15083, the San Francisco Planning Department held five public scoping meetings, one each in Sonora, Modesto, Fremont, Palo Alto and San Francisco, between October 5, 2005 and October 19, 2005. The purpose of the meetings was to present the proposed WSIP to the public and receive public input regarding the proposed scope of the Program EIR analysis. A scoping report was prepared to summarize the public scoping process and the comments received in response to the NOP, and the main body of the report is included in Appendix A of the Draft Program EIR.

B. On June 29, 2007, the Department published the Draft Program Environmental Impact Report (hereinafter "DPEIR") and provided public notice in a newspaper of general circulation of the availability of the DPEIR for public review and comment and of the date and time of the Planning Commission public hearings on the DPEIR; this notice was mailed to the Department's list of persons requesting such notice and other interested parties.

C. Notices of availability of the DPEIR and of the date and time of the public hearing were posted near the project site at O'Shaughnessy Dam in Tuolumne County by Department staff on July 25, 2007, and posting of the Notice of Availability were made by Department staff at a public library in each of the counties potentially affected by the Program (i.e., Alameda, San Francisco, San Joaquin, San Mateo, Santa Clara, Stanislaus, and Tuolumne Counties) in July 2007.

D. On June 29, 2007, copies of the DPEIR were mailed or otherwise delivered to a list of persons requesting it, to those noted on the distribution list in the DPEIR, and to government agencies, the latter both directly and through the State Clearinghouse. The DPEIR was posted on the Department's website.

E. Notice of Completion was filed with the State Secretary of Resources via the State Clearinghouse on June 29, 2007.

2. The DPEIR was circulated to local, state, and federal agencies and to interested organizations and individuals for review and comment on June 29, 2007 for a 90-day public review period. The public review period was subsequently extended and closed on October 15, 2007, for a total of 108 days. Six duly advertised public

hearings on the Draft PEIR to accept written or oral comments were held in Sonora, Modesto, Fremont, Palo Alto, and San Francisco (two hearings) between September 5, 2007 and October 11, 2007. All of the public hearings transcripts are in the Project record.

3. The Department prepared responses to comments on environmental issues received at the public hearings and in writing during the public review period for the DPEIR, prepared revisions to the text of the DPEIR in response to comments received or based on additional information that became available during the public review period, and corrected errors in the DPEIR. This material was presented in a Draft Comments and Responses document, published on September 30, 2008, distributed to the Commission and all parties who commented on the DPEIR, and made available to others upon request at Department offices and on the Department's website.

4. A Final Program Environmental Impact Report (hereinafter "FPEIR") has been prepared by the Department, consisting of the Draft Program Environmental Impact Report, any consultations and comments received during the review process, any additional information that became available, and the Comments and Responses, all as required by law.

5. Project files on the FPEIR have been made available for review by the Commission and the public. These files are available for public review at the Department offices at 1650 Mission Street, and are part of the record before the Commission. Linda Avery is the custodian of records. Copies of the DPEIR and associated reference materials as well as the C&R document are also available for review at public libraries in each of the following counties: Alameda, San Francisco, San Joaquin, San Mateo, Santa Clara, Stanislaus, and Tuolumne.

6. The San Francisco Public Utilities Commission, the Project Sponsor, has indicated that the presently preferred program is the Phased WSIP Variant, which is described and analyzed in the FPEIR.

7. The FPEIR added new information to the DPEIR, as detailed in the Department Staff Memorandum dated October 16, 2008. This additional information does not involve a new significant environmental impact, a substantial increase in the severity of a significant environmental impact, or a feasible alternative or mitigation measure considerably different from others previously analyzed that would clearly lessen the significant environmental impacts of the Program and that the Project Sponsor declines to adopt. No information indicates that the DPEIR was inadequate or conclusory. Therefore, recirculation of the PEIR is not required or necessary because: (1) no new significant environmental impact would result from the Program (the Phased WSIP Variant as well as the originally preferred Program) or from a new mitigation measure proposed to be implemented; (2) no substantial increase in the severity of an environmental impact would result; (3) no feasible program

alternative or mitigation measure considerably different from others previously analyzed would clearly lessen the environmental impacts of the Phased WSIP Variant, but the project's proponents decline to adopt it; and (4) the Draft PEIR was not so fundamentally and basically inadequate and conclusory in nature so that meaningful public review and comment were precluded.

8. The Commission, in certifying the completion of said FPEIR, hereby does find that the Phased WSIP Variant described in the FPEIR and preferred by the Project Sponsor, will have the following significant and unavoidable effects on the environment.

Significant and Unavoidable Water Supply/System Operations Impacts:

- The proposed water supply and system operations would reduce stream flows and alter the stream hydrograph along Alameda Creek below the Alameda Creek Diversion Dam in the Alameda Creek watershed in Alameda County and result in a significant and unavoidable impact on stream flow in Alameda Creek between the diversion dam and the confluence with Calaveras Creek;
- The proposed water supply and system operations would result in a potentially significant and unavoidable impact in the Peninsula watershed on fishery resources in Crystal Springs Reservoir in San Mateo County; and
- The Program would indirectly contribute to potentially significant and unavoidable environmental impacts caused by growth in the SFPUC service area, as identified in the planning documents and associated environmental documents for the affected jurisdictions.

Potentially Significant and Unavoidable WSIP Facility Improvement Project Impacts:

The WSIP may have significant and unavoidable impacts on the environment in the following ways based on programmatic information provided in the FPEIR about the WSIP facilities improvement projects. These impacts will be reevaluated in subsequent CEQA documentation based on site-specific, project-level information. Until more detailed project-level assessments are completed to determine the significance of impacts, these impacts are conservatively considered to be potentially significant and unavoidable. The impacts include:

Land Use and Visual Quality

- Temporary disruption or displacement of land uses during construction periods.

- Existing land uses could be displaced to accommodate proposed facilities at some locations.

- Removal of a large area of existing oak woodland cover as part of the Calaveras Dam Replacement project would permanently alter a scenic vista.

Cultural Resources

- Alteration or demolition of existing or potential historic facilities.

- Substantial adverse effects on existing or potential historic districts.

Noise and Vibration

- Excessive construction noise could occur in close proximity to sensitive receptors and audible construction noise could occur during the more noise-sensitive nighttime hours.

- Construction activities could generate vibration in proximity to sensitive receptors during the nighttime hours with implementation of some WSIP facility projects.

Biological Resources

- Multiple facility improvement projects in the Sunol Valley would have a potentially significant and unavoidable collective impact on biological resources because of the number of WSIP projects in this region and the extent of overlap in terms of construction activity timing and location.

- Potentially significant and unavoidable collective impacts on special-status plant species could occur during construction of the Crystal Springs/San Andreas Transmission Upgrade and Lower Crystal Springs Dam projects.

Impacts Due to Implementation of Multiple WSIP Projects (Collective Impacts)

- Temporary impacts on existing land uses near the Irvington Tunnel portal in Fremont could occur during construction if staging and access under both the New Irvington Tunnel and Bay Division Pipeline Reliability Upgrade projects overlap in this vicinity.

- Impacts on biological resources in Sunol Valley because of the number of WSIP projects in this region and the extent of overlap in terms of construction activity timing and location.
- Impacts on biological resources (special-status plant species) on the Peninsula during construction of the Crystal Springs/San Andreas Transmission Upgrade and Lower Crystal Springs Dam projects.
- Impacts on historical resources due to implementation of multiple projects in areas with water system facilities more than 45 years old.
- Truck traffic impacts due to the numerous potentially-affected roadways, including regional roadways.
- Multi-regional effects on air quality from ozone and particulate matter emissions during construction of multiple projects.
- Noise impacts from construction of multiple WSIP projects the San Joaquin, Bay Division, Peninsula, and San Francisco regions.

Impacts Due to Implementation of all WSIP Projects Combined with Non-WSIP Projects (Cumulative Impacts)

- Impacts on individual historic resources or on potential historic districts in the Sunol Valley and Peninsula regions.
- Regionwide traffic impacts from construction-related traffic (e.g., increased travel times).
- Regionwide air quality impacts due to the nonattainment status for ozone and particulate matter in both the San Francisco Bay Area and San Joaquin Valley Air Basins as well as the Program's contribution to construction-related diesel particulate matter emissions.
- Construction-related noise impacts on local and regional roadways.

9. On October 30, 2008, the Commission reviewed and considered the FPEIR and hereby does find that the contents of said report and the procedures through which the FPEIR was prepared, publicized and reviewed comply with the provisions of

CEQA, the CEQA Guidelines and Chapter 31 of the San Francisco Administrative Code.

10. The Planning Commission hereby does find that the FPEIR concerning File No. 2005.0159E, Water System Improvement Program, reflects the independent judgment and analysis of the City and County of San Francisco, is adequate, accurate and objective, and that the Comments and Responses document contains no significant revisions to the DPEIR, and hereby does CERTIFY THE COMPLETION of said FPEIR in compliance with CEQA and the CEQA Guidelines.

I hereby certify that the foregoing Motion was ADOPTED by the Planning Commission at its regular meeting of October 30, 2008.

AM FOR

Linda Avery
Commission Secretary

AYES: Commissioners Olague, Miguel, Antonini, Borden, Moore, and Lee

NOES: None

ABSENT: None

EXCUSED: Commissioner Sugaya

ADOPTED: October 30, 2008

ATTACHMENT A

WATER SYSTEM IMPROVEMENT PROGRAM

CALIFORNIA ENVIRONMENTAL QUALITY ACT FINDINGS: FINDINGS OF FACT, EVALUATION OF MITIGATION MEASURES AND ALTERNATIVES, AND STATEMENT OF OVERRIDING CONSIDERATIONS

SAN FRANCISCO PUBLIC UTILITIES COMMISSION

In determining to approve the Phased Variant of the Water System Improvement Program ("Phased WSIP Variant" or the "Program"), the San Francisco Public Utilities Commission ("SFPUC") makes and adopts the following findings of fact and decisions regarding mitigation measures and alternatives, and adopts the statement of overriding considerations, based on substantial evidence in the whole record of this proceeding and under the California Environmental Quality Act ("CEQA"), California Public Resources Code Sections 21000 et seq., particularly Sections 21081 and 21081.5, the Guidelines for Implementation of CEQA ("CEQA Guidelines"), 14 California Code of Regulations Sections 15000 et seq., particularly Sections 15091 through 15093, and Chapter 31 of the San Francisco Administration Code.

This document is organized as follows:

Section I provides a description of the Program proposed for adoption (the Phased WSIP Variant), the environmental review process for the Program, the approval actions to be taken and the location of records;

Section II identifies the impacts found not to be significant that do not require mitigation;

Section III identifies potentially significant impacts that can be avoided or reduced to less-than-significant levels through mitigation and describes the disposition of the mitigation measures;

Section IV identifies significant impacts that cannot be avoided or reduced to less-than significant levels and describes any applicable mitigation measures as well as the disposition of the mitigation measures;

Section V evaluates the different Program alternatives and the economic, legal, social, technological, and other considerations that support approval of the Phased WSIP Variant and the rejection of the alternatives, or elements thereof, analyzed; and

Section VI presents a statement of overriding considerations setting forth specific reasons in support of the Commission's actions and its rejection of the alternatives not incorporated into the Program.

The Mitigation Monitoring and Reporting Program ("MMRP") for the mitigation measures that have been proposed for adoption is attached with these findings as **Attachment B**. The MMRP is required by CEQA Section 21081.6 and CEQA Guidelines Section 15091. Attachment B provides a table setting forth each mitigation measure listed in the Final Program Environmental Impact Report for the WSIP ("Final PEIR" or "PEIR") that is required to reduce or avoid a significant adverse impact. Attachment B also specifies the agency responsible for implementation of each measure and establishes monitoring actions and a monitoring schedule. The full text of the mitigation measures is set forth in Attachment B.

These findings are based upon substantial evidence in the entire record before the Commission. The references set forth in these findings to certain pages or sections of the Draft Program Environmental Impact Report ("Draft PEIR" or "DEIR") or the Comments and Responses document ("C&R") in the Final PEIR are for ease of reference and are not intended to provide an exhaustive list of the evidence relied upon for these findings.

I. APPROVAL OF THE PROGRAM

A. Program Description

By this action, the SFPUC adopts and implements substantially the Program identified as the Phased WSIP Variant in Chapter 13, Section 13.4 of the PEIR, to increase the reliability of the regional water system that serves 2.4 million people in San Francisco and the San Francisco Bay Area; the Phased WSIP Variant is a variation of the original WSIP described in Chapter 3 of the PEIR. The Phased WSIP Variant involves *full implementation of all proposed WSIP facility improvement projects* as described in Chapter 3 of the Draft EIR to insure that the public health, seismic safety and delivery reliability goals are achieved as soon as possible *and phased implementation of a water supply program to meet projected water purchases through 2030*. Under the Phased WSIP Variant, the SFPUC establishes an interim mid-term planning horizon – 2018. The Commission is making a decision about providing water supply to the water customers through 2018 only, and is deferring a decision regarding long-term water supply after 2018 and through 2030 until it undertakes further water supply planning and demand analysis. All non-water supply related goals and system performance objectives identified for the original WSIP would be achieved under the Phased WSIP Variant and all individual WSIP facility improvement projects proposed in the original WSIP would be constructed.

Under the Phased WSIP Variant, the SFPUC will construct and operate all the regional water system WSIP facility improvement projects while (1) limiting water sales to an average annual of 265 million gallons per day (mgd) from the watersheds through 2018; and (2) improving water supply reliability to meet the goals and objectives of the WSIP including no greater than 20 percent rationing systemwide in any one year of a drought. The Phased WSIP Variant would not provide water supply to meet 300 mgd average annual water sales in 2030 as proposed under the WSIP. Rather, the SFPUC would limit deliveries to no more than an annual average of 265 mgd from the watersheds through 2018, and the SFPUC and wholesale customers would collectively develop 20 mgd in conservation, recycled water, and groundwater to meet or offset the projected regional water system purchase request of 285 mgd in 2018. This 20 mgd of conservation, recycled water, and groundwater includes development of 10 mgd of conservation, recycled water and groundwater in San Francisco as proposed under the WSIP and 10 mgd of conservation, recycled water and groundwater developed by the wholesale customers, which is in addition to 15 mgd of conservation, recycled water and groundwater already assumed by the wholesale customers in preparing their regional water system purchase requests.

There is no change between the WSIP and the Phased WSIP Variant in the average annual water delivery proposed for the SFPUC's retail customers; the current average annual retail customer demand is approximately 91 mgd and this same amount would be provided to the retail customers through 2018, although 10 mgd of this amount would be provided through conservation, recycled water, and groundwater developed in San Francisco. While the WSIP proposed to provide the full 2030 projected wholesale customer average annual purchase requests of 209 mgd, the Phased WSIP Variant instead is designed to meet a projected 2018 wholesale customer average annual purchase request of 194 mgd in 2018, although 10 mgd of this amount would be provided through conservation, recycled water, and groundwater projects.

Under the Phased WSIP Variant, the SFPUC also would implement the delivery and drought reliability elements of the WSIP, including the Westside Basin Conjunctive Use Project and proposed dry-year transfers from the Modesto Irrigation District ("MID") and the Turlock Irrigation District ("TID"), which would increase average annual diversions from the Tuolumne River by about 2 mgd over existing conditions.

Before 2018, the SFPUC would engage in a new planning process to re-evaluate water system demands and water supply options. As part of the process, San Francisco would conduct additional environmental studies and CEQA review as appropriate to address the SFPUC's recommendation regarding water supply and proposed water system deliveries after 2018. This Commission would review and consider approval of the terms of any new master Water Sales Agreement that would take effect after 2018.

As originally proposed, the WSIP established program goals for improvements to the regional water system and system performance objectives in the areas of water quality, seismic reliability, delivery reliability, and water supply through the year 2030. The facility improvement projects and the proposed water supply option included in the WSIP as originally proposed were designed to: (1) ensure compliance with existing and anticipated future water quality standards under all operating conditions; (2) upgrade the seismic standards of critical facilities to improve seismic reliability and to reduce the system's vulnerability to earthquakes; (3) improve water delivery reliability under a variety of operating conditions by improving overall operations of the system; and (4) assure that the SFPUC has an adequate supply of water available to deliver to customers during both non-drought and drought periods through 2030.

The SFPUC initially proposed the draft WSIP in early 2005 as the result of long-term planning and in response to legislative mandates, including a 2002 voter-approved bond measure. The draft WSIP is described in PEIR Chapter 3. For budgeting and management purposes, the SFPUC categorized as part of the WSIP all capital improvements and projects that will receive financing from the 2002 voter-approved bond measure. Some, but not all, of the activities and projects that the SFPUC has identified for financing purposes as part of the WSIP are analyzed in the Program EIR as explained in PEIR Section 3.4. (CEQA Guidelines section 15168.) Other proposed WSIP activities that are not evaluated in the PEIR are undergoing independent project-level CEQA review as explained in EIR Section 3.4.6. For purposes of these CEQA findings, the facility projects included under the "Program," "WSIP," or "Variant" refer only to the facility improvement projects included in the PEIR. WSIP facility improvement projects included in the PEIR will also undergo independent project-level CEQA review.

In March 2008, the SFPUC determined that it would like the option to consider approval and implementation of a variation of the WSIP. The program variation is called the Phased WSIP Variant and is a hybrid combination of the WSIP program as originally proposed and the No Purchase Request Increase Alternative analyzed in the Draft EIR at pages 9-7 through 9-16, 9-40 through 9-47 and 9-84 through 9-96, as well as the Modified WSIP Alternative analyzed in the Draft PEIR at pages 9-7 through 9-16 and 9-78 through 9-96 and in the C&R pages 14.10-1 through 14.10-26. The Phased WSIP Variant also includes some elements of the Aggressive Conservation and Recycling Alternative analyzed in the Draft EIR at pages 9-7 through 9-16, 9-47 through 9-59, and 9-84 through 9-96.

The Phased WSIP Variant includes the following key program elements:

- Full implementation of all of the 17 proposed WSIP facility improvement projects described in the PEIR (Draft EIR Sections 3.4.6 and 3.8; C&R Chapter 16, pages 16-14 to 16-17).
- Water supply delivery to regional water system customers through 2018 only of 265 mgd average annual target delivery originating from the Tuolumne, Alameda and Peninsula watersheds. This includes 184 mgd for the wholesale customers (including 9 mgd for the cities of San Jose and Santa Clara), and 81 mgd for the retail customers.
- Development of 20 mgd of conservation, recycled water and groundwater within the service area (10 mgd retail; 10 mgd wholesale).
- Dry year transfer from MID and/or TID of about 2 mgd coupled with the Westside Groundwater Basin conjunctive-use project to meet the drought year goal of limiting rationing to no more than 20 percent on a systemwide basis.
- Re-evaluation of 2030 demand projections, potential regional water system purchase requests, and water supply options by 2018 and a separate SFPUC decision in 2018 regarding regional water system water deliveries after 2018.
- Financial incentives to limit water sales to an annual average of 265 mgd from the watersheds.

The SFPUC will deliver to customers up to 265 mgd from the SFPUC watersheds on an average annual basis. While average annual deliveries from the SFPUC watersheds would be limited to 265 mgd such that there would be no increase in diversions from the Tuolumne River to serve additional demand, there would be a small increase in average annual Tuolumne River diversions of about 2 mgd over existing conditions in order to meet the delivery and drought reliability elements through 2018. As part of adoption of this Program, the SFPUC will implement the mitigation measures identified for the Phased WSIP Variant in the Final PEIR, including measures addressing interim impacts from potential increases in deliveries from the SFPUC watersheds over the total average annual of 265 mgd in the event that conservation, recycled water and groundwater projects are not completed prior to the increase in customers' demand.

The SFPUC must maintain water deliveries to all its customers for the protection of public health and safety. Therefore, the SFPUC will work with its customers to develop financial incentives to limit water sales to an average annual amount of 265 mgd from the watersheds through 2018.

With the projected 20 mgd of conservation, recycled water and groundwater projects, the system would meet average daily demand of 285 mgd in 2018.

Summaries of the WSIP facility improvement projects and the WSIP water supply under the Phased WSIP Variant are provided in the SFPUC staff memorandum dated September 30, 2008, and summaries of the WSIP facility improvement projects are set forth in PEIR Chapter 3, pages 3-48 through 3-73 and Appendix C, and are listed below. The projects are analyzed in the PEIR, Chapter 4. This approval action slightly modified the staff recommendation as set forth in the Resolution.

Phased WSIP Variant Facility Improvement Projects

The size and design of the WSIP facility improvement projects are driven by the system performance objectives and would not change as a result of the water supply decision proposed in the Phased WSIP Variant. The SFPUC prepared a memorandum describing the factors affecting facilities capacity, dated July 29, 2008, and the information from that memorandum is incorporated by reference here. The draft WSIP included multiple program goals for improving seismic reliability and water delivery reliability, meeting current and future water quality regulations, and meeting water supply reliability goals through the year 2030. Design and capacity of the WSIP facility improvement projects is driven by all four of the WSIP objectives -- the need to improve system performance for seismic reliability and water delivery reliability as well as maintaining high water quality standards and meeting water supply goals. All four of these objectives are factored into the decision on how to size the WSIP's individual facilities. As is explained in the SFPUC memorandum, even if the goal of meeting projected increases in water supply demands were dropped from the mix of program objectives, the other program goals would cause the SFPUC to design WSIP facility improvement projects of the same size. The sizing of the facilities is necessary to reliably deliver an average annual amount up to 300 mgd in light of the regional system's needs for seismic and delivery reliability during both drought and non-drought periods, and to meet water quality requirements.

The Phased WSIP Variant includes the following facility improvement projects:

San Joaquin Region
SJ-1, Advanced Disinfection
SJ-2, Lawrence Livermore Supply Improvements
SJ-3, San Joaquin Pipeline System
SJ-5, Tesla Portal Disinfection Station

Sunol Valley Region
SV-1, Alameda Creek Fishery Enhancement
SV-2, Calaveras Dam Replacement
SV-3, Additional 40-mgd Treated Water Supply
SV-4, New Irvington Tunnel
SV-5, SVWTP – Treated Water Reservoirs
SV-6, San Antonio Back-Up Pipeline

Bay Division Region
BD-1, Bay Division Pipeline Reliability Upgrade

Peninsula Region
PN-2, Crystal Springs/San Andreas Transmission Upgrade
PN-3, HTWTP Long-Term Improvements
PN-4, Lower Crystal Springs Dam Improvement:

San Francisco Region
SF-1, San Andreas Pipeline No. 3 Installation
SF-2, Groundwater Projects
SF-3, Recycled Water Projects

B. Program Objectives

The SFPUC developed the WSIP to address several problems and issues that it had identified with its regional water system. In developing the WSIP goals and objectives, the SFPUC incorporated two fundamental principles pertaining to the existing regional system: (1) maintaining a clean, unfiltered water source from the Hetch Hetchy system, and (2) maintaining a gravity-driven system.

Among the considerations leading to identification of the WSIP were the following:

• *Aging Infrastructure.* The SFPUC regional water system is old. Many of its components were built in the 1800s and early 1900s; parts of the regional water system were built using now-outdated construction materials and/or methods and are currently in need of major repair. As the system ages, its reliability decreases and the risk of failure increases.

• *Exposure to Seismic and Other Hazards.* The 167-mile-long system crosses five active earthquake faults. Many of the SFPUC regional water system components are located on or in the immediate vicinity of major earthquake faults. Due to the age of the system, many facilities do not meet modern seismic standards. To protect public safety, the California Department of Water Resources, Division of Safety of Dams has imposed operating restrictions on Calaveras and Crystal Springs Reservoirs, reducing the local storage capacity and impairing normal system operations; this storage capacity needs to be restored.

• *Maintain Water Quality.* The regional water system currently meets or exceeds existing water quality standards. However, system upgrades are needed to improve the SFPUC's ability to continue to maintain compliance with current water quality standards and to meet anticipated future water quality standards under a range of operating conditions, including such events as a major earthquake, without reducing system reliability.

• *Improve Asset Management and Delivery Reliability.* In order to implement a feasible asset management program in the future that will provide continuous maintenance and repairs to facilities, the regional water system requires redundancy (i.e., backup) of some critical facilities necessary to meeting day-to-day customer water supply needs. Without adequate redundancy of critical facilities, the SFPUC has limited operational flexibility in the event of an emergency or a system failure, as well as constraints on conducting adequate system inspection and maintenance.

• *Meet Customer Water Demands.* Additional supplies are needed to satisfy current demand in drought years and projected 2030 demand in all years. The experience of the last 150 years of record as well as recent studies on California's climate show the region is susceptible to droughts. Two of the most severe droughts occurred during the past 30 years. The regional water system currently has insufficient water supply to meet customer demand during a prolonged drought, and this situation will worsen in the future.

To address these challenges to the reliability of the regional water system, the SFPUC must replace or upgrade numerous components of the system and add some new components—thus the need for the WSIP and its associated facility improvement projects.

Goals and objectives were established for the WSIP described and analyzed in the PEIR. Because of the decision to phase implementation of a water supply program to meet projected water purchases through 2030, the water supply objective for the Phased WSIP Variant is slightly different from the water supply objective originally proposed, as revised below. The goals and objectives of the Phased WSIP Variant are presented below.

Phased WSIP GOALS AND OBJECTIVES

Program Goal	System Performance Objective
Water Quality – *maintain high water quality*	• Design improvements to meet current and foreseeable future federal and state water quality requirements. • Provide clean, unfiltered water originating from Hetch Hetchy Reservoir and filtered water from local watersheds. • Continue to implement watershed protection measures.
Seismic Reliability – *reduce vulnerability to earthquakes*	• Design improvements to meet current seismic standards. • Deliver basic service to the three regions in the service area (East/ South Bay, Peninsula, and San Francisco) within 24 hours after a major earthquake. Basic service is defined as average winter-month usage, and the performance objective for design of the regional system is 229 mgd. The performance objective is to provide delivery to at least 70 percent of the turnouts in each region, with 104, 44, and 81 mgd delivered to the East/South Bay, Peninsula, and San Francisco, respectively. • Restore facilities to meet average-day demand of up to 300 mgd within 30 days after a major earthquake.

Program Goal	System Performance Objective
Delivery Reliability – *increase delivery reliability and improve ability to maintain the system*	• Provide operational flexibility to allow planned maintenance shutdown of individual facilities without interrupting customer service. • Provide operational flexibility to minimize the risk of service interruption due to unplanned facility upsets or outages. • Provide operational flexibility and system capacity to replenish local reservoirs as needed. • Meet the estimated average annual demand of up to 300 mgd under the conditions of one planned shutdown of a major facility for maintenance concurrent with one unplanned facility outage due to a natural disaster, emergency, or facility failure/upset.
Water Supply – *meet customer water needs in non-drought and drought periods*	• Meet average annual water demand of 265 mgd from the SFPUC watersheds for retail and wholesale customers during non -drought years for system demands through 2018. • Meet dry-year delivery needs through 2018 while limiting rationing to a maximum 20 percent system-wide reduction in water service during extended droughts. • Diversify water supply options during non-drought and drought periods. • Improve use of new water sources and drought management, including groundwater, recycled water, conservation, and transfers.
Sustainability – *enhance sustainability in all system activities*	• Manage natural resources and physical systems to protect watershed ecosystems. • Meet, at a minimum, all current and anticipated legal requirements for protection of fish and wildlife habitat. • Manage natural resources and physical systems to protect public health and safety.
Cost-effectiveness – *achieve a cost-effective, fully operational system*	• Ensure cost-effective use of funds. • Maintain gravity-driven system. • Implement regular inspection and maintenance program for all facilities.

C. Environmental Review

In accordance with Sections 15063 and 15082 of the CEQA Guidelines, the San Francisco Planning Department, as lead agency, prepared a Notice of Preparation (NOP) of an EIR and conducted scoping meetings (see Draft PEIR, Appendix A). The NOP was circulated to local, state, and federal agencies and to other interested parties on September 6, 2005, initiating a public comment period that extended through October 24, 2005.

As indicated in the NOP, the Program EIR addresses the full range of environmental impacts of the WSIP. The NOP included a preliminary list of the potential environmental impacts related to the following resource topics: surface water resources; groundwater resources; fisheries and aquatic resources; terrestrial vegetation and wildlife; geology, soils, and seismicity; cultural resources; land use, plans, and policies; recreation; agricultural resources; traffic, transportation, and circulation; air quality; noise and vibration; public services, utilities, and energy; hazards and public safety; visual quality; socioeconomics; growth-inducement potential and secondary effects of growth; and cumulative effects. The NOP provided a general description of the proposed action, the need for the program and program benefits, the proposed facilities, and the program location.

Pursuant to CEQA Guidelines Section 15083, the San Francisco Planning Department held five public scoping meetings, one each in Sonora, Modesto, Fremont, Palo Alto and San Francisco, between October 5, 2005 and October 19, 2005. The purpose of the meetings was to present the proposed WSIP to the public and receive public input regarding the proposed scope of the Program EIR analysis. Attendees were provided an opportunity to voice comments or concerns regarding potential effects of the WSIP.

A scoping report was prepared to summarize the public scoping process and the comments received in response to the NOP, and the main body of the report is included in Appendix A of the Draft Program EIR. Based on sign-in sheets at each of the meetings, 260 participants attended the scoping meetings, with 75 of those participants providing oral comments. Transcripts of each scoping meeting are included in the full scoping report on file with the San Francisco Planning Department.

The San Francisco Planning Department also held a scoping meeting for resource agencies on Thursday, November 3, 2005 in San Francisco. Representatives from the following agencies attended: U.S. Army Corps of Engineers, San Francisco Bay Regional Water Quality Control Board, California Department of Fish and Game, and U.S. Fish and Wildlife Service. Representatives of the U.S. Environmental Protection Agency and the National Marine Fisheries Service were invited but unable to attend. Additional coordination with public agencies through informal consultation and telephone interviews was conducted throughout the EIR process.

In addition to comments received during scoping meetings, comments on the NOP were received by letter sent via mail, email, or fax (104, including 5 form letters counted once each but submitted multiple times), orally by speakers at the scoping meetings (79), and by phone (187 voicemail messages left with the San Francisco Planning Department). The comments addressed concerns regarding the full range of potential environmental issues as well as program alternatives and the CEQA process.

The San Francisco Planning Department then prepared the Draft Program EIR, which describes the WSIP and the environmental setting for the proposed program, identifies potential impacts, presents mitigation measures for impacts found to be significant or potentially significant, and evaluates program alternatives. It also includes an analysis of three variants to the proposed WSIP, as requested by the SFPUC. The analysis of environmental impacts is divided into three main groups: (1) construction and operational impact of the WSIP facility improvement projects; (2) water supply and system operational impacts of the WSIP; and (3) growth-inducing impacts. In assessing construction and operational impacts of the facility improvement projects, the Program EIR considers impacts of individual projects, the "collective" construction and operational impacts from multiple WSIP facility improvement projects, and cumulative impacts associated with construction and operation of WSIP projects in combination with other past, present, and future actions with potential for similar impacts on the same resources as those affected by the WSIP. Similarly, in assessing water supply and system operations impacts, the Program EIR includes analysis of cumulative impacts associated with the WSIP water supply and system operations in combination with other past, present, and future actions with potential for impacts on the same resources as those affected by the WSIP.

Each environmental issue presented in this Draft PEIR is analyzed with respect to significance criteria that are based on the San Francisco Planning Department Major Environmental Analysis Division (MEA) guidance regarding the environmental effects to be considered significant. MEA guidance is, in turn, based on CEQA Guidelines Appendix G with some modifications. In cases where potential environmental issues associated with the WSIP are identified but are not clearly addressed by MEA's standard Initial Study checklist, additional impact significance criteria are presented. (Draft EIR, Appendix B.)

The Draft EIR was circulated to local, state, and federal agencies and to interested organizations and individuals for review and comment on June 29, 2007 for a 90-day public review period, which was extended once and closed on October 15, 2007, for a total of 108 days. Six public hearings on the Draft PEIR to accept written or oral comments were held in Sonora, Modesto, Fremont, Palo Alto, and San Francisco (two hearings) between September 5, 2007 and October 11, 2007. During the public review period, the San Francisco Planning Department received approximately 1,500 written comments sent through the mail or by hand-delivery, fax, or email as well as approximately 200 oral comments made at six public hearings. A court reporter was present at each of the public hearings, transcribed the oral comments verbatim, and prepared written transcripts. Appendix J of the PEIR includes a summary of the Draft PEIR notification and public hearing process.

The Comments and Responses ("C&R") document was published on September 30, 2008 and it provides copies of all of the comments received on the Draft PEIR as well as individual responses to those comments. In some cases, the responses to individual comments are presented as master responses, which consist of comprehensive discussions of issues that received numerous comments. In addition, the C&R includes descriptions of changes in the WSIP that were proposed by the SFPUC after publication of the Draft PEIR, and it includes a description and analysis of the Phased WSIP Variant.

The C&R provided additional, updated information and clarification on issues raised by commenters, as well as consultant, SFPUC and Planning Department experts. The Final PEIR incorporates information obtained and produced after the Draft PEIR was completed, and contains additions, clarifications, and modifications, including a description and analysis of the Phased WSIP Variant. The Planning Commission reviewed and considered the Final PEIR and all of the supporting information. The Final PEIR provided augmented and updated information on many issues presented in the Draft PEIR, including (but not limited to) the following topics: revisions to the Hetch Hetchy/Local Simulation Model; additional analysis of the Tuolumne River impacts; changes and clarifications on the Pilarcitos Watershed analysis and impact conclusions; an analysis of the Alameda Creek Fisheries issues, including future potentially occurring steelhead in the Alameda Creek watershed; updated information on the San Joaquin River and the San Francisco Bay Delta; an update to the information provided on climate change issues; and WSIP facility improvement projects updates. In certifying the Final PEIR, the Planning Commission found that the Final PEIR does not add significant new information to the Draft EIR that would require recirculation of the PEIR under CEQA because the Final PEIR contains no information revealing (1) any new significant environmental impact that would result from the Phased WSIP Variant or from a new mitigation measure proposed to be implemented, (2) any substantial increase in the severity of a previously identified environmental impact, (3) any feasible project alternative or mitigation measure considerably different from others previously analyzed that would clearly lessen the environmental impacts of the Phased WSIP Variant, but that was rejected by the project's proponents, or (4) that the Draft EIR was so fundamentally and basically inadequate and conclusory in nature that meaningful public review and comment were precluded. This Commission concurs in that determination.

D. Environmental Analysis of the Phased WSIP Variant

The Final PEIR included a description and analysis of the Phased WSIP Variant, as discussed in the C&R, Chapter 13, Section 13.4. The C&R analysis concluded that the potential environmental effects of the Phased WSIP Variant fall within the range of impacts already evaluated in the Draft PEIR for the WSIP and the alternatives. This Variant is similar to the No Purchase Request Increase Alternative analyzed in the Draft EIR. Also relevant are the analyses of the No Program Alternative, the Aggressive Conservation/Water Recycling and Local Groundwater Alternative, and the Modified WSIP Alternative.

The Phased WSIP Variant would have the same impacts associated with proposed facility construction and operation as the WSIP. The 17 facility improvement projects proposed under the WSIP and analyzed in the Program EIR would also be implemented under the Phased WSIP Variant to meet the intent of the water quality, seismic reliability, delivery reliability, and water supply goals of the WSIP.

The Phased WSIP Variant would have impacts associated with its proposed water supply program similar to those described in the Draft PEIR for the alternatives where the wholesale customer purchase requests for 2030 would not be provided by the regional water system. Under those alternatives, the Draft PEIR assumed that the wholesale customers might pursue other types of projects to either reduce demand and/or to supplement the surface water supplies delivered by the regional water system from the SFPUC watersheds. The potential facility and operations impacts associated with such projects are discussed in the Draft EIR in Section 9.2.2, No Program Alternative (Vol. 4, Chapter 9, pp. 9-34 to 9-37), Section 9.2.3, No Purchase Request Increase Alternative (Vol. 4, Chapter 9, pp. 9-40 to 9-45), and Section 9.2.4, Aggressive Conservation/Water Recycling and Local Groundwater Alternative (Vol. 4, Chapter 9, pp. 9-55 to 9-57).

Similar to the Modified WSIP Alternative and the Aggressive Conservation/Water Recycling and Local Groundwater Alternative, the Phased WSIP Variant, which envisions developing additional local conservation, recycled water and groundwater projects, could result in construction and operation of additional recycled water and groundwater facilities in the wholesale customer service areas; thus, collective impacts in the Bay Division and Peninsula Regions and associated cumulative effects would occur. The types of impacts associated with implementation of the local recycled water and groundwater projects are summarized in Table

13.9 (which is the same as Draft EIR Table 9.12) in C&R Section 13.4 (C&R, page 13-34) and generally relate to construction of new infrastructure, water quality, and groundwater resources, and operational uses of energy and long-term air quality emissions.

In the event local conservation, recycled water or groundwater projects are not sufficient or cannot be developed in time to meet the demands of each of the wholesale customers, SFPUC customers could be expected to pursue alternative water supply sources. The types of impacts associated with water supply acquisition projects are summarized in Table 13.8 (which is the same as Draft EIR Table 9.10) in C&R Section 13.4 (C&R, pages 13-31 to 13-32). Depending on the facilities needed to convey the supplemental supplies to the wholesale customer service areas, the construction and operation of such facilities could result in a full range of construction and operational impacts similar to those described in Draft EIR Chapter 4 for the WSIP facility improvement projects in the South Bay and Peninsula areas (such as traffic, air quality, noise, energy use, waste disposal, and vibration). In general, certain types of impacts are common to water supply transfers/acquisition and include: the cessation of water application to lands irrigated by the water being transferred; changes related to flows, fisheries, and water quality; and impacts caused by the use of existing or the construction of new infrastructure. If water is transferred from agricultural customers, without implementation of agricultural conservation measures, the transfer can result in the conversion of agricultural land to nonagricultural land. Beneficial environmental effects (related to retiring drainage-impaired lands, reducing the application of pesticides, etc.) can also occur. The need for new facilities and/or changes in the operations of existing facilities depend on the source of supply (e.g., the Tuolumne River through transfers with TID and MID, water-rights holders north of the Delta, in the Delta, or south of the Delta), the quantity of supply, the means of conveyance, and any additional storage requirements. Construction or expansion of interties or connecting pipelines could be required, potentially resulting in impacts similar to those described for the WSIP pipeline projects.

If desalination technologies were used to supplement potable water supplies, implementation of a desalination project to augment wholesale customer water supplies would result in the full range of construction impacts at the proposed facility location (such as traffic, air quality, noise, and vibration) as well as operational impacts related to aquatic resources, water quality, energy consumption, air quality, visual resources, land use and planning, traffic, and greenhouse gas emissions. The programmatic impacts of construction and operation of a desalination facility are described in the Draft EIR under WSIP Variant 2, Regional Desalination for Drought (Draft EIR, Chapter 8, pp. 8-24 to 8-32).

The water supply impacts of the Phased WSIP Variant would be similar to those analyzed in Chapter 9 of the Draft PEIR for the No Purchase Request Increase Alternative, and overall the impacts of the Phased WSIP Variant through 2018 would be less than the water supply impacts of the WSIP set out in Chapter 5 of the PEIR. With a few exceptions, the water supply impacts identified as potentially significant and mitigable for the proposed WSIP remain potentially significant and mitigable for the Phased WSIP Variant. Two impacts on the lower Tuolumne River were determined to be less than significant as long as the SFPUC does not increase deliveries to customers above 265 mgd from the watersheds: Impact 5.3.6-4, effects on fishery resources along the Tuolumne River below La Grange Dam; and, Impact 5.3.7-6, impacts on terrestrial biological resources along the Tuolumne River below La Grange Dam. Although the

Phased WSIP Variant is designed to keep deliveries from exceeding an annual average level of about 265 mgd, in the event the SFPUC must deliver more than 265 mgd to its customers from the watersheds, the SFPUC shall implement the mitigation measures associated with these impacts in proportion to the extent of the exceedance. In implementing the Phased WSIP Variant, the need could arise to temporarily increase deliveries from the Tuolumne River and local watersheds over the 265 mgd average annual target levels to meet customer water delivery needs in the near term, because of public health and safety considerations and because it might not be possible to implement all of the local conservation, recycling and groundwater projects and actions in time to meet increasing customer demands. Although avoidance of these impacts on the lower Tuolumne River is not assured, the magnitude, frequency, and duration of the impacts are likely to be less than the originally proposed WSIP. The impact analysis for the Phased WSIP Variant recognized that, between now and 2018, deliveries from the Tuolumne River and local watersheds might increase above the 265 mgd average annual level (to a possible 275 mgd average annual) for up to a few years. By 2018, and perhaps well before, it is expected that local projects would provide sufficient local supply and conservation to bring SFPUC watershed deliveries back down to current levels, average annual 265 mgd.

Under the Phased WSIP Variant, the SFPUC would monitor sales to ensure that sales delivered from the SFPUC watersheds are limited to an average annual of 265 mgd through 2018. The SFPUC would measure and review average annual sales at the close of each fiscal year. Mitigation Measures 5.3.6-4a or 5.3.6-4b, as well as Mitigation Measure 5.3.7-6, will be implemented when the average annual sales exceed 265 mgd from the watersheds. The SFPUC would continue to implement the necessary measure(s) until the average annual SFPUC watershed deliveries are 265 mgd or less. Similar to the WSIP, implementation of Measure 5.3.6-4a is the preferred mitigation approach, and for the Phased WSIP Variant, the amount of conserved water required to reduce the impact to less than significant would be proportional to the amount of increased diversions from the Tuolumne River contributing to exceeding the 265 mgd deliveries restriction.

Four impacts in the Pilarcitos watershed were determined to be potentially significant and mitigable for the originally proposed WSIP, but are considered less than significant for the Phased WSIP Variant through 2018: Surface Water Quality Impact 5.5.3-2, effects on water quality in Pilarcitos Creek between Pilarcitos Reservoir and Stone Dam; Fisheries Impacts 5.5.5-4, effects on fishery resources in Pilarcitos Reservoir, and 5.5.5-5, effects on fishery resources along Pilarcitos Creek below Pilarcitos Reservoir and below Stone Dam; and, Terrestrial Biology Impact 5.5.6-4, impacts on biological resources in Pilarcitos Reservoir. With the Phased WSIP Variant, operations for Pilarcitos Reservoir and releases to Pilarcitos Creek will be similar to existing conditions resulting in a less than significant impact. Thus no mitigation is required. (DEIR pages 5.5.3-5 through 5.5.3-7; C&R pages 13-39 and 13-44; DEIR page 5.5.5-7; C&R pages 13-39 and 13-44; DEIR pages 5.5.6-17 through 5.5.6-22; C&R pages 13-39, 13-44 and 16-80 to 16-82.)

E. Changes to Facility Improvement Projects in the Alameda Creek Watershed

Since publication of the Draft PEIR in June 2007, SFPUC staff proposed modifications to the project descriptions of two of the facility improvement projects—the Alameda Creek Fishery

Enhancement (SV-1) and Calaveras Dam Replacement (SV-2) projects—and these proposed changes would affect overall system operations.[1] These modifications were made due to the numerous comments received on the potential impacts on future steelhead fishery resources in the Alameda Creek watershed as well as to actions taken in July 2007 by other agencies in the watershed. The SFPUC has incorporated project revisions and protective measures into these two projects to reduce the WSIP's potential to affect habitat conditions for potential future-occurring steelhead in the upper watershed. The project revisions would occur regardless of steelhead presence or absence in the upper watershed, while the protective measures are designed to reduce the WSIP's potential to affect habitat conditions for potential, future-occurring steelhead in the Alameda Creek watershed in the event that man-made barriers in Alameda Creek are removed and steelhead gain access to the upper watershed. The following project revisions have been incorporated into the Alameda Creek Fishery Enhancement (SV-1) and Calaveras Dam Replacement (SV-2) projects:

- The Calaveras Dam Replacement project would include facility modifications at the Alameda Creek Diversion Dam (ACDD) to construct a new bypass structure needed to implement bypass stream flows.

- If a structural alternative involving construction of a recapture facility is selected under the Alameda Creek Fishery Enhancement project, the recapture facility would be located at the downstream end of the reach of Alameda Creek between the lower Sunol Valley and the confluence with Arroyo de la Laguna. As an alternative to the recapture facility, the SFPUC may coordinate with other water agencies to develop and implement other means of recapturing fishery enhancement flows consistent with the 1997 California Department of Fish and Game Memorandum of Understanding (CDFG MOU).[2]

The project components designed to provide protective measures for future-occurring steelhead in the upper Alameda Creek watershed will include the following:

- An operational plan to provide minimum stream flows to support steelhead spawning below the ACDD to the confluence with Calaveras Creek when precipitation naturally generates runoff and flow in the creek, including the site-specific studies needed to determine the specific minimum stream flow requirements to support steelhead spawning in this reach of the creek.

- A detailed monitoring plan to survey and document steelhead spawning, subject to review and comment by the appropriate resource agencies.

- Interim minimum flows would be implemented consistent with the 1997 CDFG MOU, with the additional requirement that these flows would be achieved through bypass flows

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1 See Memorandum from Michael Carlin to the Planning Department dated July 16, 2008.

2 Under the 1997 CDFG MOU, the SFPUC and CDFG reached agreement on the magnitude and timing of flows to be released from Calaveras Reservoir for the purposes of improving fishery habitat conditions. The MOU includes provisions for the SFPUC to divert flows from Alameda Creek to the SFPUC regional system at a suitable downstream location equivalent to the magnitude and timing of these releases; the MOU refers to this as "recapture."

at the ACDD at all times when flows are available in upper Alameda Creek, rather than through releases at Calaveras Dam, and with the following conditions:

- The SFPUC would provide seasonal flow bypasses at the ACDD and/or flow releases from Calaveras Dam, either (1) without recapture or (2) with recapture at a point approximately at the downstream end of the reach of Alameda Creek between the lower Sunol Valley and the confluence with Arroyo de la Laguna, below critical riffle locations or lower in the creek, between December 1 and June 30 (combined adult and juvenile migration period) in an amount equivalent to the flow release schedule provided in the 1997 CDFG MOU.

- As an alternative to the recapture facility, the SFPUC would coordinate with other water agencies to develop and implement other means of recapturing enhancement flows consistent with the 1997 CDFG MOU at a location downstream of the reach of Alameda Creek between the lower Sunol Valley and the confluence with Arroyo de la Laguna.

The C&R also proposed a minor revision to an existing mitigation measure (Mitigation Measure 5.4.5-3a, Minimum Flows for Resident Trout on Alameda Creek) to address other native stream species, including steelhead. The mitigation measures are set forth in the MMRP attached to these Findings as Attachment B. The project description modifications would generally reduce the impacts identified in the Draft PEIR, and, in some cases, would reduce impacts from potentially significant to less than significant (i.e., Impacts 5.4.7-1 and 5.4.7-2). Implementation of the project revisions and protective measures, along with the mitigation measures designed to reduce impacts on resident trout, would be effective in assuring that if in the future steelhead successfully migrate above the BART weir, that the Phased WSIP Variant will not result in a significant adverse effect on steelhead life stages and habitat in Alameda Creek.

F. Approval Actions

1. Planning Commission Actions

On October 30, 2008, the Planning Commission certified the Final PEIR.

2. Public Utilities Commission Actions

The San Francisco Public Utilities Commission is taking the following actions and approvals to implement the Program.

- Adopt these CEQA findings and the attached Mitigation Monitoring and Reporting Program.
- Approve the Water System Improvement Program, the Phased WSIP Variant, as described herein.
- Endorse the selected Water Supply Elements of a new Water Sales Agreement (“Elements”) and authorize the General Manager to negotiate such Agreement with the wholesale customers in substantial conformance with the water supply principles.

3. San Francisco Board of Supervisors Actions

- The Planning Commission's certification of the EIR may be appealed to the Board of Supervisors. If appealed, the Board of Supervisors will determine whether to uphold the certification or to remand the EIR to the Planning Department for further review.

- The San Francisco Board of Supervisors approves an allocation of bond monies to pay for mitigation measures necessary to implement the Program.

4. Other -- Federal, State, and Local Agencies

Implementation of the water supply mitigation measures will involve consultation with/required approvals by other local, state and federal regulatory agencies, including:

- Modesto Irrigation District
- Turlock Irrigation District
- California Water Resources Control Board
- California Department of Fish and Game
- California Department of Health Services (for approval and permits required for drinking water source assessments for groundwater wells)
- U.S. Army Corps of Engineers
- U.S. Fish and Wildlife Service
- NOAA Fisheries- National Marine Fisheries Service
- U.S. Department of the Interior, National Park Service, Yosemite National Park (for consultation on and sharing data from ongoing studies in the Poopenaut Valley)

To the extent that the identified mitigation measures require consultation or approval by these other agencies, this Commission urges these agencies to assist in implementing, coordinating or approving the mitigation measures, as appropriate to the particular measure.

There will be further project approvals following project-specific environmental review, for each of the individual WSIP projects. The actions described herein contemplate only the approval and implementation of the Program as a whole and not each and every project-specific approval.

G. Content and Location of Record

The record upon which all findings and determinations related to the Program are based includes the following:

- The draft Water System Improvement Program and the Phased WSIP Variant.

- The PEIR, and all documents referenced in or relied upon by the PEIR. (The references in these findings to the Program EIR or the PEIR include both the Draft EIR and the C&R documents.)

- All information (including written evidence and testimony) provided by City staff to the SFPUC and the Planning Commission relating to the PEIR, the WSIP, the proposed Program, and the alternatives set forth in the PEIR.

- All information (including written evidence and testimony) presented to the SFPUC and the Planning Commission by the environmental consultant and sub-consultants who prepared the PEIR, or incorporated into reports presented to the SFPUC.

- All information (including written evidence and testimony) presented to the City from other public agencies relating to the WSIP, the Program or the PEIR.

- All information (including written evidence and testimony) presented at any public hearing or workshop related to the WSIP, the Program and the PEIR.

- For documentary and information purposes, all locally-adopted land use plans and ordinances, including, without limitation, general plans, specific plans and ordinances, together with environmental review documents, findings, mitigation monitoring programs and other documentation relevant to planned growth in the area.

- The Mitigation Monitoring and Reporting Program.

- All other documents available to the SFPUC and the public, comprising the administrative record pursuant to Public Resources Code Section 21167.6(e).

The Public Utilities Commission has relied on all of the documents listed above in reaching its decision on the Program, even if not every document was formally presented to the Commission. Without exception, any documents set forth above not so presented fall into one of two categories. Many of them reflect prior planning or legislative decisions with which the Commission was aware in approving the Program. Other documents influenced the expert advice provided to Planning Department and PUC staff or consultants, who then provided advice to the Commission. For that reason, such documents form part of the underlying factual basis for the Commission's decisions relating to the adoption of the Program.

The public hearing transcript, a copy of all letters regarding the Draft EIR received during the public review period, the administrative record, and background documentation for the Final PEIR, as well as additional materials concerning approval of the Phased WSIP Variant and adoption of these findings are contained in SFPUC files, located at the SFPUC, 1155 Market Street, San Francisco. **Kelley Capone** is the custodian of records for the SFPUC. CEQA files are also available at the San Francisco Planning Department, 1650 Mission Street, San Francisco. **Linda Avery** is the Custodian of Records for the Planning Department. All files have been available to the SFPUC and the public for review in considering these findings and whether to approve the Program.

H. Findings About Significant Environmental Impacts And Mitigation Measures

The following Sections II, III and IV set forth the SFPUC's findings about the Final PEIR's determinations regarding significant environmental impacts and the mitigation measures proposed to address them. These findings provide the written analysis and conclusions of the SFPUC regarding the environmental impacts of the Phased WSIP Variant and the mitigation measures included as part of the Final PEIR and adopted by the SFPUC as part of the Phased WSIP Variant. To avoid duplication and redundancy, and because the SFPUC agrees with, and hereby adopts, the conclusions in the Final PEIR, these findings will not repeat the analysis and conclusions in the Final PEIR, but instead incorporates them by reference herein and relies upon them as substantial evidence supporting these findings.

In making these findings, the SFPUC has considered the opinions of SFPUC staff and experts, other agencies and members of the public. The SFPUC finds that the determination of significance thresholds is a judgment decision within the discretion of the City and County of San Francisco; the significance thresholds used in the PEIR are supported by substantial evidence in the record, including the expert opinion of the PEIR preparers and City staff; and the significance thresholds used in the PEIR provide reasonable and appropriate means of assessing the significance of the adverse environmental effects of the Program. Thus, although, as a legal matter, the SFPUC is not bound by the significance determinations in the PEIR (see Pub. Resources Code, § 21082.2, subd. (e)), the SFPUC finds them persuasive and hereby adopts them as its own.

These findings do not attempt to describe the full analysis of each environmental impact contained in the Final PEIR. Instead, a full explanation of these environmental findings and conclusions can be found in the Final PEIR and these findings hereby incorporate by reference the discussion and analysis in the Final PEIR supporting the Final PEIR’s determination regarding the Phased WSIP Variant’s impacts and mitigation measures designed to address those impacts. In making these findings, the SFPUC ratifies, adopts and incorporates in these findings the determinations and conclusions of the Final PEIR relating to environmental impacts and mitigation measures, except to the extent any such determinations and conclusions are specifically and expressly modified by these findings.

As set forth below, the SFPUC adopts and incorporates all of the mitigation measures set forth in the Final PEIR and the attached MMRP to substantially lessen or avoid the potentially significant and significant impacts of the Phased WSIP Variant. In adopting these mitigation measures, the SFPUC intends to adopt each of the mitigation measures proposed in the Final PEIR for the Phased WSIP Variant. Accordingly, in the event a mitigation measure recommended in the Final EIR has inadvertently been omitted in these findings or the MMRP, such mitigation measure is hereby adopted and incorporated in the findings below by reference. In addition, in the event the language describing a mitigation measure set forth in these findings or the MMRP fails to accurately reflect the mitigation measures in the Final PEIR due to a clerical error, the language of the policies and implementation measures as set forth in the Final PEIR shall control. The impact numbers and mitigation measure numbers used in these findings reflect the impact and mitigation measure numbers used in the Final PEIR.

In the sections II, III and IV below, the same findings are made for a category of environmental impacts and mitigation measures. Rather than repeat the identical finding dozens of times to address each and every significant effect and mitigation measure, the initial finding obviates the need for such repetition because in no instance is the SFPUC rejecting the conclusions of the Final PEIR or the mitigation measures recommended in the Final PEIR for the Phased WSIP Variant. There are determinations of significance regarding the originally proposed WSIP and proposed mitigation measures identified in the PEIR that are not applicable to the Phased WSIP Variant, and therefore, those impacts and mitigation measures are not included in these findings.

II. IMPACTS FOUND TO BE LESS THAN SIGNIFICANT AND THUS REQUIRING NO MITIGATION

A. WSIP Water Supply Impacts

Under CEQA, no mitigation measures are required for impacts that are less than significant. (Pub. Resources Code, § 21002; CEQA Guidelines, §§ 15126.4, subd. (a)(3), 15091.) The Phased WSIP Variant diverts less water than the proposed WSIP and therefore the water supply impacts are generally the same as or less than those of the originally proposed WSIP. (See C&R section 13.4, pp. 13-29 through 13-44.) Based on substantial evidence in the whole record of this proceeding, the SFPUC finds that implementation of the water supply portion of the Phased WSIP Variant will not result in any significant impacts in the following areas and that these impact areas therefore do not require mitigation:

1. Tuolumne River System and Downstream Water Bodies

- **Stream Flow** (**Impacts 5.3.1-1**, effects on flow along the river below O'Shaughnessy Dam; **5.3.1-2**; effects of flow along Cherry Creek below Cherry Dam; **5.3.1-3**; effects of flow along Eleanor Creek below Eleanor Dam; **5.3-1-4**; effects of flow along the river below La Grange Dam; **5-.3-1-5**, effects of flow along the San Joaquin River and the Sacramento-San Joaquin Delta) (DEIR pages 5.3.1-20 through 5.3.1-39; C&R pages 14.6-8 to 14.6-10, 14.7-12 to 14.7-14, 14.8-2 to 14.8-9 and 16-47);
- **Geomorphology** (**Impacts 5.3.2-1**, effects on sediment transport and channel characteristics between O'Shaughnessy Dam and Don Pedro Reservoir; **5.3.2-2**, effects on sediment transport and channel characteristics below La Grange Dam) (DEIR pages 5.3.2-5 through 5.3.2-7; C&R pages 14.6-10 to 14.6-12 and 14.7-15 to 14.7-16);
- **Surface Water Quality** (**Impacts 5.3.3-1**, effects on quality in Hetch Hetchy Reservoir and along the Tuolumne River below O'Shaughnessy Dam; **5.3.3-2**, effects on quality in Don Pedro Reservoir and along the Tuolumne River below La Grange Dam; **5.3.3-3**, effects on quality along the San Joaquin River and the Sacramento-San Joaquin Delta) (DEIR pages 5.3.3-13 through 5.3.3-20; C&R pages 14.6-12 to 14.6-13, 14.7-10 to 14.7-11, and 14.8-2 to 14.8-16);
- **Surface Water Supplies** (**Impacts 5.3.4-1**, effects on Tuolumne River, San Joaquin River, and Stanislaus River water users; **5.3.4-2**, effects on Delta water users) (DEIR pages 5.3.4-5 through 5.3.4-11; C&R pages 14.8-9 to 14.8-16, 15-4-217 to 15.4-218, and 16-48);
- **Groundwater** (**Impacts 5.3.5-1**, alteration of stream flows along the Tuolumne River, which could affect local groundwater recharge and levels; **5.3.5-2**, alteration of stream

flows along the Tuolumne River, which could affect local groundwater quality) (DEIR pages 5.3.5-3 through 5.3.5-5);

- **Fisheries** (**Impacts 5.3.6-1**, impacts on effects on fishery resources in Hetch Hetchy Reservoir; **5.3.6-2**, effects on fishery resources along the Tuolumne River between Hetch Hetchy Reservoir and Don Pedro Reservoir; **5.3.6-3**, effects on fishery resources in Don Pedro Reservoir; **5.3.6-5**, fishery resources along the San Joaquin River) (DEIR pages 5.3.6-24 through 5.3.6-28 and 5.3.6-32 through 5.3.6-33; C&R pages 15.4-226 to 15.4-227 and 16-49);
- **Terrestrial Biology** (**Impacts 5.3.7-1**, impacts on riparian habitat and related biological resources in Hetch Hetchy Reservoir and along the bedrock channel portions of the Tuolumne River from O'Shaughnessy Dam to Don Pedro Reservoir; **5.3.7-3**, impacts on biological resources in Lake Eleanor and along Eleanor Creek; **5.3.7-4,** biological resources in Lake Lloyd and along Cherry Creek; **5.3.7-5**, biological resources in Don Pedro Reservoir; **5.3.7-7**, conflicts with the provisions of adopted conservation plans or other approved biological resource plans for the Tuolumne Wild and Scenic River) (DEIR pages 5.3.7-14 through 5.3.7-27);
- **Recreational and Visual Resources** (**Impact 5.3.8-1**, effects on reservoir recreation due to changes in water system operations; **5.3.8-2**, effects on river recreation due to changes in water system operations; **5.3.8-3**, effects on the aesthetic values of the Tuolumne Wild and Scenic River.) (DEIR pages 5.3.8-23 through 5.3.8-35; C&R pages 16-49);
- **Energy Resources** (**Impact 5.3.9-1**, Effects on hydropower generation at facilities along Tuolumne River (beneficial).) (DEIR pages 5.3.9-2 through 5.3.9-3);
- **Cumulative Impacts (Impacts 5.7.2-1**, cumulative effects on the Tuolumne River from Hetch Hetchy Reservoir to Don Pedro Reservoir; **5.7.2-2**, cumulative effects on the Tuolumne River from Don Pedro Reservoir to the San Joaquin River; and **5.7.2-3**, cumulative effects on the San Joaquin River, Stanislaus River, and Delta) (DEIR pages 5.7-22 through 5.7-52).

2. Alameda Creek Watershed

- **Stream Flow** (**Impacts 5.4.1-1,** effects on flow along Calaveras Creek below Calaveras Reservoir; **5.4.1-3**, effects in San Antonio Reservoir and along San Antonio Creek; **5.4.1-4**, effects on flow along Alameda Creek below the confluence of San Antonio Creek) (DEIR pages 5.4.1-19 through 5.4.1-25 and 5.4.1-35 through 5.4.1-43; C&R pages 16-50 through 16-57);
- **Geomorphology** (**Impacts 5.4.2-1**, effects on channel formation and sediment transport along Calaveras Creek; **5.4.2-2,** effects on channel formation and sediment transport along Alameda Creek downstream of the diversion dam and downstream of the San Antonio Creek confluence; **5.4.2-3,** effects on channel formation and sediment transport along San Antonio Creek downstream of San Antonio Reservoir) (DEIR pages 5.4.2-3 and -4; C&R pages 15.2-29 to 15.2-34, 15.3-15 to 15.3-17 and 16-57 to 16-58);
- **Surface Water Quality** (**Impacts 5.4.3-1**, effects on water quality in Calaveras Reservoir; **5.4.3-2,** effects on water quality in San Antonio Reservoir; **5.4.3-3,** changes in water quality along Calaveras, San Antonio, and Alameda Creeks) (DEIR pages 5.4.3-6 through 5.4.3-12; C&R pages 15.2-34 to 15.2-38 and 16-59 to 16-60);

- **Groundwater Bodies** (**Impact 5.4.4-1**, changes in groundwater levels, flows, quality, and supplies) (DEIR pages 5.4.4-5 through 5.4.4-7; C&R pages15.3-19 and 16-60);
- **Fisheries** (**Impacts 5.4.5-1**, effects on fishery resources in Calaveras Reservoir (beneficial); **5.4.5-2**, Effects on fishery resources along Calaveras Creek below Calaveras Dam and along Alameda Creek below confluence with Calaveras Creek (beneficial); **5.4.5-4**, effects on fishery resources in San Antonio Reservoir (beneficial); **5.4.5-5**, effects on fishery resources along San Antonio Creek below San Antonio Reservoir; **5.4.5-6,** effects on fishery resources along Alameda Creek below confluence with San Antonio Creek) (DEIR pages 5.4.5-16 through 5.4.5-18 and 5.4.5-21 and 22);
- **Terrestrial Biology** (**Impacts 5.4.6-1 Other Species of Concern/Common Habitats and Species,** effects on riparian habitat and related biological resources in Calaveras Reservoir; **5.4.6-2, Sensitive Habitats/Others Species of Concern,** effects on riparian habitat and related biological resources along Alameda Creek, from below the diversion dam to the confluence with Calaveras Creek; **5.4.6-3, Sensitive Habitats/Other Species of Concern/Common Habitats and Species,** effects on riparian habitat and related biological resources along Calaveras Creek, from Calaveras Reservoir to the confluence with Alameda Creek; **5.4.6-4, Sensitive Habitats/Other Species of Concern/Common Habitats and Species,** effects on riparian habitat and related biological resources along Alameda Creek, from the confluence with Calaveras Creek to the confluence with San Antonio Creek; **5.4.6-5,** effects on riparian habitat and related biological resources in San Antonio Reservoir; **5.4.6-6,** effects on riparian habitat and related biological resources along San Antonio Creek between Turner Dam and the confluence with Alameda Creek; **5.4.6-7**, effects on riparian habitat and related biological resources along Alameda Creek below the confluence with San Antonio Creek; **5.4.6-8,** conflicts with the provisions of adopted conservation plans or other approved biological resource plans) (DEIR pages 5.4.6-14 through 5.4.6-26; C&R pages 5.2-13 to 15.2-14, 16-62 to 16-64);

- **Recreational and Visual Impact -- (Impacts 5.4.7-1,** effects on recreational facilities and/or activities; and **5.4.7-2**, visual effects on scenic resources or visual character of water bodies (DEIR, pp. 5.4.7-5 and 5.4.7-6; C&R pp. 13-5 and 16-65 to 16-66). Operations under the Phased WSIP Variant would substantially reduce flows along Alameda Creek in the Sunol Regional Wilderness during winter and early spring months and could affect the recreational experience for hikers. However, protective measures included in the Calaveras Dam Replacement project would include bypass flows at the Alameda Creek Diversion Dam when flow is available, thereby retaining flowing water in the creek and maintain the recreational and visual qualities. On July 16, 2008 the SFPUC revised the project description for the Calaveras Dam Replacement project. The revised project description includes specific operational protocols for seasonal bypass flows at the Alameda Creek Diversion Dam (ACDD) and the Calaveras Dam. Bypassing flow from the ACDD, when such flows are present, results in water in Alameda Creek below the ACDD to the confluence with Calaveras Creek. The addition of the flow releases from ACDD resulted in a determination that this impact is now less than significant for recreation and visual effects.
- **Cumulative Impacts (Impact 5.7.3-1**, cumulative effects on the Alameda Creek watershed). (DEIR, pages 5.7-61 through 5.7-67; C&R, pages 14.9-24 through 14.9-50).

3. Peninsula Watersheds

- **Stream Flow** (**Impacts 5.5.1-1**, effects on flow along the San Mateo Creek; **5.5.1-2**, effects on flow along Pilarcitos Creek) (DEIR pages 5.5.1-12 through 5.5.1-22; C&R pages 16-61 to 16-73);
- **Geomorphology** (**Impact 5.5.2-1**, changes in sediment transport and channel morphology in the Peninsula watershed) (DEIR pages 5.5.2-2 through 5.5.2-4);
- **Surface Water Quality** (**Impacts 5.5.3-1,** effects on water quality in Crystal Springs Reservoir, San Andreas Reservoir, and San Mateo Creek; **5.5.3-2,** effects on water quality in Pilarcitos Creek between Pilarcitos Reservoir and Stone Dam.) (DEIR pages 5.5.3-5 through 5.5.3-7; C&R pages 13-39 and 13-44). (Note: The PEIR determined Impact 5.5.3-2 to be potentially significant and mitigable for the WSIP, but this impact determination is less than significant for the Phased WSIP Variant through 2018.) With the Phased WSIP Variant, operations for Pilarcitos Reservoir and releases to Pilarcitos Creek will be similar to existing conditions, resulting in a less than significant impact;
- **Groundwater** (**Impact 5.5.4-1,** alteration of stream flows along Pilarcitos Creek, which could affect groundwater levels and water quality) (DEIR pages 5.5.4-1 through 5.5.4-3);
- **Fisheries** (**Impacts 5.5.5-2,** effects on fishery resources in San Andreas Reservoir; **5.5.5-3**, effects on fishery resources along San Mateo Creek; **5.5.5-4**, effects on fishery resources in Pilarcitos Reservoir; **5.5.5-5**, effects on fishery resources along Pilarcitos Creek below Pilarcitos Reservoir and below Stone Dam) (DEIR page 5.5.5-7; C&R pages 13-39 and 13-44). (Note: The PEIR determined Impacts 5.5.5-4 and 5.5.5-5 to be potentially significant and mitigable for the WSIP, but these impact determinations are less than significant for the Phased WSIP Variant through 2018.) Proposed operations under the Phased WSIP Variant would be within the same range as existing conditions, resulting in a less than significant impact);
- **Terrestrial Biology** (**Impacts 5.5.6-2**, impacts on biological resources in San Andreas Reservoir; **5.5.6-3**, impacts on biological resources along San Mateo Creek below Lower Crystal Springs Dam; **5.5.6-4**, impacts on biological resources in Pilarcitos Reservoir; **5.5.6-5,** impacts on biological resources along Pilarcitos Creek below Pilarcitos Reservoir; **5.5.6-6,** impacts on biological resources along Pilarcitos Creek below Stone Dam; **5.5.6-7,** conflicts with the provisions of adopted conservation plans or other approved biological resource plans) (DEIR pages 5.5.6-17 through 5.5.6-22; C&R pages 13-39, 13-40, 13-44 and 16-80 to 16-82). (Note: The PEIR determined Impact 5.5.6-4 to be potentially significant and mitigable for special status species for the originally proposed WSIP with implementation of a mitigation measure for the originally proposed WSIP. Since the Phased WSIP Variant does not result in impacts that require mitigation, this impact is less than significant for the Phased WSIP Variant through 2018);
- **Recreational and Visual Resources** (**Impact 5.5.7-1**, effects on recreational facilities and/or activities; **5.5.7-2**, visual effects on scenic resources or the visual character of water bodies.) (DEIR pages 5.5.7-4 through 5.5.7-6);
- **Cumulative Impacts (Impacts 5.7.4-1**, cumulative effects on the San Mateo Creek watershed, **5.7.4-2**, cumulative effects on the Pilarcitos Creek watershed). (DEIR, pages 5.7-74 through 5.7-84).

4. South Westside Groundwater Basin

- **Groundwater** -- **Impacts 5.6-1 --** basin overdraft due to pumping from the Westside Groundwater Basin; **5.6-3 --** seawater intrusion due to decreased groundwater levels in the Westside Groundwater Basin. (DEIR pages 5.6-25 through 5.6-27 and 5.6-29)

5. North and South Westside Groundwater Basin

- **Groundwater -- Impacts 5.6-4,** land subsidence due to decreased groundwater levels in the Westside Groundwater Basin if the historical low water levels are exceeded; **Impact 5.6-6**, drinking water contaminants above maximum contaminant levels and adverse effects of adding treated groundwater to the distribution system.) (DEIR pages 5.6-23 through 5.6-27 and 5.6-28 through 5.6-32)
- **Cumulative Impacts (Impacts 5.7.5-1**, cumulative effects on the North Westside Groundwater Basin, **5.7.5-2,** cumulative effects on the South Westside Groundwater Basin). (DEIR pages 5.7-89 to 5.7-91.)

Each of these topics is analyzed and discussed in detail in the record, including in, but not limited to, the Draft PEIR at Chapter 5, Sections 5.3, 5.4, 5.5, and 5.6 and in the C&R Chapter 13, Section 13.4.

B. WSIP Facility Construction and Operation Impacts

Under CEQA, no mitigation measures are required for impacts that are less than significant. (Pub. Resources Code, § 21002; CEQA Guidelines, §§ 15126.4, subd. (a)(3), 15091.) The Phased WSIP Variant will have the same facility construction and operation impacts as the originally proposed WSIP because the Phased WSIP Variant implements all the same projects as the originally proposed WSIP. (See C&R pages 13-17, 13-30 through 33.) Based on substantial evidence in the whole record of this proceeding, the SFPUC finds that implementation of the Facility Construction and Operations portion of the Phased WSIP Variant will not result in any significant impacts in the following areas and that these impact areas therefore do not require mitigation:

- **Land Use and Visual Quality** (Impact **4.3-3**, Temporary construction impacts on scenic vistas or visual character) (DEIR, pp. 4.3-28 to 4.3-29);
- **Geology, Soils, and Seismicity** (Impacts **4.4-2**, Erosion during construction; **4.4-3**, Substantial alteration of topography; **4.4-5**, Surface fault rupture; **4.4-6**, Seismically induced ground shaking; **4.4-7**, Seismically induced ground failure, including liquefaction and settlement; **4.4-8** Seismically induced landslides or other slope failures) (DEIR, pp. 4.4-27 to 4.4-29, 4.4-31 to 4.4-41);
- **Hydrology and Water Quality** (Impacts **4.5-1**, Degradation of water bodies as a result of erosion and sedimentation or a hazardous materials release during construction; **4.5-3a**, Degradation of water quality due to dewatering discharges; **4.5-3b**, Degradation of water quality due to construction-related discharges of treated water; **4.5-5**, Degradation of water quality and increased flows due to discharges to surface water during operation) (DEIR, pp. 4.5-21 to 4.5-28, 4.5-31 to 4.5-37, 4.5-41 to 4.5-49);

- **Traffic, Transportation and Circulation** (Impact **4.8-6**, Long-term traffic increases during facility operation) (DEIR, pp. 4.8-28 to 4.8-31);
- **Air Quality** (Impacts **4.9-4**, Air pollutant emissions during project operation; **4.9-5**, Odors generated during project operation; **4.9-6**, Secondary emissions at power plants; **4.9-7**, Conflict with implementation of applicable regional air quality plans addressing criteria air pollutants and state goals for reducing greenhouse gas emissions) (DEIR, pp. 4.9-37 to 4.9-47);
- **Noise and Vibration** (Impact **4.10-4**, Disturbance due to long-term noise increases) (DEIR, pp. 4.10-33 to 4.10-38);
- **Hazards** (Impacts **4.14-3**, Risk of fires during construction; **4.14-4**, Gassy conditions in tunnels; **4.14-6**, Accidental hazardous materials release from construction equipment; **4.14-7**, Increased use of hazardous materials during operation; **4.14-8**, Emission or use of hazardous materials within ¼ mile of a school) (DEIR, pp. 4.14-26 to 4.14-31, 4.14-35 to 4.14-42);
- **Collective** (Impacts **4.16-2**, Collective exposure of people or structures to geologic and seismic hazards; **4.16-9**, Collective impacts on utilities and landfill capacity) (DEIR, pp. 4.16-13, 4.16-33);
- **Cumulative** (Impacts **4.17-1**, Cumulative disruption of established communities, changes in existing land use patterns, and impacts on the existing visual character; **4.17-2**, Cumulative exposure of people or structures to geologic and seismic hazards; **4.17-3**, Cumulative impacts related to the degradation of water quality, alteration of drainage patterns, increased surface runoff, and flooding hazards; **4.17-4**, Cumulative loss of sensitive biological resources; **4.17-9**, Cumulative impacts related to disruption of utility service or relocation of utilities; **4.17-10**, Cumulative effects on recreational resources during construction; **4.17-11**, Cumulative conversion of farmland to nonagricultural uses; **4.17-12**, Cumulative effects related to hazardous conditions and exposure to or release of hazardous materials; **4.17-13**, Cumulative increases in the use of nonrenewable energy resources) (DEIR, pp. 4.17-46 to 4.17-52, 4.17-60 to 4.17-64).

Each of these topics is analyzed and discussed in detail in the record, including in, but not limited to, the Draft PEIR at Chapter 4, Sections 4.3, 4.4, 4.5, 4.8, 4.9, 4.10, 4.14, 4.16, and 4.17.

III. FINDINGS OF POTENTIALLY SIGNIFICANT IMPACTS THAT CAN BE AVOIDED OR REDUCED TO A LESS-THAN-SIGNIFICANT LEVEL

CEQA requires agencies to adopt mitigation measures that would avoid or substantially lessen a project's identified significant impacts or potential significant impacts if such measures are feasible (unless mitigation to such levels is achieved through adoption of a project alternative). The findings in this Section III and in Section IV concern mitigation measures set forth in the PEIR. These findings discuss mitigation measures as proposed in the PEIR and recommended for adoption by the SFPUC, which can be implemented by the SFPUC. The mitigation measures proposed for adoption in this section are the same as the mitigation measures identified in the Final PEIR for the Phased WSIP Variant. The full explanation of the potentially significant environmental impacts is contained in Chapters 4, 5, and 13 of the Final PEIR. The full text of the mitigation measures is contained in the Final PEIR and in **Attachment B**, the Mitigation Monitoring and Reporting Program.

As explained previously, **Attachment B** contains the Mitigation Monitoring and Reporting Program required by CEQA Section 21081.6 and CEQA Guidelines Section 15091. It provides a table setting forth each mitigation measure listed in the PEIR that is required to reduce or avoid a significant adverse impact. **Attachment B** also specifies the agency responsible for implementation of each measure, establishes monitoring actions and a monitoring schedule.

The SFPUC adopts all of the mitigation measures proposed for the Phased WSIP Variant. The SFPUC will implement all of the water supply and system operations mitigation measures as part of adoption of the Phased WSIP Variant. The SFPUC will implement the programmatic mitigation measures identified to address WSIP facility improvement projects impacts as part of approval and adoption of individual WSIP projects, and these programmatic mitigation measures will be re-evaluated as part of the project-level CEQA review and will be confirmed, refined or replaced with an equivalent measure, as applicable. The SFPUC finds that all the mitigation measures are appropriate and feasible, and that changes or alterations will be required in, or incorporated into, the Program and the projects that mitigate or avoid the significant environmental effect as identified in the PEIR. Based on the analysis contained in the PEIR, other considerations in the record, and the standards of significance, the SFPUC finds that implementation of all of the proposed mitigation measures will reduce potentially significant impacts to a ***less-than-significant*** level, discussed in this Section III.

A. WSIP Water Supply and System Operations Impacts

1. Tuolumne River System and Downstream Water Bodies

Fisheries

Impact 5.3.6-4 – Fisheries: Effects on fishery resources along the Tuolumne River below La Grange Dam in the event diversions from the Tuolumne River substantially increase over existing conditions. (DEIR, pp. 5.3.6-28 to 5.3.6-32; C&R pp. 14.7-2 to 14.7-7 and 13-43 to 13-44.) Under the Phased WSIP Variant, there may be a short-term increase in deliveries to customers from the watersheds above the existing level of 265 mgd, while the SFPUC and/or BAWSCA and wholesale customers implement the local conservation, recycled water and projects needed to meet demands through 2018. In this interim period, there is a potential for increased diversions from Hetch Hetchy Reservoir to serve SFPUC customers, which in turn would result in flow reductions below La Grange Dam and infrequent water temperature increases, which could adversely affect habitat conditions for juvenile salmonids. Flow changes with the Phased WSIP Variant with the 265 mgd delivery limitation and a small increase in average annual diversions from the Tuolumne River of 2 mgd in order to implement delivery and drought reliability elements of the WSIP through 2018 were determined to be less than significant. However, it is recognized that under the Phased WSIP Variant, deliveries could exceed 265 mgd while the SFPUC and/or wholesale customers implement the local conservation, recycled water and groundwater projects needed to meet increasing demands. Therefore, it was conservatively assumed that total water deliveries above 265 mgd could cause potentially significant impacts on the lower Tuolumne River during these periods until average annual deliveries were reduced to 265 mgd. This impact is less than significant if the annual average deliveries to customers does not exceed 265 mgd from the watersheds and does not require mitigation.

Mitigation Measure 5.3.6-4a, Avoidance of Flow Changes by Reducing Demand for Don Pedro Reservoir Water, OR Mitigation Measure 5.3.6-4b, Fishery Habitat Enhancement

This Commission recognizes that mitigation measure 5.3.6-4a is partially within the jurisdiction of MID and TID. The Commission urges MID and TID to assist in implementing this mitigation measure, and finds that MID and TID can and should participate in implementing this mitigation measure.

This Commission also recognizes that mitigation measure 5.3.6-4b is partially within the jurisdiction of other agencies, including the California Department of Fish and Game. The Commission urges this agency to assist in implementing this mitigation measure, and finds that this agency can and should participate in implementing this mitigation measure if measure 5.3.6-4a is determined to be infeasible.

Terrestrial Biological Resources

Impact 5.3.7-2 – Terrestrial Biology: Impacts on alluvial features that support meadow and riparian habitat along the Tuolumne River from O'Shaughnessy Dam to Don Pedro Reservoir. (DEIR, pp. 5.3.7-21 to 5.3.7-22; C&R pages 14.6-4 to 14.6-7.) The alluvial area supporting the largest wetland complex in this section of the Tuolumne River is the Poopenaut Valley, although smaller alluvial areas downstream, where larger tributaries empty into the Tuolumne River, also support riparian and/or wetland habitats. Delayed snowmelt releases, reductions in flow, and the resulting reduction in groundwater recharge would result in an incremental reduction in the extent and diversity of wetland and riparian habitats, including sensitive wetland and riparian habitats in the Poopenaut Valley. A reduction in wetland and riparian habitat would reduce suitable breeding habitat for key special-status species potentially occurring along this reach (e.g., foothill yellow-legged frog, California red-legged frog, and willow flycatcher), the populations of which are already critically reduced in the Sierra Nevada. A reduction in the extent and diversity of wetland and riparian habitats would reduce habitat quality and extent for animal and plant species of concern. All natural habitats affected by the Program are considered sensitive. The Program could affect a large number of common animal species that depend on sensitive meadows and larger riparian areas for food and cover.

Mitigation Measure 5.3.7-2, Controlled Releases to Recharge Groundwater in Streamside Meadows and Other Alluvial Deposits.

Impact 5.3.7-6 – Terrestrial Biology: Impacts on biological resources along the Tuolumne River below La Grange Dam in the event that diversions from Hetch Hetchy Reservoir substantially increase over existing conditions (DEIR, pages 5.3.7-25 to 5.3.7-26; C&R pages 14.4-13 and 13-43 to 13-44). Under the Phased WSIP Variant, there may be a short-term increase in deliveries to customers from the watersheds above the existing level of 265 mgd, while the SFPUC and/or BAWSCA and wholesale customers implement the local conservation, recycled water and projects needed to meet demands through 2018. In this interim period, there is a potential for increased diversions from Hetch Hetchy Reservoir to serve SFPUC customers, which in turn would result in flow reductions below La Grange Dam. Delayed spring releases and reductions in average and total flow (particularly during and following an extended drought) below La Grange Dam would reduce or eliminate suitable conditions for the recruitment of some riparian species along the river. Because of the known presence of key special-status species and the very limited amount of remaining suitable habitat along this reach of the Tuolumne River, this incremental impact would be potentially significant. Flow changes with the Phased WSIP Variant with the 265 mgd delivery limitation and a small increase in average annual diversions from the Tuolumne River of 2 mgd in order to implement delivery and drought reliability elements of the WSIP through 2018 were determined to be less than significant. However, it is recognized that under the Phased WSIP Variant, deliveries could exceed 265 mgd while the SFPUC and/or wholesale customers implement the local conservation, recycled water and groundwater projects needed to meet increasing demands. Therefore, it was conservatively assumed that deliveries above 265 mgd could cause potentially significant impacts on the lower Tuolumne River during these periods until average annual deliveries were reduced to 265 mgd. Species of concern that would be adversely affected by changes in the extent and quality of suitable riparian habitat include western pond turtle, several bat species, and a wide variety of riparian- and marsh-associated bird species. The populations of common species that depend on riparian habitat could be adversely affected by the alteration of habitat. This impact is less than significant if the annual average deliveries to customers does not exceed 265 mgd from the watersheds, and would not require mitigation.

Mitigation Measure 5.3.6-4a, Avoidance of Flow Changes by Reducing Demand for Don Pedro Reservoir Water <u>OR</u> Mitigation Measure 5.3.7-6, Lower Tuolumne River Riparian Habitat Enhancement

This Commission recognizes that mitigation measure 5.3.6-4a is the preferred mitigation approach but implementation is partially within the jurisdiction of MID and TID or other water agencies. The Commission urges MID and TID or other water agencies to assist in implementing this mitigation measure, and finds that MID and TID or other water agencies can and should participate in implementing this mitigation measure.

This Commission also recognizes that mitigation measure 5.3.7-6 is partially within the jurisdiction of other agencies, depending on the selected action and could include the California Department of Fish and Game, U. S. Fish and Wildlife Service and U.S. Army Corps of Engineers. The Commission urges these agencies to assist in implementing this mitigation measure, and finds that these agencies can and should participate in implementing this mitigation measure if measure 5.3.6-4a is determined to be infeasible.

2. Alameda Creek Watershed

Fisheries

Impact 5.4.5-3 – Fisheries: Effects on fishery resources along Alameda Creek downstream of Alameda Creek Diversion Dam. (DEIR, pp. 5.4.5-18 to 5.4-20 and C&R, pp. 13-37 and 13-38; 13-44; 16-61 and 16-62.) Following implementation of the Calaveras Dam Replacement project (SV-2) as one of the WSIP facility improvement projects, operation of Calaveras Reservoir and the Alameda Creek Diversion Dam would be restored to pre-2002 conditions. A substantial increase in diversions from Alameda Creek to Calaveras Reservoir would reduce flows in this stretch of the creek, despite proposed bypass flows at the diversion dam. Diversion of most or all flows during late winter and spring months would reduce the ability of resident rainbow trout to spawn and for eggs to incubate; additional monitoring would be needed to determine the effectiveness of proposed bypass flows to sustain trout population. In addition, the increased diversion of flows to the reservoir would prevent fish passage to downstream reaches of the creek, and increase the potential for fish entrainment since there are currently no screens on the diversion dam. If monitoring indicates that resident trout populations are not being sustained, the SFPUC shall either modify the minimum stream flow or implement mitigation measure 5.4.5-3b.

Mitigation Measure 5.4.5-3a, Minimum Flows for Resident Trout on Alameda Creek
Mitigation Measure 5.4.5-3b, Alameda Diversion Dam Diversion Restrictions or Fish Screens

This Commission recognizes that mitigation measures 5.4.5-3a and 5.4.5-3b are partially within the jurisdiction of other agencies, including the California Department of Fish and Game, the California Regional Water Quality Control Board and the U.S. Army Corps of Engineers. The Commission urges these agencies to assist in implementing this mitigation measure, and finds that these agencies can and should participate in implementing this mitigation measure.

Terrestrial Biological Resources

Impact 5.4.6-1 – Terrestrial Biology: Effects on riparian habitat and related biological resources in Calaveras Reservoir. (DEIR, pp. 5.4.6-14 to 5.4.6-17; C&R pp. 13-37 and 13-38; 13-44.) Increased reservoir storage elevations would result in inundation and permanent loss of seasonal wetlands, seeps, perennial freshwater marsh, and riparian habitat that have established since 2002. Since 2002, foothill yellow-legged frogs have occupied approximately 10,000 linear feet of stream channel along Arroyo Hondo between the maximum reservoir elevation mandated by the Division of Safety of Dams and the spillway elevation. Higher maintained reservoir levels would reduce the length of this high-quality habitat along the creek and adversely affect existing populations of foothill yellow-legged frog.

Mitigation Measure 5.4.6-1, Compensation for Impacts on Terrestrial Biological Resources

This Commission recognizes that mitigation measure 5.4.6-1 is partially within the jurisdiction of other agencies, including the California Department of Fish and Game, the California Regional Water Quality Control Board, and the U.S. Army Corps of Engineers. The Commission urges these agencies to assist in implementing this mitigation measure, and finds that these agencies can and should participate in implementing this mitigation measure.

Impact 5.4.6-2 – Terrestrial Biology: Effects on riparian habitat and related biological resources along Alameda Creek, from below the diversion dam to the confluence with Calaveras Creek. (DEIR, pp. 5.4.6.2-18 to 5.4.6-19; C&R pp. 13-37 and 13-38; 13-44; 15.2-12.) A reduction in the frequency, duration, and magnitude of flows below the diversion dam would reduce the total available aquatic breeding habitat and food sources for California red-legged frog and foothill yellow-legged frog populations that currently occupy this reach of Alameda Creek.

Mitigation Measure 5.4.1-2, Diversion Tunnel Operation
Mitigation Measure 5.4.5-3a, Minimum Flows for Resident Trout on Alameda Creek

This Commission recognizes that mitigation measures 5.4.5-3a and 5.4.1-2 are partially within the jurisdiction of other agencies, including the California Department of Fish and Game. The Commission urges these agencies to assist in implementing this mitigation measure, and finds that these agencies can and should participate in implementing this mitigation measure.

Impact 5.4.6-3 – Terrestrial Biology: Effects on riparian habitat and related biological resources along Calaveras Creek, from Calaveras Reservoir to the confluence with Alameda Creek. (DEIR, pp. 5.4.6-19 to 5.4.6-22; C&R pp. 13-37 and 38; 13-44.) Future outlet work at Calaveras Dam would have the capacity to make higher-volume releases than under existing conditions. Depending on the timing and volume of operational releases, they could adversely affect the reproductive success of special-status amphibian species along this reach (e.g., California red-legged frog and foothill yellow-legged frog).

Mitigation Measure 5.4.6-3, Operational Procedures for Calaveras Dam Releases

Impact 5.4.6-4 – Terrestrial Biology: Effects on riparian habitat and related biological resources along Alameda Creek, from the confluence with Calaveras Creek to the confluence with San Antonio Creek. (DEIR, pp. 5.4.6-22 to 5.4.6-23; C&R pp. 13-37 and 13-38; 13-44.) Depending on annual rainfall and localized site conditions along this creek segment, changes in winter and summer flows along this reach could result in both beneficial and adverse impacts on habitat for California red-legged frog and foothill yellow-legged frog populations.

Mitigation Measure 5.4.6-3, Operational Procedures for Calaveras Dam Releases
Mitigation Measure 5.4.5-3a, Minimum Flows for Resident Trout on Alameda Creek

This Commission recognizes that mitigation measures 5.4.6-3 and 5.4.5-3a are partially within the jurisdiction of other agencies, including the California Department of Fish and Game. The Commission urges this agency to assist in implementing this mitigation measure, and finds that this agency can and should participate in implementing this mitigation measure.

3. Peninsula Watersheds

Terrestrial Biological Resources

1. **Impact 5.5.6-1 –** Terrestrial Biology: Impacts on biological resources in upper and Lower Crystal Springs Reservoirs. (DEIR, pp. 5.5.6-14 to 5.5.6-17; C&R pp. 13-39 to 13-41; 13-44.) Implementation of the Lower Crystal Springs Dam Improvements project (PN-4) would raise average monthly water levels in Crystal Springs Reservoir and result in a short-term reduction in the overall extent of freshwater marsh as the reservoir fills. Proposed changes in operations would maintain maximum reservoir levels during summer for longer periods than under existing conditions, which could affect the composition and structure of riparian habitats. In addition, sensitive upland habitats that are unable to tolerate these longer periods of inundation would be lost. Elevated reservoir levels would inundate existing populations of special-status plant species, including serpentine-associated fountain thistle and Marin western

flax, and their habitat could be permanently lost. The extent of available habitat for San Francisco garter snake and California red-legged frog would be temporarily reduced during reservoir refill, but wetland habitat that would establish at higher elevations could be more extensive. Raised reservoir levels would provide greater opportunities for largemouth bass and other predators to access frogs and snakes. Periodic drawdown during planned maintenance could adversely affect San Francisco garter snake foraging habitat. Changes in wetland habitat due to reservoir refill and proposed operations would adversely affect reptile and bird species of concern, particularly if permanent changes in the composition of wetland vegetation occur. Permanent loss of upland habitat, including upland trees, grassland, and coastal scrub, would result in significant impacts on several bird and mammal species of concern. Serpentine- and grassland-associated plant species unable to tolerate extended periods of inundation would be lost. Due to the extent of area involved, impacts on common habitats and species would be significant.

Mitigation Measure 5.5.6-1a, Adaptive Management of Freshwater Marsh and Wetlands at Upper and Lower Crystal Springs Reservoirs
Mitigation Measure 5.5.6-1b, Compensation for Impacts on Terrestrial Biological Resources
Mitigation Measure 5.5.6-1c, Compensation for Serpentine Seep-Related Special-Status Plants
This Commission recognizes that mitigation measure5.5.6-1 is partially within the jurisdiction of other agencies, including the California Department of Fish and Game, the California Regional Water Quality Control Board, the U.S. Army Corps of Engineers and possibly the National Marine Fisheries Service. The Commission urges these agencies to assist in implementing this mitigation measure, and finds that these agencies can and should participate in implementing this mitigation measure.

4. North Westside Groundwater Basin

1. **Impact 5.6-1 – Groundwater**: Basin overdraft due to pumping from the Westside Groundwater Basin. (DEIR, pp. 5.6-23 to 5.6-24; C&R pp. 13-10; 13-29 and 13-30.) The proposed water supply option would include installation of up to four primary production and deep aquifer production wells in San Francisco to provide a total of 2 mgd of annualized production rate, as implemented through Local Groundwater Projects (part of SF-2). With implementation of the Phased WSIP Variant, production of up to 4 mgd (4,500 afy) under the Local Groundwater Projects (SF-2) and continued nonpotable pumping of 0.5 mgd (560 afy) would be the major groundwater use in the North Westside Groundwater Basin once irrigation pumping is replaced with recycled water at the San Francisco Zoo and Golden Gate Park; thus, the maximum total annual pumping by 2018 is estimated to be 5,060 afy. Based on water years 1987 and 1988, the annual recharge to this basin was estimated at 4,850 afy. However, this analysis was done during the first two-years of an on-going drought and therefore is considered to be a low estimate of groundwater recharge to the North Westside Groundwater Basin relative to average conditions. Estimates of recharge to the basin are being refined as part of ongoing groundwater modeling efforts on behalf of the SFPUC, and this analysis indicates that recharge to the basin could range from about 4,850 afy to 6,950 afy. The total proposed pumping rate of 4.5 mgd (5,060 afy) would be within the range of recharge to the groundwater basin. However, because it exceeds the lower end of the range, and the studies indicating the range have not been completed at this program-level of analysis, potential impacts related to depletion of

groundwater resources in the North Westside Groundwater Basin would be considered *potentially significant*.

Mitigation Measure 5.6-1, Groundwater Monitoring to Determine Basin Safe Yield

Impact 5.6-2 – Surface water: changes in water levels in Lake Merced and other surface water features, including Pine Lake, due to decreased groundwater levels in the Westside Groundwater Basin. (DEIR, pp. 5.6-27 to 5.6-28; C&R pp. 13-10; 13-29 and 30.) Because the primary production aquifer is not in direct hydraulic connection with the shallow aquifer in the Lake Merced vicinity or with Lake Merced, proposed pumping from the primary production aquifer under Local Groundwater Projects is not expected to have a direct effect on lake levels, but could potentially cause an indirect effect. Shallow groundwater levels could decline due to flow from the shallow aquifer under Lake Merced toward the primary production aquifer in which future production wells would be completed under the proposed program. Therefore, the potential to adversely affect water levels in Lake Merced and other surface water features would be *potentially significant*.

Mitigation Measure 5.6-1, Groundwater Monitoring to Determine Basin Safe Yield
Mitigation Measure 5.6-2, Implementation of a Lake Level Management Plan

Impact 5.6-3 – Groundwater: Seawater intrusion due to decreased groundwater levels in the Westside Groundwater Basin. (DEIR, pp. 5.6-28 to 5.6-29; C&R pp. 13-10; 13-29 and 13-30.) In the North Westside Groundwater Basin, the shallow aquifer is in direct connection with the ocean from approximately Lake Merced to the north. Because the shallow aquifer is in direct connection with the ocean and groundwater pumping would lower groundwater levels, impacts related to the potential to cause seawater intrusion in the North Westside Groundwater Basin would be *potentially significant*.

Mitigation Measure 5.6-1, Groundwater Monitoring to Determine Basin Safe Yield

5. North and South Westside Groundwater Basins

- **Impact 5.6-5 – Groundwater**: Contamination of drinking water due to groundwater pumping in the Westside Groundwater Basin. (DEIR, pp. 5.6-31 to 5.6-32; C&R pp. 13-10; 13-29 and 30.) During operation, groundwater production wells constructed under the Local and Regional Groundwater Projects could induce migration of chemical or microbiological contamination from sources surrounding the wells, potentially resulting in an exceedance of drinking water standards in the groundwater. However, under the California Department of Public Health Drinking Water Source Assessment Protection (DWSAP) program, the SFPUC would develop a drinking water source assessment. The second step in the DWSAP program is the voluntary development and implementation of a source water protection program. Development of this program is not mandated under the DWSAP program, but protection of water quality is an important component of a complete wellhead protection program for the protection of drinking water quality. Until production well locations are selected and a drinking water source assessment performed, the potential for contamination of a drinking water well cannot be fully evaluated. Therefore, impacts related to potential contamination of a drinking water source are considered *potentially significant* for the Local and Regional Groundwater Projects (SF-2)

Mitigation Measure 5.6.5, Drinking Water Source Assessments for Groundwater Wells

B. WSIP Facility Improvement Projects Construction and Operation Impacts

The Phased WSIP Variant will have the same impacts as the originally proposed WSIP because it implements all facility improvement projects as the originally proposed WSIP. (C&R pp. 13-17; 13-30 – 33.)

1. Land Use and Visual Quality

Impact 4.3-1 – Land Use: Temporary Disruption or Displacement of Existing Land Uses During Construction. Potentially significant land use impacts were identified in association with the following facility improvement projects: SJ-3, BD-1, BD-2, SF-1, SF-2, and SF-3. (DEIR, pp. 4.3-9 to 4.3-20, 6-4 to 6-6, 6-30 to 32, 6-34 to 6-42, 6-44.)

Mitigation Measure 4.8-1a, Traffic Control Plan Measures
Mitigation Measure 4.8-1b, Coordination of Individual Traffic Control Plans
Mitigation Measure 4.9-1a, SJVAPCD Dust Control Measures
Mitigation Measure 4.9-1b, SJVAPCD Exhaust Control Measures
Mitigation Measure 4.9-1c, BAAQMD Dust Control Measures
Mitigation Measure 4.9-1d, BAAQMD Exhaust Control Measures
Mitigation Measure 4.9-2a, Health Risk Screening or Use of Soot Filters
Mitigation Measure 4.9-2b, Vacate SFPUC Land Managers' Residences in Sunol Valley
Mitigation Measure 4.10-1a, Noise Controls
Mitigation Measure 4.10-1b, Vacate SFPUC Caretaker's Residence at Tesla Portal
Mitigation Measure 4.10-2a, Limit Hourly Truck Volumes
Mitigation Measure 4.10-2b, Restrict Truck Operations
Mitigation Measure 4.10-2c, Vacate SFPUC Land Manager's Residence
Mitigation Measure 4.10-3a, Vibration Controls to Prevent Cosmetic or Structural Damage
Mitigation Measure 4.10-3b, Limit Vibration Levels at or Below Vibration Perception Threshold
Mitigation Measure 4.10-3c, Limit Tunnel-Related Detonation to Daylight Hours
Mitigation Measure 4.12-1, Coordination with Golf Course/Recreational Facility Managers

Impact 4.3-4 – Visual Quality: Permanent Adverse Impacts on Scenic Vistas or Visual Character. Potentially significant visual quality impacts were identified in association with the following facility improvement projects: SJ-1, SJ-5, SV-1, SV-4, BD-1, BD-2, PN-2, PN-3, PN-4, SF-1, SF-2, and SF-3. (DEIR, pp. 4.3-29 to 4.3-43, 6-7 to 6-8.)

Mitigation Measure 4.3-4a, Architectural Design
Mitigation Measure 4.3-4b, Landscaping Plans
Mitigation Measure 4.3-4c, Landscape Screens
Mitigation Measure 4.3-4d, Minimize Tree Removal

Impact 4.3-5 – Visual Quality: New Permanent Sources of Light and Glare. Potentially significant glare impacts were identified in association with all of the facility improvement projects. (DEIR, pp. 4.3-43 to 4.3-44, 6-8.)

Mitigation Measure 4.3-5, Reduce Lighting Effects

2. Geology, Soils, and Seismicity

Impact 4.4-1 – Geology, Soils, and Seismicity: Slope instability during construction. Potentially significant geology, soils, and seismicity impacts were identified in association with the following facility improvement projects: SJ-2, SV-1, SV-2, SV-3, SV-4, SV-5, PN-3, SF-2, and SF-3. (DEIR, pp. 4.4-23 to 4.4-27, 6-4, 6-9.)

Mitigation Measure 4.4-1, Quantified Landslide Analysis

Impact 4.4-4 – Geology, Soils and Seismicity: Squeezing Ground and Subsidence During Tunneling. Potentially significant geology, soils and seismicity impacts were identified in association with the following facility improvement projects: SV-4 and BD-1. (DEIR, pp. 4.4-29 to 4.4-31, 6-9.)

Mitigation Measure 4.4-4, Subsidence Monitoring Program

Impact 4.4-9 – Geology, Soils and Seismicity: Expansive or Corrosive Soils. Potentially significant geology, soils and seismicity impacts were identified in association with all of the facility improvement projects. (DEIR, pp. 4.4-42 to 4.4-47, 6-4, 6-9.)

Mitigation Measure 4.4-9, Characterize Extent of Expansive and Corrosive Soil

3. Hydrology and Water Quality

Impact 4.5-2 – Hydrology and Water Quality: Depletion of Groundwater Resources. Potentially significant hydrology and water quality impacts were identified in association with the following facility improvement projects: SV-4. (DEIR, pp. 4.5-28 to 4.5-30, 6-9 to 6-10.)

Mitigation Measure 4.5-2, Site Specific Groundwater Analysis and Identified Measures

Impact 4.5-4 – Hydrology and Water Quality: Flooding or water quality impacts associated with impeding or redirecting flood flows. Potentially significant hydrology and water quality impacts were identified in association with the following facility improvement projects: SJ-3, SV-1, SV-4, BD-1, BD-2, and SF-2. (DEIR, pp. 4.5-37 to 4.5-41, 6-10.)

Mitigation Measure 4.5-4a, Flood Flow Protection Measures
Mitigation Measure 4.5-4b, Site Specific Flooding Analysis and Identified Measures

Impact 4.5-5 – Hydrology and Water Quality: Degradation of water quality and increased flows due to discharges to surface water during operation. Potentially significant hydrology and water quality impacts were identified in association with the following facility improvement projects: SF-2. (DEIR, pp. 4.5-41 to 4.5-49, 6-10.)

Mitigation Measure 4.5-5, Stormwater Treatment and Groundwater Monitoring

Impact 4.5-6 – Hydrology and Water Quality: Degradation of water quality as a result of alteration of drainage patterns or an increase in impervious surfaces. Potentially significant hydrology and water quality impacts were identified in association with the following facility improvement projects: SJ-2. (DEIR, pp. 4.5-49 to 4.5-54, 6-6, 6-10.)

Mitigation Measure 4.5-6, Appropriate Source Control and Site Design Measures

4. Biological Resources

Impact 4.6-1 – Biological Resources: Impacts on wetlands and aquatic resources. Potentially significant impacts to biological resources were identified in association with the following facility improvements: SJ-1, SJ-2, SJ-3, SJ-5, SV-1, SV-2, SV-3, SV-4, SV-5, BD-1, BD-2, PN-2, PN-4, SF-1, SF-2, and SF-3. (DEIR, pp. 4.6-43 to 4.6-51, 6-4 to 6-6, 6-11 to 21.)

Mitigation Measure 4.6-1a, Wetlands Assessment
Mitigation Measure 4.6-1b, Compensation for Wetlands and Other Biological Resources

Impact 4.6-2 – Biological Resources: Impacts on Sensitive Habitats, Common Habitats, and Heritage Trees. Potentially significant impacts to biological resources were identified in association with the following facility improvements: SJ-1, SJ-2, SJ-3, SJ-5, SV-1, SV-2, SV-3, SV-4, SV-5, BD-1, BD-2, PN-2, PN-4, SF-1, SF-2, and SF-3. (DEIR, pp. 4.6-52 to 4.6-59, 6-4 to 6-6, 6-12 to 6-13.)

Mitigation Measure 4.6-1b, Compensation for Wetlands and Other Biological Resources
Mitigation Measure 4.6-2, Habitat Restoration/Tree Replacement

Impact 4.6-3 – Biological Resources: Impacts on key special status species – direct mortality and/or habitat effects. Potentially significant impacts to biological resources were identified in association with the following facility improvements: SJ-1, SJ-2, SJ-3, SJ-5, SV-1, SV-2, SV-3, SV-4, SV-5, BD-1, BD-2, PN-2, and PN-4. (DEIR, pp. 4.6-59 to 4.6-68, 6-4 to 6-6, 6-11 to 6-13.)

Mitigation Measure 4.6-1b, Compensation for Wetlands and Other Biological Resources
Mitigation Measure 4.6-3a, Protection Measures During Construction for Key Special-Status Species and Other Species of Concern
Mitigation Measure 4.6-3b, Standard Mitigation Measures for Specific Plants and Animals

Impact 4.6-4 – Biological Resources: Water discharge effects on riparian and/or aquatic resources. Potentially significant impacts to biological resources were identified in association with the following facility improvements: SJ-3, SV-4, BD-1, and BD-2. (DEIR, pp. 4.6-69 to 4.6-73, 6-13.)

Mitigation Measure 4.6-4, Pipeline and Water Treatment Plant Treated Water Discharge Restrictions

Impact 4.6-5 – Biological Resources: Conflicts with adopted conservation plans, or other approved biological resources plans. Potentially significant impacts to biological resources were identified in association with the following facility improvements: SJ-3. (DEIR, pp. 4.6-73 to 4.6-74, 6-11 to 6-13.)

Mitigation Measure 4.6-1a, **Wetlands Assessment**
Mitigation Measure 4.6-1b, Compensation for Wetlands and Other Biological Resources
Mitigation Measure 4.6-2, Habitat Restoration/Tree Replacement
Mitigation Measure 4.6-3a, Protection Measures During Construction for Key Special-Status Species and Other Species of Concern
Mitigation Measure 4.6-3b, Standard Mitigation Measures for Specific Plants and Animals

5. Cultural Resources

Impact 4.7-1 – Cultural Resources: Impacts on paleontological resources. Potentially significant impacts to cultural resources were identified in association with the following facility improvements: SJ-1, SJ-3, SJ-5, SV-1, SV-2, SV-3, SV-4, SV-5, PN-3, SF-1, SF-2, and SF-3. (DEIR, pp. 4.7-47 to 4.7-55, 6-4 to 6-6, 6-22.)

Mitigation Measure 4.7-1, Suspend Construction Work if Paleontological Resource is Identified

Impact 4.7-2 – Cultural Resources: Impacts on unknown and known prehistoric and historic archaeological resources. Potentially significant impacts to cultural resources were identified in association with all of the facility improvements. (DEIR, pp. 4.7-55 to 4.7-63, 6-4 to 6-6, 6-22 to 6-26.)

Mitigation Measure 4.7-2a, Archeological Testing, Monitoring, and Treatment of Human Remains
Mitigation Measure 4.7-2b, Accidental Discovery Measures

Impact 4.7-3 – Cultural Resources: Impacts on the historical significance of a historic district or a contributor to a historic district. Potentially significant impacts to cultural resources were identified in association with the following facility improvements: SJ-1, SJ-3, SV-4, BD-1, BD-2, PN-4, and SF-1. (DEIR, pp. 4.7-69 to 4.7-75, 6-26 to 6-30.)

Mitigation Measure 4.7-3, Protection of Historic Districts
Mitigation Measure 4.7-4a, Alternatives Identification and Resource Relocation
Mitigation Measure 4.7-4b, Historical Resources Documentation

Mitigation Measure 4.7-4c, Secretary of the Interior's Standards for Treatment of Historic Properties
Mitigation Measure 4.7-4d, Historic Resources Survey and Redesign
Mitigation Measure 4.7-4e, Historic Resources Protection Plan
Mitigation Measure 4.7-4f, Preconstruction Surveys and Vibration Monitoring

Impact 4.7-4 – Cultural Resources: Impacts on the historical significance of individual facilities resulting from demolition or alteration. Potentially significant impacts to cultural resources were identified in association with the following facility improvements: SJ-1, SJ-3, BD-1, BD-2, and SF-1. (DEIR, pp. 4.7-76 to 4.7-83, 6-4 to 6-6, 6-26 to 6-30.)

Mitigation Measure 4.7-4a, Alternatives Identification and Resource Relocation
Mitigation Measure 4.7-4b, Historical Resources Documentation
Mitigation Measure 4.7-4c, Secretary of the Interior's Standards for Treatment of Historic Properties
Mitigation Measure 4.7-4d, Historic Resources Survey and Redesign
Mitigation Measure 4.7-4e, Historic Resources Protection Plan
Mitigation Measure 4.7-4f, Preconstruction Surveys and Vibration Monitoring

Impact 4.7-5 – Cultural Resources: Impacts on adjacent historic architectural resources. Potentially significant impacts to cultural resources were identified in association with the following facility improvements: SJ-3, SJ-5, SV-2, SV-4, BD-1, BD-2, PN-2, PN-4, SF-1, and SF-3. (DEIR, pp. 4.7-83 to 4.7-86, 6-4 to 6-6, 6-26 to 6-30.)

Mitigation Measure 4.7-4a, Alternatives Identification and Resource Relocation
Mitigation Measure 4.7-4b, Historical Resources Documentation
Mitigation Measure 4.7-4c, Secretary of the Interior's Standards for Treatment of Historic Properties
Mitigation Measure 4.7-4d, Historic Resources Survey and Redesign
Mitigation Measure 4.7-4e, Historic Resources Protection Plan
Mitigation Measure 4.7-4f, Preconstruction Surveys and Vibration Monitoring

6. Traffic, Transportation, and Circulation

Impact 4.8-1 – Traffic, Transportation, and Circulation: Temporary reduction in roadway capacity and increased traffic delays. Potentially significant impacts to traffic, transportation, and circulation were identified in association with the following facility improvements: SJ-3, SV-2, BD-1, PN-2, PN-4, SF-1, SF-2, and SF-3. (DEIR, pp. 4.8-10 to 4.8-15, 6-4 to 6-6, 6-30 to 6-31.)

Mitigation Measure 4.8-1a, Traffic Control Plan Measures
Mitigation Measure 4.8-1b, Coordination of Individual Traffic Control Plans

Impact 4.8-2: Short-term traffic increases on roadways due to construction related vehicle trips. Potentially significant impacts to traffic, transportation, and circulation were identified in association with the following facility improvements: SJ-1, SJ-2, SJ-3, SJ-5, SV-1, SV-2, SV-3,

SV-4, SV-5, BD-1, BD-2, PN-2, PN-3, PN-4, SF-1, and SF-3. (DEIR, pp. 4.8-15 to 4.8-20, 6-4 to 6-6, 6-30 to 6-32.)

Mitigation Measure 4.8-1a, Traffic Control Plan Measures
Mitigation Measure 4.8-1b, Coordination of Individual Traffic Control Plans

Impact 4.8-3 – Traffic, Transportation, and Circulation: Impaired access to adjacent roadways and land uses. Potentially significant impacts to traffic, transportation, and circulation were identified in association with the following facility improvements: SJ-3, SV-2, BD-1, BD-2, PN-4, SF-1, SF-2, and SF-3. (DEIR, pp. 4.8-20 to 4.8-24, 6-4 to 6-6, 6-30 to 6-32.)

Mitigation Measure 4.8-1a, Traffic Control Plan Measures

Impact 4.8-4 – Traffic, Transportation, and Circulation: Temporary displacement of on-street parking. Potentially significant impacts to traffic, transportation, and circulation were identified in association with the following facility improvements: BD-1, PN-4, SF-1, SF-2, and SF-3. (DEIR, pp. 4.8-24 to 4.8-27. 6-4 to 6-6, 6-30 to 6-32.)

Mitigation Measure 4.8-1a, Traffic Control Plan Measures
Mitigation Measure 4.8-4, **Accommodation of Displaced Public Parking Supply for Recreational Visitors**

Impact 4.8-5 – Traffic, Transportation, and Circulation**:** Increased potential traffic safety hazards during construction. Potentially significant impacts to traffic, transportation, and circulation were identified in association with all of the facility improvements. (DEIR, pp. 4.8-27 to 4.8-28, 6-4 to 6-6, 6-30 to 6-31.)

Mitigation Measure 4.8-1a, Traffic Control Plan Measures

7. Air Quality

Impact 4.9-1 – Air Quality: Construction emissions of criteria pollutants. Potentially significant impacts to air quality were identified in association with the following facility improvements: SJ-1, SJ-2, SJ-3, SJ-5, SV-1, SV-2, SV-3, SV-4, SV-5, BD-1, and BD-2. (DEIR, pp. 4.9-21 to 4.9-27, 6-4 to 6-6, 6-34 to 6-37.)

Mitigation Measure 4.9-1a, SJVAPCD Dust Control Measures
Mitigation Measure 4.9-1b, SJVAPCD Exhaust Control Measure
Mitigation Measure 4.9-1c, BAAQMD Dust Control Measures
Mitigation Measure 4.9-1d, BAAQMD Exhaust Control Measures

Impact 4.9-2 – Air Quality: Exposure to diesel particulate matter (DPM) during construction. Potentially significant impacts to air quality were identified in association with the following facility improvements: SV-2, SV-5, and BD-1. (DEIR, pp. 4.9-27 to 4.9-34, 6-37 to 6-38.)

Mitigation Measure 4.9-2a, Health Risk Screening or Use of Soot Filters

Mitigation Measure 4.9-2b, Vacate SFPUC Land Managers' Residences in Sunol Valley

Impact 4.9-3 – Air Quality: Exposure to emissions (possibly including asbestos) from tunneling. Potentially significant impacts to air quality were identified in association with the following facility improvements: SJ-3, SV-4, BD-1, PN-2, SF-1, SF-2, and SF-3. (DEIR, pp. 4.9-34 to 4.9-36, 6-38.)

Mitigation Measure 4.9-3, Tunnel Gas Odor Control

8. Noise and Vibration

Impact 4.10-2, Noise and Vibration: Temporary Noise Disturbance Along Construction Haul Routes. Potentially significant noise impacts were identified in association with the following facility improvement project: SV-4. (DEIR, pp. 4.10-23 to 4.10-26, 6-41 to 6-42.)

Mitigation Measure 4.10-2c, Vacate SFPUC Land Manager's Residence

Impact 4.10-3 – Noise and Vibration: Disturbance due to construction related vibration. Potentially significant vibration impacts were identified in association with the following facility improvement project: SV-4. (DEIR, pp. 4.10-27 to 4.10-33, 6-42.)

Mitigation Measure 4.10-1a, Noise Controls
Mitigation Measure 4.10-3a, Vibration Controls to Prevent Cosmetic or Structural Damage

9. Public Services and Utilities

Impact 4.11-1 – Public Services and Utilities: Potential temporary damage to, or disruption of existing regional or local public utilities. Potentially significant impacts to public services and utilities were identified in association with the following facility improvement projects: SJ-3, SV-1, SV-2, SV-3, SV-4, BD-1, BD-2, PN-2, PN-4, SF-1, SF-2, and SF-3. (DEIR, pp. 4.11-10 to 4.11-15, 6-4 to 6-6, 6-43 to 6-44.)

Mitigation Measure 4.11-1a, Notify Neighbors of Potential Utility Service Disruption
Mitigation Measure 4.11-1b, Locate Utility Lines Prior to Excavation
Mitigation Measure 4.11-1c, Confirmation of Utility Line Information
Mitigation Measure 4.11-1d, Safeguard Employees from Potential Accidents Related to Underground Utilities
Mitigation Measure 4.11-1e, Notify Local Fire Departments
Mitigation Measure 4.11-1f, Emergency Response Plan
Mitigation Measure 4.11-1g, Prompt Reconnection of Utilities
Mitigation Measure 4.11-1h, Coordinate Final Construction Plans with Affected Utilities

Impact 4.11-2 – Public Services and Utilities: Temporary Solid Waste Effects on Solid Waste Landfill Capacity. Potentially significant impacts to public services and utilities were identified in association with all of the facility improvement projects. (DEIR, pp. 4.11-15 to 4.11-21, 6-44.)

Mitigation Measure 4.11-2, Waste Reduction Measures

Impact 4.11-3 – Public Services and Utilities: Impacts related to compliance with federal, state, and local statutes and regulations related to solid waste. Potentially significant impacts to public services and utilities were identified in association with all of the facility improvement projects. (DEIR, pp. 4.11-22, 6-44.)

Mitigation Measure 4.11-2, Waste Reduction Measures

Impact 4.11-4 – Public Services and Utilities: Impacts related to the relocation of utilities. Potentially significant impacts to public services and utilities were identified in association with all of the facility improvement projects. (DEIR, pp. 4.11-22 to 4.11-23, 6-4 to 6-6, 6-43 to 6-44.)

Mitigation Measure 4.11-1a, Notify Neighbors of Potential Utility Service Disruption
Mitigation Measure 4.11-1b, Locate Utility Lines Prior to Excavation
Mitigation Measure 4.11-1c, Confirmation of Utility Line Information
Mitigation Measure 4.11-1d, Safeguard Employees from Potential Accidents Related to Underground Utilities
Mitigation Measure 4.11-1e, Notify Local Fire Departments
Mitigation Measure 4.11-1f, Emergency Response Plan
Mitigation Measure 4.11-1g, Prompt Reconnection of Utilities
Mitigation Measure 4.11-1h, Coordinate Final Construction Plans with Affected Utilities

10. Recreational Resources

Impact 4.12-1 – Recreational Resources: Temporary Conflicts with established recreational uses during construction. Potentially significant impacts to recreational resources were identified in association with the following facility improvement projects: SJ-3, SV-4, BD-1, BD-2, PN-2, SF-1, SF-2, and SF-3. (DEIR, pp. 4.12-18 to 4.12-27, 6-4 to 6-6, 6-30 to 6-32, 6-34 to 6-44.)

Mitigation Measure 4.12-1, Coordination with Golf Course/Recreational Facility Managers
Mitigation Measure 4.8-1a, Traffic Control Plan Measures
Mitigation Measure 4.8-1b, Coordination of Individual Traffic Control Plans
Mitigation Measure 4.9-1a, SJVAPCD Dust Control Measures
Mitigation Measure 4.9-1b, SJVAPCD Exhaust Control Measure
Mitigation Measure 4.9-2a, Health Risk Screening or Use of Soot Filters
Mitigation Measure 4.9-2b, Vacate SFPUC Land Managers' Residences in Sunol Valley
Mitigation Measure 4.10-1a, Noise Controls
Mitigation Measure 4.10-1b, Vacate SFPUC Caretaker's Residence at Tesla Portal
Mitigation Measure 4.10-2a, Limit Hourly Truck Volumes
Mitigation Measure 4.10-2b, Restrict Truck Operations
Mitigation Measure 4.10-2c, Vacate SFPUC Land Manager's Residence
Mitigation Measure 4.10-3a, Vibration Controls to Prevent Cosmetic or Structural Damage
Mitigation Measure 4.10-3b, Limit Vibration Levels at or Below Vibration Perception Threshold

Impact 4.12-2 – Recreational Resources: Conflicts with established recreational uses due to facility siting and project operation. Potentially significant impacts to recreational resources were identified in association with the following facility improvement projects: SF-1, SF-2, and SF-3. (DEIR, pp. 4.12-27 to 4.12-28, 6-7 to 6-8, 6-44.)

Mitigation Measure 4.3-4a, Architectural Design
Mitigation Measure 4.3-4b, Landscaping Plans
Mitigation Measure 4.3-4c, Landscape Screens
Mitigation Measure 4.3-4d, Minimize Tree Removal
Mitigation Measure 4.12-2, Appropriate Siting of Proposed Facilities

11. Agricultural Resources

Impact 4.13-1 – Agricultural Resources: Temporary conflicts with established agricultural resources. Potentially significant impacts to agricultural resources were identified in association with the following facility improvement projects: SJ-3, SV-1, SV-2, SV-3, and SV-4. (DEIR, pp. 4.13-11 to 4.13-15, 6-4 to 6-6, 6-45.)

Mitigation Measure 4.13-1a, Supplemental Noticing and Soil Stockpiling
Mitigation Measure 4.13-1b, Avoidance or Soil Stockpiling

Impact 4.13-2 - Agricultural Resources: Conversion of farmlands to non-agricultural uses. Potentially significant impacts to agricultural resources were identified in association with the following facility improvement projects: SJ-3, SV-3, and SV-5. (DEIR, pp. 4.13-15 to 4.13-17, 6-45.)

Mitigation Measure 4.13-2, Siting Facilities to Avoid Prime Farmland

12. Hazards

Impact 4.14-1 – Hazards: Potential to encounter hazardous materials in soil or groundwater. Potentially significant hazards impacts were identified in association with the following facility improvement projects: BD-1, BD-2, SF-1, SF-2, and SF-3. (DEIR, pp. 4.14-16 to 4.14-22, 6-4 to 6-6, 6-45 to 6-46.)

Mitigation Measure 4.14-1a, Site Health and Safety Plan
Mitigation Measure 4.14-1b, Materials Disposal Plan
Mitigation Measure 4.14-1c, Coordination with Property Owners and Regulatory Agencies

Impact 4.14-2 – Hazards: Exposure to naturally occurring asbestos. Potentially significant hazards impacts were identified in association with the following facility improvement project: BD-1. (DEIR, pp. 4.14-23 to 4.14-26, 6-46.)

Mitigation Measure 4.14-2, Health Risk Screening and Airborne Asbestos Monitoring Plan

Impact 4.14-5 – Hazards: Exposure to hazardous building materials. Potentially significant hazards impacts were identified in association with the following facility improvement projects: SJ-3, SJ-5, SV-2, SV-4, BD-1, PN-2, PN-3, PN-4, SF-1, SF-2, and SF-3. (DEIR, pp. 4.14-31 to 4.14-35, 6-46.)

Mitigation Measure 4.14-5, Hazardous Building Materials Surveys and Abatement

13. Energy Resources

Impact 4.15-1 – Energy Resources: Construction related energy use. Potentially significant energy impacts were identified in association with all of the facility improvement projects. (DEIR, p. 4.15-8, 6-34 to 6-37, 6-47.)

Mitigation Measure 4.9-1b, SJVAPCD Exhaust Control Measure
Mitigation Measure 4.9-1d, BAAQMD Exhaust Control Measures

Impact 4.15-2 – Energy Resources: Long-term energy use during operation. Potentially significant energy impacts were identified in association with the following facility improvement projects: SJ-1, SJ-2, SJ-3, SJ-5, SV-1, SV-3, SV-5, BD-1, BD-2, PN-2, PN-3, SF-1, SF-2, and SF-3. (DEIR, pp. 4.15-8 to 4.15-14, 6-47.)

Mitigation Measure 4.15-2, Incorporation of Energy Efficient Measures

14. Collective Facilities Impacts

Impact 4.16-1a – Collective temporary and permanent impacts on existing land uses in the vicinity of the proposed facility site. Potentially significant collective land use impacts were identified in association with the following facility improvement project regions: Peninsula Region Improvements. (DEIR, pp. 4.16-8 to 4.16-11, 6-32.)

Mitigation Measure 4.8.-4, Accommodation of Displaced Public Parking Supply for Recreational Visitors

Impact 4.16-1b – Collective temporary and permanent impacts on the visual character the surrounding area. Potentially significant collective visual quality impacts were identified in association with the following facility improvement project regions: San Joaquin Region, Bay Division Region, Peninsula Region, San Francisco Region. (DEIR, pp. 4.16-11 to 4.16-12, 6-7 to 6-8.)

Mitigation Measure 4.3-4a, Architectural Design
Mitigation Measure 4.3-4b, Landscaping Plans
Mitigation Measure 4.3-4c, Landscaping Screens

Impact 4.16-3 – Collective WSIP impacts related to the degradation of surface waters and flooding hazards. Potentially significant collective hydrology and water quality impacts were identified in association with multi-regional effects as well as the following facility improvement project regions: San Joaquin Region, Sunol Valley Region, Bay Division Region, Peninsula Region and San Francisco Region. (DEIR, pp. 4.16-13 to 4.16-16, 6-10.)

Mitigation Measure 4.5-4a, Flood Flow Protection Measures
Mitigation Measure 4.5-4b, Site-Specific Flooding Analysis and Identified Measures
Mitigation Measure 4.5-5, Stormwater Treatment and Groundwater Monitoring
Mitigation Measure 4.5-6, Appropriate Source Control and Site Design Measure

Impact 4.16-4 – Collective loss of sensitive biological resources. Potentially significant collective biological resource impacts were identified in association with multi-regional effects as well as the following facility improvement project regions: San Joaquin Region and Bay Division Region. (DEIR, pp. 4.16-16 to 4.16-19, 6-11 to 6-21.)

Mitigation Measures 4.6-1a, Wetlands Assessment
Mitigation Measure 4.6-1b, Compensation for Wetlands and Other Biological Resources
Mitigation Measure 4.6-2, Habitat Restoration/Tree Replacement
Mitigation Measure 4.6-3a, Protection Measures During Construction for Key Special-Status Species and Other Species of Concern
Mitigation Measure 4.6-3b, Standard Mitigation Measures for Specific Plants and Animals
Mitigation Measure 4.16-4a, Bioregional Habitat Restoration Measures
Mitigation Measure 4.16-4b, Coordination of Construction Staging and Access

Impact 4.16-5 – Collective increase in impacts related to archaeological, paleontological and historical resources. Potentially significant collective cultural resource impacts were identified in association with multi-regional effects as well as the following facility improvement project regions: San Joaquin Region and Bay Division Region. (DEIR, pp. 4.16-19 to 4.16-22, 6-26 to 6-30.)

Mitigation Measure 4.7-4a, Alternatives Identification and Resource Relocation
Mitigation Measure 4.7-4b, Historical Resources Documentation
Mitigation Measure 4.7-4c, Secretary of the Interior's Standards for Treatment of Historic Properties
Mitigation Measure 4.7-4d, Historic Resources Survey and Redesign
Mitigation Measure 4.7-4e, Historic Resources Protection Plan
Mitigation Measure 4.7-4f, Preconstruction Surveys and Vibration Monitoring

Impact 4.16-6 – Collective traffic increases on local and regional roads. Potentially significant collective traffic impacts were identified in association with the following facility improvement project regions: San Joaquin Region, Sunol Valley Region, Bay Division Region, Peninsula Region and San Francisco Region. (DEIR, pp. 4.16-23 to 4.16-26, 6-30 to 6-33.)

Mitigation Measure 4.8-1a, Traffic Control Plan Measures
Mitigation Measure 4.8-1b, Coordination of Individual Traffic Control Plans
Mitigation Measure 4.16-6a, SFPUC WSIP Projects Construction Coordinator
Mitigation Measure 4.16-6b, Combined San Joaquin Traffic Control Plan
Mitigation Measure 4.16-6c, Combined Sunol Valley Traffic Control Plan

Impact 4.16-7 – Collective increases in construction and/or operational emission in the region. Potentially significant collective air quality impacts were identified in association with the following facility improvement project regions: San Joaquin Region, Sunol Valley Region, and Bay Division Region. (DEIR, pp. 4.16-26 to 4.16-29, 6-37 to 6-39.)

Mitigation Measure 4.9-2a, Health Risk Screening or Use of Soot Filters
Mitigation Measure 4.9-2b, Vacate SFPUC Land Managers' Residences in Sunol Valley
Mitigation Measure 4.16-7a, Dust and Exhaust Control Measures for All WSIP Projects
Mitigation Measure 4.16-7b, Health Risk Screening or Use of Soot Filters for All Projects in the San Joaquin and Sunol Valley Regions
Mitigation Measure 4.16-7c, Vacate SFPUC Land Managers' Residences for All Projects in the Sunol Valley Region

Impact 4.16-8 – Collective increases in construction-related and operational noise. Potentially significant collective noise impacts were identified in association with the following facility improvement project regions: Sunol Valley Region. (DEIR, pp. 4.16-30 to 4.16-33, 42 to 6-43.)

Mitigation Measure 4.16-8b, Vacate Land Manager's Residence for All Projects in Sunol Valley Region

Impact 4.16-9 – Collective impacts on landfill capacity. Potentially significant impacts on landfill capacity were identified in association with all of the facility improvement project regions (Draft PEIR, p. 4.16-33.)

Mitigation Measure 4.11-2, Waste Reduction Measures

Impact 4.16-10 – Collective effect on recreational resources during construction. Potentially significant collective recreational resource impacts were identified in association with the following facility improvement project regions: San Joaquin Region, Sunol Valley Region, Bay Division Region, Peninsula Region and San Francisco Region. (DEIR, pp. 4.16-33 to 4.16-34, 6-44.)

Mitigation Measure 4.12-1, Coordination with Golf Course/Recreational Facility Managers
Mitigation Measure 4.12-2, Appropriate Siting of Proposed Facilities

Impact 4.16-11 – Collective conversion of farmland to nonagricultural uses. Potentially significant collective agricultural resource impacts were identified in association with the following facility improvement project regions: San Joaquin Region and Sunol Valley Region. (DEIR, p. 4.16-34, 6-45.)

Mitigation Measure 4.13-2, Siting Facilities to Avoid Prime Farmland

Impact 4.16-12 – Collective effects related to hazardous conditions and exposure to ore release of hazardous materials. Potentially significant collective hazard impacts were identified in association with the following facility improvement project regions: San Joaquin Region, Sunol

Valley Region, Bay Division Region, Peninsula Region and San Francisco Region. (DEIR, pp. 4.16-35 to 4.16-36, 6-30 to 6-32, 6-46.)

Mitigation Measure 4.8-1a, Traffic Control Plan Measures
Mitigation Measure 4.8-1b, Coordination of Individual Traffic Control Plans
Mitigation Measure 4.14-1b, Materials Disposal Plan

Impact 4.16-13 – Collective increases in the use of nonrenewable energy resources. Potentially significant collective energy resource impacts were identified in association with multi-regional effects as well as the following facility improvement project regions: San Joaquin Region, Sunol Valley Region, Bay Division Region, Peninsula Region, and San Francisco Region. (DEIR, pp. 4.16-36 to 4.16-38, 6-35 to 6-37, 6-47.)

Mitigation Measure 4.9-1b, SJVAPCD Exhaust Control Measures
Mitigation Measure 4.9-1d, BAAQMD Exhaust Control Measures
Mitigation Measure 4.15-2, Incorporation of Energy Efficiency Measures

Conservation, Recycling and Groundwater Programs: The Final PEIR also identified possible impacts and mitigation strategies for facilities potentially developed by the wholesale customers to decrease demand for water or to supplement water supply as well. (See C&R pages 13-30 – 34; see also DEIR pp. 9-34 to 9-37; 9-55 to 9-57.) While it is difficult to predict what facilities will be implemented by the wholesale customers, any decisions to approve new projects or programs will undergo further CEQA review and will be approved by the individual customer or by BAWSCA. This Commission recommends that the wholesale customers approve projects that incorporate the mitigation strategies set forth in the Final PEIR, and finds that the wholesale customers can and should adopt applicable mitigation measures and strategies.

IV. SIGNIFICANT IMPACTS THAT CANNOT BE AVOIDED OR REDUCED TO A LESS THAN SIGNIFICANT LEVEL

Based on substantial evidence in the whole record of these proceedings, the SFPUC finds that, where feasible, changes or alterations have been required, or incorporated into, the Phased WSIP Variant to reduce the significant environmental impacts listed below as identified in the FEIR. The SFPUC finds that the mitigation measures in the PEIR and described below are appropriate, and that changes have been required in, or incorporated into, the Phased WSIP Variant that, to use the language of Public Resources Code section 21002 and CEQA Guidelines section 15091, may substantially lessen, but do not avoid (i.e., reduce to less than significant levels), the potentially significant environmental effect associated with implementation of the individual WSIP facility improvement projects, as described in the Program EIR Chapter 4, and the potentially significant or significant environmental effects associated with implementation of the water supply program, as described in the Program EIR, Chapter 13. The SFPUC adopts all of the mitigation measures proposed in the Program EIR that are relevant to the Phased WSIP Variant and set forth in the MMRP, attached hereto as Attachment B. The SFPUC further finds, however, for the impacts listed below, that no mitigation is currently available to render the effects less than significant. The effects therefore remain significant and unavoidable. Based on the analysis contained within the Program EIR, other considerations in the record, and the standards of significance, the SFPUC finds that because some aspects of the Phased WSIP Variant would cause potentially significant impacts for which feasible mitigation measures are not available to reduce the impact to a less-than-significant level, the impacts are ***significant and unavoidable***.

With respect to the facility improvement projects impacts and those water supply/system operations impacts directly related to one of the WSIP projects, the PEIR provides a program-level of analysis based on preliminary project information. Due to the lack of site-specific details, the impacts are based on reasonable worst-case assumptions, and the feasibility of many mitigation measures is uncertain. Thus, to be conservative, these impacts are considered ***potentially significant and unavoidable***. However, subsequent environmental review and analysis of all WSIP facility improvement projects will occur when more detailed, site-specific information is available, and it may be determined that either the impacts no longer apply or that feasible mitigation measures may be available.

The SFPUC determines that the following significant impacts on the environment, as reflected in the Program EIR, are unavoidable, but under Public Resources Code Section 21081(a)(3) and (b), and CEQA Guidelines 15091(a)(3), 15092(b)(2)(B), and 15093, the SFPUC determines that the impacts are acceptable due to the overriding considerations described in Section VII below. This finding is supported by substantial evidence in the record of this proceeding.

A. WSIP Water Supply and System Operations Impacts

1. Alameda Creek Stream Flow

Impact 5.4.1-2 – Stream Flow: Effects on flow along Alameda Creek below the Alameda Creek Diversion Dam. (DEIR, pp. 5.4.1-25 to 5.4.1-33, C&R page 13-37.) Restoring the levels of the Calaveras Dam reservoir under the Calaveras Dam Replacement Project would increase diversions from Alameda Creek to Calaveras Reservoir, nearly eliminating the low and moderate (1 to 650 cfs) flows in Alameda Creek downstream of the diversion dam that currently occur when the diversion gates are closed, and substantially reducing many higher (greater than 650 cfs) flows. Under the Phased WSIP Variant, flows in Alameda Creek in the reach below the diversion dam to the Calaveras Creek confluence and in the reach below the confluence would be substantially reduced compared to the conditions in existence since December 2001, when the California Department of Water Resources, Division of Safety of Dams imposed storage capacity restrictions on Calaveras Reservoir. This reduction of stream flows and alteration of the stream hydrograph is considered a substantial hydrologic effect and, as a result, this impact is *significant and unavoidable.* Implementation of Measure 5.4.1-2 would reduce the impact by requiring the SFPUC to close the diversion dam and cease Alameda Creek diversions to Calaveras Reservoir as soon as possible each year, once the reservoir is at desired levels, such that the later-season storm flows not needed to refill Calaveras Reservoir are allowed to flow down Alameda Creek past the diversion dam to the lower reaches. This measure would help reduce the impact, but not to a less than significant level.

Mitigation Measure 5.4.1-2, Diversion Tunnel Operation

2. San Francisco Peninsula Fisheries

Impact 5.5.5-1 –Fisheries: Effects on fishery resources in Crystal Springs Reservoir (Upper and Lower). (DEIR, pp. 5.5.5-6 to 5.5.5-7; C&R, pp. 15.2-15 and 15.2-16.) Restoring the levels of the reservoir under the Lower Crystal Springs Dam Improvements project (PN-4) could cause a potential loss of stream channel and potential spawning area in San Mateo Creek. However, upstream areas may provide suitable replacement habitat to support the population and this prospect is currently under evaluation in the project-level CEQA review for the Lower Crystal Springs Dam Improvements project. Thus, implementation of Measure 5.5.5-1, Create New Spawning Habitat Above Crystal Springs Reservoir, if feasible, may reduce this impact to less than significant. The project-level CEQA review for the Lower Crystal Springs Dam Improvements project will further evaluate the severity of this impact and the feasibility and efficacy of Measure 5.5.5-1. To be conservative, at the program-level of analysis, this impact is considered *potentially significant and unavoidable*.

Mitigation Measure 5.5.5-1, Create New Spawning Habitat Above Crystal Springs Reservoir

B. Growth Inducing Impacts

CEQA Guidelines section 15126.2, subdivision (d) requires a discussion of the ways in which projects could be growth inducing, including the ways in which "the proposed project could foster economic and population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment." CEQA also requires a discussion of ways in which a project may remove obstacles to growth, as well as ways in which a project may set a precedent for future growth or encourage and facilitate other activities that could significantly affect the environment, either individually or cumulatively. PEIR Chapter 7 and Appendix E provide detailed analysis of the growth-inducing effects of the originally proposed WSIP in the Draft PEIR and concluded in the C&R document, page 13-45, that the Phased WSIP Variant would have similar growth-inducing impacts through 2018.

Impact 7-1 – By removing the lack of a reliable water supply system as one potential obstacle to growth within the SFPUC service area and providing, and assisting in development of, additional water supply sources such as recycled water and groundwater projects as well as promotion of more efficient use of water through conservation measures, the Phased WSIP Variant would have an indirect growth-inducing effect according to the CEQA definition above. The Phased WSIP Variant would support planned growth in the SFPUC service area through 2018, although it appears that some growth would occur irrespective of the Phased WSIP Variant due to increased water delivery efficiencies (e.g., plumbing code changes), conservation, and other water supply sources. Growth would in turn result in indirect effects. In most cases, the effects of planned population and employment growth have been identified and addressed in the EIRs for the general plans and associated area plans and specific plans adopted by the jurisdictions in the service area. Some of the identified indirect effects of growth are significant and unavoidable; others are significant but can be mitigated.

Potentially significant and unavoidable impacts as a result of planned growth in the SFPUC service area have been identified in the following areas: traffic congestion, air pollution, traffic noise, construction noise, increased demand for public schools and other public services, loss of recreational opportunities and impacts on visual quality resulting from the loss of open space, cumulative effects on over-utilized parks, loss of wildlife habitat and wetlands and impacts on other biological resources, cumulative impacts on cultural resources, increased flooding potential, increased urban runoff pollutants, seismic hazards, induced population growth, failure to meet housing demand for projected population growth, exposure of new development to contaminated soil or groundwater, insufficient water supply, insufficient wastewater disposal capacity, loss of agricultural resources, land use conflicts, conflicts with existing land use plans or policies, and changes in density, scale, and character of an area.

The Phased WSIP Variant would have the same growth-inducement potential through 2018 as the WSIP because the SFPUC (with the cooperation of BAWSCA and the wholesale customers) would provide the additional water supply to meet 2018 purchase requests. The Phased WSIP Variant would support much of the planned growth through 2018 in the jurisdictions served by the SFPUC regional water system. In general, development planned and approved through the general plan process in the SFPUC service area would have environmental impacts. The environmental consequences of this planned growth have been largely addressed in local plans and the associated CEQA review as well as in other, project-specific documentation. In a number of jurisdictions, negative declarations or mitigated negative declarations were prepared for general plans and related planning documents that were found not to have significant environmental effects. (DEIR, pp. 7-1 to 7-78; C&R page 13-45.)

With the exception of the No Purchase Request Alternative, all of the alternatives analyzed in the PEIR contribute in similar ways to growth inducement impacts, since each of the Alternatives provides alternative ways of meeting future water supply demand as one of the WSIP objectives. It is also likely that the water customers would find alternate sources of water to meet future demand under the alternatives that are not effective in meeting demand like the Aggressive Conservation and Recycling Alternative. Under this scenario, the Alternative itself may not be growth-inducing, but growth could still occur. There are no mitigation measures proposed for implementation by the SFPUC that could substantially decrease or eliminate growth-inducing impacts because the SFPUC does not have control over the decisions that each local agency will make with respect to growth in their jurisdictions. Individual agencies' general plans and environmental documents contain actions, limitations and mitigation measures that will be implemented in the individual jurisdictions with local development project or program approvals. These kinds of mitigation measures were identified in the PEIR pages 7-67 through 7-78 and in PEIR Appendix E, Section E.5 and Table E.5.1. This Commission urges the local agencies to implement those mitigation measures already identified as feasible, and finds that these agencies can and should implement those mitigation measures

B. WSIP Facility Construction and Operation Impacts

1. Land Use and Visual Quality

Impact 4.3-1 – Land Use: Temporary disruption or displacement of existing land uses during construction. Potentially significant and unavoidable land use impacts were identified in association with the following facility improvement project: SV-4. (DEIR, pp. 4.3-9 to 4.3-16, 6-4 to 6-6, 6-8, 6-30 to 6-32, 6-34 to 6-42.)

Mitigation Measure 4.16-1a, Construction Coordination at Irvington Portal
Mitigation Measure 4.8-1a, Traffic Control Plan Measures
Mitigation Measure 4.8-1b, Coordination of Individual Traffic Control Plans
Mitigation Measure 4.9-1c, BAAQMD Dust Control Measures
Mitigation Measure 4.9-1d, BAAQMD Exhaust Control Measures
Mitigation Measure 4.9-2a, Health Risk Screening or Use of Soot Filters
Mitigation Measure 4.9-2b, Vacate SFPUC Land Managers' Residences in Sunol Valley
Mitigation Measure 4.10-1a, Noise Controls
Mitigation Measures 4.10-2a, Limit Hourly Truck Volumes
Mitigation Measure 4.10-2b, Restrict Truck Operations
Mitigation Measure 4.10-2c, Vacate SFPUC Land Manager's Residence
Mitigation Measure 4.10-3a, Vibration Controls to Prevent Cosmetic or Structural Damage
Mitigation Measure 4.10-3b, Limit Vibration Levels at or Below Vibration Perception Threshold
Mitigation Measure 4.10-3c, Limit Tunnel-Related Detonation to Daylight Hours

Impact 4.3-2 – Land Use: Permanent Displacement or Long-Term Disruption of Existing Land Uses. Potentially significant and unavoidable land use impacts were identified in association with the following facility improvement projects: SJ-3, SV-3, BD-1, PN-2, SF-2, and SF-3. (DEIR, pp. 4.3-20 to 4.3-28, 6-7.)

Mitigation Measure 4.3-2, Facility Siting Studies

Impact 4.3-4 – Visual Quality: Permanent Adverse Impacts on Scenic Vistas or Visual Character. Potentially significant and unavoidable visual quality impacts were identified in association with the following facility improvement project: SV-2. (DEIR, pp. 4.3-29 to 4.3-39, 6-7 to 6-8.)

Mitigation Measure 4.3-4a, Architectural Design
Mitigation Measure 4.3-4b, Landscaping Plans
Mitigation Measure 4.3-4c, Landscape Screens
Mitigation Measure 4.3-4d, Minimize Tree Removal

2. Cultural Resources

Impact 4.7-3 – Cultural Resources: Impacts on historical significance of a district or a contributor to a historic district. Potentially significant and unavoidable cultural resource impacts were identified in association with the following facility improvement projects: SV-2 and PN-2. (DEIR, pp. 4.7-69 to 4.7-75, 6-7 to 6-8, 6-26, 6-29 to 6-30.)

Mitigation Measure 4.7-3, Protection of Historic Districts
Mitigation Measure 4.7-4a, Alternatives Identification and Resource Relocation
Mitigation Measure 4.7-4b, Historical Resources Documentation

Mitigation Measure 4.7-4c, Secretary of the Interior's Standards for Treatment of Historic Properties
Mitigation Measure 4.7-4d, Historic Resources Survey and Redesign
Mitigation Measure 4.7-4e, Historic Resources Protection Plan
Mitigation Measure 4.7-4f, Preconstruction Surveys and Vibration Monitoring

Impact 4.7-4 – Cultural Resources: Impacts on the historical significance of individual facilities resulting from demolition or alteration. Potentially significant and unavoidable cultural resource impacts were identified in association with the following facility improvement projects: SV-2, SV-4, PN-2, and PN-4. (DEIR, pp. 4.7-76 to 4.7-82, 6-4 to 6-6, 6-26 to 6-30.)

Mitigation Measure 4.7-4a, Alternatives Identification and Resource Relocation
Mitigation Measure 4.7-4b, Historical Resources Documentation
Mitigation Measure 4.7-4c, Secretary of the Interior's Standards for Treatment of Historic Properties
Mitigation Measure 4.7-4d, Historic Resources Survey and Redesign
Mitigation Measure 4.7-4e, Historic Resources Protection Plan
Mitigation Measure 4.7-4f, Preconstruction Surveys and Vibration Monitoring

3. Noise and Vibration

Impact 4.10-1 –Noise: Disturbance from temporary construction-related noise increases. Potentially significant and unavoidable noise impacts were identified in association with all of the facility improvement projects. (DEIR, pp. 4.10-10 to 4.10-23, 6-4 to 6-6, 6-39 to 6-41.)

Mitigation Measure 4.10-1a, Noise Controls
Mitigation Measure 4.10-1b, Vacate SFPUC Caretaker's Residence at Tesla Portal

Impact 4.10-2 – Noise: Temporary noise disturbance along construction haul routes. Potentially significant and unavoidable noise impacts were identified in association with the following facility improvement projects: SJ-1, SJ-3, SJ-5, BD-1, BD-2, PN-3, SF-1, SF-2, and SF-3. (DEIR, pp. 4.10-23 to 4.10-26, 6-41 to 6-42.)

Mitigation Measure 4.10-2a, Limit Hourly Truck Volumes
Mitigation Measure 4.10-2b, Restrict Truck Operations

Impact 4.10-3 –Vibration: Disturbance due to construction-related vibration. Potentially significant and unavoidable vibration impacts were identified in association with the following facility improvement projects: SJ-3, SV-3, BD-1, BD-2, SF-1, SF-2, and SF-3. (DEIR, pp. 4.10-27 to 4.10-33, 6-42.)

Mitigation Measure 4.10-3a, Vibration Controls to Prevent Cosmetic or Structural Damage
Mitigation Measure 4.10-3b, Limit Vibration Levels at or Below Vibration Perception Threshold
Mitigation Measure 4.10-3c, Limit Tunnel-Related Detonation to Daylight Hours

4. Collective Facilities Impacts

Impact 4.16-1a – Collective temporary and permanent impacts on existing land uses in the vicinity of the proposed facility site. Potentially significant and unavoidable collective land use impacts were identified in association with the following facility improvement project regions: Bay Division Region. (DEIR, pp. 4.16-8 to 4.16-11, 6-32.)

Mitigation Measure 4.16-1a, Construction Coordination at Irvington Portal

Impact 4.16-4 – Collective loss of sensitive biological resources. Potentially significant and unavoidable collective biological resource impacts were identified in association with the following facility improvement project regions: Sunol Valley Region and Peninsula Region. (DEIR, pp. 4.16-16 to 4.16-19, 6-11 to 6-21.)

Mitigation Measure 4.6-1a, Wetlands Assessment
Mitigation Measure 4.6-1b, Compensation for Wetlands and Other Biological Resources
Mitigation Measure 4.6-2, Habitat Restoration/Tree Replacement
Mitigation Measure 4.6-3a, Protection Measures During Construction for Key Special-Status Species and Other Species of Concern
Mitigation Measure 4.6-3b, Standard Mitigation Measures for Specific Plants and Animals
Mitigation Measure 4.16-4b, Coordination of Construction Staging and Access

Impact 4.16-5 – Collective increase in impacts related to archaeological, paleontological and historical resources. Potentially significant and unavoidable collective cultural resource impacts were identified in association with the following facility improvement project regions: Sunol Valley Region and Peninsula Region. (DEIR, pp. 4.16-19 to 4.16-22, 6-26 to 6-30.)

Mitigation Measures 4.7-4a, Alternatives Identification and Resource Relocation
Mitigation Measure 4.7-4b, Historical Resources Documentation
Mitigation Measure 4.7-4c, Secretary of the Interior's Standards for Treatment of Historic Properties
Mitigation Measure 4.7-4d, Historic Resources Survey and Redesign
Mitigation Measure 4.7-4e, Historic Resources Protection Plan
Mitigation Measure 4.7-4f, Preconstruction Surveys and Vibration Monitoring

Impact 4.16-6 – Collective impact from multi-regional effects on traffic, transportation, and circulation were identified as potentially significant and unavoidable due to multiple roadways affected by construction activities within one or more regions and/or when construction vehicles use regional roadways. (DEIR, pp. 4.16-23 and 6-32)

Mitigation Measure 4.16-6a, SFPUC WSIP Projects Construction Coordinator

Impact 4.16-7 – Collective impact from multi-regional effects on air quality was identified as potentially significant and unavoidable due to residual contributions to ozone and particulate matter emissions during construction. (DEIR, pp. 4.16-26, 6-34 to 6-38)

Mitigation Measure 4.16-7a, Dust and Exhaust Control Measures for All WSIP Projects

Impact 4.16-8 – Collective increases in construction-related and operational noise. Potentially significant and unavoidable collective noise impacts were identified in association with the following facility improvement project regions: San Joaquin Region, Bay Division Region, Peninsula Region and San Francisco Region. (DEIR, pp. 4.16-30 to 4.16-33, 6-42 to 6-43.)

Mitigation Measure 4.10-1a, Noise Controls
Mitigation Measure 4.10-1b, Vacate SFPUC Caretaker's Residence at Tesla Portal
Mitigation Measure 4.10-2a, Limit Hourly Truck Volumes
Mitigation Measure 4.10-2b, Restrict Truck Operations
Mitigation Measure 4.16-8a, Limiting Hourly Truck Volumes and Restricting Truck Operations on Haul Routes for Multiple WSIP Projects
Mitigation Measure 4.16-8b, Vacate Land Manager's Residence for All Projects in Sunol Valley Region

5. Cumulative Facilities Impacts

Impact 4.17-5 – Cumulative increase in impacts on archaeological, paleontological, and historical resources. Potentially significant and unavoidable cumulative cultural resource impacts were identified in association with all of the following facility improvement project regions. (DEIR, pp. 4.17-52 to 4.17-53, 6-26 to 6-30.)

Mitigation Measure 4.7-4a, Alternatives Identification and Resource Relocation
Mitigation Measure 4.7-4b, Historical Resources Documentation
Mitigation Measure 4.7-4c, Secretary of the Interior's Standards for Treatment of Historic Properties
Mitigation Measure 4.7-4d, Historic Resources Survey and Redesign
Mitigation Measure 4.7-4e, Historic Resources Protection Plan
Mitigation Measure 4.7-4f, Preconstruction Surveys and Vibration Monitoring

Impact 4.17-6 – Cumulative traffic increases on local and regional roads. Potentially significant and unavoidable cumulative traffic impacts were identified in association with all of the following facility improvement project regions. (DEIR, pp. 4.17-54 to 4.17-57, 6-33.)

Mitigation Measure 4.8-1a, Traffic Control Plan Measures
Mitigation Measure 4.8-1b, Coordination of Individual Traffic Control Plans
Mitigation Measure 4.16-6a, SFPUC WSIP Projects Construction Coordinator
Mitigation Measure 4.16-6b, Combined San Joaquin Traffic Control Plan
Mitigation Measure 4.16-6c, Combined Sunol Valley Traffic Control Plan
Mitigation Measure 4.17-6, SFPUC WSIP Projects Construction Coordinator – Other Agencies

Impact 4.17-7 – Cumulative increases in construction and/or operational emissions in the region. Potentially significant and unavoidable cumulative air quality impacts were identified in association with all of the following facility improvement project regions. (DEIR, pp. 4.17-57 to 4.17-59, 6-34 to 6-38.)

Mitigation Measure 4.9-1a, SJVAPCD Dust Control Measures
Mitigation Measure 4.9-1b, SJVAPCD Exhaust Control Measure
Mitigation Measure 4.9-1c, BAAQMD Dust Control Measures
Mitigation Measure 4.9-1d, BAAQMD Exhaust Control Measures
Mitigation Measure 4.11-2, Waste Reduction Measures
Mitigation Measure 4.15-2, Incorporation of Energy Efficient Measures
Mitigation Measure 4.16-7a, Dust and Exhaust Control Measures for All WSIP Projects
Mitigation Measure 4.17-6, SFPUC WSIP Projects Construction Coordinator – Other Agencies

Impact 4.17-8 – Cumulative increases in construction-related and operational noise. Potentially significant and unavoidable cumulative noise impacts were identified in association with all of the following facility improvement project regions. (DEIR, pp. 4.17-59 to 4.17-60, 6-43.)

Mitigation Measure 4.10-2a, Limit Hourly Truck Volumes
Mitigation Measure 4.10-2b, Restrict Truck Operations
Mitigation Measure 4.17-8, Coordination of Truck Traffic on Local Streets

V. EVALUATION OF PROGRAM ALTERNATIVES

This Section describes the Phased WSIP Variant as well as the Program Alternatives and the reasons for approving the Phased WSIP Variant and for rejecting the Alternatives. This Article also outlines the Phased WSIP Variant's purposes and provides a context for understanding the reasons for selecting or rejecting alternatives.

CEQA mandates that an EIR evaluate a reasonable range of alternatives to the Project or the Project location that generally reduce or avoid potentially significant impacts of the Project. CEQA requires that every EIR also evaluate a "No Project" alternative. Alternatives provide a basis of comparison to the Project in terms of their significant impacts and their ability to meet Program objectives. This comparative analysis is used to consider reasonable, potentially feasible options for minimizing environmental consequences of the Project.

A. Reasons for Selection of the 2018 Phased Project Variant

The overall goals of the Phased WSIP Variant for the regional water system are to:

- Maintain high-quality water and a gravity-driven system
- Reduce vulnerability to earthquakes
- Increase delivery reliability
- Meet customer water supply needs through 2018
- Enhance sustainability
- Achieve a cost-effective, fully operational system

The SFPUC staff recommended this Variant in order to fully implement all proposed WSIP facility improvement projects to insure that the public health, seismic safety and delivery reliability goals of the WSIP are achieved as soon as possible while phasing implementation of a water supply program to meet projected water purchases through 2030. Deferring a decision on the 2030 water supply element of the WSIP until 2018 allows the SFPUC and its wholesale customers to focus first on implementing additional local recycled water, groundwater and demand management actions while minimizing additional diversions from the Tuolumne River. Under the Phased WSIP Variant, the SFPUC would establish an interim mid-term planning horizon – 2018. By adopting this Variant, the SFPUC is deferring a decision regarding long-term water supply until 2018 in light of then-current information and updated analysis. Because it remains at present unclear whether in 2018 the SFPUC will approve a water supply scenario for 2030 with adverse environmental effects beyond those associated with the Phased WSIP Variant, the Phased WSIP Variant may, in the long run, have a lesser level of environmental effect than the original WSIP. All non-water supply related WSIP goals and level of service objectives would be achieved under this Variant and all individual WSIP facility improvement projects proposed in the original WSIP would be constructed.

It is necessary to implement all of the WSIP facility improvement projects in order to achieve the program goals of the Phased WSIP Variant, as set forth in Section I of these findings, above. The Phased WSIP Variant is superior to the Alternatives in achieving the urgent goals of the WSIP; it allows the SFPUC to meet its water quality, seismic safety and water delivery reliability goals while minimizing effects on the SFPUC watersheds through 2018. The Phased WSIP Variant also focuses efforts on conservation, recycling and groundwater projects before deciding whether to increase deliveries from the watersheds.

As discussed above, impacts from Phased WSIP Variant would be less than those for the original WSIP because (1) the impact on Tuolumne River would be less and likely of shorter duration, and (2) certain impacts in the Pilarcitos watershed and in the Alameda Creek watersheds would not occur with Phased WSIP Variant.

B. Alternatives Rejected and Reasons for Rejection

The Commission rejects the Alternatives set forth in the Final PEIR and listed below because the Commission finds that there is substantial evidence, including evidence of economic, legal, social, technological, and other considerations described in this Section in addition to those described in Section VII below under CEQA Guidelines 15091(a)(3), that make infeasible such Alternatives. In making these determinations, the Commission is aware that CEQA defines “feasibility” to mean "capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, social, legal, and technological factors.” The Commission is also aware that under CEQA case law the concept of “feasibility” encompasses (i) the question of whether a particular alternative promotes the underlying goals and objectives of a project. and (ii) the question of whether an alternative is “desirable” from a policy standpoint to the extent that desirability is based on a reasonable balancing of the relevant economic, environmental, social, legal, and technological factors.

In addition, adoption of the Phased WSIP Variant will reduce many of the water supply impacts associated with increased diversions until at least 2018, and the additional water conservation, recycling and groundwater projects will have the effect of reducing the projected demand for water to be diverted from the SFPUC watersheds through 2018 and beyond. Some of the alternatives are less effective in reducing environmental impacts associated with water supply than the Phased WSIP Variant and are not environmentally superior to the Phased WSIP Variant because they do not attempt to reduce projected demand for water but would look to development of alternative sources of water, each of which has environmental effects. While some of the other alternatives would avoid or lessen certain WSIP impacts, they would also result in substantial additional impacts that the Phased WSIP Variant would not generate, because these alternatives would require substantial additional major facilities and affect other environmental resources in different geographic locations in addition to those affected by the Phased WSIP Variant. There would thus be no basis under CEQA for selecting a particular alternative where this is the case. The Phased WSIP Variant also incorporates elements of three alternatives, the No Purchase Request Alternative, the Aggressive Conservation/Water Recycling and Groundwater Alternative, and the Modified WSIP Alternative, as described below. Therefore, the Commission is not rejecting those alternatives in their entirety.

1. No Program Alternative

Under the No Program Alternative, the SFPUC would implement only those facility improvement projects driven by regulatory requirements or existing agreements with regulatory agencies. The system would meet the water quality goals of the WSIP, but it would fail to meet the seismic and delivery reliability goals and would have limited ability to serve the increase in customer purchase requests through 2018, as both the magnitude and frequency of rationing would increase in response to droughts. The SFPUC would endeavor to meet increasing customer purchase requests by diverting additional Tuolumne River water only when available. It would not secure an additional dry-year supply transfer of Tuolumne River water, implement the Westside Basin groundwater conjunctive-use program, or develop the proposed recycled water and groundwater projects in San Francisco or the wholesale customer service area. The wholesale customers may decide to pursue supplemental supply sources and/or conservation measures to make up for the reduced reliability and the supply shortfall under this alternative, but this would occur outside of and independent of the WSIP. Compared to the Phased WSIP Variant, this alternative would develop less in terms of new water supplies for the regional system and would implement far fewer of the proposed facility improvement projects. (DEIR, pages 9-23 to 9-40.)

Although it appears that fewer facility improvement projects would be implemented under the No Program Alternative and that, as a result, there would be fewer facility construction and operation impacts, it is expected that there would be much more emergency facility repair and replacement projects under this alternative as the system continues to age without proactive improvement. Ultimately, through required repair and replacement efforts, a similar level of facility improvement projects as that proposed under the Phased WSIP Variant might have to be conducted under the No Program Alternative, resulting in much of the same facility impacts as the Phased WSIP Variant; however, these repair and replacement projects would likely occur over a longer period of time and in a less coordinated and comprehensive manner. In addition, implementing system improvements through a piecemeal and largely emergency response approach could result in greater environmental impacts and less mitigation for such impacts;

when projects are implemented under emergency conditions, they often require little or no environmental review (see Pub. Resources Code, § 21080, subds. (b)(2), (b)(4)) and thus could be implemented without the same level of mitigation and mitigation compliance monitoring that would be required for the Phased WSIP Variant. Furthermore, piecemeal implementation could also increase the cumulative effects of multiple, sequential facility repair and replacement projects throughout the system.

The Commission rejects this Alternative because it will not meet the fundamental and most pressing needs of the water system – to improve the seismic safety and reliability of the water system as a means of saving human life and property under a catastrophic earthquake scenario or even a disaster scenario not rising to the level of catastrophic. As the system ages, its reliability decreases and the risk of failure increases. The 167-mile-long system crosses five active earthquake faults. Many of the SFPUC regional water system components are located on or in the immediate vicinity of major earthquake faults. Due to the age of the system, many facilities do not meet modern seismic standards. In order to implement a feasible asset management program in the future that will provide continuous maintenance and repairs to facilities, the regional water system requires redundancy (i.e., backup) of some critical facilities necessary to meeting day-to-day customer water supply needs. Without adequate redundancy of critical facilities, the SFPUC has limited operational flexibility in the event of an emergency or a system failure, as well as constraints on conducting adequate system inspection and maintenance. This Alternative would place the water system at significant risk to seismic hazards, increased facility failures, and increased supply shortages on a day-to-day basis, as well as result in prolonged service disruptions to many customers in the event of an earthquake or other emergency due to inadequate facility redundancy and operational flexibility. This Alternative is rejected as infeasible because it meets none of the vitally important Program objectives.

2. No Purchase Request Increase Alternative

As described in the PEIR, the No Purchase Request Increase Alternative is designed to serve wholesale customers only the amount of water required under the existing Master Water Sales Agreement between the City and County of San Francisco and each of the wholesale customers through 2030. Under the No Purchase Request Increase Alternative, the SFPUC would implement all of the proposed WSIP facility improvement projects. It is expected that the wholesale customers would pursue supplemental supply sources and/or conservation measures to make up the supply shortfall under this alternative, but this would occur outside of and independent of the WSIP. This alternative was included in the alternatives analysis in an effort to avoid or minimize the potential growth-inducing effects and secondary effects of growth associated with providing more water to the regional customers, and the PEIR evaluates the effects of this water supply approach on the SFPUC watersheds.

This Commission acknowledges that the Phased WSIP Variant is similar to this Alternative through the 2018 planning period. However, unlike the No Purchase Request Alternative, the Phased WSIP Variant includes financial incentives to induce the wholesale customers to limit water use and thus minimize increases in diversions from the SFPUC watersheds or other locations, and instead, emphasizes the development of alternative sources of water, including conservation measures, recycling projects and local groundwater development. This Commission adopts those portions of the No Purchase Request Increase Alternative that are the same as those included within the Phased WSIP Variant and rejects the remaining aspects of the No Purchase Request Increase Alternative as infeasible, as they do not incorporate the mitigation measures, the financial incentives or the re-evaluation of the customer demands in 2018. The Commission finds that the Phased WSIP Variant is similar to this Alternative, but the Variant provides a mechanism to re-evaluate the long term water demands and the need to divert more water from the SFPUC watersheds in 2018. The Phased WSIP Variant also provides that the SFPUC and the customers will develop the most effective and financially feasible methods of providing recycled water and implementing conservation measures as a priority in the next ten years.

To the extent that the No Purchase Request Increase Alternative would fail to increase SFPUC water deliveries through 2030 and not just through 2018, the Commission rejects the alternative as infeasible for that reason alone. It is foreseeable that, within the next 22 years, the population and economic trends within the SFPUC service area will create a substantial demand for new water supplies, even with aggressive conservation efforts. Under the Phased WSIP Variant, the SFPUC would wait until 2018 to determine whether and how to address demands arising between 2018 and 2030. This latter approach is more realistic and responsible from a public policy standpoint, in that it (i) acknowledges the likelihood of increasing customer demands between 2018 and 2030 and (ii) does not essentially force existing SFPUC customers to seek other sources for their needed new long-term water supplies, some of which may be more environmentally damaging than increasing the yield from the SFPUC system from averages of 265 mgd annually to an average of 300 mgd annually. Compared with the No Purchase Increase Alternative, the Phased WSIP Variant delays a decision on supply needs between 2018 and 2030 for a decade in order to give SFPUC customers the chance to maximize their conservation efforts and identify any available, environmentally sustainable source alternatives, while not making any irrevocable decision to deny SFPUC supply increases after 2018. In short, after balancing competing policy considerations and the extent to which the No Purchase Request Increase Alternative would address the SFPUC's long-term water supply objective, the Commission rejects as infeasible within the meaning of CEQA those portions of the No Purchase Request Increase Alternative not included within the Phased WSIP Variant.

3. Aggressive Conservation/Water Recycling and Local Groundwater Alternative

As described in the PEIR, under this alternative, the SFPUC would implement all of the proposed WSIP facility improvement projects, but would endeavor to serve the projected increase in customer purchase requests through 2030 using only additional conservation, water recycling, and local groundwater projects. It does not appear feasible, however, to fully meet the 2030 purchase requests with reasonably foreseeable conservation, recycled water, and groundwater projects within the service area. Therefore, under the Aggressive Conservation/Water Recycling and Local Groundwater Alternative, the SFPUC would have to either: (a) limit future customer purchase deliveries to the level that can be met, short of the 2030 requests (approximately 294 mgd under the most optimistic scenario instead of 300 mgd average annual) and increase the level of rationing to 25 percent or more during droughts, or (b) provide a supplemental supply to make up the delivery shortfall to meet the 300 mgd.

The Phased WSIP Variant incorporates the most important elements of this Alternative through 2018. The Variant establishes financial incentives to induce the wholesale customers to develop conservation, recycled water and groundwater projects and thus limit deliveries from the SFPUC watersheds to an average annual 265 mgd. The Phased WSIP Variant allows the SFPUC to re-evaluate water demands and the efficacy of the conservation, recycling and groundwater programs in 2018. In the Phased WSIP Variant, the SFPUC will implement 10 mgd of conservation, recycling and groundwater projects in San Francisco, and the wholesale customers will develop an additional 10 mgd of conservation, recycling and groundwater projects in the wholesale customer service area. This Commission rejects this Alternative insofar as it makes a water supply decision to attempt to meet demand of 300 mgd through 2030 (although it may be ineffective in meeting that demand and force customers to seek water from other entities); instead, the Phased WSIP Variant focuses the SFPUC and the customers on implementation of conservation, recycling and local groundwater projects before 2018. The SFPUC will then re-evaluate the water supply decision in 2018.

To the extent that the Aggressive Conservation/Water Recycling and Local Groundwater Alternative does not include sufficient supplies to deal with foreseeable customer demand through 2030, the Commission rejects those portions of the Aggressive Conservation/Water Recycling and Local Groundwater Alternative not included within the Phased WSIP Variant as infeasible for that reason alone. Under the Phased WSIP Variant, unlike the Aggressive Conservation/Water Recycling and Local Groundwater Alternative, the SFPUC has not refused to supply the amounts of water predicted to be needed by customers in 2030, but rather has delayed any such decision until 2018. The Phased WSIP Variant thus has the virtues of being more realistic and responsible from a public policy standpoint, in that it (i) acknowledges the likelihood of increasing customer demands between 2018 and 2030 and (ii) does not essentially force existing SFPUC customers to seek other sources for their needed new long-term water supplies, some of which may be more environmentally damaging than increasing the yield from the SFPUC system to the levels predicted to be needed in 2030. Compared with the Aggressive Conservation/Water Recycling and Local Groundwater Alternative, the Phased WSIP Variant delays a decision on supply needs between 2018 and 2030 for a decade in order to give all SFPUC customers the chance to maximize their conservation efforts and identify any available, environmentally sustainable source alternatives, while not making any irrevocable decision to deny SFPUC supply increases after 2018. In short, after balancing competing policy considerations and the extent to which the Aggressive Conservation/Water Recycling and Local Groundwater Alternative would address the SFPUC's long-term water supply objective, the Commission rejects as infeasible within the meaning of CEQA those portions of the Aggressive Conservation/Water Recycling and Local Groundwater Alternative not included within the Phased WSIP Variant.

4. Lower Tuolumne River Diversion Alternative

As described in the PEIR, under the Lower Tuolumne River Diversion Alternative, the SFPUC would implement all of the proposed facility improvement projects and would serve the projected increase in customer purchase requests through 2030 through diversions from the lower Tuolumne River near its confluence with the San Joaquin River, assuming it could reach agreement with TID and MID. This alternative would include construction and operation of additional conveyance and treatment facilities to divert, transport, treat, and blend the new supply into the regional system. This Alternative represented an alternative source of supply and was evaluated to address impacts on the Tuolumne River and related resources.

This Commission rejects this Alternative as infeasible. The ability to implement this Alternative is uncertain, given the number of agreements and approvals that would be required to construct the diversion and treatment facilities. Because the Phased WSIP Variant proposes to limit sales of water from the SFPUC watersheds to 265 mgd through 2018, the effects on the Tuolumne River would be substantially less since much less water would be diverted from the Tuolumne River watershed. Through 2018, the Phased WSIP Variant will divert an average annual 2 mgd more than SFPUC currently diverts from the Tuolumne River to meet its delivery and drought reliability objectives. There will be no need to construct additional conveyance and treatment facilities to divert, transport, treat, and blend the new supply into the regional system and incur the financial or the environmental costs that such construction will necessitate, as analyzed by the SFPUC in its Report (SFPUC, Water Supply Options, 2007 [Appendix C, *WSIP Alternative Water Supply Option 3*, prepared by SFPUC and Parsons, June 2006).

The analysis in the Draft PEIR concluded that the environmental impacts of this alternative would result in greater impacts on the Tuolumne River resources than the original WSIP or the Phased WSIP Variant. This Alternative would not meet the SFPUC's most basic objective of maintaining a gravity-driven system. This Alternative would require construction of pumping and treatment facilities in order to divert water from the lower Tuolumne River. This Alternative will result in far more impacts than the Phased WSIP Variant on the watershed and its resources, including fisheries, due to the construction and operation of the facilities that must be constructed to implement this Alternative. The Phased WSIP Variant is superior to this Alternative because the Phased WSIP Variant focuses first on developing more conservation, water recycling and groundwater projects before determining to divert more water from the Tuolumne River on a long-term, extended basis. Therefore, there should be no need to construct a diversion structure prior to 2018.

In short, after balancing competing policy considerations and the extent to which the Lower Tuolumne River Diversion Alternative would result in greater environmental impacts and address the SFPUC’s long-term water supply objective, the Commission rejects the Lower Tuolumne River Diversion Alternative as infeasible within the meaning of CEQA.

5. Year-round Desalination at Oceanside Alternative

As described in the PEIR, under the Year-round Desalination at Oceanside Alternative, the SFPUC would implement all of the proposed WSIP facility improvement projects and would construct a 25-mgd desalination plant in San Francisco to serve the projected increase in customer purchase requests through 2030. This alternative would not involve increased levels of diversions from the Tuolumne River. The desalination plant would provide year-round supplies during all hydrologic year types to blend into the regional system at the Sunset Reservoir in San Francisco. Compared to the originally proposed WSIP, this alternative represents an alternative source of supply and was evaluated to address the potential impacts on the Tuolumne River, Alameda Creek, and Peninsula watersheds, including Pilarcitos Creek, and related resources. (DEIR, pp. 9-66 to 9-74.) Compared to the Phased WSIP Variant, it provides a supply of water that is not yet needed but has significant environmental effects of its own, as discussed below.

This Commission rejects this Alternative as infeasible at this time for the following reasons. Construction and operation of a desalination facility raises unresolved environmental issues, including questions about protecting aquatic resources, water quality and brine disposal issues. The plant would require significant increases in long-term energy use compared to the Phased WSIP Variant. Because in California today, such energy generation typically involves the use of fossil fuels, the energy demands of a desalination facility will exacerbate global climate change by increasing emissions of greenhouse gases (GHGs), in contravention of state policy as embodied in the California Global Warming Solutions Act of 2006, also known as AB 32. This Alternative is also likely to be quite costly for the SFPUC, as analyzed by the SFPUC in its Report (SFPUC, Water Supply Options, 2007 [Appendix C, *WSIP Alternative Water Supply Option 3*, prepared by SFPUC and Parsons, June 2006). Feasibility of the desalination plant is also uncertain at this time; it would require numerous additional permits and approvals from, among other agencies, the California Department of Health Services, the U.S. Army Corps of Engineers, the RWQCB and the California Coastal Commission. It is unlikely that this facility can be approved and constructed in time to meet demand projections in the next 10 years. Thus the Phased WSIP Variant is not only more feasible from technological and timing perspectives but also will have fewer environmental impacts because of its focus on conservation, recycling and local groundwater projects. Instead, this Commission believes that efforts should be made to implement conservation measures, recycling projects and groundwater projects to meet additional water supply demands in the relative short term; following those efforts, demand for water supply can be reassessed in 2018.

In short, after balancing competing policy considerations and the extent to which the Year-round Desalination at Oceanside Alternative would add a great deal of complexity and uncertainty to the satisfaction of the SFPUC's long-term water supply objective, the Commission rejects the Year-round Desalination at Oceanside Alternative as infeasible within the meaning of CEQA.

6. Regional Desalination for Drought Alternative

As described in the PEIR, under the Regional Desalination for Drought Alternative, the SFPUC would implement all of the proposed WSIP facility improvement projects and would partner with other Bay Area water agencies to construct and operate a regional desalination plant that would provide the SFPUC with supplemental supply during drought years. Compared to the originally proposed WSIP, this alternative represents an alternative source of water supply and was evaluated to address the potential impacts on the Tuolumne River.

This Commission does not fully reject this Alternative because the SFPUC is currently exploring a regional desalination plant for drought, as a partial long-term solution to water supply and demand. The SFPUC is participating in the development of feasibility studies and pilot testing to determine the viability of the regional desalination plant. If found to be feasible, the SFPUC would contribute funds towards environmental review, project construction and operation of the plant. Development of this Alternative would require construction of multiple components, cooperation agreements with other agencies, and local, state and federal regulatory approvals. There are many unresolved environmental issues, including questions about protecting aquatic resources, water quality and brine disposal issues. The plant would require significant increases in long-term energy use compared to the Phased WSIP Variant. Because in California today, such energy generation typically involves the use of fossil fuels, the energy demands of a desalination facility will exacerbate global climate change by increasing GHG emissions, in contravention of state policy as embodied in AB 32. Depending on the agreements with other participating agencies, this Alternative could also be quite costly for the SFPUC as analyzed by the SFPUC in the Bay Area Regional Desalination Project Pre-feasibility Study, Final Report, prepared by URS Corporation, 2003. While the desalination may provide a partial solution to diverting more water from the SFPUC watersheds, it does not appear to be environmentally superior to the Phased WSIP Variant through 2018. Instead, this Commission believes that a combination of efforts to be made under the Phased WSIP Variant to limit deliveries from the SFPUC watersheds to approximately 265 mgd, average annual, as well as implementation of conservation measures, recycled water projects and groundwater projects to meet additional water supply demands in the relative short term, presents a better approach to water system management. In the near-term, this Commission considers this Alternative to be infeasible to fulfill dry year or drought water supply needs because of the potential financial and environmental costs and the uncertainty regarding the SFPUC's ability to secure all necessary agreements and approvals to implement the Alternative. This Alternative proposes a desalination facility that is in the beginning stages of feasibility analyses, and many issues remain to be resolved.

After balancing competing policy considerations and the extent to which the Regional Desalination for Drought Alternative would add a great deal of complexity and uncertainty to the satisfaction of the SFPUC’s long-term water supply objective, the Commission presently rejects the Regional Desalination for Drought Alternative as infeasible within the meaning of CEQA. In doing so, however, the SFPUC is by no means closing the door permanently on eventual participation in a regional desalination facility. As part of its assessment in 2018 as to whether to increase Tuolumne River diversions to meet anticipated 2030 demand in its service area, the SFPUC will assess any progress the region has made towards putting in place, on a timely basis and under acceptable environmental conditions, a facility for desalinating seawater as a source of supplemental water supply during droughts. Any such facility is simply too ill-defined and uncertain at present to be adopted at this time.

7. Modified WSIP Alternative

The Modified WSIP Alternative would implement all of the proposed facility improvement projects, but would modify proposed system operations to minimize environmental effects. This alternative would include as part of its "Project description" the implementation of key mitigation measures identified for the originally proposed WSIP in the PEIR, including acquiring a water transfer of conserved water as a supplemental dry-year source, implementing a minimum instream flow requirement for resident fish in a portion of Alameda Creek, incorporating mitigation measures to address impacts in the Pilarcitos Creek watershed**,** managing the inundation levels at Crystal Springs Reservoir to preserve upland habitat to the extent possible, and increasing recycled water, conservation, and local groundwater in partnership with wholesale customers. It also requires that any additional water diverted from the upper Tuolumne River must be offset by conservation efforts for water to be released to the lower Tuolumne River. This Alternative proposes to divert an average annual 15 mgd additional water from the Tuolumne River between Hetch Hetchy and Don Pedro Reservoirs compared to existing conditions. This alternative was evaluated to address the impacts identified for the originally proposed WSIP on the Tuolumne River, Alameda Creek, and Peninsula watersheds, including Pilarcitos Creek and Crystal Springs Reservoir, and related resources. (DEIR, pp. 9-78 to 9-84; C&R Section 14.10.)

Water supply sources in both the Modified WSIP Alternative and the Phased WSIP Variant are similar, but differ in a few respects. First, the Modified WSIP Alternative proposes to divert an additional annual average of 15 mgd from the upper Tuolumne River compared to existing conditions through 2030 and thus would result in diverting more water from the Tuolumne River than would occur under the Phased WSIP Variant through 2018. Under the Modified WSIP Alternative, water would be diverted at Hetch Hetchy Reservoir to meet 2030 demand. That diversion would result in reduced inflow to Don Pedro Reservoir, which, under this Alternative, would be offset by reduced outflow from Don Pedro because of conservation measures undertaken by MID or TID (and/or in the service area of another nearby water agency). Water releases from Don Pedro Reservoir to the lower Tuolumne River thus would be the similar to existing conditions under the Modified WSIP Alternative. The Phased WSIP Variant proposes long-term increases in diversions of about 2 mgd, average annual, from the Tuolumne River to meet the Program's reliability and drought rationing objectives and would maintain total deliveries to customers from the watersheds at 265 mgd, average annual. In the short term, the Phased WSIP Variant may result in the need to deliver more than a total of 265 mgd, average annual, to customers for a limited period while local conservation, recycling and groundwater programs are being implemented. Where the Phased WSIP Variant diverts more than an average annual of 265 mgd from the watersheds, mitigation measures will be implemented for the Lower Tuolumne River.

Second, the approach to the dry-year transfer is slightly different for the Modified WSIP Alternative and the Phased WSIP Variant. The Westside Groundwater Basin conjunctive use program would provide a supplemental dry-year water supply source for both the Phased WSIP Variant and the Modified WSIP Alternative. The dry-year water transfer from TID and MID under the Modified WSIP Alternative would be a transfer made only from conserved water (approximately 17.5 mgd average over the design drought). The Phased WSIP Variant does not rule out the possibility of using conserved water only, and includes preferred mitigation measure 5.3.6-4a to be implemented if average annual deliveries of water from the watersheds exceeds 265 mgd, but it does not require that dry-year transfers be conserved water only (approximately 2 mgd average over the design drought). Thus, the substantially reduced size of the dry-year transfer under the Phased WSIP Variant compared to the Modified WSIP Alternative combined with the urgency of undertaking the improvements and increasing reliability through implementation of the dry year supply measures make it difficult to require that no transfer occur without equal and balancing conservation measures in MID/TID service area at this time.

Third, the Phased WSIP Variant proposes more conservation, recycling and groundwater programs than the Modified WSIP Alternative. Both the Alternative and the Variant assume 10 mgd of conservation, recycling and groundwater programs in San Francisco. While the Modified WSIP Alternative commits to 5 – 10 mgd of additional conservation, recycling and groundwater programs in the wholesale customer area through 2030, the Phased WSIP Variant requires that a minimum of 10 mgd of additional conservation, recycling and groundwater programs be implemented in the wholesale customer area by 2018.

The Modified WSIP Alternative would result in more impacts on the upper Tuolumne River watershed than the Phased WSIP Alternative, but possibly fewer impacts on the lower Tuolumne River watershed if under the Phased WSIP Variant, average annual deliveries from the watersheds were to exceed 265 mgd in the short-term. The Modified WSIP Alternative would lessen but not entirely eliminate impacts on the lower Tuolumne River, but the impacts would be considered less than significant. (See C&R, Section 14.10, pages 14.10-2 – 14.10-26.) As long as average annual deliveries from the watersheds do not exceed 265 mgd under the Phased WSIP Variant, impacts on the lower Tuolumne River would be considered less than significant; mitigation measures will be implemented any time the SFPUC's average annual deliveries from the watersheds exceed an average annual total of 265 mgd.

In the Alameda Creek watershed, the impacts of the Phased WSIP Variant and the Modified WSIP Alternative are essentially the same. The SFPUC has already incorporated the Alameda Creek bypass flows between the Alameda Creek Diversion Dam and the confluence with Calaveras Creek as protective measures under the Calaveras Dam Replacement project (SV-2), and is adopting now the mitigation measures proposed for the Alameda Creek watershed, so the Modified WSIP Alternative and the Phased WSIP Variant result in similar impacts in the Alameda Creek watershed.

The Modified WSIP Alternative incorporated as part of its "project description" four mitigation measures proposed for operations at Pilarcitos Reservoir and Stone Dam to reduce identified significant impacts of the originally proposed WSIP in the Pilarcitos Creek watershed to a less than significant level. The Phased WSIP Variant would not have any significant impacts in the Pilarcitos watershed through 2018 because operations would be similar to existing conditions. The impacts of the Modified WSIP Alternative and the Phased WSIP Variant are fairly similar; the Phased WSIP Variant avoids the significant impacts, and the Modified WSIP Alternative incorporates mitigation measures to reduce the significant impacts to a less than significant level.

The Final PEIR concluded that impacts of the proposed Crystal Springs Reservoir operations would be potentially significant and unavoidable for both the Modified WSIP Alternative and the Phased WSIP Variant with respect to Impact 5.5.5-1, effects on trout spawning habitat along Laguna and San Mateo Creeks. The impacts would be reduced with implementation of mitigation measures, but impacts would remain potentially significant under both scenarios. Both scenarios assume that the impacts and mitigation measures will be re-evaluated in detail at the project level and refined as part of the environmental review of the Lower Crystal Springs Dam Improvements project (PN-4). Impacts on terrestrial biological resources in upper and lower Crystal Springs Reservoirs are significant and mitigable for both the Phased WSIP Variant and the Modified WSIP Alternative, although the impacts may be slightly less under the Modified WSIP Alternative.

The Modified WSIP Alternative includes implementation of potentially fewer long-term conservation, water recycling and local groundwater projects within the regional service area than under the Phased WSIP Variant. While construction of these facilities would cause temporary construction disruption and related environmental impacts, long-term implementation of these regional conservation, water recycling, and local groundwater projects would offset impacts of the operational modifications proposed under the Modified WSIP Alternative on the Tuolumne River. Compared to the Phased WSIP Variant, the Modified WSIP Alternative would result in approximately the same impacts on land use, air quality, noise, traffic, and energy in urban environments (expected to be largely mitigable). Both the Phased WSIP Variant and the Modified WSIP Alternative will result in fewer and significantly less severe impacts on biological and fishery resources in natural habitats than the originally proposed WSIP.

The Modified WSIP Alternative was identified as the environmentally superior alternative in the Draft PEIR for the 2030 planning horizon. It would reduce key impacts of the originally proposed WSIP on natural resources along the lower Tuolumne River, in Alameda and Pilarcitos Creeks, and in/around Crystal Springs and Pilarcitos Reservoirs, but it would continue to meet the WSIP's primary goals and objectives. Like the Phased WSIP Variant, this alternative would maximize the use of existing facilities and the largely gravity-driven system without also requiring the construction of additional major facilities called for under many other alternatives, or substantially increasing the energy demand of the system or need for pumping. This Alternative will have more impacts on the upper Tuolumne River, and possible less on the Lower Tuolumne River. It is not entirely clear that the Modified WSIP Alternative is substantially environmentally superior to the Phased WSIP Variant and does not provide a strong basis for selecting this Alternative.

This Commission finds that the Phased WSIP Variant is substantially similar to this Alternative in that it includes essentially the same elements relevant through 2018. The Commission rejects this Alternative insofar as it makes a decision through 2030; instead, the Phased WSIP Variant focuses the SFPUC and the customers on implementation of conservation, recycling and groundwater projects before 2018. The SFPUC will then re-evaluate the water supply decision in 2018. The Modified WSIP Alternative incorporates as part of the program most of the mitigation measures proposed for the original WSIP in the PEIR. Because this Commission is adopting all relevant mitigation measures as part of this Phased WSIP Variant approval, most of the impacts of the two approaches are similar.

The feasibility of this Alternative is not easily confirmed because of its reliance on MID and TID and/or another water supplier for conserved water of 15 mgd average annual, as well as the dry year transfer. If the SFPUC could not procure conserved water from the MID, TID or another water supplier, then no additional diversions from the Tuolumne River could occur under this Alternative. Such an outcome would push the Alternative in the direction of the No Purchase Request Increase Alternative, and the impacts of this Alternative would thus become similar to the No Purchase Request Increase Alternative.

After balancing competing policy considerations, including the extent to which those components of the Modified WSIP Alternative not included in the Phased WSIP Variant would delay resolution of key issues relating to the TID-MID dry-year "conserved water" transfer and operating criteria at Crystal Springs Reservoir, the Commission presently rejects as infeasible within the meaning of CEQA those components the Modified WSIP Alternative not included within the Phased WSIP Variant. In doing so, however, the SFPUC recognizes that mitigation measure 5.3.6-4a is the preferred mitigation measure and should be undertaken as part of the Phased WSIP Variant. The SFPUC is by no means closing the door on the possibility of an dry-year "conserved water" transfer from TID and MID. Whether the SFPUC will ultimately be able to implement the dry year transfer of conserved water will depend on complex negotiations, regulatory issues, cost considerations, and other issues that may or may not be possible for the various agencies involved to resolve within a reasonable time frame or during implementation of the Phased WSIP Variant.

VII. STATEMENT OF OVERRIDING CONSIDERATIONS

Pursuant to CEQA section 21081 and CEQA Guideline 15093, the Commission hereby finds, after consideration of the Final PEIR and the evidence in the record, that each of the specific overriding economic, legal, social, technological and other benefits of the Program as set forth below independently and collectively outweighs these significant and unavoidable impacts and is an overriding consideration warranting approval of the Program. Any one of the reasons for approval cited below is sufficient to justify approval of the Program. Thus, even if a court were to conclude that not every reason is supported by substantial evidence, the Commission will stand by its determination that each individual reason is sufficient. The substantial evidence supporting the various benefits can be found in the preceding findings, which are incorporated by reference into this Section, and in the documents found in the Record of Proceedings, as defined in Section I.

On the basis of the above findings and the substantial evidence in the whole record of this proceeding, the Commission specially finds that there are significant benefits of the proposed Program to support approval of the Phased WSIP Variant in spite of the unavoidable significant impacts, and therefore makes this Statement of Overriding Considerations. The Commission further finds that, as part of the process of obtaining Program approval, all significant effects on the environment from implementation of the Phased WSIP Variant have been eliminated or substantially lessened where feasible. All mitigation measures proposed in the PEIR for this Variant are adopted as part of this approval action. Furthermore, the Commission has determined that any remaining significant effects on the environment found to be unavoidable are acceptable due to the following specific overriding economic, technical, legal, social and other considerations.

The Phased WSIP Variant has the following benefits:

1. Implementation of facility improvement projects will reduce vulnerability to earthquakes. Improvements are designed to meet current seismic standards. The regional water system is a critical and vulnerable link in the City's and wholesale customer's ability to survive after a major earthquake and to maintain access to critically needed water supplies. Not only will water be

necessary for human consumption, but will provide emergency water supply after an earthquake to protect the public health and safety. The SFPUC will be able to meet the fundamental and most pressing needs of the water system – to improve the seismic safety and reliability of the water system as a means of saving human life and property under a catastrophic earthquake scenario or even a disaster scenario not rising to the level of catastrophic. As the system ages, its reliability decreases and the risk of failure increases. The 167-mile-long system crosses five active earthquake faults. Facilities located near these points of intersection are at risk of failure in the event of a major earthquake, an event considered likely in the next 30 years. Due to the age of the system, many facilities do not meet modern seismic standards. A failure of the water system could leave some customers without water for 10 – 30 days, and in some instances as long as 60 days. Alternative supplies will be limited. Many communities have only a few days of locally stored reserves in tanks and small reservoirs, most of which would be depleted within the first 48-72 hours of an emergency to meet the initial spike in demand for emergency services. Potential economic losses to the region from a water supply interruption as well as incremental damage from lack of adequate water supply to suppress post-quake fires would likely total tens of billions of dollars. The SFPUC system is a critical regional asset providing an essential service and commodity to the Bay Area economy. Its deteriorating condition places the regional economy and the welfare of millions of Bay Area residents at risk. Effecting the necessary repairs and improvements to assure the water system's continued reliability, and developing it as part of a larger, integrated water security strategy, is critical to the Bay Area's economic security, competitiveness and quality of life. (See "Hetch Hetchy Water and the Bay Area Economy", Bay Area Economic Forum 2002)

2. The SFPUC will be able to deliver basic service to the three regions in the service area (East/South Bay, Peninsula, and San Francisco) within 24 hours after a major earthquake.

3. The SFPUC will be able to restore facilities to meet projected average-day demand within 30 days after a major earthquake.

4. The Program reduces the physical, social, and economic impacts associated with the potential rupture of the existing system including, but not limited to, public health and safety, flooding, erosion, biological impacts, traffic interruption, and property damage.

5. The Program supports the economic vitality of the Region by fulfilling the water demands under emergency conditions.

6. The Water system will maintain high-quality water and a gravity-driven system, allowing the SFPUC to continue to provide clean, unfiltered water originating from Hetch Hetchy Reservoir and filter all other surface water sources.

7. Improvements are designed to meet current and foreseeable future federal and state water quality requirements.

8. The Phased WSIP Variant promotes on-going monitoring of watershed areas, limiting diversions while exploring all options and demand by 2018 – the dynamic nature of information and technology weighs in favor of making a decision on water supply only through 2018.

9. The Program will increase delivery reliability and improve the ability to maintain the water system, providing operational flexibility to allow planned maintenance shutdown of individual facilities without interrupting customer service, operational flexibility to minimize the risk of service interruption due to unplanned facility upsets or outages, and operational flexibility and system capacity to replenish local reservoirs as needed. In order to implement a feasible asset management program in the future that will provide continuous maintenance and repairs to facilities, the regional water system requires redundancy (i.e., backup) of some critical facilities necessary to meeting day-to-day customer water supply needs. Without adequate redundancy of critical facilities, the SFPUC has limited operational flexibility in the event of an emergency or a system failure, as well as constraints on conducting adequate system inspection and maintenance. Failure to implement the Program would place the water system at significant risk to seismic hazards, increased facility failures, and increased supply shortages on a day-to-day basis, as well as result in prolonged service disruptions to many customers in the event of an earthquake or other emergency due to inadequate facility redundancy and operational flexibility.

10. The SFPUC can meet the estimated average annual demand under the conditions of one planned shutdown of a major facility for maintenance concurrent with one unplanned facility outage.

11. The SFPUC can meet customer water supply needs; the Phased WSIP Variant would serve 265 mgd of retail and wholesale customer purchases from the SFPUC watersheds, and meet or offset the remaining 20 mgd through conservation, recycled water, and groundwater in the retail and wholesale service areas. Ten mgd of this would be met, as proposed under the WSIP, through conservation, recycled water, and groundwater projects in San Francisco, and 10 mgd would be met through local conservation, recycled water and groundwater in the wholesale service area.

12. The Phased WSIP Variant can meet dry-year delivery needs through 2018 while limiting rationing to a maximum 20 percent system-wide reduction in water service during extended droughts.

13. The Phased WSIP Variant diversifies water supply options during non-drought and drought periods.

14. The Phased WSIP Variant will substantially improve use of new water sources and drought management, including use of groundwater, recycled water, conservation, and transfers.

15. The Program will enhance sustainability in all system activities, including management of natural resources and physical systems to protect watershed ecosystems and to protect public health and safety.

16. The Phased WSIP Variant will achieve a cost-effective, fully operational system, ensuring cost-effective use of funds, and maintaining a gravity-driven system.

17. The water system will continue to provide a source of clean energy and require a low level of energy to run the system, both of which help maintain and minimize GHG emissions associated with water and power utility services.

18. The PEIR identified climate change as a factor that may affect regional water system operations due to potential changes in precipitation that originates as rainfall or snowmelt in the Tuolumne watershed, and the magnitude of rain events in the local system watersheds. Understanding and adapting to climate change as it affects watershed ecosystems will be an ongoing task for regional water system operators, but the science underlying the changes may be better known in 2018 than it is today. The Phased WSIP Variant will allow the SFPUC to benefit from a better understanding of the science and potential effects of climate change when it evaluates whether to increase water supply deliveries in 2018.

19. The PEIR identified at least three watersheds where increases in instream releases may be required by regulatory changes or in conformance with SFPUC stewardship goals, with corresponding reductions in regional water system yield. By 2018 most of these regulatory requirements or stewardship programs will have been implemented, thereby clarifying the reliability and yield of the regional water system. The Program gives the SFPUC the flexibility to take into consideration these issues when it evaluates whether to increase water supply deliveries in 2018.

To accomplish all of the SFPUC's objectives, it must move forward with the WSIP facility improvement projects as proposed, to improve seismic and water delivery reliability, to meet current and future water quality regulations, to provide for additional system conveyance for maintenance and delivery reliability, and to meet water supply reliability goals for 2018 and possibly beyond. Like all water utilities, the SFPUC must consider current needs as well as possible future changes and unplanned outages, and design a system that achieves a balance among the numerous objectives, functions and risks a water supplier must face. As prudent water managers, the SFPUC must make decisions about how to manage its water system effectively. Approval of the Phased WSIP Variant will allow the SFPUC to accomplish these many goals.

Having considered these benefits, including the benefits discussed in Section I above, the Commission finds that the benefits of the Program outweigh the unavoidable adverse environmental effects, and that the adverse environmental effects are therefore acceptable.

October 30, 2008

Final
Program Environmental Impact Report
Volume 1 of 8

For the
San Francisco Public Utilities Commission's
WATER SYSTEM IMPROVEMENT PROGRAM

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City and County of San Francisco
San Francisco Planning Department

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GLOSSARY AND ACRONYMS

Glossary

100-year flood – A flood that has a 1-percent chance of being equaled or exceeded in any given year.

A-weighted decibel (dBA) – Since the human ear is not equally sensitive to all sound frequencies within the entire spectrum, human response is factored into sound descriptions in a process called “A-weighting,” expressed as “dBA.” The dBA, or A-weighted decibel, refers to a scale of noise measurement that approximates the range of sensitivity of the human ear to sounds of different frequencies.

Accretion – An addition, such as an addition of water to a stream from groundwater or other sources.

Acre-foot – The quantity of water required to cover 1 acre to a depth of 1 foot. Equal to 1,233.5 cubic meters (43,560 cubic feet).

Aestivation habitat – Aestivation is a state of dormancy or inactivity during hot or dry months, typically characterized by a slower metabolism. For the California tiger salamander, aestivation habitat consists of shelter or protection from excess heat and aridity.

Alevins – A stage of development in young salmon and trout (salmonids). After hatching, developing salmonids remain in the gravel for four to six weeks while they grow and absorb their egg sac.

Alquist-Priolo Earthquake Fault Zone – The Alquist-Priolo Earthquake Fault Zoning Act was passed in 1972 to mitigate the hazard of surface faulting to structures for human occupancy. In accordance with this act, the state geologist established regulatory zones called “earthquake fault zones” around the surface traces of active faults and published maps showing these zones. Within these zones, buildings for human occupancy cannot be constructed across the surface trace of active faults. Each earthquake fault zone extends approximately 200 to 500 feet on either side of the mapped fault trace.

Alluvium – Consists of unconsolidated mixtures of gravel, sand, clay, and silt typically deposited by streams.

Anoxia – Generally refers to low-oxygen conditions within the hypolimnion (bottom) of a thermally stratified reservoir.

Aqueduct – A pipe or channel designed to transport water from a remote source, usually by gravity.

Aquifer – Permeable subsurface materials (soil, sediments, and rock) that contain groundwater. Aquifers may be large or small, local or regional, shallow or deep, and confined or unconfined, depending on the subsurface geologic conditions. The permeable materials that surround an unconfined aquifer allow the water table to fluctuate in response to recharge (precipitation in the wet season) and discharge (evapotranspiration in the dry season). A confined aquifer is contained within impermeable materials and, as a result, the water table does not fluctuate.

Aquitard – A semi-impermeable layer that confines an aquifer.

Amphibolite schists – Amphibolite is a metamorphic rock composed chiefly of amphibole with minor plagioclase and little quartz. In a schist, the minerals have been metamorphosed to the point that their crystals are foliated, or plated, and flaky.

Anadromous – Anadromous fish hatch (rear) in freshwater, migrate to the ocean (saltwater) to grow and mature, and migrate back to freshwater to spawn and reproduce.

Anaerobic – A condition where there is no air or free oxygen. An anaerobic organism is capable of living or growing in the absence of free oxygen.

Andesitic mudflow breccia – Breccia is a coarse-grained rock composed of angular broken rock fragments in a fine-grained matrix. Andesitic mudflow breccia is formed by a mudflow composed primarily of volcanic rock fragments of andesitic composition.

Andesitic tuffaceous sediments – Tuff is a rock consisting of consolidated volcanic ash. Andesitic tuffaceous sediments are sediments derived from a tuff of andesitic composition.

Asbestos – A term used for several types of naturally occurring fibrous materials found in many parts of California, some of which have been found to be cancer-causing agents.

Aversion – The act of pulling or tearing apart or off; forcible separation.

Bankfull channel – A channel that conveys commonly occurring flows, with larger flows spilling over the banks and onto the floodplain.

Barbel – A long, thin, fleshy growth projecting from the mouths or nostrils of some fishes.

Base flows – Flows in a river or stream that occur in the absence of any recent rainfall.

Bedload – Refers to the amount of sediment, gravel, cobbles, and rocks transported along the stream bottom (as opposed to suspended in the stream flow).

Beneficial use – Those uses of water as defined in the State of California Water Code (Chapter 10 of Part 2 of Division 2), including but not limited to agricultural, domestic, municipal, industrial, power generation, fish and wildlife habitat, recreation, and mining.

Biological monitoring – The periodic examination of biological specimens for the purposes of monitoring their exposure to or the effects of potentially toxic chemicals in the environment. Biological monitoring is typically performed by analyzing the amount of a toxic substance or its metabolites in body tissues and fluids. Also refers to assessing the biological status of populations and communities of organisms at risk in order to protect them and to gain an early warning of possible hazards to human health.

Biological Opinion – Document issued under the authority of the Federal Endangered Species Act stating the U.S. Fish and Wildlife Service and/or the National Marine Fisheries Service findings as to whether a federal action is likely to jeopardize the continued existence of a threatened or endangered species or result in the destruction or adverse modification of critical habitat.

Brackish water – Water that is saltier than freshwater, but not as salty as seawater. May result from the mixing of seawater with freshwater, as in estuaries.

Capacity – Engineering term which indicates the highest or maximum volume or flow of structures. There are multiple uses of the term, including hydraulic capacity, sustainable capacity, design capacity, and peak capacity which are defined as follows:

> *Hydraulic* – The maximum flow that can be accommodated through a treatment facility or transmission system component without consideration for regulatory, maintenance or engineering standards, or other system operational constraint.
>
> *Sustainable* – The highest flow rate at which a treatment facility (filtration plant) can be expected to operate, given normal/average source water conditions, while meeting regulatory water quality and routine maintenance requirements.
>
> *Design* – The maximum capacity or flow rate to which a treatment facility or transmission system component is designed to operate, under a specified set of regulatory criteria, engineering standards, or other engineering assumptions.
>
> *Peak* – The maximum capacity or flow rate to which a treatment facility or transmission system component is designed that will allow it to operate within regulatory or engineering standards.

Categorical Exemption – An exemption from CEQA for a class of projects based on a finding by the Secretary of Resources that the class of projects does not have a significant effect on the environment.

Channel – A natural or artificial watercourse, with a defined bed and banks to confine and convey continuously or periodically flowing water.

Chloramine/chloraminated – Chloramine is a chemical disinfecting agent comprised of a combination of chlorine and ammonia. Water that has been disinfected with chloramines is "chloraminated."

Chlorination – A disinfection process that involves the addition of free chlorine, whether as chlorine gas or liquid sodium hypochlorite.

Chute – An inclined trough, passage, or channel feature through or down which things may pass. A waterfall or rapid.

Colluvium – A loose deposit of rock debris accumulated through the action of gravity at the base of a cliff or slope.

Community Noise Equivalent Level (CNEL) – Because community receptors are more sensitive to unwanted noise intrusion during the evening and at night, state law requires that, for planning purposes, an artificial dBA increment be added to "quiet time" noise levels to form a 24-hour noise descriptor called the Community Noise Equivalent Level (CNEL). CNEL adds a 5-dBA "penalty" during the evening hours (7:00 p.m. to 10:00 p.m.) and a 10-dBA penalty during the night hours (10:00 p.m. to 7:00 a.m.).

Confined aquifer – See Aquifer.

Conjunctive-use program – The joint use of surface water and groundwater to meet water supply needs. Surface water is used when it is available rather than groundwater, and when there is a shortage of surface water, groundwater use is used. See also in-lieu recharge.

Cultural resource – A fragile and nonrenewable remain of human activity that is valued by or significantly representative of a culture or that contains significant information about a culture. Cultural resources encompass archaeological, traditional, and build environment resources, including landscapes or districts, sites, buildings, structures, objects, or cultural practices that are usually greater than 50 years of age and possess architectural, historic, scientific, or other technical value.

Cumulatively considerable – A CEQA term used to indicate whether or not a cumulative impact is significant.

Day-night noise level (Ldn) – Another 24-hour noise descriptor, called the day-night noise level (Ldn), is similar to CNEL. While both add a 10-dBA penalty to all nighttime noise events between 10:00 p.m. and 7:00 a.m., Ldn does not add the evening 5-dBA penalty. In practice, Ldn and CNEL usually differ by less than 1 dBA at any given location for transportation noise sources.

Dead pool – The depth beyond which the reservoir cannot be drained.

Deciduous trees – Trees that shed their leaves each year, typically in winter.

Delta – A low, nearly flat alluvial tract of land formed by deposits at or near the mouth of a river. In this report, "delta" refers to the delta formed by the Sacramento and San Joaquin Rivers.

Delta smelt – A small, slender-bodied fish with a typical adult size of 2 to 3 inches that is found only in the Sacramento–San Joaquin Delta Estuary.

Design capacity – The maximum size or capacity to which a facility or structure is designed, but which may or may not be realized during operation due to unforeseen conditions.

Design drought – A planning and operation tool water supply agencies use to define a reasonable worse-case drought scenario based on local hydrology in order to establish design and operating parameters for the water system. Droughts more severe than the design drought would cause failure of supply within the water system. The design drought developed by the SFPUC is based on a drought that is more severe than the worst historical drought. Studies suggest a 30 percent chance that the SFPUC system will experience a drought in the next 75 years equal to or more severe than the 1987–1992 drought, which was the most extreme recorded drought event to affect the regional system. The WSIP uses a design drought based on the hydrology of the six years of the worst historical drought (1987–1992) plus the 2.5 years of the 1976–1977 drought, for a combined total of an 8.5-year design drought sequence.

Discharge – The flow of surface water in a stream or canal or the outflow of groundwater from a flowing artesian well, ditch, or spring. Also refers to the discharge of liquid effluent from a facility, or to chemical emissions into the air through designated venting mechanisms.

Disinfection and Disinfection Byproducts – Disinfection is the treatment process used to inactivate and destroy disease-causing bacteria, viruses, and other waterborne microorganisms. Chlorine, a commonly and historically used disinfectant in drinking water, provides a high degree of public health protection from bacteria and viruses. However, in 1974 it was discovered that chlorine reacts with natural organic and inorganic matter in water to form disinfection byproducts. The major groups of disinfection byproducts produced by chlorination are trihalomethanes and haloacetic acids, and these byproducts have been shown to cause health effects in laboratory animals. Thus, based on numerous toxicological studies, the U.S. EPA adopted the Stage 1 and Stage 2 Disinfectants and Disinfection Byproducts Rules to lower the public health risk associated with potential exposure to disinfection byproducts.

Disinfectants and Disinfection Byproducts (D/DBPs) Rules – Federal drinking water regulations adopted by the U.S. EPA. The Stage 1 D/DBP Rule was adopted in December 1998 and became effective in February 1999. The Stage 1 D/DBP Rule reduces the maximum allowable levels of disinfectants and disinfection byproducts in drinking water supplies. The intent of the rule is to provide increased public health protection from exposure to potentially harmful disinfection byproducts. The Stage 2 DBP rule, adopted in December 2005, focuses on public health protection by limiting exposure to DBPs, specifically total trihalomethanes (TTHM) and five haloacetic acids (HAA5), which can form in water through disinfectants used to control microbial pathogens. This rule will apply to all community water systems and nontransient noncommunity water systems that add a primary or residual disinfectant other than ultraviolet (UV) light or deliver water that has been disinfected by a primary or residual disinfectant other than UV.

Dissolved oxygen (DO) – The oxygen freely available in water, which is vital to fish and other aquatic life and for the prevention of odors. DO levels are considered an important indicator of a water body's ability to support desirable aquatic life. Secondary and advanced waste treatment are generally designed to ensure adequate DO in waste-receiving waters.

Disturbance – Any event or series of events that disrupt ecosystem, community, or population structure and alter the physical environment.

Diversion – The use of part of a stream flow as water supply; a channel for diverting water to sites where it can be used and disposed of.

Don Pedro Reservoir/New Don Pedro Reservoir – The New Don Pedro Reservoir, owned and operated by the Turlock and Modesto Irrigation Districts, was constructed in 1971 along the Tuolumne River downstream of Hetch Hetchy and Early Intake to replace the original Don Pedro reservoir, which was constructed in 1923. The new reservoir has a capacity of 2,030,000 acre-feet and was constructed as part of the New Don Pedro Project. However, the new reservoir is now commonly referred to simply as Don Pedro Reservoir, and this terminology is used in this PEIR.

Drawdown – The lowering of the level of water body, such as a reservoir or a groundwater basin.

Early Intake – The weir, diversion tunnel, and hydropower house on the Tuolumne River upstream of Don Pedro Reservoir and downstream of Hetch Hetchy Reservoir.

Earthquake faults –

> *Reverse faults* involve predominantly vertical movement in which the upper block moves upward in relation to the lower block.
>
> *Thrust faults* are low-angle reverse faults.
>
> *Blind-thrust faults* are low-angled subterranean faults that have no surface expression.
>
> *Range-front faults* are faults along the front of mountain ranges responsible for the uplift of the mountains.

Ecosystem – A geographically identifiable area that encompasses unique physical and biological characteristics. It is the sum of the plant community, animal community, and environment in a particular region or habitat.

Endangered species – Any species or subspecies of bird, mammal, fish, amphibian, reptile, or plant that is in serious danger of becoming extinct throughout all or a significant portion of its range. Federally endangered species are officially designated by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service and published in the Federal Register. Species may also be listed under the California Endangered Species Act by the Department of Fish and Game.

Endemism – Species that are geographically restricted.

Enhancement – Measures that develop or improve the quality or quantity of existing conditions or resources beyond a condition or level that would have occurred without an action (i.e., beyond compensation).

Entrainment – The incidental trapping of fish and other aquatic organisms in the water (for example, at water and/or irrigation diversions and power plant cooling water intakes).

Environmental cases – Sites suspected of releasing hazardous substances or that have had cause for hazardous materials investigations and are identified on regulatory agency lists. These are sites where soil and/or groundwater contamination is known or suspected to have occurred.

Ephemeral streams – Streams that flow briefly during and immediately following storm events.

Epilimnion – The uppermost portion of a thermally stratified reservoir; the epilimnion is generally the warmest part and is relatively well oxygenated.

Estuary – A transition zone between inland sources of freshwater and saltwater from the ocean.

Eutrophic – Indicates generally warm and shallow waters, with high nutrient levels and high microbiological activity.

Eutrophication – The over-enrichment of a water body with nutrients, resulting in the excessive growth of organisms and depletion of dissolved oxygen.

Evapotranspiration – The return of water from the soil and from plants to the atmosphere by evaporation and transpiration.

Expansive soils – These types of soils are characterized by their ability to undergo significant volume change (shrink and swell) due to variations in soil moisture content.

Farmland Security Zone – A contract between a private landowner and a county that restricts land to agricultural or open space uses for a minimum initial term of 20 years.

Fault creep – Movement along a fault that does not entail earthquake activity.

Filter feeders – Animals that feed by straining suspended matter and food particles from water.

Filtration avoidance or filtration exemption – Use of the terms "filtration avoidance" and "filtration exemption" is meant to convey the fact that water from the Hetch Hetchy reservoir may be consumed without the need for filtration, and does not imply that this water supply does not meet the full requirements of both state and federal Safe Drinking Water Acts. EPA and the California Department of Health Services have determined that Hetch Hetchy watershed fecal / total coliform and turbidity levels are consistently below specified threshold criteria, that the SFPUC's comprehensive watershed protection program meets specific pathogen barrier criteria, and that as a consequence this water source meets state and federal water quality requirements without the need to provide filtration. In addition, the Hetch Hetchy water supply is disinfected in accordance with Safe Drinking Water Act requirements.

Firm yield – see System Firm Yield

Fish screen – Barrier on the front face of a river intake to prevent the entrainment of fish and debris into the water supply.

Fishery enhancement – A term used to refer to protection and enhancement of fishery habitat, including augmentation of stream flows during certain times of the year.

Floodplain – Land adjacent to a watercourse over which water flows in times of flood. The limits of the flood plain are defined by the peak level of a 1 in 100 year return period flood.

Flow – The volume of water passing a given point per unit of time.

> *Instream flow requirements* – Amount of water flowing through a stream course as required under statutory, regulatory, or contractual authority.
>
> *Minimum flow* – Lowest flow in a specified period of time.
>
> *Peak flow* – Maximum instantaneous flow in a specified period of time.
>
> *Return flow* – Portion of water previously diverted from a stream and subsequently returned to that stream or to another body of water.

Fluvial – Of or found in a river.

Fluvial geomorphologic conditions – This term refers to the shape of the stream channels and associated erosional and depositional features (e.g., canyons, streambeds, stream banks, floodplains), resulting from flowing water.

Free chlorine – Free chlorine consists of a compound, hypochlorous acid, and the hypochlorite ion, both of which form when chlorine gas is added to water

Fry – A stage of development in young salmon or trout. During this stage the fry is usually less than one year old, has absorbed its yolk sac, is rearing in the stream, and is between the alevin and parr stage of development.

Fugitive dust – "Fugitive" emissions generally refer to those emissions that are released to the atmosphere by some means other than through a stack or tailpipe.

Gaining river – A gaining river receives water from the inflow of groundwater. The same river could be both gaining and losing, depending on the conditions.

Geomorphology – The study of the arrangement, origin, and changes of the earth's surface features.

Groundwater banking – A water management tool that uses available space in groundwater aquifers to store water during wet years (years when there is abundant rainfall and surplus water available), so that it can be pumped and used during dry years (years with little rainfall and no surplus water).

Groundwater recharge – Inflow to aquifers from precipitation, infiltration, through-flow, and/or other means that replaces groundwater lost through pumping or other forms of discharge. The process of water being added to the saturated zone *or* the volume of water added by this process.

Habitat – The specific area or environment in which a particular type of animal or plant lives.

Hazardous materials – Defined in Section 25501(h) of the California Health and Safety Code, are materials that, because of their quantity, concentration, or physical or chemical characteristics, pose a substantial present or potential hazard to human health and safety or to the environment if released to the workplace or environment. Hazardous materials have been and are commonly used in commercial, agricultural, and industrial applications as well as in residential areas to a limited extent.

Hazardous materials business plans – Businesses that handle specified quantities of chemicals are required to submit a hazardous materials business plan (HMBP) in accordance with community right-to-know laws. This plan allows local agencies to plan appropriately for a chemical release, fire, or other incident.

Hazardous waste – Any material that is relinquished, recycled, or inherently waste-like. Title 22 of the California Code of Regulations, Division 4.5, Chapter 11 contains regulations for the classification of hazardous wastes. A waste is considered a hazardous waste if it is toxic (causes human health effects), ignitable (has the ability to burn), corrosive (causes severe burns or damage to materials), or reactive (causes explosions or generates toxic gases) in accordance with the criteria established in Article 3. Article 4 lists specific hazardous wastes, and Article 5 identifies specific waste categories, including Resource Conservation and Recovery Act (RCRA) hazardous wastes, non-RCRA hazardous wastes, extremely hazardous wastes, and special wastes.

Headwaters – The point or area of origin for a river or stream.

Heritage trees – Large, old, or historically important trees that receive protection on a local basis.

Hetch Hetchy Aqueduct – The part of the regional water system consisting of the transmission facilities that convey water from Hetch Hetchy Reservoir, including pipelines and tunnels from the beginning of the Foothill Tunnel to the Alameda East Portal.

Hypolimnion – The bottom portion of a thermally stratified water body, such as a lake or reservoir; water in the hypolimnion is generally cool and has a low oxygen concentration.

Hydraulic head – The pressure of the water column and elevation difference. The force per unit area exerted by a column of liquid at a height above a depth (and pressure) of interest. Fluids flow down a hydraulic gradient, from points of higher to lower hydraulic head.

Hydrograph – A chart that illustrates the pattern of flow in a stream as a function of time.

Hydrology – The science that deals with the waters above and below land surfaces; their occurrence, circulation, and distribution, both in time and space; their biological, chemical, and physical properties; and their reaction with their environment, including their relation to living beings.

Hydrophytic vegetation – Plant life growing in water or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content.

Hydrologic year types – The California Department of Water Resources uses the following classifications to define rainfall year types relative to average hydrologic conditions, including rainfall, runoff, and snowmelt conditions, in order of decreasing availability of water: wet year, above-normal year, normal year, below-normal year, dry year, and critically dry year. *Drought year* typically refers to one year during consecutive dry or critically dry years.

Hyporheic flow – Water that interchanges between the stream and subsurface media.

Important farmlands –

> *Prime Farmland* is land that has the best combination of physical and chemical characteristics for crop production. It has the soil quality, growing season, and moisture supply needed to produce sustained high yields of crops when treated and managed.
>
> *Farmland of Statewide Importance* is land other than Prime Farmland that has a good combination of physical and chemical characteristics for crop production.
>
> *Unique Farmland* does not meet the criteria for Prime Farmland or Farmland of Statewide Importance but has been used for the production of specific high-economic-value crops.
>
> *Farmland of Local Importance* is either currently producing crops or has the capability of production, but does not meet the criteria of the categories above.
>
> *Grazing Land* is land on which the vegetation is suited to the grazing of livestock.

In-lieu recharge – In-lieu recharge is the storage of water by utilizing surface water “in-lieu” of pumping groundwater, thereby storing an equal amount in the groundwater basin. See also conjunctive-use program.

Isothermal – Refers to constant temperature in the water column; this condition is present when the reservoir is not stratified, typically during the winter months.

Juvenile – A young or sexually immature animal.

Lateral spreading – A phenomenon where large blocks of intact, nonliquefied soil move downslope on a liquefied substrate of large aerial extent

Leq – Time variations in noise exposure are typically expressed in terms of a steady-state energy level (called Leq) that represents the acoustical energy of a given measurement. Leq (24) is the steady-state energy level measured over a 24-hour period.

Levee – An embankment raised to prevent a river from overflowing.

Liquefaction – A phenomenon in which saturated granular sediments temporarily lose their shear strength during periods of earthquake-induced, strong groundshaking. The susceptibility of a site to liquefaction is a function of the depth, density, and water content of the granular sediments and the magnitude of earthquakes likely to affect the site.

Long Term-2 Enhanced Surface Water Treatment Rule – A rule under the federal Safe Drinking Water Act that was adopted by the U.S. Environmental Protection Agency in January 2006. The purposes of this rule are to improve public health protection through the control of microbial contaminants by focusing on systems with elevated *Cryptosporidium* risk, and to prevent significant increases in microbial risk that might otherwise occur when systems implement the Stage 2 Disinfectants and Disinfection Byproducts Rule. Systems covered by this rule include water systems that use surface water or groundwater under the direct influence of surface water.

Level of service – As used in this PEIR, level of service is used as a tool to measure to operating condition and performance ability of water supply facilities and related infrastructure[1].

Losing river reach – A losing river reach loses water to the groundwater.

Mafic rocks – Igneous rocks containing a group of dark-colored minerals, composed chiefly of magnesium and iron.

Maximum contaminant level (MCL) **–** The MCL is the highest level of a contaminant that is allowed in drinking water. The MCL is set as close to the maximum contaminant level goal (MCLG – see below) as is economically or technically feasible. While the MCL is higher than the MCLG, it is considered protective of human health.

Maximum contaminant level goal – The MCLG is the level below which there is no known or expected health risk to human health.

Meander sequences – Sinuous sections of river channel.

[1] In many EIRs, level of service (abbreviated as LOS) is used in the traffic analysis as a qualitative description of transportation infrastructure's performance based on average delay per vehicle, vehicle density, or volume-to-capacity ratios. This type of analysis is not relevant to the WSIP PEIR traffic impacts.

Mélange – Generally a mixture of rock materials of differing sizes and types generally contained within a sheared matrix.

Mesotrophic – Indicates moderate nutrient levels and microbiological activity in a water body.

Metasedimentary – Rocks that were originally sedimentary, but have been metamorphosed.

Mitigation – One or all of the following: (1) Avoiding an impact altogether by not taking a certain action or parts of an action; (2) minimizing impacts by limiting the degree or magnitude of an action and its implementation; (3) rectifying an impact by repairing, rehabilitating, or restoring the affected environment; (4) reducing or eliminating an impact over time by preservation and maintenance operations during the life of an action; and (5) compensating for an impact by replacing or providing substitute resources or environments.

Modeling – A tool used to mathematically represent a process which could be based upon empirical or mathematical functions. Models can be computer programs, spreadsheets, or statistical analyses.

Montmorillonite clay – An expansive type of clay that undergoes large changes in volume with changes in water content.

Morphology – As used in this PEIR, the form and structure of a stream or river.

Negative declaration – A form of environmental review documentation of proposed projects subject to CEQA. It consists of a written statement and supporting documentation issued by the lead agency responsible for CEQA implementation that briefly describes the reasons that a proposed project will not have a significant effect on the environment and therefore does not require the preparation of an EIR.

New Don Pedro Project – See Don Pedro Reservoir

Nitrification – To oxidize (an ammonia compound) into nitric acid, nitrous acid, or any nitrate or nitrite, especially by the action of nitrobacteria.

Oscillation – The rate of oscillation of sound waves is the amount of fluctuation between two values.

Oxbows – River meanders cut off from the main channel.

Perched groundwater – A local saturated zone above the water table. It typically exists above an impervious layer (such as clay) with limited extent.

Permitted hazardous materials uses – Facilities that use hazardous materials or handle hazardous wastes but comply with current hazardous materials and hazardous waste regulations.

Pocket water – A water hole in the bed of an intermittent stream, especially the bowl at the foot of a cliff over which the stream passes when in the flood stage.

PPV – To assess the potential for structural damage associated with vibration, the vibratory ground motion in the vicinity of the affected structure is measured in terms of peak particle velocity (PPV) in the vertical and horizontal directions (vector sum), typically in units of inches per second (in/sec).

Propagation – To move or transmit something forward in space, especially as a light or sound wave.

Predation – The act of preying on another animal or animals.

Primary disinfection – Primary disinfection provides inactivation and/or reduction of microbial pathogens to meet specific regulatory requirements prior to water entering the distribution system. Primary disinfection may occur by one or more disinfecting agents.

Program Environmental Impact Report – One type of environmental review document identified under the California Environmental Quality Act that may be used to evaluate a plan or program that has multiple components (projects and actions) or to address a series of actions that are related.

Rearing – The amount of time that juvenile fish spend feeding in nursery areas of rivers, lakes, streams, and estuaries before migration, or the care and support for young fish.

Rearing habitat – Areas where larval and juvenile fish find food and shelter.

Regional water system – The entire SFPUC water system starting at Hetch Hetchy Reservoir and ending in San Francisco; the regional system includes all facilities serving the SFPUC wholesale and retail customers, except for the retail customers in San Francisco. The SFPUC regional water system consists of a complex network of facilities covering a geographic range of about 160 miles, from the Sierra Nevada on the east to San Francisco on the west. The regional water system crosses seven counties—Tuolumne, Stanislaus, San Joaquin, Alameda, Santa Clara, San Mateo, and San Francisco. The regional water system includes over 280 miles of pipelines, over 60 miles of tunnels, 11 reservoirs, 5 pump stations, and 2 water treatment plants.

Recapture – Returning released water to the system past the point of benefit.

Recruitment – The establishment of conditions that facilitate the growth of new vegetation; the entry of new individual organisms into a population of plants or animals.

Redd – A spawning nest made by a salmonid for laying eggs. The female salmonid creates the nest by undulating her tail and body against the substrate of a stream.

Reservoir – An artificially impounded body of water.

Riffles – A stretch of choppy water caused by stones or other objects in a river or stream.

Riparian – The land adjacent to a natural watercourse such as a river or stream. Riparian areas support vegetation that provides important wildlife habitat, as well as important fish habitat when sufficient to overhang the bank.

Rhyolitic tuff – Tuff is a rock composed of compacted volcanic ash varying in size from fine sand to coarse gravel. Rhyolitic tuff is comprised of ash similar in composition to granite.

Safe Drinking Water Act – The nation's major law regulating drinking water quality, implemented by the U.S. EPA. The Safe Drinking Water Act established primary and secondary drinking water regulations, and implementation and enforcement of this act has been delegated to the states. This act promulgates primary drinking water regulations that specify a maximum contaminant level for contaminants that "may have any adverse effect on the health of persons and which is known or anticipated to occur in public water systems."

Salmonid – Salmon or trout.

Salt marsh – An area where salt water from an ocean, bay, or gulf meets freshwater from a river.

Saltwater intrusion – The mixing of saltwater and groundwater in a groundwater aquifer resulting from overpumping of the aquifer.

Secondary disinfection –Secondary disinfection refers to the maintenance of a disinfectant residual in the distribution system necessary to meet regulatory requirements. The secondary disinfectant may be the same as or different from (one of) the agent(s) used for primary disinfection. Secondary disinfection of wastewater involves oxidation of organic matter using biological processes.

Secondary maximum contaminant level – Established to protect the esthetic quality of drinking water.

Sedimentation – The deposition of material suspended in a stream system, whether in suspension (suspended load) or on the bottom (bedload).

Seiche – Earthquake-induced oscillating waves in an enclosed water body.

Sensitive receptors – A land use that is sensitive or more vulnerable to (i.e., "receives") effects of noise, air quality, or a specified resource than the general population.

Serpentine – A naturally occurring group of minerals that can be formed when ultramafic rocks are metamorphosed during uplift to the earth's surface. Serpentinite is a rock consisting of one or more serpentine minerals. This rock type is commonly associated with ultramatic rock along earthquake faults. Small amounts of chrysotile asbestos, a fibrous form of serpentine minerals, are common in serpentinite.

Siltation – Sediment influx from either erosion or from sediment carried into a water body by inflowing rivers and tributaries.

Shear zones – A zone of rock fracturing consisting of many closely spaced, roughly parallel, discontinuous cracks. Shear zones typically occur along faults.

Sliplining – A method of lining the water mains to prevent corrosion and encrustation.

Smolts – Juvenile fish that have undergone the physiological changes necessary for them to migrate from freshwater streams to the ocean.

Spark arrestor – A device that prohibits exhaust gases from an internal combustion engine from passing through the impeller blades where they could cause a spark. A carbon trap is commonly used to retain carbon particles from the exhaust.

Spawning – Laying (and fertilizing) eggs in the process of reproduction.

Special-status species – Several species known to occur within the general region of the program area are accorded "special status" because of their recognized rarity or vulnerability to habitat loss or population decline. Some of these species receive specific protection in federal and/or state endangered species legislation. Others have been designated as "sensitive species" or "species of special concern" on the basis of adopted policies of federal, state, or local resource agencies. These species are referred to collectively as "special-status species."

Spill sites – Locations where a spill of hazardous materials has been reported to the state or federal regulatory agencies.

Squeezing ground – A time-dependent phenomenon usually associated with tunnel construction through a fault zone. Squeeze occurs when the in-situ stresses are high relative to the strength of the material. A high stress-to-strength ratio causes a slow creep of ground around the tunnel toward the excavated opening.

Subsidence – The lowering of the land surface in response to groundwater pumping.

Substrate – The materials found in streambeds or riverbeds (i.e., large and small boulders, stone, rubble, cobble, pebble, coarse and fine gravel, sand, silt, and clay). The surface upon which an organism grows or is attached.

Surface water – All water that is naturally open to the atmosphere (i.e., rivers, lakes, reservoirs, ponds, streams, impoundments, seas, estuaries, etc.).

Suspended particulates (PM_{10} and $PM_{2.5}$) – Particulate matter is a class of air pollutants that consists of solid and liquid airborne particles in an extremely small size range. Particulate matter is measured in two size ranges: PM_{10} for particles less than 10 microns in diameter, and $PM_{2.5}$ for particles less than 2.5 microns in diameter.

Sustainable capacity – The highest rate at which plant production can be expected to meet water quality requirements for a period of 60 days, given normal source water conditions.

Swales – Areas where winter rain collects but does not stand as long as in vernal pools.

System firm yield – The average annual water delivery that can be sustained by a water supply system throughout an extended drought.

Thermocline – The boundary between the warmer surface waters and cooler waters below.

Terrestrial species – Types of species of animals and plants that live on or grow from the land.

Threatened species – Legal status afforded to plant or animal species that are likely to become endangered within the foreseeable future throughout all or a significant portion of their range, as determined by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service.

Threshold damage vibration – The highest vibration amplitude at which no cosmetic, minor, or major damage occurs, which includes "threshold cracks" or "hair-sized" cracks in room walls that occur at the lowest vibration amplitudes.

Through-flow – Water flowing through sediments.

Tunnel Safety Order – The California Tunnel Safety Orders (California Administrative Code, Title 8, Subchapter 20, Article 8) require the Division of Industrial Safety to classify all tunnels or portions of tunnels into one of the following classifications before a public works project can be put out to bid:

- *Nongassy*, the classification assigned when there is little likelihood of encountering gas during the construction of the tunnel.
- *Potentially gassy*, the classification assigned when there is a possibility that flammable gas or hydrocarbons will be encountered during construction of the tunnel.
- *Gassy*, the classification assigned when it is likely gas will be encountered, or if monitoring indicates the presence of hazardous gases at a concentration greater than 5 percent of the lower explosive limit.
- *Extrahazardous*, the classification assigned to tunnels when the Division finds that there is a serious danger to the safety of employees, flammable gas or petroleum vapors emanating from the strata have been ignited in the tunnel, or monitoring indicates the presence of hazardous gases at a concentration greater than 20 percent of the lower explosive limit.

Turnout – A water diversion point.

Ultramafic rocks – These rock units are formed in high-temperature environments well below the surface of the earth.

Unconfined aquifer – See Aquifer.

Unimpaired flow – The natural river flow that existed prior to the placement of upstream water diversions, storage reservoirs, or other impediments.

Valve lots/valve house – A structure that encloses electrical and mechanical equipment and other related facilities uses to regulate, direct, and control flow of water.

Vernal pools – Seasonal wetlands formed in gently undulating or rolling topography where the soil is underlain by a slowly permeable claypan or hardpan.

Water rights – In California, the legal right to the use of water.

Waters of the United States – A broad federal definition that describes Corps jurisdiction over deep-water habitats and special aquatic sites, including wetlands, as follows:

a. The territorial seas with respect to the discharge of fill material.
b. Coastal and inland waters, lakes, rivers, and streams that are navigable waters of the United States, including their adjacent wetlands.
c. Tributaries to navigable waters of the United States, including wetlands.
d. Interstate waters and their tributaries, including adjacent wetlands.

All other waters of the United States not identified above, such as isolated wetlands and lakes, intermittent streams, prairie potholes, and other waters that are not a part of a tributary system to interstate waters or navigable waters of the United States, the degradation or destruction of which could affect interstate commerce.

Watershed – A region or area bounded peripherally by a water parting and draining ultimately to a particular watercourse or body of water.

Watershed management – The net result of numerous and varied actions in a watershed that directly affect watershed function and productivity. Actions may include, but are not limited to, land use decision-making, restoration and enhancement projects, monitoring and assessment of watershed condition, natural resource allocation and use, parcel management techniques, and education programs. Watershed management includes protection of existing healthy conditions.

Weir – A small dam in a river used to divert or control water flow. When uncontrolled, the weir is termed a fixed-crest weir; other weir types include broad-crested, sharp-crested, drowned, and submerged.

Wetland – A zone periodically or continuously submerged or having high soil moisture, which has aquatic and/or riparian vegetation components, and is maintained by water supplies significantly in excess of those otherwise available through local precipitation.

Wild and Scenic River – A river that has been designated under the National Wild and Scenic Rivers Act as having distinctively unique or "outstanding remarkable values" that set it apart from all other rivers, making it worthy of special protection.

Williamson Act – Under a Williamson Act (Land Conservation Act of 1965) contract, the landowner agrees to limit the use of the land to agriculture and compatible uses for a period of at least 10 years. In return, the land is taxed at a rate based on the agricultural production of the land, rather than its real estate market value.

Acronyms and Abbreviations

°C	degrees Celsius
°F	degrees Fahrenheit
AB	Assembly Bill
ABAG	Association of Bay Area Governments
ACFCWCD	Alameda County Flood Control and Water Conservation District
AC Transit	Alameda County Transit
ACWD	Alameda County Water District
afy	acre-feet per year
AGB	Academic Growth Boundary
APS	auxiliary power system
ATCM	Airborne Toxic Control Measure
AWHCP	Alameda Watershed Habitat Conservation Plan
BA	Biological Assessment
BAAQMD	Bay Area Air Quality Management District
BARDP	Bay Area Regional Desalination Plant
BART	Bay Area Rapid Transit
BAWSCA	Bay Area Water Supply and Conservation Agency (formerly BAWUA)
BAWUA	Bay Area Water Users Association (now called BAWSCA)
BDPL	Bay Division Pipelines
BMPs	best management practices
BO	Biological Opinion
C/CAG	City/County Association of Governments
CalARP	California Accidental Release Program
Cal-EPA	California Environmental Protection Agency
Cal-OSHA	California Occupational Safety and Health Administration
Caltrans	California Department of Transportation
Cal Water	California Water Service Company
CAP	Clean Air Plan
CARB	California Air Resources Board
CARE	Community Air Risk Evaluation
CBC	California Building Code
CCP	comprehensive conservation plan
CCR	California Code of Regulations
CCWD	Contra Costa Water District
CCSF	City and County of San Francisco
CDF	California Department of Forestry and Fire Protection
CDFG	California Department of Fish and Game
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CGS	California Geological Survey
CHIS	California Health Interview Survey
CIWMB	California Integrated Waste Management Board
Coastside CWD	Coastside County Water District
CMA	Congestion Management Agency

CNDDB	California Natural Diversity Database
CNEL	Community Noise Equivalent Level
CNPS	California Native Plant Society
CO	carbon monoxide
Corps	U.S. Army Corps of Engineers
CPO	chlorine-produced oxidants
CPUC	California Public Utilities Commission
CSO	combined sewer overflow
CUPA	Certified Unified Program Agency
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act of 1992
CWA	Clean Water Act
CWS	California Water Service
CY	cubic yards
dB	decibel
dBA	A-weighted decibel
DEHP	di (2 ethylhexyl) phthalate
DHS	(California) Department of Health Services
DOA	Department of Agriculture
DOF	Department of Finance
DOI	Department of Interior
DPM	diesel particulate matter
DPS	Distinct Population Segment
DSOD	(California) Division of Safety of Dams
DSS	Demand Side Management Least-Cost Planning Decision Support System
DTSC	California Department of Toxic Substances Control
DWR	(California) Department of Water Resources
DWRSIM	Department of Water Resources State Water Project Planning Simulation Model
DWSAP	Drinking Water Source Assessment and Protection
EA	environmental assessment
EBMUD	East Bay Municipal Utility District
EBRPD	East Bay Regional Park District
EFH	Essential Fish Habitat
EIR	environmental impact report
Estero MID	Estero Municipal Improvement District
ESU	Evolutionarily Significant Unit
Fed-OSHA	federal Occupational Safety and Health Administration
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FESA	Federal Endangered Species Act
fps	feet per second
FSA	FERC Settlement Agreement
FTA	Federal Transit Administration
g	gravity
GAP	Gap Analysis Project
GHGs	greenhouse gases
GGNRA	Golden Gate National Recreation Area
GIS	geographic information system

gpm	gallons per minute
gsf	gross square feet
Guadalupe Valley MID	Guadalupe Valley Municipal Improvement District
GWh	gigawatt-hours
HCP	habitat conservation plan
NCCP	natural communities conservation plan
HDPE	high-density polyethylene
HEPA	high-efficiency particulate air
HH/LSM	Hetch Hetchy Local Simulation Model
HMBP	hazardous materials business plan
hp	horsepower
HRP	Habitat Reserve Program
I-5	Interstate 5
I-280	Interstate 280
I-680	Interstate 680
in/sec	inches per second
JPA	Joint Powers Authority
kV	kilovolt
kWh	kilowatt-hours
Ldn	day-night noise level
Leq	steady-state energy level
LTCWD	Los Trancos County Water District
LUPs	linear underground/overhead projects
µg/L	micrograms per liter
µg/m^3	micrograms per cubic meter
µS/cm	microsiemen per centimeter
M	moment magnitude
MBTA	Migratory Bird Treaty Act
MCE	maximum credible earthquake
MEA	San Francisco Planning Department, Major Environmental Analysis Division
mg/L	milligrams per liter
mgd	million gallons per day
MID	Modesto Irrigation District
mm	millimeter
mm/yr	millimeters per year
MOU	memorandum of understanding
MRZ	Mineral Resource Zone
msl	mean sea level
MTBE	methyl tertiary-butyl ether
MTC	Metropolitan Transportation Commission
Muni	San Francisco Municipal Railway
mVA	millivolt-amperes
NAAQS	national ambient air quality standards
NEIC	National Earthquake Information Center
NEPA	National Environmental Policy Act

NEPDG	National Energy Policy Development Group
NFPA	National Fire Protection Association
NGVD	National Geodetic Vertical Datum
NMFS	National Marine Fisheries Service
NO_2	nitrogen dioxide
NO_x	nitrogen oxide
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRCS	National Resources Conservation Service
NRDC	National Resources Defense Council
NWR	National Wildlife Refuge
OADP	Eight-Hour Ozone Attainment Demonstration Plan
OAP	Ozone Attainment Plan
OSDP	Oceanside Seawater Desalination Plant
Oceanside WPCP	Oceanside Water Pollution Control Plant
PCBs	polychlorinated biphenyls
PCCP	prestressed concrete cylinder pipe
PEIR	Program Environmental Impact Report
PG&E	Pacific Gas and Electric Company
PM_{10}	particulate matter, 10 microns or less in diameter
$PM_{2.5}$	particulate matter, 2.5 microns or less in diameter
ppm	parts per million
ppt	parts per thousand
PPV	peak particle velocity
PRC	California Public Resources Code
RCCP	reinforced-concrete cylinder pipe
RCRA	Resource Conservation and Recovery Act
RM	river mile
RMP	risk management plan
RO	reverse osmosis
ROD	Record of Decision
ROG	reactive organic gases
ROW	right-of-way
RWQCB	(California) Regional Water Quality Control Board
SAAQS	state ambient air quality standards
SamTrans	San Mateo County Transit District
SB	Senate Bill
SBA	South Bay Aqueduct
SCADA	Supervisory Control and Data Acquisition
SCVWD	Santa Clara Valley Water District
SFBAAB	San Francisco Bay Area Air Basin
SFDE	San Francisco Department of the Environment
SFPUC	San Francisco Public Utilities Commission
SHPO	State Historic Preservation Officer
SJMWS	San Jose Municipal Water System
SJMSCP	San Joaquin County Multi-Species Habitat Conservation Plan and Open Space Plan
SJPL	San Joaquin Pipelines
SJVAB	San Joaquin Valley Air Basin

SJVAPCD	San Joaquin Valley Air Pollution Control District
SO_2	sulfur dioxide
SPCC	spill prevention, control, and countermeasure
STATSGO	State Soil Geographic
SVAPCD	San Joaquin Valley Air Pollution Control District
SVP	Society of Vertebrate Paleontology
SWANCC	Solid Waste Agency for Northern Cook County
SWP	State Water Project
SWPPP	storm water pollution prevention plan
SWRCB	State Water Resources Control Board
TAC	Technical Advisory Committee
TCPs	Traditional Cultural Properties
TDH	total discharge (or dynamic) head
TDS	total dissolved solids
TID	Turlock Irrigation District
TM	Technical Memorandum
TMDLs	total maximum daily loads
TOC	total organic carbon
TRC	total residual chlorine
TRTAC	Tuolumne River Technical Advisory Committee
UFC	Uniform Fire Code
UGB	Urban Growth Boundary
U.S. EPA	U.S. Environmental Protection Agency
USBR	U.S. Bureau of Reclamation
USC	United States Code
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UST	underground storage tank
UWMP	urban water management plan
VAMP	Vernalis Adaptive Management Program
VOC	volatile organic compound
VTA	Santa Clara Valley Transportation Authority
WDR	waste discharge requirements
WEIP	Watershed and Environmental Improvement Program
WHR	Wildlife Habitat Relationship
WMP	Watershed Management Plan
WQCP	water quality control plan
WSIP	Water System Improvement Program
WTP	water treatment plant
Zone 7	Alameda County Flood Control and Water Conservation District Zone 7

Conversion Factors

Volume

1 cubic foot (ft^3)	= 7.481 gallons
1 gallon (gal)	= 0.1337 ft^3
1 acre-foot	= 43,560 ft^3 = 325,872 gal = 0.325 million gallons
1 million gallons	= 3.068 acre-feet

Flow

1 cubic foot per second (cfs)	= 7.481 gal/sec = 448.8 gpm = 0.646 mgd = 723.941 afy
1 gallon per minute (gpm)	= 0.00223 cfs = 0.00144 mgd = 1.613 afy
1 million gallons per day (mgd)	= 1.547 cfs = 694.4 gpm = 1,120.55 afy
1 acre-foot per year (afy)	= 0.001381 cfs = 0.0008924 mgd

Temperature

Degrees Celsius (°C) = 5/9 x (°F – 32)

Degrees Fahrenheit (°F) = 9/5 x (°C) + 32

Summary

SUMMARY

S.1 Introduction and Purpose of the PEIR (Chapter 1)

The San Francisco Public Utilities Commission (SFPUC) proposes to adopt and implement the Water System Improvement Program (WSIP or proposed program) to increase the reliability of the regional water system that serves 2.4 million people in San Francisco and the San Francisco Bay Area. The WSIP would improve the regional system with respect to water quality, seismic response, water delivery, and water supply to meet water delivery needs in the service area through the year 2030 and would establish level of service goals and system performance objectives. The WSIP would implement a proposed water supply option, modify system operations, and construct a series of facility improvement projects. The proposed program area spans seven counties—Tuolumne, Stanislaus, San Joaquin, Alameda, Santa Clara, San Mateo, and San Francisco.

The San Francisco Planning Department, Major Environmental Analysis (MEA) Division, determined that implementation of the WSIP could have a significant effect on the environment and therefore required preparation of a Program Environmental Impact Report (PEIR) in compliance with the California Environmental Quality Act (CEQA). This PEIR is intended to provide the public and responsible and trustee agencies with information about the potentially significant environmental effects of the proposed program, to identify possible ways to minimize the potentially significant effects, and to describe and evaluate feasible alternatives to the proposed program.

S.2 Program Description (Chapter 3)

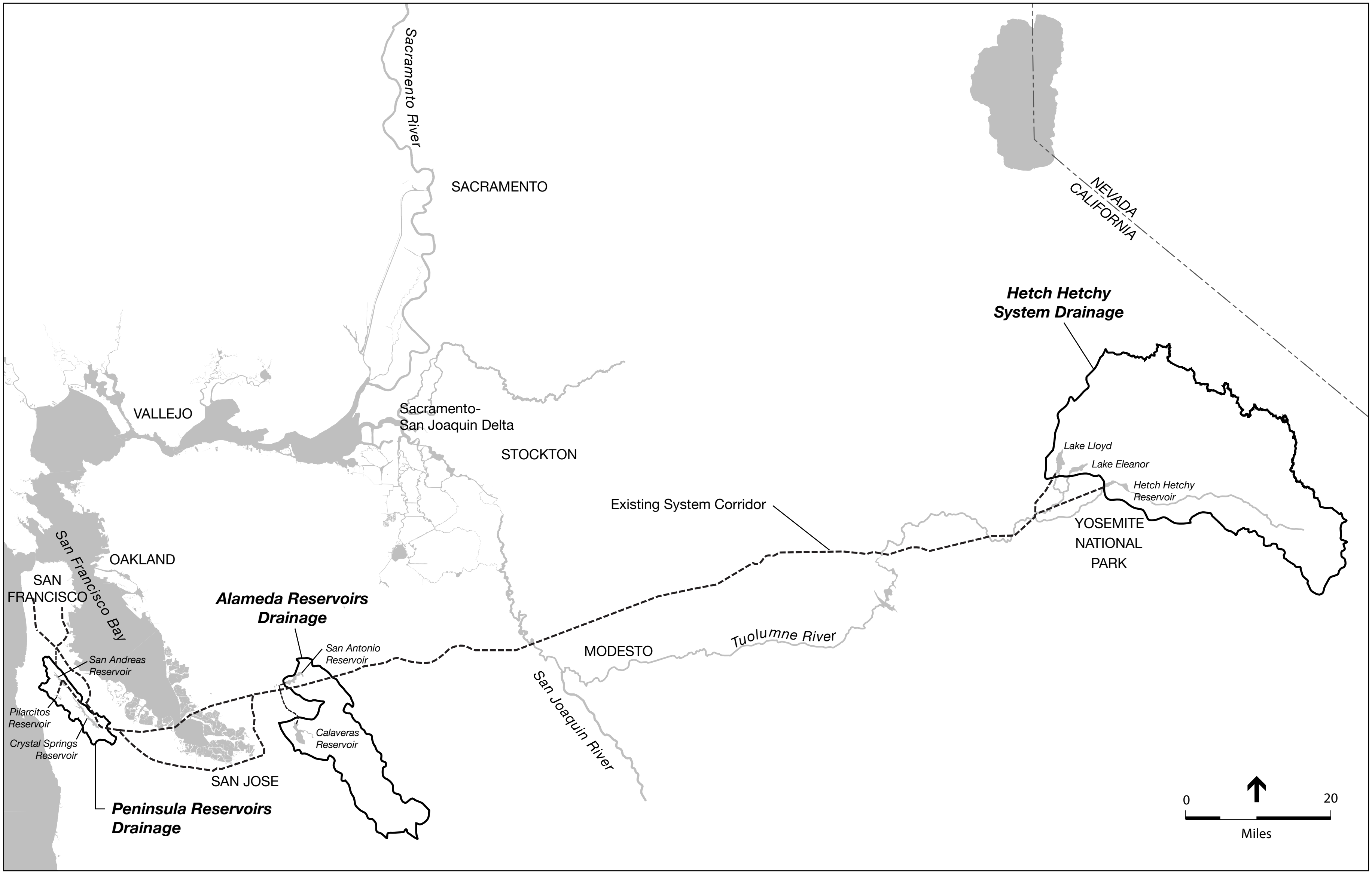
Need for and Objectives of the Program

The City and County of San Francisco (CCSF), through the SFPUC, owns and operates a regional water system that extends from the Sierra Nevada to San Francisco and serves retail and wholesale customers in San Francisco, San Mateo, Santa Clara, Alameda, and Tuolumne Counties. The existing regional system includes over 280 miles of pipelines, over 60 miles of tunnels, 11 reservoirs, 5 pump stations, and 2 water treatment plants. The SFPUC currently delivers an annual average of about 265 million gallons per day (mgd) of water to its customers. The source of the water supply is a combination of local supplies from streamflow and runoff in the Alameda Creek watershed and in the San Mateo and Pilarcitos Creeks watersheds (referred to together as the Peninsula watersheds), augmented with imported supplies from the Tuolumne River watershed. Local watersheds provide about 15 percent of total supplies and the Tuolumne River provides the remaining 85 percent. **Figure S.1** shows the general location of the SFPUC regional system and water supply watersheds.

The SFPUC serves about one-third of its water supplies directly to retail customers, primarily in San Francisco, and about two-thirds of its water supplies to wholesale customers by contractual agreement. The wholesale customers are largely represented by the Bay Area Water Supply and Conservation Agency (BAWSCA), which consists of 27 total customers, shown in **Figure S.2**. Some of these wholesale customers have other sources of water in addition to what they receive from the SFPUC regional system, while others rely completely on the SFPUC for supply.

While the SFPUC has historically met and is currently serving its customers' water demands, there are numerous factors contributing to the need for a comprehensive, systemwide program such as the WSIP. In order to continue to provide reliable water service to its customers, the SFPUC must plan for the future as well as address existing, known deficiencies, including the following:

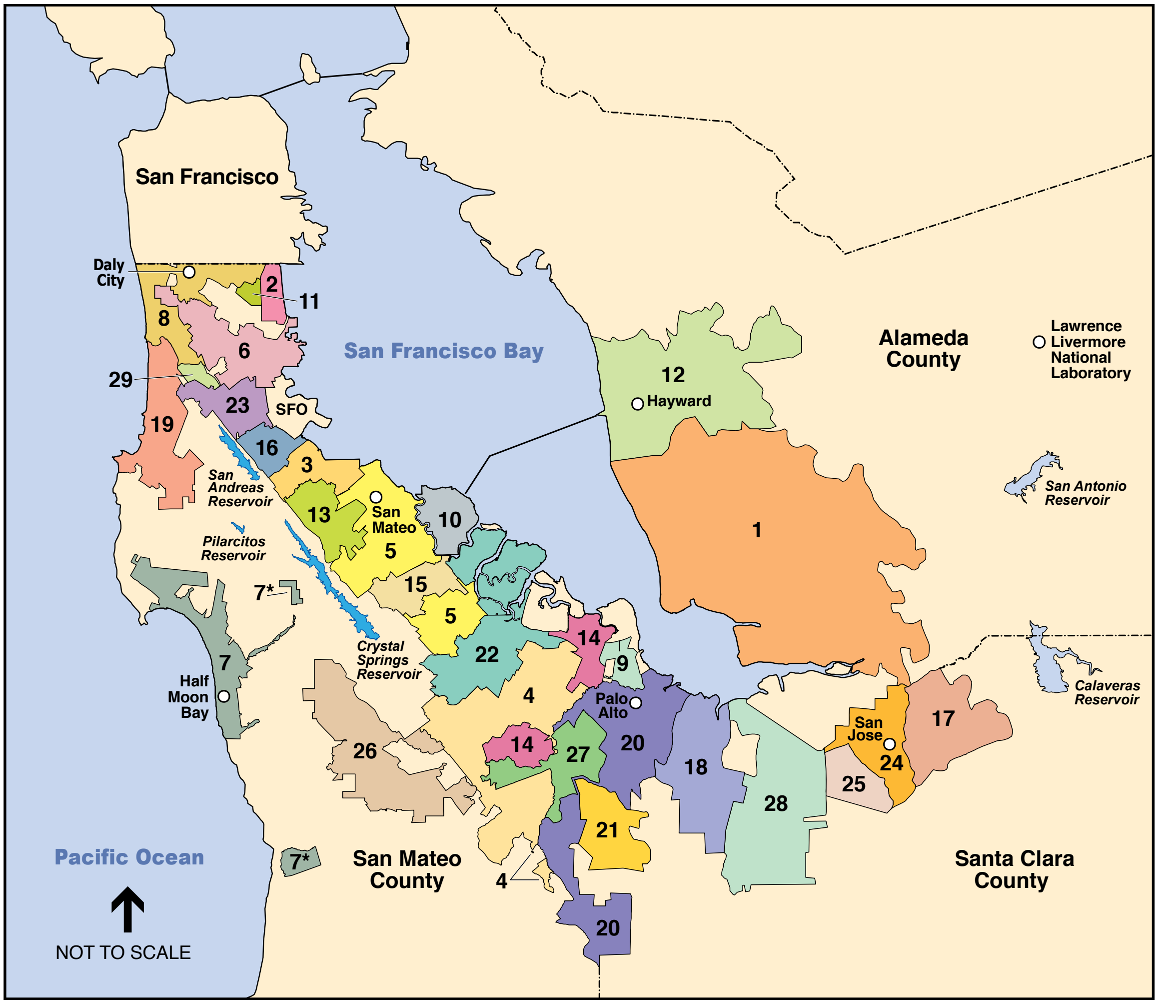
- *Aging Infrastructure*. Many of the components of the SFPUC regional water system were built in the 1800s and early 1900s. As the system ages, its reliability decreases and the risk of failure increases.



SOURCE: ESA + Orion

SFPUC Water System Improvement Program . 203287

Figure S.1
Overview of SFPUC Regional Water System
and Water Supply Watersheds



Legend

(Wholesale customers and members of Bay Area Water Supply and Conservation Agency)

1 Alameda County Water District
2 City of Brisbane
3 City of Burlingame
4 CWS – Bear Gulch
5 CWS – Mid-Peninsula
6 CWS – South San Francisco
7 Coastside County Water District
8 City of Daly City
9 City of East Palo Alto
10 Estero Municipal Improvement District
11 Guadalupe Valley Municipal Improvement District
12 City of Hayward
13 Town of Hillsborough
14 City of Menlo Park
15 Mid-Peninsula Water District
16 City of Millbrae
17 City of Milpitas
18 City of Mountain View
19 North Coast County Water District
20 City of Palo Alto
21 Purissima Hills Water District
22 City of Redwood City
23 City of San Bruno
24 City of San Jose (North)
25 City of Santa Clara
26 Skyline County Water District
27 Stanford University
28 City of Sunnyvale
29 Westborough Water District

* Portions of Coastside County Water District not served by the SFPUC regional water system.

NOTE: For the purposes of this PEIR, the California Water Service (CWS) Company is a single wholesale customer with three different water service districts.

SOURCE: BAWSCA, 2006a

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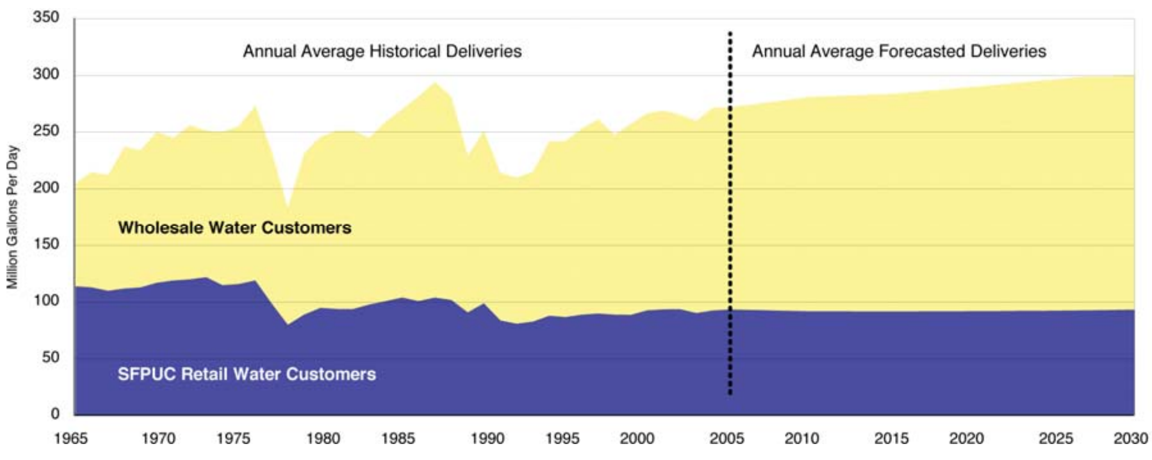
Figure S.2 (Revised)
SFPUC Water Service Area - San Francisco and SFPUC Wholesale Customers

- *Exposure to Seismic and Other Hazards*. The system crosses five active earthquake faults, and many of the existing facilities do not meet modern seismic standards. The California Division of Safety of Dams (DSOD) imposed operating restrictions on two of the system's reservoirs, Calaveras and Lower Crystal Springs Reservoirs, due to seismic and flood control safety hazards, respectively. The restricted operations at these reservoirs reduce local storage capacity and impair normal system operations.

- *Water Quality*. The regional system currently meets or exceeds existing water quality standards. However, system upgrades are needed to improve the SFPUC's ability to maintain compliance with current water quality standards and to meet anticipated future water quality standards.

- *Delivery Reliability*. The system requires additional redundancy (i.e., backup) of some critical facilities to ensure sufficient operational flexibility to carry out adequate system inspection and maintenance and to be adequately prepared in the event of an earthquake, system failure, or other emergency. These critical facilities are necessary to meeting day-to-day customer water supply needs, and increased operational flexibility is needed in order to maintain service to all customers during a full range of operating conditions.

- *Customer Water Demand*. The regional system currently has insufficient water supply to meet customer demand during a prolonged drought, and this situation will worsen in the future without the WSIP. Additional supplies are needed to satisfy current demand in drought years as well as to meet future demand. Water demand among SFPUC retail and wholesale customers is projected to increase over the next 25 years, from an average annual demand of about 366 mgd to 417 mgd in 2030. Of this total projected demand in the SFPUC service area, retail and wholesale customers would purchase an annual average of about 300 mgd from the SFPUC system in 2030, compared to 265 mgd in 2005, as shown in **Figure S.3**. Thus, the SFPUC would need to provide additional water supplies to serve a projected average annual increase in purchase requests of 35 mgd by 2030.



SFPUC Water System Improvement Program ■ 203287

SOURCE: SFPUC, 2007b

Figure S.3 (Revised)
Annual Average Historical and
Projected Future Customer Purchase Requests

To address these challenges, the SFPUC must replace or upgrade numerous system facilities, add some new facilities, and expand its water supply portfolio—thus the need for the WSIP. In 2005, the SFPUC developed goals and objectives for the WSIP based on a planning horizon through 2030. The goals and objectives are founded on two fundamental principles pertaining to the existing regional water system: (1) maintaining a clean, unfiltered water source from the Hetch Hetchy system, and (2) maintaining a gravity-driven system. The overall goals of the WSIP are to:

- Maintain high-quality water
- Reduce vulnerability to earthquakes
- Increase delivery reliability and improve the ability to maintain the system
- Meet customer water supply purchase requests in nondrought and drought periods
- Enhance sustainability in all system activities
- Achieve a cost-effective, fully operational system

To further these program goals, the WSIP includes objectives that address system performance in the areas of water quality, seismic reliability, delivery reliability, and water supply through the year 2030. **Table S.1** presents the WSIP goals and objectives. The WSIP also includes proposed levels of service for the regional water system, which are intended to further define the system performance objectives through 2030 and provide design guidelines for the facility improvement projects. The levels of service (shown in Table 3.5, in Chapter 3, Program Description) address water quality, seismic response after a major earthquake, delivery during system maintenance, average annual water supply, regional system firm yield, and drought-year rationing.

Key program elements are summarized below and described in more detail in Chapter 3 (also see the SFPUC's 2006 *Water System Improvement Program* and 2007 *Water Supply Options* reports).

- *Water Supply*. Proposed water supply option to meet customer purchase requests during both nondrought and drought years.

- *System Operations*. Proposed system operations strategy to achieve water quality, seismic response, and delivery reliability performance objectives under a range of operating conditions, including the following scenarios: day-to-day, maintenance, unplanned outage, earthquake or other emergencies, and drought.

- *Facilities*. Proposed facility improvement projects to repair, upgrade, and, in some cases, expand the regional system facilities to reliably meet level of service goals and system performance objectives and to provide a cost-effective, fully operational water system.

Proposed Water Supply

Under the WSIP, the SFPUC proposes to meet the increased 35 mgd in purchase requests by continuing to maximize use of local watershed supplies, increasing diversions from the Tuolumne River under its existing water rights, and developing new local resources consisting of a combination of additional conservation, water recycling, and groundwater supply programs in

TABLE S.1
WSIP GOALS AND OBJECTIVES

Program Goal	System Performance Objective
Water Quality – *maintain high water quality*	• Design improvements to meet current and foreseeable future federal and state water quality requirements. • Provide clean, unfiltered water originating from Hetch Hetchy Reservoir and filter all other surface water sources. • Continue to implement watershed protection measures.
Seismic Reliability – *reduce vulnerability to earthquakes*	• Design improvements to meet current seismic standards. • Deliver basic service to the three regions in the service area (East/South Bay, Peninsula, and San Francisco) within 24 hours after a major earthquake. Basic service is defined as average winter-month usage, and the performance objective for the regional system is 229 million gallons per day (mgd). The performance objective is to provide delivery to at least 70 percent of the turnouts (i.e., water diversion connecting points from the regional system to customers) in each region, with 104, 44, and 81 mgd delivered to the East/South Bay, Peninsula, and San Francisco regions, respectively. • Restore facilities to meet average-day demand of 300 mgd within 30 days after a major earthquake.
Delivery Reliability – *increase delivery reliability and improve the ability to maintain the system*	• Provide operational flexibility to allow planned maintenance shutdown of individual facilities without interrupting customer service. • Provide operational flexibility to minimize the risk of service interruption due to unplanned facility upsets or outages. • Provide operational flexibility and system capacity to replenish local reservoirs as needed. • Meet the estimated average annual demand of 300 mgd for 2030 under the conditions of one planned shutdown of a major facility for maintenance concurrent with one unplanned facility outage.
Water Supply – *meet customer water needs in nondrought and drought periods*	• Meet average annual water purchase requests of 300 mgd from retail and wholesale customers during nondrought years for system demands through 2030. • Meet dry-year delivery needs through 2030 while limiting rationing to a maximum 20 percent systemwide reduction in water service during extended droughts. • Diversify water supply options during nondrought and drought periods. • Improve use of new water sources and drought management, including use of groundwater, recycled water, conservation, and transfers.
Sustainability – *enhance sustainability in all system activities*	• Manage natural resources and physical systems to protect watershed ecosystems. • Meet, at a minimum, all current and anticipated legal requirements for protection of fish and other wildlife habitat. • Manage natural resources and physical systems to protect public health and safety.
Cost-effectiveness – *achieve a cost-effective, fully operational system*	• Ensure cost-effective use of funds. • Maintain gravity-driven system. • Implement regular inspection and` maintenance program for all facilities.

SOURCE: SFPUC, 2005.

San Francisco, as shown in **Figure S.4**. The water recycling and groundwater supply programs would be developed as part of the proposed facility improvement projects. This combination of water supply sources is expected to fully meet customer purchase requests during nondrought years through 2030. However, based on recent experience, these water supply sources would not be adequate during drought periods. The WSIP level of service goals include a policy to limit customer rationing to a maximum of 20 percent systemwide in any one year of a drought.

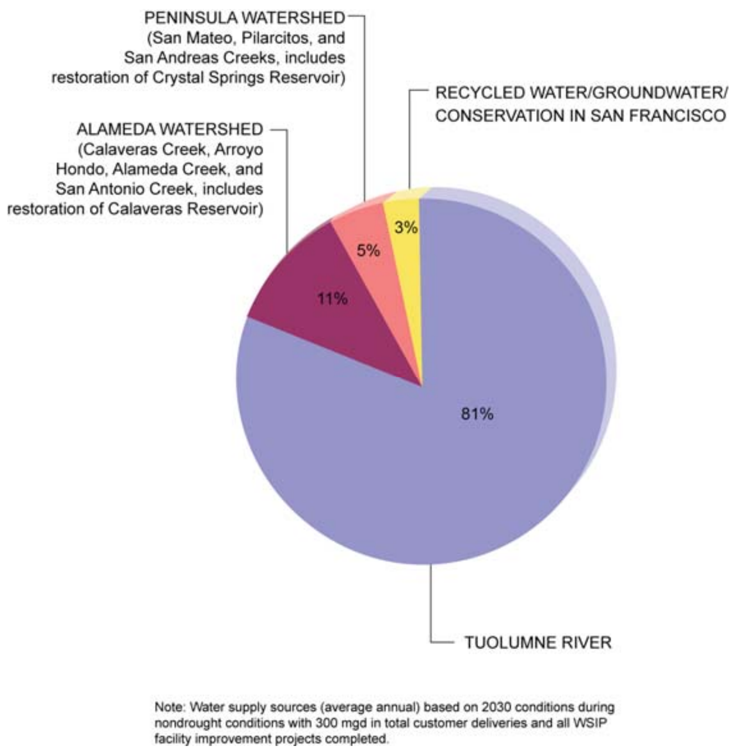


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Figure S.4
WSIP Water Supply Sources, Nondrought Years

To provide adequate water supply to customers during a prolonged drought, the WSIP includes supplemental sources to augment the nondrought-year water supplies described above. The SFPUC proposes to secure a water transfer with the Turlock Irrigation District (TID) and/or Modesto Irrigation District (MID) to provide supplemental dry-year water from the Tuolumne River. Further, the SFPUC proposes to implement a groundwater banking program in the Westside Groundwater Basin in San Mateo County. Under this program, SFPUC wholesale customers that utilize the Westside Groundwater Basin would use supplemental surface water supplies in nondrought years to reduce their groundwater pumping and allow for in-lieu groundwater banking; these wholesale customers could then increase their groundwater pumping in drought years and reduce their demand for surface water supply in those years. In addition, two of the WSIP facility improvement projects involve the restoration of historical operating capacities at two of the system reservoirs, Calaveras and Lower Crystal Springs Reservoirs, which would further augment drought supplies for the regional system. As shown in **Figure S.5**, during drought years under the WSIP, the SFPUC would also include up to 20 percent systemwide rationing.

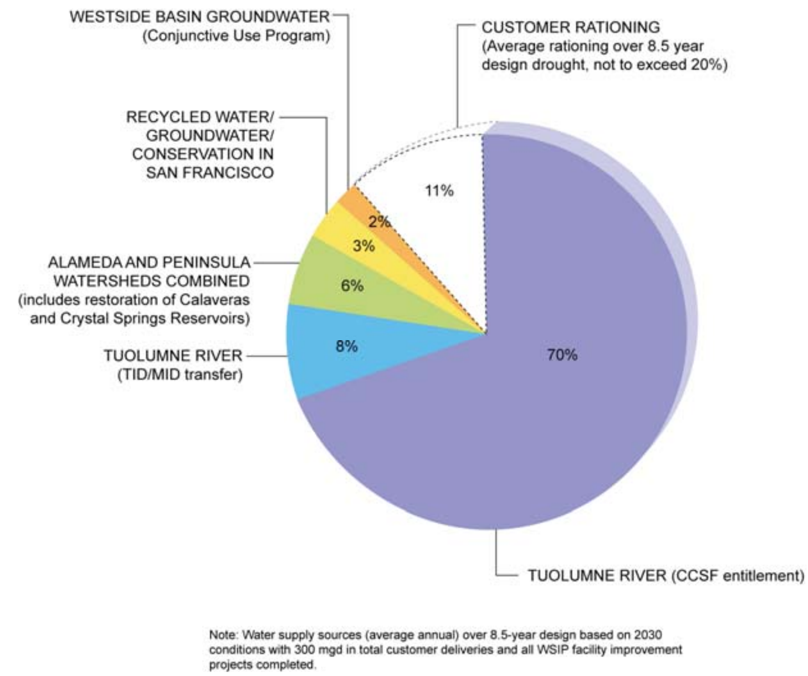

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Figure S.5
WSIP Water Supply Sources, Drought Years

Proposed System Operation Strategy

Operation of the regional water system is affected by numerous factors, including fluctuations in customer demand; meteorological and hydrologic conditions; physical facilities and infrastructure capacity and maintenance requirements; and multiple institutional parameters. The WSIP addresses the condition of the physical facilities and infrastructure while planning for and taking into account these various factors. The operating strategy addresses four components of system operation: water supply and storage, water quality, water delivery, and asset management.

Under the WSIP, general day-to-day operation of the regional water system would be similar to existing operations but would provide for additional facility maintenance activities and improved emergency preparedness. Implementation of the program would allow for a refinement of the operations strategy to meet the WSIP goals and objectives and would thereby increase system reliability and provide additional flexibility for scheduling repairs and maintenance. The proposed operations strategy would also include a multistage drought response program during an extended drought. Under the WSIP, regional system operations would continue to comply with all applicable institutional and planning requirements, including:

- Complying with all water quality, environmental, and public safety regulations
- Maximizing the use of water from local watersheds
- Assigning a higher priority to water delivery over hydropower generation
- Meeting all downstream flow requirements

Proposed Facility Improvement Projects

The WSIP includes 22 facility improvement projects along the regional system, from Oakdale Portal in Tuolumne County on the east end to San Francisco on the west. The projects, described in **Table S.2**, have been identified as necessary to achieve the level of service goals and system performance objectives of the WSIP. **Figure S.6** indicates the location of each facility improvement project.

Standard Construction Measures

The SFPUC has established standard construction measures that would be implemented as part of all WSIP projects. The main objective of these measures is to minimize potential disruption of surrounding neighborhoods during construction and to reduce impacts on environmental resources to the extent feasible. The construction measures would be implemented individually for the facility improvement projects; some measures might not be applicable to some projects, while some projects would require the development of more detailed construction measures and implementation steps as the individual projects are designed. The standard construction measures to be included in WSIP construction contracts address the following topics: neighborhood notice, seismic and geotechnical studies, onsite air and water quality measures during construction, groundwater, traffic, noise, hazardous materials, biological resources, cultural resources, and project site (i.e., the use of non-CCSF-owned land during construction).

Proposed Construction Schedule

Figure S.7 presents a preliminary master schedule of the construction phases for the facility improvement projects. The SFPUC developed the preliminary schedule to assure that water delivery service is maintained throughout construction of the numerous projects, but is preparing schedule refinements and adjustments as the projects are further developed and more information is known about construction requirements. All WSIP projects are scheduled to be completed by the end of 2014. The acquisition of supplemental water supplies during droughts would be implemented as needed to match the water supply needs of the retail and wholesale customers (see Chapter 5, Section 5.1) and is not included on the construction schedule.

TABLE S.2
WSIP FACILITY IMPROVEMENT PROJECTS

No.[a]	Project Title	Principal Type of Facility/ Objectives[b]	Location of Preferred Project[c]	Project Description
San Joaquin Region				
SJ-1	Advanced Disinfection	Treatment / Water Quality	Tesla Portal	This project would provide for the planning, design, and construction of a new advanced disinfection facility for the Hetch Hetchy water supply to comply with the new federal drinking water regulatory requirements contained in the Long Term 2 Enhanced Surface Water Treatment Rule. This regulation is designed to provide treatment for the parasite *Cryptosporidium*. The project is in the planning phase and the SFPUC is evaluating applicable technologies and possible locations to identify the most technologically sound and cost-effective alternative. In addition, the project includes planning and conceptual engineering for providing advanced disinfection facilities at the Sunol Valley and Harry Tracy Water Treatment Plants (WTPs). This project may be combined with the Tesla Portal Disinfection Station project along with portal modifications, and the need for the Lawrence Livermore Supply Improvements project may be affected by the location and technology selected for this project.
SJ-2	Lawrence Livermore Supply Improvements	Treatment / Water Quality	Thomas Shaft	This project includes design and construction of treatment upgrades for the water supplied to the Lawrence Livermore Laboratory. The project would construct water treatment facilities from the Thomas Shaft of the Coast Range Tunnel. An advanced disinfection facility planned at an upstream location under the Advanced Disinfection project could affect project design.
SJ-3	San Joaquin Pipeline System	Pipeline / Water Supply, Delivery Reliability	Isolated locations along the existing San Joaquin Pipeline corridor	The preferred project would generally be located within the existing San Joaquin Pipeline (SJPL) right-of-way and would include: • Construction of a new 6.4-mile-long, up to 86-inch-diameter fourth San Joaquin Pipeline parallel to the existing three pipelines at the east end of the pipelines, starting at Oakdale Portal, and associated portal modifications. • Construction of two additional crossover facilities between the San Joaquin Pipelines within the existing right-of-way, both located in Stanislaus County, with one about 20 miles east of Modesto and the other about 15 miles west of Modesto, and improvements at the existing Roselle Crossover. • Construction of a new 10-mile-long, up to 86-inch-diameter fourth San Joaquin Pipeline parallel to the existing three pipelines at the west end of the pipelines ending at Tesla Portal. This project would provide additional facilities to upgrade the hydraulic capacity of the San Joaquin Pipeline system to 314 mgd (and a 271-mgd average during system maintenance when a pipeline segment must be taken out of service) and to provide redundancy for prestressed concrete cylinder pipe for reliability. Note: While the current preferred alternative would construct 16 miles of pipeline, as much as 22 miles of pipeline could be constructed depending on the results of a conditions assessment of the existing pipelines.
SJ-4	Rehabilitation of Existing San Joaquin Pipelines	Pipeline / Water Supply, Delivery Reliability	Rehabilitation could occur anywhere along the pipeline corridor, which extends from Oakdale Portal to Tesla Portal	Reconditioning/rehabilitation of the existing San Joaquin Pipelines. There are three existing pipelines, each 47.7 miles long, extending from Oakdale Portal to Tesla Portal: • SJPL-1, riveted steel pipe, 56- to 72-inch internal diameter • SJPL-2, reinforced concrete pipe and welded steel pipe, 61- to 62-inch internal diameter • SJPL-3, prestressed concrete cylinder pipe and welded steel pipe, 78-inch internal diameter

TABLE S.2 (Continued)
WSIP FACILITY IMPROVEMENT PROJECTS

No.[a]	Project Title	Principal Type of Facility/ Objectives[b]	Location of Preferred Project[c]	Project Description
San Joaquin Region (cont.)				
SJ-5	Tesla Portal Disinfection Station	Treatment / Water Quality, Seismic Reliability	Tesla Portal	This project includes the planning, design, and construction of new disinfection facilities for the Hetch Hetchy water supply. The project would replace and upgrade the existing disinfection facilities at the Tesla Portal Disinfection Facility to meet current seismic, safety/fire, and building code standards. The preferred project would include construction of: • New control building and storage room • Pump houses • Chemical storage tanks and feed equipment and sampling systems • Emergency generator, including primary and standby power supplies • Access road It should be noted that the design and location of the Advanced Disinfection project would affect the design and location of this project.
Sunol Valley Region				
SV-1	Alameda Creek Fishery Enhancement	Other / Water Supply, Sustainability	Structural Alternatives: Alameda Creek in Sunol Valley, downstream of Calaveras Dam	This project would recapture the water released as part of the Calaveras Dam project and return it back to the regional system for use. A number of structural and non-structural recovery alternatives are under consideration for this project, including: a water recapture facility downstream of the Sunol Valley WTP, conjunctive groundwater use, horizontal collector wells, or other groundwater recovery systems yet to be defined. Other alternative designs for this project could be developed. If a structural alternative involving construction of a recapture facility is selected, the recapture facility would be located at the downstream end of the reach of Alameda Creek between the lower Sunol Valley and the confluence with Arroyo de la Laguna. As an alternative to the recapture facility, the SFPUC may coordinate with other water agencies to develop and implement other means of recapturing fishery enhancement flows consistent with the 1997 CDFG MOU.
SV-2	Calaveras Dam Replacement	Storage / Water Supply, Delivery and Seismic Reliability	Sunol Valley, immediately downstream of existing dam and at the Alameda Creek Diversion Dam	This project would provide for the planning, design, and construction of a replacement dam at Calaveras Reservoir to meet seismic safety requirements. The new dam would provide for a reservoir with the same storage capacity as the original reservoir (96,800 acre-feet), but the replacement dam would be designed to accommodate enlargement of the dam in the future. The preferred project would include construction of: • New earthfill dam • New intake tower and new outlet valve for water releases for instream flow requirements • New or rehabilitated outlet works for seismic safety and improved operations and maintenance • New bypass structure at the Alameda Creek Diversion Dam As part of this project, Calaveras Reservoir and the proposed bypass structure at the diversion dam would be operated to release up to 6,300 acre-feet per year (5.5 mgd) of water to Alameda Creek in support of fisheries in compliance with the 1997 CDFG MOU. When flow is available in Alameda Creek, releases would be made through the proposed bypass structure at the Alameda Creek Diversion Dam and would be supplemented as necessary with releases from Calaveras Dam.

TABLE S.2 (Continued)
WSIP FACILITY IMPROVEMENT PROJECTS

No.[a]	Project Title	Principal Type of Facility/ Objectives[b]	Location of Preferred Project[c]	Project Description
SV-3	Additional 40-mgd Treated Water Supply	Treatment / Water Quality, Delivery Reliability	Sunol Valley WTP and pipeline to connect to the Alameda Siphons or Irvington Tunnel	This project would provide for the planning, design, and construction of an additional 40 mgd of treatment capacity at the Sunol Valley WTP. The project would increase the sustainable capacity of the Sunol Valley WTP to 160 mgd. The planning-level study would evaluate treatment operations protocol and an alternative treatment process. The project would include either retrofitting the existing facilities with a membrane treatment process or expanding the existing facilities with: • New flocculation and sedimentation system • Upgrade of existing filters or addition of three new filters and a new flow distribution chamber

TABLE S.2 (Continued)
WSIP FACILITY IMPROVEMENT PROJECTS

No.[a]	Project Title	Principal Type of Facility/ Objectives[b]	Location of Preferred Project[c]	Project Description
Sunol Valley Region (cont.)				
SV-3 (cont.)				• New filtered water and backwash piping Additionally, the project would include: • New chemical feed and piping system • Upgrade of the electrical supply system • Miscellaneous piping, valves, and mechanical and electrical work • Approximately two miles of 78-inch-diameter pipe to connect to the Alameda Siphons or Irvington Tunnel
SV-4	New Irvington Tunnel	Tunnel / Delivery and Seismic Reliability	Sunol Valley to Fremont, parallel to and just south of the existing Irvington Tunnel	This project would construct a new tunnel parallel to and just south of the existing Irvington Tunnel to convey water from the Hetch Hetchy system and the Sunol Valley WTP to the Bay Area. The new tunnel would be a redundant water transmission facility to the existing Irvington Tunnel. The preferred project would include construction of: • New 18,200-foot-long, 10-foot-diameter tunnel • New portal at the east end adjacent to the existing Alameda West Portal in the Sunol Valley with connections to the existing Alameda Siphons and proposed new siphon • New portal at the west end adjacent to the existing Irvington Portal in Fremont with connections to the existing Bay Division Pipelines and proposed new pipeline (Bay Division Pipeline Reliability Upgrade) • Valves and equipment to control and monitor flows • Modifications to the existing Alameda West and Irvington Portals
SV-5	SVWTP – Treated Water Reservoirs	Storage and Treatment / Delivery Reliability	North of the Sunol Valley WTP	This project would provide for the planning, design, and construction of new treated water storage reservoirs at the Sunol Valley WTP to comply with requirements of the California Department of Health Services. The preferred project would include construction of: • One 5-million-gallon chlorine contact basin • Two 8.75-million-gallon storage basins • New inlet and outlet piping and reservoir drainage system • Pipe bridge over Alameda Creek • Chemical (ammonia and chlorine) storage and feed system • Backup filter washwater supply and filter washwater supply system • Instrumentation and controls and miscellaneous pumping appurtenances to integrate the reservoirs into the existing treatment plant • Expansion of the existing Sunol Valley WTP electrical substation • Two 750-kilowatt diesel-powered emergency generators

TABLE S.2 (Continued)
WSIP FACILITY IMPROVEMENT PROJECTS

No.[a]	Project Title	Principal Type of Facility/ Objectives[b]	Location of Preferred Project[c]	Project Description
Sunol Valley Region (cont.)				
SV-6	San Antonio Backup Pipeline	Pipeline / Delivery and Seismic Reliability	Sunol Valley between San Antonio Reservoir and San Antonio Pump Station	This project would consist of three proposed facilities: (1) San Antonio Backup Pipeline, a new pipeline (size undetermined) from San Antonio Reservoir to San Antonio Pump Station, about two miles long; (2) San Antonio Creek discharge facilities (improvements allowing for the discharge of Hetch Hetchy water and associated road improvements); and (3) Alameda East Portal vent overflow pipeline and portal modifications.
Bay Division Region				
BD-1	Bay Division Pipeline Reliability Upgrade	Pipeline and Tunnel / Water Supply, Delivery and Seismic Reliability	Along existing Bay Division Pipelines Nos. 1 and 2 easement from Fremont to Redwood City	This project would construct a new Bay Division Pipeline No. 5 (BDPL No. 5) from Irvington Tunnel Portal in Fremont to Pulgas Tunnel Portal near Redwood City, consisting of 16 miles of new pipeline and 5 miles of tunnel under San Francisco Bay. Portions of the section of BDPL No. 1 between Edgewood Valve Lot and Pulgas Valve Lot would be removed (approximately 1.4 miles), and existing aboveground and submarine sections of BDPL Nos. 1 and 2 over the five-mile-long section from Newark Valve House to Ravenswood Valve House would be decommissioned (decommissioning is not part of this project). The redundancy provided by the project would increase the overall transmission capacity of the Bay Division Pipeline system. The preferred project would include construction of: • New welded-steel pipeline, approximately 72 inches in diameter, extending along the seven-mile reach from Irvington Portal to Newark Valve Lot, located within the existing SFPUC right-of-way of BDPL Nos. 1 and 2 • New "Bay Tunnel" segment of BDPL No. 5, approximately 120 inches in diameter, extending five miles from Newark Valve Lot to Ravenswood Valve Lot, crossing under San Francisco Bay and adjacent marshlands; BDPL Nos. 1 and 2 would tie into the tunnel at both ends and would be decommissioned between Newark and Ravenswood Valve Lots • New welded-steel pipeline, approximately 60 inches in diameter extending along the nine-mile reach from Ravenswood Valve Lot to Pulgas Portal, located within the existing SFPUC right-of-way of BDPL Nos. 1 and 2 • New facilities at eight valve vault lots along the alignment, containing new concrete vaults and control structures that house electrical control panels, isolation valves, mechanical equipment, and cross-connections between BDPL No. 5 and the existing Bay Division Pipelines • Two flow metering vaults at or near Mission Boulevard (in Fremont) and Pulgas Portal areas • New Isolation valves and piping for connecting BDPL No. 5 to Irvington and Pulgas Portals

TABLE S.2 (Continued)
WSIP FACILITY IMPROVEMENT PROJECTS

No.[a]	Project Title	Principal Type of Facility/ Objectives[b]	Location of Preferred Project[c]	Project Description
Bay Division Region (cont.)				
BD-2	BDPL Nos. 3 and 4 Crossovers	Valve House / Delivery and Seismic Reliability	Three locations adjacent to where BDPL Nos. 3 and 4 traverse Guadalupe River, Barron Creek, Bear Gulch Reservoir	This project would construct three additional crossover facilities along BDPL Nos. 3 and 4 to provide operational flexibility for maintenance or during emergencies. The new crossover facilities would reduce the length of pipe to be removed from service, either for maintenance or for emergencies, and would reduce the duration of outages. Each crossover facility would include construction of: • Four mainline valves and one cross-connect valve • Automatic controlled actuators • Discharge facilities to enable release of water that meets water quality discharge requirements within discrete pipeline segments to surface waters, either for maintenance or emergencies
BD-3	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault	Pipeline / Seismic Reliability	Along existing BDPL Nos. 3 and 4 in Fremont	This project would provide for the planning, design, and construction of upgraded, seismically resistant sections of the BDPL Nos. 3 and 4 where they cross the Hayward fault. The replacement pipelines would be located between the two new crossover/isolation valves that would be built as part of BDPL Nos. 3 and 4 Crossover/Isolation Valve at Hayward Fault project (a WSIP project determined to be independent of the PEIR). In addition to the replacement pipelines, a new bypass pipeline between the two new crossover/isolation valve vaults could also be built as part of one of the several alternatives being considered for this project.
Peninsula Region				
PN-1	Baden and San Pedro Valve Lots Improvements	Valve House / Delivery and Seismic Reliability	Baden Valve Lot, South San Francisco, San Pedro Valve Lot, Daly City	This project would upgrade valve vaults, valves, and piping at the existing Baden and San Pedro Valve Lots to meet current seismic standards. Work could also be performed at the Pulgas Pump Station and Pulgas Valve Lot as part of transmission reliability. The project would include a new pressure-reducing valve at one of the locations to allow transfer of water between high and low pressure zones from the Harry Tracy WTP to the Peninsula under an emergency scenario.
PN-2	Crystal Springs/ San Andreas Transmission Upgrade	Pipeline / Delivery and Seismic Reliability	Lower Crystal Springs Reservoir to San Andreas Reservoir, including Crystal Springs Pump Station	This project would consist of seismic improvements of facilities that convey water from Crystal Springs Reservoir to the Harry Tracy WTP. This project would increase the transmission capacity of the existing raw water pipeline from Crystal Springs Reservoir to San Andreas Reservoir in order to reliably supply 140 mgd of raw water for treatment at the Harry Tracy WTP. The project would include: • Repair of Upper Crystal Springs Dam discharge culverts • Upgrade and repair of Lower Crystal Springs Dam outlet structures and tunnels conveying water to Crystal Springs Pump Station • Replacement or refurbishment of Crystal Springs Pump Station • Upgrade and repair of the chemical system and Crystal Springs chlorine emergency feed • Improvements to the Crystal Springs/San Andreas Pipeline, including replacement of approximately 1,350 feet of 66-inch-diameter pipeline, general renewal of the remaining pipeline, and addition of new manholes, blowoff valves, and isolation valves; or construction of a new redundant pipeline along a new alignment.

TABLE S.2 (Continued)
WSIP FACILITY IMPROVEMENT PROJECTS

No.[a]	Project Title	Principal Type of Facility/ Objectives[b]	Location of Preferred Project[c]	Project Description
Peninsula Region (cont.)				
PN-2 (cont.)				• Seismic and hydraulic upgrade and repair of San Andreas outlet facilities • Addition of fish screens on the outlet structures for both Crystal Springs and San Andreas Reservoirs • Repair of two pipelines that convey raw water from San Andreas Reservoir to the Harry Tracy WTP raw water pump station
PN-3	HTWTP Long-Term Improvements	Treatment / Water Quality, Delivery and Seismic Reliability	Harry Tracy WTP	This project would be a seismic retrofit and rehabilitation of the existing building and facility to provide long-term reliability and process improvements. The project would increase the sustained treatment capacity of the plant from 120 to 140 mgd for 60 days. The proposed improvements would include: • Replacement and upgrade of the ozone generation system for primary disinfection • Replacement or upgrade of the existing sedimentation basins at the same location • Improvements to sludge handling facilities • New, redundant pipeline from the treatment works to the finished water storage reservoir • Raw water pump station improvements • Upgrade and replacement of electrical and instrumentation components, including improvements to process and plant security facilities
PN-4	Lower Crystal Springs Dam Improvements	Storage / Water Supply and Delivery Reliability	Lower Crystal Springs Dam	This project would consist of major repairs and improvements to Lower Crystal Springs Dam to provide adequate protection of the dam and downstream areas from the probable maximum flood, as defined by the DSOD. DSOD has placed operational restrictions on the dam, and the capacity of the reservoir is limited to 56,800 acre-feet. The project would restore the historical reservoir capacity of 68,000 acre-feet. The project would be coordinated with San Mateo County, which is concurrently planning the replacement of the existing county bridge built above the crest of the dam. Project elements would include: • Lowering the existing parapet wall on either side of the existing spillway to lengthen the overflow weir (central spillway) from the reservoir • Raising the remaining parapet walls and adding two new spillway bays, one on each side of the existing central spillway • Enlarging the spillway stilling basin to accommodated the probable maximum flood • Installing four gates (with control building) or installing a fixed weir within the spillway to restore the historical storage capacity

TABLE S.2 (Continued)
WSIP FACILITY IMPROVEMENT PROJECTS

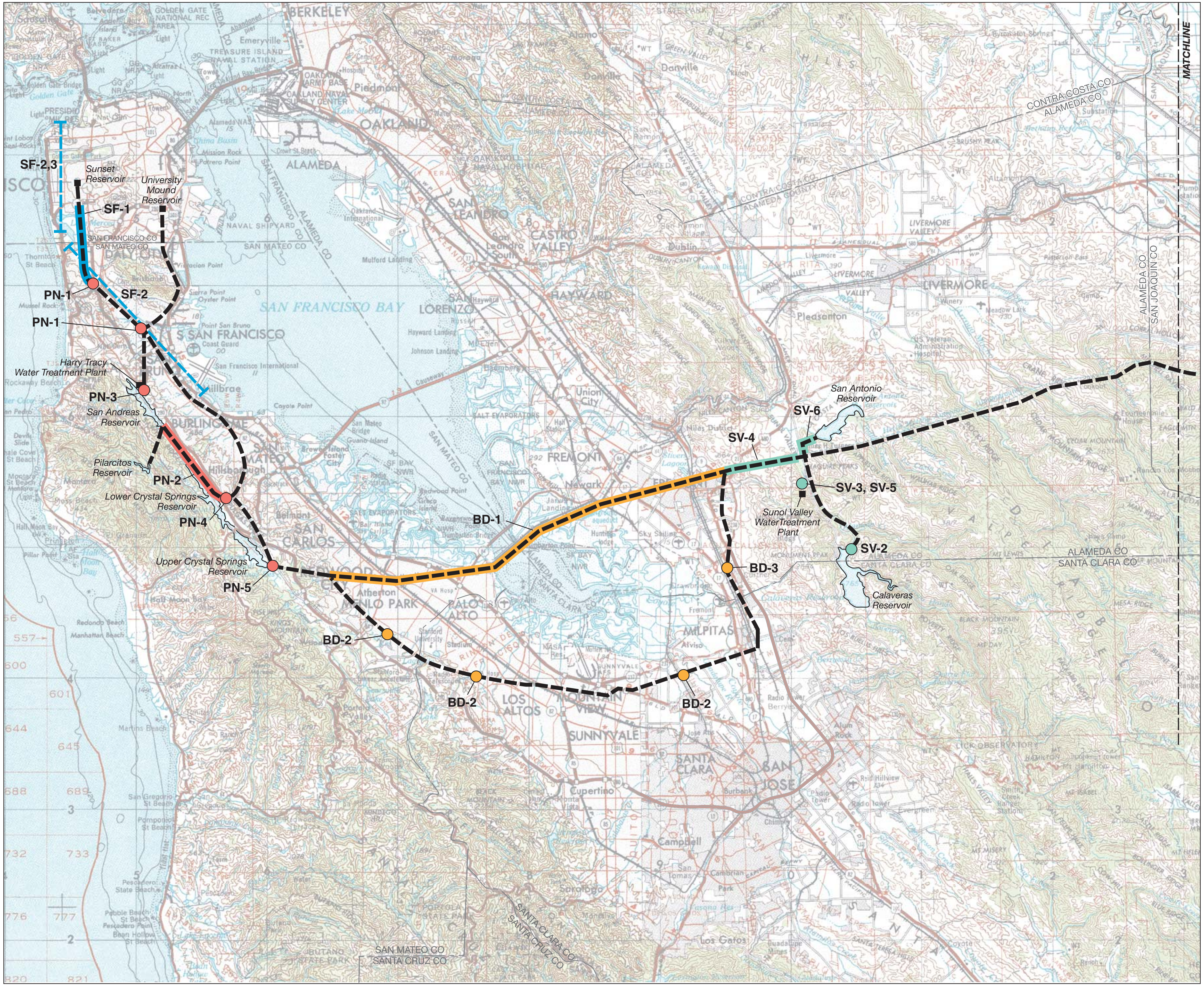
No.[a]	Project Title	Principal Type of Facility/ Objectives[b]	Location of Preferred Project[c]	Project Description
Peninsula Region (cont.)				
PN-5	Pulgas Balancing Reservoir Rehabilitation	Storage / Water Quality, Delivery and Seismic Reliability	Pulgas Balancing Reservoir and mouth of Laguna Creek at south end of Upper Crystal Springs Reservoir	This project would provide for the planning, design, and construction of improvements to the existing Pulgas Balancing Reservoir and associated facilities. The project would include: • Modifications to the inlet/outlet piping (Phase 1, currently under construction) • Design and construction to rehabilitate and/or expand the discharge channel to Crystal Springs Reservoir (or to install a parallel channel) (Phase 2) • Geotechnical investigations, design, and construction of recommended seismic improvements, including repair/replacement of the reservoir walls, floor, and roof (Phase 3) • Restoration of a six- to eight-acre sediment catchment basin in Laguna Creek to also serve as sustainable habitat for San Francisco garter snake and California red-legged frog, including culvert replacement, sediment removal, revegetation, and protective measures to avoid impacts on sensitive species (Phase 4) • Modification of the existing dechlorination process, including modifications to the chemical feed system to enable pH adjustment and dechlorination system to operate reliably (Phase 5)
San Francisco Region				
SF-1	San Andreas Pipeline No. 3 Installation	Pipeline / Delivery and Seismic Reliability	Daly City to San Francisco	This project would replace the out-of-service Baden-Merced Pipeline, which is beyond repair, and would construct a new pipeline extension of the existing San Andreas Pipeline No. 3 from San Pedro Valve Lot in Daly City to Merced Manor Reservoir in San Francisco. It would also connect the existing San Andreas Pipeline No. 2 at Sloat Boulevard in San Francisco and install an additional pipeline to serve the water turnouts along San Andreas Pipeline No. 2. The project would provide seismic reliability and system redundancy for Peninsula and San Francisco customers. The project would include: • New 3.8-mile-long, 36-inch-diameter pipeline • Approximately 0.27 mile of 36-inchdiameter pipeline for three connections between San Andreas Pipelines Nos. 2 and 3 • Removal of the Baden-Merced Pipeline where the new San Andreas Pipeline No. 3 alignment matches the Baden-Merced alignment • Less than 0.1 mile of 12- to 16-inch-diameter new pipeline for five branch connections to user turnouts (three turnouts to Daly City, two turnouts to San Francisco distribution lines) • Installation of line valves and vaults, manholes, cathodic protection and monitoring stations, sample taps, air valves, blowoffs, and other pipeline appurtenances
SF-2	Groundwater Projects	Other / Water Supply	West side of San Francisco and northern San Mateo County	This project includes three groundwater projects: Lake Merced, Local Groundwater, and Regional Groundwater. • The Lake Merced project would address raising the level of Lake Merced in San Francisco using a supplemental source of water, such as treated stormwater, recycled water, groundwater, or SFPUC system water.

TABLE S.2 (Continued)
WSIP FACILITY IMPROVEMENT PROJECTS

No.[a]	Project Title	Principal Type of Facility/ Objectives[b]	Location of Preferred Project[c]	Project Description
San Francisco Region (cont.)				
SF-2 (cont.)				• The Local Groundwater Projects would include development of 2 mgd of new local groundwater for blending with water in the potable water system in San Francisco. An estimated four wells and well stations would be constructed to develop this new local groundwater. This project would also include the use of an additional 2 mgd of groundwater through replacement of existing irrigation wells at the San Francisco Zoo, Golden Gate Park, and/or other locations, once recycled water were available for irrigation (to be developed under the Recycled Water Projects). Two existing wells would be modified to enable emergency supply to local residents in the event of a major earthquake or other disaster. This project would include the pipelines, water treatment equipment, and controls needed to add the groundwater to the municipal supply. The additional water supply developed under this project would be used during both nondrought and drought years. • As part of a regional conjunctive-use project, the SFPUC would construct about 10 new groundwater production wells in San Mateo County to develop about 6 mgd of potable groundwater for use as a supplemental drought-year supply. In nondrought years under this project, the SFPUC would provide potable water from the regional system to customers in Daly City, San Bruno, and South San Francisco to substitute for groundwater currently used for municipal purposes, thereby reducing groundwater pumping and allowing the groundwater basin to recharge naturally. In drought years, the groundwater would be available for local use to supplement the regional system water. This project would require agreements with the affected agencies see (Section 3.13).
SF-3	Recycled Water Projects	Other / Water Supply, Sustainability	Various locations on west side of San Francisco	This project includes recycled water projects in San Francisco and other locations. Projects include Westside Baseline and Harding Park/Lake Merced. This project would provide treatment, storage, and distribution facilities for about 4 mgd of recycled water to users on the west side of San Francisco. Primary users would include Golden Gate Park, Lincoln Park, Lincoln Park Golf Course, Harding Park Golf Course, San Francisco Zoo, Sunset Boulevard medians, and San Francisco State University. As described under Groundwater Projects, the SFPUC is also investigating appropriate sources of supply for increasing and maintaining Lake Merced lake levels, including recycled water that has undergone advanced treatment.

[a] The numbering system is consistent, to the extent possible, with that presented in the Notice of Preparation (NOP) regarding preparation of an environmental impact report on the WSIP issued in September 2005. However, due to a regrouping of the projects after publication of the NOP, some projects have been renumbered.
[b] General types of facilities. Objectives refer to the WSIP objectives met by each project; see Table S.1 for a complete description of WSIP goals and objectives.
[c] See Figure S.6 for the approximate locations of preferred projects; many of the projects are still in development, and the SFPUC may ultimately consider other design options.

SOURCE: SFPUC, 2006.



SFPUC WATER SYSTEM IMPROVEMENT PROGRAM, FACILITY IMPROVEMENT PROJECTS

SUNOL VALLEY REGION

SV-1 Alameda Creek Fishery Enhancement (not shown)
SV-2 Calaveras Dam Replacement
SV-3 Additional 40-mgd Treated Water Supply
SV-4 New Irvington Tunnel
SV-5 SVWTP – Treated Water Reservoirs
SV-6 San Antonio Backup Pipeline

BAY DIVISION REGION

BD-1 Bay Division Pipeline Reliability Upgrade
BD-2 BDPL Nos. 3 and 4 Crossovers (3 locations)
BD-3 Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault

PENINSULA REGION

PN-1 Baden and San Pedro Valve Lots Improvements (2 locations)
PN-2 Crystal Springs / San Andreas Transmission Upgrade
PN-3 HTWTP Long-Term Improvements
PN-4 Lower Crystal Springs Dam Improvements
PN-5 Pulgas Balancing Reservoir Rehabilitation

SAN FRANCISCO REGION

SF-1 San Andreas Pipeline No. 3 Installation
SF-2 Groundwater Projects (general geographic area indicated)
SF-3 Recycled Water Projects (general geographic area indicated)

Existing System Corridor
Existing System Facility
Proposed Facility Corridor
Proposed Facility Site
Proposed Facility, General Location

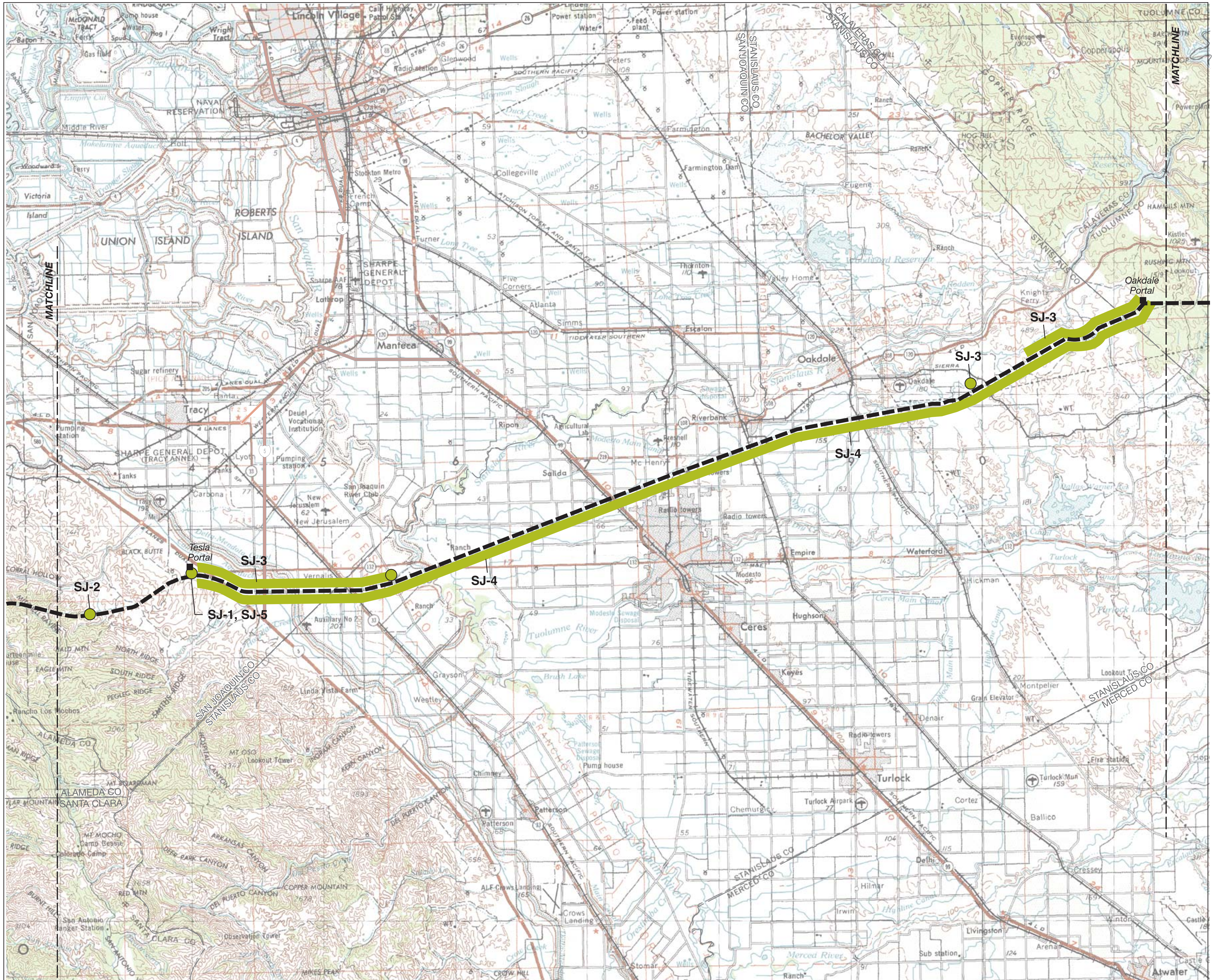
0 5 Miles

SOURCE: ESA + Orion; SFPUC, 2006; USGS 1978

SFPUC Water System Improvement Program . 203287

Figure S.6a
Location of WSIP Facility Improvement Projects-Sunol Valley, Bay Division, Peninsula, and San Francisco Regions

SFPUC WATER SYSTEM IMPROVEMENT PROGRAM, FACILITY IMPROVEMENT PROJECTS



SAN JOAQUIN REGION

SJ-1 Advanced Disinfection
SJ-2 Lawrence Livermore Supply Improvements
SJ-3 San Joaquin Pipeline System
SJ-4 Rehabilitation of Existing San Joaquin Pipelines
SJ-5 Tesla Portal Disinfection Station

Existing System Corridor
Existing System Facility
Proposed Facility Corridor
Proposed Facility Site
Proposed Facility, General Location

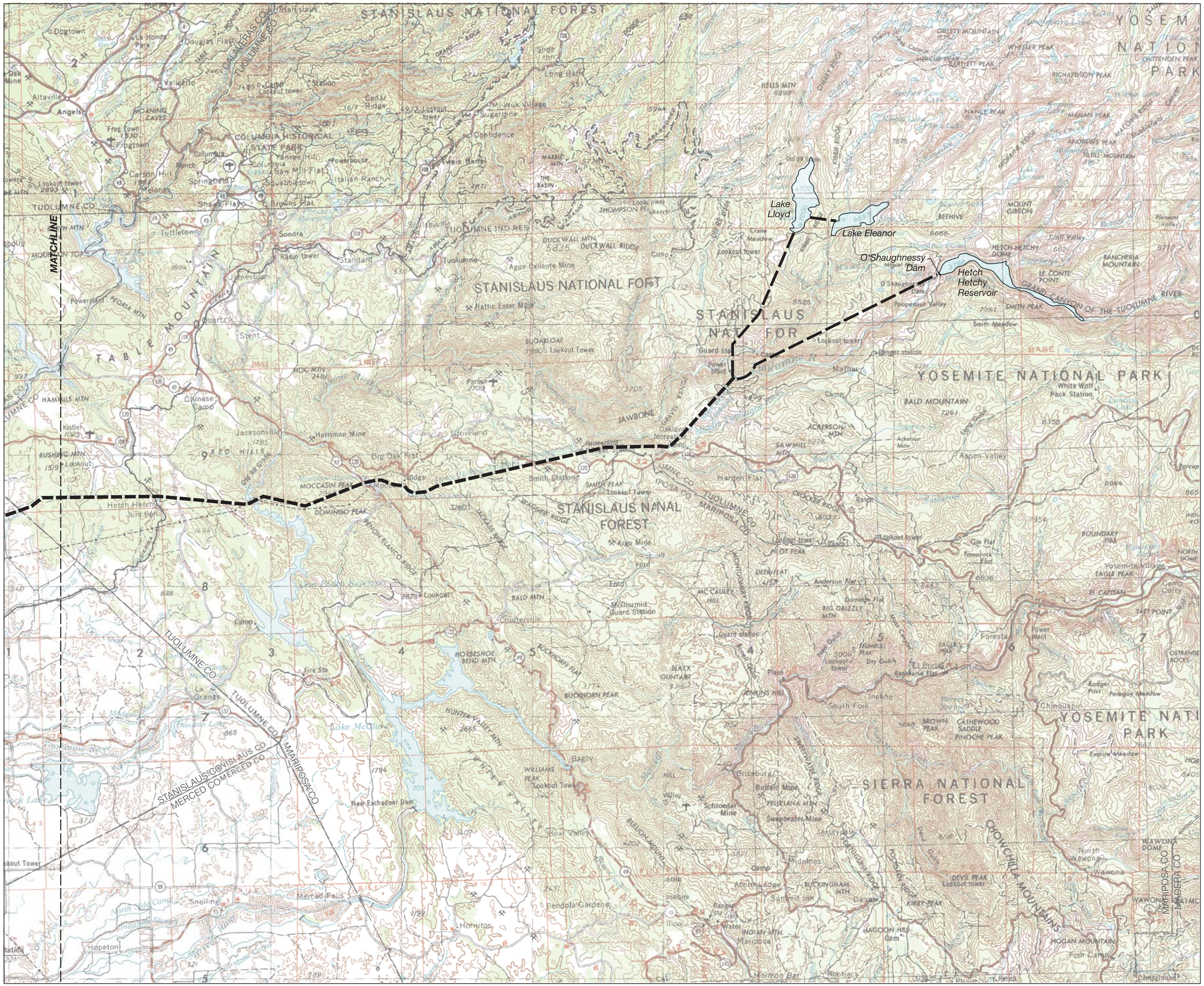
0 5
Miles

SOURCE: ESA + Orion; SFPUC, 2006; USGS 1969

SFPUC Water System Improvement Program . 203287

Figure S.6b
Location of WSIP Facility Improvement Projects-
San Joaquin Region

SFPUC WATER SYSTEM IMPROVEMENT PROGRAM, FACILITY IMPROVEMENT PROJECTS



Existing System Corridor

Existing System Facility

Proposed Facility Corridor

Proposed Facility Site

Proposed Facility, General Location

NOTE: No WSIP facilities are proposed in this region.

0 5

Miles

SOURCE: ESA + Orion; SFPUC, 2006; USGS 1970

SFPUC Water System Improvement Program . 203287

Figure S.6c
Location of WSIP Facility Improvement Projects-
Hetch Hetchy Region

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Region	No.	Project Title	2006	2007	2008	2009	2010	2011	2012	2013	2014
SAN JOAQUIN REGION	SJ-1	Advanced Disinfection				■	■				
	SJ-2	Lawrence Livermore Supply Improvements					■				
	SJ-3	San Joaquin Pipeline System						■	■	■	
	SJ-4	Rehabilitation of Exisitng San Joaquin Pipelines			■	■	■	■	■	■	■
	SJ-5	Tesla Portal Disinfection Station				■	■				
SUNOL VALLEY REGION	SV-1	Alameda Creek Fishery Enhancement						■			
	SV-2	Calaveras Dam Replacement				■	■	■			
	SV-3	Additional 40-mgd Treated Water Supply					■	■	■		
	SV-4	New Irvington Tunnel				■	■	■	■		
	SV-5	SVWTP – Treated Water Reservoirs			■	■					
	SV-6	San Antonio Backup Pipeline				■	■				
BAY DIVISION REGION	BD-1	Bay Division Pipeline Reliability Upgrade				■	■	■	■		
	BD-2	BDPL Nos. 3 and 4 Crossovers					■	■			
	BD-3	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault					■	■			
PENINSULA REGION	PN-1	Baden and San Pedro Valve Lots Improvements				■	■				
	PN-2	Crystal Springs/San Andreas Transmission Upgrade						■	■	■	
	PN-3	HTWTP Long-Term Improvements						■	■	■	
	PN-4	Lower Crystal Springs Dam Improvements					■				
	PN-5	Pulgas Balancing Reservoir Rehabilitation					■	■	■		
SAN FRANCISCO REGION	SF-1	San Andreas Pipeline No. 3 Installation				■	■				
	SF-2	Groundwater Projects - Local and Lake Merced				■	■	■			
	SF-2	Groundwater Projects - Regional					■	■	■	■	
	SF-3	Recycled Water Projects					■	■	■		

SOURCE: SFPUC, 2006

Figure S.7
Preliminary WSIP Construction Schedule

S.3 Environmental Effects (Chapters 4, 5, and 7)

Approach to Analyzing WSIP Facility Projects and Water Supply System Operations

The PEIR analysis of the environmental impacts of the WSIP is divided into three parts:

- Impacts Associated with Facility Improvement Projects (Chapter 4)
- Impacts Associated with Water Supply and System Operations (Chapter 5)
- Growth-Inducement Potential and Indirect Effects of Growth (Chapter 7)

Chapter 4 of this PEIR evaluates the major environmental effects of implementing proposed facility improvement projects from a broad perspective; this evaluation is a *program-level* analysis. While the SFPUC is aggressively developing the design, construction, and operation details of the projects included in the WSIP, these project details are not the focus of this PEIR. Instead, the PEIR frames the nature and magnitude of the expected environmental impacts associated with the proposed WSIP projects and identifies program mitigation measures to reduce the impacts of the projects as proposed. More detailed *project-level* analysis of individual facility improvement projects will be conducted separately, as required by CEQA.

In addition, Chapter 5 of this PEIR provides a *project-level* impact analysis of implementing the proposed water supply option through 2030. The chief environmental issues evaluated in the PEIR at a *project level* include:

- The effects of providing additional water to serve increasing customer purchase requests within the SFPUC service area (specifically, the effect of increasing the average annual water supply to serve customer purchase requests through 2030)
- The effects of using the proposed sources of water to serve the increased purchase requests through 2030 during both nondrought and drought periods
- The effects of proposed changes in system operations associated with implementing the proposed facility improvement projects and achieving the WSIP system performance objectives

The PEIR also evaluates the growth-inducement potential of the proposed WSIP—specifically, the proposal to serve increased customer purchase requests through 2030. The PEIR provides a comprehensive analysis of growth inducement for the WSIP as a whole and the secondary effects of growth; therefore, these issues do not need to be reevaluated during the environmental review of each individual WSIP facility improvement project.

Impact Significance Determinations

The level of significance of each impact was determined using significance criteria (thresholds) developed for each category of impacts. The following categories are used to describe impact significance:

Not Applicable (N/A). An impact is considered not applicable to a WSIP project if there is no potential for impacts or the environmental resource does not occur within the project area or the area of potential effect.

Beneficial (B). This determination applies to impacts that are beneficial for one or more environmental resource.

Less than Significant (LS). This determination applies if there is a potential for some limited impact, but not a substantial adverse effect that qualifies under the significance criteria as a significant impact.

Less than Significant with Program-Level Mitigation (LSM). This determination applies to the "collective" impact analysis only. The collective impact analysis is found in Chapter 4, Section 4.16, which presents the combined and overlapping effects of multiple WSIP facility projects.

Potentially Significant, Mitigatable (PSM). This determination applies if there is the potential for a substantial adverse effect that meets the significance criteria, but mitigation is available to reduce the impact to a less-than-significant level.

Potentially Significant, Unavoidable (PSU). This determination applies to impacts that are significant but for which there appears to be no feasible mitigation available to reduce the impacts to a less-than-significant level.

Significant Unavoidable (SU). This determination applies to impacts that are significant but for which there appears to be no feasible mitigation available to reduce the impact to a less-than-significant level.

Effects of the Facility Improvement Projects (Chapter 4)

Chapter 4 of this PEIR presents a program-level evaluation of the potential environmental impacts of constructing and operating each of the 22 regional WSIP facility improvement projects. It also evaluates the impacts associated with the combined and overlapping effects of multiple WSIP facility projects, referred to as "collective" impacts. In addition, Chapter 4 identifies the cumulative effects of implementing the WSIP facility improvement projects in combination with other past, present, and reasonably foreseeable future projects with similar impacts within the same regions. **Table S.3** lists the results of the impact assessment for each facility improvement project, by resource topic area. **Table S.4** summarizes the mitigation measures that will be implemented to avoid, minimize, or otherwise reduce significant impacts to a less-than-significant level for one or more of the facility improvement projects. The key impacts associated with implementation of the WSIP facility improvement projects are summarized below.

Facility Construction Effects

The major impacts associated with the facility improvement projects would occur primarily during the construction phase rather than during the operations phase. Although most construction impacts would be short term, they could pose significant effects. The construction of facility improvement projects could result in potential land use disruption, slope instability, water quality and flooding effects, disruption of sensitive habitats and impacts on special-status species, impacts on cultural resources, short-term traffic delays and impaired access along project roadways, local and regional degradation of air quality, short-term noise and vibration impacts, disruption of public utilities, effects on solid waste landfill capacity, temporary conflicts with recreational and agricultural uses, exposure to hazardous materials, and use of energy. These impacts would be mitigated to a less-than-significant level through implementation of the mitigation measures described in Chapter 6 of the PEIR, with the exception of the effects listed below. This PEIR makes a conservative determination that the effects listed below would be potentially significant and unavoidable. When more facility siting and construction information is available and MEA completes more detailed project-level CEQA review on the WSIP projects, it may be determined that these effects can be avoided or mitigated to a less-than-significant level.

- A ranch property in the Sunol Valley would be subject to 24-hour construction effects for the full duration of construction of the New Irvington Tunnel project, and such land use disruption is considered to be potentially significant and unavoidable even with implementation of traffic, noise, and air quality mitigation measures (Chapter 4, Section 4.3).
- Existing land uses could be displaced to accommodate proposed facilities at some locations under the following projects: San Joaquin Pipeline System, Additional 40-mgd Treated Water Supply, San Antonio Backup Pipeline, Bay Division Pipeline Reliability Upgrade, Crystal Springs/San Andreas Transmission Upgrade, Groundwater Projects, and Recycled Water Projects. Since final facility locations are undetermined, any possible permanent displacement of existing land uses is conservatively considered to be potentially significant and unavoidable in this PEIR (Chapter 4, Section 4.3).
- Removal of a large area of existing oak woodland cover as part of the Calaveras Dam Replacement project would permanently alter a scenic vista, a potentially significant and unavoidable impact (Chapter 4, Section 4.3).
- Alteration or demolition of existing facilities under the following projects could result in potentially significant and unavoidable impacts on the historical significance of individual facilities: Calaveras Dam Replacement, New Irvington Tunnel, Crystal Springs/San Andreas Transmission Upgrade, and Lower Crystal Springs Dam Improvements (Chapter 4, Section 4.7).
- The Calaveras Dam Replacement and Crystal Springs/San Andreas Transmission Upgrade projects would result in potentially significant and unavoidable impacts on historic districts, if historic districts are determined to be present (Chapter 4, Section 4.7).
- Temporary construction-related noise impacts could occur under all facility improvement projects analyzed in the PEIR and would be potentially significant and unavoidable if excessive construction noise occurred in close proximity to sensitive receptors or audible construction noise occurred during the more noise-sensitive nighttime hours (Chapter 4, Section 4.10).

TABLE S.3
SUMMARY OF WSIP FACILITY CONSTRUCTION AND OPERATION IMPACTS

Impact	Advanced Disinfection SJ-1	Lawrence Livermore Supply Improvements SJ-2	San Joaquin Pipeline System SJ-3	Rehabilitation of Existing San Joaquin Pipelines SJ-4	Tesla Portal Disinfection Station SJ-5	Alameda Creek Fishery Enhancement SV-1	Calaveras Dam Replacement SV-2	Additional 40-mgd Treated Water Supply SV-3	New Irvington Tunnel SV-4	SVWTP – Treated Water Reservoirs SV-5	San Antonio Backup Pipeline SV-6	Bay Division Pipeline Reliability Upgrade BD-1	BDPL Nos. 3 and 4 Crossovers BD-2	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault BD-3	Baden and San Pedro Valve Lots Improvements PN-1	Crystal Springs/San Andreas Transmission Upgrade PN-2	HTWTP Long-Term Improvements PN-3	Lower Crystal Springs Dam Improvements PN-4	Pulgas Balancing Reservoir Rehabilitation PN-5	San Andreas Pipeline No. 3 Installation SF-1	Groundwater Projects SF-2	Recycled Water Projects SF-3
Land Use and Visual Quality																						
Impact 4.3-1: Temporary disruption or displacement of existing land uses during construction.	LS	LS	PSM	PSM	LS	LS	LS	LS	PSU	LS	LS	PSM	PSM	LS	LS	LS	LS	LS	LS	PSM	PSM	PSM
Impact 4.3-2: Permanent displacement or long-term disruption of existing land uses.	LS	N/A	PSU	N/A	LS	N/A	N/A	PSU	LS	N/A	PSU	PSU	LS	N/A	N/A	PSU	N/A	N/A	N/A	N/A	PSU	PSU
Impact 4.3-3: Temporary construction impacts on scenic vistas or visual character.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS
Impact 4.3-4: Permanent adverse impacts on scenic vistas or visual character.	PSM	LS	LS	N/A	PSM	PSM	PSU	LS	PSM	LS	PSM	PSM	PSM	N/A	LS	PSM	PSM	PSM	PSM	PSM	PSM	PSM
Impact 4.3-5: New permanent sources of light glare.	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM
Geology, Soils, and Seismicity																						
Impact 4.4-1: Slope instability during construction.	LS	PSM	N/A	N/A	LS	PSM	PSM	PSM	PSM	PSM	PSM	LS	N/A	N/A	LS	LS	PSM	LS	PSM	LS	PSM	PSM
Impact 4.4-2: Erosion during construction.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS
Impact 4.4-3: Substantial alteration of topography.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS
Impact 4.4-4: Squeezing ground and subsidence during tunneling.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	PSM	N/A	N/A	PSM	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Impact 4.4-5: Surface fault rupture.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS
Impact 4.4-6: Seismically induced groundshaking.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS
Impact 4.4-7: Seismically induced ground failure, including liquefaction and settlement.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS
Impact 4.4-8: Seismically induced landslides or other slope failures.	LS	LS	N/A	N/A	LS	LS	LS	LS	LS	LS	LS	LS	N/A	N/A	LS	LS	LS	LS	LS	LS	LS	LS
Impact 4.4-9: Expansive or corrosive soils.	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM
Hydrology and Water Quality																						
Impact 4.5-1: Degradation of water bodies as a result of erosion and sedimentation or a hazardous materials release during construction.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS
Impact 4.5-2: Depletion of groundwater resources.	LS	N/A	LS	LS	LS	LS	LS	N/A	PSM	N/A	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	N/A	LS
Impact 4.5-3a: Degradation of water quality due to construction dewatering discharges.	LS	N/A	LS	LS	LS	LS	LS	N/A	LS	N/A	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	N/A	LS
Impact 4.5-3b: Degradation of water quality due to construction-related discharges of treated water.	LS	LS	LS	LS	LS	N/A	N/A	LS	LS	LS	LS	LS	LS	LS	N/A	N/A	LS	N/A	LS	LS	N/A	N/A
Impact 4.5-4: Flooding and water quality impacts associated with impeding or redirecting flood flows.	N/A	N/A	PSM	PSM	N/A	PSM	N/A	N/A	PSM	N/A	PSM	PSM	PSM	N/A	N/A	N/A	N/A	N/A	N/A	N/A	PSM	N/A
Impact 4.5-5: Degradation of water quality and increased flows due to discharges to surface water during operation.	N/A	N/A	LS	N/A	N/A	N/A	N/A	LS	N/A	LS	LS	LS	LS	N/A	N/A	LS	LS	N/A	LS	N/A	PSM	LS
Impact 4.5-6: Degradation of water quality as a result of alteration of drainage patterns or an increase in impervious surfaces.	LS	PSM	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS

TABLE S.3 (Continued)
SUMMARY OF WSIP FACILITY CONSTRUCTION AND OPERATION IMPACTS

Impact	Advanced Disinfection SJ-1	Lawrence Livermore Supply Improvements SJ-2	San Joaquin Pipeline System SJ-3	Rehabilitation of Existing San Joaquin Pipelines SJ-4	Tesla Portal Disinfection Station SJ-5	Alameda Creek Fishery Enhancement SV-1	Calaveras Dam Replacement SV-2	Additional 40-mgd Treated Water Supply SV-3	New Irvington Tunnel SV-4	SVWTP – Treated Water Reservoirs SV-5	San Antonio Backup Pipeline SV-6	Bay Division Pipeline Reliability Upgrade BD-1	BDPL Nos. 3 and 4 Crossovers BD-2	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault BD-3	Baden and San Pedro Valve Lots Improvements PN-1	Crystal Springs/San Andreas Transmission Upgrade PN-2	HTWTP Long-Term Improvements PN-3	Lower Crystal Springs Dam Improvements PN-4	Pulgas Balancing Reservoir Rehabilitation PN-5	San Andreas Pipeline No. 3 Installation SF-1	Groundwater Projects SF-2	Recycled Water Projects SF-3
Biological Resources																						
Impact 4.6-1: Impacts on wetlands and aquatic resources.	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	LS	PSM	LS	PSM	PSM	PSM	PSM	PSM
Impact 4.6-2: Impacts on sensitive habitats, common habitats, and heritage trees.	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	LS	PSM	PSM	PSM	PSM	PSM
Impact 4.6-3: Impacts on key special-status species – direct mortality and/or habitat effects.	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	LS	PSM	PSM	LS	LS	LS
Impact 4.6-4: Water discharge effects on riparian and/or aquatic resources.	LS	LS	PSM	PSM	LS	LS	LS	LS	PSM	LS	LS	PSM	PSM	LS	LS	LS	LS	LS	LS	N/A	N/A	N/A
Impact 4.6-5: Conflicts with adopted conservation plans or other approved biological resources plans.	N/A	N/A	PSM	PSM	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cultural Resources																						
Impact 4.7-1: Impacts on paleontological resources.	PSM	LS	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	LS	LS	PSM	PSM	LS	PSM	LS	PSM	PSM	PSM	PSM
Impact 4.7-2: Impacts on archaeological resources.	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM
Impact 4.7-3: Impacts on historical significance of a historic district or a contributor to a historic district.	PSM	N/A	PSM	PSM	N/A	N/A	PSU	N/A	PSM	N/A	PSM	PSM	PSM	PSM	N/A	PSU	N/A	PSM	N/A	PSM	N/A	N/A
Impact 4.7-4: Impacts on the historical significance of individual facilities resulting from demolition or alteration.	PSM	N/A	PSM	PSM	N/A	N/A	PSU	N/A	PSU	N/A	PSM	PSM	PSM	PSM	N/A	PSU	N/A	PSU	N/A	PSM	N/A	LS
Impact 4.7-5: Impacts on adjacent historic architectural resources.	LS	LS	PSM	PSM	PSM	LS	PSM	LS	PSM	LS	PSM	PSM	PSM	PSM	LS	PSM	LS	PSM	PSM	PSM	LS	PSM
Traffic, Transportation, and Circulation																						
Impact 4.8-1: Temporary reduction in roadway capacity and increased traffic delays.	LS	LS	PSM	PSM	LS	LS	PSM	LS	LS	LS	PSM	PSM	LS	PSM	LS	PSM	LS	PSM	PSM	PSM	PSM	PSM
Impact 4.8-2: Short-term traffic increases on roadways.	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	LS	PSM	PSM	PSM	PSM	PSM	LS	PSM
Impact 4.8-3: Impaired access to adjacent roadways and land uses.	LS	LS	PSM	PSM	LS	LS	PSM	LS	LS	LS	LS	PSM	PSM	PSM	LS	LS	LS	PSM	LS	PSM	PSM	PSM
Impact 4.8-4: Temporary displacement of on-street parking.	LS	LS	LS	PSM	LS	LS	LS	LS	LS	LS	LS	PSM	LS	PSM	LS	LS	LS	PSM	PSM	PSM	PSM	PSM
Impact 4.8-5: Increased traffic safety hazards during construction.	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM
Impact 4.8-6: Long-term traffic increases during facility operation.	LS	LS	LS	LS	LS	N/A	N/A	LS	N/A	LS	N/A	LS	LS	LS	LS	LS	LS	LS	LS	N/A	LS	LS
Air Quality																						
Impact 4.9-1: Construction emissions of criteria pollutants.	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	LS	LS	LS	LS	LS	LS	LS	LS
Impact 4.9-2: Exposure to diesel particulate matter during construction.	LS	N/A	LS	LS	LS	LS	PSM	LS	LS	PSM	LS	PSM	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS
Impact 4.9-3: Exposure to emissions (possibly including asbestos) from tunneling.	N/A	N/A	PSM	PSM	N/A	LS	N/A	LS	PSM	N/A	LS	PSM	N/A	PSM	N/A	PSM	N/A	N/A	N/A	PSM	PSM	PSM
Impact 4.9-4: Air pollutant emissions during project operation.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	N/A	LS	LS	N/A	LS	LS	LS	LS	LS	LS	LS	LS
Impact 4.9-5: Odors generated during project operation.	LS	LS	N/A	N/A	LS	N/A	N/A	LS	N/A	LS	N/A	N/A	N/A	N/A	N/A	N/A	LS	N/A	N/A	LS	LS	LS
Impact 4.9-6: Secondary emissions at power plants.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS
Impact 4.9-7: Conflict with implementation of applicable regional air quality plans addressing criteria air pollutants and state goals for reducing greenhouse gas emissions.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS

TABLE S.3 (Continued)
SUMMARY OF WSIP FACILITY CONSTRUCTION AND OPERATION IMPACTS

	Advanced Disinfection	Lawrence Livermore Supply Improvements	San Joaquin Pipeline System	Rehabilitation of Existing San Joaquin Pipelines	Tesla Portal Disinfection Station	Alameda Creek Fishery Enhancement	Calaveras Dam Replacement	Additional 40-mgd Treated Water Supply	New Irvington Tunnel	SVWTP – Treated Water Reservoirs	San Antonio Backup Pipeline	Bay Division Pipeline Reliability Upgrade	BDPL Nos. 3 and 4 Crossovers	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault	Baden and San Pedro Valve Lots Improvements	Crystal Springs/San Andreas Transmission Upgrade	HTWTP Long-Term Improvements	Lower Crystal Springs Dam Improvements	Pulgas Balancing Reservoir Rehabilitation	San Andreas Pipeline No. 3 Installation	Groundwater Projects	Recycled Water Projects
Impact	**SJ-1**	**SJ-2**	**SJ-3**	**SJ-4**	**SJ-5**	**SV-1**	**SV-2**	**SV-3**	**SV-4**	**SV-5**	**SV-6**	**BD-1**	**BD-2**	**BD-3**	**PN-1**	**PN-2**	**PN-3**	**PN-4**	**PN-5**	**SF-1**	**SF-2**	**SF-3**
Noise and Vibration																						
Impact 4.10-1: Disturbance from temporary construction-related noise increases.	PSU	PSU	PSU	PSU	PSU	PSU	PSU	PSU	PSU	PSU	PSU	PSU	PSU	PSU	PSU	PSU	PSU	PSU	PSU	PSU	PSU	PSU
Impact 4.10-2: Temporary noise disturbance along construction haul routes.	PSU	N/A	PSU	PSU	PSU	LS	LS	LS	PSM	LS	LS	PSU	PSU	PSU	PSU	LS	PSU	LS	LS	PSU	PSU	PSU
Impact 4.10-3: Disturbance due to construction-related vibration.	LS	LS	PSU	PSU	LS	LS	LS	PSU	PSM	LS	LS	PSU	PSU	PSU	PSU	LS	LS	LS	LS	PSU	PSU	PSU
Impact 4.10-4: Disturbance due to long-term noise increases.	LS	LS	LS	N/A	LS	LS	N/A	LS	LS	LS	N/A	LS	N/A	N/A	LS	LS	LS	N/A	LS	N/A	LS	LS
Public Services and Utilities																						
Impact 4.11-1: Potential temporary damage to or disruption of existing regional or local public utilities.	LS	LS	PSM	LS	LS	PSM	PSM	PSM	PSM	LS	PSM	PSM	PSM	PSM	LS	PSM	LS	PSM	LS	PSM	PSM	PSM
Impact 4.11-2: Temporary adverse effects on solid waste landfill capacity.	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM
Impact 4.11-3: Impacts related to compliance with statutes and regulations related to solid waste.	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM
Impact 4.11-4: Impacts related to the relocation of utilities.	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM
Recreational Resources																						
Impact 4.12-1: Temporary conflicts with established recreational uses during construction.	N/A	N/A	PSM	PSM	N/A	LS	LS	N/A	PSM	N/A	N/A	PSM	PSM	N/A	N/A	PSM	N/A	LS	LS	PSM	PSM	PSM
Impact 4.12-2: Conflicts with established recreational uses due to facility siting and project operation.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	PSM	PSM	PSM
Agricultural Resources																						
Impact 4.13-1: Temporary conflicts with established agricultural resources.	N/A	N/A	PSM	PSM	N/A	PSM	PSM	PSM	PSM	N/A	PSM	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Impact 4.13-2: Conversion of farmlands to nonagricultural uses.	N/A	N/A	PSM	N/A	N/A	N/A	LS	PSM	N/A	PSM	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hazards																						
Impact 4.14-1: Potential to encounter hazardous materials in soil or and groundwater.	LS	LS	LS	PSM	LS	LS	LS	LS	LS	LS	LS	PSM	PSM	PSM	PSM	LS	LS	LS	LS	PSM	PSM	PSM
Impact 4.14-2: Exposure to naturally occurring asbestos.	N/A	N/A	N/A	N/A	N/A	N/A	LS	N/A	N/A	N/A	N/A	PSM	N/A	N/A	N/A	LS	N/A	LS	N/A	LS	LS	LS
Impact 4.14-3: Risk of fires during construction.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	N/A	N/A	LS	LS	N/A	LS	LS	N/A	LS	LS
Impact 4.14-4: Gassy conditions in tunnels.	N/A	N/A	LS	LS	N/A	LS	N/A	LS	LS	N/A	LS	LS	N/A	LS	N/A	LS	N/A	N/A	N/A	LS	LS	LS
Impact 4.14-5: Exposure to hazardous building materials.	N/A	N/A	PSM	PSM	PSM	N/A	PSM	N/A	PSM	N/A	N/A	PSM	N/A	N/A	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM
Impact 4.14-6: Accidental hazardous materials release from construction equipment.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS
Impact 4.14-7: Increased use of hazardous materials during operation.	LS	LS	LS	N/A	LS	N/A	N/A	LS	N/A	LS	N/A	LS	LS	N/A	LS	N/A	LS	LS	N/A	N/A	LS	LS
Impact 4.14-8: Emission or use of hazardous materials within 1/4 mile of a school.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	LS	LS	N/A	LS	N/A	LS	N/A	N/A	N/A	LS	LS

TABLE S.3 (Continued)
SUMMARY OF WSIP FACILITY CONSTRUCTION AND OPERATION IMPACTS

	Advanced Disinfection	Lawrence Livermore Supply Improvements	San Joaquin Pipeline System	Rehabilitation of Existing San Joaquin Pipelines	Tesla Portal Disinfection Station	Alameda Creek Fishery Enhancement	Calaveras Dam Replacement	Additional 40-mgd Treated Water Supply	New Irvington Tunnel	SVWTP – Treated Water Reservoirs	San Antonio Backup Pipeline	Bay Division Pipeline Reliability Upgrade	BDPL Nos. 3 and 4 Crossovers	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault	Baden and San Pedro Valve Lots Improvements	Crystal Springs/San Andreas Transmission Upgrade	HTWTP Long-Term Improvements	Lower Crystal Springs Dam Improvements	Pulgas Balancing Reservoir Rehabilitation	San Andreas Pipeline No. 3 Installation	Groundwater Projects	Recycled Water Projects
Impact	**SJ-1**	**SJ-2**	**SJ-3**	**SJ-4**	**SJ-5**	**SV-1**	**SV-2**	**SV-3**	**SV-4**	**SV-5**	**SV-6**	**BD-1**	**BD-2**	**BD-3**	**PN-1**	**PN-2**	**PN-3**	**PN-4**	**PN-5**	**SF-1**	**SF-2**	**SF-3**
Energy Resources																						
Impact 4.15-1: Construction-related energy use.	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM
Impact 4.15-2: Long-term energy use during operation.	PSM	PSM	PSM	LS	PSM	PSM	N/A	PSM	N/A	PSM	N/A	PSM	PSM	PSM	N/A	PSM	PSM	N/A	N/A	PSM	PSM	PSM
Collective Facilities Impacts																						
Impact 4.16-1a: Collective temporary and permanent impacts on existing land uses in the vicinity of proposed facility sites.	N/A					N/A						PSU			LSM					N/A		
Impact 4.16-1b: Collective temporary and permanent impacts on the visual character of the surrounding area.	LSM					LS						LSM			LSM					LSM		
Impact 4.16-2: Collective exposure of people or structures to geologic and seismic hazards.	N/A					N/A						N/A			N/A					N/A		
Impact 4.16-3: Collective WSIP impacts related to the degradation of surface waters and flooding hazards.	LSM					LSM						LSM			LSM					LSM		
Impact 4.16-4: Collective loss of sensitive biological resources.	PSM					PSU						PSM			PSU					N/A		
Impact 4.16-5: Collective increase in impacts related to archaeological, paleontological, and historical resources.	LSM					PSU						LSM			PSU					N/A		
Impact 4.16-6: Collective traffic increases on local and regional roads.	PSM					PSM						PSM			PSM					PSM		
Impact 4.16-7: Collective increases in construction and/or operational emissions in the region.	PSM					PSM						LSM			LS					LS		
Impact 4.16-8: Collective increases in construction-related and operational noise.	PSU					PSM						PSU			PSU					PSU		
Impact 4.16-9: Collective impacts on utilities and landfill capacity.	N/A					N/A						N/A			N/A					N/A		
Impact 4.16-10: Collective effects on recreational resources during construction.	LSM					LSM						LSM			LSM					LSM		
Impact 4.16-11: Collective conversion of farmland to nonagricultural uses.	N/A					N/A						N/A			N/A					N/A		
Impact 4.16-12: Collective effects related to hazardous conditions and exposure to or release of hazardous materials.	LSM					LSM						LSM			LSM					LSM		
Impact 4.16-13: Collective increases in the use of nonrenewable energy resources.	LSM					LSM						LSM			LSM					LSM		
Cumulative Facilities Impacts																						
Impact 4.17-1: Cumulative disruption of established communities, changes in existing land use patterns, and impacts on the existing visual character.	LS																					
Impact 4.17-2: Cumulative exposure of people or structures to geologic and seismic hazards.	B/LS																					
Impact 4.17-3: Cumulative impacts related to the degradation of water quality, alteration of drainage patterns, increased surface runoff, and flooding hazards.	LS																					
Impact 4.17-4: Cumulative loss of sensitive biological resources	LS																					

TABLE S.3 (Continued)
SUMMARY OF WSIP FACILITY CONSTRUCTION AND OPERATION IMPACTS

<table>
<tr><th rowspan="2">Impact</th><th>Advanced Disinfection</th><th>Lawrence Livermore Supply Improvements</th><th>San Joaquin Pipeline System</th><th>Rehabilitation of Existing San Joaquin Pipelines</th><th>Tesla Portal Disinfection Station</th><th>Alameda Creek Fishery Enhancement</th><th>Calaveras Dam Replacement</th><th>Additional 40-mgd Treated Water Supply</th><th>New Irvington Tunnel</th><th>SVWTP – Treated Water Reservoirs</th><th>San Antonio Backup Pipeline</th><th>Bay Division Pipeline Reliability Upgrade</th><th>BDPL Nos. 3 and 4 Crossovers</th><th>Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault</th><th>Baden and San Pedro Valve Lots Improvements</th><th>Crystal Springs/San Andreas Transmission Upgrade</th><th>HTWTP Long-Term Improvements</th><th>Lower Crystal Springs Dam Improvements</th><th>Pulgas Balancing Reservoir Rehabilitation</th><th>San Andreas Pipeline No. 3 Installation</th><th>Groundwater Projects</th><th>Recycled Water Projects</th></tr>
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<tr><td colspan="23">Cumulative Facilities Impacts (cont.)</td></tr>
<tr><td>Impact 4.17-5: Cumulative increase in impacts on archaeological, paleontological, and historical resources.</td><td colspan="22">PSU</td></tr>
<tr><td>Impact 4.17-6: Cumulative traffic increases on local and regional roads.</td><td colspan="22">PSU</td></tr>
<tr><td>Impact 4.17-7: Cumulative increases in construction and/or operational emissions in the region.</td><td colspan="22">PSU</td></tr>
<tr><td>Impact 4.17-8: Cumulative increases in construction-related and operational noise.</td><td colspan="22">PSU</td></tr>
<tr><td>Impact 4.17-9: Cumulative impacts related to disruption of utility service or relocation of utilities.</td><td colspan="22">LS</td></tr>
<tr><td>Impact 4.17-10: Cumulative effects on recreational resources during construction.</td><td colspan="22">LS</td></tr>
<tr><td>Impact 4.17-11: Cumulative conversion of farmland to nonagricultural uses.</td><td colspan="22">LS</td></tr>
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<tr><td>Impact 4.17-13: Cumulative increases in the use of nonrenewable energy resources.</td><td colspan="22">LS</td></tr>
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TABLE S.4
SUMMARY OF FACILITY MITIGATION MEASURES BY IMPACT

Impact	Mitigation Measure(s)
Impact 4.3-1: Temporary disruption or displacement of existing land uses during construction.	Traffic, Transportation, and Circulation Measures (4.8-1a and 4.8-1b); Air Quality Measures (4.9-1a thru 4.9-1d, 4.9-2a and 4.9-2b); Noise Measures (4.10-1a, 4.10-1b, 4.10-2a thru 4.10-2c, 4.10-3a thru 4.10-3c); and Recreational Resources Measure (4.12-1), described below.
Impact 4.3-2: Permanent displacement or long-term disruption of existing land uses.	**Measure 4.3-2, Facility Siting Studies:** Conduct project-specific facility siting studies for non-SFPUC land and implement these studies' recommendations to avoid or minimize impacts on existing land uses.
Impact 4.3-3: Temporary construction impacts on scenic vistas or visual character.	None required.
Impact 4.3-4: Permanent adverse impacts on scenic vistas or visual character.	**Measure 4.3-4a, Architectural Design:** Design permanent new, aboveground facilities to be compatible with existing visual character of the site and surrounding area. **Measure 4.3-4b, Landscaping Plans:** Prepare and implement landscaping plans to restore (recontour, revegetate, landscape) sites to preconstruction conditions. Monitor landscape plantings. **Measure 4.3-4c, Landscape Screens:** Include new plantings and landscape berms to screen views of new structures and equipment from scenic roads. **Measure 4.3-4d, Minimize Tree Removal:** Minimize or avoid the removal of trees that screen existing and proposed WSIP facility sites; implement tree replacement plan.
Impact 4.3-5: New permanent sources of light and glare.	**Measure 4.3-5, Reduce Lighting Effects:** Use cut-off shields and nonglare fixture design, direct lighting onsite and downward, prevent use of highly reflective building materials or finishes.
Impact 4.4-1: Slope instability during construction.	**Measure 4.4-1, Quantified Landslide Analysis:** Avoid sites with landslide hazards; where they cannot be avoided, conduct site-specific slope stability analyses and implement recommendations.
Impact 4.4-2: Erosion during construction.	None required.
Impact 4.4-3: Substantial alteration of topography.	None required.
Impact 4.4-4: Squeezing ground and subsidence during tunneling.	**Measure 4.4-4, Subsidence Monitoring Program:** Monitor subsidence and implement corrective actions as warranted.
Impact 4.4-5: Surface fault rupture.	None required.
Impact 4.4-6: Seismically induced groundshaking.	None required.
Impact 4.4-7: Seismically induced ground failure, including liquefaction and settlement.	None required.
Impact 4.4-8: Seismically induced landslides or other slope failures.	None required.
Impact 4.4-9: Expansive or corrosive soils.	**Measure 4.4-9, Characterize Extent of Expansive and Corrosive Soil:** Characterize presence of expansive/corrosive soils; implement recommendations.

[a] Mitigation measure text is summarized; please see Chapter 6 for details.
[b] The City and County of San Francisco (including the SFPUC, the Planning Department, and other City agencies and departments) would be responsible for implementing all mitigation measures; please see Chapter 6 for details.

TABLE S.4 (Continued)
SUMMARY OF FACILITY MITIGATION MEASURES BY IMPACT

Impact	Mitigation Measure(s)
Impact 4.5-1: Degradation of water bodies as a result of erosion and sedimentation or a hazardous materials release during construction.	None required.
Impact 4.5-2: Depletion of groundwater resources.	**Measure 4.5-2, Site-Specific Groundwater Analysis and Identified Measures:** Conduct project-specific analysis of dewatering and implement measures to ensure that groundwater resources beneficial uses of groundwater not adversely affected.
Impact 4.5-3a: Degradation of water quality due to construction dewatering discharges.	None required.
Impact 4.5-3b: Degradation of water quality due to construction-related discharges of treated water.	None required.
Impact 4.5-4: Flooding and water quality impacts associated with impeding or redirecting flood flows.	**Measure 4.5-4a, Flood Flow Protection Measures:** Preclude exposure of stockpiled soils, hazardous materials, and construction materials to flood flows. **Measure 4.5-4b, Site-Specific Flooding Analysis and Identified Measures:** Implement design measures to preclude projects from causing flooding or damage from redirected flood flows.
Impact 4.5-5: Degradation of water quality and increased flows due to discharges to surface water during operation.	**Measure 4.5-5**, **Stormwater Treatment and Groundwater Monitoring:** If treated stormwater is used to maintain Lake Merced water levels, monitor surface water and groundwater quality in the vicinity of Lake Merced. Identify and implement corrective actions (e.g., treatment).
Impact 4.5-6: Degradation of water quality as a result of alteration of drainage patterns or an increase in impervious surfaces.	**Measure 4.5-6, Appropriate Source Controls and Site Design Measures:** If a WSIP project will affect jurisdictional wetlands, implement source control and site design measures to ensure compliance with applicable water quality criteria and goals and protect the beneficial uses of the receiving water.
Impact 4.6-1: Impacts on wetlands and aquatic resources.	**Measure 4.6-1a, Wetlands Assessment:** Wetland scientist will determine whether wetlands could be affected by the project, and if so, perform a wetland delineation and develop mitigation. **Measure 4.6-1b, Compensation for Wetlands and Other Biological Resources:** If a WSIP project will affect jurisdictional wetlands, implement avoidance measures, restoration procedures, and compensatory creation or enhancement to ensure no net loss of wetland extent or function. Compensate for sensitive riparian and upland habitats supporting key special-status species. Obtain permits for each project and comply with applicable regulations addressing sensitive habitats and species. The Habitat Reserve Program is an alternative for implementing offsite habitat compensation.
Impact 4.6-2: Impacts on sensitive habitats, common habitats, and heritage trees.	Biological Resources Measure 4.6-1b, described above. **Measure 4.6-2, Habitat Restoration/Tree Replacement:** Restore temporarily affected sensitive habitats. Replace trees designated as heritage trees (or similar local designation) consistent with requirements of local ordinances. Minimize loss of sensitive habitats by coordinating WSIP projects.

[a] Mitigation measure text is summarized; please see Chapter 6 for details.
[b] The City and County of San Francisco (including the SFPUC, the Planning Department, and other City agencies and departments) would be responsible for implementing all mitigation measures; please see Chapter 6 for details.

TABLE S.4 (Continued)
SUMMARY OF FACILITY MITIGATION MEASURES BY IMPACT

Impact	Mitigation Measure(s)
Impact 4.6-3: Impacts on key special-status species – direct mortality and/or habitat effects.	Biological Resources Measure 4.6-1b, described above. **Measure 4.6-3a, Protection Measures During Construction for Key Special-Status Species and Other Species of Concern:** Where key special-status species and other species of concern are potentially present, implement general practice measures (preconstruction surveys, worker awareness program, environmental inspector, minimization of habitat loss). **Measure 4.6-3b, Standard Mitigation Measures for Key Special-Status Plants and Animals:** Implement measures to reduce impacts on key special-status species.
Impact 4.6-4: Water discharge effects on riparian and/or aquatic resources.	**Measure 4.6-4, Pipeline and Water Treatment Plant Treated Water Discharge Restrictions:** Design planned discharges from the WSIP pipelines and water treatment plants to natural water bodies to minimize impacts on riparian and aquatic resources and to avoid or minimize temperature effects on aquatic resources.
Impact 4.6-5: Conflicts with adopted conservation plans or other approved biological resources plans.	Biological Resources Measures 4.6-1a, 4.6-1b, 4.6-2, 4.6-3a, and 4.6-3b, described above.
Impact 4.7-1: Impacts on paleontological resources.	**Measure 4.7-1, Suspend Construction Work if Paleontological Resource is Identified:** Suspend work and notify a qualified paleontologist when a paleontological resource is discovered at any of the project sites. The paleontologist will document the discovery as needed, evaluate the potential resource, and assess the significance of the find under CEQA criteria. Temporarily halt or divert excavation within 50 feet of a fossil find until the discovery is examined by a paleontologist. If avoidance is not feasible, the paleontologist will prepare an excavation plan.
Impact 4.7-2: Impacts on archaeological resources.	**Measure 4.7-2a, Archaeological Testing, Monitoring, and Treatment of Human Remains:** Determine if implementation of an archeological testing or archaeological monitoring program or both is the appropriate strategy for avoidance of potential adverse effects on significant archaeological resources. Review any requirements approved by the State Historic Preservation Officer. Prepare an archeological testing plan, an archeological monitoring plan, final archeological resources report and, if applicable, a archeological data recovery plan. The treatment of human remains and of associated or unassociated funerary objects discovered during any soil-disturbing activity will comply with applicable state laws. **Measure 4.7-2b, Accidental Discovery Measures:** Distribute archaeological resource "ALERT" to contractors. If an archeological resource may be present within the project site, an archeological consultant will evaluate it and make a recommendation as to what action (e.g., preservation in situ) is warranted. The project sponsor will implement appropriate measures.

[a] Mitigation measure text is summarized; please see Chapter 6 for details.
[b] The City and County of San Francisco (including the SFPUC, the Planning Department, and other City agencies and departments) would be responsible for implementing all mitigation measures; please see Chapter 6 for details.

TABLE S.4 (Continued)
SUMMARY OF FACILITY MITIGATION MEASURES BY IMPACT

Impact	Mitigation Measure(s)
Impact 4.7-3: Impacts on historical significance of a historic district or a contributor to a historic district.	Cultural Resources Measures 4.7-4a thru 4.7-4f, described below. **Measure 4.7-3, Protection of Historic Districts:** A qualified historian will assess the city's water system facilities affected by WSIP facility projects for their potential contribution to a historic district. If a historic district would be affected by one or more proposed WSIP facility projects, develop and implement mitigation measures for effects with attention to the potential district as a whole. Should a historic district be identified at the project level, it should be recorded as such, using National/California Register criteria of significance. Document the district by completing the State of California Department of Parks and Recreation 523 forms and submit to the State Historic Preservation Officer.
Impact 4.7-4: Impacts on the historical significance of individual facilities resulting from demolition or alteration.	**Measure 4.7-4a, Alternatives Identification and Resource Relocation:** Identify feasible project alternatives to eliminate or reduce the need for demolition or removal of a historic resource to the greatest extent possible. If preservation of the affected historical resource at the current site is determined to be infeasible, the structure will, if feasible, be stabilized and relocated to other appropriate nearby sites. After relocation, the resource will be treated according to the Secretary of the Interior's *Standards for the Treatment of Historic Properties.* If the affected historical resource is to be demolished, consult with local historical societies and governmental agencies regarding salvage of materials for public information or reuse in other locations. **Measure 4.7-4b, Historical Resources Documentation:** Prepare documentation of historical resources prior to any construction work associated with demolition or removal. The appropriate level of documentation will be selected by a qualified professional who meets the standards for history, architectural history, and/or architecture (as appropriate) set forth by the Secretary of the Interior's *Professional Qualification Standards* (36 CFR 61) in consultation with a preservation specialist assigned by the San Francisco Planning Department and the local jurisdiction, if deemed appropriate by the Planning Department. **Measure 4.7-4c, Secretary of the Interior's Standards for Treatment of Historic Properties:** Prepare materials describing and depicting the proposed project. Review the proposed project for compliance with the Secretary of the Interior's *Standards for the Treatment of Historic Properties*. If a project is determined to be inconsistent with the *Standards for the Treatment of Historic Properties*, pursue and implement redesign of the project such that consistency with the standards is achieved. **Measure 4.7-4d, Historic Resources Survey and Redesign:** Undertake a historic resources survey to identify and evaluate potential historical resources that may exist in the project's area of potential effect. If a survey identifies one or more historical resources, assess the impact the project may have on those historical

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TABLE S.4 (Continued)
SUMMARY OF FACILITY MITIGATION MEASURES BY IMPACT

Impact	Mitigation Measure(s)
Impact 4.7-4 (cont.)	resources. If the project will cause a substantial adverse change to a historical resource, assign a preservation specialist to review the proposed project, for compliance with the Secretary of the Interior's *Standards for the Treatment of Historic Properties*. If the project is determined to be inconsistent with those standards, pursue and implement redesign of the project such that consistency with the standards is achieved. **Measure 4.7-4e, Historic Resources Protection Plan:** A qualified historian will prepare a plan that specifies procedures for protecting and monitoring historical resources during construction. **Measure 4.7-4f, Preconstruction Surveys and Vibration Monitoring:** Include geotechnical investigations if vibration-related impacts could affect historical resources. Follow recommendations of the final geotechnical reports. Conduct a preconstruction survey of existing conditions and monitor the adjacent buildings for damage during construction, if recommended.
Impact 4.7-5: Impacts on adjacent historic architectural resources.	Cultural Resources Measures 4.7-4a thru 4.7-4f, described above.
Impact 4.8-1: Temporary reduction in roadway capacity and increased traffic delays.	**Measure 4.8-1a, Traffic Control Plan Measures:** Elements of the traffic control plan could include: circulation and detour plans, designated truck routes, sufficient staging area, access to driveways, use of standard construction specifications for controlling construction vehicle movements, restrictions on truck trips during peak morning and evening commute hours, lane closure restrictions, maintenance of alternate one-way traffic flow, detour signing, pedestrian and bicycle access and circulation, equipment and materials storage, construction worker parking, roadside safety protocols, considerations for sensitive land uses, coordination with local transit service providers, roadway repair, conformance with the *California Manual on Uniform Traffic Control Devices for Streets and Highways: Part 6 Temporary Traffic Control and Caltrans' 2006 Standard Plans*. **Measure 4.8-1b, Coordination of Individual Traffic Control Plans:** In the event that more than one construction contract is issued for work along existing or new pipelines, and where construction could occur within and/or across multiple streets in the same vicinity, coordinate the traffic control plans in order to mitigate the impact of traffic disruption by including measures that address overlapping construction schedules and activities, truck arrivals and departures, lane closures and detours, and the adequacy of on-street staging requirements.
Impact 4.8-2: Short-term traffic increases on roadways.	Traffic, Transportation, and Circulation Measures 4.8-1a and 4.8-1b, described above.
Impact 4.8-3: Impaired access to adjacent roadways and land uses.	Traffic, Transportation, and Circulation Measure 4.8-1a, described above.

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TABLE S.4 (Continued)
SUMMARY OF FACILITY MITIGATION MEASURES BY IMPACT

Impact	Mitigation Measure(s)
Impact 4.8-4: Temporary displacement of on-street parking.	Traffic, Transportation, and Circulation Measure 4.8-1a, described above. **Measure 4.8-4, Accommodation of Displaced Public Parking Supply for Recreational Visitors:** Include an additional measure in the traffic control plans to accommodate any anticipated visitor parking demand that would be displaced by proposed projects at public recreational facilities.
Impact 4.8-5: Increased traffic safety hazards during construction.	Traffic, Transportation, and Circulation Measure 4.8-1a, described above.
Impact 4:8-6: Long-term traffic increases during facility operation.	None required.
Impact 4.9-1: Construction emissions of criteria pollutants.	**Measure 4.9-1a, SJVAPCD Dust Control Measures:** Include San Joaquin Valley Air Pollution Control District (SJVAPCD) Basic Control Measures in contract specifications for all construction sites. Include SJVAPCD Enhanced Control Measures in contract specifications when required to mitigate significant PM_{10} impacts. Include SJVAPCD Additional Control Measures in contract specifications for construction sites that are large in area, located near sensitive receptors, or which for any other reason warrant additional emissions reductions. Include SJVAPCD Rule 9510, Indirect Source Review, Section 6.1, Construction Equipment Emissions in contract specifications for any project subject to discretionary approval by a public agency that ultimately results in the construction of a new building, facility, or structure or reconstruction of a building, facility, or structure for the purpose of increasing capacity or activity and also involving 9,000 square feet of space. **Measure 4.9-1b, SJVAPCD Exhaust Control Measures:** Include SJVAPCD Exhaust Control Measures in contract specifications, where applicable, for heavy-duty equipment to limit exhaust emissions within the San Joaquin Region. **Measure 4.9-1c, BAAQMD Dust Control Measures:** For projects in the Sunol Valley, Bay Division, Peninsula, and San Francisco Regions, include Bay Area Air Quality Management District (BAAQMD) Basic Control Measures in contract specifications for all construction sites. Include BAAQMD Enhanced Control Measures in contract specifications for sites over four acres. Include BAAQMD Optional Control Measures in contract specifications for sites that are large in area, located near sensitive receptors, or which for any other reason warrant additional emissions reductions. **Measure 4.9-1d, BAAQMD Exhaust Control Measures:** For projects in the Sunol Valley, Bay Division, Peninsula, and San Francisco Regions, include BAAQMD Exhaust Control Measures to limit exhaust emissions, where applicable.

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TABLE S.4 (Continued)
SUMMARY OF FACILITY MITIGATION MEASURES BY IMPACT

Impact	Mitigation Measure(s)
Impact 4.9-2: Exposure to diesel particulate matter during construction.	**Measure 4.9-2a, Health Risk Screening or Use of Soot Filters:** Complete a health risk screening if truck volumes associated with a particular project along a particular haul route exceed 40,000 truck trips over the entire construction period. If a potentially significant impact is indicated, complete a site-specific health risk assessment. Consider diesel particulate matter (DPM) emission rates in separate project-level analysis at the time of construction. Develop a mitigation program based on the site-specific health risk assessment implementing methods of reducing DPM emission or exposure to a less-than-significant level. **Measure 4.9-2b, Vacate SFPUC Land Managers' Residences in Sunol Valley:** Vacate the two SFPUC Land Managers' residences in the Sunol Valley during construction of the Calaveras Dam or SVWTP – Treated Water Reservoirs projects or complete a health risk screening (and, if warranted, a health risk assessment) to determine health risks at these residences from either of these two projects.
Impact 4.9-3: Exposure to emissions (possibly including asbestos) from tunneling.	**Measure 4.9-3, Tunnel Gas Odor Control:** Add water scrubbers and appropriate chemicals to tunnel ventilation systems if odorous gases become a nuisance odor problem (i.e., odor complaints are received).
Impact 4.9-4: Air pollutant emissions during project operation.	None required.
Impact 4.9-5: Odors generated during project operation.	None required.
Impact 4.9-6: Secondary emissions at power plants.	None required.
Impact 4.9-7: Conflict with implementation of applicable regional air quality plans addressing criteria air pollutants and state goals for reducing greenhouse gas emissions.	None required.
Impact 4.10-1: Disturbance from temporary construction-related noise increases.	**Measure 4.10-1a, Noise Controls:** For all WSIP projects located within 500 feet of any noise-sensitive receptors, implement appropriate noise controls to reduce daytime construction noise levels to meet the 70-dBA daytime speech interference criterion to the extent feasible. For all WSIP projects involving nighttime construction and located within 3,000 feet of any noise-sensitive receptors, implement appropriate noise controls to maintain noise levels at or below any applicable ordinance nighttime noise limits or the 50-dBA nighttime sleep interference criterion to the extent feasible. **Measure 4.10-1b, Vacate SFPUC Caretaker's Residence at Tesla Portal:** Vacate caretaker's residence at Tesla Portal during construction of the Advanced Disinfection and Tesla Portal Disinfection Station projects as well as those portions of the San Joaquin Pipeline System and Rehabilitation of Existing San Joaquin Pipelines projects located at Tesla Portal.
Impact 4.10-2: Temporary noise disturbance along construction haul routes.	**Measure 4.10-2a, Limit Hourly Truck Volumes:** Haul and delivery truck routes for all WSIP projects will, to the extent feasible, avoid local residential streets and follow local designated truck routes. Total project-related haul and delivery truck volumes on any particular haul truck route will be limited to 80 trucks per hour.

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TABLE S.4 (Continued)
SUMMARY OF FACILITY MITIGATION MEASURES BY IMPACT

Impact	Mitigation Measure(s)
Impact 4.10-2 (cont.)	**Measure 4.10-2b, Restrict Truck Operations:** Prohibit haul and delivery trucks from operating within 200 feet of any residential uses during the nighttime hours. For receptors beyond 200 feet from a haul route, limit noise levels to the 50-dBA sleep interference criterion at the closest receptor. **Measure 4.10-2c, Vacate SFPUC Land Manager's Residence:** Vacate Land Manager's residence adjacent to Alameda East Portal during offsite truck operations associated with the New Irvington Tunnel project, if truck operations occur during the nighttime hours (10 p.m. to 7 a.m.) and are estimated to exceed the 50-dBA sleep interference criterion at this residence.
Impact 4.10-3: Disturbance due to construction-related vibration.	**Measure 4.10-3a, Vibration Controls to Prevent Cosmetic or Structural Damage:** Incorporate restrictions into all contract specifications (primarily for sheetpile driving, pile driving, or tunnel construction activities), whereby surface vibration will be limited to 0.2 in/sec peak particle velocity (PPV) for continuous vibration (e.g., vibratory equipment and impact pile drivers) and 0.5 in/sec PPV for controlled detonations at the closest receptors to ensure that cosmetic or structural damage does not occur. **Measure 4.10-3b, Limit Vibration Levels at or Below Vibration Perception Threshold:** Maintain vibration levels at or below the vibration perception threshold at adjacent properties to the extent feasible during nighttime. If vibration complaints are received, operational adjustments will be made to reduce vibration annoyance effects. **Measure 4.10-3c, Limit Tunnel-Related Detonation to Daylight Hours:** Limit controlled detonation associated with tunnel construction to daylight hours, Monday through Saturday.
Impact 4.10-4: Disturbance due to long-term noise increases.	None required.
Impact 4.11-1: Potential temporary damage to or disruption of existing regional or local public utilities.	**Measure 4.11-1a, Notify Neighbors of Potential Utility Service Disruption:** Notify residents and businesses in project area of potential utility service disruption two to four days in advance of construction. **Measure 4.11-1b, Locate Utility Lines Prior to Excavation:** Locate overhead and underground utility lines prior to excavation work. **Measure 4.11-1c, Confirmation of Utility Line Information:** Find the exact location of underground utilities by safe and acceptable means. Confirm information regarding the size, color, and location of existing utilities before construction activities commence. **Measure 4.11-1d, Safeguard Employees from Potential Accidents Related to Underground Utilities:** While any excavation is open, protect, support, or remove underground utilities as necessary to safeguard employees.

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TABLE S.4 (Continued)
SUMMARY OF FACILITY MITIGATION MEASURES BY IMPACT

Impact	Mitigation Measure(s)
Impact 4.11-1 (cont.)	**Measure 4.11-1e, Notify Local Fire Departments:** Notify local fire departments any time damage to a gas utility results in a leak or suspected leak, or whenever damage to any utility results in a threat to public safety. **Measure 4.11-1f, Emergency Response Plan:** Develop an emergency response plan in the event of a leak or explosion prior to commencing construction activities.
	Measure 4.11-1g, Prompt Reconnection of Utilities: Promptly reconnect any disconnected utility lines. **Measure 4.11-1h, Coordinate Final Construction Plans with Affected Utilities:** Coordinate final construction plans and specifications with affected utilities.
Impact 4.11-2: Temporary adverse effects on solid waste landfill capacity.	**Measure 4.11-2, Waste Reduction Measures:** Incorporate into contract specifications for each WSIP project the requirement to obtain any necessary waste management permits prior to construction and to comply with conditions of approval attached to project implementation.
Impact 4.11-3: Impacts related to compliance with statutes and regulations related to solid waste.	Public Services and Utilities Measure 4.11-2, described above.
Impact 4.11-4: Impacts related to the relocation of utilities.	Public Services and Utilities Measures 4.11-1a thru 4.11-1h, described above.
Impact 4.12-1: Temporary conflicts with established recreational uses during construction.	Traffic, Transportation, and Circulation Measures (4.8-1a and 4.8-1b); Air Quality Measures (4.9-1a, 4.9-1b, 4.9-2a, 4.9-2b); and Noise Measures (4.10-1a, 4.10-1b, 4.10-2a thru 4.10-2c, and 4.10-3a thru 4.10-3b), described above. **Measure 4.12-1, Coordination with Golf Course/Recreational Facility Managers:** Coordinate with managers of golf courses or other recreational facilities directly affected by pipeline construction to minimize adverse impacts on golfers and other recreational users.
Impact 4.12-2: Conflicts with established recreational uses due to facility siting and project operation.	Land Use and Visual Quality Measures 4.3-4a thru 4.3-4d, described above. **Measure 4.12-2, Appropriate Siting of Proposed Facilities:** Locate WSIP project facilities on park and recreation properties in consultation with park planning staff to minimize the direct loss of recreation and play space and to minimize inconvenience to park and recreation users.
Impact 4.13-1: Temporary conflicts with established agricultural resources.	Traffic, Transportation, and Circulation Measures (4.8-1a and 4.8-1b); Air Quality Measures (4.9-1a thru 4.9-1d, and 4.9-2a and 4.9-2b); and Noise Measures (4.10-1a, 4.10-b, 4.10-2a thru 4.10-2c, and 4.10-3a thru 4.10-3c), described above. **Measure 4.13-1a, Supplemental Noticing and Soil Stockpiling:** For the San Joaquin Pipeline projects (San Joaquin System and Rehabilitation of Existing San Joaquin Pipeline), stockpile and replace topsoil in mapped areas of Prime and Unique Farmland and Farmland of Statewide Importance that would be temporarily disturbed by pipeline construction, unless other actions are required under specific agreements with individual landowners.

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TABLE S.4 (Continued)
SUMMARY OF FACILITY MITIGATION MEASURES BY IMPACT

Impact	Mitigation Measure(s)
Impact 4.13-1 (cont.)	**Measure 4.13-1b, Avoidance or Soil Stockpiling:** Minimize any potential impacts on agricultural lands in the Sunol Valley by avoiding these resources wherever possible. Where this is not possible, stockpile, replace, and hydroseed topsoil to prevent erosion, unless other actions are required as a result of contracts affecting use of the property or under specific agreements with individual landowners.
Impact 4.13-2: Conversion of farmlands to non-agricultural uses.	**Measure 4.13-2, Siting Facilities to Avoid Prime Farmland:** Avoid areas identified as Prime Farmland, Unique Farmland, or Farmland of Statewide Importance. If avoidance is not feasible, adopt a permanent set-aside for an equivalent acreage of similarly valued farmland in the area.
Impact 4.14-1: Potential to encounter hazardous materials in soil and groundwater.	**Measure 4.14-1a, Site Health and Safety Plan:** For all projects where the site assessment indicates the potential to encounter hazardous materials, prepare a site health and safety plan identifying the chemicals present, potential health and safety hazards, monitoring, soils-handling methods, appropriate personnel protective equipment, and emergency response procedures. **Measure 4.14-1b, Materials Disposal Plan:** For all projects where the site assessment indicates the potential to encounter hazardous materials in the soil, prepare a materials disposal plan that specifies the disposal method and approved disposal site for the soil. **Measure 4.14-1c, Coordination with Property Owners and Regulatory Agencies:** Based on regulatory agency file reviews, assess the potential to encounter unacceptable levels of hazardous materials at known environmental cases, for construction activities to cause groundwater plume migration or interfere with ongoing remediations at known environmental cases, and for increased water levels in reservoirs or lakes to inundate known environmental cases. Modify construction or remediation activities.
Impact 4.14-2: Exposure to naturally occurring asbestos.	**Measure 4.14-2, Health Risk Screening and Airborne Asbestos Monitoring Plan:** For tunneling projects where soil or rock may contain naturally occurring asbestos, conduct a health risk screening assessment to identify acceptable levels of asbestos in tunnel emissions. Prepare an airborne asbestos monitoring plan for approval by the BAAQMD.
Impact 4.14-3: Risk of fires during construction.	None required.
Impact 4.14-4: Gassy conditions in tunnels.	None required.
Impact 4.14-5: Exposure to hazardous building materials.	**Measure 4.14-5, Hazardous Building Materials Surveys and Abatement:** For all WSIP projects involving demolition or renovation of existing facilities, perform a hazardous building materials survey for each structure prior to demolition or renovation activities. If any friable asbestos-containing materials, lead-containing materials, or hazardous components of building materials are identified, implement adequate abatement practices prior to demolition or renovation.
Impact 4.14-6: Accidental hazardous materials release from construction equipment.	None required.

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TABLE S.4 (Continued)
SUMMARY OF FACILITY MITIGATION MEASURES BY IMPACT

Impact	Mitigation Measure(s)
Impact 4.14-7: Increased use of hazardous materials during operation.	None required.
Impact 4.14-8: Emission or use of hazardous materials within 1/4 mile of a school.	None required.
Impact 4.15-1: Construction-related energy use.	Air Quality Measures 4.9-1b and 4.9-1d, described above.
Impact 4.15-2: Long-term energy use during operation.	**Measure 4.15-2, Incorporation of Energy Efficiency Measures:** Consistent with the Energy Action Plan II priorities for reducing energy usage, ensure that energy-efficient equipment is used in all WSIP projects. Prepare a repair and maintenance plan for each facility to minimize power use. Evaluate the potential for use of renewable energy resources.
Impact 4.16-1a: Collective temporary and permanent impacts on existing land uses in the vicinity of proposed facility sites.	None required.
Impact 4.16-1b: Collective temporary and permanent impacts on the visual character of the surrounding area.	None required.
Impact 4.16-2: Collective exposure of people or structures to geologic and seismic hazards.	None required.
Impact 4.16-3: Collective WSIP impacts related to the degradation of surface waters and flooding hazards.	None required.
Impact 4.16-4: Collective loss of sensitive biological resources.	**Measure 4.16-4a, Bioregional Habitat Restoration Measures:** Address the following bioregional effects and implement conservation principles when implementing habitat compensation mitigation required for individual WSIP facility projects: compound impacts on functional units of habitat as WSIP projects simplify vegetation structure and increase “edge” (the boundary between two different habitats); increased habitat impacts due to the spread of weedy, non-native plant species; genetic diversity impacts on small populations; impacts on wildlife movement due to habitat fragmentation; suppression of natural disturbance regimes; and reduced population recovery opportunities from stochastic events. **Measure 4.16-4b, Coordination of Construction Staging and Access:** Coordinate construction contractor(s) to minimize surface disturbance when construction schedules for WSIP projects affecting the same areas overlap.
Impact 4.16-5: Collective increase in impacts related to archaeological, paleontological, and historical resources.	None required.
Impact 4.16-6: Collective traffic increases on local and regional roads.	**Measure 4.16-6a, SFPUC WSIP Projects Construction Coordinator:** Identify a qualified construction coordinator to coordinate project-specific traffic control plans; develop a public information campaign to inform the public of construction activities, detour routes, and alternate routes; work with local and regional agencies to pursue additional traffic mitigation measures and incorporate such measures into the project-specific traffic control plans.

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TABLE S.4 (Continued)
SUMMARY OF FACILITY MITIGATION MEASURES BY IMPACT

Impact	Mitigation Measure(s)
Impact 4.16-6 (cont.)	**Measure 4.16-6b, Combined San Joaquin Traffic Control Plan:** Develop a San Joaquin Traffic Control Plan that coordinates the project-specific traffic control plans and identifies additional measures (consistent with the standards of San Joaquin County, Stanislaus County, and Caltrans) to minimize the combined impacts of multiple WSIP project construction traffic on I-580, Chrisman Road, and Vernalis Road. **Measure 4.16-6c, Combined Sunol Valley Traffic Control Plan:** Develop a Sunol Valley Traffic Control Plan that coordinates the project-specific traffic control plans and identifies additional measures (consistent with the standards of Alameda County and Caltrans) to minimize the impacts of construction traffic on Calaveras Road and I-680.
Impact 4.16-7: Collective increases in construction and/or operational emissions in the region.	**Measure 4.16-7a, Dust and Exhaust Control Measures for All WSIP Projects:** Require implementation of Air Quality Measures 4.9-1a thru 4.9-1d for all WSIP projects to address collective construction-related air quality impacts. **Measure 4.16-7b, Health Risk Screening or Use of Soot Filters for All Projects in the San Joaquin and Sunol Valley Regions**: Require Measure 4.9-2a for all WSIP projects in the San Joaquin and Sunol Valley Regions to address collective DPM impacts. When this requirement is applied to the New Irvington Tunnel project, it will be applied to both the Sunol Valley and Fremont tunnel portals, taking into account truck traffic from other WSIP projects in the vicinity of both portals. **Measure 4.16-7c, Vacate SFPUC Land Managers' Residences for All Projects in the Sunol Valley Region:** Require Measure 4.9-2b for all WSIP projects in the Sunol Valley Region to address collective DPM impacts.
Impact 4.16-8: Collective increases in construction-related and operational noise.	**Measure 4.16-8a, Limiting Hourly Truck Volumes and Restricting Truck Operations on Haul Routes for Multiple WSIP Projects:** Apply Measures 4.10-2a and 4.10-2b to total haul and delivery truck volumes attributable to all WSIP projects on any particular haul truck route (including haul routes in the Tesla Portal, Irvington Portal, and Lower Crystal Springs Dam vicinities as well as haul routes in the San Francisco Region) to address collective truck-related noise impacts. **Measure 4.16-8b, Vacate Land Manager's Residence for All Projects in Sunol Valley Region:** To address collective noise impacts, vacate Land Manager's residence adjacent to Alameda East Portal during construction truck operations associated with all WSIP projects in this region if collective daytime truck volumes exceed the 70-dBA speech interference criterion or nighttime truck volumes exceed the 50-dBA sleep interference criterion.
Impact 4.16-9: Collective impacts on utilities and landfill capacity.	None required.
Impact 4.16-10: Collective effects on recreational resources during construction.	None required.

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TABLE S.4 (Continued)
SUMMARY OF FACILITY MITIGATION MEASURES BY IMPACT

Impact	Mitigation Measure(s)
Impact 4.16-11: Collective conversion of farmland to nonagricultural uses.	None required.
Impact 4.16-12: Collective effects related to hazardous conditions and exposure to or release of hazardous materials.	None required.
Impact 4.16-13: Collective increases in the use of nonrenewable energy resources.	None required.
Impact 4.17-1: Cumulative disruption of established communities, changes in existing land use patterns, and impacts on the existing visual character.	None required.
Impact 4.17-2: Cumulative exposure of people or structures to geologic and seismic hazards.	None required.
Impact 4.17-3: Cumulative impacts related to the degradation of water quality, alteration of drainage patterns, increased surface runoff, and flooding hazards.	None required.
Impact 4.17-4: Cumulative loss of sensitive biological resources.	None required.
Impact 4.17-5: Cumulative increase in impacts on archaeological, paleontological, and historical resources.	None required.
Impact 4.17-6: Cumulative traffic increases on local and regional roads.	**Measure 4.17-6, SFPUC WSIP Projects Construction Coordinator – Other Agencies:** The SFPUC WSIP construction coordinator designated in accordance with Measure 4.16-6a will also consider the effects of any traffic generated by SFPUC maintenance activities and other SFPUC projects; and coordinate with Caltrans, other county agencies, and local jurisdictions regarding construction of other private and public development projects so as to minimize traffic impacts on local access roads.
Impact 4.17-7: Cumulative increases in construction and/or operational emissions in the region.	None required.
Impact 4.17-8: Cumulative increases in construction-related and operational noise.	**Measure 4.17-8, Coordination of Truck Traffic on Local Streets:** The SFPUC WSIP construction coordinator designated in Measure 4.17-6 will also be responsible for coordinating truck traffic generated on these same streets by SFPUC maintenance activities and other SFPUC projects so that SFPUC-related truck noise increases are maintained at or below threshold levels specified in Measures 4.10-2a and 4.10-2b to the extent feasible.
Impact 4.17-9: Cumulative impacts related to disruption of utility service or relocation of utilities.	None required.
Impact 4.17-10: Cumulative effects on recreational resources during construction.	None required.
Impact 4.17-11: Cumulative conversion of farmland to nonagricultural uses.	None required.
Impact 4.17-12: Cumulative effects related to hazardous conditions and exposure to or release of hazardous materials.	None required.
Impact 4.17-13: Cumulative increases in the use of nonrenewable energy resources.	None required.

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- Temporary noise disturbance could occur along construction haul routes under the following projects: Advanced Disinfection, San Joaquin Pipeline System, Rehabilitation of Existing San Joaquin Pipelines, Tesla Portal Disinfection Station, Bay Division Pipeline Reliability Upgrade, BDPL Nos. 3 and 4 Crossovers, Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault, Baden and San Pedro Valve Lots Improvements, HTWTP Long-Term Improvements, San Andreas Pipeline No. 3 Installation, Groundwater Projects, and Recycled Water Projects. This impact is conservatively considered potentially significant and unavoidable because haul routes, truck volumes, and hours of truck operations have not yet been determined for these projects (Chapter 4, Section 4.10).

- If any construction activities were to generate vibration in proximity to sensitive receptors during the nighttime hours, potentially significant and unavoidable vibration impacts could occur under the following projects: San Joaquin Pipeline System, Rehabilitation of Existing San Joaquin Pipelines, Additional 40-mgd Treated Water Supply, Bay Division Pipeline Reliability Upgrade, BDPL Nos. 3 and 4 Crossovers, Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault, Baden and San Pedro Valve Lots Improvements, San Andreas Pipeline No. 3 Installation, Groundwater Projects, and Recycled Water Projects (Chapter 4, Section 4.10).

- Collective temporary impacts on residences near the Irvington Tunnel portal in Fremont (Bay Division Region) could result during construction because staging and access for both the New Irvington Tunnel and Bay Division Pipeline Reliability Upgrade projects would overlap in this vicinity. Since the feasibility of coordinating construction activities for these projects cannot be determined at this stage of project planning, such an effect is conservatively considered to be potentially significant and unavoidable (Chapter 4, Section 4.16).

- WSIP projects in the Sunol Valley Region would have a potentially significant and unavoidable collective impact on biological resources because of the number of WSIP projects in this region and the extent of overlap in terms of construction activity timing and location (Chapter 4, Section 4.16).

- Potentially significant and unavoidable collective impacts on special-status plant species could occur during construction of the Crystal Springs/San Andreas Transmission Upgrade and Lower Crystal Springs Dam projects in the Peninsula Region; incidental disturbance of plants along the road shoulder would be difficult to completely avoid, even with proposed mitigation measures (Chapter 4, Section 4.16).

- WSIP projects within the Sunol Valley and Peninsula Regions could collectively cause substantial adverse changes to historic districts, but until more detailed assessments are completed to determine if any historic districts exist, this potential collective impact is conservatively considered to be potentially significant and unavoidable (Chapter 4, Section 4.16).

- Even with proposed control measures, construction-related criteria air pollutant emissions associated with all of the WSIP projects would have a potentially significant and unavoidable collective impact on air quality, since the projects would contribute to the nonattainment status for ozone and particulate matter in both the San Francisco Bay Area and San Joaquin Valley Air Basins (Chapter 4, Section 4.16).

- Since the hours of construction as well as haul routes, truck volumes, and hours of truck operations have not yet been determined for all of WSIP facility projects within the San Joaquin, Bay Division, Peninsula, and San Francisco Regions, there is the potential that collective noise impacts could result from construction of multiple WSIP projects near Tesla Portal, Irvington Tunnel portal in Fremont, and Lower Crystal Springs Dam. Also, there could be collective truck traffic increases along any overlapping haul routes in these regions. Given these unknowns, such collective effects are conservatively considered to be potentially significant and unavoidable (Chapter 4, Section 4.16).

- Several WSIP projects and several other SFPUC projects could cumulatively affect individual historical resources or potential historic districts (if historic districts are determined to be present), and until project-level analysis is completed, this cumulative effect is conservatively considered to be potentially significant and unavoidable (Chapter 4, Section 4.17).

- Construction-related traffic generated by the WSIP projects would contribute to potentially significant and unavoidable cumulative traffic impacts (e.g., increased travel times), particularly if the travel routes of individual drivers coincided with the construction routes for the WSIP projects, other SFPUC projects, and/or other public and private projects within one or more regions, and/or when construction vehicles associated with the cumulative projects utilize regional facilities (Chapter 4, Section 4.17).

- Construction emissions associated with the WSIP projects, other SFPUC projects, and other public and private projects would cumulatively contribute to the nonattainment status for ozone and particulate matter, a potentially significant and unavoidable cumulative impact (Chapter 4, Section 4.17).

- Potential overlap of the WSIP's construction truck traffic with construction truck traffic of other public and private projects could result in cumulative increases in diesel particulate matter (DPM) and noise on local roadways. Since the SFPUC would have no control over the construction schedules or traffic routes for other projects outside its jurisdiction, potential DPM and noise impacts are considered to be potentially significant and unavoidable (Chapter 4, Section 4.17).

Facility Operations Effects

Implementation of WSIP facility improvement projects would also result in long-term effects associated with facility operations. Effects associated with long-term maintenance and operations activities would occur, such as new permanent sources of light and glare, effects on scenic vistas, effects of treated water discharge on water quality and aquatic resources, and long-term energy use. These impacts would be mitigated to a less-than-significant level through implementation of the mitigation measures described in Chapter 6.

Effects of Water Supply and System Operations (Chapter 5)

Chapter 5 of this PEIR addresses the effects of the proposed water supply and system operations on the Tuolumne River system, Alameda Creek system, Peninsula system, and Westside Basin groundwater resources. In addition, Chapter 5 identifies the cumulative effects of implementing the WSIP water supply option and system operations in combination with other past, present, and reasonably foreseeable future projects within each of these watersheds; it also discusses the potential effects of climate change and global warming on the regional water system. **Tables S.5** through **S.8** summarize the water supply and system operations effects associated with the WSIP and the mitigation measures proposed to address the effects found to be potentially significant.

TABLE S.5
SUMMARY OF WATER SUPPLY IMPACTS AND MITIGATION MEASURES – TUOLUMNE RIVER SYSTEM AND DOWNSTREAM WATER BODIES

Impact	Significance Determination					Mitigation Measures
		Biological Resource Impacts				
	All Impacts (except Biological Resources)	Sensitive Habitats	Key Special-Status Species	Other Species of Concern	Common Habitats and Species	
STREAM FLOW						
Impact 5.3.1-1: Effects on flow along the Tuolumne River below O'Shaughnessy Dam.	LS					None required.
Impact 5.3.1-2: Effects on flow along Cherry Creek below Cherry Dam.	LS					None required.
Impact 5.3.1-3: Effects on flow along Eleanor Creek below Eleanor Dam.	LS					None required.
Impact 5.3.1-4: Effects on flow along the Tuolumne River below La Grange Dam.	LS					None required.
Impact 5.3.1-5: Effects on flow along the San Joaquin River and the Sacramento–San Joaquin Delta.	LS					None required.
GEOMORPHOLOGY						
Impact 5.3.2-1: Effects on sediment transport and channel characteristics between O'Shaughnessy Dam and Don Pedro Reservoir.	LS					None required.
Impact 5.3.2-2: Effects on sediment transport and channel characteristics below La Grange Dam.	LS					None required.
SURFACE WATER QUALITY						
Impact 5.3.3-1: Effects on water quality in Hetch Hetchy Reservoir and along the Tuolumne River below O'Shaughnessy Dam.	LS					None required.
Impact 5.3.3-2: Effects on water quality in Don Pedro Reservoir and along the Tuolumne River below La Grange Dam.	LS					None required.
Impact 5.3.3-3: Effects on water quality along the San Joaquin River and the Sacramento–San Joaquin Delta.	LS					None required.

[a] Mitigation measure text is summarized; please see Chapter 6 for details.

(shaded) Not applicable

TABLE S.5 (Continued)
SUMMARY OF WATER SUPPLY IMPACTS AND MITIGATION MEASURES – TUOLUMNE RIVER SYSTEM AND DOWNSTREAM WATER BODIES

Impact	Significance Determination					Mitigation Measures
	All Impacts (except Biological Resources)	Biological Resource Impacts				
		Sensitive Habitats	Key Special-Status Species	Other Species of Concern	Common Habitats and Species	
SURFACE WATER SUPPLIES						
Impact 5.3.4-1: Effects on Tuolumne River, San Joaquin River, and Stanislaus River water users.	LS					None required.
Impact 5.3.4-2: Effects on Delta water users.	LS					None required.
GROUNDWATER						
Impact 5.3.5-1: Alteration of stream flows along the Tuolumne River, which could affect local groundwater recharge and groundwater levels.	LS					None required.
Impact 5.3.5-2: Alteration of stream flows along the Tuolumne River, which could affect local groundwater quality.	LS					None required.
FISHERIES						
Impact 5.3.6-1: Effects on fishery resources in Hetch Hetchy Reservoir.	LS					None required.
Impact 5.3.6-2: Effects on fishery resources along the Tuolumne River between Hetch Hetchy Reservoir and Don Pedro Reservoir.	LS					None required.
Impact 5.3.6-3: Effects on fishery resources in Don Pedro Reservoir.	LS					None required.
Impact 5.3.6-4: Effects on fishery resources along the Tuolumne River below La Grange Dam.	PSM					**Measure 5.3.6-4a, Avoidance of Flow Changes by Reducing Demand for Don Pedro Reservoir Water:** The SFPUC will pursue a water transfer arrangement with MID/TID and/or other water agencies which would offset the WSIP's effects on water storage in Don Pedro Reservoir and minimize WSIP-induced changes in releases from La Grange Dam. **If Measure 5.3.6-4a proves to be infeasible, the SFPUC will implement Measure 5.3.6-4b.

[shaded] Not applicable

TABLE S.5 (Continued)
SUMMARY OF WATER SUPPLY IMPACTS AND MITIGATION MEASURES – TUOLUMNE RIVER SYSTEM AND DOWNSTREAM WATER BODIES

Impact	Significance Determination					Mitigation Measures
	All Impacts (except Biological Resources)	Biological Resource Impacts: Sensitive Habitats	Biological Resource Impacts: Key Special-Status Species	Biological Resource Impacts: Other Species of Concern	Biological Resource Impacts: Common Habitats and Species	
FISHERIES (cont.)						
Impact 5.3.6-4 (cont.)						**Measure 5.3.6-4b, Fishery Habitat Enhancement:** The SFPUC will implement or fund one of two fishery habitat enhancement projects that are consistent with the Lower Tuolumne River Restoration Plan; augmentation of spawning gravel at three selected sites or the filling or isolation from the river of one of the existing inactive quarry pits.
Impact 5.3.6-5: Effects on fishery resources along the San Joaquin River.	LS					None required.
TERRESTRIAL BIOLOGY						
Impact 5.3.7-1: Impacts on riparian habitat and related biological resources in Hetch Hetchy Reservoir and along the bedrock channel portions of the Tuolumne River from O'Shaughnessy Dam to Don Pedro Reservoir.		LS	LS	LS	LS	None required.
Impact 5.3.7-2: Impacts on alluvial features that support meadow and riparian habitat along the Tuolumne River from O'Shaughnessy Dam to Don Pedro Reservoir.		PSM	PSM	PSM	PSM	The SFPUC will implement Measure 5.3.7-2 to reduce adverse impacts on sensitive habitats, key special-status species, other species of concern, and common habitats and species to a less-than-significant level. **Measure 5.3.7-2, Controlled Releases to Recharge Groundwater in Streamside Meadows and Other Alluvial Deposits:** The SPPUC will manage releases to the Tuolumne River from Hetch Hetchy Reservoir during the spring with the goal of recharging groundwater that supports meadow and riparian habitat. The SFPUC will periodically survey meadow habitat to determine the efficacy of release management and will modify releases as necessary to sustain meadow habitat.
Impact 5.3.7-3: Impacts on biological resources in Lake Eleanor and along Eleanor Creek.		LS	LS	LS	LS	None required.
Impact 5.3.7-4: Impacts on biological resources in Lake Lloyd and along Cherry Creek.		LS	LS	LS	LS	None required.

[Shaded] Not applicable

TABLE S.5 (Continued)
SUMMARY OF WATER SUPPLY IMPACTS AND MITIGATION MEASURES – TUOLUMNE RIVER SYSTEM AND DOWNSTREAM WATER BODIES

Impact	Significance Determination					Mitigation Measures
	All Impacts (except Biological Resources)	Biological Resource Impacts				
		Sensitive Habitats	Key Special-Status Species	Other Species of Concern	Common Habitats and Species	
TERRESTRIAL BIOLOGY (cont.)						
Impact 5.3.7-5: Impacts on biological resources in Don Pedro Reservoir.		LS	LS	LS	LS	None required.
Impact 5.3.7-6: Impacts on biological resources along the Tuolumne River below La Grange Dam.		PSM	PSM	PSM	PSM	The SFPUC will implement Measures 5.3.6-4a or 5.3.7-6 to reduce adverse impacts on sensitive habitats, key special-status species, other species of concern, and common habitats and species to a less-than-significant level. **Measure 5.3.6-4a, Avoidance of Flow Changes by Reducing Demand for Don Pedro Reservoir Water** – see description above. **If Measure 5.3.6-4a proves to be infeasible, the SFPUC will implement Measure 5.3.7-6. **Measure 5.3.7-6, Lower Tuolumne River Riparian Habitat Enhancement:** Consistent with the Lower Tuolumne River Restoration Plan, the SFPUC will protect and enhance one mile of riparian vegetation within the contemporary floodplain.
Impact 5.3.7-7: Conflicts with the provisions of adopted conservation plans or other approved biological resources plans for the Tuolumne Wild and Scenic River.		LS				None required.
RECREATIONAL AND VISUAL RESOURCES						
Impact 5.3.8-1: Effects on reservoir recreation due to changes in water system operations.	LS					None required.
Impact 5.3.8-2: Effects on river recreation due to changes in water system operations.	LS					None required.
Impact 5.3.8-3: Effects on the aesthetic values of the Tuolumne Wild and Scenic River.	LS					None required.
ENERGY RESOURCES						
Impact 5.3.9-1: Effects on hydropower generation at facilities along the Tuolumne River	B					None required.

Not applicable

TABLE S.6
SUMMARY OF WATER SUPPLY IMPACTS AND MITIGATION MEASURES – ALAMEDA CREEK WATERSHED

Impact	Significance Determination					Mitigation Measures
		Biological Resource Impacts				
	All Impacts (except Biological Resources)	Sensitive Habitats	Key Special Status-Species	Other Species of Concern	Common Habitats and Species	
STREAM FLOW						
Impact 5.4.1-1: Effects on flow along Calaveras Creek below Calaveras Reservoir.	LS					None required
Impact 5.4.1-2: Effects on flow along Alameda Creek below the diversion dam.	SU					**Measure 5.4.1-2, Diversion Tunnel Operation:** The SFPUC will implement operational criteria for the diversion dam which will require that water not needed to fill Calaveras Reservoir would be released to Alameda Creek below the diversion dam.
Impact 5.4.1-3: Effects in San Antonio Reservoir and along San Antonio Creek.	LS					None required.
Impact 5.4.1-4: Effects on flow along Alameda Creek below the confluence of San Antonio Creek.	LS					None required.
GEOMORPHOLOGY						
Impact 5.4.2-1: Effects on channel formation and sediment transport along Calaveras Creek.	LS					None required.
Impact 5.4.2-2: Effects on channel formation and sediment transport along Alameda Creek downstream of the diversion dam and downstream of the San Antonio Creek confluence.	LS					None required.
Impact 5.4.2-3: Effects on channel formation and sediment transport along San Antonio Creek downstream of San Antonio Reservoir.	LS					None required.
SURFACE WATER QUALITY						
Impact 5.4.3-1: Effects on water quality in Calaveras Reservoir.	LS					None required.
Impact 5.4.3-2: Effects on water quality in San Antonio Reservoir.	LS					None required.
Impact 5.4.3-3: Changes in water quality along Calaveras, San Antonio, and Alameda Creeks.	LS					None required.

[a] Mitigation measure text is summarized; please see Chapter 6 for details.

(shaded) Not applicable

TABLE S.6 (Continued)
SUMMARY OF WATER SUPPLY IMPACTS AND MITIGATION MEASURES – ALAMEDA CREEK WATERSHED

Impact	Significance Determination					Mitigation Measures
	All Impacts (except Biological Resources)	Biological Resource Impacts				
		Sensitive Habitats	Key Special Status-Species	Other Species of Concern	Common Habitats and Species	
GROUNDWATER BODIES						
Impact 5.4.4-1: Changes in groundwater levels, flows, quality, and supplies.	LS					None required.
FISHERIES						
Impact 5.4.5-1: Effects on fishery resources in Calaveras Reservoir.	B					None required.
Impact 5.4.5-2: Effects on fishery resources along Calaveras Creek below Calaveras Dam and along Alameda Creek below confluence with Calaveras Creek.	B					None required.
Impact 5.4.5-3: Effects on fishery resources along Alameda Creek downstream of Alameda Creek Diversion Dam.	PSM					**Measure 5.4.5-3a, Minimum Flows for Resident Trout on Alameda Creek:** The SFPUC will release a minimum flow of approximately 10 cubic feet per second from the diversion dam and monitor the effects of the release on resident trout spawning and egg incubation. ** If monitoring results for Measure 5.4.5-3a indicate the measure is unsuccessful, the SFPUC will implement Measure 5.4.5-3b. **Measure 5.4.5-3b, Alameda Diversion Dam Restrictions or Fish Screens:** If after 10 years the minimum release does not sustain the resident trout population, the SFPUC will either increase releases from the diversion dam or install a fish passage barrier on the diversion tunnel.
Impact 5.4.5-4: Effects on fishery resources in San Antonio Reservoir.	B					None required.
Impact 5.4.5-5: Effects on fishery resources along San Antonio Creek below San Antonio Reservoir.	LS					None required.
Impact 5.4.5-6: Effects on fishery resources along Alameda Creek below confluence with San Antonio Creek.	LS					None required.

[shaded] Not applicable

TABLE S.6 (Continued)
SUMMARY OF WATER SUPPLY IMPACTS AND MITIGATION MEASURES – ALAMEDA CREEK WATERSHED

Impact	Significance Determination					Mitigation Measures
	All Impacts (except Biological Resources)	Biological Resource Impacts				
		Sensitive Habitats	Key Special Status-Species	Other Species of Concern	Common Habitats and Species	
TERRESTRIAL BIOLOGY						
Impact 5.4.6-1: Effects on riparian habitat and related biological resources in Calaveras Reservoir.		PSM	PSM	LS	LS	The SFPUC will implement Measure 5.4.6-1 to reduce adverse impacts on sensitive habitats and key special-status species to a less-than-significant level. **Measure 5.4.6-1, Compensation for Impacts on Terrestrial Biological Resources:** The SFPUC will protect, restore. and enhance existing riparian habitat and/or create new habitat that compensates for WSIP-induced habitat losses at Calaveras Reservoir. Compensatory habitat may be provided as part of the SFPUC's Habitat Reserve Program.
Impact 5.4.6-2: Effects on riparian habitat and related biological resources along Alameda Creek, from below the diversion dam to the confluence with Calaveras Creek.		LS	PSM	LS	N/A	The SFPUC will implement Measures 5.4.1-2 and 5.4.5-3a to reduce adverse impacts on key special-status species to a less-than-significant level. **Measure 5.4.1-2, Diversion Tunnel Operation** – see description above. **Measure 5.4.5-3a, Minimum Flows for Resident Trout on Alameda Creek** – see description above.
Impact 5.4.6-3: Effects on riparian habitat and related biological resources along Calaveras Creek, from Calaveras Reservoir to the confluence with Alameda Creek.		LS	PSM	LS	LS	The SFPUC will implement Measure 5.4.6-3 to reduce adverse impacts on key special-status species to a less-than-significant level. **Measure 5.4.6-3, Operational Procedures for Calaveras Dam Releases:** The SFPUC will manage releases from Calaveras Reservoir to mimic a more natural hydrologic regime in the creek for the benefit of terrestrial biological resources. The specifics of this mitigation measure will be determined as part of project-level CEQA review.

(Shaded cells) Not applicable

TABLE S.6 (Continued)
SUMMARY OF WATER SUPPLY IMPACTS AND MITIGATION MEASURES – ALAMEDA CREEK WATERSHED

Impact	Significance Determination					Mitigation Measures
	All Impacts (except Biological Resources)	Biological Resource Impacts				
		Sensitive Habitats	Key Special Status-Species	Other Species of Concern	Common Habitats and Species	
TERRESTRIAL BIOLOGY (cont.)						
Impact 5.4.6-4: Effects on riparian habitat and related biological resources along Alameda Creek, from the confluence with Calaveras Creek to the confluence with San Antonio Creek.		LS	PSM	LS	LS	The SFPUC will implement Measures 5.4.6-3 and 5.4.5-3a to reduce adverse impacts on key special-status species to a less-than-significant level. **Measure 5.4.6-3, Operational Procedures for Calaveras Dam Releases** – see description above. **Measure 5.4.5-3a, Minimum Flows for Resident Trout on Alameda Creek** – see description above.
Impact 5.4.6-5: Effects on riparian habitat and related biological resources in San Antonio Reservoir.		LS	LS	LS	LS	None required.
Impact 5.4.6-6: Effects on riparian habitat and related biological resources along San Antonio Creek between Turner Dam and the confluence with Alameda Creek.		LS	LS	LS	N/A	None required.
Impact 5.4.6-7: Effects on riparian habitat and related biological resources along Alameda Creek below the confluence with San Antonio Creek.		LS	LS	LS	N/A	None required.
Impact 5.4.6-8: Conflicts with the provisions of adopted conservation plans or other approved biological resources plans.		LS				None required.
RECREATION AND VISUAL						
Impact 5.4.7-1: Effects on recreational facilities and/or activities.	LS					None required.
Impact 5.4.7-2: Visual effects on scenic resources or visual character of the water bodies.	LS					None required.

[shaded] Not applicable

TABLE S.7
SUMMARY OF WATER SUPPLY IMPACTS AND MITIGATION MEASURES – PENINSULA WATERSHEDS

Impact	Significance Determination					Mitigation Measures
		Biological Resource Impacts				
	All Impacts (except Biological Resources)	Sensitive Habitats	Key Special -Status Species	Other Species of Concern	Common Habitats and Species	
STREAM FLOW						
Impact 5.5.1-1: Effects on flow along San Mateo Creek.	LS					None required.
Impact 5.5.1-2: Effects on flow along Pilarcitos Creek.	LS					None required.
GEOMORPHOLOGY						
Impact 5.5.2-1: Changes in sediment transport and channel morphology in the Peninsula watershed.	LS					None required.
WATER QUALITY						
Impact 5.5.3-1: Effects on water quality in Crystal Springs Reservoir, San Andreas Reservoir, and San Mateo Creek.	LS					None required.
Impact 5.5.3-2: Effects on water quality in Pilarcitos Reservoir and along Pilarcitos Creek.	PSM					**Measure 5.5.3-2a, Low-head Pumping Station at Pilarcitos Reservoir:** The SFPUC will install a permanent low-head pumping station at Pilarcitos Reservoir which would enable the SFPUC to access and use an additional 350 acre-feet of water from Pilarcitos Reservoir. In years when the WSIP would cause releases from Pilarcitos Reservoir to Pilarcitos Creek to be reduced to reservoir inflow earlier in the summer than under the existing condition (about 25 percent of years in the hydrologic record), the SFPUC will use the pumping station to augment flow in Pilarcitos Creek with water from the reservoir. The pumping station will draw water from the cool pool of water below the thermocline during times when the reservoir is stratified. The pumping station outlet will be designed to ensure that water discharged to the creek is adequately aerated. **Measure 5.5.3-2b, Aeration System at Pilarcitos Reservoir:** The SFPUC will install a permanent aeration system at Pilarcitos Reservoir. The SFPUC will operate the aeration system as necessary to avoid anoxic conditions and maintain good water quality conditions at the reservoir.

[a] Mitigation measure text is summarized; please see Chapter 6 for details.

(grey box) Not applicable

TABLE S.7 (Continued)
SUMMARY OF WATER SUPPLY IMPACTS AND MITIGATION MEASURES – PENINSULA WATERSHEDS

Impact	Significance Determination					Mitigation Measures
	All Impacts (except Biological Resources)	Biological Resource Impacts				
		Sensitive Habitats	Key Special -Status Species	Other Species of Concern	Common Habitats and Species	
GROUNDWATER						
Impact 5.5.4-1: Alteration of stream flows along Pilarcitos Creek, which could affect groundwater levels and water quality.	LS					None required.
FISHERIES						
Impact 5.5.5-1: Effects on fishery resources in Crystal Springs Reservoir (Upper and Lower).	PSU					**Measure 5.5.5-1, Create New Spawning Habitat Above Crystal Springs Reservoir:** The SFPUC will survey the extent and quality of fish spawning habitat lost due to inundation and, if feasible, create new spawning habitat at a higher elevation. The specifics of this mitigation measure will be determined as part of project-level CEQA review.
Impact 5.5.5-2: Effects on fishery resources in San Andreas Reservoir.	LS					None required.

(Shaded cells) Not applicable

TABLE S.7 (Continued)
SUMMARY OF WATER SUPPLY IMPACTS AND MITIGATION MEASURES – PENINSULA WATERSHEDS

Impact	Significance Determination					Mitigation Measures
	All Impacts (except Biological Resources)	Biological Resource Impacts				
		Sensitive Habitats	Key Special-Status Species	Other Species of Concern	Common Habitats and Species	
FISHERIES (cont.)						
Impact 5.5.5-3: Effects on fishery resources along San Mateo Creek.	LS					None required.
Impact 5.5.5-4: Effects on fishery resources in Pilarcitos Reservoir.	PSM					**Measure 5.5.3-2b, Aeration System at Pilarcitos Reservoir –** see description above.
Impact 5.5.5-5: Effects on fishery resources along Pilarcitos Creek below Pilarcitos Reservoir.	PSM					**Measure 5.5.3-2a, Low-head Pumping Station at Pilarcitos Reservoir** – see description above. **Measure 5.5.5-5 Establish Flow Criteria, Monitor and Augment Flow –** The SFPUC will develop a monitoring and operations plan for Stone Dam to ensure WSIP-related flow reductions downstream of Stone Dam do not impair steelhead passage and spawning during the winter months of normal and wetter hydrologic years.
TERRESTRIAL BIOLOGY						
Impact 5.5.6-1: Impacts on biological resources in Upper and Lower Crystal Springs Reservoirs.		PSM	PSM	PSM	PSM	The SFPUC will implement Measures 5.5.6-1a and 5.5.6-1b to reduce adverse impacts on sensitive habitats, key special-status species, other species of concern, and common habitats and species to a less-than-significant level. In addition, the SFPUC will implement Measure 5.5.6-1c to mitigate adverse impacts to key special-status plant species (i.e., fountain thistle) adapted to serpentine seeps. **Measure 5.5.6-1a, Adaptive Management of Freshwater Marsh and Wetlands at Upper and Lower Crystal Springs Reservoirs:** The SFPUC will develop an adaptive management plan to minimize adverse effects of the WSIP-induced rise in average water levels, and periodic drawdown of reservoir water levels for maintenance, on San Francisco garter snakes and red-legged frogs. **Measure 5.5.6-1b, Compensation for Impacts on Terrestrial Biological Resources:** The SFPUC will protect, restore, and enhance existing wetland and upland habitat and/or create new habitat that compensates for WSIP-induced habitat losses at

Not applicable (shaded cells)

TABLE S.7 (Continued)
SUMMARY OF WATER SUPPLY IMPACTS AND MITIGATION MEASURES – PENINSULA WATERSHEDS

Impact	Significance Determination					Mitigation Measures
	All Impacts (except Biological Resources)	Biological Resource Impacts				
		Sensitive Habitats	Key Special-Status Species	Other Species of Concern	Common Habitats and Species	
						Crystal Springs Reservoir. Compensatory habitat may be provided as part of the SFPUC's Habitat Reserve Program. **Measure 5.5.6-1c, Compensation for Serpentine Seep-Related Special-Status Plants:** The SFPUC will protect, restore, and enhance existing habitat and/or create new habitat that compensates for WSIP-induced habitat losses for plant species adapted to serpentine seeps.

[shaded box] Not applicable

TABLE S.7 (Continued)
SUMMARY OF WATER SUPPLY IMPACTS AND MITIGATION MEASURES – PENINSULA WATERSHEDS

Impact	Significance Determination					Mitigation Measures
	All Impacts (except Biological Resources)	Biological Resource Impacts				
		Sensitive Habitats	Key Special -Status Species	Other Species of Concern	Common Habitats and Species	
TERRESTRIAL BIOLOGY (cont.)						
Impact 5.5.6-2: Impacts on biological resources in San Andreas Reservoir.		LS	LS	LS	LS	None required.
Impact 5.5.6-3: Impacts on biological resources along San Mateo Creek below Lower Crystal Springs Dam.		LS	LS	LS	LS	None required.
Impact 5.5.6-4: Impacts on biological resources in Pilarcitos Reservoir.		LS	PSM	LS	LS	**Measure 5.5.3-2c, Habitat monitoring and Compensation** - The SFPUC will protect, restore, and enhance existing habitat and/or create new habitat that compensates for WSIP-induced habitat losses at Pilarcitos Reservoir. Compensatory habitat may be provided as part of the SFPUC's Habitat Reserve Program.
Impact 5.5.6-5: Impacts on biological resources along Pilarcitos Creek below Pilarcitos Reservoir.		LS	LS	LS	LS	None required.
Impact 5.5.6-6: Impacts along Pilarcitos Creek below Stone Dam.		LS	LS	LS	LS	None required.
Impact 5.5.6-7: Conflicts with the provisions of adopted conservation plans or other approved biological resource plans.		LS				None required.
RECREATIONAL AND VISUAL RESOURCES						
Impact 5.5.7-1: Effects on recreational facilities and/or activities.	LS					None required.
Impact 5.5.7-2: Visual effects on scenic resources or the visual character of water bodies.	LS					None required.

86 Not applicable

TABLE S.8
SUMMARY OF WATER SUPPLY IMPACTS AND MITIGATION MEASURES – WESTSIDE GROUNDWATER BASIN

Impact	Significance Determination		Mitigation Measures
	North Westside Groundwater Basin	South Westside Groundwater Basin	
Impact 5.6-1: Basin overdraft due to pumping from the Westside Groundwater Basin.	PSM	LS	The SFPUC will implement Measure 5.6.1 to reduce adverse impacts to the North Westside Groundwater Basin to a less-than-significant level. **Measure 5.6-1, Groundwater Monitoring to Determine Basin Safe Yield:** The SFPUC will continue ongoing groundwater and lake level monitoring programs to determine the safe yield of the North Westside Groundwater Basin in order to avoid overdraft and associated effects including adverse effects on surface water features and seawater intrusion
Impact 5.6-2: Changes in water levels in Lake Merced and other surface water features, including Pine Lake, due to decreased groundwater levels in the Westside Groundwater Basin.	PSM	N/A	The SFPUC will implement Measures 5.6.1 and 5.6-2 to reduce adverse impacts to the North Westside Groundwater Basin to a less-than-significant level. **Measure 5.6-1, Groundwater Monitoring to Determine Basin Safe Yield** – see description above. **Measure 5.6-2, Implementation of a Lake Level Management Plan:** The SFPUC will develop and implement a lake level management plan identifying strategies for altering pumping patterns or lake augmentation to maintain Lake Merced water levels within the desired long-term range.
Impact 5.6-3: Seawater intrusion due to decreased groundwater levels in the Westside Groundwater Basin.	PSM	LS	The SFPUC will implement Measure 5.6.1 to reduce adverse impacts to the North Westside Groundwater Basin to a less-than-significant level. **Measure 5.6-1, Groundwater Monitoring to Determine Basin Safe Yield** – see description above.
Impact 5.6-4: Land subsidence due to decreased groundwater levels in the Westside Groundwater Basin if the historical low water levels are exceeded.	LS	LS	None required.

[a] Mitigation measure text is summarized; please see Chapter 6 for details.

TABLE S.8 (Continued)
SUMMARY OF WATER SUPPLY IMPACTS AND MITIGATION MEASURES – WESTSIDE GROUNDWATER BASIN

Impact	Significance Determination		Mitigation Measures
	North Westside Groundwater Basin	South Westside Groundwater Basin	
Impact 5.6-5: Contamination of drinking water due to groundwater pumping in the Westside Groundwater Basin.	PSM	PSM	The SFPUC will implement Measure 5.6.5 to reduce adverse impacts to the North Westside and South Westside Groundwater Basins to a less-than-significant level. **Measure 5.6.5, Drinking Water Source Assessments for Groundwater Wells:** The SFPUC will develop and implement a source water protection program for wells constructed under the Local and Regional Groundwater Projects that are considered vulnerable to contamination on the basis of the drinking water source assessment prepared in accordance with Department of Health Services regulations.
Impact 5.6-6: Drinking water contaminants above maximum contaminant levels and adverse effects of adding treated groundwater to the distribution system.	LS	LS	None required.

TABLE S.9
SUMMARY OF WATER SUPPLY IMPACTS AND MITIGATION MEASURES – CUMULATIVE WATER SUPPLY

Cumulative Water Supply Impact	Cumulative Impact Significance Determination							Mitigation Measures
	Hydrology	Geomorphology	Surface Water Quality	Groundwater	Fisheries	Terrestrial Biology	Recreation / Visual Quality	
Impact 5.7.2-1: Tuolumne River – Hetch Hetchy Reservoir to Don Pedro Reservoir.	LS	LS	LS	LS	LS	LS	LS	None required.
Impact 5.7.2-2: Tuolumne River – Don Pedro Reservoir to the San Joaquin River.	LS	LS	LS	LS	LS	LS	LS	None required.
Impact 5.7.2-3: San Joaquin River, Stanislaus River, and the Delta.	LS	LS	LS	LS	LS	LS	LS	None required.
Impact 5.7.3-1: Alameda Creek watershed.	N/A	LS	LS	LS	LS	LS	LS	None required.
Impact 5.7.4-1: San Mateo Creek watershed.	LS	LS	LS	LS	LS	LS	LS	None required.
Impact 5.7.4-2: Pilarcitos Creek watershed.	LS	LS	LS	LS	LS	LS	LS	None required.
Impact 5.7.5-1: North Westside Groundwater Basin.	LS							None required.
Impact 5.7.5-2: South Westside Groundwater Basin.	LS							None required.

NOTE: Significance determinations presented in this table assume implementation of all mitigation measures as they are presented in Chapter 5, Section 5.6, and described in Chapter 6.

Due to the proposed increase in diversions from the Tuolumne River and changes in system operations, implementation of the WSIP would result in changes in reservoir levels and associated changes in downstream flows in rivers or creeks in the three affected watersheds. In all three watersheds, these hydrologic changes could in turn result in impacts on geomorphology of the water body, groundwater, water quality, fisheries, terrestrial biological resources, and recreational and visual resources. In the Tuolumne River watershed, changes in stream flow could also affect downstream water supplies and hydropower generation. In the Alameda Creek and Peninsula watersheds, implementation of the WSIP would include restoration of the historical storage capacities of Calaveras and Lower Crystal Springs Reservoirs, respectively, resulting in impacts on reservoir levels, downstream flows, fisheries, terrestrial biological resources, and visual resources. In addition, implementation of the WSIP would include development of groundwater supplies in the North Westside Groundwater Basin as well as a conjunctive-use program in the South Westside Groundwater Basin. Identified impacts on these resources were determined to be less than significant with implementation of the mitigation measures described in Chapter 6, with the exception of the following:

- The WSIP would result in a significant and unavoidable impact in the Alameda Creek watershed on the flow along Alameda Creek below the Alameda Creek Diversion Dam (Chapter 4, Section 5.4.1).
- The WSIP would result in a potentially significant and unavoidable impact in the San Mateo Creek watershed on fishery resources in Crystal Springs Reservoir (Chapter 4, Section 5.5.5).

Growth Inducement (Chapter 7)

The WSIP would support planned growth in the existing SFPUC service area, although some growth associated with the availability of water would occur irrespective of the WSIP due to already planned increases in water delivery efficiencies throughout the service area (e.g., plumbing code changes), conservation, and other water supply sources. Some customers have multiple sources of supply and do not rely on the SFPUC system to meet all of their existing or future water demands; in these areas, other sources of supply may also support additional growth in the service area. In some areas, the WSIP could support a degree of population and/or employment above that planned for in jurisdictions' adopted general plans, as indicated by a comparison of the levels of growth assumed in WSIP demand studies and general plan documents. In some jurisdictions (Foster City, Half Moon Bay, Milpitas, and Burlingame), the WSIP could support more population growth than is forecasted in adopted general plans. In other jurisdictions (East Palo Alto, Foster City, San Bruno, Fremont, Newark, and Union City), the WSIP could support more employment growth than is forecasted in the adopted general plans of the respective jurisdictions.

The existing service area includes areas in four counties (San Francisco, San Mateo, Santa Clara, and Alameda) that are within the core of the nine-county Bay Area. Growth in the communities served by the SFPUC regional system would primarily be infill development within already developed Bay Area communities. This growth is representative of the "smart growth" principles promoted by the Association of Bay Area Governments (ABAG) to minimize urban and suburban sprawl and concentrate additional development in the existing core areas.

Indirect Effects of Growth Supported by the WSIP

As identified in Impact 7-1, the WSIP would indirectly contribute to environmental impacts caused by growth; some of these impacts would be unavoidable. The WSIP would support some of the growth that is reflected in the adopted land use plans of jurisdictions in the SFPUC service area. The EIRs prepared for general plans and related land use plans in the service area identified impacts of planned growth and mitigation measures to reduce the impacts. Some of the impacts of planned growth cannot be reduced to a less-than-significant level. In these cases, the respective decision-making body (e.g., city council) identified overriding considerations that justified adoption of the general plan despite its adverse impacts. Due to the longer planning horizon of the WSIP and relative age of some of the adopted general plans, as well as differing expectations about the level of job growth that will occur in the coming decades, in some jurisdictions not all of the growth that the WSIP would in part support has been addressed in adopted land use plans or evaluated in the plans' CEQA documents. Therefore, growth supported by the WSIP could result in impacts that are somewhat more severe than those identified in the general plan EIRs, although it is likely that the impacts would be similar in kind to those previously identified.

Potential impacts beyond those previously identified would generally be related either to increased density of development or to the conversion of less developed areas to urban uses. The measures specified in adopted general plans and related land use plans and their CEQA documents to mitigate the impacts of growth should also serve to reduce the impacts of growth supported by the WSIP. In addition, although the EIRs reviewed for this PEIR were prepared prior to the passage of the California Global Warming Solutions Act of 2006 and do not include assessments of impacts from greenhouse gas emissions, it is expected that planned growth in the area could result in a significant and unavoidable contribution to greenhouse gas emissions resulting from increased fossil fuel use for transportation, increased industrial and commercial activities, domestic fuel combustion, operation of power plants, and oil refining. The key regional effects of planned growth relate to air quality, traffic congestion, and water quality. Regional agencies, including the Metropolitan Transportation Commission, Bay Area Air Quality Management District, and Regional Water Quality Control Board, and the jurisdictions in the service area, are working both regionally and locally to address these impacts.

By providing water to support planned growth, the WSIP would help to mitigate the impact of insufficient water supply that was identified in the general plans EIRs of some jurisdictions in the service area.

Significant, Irreversible Environmental Changes

Construction and operational impacts associated with implementation of the WSIP projects would result in an irretrievable and irreversible commitment of natural resources through the use of fossil fuels and construction materials. Operation of project facilities would incrementally increase power consumption associated with water facilities, even though operation of SFPUC facilities would predominantly use hydropower. The program's incremental increased use of these resources, however, would not significantly increase the overall commitment of resources associated with water treatment and distribution. The program would involve only minor incremental use of nonrenewable resources and would locate facilities primarily on lands already committed to water treatment and supply purposes. Furthermore, since the SFPUC would implement the mitigation measures identified in this PEIR in concert with other ongoing stewardship and watershed protection activities, implementation of the WSIP would not result in significant irreversible environmental changes. When completed, the program would provide a high level of public health protection against potential seismic hazards as well as increase the long-term reliability of the drinking water throughout the SFPUC service area.

S.4 Areas of Controversy and Issues to be Resolved

Areas of Controversy

The San Francisco Planning Department circulated a Notice of Preparation (NOP) to prepare an EIR on the WSIP on September 6, 2005. Comments submitted during the NOP review period and scoping meetings raised issues regarding the scope and content of the Draft PEIR as well as the WSIP. Appendix A further describes the scoping process and summarizes the public comments received. Areas of controversy highlighted in this section include select items of particular public concern (as evidenced by the number of comments received during scoping on a topic and/or by a divergence of opinion on an issue) as well as topics identified during preparation of the Draft PEIR. These topics are organized into the following categories: Proposed Program; Impact Analysis – Assumptions and Methods; Environmental Impacts; and Alternatives.

Proposed Program

Comments received during the scoping process raised questions about the level of service objectives established by the SFPUC for the regional system and reflected in the WSIP, as follows:

- *Demand Estimates / Customer Purchase Request Increase*. Comments were received on the methods used for estimating future water needs, and whether and how the SFPUC's customers incorporated conservation and local water recycling projects into their future purchase request estimates. The approach to developing the customer purchase requests for 2030 is explained in detail in the 2004 San Francisco Public Utilities Commission Purchase Estimates Technical Memorandum. This approach is summarized in Chapter 3, Program Description, and Chapter 7, Growth-Inducement Potential.

  Comments were received on the ability to accurately project growth and associated water supply requirements through 2030. Water agencies must routinely develop relatively long-range projections (e.g., 15 to 25 years) regarding water supply and reliability service needs within their service areas in order to guide water system improvement and supply planning efforts. The SFPUC worked closely with its wholesale customers to support the development of future purchase estimates for their communities. Many customers, in turn, used growth projections prepared by ABAG. ABAG is the agency responsible for providing regional growth projections for the Bay Area and issues revised projections every five years. Chapter 7 includes an evaluation of the consistency between customers' demand projections and the corresponding future purchase requests using ABAG projections. Finally, while implementation of the WSIP would prepare the SFPUC to meet the projected 2030 customer purchase requests, customers would only purchase and receive additional water as needed when additional demand for water actually occurs.

- *Unfiltered Water Goal / Filtration Avoidance.* The SFPUC considers maintaining a system that can deliver high-quality water that does not require filtration to be an overarching principle to be used in developing the WSIP. Some commentors raised concerns that this objective limits the potential to consider other water supply alternatives, since few supply sources can meet this goal. The discussion and analysis in Chapter 9, Alternatives, considers the filtration avoidance principle along with other program objectives and factors in the evaluation of alternatives to the proposed program.

- *Drought Planning Assumptions – Design Drought*. Comments were provided during scoping on the drought assumptions used by the SFPUC to develop the WSIP. A necessary aspect of future water supply planning includes drought planning. Water agencies typically consider one or more potential drought scenario(s), or "design drought," in developing their drought response plans. The SFPUC developed and used an 8.5-year design drought for its planning purposes. The most recent drought experienced in the Bay Area was 6.5 years (1986 through 1992). The 8.5-year design drought represents a reasonable, worst-case scenario for planning purposes. Some commentors expressed concern that this planning assumption was too conservative and that the SFPUC should lower its objective for drought planning. Since the PEIR analysis assumes the SFPUC's 8.5-year design drought, the analysis considers the effect of actions needed in the event such a drought occurred. If this assumed drought scenario does not occur in the future, some impacts identified in the PEIR would be less severe than assumed, particularly those associated with actions taken to recover from such a severe drought.

- *Rationing Objective*. As part of its drought response planning for service through 2030, the SFPUC established a goal of limiting rationing to a maximum of 20 percent systemwide and used this level of service objective in developing the WSIP. Under the WSIP, the SFPUC could impose systemwide rationing of up to 20 percent in any one year of a drought. Commentors have argued that this planned maximum level of rationing is both too high and too low. Specifically, the BAWSCA expressed concern on behalf of its member agencies (the SFPUC wholesale customers) that this level of rationing would result in substantial hardship and economic impact on customers in the regional system service area. Other commentors suggested that system customers could implement higher levels of rationing and water conservation to reduce the need for additional water supplies during a drought. Chapter 8, WSIP Variants, analyzes a variation of the proposed WSIP that includes a 10 percent maximum systemwide rationing goal rather than the 20 percent goal. Chapter 9, Alternatives, further discusses the potential for additional conservation by the system customers and the potential effects of rationing that is greater than 20 percent.

- *San Joaquin Pipelines*. Many commentors raised concerns during scoping about an initial proposal to include a San Joaquin Pipeline No. 4 project in the WSIP to construct a new, fourth pipeline across the San Joaquin Valley, and that the PEIR needed to fully analyze the effects of such a pipeline project on the SFPUC's ability to expand the capacity of the water system in the future. This project was subsequently removed from the program and replaced with a modified version of the original proposal. The modified proposal does not include construction of a completely new fourth pipeline extending across the valley, but instead adds segments of new pipeline in select reaches along with two crossover facilities between the existing pipelines. A description of the modified project (San Joaquin Pipeline System) is included in Chapter 3, Program Description.

Impact Analysis – Assumptions and Methods

- *Environmental Baseline*. The CEQA Guidelines indicate that, in most cases, the potential environmental impacts of a project should be determined relative to the existing conditions that occur at the time the environmental process is initiated. In accordance with CEQA, mitigation measures are required, if feasible, when a project would have a significant effect on the existing environmental conditions. A project sponsor is not required to implement mitigation measures to remedy the environmental impacts caused by past actions. The effects of past actions are taken into consideration in the impact analysis insofar as the existing environmental conditions reflect the effects of such past actions. For example, the existing condition of riparian habitat along a creek may be degraded today because of a past action, such as the previous construction of a dam that altered downstream flows; or conversely, a particular fishery population may have been enhanced as a result of a past action, such as construction of a reservoir. The environmental conditions that currently exist reflect the effects of past actions and ongoing activities and operations.

  For the WSIP, the environmental conditions as they existed in the year 2005, when the PEIR process began, represent the environmental baseline for the purpose of determining the impacts of the WSIP. As discussed above, while these existing baseline conditions reflect the effects of past actions, the EIR does not analyze the impacts of past actions on those existing conditions, nor does it require mitigation for past environmental impacts.

- *Evaluation of Water Resource Impacts and Use of Modeling Tools*. Comments were received about the approach to evaluation of potential water resource impacts and, with respect to the Tuolumne River, about the need for environmental baseline studies prior to PEIR preparation. Concerns were raised about the use of computer models as part of the impact analysis, and whether the models would be accurate enough to adequately identify impacts.

  The PEIR makes use of the best available information regarding the environmental setting in areas potentially affected by the WSIP and also employed computer modeling tools to aid in the impact analysis. The SFPUC has developed a computerized mathematical model to assist in the evaluation of its water system operations: the Hetch Hetchy/Local Simulation Model (HH/LSM). This water supply planning model represents the best available tool for assessing the effects on water resources resulting from changes in regional system operations. Section 5.1 provides a summary description of the model; additional detail is provided in Appendix H.

The model includes information about key aspects of the SFPUC regional system and provides the most comprehensive approach to evaluating changes throughout the system. The model makes use of 82 years of historical hydrologic data (actual past precipitation data) and simulates system operations over the course of this 82-year sequential hydrologic period, from July 1920 through September 2002. This 82-year period includes many different types and sequences of actual hydrologic events ranging from floods to droughts of different magnitude and duration. Because natural river systems are dynamic and runoff and flow vary each year, and as it is not possible to predict future precipitation, it is a necessary and standard industry practice to use a long-term historical record to represent the range of hydrologic conditions that can be expected in the future. The model is used to assess both how the regional water system would perform in terms of meeting the system objectives established for the WSIP and what types of impacts the program might have under a broad range of hydrologic conditions.

The model does have limitations in terms of its ability to reflect the changing day-to-day operations of the system. The model uses a monthly time step, reporting changes on a monthly basis in such factors as reservoir storage levels or the volume of water released from a reservoir. This monthly timeframe is adequate for the assessment of most impact issues. However, the system operators can and do make changes in system operations on a weekly or even daily basis in some instances. To address those instances where monthly information is not sufficient for the analysis of a particular impact, the PEIR also makes use of information from the actual regional system operators rather than the model.

Environmental Impacts

- *Alameda Creek – Potential Steelhead Restoration in Alameda Creek*. Commentors raised concerns about potential effects of the program on steelhead and the potential for steelhead restoration in Alameda Creek. For the purposes of full disclosure, the PEIR provides a discussion of steelhead in lower Alameda Creek and the potential for steelhead to be restored to the upper reaches of Alameda Creek (above the BART weir). In addition to migration barriers, reduced winter and spring flows in Alameda Creek above the BART weir would limit migration and spawning if steelhead were to gain access upstream. The Alameda Creek Fisheries Restoration Workgroup (Workgroup), formed for the purpose of restoring steelhead to Alameda Creek, will be undertaking a series of flow studies to determine the flows necessary to support steelhead in the watershed. The Workgroup includes the SFPUC, Alameda County Flood Control and Water Conservation District, Alameda County Resource Conservation District, Alameda County Water District, Alameda Creek Alliance, California State Coastal Conservancy, California Department of Fish and Game, East Bay Regional Park District, National Marine Fisheries Service, Natural Resources Defense Council, Pacific Gas and Electric Company, and the Zone 7 Water Agency.

  While this restoration planning is in progress, because steelhead access does not currently exist and there is no current steelhead migration above the BART weir, there would be no impact on steelhead migration, spawning, or juvenile rearing upstream of the BART weir as a direct result of WSIP implementation compared to the existing condition. However, to address the potential that steelhead could regain access to the upper Alameda Creek watershed in the event that planned and proposed projects and actions designed to restore steelhead in Alameda Creek are successfully implemented, a cumulative impact assessment for potential future-occurring steelhead was conducted.

- *Economic Impacts.* Comments were raised about potential economic impacts associated with proposed rationing during a drought. CEQA requires analysis of physical changes in the environment and does not require analysis of potential economic effects, unless an economic effect would, in turn, indirectly result in a physical environmental effect. Chapter 5, Water Supply and Systems Operations, evaluates the environmental effects of the proposed water supply option, and Chapter 9, Alternatives, discusses the potential environmental effects of alternatives to the program, including increased levels of conservation and increased rationing requirements. The discussion in Chapter 9 acknowledges that increased rationing and/or aggressive conservation could result in economic impacts within the SFPUC service area, but these effects would not be expected to result in significant, physical environmental effects.

  With respect to potential economic effects due to increased Tuolumne River diversions, as discussed in Chapter 5, Section 5.3, the WSIP's impact on hydrology and related effects on recreational resources would be less than significant or could be mitigated to a less-than-significant level; consequently, there are no expected economic effects from the WSIP on Tuolumne River recreational users.

- *Growth-Inducement Potential and Secondary Effects.* Comments on growth inducement primarily concerned whether the 2030 customer purchase requests for water supply associated with the WSIP would provide for growth beyond the SFPUC's existing service area. The proposed program would not expand the existing service area to support 2030 customer purchase requests, but would support urban infill development. The existing service area includes four counties (San Francisco, San Mateo, Santa Clara, and Alameda) and areas within those counties that are within the core of the nine-county Bay Area. Growth in the communities served by the SFPUC regional system would primarily be infill development within already developed Bay Area communities. This growth is representative of the "smart growth" principles promoted by ABAG to minimize urban and suburban sprawl and concentrate additional development in the existing core areas.

Alternatives

- *Restore Hetch Hetchy Valley / Remove O'Shaughnessy Dam.* Construction of Hetch Hetchy Reservoir was controversial when it was approved by Congress in 1913 and remains so today. Commentors requested analysis of a proposal to remove O'Shaughnessy Dam and to restore Hetch Hetchy Valley. Doing so would require developing a replacement water supply for the SFPUC regional system. In 2004, the Environmental Defense Fund prepared a planning-level analysis for replacing the water and hydropower benefits provided by the Hetch Hetchy Reservoir and O'Shaughnessy Dam. The suggested supply alternatives included expansion of New Melones Reservoir on the Stanislaus River, expansion of Don Pedro Reservoir downstream on the Tuolumne River, and/or diversion from the Delta.

  Regardless of the merits of removing O'Shaughnessy Dam under this proposal, as explained in Chapter 9, Alternatives, the dam removal proposal does not satisfy the CEQA requirements for an alternative to the WSIP. The CEQA Guidelines state that an EIR must describe and evaluate a reasonable range of alternatives to the proposed project that would feasibly attain most of the project's basic objectives and avoid or substantially lessen any significant adverse environmental effects. This proposed alternative is a different project proposal in its own right, with a completely different set of goals and objectives from the WSIP; water supply replacement is required by this proposal, but upgrading the regional system facilities and improving the system's water quality, seismic, delivery, and supply reliability are not central objectives of this proposal. Further, this alternative proposal is not reasonably related to the reduction or elimination of the significant impacts that could occur with implementation of the proposed program, but suggests far greater changes than would be necessary to address any impacts that the WSIP would cause on the Tuolumne River and related resources. To the extent that Tuolumne River water would continue to be diverted under this alternative proposal, it would be likely to result in similar impacts as the WSIP. Further, the proposal itself is likely to result in numerous, significant environmental impacts associated with construction and operation of unknown new storage, conveyance, and treatment facilities at unknown locations and would require increased long-term energy requirements compared to the Hetch Hetchy system, which is gravity-driven and not subject to water filtration requirements. In addition, there would likely be significant impacts related to the diversion of Tuolumne River water elsewhere, as well as impacts on any other surface water bodies developed to replace Tuolumne River supply and their associated resources. For these reasons, this alternative is not evaluated in detail in this PEIR.

- *Alternative Water Supply Sources Other than the Tuolumne River*. Increasing diversions from the Tuolumne River is controversial. Many commentors requested evaluation of alternatives to this element of the WSIP, including increasing demand management efforts (conservation and water recycling) and other alternative supply sources. Further, the San Francisco Board of Supervisors has called for the PEIR to evaluate an alternative that involves no increase in Tuolumne River diversions. These alternative supply proposals are controversial for the SFPUC's water customers, since the Tuolumne River is a high-quality, secure source of supply to which the CCSF already has rights, and the use of additional Tuolumne River water would maximize the use of existing facilities and require few additional facility projects in contrast to other alternatives. In Chapter 9, the PEIR discusses the following alternatives to address these requests for program alternatives: Aggressive Conservation/Water Recycling and Local Groundwater (with and without supplemental Tuolumne River diversions), Year-round Desalination at Oceanside, and Regional Desalination for Drought.

Issues to Be Resolved

Section S.5, below, identifies the actions necessary for the overall adoption and approval of the WSIP. Following certification of the PEIR by the San Francisco Planning Commission, in order to adopt the WSIP, the SFPUC must make findings for each significant effect identified in the PEIR and determine whether it will adopt each mitigation measure (and if not, why).

As further project details are known about the facility improvement projects and site-specific information is gathered, it is possible that individual project effects identified in this document might not occur or that additional project effects not identified in this document would occur. Such changes in project details will be addressed during project-specific environmental review.

In considering approval of the WSIP as proposed, the SFPUC would be considering a commitment to: (a) meet the 2030 customer purchase request increase, (b) secure and develop the proposed water supply portfolio for long-term supply to the regional service area,

(c) establish a 20 percent maximum system rationing limit during a drought, (d) implement the 22 facility improvement projects evaluated in the PEIR to improve the regional water system, and (e) operate the system in accordance with the level of service goals and system performance objectives established for the WSIP. The proposed water supply option adds recycled water, local groundwater, conservation, water transfers, and regional groundwater conjunctive use to the SFPUC's water supply portfolio for the system, while continuing to rely predominantly on Hetch Hetchy system water and local watershed supply captured in local reservoirs.

S.5 Required Actions and Approvals (Chapter 3)

The following list identifies the approvals necessary for overall adoption and approval of the WSIP, including adoption of the proposed levels of service and water supply option, and general approval of the facility improvement projects. The approval and adoption of the overall WSIP as a program and policy are distinct actions from the approvals for individual facility improvement projects.

Approvals and actions applicable to the overall WSIP include:

- *San Francisco Planning Commission*
  - Certifies Final PEIR on the WSIP
- *San Francisco Public Utilities Commission*
  - Reviews Final PEIR and adopts CEQA findings and mitigation monitoring and reporting program
  - Approves and adopts the WSIP
- *San Francisco Board of Supervisors*
  - Hears and decides any appeals of the Planning Commission's certification of the Final PEIR

Implementation of the WSIP could involve the following additional discussion and actions by the agencies listed below:

- *San Francisco Public Utilities Commission*
  - Approves any water transfer agreements with TID, MID, or other agencies
  - Approves contracts for the construction of WSIP facility improvement projects
  - Approves operating agreements for the Westside Basin conjunction-use program
  - Annually reviews its cost of utility service and revises the rate schedules applicable to retail water sales as required[1]

[1] Retail water sales include sales to Lawrence Livermore National Laboratory, the Town of Sunol, and approximately 190 other retail customers (see list of major water customers in Table 3.1). The SFPUC sells water to Groveland Community Services District under the terms of a 1984 contract that allows the water rate to be adjusted every four years.

   - Approves any water sales agreements with SFPUC wholesale and retail customers

- *San Francisco Planning Department/Planning Commission*
   - Conducts ongoing environmental review of individual facility improvement projects as well as compliance with mitigation and monitoring reporting program during WSIP implementation
   - Makes determinations of consistency with the San Francisco General Plan, if needed, for projects requiring certain approvals by the Board of Supervisors

- *San Francisco Board of Supervisors*
   - Appropriates funding for implementation of the WSIP projects, including general obligation bond monies and annual budget appropriations
   - May reject rates and charges that the SFPUC establishes for water customers by resolution within 30 days of adoption by the SFPUC
   - Considers appeals of EIR certifications and negative declaration approvals by the San Francisco Planning Department

- *State Water Resources Control Board*
   - Reviews and authorizes any transfer under a post-1914 water right that may be necessary to implement long-term water transfers with TID or MID

- *Turlock and Modesto Irrigation Districts*
   - Review and approve water transfer agreements with the SFPUC and/or amendments to the SFPUC's water bank account in Don Pedro Reservoir

- *SFPUC wholesale and retail water customers*
   - Approves any agreements between SFPUC and individual wholesale and retail customers

- *Daly City, California Water Service Company's South San Francisco service area, and San Bruno*
   - Approve operating agreement(s) for the Westside Basin conjunctive-use program (Regional Groundwater Projects), including approval of new system wells

S.6 WSIP Variants (Chapter 8)

The SFPUC requested that the PEIR also include environmental assessment of four variants to the WSIP. The WSIP variants are essentially the same as the proposed program except for minor differences in water supply sources or rationing limits. The variants are not intended to serve as CEQA alternatives, which are discussed separately in the PEIR. This evaluation of the variants is provided to allow decision-makers to compare the environmental impacts of the variants to those of the WSIP.

Variant 1 – All Tuolumne

Variant 1 – All Tuolumne is the same as the proposed program in all respects except for one. Instead of developing 10 mgd of additional supply sources through recycled water, groundwater, and conservation projects in San Francisco, the SFPUC would rely exclusively on increased diversions from the Tuolumne River to serve the 2030 increase in purchase requests of 35 mgd during most (nondrought) years. All other aspects of the proposed water supply option would be the same, and all of the same facility improvement projects would be implemented, with the exception of the recycled water and groundwater projects in San Francisco. The environmental analysis determined that Variant 1 would result in slightly more severe impacts on the Tuolumne River resources compared to the WSIP, although it would avoid potential impacts on the North Westside Groundwater Basin. However, all other water supply and system operations impacts and mitigation measures would be the same as under the WSIP. There would be no additional impacts, and no additional mitigation measures would be required. Facilities-related impacts under Variant 1 would be slightly less than those of the WSIP, since construction and operational impacts associated with the recycled water and groundwater projects in San Francisco would not occur.

Variant 2 – Regional Desalination for Drought

Variant 2 – Regional Desalination for Drought would be identical to the WSIP except that, instead of relying on water transfers with TID and MID as a supplemental dry-year supply, the SFPUC would receive water from a regional desalination plant during droughts. All other aspects of the proposed water supply option would be the same, and all of the same facility improvement projects would be implemented. The SFPUC is currently participating with the East Bay Municipal Utility District, Contra Costa Water District, and Santa Clara Valley Water District in studying the feasibility of developing a Bay Area Regional Desalination Plant (BARDP). Depending on the location of BARDP, the SFPUC would either receive desalinated water directly from the plant for blending in the regional system or arrange for an exchange with other water agencies through existing interties connected to the regional system. The environmental impacts of Variant 2 would be essentially the same as those of the WSIP, with a very slight reduction in impacts on Tuolumne River resources, since water transfers from TID and MID during dry years would not occur. However, due to the extent of additional facilities required for the BARDP and associated conveyance facilities, this variant would have substantially greater facilities-related impacts than the WSIP, most notably the increased energy impacts and water quality/biological resources impacts associated with seawater intake structures and brine disposal.

Variant 3 – 10% Rationing

Variant 3 – 10% Rationing would be the same as the WSIP in all respects, except that the maximum systemwide rationing limit during droughts would be reduced from 20 to 10 percent. To achieve this reduction in the rationing limit, the SFPUC would increase the amount of water transfers with TID and MID during dry years, increasing average annual diversions from the Tuolumne River. Variant 3 would otherwise include the same water supply options and facility improvement projects as the WSIP. Variant 3 would result in all the same impacts as the WSIP, except for somewhat more severe impacts on Tuolumne River resources. However, all impacts would be the same as under the WSIP, and no additional mitigation measures would be required.

Variant 4 – Phased WSIP

Variant 4 – Phased WSIP would generally be the same as the WSIP, except that an interim mid-term planning horizon of 2018 would be used instead of the WSIP 2030 planning horizon. Under this variant, all facility improvement projects would be implemented, and the SFPUC would make a decision about future water supply to its customers through 2018 only and defer a decision regarding long-term water supply until after 2018. Variant 4 would limit deliveries from SFPUC watersheds to an annual average of 265 mgd through 2018 and would promote development and implementation of 10 to 20 mgd of additional local conservation, water recycling, and groundwater projects. The environmental impacts of Variant 4 would be essentially the same as those for the WSIP or Modified WSIP Alternative, except for a reduction in impacts on Tuolumne River resources. However, it would result in additional impacts associated with construction and operation of recycled water and groundwater facilities similar to those of the Modified WSIP Alternative.

S.7 Alternatives to the Proposed Program (Chapter 9)

Based on a review of the environmental impacts identified in the PEIR for the WSIP and on input received during the public scoping period, numerous alternative concepts were screened to assess their ability both to meet most of the program objectives established by the SFPUC for the WSIP and to avoid or minimize the significant environmental effects of the proposed program. A range of program alternatives was selected for more detailed review in comparison to the WSIP, as required by CEQA. The alternatives analyzed in the PEIR are summarized below.

With the exception of the No Program Alternative, these alternatives were included in the PEIR because of their apparent ability to meet most of the program's basic objectives, their ability to reduce one or more of the significant impacts associated with program implementation, their potential feasibility, and their collective ability to provide a reasonable range of alternatives to foster informed decision-making and public participation. Analysis of the No Program Alternative is included as required by CEQA.

No Program Alternative

Under the No Program Alternative, the SFPUC would implement only those facility improvement projects driven by regulatory requirements or existing agreements with regulatory agencies. The system would meet the water quality goals of the WSIP, but it would fail to meet the seismic and delivery reliability goals and would have limited ability to serve the increase in customer purchase requests through 2030, particularly during drought periods. The SFPUC would endeavor to meet increasing customer purchase requests through 2030 by diverting additional Tuolumne River water only when available. It would not secure an additional dry-year supply transfer of Tuolumne River water, implement the Westside Basin groundwater conjunctive-use program, or develop the proposed recycled water and groundwater projects in San Francisco. The wholesale customers may decide to pursue supplemental supply sources and/or conservation measures to make up for the reduced reliability and the supply shortfall under this alternative. Compared to the WSIP, this alternative would develop less in terms of new water supplies for the regional system and would implement far fewer of the proposed facility improvement projects.

No Purchase Request Increase Alternative

The No Purchase Request Increase Alternative is designed to serve wholesale customers only the amount of water required under the existing Master Water Sales Agreement between CCSF and each of the wholesale customers; therefore, this alternative would not fully meet the purchase request increase by the SFPUC wholesale customers for additional supply through

2030. Under the No Purchase Request Increase Alternative, the SFPUC would implement all of the proposed WSIP facility improvement projects. It is expected the wholesale customers would pursue supplemental supply sources and/or conservation measures to make up the supply shortfall under this alternative. This alternative was included in the alternatives analysis in an effort to avoid or minimize the potential growth-inducing effects and secondary effects of growth associated with providing more water to the regional customers, and it evaluates the consequences of the SFPUC not meeting the full future purchase request increase.

Aggressive Conservation/Water Recycling and Local Groundwater Alternative

Under this alternative, the SFPUC would implement all of the proposed WSIP facility improvement projects, but would endeavor to serve the projected increase in customer purchase requests through 2030 only through additional conservation, water recycling, and local groundwater projects. It does not appear feasible to fully meet the 2030 purchase requests with reasonably foreseeable conservation, recycled water, and groundwater projects within the service area. Therefore, under the Aggressive Conservation/Water Recycling and Local Groundwater Alternative, the SFPUC would have to either: (a) limit future customer purchase deliveries to the level that can be met, short of the 2030 requests (approximately 294 mgd instead of 300 mgd average annual) and increase the level of rationing to 25 percent or more during droughts, or (b) provide a supplemental supply to make up the delivery shortfall to meet the 300 mgd. As a result, two scenarios are discussed in the PEIR:

> **No Supplemental Tuolumne River Supply** – The SFPUC would not provide a supplemental supply of water from the Tuolumne River to augment this alternative to meet the 2030 customer purchase requests of 300 mgd.
>
> **With Supplemental Tuolumne River Supply** – The SFPUC would supplement this alternative with additional Tuolumne River diversions under its existing water rights.

These two alternatives represent alternative sources of supply and different demand delivery levels for the regional system compared to the WSIP. They are evaluated to address the impacts on resources in the Tuolumne River, Alameda Creek, and Peninsula watersheds, including Pilarcitos Creek.

Lower Tuolumne River Diversion Alternative

Under the Lower Tuolumne River Diversion Alternative, the SFPUC would implement all of the proposed facility improvement projects and would serve the projected increase in customer purchase requests through 2030 through diversions from the lower Tuolumne River near its confluence with the San Joaquin River, assuming it could reach agreement with TID and MID. This alternative would include construction and operation of additional conveyance and treatment facilities to divert, transport, treat, and blend the new supply into the regional system. Compared to the WSIP, this alternative represents an alternative source of supply and is evaluated to address impacts on the Tuolumne River and related resources.

Year-round Desalination at Oceanside Alternative

Under the Year-round Desalination at Oceanside Alternative, the SFPUC would implement all of the proposed WSIP facility improvement projects and would construct a 25-mgd desalination plant in San Francisco to serve the projected increase in customer purchase requests through 2030. This alternative would not involve increased levels of diversions from the Tuolumne River. The desalination plant would provide year-round supplies during all hydrologic year types to blend into the regional system at the Sunset Reservoir in San Francisco. Compared to the WSIP, this alternative represents an alternative source of supply and is evaluated to address the impacts on the Tuolumne River, Alameda Creek, and Peninsula watersheds, including Pilarcitos Creek, and related resources.

Regional Desalination for Drought Alternative

Under the Regional Desalination for Drought Alternative, the SFPUC would implement all of the proposed WSIP facility improvement projects and would partner with other Bay Area water agencies to construct and operate a regional desalination plant that would provide the SFPUC with supplemental supply during drought years. Compared to the WSIP, this alternative represents an alternative source of supply and is evaluated to address the impacts on the Tuolumne River, Alameda Creek, and Peninsula watersheds, including Pilarcitos Creek, and related resources.

Modified WSIP Alternative

Under the Modified WSIP Alternative, the SFPUC would implement all of the proposed facility improvement projects, but would modify proposed system operations to minimize environmental effects. This alternative would include the implementation of key mitigation measures identified in this PEIR, including acquiring a water transfer of conserved water as a supplemental dry-year source, implementing a minimum instream flow requirement for resident fish in a portion of Alameda Creek, modifying operations to accommodate increased demands from the Coastside County Water District, managing the inundation levels at Crystal Springs Reservoir to preserve upland habitat to the extent possible, and increasing recycled water, conservation, and local groundwater in partnership with wholesale customers. This alternative is similar to the WSIP but includes alternate supply sources and system operations. It is evaluated to address the impacts on the Tuolumne River, Alameda Creek, and Peninsula watersheds, including Pilarcitos Creek and Crystal Springs Reservoir, and related resources.

Comparison of Alternatives to the Proposed WSIP

The eight alternatives analyzed in the PEIR would have varying abilities to meet the goals and objectives established by the SFPUC for the WSIP and would have a wide range of additional environmental effects. The No Program, No Purchase Request Increase, and Aggressive Conservation/Water Recycling and Local Groundwater Alternatives would fail to meet one or more key program objectives, while the Lower Tuolumne River Diversion, Year-round Desalination at Oceanside, Regional Desalination for Drought, and Modified WSIP Alternatives appear to meet most of the basic project objectives.

Two alternatives—the Aggressive Conservation/Water Recycling and Local Groundwater Alternative (Without Supplemental Tuolumne River Water) and the Year-round Desalination at Oceanside Alternative—do not involve increases in Tuolumne River diversion over existing average annual levels. Impacts on the Tuolumne River and related resources would be reduced under these alternatives compared to the WSIP, but would not be completely avoided due to changes in the regional system operations that could affect the Tuolumne River in some years under all alternatives, regardless of whether there are additional average annual diversion increases. Other alternatives would also reduce impacts on the Tuolumne River compared to the WSIP, but impacts would remain potentially significant and require mitigation, similar to the WSIP. Most alternatives would result in similar impacts on Alameda Creek, Crystal Springs Reservoir and Pilarcitos Creek and related resources; impacts on these water bodies and their associated resources are primarily the result of specific facility improvement projects that must be implemented under all alternatives to meet regulatory requirements, and are not affected by which sources of supply are selected to augment the regional system supply portfolio.

All alternatives could also affect other water bodies not affected by the WSIP. The Lower Tuolumne River Diversion Alternative would result in direct impacts on the lower Tuolumne River due to construction and operation of a new intake structure on the river that would not occur under the WSIP. The Year-round Desalination at Oceanside Alternative and the Regional Desalination for Drought Alternative would affect the offshore waters of the Pacific Ocean and the upper San Francisco Bay, respectively, due to water intake for desalination treatment and discharge of the concentrated brine following treatment. The WSIP would not affect these water bodies. Under the other alternatives that require additional conservation, water recycling and local groundwater use and/or those alternatives that result in a supply or reliability shortfall for the wholesale customers, supplemental water supply projects could affect other surface water bodies, including rivers north or south of the Delta and the Delta as well as local groundwater aquifers.

All alternatives, except for the No Program Alternative, would include implementation of the 22 facility improvement projects within the regional system proposed under the WSIP. However, all alternatives would also require the construction and operation of additional major facility projects. These other facility projects would be required as part of securing alternative water supply sources and/or supplemental water supplies that the SFPUC or BAWSCA (and the wholesale customers) would need to pursue to insure the program objectives are met. The other facilities that would be required in addition to the facility improvement projects for the SFPUC regional system vary by alternative, but include new recycled water treatment, storage and transmission facilities; new groundwater wells a desalination plant and associated storage and transmission facilities and/or a new water treatment plant and associated new river intake and transmission facilities. Consequently, each alternative would result in greater impacts from facility construction and operation than the WSIP because additional new or expanded facilities would be required.

All alternatives are expected to have growth inducement potential and associated secondary effects of growth similar to those of the WSIP. The No Purchase Request Increase Alternative evaluates an option in which the SFPUC would not to fully serve its customers' purchase request through 2030, even under this alternative, BAWSCA and the wholesale customers are expected to pursue supplemental supply sources to make up for any supply delivery or drought reliability shortfall from the regional system such that the communities in the service area could implement their planned growth. Thus, withholding additional supply from the regional system to the wholesale customers would not necessarily reduce the growth in the communities within the service area.

Environmentally Superior Alternative

CEQA requires the identification of an environmentally superior alternative from among the proposed project and the set of alternatives evaluated. The CEQA Guidelines further state that if the No Program Alternative is the environmentally superior alternative, then the EIR must also identify which of the action alternatives is the environmentally superior alternative. In this case, the No Program Alternative is not the environmentally superior alternative. As summarized above, under the No Program Alternative, the SFPUC would be unable to meet most of the program objectives. The No Program Alternative would leave the SFPUC and its customers at significant risk of supply reduction or disruption during an earthquake or other emergency, or during a drought. This is not a feasible or acceptable alternative for the SFPUC.

Although it appears that fewer facility improvement projects would be implemented under the No Program Alternative and that, as a result, there would be fewer facility and construction impacts, it is expected that there would be much more emergency facility repair and replacement projects under this alternative as the system continues to age without proactive improvement. Ultimately, through required repair and replacement efforts, a similar level of facility improvement projects as that proposed under the WSIP might have to be conducted under the No Program Alternative, resulting in much of the same facility impacts as the WSIP; however, these repair and replacement projects would likely occur over a longer period of time and in a less coordinated and comprehensive manner. In addition, implementing system improvements through a piecemeal and largely emergency response approach could result in greater environmental impacts and less mitigation for such impacts; when projects are implemented under emergency conditions, they often require little or no environmental review and thus could be implemented without the same level of mitigation and mitigation compliance monitoring that would be required for the WSIP. Furthermore, piecemeal implementation could also increase the cumulative effects of multiple, sequential facility repair and replacement projects throughout the system.

With respect to impacts on water resources, the No Program Alternative's effects on the Tuolumne River would be similar to but less than those of the WSIP because river diversions would not increase quite as much as with the WSIP; however, the No Program Alternative would result in the same significant impacts on the Tuolumne River as the WSIP and would require the same mitigation. As summarized above, the No Program Alternative would also have the same impacts as the WSIP on the Alameda Creek / Alameda watershed resources and on the Peninsula watersheds (including Pilarcitos Creek) resources. The No Program Alternative would have the same growth-inducement potential and associated secondary effects of growth as the WSIP because BAWSCA and the wholesale customers would be expected to secure supplemental supplies to meet any supply delivery and reliability shortfall from the regional system that would result under the No Program Alternative.

Finally, under this alternative, BAWSCA and/or the wholesale customers might have to construct and operate additional facilities in order to develop supplemental surface water supplies, recycled water, or groundwater. Required facilities could include new treatment plants, storage and transmission facilities, and groundwater wells. The impacts of constructing and operating these facilities would be in addition to those resulting from improvement and repair of the regional system. Thus, the No Program Alternative could result in greater facility impacts than the WSIP. Because the No Program Alternative would not appreciably lessen the environmental impacts of the WSIP, might result in additional impacts due to the need for supplemental supply development and associated facility construction, and would not meet most of the basic program objectives, it is not considered the environmentally superior alternative.

The Modified WSIP Alternative is considered to be the environmentally superior alternative. It would reduce key impacts of the proposed WSIP on natural resources along the lower Tuolumne River, along Alameda Creek below the diversion dam, at Pilarcitos Reservoir and along Pilarcitos Creek, and in Crystal Springs Reservoir, but it would continue to meet the WSIP's primary goals and objectives. Like the WSIP, this alternative would maximize the use of existing facilities and the largely gravity-driven system without also requiring the construction of additional major facilities called for under many other alternatives, or substantially increasing the energy demand of the system or need for pumping. While some of the other alternatives would avoid or lessen certain WSIP impacts, they would also result in substantial additional impacts that the WSIP would not generate, because these alternatives would require substantial additional major facilities and affect other environmental resources in different geographic locations in addition to those affected by the WSIP.

The Modified WSIP Alternative includes implementation of more conservation, water recycling and local groundwater projects within the regional service area than under the WSIP, which would also require construction of some additional facilities in some areas not affected by the WSIP but not to the same extent as other alternatives. However, while construction of these facilities would cause temporary construction disruption and related environmental impacts, long-term implementation of these regional conservation, water recycling, and local groundwater projects would offset impacts of the operational modifications proposed under the Modified WSIP Alternative on the Tuolumne River. Depending on the extent of these projects implemented by wholesale customers in collaboration with the SFPUC, they could also help reduce the amount of additional diversion required from the Tuolumne River to serve the 2030 customer purchase requests. Compared to the WSIP, the Modified WSIP Alternative would result in slightly greater impacts on land use, air quality, noise, traffic, and energy in urban environments (expected to be largely mitigable), but fewer and significantly less severe impacts on biological and fishery resources in natural habitats.

1 Introduction

CHAPTER 1
Introduction

1.1 Introduction

The City and County of San Francisco (CCSF), through the San Francisco Public Utilities Commission (SFPUC), owns and operates a regional water system that extends from the Sierra Nevada to San Francisco and serves 2.4 million people in San Francisco, San Mateo, Santa Clara, Alameda, and Tuolumne Counties. The SFPUC proposes to adopt and implement the Water System Improvement Program (WSIP or proposed program) to increase the reliability of the regional system with respect to water quality, seismic response, water delivery, and water supply to meet water delivery needs in the service area through the year 2030. The WSIP would implement the SFPUC's service goals and system performance objectives for the regional system. These goals and objectives provide the basis for the facility improvement projects included in the WSIP and for the proposed water supply option to meet water delivery needs through 2030.

1.2 Purpose of the Program EIR

The San Francisco Planning Department, Major Environmental Analysis (MEA) Division, determined that implementation of the WSIP could have a significant effect on the environment and therefore required preparation of an Environmental Impact Report (EIR). The Planning Department prepared this Program Environmental Impact Report (PEIR) to provide the public and responsible and trustee agencies with information about the potentially significant environmental effects of the proposed program, to identify possible ways to minimize the potentially significant effects, and to describe and evaluate feasible alternatives to the proposed program.

This PEIR has been prepared in compliance with the California Environmental Quality Act (CEQA) of 1970 (as amended), codified in California Public Resources Code Sections 21000 et seq., and the CEQA Guidelines, codified in the California Code of Regulations, Title 14, Division 6, Chapter 3. This document has been prepared as a program EIR. According to the CEQA Guidelines, Section 15168(a), a program EIR is one type of environmental review document that may be used to evaluate a plan or program that has multiple components (projects and actions) or to address a series of actions that are related:

- Geographically
- As logical parts in the chain of contemplated actions

- In connection with the issuance of rules, regulations, plans, or other general criteria to govern the conduct of a continuing program, or
- As individual activities carried out under the same authorizing statutory or regulatory authority and having generally similar environmental effects that can be mitigated in similar ways

The proposed WSIP includes multiple projects and actions that cover a broad geographic scale. This PEIR provides a foundation for any necessary future environmental review documents that focus on individual projects of the WSIP. A program EIR can provide the following additional advantages (CEQA Guidelines, Section 15168[b]):

- Provide for a more exhaustive consideration of effects and alternatives than would be practical in an EIR on an individual action
- Ensure consideration of cumulative impacts that might not be evident in a case-by-case or project-by-project analysis
- Avoid duplicative consideration of basic policy issues
- Allow the lead agency to consider broad policy alternatives and program-wide mitigation measures early in the process when the agency has greater flexibility to deal with basic problems of cumulative impacts
- Allow a reduction in paperwork

A program EIR may be prepared on a plan or program before the details of every project included in the program have been developed, as is the case for the WSIP. Therefore, this PEIR addresses the environmental effects of the program as a whole. The analyses focus on the environmental effects of implementing the overall WSIP as a plan to improve and expand the ability of the regional water system to deliver water to the SFPUC service area through the year 2030 and increase the overall reliability of the system. To accomplish this, the PEIR includes a combination of *program-level* and *project-level* analyses.

This PEIR evaluates the major environmental effects of implementing proposed facility improvement projects from a broad perspective; this evaluation is a *program-level* analysis. While the SFPUC is aggressively developing the design, construction, and operation details of the projects included in the WSIP, these project details are not the focus of this PEIR. Instead, the PEIR frames the nature and magnitude of the expected environmental impacts associated with these proposed WSIP projects and identifies program mitigation measures to reduce the impacts of the projects as proposed. As discussed further below, more detailed *project-level* analysis of individual facility improvement projects will be conducted separately as required by CEQA.

In addition to the program-level analysis of proposed facility improvements, this PEIR also includes a *project-level* impact analysis of implementing the proposed WSIP water supply option through the 2030. The chief environmental issues evaluated in the PEIR at a *project-level* include:

- The effects of providing additional water to serve increasing purchase requests within the service area (specifically, the effect of increasing average annual water supply to serve customer needs through 2030)
- The effects of using the proposed sources of water to serve the increasing purchase requests through 2030 during both nondrought and drought periods
- The effects of proposed changes in system operations associated with implementing the proposed facility improvements and achieving the WSIP system performance objectives

For these water supply and system operations impacts, the PEIR also identifies mitigation measures when appropriate to address significant effects. This project-level analysis is intended to address these issues without the need for additional environmental review.

This PEIR can be used to simplify the task of preparing project-specific environmental review documents that evaluate the effects of implementing the individual WSIP facility improvement projects at a more detailed, *project-level* of analysis. As required by CEQA and where necessary, project-level CEQA review will be conducted separately for individual facility improvement projects proposed under the WSIP. The separate environmental review of individual projects will evaluate site-specific impacts and incorporate feasible mitigation measures and alternatives developed in the PEIR as appropriate (CEQA Guidelines, Section 15168[c]). In addition, this PEIR can be incorporated by reference into project-level CEQA analyses to deal with water supply effects, regional influences, secondary effects of growth, and other factors that apply to the program as a whole (CEQA Guidelines, Section 15168[d]).

1.3 CEQA Process

1.3.1 Notice of Preparation

In accordance with Sections 15063 and 15082 of the CEQA Guidelines, the San Francisco Planning Department, as lead agency, prepared a Notice of Preparation (NOP) of an EIR and conducted scoping meetings (see **Appendix A**). The NOP was circulated to local, state, and federal agencies and to other interested parties on September 6, 2005, initiating a public comment period that extended through October 24, 2005. An Initial Study was not prepared because the lead agency decided in advance that a PEIR would be required for this program.

As indicated in the NOP, the PEIR addresses the full range of environmental impacts of the WSIP. The NOP included a preliminary list of the potential environmental impacts related to the following resource topics: surface water resources; groundwater resources; fisheries and aquatic resources; terrestrial vegetation and wildlife; geology, soils, and seismicity; cultural resources; land use, plans, and policies; recreation; agricultural resources; traffic, transportation, and circulation; air quality; noise and vibration; public services, utilities, and energy; hazards and public safety; visual quality; socioeconomics; growth-inducement potential and secondary effects of growth; and cumulative effects. The NOP provided a general description of the proposed action, the need for the program and program benefits, the proposed facilities, and the program location.

1.3.2 Public Scoping Meetings

Pursuant to CEQA Guidelines Section 15083, the San Francisco Planning Department held five public scoping meetings as follows:

- Wednesday, October 5, 2005 – Sonora Opera House, Sonora, CA
- Thursday, October 6, 2005 – Thomas Downey High School Cafeteria, Modesto, CA
- Tuesday, October 11, 2005 – Fremont Main Library, Fremont, CA
- Tuesday, October 18, 2005 – Palo Alto Arts Center, Palo Alto, CA
- Wednesday, October 19, 2005 – Tenderloin Community School, San Francisco, CA

Public notices were placed in local newspapers informing the general public of the scoping meetings. The purpose of the meetings was to present the proposed WSIP to the public and receive public input regarding the proposed scope of the PEIR analysis. Attendees were provided an opportunity to voice comments or concerns regarding potential effects of the program.

A scoping report was prepared to summarize the public scoping process and the comments received in response to the NOP, and the report is included in Appendix A of this PEIR. Based on sign-in sheets at each of the meetings, 260 participants attended the scoping meetings, with 75 of those participants providing oral comments. Transcripts of the each scoping meeting are included in the scoping report.

The San Francisco Planning Department held a scoping meeting for resource agencies on Thursday, November 3, 2005 in San Francisco. Representatives from the following agencies attended: U.S. Army Corps of Engineers, San Francisco Bay Regional Water Quality Control Board, California Department of Fish and Game, and U.S. Fish and Wildlife Service. Representatives of the U.S. Environmental Protection Agency and the National Marine Fisheries Service were invited but were unable to attend. Additional coordination with public agencies was provided through informal consultation and telephone interviews conducted throughout the PEIR process.

1.3.3 Public and Agency Comments on the NOP

The comment period on the NOP extended from September 6 through October 24, 2005. In response to the NOP, comments were received by letter sent via mail, email, or fax (104, including 5 form letters counted once each but submitted multiple times), orally by speakers at the scoping meetings (79), and by phone (187 voicemail messages left with the San Francisco Planning Department). The comments addressed concerns regarding the full range of potential environmental issues as well as program alternatives and the CEQA process. As described in the previous section, a scoping report was prepared to compile and summarize comments received on the NOP and is included in Appendix A.

1.3.4 PEIR – Impact Determination

This document constitutes the PEIR. It describes the WSIP and the environmental setting for the proposed program, identifies potential impacts, presents mitigation measures for impacts found to be significant or potentially significant, and evaluates program alternatives. It also includes an analysis of three variants to the proposed WSIP, as requested by the SFPUC.

The analysis of environmental impacts in this PEIR is divided into three main groups: (1) construction and operational impact of the WSIP facility improvement projects are analyzed in Chapter 4; (2) water supply and system operational impacts of the WSIP are analyzed in Chapter 5; and (3) growth-inducing impacts Chapter 7. In assessing construction and operational impacts of the facility improvement projects, Chapter 4 considers impacts of individual projects, the "collective" construction and operational impacts from multiple WSIP facility improvement projects, and cumulative impacts associated with construction and operation of WSIP projects in combination with other past, present, and future actions with potential for similar impacts on the same resources as those affected by the WSIP. Similarly, in assessing water supply and system operations impacts, Chapter 5 includes analysis of cumulative impacts associated with the WSIP water supply and system operations in combination with other past, present, and future actions with potential for impacts on the same resources as those affected by the WSIP.

Each environmental issue presented in this PEIR is analyzed with respect to significance criteria that are based on MEA guidance regarding the environmental effects to be considered significant. MEA guidance is, in turn, based on CEQA Guidelines Appendix G with some modifications. In cases where potential environmental issues associated with the WSIP are identified but are not clearly addressed by MEA's standard Initial Study checklist, additional impact significance criteria are presented. Appendix B of this PEIR presents the MEA Initial Study checklist as applied to the WSIP, and indicates the criteria applicable to the WSIP and discussed in the PEIR.

For the impact analyses, the following categories are used to describe impact significance:

Not Applicable (N/A). An impact is considered not applicable if there is no potential for impacts or if the environmental resource does not occur within the study area or the area of potential effect.

Beneficial (B). An impact is considered beneficial if it is determined that WSIP water supply or system operations would improve an environmental resource or result in a beneficial effect on the environment.

Less than Significant (LS). This determination applies if there is a potential for some limited impact, but not a substantial adverse effect that qualifies under the significance criteria as a significant impact. LS impacts do not require mitigation.

Less than Significant with Program-Level Mitigation (LSM). This determination applies to the collective impact analysis and is used only in Chapter 4. It indicates a potential for some limited impact after implementation of program-level mitigation measures, but not a substantial adverse effect that qualifies under the significance criteria as a significant impact. LSM impacts for a collective impact do not require additional mitigation beyond program-level mitigation (see Chapter 4 for further explanation).

Potentially Significant, Mitigatable (PSM) / Significant Mitigable (SM). This determination applies if there is the potential for a substantial adverse effect that meets the significance criteria, but mitigation is available to reduce the impact to a less-than-significant level. In Chapter 4, an impact is labeled “potentially” significant when there is not enough site-specific information at the program level of analysis to determine definitively that it is significant; separate, project-level CEQA evaluation of the WSIP projects could confirm that the impact is significant for that project or document that the impact is less than significant. In Chapter 5, an impact is labeled “potentially” significant in the cases where the analysis cannot conclusively determine the extent of adverse effects and the PEIR errs on the conservative side.

The impacts identified as “potentially significant” are treated as significant impacts in this PEIR. In both Chapters 4 and 5, “significant, mitigable” applies if there is certainty that a substantial adverse effect that meets the significance criteria would occur, but implementation of mitigation measures would reduce the impact to less than significant. For both PSM and SM impacts, mitigation would reduce or lessen the severity of the impact to a less-than-significant level.

Potentially Significant, Unavoidable (PSU). This determination applies if there is a potential for a substantial adverse effect that meets the significance criteria but for which there appears to be no feasible mitigation available to reduce the impacts to a less-than-significant level. Mitigation might be available to lessen the severity of the impact, but the residual effect remains significant and therefore unavoidable. The impacts identified as potentially significant are treated as significant impacts in this PEIR.

In Chapter 4, an impact is labeled “potentially” significant and unavoidable when there is not enough site-specific information at the program level of analysis to determine definitively that the impact is significant or that recommended mitigation could sufficiently reduce the severity of the impact; in these cases, the PEIR errs on the conservative side and applies this determination. However, project-level CEQA evaluation could confirm that the impact is in fact significant and unavoidable for a specific WSIP project or could provide additional detail to determine the impact is significant but can be mitigated to a less-than-significant level.

In Chapter 5, an impact is labeled “potentially” significant and unavoidable when the mitigation measure could lessen the effect of the impact, but it is not certain that if it could reduce the impact to less than significant.

In both Chapter 4 and 5, this determination is also applied if the feasibility of the mitigation is contingent on review and approval by other jurisdictional agencies (i.e., mitigation feasibility is outside SFPUC control). For PSU impacts, mitigation would be required to the extent feasible even if the severity of the impact with mitigation would not be reduced to a less-than-significant level.

Significant Unavoidable (SU). This determination applies if there is certainty for a substantial adverse effect that meets the significance criteria but for which there appears to be no feasible mitigation available to reduce the impact to a less-than-significant level. The word “potentially” is not used for impacts where it can be determined during this PEIR process that: (1) the impact would occur and (2) the impact could not be mitigated to a less-than-significant level. For SU impacts, mitigation would be required to the extent feasible even if the severity of the impact with mitigation would not be reduced to a less-than-significant level.

1.3.5 PEIR—Documents Incorporated by Reference

The following documents are incorporated by reference in this PEIR. See Section 1.3.6 for locations where these documents were available for review during the public review period.

- City of Belmont, *San Juan Hills Area Plan Environmental Impact Report*, State Clearinghouse #86122320, adopted March 22, 1988.
- City of Belmont, *Western Hills Area Plan Environmental Impact Report,* State Clearinghouse #89051615, adopted June 12, 1990.
- City of Brisbane, *City of Brisbane 1993 General Plan Environmental Impact Report, Volume I: Environmental Setting* (1993) and *Volume II: Draft EIR*, State Clearinghouse #93071072, January, 1994a.
- City of Brisbane, Resolution No. 94-23: A Resolution of the City Council of the City of Brisbane, State of California, Making Certain Findings Regarding the Environmental Impact Report for the 1994 General Plan and Adopting a Mitigation Monitoring Program, June 1994b.
- City of East Palo Alto, *General Plan Final Program Environmental Impact Report*, State Clearinghouse #98051028, November 23, 1999a.
- City of East Palo Alto, Final Environmental Impact Report CEQA Findings: City of East Palo Alto General Plan Final Program EIR, November 23, 1999b.
- City of Foster City, *Final Environmental Impact Report on the General Plan Revision for the City of Foster City*, State Clearinghouse #92073017, April 1993.
- City of Fremont, *Fremont 1990 General Plan Final Program Environmental Impact Report*, State Clearinghouse #90030675, March, 1991a.
- City of Fremont, Resolution No. 8080: Resolution of the City of Fremont Adopting an Updated General Plan, Certifying a Project EIR, and Adopting Findings of Fact and a Statement of Overriding Considerations, May 7, 1991b.
- City of Hayward, *General Plan Final Environmental Impact Report*, State Clearinghouse #2001072069, January 2002a.
- City of Hayward, City of Hayward Resolution 02-025 Certifying the Program Environmental Impact Report and Adopting the Mitigation Monitoring and Reporting Program, Statement of Overriding Considerations and General Plan, March, 12, 2002b.
- City of Menlo Park, *Final Environmental Impact Report: Amendments to the City of Menlo Park General Plan and to the City of Menlo Park Zoning Ordinance including Policy Document, Background Report, and Land Use and Circulation Elements*, State

Clearinghouse #890 124 20, October 19, 1994 (includes November 15, 1994 Findings for Project and Final EIR).

- City of Millbrae, *Final Environmental Impact Report for the City of Millbrae General Plan Revision*, State Clearinghouse #98041090, October 1998a.

- City of Millbrae, *Draft Finalized with Addition of Comments and Responses as Adopted by City Council November 24, 1998: Millbrae Station Area Specific Plan Draft Environmental Impact Report*, State Clearinghouse #98041091, 1998b.

- City of Milpitas, *Draft Environmental Impact Report* (October 2001) and *Final Environmental Impact Report for the Midtown Milpitas Specific Plan*, State Clearinghouse #2000092027, January 2002a.

- City of Milpitas, Resolution No. 7150: A Resolution of the City Council of the City of Milpitas Certifying an Environmental Impact Report for the Milpitas Midtown General Plan Amendment and Specific Plan Project and Adopting Related Mitigation Findings, Findings Regarding Alternatives, A Statement of Overriding Considerations and a Mitigation Monitoring and Reporting Plan Pursuant to the California Environmental Quality Act, March 19, 2002b.

- City of Mountain View, *Final Environmental Impact Report: City of Mountain View 1992-2005 General Plan*, State Clearinghouse #91083044, November 1992a.

- City of Mountain View, Resolution 15481 series 1992, A Resolution Certifying the Final EIR for the 1992 General Plan, Adopting the 1992 General Plan Land Use Map and Adopting the City of Mountain View 1992-2005 General Plan, October 29, 1992b.

- City of Newark, *General Plan Update Project 2007 Draft Environmental Impact Report* (March 1992) and *Final Environmental Impact Report*, State Clearinghouse #91093071, June 1992a.

- City of Newark, Resolution No. 1241: Resolution Recommending to the City Council Approval and Certification of the Final Environmental Impact Report for the Newark General Plan Update, Including a Statement of Overriding Considerations and Mitigation Monitoring Program, passed May 26, 1992b.

- City of Palo Alto, *City of Palo Alto Comprehensive Plan Update Draft Environmental Impact Report* (December 1996) and *Final Environmental Impact Repor*t (September 1997), State Clearinghouse #96052043, certified July 1998a.

- City of Palo Alto, Resolution 7780 Certifying the Adequacy of the 1998-2010 Comprehensive Plan Final EIR and Making Findings Thereon Pursuant to the CEQA and Adopting the 1998-2010 City of Palo Alto Comprehensive Plan and Land Use and Circulation Map, July 20, 1998b.

- City of Redwood City, *Downtown Precise Plan Draft Environmental Impact Report* (October 2006) and *Final Environmental Impact Report*, State Clearinghouse #2006052027 certified March 2007a.

- City of Redwood City, Resolution No. 14769: A Resolution of the City Council of the City of Redwood City Making Certain Findings Concerning Mitigation Measures, Adopting a Mitigation Monitoring and Reporting Program, Making Findings Concerning Alternatives, and Adopting a Statement of Overriding Considerations in Accordance with the California Environmental Quality Act for the Redwood City Downtown Precise Plan, adopted March 26, 2007b.

- City of Redwood City, Ordinance No. 2308: An Ordinance of the City Council of the City of Redwood City Adopting the Redwood City Downtown Precise Plan and the Moderate Intensity Alternative as the Most Appropriate Maximum Alternative Development Limitation for the Downtown Precise Plan, approved April 24, 2007c.

- City of San Bruno, *City of San Bruno 1984 General Plan and Environmental Impact Report*, adopted June 25, 1984a.

- City of San Bruno, Resolution No. 1984-37 A Resolution of the City Council of the City of San Bruno Adopting a Modification to the General Plan of the City Including the Following Elements: Noise, Seismic Safety/Safety, Housing, Open Space, Conservation, Scenic Corridors, Circulation, and Land Use, and the Certification of an Environmental Impact Report Pertinent Thereto, June 25, 1984b.

- City of San Jose, *San Jose 2020 General Plan Final Environmental Impact Report*, State Clearinghouse #94023031, 1994.

- City of San Mateo, Final Environmental Impact Report: Proposed General Plan Revisions, State Clearinghouse #89100308, June 1990a.

- City of San Mateo, Resolution #77 (1990) Certifying the Final Environmental Impact Report Pertaining to the General Plan Revision, and Adopting the Revised City of San Mateo General Plan, July 16, 1990b.

- City of Santa Clara, Resolution No. 5728: A Resolution and Related Findings Certifying a Final Environmental Impact Report and Directing the Filing of a Notice of Determination, General Plan Amendment #32, State Clearinghouse #8908017, July 1992.

- City of Union City, *Draft Environmental Impact Report* (September 2001) and *Final Environmental Impact Report for the City of Union City General Plan Update*, State Clearinghouse #2000112009, January 2002a.

- City of Union City, Resolution 2109-02 A Resolution of the City Council of the City of Union City Adopting the 2002 General Plan Update Making Mitigations and Alternatives Finding and Adopting a Statement of Overriding Considerations and Adopting a Mitigation Monitoring Plan, February 12, 2002b.

- County of San Mateo, San Mateo County, Board of Supervisors Resolution 48639 Adopting Findings Pursuant to Certification of the Final Environmental Impact Report for the San Mateo County General Plan, State Clearinghouse #84042404, November 18, 1986.

- County of Santa Clara, *Santa Clara County General Plan Draft Environmental Report* (September 1994) and *Final Environmental Impact Report Addendum,* State Clearinghouse #94023004, November 1994a.

- County of Santa Clara, Resolution of the Board of Supervisors of the County of Santa Clara Recommending Certification of Final Impact Report, Adopting Related Overriding

Considerations and Monitoring Program, and Adoption of the County General Plan, December 20, 1994b.

- County of Santa Clara, *2000 Stanford University Draft Community Plan and General Use Permit Application Final Environmental Impact Report,* State Clearinghouse #1999112107, December 2000a.

- County of Santa Clara, Resolution of the Board of Supervisors or the County of Santa Clara Certifying the Environmental Impact Report, Making Related Findings, and Adopting a Mitigation Monitoring and Reporting Program for the Stanford University Community Plan and 2000 General Use Permit, December 12, 2000b.

1.3.6 Draft PEIR—Public Review

The Draft PEIR was circulated to local, state, and federal agencies and to interested organizations and individuals to allow them to review and comment on the report. Publication of this Draft PEIR marked the beginning of a 108-day public review period, which extended from June 29, 2007 to October 15, 2007 and during which written comments were directed to the following address:

San Francisco Planning Department
Attn: Paul Maltzer, Environmental Review Officer
WSIP PEIR
1650 Mission Street, Suite 400
San Francisco, CA 94103

Or by email to: wsip.peir.comments@gmail.com

Copies of the Draft PEIR and related key documents, as well as documents incorporated be reference, were available for review at the following public locations in the seven counties affected by construction and/or operation of the WSIP:

- San Francisco County:
  San Francisco Planning Department
  1660 Mission Street, 1st Floor
  Planning Information Counter
  San Francisco, CA

  San Francisco Main Library
  100 Larkin Street
  San Francisco, CA

  San Francisco Public Utilities Commission
  1145 Market Street, 1st Floor
  San Francisco, CA

- San Mateo County:
  City of San Mateo Main Library
  55 West 3rd Avenue
  San Mateo, CA

- Santa Clara County:
  Dr. Martin Luther King, Jr. Library
  150 E. San Fernando
  San Jose, CA

- Alameda County: Alameda County/City of Fremont Library
  2400 Stevenson Blvd.
  Fremont, CA

- San Joaquin County: Stockton-San Joaquin County Public Library
  605 N. El Dorado Street
  Stockton, CA

- Stanislaus County: Modesto Library
  1500 I Street
  Modesto, CA

- Tuolumne County: Tuolumne County Library
  480 Greenley Road
  Sonora, CA

The PEIR can also be accessed through the internet at: www.sfgov.org/site/planning/mea.

Public Hearings

Public comments on the Draft PEIR were accepted from June 29, 2007 to October 15, 2007. Public hearings on the Draft PEIR to accept written or oral comments were scheduled and held as follows:

- Sonora, CA: Sonora Opera House
  250 S. Washington St.
  Sonora, CA

  September 5, 2007, 6:30 pm

- Modesto, CA: Thomas Downey High School Cafeteria
  1000 Coffee Road
  Modesto, CA

  September 6, 2007, 6:30 pm

- Fremont, CA: Fremont Main Library, Fukaya Room
  2400 Stevenson Blvd
  Fremont, CA

  September 18, 2007, 6:30 pm

- Palo Alto, CA: Avenidas Senior Center
  450 Bryant Street
  Palo Alto, CA

  September 19, 2007, 6:30 pm

- San Francisco, CA: San Francisco Planning Commission
  City Hall, 1 Dr. Carleton B. Goodlet Place
  Commission Chambers, Room 400

  September 20, 2007, 1:30 pm

- San Francisco, CA: San Francisco Planning Commission
  City Hall, 1 Dr. Carleton B. Goodlet Place
  Commission Chambers, Room 400

  October 11, 2007, 3:30 pm

1.3.7 Comments and Responses Document and Final Program EIR

Written and oral comments received in response to the Draft PEIR were addressed in the Comments and Responses document. The Comments and Responses document was released for public review on September 30, 2008. The Draft PEIR and the Comments and Responses document together constitute the Final PEIR. On October 30, 2008, the Final PEIR was certified by the San Francisco Planning Commission, and the program was subsequently approved and adopted by the SFPUC.

CEQA requires the adoption of findings prior to approval of a project where a certified EIR identifies significant environmental effects (CEQA Guidelines, Sections 15091 and 15092). As part of the WSIP approval process on October 30, 2008, the SFPUC adopted the CEQA Findings, which describe the findings of fact and decisions regarding mitigation measures and alternatives, and provides a statement of overriding considerations for significant impacts identified by the PEIR that cannot be mitigated to less-than-significant levels (CEQA Guidelines, Section 15093[b]).

1.3.8 Mitigation Monitoring and Reporting

At the time of project approval, CEQA requires lead agencies to "adopt a reporting and mitigation monitoring program for the changes to the project which it has adopted or made a condition of project approval in order to mitigate or avoid significant effects on the environment" (CEQA, Section 21081.6; CEQA Guidelines, Section 15097). The mitigation measures identified and presented in this PEIR form the basis of the WSIP Mitigation Monitoring and Reporting Program (MMRP). All measures adopted by the SFPUC as conditions for approval of the program were included in the WSIP MMRP to ensure compliance. The SFPUC adopted the WSIP MMRP as part of the CEQA Findings. Project-level CEQA review for individual WSIP facility improvement projects will include mitigation measures adopted under the PEIR as appropriate based on project-specific analyses.

[Additional discussion of the CEQA process for the PEIR is provided in the Comments and Responses document. Please refer to Section 11.2, Environmental Review Process (Vol. 7, Chapter 11).]

2 Existing Regional Water System

CHAPTER 2
Existing Regional Water System

2.1 System Overview

The City and County of San Francisco (CCSF), through the San Francisco Public Utilities Commission (SFPUC), owns and operates a regional water system that serves 2.4 million people, primarily in San Francisco and the south San Francisco Bay region. The system extends about 167 miles, from Yosemite National Park to San Francisco, and develops water supply from three principal watersheds: the Tuolumne River, Alameda, and Peninsula watersheds. This water is conveyed to retail and wholesale customers in San Francisco, San Mateo, Santa Clara, Alameda, and Tuolumne Counties. The system currently delivers an annual average of about 265 million gallons per day (mgd), of which about 85 percent is from the Tuolumne River watershed and about 15 percent is from the combined Alameda and Peninsula watersheds (referred to collectively as the “local” watersheds). The regional water system includes over 280 miles of pipeline, over 60 miles of tunnels, 11 reservoirs, 5 pump stations, and 2 water treatment plants (filtration). The history of the system dates back to the 1860s, and many parts of it are over 100 years old.

This chapter provides a summary description and background of the existing regional water system, with emphasis on those components of the system that would be modified or otherwise affected by the proposed Water System Improvement Program (WSIP or program). This chapter also describes the sources and quantity of water used and how the water is generally conveyed, stored, treated, and delivered to system customers. Laws, regulations, and other institutional factors relevant to the water system are also described. Information on the system related to the proposed program, including more detail on the system customers and service area, is presented in Chapter 3, Program Description.

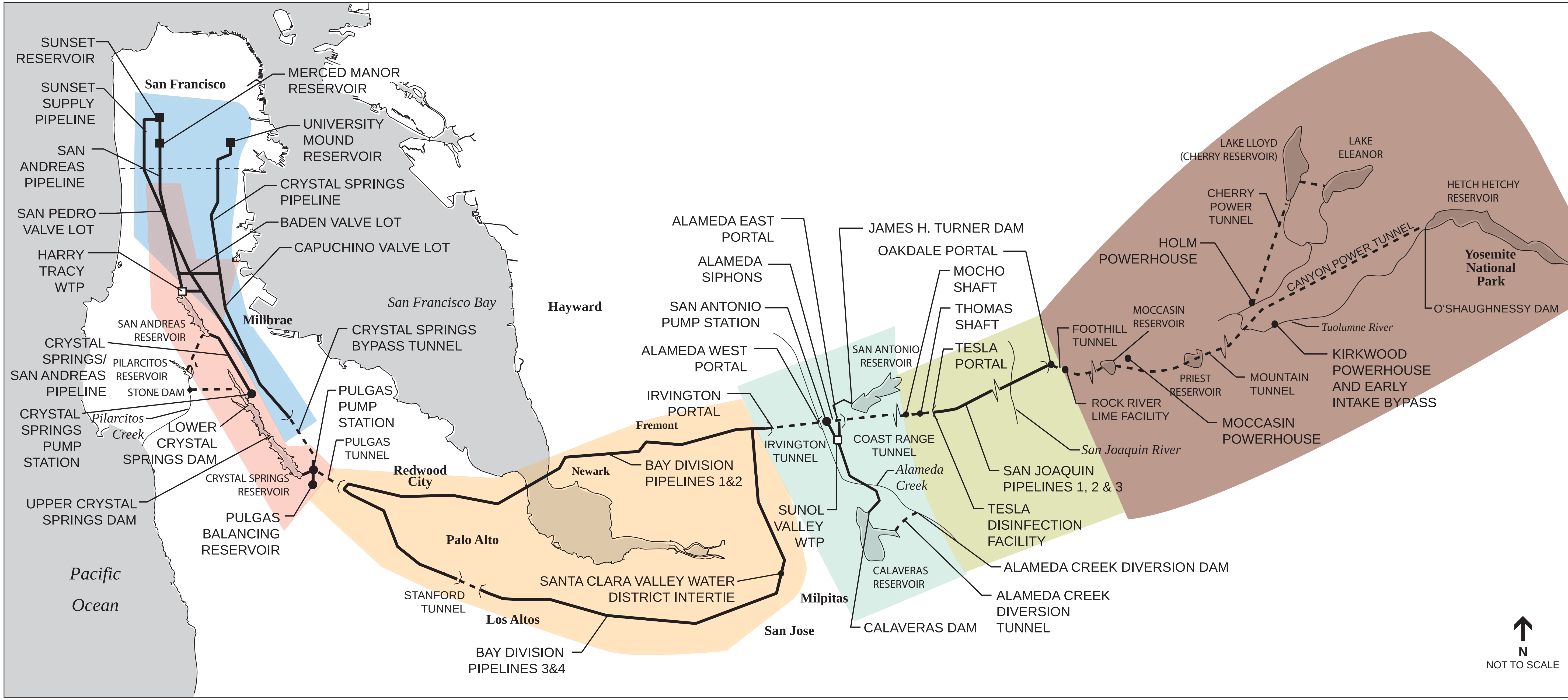
2.2 Regional Water System Facilities

The regional water system is primarily a linear system; it transports water across the state, from the Sierra Nevada to the Bay Area, almost entirely by gravity. Major facilities in the regional water system are shown in **Figure 2.1**. For the organizational purposes of this Program Environmental Impact Report (PEIR), the regional water system can be divided geographically into six smaller regions, which are, from east to west, the Hetch Hetchy, San Joaquin, Sunol Valley, Bay Division, Peninsula, and San Francisco Regions. The Hetch Hetchy Region covers the east end of the system in Tuolumne County and continues west to the east side of the San Joaquin Valley, almost to the western boundary of Tuolumne County; the San Joaquin Region covers facilities in the San Joaquin Valley, from the western boundary of Tuolumne County through Stanislaus and San Joaquin Counties, almost to the east boundary of Alameda County; the Sunol Valley Region includes facilities in the Sunol Valley within Alameda and Santa Clara Counties and west to the city of Fremont; the Bay Division Region starts in Fremont and covers the general South Bay area, including parts of Alameda, Santa Clara, and San Mateo Counties, continuing west to the south end of the San Francisco Peninsula; the Peninsula Region is entirely on the Peninsula within San Mateo County, from about San Mateo to Daly City; and the San Francisco Region, which geographically overlaps with the Peninsula Region, covers facilities in northern San Mateo County and within San Francisco. **Table 2.1** lists major facilities in the regional water system by their primary function—storage, transmission, or treatment—as well as by their geographic region. **Table 2.2** shows the capacity of the major facilities in the regional water system.

2.2.1 Hetch Hetchy Facilities

The regional water system begins with Hetch Hetchy Reservoir and O'Shaughnessy Dam, which are located in Yosemite National Park on the main stem of the Tuolumne River in the Sierra Nevada. Hetch Hetchy Reservoir was constructed between 1912 and 1923 and was raised in height in 1938. It collects drainage primarily in the form of snowmelt from the surrounding 459 square miles of the Tuolumne River watershed, which is located entirely within Yosemite National Park. The water from Hetch Hetchy Reservoir is used to supply system customers as well as to generate hydroelectric power; the reservoir is also operated to provide instream flows to benefit fisheries and other wildlife.

Two additional reservoirs in the Hetch Hetchy Region—Lake Eleanor and Lake Lloyd (also called Cherry Reservoir)—collect water from the Tuolumne River basin. Lake Eleanor (completed in 1918) is located within Yosemite National Park, and Lake Lloyd (completed in 1955) is located west of Yosemite National Park in Stanislaus National Forest; both reservoirs are



San Francisco Region
Peninsula Region
Bay Division Region
Sunol Valley Region
San Joaquin Region
Hetch Hetchy Region

Pipeline
Tunnel
Water Treatment Plant (WTP)
Other Facilities
Segments of the system not shown

SOURCE: SFPUC

SFPUC Water System Improvement Program . 203287

Figure 2.1
SFPUC Regional Water System

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TABLE 2.1
MAJOR FACILITIES IN THE REGIONAL WATER SYSTEM

Type of Facility	Hetch Hetchy Facilities (from the Sierra Nevada to the east side of the San Joaquin Valley)	San Joaquin Facilities (from the San Joaquin Valley to the west side of the Coast Ranges)	Sunol Valley Facilities (from the Sunol Valley to the west side of the East Bay Hills)	Bay Division Facilities (from Fremont to Redwood City)	Peninsula Facilities (from Redwood City to San Francisco)	San Francisco Regional Facilities (San Francisco and the northern Peninsula)
Storage Reservoirs	Hetch Hetchy Reservoir and O'Shaughnessy Dam Lake Eleanor and Eleanor Dam Lake Lloyd (also called Cherry Reservoir) and Cherry Dam (also called Cherry Valley Dam)	None	Calaveras Reservoir and Calaveras Dam San Antonio Reservoir and James H. Turner Dam	None	Crystal Springs Reservoir and Upper and Lower Crystal Springs Dams San Andreas Reservoir and San Andreas Dam Pilarcitos Reservoir and Pilarcitos Dam Stone Dam Reservoir and Stone Dam	University Mound Reservoir Sunset Reservoir Merced Manor Reservoir
Transmission	Canyon Power Tunnel Eleanor-Cherry Diversion Tunnel and Pump Station Cherry Power Tunnel Lower Cherry Diversion Dam and Aqueduct Mountain Tunnel Foothill Tunnel Priest Reservoir Moccasin Penstocks Moccasin Reservoir	San Joaquin Pipelines Nos. 1, 2, 3 Coast Range Tunnel	Alameda Siphons Nos. 1, 2, 3 Alameda Creek Diversion Dam and Tunnel Calaveras Pipeline Sunol Valley Water Treatment Plant Effluent Pipeline San Antonio Pipeline San Antonio Pump Station Irvington Tunnel	Bay Division Pipelines Nos. 1, 2, 3, 4 Santa Clara Valley Water District Intertie East Bay Municipal Utility District Intertie	Pulgas Tunnel Pulgas Pump Station Pulgas Balancing Reservoir Crystal Springs Bypass Tunnel Crystal Springs/ San Andreas Pipeline Crystal Springs Pump Station Baden Pump Station Pilarcitos Tunnels and Stone Dam Tunnels	San Andreas Pipelines Crystal Springs Pipeline Sunset Supply Pipeline
Treatment	Rock River Lime Facility	Tesla Disinfection Facility Thomas Shaft Disinfection Facility	Sunol Valley Chloramination Facility Sunol Valley Water Treatment Plant	None	Pulgas Dechloramination Facility Harry Tracy Water Treatment Plant	None

SOURCE: SFPUC, 2005a.

TABLE 2.2
EXISTING CAPACITY OF MAJOR FACILITIES IN THE REGIONAL WATER SYSTEM

Facility	Capacity	Notes
Major Storage Facilities		
Hetch Hetchy Reservoir	360,400 acre-feet (with drum gates raised) 340,000 acre-feet (with drum gates lowered)	117.4 billion gallons 110.8 billion gallons
Lake Eleanor	27,100 acre-feet (with flashboards installed) 21,500 acre-feet (without flashboards)	8.8 billion gallons 7.0 billion gallons
Lake Lloyd (Cherry Reservoir)	273,300 acre-feet (with flashboards installed) 268,800 acre-feet (without flashboards)	89.1 billion gallons 87.6 billion gallons
Calaveras Reservoir[a]	96,800 acre-feet (normal conditions) 37,800 acre-feet (interim conditions as required by the Division of Safety of Dams)	31.5 billion gallons 12.4 billion gallons
San Antonio Reservoir	50,300 acre-feet	16.4 billion gallons
Crystal Springs Reservoir[b]	56,800 acre-feet (interim conditions as required by the Division of Safety of Dams) 68,000 acre-feet (normal conditions)	18.5 billion gallons 22.2 billion gallons
Pilarcitos Reservoir	2,900 acre-feet	0.97 billion gallons
San Andreas Reservoir	19,000 acre-feet	6.2 billion gallons
Sunset Reservoir (north and south)	540 acre-feet	174.8 million gallon
University Mound Reservoir (north and south)	430 acre-feet	140.9 million gallons
Merced Manor Reservoir	30 acre-feet	9.5 million gallons
Major Transmission Facilities		
Canyon Tunnel	873 mgd	1,350 cfs
Mountain Tunnel	433 mgd	670 cfs
Foothill Tunnel	450 mgd	700 cfs
San Joaquin Pipelines Nos. 1, 2, 3	290–300 mgd (total, 3 pipelines)	Physical design capacity approximately 300 mgd
Coast Range Tunnel	345 mgd	541 cfs
Irvington Tunnel	300–340 mgd	300 mgd in winter, 340 mgd in summer
Bay Division Pipelines Nos. 1, 2, 3, 4	290–340 mgd (total, 4 pipelines)	
Major Treatment Facilities		
Sunol Valley Water Treatment Plant	120 mgd (sustainable capacity) 160 mgd (peak capacity)	Sustainable capacity is the highest flow rate at which a treatment plant can be expected to operate, given normal source water conditions, while meeting regulatory water quality and routine maintenance requirements. Peak capacity is the maximum flow rate to which a treatment plant is designed that will allow it to operate within regulatory or engineering standards.
Harry Tracy Water Treatment Plant	120 mgd (sustainable capacity) 140 mgd (peak capacity) 180 mgd (hydraulic capacity)	Plant capacity depends on the quality of raw water. During most winters, the raw water source often contains algae that can limit plant capacity to 90–100 mgd for several weeks.

[a] As designed and constructed, Calaveras Reservoir has a normal capacity of 96,800 acre-feet. However, the California Division of Safety of Dams (DSOD) has placed interim operational restrictions on the reservoir due to concerns regarding seismic stability of the dam. See Section 2.2.3 for further discussion.

[b] Since 1983, the DSOD has placed operational restrictions on Lower Crystal Springs Dam due to concerns regarding the stability of the dam during major flood events. Over the past 23 years, the SFPUC has adjusted its operating procedures to comply with the DSOD restrictions and, with the exception of the 1987 to 1992 drought period, has been able to accommodate customer water demands with this reduced level of storage in Crystal Springs Reservoir. However, it should be noted that the DSOD restriction on Crystal Springs Reservoir operations has reduced storage capacity in the Peninsula watershed by 17 percent, a critical concern from the perspective of emergency preparedness.

SOURCES: SFPUC, 2004; Olivia Chen Consultants, 2005; CDM, 2005; URS, 2006.

northwest of Hetch Hetchy Reservoir on tributaries to the Tuolumne River. The Eleanor-Cherry Diversion Tunnel and Pump Station link the two reservoirs, allowing them to be operated as a single unit.

Under normal operating conditions, Hetch Hetchy Reservoir is the only reservoir in this region that directly supplies water to the Bay Area; as discussed in Section 2.4, Hetch Hetchy water is delivered to customers without filtration, since the quality of this water supply has warranted a filtration exemption[1] from the U.S. Environmental Protection Agency (U.S. EPA) and California Department of Health Services (DHS). Water from Lake Eleanor and Lake Lloyd is used primarily to meet minimum instream flow requirements to benefit fish and other wildlife, satisfy downstream water rights of the Turlock and Modesto Irrigation Districts (TID and MID) (discussed in Section 2.5, below), produce hydroelectric power, and provide flows to support recreational use including whitewater recreation. However, if necessary during emergency or drought conditions, water from Lake Lloyd or Lake Eleanor can be released to Cherry Creek and then diverted to Mountain Tunnel for transport to the Bay Area, which occurred once during the early 1990s. In the event that water from Cherry and Eleanor Creeks is diverted to the regional water system, filtration of all water delivered from the Hetch Hetchy system would be necessary prior to delivery to customers, in accordance with requirements of the U.S. EPA and DHS.

From Hetch Hetchy Reservoir, water diverted at O'Shaughnessy Dam flows by gravity through the 10-mile-long Canyon Power Tunnel to Kirkwood Powerhouse to generate power. From Kirkwood Powerhouse, depending on flows from Canyon Tunnel, water is either returned to the river or diverted into the Early Intake Bypass and then to Mountain Tunnel. When Hetch Hetchy Reservoir was originally constructed, water from the face of the dam flowed down the river to Early Intake Reservoir (built in 1924), and from there was diverted to Mountain Tunnel; with the construction of Canyon Power Tunnel and the Early Intake Bypass in the 1960s, the Early Intake Reservoir and Diversion Dam lost much of their functional role in the regional system, and Tuolumne River water flows relatively unimpeded through the spillway adjacent to the diversion dam. Early Intake Reservoir and Diversion Dam, however, continue to serve important functions because they permit the SFPUC to divert water into the Mountain Tunnel from Cherry or Eleanor Creeks in emergencies or extended drought, and from the Tuolumne River in the event of loss of Canyon Tunnel or the Kirkwood Penstocks.

The 19-mile-long Mountain Tunnel, completed in 1925, allows the SFPUC to deliver raw water to the Groveland Community Services District, a retail customer. From Mountain Tunnel, the water is conveyed by gravity through Priest Reservoir, Moccasin Powerhouse, and Moccasin Reservoir. These two reservoirs regulate flows between facilities and can facilitate power peaking operations. If turbidity becomes a concern in these reservoirs, water is bypassed through pipelines. After Moccasin Reservoir, water travels through the Moccasin Gate Tower to the 16-mile-long Foothill Tunnel (completed in 1928), which passes beneath Don Pedro Reservoir

[1] As described in Section 2.4, the U.S. Environmental Protection Agency and the California Department of Health Services have determined that Hetch Hetchy water supply meets all state and federal water quality requirements without the need to provide filtration. In addition, the Hetch Hetchy water supply is disinfected in accordance with Safe Drinking Water Act requirements.

(owned by TID and MID) and ends at Oakdale Portal (where the San Joaquin Pipelines begin). Approximately three miles upstream from Oakdale Portal is the Rock River Lime Facility, where chemicals are added to water in Foothill Tunnel for corrosion control (SFPUC, 2004). The station is located above a shaft that accesses Foothill Tunnel. Water deliveries from the Hetch Hetchy system are transported entirely by gravity to the San Joaquin Region.

2.2.2 San Joaquin Facilities

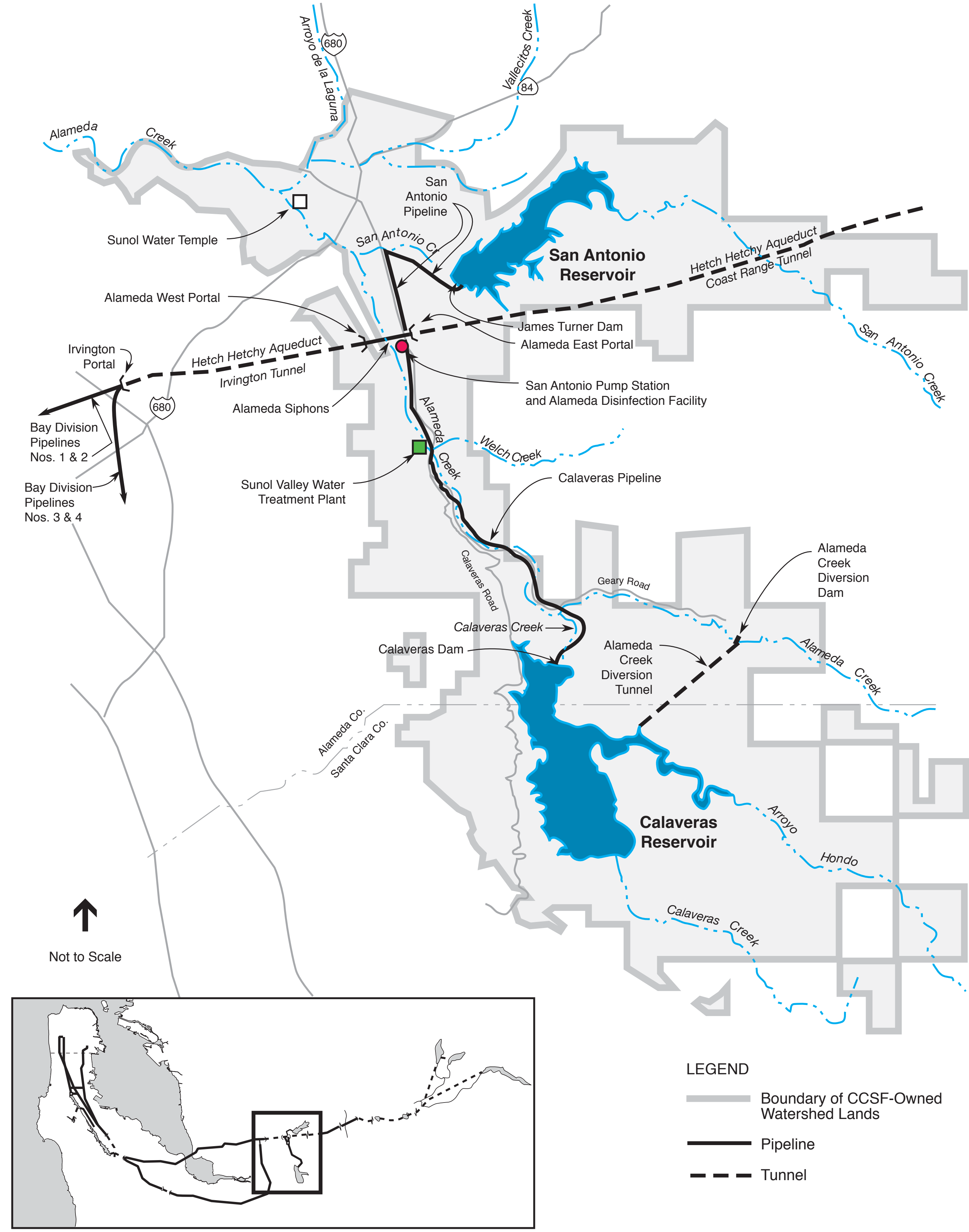
Oakdale Portal is the connection between the western end of Foothill Tunnel and the San Joaquin Pipelines. From Oakdale Portal, water from the Hetch Hetchy facilities is conveyed 47 miles west across the San Joaquin Valley by gravity in three parallel pipelines known as San Joaquin Pipelines Nos. 1, 2, and 3 (built in 1932, 1953, and 1968, respectively). The three pipelines are buried for most of their full length. The pipelines pass through Modesto, under the San Joaquin River, and past Tracy to Tesla Portal on the west side of the San Joaquin Valley. The current capacity of the three pipelines is approximately 290 mgd; however, when originally planned in 1912, the San Joaquin Pipeline system was envisioned with an ultimate nominal capacity of 400 mgd.

The San Joaquin Pipelines end at Tesla Portal and connect to the Coast Range Tunnel (built from 1927 to 1934). Tesla Portal, which is located on the east side of the Coast Ranges, is also the location of the Tesla Disinfection Facility, where Hetch Hetchy water is disinfected with chlorine and monitored for water quality. From Tesla Portal, the chlorinated Hetch Hetchy water is transported 25 miles through the Coast Range Tunnel to system facilities in the Sunol Valley. Water delivery to Lawrence Livermore Laboratory, a retail customer, occurs from the Coast Range Tunnel via two access shafts from the tunnel, Thomas and Mocho Shafts. At Thomas Shaft, a standby/backup chlorination facility provides disinfection in the event of operational difficulty at Tesla Portal. The 25-mile-long Coast Range Tunnel ends at the Alameda East Portal in the Sunol Valley (SFPUC, 2004). Again, water deliveries are transported entirely by gravity across the San Joaquin Region to the Sunol Valley.

2.2.3 Sunol Valley Facilities

Local water supplies from the Alameda watershed enter the regional system in the Sunol Valley and are blended with the Hetch Hetchy water supply. The Alameda watershed generally refers to CCSF-owned lands that are located within the much larger hydrologic boundaries of the southern Alameda Creek watershed. Local water supply sources contributing to the regional water system include Arroyo Hondo and Alameda and Calaveras Creeks, which provide inflow to Calaveras Reservoir, and San Antonio Creek, which flows to San Antonio Reservoir. **Figure 2.2** shows a schematic of the SFPUC’s Alameda watershed facilities.

The Alameda East Portal is the connection between the Coast Range Tunnel and the Alameda Siphons. The Alameda Siphons are three pipelines (built in 1934, 1953, and 1967) that cross the Sunol Valley and beneath Alameda Creek. The roughly 3,000-foot-long Alameda Siphons connect the Coast Range Tunnel at the Alameda East Portal to the Irvington Tunnel at the Alameda West Portal. At the Alameda Siphons, Hetch Hetchy water is blended with water from Calaveras



SOURCE: San Francisco Planning Department, 2000

SFPUC Water System Improvement Program . 203287

Figure 2.2
Alameda Watershed Facilities

and San Antonio Reservoirs that has been treated at the Sunol Valley Water Treatment Plant (WTP). Directly adjacent to the Alameda Siphons, the Sunol Valley Chloramination Facility provides secondary disinfection with chloramine, along with fluoride addition and pH adjustment for corrosion control, for both Hetch Hetchy water and treated water from the Sunol Valley WTP prior to transmission to the Bay Area. Water deliveries to the General Electric pumping facility and individual accounts in the town of Sunol, both retail customers, occur from two of the siphons at a location downstream of the blending point for treated water with Hetch Hetchy water.

Calaveras Reservoir, located at the south end of the Alameda watershed, collects and stores water from the local watershed, including drainage from Calaveras Creek and Arroyo Hondo. The reservoir was originally constructed in 1913 and was completed in 1925. The Alameda Creek Diversion Dam and Tunnel, constructed from 1925 to 1931 following completion of Calaveras Dam, divert flows and drainage from the southern Alameda Creek watershed into Calaveras Reservoir. Water from Calaveras Reservoir flows by gravity through the Calaveras Pipeline to the Sunol Valley WTP for treatment, and then flows to the Alameda Siphons, where it is blended with the Hetch Hetchy water supply. Water from Calaveras Reservoir can also be transferred for storage to San Antonio Reservoir and later for treatment at the Sunol Valley WTP.

In 2001, the California Department of Water Resources, Division of Safety of Dams (DSOD) performed an evaluation of Calaveras Dam and concluded that the dam does not meet current seismic stability criteria at normal operating levels due to properties of the soil material used in dam construction (DSOD, 2003; Olivia Chen Consultants, 2003). As a result, the DSOD placed interim operational restrictions on Calaveras Reservoir, lowering the level at which the reservoir can be safely operated and restricting the maximum water elevation to 705 feet. These restrictions reduced the total storage capacity of the reservoir by 60 percent (see Table 2.2 for normal and restricted reservoir capacities) and the total working storage capacity of the SFPUC's local reservoirs by over 30 percent. Due to the DSOD restrictions, the Calaveras system is currently diverting less flow from Alameda Creek via the Alameda Creek Diversion Dam and utilizes less water from Calaveras Reservoir. In addition, in 1991 the SFPUC and California Department of Fish and Game (CDFG) agreed on a minimum operating level for Calaveras Dam of 690 feet to protect juvenile fish populations (described below in Section 2.5.3). Therefore, under DSOD and CDFG restrictions, the SFPUC currently operates Calaveras Reservoir at water level elevations ranging between 690 and 705 feet to the extent feasible.[2]

These interim operating procedures allow the SFPUC to continue meeting water needs from local sources to a limited extent; however, the DSOD restrictions were placed "with the understanding that the SFPUC will continue to pursue an aggressive schedule for the remediation of Calaveras Dam" (DSOD, 2003). The SFPUC has adjusted its system operations to meet these restrictions, but considers this an impaired operating mode that puts the system at risk of being unable to adequately meet customer water demands in the event of an emergency or a prolonged drought. From the perspective of emergency preparedness, the DSOD restriction has reduced the SFPUC's total

2 Since December 2001 following periods of heavy inflow, reservoir storage levels have risen temporarily beyond the restricted levels. At such times, the SFPUC employs best efforts to lower the reservoir level by releasing water to the regional system, and if necessary, discharging excess inflow to Calaveras Creek below Calaveras Dam.

reservoir storage, including its emergency storage capacity, by over 58,000 acre-feet. The SFPUC is complying with the DSOD requirements by actively pursuing remediation of Calaveras Dam. The Calaveras Dam Replacement project is in development as part of the WSIP, and the San Francisco Planning Department initiated environmental review of this project in October 2005.

San Antonio Reservoir and Turner Dam, completed in 1965, impound water from San Antonio Creek. This reservoir can also receive and store water from the Hetch Hetchy water supply or from Calaveras Reservoir. Water stored in San Antonio Reservoir must be conveyed in the San Antonio Pipeline to the Sunol Valley WTP for treatment before it can be added to the regional distribution system at the Alameda Siphons.

The Sunol Valley WTP was constructed in 1966 and upgraded in 2003 to a peak capacity of 160 mgd (with a sustained capacity of 120 mgd); it can treat water from the local Alameda watershed drainages, including waters stored in both the Calaveras and San Antonio Reservoirs. Water from the Hetch Hetchy system can also be treated at the Sunol Valley WTP, which is necessary when the water does not meet DHS permit conditions as it enters the Sunol Valley (which occurs on rare occasions due to storm events in the Sierra causing high turbidity levels, or to conditions in the San Joaquin Pipelines) and when Hetch Hetchy water is used to maintain water treatment operations at the plant.

Hetch Hetchy water from the Coast Range Tunnel that is blended with treated water from the Alameda watershed in the Alameda Siphons then exits the Sunol Valley at the Alameda West Portal, located at the west end of the Alameda Siphons, where it enters the 3.5-mile-long Irvington Tunnel and flows by gravity to the city of Fremont in the East Bay. Irvington Tunnel was constructed in the 1930s and has a maximum capacity of 340 mgd (CDM, 2005). It is the only operating facility that conveys Hetch Hetchy and treated Alameda watershed water supplies to the Bay Area; since it must operate year-round to meet Bay Area customer demands, maintenance and inspection of Irvington Tunnel has not occurred for over 40 years (SFPUC, 2004).

2.2.4 Bay Division Facilities

The Irvington Portal in Fremont, at the west end of Irvington Tunnel, is where the tunnel connects to the four Bay Division Pipelines (Nos. 1, 2, 3, and 4), which consist of two sets of two parallel pipelines constructed in 1925, 1936, 1952, and 1973, respectively. The Bay Division Pipelines serve multiple purposes: providing water to customers in the East Bay, South Bay, and Peninsula through turnouts along the pipelines; conveying water to users in the northern Peninsula and in San Francisco; and transmitting water to Crystal Springs Reservoir to supplement local storage in the Bay Area. Numerous valve lots along the pipelines allow for flow control.

The Bay Division Pipelines Nos. 1 and 2 are 22 miles long and pass through the cities of Fremont and Newark, cross San Francisco Bay at the Dumbarton Strait, and continue through East Palo Alto, Redwood City, Menlo Park, and Atherton; they include about 3,000 feet of submarine pipeline that passes under the bay, as well as aboveground pipeline supported on a pipe bridge over water or on a trestle over the land and marsh along the bay margin. Within the urban areas, the Bay Division Pipelines Nos. 1 and 2 are buried pipelines. These two pipelines feed the SFPUC's Palo Alto Pipeline.

The Bay Division Pipelines Nos. 3 and 4 extend 34 miles around the south end of San Francisco Bay, almost entirely as buried underground pipeline. These two pipelines pass through the cities of Fremont, Milpitas, San Jose, Santa Clara, Sunnyvale, Mountain View, Los Altos, Palo Alto, Menlo Park, Atherton, Woodside, and Redwood City. Pipelines Nos. 3 and 4 converge for approximately 1,360 feet of tunnel at the Stanford Tunnel in Palo Alto. Pipelines Nos. 3 and 4 reconnect with Pipelines Nos. 1 and 2 at the Pulgas Portal entrance to Pulgas Tunnel just west of Redwood City (SFPUC, 2004).

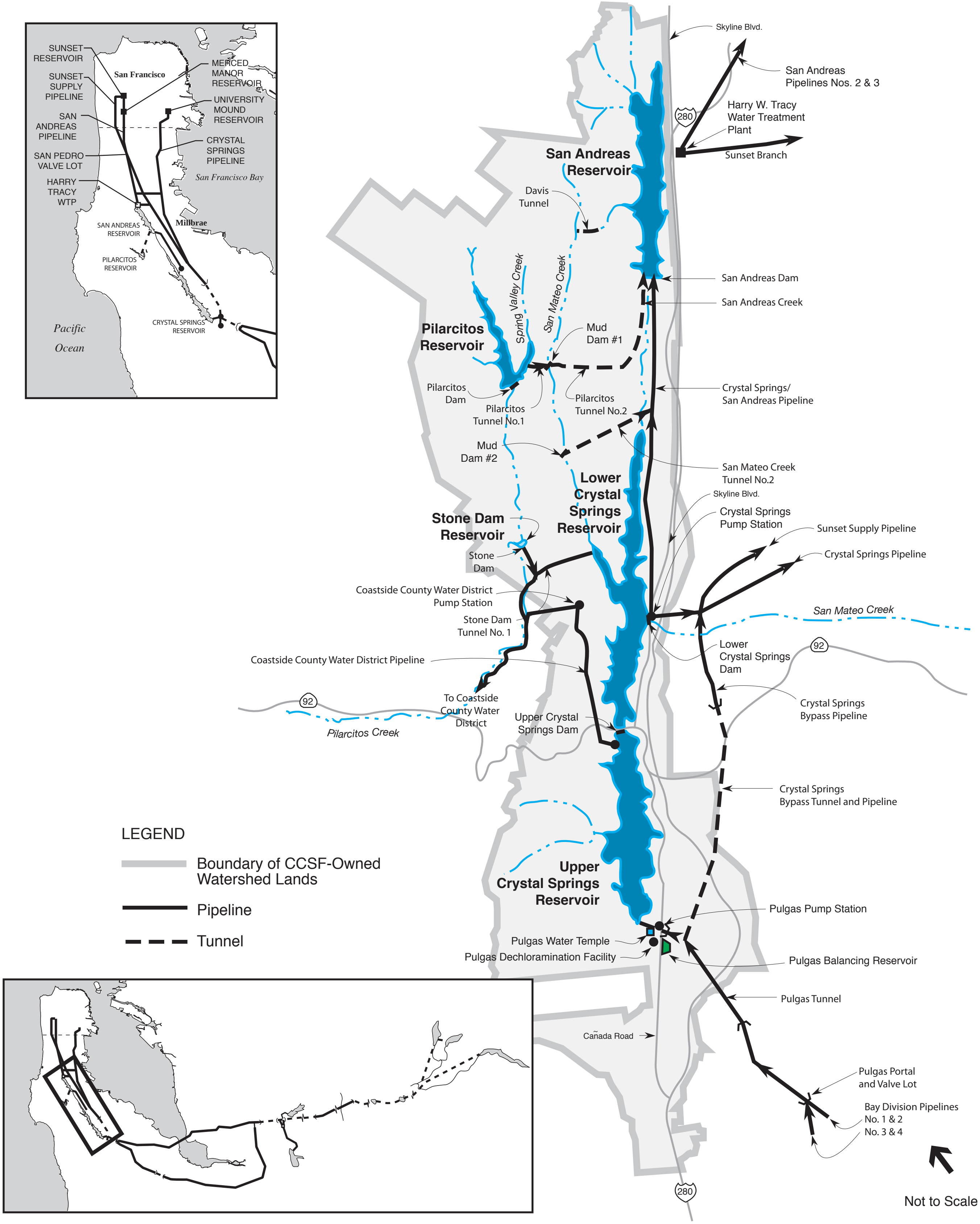
The existing SFPUC intertie with the Santa Clara Valley Water District (SCVWD) is also part of the Bay Division facilities and serves as a means to transfer water between the SFPUC and SCVWD during an emergency or during periods of planned maintenance work on critical facilities. The SFPUC intertie with the East Bay Municipal Utility District (EBMUD), which is currently under construction, will also be part of the Bay Division facilities and will serve as a means to transfer water between the SFPUC and EBMUD during an emergency or during periods of planned maintenance work on critical facilities. The actual water to flow through either intertie is not implicitly part of the operating agreements for the interties, and any exchange must occur under separate agreement by the SFPUC and the SCVWD or EBMUD.

The SCVWD intertie is located near Milpitas Boulevard in Milpitas. This intertie has a capacity of 40 mgd and has been used twice in the past to transfer a total of approximately 2 billion gallons of water from the SFPUC to SCVWD when the latter experienced shutdown of its Penitencia plant. The SCVWD is currently returning supplies to the SFPUC at an average rate of 5 mgd through the intertie.

The EBMUD intertie project includes a pump station at the Hayward Executive Airport, 1.5 miles of new pipeline, improvements to the City of Hayward's pipelines, and other modifications to the existing system that allow for the flow of up to 30 mgd. The project is scheduled for completion in June 2007.

2.2.5 Peninsula Facilities

At the Pulgas Portal and Valve Lot, Hetch Hetchy water supplies combined with treated Alameda watershed supplies enter the Peninsula system through the two-mile-long Pulgas Tunnel (built in 1926). The Peninsula system contains some of the oldest facilities in the regional system and includes three reservoirs—Crystal Springs (comprising the upper and lower reservoirs), Pilarcitos, and San Andreas Reservoirs—as well as the Harry Tracy WTP and extensive transmission facilities. The Peninsula watershed refers to the CCSF-owned lands and includes large portions of the natural drainage area of San Mateo, Pilarcitos, and San Andreas Creeks. **Figure 2.3** shows a schematic of the Peninsula watershed facilities.



SOURCE: San Francisco Planning Department, 2001

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Figure 2.3
Peninsula Watershed Facilities

From Pulgas Tunnel, the Peninsula system splits into two flow streams: one flow stream goes north along the east side of the Peninsula to the Crystal Springs Bypass system and the other west to Crystal Springs Reservoir. Generally, the bulk of the flow from Pulgas Tunnel goes directly into the 3.4-mile-long Crystal Springs Bypass Tunnel (constructed in 1969). The water flows to the 4,500-foot-long Crystal Springs Bypass Pipeline (also constructed in 1969). The Crystal Springs Bypass Pipeline connects to either the Crystal Springs Pipeline or Sunset Supply Pipeline, which convey water to users in northern San Mateo County and San Francisco. Up to this point, the water from Hetch Hetchy Reservoir is delivered entirely by gravity for over 120 miles; water conveyed through the Sunset Supply Pipeline and Crystal Springs Pipeline continues to flow by gravity north up the Peninsula, eventually ending at University Mound Reservoir in San Francisco.

A portion of water from the Pulgas Tunnel flows into Crystal Springs Reservoir, with flows regulated as necessary to meet customer demand through use of the Pulgas Balancing Reservoir and Pulgas Pump Station. Prior to discharge to Crystal Springs Reservoir, chloramine is removed from the combined Hetch Hetchy and Alameda watershed flows and the pH is adjusted at the Pulgas Dechloramination Facility in order to meet regulatory discharge requirements and to protect the water quality in the reservoir (SFPUC, 2004).

Crystal Springs Reservoir is where Hetch Hetchy and Alameda watershed water supplies blend with local water sources from the Peninsula watershed. Originally constructed as two separate reservoirs for the Spring Valley Water Company, Crystal Springs Reservoir is composed of Upper and Lower Crystal Springs Reservoirs. As constructed, Upper Crystal Springs Dam, built in 1877, divided the two reservoirs; however, since 1924, two large culverts through the dam enable unregulated flow between the reservoirs. Upper Crystal Springs Dam also forms the roadbed for State Highway 92, which crosses Crystal Springs Reservoir. Lower Crystal Springs Dam, originally built in 1888 and raised in 1891 and 1911, is located on San Mateo Creek; San Mateo County subsequently built a bridge over the crest of the dam.

Since 1983, the DSOD has placed operational restrictions on Lower Crystal Springs Dam due to concerns regarding the ability of the dam to retain water during major flood events. The DSOD operating restrictions have reduced the historical capacity of the combined Crystal Springs Reservoir by about 15 percent (see Table 2.2 for historical and restricted reservoir capacities). For the past 23 years, the SFPUC has adjusted its operating procedures to comply with the DSOD restrictions.

Crystal Springs Reservoir impounds local drainage from the surrounding lands, including the upper San Mateo Creek drainage northwest of the reservoir, as well as inflow from Pulgas Tunnel, which delivers water from the Hetch Hetchy and Alameda watersheds to the reservoir. In addition, local water supplies from Stone Dam Reservoir on Pilarcitos Creek (discussed below) are conveyed to and stored in Crystal Springs Reservoir. The Crystal Springs Pump Station (built in 1933) pumps water stored in Crystal Springs Reservoir through the Crystal Springs/San Andreas Pipeline to San Andreas Reservoir. This pipeline was originally built between 1898 and 1932, then largely rebuilt in 1968, although it still retains elements from the 1898 to 1932 era.

San Andreas Reservoir also receives water from Pilarcitos Reservoir (described below), but its primary source of water is Crystal Springs Reservoir. Water in San Andreas Reservoir is treated at the Harry Tracy WTP (also discussed below) before transmission to the regional system and delivery to customers.

Pilarcitos Dam was built in 1866 and raised in 1874; it collects local drainage and water from the Pilarcitos Creek watershed, forming Pilarcitos Reservoir. Stone Dam was built in 1871, two miles downstream of Pilarcitos Dam, capturing drainage along Pilarcitos Creek below the dam. Water from Pilarcitos Reservoir can be diverted to San Andreas and Crystal Springs Reservoirs through a system of tunnels originally built at the end of the 19th century. Almost half of Pilarcitos Reservoir supply is used to serve the Half Moon Bay area through wholesale service to the Coastside County Water District (Coastside CWD).

San Andreas Reservoir was originally constructed in 1870 to collect drainage from the San Andreas Creek watershed. Today, San Andreas Reservoir serves as the terminus for the multiple water sources collected in the Peninsula storage reservoirs. It receives inflow from Pilarcitos Reservoir, San Mateo Creek drainage, and Crystal Springs Reservoir (including Hetch Hetchy and Alameda watershed water stored in Crystal Springs Reservoir, which is conveyed through the Pulgas Tunnel). San Andreas Reservoir is the source of raw water inflow to the Harry Tracy WTP.

The Harry Tracy WTP, formerly known as the San Andreas Filter Plant, was built in 1971 and expanded in 1988 and 1990. It provides filtration, fluoridation, and disinfection for water collected in all of the Peninsula reservoirs. The plant has a hydraulic capacity of 180 mgd; however, in recent years the SFPUC has come to consider its sustainable capacity to be 120 mgd. Additionally, during most winters, San Andreas Reservoir experiences blooms of filter-clogging algae that can limit plant production to 90 to 100 mgd for several weeks.

Treated water from the Harry Tracy WTP is delivered to customers in northern San Mateo County and San Francisco through turnouts along the system. Several valve lots used to regulate flow and provide operational flexibility are located along the pipeline alignment between the Harry Tracy WTP and San Francisco, including the Capuchino, Baden, and San Pedro Valve Lots. Water from the Harry Tracy WTP is eventually delivered via the San Andreas Pipelines Nos. 2 and 3 or the Sunset Branch Pipeline to the Sunset or Merced Manor Reservoir in San Francisco, the final destination of this portion of the regional water system (SFPUC, 2004).

2.2.6 San Francisco Regional Facilities

The regional water system ends in San Francisco, where it connects to the city's local distribution system. There are three pipeline systems and three terminal reservoirs in this part of the regional system.

The three regional pipeline systems transporting water from the Peninsula to San Francisco are the Sunset Supply Pipeline, Crystal Springs Pipelines, and San Andreas Pipelines. The Sunset Supply and Crystal Springs Pipelines both extend about 20 miles from the Crystal Springs Bypass

Pipeline near Hillsborough to the Sunset and University Mound Reservoirs in San Francisco, respectively. The Crystal Springs and Sunset Supply Pipelines lines are referred to as "low zone" facilities, meaning that they operate on the Hetch Hetchy gradient, flowing by gravity from the Sierra all the way to San Francisco. Portions of these pipelines were built over 100 years ago and are still in service. The San Andreas Pipeline Nos. 2 and 3 start at the Harry Tracy WTP and deliver water to the Sunset and Merced Manor Reservoirs. These pipelines were designed to transmit water from San Andreas Reservoir to San Francisco; they are referred to as the "high zone" pipelines because the elevation of this part of the system on the Peninsula is about 150 feet higher than the low zone facilities. Water can be transferred between pressure zones at the Baden Pump Station (from low to high) and at the Capuchino Valve Lot (from high to low). Water is distributed to wholesale and a few retail customers in San Francisco and San Mateo Counties through turnouts along all three regional pipeline systems.

The three terminal reservoirs of the regional system are the Merced Manor, Sunset, and University Mound Reservoirs. Merced Manor and Sunset Reservoirs are on the west side of San Francisco. Merced Manor Reservoir, built in 1936, has a capacity of 9.5 million gallons. Sunset Reservoir–North Basin (built in 1938) and Sunset Reservoir–South Basin (built in 1960) have a combined capacity of about 177 million gallons. On the east side of San Francisco, University Mound–North Basin (built in 1924) and University Mound–South Basin (built in 1937) have a combined capacity of about 140 million gallons. The three terminal reservoirs in the regional system provide water for retail customers in San Francisco and regional system storage for wholesale customers on the Peninsula (SFPUC, 2004).

2.3 Water System Operations and Maintenance

System operations involve a complex interaction of numerous factors, including the capacity and operating conditions of physical facilities, customer needs, meteorological and hydrologic conditions, regulatory requirements, and institutional constraints. This section briefly discusses system customers, water supply sources, water quality, operational requirements, normal system operations for water deliveries, operations during drought periods, system maintenance, hydropower operations, and watershed management.

2.3.1 System Customers

The SFPUC provides water delivery services to retail and wholesale customers in San Francisco, San Mateo, Santa Clara, Alameda, and Tuolumne Counties that serve a total of about 2.4 million people. The SFPUC serves about one-third of its water supplies directly to retail customers located primarily in San Francisco, and about two-thirds of its water supplies to wholesale customers, primarily in the South Bay and Peninsula, by contractual agreement. Chapter 3 provides more detailed information on system customers, including a map of the service area (Figure 3.2), a list of retail and wholesale customers (Table 3.1), and a summary of current customer purchases from the regional system (Table 3.4).

2.3.2 Water Supply Sources

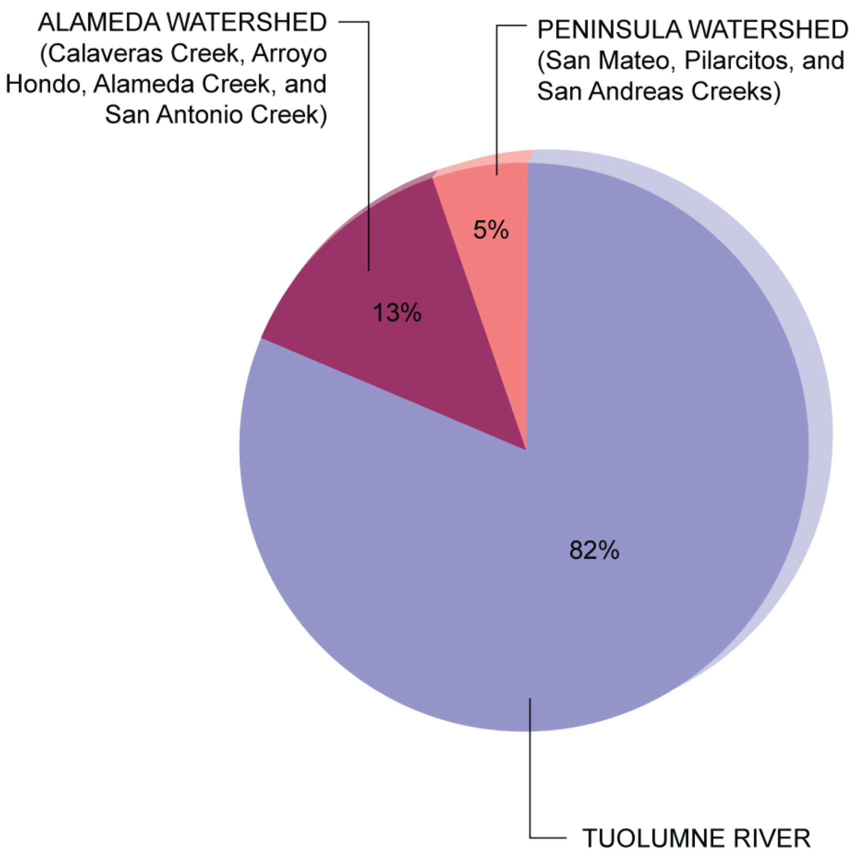
The SFPUC currently delivers an annual average of about 265 mgd through the regional water system. As described above, a majority of the water for the regional system comes from the Tuolumne River; this water is used to augment water supplies from local creeks and runoff in the Alameda and Peninsula watersheds. Local creeks and runoff in the local Alameda and Peninsula watersheds provide an average of about 15 percent of the total water supply. The Tuolumne River provides an average of about 85 percent to make up the remainder of the total water supply needed by customers.

In the Alameda watershed, the creeks feeding the local reservoirs include Arroyo Hondo and Alameda, Calaveras, and San Antonio Creeks; on the Peninsula, the major local water sources are San Mateo, Pilarcitos, and San Andreas Creeks. **Figure 2.4** illustrates the general breakdown of current water sources for the regional water system to meet all customer purchase requests for a typical year with adequate rainfall and snowmelt conditions. However, during extended dry periods, the regional system currently does not have a sufficient water supply, stored water, or supplemental water sources to fully meet customer purchase requests. Depending on the severity and duration of the drought condition, the SFPUC implements customer rationing (see the detailed discussion in Section 2.3.5), as occurred during the 1987–1992 drought. **Figure 2.5** depicts the breakdown of water sources and customer rationing that could occur under existing conditions during an extended drought sequence (see Chapter 3, Sections 3.4.1 and 3.5.4 for discussion of assumptions and planning tools, such as design drought and system firm yield, used in determining drought-year water supply needs).

2.3.3 Water Quality

The SFPUC regional water system delivers extremely high-quality water. As shown in Figure 2.4, the majority of the water is from the Tuolumne River, which originates in the upper Tuolumne River watershed high in the Sierra Nevada, remote from human development and pollution. This pristine water, referred to as Hetch Hetchy water, is delivered through pipelines and tunnels to the Bay Area and requires only minimal treatment (disinfection and pH adjustment) before it is served to customers. The U.S. EPA and DHS have approved the use of this drinking water source without requiring filtration at a treatment plant, as is generally required by the Surface Water Treatment Rule. However, in the event that water originating from Cherry and Eleanor Creeks is diverted to the regional water system, filtration of all water delivered from the Hetch Hetchy system would be required.

Local water supplies from the Alameda and Peninsula watersheds are subject to the Surface Water Treatment Rule, which specifies filtration requirements to meet drinking water quality standards. Filtration of Alameda and Peninsula water supply sources occurs at the Sunol Valley and Harry Tracy WTPs, respectively. Filtered and treated water from local watersheds is blended with Hetch Hetchy water, and all customers west of Sunol receive blended water. System water quality, including both raw and treated water quality, is continuously monitored and tested to assure that water delivered to customers meets or exceeds federal and state drinking water and public health requirements.



Note: Water supply sources (average annual) based on 2005 conditions during nondrought years, with Calaveras Reservoir operating at restricted levels and with 265 mgd in total systemwide deliveries.

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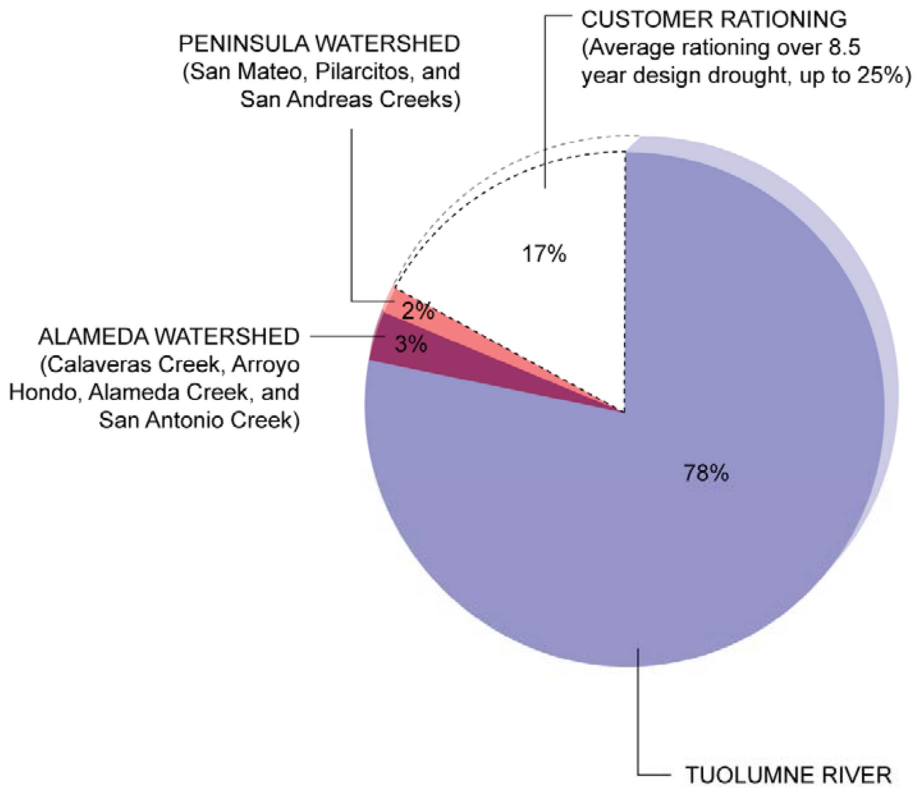
Figure 2.4
Existing Water Supply Sources, Typical Years

2.3.4 Normal System Operations for Water Deliveries

The SFPUC's Water First Policy gives priority to the production and protection of water supply over the production of hydropower generation in the operation of the Hetch Hetchy system. The Water First Policy was adopted in California in 2002 as part of the Wholesale Regional Water System Security and Reliability Act (Assembly Bill No. 1823), but has been the operational practice of the SFPUC since 1993 (Moran, 1994). Water quality is also a priority over hydropower operations that originate out of Hetch Hetchy Reservoir because of the need to meet drinking water permit requirements. The Water First Policy is further discussed in Section 2.4.3, below.



Note: Water supply sources (average annual) over 8.5-year design drought based on 2005 conditions, with Calaveras Reservoir operating at restricted levels and with 265 mgd in total systemwide deliveries. The chart depicts the expected level of water supply and rationing that could occur under these conditions.

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Figure 2.5
Existing Water Supply Sources, Dry Periods

Operation of the regional water system can be generally delineated between rules and strategies affecting the operation of the local system of reservoirs (in the Alameda and Peninsula watersheds) and rules and strategies affecting the operation of the Hetch Hetchy system. Although generally discussed separately, the two systems are interdependent, and operations of the systems are integrally linked in order to maximize water availability and quality. Schematic diagrams showing the linkage of system facilities that determine system operations are presented in **Figure 2.6**.

SFPUC customer purchase requests are met through a combination of flows from the Hetch Hetchy system and local reservoirs. The SFPUC operates the local reservoirs to conserve local watershed runoff and diverts water from the Hetch Hetchy system to supplement the supply developed by the local reservoirs. The overriding operating goal of meeting system demand is to ensure that sufficient water is available year-round regardless of hydrologic conditions (drought or nondrought).

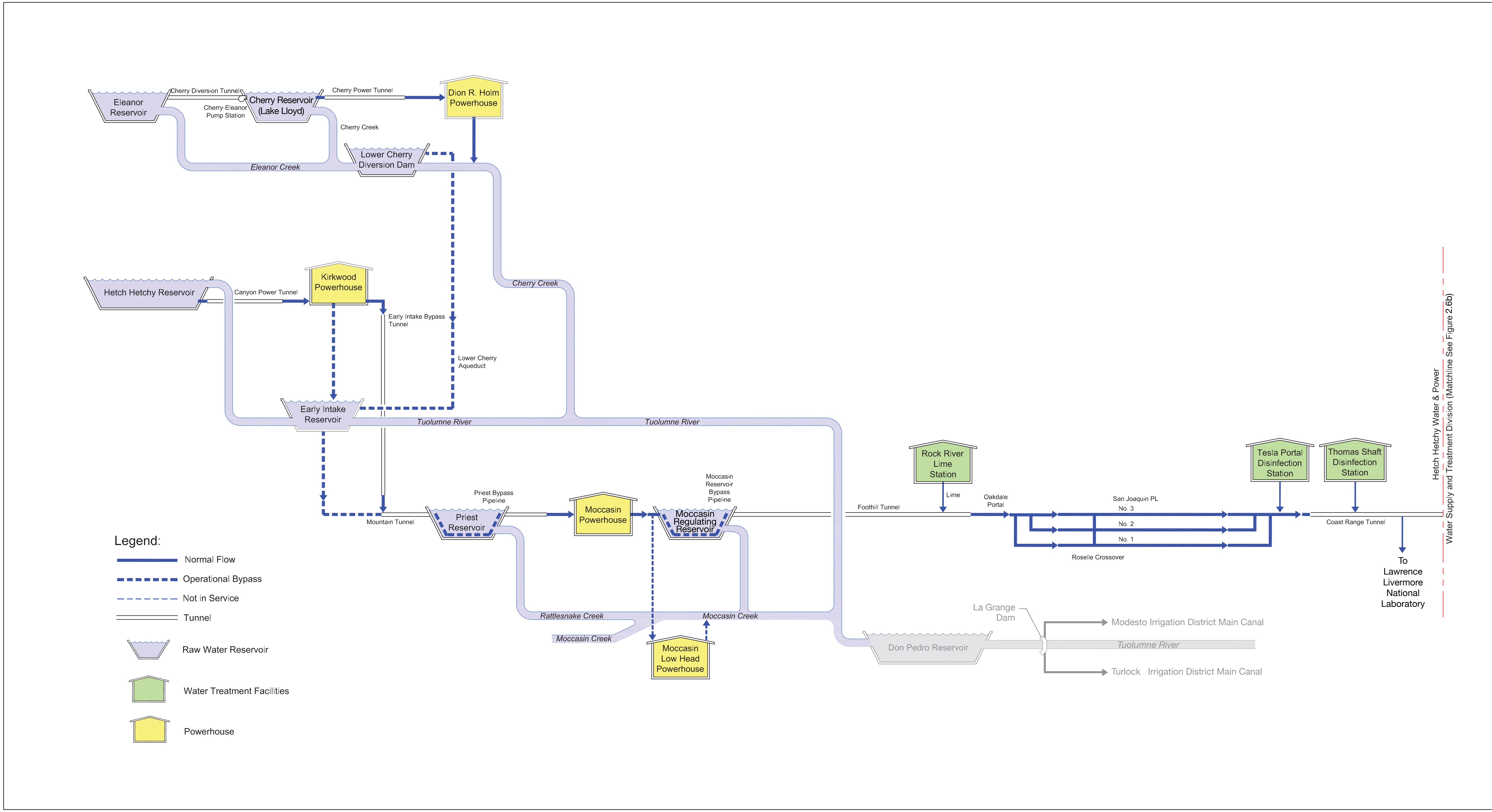
System operations and the amount of water delivered to customers vary throughout the year based on seasonal demand and the availability of water. The availability of water for delivery to customers is affected by numerous factors, including meteorological and hydrologic conditions; the capacity and operating condition of physical facilities and infrastructure; and regulatory/institutional parameters that regulate and allocate the distribution of water from the various sources. Regulatory requirements applicable to the regional system are described in Section 2.4, and institutional parameters, including system operations required to meet downstream obligations, are discussed in Section 2.5. This section describes system operations to meet customer water demand under normal conditions (i.e., in years when water supplies from rainfall, snowmelt, and storage are sufficient to fulfill customer purchase requests without rationing).

Water in the Hetch Hetchy system (which includes Hetch Hetchy Reservoir, Lake Lloyd and Lake Eleanor) comes from a combination of rainfall and inflow from the melting snowpack in the Tuolumne River watershed. The majority (approximately 80 percent) of the inflow to the reservoirs occurs during the snowmelt period from April through July. The SFPUC integrates the operation of its three Tuolumne River reservoirs with the operation of the water bank account in Don Pedro Reservoir (for an explanation of the water bank account, see Sections 2.4 and 2.5, below, regarding the Raker Act and New Don Pedro Project). The operation of these reservoirs and the water bank account is guided by two primary objectives: (1) conserve Hetch Hetchy Reservoir storage for diversion to meet the water purchase needs of SFPUC customers, and (2) fulfill the SFPUC's obligations to TID and MID under the Raker Act. There are also minimum downstream release requirements prescribed by the resource agencies (described in Section 2.5.3, below) for Hetch Hetchy Reservoir, Lake Lloyd, and Lake Eleanor.

The primary objective of Hetch Hetchy Reservoir operation is to maximize the volume of water stored in the reservoir by July 1 of every year (referred to as "carryover storage"[3]). After July 1, typically the end of snowmelt season, Hetch Hetchy Reservoir levels decline as diversions to the Bay Area exceed inflow to the reservoir.

Diversions from the Tuolumne River primarily originate from Hetch Hetchy Reservoir and incidentally provide hydroelectric generation at Kirkwood and Moccasin Powerhouses, in keeping with the SFPUC's Water First Policy. In general, the SFPUC avoids large downstream releases immediately below Hetch Hetchy Reservoir by regulating inflow and making smaller controlled releases from the reservoir. In anticipation of snowmelt runoff, the SFPUC releases water from Hetch Hetchy Reservoir by sending water through Kirkwood Powerhouse, thus lowering the level of the reservoir and reducing the storage volume to allow room for inflow from snowmelt runoff. This reduction in storage normally begins in winter as forecasts of snowmelt runoff become available. Drawdown of reservoir storage is determined first by the releases needed to meet water demand and second by the capacity of Kirkwood Powerhouse. If

3 Carryover storage is storage in a reservoir that is available for use in a succeeding period. For the SFPUC system, it is normally defined as the reservoir storage on July 1 of a given year. Carryover storage is a measurement of excess water captured when water is available, such as during the rainy season or during wet years, which is then available for later use during the dry season and/or during dry years.



SOURCE: Olivia Chen Consultants, 2005; SFPUC, 2007; ESA + Orion, 2007

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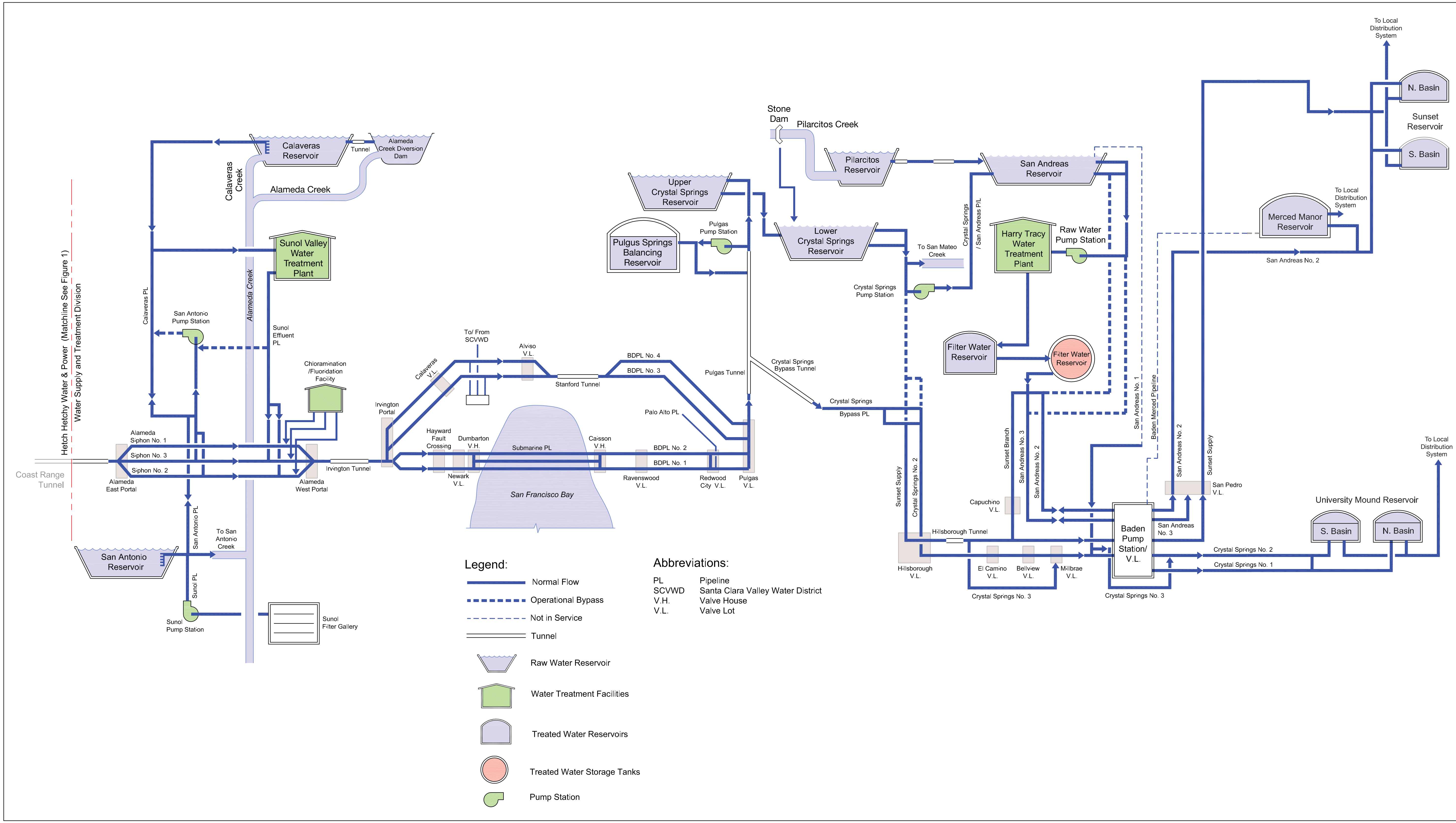
Figure 2.6a
Schematic Diagram of Regional System Facilities Linkages, Hetch Hetchy to Tesla



SOURCE: Olivia Chen Consultants, 2005; SFPUC, 2007; ESA + Orion, 2007

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Figure 2.6b
Schematic Diagram of Regional System Facilities Linkages, Tesla to San Francisco

determined necessary due to hydrologic conditions and reservoir storage capacity, additional controlled releases are made to the river.

Similar to Hetch Hetchy Reservoir operations, the Lake Lloyd and Lake Eleanor system is operated to conserve reservoir inflow for both water supply and hydroelectric generation (see Section 2.5). Winter and spring operations rely on the occurrence and forecast of runoff, which at times allows the SFPUC to drawdown reservoir storage in Lake Lloyd and Lake Eleanor and to utilize Holm Powerhouse for hydropower generation. The water transfer capability from Lake Eleanor to Lake Lloyd through the Eleanor-Cherry Diversion Tunnel, which links the two watersheds, allows for the utilization of runoff from the Eleanor Creek watershed through Holm Powerhouse. Like Hetch Hetchy Reservoir, maximum carryover storage into the summer season is the primary objective for reservoir operations.

As previously stated, the primary operating strategy is to fill all Hetch Hetchy system reservoirs on or about July 1 of each year. Historically, this occurs in about 75 percent of years, and generally by April 15 of each year the SFPUC can project the amount of water that will be stored in the system by July 1 of that year.

Operation of the Hetch Hetchy system is integrally linked with and dependent on the local system in the Alameda and Peninsula watersheds, as the Hetch Hetchy supply is used to supplement local supplies. While the Hetch Hetchy system provides the majority of the water (about 85 percent on average), the local reservoirs are operated to maximize use of annual yield for water deliveries and to provide critical backup or redundancy in the event of water quality problems, transmission disruptions in the Hetch Hetchy system, emergencies, critical maintenance, and droughts. Local water supplies stored in Calaveras Reservoir are the system's primary backup to the Hetch Hetchy supply. San Antonio and Crystal Springs Reservoirs supplement the storage capacity of Hetch Hetchy Reservoir, since the regional system conveys water from Hetch Hetchy Reservoir for storage in these local reservoirs; Calaveras Reservoir, however, stores only local watershed supplies and does not supplement the storage capacity of Hetch Hetchy Reservoir. The system is operated to maximize use of local resources for annual water deliveries, drought supply, and emergencies. Carryover storage in local reservoirs is critical to support system maintenance and emergency and drought preparedness of the regional water system (SFPUC, 2005a).

When water in excess of customer demand is available from Hetch Hetchy Reservoir and there is available capacity in the transmission system and local reservoirs, the SFPUC diverts water from the Hetch Hetchy system for storage in local reservoirs, namely San Antonio Reservoir in the Sunol Valley and Crystal Springs Reservoir on the Peninsula;[4] this "topping off" or replenishment operation also develops carryover storage in the regional system. Replenishment of local reservoirs is part of the overall strategy for maximizing the locally available water supply. The operational goal is to replenish storage in local reservoirs following the end of the rainy season, if necessary to supplement inflow from the local watershed, with water conveyed from the Hetch Hetchy system.

4 The regional system is designed so that Calaveras and Pilarcitos Reservoirs are used exclusively to store water from local drainages; they are not used to store water from the Hetch Hetchy system.

The SFPUC operates the local reservoir system to manage water needed for customer deliveries, water captured from local watershed runoff, and water conveyed from the Hetch Hetchy system. A primary objective of the local reservoir system is to conserve local watershed runoff for delivery. The local reservoir system's operation is seasonally driven. During the winter, when rainfall and local watershed runoff occurs, the local reservoirs are managed to maintain sufficient available storage and to minimize uncontrolled spills. In anticipation of or subsequent to storm events, runoff is conveyed to the Harry Tracy and Sunol Valley WTPs to maintain reservoir storage at winter storage objective levels. Towards the end of the winter as the likelihood of rain decreases, the reservoirs are operated to capture local watershed runoff with a goal of maximizing carryover storage in combination with Hetch Hetchy system storage.

During the summer, the amount of water drawn from the local reservoirs is minimized to preserve storage so that water is available in the event of a disruption of flow from Hetch Hetchy Reservoir or unplanned outages within the system. As the system demand increases beyond the capacity of flow from the Hetch Hetchy system, water is drawn from the local reservoirs to serve demand.

While the local watershed systems all have a common overall operating strategy, aspects of the Calaveras and Pilarcitos Reservoirs in the local system have a component of unique operation. As previously stated, Calaveras Reservoir's inflow is supplemented by diversions from Alameda Creek through the Alameda Creek Diversion Tunnel. Typically, the tunnel diverts flow from upper Alameda Creek when it is available up to the capacity of the tunnel. Flow at the diversion site that exceeds the diversion capacity spills over the dam and into the reach of the creek downstream of the diversion dam. Prior to 2002, the tunnel was kept open throughout the entire rainy season except when Calaveras Reservoir was full. Since 2002 with the DSOD restriction in place, the SFPUC has closed the tunnel more often, since Calaveras Reservoir is operated at reduced storage capacity. In addition, the SFPUC recently installed a low-flow valve at Calaveras Dam to allow for future low-flow releases.

Pilarcitos Reservoir stores runoff from the Pilarcitos Creek watershed for transfer to the SFPUC's reservoir in the San Mateo Creek watershed and for use by Coastside CWD. Water for Coastside CWD is released from Pilarcitos Reservoir to Pilarcitos Creek and then diverted by Coastside CWD at Stone Dam. Pilarcitos Reservoir is filled during the rainy season. Water not needed to fill the reservoir and meet Coastside CWD's needs is transferred from Pilarcitos Reservoir to San Andreas Reservoir and from Stone Dam to Crystal Springs Reservoir. Occasionally during wet months of wet years, runoff exceeds Coastside CWD's needs and the ability of the SFPUC to store water in Pilarcitos Reservoir or convey it to San Andreas and Crystal Springs Reservoirs. At such times, water spills over Stone Dam and flows down Pilarcitos Creek. In the summer months, when Coastside CWD's water demand is at its seasonal maximum, its water supply from Pilarcitos Creek becomes insufficient to meet its needs. At that point, Coastside CWD ceases diversions from Pilarcitos Creek and obtains its water by pumping from Crystal Springs Reservoir. The SFPUC is currently making experimental releases from Stone Dam to support ongoing studies of aquatic resources in Pilarcitos Creek below Stone Dam.

None of the Peninsula system reservoirs currently have regulatory agreement for an instream release immediately below their dams (see Section 2.5 for further discussion). Both San Mateo Creek downstream of Crystal Springs Reservoir, and Pilarcitos Creek below Stone Dam, have limited channel capacity due to urban (San Mateo Creek) and agricultural (Pilarcitos Creek) encroachments. Therefore, both reservoirs are operated to minimize uncontrolled reservoir spills. Calaveras Reservoir is the only reservoir in the Alameda system that has an instream release agreement; this agreement is pursuant to a 1997 Memorandum of Understanding (MOU) with the CDFG (see Section 2.5 for further discussion) (CDFG, 1997).

As described above, the regional system is highly dependent on storage, both in the Sierra Nevada and locally in the Bay Area, to be able to serve water under a wide variety of meteorological/ hydrological and operating conditions. During system upsets or when unusual water quality conditions occur in any of the reservoirs, the system provides a number of operational bypasses (see Figure 2.6) and backup facilities that allow the SFPUC to modify normal operations and continue to meet water quality standards without interrupting service to its customers.

2.3.5 Operations During Drought Periods

System operations during drought periods require more complex planning and system management than during nondrought years. Drought planning relies on two key concepts: “system firm yield” and “design drought.” System firm yield is the average annual water delivery that can be sustained throughout an extended drought. Design drought is a planning and operation tool that water supply agencies use to define a reasonable worst-case drought scenario based on local hydrology in order to establish design and operating parameters for the water system. Droughts more severe than the design drought would cause failure of supply within the water system. For the purposes of regional water system planning, the SFPUC uses a design drought that anticipates and plans for a more severe drought than historical events and evaluates the system firm yield assuming the system is experiencing the design drought. Studies suggest a 30 percent chance that the SFPUC system will experience a drought in the next 75 years equal to or more severe than the 1987–1992 drought, which was the most extreme recorded drought event to affect the regional system. The WSIP uses a design drought based on the hydrology of the six years of the worst historical drought (1987–1992) plus the 2.5 years of the 1976–1977 drought, for a combined total of an 8.5-year design drought sequence (SFPUC, 2007a).

With the DSOD restriction on Lower Crystal Springs Dam but no restriction on Calaveras Dam, the system firm yield is 226 mgd; this represented system conditions prior to December 2001. However, currently, due to the existing DSOD operating restriction on Calaveras Dam since December 2001, the system firm yield is reduced to about 219 mgd. The regional system currently provides an annual average of about 265 mgd of water to customers. Since the current deliveries (265 mgd) are greater than the system firm yield (226 mgd under normal conditions or 219 mgd under restricted conditions), the regional system cannot fully meet water deliveries to current customers during a prolonged drought. Reductions in deliveries (i.e., customer rationing) are required during drought periods (SFPUC, 2007a), as indicated in Figure 2.5.

The regional system has experienced drought periods in the last 30 years: most notable are the droughts that occurred from 1976 to 1977 and from 1987 to 1992. During the 1987–1992 drought, even with the implementation of customer rationing, the amount of carryover storage in the regional system was more severely depleted than during any previous time, and the SFPUC had to adjust its normal operating procedures to avoid running out of water (SFPUC, 2007a).

The 1987–1992 drought began at the end of the 1986 rainy season. Subsequent annual flows in the Tuolumne River were about 50 percent of average, CCSF entitlements were reduced to about 16 percent of the total river flow, and less than 50 percent of the normal amount of water delivered to customers was available from the river. As the drought progressed, the SFPUC developed and implemented short-term procedures to impose rationing on customers that resulted in a near 25 percent annual systemwide[5] reduction in water deliveries. The extended drought forced the SFPUC to adopt a mandatory rationing program from 1988 to 1989 and again from 1990 to 1993. The rationing program was based on an allocation method that reduced indoor water uses by 10 percent and outdoor water uses by 60 percent. However, due to the wide variation in types of water users in the regional service area, this program resulted in a wide variation in the cutbacks experienced by different customers, ranging from about 20 percent in areas with cooler climates and denser land use patterns to over 40 percent in areas with warmer climates and more landscaping. In the later stage of the six-year drought, the SFPUC was initiating programs to achieve a 45 percent reduction in systemwide water deliveries to balance water supplies with deliveries, but a series of storms in March 1991 provided relief from the anticipated water shortage, and the 45 percent rationing program was averted. However, based on the experience of the 1987–1992 drought, the SFPUC modified its operational procedures with regard to drought planning (SFPUC, 1993).

In 2000, the SFPUC adopted the *Interim Water Shortage Allocation Plan* (SFPUC, 2000a) in collaboration with the Bay Area Water Users Association (the organization representing wholesale customers, which has since been reorganized as the Bay Area Water Supply and Conservation Agency, or BAWSCA). This plan identified a water allocation method to be used to determine the share of water for wholesale customers during shortages caused by drought. The allocation method is effective for systemwide shortages of up to 20 percent during droughts. Following the adoption of the *Interim Water Shortage Allocation Plan* by all of the wholesale customers, the SFPUC adopted the *Retail Water Shortage Allocation Plan* consistent with the plan for wholesale customers (SFPUC, 2001b), which applies to all retail customers, including the residents and businesses in San Francisco.

Based on the two water allocation plans, the SFPUC system operations currently include a process for declaring a water shortage and a method for allocating reductions. The general protocol links total and anticipated reservoir storage conditions to suggested delivery reductions. Each year, during the spring snowmelt period, the SFPUC evaluates the amount of total water storage expected to occur throughout the regional system. If this evaluation finds the projected

5 For the purposes of this PEIR, "systemwide" refers to the entire regional water system and includes both retail and wholesale customers.

total water storage to be less than an identified level sufficient to provide sustained deliveries during drought, the SFPUC may impose delivery reductions or rationing. With existing purchase requests, there are currently three stages of delivery reduction: Stage 1 involves up to a 10 percent systemwide delivery reduction and is achieved by voluntary rationing; Stage 2 imposes up to a 20 percent systemwide delivery reduction and requires mandatory rationing; and, at Stage 3, a 20 percent or greater systemwide delivery reduction would result in mandatory rationing with further reduced allocations. As drought conditions continue and reservoir storage becomes further depleted, the SFPUC may need to impose an increasing level of delivery reductions. Prior to the initiation of any water delivery reductions, the SFPUC would hold a public meeting, open for public comment, to outline the water supply situation, the proposed water use reduction objectives, alternatives to water use reduction, and compliance methods (SFPUC, 2001b).

2.3.6 System Maintenance

The SFPUC performs maintenance of the regional system facilities as a fundamental part of operations so that it can continue to serve customers with reliable, high-quality water. Maintenance can include inspections and minor repairs/upkeep as well as major repairs, replacement, or rehabilitation. One of the inherent difficulties with performing maintenance on existing system facilities is that the most important facilities to maintain are also the most critical for system operation and, therefore, the most difficult to take out of service for inspection or repair. Planned outages for system inspections and repair must be scheduled in the context of the ongoing need to meet customer demand and maintain storage levels in local reservoirs. Pipelines, tunnels, treatment and pumping facilities, and other related facilities all require maintenance. Pipelines and tunnels have the greatest operational constraints with respect to maintenance because they need to be shut down during maintenance. Treatment and pumping facilities have more flexibility, since maintenance can generally be performed on these facilities without completely shutting them down.

Within the regional system, the current goal is to inspect all tunnels, except for the Irvington Tunnel, and all San Joaquin Pipelines on a 10-year cycle. Additionally, certain segments of the San Joaquin transmission system are inspected more frequently based on their age, leak history, condition, etc. Approximately four inspections per year are performed on the Bay Division and Peninsula pipeline sections. Following inspections, minor repairs may require outages of 45 days to two months, while major repairs may require shutdowns of 90 days or more.

The SFPUC attempts to meet the maintenance goals to the extent possible, given the capacity restrictions and limited redundancy (i.e., backup facilities) of the current system. Many of the tunnels in the system are important for water delivery to customers and lack redundancy, so it is difficult to shut them down for inspections. These include the Irvington, Pulgas, Crystal Springs Bypass, and Stanford Tunnels. Some of these tunnels have not been inspected for 20 to 30 years. As described previously, maintenance and inspection of Irvington Tunnel has not occurred for over 40 years.

Despite ongoing maintenance, unplanned outages occur periodically throughout the regional system for various reasons, including power outages and system failures. Major facility failures or outages that have recently occurred include:

- In August 1996, a rupture in SJPL No.3 occurred about 2 miles west of Oakdale Portal due to failure of the pipe material. The pipeline break resulted in reduction of water delivered from the Hetch Hetchy system to the Bay Area from 230 mgd to 150 mgd for a period of three weeks. The pipeline failure caused an unplanned discharge of over 10 million gallons of water at a rate of 200 to 400 cubic feet per second, flooded the surrounding cattle range land, and created a 1,000-foot long erosion gully. The SFPUC issued an emergency repair contract to replace the faulty pipe section and to restore water deliveries, and the surrounding lands were restored to their previous conditions.

- During the 1996/1997 rainy season, a landslide occurred on the hillside above the Crystal Springs Bypass Pipeline, burying a 350-foot segment of the roadway in which the pipeline is aligned. This landslide subjected the pipeline to excessive soil pressure and slight displacement. Although inspections of the pipeline found minor and repairable damage, corrective actions were necessary to stabilize the slope above the pipeline. The incident revealed how vulnerable the Crystal Springs Bypass Pipeline is to seismically induced landslides.

- During the 1996/1997 rainy season, concurrent with the unplanned outage of the Crystal Springs Bypass Pipeline, water in Crystal Springs Reservoir exhibited excessive levels of turbidity that limited the availability of water that could be treated at the Harry Tracy WTP. This condition lasted for about four weeks.

Pipeline leakage or failure is particularly susceptible where there are prestressed concrete cylinder pipe (PCCP) segments. PCCP breaks have occurred in recent years on parts of the San Joaquin No. 3, San Antonio, Bay Division No. 4, and San Andreas Pipelines, and repairs for these pipelines have taken from several days to several months. Seismic safety and flooding issues with Calaveras Dam and Lower Crystal Springs Dam, as described above, have restricted the normal operating capacity of the system. However, the SFPUC has generally been able to continue full water service during these outages and restricted conditions. Nevertheless, the deferred maintenance of major facilities within the system, including critical facilities, has reduced the overall system reliability and capacity over time.

2.3.7 Hetch Hetchy Hydropower Operations

Under the Raker Act of 1913 (discussed in Section 2.4.2, below), the CCSF was required to develop hydroelectric power, since such power was considered a natural byproduct of developing the Hetch Hetchy water supply. The Raker Act requires the CCSF to sell excess Hetch Hetchy power at cost, when available above the city’s own municipal needs, to TID and MID for agricultural pumping and municipal needs. After satisfying its own municipal load and Raker Act obligations to TID and MID, the Raker Act allows the CCSF to sell any remaining Hetch Hetchy power to public agencies for resale and/or directly to end-users. The Raker Act prohibits the CCSF from selling Hetch Hetchy power to private entities for resale.

The major portion of Hetch Hetchy power goes to satisfy San Francisco's own municipal needs, and the balance is sold to TID and MID, industrial customers (such as San Francisco International Airport tenants), and public entities. Municipal agencies (including the CCSF), departments, and enterprises consume slightly more than half of the electricity produced by the Hetch Hetchy power system. Among the city agencies that receive electricity from the SFPUC are the San Francisco Municipal Railway, San Francisco General Hospital, Laguna Honda Hospital, and the SFPUC's regional water, local water, and wastewater facilities. Regional water system facilities that use Hetch Hetchy power include the Sunol Valley WTP and San Antonio Pump Station. These electricity demands are expected to increase over the next decade (SFPUC, 2007b).

The hydropower system, known as the Hetch Hetchy Project, is comprised of 400 megawatts of hydroelectric power generation plants located on the Tuolumne River and 150 miles of high-voltage transmission lines delivering Hetch Hetchy power to the San Francisco Bay Area. Energy production varies by season and by year, depending on hydrologic conditions. The long-term annual average production is approximately 1.7 billion kilowatt-hours. Historical production has ranged from a low of 0.71 billion kilowatt-hours per year to a high of 2.2 billion kilowatt-hours per year (SFPUC, 2002).

There are three major hydropower facilities: the Holm, Kirkwood, and Moccasin Powerhouses. Holm Powerhouse, located on Cherry Creek, generates power from water released from Lake Lloyd/Lake Eleanor; after passing through the hydropower facilities, water is returned to Cherry Creek and ultimately flows in the Tuolumne River into Don Pedro Reservoir. Kirkwood Powerhouse, located along the Tuolumne River below O'Shaughnessy Dam, generates power from water released from Hetch Hetchy Reservoir; after passing through the hydropower facilities, this water is diverted first to Mountain Tunnel and then to the regional water system as part of the Tuolumne River water supply source. Moccasin Powerhouse, located downstream of Priest Reservoir, discharges to Moccasin Reservoir and uses Tuolumne River water to generate power before it flows to the Foothill Tunnel and then to the regional system. Water in excess of that diverted into Mountain Tunnel below Kirkwood Powerhouse and into Foothill Tunnel below Moccasin Powerhouse is released into the Tuolumne River and Moccasin Creek, respectively, and ultimately flows into Don Pedro Reservoir.

The Hetch Hetchy transmission system is comprised of eight transmission lines of varying lengths that interconnect to other power systems and the power grid; the system delivers Hetch Hetchy power to San Francisco's municipal load, TID, MID, several retail customers (including San Francisco International Airport), and to public entity customers. The Hetch Hetchy transmission system connects to MID's system at the Standiford and Warnerville substations, and to TID's system at the Oakdale substation. The Hetch Hetchy transmission system terminates in Newark, where it interconnects to the Pacific Gas and Electric Company (PG&E) power grid; PG&E facilities are used to convey Hetch Hetchy power from Newark to the San Francisco's municipal load and certain retail customers.

As described above, the SFPUC operates its facilities in accordance the Water First Policy. Under this policy, the production of hydropower is considered significant but secondary to water supply and water quality considerations (SFPUC, 2005a). The Water First Policy is also required by Assembly Bill 1823 (Water Code Section 73504[b]) and is further described under Section 2.4, below. For example, both Priest and Moccasin Reservoirs have bypass pipelines that can be put into service when warranted by water quality conditions; use of these pipelines limits peaking power generation, but assures that drinking water quality is preserved and regulatory requirements are met. As discussed in Section 2.5, hydropower operations during certain times of the year are coordinated with releases for whitewater rafting.

2.3.8 Watershed Management

Preservation and protection of watershed lands are an important aspect of SFPUC system operations. By actively managing activities within its watershed boundaries, the SFPUC can protect and maintain the water quality of the source waters for the regional system.

Tuolumne River Watershed

The 459-square-mile portion of the Tuolumne River watershed that flows into Hetch Hetchy Reservoir (Hetch Hetchy watershed) is entirely within Yosemite National Park; approximately 95 percent of this watershed is congressionally designated as wilderness area. This federal designation provides unique measures of protection to the watershed. The National Park Service (NPS) manages Yosemite National Park to preserve the resources that contribute to Yosemite's uniqueness and attractiveness, and to make the varied resources of the park available to people for enjoyment, education, and recreation. The NPS manages the Yosemite wilderness areas to meet the goals and principles of the 1964 Wilderness Act. In wilderness areas, human activities are limited to those that leave no long-term impact on the land or that have little or no effect on the natural resources of the area. People can enter wilderness areas by foot or on horseback, but mechanized access is not allowed.

The SFPUC and NPS negotiated a Watershed Protection Agreement that provides supplemental funding to the NPS to provide extra protection in the watershed (U.S. Department of Interior and SFPUC, 2005). The NPS has many regulations in place to protect water quality in Yosemite. SFPUC funding allows the NPS to employ additional rangers to enforce these regulations. The Watershed Protection Agreement also provides for additional onsite and offsite visitor education and information programs to inform park visitors to the watershed about water quality regulations and wilderness use techniques that protect water quality. Visitors are informed that the watershed is a source of drinking water for the San Francisco Bay Area and of their role in protecting the quality of the drinking water supply. The agreement also provides funding to the NPS so that it can operate and maintain facilities within the watershed to prevent source water contamination.

As part of the requirements for maintaining filtration avoidance (discussed in Section 2.4.1, below), the SFPUC conducts regular inspections of the protected Hetch Hetchy watershed and reservoirs. These inspections are collaborative efforts between the NPS and SFPUC to identify potential sources of drinking water contamination and identify actions to prevent contamination.

Alameda and Peninsula Watersheds

In the Alameda watershed, the CCSF owns about one-third of the lands comprising the southern Alameda Creek drainage area. Portions of the land have been leased for grazing, nursery, and quarry operations, although the watershed lands remain predominantly open space. In the Peninsula watershed, the CCSF owns the majority of the lands draining to the three Peninsula reservoirs (Crystal Springs, San Andreas, and Pilarcitos). In 1969, the CCSF, San Mateo County, and the state and federal governments made easement agreements to preserve the Peninsula watershed for water supply and open space purposes (Hanson, 1994, 2005).

In the 1990s, the SFPUC conducted planning and public outreach for the development of watershed management plans for the Alameda and Peninsula watersheds. Draft plans were published in 1998, followed by environmental review (San Francisco Planning Department, 2000 and 2001). The SFPUC adopted the Alameda and Peninsula Watershed Management Plans (WMPs) in 2000 and 2001, respectively (SFPUC, 2000b, 2001a). The adopted plans provide goals and polices aimed at improving water quality as well as creating a balance between the need for high-quality water and ecological resource protection, and the desire for public access and use of the watershed. The Alameda WMP includes specific elements for grazing and other Sunol Valley resources (including mining, recreation, and creek enhancements), and the Peninsula WMP includes an element for recreational access. Both plans contain specific elements to address fire management.

As part of implementation of the WMPs, the SFPUC is developing habitat conservation plans (HCPs) for both watersheds, in compliance with federal and state regulations for endangered species protection. The objective of these plans is to enable the SFPUC to implement watershed operations and maintenance activities while conserving and enhancing native species, habitats, and ecosystems. The HCPs will provide comprehensive, long-term conservation measures for species listed as threatened or endangered under the Endangered Species Acts or species that could be listed in the future. Other management actions that the SFPUC has implemented include restoration, training, and fire hazard management activities. The HCPs are further described in Chapter 4, Section 4.6, Biological Resources, under Regulatory and Conservation Planning Framework.

2.4 Regulatory Requirements

2.4.1 Safe Drinking Water Act

The basic regulations governing the regional water system are associated with the federal and California Safe Drinking Water Acts. The federal Safe Drinking Water Act, passed in 1974 and amended in 1986 and 1996, is the nation's primary law regulating drinking water quality and is implemented by the U.S. EPA. The act authorizes the U.S. EPA to set national health-based standards for drinking water and requires many actions to protect drinking water and its sources, including rivers, lakes, reservoirs, springs, and groundwater wells. In addition to source water protection, the act also provides for treatment, monitoring, sampling, analytical methods, reporting, and public information requirements. Implementation and enforcement of both the federal and California Safe Drinking Water Acts are under the jurisdiction of the California Department of Health Services (DHS), Division of Drinking Water and Environmental Management. Drinking water regulations are set forth in the California Code of Regulations, Titles 17 and 22.

The amended federal Safe Drinking Water Act established phases of regulation and a number of regulatory deadlines to address drinking water requirements. This amended act is implemented through subsidiary rules for regulation of specific contaminants or for monitoring or treatment requirements (U.S. EPA, 2007). The major U.S. EPA drinking water regulations are listed below:

- Surface Water Treatment Rule
- Interim Enhanced Surface Water Treatment Rule
- Total Coliform Rule
- Stage 1 Disinfectants and Disinfection Byproducts Rule
- Stage 2 Disinfectants and Disinfection Byproducts Rule
- Long Term 1 Enhanced Surface Water Treatment Rule
- Long Term 2 Enhanced Surface Water Treatment Rule
- Variances and Exemptions Rule
- Lead and Copper Rule
- Radionuclides Rule
- Filter Backwash Recycling Rule
- Arsenic Rule
- Public Notification Rule

Surface Water Treatment Rule and Hetch Hetchy Reservoir

In 1991, the U.S. EPA adopted the Surface Water Treatment Rule, which included water quality provisions for unfiltered systems, referred to as "filtration avoidance." In 1993, the SFPUC applied for the ability to comply with federal filtration avoidance regulations; the DHS reviewed and approved this application, and forwarded its recommendation to the U.S. EPA that the Hetch Hetchy supply be approved as an unfiltered source that meets all criteria in the federal statute for filtration avoidance. The U.S. EPA also approved this application in 1993. In 1998, the state added filtration avoidance provisions to Title 22 of the California Code of Regulations, under which the Hetch Hetchy supply is currently regulated. In 2000, the SFPUC adopted resolution number 00-0277, reaffirming its policy "to maintain the 'filtration avoidance' status for Hetch Hetchy water" and directing its staff "to prepare and submit operating fund and capital project budget requests which are consistent with proactive maintenance of 'filtration avoidance'" (SFPUC, 2000d).

Water from Hetch Hetchy Reservoir can be delivered to SFPUC customers without filtration, provided that it meets the filtration avoidance requirements outlined in the Surface Water Treatment Rule. These requirements include meeting source water quality standards, disinfection criteria, and site-specific criteria. In the Hetch Hetchy system, source water quality standards are measured for compliance at Tesla Portal, where disinfection also occurs. The SFPUC conducts extensive routine water quality monitoring and watershed protection activities and submits a monthly report to the DHS to fulfill filtration avoidance requirements. The report indicates coliform and turbidity levels, compliance with disinfection requirements, compliance with the Total Coliform Rule, quarterly disinfection byproduct levels, operability of disinfection equipment, watershed control activities, and any detected outbreaks of waterborne disease. In addition, the SFPUC submits an Annual Watershed Sanitary Survey Report summarizing compliance with watershed control program requirements, and the SFPUC's comprehensive watershed protection program has been shown to meet specific pathogen barrier criteria. Since 1993, these activities have demonstrated that, without filtration, the water from Hetch Hetchy Reservoir consistently meets or exceeds all water quality standards, indicating a high level of public health protection for regional system customers.

Water from Lake Eleanor, Lake Lloyd, and reservoirs in the Alameda and Peninsula watersheds does not meet filtration avoidance criteria and requires filtration at either the Sunol Valley or Harry Tracy WTPs before it can be delivered to customers.

2.4.2 Raker Act of 1913

In 1913, the federal government passed the Raker Act (Public Law No. 3-41, 38 Stat. 242), which states the following:

> An Act granting to the city and county of San Francisco certain rights of way in, over and through certain public lands, the Yosemite National Park, and Stanislaus National Forest, and certain lands in the Yosemite National Park, the Stanislaus National Forest, and the public lands in the State of California, and for other purposes.
>
> That there is hereby granted to the city and county of San Francisco … all necessary rights of way along such locations for the purpose of constructing, operating, and maintaining aqueducts, canals, ditches, pipes, pipe lines, flumes, tunnels, and conduits for conveying water for domestic purposes and uses to the city and county of San Francisco and such other municipalities and water districts as, with the consent of the city and county of San Francisco, or in accordance with the laws of the State of California in force at the time application is made.

The Raker Act granted to the CCSF rights-of-way and use of public lands in the affected areas to construct, operate, and maintain reservoirs, dams, conduits, and other structures necessary or incidental to developing and using water and power. However, the act imposed many conditions and obligations, stipulating, among others, that the CCSF was required to:

- Recognize the prior rights of TID and MID to receive water the districts could beneficially use, up to specified amounts of the natural daily flow, for direct use and storage
- Construct miles of scenic roads and trails in Yosemite National Park and donate them to the United States
- Started building the dam at Hetch Hetchy and complete it as rapidly as possible

- Enforce specific sanitary regulations within the watershed area
- Develop electric power for municipal and commercial use
- Not divert beyond the limits of the San Joaquin Valley any more of the waters from the Tuolumne watershed than shall be necessary for its beneficial use for domestic or other municipal purposes
- Pay an annual rental starting at $15,000 and rising to $30,000 after 20 years
- Not sell or give Hetch Hetchy water or power to a private person or corporation for resale

The CCSF ratified the Raker Act in the spring of 1914, and the Hetch Hetchy construction program started immediately. Since that time, the CCSF has developed and continues to develop the Hetch Hetchy water and power system and to use Tuolumne River water for municipal, industrial, and hydroelectric power purposes consistent with the provisions of this act.

2.4.3 Assembly Bill 1823

Adopted in 2002, California Assembly Bill 1823, known as the Wholesale Regional Water System Security and Reliability Act, is an act to add and repeal Division 20.5 of the California Water Code, which governs regional water systems. It imposes various requirements on wholesale regional water systems and applies directly to the CCSF and the SFPUC's regional water system. The bill includes numerous stipulations, including the following requirements for the CCSF: to adopt a capital improvement program by February 1, 2003; to adopt an emergency response plan by September 1, 2003; to distribute available water during any interruption to customers on an equitable basis; to continue operating reservoirs in Tuolumne County in a manner that ensures that the generation of hydroelectric power will not cause any reasonably anticipated adverse impact on water service; and to assign higher priority to water delivery to the Bay Area than to hydroelectric power generation.[6]

The act includes the Water First Policy (Water Code Section 73504[b]), which states:

> In order to supply adequately, dependably, and safely the requirements of all users of water, the city shall continue its practice of operating the reservoirs in the Counties of Tuolumne and Stanislaus in a manner that ensures the generation of hydroelectric power will not cause any reasonably anticipated adverse impact on water service. The city shall assign higher priority to delivery of water to the Bay Area than to the generation of electric power, unless the Secretary of the Interior, in writing, notifies the city that doing so would violate the Raker Act (63 Public Law 41).

The act identified specific projects to be included in the program, along with a requirement that a schedule be submitted to the DHS by March 2003 showing that projects representing 50 percent of the costs would be completed on or before 2010, and 100 percent of the projects would be completed on or before 2015. The SFPUC met this requirement and has submitted subsequent

6 The act allows the SFPUC to add or delete projects from the original capital improvement program, including the list of specific projects that was to be included in the original program.

revisions to the original capital improvement program, which has now been renamed the Water System Improvement Program (SFPUC, 2005b; SFPUC, 2006a).

2.4.4 Dam Safety Program

The California Water Code designates the regulatory Dam Safety Program to the Department of Water Resources, Division of Safety of Dams (DSOD). The principal goal of this program is to avoid dam failure and thus prevent loss of life and destruction of property. The DSOD reviews plans and specifications for the construction of new dams and for the enlargement, alteration, repair, or removal of existing dams, and must grant written approval before the owner can proceed with construction. Professional engineers and geologists from the DSOD evaluate each project, investigate proposed sites, and check available construction materials. Dams under DSOD jurisdiction include artificial barriers (together with appurtenant works) that are 25 feet or more in height or have an impounding capacity of 50 acre-feet or more. Any artificial barrier not in excess of 6 feet in height, regardless of storage capacity, or that has a storage capacity not in excess of 15 acre-feet, regardless of height, is not considered jurisdictional (DSOD, 2007).

In addition to Calaveras and Lower Crystal Springs Dams (which are currently operating under DSOD restrictions), other SFPUC regional system infrastructure under DSOD jurisdiction includes the following: Balboa Reservoir, University Mound Reservoirs (North and South), Sunset Reservoirs (North and South), Stanford Heights Reservoir, Sutro Reservoir, Calaveras Reservoir, Turner Dam, Crystal Springs Reservoir, Pilarcitos Reservoir, San Andreas Reservoir, O'Shaughnessy Dam, Lake Lloyd, Lake Eleanor, Priest Reservoir, Early Intake Reservoir, and Moccasin Reservoir.

2.5 Institutional Considerations

In additional to the regulatory requirements described above, the regional system is subject to a number of institutional agreements and other planning requirements, including those described below.

2.5.1 Existing Water Rights and Entitlements

The CCSF water rights and entitlements for the existing water supply sources of the regional water system have been obtained or granted pursuant to California law. With the exception of San Antonio Reservoir in the Alameda Creek watershed, all water diverted and stored in and through the regional system reservoirs and facilities in the Tuolumne River, Alameda, and Peninsula watersheds is done pursuant to pre-1914 appropriative water rights (see the description of appropriative rights in the following paragraphs). Water is diverted and stored in San Antonio Reservoir pursuant to a license granting an appropriative water right that was issued by the State Water Resources Control Board (SWRCB) in 1959.

Description of California Water Rights

California recognizes both appropriative and riparian water rights. An appropriative water right allows the holder to divert from a water source to a place of use not connected to the water source. The appropriative water right is based on a place of use, a purpose of use, and a method of diversion. Riparian rights holders, on the other hand, only have the right to divert from a water source to adjacent land for use on such land. Appropriative rights are based on seniority—that is, first in time, first in right—with those having the most senior water rights enjoying the most security in the use of water. In times of shortage, junior water-rights holders must cease diversions until all water rights that are senior to them have been satisfied. Use of water under an appropriative water right must be reasonable, beneficial, and not wasteful.

Originally, physical diversion was evidence of the right of use in California, but in 1872 California formally enacted Civil Code provisions (Civil Code Sections 1410–1422) recognizing appropriative water rights. After 1872, an appropriator simply had to post a notice of water right in a conspicuous place at the proposed point of diversion and then record the notice with the county recorder. Water rights noticed under the Civil Code were perfected through diligence in the construction of water diversion works that put the water to the beneficial uses in the places identified in the notice. If the appropriator followed the provisions of the Civil Code within the prescribed timeframes, the appropriator obtained a priority date as of the posting date of the notice, even though completion of the appropriation was substantially later. In recognition of the special needs of municipalities to make the best use of limited funds and to increase use as population grows, California law allows municipalities that hold pre-1914 water rights to increase the use of their water rights over time as the need for water increases (Civil Code Section 1416).

In 1914 California established a formal water rights permit system to create a more orderly method of appropriating unappropriated waters. The State Water Resources Control Board (SWRCB) now administers the water-rights permit system. While the SWRCB has sole authority to issue new appropriative water rights, it does not have authority to define the property rights created under a pre-1914 appropriative water right. The courts are charged with defining the validity and scope of water rights of pre-1914 appropriators when the extent of such rights or claims is in dispute.

San Francisco's Water Rights

The CCSF has sufficient pre-1914 and post-1914 water rights for existing operations and facilities as well as proposed operations and facilities under the WSIP. This is true for both the Hetch Hetchy and local portions of the regional water system, including the proposed Calaveras Dam Replacement project and the proposed Lower Crystal Springs Dam Improvement project (described in Chapter 3), neither of which would expand the capacity of these reservoirs beyond historical levels under CCSF water rights.

As to the Tuolumne River supply, the CCSF made numerous water-rights filings on the Tuolumne River between 1901 and 1911. The Tuolumne River water-rights filings support a *prima facie* diversion rate well over 400 mgd. The 1912 Freeman Report, which provided the basis for the CCSF's proposals to Congress to develop the Hetch Hetchy Project, identified 400 mgd as the ultimate diversion from the Tuolumne River.

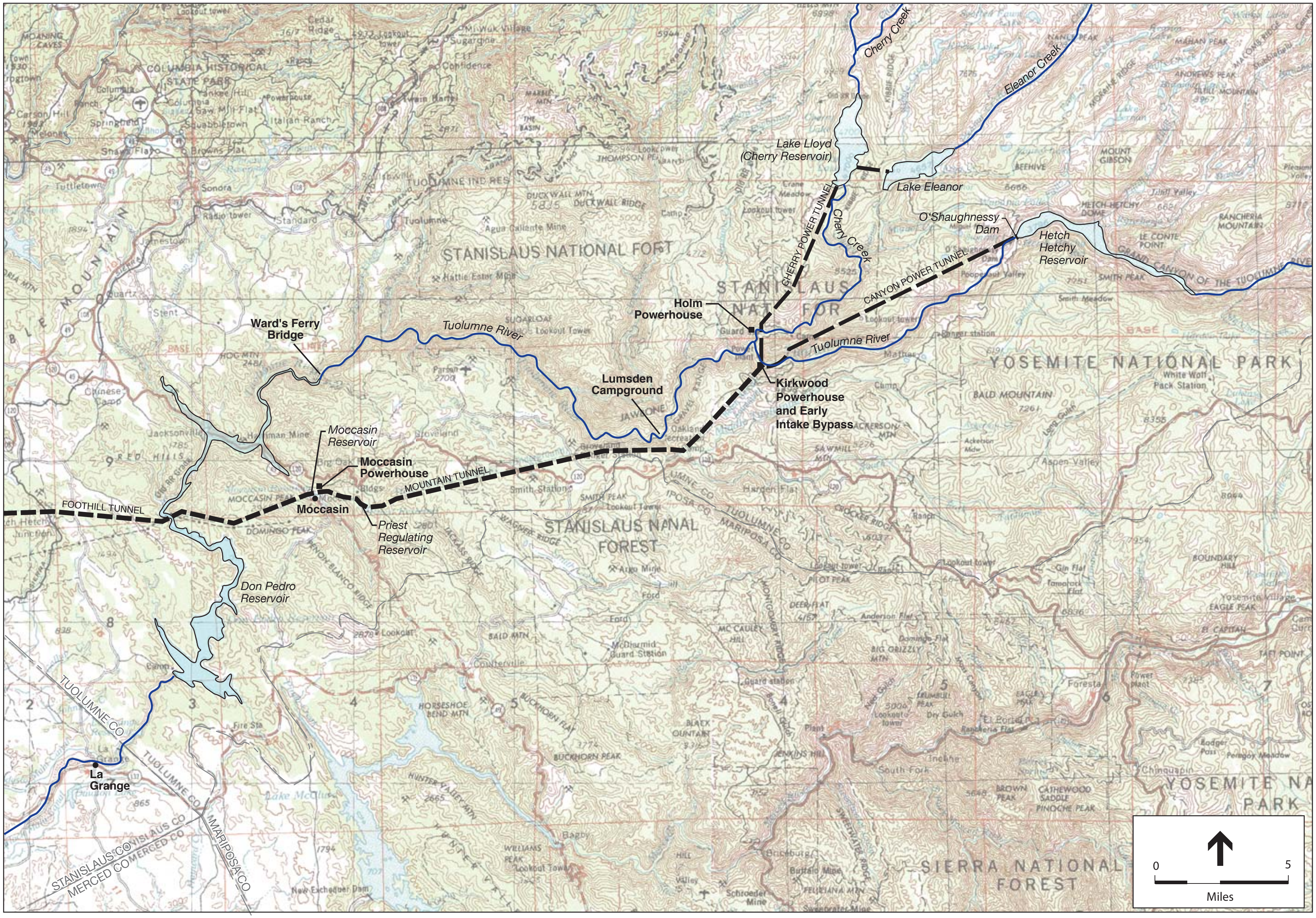
The operation of the SFPUC water supply system is a matter of historical record. Since the third San Joaquin Pipeline was put into service in 1968, the historical annual diversions to the Bay Area from the Tuolumne River through the San Joaquin Pipelines (Tuolumne River diversions) have varied widely, depending on the time of year and year type. Since 1968, Tuolumne River diversions have averaged about 197 mgd (fiscal year [FY] 1968/2004), with a maximum annual diversion of 295 mgd (FY 1987/1988). The average diversion of 197 mgd is about 12 percent of the total average natural flow of the Tuolumne River at La Grange Dam. For that same period, FY 1968/2004, annual deliveries to SFPUC customers averaged about 248 mgd, with an annual average maximum purchase of 293 mgd (FY 1987/1988). Monthly Tuolumne River diversions have been as high as 305 mgd (January 1977), with daily sustained diversions as high as 310 mgd (August 1984).

As noted above, the Raker Act requires San Francisco to recognize the senior water rights of TID and MID to divert water from the Tuolumne River. Specifically, the Raker Act requires the CCSF to bypass certain flows through its Tuolumne River reservoirs to TID and MID for beneficial use. By agreement, the CCSF, TID, and MID, have supplemented these Raker Act obligations to increase the TID and MID entitlements to account for other senior Tuolumne River water rights and to allow the CCSF to "pre-pay" TID and MID their entitlement by storing water in the Don Pedro water bank (see the Don Pedro water bank discussion below). The CCSF is required to bypass inflow to TID and MID sufficient to allow them to divert 2,416 cfs or natural daily flow, whichever is less, at all times (as measured at La Grange), except for April 15 to June 13, when the requirement is 4,066 cfs or natural daily flow as measured at La Grange, whichever is less.

2.5.2 New Don Pedro Project

In 1964, the Federal Energy Regulatory Commission (FERC) issued a license to TID and MID to construct the New Don Pedro Dam and Reservoir on the lower Tuolumne River, about 50 miles downstream from O'Shaughnessy Dam and Hetch Hetchy Reservoir, as shown in **Figure 2.7**. Construction of the New Don Pedro Reservoir (referred to hereafter in this PEIR as Don Pedro Reservoir) was completed and operation began in 1971; it has a gross capacity of 2,030,000 acre-feet and a net usable capacity for irrigation, flood control, and hydropower generation of 1,721,000 acre-feet (FERC, 1996a).

As part of the development of the New Don Pedro Project, the CCSF, TID, and MID entered into agreements to specify the rights and entitlements of each party and their respective responsibilities for the New Don Pedro Project (CCSF/TID/MID, 1966). One of the agreements allocates storage space in Don Pedro Reservoir for a specified volume of water within the CCSF entitlement. This storage space is referred to as the "water bank account" and provides the SFPUC flexibility in the operation of Hetch Hetchy Reservoir. The water bank account allows the CCSF to meet the entitlements and prior rights of TID and MID under the Raker Act and subsequent agreement, while maximizing the use of water from Hetch Hetchy Reservoir to supply



SOURCE: ESA + Orion; SFPUC, 2006; USGS 1970

SFPUC Water System Improvement Program . 203287

Figure 2.7
Tuolumne River Features Below Hetch Hetchy Reservoir

water to SFPUC customers. As described above, TID and MID have senior water rights to the CCSF for Tuolumne River water and are entitled to the first increment of flow in the basin.

San Francisco's allocation of storage space in Don Pedro Reservoir varies from 570,000 to 740,000 acre-feet, depending on whether flood control restrictions on the reservoir are in effect. Basically, the SFPUC adds water to its water bank account whenever the inflow to Don Pedro Reservoir exceeds the TID and MID entitlements; conversely, the SFPUC debits from the water bank account whenever it diverts or stores Tuolumne River water that would otherwise be within the entitlements of TID and MID.

As described in Section 2.2.1, water from Lake Eleanor and Lake Lloyd that is used to produce hydroelectric power and provide flows for recreational and fishery (i.e., nonconsumptive) uses is returned to Cherry Creek and the Tuolumne River and ultimately flows downstream to Don Pedro Reservoir. The releases from Lake Eleanor and Lake Lloyd can be used to meet the TID and MID entitlements. When in excess of TID and MID entitlements, these flows to Don Pedro Reservoir can be credited to the SFPUC water bank account, thus allowing the SFPUC more flexibility during different times of the year to deliver water from Hetch Hetchy Reservoir to its customers.

2.5.3 Instream Flow Releases

Hetch Hetchy Facilities

The Raker Act gave the CCSF the right to develop a municipal water and power system subject to conditions and regulations of the Department of the Interior (DOI) and the Department of Agriculture (DOA) for the protection of public lands. In exercising their authority, the DOI and DOA have imposed conditions on the CCSF's rights-of-way to conform with federal policies, and, in the 1950s, the DOI and DOA began requiring water releases from Hetch Hetchy facilities to maintain minimum stream flows to benefit instream fisheries and other wildlife[7] (CCSF, 1961).

Lake Lloyd (Cherry Reservoir)

In 1949, the CCSF filed an amended application to change the boundaries for rights-of-way for the then-proposed Cherry Reservoir. The CCSF entered into stipulations with the DOA, which were executed on February 28, 1950, to release specified flows from Cherry Reservoir (now known as Lake Lloyd) "for the protection and maintenance of fish, wildlife and recreation in the Cherry River below the Dam." The Cherry stipulations require the CCSF to release 5 cfs from October 1 through June 30, and 15 cfs from July 1 through September 30 (CCSF, 1956).

[7] Hetch Hetchy Project facilities, with the exception of the Moccasin low-head hydroelectric facility, are exempt from FERC jurisdiction for the licensing of hydroelectric facilities. Most hydropower facilities in the United States are regulated by FERC, and many are required by FERC to make releases for instream fisheries.

Lake Eleanor

In the mid-1950s, the CCSF applied for permission from the DOI to relocate tunnel aqueducts, steel penstock, and the power plant site of the Cherry River Project. In granting the changes in rights-of-way, the DOI conditioned its approval on the CCSF agreeing to instream releases into Eleanor Creek to support fisheries. These flows were increased in 1982 when the CCSF sought changes in rights-of-way to build the Cherry-Eleanor Pump Station. The fishery releases were based on an evaluation performed by the U.S. Forest Service fisheries biologist, and evaluations and recommendations made by the U.S. Fish and Wildlife Service (USFWS) and the CDFG. The Eleanor stipulations require the CCSF to release 5 cfs from October 1 through June 30, and 15.5 cfs from July 1 through September 30 in years when no pumping occurs between Lake Lloyd and Lake Eleanor. In years when pumping occurs, the Eleanor stipulations require the CCSF to release 5 cfs from November 1 through February 28, 10 cfs from March 1 through April 14, 20 cfs from April 15 through September 15, and 10 cfs from September 16 through October 31 (CCSF, 1982).

Hetch Hetchy Reservoir

There were no instream flow requirements when O’Shaughnessy Dam was originally constructed. However, when the Canyon Power Project and Kirkwood Powerhouse were proposed in the 1950s, it became necessary to modify right-of-way conditions specified in the Raker Act, which led to a series of conditions for fishery releases from Hetch Hetchy Reservoir. In 1958, the CCSF agreed to make interim releases from Hetch Hetchy Reservoir until the NPS, U.S. Forest Service, and USFWS completed a fishery study. The study was completed in August 1976, but the CCSF contested the study. In 1984, the CCSF, federal agencies, and interested parties reached an agreement for fishery releases, which was approved by the DOI in 1985. The 1985 stipulations established three different minimum flow release schedules based on hydrologic year type. Shortly thereafter, the CCSF began building a third generating unit at Kirkwood Powerhouse, and the DOI determined that additional conditions for fishery releases were required. These stipulations, which were signed in 1987, modified and increased the flow schedules. This last set of stipulated fishery release schedules—based on the 1976 fish study and continued discussions and negotiations between federal agencies, the CCSF, and other interested parties—currently dictates the CCSF instream flow releases at O’Shaughnessy Dam (CCSF, 1987).

The Hetch Hetchy stipulations set forth basic flow schedules and amounts for discretionary releases. The flow schedules, defined for three hydrologic year types, are triggered by the amount of cumulative precipitation and runoff at Hetch Hetchy Reservoir over a specified period of time. The schedule for a given month is determined on the first day of the month. From January through June, a schedule for a given month is determined by the cumulative precipitation in the Hetch Hetchy watershed since October 1 of the preceding year. During July and August, the cumulative runoff into Hetch Hetchy Reservoir since October 1 of the preceding year determines which schedule will be used. The schedule for the balance of the year after August is the schedule in effect on August 1. The minimum amount of water to be released annually is 59,235 acre-feet for Schedule A, 50,019 acre-feet for Schedule B, and 35,215 acre-feet for Schedule C. The SFPUC must release an additional 64 cfs into the river below Hetch Hetchy Reservoir when the diversion through Canyon Tunnel exceeds 920 cfs. Finally, the stipulations provide for an additional supplemental release depending on water-year type, subject to completion of a habitat study and a corresponding determination of the timing of such releases. Chapter 5 of this PEIR presents more information on the triggers and the minimum release schedules for Hetch Hetchy Reservoir (CCSF, 1987).

Moccasin Fish Hatchery

The SFPUC releases water for the Moccasin Fish Hatchery under a 20-year lease agreement (1992–2012) between the CCSF and the State of California. Under the lease, the state has the right to take up to 30 cfs from Moccasin Reservoir for hatchery needs. After use in the hatchery, the water is released into Moccasin Creek, where it flows into Don Pedro Reservoir (CCSF, 1992).

Peninsula and Alameda Watershed Facilities

There are currently no release agreements to support fisheries in the regional system reservoirs or dams on the Peninsula, which includes Pilarcitos, Stone, San Andreas, and Crystal Springs Dams and Reservoirs. However, as described above, the SFPUC is currently making experimental releases from Stone Dam to support ongoing studies of aquatic resources in Pilarcitos Creek below Stone Dam. The SFPUC intends to develop a final release schedule from Stone Dam in coordination with the state and federal regulatory agencies as part of the Peninsula HCP.

In the Alameda watershed, Calaveras Dam and Reservoir is the only facility operating under an agreement to make releases in support of fisheries.[8] In 1997, the SFPUC and CDFG entered into an MOU regarding the magnitude and timing of flows to be released from Calaveras Reservoir for the improvement of habitat conditions for fisheries on Alameda and Calaveras Creeks (CDFG, 1997). The MOU specifies that the maximum quantity of water the SFPUC may be required to release will not exceed 6,300 acre-feet per year, and that the SFPUC will conform with flow schedules for water releases, varying between 7 cfs during late spring and summer and up to 20 cfs during the two-month winter trout-spawning period. The MOU also states that a suitable point exists for the recapture of water released, and a recapture facility may be constructed in the vicinity of the Sunol Valley WTP so that the SFPUC can recapture this water for consumptive use in the SFPUC service area. The recapture project is one of the WSIP facility improvement projects evaluated in this PEIR.

In addition, in October 1991 the SFPUC issued an MOU with the CDFG regarding the Calaveras Reservoir intake screen design and operating procedures (SFPUC, 1991). The agreement specifies that “Calaveras Reservoir will be operated to minimize the potential hazard to juvenile fish populations by recognition of critical season periods, operating levels and screen approach velocities.” In effect, the agreement restricts Calaveras Reservoir from being operated at an elevation greater than 690 feet (CDM, 2005).

8 The other SFPUC dams in the Alameda watershed include Turner Dam (on San Antonio Reservoir). The Sunol and Niles Dams—two inactive dams on Alameda Creek below San Antonio Reservoir in Niles Canyon—were removed in the fall of 2006 to help restore fish passage.

As previously described in Section 2.3.4, the SFPUC recently installed a low-flow valve at Calaveras Dam to allow for future lower volume releases.

Other Tuolumne River Fishery Release Requirements

As described above, TID and MID own and operate the New Don Pedro Project and make fishery releases below Don Pedro Reservoir at La Grange Dam consistent with a FERC license. In general, TID and MID are required to conform releases to one of seven basic flow schedules based on hydrologic year type. The total volume of release ranges from 94,000 acre-feet to 300,923 acre-feet, depending on the wetness of the San Joaquin River basin, with a summer flow ranging from 50 cfs to 250 cfs. Annual minimum flow schedules vary by three periods, defined as October 1 to October 15, October 16 to May 31, and June 1 to September 30, with additional fall and spring pulse flows for salmon adult attraction and smolt out-migration, respectively (FERC, 1996a).

In conjunction with the 1966 FERC license to TID and MID for the New Don Pedro Project, the CCSF, TID, and MID executed the Fourth Agreement to finance construction and establish operations for the project (CCSF/TID/MID, 1966). The three parties agreed to allocate the potential water supply risk that might result from a change in the interim flow schedules as follows:

> The Districts [TID and MID] and City [CCSF] recognize that Districts, as licensees under the [FERC] license for the New Don Pedro project, have certain responsibilities regarding the water release conditions contained in said license, and that such responsibilities may be changed pursuant to further proceedings before the [FERC]. As to these responsibilities, as they exist under the terms of the proposed license or as they may be changed pursuant to further proceedings before the [FERC], Districts and City agree:
>
> > … (b) That at any time Districts demonstrate that their water entitlements, as they are presently recognized by the parties, are being adversely affected by making water releases that are made to comply with [FERC] license requirements, and that the [FERC] has not relieved them of such burdens, City and Districts agree that there will be a re-allocation of storage credits so as to apportion such burdens on the following basis: 51.7121% to City and 48.2879% to Districts. (CCSF/TID/MID, 1966)

In 1994, FERC initiated mediation among 12 parties, including the CCSF, TID, and MID, on flow schedules and other matters related to releases in support of fisheries in the lower Tuolumne River. In February 1996, TID and MID filed with FERC an uncontested settlement agreement that included minimum flow schedules that are greater than the previous flow schedules. In July 1996, FERC amended the New Don Pedro Project license to incorporate the settlement agreement flow schedules (FERC, 1996b).

The CCSF, TID, and MID entered into a settlement agreement regarding the FERC flow schedules. Under this agreement, the CCSF makes annual payments to TID and MID, and TID and MID meet all flow requirements of the minimum flow schedules. The 1996 settlement agreement extends through the remainder of the FERC license (i.e., 2016) and any annual licenses. FERC may modify the fishery release requirements for the New Don Pedro Project in 2016 when TID and MID apply for a new license for hydroelectric operations (CCSF/TID/MID, 1995).

2.5.4 Rafting Flows

There are two whitewater runs in the Tuolumne River watershed above Don Pedro Reservoir: an 18-mile run on the Main Fork from Lumsden Campground to Ward's Ferry Bridge, known as the Lumsden Run, and a 9-mile run that begins at Holm Powerhouse on Cherry Creek and ends at Lumsden Campground, known as the Cherry Creek Run (refer to Chapter 5, Figure 5.3.8-1). Commercial companies operate under special-use permits issued by the U.S. Forest Service, Stanislaus National Forest. Private whitewater boaters must obtain permits from the Forest Service to boat the Tuolumne River between April 1 and September 30. Over the last 10 years, an average of 6,000 people per year participated in whitewater rafting on the river (see Chapter 5, Section 5.3.8, for more description of whitewater recreational use).

The flow schedules for Hetch Hetchy projects were intended to benefit fish and recreational fishing, not whitewater recreation. Neither the Raker Act nor the existing stipulations require the CCSF to make instream flow releases to maintain or enhance whitewater recreation. However, as described above, the 1996 FERC Settlement Agreement for the New Don Pedro Project requires the CCSF to consult, cooperate, and communicate with whitewater recreational interests with respect to SFPUC flow releases.

Subject to the availability of water and the CCSF's need for energy, the SFPUC attempts to accommodate whitewater recreation in the Tuolumne River by adjusting the day and hour of releases (i.e., "shaping" releases) from Holm Powerhouse to meet the needs of whitewater rafters. For rafting flows, the SFPUC attempts to meet up to 1,100 cfs on the Tuolumne River at Lumsden Campground. SFPUC staff meets annually with stakeholders representing the whitewater recreational community to develop, to the degree practicable, schedules of releases for whitewater recreation.

2.5.5 Customer Agreements – Master Water Sales Contracts

The SFPUC currently holds individual agreements with its wholesale customers, who are represented by the Bay Area Water Supply and Conservation Agency (BAWSCA) (formerly the Bay Area Water Users Association, or BAWUA). A list of the current BAWSCA members is provided in Chapter 3, Table 3.1, and their locations are shown on Figure 3.2. Wholesale water rates are set in accordance with the 1984 Settlement Agreement and Master Sales Water Contract (Master Water Sales Agreement) between the CCSF and each of the wholesale customers (CCSF, 1984). The current master contract expires in June 2009.

In addition to providing terms for the rate schedule and allocation of operating and capital costs, the Master Water Sales Agreement also addresses water supply and use of local water. Under the Master Water Sales Agreement, the CCSF has agreed that the wholesale customers may collectively purchase up to 184 mgd on an average annual basis through June 2009 subject to reductions in the event of a drought, water shortage, earthquake, other natural disaster, or rehabilitation and maintenance of the system; this amount is referred to as “the supply assurance.” The supply assurance remains effective following termination of the Master Water Sales Agreement and includes the corresponding individual contracts with the wholesale customers. The Master Water Sales Agreement requires that wholesale customers employ best efforts to use all sources of water owned or controlled by them, including groundwater (SFPUC and BAWUA, 2000).

Terms of the individual agreements vary among the wholesale customers. The City of Hayward and Estero Municipal Improvement District have “all requirements” agreements; that is, the SFPUC has agreed to meet all of these two customers’ water needs in excess of other water sources owned or controlled by them. The SFPUC’s agreement with the Estero Municipal Improvement District terminates in 2011, while the agreement with the City of Hayward has no termination date. These agreements imply that as Hayward and Estero’s water usage grows, the residual water of the supply assurance is shared among the other wholesale customers. Under the Master Water Sales Agreement, the SFPUC also sells water to the Cities of San Jose and Santa Clara on a temporary, interruptible basis.

The Master Water Sales Agreement does not address the issues of whether the CCSF is obligated under federal or state law to (1) supply the wholesale customers with water beyond the supply assurance of 184 mgd, or (2) expand the regional water system in order to provide additional water. However, the SFPUC works cooperatively with the BAWSCA and the individual wholesale customers to provide reliable, high quality and affordable water to meet customers’ needs.

2.5.6 SFPUC Water Resources Policies

The SFPUC has adopted numerous resolutions related to water resources, including policies fundamental in the development of the WSIP. These resolutions and policies were used as the basis of many of the program objectives for the WSIP, including policies related to protecting and maintaining the Tuolumne River water supply source; maximizing the use of conservation, recycled water, and groundwater; augmenting dry-year water supplies; coordinating water supply planning efforts with wholesale customers; protecting the environment; and filtration avoidance for Hetch Hetchy water. These resolutions are summarized in **Table 2.3**.

TABLE 2.3
SFPUC WATER RESOURCES POLICIES RELATED TO THE WSIP

Date	Resolution Number	Description
March 1993	93-0083 to 93-0088	This series of six resolutions addresses a water resource policy aimed at preserving and enhancing San Francisco's high-quality water supply and preparing for future water needs by pursuing the beneficial use of alternate resources.
	93-0083	The SFPUC directs staff and management to work with city leaders to develop funding and to provide necessary staffing and programs to accomplish the goals and objectives of this policy statement.
	93-0084	*Defense of Water Rights.* Due to the extraordinarily high quality of the Sierra water supply and the high degree of watershed protection it receives, it is important that San Francisco's share of the waters of the Tuolumne River be preserved for the beneficial municipal and industrial use of San Francisco and its customers. The SFPUC does and will continue to vigorously protect its Sierra water rights, facilities, and method of diversion against all challenges.
	93-0085	*Conservation, Recycled Water, and Groundwater.* Conservation, recycled water, and groundwater usage will extend the time before which maximum diversions from the Hetch Hetchy system will be required, may offset some required deliveries from the Hetch Hetchy system, and will provide greater reliability of supply during times of water shortage. It is the policy of the SFPUC to maximize the use of conservation, recycled water, and groundwater to the extent economically, technically, and environmentally reasonable to do so.
	93-0086	*Dry-Year Options and Supply Augmentation.* Because of San Francisco's junior rights to the waters of the Tuolumne River and the entitlement structure embodied in the Raker Act, San Francisco's Sierra supplies are vulnerable to prolonged periods of drought. There is growing interest and opportunity within the California water community in making water transfers on a long-term, planned basis. The SFPUC directs staff to pursue contractual arrangements that will augment its Sierra supplies. Priority will be given to transfers or exchanges that increase Tuolumne River supplies available to San Francisco, or conservation projects within the Tuolumne River basin that increase supplies available to San Francisco.
	93-0087	*Bay Area Water Supply Planning.* San Francisco supplies water to itself and 33 suburban customers in the Bay Area. Some of the suburban customers have access to other supplies such as the State Water Project, Santa Clara Valley Water District, groundwater, and local surface supplies. It is not possible to plan for the needs of San Francisco's suburban customers for water supplied from San Francisco's system without also projecting the availability of their alternate water sources. The SFPUC directs staff to engage with its suburban customers, the Santa Clara Valley Water District, and other interconnected suppliers in a comprehensive and coordinated water supply planning effort.
	93-0088	*Environmental Improvements.* The SFPUC, Mayor, Board of Supervisors, and the people of San Francisco share a concern for the protection of the environment. The SFPUC directs staff to seek opportunities to contribute to the improvement of the state's aquatic environment through design and operation of its conservation, recycled water, or groundwater projects; water purchase, transfer, and exchange agreements; and future water supply development. Further, the SFPUC will not object to a statewide financial assessment on the use of water so long as it is equitable and the funds are used to purchase water for environmental uses.

TABLE 2.3 (Continued)
SFPUC WATER RESOURCES POLICIES RELATED TO THE WSIP

Date	Resolution Number	Description
April 2000	00-0110	*Water Resource Policies* • To encourage the wise use of all water resources by the City of San Francisco and SFPUC suburban customers, including conservation, water recycling, and groundwater development • To fairly allocate water shortages among the City of San Francisco and SFPUC suburban customers • To fully recover the costs of capital improvements and water purchases • To fairly share the costs of financing capital improvements as they are implemented among the City of San Francisco and SFPUC suburban customers • To aggressively preserve and protect SFPUC water rights to the Tuolumne River supply • To retain full and absolute control of SFPUC water supplies, lands, and capital assets
September 2000	00-0277	*Filtration Avoidance* • The SFPUC reaffirms its policy to maintain the filtration avoidance status for Hetch Hetchy water. • The SFPUC directs staff to prepare and submit Operating Fund and capital project budget requests that are consistent with proactive maintenance of filtration avoidance.
June 2006	06-0105	*Water Enterprise Environmental Stewardship Policy* The Environmental Stewardship Policy will be integrated into SFPUC Water Enterprise planning and decision-making processes and also directly implemented through a number of efforts, including: • Implementation and updating of the existing Alameda and Peninsula Watershed Management Plans • Development of Habitat Conservation Plans for the Alameda and Peninsula Watersheds • Development and implementation of the Watershed and Environmental Improvement Program, which will cover the Tuolumne River, Alameda Creek, and Peninsula watersheds • Development of the Lake Merced Watershed Plan • Active participation in local forums, including coordination with Yosemite National Park Service and Stanislaus National Forest in the Tuolumne River watershed, the Tuolumne River Technical Advisory Committee, the Alameda Creek Fisheries Restoration Workgroup, the Pilarcitos Creek Restoration Workgroup, and the Lake Merced Task Force • Integration of the policy into the WSIP and individual infrastructure projects (i.e., repair and replacement programs) • Reliance on the policy to guide the development of project descriptions, alternatives and mitigation for all SFPUC projects during the environmental review process under CEQA and/or NEPA • Providing support for and encouragement to all employees to integrate environmental stewardship into daily operations through communication and training

SOURCES: SFPUC, 1993a to 1993f; 2000c; 2000d; 2006b.

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3 Program Description

CHAPTER 3
Program Description

3.1 Introduction

The San Francisco Public Utilities Commission (SFPUC) proposes to adopt and implement a Water System Improvement Program (WSIP or proposed program) to increase the reliability of the regional water system. The WSIP would establish program goals for improvements to the regional water system and level of service objectives for system performance in the areas of water quality, seismic reliability, delivery reliability, and water supply through the year 2030. These goals and objectives provide the basis for a proposed water supply option to serve increased water demand, proposed operations during drought and nondrought periods, and a series of facility improvement projects to be constructed and implemented under the WSIP.

The facility improvement projects and the proposed water supply option included in the WSIP are designed to: (1) ensure compliance with existing and anticipated future water quality standards under all operating conditions; (2) upgrade the seismic standards of critical facilities to improve seismic reliability and to reduce the system's vulnerability to earthquakes; (3) improve water delivery reliability under a variety of operating conditions by improving overall operations of the system; and (4) assure that the SFPUC has an adequate supply of water available to deliver to customers during both nondrought and drought periods through 2030.

As described below in Section 3.4, the SFPUC initially proposed the draft WSIP in early 2006 as the result of long-term planning and in response to legislative mandates, including a 2002 voter-approved bond measure (see discussion of Assembly Bill No. 1823 in Section 3.4, below). However, for budgeting and management purposes, the SFPUC categorizes as part of the WSIP all capital improvements and projects that will receive financing from the 2002 voter-approved bond measure. Some, but not all, of the activities and projects that the SFPUC has identified for financing purposes as part of the WSIP are analyzed as a program in this Program Environmental Impact Report (PEIR), as defined under the California Environmental Quality Act (CEQA). Other proposed WSIP activities that are not evaluated in this PEIR as part of the proposed program are undergoing CEQA review independent of the PEIR. For the purposes of this PEIR, the WSIP or proposed program refers only to the key regional program elements of the WSIP, essentially consisting of the proposed water supply option, key regional facility improvement projects, and the associated modified operations strategy.

This chapter describes the proposed program and is organized as follows: Section 3.2 presents the regional location of the SFPUC water system (the reader is referred to Chapter 2 for additional details regarding the facilities and operations of the existing system). Section 3.3 describes the need for the program and outlines the WSIP goals and objectives, and Section 3.4 provides information on the background and development of the WSIP. Section 3.5 expands on the WSIP goals and describes the proposed levels of service and system performance objectives. Sections 3.6 and 3.7 outline the proposed water supply and the proposed system operations strategy, respectively. Section 3.8 summarizes the key regional WSIP facility improvement projects analyzed in this PEIR, and Sections 3.9, 3.10, and 3.11 describe the general construction assumptions for these projects. Section 3.12 presents related WSIP activities and their relationship to program components addressed in this PEIR. Section 3.13 outlines actions and approvals that could be required for the WSIP and the relationship to required actions and approvals for individual facility improvement projects.

[Since publication of the Draft PEIR, the SFPUC determined that it would like the option to consider approval and implementation of a variation of the WSIP called the "Phased WSIP Variant," which the SFPUC ultimately adopted. Please refer to Section 13.4, Phased WSIP Variant (Vol. 7, Chapter 13), for a description of this variation compared to the proposed program described in this chapter.]

3.2 Regional Location

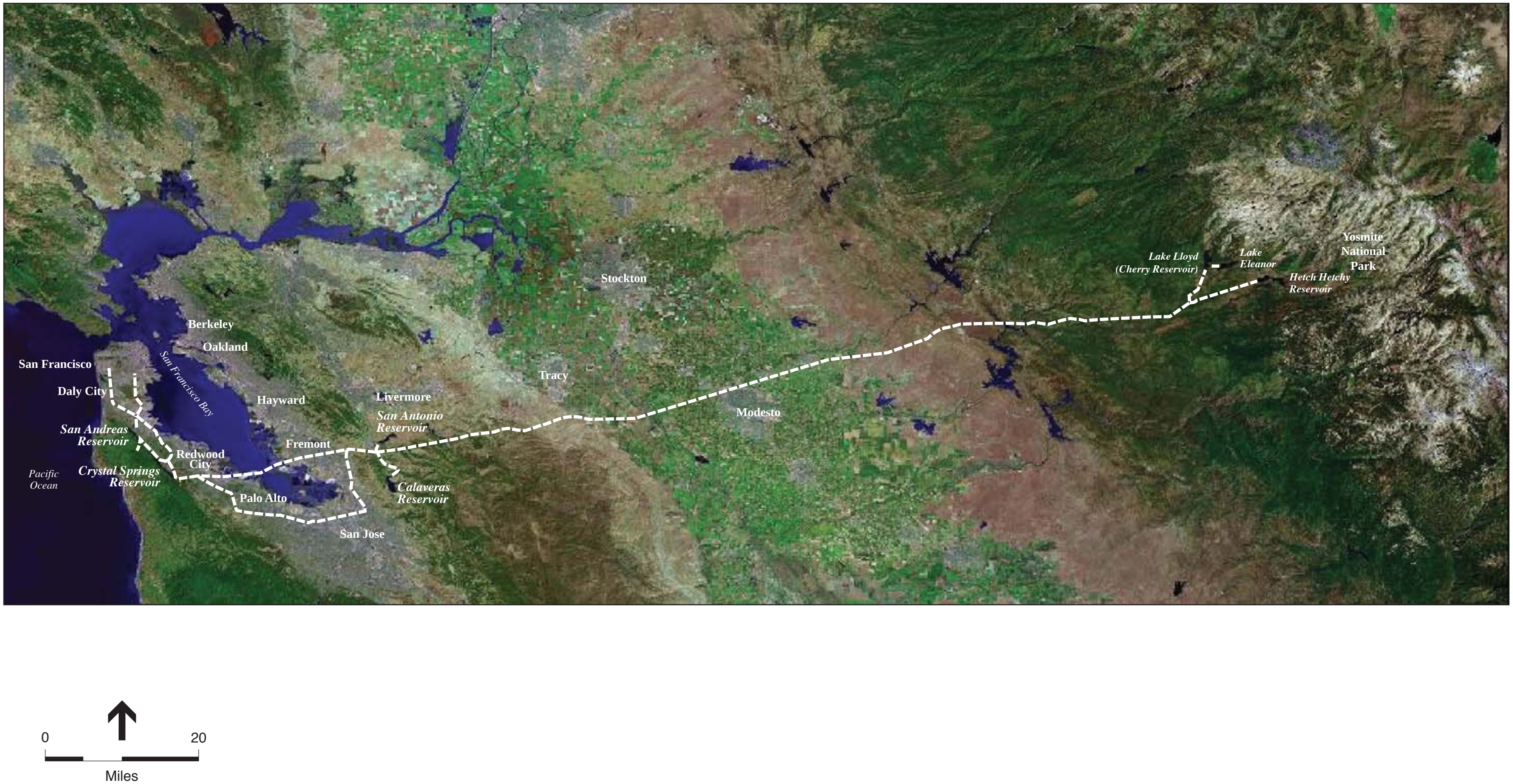
3.2.1 Facilities

The SFPUC regional water system consists of a complex network of facilities covering a geographic range of about 167 miles across Central California, from the Sierra Nevada on the east to San Francisco on the west, as shown in **Figure 3.1**. The regional water system crosses seven counties—Tuolumne, Stanislaus, San Joaquin, Alameda, Santa Clara, San Mateo, and San Francisco. The existing facilities, location, and operations of the regional system are described in more detail in Chapter 2. The general location of the regional water system facilities, from east to west, is described below. A more detailed description of jurisdictions affected by proposed facility improvement projects is provided in Section 3.8, below.

The regional water system starts with three reservoirs and dams in Tuolumne County: Hetch Hetchy Reservoir/O'Shaughnessy Dam, Lake Eleanor/Eleanor Dam, and Lake Lloyd/Cherry Dam. Hetch Hetchy Reservoir and Lake Eleanor are located within Yosemite National Park. The system crosses into Stanislaus National Forest through about 30 miles of tunnels, regulating reservoirs, and hydropower facilities, passing south of the town of Groveland and through the town of Moccasin. The Hetch Hetchy Aqueduct continues in Foothill Tunnel to the San Joaquin Valley. At the western border of Tuolumne County, the 16-mile Foothill Tunnel connects to the three San Joaquin Pipelines at Oakdale Portal.

Starting in Tuolumne County for about the first mile, the San Joaquin Pipelines extend across Stanislaus County and end 47 miles later in San Joaquin County. These pipelines are almost entirely buried as they cross the San Joaquin Valley, passing south of the towns of Oakdale and Riverbank, through the city of Modesto, and under State Highway 99 and the San Joaquin River. South of the city of Tracy, the system crosses into San Joaquin County, over the Delta-Mendota Canal and California Aqueduct, and under Interstates 5 and 580. The San Joaquin Pipelines end at Tesla Portal, located just west of Interstate 580 in San Joaquin County. At Tesla Portal, the Hetch Hetchy system continues for 25 miles in the Coast Range Tunnel through the Diablo Range and crosses into Alameda County. The Coast Range Tunnel ends at Alameda East Portal in the Sunol Valley, where the Hetch Hetchy system connects to the Sunol Valley facilities.

The Sunol Valley facilities are located in Alameda and Santa Clara Counties. The Alameda East Portal connects the western end of the Coast Range Tunnel directly to the three buried Alameda Siphons. The Alameda Siphons traverse the valley about one-half mile, extending from the Alameda East Portal to the Alameda West Portal. In this valley, the Alameda Siphons also connect to pipelines that travel south to the Sunol Valley Water Treatment Plant (WTP) in Alameda County and continue south to Calaveras Reservoir, which lies in both Alameda and Santa Clara Counties. There are also pipelines traveling north from the Alameda Siphons to San Antonio Reservoir in Alameda County. The SFPUC has maintenance facilities farther north, just west of the town of Sunol, and isolated facilities serving customers in the Pleasanton and Niles Canyon areas. From the Alameda West Portal, the system connects to the 3.5-mile-long Irvington Tunnel, which passes through the Fremont Hills and ends at Irvington Portal in the city of Fremont in Alameda County, where it connects to the four Bay Division Pipelines.



SOURCE: ESA

SFPUC Water System Improvement Program . 203287

Figure 3.1
SFPUC Water System, Regional Location Map

The Bay Division Pipelines Nos. 1 and 2 extend about 22 miles through Fremont and Newark, continue across San Francisco Bay to San Mateo County, and pass through the cities of East Palo Alto, Redwood City, Menlo Park, and Atherton. Starting in Fremont, the Bay Division Pipelines Nos. 3 and 4 extend 34 miles around the bay, passing into Santa Clara County and through the cities of Milpitas, San Jose, Santa Clara, Sunnyvale, Mountain View, Los Altos, and Palo Alto; these two pipelines continue into San Mateo County and through the cities of Menlo Park, Atherton, Woodside, and Redwood City. With the exception of aboveground segments on the east and west side of the bay shoreline and on trestle bridges across the bay, the Bay Division Pipelines are almost entirely underground. The four Bay Division Pipelines connect again at the Pulgas Portal just west of Redwood City. From there, the system continues north up the Peninsula through San Mateo County via a network of tunnels, pipelines, pump stations, valve lots, reservoirs, and one treatment plant. The system crosses through the Peninsula towns of Belmont, San Mateo, Hillsborough, Burlingame, Millbrae, San Bruno, South San Francisco, Brisbane, and Daly City until it reaches San Francisco. The terminal reservoirs in the regional water system are located in San Francisco (SFPUC, 2004a).

3.2.2 Water Service Area

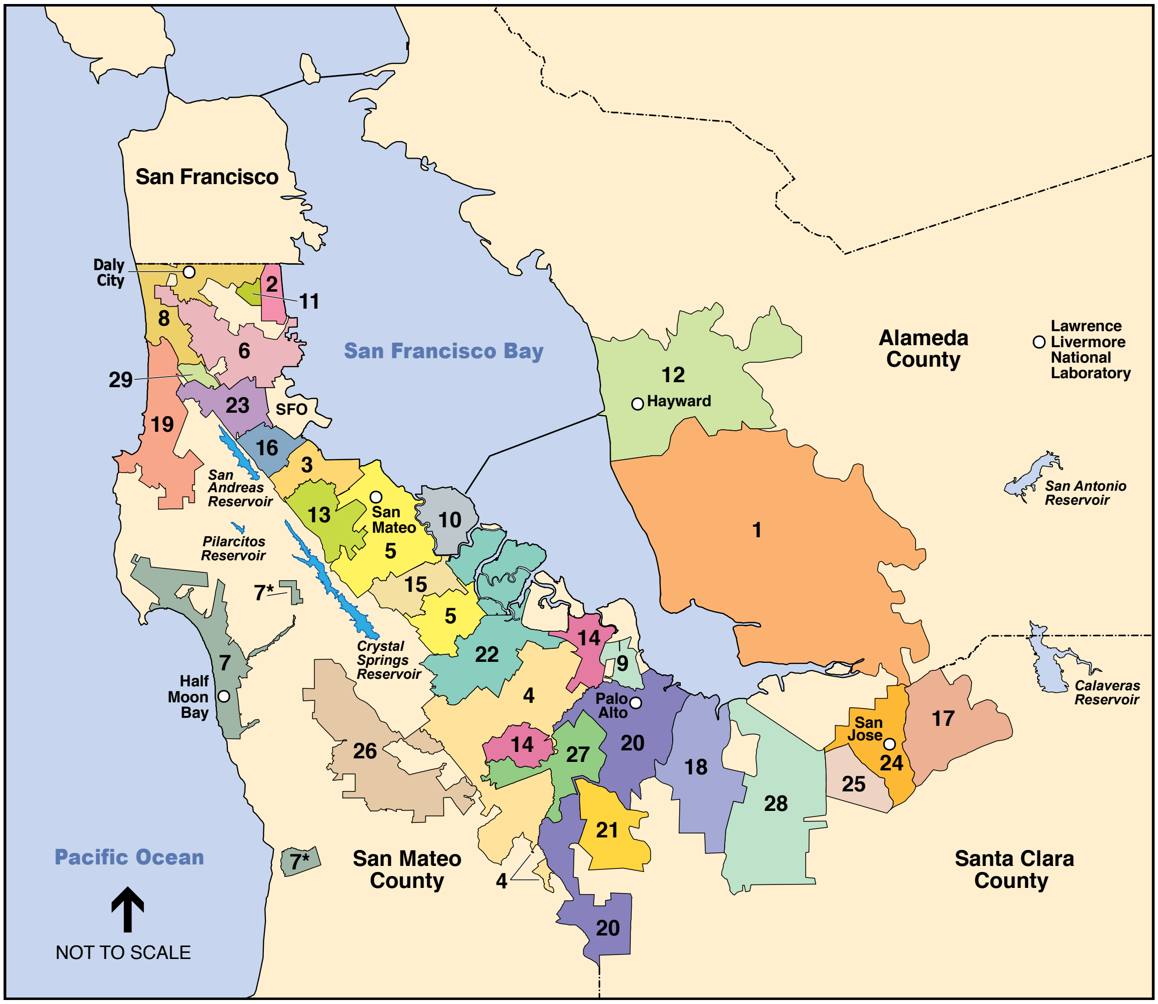
The SFPUC provides water delivery services to retail and wholesale customers, primarily in San Francisco, San Mateo, Santa Clara, and Alameda Counties, as shown in **Figure 3.2**. The SFPUC serves about one-third of its water supplies directly to retail customers in San Francisco, and about two-thirds of its water supplies to wholesale customers by contractual agreement. The wholesale customers are represented by the Bay Area Water Supply and Conservation Agency (BAWSCA) and consist of 27 total customers[11]: 25 cities and water districts plus Stanford University and one private utility. Some of these wholesale customers have other sources of water in addition to what they receive from the SFPUC regional system. The SFPUC also provides service to some isolated regional wholesale and retail customers along the water system, including customers in Tuolumne County. **Table 3.1** lists the major regional system customers and indicates the customers that receive water supplies from sources other than the SFPUC.

3.3 Need for and Objectives of the Program

The need for the WSIP is predicated on the basic mission of the SFPUC, which is in part:

> To serve San Francisco and its Bay Area customers with reliable, high-quality and affordable water, while maximizing benefits from power operations and responsibly managing the resources entrusted to its care (SFPUC, 2002)

[11] There are 28 wholesale customers identified in the 2004 SFPUC studies. Since the time of those studies, one of the wholesale customers, Los Trancos County Water District, was purchased by California Water Service Company, reducing the SFPUC wholesale customer count to 27.



Legend

(Wholesale customers and members of Bay Area Water Supply and Conservation Agency)

1 Alameda County Water District
2 City of Brisbane
3 City of Burlingame
4 CWS – Bear Gulch
5 CWS – Mid-Peninsula
6 CWS – South San Francisco
7 Coastside County Water District
8 City of Daly City
9 City of East Palo Alto
10 Estero Municipal Improvement District
11 Guadalupe Valley Municipal Improvement District
12 City of Hayward
13 Town of Hillsborough
14 City of Menlo Park
15 Mid-Peninsula Water District
16 City of Millbrae
17 City of Milpitas
18 City of Mountain View
19 North Coast County Water District
20 City of Palo Alto
21 Purissima Hills Water District
22 City of Redwood City
23 City of San Bruno
24 City of San Jose (North)
25 City of Santa Clara
26 Skyline County Water District
27 Stanford University
28 City of Sunnyvale
29 Westborough Water District

* Portions of Coastside County Water District not served by the SFPUC regional water system.

NOTE: For the purposes of this PEIR, the California Water Service (CWS) Company is a single wholesale customer with three different water service districts.

SFPUC Water System Improvement Program . 203287

SOURCE: BAWSCA, 2006a

Figure 3.2 (Revised)
SFPUC Water Service Area -
San Francisco and SFPUC Wholesale Customers

TABLE 3.1
SFPUC REGIONAL WATER SYSTEM CUSTOMERS

Wholesale Regional Customers[a] (BAWSCA Members)		
Peninsula	**South Bay**	**Other Major Customers**
California Water Service Company (South San Francisco* and Mid-Peninsula)	Alameda County Water District*	City and County of San Francisco
City of Brisbane	Mid-Peninsula Water District	Presidio Trust*
Guadalupe Valley Municipal Improvement District	California Water Service Company (Bear Gulch)*	San Francisco County Jail (San Bruno)
City of Burlingame	City of Hayward	San Francisco International Airport (San Mateo County)
City of Daly City*	City of Menlo Park*[b]	Lawrence Livermore National Laboratory (Site 200/300)
City of Millbrae	City of Milpitas*	National Aeronautics and Space Administration (Santa Clara County)
City of San Bruno*	City of Mountain View*	Town of Sunol (Alameda County)
Coastside County Water District*	City of Palo Alto*	Groveland Community Services District (Tuolumne County)
Estero Municipal Improvement District (Foster City)	City Redwood City*	
North Coast County Water District	City of San Jose (North San Jose Service Area)*	
Town of Hillsborough	City of Sunnyvale*	
Westborough County Water District	City of Santa Clara*	
	City of East Palo Alto	
	Purissima Hills Water District	
	Skyline County Water District	
	Stanford University*	

* Indicates customers that currently receive additional water supplies from sources other than the SFPUC.

a Not shown on the table because they are not a BAWSCA member, the Cordilleras Mutual Water Association is also a wholesale customer receiving water from the SFPUC. It is a small water association serving 18 single-family homes located in San Mateo County.

b Menlo Park receives all of its water supply from the SFPUC; however, a portion of the supply is obtained indirectly from the SFPUC through purchases from East Palo Alto (BAWSCA, 2006).

SOURCES: CDM, 2005; URS, 2004a.

While the SFPUC has historically met and is currently achieving its mission, there are numerous factors contributing to the need for a comprehensive, systemwide program such as the WSIP. In order to continue to reliably meet this mission in the future, the SFPUC must plan for future needs as well as address existing, known deficiencies. The proposed program would address these needs and deficiencies, including:

- *Aging Infrastructure*. The SFPUC regional water system is old. Many of its components were built in the 1800s and early 1900s; parts of the system were built using now-outdated construction materials and/or methods and are currently in need of major repair. As the system ages, its reliability decreases and the risk of failure increases.

- *Exposure to Seismic and Other Hazards*. The 167-mile-long system crosses five active earthquake faults. Many of the SFPUC system components are located on or in the immediate vicinity of major earthquake faults. Due to the age of the system, many facilities do not meet modern seismic standards. To protect public safety, the California Department of Water Resources, Division of Safety of Dams (DSOD) has imposed operating restrictions on Calaveras and Crystal Springs Reservoirs, reducing the local storage capacity and impairing normal system operations; this storage capacity needs to be restored (see Section 2.2 for discussion of the current operating restrictions on these dams).

- *Maintain Water Quality*. The regional system currently meets or exceeds existing water quality standards. However, system upgrades are needed to improve the SFPUC's ability to continue to maintain compliance with current water quality standards and to meet anticipated future water quality standards under a range of operating conditions, including such events as a major earthquake, without reducing system reliability (see Chapter 2, Section 2.4, for a discussion of water quality regulations that apply to the system).

- *Improve Asset Management and Delivery Reliability*. In order to implement a feasible asset management program in the future that will provide continuous maintenance and repairs to facilities, the system requires redundancy (i.e., backup) of some critical facilities necessary to meeting day-to-day customer water supply needs. Without adequate redundancy of critical facilities, the SFPUC has limited operational flexibility in the event of an emergency or a system failure, as well as constraints on conducting adequate system inspection and maintenance.

- *Meet Customer Water Demands*. Water demand among SFPUC customers is predicted to increase over the next 25 years. Additional supplies are needed to satisfy current demand in drought years and projected 2030 demand in all years. The experience of the last 150 years of record as well as recent studies on California's climate show the region is susceptible to droughts. Two of the biggest droughts occurred during the past 30 years. The regional system currently has insufficient water supply to meet customer demand during a prolonged drought, and this situation will worsen in the future.

To address these challenges to the reliability of the water system, the SFPUC must replace or upgrade numerous components of the system and add some new components—thus the need for the WSIP and its associated facility improvement projects.

[Additional discussion on the need for the program was prepared in response to comments on the Draft PEIR. Please refer to Section 14.1, Master Response on WSIP Purpose and Need (Vol. 7, Chapter 14).]

3.3.1 Program Goals and Objectives

The WSIP goals and objectives were developed based on a planning horizon through 2030. The SFPUC selected the year 2030 because published population projections generally do not extend beyond 20 to 25 years, and the agency determined the 2030 forecasts to be the most reasonably foreseeable future condition. The goals and objectives are founded on two fundamental principles pertaining to the existing regional system: (1) maintaining a clean, unfiltered water source from the Hetch Hetchy system, and (2) maintaining a gravity-driven system.

The overall goals of the WSIP for the regional water system are to:

- Maintain high-quality water and a gravity-driven system
- Reduce vulnerability to earthquakes

- Increase delivery reliability
- Meet customer water supply needs
- Enhance sustainability
- Achieve a cost-effective, fully operational system

To further these program goals, the WSIP includes objectives that address system performance. **Table 3.2** presents these objectives as they relate to the WSIP goals. The system performance objectives describe and, in many cases, more specifically quantify, what the regional water system proposes to achieve under the WSIP, and thereby guide the water supply actions, facility improvements, operations, and maintenance requirements included in the WSIP.

TABLE 3.2
WSIP GOALS AND OBJECTIVES

Program Goal	System Performance Objective
Water Quality – *maintain high water quality*	• Design improvements to meet current and foreseeable future federal and state water quality requirements. • Provide clean, unfiltered water originating from Hetch Hetchy Reservoir and filter all other surface water sources. • Continue to implement watershed protection measures.
Seismic Reliability – *reduce vulnerability to earthquakes*	• Design improvements to meet current seismic standards. • Deliver basic service to the three regions in the service area (East/South Bay, Peninsula, and San Francisco) within 24 hours after a major earthquake. Basic service is defined as average winter-month usage, and the performance objective for the regional system is 229 million gallons per day (mgd). The performance objective is to provide delivery to at least 70 percent of the turnouts (i.e., water diversion connecting points from the regional system to customers) in each region, with 104, 44, and 81 mgd delivered to the East/South Bay, Peninsula, and San Francisco regions, respectively. • Restore facilities to meet average-day demand of 300 mgd within 30 days after a major earthquake.
Delivery Reliability – *increase delivery reliability and improve the ability to maintain the system*	• Provide operational flexibility to allow planned maintenance shutdown of individual facilities without interrupting customer service. • Provide operational flexibility to minimize the risk of service interruption due to unplanned facility upsets or outages. • Provide operational flexibility and system capacity to replenish local reservoirs as needed. • Meet the estimated average annual demand of 300 mgd for 2030 under the conditions of one planned shutdown of a major facility for maintenance concurrent with one unplanned facility outage.
Water Supply – *meet customer water needs in nondrought and drought periods*	• Meet average annual water purchase requests of 300 mgd from retail and wholesale customers during nondrought years for system demands through 2030. • Meet dry-year delivery needs through 2030 while limiting rationing to a maximum 20 percent systemwide reduction in water service during extended droughts. • Diversify water supply options during nondrought and drought periods. • Improve use of new water sources and drought management, including use of groundwater, recycled water, conservation, and transfers.
Sustainability – *enhance sustainability in all system activities*	• Manage natural resources and physical systems to protect watershed ecosystems. • Meet, at a minimum, all current and anticipated legal requirements for protection of fish and other wildlife habitat. • Manage natural resources and physical systems to protect public health and safety.
Cost-effectiveness – *achieve a cost-effective, fully operational system*	• Ensure cost-effective use of funds. • Maintain gravity-driven system. • Implement regular inspection and maintenance program for all facilities.

SOURCE: SFPUC, 2006a.

Therefore, as described in detail below, the SFPUC conducted extensive studies leading to the development of the proposed program to increase the reliability of the regional water system. For the purposes of this PEIR, the term “reliability” is used to encompass a host of system parameters affecting water delivery, including those related to both physical facilities and water supply sources. System parameters related to the reliability of physical facilities could include physical or hydraulic capacity, physical or operational redundancy (i.e., backup systems), operational flexibility, facility vulnerability, and likelihood of failure. System parameters related to the reliability of water supply sources could include water quality considerations, vulnerability to hydrologic and meteorological conditions, and regulatory/institutional considerations. While the numerous system parameters affecting reliability are not interchangeable, they are all interrelated, and an improvement in any of the parameters affecting reliability would result in an improvement in the overall reliability of the system. The SFPUC developed the WSIP to address the need to provide comprehensive improvements to all aspects of system reliability.

3.4 Background and Development of the WSIP

Public awareness of the need for major capital improvements became evident in 2002 with the passage of three related legislative actions. Propositions A and E, passed in November 2002 by San Francisco voters, approved financing for San Francisco’s portion of the multi-billion-dollar water system improvements. Assembly Bill No. 1823 (AB 1823), the Wholesale Regional Water System Security and Reliability Act, also approved in 2002, required the City and County of San Francisco (CCSF) to adopt a capital improvement program designed to restore and improve the regional water system and to review and update the program as necessary (see Chapter 2, Section 2.4, for further description of this act). The SFPUC developed the Long-Term Strategic Plan for Capital Improvements in May 2002 (SFPUC, 2002) to address these requirements and then proceeded with a series of planning and engineering studies that form the foundation of the WSIP as currently proposed.

The SFPUC began planning for major system improvements over a decade ago and has conducted numerous planning and engineering studies of the regional system with respect to its vulnerability, reliability, performance, operations, water supply, watershed management, and water quality. The SFPUC primarily used three models in the development of the scope of the WSIP facility improvement projects, including determining the appropriate performance objectives and level of service goals. The three models—reliability, hydraulic, and hydrologic models—are described below, followed by descriptions of the major planning studies utilizing these models in the development of the WSIP.

- *Reliability Model*. The SFPUC used this statistical model to evaluate the ability of the system to meet identified targets when subjected separately to earthquakes on the San Andreas, Hayward, and Calaveras faults, as well as to quantify system risk. The model is comprised of two parts: a probabilistic model used to assess the baseline conditions for the existing and improved systems, and a deterministic model used to evaluate system recovery. For the deterministic model, the following events were used: (1) magnitude 7.9 earthquake on the San Andreas fault, (2) magnitude 7.3 earthquake on the Hayward fault, and (3) magnitude 6.9 earthquake on the Calaveras fault. The model employs the most likely value for failure of system components when subjected to the earthquake hazard for the selected scenario. The SFPUC used this model to compare system facilities under both existing and improved conditions, each under a range of operating scenarios (Parsons-CH2MHILL, 2005; Parsons, 2006). Depending on the model run, the "improved conditions" represented various conceptual stages of improvement projects included in the WSIP.

- *Hydraulic Model*. The SFPUC used this model to determine transmission pipeline and tunnel capacities, which were then used as input to the hydrologic model (see description below) to analyze system operations under existing and potential alternative future conditions. This model uses a simulation software package to simulate and analyze water distribution systems, and has been refined, enhanced, calibrated, and validated on many parts of the regional system. The SFPUC used it to analyze the hydraulic characteristics of the existing water system and to assist in determining facility sizing, given assumptions about requirements for operations and maintenance (Parsons-CH2MHILL, 2005).

- *Hydrologic Model*. The SFPUC used this model (also referred to as the Hetch Hetchy/Local Simulation Model, HH/LSM, or the water supply model) to simulate the monthly operation of all major water transmission and storage facilities in the regional water system. It was used to depict system operation under existing conditions and predict various alternative future conditions using historical hydrology for the 82-year period from July 1920 to September 2002. The model was also used to evaluate drought periods to establish system firm yield[12] capabilities, levels of rationing required, water transfer needs, and reservoir storage requirements. The model can also be used to assess the effects on system reliability under different conditions, including water supply sources, levels of conservation, operational criteria, transmission and storage facilities, and hydrologic conditions (Parsons-CH2MHILL, 2005).

3.4.1 Water Supply Studies

In 2000, the SFPUC prepared the *Water Supply Master Plan* (SFPUC, 2000) as a guidance document to address the future water supply needs for the SFPUC service area. This study recommended a water resource strategy of demand management, facilities improvements, and development of additional water supplies. Building on the analysis conducted for the *Water Supply Master Plan*, the SFPUC expanded and updated the evaluation of water supply sources as part of development of the WSIP, including review of additional water supply opportunities that had developed since preparation of the master plan. The *Water Supply Options* report (SFPUC, 2007a) presents the most current evaluation of water supply options and describes the SFPUC's proposed water supply option for the WSIP, as described in Section 3.6.

Using information developed in the *Water Supply Master Plan*, the *Water Supply Options* report reviewed seven categories of potential sources of supply for addressing SFPUC system needs through 2030. The SFPUC evaluated various water supply alternatives formulated from these categories based on facilities requirements, costs, environmental effects, water quality impacts, and institutional and regulatory issues. The evaluation determined that system capacity improvements were required regardless of the alternative. The *Water Supply Master Plan* evaluated the following seven categories of potential sources:

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[12] System firm yield is the average annual water delivery that can be sustained throughout an extended drought.

- *Tuolumne River opportunities*—potential opportunities to increase the amount of Tuolumne River water diverted under existing water rights as well as through transfers from senior water-rights holders or increased storage under existing water rights.

- *Delta opportunities*—potential to acquire water from willing sellers located south of the Delta who possess water rights or contractual entitlements, including State Water Project contractors and Central Valley Project contractors. Alternatively, water could be purchased from willing sellers upstream of the Delta on the Sacramento, Feather, or Yuba Rivers, which would require an increase in Delta export pumping. However, this category of sources had many regulatory constraints.

- *Neighboring non-Delta, non-Tuolumne River opportunities*—potential to acquire water supplies through arrangements with neighboring agencies that are either near or adjacent to the SFPUC service areas or near major SFPUC storage or conveyance facilities. However, this category of sources had limited availability, since most of these agencies are projecting dry-year shortages similar to those expected for the SFPUC system.

- *Local opportunities*—potential to increase the yield of the Alameda and Peninsula system, including expansion of existing reservoirs, construction of new reservoirs, and implementation of groundwater banking programs.

- *Desalination opportunities*—potential to develop desalination facilities using San Francisco Bay water to produce potable water and connecting these facilities to the SFPUC system.

- *Recycled water opportunities*—potential to use recycled water for nonpotable uses to reduce SFPUC customer demands for deliveries from the SFPUC system.

- *Demand management*[13] *opportunities*—potential to reduce existing and future customer demand through conservation measures.

Additional water supply option analysis conducted by the SFPUC, and documented in the *Water Supply Options* report, confirmed the conclusion of the *Water Supply Master Plan* that the preferred strategy for meeting future SFPUC regional water system demand in normal and wet years is to implement additional Tuolumne River diversions under its existing water rights augmented by demand management activities, and to pursue water transfers on the Tuolumne River for meeting dry-year needs. However, the SFPUC determined that additional evaluation was required to identify the proposed water supply option for the WSIP. In particular, the SFPUC identified other options requiring further study to determine their feasibility to meet dry-year demand. These additional dry-year options included:

- Various regional water supply options through the Bay Area Blending Evaluation / Bay Area Water Quality and Supply Reliability Program (a program funded by CALFED that examined multiple regional water supply options involving seven Bay Area water agencies, including the SFPUC). The concepts that were considered to have potential dry-year benefits for the SFPUC system included: an enlarged Los Vaqueros Reservoir; an enlarged Calaveras Reservoir; a desalination plant in the East Bay that would produce potable water

[13] Demand management is the management of water supplies through activities that reduce the demand for water by altering water use practices, improving efficiency in water use, reducing losses of water, reducing waste of water, altering land management practices, and/or altering land uses. Demand management programs include water conservation, drought rationing and rate incentive programs.

from saline groundwater in the Newark Aquifer; a desalination project in Santa Clara County proposing up to three desalination plants to treat brackish groundwater for either potable or nonpotable uses; enhanced conservation implemented by individual agencies combined with additional regional conservation activities; and various recycled water projects and concepts.

- Storage in the Semitropic Water Storage District's groundwater bank near Bakersfield. Under this option, during wet years, the SFPUC would deliver Tuolumne River water to the Semitropic Groundwater Bank using the California Aqueduct, and in dry years, the SFPUC would receive water through the Semitropic Water Storage District's allocations of water from the State Water Project via the Delta and South Bay Aqueduct. The SFPUC also considered indirect participation in this program through current Bay Area partners, including the Santa Clara Valley Water District, Alameda County Flood Control and Water Conservation District Zone 7, and Alameda County Water District via Delta exchange.

- Westside Groundwater Basin conjunctive use, in which, during wet years, the SFPUC would provide regional system water to wholesale customers who would otherwise obtain water from the Westside Groundwater Basin in northern San Mateo County. This would allow the basin to naturally recharge during wet years, and, during dry years, those users would rely on groundwater and reduce their use of regional system water.

- Bay Area Regional Desalination Project involving four Bay area water agencies, including Contra Costa Water District, East Bay Municipal Utility District, Santa Clara Valley Water District, and the SFPUC, to explore the feasibility of developing a regional desalination plant to produce potable water for both drought and nondrought years.

The SFPUC analyzed and screened the above water supply options based on a combination of institutional, legal, technical, operational, environmental, and cost criteria. The screening analysis resulted in the retention of some options for further analysis and the elimination of others from further study. The following dry-year options were retained for further analysis: additional Tuolumne River supplies through transfers from the Turlock Irrigation District (TID) and/or Modesto Irrigation District (MID), demand management, recycled water and local groundwater programs, Westside Basin conjunctive use, and regional desalination(SFPUC, 2007a). These options are included either as part of the preferred WSIP water supply option described in this chapter or as part of the variants or alternatives discussed in Chapters 8 and 9 of this PEIR. The SFPUC eliminated the remaining options from further consideration due to institutional and technical feasibility issues. Further review of these options is provided in Chapter 9 of this PEIR to consider their potential as CEQA alternatives.

In addition to water supply sources, the water supply studies also examined drought-related strategies for meeting customer demand during extended periods of below-normal rainfall/snowmelt. As described in Chapter 2, Section 2.3.5, the regional system has experienced drought periods in the last 30 years, most notably the droughts from 1976 to 1977 and from 1987 to 1992. After the 1987–1992 drought, the SFPUC reevaluated and modified its operating procedures. As part of these modifications, the SFPUC developed a "design drought" to use in its system planning and adopted a Water First Policy to guide regional system operations (see Chapter 2, Section 2.3.4).

"Design drought" is a planning and operation tool that water supply agencies use to define a reasonable worst-case drought scenario based on known hydrology in order to establish design and operating parameters for the water system. Droughts more severe than the design drought would cause failure of supply within the water system. For purposes of regional water system planning, the SFPUC uses a design drought that anticipates and plans for a more severe drought than historical events and evaluates the system firm yield assuming the system is experiencing the design drought. Studies suggest a 30 percent chance that the SFPUC system will experience a drought in the next 75 years equal to or more severe than the 1987–1992 drought, which was the most extreme recorded drought event to affect the regional system. The WSIP uses a design drought based on the hydrology of the six years of the worst historical drought (1987–1992) plus the 2.5 years of the 1976–1977 drought, for a combined total of an 8.5-year design drought sequence (SFPUC, 2007a).

During a dry period, there is reduced inflow to the regional system's reservoirs, and maintaining water deliveries to customers is highly dependent on the amount water utilized from storage in the reservoirs. During a prolonged drought, the water delivered to customers exceeds inflow to the reservoirs, and the volume of water held in storage is continually depleted. In developing the water supply and drought-related goals for the WSIP, the SFPUC used the design drought along with customer demand projections to develop system firm yield requirements for 2030. (System firm yield is the average annual water delivery that can be sustained throughout an extended drought.) In addition to identifying options for acquiring additional water supply in dry years, the SFPUC also examined demand management and rationing as part of its drought planning strategy.

Current plans for drought response include a 20 percent rationing allocation, as established in the *Interim Water Shortage Allocation Plan* and the *Retail Water Shortage Allocation Plan* (described in Chapter 2, Section 2.3.5). In January 2005, the SFPUC staff presented two system rationing scenarios to the SFPUC commissioners for consideration: 10 and 20 percent maximum rationing during any given year of a drought. As described below, the Commission selected the 20 percent maximum systemwide[14] reduction in water service during drought periods for further study.

This systemwide level of 20 percent rationing translates into different percentages of allocation adjustments for each individual SFPUC customer. These percentages are dependent on the allocation plans mentioned above as well as further agreements among the wholesale customers. SFPUC wholesale customer allocation adjustments for a 20 percent systemwide rationing scenario could range from 12 to 40 percent for individual customers.

14 This rationing objective applies to the regional system as a whole, meaning overall system deliveries could be reduced by a maximum of 20 percent in any one year; this systemwide level of rationing could affect deliveries to specific sectors (turnouts) of the regional system differently, and individual customers could experience delivery reductions of more or less than 20 percent during a 20 percent systemwide reduction.

3.4.2 System Performance Studies

The SFPUC conducted extensive engineering analyses and studies regarding individual facilities and overall system performance to guide development of the facilities improvement program. A detailed assessment of regional system facilities was conducted from 1995 to 2006 to evaluate the vulnerability and reliability of the system. Using a statistical risk-based approach, the studies examined hazards and deficiencies at existing facilities, assessed their reliability, and determined the risk to the overall system (SFPUC, 1995; SFPUC, 2004b). The studies identified a range of conditions and deficiencies that could affect the reliability of critical system facilities, including hazards such as earthquakes, landslides, flood, fire, and general wear and tear. The SFPUC determined that the primary risks to its facilities are associated with seismic hazards as well as normal operating wear and tear. During this time, the SFPUC used the results of these studies to develop the capital improvement program in response to the AB 1823 requirements described above. The capital improvement program included numerous facility improvement projects that address the identified system deficiencies, particularly with respect to aging infrastructure and seismic hazards.

From 2004 through 2006, the SFPUC conducted system assessment and performance analyses of the WSIP (formerly known as the capital improvement program) with respect to the seismic and delivery reliability of the system over a range of operating conditions (SFPUC, 2004c; SFPUC, 2004d; Parsons, 2006). Using guidance from the SFPUC commissioners in January 2005, the system assessment developed level of service objectives for seismic and delivery reliability of the regional system on the basis of the following criteria:

- *Seismic Reliability*
  - Delivery after a major earthquake—how much can the system deliver after a major earthquake?
  - Percentage of turnouts that receive water—what percentage of the turnouts in each customer group will receive water after an earthquake?
  - Post-earthquake recovery—how much will the system be able to deliver 30 days after an earthquake?
- *Delivery Reliability*
  - Maintenance conditions—when key facilities are shut down for planned maintenance, how much can the system deliver without interrupting customer service?
  - Delivery during a Hetch Hetchy water quality event—how much can the system deliver when the quality of Hetch Hetchy water does not meet the requirements for unfiltered water sources[15] and filtration of all water sources is required prior to delivery to customers?
  - Delivery impacts due to unplanned outages—does the system have enough redundancy to allow for unplanned facility outages?

15 Water from Hetch Hetchy Reservoir can sometimes fail to meet the requirements for filtration avoidance, such as during storm events in the Sierra Nevada, which can lead to turbidity levels exceeding standards.

The seismic analyses were based on three earthquake scenarios: magnitude 7.9, 7.3, and 6.9 events on the San Andreas, Hayward, and Calaveras faults, respectively. For the seismic reliability assessment, delivery was evaluated on a customer group basis, and delivery to individual turnouts within a customer group could vary. The three customer groups in the service area consisted of the South Bay (Alameda/Santa Clara/southern San Mateo County), Peninsula (northern San Mateo County), and San Francisco.

The delivery analysis was used to evaluate the operational flexibility and redundancy within the system under reasonably foreseeable conditions, and evaluated three types of plausible scenarios. The planned maintenance scenarios assumed one planned shutdown of any one facility combined with an unplanned pipeline leak or break on either the San Joaquin or Bay Division Pipelines. Delivery during a Hetch Hetchy water quality event assumed that average-day demand could be met without the Hetch Hetchy source, or by treating part of the Hetch Hetchy source in addition to other supplies. In order to minimize risk of delivery due to unplanned outages under day-to-day conditions, the analysis evaluated the delivery capability with one source—Hetch Hetchy, Sunol Valley WTP, or Harry Tracy WTP—out of service.

Preliminary results indicated that the existing system would fail to meet seismic and delivery level of service objectives under most operating conditions, and that the performance of the system would decline in the future if no improvements were made. The studies also modeled how the regional system would perform with implementation of a program of facility improvement projects, and results demonstrated significant improvement in system performance under all operating conditions. The studies identified specific improvement projects and helped shape the scope of the facility improvement projects that are now proposed as part of the WSIP. Final results of the system assessment studies showing system performance with implementation of the proposed program are presented below in Section 3.5.

3.4.3 Operations Studies

Concurrent with the system performance studies, the SFPUC developed regional water system operations plans (CDM, 2005; URS, 2006a). These documents address operating goals, strategies, and constraints with respect to water supply and storage, water quality, and water delivery. Information from these studies was largely incorporated into the WSIP and is described further below in Section 3.7.

3.4.4 Water Demand Studies

From 2002 to 2006, the SFPUC, in collaboration with its wholesale customers and BAWSCA, conducted comprehensive planning studies to assess future water demands as well as the potential for water conservation programs and the use of recycled water to offset demand for potable water supplies in its retail and wholesale customer service areas. These studies, which provided a basis for 2030 water purchase estimates from the SFPUC regional water system, include the following:

- SFPUC Wholesale Customer Water Demand Projections (URS, 2004a)
- SFPUC Wholesale Customer Water Conservation Potential (URS, 2004b)

- SFPUC Wholesale Customer Recycled Water Potential (RMC, 2004)
- City and County of San Francisco Retail Water Demands and Conservation Potential (Hannaford and Hydroconsult, 2004)
- City and County of San Francisco Recycled Water Master Plan (RMC, 2006)
- SFPUC 2030 Purchase Estimates Technical Memorandum (URS, 2004c)

The studies indicate that total demand in 2000/2001 in the entire SFPUC service area from all water sources was about 366 million gallons per day (mgd). Of that total demand, about 261 mgd was purchased from the SFPUC regional water system. SFPUC wholesale customers met the balance of their supply needs from other water sources and conservation. The projected total service area demand in 2030 is approximately 417 mgd,[16] of which approximately 300 mgd would be purchased from the SFPUC system. The remaining 117 mgd would be met through other supply sources available to customers, primarily water purchases from other agencies, customers' local groundwater sources, additional water recycling, and conservation. Each customers' estimates of conservation savings and the use of recycled water, groundwater, and other supply sources as well as its 2030 purchase estimate is shown in **Table 3.3**. **Table 3.4** compares the 2030 estimated purchases to actual 2001 purchases of the wholesale and retail customers.

Demand Projection Methodology

This section summarizes the key steps involved in projecting 2030 water demand, upon which the estimates of 2030 purchases from the SFPUC regional water system are based. Following completion of the above studies, each wholesale customer submitted its estimate of 2030 purchases from the SFPUC regional system, taking into account water savings from ongoing and planned conservation programs and planned use of other water supply sources. The SFPUC also developed its estimate for the retail service area. These 2030 purchase estimates provide the basis for the WSIP water supply and delivery reliability objectives. A full description of the methodology used to forecast future water demand and assess conservation and recycled water potential is provided in the reports referenced above. Appendix E, Section E.2, of this PEIR also provides a detailed summary of the water demand forecasting methodology and results.

End-Use Demand Model

Future water demand projections for both retail and wholesale customers were developed using end-use demand models that break down total water use, by water service account, to specific end uses such as toilets, faucets, and irrigation. Projections for the wholesale service area were developed in close consultation with the wholesale customers, who provided critical inputs to the demand models and subsequently submitted statements concurring with the demand projections.

[16] Total 2030 demand (417 mgd) includes expected savings due to compliance with existing plumbing codes, which contain efficiency requirements. Total SFPUC service area demand without plumbing code savings is estimated at 453 mgd.

TABLE 3.3
SUMMARY OF WATER SUPPLY ASSUMPTIONS AND 2030 DEMAND PROJECTIONS

	A	B	C	D	E	TOTAL	
Customer	2030 Purchase Estimates (mgd[a])	2030 Projected Conservation Savings (mgd[a])	2030 Projected Use of Groundwater Sources (mgd[a])	2030 Projected Use of Other Surface Water Sources (mgd[a])	2030 Projected Use of Recycled Water (mgd[a])	Total 2030 Supply (mgd[a])[b]	2030 Projected Demand (with Plumbing Code Savings) (mgd[a])
						(A+B+C+D+E)	
Alameda County Water District	13.76	3.16	13.98	27.00	1.40	59.3	59.3
City of Brisbane	0.89	0.04				0.93	0.93
City of Burlingame	4.70	0.20				4.9	4.9
CWS–Bear Gulch District[c,d]	11.76	0.93		1.37		14.06	14.06
CWS–Mid-Peninsula District[c]	17.24	0.86				18.1	18.1
CWS–South San Francisco District[c]	7.97	0.56	1.37			9.9	9.9
Coastside County Water District[e]	2.24 – 3.02	0.18	0.0 – 0.30	0.0 – 0.48		3.2	3.2
City of Daly City[f]	4.90 – 7.32	0.44	1.34 - 3.76			9.1	9.1
City of East Palo Alto	4.64	0.16				4.8	4.8
Estero Municipal Improvement District	6.20 – 6.80	0.0 – 0.60				6.8	6.8
Guadalupe Valley Municipal Improvement District	0.71	0.10				0.81	0.81
City of Hayward	27.95	0.76				28.7	28.7
Town of Hillsborough	3.70	0.20				3.9	3.9
City of Menlo Park	4.54	0.16				4.7	4.7
Mid-Peninsula Water District	3.70	0.10				3.8	3.8
City of Millbrae[g]	3.19	0.08 – 0.11				3.3	3.3
City of Milpitas	8.20	0.61		7.13	1.77	17.7	17.7
City of Mountain View	13.20	0.24 – 1.21	0.05	1.30		14.8 – 15.8	14.8
North Coast County Water District	3.61 – 3.80	0.0 – 0.19				3.8	3.8
City of Palo Alto[h]	13.00	0.60			0.76	14.4	14.4
Purissima Hills Water District	3.22	0.08				3.3	3.3
City of Redwood City[i]	11.60 – 12.60	0.59 – 1.02			0 – 1.00	13.2 – 13.6	13.4
City of San Bruno	4.30	0.19				4.5	4.5
City of San Jose (North)[j]	6.34	0.16				6.5	6.5
City of Santa Clara	4.90	1.00	19.99	4.00	4.00	33.9	33.9
Skyline County Water District	0.30	0.01				0.31	0.31
Stanford University	4.20	0.70		1.90		6.8	6.8
City of Sunnyvale	12.10	0.70	2.60	9.90	1.50	26.8	26.8
Westborough Water District[k]	1.03	see note k				1.03	1.03
Total, Wholesale Service Area[l]	**204 – 209**	**13 – 15**	**39 – 42**	**53**	**9 – 10**	**323 – 325**	**324**
SFPUC Retail Service Area[l,m]	**80 – 91**	**0 – 4**	**3 – 5**	**0**	**0 – 4**	**93 – 94**	**93**
TOTAL[l,n]	**284 – 300**	**13 – 19**	**42 – 47**	**53**	**9 – 14**	**417**	**417**

NOTES: 1. Numbers may not sum due to rounding.
2. The SFPUC serves one additional Bay Area wholesale customer, Cordilleras Mutual Water Users Association, which did not participate in the study because it is a finite group (18 single-family homes) with minimal usage (4,600 gallons per day, or 0.0046 mgd). As indicated in Table 3.1, Cordilleras Mutual Water Users Association is not a member of BAWSCA.

a mgd = million gallons per day.
b Total assumes low-range purchase estimate plus high-range value of other supply sources, and high-range purchase estimate plus low-range value of other sources, where a range was provided.
c CWS = California Water Service Company.
d CWS–Bear Gulch District includes the former Los Trancos County Water District.
e The upper range purchase estimate assumes loss of all local water sources (surface water and groundwater) and the lower range estimate assumes continuation of local sources; both estimates assume Level B water conservation.
f The purchase estimate range reflects a range of potential groundwater usage, established under a pilot project, from the sustainable yield (3.76 mgd) to the lowest annual production yield (1.34 mgd) according to Daly City's best estimate of 2030 water purchases (SFPUC, 2004e).
g 2030 conservation savings is based on URS 2004b and the City's UWMP as confirmed by the City (Popp, 2007).
h 2030 demand and conservation savings are based on information provided by the City of Palo Alto to the SFPUC (City of Palo Alto, 2005).
i In November 2005, Redwood City informed the SFPUC that it would be purchasing its low-range estimate of 11.6 mgd due to anticipated implementation of 1 mgd of recycled water in 2030(City of Redwood City, 2005). The high-range purchase estimate total of 300 mgd published in URS 2004c remains the SFPUC 2030 purchase estimate total for planning purposes, to be consistent with the previous and ongoing WSIP studies. The purchase estimate range originally submitted apparently reflects the average of the City's estimated conservation range plus the originally estimated range of recycled water use.
j Portion of north San Jose only.
k Demand and purchase estimates are based on Westborough Water District's 2005 UWMP, as requested by the district in a letter to the SFPUC (Westborough Water District, 2007). The UWMP discusses ongoing and planned future demand management programs but does not quantify conservation savings in relation to the demand and purchase estimate. The District's original estimate of water purchases indicated conservation savings of 0.020 mgd (SFPUC, 2004e).
l All totals have been rounded to the nearest 1 mgd.
m The low range of the SFPUC retail customer purchase estimate reflects the identified groundwater, recycled water, and conservation programs totaling 10 mgd in San Francisco that are included as part of the WSIP proposed water supply option.
n The single value for total supply assumes the low-range purchase estimate plus high-range value of other sources, and the high-range purchase estimate plus low-range value of other sources (i.e., both approaches round to 417 mgd).

SOURCES: URS, 2004a; URS, 2004c; URS, 2006b; SFPUC, 2004e; SFPUC, 2007a; City of Palo Alto, 2005; City of Redwood City, 2005; Westborough Water District, 2005 and 2007; Popp, 2007.

TABLE 3.4
SUMMARY OF SFPUC 2030 PURCHASE ESTIMATES

SFPUC Customer	Fiscal Year 2001/2002 Purchases from the SFPUC (mgd)	2030 Purchase Estimates (mgd)	Change in Water Purchases from the SFPUC (mgd)
Wholesale Customers			
Alameda County Water District[a]	11.99	13.76	1.77
City of Brisbane	0.39	0.89	0.50
City of Burlingame	4.64	4.70	0.06
CWS–Bear Gulch District[a,b]	11.12	11.60	0.48
CWS–Mid-Peninsula District[b]	16.75	17.24	0.49
CWS–South San Francisco District[a,b]	7.56	7.97	0.41
Coastside County Water District[a,c]	1.80	2.24 – 3.02	0.44 – 1.22
City of Daly City[a]	5.08	4.90 – 7.32	-0.18 – 2.24
City of East Palo Alto	2.04	4.64	2.60
Estero Municipal Improvement District	5.62	6.20 – 6.80	0.58 – 1.18
Guadalupe Valley Municipal Improvement District	0.3	0.72	0.42
City of Hayward	17.61	27.95	10.34
Town of Hillsborough	3.56	3.70	0.14
Los Trancos County Water District[d]	0.11	0.16	0.05
City of Menlo Park[g]	3.57	4.54	0.97
Mid-Peninsula Water District	3.46	3.70	0.24
City of Millbrae	2.47	3.19	0.72
City of Milpitas[a]	6.83	8.20	1.37
City of Mountain View[a]	10.97	13.20	2.23
North Coast County Water District	3.45	3.61 – 3.80	0.16 – 0.35
City of Palo Alto[a]	13.19	13.00	-0.19
Purissima Hills Water District	2.2	3.22	1.02
City Redwood City[a,e]	11.64	11.60 – 12.60	-0.04 – 0.96
City of San Bruno[a,c]	2.7	4.30	1.60
City of San Jose (North)[a,c,f]	4.42	6.34	1.92
City of Santa Clara[a]	3.84	4.90	1.06
Skyline County Water District	0.17	0.30	0.13
Stanford University[a]	2.36	4.20	1.84
City of Sunnyvale[a]	9.69	12.10	2.41
Westborough Water District	1.02	1.03	0.01
Subtotal, Wholesale Customers	171	204 – 209	34 – 38
Retail Customers	90	80 – 91	-10 – 1
Total, SFPUC Regional Water System Customers	**261**	**284 – 300**	**24 – 39**

NOTES: 1. Numbers may not sum due to rounding.
2. One additional wholesale customer, Cordilleras Mutual Water Users Association, did not participate in the study because they are a finite group (18 single-family homes) with minimal usage (4,600 gallons per day).

a Wholesale customer that currently receives water supplies from sources other than the SFPUC, including local groundwater, local surface water, recycled water, and other sources of supply.
b CWS = California Water Service Company
c Wholesale customer that currently receive water supplies from other sources but projects receiving only SFPUC water by 2030 (assuming the high-range purchase estimate where a range is given).
d The former Los Trancos County Water District is now part of CWS–Bear Gulch District; information presented here reflects information in background reports (URS, 2004a; URS, 2004c).
e In November 2005, Redwood City informed the SFPUC that it would be purchasing its low-range estimate of 11.60 mgd due to anticipated implementation of 1 mgd of recycled water in 2030. The high-range purchase estimate total of 300 mgd published in URS 2004b remains the SFPUC 2030 purchase estimate total for planning purposes, to be consistent with the previous and ongoing WSIP studies.
f Portion of north San Jose only.
g Menlo Park purchased 96 percent of its 2001/2002 supply directly from the SFPUC; the balance of its 2001/2002 purchases also came from the SFPUC regional system, but was purchased from East Palo Alto. Menlo Park projects that it will purchase all of its 2030 supply directly from the SFPUC.

SOURCES: URS, 2004c; City of Redwood City, 2005; Westborough Water District, 2007.

To develop projections of future water demand in the wholesale customer service area, the SFPUC employed a model called the Decision Support System (DSS) model. The DSS model involves breaking down existing water use by customer type (residential or nonresidential) into detailed water end uses,[17] and then uses population and employment projections to develop residential and nonresidential account growth rates for projecting future water demand by end use. Water demand projections for the SFPUC retail service area were developed using a similar end-use model. The retail model, however, used composite employee water use rates (gallons per employee per day) with Association of Bay Area Governments (ABAG) industry-specific employment projections to project nonresidential water demand (rather than using employment forecasts to develop nonresidential account growth rates). The SFPUC selected the end-use models over other forecasting methods (e.g., forecasting water use by land use type in gallons per acre per day or on a simple per capita basis) because they allow for a more accurate representation of changing conditions, such as the future impact of plumbing and appliance codes and the effects of additional specific-use planned conservation (URS, 2004a).

Existing Water Demand

A key first step in water demand forecasting is developing accurate estimates of existing water demand (i.e., base-year conditions). Establishing base-year conditions for the end-use models entailed the following steps:

- Selecting the appropriate base year
- Developing water-use data
- Calibrating end uses for that year

The demand projection studies were initiated in the fall of 2002. The year 2001 was selected as a representative base year for the wholesale customer service area because water use data in 2001 showed less influence of the recession than did 2002 data, and because 2001 was a typical year in terms of rainfall. (Complete data were not available for 2003 since the wholesale customer demand study was undertaken that year.) The year 2000 was used as the base year for the SFPUC retail service area demand study because this year provided the best available data.

Customer billing data, along with published information on demographics and housing stock from sources such as the California Department of Finance and U.S. Census Bureau, were used to develop base-year water use, by end use, and plumbing fixture conditions. Base-year parameters, such as the average number of water users per household and per nonresidential account and the percentage of non-water-efficient toilets, were estimated for each service area.

[17] For example, for single-family and multifamily residential customers, water use was subdivided into indoor and outdoor use and then estimated for up to eight indoor end uses (e.g., toilets, showers, faucets, baths, clothes washers, etc.) and up to five outdoor end uses (e.g., irrigation, pools, etc.).

Projecting Future Demands

Once base-year conditions were estimated, the models were set up to project future water use through 2030. Account growth rates were developed for residential and nonresidential accounts using published population and employment projections, respectively. Each wholesale customer was asked to select the published population projection source to be used for its service area, and was asked to ensure that the employment and population projections were based on land use plans relevant to its service area. Most (19 of 30 wholesale customer entities[18]) selected *Projections 2002*, ABAG's current projections series at the time. Other wholesale customers selected from among the following sources: Annual Survey conducted by BAWSCA (known as the Bay Area Water Users Association [BAWUA] when the surveys cited were conducted) (3 customers); urban water management plans (3 customers); selected city planning sources (2 customers); another service area planning study (1 customer); a draft general plan (1 customer), and a water master plan (1 customer). Citywide planning estimates were used for the SFPUC retail service area population projections. *Projections 2002* was used as the source of employment projections for most of the SFPUC wholesale customers and was used in developing nonresidential demand for the retail service area.

Conservation Potential

As part of the modeling effort, the SFPUC also evaluated future water conservation potential in the wholesale and retail service areas (Hannaford and Hydroconsult, 2004; URS, 2004b). The evaluation considered the effects of implementation of existing plumbing code requirements for conservation practices on existing and future water users and continuation of existing conservation practices, as well as additional indoor and outdoor conservation measures for residential and non-residential customers that could feasibly be implemented. In the wholesale service area, the total water savings potential ranged from about 7.7 mgd to 19.6 mgd in 2030, not including the 25.4-mgd savings from effects of the plumbing codes. In the SFPUC retail service area, the total water savings potential ranged from about 0.64 mgd to 4.45 mgd in 2030, not including the 10.3-mgd savings from effects of the plumbing codes.

Although it is difficult to quantify water savings resulting from existing or historical conservation programs, substantial and sustained decreases in per-capita water demands were observed following the 1976–1977 and 1987–1992 droughts (of approximately 26 percent in the wholesale customer service area and over 22 percent in the retail service area) (RMC, 2003). The low range of conservation potential noted above represents the forecasted 2030 water savings associated with a continuation of the conservation measures currently being implemented. The high range of conservation potential presented above represents the outer range of feasible and cost-effective conservation programs.

[18] There are 27 wholesale customers that are members of BAWSCA; however, the background studies consider the three California Water Service Company districts and the former Los Trancos County Water District (now part of CWS–Bear Gulch District) as distinct entities.

Recycled Water Potential

The SFPUC evaluated recycled water potential by considering existing recycled water programs, plans to expand uses in the future, and the amount of potable water that could potentially be offset by future recycled water uses. The studies indicated that there is a range of about 47 to 53 mgd in potential for recycled water use in the wholesale and retail service areas, including current plus additional uses through 2020 (RMC, 2004). The *Recycled Water Master Plan* (RMC, 2006) assesses the technical feasibility of recycled water projects in the westside area of San Francisco; it identifies projects with the potential to provide approximately 6.2 mgd of recycled water to irrigate Golden Gate Park, Lincoln Park, Harding Park, the San Francisco Zoo, San Francisco State University, and other locations, as well as provide a supplemental water supply for Lake Merced. The first phase of projects identified in the report would provide 4.1 mgd of recycled water to this area (RMC, 2006). These San Francisco projects are included in the total SFPUC service area recycled water potential of 47 to 53 mgd in 2020 (RMC, 2004). It should be noted, however, that during the project planning and design phase of recycled water projects, the recycled water potential of specific users will be refined and could potentially be reduced. As such, it is assumed that 100 percent of these specific users' demand represents an offset in potable surface water supplies and that could be met by other appropriate sources of alternative water supply such as groundwater and/or stormwater if recycled water is deemed inappropriate for the specified use (SFPUC, 2008a).

[Additional discussion on the demand projections, conservation, and recycling assumptions was prepared in response to comments on the Draft PEIR. Please, refer to Section 14.2, Master Response on Demand Projections, Conservation, and Recycling (Vol. 7, Chapter 14) and to Section 15.4, Response SI_PacInst, responses to the letter from Pacific Institute (Vol. 7, Chapter 15).]

Purchase Estimates

Upon completion of the demand, conservation, and recycled water studies, the wholesale customers and the SFPUC (for the retail service area) submitted their best estimates of purchases from the SFPUC regional system in 2030. The purchase estimates incorporate the customers' expected 2030 conservation savings (shown in Table 3.3). As the table indicates, some customers provided an estimated range of purchases. The high-range estimate of 300 mgd was used for planning purposes to establish the delivery reliability and water supply objectives for the proposed program, as described below.

3.4.5 Draft Water System Improvement Program

From October 2004 to January 2005, the SFPUC held a series of public workshops to present the results of the planning and engineering studies conducted for the development of the proposed program. At the final workshop, the SFPUC Commission established guidance on the proposed performance standards and levels of service to serve as the basis for WSIP (described in Section 3.3). The SFPUC staff incorporated the performance standards and levels of service selected by the Commission into the proposed program and completed the *Water System*

Improvement Program in February 2005 (SFPUC, 2005a). This document was submitted to the San Francisco Planning Department for preparation of this PEIR, and a follow-up report documenting the proposed program in response to AB 1823 legislation was completed in March 2005 (SFPUC, 2005b). Following development of the level of service objectives published in the February 2005 report, the SFPUC continued to conduct technical and engineering assessments to evaluate and refine the program as needed. The Commission adopted refinements to the WSIP in November 2005, and the SFPUC completed a revised WSIP program description (SFPUC, 2006a) along with the required AB 1823 report (SFPUC, 2006b) in January 2006. These program description documents, together with supplemental information on the facility improvement projects and the proposed water supply option developed by the SFPUC (SFPUC, 2007a), provide the basis for the proposed program analyzed in this PEIR.

3.4.6 WSIP Project Refinement and Other WSIP Components

In addition to presenting the WSIP goals and objectives (described in Section 3.3), the draft WSIP program description issued in January 2006 included 34 facility improvement projects in five regions plus two systemwide projects; it focused on regional projects and did not include the San Francisco (local) projects to be funded through the WSIP bond measure. Since that time, the SFPUC has continued to develop and refine the WSIP projects identified in 2006. This refinement has resulted in the minor reclassification of some proposed facility improvement projects as well as identification by the San Francisco Planning Department of some regional projects that could proceed independently of projects and actions included in the PEIR. As explained earlier, for budgeting purposes, the SFPUC classifies as part of the WSIP all projects and actions that are or will be funded through the 2002 voter-approved bond measure, including projects analyzed in this PEIR as well as other projects and activities.

The SFPUC has identified the following projects for funding through the WSIP bond measure; these projects are listed below in six categories:

A. **Key Regional Projects** considered as part of a program pursuant to CEQA requirements and authorizations and analyzed as a program in this PEIR (the reference to WSIP and WSIP project or facilities in the PEIR refers to these projects and activities).

1. Advanced Disinfection
2. Tesla Portal Disinfection Station
3. Lawrence Livermore Supply Improvements
4. San Joaquin Pipeline System
5. Rehabilitation of Existing San Joaquin Pipelines
6. Alameda Creek Fishery Enhancement
7. Calaveras Dam Replacement
8. Additional 40-mgd Treated Water Supply
9. New Irvington Tunnel
10. Sunol Valley Water Treatment Plant (SVWTP) – Treated Water Reservoirs
11. San Antonio Backup Pipeline
12. Bay Division Pipeline Reliability Upgrade
13. Bay Division Pipelines Nos. 3 and 4 Crossovers
14. Seismic Upgrade of Bay Division Pipelines Nos. 3 and 4 at Hayward Fault
15. Baden and San Pedro Valve Lots Improvements
16. Crystal Springs/San Andreas Transmission Upgrade
17. Harry Tracy Water Treatment Plant (HTWTP) Long-Term Improvements
18. Lower Crystal Springs Dam Improvements
19. Pulgas Balancing Reservoir Rehabilitation
20. San Andreas Pipeline No. 3 Installation
21. Local and Regional Groundwater Projects
22. Recycled Water Projects

The PEIR evaluates the SFPUC's proposed water supply option to meet its identified water delivery needs and, at a programmatic level of detail, the key regional facility improvement projects listed above that the SFPUC proposes to construct to meet system performance goals and level of service objectives. These projects are described in Table 3.10 and

Appendix C. In addition, where necessary, project-level CEQA review will be conducted for the facility improvement projects evaluated in this PEIR.

In Sections 4.17 and 5.7, the PEIR analyzes whether the other projects funded through the 2002 voter-approved bond funds that are listed below have the potential to contribute to cumulative impacts in combination with impacts associated with the facility improvement projects evaluated in the PEIR and other reasonably foreseeable future projects.

B. **Regional Projects** that are determined to be independent of the Program for CEQA purposes and are not analyzed as part of the program in this PEIR:

1. Alameda Siphons
2. San Antonio Pump Station Upgrade
3. Pipeline Repair and Readiness Improvements
4. Standby Power Facilities
5. BDPL Nos. 3 and 4 Crossover/Isolation Valve at Hayward Fault
6. SFPUC/EBMUD Intertie
7. Installation of SCADA System – Phase 2 & System Security Upgrades
8. Adit Leak Repair – Crystal Springs/Calaveras
9. Capuchino Valve Lot Improvements
10. Cross Connection Controls
11. New Crystal Springs Bypass Tunnel
12. HTWTP Short-Term Improvements
13. Crystal Springs Pipeline No. 2 Replacement
14. Sunset Reservoir Upgrades – North Basin
15. University Mound Reservoir Upgrades – North Basin

In September 2005, the Notice of Preparation (NOP) on the WSIP PEIR identified most of the projects listed above as projects that might undergo environmental review independent of and possibly in advance of the PEIR (refer to the NOP in Appendix A of this PEIR for brief descriptions of these projects). As a result of reclassification of projects and program refinement since the issuance of the NOP, the San Francisco Planning Department has determined that three other projects not listed in the NOP as such are appropriate for environmental review separate from the PEIR: Alameda Siphons (previously classified as part of the Irvington Tunnel project), San Antonio Pump Station Upgrade and Capuchino Valve Lot Improvements. The Planning Department is preparing or has completed environmental review for all of the projects listed above separate from the PEIR, and the SFPUC has already implemented some of the projects. The Planning Department has determined that these projects may appropriately proceed with environmental review in advance of completion of the WSIP PEIR for several reasons: (1) these projects are necessary irrespective of whether the SFPUC approves the overall WSIP goals and objectives or any other WSIP facility project; (2) construction of the particular project will not increase the normal operating or delivery capacity of the SFPUC's regional system, change the manner in which water is dispersed, increase the storage capacity of the system, or increase or alter the nature of any treatment capacity of the system; (3) these projects do not commit the SFPUC to any other WSIP project; and (4) any cumulative impacts associated with the individual project can be and are adequately addressed by the analysis in the individual environmental review documents. Although the independent utility projects may contribute to the overall reliability of the regional water system, the primary purpose of these projects is to rehabilitate existing facilities and provide flexibility for maintenance and emergency response.

Subsequent to Draft PEIR publication in June 2007 and based on more detailed project information, the San Francisco Planning Department determined that five additional regional WSIP projects, previously identified as Key Regional Projects in category A above, could appropriately proceed with environmental review independent of the WSIP PEIR: Rehabilitation of Existing San Joaquin Pipelines, BDPL Nos. 3 and 4 Crossovers, Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault, Baden and San Pedro Valve Lots Improvements, and Pulgas Balancing Reservoir Rehabilitation (all phases). Thus, these five additional projects have been determined to have independent utility from the overall program analyzed in the WSIP PEIR (SFPUC, 2008b) and can undergo environmental review independent of and possibly in advance of the PEIR.

C. **Local Projects** are located in San Francisco and would only affect the San Francisco component of the water system. These projects entail upgrades to pump stations, reservoir facilities, water transmission lines, and tanks in addition to other similar actions. Environmental review is complete for most of these projects, and many of the projects have been or are in the process of being implemented.

D. **WSIP-Related Activities**, including the Watershed Environmental Improvement Program, Habitat Reserve Program, and Regional Desalination Feasibility Project, which are described in Section 3.12 of this chapter, are in the preliminary planning phase and will be subject to separate CEQA review when they are further defined.

E. **Regional Recycled Water Projects** (note that these are different than the project #22, Recycled Water Projects, listed above under A). The SFPUC expects that some recycled water projects that would be located outside of San Francisco will be developed in coordination with other jurisdictions. As these projects are developed and designed, they will be reviewed to determine the appropriate lead agency and level of environmental review.

F. **Bay Division Pipeline No. 4 Slipline PCCP Sections – Condition Assessment** was identified in the draft 2006 WSIP and NOP as a pipeline rehabilitation project, but has since been redefined and is limited to the assessment of the condition of sections of Bay Division Pipeline No. 4 where vulnerable prestressed concrete cylinder pipe (PCCP) currently exists. No construction activities are proposed at this time. Physical work needed for the assessment, if any, is expected to be minimal and exempt from CEQA.

3.4.7 WSIP PEIR Components

As explained above, the program analyzed in this PEIR consists of the following: a proposed water supply option for both drought and nondrought periods; 22 key regional facility improvement projects, as listed above in Section 3.4.6; and a proposed system operations strategy that would incorporate the proposed facility improvement projects into the existing system and would allow the SFPUC to exercise the proposed water supply option as needed, either to serve dry-year needs or increases in customer purchase requests through 2030.

The proposed levels of service established to achieve the WSIP goals and service performance objectives are discussed below in Section 3.5. The proposed water supply option is presented in Section 3.6, followed by the proposed changes in system operations (Section 3.7). Sections 3.8 through 3.11 describe the key regional facility improvement projects analyzed in the PEIR for implementation under the WSIP, including the facility locations, components, and construction requirements.

3.5 Proposed Levels of Service to Achieve Program Objectives

The WSIP includes proposed levels of service for the regional water system, which are intended to further define the system performance objectives through 2030 and to provide design criteria for the facility improvement projects. The proposed levels of service address the following categories: water quality, seismic reliability, delivery reliability, and water supply. **Table 3.5** summarizes the proposed changes in levels of service with implementation of the WSIP as compared to existing conditions.

TABLE 3.5
EXISTING AND PROPOSED REGIONAL SYSTEM LEVELS OF SERVICE[a]

Operating Parameter	Existing Level of Service (2005)	Proposed Level of Service with WSIP (2030)
Water Quality	Meet all existing local, state, and federal water quality requirements	Meet all local, state, and federal water quality requirements in 2030
Seismic Response After Major Earthquake	Not defined	Provide basic service[b] of 229 mgd within 24 hours; average-day service of 300 mgd within 30 days
Delivery During System Maintenance	Not defined	Average-day demand of 300 mgd
Average Annual Water Supply	265 mgd	300 mgd[c]
Regional System Firm Yield[d]	219 mgd[d]	256 mgd
Drought-Year Rationing	No maximum limit to rationing	Up to 20 percent systemwide rationing

[a] Level of service flow rates are defined on a systemwide basis and are not specific to any customer turnout.
[b] Basic service is defined as winter-time delivery (estimated to be 229 mgd in 2030). The performance objective is to provide delivery to at least 70 percent of the turnouts in each region, with 104, 44, and 81 mgd delivered to the East/South Bay, Peninsula, and San Francisco regions, respectively (Parsons, 2006).
[c] Includes 10 mgd from conservation, recycled water, and groundwater supply programs in San Francisco.
[d] System firm yield is defined as the average annual water delivery that can be sustained by the regional water system during an extended drought. The SFPUC uses an 8.5-year design drought for planning purposes. Currently, due to operating restrictions imposed by the California Division of Safety of Dams on the Calaveras Dam in 2001, the system firm yield is reduced from its normal system firm yield of 226 mgd to about 219 mgd.

SOURCES: SFPUC, 2006a; Parsons, 2006.

3.5.1 Water Quality Level of Service

The purpose of the water quality level of service goals is to ensure compliance with all existing and anticipated federal, state, and local drinking water requirements as well as to provide systemwide watershed management. The regional system currently meets or exceeds existing water quality standards. Existing water quality requirements applicable to the regional system are summarized in Chapter 2, Section 2.4.

The WSIP includes provisions to enhance the SFPUC's ability to maintain compliance with water quality standards under a range of operating conditions, including catastrophic events such as a major earthquake. Projects are proposed to improve both of the regional treatment plants. In addition to supporting the objective of maintaining the filtration avoidance status for Hetch Hetchy water, ongoing/proposed system operations would include continued implementation of source water protection and systemwide watershed management and protection. The Watershed and Environmental Improvement Program (see Section 3.12 for further description) is a related WSIP activity that would further support these objectives.

In addition, implementation of the WSIP would allow the SFPUC to comply with the recently approved Long Term 2 Enhanced Surface Water Treatment Rule (approved in January 2006). The U.S. Environmental Protection Agency established this regulation to reduce disease incidence associated with *Cryptosporidium* and other pathogenic microorganisms in systems that use surface water. This rule includes requirements for all unfiltered systems to treat for *Cryptosporidium*, with the required degree of treatment depending on the source water contamination level. Dates for implementation of this rule depend on the size of the system as well as the source water conditions. The WSIP includes the Advanced Disinfection project (see Section 3.8 for further description) to address the requirements of this rule.

Proposed federal regulations that could affect the SFPUC in the future include the following (the date in parentheses indicates when the regulation was proposed):

- Proposed Ground Water Rule (August 9, 2000)
- Proposed Radon in Drinking Water Rule (November 2, 1999)

The SFPUC's current plans for developing groundwater supplies take into account the proposed Ground Water Rule (see Groundwater Projects, described in Section 3.8), and no significant modification of the WSIP groundwater projects would be needed in the event the rule is adopted. Specifically, the groundwater sources planned for development have been tested and are typically free of bacteria. Nonetheless, the SFPUC would disinfect (with chlorine) all groundwater prior to blending with regional system supplies and distribution to customers, thus adding an additional protective barrier. Furthermore, the SFPUC would conduct regular groundwater monitoring and implement a wellhead protection program to provide further protection. All of these activities would be consistent and ensure compliance with the proposed Ground Water Rule.

The proposed Radon in Drinking Water Rule applies only to systems using groundwater sources. Surface water systems are not affected. At this time, no significant modifications of the WSIP groundwater projects are expected in the event the rule is adopted. The SFPUC will coordinate closely with the U.S. Environmental Protection Agency and California Department of Health Services regarding the regulatory requirements associated with the Radon Rule, and their application to the WSIP groundwater projects, to ensure compliance.

Other water quality regulations of significance to the SFPUC could include the Stage 2 Disinfectants and Disinfection Byproducts Rule, Candidate Contaminant List, California Action Levels, and California Public Health Goals. The SFPUC will address these regulations as appropriate as part of its ongoing operations as well as to ensure consistency with the WSIP water quality levels of service.

3.5.2 Seismic Reliability Level of Service

The WSIP goal for seismic reliability is to reduce the regional system's vulnerability to earthquakes, thereby ensuring water service to customers within a defined period following a major earthquake. As described above in Section 3.4.2, the SFPUC conducted an extensive series of facility reliability and system performance studies, and presented the results to the SFPUC Commission during 2004 to 2005; in January 2005, the Commission selected the levels of service to be achieved under the WSIP.

To improve the seismic reliability of the regional system, critical facilities would be upgraded to meet current seismic standards, thereby improving their ability to withstand seismic damage and reducing the overall vulnerability of the system to earthquake damage. For planning purposes, the earthquake scenarios used to develop seismic upgrade criteria are the largest earthquakes likely to be generated on each of the three major faults—the San Andreas, Hayward, and Calaveras faults—as defined by the U.S. Geological Survey. The seismic upgrade criteria take into account how critical each facility is to the system in restoring customer service following an earthquake. The proposed program would establish seismic criteria appropriate to individual facilities to achieve the required level of seismic reliability in the most cost-effective manner (SFPUC, 2004a).

In addition to upgrading critical facilities to meet current seismic standards, the proposed level of service for seismic reliability addresses the ability of the SFPUC to restore disrupted service after an earthquake, as shown in Table 3.5. The WSIP would provide basic service to the service area within 24 hours after a major earthquake and average-day service within 30 days after a major earthquake. Basic service is defined as average, monthly winter usage, which is projected to be 229 mgd systemwide in 2030. This level of service was broken down for the three customer groups in the service area, with basic service levels of 104, 44, and 81 mgd established for the East/South Bay, Peninsula, and San Francisco regions, respectively. The system performance objective for this level of service is to provide delivery to at least 70 percent of the customer turnouts within each customer group. Assuming that resources, repair materials, and roadway access are available, this level of service would restore delivery of average-day demand to each customer group within 30 days after a major earthquake, which is estimated to be 300 mgd systemwide in 2030. To achieve this level of service, the proposed program includes provisions for redundant facilities, backup/standby power, and stockpiling of supplies/equipment to expedite emergency repairs.

Under the WSIP, the increased level of operational flexibility would also improve the system's overall ability to respond and restore service following an earthquake. As described below for water delivery reliability, the restored water storage capacity in the Bay Area reservoirs proposed under the WSIP would also provide increased seismic reliability for the system, since it would allow water service to resume more rapidly and reliably following a seismic event.

The SFPUC conducted a system assessment to evaluate and compare the performance of the existing system with that of the future system under the WSIP in terms of the system's ability to meet the level of service objectives for seismic reliability (Parsons, 2006). **Table 3.6** presents the results of the performance analysis. Although the model estimates have an estimated uncertainty of 10 percent, the results show a vast improvement in system performance with implementation of the WSIP in all categories. The model results indicate that a major earthquake on the San Andreas, Hayward, or Calaveras fault under existing conditions would result in a drastic disruption of service to all customer groups, and that the ability of the system to recover following an earthquake would be limited. A major earthquake on these faults would result in failure of critical facilities and prolonged outages; customers could be without service for more than 14 days and possibly more than 30 days. With construction and implementation of facility improvement projects under the WSIP, all level of service objectives for seismic reliability would be met or exceeded.

3.5.3 Delivery Reliability Level of Service

The water delivery reliability goal addresses the overall operations of the system with regard to its ability to deliver water to customers under a variety of operating conditions. The goal is to increase the reliability of the regional system to meet customer demand under a range of operating conditions, such as reservoir replenishment requirements during planned maintenance,

TABLE 3.6
SYSTEM ASSESSMENT FOR SEISMIC RELIABILITY LEVELS OF SERVICE[a]

Operating Parameter	WSIP Level of Service Objective[b]	Existing System Performance	Future System Performance with WSIP[c]
Delivery After a Major Earthquake, Total System			
San Andreas Fault	229 mgd	**<30 mgd**	267 mgd
Hayward Fault	229 mgd	**<30 mgd**	278 mgd
Calaveras Fault	229 mgd	**<30 mgd**	297 mgd
Percent of Turnouts Receiving Basic Service After a Major Earthquake, Total System			
San Andreas Fault	70%	**<10%**	79%
Hayward Fault	70%	**<10%**	92%
Calaveras Fault	70%	**<10%**	96%
Post-Earthquake Recovery, Delivery 30 Days After a Major Earthquake, Total System			
San Andreas Fault	300 mgd	**255 mgd**	463 mgd
Hayward Fault	300 mgd	**120 mgd**	463 mgd
Calaveras Fault	300 mgd	378 mgd	463 mgd

NOTE: Boldface type indicates scenarios that would fail to meet the level of service objective.

[a] The earthquake scenarios analyzed were: San Andreas fault—magnitude 7.9 event; Hayward fault—magnitude 7.3 event; Calaveras fault—magnitude 6.9 event.
[b] The level of service objective following a seismic event is defined as: (1) basic service equivalent to average winter-month demand, or 229 mgd, within 24 hours, and (2) average-day demand, or 300 mgd, within 30 days.
[c] Note that future performance indicates greater capacities under the WSIP than the level of service objective of 300 mgd. This is because facilities are sized to meet peak-day demand; 2030 peak-day demand is estimated to be 463 mgd.

SOURCE: Parsons, 2006.

unplanned outages, and loss of any one water source. As described above in Section 3.4.2, the SFPUC conducted an extensive series of facility reliability and system performance studies, and presented the results to the SFPUC Commission during 2004 to 2005; in January 2005, the SFPUC Commission selected the levels of service to be achieved under the WSIP, including measures of the reliability of the regional system to deliver water. As summarized in Table 3.5, the proposed system performance and level of service objective for delivery reliability is 300 mgd for 2030 under the following conditions:

- *Maintenance Conditions*. This scenario measures how much water the system can deliver when one key facility is shut down for planned maintenance at the same time that an unplanned outage occurs. SFPUC operations staff identified the following 12 key facilities affecting delivery reliability: the Harry Tracy and Sunol Valley WTPs; Coast Range, Irvington, Pulgas, and Stanford Tunnels; Crystal Springs Pump Station; Bay Division Pipeline No. 4; San Joaquin Pipeline No. 3; Crystal Springs Bypass Pipeline; San Andreas Pipeline No. 2; and the proposed Bay Division Pipeline No. 5 Tunnel. Although all facilities in the system require planned maintenance at some point, these 12 facilities were selected because they would have the most impact on deliveries during shutdown. Furthermore, it was determined that analyzing these 12 critical facility shutdowns would capture the most significant maintenance condition impacts (Parsons, 2006). The WSIP level of service objective was analyzed based on the shutdown of each of these 12 facilities for maintenance combined with one unplanned outage on one pipeline reach of the Bay Division or San Joaquin Pipelines.

- *Delivery During a Hetch Hetchy Water Quality Event*. This scenario measures how much water the system can deliver in the event of a Hetch Hetchy water quality event. During such an event, the system is required to supply up to 300 mgd of water for treatment at the Harry Tracy and Sunol Valley WTPs. The Harry Tracy WTP would treat a sustained capacity of 140 mgd from the Peninsula reservoirs, while the Sunol Valley WTP would treat a sustained capacity of 160 mgd from some combination of Hetch Hetchy and Alameda sources. System delivery during this type of event is not dependent on operating capacity in the San Joaquin Pipelines.

- *Delivery Impacts Due to Unplanned Outages*. This scenario measures the ability of the system to deliver water when one water source is unavailable. It examines the scenarios with either Hetch Hetchy water, Sunol Valley WTP, or Harry Tracy WTP out of service. The level of service objective is to achieve a systemwide delivery capacity of average-day demand with one water source unavailable.

The SFPUC conducted a system assessment to evaluate and compare the performance of the existing system with that of the future system under the WSIP in terms of the system's ability to meet the level of service objectives for delivery reliability (Parsons, 2006). **Table 3.7** presents the results of the performance analysis.

As indicated in Table 3.7, the regional system under existing conditions cannot meet comparable level of service targets for delivery under most scenarios analyzed. For planned maintenance conditions with one critical facility shutdown concurrently with one unplanned outage, the existing system could not meet average daily demand if any one of the following five critical facilities were shut down for maintenance: the Harry Tracy WTP, Sunol Valley WTP, Irvington Tunnel, Coast Range Tunnel, or Bay Division Pipeline No. 4. However, with implementation of the WSIP, the level of service objective of total system delivery of average-day demand (300 mgd) would be met for all of the critical maintenance conditions.

The system assessment also determined that the existing system would be unable to deliver the average annual demand to customers during a water quality event in the Hetch Hetchy supply for the full range of flow scenarios. Different flow rates were evaluated because system deficiencies vary depending on the flow rate. However, with implementation of the WSIP, the level of service objective of total system delivery of average-day demand (300 mgd) would be met or exceeded for all flow rates.

Delivery impacts due to unplanned outages were also evaluated as a measure of delivery reliability of the system. The system assessment showed that if there were an unplanned outage of the Hetch Hetchy supply under the existing system, the SFPUC could not meet customer demand, since the systemwide delivery capability would be limited to 243 mgd. With implementation of the WSIP projects, this delivery capability would increase to 313 mgd, surpassing the level of service objective.

TABLE 3.7
SYSTEM ASSESSMENT FOR DELIVERY RELIABILITY LEVELS OF SERVICE
(mgd)

Operating Parameter	WSIP Level of Service Objective[b]	Existing System Performance	Future System Performance with WSIP[c]
Delivery During Planned Maintenance with one critical facility shutdown and one unplanned outage[a]			
Harry Tracy WTP Shutdown	300	**273**	359
Sunol Valley WTP Shutdown		**273**	339
Irvington Tunnel Shutdown		**111**	463
Coast Range Tunnel Shutdown		**231**	313[e]
Pulgas Tunnel Shutdown		367	409
Bay Division Pipeline No. 4 Shutdown		**270**	405
San Joaquin Pipeline No. 3 Shutdown		313	421
Crystal Springs Pump Station Shutdown		350	436
Crystal Springs Bypass Pipeline Shutdown		379	463
San Andreas Pipeline No. 2 Shutdown		393	463
Stanford Tunnel Shutdown		344	463
Bay Division Pipeline No. 5 Shutdown[d]		N/A	409
Delivery During a Hetch Hetchy Water Quality Event			
Hetch Hetchy flow rate 70 mgd	300	**243**	313[e]
Hetch Hetchy flow rate 150 mgd		**213**	313[e]
Hetch Hetchy flow rate 230 mgd		**213**	313[e]
Hetch Hetchy flow rate 290 mgd		**213**	313[e]
Delivery Capacity Due to Unplanned Outages			
Hetch Hetchy outage	300	**243**	313[e]

NOTE: Boldface type indicates scenarios that would fail to meet the level of service objective.

a An unplanned outage is assumed to be the worst case of one reach of either the Bay Division or San Joaquin Pipeline out of service.
b The WSIP level of service objective for delivery reliability is defined as average-day demand, or 300 mgd.
c Note that future performance indicates greater capacities under the WSIP than the level of service objective of 300 mgd. This is because facilities are sized to meet peak-day demand; 2030 peak-day demand is estimated to be 463 mgd.
d One of the key regional facility improvement projects under the WSIP, the Bay Division Pipeline Reliability Upgrade.
e Based on completion of the Sunol Valley WTP, Harry Tracy WTP, groundwater/recycled water/conservation program, and partial delivery to Coastside County Water District from Crystal Springs Reservoir.

SOURCE: Parsons, 2006.

3.5.4 Water Supply Level of Service

The purpose of the SFPUC's water supply goal is to assure that the SFPUC has an adequate supply of water to deliver to customers during both nondrought and drought periods. For the purposes of this PEIR, the terms "nondrought period" and "drought period" are used as a simplified breakdown of the two basic hydrologic/meteorological conditions (a more detailed breakdown of hydrologic year types is provided in Chapter 5 of this PEIR). Most years are nondrought periods, which refers to typical years or sequences of years during which hydrologic/meteorological conditions can assure adequate SFPUC water supplies to fully meet customer purchase requests and to allow operation of the regional system in normal operating mode. Drought period refers to all other years or sequences of years, when hydrologic/ meteorological conditions indicate that water supplies may not be adequate and the SFPUC needs to modify its operating procedures and implement drought response actions.

The WSIP level of service objectives for water supply are: (1) to fully meet customer purchase requests in nondrought years through the planning year 2030, estimated to be 300 mgd average annual delivery, and (2) to provide drought-year delivery with a maximum systemwide cutback of 20 percent in any one year of a drought. As described in Section 3.4.4, above, the SFPUC, in conjunction with its wholesale customers, conducted extensive studies to determine water demand projections, conservation and recycled water potential, and the extent to which customers receive water supplies from sources other than the SFPUC. The studies ultimately resulted in water purchase estimates from the regional system in 2030, with the wholesale customers projected to purchase 209 mgd and the retail customers projected to purchase 91 mgd, or a total estimated purchase request of 300 mgd. This formed the basis for the water supply level of service for nondrought years.

With respect to drought-year supply, the proposed level of service is to limit rationing to a maximum of 20 percent systemwide in any one year. This corresponds to a required system firm yield of 256 mgd in 2030. System firm yield is the average annual water delivery that can be sustained throughout an extended drought. The SFPUC uses an 8.5-year design drought for planning purposes and for calculating system firm yield. The normal system firm yield is 226 mgd.[19] By 2030, with customer purchase requests of 300 mgd, the system firm yield needed to meet the WSIP goals and objectives to provide adequate water delivery in drought years is estimated to be 256 mgd—an increase of 30 mgd. (Under the current restricted operating condition that limits storage levels in Calaveras Reservoir, the system firm yield is 219 mgd, and an additional 37 mgd of system firm yield would be needed to meet the WSIP 2030 level of service objective of 256 mgd.) The proposed water supply option to meet the projected increase in water deliveries during nondrought and drought periods is described in Section 3.6, below.

3.5.5 Other Goals and Objectives

In addition to program goals in the areas of water quality, seismic reliability, delivery reliability, and water supply, Table 3.2 also lists program goals in the areas of sustainability and cost-effectiveness provided in the SFPUC's January 2006 WSIP description. The SFPUC has included these program goals as fundamental elements of the WSIP, although the WSIP does not establish quantitative levels of service for the sustainability and cost-effectiveness goals.

Enhancing sustainability is part of the SFPUC's ongoing watershed management and operational efforts and is not specifically or exclusively an element of the WSIP. The WSIP enhances sustainability by integrating and incorporating the sustainability objectives listed in Table 3.2 into each of the facility improvement projects. The SFPUC is also taking other actions indirectly related to the WSIP that support sustainability objectives, such as development of the Watershed and Environmental Improvement Program funded through WSIP bond financing (described further in Section 3.12, below, under WSIP Related Activities). The systemwide watershed management and enhancement activities are related to the water quality goals as well as to the overriding program principle of maintaining a clean, unfiltered water source from Hetch Hetchy

[19] Currently, due to operating restrictions imposed by the California Division of Safety of Dams in 2001 on the Calaveras Dam, the system firm yield is reduced from its normal system firm yield of 226 mgd to about 219 mgd.

Reservoir (see Chapter 2, Section 2.4, regarding the Surface Water Treatment Rule and Hetch Hetchy Reservoir) and maintaining a gravity-driven system.

Similarly, the WSIP integrates the cost-effectiveness goals listed in Table 3.2 in the planning, development, and design of facility improvement projects. The SFPUC has developed detailed preliminary cost information on the WSIP and its individual facility improvement projects, and the cost information is provided in the January 2006 program description (SFPUC, 2006a).

3.6 Proposed Water Supply Sources

To achieve the WSIP water supply level of service objectives to fully meet customer purchase requests in nondrought years through 2030 and to provide drought-year delivery with a maximum systemwide rationing of 20 percent, the WSIP's proposed water supply option specifies water sources during drought as well as nondrought periods. The proposed water supply option would serve the projected 35 mgd increase in average annual purchase requests through deliveries from the regional system and through conservation/recycled water/groundwater programs in San Francisco, while limiting customer rationing to a maximum of 20 percent systemwide in any one year.

SFPUC studies indicate that the SFPUC's existing water rights for the current water sources of the regional system in the Alameda, Peninsula, and Tuolumne River watersheds are sufficient to meet current and future water purchases in nondrought years, assuming restored storage capacity in the system's Bay Area reservoirs (SFPUC, 2007a). The SFPUC currently holds entitlements for sufficient water to meet 2030 purchase requests in nondrought years through increased Tuolumne River diversions that could supplement current Tuolumne River diversions and local watershed supplies. However, during drought periods, the SFPUC's existing water supply sources are insufficient to satisfy the WSIP water supply goal under 2005 purchase requests, and this shortage will become more severe by 2030 with the projected increase in purchase requests.

The facilities and facility improvement projects required to implement the proposed water supply option during both nondrought and drought periods are described in greater detail in Section 3.8 of this chapter. Key regional system facility improvements include: increasing SFPUC regional system transmission reliability and redundancy in the San Joaquin and Bay Division Pipelines; restoring full, historical storage capacity in the existing Crystal Springs and Calaveras Reservoirs; developing groundwater wells in San Francisco to supplement the regional water system as well as additional wells in northern San Mateo County to implement the regional groundwater conjunctive-use program; and constructing recycled water treatment facilities and associated distribution systems in San Francisco. Also needed is the implementation of a water recapture project on Alameda Creek, in accordance with the 1997 Memorandum of Understanding (MOU) between the SFPUC and the California Department of Fish and Game (CDFG), as described in Chapter 2, Section 2.3.4. The recapture project in itself would not increase the firm yield of the system; however, it is necessary to avoid the loss of yield since fishery releases from Calaveras Reservoir would be made as a part of the Calaveras Dam Replacement project and the recapture part would be conducted through the Alameda Creek Fishery Enhancement project (both are

WSIP facility improvement projects described in Section 3.8). In addition to these facility improvement projects, other WSIP facility improvement projects (also described in Section 3.8) would be needed to achieve the WSIP level of service performance objectives for water quality, seismic reliability, and delivery reliability the SFPUC has established for the regional system in nondrought and drought years.

3.6.1 Proposed Nondrought Water Supply

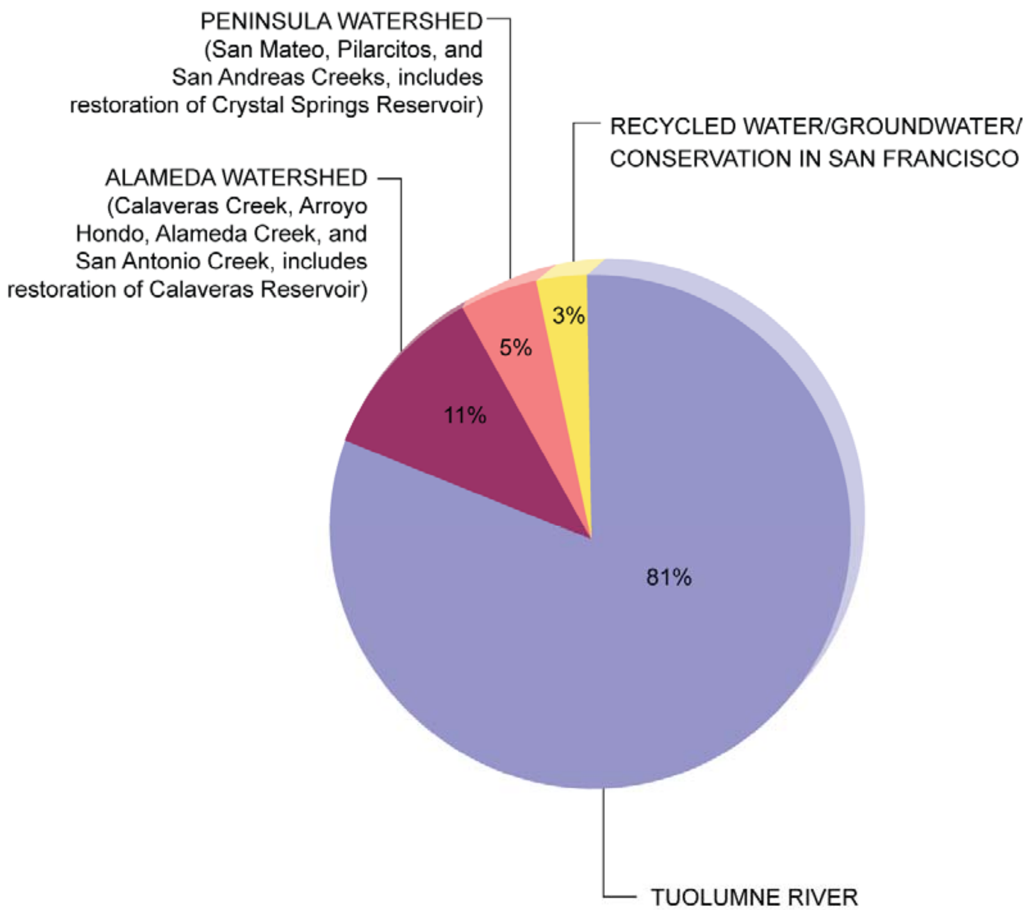
During years with nondrought conditions, the SFPUC proposes to meet the increased 35 mgd in purchase requests through a combination of conservation, water recycling, and groundwater supply programs in San Francisco and increased diversions from the Tuolumne River (SFPUC, 2007a).

Under the proposed WSIP water supply option, the SFPUC would implement conservation, water recycling, and groundwater supply programs in the SFPUC retail service area to achieve the equivalent of 10 mgd of supply every year, including nondrought and drought periods. The SFPUC has determined that 10 mgd of additional supply (including demand management) could be met within San Francisco alone with projects that have already undergone completed preliminary planning phases. These projects would consist of about 2 mgd of local groundwater development, 4 mgd of recycled water projects, and 4 mgd of additional water conservation measures, as described below:

- *Local Groundwater Projects*. One of the WSIP facility improvement projects described in Section 3.8 involves installation of new groundwater production wells in the North Westside Groundwater Basin (located on the west side of San Francisco) to provide an average annual 2 mgd of potable water to augment the regional system water supply sources.
- *Recycled Water Projects*. One of the WSIP facility improvement projects described in Section 3.8 includes treatment, storage, and distribution facilities to provide about 4 mgd of recycled water to irrigation users on the west side of San Francisco based on preliminary estimates of recycled water demand. However, due to ongoing planning efforts and demand projection refinements, the project sizes may be reduced to match the refined demands (SFPUC, 2008a).
- *Additional Conservation Measures*. The SFPUC has identified additional conservation measures to provide about 4 mgd not already included in the 2030 San Francisco retail water demand projections, as summarized in the *2005 Urban Water Management Plan for the City and County of San Francisco* (SFPUC, 2005c). The additional measures were identified as Package C in the *Retail Water Demands and Conservation Potential* (Hannaford and Hydroconsult, 2004) and would be implemented using funding from the SFPUC operating budget.[20] These programs would be in addition to plumbing code savings of 10 mgd already accounted for in the 2030 purchase request for the retail service area (Hannaford and Hydroconsult, 2004).

[20] The study entitled *San Francisco Retail Water Demands and Conservation Potential* (Hannaford and Hydroconsult, 2004) identified three conservation packages—Packages A, B, and C—based on the results of a benefit-cost analysis and identification of potential water conservation measures that either the SFPUC is currently implementing or other water agencies have considered or are currently implementing. Package A consists of the measures San Francisco is currently implementing, Package B includes all elements of Package A plus additional measures that reflect an expansion of the current conservation program, and Package C consists of Package B plus four additional measures. Package C represents an upper bound of conservation that is considered achievable and fundable. The reader is referred to that study for descriptions of specific conservation measures.

The SFPUC proposes to satisfy the remaining 25 mgd of increase in average annual purchase requests with increased use of Tuolumne River water under its existing water rights (see Chapter 2, Section 2.5.1, for discussion of CCSF water rights). The regional system would continue to maximize its use of local watershed water supplies. This increased level of diversions includes the additional deliveries needed to serve 2030 purchase requests as well as to maintain and maximize local storage for unplanned outages and drought needs. **Figure 3.3** depicts the various supply sources and their relative contributions of the proposed water supply option for typical years (nondrought).



Note: Water supply sources (average annual) based on 2030 conditions during nondrought conditions with 300 mgd in total customer deliveries and all WSIP facility improvement projects completed.

SFPUC Water System Improvement Program . 203287

Figure 3.3
WSIP Water Supply Sources, Nondrought Years

Although during nondrought years the SFPUC would be able to meet the increase in future purchase requests with its proposed conservation, water recycling, and groundwater supply programs and additional diversions from the Tuolumne River under existing entitlements, the nature of the proposed supplemental drought supplies would indirectly affect water supplies during nondrought years. For instance, implementation of a groundwater conjunctive-use program in the South Westside Groundwater Basin in San Mateo County would involve the use of regional system water in nondrought years to enable the storage of water from natural recharge for extraction during drought years. Also, the proposed water transfer agreement with TID and MID (described below) could be established to enable a transfer of water every year as an assurance, given the unpredictable nature of droughts in the region. These components of the proposed water supply option are further discussed in Section 3.6.2, below.

3.6.2 Proposed Drought Water Supply

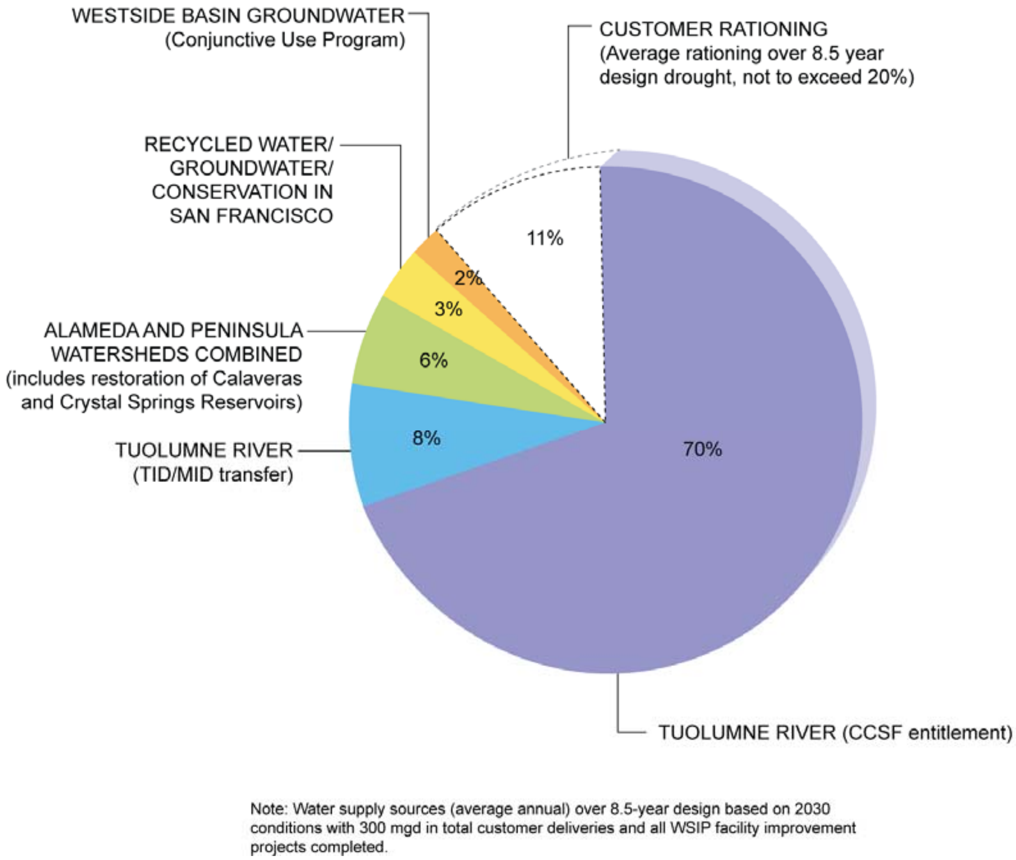
Although the SFPUC can meet projected 2030 water purchases of 300 mgd from existing local supplies combined with existing and increased Tuolumne River diversions in nondrought years, these sources alone have not allowed for full water deliveries during past droughts and cannot be solely relied upon in the future for water deliveries during potential future droughts. During a drought, the SFPUC proposes to serve the 2030 purchase requests, while limiting customer rationing to a maximum of 20 percent systemwide in any one year, with a combination of: (1) existing local watersheds and Tuolumne River resources; (2) conservation, water recycling, and groundwater supply programs in San Francisco (implemented in all years, both drought and nondrought); (3) water transfers; (4) groundwater conjunctive-use programs; and (5) restoration of storage at Crystal Springs and Calaveras Reservoirs (SFPUC, 2007a). **Figure 3.4** depicts the proposed WSIP drought-period water supply described above. The proposed supplemental water sources and estimated amounts that would be developed under the WSIP for use during drought periods to increase the system firm yield from the current 219 mgd[21] to the proposed 2030 level of service of 256 mgd, are described below:

- *Water transfers*. Utilize up to an equivalent of 26 mgd (annual average over 8.5-year design drought) of supplemental Tuolumne River water through water transfer agreements with TID and MID.

  [Additional discussion on the proposed dry-year transfer was prepared in response to comments on the Draft PEIR. Please refer to Section 14.3, Master Response on Proposed Dry-Year Transfer (Vol. 7, Chapter 14).]

- *Restoration of Calaveras and Crystal Springs Reservoirs capacities*. Restore Calaveras and Crystal Springs Reservoirs to historical operational capacities. Restore the historical operating storage capacity at Crystal Springs Reservoir by an equivalent of 1 mgd of water (annual average over 8.5-year design drought) and restore Calaveras Reservoir capacity to provide a equivalent of 7 mgd of water (annual average over 8.5-year design drought).[22] The restoration of reservoir capacities would occur through two of the WSIP facility improvement projects, Lower Crystal Springs Dam Improvements and Calaveras Dam Replacement, as described in Section 3.8.

[21] Currently, due to operating restrictions imposed by the California Division of Safety of Dams on the Calaveras Dam in 2001, the system firm yield is reduced from its normal system firm yield of 226 mgd to about 219 mgd.
[22] The 7 mgd of dry-year supply that would be provided by Calaveras Reservoir storage restoration has been considered in the normal system firm yield of 226 mgd.



SFPUC Water System Improvement Program . 203287

Figure 3.4
WSIP Water Supply Sources, Drought Years

- *Groundwater conjunctive use*. Utilize the extraction component of a groundwater conjunctive-use program in the Westside Groundwater Basin in northern San Mateo County to provide the equivalent of approximately 6 mgd of water (annual average over 8.5-year design drought) through one of the WSIP facility improvement projects, Regional Groundwater Projects, as described in Section 3.8.

In drought years, the SFPUC would implement a multistep drought response program. Under this program, the initial response to a drought would be to initiate the extraction component of the above-described groundwater conjunctive-use program and to continue to fully deliver customer purchase requests during the initial response stage. If drought conditions were to persist, the groundwater extraction would be augmented with the water transfer, which might be sufficient to defer any additional response actions. If necessary, in combination with the supplemental water supplies and within the WSIP goals for drought periods, the SFPUC would then implement up to 20 percent systemwide rationing.

The water transfer program would entail agreements with TID and MID for a supplemental water supply for the SFPUC. Although there are no agreements currently in place, the SFPUC is pursuing this approach with TID and MID. For the purpose of developing the WSIP water supply option, SFPUC assumed that water in excess of TID and MID needs would be made available annually to the SFPUC. Since the SFPUC cannot directly divert water out of Don Pedro Reservoir, the transfer would be made through a mechanism that credits water to the SFPUC's "water bank account" in Don Pedro Reservoir (see Chapter 2, Section 2.5.2, for description of the water bank account). Such a credit would reduce the obligation of the SFPUC to release water from Hetch Hetchy facilities for downstream capture in Don Pedro Reservoir for TID and MID under the Raker Act (see Chapter 2, Section 2.5.1). This reduction in release obligation would lead to additional water being retained in Hetch Hetchy Reservoir, thus increasing the storage available for diversion to the Bay Area to serve drought-year demands. Due to the unpredictable nature of hydrologic conditions and the uncertainties in predicting the timing and duration of drought periods, a pragmatic assumption for the transfer agreement is that the water would be made available to the SFPUC every year regardless of hydrologic conditions, and the payment for the transfer could be structured accordingly. Therefore, the proposed water supply option assumes that the transfer would occur every year, and only during drought years, the SFPUC would be able to retain the additional water in Hetch Hetchy Reservoir so that it would be available to serve customer demands. The proposed water supply option assumes that the water transfer has been sized to provide 27,000 acre-feet as an annual credit to the water bank account of the SFPUC. This transfer would equate to 23 mgd of delivery yield during drought years (average over design drought).

The proposed program includes a facility improvement project to restore Crystal Springs Reservoir capacity; this project would consist of major repairs and improvements to Lower Crystal Springs Dam to provide adequate protection from the probable maximum flood as well as the maximum credible earthquake (as described in Section 3.8). Due to DSOD operational restrictions on the dam, the current capacity of the reservoir is limited to 58,400 acre-feet. The project would restore the historical reservoir capacity of 69,300 acre-feet. This additional storage capacity, once filled with local watershed runoff or Tuolumne River diversions during nondrought years, would be available for use during drought years. When delivered, the additional volume of stored water would equate to an additional 1 mgd of delivery yield during drought years (average over design drought).

Similarly, the WSIP includes a facility improvement project to restore the historical capacity of Calaveras Reservoir through the construction and operation of a replacement dam that meets seismic safety requirements (as described in Section 3.8). Due to DSOD operational restrictions on the dam, the current capacity of the reservoir is restricted to 37,800 acre-feet, and the project would restore the historical reservoir capacity of 96,800 acre-feet. This additional storage capacity, once filled with local watershed runoff, would be available for use during drought years, providing an additional 7 mgd of delivery yield during drought years (average over design drought).

The groundwater conjunctive-use program would provide up to 8,100 acre-feet per year[23] of drought supply to the SFPUC. In nondrought years, the SFPUC would deliver water to customers in northern San Mateo County in excess of their purchase requests. This water would be used by customers “in-lieu” of the groundwater they would normally have pumped to meet part of their demand. The substitution of this pumping with additional SFPUC deliveries would offset groundwater pumping and allow water to be “banked” in the Westside Groundwater Basin aquifer through natural recharge. During a drought, the initial drought response of the SFPUC would be to initiate the extraction of this banked water by these same customers coincident with a reduction in their purchase requests. The total volume of water to be banked during a succession of nondrought years is estimated to be approximately 61,000 acre-feet. This additional volume of water available (storage) would equate to an additional 6 mgd of delivery yield during drought years (average over 8.5-year design drought).

3.7 Proposed System Operations Strategy

Operation of the regional water system is affected by numerous factors, including fluctuations in customer demands; hydrologic and meteorological conditions; physical facilities and infrastructure capacity and maintenance requirements; and multiple institutional parameters. The WSIP addresses the condition of the physical facilities and infrastructure while also planning for and taking into account customer demand, hydrologic/meteorological conditions, and institutional parameters. Under the WSIP, general day-to day operation of the regional water system would essentially remain unchanged, but implementation of the program would allow refinements to the operations strategy to meet the WSIP goals and objectives, thereby increasing system reliability and providing additional flexibility for scheduling repairs and maintenance. The regional system operations would continue to comply with the conditions of all applicable institutional and planning requirements, including:

- Complying with all water quality, environmental, and public safety regulations
- Maximizing use of water from local watersheds
- Assigning a higher priority to water delivery over hydropower generation
- Meeting all downstream flow requirements

The WSIP goals and objectives have resulted in system operating goals and strategies for 2030 (SFPUC, 2007a; CDM, 2005; Parsons-CH2MHILL, 2006). Under the WSIP, the system would be operated to meet the following objectives:

- Optimize use of available supplies by maximizing: (a) use of local resources, (b) carryover storage, and (c) local storage to provide system reliability
- Provide drinking water that meets all regulatory standards

[23] The conjunctive use program has been designed to provide an extraction capacity of approximately 8,100 acre-feet during a dry year, equivalent to about 7 mgd, over 7.5 years. While the initiation of the extraction component of the conjunctive use program would occur as the first response to anticipated drought, the realization of a drought does not typically occur until the second year of a dry sequence. Thus, in the 8.5-year design drought, the extraction component of the conjunctive use program would only occur for 7.5 years. Groundwater pumping of about 7 mgd over 7.5 years is approximately equivalent in volume to 6 mgd over 8.5 years.

- Reliably deliver water to meet the demand of San Francisco, other retail customers, and wholesale customers
- Maintain the regional water system for the benefit of its retail and wholesale customers
- Maintain a gravity-fed system, unfiltered Hetch Hetchy source water, and local filtered water sources

The operations strategy addresses four components of system operation: water supply and storage, water quality, water delivery, and asset management.

3.7.1 Water Supply and Storage Operations Strategy

General Operations

Operation of the water supply and storage aspects of the regional system would continue to be based on the need to ensure reliable, high-quality water to meet customer demand year-round and under a variety of conditions, and implementation of the WSIP would increase reliability and system performance to meet these program goals and objectives. The SFPUC would continue to integrate operation of the local system with that of the Hetch Hetchy system. Local storage system operations would be consistent with applicable regulatory and institutional requirements (described in Chapter 2, Sections 2.4 and 2.5), while balancing maximum use of local water sources, maintaining prudent carryover storage for drought supply, and maximizing storage of local supplies in Bay Area reservoirs.

The SFPUC would continue to operate the Hetch Hetchy system to conserve water from the Tuolumne River watershed for the consumptive domestic and municipal uses of its customers and the production of hydroelectricity, as authorized by the Raker Act (see Chapter 2, Section 2.4). In addition to serving domestic, municipal, and hydropower uses, the Hetch Hetchy system is operated to meet instream flow requirements and to augment flows for whitewater rafting, as described in Chapter 2, Sections 2.5.3 and 2.5.4 and below. The Raker Act requires that the SFPUC recognize the prior rights of TID and MID (see Chapter 2, Section 2.5.1) as well as comply with conditions of the U.S. Department of the Interior (DOI) for the protection of public lands (Raker Act, Section 4); the DOI conditions require minimum instream flow releases for fish and wildlife habitat. The FERC settlement agreement for the New Don Pedro Project (described below under Other Operational Considerations) requires the CCSF "to continue to work cooperatively with the organized and permitted recreational river users (rafters and kayakers) to schedule flows and to communicate daily flow schedules" (FERC, 1996). With implementation of the WSIP, the SFPUC would continue to operate the Hetch Hetchy system in compliance with instream flow requirements and in cooperation with recreational interests on the Tuolumne River. As described in more detail in Chapter 5, Section 5.3.1, system operations under the WSIP would result in a reduction in average monthly storage in Hetch Hetchy Reservoir and a delay in releases from O'Shaughnessy Dam to the Tuolumne River compared to existing conditions.

Local reservoirs in the Alameda and Peninsula watersheds would continue to be operated to maximize the use of local resources for annual water deliveries, drought supply, and emergencies.

Calaveras Reservoir would be restored to its historical operating capacity, and the DSOD restrictions would no longer constrain operations and storage; the SFPUC would generally return to its normal operating procedures, diverting flow from upper Alameda Creek through the Alameda Creek Diversion Tunnel to Calaveras Reservoir. Crystal Springs Reservoir would also be restored to its historical capacity, providing increased local storage. These reservoirs would continue to be operated to avoid releases that could harm SFPUC facilities or otherwise present risks to public health and safety. In general, the local reservoirs would be maintained at a higher level under the WSIP than under current practices in order to maintain and maximize local storage for unplanned outages or drought needs.

Under the WSIP, operation of the Sunol Valley WTP would be modified to take advantage of system flexibility that is not currently available. Under current operations, the SFPUC can filter diversions from the Tuolumne River at Sunol Valley WTP in limited quantities for limited time periods; however, this operation is not typical, since water from Hetch Hetchy does not require filtration. Under normal system operations, raw water from Calaveras Reservoir flows to the Sunol Valley WTP for treatment, and this water source is also used to supply the minimum flows needed to maintain filtration process operations at the WTP. However, with implementation of the WSIP, it is assumed that diversions from the Tuolumne River could be used to meet the minimum flow requirements at the Sunol Valley WTP so that water in Calaveras Reservoir can be maintained at a higher level, thus maximizing local storage for unplanned outages or drought needs.

Under the WSIP, other system improvements that would affect operations include the additional conveyance capacity in system facilities, such as the San Joaquin and Bay Division Pipelines, which would allow for implementation of a regular, planned maintenance schedule for critical facilities. The maintenance schedule would allow for planned outages for critical facilities, during which time the SFPUC would utilize redundant facilities to maintain system deliveries. Depending on the facility subject to maintenance and inspection, the SFPUC would adjust the normal system operation as needed in order to avoid disruption of service to customers.

Additionally, restoration of the historical capacity at Crystal Springs Reservoir would allow the reservoir to be operated with additional storage. Typical operations would be to fill the reservoir whenever possible within the cyclic operational storage goals of the system for maximum local reservoir and system storage.

Nondrought-Year System Operations

In nondrought periods with average or above-average rainfall and snowmelt conditions, the SFPUC proposes to meet the increased purchase requests of 35 mgd through 2030 with increased Tuolumne River diversions and 10 mgd of recycled water, conservation, and groundwater programs in San Francisco. The amount of diversion from the Tuolumne River would vary from year to year, and in some years, particularly after a dry period, a portion of the Tuolumne River diversions would be used to replenish local reservoirs. Under the WSIP, the local reservoirs in the Alameda and Peninsula watersheds would provide an average of about 16 percent of the total water supply, with the Hetch Hetchy system providing about 81 percent and recycled water, conservation, and groundwater programs in San Francisco providing the remaining 3 percent. Seasonal operation of diversions and the reservoir system would essentially continue as currently practiced, although the local reservoirs would generally be maintained at a higher level than under current conditions in order to maintain and maximize local storage for unplanned outages or drought needs.

As part of the WSIP, the SFPUC would utilize a groundwater conjunctive-use program in the Westside Groundwater Basin in northern San Mateo County. Under this program, wholesale customers in this area (such as Daly City, California Water Service Company, and San Bruno, which currently pump groundwater to meet a portion of their potable demand) would receive additional supplies from the regional system during nondrought years to offset their groundwater pumping, and would cease pumping and allow the aquifer to recharge naturally. In exchange, those customers would increase groundwater pumping during drought periods, thereby reducing the amount of their purchase requests during a drought and making more water available for serving regional water system demand.

Drought-Year System Operations

As described above in Table 3.5, the proposed level of service objective for water supply during a drought is to limit rationing to a maximum of 20 percent systemwide reduction in water service in any one year. The proposed WSIP facilities and operations strategy are designed to meet this level of service. Under the WSIP, in response to reduced water supply conditions, the SFPUC would manage drought-year supplies and water deliveries through implementation of a four-stage response program to ensure that water is delivered to customers continuously through the duration of the drought.

The first stage of response would be to implement water supply options specific to drought-year water conditions, namely the conjunctive-use program within the Westside Groundwater Basin and the TID and MID water transfer. As described above in Section 3.6.2, the groundwater conjunctive-use program in the Westside Groundwater Basin would be put into the extraction mode, with the participating customers substituting groundwater for a portion of their otherwise requested system delivery. During this first stage of response and if still needed following implementation of groundwater pumping in the Westside Basin, the water transfer from TID and MID would also supplement the supply available for SFPUC deliveries. Then, as needed for a severe drought, the SFPUC would implement Stages 2 and 3 of the response program in combination with the supplemental dry-year supplies and would initiate water delivery reductions. A Stage 2 response would include up to 10 percent systemwide rationing, and a Stage 3 response would include up to 20 percent systemwide rationing. The procedures include customer notification, customer allocation if necessary, and evaluation of customer performance. Water use reduction programs would remain in place until total system storage is recovered and drought conditions appear to have ended.

During a drought that exceeds the 8.5-year design drought scenario, a fourth stage of response would be implemented. Stage 4 would increase rationing beyond the WSIP proposed level of service goal of 20 percent. However, with implementation of the WSIP facility improvement projects (see Section 3.8) and the proposed water supply option, the Stage 4 response would not be necessary for any drought sequence equal to or less severe than the 8.5-year design drought.

The SFPUC uses total system and local system reservoir storage levels as parameters to indicate response level in the four-stage dry-year response program. The specific storage levels that indicate a certain response are related to demand and water supply resources and are updated as demand and resources change. As part of operations, by April 15 of each year, the SFPUC can project what system storage will be on July 1 based on current storage, rainfall, and snowpack conditions (SFPUC, 2007a).

Other Operational Considerations

Instream Flow Releases

The SFPUC will meet, at a minimum, all current and anticipated legal requirements for protection of fish and other wildlife habitat, as stated in Table 3.2 under the sustainability goal. Current requirements, as described in Chapter 2, Section 2.5.3, include releases from the following SFPUC regional facilities: Lake Lloyd, Lake Eleanor, Hetch Hetchy Reservoir, Moccasin Reservoir, and Calaveras Reservoir. In addition, the National Marine Fisheries Service has raised concerns regarding stream flows in Pilarcitos Creek below Stone Dam, and the SFPUC is currently making experimental releases and undertaking studies in an effort to address these concerns.

TID and MID own and operate Don Pedro Reservoir (built under the New Don Pedro Project) and are solely responsible as project licensees for meeting the Federal Energy Regulatory Commission (FERC) requirements for fishery releases. Nevertheless, under the Fourth Agreement with TID and MID (see Chapter 2, Section 2.5.3), the CCSF may be required to provide water for these FERC-imposed fishery releases from Don Pedro Reservoir if TID and MID demonstrate that their water entitlements are being adversely affected by providing the flows. The CCSF, TID, and MID entered into two funding agreements to implement the FERC Settlement Agreement; the CCSF now pays TID and MID to provide all of the additional water required under the 1996 FERC order amending the requirements for fishery releases from Don Pedro Reservoir.

The current FERC license expires in 2016, at which time TID and MID will be required to apply for a new license for hydroelectric operations on Don Pedro Reservoir. As part of the license renewal, FERC may modify the fishery release requirements. Although the fishery release requirements that FERC may impose in 2016 cannot be anticipated at this time, the SFPUC assumes, for purposes of the WSIP, that it will be able to continue its current agreement with TID and MID to pay them to provide all of the additional water, if any, required for the fishery releases.

There are no regulatory or contractual flood control restrictions on the local reservoirs. With the exception of Calaveras Dam, none of the local reservoirs or dams has requirements for downstream fishery releases. The SFPUC has not implemented the instream flow releases from Calaveras Reservoir that are stipulated under a 1997 MOU with the CDFG due to the DSOD restrictions on the reservoir water level (discussed in Chapter 2, Section 2.5.4). The SFPUC proposes to implement these releases after completion of the Calaveras Dam Replacement project, which is one of the WSIP facility improvement projects. The Calaveras Dam

Replacement project would include new outlet valve structures to provide for the instream flow releases. As part the MOU stipulations (CDFG, 1997), the WSIP facility improvement projects include a flow recapture project downstream of Calaveras Reservoir (referred to as the Alameda Creek Fishery Enhancement project and described in Section 3.8), which would divert water from Alameda Creek back to the SFPUC water supply system corresponding to the amount of any releases made.

Whitewater Rafting Flows

As described in Chapter 2, Section 2.5.4, although there is no regulatory obligation beyond working cooperatively with the rafters, each year, the SFPUC coordinates with the whitewater recreational interests regarding releases from the Hetch Hetchy system. Currently, subject to the availability of water and hydropower needs, the SFPUC attempts to accommodate whitewater recreation in the Tuolumne River below its reservoirs by adjusting the timing and volume of releases from Holm Powerhouse in order to augment river flows for whitewater rafting.

Under the WSIP's proposed water supply option, the SFPUC intends to continue its general practice regarding releases for whitewater rafting in the Tuolumne River and would continue to coordinate its release patterns with the whitewater recreational interests to provide rafting flow patterns similar to current conditions. During the height of the spring runoff, the rafting release would be met through unregulated flow and releases from Hetch Hetchy Reservoir, Lake Eleanor, and Lake Lloyd. Following the end of the runoff season from July through Labor Day weekend, in addition to the minimum instream flow releases, the SFPUC would augment river flows for whitewater rafting through releases at the Holm Powerhouse, subject to the availability of water and the CCSF's need for hydroelectric power generation. As described in Chapter 5, Section 5.3.8, system operations under the WSIP could result in a slight reduction in the number of days of higher flows compared to existing conditions.

3.7.2 Water Quality Operations Strategy

The SFPUC would continue to conduct all system operations to provide reliable, high-quality water year-round as a priority and to maintain a clean, unfiltered water source from the Hetch Hetchy system. The SFPUC's program to assure high-quality water is based on a multi-barrier approach, starting with source water protection, which would continue with implementation of the WSIP. As stated previously, watershed management and source water protection are included under the sustainability objectives for the WSIP, but these efforts are not specifically or exclusively an element of the WSIP.

After source protection, the next step in maintaining high-water quality involves the use of best management practices during operation of transmission system and water treatment facilities. Transmission facilities are operated at appropriate pressures, not only to meet demand but also to avoid possible entry of contaminants into the system and to avoid cross-connection with nonpotable water sources. Treatment facilities would continue to provide disinfection of all water sources, including Hetch Hetchy system water, and filtration of local watershed water sources. The Hetch Hetchy system would continue to be operated and maintained to meet filtration avoidance requirements, and Hetch Hetchy system water would continue to be treated for corrosion control and to reduce exposure to lead and copper from plumbing systems.

The overall water quality operations strategy would not change with implementation of the WSIP, although refinements to system operations would be developed as part of the new and improved treatment facilities. Under the WSIP, the SFPUC would construct a new advanced disinfection facility to provide a higher level of disinfection for the Hetch Hetchy supply, as required by the federal Long Term 2 Enhanced Surface Water Treatment Rule, and the specific operation of this facility would be incorporated into project planning and design. The WSIP also proposes construction of facilities to meet the same requirements for the Lawrence Livermore Laboratory supply. The program also includes funding to support conceptual engineering of improvements at the Sunol Valley and Harry Tracy WTPs; these improvements are not expected to be needed for compliance with this regulation, but could become necessary in the future if source water quality degrades or changes. Other WSIP system improvements to increase water quality reliability involve upgrades to the primary disinfection facilities currently located at Tesla Portal, process improvements to the Harry Tracy WTP, capacity expansions to meet sustainable production requirements at both water treatment plants, construction of the Sunol Valley Treated Water Reservoir to provide a barrier between the treatment plant and the distribution system, improvements to sanitary deficiencies at the Pulgas Balancing Reservoir, and upgrades of various valves and piping to eliminate cross connections. These proposed facility improvement projects are further described in Section 3.8, below.

3.7.3 Water Delivery Operations Strategy

The SFPUC operates the regional transmission system with the overarching goal to reliably deliver water to meet customer demands. While current system operating strategies would generally remain unchanged, implementation of the WSIP would rehabilitate and upgrade existing facilities as well as provide a wider range of operational flexibility, thereby increasing the reliability of the system to deliver water to all customers under a range of operating conditions. For example, proposed improvements to the Baden and San Pedro Valve Lots would increase the system's capability to provide water from Peninsula sources to South Bay customers in the event of a catastrophic failure of water supplies from the Hetch Hetchy and Alameda watersheds.

The WSIP includes a maintenance program that would increase day-to-day reliability and would establish a schedule to allow for the planned shutdown of facilities for inspection and maintenance while continuing to meet customer demands. Currently, the SFPUC has limited ability to take certain facilities out of service for the extended period of time needed to conduct appropriate inspection and maintenance, but the WSIP would provide adequate redundancy of critical facilities to enable inspection and maintenance on a regular schedule. Redundant facilities would also increase the operational flexibility and thus the reliability of water service to customers in the event of an unplanned facility failure or system upset, natural disaster, or other emergency situation. As summarized in Table 3.2, the WSIP includes performance objectives that would maintain water delivery services during planned facility maintenance activities and unplanned outages of key facilities. As described in Section 3.8, the WSIP includes improvements that would provide varying levels of redundancy to the following facilities: Irvington Tunnel, Bay Division Pipelines, and San Joaquin Pipelines.

The proposed system upgrades would optimize local water storage to provide the SFPUC with a local supply in the event of an emergency. At present, depending on hydrologic conditions and the transmission capacity of pipelines, the replenishment of local reservoirs can take more than one year to complete. The addition of redundant facilities and hydraulic capacity upgrades would also increase the system's transmission capability so that local reservoirs in the Alameda and Peninsula watersheds can continue to be replenished during maintenance periods to maintain higher average annual storage levels, thus ensuring that water would be available for use during emergencies or droughts, while also continuing to meet ongoing customer demands.

3.7.4 Maintenance and Asset Management Strategy

As part of operations under the WSIP, the SFPUC would continue to maintain the regional water system. The SFPUC published the *Post-WSIP Preliminary Maintenance Plan for Regional Water Transmission Facilities* (Parsons-CH2MHILL, 2006), which outlines inspection as well as minor and major maintenance activities for the regional system following completion of the WSIP facility improvement projects. Maintenance activities are grouped in a cycle of regular maintenance, repair/replacement, and renewal and are coordinated under an overall asset management program. These activities are described below:

- Regular Maintenance – maximizing and extending the useful life of facilities, including:
  - *Predictive Maintenance* – inspecting and testing facilities to assess conditions, identify problems, and identify the need for repairs.
  - *Preventive Maintenance* – includes scheduled servicing, painting, cleaning, lubrication, and other work performed on a routine basis.
  - *Reactive Maintenance* – includes unscheduled remedial work to address unplanned component failures (e.g., repair of a pipeline leak).
- *Repair and Replacement* – repair or replacement of system components to extend the life of an asset until the renewal phase (e.g., replacement of a limited length of pipeline).
- *Renewal* – renewal or replacement of an asset near the end of its useful service life (e.g., renewal of pipeline through the insertion of steel liners).

The SFPUC's preliminary maintenance plan (Parsons-CH2MHILL, 2006) is based on a 20-year planning horizon. It is a "living document" that will be revised and adapted according to ongoing condition assessments. The plan focuses initially on the major transmission pipelines and tunnels of the regional system, as listed in **Table 3.8**, although the SFPUC has developed a preliminary list of 123 additional facilities requiring maintenance. The maintenance plan can be expanded to a more comprehensive maintenance program to cover the maintenance needs for other facilities in the regional system, including dams, powerhouses, chemical stations, pump stations, treatment plants, balancing reservoirs, valve lots, and other pipelines.

TABLE 3.8
MAJOR WATER TRANSMISSION FACILITIES INCLUDED IN THE INITIAL MAINTENANCE PROGRAM

San Joaquin Pipelines and Hetch Hetchy Tunnels	Bay Division Pipelines and Bay Area Tunnels
Canyon Tunnel	Alameda Siphon No. 1
Mountain Tunnel	Alameda Siphon No. 2
Moccasin Penstocks or Pipelines	Alameda Siphon No. 3
Foothill Tunnel	Alameda Siphon No. 4
San Joaquin Pipeline No. 1	Irvington Tunnel, 1 and 2
San Joaquin Pipeline No. 2	Bay Division Pipeline No. 1
San Joaquin Pipeline No. 3	Bay Division Pipeline No. 2
San Joaquin Pipeline New Segment	Bay Division Pipeline No. 3
Coast Range Tunnel	Bay Division Pipeline No. 4
	Bay Division Pipeline No. 5
	Bay Tunnel
	Stanford Tunnel
	Pulgas Tunnel

SOURCE: SFPUC, 2006c.

The WSIP maintenance goals are generalized, and specific maintenance requirements for individual facilities would depend on actual conditions and risk. The predictive and preventive maintenance goals for the major transmission facilities are shown in **Table 3.9**. The maintenance frequency for pipelines and tunnels varies based on the material composition of each facility. These regular maintenance goals, along with repair/replacement and renewal maintenance goals, have been incorporated into a 20-year timeline that identifies the maintenance schedule for each facility listed in Table 3.8. The maintenance timeline details the expected number of regular, repair/replacement, and renewal maintenance outages and the duration of each outage for specific months and years during the 20-year planning horizon.

TABLE 3.9
PREDICTIVE AND PREVENTIVE MAINTENANCE GOALS

Maintenance Activity	Expected Frequency Interval (years)	Approximate Outage Duration (months)
Pipelines		
Prestressed concrete cylinder pipelines (PCCP)	5	2 – 3
Concrete pipelines	10	2 – 3
Steel pipelines	20	2 – 3
Tunnels		
Rock – lined	20	2 – 3
Rock – unlined	10	2 – 3
Soft Ground – steel liner	20	2 – 3

SOURCE: Parsons-CH2MHILL, 2006.

Currently, the SFPUC attempts to meet maintenance goals to the extent possible; it is generally able to conduct adequate maintenance on treatment and pumping facilities, because these services can typically be performed without completely shutting them down. However, the SFPUC has limited ability to shut down some of the tunnels and pipelines while still meeting customer demand. The transmission system needs additional tunnels and/or pipelines to provide redundant capabilities to enable shutdown, inspection, and maintenance of some major components of the existing system.

Improvements to the transmission system under the WSIP would allow the SFPUC to meet its maintenance goals. The WSIP level of service objective for delivery reliability is to meet the average annual demand of 300 mgd for 2030 under the conditions of one planned shutdown for maintenance concurrent with one unplanned facility outage due to a facility failure caused by a natural disaster or other emergency. Under the WSIP, the regional transmission system has been sized to allow for system demand to be met with a major reach of pipeline, such as one reach of the Bay Division Pipelines, out of service for major maintenance. System operations under the WSIP would allow planned facility inspection, repair, and maintenance without interrupting customer service, and the SFPUC could schedule planned facility shutdowns to accommodate ongoing system demand. Planned shutdowns of major pipeline reaches would occur during the lower demand months of November through March. The proposed program would enable the SFPUC to conduct deferred maintenance and repair work throughout the regional system, thereby extending the useful life of facilities and improving overall system reliability (SFPUC, 2005d).

3.8 Proposed Facility Improvement Projects

To achieve the system performance objectives of the WSIP, the SFPUC has proposed a series of facility improvement projects that would repair, improve, and in some cases expand the physical facilities in the regional system. This PEIR addresses the key regional system projects in the WSIP, as described in Section 3.4.6. **Table 3.10** describes the key regional facility improvement projects that have been identified as necessary to meet the goals and objectives of the WSIP and to support implementation of the proposed water supply option; more detailed information regarding project facilities, operations, locations, construction, and permits is included in Appendix C. **Figure 3.5** shows the locations of the WSIP's key regional facility improvement projects relative to the existing regional system. **Table 3.11** identifies the jurisdictions that would be affected by each of the projects.

The descriptions in Table 3.10 and Appendix C are based on the best available information at this time about each project; however, due to the complexity and extent of the overall program and the varying levels of individual project development, some of the projects have more detailed information than others. The project descriptions presented in this PEIR are of a level of detail appropriate to identify the overall magnitude of effects expected from implementation of the WSIP as a whole. Chapter 4 of this PEIR assesses the potential impacts of implementing the WSIP facility improvement projects listed in Table 3.10 at a program level (see Chapter 1 for a description of program-level impact analyses), including cumulative impacts. While each of these key regional projects is assessed in Chapter 4, the purpose of the analysis is to provide a comprehensive environmental review of the overall range of effects of implementing the WSIP

TABLE 3.10
WSIP FACILITY IMPROVEMENT PROJECTS

No.[a]	Project Title	Principal Type of Facility/ Objectives[b]	Location of Preferred Project[c]	Project Description
San Joaquin Region				
SJ-1	Advanced Disinfection	Treatment / Water Quality	Tesla Portal	This project would provide for the planning, design, and construction of a new advanced disinfection facility for the Hetch Hetchy water supply to comply with the new federal drinking water regulatory requirements contained in the Long Term 2 Enhanced Surface Water Treatment Rule. This regulation is designed to provide treatment for the parasite *Cryptosporidium*. The project is in the planning phase and the SFPUC is evaluating applicable technologies and possible locations to identify the most technologically sound and cost-effective alternative. In addition, the project includes planning and conceptual engineering for providing advanced disinfection facilities at the Sunol Valley and Harry Tracy WTPs. This project may be combined with the Tesla Portal Disinfection project (SJ-5) along with portal modifications, and the need for the Lawrence Livermore project (SJ-2) may be affected by the location and technology selected for this project.
SJ-2	Lawrence Livermore Supply Improvements	Treatment / Water Quality	Thomas Shaft	This project includes design and construction of treatment upgrades for the water supplied to the Lawrence Livermore Laboratory. The project would construct water treatment facilities from the Thomas Shaft of the Coast Range Tunnel. An advanced disinfection facility planned at an upstream location under SJ-1 could affect project design.
SJ-3	San Joaquin Pipeline System	Pipeline / Water Supply, Delivery Reliability	Isolated locations along the existing San Joaquin pipeline corridor	The preferred project would generally be located within the existing San Joaquin Pipeline (SJPL) right-of-way and would include: • Construction of a new 6.4-mile-long, up to 86-inch-diameter fourth San Joaquin Pipeline parallel to the existing three pipelines at the east end of the pipelines, starting at Oakdale Portal, and associated portal modifications. • Construction of two additional crossover facilities between the San Joaquin Pipelines within the existing right-of-way, both located in Stanislaus County, with one about 20 miles east of Modesto and the other about 15 miles west of Modesto, and improvements at the existing Roselle Crossover. • Construction of a new 10-mile-long, up to 86-inch-diameter fourth San Joaquin Pipeline parallel to the existing three pipelines at the west end of the pipelines ending at Tesla Portal. This project would provide additional facilities to upgrade the hydraulic capacity of the San Joaquin Pipeline system to 314 mgd (and a 271-mgd average during system maintenance when a pipeline segment must be taken out of service) and to provide redundancy for prestressed concrete cylinder pipe for reliability. Note: While the current preferred alternative would construct 16 miles of pipeline, as much as 22 miles of pipeline could be constructed depending on the results of a conditions assessment of the existing pipelines.
SJ-4	Rehabilitation of Existing San Joaquin Pipelines	Pipeline / Water Supply, Delivery Reliability	Rehabilitation could occur anywhere along the pipeline corridor, which extends from Oakdale Portal to Tesla Portal	Reconditioning/rehabilitation of the existing San Joaquin Pipelines. There are three existing pipelines, each 47.7 miles long, extending from Oakdale Portal to Tesla Portal: • SJPL-1, riveted steel pipe, 56- to 72-inch internal diameter • SJPL-2, reinforced concrete pipe and welded steel pipe, 61- to 62-inch internal diameter • SJPL3, prestressed concrete cylinder pipe and welded steel pipe, 78-inch internal diameter

TABLE 3.10 (Continued)
WSIP FACILITY IMPROVEMENT PROJECTS

No.[a]	Project Title	Principal Type of Facility/ Objectives[b]	Location of Preferred Project[c]	Project Description
San Joaquin Region (cont.)				
SJ-5	Tesla Portal Disinfection Station	Treatment / Water Quality, Seismic Reliability	Tesla Portal	This project includes the planning, design, and construction of new disinfection facilities for the Hetch Hetchy water supply. The project would replace and upgrade the existing disinfection facilities at the Tesla Portal Disinfection Facility to meet current seismic, safety/fire, and building code standards. The preferred project would include construction of: • New control building and storage room • Pump houses • Chemical storage tanks and feed equipment and sampling systems • Emergency generator, including primary and standby power supplies • Access road It should be noted that the design and location of the Advanced Disinfection project (SJ-1) would affect the design and location of this project.
Sunol Valley Region				
SV-1	Alameda Creek Fishery Enhancement	Other / Water Supply, Sustainability	Structural Alternatives: Alameda Creek in Sunol Valley, downstream of Calaveras Dam	This project would recapture the water released as part of the Calaveras Dam project (SV-2) and return it back to the regional system for use. A number of structural and non-structural recovery alternatives are under consideration for this project, including: a water recapture facility downstream of the Sunol Valley WTP, conjunctive groundwater use, horizontal collector wells, or other groundwater recovery systems yet to be defined. Other alternative designs for this project could be developed. If a structural alternative involving construction of a recapture facility is selected, the recapture facility would be located at the downstream end of the reach of Alameda Creek between the lower Sunol Valley and the confluence with Arroyo de la Laguna. As an alternative to the recapture facility, the SFPUC may coordinate with other water agencies to develop and implement other means of recapturing fishery enhancement flows consistent with the 1997 CDFG MOU.
SV-2	Calaveras Dam Replacement	Storage / Water Supply, Delivery and Seismic Reliability	Sunol Valley, immediately downstream of existing dam and at the Alameda Creek Diversion Dam	This project would provide for the planning, design, and construction of a replacement dam at Calaveras Reservoir to meet seismic safety requirements. The new dam would provide for a reservoir with the same storage capacity as the original reservoir (96,800 acre-feet), but the replacement dam would be designed to accommodate enlargement of the dam in the future. The preferred project would include construction of: • New earthfill dam • New intake tower and new outlet valve for water releases for instream flow requirements • New or rehabilitated outlet works for seismic safety and improved operations and maintenance • New bypass structure at the Alameda Creek Diversion Dam As part of this project, Calaveras Reservoir and the proposed bypass structure at the diversion dam would be operated to release up to 6,300 acre-feet per year (5.5 mgd) of water to Alameda Creek in support of fisheries in compliance with the 1997 CDFG MOU. When flow is available in Alameda Creek, releases would be made through the proposed bypass structure at the Alameda Creek Diversion Dam and would be supplemented as necessary with releases from Calaveras Dam.

TABLE 3.10 (Continued)
WSIP FACILITY IMPROVEMENT PROJECTS

No.[a]	Project Title	Principal Type of Facility/ Objectives[b]	Location of Preferred Project[c]	Project Description
SV-3	Additional 40-mgd Treated Water Supply	Treatment / Water Quality, Delivery Reliability	Sunol Valley WTP and pipeline to connect to the Alameda Siphons or Irvington Tunnel	This project would provide for the planning, design, and construction of an additional 40 mgd of treatment capacity at the Sunol Valley WTP. The project would increase the sustainable capacity of the Sunol Valley WTP to 160 mgd. The planning-level study would evaluate treatment operations protocol and an alternative treatment process. The project would include either retrofitting the existing facilities with a membrane treatment process or expanding the existing facilities with: • New flocculation and sedimentation system • Upgrade of existing filters or addition of three new filters and a new flow distribution chamber

TABLE 3.10 (Continued)
WSIP FACILITY IMPROVEMENT PROJECTS

No.[a]	Project Title	Principal Type of Facility/ Objectives[b]	Location of Preferred Project[c]	Project Description
Sunol Valley Region (cont.)				
SV-3 (cont.)				• New filtered water and backwash piping Additionally, the project would include: • New chemical feed and piping system • Upgrade of the electrical supply system • Miscellaneous piping, valves, and mechanical and electrical work • Approximately two miles of 78-inch-diameter pipe to connect to the Alameda Siphons or Irvington Tunnel
SV-4	New Irvington Tunnel	Tunnel / Delivery and Seismic Reliability	Sunol Valley to Fremont, parallel to and just south of the existing Irvington Tunnel	This project would construct a new tunnel parallel to and just south of the existing Irvington Tunnel to convey water from the Hetch Hetchy system and the Sunol Valley WTP to the Bay Area. The new tunnel would be a redundant water transmission facility to the existing Irvington Tunnel. The preferred project would include construction of: • New 18,200-foot-long, 10-foot-diameter tunnel • New portal at the east end adjacent to the existing Alameda West Portal in the Sunol Valley with connections to the existing Alameda Siphons and proposed new siphon • New portal at the west end adjacent to the existing Irvington Portal in Fremont with connections to the existing Bay Division Pipelines and proposed new pipeline (BDPL Reliability Upgrade, BD-1) • Valves and equipment to control and monitor flows • Modifications to the existing Alameda West and Irvington Portals
SV-5	SVWTP – Treated Water Reservoirs	Storage and Treatment / Delivery Reliability	North of the Sunol Valley WTP	This project would provide for the planning, design, and construction of new treated water storage reservoirs at the Sunol Valley WTP to comply with requirements of the California Department of Health Services. The preferred project would include construction of: • One 5-million-gallon chlorine contact basin • Two 8.75-million-gallon storage basins • New inlet and outlet piping and reservoir drainage system • Pipe bridge over Alameda Creek • Chemical (ammonia and chlorine) storage and feed system • Backup filter washwater supply and filter washwater supply system • Instrumentation and controls and miscellaneous pumping appurtenances to integrate the reservoirs into the existing treatment plant • Expansion of the existing Sunol Valley WTP electrical substation • Two 750-kilowatt diesel-powered emergency generators

TABLE 3.10 (Continued)
WSIP FACILITY IMPROVEMENT PROJECTS

No.[a]	Project Title	Principal Type of Facility/ Objectives[b]	Location of Preferred Project[c]	Project Description
Sunol Valley Region (cont.)				
SV-6	San Antonio Backup Pipeline	Pipeline / Delivery and Seismic Reliability	Sunol Valley between San Antonio Reservoir and San Antonio Pump Station	This project would consist of three proposed facilities: (1) San Antonio Backup Pipeline, a new pipeline (size undetermined) from San Antonio Reservoir to San Antonio Pump Station, about 2 miles long; (2) San Antonio Creek discharge facilities (improvements allowing for the discharge of Hetch Hetchy water and associated road improvements); and (3) Alameda East Portal vent overflow pipeline and portal modifications.
Bay Division Region				
BD-1	Bay Division Pipeline Reliability Upgrade	Pipeline and Tunnel / Water Supply, Delivery and Seismic Reliability	Along existing Bay Division Pipelines Nos. 1 and 2 easement from Fremont to Redwood City	This project would construct a new Bay Division Pipeline No. 5 (BDPL No. 5) from Irvington Tunnel Portal in Fremont to Pulgas Tunnel Portal near Redwood City, consisting of 16 miles of new pipeline and 5 miles of tunnel under San Francisco Bay. Portions of the section of BDPL No. 1 between Edgewood Valve Lot and Pulgas Valve Lot would be removed (approximately 1.4 miles), and existing aboveground and submarine sections of BDPL Nos. 1 and 2 over the five-mile-long section from Newark Valve House to Ravenswood Valve House would be decommissioned (decommissioning is not part of this project). The redundancy provided by the project would increase the overall transmission capacity of the Bay Division pipeline system. The preferred project would include construction of: • New welded-steel pipeline, approximately 72 inches in diameter, extending along the seven-mile reach from Irvington Portal to Newark Valve Lot, located within the existing SFPUC right-of-way of BDPL Nos. 1 and 2 • New “Bay Tunnel” segment of BDPL No. 5, approximately 120 inches in diameter, extending five miles from Newark Valve Lot to Ravenswood Valve Lot, crossing under San Francisco Bay and adjacent marshlands; BDPL Nos. 1 and 2 would tie into the tunnel at both ends and would be decommissioned between Newark and Ravenswood Valve Lots • New welded-steel pipeline, approximately 60 inches in diameter extending along the nine-mile reach from Ravenswood Valve Lot to Pulgas Portal, located within the existing SFPUC right-of-way of BDPL Nos. 1 and 2 • New facilities at eight valve vault lots along the alignment, containing new concrete vaults and control structures that house electrical control panels, isolation valves, mechanical equipment, and cross-connections between BDPL No. 5 and the existing Bay Division Pipelines • Two flow metering vaults at or near Mission Boulevard (in Fremont) and Pulgas Portal areas • New Isolation valves and piping for connecting BDPL No. 5 to Irvington and Pulgas Portals

TABLE 3.10 (Continued)
WSIP FACILITY IMPROVEMENT PROJECTS

No.[a]	Project Title	Principal Type of Facility/ Objectives[b]	Location of Preferred Project[c]	Project Description
Bay Division Region (cont.)				
BD-2	BDPL Nos. 3 and 4 Crossovers	Valve House / Delivery and Seismic Reliability	Three locations adjacent to where BDPL Nos. 3 and 4 traverse Guadalupe River, Barron Creek, Bear Gulch Reservoir	This project would construct three additional crossover facilities along BDPL Nos. 3 and 4 to provide operational flexibility for maintenance or during emergencies. The new crossover facilities would reduce the length of pipe to be removed from service, either for maintenance or for emergencies, and would reduce the duration of outages. Each crossover facility would include construction of: • Four mainline valves and one cross-connect valve • Automatic controlled actuators • Discharge facilities to enable release of water that meets water quality discharge requirements within discrete pipeline segments to surface waters, either for maintenance or emergencies
BD-3	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault	Pipeline / Seismic Reliability	Along existing BDPL Nos. 3 and 4 in Fremont	This project would provide for the planning, design, and construction of upgraded, seismically resistant sections of the BDPL Nos. 3 and 4 where they cross the Hayward fault. The replacement pipelines would be located between the two new crossover/isolation valves that would be built as part of BDPL Nos. 3 and 4 Crossover/Isolation Valve at Hayward Fault project (a WSIP project determined to be independent of the PEIR). In addition to the replacement pipelines, a new bypass pipeline between the two new crossover/isolation valve vaults could also be built as part of one of the several alternatives being considered for this project.
Peninsula Region				
PN-1	Baden and San Pedro Valve Lots Improvements	Valve House / Delivery and Seismic Reliability	Baden Valve Lot, South San Francisco, San Pedro Valve Lot, Daly City	This project would upgrade valve vaults, valves, and piping at the existing Baden and San Pedro Valve Lots to meet current seismic standards. Work could also be performed at the Pulgas Pump Station and Pulgas Valve Lot as part of transmission reliability. The project would include a new pressure-reducing valve at one of the locations to allow transfer of water between high and low pressure zones from the Harry Tracy WTP to the Peninsula under an emergency scenario.
PN-2	Crystal Springs/ San Andreas Transmission Upgrade	Pipeline / Delivery and Seismic Reliability	Lower Crystal Springs Reservoir to San Andreas Reservoir, including Crystal Springs Pump Station	This project would consist of seismic improvements of facilities that convey water from Crystal Springs Reservoir to the Harry Tracy WTP. This project would increase the transmission capacity of the existing raw water pipeline from Crystal Springs Reservoir to San Andreas Reservoir in order to reliably supply 140 mgd of raw water for treatment at the Harry Tracy WTP. The project would include: • Repair of Upper Crystal Springs Dam discharge culverts • Upgrade and repair of Lower Crystal Springs Dam outlet structures and tunnels conveying water to Crystal Springs Pump Station • Replacement or refurbishment of Crystal Springs Pump Station • Upgrade and repair of the chemical system and Crystal Springs chlorine emergency feed • Improvements to the Crystal Springs/San Andreas Pipeline, including replacement of approximately 1,350 feet of 66-inch-diameter pipeline, general renewal of the remaining pipeline, and addition of new manholes, blowoff valves, and isolation valves; or construction of a new redundant pipeline along a new alignment.

TABLE 3.10 (Continued)
WSIP FACILITY IMPROVEMENT PROJECTS

No.[a]	Project Title	Principal Type of Facility/ Objectives[b]	Location of Preferred Project[c]	Project Description
Peninsula Region (cont.)				
PN-2 (cont.)				• Seismic and hydraulic upgrade and repair of San Andreas outlet facilities • Addition of fish screens on the outlet structures for both Crystal Springs and San Andreas Reservoirs • Repair of two pipelines that convey raw water from San Andreas Reservoir to the Harry Tracy WTP raw water pump station
PN-3	HTWTP Long-Term Improvements	Treatment / Water Quality, Delivery and Seismic Reliability	Harry Tracy WTP	This project would be a seismic retrofit and rehabilitation of the existing building and facility to provide long-term reliability and process improvements. The project would increase the sustained treatment capacity of the plant from 120 to 140 mgd for 60 days. The proposed improvements would include: • Replacement and upgrade of the ozone generation system for primary disinfection • Replacement or upgrade of the existing sedimentation basins at the same location • Improvements to sludge handling facilities • New, redundant pipeline from the treatment works to the finished water storage reservoir • Raw water pump station improvements • Upgrade and replacement of electrical and instrumentation components, including improvements to process and plant security facilities
PN-4	Lower Crystal Springs Dam Improvements	Storage / Water Supply and Delivery Reliability	Lower Crystal Springs Dam	This project would consist of major repairs and improvements to Lower Crystal Springs Dam to provide adequate protection of the dam and downstream areas from the probable maximum flood, as defined by the DSOD. DSOD has placed operational restrictions on the dam, and the capacity of the reservoir is limited to 56,800 acre-feet. The project would restore the historical reservoir capacity of 68,000 acre-feet. The project would be coordinated with San Mateo County, which is concurrently planning the replacement of the existing county bridge built above the crest of the dam. Project elements would include: • Lowering the existing parapet wall on either side of the existing spillway to lengthen the overflow weir (central spillway) from the reservoir • Raising the remaining parapet walls and adding two new spillway bays, one on each side of the existing central spillway • Enlarging the spillway stilling basin to accommodated the probable maximum flood • Installing four gates (with control building) or installing a fixed weir within the spillway to restore the historical storage capacity

TABLE 3.10 (Continued)
WSIP FACILITY IMPROVEMENT PROJECTS

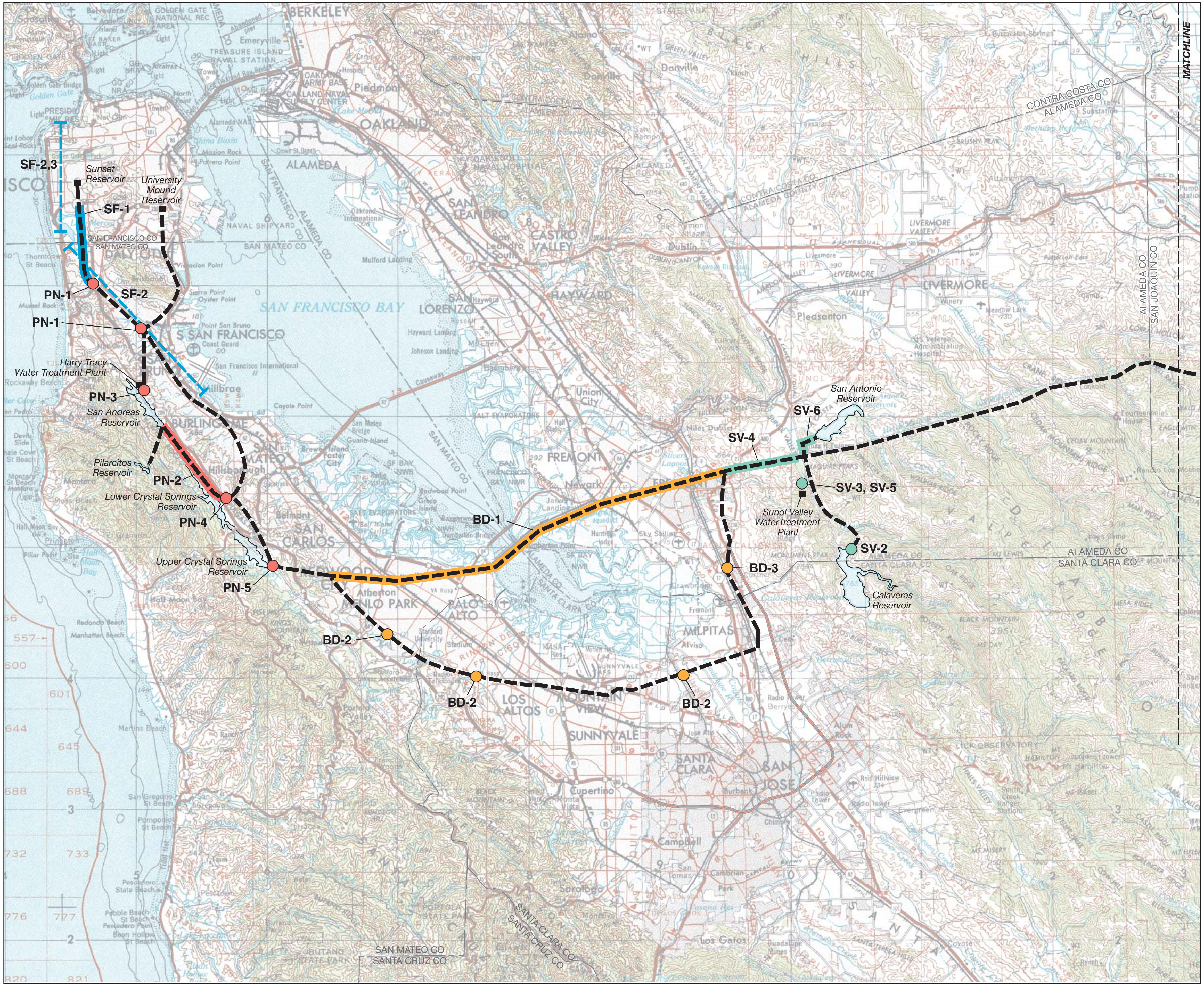
No.[a]	Project Title	Principal Type of Facility/ Objectives[b]	Location of Preferred Project[c]	Project Description
Peninsula Region (cont.)				
PN-5	Pulgas Balancing Reservoir Rehabilitation	Storage / Water Quality, Delivery and Seismic Reliability	Pulgas Balancing Reservoir and mouth of Laguna Creek at south end of Upper Crystal Springs Reservoir	This project would provide for the planning, design, and construction of improvements to the existing Pulgas Balancing Reservoir and associated facilities. The project would include: • Modifications to the inlet/outlet piping (Phase 1, currently under construction) • Design and construction to rehabilitate and/or expand the discharge channel to Crystal Springs Reservoir (or to install a parallel channel) (Phase 2) • Geotechnical investigations, design, and construction of recommended seismic improvements, including repair/replacement of the reservoir walls, floor, and roof (Phase 3) • Restoration of a six- to eight-acre sediment catchment basin in Laguna Creek to also serve as sustainable habitat for San Francisco garter snake and California red-legged frog, including culvert replacement, sediment removal, revegetation, and protective measures to avoid impacts on sensitive species (Phase 4) • Modification of the existing dechlorination process, including modifications to the chemical feed system to enable pH adjustment and dechlorination system to operate reliably (Phase 5)
San Francisco Region				
SF-1	San Andreas Pipeline No. 3 Installation	Pipeline / Delivery and Seismic Reliability	Daly City to San Francisco	This project would replace the out-of-service Baden-Merced Pipeline, which is beyond repair, and would construct a new pipeline extension of the existing San Andreas Pipeline No. 3 from San Pedro Valve Lot in Daly City to Merced Manor Reservoir in San Francisco. It would also connect the existing San Andreas Pipeline No. 2 at Sloat Boulevard in San Francisco and install an additional pipeline to serve the water turnouts along San Andreas Pipeline No. 2. The project would provide seismic reliability and system redundancy for Peninsula and San Francisco customers. The project would include: • New 3.8-mile-long, 36-inch-diameter pipeline • Approximately 0.27 mile of 36-inchdiameter pipeline for three connections between San Andreas Pipelines Nos. 2 and 3 • Removal of the Baden-Merced Pipeline where the new San Andreas Pipeline No. 3 alignment matches the Baden-Merced alignment • Less than 0.1 mile of 12- to 16-inch-diameter new pipeline for five branch connections to user turnouts (three turnouts to Daly City, two turnouts to San Francisco distribution lines) • Installation of line valves and vaults, manholes, cathodic protection and monitoring stations, sample taps, air valves, blowoffs, and other pipeline appurtenances
SF-2	Groundwater Projects	Other / Water Supply	West side of San Francisco and northern San Mateo County	This project includes three groundwater projects: Lake Merced, Local Groundwater, and Regional Groundwater. • The Lake Merced project would address raising the level of Lake Merced in San Francisco using a supplemental source of water, such as treated stormwater, recycled water, groundwater, or SFPUC system water.

TABLE 3.10 (Continued)
WSIP FACILITY IMPROVEMENT PROJECTS

No.[a]	Project Title	Principal Type of Facility/ Objectives[b]	Location of Preferred Project[c]	Project Description
San Francisco Region (cont.)				
SF-2 (cont.)				• The Local Groundwater Projects would include development of 2 mgd of new local groundwater for blending with water in the potable water system in San Francisco. An estimated four wells and well stations would be constructed to develop this new local groundwater. This project would also include the use of an additional 2 mgd of groundwater through replacement of existing irrigation wells at the San Francisco Zoo, Golden Gate Park, and/or other locations, once recycled water were available for irrigation (to be developed under the Recycled Water Projects, SF-3). Two existing wells would be modified to enable emergency supply to local residents in the event of a major earthquake or other disaster. This project would include the pipelines, water treatment equipment, and controls needed to add the groundwater to the municipal supply. The additional water supply developed under this project would be used during both nondrought and drought years. • As part of a regional conjunctive-use project, the SFPUC would construct about 10 new groundwater production wells in San Mateo County to develop about 6 mgd of potable groundwater for use as a supplemental drought-year supply. In nondrought years under this project, the SFPUC would provide potable water from the regional system to customers in Daly City, San Bruno, and South San Francisco to substitute for groundwater currently used for municipal purposes, thereby reducing groundwater pumping and allowing the groundwater basin to recharge naturally. In drought years, the groundwater would be available for local use to supplement the regional system water. This project would require agreements with the affected agencies see (Section 3.13).
SF-3	Recycled Water Projects	Other / Water Supply, Sustainability	Various locations on west side of San Francisco	This project includes recycled water projects in San Francisco and other locations. Projects include Westside Baseline and Harding Park/Lake Merced. This project would provide treatment, storage, and distribution facilities for about 4 mgd of recycled water to users on the west side of San Francisco. Primary users would include Golden Gate Park, Lincoln Park, Lincoln Park Golf Course, Harding Park Golf Course, San Francisco Zoo, Sunset Boulevard medians, and San Francisco State University. As described under Groundwater Projects (SF-2), the SFPUC is also investigating appropriate sources of supply for increasing and maintaining Lake Merced lake levels, including recycled water that has undergone advanced treatment.

[a] The numbering system is consistent to the extent possible with the system presented in the NOP. However, due to regrouping of the projects after publication of the NOP, some projects have been renumbered.
[b] General types of facilities. Objectives refer to the WSIP objectives met by each project; see Table 3.2 for a complete description of WSIP goals and objectives.
[c] See Figure 3.5 for the approximate locations of preferred projects; many of the projects are still in development and the SFPUC may ultimately consider other design options.

SOURCE: SFPUC, 2006a.



SFPUC WATER SYSTEM IMPROVEMENT PROGRAM, FACILITY IMPROVEMENT PROJECTS

SUNOL VALLEY REGION

SV-1 Alameda Creek Fishery Enhancement (not shown)
SV-2 Calaveras Dam Replacement
SV-3 Additional 40-mgd Treated Water Supply
SV-4 New Irvington Tunnel
SV-5 SVWTP – Treated Water Reservoirs
SV-6 San Antonio Backup Pipeline

BAY DIVISION REGION

BD-1 Bay Division Pipeline Reliability Upgrade
BD-2 BDPL Nos. 3 and 4 Crossovers (3 locations)
BD-3 Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault

PENINSULA REGION

PN-1 Baden and San Pedro Valve Lots Improvements (2 locations)
PN-2 Crystal Springs / San Andreas Transmission Upgrade
PN-3 HTWTP Long-Term Improvements
PN-4 Lower Crystal Springs Dam Improvements
PN-5 Pulgas Balancing Reservoir Rehabilitation

SAN FRANCISCO REGION

SF-1 San Andreas Pipeline No. 3 Installation
SF-2 Groundwater Projects (general geographic area indicated)
SF-3 Recycled Water Projects (general geographic area indicated)

Existing System Corridor
Existing System Facility
Proposed Facility Corridor
Proposed Facility Site
Proposed Facility, General Location

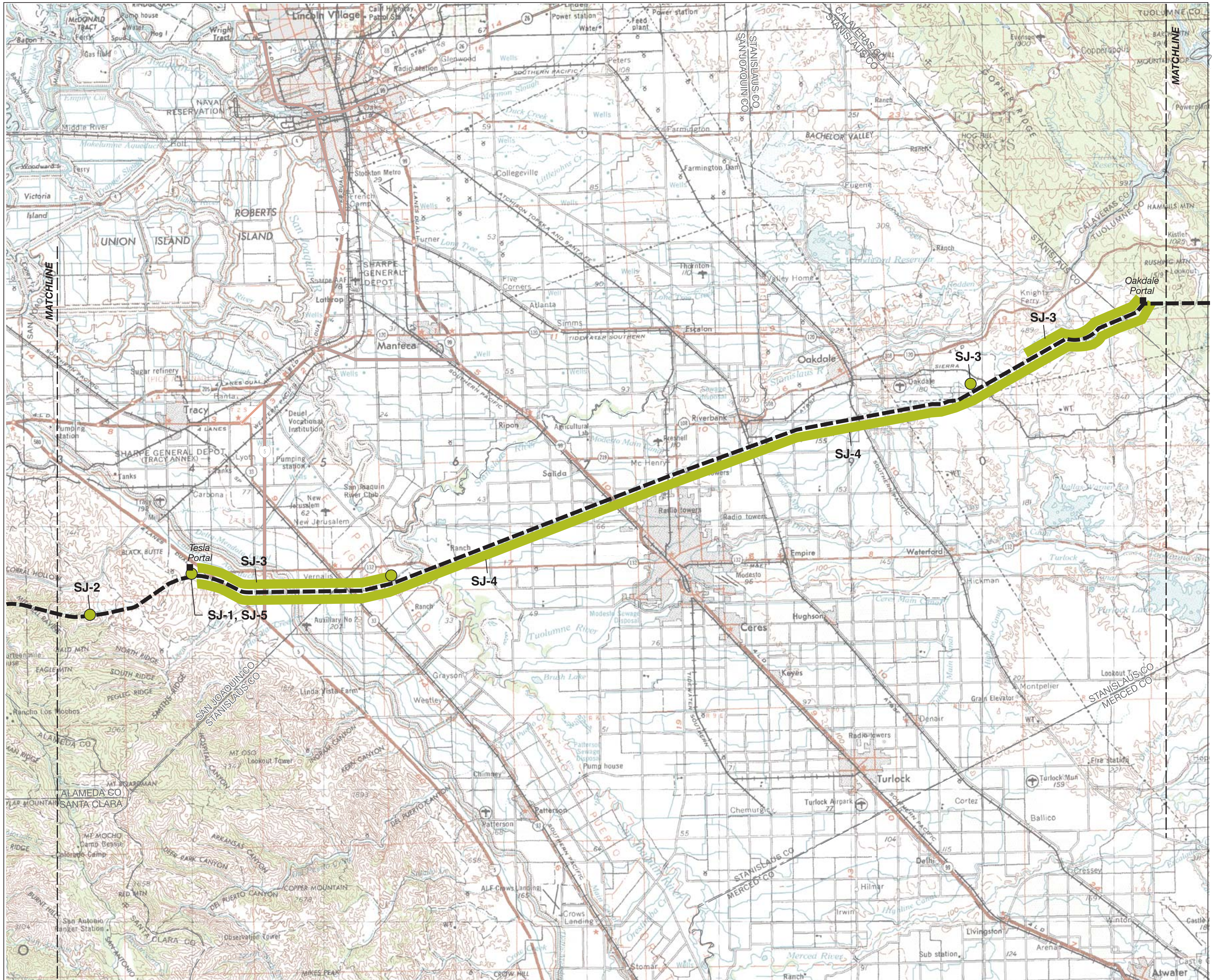
0 5
Miles

SOURCE: ESA + Orion; SFPUC, 2006; USGS 1978

SFPUC Water System Improvement Program . 203287

Figure 3.5a
Location of WSIP Facility Improvement Projects-
Sunol Valley, Bay Division, Peninsula,
and San Francisco Regions

SFPUC WATER SYSTEM IMPROVEMENT PROGRAM, FACILITY IMPROVEMENT PROJECTS



SAN JOAQUIN REGION

SJ-1 Advanced Disinfection
SJ-2 Lawrence Livermore Supply Improvements
SJ-3 San Joaquin Pipeline System
SJ-4 Rehabilitation of Existing San Joaquin Pipelines
SJ-5 Tesla Portal Disinfection Station

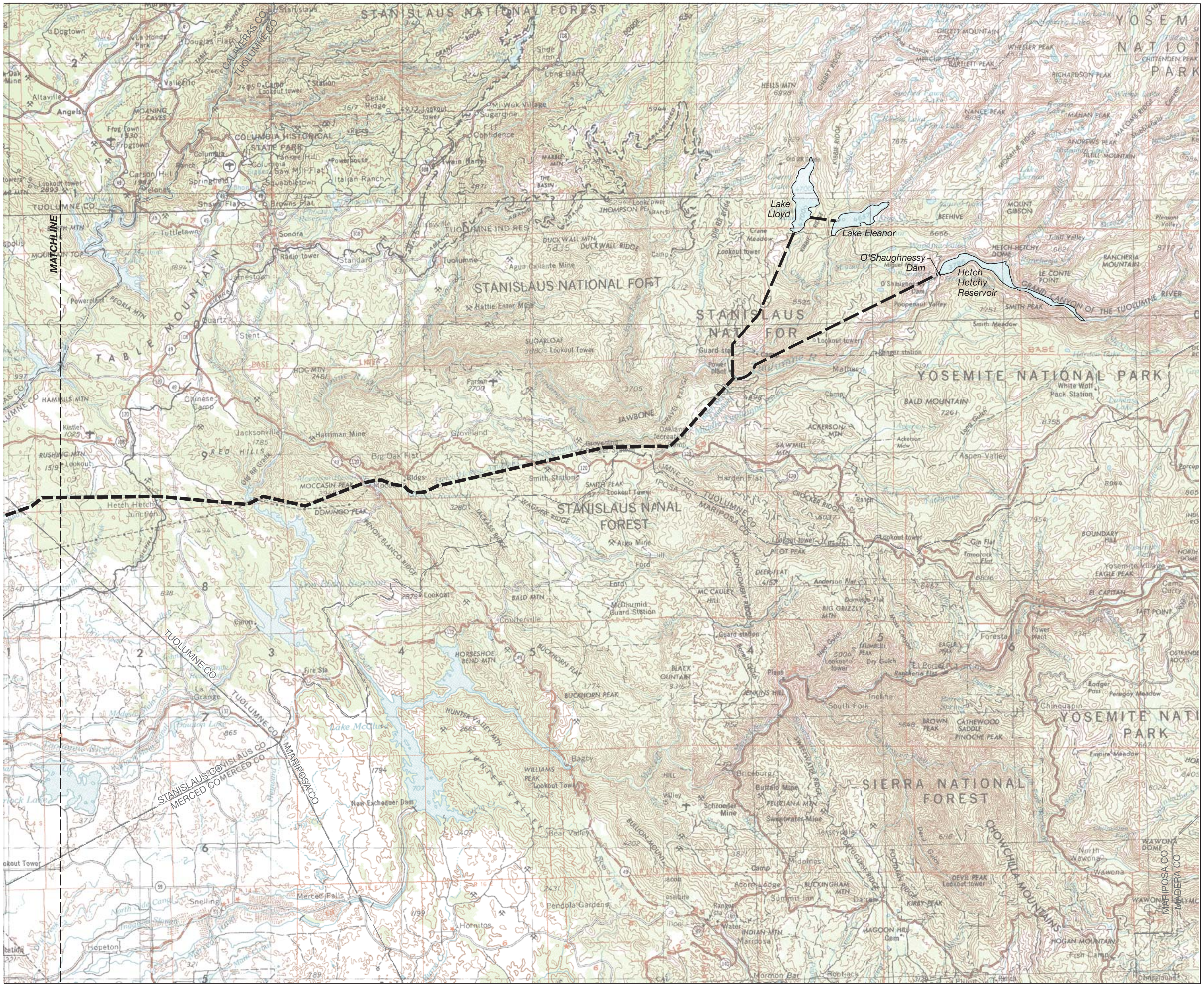
- Existing System Corridor
- Existing System Facility
- Proposed Facility Corridor
- Proposed Facility Site
- Proposed Facility, General Location

0 5
Miles

SOURCE: ESA + Orion; SFPUC, 2006; USGS 1969

SFPUC Water System Improvement Program . 203287

Figure 3.5b
Location of WSIP Facility Improvement Projects-
San Joaquin Region



SFPUC WATER SYSTEM IMPROVEMENT PROGRAM, FACILITY IMPROVEMENT PROJECTS

- Existing System Corridor
- Existing System Facility
- Proposed Facility Corridor
- Proposed Facility Site
- Proposed Facility, General Location

NOTE: No WSIP facilities are proposed in this region.

0 — 5 Miles

SOURCE: ESA + Orion; SFPUC, 2006; USGS 1970

SFPUC Water System Improvement Program . 203287

Figure 3.5c
Location of WSIP Facility Improvement Projects-
Hetch Hetchy Region

TABLE 3.11
WSIP IMPROVEMENT PROJECTS – AFFECTED JURISDICTIONS

Affected County and City Jurisdictions	Advanced Disinfection	Lawrence Livermore Supply Improvements	San Joaquin Pipeline System	Rehabilitation of Existing San Joaquin Pipelines	Tesla Portal Disinfection Station	Alameda Creek Fishery Enhancement	Calaveras Dam Replacement	Additional 40-mgd Treated Water Supply	New Irvington Tunnel	SVWTP – Treated Water Reservoirs	San Antonio Backup Pipeline	Bay Division Pipeline Reliability Upgrade	BDPL Nos. 3 and 4 Crossovers	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault	Baden and San Pedro Valve Lots Improvements	Crystal Springs/San Andreas Transmission Upgrade	HTWTP Long-Term Improvements	Lower Crystal Springs Dam Improvements	Pulgas Balancing Reservoir Rehabilitation	San Andreas Pipeline No. 3 Installation	Groundwater Projects	Recycled Water Projects
	SJ-1	SJ-2	SJ-3	SJ-4	SJ-5	SV-1	SV-2	SV-3	SV-4	SV-5	SV-6	BD-1	BD-2	BD-3	PN-1	PN-2	PN-3	PN-4	PN-5	SF-1	SF-2	SF-3
Tuolumne County																						
Unincorporated Areas			X	X																		
Stanislaus County																						
Unincorporated Areas			X	X																		
Riverbank				X																		
Modesto				X																		
San Joaquin County																						
Unincorporated Areas	X	X	X	X	X																	
Alameda County																						
Unincorporated Areas (including Sunol and Castro Valley)						X	X	X	X	X	X											
Newark												X										
Fremont									X			X		X								
Santa Clara County																						
Unincorporated Areas							X															
Milpitas							A						A									
San Jose													X									
Santa Clara													X									
Sunnyvale													A									
Mountain View													A									
Los Altos													A									
Palo Alto													X									
San Mateo County																						
Unincorporated Areas												X				X	X	X	X		X	
East Palo Alto												X										
Menlo Park												X										
Atherton													X									
Redwood City												X	A									
Woodside													A									
San Mateo																						
Hillsborough																C						
Burlingame																C					X	
Millbrae																C	C				X	
San Bruno																C	C				X	
South San Francisco															X						X	
Colma																					X	
Brisbane																						
Daly City															X					X	X	X
City and County San Francisco																				X	X	X

NOTES: X = Indicates a preferred project location, but an alternative site may also be present in this jurisdiction.
A = Alternative sites under consideration.
C = Not located in the city, but very close to the city limits.

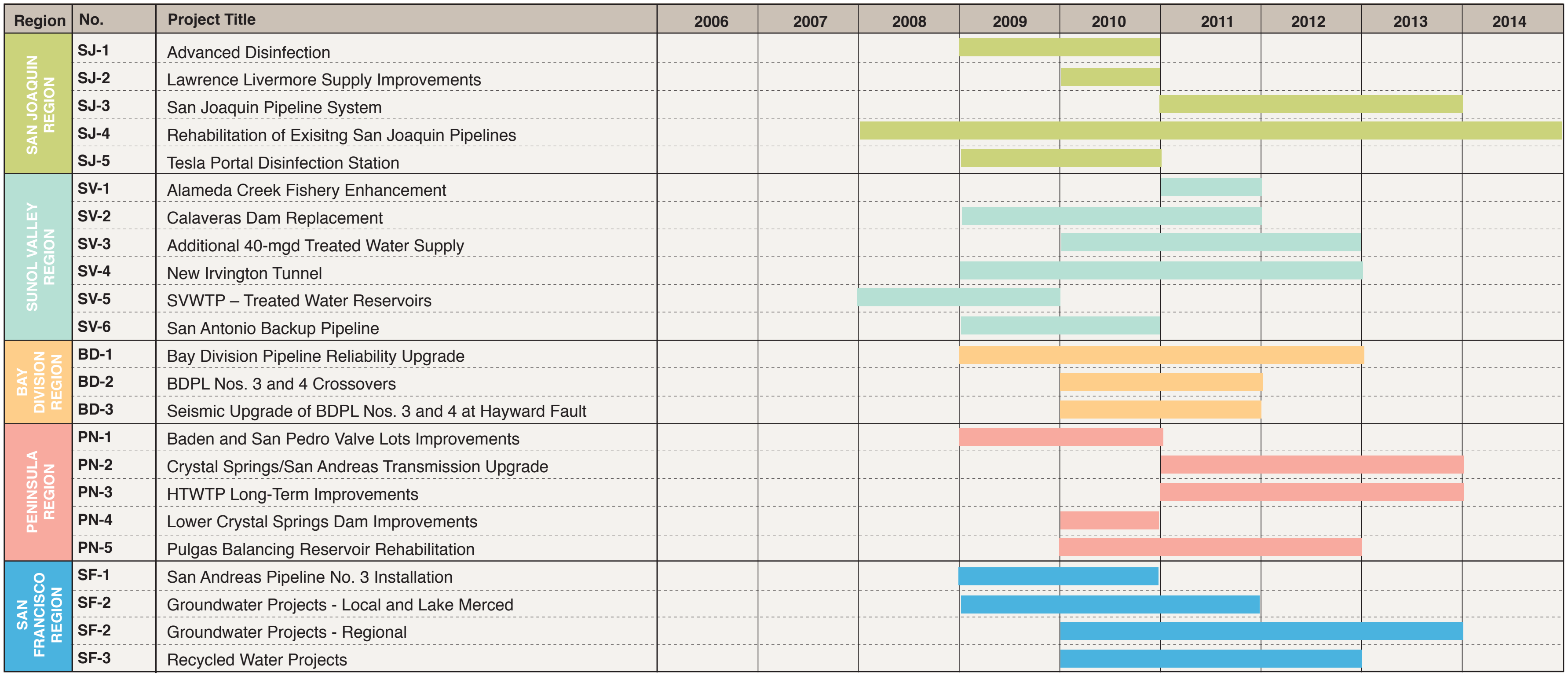
facility improvement projects as a whole and to identify programmatic mitigation measures. As further project details and site-specific information are developed, it is possible that individual project effects identified in this document may not occur or additional project effects not identified in this document may occur. Such changes in project details would be addressed during subsequent project-specific environmental review.

[Since publication of the Draft PEIR, the SFPUC modified the project descriptions of two of the facility improvement projects, as reflected in the revisions to Table 3.10. Please refer to Section 13.2, Program Description Changes Affecting System Operations (Vol. 7, Chapter 13, for further discussion).]

As described in Chapter 2, for the purposes of this PEIR, the regional water system is divided geographically into regions (see Chapter 2, Figure 2.1). The WSIP facility improvement projects are located in the following five regions: San Joaquin (SJ), Sunol Valley (SV), Bay Division (BD), Peninsula (PN), and San Francisco (SF). There are no WSIP facility improvement projects in the Hetch Hetchy Region. The San Joaquin Region, covering the system from the Oakdale Portal to the Coast Range Tunnel, includes five improvement projects, three of which are treatment projects and two of which are pipeline projects. The Sunol Valley Region, with six improvement projects, covers a wide variety of facilities, including storage, treatment, tunnel, pipeline, and other facilities. The Bay Division Region, encompassing the south Bay Area, has three improvement projects, primarily related to pipeline, tunnel, and other transmission facilities. There are five improvement projects in the Peninsula Region, including valve houses, pipelines, and treatment and storage facilities. Overlapping with the Peninsula Region, the San Francisco Region includes three projects in northern San Mateo County and San Francisco, with one pipeline project and two water supply projects. For the most part, individual project activities are confined within the region, although two projects in the San Francisco Region have facilities that are also located in the Peninsula Region. This PEIR analyzes 22 key WSIP facility improvement projects, which are located along the regional system from Oakdale Portal on the east to San Francisco on the west. For the purposes of this PEIR, the projects are coded and numbered by region, as shown in Table 3.10 and Figure 3.5; these project numbers are used throughout this PEIR.[24]

Table 3.12 summarizes the preliminary construction and operational assumptions that the SFPUC has developed for the key regional facility improvement projects; **Figure 3.6** presents the preliminary construction schedule. The information presented in Table 3.12 is based on detailed project information tables, which are included in Appendix C of this PEIR; these tables provide additional project information such as site ownership, land acquisition requirements, existing uses, alternative designs, access routes, construction schedule, proximity to waterways, key environmental issues, construction scenario assumptions, and expected permits/approvals. However, all project information presented in this program-level evaluation is considered preliminary and will be subject to further study, design, and refinement during site-specific analyses. For this PEIR, the facility improvement projects are grouped by regional location and are discussed by region below.

[24] The numbering system for the facility improvement projects is consistent, to the extent possible, with the system presented in the Notice of Preparation (NOP). However, due to regrouping of the projects after publication of the NOP, some projects have been renumbered.



SOURCE: SFPUC, 2006

SFPUC Water System Improvement Program . 203287

Figure 3.6
Preliminary WSIP Construction Schedule

TABLE 3.12
WSIP FACILITY IMPROVEMENT PROJECTS – CONSTRUCTION AND OPERATIONS ASSUMPTIONS

No.	Project Title	Preferred Location	Existing Land Use	Project Facilities: Pipeline (miles)	Tunnel (miles)	Storage/ Basin (sq. ft.)	Treatment (sq. ft.)	Vaults/ Valve Houses (no. of structures)	Pump Station (no. of structures)	Other Facilities	Construction Area (acres)	Excavation/ Spoils Volume (cubic yards)	Operational Changes
San Joaquin Region													
SJ-1	Advanced Disinfection	Tesla Portal in San Joaquin County.	Existing SFPUC facility site developed with a caretaker's residence, two valve houses, and chlorination facility.	0.2	0	0	20,000	4	0	None	2	TBD	TBD, may require increased manpower.
SJ-2	Lawrence Livermore Supply Improvements	Thomas Shaft in San Joaquin County.	Undeveloped at Thomas Shaft site.	0	0	0	TBD	TBD	TBD	TBD	TBD	TBD	None. This unmanned facility is monitored by a SCADA system 24/7.
SJ-3	San Joaquin Pipeline System	Construction of a new eastern 6.4-mile pipeline (starting at Oakdale Portal) and a new western 10-mile fourth pipeline (ending at Tesla Portal), traversing Tuolumne, Stanislaus, and San Joaquin Counties. Construction of two additional crossover facilities, one about 20 miles east of Modesto and the other about 15 miles west of Modesto.	Alignment traverses areas developed with agricultural, residential, and golf course uses.	16.4[a]	TBD	0	0	2	0	• New valve houses and improvements at Tesla Portal • Two new crossover facilities	100 to 575 (plus up to 70 acres for staging)	424,000	Increased manpower during flow rate changes.
SJ-4	Rehabilitation of Existing San Joaquin Pipelines	Across the Central Valley from Oakdale Portal to Tesla Portal.	Pipelines are routed through open grasslands (sometimes used for grazing), City of Modesto (including linear parks with walking and bike paths), orchards, Tracy Golf Course.	47.7 (each pipeline)	0	0	0	Throttling Stations Nos. 1 & 2; Roselle Crossover; San Joaquin River Valve House	0	None	All work would be within the existing right-of-way.	Conservatively, about 100,000	None
SJ-5	Tesla Portal Disinfection Station	Tesla Portal in San Joaquin County.	Existing SFPUC facility site developed with a caretaker's residence, two valve houses, and chlorination facility.	0	0	0	6,000	0	0	• Administration building (control room and offices) • Pump houses • Chemical storage tanks and feed equipment and sampling systems • Emergency generator, including primary and standby power supplies • Access road	2	TBD	None. This unmanned facility is monitored by a SCADA system 24/7.
			Subtotal (Rounded)	**64+**	**0**	**0**	**26,000**	**6+**	**0**		**±104 to 650**	**±524,000**	
Sunol Valley Region													
SV-1	Alameda Creek Fishery Enhancement	Alameda Creek in Alameda County.	Alternatives would be located in or near Alameda Creek downstream of Sunol Valley WTP.	TBD	0	0	0	0	TBD	A number of structural and non-structural recovery alternatives are under consideration, including: a water recapture facility downstream of the Sunol Valley WTP, conjunctive groundwater use, horizontal collector wells, or other groundwater recovery systems yet to be defined. Other alternative designs for this project could be developed.	TBD	TBD	TBD, depending on alternative selected
SV-2	Calaveras Dam Replacement	Immediately downstream of Calaveras Dam at the south end of the Sunol Valley in Alameda and Santa Clara Counties.	Existing Calaveras Dam.	0	0	62.5 million	0	2	0	• Zoned earthfill dam with open-chute spillway • New intake tower and outlet valve for water releases for instream flow requirements • New or rehabilitated outlet works for seismic safety and improved operations and maintenance • Various instrumentation • Calaveras Road upgrades – TBD	666 (includes borrow areas)	6,300,000 cy total excavation and 4,000,000 cy spoil	Increased maintenance; Calaveras Reservoir would be operated to release up to 6,300 acre-feet per year (5.5 mgd) of water to Alameda Creek to support fisheries.

TABLE 3.12 (Continued)
WSIP FACILITY IMPROVEMENT PROJECTS – CONSTRUCTION AND OPERATIONS ASSUMPTIONS

No.	Project Title	Preferred Location	Existing Land Use	Project Facilities									
				Pipeline (miles)	Tunnel (miles)	Storage/ Basin (sq. ft.)	Treatment (sq. ft.)	Vaults/ Valve Houses (no. of structures)	Pump Station (no. of structures)	Other Facilities	Construction Area (acres)	Excavation/ Spoils Volume (cubic yards)	Operational Changes
Sunol Valley Region (cont.)													
SV-3	Additional 40-mgd Treated Water Supply	Sunol Valley WTP in Sunol Valley, Alameda County.	Undeveloped land immediately adjacent to Sunol Valley WTP facilities.	1.5 to 2	0	42,000	0	0	0	• New flocculation and sedimentation system • Upgrade of existing filters or addition of three new filters and a new flow distribution chamber • New filtered water and backwash piping • New chemical feed and piping system • Upgrade of the electrical supply system • Miscellaneous piping, valves, and mechanical and electrical work • Approximately two miles of 78-inch-diameter pipe to connect to the Alameda Siphons or Irvington Tunnel	1.5	100,000	25% increase in maintenance activities.
SV-4	New Irvington Tunnel	New east tunnel portal would be about 75 feet north or south of Alameda West Portal in the Sunol Valley. New west tunnel portal would be about 175 feet south of existing Irvington Portal within the Fremont city boundary.	Tunnel portals would be located on undeveloped lands near existing SFPUC facilities: Alameda West Portal and Irvington Portal. Lands immediately adjacent to existing portals are undeveloped, except for caretaker's home and water facilities at Irvington Portal and water facilities at Alameda West Portal. There is one residence located south of Alameda West Portal, and residential uses located west of Irvington Portal.	0	3.4	0	0	9 to 12	0	• New Alameda West Portal 2 and Overflow Shaft • New access road to Irvington Portal and Alameda West Portal • New Irvington Portal 2 and air release pipe • Demolition and rebuilding of existing Irvington Portal manifold • Valves and equipment to control and monitor flows • Two new permanent bridges across Alameda Creek. (Note that a total of two bridges are necessary to construct and operate both the New Irvington Tunnel and Alameda Siphons Upgrade projects; the determination of when to build the bridges would depend on which project would be constructed first. Since this determination has not been made to date, the bridges are evaluated under both projects.)	120 (additional area for staging could be required)	190,000	NA
SV-5	SVWTP – Treated Water Reservoirs	Site is within the boundary of the existing Sunol Valley WTP in Sunol Valley, Alameda County.	Site is within boundary of existing Sunol Valley WTP. Site is currently used for temporary equipment or supply storage on an as-needed basis. The Calaveras Nursery is located to the north, and open space is located to the west.	0.3	0	138,200	0	1	0	• Chemical storage and feed system • Pumping system for filter backwashing and other miscellaneous pumping appurtenances • Backup filter backwash system • Washwater supply system • Reservoir drainage system, controls, and instrumentation • Expansion of the existing Sunol Valley WTP electrical substation • Modification of existing valves • Upgrade of existing dechlorination station and miscellaneous piping	10.5	300,000	No
SV-6	San Antonio Backup Pipeline	Pipeline would extend between San Antonio Reservoir and San Antonio Pump Station.	Undeveloped SFPUC lands.	2.3	0	0	0	2	0	• New discharge facilities at San Antonio Creek (at end of the new pipeline) • New pipeline from the existing overflow outlet near Alameda East Portal, passing adjacent to the San Antonio Pump Station, and continuing to the discharge point on Alameda Creek	TBD	51,000 cy total excavation and 37,000 cy spoil	Second pipeline would allow discharge of dechlorinated water to San Antonio Creek during emergency outages. Pipeline would serve as a water supply alternative if the existing San Antonio Pipeline is out of service due to maintenance or emergency.
			Subtotal (Rounded)	**4 to 5**	**3+**	**63 million**	**0**	**14 to 17**	**TBD**		**±800**	**±7 million**	

TABLE 3.12 (Continued)
WSIP FACILITY IMPROVEMENT PROJECTS – CONSTRUCTION AND OPERATIONS ASSUMPTIONS

				Project Facilities									
No.	**Project Title**	**Preferred Location**	**Existing Land Use**	**Pipeline (miles)**	**Tunnel (miles)**	**Storage/ Basin (sq. ft.)**	**Treatment (sq. ft.)**	**Vaults/ Valve Houses (no. of structures)**	**Pump Station (no. of structures)**	**Other Facilities**	**Construction Area (acres)**	**Excavation/ Spoils Volume (cubic yards)**	**Operational Changes**
Bay Division Region													
BD-1	Bay Division Pipeline Reliability Upgrade	Within existing easement for the BDPL Nos. 1 and 2, which extends approximately 21 miles from Irvington Tunnel Portal in Fremont to Pulgas Tunnel Portal near Redwood City. Pipeline right-of-way traverses urbanized areas of Fremont, Newark, East Palo Alto, Menlo Park, and Redwood City in Alameda and San Mateo Counties. The five-mile-long tunnel portion extends from Newark to East Palo Alto, running beneath San Francisco Bay and surrounding marshlands. A subsurface easement would be required for this portion.	Pipeline right-of-way traverses commercial, residential, school, and park uses. The pipeline would cross various highways, major roads, minor roads, and railroads. The Bay Tunnel would be underground and would not affect surface land uses, except at the tunnel shafts on either side of the bay. The Newark tunnel shaft site is developed with an existing SFPUC valve house and is surrounded by industrial uses. The Ravenswood tunnel shaft site is bordered by Bay Division Pipeline right-of-way to the south, marshland to the east, Cargill Salt Ponds to the north, and University Avenue and residential uses to the west. Approximately 15 acres of this site is being used for soil remediation and might eventually be used as a maintenance yard.	16	5	0	0	8 valve vaults, with up to 15 vaults total	0	Isolation valves and piping for connection to new Irvington extension and Pulgas Tunnels. One flow meter at each end of the alignment (2 total). Control buildings for electrical and mechanical equipment at each of the valve lots (8 total). New tunnel shafts at Ravenswood and Newark. Final decision on which shaft would be the drive shaft and which would be the receiving shaft is still to be determined. For the drive shaft, the excavated diameter would be approximately 50 feet, with parking for up to 40 construction work vehicles. Staging area would accommodate mucking out materials handling area, on- site power generation (as needed), or a transformer station, ventilation fans and mufflers, water supply, compressed air supply, and miscellaneous temporary construction facilities totaling approximately 30,000 s.f. The receiving shaft would require a demobilization area for disassembly and removal of a tunnel boring machine, materials handling area, onsite power generation (as needed), or a transformer station, ventilation fans and mufflers, water supply, compressed air supply, and miscellaneous temporary construction facilities totaling approximately 11,000 s.f.	165 to 175	Pipeline: 434,000 Tunnel: 260,000 to 355,000	Would increase system capacity to meet 2030 demand, improve drought delivery through increased replenishment of Peninsula reservoirs, and allow more frequent maintenance of the existing Bay Division Pipelines than is now possible. Following construction of the project, the aboveground and submarine sections of BDPL Nos. 1 and 2 from Newark Valve House to Ravenswood Valve House would be decommissioned. The westernmost reach of BDPL No. 1 between Edgewood Valve Lot and Pulgas Valve Lot would be decommissioned.
BD-2	BDPL Nos. 3 and 4 Crossovers	Preferred locations and sites include: (1) Guadalupe River (Site B) in San Jose, Santa Clara County; (2) Barron Creek (Site C) in Palo Alto, Santa Clara County; and (3) Bear Gulch Reservoir (Site C) in Atherton, San Mateo County.	Sites would be located in undeveloped areas on Veterans Administration Medical Center and Gunn High School lands (Barron Creek), Ulistac Natural Area (Guadalupe Creek), and reservoir lands (Bear Gulch).	0	0	0	0	3 valve vaults	0	Valve vaults would be 3,750 sq. ft. each. The discharge location of drainage outfalls would vary depending on site conditions. Piping to connect facility to outfalls. Control buildings for electrical and mechanical equipment at each valve vault (3 total).	0.4 (minimum) at each site	43,500	Would reduce the length of pipe out of service at any one time and reduce the impact of maintenance or unplanned outages of BDPL Nos. 3 or 4 on system flows. Could allow more frequent maintenance than is now possible.
BD-3	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault	Spans the I-680/Mission Boulevard interchange in Fremont (Alameda County) between Tissiack Place, Cayuga Place, and Indian Hills Road on the north side and Crawford Street on the south side.	Site spans the I-680/Mission Boulevard freeway interchange.	3	0	0	0	0 to 2 (TBD)	0	None	TBD	Phase B: 55,300	Would improve the seismic resistance of BDPL Nos. 3 and 4 across the Hayward fault.
			Subtotal (Rounded)	**19**	**5**	**0**	**0**	**11 to 20**	**0**		**±170 to 180**	**±800,000 to 900,000**	

TABLE 3.12 (Continued)
WSIP FACILITY IMPROVEMENT PROJECTS – CONSTRUCTION AND OPERATIONS ASSUMPTIONS

No.	Project Title	Preferred Location	Existing Land Use	Project Facilities: Pipeline (miles)	Tunnel (miles)	Storage/ Basin (sq. ft.)	Treatment (sq. ft.)	Vaults/ Valve Houses (no. of structures)	Pump Station (no. of structures)	Other Facilities	Construction Area (acres)	Excavation/ Spoils Volume (cubic yards)	Operational Changes
Peninsula Region													
PN-1	Baden and San Pedro Valve Lots Improvements	Baden site: W. Orange Avenue at El Camino Real in South San Francisco, San Mateo County. San Pedro site: San Pedro Road and Junipero Serra Boulevard in Daly City. Pulgas Pump Station: West of Cañada Road adjacent to Pulgas Water Temple in San Mateo County. Pulgas Valve Lot: Edgewood Road near I-280 in San Mateo County.	All work would occur within existing valve lots.	<1	0	0	0	2 at San Pedro; 6 at Baden	2	• Install new valves, pressure and flow meters, motor operators, SCADA valve controls • Modify valves/pumps/sump/vent shaft • Either enlarge existing vault or add new vault at Baden and/or San Pedro Valve Lots	Approximately 2 acres	5,000+	Operation of new PRV at Baden Valve Lot would occur during emergencies only but would be run for maintenance purposes approximately 2 times per year.
PN-2	Crystal Springs/ San Andreas Transmission Upgrade	Facility locations in San Mateo County: • Upper Crystal Springs Dam culverts under Highway 92. • Crystal Springs Outlet Tower Nos. 1 and 2 and Crystal Springs Pump Station located west of I-280 near Skyline Boulevard/Crystal Springs Road intersection, near Hillsborough. • Crystal Springs/San Andreas Pipeline, San Andreas Inlet Structure, San Andreas Outlet Towers Nos. 2 and 3 located west of I-280, generally between Millbrae Avenue and Crystal Springs Road (adjacent to Hillsborough, Burlingame, and Millbrae). • Harry Tracy WTP located east of I-280 and south of Crystal Springs Road in San Mateo County, adjacent to San Bruno.	Project involves repair or replacement of existing SFPUC water facilities. If a new parallel pipeline is needed and an alternative alignment is chosen, an easement may be necessary. The most likely alignments would be within the watershed on lands currently owned by the CCSF.	4.5	0.5**	0	Emergency chemical injection systems at Crystal Springs and San Andreas Reservoirs.	32 existing vaults (number of vaults would most likely be reduced), and new vaults are limited to Crystal Springs Pump Station and outlet of four tunnels.	Renovation of existing pump station or 1 new pump station	• Repair lower culvert linking Upper and Lower Crystal Springs Reservoirs • Upgrade/repair Crystal Springs Outlet Structure Nos. 1 and 2 • Upgrade or replace Crystal Springs Pump Station (including increasing the capacity to transfer water between reservoirs from 80 to approximately 120 mgd, depending on the future modeling (maximum rate would be 140 mgd to match Harry Tracy WTP output), and build new substation (chemical injection equipment is new, only minor strengthening of pipe required) • Renew pipeline sections that are not replaced at San Andreas Reservoir • Depending on alternatives analysis, a new redundant pipeline may be required • Upgrade/repair San Andreas Outlet Structure Nos. 2 and 3 (significant retrofit of San Andreas No. 2 Tunnel may be required) • Repair San Andreas Pipelines Nos. 2 and 3 • Pump station capacity upgrades as required to meet Harry Tracy WTP raw water supply requirements **There are four existing tunnels that would require strengthening and/or retrofit.	TBD	Not specified (estimate up to 9,000 cy)	Increased operations and maintenance due to increased pumping/ transmission capacity.
PN-3	HTWTP Long-Term Improvements	Harry Tracy WTP is located south of Crystal Springs Road in San Mateo County, adjacent to San Bruno and Millbrae.	Harry Tracy WTP site is currently developed with water treatment facilities.	1 to 2	0	2	Project is a treatment facility.	TBD	1	Some of the 16 identified structures would require upgrades. Mechanical, structural, electrical, and process upgrades are expected to be necessary, with known upgrades occurring within existing development footprints. However, structures could be added within the Harry Tracy WTP property. Improvements include disinfection treatment upgrades, raw water pumping upgrades, replacement/upgrade of sedimentation basins at same location, sludge facilities, and power and instrumentation upgrades.	TBD	Not specified	Potential increase in operations and maintenance due to increased sustainable treatment capacity.

TABLE 3.12 (Continued)
WSIP FACILITY IMPROVEMENT PROJECTS – CONSTRUCTION AND OPERATIONS ASSUMPTIONS

				Project Facilities									
No.	**Project Title**	**Preferred Location**	**Existing Land Use**	**Pipeline (miles)**	**Tunnel (miles)**	**Storage/ Basin (sq. ft.)**	**Treatment (sq. ft.)**	**Vaults/ Valve Houses (no. of structures)**	**Pump Station (no. of structures)**	**Other Facilities**	**Construction Area (acres)**	**Excavation/ Spoils Volume (cubic yards)**	**Operational Changes**
Peninsula Region (cont.)													
PN-4	Lower Crystal Springs Dam Improvements	Dam is located west of I-280 and Skyline Boulevard, and south of Crystal Springs Road in San Mateo County.	Lower Crystal Springs Dam is an existing dam, and the Lower Crystal Springs Reservoir level is currently restricted by the CA Division of Safety of Dams (DSOD). The zone around the reservoir that would be inundated under the WSIP is currently undeveloped; however, with implementation of the proposed project, including improvements to the dam and spillway, the reservoir levels would be restored to inundation zone levels that were permissible by DSOD prior to 1983.	0	0	0	0	0	0	• Raise dam parapet wall to provide required freeboard during probable maximum flood (PMF), which could also require strengthening abutments • Lengthen spillway crest to increase discharge capacity • Install new mechanical gates to replace the antiquated stop-log system • Enlarge the stilling basin to accommodate the probable maximum flood discharge. Project cannot be completed until San Mateo County completes the Skyline Boulevard (Highway 35) bridge project.	6 acres	21,000 cy	Increased maintenance (although project would restore historical storage capacity).
PN-5	Pulgas Balancing Reservoir Rehabilitation	Located on the east side of Cañada Road, southeast of the Pulgas Water Temple in San Mateo County.	This project would be located within the areas of the existing Pulgas Balancing Reservoir Pulgas Channel, and Pulgas dechloramination facility as well as near the mouth of Laguna Creek.	0	0	0	0	0	0	Five phases: • New inlet/outlet piping to ensure optimal mixing in reservoir • Replace Pulgas Channel with an enlarged channel to accommodate estimated maximum flow of 250 mgd • Structural rehabilitation and roof replacement • Restore the existing sedimentation basin for the enhancement of habitat as a mitigation • Modify existing dechlorination process – increase capacity of carbon dioxide system and chemical feed systems	TBD	TBD	No
			Subtotal (Rounded)	**±7 to 9**	**0.5+**	**2**	**0**	**8+**	**3+**		**±8**	**±35,000**	
San Francisco Projects													
SF-1	San Andreas Pipeline No. 3 Installation	This pipeline alignment extends from the San Pedro Valve Lot in Daly City (San Pedro Road at Junipero Serra Boulevard) to Merced Manor Reservoir in San Francisco (at Ocean Avenue and 22nd Avenue).	Most of the pipeline would be located within existing roadways, parking lots, and other paved areas, with the remainder crossing through open space corridors in Lake Merced Golf and Country Club and San Francisco Golf Club. Adjacent uses include residential, commercial, school, church, and park uses.	4.17	0	0	0	2	0	• 4.07 miles of 36-inch-diameter and 0.1 mile of 12- to 16-inch-diameter steel pipeline • Removal and/or slurry fill of the existing Baden-Merced Pipeline • Installation of line valves, vaults, and manholes • Installation of cathodic protection systems and monitoring stations, sample taps, air valves, blowoffs, and other pipeline appurtenances	23	44,170	No
SF-2	Groundwater Projects	Local Projects in San Francisco: Lake Merced Pump Station, South Sunset Playground (40th Avenue/Wawona Street), West Sunset Playground (41st Avenue/Quintara Street), Golden Gate Park (Lincoln/42nd Avenue), or alternative locations; North Lake (north side of North Lake in Golden Gate Park, near Fulton Street/43rd Avenue intersection); San Francisco Zoo; Central Pump Station; Pine Lake (Stern Grove), other Golden Gate Park locations. Regional Projects in San Mateo County: up to 10 sites in Daly City and San Bruno and the California Water Service	San Francisco sites already developed with municipal water supply, playground, school parking lot, park, and zoo uses. Regional well sites have not yet been identified.	4.0	0	0	500	0	0	• San Francisco: Install new wells, well stations, and associated pipelines, water treatment equipment, and controls at Lake Merced Pump Station, South Sunset Playground, West Sunset Playground, and Golden Gate Park (or alternate location at Central Pump Station or Francis Scott Key Annex). Modify wells at San Francisco Zoo and North Lake (Golden Gate Park) for emergency supply. Replace wells at San Francisco Zoo, Pine Lake (Stern Grove), Golden Gate Park, and/or other locations (TBD); 2,500 sq. ft. per site. • Regional: Up to 10 new wells and well stations in San Mateo County, Daly City, San Bruno, South San Francisco, and Colma. Wells are estimated to be 600 feet deep.	0.04 acre per site plus pipeline alignments (or 0.7 acre for 18 sites)	TBD	Increased chlorination or chloramination supplies during drought years only, operation inspections, lubrication, calibration of monitoring equipment.

TABLE 3.12 (Continued)
WSIP FACILITY IMPROVEMENT PROJECTS – CONSTRUCTION AND OPERATIONS ASSUMPTIONS

No.	Project Title	Preferred Location	Existing Land Use	Project Facilities: Pipeline (miles)	Tunnel (miles)	Storage/ Basin (sq. ft.)	Treatment (sq. ft.)	Vaults/ Valve Houses (no. of structures)	Pump Station (no. of structures)	Other Facilities	Construction Area (acres)	Excavation/ Spoils Volume (cubic yards)	Operational Changes
San Francisco Projects (cont.)													
SF-2 (cont.)	Groundwater Projects (cont.)	Company's South San Francisco service area (including South San Francisco, Colma, and unincorporated areas of northern San Mateo County). Wells could possibly be located in San Francisco, Burlingame, or Millbrae.											
SF-3	Recycled Water Projects	Treatment site location is TBD; options include the Oceanside Water Pollution Control Plant, San Francisco Zoo overflow parking lot, the site of the old Richmond-Sunset Treatment Plant, and the site of the old McQueen Plant. Treated water storage would be provided at the treatment site as well as offsite; offsite locations include new storage in Lincoln Park (golf course), and the conversion of existing storage in Golden Gate Park. Pipeline alignments would be within city streets.	The Oceanside Water Pollution Control Plant has limited space in an existing room that houses odor control scrubbers; the zoo overflow parking lot is unpaved and in use by the zoo; the Richmond-Sunset site is used for construction spoils storage; and the McQueen site is being used by the Recreation & Park Department as an Urban Forestry Center. Lincoln Park is a golf course, and the Golden Gate Park storage tank is an existing storage facility.	20	0	TBD	Approx. 50,000	0	1 or 2	Utilize existing 2-million-gallon Golden Gate Park Reservoir. Additional storage in the Lincoln Park area. Other potential small booster pumping station(s) have not been identified.	5 to 7	47,200	Increased deliveries and maintenance.
			Subtotal (Rounded)	**28+**	**0**	**0**	**50,500**	**2**	**1 or 2**		**±29 to 31**	**±91,400**	

mgd = million gallons per day
NA = not applicable
SCADA = Supervisory Control and Data Acquisition
sq. ft. = square feet
cy = cubic yards
TBD = to be determined during project design and as part of separate, project-level CEQA review

[a] While the current preferred alternative would construct 16 miles of pipeline, as much as 22 miles of pipeline could be constructed (depending on the results of a condition assessment of the existing pipelines), as well as a new valve house at Oakdale Portal (in addition to Tesla Portal).

3.8.1 San Joaquin Region

Of the five key regional WSIP projects in the San Joaquin Region, most project facilities would be constructed along the San Joaquin Pipelines alignment or at Tesla Portal. As summarized in Table 3.12, implementation of the WSIP in the San Joaquin Region would be expected to result in construction of approximately:

- 16 miles of pipeline between Oakdale Portal and Tesla Portal (SJPL System, SJ-3, and Advanced Disinfection, SJ-1)[25]
- Rehabilitation of the existing San Joaquin Pipelines Nos. 1, 2, and 3 (SJPL Rehabilitation, SJ-4) at locations to be determined, potentially anywhere along its 48-mile length
- 26,000 square feet of treatment facilities at Tesla Portal (Advanced Disinfection, SJ-1, and Tesla Portal Disinfection, SJ-5)

In addition, a small treatment facility could be developed at Thomas Shaft, west of Tesla Portal (under the Lawrence Livermore project, SJ-2), although the design and locations of treatment facilities associated with the Advanced Disinfection (SJ-1), Lawrence Livermore (SJ-2), and Tesla Portal Disinfection (SJ-5) projects are all interrelated and subject to change. In general, program implementation would not alter existing operation and maintenance activities in this region, although there could an increase in chemical usage, truck traffic, and energy usage, all related primarily to the Advanced Disinfection project.

Based on the preliminary WSIP schedule, program-related construction activities in this region are scheduled to occur between 2008 and 2014 and would be expected to result in surface disturbance of as much as 650 acres (99 percent attributable to the SJPL System project, SJ-3). Such disturbance would generate approximately 424,000 cubic yards of excavated material/trench spoils (100 percent attributable to the SJPL System project, SJ-3), though an additional approximately 100,000 cubic yards could result from SJPL Rehabilitation, SJ-4.

3.8.2 Sunol Valley Region

Of the six key regional WSIP projects in the Sunol Valley Region, the largest projects (as defined by the construction duration and extent of earthwork required) would be the Calaveras Dam (SV-2) and New Irvington Tunnel (SV-4) projects. As summarized in Table 3.12, WSIP implementation in the Sunol Valley Region would be expected to result in construction of approximately:

- 4 to 5 miles of pipeline within the Sunol Valley (40-mgd Treated Water, SV-3; Treated Water Reservoirs, SV-5; and SABUP, SV-6)
- Over 3 miles of tunnel between the Sunol Valley and Fremont (New Irvington Tunnel, SV-4)

[25] While the current preferred alternative would construct 16 miles of pipeline, as much as 22 miles of pipeline could be constructed depending on the results of a condition assessment of the existing pipelines.

- Replacement of the existing earthen dam at Calaveras Reservoir (Calaveras Dam, SV-2)
- 180,200 square feet of storage and treatment facilities at the Sunol Valley WTP (40-mgd Treated Water, SV-3, and Treated Water Reservoirs, SV-5)
- 14 to 17 vaults or valve houses at Calaveras Reservoir (SV-2), near Turner Dam and San Antonio Pump Station (SABUP, SV-6), Alameda West Portal and Irvington Portal (New Irvington Tunnel, SV-4), and Sunol Valley WTP (Treated Water Reservoirs, SV-5)
- Pump stations in the Sunol Valley could be developed along Alameda Creek, depending on the alternative implemented (Alameda Creek Fishery, SV-1)

In addition, various other water facilities (piping, pumping, chemical feed, valve, manifold, electrical substation facilities, portable propane- or diesel-powered generators, and propane fuel tanks at some sites) would be constructed in the Sunol Valley (SV-2 through SV-6). Facilities associated with the Alameda Creek Fishery project (SV-1), other than the possible pump stations, have not yet been identified. In general, WSIP implementation would result in a long-term increase in operation, maintenance, and monitoring activities associated with the instream fishery releases and the facilities for recapturing the released water downstream in Alameda Creek and returning it to the regional water supply. There would also be operations and maintenance needs associated with periodic instrumentation calibration, valve cleaning, and increased use of treatment chemicals associated with expanded treatment capacity (Alameda Creek Fishery, SV-1; Calaveras Dam, SV-2; 40-mgd Treated Water, SV-3; and Treated Water Reservoirs, SV-5) in Sunol Valley.

Based on the preliminary WSIP schedule, program-related construction activities would occur between 2008 and 2013, with most work performed in 2009 to 2011. Construction would be expected to result in surface disturbance of approximately 800 acres (98 percent attributable to the Calaveras Dam, SV-2, and New Irvington Tunnel, SV-4, projects) and would generate approximately 7 million cubic yards of excavated material/spoils that would require permanent disposal (90 percent attributable to the Calaveras Dam project).

3.8.3 Bay Division Region

Of the three key regional WSIP projects in this region, most project facilities would be associated with the BDPL Reliability Upgrade project (BD-1). As summarized in Table 3.12, program implementation in the Bay Division Region would be expected to result in construction of approximately:

- 19 miles of pipeline in the East Bay, South Bay, and Peninsula (BDPL Reliability Upgrade, BD-1, and BDPL 3 and 4 Seismic Upgrade at Hayward Fault, BD-3)
- 5 miles of tunnel extending across San Francisco Bay between Newark and East Palo Alto (BDPL Reliability Upgrade, BD-1)
- 11 to 20 valve lots or vaults along the existing rights-of-way of Bay Division Pipelines Nos. 1, 2, 3, and 4 (BDPL Reliability Upgrade, BD-1; BDPL 3 and 4 Crossovers, BD-2; BDPL 3 and 4 Seismic Upgrade at Hayward Fault, BD-3)

In addition, various other appurtenant facilities (isolation valves, piping, drainage outfalls, control rooms, transformers, emergency generators, and electronic equipment) would be constructed in various cities under all three projects in the region. In general, program implementation would not alter existing operation and maintenance activities (e.g., no change chemical deliveries, storage, and use) in this region.

Based on the preliminary WSIP schedule, program-related construction activities would occur between 2009 and 2013. Construction in the Bay Division Region would be expected to result in surface disturbance of approximately 170 to 180 acres (99 percent attributable to BDPL Reliability Upgrade project, BD-1) and would generate approximately 800,000 to 900,000 cubic yards of excavated material/spoils that would require permanent disposal (most attributable to the BDPL Reliability Upgrade project).

3.8.4 Peninsula Region

There are five key regional WSIP projects in this region, and most facilities are attributable to the CS/SA Transmission (PN-2) and Lower Crystal Springs Dam (PN-4) projects. As summarized in Table 3.12, program implementation in the Peninsula Region would be expected to result in construction of approximately:

- 7 to 9 miles of pipeline in San Mateo County, including segments between Lower Crystal Springs Reservoir and San Andreas Reservoir (CS/SA Transmission, PN-2), at Harry Tracy WTP (HTWTP Long-Term, PN-3), and at various valve lots (Baden and San Pedro Valve Lots, PN-1)
- 0.5 mile of tunnel in San Mateo County (CS/SA Transmission, PN-2)
- Raising the Lower Crystal Springs Dam (Lower Crystal Springs Dam, PN-4)
- 2 storage basins at Harry Tracy WTP (HTWTP Long-Term, PN-3)
- About 8 vaults/valves lot in or near South San Francisco and Daly City (Baden and San Pedro Valve Lots, PN-1, and CS/SA Transmission, PN-2)
- 3 to 4 pump stations, new or upgrades (Baden and San Pedro Valve Lots, PN-1; CS/SA Transmission, PN-2; and HTWTP Long-Term, PN-3)
- Replacement and enlargement of discharge channel (Pulgas Balancing Reservoir, PN-5)

Except for the pipeline facilities, most of the projects in this region would generally involve modifying or expanding existing water facilities and would be located in developed areas in San Mateo County or within the cities of Daly City and South San Francisco (Baden and San Pedro Valve Lots, PN-1; CS/SA Transmission, PN-2; and HTWTP Long-Term, PN-3). These projects include installing new valves, pressure and flow meters, or motor operators; modifying, repairing, upgrading, or seismic retrofitting vaults, valves, vent shafts, piping, pumps, sumps, chemical feeds, filters, or other treatment facilities; and rehabilitating or adding structures. Larger projects also include pump station upgrades (CS/SA Transmission, PN-2), reservoir outlet upgrades/repairs (CS/SA Transmission, PN-2), raising the dam parapet at Lower Crystal Springs

Reservoir (Lower Crystal Springs Dam, PN-4), and replacing/enlarging Pulgas Channel at Upper Crystal Springs Reservoir (Pulgas Balancing Reservoir, PN-5).

Program implementation in the Peninsula Region would increase pumping and transmission capacity between Lower Crystal Springs Reservoir and San Andreas Reservoir (CS/SA Transmission, PN-2) as well as increase the sustained treatment capacity at the Harry Tracy WTP (HTWTP Long-Term, PN-3). In addition, raising the parapet at Lower Crystal Springs Reservoir would restore the historical storage capacity (Lower Crystal Springs Dam, PN-4). However, the other WSIP projects in this region would not alter existing operation and maintenance activities in the region.

Based on the preliminary WSIP schedule, program-related construction activities would occur between 2008 and 2013. The extent of surface disturbance associated with projects in this region cannot be estimated at this time because many of the projects are still in the preliminary planning stage. Projects with the potential for extensive surface disturbance include the CS/SA Transmission (PN-2), Lower Crystal Springs Dam (PN-4), and Pulgas Balancing Reservoir (PN-5) projects. Surface disturbance for some projects (Baden and San Pedro Valve Lots, PN-1, HTWTP Long-Term, PN-3, and part of Pulgas Balancing Reservoir, PN-5) would be limited to expanded facilities and staging areas, since these projects would primarily be located within existing development footprints. Program-related construction activities in the Peninsula Region would generate approximately 35,000 cubic yards of excavated material/spoils, attributable mostly to the CS/SA Transmission Upgrade (PN-2) and Lower Crystal Springs Dam (PN-4) projects, with the potential for additional excavation under the Baden and San Pedro Valve Lots, HTWTP Long-Term, and Pulgas Balancing Reservoir projects.

3.8.5 San Francisco Region

Of the three key regional WSIP projects in this region, most of the project facilities would be associated with the San Andreas Pipeline No. 3 Installation project (SF-1) and Recycled Water Projects (SF-3). As summarized in Table 3.12, program implementation in the San Francisco Region would be expected to result in construction of:

- Approximately 28 miles of pipeline in Daly City and San Francisco (SAPL 3 Installation, SF-1; Groundwater Projects, SF-2; and Recycled Water Projects, SF-3)
- An estimated 14 new groundwater wells in San Francisco, Daly City, San Bruno, and South San Francisco (Groundwater Projects, SF-2)
- Approximately 50,000 square feet of treatment facilities for recycled water (Recycled Water Projects, SF-3)

In addition, various other water facilities (line valves, vaults, manholes, cathodic protection systems and monitoring stations, sample taps, air valves, blowoffs, and other pipeline appurtenances) would be constructed in Daly City and San Francisco under the SAPL 3 Installation project (SF-1). Approximately 14 new well stations (which could include new buildings and booster pumps) and associated piping could be installed, and some existing wells in San Francisco could be upgraded under the Groundwater Projects (SF-2).

Program implementation in the San Francisco Region could modify or add treatment facilities for the Groundwater and Recycled Water Projects in San Francisco (SF-2 and SF-3). The other WSIP project in this region (SAPL 3 Installation, SF-1) would not alter existing operation and maintenance activities in the region.

Based on the preliminary WSIP schedule, program-related construction activities would occur between 2009 and 2014. Approximately 30 acres of surface disturbance is estimated for this region. Program-related construction activities in the San Francisco Region would generate approximately 91,000 cubic yards of excavated material/spoils (nearly all attributable to the SAPL 3 Installation, SF-1, and Recycled Water Projects, SF-3).

3.9 Construction Scenarios for Facility Types

Typical construction scenarios for the different types of facilities proposed under the WSIP are described below. These descriptions address the nature, extent, and duration of anticipated construction activities and are used in the programmatic analysis of construction impacts in Chapter 4 of this PEIR. Actual construction activities could vary and would be determined during subsequent, project-specific review of the individual WSIP projects.

3.9.1 Pipelines

Construction of the WSIP facility improvement projects related to water transmission and distribution pipelines would be accomplished using standard pipeline installation methods, generally the open-cut trench method (also referred to as the cut-and-cover construction method) where feasible. In general, cut-and-cover pipeline construction would progress at a rate of approximately 120 to 160 feet per day depending on conditions (e.g., whether the pipeline is located in an urbanized or undeveloped area), the length and size of the pipe segment, number of utility crossings, traffic congestion, and any restrictions on work schedules. However, in areas where there are no obstructions and construction occurs entirely within the SFPUC right-of-way (e.g., where there are no road crossings), the pipeline construction could progress at a rate of up to 300 feet per day. Periodically, staging areas could be required for equipment laydown and for stockpiling backfill and spoils from the trench, but construction disruption associated with pipeline installation would generally be limited to one section at a time rather than the entire length of the alignment.

The key steps in the cut-and-cover construction process would be as follows: (1) surface preparation, (2) trench excavation and shoring, (3) pipe installation, (4) trench backfilling and compacting, and (5) surface restoration. Surface preparation could involve removing structures (such as fences), saw-cutting and removing pavement, or removing vegetation from the surface of the trench area. Equipment used for this activity could include jackhammers, pavement saws, mowers, graders, and loaders. Trench excavation would be done using a backhoe or excavator, and excavated soil of suitable quality would be stockpiled along the trench for later reuse as backfill; where excavated soil is not of suitable quality, engineered fill could be trucked to the site for backfilling. Excess soil would be hauled offsite for disposal.

The depth and width of the trench would depend on the size of the pipeline to be installed. For pipe diameters ranging from 12 to 36 inches, the depth of the trench would range from 5 to 8 feet and the width of the trench from 2 to 5 feet. For larger pipelines (54 to 78 inches in diameter), the depth of the trench would range from 10 to 15 feet and the width of the trench from 8 to 12 feet. There would be a minimum of 3 feet of cover over the pipelines. To protect workers from trench failure, shoring would be required for trenches over 5 feet deep. Depending on the geotechnical characteristics, soil conditions, and the depth of excavation, various methods of shoring could be employed, including use of a shield or trench box, steel plates, sheet piling and beams, or solder piles and lagging, which would be installed with a pile driver or excavator. Typically, sheet-piling would be required for trenches over 10 feet deep in unstable soils, such as sand or heavy clay. If groundwater is encountered during trench excavation, dewatering would typically be required so that the pipe could be installed in dry conditions. Any groundwater produced during dewatering would likely be discharged to the local sewer system, the storm sewer, or a nearby waterway, in compliance with appropriate regulations.

Pipe-bedding materials would then be placed in the stabilized trench, followed by the new segment of pipeline. Pipe segments would be connected, typically with welded joints (for steel pipe) or bell and spigot joints (for ductile iron pipe). Flexible couplings are typically used when the pipe needs special protection from damage due to earthquakes or other soil movement. Depending on the soil conditions, imported pipe-bedding materials could be used to backfill the pipe up to its approximate centerline. The trench would then be backfilled with native soil, to the extent possible, in order to meet applicable compaction requirements. Imported backfill could be necessary for compactibility and stability. For pipelines located within paved roadways, surface restoration would involve repaving the area with new asphalt or concrete pavement. For undeveloped areas, the disturbed area would be graded and revegetated with approved plant materials. Finally, construction debris would be hauled from the site for disposal.

Open-cut construction would not be appropriate for some pipeline crossings of major roadways (including freeways and highways), railroads, environmentally sensitive areas, perennial creeks,[26] or aqueducts/canals. In these cases, several alternative "trenchless" pipeline construction techniques that avoid trenching along the entire length of the pipeline could be utilized as appropriate, including the following:

- Where an aboveground crossing would be appropriate (considering security and access issues), a pipeline could be elevated above ground and either hung beneath an overpass with brackets or supported by footings from below.

- Where an underground crossing is required, the pipeline crossing could be constructed using trenchless methods, such as jack-and-bore or microtunneling, as appropriate.

26 For seasonal creeks, trenched crossings could be accomplished during the dry season, to protect environmentally sensitive habitat (such as riparian habitat).

Jack-and-bore construction requires excavation of a jacking pit at the jacking end and a receiving pit at the other end of each pipeline crossing segment, through which the piping installation equipment is respectively inserted and retrieved. Jacking pits for larger pipelines would be approximately 12 to 20 feet deep, 15 to 20 feet wide, and 30 feet long. Jack-and-bore construction would typically be used for pipeline crossings that are 80 to 300 feet long and for pipe diameters of 30 to 78 inches. Similarly, microtunneling could be used for pipeline segments that are 100 to 1,000 feet long and would be appropriate for areas with coarse soils and rocks and where precise alignment is needed. Microtunneling requires excavation of a shaft at each end of the pipeline crossing, and surface disturbance is limited to either end of the pipeline segment.

- In some cases, where pipeline installation or replacement is not required, it might be possible to slipline some sections of an existing pipeline. This method, which could be employed where the pipeline is straight, would require excavation of access pits at all angle points and on either side of the segment to be sliplined, rather than trenching along the length of the entire segment. Sliplining would involve disturbance of less surface area than cut-and-cover construction. However, as with cut-and-cover construction, periodic staging locations might be needed for equipment laydown and for stockpiling backfill and spoils from the access pits.

3.9.2 Tunnels

Whereas pipeline construction would generally occur during daytime working hours and would affect adjacent uses for a short period of time as construction progresses along the alignment, tunnel construction would typically occur 24 hours per day, seven days a week, and construction activities would be focused at two locations (the entrance and exit tunnel portals) for the duration of tunnel construction.

Tunneling is typically accomplished by mechanical means, with the use of a tunneling machine (such as a tunnel boring machine, or roadheader, or an earth-pressure-balancing tunnel machine) that excavates the tunnel, removes the spoils (or “muck”), and lines the tunnel with concrete segments. Within the tunnel, a narrow-gage railway or tunnel train is built on the concrete segments for delivering supplies into the tunnel, and a conveyor belt is installed to remove tunnel spoils. Spoils from tunnel excavations are typically removed from the tunnel face and deposited outside the portal using various methods, such as a conveyor belt, front-end loader, hoppers, or tunnel train (also known as a muck train). Excavated material stockpiled outside the portal is then loaded onto trucks or barges (if applicable) and transported offsite. Other related tunneling equipment includes a tunnel ventilation fan, muck removal equipment, dewatering and groundwater treatment system, etc. Depending on the tunnel design, vent shafts could be required at certain locations along the tunnel alignment, with associated surface disturbance occurring outside of the tunnel portal areas.

Depending on the subsurface conditions encountered, drilling and controlled detonations might be needed as part of tunnel construction. Controlled detonation is performed by drilling holes in a specified pattern in the rock face of the tunnel excavation, packing the holes with small amounts of explosive and primer, and detonating the explosives using a time delay between successive detonations.

Tunnel construction would start at the entry portal, which would serve as the primary staging area for tunnel construction and require a large construction staging area for the duration of tunneling activities. Removal and transport of tunnel spoils would generally occur at the entry portal, as would equipment storage and deliveries. Depending on the construction specifications, activities at the exit portal could be limited; in some cases, this portal would primarily be used to remove the tunneling equipment upon completion of tunneling. Tunnel portal construction could require grading and construction of an access road and staging areas for construction office trailers, equipment and materials storage, and temporary stockpiling. Tunnel construction would include excavation and construction of a tunnel portal entry or launch shaft, which would serve as the main access for installation of equipment as well as for removal of tunnel spoils. Depending on the depth, size, and location of the tunnel, the portal entry could require shoring and associated supports and/or dewatering systems.

Tunneling operations typically take place 24 hours a day to maximize construction efficiency, since most activities occur underground and cause limited surface disturbance. However, surface activities at the tunnel portals could be suspended during nighttime shifts, depending on the location. Upon completion of tunnel construction, portal areas would generally include construction of permanent tunnel access and maintenance facilities, and construction staging areas would be restored to their original conditions.

3.9.3 Vaults, Valve Lots, and Crossover Facilities

Vaults, valve lots, and crossover facilities are located at discrete sites along the regional system and house a variety of electrical and mechanical equipment used for system operation and maintenance. The design of vaults, valve lots, and crossover facilities varies from project to project and site to site. These structures are generally partially or entirely buried, have a building footprint of about 4,000 square feet (50 feet by 75 feet), and range in depth from 6 to 15 feet below grade. Partially buried vaults can extend up to 30 inches above the ground surface, whereas access doors to completely buried vaults are at grade. Whether or not a vault can be completely buried depends on site-specific conditions, such as depth to groundwater or adjacent uses. Vaults are used to house valves, and control buildings are often associated with them. Control buildings house instrumentation and electrical facilities. Control buildings can be buried, but are more frequently above grade; they are typically small, one-story structures (minimum height of 8 feet) and have power requirements. Some facilities, such as crossover structures, could require permanent discharge facilities to local creeks or other water bodies so that transmission pipelines can be drained prior to maintenance or if needed to conduct emergency repairs.

Construction activities for vaults or valve lots are assumed to be restricted to the immediate vicinity of the site (either existing sites proposed for repair or new sites) and to continue at the same location for the full duration of construction. Construction activities could include excavation and shoring, concrete construction, equipment installation, startup, and testing. Staging areas for equipment storage and temporary stockpiling could also be required. The extent and duration of construction would depend on the specific project.

3.9.4 Pump Stations

As with valve lots, existing or proposed pumping facilities are located at discrete sites along the regional system, but generally require a much larger area and larger equipment than valve lots. The WSIP improvements for this category of facility involve upgrades to pump stations, although there is a possibility that one station would be abandoned and a new station constructed on adjacent developed land. The proposed pumping facility modifications include replacing pumping, electrical, power, and valving systems to allow them to reliably operate at their original capacity. Pump stations typically include a series of pumps, the largest being about 1,000 horsepower. The proposed improvements would include the use of electrically driven pumps, so there would be no additional onsite emissions from internal combustion engines. One pump station has three existing diesel-driven pumps that would remain available for use. All of the new facilities would be designed to comply with current noise abatement ordinances.

Pump station upgrades generally involve replacing existing pumps with new pumps. The buildings that house the pumps would typically remain unchanged.

In general, construction associated with pumping facilities can be phased so that system operations are not interrupted during construction. Construction of new pump stations or rehabilitation of existing stations would generally include the following types of construction activities: partial demolition of existing facilities, removal and replacement of pumps and valves, structural modifications, electrical modifications, power system modifications (which could include backup power), and modifications to the instrumentation and controls.

3.9.5 Treatment Facilities

The WSIP treatment facility projects include constructing a new secondary disinfection facility, upgrading the system's existing primary disinfection facility at Tesla Portal, and expanding/upgrading treatment facilities at both the Sunol Valley and Harry Tracy WTPs. For all of these projects, construction activities would be confined to the proposed site location and immediate vicinity for the duration of construction.

For projects proposed at existing treatment facility locations, all construction activities would be limited to the area within the property boundaries, and changes in operations would involve minor modifications over existing procedures. The general types of proposed modifications to treatment facilities include:

- Process improvements and additions
- Hydraulic system improvements
- Structural/seismic improvements
- Instrumentation and control improvements
- Electrical and power system improvements
- Site grading, paving, and drainage

In general, construction associated with treatment facilities would be phased so that system operations would not be interrupted during construction. Construction of both new and modified treatment facilities would generally include the following types of construction activities: a relatively minor amount of excavation, relocation of existing utilities, demolition, site grading, structural work, mechanical/process system work, electrical work, and instrumentation and controls.

3.9.6 Storage Facilities

The WSIP includes construction or improvement of two types of storage facilities: reservoirs and dams. For both types of facilities, construction activities would occur at the project site and vicinity throughout the duration of construction. There would be about 30 to 40 workers per crew (with one or more crews, depending on the project).

Storage reservoirs can be associated with water treatment facilities or can be an isolated end point in the distribution system. In the SFPUC system, existing storage reservoirs are entirely or partially below grade; construction of new storage reservoirs under the WSIP would involve extensive excavation to accommodate the basin(s), with excavations extending up to approximately 25 feet below grade. Excavated soils would be reused or would be hauled offsite for disposal. A dewatering system could be required if the excavation extends below groundwater elevations. The excavated area would have vertical side walls, which would require shoring by tieback walls, sheet piles, and/or solder piles in select areas; these are typically installed through pile driving or drilling, depending on the type of shoring used. The next phase of construction would involve the placement of steel-reinforced concrete. Following excavation, shoring, and concrete placement, equipment would be delivered and installed. Equipment could include pumping systems, filters, chemical feed equipment, piping, valves, and electrical and instrumentation facilities. Storage basins would require extensive seismic support and strengthening for public safety as well as for compliance with applicable requirements of the DSOD.

Dam improvements associated with the WSIP facilities range from replacing of the earthen dam at Calaveras Reservoir to raising the dam parapet at Lower Crystal Springs Dam. Replacement of Calaveras Dam would involve extensive earthmoving activities, not only to construct the new earthen dam but also to remove a portion of the existing dam. Dam replacement would also require the development of borrow and disposal areas as well as associated access roads between the borrow and fill areas and the dam site. In contrast, the Lower Crystal Springs Dam improvements would require much less earthmoving activities. Raising the dam parapet would primarily involve strengthening dam abutments and upgrading the spillway crest, tilt-weir gates, and stilling basin (below the dam).

3.10 Standard Construction Measures and GHG Reduction Actions

The SFPUC has established standard construction measures and greenhouse gas (GHG) reduction actions that would be implemented as part of all SFPUC projects, including the WSIP projects listed in Table 3.10. The main objective of the standard construction measures is to minimize potential disruption of surrounding neighborhoods during construction and to reduce impacts on existing resources to the extent feasible. The construction measures will be implemented individually for the different facility improvement projects; some measures might not be applicable to individual maintenance or repair projects, and some projects will require the development of more detailed implementation steps as the individual projects are designed and implemented. Each SFPUC project manager, environmental project manager, and contract manager would ensure that every project involving construction work contains uniform provisions to address the issues addressed in the standard construction measures. To that end, each construction contract or project must include the following standard construction measures in either the contract or project implementation procedures, as appropriate. The measures would apply to any project subject to environmental review under CEQA and would be implemented by SFPUC staff or by outside contractors under contract to the SFPUC. Although some of the SFPUC standard construction measures might not be appropriate for certain projects, each measure must be addressed through one of the following: undertaking the activities listed, undertaking further investigation and developing a more detailed work plan to address the issue, or explaining why the measure is not applicable to the particular site.

The standard construction measures to be included in WSIP construction contracts consist of the following ten provisions (SFPUC, 2007b):

1. *Neighborhood Notice*: The SFPUC will provide reasonable advance notification to the businesses, owners and residents of adjacent areas potentially affected by the Water System Improvement Program (WSIP) projects about the nature, extent and duration of construction activities. Interim updates should be provided to such neighbors to inform them of the status of the construction.

   Where schools would be affected, the SFPUC will coordinate with school facility managers to schedule construction for time periods with the least impact on school activities and facilities to ensure student safety and to minimize disruption to educational and recreational uses of the school property.

2. *Seismic and Geotechnical Studies*: Projects will incorporate review of existing information and, if necessary, new engineering investigations to provide relevant geotechnical information about the particular site and project, including a characterization of the soils at the site, and the potential for subsidence and other ground failure. Construction will address any recommendations by such geotechnical reports to ensure seismic stability and reliability of the proposed project. All SFPUC projects must be designed for seismic reliability and minimum potential water loss and property damage. All components of the water system improvement program must be designed to continue water service during a major earthquake.

3. *On-Site Air and Water Quality Measures during Construction*: All construction contractors must take measures to minimize fugitive dust and dirt emissions resulting from the construction, and implement measures to minimize any construction effects on local air and water quality, including a local storm drain system or watercourse. These measures could include preparation of a stormwater pollution prevention plan (SWPPP), if required by the California Regional Water Quality Control Board. At a minimum, construction contractors should undertake the following measures, as applicable, to minimize any adverse effects:

   - Erosion and sedimentation controls tailored to the site and project
   - Dust control plan
   - Placement of straw rolls around each of the nearby stormwater inlets
   - Preservation of existing vegetation
   - Installation of silt fences
   - Use of wind erosion control (e.g. – geotextile or plastic covers on stockpiled soil)
   - Sweeping of nearby streets at least once a day
   - Stabilization of site ingress/egress locations to minimize erosion
   - Spraying the disturbed areas of the site, or any stockpiled soil, with water to minimize fugitive dust emissions

4. *Groundwater*: If groundwater is encountered during any excavation activities, the construction contractor shall prepare a dewatering plan so that water is discharged to the stormwater system in compliance with the local standards and discharge permit requirements.

5. *Traffic*: Each contractor shall prepare a traffic control plan which will minimize the impacts on traffic and on-street parking on any streets affected by construction of the proposed project. As appropriate, SFPUC or the contractor will consult with local traffic and transit agencies.

6. *Noise*: The contractor will comply with local noise ordinances regulating construction noise to the extent feasible, and will undertake efforts to minimize any noise disruption to nearby neighbors and sensitive receptors during construction.

7. *Hazardous Materials*: Appropriate measures will be implemented to characterize and dispose of hazardous materials should they be encountered during excavation and construction. Contract specifications will mandate full compliance will all applicable local, state and federal regulations related to the identification, transportation and disposal of hazardous materials/soils. As necessary, a spill prevention and countermeasure plan will be prepared.

   A qualified environmental professional will conduct any necessary site assessment. The site assessment would include a regulatory database review to identify permitted hazardous materials and environmental cases in the vicinity of each project no more than three months before construction, and a review of appropriate standard information sources to determine the potential for soil or groundwater contamination to occur. Follow-up sampling would be conducted as necessary to characterize soil and groundwater quality prior to construction and, if needed, site investigations or remedial activities would e performed in accordance with applicable laws. The environmental professional would prepare a report documenting the activities performed, summarize the results and make recommendations for appropriate handling of any contaminated materials during construction. A contingency plan would also be prepared identifying measures to be taken should unanticipated contamination be identified during construction. Construction contractors will conduct asbestos and lead abatement in accordance with established regulations.

8. *Biological Resources*: As an initial matter, SFPUC project managers will screen the project site and area to determine whether biological resources may be affected by construction activities. In the event further investigation is necessary, the SFPUC will comply with all requirements for investigation, analysis and protection of biological resources. A qualified biologist must conduct any required biological screening survey. The biologist will review standard information sources to determine special status species with the potential to occur on the project site. The biologist would carry out a site survey by walking or driving over the project site, as appropriate, to note the general resources and whether any habitat for special-status species is present. The biologist would then document the survey with a brief letter report or memo, setting forth the date of the visit, whether habitat for special-status species is present, providing a map or description showing where sensitive areas exist within the site, and identifying any appropriate avoidance measures.

9. *Cultural Resources*: As an initial matter, SFPUC project managers will screen the project site and area to determine whether cultural resources, including archaeological and other historical resources, may be affected by construction activities. In the event further investigation is necessary, the SFPUC will comply with all requirements for investigation, analysis and protection of cultural resources.

   CEQA considers paleontological resources to be "cultural resources." Any screening for cultural resources would include screening for archaeological, paleontological and historic resources. For projects requiring excavation, deep grading, well drilling or tunneling into geologic material at sites identified as having high potential for encountering paleontological resources, a state-registered professional geologist or qualified professional paleontologist will conduct a site-specific evaluation of the paleontological sensitivity. The assessment will include a report of findings for the SFPUC.

   A qualified archaeologist, historian or paleontologist will conduct all cultural resources survey and screening work. Screening surveys for cultural resources would include a cultural resources records search to be conducted at the appropriate office member of the California Historical Resources Information System. A field survey will be conducted if determined necessary after the cultural resources records search. Any impacts on identified cultural resources will be avoided to the extent feasible.

   Any initial historic resource screening will identify historic resources on the project site as well as adjacent to the project site.

   It is possible that project work may affect accidentally discovered buried or submerged cultural resources. Any contractor must distribute the Planning Department archaeological resource "ALERT" sheet to any person involved in soil-disturbing activities. If there is any indication of an archaeological or a paleontological resource during the soils disturbing activity of the project, the contractor shall immediately suspend any soils disturbing activities in the area and notify the SFPUC of such discovery. The SFPUC will then work with the Planning Department's Environmental Review Officer to determine what additional measures should be implemented, based on reports from a qualified archaeological or paleontological consultant.

10. *Project Site*: The SFPUC will conduct construction activities on SFPUC-owned lands to the extent feasible and minimize the need for use of non-SFPUC-owned land during construction. In cases where construction easement or staging areas are needed on non-SFPUC land, the SFPUC will restore these areas to their prior condition so that the owner may return them to their prior use, unless otherwise arranged with the property owner. The site will be maintained to be clean and orderly. Construction staging areas will be sited away from public view where possible. Nighttime lighting will be directed away from residential areas.

    Upon project completion, the construction contractor will return the SFPUC project site to its general condition before construction, including re-grading of the site and re-vegetation of disturbed areas.

In addition, the SFPUC is committed to the following GHG reduction actions as part of the WSIP program. The SFPUC will include the first two measures in all WSIP contractor specifications and implement the third measure during project planning and design, which in addition to having other environmental benefits, would also help reduce GHG emissions.

1. The SFPUC will require that all contractors maintain tire inflation to the manufacturers' inflation specifications.

2. The SFPUC will implement a construction worker education program for all WSIP projects.

3. WSIP projects that include construction of new buildings will consult with the SFPUC Power Enterprise's Energy Efficiency Group to incorporate all applicable energy efficiency measures into the project design. Projects with buildings components will attempt to maximize energy efficiency by exceeding Title 24 minimum requirements by at least 20 percent. Projects with buildings components will attempt to meet or exceed LEED Silver certification as required by the City's Green Building Ordinance.

3.11 Proposed Construction Schedule

Figure 3.6 presents a preliminary master schedule of the construction phases for the key regional WSIP facility improvement projects. The SFPUC developed the preliminary schedule to assure that water delivery service is maintained throughout construction of the numerous projects, but is preparing schedule refinements and adjustments as the projects are further developed and more information is known about construction requirements. As the preliminary schedule indicates, construction of projects is expected to be completed by the end of 2014; there would be an intense period of construction from 2009 to 2010, when 18 of the 22 projects would be under construction concurrently. All WSIP projects would be completed by the end of 2014. The acquisition of supplemental water supplies during droughts would be implemented as needed to match the water delivery needs of the systemwide customers (see Chapter 5, Section 5.1) and is not included on the construction schedule.

3.12 WSIP-Related Activities

As discussed in Section 3.4, above, the SFPUC has included several components under the funding umbrella of the WSIP that are not analyzed in this PEIR. Three of these components—the Watershed Environmental Improvement Program, Regional Desalination Feasibility Study, and Habitat Reserve Program—are indirectly related to the proposed program analyzed in this PEIR and are described below.

3.12.1 Watershed Environmental Improvement Program

The purpose of the Watershed Environmental Improvement Program (WEIP) is to identify, prioritize, protect, and restore lands and natural resources in the vicinity of the SFPUC's regional water system. The WEIP encompasses the entire geographic range of areas that affect or are affected by water system operations, including the Tuolumne River watershed, Alameda Creek watershed, Peninsula watershed, and other SFPUC lands and rights-of-way. The program could include ecosystem and habitat protection, improvements, and restoration projects, addressing such issues as fish passage, riparian habitat degradation, and sensitive species recovery. This program is currently under development, and preliminary WEIP activities have focused on the development of studies and monitoring programs as well as coordination with other projects and work groups with similar goals. Many of the WEIP projects and activities identified at this time consist of the implementation of activities previously identified in the SFPUC's adopted Alameda and Peninsula Watershed Management Plans. CEQA documents have been certified for both plans, so programmatic environmental review of these activities has already been completed. Additional environmental review will be conducted as appropriate as the WEIP projects and activities become further defined.

Although the SFPUC is funding the WEIP through the WSIP bond funds, the WEIP is considered separate from and in addition to the mitigation measures identified in this PEIR. However, the SFPUC is coordinating the projects and activities of the WEIP with the WSIP facility improvement projects and water supply and system operations described in this PEIR, and the general scope of the WEIP is considered in the cumulative impact analyses presented in Chapter 4, Section 4.17, and in Chapter 5, Section 5.7.

3.12.2 Bay Area Regional Desalination Project

This activity consists of the SFPUC's participation with the East Bay Municipal Utility District, Santa Clara Valley Water District, and Contra Costa Water District to study the feasibility of a Bay Area Regional Desalination Plant (BARDP). These regional water agencies have formed a partnership to investigate the feasibility of jointly implementing a desalination project in the Bay Area to improve water supply reliability for the over 5 million people served by the four agencies. The project would produce potable water from seawater or brackish water to meet some of the water supply needs in the agencies' combined service areas (URS, 2003).

The participating agencies are currently preparing a feasibility study for the project and planning for construction of a pilot plant. The feasibility study includes analysis of institutional issues related to implementing the full-scale BARDP and assessment of site and infrastructure options for three potential sites. The possible sites are located along the eastern Contra Costa County shoreline, near the east end of the Bay Bridge in Oakland, and near the Oceanside Water Pollution Control Plant in San Francisco. The pilot plant and related studies are scheduled to be implemented from 2007 to 2008. Assuming a positive outcome from the feasibility study and the pilot plant, it is expected that environmental review of the BARDP would occur in 2009, design in 2010, and construction of the full-scale BARDP in 2012.

The regional desalination project is considered in this PEIR as a potential alternative water supply source. The project is analyzed in Chapter 8 as a component of one of the WSIP variants and is considered in Chapter 9 as part of the CEQA alternatives analysis.

3.12.3 Habitat Reserve Program

The SFPUC is proposing the Habitat Reserve Program (HRP) with the objective of developing and enhancing wetlands and other habitats to be applied toward mitigation of impacts on biological resources resulting from implementation of the WSIP. The program would enhance, restore, create, and preserve habitats on existing SFPUC property and/or on other land to be covered by conservation easements. The HRP would serve as compensation for both temporary and permanent impacts on potentially affected sensitive habitats, including habitats of special-status species, due to construction and operation of the WSIP facility improvement projects as well as implementation of the proposed water supply option (SFPUC, 2006c).

The HRP would provide a comprehensive, coordinated approach to implementing mitigation measures for impacts on biological resources from WSIP actions identified in this PEIR and in project-level CEQA documents for the individual WSIP projects. The SFPUC would coordinate the implementation and management of the HRP with the implementation and management of mitigation measures presented in this PEIR and in project-level CEQA documents. In most cases, the HRP would augment the project-specific mitigation measures, focusing on habitat compensation requirements. The HRP could provide a vehicle for the SFPUC to comply with regulatory permit requirements related to biological resources affected by the WSIP.

The HRP would consolidate habitat enhancement, restoration, creation, and preservation at a select number of mitigation sites located throughout the WSIP program area on CCSF-owned lands or on county, nonprofit, or private lands that are appropriate for conservation easements, if necessary. The HRP would establish performance criteria for habitat enhancement, restoration, creation, and preservation and would include monitoring to ensure that the criteria are satisfied. In addition to enhancing, restoring, creating, or protecting habitat, the HRP could also involve funding research or local projects, purchase of mitigation credits from existing mitigation banks, or participation in regional habitat restoration efforts. Where appropriate, the HRP actions would be coordinated with other ongoing SFPUC activities, including implementation of the Alameda and Peninsula Watershed Management Plans, the Alameda and Peninsula Habitat Conservation Plans (in development), and the WEIP (described above).

As part of the HRP, a preliminary identification has been conducted to determine the types of habitats that could be created as well as potentially suitable mitigation sites. The types of actions being considered under the HRP include: altering existing agricultural uses to enhance or restore habitat; fencing and managing grazing lands; grading, planting, and monitoring vegetation; excavating, grading, and constructing stock ponds and installing water control structures to provide appropriate hydraulic conditions; harvesting local seed stock; and fencing to protect habitats and control non-native species. **Table 3.13** provides a preliminary list of habitat types and possible mitigation sites for each region.

TABLE 3.13
HABITAT RESERVE PROGRAM – PRELIMINARY LIST OF HABITAT TYPES AND MITIGATION SITES

Region	Habitat Type	Potential Location of Mitigation Sites
San Joaquin Region		
	Vernal Pools and Wetland	Stanislaus County, Tuolumne County
	Grassland	San Joaquin County, Stanislaus County
Sunol Valley Region		
	Oak Woodland	Within the Alameda watershed
	Riparian	Along Alameda Creek or its tributaries
	Wetland	Along tributaries to Calaveras and San Antonio Reservoirs
	Serpentine	Within the Alameda watershed
	Grassland	Within the Alameda watershed
Bay Division Region		
	Oak Woodland	Within the Alameda and Peninsula watersheds
	Riparian	Within the Alameda and Peninsula watersheds, or in tributaries to San Francisco Bay
	Freshwater Wetland	Within the Alameda and Peninsula watersheds, or other watersheds draining to San Francisco Bay
	Grassland	Within the Alameda and Peninsula watersheds
	Saline Wetland	Along the San Francisco Bay shoreline
	Tidal Marsh	Along the San Francisco Bay shoreline
Peninsula and San Francisco Regions		
	Oak Woodland	Within the Peninsula watershed
	Riparian	Within the Peninsula watershed or other parts of San Mateo County and San Francisco
	Freshwater Wetland	Within the Peninsula watershed or other parts of San Mateo County and San Francisco
	Grassland	Within the Peninsula watershed or other parts of San Mateo County and San Francisco

SOURCE: SFPUC, 2006c.

The San Francisco Planning Department recently began environmental review of the HRP, and the SFPUC is currently designing the program with the intent of initiating habitat enhancement, restoration, creation, and preservation before or concurrent with the WSIP project activities, and in advance of impacts where possible. The HRP schedule includes environmental review from 2007 to 2008, habitat creation and/or enhancement and negotiation of conservation easements between 2008 and 2010, and monitoring extending from 2009 to 2010 and longer.

Chapter 6 of this PEIR describes mitigation measures for WSIP impacts on biological resources, and the HRP is identified as a potential approach to mitigating WSIP impacts on biological resources. However, CEQA environmental review of the HRP must be completed before the SFPUC can approve and implement the HRP. Once the HRP is approved, the SFPUC can then implement it and apply any habitat creation and/or enhancement towards habitat compensation requirements of WSIP-related mitigation measures as approved by the appropriate regulatory agencies. Otherwise, in the absence or delayed approval of the HRP, where necessary, the SFPUC will develop and implement appropriate habitat compensation mitigation for individual WSIP projects.

3.13 Required Actions and Approvals

The following list sets forth the approvals necessary for overall adoption and approval of the WSIP as described in this chapter, including adoption of the proposed levels of service and water supply option, and general approval of the facility improvement projects.

Each of the individual WSIP facility improvement projects will undergo project-level CEQA review, and CEQA documents developed through those reviews will identify needed approvals by local, state, and federal agencies for individual projects. Table C.6 of Appendix C presents the specific permits and approvals that could be required for individual projects as well as interested agencies that have requested early consultation and coordination with the SFPUC. Several projects are expected to require U.S. Department of the Army permits to comply with the Clean Water Act, which, in turn, will require compliance with the Federal Endangered Species Act, the Clean Water Act Section 401, and the National Historic Preservation Act. Several projects are expected to require Streambed Alteration Agreements from the California Department of Fish and Game and compliance with the California Endangered Species Act. When individual projects undergo CEQA review, the project's environmental documentation will provide more detailed and up-to-date information on the required approvals and need for consultation with interested agencies. The approval and adoption of the overall WSIP as a program and policy are distinct actions from the approvals for individual facility improvement projects.

Approvals and actions applicable to the overall WSIP include:

- *San Francisco Planning Commission*
  - Certifies Final PEIR on the WSIP

- *San Francisco Public Utilities Commission*
  - Reviews Final PEIR and adopts CEQA findings and mitigation monitoring and reporting program
  - Approves and adopts WSIP
- *San Francisco Board of Supervisors*
  - Hears and decides any appeals of the Planning Commission's certification of the Final PEIR

Local, state and federal agency approvals for individual facility improvement projects are listed in Appendix C, Table C.6. Implementation of the WSIP could involve the following additional discussion and actions by the agencies listed below:

- *San Francisco Public Utilities Commission*
  - Approves any water transfer agreements with the Turlock and Modesto Irrigation Districts or other agencies
  - Approves contracts for construction of WSIP facility improvement projects
  - Approves operating agreements for the Westside Basin conjunction-use program
  - Reviews its cost of utility service annually and revises its rate schedules applicable to retail water sales as required[27]
  - Approves any water sales agreements with SFPUC wholesale and retail customers
- *San Francisco Planning Department/Planning Commission*
  - Conducts ongoing environmental review of individual facility improvement projects as well as compliance with mitigation and monitoring reporting program during WSIP implementation
  - Makes determinations of consistency with the San Francisco General Plan, if needed, for projects requiring certain approvals by the Board of Supervisors
- *San Francisco Board of Supervisors*
  - Appropriates funding for implementation of the WSIP projects, including general obligation bond monies and annual budget appropriations
  - May reject rates and charges that the SFPUC establishes for water customers by resolution within 30 days of adoption by the SFPUC
  - Considers appeals of EIR certifications and negative declaration approvals by the San Francisco Planning Department
- *State Water Resources Control Board*
  - Reviews and authorizes any transfer under a post-1914 water right that may be necessary to implement long-term water transfers with the Turlock or Modesto Irrigation Districts

[27] Retail water sales include sales to Lawrence Livermore National Laboratory, the Town of Sunol, and approximately 190 other retail customers (see list of major water customers in Table 3.1). The SFPUC sells water to Groveland Community Services District under the terms of a 1984 contract that allows the water rate to be adjusted every four years.

- *Turlock and Modesto Irrigation Districts*
  - Review and approve water transfer agreements with the SFPUC and/or amendments to the SFPUC's water bank account in Don Pedro Reservoir
- *SFPUC wholesale and retail water customers*
  - Approves any agreements between SFPUC and individual wholesale and retail customers
- *Daly City, California Water Service Company's South San Francisco service area, and San Bruno*
  - Approves operating agreement(s) for the Westside Basin conjunctive-use program (Regional Groundwater Projects, part of SF-2), including approval of new system wells

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WATER SYSTEM IMPROVEMENT PROGRAM

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4.1 Overview

CHAPTER 4

WSIP Facility Projects – Setting and Impacts

Chapter 4 Sections

4.1 Overview

This chapter addresses the Water System Improvement Program (WSIP) facility improvement projects described in Chapter 3, Section 3.9, and provides a program-level evaluation of the potential environmental impacts of constructing and operating each of the 22 regional WSIP facility projects. This overview section describes key aspects of the approach to analysis that applies to the program-level impact evaluation of WSIP facility projects.

This chapter focuses only on the WSIP projects and does not address the effects of the proposed WSIP water supply and system operations through 2030, which are evaluated separately in Chapter 5. Chapter 5 addresses the effects of the proposed water supply and system operations on the Tuolumne River system, Alameda Creek system, Peninsula system, and Westside Basin Groundwater Resources.

The Chapter 4 impact analysis is based on preliminary information about the individual projects that are proposed for implementation following approval of the WSIP. The project information presented is conceptual in nature, based on readily available information about the projects, types of facilities proposed, and their general site locations. This level of information is appropriate for this programmatic analysis of these projects. This chapter identifies the general types of impacts that could be expected to result from the individual projects, based on existing project information. The information about the individual projects continues to evolve as data about the project sites, design, operation, and effects are refined. All projects will be examined in more detail at the project level. If the individual WSIP projects have additional significant impacts that were not addressed in this Program EIR, the San Francisco Planning Department will prepare EIRs or negative declarations to examine the site-specific and project-specific effects of the individual projects. More detailed information about the individual projects (i.e., construction plans as well as siting and operational details) will be considered in the project-level environmental documents.

Sections 4.2 through 4.15 present program-level impacts associated with each WSIP facility project by environmental resource topic. Section 4.16 presents combined or collective impacts resulting from implementation of multiple WSIP facility projects, also organized by environmental resource topic. Section 4.17 presents cumulative impacts resulting from implementation of the WSIP as a whole in conjunction with other cumulative development.

Scope of the WSIP Facility Impact Analysis

This program-level impact analysis identifies the potential environmental effects of the individual WSIP projects based on general information about each project and project site(s). To date, many of the WSIP projects have been developed at the conceptual level only and only some projects have more detailed siting and design information. Accordingly, this program-level evaluation addresses all projects from a broad, overview perspective. It does not provide detailed, site-specific impact assessment of each project, but rather frames the nature and magnitude of the expected environmental impacts associated with the proposed WSIP projects. Based on these impacts, Chapter 6 identifies the appropriate program-level mitigation measures in general terms; these measures would be refined to specifically apply to each project as the projects are further developed.

Since there are undetermined aspects of many of the WSIP projects at this stage of program planning, this Program Environmental Impact Report (PEIR) errs on the conservative side of impact significance determination and assumes that separate, project-level California Environmental Quality Act (CEQA) review would confirm the existing conditions and degree of impact. The San Francisco Public Utilities Commission (SFPUC) is conducting detailed project development studies on many of the WSIP projects concurrent with preparation of the PEIR. For many of the WSIP projects, project-level CEQA review is being conducted or will be conducted as appropriate to provide additional information and analyses and further address the site-specific impacts outlined in this PEIR. The project-level analyses will consider whether additional project information changes the environmental impact determinations contained in the PEIR about the individual project, and whether the programmatic mitigation measures identified in this PEIR should be refined. Both project-level EIRs and negative declarations are being prepared or will be prepared for many of the WSIP projects. All projects will be assessed to determine whether additional environmental review is required.

[Additional discussion on the appropriate level of detail for environmental analysis was prepared in response to comments on the Draft PEIR. Please refer to Section 14.4, Master Response on PEIR Appropriate Level of Analysis (Vol. 7, Chapter 14).]

Study Area for WSIP Regional Facility Projects

The study area applicable to the WSIP facility projects discussed in this chapter extends from Oakdale Portal on the SFPUC regional water system, which is the easternmost location of any of the WSIP projects (i.e., the San Joaquin Pipeline System project, SJ-3), westward along the regional water system to San Francisco, which is the westernmost location of the WSIP projects. The study area for the WSIP facility projects includes the five regions described in Chapter 2, Section 2.2 and shown in Figure 2.1: the San Joaquin (SJ), Sunol Valley (SV), Bay Division (BD), Peninsula (PN), and San Francisco (SF) Regions (there are five regional WSIP projects located in both San Francisco and northern San Mateo County, overlapping with parts of the Peninsula Region). No WSIP facility projects are proposed east of Oakdale Portal in the Hetch Hetchy region of the regional system, so no discussion of this eastern region is provided in this chapter. The locations of the WSIP projects are shown in Figures 3.5a and 3.5b.

In a few instances (i.e., Section 4.15, Energy Resources, and Section 4.16, Collective Impacts Related to WSIP Facilities), the impact analysis addresses impacts of the *program area* rather than the *study area*. The program area encompasses the entire area affected by the WSIP, from Hetch Hetchy Reservoir to San Francisco.

WSIP Project Names

Chapter 3, Table 3.10, describes each WSIP project and gives the complete project name and number. Throughout this chapter, the WSIP project names are abbreviated and the project number is also referenced. To aid the PEIR reader, a complete WSIP project list is presented as **Figure 4.1-1**. The list gives the full project names, abbreviated project names, and reference numbers and is organized by region.

Proposed Project Sites

The impact analysis in this PEIR is based on project description information provided by the SFPUC with respect to facility location and conceptual project construction and operation scenarios for each of the projects. This information is summarized in Chapter 3 and further detailed in Appendix C.

In cases where the SFPUC has chosen a preferred site location for a particular project, each section in this chapter evaluates the impacts of the WSIP facility improvement projects at their preferred site locations (as listed in Table 3.12 in Chapter 3). Some WSIP projects have alternative locations (specified in Tables 3.10 and 3.11); impacts associated with potential project development at these alternative locations are not evaluated in this PEIR, although generic impacts for each type of facility that could apply to the alternative sites are described. Project location alternatives and alternative site design and layout would be evaluated as appropriate in the project-level CEQA evaluations for select WSIP projects. For some WSIP projects, specific project locations have not yet been developed. In these cases, the program-level analysis considers the range of alternatives presented and a reasonable worst-case scenario regarding the potential environmental impacts that could occur.

GUIDE TO NAMES AND NUMBERS OF WSIP FACILITY IMPROVEMENT PROJECTS

SAN JOAQUIN REGION

No.	Project Title	Abbreviated Project Title
SJ-1	Advanced Disinfection	Advanced Disinfection
SJ-2	Lawrence Livermore Supply Improvements	Lawrence Livermore
SJ-3	San Joaquin Pipeline System	SJPL System
SJ-4	Rehabilitation of Existing San Joaquin Pipelines	SJPL Rehabilitation
SJ-5	Tesla Portal Disinfection Station	Tesla Portal Disinfection

SUNOL VALLEY REGION

No.	Project Title	Abbreviated Project Title
SV-1	Alameda Creek Fishery Enhancement	Alameda Creek Fishery
SV-2	Calaveras Dam Replacement	Calaveras Dam
SV-3	Additional 40-mgd Treated Water Supply	40-mgd Treated Water
SV-4	New Irvington Tunnel	New Irvington Tunnel
SV-5	SVWTP – Treated Water Reservoirs	Treated Water Reservoirs
SV-6	San Antonio Backup Pipeline	SABUP

BAY DIVISION REGION

No.	Project Title	Abbreviated Project Title
BD-1	Bay Division Pipeline Reliability Upgrade	BDPL Reliability Upgrade
BD-2	BDPL Nos. 3 and 4 Crossovers	BDPL 3 and 4 Crossovers
BD-3	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault	BDPL 3 and 4 Seismic Upgrade at Hayward Fault

PENINSULA REGION

No.	Project Title	Abbreviated Project Title
PN-1	Baden and San Pedro Valve Lots Improvements	Baden and San Pedro Valve Lots
PN-2	Crystal Springs / San Andreas Transmission Upgrade	CS/ SA Transmission
PN-3	HTWTP Long-Term Improvements	HTWTP Long-Term
PN-4	Lower Crystal Springs Dam Improvements	Lower Crystal Springs Dam
PN-5	Pulgas Balancing Reservoir Rehabilitation	Pulgas Balancing Reservoir

SAN FRANCISCO REGION

No.	Project Title	Abbreviated Project Title
SF-1	San Andreas Pipeline No. 3 Installation	SAPL 3 Installation
SF-2	Groundwater Projects	Groundwater Projects
SF-3	Recycled Water Projects	Recycled Water Projects

SOURCE: ESA + Orion, 2007

Figure 4.1-1
Guide to Names and Numbers of WSIP Facility Improvement Projects

Impact Significance Determinations

The impact significance criteria used in this PEIR are based on San Francisco Planning Department Major Environmental Analysis (MEA) guidance regarding the environmental effects to be considered significant. MEA guidance is, in turn, based on the CEQA Guidelines Appendix G with some modifications. In cases where potential environmental issues associated with the WSIP are identified but are not clearly addressed by MEA's guidance, additional impact significance criteria are presented. Appendix B of this PEIR presents the MEA Initial Study checklist as applied to the WSIP, and indicates the criteria applicable to the WSIP and discussed in the PEIR. The significance criteria used for each environmental topic/resource area are presented in each section of Chapter 4 following the setting and before the discussion of impacts.

For the impact analyses, the following categories are used to determine impact significance:

> **Not Applicable (N/A).** An impact is considered not applicable to a WSIP project if there is no potential for impacts or the environmental resource does not occur within the project area or the area of potential effect. For example, an impact on a biological resource may not be applicable to some projects if there are no biological resources within the construction or operation zone that could be affected by the project.
>
> **Less than Significant (LS).** This determination applies if there is a potential for some limited impact, but not a substantial adverse effect that qualifies under the significance criteria as a significant impact.
>
> **Less than Significant with Program-Level Mitigation (LSM).** This determination applies to the collective impact analysis only. It indicates a potential for some limited impact after implementation of program-level mitigation measures (those numbered 4.3-1 through 4.15-2, as listed in Chapter 6), but not a substantial adverse effect that qualifies under the significance criteria as a significant impact.
>
> **Potentially Significant, Mitigatable (PSM).** This determination applies if there is the potential for a substantial adverse effect that meets the significance criteria, but mitigation is available to reduce the impact to a less-than-significant level. The impact is labeled "potentially" significant because there is not enough site-specific information at the program level of analysis to determine definitively that it is significant. The impacts identified as "potentially significant" are treated as significant impacts in this PEIR. Separate, project-level CEQA evaluation of the WSIP projects could confirm that the impact is significant for that project or document that the impact is less than significant.
>
> **Potentially Significant, Unavoidable (PSU).** This determination applies to impacts that are significant but for which there appears to be no feasible mitigation available to reduce the impacts to a less-than-significant level. There might be some mitigation available to lessen the impact, but the residual effect remains significant and therefore unavoidable. The impact is labeled "potentially" significant and unavoidable because there is not enough site-specific information at the program level of analysis to determine definitively that it is significant or that mitigation could sufficiently reduce the severity of the impact. When project design or location information is not available at this stage of project planning, the PEIR errs on the conservative side and also applies this determination. The impacts identified as "potentially significant and unavoidable" are treated as significant and

unavoidable impacts in this PEIR. Under both these circumstances, separate, project-level CEQA evaluation of the WSIP projects could confirm that the impact is, in fact, significant and unavoidable for a specific WSIP project or document that the impact is significant but can be mitigated to a less-than-significant level. This determination is also applied if the feasibility of the mitigation is contingent on review and approval by other jurisdictional agencies (i.e., mitigation feasibility is outside SFPUC control).

Significant Unavoidable (SU). This applies to impacts that are significant but for which there appears to be no feasible mitigation available to reduce the impact to a less-than-significant level. The word "potentially" is not used for select impacts where it can be determined during this PEIR process that: (1) the impact would occur, and (2) the impact could not be mitigated to a less-than-significant level.

In determining the significance of a potential WSIP impact, the analysis first describes the nature, magnitude, and severity of a potential effect and determines whether it is potentially significant, less than significant, or not applicable for each WSIP project. The PEIR significance determinations err on the conservative side, since the impact analyses at the program level must generalize the types and classes of impacts as well as the feasibility of mitigation measures to reduce impacts to a less-than-significant level. The feasibility of mitigation measures varies based on project design and existing conditions at each project site. Also, the PEIR conservatively determines impacts to be potentially significant when there is a potential for a specific resource to be affected, even though the presence or absence of the resource has not been determined at this stage of project planning. For example, under Biological Resources, Cultural Resources, and Hazards (Sections 4.6, 4.7, and 4.14, respectively), the analysis indicates that some impacts are potentially significant and require mitigation, but this determination would only apply if the specified resource or condition is actually found to be present on the site. Site-specific conditions will be determined as part of a separate, project-level CEQA review conducted for each WSIP project. Therefore, significance determinations for a particular impact could change when more detailed project descriptions and site-specific information becomes available during these project-level reviews. This PEIR gives a broader overview of potential impacts that is appropriate for a program level of analysis.

As part of the significance determination process, the analysis evaluates whether there are applicable regulations requiring compliance with measures that could reduce a potentially significant impact to a less-than-significant level. If so, compliance with the regulation is assumed, and the impact is considered to be less than significant. The analysis also determines whether there is an applicable SFPUC Alameda or Peninsula Watershed Management Plan (WMP) policy or requirement for WSIP projects located within WMP boundaries. If they apply, compliance with the WMP policies/requirements is assumed, and the impact is considered to be less than significant.

The analysis also considers whether implementation of the SFPUC construction measures could avoid potential impacts. As described in Chapter 3, Section 3.11, the SFPUC has established 10 construction measures that are to be implemented as part of all of its projects. The main objective of these measures is to minimize potential disruption of surrounding neighborhoods during construction and to reduce impacts on existing resources to the extent feasible. Each

SFPUC project manager, environmental project manager, and contract manager would ensure that every project involving construction work contains uniform provisions to address these issues. The measures would apply to any construction activities that require environmental review and are conducted by SFPUC staff or by outside contractors under contract with the SFPUC. If the impact would be less than significant with implementation of the SFPUC construction measures, then no mitigation is identified. However, in most cases, the SFPUC construction measures are not detailed enough to ensure that impacts would be less than significant, so the PEIR identifies more specific mitigation measures that would need to be implemented, sometimes along with or as part of SFPUC construction measures, to ensure impacts are reduced to a less-than-significant level.

In cases where there are no applicable regulations or SFPUC construction measures, or such regulations and measures exist but by themselves would not reduce an impact to a less-than-significant level, then the impact is considered potentially significant. If there are feasible measures available that could reduce these potentially significant impacts to a less-than-significant level, then the impact is considered potentially significant but mitigatable (PSM), and the PEIR identifies mitigation measure(s) to address the potentially significant impact. Impacts described in this chapter are numbered so they can be cross-referenced to the mitigation measures presented in Chapter 6.

Within each section in this chapter, a summary table is included at the beginning of each impact discussion to summarize the potential impacts by project and indicate the level of impact significance. The impact discussion for the WSIP projects is organized by region, and impact significance determinations for each project are repeated in a table under each region for ease of reference. Impacts are numbered by section number, with the corresponding numbers used for mitigation measures in Chapter 6.

4.2 Plans and Policies

4.2 Plans and Policies

4.2.1 Overview

Pursuant to CEQA Guidelines Section 15125(d), Section 4.2 first describes land use plans and policies and the manner in which they apply to WSIP facility improvement projects (Section 4.2.2), and then discusses program consistency with applicable plans (Section 4.2.3). The focus of this section reflects the authority of the agencies discussed herein relative to the WSIP projects and, consequently, the applicability of their planning documents. As described in Chapter 3, Section 3.13, the agencies responsible for approving the overall WSIP and PEIR include the San Francisco Planning Commission, the SFPUC, and the San Francisco Board of Supervisors. Plans and policies addressed in this section include:

- *City and County of San Francisco*. San Francisco General Plan, Accountable Planning Initiative, San Francisco Sustainability Plan.
- *SFPUC*. Alameda and Peninsula Watershed Management Plans, Water Enterprise Environmental Stewardship Policy.
- *U.S. Department of the Interior*. Golden Gate National Recreation Area – Scenic Easement and Scenic and Recreation Easement.
- *Bay Conservation and Development Commission*. San Francisco Bay Plan.
- *Other Agencies*. Local general plans, other regional plans.

The analysis in this section complements that of Section 5.2, which focuses on plans and policies relevant to the effects of proposed changes in WSIP water supply and system operations. Sections 4.3 through 4.15 describe resource-specific plans (e.g., air quality management plans are discussed in Section 4.9, Air Quality; habitat conservation plans are discussed in Section 4.6, Biological Resources), and Chapter 7 describes plans and policies related to growth in population and employment.

4.2.2 Land Use Plans and Policies Potentially Relevant to WSIP Projects

City and County of San Francisco Plans and Policies

The City and County of San Francisco (CCSF) land use plans and policies are primarily applicable to projects within the jurisdictional boundaries of San Francisco, although in some cases they may apply to projects outside of San Francisco. The SFPUC is guided by the San Francisco City Charter along with other city plans and policies. These plans include the San Francisco General Plan, which sets forth the comprehensive, long-term land use policy for San Francisco, and the *San Francisco Sustainability Plan*, which addresses the long-term sustainability[1] of the city. In addition, the SFPUC has adopted various plans and policies that further direct its activities, including the Alameda and Peninsula Watershed Management Plans (WMPs) and the Water Enterprise Environmental Stewardship Policy.

Extraterritorial Lands

Under the San Francisco City Charter,[2] the SFPUC has authority over the management, use, and control of extraterritorial lands; that it, properties outside of the city that the CCSF owns or leases or over which it holds easements. Although the San Francisco General Plan and Sustainability Plan were developed for lands within the jurisdictional boundaries of San Francisco, their underlying goals apply to SFPUC projects on extraterritorial lands. The Alameda and Peninsula WMPs specifically apply to CCSF-owned extraterritorial lands in Alameda, Santa Clara, and San Mateo Counties.

San Francisco General Plan

The San Francisco General Plan sets forth the comprehensive, long-term land use policy for San Francisco. One of the basic goals of the general plan is “coordination of the growth and development of the city with the growth and development of adjoining cities and counties and of the San Francisco Bay Region.” The general plan consists of 10 issue-oriented plan elements—Air Quality, Arts, Commerce and Industry, Community Facilities, Community Safety, Environmental Protection, Housing, Recreation and Open Space, Transportation, and Urban Design. The plan elements that may be relevant to the WSIP facility improvement projects are briefly described below (CCSF, 1988).

Air Quality Element

This element promotes the goal of clean air planning through objectives and policies aimed at adherence to air quality regulations, focusing development near transit services, and advocating alternatives to the private automobile.

Commerce and Industry Element

This element serves as a guide for decisions related to economic growth and change in San Francisco. The three goals of the element—continued economic vitality, social equity (with respect to employment opportunities), and environmental quality—address general citywide objectives as well as objectives for each of the major sectors of San Francisco’s economy.

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1 Sustainability or sustainable development can be defined as development that meets the needs of the present without compromising the ability of future generations to meet their needs.

2 Section 8B.121 of the City Charter provides that “. . . the Public Utilities Commission shall have exclusive charge of the construction, management, supervision, maintenance, extension, expansion, operation, use and control of all water, clean water and energy supplies and utilities of the City as well as the real, personal and financial assets, that are under the Commission’s jurisdiction or assigned to the Commission under Section 4.132.”

Community Safety Element

This element addresses the potential for geologic, structural, and nonstructural hazards to affect CCSF-owned structures and critical infrastructure. The goal of this element is to protect human life and property from hazards.

Environmental Protection Element

This element addresses the impact of urbanization on the natural environment. The element promotes the protection of plant and animal life and fresh water sources; it also speaks to the responsibility of San Francisco to provide a permanent, clean water supply to meet present and future needs and to maintain an adequate water distribution system.

Urban Design Element

This element promotes the preservation of landmarks and structures with notable historic, architectural, or aesthetic value.

Recreation and Open Space Element

This element contains objectives and policies related to maintaining, creating, and enhancing recreational and open space resources.

The San Francisco General Plan also contains area plans that cover specific geographic areas within the city. One of the area plans, the *Western Shoreline Plan*, covers the western shoreline of San Francisco and includes the location of proposed WSIP facilities in the San Francisco Region (Groundwater Projects, SF-2; Recycled Water Projects, SF-3). The *Western Shoreline Plan* includes the Local Coastal Program under the California Coastal Act of 1976. This area plan addresses objectives to preserve open space, improve public access to the shoreline, and enhance recreation for 10 subareas, including Golden Gate Park, the San Francisco Zoo, and Lake Merced.

Two other San Francisco planning documents that pertain to the western shoreline area could be relevant to WSIP facilities. The *San Francisco Zoo Master Plan* contains polices that address water supply and distribution facilities. This plan calls for developing new irrigation water supplies and improving and maintaining the existing well system. The *Golden Gate Park Master Plan* (adopted by the San Francisco Recreation and Park Commission in October 1998) is intended to "provide a framework and guidelines to ensure responsible and enlightened stewardship of the park." The goal of this plan is to "manage the current and future park and recreation demands while preserving the historic significance of the park." The plan identifies objectives and policies for park landscape, circulation, recreation, visitor facilities, buildings and monuments, utilities and infrastructure, maintenance and operations areas, park management, park funding, and special area plans.

Accountable Planning Initiative

In November 1986, the voters of San Francisco approved Proposition M, the Accountable Planning Initiative, which added Section 101.1 to the City Planning Code to establish eight Priority Policies. These policies are as follows:

1. Existing neighborhood-serving retail uses shall be preserved and enhanced and future opportunities for resident employment in and ownership of such businesses enhanced.

2. Existing housing and neighborhood character shall be conserved and protected in order to preserve the cultural and economic diversity of our neighborhoods.

3. The City's supply of affordable housing shall be preserved and enhanced.

4. Commuter traffic shall not impede Muni transit service or overburden our streets or neighborhood parking.

5. A diverse economic base shall be maintained by protecting our industrial and service sectors from displacement due to commercial office development, and future opportunities for resident employment and ownership in these sectors shall be enhanced.

6. The City shall achieve the greatest possible preparedness to protect against injury and loss of life in an earthquake.

7. Landmarks and historic buildings shall be preserved.

8. Parks and open space and their access to sunlight and vistas shall be protected from development.

In accordance with the Accountable Planning Initiative, prior to issuing a permit for any project, or adopting legislation that requires an initial study under CEQA, or adopting any zoning ordinance or development agreement, and before taking any action that requires a finding of consistency with the general plan, the CCSF is required to find that the project is consistent with the Priority Policies established by Proposition M.

San Francisco Sustainability Plan

The San Francisco Board of Supervisors endorsed the *San Francisco Sustainability Plan* in 1997, but has not committed the CCSF to perform the actions addressed in the plan. The plan serves as a blueprint for sustainability, with many of its individual proposals requiring further development and public comment. The underlying goals of the plan are to maintain the physical resources and systems that support life in San Francisco and to create a social structure that will allow such maintenance. The plan is divided into 15 topic areas, 10 that address specific environmental issues (air quality; biodiversity; energy, climate change, and ozone depletion; food and agriculture; hazardous materials; human health; parks, open spaces and streetscapes; solid waste; transportation; and water and wastewater), and five that are broader in scope and cover many issues (economy and economic development, environmental justice, municipal expenditures, public information and education, and risk management). Under the topic "water" are goals addressing water reuse, water quality, water supply, groundwater supply, and infrastructure. Each topic area in the plan contains a set of indicators to be used over time in determining whether San Francisco is moving in a sustainable direction in that particular area (CCSF, 1997).

San Francisco Municipal Green Building Program

San Francisco's Green Building Program was founded in 1999 when the CCSF adopted the Resource Efficient Building Ordinance, which established green building standards for municipal buildings to increase energy efficiency, conserve CCSF finances, reduce the environmental impacts of demolition, construction, and operation of buildings, and create safe workplaces for CCSF employees and visitors. The ordinance created the inter-departmental Resource Efficient Building (REB) Task Force and charged the San Francisco Department of Environment with implementing the ordinance in partnership with the Department of Public Works and other REB Task Force departments. In 2004, amendments to Chapter 7 of the Environment Code set LEED (Leadership in Energy and Environmental Design) Silver Certification by the U.S. Building Council as the minimum environmental performance requirement for all municipal projects over 5,000 square feet. The REB Task Force assists City departments in compliance with the LEED Silver Certification requirement and helps to determine which projects are applicable for LEED ratings. For all municipal construction projects, including those projects that do not involve buildings and are not required to obtain LEED Silver Certification, the REB Task Force provides recommended best practices and sample specifications for building materials (e.g. recycled content of steel and concrete) (SF Dept of Environment, 2004-2007).

SFPUC Plans and Policies

The SFPUC adopted the Alameda and Peninsula WMPs in 2000 and 2001, respectively. In 2006, the SFPUC adopted the Water Enterprise Environmental Stewardship Policy.

Alameda and Peninsula Watershed Management Plans

As described in Chapter 2, Section 2.3.8, the SFPUC has adopted watershed management plans (CCSF, 2001, 2002) for CCSF-owned lands in the Alameda and Peninsula watersheds to provide a policy framework for the SFPUC to make decisions about activities that are appropriate on watershed lands. The plans provide goals, policies, and management actions that address watershed activities and reflect the unique qualities of each watershed. The WMPs are also intended for use by the SFPUC as watershed management implementation guidelines. Watershed lands are managed by the SFPUC Natural Resources Division, Watershed Resources Management Section.

As part of implementation of the WMPs, the SFPUC reviews all plans, projects, and activities that occur within the Alameda and Peninsula watersheds for conformity with the management plans and for compliance with environmental codes and regulations. To accomplish this, the SFPUC has established a project review team with members from various SFPUC departments as well as the City Attorney's office. Appropriate SFPUC personnel review proposals for new facilities, structures, roads, trails, projects, and leases or for improvements to existing facilities. Projects subject to this review include those that involve construction, digging or earthmoving, clearing, installation, use of hazardous materials, or other disturbance to watershed resources. In addition, projects that involve the issuance of new or revised leases and permits are subject to this review procedure.

For both WMPs, the SFPUC considers water quality protection as the first and foremost goal. The goals and policies are organized around the primary goal of water quality protection and secondary goals pertaining to water supply, natural resources, watershed protection, land use compatibility, fiscal management, and public awareness. The primary and secondary goals common to both watershed management plans are as follows:

- *Primary Goal*: Maintain and improve source water quality to protect public health and safety.
- *Secondary Goals*:
  - Maximize water supply.
  - Preserve and enhance the ecological and cultural resources of the watershed.
  - Protect the watersheds, adjacent urban areas, and the public from fire and other safety hazards.
  - Continue existing compatible uses and provide opportunities for potential compatible uses on watershed lands, including educational, recreational, and scientific uses.

- Provide a fiscal framework that balances financial resources, revenue-generating activities, and overall benefits and an administrative framework that allows implementation of the watershed management plans.
- Enhance public awareness of water quality, water supply, conservation, and watershed protection issues.

Water Enterprise Environmental Stewardship Policy

Adopted in June 2006, the Water Enterprise Environmental Stewardship Policy established the long-term management direction for CCSF-owned lands and natural resources affected by operation of the SFPUC water system within the Tuolumne River, Alameda Creek, and Peninsula watersheds (SFPUC, 2006). It also addresses rights-of-way and properties in urban surroundings under SFPUC management. The policy includes the following:

- The SFPUC will proactively manage the watersheds under its responsibility in a manner that maintains the integrity of the natural resources, restores habitats for native species, and enhances ecosystem function.

- To the maximum extent practicable, the SFPUC will ensure that all operations of the SFPUC water system (including water diversion, storage, and transport), construction and maintenance of infrastructure, land management policies and practices, purchase and sale of watershed lands, and lease agreements for watershed lands protect and restore native species and the ecosystems that support them.

- Rights-of-way and properties in urban surroundings under SFPUC management will be managed in a manner that protects and restores habitat value where available, and encourages community participation in decisions that significantly interrupt or alter current land use in these parcels.

The Environmental Stewardship Policy calls for implementation and update of the Alameda and Peninsula WMPs (described above), development of habitat conservation plans for the Alameda and Peninsula watersheds (described in Section 4.6, Biological Resources), and development and implementation of the Watershed and Environmental Improvement Program (described in Chapter 3, Section 3.12, WSIP-Related Activities), as well as specific integration of this policy into the WSIP and individual infrastructure projects.

Other Land Use Plans and Policies

In some portions of the WSIP study area, the SFPUC may be subject to certain provisions of the land use plans and policies of other agencies, such as the U.S. Department of the Interior and the National Park Service (NPS), which hold easements over some SFPUC property. Several federal, state, and regional agencies have adopted land use plans that establish guidelines regarding appropriate land uses and activities within the boundaries of their respective plans. Federal, state, and regional plans that are applicable to the WSIP are described below.

U.S. Department of the Interior, Golden Gate National Recreation Area – Scenic Easement and Scenic and Recreation Easement

In 1969, the CCSF granted two easements over the vast majority of the Peninsula watershed to the Department of the Interior. The easements were granted to the federal government in order to obtain a change in the route of Interstate 280 (I-280) (and an increase in the federal share of costs) to a less environmentally damaging location further east of Crystal Springs Reservoir. The approximately 19,000-acre Scenic Easement covers the lands west of Crystal Springs and San Andreas Reservoirs. The approximately 4,000-acre Scenic and Recreation Easement applies to lands in the vicinity of I-280. The CS/SA Transmission project (PN-2), Lower Crystal Springs Dam project (PN-4), and the Pulgas Channel and sediment catch basin components of the Pulgas Balancing Reservoir project (PN-5) are within the Scenic Easement, while the Pulgas Balancing Reservoir itself is within the Scenic and Recreation Easement. The easements cover nearly all of the CCSF-owned Peninsula watershed lands and place restrictive covenants on use of the lands that are unrelated to the SFPUC's overall management of the land for utility purposes. The provisions of the easement include:

1. The land shall be preserved in its present natural state and shall not be used for any purpose other than for the collection, storage and transmission of water and protection of water quality, and other purposes which shall be compatible with said use and preserving said land as open-space land;

2. No structures shall be erected upon said land except such structures as may be directly related to and compatible with the aforesaid uses. No trailer shall be placed, used or maintained on said land as a substitute for a caretaker's residential building. The design and location of all buildings except water utilities buildings and appurtenances, shall be subject to the concurrence of a regional representative of the Department of the Interior to be designated by the Secretary of the Interior;

3. No signs, billboards, or advertisements excepting directional signs and identification signs in connection with permitted uses, shall be displayed or placed upon the land;

4. Except as required to accomplish the improvements hereinafter permitted or as otherwise permitted to the Grantor hereunder, the general topography of the landscape shall be maintained in its present condition and no substantial excavation or topographic changes shall be made without the concurrence of a regional representative of the Department of the Interior to be designated by the Secretary of the Interior; and

5. Except as required to accomplish the purposes and uses herein permitted to Grantor, there shall be no cutting or permitting of cutting, destroying or removing any timber or brush without the concurrence in writing by a regional representative of the Department of the Interior to be designated by the Secretary of the Interior.

In 1980, Congress transferred responsibility for administration of the easements to the National Park Service/Golden Gate National Recreation Area (NPS/GGNRA). The legislation provides that the terms of the easements are to be administered by the NPS. The Peninsula watershed is not part of a national park or recreation area *per se*, as the CCSF retains ownership of the land and the NPS has only a limited interest. The NPS can object to development unrelated to utility management or other uses not permitted by the terms of the easements.

California Department of Fish and Game, Game Refuge Designation

In 1931, at the request of the SFPUC (then the San Francisco Water Department), the California Department of Fish and Game (CDFG) designated the Peninsula watershed as a game refuge. Pursuant to Section 10500 et seq. of the California Fish and Game Code, the "taking"[3] of birds or mammals or the use of firearms (or other weapons used for the purpose of taking birds or mammals) within the Peninsula watershed is prohibited without specific authorization.

San Francisco Bay Conservation and Development Commission, San Francisco Bay Plan

The San Francisco Bay Plan (SF Bay Plan), prepared by the San Francisco Bay Conservation and Development Commission (BCDC) in 1968 in accordance with the McAteer-Petris Act of 1965, is an enforceable plan that guides the protection and use of San Francisco Bay and its shoreline. Under the McAteer-Petris Act, BCDC has the authority to issue or deny permit applications for placing fill, extracting materials, or changing the use of any land, water, or structure within the area of its jurisdiction and to enforce policies aimed at protecting the bay and its shoreline.[3a] The SF Bay Plan designates shoreline areas that should be reserved for water-related purposes like ports, industry, public recreation, airports, and wildlife refugees. Since its adoption by BCDC in 1968, the SF Bay Plan has been amended periodically to keep pace with changing conditions and to incorporate new information concerning the bay. The new Bay Division Pipeline Tunnel No. 5 proposed under the BDPL Reliability Upgrade project (BD-1) includes approximately five miles of tunnel under the Don Edwards San Francisco Bay Wildlife Refuge, Newark Slough, and San Francisco Bay. The pipeline would be buried between 100 and 150 feet below mean sea level and result in approximately 355,000 cubic yards of bay mud excavation/spoils. As a result, this project could be subject to SF Bay Plan policies concerning the placement of fill in the bay, dredging, public access, and other policies and provisions contained in the SF Bay Plan (BCDC, 2005), depending on the final siting, construction, and operation of the BDPL Reliability Upgrade project.

Other Jurisdictions, General Land Use Plans[4]

General plans are long-range policy documents to guide the use and future development of private and public lands within the boundaries of a city or county. General plans represent a jurisdiction's official position on issues such as development and resource management.

[3] The term "taking" means to kill, harass, or disturb species or their habitats.

[3a] BCDC has jurisdiction over all of San Francisco Bay up to mean high tide, areas of marsh up to 5 feet above mean sea level, a shoreline band lying 100 feet inland from the bay, as well as salt ponds, managed wetlands, and certain waterways.

[4] A variety of local general plans were reviewed in the preparation of this section. See City of Brisbane, 1994; City of Burlingame, 1969; City of Daly City, 1989; City of Daly City, 1987; City of East Palo Alto, 1999; City of Fremont, 1991; City of Hillsborough, 2005; City of Los Altos, 2002; City of Menlo Park, 1994; City of Millbrae, 1998; City of Milpitas, 1997; City of Modesto, 1997; City of Mountain View, 1992; City of Newark, 1992; City of Palo Alto, 1998; City of Redwood City, 1990; City of Riverbank, 1987; City of San Bruno, 1984; City of San Carlos, 1992; City of San Jose, 1994; City of San Mateo, 1990; City of Santa Clara, 2002; City of South San Francisco, 1999; City of Sunnyvale, 1993a; City of Sunnyvale, 1993b; Alameda County, 1975; Alameda County, 1976; San Joaquin County, 1991; San Mateo County, 1986; Santa Clara County, 1994; Stanislaus County, 1994; Tuolumne County, 1996; Town of Colma, 1987; Town of Woodside, 1988.

California planning law (Government Code Sections 65302–65303) requires that each city or county in the state develop and adopt a general plan that addresses the following subjects: land use, circulation, housing, conservation, open space, safety, and noise. In essence, general plans represent the visions of local governments for their communities' future, and provide the policy framework intended to realize those visions.

Figure 4.2-1 shows the counties, unincorporated areas, and local city jurisdictions in which WSIP facilities would be constructed, repaired, upgraded, or replaced. The following factors affect the application of these communities' general plans to the WSIP:

- *Local Agency Project Approval*. No local agency approvals would be needed for adoption of the overall WSIP (see Section 3.13, Chapter 3). Individual projects could, in select cases, require encroachment permits from local agencies. Separate, project-level CEQA review of the individual WSIP projects will provide more detailed and up-to-date information on the approvals required for each project.

- *Building and Zoning Ordinances*. Building and zoning ordinances represent the most specific expressions of general plan goals, objectives, and policies. State law and judicial interpretation of state law[5] mutually exempt cities and counties from complying with each other's building and zoning ordinances. The SFPUC, which is part of the CCSF, is therefore exempt from complying with the building and zoning ordinances of other cities and counties. This same state law also exempts public utilities and special-purpose local agencies (such as water districts) from complying with local building and zoning ordinances when locating or constructing facilities for the production, generation, storage, treatment, or transmission of water.

- *Local Government Notification and Consistency Determination Requirements*. California Government Code Section 65402(b) requires that the SFPUC inform cities and counties of its plans to construct projects or acquire or dispose of extraterritorial property. The local governments have 40 days to determine project consistency with their general plans; these consistency determinations are advisory to the SFPUC rather than binding. Approval of the WSIP would not trigger the requirements of Section 65402(b), but implementation of the individual WSIP projects would. The SFPUC would notify local governments of WSIP facilities to be constructed, repaired, upgraded, or replaced within the city or county as part of any project-level CEQA process. Prior to project implementation, local governments would be notified pursuant to California Government Code Section 65402(b).

Notwithstanding the above, where CCSF-owned facilities are sited outside of San Francisco, the SFPUC seeks to work cooperatively with local jurisdictions to avoid conflicts with local land use plans and building and zoning codes. For the WSIP, a key issue for local agencies that receive SFPUC water is whether the WSIP adequately addresses community goals regarding water service for existing and future land uses. The cities and counties that receive all or part of their water supply from the SFPUC (not including the CCSF) include:

Atherton	East Palo Alto	Los Altos Hills	Pacifica	San Jose
Belmont	Foster City	Menlo Park	Palo Alto	San Mateo
Brisbane	Fremont	Millbrae	Portola Valley	Santa Clara
Burlingame	Half Moon Bay	Milpitas	Redwood City	South San Francisco
Colma	Hayward	Mountain View	San Bruno	Sunnyvale
Daly City	Hillsborough	Newark	San Carlos	Union City
				Woodside

5 California Government Code Section 53090 et seq.

The intent of the general plans prepared by these communities is to preserve and improve the quality of life for its citizens and to consider growth in a manner that appropriately reflects the community's values; an adequate, reliable water supply is a chief public service needed to accomplish these goals.

A second issue of importance to local agencies is whether implementation of the WSIP would be consistent with community goals regarding resource protection. **Table 4.2-1** presents an overview of general plan policies and goals that address the protection of environmental resources or the mitigation of environmental impacts. All of the issues identified in the table are addressed in this PEIR in one form or another; some specific policies are used as criteria to determine the significance of physical effects on the environment. **Table 4.2-2** lists the significance criteria that directly relate to consistency with plans and policies and indicates where in this chapter the reader can find the impact evaluation.

Habitat Conservation Plans

Habitat conservation plans provide comprehensive, long-term conservation measures for species listed as threatened or endangered under the California and Federal Endangered Species Acts, or for species that could be listed in the future. Section 4.6, Biological Resources, presents a discussion of habitat conservation plans relevant to the WSIP and addresses plan consistency.

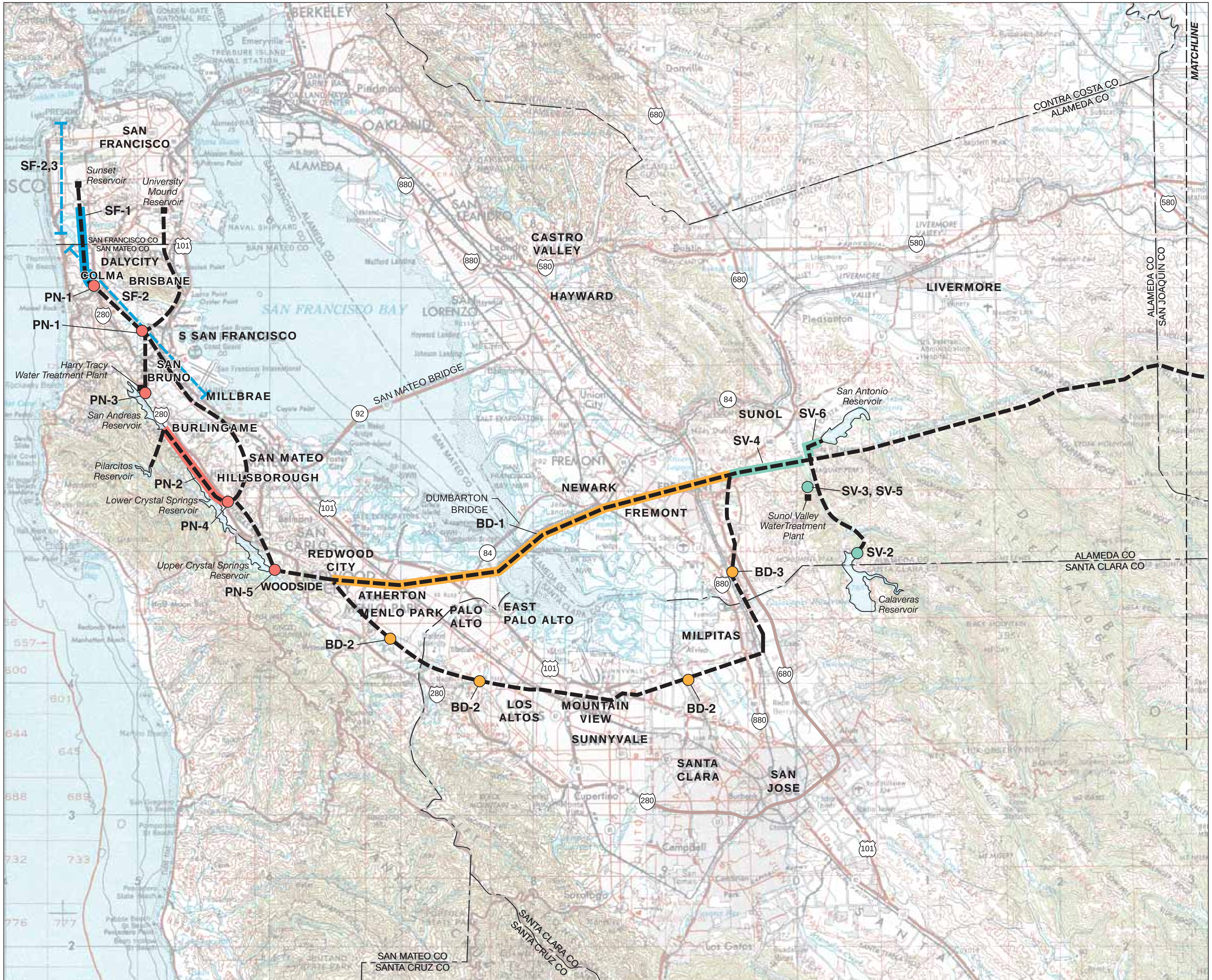
4.2.3 Plan Consistency Evaluation

The evaluation of plan consistency is based on the applicability of relevant land use plans and policies to the siting, construction, and operation of WSIP facilities. Because the policy language found in a land use plan is susceptible to varying interpretations, it is often difficult to determine whether a proposed project is consistent or inconsistent with such policies. Further, because land use plans often contain numerous policies emphasizing differing legislative goals, the WSIP projects may be consistent with a general plan, taken as a whole, even though they may appear to be inconsistent with specific policies within the plan. The board or commission that enacted the plan or policy generally determines the meaning of such policies; these interpretations prevail if they are "reasonable," even though other reasonable interpretations are also possible. In light of these considerations, the consistency evaluation in this PEIR represents the best attempt to advise the decision-makers as to whether the proposed program is consistent with applicable land use plans and policies.

Consistency with San Francisco Plans and Policies

San Francisco General Plan

As described above in Section 4.2.2, the San Francisco General Plan addresses elements such as air quality, community safety (including protection from geologic and seismic hazards), environmental protection (including protection of water resources, biological resources, and other natural resources as well as addressing construction-related noise and ambient air quality), and urban design (including protection of historic and visual resources).



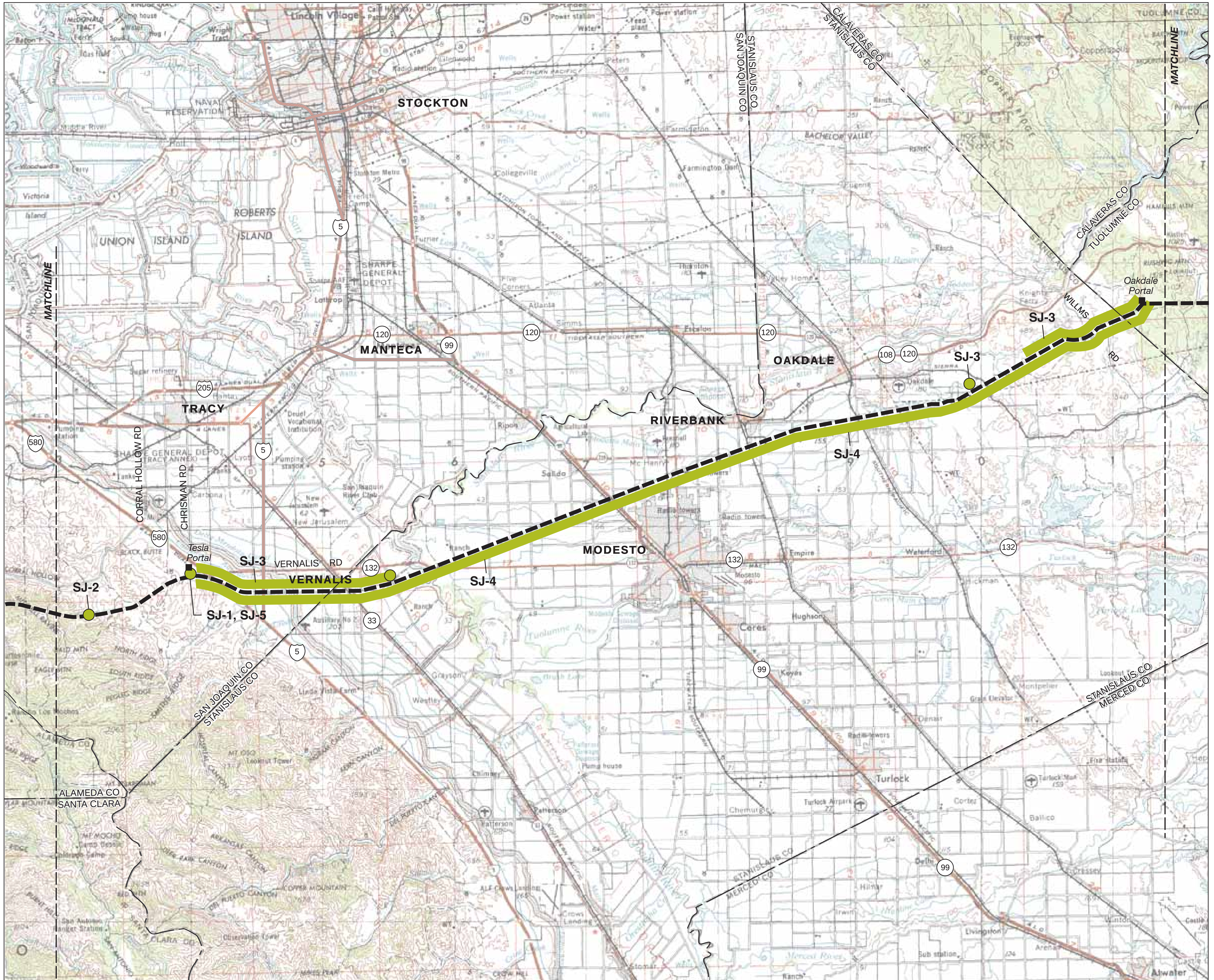
Existing System Corridor
Existing System Facility
Proposed Facility Corridor
Proposed Facility Site
Proposed Facility, General Location

Note: See Figure 4.1-2 for full Project Names

SOURCE: ESA + Orion; SFPUC, 2006

SFPUC Water System Improvement Program . 203287

Figure 4.2-1a
WSIP Projects Jurisdictions and Major Roadways



Existing System Corridor
Existing System Facility
Proposed Facility Corridor
Proposed Facility Site
Proposed Facility, General Location

Note: See Figure 4.1-2 for full Project Names

0 5
Miles

SOURCE: ESA + Orion; SFPUC, 2006

SFPUC Water System Improvement Program . 203287

Figure 4.2-1b
WSIP Projects Jurisdictions and Major Roadways

TABLE 4.2-1
SUMMARY OF GENERAL PLAN POLICIES OF OTHER JURISDICTIONS BY CEQA RESOURCE TOPIC

Resource Topic	Summary Description
Land Use and Visual Quality	General plan goals, policies, and implementation actions related to land use generally call for the use of an environmental review process to minimize potential impacts of projects, and strive to minimize the impact of construction projects on surrounding land uses.
Geology, Soils, and Seismicity	General plan policies related to geology, soils, and seismicity call for appropriate placement, design, and construction of utilities to minimize damage from seismic and geologic hazards and for the implementation of extra precautionary measures to restore utility services following earthquakes. Effective mitigation measures are required for utilities in areas prone to geologic hazards such as soil erosion, liquefaction, and slope failure.
Hydrology and Water Quality	General plan policies related to hydrology and water quality generally deal with the utilization of erosion control measures and storm water quality controls, the protection of riparian zones, and the conservation of water resources in the natural environment. Dam maintenance and monitoring are prescribed in areas potentially subject to dam failure.
Biological Resources	General plan goals, policies, and implementation programs related to biological resources are aimed at the protection of sensitive wildlife habitat and plants, including wetlands, riparian zones, native hardwoods, open space, and sensitive habitats for rare and endangered fish and wildlife species. Heritage tree programs specify guidelines for the avoidance, protection, and, when necessary, replacement of heritage trees. Use of the CEQA process to ensure that detrimental biological impacts do not occur is prescribed.
Cultural Resources	General plan policies related to cultural resources prescribe procedures to prevent detrimental impacts on archaeological/paleontological sites during construction, and the use of good planning practices to preserve cultural and historic heritage.
Traffic, Transportation, and Circulation	General plan policies related to traffic, transportation, and circulation generally require an impact analysis of new development proposals on traffic and encourage the use of utility corridors and river/ creek rights-of-way for nonmotorized transportation modes such as bicycle and pedestrian facilities.
Air Quality	General plan policies related to air quality call for air quality impact analyses for proposed projects and the use of air quality controls, such as dust abatement measures during construction, to reduce air quality impacts.
Noise and Vibration	General plan policies related to noise and vibration generally establish enforceable noise thresholds, require the use of noise suppression techniques during construction activities, encourage the incorporation of noise reduction techniques in new structures, and call for compliance with noise ordinances during facility operation.
Public Services and Utilities	General plan policies related to public services and utilities call for safeguarding utility lines from rupture or malfunction from natural or manmade hazards.
Recreational Resources	General plan policies related to recreational resources encourage the use of utility corridors and SFPUC rights-of-way for recreational uses such as parks, pedestrian and bicycle trails, open space, and other recreational facilities and programs.
Agricultural Resources	General plan policies related to agricultural resources encourage utilities to route their facilities along property lines to prevent interference with agricultural operations.
Hazards	General plan policies related to hazards call for the proper handling, use, disposal, and transport of hazardous materials and the placement, design, construction, and protection of critical utilities from potential disasters.
Energy Resources	No relevant general plan policies related to energy resources were identified.

TABLE 4.2-2
SIGNIFICANCE CRITERIA RELATED TO CONSISTENCY WITH PLANS AND POLICIES BY CEQA RESOURCE TOPIC

Resource Topic	Significance Criterion
Geology, Soils, and Seismicity (Section 4.4)	Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan.
Biological Resources (Section 4.6)	Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance. Conflict with the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or state habitat conservation plan.
Traffic, Transportation, and Circulation (Section 4.8)	Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., conflict with policies promoting bus turnouts, bicycle racks, etc.), or cause a substantial increase in transit demand that cannot be accommodated by existing or proposed transit capacity or alternative travel modes).
Noise and Vibration (Section 4.10)	Expose people to or generate noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies. For a project located within an area covered by an airport land use plan (or, where such a plan has not been adopted, within two miles of a public airport or public use airport), expose people residing or working in the project area to excessive noise levels.
Agricultural Resources (Section 4.13)	Conflict with existing zoning for agricultural use or a Williamson Act contract.

The WSIP includes facility improvement projects that would seismically upgrade the SFPUC regional water system facilities and serve the water supply needs of the SFPUC's service area through 2030. Although some of these projects would result in impacts on air quality and natural resources, on the whole the proposed program would mitigate such impacts, restore natural systems, and support the orderly growth and development of San Francisco and the adjoining cities and counties of the San Francisco Bay region.

Implementation of the WSIP would increase community safety by protecting the regional water system from earthquake hazards and providing redundancy in the system in the event that substantial damage and/or a failure of part of the system occurred. The WSIP would, on the whole, be consistent with the San Francisco General Plan.

San Francisco Priority Policies

Of the eight Priority Policies, only the last two would be relevant to the WSIP. The remaining six policies would not be relevant because the WSIP would: be largely constructed outside of San Francisco, be located away from San Francisco neighborhoods, have no effect on or create the need for affordable housing, not result in any commuter automobiles, and not result in commercial office development. The WSIP would have no long-term effect on open space.

With regard to the Priority Policy to protect historic buildings, the WSIP projects that could potentially affect historical resources would be implemented in a manner that is consistent with the Secretary of Interior Standards; most impacts would be mitigated to a less-than-significant level. With regard to the Priority Policy to prepare for earthquakes: one of the primary goals of the proposed program is seismic reliability of the regional water system to reduce vulnerability to earthquakes; the WSIP proposes improvements to meet current seismic standards and would establish and implement a defined level of service response after a major earthquake. The WSIP would, on the whole, be consistent with San Francisco's Priority Policies.

San Francisco Sustainability Plan

The *San Francisco Sustainability Plan* was developed for the purpose of addressing San Francisco's long-term environmental sustainability. The WSIP facility improvement projects would be consistent with the goals of the Sustainability Plan, since it would maintain the physical resources and systems that support life in San Francisco. The WSIP would be inherently consistent with goals pertaining to increasing water reuse, ensuring an adequate water supply under normal and extraordinary conditions, restoring groundwater supplies, and upgrading infrastructure.

San Francisco Municipal Green Building Program

The San Francisco Municipal Green Building Program was developed for the purpose of improving the environmental performance of municipal buildings. The WSIP facility improvement projects would be consistent with the San Francisco Municipal Green Building Program, since all applicable facility improvement projects constructed under the WSIP would be designed, constructed, and operated in accordance with the City's Green Building requirements. The SFPUC would complete and submit LEED checklists to the REB Task Force on all applicable WSIP projects.

Consistency with SFPUC Plans and Policies

Alameda and Peninsula Watershed Management Plans

Generally, the Alameda and Peninsula WMPs guide SFPUC activities that are located within the plans' boundaries. The Alameda WMP would be applicable to six of the WSIP projects located in the Alameda watershed: Alameda Creek Fishery (SV-1), Calaveras Dam (SV-2), 40-mgd Treated Water (SV-3), New Irvington Tunnel (SV-4, which is partially within watershed boundaries), Treated Water Reservoirs (SV-5), and SABUP (SV-6). The Peninsula WMP would be applicable to three of the WSIP projects proposed to be entirely located in the Peninsula watershed: CS/SA Transmission (PN-2), Lower Crystal Springs Dam (PN-4), and Pulgas Balancing Reservoir (PN-5).

The Peninsula and Alameda WMPs are designed to guide the SFPUC's activities with respect to its watershed lands and operation of the regional water system to ensure protection and restoration of watershed resources. The WMP's goals and policies include maximizing the local water supply and improving source water quality to protect public health and safety, which are aligned with the goals of the WSIP. As part of implementing the WMPs, the SFPUC Natural Resources Division will review the WSIP plans, projects, and activities that occur within these watersheds for conformity with the WMPs as well as for compliance with environmental codes and regulations. As a result of this watershed project review process, the WSIP would, on the whole, be implemented in a manner consistent with the WMPs.

Water Enterprise Environmental Stewardship Policy

The WSIP would be consistent with the underlying goals of the Water Enterprise Environmental Stewardship Policy, particularly with respect to the WSIP sustainability goal and the WSIP objective to manage natural resources and physical systems to protect watershed ecosystems. Conversely, the Stewardship Policy implementation strategy specifically calls for integration of the policy into the WSIP. And, as stated above, WSIP projects located in the Alameda and Peninsula watersheds would be required to comply with the respective WMP policies, actions, and design guidelines and feasible mitigation measures. Mitigation measures described in

Chapter 6 identify programmatic approaches to protecting and restoring natural resources and habitats, including measures that would reduce bioregional effects and habitat fragmentation and would enhance ecosystem function.

Consistency of WSIP Projects with Other Applicable Land Use Plans and Policies

As described in Section 4.2.2, federal, state, and regional land use plans establish guidelines regarding appropriate land uses and activities within the boundaries of the respective plans. The relevant land use plans for the WSIP study area are: the GGNRA – Scenic Easement and Scenic and Recreation Easement and the *San Joaquin County Multi-species Conservation Plan and Open Space Plan*. WSIP consistency with habitat conservation plans, including the San Joaquin County's multi-species conservation plan, is addressed in Section 4.6, Biological Resources. WSIP consistency with the GGNRA – Scenic Easement and Scenic and Recreation Easement is presented below.

GGNRA – Scenic Easement and Scenic and Recreation Easement

The proposed WSIP projects in the Peninsula watershed would involve construction of new, or improvements to existing, water utility facilities. Therefore, implementation of these projects is an exercise of the CCSF's reserved rights under the terms of both easements. The WSIP would, on the whole, be consistent with the GGNRA easement covenants.

California Department of Fish and Game, Game Refuge Designation

Implementation of the WSIP projects in the Peninsula watershed would not result in the unauthorized taking of birds or mammals and, therefore, would be consistent with the area's designation as a game refuge.

San Francisco Bay Plan

Implementation of the BDPL Reliability Upgrade project (BD-1) includes construction of a tunnel to replace aboveground pipelines located in San Francisco Bay. Depending on the final scope of work undertaken with respect to this project, SF Bay Plan policies could be relevant to the project. The proposed five-mile tunnel under Don Edwards San Francisco Bay Wildlife Refuge, Newark Slough, and San Francisco Bay is generally straight, which provides for ease in constructability, but is also designed to minimize environmental disruption, particularly with respect to protected species. Programmatic mitigation measures described in Chapter 6, if determined to be applicable, identify measures to protect and restore natural resources and habitats, including special-status species. Compliance with BCDC permitting requirements and consideration of applicable SF Bay Plan policies would also ensure that relevant policies of the SF Bay Plan are addressed and carried out to minimize environmental effects on the bay. The WSIP would, on the whole, be consistent with policies contained in the SF Bay Plan.

Local General Plans

Section 4.2.2 describes the application of local general plans to the WSIP. Determinations of project consistency with general plans would be made by the pertinent land use jurisdictions following preparation of project-specific CEQA documentation and notification by the SFPUC pursuant to state law.

For those counties and cities that receive all or part of their water from the SFPUC, the WSIP would generally be consistent with goals to maintain and improve the quality of life of the local population by increasing the reliability of the water supply now and into the future. The objectives of the WSIP include maintaining high-quality water, reducing system vulnerability to earthquakes, increasing delivery reliability, meeting customer water supply needs, enhancing sustainability, and achieving a cost-effective, fully operational system. Chapter 7 of this PEIR addresses this issue in more detail by comparing the population and employment projections of the jurisdictions that rely on SFPUC water with SFPUC projections for water demand.

Regarding WSIP consistency with community goals related to resource protection, through preparation of this PEIR and attendant scoping and public outreach efforts, the CCSF has systematically identified the significant environmental impacts associated with implementation of the WSIP as well as feasible measures and alternatives to avoid or substantially lessen such effects. The significance criteria used in this PEIR dovetail with the intent of general plan goals and policies related to protecting the environment. As detailed throughout the remaining sections of Chapter 4, most of the environmental impacts attributable to the WSIP are associated with construction, and these impacts would be reduced to less-than-significant levels, either through measures proposed as part of the program or otherwise committed to by the CCSF.

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4.3 Land Use and Visual Quality

4.3 Land Use and Visual Quality

This section provides an overview of existing land uses and visual character within the WSIP study area and evaluates potential land use and visual impacts that could result from implementation of the proposed WSIP projects.

4.3.1 Setting

Regional Overview

This section describes the general types of land uses and visual characteristics that occur within the WSIP facilities study area, which extends from Oakdale Portal in Tuolumne County west along the regional system to its terminus in San Francisco. **Figure 4.3-1** characterizes the WSIP study area under two main categories: (1) urbanized, which includes all levels of urban or suburban development, or (2) undeveloped, which includes all types of open space and undeveloped land uses such as parks and agriculture. From east to west, land uses across the WSIP study area generally include rangelands in the Sierra foothills, agricultural and urban and suburban uses in the Central Valley, open space/recreation/watershed areas within the urban fringe, and urban and suburban uses in the San Francisco Bay Area.

San Joaquin Region

Land Use

Most of the areas adjacent to proposed WSIP facility activities in this region are undeveloped and used for agriculture. Cities near existing regional water system facilities include Oakdale, Riverbank, and Modesto in Stanislaus County. Oakdale and Riverbank are generally comprised of rural residential and, more recently, suburban residential uses. Modesto, located in the center of this region, has mainly residential, commercial, school, and park uses.

The SFPUC's facilities in this region include Oakdale Portal on the east, which connects the western end of Foothill Tunnel and the San Joaquin Pipelines. The three San Joaquin Pipelines, which carry water from the Hetch Hetchy facilities, are almost entirely buried for their full 47-mile length (short segments extend aboveground through hilly terrain west of Oakdale Portal). These pipelines extend underground through urban land uses in Modesto and rural residential uses south of Oakdale and Riverbank. Within the western margin of this region in the Tesla Portal vicinity, the San Joaquin Pipelines extend underground through a private golf course (Tracy Golf and Country Club), agricultural land uses, and rural residential development.

Visual Resources

The visual character of the region is typical of the Central Valley, with undeveloped lands along the regional system. Except for the city of Modesto, this region consists mainly of annual grassland, irrigated pasture, and various agricultural crops. The eastern portion of this region in the Oakdale Portal vicinity is almost entirely in agricultural use. In the area of proposed improvements in this portion of the region, Willms Road crosses the program area and is the only public road providing viewing opportunities of the regional system. Most of the SFPUC facilities are underground in this area, and the aboveground facilities are obscured from public view by the topography of the foothills. The central portion of this region includes Modesto, and aboveground facilities (e.g., crossovers) are visible from nearby public roadways. On the west side of the region, the Tesla Portal facilities are aboveground, consisting of about seven buildings and the pipelines/portal structures leading to the Coast Range Tunnel. The Tesla Portal facilities are visible from Vernalis Road and the nearby rural residential development, with distant views of the site available from I-580 (San Francisco Planning Department, 2000b).

Sunol Valley Region

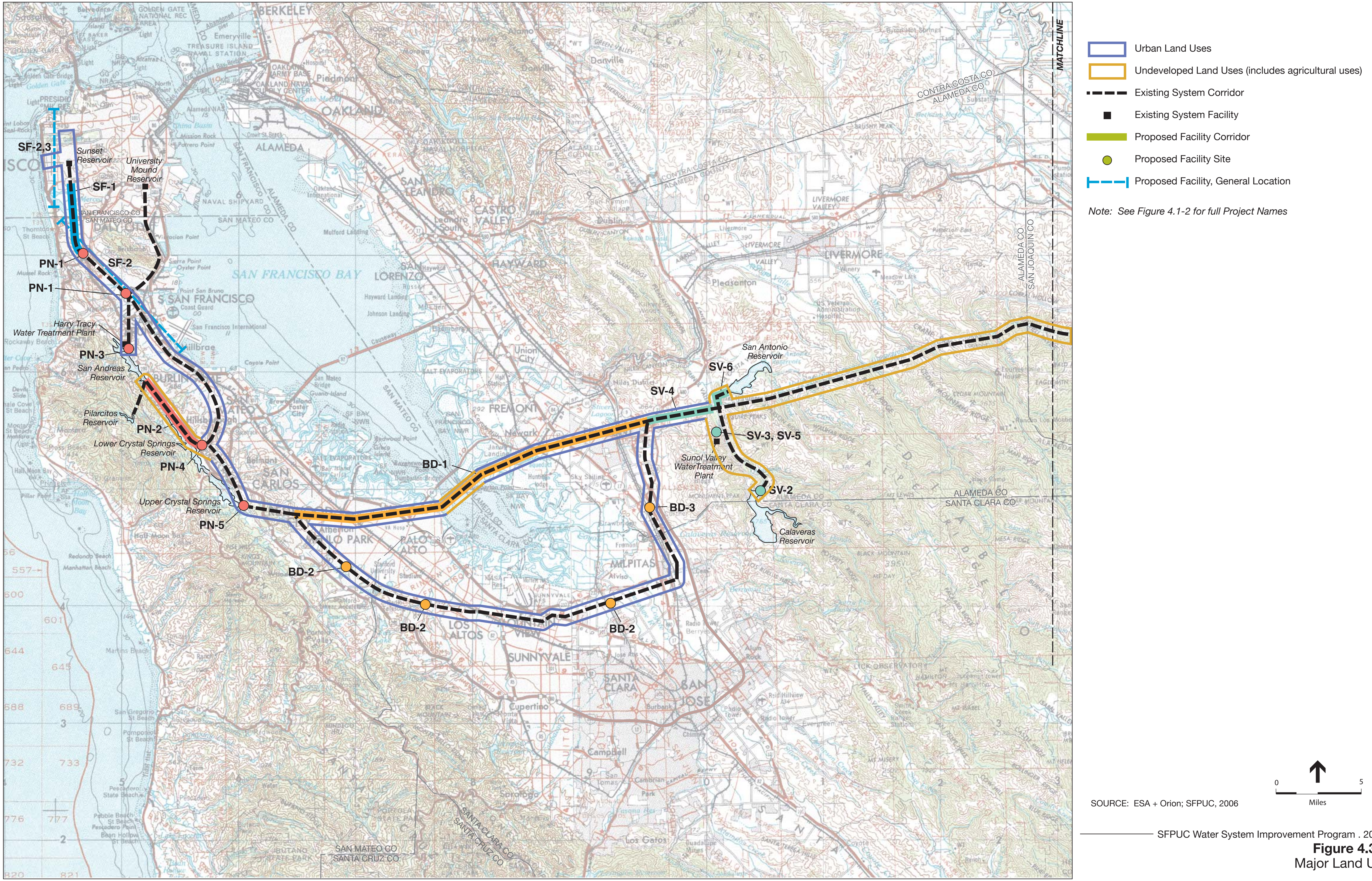
Land Use

The Sunol Valley Region includes facilities in the Sunol Valley within Alameda and Santa Clara Counties and west to the city of Fremont. Existing facilities within this region include storage facilities (Calaveras Reservoir, Calaveras Dam, San Antonio Reservoir, and James H. Turner Dam); transmission facilities (Alameda Siphons, Alameda Creek Diversion Dam and Tunnel, Calaveras Pipeline, San Antonio Pipeline, San Antonio Pump Station, and Irvington Tunnel); treatment facilities (Alameda Disinfection Facility and Sunol Valley Water Treatment Plant [WTP]); and the Irvington Tunnel Portal in Fremont on the west side of the hills.

As shown on Figure 4.3-1, the southern portion of the Sunol Valley and the area surrounding Calaveras Reservoir is mostly undeveloped, while the northern portion of the Sunol Valley includes commercial nurseries and aggregate quarries. The SFPUC system facilities in the Sunol Valley Region lie within the SFPUC's 36,000-acre Alameda watershed lands (see Figure 2.2 in Chapter 2, Existing Regional Water System), consisting primarily of rolling grassland and scattered oak woodlands that cover portions of Alameda and Santa Clara Counties. This area is largely undeveloped with recreational uses such as the Sunol Regional Wilderness, which is located on watershed land owned by the SFPUC and leased by the East Bay Regional Park District. In the western portion of this region, there are large-lot rural residential uses scattered throughout the hills between Sunol Valley and Fremont, and one private residence located about a quarter mile southeast of the existing Alameda West Portal. There are also two SFPUC Land Managers' residences, one near Calaveras Dam and the other near Alameda East Portal. Suburban residential uses on the east side of Mission Boulevard (Highway 238) in Fremont are adjacent to the Irvington Tunnel Portal, which is the westernmost existing SFPUC facility located in this region.

Visual Resources

For the most part, the SFPUC facilities in the Sunol Valley are relatively remote and not accessible to or viewed by the general public, except from Calaveras Road. Distant views of SFPUC facilities may also be available from public trails in the Sunol Regional Wilderness. Alameda and Santa Clara Counties have designated Calaveras Road as a scenic route. Calaveras Reservoir, as viewed from Calaveras Road, is one of the key features of interest (San Francisco



SOURCE: ESA + Orion; SFPUC, 2006

SFPUC Water System Improvement Program . 203287

Figure 4.3-1a
Major Land Uses

Urban Land Uses

Undeveloped Land Uses (includes agricultural uses)

Existing System Corridor

Existing System Facility

Proposed Facility Corridor

Proposed Facility Site

Proposed Facility, General Location

Note: See Figure 4.1-2 for full Project Names

0 5 Miles

SOURCE: ESA + Orion; SFPUC, 2006

SFPUC Water System Improvement Program . 203287

Figure 4.3-1b
Major Land Uses

Planning Department, 2000a). Irvington Tunnel Portal is visible from neighboring residences in the city of Fremont to the west.

Bay Division Region

Land Use

The Bay Division Region starts in Fremont and covers the general South Bay area, including parts of Alameda, Santa Clara, and San Mateo Counties, extending west to the south end of the Peninsula. The existing regional water system through this region is comprised of transmission facilities, including the Bay Division Pipelines Nos. 1, 2, 3, and 4.

For the most part, the WSIP project sites in this region are within developed urban areas. The urban areas are comprised of typical urban land uses found within a developed area, including residential, commercial, and industrial uses as well as schools, city parks, childcare centers, churches, hospitals, etc. Urban areas where WSIP projects are proposed include the cities of Newark and Fremont in Alameda County; the cities of San Jose, Santa Clara, and Palo Alto within Santa Clara County; and the cities of East Palo Alto, Menlo Park, Atherton, and Redwood City in San Mateo County. (See Chapter 3, Program Description, Table 3.11 for a review of jurisdictions relevant for each WSIP project.)

Undeveloped areas in this region consist primarily of marshland along the bay margin on the east and west sides of the bay, including the 30,000-acre Don Edwards San Francisco Bay National Wildlife Refuge. These undeveloped areas include aboveground portions of the Bay Division Pipelines Nos. 1 and 2 and valve houses.

Visual Resources

SFPUC facilities in the urban areas of the Bay Division Region are almost entirely buried and not distinguishable from the surrounding urban landscape. However, aboveground portions of the Bay Division Pipelines Nos. 1 and 2 and valve houses are present in the undeveloped areas along the east and west margins of the bay; these facilities are visible from the wildlife refuge and marshlands, with remote views available from the Dumbarton Bridge (Highway 84).

Peninsula Region

Land Use

The Peninsula Region is entirely on the Peninsula within San Mateo County. The regional water system facilities within this region include storage, transmission, and treatment facilities. This region spans the urbanized areas between San Francisco Bay and I-280, but also includes the undeveloped SFPUC Peninsula watershed lands (see Figure 2.3), which is the area surrounding the Upper and Lower Crystal Springs Reservoirs, Pilarcitos Reservoir, and San Andreas Reservoir. The watershed area is undeveloped, with heavily forested vegetation on the western slopes and grassland and scattered oak woodlands on the eastern edge.

Urbanized areas in proximity to SFPUC facilities in this region include land uses typically found in developed areas, such as commercial and residential uses, schools, churches, and hospitals. Residential uses adjacent to the Peninsula watershed are located in heavily wooded areas with narrow winding roads, hilly topography, blending with the general forested character of the watershed.

Visual Resources

While many of the SFPUC facilities located within the Peninsula watershed are aboveground structures, they are typically screened by vegetation and blend with the watershed's landscape or are buried. SFPUC reservoir facilities are an integral part of the visual character of the San Mateo County Peninsula.

The California Department of Transportation (Caltrans) has designated I-280 as a scenic highway. Key views in the area include Upper and Lower Crystal Springs Reservoirs and San Andreas Reservoir from I-280; views of Upper and Lower Crystal Springs Reservoirs from Highway 92; and views of Lower Crystal Springs Reservoir and San Andreas Reservoir from the Sawyer Camp Trail, a public hiking/bicycle trail. Features of interest in the area include the Pulgas Water Temple, a large roadside statue of Father Junipero Serra on I-280, the Eugene Doran Memorial Bridge, and the Crystal Springs Dam and vista point. As described in Section 4.2, Plans and Policies, the Peninsula watershed is part of a Scenic Easement and Scenic and Recreation Easement that were developed under a four-party agreement among the City and County of San Francisco (CCSF), the U.S. Department of the Interior, Caltrans, and San Mateo County (San Francisco Planning Department, 2001). Provisions of the easement are described in Section 4.2.2, under U.S. Department of the Interior, Golden Gate National Recreation Area – Scenic Easement and Scenic and Recreation Easement.

San Francisco Region

Land Use

The San Francisco Region includes regional facilities within San Francisco and northern San Mateo County, which overlap with a portion of the geographic area covered in the Peninsula Region. Existing regional water system facilities within this region include storage facilities (University Mound Reservoir, Sunset Reservoir, and Merced Manor Reservoir) and transmission facilities (San Andreas Pipeline, Crystal Springs Pipeline, and Sunset Supply Pipeline).

Most of the SFPUC facilities in the San Francisco Region are located in densely populated, urbanized areas of the west and south sides of the city. Proposed WSIP facilities in San Francisco are located as far north as Lincoln Park, as far south as Lake Merced, and as far east as McLaren Park. Proposed facilities in San Mateo County consist of regional transmission facilities (pipelines) extending from Peninsula facilities to terminal reservoirs in San Francisco. As shown in Figure 4.3-1, land uses in proximity to WSIP facilities in this region are entirely developed, comprising a mix of commercial and residential land uses, including schools, churches, golf courses, cemeteries, and parks.

Visual Resources

The visual setting surrounding SFPUC facility sites in this region is characterized by suburban commercial districts, residential neighborhoods, some industrial areas in northern San Mateo County, and predominantly urban commercial and residential areas in San Francisco.

Regulatory Framework

Please see Section 4.2, Plans and Policies, for a discussion of the regulatory setting related to land use plans and policies and for analysis of the consistency of proposed WSIP projects with relevant plans and policies.

4.3.2 Impacts

Significance Criteria

The CCSF has not formally adopted significance standards for impacts related to land use and visual quality, but generally considers that implementation of the proposed program would have significant impacts on these resources if it were to:

Land Use

- Physically divide an existing community (Not evaluated in this section, see Appendix B)
- Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect (Evaluated in Section 4.2, Plans and Policies)
- Have any substantial impact on the existing character of the vicinity (Evaluated in this section)
- Substantially disrupt or displace existing land uses or land use activities (Evaluated in this section)

Visual Quality

- Have a substantial adverse effect on a scenic vista (Evaluated in this section)
- Substantially damage scenic resources, including but not limited to trees, rock outcroppings, and other features of the built or natural environment that contribute to a scenic public setting (Evaluated in this section)
- Substantially degrade the existing visual character or quality of the site and its surroundings (Evaluated in this section)
- Create a new source of substantial light or glare that would adversely affect day or nighttime views in the area or substantially affect other people or properties (Evaluated in this section)

Approach to Analysis

Land Use

This program-level land use analysis evaluates short-term impacts on existing land uses resulting from temporary construction activity as well as long-term impacts resulting from the siting of WSIP project facilities. Impacts specific to recreational and agricultural land uses are discussed in Sections 4.12 and 4.13, respectively.

Generally, construction and operation of most WSIP projects would occur at existing SFPUC facility sites or within existing SFPUC rights-of-way. Some projects would be constructed outside of existing CCSF-owned watersheds, land, or rights-of-way, and additional new land would need to be acquired for facilities and/or for temporary construction easements or staging areas (see Table 4.3-3). Information regarding potential WSIP facility locations and projects that might require land acquisition is based on the project siting and construction information, provided by the SFPUC; this information is summarized in Chapter 3 and further detailed in Appendix C for each of the WSIP projects.

Local planning documents and maps (including maps available electronically via the Internet) were reviewed to characterize existing land uses within proximity to the pipelines, tunnels, vaults/valve lots, pump stations, treatment facilities, and storage facilities proposed under the WSIP.

In suburban and urban areas, a considerable number of schools are located near proposed WSIP project sites (see Table 4.3-2). These schools have been identified because they represent the predominant land use that could be affected by WSIP construction activities. This list of schools is not necessarily a definitive list for each WSIP project site, since facility site locations have not yet been finalized for all WSIP projects. The evaluation of potential impacts on schools provides an indication of the potential extent to which WSIP projects might affect schools and other sensitive land uses.

Potential physical environmental effects on surrounding land uses resulting from implementation of the WSIP projects are addressed in the respective sections of this PEIR, including Section 4.7, Cultural Resources; Section 4.8, Traffic, Transportation, and Circulation; Section 4.9, Air Quality; Section 4.10, Noise and Vibration; and Section 4.12, Recreational Resources.

Visual Resources

The analysis of visual resources identifies potential temporary and permanent adverse visual impacts that WSIP projects could have on scenic vistas, as seen from scenic highways and local scenic roads, or on other visual resources identified by local jurisdictions. For the analysis of impacts on scenic vistas, information was compiled from Caltrans' list of designated scenic highways and from local governments' general plans. Local jurisdictions also identified other visual resources, such as trees, rock outcroppings, viewsheds, ridgelines, gateways, waterways, and open space corridors. It is expected that project-level visual assessments would be completed as part of separate, project-level CEQA review of individual WSIP projects, at which time specific project design information would allow for a more detailed analysis of potential visual effects. Most of the potentially significant permanent visual impacts identified for each region would not likely result in significant impacts at the project level when specific information becomes available concerning the height, mass, and location of structures. However, this PEIR uses a conservative approach in order to identify all visual effects that could possibly be considered significant.

Impact Summary by Region

Table 4.3-1 provides a summary of potential land use and visual quality impacts associated with implementation of the WSIP. The summary includes the expected level of significance of each potential impact.

Construction Impacts

Impact 4.3-1: Temporary disruption or displacement of existing land uses during construction.

The construction of pipelines, tunnels, dams, and other WSIP facilities could result in temporary adverse land use impacts in the WSIP study area by causing a temporary disruption or displacement of existing land uses.

Most WSIP projects would involve improvements to existing SFPUC facilities that would occur within existing facility sites and SFPUC rights-of-way in areas isolated from other developed land uses, thereby reducing the likelihood for temporary land use disruption or conflicts during construction. However, some project facilities would involve construction on CCSF-owned land within densely developed areas or outside of CCSF-owned lands and thus would be more likely to affect adjacent land uses. In some project areas, temporary land use disruption due to adjacent construction activity could generate a combination of effects, including noise, vibration, dust, traffic congestion, and/or access disruption. Each of these potential construction effects is evaluated separately in the following sections: 4.8, Traffic, Transportation, and Circulation; 4.9, Air Quality; and 4.10, Noise and Vibration; however, the intensity or potential combination of these construction effects is considered in this section as a land use disruption issue.

In most cases, construction effects would be relatively short term and intermittent, and land use disruption would be considered less than significant. Furthermore, for all WSIP projects, the SFPUC would implement construction measures to limit certain temporary construction effects on nearby land uses. However, WSIP project construction activities could substantially disrupt certain land use activities in areas where the duration of construction is lengthy and/or these effects, either individually or combined, are particularly intense. For example, schools could be particularly sensitive to a combination of access restriction, noise, and dust from construction activities; these effects could substantially disrupt the indoor or outdoor activities at the school site, making it difficult to effectively continue the existing land use activity during the construction period. The potential for substantial temporary land use disruption is site and project specific and would be further assessed during separate, project-level CEQA environmental review of the WSIP

TABLE 4.3-1
POTENTIAL IMPACTS AND SIGNIFICANCE – LAND USE AND VISUAL RESOURCES

Projects	Project Number	4.3-1: Temporary disruption or displacement of existing land uses during construction	4.3-2: Permanent displacement or long-term disruption of existing land uses	4.3-3: Temporary construction impacts on scenic vistas or visual character	4.3-4: Permanent adverse impacts on scenic vistas or visual character	4.3-5: New permanent sources of light glare
San Joaquin Region						
Advanced Disinfection	SJ-1	LS	LS	LS	PSM	PSM
Lawrence Livermore Supply Improvements	SJ-2	LS	N/A	LS	LS	PSM
San Joaquin Pipeline System	SJ-3	PSM	PSU	LS	LS	PSM
Rehabilitation of Existing San Joaquin Pipelines	SJ-4	PSM	N/A	LS	N/A	PSM
Tesla Portal Disinfection Station	SJ-5	LS	LS	LS	PSM	PSM
Sunol Valley Region						
Alameda Creek Fishery Enhancement	SV-1	LS	N/A	LS	PSM	PSM
Calaveras Dam Replacement	SV-2	LS	N/A	LS	PSU	PSM
Additional 40-mgd Treated Water Supply	SV-3	LS	PSU	LS	LS	PSM
New Irvington Tunnel	SV-4	PSU	LS	LS	PSM	PSM
SVWTP – Treated Water Reservoirs	SV-5	LS	N/A	LS	LS	PSM
San Antonio Backup Pipeline	SV-6	LS	PSU	LS	PSM	PSM
Bay Division Region						
Bay Division Pipeline Reliability Upgrade	BD-1	PSM	PSU	LS	PSM	PSM
BDPL Nos. 3 and 4 Crossovers	BD-2	PSM	LS	LS	PSM	PSM
Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault	BD-3	LS	N/A	LS	N/A	PSM
Peninsula Region						
Baden and San Pedro Valve Lots Improvements	PN-1	LS	N/A	LS	LS	PSM
Crystal Springs/San Andreas Transmission Upgrade	PN-2	LS	PSU	LS	PSM	PSM
HTWTP Long-Term Improvements	PN-3	LS	N/A	LS	PSM	PSM
Lower Crystal Springs Dam Improvements	PN-4	LS	N/A	LS	PSM	PSM
Pulgas Balancing Reservoir Rehabilitation	PN-5	LS	N/A	LS	PSM	PSM
San Francisco Region						
San Andreas Pipeline No. 3 Installation	SF-1	PSM	N/A	LS	PSM	PSM
Groundwater Projects	SF-2	PSM	PSU	LS	PSM	PSM
Recycled Water Projects	SF-3	PSM	PSU	LS	PSM	PSM

LS = Less than Significant impact, no mitigation required
PSM= Potentially Significant impact, can be mitigated to less than significant
PSU = Potentially Significant Unavoidable impact
N/A = Not Applicable

projects. This program-level analysis considers the general WSIP project location information available at this time, the proximity to uses such as residential areas and schools, and the potential to displace these existing uses during construction.

Temporary land use displacement could result from the short-term use of properties adjacent to WSIP facility sites for equipment and materials staging areas and/or for temporary construction easements. The SFPUC constructs its facilities on CCSF-owned land to the extent feasible. However, in cases where construction easements or staging areas are required on non-CCSF-owned land, uses such as vacant lots, parking lots, and open space (parks and agricultural fields) on private or other public land could be temporarily displaced. The SFPUC and its construction contractors often have flexibility in locating temporary staging areas, and are typically able to identify staging sites that are acceptable to landowners for short-term use. Where a willing property owner makes arrangements for short-term property use during project construction, temporary displacement of an existing land use would be considered a less-than-significant impact. Potential changes in the existing land use character in the vicinity of these staging areas would also be less than significant due to the temporary or short-term nature of construction staging.

In other cases, however, temporary use of non-CCSF-owned land for construction activity or staging could constitute a potentially significant impact if the SFPUC has little to no flexibility in using a certain property, and the owner's use of the property would be halted or substantially reduced as a result of the temporary construction activity (e.g., a property next to an SFPUC facility requires repair or improvement, and that property must be used to access or work on the SFPUC facility). Mitigation measures such as providing the property owner with an acceptable alternate site for the displaced use could mitigate this impact to a less-than-significant level. Such relocation could temporarily alter the land use character in the vicinity of the displaced use; however, this effect would be less than significant due to its temporary nature.

The potential temporary land use conflicts resulting from construction of WSIP facilities are generally described below, first by facility type and then more specifically by region.

Pipelines. Where feasible, WSIP pipeline construction would be accomplished using standard open-cut or cut-and-cover construction methods, progressing at a rate of approximately 120 to 160 feet per day, depending on the presence of road, utility, or stream crossings. Staging areas would be required for stockpiling supplies and equipment close to the construction area. Depending on the location of staging areas and pipeline construction activities in relation to existing land uses, these activities have the potential to cause adverse but temporary land use impacts, either at the staging site or in proximity to pipeline alignments. While these impacts could be significant, they would for the most part be reduced to a less-than-significant level with the incorporation of mitigation measures, such as maintaining access to residences, installing noise barriers to minimize noise effects on adjacent uses, or prohibiting nighttime construction to avoid noise, vibration, and light and glare effects on nearby uses; however, a site-specific analysis would be necessary to characterize the existing land uses and the potential for impacts along each pipeline alignment. The level of impact significance from pipeline projects would depend on the pipeline's proximity to noise-sensitive land uses and the duration of construction at any one location.

Tunnels. Tunnel projects could affect existing land uses in the vicinity of entry/exit portal or shaft locations, which would serve as construction staging areas. Land use impacts could occur if the portals resulted in a disruption of onsite uses, if access to land uses were impeded by construction traffic or grading for new construction access roads, or if construction activities near sensitive land uses (such as residences or schools) lasted for an extended period of time. Tunneling operations typically occur 24 hours per day, as is being proposed by the SFPUC. One of the two tunnel portals (the entry portal) is designated as the location for most of the tunneling activity, involving the removal of the excavated spoils material, staging, and mobilization of the tunnel building materials and crew. While these activities would be temporary, lasting only as long as the tunnel construction requires, the construction activities and effects at the entry portal site are substantial and would last for an extended duration (a year or more). Land use disruption could be a significant effect on sensitive land uses near the active tunnel portal site. The level of impact significance from tunnel projects would depend on the project's proximity to existing land uses and the duration and severity of the impact.

Vaults, Valve Lots, and Crossover Facilities. These facilities would be constructed at isolated locations near existing SFPUC facilities along the regional system. Design would vary by location, but facilities would typically occupy approximately 4,000 square feet and would be partially or completely buried. Surface structures might be constructed to house associated electrical controls and emergency generators. Crossover structures could require permanent discharge or drainage piping for maintenance or emergency repairs. Construction activities would be confined to the immediate site vicinity. If these facilities are located in or near existing land uses, they could temporarily disrupt such uses.

Pump Stations. The WSIP includes proposals to construct new pump stations and to upgrade existing pump stations along the regional system. Upgrading pump stations, which would involve removing equipment and replacing it with new equipment, would not affect existing land uses. The construction of new pump stations could temporarily affect existing land uses if proposed facility sites are located on or in close proximity to existing uses.

Treatment Facilities. The WSIP includes proposals to upgrade and expand treatment facilities at two treatment plants as well as at the system's primary disinfection facility. Construction activities at existing treatment plants would occur within the property boundaries or on SFPUC lands and would not be expected to affect existing land uses. Temporary construction impacts associated with a new treatment facility would depend on the site location in relation to existing land uses.

Storage Facilities. The WSIP calls for improvements to water storage facilities, including reservoirs and dams. For reservoirs, construction activities would include excavation at the reservoir location, offsite hauling of excavated soils, installation of new pumping and electrical equipment, and seismic strengthening. Dam improvements would include raising the dam parapet wall at Lower Crystal Springs Dam and replacing Calaveras Dam. Construction activities at these WSIP project sites would not likely affect existing land uses since these projects are generally within undeveloped areas on property owned by the CCSF, except for offsite staging areas and adjacent access roadways in the Lower Crystal Springs Dam vicinity.

San Joaquin Region

Impact 4.3-1: Temporary disruption or displacement during construction		
Advanced Disinfection	SJ-1	LS
Lawrence Livermore	SJ-2	LS
SJPL System	SJ-3	PSM
SJPL Rehabilitation	SJ-4	PSM
Tesla Portal Disinfection	SJ-5	LS

The WSIP project sites within this region would be located in largely undeveloped areas that generally contain open space or agricultural uses. Of the five WSIP projects in the San Joaquin Region, three of the projects (Advanced Disinfection, SJ-1; Lawrence Livermore, SJ-2; and Tesla Portal Disinfection, SJ-5) would involve improvements at existing SFPUC facility sites that are situated in undeveloped areas and currently used for water system purposes. Thus, these projects would have a *less than significant* effect on existing land uses, since they would not disrupt or displace land uses during construction.

The SJPL System project (SJ-3) would entail construction of a new valve house at the Tesla Portal facility, open-trench construction of approximately 16 to 22 miles of pipeline, and construction of two crossover facilities for the existing San Joaquin Pipeline system. Most construction would occur within the existing SFPUC right-of-way, but additional right-of-way could be required to accommodate the pipeline, access roads, associated power facilities, or construction staging, depending on the final locations selected. The 10-mile western segment of the pipeline would extend through residential areas as well as the Tracy Golf and Country Club, which is located on both sides of the freeway. The temporary construction impacts of the SJPL System project could be *potentially significant* in this area due to the proximity of adjoining residential uses (in some cases residences could be within 100 feet of the right-of-way); the potential land use disturbance and disruption would primarily be associated with noise and recreation impacts.

The SJPL Rehabilitation project (SJ-4) would involve a condition assessment to determine the need for the rehabilitation of the existing San Joaquin Pipelines. Project construction, if needed, would occur at discrete locations along the pipeline alignment, although construction requirements for this project have not yet been identified. Since these pipelines extend through the city of Modesto and the southern margins of Riverbank and Oakdale, this project could result in temporary conflicts with existing rural suburban and urban land uses during construction, particularly through Modesto, which could be *potentially significant*. There are several schools located near this pipeline alignment, as listed in **Table 4.3-2**. The potential land use impacts of this project would be evaluated in more detail as part of separate, project-level CEQA review, which would identify appropriate mitigation measures, if needed, to reduce impacts to a less-than-significant level.

The potentially significant, temporary construction impacts associated with the SJPL System (SJ-3) and SJPL Rehabilitation (SJ-4) projects on adjacent land uses could be reduced to a less-than-significant level with implementation of SFPUC Construction Measure #1 (neighborhood notice), Construction Measure #3 (reduction of construction-related emissions), Construction Measure #5 (traffic control plan), Construction Measure #6 (compliance with local noise ordinances to the extent feasible), and Construction Measure #10 (construction site maintenance/ restoration), as well as mitigation measures identified in Chapter 6 under 4.8, Traffic,

TABLE 4.3-2
SCHOOLS LOCATED NEAR PROPOSED WSIP PROJECT SITES – PRELIMINARY LIST[a]

WSIP Project	School (District) Location
San Joaquin Region	
SJ-4: Rehabilitation of Existing San Joaquin Pipelines	▪ Agnes M. Elementary School (Stanislaus Union Elementary School District), Modesto ▪ Josephine Chrysler Elementary School (Stanislaus Union Elementary School District), Modesto ▪ George Eisenhut Elementary School (Stanislaus Union Elementary School District), Modesto
Sunol Valley Region – none	
Bay Division Region	
BD-1: BDPL Reliability Upgrade	▪ Walters Junior High School (Fremont Unified School District), Fremont ▪ Mission San Jose High School (Fremont Unified School District), Fremont ▪ Bunker Elementary School (Newark Unified School District), Newark ▪ Cesar Chavez Academy (Ravenswood City School District), East Palo Alto ▪ Constaño Elementary School (Ravenswood City School District), East Palo Alto ▪ Belle Haven Elementary School (Ravenswood City School District), Menlo Park ▪ James Flood Magnet School (Ravenswood City School District), Menlo Park ▪ Gill School (Redwood City School District), Redwood City ▪ Hawes School (Redwood City School District), Redwood City ▪ Washington School (Redwood City School District), Redwood City
BD-2: BDPL 3 and 4 Crossovers	▪ San Jose Elementary School (San Jose Unified School District), San Jose ▪ Gunn High School (Palo Alto Unified School District), Palo Alto
Peninsula Region – none	
San Francisco Region	
SF-2: Groundwater Projects	▪ Francisco Scott Key School (San Francisco Unified School District), San Francisco

[a] Because many WSIP project locations are still under development by the SFPUC, this preliminary list is not considered definitive, but rather serves to highlight project areas where schools could be affected by the WSIP projects.

SOURCE: ESA+Orion (compiled from map review).

Transportation, and Circulation (Measures 4.8-1a and 4.8-1b); 4.9, Air Quality (Measures 4.9-1a, 4.9-1b, and 4.9-2a); 4.10, Noise and Vibration (Measures 4.10-1a, 4.10-2a, 4.10-2b, 4.10-3a, and 4.10-3b); and 4.12, Recreational Resources (Measure 4.12-1). It is expected that the SFPUC and its contractors would be able to make arrangements with willing property owners for temporary staging areas such that displacement of existing land uses would not be a significant impact. Separate, project-level CEQA review would be conducted on these projects to determine if potential land use disruption impacts would occur and to refine the mitigation measures to address site-specific conditions if appropriate.

Sunol Valley Region

Impact 4.3-1: Temporary disruption or displacement of existing land uses during construction		
Alameda Creek Fishery	SV-1	LS
Calaveras Dam	SV-2	LS
40-mgd Treated Water	SV-3	LS
New Irvington Tunnel	SV-4	PSU
Treated Water Reservoirs	SV-5	LS
SABUP	SV-6	LS

The WSIP project sites in the Sunol Valley Region are largely within undeveloped areas or Alameda watershed lands. Construction impacts associated with the Alameda Creek Fishery (SV-1) and Treated Water Reservoirs (SV-5) projects would be *less than significant*, as construction activities would occur on or near existing SFPUC facilities currently used for water system purposes, or within undeveloped areas that are not in the immediate vicinity of sensitive developed land uses.

The Calaveras Dam project (SV-2) would replace the existing Calaveras Dam and restore the capacity of Calaveras Reservoir. This project would require closure of the southern section of Calaveras Road during the two- to three-year construction period, temporarily blocking access to the Sunol Regional Wilderness from the south. The Sunol Regional Wilderness would remain accessible from the north during project construction, and this temporary impact would therefore be *less than significant*. The effects of closing Calaveras Road are discussed in detail in Section 4.8, Traffic, Transportation, and Circulation, and Section 4.12, Recreational Resources. The 40-mgd Treated Water project (SV-3) would include improvements to the Sunol Valley WTP as well as construction of a two-mile pipeline to connect to the Alameda Siphons or the New Irvington Tunnel. This project would also use Calaveras Road for access, but would not require temporary closure of this road. This project would also require temporary and permanent use of private property for installation of the new pipeline within a new easement.

Project construction of the Calaveras Dam (SV-2), 40-mgd Treated Water (SV-3), and SABUP (SV-6) projects would temporarily disrupt access from Calaveras Road to adjacent land uses, including nurseries, quarry operations, and large-lot residential uses. This impact would be temporary and intermittent and would be *less than significant* with implementation of SFPUC Construction Measure #5 (traffic control plan), which is designed to preserve access to these land uses. Establishment of a permanent easement across private property for the new pipeline and potential temporary use of additional private property during construction under the 40-mgd Treated Water and SABUP projects would displace land now used in the Sunol Valley area for agriculture (ranchland or nurseries); however, given the relatively narrow swath of land required for pipeline installation, the extent of this displacement and the potential for land use disruption on surrounding land would be *less than significant*. In addition, following project completion, agricultural use on the surface could likely resume.

Construction of the New Irvington Tunnel project (SV-4) would require construction of two new tunnel portals and associated construction staging areas. The new portal in the Sunol Valley would be about 75 feet south of the existing Alameda West Portal, and the new portal in Fremont would be about 175 feet south of the existing Irvington Portal. The new portal in the Sunol Valley would be in the vicinity of a privately owned ranch located to the south. In addition, construction staging would require temporary use of the northern portion of the private ranch property for construction staging. As currently planned, the majority of the tunneling construction activity and staging would occur at the new portal in the Sunol Valley. As a result, the ranch property would experience 24-hour construction effects for the full duration of the tunneling activity. Although implementation of several SFPUC construction measures (#1, neighborhood notice; #3, reduction of construction-related emissions; #6, compliance with local noise ordinances to the extent feasible; #10, construction site maintenance/restoration) and other mitigation measures identified in this PEIR (Traffic Measure 4.8-1, Air Quality Measures 4.9-1 and 4.9-2, and Noise Measures 4.10-1 through 4.10-3) would reduce the impact of the tunneling activity on the neighboring ranch property, the residual impacts would remain *potentially significant and unavoidable*. Separate, project-level CEQA review of this project would determine the extent and severity of this impact and determine if mitigation measures could reduce the effects to a less-than-significant level. On the west end of the tunnel, the new west portal would be constructed in the vicinity of single-family residences located west of the Irvington Portal in the city of Fremont. Although this portal would not host the majority of the tunneling activity, tunnel completion activity at this portal would have the potential to significantly disrupt nearby residential uses. This activity would take place over a period of months, involve 24-hour construction work at times, and occur in close proximity to several homes.

With the exception of construction disruption effects at the two new portals for the New Irvington Tunnel (SV-4), the potential short-term land use disruption effects at WSIP project sites in this region would be less than significant with implementation of SFPUC Construction Measure #1 (neighborhood notice), Construction Measure #3 (reduction of construction-related emissions), Construction Measure #5 (traffic control plan), Construction Measure #6 (compliance with local noise ordinances to the extent feasible), and Construction Measure #10 (construction site maintenance/restoration).

The potential land use impacts associated with the Calaveras Dam project (SV-2), 40-mgd Treated Water project (SV-3), and the New Irvington Tunnel (SV-4) would also be evaluated in more detail as part of separate, project-level CEQA review. This review would identify appropriate mitigation measures, if needed, to reduce this impact to a less-than-significant level.

Bay Division Region

Impact 4.3-1: Temporary disruption or displacement of existing land uses during construction		
BDPL Reliability Upgrade	BD-1	PSM
BDPL 3 and 4 Crossovers	BD-2	PSM
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	LS

The Bay Division facilities are located in urbanized areas that are more densely developed than the outlying study area regions. Construction of the BDPL Reliability Upgrade (BD-1), BDPL 3 and 4 Crossovers (BD-2), and BDPL 3 and 4 Seismic Upgrade at Hayward Fault (BD-3) projects could potentially affect existing land uses, since WSIP construction would occur in densely developed areas and near uses that are potentially sensitive to construction effects such as schools and residences.

Of the WSIP projects proposed for construction in the Bay Division Region, the BDPL Reliability Upgrade project (BD-1) would have the most extensive impact on existing land uses. This project would consist of approximately 16 miles of pipeline and 5 miles of bay tunnel extending from Fremont and Newark in southern Alameda County through East Palo Alto, Menlo Park, and Redwood City and unincorporated areas in the central-eastern portion of San Mateo County.

There are a number of schools located on, adjacent to, or near the BDPL Reliability Upgrade (BD-1) pipeline alignment, as listed in Table 4.3-2. While the 16-mile project alignment crosses a wide range of land uses, schools are called out because these facilities are particularly sensitive to construction emissions and noise impacts, more vulnerable to safety hazards, and typically do not have alternative locations where construction impacts could be avoided. Depending on the specific location, schedule, and type of construction activity, temporary conflicts with and disruption to school uses during construction could be *potentially significant*, particularly along the open-trench sections of the pipeline. However, pipeline construction activities would move to the next segment as installation of the pipeline occurs, so that construction activities for this pipeline project would generally not occur at any one location for an extended period of time.

The BDPL Reliability Upgrade project's (BD-1) *potentially significant* impact related to land use disruption during construction would be reduced to a less-than-significant level with implementation of SFPUC Construction Measure #1 (neighborhood notification), Construction Measure #3 (reduction of construction-related emissions), Construction Measure #5 (traffic control plan), Construction Measure #6 (compliance with local noise ordinances to the extent feasible), and Construction Measure #10 (construction site maintenance/restoration), in addition to mitigation measures identified in Chapter 6 (under 4.8, Traffic, Transportation, and Circulation (Measures 4.8-1a and 4.8-1b); 4.9, Air Quality (Measures 4.9-1c, 4.9-1d, and 4.9-2a); and 4.10, Noise and Vibration (Measures 4.10-1a, 4.10-2a, 4.10-2b, 4.10-3a, and 4.10-3b). The potential land use impacts of this project would be evaluated in more detail as part of separate, project-level CEQA review, during which appropriate, site-specific mitigation measures would be tailored as needed to reduce impacts to a less-than-significant level.

The BDPL 3 and 4 Crossovers project (BD-2) would involve construction of pipeline crossovers at three separate locations along a 32-mile stretch of the existing Bay Division Pipelines Nos. 3 and 4. One of these crossover locations would be near an existing water storage facility. The two other locations would be near Barron Creek, adjacent to the running track and sports fields at Gunn High School in Palo Alto, and another would be near an existing publicly accessible nature area. Temporary construction impacts could be *potentially significant* in areas adjacent to these two crossovers, but could be reduced to a less-than-significant level with implementation of SFPUC Construction Measure #1 (neighborhood notification), Construction Measure #3 (reduction of construction-related emissions), Construction Measure #5 (traffic control plan), Construction Measure #6 (compliance with local noise ordinances to the extent feasible), and Construction Measure #10 (construction site maintenance/restoration), as well as mitigation measures identified in Chapter 6 (under 4.8, Traffic, Transportation, and Circulation (Measures 4.8-1a and 4.8-1b); 4.9, Air Quality (Measures 4.9-1c, 4.9-1d, and 4.9-2a); and 4.10, Noise and Vibration (Measures 4.10-1a, 4.10-2a, 4.10-2b, 4.10-3a, and 4.10-3b).

The third WSIP project in the Bay Division Region is the BDPL 3 and 4 Seismic Upgrade at Hayward Fault (BD-3). Construction would be conducted in existing SFPUC right-of-way on either side of the I-680/Mission Boulevard interchange. As there are no sensitive land uses nearby, temporary construction impacts of BD-3 would be *less than significant.*

Peninsula Region

Impact 4.3-1:	**Temporary disruption or displacement of existing land uses during construction**	
Baden and San Pedro Valve Lots	PN-1	LS
CS/SA Transmission	PN-2	LS
HTWTP Long-Term	PN-3	LS
Lower Crystal Springs Dam	PN-4	LS
Pulgas Balancing Reservoir	PN-5	LS

Construction of the Baden and San Pedro Valve Lots (PN-1) and HTWTP Long-Term (PN-3) projects within the Peninsula Region would occur on existing SFPUC facility sites; thus, no land use disruption or displacement would occur. Although there is residential development near the Baden and Harry Tracy WTP facility sites, it is expected that with implementation of SFPUC Construction Measure #1 (neighborhood notification), Construction Measure #3 (reduction of construction-related emissions), Construction Measure #5 (traffic control plan), Construction Measure #6 (compliance with local noise ordinances to the extent feasible), and Construction Measure #10 (construction site maintenance/restoration), temporary community disruption impacts during construction would be *less than significant.*

The CS/SA Transmission (PN-2), Lower Crystal Springs Dam (PN-4), and Pulgas Balancing Reservoir (PN-5) projects are located in unincorporated San Mateo County, outside of urbanized areas. Construction activities for these facilities would not affect existing land uses, with the exception of recreational uses. These projects are in the vicinity of recreational facilities on the Peninsula watershed, including Crystal Springs Golf Course and Sawyer Camp Trail (CS/SA Transmission project) and the Pulgas Water Temple (Pulgas Balancing Reservoir). Lower Crystal Springs Dam construction activity would be coordinated with the County’s replacement of the San Mateo County Bridge. This bridge, along with a nearby vista point, provides sightseeing opportunities of the reservoir. There is a parking area north of the bridge for sightseers. Project construction could disturb recreational users and disrupt recreational uses. This impact would be *less than significant* for these three projects with implementation of SFPUC Construction Measure #1 (neighborhood notification), Construction Measure #3 (reduction of construction-related emissions), Construction Measure #5 (traffic control plan), Construction Measure #6 (compliance with local noise ordinances to the extent feasible), and Construction Measure #10 (construction site maintenance/restoration). Potential temporary land use impacts during project construction would be assessed in more detail as part of separate, project-level CEQA review for each of these three projects.

San Francisco Region

Impact 4.3-1: Temporary disruption or displacement of existing land uses during construction		
SAPL 3 Installation	SF-1	PSM
Groundwater Projects	SF-2	PSM
Recycled Water Projects	SF-3	PSM

Within the San Francisco Region, all WSIP facilities would be constructed in a dense urban environment with a mix of uses, including schools. The SAPL 3 Installation (SF-1) project could result in potentially significant short-term disturbance of adjacent residential land uses due to the proximity of residences along the pipeline alignment in some locations (less than 25 feet in some areas). Although pipeline construction activities do not generally occur for extended periods of time in any one area, in some cases, such as in areas of jack-and-bore operations or difficult construction (e.g., around other existing major underground utilities), construction activities could occur for several weeks. If construction activities occurred for extended periods near residences, schools, or other sensitive uses, the combination of construction effects (including noise, vibration, dust, traffic congestion, and access restrictions) could result in significant short-term land use disruption impacts. This *potentially significant* impact would be reduced to a less-than-significant level with implementation of SFPUC Construction Measure #1 (neighborhood notification), Construction Measure #3 (reduction of construction-related emissions), Construction Measure #5 (traffic control plan), Construction Measure #6 (compliance with local noise ordinances to the extent feasible), and Construction Measure #10 (construction site maintenance/restoration), as well as mitigation measures identified in Chapter 6 (under 4.8, Traffic, Transportation, and Circulation (Measures 4.8-1a and 4.8-1b); 4.9, Air Quality (Measures 4.9-1c, 4.9-1d, and 4.9-2a); and 4.10, Noise and Vibration (Measures 4.10-1a, 4.10-2a, 4.10-2b, 4.10-3a, and 4.10-3b).

The SAPL 3 Installation (SF-1) project could also require additional rights-of-way for construction staging, stockpiling, and laydown areas. While it is expected that the SFPUC and its contractors would be able to make arrangements with willing property owners for temporary staging areas (such that displacement of existing land uses would not be a significant impact), there is the potential for significant short-term land use displacement to occur. Implementation of SFPUC Construction Measure #1 and Construction Measure #10 result in a less than significant impact on displacement of existing land uses.

Under the Groundwater Projects (SF-2), new groundwater wells would be installed at various locations within San Francisco and the upper Peninsula region in urban, suburban, and perhaps open space areas. One proposed location for a new well is Francis Scott Key Elementary School in San Francisco (in the parking lot of the annex structures). Well installation involves 24-hour drilling activities, which could disrupt sensitive land uses such as schools and nearby residential uses. This *potentially significan*t impact would be reduced to a less-than-significant level with implementation of SFPUC Construction Measure #1 (neighborhood notification, including the provision for coordinating the construction schedule with school facility managers), Construction Measure #3 (reduction of construction-related emissions), Construction Measure #5 (traffic control plan), Construction Measure #6 (compliance with local noise ordinances to the extent feasible), and Construction Measure #10 (construction site maintenance/restoration), as well as mitigation measures identified in Chapter 6 (under 4.8, Traffic, Transportation, and Circulation

(Measures 4.8-1a and 4.8-1b); 4.9, Air Quality (Measures 4.9-1c, 4.9-1d, and 4.9-2a); and 4.10, Noise and Vibration (Measures 4.10-1a, 4.10-2a, 4.10-2b, 4.10-3a, and 4.10-3b). Potential impacts associated with these projects would be assessed in more detail as part of separate, project-level CEQA review.

The Recycled Water Projects (SF-3) facilities would be constructed within urban residential and commercial neighborhoods in San Francisco. Potential sites for treatment and storage facilities are located adjacent to the San Francisco Zoo and in the vicinity of Lincoln Park. Temporary construction impacts could be *potentially significant* in some areas, such as near schools and close to residences. Implementation of SFPUC Construction Measure #1 (neighborhood notification), Construction Measure #3 (reduction of construction-related emissions), Construction Measure #5 (traffic control plan), Construction Measure #6 (compliance with local noise ordinances to the extent feasible), and Construction Measure #10 (construction site maintenance/restoration), as well as mitigation measures identified in Chapter 6 (under 4.8, Traffic, Transportation, and Circulation (Measures 4.8-1a and 4.8-1b); 4.9, Air Quality (Measures 4.9-1c, 4.9-1d, and 4.9-2a); and 4.10, Noise and Vibration (Measures 4.10-1a, 4.10-2a, 4.10-2b, 4.10-3a, and 4.10-3b) would reduce temporary construction effects of the Recycled Water Projects to a less-than-significant level. It is expected that the SFPUC and its contractors would be able to make arrangements with willing property owners for temporary staging areas such that displacement of existing land uses would not be a significant impact. Potential impacts of proposed recycled water facilities would be assessed in more detail as part of separate, project-level CEQA review.

Long-Term Facility Siting Impacts

Impact 4.3-2: Permanent displacement or long-term disruption of existing land uses.

This section addresses potential impacts on existing land uses associated with permanent operation and siting of WSIP facility projects in each region. Siting and operation of proposed WSIP facilities could, under certain circumstances, result in adverse impacts on existing land uses in the project regions. Adverse land use impacts would not be expected to occur for WSIP facilities constructed on CCSF-owned land used for water system purposes, as these projects would neither displace or relocate an existing land use nor change an existing water system use. Therefore, WSIP projects on CCSF-owned land would not result in adverse effects on surrounding uses, as land use conditions would remain similar. For WSIP projects where acquisition of non-CCSF-owned land would be required to build, operate, or access a WSIP project facility or facility component (e.g., discharge outfall of a pipeline), adverse impacts could occur if the WSIP facilities located on non-CCSF-owned property were not compatible with the surrounding land uses or would result in the permanent displacement of an existing land use.

Most of the WSIP projects would be located on CCSF-owned property on, or adjacent to, existing SFPUC facilities, and the SFPUC would seek to locate any required ancillary or additional easements on CCSF-owned land to the extent feasible. Eight WSIP projects have been identified to date that would require acquisition of additional permanent easements or property (see **Table 4.3-3**). (In developing detailed plans for the WSIP projects, the SFPUC may identify other land acquisition requirements for WSIP projects in addition to those listed here. This program-level analysis describes the nature and magnitude of potential land use effects that could result from such land acquisition.) Additional land acquisition could be required to access existing or new facilities, construct new facility components, and/or to expand or upgrade existing facilities. In most cases, land acquisition would be required for new pipeline alignments and relatively minor facility components such as access roads, power utilities, or a new discharge outfall. Land acquisition would almost always occur next to or near existing SFPUC facilities sites that are within existing SFPUC right-of-way and that have been zoned or designated as a public facility or water system use. Acquisition of permanent easement and property could have a significant land use effect if such acquisition displaced an existing use that would be difficult to relocate. For WSIP projects located entirely on CCSF-owned property and where no land acquisition is required (as listed in Table 4.3-3), displacement or relocation of an existing land use would not occur, and land use impacts related to displacement would not be applicable.

San Joaquin Region

Impact 4.3-2: Permanent displacement or long-term disruption of existing land uses		
Advanced Disinfection	SJ-1	LS
Lawrence Livermore	SJ-2	N/A
SJPL System	SJ-3	PSU
SJPL Rehabilitation	SJ-4	N/A
Tesla Portal Disinfection	SJ-5	LS

The WSIP project sites in the San Joaquin Region are within largely undeveloped areas that contain open space or agricultural uses, except for the city of Modesto, a moderately dense urban center. Three projects in this region could require land acquisition outside of the SFPUC right-of-way.

The Advanced Disinfection (SJ-1), SJPL System (SJ-3), and Tesla Portal Disinfection (SJ-5) projects could each require land acquisition outside of the SFPUC right-of-way for power equipment and structures and access roads. Generally, a relatively narrow strip of land would be required to extend new or additional power service infrastructure to the site (i.e., underground or aboveground powerlines), and a small additional site could be required for power station facilities. Given that these three project sites are for the most part located in undeveloped, agricultural areas, it is likely that power facilities could be sited along the margin of existing roads and/or private properties without causing significant land use displacement or disruption. For the Advanced Disinfection and Tesla Portal Disinfection projects, this impact is expected to be *less than significant*.

Agriculture is the predominant land use along the pipeline segments of the SJPL System project (SJ-3); however, rural and suburban residential and recreational uses are also located adjacent to the alignment, including the Tracy Golf and Country Club near I-580. Since the locations of power supply facilities have not yet been determined, the PEIR analysis errs on the conservative side and has determined that any permanent displacement of these existing residential or recreational uses would be a *potentially significant and unavoidable* impact. It is possible that this impact could be reduced to a less-than-significant level by implementing the recommendations of facility siting studies for power facilities and access roads (Measure 4.3-2). Although it is expected

TABLE 4.3-3
POTENTIAL LAND ACQUISITION REQUIRED OUTSIDE OF SFPUC RIGHT-OF-WAY

No.	Project Title	Potential Need for Permanent Easement or Land Acquisition
SJ-1	Advanced Disinfection	Land possibly needed for associated power infrastructure requirements.
SJ-2	Lawrence Livermore Supply Improvements	None at Thomas Shaft site.
SJ-3	San Joaquin Pipeline System	Additional right-of-way/easement possibly needed for associated power requirements and access roads. Presumably, power facilities would be located near two new crossovers (both located in Stanislaus County, with one about 20 miles east of Modesto and the other about 15 miles west of Modesto).
SJ-4	Rehabilitation of Existing San Joaquin Pipelines	None
SJ-5	Tesla Portal Disinfection Facility	Land possibly needed for associated power infrastructure requirements.
SV-1	Alameda Creek Fishery Enhancement	None
SV-2	Calaveras Dam Replacement	None
SV-3	Additional 40-mgd Treated Water Supply	Easement possibly needed across private property for new pipeline.
SV-4	New Irvington Tunnel	Could need additional right-of-way/easement for access to new west portal in Fremont.
SV-5	SVWTP – Treated Water Reservoirs	None
SV-6	San Antonio Backup Pipeline	Potential land acquisition to be determined (possible easement for new pipeline).
BD-1	Bay Division Pipeline Reliability Upgrade	Easements could be required along the existing Bay Division Pipeline right-of-way for access along the alignment. An easement could be required north of the Hayward fault crossing. Other easements would be required in the areas near the beginning (Irvington Portal area) and terminus (Newark Valve House area) of the eastern pipeline segments within Fremont and Newark; and the beginning (Ravenswood Valve House) and terminus (Edgewood Valve Lot) at the eastern segment within East Palo Alto and the unincorporated Edgewood community in San Mateo County.
BD-2	BDPL Nos. 3 and 4 Crossovers	Additional right-of-way/easement could be needed for permanent discharge outfalls at all three locations. Preferred locations are in undeveloped areas on Veterans Administration Medical Center–Gunn High School lands (Barron Creek), Ulistac Natural Area (Guadalupe Creek), and reservoir lands (Bear Gulch).
BD-3	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault	None
PN-1	Baden and San Pedro Valve Lots Improvements	None
PN-2	Crystal Springs/San Andreas Transmission Upgrade	Land acquisition to be determined.
PN-3	HTWTP Long-term Improvements	None
PN-4	Lower Crystal Springs Dam Improvements	None
PN-5	Pulgas Balancing Reservoir Rehabilitation	None
SF-1	San Andreas Pipeline No. 3 Installation	None
SF-2	Groundwater Projects	None within San Francisco for local projects (these would be on CCSF-owned property or in public right-of-way). Regional projects – acquisition to be determined. None in San Francisco (all sites located on city property, except one located at Francis Scott Key School on school district property).
SF-3	Recycled Water Projects	None but proposed sites on CCSF-owned property developed with other uses. Treatment Plant Site: Oceanside Water Pollution Control Plant / San Francisco Zoo vicinity; Storage: Golden Gate Park (existing 2-million-gallon reservoir); another could be required in the Lincoln Park area, which is owned/operated by the San Francisco Recreation & Park Department.

SOURCE: SFPUC (see Appendix C, Table C.1).

that power supply facilities could be located to avoid permanent impacts on existing land uses, the significance of any potential land use impacts would be evaluated as part of separate, project-level CEQA review, and this evaluation would determine if impacts could be mitigated to a less-than-significant level. Following project construction and installation of power supply facilities, no long-term disruption of adjacent land uses would result from operation of the pipelines.

The Lawrence Livermore (SJ-2) and SJPL Rehabilitation (SJ-4) projects would not require acquisition of land or right-of-way. Therefore, these projects would not have long-term land use impacts due to permanent displacement or disruption of existing land uses, and this impact would *not apply*.

Sunol Valley Region

Impact 4.3-2: Permanent displacement or long-term disruption of existing land uses		
Alameda Creek Fishery	SV-1	N/A
Calaveras Dam	SV-2	N/A
40-mgd Treated Water	SV-3	PSU
New Irvington Tunnel	SV-4	LS
Treated Water Reservoirs	SV-5	N/A
SABUP	SV-6	PSU

Two projects in this region, the 40-mgd Treated Water (SV-3) and New Irvington Tunnel (SV-4), would require acquisition of land outside of the existing SFPUC right-of way.

The Treated Water Reservoirs (SV-5) project would be entirely contained within existing SFPUC facilities, and therefore this impact would not be applicable to this project. The Alameda Creek Fishery (SV-1) and Calaveras Dam (SV-2) projects would involve development of new facilities on currently undeveloped sites, but entirely within Alameda watershed lands owned by the CCSF. Therefore, these projects would not displace or disrupt any existing land uses, and this impact would *not apply* to these projects. The SFPUC has not yet determined if land would need to be acquired for the SABUP project (SV-6). However, to address the remote possibility that acquisition of additional pipeline easement on private property might be necessary, the PEIR analysis errs on the conservative side and has determined that any permanent displacement of existing uses would be a *potentially significant and unavoidable* impact. It is possible that this impact could be reduced to a less-than-significant level by implementing the recommendations of facility siting studies (Measure 4.3-2). Although it is expected that project facilities could be located to avoid permanent impacts on existing land uses, the significance of any potential land use impacts would be evaluated as part of separate, project-level CEQA review, and this evaluation would determine if impacts could be mitigated to a less-than-significant level.

The 40-mgd Treated Water project (SV-3) could require a permanent easement across private property adjacent to the Sunol Valley WTP for a new pipeline, although a specific alignment for this pipeline has not yet been determined. Existing land uses in the Sunol Valley, besides SFPUC water system facilities and public open space and recreation uses, include rangeland, nurseries, and quarries. The proposed easement would occupy a relatively narrow strip of land, and it is likely that the existing land use activities could return following pipeline installation. While it is expected that the proposed pipeline easement could be located without significant permanent impacts on existing land uses (i.e., the need to relocate the existing use), the PEIR analysis errs on the conservative side and has determined that any permanent impacts on existing uses would be a *potentially significant and unavoidable* impact. It is possible that this impact could be reduced to a less-than-significant level by implementing the recommendations of facility siting studies (Measure 4.3-2). Although it is expected that project facilities could be located to avoid permanent impacts on existing land uses, the significance of any potential land use impacts would be evaluated as part of separate, project-level CEQA review, and this evaluation would determine if impacts could be mitigated to a less-than-significant level.

The New Irvington Tunnel project (SV-4) would require construction of two new tunnel portals and associated construction staging areas. This project also involves construction of a new access road within existing SFPUC right-of-way to accommodate truck traffic during construction and provide permanent site access. The new road would be located within the SFPUC's existing Bay Division Pipeline easement up to the Irvington Portal area, adjacent to residences in Fremont. This existing right-of-way extends through a residential neighborhood and creates an undeveloped, open space corridor behind these homes. The proposed access road would be a distinct change of land use from the current condition and use. Although this change in use could be significant during the construction phase when the road would be used by construction vehicles (see Impact 4.3-1, above), long-term use of this road would be limited to SFPUC maintenance vehicles and would be a continuation of an existing SFPUC water-related corridor and use (i.e., an access road), which would limit the potential for long-term disruption of existing residences. Therefore, this impact would be *less than significant*.

The New Irvington Tunnel project (SV-4) would also require acquisition of several parcels of land in the vicinity of the existing Irvington Tunnel in order to extend the new access road to the new portal on the west side of the new tunnel. This land is currently undeveloped and zoned for large-lot residential use. The proposed new access road could reduce the size and alter the configuration of some of these undeveloped parcels, but would not preclude future residential development and use in this area. Potential effects with respect to future residential use of this area would be less than significant.

Bay Division Region

Impact 4.3-2: Permanent displacement or long-term disruption of existing land uses		
BDPL Reliability Upgrade	BD-1	PSU
BDPL 3 and 4 Crossovers	BD-2	LS
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	N/A

The BDPL Reliability Upgrade (BD-1) and BDPL 3 and 4 Crossovers (BD-2) projects would be located in densely urbanized areas that include a mix of land uses. The BDPL Reliability project involves approximately 16 miles of pipeline and 5 miles of bay tunnel extending from Fremont and Newark in southern Alameda County through East Palo Alto, Menlo Park, and Redwood City and unincorporated areas in the central-eastern portion of San Mateo County. The existing right-of-way crosses through urban areas with a mix of land uses, including residential and school uses. A narrow strip of additional land adjacent to the existing SFPUC right-of-way would need to be acquired for pipeline easements along the BDPL Reliability Upgrade alignment. This additional land would be on the order of 5 to 15 feet wide, extending up to one-half mile or more. New easements could be required in areas north of the Hayward fault crossing, and in the vicinities of the Newark and Ravenswood Valve Houses and the Edgewood Valve Lot. Except for the Hayward fault location in a residential area, the proposed easements are adjacent to existing SFPUC facilities and are within undeveloped lands in industrial or open space areas; in the Hayward fault crossing location, the pipeline extends through residential areas.

Establishing this additional easement would impose some restrictions on land uses within the easement, but would not necessarily prohibit continuation of the existing land use. For example, the new easement might be established along the border of residential backyards adjacent to the current Bay Division Pipeline right-of-way or along the border of a park where the open areas, playfields, and gardens now present could be restored following pipeline installation. Similarly, the new easement might extend across a commercial property in a back parking lot or storage area, the use of which could be restored following pipeline construction. In other cases, some existing structures might need to be relocated, which could restrict the current use. In general, land uses and activities that make use of open, outdoor space could likely continue within the new easement area, while uses that involve permanent structures would need to be relocated, outside of the easement. In such cases, it might be possible to relocate structures such as garages or storage facilities elsewhere on the same property but outside the required easement area, thus resulting in a minor modification of the existing site use and land use configuration. The site-specific impacts on existing land uses of establishing additional pipeline easements would be analyzed in separate, project-level CEQA review of the BDPL Reliability Upgrade project (BD-1). While it is expected that the proposed pipeline easement could be located without the need to relocate an existing use, the PEIR analysis errs on the conservative side and has determined that any permanent impacts on existing uses would be a *potentially significant and unavoidable* impact. It is possible that this impact could be reduced to a less-than-significant level by implementing the recommendations of facility siting studies (Measure 4.3-2). Although it is expected that project facilities could be located to avoid permanent impacts on existing land uses, the significance of any potential land use impacts would be evaluated as part of separate, project-level CEQA review, and this evaluation would determine if impacts could be mitigated to a less-than-significant level. This project, an underground pipeline, would not result in long-term operational effects that would be incompatible with surrounding uses and thus would not result in permanent land use disruption.

Within the BDPL Reliability Upgrade project (BD-1) alignment, a number of existing land uses or improvements have encroached onto the SFPUC right-of-way, including residential fencing, schoolyards, play fields, landscaping, and parking lots. These uses would be removed or would be otherwise authorized (e.g., SFPUC leases or permits) according to the policies and procedures set forth in the SFPUC Right-of-Way Encroachment Removal Policy (SFPUC, 2007). The removal or authorization of these encroachments is not part of the BDPL Reliability Upgrade, as the SFPUC would enforce its encroachment removal policy with or without implementation of this project. Therefore, removal of these uses would not constitute a permanent displacement or change in land use for purposes of this PEIR.

The BDPL 3 and 4 Crossovers project (BD-2) would involve construction of pipeline crossovers at three separate locations along a 32-mile stretch of the existing Bay Division Pipelines Nos. 3 and 4. Additional right-of-way or easements could be required for discharge outfalls associated with the crossover facilities at three locations: Guadalupe Creek in Santa Clara, Bear Gulch Reservoir in Atherton, and Barron Creek in Palo Alto. The proposed outfalls would be installed within creek corridors; although temporary disruption of such uses as recreation trails might occur, these uses would be restored following installation, and no long-term displacement of existing land use activities would occur. The crossover and discharge outfall near Barron Creek is adjacent to the running track and sports fields at Gunn High School in Palo Alto; it is not known at this time if any easement would be required on the school property. However, placement of a new crossover facility near an open sports field would not restrict, disrupt, or displace existing uses. Also, the crossover facility would be located near, and would be similar in use to, the existing outfall facility at Barron Creek and thus would not constitute a change in use. This project would not result in long-term operational effects that would be incompatible with surrounding uses and thus would not result in permanent land use disruption. Therefore, these long-term operational impacts would be *less than significant*.

The BDPL 3 and 4 Seismic Upgrade at Hayward Fault project (BD-3) would involve improvements at an existing CCSF-owned facility site that is currently used for water system purposes. No new land uses would be introduced to this site, nor would this project require the acquisition of additional property. Therefore, this would not displace or disrupt any existing land uses, and this impact would *not apply*.

Peninsula Region

Impact 4.3-2: Permanent displacement or long-term disruption of existing land uses		
Baden and San Pedro Valve Lots	PN-1	N/A
CS/SA Transmission	PN-2	PSU
HTWTP Long-Term	PN-3	N/A
Lower Crystal Springs Dam	PN-4	N/A
Pulgas Balancing Reservoir	PN-5	N/A

The five WSIP project sites within the Peninsula Region would be located within existing SFPUC facilities or on SFPUC right-of-way or property. They would not involve the acquisition of additional land, with the possible exception of the CS/SA Transmission project (PN-2). Therefore, with the possible exception of PN-2, this impact would *not apply* to these projects.

At this time, the SFPUC believes that the CS/SA Transmission project (PN-2) would not require additional easement or land acquisition. If replacement of the existing pipeline were needed, a new parallel pipeline would most likely be located on the SFPUC property within the Peninsula watershed. However, since the need for and location of a new alignment has not been determined, to address the remote possibility that additional pipeline easement might be needed on private property, the PEIR analysis errs on the conservative side and has determined that any permanent impacts on existing uses would be a *potentially significant and unavoidable* impact. It is possible that this impact could be reduced to a less-than-significant level by implementing the recommendations of facility siting studies (Measure 4.3-2). Although it is expected that project facilities could be located to avoid permanent impacts on existing land uses, the significance of any potential land use impacts would be evaluated as part of separate, project-level CEQA review, and this evaluation would determine if impacts could be mitigated to a less-than-significant level.

San Francisco Region

Impact 4.3-2: Permanent displacement or long-term disruption of existing land uses		
SAPL 3 Installation	SF-1	N/A
Groundwater Projects	SF-2	PSU
Recycled Water Projects	SF-3	PSU

The SAPL 3 Installation project (SF-1) would involve the installation, repair, or replacement of up to 4.17 miles of pipeline through densely populated urbanized areas. The SFPUC expects that this project would not require additional easement or land acquisition, and permanent land use impacts would *not apply*.

In some cases, existing land uses have encroached onto the SFPUC right-of-way along this alignment, including two golf courses, mature landscaping, and permanent or temporary structures. These uses would either be removed or would be authorized according to the policies and procedures set forth in the SFPUC Right-of-Way Encroachment Removal Policy (SFPUC, 2007). The removal or authorization of these encroachments is not part of the SAPL 3 Installation project, but would be implemented in accordance with the SFPUC policy as part of its ongoing right-of-way maintenance program. Thus, while the SAPL 3 Installation project would necessitate SFPUC action on these encroachments in a timely manner to accommodate the WSIP schedule, such enforcement action is not part of the WSIP project, and any effects of implementing such enforcement actions are not analyzed in this PEIR. Enforcement actions will occur irrespective of whether the WSIP projects are implemented.

The Groundwater Projects (SF-2) and Recycled Water Projects (SF-3) could require additional right-of-way to accommodate wells and recycled storage, treatment, and pumping facilities. The Groundwater Projects would result in the installation of new wells, wells stations, and associated piping. Potential sites that could be affected include Francis Scott Key School or other sites in San Francisco and northern San Mateo County. While it is expected that the proposed groundwater and recycled water facilities could be located without significant permanent impact on existing land uses (i.e., the need to relocate the existing use), the PEIR analysis errs on the conservative side and has determined that any permanent impacts on existing uses would be a *potentially significant and unavoidable* impact. It is possible that this impact could be reduced to a less-than-significant level by implementing SFPUC Construction Measure #6 (compliance with local noise ordinances to the extent feasible) and Construction Measure #10 (locating staging areas away from public view and directing nighttime lighting away from residential areas) as well as recommendations of facility siting studies (Measure 4.3-2). Although it is expected that project facilities could be located to avoid permanent impacts on existing land uses, the significance of any potential land use impacts would be evaluated as part of separate, project-level CEQA review, and this evaluation would determine if impacts could be mitigated to a less-than-significant level. With Measure 4.3-2, the Groundwater Projects are not expected to result in long-term operational effects that would be incompatible with surrounding uses, and thus would not result in permanent land use disruption; wells and associated facilities are generally small utility type structures that would not alter the use of an existing site.

Recycled Water Projects (SF-3) facilities could require land acquisition for a new treatment facility at or near the Oceanside Water Pollution Control Plant (WPCP) or within Golden Gate Park, as well as multiple storage facilities for recycled water in the vicinity of Lincoln Park, Golden Gate Park, and the San Francisco Zoo. These facilities could also affect recreation and visitor-oriented uses at the zoo, Golden Gate Park, and the Lincoln Park golf course. The Recycled Water Projects (SF-3) could establish more substantial treatment and/or pump station facilities in residential areas. Since facility locations are undetermined at this stage of project planning, the PEIR analysis errs on the conservative side and has determined that any permanent impacts on existing uses would be a *potentially significant and unavoidable* impact. It is possible that this impact could be reduced to a less-than-significant level with implementation of SFPUC Construction Measure #6 (compliance with local noise ordinances to the extent feasible) and Construction Measure #10 (locating staging areas away from public view and directing nighttime lighting away from residential areas) as well as the recommendations of facility siting studies (Measure 4.3-2). Although it is expected that project facilities could be located to avoid permanent impacts on existing land uses, the significance of any potential land use impacts would be evaluated as part of separate, project-level CEQA review, and this evaluation would determine if impacts could be mitigated to a less-than-significant level.

Visual Quality

This analysis identifies three potential impacts on visual quality. The first type of impact is the temporary construction-related effect that WSIP projects could have on vistas, as seen from scenic highways and local scenic routes, or on the visual character of a community. The second is the permanent visual impact that projects would have on these same vistas or on visual character. The third impact relates to new sources of light and glare that could be created through implementation of WSIP projects.

Impact 4.3-3: Temporary construction-related adverse impacts on scenic vistas or the visual character of a community.

WSIP projects could result in temporary construction-related impacts on scenic vistas, depending on the location of the WSIP project in relation to those resources. With implementation of SFPUC Construction Measure #10 (maintaining a clean and orderly site, locating staging areas away from public view, and directing nighttime lighting away from residential areas), this impact would be less than significant.

All Regions

Construction activities typically have only temporary effects on visual quality and therefore are generally considered to have a less-than-significant impact. However, construction projects that would be located at one site for a year or more could result in construction-related visual impacts. Although pipeline projects progress along the alignment and typically affect a specific location for a short period of time (less than one year), staging areas associated with these projects could be used for more than one year. In addition, any projects involving nighttime construction (e.g., tunnel portals or shafts) would require lighting, and adjacent areas could be subject to visual impacts associated nighttime lighting for more than one year. Based on the construction schedule presented in Chapter 3 (Figure 3.6) and Appendix C (Table C.4), construction activities associated with all WSIP projects would occur for at least one year. It should be noted, however, that construction of some of these projects could actually last for less than a year.

Although construction activities associated with all WSIP projects could occur over one year or longer, temporary visual impacts would be *less than significant* with implementation of SFPUC Construction Measure #10 (maintaining a clean and orderly site, locating staging areas away from public view, and directing nighttime lighting away from residential areas).

Impact 4.3-4: Permanent adverse impacts on scenic vistas or the visual character of a community.

The long-term visual impacts of WSIP projects could be potentially significant, depending on site selection, facility scale and design, and location relative to public viewing opportunities. The major factor affecting visual impacts is the visibility of the proposed improvements. Pipelines and tunnels are typically underground and would have no permanent visual impacts. Treatment facilities, storage basins, vaults and valve houses, crossovers, and other facilities can be partially buried, but in general have a visible aboveground component. Construction of permanent new facilities as well as renovation or repair of existing facilities could result in negative aesthetic effects, depending on the existing character of the project site and the degree of proposed changes, such as the height and mass of proposed structures or whether mature trees would be removed. **Table 4.3-4** summarizes key information used to assess potential visual impacts, including aboveground structures proposed as part of each project, scenic roads and highways in the vicinity of each project site, site visibility from these scenic roads, and other considerations.

San Joaquin Region

Impact 4.3-4: Permanent adverse impacts on scenic vistas or visual character		
Advanced Disinfection	SJ-1	PSM
Lawrence Livermore	SJ-2	LS
SJPL System	SJ-3	LS
SJPL Rehabilitation	SJ-4	N/A
Tesla Portal Disinfection	SJ-5	PSM

The Advanced Disinfection (SJ-1) and Tesla Portal Disinfection (SJ-5) projects would construct new buildings at the Tesla Portal facility. The Advanced Disinfection project would construct a new structure up to 35 feet high, and four partially buried vaults up to 30 inches high. The Tesla Portal Disinfection (SJ-5) project involves building a structure up to 30 feet high. These projects could also require the purchase of additional land for associated power supply facilities, depending on the final locations selected (see Table 4.3-4). There are distant views of the Tesla Portal facility from I-580, a Caltrans-designated scenic highway (from I-5 to the Alameda County line) and a San Joaquin County–designated scenic route (where I-5 and I-580 are combined). These two projects would expand the existing cluster

TABLE 4.3-4
POTENTIAL PERMANENT VISUAL IMPACTS OF WSIP PROJECTS

Project No.	Project Name	Proposed New Permanent Aboveground Structures	Scenic Routes in the Project Region	Would WSIP Facilities Be Visible from Scenic Routes or Other Visually Sensitive Areas?	Visual Considerations (including whether WSIP project is located in Alameda or Peninsula Watershed Management Plan [WMP] areas)	Impact Significance Determination
SJ-1	Advanced Disinfection	*Tesla Portal*: ▪ 1 new structure (up to 35 feet high) ▪ 4 partially buried vaults (typically up to 30 inches high) ▪ Modification of Tesla Portal	*Caltrans:* ▪ I-580 from I-5 to Alameda County line *San Joaquin County:* ▪ I-580 and I-5 (where combined)	Yes, distant views of this building would be available from I-580.	There are about seven existing structures at Tesla Portal that are currently visible from I-580, and this project would expand the cluster of buildings currently visible from this road. Potentially significant impacts would be reduced to less than significant with implementation of mitigation measures to ensure visual compatibility with existing adjacent SFPUC facilities.	PSM
SJ-2	Lawrence Livermore Supply Improvements	New structures at Thomas Shaft (size, height, appearance to be determined)	*San Joaquin County:* ▪ Corral Hollow Road	No, depending on building height. Facility located approximately 1.5 miles south of Corral Hollow Road where topography and distance would limit the potential for visibility.	Thomas Shaft not visible from Corral Hollow Road.	LS
SJ-3	San Joaquin Pipeline System	▪ No new buildings ▪ 2 partially buried vaults at crossover locations (typically up to 30 inches high) ▪ Modification of Oakdale Portal	*Caltrans:* ▪ I-580 from I-5 to Alameda County line ▪ I-5 from Merced County line to San Joaquin County line *San Joaquin County:* ▪ I-580 and I-5 (where combined)	No, facilities near scenic roads would be underground and not visible. No pipelines are currently visible from Willms Road and this would not change with this project. Although this road is not designated as a scenic road, Willms Ranch, a California landmark, is located on Willms Road.	Vaults would be visible, but they would not be located near scenic roads.	LS
SJ-4	San Joaquin Pipeline Rehabilitation	None, existing pipelines would be rehabilitated.	*Caltrans:* ▪ I-580 from I-5 to Alameda County line ▪ I-5 from Merced County line to San Joaquin County line *San Joaquin County:* ▪ I-580 and I-5 (where combined)	No change in visibility from scenic roads compared to existing conditions.	Existing pipelines are mostly underground, with some aboveground sections at the east end (west of Oakdale Portal) in agricultural areas, and rehabilitation would not alter visibility.	N/A
SJ-5	Tesla Portal Disinfection Station	*Tesla Portal*: ▪ 1 new structure to replace/upgrade existing disinfection facility (up to 30 feet high)	*Caltrans:* ▪ I-580 from I-5 to Alameda County line *San Joaquin County:* ▪ I-580 and I-5 (where combined)	Yes, distant views of this building would be available from I-580.	Since there are existing structures at Tesla Portal that are currently visible from I-580, this project would expand the cluster of buildings currently visible from this road. Mitigation measures would ensure visual compatibility with existing adjacent SFPUC facilities.	PSM

TABLE 4.3-4 (Continued)
POTENTIAL PERMANENT VISUAL IMPACT OF WSIP PROJECTS

Project No.	Project Name	Proposed New Permanent Aboveground Structures	Scenic Routes in the Project Region	Would WSIP Facilities Be Visible from Scenic Routes or Other Visually Sensitive Areas?	Visual Considerations (including whether WSIP project is located in Alameda or Peninsula Watershed Management Plan [WMP] areas)	Impact Significance Determination
SV-1	Alameda Creek Fishery Enhancement	*Alameda Creek, downstream from Sunol Valley WTP*: ▪ Facilities not yet determined	*Alameda and Santa Clara Counties:* ▪ Calaveras Road	Yes, new facilities could be visible from Highway 84/Niles Canyon Road, Calaveras Road, or I-680, if any aboveground facilities are located in segments of Alameda Creek that are currently visible from these roadways.	All project alternatives would be located within the Alameda WMP area. With implementation of the WMP's required design guidelines and mitigation measures, visual impacts would be less than significant.	PSM
SV-2	Calaveras Dam Replacement	*Calaveras Dam site*: ▪ Replacement of dam, spillway, and inlet tower (maximum height of dam: 220 feet from foundation to dam crest) ▪ 2 vaults (typically up to 30 inches high)	*Alameda and Santa Clara Counties:* ▪ Calaveras Road	Yes, views could be available from immediately surrounding ridges, with distant views possible from the Sunol Regional Wilderness (although topography would likely block distant views). Although the dam would not be visible from Calaveras Road, the reservoir, borrow areas, and the road between the borrow areas and dam could be visible from this road and trails within the Sunol Regional Wilderness.	The dam itself is not visible from Calaveras Road, but the reservoir as well as potential changes in the surrounding topography (from borrow areas and access roads) would be visible from Calaveras Road and trails within the Sunol Regional Wilderness. The project would alter views of the reservoir and surrounding hillsides when water levels are raised and oak woodland cover is removed in areas subject to excavation and grading. WMP design guidelines and mitigation measures would help to minimize visual impacts somewhat from Calaveras Road.	PSU
SV-3	Additional 40-mgd Treated Water Supply	*Sunol Valley WTP*: ▪ One new building (up to 10 feet high)	*Alameda and Santa Clara Counties:* ▪ Calaveras Road	No, existing Sunol Valley WTP facilities are not visible from Calaveras Road, since trees in the Alameda Creek riparian corridor screen views of facilities from this road. Likewise, proposed facilities would not be visible from this road.	The new building would not be visible from Calaveras Road. With implementation of the WMP's required design guidelines, any potential visual impacts from the new building (up to 10 feet high) at the Sunol Valley WTP facility would be less than significant.	LS
SV-4	New Irvington Tunnel	*New Irvington Tunnel East Portal in Sunol Valley and West Portal in Fremont*: ▪ New portals ▪ 9–12 concrete vaults to be built across the fault (typically up to 30 inches high) ▪ Modification of Irvington Portal and Alameda West Portal	*Alameda and Santa Clara Counties:* ▪ Calaveras Road	Yes, distant views of the new and existing portals in the Sunol Valley could be available from Calaveras Road, although the riparian corridor along Alameda Creek could obscure these views. Views of the new and existing portals east of Mission Boulevard in Fremont could be visible from nearby homes to the west, but these homes would obscure views of the portal from Mission Boulevard.	With the implementation of the WMP's required design guidelines and mitigation measures, visual impacts on Calaveras Road due to the new portal and vaults in the Sunol Valley would be less than significant. Mitigation measures would reduce visual impacts of the new portal in Fremont.	PSM

TABLE 4.3-4 (Continued)
POTENTIAL PERMANENT VISUAL IMPACT OF WSIP PROJECTS

Project No.	Project Name	Proposed New Permanent Aboveground Structures	Scenic Routes in the Project Region	Would WSIP Facilities Be Visible from Scenic Routes or Other Visually Sensitive Areas?	Visual Considerations (including whether WSIP project is located in Alameda or Peninsula Watershed Management Plan [WMP] areas)	Impact Significance Determination
SV-5	SVWTP – Treated Water Reservoirs	Sunol Valley WTP: ▪ 1 new structure (up to 15 feet high) ▪ 1 new vault	*Alameda and Santa Clara Counties:* ▪ Calaveras Road	No, existing Sunol Valley WTP facilities are not visible from Calaveras Road, since trees in the Alameda Creek riparian corridor screen views of facilities from this road. Likewise, proposed facilities would not be visible from this road.	The new building would not be visible from Calaveras Road. With implementation of the WMP's design guidelines, potential visual impacts from the proposed structure (up to 15 feet high) at the Sunol Valley WTP facility would be less than significant.	LS
SV-6	San Antonio Backup Pipeline	Alameda East Portal: ▪ 2 new vaults ▪ Modification of Alameda East Portal	*Alameda and Santa Clara Counties:* ▪ Calaveras Road	Yes, views of any aboveground features associated with the discharge facility could be available from Calaveras Road, although the Alameda Creek riparian corridor would likely obscure these views. All pipeline facilities would be underground, and long-term views from this road would not be altered.	With implementation of the WMP's design guidelines and mitigation measures, visual impacts from the new vaults (up to 30 inches high) on Calaveras Road would be less than significant.	PSM
BD-1	Bay Division Pipeline Reliability Upgrade	8 electrical control buildings at valve lots (up to 30 feet high) and tunnel shaft facilities at Ravenswood and Newark Valve Houses	*Alameda County, Cities of Fremont and Newark (routes and interchanges):* ▪ Dumbarton Freeway (Dumbarton Bridge/Highway 84) and Newark Boulevard ▪ Dumbarton Freeway (Dumbarton Bridge/Highway 84) and Thornton Avenue ▪ Nimitz Freeway (I-880) and Thorton Avenue ▪ Nimitiz Freeway (I-880) and Mowry Avenue ▪ Nimitz Freeway (I-880) and Stevenson Boulevard ▪ I-880 from the northern city limits to the southern city limits ▪ Mission Boulevard (northern city limits to I-880) ▪ Fremont Boulevard (northern city limits to Warm Springs Boulevard)	Possibly, depending on proximity of one-story buildings to scenic roads, although the visibility of project facilities at tunnel shafts from I-880 and Dumbarton Freeway/Highway 84 would be limited by level topography and intervening development. With the level topography in the bay vicinity (Ravenswood Valve House near East Palo Alto and Newark Valve House in Newark), intervening vegetation obscures views of the tunnel portal areas from scenic roadways or waterways. In addition, industrial buildings located south of Thornton Avenue and west of Willow Street block views of the Newark Valve House from Thornton Avenue and the Dumbarton Freeway. Views of the easternmost pipeline alignment from I-680 would also be obscured by distance (approximately one-half mile north of the freeway), intervening development and landscape trees.	New one-story buildings could be visible from adjacent roadways (and possibly scenic roadways depending on their location), but they would be located near existing development, which is adjacent to most of the pipeline alignment. Mitigation measures would reduce potential visual impacts of new vaults by addressing architectural design, landscaping plans, landscape screens, and tree removal.	PSM

TABLE 4.3-4 (Continued)
POTENTIAL PERMANENT VISUAL IMPACT OF WSIP PROJECTS

Project No.	Project Name	Proposed New Permanent Aboveground Structures	Scenic Routes in the Project Region	Would WSIP Facilities Be Visible from Scenic Routes or Other Visually Sensitive Areas?	Visual Considerations (including whether WSIP project is located in Alameda or Peninsula Watershed Management Plan [WMP] areas)	Impact Significance Determination
BD-1 (cont.)	Bay Division Pipeline Reliability Upgrade (cont.)		▪ Washington Boulevard (Fremont to Mission Boulevards) ▪ Mowry Avenue (from I-880 to Mission Boulevard) ▪ Stevenson Boulevard (from I-880 to Mission Boulevard) ▪ Thornton Avenue in Newark ▪ Newark Slough and Mowry Slough in Newark *City of East Palo Alto:* ▪ University Avenue (an important gateway to the city) *San Mateo County* ▪ *Edgewood Road from Alameda de las Pulgas to Cañada Road*			
BD-2	BDPL Nos. 3 and 4 Crossovers	3 new aboveground control buildings and/or vaults along the Bay Division Pipeline (3 to 8 feet high)	*City of Palo Alto:* ▪ Junipero Sierra Boulevard/ Foothill Expressway *Town of Woodside:* ▪ I-280 ▪ Highway 84	Possibly, although crossover facilities would generally be located away from public streets due to their proximity to creeks, rivers, and other waterways. However, nearby scenic roads include: ▪ Foothill Boulevard, adjacent to Veterans Administration Medical Center and near Gunn High School (Barron Creek) ▪ I-280 and Highway 84, near Bear Gulch Reservoir	New buildings would be 3 to 8 feet high. Existing visual character of the three crossover sites, including views from public rights-of-way, would be considered for all permanent aboveground facilities, if applicable. New building adjacent to Bear Gulch Reservoir could be visible from nearby residential development. The new building at Barron Creek would be near the Veterans Administration Medical Center and Gunn High School, while the building at Guadalupe Creek would be located in the Ulistac Natural Area. Mitigation measures would reduce potential visual impacts of the control buildings at these locations by addressing architectural design, landscaping plans, landscape screens, and tree removal.	PSM

TABLE 4.3-4 (Continued)
POTENTIAL PERMANENT VISUAL IMPACT OF WSIP PROJECTS

Project No.	Project Name	Proposed New Permanent Aboveground Structures	Scenic Routes in the Project Region	Would WSIP Facilities Be Visible from Scenic Routes or Other Visually Sensitive Areas?	Visual Considerations (including whether WSIP project is located in Alameda or Peninsula Watershed Management Plan [WMP] areas)	Impact Significance Determination
BD-3	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault	None	▪ I-880 from Fremont's northern city limits to its southern city limits ▪ Mission Boulevard (northern city limits to I-880)	N/A	N/A	N/A
PN-1	Baden and San Pedro Valve Lots Improvements	*San Pedro Valve Lot*: ▪ 2 structures *Baden Valve Lot*: ▪ 4 new structures (all new structures, 1 to 3 feet high)	*Caltrans:* ▪ I-280 from Highway 17 to I-80 north of First Street in San Francisco	Possibly, but views would be limited. Baden Valve Lot located west of El Camino Real (Highway 82), and trees along the west side of this street obscure views of this facility. San Pedro Valve Lot is adjacent to I-280 and Junipero Serra Boulevard and would be visible from these streets.	Proposed facilities would be located within these existing valve lots and would not significantly alter existing views of these facilities. Expected low height (1 to 3 feet) would minimize the potential for changes in views.	LS
PN-2	Crystal Springs/ San Andreas Transmission Upgrade	1 or 2 existing structures could be replaced and would be the same height as existing structures (25 feet high).	*Caltrans:* ▪ I-280 from Highway 17 to I-80 north of First Street in San Francisco *Santa Clara County and City of San Mateo:* ▪ Highway 35 (northern end of the Skyline Scenic Recreation Route) ▪ Skyline Boulevard (in the Crystal Springs Reservoirs vicinity) ▪ Crystal Springs Road ▪ Black Mountain Road	Yes, structures in the Crystal Springs Pump Station vicinity could be visible from Highway 35/Skyline Road bridge over Lower Crystal Springs Dam or Crystal Springs Road, but views would be limited by elevational differences and vegetation.	Potentially visible, but the existing pump station structure is currently visible and within the Peninsula WMP area. Implementation of the WMP's design guidelines for structures and roads within the watershed plan area and mitigation measures addressing visual impacts from vegetation/tree removal would reduce visual impacts to less than significant.	PSM
PN-3	HTWTP Long-Term Improvements	To be determined	*Caltrans:* ▪ I-280 from Highway 17 to I-80 north of First Street in San Francisco	Possibly; this project is located east of I-280, but views of this facility are limited by intervening topography and trees. This site is already developed with structures associated with water facilities.	Locations and designs of any above-ground facilities/structures have not yet been determined, but they would be located within the existing water treatment facility. Since this site is already developed with water facilities, the project is not expected to significantly alter existing views of this facility. However, due to the visual sensitivity of the area, any change in visual character would be a potentially significant impact. Mitigation	PSM

TABLE 4.3-4 (Continued)
POTENTIAL PERMANENT VISUAL IMPACT OF WSIP PROJECTS

Project No.	Project Name	Proposed New Permanent Aboveground Structures	Scenic Routes in the Project Region	Would WSIP Facilities Be Visible from Scenic Routes or Other Visually Sensitive Areas?	Visual Considerations (including whether WSIP project is located in Alameda or Peninsula Watershed Management Plan [WMP] areas)	Impact Significance Determination
PN-3 (cont.)	HTWTP Long-Term Improvements (cont.)				measures would reduce potential visual impacts of the control buildings at these locations by addressing architectural design, landscaping plans, landscape screens, and tree removal.	
PN-4	Lower Crystal Springs Dam Improvements	To be determined	*Caltrans:* ▪ I-280 from Highway 17 to I-80 north of First Street in San Francisco *San Mateo County and City of San Mateo:* ▪ Highway 35 (northern end of the Skyline Scenic Recreation Route) ▪ Skyline Boulevard (in the Crystal Springs Reservoirs vicinity) ▪ Crystal Springs Road ▪ Black Mountain Road	Yes, existing dam is visible from Highway 35/Skyline Road bridge over this dam and scenic overlook located west of this road. Also, visible from I-280 and Crystal Springs Road.	This dam would be visible from a number of scenic roads and scenic overlooks, and visual sensitivity of this structure would be high. The dam is located in the Peninsula WMP area and would be subject to WMP design guidelines. Design of the dam parapet wall has not yet determined, but would be evaluated as part of separate, project-level CEQA review. Implementation of the WMP's design guidelines would reduce the visual impacts of new structures, and additional mitigation measures would be required to specifically address changes in views from visually sensitive areas. Raising the water levels in the reservoir could also affect views from the scenic overlook (see Chapter 5 for more discussion). However, the scenic quality of the reservoir vicinity would not change with this project.	PSM
PN-5	Pulgas Balancing Reservoir Rehabilitation	No new structures, but includes work on the Pulgas Channel.	*Caltrans:* ▪ I-280 from Highway 17 to I-80 north of First Street in San Francisco *San Mateo County:* ▪ Cañada Road	Yes, any changes to Pulgas Channel would be visible from Cañada Road, a designated scenic route. Scenic vistas from I-280 would not be affected by this project, since this freeway is located almost one mile to the east. Project would be located adjacent to Pulgas Water Temple, an important visual and historic resource, and cross under Cañada Road.	Any required tree/vegetation removal could alter views of the Pulgas Channel from Cañada Road. This facility is located in the Peninsula WMP area, and any changes to the reservoir facility or channel would be subject to WMP design guidelines. Additional mitigation measures would be required to specifically address vegetation/tree removal.	PSM

TABLE 4.3-4 (Continued)
POTENTIAL PERMANENT VISUAL IMPACT OF WSIP PROJECTS

Project No.	Project Name	Proposed New Permanent Aboveground Structures	Scenic Routes in the Project Region	Would WSIP Facilities Be Visible from Scenic Routes or Other Visually Sensitive Areas?	Visual Considerations (including whether WSIP project is located in Alameda or Peninsula Watershed Management Plan [WMP] areas)	Impact Significance Determination
SF-1	San Andreas Pipeline No. 3 Installation	2 new structures to replace out-of-service pipeline (up to 8 feet high) 2 vaults (typically up to 30 inches high)	*Caltrans:* ▪ I-280 from Highway 17 to I-80 north of First Street in San Francisco ▪ Highway 1: from Highway 35 to Highway 101 North of the Golden Gate Bridge	Yes, this pipeline alignment traverses the Lake Merced Golf & Country Club and San Francisco Golf Club.	Depending on location, new structures (up to eight feet high) could be visible from visually sensitive areas like the Lake Merced Golf & Country Club and San Francisco Golf Club. Pipeline construction could result in visual impacts due to damage or loss of mature trees at Lake Merced Golf & Country Club and San Francisco Golf Club. Mitigation measures would be required to minimize potential visual impacts due to facility design and loss of trees.	PSM
SF-2	Groundwater Projects	*San Francisco*: ▪ 6 new structures for wells and well stations *Northern San Mateo County*: 10 new structures	*Caltrans:* ▪ I-280 from Highway 17 to I-80 north of First Street in San Francisco *City of Colma:* ▪ El Camino Real ▪ Hillside Boulevard ▪ Junipero Serra Boulevard	Possibly, depending on final locations of facilities. Facilities could be within the scenic viewshed of I-280, Great Highway, Lake Merced, Pine Lake, San Francisco Zoo, and/or Golden Gate Park.	The potential for visual impacts would depend on final locations. Up to 16 single-story structures could be developed at various locations on the west side of San Francisco or in northern San Mateo County. These buildings would be small in scale and located generally in urbanized areas. Mitigation measures would reduce potential visual impacts by addressing architectural design, landscaping plans, landscape screens, and tree removal, as appropriate.	PSM
SF-3	Recycled Water Projects	1 to 4 new structures (for a recycled water treatment facility at or near Oceanside Water Pollution Control Plant) (up to 40 feet high)	*Caltrans:* ▪ Highway 1/19th Avenue	Possibly; if the recycled water treatment facility is located in the vicinity of the San Francisco Zoo and Oceanside WPCP, it could be visible from the Great Highway and Skyline Boulevard (Highway 35).	Any new facilities (up to 40 feet high) in the vicinity of the San Francisco Zoo and Oceanside WPCP could affect views from the Great Highway, Skyline Boulevard (Highway 35), or other scenic routes in this area. At 40 feet high, this building might have to be constructed partially below grade in order to minimize visual impacts on nearby scenic roads. Mitigation measures would reduce potential visual impacts by addressing architectural design, landscaping plans, landscape screens, and tree removal, as appropriate.	PSM

of buildings at the Tesla Portal facility that can be viewed at a distance from I-580. The two buildings and aboveground portions of the four vaults would alter the visual character of the area by intensifying the scale and mass of buildings and structures at the Tesla Portal site. Because the surrounding area is largely undeveloped, impacts on scenic vistas and visual character could be *potentially significant*. However, with implementation of mitigation measures addressing architectural design (Measure 4.3-4a), landscaping plans (Measure 4.3-4b), landscape screens (Measure 4.3-4c), and tree removal (Measure 4.3-4d), these potentially significant impacts could be reduced to a less-than-significant level.

The Lawrence Livermore project (SJ-2) would involve improvements at Thomas Shaft, an existing SFPUC facility site. Because the new structures have not been designed, their size, height, and appearance are not yet known. The closest scenic route is Corral Hollow Road (as designated by San Joaquin County), which is approximately 1.5 miles north of the project. Given the distance from the facility and the surrounding topography, the project would not likely be visible from Corral Hollow Road. The impact on the visual character and resources due to this project would be *less than significant*.

The SJPL System project (SJ-3) would build two partially buried vaults (up to 30 inches high) at crossover locations. The nearby scenic routes are I-580 (as designated by Caltrans from I-5 to the Alameda County line), I-5 (as designated by Caltrans from the Merced County line to the San Joaquin County line), and I-580 and I-5 (as designated by San Joaquin County where the two routes combine). The SJPL System's facilities are underground near these scenic routes. These vaults would be visible but would not be located near the scenic roads. Therefore, the visual impact from this project would be *less than significant*.

The SJPL Rehabilitation project (SJ-4) would involve work on existing pipelines. There would be no change in visibility from scenic roads (which are the same roads listed for the SJPL System project above). The existing pipelines are mostly underground, but there are aboveground sections at the east end (west of the Oakdale Portal); however, the rehabilitation of these pipelines would not alter their visibility or the visual character of the area. Therefore, the impact on visual resources from this project would be *not applicable*.

Sunol Valley Region

Impact 4.3-4: Permanent adverse impacts on scenic vistas or visual character		
Alameda Creek Fishery	SV-1	PSM
Calaveras Dam	SV-2	PSU
40-mgd Treated Water	SV-3	LS
New Irvington Tunnel	SV-4	PSM
Treated Water Reservoirs	SV-5	LS
SABUP	SV-6	PSM

All of the Sunol Valley Region projects are located within the Alameda Watershed Management Plan (WMP) area. The plan describes the following design guidelines (under *"Action des 5"*) that would apply to these projects:

- Where grading is necessary, contour slopes and landforms to mimic the surrounding environment as much as possible

- Design and site new roads and trails to minimize grading and the visibility of cut banks and fill slopes
- Incorporate architectural siting/design elements that are compatible with the applicable surrounds
- Site, shield, and direct downward exterior lighting such that it is not highly visible or obtrusive
- Maintain the silhouette of new structures below the skyline of bluffs, cliffs, or ridges
- Design any new structural additions to historic structures to harmonize with older structural features and comply with scenic easements and aesthetic guidelines
- Encourage the salvage and selective reuse of building features if historic structures are demolished

Views of the Calaveras Dam project (SV-2) would be available from the immediately surrounding ridges, and distant views could also be visible from the Sunol Regional Wilderness. The borrow areas and possibly access roads associated with this project would be visible from Calaveras Road, which is designated by Alameda and Santa Clara Counties as a scenic route. Although the dam itself would not be visible from this road, the reservoir and surrounding hillsides, are considered important visual features in the Alameda watershed. Excavation and grading activities associated with this project would require removal of a large area of existing oak woodland cover. This removal of vegetation would create visual discontinuity within the existing pattern of oak woodland cover on the north- and east-facing slopes in the immediate vicinity of the dam. Although these areas of disturbance would be contoured and revegetated, to the extent feasible, as part of the proposed project, fast-growing grasses and scrub would cover the disturbed areas until a cover of oak woodland could mature. Due to the visual sensitivity of the area and the extent of surface disturbance that would occur, implementation of design guidelines in the Alameda WMP and mitigation measures addressing architectural design (Measure 4.3-4a), landscaping plans (Measure 4.3-4b), landscape screens (Measure 4.3-4c), and tree removal (Measure 4.3-4d) would be required to help reduce potential visual impacts. However, because recovery of oak woodland on disturbed areas could require decades, the visual discontinuity in the cover and color of vegetation would persist for decades as evidence of ground disturbance. The impact of site disturbance would therefore extend beyond the construction phase and would be considered a long-term, *potentially significant and unavoidable* visual impact of the project.

The tunnel component of the New Irvington Tunnel project (SV-4) would be buried, but the portals at either end of the tunnel would be visible. Between 9 and 12 concrete vaults (up to 30 inches high) would also be built along the tunnel alignment. Project facilities at the new tunnel portal and modifications at the existing portal could be visible at a distance from Calaveras Road in the Sunol Valley, although the riparian corridor at Alameda Creek could obscure these views. Views of the new portal east of Mission Boulevard in Fremont could be visible from nearby homes to the west, but these homes would partially obscure views of the portal from Mission Boulevard. The project's impact on the visual character of the Sunol Valley and the adjacent neighborhood in Fremont at tunnel portals would be *potentially significant*, but could be reduced to a less-than-significant level with implementation of design guidelines in the Alameda WMP and mitigation measures addressing architectural design (Measure 4.3-4a), landscaping plans (Measure 4.3-4b), landscape screens (Measure 4.3-4c), and tree removal (Measure 4.3-4d).

While the design of the Alameda Creek Fishery project (SV-1) has not yet been determined, it is likely to include facilities on or adjacent to Alameda Creek downstream of the Sunol Valley WTP. This project could be visible from Highway 84/Niles Canyon Road or I-680 (both designated by Caltrans as scenic highways) or from Calaveras Road. Any removal of riparian vegetation along Alameda Creek to accommodate project facilities could alter the visual character of this reach of the creek. Depending on final design and siting of project facilities, implementation of the Alameda Creek Fishery project could result in *potentially significant* changes in the visual character of this reach of Alameda Creek. The project's impact could be reduced to a less-than-significant level with implementation of design guidelines in the Alameda WMP and mitigation measures addressing architectural design (Measure 4.3-4a), landscaping plans (Measure 4.3-4b), landscape screens (Measure 4.3-4c), and tree removal (Measure 4.3-4d).

The SABUP project (SV-6) would construct two new vaults that could be visible from Calaveras Road, although the Alameda Creek riparian corridor would likely obscure these views. All pipeline facilities would be underground, and long-term views from this road would not be altered. However, any removal of riparian vegetation along San Antonio or Alameda Creeks to accommodate outfall and pipeline facilities could alter the visual character of these creeks. Depending on final design and siting of the various project facilities, implementation of this project could result in *potentially significant* changes in the visual character of San Antonio and Alameda Creeks. The project's impact could be reduced to a less-than-significant level with implementation of design guidelines in the Alameda WMP and mitigation measures addressing architectural design (Measure 4.3-4a), landscaping plans (Measure 4.3-4b), landscape screens (Measure 4.3-4c), and tree removal (Measure 4.3-4d).

Two projects would construct new buildings at the Sunol Valley WTP. The 40-mgd Treated Water project (SV-3) would construct a new 10-foot-high building. The Treated Water Reservoirs project (SV-5) would construct a new structure (up to 15 feet high) and one new vault. The water treatment plant is not visible from Calaveras Road because trees in the Alameda Creek riparian corridor block the view. With implementation of the WMP's design guidelines, the visual impacts from these projects would be *less than significant*.

Bay Division Region

Impact 4.3-4: Permanent adverse impacts on scenic vistas or visual character		
BDPL Reliability Upgrade	BD-1	PSM
BDPL 3 and 4 Crossovers	BD-2	PSM
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	N/A

The BDPL Reliability Upgrade project (BD-1) would consist primarily of underground pipelines and a tunnel, which would not be visible from any scenic highways. Although tunnel portal staging areas could be visible during tunnel construction, there would not be any permanent aboveground structures associated with tunnel portals. In any case, the level topography in the bay vicinity (Ravenswood Valve House near East Palo Alto and Newark Valve House in Newark) and intervening vegetation obscure views of the tunnel portal areas from scenic roadways or waterways. In addition, industrial buildings located south of Thornton Avenue and west of Willow Street block views of the Newark Valve House from Thornton Avenue and the Dumbarton Freeway. The project would also construct eight new structures for electrical controls with aboveground heights of up to 30 feet. The new one-story buildings could be visible from adjacent roadways (and possibly scenic roadways, depending on their location), which could alter the visual character of adjacent areas, a *potentially significant* impact. However, the project's impact could be reduced to a less-than-significant level with implementation of mitigation measures addressing architectural design (Measure 4.3-4a), landscaping plans (Measure 4.3-4b), landscape screens (Measure 4.3-4c), and tree removal (Measure 4.3-4d).

Because the BDPL Reliability Upgrade project (BD-1) traverses mostly developed urban locations—many of which are older, established residential areas—construction of the project could result in the damage or loss of mature trees adjacent to the SFPUC right-of-way, which would alter the visual character of these communities. This *potentially significant* impact could be reduced to a less-than-significant level with implementation of mitigation measures addressing landscaping plans (Measure 4.3-4b), landscape screens (Measure 4.3-4c), and tree removal (Measure 4.3-4d).

The BDPL Nos. 3 and 4 Crossovers project (BD-2) would construct three new aboveground control buildings and/or vaults along the existing Bay Division Pipeline alignments. These structures would be 3 to 8 feet high. The proposed structure at Barron Creek in Palo Alto could be visible from nearby Foothill Boulevard to the south, a designated scenic route, but adjacent structures associated with Gunn High School and the Veterans Administration Medical Center would obscure views of this facility from this and other nearby roadways. The proposed structure at Bear Gulch Reservoir in Atherton could be visible from nearby residences, but topography would block visibility from the closest designated scenic routes, I-280 to the west and Highway 84 to the north. The proposed structure at Guadalupe Creek could be visible from the adjacent Ulistac Natural Area, Tasman Drive, and development in Santa Clara. Due to the proximity of existing development to these three facility sites, proposed structures could adversely affect the existing visual character, a *potentially significant* impact. However, the project's impact could be reduced to a less-than-significant level with implementation of mitigation measures addressing architectural design (Measure 4.3-4a), landscaping plans (Measure 4.3-4b), landscape screens (Measure 4.3-4c), and tree removal (Measure 4.3-4d).

The BDPL 3 and 4 Seismic Upgrade at Hayward Fault (BD-3) would not result in the construction of any new permanent aboveground structures. Therefore, the impact on scenic vistas or visual character from this project would be *not applicable*.

Peninsula Region

Impact 4.3-4: Permanent adverse impacts on scenic vistas or visual character		
Baden and San Pedro Valve Lots	PN-1	LS
CS/SA Transmission	PN-2	PSM
HTWTP Long-Term	PN-3	PSM
Lower Crystal Springs Dam	PN-4	PSM
Pulgas Balancing Reservoir	PN-5	PSM

The CS/SA Transmission project (PN-2) could involve the replacement or upgrade of various aboveground structures in the vicinity of the Crystal Springs Reservoir, San Andreas Reservoir, and Harry Tracy WTP. The largest structure to be upgraded or replaced would be the Crystal Springs Pump Station, and the new structure would maintain its current 25-foot maximum height. The structures in the Crystal Springs Pump Station vicinity could be visible from Highway 35 (Skyline Road Bridge over Lower Crystal Springs Dam) or Crystal Springs Road, both designated scenic routes, but these views would be limited somewhat by elevational differences and intervening vegetation. Due to the visual sensitivity of this area, any changes to scenic vistas or the existing visual character associated with project facilities would be a *potentially significant* impact. Any changes to the existing pump station structure or development of new structures would be subject to the Peninsula WMP design guidelines for structures and roads within the watershed plan area (the same as the design guidelines for the Alameda WMP, presented above under the Sunol Valley Region). Implementation of the WMP's guidelines would reduce impacts, but mitigation measures addressing architectural design (Measure 4.3-4a), landscaping plans (Measure 4.3-4b), landscape screens (Measure 4.3-4c), and tree removal (Measure 4.3-4d) would also be required to reduce potential visual impacts to a less-than-significant level.

The structures to be constructed at the Harry Tracy WTP as part of the HTWTP Long-Term project (PN-3) have not yet been designed or located. Although this facility is located immediately east of I-280 (a designated scenic highway), views of the facility from the highway are limited by intervening topography and trees. Since this site is already developed with water treatment structures, the project is not expected to significantly alter existing views of this facility from surrounding areas. However, given the visual sensitivity of the area, any change in the visual character would be considered a *potentially significant* impact. Since the Harry Tracy WTP is located outside the WMP area and is not subject to WMP design guidelines, mitigation measures addressing architectural design (Measure 4.3-4a), landscaping plans (Measure 4.3-4b), landscape screens (Measure 4.3-4c), and tree removal (Measure 4.3-4d) would be required to reduce potential visual impacts to a less-than-significant level.

The Lower Crystal Spring Dam project (PN-4) would make major repairs and improvements to the dam to provide adequate protection from the probable maximum flood. The project would restore the reservoir's historical capacity of 69,300 acre-feet (from the current level of 58,400 acre-feet). The project would lower the existing parapet wall to lengthen the overflow weir from the reservoir; raise the remaining parapet walls and add one new spillway bay on each side of the central spillway; and install four gates (with a control building) and a fixed weir. The dam is visible from a number of scenic roads and scenic overlooks, and the visual sensitivity of this structure would be high. Therefore, any changes in scenic vistas and visual character as a result of the Lower Crystal Spring Dam project would be a *potentially significant* impact. Raising the water levels in the reservoir could also alter views from the scenic overlook (see Chapter 5 for more discussion), although this project would not change the scenic quality of the reservoir vicinity. The dam is located in the Peninsula WMP area and would be subject to WMP design guidelines. The dam parapet wall has not yet been designed, but would be evaluated as part of separate, project-level CEQA review. Implementation of the WMP's design guidelines would require new structures to be consistent in design with existing SFPUC facilities, thus reducing potential visual impacts. However, implementation of mitigation measures addressing architectural design (Measure 4.3-4a), landscaping plans (Measure 4.3-4b), landscape screens (Measure 4.3-4c), and tree removal (Measure 4.3-4d) could be required to specifically address changes in views from visually sensitive areas and reduce visual impacts in these areas to a less-than-significant level.

The Pulgas Balancing Reservoir project (PN-5) would not construct new buildings but would modify the Pulgas Channel. Any changes to the Pulgas Channel would be visible from Cañada Road, a designated scenic route. Scenic vistas from I-280 would not be affected by this project, since this freeway is located almost one mile to the east. This project would be located adjacent to the Pulgas Water Temple, an important visual and historic resource, and would cross under Cañada Road. Any required tree or vegetation removal could alter views of the Pulgas Channel from Cañada Road, a *potentially significant* visual impact. Potential changes in views from Cañada Road would be evaluated as part of separate, project-level CEQA review. This facility is located in the Peninsula WMP area, and any changes to the reservoir facility or channel would be subject to WMP design guidelines. However, due to the visual sensitivity of the area, it is expected that additional mitigation measures addressing architectural design (Measure 4.3-4a), landscaping plans (Measure 4.3-4b), landscape screens (Measure 4.3-4c), and tree removal (Measure 4.3-4d) could be required to specifically address changes in views from visually sensitive areas and reduce visual impacts to a less-than-significant level.

The Baden and San Pedro Valve Lots project (PN-1) would construct two structures, which would be 1 to 3 feet tall. The Baden Valve Lot is located west of El Camino (Highway 82), and trees and fencing along the west side of this street obscure views of this facility. The San Pedro Valve Lot is adjacent to I-280 and Junipero Serra Boulevard, and existing facilities are visible from these streets. Caltrans has designated I-280 as a scenic highway (from the Santa Clara County line to north of the city limit in San Bruno). Proposed facilities would be located within these existing valve lots and would not significantly alter the existing visual character of these facilities or vicinity. The proposed height of project facilities (1 to 3 feet) would also minimize the potential for changes in views. Therefore, the visual impact from this project would be *less than significant*.

San Francisco Region

Impact 4.3-4: Permanent adverse impacts on scenic vistas or visual character		
SAPL 3 Installation	SF-1	PSM
Groundwater Projects	SF-2	PSM
Recycled Water Projects	SF-3	PSM

The SAPL 3 Installation project (SF-1) would construct two new structures (up to 8 feet high) and two new vaults (up to 30 inches high). The pipeline alignment traverses or extends along the boundary of the Lake Merced Golf & Country Club and San Francisco Golf Club properties. The alignment would be within the viewshed of I-280 and 19th Avenue in San Francisco, both scenic routes. Depending on location, new structures (up to 8 feet high) could be visible from sensitive areas such as these two golf clubs. Pipeline construction could result in visual impacts if damage or loss of mature trees were to occur at the Lake Merced Golf & Country Club or the San Francisco Golf Club. The visual impacts from this project could be *potentially significant*, but implementation of mitigation measures addressing architectural design (Measure 4.3-4a), landscaping plans (Measure 4.3-4b), landscape screens (Measure 4.3-4c), and tree removal (Measure 4.3-4d) would reduce potential visual impacts to a less-than-significant level.

The Groundwater Projects (SF-2) would build new wells and well stations in San Francisco and San Mateo Counties. The facilities could be within the viewsheds of I-280 and the Great Highway, both designated scenic routes, as well as Lake Merced, Pine Lake, San Francisco Zoo, and/or Golden Gate Park. The potential for visual impacts would depend on the final locations. Up to 16 single-story structures could be developed at various locations on the west side of San Francisco or in northern San Mateo County. These buildings would be small in scale and generally located in urbanized areas, reducing the potential for adverse changes to the existing surrounding visual character. Therefore, visual impacts would be *potentially significant*, but implementation of mitigation measures addressing architectural design (Measure 4.3-4a), landscaping plans (Measure 4.3-4b), landscape screens (Measure 4.3-4c), and tree removal (Measure 4.3-4d) would reduce potential visual impacts to a less-than-significant level.

The Recycled Water Projects (SF-3) would construct up to four new structures for a recycled water facility. The structures could be visible if the recycled water treatment facility is located in the vicinity of the San Francisco Zoo and Oceanside WPCP, which are visible from the Great Highway and Skyline Boulevard (Highway 35) as well as from within Golden Gate Park. Any new facilities (up to 40 feet high) in the vicinity of the San Francisco Zoo and Oceanside WPCP could affect views from the Great Highway, Skyline Boulevard (Highway 35), or other scenic roads in this area, a *potentially significant* impact. With implementation of mitigation measures addressing architectural design (Measure 4.3-4a), landscaping plans (Measure 4.3-4b), landscape screens (Measure 4.3-4c), and tree removal (Measure 4.3-4d), as appropriate, these potentially significant impacts would be reduced to a less-than-significant level.

Impact 4.3-5: New permanent sources of light and glare.

Some of the WSIP projects would involve the installation of permanent new outdoor lighting on aboveground project components. Lighting design information is not yet available for WSIP projects. It is expected that visual impacts associated with light and glare would be evaluated as part of separate, project-level CEQA review when more detailed project designs become available.

All Regions

Development of some WSIP projects, particularly those located in urban areas, would have the potential to introduce new sources of light and glare. Until project-specific design information becomes available, this impact is considered *potentially significant* for all WSIP projects. However, two of these WSIP projects involve the rehabilitation or development of underground facilities only except for existing vaults (SJPL Rehabilitation, SJ-4, and BDPL 3 and 4 Seismic Upgrade at Hayward Fault, BD-3). Since there are no new aboveground structures, the potential need for outdoor lighting would be low. It is expected that implementation of design measures to limit lighting effects (Measure 4.3-5) would reduce this impact to a less-than-significant level for all WSIP projects.

4.3.3 References – Land Use and Visual Quality

San Francisco Planning Department, *Alameda Watershed Management Plan, Final Environmental Impact Report*, August 2000a.

San Francisco Planning Department, *Hetch Hetchy Water Treatment Project Chloramine Conversion, Final Environmental Impact Report*, December 2000b.

San Francisco Planning Department, *Peninsula Watershed Management Plan, Final Environmental Impact Report*, 2001.

San Francisco Public Utilities Commission (SFPUC), Right of Way Encroachment Policy, www.sfwater.org, 2007.

4.4 Geology, Soils, and Seismicity

4.4 Geology, Soils, and Seismicity

4.4.1 Setting

Regional Physiography

California has an extremely varied landscape and physiography, which ranges from broad, nearly flat valleys to jagged, glaciated mountains. To help distinguish these areas, California has been divided into 12 geomorphic provinces that are topographic-geologic groupings of convenience based primarily on landforms and geologic history (Norris and Webb, 1976). WSIP facilities would be located within two geomorphic provinces of California: the Coast Ranges and Great Valley provinces. The westernmost facility in the San Joaquin Region (Lawrence Livermore, SJ-2) and all facilities in the Sunol Valley, Bay Division, Peninsula, and San Francisco Regions are located in the Coast Ranges Geomorphic Province. The remaining San Joaquin Region facilities are located on the eastern and western edges of the Great Valley Geomorphic Province.

Coast Ranges Geomorphic Province

The Coast Ranges province extends approximately 600 miles, from the Santa Ynez River in Santa Barbara County to the Oregon border in northern Humboldt County. The region consists of northwest-trending mountain ranges, broad basins, and elongated valleys generally parallel to the San Andreas fault. The Coast Ranges are generally divided in two sub-provinces, north and south of San Francisco Bay. In the Coast Ranges, older, consolidated rocks are characteristically exposed in the mountains but are buried beneath younger, unconsolidated alluvial fan and fluvial sediments in the valleys and lowlands. In the coastal lowlands, these younger sediments commonly interfinger with marine deposits.

The portions of the program area in the Coast Ranges province are located in the southern Coast Ranges sub-province. The major geographic features in this area include: the Diablo Range, Santa Cruz Mountains, San Francisco Peninsula, and San Francisco Bay.

Great Valley Geomorphic Province

The Great Valley province is an elongated depression that lies between the Coast Ranges and the Sierra Nevada. It is about 430 miles long and 75 miles wide. At its extreme northern and southern ends, the elevation is about 400 feet. At its center, east of San Francisco Bay, it is slightly below sea level.

The Great Central Valley is actually two large valleys lying end to end, each drained by a major river. The Sacramento Valley is drained by the Sacramento River, and the San Joaquin Valley is drained by the San Joaquin River. The confluence of these two rivers is east of San Francisco Bay. This area, the Sacramento–San Joaquin Delta, was formerly a massive wetland. It is now one of California's important agricultural areas. The Great Valley is a trough in which sediments have been deposited almost continuously since the Jurassic (about 160 million years ago). Sands and gravel over 30,000 feet deep lie upon Sierran basement rocks that extend downward at an angle from the western slope of the Sierra Nevada. Great oil fields have been found in southernmost San Joaquin Valley and along its southwestern margin.

Regional Geologic Hazards

Slope Failure

Slope failures, commonly referred to as landslides, include many phenomena that involve the downslope displacement and movement of material, either triggered by static (i.e., gravity) or dynamic (i.e., earthquake) forces. Exposed rock slopes undergo rockfalls, rockslides, or rock avalanches, while soil slopes experience soil slumps, rapid debris flows, and deep-seated rotational slides. Slope stability can depend on a number of complex variables, including the geology, structure, and amount of groundwater, as well as external processes such as climate, topography, slope geometry, and human activity. The factors that contribute to slope movements include those that decrease the resistance in the slope materials and those that increase the stresses on the slope.

Landslides can occur on slopes of 15 percent or less, but the probability is greater on steeper slopes that exhibit old landslide features such as scarps, slanted vegetation, and transverse ridges. Landslides typically occur within slide-prone geologic units that contain excessive amounts of water or are located on steep slopes, or where planes of weakness are parallel to the slope angle.

The best available predictor of where slides and earth flows might occur is the distribution of past movements (Nilsen and Turner, 1975). In 1997, the U.S. Geological Survey (USGS) released a preliminary map and geographic information system (GIS) database that provides a summary of the distribution of landslides evident in the landscape of the San Francisco Bay region (USGS, 1997). The map is a digitized nine-county compilation of existing landslides that has been used to divide the area into four landslide zones. These four zones are designated as follows:

- *Mostly Landslide*. Consists of mapped landslides, intervening areas typically narrower than 1,500 feet, and narrow borders around landslides; defined by drawing envelopes around groups of mapped landslides.

- *Many Landslides*. Consists of mapped landslides and more extensive intervening areas than in “mostly landslide”; defined by excluding areas free of mapped landslides; outer boundaries are quadrangle and county limits to the areas in which this unit was defined.

- *Few Landslides*. Contains few, if any, large mapped landslides, but locally contains scattered small landslides and questionably identified larger landslides; defined in most of the region by excluding groups of mapped landslides, but defined directly in areas containing the “many landslides” unit by drawing envelopes around areas free of mapped landslides.

- *Flat Land*. Areas of gentle slope at low elevations that have little or no potential for the formation of slumps, landslides, or earth flows, except along stream banks and terrace margins; defined by the distribution of surficial deposits (Wentworth, 1997).

Unsuitable Soils

Soil mapping by the U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS) has provided information on surface and near-surface subsurface soil materials in the program area. A generalized soil map for the state of California, generated using GIS data provided in the NRCS State Soil Geographic (STATSGO) database, was used to identify soil conditions at the WSIP project sites. The STATSGO map combines individual soil units from more detailed maps into larger map units of soils with similar general characteristics. The distribution of soil units is highly variable within the program area. Although tables of soil characteristics are included in the STATSGO database, the data in the tables are divided into a much greater level of detail than the map and cannot be directly correlated to the generalized map units on the STATSGO soil map. These data could not be effectively used to evaluate specific soil parameters along the alignments; therefore, the following discussions regarding the potential for corrosive, expansive, and erodible soil conditions provide only a general discussion of these potential soil issues.

Corrosive Soils

Corrosivity of soils is commonly related to several key parameters: soil resistivity, the presence of chlorides and sulfates, oxygen content, and pH. Typically, the most corrosive soils are those with the lowest pH and highest concentration of chlorides and sulfates. Wet/dry conditions can result in a concentration of chlorides and sulfates as well as movement in the soil that tends to break down protective corrosion films and coatings on the surface of building materials. High-sulfate soils are also corrosive to concrete and may prevent complete curing, reducing its strength considerably. Low pH and/or low-resistivity soils can corrode buried or partially buried metal structures.

Expansive Soils

Expansive soils are characterized by their ability to undergo significant volume change (i.e., to shrink and swell) due to variations in soil moisture content. Changes in soil moisture can result from rainfall, landscape irrigation, utility leakage, roof drainage, and/or perched groundwater.[1] Expansive soils are typically very fine grained with a high to very high percentage of clay.

Squeezing Ground

Squeezing ground is a time-dependent phenomenon usually associated with tunnel construction through a fault zone. Squeeze occurs when the in-situ stresses are high relative to the strength of the material. A high stress-to-strength ratio causes a slow creep of ground around the tunnel toward the excavated opening (Brown et al., 1981). Squeezing ground occurs when soil pressure above the tunnel leads to a lateral squeezing of the tunnel walls, and can cause tunneling difficulties that require special tunneling techniques. Squeezing ground conditions are expected where shear zones[2]

1 Perched groundwater is a local saturated zone above the water table. It typically exists above an impervious layer (such as clay) with limited extent.

2 A shear zone is a zone of rock fracturing consisting of many closely spaced, roughly parallel, discontinuous cracks. Shear zones typically occur along faults.

are encountered, especially within the Hayward Fault Zone. This phenomenon can be controlled and is further discussed in the impact analysis.

Mineral Resources

Mineral resources in central California include a mix of fuel and nonfuel resources. Fuel resources in the central California region consist of oil and gas, which are found in the San Joaquin Region. Nonfuel resources, found in all of the regions, include gravel and sand, aggregate, clay, stone/rock, and salt. Sand, clay, gravel, and rock products are the most important mineral resources in California and are still actively mined or quarried in the Sunol Valley. As discussed in Section 4.14, Hazards, the western segment of the SJPL System (SJ-3) alignment passes between the Vernalis and Southwest Vernalis Gas Fields. Active gas wells in the Vernalis Field are more than one mile north of the alignment, although plugged and abandoned dry oil exploration holes are located about one-half mile from the alignment.

Regional Faulting and Seismic Hazards

Seismicity

The San Francisco Bay Area is situated near the boundary between two major tectonic plates, the Pacific Plate to the southwest and the North American Plate to the northeast. Since the Miocene (approximately 23 million years ago), about 200 miles of right-lateral slip has occurred along the San Andreas Fault Zone to accommodate the relative movement between these two plates. This movement has juxtaposed the granitic rocks southwest of the San Andreas fault with the Franciscan rocks lying to the northeast. The movement between the Pacific Plate and the North American Plate generally occurs across a 50-mile zone extending from the San Gregorio fault in the southwest to the Great Valley Thrust Belt to the northeast. In addition to the right-lateral slip movement between tectonic plates, a compressional component of relative movement has developed during the last 3.5 million years between the Pacific Plate and the Sierran micro-plate of the North American Plate at the latitude of San Francisco Bay (Fenton and Hitchcock, 2001). Strain produced by the relative motions of these plates is relieved by right-lateral strike-slip faulting on the San Andreas and related faults, and by vertical reverse-slip displacement on the Great Valley and other thrust faults in the central California area.

The San Francisco Bay Area and surrounding areas are characterized by numerous geologically young faults. These faults can be classified based on the following criteria (CGS, 1999):

- *Historically Active*. Faults that have generated earthquakes accompanied by surface rupture during historic time (approximately the last 200 years) and faults that exhibit aseismic fault creep.[3]
- *Active*. Faults that show geologic evidence of movement within Holocene time (approximately the last 11,000 years).

3 Fault creep is movement along a fault that does not entail earthquake activity.

- *Potentially Active*. Faults that show geologic evidence of movement during the Quaternary (approximately the last 1.6 million years).
- *Inactive*. Faults that show direct geologic evidence of inactivity during all of Quaternary time or longer.

Although it is difficult to quantify the probability that an earthquake will occur on a specific fault, this classification is based on the assumption that if a fault has moved during the Holocene epoch, it is likely to produce earthquakes in the future.

Thrust faults have no surface expression and have been located using subsurface geologic and geophysical methods. Since movement along these faults occurs on subsurface planes, the activity classification is predominantly based on historical earthquakes and microseismic activity along the fault, unlike faults with surface expression.

Because periodic earthquakes accompanied by surface displacement can be expected to continue in the program area through the lifetime of the proposed WSIP projects, the effects of strong groundshaking and fault rupture are of primary concern with respect to the safe operation of WSIP facilities. **Figure 4.4-1** shows the locations of active and potentially active faults (representing possible seismic sources) in the program vicinity. **Table 4.4-1** indicates the faults in the program vicinity that represent substantial potential seismic sources. The USGS Working Group on California Earthquake Probabilities (WG02) concluded that there is a 62 percent probability of a strong earthquake (magnitude ≥6.7) occurring in the San Francisco Bay region in a 30-year period between 2003 and 2032 (USGS, 2003).

The San Andreas, San Gregorio, Hayward, Rodgers Creek, Calaveras, and Greenville strike-slip faults[4] are active faults of the San Andreas system that predominantly accommodate lateral movement between the North American and Pacific tectonic plates. Active blind- and reverse-thrust faults[5] in the program vicinity include the Monte Vista–Shannon, Mount Diablo, Great Valley 7, and Great Valley 8 faults. The eastern portions of the SFPUC regional water system may also be affected by movement on the potentially active Foothills Fault System, which comprises range-front faults[6] in the Sierra Nevada foothills that are responsible for the uplift of the Sierra Nevada mountains.

Groundshaking

An earthquake is classified by the amount of energy released, which traditionally has been quantified using the Richter scale. Seismologists have begun using a moment magnitude (M) scale because it provides a more accurate measurement of the size of major and great earthquakes. For earthquakes of less than M 7.0, the moment and Richter magnitude scales are

4 Strike-slip faults involve the two blocks moving parallel to each other without a vertical component of movement.
5 A reverse fault is one with predominantly vertical movement in which the upper block moves upward in relation to the lower block; a thrust fault is a low-angle reverse fault. Blind-thrust faults are low-angled subterranean faults that have no surface expression.
6 Range-front faults are faults along the front of mountain ranges responsible for the uplift of the mountains.

nearly identical. For earthquake magnitudes greater than M 7.0, readings on the moment magnitude scale are slightly greater than a corresponding Richter magnitude.

The intensity of the seismic shaking, or strong ground motion, during an earthquake is dependent on the distance between the project area and the epicenter of the earthquake, the magnitude of the earthquake, and the geologic conditions underlying and surrounding the project area. Earthquakes occurring on faults closest to the project area would most likely generate the largest ground motions.

A review of historical earthquake activity during the period from 1800 to 2004 indicates that 23 earthquakes of M 6.0 or greater occurred within and near the program area during this timeframe. **Table 4.4-2** presents a summary of significant and/or damaging earthquakes.[7] There were an additional 35 earthquakes in the program area with magnitudes between M 5.5 and M 6.0 during this time period, including numerous aftershocks of larger earthquakes.

The intensity of earthquake-induced ground motions can be described using peak ground accelerations, represented as a fraction of the acceleration of gravity (g).[8] The interactive California Geological Survey (CGS) Probabilistic Seismic Hazard Assessment map (CGS, 2007) provides data to estimate peak ground accelerations in California. Taking into consideration the uncertainties regarding the size and location of earthquakes and the resulting ground motions that can affect a particular site, the map depicts peak ground accelerations with a 10 percent probability of being exceeded in 50 years, which equals an annual probability of 1 in 475 of being exceeded each year.

Another commonly used measure of earthquake intensity is the Modified Mercalli Scale, which is a subjective measure of the strength of an earthquake at a particular place as determined by its effects on people, structures, and earth materials. **Table 4.4-3** presents the Modified Mercalli Scale for Earthquake Intensity, along with approximate earthquake magnitudes and average peak accelerations associated with each intensity value.

Fault Rupture

Surface rupture occurs when movement on a fault deep within the earth breaks through to the surface. Surface ruptures associated with the 1906 San Francisco earthquake extended for more than 260 miles, with displacements of up to 21 feet. However, not all earthquakes result in surface rupture. The Loma Prieta earthquake of 1989 caused major damage in the San Francisco Bay Area, but the fault movement did not break through to the ground surface.

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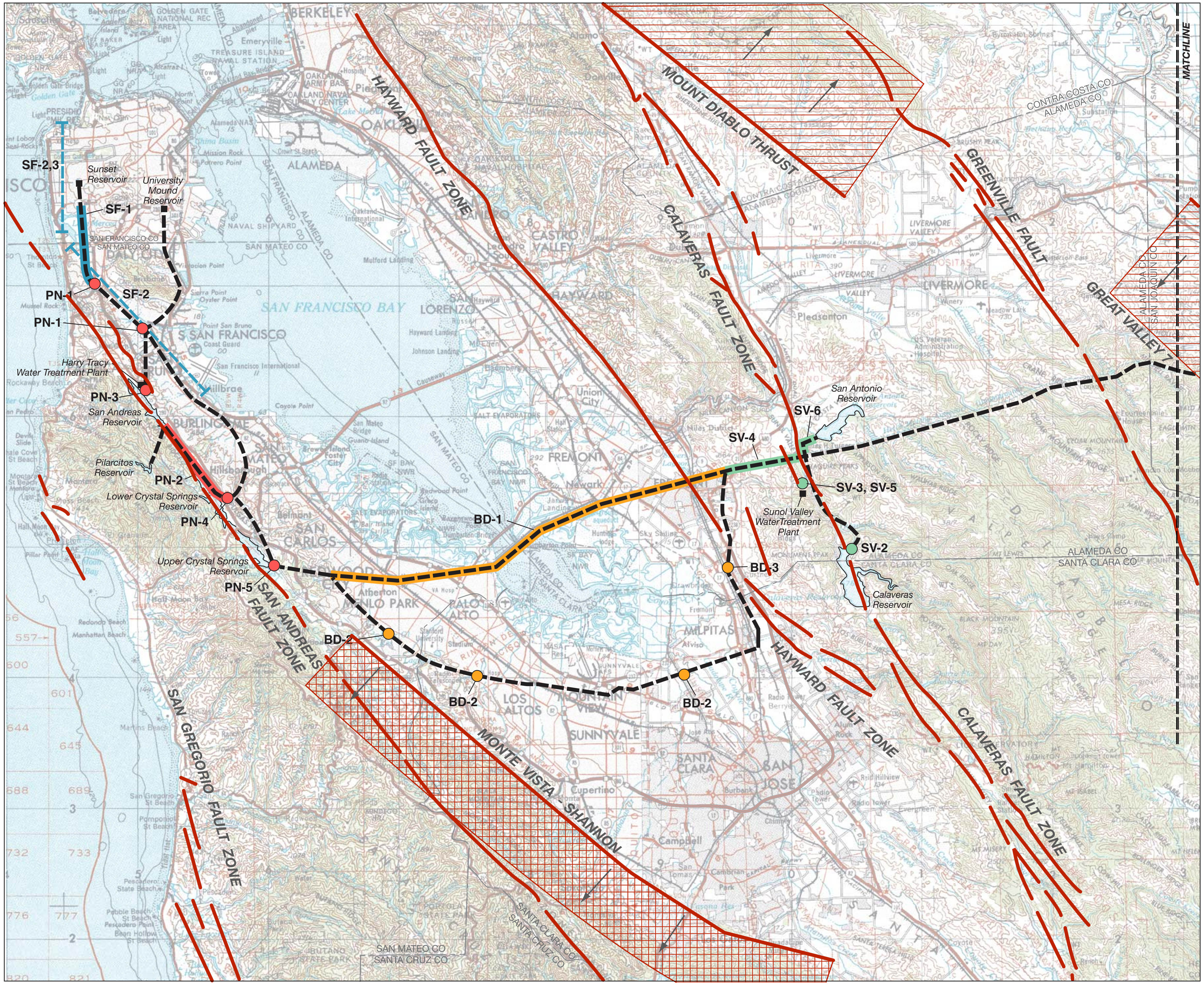
[7] In Table 4.4-2, the estimated magnitude of the 1868 earthquake on the Hayward fault is 7.0; however, as presented in Table 4.4-1, the USGS estimates the maximum earthquake magnitude on this fault at 6.7. This discrepancy is likely due to inaccuracies in estimating earthquake magnitudes prior to use of the sophisticated earthquake measurement equipment in existence today.

[8] Acceleration of gravity (g) = 980 centimeters per second squared. 1.0 g of acceleration is a rate of increase in speed equivalent to a car traveling 328 feet from rest in 4.5 seconds.

MAJOR FAULTS IN THE VICINITY OF THE SFPUC REGIONAL WATER SYSTEM



- Active Fault
- Pre-Quaternary Fault considered Potentially Active
- Blind Thrust Fault (fault does not intersect the surface, heavy solid line represents projection of the upper edge of the fault to the surface and rectangle represents the projection of the fault plane to the surface. Arrow points in the dip direction.)
- Reverse Thrust Fault (fault does not intersect the surface, heavy solid line represents projection of the upper edge of the fault to the surface and rectangle represents the projection of the fault plane to the surface. Arrow points in the dip direction.)
- Existing System Corridor
- Existing System Facility
- Proposed Facility Corridor
- Proposed Facility Site
- Proposed Facility, General Location

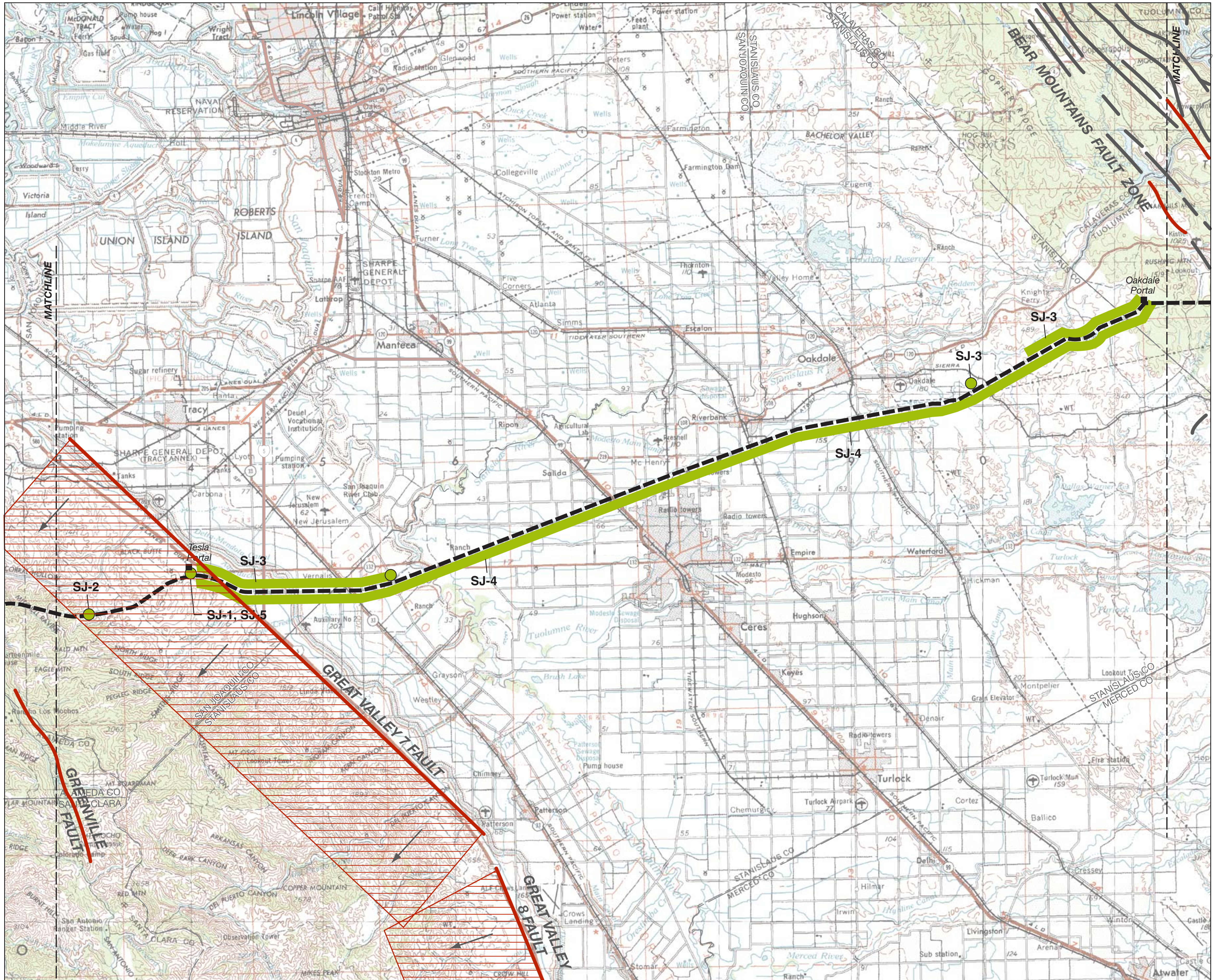
Note: See Figure 4.1-2 for full Project Names

0 5
Miles

SOURCE: ESA+Orion JV, 2006. Fault information based on: California Geological Survey (CGS), /Probabilistic Seismic Hazard Assessment For The State Of //California//, Appendix A: Fault Source Parameters/, revised in 2002, from CDMG Open File-Report 96-08, accessed at http://www.consrv.ca.gov/CGS/rghm/psha/ofr9608/, 2002.

SFPUC Water System Improvement Program . 203287

Figure 4.4-1a
Major Faults in the Vicinity of the SFPUC Regional Water System



MAJOR FAULTS IN THE VICINITY OF THE SFPUC REGIONAL WATER SYSTEM

- Active Fault
- Pre-Quaternary Fault considered Potentially Active
- Blind Thrust Fault (fault does not intersect the surface, heavy solid line represents projection of the upper edge of the fault to the surface and rectangle represents the projection of the fault plane to the surface. Arrow points in the dip direction.)
- Reverse Thrust Fault (fault does not intersect the surface, heavy solid line represents projection of the upper edge of the fault to the surface and rectangle represents the projection of the fault plane to the surface. Arrow points in the dip direction.)
- Existing System Corridor
- Existing System Facility
- Proposed Facility Corridor
- Proposed Facility Site
- Proposed Facility, General Location

Note: See Figure 4.1-2 for full Project Names

0 5
Miles

SOURCE: ESA+Orion JV, 2006. Fault information based on: California Geological Survey (CGS), /Probabilistic Seismic Hazard Assessment For The State Of //California//, Appendix A: Fault Source Parameters/, revised in 2002, from CDMG Open File-Report 96-08, accessed at http://www.consrv.ca.gov/CGS/rghm/psha/ofr9608/, 2002.

SFPUC Water System Improvement Program . 203287

Figure 4.4-1b
Major Faults in the Vicinity of the SFPUC Regional Water System

TABLE 4.4-1
SIGNIFICANT ACTIVE AND POTENTIALLY ACTIVE FAULTS

Fault Name	Estimated Maximum Earthquake Magnitude[a,b]	Approximate Fault Segment Length (miles)[b]	Average Recurrence Interval (years)[c]	Fault Type and Dip Direction[b]	Approximate Slip Rate (mm/yr)[b,d]
San Andreas (Peninsula)	7.2	53	229	Right-Lateral Strike-Slip, 90 degrees	17.0
San Andreas (North Coast South)	7.4	118	223	Right-Lateral Strike-Slip, 90 degrees	24.0
San Gregorio (North)	7.2	68	392	Right-Lateral Strike-Slip, 90 degrees	7.0
Monte Vista–Shannon	6.7	28	2,400[c]	Blind Thrust, 60 degrees west	0.4
Hayward (Northern)	6.5	22	155	Right-Lateral Strike-Slip, 90 degrees	9.0
Hayward (Southern)	6.7	33	161	Right-Lateral Strike-Slip, 90 degrees	9.0
Rodgers Creek	7.0	38	205	Right-Lateral Strike-Slip, 90 degrees	9.0
Calaveras (Northern)	6.8	28	187	Right-Lateral Strike-Slip, 90 degrees	6.0
Calaveras (Central)	6.2	37	54	Right-Lateral Strike-Slip, 90 degrees	15.0
Mount Diablo	6.7	15	389	Reverse Thrust, 38 degrees northeast	2.0
Greenville (North)	6.7	17	644	Right-Lateral Strike-Slip, 90 degrees	2.0
Greenville (South)	6.6	15	623	Right-Lateral Strike-Slip, 90 degrees	2.0
Great Valley 7	6.7	28	560[c]	Reverse Thrust, 15 degrees west	1.5
Great Valley 8	6.6	25	540[c]	Reverse Thrust, 15 degrees west	1.5
Foothills Fault System	6.5	223	12,500[c]	Normal Right-Lateral Oblique, 75 degrees east	0.05

[a] The maximum earthquake magnitude is the strongest earthquake that appears capable of occurring under the presently known tectonic framework, using the Richter scale.
[b] Fault parameters from CGS, 2002, and USGS, 2003.
[c] Recurrence Intervals from USGS, 2003.
[d] References to fault slip rates are traditionally presented in millimeters per year.

Fault rupture almost always follows preexisting faults, which are zones of weakness. Rupture may occur suddenly during an earthquake or slowly in the form of fault creep. Sudden displacements are more damaging to structures because they are accompanied by shaking. Fault creep is the slow rupture of the earth's crust. The Hayward fault where it crosses highly developed areas in Contra Costa and Alameda Counties exhibits fault creep, which offsets and deforms curbs, streets, buildings, and other structures that lie on the fault trace.

TABLE 4.4-2
SIGNIFICANT HISTORICAL EARTHQUAKES

Date	Earthquake Magnitude[a]	Name, Location, or Region Affected	Associated Fault	Comments[b]
June 1838	Assumed between 6.8 and 7.4	San Francisco Area	San Andreas	This earthquake is associated with probable rupture of the San Andreas fault from Santa Clara to San Francisco (approximately 37 miles). Walls were cracked at Mission Dolores and in Monterey.
October 8, 1865	6.5	Santa Cruz Mountains	San Andreas	Caused severe damage in New Almaden, Petaluma, San Francisco, San Jose, Santa Clara, and Santa Cruz resulting in $500,000 in property damage. Ground cracks, heaving, and subsidence were noted in several areas.
October 21, 1868	7.0	Hayward	Hayward	Felt throughout northern California and Nevada. Resulted in 30 deaths and $300,000 in property damage. Occurred on the Hayward fault with rupture from Berkeley to Fremont. Caused severe damage in the East Bay and San Francisco.
June 20, 1897	6.2	Gilroy	Calaveras	Felt from Woodland to San Luis Obispo. Resulted in building collapse in the Santa Clara Valley. Fissures were noted on the Calaveras fault southeast of Gilroy.
April 18, 1906	7.8	San Francisco Earthquake, San Francisco	San Andreas	This earthquake and the resulting fires caused approximately 3,000 deaths and $524 million in damage ($24 million from the earthquake alone). Destruction from this earthquake occurred at distances of up to 350 miles from the epicenter.
July 1, 1911	6.4	Morgan Hill	Calaveras	Located on the Calaveras fault, caused substantial damage in Gilroy and the Santa Clara Valley. Felt as far away as Reno, Nevada.
January 24, 1980	5.8	North of Livermore Valley	Greenville	Occurred on the Greenville fault with surface rupture of approximately nine miles. Resulted in numerous injuries and $11.5 million in property damage (primarily at Lawrence Livermore Laboratory).
April 24, 1984	6.2	Morgan Hill Earthquake, Morgan Hill	Calaveras	Earthquake was felt from San Francisco to Bakersfield and was located near the epicenter of the 1911 earthquake in Morgan Hill. Resulted in injuries and approximately $8 million in property damage.
October 17, 1989	6.9	Loma Prieta Earthquake, Santa Cruz Mountains	San Andreas	Largest earthquake to occur on the San Andreas fault since 1906. Resulted in 63 deaths, over 3,000 injuries, and an estimated $6 billion in property damage. Severe damage occurred from San Francisco to Monterey and in the East Bay, and included damage and destruction of buildings, roads, bridges, and freeways.

[a] Earthquake magnitudes and locations before 1932 are estimated based on reports of damage and felt effects (Toppozada et al., 1978, 1981, and 1982). Magnitudes reported using the Richter scale.
[b] Earthquake damage information primarily compiled from NEIC, 2007, and Berkeley Seismological Laboratory, 2007. Estimates of property damage values are in dollars valued to the year of damage.

TABLE 4.4-3
MODIFIED MERCALLI SCALE FOR EARTHQUAKE INTENSITY

Intensity Value	Intensity Description	Approximate Earthquake Magnitude (Richter)	Average Peak Acceleration
I	Not felt except by a very few persons under especially favorable circumstances.	1.0–3.0	
II	Felt only by a few persons at rest, especially on upper floors on buildings. Delicately suspended objects may swing.		<0.015 g
III	Felt noticeably indoors, especially on upper floors of buildings, but many people do not recognize it as an earthquake. Standing motor cars may rock slightly, vibration similar to a passing truck. Duration estimated.	3.0–3.9	
IV	During the day felt indoors by many, outdoors by few. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.	4.0–4.9	0.015–0.03 g
V	Felt by nearly everyone, many awakened. Some dishes and windows broken; a few instances of cracked plaster; unstable objects overturned. Disturbances of trees, poles may be noticed. Pendulum clocks may stop.		0.03–0.08 g
VI	Felt by all, many frightened and run outdoors. Some heavy furniture moved; and fallen plaster or damaged chimneys. Damage slight.	5.0–5.9	0.08–0.15 g
VII	Everybody runs outdoors. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable in poorly built or badly designed structures; some chimneys broken. Noticed by persons driving motor cars.		0.15–0.25 g
VIII	Damage slight in specially designed structures; considerable in ordinary substantial buildings, with partial collapse; great in poorly built structures. Panel walls thrown out of frame structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. Sand and mud ejected in small amounts. Changes in well water. Persons driving motor cars disturbed.	6.0–6.9	0.25–0.45 g
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb; great in substantial buildings, with partial collapse. Buildings shifted off foundations. Ground cracked conspicuously. Underground pipes broken.		0.45–0.60 g
X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations; ground badly cracked. Rails bent. Landslides considerable from riverbanks and steep slopes. Shifted sand and mud. Water splashed (slopped) over banks.	7.0 and higher	0.60–0.80 g
XI	Few, if any, masonry structures remain standing. Bridges destroyed. Broad fissures in ground. Underground pipelines completely out of service. Earth slumps and land slips in soft ground. Rails bent greatly.		0.80–0.90 g
XII	Damage total. Practically all works of construction are damaged greatly or destroyed. Waves seen on ground surface. Lines of sight and level are distorted. Objects are thrown upward into the air.		>0.90 g

SOURCE: Bolt, 1988.

Although future earthquakes could occur anywhere along the length of the faults listed in Table 4.4-1, only regional strike-slip earthquakes of magnitude 6.0 or greater are likely to be associated with surface fault rupture and offset (CGS, 1996). It is also important to note that earthquake activity and fault rupture due to unmapped subsurface fault traces is a possibility that is not predictable.

Liquefaction

Liquefaction is a phenomenon in which saturated granular sediments temporarily lose their shear strength during periods of earthquake-induced, strong groundshaking. The susceptibility of a site to liquefaction is a function of the depth, density, and water content of the granular sediments and the magnitude of earthquakes likely to affect the site. Saturated, unconsolidated silts, sands, silty sands, and gravels within 50 feet of the ground surface are most susceptible to liquefaction. Liquefaction-related phenomena include vertical settlement from densification, lateral spreading, ground oscillation, flow failures, loss of bearing strength, subsidence, and buoyancy effects.

Holocene-age alluvial sediments are especially prone to liquefaction. Older alluvial sediments deposited during the Pleistocene epoch are generally not liquefiable because they are more consolidated. Artificial fills, especially those placed on the San Francisco Bay margins prior to about 1950, are also highly prone to liquefaction.

Lateral Spreading

Of the liquefaction hazards, lateral spreading generally causes the most damage. This is a phenomenon where large blocks of intact, nonliquefied soil move downslope on a liquefied substrate of large aerial extent (Youd et al., 1978). The mass moves toward an unconfined area, such as a descending slope or stream-cut bluff, and can occur on slope gradients as gentle as 1 degree. Drainages and swales between hill slopes are generally filled by alluvium,[9] colluvium,[10] landslide debris, and slope wash. Unconsolidated deposits often develop soils along steep and shallow slopes in these areas.

Earthquake-Induced Settlement

Settlement of the ground surface can be accelerated and accentuated by earthquakes. During an earthquake, settlement can occur as a result of the relatively rapid rearrangement, compaction, and settling of subsurface materials (particularly loose, noncompacted, and variable sandy sediments). Settlement can occur both uniformly and differentially (i.e., where adjoining areas settle at different rates). Areas are susceptible to differential settlement if underlain by compressible sediments, such as poorly engineered artificial fill or bay mud.

Seismic Slope Instability/Ground Cracking

Earthquake motions can also induce substantial stresses in slopes, causing earthquake-induced landslides or ground cracking when the slope fails. Earthquake-induced landslides can occur in

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9 Alluvium consists of unconsolidated mixtures of gravel, sand, clay, and silt typically deposited by streams.
10 Colluvium is a loose deposit of rock debris accumulated through the action of gravity at the base of a cliff or slope.

areas with steep slopes that are susceptible to strong ground motion during an earthquake. The 1989 Loma Prieta earthquake triggered thousands of landslides over an area of 770 square miles.

San Joaquin Valley (San Joaquin Region)

Physiography

WSIP facilities in the San Joaquin Valley lie within and on the margins of California's Great Valley Geomorphic Province. The San Joaquin Valley is an elongated, asymmetrical structural trough approximately 250 miles long and averaging 35 miles wide (Davis et al., 1959). The valley lies between the Coast Ranges Geomorphic Province to the west and the Sierra Nevada Range Geomorphic Province to the east. Traversing from southwest to northeast, the WSIP facilities span from the eastern end of the Coast Ranges, across the San Joaquin Valley floor, and onto the western foothills of the Sierra Nevada. Ground surface elevations along the western portion of this region range from a peak of approximately 825 feet at the existing Thomas Shaft facility in the Coast Ranges (where Lawrence Livermore, SJ-2, would be located) to an approximate elevation of 325 feet near the base of these mountains at Tesla Portal (where Advanced Disinfection, SJ-1, and Tesla Portal Disinfection, SJ-5, would be located) to a low elevation of approximately 30 feet along the existing San Joaquin Pipeline alignments (where SJPL System, SJ-3, and SJPL Rehabilitation, SJ-4, would be located). Along the eastern segment of the existing San Joaquin Pipeline system, elevations reach a peak of approximately 825 feet in the Sierra foothills at Oakdale Portal (USGS, 1989, 1994).

Geology

WSIP facilities in the San Joaquin Valley region span a nearly flat alluvial plain that forms the San Joaquin Valley within the Great Valley Geomorphic Province. The Great Valley is a large, northwest-trending structural trough that has been filled with several thousand feet of sedimentary and volcanic rocks.

In the program area, the sedimentary and volcanic sequence typically consists of marine sedimentary rocks that range in age from Jurassic to Cretaceous, overlain by Cenozoic to Quaternary continental deposits. The marine sedimentary rocks in the region are comprised of undifferentiated Upper Cretaceous sedimentary rocks, and sandstones and shales of the Panoche and Marino Formations.

The continental rocks comprise moderately consolidated sedimentary rock and volcanic deposits that outcrop in the foothills along the flanks of the Central Valley, and poorly consolidated alluvial deposits containing gravel, sand, silt, and clay that are present on the valley floor. The moderately consolidated sedimentary and volcanic deposits typically occupy the eastern margin of the Great Valley and consist of andesitic mudflow breccia[11] of the Mehrten Formation, and rhyolitic tuff[12] and sedimentary rocks of the Valley Springs Formation (Wagner et al., 1990).

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11 Breccia is a coarse-grained rock composed of angular broken rock fragments in a fine-grained matrix. Andesitic mudflow breccia is formed by a mudflow composed primarily of volcanic rock fragments of andesitic composition.

12 Tuff is a rock composed of compacted volcanic ash varying in size from fine sand to coarse gravel. Rhyolitic tuff is comprised of ash similar in composition to granite.

Shallow alluvial deposits (Quaternary) that span the valley floor in the program area include alluvial fan deposits along the eastern margin of the Coast Ranges, and floodplain and riverbank deposits of the Dos Palos, Modesto, Riverbank, and Turlock Lake Formations (Wagner et al., 1990).

Beneath the Coast Ranges and the western side of the Central Valley, the sedimentary rocks are underlain by a basement complex of Mesozoic-age metamorphic rocks of the Franciscan Complex (Wagner et al., 1990). Beneath the Sierra foothills and the eastern side of the Central Valley, the sedimentary and volcanic sequence rocks are underlain by a basement complex of Mesozoic-age granitic and metamorphic rocks, including the Salt Springs and Merced Falls Slates and the Gopher Ridge Volcanics (Wagner et al., 1990). The structure of these basement rocks beneath the sedimentary deposits on the floor of the San Joaquin Valley region is poorly known (Wagner et al., 1990).

Seismicity

The San Joaquin Valley region of California is relatively seismically inactive compared to the west-neighboring San Francisco Bay and South Bay regions. Although no faults are known to displace the sediments underlying WSIP facilities in the Central Valley, earthquakes on any of the active faults in the greater Bay Area could produce groundshaking and associated seismic hazards at WSIP facilities in the region. For example, the great earthquake of 1906 on the San Andreas fault caused Level IV to VI intensity (Modified Mercalli Scale) across the San Joaquin Valley where WSIP facilities currently exist (USGS, 2007). The nearest fault to WSIP facilities in the San Joaquin Valley capable of producing strong groundshaking is the Great Valley 7 fault, which the SJPL System (SJ-3) and SJPL Rehabilitation (SJ-4) projects cross at the western margin of the region. The Advanced Disinfection (SJ-1) and Tesla Portal Disinfection (SJ-5) projects at Tesla Portal and the Lawrence Livermore project (SJ-2) at Thomas Shaft are also located over this thrust fault. Historical earthquakes on the Great Valley faults include an M 6.5 in 1983 (Segment 6), an M 6.5 in 1892 (Segment 4), and an M 6.0 in 1866 (Segment 7) (USGS, 1996).

South Bay (Sunol Valley and Bay Division Regions)

Physiography

WSIP facilities in the South Bay lie within the Coast Ranges Geomorphic Province. Significant physiographic features in the South Bay include San Francisco Bay and the broad alluvial fans (or flatlands) that were formed between the mountain ranges and the bay. The surrounding mountain ranges that bound the South Bay are the Santa Cruz Mountains on the south and west and the Diablo Range to the east.

The San Antonio and Calaveras Reservoirs are located in long, narrow valleys within the Diablo Range. The reservoirs occupy the La Costa Valley and the Calaveras Valley, respectively. Floor elevations in the La Costa Valley range from approximately 320 feet at the dam on the east side of the valley to 560 feet on the west side. Ground surface elevations along the WSIP facilities range from about 300 feet at the northeasterly base of the Santa Cruz Mountains to sea level across the San Francisco Bay margin, then to an elevation of up to approximately 1,000 feet through the Diablo Range.

Geology

WSIP facilities in the South Bay are located within the Bay Division and Sunol Valley Regions. Facilities within the Bay Division Region cross sediments of San Francisco Bay and alluvial soils of the Santa Clara Valley. Facilities at the western end of the Bay Division Region also cross into bedrock at the northeastern flank of the Santa Cruz Mountains. Facilities within the Sunol Valley Region primarily traverse bedrock materials of the Diablo Range. Some facilities lie within the valley floors, such as in the Sunol Valley, Calaveras Valley, and La Costa Valley, where alluvial soils overlie the bedrock.

San Francisco Bay, a dominant feature in the South Bay, occupies a Late Pliocene structural depression that has been flooded several times in response to Pleistocene glacial cycles. Sediment deposition within the basin now occupied by the bay has been strongly influenced by ocean-level fluctuations. During periods of glacial advance, sea levels were lower, leaving the basin dry and subject to alluvial deposition, stream channel erosion, and aeolian (wind-related) processes. During periods of glacial retreat, sea levels rose, flooding the basin and resulting in fluvial deposition of fine-grained sediments at the bottom of the bay. The upper sediments within and along the margins of the bay include younger bay mud that has been deposited during and after the melting of the Wisconsin continental glaciers. The younger bay mud in the South Bay is up to approximately 60 feet thick (CDMG, 1969). Underlying the younger bay mud are sequences of alluvial and bay deposits consisting of sand, gravel, clay, and silt associated with previous ocean-level fluctuations. Bedrock underlying San Francisco Bay is predominantly of Jurassic and Cretaceous age and grouped within the Franciscan Complex. Bedrock depths range from about 200 feet near the northern bay crossing of the WSIP facilities to well over 1,000 feet toward the south. Historical development around the bay margins has included placement of artificial fill materials bayward of the natural shoreline, significantly altering the shoreline and reducing the size of the bay.

Flatlands, created by alluvial deposition of locally derived sediments, are found between the bay margins and the surrounding hills. Alluvial soils in the flatlands were deposited during the Quaternary period (during the last 1.8 million years). Alluvial soils range widely from fine-grained clay and silt on the broader, more gently sloping portions of the Santa Clara Valley to coarse-grained sand and gravel along the active or buried historical stream channels and at higher elevations along the range fronts. The upper tens of feet of soil within the Santa Clara Valley tend to be interstratified clay, silt, sand, and gravel as a result of the depositional history of the area. Alluvial soils extend to great depths in the Santa Clara Valley, with bedrock surfaces measuring well over 1,000 feet deep.

Sunol Valley Region

The WSIP facilities within the Sunol Valley Region are predominantly located within bedrock units of the Diablo Range, including marine sedimentary rocks comprised of sandstone, shell breccia, shale, chert, and pebble conglomerates. The marine sedimentary rocks are locally known as Neroly Formation, Briones Formation, Claremont (Monterey) Formation, Temblor Sandstone, and Irvington Gravels (Santa Clara Formation). These predominantly Tertiary-age formations overlie Mesozoic basement rocks consisting of Creatceous marine sedimentary rocks, primarily of the Niles Canyon and Panoche Formations west of the Hayward fault, and of the Franciscan Complex east of the fault. Alluvial deposits consisting of unconsolidated silt, clay, sand, and gravel overlie the bedrock in the valley areas.

Franciscan serpentinite,[13] an ultramafic[14] rock, and Franciscan mélange,[15] both of which may contain chrysotile (a form of naturally occurring asbestos[16]), occur at Calaveras Dam (SV-2). No serpentinite is mapped near the Alameda Creek Fishery (SV-1), 40-mgd Treated Water (SV-3), or Treated Water Reservoir (SV-4) projects at the Sunol Valley Water Treatment Plant (WTP), or near the New Irvington Tunnel (SV-4) or SABUP (SV-6) projects.

Bay Division Region

WSIP facilities within the Bay Division Region near the northeastern flank of the Santa Cruz Mountains are primarily located on sedimentary and meta-sedimentary bedrock units. The facilities cross units of Plio-Pliestocene-age Santa Clara Formation, marine sedimentary rocks of Eocene age, and Franciscan Complex sandstone.

The Santa Clara Formation is a fluvially deposited, unconsolidated to lightly consolidated unit of bedded conglomerate, sandstone, siltstone, and claystone. These deposits contain significant amounts of montmorillonite clay,[17] which renders the bedrock and the residual soils derived from the bedrock expansive. The next older formations were deposited in a marine environment during the Eocene epoch of the Tertiary period and are comprised of sandstone and mudstone. These formations are underlain by the Franciscan Complex, which is also exposed at the ground surface at the furthest northwest reaches of the South Bay.

The Franciscan Complex is of Jurassic and Cretaceous age and consists of mafic[18] and ultramafic basement rocks and sedimentary rocks that were deposited in a deep ocean environment and subsequently transported to the western margin of the North American Plate by tectonic forces. In the Bay Division Region, the Franciscan Complex is mapped only on the west side of the bay and is predominantly comprised of sandstone. However, geophysical testing in support of the BDPL Reliability Upgrade project (BD-1) indicates the presence of a buried ridge of Franciscan Complex rock, consisting of highly weathered and intensely fractured serpentinite, sandstone, and shale, approximately 1,000 feet west of the Newark Shaft. Serpentinite contains naturally

[13] Serpentinite is a rock consisting of one or more serpentine minerals. Serpentine is a naturally occurring group of minerals that can be formed when ultramafic rocks are metamorphosed during uplift to the earth's surface. This rock type is commonly associated with ultramafic rock along faults. Small amounts of chrysotile asbestos, a fibrous form of serpentine minerals, are common in serpentinite.

[14] Ultramafic rocks are formed in high-temperature environments well below the surface of the earth.

[15] Mélange is a mixture of rock materials of differing sizes and types generally contained within a sheared matrix.

[16] Asbestos is a term used for several types of naturally occurring fibrous materials found in many parts of California.

[17] Montmorillonite clay is an expansive type of clay that undergoes large changes in volume with changes in water content.

[18] Mafic rocks are igneous rocks containing a group of dark-colored minerals, composed chiefly of magnesium and iron.

occurring asbestos in the form of chrysotile, which could be encountered during tunneling for the BDPL Reliability Upgrade project.

Seismicity

The South Bay is a very seismically active area. The active faults within and adjacent to the region are the Hayward, Calaveras, San Andreas, and Monte–Vista Shannon faults. The Hayward and Calaveras faults cross or are adjacent to WSIP facilities, and the San Andreas and Monte Vista–Shannon faults are in close proximity to other facilities in the South Bay.

San Francisco Peninsula (San Francisco and Peninsula Regions)

Physiography

The San Francisco Peninsula is located in the central portion of the Coast Ranges Geomorphic Province of California. The mountains and hills of the San Francisco Peninsula are separated from the parallel range of the East Bay Hills by San Francisco Bay. WSIP projects located on the San Francisco Peninsula traverse the northern and eastern foothills of the Santa Cruz Mountains, the San Andreas Fault Zone, and flatlands adjacent to San Francisco Bay.

The elevations of facilities in this region range from approximately 30 feet along Crystal Springs Pipeline No. 2 near the bay to 525 feet at the Harry Tracy WTP in the hills adjacent to the San Andreas Fault Zone.

Geology

The San Francisco Peninsula region lies directly east of the San Andreas fault and is underlain by basement rock composed of tectonically mixed rock of Cretaceous to Jurassic age known as the Franciscan Complex. On the San Francisco Peninsula, the Franciscan Complex is locally capped by Tertiary, Quaternary, and Recent marine and nonmarine sedimentary deposits. The geologic units expected to be encountered during construction of the facility improvement projects include artificial fill, bay mud, colluvium, alluvium, stream channel deposits, and alluvial fans. Bedrock units in this region are the Colma Formation, Santa Clara Formation, Merced Formation, Whiskey Hill Formation, and Franciscan Complex, which consist of greenstone, sandstone, serpentinite, mélange, and chert.

The geologic units exposed at the surface consist primarily of artificial fill, alluvium, colluvium, and stream channel deposits of Holocene and Quaternary age; marine sandstone, siltstone, and claystone of Pliocene and Pleistocene age; and Cretaceous- and Tertiary-age sandstone, shale, chert, greenstone, and serpentinite units of the Franciscan Complex and the Whiskey Hill Formation (Brabb et al., 1998).

Plio-Pleistocene sandstone, siltstone, and claystone of the Merced Formation overlies Franciscan rocks over large areas, particularly near the Baden and San Pedro Valve Lots (PN-1) and SAPL 3 Installation (SF-1) projects. Holocene bay mud is not exposed at the surface but underlies the artificial fill along the San Francisco Bay margin, and is expected to be encountered in excavations in the program area.

In the Peninsula Region, most of the proposed WSIP projects are underlain by significant amounts of Franciscan ultramafic bedrock (primarily serpentinite) and mélange. These units contain naturally occurring asbestos in the form of chrysotile, which could be encountered during excavation for the CS/SA Transmission (PN-2) and Lower Crystal Springs Dam (PN-4) projects.

Seismicity

The major active faults in the Peninsula Region and San Francisco Extended Regions are part of the San Andreas Fault System—a complex system of right-lateral, strike-slip faults that includes the San Andreas, San Gregorio, Hayward, and Calaveras faults. These faults have produced measurable historic ground motion and movement. The Peninsula segment of the San Andreas Fault is nearest to all of the projects in this region and the CS/SA Transmission project (PN-4) could potentially cross this fault. The CGS estimates that the Peninsula segment of the San Andreas Fault is capable of producing an earthquake of maximum moment magnitude 7.2, with a recurrence interval on the order of 200 years (Cao et al., 2003). None of the other faults cross a WSIP project.

Regulatory Framework

Alquist-Priolo Earthquake Fault Zoning Act

Surface rupture is the most easily avoided seismic hazard. The Alquist-Priolo Earthquake Fault Zoning Act was passed in 1972 to mitigate the hazard of surface faulting to structures for human occupancy. In accordance with this act, the state geologist established regulatory zones, called "earthquake fault zones," around the surface traces of active faults and published maps showing these zones. Within these zones, buildings for human occupancy cannot be constructed across the surface trace of active faults. Each earthquake fault zone extends approximately 200 to 500 feet on either side of the mapped fault trace, because many active faults are complex and consist of more than one branch. There is the potential for ground surface rupture along any of the branches.

Title 14 of the California Code of Regulations, Section 3601(e), defines buildings intended for human occupancy as those that would be inhabited for more than 2,000 hours per year. None of the WSIP projects that would be constructed within an Alquist-Priolo Earthquake Fault Zone meet this criterion.[19] Therefore, this act does not apply to the WSIP projects.

[19] The Advanced Disinfection project (SJ-1) and Recycled Water Projects (SF-3) could include construction of facilities for human occupancy, and the HTWTP Long-Term project (PN-5) would include improvements at a facility for human occupancy, but none of these projects would be constructed within an Alquist-Priolo Earthquake Fault Zone.

Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act was passed in 1990 following the Loma Prieta earthquake to reduce threats to public health and safety and to minimize property damage caused by earthquakes. The act directs the Department of Conservation to identify and map areas prone to the earthquake hazards of liquefaction, earthquake-induced landslides, and amplified groundshaking. For structures intended for human occupancy, the act requires site-specific geotechnical investigations to identify potential seismic hazards and formulate mitigation measures prior to permitting most developments designed for human occupancy within the Zones of Required Investigation. Only two of the WSIP projects would involve buildings for human occupancy within a Zone of Required Investigation (HTWTP Long-Term, PN-3, and Recycled Water Projects, SF-3).[20] However, the seismic hazard maps are useful tools for identifying areas with the potential for liquefaction and earthquake-induced landslides.

As of January 2006, 110 official seismic hazard zone maps showing areas prone to liquefaction and landslides had been published in California, and more are scheduled in the future. Most of the mapping has been performed in Southern California and the San Francisco Bay Area. Twenty-two official maps for the San Francisco Bay Area have been released, with preparation of 19 additional maps for San Mateo, Santa Clara, Alameda, and Contra Costa Counties planned or in progress. The CGS has no current plans to map San Joaquin County.

Surface Mining and Reclamation Act

In accordance with the Surface Mining and Reclamation Act of 1975, the state has established a mineral land classification system to help identify and protect mineral resources in areas that are subject to urban expansion or other irreversible land uses that would preclude mineral extraction. Protected mineral resources include construction materials, industrial and chemical mineral materials, metallic and rare minerals, and nonfluid mineral fuels. The act directs the state geologist to classify (identify and map) the nonfuel mineral resources of the state to show where economically significant mineral deposits occur and where they are likely to occur based on the best available scientific data. Nonfuel mineral resources include: metals such as gold, silver, iron, and copper; industrial minerals such as boron compounds, rare-earth elements, clays, limestone, gypsum, salt, and dimension stone; and construction aggregate, which includes sand, gravel, and crushed stone. Many areas of the state have been mapped using the California Mineral Land Classification System to identify areas with known mineral resources. This system provides guidance for identifying Mineral Resource Zones (MRZs) based on these four general categories:

- *MRZ-1*. Areas where adequate information indicates that no significant mineral deposits are present, or where it is judged that little likelihood exists for their presence.
- *MRZ-2*. Areas where adequate information indicates that significant mineral deposits are present, or where it is judged that a high likelihood exists for their presence.

[20] The Advanced Disinfection project (SJ-1) and Recycled Water Projects (SF-3) could include construction of facilities for human occupancy, but only the Recycled Water Projects would potentially be located in a Zone of Required Investigation. Although HTWTP Long-Term would include improvements to a facility for human occupancy, seismic hazards mapping has not been conducted in San Mateo County, and the improvements would not be subject to the Seismic Hazards Mapping Act unless mapping has been completed at the time of construction.

- *MRZ-3*. Areas containing mineral deposits, the significance of which cannot be evaluated.
- *MRZ-4*. Areas where available information is inadequate for assignment to any other zone.

Pipeline and other public engineering projects are not subject to Surface Mining and Reclamation Act regulation.

California Building Code

The 2001 California Building Code (CBC) is based on the 1997 Uniform Building Code, with the addition of more extensive structural seismic provisions. The CBC is contained in the California Code of Regulations, Title 24, or the California Building Standards Code, and is a compilation of three types of building standards from three different origins:

- Building standards that have been adopted by state agencies without change from building standards contained in national model codes
- Building standards that have been adopted and adapted from the national model code standards to meet California conditions
- Building standards, authorized by the California legislature, that constitute extensive additions not covered by the model codes that have been adopted to address particular California concerns

Title 24, Part 2, Volume 2, Chapter 16 of the California Code of Regulations contains definitions of seismic sources and the procedure used to calculate seismic forces on structures. As the proposed WSIP projects lie within Uniform Building Code Seismic Zones 3 and 4, provisions for design would follow the requirements of Chapter 16.

SFPUC General Seismic Design Requirements

The SFPUC's *General Seismic Design Requirements* (SFPUC, 2006) set forth consistent criteria for the seismic design and retrofit of all facilities and components of the regional water system. In accordance with these design requirements, every WSIP project must have project-specific design criteria based on the seismic environment and importance of the facility in achieving water service delivery goals in the event of a major earthquake.[21] The design criteria are based on the referenced codes, standards, and industry publications, but would exceed these requirements for facilities that are located in a severe seismic environment and are needed to achieve water service delivery goals. Covered facilities include offices, operating centers, water treatment plants, water storage structures, pumping plants, pipelines, tunnels, and related equipment. Dams and associated components under the jurisdiction of the California Division of Safety of Dams (DSOD) and/or the Federal Energy Regulatory Commission (FERC) may be subject to additional design criteria and seismic evaluation methodology. For this type of project, the DSOD and/or FERC would be consulted to determine appropriate criteria and methodology.

[21] In the *General Seismic Design Requirements*, the term "major earthquake" is defined as an earthquake of Richter magnitude 7.8 or larger on the San Andreas fault, 7.1 or larger on the Hayward fault, or 6.8 or larger on the Calaveras fault.

Under these design requirements, each facility is evaluated for its necessity in meeting the water service delivery goals and assigned a seismic performance class for the purposes of determining appropriate seismic design criteria. Facilities needed to achieve a basic level of service within 24 hours of a major earthquake are assigned a seismic performance class of Critical. This class includes structures and components of the storage, distribution, treatment, and control system, with either no redundancy or with redundancy that have common-cause failure modes (such as the same fault crossing) and for which the failure would result in an unacceptable service level. Facilities needed for emergency response, such as emergency operations centers and emergency repair response centers, are classified as Critical. Facilities needed to achieve the specified level of service within 30 days of a major earthquake are classified as Important. This class includes structures and components of the storage, distribution, treatment, and control systems with some level of redundancy or for which failure would not result in an unacceptable level of service. Other facilities, such as administrative centers, repair shops, service centers, and similar support facilities, are classified as Standard. These facilities are not needed to achieve the water service delivery goals of the WSIP and might not be repaired following a major earthquake for economic reasons. Many of the planned WSIP projects are classified as Critical.

4.4.2 Impacts

Significance Criteria

The CCSF has not formally adopted significance standards for impacts related to geology, soils, and seismicity, but generally considers that implementation of the proposed program would have a significant impact if it were to:

- Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
  - Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the state geologist for the area or based on other substantial evidence of a known fault (refer to Division of Mines and Geology Special Publication 42),
  - Strong seismic groundshaking,
  - Seismic-related ground failure, including liquefaction,
  - Landslides (Evaluated in this section)
- Result in substantial soil erosion or the loss of topsoil (Evaluated in this section)
- Be located on a geologic or soil unit that is unstable, or that would become unstable as a result of the project, and potentially result in onsite or offsite landslide, lateral spreading, subsidence, liquefaction, or collapse (Evaluated in this section)
- Be located on expansive or corrosive soil, creating substantial risks to life or property (Evaluated in this section)
- Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater (Not evaluated in this section, see Appendix B)

- Substantially change the topography or any unique geologic or physical features of the site (Evaluated in this section)

Implementation of the proposed program would have a significant impact related to mineral resources if it were to:

- Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state (Not evaluated in this section, see Appendix B)
- Result in the loss of availability of a locally important mineral resource recovery site delineated in a local general plan, specific plan, or other land use plan (Not evaluated in this section, see Appendix B)
- Encourage activities which result in the use of large amounts of fuel, water, or energy, or use these in a wasteful manner (Evaluated in Section 4.15, Energy Resources)

Approach to Analysis

The WSIP includes water system improvement projects that would ensure the SFPUC can maintain an adequate water supply in the event of a major earthquake, with the goals of restoring basic service within 24 hours of a major earthquake and meeting average-day demand within 30 days. To meet these goals, projects are included that: (1) strengthen and improve the seismic resistance of many of the water system components, and (2) provide system redundancy so that water service can be maintained should a component of the system fail. Each of these projects would be constructed in accordance with the SFPUC's *General Seismic Design Requirements* (described above in the Setting), which require a site-specific investigation and development of project-specific design criteria based on the seismic performance class of the facility and site-specific geologic and seismic hazards, including fault rupture, ground motions generated by earthquakes (groundshaking), slope instability, liquefaction, and loss of soil strength. Implementation of these design requirements would ensure that water service delivery goals are achieved in the event of a major earthquake. Collectively, this is a beneficial impact of the WSIP, as discussed in Section 4.16, Collective WSIP Impacts. Potential seismic hazards related to the operation, siting, and design of the WSIP projects are considered less than significant for each WSIP project, given compliance with the *General Seismic Design Requirements*. This section also analyzes geology, soils, and seismicity impacts that could occur during construction, and impacts associated with locating projects in areas of expansive or corrosive soils.

Although all WSIP projects in the Sunol Valley Region (located in the Alameda Creek watershed) and the CS/SA Transmission (PN-2), Lower Crystal Springs Dam (PN-4), and Pulgas Balancing Reservoir (PN-5) projects (located in the Peninsula watershed) would be required to comply with the following Alameda and Peninsula Watershed Management Plan (WMP) policies and actions, compliance with the *General Seismic Design Requirements* would incorporate the intent of these policies and actions, and they are not further discussed below:

- *Policy S7*: Require adequate seismic and static geohazards engineering studies for proposed facilities, infrastructure, and utilities easements within the watershed.

- *Policy S8*: Require that utility pipelines within the watershed meet current seismic standards and comply with applicable hazardous materials regulations.
- *Action des2.2*: Prior to the approval of construction of any new facility or structure, within the watershed but outside of an Alquist-Priolo Earthquake Fault Zone, require appropriate geotechnical evaluations to assure that the structure can withstand the effects of a seismic event. If the facility or structure is intended for human occupancy and sited over active fault traces, design and construction should comply with the policies and provisions of the Alquist-Priolo Earthquake Fault Zoning Act.

Impact Summary by Region

Table 4.4-4 provides a summary of the geology, soils, and seismicity impacts associated with implementation of the WSIP.

Construction Impacts

Impact 4.4-1: Slope instability during construction.

Destabilization of natural or constructed slopes could occur as a result of construction activities due to excavation and/or grading operations. Excavations for new and replacement pipelines, building foundations, tunnel portals, and temporary access roads and work areas could result in slope instability, potentially triggering slope failures that could result in landslides, slumps, soil creep, or debris flows. Slope failures are more likely to occur in areas with a history of previous failure and in weak geologic units exposed on unfavorable slopes, such as areas mapped by the USGS (1997) as having “many landslides” or areas of weak, fault-sheared rock. Such slope failures could damage WSIP or other nearby facilities and properties.

For projects located in areas with a low potential for landslides, this impact would be less than significant, but the site-specific information analyzed in accordance with SFPUC Construction Measure #2 (seismic and geotechnical studies) and during separate, project-level CEQA review could either confirm the program-level determination of less than significant or provide a basis to revise this determination.

For projects in areas with an identified landslide hazard, it could be necessary to conduct a quantified landslide analysis (Measure 4.4-1) and implement the recommendations of the investigation to reduce impacts to a less-than-significant level, although the need for mitigation would be determined during separate, project-level CEQA review of each WSIP project. All Sunol Valley and Peninsula Region projects located in the Peninsula watershed would also be required to comply with the following WMP policies related to slope instability:

- *Policy S5*: Minimize damage from potential mass movement hazards by avoiding construction or other disturbances in known dormant landslides and on slopes greater than 30 percent, without proper engineering.
- *Policy S6*: Conduct (for CCSF-owned) and require (for easements) inspection of facilities and utilities near active landslide areas and fault traces following earthquakes and slope failures to assess their stability and integrity, and complete repairs or further monitoring as needed to prevent geohazards.

TABLE 4.4-4
POTENTIAL IMPACTS AND SIGNIFICANCE – GEOLOGY, SOILS, AND SEISMICITY

Projects	Project Number	Impact 4.4-1: Slope instability during construction	Impact 4.4-2: Erosion during construction	Impact 4.4-3: Substantial alteration of topography	Impact 4.4-4: Squeezing ground and subsidence during tunneling	Impact 4.4-5: Surface fault rupture	Impact 4.4-6: Seismically induced groundshaking	Impact 4.4-7: Seismically induced ground failure, including liquefaction and settlement	Impact 4.4-8: Seismically induced landslides or other slope failures	Impact 4.4-9: Expansive or corrosive soils
San Joaquin Region										
Advanced Disinfection	SJ-1	LS	LS	LS	N/A	LS	LS	LS	LS	PSM
Lawrence Livermore Supply Improvements	SJ-2	PSM	LS	LS	N/A	LS	LS	LS	LS	PSM
San Joaquin Pipeline System	SJ-3	N/A	LS	LS	N/A	LS	LS	LS	N/A	PSM
Rehabilitation of Existing San Joaquin Pipelines	SJ-4	N/A	LS	LS	N/A	LS	LS	LS	N/A	PSM
Tesla Portal Disinfection Station	SF-5	LS	LS	LS	N/A	LS	LS	LS	LS	PSM
Sunol Valley Region										
Alameda Creek Fishery Enhancement	SV-1	PSM	LS	LS	N/A	LS	LS	LS	LS	PSM
Calaveras Dam Replacement	SV-2	PSM	LS	LS	N/A	LS	LS	LS	LS	PSM
Additional 40-mgd Treated Water Supply	SV-3	PSM	LS	LS	N/A	LS	LS	LS	LS	PSM
New Irvington Tunnel	SV-4	PSM	LS	LS	PSM	LS	LS	LS	LS	PSM
SVWTP – Treated Water Reservoirs	SV-5	PSM	LS	LS	N/A	LS	LS	LS	LS	PSM
San Antonio Backup Pipeline	SV-6	PSM	LS	LS	N/A	LS	LS	LS	LS	PSM
Bay Division Region										
Bay Division Pipeline Reliability Upgrade	BD-1	LS	LS	LS	PSM	LS	LS	LS	LS	PSM
BDPL Nos. 3 and 4 Crossovers	BD-2	N/A	LS	LS	N/A	LS	LS	LS	N/A	PSM
Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault	BD-3	N/A	LS	LS	N/A	LS	LS	LS	N/A	PSM
Peninsula Region										
Baden and San Pedro Valve Lots Improvements	PN-1	LS	LS	LS	N/A	LS	LS	LS	LS	PSM
Crystal Springs/San Andreas Transmission Upgrade	PN-2	LS	LS	LS	N/A	LS	LS	LS	LS	PSM
HTWTP Long-Term Improvements	PN-3	PSM	LS	LS	N/A	LS	LS	LS	LS	PSM
Lower Crystal Springs Dam Improvements	PN-4	LS	LS	LS	N/A	LS	LS	LS	LS	PSM
Pulgas Balancing Reservoir Rehabilitation	PN-5	PSM	LS	LS	N/A	LS	LS	LS	LS	PSM
San Francisco Region										
San Andreas Pipeline No. 3 Installation	SF-1	LS	LS	LS	N/A	LS	LS	LS	LS	PSM
Groundwater Projects	SF-2	PSM	LS	LS	N/A	LS	LS	LS	LS	PSM
Recycled Water Projects	SF-3	PSM	LS	LS	N/A	LS	LS	LS	LS	PSM

LS = Less than Significant impact, no mitigation required
PSM= Potentially Significant impact, can be mitigated to less than significant
N/A = Not Applicable

San Joaquin Region

Impact 4.4-1: Slope instability during construction		
Advanced Disinfection	SJ-1	LS
Lawrence Livermore	SJ-2	PSM
SJPL System	SJ-3	N/A
SJPL Rehabilitation	SJ-4	N/A
Tesla Portal Disinfection	SJ-5	LS

The USGS has not mapped the landslide distribution in the San Joaquin Region. The Lawrence Livermore project (SJ-2) is located in landslide-prone Franciscan Complex units on moderate to steep slopes of the Diablo Range. Excavation and grading for construction at this site could potentially trigger landslides that could cause damage to the facility or nearby properties. Because this project is located in an area of potential landslide susceptibility, impacts related to construction-triggered landslides are considered *potentially significant,* but would be reduced to a less-than-significant level with implementation of SFPUC Construction Measure #2 (seismic and geotechnical studies) and preparation of a quantified landslide analysis (Measure 4.4-1).

The Advanced Disinfection (SJ-1) and Tesla Portal Disinfection (SJ-5) projects are located on gentle hills underlain by Plio-Pleistocene-age, nonmarine sedimentary deposits with a low potential for landslides. If any slope failures did occur due to substantial excavation into the slope, it is expected that they would be minor surficial failures and not likely to cause damage. Therefore, impacts related to construction-triggered landslides would be *less than significant* for these projects.

The remaining San Joaquin Region projects (SJPL System, SJ-3, and SJPL Rehabilitation, SJ-4) would not be located on substantial slopes; therefore, the potential for construction-triggered landslides would be low, and this impact would *not apply* to these projects.

Sunol Valley Region

Impact 4.4-1: Slope instability during construction		
Alameda Creek Fishery	SV-1	PSM
Calaveras Dam	SV-2	PSM
40-mgd Treated Water	SV-3	PSM
New Irvington Tunnel	SV-4	PSM
Treated Water Reservoirs	SV-5	PSM
SABUP	SV-6	PSM

All of the Sunol Valley Region projects (Alameda Creek Fishery, SV-1; Calaveras Dam, SV-2; 40-mgd Treated Water, SV-3; New Irvington Tunnel, SV-4; Treated Water Reservoirs, SV-5; and SABUP, SV-6) are located at least partially on and/or adjacent to gentle to moderately steep slopes of the Alameda Creek drainage and Diablo Range foothills, in areas mapped as “mostly landslides” (USGS, 1997). These areas are primarily underlain by sheared Miocene and Cretaceous sedimentary bedrock and sheared Franciscan Complex. Existing landslides are also mapped adjacent to the Calaveras Dam site (SV-2). Because these projects are located in an area of potential landslide susceptibility, impacts related to construction-triggered landslides are considered *potentially significant*. However, with implementation of SFPUC Construction Measure #2 (seismic and geotechnical studies) and preparation of a quantified landslide analysis (Measure 4.4-1), impacts related to slope stability would be reduced to a less-than-significant level. Compliance with policies related to slope instability (S5 and S6) of the Alameda WMP, described above, would also be required.

Bay Division Region

Impact 4.4-1: Slope instability during construction		
BDPL Reliability Upgrade	BD-1	LS
BDPL 3 and 4 Crossovers	BD-2	N/A
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	N/A

All proposed WSIP projects in the Bay Division Region (BDPL Reliability Upgrade, BD-1; BDPL 3 and 4 Crossovers, BD-2; and BDPL 3 and 4 Seismic Upgrade at Hayward Fault, BD-3) would be located on flat and gently sloping terrain adjacent to San Francisco Bay in areas designated as "flat land," but with areas mapped as "few landslides" on both ends of the BDPL Reliability Upgrade alignment (USGS, 1997). Therefore, this impact would *not apply* to the BDPL 3 and 4 Crossovers and BDPL 3 and 4 Seismic Upgrade at Hayward Fault projects. Although both ends of the BDPL Reliability Upgrade pipeline alignment would be located in areas mapped as "few landslides," impacts related to construction-triggered landslides would be *less than significant* because any slope failures that did occur due to substantial excavation into the slopes are expected to be minor surficial failures and not likely to cause damage.

Peninsula Region

Impact 4.4-1: Slope instability during construction		
Baden and San Pedro Valve Lots	PN-1	LS
CS/SA Transmission	PN-2	LS
HTWTP Long-Term	PN-3	PSM
Lower Crystal Springs Dam	PN-4	LS
Pulgas Balancing Reservoir	PN-5	PSM

The HTWTP Long-Term (PN-3) and Pulgas Balancing Reservoir (PN-5) project sites would be located on or adjacent to sloping terrain, where there are small areas designated as "mostly landslides" and several existing landslides are mapped along the edges of the Harry Tracy WTP (GTC, 2005). Because these projects are located in an area of potential landslide susceptibility, impacts related to construction-triggered landslides are considered *potentially significant,* but would be reduced to a less-than-significant level with implementation of SFPUC Construction Measure #2 (seismic and geotechnical studies) and preparation of a quantified landslide analysis (Measure 4.4-1). Compliance with policies related to slope instability (S5 and S6) of the Peninsula WMP, described above, would also be required for the Pulgas Balancing Reservoir project.

The Baden and San Pedro Valve Lots (PN-1), CS/SA Transmission (PN-2), and Lower Crystal Springs Dam (PN-4) projects are located on the flat-to-sloping terrain of the foothills and San Andreas Fault Zone, in areas primarily designated as "few landslides" (USGS, 1997). Therefore, this impact would be *less than significant* for these projects.

San Francisco Region

Impact 4.4-1: Slope instability during construction		
SAPL 3 Installation	SF-1	LS
Groundwater Projects	SF-2	PSM
Recycled Water Projects	SF-3	PSM

The Local Groundwater Projects (SF-2) would be constructed in the vicinity of the San Francisco Zoo, in the Sunset District, and in Golden Gate Park. Because the CGS has not mapped areas of landslide susceptibility at these sites, the potential for construction-related landslides is low for this project. However, construction-triggered landslides could occur during the construction of the Regional Groundwater Projects

(SF-2); the associated wells would not likely be constructed in a landslide-prone area, but the pipelines could cross areas of potential landslide susceptibility in San Mateo County. In addition, the Recycled Water Projects (SF-3) could include construction of a storage tank in Lincoln Park where the CGS has mapped a zone of landslide susceptibility. Therefore, impacts related to construction-triggered landslides are considered *potentially significant* for both projects, but would be reduced to a less-than-significant level with implementation of SFPUC Construction Measure #2 (seismic and geotechnical studies) and preparation of a quantified landslide analysis (Measure 4.4-1).

The SAPL 3 Installation project (SF-1) is proposed on flat and gently sloping terrain adjacent to San Francisco Bay and the surrounding hills in areas designated as "flat land" and "few landslides" (USGS, 1997). Therefore, impacts related to construction-triggered landslides would be *less than significant* for this project.

Impact 4.4-2: Erosion during construction.

Construction activities such as backfilling, grading, and compaction can remove stabilizing vegetation and expose areas of loose soil that, if not properly stabilized during construction, can be subject to soil loss and erosion by wind and stormwater runoff. Newly constructed and compacted engineered slopes can also undergo substantial erosion through dispersed sheet-flow runoff, and more concentrated runoff can cause the formation of small erosional channels and larger gullies, each compromising the integrity of the slope and resulting in significant soil loss.

All Regions

Impact 4.4-2: Erosion during construction		
Advanced Disinfection	SJ-1	LS
Lawrence Livermore	SJ-2	LS
SJPL System	SJ-3	LS
SJPL Rehabilitation	SJ-4	LS
Tesla Portal Disinfection	SJ-5	LS
Alameda Creek Fishery	SV-1	LS
Calaveras Dam	SV-2	LS
40-mgd Treated Water	SV-3	LS
New Irvington Tunnel	SV-4	LS
Treated Water Reservoirs	SV-5	LS
SABUP	SV-6	LS
BDPL Reliability Upgrade	BD-1	LS
BDPL 3 and 4 Crossovers	BD-2	LS
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	LS
Baden and San Pedro Valve Lots	PN-1	LS
CS/SA Transmission	PN-2	LS
HTWTP Long-Term	PN-3	LS
Lower Crystal Springs Dam	PN-4	LS
Pulgas Balancing Reservoir	PN-5	LS
SAPL 3 Installation	SF-1	LS
Groundwater Projects	SF-2	LS
Recycled Water Projects	SF-3	LS

All WSIP facilities requiring grading or excavation could be subject to soil loss and erosion by wind and stormwater runoff. Although erosion can be a common construction-related occurrence, especially during wintertime construction projects, all WSIP projects would be required to implement SFPUC Construction Measure #3 (onsite air and water quality measures during construction), which requires the implementation of erosion control measures, as described in Impact 4.5-1 (see Section 4.5, Hydrology and Water Quality). This measure would require preparation of a stormwater pollution prevention plan for projects disturbing more than one acre of land outside of San Francisco; preparation of an erosion control plan in accordance with Article 4.1 of the

San Francisco Public Works Code for projects within San Francisco; and implementation of erosion and sedimentation controls tailored to the site and project for projects outside of San Francisco that disturb less than one acre of land. As summarized in Impact 4.5-1, projects located in the Alameda and Peninsula watersheds would also be required to comply with the erosion control actions of the Alameda and Peninsula WMPs. With implementation of these required measures, impacts related to erosion during construction would be *less than significant* for all WSIP projects.

Impact 4.4-3: Substantial alteration of topography.

Substantial alteration of topography (defined as changes in the character of the slope and gradient due to grading, excavation, or cut and fill) could result in unstable slopes or increased wind or water erosion due to resultant drainage pattern changes and/or slope changes. These potential geologic impacts are discussed above under Impacts 4.4-1 and 4.4-2.

San Joaquin, Bay Division, Peninsula, and San Francisco Regions

Impact 4.4-3: Substantial alteration of topography		
Advanced Disinfection	SJ-1	LS
Lawrence Livermore	SJ-2	LS
SJPL System	SJ-3	LS
SJPL Rehabilitation	SJ-4	LS
Tesla Portal Disinfection	SJ-5	LS
BDPL Reliability Upgrade	BD-1	LS
BDPL 3 and 4 Crossovers	BD-2	LS
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	LS
Baden and San Pedro Valve Lots	PN-1	LS
CS/SA Transmission	PN-2	LS
HTWTP Long-Term	PN-3	LS
Lower Crystal Springs Dam	PN-4	LS
Pulgas Balancing Reservoir	PN-5	LS
SAPL 3 Installation	SF-1	LS
Groundwater Projects	SF-2	LS
Recycled Water Projects	SF-3	LS

Although projects in the San Joaquin, Bay Division, Peninsula, and San Francisco Regions would require some excavation or grading, most of these projects are located in previously disturbed areas, or the grading or excavation associated with the projects is not expected to significantly alter the topography. Furthermore, SFPUC Construction Measure #10 (project site) would require construction contractors to return the WSIP project sites to the general condition that existed before construction, which would include regrading the sites and revegetating disturbed areas. Therefore, impacts related to the substantial alteration of topography would be *less than significant* for projects in these regions.

Sunol Valley Region

Impact 4.4-3: Substantial alteration of topography		
Alameda Creek Fishery	SV-1	LS
Calaveras Dam	SV-2	LS
40-mgd Treated Water	SV-3	LS
New Irvington Tunnel	SV-4	LS
Treated Water Reservoirs	SV-5	LS
SABUP	SV-6	LS

In the Sunol Valley Region, the excavation of borrow pits and grading of hills for the new spillway, required for construction of the Calaveras Dam project (SV-2), as well as improvements at the Irvington Portal under the New Irvington Tunnel project (SV-4) would substantially alter topography and could result in increased wind or water erosion. However, this impact would be *less than significant* with implementation of SFPUC Construction Measure #3 (onsite air and water quality measures during construction), which requires erosion control measures and preparation of a stormwater pollution prevention plan, and SFPUC Construction Measure #10 (project site), which requires the construction contractor to restore project sites to the general condition that existed before construction, and which would include regrading the site and revegetating disturbed areas. For the Calaveras Dam project (SV-2), implementation of the following Alameda WMP action would further reduce impacts related to the alteration of topography to a less-than-significant level:

- *Action des5*: Prior to approval of new construction activities or renovation/alteration of existing facilities, structures, or roads, ensure that the following design guidelines are met:

  A. Where grading is necessary, slopes and landforms shall be contoured to mimic the surrounding environment as much as possible.

  B. Design and site new roads and trails to minimize grading and the visibility of cut banks and fill slopes.

The other Sunol Valley Region projects (Alameda Creek Fishery, SV-1; 40-mgd Treated Water, SV-3; Treated Water Reservoirs, SV-5; and SABUP, SV-6) would require some excavation or grading. However, many of these projects are located in previously disturbed areas, or the grading or excavation associated with these projects would not appreciably alter the topography. Furthermore, SFPUC Construction Measure #10 (project site) would require construction contractors to return the WSIP project sites to the general condition that existed before construction, which would include regrading the sites and revegetating disturbed areas. Therefore, impacts related to the substantial alteration of topography would be *less than significant* for these projects.

Impact 4.4-4: Squeezing ground and subsidence during tunneling.

The effects of squeezing ground could occur during tunnel construction and the ground surface overlying the proposed tunnels could subside due to tunnel excavation, damaging interior supports and resulting in potential health and safety hazards. Squeezing ground is a common construction challenge for tunnel projects, especially in sheared materials such as those expected during the excavation of proposed WSIP tunnels. Although the effects of squeezing ground can damage a tunnel’s interior support structure and sometimes cause injury to workers, standard engineering design would reduce the potential for this phenomenon to compromise the structural integrity of the tunnel structure or cause tunneling delays. Design might include reinforcing the tunnel excavation with steel rib-type supports; blocking in areas of crushed and sheared material; installing immediate face, roof, and sidewall support for stability in areas of crushed and squeezing ground; and using shotcrete to strengthen sidewalls and faces when the tunnel excavation is not advanced within about a day.

Additionally, with subsurface excavation projects such as tunneling, there is a potential that the ground surface could subside in response to the removal of subsurface materials. Subsidence occurs when the earth materials above the tunnel lose the capacity to support the overlying weight as the tunneling progresses. Subsidence can damage overlying structures such as homes and other buildings, as well as infrastructure such as roadways and utilities, and can also endanger the health and safety of construction workers. However, the tunnel interior would be reinforced by support elements to maintain the tunnel opening and minimize subsidence during tunneling.

San Joaquin Region, Peninsula, and San Francisco Regions

Impact 4.4-4: Squeezing ground and subsidence during tunneling		
Advanced Disinfection	SJ-1	N/A
Lawrence Livermore	SJ-2	N/A
SJPL System	SJ-3	N/A
SJPL Rehabilitation	SJ-4	N/A
Tesla Portal Disinfection	SJ-5	N/A
Baden and San Pedro Valve Lots	PN-1	N/A
CS/SA Transmission	PN-2	N/A
HTWTP Long-Term	PN-3	N/A
Lower Crystal Springs Dam	PN-4	N/A
Pulgas Balancing Reservoir	PN-5	N/A
SAPL 3 Installation	SF-1	N/A
Groundwater Projects	SF-2	N/A
Recycled Water Projects	SF-3	N/A

Impacts related to squeezing ground and subsidence would *not apply* to any projects in the San Joaquin, Peninsula, or San Francisco Regions because none of the projects in these regions would involve tunneling.

Sunol Valley Region

Impact 4.4-4: Squeezing ground and subsidence during tunneling		
Alameda Creek Fishery	SV-1	N/A
Calaveras Dam	SV-2	N/A
40-mgd Treated Water	SV-3	N/A
New Irvington Tunnel	SV-4	PSM
Treated Water Reservoirs	SV-5	N/A
SABUP	SV-6	N/A

Although squeezing ground could become an issue during construction of the New Irvington Tunnel project (SV-4), tunnel damage would not likely occur, because standard engineering design would reduce the potential for this phenomenon to compromise the structural integrity of the tunnel structure or cause tunneling delays. However, subsidence could become an issue during the construction of this project; therefore, impacts related to subsidence during tunneling would be *potentially significant,* but would be reduced to a less-than-significant level by use of internal supports during tunneling, as described above, and implementation of a subsidence monitoring program (Measure 4.4-4) to detect potential ground movement well before major subsidence occurs. Corrective action, such as increased tunnel support, would be implemented if measured displacement reached a designated minimum trigger amount. This impact would be evaluated in greater detail as part of separate, project-level CEQA review for this project, and specific triggers for corrective action would be addressed during that review.

None of the other Sunol Valley Region projects (Alameda Creek Fishery, SV-1; Calaveras Dam, SV-2; 40-mgd Treated Water, SV-3; Treated Water Reservoirs, SV-5; or SABUP, SV-6) would involve tunneling. Therefore, impacts related to squeezing ground and subsidence would *not apply* to these projects.

Bay Division Region

Impact 4.4-4: Squeezing ground and subsidence during tunneling		
BDPL Reliability Upgrade	BD-1	PSM
BDPL 3 and 4 Crossovers	BD-2	N/A
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	N/A

Although squeezing ground could become an issue during construction of the BDPL Reliability Upgrade project (BD-1), tunnel damage would not likely occur, because standard engineering design would reduce the potential for this phenomenon to compromise the structural integrity of the tunnel structure or cause tunneling delays. However, subsidence could become an issue during the construction of this project; therefore, impacts related to subsidence during tunneling would be *potentially significant*, but would be reduced to a less-than-significant level by use of internal supports during tunneling, as described above, and implementation of a subsidence monitoring program (Measure 4.4-4) to detect potential ground movement well before major subsidence occurs. Corrective action, such as increased tunnel support, would be implemented if measured displacement reached a designated minimum trigger amount. This impact would be evaluated in greater detail as part of separate, project-level CEQA review for this project, and specific triggers for corrective action would be addressed during that review.

None of the other Bay Division Region projects (BDPL 3 and 4 Crossovers, BD-2 and BDPL 3 and 4 Seismic Upgrade at Hayward Fault, BD-3) would involve tunneling. Therefore, impacts related to squeezing ground and subsidence would *not apply* to these projects.

Operations, Siting, and Design Impacts

Seismic Hazard Impacts

Impact 4.4-5: Surface fault rupture.

Although construction of the WSIP facilities would not alter the seismic environment or increase the risk of fault rupture, there is the potential for proposed improvements to be damaged by surface fault ruptures. Ground rupture most commonly occurs along preexisting faults, which are zones of weakness, and can occur slowly as fault creep (the slow rupture of the earth's crust along a fault) or more suddenly as earthquakes. The rate of movement along a fault can range from approximately 0.1 to 25 millimeters per year (mm/yr). This gradual movement can displace the ground surface and structures (such as buildings, roads, or fences) built over the trace of the fault, causing structural damage but generally not injury to people. Sudden movement resulting from an earthquake is more damaging than fault creep because it generally includes greater and more sudden displacement of the ground surface and is accompanied by groundshaking.

Because the SFPUC water system carries water from the Sierra Nevada to the San Francisco Bay Area, the crossing of several regional faults is unavoidable. Many of the WSIP facility projects include seismic upgrades and redundant features at fault crossings (as discussed by region below), which would enable the SFPUC to meet the water service delivery goals of the WSIP. These facilities would be designed to withstand fault rupture or maintain water service in accordance with the *General Seismic Design Requirements*.

The Alquist-Priolo Earthquake Fault Zoning Act prohibits construction of a structure for human occupancy within 50 feet of the trace of a known active fault. None of the WSIP facilities proposed for human occupancy are located within an Alquist-Priolo Earthquake Fault Zone.

The Sunol Valley and Peninsula Region projects located in the Peninsula watershed would also be required to comply with the following WMP policies related to fault rupture:

- *Policy S4*: Minimize damage from future seismic hazards by avoiding construction of facilities in active fault zones and traces, where feasible.
- *Policy S6*: Conduct (for CCSF-owned) and require (for easements) inspection of facilities and utilities near active landslide areas and fault traces following earthquakes and slope failures to assess their stability and integrity, and complete repairs or further monitoring as needed to prevent geohazards.

San Joaquin Region

Impact 4.4-5: Surface fault rupture		
Advanced Disinfection	SJ-1	LS
Lawrence Livermore	SJ-2	LS
SJPL System	SJ-3	LS
SJPL Rehabilitation	SJ-4	LS
Tesla Portal Disinfection	SJ-5	LS

Although the Advanced Disinfection (SJ-1), Lawrence Livermore (SJ-2), and Tesla Portal Disinfection (SJ-5) projects and the west end of the SJPL System (SJ-3) and SJPL Rehabilitation (SJ-4) projects would be constructed over the Great Valley 7 blind-thrust fault, there is no surface fault rupture associated with this thrust fault. There are no Alquist-Priolo Earthquake Fault Zones mapped in the San Joaquin Region. Therefore, the potential for fault rupture in this region is considered low, and impacts related to fault rupture would be *less than significant* for all San Joaquin Region projects.

Sunol Valley Region

Impact 4.4-5 Surface fault rupture		
Alameda Creek Fishery	SV-1	LS
Calaveras Dam	SV-2	LS
40-mgd Treated Water	SV-3	LS
New Irvington Tunnel	SV-4	LS
Treated Water Reservoirs	SV-5	LS
SABUP	SV-6	LS

Several of the WSIP facilities within the Sunol Valley Region lie within or cross the Calaveras Fault Zone. The Calaveras Fault Zone is expressed as numerous strands that form a zone tens of feet to more than 1,500 feet in width. North of Calaveras Reservoir, the fault is characterized by sparse seismicity, but would probably rupture to the surface in moderate to large earthquakes (Bryant and Cluett, 2000).

The Alameda Creek Fishery (SV-1), 40-mgd Treated Water (SV-3), Treated Water Reservoirs (SV-5), and SABUP (SV-6) projects would each include construction of structures within the Alquist-Priolo Earthquake Fault Zone for the Calaveras fault (CGS, 2000). However, the SABUP project would provide a redundant pipeline to the existing San Antonio Pipeline, and new discharge facilities would allow discharge to San Antonio Creek during an emergency outage. These projects would be designed and constructed in accordance with the *General Seismic Design Requirements*, which would ensure that water service delivery goals are met after an earthquake, and impacts related to fault rupture would be *less than significant*.

Although the Alquist-Priolo Earthquake Fault Zone extends beneath Calaveras Reservoir, the dam is located outside of the zone. The Calaveras Dam (SV-2) and New Irvington Tunnel (SV-4) projects would not cross or be located within 50 feet of an active fault trace. Therefore, impacts related to fault rupture would be *less than significant* for these projects.

Implementation Alameda WMP policies related to fault rupture (S4 and S6), described above, would also be required for all Sunol Valley Region projects.

Bay Division Region

Impact 4.4-5: Surface fault rupture		
BDPL Reliability Upgrade	BD-1	LS
BDPL 3 and 4 Crossovers	BD-2	LS
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	LS

Both Bay Division Pipelines Nos. 1 and 2 and Pipelines Nos. 3 and 4 cross the southern segment of the Hayward fault. Most of the fault exhibits fault creep between 3 and 6 mm/yr, although the historical creep rate has been as high as 9 mm/yr near the southern part of the southern segment of the Hayward fault (Bryant and Cluett, 2000). In 1868, a substantially damaging earthquake of M 7.0 occurred on this segment of the Hayward fault, with a rupture length of approximately 32 miles.

The BDPL Reliability Upgrade project (BD-1) crosses the Hayward fault and would include construction of new seismically improved pipeline between the Irvington and Pulgas Portals, and the BDPL 3 and 4 Seismic Upgrade at Hayward Fault project (BD-3) would include construction of upgraded, seismically resistant sections of the Bay Division Pipelines Nos. 3 and 4 where they cross the Hayward fault (CGS, 2000). Because these projects would be designed and constructed in accordance with the *General Seismic Design Requirements*, impacts related to fault rupture would be *less than significant* for these projects.

The crossovers that would be constructed under the BDPL 3 and 4 Crossovers project (BD-2) would not be located within an Alquist-Priolo Earthquake Fault Zone. Therefore, impacts related to fault rupture would be *less than significant* for this project.

Peninsula Region

Impact 4.4-5: Surface fault rupture		
Baden and San Pedro Valve Lots	PN-1	LS
CS/SA Transmission	PN-2	LS
HTWTP Long-Term	PN-3	LS
Lower Crystal Springs Dam	PN-4	LS
Pulgas Balancing Reservoir	PN-5	LS

The active trace of the San Andreas fault and the associated Alquist-Priolo Earthquake Fault Zone cross the San Andreas Reservoir and Dam. In this area, the San Andreas Fault Zone is expressed as several overlapping and parallel strands that form a linear valley, ranging from several hundred feet to approximately one-half mile wide. The San Andreas fault passes under the eastern abutment of the dam and, although there was an 8-foot shearing movement along the rift during the 1906 earthquake, there was no damage to the dam (SFPUC, 2007). Two studies conducted to evaluate the rupture potential and seismic safety at the San Andreas Dam (ESA, 1980 and 1983) found no faulting in the west abutment or valley immediately downstream of the dam during the last 5,000 years. The studies concluded that fault rupture in the dam vicinity over the past 7,500 years has been confined within a fairly narrow zone (100 to 150 feet wide) in an area east of and within the eastern abutment of the dam, and that, in the unlikely event of rupture through the dam, the clayey fill and native materials within and underlying the dam would be able to withstand some offset without catastrophic failure of the dam.

The CS/SA Transmission project (PN-2) includes seismic improvements to facilities that convey water from Crystal Springs Reservoir to the Harry Tracy WTP, including the Crystal Springs Pump Station, Crystal Springs/San Andreas Pipeline, and pipelines that convey raw water to the Harry Tracy WTP pump station. This project could be located almost entirely within the Alquist-Priolo Earthquake Fault Zone for the San Andreas fault (CGS, 2000), and the Crystal Springs/San Andreas Pipeline to be improved or replaced under this project would parallel the fault; however, the project would be designed and constructed in accordance with the *General Seismic Design Requirements*, and impacts related to fault rupture would thus be *less than significant.* Implementation of Peninsula WMP policies related to fault rupture (S4 and S6), described above, would also be required.

The HTWTP Long-Term (PN-3), Lower Crystal Springs Dam (PN-4), and Pulgas Balancing Reservoir (PN-5) projects as well as the Pulgas Pump Station to be improved under the Baden and San Pedro Valve Lots project (PN-1) are located in close proximity to the Alquist-Priolo Earthquake Fault Zone for the San Andreas fault. However, because they are outside of the zone, it is not expected that these projects would be affected by fault rupture. Other improvements under the Baden and San Pedro Valve Lots project would not be located within 50 feet of or in proximity to an active fault trace. Therefore, impacts related to fault rupture would be *less than significant* for these projects. Implementation of Peninsula WMP policies related to fault rupture (S4 and S6), described above, would be required for the Lower Crystal Springs Dam and Pulgas Balancing Reservoir projects.

San Francisco Region

Impact 4.4-5: Surface fault rupture		
SAPL 3 Installation	SF-1	LS
Groundwater Projects	SF-2	LS
Recycled Water Projects	SF-3	LS

There are no active faults or Alquist-Priolo Earthquake Fault Zones mapped in the city of San Francisco where the Local Groundwater Projects (SF-2) and Recycled Water Projects (SF-3) would be constructed. Although the SAPL Installation project (SF-1) includes pipeline installation south of San Francisco and in the city itself, the pipeline would not cross an Alquist-Priolo Earthquake Fault Zone. The Regional Groundwater Projects in San Mateo County would be constructed to the east of the Alquist-Priolo Earthquake Fault Zone for the San Andreas fault. Therefore, the potential for fault rupture is considered low, and impacts related to fault rupture would be *less than significant* for the three projects in this region.

Impact 4.4-6: Seismically induced groundshaking.

Groundshaking is the most widespread effect of earthquakes and poses a greater seismic threat than local ground rupture. Depending on the level of groundshaking, an earthquake could damage buildings, pipelines, valves, control facilities, tunnels, and pump stations, resulting in a disruption of water service and/or endangering the health and welfare of people. Damage to treatment facilities could affect the ability of the SFPUC to provide treated water to its customers, and damage to storage facilities could reduce the amount of storage available in the regional water system. Such damage could require short-term, temporary service interruptions for inspections and repairs, and long-term repairs could also be required. However, facilities constructed under the WSIP would meet current seismic standards in accordance with the *General Seismic Design Requirements*, thereby improving their ability to withstand seismic damage due to groundshaking.

San Joaquin Region

Impact 4.4-6: Seismically induced groundshaking		
Advanced Disinfection	SJ-1	LS
Lawrence Livermore	SJ-2	LS
SJPL System	SJ-3	LS
SJPL Rehabilitation	SJ-4	LS
Tesla Portal Disinfection	SJ-5	LS

Although there are few active or potentially active faults within the San Joaquin Region, several faults in the greater Northern California region are capable of producing groundshaking in the region. Most notable of these faults are the San Andreas, Hayward, San Gregorio, Calaveras, and Great Valley faults. The western portion of this region (at the eastern margin of the Diablo Range) is closest to these faults. The following WSIP projects or facilities would be located in this area: Advanced Disinfection (SJ-1), Lawrence Livermore (SJ-2), the western pipeline segments of the SJPL System (SJ-3) and SJPL Rehabilitation (SJ-4), and Tesla Portal Disinfection (SJ-5). Because of the type of rock beneath them, these facilities could be subject to groundshaking magnitudes ranging from 20 to 50 percent of gravity (0.2 to 0.5 g). However, due to its distance from these regional seismic sources, the eastern pipeline segment of the SJPL System and SJPL Rehabilitation projects are expected to experience lower groundshaking magnitudes, ranging from 10 to 20 percent of gravity (0.1 to 0.2 g). These approximate values are presented in this document for general review and estimation of potential seismic groundshaking and are not intended for the purpose of project design. All WSIP projects would be designed and constructed in accordance with the *General Seismic Design Requirements*. Therefore, impacts related to groundshaking would be *less than significant* for all San Joaquin Region projects.

Sunol Valley, Bay Division, Peninsula, and San Francisco Regions

Impact 4.4-6: Seismically induced groundshaking.		
Alameda Creek Fishery	SV-1	LS
Calaveras Dam	SV-2	LS
40-mgd Treated Water	SV-3	LS
New Irvington Tunnel	SV-4	LS
Treated Water Reservoirs	SV-5	LS
SABUP	SV-6	LS
BDPL Reliability Upgrade	BD-1	LS
BDPL 3 and 4 Crossovers	BD-2	LS
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	LS
Baden and San Pedro Valve Lots	PN-1	LS
CS/SA Transmission	PN-2	LS
HTWTP Long-Term	PN-3	LS
Lower Crystal Springs Dam	PN-4	LS
Pulgas Balancing Reservoir	PN-5	LS
SAPL 3 Installation	SF-1	LS
Groundwater Projects	SF-2	LS
Recycled Water Projects	SF-3	LS

Active and potentially active faults capable of producing strong groundshaking are located within and near each of the Sunol Valley, Bay Division, Peninsula, and San Francisco Regions. Most notable of these faults are the San Andreas, Hayward, San Gregorio, Calaveras, and Greenville faults. WSIP facilities in any of these regions could experience strong groundshaking from a seismic event on one of these faults. Anticipated groundshaking magnitudes in each region are summarized in **Table 4.4-5** and range from approximately 50 to 70 percent of gravity (0.5 g to 0.7 g). These approximate values are presented in this document for general review and estimation of potential seismic groundshaking in each region and are not intended for the purpose of project design.

TABLE 4.4-5
APPROXIMATE GROUND MOTIONS EXPECTED IN EACH REGION
(10% probability of being exceeded in 50 years)

Region	Range of Approximate Peak Ground Acceleration (g)[a,b]
Sunol Valley	0.72 – 0.73
Bay Division	0.50 – 0.71
Peninsula	0.68 – 0.72
San Francisco	0.55 – 0.69

[a] Ground motions are expressed as a fraction of the acceleration due to gravity (g) and have a 10% probability of being exceeded in 50 years.
[b] Ground motion values are the same for firm rock (conditions on the boundary between site categories B and C, as defined by the building code), soft rock (site category C), and alluvium (site category D).

SOURCE: CGS, 2007.

All WSIP projects would be designed and constructed in accordance with the *General Seismic Design Requirements.* Therefore, impacts related to ground shaking would be *less than significant* for all WSIP projects in the Sunol Valley, Bay Division, Peninsula, and San Francisco Regions.

Impact 4.4-7: Seismically induced ground failure, including liquefaction and settlement.

Liquefaction-related phenomena can include lateral spreading, ground oscillation, loss of bearing strength, subsidence, and buoyancy effects, all of which can damage to structures. During the loss of bearing capacity, large deformations can occur within the soil mass. Damage from liquefaction and lateral spreading is generally most severe when liquefaction occurs within 15 to 20 feet of the ground surface. The WSIP projects most likely to suffer damage from liquefaction-related phenomena are foundations for structures, vaults, and pipelines.

Seismically induced settlement can occur in areas underlain by compressible sediments. Stream channel deposits and recent valley alluvium are generally the most susceptible to earthquake-induced settlement. Additionally, artificial fills, especially fills placed before 1965 and those placed on top of bay mud, are highly susceptible to mobilization and densification, resulting in earthquake-induced subsidence.

For this analysis, areas susceptible to liquefaction were identified based on mapping conducted by the CGS and USGS. As required by the Seismic Hazards Mapping Act, the CGS has mapped areas of liquefaction potential within portions of the program area, and additional mapping is underway or planned. The USGS has issued a GIS map and report that includes liquefaction susceptibility mapping for the San Francisco Bay Area (USGS, 2000). For this mapping, the USGS has assigned liquefaction susceptibility designations of very low, low, moderate, high, and very high based on the geologic unit (type and age of deposit) and depth to groundwater.

Because the regional water system carries water from the Sierra Nevada to the San Francisco Bay Area, the crossing of many areas of moderate to very high liquefaction susceptibility is unavoidable. However, many of the WSIP facility projects include improvements to the water system within these areas (as discussed below by region), which would enable the SFPUC to meet the water service delivery goals of the WSIP, and these facilities would be designed to withstand liquefaction and settlement or maintain water service in accordance with the *General Seismic Design Requirements*.

Pipelines and Related Facilities. Where pipelines are buried in soil overlying deeper liquefiable soil layers, liquefaction of the deeper layers can result in substantial lateral spreading of the upper competent soil layer. Lateral spreading can extend several hundred feet from a slope, and displacements of tens of feet can occur if soil conditions are especially favorable for liquefaction and if earthquake shaking is of sufficient duration. Lateral spreading was responsible for most of the pipeline failures in San Francisco during the 1989 Loma Prieta earthquake.

During an earthquake, underground utilities tend to fail at the interface between a softer unit and a stiffer unit due to the settlement that occurs within the softer unit, a phenomenon known as differential settlement. The unconsolidated sediments underlying water crossings are typical examples of such conditions. During the Loma Prieta earthquake, differential settlement due to groundshaking resulted in water pipeline ruptures in the Marina District of San Francisco. Differential settlement is of most concern, as it can cause the uneven movement of pipelines, resulting in substantial damage to pipelines, including cracks and breakage.

Other Facilities. Liquefaction can result in a loss of bearing capacity, subsidence, and lateral spreading, all of which can cause serious building foundation failures, and naturally buoyant structures such as underground storage tanks can also be raised above ground. In response to seismically induced settlement, buildings and other structures can settle and tilt. Differential settlement is of most concern because it can cause uneven movement of foundations, resulting in significant damage to structures.

San Joaquin Region

Impact 4.4-7: Seismically induced ground failure, including liquefaction and settlement		
Advanced Disinfection	SJ-1	LS
Lawrence Livermore	SJ-2	LS
SJPL System	SJ-3	LS
SJPL Rehabilitation	SJ-4	LS
Tesla Portal Disinfection	SJ-5	LS

Seismic hazard maps have not been prepared for the San Joaquin Valley, and the CGS does not indicate plans for completing maps for this region. However, some areas are potentially liquefiable, including near-surface soils comprised of sandy and gravelly alluvial deposits and areas of shallow groundwater along the eastern margin of the Coast Ranges, where the following WSIP projects or facilities would be located: Advanced Disinfection (SJ-1), Lawrence Livermore (SJ-2), Tesla Portal Disinfection (SJ-5), and the western pipeline segments of the SJPL System (SJ-3) and SJPL Rehabilitation (SJ-4) projects. However, the SJPL System project would include construction of a fourth pipeline parallel to the existing pipelines as well as two crossover facilities, and the SJPL Rehabilitation project includes a conditions assessment and rehabilitation of the existing San Joaquin Pipelines where improvements are needed. Rehabilitation of the pipelines to current seismic design criteria would improve the reliability of the San Joaquin Pipelines and reduce the potential for failure in the event of liquefaction or settlement. Because each of these projects would be designed and constructed in accordance with the *General Seismic Design Requirements*, impacts related to liquefaction and other seismically induced ground failures are considered *less than significant* for all San Joaquin Region projects.

Sunol Valley Region

Impact 4.4-7: Seismically induced ground failure, including liquefaction and settlement		
Alameda Creek Fishery	SV-1	LS
Calaveras Dam	SV-2	LS
40-mgd Treated Water	SV-3	LS
New Irvington Tunnel	SV-4	LS
Treated Water Reservoirs	SV-5	LS
SABUP	SV-6	LS

Of the six WSIP projects in the Sunol Valley Region, a seismic hazard map has been prepared only for an area covering the western portion of the New Irvington Tunnel (SV-4, shown on the Niles quadrangle); based on this mapping, the western portion of the New Irvington Tunnel does not pass beneath any zones of potential liquefaction. The CGS plans to prepare a seismic hazard map for the La Costa Valley quadrangle, where many of the Sunol Valley projects would be constructed.

The USGS liquefaction susceptibility mapping delineates areas of moderate to very high liquefaction potential in the Sunol Valley Region. The highest liquefaction potential is in areas of Quaternary deposition on the valley floor and along the drainage of Alameda Creek. The

Alameda Creek Fishery project (SV-1) and the pipeline component of the 40-mgd Treated Water project (SV-3) would be located in areas with moderate to very high liquefaction susceptibility. A portion of the SABUP project (SV-6) would also be located in areas with moderate to very high liquefaction susceptibility. However, this project would provide a redundant pipeline to the existing San Antonio Pipeline, and new discharge facilities would allow discharge to San Antonio Creek during an emergency outage. Because these projects would be designed and constructed to withstand liquefaction and settlement in accordance with the *General Seismic Design Requirements*, impacts related to liquefaction and other seismically induced ground failures are considered *less than significant* for these projects.

The Calaveras Dam (SV-2), New Irvington Tunnel (SV-4), and Treated Water Reservoirs (SV-5) projects are located in areas designated as having low to very low susceptibility to liquefaction; therefore, potential impacts related to liquefaction and other seismically induced ground failures would be *less than significant* for these projects.

Bay Division Region

Impact 4.4-7: Seismically induced ground failure, including liquefaction and settlement		
BDPL Reliability Upgrade	BD-1	LS
BDPL 3 and 4 Crossovers	BD-2	LS
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	LS

The Niles and Newark seismic hazard maps cover the segment of the BDPL Reliability Upgrade project (BD-1) to the east of the bay, and maps are planned or under preparation for the segment of this project to the west of the bay. Based on existing seismic hazard mapping, most of the eastern segment of the BDPL Reliability Upgrade traverses a zone of potential liquefaction. USGS mapping also indicates that the eastern segment of the pipeline traverses areas of moderate to very high liquefaction susceptibility.

The existing Bay Division Pipelines Nos. 3 and 4 traverse a broad area mapped by the CGS as having liquefaction potential, and by the USGS as having moderate to very high liquefaction susceptibility. These liquefaction-susceptible areas are located along the San Francisco Bay margins, where recent deposition has created a thick stratum of Holocene-age alluvium (greater than 60 feet in some areas). Significant bay filling has also created more liquefaction-prone areas of artificial fill. The BDPL 3 and 4 Crossovers (BD-2) and BDPL 3 and 4 Seismic Upgrade at Hayward Fault (BD-3) projects would be constructed on these existing pipeline segments in an area of liquefaction potential.

The BDPL Reliability Upgrade project (BD-1) would include construction of new seismically improved pipeline between the Irvington and Pulgas Portals; the BDPL 3 and 4 Crossovers (BD-2) would increase the reliability of water service delivery by reducing the amount of pipeline that would need to be taken out of service at one time; and the BDPL 3 and 4 Seismic Upgrade at Hayward Fault project (BD-3) would include construction of upgraded, seismically resistant sections of the Bay Division Pipelines Nos. 3 and 4 where they cross the Hayward fault. Because these projects would be designed and constructed to withstand liquefaction and settlement in accordance with the *General Seismic Design Requirements*, impacts related to liquefaction and other seismically induced ground failures are considered *less than significant* for all Bay Division Region projects.

Peninsula Region

Impact 4.4-7: Seismically induced ground failure, including liquefaction and settlement		
Baden and San Pedro Valve Lots	PN-1	LS
CS/SA Transmission	PN-2	LS
HTWTP Long-Term	PN-3	LS
Lower Crystal Springs Dam	PN-4	LS
Pulgas Balancing Reservoir	PN-5	LS

The CGS plans, but has yet to prepare, seismic hazard maps delineating areas of potential liquefaction for the Peninsula Region to the south of San Francisco. USGS mapping delineates areas of moderate liquefaction potential at the south end of Lower Crystal Springs Reservoir, where the Pulgas Balancing Reservoir project (PN-5) would be constructed, and between the Lower and Upper Crystal Springs Reservoirs, where the Crystal Springs/San Andreas Pipeline would be repaired or replaced under the CS/SA Transmission project (PN-2). However, whether repaired or replaced, this pipeline would improve the reliability of water conveyance from Crystal Springs Reservoir to the Harry Tracy WTP. Because these projects would be designed and constructed to withstand liquefaction and settlement in accordance with the *General Seismic Design Requirements*, impacts related to liquefaction and other seismically induced ground failures are considered *less than significant* for these projects.

Other WSIP facilities in this region are located in areas underlain by Pleistocene and older bedrock units that have low to very low liquefaction susceptibility as mapped by the USGS. Therefore, the potential for liquefaction at the remaining facilities in this region is low, and impacts related to liquefaction other seismically induced ground failures would be *less than significant* for the Baden and San Pedro Valve Lots (PN-1), HTWTP Long-Term (PN-3), and Lower Crystal Springs Dam (PN-4) projects.

San Francisco Region

Impact 4.4-7: Seismically induced ground failure, including liquefaction and settlement		
SAPL 3 Installation	SF-1	LS
Groundwater Projects	SF-2	LS
Recycled Water Projects	SF-3	LS

Based on CGS seismic hazard mapping, the SAPL 3 Installation project (SF-1) could cross several small areas of potential liquefaction in the vicinity of Lake Merced. However, the project would repair and replace portions of the existing Crystal Springs Pipeline No. 2 to improve the seismic reliability of the water system. Final locations have not been selected, but the Local Groundwater Projects (SF-2) and Recycled Water Projects (SF-3) could be constructed in areas of potential liquefaction mapped by the CGS in the vicinity of Lake Merced and along the coastline in the Sunset District and Golden Gate Park to the north. The CGS plans, but has yet to prepare, seismic hazard maps for the Peninsula Region to the south of San Francisco, where the Regional Groundwater Projects (SF-2) would be constructed. However, these projects would be designed and constructed to withstand liquefaction in accordance with the *General Seismic Design Requirements*, and impacts related to liquefaction and other seismically induced ground failures would be *less than significant* for all San Francisco Region projects.

In addition, if the Recycled Water Projects (SF-3) are located in a CGS zone of potential liquefaction, construction of the treatment plant under this project would be required to comply with Seismic Hazards Mapping Act requirements (described in the Setting), because the plant would likely be staffed for more than 2,000 hours per year. The applicability of this act would be determined during separate, project-level CEQA environmental review of this project.

Impact 4.4-8: Seismically induced landslides or other slope failures.

Impact 4.4-8: Seismically induced landslides or other slope failures		
Advanced Disinfection	SJ-1	LS
Lawrence Livermore	SJ-2	LS
SJPL System	SJ-3	N/A
SJPL Rehabilitation	SJ-4	N/A
Tesla Portal Disinfection	SJ-5	LS
Alameda Creek Fishery	SV-1	LS
Calaveras Dam	SV-2	LS
40-mgd Treated Water	SV-3	LS
New Irvington Tunnel	SV-4	LS
Treated Water Reservoirs	SV-5	LS
SABUP	SV-6	LS
BDPL Reliability Upgrade	BD-1	LS
BDPL 3 and 4 Crossovers	BD-2	N/A
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	N/A
Baden and San Pedro Valve Lots	PN-1	LS
CS/SA Transmission	PN-2	LS
HTWTP Long-Term	PN-3	LS
Lower Crystal Springs Dam	PN-4	LS
Pulgas Balancing Reservoir	PN-5	LS
SAPL 3 Installation	SF-1	LS
Groundwater Projects	SF-2	LS
Recycled Water Projects	SF-3	LS

As discussed in Impact 4.4-1, many WSIP projects would be located in areas mapped as "many landslides" (USGS, 1997). Therefore, the potential exists for seismically induced ground failure in the form of landsliding or ground-cracking at these sites. Slope instability (including landslides, earth flows, and debris flows) could undermine foundations, cause distortion and distress to overlying structures, and displace or destroy project components. However, all WSIP projects would be designed and constructed to withstand or avoid seismically induced landslides in accordance with the *General Seismic Design Requirements.* Therefore, impacts related to seismically induced landslides or other slope failures would be *less than significant* for all WSIP projects located in an area susceptible to landslides. Implementation of Alameda WMP Policies 55 and 56 described in Impact 4.4-1 would also be required for projects located in the Alameda and Peninsula watersheds. Similar to Impact 4.4-1, this impact would *not apply* to projects located outside of areas susceptible to landslides.

None of the WSIP facilities intended for human occupancy are located in areas mapped by the CGS as having the potential for seismically induced landslides, and these facilities would thus not be subject to the Seismic Hazards Mapping Act. If seismic hazard mapping is completed in San Mateo County by the time of construction, improvements at the Harry Tracy WTP under the HTWTP Long-Term project (PN-3) could be subject to Seismic Hazards Mapping Act requirements (described in the Setting).

Geologic Hazard Impacts

Impact 4.4-9: Expansive or corrosive soils.

Problematic soils, including corrosive and expansive soils, can cause damage to structures and buried utilities and can also increase required maintenance. Depending on the degree of corrosivity of the subsurface soils, building materials such as concrete, reinforcing steel in concrete structures, and bare-metal structures exposed to these soils can deteriorate, eventually leading to structural failures. Expansion and contraction of expansive soils in response to changes in moisture content can lead to differential and cyclical movements that can cause damage and/or distress to structures and equipment.

Some of the natural soil types identified within the WSIP project areas are known to be corrosive or expansive. Under the CBC, the expansive characteristics of a soil would be determined according to Uniform Building Code Standard 18-2, and the soil classified according to CBC Table 18A-1-B. For projects located on soil with an expansion index greater than 20, a geotechnical investigation could be required. If the soil expansion index varies with depth, the variation would be included in the engineering analysis of the effects of expansive soils on the structure. The report for the geotechnical investigation would provide a recommended foundation type, design criteria (including bearing capacity), and provisions to protect against the effects of expansive soils. The geotechnical report would also identify the total and differential settlement that could occur.

Examples of measures that could be taken to correct for expansive soils include removing unsuitable subgrade soils and replacing them with engineered fill, supporting structures on deep-pile foundation systems, densifying compactable subgrade soils with in-situ techniques, and placing moisture barriers above and around expansive subgrade soils to help prevent variations in soil moisture content. Examples of measures that could be taken to correct for corrosive soils include installing cathodic protection systems to protect buried metal utilities, using coated or nonmetallic (i.e., concrete or PVC) pipes not susceptible to corrosion, and constructing foundations using sulfate-resistant concrete.

All WSIP projects are located in an area of potentially corrosive or expansive soil, as discussed below; therefore, this impact is considered potentially significant for all projects. However, the site-specific information analyzed in accordance with SFPUC Construction Measure #2 (seismic and geotechnical studies) and during separate, project-level CEQA review would either confirm the program-level determination or provide a basis to revise this determination.

San Joaquin Region

Impact 4.4-9: Expansive or corrosive soils		
Advanced Disinfection	SJ-1	PSM
Lawrence Livermore	SJ-2	PSM
SJPL System	SJ-3	PSM
SJPL Rehabilitation	SJ-4	PSM
Tesla Portal Disinfection	SJ-5	PSM

Based on the STATSGO Map (described in the setting), the distribution of soil units in the San Joaquin Region is highly variable. **Table 4.4 6** summarizes the characteristics of the major soil types that could be encountered during construction of the new pipeline

TABLE 4.4-6
MAJOR SOIL TYPES FOR SAN JOAQUIN REGION PROJECTS

Unit ID	Soil Association	Description	Shrink/Swell Potential	Risk of Corrosion: Concrete	Risk of Corrosion: Uncoated Steel
CA402	Auburn–Whiterock–Rock Outcrop	Soils consist of silt loam and loam.[a] Shallow soils formed on amphibolite schists and other metasedimentary rock types.	Low to High	Low to Moderate	Moderate to High
CA431	Pentz–Peters–Pardee	Predominantly shallow soils formed in material weathered from andesitic tuffaceous sediments, some soils formed in mixed alluvium. Soils consist of clay, fine sandy loam, and gravelly to cobbly loam.	Low, with some areas of Moderate to High	Low to Moderate	Moderate to High
CA469	Capay–El Sloyo–Vernalis	Very deep soils consisting of clay, clay loam, and silty clay loam that form on fine-grained alluvial fans and flats.	Moderate to High	Low to Moderate	High
CA470	Carbona–Capay–Calla	Soils consist of clays and clay loams. Deep soils formed in fine alluvial fans and terraces.	Moderate to High	Low to Moderate	High
CA484	Vernalis–San Emigdio–Garretson	Soils consist of clay loam, loam, sandy loam, gravelly loam, and gravelly sandy loam. Very deep soils that form on alluvial fans and floodplains.	Low to Moderate	Low	Moderate to High
CA485	Capay–Zacharias–Stomar	Very deep soils formed in fine-grained alluvium consisting of clay and clay loam.	Low to High	Low to Moderate	Moderate to High

[a] Loam soil composed of sand, silt, clay, and organic matter in evenly mixed particles of various sizes.

SOURCES: NRCS, 1994 and 2007.

segments and disinfection facilities. Some soil types exhibit a high shrink/swell potential and some exhibit a high risk of corrosion to uncoated steel. Therefore, impacts related to expansive and corrosive soils would be *potentially significant* for all San Joaquin Region projects (Advanced Disinfection, SJ-1; Lawrence Livermore, SJ-2; SJPL System, SJ-3; SJPL Rehabilitation, SJ-4; and Tesla Portal Disinfection, SJ-5). However, implementation of SFPUC Construction Measure #2 (seismic and geotechnical studies) and characterization of the extent of expansive and corrosive soils (Measure 4.4-9), including conformance with CBC requirements, would reduce this impact to a less-than-significant level.

Sunol Valley Region

Impact 4.4-9: Expansive or corrosive soils		
Alameda Creek Fishery	SV-1	PSM
Calaveras Dam	SV-2	PSM
40-mgd Treated Water	SV-3	PSM
New Irvington Tunnel	SV-4	PSM
Treated Water Reservoirs	SV-5	PSM
SABUP	SV-6	PSM

Soils in the Sunol Valley Region consist of one soil association, the Millsholm–Los Osos–Los Gatos Association. **Table 4.4-7** summarizes the characteristics of this soil type. The major soil type in this region exhibits a moderate shrink/swell potential and a high risk of corrosion to uncoated steel. Therefore, impacts related to expansive and corrosive soils are *potentially significant* for the Sunol Valley Region projects (Alameda Creek Fishery, SV-1; Calaveras Dam, SV-2; 40-mgd Treated Water, SV-3; New Irvington Tunnel, SV-4; Treated Water Reservoirs, SV-5; and SABUP, SV-6), but would be reduced to a less-than-significant level with implementation of SFPUC Construction Measure #2 (seismic and geotechnical studies) and characterization of the extent of expansive and corrosive soils (Measure 4.4-9), including conformance with CBC requirements.

TABLE 4.4-7
MAJOR SOIL TYPES FOR SUNOL VALLEY REGION PROJECTS

Unit ID	Soil Association	Description	Shrink/Swell Potential	Risk of Corrosion: Concrete	Risk of Corrosion: Uncoated Steel
CA423	Millsholm–Los Osos–Los Gatos	Moderately deep to shallow soils formed in material weathered from sandstone and shale consisting of clay, clay loam, loam,[a] and sandy loam.	Low, some areas of Moderate	Low to Moderate	Moderate to High

[a] Loam soil composed of sand, silt, clay, and organic matter in evenly mixed particles of various sizes.

SOURCES: NRCS, 1994 and 2007.

Bay Division Region

Impact 4.4-9: Expansive or corrosive soils		
BDPL Reliability Upgrade	BD-1	PSM
BDPL 3 and 4 Crossovers	BD-2	PSM
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	PSM

The distribution of soil types in this region is also highly variable, with soils of varying expansive and corrosive properties. **Table 4.4-8** summarizes the characteristics of the major soil types that could be encountered during construction of the new pipeline and new pipeline interties, valve structures, and crossover facilities. Some soil types exhibit a high shrink/swell potential and some exhibit a high risk of corrosion to uncoated steel. Therefore, impacts related to expansive and corrosive soils are *potentially significant* for the all projects in this region (BDPL Reliability Upgrade, BD-1; BDPL 3 and 4 Crossovers, BD-2; and BDPL 3 and 4 Seismic Upgrade at Hayward Fault, BD-3), but would be reduced to a less-than-significant level with implementation of SFPUC Construction Measure #2 (seismic and geotechnical studies) and characterization of the extent of expansive and corrosive soils (Measure 4.4-9), including conformance with CBC requirements.

TABLE 4.4-8
MAJOR SOIL TYPES FOR BAY DIVISION REGION PROJECTS

Unit ID	Soil Association	Description	Shrink/Swell Potential	Risk of Corrosion: Concrete	Risk of Corrosion: Uncoated Steel
CA202	Reyes–Novato–Tamba	Deep soils formed in alluvium next to bays and in marshes consisting of silty clay, clay, and mucky clay.	Moderate to High	Low to High	High
CA240	Clear Lake–Pescadero–Cropley	Deep to very deep soils formed in fine-grained alluvium. Soil types include clay, silty clay, and silty clay loam.[a]	Low to High	Low to Moderate	Moderate to High
CA242	Danville–Botella–Urban Land[b]	Very deep soils formed in alluvial fans and terraces consisting of clay, sandy clay loam, silty clay loam, sandy clay, and clay loam.	Moderate to High	Low to Moderate	Moderate to High
CA592	Urban Land–Xerorthents[c]–Accelerator	Deep soil formed in material weathered from soft sandstone and siltstone. Consists of loam, clay, and gravelly clay loam.	Low to High	Low to Moderate	Moderate to High
CA593	Accelerator–Fagan–Urban Land	Deep soil formed in material weathered from soft sandstone and siltstone. Consists of loam, clay loam, clay, and gravelly clay loam.	Low to High	Low to Moderate	Moderate
CA595/596	Associations including varying amounts of Urban Land, Xerorthents, and Botella	Very deep soils formed in alluvium from sedimentary rocks consisting of silty clay loam, sandy clay, and clay loam.	Moderate to High	Moderate to High	Moderate to High

[a] Loam soil composed of sand, silt, clay, and organic matter in evenly mixed particles of various sizes.
[b] Urban Land – areas of urbanized land where soil units have been modified by urban uses or engineered materials.
[c] Xerorthents type is used to describe the highly variable, disturbed urban flatlands.

SOURCES: NRCS, 1994 and 2007.

Peninsula Region

Impact 4.4-9: Expansive or corrosive soils		
Baden and San Pedro Valve Lots	PN-1	PSM
CS/SA Transmission	PN-2	PSM
HTWTP Long-Term	PN-3	PSM
Lower Crystal Springs Dam	PN-4	PSM
Pulgas Balancing Reservoir	PN-5	PSM

The distribution of soil types in this region is highly variable, with soils of varying expansive and corrosive properties. **Table 4.4-9** summarizes the characteristics of the major soil types that could be encountered during construction of the facility improvements, replacement pipelines, and other new structures. Some soil types exhibit a high shrink/swell potential and some exhibit a high risk of corrosion to uncoated steel. Therefore, impacts related to expansive and corrosive soils are *potentially significant* for each of the Peninsula Region projects (Baden and San Pedro Valve Lots, PN-1; CS/SA Transmission, PN-2; HTWTP Long-Term, PN-3; Lower Crystal Springs Dam, PN-4; and Pulgas Balancing Reservoir, PN-5), but would be reduced to a less-than-significant level with implementation of SFPUC Construction Measure #2 (seismic and geotechnical studies) and characterization of the extent of expansive and corrosive soils (Measure 4.4-9), including conformance with CBC requirements.

TABLE 4.4-9
MAJOR SOIL TYPES FOR PENINSULA REGION PROJECTS

Unit ID	Soil Association	Description	Shrink/Swell Potential	Risk of Corrosion	
				Concrete	Uncoated Steel
CA588	Alambique–McGarvey–Zeni	Moderately deep soils formed in material weathered from sandstone, consists of gravelly loam, clay loam, and loam.[a]	Low to Moderate	Low to Moderate	Moderate to High
CA591	Fagan–Obispo–Urban Land[b]	Deep soils in material weathered from sandstone consisting of clay and clay loam, and shallow soils in material weathered from serpentinite consisting of clay.	Low to Moderate	Low to High	Moderate to High
CA592	Urban Land–Xerorthents[c]–Accelerator	Deep soil formed in material weathered from soft sandstone and siltstone. Consists of loam, clay, and gravelly clay loam.	Low to High	Low to Moderate	Moderate to High
CA595	Urban Land–Xerorthents–Botella	Very deep soils formed in alluvium from sedimentary rocks consisting of silty clay loam, sandy clay, and clay loam.	Moderate to High	Moderate to High	Moderate to High
CA599	Urban Land–Xerorthents–Sirdrak	Sirdrak soils are very deep soils formed in eolian sands consisting of grayish to yellowish brown sand.	Low	Moderate	Moderate

a Loam soil composed of sand, silt, clay, and organic matter in evenly mixed particles of various sizes.
B Urban Land – areas of urbanized land where soil units have been modified by urban uses or engineered materials.
C Xerorthents type is used to describe the highly variable, disturbed urban flatlands.

SOURCES: NRCS, 1994 and 2007.

San Francisco Region

Impact 4.4-9: Expansive or corrosive soils		
SAPL 3 Installation	SF-1	PSM
Groundwater Projects	SF-2	PSM
Recycled Water Projects	SF-3	PSM

The distribution of soil types in this region is highly variable, with soils of varying expansive and corrosive properties. **Table 4.4-10** summarizes the characteristics of the major soil types that could be encountered during construction of the new pipelines and related facilities/structures. Some soil types exhibit a high shrink/swell potential and some exhibit a high risk of corrosion to uncoated steel. Therefore, impacts related to expansive and corrosive soils are *potentially significant* for each of the San Francisco Region projects (SAPL 3 Installation, SF-1; Groundwater Projects, SF-2; and Recycled Water Projects, SF-3), but would be reduced to a less-than-significant level with implementation of SFPUC Construction Measure #2 (seismic and geotechnical studies) and characterization of the extent of expansive and corrosive soils (Measure 4.4-9), including conformance with CBC requirements.

TABLE 4.4-10
MAJOR SOIL TYPES FOR SAN FRANCISCO REGION PROJECTS

Unit ID	Soil Association	Description	Shrink/Swell Potential	Risk of Corrosion Concrete	Risk of Corrosion Uncoated Steel
CA590	Barnabe–Candlestick–Buriburi	Shallow to moderately deep soil formed in material weathered from sandstone. Consists of gravelly loam, very gravelly loam, sandy loam, and loam.[a]	Low to Moderate	Moderate	Moderate
CA591	Fagan–Obispo–Urban Land[b]	Deep soils in material weathered from sandstone consisting of clay and clay loam, and shallow soils in material weathered from serpentinite consisting of clay.	Low to Moderate	Low to High	Moderate to High
CA592	Urban Land–Xerorthents[c]–Accelerator	Deep soil formed in material weathered from soft sandstone and siltstone. Consists of loam, clay, and gravelly clay loam.	Low to High	Low to Moderate	Moderate to High
CA595	Urban Land–Xerorthents–Botella	Very deep soils formed in alluvium from sedimentary rocks consisting of silty clay loam, sandy clay, and clay loam.	Moderate to High	Moderate to High	Moderate to High
CA599	Urban Land–Xerorthents–Sirdrak	Sirdrak soils are very deep soils formed in eolian sands consisting of grayish to yellowish brown sand.	Low	Moderate	Moderate

[a] Loam soil composed of sand, silt, clay, and organic matter in evenly mixed particles of various sizes.
[b] Urban Land – areas of urbanized land where soil units have been modified by urban uses or engineered materials.
[c] Xerorthents type is used to describe the highly variable, disturbed urban flatlands.

SOURCES: NRCS, 1994 and 2007.

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4.5 Hydrology and Water Quality

4.5 Hydrology and Water Quality

4.5.1 Setting

WSIP facility improvement projects would be located in several major watersheds within and near the San Francisco Bay and San Joaquin River areas, and major project activities would occur in or adjacent to water bodies that support substantial beneficial uses for both wildlife and humans. Major water bodies in the WSIP program area are shown in **Figure 4.5-1**. This section discusses the major water bodies or watersheds that could be affected by the WSIP projects and identifies potential flooding issues in the vicinity of WSIP projects.

San Joaquin Region

The Tuolumne River, Stanislaus River, San Joaquin River, Delta-Mendota Canal, and California Aqueduct are the major water bodies within this region (Figure 4.5-1).

Tuolumne River

The Tuolumne River and watershed are described in Chapter 5, Section 5.3, Tuolumne River System and Downstream Water Bodies.

Stanislaus River

The Stanislaus River is a tributary to the San Joaquin River, which flows westward from the Sierra Nevada roughly parallel to and north of the Tuolumne River; the Hetch Hetchy Aqueduct runs between these two rivers. The North and Middle Forks of the Stanislaus River originate in Alpine County, while the South Fork originates in the Emigrant Wilderness north of Yosemite National Park. All three forks converge before the river enters New Melones Reservoir.

Delta-Mendota Canal

The Delta-Mendota Canal is a 120-mile-long component of the Central Valley Project, a system of irrigation and hydroelectric canals and dams. The Delta-Mendota Canal is used for irrigation water. The Tracy Pumping Plant is located at the northern end of the canal and diverts water to it from the Delta Cross Channel. The canal runs south along the western edge of the San Joaquin Valley and ends at the San Joaquin River near the town of Mendota, just west of Fresno. The Hetch Hetchy Aqueduct crosses over the canal west of Modesto. The Delta-Mendota Canal is operated by the Delta-Mendota Water Authority, which is responsible for maintaining the quality of the water discharged from the south end of the canal.

San Joaquin River

The San Joaquin River originates from Thousand Island Lake near Mount Ritter, high on the western slopes of the Sierra Nevada, in the Ansel Adams Wilderness near Mammoth Mountain. The San Joaquin River drains most of the area from the southern border of Yosemite National Park south to Kings Canyon National Park, making it the second largest river drainage in the state. The river emerges from the foothills at the former town of Millerton; Friant Dam, located in Millerton since 1944, forms Millerton Lake. From the foothills, the river flows west to the trough of the Central Valley, where its major tributaries include the Stanislaus River, Tuolumne River, Merced River, Calaveras River, and Mokelumne River; it then flows north to the Sacramento–San Joaquin Delta and on to San Francisco Bay. The Hetch Hetchy Aqueduct crosses the river west of Modesto.

California Aqueduct

The California Aqueduct is a concrete-lined aqueduct that transports water from Northern California to Southern California. It is the main water transport structure of the State Water Project and, at nearly 450 miles in length, is the longest water channel in California. The aqueduct, built by the California Department of Water Resources, begins at the Sacramento River Delta and carries water south through the Central Valley, where it often parallels Interstate 5 (I-5). Here, the coastal branch splits off in a southwesterly direction to serve the central coast. The Hetch Hetchy Aqueduct crosses over the California Aqueduct west of Modesto. At Bakersfield, water is pumped up 2,000 feet to cross the Tehachapi Mountains.

Corral Hollow Watershed

Both the Advanced Disinfection (SJ-1) and the Tesla Portal Disinfection (SJ-5) facilities would be located at Tesla Portal, which is in the Corral Hollow Creek watershed on the eastern flank of the Coast Ranges in San Joaquin County. This watershed is within the overall Old River watershed but is hydraulically divided from the watershed by I-580, the California Aqueduct, and the Delta-Mendota Canal. Surface drainages in the Corral Hollow Creek watershed are not well defined due to limited precipitation. However, no surface runoff from the Tesla Portal site or the surrounding area contributes water to the aqueduct or canal or directly to Corral Hollow Creek.

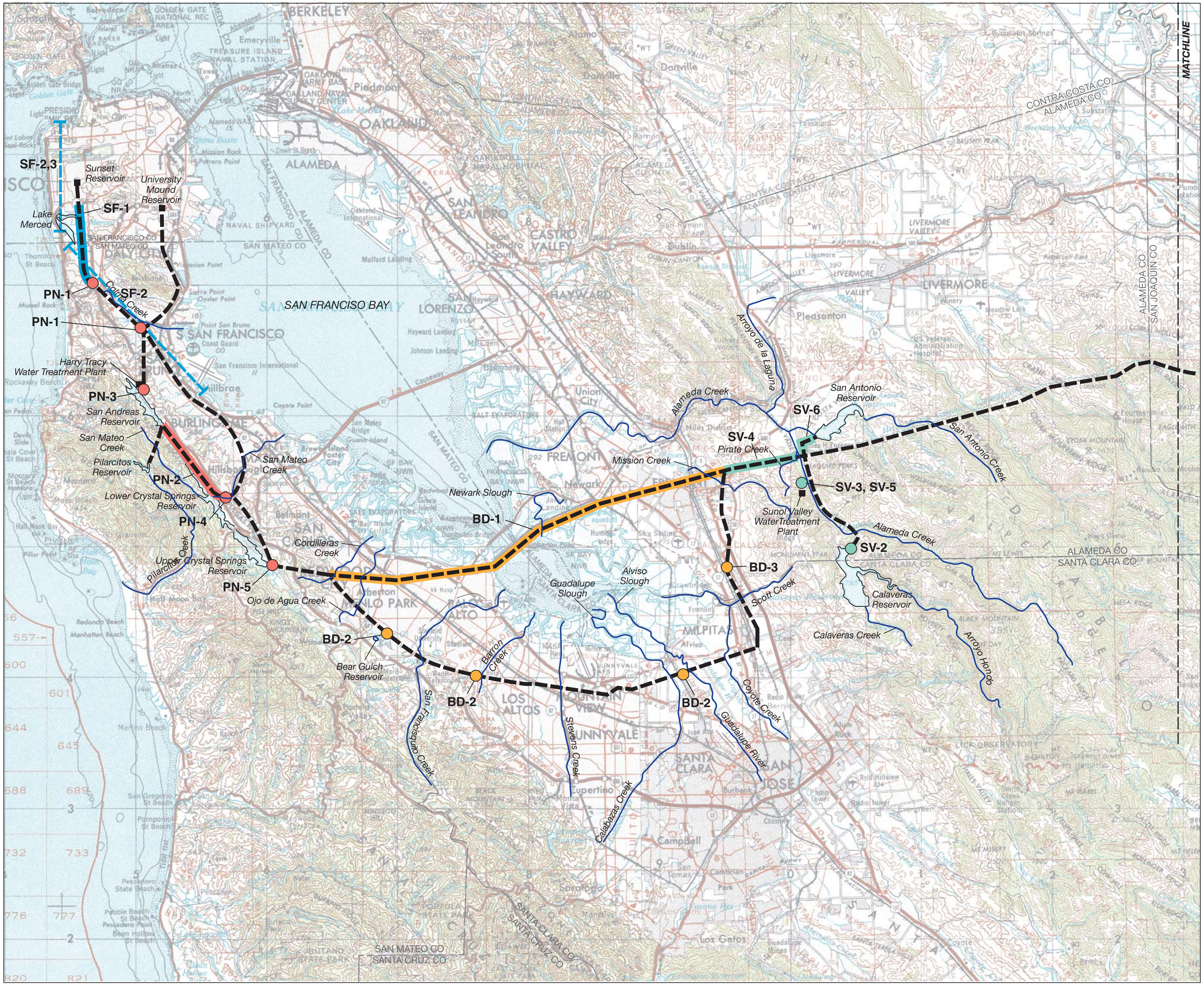
Flooding

The San Joaquin Pipeline system crosses a 3.6-mile-wide section of the 100-year flood zone of the San Joaquin River (FEMA, 2004). The pipeline system crosses no other 100-year flood zones in the San Joaquin Region.

Sunol Valley Region

Alameda Creek Watershed

All of the Sunol Valley Region projects are located in the Alameda Creek watershed on watershed lands owned by the City and County of San Francisco (CCSF) (see Figure 2.2 in Chapter 2). The Alameda Creek watershed is the largest drainage in the southern San Francisco Bay region, encompassing 633 square miles, and includes remote wildlands along upper Alameda Creek within the Sunol and Ohlone Regional Wilderness Preserves and SFPUC Alameda watershed lands. The watershed is comprised of the Livermore Drainage Unit and the Southern Alameda Creek Drainage Unit (SFPUC, 2001).



- Existing System Corridor
- Existing System Facility
- Proposed Facility Corridor
- Proposed Facility Site
- Proposed Facility, General Location

Note: See Figure 4.1-2 for full Project Names

0 — 5 Miles

SOURCE: ESA + Orion JV, 2006

SFPUC Water System Improvement Program . 203287

Figure 4.5-1a
Major Streams and Rivers

Existing System Corridor

Existing System Facility

Proposed Facility Corridor

Proposed Facility Site

Proposed Facility, General Location

Note: See Figure 4.1-2 for full Project Names

0 5
Miles

SOURCE: ESA + Orion; SFPUC, 2006

SFPUC Water System Improvement Program . 203287

Figure 4.5-1b
Major Streams and Rivers

All of the Sunol Valley Region projects are located in the Southern Alameda Creek Drainage Unit; this unit encompasses 175 square miles, of which approximately one-third, or approximately 36,000 acres, are owned by the CCSF. These landholdings are split between Alameda County (23,000 acres) and Santa Clara County (13,000 acres). Major water bodies located within the southern Alameda Creek watershed, and on CCSF-owned lands, include the Calaveras and San Antonio Reservoirs, Alameda Creek, Arroyo Hondo, Calaveras Creek, and San Antonio Creek (see Figure 4.5-1).

The SFPUC Alameda watershed lands include primary and secondary watershed lands. The 30,000 acres of primary watershed lands are tributary to the San Antonio and Calaveras Reservoirs and Alameda Creek. The 6,000 acres of secondary watershed lands are tributary to Alameda Creek below Calaveras Dam, San Antonio Dam, and the Alameda Creek Diversion Dam. The Calaveras Dam (SV-2), 40-mgd Treated Water (SV-3), and Treated Water Reservoirs (SV-5) projects and part of the Alameda Creek Fishery project (SV-1) are located in the CCSF-owned primary watershed lands, the most sensitive lands in terms of water quality protection. The New Irvington Tunnel (SV-4), and SABUP (SV-6) projects as well as the majority of the Alameda Creek Fishery project are located in the CCSF-owned secondary watershed lands.

Alameda Creek

Alameda Creek flows from its headwaters near Mount Hamilton northward through the Alameda watershed and the Sunol Valley, where it is joined by Arroyo de la Laguna. Alameda Creek then exits SFPUC lands through Niles Canyon and eventually drains to San Francisco Bay.

Calaveras Reservoir

Calaveras Reservoir is located at the southern end of the Alameda watershed; it is formed by Calaveras Dam, which is an earthen dam structure. The reservoir, originally constructed in 1913 and completed in 1925, collects and stores water from the local watershed, including drainage from Calaveras Creek and Arroyo Hondo, and has a tributary watershed area of approximately 98 square miles. The Alameda Creek Diversion Dam and Tunnel, constructed from 1925 to 1931 following completion of Calaveras Dam, divert flows and drainage from Alameda Creek to Calaveras Reservoir. Local runoff collected in Calaveras Reservoir is routed to the Sunol Valley Water Treatment Plant (WTP) by gravity flow through the Calaveras Pipeline.

Calaveras Reservoir is currently operating under restrictions imposed by the California Department of Water Resources, Division of Safety of Dams (DSOD) due to concern regarding the seismic stability of the dam. These restrictions allow the reservoir to be filled to about 40 percent of its maximum capacity; at this level, the reservoir has a surface area of 1.35 square miles and a storage capacity of 37,800 acre-feet.

San Antonio Reservoir

San Antonio Reservoir is formed by the James H. Turner Dam, an earthen dam completed in 1965. San Antonio Reservoir has a surface area of 1.3 square miles and a storage capacity of 50,300 acre-feet. The reservoir has a tributary watershed area of about 40 square miles and impounds water from San Antonio Creek. In addition to storing local runoff, San Antonio Reservoir is used to store Calaveras Reservoir surplus water, Hetch Hetchy water, and has received water from the South Bay Aqueduct during an extended drought. Water from San Antonio Reservoir is conveyed through the San Antonio Pipeline to the Sunol Valley WTP.

Flooding

Alameda Creek flows through much of the Sunol Valley Region, and stream flow is largely regulated by operation of the Calaveras and San Antonio Reservoirs, owned by the CCSF, and the Del Valle Reservoir, owned and operated by the California Department of Water Resources. Within the WSIP study area, the Alameda Creek Fishery (SV-1) and SABUP (SV-6) projects are located in 100-year flood zones designated on flood insurance maps (FEMA, 2000b). There are no mapped 100-year flood zones upstream of these projects, where the remainder of the Sunol Valley Region projects would be located.

Groundwater Resources

None of the proposed WSIP projects would substantially affect groundwater resources of the Sunol Valley, as described in Section 5.4.4. However, the New Irvington Tunnel project (SV-4) would penetrate marine rocks of the Diablo Range, which is composed of interbedded permeable sandstone and relatively impermeable shale (Water Infrastructure Partners, 2005). While these rocks do not produce commercial quantities of groundwater, they do produce some local domestic or stock water supplies, primarily through springs and shallow dug wells. In the 1930s, there were 104 wells, springs, or piezometers in the vicinity of the Irvington Tunnel, many of which are no longer in use or have been abandoned. The quality of water from these rocks tends to be poor.

Bay Division Region

The Bay Division Region includes many watersheds defined by intermittent and perennial drainages. Pipeline and related projects in this region would be constructed across or near numerous creeks and other water bodies; the main water bodies are shown in Figure 4.5-1. On the east side of San Francisco Bay, the right-of-way of the existing Bay Division Pipelines Nos. 1 and 2, where the BDPL Reliability Upgrade project (BD-1) would be constructed, crosses the following major water bodies: Mission Creek, Agua Caliente Creek, and Newark Slough. On the west side of the bay, the right-of-way of the Bay Division Pipelines Nos. 1 and 2 crosses Ojo de Agua Creek and Cordilleras Creek. The pipeline right-of-way also crosses unnamed creeks, drainages, and flood control channels on both sides of the bay. Major creeks or water bodies crossed by or near the right-of-way for the existing Bay Division Pipelines Nos. 3 and 4, where the BDPL 3 and 4 Crossovers (BD-2) and BDPL 3 and 4 Seismic Upgrade at Hayward Fault (BD-3) would be constructed, include Barron Creek, Bear Gulch Reservoir, and the Guadalupe River.

Most of the creeks and flood control channels in each of the watersheds traversed by a Bay Division Region project discharge to sloughs in the tidal flats of South San Francisco Bay. Much of the land at the bay’s shore has been altered to form evaporative salt ponds, with drainage routed around dikes to the various sloughs.

Flooding

Flooding in the Bay Division Region occurs primarily along the bay margins and along individual streams. An extensive network of flood control channels has been constructed throughout this region, and flood control improvements have been made to many of the streams to contain the 100-year and 500-year floods. In some areas, flood flows are contained by levees.

Peninsula Region

Major water bodies in this region are shown in Figure 4.5-1. The primary watershed in the Peninsula Region is within the CCSF-owned Peninsula watershed, including the San Mateo Creek watershed and the Pilarcitos Creek watershed. Peninsula Region projects located at least partially in the Peninsula watershed include the Baden and San Pedro Valve Lots (PN-1), CS/SA Transmission (PN-2), Lower Crystal Springs Dam (PN-4), and the Pulgas Balancing Reservoir (PN-5) projects. The Lower Crystal Springs Dam project would also be located in the San Mateo Creek watershed.

Peninsula Watershed

The Peninsula watershed encompasses 23,000 acres of the San Francisco Peninsula, which is owned by the CCSF (see Figure 2.3 in Chapter 2). The watershed is located in central San Mateo County and includes the San Andreas and Upper and Lower Crystal Springs Reservoirs, adjacent to I-280 and the Pilarcitos Reservoir to the northwest.

Crystal Springs Reservoir

While originally built as two separate reservoirs, Upper and Lower Crystal Springs Reservoirs are connected through a culvert beneath Highway 92, so there is free exchange between the two reservoirs. Upper Crystal Springs Dam is an earthen dam built in 1877. Lower Crystal Springs Dam, a concrete gravity dam built on San Mateo Creek in 1888, was raised a few feet in 1891 and again in 1911. The combined Crystal Springs Reservoir has a design capacity of 69,320 acre-feet and a catchment area of 22.5 square miles, with 13.5 and 9 square miles in the drainages of the upper and lower reservoirs, respectively. The water level in Crystal Springs Reservoir has been lowered in accordance with a DSOD mandate and cannot be raised to its original level unless Lower Crystal Springs Dam is renovated to safely contain the probable maximum flood. This mandate has reduced the available water storage to an interim operating capacity of 58,400 acre-feet.

San Andreas Reservoir

San Andreas Reservoir is an earth-fill dam originally constructed in 1870. The reservoir has a tributary area of 4.4 square miles and provides a total of 19,000 acre-feet of storage.

Pilarcitos Reservoir

Pilarcitos Reservoir is formed by an earthen dam that was constructed in 1864 and raised in 1871. Stone Dam, a masonry-arch dam built in 1871, is located two miles downstream of Pilarcitos Reservoir. Pilarcitos Reservoir has a tributary area of 6 square miles and provides a total of

3,100 acre-feet of storage. The upper watershed has the highest annual rainfall on the Peninsula (42 inches).

Flooding

Flooding in the Peninsula Region is primarily related to individual streams, and flood control improvements have been made to many of the streams to contain the 100-year and 500-year floods. None of the Peninsula Region projects are located within or cross a 100-year floodplain.

San Francisco Region

There are currently no natural surface water bodies or streams in San Francisco, with the exception of Lobos Creek (which flows through the Presidio), San Francisco Bay, which borders the east and north sides of the city, and the Pacific Ocean to the west. Historically, there were small creeks flowing to the bay, but most of the creeks were filled during development of the city. Lake Merced is the only major open water body in San Francisco (see Figure 4.5-1).

Freshwater drainage in San Francisco has been almost entirely diverted to the city's combined sewer and stormwater system, which collects and transports both sanitary sewage and stormwater runoff in the same set of pipes. The stormwater drainage is conveyed through the combined sewer system, treated, and eventually discharged through outfalls and overflow structures along the shoreline. Water treatment plants on both the east and west sides of the city provide full secondary treatment for all dry-weather flow, and storage and discharge structures provide the equivalent of primary treatment for wet-weather flows when the treatment capacity of the water treatment plants is reached. Flows from these structures are discharged through combined sewer discharge structures located along the city's bayside and ocean waterfronts. Wet-weather flows are intermittent throughout the rainy season, and combined sewer discharges vary in nature and duration depending largely on the intensity of individual rainstorms.

Lake Merced

Lake Merced, described in Section 5.6, Westside Basin Groundwater Resources, is comprised of four lake bodies (North Lake, East Lake, South Lake, and Impound lake). As the largest freshwater body in San Francisco, Lake Merced supports numerous recreational activities.

Flooding

San Francisco is not presently mapped by the Federal Emergency Management Agency (FEMA), but localized flooding does occur during periods of intense precipitation, especially in low-lying areas where storm drains become clogged with debris.

Regulatory Framework

Water Quality Regulations

The federal Clean Water Act and subsequent amendments, under the enforcement authority of the U.S. Environmental Protection Agency (U.S. EPA), was enacted "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters." The Clean Water Act gave the U.S. EPA the authority to implement pollution control programs such as setting wastewater standards for industry. The act also set water quality standards for surface waters and established the National Pollutant Discharge Elimination System (NPDES) program to protect water quality. Under Section 402 of the act, discharge of pollutants to navigable waters is prohibited unless the discharge is in compliance with an NPDES permit. The U.S. EPA determined that California's water pollution control program has sufficient authority to manage the NPDES program under state law in a manner consistent with the Clean Water Act. Therefore, implementation and enforcement of the NPDES program is conducted through the California State Water Resources Control Board (SWRCB) and the nine Regional Water Quality Control Boards (RWQCBs). These agencies also implement the Waste Discharge Requirements (WDR) Program, which regulates discharges of waste to land under the California Water Code as well as discharges of waste into waters of the state that are outside federal jurisdiction, as defined under the Clean Water Act.

The RWQCBs regulate water quality under the Porter-Cologne Water Quality Control Act through the regulatory standards and objectives set forth in water quality control plans (referred to as Basin Plans) prepared for each region. The Basin Plans identify existing and potential beneficial uses and provide numerical and narrative water quality objectives to protect those uses. The San Francisco Bay RWQCB (Region #2) is responsible for protection of the beneficial uses of San Francisco Bay Area water resources, including water bodies in the Sunol Valley, Bay Division, Peninsula, and San Francisco Regions. The San Francisco Bay RWQCB adopted its Basin Plan in 1995, and most recently revised the plan in December 2006. The Central Valley RWQCB (Region#5) has regulatory authority over water bodies in the San Joaquin Region. The Central Valley RWQCB adopted its Basin Plan in 1998, and most recently revised the plan in October 2007.

Beneficial Uses

Beneficial uses serve as a basis for establishing water quality objectives and discharge prohibitions to attain the goal of achieving the highest water quality consistent with the maximum benefit to the people of the state. Beneficial uses are designated in Basin Plans for surface waters and groundwater basins, and in the case of the San Francisco Bay Basin, wetlands. **Table 4.5-1** lists the designated beneficial uses for those water bodies that could be affected by the WSIP. The beneficial uses of the water bodies generally apply to all tributaries.

Impaired Water Bodies and Total Maximum Daily Loads

In accordance with Section 303(d) of the Clean Water Act, state governments must present the U.S. EPA with a list of "impaired water bodies," defined as those water bodies that do not meet water quality standards, even after point sources of pollution have installed the minimum required levels of pollution control technology. The law requires the development of actions, known as

TABLE 4.5-1
DESIGNATED BENEFICIAL USES

Water Body	Designated Beneficial Uses
San Joaquin Region	
San Joaquin River	MUN (potential), AGR, IND, MIGR, REC-1, REC-2, WARM, SPWN, WILD
California Aqueduct	MUN, AGR, IND, REC-1, REC-2, WILD
Delta-Mendota Canal	MUN, AGR, REC-1, REC-2, WARM, WILD
Sunol Valley Region	
Alameda Creek	AGR, COLD, GWR, MIGR, REC-1, REC-2, SPWN, WARM, WILD
Arroyo Hondo	COLD, FRSH, MUN, REC-1, REC-2, SPWN, WARM, WILD
Calaveras Reservoir	COLD, MUN, REC-1 (limited), REC-2, SPWN, WARM, WILD
San Antonio Reservoir	COLD, MUN, REC-1 (limited), REC-2, SPWN, WARM, WILD
Niles Cone Groundwater	MUN, PROC, IND, AGR
Bay Division Region	
Guadalupe River	COLD, MIGR (potential), REC-1 (potential), REC-2, SPWN (potential), WARM, WILD
Santa Clara Valley Groundwater	MUN, PROC, IND, AGR (potential)
Peninsula Region	
San Mateo Creek	COLD (potential), FRSH, RARE, REC-1 (potential), REC-2 (potential), SPWN, WILD
Crystal Springs Reservoir	COLD, MUN, RARE, REC-2, SPWN, WARM, WILD
San Andreas Reservoir	COLD, MUN, RARE, REC-1 (limited), REC-2, SPWN, WARM, WILD
San Mateo Plain Groundwater	MUN, PROC, IND, AGR (potential)
San Francisco Region	
Lake Merced	COLD, MUN (potential), REC-1, REC-2, SPWN, WARM, WILD
Westside Groundwater	MUN, PROC (potential), IND (potential), AGR
San Francisco Bay	
San Francisco Bay, Lower	COMM, EST, IND, MIGR, NAV, RARE, REC-1, REC-2, SHELL, SPWN (potential), WILD
San Francisco Bay, South	COMM, EST, IND, MIGR, NAV, RARE, REC-1, REC-2, SHELL, SPWN (potential), WILD

Beneficial Uses Key:

MUN (Municipal and Domestic Supply); AGR (Agriculture); REC-1 (Body Contact Recreation); REC-2 (Noncontact Recreation); WARM (Warm Freshwater Habitat); COLD (Cold Freshwater Habitat); MIGR (Fish Migration); SPWN (Fish Spawning); WILD (Wildlife Habitat); NAV (Navigation); GWR (Groundwater Recharge); FRSH (Freshwater Replenishment); RARE (Preservation of Rare and Endangered Species); SHELL (Shellfish Harvesting); COMM (Ocean, Commercial, and Sport Fishing); EST (Estuarine Habitat); IND (Industrial Service Supply); PROC (Industrial Process).

Note: Beneficial uses for specific wetland sites affected by the WSIP facility improvement projects in the San Francisco Bay region will be determined as needed based on the process described in the San Francisco Bay Basin Plan.

total maximum daily loads (TMDLs), to improve water quality of impaired water bodies. The TMDL is the quantity of a pollutant that can be safely assimilated by a water body without violating water quality standards. The listing of a water body as impaired does not necessarily suggest that the water body cannot support the beneficial uses; rather, the intent is to identify the water body as requiring future development of a TMDL to maintain water quality and reduce the potential for future water quality degradation. NPDES permits for water discharges must take into account the pollutant from which a water body is listed as impaired. Specific requirements for the permits would be specified in the TMDL for that pollutant.

Table 4.5-2 lists the water bodies in the program area that could be affected by WSIP projects and are identified on the Section 303(d) list of impaired water bodies, indicates the planned date for TMDL completion (based on information provided by the SWRCB), and identifies the water bodies for which a TMDL has been approved.

TABLE 4.5-2
SECTION 303(D) LIST OF IMPAIRED WATER BODIES

Water Body	Pollutant	Potential Source	Status of TMDL Preparation and Approval[a]
San Joaquin Region			
San Joaquin River	Boron	Agriculture	Planned (2006)
	Chlorpyrifos	Agriculture	Approved (2005)
	DDT	Agriculture	Planned (2011)
	Diazinon	Agriculture	Approved (2005)
	Electrical conductivity	Agriculture	Planned (2006)
	Group A pesticides	Agriculture	Planned (2011)
	Mercury	Resource extraction	Planned (2020)
	Selenium	Source unknown	Approved (2002)
	Toxaphene	Source unknown	Planned (2019)
	Unknown toxicity	Agriculture	Planned (2019)
Delta Waterways (Stockton Deep Channel)	Organic enrichment/low Dissolved oxygen	Municipal point sources Urban Runoff/Storm Sewers	Approved (2005)
Sunol Valley Region			
Alameda Creek	Diazinon	Urban runoff/storm sewers	Planned (2005)
Bay Division Region			
Guadalupe River	Diazinon	Urban runoff/storm sewers	Planned (2005)
	Mercury	Mine tailings	Planned (2006)
Peninsula Region			
San Mateo Creek	Diazinon	Urban runoff/storm sewers	Planned (2005)
San Francisco Region			
Lake Merced	Low dissolved oxygen	Unknown	Planned (2019)
	pH	Unknown	Planned (2019)
San Francisco Bay (Lower and South)	Chlordane	Nonpoint source	Planned (2008)
	DDT	Nonpoint source	Planned (2008)
	Dieldrin	Nonpoint source	Planned (2008)
	Dioxin compounds	Atmospheric deposition	Planned (2019)
	Exotic species	Ballast water	Planned (2019)
	Furan compounds	Atmospheric deposition	Planned (2019)
	Mercury	Industrial point sources Municipal point sources Resource extraction Atmospheric deposition Natural sources Nonpoint source	Planned (2006)
	PCBs	Unknown nonpoint source	Planned (2006)
	PCBs (dioxin-like)	Unknown nonpoint source	Planned (2019)
	Selenium (south bay only)	Agriculture Domestic use of groundwater	Planned (2019)

[a] The date of planned TMDL completion is provided in the 303(d) lists from the SWRCB. Although the planned date of completion has been passed for many of the TMDL projects, approved TMDLs have not been completed as of February 2006.

SOURCE: SWRCB, 2006a and 2006b.

Construction in Waters of the State and of the United States

The Regional Water Quality Control Board (RWQCB) has regulatory authority over construction in waters of the United States and waters of the state, including activities in wetlands, under both the Clean Water Act and the State of California's Porter-Cologne Water Quality Control Act (California Water Code, Division 7). Under the Clean Water Act, the RWQCB has regulatory authority over actions in waters of the United States through the issuance of water quality certifications under Section 401 of the Clean Water Act, which are issued in conjunction with permits issued by the Army Corps of Engineers (Corps) under Section 404 of the Clean Water Act. When the RWQCB issues a Section 401 certification for a project, the project is also regulated under State Water Resources Control Board Order No. 2003-0017-DWQ, "General Waste Discharge Requirements for Dredge and Fill Discharges That Have Received State Water Quality Certification," which requires compliance with all conditions of the water quality certification. Activities in areas that are outside the jurisdiction of the Corps (e.g., isolated wetlands, vernal pools, or stream banks above the ordinary high water mark) are regulated by the RWQCB under the authority of the Porter-Cologne Act. Activities that lie outside of Corps jurisdiction may require the issuance of either individual or general waste discharge permits.

The California Department of Fish and Game (CDFG) has jurisdiction over any activity that could affect the bank or bed of any stream that has value to fish and wildlife. If any changes are proposed along a creek or waterway within its jurisdiction, a streambed alteration agreement would be required under California Fish and Game Code Sections 1601 and 1603. Refer to Section 4.6, Biological Resources, for additional information.

Section 401 of the Clean Water Act provides the SWRCB and the RWQCBs with the regulatory authority to waive, certify, or deny any proposed federally permitted activity that could result in a discharge to surface waters of the state. To waive or certify an activity, these agencies must find that the proposed discharge will comply with state water quality standards, including protection of beneficial uses and water quality objectives. If these agencies deny the proposed activity, the federal permit cannot be issued. This water quality certification is generally required for projects involving the discharge of dredged or fill material to wetlands or other water bodies, as described in Section 4.6, Biological Resources.

NPDES Waste Discharge Regulations

The NPDES program requires all facilities that discharge pollutants into waters of the United States to obtain a permit. The discharge permit provides two levels of control for the protection of water quality: technology-based limits and water-quality-based limits. Technology-based limits are based on the ability of dischargers in the same category to treat wastewater, while water-quality-based limits are required if technology-based limits are not sufficient to provide protection of the water body. Water-quality-based effluent limitations required to meet water quality criteria in the receiving water are based on criteria specified in the National Toxics Rule, the California Toxics Rule, and the Basin Plan. NPDES permits must also incorporate TMDL waste load allocations when they are developed.

In 1972, the NPDES regulations initially focused on municipal and industrial wastewater discharges, followed by stormwater discharge regulations, which became effective in November 1990. NPDES permits for wastewater and industrial discharges specify discharge prohibitions and effluent limitations and also include other provisions (such as monitoring and reporting programs) deemed necessary to protect water quality. In California, the SWRCB and the RWQCBs implement and enforce the NPDES program.

Municipal Stormwater Permits

Stormwater in San Joaquin, Stanislaus, Tuolumne, Alameda, Santa Clara, and San Mateo Counties is managed in accordance with an NPDES permit from the San Francisco Bay or Central Valley RWQCB. These permits contain a comprehensive plan to reduce the discharge of pollutants to the "maximum extent practicable" and mandate that participating municipalities implement an approved stormwater management plan. The stormwater programs incorporate best management practices (BMPs) that include construction controls (such as a model grading ordinance), legal and regulatory approaches (such as stormwater ordinances), public education and industrial outreach (to encourage the reduction of pollutants at various sources), inspection activities, wet-weather monitoring, and special studies.

The RWQCBs added provision C.3 to municipal stormwater permits for Alameda, Santa Clara, and San Mateo Counties in 2003. In accordance with these updated requirements, new development and redevelopment projects are required to incorporate treatment measures and other appropriate source control and site design features to reduce the pollutant load in stormwater discharges and manage runoff flows. The required schedule for compliance is based on the size and type of project. Group 1 projects were required to comply with these requirements by February 15, 2005. This group includes previously undeveloped sites and redevelopment projects that involve the creation or replacement of one or more acre of impervious surfaces. Group 2 projects were required to comply with these requirements by August 15, 2006. These include new and redevelopment projects that involve the creation or replacement of 10,000 square feet or more of impervious surfaces.

The C.3 requirements are similar for all counties. However, local municipalities are phasing in these requirements, and specific procedures and application requirements may differ from one municipality to another. Reconstruction projects located within a public street or road right-of-way, such as some pipeline projects proposed as part of the WSIP, are exempt from the C.3 requirements where both sides of the right-of-way are developed.

San Francisco currently holds NPDES permits adopted by the RWQCB that cover the Oceanside Water Pollution Control Plant, the South East Water Pollution Control Plant, the North Point Wet Weather Facility, and all of the wet-weather facilities, including combined sewer discharges to the bay or ocean. The permits specify discharge prohibitions, dry-weather effluent limitations, wet-weather effluent performance criteria, receiving water limitations, sludge management practices, and monitoring and reporting requirements. The permits prohibit discharges from the combined sewer structures during dry weather, and require wet-weather discharges to comply with the nine minimum controls specified in the federal Combined Sewer Overflow Control Policy, including compliance with a specified number of combined sewer discharges.

Construction stormwater discharges from sites served by the combined sewer system are subject to the requirements of Article 4.1 of the San Francisco Public Works Code, which incorporates and implements the City's NPDES permit and the nine minimum controls described in the federal Combined Sewer Overflow Control Policy. The nine minimum controls include development and implementation of a pollution prevention program. At a minimum, the City requires that a project sponsor develop and implement an erosion and sediment control plan to reduce the impact of runoff from construction sites that are 0.5 acre or more in size. The City must review and approve the erosion and sediment control plan prior to implementation, and conducts periodic inspections to ensure compliance with the plan. Discharges during dewatering must also comply with Article 4.1, as supplemented by Order No. 158170.

Small areas within San Francisco, including Lake Merced, are served by separate stormwater systems that discharge without treatment of the stormwater. Discharges from these systems are regulated under the Statewide General Permit for Stormwater Discharges from Small Separate Storm Sewer Systems.

Regionwide General NPDES Permit for Discharges from Surface Water Treatment Facilities for Potable Supply

The San Francisco Bay RWQCB has issued the Regionwide General NPDES Permit for Discharges from Surface Water Treatment Facilities for Potable Supply (Order No. R2-2003-0062, NPDES General Permit No. CAG382001) to regulate the quality of discharges from water treatment plants to surface water (RWQCB, 2003). Covered discharges include filter backwash water discharge and storage/settling basin discharge; discharges from treatment unit overflow and broken waterlines within the treatment facility; leakage water; treatment unit dewatering/drainage water; treatment system flushing water during startup after facility shutdown; onsite water storage facility drainage; and excess raw water released from the treatment facility. The requirements of this general permit supersede other stormwater permitting requirements regulating discharges to the storm sewer system at a covered facility.

To obtain coverage under the general permit, the discharger must complete a notice of intent, including a description of all discharges that would be covered by the permit, water quality data for each discharge point, receiving water information, a site location map, a flow chart showing the general route taken by the effluent from intake to discharge, and a site-specific BMP plan. All dischargers must comply with the self-monitoring program required by the general permit, file annual reports in accordance with the standard provisions and reporting requirements for NPDES surface water discharge permits, and annually update the BMP plan.

If the discharger plans any modifications or maintenance at the facility that may result in a violation of effluent limitations or an alteration of discharge locations, the discharger is required to submit a schedule for approval by the RWQCB 30 days before the changes are made. The schedule must include a description of the modifications or maintenance, including the altered discharge characteristic or location(s) and its purpose; the period of the modification or maintenance; and steps taken to reduce, eliminate, and prevent occurrence of noncompliance.

General Order for Dewatering and Other Low Threat Discharges to Surface Waters

The Central Valley RWQCB has issued a General Order for Dewatering and Other Low Threat Discharges to Surface Waters (Order No. 5-00-175, NPDES No. CAG995001) to regulate the quality of discharges considered to have a low threat to water quality, including discharges from water supply systems (RWQCB, 2000). Similar to other NPDES permits, to obtain coverage under the general permit the discharger must complete a notice of intent. All dischargers must comply with specified effluent limitations and the self-monitoring program required by the general permit. Water suppliers with numerous discharge points may elect to prepare a pollution prevention plan and monitoring and reporting program rather than identify and monitor each discharge as required by the notice of intent and monitoring and reporting program.

Construction Stormwater NPDES Permit

The federal Clean Water Act prohibits discharges of stormwater from construction projects unless the discharge is in compliance with an NPDES permit. The SWRCB is the permitting authority in California and has adopted a Statewide General Permit for Stormwater Discharges Associated with Construction Activity (Construction General Permit) that encompasses one or more acres of soil disturbance (SWRCB, 1999). Construction activity includes clearing, grading, excavation, stockpiling, and reconstruction of existing facilities involving removal or replacement.

In general, the NPDES stormwater permitting requirements for construction activities require that the landowner and/or contractor submit a notice of intent and develop and implement a storm water pollution prevention plan (SWPPP). The SWPPP includes a site map(s) showing the construction site perimeter, existing and proposed buildings, lots, roadways, stormwater collection and discharge points, general topography both before and after construction, and drainage patterns across the site. The SWPPP must also specify BMPs that will be used to protect stormwater runoff as well as the placement of those BMPs; a visual monitoring program; a chemical monitoring program for non-visible pollutants to be implemented if there is a failure of BMPs; and a sediment monitoring plan if the site discharges directly to a water body listed as an impaired water body for sediment. Measures for erosion and sediment control, construction waste handling and disposal, and post-construction erosion and sediment control must also be addressed, along with methods to eliminate or reduce non-stormwater discharges to receiving waters.

The SWRCB is in the process of reissuing the Construction General Permit and released a preliminary draft of the new permit on March 2, 2007 (SWRCB, 2007). When adopted, this permit will replace the 1999 Construction General Permit, and, as proposed, would require the permittee to implement additional minimum BMPs as well as specific analytical procedures to determine whether the BMPs implemented on a construction site are (1) preventing further impairment due to sediment in stormwaters discharged directly into waters listed as impaired for sediment or silt, and (2) preventing non-visible pollutants in stormwater discharges from construction sites from causing or contributing to exceedances of water quality objectives. In addition, all sites would be required to meet new development and redevelopment performance standards to minimize or mitigate hydromodification impacts. As proposed, the permit allows for a risk-based permitting approach and specifies water quality action levels, numeric effluent levels, and detailed management practices. Under the new permit, the SWPPP must be prepared by a qualified SWPPP developer; the SWPPP would be much more limited and would be meant to demonstrate compliance with the detailed permit requirements, with less discretion in how these requirements are met. The permit would also enable public review and hearings on permit applications.

Construction Stormwater NPDES Permit for Small Linear Projects

The SWRCB considers certain projects involving the installation of underground and overhead utilities, such as installation of infrastructure, as small linear underground/overhead projects (referred to as small LUPs). Construction activities required for these projects have a lower potential to affect water quality via runoff than traditional construction projects because the projects are typically shorter in duration and constructed within or around hard paved surfaces, thus resulting in minimal disturbed land area at the close of the construction day. To simplify the stormwater permitting process for these projects, the SWRCB has issued the Statewide LUP General Permit for small LUPs that disturb more than one acre but less than five acres of land (SWRCB, 2003a). The LUP General Permit covers projects associated with private or municipal development projects, such as those operated by the LUP owner or operator, to relocate facilities in advance of pending developments or redevelopments or to provide new facilities.

Under the LUP General Permit, the owner/operator must submit the required notices; prepare a SWPPP specifying BMPs to control and reduce discharges of pollutants associated with construction stormwater runoff into storm drains and receiving waters; eliminate or reduce non-stormwater discharges to the storm sewers and receiving waters; and monitor the construction site to ensure that all BMPs are implemented, maintained, and effective. Permit requirements, such as the notification requirements, minimum SWPPP elements, and the amount and degree of monitoring vary depending on the complexity of the small LUP.

Waste Discharge Requirements

All point-source discharges of waste to land that do not involve the discharge of pollutants to surface waters are regulated under the WDR program implemented by the RWQCBs, including groundwater produced during dewatering as well as clear water (discharges to surface water are regulated under the NDPES program described above). Under this program, a discharger must complete a report of waste discharge with the appropriate RWQCB in order to obtain waste discharge requirements. These requirements, adopted under the WDR Program, protect surface water by either prohibiting the discharge of a pollutant to waters of the U.S. or identifying requirements for discharge to surface waters that are not waters of the U.S. They protect groundwater by identifying requirements for waste containment, treatment, and control. The report of waste discharge must include: a description of the facility or activity responsible for the discharge; the location of the operation; a description of the discharge by type, quality, quantity, interval, and method of discharge; identification of the source water contributing or transporting the waste; a water flow and location map identifying all discharge points; and a statement noting whether an environmental document has been or must be prepared. Filing of a report of waste discharge requires a fee, standard forms, and supporting technical information. The RWQCB can waive filing of a report or adopt waste discharge requirements. General orders have been prepared for certain types of similar discharges.

Statewide General Waste Discharge Requirements for Discharges to Land with a Low Threat to Water Quality

The SWRCB has issued the Statewide General Waste Discharge Requirements for Discharges to Land with Low Threat to Water Quality (Order No. 2003-003-DWQ) (SWRCB, 2003b) to regulate discharges to land that are considered to have a low threat to water quality. Categories of covered discharges include wastes from the installation of borings and wells, clear water discharges, small dewatering projects, and miscellaneous discharges. In accordance with this permit, all dischargers must comply with all applicable Basin Plan provisions, including any prohibitions and water quality objectives governing the discharge. In addition, the discharge of waste may not cause the spread of groundwater contamination. Discharges must be made to land owned or controlled by the discharger, unless the discharger has a written lease or agreement with the landowner.

Similar to the NPDES program, dischargers seeking coverage under this permit must submit a notice of intent to comply with the terms and conditions of this general permit or a report of waste discharge, fees, a project map, evidence of CEQA compliance, and a discharger monitoring plan.

The plan must include a list of all pollutants believed to be present in the discharge, the approximate concentration of pollutants in the discharge, monitoring locations, monitoring frequencies, and a reporting schedule.

Discharges to land listed as a hazardous materials site are not eligible for coverage under this general permit. In addition, discharges that could have a significant impact on biological resources, cultural resources, aesthetics, or air quality, or that could significantly alter the existing drainage pattern of a discharge site or surroundings are not eligible for coverage. Other discharges not covered under this permit are those that would significantly physically divide an established community, significantly conflict with any applicable land use plan, policy, or regulation of an agency, or significantly conflict with any applicable habitat or community conservation plan.

Discharge of Chlorinated Water

Because chlorine is toxic to aquatic life in both freshwater and saltwater, the SWRCB considers that every discharger that uses chlorine has the potential to cause acute toxicity due to total residual chlorine (TRC) in freshwater and chlorine-produced oxidants (CPO) in saltwater. However, the approach to regulating residual chlorine in discharges varies between regions. To facilitate a consistent approach, the SWRCB has proposed the Total Residual Chlorine and Chlorine-Produced Oxidants Policy of California to establish TRC and CPO objectives that apply to all inland surface waters, enclosed bays, and estuaries throughout the state to protect aquatic life beneficial uses; establish consistent procedures that apply to non-stormwater NPDES permits to regulate TRC and CPO discharges; and establish a basis for equitable compliance determination to adequately enforce violations of the TRC and CPO effluent limitations in non-stormwater NPDES permits (SWRCB, 2006c). The policy will also establish monitoring and reporting requirements to demonstrate compliance with effluent limitations. If adopted, the requirements of this policy will supersede all other numeric TRC or CPO objectives and implementation provisions for TRC and CPO in existing Basin Plans.

Recycled Water

The California Water Code defines recycled water (alternatively called reclaimed water) as “water which, as a result of treatment of waste [water], is suitable for a direct beneficial use or a controlled use that would not otherwise occur.” Recycled water is wastewater that has been highly purified through multiple stages of treatment to meet stringent and protective health and safety standards set by the California Department of Health Services (DHS). Federal laws provide regulation of recycled water through the Water Pollution Control Act of 1972 (also referred to as the Clean Water Act) and its related amendments. However, the State of California has primary responsibility for the development of regulations regarding the treatment and distribution of recycled water and operation of recycled water facilities. The following laws govern the use of recycled water in California:

- California Health and Safety Code (Division 104; Part 12)
- California Water Code (Division 7; Chapters 2, 6, 7, and 22)
- California Code of Regulations, Title 22 (Division 4; Chapters 1, 2, and 3)
- California Code of Regulations, Title 17 (Division 1; Chapter 5)

Recycled water laws are enforced by DHS and the San Francisco Bay RWQCB. In January 1996, the San Francisco Bay RWQCB adopted General Reuse Order 96-011 (RWQCB, 1996). This order applies to publicly owned wastewater and water agencies that are currently recycling water, or propose to do so in the future. The order authorizes domestic wastewater reuse by producers, distributors, and users throughout the region through a local agency administered program. An agency may apply for the order through the notice of intent process. General Order 96-011 replaces individual reuse orders for those agencies choosing to be included under General Order 96-011. The intent of the order is to streamline the permitting process and delegate the responsibility of administering water reuse programs to local agencies to the fullest extent possible.

In accordance with this order, the recycled water must meet DHS water quality reuse criteria, as specified in Sections 60301 through 60355 of Title 22 of the California Code of Regulations. These regulations provide specific treatment requirements as well as water quality criteria appropriate for the intended use of the recycled water. In addition, the order specifies prohibitions on the application of recycled water to ensure that this water does not enter a surface water body or otherwise degrade surface or groundwater quality. Recycled water that is treated to higher standards (i.e., advanced treatment) can be discharged to surface water bodies, including water bodies that allow body-contact water recreational activities (Section 60301.620).

An agency that produces recycled water must submit a notice of intent and technical report to both the RWQCB and DHS, including a description of the existing or proposed treatment, storage, and transmission facilities for water reuse; the types of applications for which the recycled water will be used; a description of the agency's water reuse permit program; a description of the reuse program administration specifying how the permitting system for regulating users will be implemented and how compliance with the DHS reuse criteria will be approved; and any additional site-specific information that is appropriate. The order becomes effective upon written approval of the notice of intent by the RWQCB.

The producer of recycled water must establish and enforce rules and regulations for recycled water uses that govern the design and construction of recycled water facilities and the reuse of recycled water in accordance with DHS reuse criteria. The producer must also develop a water reuse monitoring program in accordance with the self-monitoring requirements of the order, submit an annual monitoring report to the RWQCB, and conduct periodic inspections of the user's facilities and operations to monitor and assure compliance with the conditions of the producer's permit and Order 96-011.

In groundwater basins that are a significant source of drinking water, the RWQCB can require a salt management plan if there is a likely potential for salt buildup from irrigation with recycled water. In addition, the DHS is preparing Groundwater Recharge Reuse regulations for the use of recycled water for recharge of groundwater by surface spreading or subsurface injection (DHS, 2007), and a separate NPDES permit is required for use of recycled water for these purposes.

The CCSF's Reclaimed Water Ordinance, contained in Article 22 of the San Francisco Public Works Code, specifies that certain development projects of 40,000 square feet or more, and irrigated areas of 10,000 square feet or more that are located within designated Reclaimed Water Use Areas must use recycled water for nonpotable uses unless an exemption is granted. The owner, operator, or manager of a development project or irrigation system must register with the SFPUC (part of which was formerly known as the San Francisco Water Department) and obtain a reclaimed water use certificate for the reclaimed water system, and the SFPUC may inspect any recycled water operations to ensure compliance with the Reclaimed Water Ordinance, including mandatory use of recycled water. Golden Gate Park, Lincoln Park, Lincoln Park Golf Course, San Francisco Zoo, Sunset Boulevard medians, San Francisco State University, and Harding Park, which would use recycled water under the Recycled Water Projects (SF-3), and Lake Merced, which could be supplemented with recycled water under the Local Groundwater Projects (SF-2), are all located in a Reclaimed Water Use Area.

Dam Safety Regulations

The California Water Code entrusts the regulatory Dam Safety Program to the DSOD, which regulates dams that are 25 feet or more in height or have an impounding capacity of 50 acre-feet or more.[1] The principal goal of this program is to avoid dam failure and thus prevent loss of life and destruction of property. DSOD staff makes periodic inspections of dams and reservoirs under DSOD jurisdiction for the purpose of determining their safety, and may require dam owners to perform work to safeguard life and property. Construction of any new dam or the repair or alteration of an existing dam requires DSOD approval.

The California Office of Emergency Services dam failure inundation mapping and emergency procedure program requires the preparation of inundation maps, provides for inundation map waivers, and establishes emergency procedures for the evacuation and control of populated areas below dams under the jurisdiction of the DSOD. Inundation maps are prepared by the dam owner and represent the best estimate of where water would flow if a dam failed completely and suddenly with a full reservoir; copies of the maps are sent to the city and county emergency service coordinators of affected local jurisdictions. Based on approved inundation maps or information obtained in preparation of a waiver, cities and counties with territory in the mapped inundation areas are required to adopt emergency procedures for the evacuation and control of populated areas below dams where death or personal injury could occur.

Alameda County Watercourse Protection Ordinance

Chapter 13.12 of the Alameda County General Ordinances is the Watercourse Protection Ordinance, which requires permits from the County Director of Public Works for the following activities in all unincorporated lands within Alameda County:

- Discharging into or connecting any pipe or channel to a watercourse
- Modifying the natural flow of water in a watercourse
- Development within a setback, as defined by the ordinance

[1] Small dams with a height of 6 feet or less or an impounding capacity of 15 acre-feet or less are not subject to DSOD regulations.

- Depositing or planting materials in or removing any material from a watercourse, including its banks, except as required for necessary maintenance
- Constructing, altering, enlarging, connecting to, changing, or removing any structure in a watercourse
- Placing any loose or unconsolidated material along the side of or within a watercourse or so close to the side as to cause a diversion of the flow, or to cause a probability of such material being carried away by stormwater passing through the watercourse

This ordinance does not apply to the primary watershed lands owned by the SFPUC, but does apply to private lands in the watershed.

4.5.2 Impacts

Significance Criteria

The CCSF has not formally adopted significance standards for impacts related to hydrology and water quality, but generally considers that implementation of the proposed program would have a significant hydrologic or water quality impact if it were to:

- Violate any water quality standards or waste discharge requirements (Evaluated in this section)
- Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of preexisting nearby wells would drop to a level that would not support existing land uses or planned uses for which permits have been granted) (Evaluated in this section)
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation on or off the site (Evaluated in this section)
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on or off the site (Evaluated in this section)
- Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff (Evaluated in this section)
- Otherwise substantially degrade water quality (Evaluated in this section)
- Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other authoritative flood hazard delineation map (Not evaluated in this section, see Appendix B)
- Place within a 100-year flood hazard area structures that would impede or redirect flood flows (Evaluated in this section)

- Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam (Not evaluated in this section, see Appendix B)
- Expose people or structures to a significant risk of loss, injury, or death involving inundation by seiche, tsunami, or mudflow (Not evaluated in this section, see Appendix B)

Approach to Analysis

This program-level analysis of water quality impacts is based on a general characterization of the potential for water quality degradation and increased erosion, sedimentation, and runoff attributable to the construction and operation of WSIP facility improvement projects and legal requirements for managing these issues. Mitigation measures are provided as necessary to mitigate potential impacts that could be significant even with implementation of SFPUC construction measures and compliance with legal requirements. In general, implementation of the WSIP projects would not have direct long-term effects on the hydrology or water quality of regional and local surface waters. However, short-term construction impacts could result in erosion and sedimentation or discharge of construction-related pollutants to local water bodies, causing water quality effects. Operation of some projects could also result in the discharge of chlorinated or chloraminated water, treated stormwater, or recycled water to water bodies, causing potential water quality effects. Through compliance with existing regulations and established project procedures as well as implementation of mitigation measures specified in this section, these impacts would be less than significant.

Impact Summary by Region

Table 4.5-3 provides a summary of the WSIP facility-related impacts by region.

Construction Impacts

Impact 4.5-1: Degradation of water bodies as a result of erosion and sedimentation or a hazardous materials release during construction.

In the absence of proper controls, construction activities associated with implementation of the WSIP adjacent to and through creeks could degrade water quality. Activities involving soil disturbance, such as excavation, soil stockpiling, or grading, adjacent to or near creeks or storm drains could result in substantial erosion and sedimentation, particularly if construction were to occur during the rainy season. Where construction or trenching activities would occur along the creek banks or would cross a creek, the potential for effects to creeks would increase due to the proximity of construction activities and the limited space for the construction easement. Sedimentation to the creeks would degrade water quality and could also increase channel siltation, reduce the flood-carrying capacity, and affect associated habitats (see Section 4.6, Biological Resources, for a discussion of facility impacts on aquatic habitats). In addition, the temporary storage of diesel and use of construction equipment could accidentally release construction-related chemicals, such as oil, grease, and fuel, which could degrade water quality.

TABLE 4.5-3
POTENTIAL IMPACTS AND SIGNIFICANCE – HYDROLOGY AND WATER QUALITY

Projects	Project Number	4.5-1: Degradation of water bodies as a result of erosion and sedimentation or a hazardous materials release during construction	Impact 4.5-2: Depletion of groundwater resources	Impact 4.5-3a: Degradation of water quality due to construction dewatering discharges	Impact 4.5-3b: Degradation of water quality due to construction-related discharge of treated water	Impact 4.5-4: : Flooding and water quality impacts associated with impeding or redirecting flood flows	Impact 4.5-5: Degradation of water quality and increased flows due to discharges to surface water during operation	Impact 4.5-6: Degradation of water quality as a result of alteration of drainage patterns or an increase in impervious surfaces
San Joaquin Region								
Advanced Disinfection	SJ-1	LS	LS	LS	LS	N/A	N/A	LS
Lawrence Livermore Supply Improvements	SJ-2	LS	N/A	N/A	LS	N/A	N/A	PSM
San Joaquin Pipeline System	SJ-3	LS	LS	LS	LS	PSM	LS	LS
Rehabilitation of Existing San Joaquin Pipelines	SJ-4	LS	LS	LS	LS	PSM	N/A	LS
Tesla Portal Disinfection Station	SJ-5	LS	LS	LS	LS	N/A	N/A	LS
Sunol Valley Region								
Alameda Creek Fishery Enhancement	SV-1	LS	LS	LS	N/A	PSM	N/A	LS
Calaveras Dam Replacement	SV-2	LS	LS	LS	N/A	N/A	N/A	LS
Additional 40-mgd Treated Water Supply	SV-3	LS	N/A	N/A	LS	N/A	LS	LS
New Irvington Tunnel	SV-4	LS	PSM	LS	LS	PSM	N/A	LS
SVWTP – Treated Water Reservoirs	SV-5	LS	N/A	N/A	LS	N/A	LS	LS
San Antonio Backup Pipeline	SV-6	LS	LS	LS	LS	PSM	LS	LS
Bay Division Region								
Bay Division Pipeline Reliability Upgrade	BD-1	LS	LS	LS	LS	PSM	LS	LS
BDPL Nos. 3 and 4 Crossovers	BD-2	LS	LS	LS	LS	PSM	LS	LS
Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault	BD-3	LS	LS	LS	LS	N/A	N/A	LS
Peninsula Region								
Baden and San Pedro Valve Lots Improvements	PN-1	LS	LS	LS	N/A	N/A	N/A	LS
Crystal Springs/San Andreas Transmission Upgrade	PN-2	LS	LS	LS	N/A	N/A	LS	LS
HTWTP Long-Term Improvements	PN-3	LS	LS	LS	LS	N/A	LS	LS
Lower Crystal Springs Dam Improvements	PN-4	LS	LS	LS	N/A	N/A	N/A	LS
Pulgas Balancing Reservoir Rehabilitation	PN-5	LS	LS	LS	LS	N/A	LS	LS
San Francisco Region								
San Andreas Pipeline No. 3 Installation	SF-1	LS	LS	LS	LS	N/A	N/A	LS
Groundwater Projects	SF-2	LS	N/A	N/A	N/A	PSM	PSM	LS
Recycled Water Projects	SF-3	LS	LS	LS	N/A	N/A	LS	LS

LS = Less than Significant impact, no mitigation required
PSM= Potentially Significant impact, can be mitigated to less than significant
N/A = Not Applicable

All WSIP projects would be required to implement SFPUC Construction Measure #3 (onsite air and water quality measures during construction), which requires the implementation of erosion control measures. For projects located outside of San Francisco that disturb more than one acre of land, construction activities would have to comply with the applicable NPDES permit implemented by the RWQCB. For construction of WSIP pipeline projects involving disturbance of one to five acres of land, the requirements of the LUP General Permit would apply. For construction of WSIP projects involving disturbance of one or more acres of land and pipeline projects involving more than five acres of temporary land disturbance, the requirements of the NPDES Construction General Permit would apply.

In accordance with these permits, the SFPUC or its contractor(s) would submit the required notices, develop a SWPPP, and implement site-specific BMPs in accordance with the SWPPP to control and reduce discharges of sediments and pollutants associated with construction stormwater runoff into storm drains and any receiving waters. These practices would include a provision requiring the placement of drip pans underneath heavy equipment that is stored overnight to prevent leaks of hydraulic fluids, oil, grease, or fuels from reaching an adjacent waterway or stormwater collection system.

The SWPPP would also include protection measures for the temporary onsite storage of diesel fuels used during construction, including requirements for secondary containment and berming of the diesel storage area or any chemical storage areas to contain a potential release and to prevent any such release from reaching an adjacent waterway or stormwater collection system. Non-stormwater discharges to the storm sewers and receiving waters would be eliminated or reduced and monitoring would be conducted to ensure that all BMPs are implemented, maintained, and effective. The control measures would also be consistent with the appropriate local guidelines for stormwater control and policies and actions of the SFPUC's Alameda and Peninsula Watershed Management Plans (WMPs) for projects located in these watersheds.

For projects located within San Francisco, the construction contractor(s) would obtain approval from the SFPUC and would comply with all permit requirements for the control of construction-related stormwater. Subject to the requirements of Article 4.1 of the San Francisco Public Works Code, the contractor(s) would be required, at a minimum, to develop and implement an erosion and sediment control plan to reduce the impact of runoff from the construction site. The erosion and sediment control plan must be reviewed and approved by the SFPUC prior to implementation, and the SFPUC would conduct periodic inspections to ensure compliance with the erosion and sediment control plan.

For projects not subject to NPDES or Article 4.1 requirements, SFPUC Construction Measure #3 (onsite air and water quality measures during construction) would require preparation and implementation of an erosion control plan for each facility site. The plan would provide both interim and permanent erosion control measures and requirements for secondary containment and berming of the diesel storage area or any chemical storage areas to contain a potential release and to prevent any such release from reaching an adjacent waterway or stormwater collection system.

In addition, WSIP projects in the Sunol Valley Region would be located within the Alameda watershed (and subject to the Alameda WMP), while some of the WSIP projects in the Peninsula Region would be located within the Peninsula watershed (and subject to the Peninsula WMP). Since these WSIP projects would be required to implement all pertinent WMP policies and actions, this analysis assumes the following actions pertaining to erosion and sedimentation would be implemented as part of the WSIP projects. (In the actions listed below, if two numbers are listed, the first number refers to the Alameda plan, and the second number refers to the Peninsula plan):

- *Action aqu1*. Prior to undertaking or constructing any non-water dependent facility or watershed activity, conduct site-specific review in conjunction with the review process for proposed plans and projects to ensure that the facility or activity is not located within a High Water Quality Vulnerability Zone. If feasible, relocate the activity or facility to an alternative upland site. If no feasible site exists, follow BMPs as set forth in Appendix C-6 of the Watershed Management Plan and minimize stream crossings.

- *Action aqu5*. Rehabilitate shoreline areas using structural shoreline protection practices in areas where erosion and sedimentation cannot be adequately controlled by land use restrictions.

- *Action veg4*. Prior to the initiation of any construction project involving grading, a grading plan shall be prepared by the project proponent and approved by appropriate SFPUC staff. Revegetation of all graded areas shall be required to the maximum extent practicable.

- *Action veg7/veg 9*. When conducting operations, maintenance, and construction activities, follow erosion control BMPs to ensure protection of wetlands, streams, and shoreline areas. BMPs provided in Appendix C-6 of the watershed management plan to be employed in the vicinity of wetlands and riparian areas shall be coordinated with the requirements of the CDFG Streambed Alteration Agreement and Clean Water Act Section 404 permit from the Army Corps of Engineers.

- *Action veg13/veg 17*. Encourage other agencies with interest in watershed lands to minimize the disturbance of serpentine bedrock or soils to prevent the erosion of asbestos fibers into the water supply.

Pipelines and Infiltration Galleries. The installation of pipelines would generally require excavation of a trench ranging from 5 to 8 feet deep and 2 to 5 feet wide for smaller pipe diameters, to as large as 15 feet deep and 12 feet wide where trenches are shored in congested areas. In open areas where the trenches would be constructed with sloped sides, the trench could be as wide as 50 feet at the surface. Pipelines would cross creek channels using cut-and-cover or open-cut methods for seasonal creeks during the dry season only, or jack-and-bore or microtunneling methods for perennial creeks. Rehabilitation of the infiltration galleries that could be conducted for the Alameda Creek Fishery project (SV-1) could also require excavation of substantial amounts of soil adjacent to Alameda Creek.

In addition to the NPDES requirements described above, the SFPUC or its contractor(s) would be subject to an encroachment permit from the local flood control district or other appropriate local agency. They must also comply with CDFG and U.S. Army Corps of Engineers (Corps) requirements pertaining to wetlands or streambeds, including associated water quality protection requirements of the applicable RWQCB.

Tunnels. Erosion and sedimentation during tunnel construction (and the resulting potential to degrade water bodies) would primarily be an issue at tunnel entry and exit shafts or portals where construction staging occurs, including the handling and removal of excavated materials (shaft/portal and tunnel spoils), and would depend on the extent of land disturbance and proximity to nearby water bodies. Construction activities at the tunnel portals would be subject to the NPDES Construction General Permit if more than one acre of land would be disturbed. Although a tunnel may pass beneath one or more water bodies, tunneling beneath water bodies would not result in increased sedimentation or erosion.

Other Facilities. Where feasible, WSIP facilities would be sited to avoid construction across creeks or other water bodies. The area of land disturbance required for construction would vary by project, and the potential for water quality effects related to construction activities would depend on a project's proximity to nearby water bodies and the size of the disturbed area. The applicable NPDES or erosion control requirements for construction activities would depend on the size and location of the project.

San Joaquin Region

Impact 4.5-1: Degradation of water bodies as a result of erosion and sedimentation or a hazardous materials release during construction		
Advanced Disinfection	SJ-1	LS
Lawrence Livermore	SJ-2	LS
SJPL System	SJ-3	LS
SJPL Rehabilitation	SJ-4	LS
Tesla Portal Disinfection	SJ-5	LS

The Advanced Disinfection (SJ-1) and Tesla Portal Disinfection (SJ-5) projects would each disturb more than one acre of soil. These facilities are located adjacent to vegetated swales, and runoff from these sites would not directly enter a waterway. Pipeline construction associated with the SJPL System project (SJ-3) could disturb 400 or more acres of land and would cross the Delta-Mendota Aqueduct and California Aqueduct. The amount of land disturbance for the Lawrence Livermore (SJ-2) and SJPL Rehabilitation (SJ-4) projects has not been determined. However, with implementation of SFPUC Construction Measure #3 (onsite air and water quality measures during construction) and implementation of control measures in compliance with NPDES permit requirements for projects disturbing more than one acre of land, impacts related to the degradation of water bodies as a result of erosion and sedimentation during construction would be *less than significant* for all projects in this region. The SJPL System project would also be required to comply with encroachment permitting requirements and the requirements of other regulatory agencies, as described above.

Sunol Valley Region

Impact 4.5-1:	**Degradation of water bodies as a result of erosion and sedimentation or a hazardous materials release during construction**	
Alameda Creek Fishery	SV-1	LS
Calaveras Dam	SV-2	LS
40-mgd Treated Water	SV-3	LS
New Irvington Tunnel	SV-4	LS
Treated Water Reservoirs	SV-5	LS
SABUP	SV-6	LS

Erosion and sedimentation from the Sunol Valley Region projects could affect water quality in Alameda Creek, Calaveras Creek, Arroyo Hondo, San Antonio Creek, and several unnamed drainages. The Calaveras Dam (SV-2), 40-mgd Treated Water (SV-3), New Irvington Tunnel (SV-4), and Treated Water Reservoirs (SV-5) projects would each disturb more than one acre of land, with the Calaveras Dam project disturbing over 600 acres and the New Irvington Tunnel project disturbing an estimated 120 acres. The area of disturbance has not been determined for the Alameda Creek Fishery (SV-1) and SABUP (SV-6) projects. However, with implementation of SFPUC Construction Measure #3 (onsite air and water quality measures during construction) and implementation of control measures in compliance with NPDES permit requirements for projects disturbing more than one acre of land, impacts related to the degradation of water bodies as a result of erosion and sedimentation during construction would be *less than significant* for all projects in this region. The Alameda Creek Fishery, 40-mgd Treated Water, and SABUP projects would also involve creek or stream crossings and would be required to implement control measures to comply with encroachment permitting requirements and the requirements of other regulatory agencies, as described above. Projects in this region would also be required to implement policies and actions of the Alameda WMP regarding erosion control, also described above.

Bay Division Region

Impact 4.5-1:	**Degradation of water bodies as a result of erosion and sedimentation or a hazardous materials release during construction**	
BDPL Reliability Upgrade	BD-1	LS
BDPL 3 and 4 Crossovers	BD-2	LS
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	LS

Erosion and sedimentation from Bay Division Region projects could affect water quality in a number of water bodies. The BDPL Reliability Upgrade project (BD-1) would involve disturbance of more than 150 acres of land and would cross Newark Slough, Mission Creek, Agua Caliente Creek, Ojo de Agua Creek, and Cordilleras Creek as well as unnamed creeks, drainages, and flood control channels. The area of land disturbance has not been determined for the BDPL 3 and 4 Crossovers (BD-2) or BDPL 3 and 4 Seismic Upgrade at Hayward Fault (BD-3) projects. However, with implementation of SFPUC Construction Measure #3 (onsite air and water quality measures during construction) and implementation of control measures in compliance with NPDES permit requirements for projects disturbing more than one acre of land, impacts related to degradation of water bodies as a result of erosion and sedimentation during construction would be *less than significant* for all projects in this region. Implementation of additional control measures in compliance with encroachment permitting requirements and the requirements of other regulatory agencies, as described above, would also be required for the BDPL Reliability Upgrade project.

Peninsula Region

Impact 4.5-1: Degradation of water bodies as a result of erosion and sedimentation or a hazardous materials release during construction		
Baden and San Pedro Valve Lots	PN-1	LS
CS/SA Transmission	PN-2	LS
HTWTP Long-Term	PN-3	LS
Lower Crystal Springs Dam	PN-4	LS
Pulgas Balancing Reservoir	PN-5	LS

Construction of the Lower Crystal Springs Dam project (PN-4) would involve land disturbance of approximately six acres. The amount of land disturbance has not been determined for the CS/SA Transmission (PN-2), HTWTP Long-Term (PN-3), and Pulgas Balancing Reservoir (PN-5) projects. Valve lot improvements under the Baden and San Pedro Valve Lots project (PN-1) would likely involve land disturbance of less than one acre at each construction site. However, with implementation of SFPUC Construction Measure #3 (onsite air and water quality measures during construction) and implementation of control measures in compliance with NPDES permit requirements for projects disturbing more than one acre of land, impacts related to degradation of water bodies as a result of erosion and sedimentation during construction would be *less than significant* for all projects in this region.

The Lower Crystal Springs Dam project (PN-4) would involve work in San Mateo Creek, and the Pulgas Balancing Reservoir project (PN-5) would enlarge Pulgas Channel. Encroachment permits and implementation of control measures in compliance with the requirements of other regulatory agencies could also be required for the Lower Crystal Springs Dam and Pulgas Balancing Reservoir projects.

Because they are located in the Peninsula watershed, the CS/SA Transmission (PN-2), Lower Crystal Springs Dam (PN-4), and Pulgas Balancing Reservoir (PN-5) projects as well as portions of the Baden and San Pedro Valve Lots project (PN-1) would also be required to implement policies and actions of the Peninsula WMP regarding erosion control, as described above.

San Francisco Region

Impact 4.5-1: Degradation of water bodies as a result of erosion and sedimentation or a hazardous materials release during construction		
SAPL 3 Installation	SF-1	LS
Groundwater Projects	SF-2	LS
Recycled Water Projects	SF-3	LS

As discussed in the Setting, most creeks within San Francisco were contained in underground culverts during urbanization of the city; most of the city is served by a combined sewer system that collects both sanitary sewage and stormwater and transports this combined flow to wastewater treatment plants. Discharges to the combined sewer system are treated and discharged to the bay or ocean in compliance with the City’s NPDES permit and must be in conformance with requirements of the Clean Water Act, Combined Sewer Overflow Control Policy, and the associated state requirements in San Francisco’s Basin Plan.

The SAPL 3 Installation project (SF-1) would be located partially within San Francisco and San Mateo Counties. The portions of this project located in San Francisco are served by the combined sewer system. The portions of the pipelines located in San Mateo County would be served by a separate sewer. However, with implementation of SFPUC Construction Measure #3 (onsite air and water quality measures during construction), implementation of control measures in compliance with NPDES permit requirements for those portions of the project disturbing more than one acre of land outside of San Francisco, and implementation of control measures in compliance with Article 4.1 of the San Francisco Public Works Code for those portions of the project within San Francisco, impacts related to the degradation of water bodies as a result of erosion and sedimentation during construction would be *less than significant* for the SAPL 3 Installation project.

Final locations for the Groundwater Projects (SF-2) have not been selected, but the local projects would be located in San Francisco and the regional projects would be located in San Mateo County. Final locations for the Recycled Water Projects (SF-3) have not been determined, but these projects would generally be located in San Francisco. With implementation of SFPUC Construction Measure #3 (onsite air and water quality measures during construction), implementation of control measures in compliance with NPDES permit requirements for projects disturbing more than one acre of land outside of San Francisco, and implementation of control measures in compliance with Article 4.1 of the San Francisco Public Works Code for projects within San Francisco, impacts related to the degradation of water bodies as a result of erosion and sedimentation during construction would be *less than significant* for these two projects.

Impact 4.5-2: Depletion of groundwater resources.

Construction Dewatering. Dewatering for construction of most facilities (except for tunnels, as discussed below) could temporarily affect groundwater levels in the shallow groundwater zones where WSIP facilities are located. As a result, water levels in shallow wells located near construction sites could be lowered temporarily. However, groundwater extracted from shallow sources tends to be of poor quality and unsuitable for human consumption; as a result, there would not likely be many domestic wells tapping the shallow groundwater zone near WSIP project facilities. Furthermore, any effects related to lowering the water table would be temporary. Therefore, groundwater dewatering would not be expected to substantially deplete shallow groundwater resources, and impacts related to the depletion of shallow groundwater resources are considered less than significant for all WSIP projects that would require dewatering.

Tunnels. Groundwater for domestic and other uses is commonly obtained from deeper groundwater-bearing zones that contain water of sufficient quality for the intended use. Groundwater dewatering, required for tunnel projects could affect water levels in the deeper groundwater-bearing zones by stopping or reducing the flow to springs or lowering groundwater levels in nearby wells, thus reducing the capacity of the wells or rendering them inoperable in the short or long term.

The use of a water-tight lining system and backfilling of the annular space between the pipe and the tunnel shaft would reduce the rate of groundwater infiltration and related groundwater dewatering requirements along much of the tunnel alignment. However, greater amounts of groundwater dewatering could be required for shaft or portal construction. After tunnel construction, the shafts or portals would be backfilled, and there would be no long-term groundwater infiltration into the shafts, portals, or tunnel.

San Joaquin Region

Impact 4.5-2: Depletion of groundwater resources		
Advanced Disinfection	SJ-1	LS
Lawrence Livermore	SJ-2	N/A
SJPL System	SJ-3	LS
SJPL Rehabilitation	SJ-4	LS
Tesla Portal Disinfection	SJ-5	LS

Temporary groundwater dewatering could be required during construction of the Advanced Disinfection (SJ-1), SJPL System (SJ-3), SJPL Rehabilitation (SJ-4), and Tesla Portal Disinfection (SJ-5) projects. However, only shallow groundwater resources would be affected. Therefore, impacts related to the depletion of groundwater resources would be *less than significant* for these projects.

The Lawrence Livermore project (SJ-2) would not require construction dewatering or involve tunneling. Therefore, impacts related to the depletion of groundwater resources would *not apply* to this project.

Sunol Valley Region

Impact 4.5-2: Depletion of groundwater resources		
Alameda Creek Fishery	SV-1	LS
Calaveras Dam	SV-2	LS
40-mgd Treated Water	SV-3	N/A
New Irvington Tunnel	SV-4	PSM
Treated Water Reservoirs	SV-5	N/A
SABUP	SV-6	LS

Springs located in the vicinity of the proposed alignment of the New Irvington Tunnel project (SV-4) indicate a groundwater level of at least 683 feet (more than 300 feet above the planned elevation of the tunnel bore), so considerable hydrostatic pressure can be expected at tunnel grade, and dewatering would be required during construction of the tunnel (Water Infrastructure Partners, 2005). Dewatering for construction of the existing Irvington Tunnel in the 1930s produced an average of about 250 gallons per minute (gpm) of groundwater and maximum sustained groundwater flows of about 1,000 gpm. This dewatering stopped or decreased flows in several local springs and caused groundwater levels to fall in some nearby wells. Under the New Irvington Tunnel project, groundwater dewatering would be conducted at rates of up to 2,000 gpm over a period of two years. Although many of the 104 wells noted in the vicinity of the Irvington Tunnel in the 1930s (described in the Setting) may have since been abandoned or may no longer be in use, construction of the tunnel and associated dewatering under the New Irvington Tunnel project could stop or decrease spring flow or lower groundwater levels in nearby wells, thus reducing the capacity of the wells or rendering them inoperable.

The effects of this dewatering on nearby springs and wells cannot be estimated without conducting an inventory of the existing springs and wells within the affected groundwater zone and performing additional site-specific analysis of the area’s geology and groundwater occurrence as well as dewatering requirements for the project. Therefore, impacts related to the depletion of groundwater resources are considered *potentially significant* for the New Irvington Tunnel project (SV-4), but would likely be reduced to a less-than-significant level though implementation of site-specific analysis and identified measures (as outlined in Measure 4.5-2). These impacts would be evaluated in greater detail as part of separate, project-level CEQA review for this project.

Temporary groundwater dewatering could be required during construction of the Alameda Creek Fishery (SV-1), Calaveras Dam (SV-2), and SABUP (SV-6) projects. However, only shallow groundwater resources would be affected. Therefore, impacts related to the depletion of groundwater resources would be *less than significant* for these projects. The 40-mgd Treated Water (SV-3) and Treated Water Reservoirs (SV-5) projects would not require construction dewatering or involve tunneling. Therefore, impacts related to the depletion of groundwater resources would *not apply* to these projects.

Bay Division Region

Impact 4.5-2: Depletion of groundwater resources		
BDPL Reliability Upgrade	BD-1	LS
BDPL 3 and 4 Crossovers	BD-2	LS
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	LS

The BDPL Reliability Upgrade project (BD-1) would involve construction dewatering along the portions of the alignment where pipeline would be installed using cut-and-cover methods. However, only shallow groundwater resources would be affected. The tunnel shafts for this project would be constructed using a slurry panel wall or secant pile method, which would prevent water from entering the work shaft. Although limited dewatering could be required at the base of the Ravenswood tunnel shaft to reduce uplift, dewatering would not be allowed at the Newark tunnel shaft, where there is groundwater contamination. Therefore, impacts related to the depletion of shallow and deep groundwater resources would be *less than significant* for this project.

Both the BDPL 3 and 4 Crossovers (BD-2) and BDPL 3 and 4 Seismic Upgrade at Hayward Fault (BD-3) projects would require construction dewatering. However, only shallow groundwater resources would be affected. Therefore, impacts related to the depletion of groundwater resources would be *less than significant* for these projects.

Peninsula Region

Impact 4.5-2: Depletion of groundwater resources		
Baden and San Pedro Valve Lots	PN-1	LS
CS/SA Transmission	PN-2	LS
HTWTP Long-Term	PN-3	LS
Lower Crystal Springs Dam	PN-4	LS
Pulgas Balancing Reservoir	PN-5	LS

All of the Peninsula Region projects (Baden and San Pedro Valve Lots, PN-1; CS/SA Transmission, PN-2; HTWTP Long-Term, PN-3; Lower Crystal Springs Dam, PN-4; and Pulgas Balancing Reservoir, PN-5) could require construction dewatering. However, only shallow groundwater resources would be affected. Therefore, impacts related to the depletion of groundwater resources would be *less than significant* for these projects.

San Francisco Region

Impact 4.5-2: Depletion of groundwater resources		
SAPL 3 Installation	SF-1	LS
Groundwater Projects	SF-2	N/A
Recycled Water Projects	SF-3	LS

Both the SAPL 3 Installation (SF-1) and Recycled Water Projects (SF-3) could require construction dewatering. However, only shallow groundwater resources would be affected. Therefore, impacts related to the depletion of groundwater resources would be *less than significant* for these projects. The Groundwater Projects (SF-2) would not require construction dewatering. Therefore, impacts related to the depletion of groundwater resources would *not apply* to this project. (Potential depletion of groundwater resources resulting from operation of the groundwater projects is addressed in Chapter 5, Section 5.6.)

Impact 4.5-3: Construction dewatering discharges to surface waters and construction-related discharges of treated water.

Dewatering would be necessary for construction of facilities where excavation is required below the groundwater table; for pipeline projects where there is a shallow groundwater table and at stream crossings; and for all tunnel projects. Water produced during construction dewatering could contain sediments and contaminants that could degrade water quality if the water were discharged directly to surface water or if it infiltrated to groundwater. Water from dewatering during tunnel construction is expected to contain sediment, oils, and grout. Water quality impacts and permitting requirements related to these discharges are discussed below and analyzed by region in Impact 4.5-3a.

Construction-related discharges of treated water would also be required for construction of some WSIP facilities. These discharges could contain chlorine or chloramines and could degrade water quality and affect aquatic organisms. Depending on the rate of discharge, either type of discharge could also result in erosion in the receiving water or cause downstream flooding. Water quality impacts and permitting requirements related to these discharges are discussed below and analyzed by region in Impact 4.5-3b.

For projects that are subject to the Construction General Permit (described in Impact 4.5-1, above), the discharges could possibly be made in accordance with this permit, provided it could be demonstrated that the water is uncontaminated. In the San Joaquin Region, the groundwater could possibly be discharged to surface water under the General Order for Dewatering and Other Low Threat Discharges to Surface Waters, as described in the Setting, although in all regions an individual NPDES permit, or waiver, might be required. In agricultural areas or other areas where the groundwater would be discharged to land, the discharges could possibly be made under the Statewide General Waste Discharge Requirements for Discharges to Land with Low Threat to Water Quality, although individual waste discharge requirements, or a waiver, could be required. If discharges were made to lands not owned, controlled, or leased by the CCSF, then the CCSF would enter into agreements with landowners for the discharge. Discharges to a local sanitary sewer system would comply with the requirements of the local permitting agency. Other General Permits in the San Francisco Region under which dewatered groundwater may be discharged include the following General NPDES Permits:

- General NPDES Permit for VOC Cleanups (Order No. R2-2004-0055)
- General NPDES Permit for Fuel Cleanups (Order No. R2-2006-0075)
- General NPDES Permit for Groundwater Dewatering (Order No. R2-2006-0075)

Before discharging under any general permit, the SFPUC must submit a completed Notice of Intent that includes a dewatering plan with appropriate treatment and monitoring specifications. The SFPUC should also allow at least 60 days for the RWQCB review and acceptance of the Notice of Intent and dewatering plans.

For projects located in San Francisco, the construction contractor(s) would obtain approval from the SFPUC and comply with all NPDES permit requirements for the discharge of treated water to the combined sewer system, subject to the provisions of Article 4.1 of the San Francisco Public Works Code.

In accordance with the requirements of these permits or waivers, the contractor(s) would be required to implement control measures to ensure adequate quality of the discharged water, conduct the appropriate sampling to demonstrate permit compliance, and regulate flow rates to prevent erosion or downstream flooding in the receiving water. A groundwater treatment unit would be used, as needed, to comply with discharge requirements.

The contractor(s) would also be required to obtain the necessary permit from the local flood control district or any appropriate local agencies. For any discharge facilities affecting areas immediately adjacent to or within creeks and rivers, permits would be obtained from the Corps, CDFG, and RWQCB if needed. Depending on the location, the SFPUC would consult with and/or obtain approval from the U.S. Fish and Wildlife Service and/or National Marine Fisheries Service if sensitive aquatic species or habitat could be affected. If required, permits would include provisions for energy dissipation of discharges and regulation of flow rates to prevent downstream flooding.

Implementation of control measures in compliance with the permitting requirements described above would ensure that construction-related dewatering discharges would not degrade water quality or violate any water quality standards or waste discharge requirements. In addition, all WSIP projects would be required to implement SFPUC Construction Measure #4 (groundwater), which requires the preparation of a dewatering plan to ensure groundwater discharges to the storm sewer system comply with applicable local standards and discharge permit requirements.

In addition, WSIP projects in the Sunol Valley Region would be located within the Alameda watershed (and subject to the Alameda WMP), while some of the WSIP projects in the Peninsula Region would be located within the Peninsula watershed (and subject to the Peninsula WMP). Since these WSIP projects would be required to implement all pertinent watershed management plan policies and actions, this analysis assumes the following action pertaining to dechlorination of water prior to discharge would be implemented as part of the WSIP projects:

- *Action fis6*. Identify and adopt alternative nontoxic management practices for the protection of aquatic resources in coordination with the Integrated Pest Management program. Guidelines include:
  - Dechlorinate water before it is discharged to streams and reservoirs
  - Minimize the use of copper sulfate in the treatment of algal blooms in reservoirs
  - Limit the use of chemical fire retardants and Class A foams (except protein-based foams) in or near aquatic zones

Construction dewatering and construction-related discharges of clear water are evaluated separately below.

Degradation of Water Quality Due to Construction Dewatering Discharges

San Joaquin Region

Impact 4.5-3a: Degradation of water quality due to construction dewatering discharges		
Advanced Disinfection	SJ-1	LS
Lawrence Livermore	SJ-2	N/A
SJPL System	SJ-3	LS
SJPL Rehabilitation	SJ-4	LS
Tesla Portal Disinfection	SJ-5	LS

The Advanced Disinfection (SJ-1), SJPL System (SJ-3), SJPL Rehabilitation (SJ-4), and Tesla Portal Disinfection (SJ-5) projects could involve construction dewatering, with potential discharges to a surface water body, storm sewer system, sanitary sewer system, or land. However, potential water quality impacts related to these construction discharges would be *less than significant* for all projects in this region with implementation of control measures in compliance with NPDES permitting, waste discharge requirements, or local agency permitting requirements (described above). SFPUC Construction Measure #4 (groundwater) would also require preparation of a dewatering plan for discharges to the storm sewer system.

The Lawrence Livermore project (SJ-2) would not likely involve dewatering; therefore, this impact would *not apply* to this project.

Sunol Valley Region

Impact 4.5-3a: Degradation of water quality due to construction dewatering discharges		
Alameda Creek Fishery	SV-1	LS
Calaveras Dam	SV-2	LS
40-mgd Treated Water	SV-3	N/A
New Irvington Tunnel	SV-4	LS
Treated Water Reservoirs	SV-5	N/A
SABUP	SV-6	LS

The Alameda Creek Fishery (SV-1), Calaveras Dam (SV-2), New Irvington Tunnel (SV-4), and SABUP (SV-6) projects could each involve construction dewatering, with potential discharges to a surface water body or storm sewer system. However, potential water quality impacts related to these construction discharges would be *less than significant* for all projects in this region with implementation of control measures in compliance with NPDES permitting requirements for these discharges (described above). SFPUC Construction Measure #4 (groundwater) would also require preparation of a dewatering plan for discharges to the storm sewer system.

The 40-mgd Treated Water (SV-3) and Treated Water Reservoirs (SV-5) projects would not likely involve dewatering; therefore, this impact would *not apply* to these projects.

Bay Division Region

Impact 4.5-3a: Degradation of water quality due to construction dewatering discharges		
BDPL Reliability Upgrade	BD-1	LS
BDPL 3 and 4 Crossovers	BD-2	LS
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	LS

All WSIP projects in this region (BDPL Reliability Upgrade, BD-1; BDPL 3 and 4 Crossovers, BD-2; and BDPL 3 and 4 Seismic Upgrade at Hayward Fault, BD-3) could involve construction dewatering, with potential discharges to a surface water body, storm sewer system, or sanitary sewer system. However, potential water quality impacts related to these construction discharges would be *less than significant* for all projects in this region with implementation of control measures in compliance with NPDES and local agency permitting requirements for these discharges (described above). SFPUC Construction Measure #4 (groundwater) would also require preparation of a dewatering plan for discharges to the storm sewer system.

Peninsula Region

Impact 4.5-3a: Degradation of water quality due to construction dewatering discharges		
Baden and San Pedro Valve Lots	PN-1	LS
CS/SA Transmission	PN-2	LS
HTWTP Long-Term	PN-3	LS
Lower Crystal Springs Dam	PN-4	LS
Pulgas Balancing Reservoir	PN-5	LS

All WSIP projects in this region (Baden and San Pedro Valve Lots, PN-1; CS/SA Transmission, PN-2; HTWTP Long-Term, PN-3; Lower Crystal Springs Dam, PN-4; and Pulgas Balancing Reservoir, PN-5) could involve construction dewatering, with potential discharges to a surface water body, storm sewer system, or sanitary sewer system. However, potential water quality impacts related to these construction discharges would be *less than significant* for all projects in this region with implementation of control measures in compliance with NPDES and local agency permitting requirements (described above). SFPUC Construction Measure #4 (groundwater) would also require preparation of a dewatering plan for discharges to the storm sewer system.

San Francisco Region

Impact 4.5-3a: Degradation of water quality due to construction dewatering discharges to surface water		
SAPL 3 Installation	SF-1	LS
Groundwater Projects	SF-2	N/A
Recycled Water Projects	SF-3	LS

The SAPL 3 Installation (SF-1) and Recycled Water Projects (SF-3) could involve construction dewatering, with potential discharges to a surface water body, storm sewer system, or sanitary sewer system. However, potential water quality impacts related to these construction discharges would be *less than significant* for each project with implementation of control measures in compliance with NPDES and local agency permitting requirements for those projects or portions of a project outside of San Francisco (described above), and compliance with Article 4.1 of the San Francisco Public Works Code for those projects or portions of a project within San Francisco. SFPUC Construction Measure #4 (groundwater) would also require preparation of a dewatering plan for discharges to the storm sewer system.

The Groundwater Projects (SF-2) would not likely involve dewatering; therefore, this impact would *not apply* to this project.

Degradation of Water Quality Due to Construction-Related Discharges of Treated Water

San Joaquin Region

Impact 4.5-3b: Degradation of water quality due to construction-related discharges of treated water		
Advanced Disinfection	SJ-1	LS
Lawrence Livermore	SJ-2	LS
SJPL System	SJ-3	LS
SJPL Rehabilitation	SJ-4	LS
Tesla Portal Disinfection	SJ-5	LS

Construction of the proposed crossover facilities and construction of valving and connections for the SJPL System project (SJ-3) and rehabilitation of pipelines under the SJPL Rehabilitation project (SJ-4) would require the discharge of water from the pipeline system during construction. This portion of the pipeline system contains raw water that has not been chlorinated or chloraminated; thus, dechlorination would not be required. Small discharges of chlorinated water could be required during construction of the Advanced Disinfection (SJ-1), Lawrence Livermore (SJ-2), and Tesla Portal Disinfection (SJ-5) projects. However, impacts related to construction discharges of raw and treated water from these facilities would be *less than significant* with implementation of control measures in compliance with NPDES permit or waste discharge requirements and the requirements of other regulatory agencies, as described above.

Sunol Valley Region

Impact 4.5-3b: Degradation of water quality due to construction-related discharges of treated water		
Alameda Creek Fishery	SV-1	N/A
Calaveras Dam	SV-2	N/A
40-mgd Treated Water	SV-3	LS
New Irvington Tunnel	SV-4	LS
Treated Water Reservoirs	SV-5	LS
SABUP	SV-6	LS

Small discharges of chloraminated water could be required during construction of improvements to the Sunol Valley WTP for the 40-mgd Treated Water (SV-3) and Treated Water Reservoirs (SV-5) projects. However, these discharges would be managed in compliance with the Regionwide General NPDES Permit for Discharges from Surface Water Treatment Facilities for Potable Supply, as described in the Setting. Therefore, water quality impacts related to these discharges would be *less than significant* with implementation of control measures in compliance with existing regulations.

The SABUP project (SV-6) would likely require the discharge of chloraminated water for construction of valving and connections, and the New Irvington Tunnel project (SV-4) could require dewatering of the existing tunnel. However, water quality impacts related to these construction discharges of treated water would be *less than significant* with implementation of control measures in compliance with NPDES permit requirements and the requirements of other regulatory agencies, as described above. Implementation of Alameda WMP Action fis6 regarding the discharge of chlorinated water would also be required for all projects in the Sunol Valley Region.

No construction discharges of treated water are expected with the remaining Sunol Valley Region projects (Alameda Creek Fishery, SV-1, and Calaveras Dam, SV-2). Therefore, this impact would *not apply* to these projects.

Bay Division Region

Impact 4.5-3b: Degradation of water quality due to construction-related discharges of treated water		
BDPL Reliability Upgrade	BD-1	LS
BDPL 3 and 4 Crossovers	BD-2	LS
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	LS

Construction-related discharges of chloraminated water would be required for all WSIP projects in this region (BDPL Reliability Upgrade, BD-1; BDPL 3 and 4 Crossovers, BD-2; and BDPL 3 and 4 Seismic Upgrade at Hayward Fault, BD-3). However, water quality impacts related to these construction discharges of treated water would be *less than significant* with implementation of control measures in compliance with NPDES permit requirements and the requirements of other regulatory agencies, as described above.

Peninsula Region

Impact 4.5-3b: Degradation of water quality due to construction-related discharges of treated water		
Baden and San Pedro Valve Lots	PN-1	N/A
CS/SA Transmission	PN-2	N/A
HTWTP Long-Term	PN-3	LS
Lower Crystal Springs Dam	PN-4	N/A
Pulgas Balancing Reservoir	PN-5	LS

Small discharges of chloraminated water could be required during construction of treatment plan improvements under the HTWTP Long-Term project (PN-3). However, these discharges would be managed in compliance with the Regionwide General NPDES Permit for Discharges from Surface Water Treatment Facilities for Potable Supply; therefore, water quality impacts related to these chloraminated water discharges would be *less than significant* with implementation of control measures in compliance with these regulations.

Discharges of chloraminated water could also be required for construction of the Pulgas Balancing Reservoir (PN-5) project. However, water quality impacts related to these construction discharges would be *less than significant* with implementation of control measures in compliance with NPDES permit requirements and the requirements of other regulatory agencies. Because the Pulgas Balancing Reservoir project would be located within the Peninsula watershed, implementation of Peninsula WMP Action fis6 regarding the discharge of chlorinated water would also be required.

The Baden and San Pedro Valve Lots (PN-1), CS/SA Transmission (PN-2), and Lower Crystal Springs Dam (PN-4) projects are not expected to require construction-related discharges of chloraminated water. Therefore, this impact would *not apply* to these projects.

San Francisco Region

Impact 4.5-3b: Degradation of water quality due to construction-related discharges of treated water		
SAPL 3 Installation	SF-1	LS
Groundwater Projects	SF-2	N/A
Recycled Water Projects	SF-3	N/A

Small discharges of chloraminated water could be required for the SAPL 3 Installation project (SF-1). However, water quality impacts related to these construction discharges would be *less than significant* with implementation of control measures in compliance with NPDES permit requirements and the requirements of other regulatory agencies for discharges to surface waters or separate storm sewer systems outside of San Francisco, as well as implementation of control measures in compliance with Article 4.1 of the San Francisco Municipal Code for discharges to the combined sewer system in San Francisco.

The Groundwater Projects (SF-2) and Recycled Water Projects (SF-3) are not expected to involve construction-related discharges of chlorinated or chloraminated water. Therefore, this impact would *not apply* to these projects.

Impact 4.5-4: Flooding and water quality impacts associated with impeding or redirecting flood flows.

Construction of WSIP facilities within an existing flood zone could impede or redirect flood flows.

Pipelines and Tunnels. Pipelines and tunnels would be constructed beneath the land surface and therefore would not impede or redirect flood flows once constructed. However, construction activities within FEMA-designated 100-year flood zones could impede flood flows or cause the discharge of sediments and pollutants to flood flows if a flood occurred during construction. Hazardous materials and debris could also be released into flood flows if construction diesel tanks, hazardous materials, or other construction materials were stored in a flood zone. Associated structures would be designed to withstand flood flows and pass the floodwaters without significant impedance or erosion.

Dams. Dams constructed within a creek could increase flooding impacts if located in a flood zone or could cause flooding if located in an area not already subject to flooding. The degree of impact would depend on the design, placement, and operation of the dam.

Other Facilities. Except for groundwater wells proposed under the Alameda Creek Fishery project (SV-1) and proposed crossover facilities located at Barron Creek and Guadalupe River under the BDPL 3 and 4 Crossovers project (BD-2), discussed below under the Bay Division Region projects, no other facilities would be constructed within 100-year flood zones; therefore, flooding impacts are not applicable to these facilities. Outlet structures for crossover facilities could include construction of permanent facilities within a stream channel, which could potentially impede or redirect stream flows and contribute to flooding. However, compliance with permitting requirements would ensure that these facilities are designed such that they do not impede or redirect stream flows.

San Joaquin Region

Impact 4.5-4: Flooding and water quality impacts associated with impeding or redirecting flood flows		
Advanced Disinfection	SJ-1	N/A
Lawrence Livermore	SJ-2	N/A
SJPL System	SJ-3	PSM
SJPL Rehabilitation	SJ-4	PSM
Tesla Portal Disinfection	SJ-5	N/A

As discussed in the Setting, the existing San Joaquin Pipelines cross an approximate 3.6-mile-wide section of the 100-year flood zone of the San Joaquin River. None of the new pipeline segments proposed under the SJPL System project (SJ-3) would be located within this flood zone, although the western crossover facility with an aboveground power supply could potentially be located within this zone. Power supply facilities for the SJPL System project would be designed to withstand flood flows and pass the floodwaters without substantial impedance or erosion. Although this facility would not redirect or impede flood flows, impacts related to flooding are considered *potentially significant* for this project, because construction of this facility could still contribute sediment or contaminants to flood flows. Rehabilitation activities under the SJPL Rehabilitation project (SJ-4) could occur anywhere along the existing San Joaquin Pipelines, including within the flood zone. Therefore, impacts related to the diversion of flood flows or contribution of sediment or contaminants to flood flows during construction are also considered *potentially significant* for this project. However, incorporation and implementation of flood flow protection measures (Measure 4.5-4a) in the erosion control measures or SWPPP prepared for the SJPL System and SJPL Rehabilitation projects would reduce this impact to a less-than-significant level.

None of the components of other San Joaquin Region projects (Advanced Disinfection, SJ-1; Lawrence Livermore, SJ-2; and Tesla Portal Disinfection, SJ-5) would be located within a 100-year floodplain. Therefore, flooding impacts would *not apply* to these projects.

Sunol Valley Region

Impact 4.5-4: Flooding and water quality impacts associated with impeding or redirecting flood flows		
Alameda Creek Fishery	SV-1	PSM
Calaveras Dam	SV-2	N/A
40-mgd Treated Water	SV-3	N/A
New Irvington Tunnel	SV-4	PSM
Treated Water Reservoirs	SV-5	N/A
SABUP	SV-6	PSM

The Alameda Creek Fishery project (SV-1) could construct new facilities such as groundwater extraction wells, pipelines, or pump stations within the 100-year floodplain of Alameda Creek. The SABUP project (SV-6) would install a new outfall energy dissipation structure within this flood zone (FEMA, 1981). Any groundwater extraction wells constructed under the Alameda Creek Fishery project would be located primarily below ground with, at most, small aboveground structures. The SABUP project would construct an outfall energy dissipation structure within the channel of Alameda Creek and a new outfall structure in San Antonio Creek, but these structures would be designed so they do not substantially impede flow in the creek. Although these structures would not substantially impede flood flows, impacts related to flooding are considered *potentially significant* for these projects, because construction activities could contribute sediment or contaminants to flood flows. However, incorporation and implementation of flood flow protection measures (Measure 4.5-4a) in the SWPPP prepared for these projects would reduce this impact to a less-than-significant level.

It is possible that a diversion dam or concrete weir could be constructed under the Alameda Creek Fishery project (SV-1). If the diversion dam or weir were located south of the Alameda Siphons, it would be outside of the 100-year floodplain of Alameda Creek. However, if the diversion dam or weir were located north of the Alameda Siphons, it could be constructed within the flood zone. In addition, small earthen dams could be constructed within the 100-year flood zone of Alameda Creek during high stream flows if infiltration galleries are used as part of this project. If located outside of the flood zone, these structures could alter the drainage of surface flows in Alameda Creek, causing flooding or siltation. If located within the flood zone, the dams could exacerbate flooding issues and also contribute to siltation. These effects cannot be estimated without information on stream flows as well as the planned operation of the project. Therefore, impacts related to the impedance or redirection of flood flows would be *potentially significant* for this project. However, implementation of a site-specific flooding analysis and identified measures (Measure 4.5-4b) would be expected to reduce this impact to a less-than-significant level.

Although the primary components of the New Irvington Tunnel project (SV-4) are outside the 100-year floodplain, the proposed permanent access road and bridges, as well as the spoils area, under this project might require placement of fill in the 100-year floodplain area. The potential flooding impacts would be *potentially significant* for this project. However, implementation of flood flow protection measures (Measure 4.5-4a) and a site-specific flooding analysis and identified measures (Measure 4.5-4b) would be expected to reduce this impact to a less-than-significant level.

The Calaveras Dam (SV-2), 40-mgd Treated Water (SV-3), and Treated Water Reservoirs (SV-5) projects would not be located within a mapped 100-year floodplain. Therefore, flooding impacts would *not apply* to these projects.

Bay Division Region

Impact 4.5-4: Flooding and water quality impacts associated with impeding or redirecting flood flows		
BDPL Reliability Upgrade	BD-1	PSM
BDPL 3 and 4 Crossovers	BD-2	PSM
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	N/A

The BDPL Reliability Upgrade project (BD-1) would cross 100-year floodplains and areas designated as Zone B[2] (associated with Mission Creek and Lake Elizabeth) and would pass beneath several flood control channels on the east side of San Francisco Bay (FEMA, 1983, 2000a). Flood flows are expected to be contained within each flood control channel. On

[2] Zone B is an area between the limits of the 100-year flood and the 500-year flood; or certain areas subject to 100-year flooding with average depths less than 1 foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood.

the west side of the bay, much of the alignment between the intersection of Ivy and Hollyburne Avenues and the Ravenswood Valve House is located within a broad 100-year flood zone associated with the west bay margin (FEMA, 1999a, 1999b, 1999c, 1999e). The west tunnel shaft would be constructed within this zone. The alignment would also cross a 100-year flood zone at the Bayshore Freeway (FEMA, 1999c) and the 500-year floodplains of Redwood Creek and Jefferson Creek (FEMA, 1982). Facilities constructed within these flood zones would be designed to withstand flood flows and pass the floodwaters without substantial impedance or erosion.

The Barron Creek crossover facility associated with the BDPL 3 and 4 Crossovers project (BD-2) could be located within or near a small 100-year floodplain associated with Barron Creek (FEMA, 1999d). In addition, the existing Bay Division Pipelines Nos. 3 and 4 cross a broad 100-year floodplain between Coyote Creek and the Guadalupe River (FEMA, 1988). The floodplain is located entirely to the east of the river. If the Guadalupe River crossover facility associated with this project were located to the east of the river, it would be located within the 100-year floodplain. If it were located to the west of the river, it would be located in Zone B, where flooding impacts would be less than significant. Outlet structures constructed at each crossover facility under the BDPL 3 and 4 Crossovers project would be designed so they do not substantially impede flood flows in a creek or redirect flood flows.

Even though BDPL Reliability Upgrade (BD-1) and BDPL 3 and 4 Crossovers (BD-2) facilities that would be located within identified 100-year floodplains would be designed so they do not substantially impede flood flows, impacts related to flooding are considered *potentially significant* for these projects, because construction activities could contribute sediment or contaminants to flood flows. However, incorporation and implementation of flood flow protection measures (Measure 4.5-4a) in the SWPPP prepared for these projects would reduce this impact to a less-than-significant level.

The Bear Gulch crossover facility constructed under the BDPL 3 and 4 Crossovers project (BD-2) and the BDPL 3 and 4 Seismic Upgrade at Hayward Fault project (BD-3) would not be located within a 100-year flood zone. Therefore, impacts related to the diversion of flood flows and contribution of sediments and contaminants to flood flows would *not apply* to the Bear Gulch crossover facility (under BD-2) or to the BDPL 3 and 4 Seismic Upgrade at Hayward Fault project.

Peninsula Region

Impact 4.5-4: Flooding and water quality impacts associated with impeding or redirecting flood flows		
Baden and San Pedro Valve Lots	PN-1	N/A
CS/SA Transmission	PN-2	N/A
HTWTP Long-Term	PN-3	N/A
Lower Crystal Springs Dam	PN-4	N/A
Pulgas Balancing Reservoir	PN-5	N/A

The Baden Valve Lot (under PN-1) and the CS/SA Transmission (PN-2), HTWTP Long-Term (PN-3), Lower Crystal Springs Dam (PN-4), and Pulgas Balancing Reservoir (PN-5) projects are not located within a 100-year floodplain. FEMA maps do not cover Daly City, where the San Pedro Valve Lot (under PN-1) is located. However, none of these sites is near a surface water feature and would not likely be subject to flooding. Therefore, flooding impacts would *not apply* to projects in this region.

San Francisco Region

Impact 4.5-4: Flooding and water quality impacts associated with impeding or redirecting flood flows		
SAPL 3 Installation	SF-1	N/A
Groundwater Projects	SF-2	PSM
Recycled Water Projects	SF-3	N/A

San Francisco is not presently mapped by FEMA, but localized flooding does occur during periods of intense precipitation, especially in low-lying areas where storm drains become clogged with debris. Because major flooding would not be expected in San Francisco, flooding impacts are not applicable to San Francisco Region projects within San Francisco. In addition, FEMA has not produced flood maps for Daly City, where the southern portion of the SAPL 3 Installation project (SF-1) would be located. Therefore, impacts related to the diversion of flood flows or contribution of sediment or contaminants to flood flows during construction would *not apply* to the SAPL 3 Installation which is located in San Francisco and Daly City and Recycled Water Projects (SF-3) which is located in San Francisco.

Some facilities under the Groundwater Projects (SF-2) would be constructed in San Mateo County, but their locations have not been determined. These facilities would be designed so they do not substantially impede flood flows, but if the facilities were constructed in a flood zone, impacts related to flooding would be *potentially significant* for these facilities, because construction activities could contribute sediment or contaminants to flood flows. However, incorporation and implementation of flood flow protection measures (Measure 4.5-4a) in the SWPPP prepared for this project would reduce this impact to a less-than-significant level.

Operational Impacts

Impact 4.5-5: Degradation of water quality and increased flows due to discharges to surface water during operation.

Various facilities would require the discharge of treated water to local surface waters during operation of proposed improvements, resulting in potential impacts related to water quality, aquatic organisms, and/or downstream flooding. Chemicals present in treated (chlorinated or chloraminated) water could affect aquatic organisms, as could temperature differences between the discharge and receiving waters. In addition, depending on the volume, timing, and location of the discharge, discharges could result in increased flows and related increases in erosion in surface waters and downstream flooding. Nutrients present in recycled water or treated stormwater could also cause eutrophication[3] of Lake Merced. The potential water quality effects, the types of discharges that would occur from each facility type, and the expected operational discharges within each region are described below.

[3] Eutrophication is the over-enrichment of a water body with nutrients, resulting in the excessive growth of organisms and depletion of dissolved oxygen.

Water Quality Effects of Discharges

Toxicity Effects. While both chlorine and chloramine are effective disinfectants for potable water, the discharge of chlorinated and chloraminated water into natural waters can be detrimental due to the toxicity of chlorine, ammonia, and chloramine to aquatic organisms. Chlorine residuals (both free and combined) are acutely toxic to aquatic organisms at low concentrations and are persistent due to their stability. The San Francisco Bay Basin Plan standard for residual chlorine is 0.0 milligrams per liter and the Central Valley Region General Order for Dewatering and Other Low Threat Discharges to Surface Waters standard for residual chlorine is 0.02 milligrams per liter; thus, dechlorination of any discharges would be required in order to remove all residual chlorine prior to discharge to surface waters, and to assure compliance with RWQCB requirements. There would be a potential for discharges of chlorinated water during operation of WSIP projects located downstream of chlorination (Tesla Disinfection Facility) and chloramination (Alameda Disinfection Facility) processes in the regional system.

Ammonia, which is contained in chloraminated water, exists in two forms in water: un-ionized and ionized. The un-ionized form of ammonia is toxic, while the ionized form is relatively harmless. In the temperature and pH range of natural waters, ammonia exists predominately in its nontoxic form. In general, ammonia in chloraminated discharges would be diluted or degraded to a nontoxic form fairly rapidly. Therefore, the potential for ammonia toxicity as a result of chloraminated water discharges would be less than significant.

Chloramine is regulated in the Basin Plan as a form of chlorine. Like chlorine and ammonia, chloramine is toxic to aquatic life due to its reactive nature. In general, removal of the chlorine portion of chloramine is required to eliminate toxicity before water is discharged to surface waters. Dechlorination of discharges would therefore reduce potential impacts on surface water quality and aquatic organisms to a less-than-significant level.

Temperature Effects. The sensitivity of aquatic organisms to water temperature depends on numerous factors, including the species, the stage in its life cycle, and the surrounding conditions. In particular, discharges to surface waters during the dry, summer months can result in thermal shock to aquatic organisms when a large volume of cool water enters a natural stream with relatively warm water.

Eutrophication. Increased aquatic plant growth (such as an increase in algae), known as eutrophication, can result from the addition of nutrients to a water body. Although algal blooms usually pose no direct health effects for humans, some species of algae flourish in highly eutrophic waters and can develop noxious blooms that cause offensive tastes and odors. Excessive algal growth may also deplete dissolved oxygen and cause toxic conditions for fish.

Erosional and Flooding Effects. Depending on such factors as the location, timing, and volume, discharges could result in erosional effects on surface water bodies and increase the potential for downstream flooding. Effects could include scouring of banks or vegetation, particularly in smaller creeks. In general, the larger watercourses and static water bodies would be less sensitive to discharges. Sites with stabilized banks and channels would also be less sensitive than natural banks and channels. Where large volumes of water would be discharged to creeks, the installation of energy dissipation structures and stream bank improvements would minimize scouring, and flows would be regulated to prevent downstream flooding. Energy dissipation structures could be permanently placed in the stream channel, or could be temporarily placed when dewatering occurs.

For any discharge facilities affecting areas immediately adjacent to or within creeks and rivers, permits would likely be required from the Corps, CDFG, and RWQCB; and, depending on the location, consultation/approval with the U.S. Fish and Wildlife Service and/or National Marine Fisheries Service could be necessary if sensitive species or habitat would be affected. If required, permits would include provisions for energy dissipation of discharges and regulation of discharge rates to prevent downstream flooding.

General Discussion of Discharges During Operation

Water Treatment Facilities. During operation, water treatment facilities would be expected to require miscellaneous discharges related to maintenance or emergencies at the facility. These discharges would be dechlorinated or dechloraminated and would occur at a rate that would not cause erosion or downstream flooding. Within the jurisdiction of the San Francisco Bay RWQCB, these discharges would be subject to the Regionwide General NPDES Permit for Discharges from Surface Water Treatment Facilities for Potable Supply, and within the jurisdiction of the Central Valley RWQCB, these discharges would be subject to the General Order for Dewatering and Other Low Threat Discharges to Surface Waters. These permits (described in the Setting) would include provisions to protect water quality and aquatic organisms.

Crossover Facilities and Pipelines. Crossover facilities consist of valves and related equipment that enable operators to isolate and shut down discrete segments of pipelines along the regional system, either for maintenance or emergencies. In either event, shutting down a segment of pipeline could require draining that portion of the pipeline to a local surface water body. This discharge could be treated or raw water of various volumes. Discharges from crossover facilities and pipelines could result in toxicity, temperature, and erosional effects; however, as described above, discharges would be dechlorinated or dechloraminated and would occur at a rate that would not cause erosion or downstream flooding.

In areas under jurisdiction of the Central Valley RWQCB, these discharges could possibly be discharged to surface water under the General Order for Dewatering and Other Low Threat Discharges to Surface Waters, although in all regions, an individual NPDES permit, or waiver, might be required. In agricultural areas or other areas where the water would be discharged to land, the discharges could possibly be made under the Statewide General Waste Discharge Requirements for Discharges to Land with Low Threat to Water Quality, although individual waste discharge requirements, or a waiver, could be required. If discharges were made to lands not owned, controlled, or leased by the CCSF, the CCSF would enter into agreements with landowners for the discharge. Compliance with Corps and CDFG requirements could also be required for these discharges. Permit requirements for any discharges to surface water bodies would include provisions to protect water quality and aquatic organisms.

For projects located in San Francisco, the construction contractor(s) would obtain approval from the SFPUC and comply with all permit requirements for the discharge of treated water to the combined sewer system, subject to the provisions of Article 4.1 of the San Francisco Public Works Code.

Other Facilities. Routine and non-routine discharges of treated water from tunnels, vaults, valve lots, and pump stations would not be required during operation of these facilities.

Use of Recycled Water for Irrigation. The SFPUC would produce and distribute recycled water in San Francisco in compliance with the RWQCB General Water Reuse Order described in the Setting. All recycled water for irrigation purposes would be treated to disinfected tertiary standards specified in Title 22 of the California Code of Regulations, and recycled water would be applied in a manner that is protective of surface and groundwater quality. In addition, the recycled water "users" would comply with San Francisco's Reclaimed Water Ordinance and would be required to obtain a reclaimed water use certificate from the SFPUC in accordance with the ordinance (also described in the Setting). Adherence to these regulatory requirements would ensure that high-quality recycled water is consistently produced, monitored, and carefully applied, and that public health and surface and groundwater quality are protected.

Because recycled water typically has elevated levels of salts (as measured by total dissolved solids, or TDS), the infiltration of recycled water used in irrigation could cause salts to accumulate in the groundwater. However, the potential for salt buildup would be low in San Francisco, since the recycled water would be derived from high-quality SFPUC system water originating primarily from Hetch Hetchy Reservoir. Because SFPUC system water (which is the source of the recycled wastewater) is naturally very low in TDS, the recycled water is also expected to be low in TDS. The RWQCB may determine that irrigation with recycled water could result in salt buildup in the groundwater and may require preparation of a salt management plan in accordance with the General Water Reuse Order.

Lake Augmentation. Augmentation of water levels in Lake Merced using SFPUC system water, recycled water, or treated stormwater could potentially degrade Lake Merced water quality as well as groundwater quality in the shallow groundwater aquifer (the relationship of Lake Merced and the shallow groundwater aquifer is discussed in Section 5.6). Mechanisms that could affect water quality include: eutrophication of surface water resulting from the addition of nutrients in recycled water or stormwater; introduction of chlorine or chloramines in SFPUC system water or recycled water to surface or groundwater, resulting in the toxicity effects noted above; and degradation of surface or groundwater quality by contaminants that could be present in stormwater.

Degradation of Lake Merced water quality could affect the lake's beneficial uses, including cold and warm freshwater habitat, wildlife habitat, fish spawning, and recreational purposes as well as its potential use as an emergency water supply. Degradation of groundwater quality could affect use of the North Westside Groundwater Basin (described in Section 5.6) as a municipal water supply. However, use of any water to augment Lake Merced water levels would be subject to an NPDES permit, which would establish water quality goals and criteria that are protective of the lake's beneficial uses.

Watershed Management Plan Actions

In addition, WSIP projects in the Sunol Valley Region would be located within the Alameda watershed (and subject to the Alameda WMP), while some of the WSIP projects in the Peninsula Region would be located within the Peninsula watershed (and subject to the Peninsula WMP). Since these WSIP projects would be required to follow all pertinent watershed management plan policies and actions, this analysis assumes the following action pertaining to the dechlorination of water prior to discharge would be implemented as part of the WSIP projects.

- *Action fis6*. Identify and adopt alternative nontoxic management practices for the protection of aquatic resources in coordination with the Integrated Pest Management program. Guidelines include:
  - Minimize the use of copper sulfate in the treatment of algal blooms in reservoirs
  - Dechlorinate water before it is discharged to streams and reservoirs
  - Limit the use of chemical fire retardants and Class A foams (except protein-based foams) in or near aquatic zones

San Joaquin Region

Impact 4.5-5: Degradation of water quality and increased flows due to discharges to surface water during operation		
Advanced Disinfection	SJ-1	N/A
Lawrence Livermore	SJ-2	N/A
SJPL System	SJ-3	LS
SJPL Rehabilitation	SJ-4	N/A
Tesla Portal Disinfection	SJ-5	N/A

Operation of the SJPL System project (SJ-3) could result in minor discharges of raw water from the crossover facilities for pipeline maintenance or repairs. However, water quality impacts related to these discharges during operation would be *less than significant* with implementation of control measures in compliance with NPDES permit or waste discharge requirements and the requirements of other regulatory agencies, as described above.

No new discharges would be expected during operation of the Advanced Disinfection (SJ-1), SJPL Rehabilitation (SJ-4), and Tesla Portal Disinfection (SJ-5) projects, and discharges would not be expected during operation of the Lawrence Livermore project (SJ-2). Therefore, this impact would *not apply* to these projects.

Sunol Valley Region

Impact 4.5-5: Degradation of water quality and increased flows due to discharges to surface water during operation		
Alameda Creek Fishery	SV-1	N/A
Calaveras Dam	SV-2	N/A
40-mgd Treated Water	SV-3	LS
New Irvington Tunnel	SV-4	N/A
Treated Water Reservoirs	SV-5	LS
SABUP	SV-6	LS

The 40-mgd Treated Water (SV-3) and Treated Water Reservoirs (SV-5) projects at the Sunol Valley WTP would not likely result in new discharges of chloraminated water during operation, although intermittent discharges could be required for maintenance. Water quality impacts related to these intermittent discharges would be *less than significant* with implementation of control measures in compliance with the Regionwide General NPDES Permit for Discharges from Surface Water Treatment Facilities for Potable Supply.

Under the SABUP project (SV-6), chloraminated water would be dechlorinated using the existing dechlorination train and discharged to San Antonio Creek using the San Antonio Pipeline. Under this project, new discharge facilities consisting of a cone valve and stilling basin would be installed as energy dissipation devices to reduce erosion in San Antonio Creek, and the creekbeds at the discharge point would be armored to prevent scouring. Vent overflows from the Alameda East Portal would also be discharged to Alameda Creek and would be dechlorinated using the existing chlorination trains. An energy dissipation structure and creekbed armoring would be installed at the point of discharge to prevent erosion of Alameda Creek. Water quality impacts related to these discharges would be *less than significant* with implementation of control measures in compliance with NPDES permit requirements and the requirements of other regulatory agencies, as described above.

The SFPUC would also implement Alameda WMP Action fis6, as described above, as it applies to discharges from the 40-mgd Treated Water (SV-3), Treated Water Reservoirs (SV-5), and SABUP (SV-6) projects.

No discharges of treated water would be expected during operation of the remaining Sunol Valley Region projects (Alameda Creek Fishery, SV-1; Calaveras Dam SV-2; and New Irvington Tunnel, SV-4). Therefore, this impact would *not apply* to these projects.

Bay Division Region

Impact 4.5-5: Degradation of water quality and increased flows due to discharges to surface water during operation		
BDPL Reliability Upgrade	BD-1	LS
BDPL 3 and 4 Crossovers	BD-2	LS
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	N/A

Infrequent discharges of chloraminated water would be required for maintenance during operation of the BDPL Reliability Upgrade (BD-1) and BDPL 3 and 4 Crossovers (BD-2) projects. However, water quality impacts related to these discharges would be *less than significant* with implementation of control measures in compliance with NPDES permit requirements and the requirements of other regulatory agencies, as described above.

No discharges of treated water would be associated with operation the BDPL 3 and 4 Seismic Upgrade at Hayward Fault project (BD-3). Therefore, this impact would *not apply* to this project.

Peninsula Region

Impact 4.5-5: Degradation of water quality and increased flows due to discharges to surface water during operation		
Baden and San Pedro Valve Lots	PN-1	N/A
CS/SA Transmission	PN-2	LS
HTWTP Long-Term	PN-3	LS
Lower Crystal Springs Dam	PN-4	N/A
Pulgas Balancing Reservoir	PN-5	LS

The HTWTP Long-Term project (PN-3) would not likely result in new discharges of chloraminated water during operation, although intermittent discharges could be required for maintenance. However, water quality impacts related to these discharges would be *less than significant* with implementation of control measures in compliance with the Regionwide General NPDES Permit for Discharges from Surface Water Treatment Facilities for Potable Supply.

Current discharges of treated water at Pulgas Balancing Reservoir occur in accordance with a permit from the RWQCB, and these discharges would continue following implementation of proposed improvements at this reservoir under PN-5. These discharges flow down an unnamed drainage south of the Pulgas Water Temple public parking lot and eventually flow to Upper Crystal Springs Reservoir. Proposed improvements under the Pulgas Balancing Reservoir project would include modifications to the dechlorination system so that treated discharges would be reliably dechlorinated prior to flowing to Crystal Springs Reservoir. With construction of these improvements and implementation of control measures in compliance with NPDES and other agency permitting requirements, water quality impacts associated with this discharge would be *less than significant*. Operational discharges of treated water could also occur as a result of construction of the CS/SA Transmission project (PN-2); however, water quality impacts associated with these discharges would be *less than significant* with compliance with NPDES discharge requirements and the requirements of other regulatory agencies, as described above. The SFPUC would also implement Peninsula WMP Action fis6 as it applies to these discharges.

The Baden and San Pedro Valve Lots (PN-1) and Lower Crystal Springs Dam (PN-4) projects would not result in discharges of treated water during operation. Therefore, this impact would *not apply* to these projects.

San Francisco Region

Impact 4.5-5: Degradation of water quality and increased flows due to discharges to surface water during operation		
SAPL 3 Installation	SF-1	N/A
Groundwater Projects	SF-2	PSM
Recycled Water Projects	SF-3	LS

Augmentation of Lake Merced. Under the Local Groundwater Projects (SF-2), SFPUC system water, treated stormwater, or recycled water would be added to Lake Merced to augment lake levels (restoration of lake levels and potential effects on groundwater resources are discussed in Section 5.6). If recycled water were used, it would be produced under the Recycled Water Projects (SF-3). Addition of SFPUC system water, treated stormwater, or recycled water could degrade water quality in Lake Merced, potentially causing eutrophication or otherwise affecting beneficial uses of the lake. Degradation of shallow groundwater quality could also occur, because the lake recharges the shallow groundwater system, as discussed in Section 5.6.

Although water added to Lake Merced to maintain water levels would be dechlorinated to meet Basin Plan standards and would be conducted under an NPDES permit from the RWQCB, studies in support of the Recycled Water Projects (SF-3) have shown that it may also be necessary to remove nutrients from the recycled water to avoid eutrophication of Lake Merced (RMC, 2006). Because advanced treatment is proposed under the Recycled Water Projects, impacts related to eutrophication of Lake Merced would be less than significant if recycled water were used to augment water levels. However, because of the potential for nutrients in treated stormwater, eutrophication could occur if stormwater were used to augment Lake Merced water levels.

Eutrophication would result in an increase algal growth in the lake, potentially lowering dissolved oxygen levels in the lake and affecting aquatic organisms.

The use of treated stormwater for groundwater recharge could affect groundwater quality if the bacterial standards for the source water were less stringent than those for drinking water. Therefore, water quality impacts related to the addition of treated stormwater to Lake Merced are considered *potentially significant* for the Groundwater Projects (SF-2), but would be reduced to a less-than-significant level with treatment to remove nutrients from stormwater and implementation of groundwater monitoring in the vicinity of Lake Merced (specified in Measure 4.5-5). Requirements for treatment are determined on a case-by-case basis and would be identified during separate, project-level CEQA review for the Local Groundwater Projects.

Ocean Outfall Discharges. If it became necessary to implement advanced tertiary treatment of wastewater under the Recycled Water Projects (SF-3) to avoid adverse water quality effects of recycled water use in Lake Merced, the treatment process could require discharges of reverse-osmosis concentrate, likely through the ocean outfall. Discharges from this outfall are regulated under the City of San Francisco's NPDES permit for the Oceanside Water Pollution Control Plant, and this permit would be modified as necessary to cover discharges of reverse-osmosis concentrate. With implementation of control measures in compliance with NPDES permitting requirements, water quality impacts related to this discharge would be *less than significant*.

Discharges to Surface Waters or Sewer Systems. Incidental discharges of chlorinated water to surface waters, a separate storm sewer system, or the combined sewer system could be required for maintenance purposes during operation of the Recycled Water Projects (SF-3). However, if any treated water were discharged directly to surface water or a separate storm sewer system as part of project operations, these discharges would need to comply with NPDES permit requirements and the requirements of other regulatory agencies, as described above. Discharges to the combined sewer system would need to comply with Article 4.1 of the San Francisco Public Works Code. With implementation of control measures in compliance with these regulatory requirements, water quality impacts associated with these maintenance discharges to surface water, the combined sewer, or a separate storm sewer system would be *less than significant*.

Irrigation Uses of Recycled Water. The Recycled Water Projects (SF-3) would include development of projects to provide recycled water treated to a disinfected tertiary level for irrigation at Golden Gate Park, Lincoln Park, Lincoln Park Golf Course, San Francisco Zoo, Sunset Boulevard medians, and San Francisco State University. The potential for the accumulation of salts in the groundwater would be low in San Francisco, because the recycled water would be derived from high-quality SFPUC system water originating primarily from the Hetch Hetchy Reservoir, which is naturally very low in TDS. Regardless, a salt management plan would be prepared in accordance with the General Water Reuse Order if the recycled water user or RWQCB determines that irrigation with recycled water could result in salt buildup in the groundwater. With implementation of this plan in accordance with RWQCB regulatory requirements, if needed, groundwater quality impacts related to the use of recycled water for irrigation under the Recycled Water projects would be *less than significant*. However, this program-level review would be further refined as part of the separate, project-level CEQA review for the Recycled Water Projects, which could result in a change in the significance determination.

The SAPL 3 Installation project (SF-1) would not require discharges of treated water. Therefore, this impact would be *not apply* to this project.

Impact 4.5-6: Degradation of water quality, including offsite erosion and flooding, as a result of alteration of drainage patterns or an increase in impervious surfaces.

Construction of the WSIP facilities could alter drainage patterns and would result in a minor increase in impervious surfaces associated with new structures and paved areas, potentially resulting in offsite erosion or flooding. Although the amount of impervious surfaces that would be added is negligible compared to the existing acreage of impervious surfaces throughout the program area, the WSIP's addition of impervious surfaces could result in an incremental increase in surface runoff and related stormwater pollutants.

However, implementation of SFPUC Construction Measure #10 (project site) would require the SFPUC or its contractor(s) to return project sites to the general condition that existed prior to construction, including regrading the site and revegetating disturbed areas, which would ensure that drainage patterns are not altered in a way that would cause offsite flooding, erosion, or sedimentation. In addition, projects in all regions would be required to implement permanent erosion control measures in accordance with SFPUC Construction Measure #3 (onsite air and water quality measures during construction) and to implement control measures in compliance with applicable water quality regulations, including Article 4.1 of the San Francisco Public Works Code for projects in San Francisco and NPDES stormwater permitting requirements for other projects. In accordance with these requirements, projects would incorporate BMPs for temporary and permanent erosion control and incorporate stormwater control measures to reduce the quantity and rate of stormwater runoff and related erosion and flooding effects, as well as the potential for pollutants in stormwater.

Tunnels and Pipelines. Where a pipeline is located in a public right-of-way, construction could result in the replacement of asphalt or other impervious surfaces. However, the replacement of paved surfaces within a public right-of-way is generally exempted from municipal stormwater permitting requirements related to impervious surfaces. Additionally, the installation of pipelines in unpaved areas and the construction of tunnels would generally not result in the creation or replacement of impervious surfaces, because these facilities are underground and would not be paved. Therefore, there would be no water quality impacts associated with increased impervious surfaces for tunnel and pipeline projects, unless new impervious surfaces would be constructed.

Installation of pipelines and tunnels in unpaved areas would not alter drainage patterns in a way that results in offsite flooding, erosion, or sedimentation because, in accordance with SFPUC Construction Measure #10 (project site), the contractor(s) would be required to return the project site to the general condition that existed prior to construction, including regrading the site and revegetating disturbed areas. These projects would also be required to implement BMPs for temporary and permanent erosion control in accordance with SFPUC Construction Measure #3 (onsite air and water quality measures during construction), Article 4.1 of the San Francisco Public Works Code for projects in San Francisco, and NPDES construction stormwater permitting requirements for other projects.

Other Projects. With the exception of San Francisco and San Joaquin County, the municipal stormwater permits for the counties within the WSIP study area require new development and redevelopment projects that involve the creation or replacement of impervious surfaces to incorporate treatment measures and other appropriate source control and site design features to reduce the pollutant load in stormwater discharges and to manage runoff flows; the applicability of countywide MS4 stormwater management controls to the WSIP will be determined on a project-by-project basis as part of project-level review of individual WSIP projects. In each county, projects subject to these controls that involve the creation or replacement of one or more acres of impervious surfaces were required to comply with the new development and redevelopment requirements as of February 15, 2005. Projects subject to countywide MS4 stormwater management controls that involve the creation or replacement of 10,000 square feet or more of impervious surfaces were required to comply with the requirements by August 15, 2006. These thresholds apply to individual projects and are not applied to a cumulative set of projects if the locations of the cumulative set of projects under a single program are noncontiguous and/or are not part of a single common plan of development. To the extent that projects subject to countywide MS4 stormwater management controls are part of a single common plan of development that cumulatively exceeds 10,000 square feet of new or replaced impervious surface, the smaller amount of impervious surface from each sub-project would require appropriately sized stormwater treatment BMPs.

In addition, projects subject to countywide MS4 stormwater management controls that involve land disturbance of more than one acre would be required to include post-construction erosion and sediment control BMPs in the SWPPP prepared for the project (Described in the Setting and in Impact 4.5-1). For projects subject to countywide MS4 stormwater management controls, the post-construction erosion and sediment control BMPs for projects located in Alameda, Santa Clara, and San Mateo Counties and creating or replacing more than one acre of impervious surface must also comply with requirements in the Hydrograph Modification Management Plans for those counties. Post-construction BMPs could include minimizing land disturbance or the amount of impervious surfaces; treating stormwater runoff using infiltration, detention/retention, or biofilters; using efficient irrigation systems; ensuring that interior drains are not connected to a storm sewer system; and using appropriately designed and constructed energy dissipation devices. These measures would be designed to ensure that drainage patterns are not changed in a way that results in offsite erosion or flooding, and must be consistent with all local post-construction stormwater management requirements, policies, and guidelines. Coverage under the General Construction Permit cannot be terminated until the site is in compliance with all local stormwater management requirements and a post-construction stormwater management plan is in place, as described in the SWPPP.

Projects located in San Francisco would not be subject to the new development and redevelopment guidelines described above because stormwater discharges to the combined sewer system are regulated under the City's NPDES permit, in conformance with the Combined Sewer Overflow Control Policy. However, an increase in impervious surfaces could result in an incremental increase in the number or volume of combined sewer discharges. Projects located in San Joaquin County would not be regulated under a municipal stormwater permit.

Alameda and Peninsula Watershed Plans Actions. WSIP projects located in the Alameda and Peninsula watersheds would also be required to implement the following watershed management plan action pertaining to onsite stormwater collection and drainage systems:

- *Action sto1*. Assess the onsite stormwater collection and drainage systems at SFPUC facilities, Sunol Water Temple, applicable East Bay Regional Park District facilities, the Sunol Valley Golf Course, quarries, and nurseries for adequate sizing and erosion. Remediate where necessary by establishing preventive maintenance programs, infiltration drainfields and trenches, or wet and dry detention basins to optimize the quality of stormwater which flows into reservoirs and tributaries.

San Joaquin Region

Impact 4.5-6: Degradation of water quality as a result of alteration of drainage patterns or an increase in impervious surfaces		
Advanced Disinfection	SJ-1	LS
Lawrence Livermore	SJ-2	PSM
SJPL System	SJ-3	LS
SJPL Rehabilitation	SJ-4	LS
Tesla Portal Disinfection	SJ-5	LS

The Advanced Disinfection (SJ-1) and Tesla Portal Disinfection (SJ-5) projects would include construction of new disinfection facilities, most likely at Tesla Portal, and could involve the creation or replacement of impervious surfaces. Construction of two crossover facilities under the SJPL System project (SJ-3) would also create new impervious surfaces. These facilities would not be covered by a municipal stormwater permit. However, the construction contractor(s) would be required to comply with SFPUC Construction Measure #10 (project site); post-construction stormwater controls would be implemented and maintained, as specified in the SWPPP; and a post-construction stormwater management plan would be prepared for these projects. With implementation of SFPUC Construction Measure #10 (project site) and implementation of control measures in compliance with these legal requirements, impacts related to increases in surface runoff, stormwater pollutants, and the potential for offsite erosion and flooding would be *less than significant* for these projects.

The Lawrence Livermore project (SJ-2) would construct a new disinfection facility, most likely at Thomas Shaft, and would create new impervious surfaces. If this project involved less than one acre of land disturbance, it would not be covered by the General Construction Stormwater Permit. Therefore, NPDES permitting requirements would not apply, and impacts related to increases in surface runoff and stormwater pollutants as well as the potential for offsite erosion and flooding would be *potentially significant*, but would be reduced to a less-than-significant level with implementation of SFPUC Construction Measure #10 (project site) and implementation of appropriate source control and site design measures (Measure 4.5-6).

The SJPL Rehabilitation project (SJ-4) would involve rehabilitation of pipelines in a public right-of-way and would not result in the creation of new impervious surfaces. Although ground disturbance would occur, impacts related to the potential to alter drainage patterns would be *less than significant* with implementation of SFPUC Construction Measure #10 (project site) and post-construction erosion and sediment control BMPs required by NPDES regulations.

Sunol Valley Region

Impact 4.5-6: Degradation of water quality as a result of alteration of drainage patterns or an increase in impervious surfaces		
Alameda Creek Fishery	SV-1	LS
Calaveras Dam	SV-2	LS
40-mgd Treated Water	SV-3	LS
New Irvington Tunnel	SV-4	LS
Treated Water Reservoirs	SV-5	LS
SABUP	SV-6	LS

The Alameda Creek Fishery project (SV-1) could include the construction of a pump house, which would create new impervious surfaces. The 40-mgd Treated Water (SV-3) and Treated Water Reservoirs (SV-5) projects would include improvements to the Sunol Valley WTP to provide new and upgraded water treatment facilities and increased treated water storage and would therefore result in the creation or replacement of impervious surfaces. Construction of new tunnel portals for the New Irvington Tunnel project (SV-4) would involve the creation or replacement of impervious surfaces, and the Calaveras Dam project (SV-2) would involve construction of new access roads, which would create new impervious surfaces. Each of these projects would also include ground disturbance activities with the potential to alter drainage patterns, including excavation of the proposed borrow and disposal areas the under the Calaveras Dam project; this project would also inundate a portion of Alameda Creek downstream of the dam.

However, impacts related to increased surface runoff and stormwater pollutants, as well as the potential for offsite erosion and flooding resulting from alteration of drainage patterns, would be *less than significant* with implementation of SFPUC Construction Measure #10 (project site) and implementation of control measures in compliance with stormwater permitting requirements. Stormwater control measures to achieve compliance with permitting requirements would be specified in the SWPPP and the post-construction stormwater management plan prepared for these projects. These projects would also implement Alameda WMP Action sto1 regarding stormwater collection systems, as described above. Inundation of a portion of Alameda Creek due to construction of the Calaveras Dam project (SV-2) would not result in offsite flooding, erosion, or sedimentation because releases from the dam would be controlled to prevent these effects.

The SABUP project (SV-6) would not involve the creation or replacement of impervious surfaces. Although ground disturbance would occur, impacts related to the potential to alter drainage patterns would be *less than significant* with implementation of SFPUC Construction Measure #10 (project site) and post-construction erosion and sediment control BMPs required by NPDES regulations.

Bay Division Region

Impact 4.5-6: Degradation of water quality as a result of alteration of drainage patterns or an increase in impervious surfaces		
BDPL Reliability Upgrade	BD-1	LS
BDPL 3 and 4 Crossovers	BD-2	LS
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	LS

The BDPL Reliability Upgrade (BD-1), BDPL 3 and 4 Crossovers (BD-2), and BDPL 3 and 4 Seismic Upgrade at Hayward Fault (BD-3) projects would include construction of new vaults, shafts, and other structures, which would result in a small increase in impervious surfaces. Depending on the alternative selected, the BDPL 3 and 4 Seismic Upgrade at Hayward Fault project could construct up to 128,000 square feet of impervious surface. Impacts related to increased surface runoff and stormwater pollutants, as well as the potential for erosion and flooding resulting from alteration of drainage patterns, would be *less than significant* with implementation of SFPUC Construction Measure #10 (project site) and implementation of control measures in compliance with stormwater permitting requirements. Stormwater control measures to achieve compliance with permitting requirements would be specified in the SWPPP and post-construction stormwater management plan prepared for these projects.

Peninsula Region

Impact 4.5-6:	**Degradation of water quality as a result of alteration of drainage patterns or an increase in impervious surfaces**	
Baden and San Pedro Valve Lots	PN-1	LS
CS/SA Transmission	PN-2	LS
HTWTP Long-Term	PN-3	LS
Lower Crystal Springs Dam	PN-4	LS
Pulgas Balancing Reservoir	PN-5	LS

Impervious surfaces could be created or replaced under the Baden and San Pedro Valve Lots (PN-1), CS/SA Transmission (PN-2), HTWTP Long-Term (PN-3), Lower Crystal Springs Dam (PN-4), and Pulgas Balancing Reservoir (PN-5) projects. Impacts related to increased surface runoff and stormwater pollutants, as well as the potential for offsite erosion and flooding due to the alteration of drainage patterns, would be *less than significant* with implementation of SFPUC Construction Measure #10 (project site) and implementation of control measures in compliance with stormwater permitting requirements. Stormwater controls to achieve compliance with permitting requirements would be specified in the SWPPP and post-construction stormwater management plan prepared for these projects. The CS/SA Transmission (PN-2), Lower Crystal Springs Dam (PN-4), and Pulgas Balancing Reservoir (PN-5) projects and those portions of the Baden and San Pedro Valve Lots project within the Peninsula watershed would also be required to implement Peninsula WMP Action sto1, as described above.

San Francisco Region

Impact 4.5-6:	**Degradation of water quality as a result of alteration of drainage patterns or an increase in impervious surfaces**	
SAPL 3 Installation	SF-1	LS
Groundwater Projects	SF-2	LS
Recycled Water Projects	SF-3	LS

Impervious surfaces associated with San Francisco Region projects could increase stormwater flows to the combined sewer system, with an associated potential increase in the volume or frequency of combined sewer discharges. However, none of the projects within San Francisco are expected to increase stormwater flows or alter drainage patterns in a way that would result in offsite erosion or flooding, because these projects would replace existing impervious surfaces. If new impervious surfaces were created, the extent would be minimal and would not be expected to measurably affect the volume or frequency of combined sewer discharges. Furthermore, projects in San Francisco would be required to implement erosion control measures in accordance with SFPUC Construction Measure #3 (onsite air and water quality measures during construction) and Article 4.1 of the San Francisco Public Works Code.

Therefore, impacts related to the alteration of drainage patterns and an increase in stormwater flows due to increased impervious surfaces would be *less than significant* for all San Francisco Region projects located in San Francisco (portions of the SAPL 3 Installation, SF-1; portions of the Groundwater Projects, SF-2; and the Recycled Water Projects, SF-3).

The Regional Groundwater Projects (SF-2) constructed within San Mateo County could involve the creation or replacement of impervious surfaces. Impacts related to increased surface runoff and stormwater pollutants, as well as the potential for offsite erosion and flooding due to the alteration of drainage patterns, would be *less than significant* with implementation of SFPUC Construction Measure #10 (project site) and implementation of control measures in compliance with stormwater permitting requirements. Stormwater controls to achieve compliance with permitting requirements would be specified in the SWPPP and post-construction stormwater management plan prepared for this project.

The portions of SAPL 3 Installation (SF-1) located in San Mateo County would include underground pipeline construction, either in unpaved areas or within a public right-of-way, and would not result in the creation of new impervious surfaces. Although ground disturbance would occur, impacts related to the potential to alter drainage patterns would be *less than significant* with implementation of SFPUC Construction Measure #10 (project site) and post-construction erosion and sediment control BMPs required by NPDES regulations.

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4.6 Biological Resources

4.6 Biological Resources

This section provides a program-level evaluation of the potential effects of constructing and operating the proposed WSIP facility improvement projects on terrestrial biological resources and aquatic resources. Chapter 5 deals separately with the effects of the proposed water supply and system operations, including effects on fisheries and other biological resources associated with the water supply sources.

This discussion of potential effects begins by providing a broad regional context and then focuses on those sensitive habitats and key special-status species that have the highest degree of ecological sensitivity and legal protection. "Key special-status species" include those that have been formally listed or designated under the California and Federal Endangered Species Acts or identified as having special sensitivity in the WSIP program area.[1] At the programmatic level, this PEIR describes the nature and magnitude of potential WSIP impacts on key special-status species and sensitive habitats and frames appropriate mitigation strategies where necessary. Separate, project-level CEQA review will be conducted as appropriate for the WSIP projects; this review will describe project impacts on the full range of biological resources more precisely and, where necessary, tailor the mitigation measures presented in Chapter 6 to site-specific project conditions.

4.6.1 Setting

For the purpose of this analysis, the WSIP study area has been defined as comprising the areas directly affected by proposed projects and their immediate surroundings. The WSIP projects would be within the San Joaquin and Bay Area Delta ecological regions, two of the 10 ecological regions identified in California as part of a program to conserve biodiversity.[2] The San Joaquin ecological region has the highest concentration of endangered plants and animals of the two ecological regions crossed by WSIP projects. However, this ecological region—originally a vast mosaic of marshes, lakes, rivers, and uplands—has been substantially altered — even the most common elements (such as perennial grasses) have been replaced by Mediterranean annuals. The Bay Area Delta ecological region, adjacent to the San Joaquin Valley at a zone of overlap in the distribution of Northern and Southern California plants and animals, is the second most important region.

1 Several species known or that may occur on or in the program area are accorded "key special status" because of their recognized rarity or vulnerability to various causes of habitat loss or population decline. Some of these species receive specific protection defined in federal or state endangered species legislation, but others have been designated as key special-status species on the basis of expertise of state resource agencies or other organizations.

2 In 1991, a Biodiversity Memorandum of Understanding was signed by major federal and state agencies, with the intent of promoting interagency cooperation in conserving biodiversity across administrative boundaries. As part of this conservation strategy, California was divided into 10 ecological regions that are defined mainly by physical features, such as soils, topography, and climate, and by the distribution patterns of plants and animals.

Vegetation mapping developed for the 2005 California Gap Analysis Project (GAP),[3] conducted by the US Geological Survey, was used to compile **Figure 4.6-1** for the WSIP study area (California Gap Analysis Project, 2007). Vegetation groupings are reported as Wildlife Habitat Relationship (WHR) types, or habitat types (Mayer and Laudenslayer, 1988). WHR types are more useful when evaluating plant and animal resources simultaneously.

The setting discussion for each region describes the WHR habitat types as well as the sensitive natural communities known to occur within the WSIP study area. A natural community is a subset of a habitat type, with more or less consistent plant species composition, structure, and physical conditions. Of the roughly 375 natural communities defined and described by Holland (1986), about 125 are considered "sensitive" by the California Natural Diversity Database (CNDDB) because of their rarity in California. Sensitive natural communities often support key special-status species and are therefore a useful filter for identifying sensitive biological resources at the program level of analysis. Separate, project-level CEQA review will present detailed discussions of sensitive natural communities based on further field investigation and more refined project descriptions for the WSIP projects.

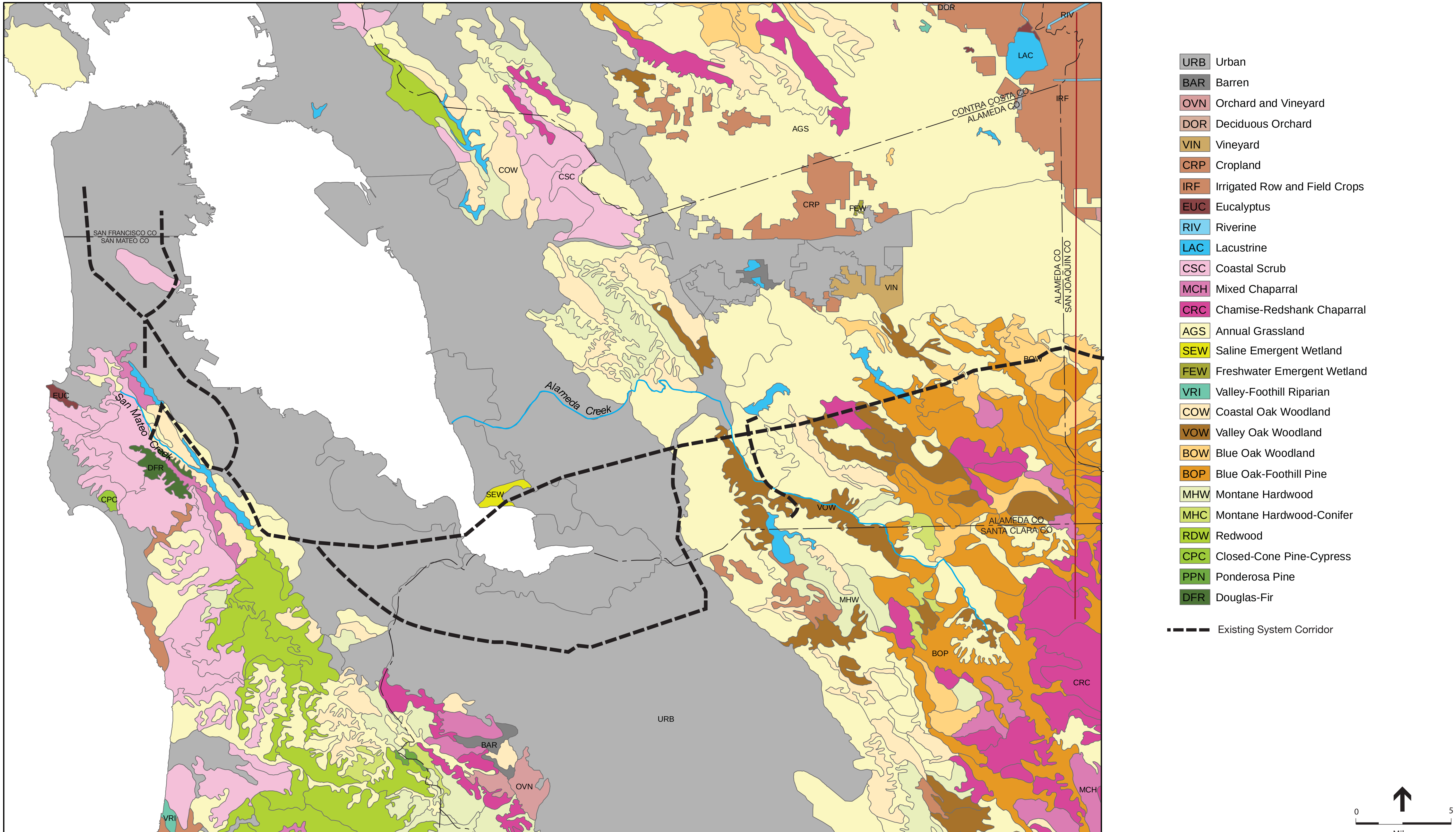
This setting discussion also identifies species considered to be key special-status species. In addition to state- and federally listed species, four other species have been included based on input from state resource agencies or other organizations. Western burrowing owl (*Athene cunicularia hypugaea*) is included in this analysis because it has been the subject of two recent listing petitions. Foothill yellow-legged frog (*Rana boylii*), a California species of special concern,[4] has been identified by the CDFG as a species deserving special attention in the Alameda Creek watershed. Finally, the Alameda Creek watershed's population of rainbow trout (*Oncorhynchus mykiss*) is also considered.[5] Because there are impassable barriers to fish migration in lower Alameda Creek, the National Marine Fisheries Service (NMFS) considers the population in Alameda Creek to be rainbow trout rather than steelhead (Federal Register, 2005a). In general, the key special-status species discussed in this analysis occupy sensitive habitats, and many are associated with other species of concern.[6] Together with the sensitive natural communities, key special-status species are used in this PEIR as indicators of the nature and extent of impacts on sensitive biological resources.

[3] GAP provides regional assessments of the conservation status of native vertebrate species and natural land cover types and facilitates the application of this information to land management activities. GAP is conducted as state-level projects and is coordinated by the U.S. Geological Survey Biological Resources Division.

[4] "California species of special concern" is a list of animal species maintained by the California Department of Fish and Game to identify animal species whose populations have declined in California and whose breeding populations are at risk of extirpation (local extinction) in California. Species on this list have no legal protection under the California Endangered Species Act.

[5] Rainbow trout and steelhead are the same species of trout (*Oncorhynchus mykiss*). Rainbow trout spend their whole life in freshwater; steelhead spend much of their life in the ocean but return to freshwater to spawn. Alameda Creek historically supported a run of steelhead, but impassable barriers have prevented steelhead from returning to spawn.

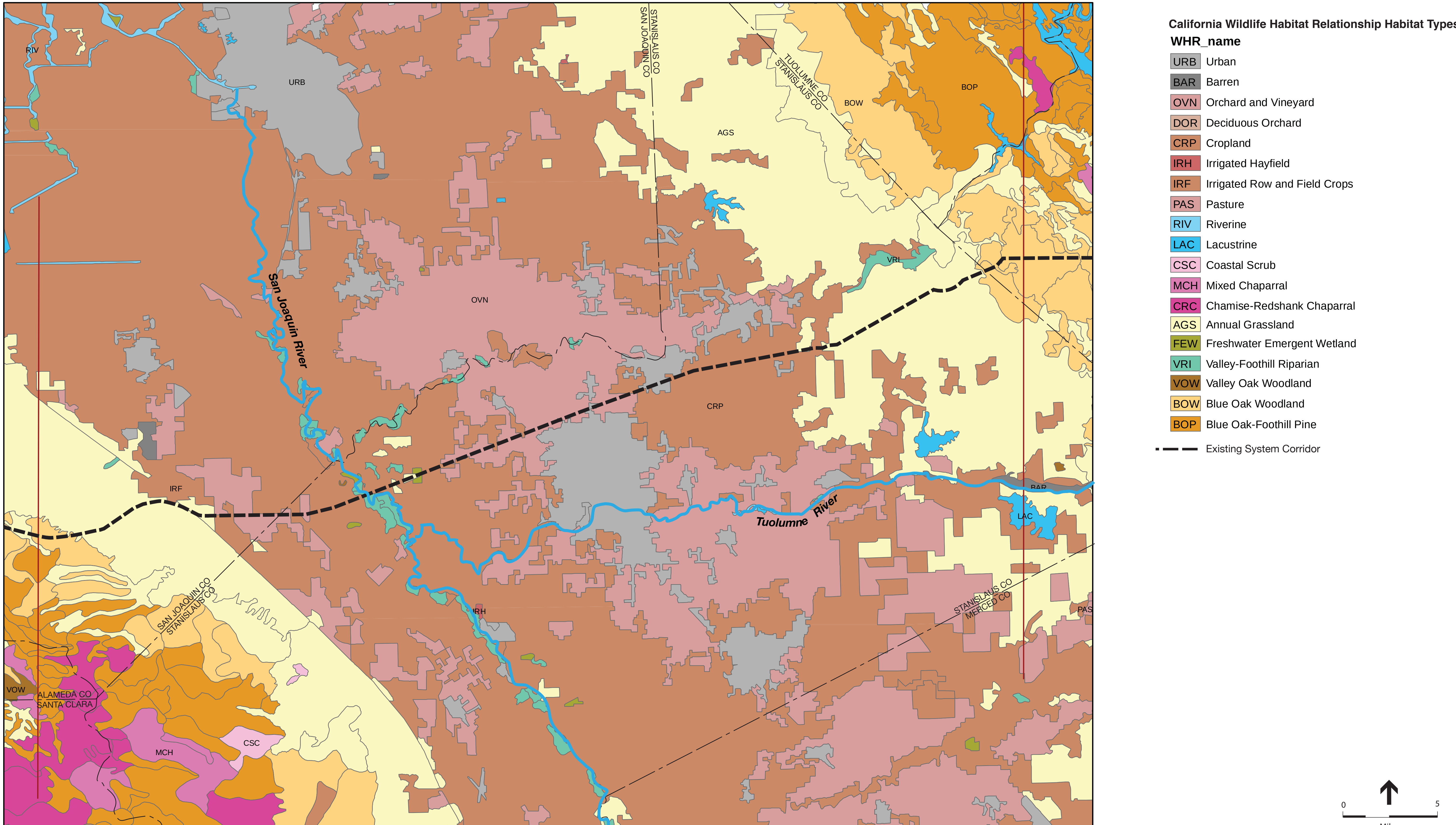
[6] "Other species of concern," defined in this PEIR as U.S. Fish and Wildlife Service (USFWS) candidate species, California Department of Fish and Game (CDFG) species of special concern, and California Native Plant Society (CNPS) List 1A, 1B, and List 2 species, are too numerous and site-specific to identify at the program level; however, most of these additional species are associated with the sensitive habitats addressed in this section. "Other species of concern" are evaluated in Chapter 5 for those WSIP elements that would not receive further CEQA analysis.



SOURCE: California Gap Analysis Project, 2005

SFPUC Water System Improvement Program . 203287

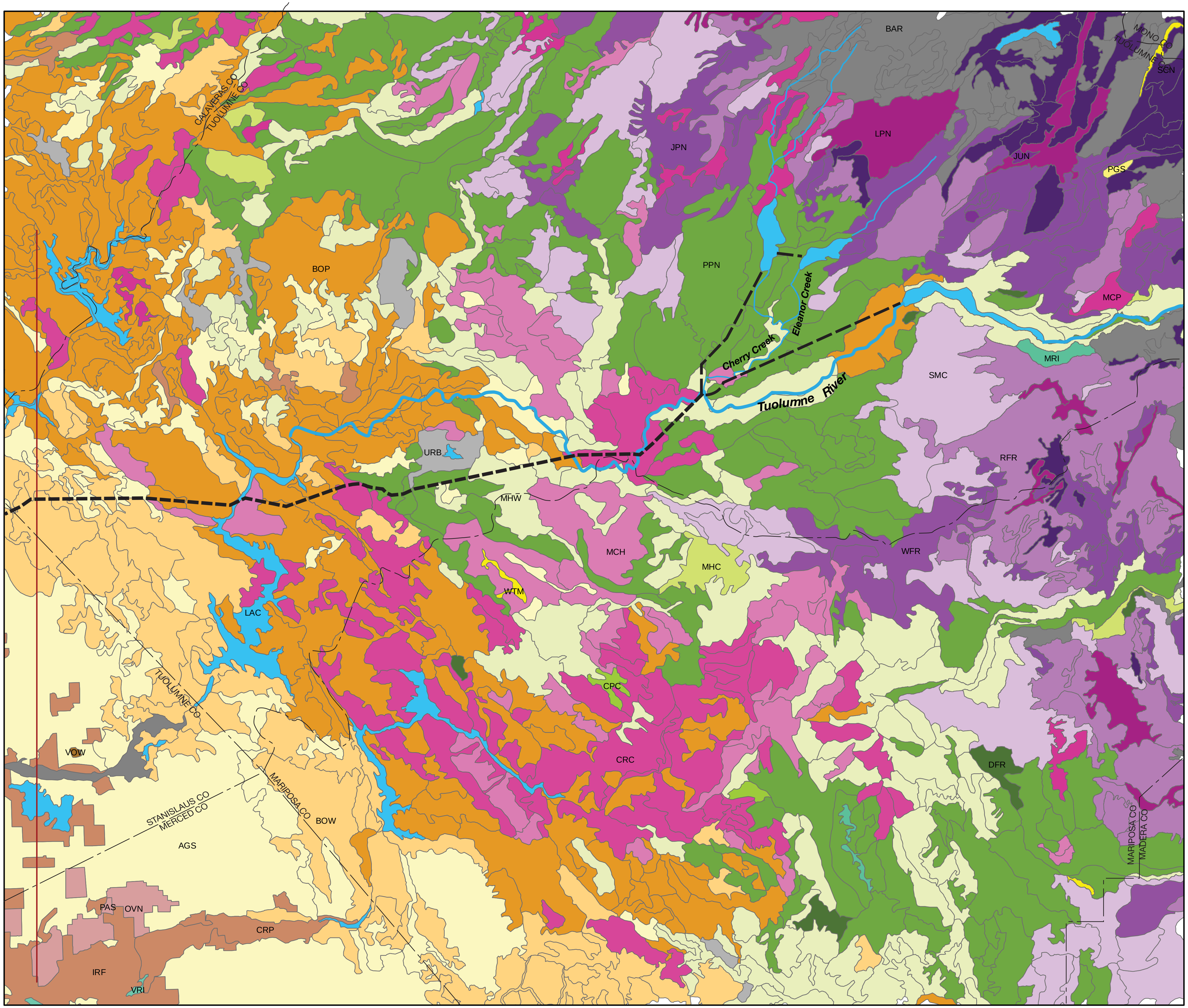
Figure 4.6-1a
Habitat Types in the WSIP Study Area



SOURCE: California Gap Analysis Project, 2005

SFPUC Water System Improvement Program . 203287

Figure 4.6-1b
Habitat Types in the WSIP Study Area



California Wildlife Habitat Relationship Habitat Types

WHR_name

URB	Urban
BAR	Barren
OVN	Orchard and Vineyard
CRP	Cropland
IRF	Irrigated Row and Field Crops
PAS	Pasture
LAC	Lacustrine
MCH	Mixed Chaparral
CRC	Chamise-Redshank Chaparral
MCP	Montane Chaparral
AGS	Annual Grassland
PGS	Perennial Grassland
WTM	Wet Meadow
VRI	Valley-Foothill Riparian
MRI	Montane Riparian
VOW	Valley Oak Woodland
BOW	Blue Oak Woodland
BOP	Blue Oak-Foothill Pine
MHW	Montane Hardwood
MHC	Montane Hardwood-Conifer
CPC	Closed-Cone Pine-Cypress
PPN	Ponderosa Pine
DFR	Douglas-Fir
SMC	Sierran Mixed Conifer
RFR	Red Fir
WFR	White Fir
JPN	Jeffrey Pine
JUN	Juniper
LPN	Lodgepole Pine
SCN	Subalpine Conifer

Existing System Corridor

0 5
Miles

SOURCE: California Gap Analysis Project, 2005

SFPUC Water System Improvement Program . 203287

Figure 4.6-1c
Habitat Types in the WSIP Study Area

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As noted above, project-level environmental review will address the full suite of species that must be assessed under CEQA—that is, candidates for listing, rare and endangered plants, federal species of concern, California species of special concern, and California fully protected species. Special-status fish species that could be affected by construction of specific WSIP projects are described in this section, but are discussed in more detail in the fisheries sections of Chapter 5 (Sections 5.3.6, 5.4.5, and 5.5.5), which addresses WSIP impacts related to the proposed water supply and system operations.

San Joaquin Region

Habitats

This region includes the area crossed by the Hetch Hetchy Aqueduct between Oakdale Portal and the Telsa Portal. Over 50 percent of this corridor has been altered by human development; it includes 34 percent cropland,28 percent orchard and vineyard, and 6 percent urban uses. Prevalent or important natural habitats are discussed below.

Annual Grassland (23%)

Introduced annual grasses are the dominant plant species in this habitat. Annual grassland habitats are open grasslands composed primarily of annual plant species. Many of these species also occur as understory plants in valley oak woodland and other habitats. Structure in annual grassland depends largely on weather and livestock grazing patterns. Dramatic differences in plant growth, both among seasons and among years, are characteristic of this habitat. Fall rains lead to the germination of annual plant seeds. Plants grow slowly during the cool winter months, remaining low in stature until spring, when temperatures increase and stimulate more rapid growth (Mayer and Laudenslayer, 1988). Annual grasslands are found primarily in the eastern and western portion of the San Joaquin Region, on the foothills, lower terraces, and periphery of the valley floor. In areas with soils underlain by a slowly pervious hardpan or claypan, annual grasslands are often associated with vernal pools, a sensitive natural community. Remnant alkali meadows, also a sensitive natural community, are present on floodplains near the San Joaquin River. These resources are too small to map at the program level and thus are included in this habitat type.

Blue Oak Woodland (6%)

Generally, blue oak woodland has an overstory of scattered trees, although the canopy can be nearly closed on more fertile sites. The canopy is dominated by broad-leaved trees that are 16 to 50 feet tall, commonly forming open stands on dry ridges and gentle slopes. Blue oak (*Quercus douglasii*) is the dominant species, constituting 85 to 100 percent of the trees. Typical understory is similar to that of annual grassland (Mayer and Laudenslayer, 1988). In this region, blue oak woodland is found in rolling terrain on the Sierra Nevada and Coast Range foothills at elevations above annual grasslands and below chaparral, woodland, and forest habitats.

Valley Foothill Riparian, Freshwater Emergent Wetlands, and Aquatic Habitats (3%)

The canopy height of valley foothill riparian vegetation is approximately 100 feet in a mature riparian forest, with a canopy cover of 20 to 80 percent. Most trees are winter-deciduous. There is a subcanopy tree layer and an understory shrub layer. Herbaceous vegetation constitutes about 1 percent of the cover, except in openings where tall herbs and shade-tolerant grasses are present. Generally, the understory is impenetrable and includes fallen limbs and other debris. Dominant species in the canopy layer are Fremont cottonwood (*Populus fremontii*), California sycamore (*Platanus racemosa*), and valley oak (*Quercus lobata*). Subcanopy trees are white alder (*Alnus rhombifolia*), box-elder (*Acer negundo* var. *californica*), and Oregon ash (*Fraxinus latifolia*). Riparian vegetation occurs along perennial watercourses that drain the San Joaquin Region, such as the San Joaquin River and its tributaries. Riparian vegetation is also seen along canals and ditches, although its development is generally limited by maintenance practices. Riparian, wetland, and aquatic habitats are the most productive and diverse of California's habitats, although they have been largely eliminated due to agriculture and urbanization, especially in the San Joaquin Region. For example, less than 2 percent of valley foothill riparian habitats remain in the Central Valley of California (Smith, 1980).

Freshwater emergent wetlands are characterized by erect, perennial herbs and grass-like plants with special adaptations to permanent or seasonal flooding. The term "emergent wetland" refers to the vegetation growing out of flooded soils. The vegetation may vary in extent from a few square feet to vast areas covering several square miles. The acreage of freshwater emergent wetlands in California has decreased dramatically since the turn of the century, especially in this region, due to drainage and conversion to other uses, primarily agriculture (Mayer and Laudenslayer, 1988). Extremely small remnant examples of freshwater emergent vegetation are associated with the San Joaquin River and other waterways.

Aquatic habitat includes perennial and seasonal streams, seasonal wetlands, vernal pools, natural ponds and lakes, and reservoirs, including stock ponds. Aquatic habitat throughout the Central Valley, and especially in the San Joaquin River watershed, has been greatly modified since the arrival of Europeans. Formerly vast marshes and riparian areas were cleared, drained, and otherwise modified for increasingly intensive agricultural operations, urbanization, and water storage and distribution projects. The resulting changes in aquatic habitat and water quality conditions (e.g., reduced or lost summer flows in many areas, elevated temperatures, increased turbidity, altered sediment transport, and the runoff or discharge of water containing pesticides, fertilizers, and animal or human wastes) reduced the available habitat suitable for native aquatic species while improving conditions for non-native species, many of which were deliberately or inadvertently introduced to the system, often to the further detriment of native species. Seasonal wetlands, ephemeral or seasonal streams, vernal pools, and stock ponds are located primarily in annual grasslands, mostly at the eastern and western sides of the San Joaquin Region.

Sensitive Natural Communities

Sensitive natural communities in the San Joaquin Region are found in areas of extensive natural habitat, such as the eastern and western foothills of the San Joaquin Valley, and near the San Joaquin River and its floodplain. The sensitive natural communities known to occur in this region and a brief description of known or potential distribution within the WSIP study area are provided below.

Valley needlegrass grassland and pine bluegrass grassland. Small areas dominated by purple needlegrass (*Nassella pulchra*) or pine bluegrass (*Poa secunda*) may occur in the lower Sierra Nevada foothills and Inner Coast Ranges, respectively, generally in areas with relatively thin soils, steep slopes, and historically limited livestock influence.

Northern hardpan vernal pool. This sensitive natural community is known to occur in the rolling grasslands and low terraces between Oakdale Portal and the irrigated pasture on the eastern valley floor.

Alkali meadow. This community is a native-dominated grassland found on alkaline-affected soils such as on the San Joaquin floodplain.

Coastal and valley freshwater marsh. A few natural examples of this formerly extensive community still remain, primarily in the vicinity of the San Joaquin River.

Great Valley cottonwood riparian forest, Great Valley mixed riparian forest, Great Valley valley oak riparian forest, Great Valley willow scrub, and Great Valley elderberry scrub. These riparian natural communities are associated with permanent water. The most extensive natural examples in the WSIP study area are along the San Joaquin and Tuolumne Rivers, although these communities may also be found along smaller perennial streams and along canals and other artificial waterways in the Central Valley.

Key Special-Status Species in the San Joaquin Region

Invertebrates

Vernal pool fairy shrimp (*Branchinecta lynchi*) is a federal threatened species typically found in vernal pools (winter rain pools formed over impervious or slowly permeable soils) and valley grassland drainage swales (areas where winter rain collects but does not stand as long as in vernal pools). This aquatic invertebrate is also found in unvegetated areas with pooled water. Of the listed vernal pool invertebrates, vernal pool fairy shrimp has the largest distributional range; it is found from southern Oregon to Southern California, but primarily in the Sacramento and San Joaquin Valleys.

Conservancy fairy shrimp (*Branchinecta conservatio*) is a federal endangered species found in large, turbid pools as well as in swales formed by old, braided alluvium that fill with winter rains. It ranges from the northern Sacramento Valley through the western San Joaquin Valley and into the South Coast of California.

Vernal pool tadpole shrimp (*Lepidurus packardi*) is a federal endangered species that shares the same habitat as vernal pool fairy shrimp. It ranges from the northern and central Sacramento Valley to the northern half of the San Joaquin Valley and the southern San Francisco Bay.

Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) is a federal threatened species. During the springtime, adult Valley elderberry longhorn beetles feed and lay eggs on blue elderberry (*Sambucus mexicana*) shrubs found within riparian habitat in the San Joaquin

Valley. It ranges from Red Bluff southward to Tulare or Kern County in the Central Valley, and from the valley floor to elevations as high as 2,200 feet (Barr, 1991). The only critical habitat designated for Valley elderberry longhorn beetle is in Sacramento County, along the Sacramento and American Rivers (Federal Register, 1980).

Program Area Occurrence. The best natural habitat along the Hetch Hetchy Aqueduct for the three key special-status crustaceans (vernal pool fairy shrimp, Conservancy fairy shrimp, and vernal pool tadpole shrimp) occurs in two areas: the low, rolling grasslands on the east side of the program area between Oakdale Portal and the irrigated pastures on the valley floor, and the alkaline grasslands near the San Joaquin River. There is critical habitat for vernal pool fairy shrimp (Unit 14A) in the alkaline grasslands of the San Joaquin River floodplain immediately south of the Hetch Hetchy Aqueduct (Federal Register, 2005b). Critical habitat for the Conservancy fairy shrimp in the San Joaquin Region (Unit 5) is located in the alkaline grasslands north of Highway 132 and west of Gates Road in Stanislaus County. Critical habitat for vernal pool tadpole shrimp in the San Joaquin Region (Unit 13) is situated at the lower edge of the rolling grasslands south of Claribel Road and adjacent to Tim Bell Road to the west of Oakdale Portal in Stanislaus County (Federal Register, 2005b).[7] Although their natural habitat is vernal pools and swales, these species could be found in the program area wherever water ponds for extended periods of time, including in manmade depressions. As a result, these species are considered potentially present throughout their range.

Valley elderberry longhorn beetle could be present anywhere that supports blue elderberry between Oakdale Portal and Tesla Portal, excluding leveled agricultural fields and developed areas.

Fishes

Chinook salmon (*Oncorhynchus tshawytscha*) is an anadromous[8] fish with populations that spawn at different times of year; the Central Valley fall- and late fall-run population is a federal species of concern (69 FR 73:19975). In the Central Valley, all designated critical habitat for the Chinook is in the Sacramento River watershed, not the San Joaquin River (CDFG, 2007). Chinook salmon spawn only once in their lifetime, and the resulting young swim to the ocean in their first months of life.

Central Valley Distinct Population Segment (DPS) steelhead (*Oncorhynchus mykiss*) is a federal threatened anadromous species historically known to occur within all of the major streams in the Central Valley. Steelhead Central Valley DPS critical habitat includes the San Joaquin River to the Tuolumne River, and the Tuolumne River to La Grange Dam (CDFG, 2007). Like Chinook salmon, steelhead live most of their lives in the ocean and return to freshwater to spawn.

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7 From time to time, the USFWS revises the boundaries of critical habitats, and several such revisions were published for vernal pool invertebrates prior to 2007. As a result, the critical habitat boundaries described here may differ from current boundaries at the time of this reading, and may also differ slightly from those shown on Figure 4.6-2, which was prepared at a later time. This information should be considered as guidance for resource analysis; definitive analysis would be performed during preparation of project-level CEQA review.

8 Anadromous fish hatch (rear) in freshwater, migrate to the ocean (saltwater) to grow and mature, and migrate back to freshwater to reproduce.

Unlike Chinook salmon, steelhead are capable of spawning more than once. Young steelhead live in freshwater for their first year or more before migrating to the ocean.

Rainbow trout (*Oncorhynchus mykiss*) is the resident, stream-dwelling form of steelhead. When present in landlocked streams, rainbow trout are considered a distinct population segment (DPS). Currently, they are not part of the Central Valley DPS and thus have no federal or state protection status in the program area (NMFS, 2006).

Green sturgeon (*Acipenser medirostris*) is a bottom-feeding fish that lives in marine and estuarine waters but spawns in freshwater. It is a large, olive-green, bony-plated fish. Water flow is one of the key determinants of larval survival. Juveniles migrate downstream to estuaries, where they live and grow for some time before migrating to the ocean. The Southern DPS is federally listed as threatened (Federal Register, 2006a).

Program Area Occurrence. A wild run of Chinook salmon still exists in the Tuolumne River, but the steelhead run has dwindled, in part due to its requirement for year-round suitable conditions in the river. Efforts are underway to restore both runs, and are focused on the Chinook run in particular. The San Joaquin River and the Tuolumne River up to La Grange Dam are critical habitat for the steelhead Central Valley DPS (CDFG, 2007a; Federal Register, 2006a; CDFG, 2007).Green sturgeon is assumed to have used the main stem of the San Joaquin River for spawning as far south as the confluence with the Tuolumne River. No critical habitat is present in the program area for green sturgeon or Chinook salmon.

Amphibians and Reptiles

California red-legged frog (*Rana aurora draytonii*) is a federal threatened species known or expected to occur in association with stream crossings. Preferred habitat is permanent water (ponded water or slow-moving streams) with densely vegetated shorelines.

California tiger salamander (*Ambystoma californiense*), an inhabitant of annual grasslands, breeds and lays eggs in vernal pools and other temporary ponds (Zeiner et al., 1988). Recently listed as threatened at the federal level and a California species of special concern, California tiger salamander can be found seeking refuge in grassland burrows during most of the year. In the rainy season, tiger salamanders migrate to and breed in temporary ponds. Their summer retreats may be up to one-quarter mile from their winter breeding pools.

Program Area Occurrence. The most likely range for California red-legged frog is west of the California Aqueduct. No critical habitat has been designated for this species in the San Joaquin Region (Federal Register, 2006b). The historical range for California tiger salamander covers the entire San Joaquin Region, from Oakdale Portal to Tesla Portal. The species is now known to occur primarily in the eastern grasslands in the San Joaquin Region, where it breeds in vernal pools and stock ponds. Historical records indicate that this species was known to be present within the Tuolumne River floodplain as well as the rolling grasslands to the north and south. Critical habitat for California tiger salamander has been designated in Stanislaus County just north of the Stanislaus River near Oakdale (Unit 7) and south of Highway 132 in Stanislaus

County (Unit 8). The highest quality natural habitat for this species is natural grasslands that contain large vernal pools, such as those found in the eastern grasslands; however, populations may persist in irrigated pasture and orchards where there is sufficient ponded water for breeding.

Birds

Swainson's hawk (*Buteo swainsoni*), a state threatened species, hunts for small mammals and insects in the grasslands of the San Joaquin Valley. Mature trees (such as oaks) surrounded by large open areas provide nesting habitat. Swainson's hawk nests in the valley are frequently found in riparian areas adjacent to grasslands, grazing lands, and some croplands. Breeding occurs from late March through late August.

Western burrowing owl (*Athene cunicularia hypugaea*), a federal species of concern and California species of special concern, inhabits grasslands as well as disturbed or bermed areas. Burrowing owl is included in this analysis because recent evaluations of its status suggest the species may be a candidate for state or federal listing in the near future. These owls utilize the burrows of ground-dwelling mammals, in particular California ground squirrel (*Spermophilus beecheyi*). Breeding occurs from February through August, with a peak in April and May.

Least Bell's vireo (*Vireo belli pusillus*) is listed as endangered at both the state and federal levels. It inhabits riparian brush, where it feeds on insects and nests in dense vegetation within a meter of the ground. This species winters in Baja California and migrates to central and coastal California to breed. Least Bell's vireo was formerly widespread in riparian habitats in the Central Valley; the species has been considered extinct from the valley until recent years, but anecdotal reports suggest it may have returned. Least Bell's vireo has high site fidelity (i.e., individuals return to nest in the same territory and often in the same shrub). Nesting can extend from late March to August.

Program Area Occurrence. Swainson's hawk is opportunistic in its foraging and could be found virtually anywhere. Nesting is more restricted, but could occur anywhere along the Hetch Hetchy Aqueduct where large trees are present. Swainson's hawks can nest in riparian forest or in isolated trees near agricultural fields. This species has been reported as nesting in large trees in some of the older sections of large San Joaquin Valley cities. Western burrowing owl is also opportunistic in its foraging habits and can be found in agricultural fields as well as grasslands throughout the program area. The species can persist at the edges of plowed fields and along the banks of canals. Since the USFWS has not listed these two species, no critical habitat has been designated for them. A recent sighting of Least Bell's vireo at the San Joaquin River National Wildlife Refuge has confirmed its presence in the Central Valley.

Mammals

San Joaquin kit fox (*Vulpes macrotis mutica*), a federal endangered and state threatened species, primarily inhabits annual grassland habitat on flat terrain. San Joaquin kit foxes usually construct dens in loose soils, often enlarging the dens or burrows of other species. Evidence of den use includes the presence of scat, prey remains, tracks, or matted vegetation at the entrance. However, evidence of den use is not always readily apparent. Kit foxes are born in late February or early March and will venture from the dens by late March. Young of the year generally disperse by October, when family groups begin to split up.

The **riparian, or San Joaquin, woodrat** (*Neotoma fuscipes riparia*) is a federal endangered species closely associated with large rivers in the San Joaquin Valley. Its habitat is dense riparian vegetation with a mix of brush and trees, with trees, snags, and logs for nesting. Riparian woodrats live in loosely cooperative societies, building large stick houses in dense brush such as willow thickets. They are mostly nocturnal and feed on plant material such as flower buds, young shoots, nuts, and fungi.

Program Area Occurrence. Currently, San Joaquin kit fox is primarily present in the remaining native valley and foothill grasslands and saltbush scrub communities of the valley floor and surrounding foothills (Endangered Species Recovery Program, 2007). The only potentially suitable habitat for riparian woodrat in the program area is along the San Joaquin River. No critical habitat has been designated for either San Joaquin kit fox or the riparian woodrat.

Vernal Pool Plants

Vernal pools are seasonal wetlands formed in gently undulating or rolling topography where the soil is underlain by a slowly permeable subsoil layer. The extreme conditions of ponding in the winter and complete drying in the summer have given rise to many species that are adapted to these conditions, and further new species have evolved in response to specific conditions of soil texture, chemistry, and length of inundation. Many of the key special-status vernal pool plants are closely associated with specific soil types. The physical conditions necessary for vernal pools are permanently altered when the subsoil layer is disturbed, so vernal pools persist mainly on the uncultivated terrace soils peripheral to the valley floor.

Succulent owl's-clover (*Castilleja campestris* ssp. *succulenta*), a federal endangered, state endangered, and CNPS List 1B plant species, occurs on somewhat acid, gravelly loams such as Pentz and Redding soils. **Hoover's spurge** (*Chamaesyce hooveri*), a federal threatened and CNPS List 1B species, occurs on large and relatively deep, clay-lined vernal pools. Four related grass species, **Colusa grass** (*Neostapfia colusana*), **San Joaquin Valley Orcutt grass** (*Orcuttia inaequalis*), **hairy Orcutt grass** (*Orcuttia pilosa*), and **Greene's tuctoria** (*Tuctoria greenei*), are CNPS List 1B and both federally and state-listed species. These species are typically found in the larger and deeper vernal pools on the terrace soils on the east side of the San Joaquin Valley.

Program Area Occurrence. The grasslands in the eastern portion of the valley contain vernal pools on the somewhat acid soils of the Keyes-Pentz-Peters association—habitat consistent with that of several key special-status vernal pool plants. The largest and deepest vernal pools are the most likely to support rare vernal pool plants. Critical habitat has been designated for all six of these plants. Critical habitat units for five of the species are located at or near the Hetch Hetchy Aqueduct, primarily in Stanislaus County. Unit 2A for succulent owl's-clover extends from Highway 132 north to Rock River Road and Warnerville Road, just south of the aqueduct. Unit 4A for Hoover's spurge also occupies a large area of rolling grasslands from Highway 132 north to Rock River Road and Warnerville Road. Unit 4A for Colusa grass extends both to the north and south of Willms Road near the Tuolumne-Stanislaus County line; Unit 4B lies to the south of Claribel Road, south of the aqueduct, and Units 4D and 4E occupy the large area of rolling grasslands from Highway 132 north to Warnerville Road. Units 4A and 4B for hairy Orcutt grass are located south of Highway 132 and the Tuolumne River. Unit 6D for Greene's tuctoria is located in eastern Stanislaus County south of Rock River Road, and Unit 6E is located on the western edge of Tuolumne County on both sides of Highway 120 (Federal Register, 2005b).

Grassland Plants

Large-flowered fiddleneck (*Amsinckia grandiflora*), a state endangered, federal endangered, and CNPS List 1B annual plant, grows in grasslands on deep loamy soils, typically on northern slopes of the Inner Coast Ranges. Its historical distribution was from Antioch to northern San Joaquin County, but the species is currently restricted to three natural populations in Corral Hollow and one introduced population at Black Diamond Mines Regional Park.

Program Area Occurrence. In Corral Hollow, there are two natural populations of large-flowered fiddleneck at Lawrence Livermore National Laboratory's Site 300 and one on private land. The population on private land is the largest and the most recently discovered, suggesting that additional populations could exist in the area. The Lawrence Livermore project (SJ-2), at the Thomas and Mocho Shafts and their access roads, is located in an area that could be suitable habitat for this species. Although not strictly located within the San Joaquin Region, large-flowered fiddleneck is included in this discussion because of its close association with Tesla Portal. Critical habitat has been designated for large-flowered fiddleneck and consists of 160 acres at Lawrence Livermore Laboratory's Site 300 in Corral Hollow (Federal Register, 1985).

Riparian Plants

Delta button-celery (*Eryngium racemosum*), a state endangered, CNPS List 1B plant, grows in clay depressions in riparian scrub. It is geographically restricted to the floodplains of large rivers in the area from San Joaquin County to Merced County.

Program Area Occurrence. There are two CNDDB records for Delta button-celery at Caswell State Park and one in the city of San Joaquin, about three miles north of the Hetch Hetchy Aqueduct as it crosses the San Joaquin River. If any suitable habitat is present, it would be near the San Joaquin River. No critical habitat is designated for this species.

Sunol Valley, Bay Division, Peninsula, and San Francisco Regions

Habitats

The Sunol Valley, Bay Division, Peninsula, and San Francisco Regions support some of the same habitats already described for the San Joaquin Region, including annual grassland (15 percent) and blue oak woodland (5 percent). In addition, these regions contain coastal oak woodland (6 percent), valley oak woodland (2 percent), coastal scrub (1 percent), riparian and aquatic habitats (less than 1 percent), and saline emergent wetland (1 percent). Blue oak woodland was described in the preceding section; its occurrence in these regions is limited to the Inner Coast Ranges, primarily east of the Sunol Valley. The other habitat types are described below. Many occurrences of habitat types are interspersed, but are too small to map at the program level. Due to the large number of key special-status species known to occur in the Bay Area, and the extent of habitat conversion to urban and agricultural land uses that has taken place, even small areas of natural habitat may have high ecological importance.

Annual Grassland (15%)

As noted in the preceding section, annual grasslands are non-native-dominated but support a variety of native annual and perennial grasses and broadleaf plants. Under some harsh site conditions, such as very dry, steep, or infertile soils, native species still predominate. Examples of these habitats are serpentine grasslands, valley needlegrass grassland, and wildflower fields, all of which are considered sensitive natural communities (see discussion under Sensitive Natural Communities, below). Most remnant examples of these communities are too small to map at the program level, but would be identified (and potential impacts addressed) at the project level. Some native grasslands, including purple needlegrass grassland and potential serpentine grassland, are located to the east, west, and north of Calaveras Reservoir in the Sunol Valley (SFPUC, 2001).

Coastal Oak Woodland (6%)

Coastal oak woodland is extremely variable. In the program area, this habitat type consists of an open- to closed-canopy overstory primary made up of evergreen hardwoods, such as coast live oak (*Quercus agrifolia*) and California bay (*Umbellularia californica*), that are 15 to 70 feet tall. The understory is also variable; it can consist of shrubs from adjacent scrub or chaparral, or shrubs scattered among and under trees. Where trees form a dense canopy, the understory can be a lush cover of shade-tolerant shrubs and herbs or a sparse cover with a thick layer of leaf litter (Mayer and Laudenslayer, 1988). Coastal oak woodland is found on moderate slopes and sometimes near watercourses in the Sunol Valley, Peninsula, and San Francisco Regions.

Valley Oak Woodland (2%)

Valley oak woodland varies from savanna-like to forest-like stands of trees with partially closed canopies, comprised mostly of winter-deciduous, broad-leaved species. Denser stands typically grow in valley soils along natural drainages. Similarly, the shrub layer is best developed on deep soils near drainages, becoming insignificant in the uplands with the sparser stands of trees. In these locations, the herbaceous understory resembles annual grassland. In most situations, the canopy of valley oak woodland consists almost exclusively of valley oaks. Mature trees with well-developed crowns range in height from 50 to 115 feet (Mayer and Laudenslayer, 1988). Because valley oak woodland is typically found on deep soils on gentle slopes, most has been urbanized. Narrow bands of valley oaks are often associated with watercourses in all three regions, but the Sunol Valley still supports extensive stands of valley oak woodland on the valley floor.

Coastal Scrub (1%)

The structure of coastal scrub ranges from low- to moderate-height shrubs with generally small leaves, flexible branches, semiwoody stems growing from a woody base, and a shallow root system. In the program area, mature coastal scrub consists of a nearly closed canopy of dense shrubs about 7 feet tall with a limited herbaceous layer growing in the openings. Bare zones about 3 feet wide may extend from stands dominated by coastal sage (*Artemisia californica*) into surrounding annual grasslands (Mayer and Laudenslayer, 1988). Most of the coastal scrub in the program area is located on steep, rocky slopes above the Sunol Valley, but some also occurs on steep, rocky slopes in the Peninsula and San Francisco Regions, such as in San Mateo Creek Canyon.

Valley Foothill Riparian and Aquatic Habitats (1%)

These habitat types are extremely rare and have been diminished in the Sunol Valley, Bay Division, Peninsula, and San Francisco Regions, but some of the best remaining examples in the Bay Area lie within the Sunol Valley Region. The Sunol Valley supports one of the largest remaining stands of sycamore alluvial woodland in the Bay Area—a widely spaced stand of sycamores in the broad floodplain of Alameda Creek. Well-developed examples of arroyo willow scrub and valley oak forest, and even small examples of alder forest, are found along Alameda Creek and its tributaries in the Sunol Valley as well as along the larger and more natural creeks in the Peninsula and San Francisco Regions, such as San Mateo Creek.

Aquatic habitats include perennial and seasonal streams, seasonal wetlands, vernal pools, natural ponds and lakes, and reservoirs, including stockponds. Stockponds are the main breeding sites for both California tiger salamanders and California red-legged frogs.

South San Francisco Bay is a shallow, mud-bottom estuary, with limited circulation and events of poor water quality during the dry season and following flood flows in the wet season. Numerous factors have greatly modified the ecology of the South Bay, including deposition of vast amounts of sediment, reclamation of tidal wetlands, unregulated harvest of native species, pollution, reduced input of freshwater, and rampant, continuing introductions of non-native species of plants, fish, and invertebrates. Nevertheless, the South Bay still serves as a migration corridor for anadromous fishes such as Chinook salmon and steelhead, and plans are underway to restore stream habitat where possible. One such example is the SFPUC's removal of the Sunol and Niles Dams on Alameda Creek in 2006. The Peninsula and San Francisco Regions represent the most highly altered aquatic habitats of all. Several of the larger streams occupy their natural channels in the Peninsula hills, and then enter culverts as they pass the low-lying areas before emptying into the bay. The SFPUC reservoirs—Upper and Lower Crystal Springs Reservoirs and San Andreas Reservoir—are the largest freshwater bodies. Lake Merced is a smaller lake in western San Francisco.

Saline Emergent Wetland (1%)

The South Bay supports a network of tidal sloughs and salt marshes, and efforts are underway to restore extensive areas of former marshes. Saline emergent wetlands are salt or brackish marshes consisting mostly of perennial herbs and grass-like plants, ranging in height from 0.7 to 7 feet or more, along with algal mats on moist soils and at the base of larger plants. These wetlands occur above sand and mud flats flooded for long periods with each cycle of the tide, and below upland communities that are not subject to tidal action; they provide food, cover, nesting, and roosting habitat for a variety of birds, mammals, reptiles, and amphibians. These include endemic subspecies of birds such as the endangered California clapper rail (*Rallus longirostris obsoletus*), and mammals such as the salt marsh harvest mouse (*Reithrodontomys raviventris*).

Sensitive Natural Communities

Sensitive natural communities in these regions are concentrated in areas of extensive natural habitat, such as the Sunol Valley, the Peninsula watershed, and various perennial watercourses. The sensitive natural communities known to occur in these regions and a brief description of known distribution within the WSIP study area are provided below. Other sensitive natural communities may also be present, especially in areas of extensive natural vegetation, such as along the margins of San Francisco Bay, the Alameda and Peninsula watersheds, and San Bruno Mountain.

Valley needlegrass grassland and serpentine grassland. Areas dominated by native bunchgrasses occur in grasslands in the Sunol Valley, especially to the north and east of Calaveras Reservoir, on the ridges to the east and west of Upper and Lower Crystal Springs Reservoirs, and on San Bruno Mountain. Those areas on serpentine soils are considered serpentine grassland, while others are simply native bunchgrass-dominated and are considered valley needlegrass grassland.

Alkali meadow. Native-dominated grasslands on alkaline-affected soils are found along the margins of the South Bay, such as at the Don Edwards San Francisco Bay National Wildlife Refuge in Fremont.

Northern coastal salt marsh. This tidal marsh, located around the periphery of San Francisco Bay, is dominated by pickleweed (*Salicornia* spp.). A large amount of this sensitive natural community has been lost to development, and much of the remaining areas have been modified by diking and draining. However, even somewhat degraded examples of northern coastal salt marsh provide habitat for a number of key special-status species that may be found in the vicinity of the Newark and Ravenswood Valve Houses, and in low-lying land near San Bruno Mountain.

Coastal and valley freshwater marsh and freshwater seep. Examples of these natural communities can be found along the perimeter of Calaveras Reservoir and Upper and Lower Crystal Springs Reservoirs, and in areas where there is permanent standing water, such as below Crystal Springs Dam. Freshwater seep communities can be found occasionally in the Peninsula and Alameda watersheds.

Central coast cottonwood-sycamore riparian forest, central coast live oak riparian forest, central coast arroyo willow riparian forest, sycamore alluvial woodland, white alder riparian forest, valley oak riparian forest, and central coast riparian scrub. These riparian natural communities are associated with permanent water. The most extensive natural examples in the WSIP study area are in the Sunol Valley along Alameda Creek and its tributaries, in the

Peninsula watershed along San Mateo Creek and its tributaries. Smaller examples are also found along other permanent streams such as the Guadalupe River and other creeks in the East Bay, South Bay, and Peninsula, although many of these have been highly altered through channelization, urbanization, and vegetation management for flood control.

Key Special-Status Species in the Sunol Valley, Bay Division, Peninsula, and San Francisco Regions

For species already described under the San Joaquin Region, the text below provides only "Program Area Occurrence" information.

Invertebrates

Vernal pool tadpole shrimp. See description in the San Joaquin Region section for status and ecology.

Bay checkerspot butterfly (*Euphydryas editha editha [=E. e. bayensis]*), a federal threatened species, is a medium-sized butterfly with a wingspan of 1 to 2 inches. The black bands along the veins on the upper wing surface contrast sharply with bright red and yellow spots. The black basal coloration gives a checkered appearance. Habitat consists of isolated patches of native grassland on shallow, serpentine-derived or similar soils that support growth of the butterfly's two larval foodplants, annual plantain (*Plantago erecta*) and annual owl's-clover (*Orthocarpus densiflorus*).

Callippe silverspot butterfly (*Speyeria callippe callippe*), a federal endangered species, is a small yellow-orange butterfly with dark markings. There are 16 subspecies of silverspot, of which two are found in the Bay Area. Only the Callippe silverspot subspecies is protected under the Federal Endangered Species Act. The Callippe silverspot larval foodplant is the Johnny-jump-up violet (*Viola pedunculata)*, which is generally found in native-dominated grasslands. The adults feed on nectar from several sources, including California buckeye (*Aesculus californica*), coyote mint (*Monardella villosa)*, and thistles such as *Cirsium* and *Silybum*.

Program Area Occurrence. Bay checkerspot butterfly is found on serpentine grasslands on San Bruno Mountain and on several ridges east of Upper and Lower Crystal Springs Reservoirs. Surveys for this species have been carried out in the native grasslands around Calaveras Reservoir, but none have been found (Arnold, 2005). Critical habitat for Bay checkerspot butterfly (see the Regulatory and Conservation Planning Framework section, below) is mapped on San Bruno Mountain in the San Francisco Region, extending to the eastern shoulder of the mountain, including a small segment of the Crystal Springs Pipeline No. 2. Another critical habitat unit is located in the Bay Division Region, extending from Edgewood County Park to the west side of Cañada Road, slightly south of the program area. A third unit is located at Stanford University's Jasper Ridge Ecological Reserve, to the southwest of the Bay Division Pipelines Nos. 3 and 4 (Federal Register, 2001).

Callippe silverspot butterfly is found on San Bruno Mountain and at Edgewood County Park. A population of silverspot butterfly similar to the endangered subspecies was observed on the Alameda watershed near Calaveras Reservoir in 2004 (Arnold, 2005). The Alameda watershed population exhibits characteristics somewhat intermediate between the Callippe silverspot and another subspecies, *S. callippe comstocki*; however, Arnold (2005) concluded that its attributes were sufficiently similar to the Callippe silverspot that it should be treated as such.

A review of the distribution of the vernal pool invertebrates and information from an SFPUC biologist (Stoltz, 2006) indicates that habitat in the Sunol Valley area is considered unsuitable for vernal pool fairy shrimp, vernal pool tadpole shrimp, and Conservancy fairy shrimp and is somewhat outside the known range for these species. Several recent records exist for vernal pool tadpole shrimp in the alkaline grasslands near the Don Edwards San Francisco Bay National Wildlife Refuge, so this species is considered to be potentially present in the Bay Division Region. Critical Habitat Units 16A and 16B for vernal pool tadpole shrimp are located west of Interstate 880 between Mowry Slough and Mud Slough in the Don Edwards San Francisco Bay National Wildlife Refuge (Federal Register, 2005b), some distance from both the Bay Division Pipelines Nos. 1 and 2 and Bay Division Pipelines Nos. 3 and 4.

Fishes

Chinook salmon. The California Coast DPS Chinook salmon is federally listed as threatened. Chinook salmon spawn only once, and their young migrate to the ocean during their first months of life. The designated critical habitat for this DPS extends only from Eureka to Santa Rosa, but the range of the population includes San Francisco Bay.

Central California Coast DPS steelhead (*Oncorhynchus mykiss*) is federally listed as threatened. Like the Central Valley DPS steelhead, this population segment spawns in streams, then swims to the ocean where it grows and matures, returning to spawn in its natal stream. This DPS is defined as steelhead originating in streams that drain directly into San Francisco and San Pablo Bays, or into the Pacific Ocean along the Central Coast.

Rainbow trout (*Oncorhynchus mykiss*) is the resident, stream-dwelling form of steelhead. When present in landlocked streams, rainbow trout are considered a distinct population segment and are not part of the Central California Coast DPS (NMFS, 2006).

Program Area Occurrence. Chinook salmon of the California Coast DPS have spawned in small numbers in accessible portions of the Guadalupe River in recent years, although this drainage has not been designated as critical habitat. In the Bay Division and Peninsula Regions, Central California Coast DPS steelhead have continued to spawn in accessible reaches of the larger creeks draining into San Francisco Bay as well as the major creeks along the coast that drain into the Pacific Ocean. Critical habitat for the Central California Coast DPS steelhead includes the Guadalupe River, Coyote Creek, and San Francisquito Creek and their tributaries (Federal Register, 2005a).

For many decades, impassible barriers along Alameda Creek have blocked steelhead from entering the upper Alameda Creek watershed in the Sunol Valley to spawn. In 2006, the SFPUC removed two upstream barriers, the Niles and Sunol Dams. However, other barriers, including the

BART weir downstream, continue to block anadromous fish passage. Thus, rainbow trout is the only form of *Oncorhynchus mykiss* present in Alameda Creek within the Sunol Valley Region.

On the coast side of the Peninsula watershed, Central California Coast DPS steelhead spawn in Pilarcitos and San Pedro Creeks, both of which are considered critical habitat for steelhead.

In the Bay Division and Peninsula Regions, Central California Coast DPS steelhead have continued to spawn in accessible reaches of Coyote Creek, Guadalupe River, San Francisquito Creek, Stevens Creek, San Mateo Creek, and smaller seasonal streams. Additionally, Chinook salmon of the California Coastal DPS have spawned in small numbers in accessible portions of the Guadalupe River in recent years.

Amphibians and Reptiles

Foothill yellow-legged frog (*Rana boylii*) is a California species of special concern. It lives in shallow, moving water with riffles and sunny banks. It is always found near water. Populations of this species have been nearly eliminated from the Bay Area. Foothill yellow-legged frog is subject to predation from introduced species, poorly timed fluctuations in water releases from upstream reservoirs, and unfavorable precipitation conditions, all of which have contributed to its ongoing decline in California.

California red-legged frog. See description in the San Joaquin Region section for status and ecology.

California tiger salamander. See description in the San Joaquin Region section for status and ecology.

San Francisco garter snake (*Thamnophis sirtalis tetrataenia)* is a federal and state endangered and California fully protected species most often found in the vicinity of standing water, mainly ponds, lakes, marshes, and sloughs.

Alameda whipsnake (*Mastcophis lateralis euryxanthus)* is a federal and state threatened species that occurs within coastal scrub, woodland, and grassland habitat in the eastern Bay Area. Home ranges are typically centered on areas of scrub habitats with open to partially open canopies, on south-, southeast-, east-, and southwest-facing slopes.

Program Area Occurrence. Healthy populations of foothill yellow-legged frogs are present in the Alameda watershed. California red-legged frog is well distributed in suitable habitat throughout the three regions. Critical Habitat Unit SNM-1A includes much of the Peninsula watershed north of Highway 92 (Federal Register, 2006b). Critical Habitat Unit STC-1A for California red-legged frog has also been designated in Santa Clara County south of Calaveras Reservoir (CDFG, 2007a). California tiger salamander has been reported to occur in pools in the Sunol Valley near the Alameda East and West Portals; however, in the Bay Area it has disappeared from almost all of the lower elevation areas, except for one small site at the Don Pedro San Francisco Bay Wildlife Refuge near Fremont (Goals Project, 2000) and a declining population at Lake Lagunitas at Stanford University. They may extend somewhat further north on the Peninsula. Critical

Habitat Unit 3 for California tiger salamander is located in the Calaveras Creek watershed, between Arroyo Hondo and Calaveras Reservoir.

The largest extant population of San Francisco garter snake is on SFPUC Peninsula watershed lands (USFWS, 1985), in and near most of the Peninsula region projects (PN-1, PN-2, PN-4 and PN-5) and the western terminus of the Bay Division pipeline (BD-1). No critical habitat is designated for this species. The Alameda whipsnake range is restricted to the Inner Coast Ranges in western and central Contra Costa and Alameda Counties (Federal Register, 2005c). Critical Habitat Unit 5B for Alameda whipsnake includes 18,214 acres in the Sunol Valley between Calaveras and San Antonio Reservoirs. This habitat unit therefore includes the southern but not northern part of the Sunol Valley (the New Irvington Tunnel project, SV-4, is outside the designated critical habitat).

Birds

Bald eagle *(Haliaeetus leucocephalus)* is a federal threatened species, but was proposed for delisting in 1999. It is state-listed as endangered and is a California fully protected species. Bald eagle nests in tall trees, often near water. It is an opportunistic forager, feeding on fish, waterfowl, and carrion. Breeding territory for bald eagle has been expanding in the past several decades, which prompted the proposal for federal delisting.

Western burrowing owl. See description in the San Joaquin Region section for status and ecology.

California clapper rail (*Rallus longirostris obsoletus*) is a federal and state endangered species and a California fully protected species. It is a secretive, hen-like bird that nests and forages in emergent wetlands with pickleweed (*Salicornia* spp.), cordgrass (*Spartina foliosa*), gumplant (*Grindelia stricta* var. *angustifolia*), and bulrush (*Scirpus* spp.). Clapper rails are non-migratory, but juveniles have been known to move as much as a half-mile when dispersing. This species feeds primarily on aquatic invertebrates (Goals Project, 2000).

California black rail (*Laterallus jamaicensis coturniculus*) is state-listed as threatened. It relies on tidally influenced, heavily vegetated, high-elevation marshlands. It is highly secretive and is observed mainly during high tides when forced out by high water. Its habitat requirements resemble those of the salt marsh harvest mouse but are more restrictive (Goals Project, 2000).

Western snowy plover (*Charadrius alexandrinus nivosus*) is a federal threatened species and a California species of special concern. It nests and forages on sandy beaches on marine and estuarine shores. It requires sandy, gravely, or friable soils for nesting.

Program Area Occurrence. Bald eagle has been frequently observed wintering near large lakes and reservoirs such as those in the Alameda Creek watershed, and in recent years may be breeding there as well. Western burrowing owl is well distributed in suitable habitat throughout the WSIP study area, especially in the South Bay. The largest populations of California clapper rail occur in the Dumbarton and Mowry Marshes in the East Bay, and the Palo Alto and Greco Marshes on the

Peninsula, both near the Hetch Hetchy Aqueduct. Nesting California black rail were historically known to occur in the South Bay, but the individuals recently observed there are juveniles and non-breeding adults. The majority of western snowy plover nest in salt evaporation ponds south of the San Mateo Bridge, predominantly on the eastern side of San Francisco Bay (using Guadalupe Slough as the division line) (Goals Project, 2000).

Mammals

San Joaquin kit fox. See description in the San Joaquin Region section for status and ecology.

Salt marsh harvest mouse (*Reithrodontomys raviventris*) is a small, native mouse that is both federal and state endangered and California fully protected. It is endemic to the salt marshes and adjacent diked wetlands of San Francisco Bay and is most abundant in the middle and upper portions of salt marshes in the thick perennial cover of pickleweed (Goals Project, 2000).

Program Area Occurrence. Two adult San Joaquin kit fox were sighted recently on another SFPUC project site in the Sunol Valley.[9] Despite this sighting of apparently a pair of transient animals, this species is not otherwise considered present in the Sunol Region. Salt marsh harvest mouse occurs most frequently in suitable habitat that lies generally south of a line between Redwood City and Hayward (Goals Project, 2000).

Plants

Fountain thistle (*Cirsium fontinale* var. *fontinale*) is both a state and federal endangered species. It grows in moist soils near springs and seeps on serpentine soils. It is restricted to just a few populations in the vicinity of Crystal Springs Reservoir and nearby uplands.

San Mateo woolly sunflower (*Eriophyllum latilobum*) is both a state and federal endangered species. It grows in shady openings in live oak woodlands, both on and off serpentine soils. San Mateo woolly sunflower is a highly restricted endemic whose distribution is limited to several hundred individuals in less than a dozen scattered subpopulations in the Crystal Springs area of San Mateo County. Many of the known populations occur on roadcuts along Crystal Springs Road in the San Mateo Creek canyon.

M**arin western flax** (*Hesperolinon congestum)* is both a state and federal threatened species. It grows on serpentine ridges covered with bunchgrass from Marin County to San Mateo County. There are now 20 known occurrences. Residential development and road and freeway construction have eliminated five of the historically known populations of Marin western flax.

Program Area Occurrence. Fountain thistle grows along the shores of Upper Crystal Springs Reservoir. San Mateo woolly sunflower is known to occur in several colonies along Crystal Springs Road, where it is highly vulnerable both to proposed WSIP project activities and to ordinary road maintenance activities. Marin western flax is known to occur in grasslands in the Crystal Springs and San Mateo Creek canyon area.

9 A single individual was observed during nighttime surveys associated with the SFPUC Sunol / Niles Dam Removal Project in 2006, performed by Environmental Science Associates.

Regulatory and Conservation Planning Framework

Key Special-Status Species and Other Species of Concern

Federal Endangered Species Act

Under the Federal Endangered Species Act (FESA), the Secretary of the Interior (represented by the USFWS) and the Secretary of Commerce (represented by the NMFS) have joint authority to list a species as threatened or endangered (16 United States Code [USC] 1533[c]). Pursuant to the requirements of FESA, an agency reviewing a proposed project within its jurisdiction must determine whether any federally listed threatened or endangered species may be present in the project area and determine whether the project will have a potentially significant impact on such species. In addition, the agency is required to determine whether the project is likely to jeopardize the continued existence of any species proposed for listing under FESA or result in the destruction or adverse modification of critical habitat proposed to be designated for such species (16 USC 1536[3], [4]). Project impacts on these species or their habitats are considered potentially significant in this PEIR. Before granting a permit, the U.S. Army Corps of Engineers will ask either or both the USFWS and NMFS to concur with its decision to issue the permit. If endangered species or endangered migratory fish protected under FESA are present in the project area, a consultation under Section 7 of the act may be required. Consultations may be either formal or informal. If a formal consultation is required, the project proponent prepares a Biological Assessment to evaluate the potential impacts of a particular project on listed species that are known or likely to occur in the project area. The agency with jurisdiction over the listed species (either the USFWS or NMFS) then reviews the Biological Assessment and issues a Biological Opinion (the agency's determination as to whether or not the proposed project will jeopardize the listed species), which includes the conditions under which the project may proceed; an incidental take permit is also issued, identifying the number of individuals of the listed species allowed to be harmed by project activities without violating the terms of the permit. If appropriate for certain listed species (e.g., California red-legged frog), the Corps may invoke a Programmatic Biological Opinion.[10]

FESA of 1973 was amended in 1982 under Section 10 of the act to permit the "taking" (i.e., killing, harassing, or disturbing the habitat of) federally listed species when such taking was incidental to an otherwise lawful activity (16 USC 1539). It was the intent of Congress to resolve the issues of onsite taking of listed species or critical habitat by creating the habitat conservation plan (HCP) process. An HCP accompanies a permit application to "take" a certain number of threatened and endangered species or acres of their habitat over a certain period of time, and demonstrates that the permit applicant will compensate for the taking so as to achieve "no net reduction" in the species' chances for survival. There is one adopted HCP in the WSIP study area—the *San Joaquin County Multi-species Habitat Conservation and Open Space Plan*. Several other HCPs are under preparation, including two by the SFPUC for operations on its Peninsula and Alameda watersheds and one by a multi-agency partnership that includes Santa Clara County, Santa Clara Valley Water District, the City of San Jose, the Santa Clara Valley Transit Authority,

[10] A Programmatic Biological Opinion is a general set of rules designed to protect the listed species; these rules must be followed during construction of certain types of projects that frequently recur within the range of the species (e.g., road or culvert repairs).

and the Cities of Gilroy and Morgan Hill. Section 4.2, Plans and Policies, describes HCP efforts underway by the SFPUC. The "Conservation Planning" section below also discusses HCP efforts in more detail.

The USFWS also publishes a list of candidate species for listing. Species on this list receive special attention from federal agencies during environmental review, although they are not otherwise protected under FESA. The candidate species are those for which the USFWS has sufficient biological information to support a proposal to list as endangered or threatened. Project impacts on such species may, on a case-by-case basis, be considered potentially significant in this PEIR.

California Endangered Species Act

Under the California Endangered Species Act (CESA), the CDFG has the responsibility for maintaining a list of threatened and endangered species (California Fish and Game Code Section 2070). The CDFG also maintains a list of candidate species, which are species that the CDFG has formally noticed as being under review for addition to either the list of endangered species or the list of threatened species. The CDFG also maintains lists of "species of special concern," which are animal species whose populations have diminished and may be considered for listing if declines continue. Pursuant to the requirements of CESA, an agency reviewing a proposed project within its jurisdiction must determine whether any state-listed endangered or threatened species may be present in the project area and determine whether the project will have a potentially significant impact on such species. In addition, the CDFG encourages informal consultation on any proposed project that could affect a candidate species.

Actions otherwise prohibited under CESA can be legalized under the state's Natural Community Conservation Planning Act (Fish and Game Code Sections 2800–2840), which is somewhat broader in its orientation and objectives than CESA or FESA. These laws are designed to identify and protect individual species that have already significantly declined in number. The primary objective of the program is to conserve natural communities at the ecosystem scale while accommodating compatible land uses. The program provides limited authorization to adversely affect habitat supporting special-status species.

For the potential taking of individual animals (as opposed to habitat) listed under CESA, there is a permit process somewhat similar to Section 10 of FESA, which allows the USFWS to issue take permits for federally listed species.[11] If the species is listed by California alone, and a proposed project would result in impacts, an incidental take permit pursuant to Section 2081 of the Fish and Game Code would be necessary. The CDFG will issue an incidental take permit only if:

- The authorized take is incidental to an otherwise lawful activity
- The impacts of the authorized take are minimized and fully mitigated

[11] If a landowner obtains a federal take permit for a species that is also state listed, CESA does not require an additional state permit, but CESA Section 2080.1(c) does require the CDFG to review the terms and conditions of the permit to ensure they meet CESA's requirements.

- The measures required to minimize and fully mitigate the impacts of the authorized take are roughly proportional in extent to the impact of the taking on the species; maintain the project applicant's objectives to the greatest extent possible; are capable of successful implementation; and adequate funding is provided to implement the required minimization and mitigation measures and to monitor compliance with, and the effectiveness of, the measures

California Fully Protected Species

California law (Fish and Game Code Sections 3511, 4700, 5050, and 5515) allows the designation of a species as fully protected. This is a greater level of protection than is afforded by CESA, since such a designation means the listed species cannot be taken at any time.

California Native Plant Protection Act

The California Native Plant Protection Act (Fish and Game Code Sections 1900–1913) and the Natural Communities Conservation Planning Act provide guidance on the preservation of plant resources; these two acts underlie the language and intent of Section 15380(d) of the CEQA Guidelines. Vascular plants listed as rare or endangered by the CNPS (2001), but which have no designated status or protection under federal or state endangered species legislation, are defined as follows:

- List 1A: Plants presumed extinct
- List 1B: Plants rare, threatened, or endangered in California and elsewhere
- List 2: Plants rare, threatened, or endangered in California, but more numerous elsewhere
- List 3: Plants about which more information is needed – a review list
- List 4: Plants of limited distribution – a watch list

In general, plants appearing on CNPS List 1A, 1B, or 2 are considered to meet the criteria of Section 15380 of the CEQA Guidelines. Additionally, plants listed on CNPS List 1A, 1B, or 2 also meet the definition of Section 1901, Chapter 10 (Native Plant Protection Act) and Sections 2062 and 2067 (CESA) of the California Fish and Game Code.

Other Statutes, Codes, and Policies Affording Limited Species Protection

The federal Migratory Bird Treaty Act (MBTA) (16 USC, Section 703, Supp. I, 1989) prohibits killing, possessing, or trading in migratory birds, except in accordance with regulations prescribed by the Secretary of the Interior. This act encompasses whole birds, parts of birds, and bird nests and eggs. For projects that would not result in the direct mortality of birds, the MBTA is generally interpreted in CEQA analyses as protecting active nests of all species of birds that are included in the "List of Migratory Birds" published in the Federal Register in 1995.

Independent of the MBTA, birds of prey are protected in California under the Fish and Game Code (Section 3503.5, 1992). Section 3503.5 states that it is "unlawful to take, possess, or destroy any birds in the order Falconiformes or Strigiformes (birds of prey) or to take, possess, or destroy the nest or eggs of any such bird except as otherwise provided by this code or any regulation adopted pursuant thereto." Construction disturbance during the breeding season could result in the incidental loss of fertile eggs or nestlings, or otherwise lead to nest abandonment. Disturbance that causes nest abandonment and/or loss of reproductive effort is considered taking by the CDFG. Any loss of fertile eggs, nesting raptors, or any activities resulting in nest abandonment would constitute a potentially significant impact. This approach would apply to red-tailed hawks, American kestrels, burrowing owls, and other birds of prey. Substantial adverse project impacts on these species are considered potentially significant in this PEIR if a species is known or has a high potential to nest on the site or rely on it for primary foraging.

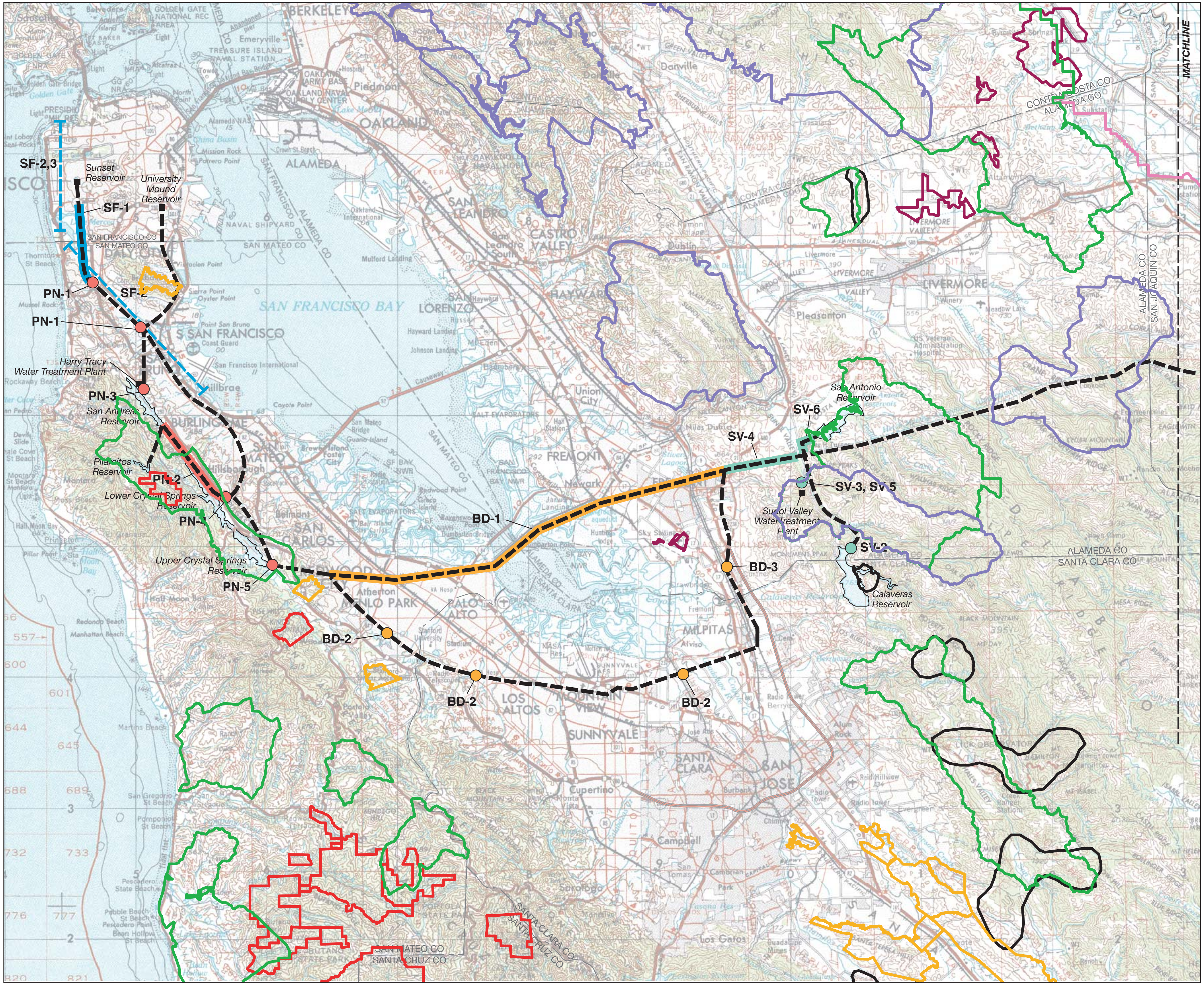
The federal Bald Eagle Protection Act prohibits persons within the United States (or places subject to U.S. jurisdiction) from "possessing, selling, purchasing, offering to sell, transporting, exporting or importing any bald eagle or any golden eagle, alive or dead, or any part, nest, or egg thereof."

Sensitive Natural Communities and Critical Habitat

The CDFG has identified several natural communities within California (as distinct from the organisms they support) as rare and/or sensitive. These natural communities are of special significance because the present rate of loss indicates that acreage reductions or habitat degradation could threaten the viability of dependent plant and wildlife species and possibly hinder the long-term sustainability of the community or species dependent on the community. As natural communities diminish, the need to list dependent plant and wildlife species as rare, threatened, or endangered under the state or federal endangered species acts increases. The loss of some significant natural communities can diminish valued ecosystem functions, such as the roles of marshes in water filtration or of riparian woodlands in riverbank stabilization.

The primary types of sensitive habitat are wetlands, including riparian habitat types such as sycamore alluvial woodland and willow scrub. Almost all types of wetlands are highly biologically active, and almost all have suffered significant declines in California. Various laws and regulations protect wetlands, as described below. Other sensitive habitats that could occur in the program area but are too small to map at the GAP level of analysis include native grasslands, such as serpentine grassland, native bunchgrass grassland, and alkali meadow.

Officially designated critical habitat is also included in this category. Critical habitat is defined as specific areas that are essential to the conservation of a federally listed species, and which may require special management considerations or protection. Critical habitat is determined using the best available scientific information about the physical and biological needs of the species. These needs, or primary constituent elements, include: space for individual and population growth and for normal behavior; food, water, light, air, minerals, or other nutritional or physiological needs; cover or shelter; sites for breeding, reproduction, and rearing of offspring; habitat that is protected from disturbance or is representative of the historical geographic and ecological distribution of a species. Critical habitats are delineated on maps published in the Federal Register and are subject to modification from time to time. **Figure 4.6-2** displays those critical habitats in effect at the time of PEIR preparation.



SOURCE: U.S. Fish and Wildlife Service, 2005

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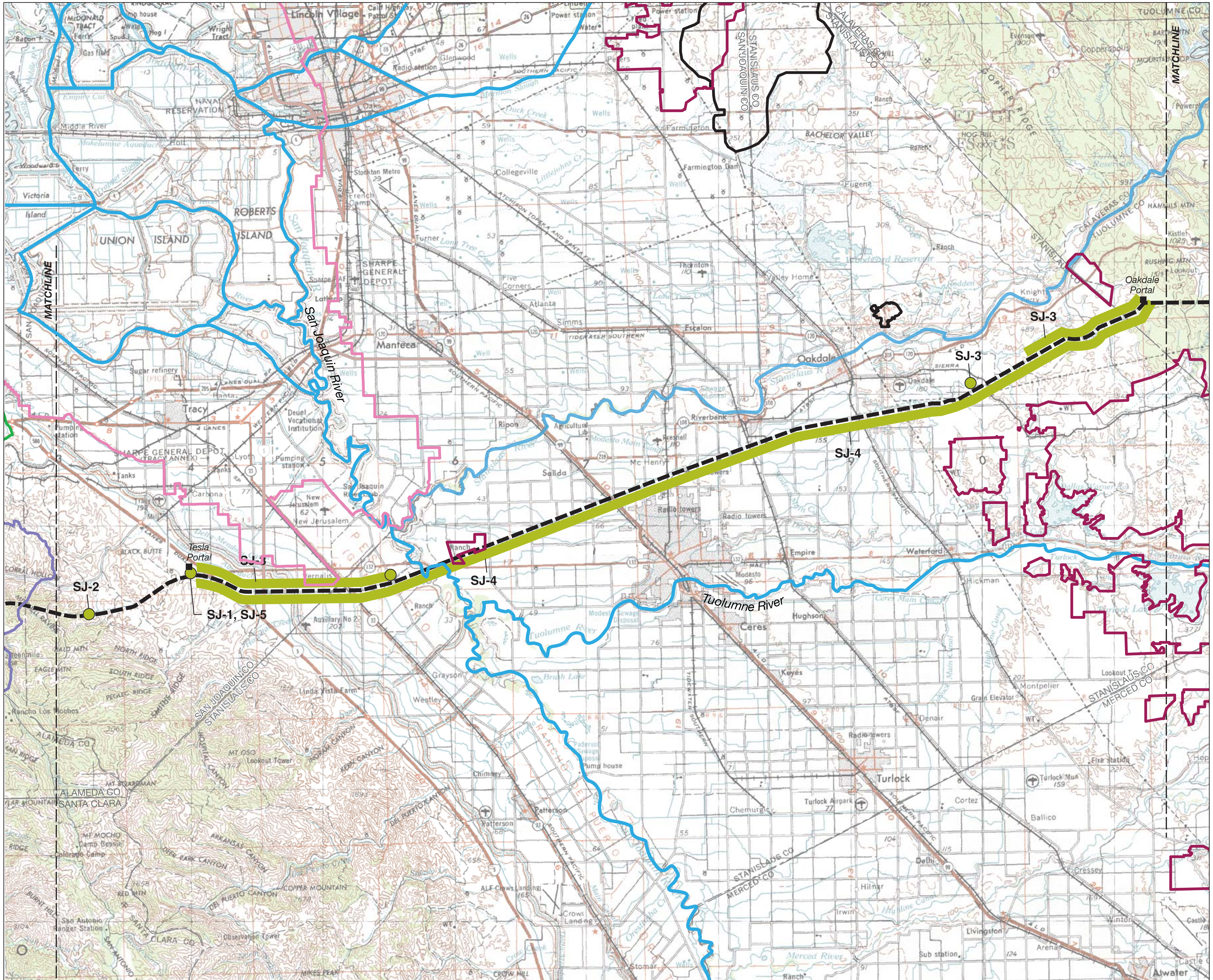
Figure 4.6-2a
Critical Habitats in the WSIP Study Area



Vernal pool species:
Vernal pool fairy shrimp *(Branchinecta lynchi)*
Conservancy fairy shrimp *(Branchinecta conservatio)*
Vernal pool tadpole shrimp *(Lepidurus packardi)*
Hoover's spurge *(Chamaesyce hooveri)*
Succulent owl's-clover *(Castilleja campestris ssp. succulenta)*
Colusa grass *(Neostapfia colusana)*
San Joaquin Valley Orcutt grass *(Orcuttia inaequalis)*
Hairy Orcutt grass *(Orcuttia pilosa)*
Greene's tuctoria *(Tuctoria greenei)*
(Note: Not all listed secies occur in all polygons.)

Delta smelt *(Hypomesus transpacificus)*
California tiger salamander *(Ambystoma californiense)*
California red-legged frog *(Rana aurora draytonii)*
Alameda whipsnake *(Mastcophis lateralis euryxanthus)*
Central Valley District Population Segment Steelhead *(Oncorhynchus mykiss)*

Notes:
1. A federally-listed species may occur outside its designated critical habitat.
2. Some federally-listed species do not have a designated critical habitat.
3. Critical habitat may be designated for federally-listed species only. Some critical habitats shown on this figure are for species that will not be impacted by the WSIP project.
4. Location of critical habitat in relation to WSIP is for guidance only. Published critical habitats are revised periodically. Current critical habitat boundaries will be analyzed during project-specific CEQA reviews.

Existing System Corridor
Existing System Facility
Proposed Facility Corridor
Proposed Facility Site
Proposed Facility, General Location

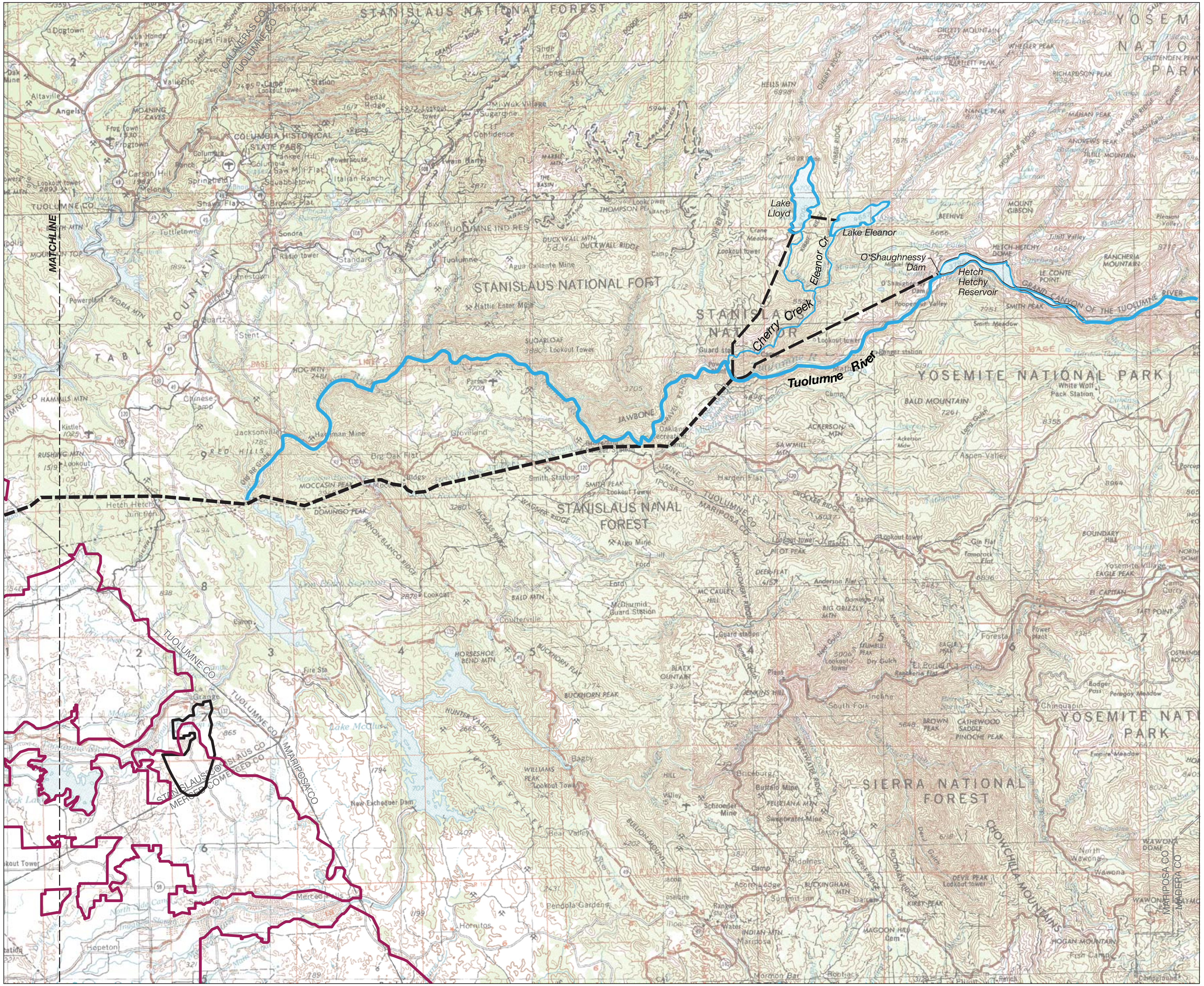
Note: See Figure 4.1-2 for full Project Names

0 5
Miles

SOURCE: U.S. Fish and Wildlife Service, 2005, CDFG, 2007

SFPUC Water System Improvement Program . 203287

Figure 4.6-2b
Critical Habitats in the WSIP Study Area



Vernal pool species:
Vernal pool fairy shrimp *(Branchinecta lynchi)*
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Hoover's spurge *(Chamaesyce hooveri)*
Succulent owl's-clover *(Castilleja campestris ssp. succulenta)*
Colusa grass *(Neostapfia colusana)*
San Joaquin Valley Orcutt grass *(Orcuttia inaequalis)*
Hairy Orcutt grass *(Orcuttia pilosa)*
Greene's tuctoria *(Tuctoria greenei)*
(Note: Not all listed secies occur in all polygons.)

California tiger salamander *(Ambystoma californiense)*

Notes:
1. A federally-listed species may occur outside its designated critical habitat.
2. Some federally-listed species do not have a designated critical habitat.
3. Critical habitat may be designated for federally-listed species only. Some critical habitats shown on this figure are for species that will not be impacted by the WSIP project.
4. Location of critical habitat in relation to WSIP is for guidance only. Published critical habitats are revised periodically. Current critical habitat boundaries will be analyzed during project-specific CEQA reviews.

Existing System Corridor
Existing System Facility
Proposed Facility Corridor
Proposed Facility Site
Proposed Facility, General Location

Note: See Figure 4.1-2 for full Project Names

SOURCE: U.S. Fish and Wildlife Service, 2005

SFPUC Water System Improvement Program . 203287

Figure 4.6-2c
Critical Habitats in the WSIP Study Area

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Federal and State Provisions Applying to Wetlands

In a jurisdictional sense, there are two definitions of a wetland, one adopted by federal agencies and another adopted by the State of California. Both definitions are presented below.

Federal Wetland Definition. Wetlands are a subset of "waters of the United States" and receive protection under Section 404 of the Clean Water Act. The term "waters of the United States,"[12] as defined in Code of Federal Regulations (33 CFR 328.3[a]; 40 CFR 230.3[s]), includes:

1. All waters which are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide.

2. All interstate waters including interstate wetlands. (Wetlands are defined by the federal government [CFR, Section 328.3(b)] as those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.)

3. All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mud flats, sand flats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation, or destruction of which could affect interstate or foreign commerce including any such waters which are or could be used by interstate or foreign travelers for recreational or other purposes; or from which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or which are used or could be used for industrial purposes by industries in interstate commerce.

4. All impoundments of waters otherwise defined as waters of the United States under the definition.

5. Tributaries of waters identified in paragraphs (1) through (4).

6. Territorial seas.

7. Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (1) through (6).

8. Waters of the United States do not include prior converted cropland. Notwithstanding the determination of an area's status as prior converted cropland by any other federal agency, for the purposes of the Clean Water Act, the final authority regarding Clean Water Act jurisdiction remains with the U.S. Environmental Protection Agency.

[12] Based on the Supreme Court ruling in *Solid Waste Agency for Northern Cook County v. U.S. Army Corps of Engineers* (SWANCC) concerning the Clean Water Act jurisdiction over isolated waters (January 9, 2001), non-navigable, isolated, intrastate waters are no longer defined as waters of the United States based solely on their use by migratory birds. Jurisdiction of non-navigable, isolated, intrastate waters may be possible if their use, degradation, or destruction could affect other waters of the Unites States, or interstate or foreign commerce. Jurisdiction over such other waters should be analyzed on a case-by-case basis. Impoundments of waters, tributaries of waters, and wetlands adjacent to waters should be analyzed on a case-by-case basis. Further legal cases recently decided by the Court (e.g., *Rapanos* and *Carabel*) have not yet been interpreted in Corps regulations or definitions.

California Wetland Definition. California has adopted the Cowardin et al. (1979) classification system to define wetlands. For purposes of this classification, wetlands must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes[13] (at least 50 percent of the aerial vegetative cover); (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year (Cowardin et al., 1979).

Under normal circumstances, the federal definition of wetlands requires all three wetland identification parameters to be met, whereas the Cowardin definition requires the presence of at least one of these parameters.

Regulation of Activities in Wetlands. The regulations and policies of various federal agencies (e.g., U.S. Army Corps of Engineers, U.S. EPA, USFWS, NMFS) mandate that the filling of wetlands be avoided unless it can be demonstrated that no practicable alternatives exist. The Corps has primary federal responsibility for administering regulations that concern waters and wetlands. In this regard, the Corps acts under two statutory authorities: the Rivers and Harbors Act (Sections 9 and 10), which governs specified activities in "navigable waters," and the Clean Water Act (Section 404), which governs specified activities in waters of the United States, including wetlands. The Corps requires that a permit be obtained if a project proposes to place structures within navigable waters and/or to alter waters of the United States below the ordinary high-water mark in nontidal waters. The U.S. EPA, USFWS, NMFS, and several other agencies may provide comment on Corps permit applications. The U.S. EPA has provided the primary criteria for evaluating the biological impacts of Corps permit actions in wetlands.

The state's authority to regulate activities in wetlands and water at the project sites resides primarily with the California Regional Water Quality Control Board (RWQCB), which regulates construction in waters of the United States and waters of the state, including activities in wetlands, under both the Clean Water Act and the State of California's Porter-Cologne Water Quality Control Act. The CDFG provides comment on Corps permit actions under the Fish and Wildlife Coordination Act. The CDFG is also authorized under the Fish and Game Code, Sections 1600–1607, to develop mitigation measures and enter into a streambed alteration agreement with applicants proposing a project that would obstruct the flow or alter the bed, channel, or bank of a river or stream in which there is a fish or wildlife resource, including intermittent streams and ephemeral streams (i.e., those flowing briefly during and immediately following storm events). The RWQCB must certify that a Corps permit action meets state water quality objectives (Section 401, Clean Water Act).

State Provisions and Policies Applying to Sensitive Habitats in both Wetlands and Uplands

In addition to the lists of special-status plants and animals, the CDFG maintains a classification of the state's natural communities (both terrestrial and aquatic). The natural community classification is used by a wide variety of government agencies, private conservation organizations, and private biological consultants to help identify and prioritize species preservation, acquisition, or designation activities.

[13] The USFWS has developed the following definition for hydrophytic vegetation: "plant life growing in water or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content" (Cowardin et al., 1979).

Each community is ranked according to its rarity and threat of extinction on both global and statewide scales, regardless of its state or federal listing or management status.[14] By virtue of the rarity or sensitivity of such natural communities (as determined by the state authority responsible for resource protection), impacts on such a community may be considered significant under CEQA.

Local Laws, Regulations, and Policies Applying to Natural Resource Protection

The San Francisco Bay Conservation and Development Commission (BCDC) was formed in 1969 under the McAteer-Petris Act to regulate development in and around San Francisco Bay. BCDC developed the San Francisco Bay Plan to guide the wise use of the bay's water and shorelines. In reviewing permit applications for projects within its jurisdiction, BCDC relies on its Bay Plan policies to ensure the protection of habitats and biological resources, including fish, other aquatic organisms, and wildlife, and water quality; as well as policies on uses of the bay and shoreline.

City and county general plans usually contain provisions to maintain parks and open space, and to protect valued biological resources such as wetlands. Many of the resources protected by local policies and ordinances also are protected under state and federal laws and regulations; others, such as heritage trees, are not. **Table 4.6-1** lists vegetation ordinances (including tree protection ordinances) adopted by jurisdictions where WSIP projects are proposed. Consistency with the provisions of these ordinances (as well as the habitat conservation planning efforts described below) would be further evaluated during preparation of project-specific CEQA documentation.

Conservation Planning in the WSIP Study Area

SFPUC Watershed Management Plans

The SFPUC articulates its policies for the protection and management of key special-status species and other species of concern in its Alameda and Peninsula Watershed Management Plans (WMPs) (SFPUC, 2001, 2002). (See Section 4.2, Plans and Policies, for a more detailed description of this topic.) SFPUC policy is to preserve, protect, and enhance significant botanical and wildlife resources, including rare, threatened, endangered, and sensitive species and their habitat, and to preserve biodiversity and genetic diversity of wildlife populations where possible. The policy requires a site-specific analysis prior to implementing facility and infrastructure projects, operations and maintenance activities, and construction projects in order to determine the presence of sensitive vegetation and wildlife and the potential effects of the activity on these resources. Analyses must be conducted in accordance with applicable state and federal laws, statutes, and guidelines.

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[14] Global and State Sensitivity Rankings are part of a system devised by the CDFG to provide information on the rarity of a species or community. For example, G1 is defined as: less than six viable element occurrences *or* less than 1,000 individuals *or* less than 2,000 acres.

Habitat Conservation Plans (HCPs)

Habitat conservation plans provide comprehensive, long-term conservation measures for species listed as threatened or endangered under the California and Federal Endangered Species Acts, or for species that could be listed in the future. Several conservation plans are described below, two of which have been adopted: the *San Joaquin County Multi-species Habitat Conservation and Open Space Plan* and the *San Joaquin River National Wildlife Refuge Comprehensive Conservation Plan*.

TABLE 4.6-1
PERTINENT LOCAL VEGETATION ORDINANCES

Jurisdiction and Code	Ordinances
San Joaquin County Ordinance Code (amended through July 27, 2004)	Title 10, Streets and Highways, Division 5, Miscellaneous Regulations, Chapter 2, Trees, Shrubs and Other Plants
Alameda County General Code (amended through March 2005)	Title 12, Public Roadways and Parks, Chapter 12.11, Regulation of Trees in County Right-of-Way
Santa Clara County Ordinance Code (amended through September 28, 2004)	Title C, Construction, Development and Land Use, Division C16, Tree Preservation and Removal
San Mateo County Ordinance Code (amended through June 7, 2005)	Title 3, Public Safety, Morals and Welfare, Chapter 3.92, Street Trees
Fremont Municipal Code (amended through May 24, 2005)	Title IV, Sanitation and Health, Chapter 5, Tree Preservation
	Title VI, Public Works and Public Utilities, Chapter 2, Street Trees
Newark Municipal Code (amended through February 2005)	Title 12, Streets, Sidewalks and Public Places, Chapter 12.28, Parkway Maintenance
	Title 8, Health and Safety, Chapter 8.16, Preservation of Trees on Private Property
Hayward Municipal Code	Chapter 10, Planning, Zoning and Subdivisions, Article 15, Tree Preservation
Milpitas Municipal Code (amended through July 2005)	Title X, Trees and Sidewalks, Chapter 2, Tree and Planting
San Jose Municipal Code	Chapter 13.28, Trees, Hedges and Shrubs
Santa Clara City Code (amended through June 28, 2005)	Title 12, Streets, Sidewalks and Public Places, Chapter 12.35, Trees and Shrubs
Mountain View Municipal Code	Chapter 32, Protection of the Urban Forest
Los Altos Municipal Code	Title 11, Chapter 11.08, Tree Protection Regulations
Palo Alto Municipal Code (amended through May 25, 2005)	Title 8, Trees and Vegetation, Chapter 8.04, Street Trees, Shrubs and Plants
	Title 8, Trees and Vegetation, Chapter 8.10, Tree Preservation and Management Regulations
East Palo Alto Municipal Code (amended through June 15, 2004)	Title 13, Public Services, Chapter 13.24, Water System, Section 13.24.410, Street Trees
Menlo Park Municipal Code (amended through March 2005)	Title 13, Streets, Sidewalks and Utilities, Chapter 13.24, Heritage Trees
	Title 13, Streets, Sidewalks and Utilities, Chapter 13.20, Street Trees, Shrubs and Plants
Atherton Municipal Code (amended through May 18, 2005)	Title 8, Health and Safety, Chapter 8.10, Removal of and Damage to Heritage Trees
Redwood City Municipal Code (amended through March 2005)	Chapter 18, Local Improvements and Planning, Article XIV, Local Development Standards, Section 18.241, Street Improvements – Street Trees
	Chapter 29, Streets, Sidewalks and Driveways, Article VI, Planting and Care of Trees and Other Vegetation on Public Streets
	Chapter 35, Tree Preservation
San Mateo Municipal Code	Title X, Peace, Safety and Morals, Chapter 10.52, Heritage Trees
Hillsborough Municipal Code (amended through February 14, 2005)	Title 14, Trees, Chapter 14.04, Tree Removal

TABLE 4.6-1 (Continued)
PERTINENT LOCAL VEGETATION ORDINANCES

Jurisdiction	Ordinances
Burlingame Municipal Code (amended through January 2004)	Title 11, Trees and Vegetation, Chapter 11.04, Street Trees
	Title 11, Trees and Vegetation, Chapter 11.06, Urban Reforestation and Tree Protection
	Title 11, Trees and Vegetation, Chapter 11.12, Obstructing View at Intersections
Millbrae Municipal Code (amended through June 14, 2005)	Title 8, Public Works, Chapter 8.60, City of Millbrae Tree Protection and Urban Forestry Program
San Bruno Municipal Code	Title 8, Streets, Sidewalks, and Rights-of-Way, Chapter 8.24, Street Trees and Other Plantings
	Title 8, Streets, Sidewalks, and Rights-of-Way, Chapter 8.25, Heritage Trees
South San Francisco Municipal Code (amended through June 2005)	Title 13, Public Improvements, Chapter 13.28, Street Trees
	Title 13, Public Improvements, Chapter 13.30, Tree Preservation
Brisbane Municipal Code (amended through April 2005)	Title 12, Streets, Sidewalks and Public Places, Chapter 12.12, Tree Regulations
Daly City Municipal Code (amended through April 2005)	Title 12, Streets, Sidewalks and Public Places, Chapter 12.40, Urban Forestry
San Francisco Public Works Code (amended through August 19, 2005)	Article 16, Urban Forestry Ordinance

San Joaquin County Multi-Species Habitat Conservation and Open Space Plan. The *San Joaquin County Multi-species Habitat Conservation Plan and Open Space Plan* provides a strategy for conserving open space while addressing the need to convert open space to non-open-space uses, protecting agricultural resources, preserving property rights, and providing for the long-term management of plant, fish, and wildlife species, especially special-status species. A Joint Powers Authority/Technical Advisory Committee implements the *Multi-species Habitat Conservation Plan and Open Space Plan* (SJMSCP JPA, 2001). The WSIP projects located in San Joaquin County are the Advanced Disinfection (SJ-1), Lawrence Livermore (SJ-2), SJPL System (SJ-3), SJPL Rehabilitation (SJ-4), and Tesla Portal Disinfection (SJ-5) projects.

Draft Santa Clara Valley Habitat Conservation Plan / Natural Communities Conservation Plan. The City of San Jose, Santa Clara County, Santa Clara Valley Transportation Authority, Santa Clara Valley Water District, City of Gilroy, and City of Morgan Hill have initiated a collaborative process to prepare and implement a habitat conservation plan/natural communities conservation plan (HCP/NCCP) for the Santa Clara Valley. The Draft Santa Clara Valley HCP/NCCP targets specifics areas of the county where land development activities and the continued survival of endangered, threatened, or other species of concern are in conflict. The goal of this plan is to provide the means for conservation of these species, thereby contributing to their recovery while allowing for compatible and appropriate development to occur. The HCP/NCCP and associated environmental documentation are scheduled for completion in 2009 (Santa Clara Valley HCP/NCCP, 2007).

SFPUC Habitat Conservation Plans. The SFPUC is also developing HCPs for its watershed lands as part of implementation of the Alameda and Peninsula WMPs. The Peninsula and Alameda Creek watershed HCPs are being prepared in compliance with federal and state regulations for endangered species protection. The HCPs will identify specific species to be covered, including steelhead, in consultation with federal and state resource agencies. The plans will also identify and describe SFPUC watershed operations and maintenance activities to be covered. The intent of the HCPs is to minimize and/or mitigate potential adverse effects on species addressed in the plans that could result from watershed operations and maintenance activities through implementation of conservation programs. The conservation programs will focus on providing long-term protection of covered species by protecting biological communities in the watersheds. The draft Alameda Creek watershed HCP is scheduled for public review in 2007, and the draft Peninsula watershed HCP is scheduled for public review in 2008. The plans are subject to environmental review by the San Francisco Planning Department before the SFPUC can consider adoption and begin implementation.

San Joaquin River National Wildlife Refuge Comprehensive Conservation Plan. The San Joaquin River National Wildlife Refuge (NWR) was established in 1987 as a unit of the San Luis NWR complex with its primary goal initially to protect habitat for the Aleutian Canada goose, then a federally listed endangered species. Its goals have since been expanded to include protection for other threatened and endangered species, and restoration of wetlands and floodplain habitat and the species that depend on them. The approved Refuge boundary encompasses 12,887 acres along the San Joaquin River both north and south of the confluence with the Tuolumne River (USFWS, 2007). About three miles of the Hetch Hetchy Aqueduct crosses the San Joaquin River NWR. The SJPL System (SJ-3) project could extend into the western portion of the NWR, primarily in cropland and recently established floodplain riparian habitat near the San Joaquin River. The SJPL Rehabilitation project (SJ-4) could involve repair and replacement of pipeline within the San Joaquin River NWR (generally within the pipelines right-of-way), including areas adjacent to floodplain, native grassland, cropland and irrigated pasture.

The USFWS has adopted a comprehensive conservation plan (CCP) that describes the goals, objectives, and management strategies of the CCP. The five primary goals of the San Joaquin River NWR CCP, as identified in the CCP/EA (USFWS, 2007), are summarized below:

- *Biological Diversity*. Conserve and protect the natural diversity of migratory birds, resident wildlife, fish, and plants through restoration and management of riparian, upland, and wetland habitats on refuge lands.
- *Threatened and Endangered Species*. Contribute to the recovery of threatened/endangered species, as well as the protection of populations of special-status wildlife and plant species and their habitats.
- *Aleutian Canada Goose*. Provide optimum wintering habitat for Aleutian Canada geese to ensure the continued recovery from threatened and endangered status.
- *Ecosystem Management*. Coordinate the natural resource management of the San Joaquin River NWR within the context of the larger Central Valley/San Francisco Ecoregion.

- *Public Use of the Refuge*. Provide the public with opportunities for compatible, wildlife-dependent visitor serves to enhance understanding, appreciation, and enjoyment of natural resources at the San Joaquin River NWR (USFWS, 2007).

4.6.2 Impacts

Significance Criteria

The CCSF has not formally adopted significance standards for impacts related to biological resources, but generally considers that implementation of the proposed program would have a significant biological impact if it were to:

- Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the CDFG or USFWS (Evaluated in this section)

- Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the CDFG or USFWS (Evaluated in this section)

- Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act and as protected under the Porter-Cologne Water Quality Control Act (including but not limited to marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means (Evaluated in this section)

- Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites (Evaluated in this section)

- Have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, or substantially reduce the number or restrict the range of an endangered, rare or threatened species (Evaluated in this section)

- Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance (Evaluated in this section)

- Conflict with the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or state habitat conservation plan (Evaluated in this section)

Approach to Analysis

The potential for key special-status species occurrence in the WSIP study area was determined based on CNDDB records (CDFG, 2007b), CDFG and USFWS lists of species (CDFG, 2007a; Federal Register, 2006b), CNPS data (CNPS, 2005), and GAP analysis maps, species ranges, and habitat suitability information from such sources as Mayer and Laudenslayer (1988). Other documents prepared for the SFPUC supplied additional information (e.g., ESA, 1999); however, no site-specific surveys were conducted for this programmatic analysis. This process resulted in the selection of the key special-status species described above in the Setting. These species are evaluated in terms of their reasonably predictable responses to proposed facility construction and operation (based on such factors as the size of the project footprint and proximity to known occupied habitat). While some sensitive natural communities could be identified at this program level of analysis, others are evaluated based on a reasonable probability of occurrence and impact. More detailed analyses would be performed during separate, project level CEQA review of the WSIP projects.

"Rare" and "endangered" are analogous terms defined in CEQA Guidelines Sections 15380(a) and 15380(d) and provide additional regulatory guidance. Program impacts on species listed as endangered or threatened under CESA or FESA are considered potentially significant in this PEIR. Impacts on other species of special concern are considered significant under certain circumstances. However, a detailed analysis of potential impacts on these species at the program level is not feasible because of the large number of other species of special concern, each with its own ecological characteristics, and because many aspects of the projects have not yet been defined. Impacts on many of these species would be similar to those on the sensitive natural communities, upon which most of these species depend.

For the purposes of this PEIR, the definition of the word "substantial" (as used in the significance criteria) has three principal components:

- Magnitude and duration of the impact (e.g., substantial/not substantial)
- Uniqueness of the affected resource (rarity)
- Susceptibility of the affected resource to disturbance

The evaluation of significance must also consider the interrelationship of these three components. For example, a relatively small-magnitude impact on a state or federally listed species would be considered significant because the species is rare and is believed to be very susceptible to disturbance. Conversely, a natural community such as California annual grassland is not necessarily rare or sensitive to disturbance, and thus a much larger magnitude of impact would be required to result in a significant impact. Impacts on biological resources are considered significant when project-related habitat modifications (e.g., development, introduction of non-native plant and animal species, increased human intrusion, barriers to movement, or landscape management) could reduce species populations to the extent that they become locally less numerous; impacts on habitats are considered significant when the habitats could not continue to support viable populations of associated plant and animal species as a result of project implementation.

Before identifying ways to lessen or mitigate these impacts, the PEIR preparers reviewed the Alameda and Peninsula WMPs (SFPUC, 2001, 2002) for guidance on actions that would routinely be applied to projects on SFPUC lands and for consistency between the WMPs and mitigation identified in this PEIR. For example, Policy V15 (for the Alameda watershed) requires a site-specific analysis prior to implementing facility and infrastructure projects, operations and maintenance activities, and construction projects to determine the presence of sensitive vegetation resources and the potential effects of the activity on the resource. Policy W6 (for the Peninsula watershed) stipulates that the integrity of the watershed creeks must be maintained to preserve their value as riparian ecosystems and wildlife corridors. Policy V15 ensures that the WSIP projects would be subject to a site-specific analysis independent of CEQA mitigation requirements and would be consistent with SFPUC Construction Measure #8 for biological resources, and Policy W6 sets a significance standard, based on local policy, which makes loss of riparian integrity a significant impact.

This PEIR evaluates the potential for impacts of the facility improvement projects at a program level and does not address project-specific aspects that require design details, such as the size and location of borrow and spoils areas; site-specific locality information, such as the location of key special-status species; and information typically developed at the project level, such as local hydrology. Project-specific information would be needed to determine the nature and extent of impacts more precisely and would be developed during the separate CEQA review of individual WSIP projects.

This analysis also proposes general, programmatic mitigation measures that could reduce identified program-level impacts to a less-than-significant level where adequate information is known; in some cases, additional analysis at the project level would be needed to identify project-specific mitigation measures to reduce impacts to a less-than-significant level. Mitigating the impacts of infrastructure projects is not a new regulatory or applied ecological endeavor in California. The natural history of most of the species involved is well enough understood, and there have been sufficient opportunities to test mitigation measures based on this understanding. Therefore, reliance on precedent and standard practice is justifiable for most projects. For example, burrowing owl impact analysis and mitigation was the subject of a CDFG staff report in 1995 (California Burrowing Owl Consortium, 1995); the USFWS developed guidance for California red-legged frog 1997, and programmatic avoidance measures/mitigations for San Joaquin kit fox and red-legged frog in 1997 and 1999, respectively (USFWS, 1997, 1999). For this reason, this PEIR is able to recommend standard programmatic mitigation measures for constructing project facilities based on accepted protocols.

[Additional discussion on the appropriate level of detail for analysis of biological resources was prepared in response to comments on the Draft PEIR. Please refer to Section 14.4, Master Response on PEIR Appropriate Level of Analysis (Vol. 7, Chapter 14).]

Impact Summary by Region

Table 4.6-2 presents a summary of impacts of the WSIP projects by region. While implementation of various WSIP projects would result in potentially significant impacts on biological resources, all impacts identified herein are determined to be less than significant with mitigation. **Table 4.6-3** summarizes the natural habitats and key special-status species with the potential to occur at each WSIP facility site. Table 6-1 in Chapter 6 summarizes the mitigation measures that might be required at each WSIP facility site if these habitats and species are found, and Table 6-2 defines the mitigation measures in detail.[15]

[15] The measures in Table 6-2 are not applicable at every site and could be modified for individual projects.

TABLE 4.6-2
POTENTIAL IMPACTS AND SIGNIFICANCE – BIOLOGICAL RESOURCES

Projects	Project Number	Impact 4.6-1: Impacts on wetlands and aquatic resources	Impact 4.6-2: Impacts on sensitive habitats, common habitats, and heritage trees	Impact 4.6-3: Impacts on key special-status species – direct mortality and/or habitat effects	Impact 4.6-4: Water discharge effects on riparian and/or aquatic resources	Impact 4.6-5: Conflicts with adopted conservation plans or other approved biological resources plans
San Joaquin Region						
Advanced Disinfection	SJ-1	PSM	PSM	PSM	LS	N/A
Lawrence Livermore Supply Improvements	SJ-2	PSM	PSM	PSM	LS	N/A
San Joaquin Pipeline System	SJ-3	PSM	PSM	PSM	PSM	PSM
Rehabilitation of Existing San Joaquin Pipelines	SJ-4	PSM	PSM	PSM	PSM	PSM
Tesla Portal Disinfection Station	SJ-5	PSM	PSM	PSM	LS	N/A
Sunol Valley Region						
Alameda Creek Fishery Enhancement	SV-1	PSM	PSM	PSM	LS	LS
Calaveras Dam Replacement	SV-2	PSM	PSM	PSM	LS	LS
Additional 40-mgd Treated Water Supply	SV-3	PSM	PSM	PSM	LS	LS
New Irvington Tunnel	SV-4	PSM	PSM	PSM	PSM	LS
SVWTP – Treated Water Reservoirs	SV-5	PSM	PSM	PSM	LS	LS
San Antonio Backup Pipeline	SV-6	PSM	PSM	PSM	LS	LS
Bay Division Region						
Bay Division Pipeline Reliability Upgrade	BD-1	PSM	PSM	PSM	PSM	N/A
BDPL Nos. 3 and 4 Crossovers	BD-2	PSM	PSM	PSM	PSM	N/A
Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault	BD-3	PSM	PSM	PSM	LS	N/A
Peninsula Region						
Baden and San Pedro Valve Lots Improvements	PN-1	LS	PSM	PSM	LS	LS
Crystal Springs/San Andreas Transmission Upgrade	PN-2	PSM	PSM	PSM	LS	LS
HTWTP Long-Term Improvements	PN-3	LS	LS	LS	LS	N/A
Lower Crystal Springs Dam Improvements	PN-4	PSM	PSM	PSM	LS	LS
Pulgas Balancing Reservoir Rehabilitation	PN-5	PSM	PSM	PSM	LS	LS
San Francisco Region						
San Andreas Pipeline No. 3 Installation	SF-1	PSM	PSM	LS	N/A	N/A
Groundwater Projects	SF-2	PSM	PSM	LS	N/A	N/A
Recycled Water Projects	SF-3	PSM	PSM	LS	N/A	N/A

LS = Less than Significant impact, no mitigation required
PSM= Potentially Significant impact, can be mitigated to less than significant
N/A = Not Applicable

TABLE 4.6-3
ESTIMATED PROJECT ACREAGE AND POTENTIAL OCCURRENCE, BY PROJECT, OF TERRESTRIAL HABITATS AND KEY SPECIAL-STATUS SPECIES

		Habitat Types								Suites of Key Special-Status Species						Individual Key Special-Status Species								
No.	**Project Name, Estimated Construction (C) Project Acreage (ac), and estimated borrow (B) and spoils (S) volume, in cubic yards (cy) (TBD=acreage to be determined during project design)**	Annual Grassland	Blue Oak Woodland	Valley Foothill Riparian	Coastal Scrub	Coastal Oak and Valley Oak Woodland	Vernal Pools	Saline Emergent Wetland	Freshwater Emergent Wetland	Vernal Pool Invertebrates	Vernal Pool Plants	Riparian and Reservoir Species	Native Grassland Species	Salt Marsh Species	Fishes	Large-Flowered Fiddleneck	Foothill Yellow-Legged Frog	California Red-Legged Frog	California Tiger Salamander	San Francisco Garter Snake	Alameda Whipsnake	Swainson's Hawk	Western Burrowing Owl	San Joaquin Kit Fox
San Joaquin Region																								
SJ-1	Advanced Disinfection (C: 2 ac / B: TBD / S: TBD)	X							X	X								X	X			X	X	X
SJ-2	Lawrence Livermore Supply Improvements (C: TBD / B: TBD / S: TBD)	X	X						X	X						X		X	X			X	X	X
SJ-3	San Joaquin Pipeline System (C: 140–560 ac / B: 0 / S: 424,000 cy)	X	X	X			X		X	X	X	X			X			X	X			X	X	X
SJ-4	Rehabilitation of Existing San Joaquin Pipelines (C: TBD / B: TBD / S: 100,000)	X	X	X		X	X		X	X	X	X			X			X	X			X	X	X
SJ-5	Tesla Portal Disinfection Station (C: 2 ac / B: 0 / S: 0)	X								X								X	X				X	X
Sunol Valley Region																								
SV-1	Alameda Creek Fishery Enhancement (C: TBD / B: TBD / S: TBD	X		X	X	X			X						X		X	X	X		X		X	
SV-2	Calaveras Dam Replacement (C: 666 ac / B: 6,300,000 cy / S: 4,000,000 cy)	X		X	X	X			X			X	X		X		X	X	X		X		X	
SV-3	Additional 40-mgd Treated Water Supply (C: 1.5 ac / B: 0 / S: 100,000 cy)	X		X	X	X			X				X				X	X	X		X		X	
SV-4	New Irvington Tunnel (C: 120 ac / B: 0 / S: 186,175 cy)	X		X	X	X			X				X					X	X		X		X	
SV-5	SVWTP – Treated Water Reservoirs (C: 10.5 ac / B: 0 / S: 300,000 cy)	X		X	X	X			X				X		X		X	X	X		X		X	
SV-6	San Antonio Backup Pipeline (C: TBD / B: 51,000 cy / S: 37,000 cy)	X		X		X			X				X		X		X	X	X		X		X	
Bay Division Region																								
BD-1	Bay Division Pipeline Reliability Upgrade (C: 165–175 ac / B: 0 / S: 434,000 cy)	X		X		X		X	X	X				X	X			X	X	X			X	
BD-2	BDPL Nos. 3 and 4 Crossovers (C: 1.2 ac / B: 0 / S: 43,500)	X		X		X			X	X					X			X	X				X	
BD-3	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault (C: TBD / B: 0 / S: 55,300)	X		X					X									X	X				X	

TABLE 4.6-3 (Continued)
ESTIMATED PROJECT ACREAGE AND POTENTIAL OCCURRENCE, BY PROJECT, OF TERRESTRIAL HABITATS AND KEY SPECIAL-STATUS SPECIES

		Habitat Types								Suites of Key Special-Status Species						Individual Key Special-Status Species								
No.	**Project Name, Estimated Construction (C) Project Acreage (ac), and estimated borrow (B) and spoils (S) volume, in cubic yards (cy) (TBD=acreage to be determined during project design)**	Annual Grassland	Blue Oak Woodland	Valley Foothill Riparian	Coastal Scrub	Coastal Oak and Valley Oak Woodland	Vernal Pools	Saline Emergent Wetland	Freshwater Emergent Wetland	Vernal Pool Invertebrates	Vernal Pool Plants	Riparian and Reservoir Species	Native Grassland Species	Salt Marsh Species	Fishes	Large-Flowered Fiddleneck	Foothill Yellow-Legged Frog	California Red-Legged Frog	California Tiger Salamander	San Francisco Garter Snake	Alameda Whipsnake	Swainson's Hawk	Western Burrowing Owl	San Joaquin Kit Fox
Peninsula Region																								
PN-1	Baden and San Pedro Valve Lots Improvements (C: 2 ac / B: 0 / S: 4,970)								X									X	X	X				
PN-2	Crystal Springs/San Andreas Transmission Upgrade (C: TBD / B: 0 / S: 9,000 cy)	X		X	X	X			X									X	X	X				
PN-3	HTWTP Long-Term Improvements (C: TBD / B: TBD / S: TBD)																	X						
PN-4	Lower Crystal Springs Dam Improvements (C: 6 ac / B: 0 / S: 21,000 cy)	X*		X	X	X			X				X		X			X	X	X				
PN-5	Pulgas Balancing Reservoir Rehabilitation (C: TBD / B: TBD / S: TBD)	X		X	X	X			X						X			X	X	X				
San Francisco Region																								
SF-1	San Andreas Pipeline No. 3 Installation (C: 23 ac / B: 0 / S: 44,170 cy)																							
SF-2	Groundwater Projects (C: 0.7 / B: TBD / S: TBD)	X							X															
SF-3	Recycled Water Projects (C: 5-7 ac / B: 0 / S: 47,200 cy)	X							X															

Notes: Project-specific CEQA documents would review recent special-status species lists relevant to the habitats present. The information presented here is for guidance only, and project design and site-specific assessment is needed to definitively determine the presence of habitats and key special-status species for each project.

Vernal pool invertebrates:
- Vernal pool fairy shrimp
- Conservancy fairy shrimp
- Vernal pool tadpole shrimp

Salt marsh species:
- Western snowy plover
- California clapper rail
- California black rail
- Salt marsh harvest mouse

Fishes:
- Green sturgeon (San Joaquin Valley only)
- Chinook salmon
- Central Valley DPS steelhead
- Central California Coast DPS steelhead
- Rainbow trout (Alameda Creek)

Vernal pool plants:
- Succulent owl's-clover
- Hoover's spurge
- Colusa grass
- San Joaquin Valley Orcutt grass
- Hairy Orcutt grass
- Greene's tuctoria

Riparian and Reservoir species:
- Least Bell's vireo (San Joaquin)
- Valley elderberry longhorn beetle (San Joaquin)
- Riparian woodrat (San Joaquin)
- Delta button-celery (San Joaquin)
- Bald eagle (Sunol Valley)
- Foothill yellow-legged frog

Native grassland species:
- Bay checkerspot butterfly (Peninsula)
- Callippe silverspot butterfly
- Fountain thistle (Peninsula)
- Marin dwarf flax (Peninsula)
- San Mateo woolly sunflower (Peninsula)

Impact 4.6-1: Impacts on wetlands and aquatic resources.

Many of the WSIP projects would affect streams or wetlands that fall under state or federal jurisdiction. Most impacts would be associated with construction activities and thus would be temporary. Projects crossing streams and rivers could require dredging or filling, potentially causing erosion, siltation, and the loss of riparian habitat. In addition, aquatic plants and animals could be stranded by dewatering, exposed to predation, and trampled or crushed. Aquatic resources could also be affected by siltation or degradation of water quality from spills during construction. Hazardous materials, including hydrocarbons such as fuel and lubricants, could enter waterways during construction and contaminate the soil and water, causing direct and indirect impacts on wetlands and aquatic resources (see Sections 4.5, Water Quality, and 4.14, Hazards). Some types of wetlands, such as vernal pools, are permanently affected by changes in soil permeability or drainage. The extent of wetlands affected by a project is usually small compared with the total project footprint, but highly dependent on the final project design. Since final designs have not been prepared for most WSIP projects, the acreage of affected wetlands is not specified in this analysis, but would be determined during project-level CEQA review. The majority of WSIP projects also have the potential to affect seasonal wetlands under state or federal jurisdiction. In addition, pending the outcome of recent cases in federal court, some man-made depressions where water collects for long periods of time may be considered jurisdictional and, in addition, may have the potential to support key special-status invertebrates. Permanent freshwater and saline wetlands could be affected by those projects located in salt marsh or freshwater habitats, but few projects are near these relatively rare habitats. Vernal pools would be permanently affected by excavation or substantial alteration of the soil surface. Even with subsequent compaction, such activity would alter the slow soil permeability upon which vernal pool hydrology depends.

Because wetlands, especially small seasonal wetlands, could occur on almost any facility site, impacts on wetlands are assumed to occur for all WSIP projects that involve surface disturbance. For those projects restricted to sites that are already surfaced, drained, landscaped, or maintained free of vegetation, the potential for impacts on wetlands is low but cannot be entirely ruled out. Once the WSIP projects have undergone preliminary design and biological surveys have been conducted, some of these projects could be determined to have no impact on wetland resources, in which case no mitigation would be required. If impacts on wetlands would occur, further analysis and permitting would be required. Potential impacts on wetlands, by facility type, are described below.

Pipelines. The standard pipeline installation method proposed for the WSIP projects is the open-cut trench method. In environmentally sensitive areas such as creeks, “trenchless” construction techniques such as jack-and-bore or microtunneling could be utilized. Where pipeline installation or replacement is not required, sliplining might be possible. For the open-cut trench method, the construction area would extend for the length of the pipeline and would have a width dependent on the size of the pipe. For trenchless pipeline construction and sliplining, vehicle access and a work area would be required for each pit or entry point. Some land would be temporarily used for construction or staging areas, while a small amount would be permanently committed to accessways, valves, and other control structures. Wetlands would be temporarily affected in construction and staging areas, and permanently affected where habitat is lost. Vernal pools are a special example, because breaking up the impervious or slowly pervious subsoil permanently alters the hydrology of the pool; if this occurred, the vernal pool habitat would be deemed lost, even though post-construction restoration might be able to restore some vernal pool functions and values.

Tunnels. Impacts on wetlands could occur at portals and shaft openings. The construction area at the entry portal would be the largest, as it must accommodate the portal/shaft entry, vehicles, spoils, equipment, and materials storage. Construction areas at exit portals and shaft openings would require vehicle access and a smaller work area. Dewatering of the tunnel during construction sometimes affects the groundwater, resulting in impacts on surface water features such as springs, seeps, and even creeks. Assessment of this impact would require site-specific information on hydrology and project design, which would be developed as part of project-level CEQA review. Tunnels require spoils disposal sites and access from the portal or shaft openings to the disposal site. The spoils disposal site, as well as a portion of the work area at both portals and shafts, would be permanently committed to access, control, and maintenance structures; permanent loss of wetlands could occur in these areas.

Valves, Valve Lots, and Crossovers. Valves, valve lots, and crossovers are located along existing pipelines and already have developed vehicular access. WSIP projects sited in developed areas that are drained and maintained free of vegetation would not affect wetlands. Projects in undeveloped areas could affect seasonal wetlands. Crossover facilities must be sited near creeks so they can discharge large volumes of water into the watercourse during regular maintenance and during emergency situations. The discharge of water from crossover facilities could cause erosion, temporary out-of-season flooding of the stream channel, loss of wetland and riparian vegetation, and mortality of aquatic organisms dislodged by the high flows.

Pump Stations. New pump stations that would replace existing pump stations (on sites that are surfaced, drained, and maintained free of vegetation) would not affect wetlands. However, if the surfaces at existing pump stations collect soil and standing water, the potential exists for species that live in temporary ponds to establish themselves. New stations on natural habitat could result in temporary and permanent habitat loss, particularly of seasonal wetlands.

Treatment Facilities. WSIP treatment facility projects in developed areas (on sites that are surfaced, drained, and maintained free of vegetation) would not affect wetlands. If natural habitat were affected, impacts on seasonal wetlands could occur (temporary impacts in the work area and permanent impacts where buildings, surfacing, or other facilities are constructed). If it were necessary to install pipelines to connect treatment facilities to the rest of the Hetch Hetchy system, the same type of impacts discussed above in the pipeline section could occur.

Storage Facilities. WSIP storage facility projects would involve the construction or improvement of storage reservoirs and dams. Improvements to below-grade storage reservoirs would require extensive grading and structural work, and it could be necessary to haul material offsite for disposal. Construction activity in areas of natural vegetation could result in impacts on seasonal wetlands. Dam improvements would involve extensive earthmoving activities around the dam as well as the development of borrow areas, disposal areas, and access roads. These projects would result in temporary construction impacts on the impounded stream and its associated riparian vegetation, and permanent loss of riparian habitat where facilities and access roads are sited. Also, raising or lowering reservoir water levels could inundate existing wetlands or allow them to dry out. This impact of WSIP operations is discussed in Chapter 5.

San Joaquin Region

Impact 4.6-1: Impacts on wetlands and aquatic resources		
Advanced Disinfection	SJ-1	PSM
Lawrence Livermore	SJ-2	PSM
SJPL System	SJ-3	PSM
SJPL Rehabilitation	SJ-4	PSM
Tesla Portal Disinfection	SJ-5	PSM

All five of the projects in this region have the potential to affect at least small areas of seasonal wetlands. The Advanced Disinfection (SJ-1) and Tesla Portal Disinfection (SJ-5) projects would be located in the vicinity of Tesla Portal in largely developed area. Only a small portion of this project site could support seasonal wetlands. However, both projects would generate spoils requiring offsite disposal. The location and area required for spoils disposal have not been determined, so impacts on wetlands are conservatively considered to be *potentially significant*. The Lawrence Livermore (SJ-2) project could also affect small seasonal wetlands or watercourses at the facility sites or along access roads if they required improvements, resulting in *potentially significant* impacts.

The SJPL System (SJ-3) project would construct approximately 16 miles of pipeline and two crossovers, while the SJPL Rehabilitation (SJ-4) project would rehabilitate the existing pipelines at discrete locations. The pipeline construction area for both projects would be partially located on previously disturbed areas and partially on undisturbed areas of the right-of-way, because the work area must be located to the side of the existing pipelines. As a result, vernal pools in the eastern grasslands, alkaline meadows in the floodplains of the San Joaquin River, and other small seasonal wetlands throughout the pipeline route could be temporarily or permanently lost due to construction. Such impacts would be *potentially significant* for the SJPL System and SJPL Rehabilitation projects due to the presence of vernal pools and riparian areas within the project rights-of-way. However, pipeline rehabilitation work under the SJPL Rehabilitation project would occur primarily on previously disturbed lands, and the potential for impacts on vernal pools, small seasonal wetlands, or riparian habitats would be less than under the SJPL System project. In addition, these projects could adversely affect wetlands associated with the San Joaquin River and several other watercourses and their corresponding wetland, riparian, and aquatic life. Potential impacts on riparian areas would be greatly reduced through the proposed use of trenchless construction methods across permanent creeks and creeks with riparian vegetation. Crossovers associated with the SJPL System project may be located at watercourses, and construction could affect wetlands in these areas.

Taken as a whole, the San Joaquin Region projects would result in surface disturbance of 100 to 400 acres in construction areas (99 percent attributable to the SJPL System project, SJ-3, although the extent of construction under SJPL Rehabilitation project, SJ-4, is unknown); these projects would generate approximately 357,000 cubic yards of spoils (99 to 100 percent attributable to the

SJPL System project, and not including the SJPL Rehabilitation project). The location and extent of spoils disposal has not been determined, so the potential impacts on wetlands cannot be analyzed at the program level. Tunneling where feasible would minimize impacts on river and creek resources.

SFPUC Construction Measure #8 (biological screening survey) would be implemented for all projects to determine whether any wetlands could be affected by proposed development. Measures 4.6-1a and 4.6-1b call for assessment, avoidance, restoration, and, in the case of permanent impacts, compensatory creation or enhancement to ensure no net loss of wetlands. Implementation of Measures 4.6-1a and 4.6-1b could reduce *potentially significant* impacts to a less-than-significant level for the Advanced Disinfection (SJ-1), Lawrence Livermore (SJ-2), and Tesla Portal Disinfection (SJ-5) projects.

Substantial wetland resource impacts could occur under the SJPL System project (SJ-3) and the SJPL Rehabilitation project (SJ-4). For projects that could not avoid impacts on wetlands, compensation would be implemented as appropriate to ensure no net loss. An example of a mechanism for compensating wetland loss is the proposed Habitat Reserve Program (HRP), described in Chapter 3 as a related activity under the WSIP. The HRP proposes a variety of means to identify, protect, restore, and manage wetland resources as compensation for WSIP impacts.[16] Implementation of SFPUC Construction Measure #8 and Measures 4.6-1a and 4.6-1b would reduce potential impacts from all San Joaquin Region projects to a less-than-significant level. Potential impacts on wetlands will be evaluated in more detail as part of separate, project-level CEQA review.

Sunol Valley Region

Impact 4.6-1: Impacts on wetlands and aquatic resources		
Alameda Creek Fishery	SV-1	PSM
Calaveras Dam	SV-2	PSM
40-mgd Treated Water	SV-3	PSM
New Irvington Tunnel	SV-4	PSM
Treated Water Reservoirs	SV-5	PSM
SABUP	SV-6	PSM

All of the projects in this region have the potential to affect small areas of seasonal wetlands. The Alameda Creek Fishery project (SV-1) would likely involve construction of pipeline, pumps, collection wells, control structures, and a recapture facility in and near Alameda Creek, downstream from Calaveras Dam. Since it would be situated in and near Alameda Creek, this project could result in *potentially significant* impacts on wetlands and associated vegetation. The volume of spoils generated by this project has not been determined, and the location and area required for spoils disposal have not been identified. The design and nature of the facilities would determine the extent of impacts on wetland and aquatic resources and whether a nationwide or individual Corps permit would be required.

16 The proposed HRP is one of a number of options for achieving the same mitigation goal, and in the absence of the HRP, project-level CEQA review would be required to identify and provide for distinct, project-specific mitigation actions.

The Calaveras Dam project (SV-2) would affect about 100 acres of habitat in the construction area, including portions of Calaveras Creek downstream from the existing dam and portions of Alameda Creek in the vicinity of the Alameda Creek Diversion Dam. Approximately 220 acres of land would be disturbed during the acquisition of borrow material and for spoils disposal. Surface disturbance and alteration of natural surface contours at the construction area would cause impacts on seasonal or permanent wetlands such as freshwater marsh, freshwater seeps, and perennial and seasonal streams, including several hundred linear feet of Calaveras Creek below the existing dam. This project would result in the temporary loss of wetlands and associated aquatic and riparian habitat in the construction area. Riparian and aquatic habitat loss would be permanent at the dam and associated facility sites and in borrow and spoils disposal areas. In addition, seasonal and permanent wetlands that have developed in the area between the existing and proposed reservoir elevations could become more or less permanently inundated (see Section 5.4.6 for a discussion of impacts related to Calaveras Dam operations). The impact of constructing the Calaveras Dam project on wetland resources would be *potentially significant*, but could be minimized through project siting, avoidance of sensitive resources to the extent possible, revegetation of temporarily disturbed areas, and compensatory habitat creation or enhancement in the case of permanent impacts (also see Section 5.4.6 for an analysis of system operations impacts on wetlands and other sensitive habitats).

The 40-mgd Treated Water project (SV-3) would have a construction footprint of 1.5 acres and a final footprint of about 1 acre. This facility would be situated on or near the Sunol Valley Water Treatment Plant (WTP) site, primarily on previously disturbed grasslands. Seasonal wetlands could be present in this area, but they would be man-made and very limited in extent. This project would generate an estimated 100,000 cubic yards of spoils. The location and area required for spoils disposal have not been determined, but could result in impacts on wetlands. Construction grading, erosion, and sedimentation could potentially affect the wetlands and riparian vegetation along adjacent areas of Alameda Creek. The proposed two miles of pipeline to the Alameda Siphons or New Irvington Tunnel as part of this project could affect wetland and aquatic resources along several ephemeral streams. Siting the 40-mgd Treated Water project to avoid the wetland and riparian resources at Alameda Creek could avoid significant impacts on wetlands. However, the two-mile pipeline must either cross steep terrain and several ephemeral tributaries of Alameda Creek, or be situated in the floodplain of Alameda Creek. Either location could cause a *potentially significant* impact on wetland resources.

Under the New Irvington Tunnel project (SV-4), construction of facilities at the proposed tunnel portals south of the Alameda West and Irvington Portals, as well as land required for access roads, shafts, control structures, and a spoils disposal area, could permanently affect seasonal and permanent wetlands. In addition, seasonal wetlands could be temporarily affected in the construction area. The construction footprint at the proposed tunnel portal in the Sunol Valley would be located primarily in uplands; however, impacts could extend to seasonal or permanent wetland or riparian resources near Alameda Creek. The construction area required for this project is estimated at 127 acres, with most spoils to be disposed of onsite. The location of any offsite spoils disposal areas and associated access routes have not been determined. Taken together, the impacts on wetlands would be *potentially significant* for this project.

The Treated Water Reservoirs project (SV-5) would require installation of a 0.3-mile pipeline, including a pipe bridge across Alameda Creek; it would have a construction footprint of 10.5 acres and a final footprint of 3.2 acres. This project would generate a spoils volume of 300,000 cubic yards, although the location and extent of land required for spoils disposal have not been identified for this WSIP. The Treated Water Reservoirs project would result in *potentially significant* temporary and permanent losses of wetland and aquatic habitat in and near Alameda Creek near the Sunol Valley WTP and elsewhere, depending on the location of spoils disposal.

The SABUP project (SV-6) would closely parallel (but would not cross) San Antonio Creek. This project would install 2.3 miles of backup pipeline and would include a new discharge structure in San Antonio Creek and about 1,000 feet of pipeline from Alameda East Portal to Alameda Creek, ending with an energy dissipation structure in Alameda Creek. The construction and permanent placement of such structures would affect these watercourses, and the installation of pipeline could affect ephemeral watercourses and small seasonal wetlands along the proposed alignment. As indicated previously, construction in riparian areas would cause temporary impacts, and the placement of facilities within wetland or aquatic habitat would cause permanent impacts. Siting the SABUP project along existing graded access roads would reduce impacts on wetlands. This project would also generate an estimated net 37,000 cubic yards of spoils. The location and extent of the area required for spoils disposal have not been determined, but could result in a *potentially significant* impact on wetlands and aquatic resources.

Since all WSIP PEIR projects in this region could have a significant impact on wetlands, SFPUC Construction Measure #8 (biological screening survey) would be required to determine the presence and potential impact on wetlands. For projects on SFPUC watershed lands, Construction Measure #8 would ensure consistency with the Alameda WMP. Impacts on permanent creeks and creeks with riparian vegetation would be minimized through the use of trenchless construction methods, which are proposed for crossing such creeks. As mentioned above, these projects are subject to separate, project-level CEQA review, which will evaluate potential impacts in more detail and determine appropriate mitigation measures based on the presence of sensitive biological resources. A wetlands assessment and implementation of avoidance, protection, restoration, and compensation (Measures 4.6-1a and 4.6-1b), would be implemented as appropriate. Taken together, SFPUC Construction Measure #8 and Measures 4.6-1a and 4.6-1b would reduce these potentially significant impacts to a less-than-significant level.

Bay Division Region

Impact 4.6-1: Impacts on wetlands and aquatic resources		
BDPL Reliability Upgrade	BD-1	PSM
BDPL 3 and 4 Crossovers	BD-2	PSM
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	PSM

Of the three projects in this region, the BDPL Reliability Upgrade project (BD-1) has the greatest potential to affect small seasonal wetlands. This project would consist of about 16 miles of pipeline and 5 miles of tunnel. The pipeline segment would cross several modified creek channels and artificial flood control channels between the Irvington Portal and Newark Valve House. This pipeline could affect degraded saline emergent wetland habitat near the valve houses at the edge of San Francisco Bay, especially at the Newark Valve House where the staging area would be located for the tunnel segment of the pipeline. West of the bay, the pipeline would cross two urbanized flood control channels and one natural stream course. Depending on the extent of pipeline requiring upgrades, construction for this project would affect from 82 to 164 acres. In addition, spoils generated by this project are estimated at 614,000 cubic yards. Some of the spoils from the tunnel could be placed in one or more former salt evaporation ponds that are being restored. While there might be temporary impacts on wetlands associated with placing the spoils, the spoils could be used as part of the restoration effort and could therefore have a long-term beneficial impact. Other spoils might be disposed of at other locations, but the extent of any disposal areas has not been determined. The typical construction scenario for pipelines (presented in Chapter 3, Section 3.10.1) indicates that trenchless construction methods would be used to cross beneath streams and avoid sensitive habitats such as salt marsh, and that unpaved affected areas would be graded and revegetated following construction. The proposed use of trenchless construction methods across permanent creeks and creeks with riparian vegetation would reduce potential impacts, but impacts on riparian vegetation could still occur due to construction activity at the tunneling sites. Therefore, the BDPL Reliability Upgrade project would have a *potentially significant* impact on wetlands and aquatic resources.

The BDPL 3 and 4 Crossovers project (BD-2) would affect a minimum of 0.4 acre and could affect wetlands and aquatic resources associated with the Guadalupe River, Barron Creek, and Bear Gulch Reservoir during construction. The effect on wetlands would be temporary, except for the permanent loss of habitat associated with the small vaults and discharge pipes installed at each of the crossovers to enable discharge for maintenance or emergencies. Although small, these impacts would be *potentially significant*.

The BDPL 3 and 4 Seismic Upgrade at the Hayward Fault (BD-3) would involve construction or replacement of up to three miles of pipeline in the vicinity of I-680 and Mission Boulevard in Fremont. The extent of the construction area and spoils disposal sites has not been determined. The proposed use of trenchless methods for creek crossings would reduce the potential impact on these aquatic resources. Although the wetland resources in this area have been highly modified, impacts are considered *potentially significant* pending further analysis.

SFPUC Construction Measure #8 (biological screening survey) would be implemented for all WSIP projects to determine the extent of impacts on wetlands and aquatic resources. Impacts on permanent creeks and creeks with riparian vegetation would be minimized through the proposed use of trenchless construction methods across such creeks. Where wetland resources are present, Measure 4.6-1a calls for a wetland assessment, and Measure 4.6-1b would provide for identifying, preserving, creating, enhancing, and managing compensation lands, as appropriate to fully compensate for temporary and permanent loss of wetlands. Taken together, these measures would reduce impacts on wetlands to a less-than-significant level.

Peninsula Region

Impact 4.6-1: Impacts on wetlands and aquatic resources		
Baden and San Pedro Valve Lots	PN-1	LS
CS/SA Transmission	PN-2	PSM
HTWTP Long-Term	PN-3	LS
Lower Crystal Springs Dam	PN-4	PSM
Pulgas Balancing Reservoir	PN-5	PSM

Most of the projects in this region have the potential to affect small seasonal wetlands. It should be noted that the acreage of potentially affected area has not been determined for any of these projects.

The Baden and San Pedro Valve Lots project (PN-1) is located primarily on maintained, surfaced land, with some access areas on well-sloped, disturbed land that cannot support wetlands. The HTWTP Long-Term project (PN-3) would be located entirely on maintained, surfaced land. Therefore, impacts on wetlands under these two projects would be *less than significant* if all activity is limited to graded, paved, and drained sites that are maintained free of vegetation, or areas that do not contain wetland characteristics.

The CS/SA Transmission project (PN-2) would consist of repairing or replacing 4.5 miles of pipeline and 0.5 mile of tunnel between the Lower Crystal Springs and San Andreas Reservoirs. This project would cause *potentially significant* temporary impacts on wetlands, including freshwater emergent wetlands, and on riparian resources at stream crossings where existing facilities would be replaced, such as the culverts connecting Upper and Lower Crystal Springs Reservoirs and outlet structures and tunnels at Crystal Springs Dam. In addition, impacts on riparian wetlands could occur where the pipeline crosses streams. The acreage of required construction area and the location and extent of borrow or spoils areas have not been determined, and impacts on wetlands will be analyzed in more detail as part of separate, project-level CEQA review for this project.

The Lower Crystal Springs Dam project (PN-4) could adversely affect creek and riparian resources along San Mateo Creek if work areas are needed at the base of the dam. If the stilling basin area at the base of the dam is reconstructed, the freshwater marsh habitat would be lost, a *potentially significant* impact. This project would generate 21,000 cubic yards of spoils; disposal of this volume could affect wetlands if any watercourses or wetlands are located at the spoils disposal site. Operationally, this project would allow Upper and Lower Crystal Springs Reservoirs to be maintained at historical levels, which are higher than the prevailing reservoir levels. This impact of WSIP operations is discussed in Section 5.5.6.

The Pulgas Balancing Reservoir project (PN-5) would affect streams at pipeline crossings and could affect limited freshwater emergent wetland habitat, a *potentially significant* impact. Potential impacts on wetlands and aquatic resources would be evaluated in more detail as part of separate, project-level CEQA review for these projects. Impacts on permanent creeks and creeks with riparian vegetation would be minimized through the proposed use of trenchless construction methods across such creeks.

Implementation of SFPUC Construction Measure #8 (biological screening survey) calls for an initial screening of all project sites for sensitive wetland and aquatic resources. If wetland resources were present, performance of wetlands assessment and avoidance, protection, restoration, and compensation for the lost wetlands and aquatic resources would be required (Measures 4.6-1a and 4.6-1b). Taken together, these measures would reduce wetlands impacts for all Peninsula Region projects to a less-than-significant level.

San Francisco Region

Impact 4.6-1: Impacts on wetlands and aquatic resources		
SAPL 3 Installation	SF-1	PSM
Groundwater Projects	SF-2	PSM
Recycled Water Projects	SF-3	PSM

All three projects in this region have the potential to affect small seasonal wetlands, either directly in construction areas or in spoils disposal areas, a *potentially significant* impact. The SAPL 3 Installation project (SF-1) consists of about four miles of pipeline through predominantly urban and developed areas, but would generate an estimated 44,000 cubic yards of spoils. The location and extent of spoils disposal areas have not been determined. The Groundwater Projects (SF-2) would affect Lake Merced by raising its water level, a potentially beneficial impact. It could also affect wetlands and stream crossings at undetermined locations, totaling 0.6 acre in western San Francisco and northern San Mateo County. The Recycled Water Projects (SF-3) would install 20 miles of pipeline; it would require an estimated five to seven acres for construction and would generate an estimated 47,200 cubic yards of spoils. The location and extent of the construction areas and spoils disposal areas have not been determined. This project could affect larger wetlands, depending on the locations of proposed pipeline, treatment, and storage facilities.

Impacts on any identified permanent creeks and creeks with riparian vegetation would be reduced through the proposed use of trenchless construction methods to cross such creeks. The potential impacts associated with the SAPL 3 Installation project (SF-1), Groundwater Projects (SF-2), and Recycled Water Projects (SF-3) would be evaluated as part of separate, project-level CEQA review. SFPUC Construction Measure #8 (biological screening survey) would be implemented for all WSIP projects to determine whether biological resources could be affected, including wetland and aquatic resources. If jurisdictional wetlands were identified at any of these sites, performance of a wetlands assessment and avoidance, protection, restoration, and compensation for the loss of wetlands would be required (Measures 4.6-1a and 4.6-1b). Taken together, SFPUC Construction Measure #8 and Measures 4.6-1a and 4.61b would reduce wetlands impacts for all three WSIP projects in this region to a less-than-significant level.

Impact 4.6-2: Impacts on sensitive habitats,[17] common habitats, and heritage trees.

For the purpose of this analysis, sensitive habitats include sensitive natural communities, as defined by Holland (1986), and USFWS-defined critical habitats for listed species. Many of the sensitive habitats that could be affected by WSIP implementation are wetlands or are associated with wetlands, such as vernal pools, riparian habitats, and alkali meadows; wetland-related impacts are discussed above under Impact 4.6-1. Impact 4.6-2 addresses non-wetland-related sensitive habitats, such as native grasslands, and also applies to the full extent of the sensitive habitat (e.g., the outer canopy of riparian trees and shrubs).

More common or widespread habitats would also be affected, such as ruderal (or weedy) areas and non-native grassland. As discussed above, impacts on common habitats must be extensive to be considered significant. To determine the level of impact, the estimated amounts of total ground disturbance displayed in Table 4.6-3 were used as a general guide to conclude that impacts on common habitats would not be significant if the extent of the construction area and expected volume of borrow and spoils were small. These numbers would be refined and partitioned among habitat types as part of separate, project-level CEQA review for the individual WSIP projects. Impacts on sensitive habitats also include the disturbance or removal of large, old, or historically important trees. For example, Alameda County protects heritage trees, and the CCSF has specific prohibitions against the removal of street trees and landmark trees. These trees are collectively referred to in this section as heritage trees. Also included in the loss of sensitive habitats are impacts on critical habitat for listed species, as described above and mapped in Figure 4.6-2. Impacts and mitigations do not vary by region, except with respect to the species associated with critical habitats. Potential impacts on sensitive habitats, by facility type, are described below.

Project- and site-specific impacts would be analyzed when more detailed project design information is developed, especially with regard to access, construction and staging areas, location and extent of borrow areas, and spoils disposal areas. Such impacts would be analyzed as part of separate, project-level CEQA review for those projects that could result in potentially significant impacts on sensitive natural communities and habitats.

Pipelines. Pipelines could affect sensitive habitats through temporary and permanent disturbance as well as loss of rare natural communities and critical habitat. As linear features, pipelines cannot avoid these sensitive resources entirely. Where pipelines are constructed using the open-trench method, the trench, work area, spoils pile, and vehicle lanes must be cleared. In addition to the direct loss of heritage trees and other sensitive habitat along the pipeline route, nearby trees could be killed due to root damage. Trenching and stockpiling soil could have an adverse impact on nearby trees if the roots were cut or the drainage altered. If trenching occurred within the dripline of a tree, large roots would likely be damaged. Other construction activity, such as vehicle traffic, under the dripline of trees could compact the soil and damage the roots. Piling soil against tree trunks could also alter the drainage around trees, potentially resulting in disease or death. The right-of-way would be maintained as annual vegetation, so heritage trees or sensitive habitat supporting trees or shrubs could be permanently affected. Trenching, clearing, and soil

[17] Sensitive habitats include critical habitat for listed species.

compaction associated with open-trench construction can permanently alter the soil structure, causing vernal pools and alkali meadows to be permanently lost. With trenchless methods, a larger work area would be developed at the openings of tunnels or jack-and-bore pits, but sensitive habitats would not be affected between these work areas. Trenchless methods would be used where sensitive habitats must be avoided.

Tunnels. Impacts on sensitive habitats or heritage trees could occur at portals, shaft openings and accessways, associated staging areas, and spoils disposal sites. Sensitive habitats in the construction area would be temporarily affected, while sensitive habitats at the tunnel openings used for operational activity would be permanently affected. Impacts on areas that are maintained as access roads to shafts would also be permanent. Compacting or disturbing soil within the dripline of a tree or piling soil against the trunk of a tree could affect the tree, potentially resulting in disease or death.

Valves, Valve Lots, and Crossovers. Valves, valve lots, and crossovers could remove sensitive habitats and heritage trees; however, projects located at existing developed sites would have little impact on adjacent resources, except for potential root damage to nearby large trees, as described for pipelines and tunnels. Valves and crossovers located at watercourse crossings could require the removal of trees and other sensitive riparian vegetation.

Pump Stations. The proposed replacement of pump stations at developed sites would generally not affect sensitive habitats or heritage trees, except for potential root damage to nearby trees. New pump stations could result in temporary and permanent loss of sensitive habitats, similar to impacts described above for pipelines and tunnels.

Treatment Facilities. In general, proposed treatment facility projects would be located in developed areas that are surfaced, drained, and maintained free of vegetation and would not affect sensitive habitats or heritage trees, except for potential root damage to nearby large trees. Treatment facilities sited in areas of natural vegetation could affect heritage trees and sensitive habitats, as discussed above. Some treatment facility projects would require pipelines; if pipelines are located outside of developed areas, these projects could affect sensitive habitats.

Storage Facilities. Construction or improvement of storage reservoirs and dams could affect nearby sensitive habitats through direct temporary and permanent loss of habitat and heritage trees. Improvements to below-grade storage reservoirs could affect large ornamental trees (which in San Francisco could meet the requirements for protection under city ordinance), and construction activities could harm the roots of nearby trees. Construction of new storage reservoirs and dams, depending on their location, could cause extensive impacts on sensitive habitats and heritage trees. Sensitive habitats would be permanently lost within the zone of inundation and in the area required for the impoundment, control structures, and accessways. Permanent loss of sensitive habitat could also occur in borrow and spoils disposal areas as well as their associated accessways. Restoration of certain types of sensitive habitats, such as riparian vegetation, might be possible in some construction, borrow, and spoils disposal areas. Storage facilities are often located in bottomlands, which contain such sensitive habitat types as sycamore alluvial woodland and riparian forest and scrub communities. Impacts on sensitive habitats during operation of the WSIP projects are discussed in Chapter 5.

San Joaquin Region

Impact 4.6-2: Impacts on sensitive habitats, common habitats, and heritage trees		
Advanced Disinfection	SJ-1	PSM
Lawrence Livermore	SJ-2	PSM
SJPL System	SJ-3	PSM
SJPL Rehabilitation	SJ-4	PSM
Tesla Portal Disinfection	SJ-5	PSM

There is a limited potential for sensitive habitat impacts under the Advanced Disinfection (SJ-1) and Tesla Portal Disinfection (SJ-5) projects because of their location in previously developed and non-native-dominated areas with few native trees. However, the Lawrence Livermore project (SJ-2) could affect small areas of sensitive valley needlegrass grassland and pine bluegrass grassland natural communities in the hills west of Tesla Portal. Also, the Advanced Disinfection and Tesla Portal Disinfection projects would generate significant volumes of spoils requiring offsite disposal. The location of spoils disposal has not been determined, so this impact on sensitive habitats is conservatively considered to be *potentially significant*. This impact will be evaluated in more detail as part of separate, project-level CEQA review for these projects.

The eastern portion of the SJPL System project (SJ-3) would affect potentially large areas of non-native grassland and oak woodland, and smaller areas of the sensitive natural communities northern hardpan vernal pool and valley needlegrass grassland. If the pipeline crosses the San Joaquin River and floodplain in the central section of the valley, it could affect relatively small areas of sensitive natural communities, including alkaline meadow, coastal and valley freshwater marsh, Great Valley cottonwood forest, Great Valley mixed riparian forest, Great Valley oak riparian forest, Great Valley willow scrub, and elderberry savanna. The extent of potential impacts in this area would depend on the project design and methods for crossing the river. Where open-trench construction is used, a portion of the construction area would be located on previously undisturbed habitat. Because of their dependence on natural soil conditions, northern hardpan vernal pool and alkaline meadow communities in these areas could be permanently affected by any soil disturbance. Valley needlegrass grassland and riparian natural communities could be temporarily affected by pipeline construction and work/staging areas and could be permanently affected by roads and control structures. Although the potentially affected areas would be fairly small, the remaining acreage of these communities is so limited in extent that the impact would be *potentially significant*. Stanislaus County has no heritage tree protection ordinance, so the loss of large trees such as isolated blue oaks or valley oaks would not be considered significant. This project would pass through critical habitat for Colusa grass in the eastern rolling foothills, and critical habitat for the Conservancy fairy shrimp in the alkaline grasslands near the San Joaquin River. The area required for spoils disposal could affect sensitive habitats or heritage trees.

The SJPL Rehabilitation project (SJ-4) could affect areas where pipeline repair or replacement is needed. Since this project encompasses the entire San Joaquin portion of the Hetch Hetchy Aqueduct, impacts could occur on any of the sensitive natural communities described for the SJPL System project (SJ-3), including riparian forests and scrubs, vernal pools, and grasslands, as well as the established critical habitat units for Colusa grass and Conservancy fairy shrimp. The area required for spoils disposal could affect sensitive habitats or heritage trees. The impact of this project on sensitive habitats is *potentially significant*.

Implementation of SFPUC Construction Measure #8 (biological screening survey) would ensure that all potentially affected areas would be surveyed for biological resources, including heritage trees, sensitive natural communities, and critical habitats. If sensitive habitats were present, onsite avoidance, protection, and restoration for impacts would be required, including compensation for heritage trees, as appropriate (Measure 4.6-2). As described above under Impact 4.6-1, in Measure 4.6-1b the WSIP HRP or similar offsite compensation would provide a mechanism for identifying, preserving, creating, enhancing, and managing compensation lands, as appropriate, although mitigation actions would be implemented on a project-by-project basis. Taken together, SFPUC Construction Measure #8, Measure 4.6-1b, and Measure 4.6-2 would reduce potential impacts on sensitive habitats to a less-than-significant level.

Sunol Valley Region

Impact 4.6-2: Impacts on sensitive habitats, common habitats, and heritage trees		
Alameda Creek Fishery	SV-1	PSM
Calaveras Dam	SV-2	PSM
40-mgd Treated Water	SV-3	PSM
New Irvington Tunnel	SV-4	PSM
Treated Water Reservoirs	SV-5	PSM
SABUP	SV-6	PSM

Most of the projects in the Sunol Valley Region have the potential to affect one or more sensitive riparian habitats and to result in the loss of large native trees. All of the Sunol Valley Region projects are situated in critical habitat for one or more listed species. Some of the projects would also affect large areas of relatively common habitats.

The Alameda Creek Fishery (SV-1) and Calaveras Dam (SV-2) projects would affect relatively large areas of sensitive riparian natural communities, including central coast cottonwood sycamore riparian forest, central coast arroyo willow riparian forest, central coast riparian scrub, and sycamore alluvial woodland. Areas of serpentine grassland below Calaveras Dam and east of Calaveras Reservoir could be affected during dam reconstruction. Relatively small areas of these sensitive natural communities would be committed to permanent facilities and accessways for the Alameda Creek Fishery project, and most project impacts on these communities are assumed to be temporary construction impacts. The Calaveras Dam project would result in the permanent loss of sensitive riparian natural communities in the vicinity of the new dam and associated facilities and accessways, as well as the temporary loss of these communities in construction and staging areas. Although the borrow and spoils disposal areas have not been identified, riparian communities (such as coast live oak riparian forest, central coast arroyo willow riparian forest, or central coast riparian scrub) could be permanently lost to accommodate them. Established critical habitat in the Sunol Valley includes the area between Arroyo Hondo and Calaveras Reservoir (for California tiger salamander) and the area between the Alameda Creek Diversion Dam, Calaveras Reservoir and San Antonio Reservoir (for Alameda whipsnake). Critical habitat for California tiger salamander could be affected by the construction, borrow, or spoils disposal areas associated with the Calaveras Dam project. Alameda whipsnake critical habitat encompasses all of the Sunol Valley Region projects. Relatively large areas of common habitats, such as non-native annual grassland, oak woodland,

and coastal scrub, could also be affected by the Calaveras Dam construction, borrow, and spoils disposal areas. The Alameda Creek Fishery project could result in impacts on smaller areas of these common habitats.

The remaining WSIP projects in this region (40-mgd Treated Water, SV-3; New Irvington Tunnel, SV-4; Treated Water Reservoirs, SV-5; and SABUP, SV-6) would affect riparian forest and alluvial woodland, including coast live oak riparian forest, central coast arroyo willow forest, and sycamore alluvial woodland where the project facilities would cross Alameda Creek or its floodplain and tributaries. These sensitive natural communities would be permanently lost to storage facilities, control buildings, accessways, pipelines, outfalls, and, in the case of the New Irvington Tunnel, spoils disposal. Temporary loss of sensitive riparian and alluvial natural communities would occur in construction and staging areas. Critical habitat for the Alameda whipsnake could be lost under any of these projects. Common habitats such as non-native annual grassland, oak woodland, and coastal scrub could also be affected by these projects, especially the New Irvington Tunnel, which would have a project footprint estimated at 127 acres. Impacts on sensitive habitats would be *potentially significant* for each WSIP project in this region due to the presence of critical habitat, sensitive riparian and serpentine grassland habitats, and the size of the project footprints, including spoils disposal.

Implementation of SFPUC Construction Measure #8 (biological screening survey) would be required for all WSIP projects to determine the presence of sensitive habitats. If the survey identified sensitive habitats, heritage trees, or critical habitat, further mitigation would be required. Measure 4.6-2 would ensure onsite avoidance, minimization of the impact area, protection, restoration of habitats, and replacement of lost trees, including heritage trees, as appropriate. In Measure 4.6-1b, the WSIP HRP or similar program would provide a mechanism for offsite identification, protection, restoration, and management of compensation land (although not necessarily outside of lands already managed by the SFPUC). Mitigation actions could be implemented on a project-by-project basis or on a more comprehensive basis. Taken together, these measures would reduce impacts to a less-than-significant level.

Bay Division Region

Impact 4.6-2: Impacts on sensitive habitats, common habitats, and heritage trees		
BDPL Reliability Upgrade	BD-1	PSM
BDPL 3 and 4 Crossovers	BD-2	PSM
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	PSM

The largest project in this region, the BDPL Reliability Upgrade project (BD-1), would cross several natural watercourses and could affect the associated riparian communities, which could include central coast riparian scrub or central coast arroyo willow forest. This project could also affect somewhat disturbed examples of northern coastal salt marsh and coastal and valley freshwater marsh in the vicinity of the Newark and Ravenswood Valve Houses. Most if not all of the salt marsh would be avoided, however, due to the use of a tunnel under San Francisco Bay. Spoils disposal could affect sensitive habitats, although some of the spoils could be used to enhance San Francisco Bay wetland habitat. Some heritage trees could also be lost as a result of pipeline construction. The BDPL Reliability Upgrade project would cross critical habitat for Central California DPS steelhead in the Guadalupe River, Coyote Creek, and San Francisquito Creek. Although not identified as critical habitat for steelhead, Stevens Creek, San Mateo Creek, and several smaller streams still support populations of this species. The Guadalupe River also supports a small run of Chinook salmon. Common habitats that could be significantly affected include non-native grassland and oak woodland. The impact of this project would be *potentially significant*.

The BDPL 3 and 4 Crossovers project (BD-2) would cause limited impacts on maintained coast and valley freshwater marsh and central coast riparian scrub (or a similar natural riparian vegetation community) within the Guadalupe River floodplain. Construction could remove a small number of native oaks at Barron Creek and Bear Gulch Reservoir, some of which could meet criteria for heritage trees. Since this project involves construction at the Guadalupe River, impacts on steelhead critical habitat and Chinook salmon sensitive habitat could occur, such as erosion and sedimentation at the discharge outfall; therefore, the impact of this project would be *potentially significant*.

The BDPL 3 and 4 Seismic Upgrade at Hayward Fault project (BD-3) would cross one or more highly modified creek channels and flood control channels that support limited riparian vegetation and few trees, so the potential impact of this project on sensitive habitats in the construction area would be small. The volume of spoils has not been determined for this project, so the impact of this project on sensitive habitats is conservatively considered to be *potentially significant*.

SFPUC Construction Measure #8 (biological screening survey) would be required for all WSIP projects to determine whether sensitive habitats were present. If so, additional mitigation would be required to ensure avoidance, protection, restoration, and replacement of heritage trees (Measure 4.6-2). In Measure 4.6-1b, additional compensation would be implemented through the WSIP HRP or similar mechanism to provide for the identification, protection, restoration, and management of compensation lands, although mitigation actions would be implemented on a project-by-project basis. Taken together, SFPUC Construction Measure #8, Measure 4.6-1b, and Measure 4.6-2 would reduce potential impacts on sensitive habitats resulting from Bay Division Region projects to a less-than-significant level.

Peninsula Region

Impact 4.6-2: Impacts on sensitive habitats, common habitats, and heritage trees		
Baden and San Pedro Valve Lots	PN-1	PSM
CS/SA Transmission	PN-2	PSM
HTWTP Long-Term	PN-3	LS
Lower Crystal Springs Dam	PN-4	PSM
Pulgas Balancing Reservoir	PN-5	PSM

The HTWTP Long-Term project (PN-3) would be sited within a surfaced, drained site that is landscaped or maintained free of vegetation. Therefore, this project is not expected to affect sensitive habitats and would have a limited potential to affect nearby heritage trees. Implementation of SFPUC Construction Measure #8 would be adequate to ensure impacts on sensitive resources are *less than significant*.

The Baden and San Pedro Valve Lots project (PN-1) is located primarily on graded, drained, and surfaced sites, but also includes some small elements in more or less natural habitat where heritage trees could be affected, a *potentially significant* impact. The CS/SA Transmission project (PN-2) would affect coastal and valley freshwater marsh at Upper and Lower Crystal Springs Reservoirs at the culverts between the reservoirs and at several outlet sites, as well as potentially at the base of Crystal Springs Dam where freshwater marsh vegetation has grown around old, existing structures. In addition, repair and replacement of segments of the Crystal Springs/San Andreas Pipeline could affect one or more types of sensitive natural communities, such as central coast riparian forest at watercourse crossings and along the trace of San Mateo Creek between San Andreas and Lower Crystal Springs Reservoirs. The location and extent of spoils disposal have not been determined, but could affect sensitive habitats, including heritage trees. The extent of this impact would be analyzed in more detail following the pipeline assessment and completion of project-level CEQA review. Impacts of the CS/SA Transmission project are also considered *potentially significant.*

The Lower Crystal Springs Dam project (PN-4) would affect coastal and valley freshwater marsh and potentially central coast riparian forest at the stilling basin at the base of the dam. Areas of serpentine grassland could be affected by construction of this project. The construction area and staging areas have not been identified, but depending on their size and location could cause impacts on heritage trees. This project could affect critical habitat for California red-legged frog. Common habitats would also be affected by these projects, including non-native grassland, coastal scrub, and oak woodland. Impacts of the Lower Crystal Springs Dam project would be *potentially significant.* (The impacts of project operation, including the impact of raising water levels at Upper and Lower Crystal Springs Reservoirs, are discussed in Chapter 5.)

The Pulgas Balancing Reservoir project (PN-5) would require the removal of trees that could meet heritage tree criteria and could affect sensitive natural communities such as central coast riparian forest and willow riparian forest along the smaller ephemeral watercourses where the pipeline to the Pulgas Water Temple is proposed. Areas of oak woodland and non-native grassland could also be affected, although much of the route traversed by this project would pass through maintained, landscaped areas around the Pulgas Water Temple. The impact of this project would be *potentially significant.*

SFPUC Measure #8 would be implemented for all projects in this region to screen for sensitive resources; if sensitive habitats were present, additional mitigation would be required to ensure that identified resources would be avoided, protected, and restored to the extent possible. Measure 4.6-2 would ensure that onsite sensitive habitats were avoided, protected, and restored to the extent possible, and also would provide compensation for the loss of heritage trees. If further compensation were required, Measure 4.6-1b specifies the WSIP HRP or similar program as a mechanism for habitat compensation, although mitigation actions would be implemented on a project-by-project basis. Taken together, SFPUC Construction Measure #8, Measure 4.6-1b, and Measure 4.6-2 would reduce the potentially significant impacts from Peninsula Region projects to a less-than-significant level.

San Francisco Region

Impact 4.6-2: Impacts on sensitive habitats, common habitats, and heritage trees		
SAPL 3 Installation	SF-1	PSM
Groundwater Projects	SF-2	PSM
Recycled Water Projects	SF-3	PSM

All projects in this region (SAPL 3 Installation, SF-1; Groundwater Projects, SF-2; and Recycled Water Projects, SF-3) could affect heritage trees, a *potentially significant* impact. The location of spoils disposal for the SAPL 3 Installation project could affect sensitive habitats. The locations of facilities, construction areas, and spoils disposal areas, as needed, have not been determined for the Groundwater and Recycled Water Projects. Implementation of SFPUC Construction Measure #8 would ensure that all project sites are screened for the occurrence of sensitive habitats, including heritage trees. If sensitive habitats were present, additional mitigation would be required, including onsite habitat restoration/tree replacement measures, avoidance of sensitive resources, and protection, as appropriate (Measure 4.6-2). If additional compensation were required, Measure 4.6-1b specifies the WSIP HRP as one potential mechanism to provide for the identification, protection, restoration, and management of compensation land, as appropriate. Taken together, SFPUC Construction Measure #8, Measure 4.6-1b, and Measure 4.6-2 would reduce impacts from San Francisco Region projects to a less-than-significant level.

Impact 4.6-3: Impacts on key special-status species – direct mortality and/or habitat effects.

Most of the WSIP projects would affect natural habitats (such as grasslands, seasonal or permanent wetlands and watercourses, and oak woodland) or disturbed habitat that could support one or more key special-status species. As a result, all projects would be evaluated to determine their potential to affect these resources. Some projects are likely to be sited largely or entirely on surfaced, drained areas that are maintained free of vegetation, in which case these projects could have no impact or a less-than-significant impact on sensitive species. However, not all WSIP project designs have been finalized. Potential impacts on key special-status species, by facility type, are described below.

For projects where key special-status species or their habitat would be affected, avoidance is the foremost impact minimization measure. Avoidance would consist of siting the project to avoid habitat, to the extent possible; fencing or other measures to limit the construction footprint and reduce interaction between construction activity and individual animals; timing construction to avoid interrupting the reproductive season; and monitoring to ensure no take of species during construction. Where loss of habitat is inevitable, mitigation measures include actively or passively relocating animals and salvaging key special-status plants. The loss of key special-status species and their habitat would require compensatory measures, such as restoring habitat in the construction footprint, restoring degraded or lost habitat outside the construction area, and protecting existing, high-quality habitat elsewhere, which could be accomplished through acquisition, management agreement, conservation easement, or other measures. The WSIP HRP outlines a potential programmatic approach to habitat compensation.

Consultation with the USFWS, NMFS, and CDFG, as appropriate, would be initiated on a project-by-project basis for those WSIP projects that could affect listed species.

It should be noted that there would be effects not only on key special-status species discussed herein, but also on other species of concern (see the introduction to this section), such as California species of special concern, federal candidate species, CNPS List 1 plants (rare and endangered), and List 2 plants (rare but not endangered). Many of these species would also benefit from mitigation measures developed for listed species, although the impact on each species and appropriate mitigation must be analyzed at the project level during separate CEQA review.

Pipelines. Trenching and other soil disturbance has the potential to cause direct mortality of key special-status plants and their seed accumulated in the soil. Key special-status animals could be killed by vehicles and equipment, their burrows or other retreats could be crushed, or they could be killed if they fall into trenches or pits and cannot escape. Trenching and other surface-disturbing activity could dry out the streams, wetlands, or seasonal ponds in which aquatic animals live, or the pools in which the larval stages of amphibians develop. Sediment or other pollutants could cause mortality to aquatic animals in streams at and below the construction areas. Fish could be stranded as a result of dewatering (leading to suffocation or exposure to birds, raccoons, and other predators attracted to dewatered areas), or they could be trampled or crushed by humans, vehicles, or other equipment. The noise, dust, and traffic caused by construction activity could also cause breeding animals to abandon their nests or their young. The loss of habitat would be temporary in construction areas that could be fully restored to their original vegetation. The loss of habitat would be permanent in areas permanently committed to project facilities, or when the habitat could not be fully restored, such as vernal pools. During operation of the WSIP projects, wildlife could be affected by ongoing vehicle activity along pipeline accessways, and by erosion, sedimentation, or other pollution of waterways; reptiles and amphibians would be especially vulnerable.

Tunnels. As with pipelines, direct mortality of individual key special-status species could result from interactions with vehicles and equipment or the removal of individual plants and their seed in the soil during construction. The area of surface disturbance for tunnels would be more restricted than for pipelines and would be limited to tunnel shafts or portals. However, dewatering during tunnel construction could alter the hydrology of nearby surface features, such as ponds, seeps, springs, and creeks on which certain key special-status animal species depend. Vehicle activity to and from spoils disposal sites presents a high risk of mortality to key special-status animals, particularly reptiles and amphibians. Also, noise would occur 24 hours per day at tunnel entry shafts/portals, potentially causing more intensive disturbance to key special-status wildlife species. Temporary and permanent loss of habitat would occur as discussed above for pipelines. Temporary and permanent impacts could result from habitat loss due to spoils disposal. During operation, ongoing vehicle activity could be a cause of mortality, especially for reptiles and amphibians. Nesting birds are unlikely to be affected by vehicle activity and noise, as they would become accustomed to the activity.

Valves, Valve Lots, and Crossovers. Valves and valve lot projects could be sited in existing maintenance yards that are surfaced, drained, and maintained free of vegetation. These projects could affect key special-status species if the construction area were expanded into natural vegetation. Crossover facilities must be sited near creeks, so they would have a high potential to cause direct mortality to animals and plants that depend on aquatic habitats. Dispersing animals could move across valve lots and crossovers from nearby natural habitat, even if little or no cover were present, resulting in direct mortality to animals in the construction area. Temporary and permanent loss of habitat would occur as discussed above for pipelines. During project operation, releases from crossovers into watercourses could cause scouring and result in thermal shock for sensitive species that depend on aquatic habitats.

Pump Stations. New pump stations sited at existing developed pump station sites that are surfaced, drained, and maintained free of vegetation would not affect key special-status species unless construction activity were extended into areas of natural vegetation, or if key special-status animals moved into the construction area from nearby natural habitat. If new pump stations were located within natural habitat, project activities could result in direct mortality of key special-status species and temporary and permanent loss of habitat, as discussed above for pipelines. Impacts during project operation on key special-status wildlife species are expected to be insignificant, because wildlife would become accustomed to pump station operations and activity.

Treatment Facilities. Proposed treatment facility projects sited in developed areas that are surfaced, drained, and maintained free of vegetation would have a low potential to affect key special-status species unless construction were extended into areas of natural vegetation. However, some treatment facilities are situated near extensive areas of natural, high-quality habitat, such as the Sunol Valley and the Peninsula watershed. Animals could move into the construction area from nearby habitat and could be killed by moving vehicles and equipment, by falling into trenches or pits, or by dewatering of aquatic habitat on which the species depend. Noise could result in the abandonment of nests or other breeding areas used by key special-status animals. Locating treatment facilities in natural, undisturbed habitats would have a greater risk of causing direct mortality to key special-status species. Temporary and permanent loss of habitat would occur as discussed above for pipelines. Operationally, vehicle activity at treatment facilities could result in roadkills, especially of slow-moving reptiles and amphibians.

Storage Facilities. Storage reservoirs requiring extensive grading could cause direct mortality of key special-status animals due to moving vehicles and equipment, animals falling into pits or trenches, and dewatering of aquatic habitat. Construction of facilities in areas surrounded by extensive urban development would have a low potential to affect key special-status species. Dam improvements involving extensive earthmoving activities near streams and associated riparian vegetation have a high potential to cause mortality of key special-status species that depend on these habitats. Temporary and permanent loss of habitat would occur as discussed above for pipelines.

San Joaquin Region

Impact 4.6-3: Impacts on key special-status species – direct mortality and/or habitat effects		
Advanced Disinfection	SJ-1	PSM
Lawrence Livermore	SJ-2	PSM
SJPL System	SJ-3	PSM
SJPL Rehabilitation	SJ-4	PSM
Tesla Portal Disinfection	SJ-5	PSM

All five projects in this region (Advanced Disinfection, SJ-1; Lawrence Livermore, SJ-2; SJPL System, SJ-3; SJPL Rehabilitation, SJ-4; and Tesla Portal Disinfection, SJ-5) would be located within the habitat and range of the following key special-status species: San Joaquin kit fox, vernal pool crustaceans, Swainson's hawk, burrowing owl, California red-legged frog, and California tiger salamander. Impacts on key special-status species would be *potentially significant* for all of the projects in this region.

Construction activity at Tesla Portal for the Advanced Disinfection and Tesla Portal Disinfection projects and associated spoils disposal activity could cause direct mortality of these species, as described above. The Lawrence Livermore project would be located within the range of large-flowered fiddleneck. Construction in natural grassland habitat, such as improving access roads or installing control facilities, could result in direct mortality and permanent loss of habitat for these species.

The SJPL System (SJ-3) and SJPL Rehabilitation (SJ-4) projects could affect the suite of vernal pool plants in the grasslands west of Oakdale Portal, as well as riparian key special-status species such as Valley elderberry longhorn beetle, riparian woodrat, least Bell's vireo, and Delta button-celery. These projects are located within the habitat and range of Central Valley DPS steelhead, green sturgeon, and Chinook salmon, and impacts on these species and their habitat could occur at the San Joaquin River pipeline crossing. Temporary loss of habitat would occur in all construction areas containing habitat for key special-status species. Permanent loss of habitat would occur where new project facilities are sited on habitat for key special-status species and where that habitat is permanently altered, such as vernal pools in the trenching construction area and in spoils disposal areas.

SFPUC Construction Measure #8 (biological screening survey) would be required for all WSIP projects in this region to identify potentially occurring key special-status species and their habitat. If the screening survey identified the potential for key special-status species to be affected, then additional surveys would be carried out to determine the presence and extent of key special-status species, the extent of project impacts, and measures to avoid or reduce these potential impacts as much as possible (Measure 4.6-3a, first bullet). If impacts would occur, applicable standard programmatic measures (Measure 4.6-3b, as modified for each project) would be implemented to compensate for these impacts. If additional compensation were required, Measure 4.6-1b provides for identifying, preserving, creating, enhancing, and managing compensation lands, as appropriate. Taken together, these measures would reduce impacts to a less-than-significant level for key special-status species for all projects in this region.

In addition, SFPUC Construction Measure #8, Measure 4.6-1b, and Measures 4.6-3a and 4.6-3b and project-specific CEQA analysis would identify all other species of concern (such as

California species of special concern, federal candidate species, and CNPS List 1 and 2 plants) that could be affected by a specific project, as well as determine project impacts on these species and establish appropriate avoidance, protection, minimization, and compensation measures.

Sunol Valley Region

Impact 4.6-3: Impacts on key special-status species – direct mortality and/or habitat effects		
Alameda Creek Fishery	SV-1	PSM
Calaveras Dam	SV-2	PSM
40-mgd Treated Water	SV-3	PSM
New Irvington Tunnel	SV-4	PSM
Treated Water Reservoirs	SV-5	PSM
SABUP	SV-6	PSM

Because the Sunol Valley Region projects are located in an area of extensive high-quality habitat for rainbow trout, California red-legged frog, foothill yellow-legged frog, California tiger salamander, Alameda whipsnake, and burrowing owl, construction activity of all projects in this region could cause direct mortality of these species. Temporary loss of habitat could occur in all construction areas. Habitat degradation (such as erosion or sedimentation within aquatic habitats) could result in mortality of individuals and degradation of breeding habitat for aquatic-dependent species. Permanent loss of habitat for key special-status species would occur where new project facilities are sited and where habitat is permanently altered. Impacts on key special-status species would be *potentially significant* for each project in this region (Alameda Creek Fishery, SV-1; Calaveras Dam, SV-2; 40-mgd Treated Water, SV-3; New Irvington Tunnel, SV-4; Treated Water Reservoirs, SV-5; and SABUP, SV-6).

Construction of the Alameda Creek Fishery project (SV-1) would cause a temporary loss of habitat and potential mortality of rainbow trout and other water-dependent species such as California tiger salamander, foothill yellow-legged frog, and California red-legged frog during facility construction. Upland habitat for Alameda whipsnake and burrowing owl could also be lost, and mortality could result from vehicle activity and animals becoming trapped in trenches.

Construction of the Calaveras Dam project (SV-2) would affect riparian and wetland areas, potentially resulting in mortality of individuals and affecting breeding habitat for foothill yellow-legged frog, California red-legged frog, California tiger salamander, and rainbow trout. The project could affect grassland species such as the Callippe silverspot butterfly, which is known to occur near the dam, reservoir, access roads, and borrow and spoils disposal areas. The loss of upland habitats, such as non-native grassland, oak woodland, and coastal scrub, could result in mortality of Alameda whipsnake, burrowing owl, California red-legged frog, and California tiger salamander, species that depend on these upland habitats for portions of their life cycle. Construction activity and noise in and around Calaveras Reservoir could disturb nesting or foraging bald eagles. Construction impacts are usually considered temporary, but habitat loss would be considered permanent unless the habitat could be fully restored. The location of the 220-acre borrow areas have not been identified, but construction activity could affect ponds, non-native grassland, coastal scrub, oak woodlands, and riparian habitat, and thus could result in habitat loss and direct mortality of any of these key special-status species. Impacts related to Calaveras Dam operations are discussed in Section 5.4.6.

Construction of the 40-mgd Treated Water project (SV-3) could temporarily affect habitat for California red-legged frog, foothill yellow-legged frog, California tiger salamander, Alameda whipsnake, burrowing owl, and rainbow trout, since this project would be located adjacent to riparian habitat; the pipeline for this project would cross several small watercourses and would also affect upland habitat supporting non-native grasslands, oak woodland, and coastal scrub. Depending on the final project footprint, a portion of the water treatment facilities and the associated pipeline could result in permanent habitat loss for these species. These facilities would have a minimal additional impact on the movements and dispersal of tiger salamanders, red-legged frogs, yellow-legged frogs, and burrowing owls, because the footprint of the fenced area at the Sunol Valley WTP is expected to be about the same as at present. Construction activity could cause direct mortality of these key special-status species.

The New Irvington Tunnel (SV-4) and SABUP (SV-6) projects would cause a temporary loss of habitats in the construction zone and a permanent loss of habitats where facilities are sited (including accessways and spoils disposal areas), as well as the permanent conversion of forest and woodland habitat for pipelines. These projects could affect foraging habitat for the Callippe silverspot butterfly, breeding and estivation habitat for California red-legged frog and California tiger salamander, breeding and foraging habitat for burrowing owl, and movement corridors for Alameda whipsnake; they could also cause erosion and sedimentation in Alameda Creek and its tributaries, which could affect foothill yellow-legged frog and resident rainbow trout. Dewatering during tunnel construction could alter surface water features such as ponds, seeps, springs, and streams, with potential impacts on associated key special-status species such as California red-legged frog and California tiger salamander.

The Treated Water Reservoirs project (SV-5) would result in about three acres of permanent habitat loss for the new storage and contact basins. This project could temporarily affect habitat in nearby Alameda Creek due to construction of a pipe bridge across the creek, and permanently affect disturbed grassland and oak woodland near the existing Sunol Valley WTP, resulting in habitat loss for California red-legged frog, foothill yellow-legged frog, California tiger salamander, burrowing owl, and Alameda whipsnake. Fencing around the facility would alter movement corridors between uplands and Alameda Creek for California red-legged frogs and California tiger salamanders, a permanent impact. Temporary impacts on rainbow trout habitat in Alameda Creek could occur during construction. Mortality of individual animals, especially red-legged frogs, yellow-legged frogs, and tiger salamanders could occur, both during construction and operation.

SFPUC Construction Measure #8 (biological screening survey) would be required for all WSIP projects in this region to identify potential habitat for key special-status species. Measures 4.6-3a and 4.6-3b call for surveys to verify the presence or absence of key special-status species, a worker awareness program, environmental inspections, protection measures to avoid mortality to individuals during construction and operation of the projects, and restoration of temporary use areas. Measure 4.6-1b would provide a mechanism for identifying, preserving, creating, enhancing, and managing compensation lands, as appropriate to fully compensate for temporary and permanent loss of habitat. Taken together, these measures would reduce impacts on key special-status species to a less-than-significant level for all projects in this region.

In addition, SFPUC Construction Measure #8 and project-specific CEQA analysis would identify all other species of concern (such as California species of special concern, federal candidate species, and CNPS List 1 and 2 plants) that could be affected by a specific project, as well as determine project impacts on these species and appropriate avoidance, protection, minimization, and compensation measures.

Bay Division Region

Impact 4.6-3: Impacts on key special-status species – direct mortality and/or habitat effects		
BDPL Reliability Upgrade	BD-1	PSM
BDPL 3 and 4 Crossovers	BD-2	PSM
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	PSM

All of the projects in this region have the potential to affect key special-status species. The BDPL Reliability Upgrade project (BD-1) could affect salt-marsh-dependent key special-status species near San Francisco Bay (such as western snowy plover, California clapper rail, and salt marsh harvest mouse) through roadkills, loss of habitat, and mortality due to dewatering, trenching, and disturbance. Although these impacts could be significant, they would be limited to previously disturbed salt marshes near the Newark and Ravenswood Valve Houses; the Bay Tunnel section of this project would avoid most of the habitat supporting these species. Some of the spoils from the tunnel could be placed in a restoration area at a former salt evaporation pond, and thus could result in a beneficial impact on salt-marsh-dependent sensitive species. Impacts on California red-legged frog, California tiger salamander, and burrowing owl could occur at the stream crossings and in disturbed grasslands, although this habitat is much degraded and fragmented along the pipeline route. The potential for direct mortality during construction is therefore relatively low. Some temporary habitat loss of riparian and grassland habitat would occur during construction. This project could cause sedimentation or other reduction in water quality in the bay and in tributary streams used by spawning anadromous fishes such as the Chinook salmon and Central Coast DPS steelhead. Replacement of Bay Division Pipelines Nos. 3 and 4 could affect vernal pool tadpole shrimp, known to be present in the vicinity of Milpitas, resulting in the loss of habitat and potential mortality of individuals. The western terminus of the Bay Division Pipelines at the entrance to the Pulgas Tunnel is also within the range of the San Francisco garter snake. Therefore, the BDPL Reliability Upgrade project would result in *potentially significant* impacts on key special-status species in this region.

The BDPL 3 and 4 Crossovers project (BD-2) could temporarily affect migration or spawning habitat for Central Coast DPS steelhead in the Guadalupe River due to erosion and sedimentation within the river levees during construction. Temporary habitat loss for California red-legged frog and California tiger salamander could occur at Barron Creek and Bear Creek Reservoir. Although these projects are small in extent, habitat loss and potential mortality of individuals is *potentially significant.* Operationally, large volumes of water are released from the crossover valves for brief periods during maintenance and emergencies. This potential impact on listed species is expected to be less than significant because the increased flows would be short in duration.

The BDPL 3 and 4 Seismic Upgrade at Hayward Fault project (BD-3) could affect California red-legged frog, California tiger salamander, and burrowing owl through loss of habitat as well as mortality due to construction vehicle activity, dewatering, sedimentation, water quality degradation, trenching, and disturbance. However, the watercourses in this portion of the East Bay are highly modified and support little or no habitat for red-legged frog and tiger salamander. There could be marginal habitat for burrowing owl on the levee banks and disturbed grasslands, so temporary loss of habitat could occur for this species, a *potentially significant* impact.

SFPUC Construction Measure #8 (biological screening survey) would be required for all WSIP projects in this region to identify potential habitat for key special-status species. If the screening survey identified the potential for key special-status species to be affected, then additional measures would be required to avoid, minimize, and compensate for potential impacts. Measure 4.6-3a calls for surveys to determine the presence and extent of key special-status species, the extent of project impacts, and measures to avoid or reduce these potential impacts as much as possible (Measure 4.6-3a, first bullet); it would also require a worker awareness program, environmental inspections, project planning to minimize direct impacts, and onsite restoration. If impacts could occur, applicable standard programmatic measures (Measure 4.6-3b, as modified for each project) would be implemented to compensate for these impacts. If additional compensation were required outside the construction footprint, Measure 4.6-1b would provide for identifying, preserving, creating, enhancing, and managing compensation lands, as appropriate to fully compensate for temporary and permanent loss of habitat. Taken together, these measures would reduce impacts to a less-than-significant level for these projects.

In addition, SFPUC Construction Measure #8 and project-specific CEQA analysis would identify all other sensitive species (such as California species of special concern, federal candidate species, and CNPS List 1 and 2 plants) that could be affected by a specific project, as well as determine impacts on these species from the project and appropriate avoidance, protection, minimization, and compensation measures.

Peninsula Region

Impact 4.6-3: Impacts on key special-status species – direct mortality and/or habitat effects		
Baden and San Pedro Valve Lots	PN-1	PSM
CS/SA Transmission	PN-2	PSM
HTWTP Long-Term	PN-3	LS
Lower Crystal Springs Dam	PN-4	PSM
Pulgas Balancing Reservoir	PN-5	PSM

Although the Baden and San Pedro Valve Lots (PN-1) are located on developed sites, some improvements that are part of this project would take place within known habitat for California red-legged frog and San Francisco garter snake, and potential habitat for California tiger salamander. Therefore, the impact from this project would be *potentially significant*.

The CS/SA Transmission project (PN-2) would pass through areas of known habitat for the San Francisco garter snake and California red-legged frog. Although unlikely, potential habitat for California tiger salamander may be present. Construction activity, including staging areas, could temporarily affect aquatic and nearby upland habitat on which these species depend. Direct mortality of individuals from roadkills and heavy equipment activity could occur during construction, both at the culvert repair site at Highway 92 and along the pipeline itself. It is expected that all construction and staging impacts would be temporary for the garter snake and red-legged frog, since the upland and wetland habitats along Upper and Lower Crystal Springs Reservoirs can be restored. The impact of this project would be *potentially significant*.

The HTWTP Long-Term project (PN-3) would occur entirely on graded, surfaced, or maintained sites, and therefore is not expected to affect key special-status species (*less than significant*).

The Lower Crystal Springs Dam project (PN-4) could affect California red-legged frog and its habitat in the pools and wetlands at the base of the dam, as well as any populations in and around the parapet. Depending on the design of improvements, some of the impacts on this habitat would be permanent and some temporary. Since the area below the dam is potential habitat for San Francisco garter snake, these species also could be impacted by construction activity in and around the stilling basin. Construction or staging areas in San Mateo Creek canyon could result in habitat loss and direct mortality of two key special-status plant species: San Mateo woolly sunflower and Marin western flax. Potential habitat for California tiger salamander may also be present. Disturbance associated with spoils disposal and vehicle activity could result in direct mortality and loss of habitat for any of these key special-status species. Unless restoration can be demonstrated, any impacts would be considered permanent. Any project activity or staging areas at the top of the dam could potentially affect San Francisco garter snake, especially if activity is in or near emergent wetland vegetation along the reservoir margins. Erosion or sedimentation in San Mateo Creek downstream from the dam could result in habitat degradation or mortality of Central Coast DPS steelhead. The impact of the Lower Crystal Springs Dam project would be *potentially significant*. Operation of the project, which would involve raising the reservoir water level to historical elevations, would affect California red-legged frog, San Francisco garter snake, and fountain thistle (which grows at the perimeter of the reservoir). These impacts are discussed in Chapter 5.

Construction of the Pulgas Balancing Reservoir project (PN-5) could affect California red-legged frog, California tiger salamander, and San Francisco garter snake and their habitat. Construction and operation at the existing reservoir site would occur within potential dispersal habitat for California red-legged frog, but this site does not support foraging or breeding habitat for any key special-status species. However, this project also includes improvements to the discharge channel from Pulgas Water Temple to Upper Crystal Springs Reservoir. Construction activity could result in the temporary loss of habitat for California red-legged frog and San Francisco garter snake as well as direct mortality of individuals. Permanent loss of habitat would occur where new project facilities are sited on natural habitat. Direct mortality and loss of habitat could occur as a result of spoils disposal vehicle activity and habitat disturbance. The impact of the Pulgas Balancing Reservoir project would be *potentially significant*.

SFPUC Construction Measure #8 (biological screening survey) would be required for all WSIP projects in this region to determine the presence of habitat for key special-status species. If the screening survey identifies the potential for key special-status species to be affected, then additional surveys would be carried out to determine the presence and extent of suitable habitat, the extent of project impacts, and measures to avoid or reduce these potential impacts as much as possible (Measure 4.6-3a, first bullet). If impacts would occur, applicable standard programmatic measures (Measure 4.6-3b, as modified for each project) would be implemented to compensate for these impacts. These measures include a worker environmental awareness program, environmental inspections, and minimizing and restoring temporary use areas. If additional compensation were required, Measure 4.6-1b calls for identifying, preserving, creating, enhancing, and managing compensation lands, as appropriate. Taken together, these measures would reduce impacts on key special-status species to a less-than-significant level.

In addition, SFPUC Construction Measure #8 and project-specific CEQA analysis would identify all other sensitive species (such as California species of special concern, federal candidate species, and CNPS List 1 and 2 plants) that could be affected by a specific project, as well as determine impacts on these species from the project and appropriate avoidance, protection, minimization, and compensation measures.

San Francisco Region

Impact 4.6-3: Impacts on key special-status species – direct mortality and/or habitat effects		
SAPL 3 Installation	SF-1	LS
Groundwater Projects	SF-2	LS
Recycled Water Projects	SF-3	LS

The SAPL 3 Installation project (SF-1) consists of about 4.2 miles of pipeline. It is located in urban and developed land. There are no recent records for any listed species in this area, and therefore impacts are expected to be *less than significant*. However, a number of species of concern could be affected by this project, and potential impacts on these species will be analyzed in detail as part of separate, project-level CEQA review for this project.

The Local Groundwater Projects (SF-2) would raise the level of Lake Merced and would involve construction of wells, pumps, and control facilities at various locations in San Francisco. The Regional Groundwater Projects (SF-2) would involve construction of up to 10 wells and 0.5 mile of pipeline to connect the wells with the existing water conveyance system. These facilities would be located in San Mateo County. All project facilities are assumed to be located in previously disturbed areas that do not support key-special-status species. No listed species are known to be present in the area proposed for project facilities, and therefore potential impacts on key special-status species would be *less than significant*, although impacts on other species of concern would be addressed as part of separate, project-level CEQA review for this project.

The Recycled Water Projects (SF-3) would affect five to seven acres and would involve 20 miles of pipeline. All project facilities are assumed to be located in previously disturbed areas that do not support key-special-status species. No listed species are known to be present in the area proposed for project facilities, and therefore potential impacts on key special-status species would be *less than significant*, although impacts on other species of concern would be addressed as part of separate, project-level CEQA review for this project.

SFPUC Construction Measure #8 (biological screening survey) would be required for all WSIP projects in this region to determine the presence of habitat for key special-status species.

Impact 4.6-4: Water discharge effects on riparian and/or aquatic resources.

Construction and operation of many of the WSIP projects would involve discharges of system water to surface waters. These discharges would have the potential to affect riparian and aquatic resources, depending on the water quality, volume, timing, frequency, and location of the discharge. Under the WSIP projects, there could be controlled, uncontrolled, and accidental discharges of chlorinated or chloraminated water into natural water bodies at any of the streams and reservoirs that are integral to or crossed by regional water system facilities. General water quality impacts related to chlorine, chloramine, and ammonia toxicity and to nitrogen loading and algal stimulation are discussed in detail in Section 4.5, Hydrology and Water Quality, Impacts 4.5-3 and 4.5-5 (degradation of surface water quality during construction and operation, respectively).

During construction, discharges of treated water would be required for construction of some WSIP facilities, including discharges of large volumes of water in the existing pipelines or tunnels in order for construction to proceed; these discharges would be required to include control measures to prevent erosion and to protect water quality in accordance with Regional Water Quality Control Board waste discharge requirements or National Pollutant Discharge Elimination System (NPDES) permit (see Section 4.5, Impact 4.5-3b).

Similarly, during operation, the SFPUC would periodically discharge treated water from some facilities (such as treatment plants and crossover facilities), primarily for maintenance or emergency purposes. Aquatic organisms can experience mortality from thermal shock when large quantities of cold water are released into a stream with much warmer water, especially in summer under low-flow conditions. Aquatic organisms also can experience mortality when large quantities of chlorinated or chloraminated water are released into water bodies. During scheduled maintenance, discharges would be dechlorinated or dechloraminated as needed, and would also be required to include control measures to prevent erosion and to protect water quality in accordance with NPDES permits, as described in Section 4.5 under Impact 4.5-5. Thus, the greatest potential for impact would be under emergency conditions when releases are unscheduled and the water may not be fully dechlorinated or dechloraminated. In cases where the discharge would be to rivers, creeks, or other natural water bodies and where sensitive habitat or species could be affected, impacts on biological resources could be avoided or reduced through avoidance, protection, restoration, and compensation for loss of wetlands.

During construction, discharges of untreated surface or groundwater (that is, non-system water) may be required in projects that require dewatering. These project discharges would be subject to NPDES permitting requirements.

In addition, WSIP projects in the Sunol Valley Region would be located in the Alameda Creek watershed (and subject to the Alameda WMP), and some of the WSIP projects in the Peninsula Region would be located in the Peninsula watershed (and subject to the Peninsula WMP). Since these WSIP projects would be required to implement all pertinent watershed management plan policies and actions, this analysis assumes the following action pertaining to dechlorination of water prior to discharge would be implemented as part of the WSIP projects:

- *Action fis6*. Identify and adopt alternative nontoxic management practices for the protection of aquatic resources in coordination with the Integrated Pest Management program. Guidelines include:
  - Dechlorinate water before it is discharged to streams and reservoirs
  - Minimize the use of copper sulfate in the treatment of algal blooms in reservoirs
  - Limit the use of chemical fire retardants and Class A foams (except protein-based foams) in or near aquatic zones

San Joaquin Region

Impact 4.6-4: Water discharge effects on riparian and/or aquatic resources		
Advanced Disinfection	SJ-1	LS
Lawrence Livermore	SJ-2	LS
SJPL System	SJ-3	PSM
SJPL Rehabilitation	SJ-4	PSM
Tesla Portal Disinfection	SJ-5	LS

Construction and operation of the SJPL System project (SJ-3) and construction for rehabilitation of pipelines under the SJPL Rehabilitation project (SJ-4) would require the discharge of water from the regional system. This portion of the pipeline system contains raw water that has not been chlorinated or chloraminated; thus, removal of chlorine or chloramine would not be required. Discharges to water bodies may also be required as part of dewatering during construction. Depending on their magnitude, frequency, and location, construction and operational discharges under these two projects could result in *potentially significant* impacts on riparian or aquatic resources, particularly in the vicinity of the San Joaquin River. These impacts could be avoided or reduced to a less-than-significant level by discharging to drainage systems where feasible, applying control measures required as conditions of NPDES and other regulatory permits, or by implementing Measure 4.6-4 and controlling the nature and timing of discharges to minimize effects on biological resources.

Small discharges of chlorinated water could be required during construction of the Advanced Disinfection (SJ-1), Lawrence Livermore (SJ-2), and Tesla Portal Disinfection (SJ-5) projects, and no new discharges would be expected during operation of these three facilities. Impacts related to construction discharges of raw and treated water from these facilities would be *less than significant* with implementation of control measures, in compliance with NPDES permits or waste discharge requirements, and adherence to the requirements of other regulatory agencies, as described in Section 4.5 for fishery resources.

Sunol Valley Region

Impact 4.6-4: Water discharge effects on riparian and/or aquatic resources		
Alameda Creek Fishery	SV-1	LS
Calaveras Dam	SV-2	LS
40-mgd Treated Water	SV-3	LS
New Irvington Tunnel	SV-4	PSM
Treated Water Reservoirs	SV-5	LS
SABUP	SV-6	LS

Construction of the Alameda Creek Fishery (SV-1) would involve dewatering of Alameda Creek, and return of this water to the creek under best management practices. There would be no discharge of system water during construction or operation and therefore, this impact would be *less than significant*.

Construction of the Calaveras Dam (SV-2) project would involve large amounts of discharge into surface waters from dewatering during construction, and would occur over a long construction period spanning the winter high-flow months. These discharges would be raw, untreated surface water. However, because of the potential for sedimentation during winter storm events, the discharges could contain large amounts of sediments. With implementation of control measures in compliance with NPDES permitting requirements for these discharges, potential impacts to riparian habitat associated with erosion would be *less than significant* (see Section 4.5, Hydrology and Water Quality, Impact 4.5-3a, for more discussion). Impacts related to discharges or releases of water during operation of these facilities are analyzed in Chapter 5, Section 5.4.6.

Small discharges of chloraminated water could be required during construction and operation of improvements to the Sunol Valley WTP for the 40-mgd Treated Water (SV-3) and Treated Water Reservoirs (SV-5) projects. However, these discharges would be managed in compliance with the required water quality permits, as described in Section 4.5, and continuation of existing SFPUC protective measures as well as secondary containment and other design provisions included in the proposed WSIP project designs would ensure that impacts on aquatic habitat associated with discharges or accidental spills would be *less than significant* for these two projects.

Dewatering of the existing tunnel under the New Irvington Tunnel project (SV-4) would require discharges to Alameda Creek, and periodic maintenance during operations might also require discharging system water to the creek. Depending on their magnitude, frequency, and location, these discharges could result in *potentially significant* impacts on riparian or aquatic resources in Alameda Creek, including sensitive habitats and special-status species. These impacts could be avoided or reduced to a less-than-significant level by discharging to drainage systems where feasible, applying control measures required as conditions of NPDES and other regulatory permits, or by implementing Measure 4.6-4, which involves controlling the nature and timing of discharges to minimize effects on biological resources.

The SABUP project (SV-6) would likely require the discharge of chlorinated or chloraminated water during construction, although implementation of control measures in compliance with NPDES permit requirements and the requirements of other regulatory agencies, as described in Section 4.5, would reduce impacts on biological resources. During operation, the SABUP project would include periodic discharges of system water to San Antonio and Alameda Creeks, but this project includes energy dissipation devices to minimize impacts of these discharges on habitat. Since the nature of the operational discharges would be essentially the same as under existing conditions, this impact would be *less than significant*.

Implementation of Alameda WMP Action fis6 regarding the discharge of chlorinated water would also be required for all projects in the Sunol Valley Region. Implementation of this measure, as well as Measure 4.6-4 where appropriate, would reduce impacts to a less-than-significant level.

Bay Division Region

Impact 4.6-4: Water discharge effects on riparian and/or aquatic resources		
BDPL Reliability Upgrade	BD-1	PSM
BDPL 3 and 4 Crossovers	BD-2	PSM
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	LS

Construction-related discharges of chloraminated water would be required for all WSIP projects in this region (BDPL Reliability Upgrade, BD-1; BDPL 3 and 4 Crossovers, BD-2; and BDPL 3 and 4 Seismic Upgrade at Hayward Fault, BD-3). Depending on the magnitude and location, these discharges could affect riparian and/or aquatic resources if discharges are directed to creeks, rivers, or other natural water bodies. Implementation of construction control measures in compliance with NPDES and other regulatory permits, including avoidance of discharges to sensitive habitats where feasible, would ensure that construction-related impacts on biological resources are less than significant.

However, the BDPL Reliability Upgrade (BD-1) and BDPL 3 and 4 Crossovers (BD-2) projects would include periodic operational discharges of chloraminated water, generally for maintenance purposes. In particular, the design of the BDPL 3 and 4 Crossovers calls for operational discharges of large volumes of water to an adjacent creek, river, or other water body. Depending on their magnitude, frequency, and location, these discharges could result in *potentially significant* impacts on riparian or aquatic resources, including sensitive habitats and special-status species. Potential adverse impacts include erosion, scouring, and rapid temperature changes in the receiving water body. These impacts could be avoided or reduced to a less-than-significant level by discharging to drainage systems where feasible, implementing of control measures required as conditions of NPDES and other regulatory permits, or by implementing Measure 4.6-4 and controlling the nature and timing of discharges to minimize effects on biological resources. Site-specific mitigation measures would be developed as part of project-level CEQA review on these projects.

The BDPL 3 and 4 Seismic Upgrade at Hayward Fault project (BD-3) would require only construction-related discharges and no operational discharges. As discussed above, this construction-related impact would be *less than significant*.

Peninsula Region

Impact 4.6-4: Water discharge effects on riparian and/or aquatic resources		
Baden and San Pedro Valve Lots	PN-1	LS
CS/SA Transmission	PN-2	LS
HTWTP Long-Term	PN-3	LS
Lower Crystal Springs Dam	PN-4	LS
Pulgas Balancing Reservoir	PN-5	LS

Small discharges of chloraminated water could be required during construction and operation of treatment plant improvements under the Baden and San Pedro Valve Lots (PN-1) and HTWTP Long-Term (PN-3) projects. However, standard control measures for protecting riparian and aquatic resources as well as required water quality control measures would be incorporated into construction and operational procedures. In addition, secondary containment and other design provisions included in these two projects would ensure that impacts on aquatic habitat associated with accidental spills would be less than significant. Therefore, impacts on biological resources due water discharges from these two projects would be *less than significant*.

The CS/SA Transmission (PN-2) and Lower Crystal Springs Dam (PN-4) projects are not expected to require construction or operational discharges of chloraminated water. However, they may require extensive dewatering for long construction periods and are located in areas of sensitive wetlands. With implementation of control measures required as conditions of NPDES and other regulatory permits and the Peninsula WMP Action fis6 regarding the discharge of chlorinated water, this impact would be *less than significant* for these two projects. Impacts related to discharges or releases of water during operation of the Lower Crystal Springs Dam are analyzed in Chapter 5, Section 5.5.6.

The Pulgas Balancing Reservoir project (PN-5) includes improvements to the Pulgas Discharge Channel. This area has already experienced erosion due to ongoing discharge flows into Upper Crystal Springs Reservoir without sufficient energy dissipation. Changes in discharge flow patterns under the WSIP could incrementally increase erosion at the discharge point and this area contains sensitive habitats and species. With implementation of control measures required as conditions of NPDES and other regulatory permits, potential impacts associated with erosion would be *less than significant* (see Section 4.5, Hydrology and Water Quality, Impact 4.5-5, for more discussion). Potential impacts associated with construction or operational discharges of chloraminated water would be less than significant since this project, located within the Peninsula watershed, would be required to implement Peninsula WMP Action fis6 regarding the discharge of chlorinated water.

San Francisco Region

Impact 4.6-4: Water discharge effects on riparian and/or aquatic resources		
SAPL 3 Installation	SF-1	N/A
Groundwater Projects	SF-2	N/A
Recycled Water Projects	SF-3	N/A

No construction or operational discharges of system water would be expected under the SAPL 3 Installation project (SF-1), Groundwater Projects (SF-2), and Recycled Water Projects (SF-3). Therefore, this impact would *not apply* to these projects.

Impact 4.6-5: Conflicts with the provisions of adopted conservation plans or other approved biological resources plans.

The adopted conservation plans described in the Regulatory Framework section were reviewed to determine whether the WSIP would conflict with the plans' provisions. The adopted plans include *San Joaquin River National Wildlife Refuge Comprehensive Conservation Plan* and the *San Joaquin County Multi-Species Habitat Conservation and Open Space Plan*. Two WSIP projects, the SJPL System (SJ-3) and SJPL Rehabilitation (SJ-4) could have *potentially significant* impacts on resources within the San Joaquin River NWR planning area, including impacts on riparian restoration areas, native perennial grasslands, and seasonal wetlands. SFPUC Construction Measure #8 (biological screening survey) and avoidance, minimization and compensation measures for biological resources as discussed in Measures 4.6-1a, 4.6-1b, 4.6-2, 4.6-3a, and 4.6-3b would be implemented to reduce impacts on biological resources to a less-than-significant level. SFPUC would negotiate with the refuge owner, USFWS, to determine specific actions to fully compensate for impacts within the San Joaquin NWR to ensure no net loss of extent or function of biological resources. Implementation of this agreement would ensure that project implementation would occur in a manner consistent with the provisions of the NWR Comprehensive Conservation Plan. Regarding the *San Joaquin County Multi-Species Habitat Conservation and Open Space Plan,* CCSF is not a signatory to the plan, so the WSIP would not be covered under the plan's incidental take permit or compensation mechanism. From a county-wide perspective, impacts from the WSIP within the plan area (San Joaquin County) are sufficiently small that they would not preclude implementation of the plan or protection of the covered species.

All six of the projects in the Sunol Valley Region and four of the five project in the Peninsula Region (PN-1, 2, 4, and 5) are situated within the SFPUC's Alameda and Peninsula Watershed Management Plan areas. These plans specifically provide for Hetch Hetchy system-wide improvements, and also identify avoidance, protection and compensation measures for biological resources. Therefore, impacts from these projects on biological resources would be consistent with these plans and the impacts would be *less than significant*.

There are no other adopted plans that affect the other WSIP projects, thus this impact is *not applicable* for the other 10 WSIP facility improvement projects. The CCSF will, as part of preparing project-specific CEQA documentation, evaluate project consistency with the provisions of any other relevant HCPs adopted subsequent to publication of the PEIR.

4.6.3 References – Biological Resources

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4.7 Cultural Resources

4.7 Cultural Resources

Cultural resources include paleontological resources, archaeological resources, historical resources, and human remains. This section provides a program-level assessment of potential WSIP impacts on historical, paleontological, or archaeological resources that might be present in the vicinity of the WSIP projects and/or historic water system facilities. Programmatic mitigation measures to reduce or eliminate potentially significant impacts on these cultural resources are identified in this section and presented in detail in Chapter 6. This analysis does not identify specific cultural resources at each of the 22 WSIP facility project sites, although some previously identified cultural resources are located at or near those project sites. Site-specific analysis will be conducted as part of separate, project-level CEQA review for individual WSIP projects.

4.7.1 Setting and Resource Types

Paleontological Setting

Paleontological resources within the WSIP study area consist of the fossilized remains of plants and animals, including vertebrates (animals with backbones) and invertebrates (e.g., starfish, clams, ammonites, and coral marine). Fossils of microscopic plants and animals, or microfossils, are also considered in this analysis. The age and abundance of fossils depend on the location, topographic setting, and particular geologic formation in which they are found. The geologic formations containing the majority of fossils in the WSIP study area are considered geologically young; the oldest fossil-bearing formation dates to the Paleocene epoch (65 million years old). Most of the fossil-bearing geologic units in the WSIP study area were formed in ancient marine environments such as inland embayments, coastal areas, and extensive inland seas. However, in the eastern portion of the study area, some vertebrate fossils have been found in non-marine formations consisting of sand, gravel, and mudflow deposits.

San Joaquin Region

Paleontological resources in the San Joaquin Region are most prevalent in geologic formations located along the western margin of the San Joaquin Valley. These formations include the marine sandstone, mudstone, siltstone, and shale of the San Pablo Formation (including units of the Neroly Sandstone, Cierbo Sandstone, and Briones Sandstone); various undivided conglomerate, sandstone, and siltstone units (including the Carbona and Oro Loma Formations); and the Moreno Formation. The Moreno Formation, which is present along the western margin of the Great Valley as an elongated and continuous, northwest-trending unit, consists of shale, sandstone, and siltstone that were once deposited in a deep-marine environment. The Moreno Formation contains abundant fossils, including a variety of marine reptiles, fish skeletons, and various marine invertebrates; plant remains such as wood, leaves, and needles; and the remains of dinosaurs (USFWS/CDFG, 2006). Dinosaurs are rarely found in California, but many of the plesiosaurs and mosasaurs found in the state come from the Moreno Formation (USFWS/CDFG, 2006).

The University of California Museum of Paleontology Collections Database lists 81 fossil localities in San Joaquin County; the majority of these sites are along the western boundary of the San Joaquin Valley. Several fossil localities are grouped in the San Pablo and Moreno Formations west of Vernalis near the Tesla Portal of the Hetch Hetchy Aqueduct (UCMP, 2006). These fossils include an extinct horse, mammoth, and boney fish dating to the Pleistocene epoch, about 1.8 million years ago. The Collections Database includes a fossil locality at the Hetch Hetchy Tunnel (Locality No. 3315), which is listed as a discovery site for a prehistoric camel (up to 1.8 million years old). Only a few fossil localities have been identified in the younger alluvial deposits throughout the central portion of the San Joaquin Valley. Fossil localities appear again on the east side of the San Joaquin Valley near Oakdale, where the Hetch Hetchy Aqueduct extends through the Mehrton Formation, a non-marine formation ranging in age from 24 to 5 million years old (Miocene). Fossils found at sites in the Mehrten Formation near Oakdale include early (Miocene age) turtles, tortoises, kangaroo rats, single-hoofed horses, and mammoths.

Sunol Valley and Bay Division Regions

Many fossil localities in the Sunol Valley and Bay Division Regions occur in marine and non-marine deposits ranging in age from 10,000 to 5.3 million years old.[1] These geologic formations include non-marine sediments of the Santa Clara Formation, Livermore Gravels, and Irvington Gravels. Marine fossil-bearing geologic deposits include the Cierbo Sandstone found in the San Pablo, Monterey, Santa Margarita, and Panoche Formations, and in the older (55 to 34 million years old) Domengine Formation. The majority of the fossils found in the Sunol Valley and Bay Division Regions are vertebrate fossils, including extinct bison, camels, boney fish, mammoths, and horses, although some localities contain marine invertebrate fossils such as bivalves (clams). A fossil of a mastodon from the Pleistocene epoch was discovered in Sunol (Locality No. 6535), while an unidentified vertebrate fossil was discovered in the vicinity of Calaveras Dam (Locality No. 3937) (UCMP, 2006).

The distribution of fossil localities and the location of corresponding geologic units indicate that most of the paleontological resources in the Sunol Valley Region are east and south of Interstate 680 in the upland foothills of the Diablo Range. Fossil localities diminish west of Interstate 680, towards the Santa Clara Valley and the central portion of the Bay Division Region, because the Santa Clara Valley and the south San Francisco Bay margin is underlain by much younger alluvial and basin deposits that do not contain abundant fossil remains. There are 280 fossil localities in Alameda County, but only 36 in Santa Clara County (UCMP, 2006). Some of the fossil localities in Santa Clara County contain vertebrate fossils, including a bison and another mammal that appears to be an ancient descendant of an elephant or sea cow.

1 The age range of these deposits is referred to as the Plio-Pleistocene, which is the period of time that spans the Pliocene epoch (5.3 to 1.8 million years ago) and the Pleistocene epoch (1.8 million to 10,000 years ago).

Peninsula and San Francisco Regions

There are few fossil localities in the Peninsula and San Francisco Regions. Most fossils are found along the Pacific Coast in the younger (Pliocene, 5.3 to 1.8 million years ago) marine units, such as the Purisima Formation, Monterey Formation, Butano Formation, Colma Formation, and Merced Formation, and in locations within the outcropping marine units in the Santa Cruz Mountains, west of the WSIP regions. Fossils found along the coast include vertebrates (e.g., extinct camels, horses, and sea mammals) and invertebrates (e.g., clams and corals). Fossil localities diminish along the eastern flank of the Santa Cruz Mountains, likely due to the presence of chaotically mixed and severely fractured Franciscan Complex bedrock and geologically younger alluvial deposits in the upland foothills.[2] No fossil localities were identified in the Crystal Springs Reservoir or San Andreas Reservoir areas. The lack of fossil localities is partly due to the Franciscan Complex bedrock surrounding the reservoirs and the degree of fracturing in this bedrock unit caused by the San Andreas Rift Zone. The closest fossil locality south of the WSIP study area is an extinct sea mammal, an ancestor of the sea lion (UCMP, 2006). To the north, the closest fossil locality to the study area is an extinct horse from the Pleistocene epoch (1.8 million to 10,000 years ago).

Archaeological / Prehistoric-Period Setting

Both prehistoric and historic resources are considered archaeological resources. This discussion of prehistoric archaeology addresses cultural patterns in the WSIP study area through the time of European contact. Historic archaeological resources, starting with the Mission era, are discussed below under "Historic-Period Setting."

Numerous prehistoric archaeological sites have been identified in a variety of environments within the WSIP study area. In many cases, these sites are buried by alluvial deposits at or near former or existing wetland boundaries, along seasonal and perennial watercourses and other sources of fresh water such as springs, at the base of foothills, or at or near vegetation ecotones (i.e., a region between two neighboring but dissimilar plant communities). Many of the sites are deposits of stone tools, while others are large habitation sites that represent years of layered subsurface material or residues that chronicle the behavior of the inhabitants.

Efforts to reconstruct the prehistoric period into broad cultural stages (e.g., the Windmiller, Berkeley, and Augustine Patterns, as discussed below) allow researchers to describe a wide variety of sites with similar cultural patterns during a given period of time, thereby creating a regional chronology. In some cases, regional patterns in material culture are reflected in areas that are broader than the WSIP regions. For example, the greater San Francisco Bay Area is often discussed as a single region in terms of archaeological sequences (Moratto, 1984). As a result, a broad discussion of the region that encompasses the Bay Area would include the Bay Division, Peninsula, and San Francisco Regions, in addition to elements of the Sunol Valley Region,

2 Fossils are rarely found in the Franciscan Complex bedrock of the Coast Range Province; any fossil remains originally present in the rock would not likely remain because the Franciscan Complex in this area is a chaotically mixed and fragmented mass of rock in a sheared matrix.

although some Central Valley regional patterns can be associated with the Sunol Valley and inland Alameda County in general.

San Joaquin Region

Although the Sacramento and San Joaquin Valleys were likely inhabited by humans as early as 10,000 years ago, any evidence of this time period is buried by alluvial deposits that have accumulated during the last several thousand years. Later periods are better understood because there is more representation in the archaeological record. Central California archaeology has been described as a series of patterns. Fredrickson (1973) defines these patterns as general modes of living shared by people within a given geographic region. Three such patterns, which overlap somewhat in adjoining areas, are recognized for central California: the Windmiller, Berkeley, and Augustine Patterns.

The Windmiller Pattern, which may represent the advent of early Penutian-speaking populations, extends from about 4,500 to 3,000 years ago. This pattern primarily encompasses the lower Central Valley and Delta regions and reflects the influence of a lacustrine or marsh adaptation (i.e., adaptation to settlement near lakes and marshes). This pattern may have pre-adapted the Windmiller people to the environment of the lower Sacramento–San Joaquin Valley and Delta; it is possible that these people entered the region with this adaptation more or less fully developed.

The Berkeley Pattern extends roughly from 3,000 to 1,500 years ago and became more widespread, or at least more archaeologically visible, than the previous pattern. The Berkeley Pattern places a greater emphasis on the exploitation of the acorn as a staple. The Berkeley Pattern may represent the spread of proto-Miwok and Costanoans, collectively known as Utians, from their hypothesized lower Sacramento Valley/Delta homeland.

The last complex in this sequence, the Augustine Pattern, extended from about 1,500 years ago to the time of European contact. The Augustine Pattern initially appears to be an outgrowth of the Berkeley Pattern, but may have become a blend of Berkeley traits with those carried into California during the migration of Wintuan populations from the north (Moratto, 1984).

Sunol Valley Region

The Sunol Valley Region was a favorable setting for prehistoric and early settlement. The diverse habitats and numerous creeks within Alameda watershed lands and surrounding areas support an abundance of animal and plant resources that would have encouraged permanent and seasonal habitation. There is evidence of settlement in this region from about 2,300 years ago, with numerous documented sites, including sites in Pleasanton and the Sunol Regional Wilderness. The Sunol Regional Wilderness Area Site (CA-Ala-428H) consists of a midden (i.e., refuse) deposit and associated bedrock mortars. Site occupation is dated from approximately 2,349 to 276 years ago (343 BC to AD 1730) (Leventhal et al., 1989; as cited in Chavez, 1994).

When Europeans first came to the general area, in about 1769, the land was inhabited by the Ohlone people (also known as the Costanoans). The tribe controlled the present-day East Bay, from Richmond to San Jose, and the Livermore Valley to the east. It is estimated that approximately 2,000 people inhabited this area at the time of European contact. Near the Alameda watershed lands, villages would have been situated adjacent to major and minor creeks and the prehistoric marsh located in the Pleasanton area, with both permanent villages and temporary camps for seasonal resources. Within the Alameda watershed lands, at least one prehistoric village, El Molino, located near the present-day Sunol Water Temple, is known to have existed (San Francisco Planning Department, 2000a).

Bay Division Region

Toward the end of the Pleistocene epoch (2 million to 10,000 years ago), the present-day San Francisco Bay region and central California coast experienced gradual shifts in coastal environmental conditions as sea levels rose in response to a general warming trend in climate (Fagan, 2003). Slowly, as human settlements began coping with the changing climate and landscape, the marshland biotic communities[3] along the edges of bays and channels, in contrast to earlier vegetal food sources, became the principal source for subsistence in the bay region.

Many of the original surveys of archaeological sites in the San Francisco Bay region, including the East Bay, were conducted between 1906 and 1908; these surveys yielded the initial documentation of nearly 425 “earth mounds and shell heaps” along the bay shoreline (Nelson, 1909). The most notable of these sites were excavated, such as the Emeryville shellmound (CA-Ala-309), the Ellis Landing site (CA-CCo-295) in Richmond, the Fernandez site (CA-CCo-259) in Rodeo Valley, and the West Berkeley site (CA-Ala-307) (Morrato, 1984). These dense midden sites, such as CA-Ala-309, have been carbon-14 dated to be 2,310 (±220 years) old, but other evidence from around the bay suggests that human occupation in the region dates back farther, to about 7,000 years ago (Davis and Treganza, 1959). Many of the earliest sites suggest less emphasis on shellfish than on hunting and vegetal food processing. These sites provide the basis for understanding cultural chronologies and evolution in the Bay Area.

Another site of equal importance, the West Berkeley site (CA-Ala-307)—occupied from 4,000 to 1,700 years ago (2000 BC to AD 300)—reflected a change in socioeconomic and technological complexity and settlement patterns from the Windmiller Central Valley influence to the more uniquely local Berkeley Pattern (Wallace and Lathrap, 1975; Fredrickson, 1973). This artifact pattern is characterized by minimally shaped cobble mortar and pestle, dart and atlatl,[4] and bone industry. Given the size of these settlements, it is probable that the populations were denser and more sedentary yet continued to exploit a diverse resource base, from woodland, grassland, and marshland to bay-shore resources throughout the San Francisco Bay region (Bickel, 1978; King, 1974).

While the bay shellmounds tend to dominate East Bay archaeology, a number of important sites have been investigated in the interior valleys of Alameda County. For example, the Santa Rita Village site (CA-Ala-413) in Pleasanton yielded numerous artifacts, burials, and plant and animal

3 A large ecosystem that supports a particular assemblage of plants and animals.
4 An Aztec term for spear thrower; a wooden device with a handle at one end and a hook or spur at the other that fits to the end of a dart or projectile.

remains. The site contains two stratigraphic components indicating occupation from 2,400 to 2,000 years ago (400 BC to AD 100); the later component revealed evidence of technological influence derived from the Delta region (Chavez, 1994).

Peninsula Region

The Peninsula Region was intensively occupied during prehistoric times due to the variety and proximity of resources from San Francisco Bay, the interior foothills and valleys, and the Pacific Ocean as well as the relatively easy access to these areas. Creeks and springs in the area also provided drinking water and riparian resources. Evidence indicates that the area was inhabited as early as 5,400 years ago and was likely associated with a pre-Ohlone/Costanoan, and possibly Esselen, population. Archaeological sites are documented in coastal areas west of this region as well as along the bay in areas east of this region.

San Francisquito Creek, which flows through Palo Alto, represents one of the most densely occupied watersheds along the San Francisco Peninsula. Two or more Ohlone tribelets may have occupied this watershed and would have relied on a variety of local resources, from mammals to shellfish (Bocek, 1992). Of the approximate 170 site locations discovered on the southern peninsula, about 75 percent are located within 100 meters of a creek or former creek bed (Bocek, 1992). Given the attractiveness of the riparian corridor along San Francisquito Creek to prehistoric inhabitants, areas along this corridor—even in currently urbanized settings—are more likely to yield both known and previously unidentified historic resources or unique archaeological resources. The sites contain extensive artifacts, cultural materials, and evidence of human burials (which is considered a rare finding in San Mateo County) and may be of cultural importance to the local Native American community. There is a potential for additional prehistoric cultural resources to exist within this region, including areas submerged by the reservoirs (San Francisco Planning Department, 2001).

San Francisco Region

Many areas of what is now San Francisco presented favorable conditions for the settlement of Native Americans. Previous archaeological research in San Francisco suggests that prehistoric resources may be encountered in remarkably diverse conditions. Sites have been found along beachfront as well as inland areas of the city. Only a small percentage of the total prehistoric sites in San Francisco have been systematically recorded. It is probable that many sites were covered rather than destroyed. Recent archaeological work reveals that numerous, relatively intact prehistoric deposits throughout San Francisco appear to have been buried beneath the region's sand dunes long before the beginning of the historic era. These sites are generally buried deep enough below the present ground surface to have avoided being disturbed by development. (This information is summarized from the *San Francisco Draft Water Recycling Master Plan Cultural Resources Evaluation 92.371E,* January 13, 1993.)

Historic-Period Setting

For the purpose of this analysis, the historic period begins with the Mission era and extends through the Gold Rush for each region. The historical setting of each region is described below. The historical context of the water system (from 1856 to the present) is described after these regional descriptions of earlier history.

The sections below are organized into the various geographic regions that are addressed in this PEIR. The regions are presented geographically from east to west in the order they are physically crossed by the Hetch Hetchy pipelines. Chronologically, however, European settlement and development in these regions generally occurred in the opposite order, beginning around the San Francisco Bay and spreading eastward toward the Sierra Nevada.

San Joaquin Region

Native American groups known as the Yokuts and Miwoks originally inhabited the San Joaquin Region. Many individual tribes within the larger Yokut and Miwok groups were scattered throughout the region, living primarily near rivers and creeks. It was not until the late 1770s that European influence made its way inland to the San Joaquin Valley. The first European party to visit the area was a Spanish military expedition lead by Jose Joaquin Moraga in 1776. The party followed the San Joaquin River into Stanislaus County and the vicinity of present-day Modesto. A second expedition, lead by Moraga’s son Gabriel in 1806, made a foray into the area and traveled as far east as the location of Knight’s Ferry. Gabriel Moraga led another expedition into the area in 1810.

As Spanish missions began to be established, primarily in the coastal regions of California, the Yokuts of the inland San Joaquin Valley were relocated to the nearest missions, including Mission San Jose, Mission San Francisco, and San Juan Bautista. These missions undertook efforts to convert the local Native Americans to Catholicism and a European style of farming and labor. Many Native Americans were the victims of diseases brought by the Spanish, including those who managed to remain outside the mission system. The land that had previously been inhabited by the Yokuts and Miwoks was thus left in the hands of the Catholic Church, which owned vast tracts throughout California at the height of the Mission era.

With secularization, the lands in the San Joaquin Region were divided into privately owned ranchos, initially consisting of the Rancheria del Rio Estanislao, Rancho El Pescadero, Rancho del Puerto, Rancho Orestimba, and Thompson’s Rancho. These huge ranchos were later sold and resold in increasingly smaller parcels as people flocked to the region to mine gold in the mid-1800s, and later turned to farming once the Gold Rush had ended (Tatam, 1994).

Sunol Valley Region

In 1797, Spanish Franciscan missionaries established Mission San Jose in present-day Fremont. Native Americans, primarily of the Ohlone tribe, were brought to the mission, converted to Catholicism, and taught to farm. With the 1836 Secularization Act, many of the Native Americans left Mission San Jose and settled on a rancheria know as Alisal, near Castlewood. This site is still owned by the City and County of San Francisco (CCSF). Elsewhere, Mexican and European settlers filed land grants, and vast ranchos became established throughout the region. Rather than selling land near the mission to private parties after secularization, the Catholic Church held the land in stewardship for the missionized Native Americans, hoping they would continue the mission way of life. However, this land tended to attract squatters—particularly those journeying west from the United States—because of its uncertain ownership and the lack of recognition of the Indians' claim to the land. Despite their mission training, the Indians were not prepared for the responsibility of land ownership and often lost their holdings to these squatters through gambling and other fraud.

The population of the Sunol Valley Region grew once California was admitted to the United States, in 1848, and as the Gold Rush brought prospectors west during this period. Those who did not find their fortune often settled as farmers in rural areas of California, many of them close to the community that had developed around the former Mission San Jose. The squatters farmed and established businesses and settlements on the land. Mexican land grants were often disputed, and most of the rancho properties in the area were sold and redistributed to new settlers, both Anglo-American as well as Mexican landholders, who managed to retain portions of their original holdings. In 1858, the United States government returned the mission buildings and a small portion of adjacent land to the Catholic Church (Krell, 1979). Shortly thereafter, around 1867, the squatters obtained official title to the land on which they were living.

By the late 1800s, the prosperity of the area was further stimulated by the arrival of the Western Pacific and South Pacific Coast Railroads, which led to the establishment of towns and influenced the growth of many settlements. The railroads provided for easy transport of people and goods to the Sunol Valley and Niles Canyon from San Jose and other areas south of the bay. Because the area was such a large agricultural producer, railroads were critical to the transportation of produce from farms to consumers in the more metropolitan Bay Area cities. Grain and vegetables were the dominant crops in the area, but were replaced by vineyards and orchards later in the 19th century. This shift in agricultural trends met with opposition when blight and prohibition decreased both the productivity and demand for vineyard crops. Drought was also a problem in the early 20th century, and the Depression later limited the sale of crops. However, the existence of natural hot springs in the area attracted recreational travel to the region, and the area continued to gain popularity for vacationing and seasonal living until the years of World War II. The Sunol Valley continued on its agricultural path and experienced prosperity because of the significant demand on production created by the war. During the post-war decade, an increasing number of people permanently settled in the Fremont and Sunol areas because of housing shortages throughout the Bay Area, leading to a population boom that continues today.

Bay Division and Peninsula Regions

The areas referred to in the PEIR as the Peninsula Region, located south of San Francisco, and the Bay Division Region, located at the southern end of San Francisco Bay, were once inhabited by the Ohlone/Coastanoan people. Today the area comprises San Mateo and Santa Clara Counties and a portion of Alameda County. In 1776, Spanish missionaries established the Mission Santa Clara de Asis at the southern end of the bay along Guadalupe Creek, and a settlement of colonists from Mexico soon followed. The mission settlement and the colonists' pueblo grew into the neighboring cities of Santa Clara and San Jose. In 1793, an outpost of Mission Dolores in San Francisco was established in the area of present-day San Mateo, which allowed the Spanish missionaries to maintain better contact with the Native American converts of the region and oversee their herding and food-producing activities. The majority of the Native Americans in the region became converts at the mission and were subjects of the Catholic Church until secularization in 1836. At that time, the mission passed from the church's possession and, in 1851, the mission site was gifted to the Jesuit order for the establishment of a university, which is today Santa Clara University.

With secularization, the Mexican government seized former mission lands and divided the Peninsula Region into a number of large ranchos, including Rancho San Mateo, granted in 1846 to Cayetano Arenas, and Rancho de las Pulgas, granted in 1835 to Luis Antonio Arguello, a former governor of Alta California. Other lands in the Bay Division Region were granted to private owners, and many ranchos were established throughout the region.

The construction of railroads stimulated growth and development in the Bay Division and Peninsula Regions by connecting these areas to distant agricultural markets. The industries of agriculture, viticulture, lumber, and even oil drilling supported the economic growth of these regions in the latter half of the 19th century and the early 20th century. As in other areas, a building boom in the 1920s was followed by the Depression; however, the high demand for various products during the years of World War II led to another economic resurgence. These products included ships, many of which were produced in the ports at the southern end of San Francisco Bay.

San Francisco Region

The following information is summarized from the *San Francisco Draft Water Recycling Master Plan Cultural Resources Evaluation 92.371E,* January 13, 1993, unless otherwise noted.

The Spanish first explored Northern California during the latter part of the 18th century. The Spanish began colonizing California as early as the 1760s. It is estimated that, at the time of European contact, between 7,000 and 10,000 Native Americans inhabited the coastal area between Point Sur, in Monterey County, and San Francisco Bay. Native American shellmounds once dotted the shoreline of the bay. According to site records on file at the Northwest Information Center, Sonoma State University, about 35 prehistoric sites have been officially recorded within San Francisco; about one-third of these were found in the Hunters Point–Islais Creek area. Prehistoric sites have also been found in the South of Market/Civic Center area, and in and around Fort Mason and the Marina District (Archeo-Tec, 1995). These sites consist mostly of a variety of shellmounds, but some of the sites on the east side have included prehistoric human remains (burial sites) and midden deposits. Like the Bay Division and Peninsula Regions (see above), the San Francisco Region was inhabited by Native Americans of the Ohlone/Costanoan tribe.

As Spanish missions were established, primarily in the coastal regions of California, the Native Americans were relocated to the nearest missions. In 1776, Mission Dolores (also known as Mission San Francisco de Asis) was founded along with the Presidio, in present-day San Francisco. At the missions, Native Americans were converted to Catholicism and introduced to a European style of farming and labor, which were much different from their own hunting and gathering practices. However, Mission Dolores had a difficult time retaining its converts.

The 1836 Secularization Act, enacted by the presiding Mexican government, disbanded the mission system, granted church lands to private citizens, and allowed Native Americans to leave the missions and establish their own settlements. Now familiar with the areas around the missions, many Native Americans presumably stayed in those areas and did not return to their original lands. The influence of Mission Dolores declined rapidly after the land was granted to Jose Galinda in 1835; he established the Rancho Laguna de Merced, which was purchased by Francisco de Haro in 1837. During the 1830s, the pueblo of Yerba Buena Cove developed on the original waterfront of what is now downtown San Francisco. DeHaro became the first *alcalde*, or mayor, of Yerba Buena in 1834 and served in that post again from 1838 to 1839 (Alexander and Heig, 2002).

In 1846, the United States Navy sailed into San Francisco Bay and took control of the pueblo of Yerba Buena, which was renamed San Francisco in 1847. California became part of the United States by conquest and treaty in 1848 and was admitted to the Union as a state in 1850. The Gold Rush brought hundreds of thousands of prospectors and other settlers from around the world to California during this period. During this time, the area surrounding the mission became a venue for gambling and taverns due to its distance from the pueblo. With the influx of gold miners after 1848, the city of San Francisco soon expanded to surround the mission and dominate the tip of the peninsula.

The population in San Francisco rose drastically in the years leading up to the Gold Rush. The small population of 500 in 1847 rose to 1,000 by early 1848 and doubled again by early 1849. In that year alone, the population soared to 20,000. The physical city grew quickly in response to this population explosion, and heavy demands were placed on its infrastructure. At least six major fires destroyed much of the city in the years immediately after the Gold Rush; these devastating fires—along with the general needs of such a rapidly growing population—served as an early indication of San Francisco's need for a reliable water supply.

San Francisco's population was as high as 50,000 in 1850 and, at the time of the 1906 earthquake, had reached 375,000. The earthquake became a major factor in reshaping San Francisco's future growth and unleashing an era of progressive municipal politics. Not only did the earthquake spark fires that decimated much of the city, it also broke the existing water delivery systems that may have made controlling the fires possible. Failure of the city's private water system gave impetus to the drive for a municipal water supply that would be drawn from distant Hetch Hetchy in Yosemite National Park.

San Francisco's downtown was largely rebuilt within three years of the disaster, and the city as a whole recovered within the following decade. The city's hosting of the 1915 Panama Pacific

International Exposition prompted further development on a grand scale leading up to the event. Though the earthquake and fire were devastating, they allowed the city a fresh start and an opportunity to grow beyond its previous size and complexity. By the time of the Exposition, the population of the city was approximately 500,000 people (Richards, 1997).

History of the SFPUC Regional Water System

The Need for a Water System

The transformation of San Francisco's water system from a local, private concern, to a regional private water company, to a municipally owned and operated system was part of a national trend that began before the Civil War on the east coast, and in major Midwestern and California cities in the later decades of the 19th century and early decades of the 20th century. For San Francisco, the resulting history can be seen as two major historical contexts that intersect: the history of the plans and developments of the Spring Valley Water Company; and later, the push for municipal control and development of the Hetch Hetchy system.[5]

The development of San Francisco's municipal water system in the history of urban water development has themes in common with many other major urban areas that made the same transformation:

- Gradual development of more distant and purer supplies, typically through systems relying on gravity for delivery
- Development of specific water supply and delivery plans, by both private and public entities, to assure supplies would continue to meet growing demand
- Transformation of private water companies into public entities
- Interrelationship of science, engineering, and political reform, and the role of trained engineers in developing water systems
- Transformation of municipal or other government agencies' ability to finance public works projects

Cities around the nation have, since the early decades of the 19th century, sought to improve their water supply systems, both in quality and quantity. Most rapidly growing cities soon found they were faced with a double—and related—dilemma: handling the vast amounts of waste produced in cities without sanitary sewer systems; and assuring their citizens ample supplies of water. The production of sewage and other waste had a direct impact on local supplies, because city wells and local streams flowing through urban areas were often fouled by animal waste, garbage, local privy pits, cesspools, and sewage vaults. While the direct connection between unsanitary waste handling and disease was not scientifically understood until late in the 19th century, the

5 The entire San Francisco water system is sometimes referred to in the press or other general publications as the Hetch Hetchy system. This usage is historically inaccurate and, in this chapter, references to and discussion of the "Hetch Hetchy system" or "Hetch Hetchy Project" refer specifically to the portion of San Francisco's water system directly related to the city's municipal development of delivering water from the Hetch Hetchy Valley to San Francisco that occurred in the 20th century.

relationship between pollution and disease, and the need for purer water, was generally recognized if not accurately attributed.

New York City was among the first to build a system to bring water to the city from an outside watershed. In 1842, it completed the Croton Project to supply additional water from the Croton River in Westchester County to the growing city. Water flowed into the city through what is now known as the Old Croton Aqueduct. Boston followed soon thereafter with its Long Pond / Lake Cochituate system, completed in October 1848.[6] In both instances, specific plans provided for local supplies to be replaced or augmented by water from more distant sources that were of higher quality, and in both cases private companies were replaced by city-owned systems. Historian Letty Anderson's study of New England systems also pointed out that the use of gravity to deliver water was a consistent goal of engineers establishing such systems, because it provided a constant flow at regular pressures, avoided the need to buy costly pumping equipment, and did not incur substantial and continuing operation and maintenance costs.[7]

Anderson's examination of urban water supplies also showed that in 1800, only 6.3 percent of water utilities in the United States were publicly owned. By 1850, that percentage had grown to 39.7 percent, and by 1897 reached 53.2 percent. Of course, the number of water utilities of all kinds had also grown, from only 16 in 1800, to 83 in 1850, to 3,196 in 1897.[8] In most California cities, the conversion of private water systems to public entities occurred later, often in the 20th century.

Nelson Blake, in his seminal history of urban water systems entitled *Water for the Cities* (1956), noted that by 1860, of the nation's 16 largest cities, 12 had municipal systems; only San Francisco, New Orleans, Buffalo, and Providence had privately owned systems. Private systems were characteristically located in smaller cities and towns; of the 136 water works in existence in 1860, noted Blake, 58 percent were privately owned. Water consumption on a per-capita basis was also increasing during this period, in large part due to the introduction of water closets, showers, and bathtubs connected to indoor plumbing. While such arrangements were not common in the last decades of the 19th century, their introduction over the decades had a profound effect. Blake reported that by the years just before World War II, per-capita use in major European cities averaged around 39 gallons a day; in the United States the rate was 155 gallons a day.[9]

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6 The story of the Old Croton System is described on the New York Department of Environmental Protection's website, http://www.ci.nyc.ny.us/html/dep/html/history.html, accessed April 21, 2007. Other sources on the development of the New York system include Nelson Blake's *Water for the Cities: A History of the Urban Water Supply Problem in the United States* (Syracuse University Press, 1956). The history of Boston's fight for pure water, and the themes and factors leading to development of its system, is explored in Michael Rawson, "The Nature of Water: Reform and the Antebellum Crusade for Municipal Water in Boston." *Environmental History*, 2004, 9(3): 411-435.

7 Letty Anderson, "Hard Choices: Supplying Water to New England Towns." *Journal of Interdisciplinary History*, xv:2 (Autumn, 1984), 211-234. Anderson focused on New England's experience, but placed it in a national context.

8 Anderson, "Hard Choices." *Journal of Interdisciplinary History*, 1984, 211-234.

9 Nelson M. Blake, *Water for the Cities: A History of the Urban Water Supply Problem in the United States*. (Syracuse University Press, 1956); see 267.

Blake also summarized the development of major urban systems in New York, Boston, Philadelphia, and Baltimore. Each followed the paradigm of an original private local system being integrated into a much larger set of public facilities, sequentially planned and constructed to meet demand, and that brought water to the urban area from distant supplies.

In New York, after completion of the Croton Aqueduct, the city quickly faced increased water use and a concomitant growth in demand that led to acquisition of additional sources of supply. It designed the Second Croton Aqueduct, completed in 1893, which brought water from 31 miles away through a system of tunnels. As New York expanded its boundaries to include Brooklyn, Queens, Richmond, and additional portions of the Bronx, it required new sources of supply to meet demand. In 1905, after an attempt to incorporate a private company's system, the city—with the approval of the state legislature—established the Board of Water Supply, which had "broad powers to plan and build new reservoirs and aqueducts." It was this board that planned and built the Catskill Aqueduct between 1907 and 1917, which brought water from Ashokan Reservoir in the Catskills 120 miles to the city. Some of the construction involved substantial engineering skills. "Picturesque arched bridges across rivers and valleys were now a thing of the past," Blake observed. "Instead, the aqueduct was carried through pressure tunnels bored deep in the solid rock. Thus the water was conveyed under the Hudson River near Storm King Mountain by the Roundout Siphon, 1,114 feet below sea level. The main artery of the city distributing system was a pressure tunnel from 200 to 750 feet below the street level." This system was again enlarged in 1927, and from 1921 through 1964 the Board of Water Supply planned and constructed a system to tap the Delaware River.[10]

Boston's system underwent a similar transformation. By 1869, it had become clear that the Cochituate system was inadequate, so the city added a 17-mile-long aqueduct to provide water from reservoirs on the Sudbury River. As the city annexed small towns on its periphery, the need for additional water grew, leading the city and state to organize the Metropolitan Water District. This body arranged for the construction of Wachusett Reservoir and Aqueduct, which fed the Sudbury system, in 1906. By 1922, the district recommended adding a connection to the Ware and Swift Rivers, requiring the construction of Quabbin Aqueduct and a later aqueduct to tap the two rivers. Later, the district built Quabbin Reservoir, which, Blake noted, was "designed to impound the entire flow from a watershed of 186 square miles," and nearly tripled the district's safe yield. The new works also allowed for the old Cochituate system to be retired in 1931, because development in its watershed had the potential to compromise its purity. Similarly, during the last decades of the 19th century, and well into the 20th century, both Baltimore and Philadelphia made similar improvements to their water supplies. In both cases the cities tapped distant supplies, building large storage dams and aqueducts to deliver the stored water. These series of projects were also developed through a set of specific plans. Both cities' systems utilized pressure tunnels; for example, Philadelphia's diversion of the Delaware River used a gravity-fed pressure tunnel some 80 miles long.[11]

[10] Blake, *Water for the Cities*, 280-285; http://www.ci.nyc.ny.us/html/dep/html/history.html, accessed April 21, 2007.
[11] Blake, *Water for the Cities*, 272-276.

Analogues to these urban systems existed in California. For example, Los Angeles' private water company had appeared to reach its capacity in the last decade of the 19th century, and its superintendent, William Mulholland, with local businessmen, turned to the Owens Valley to tap the river for the city's use. The story of Los Angeles' acquisition of water rights and water, and construction of the Los Angeles Aqueduct, is an oft-told tale and will not be recounted here in detail.[12] By 1903, the city acquired the existing local private water company. Like New York, Boston, Baltimore, and Philadelphia, and at much the same time, Los Angeles acquired its enhanced supply from a distant watershed, and brought water through an aqueduct fed by gravity to its terminal reservoir. Moreover, after its initial completion in 1913, the city's Department of Water and Power later made extensions to enhance its supply by designing separate projects, like the Mono Basin extension, to bring more water to the system. In addition, in 1928, the southern California region, including Los Angeles, formed the Metropolitan Water District. Its aim was to tap another distant source, the Colorado River, and transport the water 242 miles through an aqueduct to Lake Matthews, its terminal reservoir. The Colorado River Aqueduct was completed in 1941.[13]

The cities of the East Bay also sought a larger supply of better quality water after the turn of the 20th century. By 1910, the small reservoirs were seen as insufficient to keep up with demand, and by 1915 it had become apparent to the area's citizens that new sources of water were needed. Dissatisfaction with private water companies, particularly the East Bay Water Company, was led by the Progressives in the East Bay, who focused their anger on private utilities as inefficient and often the sources of graft and corruption of local officials. This led at first to the passage of the Municipal Water District Act of 1911, followed by the Public Utilities Act, which put private utilities under the jurisdiction of the California Railroad Commission (later the Public Utilities Commission). It also led to a movement in the East Bay to establish a municipal utility district, a special district provided for by the Municipal Utility District Act in 1921. The act provided for districts that could straddle county lines and include incorporated cities and unincorporated areas; importantly, they could also issue revenue bonds to fund construction and development. The district was seen as a victory for regionalism over parochial local development that would allow for more efficient and comprehensive development. The East Bay Municipal Utility District was the first such district formed under the act, through an election in May 1923.[14]

Upon formation, the district immediately hired staff and engineers, including Arthur P. Davis (who had for many years been an engineer for the U.S. Bureau of Reclamation) as chief engineer, and established an advisory consultant team of George W. Goethals (chief engineer of the

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12 There are a large number of books and articles written on the subject of Los Angeles's acquisition of water in the Owens Valley. William Karhl's *Water and Power* is one of the best known; it is also described in Norris Hundley's *The Great Thirst*.

13 Blake, *Water for the Cities*, 285-287; Remi Nadeau, "The Water War." *American Heritage*, 1961, 13(1), 30-35, 103-107; William L. Kahrl, "The Politics of California Water: Owens Valley and the Los Angeles Aqueduct, 1900-1927." *California Historical Quarterly*, 1976, 55(1): 2-25.

14 Susan S. Elkind, *Bay Cities and Water Politics: The Battle for Resources in Boston and Oakland* (Lawrence, Kansas: University Press of Kansas, 1998); East Bay Municipal Utility District, *The Story of Water: A Brief History of the East Bay Municipal Utility District* (EBMUD, 1931?), 1-7; John H. Plumb, "Summary of the History of Municipal Utility Districts in California and of the Municipal Utility District Act," November 13, 1974. MS, WRCA, G4084/K4-4.

Panama Canal) and William Mulholland of Los Angeles. The district initially considered asking to join with San Francisco in its Hetch Hetchy Project, but soon decided to seek an independent supply. After considering a number of sources, the district settled on the Mokelumne River, and over the next years planned a system that stored water behind Pardee Dam and delivered it to the district through 93 miles of pipe and tunnels. The district noted, "by taking the water out through the tunnel 170 feet above the bottom of the dam it is possible to operate the pipe line to its entire capacity by gravity as far as Walnut Creek and even to carry over forty million gallons a day by gravity all the way into the District." The district described its aqueduct as "one of the great pipe lines of the world," which began deliveries in June 1929. Water flowing through the system replenished the nearly-empty reservoirs built by the original private water company that had been acquired by the district.[15]

The ability to fund such systems with municipal bonds was a key to their development. In the years following the massive bank failures associated with the Panic of 1873, the majority of municipalities around the nation could not go into debt to pay for municipal systems, and thus relied on private capital and private enterprise to build enlarged systems, usually under an exclusive franchise. Historian Anderson noted, "a city typically had two major problems with a private water company: rates and service." Rates were often well above those charged in municipally owned systems, and private companies often concentrated on profitable areas in their service area to the exclusion of poor or outlying areas.[16] Mechanisms such as the Municipal Water District Act or the Municipal Utility District Act, or other bonding provisions created by changes to other state laws, allowed for cities to take on debt to build their own systems.

Interestingly, these themes worked their way down to smaller cities and towns during the early decades of the 20th century; many underwent similar transformations from private to public ownership, and set about acquiring water from more distant sources. In addition, technological advances made by engineers working in the larger cities, such as in pumps, pipes, engineering, purification systems, and so on, worked their way down to the smaller cities and towns.[17] An example of this process within the Bay Area can be found in the story of the Marin Municipal Water District. Areas within Marin County had been served since the 1870s by private water companies such as the Marin Water Company (later called the Marin Water and Power Company), North Coast Water Company, and other, smaller enterprises. These companies built a number of reservoirs, large and small, to serve their customers, and added reservoirs as demand grew. However, by the first decades of the 20th century, poor service led to public acquisition of the systems by Marin Municipal Water District, formation of which was made possible by the passage of the Municipal Water District Act of 1911. This act, made during a period of Progressive reform in the state, allowed for the formation of municipal water districts. Between 1914 and 1918, the new district acquired the private companies within its boundaries. Soon

15 Elkind, *Bay Cities and Water Politics*, 120-133; East Bay Municipal Utility District, *The Story of Water*, 1-7, 12; Plumb, "Summary of the History of Municipal Utility Districts."
16 Anderson, "Hard Choices." *Journal of Interdisciplinary History*, 1984, 218-221.
17 Anderson, "Hard Choices." *Journal of Interdisciplinary History*, 1984, 212.

thereafter it began improving the acquired systems and planning for new construction to meet growing demand.[18]

An important related factor in the construction of major systems, whether public or private, was the role of professional engineers in their planning, construction, and development, and the fact that many of the most prominent and influential engineers worked on projects around the nation. Particularly after the last decades of the 19th century, trained and experienced engineers not only brought technical skills to their work, but also an ethos of disinterested neutrality and rationalism. Historians Stanley K. Schultz and Clay McShane noted that city engineers "contributed to the rationalization of fiscal techniques," and labeled themselves "neutral experts" who "professed to work above the din of local politics. Usually they tried to isolate themselves from partisan wrangles, and often succeeded." More than that, they were often typified by long tenure of position and were praised as "models of efficient bureaucrats." They were also prone to employing consultants, experts who moved around the country working on major projects. Schuyltz and McShane stated:

> As an emerging 'strategic elite,' in sociologist Suzanne Keller's telling phrase, engineers secured job tenure through professionalization. At a time when few if any clearinghouses for the exchange of ideas and practices benefited cities nationwide, the engineers built up a remarkable communications network among themselves. Their common training, whether in the relatively few engineering schools of the period or in shared apprenticeships, usually on the major railroads, bound them together. The practice of review by outside consultants reinforced these connections. Engineers belonged to the same national organizations. The majority held membership in the American Society of Civil Engineers that frequently published papers on municipal engineering with appended comments from experts throughout the nation. They also belonged to local professional clubs that corresponded with one another, publishing and exchanging reports about conditions in their individual cities.

These engineers contributed to debate and discussion in professional journals and discussed legal and administrative issues faced by their group. They also disseminated information about how similar problems were solved in other cities around the world.[19] Many of the engineers who worked on water supply systems in eastern cities, such as John R. Freeman, or had experience in California systems, like William Mulholland, or worked on federal irrigation systems, like A.P. Davis, also worked on Bay Area systems. Thus, it is not surprising that obstacles confronted by engineers might be surmounted through similar means in different projects, or that knowledge regarding the benefits and efficacy of certain designs might be widely distributed.

In all these cases, from New York to Boston, the East Bay, Marin County, and Los Angeles, the conversion from private to public entities resulted in the absorption of existing local private facilities into larger public systems. Historian Susan Elkind noted that this was a common process, if not always the most efficient. "But regional networks also retained the characteristics

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18 JRP Historical Consulting, "Historic Resources Inventory and Evaluation Report, Chlorinator House at Alpine Lake, Alum House at Alpine Lake, and Weir House at Lake Lagunitas." Prepared for MMWD, July 2005.

19 Stanley K. Schultz and Clay McShane, "To Engineer the Metropolis: Sewers, Sanitation, and City Planning in Late-Nineteenth-Century America." *The Journal of American History*, 1978 65(2): 389-411. See especially 400-403.

of their municipal and private antecedents because regional officials saved enormous amounts of time and money simply by grafting bigger sewer mains and water supplies onto existing service networks," she reported. "The adaptation of existing infrastructure physically locked regional officials into established water supply and sewerage practices."[20]

San Francisco's water system followed this paradigm. The Spring Valley Water Company system grew organically within the city to provide local service, and then reached out to ever more distant sources through a series of specific plans to enhance and increase supply, the execution of which provided the means to keep up with demand and assure a growing supply. These plans were developed by expert engineers with wide experience. Finally, over the years, public dissatisfaction with this private system increased, and reform-minded citizens led the demand for conversion from a private to public water supply.[21]

The San Francisco Water System

The history of the SFPUC water system starts with a driving need for water in an area that is often described as a semi-arid peninsula. Though surrounded by the salt water of the ocean and bay, San Francisco had very little fresh water. The few creeks and springs that existed were sufficient to support early settlements, but as the area developed the need for water became critical. The Gold Rush of the mid-1800s brought the need for a water system to the forefront. As the population of San Francisco boomed with the influx of fortune seekers, the existing water supply proved to be inadequate. At that time, water was transported in barrels, sometimes from the other side of the bay, and sold at exorbitant prices to San Franciscans, who had little choice but to pay for it.

Before the establishment of an official water company in 1856 (as described below), one company attempted to provide San Francisco with an adequate water supply. In 1851, the Mountain Lake Water Company formed to distribute water from Mountain Lake in the Presidio, but its methods were inadequate and its finances shaky. It was granted a few time extensions to bring its business up to caliber, but it eventually folded in 1865.

The early history of the City Distribution System / Spring Valley Water Company, and the Peninsula and Alameda Systems are described below. The CCSF attempted to buy the Spring Valley Water Company during the 1870s, and eventually purchased it in 1930 (as further described under "Hetch Hetchy System").

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[20] Elkind, *Bay Cities and Water Politics*: 164.

[21] The history of the transformation of San Francisco's water system from the control of a private corporation to a public entity is the subject of a recent dissertation by David R. Long, "The Flume Wildcatters: San Francisco, Private Waterworks, and Urban Development in the American West's Hydraulic Society, 1850-1930," (University of North Carolina, Chapel Hill, 2004).

City Distribution System / Spring Valley Water Company (1856–1877)

The San Francisco Water Works was formed in 1856 by an official city order and spearheaded by engineer Alexei Waldemar von Schmidt. The first water system was formed by a dam on Lobos Creek, a system of flumes and tunnels, a pumping station, and the Francisco and Lombard Reservoirs. The company was one of several, such as the Islais and Salinas Water Company and the Bensley Water Company, which competed within the city and supplied water to various service areas. San Francisco's private companies underwent a period of consolidation that mirrored similar experiences in other urban areas.

Soon, the San Francisco Water Works met with competition from the Spring Valley Water Company, founded by George H. Ensign in 1860, which used a spring at Mason and Washington Streets as its initial water source. It was this spring that gave the company its name. Though its beginnings were small, the Spring Valley Water Company soon came to dominate the city's water distribution. It began to consolidate its position, and bought out the Islais and Salinas Water Company and incorporated water from Islais Creek into the Spring Valley system, using a reservoir on Potrero Hill to hold the water. It also took over the competing Bensley Company's supply from Lobos Creek. The Spring Valley Water Company was especially successful because of the help of Von Schmidt, who, after a dispute with the San Francisco Water Works, gave his allegiance to the opposition in 1860. The resulting failure of the San Francisco Water Works left Spring Valley in a strong position. In 1864, the Spring Valley Water Company hired an engineer named Hermann Schussler, who in 1866 made his mark by raising Pilarcitos Dam. Schussler stayed with the company well into the 20th century and designed some of its most important components.

By 1868, Spring Valley had commenced negotiations to purchase Lake Merced from another local competitor—the Lake Merced and Clear Lake Water Company—and by 1877 integrated this spring-fed, natural reservoir into its system. Spring Valley dammed the outflow of Lake Merced, which had originally flowed northwest to the ocean. The company constructed Laguna Honda Reservoir in 1865 and incorporated it into the supply system; the north basin of University Mound Reservoir was constructed in 1885 and improved in 1924. These improvements are discussed below.

Peninsula System (1861–1898)

The Pilarcitos development, started in 1861, completed in 1863, and raised in 1866, was the first of a succession of large-scale projects planned and constructed by the Spring Valley Water Company. It was designed by company engineer Alexis von Schmidt. Pilarcitos Creek was the first source outside of San Francisco to be tapped as a water supply, and it proved to be the most productive of the dams and reservoirs on the Peninsula owing to high local rainfall. Pilarcitos Dam was a rolled earth dam with a puddle core and, at 70 feet high, was a large dam for the period. Its associated Tunnel No. 1 through Cahill Ridge to San Mateo Creek was a major construction project in its own right. The subsequent Pilarcitos Reservoir supplied water, via a gravity-fed system, to Laguna Honda Reservoir, which was constructed in San Francisco in 1865. Von Schmidt left Spring Valley in 1864 and was replaced by Hermann Schussler, a Swiss engineer trained at the Universities of Karlsruhe and Zurich. Schussler's long career as an engineer with Spring Valley was typified by a succession of plans, each of which served to increase the company's supply.

Schussler identified the San Andreas Valley as a prime reservoir site for the company's next plan of development. In 1868, he relocated the Pilarcitos pipeline and began constructing a dam to flood the valley. San Andreas Dam was a straight-crest gravity dam of earthen construction and was larger than Pilarcitos Dam, which used the same construction method. A tunnel through Buri Buri Ridge carried water from San Andreas Reservoir to Millbrae and then into San Francisco's network of mains and pipes through a gravity-flow system. By 1870, these facilities were supplying water to the city and had increased the amount sixfold. The dam was raised in 1874, and again in 1928, to a final height of 105 feet. It contributed up to 80 or 90 percent of San Francisco's water supply from the Peninsula system, greatly reducing the strain on sources within the city.

Stone Dam and Reservoir was the company's next system on the Peninsula. Relatively small, it collected the excess water from Pilarcitos Creek that was not impounded by Pilarcitos Reservoir and carried it by flume to San Andreas Reservoir. Stone Dam was also the receiving point for water from Lock's Creek flume, which brought water from Nuff Creek, Corinda Los Trancos, Apanolia Creek, Frenchman's Creek, and Lock's Creek through a tunnel to the reservoir. Stone Dam, built in 1871, was an engineering achievement despite its small size. It was the first dam of its type, and Schussler designed it of rubble masonry, blocks of local granite, and a herring-bone brick coping in a thin-arch configuration. The dam impounded nearly 5 million gallons of water.

The continuing increase in demand led Spring Valley Water Company to design and build its next system in Crystal Springs Canyon. From 1873 to 1877, the company installed an earthen dam with a puddle clay core across Laguna Creek. The water impounded behind it became Upper Crystal Springs Reservoir, the outlet of which consisted of a brick-lined, horseshoe-shaped tunnel. Upper Crystal Springs Dam was raised in 1891 to increase the capacity of its corresponding reservoir.

Spring Valley built Lower Crystal Springs Dam in 1890; the dam, credited to Schussler's design and plan, was an engineering achievement and, when completed, was the largest concrete dam in the world. The gravity-arch dam, made of poured-in-place interlocking blocks and reaching 150 feet high, dammed San Mateo Creek and created Lower Crystal Springs Reservoir. The dam was raised in 1890 and again in 1911. In 1976, the American Society of Civil Engineers listed Lower Crystal Springs Dam as a California Historic Civil Engineering Landmark, in part for Schussler's development of a number of innovative construction techniques that included washing the aggregate, machine-mixing the concrete, roughening the existing surfaces to ensure adhesion, curing the concrete by covering and wetting, and staggering the joints between the concrete blocks. An 1880s pump station designed by Willis Polk raised water to San Andreas Reservoir when Lower Crystal Springs Reservoir was experiencing low water levels.

During the Peninsula system era, Spring Valley also constructed the north basin of University Mound Reservoir in San Francisco to receive and store the new supplies of water coming into the city from the various dams and reservoirs. Development and construction of the Peninsula system continued after construction of the Crystal Springs dams. In 1898, Spring Valley built San Mateo Creek Dams Nos. 1 and 2 to collect more water for San Andreas Reservoir. Davis Tunnel also diverted water from San Mateo Creek into San Andreas Reservoir. This reservoir was fed with water from the Crystal Springs Reservoirs via the Crystal Springs/San Andreas Pipeline, which was constructed in portions in 1898 and 1932. This pipeline incorporates the Crystal Springs Pump Station, originally constructed in 1933, which is necessary to raise the water between the reservoirs.

Alameda Creek System (1875–1925)

At the same time that the company had dams under construction on the Peninsula, it also looked eastward across the bay to seek additional water, turning to sources in Alameda County. The company acquired land in the Calaveras Valley and a dam and mill property near Niles. In 1874, a report prepared by engineer T.R. Scowden recommended the Calaveras Valley as a source of water for a potential San Francisco municipal utility. The Spring Valley Water Company bought Calaveras Valley from the Alameda Water Company in 1875, ensuring its control of this source until the 1930s.

Niles Dam was the diversion point for a 1840s water right used to grind flour at the mill of Jose de Jesus Vallejo. The first project undertaken by Spring Valley on Alameda Creek, in 1887 and 1888, raised and adapted the Niles Dam system to divert water from the creek to San Francisco via the transbay pipelines at Dumbarton. The transbay pipelines carried the creek's water that was pumped from Dumbarton at the Belmont Pump Station into San Francisco.

In 1900, Spring Valley completed construction of the Sunol Filter Beds, Dam, and Aqueduct on Alameda Creek in the Sunol Valley area. Another Schussler plan, Sunol Dam did not form a reservoir, but rather backed shallow groundwater into the gravels upstream for diversion into the filter galleries. The water then passed into the greater water system through large concrete pipes and the Niles Canyon Aqueduct. These filter gallery diversions, plus withdrawals at Pleasanton, enabled the Spring Valley Water Company to divert in excess of 21.5 million gallons per day (mgd) to San Francisco from the Alameda Creek watershed. Additional transbay pipelines were added in 1903. As it had with Crystal Springs Dam, the American Society of Civil Engineers identified this system as an engineering landmark in 1976.

More groundwater was collected from artesian wells in the Livermore Valley, where the company created the Pleasanton Well Field. Under this plan, the company had a series of trenches dug in Pleasanton to feed artesian water into Arroyo de la Laguna; as water levels dropped, additional lines of deeper wells were dug and pumped for export. The 30-inch-diameter Pleasanton-Sunol Pipeline, constructed in 1909 and feeding into the Sunol Water Temple, eventually replaced Arroyo de la Laguna as the diversion method. The wells were regularly used from 1898 to 1930, at which time the CCSF purchased Spring Valley Water Company and stopped exporting water from the Livermore Valley. The system had become unnecessary because of the availability of water from Hetch Hetchy Reservoir. The CCSF used the wells again for a brief period during the 1949 drought. In the interim, water levels in Pleasanton returned to the artesian flows of earlier years. The Sunol Filter Beds are now operated intermittently as one of the sources supplying San Antonio Reservoir, and the Pleasanton Wells are operated to supply the Castlewood community south of Pleasanton.

The only substantial groundwater supplies in the Alameda Creek watershed above Niles were in the Livermore Valley. Shallow groundwater in the Sunol Valley was highly influenced by flood flows from Alameda Creek and was used during the rainy season, after which the Pleasanton Wells could pick up the slack and keep the transbay pipelines full over the summer months.

The Sunol Water Temple is a monument of high architecture that stands at the convergence of the three water sources within the Alameda Creek system: the creek itself, the Sunol Filter Beds, and the Pleasanton Wells. The temple, designed by Willis Polk in 1910, exhibits a Classical style. Consisting of a circle of Corinthian columns that support a wide entablature and conical roof of red tile, the temple shelters an oculus that allows viewers to see water flowing through the tunnel beneath it.

The other element of the Alameda Creek system is Calaveras Dam and Reservoir. The dam, located upstream of the Sunol Valley, effectively collected water from a number of sources, including Arroyo Hondo. Schussler retired from the company in 1909 and was replaced in 1911 by Fred C. Herrman. Spring Valley began construction of Calaveras Dam in 1913; after a structural failure in March of 1918, the dam was completed in 1925. A 1918 engineering study indicated that the dam had not been properly compacted, which left voids in the structure and caused the upstream face to collapse and the water gate tower to be destroyed. Although he was not part of the project, San Francisco's city engineer, Michael O'Shaughnessy, who at the time was playing an integral role in the Hetch Hetchy water system's construction, monitored the project with the forethought that it would someday be part of the larger municipal water system (CCSF, 2007).

Calaveras Dam incorporated hydraulic fill in its lower portions and was topped with rolled clay and rubble fill. When it was completed in 1925, it stood 215 feet tall and was reputedly the tallest dam the world (although it was only slightly taller than Upper San Leandro Dam, a 190-foot hydraulic-fill dam, built in 1926; Lake Arrowhead's 190-foot hydraulic-fill dam, built in 1922; or the City of Los Angeles' Stone Canyon Dam, a 185-foot earthen dam, built in 1925). These dams were soon surpassed by structures such as San Gabriel No. 1, an earth and rock dam built in 1938 to a height of 320 feet.

The corresponding Calaveras Reservoir was a major East Bay addition to the company's water system. It delivered water to San Francisco through the Niles Canyon Aqueduct and the city's Bay Division Pipeline No. 1, which was built in 1925 and ran across the southern end of San Francisco Bay. The CCSF built Bay Division Pipeline No. 1 as part of the Hetch Hetchy Project, but Spring Valley Water Company leased the pipeline for delivery of Calaveras water to Crystal Springs under a Railroad Commission order negotiated by San Francisco's engineers and attorneys. In order to convey the additional yield from Calaveras Reservoir to San Francisco, Spring Valley enlarged the Sunol Aqueduct in 1924 to carry 70 mgd, and also built Niles

Regulating Reservoir and Niles/Irvington Pipeline and Pump Station to boost Calaveras Dam and Sunol Filter Bed water into Bay Division Pipeline No. 1 (URS, 2004).

Hetch Hetchy System (1914–1934)

The CCSF's planning and development of the Hetch Hetchy system represents a second major context in which to understand the development of the regional water system. The Hetch Hetchy system was planned as a major part of the movement to wrest control of the water supply from Spring Valley Water Company; while parts of the systems overlap or were temporarily used by the Spring Valley Water Company (like Bay Division Pipeline No. 1), the overwhelming acceptance of the Hetch Hetchy system by the citizens of San Francisco represents a distinct break from the reliance on private water company developments to provide San Francisco with its municipal water supply.

The centerpieces of the Hetch Hetchy system—O'Shaughnessy Dam and Hetch Hetchy Reservoir—were hard won, and much controversy surrounded their construction. The effort began in 1890, when the Tuolumne River was surveyed as a potential water source for San Francisco and the Hetch Hetchy Valley as a potential reservoir site. The Sierra Club contested the damming of the Tuolumne River under the leadership of its first president, John Muir. Muir, one of the nation's best-known conservationists, first visited Hetch Hetchy Valley in 1871 and equated its damming to turning a cathedral into a water tank. He waged an eight-year campaign to thwart the valley's development, but was eventually defeated by a number of government decisions ending with the Raker Act in 1913.

Beginning in 1903, San Francisco sought permission from successive secretaries of the interior to build a dam in the Hetch Hetchy Valley and to use other federal lands in Yosemite National Park and Stanislaus National Forest to deliver the water to the Bay Area. Secretary of the Interior Ethan Allen Hitchcock denied the first request in 1903.

San Francisco's efforts to dam Hetch Hetchy gained momentum following the destructive fires associated with the 1906 San Francisco earthquake, during which there was limited water for firefighting because of breaks in water lines in the city and throughout the water distribution system. Two years after the 1906 earthquake and fire, Secretary of the Interior James R. Garfield granted San Francisco the so-called "Garfield Permit," many provisions of which anticipated the 1913 Raker Act. In 1909, the CCSF purchased much of the patented land in the Hetch Hetchy Valley from private owners. With the election of President William Howard Taft, new Secretary of the Interior R.A. Ballinger issued a 1910 "Order to Show Cause" directing San Francisco to establish why it required water from its proposed Hetch Hetchy Valley reservoir, as opposed to diverting water from Cherry and Eleanor Creeks. Also in 1910, the CCSF acquired competing rights to divert at Cherry and Eleanor Creeks from William Hammond Hall's Tuolumne Water Supply Company.

Ballinger asked the U.S. Army Corps of Engineers to prepare a report on other potential sources of supply available to San Francisco, including the Eel River, Mount Shasta, Clear Lake, Cosumnes River, and other sources. The Corps concluded that the Tuolumne River was the best available source for San Francisco for several reasons: it was comparatively free of conflicting claims to water rights; could be economically developed; could generate power as a valuable byproduct of water deliveries; could provide a pure water source that was unlikely to be compromised by future human activity because the watershed was protected in a national park; and had sufficient water to accommodate the future demands of the Bay Area. With another change of presidential administrations, former San Francisco City Attorney Franklin Lane became secretary of the interior under President Woodrow Wilson. To avoid the appearance of conflict, Secretary Lane did not approve the Hetch Hetchy permit, but rather recommended that the CCSF seek congressional approval. This move also avoided the potential for revocation of any permit by succeeding secretaries of the interior.

On President Taft's advice, the city needed to prove its need for more water. It hired influential consulting hydraulic engineer John R. Freeman to make the case for Hetch Hetchy before the Corps. His report was instrumental in pushing the project through to approval. An engineer from Rhode Island, Freeman was a consulting engineer on the early 20th century expansion of the municipal water supply of Boston and had consulted on the plan for the Los Angeles Aqueduct in 1906. He worked with California-based hydraulic engineers C.E. Grunsky and Marsden Manson, expanding on their initial concepts for the Hetch Hetchy Project.

Freeman's 1912 report called for the delivery of 160 mgd from Hetch Hetchy to San Francisco, with the prospect of increasing that amount to 400 mgd, an amount sufficient to serve the entire Bay Area. The plan also allowed for construction of powerhouses to supply electricity for the project and later, for the city. With this vast municipal water supply secured from the upper Tuolumne watershed, Freeman envisioned a booming metropolis developing around the bay. He treated the various parts of the upper drainage basin (those associated with Lake Eleanor, Hetch Hetchy Valley, and Cherry Valley) as part of the city's water system, adding them to the existing facilities of the Spring Valley Water Company. Promoting the "urban destiny" of the Bay Area, Freeman compared San Francisco's Hetch Hetchy development to the water systems that supported the industrial and population growth of other major metropolitan areas, including Boston, New York, London, and Oslo, Norway. Lastly, he argued that the reservoir created by damming Hetch Hetchy Valley would attract as many visitors, if not more, than if the valley were kept in its natural state. With a good network of mountain roads established by the construction project, Freeman envisioned Hetch Hetchy and the upper Tuolumne River watershed as a popular tourist destination high in the Sierra Nevada mountains. These various arguments favoring conservation and use of Hetch Hetchy eventually proved to be major contributing factors in the approval of the Hetch Hetchy Project.

The 1913 Raker Act succeeded in gaining the CCSF a congressional grant of right-of-way, construction, and use privileges in Hetch Hetchy Valley, which ultimately allowed the Tuolumne River to be dammed and the valley flooded. The act passed despite determined opposition from those in favor of preserving the valley, and from individual landowners in the Turlock and Modesto Irrigation Districts (TID and MID) who disagreed with the district boards' decisions to support San Francisco. Congress supported the act as an example of "conservation for use," believing it served a public need that outweighed any detriment to the natural environment.

(Readers interested in the Hetch Hetchy controversy, and the Raker Act's legislative history and passage through Congress, can find a large number of articles and books on the subject, some of which are included in this report's bibliography.)

Opposition to construction of the Hetch Hetchy project came from a variety of interests. Understandably, the Spring Valley Water Company opposed this project, which effectively ended the company's role as the utility company supplying San Francisco with its municipal and domestic water.[21a] The Hetch Hetchy project was designed to transmit electrical power to San Francisco from a power plant at Moccasin. A politically charged conflict over this electric power and associated revenue pitted public power advocates against the privately financed electric power industry. Opposition came from electrical power generating companies like Pacific Gas and Electric Company (PG&E) and Great Western Power Company (GWP), two utilities that served San Francisco and the Bay Area. These private power companies opposed the competing generation and sale of electricity by public agencies, which was a provision of the Raker Act. The CCSF planned to acquire PG&E and GWP's distribution systems within its service area, but between 1927 and 1941 the public consistently rejected bond issues required to fund their acquisition; allegedly, this opposition to the bond measures was largely funded by PG&E.[21b] The CCSF's agreements to have PG&E (which had acquired GWP in the 1930s) wheel its power through the company's existing transmission and distribution systems for delivery to San Francisco agencies, and its purchase of city power for resale, caused a longstanding controversy between the federal government, public power advocates, and the CCSF.[21c]

Perhaps the most prominent name associated with development of the Hetch Hetchy water and power system was that of Michael O'Shaughnessy, San Francisco's city engineer (1912–1934) and ex-officio city planner. Working under the direction of Mayor James Rolph, O'Shaughnessy had many of the state's best engineers in his work force. The rebuilding efforts following the 1906 earthquake had brought many skilled engineers and construction laborers to the area, and they were eager for more work, especially under the leadership of the well-respected O'Shaughnessy.

As the congressional act required, development of the gigantic Hetch Hetchy undertaking began in earnest after passage of the Raker Act in 1913. In 1918, Lower Cherry Diversion Dam and Aqueduct, the first major facilities in the system, were completed, enabling the generation of power at Early Intake Powerhouse on the Tuolumne River. This network of facilities was critical to development of the rest of the Hetch Hetchy system, as it supplied electricity to power construction efforts. Lower Cherry Diversion Dam and Aqueduct are still in use and available to provide additional water during droughts. Early Intake Powerhouse was demolished in 1967.

[21a] Elmo R. Richardson, "The Struggle for the Valley: California's Hetch Hetchy Controversy, 1905–1913," *California Historical Society Quarterly*, Vol. 38, 1959.

[21b] Norris Hundley, *The Great Thirst: Californians and Water, 1770s–1990s.* University of California Press, pp. 187–189, 1992; and Stephen P. Sayles, "Hetch Hetchy Reversed: A Rural Urban Struggle for Power." *California History*, 64:4, p. 256, Fall 1985.

[21c] [21c]San Francisco Public Utilities Commission (SFPUC), *San Francisco Water and Power,* pp. 57–61, June 1949.

The Hetch Hetchy system, in some elements of its concept and engineering design, mirrored similar developments made by other urban centers at much the same time. Part of the challenge of building the system was its remote location, which required construction of an array of supporting facilities in the vicinity of the project; these included a railroad for transporting materials and workers to the dam site, a sawmill to produce lumber, and a powerhouse to generate electricity for construction equipment.

Multi-purpose dam and water conveyance projects proliferated within river basins throughout America in the early decades of the 20th century. The projects were built for a variety of purposes: municipal water supplies, federal land reclamation, irrigation, and electric power generation. Thousands of workers contributed to this construction work, often under tight schedules and difficult, even dangerous, conditions. Hetch Hetchy water project contract workers and wage laborers consisted of a varied group of individuals stratified by skill, race, and ethnicity. The largest proportion was low-paid, unskilled laborers, both native-born and immigrants. Above them were the better-paid skilled workers and craftsmen, and at the top was a smaller group consisting of managers, supervisors, administrative personnel, and skilled professionals such as civil and electrical engineers, hydrographers, and surveyors. Over more than 25 years of construction activity, the Hetch Hetchy project provided employment to many thousands of workers in many fields of industrial labor; these workers built everything from mountain roads, railroads, labor camps, buildings, bridges, and trestles that served as project infrastructure, to dams, tunnels, pipelines, siphons, and penstocks that stored and conveyed municipal water. Many of the lesser-skilled construction laborers were highly migratory, non-unionized workers whose employment was seasonal, with peak employment coming during the summer and autumn and minimal opportunities in winter and spring.

While some workers were more sedentary and lived in towns or work camps with their families, the majority of the workers—who were predominantly unmarried, mobile, and male—resided in boardinghouses or labor camps near their work sites. The ethnic makeup of the workingmen's boarding houses was often quite diverse, according to 1920 census records. For example, one lumber camp near Groveland was operated by an American civil engineer whose wife kept house with the assistance of one cook. Twenty-five boarders lived there, including painters, carpenters, contractors, lumberjacks, millwrights, and the lumberyard foreman. While the nationality of the boarders was predominately native-born, there were also Hungarians, Poles, Swedes, Germans, and Italians represented among the lodgers. Similarly, a tunnel camp in Groveland Precinct in 1920 contained boarding houses operated by a Swedish immigrant and a Canadian-born mine superintendent. While the Swedish-run operation catered mostly to about 20 Swedish, Norwegian, and native-born tunnel workers, the Canadian establishment lodged a diverse clientele of 22 workers, including tunnel miners and laborers, blacksmiths, foremen, and electricians. They were a diverse lot by nationality, including Canadians, native-born Americans, Spanish, German, Swedish, Italian, Irish, and Austrian workers. This pattern of boarding house occupation by workers of various nationalities was borne out at other tunnel camps and dam construction camps located outside the town of Groveland and at Lake Eleanor.[21d]

[21d] U.S. Census Bureau, MSS Population, Groveland Precinct, Tuolumne County, CA, 1920.

Unsafe working conditions and inadequate wages were issues that periodically contributed to labor strife and fostered efforts to unionize the rural industrial labor force assembled to construct the Hetch Hetchy project. During August of 1920, workers at some of the city's construction camps, particularly in the Mountain Tunnel Division, staged a general strike that lasted until May 1921. City officials, particularly O'Shaughnessy, had expressed general support for trade or craft unionism, but objected to "radicals" who organized the day laborers/construction workers hired by the CCSF and advocated worker solidarity, class conflict, and direct action (strikes) at the point of production. These radical labor leaders included representatives of the Industrial Workers of the World (I.W.W., or "Wobblies"), which variously functioned as an umbrella labor organization and revolutionary social movement, and the International Union of Mine, Mill & Smelter Workers, a labor union with militant roots in the copper, nickel, lead, and gold mines of the American West and British Columbia. During the 1920s and 1930s, Mine and Mill, as the union was known, made concerted efforts to organize unskilled national minorities such as Mexican-Americans and African-Americans in the American Southwest. City records indicated that Swedish/Finnish tunnel crews and Mexican laborers were among the more ardent supporters of the radical unionization effort.[21e]

Construction of Hetch Hetchy Dam, ancillary water storage structures, the city's extensive water conveyance system, and its power plant at Moccasin proceeded over several decades, from 1913 into the late 1930s. In 1925, in his report to the CCSF on Hetch Hetchy's progress, O'Shaughnessy made little mention of labor problems or strife over organizing, and no comments related to national groups and/or the ethnic composition of the workforce. He reported that the total number of "men" productively employed on the project between 1914 and mid-1925 ranged from over 500 at the end of 1914, less than a hundred at the beginning of 1915, and then a gradual increase (with ebbs and flows) to about 750 in 1919. Thereafter the numbers increased quickly, reaching over 2,000 in 1922, before dropping off again to less than 400 by mid-1925.[21f] After 1925, the bulk of the construction effort shifted to the Foothill and Coast Range Tunnels and installation of the San Joaquin Pipeline, leading eventually to the delivery of Hetch Hetchy water into the city in October 1934.[21g]

In the end, the Hetch Hetchy system included multiple dams and reservoirs, conduits, power plants, and 150 miles of aqueduct to transport water from high in the mountains down to the coastal city of San Francisco near sea level. Like other major urban systems on the East Coast, facilities within the system were sited to maintain a gravity flow of water from Hetch Hetchy Reservoir and O'Shaughnessy Dam to the various storage reservoirs and places of use in and near San Francisco. O'Shaughnessy Dam, named after the engineer who oversaw its construction, was of cyclopean concrete construction, consisting of large granite blocks embedded in concrete. It

[21e] Ted Wurm, *Hetch Hetchy and its Dam Railroad*, Trans-Anglo Books, Glendale, CA, pp. 121–122, 1973; Melvyn Dubofsky, *We Shall Be All: A History of the Industrial Workers of the World*, Urbana: University of Illinois Press, 1988; Mario T. Garcia, *Mexican Americans: Leadership, Ideology and Identity, 1930–1960*, Urbana: Yale University Press, pp. 175–198, 1989; City and County of San Francisco (CCSF), Moccasin Archives, n.d.

[21f] M.M. O'Shaughnessy, *Hetch Hetchy Water Supply*, Bureau of Engineering of the Department of Public Works, report prepared for the City and County of San Francisco, p. 42, October 1925.

[21g] Hanson, Warren D., *San Francisco Water and Power: A History of the Municipal Water Department and Hetch Hetchy System*, City and County of San Francisco, pp. 55–56, 1994.

had an arch-gravity configuration with a 101-foot-deep foundation. At 226.5 feet high, it was a major structure on the West Coast when it was completed in 1923. Its construction took four years and employed laborers around-the-clock, which was uncommon at that time. Utah Construction Company built the $17 million O'Shaughnessy Dam,[22] which was one of the company's early major dam projects. The company went on to become one of the major dam builders in the American West, being credited with construction of at least 58 large dams between 1916 and 1969, including the colossal Hoover Dam on the Colorado River.

[22] Founded in 1900, Utah Construction Company began as a railroad builder in the inter-mountain West. Among its projects was Western Pacific's Feather River Canyon Route (1911) on the Oakland to Salt Lake City line.

At the same time that O'Shaughnessy Dam was nearing completion, the city had another auxiliary dam and reservoir under construction. In 1923, Priest Dam and Regulating Reservoir was built to regulate the flow of water to the city's Moccasin Powerhouse. The following year, the city built Early Intake Diversion Structure, which was the major diversion point for the project. It took water spilled from Hetch Hetchy Reservoir and diverted it through Mountain Tunnel (1925). The tunnel traveled through solid granite and was a concrete-lined, horseshoe-shaped passage that conveyed water to Priest Reservoir and subsequently to the Moccasin facility. The water flowed through Moccasin Power Tunnel, down the penstock, and to Moccasin Powerhouse, where electricity was generated primarily during peak hours. In 1925, a switchyard, other facilities, and a small city-owned town, originally known as Moccasin Camp, sprang up around the powerhouse. The town and associated buildings, and the powerhouse, were designed in a uniform Mission Revival architectural style.

The Red Bar Mountain Siphon, a portion of Foothill Tunnel, was also constructed at this time to carry water across the Tuolumne River Canyon. Foothill Tunnel was constructed in 1928 and conducted water to the Central Valley, releasing it into the San Joaquin Pipelines.

In the San Joaquin Valley, Tesla Portal was added in 1928, providing a connection between the San Joaquin Pipelines (the first of which was constructed in 1932) and the Coast Range Tunnel (completed in 1934). In 1934, at the other end of the Coast Range Tunnel, the city constructed the first Alameda Siphon and Irvington Tunnel to carry water through to the Bay Division Pipelines. Alameda Creek Diversion Dam and Tunnel were begun in 1925 by Spring Valley Water Company and finished in 1931 by the CCSF. Located on Alameda Creek upstream of the Alameda Siphons, the dam diverted water from Alameda Creek through the diversion tunnel and into Calaveras Reservoir. The Alameda Creek Diversion Dam and Tunnel added 35 square miles of watershed area to the system (SFPUC, 2004).

O'Shaughnessy Dam was designed and built in a manner that would allow it to be raised. In the 1930s, President Franklin D. Roosevelt sought to provide America with a New Deal, a government-sponsored socioeconomic initiative that among its most prominent programs included dam construction projects as massive public works. Not long after Roosevelt's election (November 1932) and the start of the New Deal (after his inauguration in March 1933), the CCSF received a grant from the federal government covering 30 percent of the cost of labor and materials for raising O'Shaughnessy Dam. The money came from the National Recovery Administration, which was formed by the National Industrial Recovery Act of June 1933. The SFPUC reported that on November 7, 1933, the citizens of San Francisco passed a bond measure for $3.5 million to cover the city's portion of the cost of enlarging O'Shaughnessy Dam. The federal grant also stipulated that all available unemployed workers in Tuolumne County had to be put to work before unemployed people from San Francisco could be used. Soon thereafter, the state requested that the CCSF use 500 to 600 unemployed laborers it had available for "maintenance of municipal property" under the State Emergency Relief Act (SERA). By March 1934, the CCSF had erected seven SERA work camps capable of housing and feeding nearly 700 workers. Later, the state's SERA program for unemployment relief was absorbed into the federal

Works Progress Administration. The CCSF issued the contract for the Hetch Hetchy Dam enlargement project onApril 8, 1935 to the Transbay Construction Company, and the dam's raising was completed more than three years later, on July 1, 1938.[22a]

In 1926, Pulgas Tunnel was constructed to carry water from the Bay Division Pipelines to Upper Crystal Springs Reservoir. The Crystal Springs/San Andreas Pipeline, constructed in 1932, connected Crystal Springs Reservoirs to San Andreas Reservoir. In 1934, the arrival of Hetch Hetchy water at Crystal Springs was commemorated with construction of the Beaux Arts–style Pulgas Water Temple. The temple was designed by William Merchant, a San Francisco architect who trained under Bernard Maybeck, in a style sympathetic to the Sunol Water Temple. Completion of this pipeline allowed water to travel continuously by gravity flow from Hetch Hetchy Reservoir to the city of San Francisco, a total of over 170 miles.

During construction of the Hetch Hetchy system, the city finally completed the long process of acquiring Spring Valley Water Company. Citizens of the city had strongly supported the Hetch Hetchy system, regularly passing bond measures to fund its construction. Acquisition of the Spring Valley system proved more difficult. The city's board of supervisors put measures to acquire the system on the ballot five times between 1910 and 1928; it was only in 1928 that the voters finally approved its acquisition. While some of the elections nearly reached the required

[22a] San Francisco Public Utilities Commission (SFPUC), *San Francisco Water and Power,* pp. 59–60, June 1949; Ted Wurm, *Hetch Hetchy and its Dam Railroad*, Trans-Anglo Books, Glendale, CA, p. 251, 1973.

two-thirds majority, the 1928 vote in favor of purchase reached 82 percent.[23] The city then entered into negotiations to set a purchase price, and finally acquired the Spring Valley Water Company in 1930 for $39.96 million, at last converting the private utility into a public agency. This led to the creation of the San Francisco Water Department under the Department of Public Works. The first delivery of water from Hetch Hetchy to San Francisco occurred in 1934.

Expansion and Improvements (1934–1955)

Although San Francisco's water system was completed to its fullest geographic extent with the construction of Hetch Hetchy Reservoir, the city made later separate improvements and expansions to its municipal water system and undertook major maintenance projects to improve facilities already in use. Among the most notable of these improvement and expansion projects was raising O'Shaughnessy Dam by 85.5 feet in 1938.

In 1934, the city completed Moccasin Dam, forming Moccasin Reregulating Reservoir; the dam formed an afterbay that assisted in making the flow of water downstream from the Moccasin Power Plant facility more consistent, because the generators at the powerhouse operated in cycles and created varying water flow levels into the afterbay. That same year, the city installed the first of the Alameda Siphons to assist in carrying water under Alameda Creek, between the Coast Range Tunnel and Irvington Tunnel. Merced Manor Reservoir was constructed in 1936 in San Francisco to store water for the residential area surrounding it and to supply Central Pump Station, which pumps water to other reservoirs in the city. In addition, the south basin of University Mound Reservoir, constructed in 1937, and the north basin of Sunset Reservoir, constructed in 1938, greatly improved the capacity of city-based water storage facilities. The city constructed an additional Sunset Reservoir basin in the 1950s. The Sunset Wells in San Francisco were added to the system from 1930 to 1936, just after the city bought Spring Valley. The water department added and improved pipelines that enhanced the amount and dependability of the water supply. In 1936, the city constructed a second Bay Division Pipeline, parallel to the first, and in 1952, added a third Bay Division Pipeline. It skirted the southern end of the bay rather than crossing it. In addition, the city built a second San Joaquin Pipeline and a second Alameda Siphon in 1953.

Between 1953 and 1955, the city built Cherry Dam and created Lake Lloyd near Lake Eleanor Dam, high in the Sierras, adding to the facilities already associated with Cherry Creek. The city also constructed additional power tunnels and powerhouses in this portion of the system. Although Cherry Dam contributes to the system, it primarily provides water to TID and MID, as well as generating hydroelectric power for the city of San Francisco. Water comes into Lake Lloyd from Lake Eleanor via the Cherry-Eleanor Tunnel and Pump Facility. Water is transported out of Lake Lloyd via the Cherry Power Tunnel (1955), which conveys it to Holm Powerhouse (1960).

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[23] David R. Long, "Pipe Dreams: Hetch Hetchy, the Urban West, and the Hydraulic Society Revisited." *Journal of the West*, 1995 34(3): 19-31; see especially 26-27.

Modernization (post-1955)

Creative engineering aimed at solving specific problems sustained a later period of system development in the 1960s and 1970s, focused primarily on water quality issues. This period was typified by construction of Pulgas Pump Station and Balancing Reservoir, Pulgas Bypass Tunnel, Crystal Springs Bypass, San Andreas Treatment Plant, Sunol Valley Water Treatment Plant (WTP), and San Antonio Pump Station, Pipeline, and Reservoir, which were designed based on a specific set of plans to make the system more modern and efficient.

In the 1960s and 1970s, water quality issues became more of a concern on a national level, as well as statewide and local levels, than it had been in the early years of municipal water system development. Water quality became the focus of federal legislation in the 1970s; congress passed the landmark Clean Water Act in 1972, focusing primarily on the treatment of wastewater, and the Safe Drinking Water Act in 1974, which set standards for water quality around the nation. Accordingly, the city put into service facilities like the Sunol Valley WTP, serving Calaveras Reservoir, and the Harry Tracy WTP, serving San Andreas Reservoir. These facilities filter, disinfect, and introduce additives to the water before it is delivered to consumers.

In the mid-1960s, the city built Turner Dam and San Antonio Reservoir, the most recent of the major water system facilities. The dam and reservoir had been under consideration early in the system's history; in fact, these facilities were originally sited by the Spring Valley Water Company in 1875 and presented in the Freeman report of 1912, but were never built under any plan until the city did so. Finally completed in 1965, these facilities provided a needed water collection and storage point. In addition, the city had the upstream face of Pilarcitos Dam repaired in 1972, and strengthened Calaveras Dam in 1975.[24]

Many other mechanical facilities and stretches of pipeline have been constructed over the years. These various engineering facilities and structures, which were conceived, designed, and built during discrete periods and by separate plans, work together to unite the dispersed larger elements of the system, such as Peninsula, Alameda, and Tuolumne watershed dams and reservoirs, and make the SFPUC water system operate as an efficient whole.

Resource Types

The following discussion describes the types of cultural resources that might occur within the WSIP study region.

Paleontological Resource Types

Invertebrate fossils found in young marine sediments are usually not considered by paleontologists to be significant resources because they are often widespread, abundant, fairly well preserved, and present in predictable locations; the same or similar fossils can be located at

[24] During this time, TID and MID constructed New Don Pedro Dam (1967–1971). It replaced a smaller, 1923 dam in the same area and created Don Pedro Reservoir from the waters of the Tuolumne River. New Don Pedro Dam, while partially financed by the SFPUC (acting on behalf of the CCSF), is owned and operated by TID and MID as a part of their systems; it plays no direct role in the provision of water to San Francisco.

any number of sites throughout California. Most limestone deposits are prolific with invertebrate skeletal material; organic mudstones are also rich with invertebrate fossils. However, a new marine invertebrate fossil discovery that might provide a better understanding of a geologic unit or shed light on a new genus or species would be considered an important scientific discovery. Fossil remains of vertebrates are common in Pleistocene (1.8 million to 10,000 years ago) units throughout California, and units of alluvium, in particular, can contain diverse animal fossils that represent key evolutionarily significant specimens.

Archaeological Resource Types

Prehistoric Archaeological Resources

Prehistoric archaeological site types in the WSIP study areas include village sites, temporary campsites, milling sites, petroglyphs, stone or rock scatters, quarry sites, shell and ash middens, and burial sites. Prehistoric sites are more likely to be intact in areas that are not fully developed or farmed, or are beneath alluvial fans that have not been extensively plowed. Although buried deposits can occur in urbanized settings, substantial commercial and residential development has disturbed or destroyed many of these sites. For example, the Central Valley has undergone substantial change since prehistoric times due to its agricultural development, but it is possible to encounter paleontological resources when they become exposed due to soil erosion. Deeply buried prehistoric sites have also been found in San Francisco and the East Bay Hills; permanent settlements were common in the San Francisco Bay region, and prehistoric sites are likely to occur throughout much of the area.

Historic Archaeological Resources

Historic archaeological sites in the Central Valley are characterized by artifacts associated with mid-19th-century ranching and agricultural settlements, which may have also left behind farming landscapes, homesteads, corrals, fences, and canal and irrigation features. The historic archaeological resources in the San Francisco Bay Area include recreational sites, mining-related sites, early military sites, and refuse deposits, such as artifact-filled privies or wells. Of particular interest are those sites related to Mission-era activities, including dwellings or house depressions, cairns,[25] rock alignments, and household features such as hearths, pits, and fire-cracked rock. Throughout the WSIP study area, historic railroad properties remain, including railroad segments, campsites, berms, trestles, material dumps, and associated structural ruins (see Chapter 2, Existing Regional Water System, Table 2.1, for a listing of major SFPUC facilities).

Traditional Cultural Properties

Traditional Cultural Properties (TCPs), or sacred lands, are holy places, ceremonial sites, and other important places for Natives Americans. TCPs and other sacred lands may be eligible for listing in the National Register of Historic Places under the National Historic Preservation Act (Section 101[d][6][a]). TCPs may also be eligible for listing in the California Register of Historical Resources under Section 15064.5[a][3] of CEQA. In the WSIP study area, TCPs often consist of natural or geologic features that are traditionally considered sensitive or sacred. For

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25 A rock pile, cache, or suspected burial.

example, Mount Diablo and Mount Tamalpais are landmarks considered to be TCPs for their religious and ceremonial significance to several Native American groups. However, not all TCPs are necessarily mountaintops or overt features of the landscape. The California Native American Heritage Commission maintains a database of known sacred lands and distributes information concerning these properties upon request.

Historic Architectural Resource Types

In a complicated hydraulic facility such as the SFPUC regional water system, each individual element contributes in some way to the overall function, which in this case is to capture, store, treat, and transport water from reservoirs to the city distribution system and ultimately to consumers. One useful document in identifying, assessing, and evaluating features of water conveyance systems, such as those in the regional water system, is *Water Conveyance Systems in California* (JRP Historical Consulting Services and Caltrans, 2000).

Some major facilities in water conveyance systems (such as certain dams and aqueducts) play more central roles and may have surmounted substantial engineering challenges through innovative solutions, warranting recognition as important examples of hydraulic engineering under the contexts of municipal water systems. Others (such as certain pumping plants, distribution reservoirs, and wells) perform more ancillary or subsidiary services and may be of well-known and common designs. Generally, these elements can be classified as either structures that physically manipulate the movement of water, or structures that house mechanisms or facilities for treating water.

Physically, each of the architectural resource types described below—as dictated by its function and period of construction—have distinct forms and materials. In addition, variations exist within each type according to the function it needed to fulfill, the preferences and skills of the designing engineers, and the technology and construction practices that were common when it was built. A number of resource types within the regional system may possess historical significance and still be active in the water system, while others are partially or no longer active. The following is a list of historic resource types, with variations described. Generally, these resource types take many diverse forms, not only among the resource types but also within those types. Therefore, resources must be assessed on an individual basis. The generalized descriptions given above provide a context for determining possible historic resources; however, the final determination is made based on the historical significance and historic integrity of the resource within a specific historical context, identified with a specific period of significance.

- <u>Dams</u>. A dam is a structure confining a body of water, or any barrier constructed across a waterway to control the flow or raise the level of water. Historic dams within the water system come in a number of configurations and materials, including: concrete buttressed arch dams, earth- and rock-fill dams, concrete gravity arch dams, earth and rock hydraulic fill dams, earth dams, masonry arch dams, and earth-fill clay core dams. Some of the dam designs may be considered innovative and pioneering for their eras of construction. Dams in the regional system range in height from 4 feet to 330 feet. While the size of a dam alone is not a sufficient measure of its potential historical significance, it can be a contributing attribute when combined with other design factors. The regional system dams of interest for the WSIP are those in the Sunol Valley and Peninsula Regions: the Calaveras, Turner, San Antonio, and Lower Crystal Springs Dams. Of those, only Calaveras and Lower Crystal Springs Dams would be directly affected by WSIP projects.

- *Reservoirs*. A reservoir is any natural or artificial pond or lake used for the storage and regulation of water. A reservoir is usually created by the installation of a dam, which forces water to collect behind it. Many reservoirs within the water system consist of natural depressions in the earth that are flooded with water from streams or creeks flowing into the valley. Historic reservoirs within the water system include flooded valleys, existing lakes, and man-made ponds. Reservoirs can be covered or uncovered. Smaller urban distribution reservoirs hold as little as 9.5 million gallons, while larger rural storage reservoirs hold as much as 117.4 million gallons. The proposed WSIP projects would affect the Calaveras, San Antonio, Lower Crystal Springs, and Pilarcitos Reservoirs.

- *Tunnels*. Tunnels are water-conveying structures that pass through topographic features or below the ground surface, and thus are surrounded by solid material like stone or soil. They can take the shape of a horseshoe, circle, or "U" and can be either unlined (the walls of the tunnel consisting of the surrounding material, typically stone) or lined with concrete, steel, or gunite. Historic tunnels in the regional system range from approximately 4 feet to 14.5 feet in diameter. Power tunnels are specific in their function only (i.e., delivering water to a powerhouse). The proposed WSIP projects would affect the Irvington Tunnel.

- *Aqueducts/Flumes*. An aqueduct (or, on a smaller scale, a flume) is an open channel designed to transport water, usually via gravity flow. The only operating historic aqueduct within the water system is the Lower Cherry Diversion Aqueduct, which is a concrete canal measuring 7.5 feet wide and 7.5 feet deep. Remnants of pre-1906 flumes built by the Spring Valley Water Company also remain near Crystal Springs Reservoir and Pilarcitos Reservoir. The WSIP would not affect the regional system's aqueducts or flumes.

- *Pipelines*. A pipeline is a conduit of pipe used to convey water. It can run above or below ground. Along with tunnels, aqueducts, and other conveyance arteries, pipelines connect reservoirs and other facilities within the water system. Pipelines from the historic period in this system consist of steel pipe, riveted steel pipe, wrought steel pipe, welded steel pipe, steel pipe that is cement-lined and coated, steel pipe that is cement-lined and coal-tar coated and wrapped, reinforced-concrete cylinder pipe, or prestressed concrete cylinder pipe. The pipelines in the regional system generally measure from 54 to 72 inches in diameter and can carry between 37 and 300 mgd of water. The proposed WSIP projects would affect the San Joaquin, Bay Division, and other pipelines.

- *Towers*. Towers have a variety of functions within the water system but have been grouped together as a single historic resource type. Surge towers are designed to reduce the damage to piping in the event of pump failure, which could cause water to surge backward from a pump station. Intake and outlet towers are located above the openings of reservoir intake and outlet pipes, and house controls that regulate the flow of water through the pipes. Intake/outlet towers are tall structures that are usually located in the water of a reservoir and are connected to shore by a catwalk. Within this system, the historic towers appear to be constructed primarily of poured concrete and have various shapes and detailing, some with notable architectural merit. The proposed WSIP projects would affect towers at Calaveras and Lower Crystal Springs Dams.

- *Powerhouses*. Powerhouses use water passing through them to generate electricity through the movement of a turbine. The water system's secondary function (after providing water to the city) is providing hydroelectric power. Powerhouses are typically large structures located below a reservoir or along the course of a waterway. The only extant historic powerhouse in the system is the Old Moccasin Powerhouse, which is a steel frame and concrete building measuring 225 by 98 feet and 67 feet high. It was built in the California Mission style with a tile roof, arcades, and other architectural details. The WSIP would not affect powerhouses in the regional water system.

- *Penstocks*. Also associated with powerhouses, penstocks are the pressure pipes that carry water from a forebay reservoir to the turbine. The Moccasin Penstocks are the only penstocks from the historic period. They are relatively small-diameter pipes that run parallel to one another over a distance of 5,625 feet and carry 800 mgd of water. The WSIP would not affect penstocks in the regional water system.

- *Switchyards*. Switchyards manage the electric power generated by the hydroelectric powerhouse. The Moccasin Switchyard is the only switchyard from the historic period. It contains various pieces of equipment, such as electrical transformers. The switchyards handle the maximum 102 kilowatts of electricity that the Moccasin facility can produce. The WSIP would not affect switchyards in the regional water system.

- *Siphons*. Siphons are pipelines used to convey water across a range of elevations (or topography) without the need for pumping. Siphons can be used when the starting elevation is higher than the final elevation, regardless of intervening changes in elevation, due to the force of water pressure; in this way, they are able to carry water across canyons or under riverbeds. Like pipelines, siphons can be located above or below ground. Essentially made of the same materials as pipelines, historic-period siphons in the SFPUC water system are made of riveted steel pipe, steel cylinder reinforced-concrete pipe, or steel plate with tar lining and coating and wrapped in felt. They range from 5.75 to 9.5 feet in diameter and generally convey from 70 to 150 mgd of water. The WSIP would affect the Alameda Siphons.

- *Portals*. Portals are the connecting points between pipelines and tunnels. The main feature of a portal is the tunnel mouth and connecting pipeline. Historically, portals typically consisted of a steel manifold that emerged from the tunnel mouth and connected to the pipeline(s) by way of multiple apertures. Portals often incorporate a small complex of facilities, including valve houses, storage tanks, equipment buildings, and caretaker residences. In some instances, these utility buildings and residences have some notable architectural merit. Valve houses are typically small, one-room structures made of concrete, and their number at each portal facility usually corresponds to the number of pipelines coming into or out of the associated portal. Most other utility buildings at portal facilities follow similar construction guidelines, being of modest size and made of utilitarian materials (typically concrete). In some instances, these buildings have some notable architectural merit, most typically in the Mission Revival style. The proposed WSIP projects would affect the Irvington, Alameda West, Alameda East, Tesla, and Oakdale Portals.

- *Pump Stations*. Pump stations function to pump water from a lower elevation to a higher elevation through mechanical means. The majority of the water system functions through gravity, with water flowing downward to facilities at progressively lower elevations; however, in some instances, when the water level is particularly low in any given reservoir or the topography rises along the water’s path, a pump station will raise it to the desired elevation. The only historic pump station in the system is the Crystal Springs Pump Station; this large building houses four pump mechanisms and has some notable architectural merit. A 60-inch pipe serves the pumping station, and the station pumps 80 mgd of water. The proposed WSIP projects would affect the Crystal Springs Pump Station.

- *Water Temples*. Water temples are unique structures with notable architectural merit that serve a primarily aesthetic function, though they also mark the confluence of certain water routes within the water system. Designed as circular temples in the Classical style, with fluted columns, wide entablatures, and expressive murals, they shelter an oculus that looks down into the tunnels that pass below them. The water temples are round, 60-foot tall structures surrounded by park-like open space. There are two water temples in the regional water system, Spring Valley's Sunol Water Temple and the SFPUC's Pulgas Water Temple. A proposed WSIP project would be adjacent to Pulgas Water Temple and could affect it.

- *Residences*. There are historic residences associated with water system facilities throughout the water system. Some portal facilities have caretaker cottages, while a notable neighborhood of employee residences, known as Moccasin Camp, is located near the Moccasin Powerhouse complex. This complex, typified by a unified architectural design, includes a historic administration building and powerhouse, as well as a core area of California Mission-style houses dating to the 1920s. It should be noted, however, that there are other residences in the town of Moccasin adjacent to this original core that were built in later decades. Historic houses within the water system are of various construction types and styles. Most are utilitarian in design, but some have notable architectural styling such as the residences at Moccasin Camp, which are in the California Mission style. Historic water system residences are typically modest in size. The proposed WSIP projects would affect residences, or former residences, at the Calaveras Dam and Tesla Portal sites. The residence at Calaveras Dam would be vacated during construction, but would not otherwise be affected.

- *Roads*. Roads are necessary to access facilities and water-conveying arteries throughout the system. Historic roads may still remain as accessways to historic resources, and can take the form of paved or unpaved roadways of varying lengths and widths built to fit the terrain and distance of resources from access points. Such roads are commonly subject to regular maintenance and improvement. The proposed WSIP projects would affect roads to the project sites.

4.7.2 Regulatory Framework

Federal, state, and local government laws and regulations protect significant cultural resources. As discussed below, the CEQA statute and guidelines include procedures for identifying, analyzing, and addressing potential impacts on cultural resources, and CEQA takes into account federal laws and regulations that pertain to paleontological, archaeological, and historic resources. CEQA also takes into account the laws and procedures of local California jurisdictions, such as the CCSF, that pertain to cultural resources.

The federal government, California state government, and local governments have published guidelines and standards for identifying and addressing archaeological and historical resources. Among these publications that would be useful for cultural resources studies related to the WSIP projects are the National Park Service's National Register Bulletins; the "Instructions for Recording Historical Resources" (Office of Historic Preservation, 1995); *Water Conveyance Systems in California* (JRP Historical Consulting Services and Caltrans, 2000); and "San Francisco Preservation Bulletin No. 16, CEQA Review Procedures for Historic Resources" (CCSF, 2004).

Federal

The Antiquities Act of 1906 (United States Code, Title 16, Sections 431–433) provides for fines or imprisonment of any person convicted of appropriating, excavating, injuring, or destroying any historic or prehistoric ruin or monument or other object of antiquity that falls under the jurisdiction of the federal government. According to the *Standard Environmental Reference of the California Department of Transportation* (Caltrans, 2007), the National Park Service, Bureau of Land Management, U.S. Forest Service, and other federal agencies have interpreted "objects of antiquity" to include fossils. The Antiquities Act provides for the issuance of permits to collect fossils on lands administered by federal agencies and requires projects involving federal lands to obtain permits for both paleontological resource evaluation and mitigation efforts.

Paleontological Resources Preservation Act

The federal Paleontological Resources Preservation Act of 2002 was enacted to codify the generally accepted practice of limiting the collection of vertebrate fossils and other rare and scientifically significant fossils to qualified researchers; these researchers must obtain a permit from the appropriate state or federal agency and agree to donate any materials recovered to recognized public institutions, where they will remain accessible to the public and to other researchers (USFWS/CDFG, 2006). The Paleontological Resources Preservation Act incorporates the following key findings of a recent report issued by the Secretary of the Interior, with input from staff of the Smithsonian Institute, U.S. Geological Survey, various federal land management agencies, paleontological experts, and the public (Society of Vertebrate Paleontology, 2003; as cited in USFWS/CDFG, 2006).

- Most vertebrate fossils and some fossils of other types (invertebrates, plants) represent a rare resource.
- Illegal collection and theft of fossil materials from public lands is a serious problem; penalties for fossil theft should be strengthened.
- Effective stewardship requires accurate information; federal fossil collections should be preserved and made available for research and educational use.
- Federal management of fossil resources should emphasize opportunities for public involvement.

National Register of Historic Places

The National Register of Historic Places is the official federal list of significant historic resources. The National Park Service administers the National Register in conjunction with the State Historic Preservation Officers. The National Register includes buildings, structures, sites, objects, and districts that possess historic, architectural, engineering, archaeological, or cultural significance at the national, state, or local level. The National Register criteria and associated definitions are presented in *National Register Bulletin Number 15: How to Apply the National Register Criteria for Evaluation*.

To qualify for the National Register, a property must meet at least one of the National Register criteria and retain sufficient historic integrity of convey its significance. A property that is significant under one or more of the National Register criteria must be associated with an important historical context *and* be significant within that historical context. Determining this significance is accomplished through physical examination of a property combined with thorough documentary research. National Register Bulletin 15 outlines the sequence for evaluating properties for eligibility to, and listing in, the National Register. A property must be classified as a specific property type (i.e., a building, structure, object, site, or district). Then one must identify the proper historical context (or prehistorical context) that the property represents, evaluate the property under the National Register criteria, conduct further evaluation (if necessary) for properties that are usually excluded from the National Register, and assess the historic integrity of the property.

The National Park Service uses specific definitions for property type categories. *Buildings* are used principally to shelter human activity. *Structures* are functional constructions, such as engineering features, for purposes other than creating human shelter. *Objects* are constructions that are artistic in nature, such as monuments or statuary, or simple features such as boundary markers. *Sites* are the locations of significant events that may or may not contain buildings, structures, objects, or archaeological resources. The resource boundaries of buildings, structures, and objects are limited to the resource itself, along with any setting that may contribute to its significance. *Districts* include more than one resource and "possess a significant concentration, linkage, or continuity of sites, buildings, structures, or objects united historically or aesthetically by plan or physical development."[26]

Historic districts derive their importance from being unified entities, and can include a few types of resources or a diverse set of resources. The unified quality of historic districts is a result of the interrelationships among resources, which often convey an overall visual sense of the historic environment to which the resources are associated. Districts can also be an arrangement of historically or functionally related properties, as well as a grouping of archaeological sites related by common components. Historic districts can include individually distinctive resources and/or resources that lack individual distinction but contribute to a significant or distinguishable entity or grouping of resources. This property type must be located in a definable geographic area that is distinguished from its surroundings, and these boundaries must be based on the shared relationship of the properties that constitute the district. A majority of resources in a historic district's boundaries must retain sufficient historic integrity to convey the district's significance as a whole.

Historic districts include contributors and non-contributors. A "contributor" is a building, site, structure, or object that adds to the historic associations or historic architectural qualities for which the district is significant. A "non-contributor" does not add to the historic associations or historic architectural qualities, as it was not present during the period of significance or has been altered in a manner that it no longer retains the historic integrity to convey the district's significance. Besides commercial areas and residential neighborhoods, historic districts can also

[26] National Register Bulletin 15, 5.

be located in industrial or rural locations as well as in areas with a concentration of resources that are significant within a specific context, such as may be identified in portions of the SFPUC regional water system. It is possible to have discontiguous historic districts that are united in historical significance but are located in more than one definable area and separated by non-significant areas. The use of discontiguous historic districts is limited to situations where, for example, the elements of the district are spatially discrete, the spaces between elements of the district are not related to its significance, and where visual continuity is not a factor in the significance. For example, a group of dams united in a water system by plan, design, and distinct period of significance, but spatially separated from one another, could be considered a discontiguous district.[27]

When evaluating a resource under National Register criteria, one must evaluate and clearly state the significance of that resource to American history, architecture, archaeology, engineering, or culture. In this process, one must identify the historical context, or facet of history, to which a resource is associated and identify whether that context is significant. Then one can identify the resource's relative importance within that context, assess how the resource illustrates that history, and identify whether the resource has the physical features necessary to convey the history to which it is associated.

According to National Register guidelines, a historic resource's "quality of significance in American history, architecture, archeology, engineering and culture" is determined based on whether it meets at least one of four main criteria. Resources may be significant at the local, state, or national level:

> Criterion A: Association with events or trends significant in the broad patterns of our history.
>
> Criterion B: Association with the lives of significant individuals.
>
> Criterion C: A property that embodies the distinctive characteristics of a type, period, or method of construction, represents the work of a master, or that possesses high artistic values.
>
> Criterion D: Has yielded or is likely to yield information important to history or prehistory.

A resource may be considered eligible for listing in the National Register if it meets one or more of the above-listed criteria for significance and it possesses historic integrity. Historic properties must retain sufficient historic integrity to convey their significance. The assessment of historic integrity must be grounded in an understanding of the resource's physical features and how they relate to its significance. The National Register recognizes seven aspects or qualities that define historic integrity. They are as follows:

- *Location*. The place where the historic property was constructed or the place where the historic event occurred.

[27] National Register Bulletin 15, 5-6.

- *Design*. The combination of elements that create the form, plan, space, structure, and style of a property.
- *Setting*. The physical environment of a historic property.
- *Materials*. The physical elements that were combined or deposited during a particular period of time and in a particular pattern or configuration to form a historic property.
- *Workmanship*. The physical evidence of the crafts of a particular culture or people during any given period in history or prehistory.
- *Feeling*. A property's expression of the aesthetic or historic sense of a particular period of time.
- *Association*. The direct link between an important historic event or person and a historic property.

Certain properties and resources are usually excluded from consideration for eligibility to or listing in the National Register, but can be considered if they meet special requirements in addition to meeting the regular criteria. The following are the seven Criteria Considerations that deal with properties usually excluded from listing in the National Register:[28]

Consideration A: Religious properties

Consideration B: Moved properties

Consideration C: Birthplaces and graves

Consideration D: Cemeteries

Consideration E: Reconstructed properties

Consideration F: Commemorative properties

Consideration G: Properties that have achieved significance within the past 50 years

The WSIP is unlikely to affect most of the types of properties or resources that are usually excluded from listing in the National Register. The two criteria considerations most likely to be applied to resources that could be affected by the WSIP are Criteria Consideration B, for moved properties, and Criteria Consideration G, for properties that have achieved significance within the past 50 years. The latter criteria consideration, as discussed below in Section 4.7.3, also frames the standard to which survey populations of known and potential historic resources are identified.

Resources moved after their period of significance are usually not eligible for listing in the National Register because they have lost the relationship with their original setting and the direct association with their original location. A moved resource could be eligible for listing in the National Register, under the standards of Criteria Consideration B, if its significance is primarily architectural or if it is the sole surviving resource associated with a historic person or event.

[28] USDI, National Park Service, "How to Apply the National Register Criteria for Evaluation," *National Register Bulletin 15*, 25, 41-43; USDI, National Park Service, "Guidelines for Evaluating and Nominating Properties that have Achieved Significance within the Last Fifty Years," *National Register Bulletin No. 22* (Washington, D.C.: Government Printing Officer, 1979, revised 1990 and 1996).

Resources that are less than 50 years old are usually not eligible for listing in the National Register, unless they can be shown, under the standards of Criteria Consideration G, to be of exceptional importance.[29]

The following properties, which are known to exist as part of or related to the SFPUC water system, are either listed, or have been determined to be eligible for listing, in the National Register:[29a]

- Delia Fleishhacker Memorial Building (listed in the National Register. This site is near one of the potential locations of a recycled water treatment facility under the Recycled Water Projects, SF-3, in San Francisco.)
- Lower Crystal Springs Dam (individually eligible for listing)
- Sunol Aqueduct (individually eligible for listing)
- Sunol Dam (individually eligible for listing)[30]
- Vallejo / Spring Valley Water Company's Niles Dam (individually eligible for listing)[31]
- Spring Valley Water Company's Alameda Creek System Historic District (eligible for listing)

National Historic Preservation Act

Federal involvement in a local project through permitting, approval, or funding requires project compliance with the Code of Federal Regulations (CFR), Section 36, Part 800, Protection of Historic Properties. Several WSIP projects would require a permit from the U.S. Army Corps of Engineers. Compliance with federal regulations regarding the protection of historic properties requires completion of cultural resource studies in compliance with Section 106 of the National Historic Preservation Act. Results of these studies would require concurrence from the State Historic Preservation Officer (SHPO) and would be supplied to the Corps. A federal lead agency may also enter into a Programmatic Agreement with the SHPO to address multiple projects within a program such as the WSIP.

As mentioned previously, TCPs may be eligible for listing in the National Register under the National Historic Preservation Act (Section 101[d][6][a]), which states that "Properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization may be determined to be eligible for inclusion on the National Register."

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29 National Park Service, "How to Apply the National Register Criteria for Evaluation," *National Register Bulletin 15*, 25, 29-31, and 41-43; National Park Service, "Guidelines for Evaluating and Nominating Properties that have Achieved Significance within the Last Fifty Years," *National Register Bulletin No. 22* (Washington, D.C.: Government Printing Officer, 1979, revised 1990 and 1996).

29a These properties have been determined eligible for listing in the National Register through consensus between a federal agency and the State Historic Preservation Officer. Information regarding National Register eligibility was acquired through a records search conducted at the Northwest Information Center at Sonoma State University, which is one of regional offices of the California Historical Resources Information System established by the California Office of Historic Preservation.

30 This property was removed by the SFPUC in September 2006.

31 This property was removed by the SFPUC in September 2006.

State

California Public Resources Code

Several sections of the California Public Resources Code (PRC) protect paleontological resources. Section 5097.5 prohibits "knowing and willful" excavation, removal, destruction, injury, and defacement of any paleontologic feature on public lands (lands under state, county, city, district, or public authority jurisdiction, or the jurisdiction of a public corporation), except where the agency with jurisdiction has granted permission. Section 30244 requires reasonable mitigation for impacts on paleontological resources that occur as a result of development on public lands. The sections of the California Administrative Code pertaining to the State Division of Beaches and Parks afford protection to geological features and "paleontological materials," but grant the director of the state park system authority to issue permits for specific activities that may result in damage to such resources, if the activities are in the interest of the state park system and for state park purposes (California Administrative Code Sections 4307–4309; as cited in USFWS/CDFG, 2006).

The Public Resources Code also addresses archaeological resources. Archaeological resources that are not "historical resources" may be "unique archaeological resources" as defined in PRC Section 21083.2, which also generally provides that "non-unique archaeological resources" do not receive any protection under CEQA. PRC Section 21083.2 (g) defines "unique archaeological resource" as an archaeological artifact, object, or site that does not merely add to the current body of knowledge, but has a high probability of meeting any of the criteria identified in this section. If an archaeological resource is neither a unique archaeological nor a historical resource, the effects of the project on that resource will not be considered a significant effect on the environment. It is sufficient that the resource and the effects on it be noted in the EIR, but the resource need not be considered further in the CEQA process.

Additional sections of the Public Resources Code that are applicable to the proposed program are as follows:

- *Section 5097.5*. Provides that any unauthorized removal or destruction of archaeological or paleontological resources on sites located on public lands is a misdemeanor.
- *Section 5097.98*. Prohibits obtaining or possessing Native American artifacts or human remains taken from a grave or cairn, and sets penalties for such acts.
- *Section 5097.5*. Provides that any unauthorized removal of archaeological resources on sites located on public lands is a misdemeanor. As used in this section, "public lands" means lands owned by, or under the jurisdiction of, the state, or any city, county, district, authority, or public corporation, or any agency thereof.

California Register of Historical Resources

The California Register of Historical Resources is a statewide program of similar scope to the National Register. All resources listed in or formally determined eligible for the National Register are also eligible for listing in the California Register. In addition, properties designated under municipal or county ordinances are also eligible for the California Register. A historical resource must be significant at the local, state, or national level under one or more of the following criteria defined in the California Code of Regulations, Title 14, Chapter 11.5, Section 4850, identified as Criteria 1 through 4.

1. It is associated with events or patterns of events that have made a significant contribution to the broad patterns of local or regional history, or the cultural heritage of California or the United States; or

2. It is associated with the lives of persons important to local, California, or national history; or

3. It embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of a master, or possesses high artistic values; or

4. It has yielded, or has the potential to yield, information important to the prehistory or history of the local area, California, or the nation.

The California Register definition of integrity and its special considerations for certain properties are slightly different than those for the National Register. Integrity is defined as "the authenticity of a historical resource's physical identity evidenced by the survival of characteristics that existed during the resource's period of significance." The California Register further states that eligible resources must "retain enough of their historic character or appearance to be recognizable as historical resources and to convey the reasons for their significance," and lists the same seven aspects of integrity used for evaluating properties under the National Register criteria. The California Register's special considerations for certain properties types are limited to: (1) moved buildings, structures, or objects; (2) historical resources achieving significance within the past 50 years; and (3) reconstructed buildings.

The following properties, which are known to exist as part of or related to the SFPUC water system, are either listed or have been determined to be eligible for listing in the California Register:

- *Delia Fleishhacker Memorial Building*. This building is listed in both the National and California Registers.
- *Sunol Aqueduct*. This facility is eligible for listing in both the National and California Registers.
- *Lower Crystal Springs Dam*. This dam is listed as a California Historic Civil Engineering Landmark and in the California Inventory of Historical Resources; it is eligible for listing in the California Register.
- *Hetch Hetchy Coast Range Tunnel*. This facility is listed as a California Historic Civil Engineering Landmark and appears to meet the criteria or listing in the National and California Register.
- *Stone Dam*. This dam is eligible for landmark status (San Francisco Department of Public Works, 1999) and is eligible for listing in the California Register.

Niles and Sunol Dams were removed in August and September 2006, respectively. Section 106 consultation was completed in August 2006 prior to the removal of Niles Dam. The EIR for this project concluded that the demolition created a significant unavoidable impact on these historical resources.

California Environmental Quality Act Statute and Guidelines

The CEQA Statute and Guidelines include procedures for identifying, analyzing, and disclosing potential adverse impacts on cultural resources, which include all resources listed in or formally determined eligible for the National Register, the California Register, or local registers.

CEQA requires the lead agency to consider the effects of a project on archaeological resources and to determine whether any identified archaeological resource is a historical resource (i.e., if the archaeological resource meets the criteria for listing in the California Register) (CEQA Guidelines Sections 15064.5[a][1] and [3] and [c][1] and [2]). An archaeological resource that qualifies as a historical resource under CEQA generally qualifies for listing under Criterion 4 of the California Register (CEQA Guidelines Section 15064.5[a][3][D]) (National Register Criterion D). An archaeological resource may qualify for listing under Criterion 4 when it can be demonstrated that the resource has the potential to significantly contribute to questions of scientific or historical importance. Archaeological resources that are not historical resources according to the above definitions may be "unique archaeological resources," as defined in PRC Section 21083.2, which generally provides that "non-unique archaeological resources" do not receive any protection under CEQA. If an archaeological resource is neither a unique archaeological resource nor a historical resource, the effects of a project on those resources are not considered significant.

CEQA defines a historical resource as a resource that meets any of the following criteria:

- A resource listed in, or determined to be eligible for listing in, the National Register or California Register.
- A resource included in a local register of historical resources, as defined in PRC Section 5020.1(k), unless the preponderance of evidence demonstrates that it is not historically or culturally significant.
- A resource identified as significant (e.g., rated 1 through 5) in a historical resource survey meeting the requirements of PRC Section 5024.1(g) (Department of Parks and Recreation Form 523), unless the preponderance of evidence demonstrates that it is not historically or culturally significant.
- Any object, building, structure, site, area, place, record, or manuscript which a lead agency determines to be historically significant or significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California, provided the determination is supported by substantial evidence in light of the whole record. Generally, a resource is considered "historically significant" if it meets the criteria for listing in the California Register (CEQA Guidelines Section 15064.5).
- A resource that is determined by a local agency to be historically or culturally significant even though it does not meet the other four criteria listed here (e.g., Article 10 and Article 11 of the San Francisco Planning Code).

According to the CEQA Guidelines (Section 15064.5[a][3]), a resource is generally considered historically significant if the resource meets the criteria for listing in the California Register (PRC Section 5024.1, California Code of Regulations, Title 14, Section 4852). A historical resource is defined as any site that:

1. Is listed in or determined to be eligible by the State Historical Resources Commission for listing in the California Register, or is determined to be significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, or cultural annals of California; and

2. Is eligible for listing in the California Register (criteria noted above); or

3. Is included in a local register of historical resources, as defined by PRC Section 5020.1(k), or identified as significant in a historical resource survey meeting the requirements of PRC Section 5024.l(g), is presumed to be historically or culturally significant.

Archaeological resources may be historical resources under CEQA. TCPs may also be eligible for the California Register under Section 15064.5[a][3]. CEQA Guidelines Section 15064.5 provides that, in general, a resource not listed in state or local registers of historical resources shall be considered by the lead agency to be historically significant if the resource meets the criteria for listing in the California Register. Section 15064.5(b) states that "a project with an effect that may cause a substantial adverse change in the significance of a historical resource is a project that may have a significant effect on the environment." This section also provides standards for determining what constitutes a "substantial adverse change" on archaeological or historical resources, including physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of the historical resource would be materially impaired (CEQA Guidelines Section 15064.5[b][1]). The significance of a historical resource is considered to be materially impaired when a project demolishes or materially alters in an adverse manner those characteristics that convey its historical significance and that justify its inclusion on a historical resource list (CEQA Guidelines 15064.5[b][2]).

California Health and Safety Code

The proposed program is also subject to the provisions of the California Health and Safety Code with respect to the discovery of human remains. Health and Safety Code Section 7050.5 states that "Every person who knowingly mutilates or disinters, wantonly disturbs, or willfully removes any human remains in or from any location other than a dedicated cemetery without authority of law is guilty of a misdemeanor, except as provided in Section 5097.99 of the Public Resources Code." PRC Section 5097.98, as amended by Assembly Bill 2641, states:

(a) Whenever the commission receives notification of a discovery of Native American human remains from a county coroner pursuant to subdivision (c) of Section 7050.5 of the Health and Safety Code, it shall immediately notify those persons it believes to be most likely descended from the deceased Native American. The descendents may, with the permission of the owner of the land, or his or her authorized representative, inspect the site of the discovery of the Native American human remains and may recommend to the owner or the person responsible for the excavation work means for treatment or disposition, with appropriate dignity, of the human remains and any associated grave goods. The descendents shall complete their inspection and make recommendations or preferences for treatment within 48 hours of being granted access to the site.

(b) Upon the discovery of Native American remains, the landowner shall ensure that the immediate vicinity, according to generally accepted cultural or archaeological standards or practices, where the Native American human remains are located, is not damaged or disturbed by further development activity until the landowner has discussed and conferred, as prescribed in this section, with the most likely descendents regarding their recommendations, if applicable, taking into account the possibility of multiple human remains. The landowner shall discuss and confer with the descendents on all reasonable options regarding the descendents' preferences for treatment.

City and County of San Francisco

Planning Code, Articles 10 and 11

The CCSF reviews the historic resources described under Articles 10 and 11 of the San Francisco Planning Code when it evaluates impacts on historic resources (see "Significance Criteria" below). Article 10 describes procedures regarding the preservation of sites and areas of special character or special historical, architectural, or aesthetic interest or value, such as officially designated city landmarks and buildings included within locally designated historic districts. Article 11 of the Planning Code designated six downtown conservation districts.

Historical Resources in the WSIP Study Area under Articles 10 and 11. There are no designated city landmarks or properties that contribute to designated historic districts in the WSIP study area.

Planning Department, CEQA Review Procedures for Historic Resources

The San Francisco Planning Department prepared the *CEQA Review Procedures for Historic Resources* (Final Draft, October 8, 2004, subject to change) (also referred to as San Francisco Preservation Bulletin No. 16) to determine whether a potential property or structure fits the definition of a historical resource as defined in the CEQA Statutes and Guidelines. Three categories of properties are defined.

- <u>*Category A*</u>. Category A has two sub-categories:
  - *Category A.1*. Resources listed in or formally determined to be eligible for the California Register.
  - *Category A.2*. Resources listed in adopted local registers, or properties that appear eligible, or may become eligible, for the California Register.
- <u>*Category B*</u>. Properties requiring further consultation and review.
- <u>*Category C*</u>. Properties determined not to be historical resources, or properties for which the city has no information indicating that the property is a historical resource.

Planning Department Citywide Survey (1976)

Between 1974 and 1976, the San Francisco Planning Department conducted a citywide inventory of the city's approximately 170,000 structures to determine their architectural importance. The physical appearance of both contemporary and older buildings was surveyed, but historical associations were not included in the study. An advisory review committee of architects and architectural historians determined that 10,000 of these buildings were eligible for inclusion in the survey based on various factors such as architectural design, urban design context, and overall environmental significance. These buildings represent roughly 10 percent of the city's entire building stock. Buildings included in the survey are rated from a low of 0 (least significant) to a high of 5 (most significant).

1976 Survey Properties in the WSIP Study Area. There are no WSIP facilities rated in the 1976 survey.

Other Cities and Counties

CEQA guidelines state that a resource does not need to be listed in or determined eligible for listing in the California Register for it to be considered a historical resource for the purposes of compliance under CEQA. Section 15064.5(a)(4) of the CEQA Guidelines provides for a lead agency to identify resources that are of historical significance and to categorize those resources as historical resources. This is usually accomplished with a city or county list of designated historic landmarks. In addition, some local governments identify historical resources to include previously recorded resources that were determined to have some measure of historical significance. Jurisdictions adjacent to the WSIP facility improvement projects, outside of San Francisco, may identify historical resources differently from one another.

Some WSIP projects have the potential to affect properties outside of the SFPUC right-of-way in areas outside of San Francisco. In locations where the study area of a WSIP project extends beyond the water system right-of-way in areas outside of San Francisco, CEQA compliance documentation related to historical resources should identify whether there are buildings, structures, objects, sites, or districts that the adjacent jurisdiction would consider to be historical resources. This effort would include verifying that resources other than SFPUC water system resources are neither local historical landmarks nor have been identified in some manner as potential historical resources. In addition to evaluating resources under National Register and California Register criteria, it may also be appropriate for WSIP project-level analyses to evaluate buildings, structures, objects, sites, and/or districts situated outside of the SFPUC right-of-way, in areas outside of San Francisco, under the historic landmarks and historical resources criteria of those adjacent jurisdictions.

4.7.3 Impacts

Significance Criteria

The CCSF has not formally adopted significance standards for impacts related to cultural resources, but generally considers that implementation of the proposed program would have a significant impact on cultural resources if it were to:

- Cause a substantial adverse change in the significance of a historical resource as defined in CEQA Guidelines Section 15064.5, including those resources listed in Article 10 or Article 11 of the San Francisco Planning Code (Evaluated in this section)
- Cause a substantial adverse change in the significance of a unique archaeological resource pursuant to Section 15064.5 (Evaluated in this section)
- Directly or indirectly destroy a unique paleontological resource or site or unique geological feature (Evaluated in this section)
- Disturb any human remains, including those interred outside of formal cemeteries (Evaluated in this section)

Approach to Impact Analysis

The WSIP study area was screened at a programmatic level to determine the potential for WSIP projects to encounter historical resources as well as paleontological and archaeological resources. The evaluation of paleontological impacts (Impact 4.7-1) considered areas with known fossil localities and fossil-bearing geologic units. The evaluation of archaeological sensitivity (Impact 4.7-2) focused on areas favorable to human settlement.

The WSIP has the potential to cause substantial adverse changes in the historical significance of historical resources, as defined in CEQA Guidelines Section 15046.5. An analysis to assess whether the program would cause a substantial adverse change is only required for those resources that are or should be considered historical resources for the purposes of CEQA. Historical resources that could be affected by the WSIP include both individual resources and historic districts. There are three categories of impacts on historical resources, as follows:

- Impacts on a historic district or a contributor to a historic district (Impact 4.7-3)
- Impacts on individual resources that are part of the water system (Impact 4.7-4)
- Impacts on individual resources located adjacent to a WSIP facility improvement project (Impact 4.7-5)

These resources are assessed in this PEIR at a programmatic level. This review will be further refined, based on site-specific information, during separate project-level CEQA review of individual WSIP projects. The following text provides guidance in addressing the identification of historical resources that could be affected by the WSIP. This introduction is followed by a discussion of impacts on known or potential cultural resources, organized by WSIP region.

Table 4.7-1 lists potential impacts of the WSIP on paleontological, archaeological, and historical resources, divided into the three categories. Further identification of these resources will occur as part of the project-level analysis for individual WSIP projects. These project-level analyses will require identification of an appropriate study area and identification of known and potential historical resources that could be affected by the WSIP projects. Potential impacts could include direct, indirect, and cumulative impacts. In urban areas, it may be appropriate for the study area to include parcels or properties that are adjacent to a proposed facility improvement project. In rural areas, it would not likely be necessary for the study area to encompass entire large parcels if the WSIP project would only affect a portion of that property. Following standard cultural resources practices, which allow for time between environmental review and actual construction, resources that are more than 45 years old within the study area of a WSIP project will be considered part of the survey population of potential historical resources.[32] The inventory and evaluation process for project-level analyses will include the following tasks:

- Further refine the historical context(s) for the resources in the project study area
- Evaluate resources under National Register, California Register, CCSF historic landmarks, and other local landmarks criteria (if appropriate)
- Identify appropriate potential historical periods of significance for resources in a study area
- Identify character-defining features of individual properties and historic districts that should be considered historical resources for the purposes of CEQA compliance

Analysis regarding the potential impacts of a project on historical resources and the identification of mitigation measures to reduce the impacts depend on the identification of an appropriate period of significance, along with identification of the character-defining features that help convey the significance of the individual historical resources or historic districts. An appropriate historical context and period of significance for resources will be determined during the project-level CEQA analyses, based on an understanding of the history and importance of the components of the water-delivery system. This programmatic analysis lays the foundation for these project-level analyses.

Impact Summary by Region

Table 4.7-1 provides a summary of the cultural resources impacts associated with implementation of the WSIP.

[32] The California Office of Historic Preservation's guidelines for project review and planning call for the identification and evaluation of resources more than 45 years old to account for the passage of time between the period of project review and project completion. See Office of Historic Preservation, "Instructions for Recording Historical Resources," March 1995, 2.

TABLE 4.7-1
POTENTIAL IMPACTS AND SIGNIFICANCE – CULTURAL RESOURCES

Projects	Project Number	Impact 4.7-1: Impacts on paleontological resources	Impact 4.7-2: Impacts on archaeological resources	Impact 4.7-3: Impacts on historical significance of a historic district or a contributor to a historic district	Impact 4.7-4: Impacts on the historical significance of individual facilities resulting from demolition or alteration	Impact 4.7-5: Impacts on adjacent historic architectural resources
San Joaquin Region						
Advanced Disinfection	SJ-1	PSM	PSM	PSM	PSM	LS
Lawrence Livermore Supply Improvements	SJ-2	LS	PSM	N/A	N/A	LS
San Joaquin Pipeline System	SJ-3	PSM	PSM	PSM	PSM	PSM
Rehabilitation of Existing San Joaquin Pipelines	SJ-4	PSM	PSM	PSM	PSM	PSM
Tesla Portal Disinfection Station	SF-5	PSM	PSM	N/A	N/A	PSM
Sunol Valley Region						
Alameda Creek Fishery Enhancement	SV-1	PSM	PSM	N/A	N/A	LS
Calaveras Dam Replacement	SV-2	PSM	PSM	PSU	PSU	PSM
Additional 40-mgd Treated Water Supply	SV-3	PSM	PSM	N/A	N/A	LS
New Irvington Tunnel	SV-4	PSM	PSM	PSM	PSU	PSM
SVWTP – Treated Water Reservoirs	SV-5	PSM	PSM	N/A	N/A	LS
San Antonio Backup Pipeline	SV-6	PSM	PSM	PSM	PSM	PSM
Bay Division Region						
Bay Division Pipeline Reliability Upgrade	BD-1	LS	PSM	PSM	PSM	PSM
BDPL Nos. 3 and 4 Crossovers	BD-2	LS	PSM	PSM	PSM	PSM
Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault	BD-3	PSM	PSM	PSM	PSM	PSM
Peninsula Region						
Baden and San Pedro Valve Lots Improvements	PN-1	PSM	PSM	N/A	N/A	LS
Crystal Springs/San Andreas Transmission Upgrade	PN-2	LS	PSM	PSU	PSU	PSM
HTWTP Long-Term Improvements	PN-3	PSM	PSM	N/A	N/A	LS
Lower Crystal Springs Dam Improvements	PN-4	LS	PSM	PSM	PSU	PSM
Pulgas Balancing Reservoir Rehabilitation	PN-5	PSM	PSM	N/A	N/A	PSM
San Francisco Region						
San Andreas Pipeline No. 3 Installation	SF-1	PSM	PSM	PSM	PSM	PSM
Groundwater Projects	SF-2	PSM	PSM	N/A	N/A	LS
Recycled Water Projects	SF-3	PSM	PSM	N/A	LS	PSM

LS = Less than Significant impact, no mitigation required
PSM= Potentially Significant impact, can be mitigated to less than significant
PSU = Potentially Significant Unavoidable impact
SU = Significant Unavoidable impact
N/A = Not Applicable

Paleontological Resources

Impact 4.7-1: Impacts on paleontological resources.

This paleontological analysis identifies the potential to encounter paleontological resources (i.e., plant, animal, or invertebrate fossils or microfossils) in each WSIP region based on the following factors: the number of known fossil localities, the geologic formations (units) where these fossils occur, and the presence of fossil-bearing geologic units relative to WSIP facility locations. This analysis was conducted using local, available paleontology information provided through the University of California Museum of Paleontology Collections Database. The geological setting of the known fossil localities was determined using the geological map of the San Francisco–San Jose quadrangle prepared by the California Geological Survey (Wagner et al., 1991). By applying the fossil locality data and geological information from these sources, the distribution and abundance of fossil localities within fossil-bearing units in each WSIP region were determined. Based on this information, the paleontological sensitivity (or potential for discovery of paleontological resources during implementation) was determined for each WSIP project. The determination of whether a certain project has the potential to encounter a paleontological resource was based on the following criteria:

- The project is located in an area underlain by geologic materials known to contain fossils or microfossils of animals, invertebrates, or plants. In the WSIP study area, these geologic units are primarily marine sedimentary deposits ranging in age from 65 million years old (Paleocene epoch) to 10,000 years old (Pleistocene epoch).
- A fossil locality is within the project site, or the project site is in proximity to other fossil localities within the same or similar geologic unit.

These criteria were applied to the WSIP project information provided in Chapter 3, Program Description, and Appendix C to determine whether the WSIP projects would have the potential to disturb or destroy a paleontological resource and thus cause a significant impact. If the proposed project would be located in a fossil-bearing geologic unit or there are several nearby or regional fossil localities in the same geologic unit, the potential to encounter paleontological resources would be high. If the proposed project would be located in a geologic formation that is not typically fossil-bearing and no or very few recorded fossil localities exist in the geologic material, there would be a low potential to encounter paleontological resources. **Figure 4.7-1** generally indicates areas of paleontological sensitivity in the vicinity of WSIP facilities.

Paleontological resources could be disturbed during project excavation, deep grading, and tunneling. Destruction of a paleontological resource during construction of any of the WSIP projects would be considered a significant impact. **Table 4.7-2** indicates the geologic formation in which each WSIP project is located, whether fossils have been identified in the project area, the potential to encounter paleontological resources, and a determination of impact significance. As shown in this table, there is a high potential for the occurrence of paleontological resources in all five of the regions within the WSIP study area. Potential project impacts are discussed by region below. SFPUC Construction Measure #9 (cultural resources) requires that a qualified paleontologist or state-registered geologist conduct a preconstruction screening for paleontological resources, that impacts on identified cultural resources be avoided to the extent feasible, and that soil-disturbing construction work be immediately suspended if there is any indication of a paleontological resource. Table 4.7-2 describes the WSIP projects as having either a high potential or a low potential for impacts on paleontological resources. The preconstruction screenings required under Construction Measure #9 would analyze site-specific information, which would either confirm these program-level determinations or provide a basis to revise them.

For projects with a low potential to encounter paleontological resources, the implementation of SFPUC Construction Measure #9 (cultural resources) would ensure that impacts are less than significant.

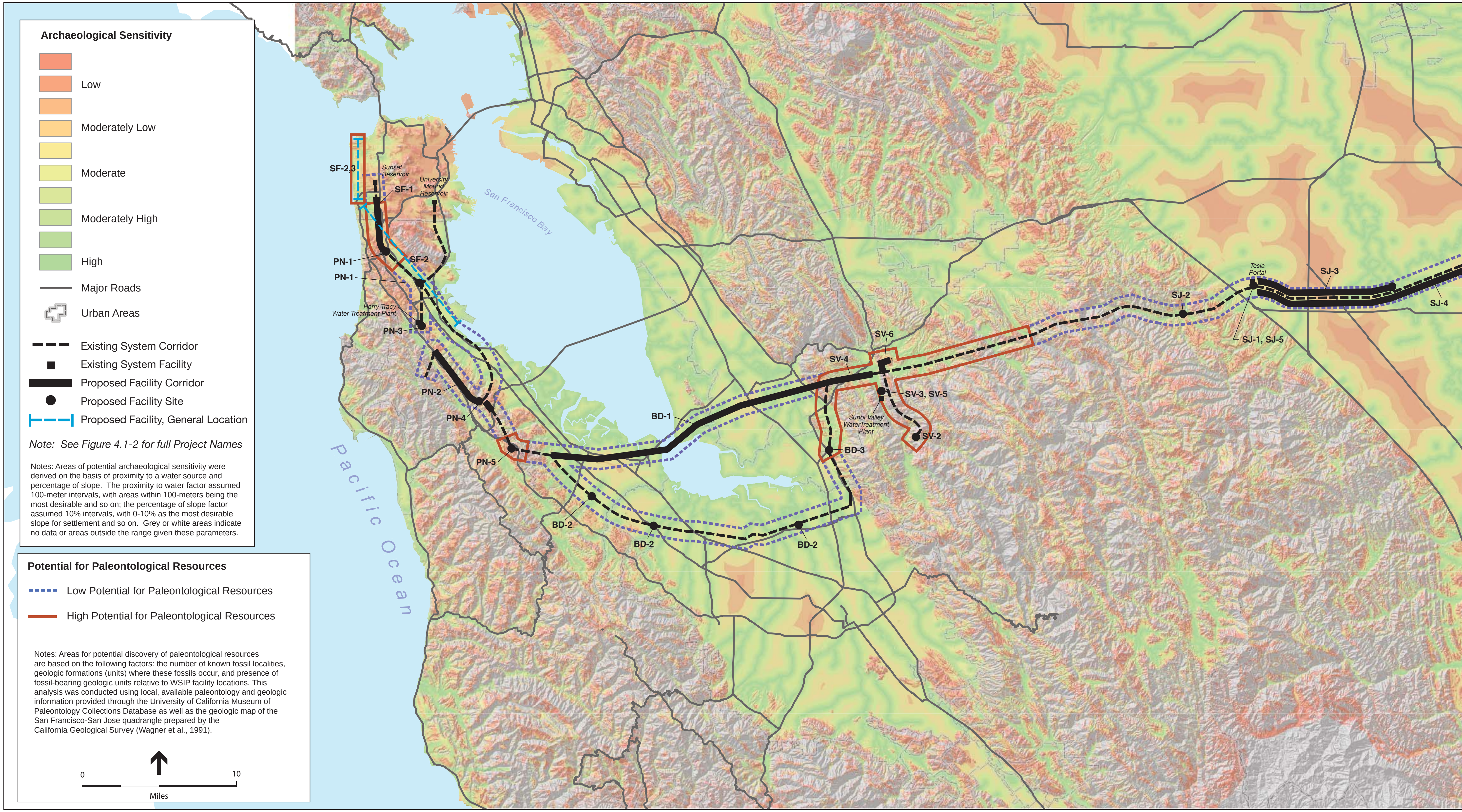
For projects that would require subsurface disturbance in areas with a high potential to encounter paleontological resources, the impact would be potentially significant and would require additional mitigation to protect the resources. If a paleontological resource is encountered, it would be necessary to suspend work and have the site inspected by a qualified paleontologist (Measure 4.7-1), which would reduce this impact to a less-than-significant level.

San Joaquin Region

Impact 4.7-1: Impacts on paleontological resources		
Advanced Disinfection	SJ-1	PSM
Lawrence Livermore	SJ-2	LS
SJPL System	SJ-3	PSM
SJPL Rehabilitation	SJ-4	PSM
Tesla Portal Disinfection	SJ-5	PSM

In the San Joaquin Region, the Advanced Disinfection (SJ-1), SJPL System (SJ-3), SJPL Rehabilitation (SJ-4), and Tesla Portal Disinfection (SJ-5) projects would have the highest potential for encountering and disturbing paleontological resources because they overlie fossil-bearing marine sedimentary rocks and are located in areas that have several existing recorded fossil localities. The Advanced Disinfection and Tesla Portal Disinfection project sites at Tesla Portal are underlain by geologic units that are known to contain fossil remains (in this case, possibly the San Pablo Group or other closely related fossil-bearing sandstone or siltstone deposits). A fossil locality has been identified (Locality No. 3315) at or very near the Advanced Disinfection project site. The proposed SJPL System and SJPL Rehabilitation projects would require excavation into the Mehrten Formation, a geologic unit that is known to contain fossil remains. Given the high likelihood that these projects could affect paleontological resources, this impact would be *potentially significant*, but could be reduced to a less-than-significant level by suspending work if a paleontological resource is identified and having the site inspected by a qualified paleontologist (Measure 4.7-1).

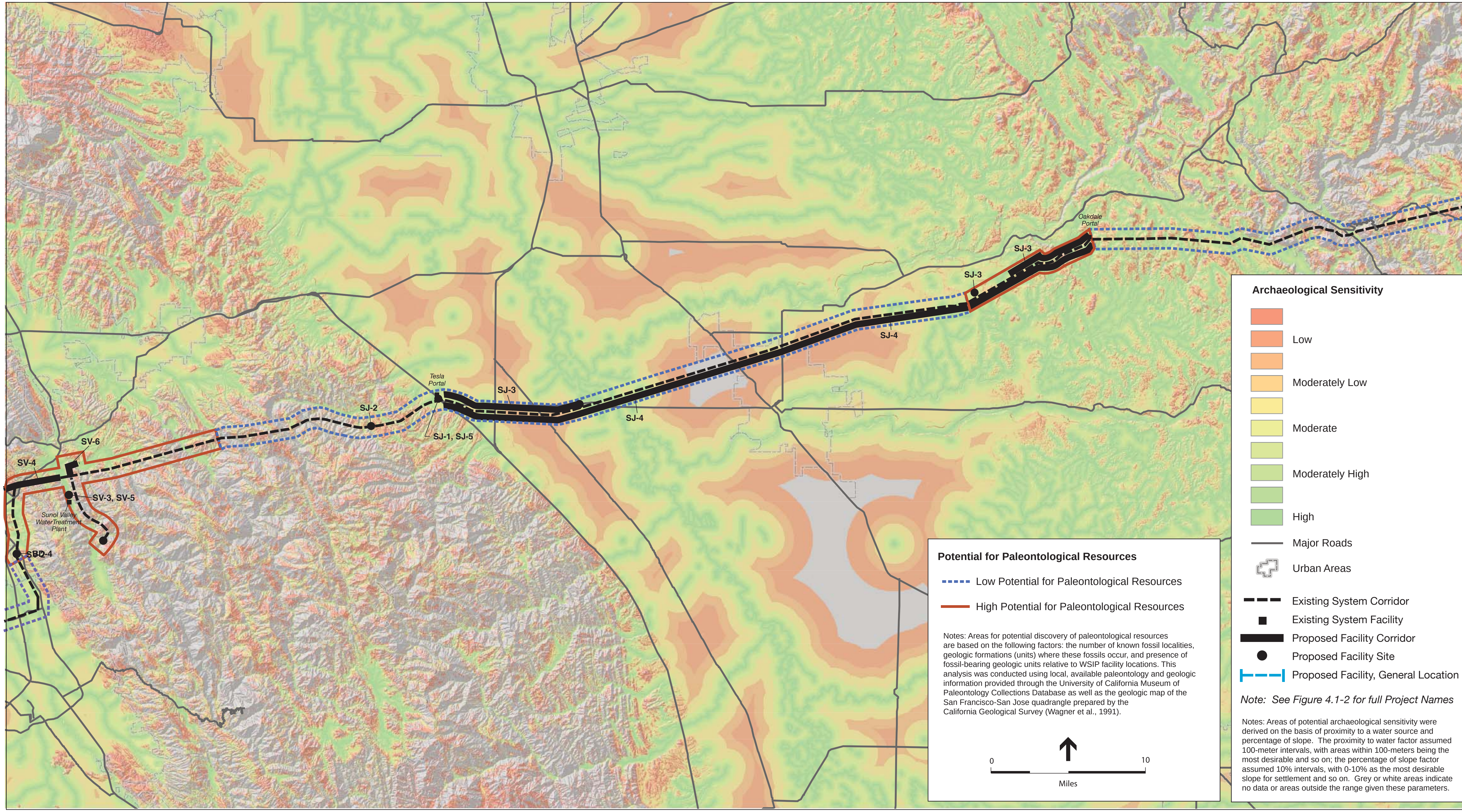
The proposed Lawrence Livermore project (SJ-2) is located in an area underlain by the Franciscan Complex, and fossil remains are not likely present. With implementation of SFPUC Construction Measure #9 (cultural resources), which includes a preconstruction paleontological screening and suspension of construction work if a paleontological resource is identified, impacts from the Lawrence Livermore project would be *less than significant*.



SOURCE: ESA + Orion; SFPUC, 2007

SFPUC Water System Improvement Program . 203287

Figure 4.7-1a
Archaeological Sensitivity and Potential for Paleontological Resources in the WSIP Study Area



SOURCE: ESA + Orion; SFPUC, 2007

SFPUC Water System Improvement Program . 203287

Figure 4.7-1b
Archaeological Sensitivity and Potential for Paleontological Resources in the WSIP Study Area

TABLE 4.7-2
POTENTIAL FOR PALEONTOLOGICAL IMPACTS

Project No.	Project Name	Would the WSIP project be located in an area of geologic formations where there is a high likelihood of paleontological impact?[a]	Have fossil localities been identified at other locations within the geologic formation?[a]	What is the potential for impacts on paleontological resources?	Impact significance
San Joaquin Region					
SJ-1	Advanced Disinfection	Yes, San Pablo Group, other marine deposits	Yes	High	PSM
SJ-2	Lawrence Livermore Supply Improvements	No, Franciscan Complex	No	Low	LS
SJ-3	San Joaquin Pipeline System	Yes, Mehrten Formation	Yes	High	PSM
SJ-4	Rehabilitation of Existing San Joaquin Pipelines	Yes, Mehrten Formation	Yes	High	PSM
SJ-5	Tesla Portal Disinfection Station	Yes, San Pablo Group, other marine deposits	Yes	High	PSM
Sunol Valley Region					
SV-1	Alameda Creek Fishery Enhancement	Yes, possible marine sedimentary rocks	Yes	High	PSM
SV-2	Calaveras Dam Replacement	Yes, Monterey Formation, Panoche Formation, other sedimentary rocks	Yes	High	PSM
SV-3	Additional 40-mgd Treated Water Supply	Yes, Monterey Formation, Panoche Formation, other sedimentary rocks	Yes	High	PSM
SV-4	New Irvington Tunnel	Yes, possible Panoche Formation, other sedimentary rocks	Yes	High	PSM
SV-5	SVWTP – Treated Water Reservoirs	Yes, Monterey Formation, Panoche Formation, other sedimentary rocks	Yes	High	PSM
SV-6	San Antonio Backup Pipeline	Yes, marine sedimentary rocks	Yes	High	PSM
Bay Division Region					
BD-1	Bay Division Pipeline Reliability Upgrade	No, young valley basin alluvium	No	Low	LS
BD-2	BDPL Nos. 3 and 4 Crossovers	No, young valley basin alluvium	No	Low	LS
BD-3	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault	Potentially yes, in either Plio-Pleistocene Santa Clara or Livermore/Irvington Gravels, or in young valley basin alluvium	Yes	High	PSM
Peninsula Region					
PN-1	Baden and San Pedro Valve Lots Improvements	Yes, Butano Sandstone/Whiskey Hill Formation	Yes	High	PSM
PN-2	Crystal Springs/San Andreas Transmission Upgrade	No, Franciscan Complex	No	Low	LS

TABLE 4.7-2 (Continued)
POTENTIAL FOR PALEONTOLOGICAL IMPACTS

Project No.	Project Name	Would the WSIP project be located in area of geological formations where there is a high likelihood of paleontological impact?	Have fossil locations been identified at other locations within the geologic formation?	What is the potential for impacts on paleontological resources?	Impact significance
Peninsula Region (cont.)					
PN-3	HTWTP Long-Term Improvements	Yes, marine deposits, possible Merced Formation	Yes	High	PSM
PN-4	Lower Crystal Springs Dam Improvements	No, Franciscan Complex	No	Low	LS
PN-5	Pulgas Balancing Reservoir Rehabilitation	Yes, marine deposits, possible Butano Formation and other marine sandstones and shale	Yes	High	PSM
San Francisco Region					
SF-1	San Andreas Pipeline No.3 Installation	Yes, marine sedimentary rocks	Yes	High	PSM
SF-2	Groundwater Projects	Yes, marine sedimentary rocks	Yes	High	PSM
SF-3	Recycled Water Projects	Yes, possible marine deposits	Yes	High	PSM

[a] Based on the information provided in Figure 4.7-1.
[b] Based on the information provided in Appendix C, Table C.4, all WSIP projects would either involve some level of excavation, or excavation is yet to be determined. For this analysis, a conservative assessment is made that excavation will occur and have an impact on paleontological resources.

Sunol Valley Region

Impact 4.7-1: Impacts on paleontological resources		
Alameda Creek Fishery	SV-1	PSM
Calaveras Dam	SV-2	PSM
40-mgd Treated Water	SV-3	PSM
New Irvington Tunnel	SV-4	PSM
Treated Water Reservoirs	SV-5	PSM
SABUP	SV-6	PSM

Projects in the Sunol Valley Region would be located, for the most part, in an area underlain by marine sedimentary rocks, including the Panoche Formation, Monterey Formation, and other fossil-bearing, marine and non-marine sandstone, siltstone, or gravel deposits. Fossil localities have been identified in the Sunol Valley and surrounding area (UCMP, 2006).

Construction and excavation required for the Alameda Creek Fishery project (SV-1) could encounter paleontological resources in the Sunol Valley, an area where geologic conditions and recorded localities indicate the likely presence of fossils. Considering the amount of excavation and grading for the Calaveras Dam project (SV-2), and the discovery of a nearby fossil locality (Locality No. 3937), the potential to encounter paleontological resources during this project is considered high. The 40-mgd Treated Water (SV-3) and Treated Water Reservoirs (SV-5) sites are underlain by the sedimentary, fossil-bearing Monterey and Panoche Formations, so the potential for encountering paleontological resources is also considered high. The New Irvington Tunnel project (SV-4) would likely bore through sedimentary geologic formations, including the Panoche Formation, that contain fossil remains; therefore, this project is considered to have a high potential for encountering and disturbing paleontological resources. Construction and excavation work associated with the SABUP project (SV-6) would take place in marine sedimentary rocks at the southwest end of San Antonio Reservoir and could encounter paleontological resources.

Given the high likelihood that the projects in this region could affect paleontological resources, this impact would be *potentially significant*, but could be reduced to a less-than-significant level by suspending work if a paleontological resource is identified and having the site inspected by a qualified paleontologist (Measure 4.7-1).

Bay Division Region

Impact 4.7-1: Impacts on paleontological resources		
BDPL Reliability Upgrade	BD-1	LS
BDPL 3 and 4 Crossovers	BD-2	LS
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	PSM

Two WSIP projects in the Bay Division Region (BDPL Reliability Upgrade, BD-1, and BDPL 3 and 4 Crossovers, BD-2) would be located in areas of the Santa Clara Valley that are underlain by young alluvial deposits. The deposits include unconsolidated basin deposits containing geologically young gravel, sand, silts, and clays as well as intertidal deposits such as soft mud and peat. There is a low likelihood that notable paleontological resources would be encountered during excavation and grading for these projects because of the relatively young geologic age of these deposits. In Santa Clara County, the majority of fossil localities are in geologically older sandstones, siltstones, and shale found in the uplands surrounding the Santa Clara Valley, a considerable distance from these WSIP projects.

With implementation of SFPUC Construction Measure #9 (cultural resources), which includes a preconstruction paleontological screening and suspension of construction work if a paleontological resource is identified, potential impacts would be *less than significant* for these two projects.

Due to the relative complexity of the surrounding geology, the third WSIP project in this region, BDPL 3 and 4 Seismic Upgrade at Hayward Fault (BD-3), could be underlain by a fossil-bearing, non-marine formation (either the Santa Clara Formation or Livermore/Irvington Gravels) or a young valley alluvium that would be less likely to contain paleontological resources. Due to the presence of fossil-bearing, non-marine sedimentary deposits, there is a high potential to encounter paleontological resources at this project site. This determination, as with other WSIP projects, would be reevaluated based on site-specific information as part of separate, project-level CEQA review. Given the high likelihood that this project could affect paleontological resources, the impact would be *potentially significant*, but could be reduced to a less-than-significant level by suspending work if a paleontological resource is identified and having the site inspected by a qualified paleontologist (Measure 4.7-1).

Peninsula Region

Impact 4.7-1: Impacts on paleontological resources		
Baden and San Pedro Valve Lots	PN-1	PSM
CS/SA Transmission	PN-2	LS
HTWTP Long-Term	PN-3	PSM
Lower Crystal Springs Dam	PN-4	LS
Pulgas Balancing Reservoir	PN-5	PSM

Paleontological resources could be encountered during construction work for the Baden and San Pedro Valve Lots (PN-1), HTWTP Long-Term (PN-3), and Pulgas Balancing Reservoir (PN-5) projects. These project areas overlie marine sedimentary geologic units that have recorded fossil localities. The HTWTP Long-Term project overlies the Merced Formation, a marine sandstone, siltstone, claystone, and conglomerate deposit that contains numerous invertebrate fossil localities throughout the San Francisco Peninsula. The Pulgas Balancing Reservoir and Baden and San Pedro Valve Lots Improvements projects include construction at the southern end of Crystal Springs Reservoir, in areas underlain by Butano Formation sandstone/Whiskey Hill Formation[32a] and other fossil-bearing marine sandstones and shales. The Butano Formation/Whiskey Hill Formation contains numerous fossil localities throughout San Mateo County (UCMP, 2006). Given the high likelihood that these projects could affect paleontological resources, this impact would be *potentially significant*, but could be reduced to a less-than-significant level by suspending work if a paleontological resource is identified and having the site inspected by a qualified paleontologist (Measure 4.7-1).

[32a] The Whiskey Hill Formation was previously mapped as the Butano sandstone. However, in 1993 the USGS determined that the Butano sandstone was actually composed of two similar sandstones indistinguishable in lithology and age but separated by the San Andreas-Pilarcitos fault system and having different stratigraphic relations to other geologic units. As a result of this determination, the geologic unit in the vicinity of the southern end of Crystal Springs Reservoir is now identified as the Whiskey Hill Formation, but references prepared prior to 1993 (including the University of California Museum of Paleontology Collections Database) refer to the Butano sandstone instead of the Whiskey Hill Formation. For this reason, the formation is referred to as the Butano sandstone/Whiskey Hill Formation in this analysis.

The CS/SA Transmission (PN-2) and Lower Crystal Springs Dam (PN-4) projects would be located in areas underlain by the chaotically mixed Franciscan Complex rocks. There are few, if any, recorded fossil localities in this area of the Santa Cruz Mountains. Proposed construction excavation and grading work at these project sites would not likely encounter paleontological resources. With implementation of SFPUC Construction Measure #9 (cultural resources), which includes a preconstruction paleontological screening and suspension of construction work if a paleontological resource is identified, potential impacts would be *less than significant* for these two projects.

San Francisco Region

Impact 4.7-1: Impacts on paleontological resources		
SAPL 3 Installation	SF-1	PSM
Groundwater Projects	SF-2	PSM
Recycled Water Projects	SF-3	PSM

All three projects in the San Francisco Region would be located in areas mapped as marine sedimentary deposits, including the Merced and Colma Formations. Several fossil localities have been recorded in the Merced Formation and, to a lesser degree, the Colma Formation. Excavation, grading, and well drilling work in these areas could encounter and disturb paleontological resources, such as invertebrate fossils and microfossils. The SAPL 3 Installation project (SF-1) would involve excavation to remove historic pipes and install pipes within new alignments, which could affect subsurface paleontological resources. Project-level studies would be conducted to evaluate the likelihood of buried sites along the alignment as part of separate, project-level CEQA review. The Groundwater Projects (SF-2) and Recycled Water Projects (SF-3) could also involve excavation. Given the high likelihood that these projects could affect paleontological resources, the impacts would be *potentially significant*, but could be reduced to a less-than-significant level by suspending work if a paleontological resource is identified and having the site inspected by a qualified paleontologist (Measure 4.7-1).

Archaeological Resources

Impact 4.7-2: Impacts on unknown and known prehistoric and historic archaeological resources.

This analysis provides a programmatic assessment of potential impacts on important archaeological resources that could result from the WSIP projects. Due to the geographic scale of the WSIP study area and the wide range of actions that fall within the scope of the WSIP, impacts on specific archaeological resources at each project site are not addressed in this PEIR, but would be assessed as part of separate, project-level CEQA review for each WSIP project. During these project-level reviews, cultural resource sites that have been previously identified and recorded would be reevaluated in accordance with Section 15064.5(a)(2)(3) of the CEQA Guidelines, if appropriate, using the criteria outlined in PRC Section 5024.1. Project-level reviews would also include communication with the Native American Heritage Commission. (This work must be performed on a project rather than program level, since the commission requires specific location information to effectively search its database of sacred lands.)

To identify areas within the WSIP study area where archaeological resources might be found, a predictive model was developed using a geographic information system (GIS). The purpose of a predictive model is to project known patterns and relationships into unknown areas. In the case of archaeological predictive modeling, the primary assumption is that archaeological sites tend to be found in areas favorable to human settlement. Although the focus of this model is to predict prehistoric settlements, the model might also be useful in studying younger historic resources, because areas favorable to settlement in the prehistoric era are likely to have continued as such during the historic period.

Given the size of the WSIP study area and the limitations on available datasets, only two dominate variables were considered for this model: distance-cost to water and slope percentage. In general, this model assumes that prehistoric people settled fairly close to water, as described previously under “Archaeological / Prehistoric-Period Setting,” and tended to live on relatively level ground. Other datasets were not useful as screening tools for determining archaeological sensitivity on a regional scale. For example, soil type was not considered due to the wide variability of soils in the study area. Consequently, the model is highly conservative in predicting whether sites would likely be located within a given geographic area. Figure 4.7-1 generally indicates the archaeological sensitivity of areas in the vicinity of WSIP facilities.

After areas of potential archaeological sensitivity were identified, the potential impacts from projects were evaluated. In general, projects that entail minor surface disturbance would likely result in less-than-significant impacts on archaeological resources. Projects on sites that are already surfaced, drained, or otherwise modified from native conditions also have a lower potential to affect archaeological resources. Projects that require the movement of large quantities of sediment would have the potential to cause more significant impacts. Any physical disturbance of significant historic and prehistoric archaeological resources could result in the permanent loss of scientific information that could contribute to our understanding of the past.

Potential impacts on archaeological resources are generally described below for the types of facilities and facility projects that would be implemented under the WSIP. Following this overview is a discussion of each WSIP project by region.

Pipelines. The standard pipeline installation method proposed for the WSIP projects is the open-cut trench method. With this method, the construction area would extend for the length of the pipeline and would have a width dependent on the size of the pipe. In archaeologically sensitive areas where known site locations would be directly affected, “trenchless” construction techniques such as jack-and-bore or microtunneling could be used to minimize impacts. Where pipeline installation or replacement is not required, sliplining might be possible. For trenchless pipeline construction and sliplining, vehicle access and a work area would be required for each pit or entry point. Some land would be temporarily used for construction or staging areas, while a small amount would be permanently committed to accessways, valves, and other control structures. In some cases, the disturbance of a surface area for staging activities could adversely affect archaeological deposits at the surface.

Tunnels. Impacts on archaeological resources could occur at portals and shaft openings. The construction area at the entry portal would be the largest, as it must accommodate the portal/shaft entry, vehicles, spoils, equipment, and materials storage. Construction areas at exit portals and shaft openings would require vehicle access and a smaller work area. A portion of the work area at both portals and shafts would be permanently committed to access, control, and maintenance structures, which could adversely affect archaeological resources if they were present within these project areas.

Valves, Valve Lots, and Crossovers. Valves, valve lots, and crossovers are located along existing pipelines and already have developed vehicular access. Projects sited in existing maintenance areas that are paved and graded are not likely to encounter intact, significant archaeological deposits. Moreover, these areas are less conducive to archaeological survey because the native surface has been modified or is obscured by concrete or asphalt. New crossover facilities must be sited near creeks so that water can be discharged into the watercourse during regular maintenance or emergency situations. Proximity to permanent or ephemeral water sources increases the probability that archaeological resources are present.

Pump Stations. New pump stations that would replace existing pump stations (on sites that are surfaced, drained, and maintained free of vegetation) would not likely affect archaeological resources. The construction of new stations on previously undeveloped, native topography could result in adverse effects on archaeological resources.

Treatment Facilities. WSIP treatment facility projects in developed areas (on sites that are surfaced and graded) would not likely affect intact, significant archaeological resources. If new buildings or facilities are constructed in previously undisturbed areas, the potential to encounter intact archaeological deposits is greater. If pipelines are required to connect treatment facilities to the rest of the Hetch Hetchy system, impacts on archaeological resources could result.

Storage Facilities. WSIP storage facility projects consist of the construction or improvement of storage reservoirs and dams. Improvements to below-grade storage reservoirs would require extensive grading and structural work, and it could be necessary to haul material offsite for disposal. Construction activity in natural topography could result in impacts on archaeological resources. Dam improvements would involve extensive earthmoving activities around the dam in addition to the development of borrow areas, disposal areas, and access roads. These project activities could cause adverse impacts on archaeological resources.

Table 4.7-3 indicates the potential for archaeological resources to be present at the WSIP project sites based on the distance to water and slope of the sites; each project site was evaluated as having a low, low-to-moderate, moderate, or high potential to affect known or unknown archaeological resources. Impacts from small, low-intensity, non-ground-disturbing project actions proposed in heavily disturbed settings are considered less than significant. Major construction operations that require substantial excavation pose a greater risk of impact on archaeological resources and would result in potentially significant impacts if they occur in areas of moderate to high potential for archaeological resources. SFPUC Construction Measure #9 (cultural resources) would require a qualified archaeologist to perform a preconstruction screening of each WSIP project site and its vicinity to determine whether archaeological resources could be affected by construction activities and to ensure that effects on cultural resources are avoided to the extent feasible. This measure also requires that construction be halted if an archaeological resource is discovered and, in the event that further investigation is necessary, would ensure that the SFPUC complies with all requirements for the investigation, analysis, and protection of cultural resources.

TABLE 4.7-3
POTENTIAL FOR ARCHAEOLOGICAL IMPACTS

Project No.	Project Name	Area of Archaeological Sensitivity?[a]	Potential for Impacts on Archaeological Resources?[b]	Impact Significance
SJ-1	Advanced Disinfection	Moderate	Yes	PSM
SJ-2	Lawrence Livermore Supply Improvements	Moderate	Yes	PSM
SJ-3	San Joaquin Pipeline System	Low to Moderate	Yes	PSM
SJ-4	Rehabilitation of Existing San Joaquin Pipelines	High	Yes	PSM
SJ-5	Tesla Portal Disinfection Station	Moderate	Yes	PSM
SV-1	Alameda Creek Fishery Enhancement	High	Yes	PSM
SV-2	Calaveras Dam Replacement	High	Yes	PSM
SV-3	Additional 40-mgd Treated Water Supply	Moderate to High	Yes	PSM
SV-4	New Irvington Tunnel	Low to Moderate	Yes	PSM
SV-5	SVWTP – Treated Water Reservoirs	Moderate to High	Yes	PSM
SV-6	San Antonio Backup Pipeline	High	Yes	PSM
BD-1	Bay Division Pipeline Reliability Upgrade	High	Yes	PSM
BD-2	BDPL Nos. 3 and 4 Crossovers	Low to Moderate	Yes	PSM
BD-3	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault	Moderate	Yes	PSM
PN-1	Baden and San Pedro Valve Lots Improvements	Moderate	Yes	PSM
PN-2	Crystal Springs/San Andreas Transmission Upgrade	Moderate	Yes	PSM
PN-3	HTWTP Long-Term Improvements	Low to Moderate	Yes	PSM
PN-4	Lower Crystal Springs Dam Improvements	High	Yes	PSM
PN-5	Pulgas Balancing Reservoir Rehabilitation	High	Yes	PSM
SF-1	San Andreas Pipeline No. 3 Installation	Moderate	Yes	PSM
SF-2	Groundwater Projects	Low to Moderate	Yes	PSM
SF-3	Recycled Water Projects	Low to Moderate	Yes	PSM

[a] Based on the information provided in Figure 4.7-1.
[b] Based on the information provided in Appendix C, Table C.4, all WSIP projects would either involve some level of excavation, or excavation is yet to be determined. For this analysis, a conservative assessment is made that excavation will occur and have an impact on archaeological resources.

If any WSIP projects were located in areas with a low potential to encounter archaeological resources, implementation of SFPUC Construction Measure #9 (cultural resources) would ensure that impacts are less than significant. However, in this program-level evaluation, it does not appear that any of the WSIP projects would be located in areas of low archaeological sensitivity.

Table 4.7-3 identifies the WSIP projects as having a low-to-moderate, moderate, or high potential for archaeological sensitivity. The preconstruction screenings under Construction Measure #9 would analyze site-specific information, which would either confirm these program-level determinations or provide a basis to revise them.

Because projects in areas of low-to-moderate, moderate, or high archaeological sensitivity would have an increased likelihood to encounter archaeological resources during soil-disturbing activities, impacts on archaeological resources would be potentially significant and would require additional mitigation to protect these resources. In such cases, implementation of archaeological testing, monitoring, and treatment of human remains (Measure 4.7-2a) and accidental discovery measures (Measure 4.7-2b) would reduce impacts from the WSIP projects to a less-than-significant level.

San Joaquin Region

Impact 4.7-2: Impacts on unknown and known prehistoric and historic archaeological resources		
Advanced Disinfection	SJ-1	PSM
Lawrence Livermore	SJ-2	PSM
SJPL System	SJ-3	PSM
SJPL Rehabilitation	SJ-4	PSM
Tesla Portal Disinfection	SJ-5	PSM

All five WSIP projects in this region would have the potential to adversely affect archaeological resources.

The SJPL System project (SJ-3) would install approximately 16 to 22 miles of new pipeline and construct two crossovers, while the SJPL Rehabilitation project (SJ-4) would rehabilitate the existing pipelines at discrete locations. These projects would be located in areas of low-to-moderate archaeological sensitivity. Some segments of both projects would be conducted in the vicinity of the San Joaquin River, an attractive location for prehistoric settlement and thus of greater sensitivity for archaeological resources. The pipeline construction area for both projects would be partially located in previously disturbed areas, but because the work area must be located to the side of existing pipelines, it could be partially located in undisturbed parts of the right-of-way. The SJPL System project would entail a greater degree of excavation—the primary construction activity that causes impacts on archaeological resources—than the SJPL Rehabilitation project.

The Advanced Disinfection (SJ-1) and Tesla Portal Disinfection (SJ-5) projects would be located in the vicinity of Tesla Portal within largely developed areas of moderate archaeological sensitivity. The Lawrence Livermore project (SJ-2), which would also be located in an area of moderate archaeological sensitivity, could affect archaeological resources at the facility sites or along access roads if they required improvements. However, potential impacts associated with these three projects would be minimal due to the small areas involved (approximately two acres at the Tesla Portal facility for the Advanced Disinfection and Tesla Portal Disinfection projects).

All five projects in this region would be subject to separate, project-level CEQA review, which would evaluate potential impacts in more detail and determine appropriate mitigation measures based on the presence and type of archaeological resources identified. Given the likelihood that these projects could affect archaeological resources, impacts would be *potentially significant*, but could be reduced to a less-than-significant level with implementation of archaeological testing, monitoring, and treatment of human remains (Measure 4.7-2a) and accidental discovery measures (Measure 4.7-2b).

Sunol Valley Region

Impact 4.7-2: Impacts on unknown and known prehistoric and historic archaeological resources		
Alameda Creek Fishery	SV-1	PSM
Calaveras Dam	SV-2	PSM
40-mgd Treated Water	SV-3	PSM
New Irvington Tunnel	SV-4	PSM
Treated Water Reservoirs	SV-5	PSM
SABUP	SV-6	PSM

All of the projects in this region would have the potential to affect archaeological resources. The Alameda Creek Fishery project (SV-1) would involve the construction of pipelines, pumps, collection wells, control structures, and a water recapture facility. This project would be situated in and near Alameda Creek and thus would have a greater potential to adversely affect archaeological resources.

The Calaveras Dam project (SV-2) would be located in an area of high archaeological sensitivity. The project would affect approximately 660 acres in the dam construction area, including portions of Alameda and Calaveras Creeks downstream from the existing dam, and the excavation of borrow areas could affect archaeological resources. Anecdotal evidence indicates that a number of burial sites were identified during construction of the Calaveras Dam (O'Shaughnessy, 1915), suggesting that the area surrounding the dam may be sensitive for significant archaeological resources. (If human remains are found at this or any WSIP project site, Measure 4.7-2a provides direction for the treatment of human remains and funerary objects.)

The 40-mgd Treated Water project (SV-3) would install approximately 1.5 to 2 miles of new pipeline. These pipelines would be situated on or near the Sunol Valley WTP and would be located primarily in previously disturbed grasslands. Thus, it is unlikely that this project would affect intact, significant archaeological deposits. However, the proposed two-mile pipeline to the Alameda Siphons or Irvington Tunnel as part of this project could affect archaeological resources along several ephemeral streams where there may have been prehistoric use for resource procurement. The archaeological sensitivity of this area is considered to be moderate to high.

The New Irvington Tunnel project (SV-4) could affect archaeological resources at permanent facilities proposed to be located at the new tunnel's portals in the Sunol Valley and Fremont. The project could also affect archaeological resources near Alameda Creek, where two new bridges would be built, and in the surrounding area required for access roads, shafts, control structures, and spoils disposal. The construction footprint at the tunnel's Sunol Valley portal (West Portal) would be located primarily on slopes, which would be less likely to yield archaeological resources; however, because the location of the spoils disposal area has not been designated, an impact assessment cannot be performed at this time. This project is in an area of low-to-moderate archaeological sensitivity.

The Treated Water Reservoirs project (SV-5) would have a construction footprint of approximately 10.5 acres and a pipeline alignment of approximately 0.3 mile. Depending on the location of the construction relative to identified archaeological resources, this project could have an adverse impact on these resources. The project is located in an area of moderate to high archaeological sensitivity.

The SABUP project (SV-6) would closely parallel San Antonio Creek but would not cross the creek itself. An outlet/energy dissipation structure would be located at the east channel of Alameda Creek, which could result in potential impacts on archaeological resources due to the project's proximity to a watercourse. The project is in an area of high archaeological sensitivity.

The projects in the Sunol Valley Region would be subject to separate, project-level CEQA review, which would evaluate potential impacts in more detail and determine appropriate mitigation measures based on the presence and type of archaeological resources identified. Given the likelihood that these projects could affect archaeological resources, the impacts would be *potentially significant*, but could be reduced to a less-than-significant level with implementation of archaeological testing, monitoring, and treatment of human remains (Measure 4.7-2a) and accidental discovery measures (Measure 4.7-2b).

Bay Division Region

Impact 4.7-2: Impacts on unknown and known prehistoric and historic archaeological resources		
BDPL Reliability Upgrade	BD-1	PSM
BDPL 3 and 4 Crossovers	BD-2	PSM
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	PSM

All of the projects in this region would have the potential to affect archaeological resources. The BDPL Reliability Upgrade project (BD-1) would install approximately 16 miles of pipeline and 5 miles of tunnel. The pipeline segment would cross several modified creek channels and artificial flood control channels between the Irvington Portal in Fremont and the Newark Valve House. While it appears that this construction activity would occur in previously disturbed areas, it is possible that intact, significant archaeological resources may exist in this area due to the project's proximity to bay and freshwater sources (i.e., in an area of high archaeological sensitivity).

The BDPL 3 and 4 Crossovers project (BD-2) is located in an area of low-to-moderate archaeological sensitivity near creeks, an attractive location for prehistoric settlement.

The BDPL 3 and 4 Seismic Upgrade at Hayward Fault project (BD-3) would provide for the planning, design, and construction of upgraded, seismically resistant sections of the Bay Division Pipelines Nos. 3 and 4 where they cross the Hayward fault. The replacement pipelines would be located between the two new crossover/isolation valves. This project is also in proximity to bay and freshwater sources, in an area of moderate archaeological sensitivity.

All three projects in this region would be subject to separate, project-level CEQA review, which would evaluate potential impacts in more detail and determine appropriate mitigation measures based on the presence and type of archaeological resources identified. Given the likelihood that these projects could affect archaeological resources, impacts would be *potentially significant*, but could be reduced to a less-than-significant level with implementation of archaeological testing, monitoring, and treatment of human remains (Measure 4.7-2a) and accidental discovery measures (Measure 4.7-2b).

Peninsula Region

Impact 4.7-2: Impacts on unknown and known prehistoric and historic archaeological resources		
Baden and San Pedro Valve Lots	PN-1	PSM
CS/SA Transmission	PN-2	PSM
HTWTP Long-Term	PN-3	PSM
Lower Crystal Springs Dam	PN-4	PSM
Pulgas Balancing Reservoir	PN-5	PSM

All of the projects in this region would have the potential to affect archaeological resources. The Lower Crystal Springs Dam project (PN-4) could adversely affect significant archaeological resources near San Mateo Creek if work areas are needed at the base of the dam. The Pulgas Balancing Reservoir project (PN-5) is located near the Pulgas Channel and Laguna Creek, which increases the potential for intact archaeological resources. These projects, both of which would be located in areas of high archaeological sensitivity, would be subject to separate, project-level CEQA review, which would further evaluate potential impacts on archaeological resources found during the cultural resources screening survey.

It is unlikely that the Baden and San Pedro Valve Lots (PN-1), CS/SA Transmission (PN-2), and HTWTP Long-Term (PN-3) projects would adversely affect significant archaeological resources, because the majority of the proposed activities would be conducted within existing facilities that have been previously disturbed, graded, or paved. Extant cultural resources are likely to be obscured or deeply buried beneath the native surface. However, because the Baden and San Pedro Valve Lots and CS/SA Transmission projects would be located in areas of moderate archaeological sensitivity, and the HTWTP Long-Term project would be located in an area of low-to-moderate sensitivity, the potential exists to adversely affect archaeological resources.

Given the likelihood that these projects could affect archaeological resources, the impacts would be *potentially significant*, but could be reduced to a less-than-significant level with implementation of archaeological testing, monitoring, and treatment of human remains (Measure 4.7-2a) and accidental discovery measures (Measure 4.7-2b).

San Francisco Region

Impact 4.7-2: Impacts on unknown and known prehistoric and historic archaeological resources		
SAPL 3 Installation	SF-1	PSM
Groundwater Projects	SF-2	PSM
Recycled Water Projects	SF-3	PSM

All of the projects in this region would have the potential to affect archaeological resources. The SAPL 3 Installation project (SF-1) would remove historic pipes and lay pipes along new alignments, which could affect subsurface archaeological resources. Preliminary investigation indicates that the general area around the alignment was inhabited prehistorically; therefore, the area is considered to be of moderate archaeological sensitivity. Project-level studies would be conducted to evaluate the likelihood of buried cultural sites along the alignment.

The Groundwater Projects (SF-2) and Recycled Water Projects (SF-3) could affect Lake Merced by raising its water level, which could result in impacts on archaeological resources. The projects would be located in areas of low-to-moderate archaeological sensitivity. In addition, the Groundwater Projects would construct new wells and associated facilities, and the Recycled

Water Projects would construct approximately 20 miles of pipeline on five to seven acres. Depending on the amount of increase in the lake's water level and the locations of the new facilities, these projects could adversely affect archaeological resources.

The projects in this region would be subject to separate, project-level CEQA review, which would further evaluate potential impacts on archaeological resources found during the cultural resources screening survey. Given the likelihood that these projects could affect archaeological resources, impacts would be *potentially significant*, but could be reduced to a less-than-significant level with implementation of archaeological testing, monitoring, and treatment of human remains (Measure 4.7-2a) and accidental discovery measures (Measure 4.7-2b).

Historic Architectural Resources

As previously stated, this PEIR identifies three categories of potential impacts on historic architectural resources. These categories are as follows:

- Impacts on a historic district or a contributor to a historic district (Impact 4.7-3)
- Impacts on individual resources that are part of the water system (Impact 4.7-4)
- Impacts on individual resources located adjacent to a WSIP facility improvement project (Impact 4.7-5)

As noted above, identification of historical resources that could be affected by the WSIP will also be conducted during project-level CEQA review of the individual facility improvement projects. Assumptions were made for the purposes of this programmatic analysis regarding the potential for historical resources to be located in the study areas of specific WSIP facility improvement projects. The analysis presented in this section assumes that all water system facilities constructed during their period(s) of potential historical significance have retained historic integrity. Although this assumption has not been verified as part of this program-level analysis, it provides a conservative approach to evaluating potential impacts. Again, an appropriate historical context and period of significance for resources will be determined during the project-level CEQA analyses, based on an understanding of the water system's history and importance of the components of the water-delivery system. Table 4.7-1 summarizes the conclusions of this PEIR regarding the potential for WSIP facility improvement projects to affect historical resources. **Table 4.7-4** describes the potential impacts of the WSIP projects on historical resources in the regional water system.

This program-level analysis is based on information presented in Chapter 3, Program Description, and Appendix C, as well as on site visits to some of the SFPUC facilities. The site visits verified whether other buildings, structures, or objects are located at or near proposed WSIP facilities. It should be noted that this analysis is not a comprehensive evaluation of all historical resources in the WSIP study area. Detailed evaluations of historic architectural resources would be conducted as part of separate, project-level CEQA review, where warranted, to further define potential

TABLE 4.7-4
HISTORIC ARCHITECTURAL RESOURCES IMPACT POTENTIAL ON REGIONAL WATER SYSTEM FACILITIES

WSIP Facility Improvement Project	Construction Date of Potentially Affected Facilities	Would the project affect a potential historic district?	Significance determination for impacts on the historical significance of a potential historic district[a]	Would the project demolish or alter the historic fabric or function of a specific existing facility?	Significance determination for impacts on the historical significance of the individual facility[a]
SJ-1: Advanced Disinfection	Tesla Portal: 1928	Yes, the existing Tesla Portal could be a contributor to a potential historic district related to the implementation of John R. Freeman's plan for the development of the Hetch Hetchy system. The existing Tesla Portal would be modified as part of this project, which would result in a potentially significant impact on the potential historic district. This impact could likely be reduced to a less-than-significant level.	PSM	Yes, the existing Tesla Portal would be modified as part of this project. If the portal were considered to be an individual historical resource for the purposes of CEQA compliance, this project would result in a potentially significant impact on the potential historic facility. This impact could likely be reduced to a less-than-significant level.	PSM
SJ-2: Lawrence Livermore Supply Improvements	N/A (new construction)	No, new facilities would be added near non-historic facilities.	N/A	No, new facilities would be associated with non-historic facilities.	N/A
SJ-3: San Joaquin Pipeline System	Pipeline No. 1: 1932 Pipeline No. 2: 1953[b] Pipeline No. 3: 1968 Oakdale Portal: 1928	Yes, the proposed work on the existing pipelines and the modification of the existing Oakdale Portal could have a potentially significant impact on a potential historic district associated with the implementation of John R. Freeman's plan for the development of the Hetch Hetchy system. However, because the project would add new portions of pipelines and crossovers, and direct impacts on the existing pipelines and portal would be limited, it is likely that such impacts could be reduced to a less-than-significant level.	PSM	Yes, the existing Oakdale Portal would be modified as part of this project. If the portal were considered to be an individual historical resource for the purposes of CEQA compliance, this project would result in a potentially significant impact on the potential historic facility. This impact could likely be reduced to a less-than-significant level.	PSM
SJ-4: Rehabilitation of Existing San Joaquin Pipelines	Pipeline No. 1: 1932 Pipeline No. 2: 1953[b] Pipeline No. 3: 1968 Tesla Portal: 1928	Yes, the proposed work on the existing pipelines could have a potentially significant impact on a potential historic district associated with the implementation of John R. Freeman's plan for the development of the Hetch Hetchy system. However, because direct impacts on the existing pipelines would be limited, it is likely that such impacts could be reduced to a less-than-significant level.	PSM	Yes. Although the pipeline system would retain its historical function, the pipelines themselves could be altered enough to cause a substantial adverse change in their historical significance, if they were considered eligible. This would be a potentially significant impact. It is expected that the impact could be reduced to a less-than-significant level with mitigation.	PSM
SJ-5: Tesla Portal Disinfection Station	Approximately 1928	No, would replace and upgrade an existing non-historic disinfection facility.	N/A	No, would replace and upgrade an existing non-historic facility.	N/A

TABLE 4.7-4 (Continued)
HISTORICAL RESOURCES IMPACT POTENTIAL FOR WSIP PROJECTS

WSIP Facility Improvement Project	Construction Date of Potentially Affected Facilities	Would the project affect a potential historic district?	Significance determination for impacts on the historical significance of a potential historic district[a]	Would the project demolish or alter the historic fabric or function of a specific existing facility?	Significance determination for impacts on the historical significance of the individual facility[a]
SV-1: Alameda Creek Fishery Enhancement	N/A (new construction or nonstructural water recovery alternatives)	No. One alternative would construct a new water recapture facility near non-historic facilities. Other alternatives would not include construction.	N/A	No, new facility.	N/A
SV-2: Calaveras Dam Replacement	1925	Yes. Because the project requires demolition of Calaveras Dam and its associated structures, the project would have a potentially significant unavoidable impact on a historic district (if one exists) that may include Calaveras Dam and its associated structures.	PSU	Yes. Because the project requires demolition of Calaveras Dam and its associated structures, the project would have a potentially significant unavoidable impact on the complex as a historical resource.	PSU
SV-3: Additional 40-mgd Treated Water Supply	Sunol Valley Water Treatment Plant: 1966, upgraded 1976, 1990, 2001–2003	No, would upgrade an existing non-historic facility.	N/A	No, would upgrade an existing non-historic facility.	N/A
SV-4: New Irvington Tunnel	Irvington Tunnel: 1934 Irvington Portal: 1934 Alameda West Portal: 1934 Coast Range Tunnel: 1934	Yes, the existing Irvington Tunnel and the Irvington and Alameda West Portals could be contributors to a potential historic district related to the implementation of John R. Freeman's plan for the development of the Hetch Hetchy system. Because the existing Irvington Tunnel and Alameda West Portal would continue as originally designed, and the project would create a new component of the system (a new, redundant tunnel) rather than eliminate the existing tunnel, the impact on such a potential historic district would be less than significant. However, the existing Irvington Portal would be demolished as part of this project, which would result in a potentially significant impact on the potential historic district. This impact could likely be reduced to a less-than-significant level.	PSM	Yes, the project would demolish the unique spherical Irvington Portal (in Fremont) that was built in the 1930s. Since retaining the portal is not feasible due to safety concerns, the impact on the historic facility would be potentially significant and unavoidable, if the portal were determined to be a historical resource for the purposes of CEQA compliance.	PSU
SV-5: SVWTP – Treated Water Reservoirs	1966, upgraded 1976, 1990, 2001–2003	No, would upgrade an existing non-historic facility and construct new treated water reservoirs.	N/A	No, would upgrade an existing non-historic facility.	N/A

TABLE 4.7-4 (Continued)
HISTORICAL RESOURCES IMPACT POTENTIAL FOR WSIP PROJECTS

WSIP Facility Improvement Project	Construction Date of Potentially Affected Facilities	Would the project affect a potential historic district?	Significance determination for impacts on the historical significance of a potential historic district[a]	Would the project demolish or alter the historic fabric or function of a specific existing facility?	Significance determination for impacts on the historical significance of the individual facility[a]
SV-6: San Antonio Backup Pipeline	Alameda East Portal Vent Overflow Pipeline: 1934 Alameda East Portal: 1934 New pipelines to be built from San Antonio Reservoir (1965) to San Antonio Pump Station (1968)	Yes, the existing Alameda East Portal could be a contributor to a potential historic district related to the implementation of John R. Freeman's plan for the development of the Hetch Hetchy system. The existing Alameda East Portal would be modified as part of this project, which would result in a potentially significant impact on the potential historic district. This impact could likely be reduced to a less-than-significant level.	PSM	Yes, the existing Alameda East Portal would be modified as part of this project. If the portal were considered to be an individual historical resource for the purposes of CEQA compliance, this project would result in a potentially significant impact on the potential historic facility. This impact could likely be reduced to a less-than-significant level.	PSM
BD-1: Bay Division Pipeline Reliability Upgrade	Pipeline No. 1: 1925 Pipeline No. 2: 1935–1936 Pipeline No. 3: 1952[b] Pipeline No. 4: 1967–1973	Yes, one or more of the Bay Division Pipelines could be a contributor to a potential historic district related to the implementation of John R. Freeman's plan for the development of the Hetch Hetchy system. This project could have a significant impact on this potential historic district. The nature of the project and the fact that at least portions of the existing pipeline would remain following construction indicate that the impact could be reduced to a less-than-significant level.	PSM	Yes, impacts would be potentially significant if the pipelines were considered to be individual historical resources for the purposes of CEQA compliance. The impact on these resources is expected to be reduced to a less-than-significant level with mitigation.	PSM
BD-2: BDPL Nos. 3 and 4 Crossovers	Pipeline No. 3: 1952[b] Pipeline No. 4: 1967–1973	Yes, one or more of the Bay Division Pipelines could be a contributor to a potential historic district related to the implementation of John R. Freeman's plan for the development of the Hetch Hetchy system. This project could have a significant impact on this potential historic district. The nature of the project and the fact that at least portions of the existing pipeline would remain following construction indicate that the impact could be reduced to a less-than-significant level.	PSM	Yes, impacts would be potentially significant if the pipelines were considered to be individual historical resources for the purposes of CEQA compliance. The impact on these resources is expected to be reduced to a less-than-significant level.	PSM

**TABLE 4.7-4 (Continued)
HISTORICAL RESOURCES IMPACT POTENTIAL FOR WSIP PROJECTS**

WSIP Facility Improvement Project	Construction Date of Potentially Affected Facilities	Would the project affect a potential historic district?	Significance determination for impacts on the historical significance of a potential historic district[a]	Would the project demolish or alter the historic fabric or function of a specific existing facility?	Significance determination for impacts on the historical significance of the individual facility[a]
BD-3: Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault	Pipeline No. 3: 1952[b] Pipeline No. 4: 1967–1973	Yes, one or more of the Bay Division Pipelines could be a contributor to a potential historic district related to the implementation of John R. Freeman's plan for the development of the Hetch Hetchy system. This project could have a significant impact on this potential historic district. The nature of the project and the fact that the existing pipeline would remain following construction indicate that the impacts could be reduced to a less-than-significant level.	PSM	Yes, impacts would be potentially significant if the pipelines were considered to be individual historical resources for the purposes of CEQA compliance. The impact on these resources is expected to be reduced to a less-than-significant level.	PSM
PN-1: Baden and San Pedro Valve Lots Improvements	Non-historic	No, would upgrade existing non-historic facilities.	N/A	No, would upgrade existing non-historic facilities.	N/A
PN-2: Crystal Springs/San Andreas Transmission Upgrade	Upper Crystal Springs Dam: 1877 Lower Crystal Springs Dam: 1890 Crystal Springs Pump Station: 1933 Crystal Springs/San Andreas Pipeline: 1898–1932 San Andreas Reservoir: 1870	Yes, the pipeline and the pump station, and other associated structures that may be located near them, could be contributors to a potential historic district related to all or a portion of the Spring Valley Water Company's development of Crystal Springs Reservoir or San Andreas Reservoir. There could also be a historic district that includes the historical context related to San Francisco's incorporation of this portion of the former Spring Valley Water Company facilities into the municipal system.	PSU	Yes, the pipeline, and other associated structures that may be located near it, could be individually significant and considered to be historical resources for the purposes of CEQA. It is expected that many of the impacts could be reduced to a less-than-significant level, but impacts on the Crystal Springs Pump Station could be potentially significant and unavoidable.	PSU
PN-3: HTWTP Long-Term Improvements	1971, expansions in 1988, 1990	No, would alter and upgrade an existing non-historic facility, but would not affect its function or a nearby potential historic district.	N/A	No, would alter and upgrade an existing non-historic facility.	N/A

TABLE 4.7-4 (Continued)
HISTORICAL RESOURCES IMPACT POTENTIAL FOR WSIP PROJECTS

WSIP Facility Improvement Project	Construction Date of Potentially Affected Facilities	Would the project affect a potential historic district?	Significance determination for impacts on the historical significance of a potential historic district[a]	Would the project demolish or alter the historic fabric or function of a specific existing facility?	Significance determination for impacts on the historical significance of the individual facility[a]
PN-4: Lower Crystal Springs Dam Improvements	1890	Yes, this structure, and other associated structures, could be contributors to a potential historic district related to a portion of the Spring Valley Water Company's development of Crystal Springs Reservoir. Because the project would repair and upgrade portions of the historic dam rather than demolish or replace the dam, the impact could be reduced to a less-than-significant level.	PSM	Yes, could alter the historic fabric of the dam. Detailed project-level review may determine that effects could be mitigated, but until such determination, the impact is considered potentially significant and unavoidable.	PSU
PN-5: Pulgas Balancing Reservoir Rehabilitation	1975	No, would upgrade existing a non-historic facility.	N/A	No, would upgrade existing a non-historic facility.	N/A
SF-1: San Andreas Pipeline No. 3 Installation	Pipeline No. 1: 1870 (rebuilt in 1893 and taken out of service in 1983) Pipeline No. 2: 1927– 928 Pipeline No. 3: approx. 1928	Yes, the pipeline could be a contributor to a potential historic district associated with the development of a portion of the Spring Valley Water Company's system on the Peninsula or the SFPUC municipal water system. This project would remove and permanently decommission portions of the Baden-Merced Pipeline. This impact could be a potentially significant; however, it is expected that such an impact could be reduced to a less-than-significant level because portions of the original pipeline would remain following construction of the project.	PSM	Yes, because portions of the existing Baden-Merced Pipeline would be removed, this impact would be potentially significant if the pipeline were considered to be a historical resource for the purposes of CEQA compliance. The project's impact on these pipelines could be reduced to a less-than-significant level with mitigation.	PSM
SF-2: Groundwater Projects	N/A (new construction)	No, new facilities (including wells) would be added.	N/A	No, new facilities would be added to the system, but final facility locations have not yet been determined.	N/A
SF-3: Recycled Water Projects	N/A (new construction)	No, new facilities would be added.	N/A	No, new facilities would be added to the system, but final facility locations have not yet been determined.	N/A

[a] These are preliminary determinations that would be reviewed during project-level CEQA analysis.
[b] Detailed property evaluations of the facilities conducted during subsequent, project-level CEQA review would determine if these pipelines are historically significant facilities. If the pipelines are found to lack engineering merit or a strong association to historic events or people, they could be determined not historically significant. If so, that determination would not affect the potential historical significance of older pipelines in the same systems.

impacts on the water system and other cultural resources in the WSIP study area and to develop appropriate project-specific mitigation measures based on specific project design.

Implementation of SFPUC Construction Measure #9 (cultural resources) would ensure that a qualified historian conducts a preconstruction screening of each WSIP project site and its vicinity to determine whether historical resources could be affected by construction activities and to ensure that impacts on identified cultural resources are avoided to the extent feasible. This measure requires that soil-disturbing activities be immediately suspended if there is any indication of a cultural resource and, in the event that further investigation is necessary, would ensure that the SFPUC complies with all requirements for the investigation, analysis, and protection of cultural resources.

Impact 4.7-3: Impacts on the historical significance of a historic district or a contributor to a historic district.

As discussed in Section 4.7.2, a historic district is an area that "possesses a significant concentration, linkage or continuity of sites, buildings, structures, or objects, united historically or aesthetically by plan or physical development."[33] This analysis assesses impacts on potentially interrelated groups of facilities and resources, united by historic plan and function, which could be considered discrete historic districts. Historically significant historic districts that retain sufficient historic integrity to convey their significance are considered singular historical resources for the purposes of CEQA compliance and would include contributing and non-contributing elements. The WSIP would have an effect on potential historic districts within the water system if it were to remove or alter individual resources within a district in a manner that would diminish the district's historic integrity, and thus its ability to convey its significance, purpose, or original appearance.

Potential historic districts usually conform with the following standards:

- Resources in the district are physically located in relatively close proximity to one another as a cohesive unit.
- Approximately two-thirds of the resources should be contributors to a potential district in order for that district to be readily supportable.
- Boundaries of the district should encompass but not exceed the extent of the significant resources.
- Districts should not include buffer zones or "donut holes" of low-integrity, non-contributing resources, or empty acreage. (Non-contributing resources surrounded by a majority of contributing resources should be included within the district as non-contributors, or a discontiguous district should be specified when large areas lacking contributing resources intervene.)

[33] National Park Service, "National Register Bulletin #15: How to Apply the National Register Criteria for Evaluation," National Park Service: Washington DC, 1998.

- The majority of the district must retain historic integrity.
- Geographic, topographic, and historic boundaries should be considered when selecting district boundaries.

Historic districts may be identified as subsets of facilities within the regional water system. To qualify as a historic district, these facilities would also have to be united historically or aesthetically. These historic districts may be identified, for example, through common association with a specific and identifiable engineering plan implemented during a specific time in history.

A district could include water system facilities or a combination of system and non-system facilities, depending on the historical context of the resource. Resources within a potential district must be unified by historic plan and must work together to perform a specific function within the water system (acting as a subsystem, for instance). Resources within a potential district must share a historical timeframe that is specific to that district, during which facilities would have been built or modified. Groups of facilities might qualify as historic districts based on a specific aspect of their history, or, most importantly, through a plan of development that was designed and subsequently executed with a specific purpose in mind. Given the concentration of system facilities in the Sunol Valley and Peninsula Regions, there is greater potential for impacts on historic districts in these areas than in the other regions along the system (i.e., the San Joaquin, Bay Division, and San Francisco Regions), but the final determination will be made during project-level evaluation. For instance, the San Andreas Dam complex on the Peninsula, including its earthen dam, associated conveyance structures, and other structures and features, might be an example of a historic district, in which a collection of interrelated facilities represent a historical resource, in addition to the historical significance of some of the individual facilities.

As described in Section 4.7.1, facilities in various portions of the water system were built at different times: the Spring Valley Water Company's earliest facilities in the city were built between 1856 and 1877, the Peninsula facilities between 1861 and 1898, and the Alameda facilities between 1875 and 1925; the essential Hetch Hetchy system was built and became operative between 1914 and 1934. It is possible that there are historic districts with separate and distinct periods of significance within these areas and time periods that were united by plans of development or other direct historical associations. Alternatively, some resources may be individually eligible within their appropriate historical context, as discussed under Impact 4.7-4.

San Joaquin Region

Impact 4.7-3: Impacts on the historical significance of a historic district or a contributor to a historic district		
Advanced Disinfection	SJ-1	PSM
Lawrence Livermore	SJ-2	N/A
SJPL System	SJ-3	PSM
SJPL Rehabilitation	SJ-4	PSM
Tesla Portal Disinfection	SJ-5	N/A

The SJPL System project (SJ-3) would add new pipes at the west and east ends of the pipelines and would modify Oakdale Portal. The SJPL Rehabilitation project (SJ-4) would repair or rehabilitate existing pipelines. The Advanced Disinfection project (SJ-1) would modify Tesla Portal. All three of these projects could affect one or more of the San Joaquin Pipelines and would modify the Oakdale and Tesla Portals; these facilities could be contributors to a potential historic district associated with the implementation of John R. Freeman's plan for the development of the Hetch Hetchy system. These three projects could have a *potentially significant* impact on a historic district, but because of the nature of the projects, impacts would be reduced to a less-than-significant level with implementation of Measure 4.7-3, which requires evaluation of historic districts, and Measures 4.7-4a through 4.7-4f, which require historical surveys (Measure 4.7-4d), evaluation of alternatives and materials salvage to the extent feasible (Measure 4.7-4a), documentation of historical resources (Measure 4.7-4b), project design consistent with the Secretary of the Interior's *Standards for the Treatment of Historic Properties* to the extent feasible (Measure 4.7-4c), resource protection during construction (Measure 4.7-4e), and consideration of vibration effects (Measure 4.7-4f).

The Lawrence Livermore project (SJ-2) would construct new facilities, while the Tesla Portal Disinfection project (SJ-5) would replace and upgrade an existing facility that is not from the historic period. Therefore, this impact would *not apply* to these projects.

Sunol Valley Region

Impact 4.7-3: Impacts on the historical significance of a historic district or a contributor to a historic district		
Alameda Creek Fishery	SV-1	N/A
Calaveras Dam	SV-2	PSU
40-mgd Treated Water	SV-3	N/A
New Irvington Tunnel	SV-4	PSM
Treated Water Reservoirs	SV-5	N/A
SABUP	SV-6	PSM

The Calaveras Dam project (SV-2) would replace the earth-fill dam (built in 1925) with a new earth-fill dam to meet the seismic and public safety requirements of the California Department of Water Resources, Division of Safety of Dams (DSOD). As described in Chapter 3, Program Description, the DSOD imposed operating restrictions on Calaveras Dam in 2001 that limit the reservoir to approximately 40 percent of its historical capacity, or 38,100 acre-feet. According to the *Calaveras Dam Replacement Project: Final Conceptual Engineering Report* (URS, 2005), the DSOD imposed this interim operating level to accommodate the SFPUC's water needs, with the understanding that the SFPUC would pursue an aggressive schedule to address the dam's safety issues. Under the project, a replacement dam would be built immediately downstream of the existing dam and would restore Calaveras Reservoir's capacity of 96,850 acre-feet.

The project would demolish the existing dam, including its intake and outlet towers and other related structures. The new reservoir would inundate the original dam's location. During construction of the project, the existing dam would be used as a cofferdam (i.e., a temporary structure to keep water away from the construction site). The existing dam would then be leveled off to an elevation approximately 50 feet below the water level of the refilled reservoir. The material removed from the existing dam would be placed between the original dam and the replacement dam.

The Spring Valley Water Company built Calaveras Dam and its complex of structures between the 1910s and 1940. The project could affect a potential historic district that includes the dam and its structures, which would be likely contributors. This potential historic district would be associated with the construction of Calaveras Dam, which was a distinct planned development that greatly expanded the delivery of water from the Alameda Creek portion of the Spring Valley system.

Unlike the other WSIP projects involving former Spring Valley facilities, the existing dam and all its appurtenant structures would be removed under this project. The Calaveras Dam project (SV-2) would have a *potentially significant unavoidable* impact on a historic district (if one exists) that could include Calaveras Dam and its associated structures. Total demolition of a historical resource, such a historic district or most of the contributors to a historic district, usually cannot be reduced to a less-than-significant level.

One mitigation option, however, would be to identify alternatives that eliminate or reduce the need for demolition (Measure 4.7-4a). A technical memorandum, *Development of Calaveras Dam Replacement Project* (URS, 2005), summarizes an evaluation of project alternatives. The alternatives considered were: remediating or replacing the dam for the same reservoir storage (96,850 acre-feet), remediating or replacing the dam for increased reservoir storage (up to 420,000 acre-feet), and remediating or replacing the dam for the same reservoir storage while retaining an option for future enlargement. The alternatives were evaluated for their environmental impacts, implementability, cost, dam safety approval, as well as operational flexibility, maintainability, and reliability. The alternative chosen as the preferred alternative at that stage of planning was to replace (instead of remediate) the existing dam with a new earth-fill dam to be located downstream of the existing dam and designed with an open-chute spillway. The DSOD wrote the SFPUC in July 2005 expressing its approval of the conceptual design for this alternative. The next stage of planning, to be conducted as part of the separate, project-level CEQA analysis, will further assess the feasibility of this mitigation.

Even with implementation of Measure 4.7-3 and Measures 4.7-4a through 4.7-4f, the Calaveras Dam project's impact on most, or all, of a historic district's resources and character-defining features that would contribute to a potential historic district in this project area would be significant and unavoidable. Impacts on the subsidiary structures associated with the dam, including its intake and outlet towers, could be reduced through implementation of Measures 4.7-4a through 4.7-4f, including consistency with the Secretary of the Interior's *Standards for the Treatment of Historic Properties* and project redesign (Measure 4.7-4c). Despite these mitigation actions, the impacts would remain significant.

The Irvington Tunnel was built in 1934 as a part of the Hetch Hetchy Project. Under the New Irvington Tunnel project (SV-4), a new tunnel would be built parallel to and just south of the existing Irvington Tunnel to convey water from the Hetch Hetchy system and the Sunol Valley WTP to the Bay Area. A new portal would be constructed at the east end adjacent to the existing Alameda West Portal in the Sunol Valley, with connections to the existing and proposed Alameda Siphons. A new portal would also be built at the west end adjacent to the existing Irvington Portal in Fremont, with connections to the existing Bay Division Pipelines as well as to pipelines installed under the BDPL Reliability Upgrade project (BD-1). The existing Irvington Tunnel and the Irvington and Alameda West Portals could be considered contributors to a potential historic district related to the implementation of John R. Freeman's plan for the development of the Hetch Hetchy system. Because use of the existing Irvington Tunnel would continue as originally designed, and the project would create a new component of the system (a new, redundant tunnel) rather than eliminate the existing tunnel, the impact on such a potential historic district would be less than significant. However, the existing Irvington Portal would be demolished as part of this project, which would result in a *potentially significant* impact on the potential historic district; however, because of the nature of the projects, the impact would be reduced to a less-than-significant level with implementation of Measure 4.7-3, which requires evaluation of historic districts, and Measures 4.7-4a and 4.7-4f, which require surveys and documentation of historic resources. The removal of Irvington Portal and the modification of the Alameda West Portal would not likely disqualify a potential Hetch Hetchy historic district from being considered a historical resource for the purposes of CEQA. However, the determination of impact significance would be made during project-level CEQA review of the New Irvington Tunnel project.

The SABUP project (SV-6) would construct three new facilities: the San Antonio Backup Pipeline, the San Antonio Creek Discharge Facilities, and the Alameda East Portal Vent Overflow Pipeline. This project also includes modifications to the existing Alameda East Portal, which was built in 1934. This structure could be a contributor to a potential historic district related to the implementation of John R. Freeman's plan for the development of the Hetch Hetchy system. The SABUP project would have a *potentially significant* impact on a historic district, but because the portal would continue to function, the impact would be reduced to a less-than-significant level with implementation of Measure 4.7-3, which requires evaluation of historic districts, and Measures 4.7-4b and 4.7-4d, which require documentation and surveys of historic resources. In addition, both projects would be carried out in a manner that is consistent with the Secretary of the Interior's *Standards for the Treatment of Historic Properties* (Measure 4.7-4c).

The Alameda Creek Fishery (SV-1), 40-mgd Treated Water (SV-3), and Treated Water Reservoirs (SV-5) projects would not affect historical resources because they would involve construction of new facilities or upgrades to non-historic facilities. Therefore, this impact would *not apply* to these projects.

Bay Division Region

Impact 4.7-3: Impacts on the historical significance of a historic district or a contributor to a historic district		
BDPL Reliability Upgrade	BD-1	PSM
BDPL 3 and 4 Crossovers	BD-2	PSM
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	PSM

The Bay Division Pipelines were completed between 1925 and 1952 (1925 for Pipeline No. 1; 1935–1936 for Pipeline No. 2; 1952 for Pipeline No. 3). Under the BDPL Reliability Upgrade project (BD-1), a new Bay Division Pipeline (No. 5) would be built from the Irvington Portal in Fremont to the Pulgas Tunnel near Redwood City. Portions of Pipeline No. 1 would be removed or decommissioned to repair the pipeline. Approximately 1.4 miles of pipeline between the Edgewood and Pulgas Valve Lots would be removed, and aboveground and submarine sections of Bay Division Pipelines Nos. 1 and 2 would be decommissioned. The BDPL 3 and 4 Crossovers project (BD-2) would construct three additional crossover facilities along the Bay Division Pipelines to provide operational flexibility for maintenance and emergencies. The BDPL 3 and 4 Seismic Upgrade at Hayward Fault project (BD-3) would replace portions of the Bay Division Pipelines Nos. 3 and 4 with seismically resistant sections.

One or more of the Bay Division Pipelines could be a contributor to a potential historic district related to the implementation of John R. Freeman's plan for the development of the Hetch Hetchy system. All three projects in this region could have a *potentially significant* impact on this potential historic district. However, because of the nature of the projects, this impact would be reduced to a less-than-significant level with implementation of Measure 4.7-3, which requires evaluation of historic districts, and Measures 4.7-4b and 4.7-4d, which include surveys and documentation of historic resources. In addition, all three projects must be carried out in a manner that is consistent with the Secretary of the Interior's *Standards for the Treatment of Historic Properties* (Measure 4.7-4c). It should be noted that portions of the existing pipelines would remain following construction.

Peninsula Region

Impact 4.7-3: Impacts on the historical significance of a historic district or a contributor to a historic district

Baden and San Pedro Valve Lots	PN-1	N/A
CS/SA Transmission	PN-2	PSU
HTWTP Long-Term	PN-3	N/A
Lower Crystal Springs Dam	PN-4	PSM
Pulgas Balancing Reservoir	PN-5	N/A

The Spring Valley Water Company built Upper Crystal Springs Dam in 1877 and Lower Crystal Springs Dam in 1890. Crystal Springs/San Andreas Pipeline was built between 1898 and 1932 and may include portions built by the Spring Valley Water Company and portions built by the City of San Francisco. The Crystal Springs Pump Station, built in 1933, is also located in this vicinity.

These structures, and other associated structures that may be located near them, could be contributors to a potential historic district. It is unclear at this time to what specific historical context and planned development each of these resources may be associated. There could be a historic district related to all or a portion of the Spring Valley Water Company's development of Crystal Springs Reservoir or San Andreas Reservoir. There could also be a historic district that includes the historical context related to San Francisco's incorporation of this portion of the former Spring Valley facilities into the municipal system.

The CS/SA Transmission project (PN-2) would seismically improve existing facilities, including replacing or refurbishing the existing Crystal Springs Pump Station. Although it has not been determined at this time whether a district in this area exists or whether modification of the Crystal Springs/San Antonio Pipeline and demolition of the Crystal Springs Pump Station would significantly affect the historic integrity of such a potential district, this PEIR conservatively considers this impact on a historic district (if one exists) to be a *potentially significant unavoidable*. Even with protection of historic districts (Measures 4.7-3) and implementation of Measures 4.7-4a through 4.7-4f, which include historical surveys and documentation prior to demolition as well as compliance with the Secretary of the Interior's *Standards for the Treatment of Historic Properties* (Measure 4.7-4c), the CS/SA Transmission project's impact on most, or all, of a historic district's resources and character-defining features that would contribute to a potential historic district in this project area could be significant.

Under the Lower Crystal Spring Dam project (PN-4), the existing dam would be repaired to comply with DSOD requirements, and the dam would continue to function as originally designed. This project could have a *potentially significant* impact on one or more historic districts. One of these historic districts may include the Lower Crystal Springs Dam, which is already listed in the National Register and would be considered an individual historical resource for the purposes of CEQA compliance. It is expected, however, that protection of historic districts (Measure 4.7-3), and implementation of Measures 4.7-4a through 4.7-4f, which include historical surveys, documentation, compliance with the Secretary of the Interior's *Standards for the Treatment of Historic Properties*, and project redesign, could reduce this impact to a less-than-significant level, especially since most of the existing dam would remain following construction.

The other WSIP projects in this region (Baden and San Pedro Valve Lots, PN-1; HTWTP Long-Term, PN-3; and Pulgas Balancing Reservoir, PN-5) would affect non-historic facilities. Therefore, this impact would *not apply* to these projects.

San Francisco Region

Impact 4.7-3: Impacts on the historical significance of a historic district or a contributor to a historic district		
SAPL 3 Installation	SF-1	PSM
Groundwater Projects	SF-2	N/A
Recycled Water Projects	SF-3	N/A

The SAPL 3 Installation project (SF-1) would replace the existing Baden-Merced Pipeline, which was built in the late 1890s, and would construct a new pipeline extension of San Andreas Pipeline No. 3. Portions of the Baden-Merced Pipeline would be removed where its alignment merges with the San Andreas Pipeline No. 3 alignment.

It is unclear, at this time, to which planned development the Baden-Merced Pipeline is associated and to what potential historic district (if any) it could be a contributor. The structure could be a contributor to a potential historic district associated with the development of a portion of the Spring Valley Water Company's system on the Peninsula. The SAPL 3 Installation project (SF-1) would remove and permanently decommission portions of this pipeline, which would constitute a *potentially significant* impact. It is expected, however, that protection of historic districts (Measure 4.7-3), and implementation of Measures 4.7-4a through 4.7-4f, which include historical surveys, documentation, compliance with the Secretary of the Interior's *Standards for the Treatment of Historic Properties*, and project redesign, could reduce this impact to a less-than-significant level, especially since at least portions of the existing pipeline would remain following construction.

The Groundwater Projects (SF-2) and Recycled Water Projects (SF-3) would add new facilities to the system or upgrade existing non-historic facilities. Because these projects would not affect historic components of the regional system, this impact would *not apply* to these projects.

Impact 4.7-4: Impacts on the historical significance of individual facilities resulting from demolition or alteration.

Some of the WSIP projects have the potential to cause a substantial adverse change (i.e. an adverse impact) on the historical significance of individual facilities within the regional water system.

Implementation of the WSIP could result in two types of adverse impacts on the historical significance of individual facilities: demolition or alteration. The demolition or destruction of a facility with historical significance is considered a significant impact under CEQA. Development of alternatives to the project, such as relocating a proposed facility to avoid demolition (Measure 4.7-3), would reduce this significant impact to a less-than-significant level. However, if relocation were not feasible, this impact would likely be significant and unavoidable, even with historical documentation prior to demolition (Measure 4.7-4b).

Alteration of a historical resource includes directly modifying a facility with historical significance or making an alteration that physically connects new elements with a historic facility. Such effects are considered potentially significant, because the historic fabric of the facility could be altered. Implementation of SFPUC Construction Measure #9 (cultural resources evaluation) along with historical documentation (Measure 4.7-4b) and compliance with the Secretary of the Interior's *Standards for the Treatment of Historic Properties* (Measure 4.7-4c) would reduce potential impacts to a less-than-significant level.

Numerous WSIP projects would entail the replacement, repair, or alteration of water conveyance pipelines. Many of these facilities are old enough to be considered potential historical resources under CEQA. To be individually eligible, a pipeline would have to stand on its own merits as a resource that reaches the significance threshold under one or more National Register or California Register criteria. For example, for a pipeline to be considered under Criterion A / Criterion 1, it would have to be related to important events or processes beyond simply providing water to a city; water supply facilities are inherently important to the towns they serve, as are city streets, schools, hospitals, and other infrastructural elements. To avoid an overly broad characterization of water delivery pipelines as important historical resources, they must be demonstrably significant to our history beyond simply delivering water in support of urban growth. All municipal water systems possess this characteristic. Engineering structures and features are infrequently, if ever, found to be significant under Criterion B / Criterion 2. Important historic persons associated with engineering structures and features are usually involved with their design, thus making them significant under Criterion C / Criterion 3, as the "work of a master." Under Criterion C / Criterion 3, a pipeline would need to be significant in the context of municipal water system engineering as an innovative and important example of water conveyance or transfer technology within a distinct period of significance. Such a feature might also be significant as an important work of a master engineer or builder. Criterion D / Criterion 4 is rarely applied, as archival data are usually sufficient to provide information related to historic engineering features.

Historic resources are often aboveground and visible, and alteration of aboveground facilities, if sufficiently extensive, would be potentially significant. However, the SFPUC regional water system includes numerous underground pipelines. The report entitled *Water Conveyance Systems in California* (JRP Historical Consulting Services and Caltrans, 2000) indicates that to retain historic integrity, the "property's essential physical features, important elements that were present during the historic period, must be present and visible." However, for the purposes of this analysis, a conservative assumption has been made that impacts on all pipelines built during the historical period, whether visible or not, are potentially significant. The impact could be reduced to a less-than-significant level through implementation of Measures 4.7-4a through 4.7-4f. More detailed information about the historical significance of the individual facility, its integrity, and compliance with the Secretary of the Interior's *Standards for the Treatment of Historic Properties* would be provided during separate, project-level CEQA review for each of the WSIP projects.

Some projects might alter or indirectly affect a historic facility, but impacts cannot be determined because the design or location of the proposed facility is not yet known. For these projects, implementation of SFPUC Construction Measure #9 (cultural resources), which requires preconstruction screening and further investigation/protection as necessary, is expected to adequately reduce potential impacts to a less-than-significant level.

To summarize, for the purposes of analyzing the potential impacts on the historical significance of individual facilities, a project is considered to have a potentially significant impact if it would demolish or make significant alterations to a presumed historic facility. A project would have a less-than-significant impact if work would be done on a historic facility, but the work would have a minimal effect on the qualities or characteristics that make the resource significant. This impact would not apply to projects that would either construct a new facility or replace or upgrade a non-historic facility.

San Joaquin Region

Impact 4.7-4: Impacts on the historical significance of individual facilities resulting from demolition or alteration		
Advanced Disinfection	SJ-1	PSM
Lawrence Livermore	SJ-2	N/A
SJPL System	SJ-3	PSM
SJPL Rehabilitation	SJ-4	PSM
Tesla Portal Disinfection	SJ-5	N/A

Two of the San Joaquin Pipelines were built during the assumed period of historical significance of the Hetch Hetchy system (1932 for Pipeline No. 1, and 1953 for Pipeline No. 2). If this pipeline system were considered to be eligible for listing in the National Register or California Register, it would be considered a historical resource for the purposes of CEQA.

The SJPL Rehabilitation project (SJ-4) would rehabilitate existing pipelines. Although the pipeline system would retain its historical function, the pipelines themselves could be altered enough to cause a substantial adverse change in their historical significance. This impact would be *potentially significant*, even though some pipeline segments are underground. It is expected, however, that SFPUC Construction Measure #9 (cultural resource screening) along with mitigation measures, such as historical documentation and compliance with the Secretary of the Interior's *Standards for the Treatment of Historic Properties* (Measures 4.7-4a through 4.7-4f), could reduce this impact to a less-than-significant level.

The SJPL System project (SJ-3) would add a new pipeline at the east and west ends of the San Joaquin Pipeline right-of-way, would modify the existing Oakdale Portal, and replace non-historic facilities. This impact would be *potentially significant*. It is expected, however, that SFPUC Construction Measure #9 (cultural resource screening) along with mitigation measures, such as historical documentation and compliance with the Secretary of the Interior's *Standards for the Treatment of Historic Properties* (Measures 4.7-4a through 4.7-4f), could reduce this impact to a less-than-significant level.

The Advanced Disinfection project (SJ-1) would modify the existing Tesla Portal. This impact would be *potentially significant*. It is expected, however, that SFPUC Construction Measure #9 (cultural resource screening) along with mitigation measures, such as historical documentation and compliance with the Secretary of the Interior's *Standards for the Treatment of Historic Properties* (Measures 4.7-4a through 4.7-4f), could reduce this impact to a less-than-significant level.

The Lawrence Livermore project (SJ-2) would construct new facilities, and the Telsa Portal Disinfection project (SJ-5) would replace and upgrade an existing facility that is not historic. Therefore, this impact would *not apply* to these projects.

Sunol Valley Region

Impact 4.7-4: Impacts on the historical significance of individual facilities resulting from demolition or alteration		
Alameda Creek Fishery	SV-1	N/A
Calaveras Dam	SV-2	PSU
40-mgd Treated Water	SV-3	N/A
New Irvington Tunnel	SV-4	PSU
Treated Water Reservoirs	SV-5	N/A
SABUP	SV-6	PSM

Calaveras Dam was built in 1925 and is currently being evaluated for its eligibility for listing in the National Register and California Register. As described under Impact 4.7-3, the Calaveras Dam project (SV-2) would destroy the existing dam and associated structures and replace them with new dam structures downstream of the location of the original dam. This impact on the historic facility would be *potentially significant and unavoidable* if this complex of resources were considered to be a historical resource for the purposes of CEQA compliance. This impact would be unavoidable even with the application of Measures 4.7-4a through 4.7-4f, which include identification of alternatives and/or relocation of historic resources and documentation of historic sites prior to demolition.

Under the New Irvington Tunnel project (SV-4), the existing Irvington Tunnel would continue its historical role and would not be affected in terms of its function; however, this project would demolish the unique spherical Irvington Portal in Fremont and modify the Alameda West Portal. The impact on the Irvington Portal would be *potentially significant and unavoidable* if the Irvington Portal were determined to be eligible for listing in the National Register or California Register and if relocation of the historic portal were not feasible (Measure 4.7-4a). This impact would be potentially significant and unavoidable even with implementation of Measures 4.7-4a through 4.7-4f, which include historical documentation prior to demolition. Impacts on the Alameda West Portal would be *potentially significant*. It is expected, however, that implementation of Measures 4.7-4a through 4.7-4f, which include historical documentation and compliance with the Secretary of the Interior's *Standards for the Treatment of Historic Properties*, could reduce the impact on the Alameda West Portal to a less-than-significant level.

The SABUP project (SV-6) would construct a new pipeline from the existing overflow outlet near Alameda East Portal to the discharge point on Alameda Creek and would modify the Alameda East Portal, which was built in 1934. If the Alameda East Portal were considered to be a historical resource for the purposes of CEQA compliance, this impact would be *potentially significant*. It is expected, however, that implementation of SFPUC Construction Measure #9 (cultural resource screening) along with Measures 4.7-4a through 4.7-4f, which include historical documentation and compliance with the Secretary of the Interior's *Standards for the Treatment of Historic Properties*, could reduce this impact to a less-than-significant level.

The Alameda Creek Fishery (SV-1), 40-mgd Treated Water (SV-3), and Treated Water Reservoirs (SV-5) projects would not affect historical resources because they involve the construction of new facilities. Therefore, this impact would *not apply* to these projects.

All of the WSIP projects in the Sunol Valley are located in the *Alameda Watershed Management Plan* (Alameda WMP) area. The cultural resource policies and actions of the WMP would guide the implementation of these projects. The Alameda WMP's actions for cultural resources are:

1) Conduct appropriate levels of review in conjunction with the review process for proposed plans and projects, prior to operations and maintenance activities as well as construction activities involving surface disturbance and/or excavation to avoid damage to buried cultural resources in the vicinity of known sites and within mapped cultural sensitivity zones. Sensitivity zones generally include valley floors adjacent to water sources, other flat terrain near creeks and springs, and level areas along ridgetops. Guidelines include:

    A) Prior to any excavation activities, request a database check from the watershed GIS operator and the State of California database for any known cultural resources or sensitive areas within the vicinity of proposed exaction activity.

    B) Authorize archival research and field reconnaissance by a certified specialist or archaeologist of any project site and vicinity of proposed surface disturbance and/or excavation.

    C) Consult with the local Native American tribes as required by federal, state, and local requirements when considering subsurface testing and excavation of prehistoric and archaeological sites. All aspects of proposed actions shall be addressed, including the treatment of cultural materials and in particular the removal, study, and reinternment of Native American burials.

    D) Recommend project modifications or alternative sites that would avoid adverse effects to highly sensitive and significant cultural resource sites and features, including developing and implementing mitigation measures in accordance with all applicable state and federal laws.

2) Authorize data recovery by qualified professionals in circumstances where archaeological deposits cannot be preserved through avoidance or protection measures. (Guidelines are described in the watershed management plan.)

3) When considering demolition or alteration of a historic structure, consult with an architectural historian to determine the feasibility and suitability of relocation; although the integrity of setting would be lost, the structure would be preserved.

4) Evaluate and document the significance of cultural resources threatened by demolition or alteration through application of criteria set forth in the Secretary of the Interior's Standards and Guidelines, CEQA Guidelines, and the California Register of Historical Resources. Where applicable, recommend registration of cultural resources deemed to be eligible for the National Register of Historic Places and the California Register of Historical Resources.

5) Employ nondestructive methods when undertaking research activities, to the maximum extent feasible and where practical, to leave the features of sites and structures in place. Data, objects, and specimens recovered from research sites shall be conserved and curated according to legal requirements.

6) Suspend excavation activities in the event that suspected cultural resources are uncovered; consult with a qualified archaeologist regarding the significance, disposition, and treatment of artifacts; and revise, as necessary, excavation plans to avoid and/or minimize damage to known cultural resources.

7) Suspend excavation activities in the event that human remains are discovered, and immediately inform the county coroner. Consult with a qualified archaeologist to determine if the remains are of Native American origin, and if so, contact the California Native American Heritage Commission to identify most likely descendants for instructions regarding the treatment and disposition of human remains and associated grave artifacts.

8) When previously unknown cultural resources are discovered, report new findings to the California Historical Resources Information System using standard descriptive methods.

9) Implement protective measures, where necessary, to eliminate and minimize potentially negative effects of public access on cultural resources. (Guidelines are described in the watershed management plan.)

10) Prior to initiating new construction, consider reuse of existing historic structures for departmental uses. Prior to modifying historic structures, an architectural historian shall be consulted to determine the feasibility and suitability of any modifications.

11) Periodically inspect historic structures for pest damage and use Integrated Pest Management techniques to control pests in historic structures.

12) Periodically monitor known significant cultural resource sites for evidence of disturbance, damage, or vandalism.

Bay Division Region

Impact 4.7-4: Impacts on the historical significance of individual facilities resulting from demolition or alteration		
BDPL Reliability Upgrade	BD-1	PSM
BDPL 3 and 4 Crossovers	BD-2	PSM
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	PSM

The Bay Division Pipelines were built between 1925 and 1936 as a part of the Hetch Hetchy Project. Under the BDPL Reliability Upgrade project (BD-1), a buried section of Bay Division Pipeline No. 1 between the Edgewood and Pulgas Valve Lots would be removed (approximately 1.4 miles) and replaced by a new buried pipeline (Pipeline No. 5). Although most of this pipeline is buried, short stretches are visible where it crosses the creek. The longer visible portions of the pipeline, from the Newark Valve House to the Ravenswood Valve House, would be decommissioned but kept in place. These impacts, on both the underground pipeline and the visible pipelines, would be *potentially significant* if the pipelines were considered to be individual historical resources for the purposes of CEQA compliance. With implementation of SFPUC Construction Measure #9 (cultural resources), as well as implementation of Measures 4.7-4a through 4.7-4f, which include historical documentation and compliance with the Secretary of the Interior's *Standards for the Treatment of Historic Properties*, the impact of this project would be reduced to a less-than-significant level.

The BDPL 3 and 4 Crossovers project (BD-2) would construct three additional crossover facilities along the Bay Division Pipelines. The BDPL 3 and 4 Seismic Upgrade at Hayward Fault (BD-3) would remove and replace portions of Pipeline No. 3, which was built in 1952. Impacts from these projects would be *potentially significant* if the pipelines were considered to be individual historical resources for the purposes of CEQA compliance. However, implementation of SFPUC Construction Measure #9 (cultural resources), as well as implementation of Measures 4.7-4a through 4.7-4f, which include historical documentation and compliance with the Secretary of the Interior's *Standards for the Treatment of Historic Properties*, could reduce these impacts to a less-than-significant level.

Peninsula Region

Impact 4.7-4: Impacts on the historical significance of individual facilities resulting from demolition or alteration		
Baden and San Pedro Valve Lots	PN-1	N/A
CS/SA Transmission	PN-2	PSU
HTWTP Long-Term	PN-3	N/A
Lower Crystal Springs Dam	PN-4	PSU
Pulgas Balancing Reservoir	PN-5	N/A

The Lower Crystal Springs Dam project (PN-4) would alter the historic fabric of the dam, which was built in 1890 as part of a separate plan of development by the Spring Valley Water Company. The Lower Crystal Springs Dam was previously determined eligible for listing in the National Register and would be considered a historical resource for the purposes of CEQA. The impact from this project would thus be potentially significant. Depending on the proposed extent of alteration, it is possible that impacts could be reduced to a less-than-significant level with implementation of SFPUC Construction Measure #9 (cultural resources), as well as implementation of Measures 4.7-4a through 4.7-4f, which include historical documentation and compliance with the Secretary of the Interior's *Standards for the Treatment of Historic*

Properties. However, since the extent of the work on the historic dam is not yet known, this impact is conservatively considered to be *potentially significant and unavoidable*.

The Crystal Springs/San Andreas Pipeline was built between 1898 and 1932. The CS/SA Transmission project (PN-2) would upgrade or replace the existing Crystal Springs Pump Station. Approximately 144 feet of aboveground flume would be modified or replaced. Assuming for the purposes of this analysis that the building would be considered a historical resource for the purposes of CEQA compliance, alteration or replacement of the historic fabric of the pump station is conservatively considered to be *potentially significant and unavoidable*. However, depending on the proposed extent of alteration, it is possible that impacts could be reduced to a less-than-significant level with historical documentation and compliance with the Secretary of the Interior's *Standards for the Treatment of Historic Properties* and project redesign (Measures 4.7-4b and 4.7-4c). This project would also remove and replace the existing Crystal Springs/San Andreas Pipeline. If the pipeline were considered to be a historical resource for the purposes of CEQA, the project's impact on the pipeline could be reduced to a less-than-significant level with implementation of SFPUC Construction Measure #9 (cultural resources), as well as implementation of Measures 4.7-4a through 4.7-4f, which include historical documentation and compliance with the Secretary of the Interior's *Standards for the Treatment of Historic Properties*.

The Lower Crystal Springs Dam (PN-4) and CS/SA Transmission (PN-2) projects are located within the *Peninsula Watershed Management Plan* (Peninsula WMP) area. The Peninsula WMP's cultural resource policies (which are the same as those presented above under the Sunol Valley Region for the Alameda WMP) and cultural resource actions provide guidelines for proposed construction associated with these projects.

The other WSIP projects in this region (Baden and San Pedro Valve Lots, PN-1; HTWTP Long-Term, PN-3; and Pulgas Balancing Reservoir, PN-5) would affect non-historic facilities. Therefore, this impact would *not apply* to these projects.

San Francisco Region

Impact 4.7-4: Impacts on the historical significance of individual facilities resulting from demolition or alteration		
SAPL 3 Installation	SF-1	PSM
Groundwater Projects	SF-2	N/A
Recycled Water Projects	SF-3	LS

The SAPL 3 Installation project (SF-1) would replace the existing Baden-Merced Pipeline, which was built in the late 1890s, and would construct a new pipeline extension of San Andreas Pipeline No. 3. Portions of the Baden-Merced Pipeline would be removed where its alignment merges with the San Andreas Pipeline No. 3 alignment. Because portions of the existing pipeline would be removed, this impact would be *potentially significant* if the pipeline were considered to be a historical resource for the purposes of CEQA compliance. The project's impact on these pipelines could be reduced to a less-than-significant level with implementation of SFPUC Construction Measure #9 (cultural resources), as well as implementation of Measures 4.7-4a through 4.7-4f, which include historical documentation and compliance with the Secretary of the Interior's *Standards for the Treatment of Historic Properties*.

Because demolition under the Groundwater Projects (SF-2) would be limited to paved parking areas and playgrounds at the Francis Scott Key School Annex, and West and South Sunset Playgrounds, this impact would *not apply* to this project.

The Recycled Water Projects (SF-3) are not expected to affect historic water system facilities. If it is found after final facility locations are determined that historic resources could be adversely affected, implementation of SFPUC Construction Measure #9 (cultural resources) would ensure that impacts are *less than significant.*

Impact 4.7-5: Impacts on adjacent or nearby historic architectural resources.

Demolition, alteration, or other construction activities could also affect historic resources that are located near WSIP projects. These individual facilities or historic districts could include both SFPUC and non-SFPUC structures, and the types of impacts could be either direct or indirect. In particular, impacts on a nearby building associated with the Spring Valley Water Company could constitute significant impacts on potential historic districts united by plan and development. Impacts on non-SFPUC buildings near a WSIP project would not constitute significant impacts on the water system or its individual facilities, but would have to be evaluated in their own specific contexts at the project level.

Construction activities could cause indirect effects, such as damage due to vibration, staging and material storage, or the operation of construction equipment. With respect to vibration, construction activities could cause cosmetic or structural damage to buildings and structures (see Section 4.10, Noise and Vibration, for more discussion). Implementation of mitigation measures requiring the preparation of historic resources surveys and historic resource protection plans, vibration protection measures, and preconstruction surveys (Measures 4.7-4a through 4.7-4f), as appropriate, would reduce this potential impact to a less-than-significant level.

This analysis identifies historic SFPUC facilities that could be indirectly affected by the WSIP because they are located in or adjacent to the WSIP study area. The following information is based on project information presented in Chapter 3, Program Description, and Appendix C. It does not include all of the historic SFPUC and non-SFPUC resources in the WSIP study area. Implementation of SFPUC Construction Measure #9 (cultural resources) would require preconstruction screening to determine whether adjacent historic resources could be affected by the WSIP projects.

San Joaquin Region

Impact 4.7-5: Impacts on adjacent historic architectural resources		
Advanced Disinfection	SJ-1	LS
Lawrence Livermore	SJ-2	LS
SJPL System	SJ-3	PSM
SJPL Rehabilitation	SJ-4	PSM
Tesla Portal Disinfection	SJ-5	PSM

Two of the existing San Joaquin Pipelines were built in 1932 and 1953 (1932 for Pipeline No. 1, and 1953 for Pipeline No. 2). The SJPL System project (SJ-3) would add a new pipeline at the west and east ends of the San Joaquin right-of-way. The SJPL Rehabilitation project (SJ-4) would rehabilitate existing pipelines. While direct impacts on these pipelines are addressed in the previous impact (Impact 4.7-4), construction activities associated with both of these projects could indirectly affect the adjacent existing pipelines. Potential impacts associated with these two projects would be *potentially significant*. In addition to SFPUC Construction Measure #9 (cultural resources), implementation of mitigation measures requiring the preparation of historic resources surveys and protection plans, vibration protection measures, and preconstruction surveys (Measures 4.7-4a through 4.7-4f), as appropriate, would reduce this potential impact to a less-than-significant level.

The caretaker's residence associated with the Tesla Portal Disinfection project (SJ-5) could be altered or modified, depending on the design of proposed improvements. This residence is a potentially contributing feature to a historic district (San Francisco Planning Department, 2000), and impacts on this structure could be *potentially significant*. In addition to SFPUC Construction Measure #9 (cultural resources), implementation of mitigation measures requiring the preparation of historic resources surveys and protection plans, vibration protection measures, and preconstruction surveys (Measures 4.7-4a through 4.7-4f), as appropriate, would reduce this potential impact to a less-than-significant level.

The Advanced Disinfection (SJ-1) and Lawrence Livermore (SJ-2) projects would construct new facilities and would replace and upgrade existing non-historic facilities. With implementation of SFPUC Construction Measure #9 (cultural resources), requiring preconstruction screening for historic resources adjacent to these projects, the impact of these two projects would be *less than significant*.

Sunol Valley Region

Impact 4.7-5: Impacts on adjacent historic architectural resources		
Alameda Creek Fishery	SV-1	LS
Calaveras Dam	SV-2	PSM
40-mgd Treated Water	SV-3	LS
New Irvington Tunnel	SV-4	PSM
Treated Water Reservoirs	SV-5	LS
SABUP	SV-6	PSM

The Calaveras Dam project (SV-2) could affect the tender's (or watershed keeper's) residence, barn, and other historic structures, if any, at the dam site. The New Irvington Tunnel project (SV-4) could affect the historic components of the portals and tunnel, including the Irvington and Alameda West Portal Valve Houses and the caretaker's house. The SABUP project (SV-6) would conduct work within the area of the existing Alameda East Portal, which was built in 1934. The potential impacts associated with these projects would be *potentially significant*. In addition to SFPUC Construction Measure #9 (cultural resources), implementation of mitigation measures requiring the preparation of historic resources surveys and protection plans, vibration protection measures, and preconstruction surveys (Measures 4.7-4a through 4.7-4f), as appropriate, would reduce this potential impact to a less-than-significant level.

Implementation of SFPUC Construction Measure #9 (cultural resources), which would require preconstruction surveys to confirm the presence of historic resources adjacent to the Alameda Creek Fishery (SV-1), 40-mgd Treated Water (SV-3), and Treated Water Reservoirs (SV-5) projects as well as further investigation and protection as necessary, would ensure that impacts are *less than significant.*

Bay Division Region

Impact 4.7-5: Impacts on adjacent historic architectural resources		
BDPL Reliability Upgrade	BD-1	PSM
BDPL 3 and 4 Crossovers	BD-2	PSM
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	PSM

As described above, the Bay Division Pipeline system was built between 1925 and 1936. While direct impacts on these pipelines are addressed in the previous impact (Impact 4.7-4), construction activities associated with these projects could indirectly affect the adjacent existing pipelines. Potential impacts associated with these projects would be *potentially significant*. In addition to SFPUC Construction Measure #9 (cultural resources), implementation of mitigation measures requiring the preparation of historic resources surveys and protection plans, vibration protection measures, and preconstruction surveys (Measures 4.7-4a through 4.7-4f), as appropriate, would reduce this potential impact to a less-than-significant level.

Peninsula Region

Impact 4.7-5: Impacts on adjacent historic architectural resources		
Baden and San Pedro Valve Lots	PN-1	LS
CS/SA Transmission	PN-2	PSM
HTWTP Long-Term	PN-3	LS
Lower Crystal Springs Dam	PN-4	PSM
Pulgas Balancing Reservoir	PN-5	PSM

Facilities in the Lower Crystal Springs Dam vicinity were built during the historic period. The Lower Crystal Springs Dam was built in 1890. The Crystal Springs/San Andreas Pipeline was built between 1898 and 1932. The Crystal Springs Pump Station was built in 1933. In addition to potential direct impacts on these historic resources (addressed under Impact 4.7-4), the CS/SA Transmission (PN-2), Lower Crystal Springs Dam (PN-4), and Pulgas Balancing Reservoir (PN-5) projects could result in *potentially significant* impacts on adjacent historic resources, given the age of this portion of the regional water system. In addition to SFPUC Construction Measure #9 (cultural resources), implementation of mitigation measures requiring the preparation of historic resources surveys and protection plans, vibration protection measures, and preconstruction surveys (Measures 4.7-4a through 4.7-4f), as appropriate, would reduce this potential impact to a less-than-significant level.

The Baden and San Pedro Valve Lots (PN-1) and HTWTP Long-Term (PN-3) projects are upgrades of non-historic-era facilities. Implementation of SFPUC Construction Measure #9 (cultural resources), which would require preconstruction screening surveys to confirm the presence of historic resources adjacent to these projects as well as further investigation and protection as necessary, would ensure that impacts associated with these projects are *less than significant*.

San Francisco Region

Impact 4.7-5: Impacts on adjacent historic architectural resources		
SAPL 3 Installation	SF-1	PSM
Groundwater Projects	SF-2	LS
Recycled Water Projects	SF-3	PSM

The facility locations for the Recycled Water Projects (SF-3) have not yet been determined. If the San Francisco Zoo is selected as a site for this recycled water treatment facility, the historic Fleishhacker Bath House, which was built in 1925, could be indirectly affected. Impacts of the Recycled Water Projects on this structure would be *potentially significant* and would be evaluated during separate, project-level CEQA review. In addition to SFPUC Construction Measure #9 (cultural resources), implementation of mitigation measures requiring the preparation of historic resources surveys and protection plans and historical documentation (Measures 4.7-4a through 4.7-4f), as appropriate, would reduce this potential impact to a less-than-significant level.

The SAPL 3 Installation project (SF-1) would extend an existing non-historic pipeline (San Joaquin Pipeline No. 3). This project would also remove or decommission portions of the existing Baden-Merced Pipeline, which was built in the late 1890s. Portions of the Baden-Merced Pipeline would be removed where its alignment merges with that of San Joaquin Pipeline No. 3. Where its alignment diverges from the San Joaquin Pipeline alignment, it would be capped and filled with slurry. Because portions of the existing Baden-Merced Pipeline would be removed and other portions decommissioned, the impact on the historical significance of the adjacent architectural resources would be *potentially significant*. In addition to SFPUC Construction Measure #9 (cultural resources), implementation of mitigation measures requiring the preparation of historic resources surveys and protection plans and historical documentation (Measures 4.7-4a through 4.7-4f), as appropriate, would reduce this potential impact to a less-than-significant level.

The Groundwater Projects (SF-2) would build new facilities or upgrade non-historic-era facilities. With implementation of SFPUC Construction Measure #9 (cultural resources), which would require preconstruction screening surveys to confirm the presence of historic resources near or adjacent to these projects as well as further investigation and protection as necessary, potential impacts on any adjacent or nearby historic resources would be *less than significant*.

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4.8 Traffic, Transportation, and Circulation

4.8 Traffic, Transportation, and Circulation

4.8.1 Setting

This section presents the existing transportation network for the five WSIP regions. Preferred and alternative sites for WSIP projects are located in seven counties, including unincorporated areas within these counties and 25 cities (see Table 3.8, Chapter 3). The roadway network that would be used for project construction and/or as access routes for construction workers and construction vehicles include regional highways and freeways, local arterials, local residential streets, as well as rural roadways.

Many regional highways and freeways serve more than one WSIP region; depending on the origin and destination of the construction-related vehicles, vehicle trips associated with a particular WSIP project could travel on regional facilities in multiple regions. For each region, the location of interchanges and daily traffic volumes are presented for facilities in the vicinity of the WSIP projects in that region. Average daily traffic volumes on these facilities are based on the most recent data published by the California Department of Transportation (Caltrans). **Table 4.8-1** summarizes the average annual daily traffic volumes on regional facilities serving the five WSIP regions.

San Joaquin Region

Regional and Local Roadways

Regional access to the San Joaquin Region is provided by Interstate 5 (I-5) and Highway 99, both major north-south freeways containing between four and eight travel lanes. I-5 runs between the Canadian border in Washington State to the north and the Mexican border in San Diego to the south. Highway 99 connects with I-80 near Sacramento to the north and I-5 in Bakersfield to the south. The nearest interchanges with local access roadways to WSIP projects are Highway 132 at I-5 and Highway 120 at Highway 99.

In addition, I-580 provides east-west access between the San Francisco–Oakland Bay Bridge to the west and I-5 in San Joaquin County to the east. I-580 is a four-lane freeway in the San Joaquin Region, with an interchange at Highway 132. The average daily traffic volumes on the regional freeways in the vicinity of the WSIP projects are about 23,000 vehicles on I-5, 126,000 vehicles on Highway 99, and 38,000 vehicles on I-580.

Highway 132 (Vernalis Road), Highway 108/120, and Highway 120 serve as access routes for the WSIP projects in the San Joaquin Region. These roadways generally contain two to four travel lanes and do not provide on-street parking. Average daily traffic volumes on these roadways range between 20,000 and 30,000 vehicles. Local roadways in the immediate vicinity of the project sites are primarily two-lane rural roadways.

In the cities of Modesto and Riverbank, McHenry Avenue, Standiford Avenue, Prescott Road, Kiernan Avenue (Highway 219)/Claribel Road, and Ladd Road/Patterson Road (Highway 108), as well as a number of rural and local residential roadways, provide local access to the

TABLE 4.8-1
DAILY TRAFFIC VOLUMES ON REGIONAL ROADWAYS IN THE WSIP REGIONS

Regional Roadways	Location	Daily Traffic (Vehicles Per Day)
Highway 99	Modesto, Junction at Highway 132	126,000
Highway 101	Menlo Park, Willow Avenue	180,000
Highway 101	South San Francisco, Oyster Point Boulevard	200,000
Highway 101	San Francisco, Third Street	213,000
I-5	Modesto, Junction Highway 132	23,200
I-280	Redwood City, Edgewood Road	113,000
I-280	San Mateo, Junction at Highway 35, Bunker Hill	114,000
I-280	San Francisco, Geneva/Ocean Avenues	193,000
I-580	Modesto, Junction at Highway 132	37,500
I-680	Sunol, Junction at Highway 84 West	149,000
I-680	Fremont, Washington Boulevard	152,000
I-880	Fremont, Mowry Avenue	189,000

SOURCE: Caltrans, 2005.

San Joaquin Pipeline right-of-way. The roadways generally contain two to four lanes and do not provide on-street parking. Average daily traffic volumes on the above-noted roadways in Modesto range between 20,000 and 40,000 vehicles, while average daily traffic volumes on the roadways in Riverbank range between 10,000 and 25,000 vehicles (Caltrans, 2005).

Transit Service

The San Joaquin Region is served by a number of transit service providers, including Stanislaus Regional Transit, Modesto Area Express, and Riverbank–Oakdale Transit Authority Trolley. In the vicinity of the San Joaquin Pipeline in Modesto and Riverbank, one or more transit routes run along Kiernan Avenue, Standiford Avenue, McHenry Avenue, and Patterson Road. There are no transit routes in the immediate vicinity of the WSIP project sites outside of the cities of Modesto and Riverbank (MAX, 2006).

Bicycle and Pedestrian Network

There are a number of intercity/interregional bicycle routes on roadways that could serve as haul routes for the WSIP projects. The majority of these routes are Class III facilities (e.g., signed bike routes on roadways that allow shared use by bicycles and vehicles). Highway 120, Highway 108, and Willms Road are bicycle routes in the eastern portion of the region, and Highway 33 and Kasson Road are bicycle routes in the western portion of the region. There are limited pedestrian facilities on roadways in the vicinity of the WSIP project sites. In Modesto, the SFPUC right-of-way between Semallon Drive (west of McHenry Avenue and the Union Pacific railroad tracks) and Standiford Avenue contains a bicycle/pedestrian path (Class I facility). Bicycle lanes (Class II facilities) are provided on Standiford Avenue, Prescott Road, Tully Road, and Coffee Road (City of Modesto, 2002).

Sunol Valley Region

Regional and Local Roadways

Regional access to the Sunol Valley Region is provided by I-680. I-680 is an eight-lane, north-south freeway that connects I-80 near Fairfield to the north with I-280 in San Jose to the south. I-680 interchanges near the WSIP project sites are provided at Highway 237 in Milpitas and Highway 84 in Sunol. I-680 in the vicinity of Highway 84 carries about 149,000 vehicles per day.

Local access between the project sites in the western portion of the region and I-680 is via Calaveras Road. Calaveras Road between I-680 and Geary Road is generally a two-lane roadway with average daily traffic volumes of about 1,400 vehicles. South of Geary Road, Calaveras Road is a one to two-lane, rural roadway serving the Sunol Regional Wilderness and Calaveras Reservoir and Dam, and connects with Highway 237 and I-680 in Milpitas. Mission Boulevard (Highway 238), a four-lane divided arterial, provides local access to I-680 in the western portion of the Sunol Valley Region. Mission Boulevard (Highway 238) has an average daily traffic volume of about 32,000 vehicles (Caltrans, 2005).

Transit Service

Alameda County (AC) Transit is the principal bus service provider in the county, while Santa Clara Valley Transportation Authority (VTA) is the primary transit provider in Santa Clara County. There is no bus service provided by either AC Transit or VTA along Calaveras Road. A number of AC Transit bus lines (140, 141, 180, 217, and 520) provide service along Mission Boulevard (Highway 238) in Fremont (AC Transit, 2007; VTA, 2007).

Bicycle and Pedestrian Network

Neither Calaveras Road nor Mission Boulevard (north of I-680) are part of the designated Alameda countywide bicycle network. However, the East Bay Bicycle Coalition has identified Calaveras Road between I-680 and Milpitas, and Mission Boulevard as on-road routes recommended for bicycle travel. Calaveras Road experiences considerable recreational bicycle travel on weekends. There are no pedestrian facilities on Calaveras Road. Mission Boulevard has sidewalks on both sides of the street (Alameda County Congestion Management Agency, 2006; East Bay Bicycle Coalition, 2005).

Bay Division Region

Regional and Local Roadways

Regional access to the Bay Division Region is provided by I-680 and I-880 serving the eastern portion of the region in Alameda County, and Highway 101 and I-280 serving the western portion of the region in San Mateo County. Within the Bay Division Region, I-680 is a six-lane, east-west freeway, with interchanges at Mission Boulevard (Highway 238) and at Washington Street. I-880 is an eight-lane, north-south freeway that connects I-580 in Oakland to the north and I-280 in San Jose to the south. Within the region, I-880 has interchanges at Stevenson Boulevard and

Mowry Avenue. The average daily traffic volumes are about 152,000 vehicles on I-680, and 189,000 vehicles on I-880.

Highway 101 runs between I-5 near the Washington border to the north and the east Los Angeles interchange to the south. Highway 101 in the vicinity of the program area is an eight-lane, north-south freeway with interchanges at University Avenue, Willow Road, and Marsh Road. I-280 runs between San Francisco to the north and Highway 101/I-680 in San Jose to the south. In the Bay Division Region, I-280 has an interchange at Edgewood Road. Average daily traffic volumes in the Bay Division Region are about 180,000 vehicles on Highway 101, and 113,000 vehicles on I-280.

Woodside Road (Highway 84), El Camino Real (Highway 82) and Mission Boulevard (Highway 238) also serve as major regional access routes within the region. These roadways contain four to six travel lanes and generally do not provide on-street parking. Average daily traffic volumes on these facilities range between 36,000 and 46,000 vehicles (Caltrans, 2005).

WSIP projects are located in the vicinity of numerous residential and commercial streets in this region. Minor arterials and local residential streets generally contain two travel lanes and parking on both sides of the street.

Transit Service

The Bay Division Region is served by two transit agencies: AC Transit and San Mateo County Transit District (SamTrans). AC Transit is the principal bus service provider in the Alameda County portion of this region, with a number of local routes along the roadways in the vicinity of WSIP projects. SamTrans serves San Mateo County with a number of express and local routes in this region. Mission Boulevard, Paseo Padre Parkway, El Camino Real, and Edgewood Road are among this region’s roadways served by one or more AC Transit and SamTrans bus routes (AC Transit, 2007; SamTrans, 2007).

Bicycle and Pedestrian Network

There are a number of bicycle facilities on roadways in the vicinity of WSIP projects in this region. The eastern portion of the region in Alameda County has an established network of existing and proposed Class II (bike lanes striped within the paved area of roadways and established for the preferential use of bicycles) and Class III facilities. Many of the routes overlap with major arterials (e.g., Mission Boulevard, Paseo Padre Parkway). The East Bay Bicycle Coalition identifies most arterials as on-road bicycle routes. The western portion of the region in San Mateo County also has an established bicycle route network, primarily along major arterials (including Edgewood Road, Bay Road, El Camino Real, and Woodside Road) (Alameda County Congestion Management Agency, 2006).

The San Francisco Bay Trail has identified routes in both the eastern and western portions of the region. The Bay Trail is designed to create pathway links to the various commercial, residential, and industrial neighborhoods that surround San Francisco Bay. In the vicinity of WSIP projects in the Bay Division Region, the Bay Trail includes off-street paths along Highway 84, and on-road paths on University Avenue (Association of Bay Area Governments, 2003).

Most, but not all, roadways in the vicinity of the WSIP projects in the Bay Division Region have sidewalks on both sides of the street.

Peninsula Region

Regional and Local Roadways

Regional access to the Peninsula Region is provided by Highway 101 and I-280 in San Mateo County. Highway 101 in the Peninsula Region contains eight lanes and has interchanges at Millbrae Avenue and I-380. I-280 in the Peninsula Region contains eight lanes, with interchanges at Edgewood Road, Highway 92, Bunker Hill Drive, Hayne Road, and San Bruno Avenue. In the Peninsula Region, the average daily traffic volumes are about 200,000 vehicles on Highway 101, and 114,000 vehicles on I-280 (Caltrans, 2005).

El Camino Real (Highway 82) and Junipero Serra Boulevard also serve as access routes within the region, and Skyline Boulevard (Highway 35), Cañada Road, and Crystal Springs Road provide local access. These roadways contain two to four travel lanes. Skyline Boulevard is also part of the Scenic Highway System. El Camino Real and Junipero Serra Boulevard generally provide on-street parking.

Transit Service

Transit service in the Peninsula Region is primarily provided by the SamTrans, which offers a number of express and local routes along the arterials in the region, particularly along El Camino Real (Highway 82). There are no bus routes on Skyline Boulevard or Crystal Springs Road. The Peninsula Region is also served by the regional Bay Area Rapid Transit (BART) rail service to the San Francisco International Airport, and Caltrain commuter rail service between San Francisco and San Jose (SamTrans, 2007).

Bicycle and Pedestrian Network

The Peninsula Region has an established network of bicycle routes. The majority of these routes are Class III (signed routes only). Many of the routes overlap with major arterials (e.g., Mission Boulevard, Paseo Padre Parkway). Most, but not all, arterials and local streets in the vicinity of the WSIP projects in the Peninsula Region include sidewalks on both sides of the street (Alameda County Congestion Management Agency, 2006; San Mateo County, n.d.).

San Francisco Region

Regional and Local Roadways

Regional access to the San Francisco Region is provided by Highway 101 and I-280. Highway 101 in this region contains eight lanes and has interchanges at Millbrae Avenue, Oyster Point Boulevard, Third Street/Bayshore Boulevard, and Silver Avenue. I-280 in this region contains eight lanes, with an interchange at 19th Avenue/Highway 1. In the San Francisco Region, the average daily traffic volumes are about 213,000 vehicles on Highway 101, and 193,000 vehicles on I-280 (Caltrans, 2005).

A number of local roadways connect with the regional facilities, including El Camino Real (Highway 82) and Bayshore Boulevard in San Mateo County, as well as Ocean and Geneva Avenues in San Francisco. Local and regional access to the western portion of San Francisco is provided by 19th Avenue/Highway 1. These arterials generally contain four to six travel lanes, and most arterials provide for on-street parking on both sides of the street.

WSIP projects are located along and across numerous residential streets in both San Mateo and San Francisco Counties. Residential streets generally contain two travel lanes and on-street parking on one or both sides of the street.

Transit Service

Transit service in the San Francisco Region is primarily provided by the San Francisco Municipal Railway (Muni) (bus and light rail service in San Francisco), SamTrans, BART, and Caltrain. In the vicinity of the WSIP projects in this region, there are bus and/or light rail routes on 19th Avenue, Ocean Avenue, and Geneva Avenue. SamTrans provides a number of express and local bus routes along El Camino Real, and along local streets in Colma, San Bruno, Millbrae, and San Mateo. SamTrans provides some limited service in San Francisco (e.g., on Bayshore Boulevard) (Muni, 2005; SamTrans, 2007).

Bicycle and Pedestrian Network

The San Francisco Region has an established network of bicycle routes in both San Mateo and San Francisco Counties. In the vicinity of the WSIP project sites, most routes are Class III facilities (signed routes only) and overlap with major arterials (e.g., Geneva Avenue in San Francisco, and El Camino Real and Junipero Serra Boulevard in San Mateo County). Most, but not all, arterials and local streets in the vicinity of the WSIP projects in this region include sidewalks on both sides of the street (San Mateo County, n.d.).

Regulatory Framework

Transportation analysis in California is guided by policies and standards set at the state level by Caltrans as well as by local jurisdictions. There are no federal regulations that address transportation impacts associated with the WSIP projects.

Both Caltrans and local jurisdictions generally assess the impact of long-term, not short-term, traffic conditions. Plans and policies related to transportation aim to plan for and accommodate future growth and the vehicular, transit, pedestrian, and bicycle demand associated with that growth.

Policies regarding traffic service levels apply to long-term, not short-term, traffic conditions. These policies generally specify maintaining a level of service[1] (LOS) of LOS C or LOS D on major streets during the peak periods of traffic flow, and require mitigation measures when project-specific impacts would result in a level of service exceeding the threshold.

4.8.2 Impacts

Significance Criteria

The CCSF has not formally adopted significance standards for impacts related to traffic, but generally considers that implementation of the proposed program would have a significant traffic impact if it were to:

- Cause an increase in traffic that is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume-to-capacity ratio on roads, or congestion at intersections) (Evaluated in this section)
- Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways (unless it is practical to achieve the standard through increased use of alternative transportation modes) (Not evaluated in this section, see Appendix B)
- Result in a change in air traffic patterns, including either an increase in traffic levels, an obstruction to flight, or a change in location, that results in substantial safety risks (Not evaluated in this section, see Appendix B)
- Substantially increase hazards due to a design feature (e.g., sharp curves at dangerous intersections) or incompatible uses, or interfere with existing transportation systems (including vehicular, pedestrian, and bicycle networks), causing substantial alterations to circulation patterns or major traffic hazards (Evaluated in this section)
- Result in inadequate emergency access (Evaluated in this section)
- Result in inadequate parking capacity that could not be accommodated by alternative solutions (Evaluated in this section)
- Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., conflict with policies promoting bus turnouts, bicycle racks, etc), or cause a substantial increase in transit demand that cannot be accommodated by existing or proposed transit capacity or alternative travel modes (Not evaluated in this section, see Appendix B)

Since many of the WSIP facilities are located in roadways or cross roadways, a significance criterion that relates to interference with existing transportation systems (second half of fourth

1 Level of service (LOS) is a qualitative description a facility's performance based on average delay per vehicle, vehicle density, or volume-to-capacity ratios. Levels of service range from LOS A, which indicates free-flow or excellent conditions with short delays, to LOS F, which indicates congested or overloaded conditions with extremely long delays.

bullet) has been added to the CCSF's standard list. This criterion has been applied in the past by the CCSF to development projects located in San Francisco.

Approach to Analysis

This program-level analysis presents a screening-level assessment of the potential transportation impacts associated with the WSIP projects. This assessment evaluates the potential for project-specific, short-term, construction-related impacts on roadways due to changes in roadway capacities or increases in construction-related traffic, as well as longer-term impacts due to the operation of WSIP facilities.

The impact assessment of construction-related impacts assumes that for all WSIP projects the contractor(s) would obtain any necessary road encroachment permits prior to construction and would comply with the conditions of approval attached to project implementation. In particular, the assessment assumes implementation of SFPUC Construction Measure #5 for traffic, which specifies that each contractor must prepare a traffic control plan to minimize traffic and on-street parking impacts on any streets affected by construction of a proposed project. As appropriate, the SFPUC or the contractor would consult with local traffic and transit agencies. The transportation impact assessment assumes that if multiple contracts for work within a project are issued, each individual project would prepare a traffic control plan, as applicable to the situation.

A number of the WSIP projects also include improvements to existing roads or construction of new temporary access roads between the project sites and public roadways serving as haul routes. The assessment assumes that any improvements at the intersection of existing or new temporary access roads with public roadways would be constructed to meet the applicable intersection design standards of the jurisdiction in which the facility is located. As appropriate, truck deceleration and acceleration lanes would be provided to facilitate truck access into and out of the project site, and to minimize conflicts between construction vehicles and adjacent traffic flow.

Impact Summary by Region

Table 4.8-2 presents a summary of the traffic and transportation impacts associated with implementation of the WSIP.

Construction-Related Impacts

Construction-related traffic impacts are not generally considered significant, because given their temporary nature, they are usually of limited duration. However, since construction of some WSIP projects could affect the transportation network for a longer duration (e.g., construction activities occurring for a two-year period), their impacts could be determined to be potentially significant. Construction activities that affect roadway operations are typically regulated through permits and construction requirements to ensure acceptable levels of traffic flow during the period of traffic disruption. Construction best management practices, including the preparation of a traffic control plan, are required to be in place to ensure the safety of construction workers, motorists, bicyclists, and pedestrians throughout project construction.

TABLE 4.8-2
POTENTIAL IMPACTS AND SIGNIFICANCE – TRAFFIC, TRANSPORTATION, AND CIRCULATION

Projects	Project Number	Impact 4.8-1: Temporary reduction in roadway capacity and increased traffic delays	Impact 4.8-2: Short-term traffic increases on roadways	Impact 4.8-3: Impaired access to adjacent roadways and land uses	Impact 4.8-4: Temporary displacement of on-street parking	Impact 4.8-5: Increased traffic safety hazards during construction	Impact 4.8-6: Long-term traffic increases during facility operation
San Joaquin Region							
Advanced Disinfection	SJ-1	LS	PSM	LS	LS	PSM	LS
Lawrence Livermore Supply Improvements	SJ-2	LS	PSM	LS	LS	PSM	LS
San Joaquin Pipeline System	SJ-3	PSM	PSM	PSM	LS	PSM	LS
Rehabilitation of Existing San Joaquin Pipelines	SJ-4	PSM	PSM	PSM	PSM	PSM	LS
Tesla Portal Disinfection Station	SJ-5	LS	PSM	LS	LS	PSM	LS
Sunol Valley Region							
Alameda Creek Fishery Enhancement	SV-1	LS	PSM	LS	LS	PSM	N/A
Calaveras Dam Replacement	SV-2	PSM	PSM	PSM	LS	PSM	N/A
Additional 40-mgd Treated Water Supply	SV-3	LS	PSM	LS	LS	PSM	LS
New Irvington Tunnel	SV-4	LS	PSM	LS	LS	PSM	N/A
SVWTP – Treated Water Reservoirs	SV-5	LS	PSM	LS	LS	PSM	LS
San Antonio Backup Pipeline	SV-6	PSM	PSM	LS	LS	PSM	N/A
Bay Division Region							
Bay Division Pipeline Reliability Upgrade	BD-1	PSM	PSM	PSM	PSM	PSM	LS
BDPL Nos. 3 and 4 Crossovers	BD-2	LS	PSM	PSM	LS	PSM	LS
Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault	BD-3	PSM	PSM	PSM	PSM	PSM	LS
Peninsula Region							
Baden and San Pedro Valve Lots Improvements	PN-1	LS	LS	LS	LS	PSM	LS
Crystal Springs/San Andreas Transmission Upgrade	PN-2	PSM	PSM	LS	LS	PSM	LS
HTWTP Long-Term Improvements	PN-3	LS	PSM	LS	LS	PSM	LS
Lower Crystal Springs Dam Improvements	PN-4	PSM	PSM	PSM	PSM	PSM	LS
Pulgas Balancing Reservoir Rehabilitation	PN-5	PSM	PSM	LS	PSM	PSM	LS
San Francisco Region							
San Andreas Pipeline No. 3 Installation	SF-1	PSM	PSM	PSM	PSM	PSM	N/A
Groundwater Projects	SF-2	PSM	LS	PSM	PSM	PSM	LS
Recycled Water Projects	SF-3	PSM	PSM	PSM	PSM	PSM	LS

LS = Less than Significant impact, no mitigation required
PSM= Potentially Significant impact, can be mitigated to less than significant
N/A = Not Applicable

The construction impacts identified below for each type of facility have been developed to allow a general assessment of the nature and magnitude of potential construction impacts associated with each individual facility. The final construction scheduling of specific projects could result in overlapping impacts due to simultaneous construction of more than one facility. Since most transportation impacts associated with each facility would be specific to each facility site, overlapping impacts would be limited to impacts at adjoining construction sites or along common haul routes, where overlapping schedules for two or more facilities could result in combined traffic impacts.

Short-Term Impacts of Construction Traffic

Impact 4.8-1: Temporary reduction in roadway capacity and increased traffic delays.

Impacts of WSIP project construction on the availability of travel lanes could result if facility construction occurs within or adjacent to a public roadway, and a portion of the pavement is required for construction purposes. Construction could then result in a temporary reduction in the number of travel lanes or the available width of travel lanes, and subject vehicles (including transit) using the affected roadways to increased congestion and delays. Road closures would require drivers to detour to other, potentially less convenient routes to access their destinations. Impacts would be significant and unavoidable if roadways would be closed and no detour routes provided, or if through-traffic or access to adjacent land uses would be restricted for a substantial duration. The actual impact of construction activities on roadway capacity and traffic operations would depend on the length of the affected roadway segment, the number of travel lanes that would be available for vehicular flow, and the duration of construction activities on the roadways.

Pipelines. Pipeline construction would occur both within the SFPUC right-of-way and within or adjacent to public roadway right-of-way.[2] Construction across minor roadways and some major roadways would be conducted via the cut-and-cover method, which would require construction activities to occur within the roadway pavement. Impacts on any particular segment of roadway would be limited in duration, as construction of pipelines generally progresses at an average rate of about 120 feet per day in urban and suburban areas, and 160 feet per day in rural areas. In general, multiple crews are expected to work on pipeline construction; therefore, for a particular pipeline project, construction at more than one segment of the pipeline could occur simultaneously. Cut-and-cover construction across some major roadways could result in substantial impacts on traffic flow, and trenchless construction techniques such as the jack-and-bore method may be selected by the contractor or required by local jurisdictions. Construction of pipelines across freeways, some major roadways, and railroads would be completed using the jack-and-bore or similar method, which would not affect operations on these facilities. (See Chapter 3, Section 3.10, for a description of the various proposed construction techniques.)

[2] For purposes of the transportation discussion, "SFPUC right-of-way" implies off-road areas through which the pipeline alignment travels, and "public roadway right-of-way" implies in-road areas. The SFPUC may have easements through the public roadway; however, construction activities in the public roadway right-of-way could encroach on vehicular, pedestrian, and bicycle access and on-street parking, if provided.

Pipeline construction within public roadways would result in greater traffic impacts, as construction activities would require the use of a portion of the roadway for excavation of the pipeline, and additional roadway area would be needed for construction staging, including materials storage and construction vehicle and construction worker parking. If the public roadway right-of-way is narrow (e.g., minor residential streets), then temporary roadway closures could be required.

Tunnels. Since tunnel construction would occur from tunnel portals and shafts within the tunnel alignment, WSIP projects involving new tunnel construction would generally not require the use of parking or travel lanes for construction activities. In some cases, however, haul trucks traveling to a facility site could result in the need to utilize shoulders or parking lanes for staging prior to accessing the construction site. In addition, some temporary roadway closures could be required for tunnel construction activities if they occur adjacent to a public roadway right-of-way.

Other Facilities. Construction of other types of facilities (vaults, valve lots, crossovers, pump stations, treatment facilities, and storage facilities) would generally occur at discrete locations along the alignment, and onsite parking would be provided within the designated construction staging area. Any travel lane closures would be of limited duration. At some urban locations, where the size of staging areas could be limited, construction worker parking demand might need to be accommodated on adjacent public streets.

San Joaquin Region

Impact 4.8-1: Temporary reduction in roadway capacity and increased traffic delays		
Advanced Disinfection	SJ-1	LS
Lawrence Livermore	SJ-2	LS
SJPL System	SJ-3	PSM
SJPL Rehabilitation	SJ-4	PSM
Tesla Portal Disinfection	SJ-5	LS

The SJPL System project’s (SJ-3) 6-mile eastern pipeline segment and crossover location west of Oakdale Portal would be sited in an undeveloped area, where the potential for traffic impacts would be low. The 10-mile western pipeline segment east of Tesla Portal would extend through a primarily agricultural area that contains a cluster of residences and a golf course.

Most construction on the SJPL System project (SJ-3) would occur within the SFPUC right-of-way, but this right-of-way would cross a number of local roadways, highways, and freeways as well as a railroad. Construction of the new pipeline across freeways (Highway 33, Highway 99, I-5, and I-580) and railroad tracks would be conducted using the jack-and-bore method, and disruption to traffic flow would be minimal. Construction across other roadways would be conducted primarily using the cut-and-cover method; however, since most roadways serving the project site are rural roadways with low volumes of traffic, disruption of traffic flow would also be minimal. Potential traffic impacts associated with the SJPL System project would be evaluated as part of separate, project-level CEQA review for this project. Implementation of SFPUC Construction Measure #5 (traffic control plan) and additional traffic control measures identified in Measure 4.8-1a is expected to be adequate to reduce any *potentially significant* traffic impacts to a less-than-significant level.

The SJPL Rehabilitation project (SJ-4) involves reconditioning of 48 miles of the existing San Joaquin Pipelines. While the eastern and western portions of the pipeline run through undeveloped and agricultural areas, where the potential for traffic impacts would be low, the central portion of the pipeline runs through the cities of Modesto and Riverbank, and largely through developed residential areas. Any construction through Modesto and Riverbank would be conducted using both the jack-and-bore and cut-and-cover methods and could result in temporary lane closures. Implementation of SFPUC Construction Measure #5 (traffic control plan) and additional traffic control measures identified in Measure 4.8-1a is expected to reduce any *potentially significant* traffic impacts to a less-than-significant level. When project elements and locations of the SJPL Rehabilitation project are defined, it would be subject to separate, project-level CEQA review.

Other WSIP projects could be located in the Tesla Portal vicinity (under Advanced Disinfection, SJ-1, and Tesla Portal Disinfection, SJ-5) or at the Thomas Shaft (under Lawrence Livermore, SJ-2) and would involve construction of new treatment facilities within the SFPUC right-of-way. No construction within public roadways is anticipated. Construction activities associated with these facilities would not result in a reduction in the number of travel lanes on roadways in the vicinity of the site. Therefore, traffic impacts are expected to be *less than significant* with implementation of SFPUC Construction Measure #5 (traffic control plans).

Sunol Valley Region

Impact 4.8-1: Temporary reduction in roadway capacity and increased traffic delays		
Alameda Creek Fishery	SV-1	LS
Calaveras Dam	SV-2	PSM
40-mgd Treated Water	SV-3	LS
New Irvington Tunnel	SV-4	LS
Treated Water Reservoirs	SV-5	LS
SABUP	SV-6	PSM

All WSIP projects in this region would be constructed within the SFPUC right-of-way. The Alameda Creek Fishery (SV-1), 40-mgd Treated Water (SV-3), New Irvington Tunnel (SV-4), and Treated Water Reservoirs (SV-5) projects would not require construction within or across public roadways, and therefore would not affect the number of travel lanes in the vicinities of these projects. With implementation of SFPUC Construction Measure #5 (traffic control plan), this impact would be *less than significant* for these projects.

The SABUP project (SV-6) would require crossing of Calaveras Road, a temporary but *potentially significant* impact on Calaveras Road. With implementation of SFPUC Construction Measure #5 (traffic control plan) and additional traffic control measures as part of Measure 4.8-1a, this impact would be reduced to a less-than-significant level.

Construction of Calaveras Dam (SV-2) would require temporary closure of a segment of Calaveras Road (between Geary and Felter Roads) to through-traffic during the two- to three-year construction period. Through-traffic using Calaveras Road would be required to find an alternate route for the duration of the construction period and would likely use I-680. Construction-related traffic impacts associated with Calaveras Dam would be evaluated as part of separate, project-level CEQA review. Implementation of SFPUC Construction Measure #5 (traffic control plan) and additional traffic control measures (including detour plans) as part of Measure 4.8-1a is expected to reduce the *potentially significant* impacts of the roadway closure to a less-than-significant level.

Bay Division Region

Impact 4.8-1: Temporary reduction in roadway capacity and increased traffic delays		
BDPL Reliability Upgrade	BD-1	PSM
BDPL 3 and 4 Crossovers	BD-2	LS
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	PSM

Within the Bay Division Region, the BDPL Reliability Upgrade (BD-1) project would primarily involve construction activities within the SFPUC pipeline right-of-way. However, since this project is located in an urbanized area, it may require construction across multiple roadways, highways, and freeways. Construction across roadways could potentially affect the number of available travel lanes as well as traffic flow on these roadways. The jack-and-bore method of construction is proposed to be used for crossing I-880 and Highway 101, while the cut-and-cover method would be employed to cross all other roadways. Use of cut-and-cover method for construction across a number of multiple-lane arterials, particularly in Fremont (e.g., Mission Boulevard, Paseo Padre Parkway, and Fremont Boulevard), could result in significant impacts on traffic operations. The impacts could be compounded if construction occurs simultaneously on more than one major arterial, and/or if the arterial is used as a haul route for other projects in the region. The BDPL Reliability Upgrade (BD-1) project would also require construction under the commuter and freight rail tracks at a number of locations; however, train movements would not be affected because the jack-and-bore method would be used. A more detailed traffic impact analysis for the BDPL Reliability Upgrade (BD-1) project would be completed as part of separate, project-level CEQA review. Implementation of SFPUC Construction Measure #5 (traffic control plan), additional traffic control measures identified in Measure 4.8-1a, and coordination of individual traffic control plans (Measure 4.8-1b) are expected to reduce *potentially significant* traffic impacts of the BDPL Reliability Upgrade (BD-1) project to a less-than-significant level.

BDPL 3 and 4 Crossovers (BD-2) would involve construction of new valve and vault structures and would not require construction within public roadways; therefore, potential traffic impacts on nearby roadways would be *less than significant* with implementation of SFPUC Construction Measure #5 (traffic control plan).

BDPL 3 and 4 Seismic Upgrade at Hayward Fault (BD-3) includes a replacement pipeline between the new isolation valves**,** and would likely include work within public roadways. Implementation of SFPUC Construction Measure #5 (traffic control plan) and additional traffic control measures identified in Measure 4.8-1a are expected to reduce any *potentially significant* traffic impacts to a less-than-significant level.

Peninsula Region

Impact 4.8-1: Temporary reduction in roadway capacity and increased traffic delays		
Baden and San Pedro Valve Lots	PN-1	LS
CS/SA Transmission	PN-2	PSM
HTWTP Long-Term	PN-3	LS
Lower Crystal Springs Dam	PN-4	PSM
Pulgas Balancing Reservoir	PN-5	PSM

Within this region, the Baden and San Pedro Valve Lots (PN-1) and HTWTP Long-Term (PN-3) projects would be constructed at discrete locations within the SFPUC pipeline and tunnel alignments and would not require construction within public roadways. With implementation of SFPUC Construction Measure #5 (traffic control plan), this impact would be *less than significant* for these projects.

CS/SA Transmission (PN-2) facilities would be located on SFPUC property, except for repair work proposed on the Upper Crystal Springs Dam culverts under Highway 92. The Pulgas Balancing Reservoir project (PN-5) would include enlargement of the channel that crosses under Cañada Road. Both of these projects could require temporary closure of traffic lanes. Since these projects cross under public roadways, the potential for traffic disruption would be limited to the crossing location. For both of these projects, implementation of SFPUC Construction Measure #5 (traffic control plan) and additional traffic control measures identified in Measure 4.8-1a are expected to reduce any *potentially significant* traffic impacts to a less-than-significant level. The CS/SA Transmission project would be evaluated as part of separate, project-level CEQA review and a more detailed traffic analysis would be completed at that time.

Lower Crystal Springs Dam (PN-4) would require temporary closure of San Mateo County's Skyline Boulevard Bridge, which was built across the top of the dam. This section of Skyline Boulevard would be closed during the one-year construction period and would be reopened upon completion of the project. Implementation of SFPUC Construction Measure #5 (traffic control plan) and detour plans for the closure of Skyline Boulevard Bridge (Measure 4.8-1a) is expected to reduce *potentially significant* impacts of the roadway closure to a less-than-significant level. Potential traffic impacts associated with this project would be evaluated in more detail as part of separate, project-level CEQA review.

San Francisco Region

Impact 4.8-1: Temporary reduction in roadway capacity and increased traffic delays		
SAPL 3 Installation	SF-1	PSM
Groundwater Projects	SF-2	PSM
Recycled Water Projects	SF-3	PSM

Within this region, the SAPL 3 Installation, (SF-1) project would have the greatest potential to affect roadway capacity as well as traffic and transit operations. The pipeline alignment would travel through densely populated areas, and pipelines would be located within public roadways. Pipeline replacement would necessitate partial or full temporary lane closures and could include closure of parking and/or travel lanes. Implementation of SFPUC Construction Measure #5 (traffic control plan), additional traffic control measures identified in Measure 4.8-1a, and coordination of individual traffic control plans (Measure 4.8-1b) is expected to reduce *potentially significant* impacts of this project to a less-than-significant level. Potential traffic impacts would be evaluated in more detail as part of separate, project-level CEQA review.

The Groundwater Projects (SF-2) and Recycled Water Projects (SF-3) could also require construction within or across local roadways, which could affect traffic operations. Implementation of SFPUC Construction Measure #5 (traffic control plan) and additional traffic control measures identified in Measure 4.8-1a is expected to reduce *potentially significant* impacts of each project to a less-than-significant level. Potential traffic impacts would be evaluated in more detail as part of separate, project-level CEQA review for both of these projects.

Impact 4.8-2: Short-term traffic increases on roadways due to construction-related vehicle trips.

Construction-related vehicles trips would include construction workers traveling to and from the project site, haul truck trips associated with excavation materials transfer and disposal, and materials and equipment deliveries. The number of construction-related vehicles traveling to and from WSIP project sites would vary on a daily basis, depending on the type of project, construction phase, planned activity, and material needs. The greatest number of construction-generated vehicle trips would generally occur during the excavation, concrete pouring, and backfilling stages of construction. Truck operations, including haul trucks and materials delivery trucks, would occur mostly during daytime hours, but could extend beyond these hours (see Section 4.10, Noise and Vibration for more discussion of construction hours).

Construction traffic could result in short-term increases in traffic volumes on roadways in the immediate vicinity of WSIP project sites and along haul routes. The addition of construction vehicle traffic to the existing roadway volumes, without increasing the capacity of the roadway, could result in increased congestion and delay for vehicles, including transit. The reduction in capacity of roadways through temporary lane closures could further increase congestion and delays for vehicles using the roadway. The presence of construction truck traffic could also temporarily reduce roadway capacities due to the slower travel speeds and larger turning radii of trucks. The actual impact of construction vehicle traffic on local and regional facilities would depend on the number and type of construction-related vehicles, the number of travel lanes on the roadways used as haul routes, existing traffic volumes on these roadways, as well as the terrain and other factors. Impacts of construction traffic would be most noticeable in the immediate vicinity of the WSIP projects, and less noticeable farther away and on regional facilities.

Haul routes for offsite disposal of excavated materials, and deliveries of concrete and other materials would include a combination of regional highways, local arterials, and residential and rural streets, depending on the geographic locations of WSIP projects. Offsite disposal of excavated materials would depend of the type of material to be disposed of, and could occur at any of the 17 active landfills located in Stanislaus, San Joaquin, Alameda, San Mateo, and Santa Clara counties. Depending on project location, regional freeways such as Highway 92, I-280, I-580, and I-680 would be used to access these facilities.

Due to the proximity of WSIP projects to each other, the use of common haul routes, and overlapping schedules, the number of daily truck trips on roadways serving as haul routes could increase substantially over existing conditions. The effect of such combined or collective increases in construction vehicle traffic, and particularly truck traffic, on roadways would be increased delays due to the trucks' slower travel speeds and larger turning radii. The impact of combined construction vehicle traffic increases on roadway operations would depend on a number of factors, including the number of daily and peak-period truck volumes, the duration of the overlapping phases of the construction projects, and the characteristics of the haul route (e.g., the number of travel lanes in each direction, existing traffic volumes, and terrain). Combined or collective traffic impacts are discussed in Section 4.16, Impact 4.16-7, Localized Collective Impacts.

Pipelines. Construction-vehicle activity associated with pipeline construction includes excavation, disposal of excavated materials, and materials delivery. Pipeline construction would proceed at an average rate of approximately 120 feet per day in urban and suburban areas, and 160 feet per day in rural areas; the haul routes would vary depending on the location of the segment of pipeline being constructed. At a minimum, there would be 20 truck trips (round-trips) per day, with a maximum of 10 truck trips per hour during the a.m. and p.m. peak hours. In addition, there would be approximately 30 to 40 workers per crew traveling to and from the site each day. Construction activities could occur six days per week and would generally occur between 7:00 a.m. and 5:00 p.m., although construction could extend beyond these hours.

Tunnels. Construction-vehicle activity associated with tunnel construction would include construction of the tunnel shaft, removal of excavated materials, and materials delivery. Construction staging and materials removal would occur at the tunnel entry and exit shafts or portals, and construction at the tunnel would typically be conducted 24 hours per day, seven days a week. Excavated materials would be disposed of onsite, or stored onsite and then disposed offsite. Offsite disposal of excavated materials would result in greater traffic impacts. If excavated materials were disposed of offsite on a daily basis, the number of haul trucks would be based on the amount of material that could be excavated per day. Typical tunnel excavation could result in between 20 and 40 truck trips (round-trips) per day. If excavation materials were stored onsite prior to offsite disposal, the number of truck trips would be limited to the amount of available staging area and could exceed the 20 to 40 truck trips per day. Truck activity associated with offsite disposal would occur on weekdays during the designated construction hours and, assuming between 20 and 40 truck trips per day, would result in a maximum of 10 truck trips during the a.m. or p.m. peak hours. Since tunnel activities would be conducted 24 hours a day, there would be three shifts of 10 construction workers per crew on a daily basis traveling to and from the project site.

Other Facilities. The number of construction vehicles associated with other types of WSIP projects would depend on the facility, and whether new facilities would be constructed or existing facilities upgraded. New treatment and storage facilities would generate the greatest number of construction vehicles, as these facilities would involve excavation and construction of new structures. The number of vehicle trips would depend on the amount of excavated materials;

however, during the a.m. and p.m. peak hours up to 180 truck trips could be expected. Construction of the new treatment and storage facilities would involve an average of 30 to 50 onsite construction workers per day. Other facilities such as valve vaults and pump stations would have substantially fewer construction vehicles and workers onsite per day. Construction activities could occur six days per week and would generally occur between 7:00 a.m. and 5:00 p.m., although construction could extend beyond these hours.

San Joaquin Region

Impact 4.8-2: Short-term traffic increases on roadways due to construction-related vehicle trips		
Advanced Disinfection	SJ-1	PSM
Lawrence Livermore	SJ-2	PSM
SJPL System	SJ-3	PSM
SJPL Rehabilitation	SJ-4	PSM
Tesla Portal Disinfection	SJ-5	PSM

Of the five projects in the San Joaquin Region, pipeline construction associated with the SJPL System (SJ-3) and SJPL Rehabilitation (SJ-4) projects would generate the greatest amount of construction traffic associated with construction crews and materials deliveries. Construction of the eastern pipeline segment of the SJPL System project (SJ-3) would increase traffic volumes on local highways, such as Highways 120 and 128, as well as on rural, two-lane roadways. Construction of the western pipeline segment of SJ-3 would increase traffic volumes on I-580, Vernalis Road (Highway 132), and Highway 33 as well as on rural, two-lane roadways. The traffic impacts of the SJPL System (SJ-3) and SJPL Rehabilitation (SJ-4) projects would be evaluated in more detail during separate, project-level CEQA review. Implementation of SFPUC Construction Measure #5 (traffic control plan), additional traffic control measures as part of Measure 4.8-1a, and coordination of individual traffic control plans for projects in the Tesla Portal vicinity (Measure 4.8-1b) would reduce this *potentially significant* impact to a less-than-significant level.

Since the project elements and location of the SJPL Rehabilitation project (SJ-4) have not been defined, the potential exists that construction could occur at multiple locations along the existing 48-mile pipeline. Construction within Modesto could result in more than one construction project utilizing the same residential streets as haul routes and in partial or full closure of local streets, which could cause significant traffic impacts. Implementation of SFPUC Construction Measure #5 (traffic control plan for each individual project), additional traffic control measures identified in Measure 4.8-1a, and coordination of individual traffic control plans for nearby projects (Measure 4.8-1b) would reduce this *potentially significant* impact to a less-than-significant level.

Access routes for Tesla Portal (Advanced Disinfection, SJ-1, and Tesla Portal Disinfection, SJ-5) would include I-580, Chrisman Road, and Vernalis Road, while access routes for Thomas Shaft (Lawrence Livermore, SJ-2) would include I-580, Corral Hollow Road, and a dirt access road. The amount of activity associated with construction of these facilities has not yet been determined. With implementation of SFPUC Construction Measure #5 (traffic control plan) for these projects and additional traffic control measures identified in Measure 4.8-1a, *potentially significant* impacts of project-related increases in traffic would be reduced to a less-than-significant level.

Sunol Valley Region

Impact 4.8-2: Short-term traffic increases on roadways due to construction-related vehicle trips		
Alameda Creek Fishery	SV-1	PSM
Calaveras Dam	SV-2	PSM
40-mgd Treated Water	SV-3	PSM
New Irvington Tunnel	SV-4	PSM
Treated Water Reservoirs	SV-5	PSM
SABUP	SV-6	PSM

Within this region, construction of the Calaveras Dam (SV-2) and Treated Water Reservoirs (SV-5) projects would require an extensive amount of excavation for dam replacement and construction of the new storage reservoirs at the Sunol Valley WTP. Of the six projects in the Sunol Valley Region, these projects would result in the greatest number of construction vehicles traveling to and from project sites. These trips would include disposal of excavated materials, and delivery of construction and filter materials. In addition, each project would have between 50 and 190 construction workers traveling to and from the site each day. The Calaveras Dam project would close Calaveras Road to through-traffic between Geary Road and Felter Road, requiring through-traffic using this section of Calaveras Road to divert to I-680. The traffic impacts associated with the Calaveras Dam and Treated Water Reservoirs projects would be evaluated in more detail as part of separate, project-level CEQA review.

The haul route for the New Irvington Tunnel (SV-4) exit portal would be via a new access road that would extend through a residential neighborhood and would connect the portal with Mission Boulevard (Highway 238) and the I-680 freeway. Due to the possible overlap in the construction schedules of the New Irvington Tunnel and BDPL Reliability Upgrade (BD-1) projects, there could be substantial increases in haul and delivery truck traffic in this area, which could substantially affect the operating conditions on Mission Boulevard. Combined or collective impacts associated with this overlap are discussed in Section 4.16, Impact 4.16-7.

For the six projects in the Sunol Valley Region, including Alameda Creek Fishery (SV-1), 40-mgd Treated Water (SV-3), and SABUP (SV-6), implementation of SFPUC Construction Measure #5 (traffic control plans) and additional traffic control measures identified in Measure 4.8-1a are expected to reduce any *potentially significant* traffic impacts to a less-than-significant level.

Bay Division Region

Impact 4.8-2: Short-term traffic increases on roadways due to construction-related vehicle trips		
BDPL Reliability Upgrade	BD-1	PSM
BDPL 3 and 4 Crossovers	BD-2	PSM
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	PSM

Of the three projects in the Bay Division Region, the pipeline construction projects (BDPL Reliability, BD-1, and BDPL 3 and 4 Seismic Upgrade at Hayward Fault, BD-3) would generate the greatest amount of construction traffic associated with construction crews, disposal of excavated materials, and materials deliveries. Haul routes would be along highways and freeways such as I-680, I-880, I-280, Highway 101, and Highway 238 (Mission Boulevard), major arterials such as El Camino Real, Paseo Padre Parkway, and

Edgewood Drive, as well as local commercial and residential streets. Potential construction traffic impacts would be evaluated in more detail as part of separate, project-level CEQA review for the BDPL Reliability Upgrade and BDPL 3 and 4 Seismic Upgrade at Hayward Fault projects. For the BDPL 3 and 4 Crossovers (BD-2) and BDPL 3 and 4 Seismic Upgrade at Hayward Fault (BD-3) projects, it is expected that SFPUC Construction Measure #5 (traffic control plans) and additional traffic control measures (Measure 4.8-1a) would be adequate to reduce any *potentially significant* traffic impacts to a less-than-significant level.

However, for the BDPL Reliability project, significant traffic impacts could result from construction across major roadways as well as from multiple construction crews in this region using the same haul routes. Implementation of SFPUC Construction Measure #5 (traffic control plan), additional traffic control measures (Measure 4.8-1a), and coordination of individual traffic control plans (Measure 4.8-1b) would reduce *potentially significant* impacts to a less-than-significant level.

Construction of WSIP projects in the Bay Division Region is not expected to substantially overlap with other projects in this region or in other regions. In addition, due to the geographic distribution of the projects, construction traffic in this region would be dispersed over a number of roadways and freeways. The exception is the BDPL Reliability Upgrade and New Irvington Tunnel (SV-4) projects in the Sunol Valley Region as mentioned above.

Peninsula Region

Impact 4.8-2: Short-term traffic increases on roadways due to construction-related vehicle trips

Baden and San Pedro Valve Lots	PN-1	LS
CS/SA Transmission	PN-2	PSM
HTWTP Long-Term	PN-3	PSM
Lower Crystal Springs Dam	PN-4	PSM
Pulgas Balancing Reservoir	PN-5	PSM

Of the five projects in the Peninsula Region, the Lower Crystal Springs Dam (PN-4) project would generate the greatest amount of construction traffic associated with construction crews, disposal of excavated materials, and materials deliveries. Offsite disposal of excavated materials associated with the Lower Crystal Springs Dam project would result in increases in traffic volumes on Crystal Springs Road, I-280, Highway 92, and possibly Highway 101, depending on the disposal site. Haul routes for the Lower Crystal Springs Dam project would include Crystal Springs Road, Skyline Boulevard, and I-280. Crystal Springs Road and Skyline Boulevard are recreational facilities, and increases in construction traffic on these two-lane roadways could affect pedestrian and bicycle circulation. The CS/SA Transmission (PN 2) and HTWTP Long-Term (PN-3) projects would also use Crystal Springs Road and Skyline Boulevard as access routes. Implementation of SFPUC Construction Measure #5 (traffic control plan), additional traffic control measures (Measure 4.8-1a), and coordination of individual traffic control plans (Measure 4.8-1b) for the CS/SA Transmission, HTWTP Long-Term, and Lower Crystal Springs Dam projects would be adequate to reduce *potentially significant* traffic impacts to a less-than-significant level.

It is expected that construction vehicles associated with the Baden and San Pedro Valve Lots (PN-1) project would be dispersed among numerous roadways in the Peninsula Region, so potential impacts are expected to be *less than significant* with implementation of SFPUC Construction Measure #5 (traffic control plan).

The number of construction vehicles associated with the Pulgas Balancing Reservoir project (PN-5) has not yet been determined. However, improvements associated with this project are expected to occur over an extended period of time (about four years of construction occurring from 2007 to 2008 and 2010 to 2013), and trips to and from the facility would occur south of other SFPUC construction projects in the region. Implementation SFPUC Construction Measure #5 (traffic control plan) and additional traffic control measures identified in Measure 4.8-1a would be adequate to reduce any *potentially significant* traffic impacts to a less-than-significant level.

San Francisco Region

Impact 4.8-2: Short-term traffic increases on roadways due to construction-related vehicle trips		
SAPL 3 Installation	SF-1	PSM
Groundwater Projects	SF-2	LS
Recycled Water Projects	SF-3	PSM

Of the three projects in the San Francisco Region, the SAPL 3 Installation (SF-1) and Recycled Water Projects (SF-3) projects would generate the greatest amount of construction vehicles. Haul routes would include Highway 1, Highway 101, and I-280 as well as numerous local arterials. Potential impacts associated with increased traffic volumes on roadways would be evaluated as part of separate, project-level CEQA review. For these two projects, implementation of SFPUC Construction Measure #5 (traffic control plans), additional traffic control measures identified in Measure 4.8-1a, and coordination of individual traffic control plans (Measure 4.8-1b) are expected to reduce any *potentially significant* impacts of construction-related traffic volume increases to a less-than-significant level.

The number of construction vehicles associated with Groundwater Projects (SF-2) has not yet been determined. However, improvements associated with these projects are expected to occur over an extended period of time, and trips to and from the facilities would likely be dispersed among numerous roadways in the San Francisco Region. Construction vehicles are not expected to substantially increase traffic volumes on the access routes to these facilities, and therefore potential impacts are expected to be *less than significant* with implementation of SFPUC Construction Measure #5 (traffic control plan).

Impact 4.8-3: Impaired access to adjacent roadways and land uses for both general and emergency response traffic as well as for bicycles and pedestrians.

Pipelines. Pipeline construction would be conducted within the SFPUC right-of-way or within public roadways. Trenching and paving activities within or across public roadways could result in a temporary reduction in parking and travel lanes or temporary road closures, could impede or block vehicular, pedestrian, and bicycle circulation and access to adjacent land uses, and could increase hazards. In addition, temporary road closures could affect access to adjacent land uses by emergency service providers. These impacts would occur mostly during the day when construction is ongoing, as vehicle access would be restored at the end of each workday through the use of steel trench plates or trench backfilling.

Pipeline construction could result in temporary full street closures if the required width of the construction zone would prevent maintenance of, at a minimum, alternate one-way traffic flow adjacent to the work zone. These road closures would be an inconvenience for motorists, bicyclists, and pedestrians, who would be required to detour onto other roadways.

Tunnels. Tunnel construction would occur from tunnel shafts or portals and adjacent staging areas. Impacts on access to adjacent uses would be limited, and would occur only if temporary access roads or staging areas would be required to gain access to public roads. If truck staging for access to construction sites occurs on public roadways, bicycle and pedestrian circulation could be impeded.

Treatment and Storage Facilities. Construction activities would occur at facility sites, and impacts on access to adjacent uses would be limited. Access impacts could occur if temporary access roads or staging areas are constructed across private land to gain access to public roads.

Other Facilities. The impact of other WSIP projects (such as installation of valves, vaults, standby power equipment, and monitoring equipment) on access to adjacent land uses and streets would vary depending on the type of project. Most projects would be at discrete locations along the pipeline alignments and would not require construction within roadways or other activities that could affect access to adjacent land uses or impede emergency access.

San Joaquin Region

Impact 4.8-3: Impaired access to adjacent roadways and land uses		
Advanced Disinfection	SJ-1	LS
Lawrence Livermore	SJ-2	LS
SJPL System	SJ-3	PSM
SJPL Rehabilitation	SJ-4	PSM
Tesla Portal Disinfection	SJ-5	LS

Construction of the treatment facilities (Advanced Disinfection, SJ-1; Lawrence Livermore, SJ-2; and Tesla Portal Disinfection, SJ-5) would occur at Tesla Portal and Thomas Shaft, and use of public roadways for construction staging and equipment parking would be minimal. Existing roadways would be used for construction worker and construction vehicle access. As a result, impacts on pedestrian and bicycle circulation and access to nearby land uses would be *less than significant* for these projects with implementation of SFPUC Construction Measure #5 (traffic control plans).

Pipeline construction associated with the SJPL System project (SJ-3) and SJPL Rehabilitation project (SJ-4) would occur primarily within the SFPUC right-of-way, and impacts on access to nearby land uses would be minimal. However, in some locations, the SFPUC right-of-way crosses agricultural lands, and access to some fields could be affected. In addition, in some locations, temporary construction access routes would cross private property, and construction access would need to be negotiated with local landowners. Some of the temporary construction access roads crossing private property could affect access to the uses, depending on the location of the access route. In addition, the SJPL System project would require crossing of local roadways and freeways, and construction activities associated with the roadway crossings (staging, parking for equipment and construction workers) could affect access to adjacent land uses as well as pedestrian and bicycle circulation. In addition, construction associated with the SJPL Rehabilitation project improvements along the existing pipeline through largely developed residential areas of Modesto and Riverbank could require crossing of local residential streets.

The SJPL System project (SJ-3) would be evaluated as part of separate, project-level CEQA review. When project elements of the SJPL Rehabilitation project (SJ-4) are defined, this project would also be subject to separate, project-level CEQA review. Implementation of SFPUC Construction Measure #5 (traffic control plan) and additional traffic control measures identified in Measure 4.8-1a would be adequate to ensure acceptable levels of traffic, pedestrian, and bicycle flow and to reduce any *potentially significant* circulation and access impacts to a less-than-significant level.

Sunol Valley Region

Impact 4.8-3: Impaired access to adjacent roadways and land uses		
Alameda Creek Fishery	SV-1	LS
Calaveras Dam	SV-2	PSM
40-mgd Treated Water	SV-3	LS
New Irvington Tunnel	SV-4	LS
Treated Water Reservoirs	SV-5	LS
SABUP	SV-6	LS

Construction of WSIP facilities in this region would occur on existing facility sites, and impacts on access to nearby land uses and on pedestrian and bicycle circulation would be minimal and generally *less than significant* with implementation of SFPUC Construction Measure #5 (traffic control plans) for all WSIP projects in this region except Calaveras Dam (SV-2). Existing roadways would be used for construction worker and construction vehicle access.

Construction of Calaveras Dam (SV-2) would require temporary closure of Calaveras Road between Geary Road and Felter Road to through-traffic during the two- to three-year construction period. Through-traffic using Calaveras Road would be required to find an alternate route for the duration of the construction period and would likely use I-680. Access to the East Bay Regional Park District's (EBRPD) Sunol Regional Wilderness would still be provided via Calaveras Road and Geary Road from the north, and emergency vehicles would continue to have access to temporarily closed roads. Direct access to the EBRPD Ohlone Wilderness Regional Trail may be restricted, including access to the Bay Area Ridge Trail connection from the west. There are no private residences or commercial uses on this segment of Calaveras Road. This project would be evaluated as part of separate, project-level CEQA review. Implementation of SFPUC Construction Measure #5 (traffic control plan) and additional traffic control measures identified in Measure 4.8-1a would be adequate to ensure acceptable levels of traffic, pedestrian, and bicycle flow and to reduce any *potentially significant* circulation and access impacts to a less-than-significant level.

Bay Division Region

Impact 4.8-3: Impaired access to adjacent roadways and land uses		
BDPL Reliability Upgrade	BD-1	PSM
BDPL 3 and 4 Crossovers	BD-2	PSM
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	PSM

All WSIP projects in this region would involve construction activities within the SFPUC right-of-way or construction at discrete locations along the alignments. However, within this region, the pipeline alignments traverse urbanized areas, cross numerous arterials and freeways, and extend along residential streets. Depending on the constraints associated with construction across roadways, construction activities could affect access to residences and local businesses as well as pedestrian and bicycle circulation. Of the three projects in the Bay Division Region, construction of the BDPL Reliability Upgrade (BD-1) project would have the greatest potential for impacts. Implementation of SFPUC Construction Measure #5 (traffic control plan) and additional traffic control identified in Measure 4.8-1a, would be adequate to ensure acceptable levels of traffic, pedestrian, and bicycle flow and to reduce any *potentially significant* circulation and access impacts associated with all three projects in this region to a less-than-significant level.

Peninsula Region

Impact 4.8-3: Impaired access to adjacent roadways and land uses		
Baden and San Pedro Valve Lots	PN-1	LS
CS/SA Transmission	PN-2	LS
HTWTP Long-Term	PN-3	LS
Lower Crystal Springs Dam	PN-4	PSM
Pulgas Balancing Reservoir	PN-5	LS

All WSIP projects within the Peninsula Region would involve construction activities along the SFPUC right-of-way or construction at discrete locations along the pipeline alignments. Therefore, impacts on pedestrian and bicycle circulation and access to adjacent roadways and land uses would be minimal. With implementation of SFPUC Construction Measure #5 (traffic control plan), this impact would be *less than significant* for the Baden and San Pedro Valve Lots (PN-1), CS/SA Transmission (PN-2), HTWTP Long-Term (PN-3), and Pulgas Balancing Reservoir (PN-5) projects.

The Lower Crystal Springs Dam project (PN-4) would likely affect access to, and parking areas for, Sawyer Camp Trail near the intersection of Skyline Boulevard and Crystal Springs Road, in the vicinity of the dam. This project would require reconstruction of San Mateo County's Skyline Boulevard Bridge, which was built across the top of the dam. This section of Skyline Boulevard would be closed during construction of this project and would be reopened upon completion of the project. The Lower Crystal Springs Dam project would be evaluated as part of separate, project-level CEQA review. Implementation of SFPUC Construction Measure #5 (traffic control plan) and additional traffic control measures identified in Measure 4.8-1a would be adequate to ensure acceptable levels of traffic, pedestrian, and bicycle flow and to reduce any *potentially significant* circulation and access impacts to a less-than-significant level.

San Francisco Region

Impact 4.8-3: Impaired access to adjacent roadways and land uses		
SAPL 3 Installation	SF-1	PSM
Groundwater Projects	SF-2	PSM
Recycled Water Projects	SF-3	PSM

All WSIP projects in this region (SAPL 3 Installation, SF-1; Groundwater Projects, SF-2; and Recycled Water Projects, SF-3) would have the potential to result in impacts on adjacent land uses and on pedestrian and bicycle circulation. These projects would be constructed within densely populated areas, and pipeline construction would occur within public roadways, many of which are narrow residential streets. Construction staging would likely necessitate the use of the on-street parking lane, which could temporarily restrict access to adjacent land uses. For these projects, impacts on local access would be evaluated as part of separate, project-level CEQA review.

Implementation SFPUC Construction Measure #5 (traffic control plan) and additional traffic control measures identified in Measure 4.8-1a would be adequate to ensure acceptable levels of traffic, pedestrian, and bicycle flow and to reduce any *potentially significant* circulation and access impacts to a less-than-significant level for all projects in this region.

Impact 4.8-4: Temporary displacement of on-street parking at some locations due to increased parking demand or construction within roadways.

Pipelines. Construction of pipelines would be conducted within the SFPUC right-of-way and within or adjacent to public roadways. Work within public roadways would temporarily displace on-street parking, if provided, along affected roadways. Pipeline construction would generally involve crews of 30 to 40 workers, who would park their vehicles in the identified parking areas within the designated construction zone. Temporary parking impacts on any particular segment of roadway would not be long in duration, since pipeline construction would generally proceed at an average rate of 120 feet per day in urban and suburban areas, and 160 feet per day in rural areas.

Other Facilities. Construction of other types of facilities (tunnels, vaults, valve lots, crossovers, pump stations, treatment facilities, and storage facilities) would occur at discrete locations along the alignment, and onsite parking would be provided within the designated construction staging area. At some urban locations, where the size of staging areas could be limited, construction worker parking demand might need to be accommodated on public streets. The number of construction workers would vary by facility type, and would range from 1 or 2 workers for minor repair work to up to 190 workers for dam replacement and water reservoirs.

San Joaquin Region

Impact 4.8-4: Temporary displacement of on-street parking at some locations due to increased parking demand or construction within roadways		
Advanced Disinfection	SJ-1	LS
Lawrence Livermore	SJ-2	LS
SJPL System	SJ-3	LS
SJPL Rehabilitation	SJ-4	PSM
Tesla Portal Disinfection	SJ-5	LS

Of the five projects in this region, construction of the SJPL System project (SJ-3) and SJPL Rehabilitation project (SJ-4) would have the greatest potential to result in parking impacts. However, most of the pipeline construction would occur within the SFPUC right-of-way, and it is expected that construction vehicles and equipment would park within the construction zone, along access roads, and in offsite staging areas. Pipeline construction would cross roadway and freeway segments, which could result in the need for on-street parking of construction worker vehicles and equipment. For the SJPL System project (SJ-3), the majority of the roadways that would be affected are adjacent to agricultural uses that have limited on-street parking demand. With implementation of SFPUC Construction Measure #5 (traffic control plan), parking impacts would be *less than significant*.

Program elements and locations of the SJPL Rehabilitation project (SJ-4) have not yet been defined, and rehabilitation of the San Joaquin Pipeline through Modesto and Riverbank could affect local streets in developed residential areas. With implementation of SFPUC Construction Measure #5 (traffic control plan) and additional parking measures identified in Measure 4.8-1a, *potentially significant* parking impacts would be reduced to less-than-significant levels.

Other WSIP projects in this region would be located at Tesla Portal (Advanced Disinfection, SJ-1, and Tesla Portal Disinfection, SJ-5) and at Thomas Shaft (Lawrence Livermore, SJ-2). Construction staging areas that would accommodate construction worker vehicles and equipment would be provided onsite, and it is expected that parking impacts associated with these projects would be *less than significant* with implementation SFPUC Construction Measure #5 (traffic control plan).

Sunol Valley Region

Impact 4.8-4: Temporary displacement of on-street parking at some locations due to increased parking demand or construction within roadways		
Alameda Creek Fishery	SV-1	LS
Calaveras Dam	SV-2	LS
40-mgd Treated Water	SV-3	LS
New Irvington Tunnel	SV-4	LS
Treated Water Reservoirs	SV-5	LS
SABUP	SV-6	LS

WSIP projects in this region would include onsite construction staging areas that would accommodate construction worker vehicles and equipment. Therefore, parking impacts for all projects within the Sunol Valley Region are expected to be *less than significant* with implementation of SFPUC Construction Measure #5 (traffic control plans).

Bay Division Region

Impact 4.8-4: Temporary displacement of on-street parking at some locations due to increased parking demand or construction within roadways		
BDPL Reliability Upgrade	BD-1	PSM
BDPL 3 and 4 Crossovers	BD-2	LS
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	PSM

Within this region, construction of the BDPL Reliability Upgrade (BD-1) and BDPL 3 and 4 Seismic Upgrade at Hayward Fault (BD-3) would have the greatest potential to result in parking impacts. Most of the construction activity would occur within the SFPUC right-of-way, and construction vehicles and equipment are expected to be able to park within the construction zone; however, some segments of pipeline would be located within the public roadway right-of-way. In addition, pipeline construction would cross numerous local arterials and residential streets as well as I-680, which could result in the need for on-street parking of construction worker vehicles and equipment. The majority of the roadways that would be affected are urbanized and adjacent to commercial and residential land uses. These projects would be evaluated as part of separate, project-level CEQA review. Implementation of SFPUC Construction Measure #5 (traffic control plans) and additional parking measures identified in Measure 4.8-1a for these projects would be adequate to reduce any *potentially significant* parking impacts to a less-than-significant level.

The BDPL 3 and 4 Crossovers project (BD-2) would be located at discrete locations within the SFPUC right-of-way, with construction staging areas that would accommodate construction worker vehicles and equipment, as appropriate. Parking impacts associated with this project are therefore expected to be *less than significant* with implementation of SFPUC Construction Measure # 5 (traffic control plan).

Peninsula Region

Impact 4.8-4: Temporary displacement of on-street parking at some locations due to increased parking demand or construction within roadways		
Baden and San Pedro Valve Lots	PN-1	LS
CS/SA Transmission	PN-2	LS
HTWTP Long-Term	PN-3	LS
Lower Crystal Springs Dam	PN-4	PSM
Pulgas Balancing Reservoir	PN-5	PSM

Within this region, all of the projects would be constructed at discrete locations within the SFPUC tunnel and pipeline alignments. It is anticipated that all projects in this region would include construction staging areas that would accommodate construction worker vehicles and equipment. For the Baden and San Pedro Valve Lots (PN-1), CS/SA Transmission (PN-2), and HTWTP Long-Term (PN-3) projects, staging areas are expected to be provided onsite, and therefore parking impacts are expected to be *less than significant* with implementation of SFPUC Construction Measure # 5 (traffic control plans).

The Lower Crystal Springs Dam project (PN-4) would likely affect the roadside parking areas used by visitors to Sawyer Camp Trail on Skyline Boulevard near the intersection with Crystal Springs Road. Pulgas Balancing Reservoir (PN-5) could affect parking used by visitors at the Pulgas Water Temple. Displacement of parking to public recreational areas where other nearby parking is not available could result in hazardous parking situations in the vicinity. These projects would be evaluated as part of separate, project-level CEQA review to ensure safe accommodation of visitor parking demand. Implementation of SFPUC Construction Measure # 5 (traffic control plan), additional parking measures identified in Measure 4.8-1a, and accommodation of displaced public parking supply for recreational visitors (Measure 4.8-4) would reduce any *potentially significant* parking impacts of these two projects to a less-than-significant level.

San Francisco Region

Impact 4.8-4: Temporary displacement of on-street parking at some locations due to increased parking demand or construction within roadways		
SAPL 3 Installation	SF-1	PSM
Groundwater Projects	SF-2	PSM
Recycled Water Projects	SF-3	PSM

Within this region, the SAPL 3 Installation project (SF-1) would have the greatest potential to result in parking impacts. The pipeline alignment would travel through densely populated areas, and the pipeline would be located within roadways. Pipeline replacement would likely necessitate the use of the on-street parking lanes for construction staging of equipment and materials and for construction worker parking. Potentially significant parking impacts would be evaluated as part of separate, project-level CEQA review. With implementation of SFPUC Construction Measure #5 (traffic control plan) and additional parking measures identified in Measure 4.8-1a, *potentially significant* parking impacts associated with this project would be reduced to a less-than-significant level.

The Groundwater Projects (SF-2) and Recycled Water Projects (SF-3) projects could require construction within or across local roadways and could require on-street staging of equipment and materials, and parking for construction workers. The Groundwater and Recycled Water Projects would be evaluated as part of separate, project-level CEQA review. Implementation of SFPUC Construction Measure #5 (traffic control plan) and additional parking measures identified in Measure 4.8-1a is expected to reduce *potentially significant* parking impacts of these projects to a less-than-significant level.

Impact 4.8-5: Increased potential traffic safety hazards for vehicles, bicyclists, and pedestrians on public roadways during construction.

Since construction activities temporarily suspend the normal function of roadways, the potential exists for an increase in traffic safety hazards during construction of the WSIP projects. This increase in safety hazards would be due to the increased potential for:

- Conflicts between construction vehicles (with slower speeds and wider turning radii than autos) and vehicles, bicyclists, or pedestrians using the roadways
- Conflicts between the movement of traffic and the construction activities, particularly where traffic is routed into the travel lane adjacent to the work zone
- Confusion of drivers during one-lane, two-way traffic operation

- Confusion of bicyclists and pedestrians due to temporary alterations in bicycle and pedestrian circulation and on-street parking supply
- Distraction of drivers related to construction activities and nighttime lighting (at tunnel portals or shaft locations)

All Regions

Construction activities associated with the WSIP projects in all regions would increase the potential for safety hazards, which would be a *potentially significant* impact. In general, construction contractors for any projects affecting public rights-of-way (e.g., roadways, sidewalks, and walkways) are required to provide for continuity of traffic, pedestrians, and bicyclists; reduce the potential for traffic accidents; and ensure worker safety in construction zones. In addition, as part of project development, haul routes would be established to minimize truck traffic near schools, especially prior to school start times and following dismissal times, when students are on the roads traveling to and from schools. Implementation of SFPUC Construction Measure #5 (traffic control plan) and additional traffic control measures identified in Measure 4.8-1a (stipulating actions required of contractors) would reduce traffic safety impacts to a less-than-significant level for all WSIP projects.

It should be noted that, prior to construction of some WSIP projects, some roadways used to access the project sites could be improved to meet current safety standards, which would be a beneficial impact. For example, construction of the Treated Water Reservoirs project (SV-6) would bring a portion of Calaveras Road adjacent to the turnoff for the Sunol Valley WTP up to current Alameda County standards for safety both during and after construction.

Operational Impacts

Long-Term Traffic Increases

Impact 4.8-6: Increases in vehicle trips to and from the facility sites for operation and maintenance.

Operation of some of the WSIP facilities could result in an increase in the number of vehicles traveling to and from the facility site. The primary increase in vehicle trips would result from increases in the number of employees at an existing facility, increases in the number of deliveries to the facility, and new trips associated with operations, monitoring, inspection, and maintenance activities at new facilities. In most cases, there would be minimal increases over existing trips to the facility, and these vehicle trips would not result in a noticeable increase in traffic on adjacent streets.

Pipelines, Tunnels, and Crossovers. Operation of pipelines, tunnels, and crossovers would not result in new long-term trips. These facilities would be located underground and would not generate new vehicle trips.

Vaults, Valves, and Standby Power Facilities. Operation of these facilities would not result in a substantial number of new daily trips. These facilities require routine inspection and maintenance, but would not generate significant levels of new vehicle trips.

Storage Facilities, Treatment Facilities, and Pump Stations. Storage facilities include reservoirs and basins, and treatment facilities include basins, filters, and drains. These facilities could generate long-term vehicle trips associated with ongoing operations and monitoring of the facilities, and routine inspection and maintenance.

San Joaquin Region

Impact 4.8-6: Increases in vehicle trips to and from the facility sites for operation and maintenance		
Advanced Disinfection	SJ-1	LS
Lawrence Livermore	SJ-2	LS
SJPL System	SJ-3	LS
SJPL Rehabilitation	SJ-4	LS
Tesla Portal Disinfection	SJ-5	LS

Operation of WSIP facilities in the San Joaquin Region would result in minimal increases in long-term vehicle trips to these facilities. The Advanced Disinfection (SJ-1) and Tesla Portal Disinfection (SJ-5) facilities at Tesla Portal and the Lawrence Livermore (SJ-2) facility at Thomas Shaft would be unmanned facilities and would require a daily visit to the site by an operations representative. The SJPL System (SJ-3) and SJPL Rehabilitation (SJ-4) pipelines would not in themselves result in an increase in vehicle trips, but would require occasional visits by operations representatives during flow rate changes. Overall, the vehicle trips generated by these facilities would not result in a noticeable increase in traffic on adjacent streets, and operational impacts are expected to be *less than significant*.

Sunol Valley Region

Impact 4.8-6: Increases in vehicle trips to and from the facility sites for operation and maintenance		
Alameda Creek Fishery	SV-1	N/A
Calaveras Dam	SV-2	N/A
40-mgd Treated Water	SV-3	LS
New Irvington Tunnel	SV-4	N/A
Treated Water Reservoirs	SV-5	LS
SABUP	SV-6	N/A

The proposed treatment facilities at the Sunol Valley WTP (40-mgd Treated Water, SV-3, and Treated Water Reservoirs, SV-5) would result in an increased frequency of chemical deliveries to this facility. Overall, the increase in traffic volumes generated by operation of these facilities would not result in a noticeable increase in traffic on adjacent streets, and operational impacts are expected to be *less than significant*.

All remaining WSIP projects in this region (Alameda Creek Fishery, SV-1; Calaveras Dam, SV-2; New Irvington Tunnel, SV-4; and SABUP, SV-6) would involve upgrades to or replacement of existing facilities as well as construction of new tunnels and pipelines. At these facilities, the number of employees would remain the same as under existing conditions; therefore, the number of vehicle trips to and from the facilities is not expected to increase, and operational traffic impacts would not occur *(not applicable).* The tunnels and pipelines would not result in new employees or deliveries to facility sites.

Bay Division Region

Impact 4.8-6: Increases in vehicle trips to and from the facility sites for operation and maintenance		
BDPL Reliability Upgrade	BD-1	LS
BDPL 3 and 4 Crossovers	BD-2	LS
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	LS

All WSIP projects in this region (BDPL Reliability Upgrade, BD-1; BDPL 3 and 4 Crossovers, BD-2; and BDPL 3 and 4 Seismic Upgrade at Hayward Fault, BD-3) would include pipelines, tunnels, and crossovers, which would not generate any long-term vehicle trips. However, these projects would include existing and new vaults and valves, which would require periodic operations review and maintenance. Overall, any increase in traffic generated by operation and maintenance of these facilities would be minimal and would not result in a noticeable increase in traffic on adjacent streets, and operational impacts are expected to be *less than significant*.

Peninsula Region

Impact 4.8-6: Increases in vehicle trips to and from the facility sites for operation and maintenance		
Baden and San Pedro Valve Lots	PN-1	LS
CS/SA Transmission	PN-2	LS
HTWTP Long-Term	PN-3	LS
Lower Crystal Springs Dam	PN-4	LS
Pulgas Balancing Reservoir	PN-5	LS

WSIP projects in this region include repair, upgrades, and improvements to existing valves, vaults, and reservoirs (Baden and San Pedro Valve Lots, PN-1; Lower Crystal Springs Dam, PN-4; and Pulgas Balancing Reservoir, PN-5) and improvements to an existing water treatment plant (HTWTP Long-Term, PN-3). Only the HTWTP Long-Term project is expected to increase the number of employees (although not specified), and could require an increased frequency of chemical deliveries to the facility. Overall, long-term increases in traffic generated by operation of these facilities would be minimal and would not result in a noticeable increase in traffic on adjacent streets, and operational impacts are expected to be *less than significant*.

San Francisco Region

Impact 4.8-6: Increases in vehicle trips to and from the facility sites for operation and maintenance		
SAPL 3 Installation	SF-1	N/A
Groundwater Projects	SF-2	LS
Recycled Water Projects	SF-3	LS

New pipelines installed as part of the SAPL 3 Installation project (SF-1) would not result in any new employees or delivery trips to the facilities. Therefore, operational traffic impacts would not occur *(not applicable)*.

The Groundwater Projects (SF-2) include three projects in San Francisco and San Mateo, which would require an operations and maintenance check every day or two on average, as well as some increased chemical deliveries. These increases in trips would not result in a noticeable increase in traffic on adjacent streets. The Recycled Water Projects (SF-3) include recycled water projects at two locations in San Francisco, which would result in an increase of up to six employees as well as increased chemical deliveries to the site. Overall, the traffic generated by operation of these facilities would be minimal and would not result in a noticeable increase in traffic on adjacent streets, and operational impacts are expected to be *less than significant*.

4.8.3 References – Traffic, Transportation, and Circulation

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4.9 Air Quality

4.9 Air Quality

4.9.1 Air Pollutant Properties, Effects, and Sources

Air quality conditions in the WSIP study area are indicated by six criteria air pollutants, as described below (BAAQMD, 1999; SJVAPCD, 2002a).

Ozone. Ozone is a secondary air pollutant produced in the atmosphere through a complex series of photochemical reactions involving reactive organic gases (ROG) and nitrogen oxide (NO_x). The main sources of NO_x and ROG, often referred to as ozone precursors, are combustion processes (including motor vehicle engines) and the evaporation of solvents, paints, and fuels. In the Bay Area, automobiles are the single largest source of ozone precursors. In San Joaquin Valley, primary sources of ozone precursors are mobile sources, solvents, farming operations, area sources (e.g., consumer products, fuel combustion, landscape maintenance equipment, etc.), and oil/gas production. Ozone is a regional air pollutant because its precursors are transported and diffused by wind concurrently with ozone production through the photochemical reaction process. Ozone causes eye irritation, airway constriction, and shortness of breath and can aggravate existing respiratory diseases such as asthma, bronchitis, and emphysema.

Carbon Monoxide (CO). CO is an odorless, colorless gas usually formed as the result of the incomplete combustion of fuels. The single largest source of CO is motor vehicles; the highest emissions occur during low travel speeds, stop-and-go driving, cold starts, and hard acceleration. Exposure to high concentrations of CO reduces the oxygen-carrying capacity of the blood and can cause dizziness and fatigue, impair central nervous system function, and induce angina in persons with serious heart disease.

Suspended Particulates (PM_{10} and $PM_{2.5}$). Particulate matter is a class of air pollutants that consists of solid and liquid airborne particles in an extremely small size range. Particulate matter is measured in two size ranges: PM_{10} for particles less than 10 microns in diameter, and $PM_{2.5}$ for particles less than 2.5 microns in diameter. In San Joaquin Valley, $PM_{2.5}$ sources tend to be combustion sources such as vehicles, power generation, industrial processes, and wood burning; PM_{10} sources include these same sources in addition to farming operations (23.2 percent) and road dust (36.6 percent). In the Bay Area, motor vehicles generate about half of the air basin's particulates, through tailpipe emissions as well as brake pad and tire wear. Wood burning in fireplaces and stoves, industrial facilities, and ground-disturbing activities such as construction are other sources of fine particulates in the Bay Area. Fine particulates are small enough to be inhaled into the deepest parts of the human lung can cause adverse health effects. Among the criteria pollutants that are regulated, particulates appear to represent the most serious overall health hazard. Studies have shown that elevated particulate levels contribute to the death of approximately 200 to 500 people per year in the Bay Area. High levels of particulates have also been known to exacerbate chronic respiratory ailments, such as bronchitis and asthma, and have been associated with increased emergency room visits and hospital admissions.

Diesel exhaust is a growing concern throughout California. The California Air Resources Board (CARB) identified diesel engine particulate matter as a toxic air contaminant. The exhaust from diesel engines includes hundreds of different gaseous and particulate components, many of which are toxic. Many of these toxic compounds adhere to the diesel particles, which are very small and can penetrate deeply into the lungs. Diesel engine particulate matter has been identified as a human carcinogen. Mobile sources such as trucks, buses, and automobiles are some of the primary sources of diesel emissions. Studies show that diesel particulate matter concentrations are much higher near heavily traveled highways and intersections. The cancer risk from exposure to diesel exhaust is much higher than the risk associated with any other toxic air pollutant routinely measured in the region. Diesel exhaust contains both pulmonary irritants and hazardous compounds that could affect sensitive receptors such as young children, senior citizens, or those susceptible to chronic respiratory disease such as asthma, bronchitis, and emphysema.

In 2001, the California Health Interview Survey (CHIS) found that California's lifetime asthma prevalence, at 11.5 percent of the population, is higher than the national lifetime asthma prevalence of 10.1 percent (UCLA Center for Health Policy Research, 2007).[1] When asthma symptom prevalence in 2001 is sorted by county, the CHIS found that people who live in rural areas have more frequent asthma symptoms. Asthma symptom prevalence by region ranged from 10.4 to 13.8 percent for all ages. The highest rates occurred in Northern California, Sierra, and Sacramento area counties (13.8 percent). The San Joaquin region had a rate of 12.9 percent, while the Bay Area region had a rate of 12.2 percent. These data indicate that asthma is a regional (not localized) problem. However, these regional statistics mask the fact that asthma rates are higher among African-Americans (16.2 percent) than among the rest of the population (7.0 to 13.1 percent), suggesting there may be asthma "hot spots" in some communities that are not well characterized by regional averages.

Nitrogen Dioxide (NO_2). NO_2 is a reddish brown gas that is a byproduct of combustion processes. Automobiles and industrial operations are the main sources of NO_2. Aside from its contribution to ozone formation, NO_2 can increase the risk of acute and chronic respiratory disease and reduce visibility. NO_2 may be visible as a coloring component on high pollution days, especially in conjunction with high ozone levels.

Sulfur Dioxide (SO_2). SO_2 is a colorless acidic gas with a strong odor. It is produced by the combustion of sulfur-containing fuels such as oil, coal, and diesel. SO_2 has the potential to damage materials and can cause health effects at high concentrations. It can irritate lung tissue and increase the risk of acute and chronic respiratory disease (BAAQMD, 1999).

Greenhouse Gases. Gases that trap heat in the atmosphere are often called greenhouse gases (GHGs). Both natural processes and human activities emit GHGs. The accumulation of GHGs in the atmosphere regulates the earth's temperature; however, emissions from human activities such as electricity production and vehicles have elevated the concentration of these gases in the atmosphere. This accumulation of GHGs has contributed to an increase in the temperature of the

1 "Lifetime asthma prevalence" includes people diagnosed with asthma at some point in their lives, while "asthma symptom prevalence" includes those who experience asthma symptoms at least once per year.

earth's atmosphere and contributed to climate change. The principal greenhouse gases are carbon dioxide, methane, nitrous oxide, ozone, and water vapor. Carbon dioxide is the reference gas for climate change.

4.9.2 Setting

The CARB has divided California into regional air basins according to topographic air drainage features. The WSIP study area spans two of these regional air basins: San Joaquin Valley Air Basin (SJVAB) and San Francisco Bay Area Air Basin (SFBAAB). The SJVAB, the second largest air basin in the state, is defined by the Sierra Nevada mountains to the east, the Coast Range mountains to the west, and the Tehachapi Mountains to the south. The SJVAB is a "bowl" that opens to the north at the Carquinez Strait, where the San Joaquin–Sacramento Delta empties into San Francisco Bay (SJVAPCD, 2002a). The SFBAAB lies west of the Coast Range. In the Bay Area, the Coast Range splits into western and eastern ranges, and San Francisco Bay lies between the two ranges. Air flows into the SFBAAB from the west at the Golden Gate and then flows out of the SFBAAB to the east at the Carquinez Strait (where it enters the SJVAB).

San Joaquin Valley Air Basin

Meteorology

The SJVAB has an "inland Mediterranean" climate averaging over 260 sunny days per year. The valley floor is characterized by warm, dry summers and cooler winters. Summer high temperatures often exceed 100 degrees Fahrenheit (ºF), averaging in the low 90s during summer. Winter highs average in the 50s, but highs in the 30s and 40s can occur on days with persistent fog and low clouds. Wind speed and direction data indicate that summer winds typically originate at the north end of the valley and flow in a south-southeasterly direction. Winter winds occasionally originate from the south end of the valley and flow in a north-northwesterly direction. During the winter months, the valley experiences light, variable winds of less than 10 miles per hour (mph).

The potential for high pollutant concentrations depends on two primary factors: (1) the quantity of pollutant emissions in the surrounding area and upwind of the area, and (2) topographic and climatological factors (e.g., winds, inversion potential, terrain, stability/vertical mixing, and solar radiation). San Joaquin Valley's "bowl" topography induces persistent temperature inversions. Persistent inversions combined with high summer temperatures and low wind speeds during the winter result in a high year-round potential for air pollution.

Ambient Air Quality

The San Joaquin Valley Air Pollution Control District (SJVAPCD) operates a regional monitoring network that measures the ambient concentrations of six criteria air pollutants: ozone, CO, PM_{10}, $PM_{2.5}$, NO_2, and SO_2. Existing air quality in the WSIP study area can generally be inferred from basinwide ambient air quality measurements. **Table 4.9-1** provides a five-year summary of monitoring data (2001–2005) compiled by the CARB and compares measured pollutant concentrations with the most stringent applicable standard.

TABLE 4.9-1
SAN JOAQUIN VALLEY AIR BASIN AMBIENT AIR QUALITY MONITORING SUMMARY (2001–2005)

Pollutant	Most Stringent Applicable Standard	Number of Days Standards were Exceeded and Maximum Concentrations Measured				
		2001	2002	2003	2004	2005
Ozone (ROG)						
- Days 1-hour Std. Exceeded	>0.09 ppm[a]	123	127	137	106	83
- Max. 1-hour Conc. (ppm)[b]		**0.149**	**0.164**	**0.156**	**0.155**	**0.134**
- Days 8-hour Std. Exceeded	>0.08 ppm[b]	109	125	134	109	72
- Max. 8-hour Conc. (ppm)[b]		**0.120**	**0.132**	**0.127**	**0.126**	**0.113**
Carbon Monoxide (CO)						
- Days 1-hour Std. Exceeded	>20 ppm[a]	0	0	0	0	0
- Max. 1-hour Conc. (ppm)		8.4	6.1	5.8	4.6	4.3
- Days 8-hour Std. Exceeded	>9 ppm[a]	0	0	0	0	0
- Max. 8-hour Conc. (ppm)		6.0	4.5	4.1	3.0	3.0
Suspended Particulates (PM_{10})						
- Days 24-hour Std. Exceeded[c]	>50 $\mu g/m^3$ [a]	168	256	167	113	146
- Max. 24-hour Conc. ($\mu g/m^3$)		**221**	**194**	**150**	**219**	**137**
Suspended Particulates ($PM_{2.5}$)						
- Days 24-hour Std. Exceeded	>65 $\mu g/m^3$ [b, d]	19	14	1	3	10
- Max. 24-hour Conc. ($\mu g/m^3$)		**154.7**	**104.3**	**84.5**	**77.0**	**102.0**
- Annual Average ($\mu g/m^3$)	>12 $\mu g/m^3$ [a]	**20.8**	**24.1**	**24.8**	**18.2**	**22.4**
Nitrogen Dioxide (NO_2)						
- Days 1-hour Std. Exceeded	>0.25 ppm[a]	0	0	0	0	0
- Max. 1-hour Conc. (ppm)[b]		0.115	0.107	0.092	0.083	0.087
Sulfur Dioxide (SO_2)						
- Days 1-hour Std. Exceeded	>0.25 ppm[a]	0	0	0	0	0
- Max. 1-hour Conc. (ppm)[b]		0.03	N/A	0.019	N/A	N/A

NOTES: **Bold** values are in excess of applicable standard. "N/A" indicates that data are not available.
conc. = concentration; ppm = parts per million; $\mu g/m^3$ = micrograms per cubic meter

[a] State standard, not to be exceeded.
[b] Federal standard, not to be exceeded.
[c] The first number represents measured exceedances but not all exceedances since PM_{10} is not sampled every day. The second number is the calculated days exceeding the standard, which is an estimate of days expected to exceed the standard if there was sampling every day. This estimate could be low if insufficient samples are collected.
[d] Sample days exceeding the standard, which would not represent all possible exceedances since not all days were sampled.

SOURCE: CARB, 2006a.

Ozone

Table 4.9-1 shows that, according to published data, the most stringent applicable ozone standards (the state 1-hour standard of 0.09 parts per million [ppm] and the federal 8-hour standard of 0.08 ppm) were exceeded approximately 20 to 40 percent of each year in the SJVAB between 2001 and 2005.

Carbon Monoxide

As shown in the table, no exceedances of state CO standards were recorded between 2001 and 2005. Measurements of CO indicate hourly maximums ranging between 20 and 40 percent of the more stringent state standard. Similarly, maximum 8-hour CO levels range between 35 and 65 percent of the allowable 8-hour standard.

Suspended Particulates (PM_{10} and $PM_{2.5}$)

Table 4.9-1 shows that exceedances of the state PM_{10} standard occur relatively frequently in the SJVAB. It is estimated that the state 24-hour PM_{10} standard was exceeded between 113 and 256 days per year between 2001 and 2005.

In 1997, the U.S. Environmental Protection Agency (U.S. EPA) adopted a standard for $PM_{2.5}$, the fine fraction of particulate matter (Table 4.9-1). California's standard went into effect in 2003. It is estimated that the federal 24-hour $PM_{2.5}$ standard was exceeded on 1 to 19 sample days per year between 2001 and 2005. The state annual average standard was exceeded every year between 2001 and 2005.

Other Criteria Air Pollutants

Table 4.9-1 shows that the standards for NO_2 and SO_2 are being met in the SJVAB, and pollutant trends suggest that the air basin will continue to meet these standards for the foreseeable future.

Greenhouse Gases

The SJVAPCD's emissions inventory identifies sources of criteria air pollutants but does not include GHGs, pollutants contributing to climate change. Sources of GHG emissions in the San Joaquin Valley include mobile sources (on-road motor vehicles, off-highway mobile sources, and aircraft) as well as stationary sources associated with agricultural, industrial, and commercial operations.

Sensitive Receptors

Land uses such as schools, children's daycare centers, hospitals, and convalescent homes are considered to be more sensitive than the general public to poor air quality because the population groups associated with these uses have increased susceptibility to respiratory distress. Persons engaged in strenuous work or exercise also have increased sensitivity to poor air quality. Residential areas are considered more sensitive to air quality conditions than commercial and industrial areas, because people generally spend longer periods of time at their residences, resulting in greater exposure to ambient air quality conditions. Recreational uses or parks are also considered sensitive due to the greater exposure to ambient air quality conditions, and because the presence of pollution detracts from the recreational experience.

Most of the areas adjacent to WSIP facilities in the SJVAB are undeveloped or used for agriculture. The city of Modesto, located in the center of the San Joaquin Region, includes residential, commercial, school, and park uses. There are also rural residential uses located south of Riverbank. In the western margin of this region (in the Tesla Portal vicinity), there is a private golf course (Tracy Golf and Country Club) and residential development.

San Francisco Bay Area Air Basin

Meteorology

Temperatures in the San Francisco Bay Area average 58 ºF annually, with summer highs in the mid-80s and winter lows in the mid-30s. However, since land tends to heat up and cool off more quickly than water, summer temperatures at the coast can be as much as 35 ºF cooler than temperatures 15 to 20 miles inland. At night, this contrast usually decreases to less than 10 ºF. During the winter, the relationship of minimum and maximum temperatures is reversed, with a small temperature contrast between the coast and inland areas during the day and a large temperature contrast at night.

Summer winds generally flow from the northwest through the Golden Gate, and, when they meet the East Bay Hills, split off to the northwest toward Richmond and to the southwest toward San Jose. In the late morning or early afternoon, air begins to flow onshore (from the coast to the Central Valley), increasing in depth and velocity while spreading inland. The depth of the onshore flow depends in large part on the height and strength of the inversion. During winter, the Bay Area frequently experiences stormy conditions with moderate to strong winds as well as periods of stagnation with very light winds. Winter stagnation episodes are characterized by nighttime drainage flows in coastal valleys. Drainage is a reversal of the usual daytime air-flow patterns; air moves from the Central Valley toward the coast and back down toward the Bay from the smaller valleys within the Bay Area.

The SFBAAB is divided into 11 climatological regions, and WSIP facilities would be located in four of these regions: Livermore Valley, West Alameda, Santa Clara Valley, and Peninsula. The air pollution potential in these areas is highest in the Livermore Valley and Santa Clara Valley, where high summer temperatures, stable air, and the surrounding mountains combine to promote ozone formation. There are also many emissions sources within and upwind of these areas. Although coastal areas of the Peninsula have a lower potential for air pollution due to the marine influence, the southeastern Peninsula area has a high air pollution potential because it is protected from the winds and fog associated with the marine layer. West Alameda has more of a marine influence than the inland valleys, but it also has a relatively high potential for air pollution during the summer and fall.

Ambient Air Quality

The Bay Area Air Quality Management District (BAAQMD) operates a regional monitoring network that measures the ambient concentrations of six criteria air pollutants: ozone, CO, PM_{10}, $PM_{2.5}$, NO_2, and SO_2. Existing air quality in the WSIP study area can be generally inferred from basinwide ambient air quality measurements. **Table 4.9-2** provides a five-year summary of monitoring data (2001–2005) compiled by the CARB and compares measured pollutant concentrations with the most stringent applicable standard.

TABLE 4.9-2
BAY AREA AIR BASIN AMBIENT AIR QUALITY MONITORING SUMMARY (2001–2005)

Pollutant	Most Stringent Applicable Standard	Number of Days Standards were Exceeded and Maximum Concentrations Measured				
		2001	2002	2003	2004	2005
Ozone (ROG)						
- Days 1-hour Std. Exceeded	>0.09 ppm[a]	15	16	19	7	9
- Max. 1-hour Conc. (ppm)[b]		**0.134**	**0.160**	**0.128**	**0.113**	**0.120**
- Days 8-hour Std. Exceeded	>0.08 ppm[b]	7	7	7	0	1
- Max. 8-hour Conc. (ppm)[b]		**0.102**	**0.106**	**0.101**	**0.084**	**0.090**
Carbon Monoxide (CO)						
- Days 1-hour Std. Exceeded	>20 ppm[a]	0	0	0	0	0
- Max. 1-hour Conc. (ppm)		7.6	7.7	8.6	4.8	4.5
- Days 8-hour Std. Exceeded	>9 ppm[a]	0	0	0	0	0
- Max. 8-hour Conc. (ppm)		5.1	5.1	4.4	3.4	3.1
Suspended Particulates (PM_{10})						
- Days 24-hour Std. Exceeded[c]	>50 µg/m^3 [a]	48	24	18	25	23
- Max. 24-hour Conc. (µg/m^3)		**113.9**	**83.5**	**59.5**	**65.0**	**80.8**
Suspended Particulates ($PM_{2.5}$)						
- Days 24-hour Std. Exceeded	>65 µg/m^3 [b, d]	4	4	0	1	0
- Max. 24-hour Conc. (µg/m^3)		**107.5**	**84.5**	56.1	**73.7**	54.6
- Annual Average (µg/m^3)	>12 µg/m^3 [a]	**12.9**	**14.0**	11.7	11.6	11.8
Nitrogen Dioxide (NO_2)						
- Days 1-hour Std. Exceeded	>0.25 ppm[a]	0	0	0	0	0
- Max. 1-hour Conc. (ppm)[b]		0.108	0.080	0.081	0.073	0.074
Sulfur Dioxide (SO_2)						
- Days 1-hour Std. Exceeded	>0.25 ppm[a]	0	0	0	0	0
- Max. 1-hour Conc. (ppm)[b]		0.104	0.111	0.134	0.090	0.038

NOTES: **Bold** values are in excess of applicable standard. “N/A” indicates that data is not available.
conc. = concentration; ppm = parts per million; µg/m^3 = micrograms per cubic meter

a State standard, not to be exceeded.
b Federal standard, not to be exceeded.
c The first number represents measured exceedances but not all exceedances since PM_{10} is not sampled every day. The second number is the calculated days exceeding the standard, which is an estimate of days expected to exceed the standard if there was sampling every day. This estimate could be low if insufficient samples are collected.
d Sample days exceeding the standard, which would not represent all possible exceedances since not all days were sampled.

SOURCE: CARB, 2006a.

Ozone

Table 4.9-2 shows that, according to published data, the most stringent applicable standards (state 1-hour standard of 0.09 ppm and the federal 8-hour standard of 0.08 ppm) are exceeded in the SFBAAB approximately 2 to 5 percent of every year.

Carbon Monoxide

As shown in the table, no exceedances of state CO standards were recorded between 2001 and 2005. Measurements of CO indicate hourly maximums ranging between 20 and 40 percent of the more stringent state standard. Similarly, maximum 8-hour CO levels range between 30 and 60 percent of the allowable 8-hour standard.

Suspended Particulates (PM_{10} and $PM_{2.5}$)

Table 4.9-2 shows that exceedances of the state PM_{10} standard have occurred in the SFBAAB. It is estimated that the state 24-hour PM_{10} standard was exceeded between 18 and 48 days per year between 2001 and 2005.

The BAAQMD began monitoring $PM_{2.5}$ concentrations in 1999. The federal 24-hour $PM_{2.5}$ standard was exceeded on 1 to 4 days each year, for a total of 9 sample days between 2001 and 2005 (not exceeded in 2003 and 2005). The state annual average standard was exceeded in 2001 and 2002.

In 2004, the BAAQMD initiated the Community Air Risk Evaluation program, with the goal of sampling ambient levels of diesel particulate matter; however, the results are not yet available.

Other Criteria Air Pollutants

Table 4.9-2 shows that the standards for NO_2 and SO_2 are being met in the Bay Area, and pollutant trends suggest that the air basin will continue to meet these standards for the foreseeable future.

Greenhouse Gases

The BAAQMD has prepared an emissions inventory of GHGs, pollutants contributing to climate change. Fossil fuel consumption in the transportation sector (on-road motor vehicles, off-highway mobile sources, and aircraft) is the single largest source of Bay Area GHG emissions, accounting for approximately half of the Bay Area’s GHG emissions in 2002. Industrial and commercial sources were the second largest contributors of GHG emissions (with about one-fourth of total emissions), while power plants contribute approximately seven percent of total emissions (BAAQMD, 2006a).

Sensitive Receptors

Land uses considered most sensitive to air quality include residential uses, recreational/park uses, schools, children’s daycare centers, hospitals, and convalescent homes. All of these uses are present in the vicinity of WSIP facilities within the SFBAAB. Since the area surrounding WSIP facilities in the Sunol Valley contains only one residence, this region has the lowest sensitivity. WSIP facilities in the Bay Division Region would be located near residential, park, school, childcare, and convalescent/nursing home uses. WSIP facilities in the Peninsula Region would be located near residential, park, school, and hospital uses. Sensitive receptors near WSIP facilities in the San Francisco Region include residential and school uses.

Regulatory and Planning Framework

Federal Standards

The 1970 Clean Air Act (last amended in 1990, 42 United States Code 7401 et seq.) required that regional planning and air pollution control agencies prepare a regional air quality plan to outline the measures by which both stationary and mobile sources of pollutants will be controlled in order to achieve all standards by the deadlines specified in the Clean Air Act. The ambient air quality standards are intended to protect the public health and welfare, and they specify the concentration of pollutants (with an adequate margin of safety) to which the public can be exposed without adverse health effects. They are designed to protect those segments of the public most susceptible to respiratory distress, known as sensitive receptors, including asthmatics, the very young, the elderly, people weak from other illness or disease, or persons engaged in strenuous work or exercise. Healthy adults can tolerate occasional exposure to air pollution levels that are somewhat above the ambient air quality standards before adverse health effects are observed.

San Joaquin Valley Air Basin

The SJVAB includes the counties of San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, and Tulare, in addition to the valley portion of Kern County. For each nonattainment criteria pollutant (ozone and PM_{10}), the SJVAPCD is responsible for preparing attainment plans, which establish the strategies that the District will use to attain the federal standards. The SJVAB's current attainment status with respect to federal standards is summarized in **Table 4.9-3**. The SJVAB is currently not in compliance with federal ozone and PM_{10} standards and is designated as "severe nonattainment" for the federal ozone standard and "serious nonattainment" for the federal PM_{10} and $PM_{2.5}$ standards.

The SJVAPCD adopted the *Amended 2002 and 2005 Rate of Progress Plan for San Joaquin Valley Ozone* in December 2002. This ozone plan contains emission control strategies for various mobile and stationary sources, none of which pertain to construction projects. In response to the U.S. EPA's nonattainment designation of the 1-hour ozone standard, the *2004 Extreme Ozone Attainment Demonstration Plan* was prepared for this air basin and submitted to the U.S. EPA in November 2004. The plan set forth emissions reductions for attaining this standard by November 15, 2010. Because this standard (including associated designations and classifications) was revoked in June 2005, the U.S. EPA never approved the plan. However, preliminary work has begun on developing the *Eight-Hour Ozone Attainment Demonstration Plan* (OADP) for San Joaquin Valley. The OADP, which will be part of the State Implementation Plan, must demonstrate attainment of the new federal 8-hour ozone standard by 2013; it must also be adopted by the local air districts and the CARB, and be submitted to the U.S. EPA by June 15, 2007 (SJVAPCD, 2007a).

The SJVAPCD adopted the *2003 PM_{10} Plan* (PM_{10} Plan) in response to the SJVAB's nonattainment status for PM_{10}. The plan is designed to meet the requirements of the federal Clean Air Act and contains new control strategies for stationary, area, and mobile sources needed to attain the federal PM_{10} standards at the earliest possible date. The PM_{10} Plan does have control strategies related to construction projects. This plan became part of the State Implementation Plan for San Joaquin Valley when it was adopted by the CARB in August 2003. The U.S. EPA approved this plan in June 2004. In February 2006, the SJVAPCD adopted the *2006 PM_{10} Plan* and this plan is undergoing review by the CARB. The *2006 PM_{10} Plan* is due to the EPA by March 31, 2006. The *2006 PM_{10} Plan* is a continuation of the SJVAPCD's strategy for attaining federal PM_{10} standards.

TABLE 4.9-3
STATE AND FEDERAL AMBIENT AIR QUALITY STANDARDS AND ATTAINMENT STATUS

		(State) SAAQS[a]			(Federal) NAAQS[b]		
Pollutant	**Averaging Time**	**Standard**	**San Joaquin Attainment Status**	**Bay Area Attainment Status**	**Standard**	**San Joaquin Attainment Status**	**Bay Area Attainment Status**
Ozone (O_3)	1 hour	0.09 ppm	**N/Severe**	**N**	NA	See Note (c)	See Note (c)
	8 hour	0.07 ppm	See Note (d)	See Note (d)	0.08 ppm	**N/Serious**	**N/Marginal**
Carbon Monoxide (CO)	1 hour	20 ppm	A	A	35 ppm	U/A	A
	8 hour	9 ppm	A	A	9 ppm	U/A	A
Nitrogen Dioxide (NO_2)	1 hour	0.25 ppm	A	A	NA	NA	NA
	Annual	NA	NA	NA	0.053 ppm	U/A	A
Sulfur Dioxide (SO_2)	1 hour	0.25 ppm	A	A	NA	U	NA
	24 hour	0.04 ppm	A	A	0.14 ppm	U	A
	Annual	NA	NA	NA	0.03 ppm	U	A
Particulate Matter (PM_{10})	24 hour	50 $\mu g/m^3$	**N**	**N**	150 $\mu g/m^3$	**N/Serious**	U
	Annual[e]	20 $\mu g/m^3$ [f]	**N**	**N**	50 $\mu g/m^3$	**N/Serious**	A
Fine Particulate Matter ($PM_{2.5}$)	24 hour	NA	NA	NA	65 $\mu g/m^3$	**N/Serious**	A
	Annual	12 $\mu g/m^3$ [f]	**N**	**N**	15 $\mu g/m^3$	**N/Serious**	A
Sulfates	24 hour	25 $\mu g/m^3$	A	A	NA	NA	NA
Lead	30 day	1.5 $\mu g/m^3$	A	A	NA	NA	NA
	Quarter	NA	NA	NA	1.5 $\mu g/m^3$	ND	A
Hydrogen Sulfide	1 hour	0.03 ppm	U	U	NA	NA	NA
Visibility-Reducing Particles	8 hour	See Note (g)	U	A	NA	NA	NA

NOTES: A = Attainment; **N** = Nonattainment; U = Unclassified; NA = Not Applicable, no applicable standard; ND = no designation; ppm = parts per million; $\mu g/m^3$ = micrograms per cubic meter.

a SAAQS = state ambient air quality standards (California). SAAQS for ozone, carbon monoxide (except Lake Tahoe), sulfur dioxide (1-hour and 24-hour), nitrogen dioxide, particulate matter, and visibility-reducing particles are values that are not to be exceeded. All other state standards shown are values not to be equaled or exceeded.

b NAAQS = national ambient air quality standards. NAAQS, other than ozone and particulates, and those based on annual averages or annual arithmetic means, are not to be exceeded more than once a year. The 8-hour ozone standard is attained when the three-year average of the fourth highest daily concentration is 0.08 ppm or less. The 24-hour PM_{10} standard is attained when the three-year average of the 99th percentile of monitored concentrations is less than the standard. The 24-hour $PM_{2.5}$ standard is attained when the three-year average of the 98th percentile is less than the standard.

c The U.S. EPA revoked the national 1-hour ozone standard on June 15, 2005.

d This state 8-hour ozone standard was approved in April 2005 and became effective in May 2006. Attainment status in both districts is Unclassified.

e State standard = annual geometric mean; national standard = annual arithmetic mean.

f In June 2002, CARB established new annual standards for $PM_{2.5}$ and PM_{10}.

g Statewide visibility-reducing particle standard (except Lake Tahoe Air Basin): Particles in sufficient amount to produce an extinction coefficient of 0.23 per kilometer when the relative humidity is less than 70 percent. This standard is intended to limit the frequency and severity of visibility impairment due to regional haze and is equivalent to a 10-mile nominal visual range.

SOURCES: BAAQMD and SJVAPCD standards, and attainment status as of February 2007 (BAAQMD 2007; SJVAPCD 2007b).

The U.S. EPA is currently developing implementation guidance for fine particulate matter ($PM_{2.5}$). Air districts will be designated as attainment or nonattainment for this new standard in the near future. The SJAPCD has been designated as nonattainment for the $PM_{2.5}$ standard, and the *$PM_{2.5}$ Plan* is due to the U.S. EPA in April 2008. Air districts that are designated as nonattainment will be subject to more stringent air quality planning requirements.

San Francisco Bay Area Air Basin

The SFBAAB's current attainment status with respect to federal standards is summarized in Table 4.9-3. In general, the Bay Area experiences low concentrations of most pollutants when compared to federal standards, except for ozone and particulate matter (PM_{10} and $PM_{2.5}$), for which standards are exceeded periodically. The Bay Area's attainment status for ozone has changed several times over the past decade, first from "nonattainment" to "attainment" in 1995, then back to "unclassified nonattainment" in 1998 for the 1-hour federal ozone standard. In June 2004, the Bay Area was designated as "marginal nonattainment" for the 8-hour ozone standard. In 1998, after many years without violations of any CO standards, the attainment status for CO was upgraded to "attainment."

The BAAQMD's *Clean Air Plan* (CAP), last adopted in 2000, applies control measures to stationary and mobile sources and outlines transportation control measures. Although the 2000 CAP is an ozone plan, it includes PM_{10} attainment planning as an informational item. The 1997 CAP and 2000 CAP included 19 transportation control measures, many of which were partially implemented between 1998 and 2000. The 2000 CAP continues to implement and expand key mobile-source programs included in the 1997 CAP.

In response to the U.S. EPA redesignation of the basin for the 1-hour federal ozone standard to nonattainment, the BAAQMD, Association of Bay Area Governments (ABAG), and Metropolitan Transportation Commission (MTC) were required to develop an ozone attainment plan to meet this standard. The *1999 Ozone Attainment Plan* (OAP) was prepared and adopted by these agencies in June 1999. However, in March 2001, the U.S. EPA proposed and took final action to approve portions of the 1999 OAP and disapprove other portions, while also making the finding that the Bay Area had not attained the national 1-hour ozone standard. As a result, a revised OAP was prepared and adopted in October 2001. The 2001 OAP amends and supplements the 1999 OAP. The 2001 OAP contains control strategies for stationary and mobile sources. The adopted mobile-source control program was estimated to significantly reduce volatile organic compound and NOx emissions between 2000 and 2006, reducing emissions from on- and off-road diesel engines (including construction equipment). In addition to emission reduction requirements for engines and fuels, the OAP identified 28 transportation control measures to reduce automobile emissions, including improved transit service and transit coordination, new carpool lanes, signal timing, freeway incident management, and increased state gas tax and bridge tolls. In June 2005, the U.S. EPA revoked the federal 1-hour ozone standard, although the 8-hour standard is still in effect. The attainment deadline for "marginal nonattainment" areas for the 8-hour federal ozone standard is June 2007.

State Standards

The Clean Air Act Amendments of 1970 established national ambient air quality standards, and individual states retained the option to adopt more stringent standards and to include other pollution sources. California had already established its own air quality standards when federal standards were established, and because of the unique meteorological problems in California, there is considerable diversity between the state and national ambient air quality standards, as shown in Table 4.9-3. California ambient standards tend to be at least as protective as national ambient standards and are often more stringent. Currently, there are no federal or state ambient air quality standards for any of the six greenhouse gases.[2]

In 1988, California passed the California Clean Air Act (California Health and Safety Code Sections 39600 et seq.), which, like its federal counterpart, called for the designation of areas as attainment or nonattainment, but based on state ambient air quality standards rather than the federal standards.

In 2005, in recognition of California's vulnerability to the effects of climate change, Governor Schwarzenegger established Executive Order S-3-05, which sets forth a series of target dates by which statewide emission of GHG would be progressively reduced, as follows:

- By 2010, reduce GHG emissions to 2000 levels;
- By 2020, reduce GHG emissions to 1990 levels; and
- By 2050, reduce GHG emissions to 80 percent below 1990 levels.

In 2006, California passed the California Global Warming Solutions Act of 2006 (Assembly Bill No. 32; California Health and Safety Code Division 25.5, Sections 38500, et seq., or AB 32), which requires the CARB to design and implement emission limits, regulations, and other measures, such that feasible and cost-effective statewide GHG emissions are reduced to 1990 levels by 2020 (representing a 25 percent reduction in emissions).

California Air Resources Board

The CARB is the state agency responsible for regulating air quality. The CARB's responsibilities include establishing state ambient air quality standards, emissions standards, and regulations for mobile emissions sources (e.g., autos, trucks, etc.), as well as overseeing the efforts of countywide and multi-county air pollution control districts, which have primary responsibility over stationary sources. The emission standards most relevant to proposed WSIP facilities are those related to automobiles and on- and off-road heavy-duty diesel engines. The CARB also regulates vehicle fuels with the intent to reduce emissions; it has set emission reduction performance requirements for gasoline (California reformulated gasoline) and limited the sulfur and aromatic content of diesel fuel to make it burn cleaner. The CARB also sets the standards used to pass or fail vehicles in smog check and heavy-duty truck inspection programs.

[2] The six GHGs are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFC), perfluorocarbons (PFC), and sulfur hexafluoride (SF_6).

Diesel Idling Limits. In 2005, the CARB approved a regulatory measure to reduce emissions of toxic and criteria pollutants by limiting the idling of new heavy-duty diesel vehicles, which altered five sections of Title 13 of the California Code of Regulations. The relevant changes with respect to the WSIP are Sections 2480 and 2485. The pertinent requirements of Section 2480, Airborne Toxic Control Measure to Limit School Bus Idling and Idling at Schools, include the following:

(c)(2) A driver of a commercial motor vehicle:

(A) must turn off the bus or vehicle engine upon stopping at a school and must not turn the bus or vehicle engine on more than 30 seconds before beginning to depart from a school; and

(B) must not cause or allow a bus or vehicle to idle at any location within 100 feet of, but not at, a school for:

(i) more than five consecutive minutes; or
(ii) a period or periods aggregating more than five minutes in any one hour.

(c)(4) A motor carrier of a commercial motor vehicle must ensure that:

(A) the bus or vehicle driver, upon employment and at least once per year thereafter, is informed of the requirements in (c)(2), and of the consequences, under this section and the motor carrier's terms of employment, of not complying with those requirements;

(B) all complaints of non-compliance with, and enforcement actions related to, the requirements of (c)(2) are reviewed and remedial action is taken as necessary; and

(C) records of (4) (A) and (B) are kept for at least three years and made available or accessible to enforcement personnel as defined in subsection (g) within three business days of their request.

Pertinent requirements of Section 2485, Airborne Toxic Control Measure to Limit Diesel-Fueled Commercial Motor Vehicle Idling, include the following:

(c) The driver of any vehicle subject to this section:

(1) shall not idle the vehicle's primary diesel engine for greater than five minutes at any location, except as noted in subsection (d); and

(2) shall not operate a diesel-fueled auxiliary power system (APS) to power a heater, air conditioner, or any ancillary equipment on that vehicle during sleeping or resting in a sleeper berth for greater than five minutes at any location when within 100 feet of a restricted area, except as noted in subsection (d).

"Restricted area" means any real property zoned for individual or multifamily housing units that has one or more such units. There are 12 exceptions to this requirement (e.g., emergency situations, military, adverse weather conditions, etc.), including: when a vehicle's power takeoff is being used to run pumps, blowers, or other equipment; when a vehicle is stuck in traffic, stopped at a light, or under direction of a police officer; when a vehicle is queuing beyond 100 feet from any restricted area; or when an engine is being tested, serviced, or repaired.

Greenhouse Gas Emissions Limits. The California Global Warming Solutions Act of 2006 establishes a timetable for the CARB to adopt emission limits, rules, and regulations designed to achieve the intent of the Act, as follows (CARB, 2006b):

- Publish a list of discrete early action GHG emission reduction measures by June 30, 2007.
- Establish a statewide GHG emissions cap for 2020, equivalent to the 1990 emissions level by January 1, 2008.
- Adopt mandatory reporting rules for significant sources of GHGs by January 1, 2008.
- Adopt a scoping plan by January 1, 2009, indicating how GHG emission reductions will be achieved from significant GHG sources via regulations, market-based compliance mechanisms and other actions, including the recommendation of a *de minimus* threshold for GHG emissions, below which emission reduction requirements would not apply.
- Adopt regulations by January 1, 2011 to achieve the maximum technologically feasible and cost-effective reductions in GHGs, including provisions for using both market-based and alternative compliance mechanisms.
- Establish January 1, 2012 as the date by which all regulations adopted prior to January 1, 2010 are to become operative (enforceable).

The CARB is proposing "Early Action Measures" in three groups; together, these measures will make a substantial contribution to the overall 2020 statewide GHG emission reduction goal of approximately 174 million metric tons of carbon dioxide equivalent gases (CARB, 2007). (The term "carbon dioxide equivalent" is used to account for the differences in global warming potential [GWP] among the six greenhouse gases.) These measures are summarized as follows:

> *Group 1*: Three new GHG-only regulations are proposed to meet the narrow legal definition of "discrete early action GHG reduction measures": a low-carbon fuel standard, reduction of refrigerant losses from motor vehicle air conditioning system maintenance, and increased methane capture from landfills. These regulations are expected to take effect by January 1, 2010.
>
> *Group 2*: The CARB is initiating work on 23 other GHG emission-reducing measures in the 2007 to 2009 time period with rulemaking to occur as soon as possible, where applicable. These GHG measures relate to the following sectors: agriculture, commercial, education, energy efficiency, fire suppression, forestry, oil and gas, and transportation.
>
> *Group 3*: The CARB is initiating work on 10 conventional air pollution controls aimed at criteria and toxic air pollutants, but with concurrent climate co-benefits through reductions in carbon dioxide or non-Kyoto pollutants (i.e., diesel particulate matter, other light-absorbing compounds, and/or ozone precursors) that contribute to global warming.

With the exception of the low-carbon fuel standard,[3] none of the Group 1 measures specifically relate to construction or operation of water infrastructure projects, such as the WSIP facility

[3] Feasiblity of this measure is currently unknown depending on availability and suitability of low-carbon fuel for construction equipment and proximity to construction site.

improvement projects. Proposed Groups 2 and 3 measures that could become effective during implementation of the WSIP and could pertain to construction-related equipment operations or specific WSIP facility design include the following actions:

- Measure 2-6, Education: Guidance/protocols for local governments to facilitate GHG emission reductions
- Measure 2-9, Energy Efficiency: Light-covered paving, cool roofs and shade trees
- Measures 2-14, 3-2, 3-4, Transportation: emission reductions for heavy-duty vehicles, on-road diesel trucks, and off-road diesel equipment (non-agricultural); efficiency improvements
- Measure 2-20, Transportation: Tire inflation program
- Measure 3-10, Fuels: Evaporative standards for aboveground tanks

Some proposed measures will require new legislation to implement, some will require subsidies, some have already been developed, and some will require additional effort to evaluate and quantify. Applicable early action measures that are ultimately adopted from Groups 2 and 3 will become effective during implementation of the WSIP and some WSIP facility projects might be subject to these requirements, depending on their timing.

In consultation with the CARB and California Public Utilities Commission, the California Energy Commission (CEC) is currently establishing a GHGs emission performance standard for local, public-owned electric utilities (pursuant to Senate Bill No. 1368). This standard will limit the rate of GHGs emissions to a level that is no higher than the rate of emissions of GHGs for combined-cycle natural gas baseload generation. The rulemaking shall consider, but not necessarily be limited to, establishing a GHGs emission performance standard for baseload generation facilities by June 30, 2007, a process for calculating the emissions of GHGs from baseload facilities and enforcing the standard, and a process for reevaluating and revising as necessary the GHGs emission performance standard. This standard must take into consideration the effect of the standard on rates, reliability, and financial resources, while recognizing the Legislature's intent to encourage use of renewable resources and its goal of environmental improvement.

San Joaquin Valley Air Basin

The SJVAPCD is the regional agency responsible for air quality regulation within the SJVAB. The SJVAPCD regulates air quality through its control of stationary sources of pollution such as industrial processes and equipment, but also implements indirect source control programs to reduce mobile-source emissions (including transportation control measures). The SJVAB also provides the CARB with local strategies for sources under its jurisdiction for inclusion in the State Implementation Plan. (See the discussion above under Federal Standards for the SJVAB.)

Table 4.9-3 presents a summary of the SJVAB's attainment status with respect to state standards. As indicated in the table, the SJVAB is designated as "severe nonattainment" for the state ozone standard and "nonattainment" for the state PM_{10} and $PM_{2.5}$ standards. The SJVAB is designated as "attainment" for all other criteria pollutants listed in Table 4.9-3.

San Francisco Bay Area Air Basin

The BAAQMD is the regional agency responsible for air quality regulation within the SFBAAB. The BAAQMD regulates air quality through its planning and review activities. The BAAQMD has permit authority over most types of stationary emission sources and can require stationary sources to obtain permits; it can also impose emission limits, set fuel or material specifications, or establish operational limits to reduce air emissions. The BAAQMD regulates new or expanding stationary sources of toxic air contaminants.

In September 2005, the BAAQMD, in cooperation with the MTC and ABAG, prepared the draft *Bay Area 2005 Ozone Strategy*. The Ozone Strategy is a roadmap showing how the San Francisco Bay Area will achieve compliance with the state 1-hour ozone standard as expeditiously as practicable, and how the region will reduce transport of ozone and ozone precursors to neighboring air basins. The control strategy includes stationary-source control measures to be implemented through BAAQMD regulations; mobile-source control measures to be implemented through incentive programs and other activities; and transportation control measures to be implemented through transportation programs in cooperation with the MTC, local governments, transit agencies, and others.

Table 4.9-3 presents a summary of the BAAQMD's attainment status with respect to state standards. As indicated in the table, the SFBAAB is designated as "nonattainment" for state ozone, PM_{10}, and $PM_{2.5}$ standards. The SFBAAB is designated as "attainment" for all other criteria pollutants listed in the table.

Climate Action Plan for San Francisco. In February 2002, the San Francisco Board of Supervisors passed the *Greenhouse Gas Emissions Reduction Resolution* (Number 158-02) committing the City and County of San Francisco to a greenhouse gas (GHG) emissions reductions goal of 20 percent below 1990 levels by the year 2012. The resolution also directs the San Francisco Department of the Environment, the SFPUC, and other appropriate City agencies to complete and coordinate an analysis and planning of a local action plan targeting GHG emission reduction activities. In September 2004, the San Francisco Department of the Environment and the SFPUC published the *Climate Action Plan for San Francisco: Local Actions to Reduce Greenhouse Emissions* (Plan) (SFDE and SFPUC, 2004). Although the San Francisco Board of Supervisors has not formally committed the City to perform the actions addressed in the Plan, and many of the actions require further development and commitment of resources, it serves as a blueprint for GHG emission reductions, and several actions are now in progress.

The Plan presents estimates of San Francisco's baseline GHG inventory and reduction targets. It states that burning fossil fuels in vehicles and for energy use in buildings and facilities are the major contributors to San Francisco's GHG emissions; in 1990, these activities produced approximately 9.1 million tons of carbon dioxide (CO_2). The Plan also describes recommended emissions reduction actions in the key target sectors – transportation, energy efficiency, renewable energy, and solid waste management – to meet stated goals by 2012.

The Plan presents proposals to reduce annual carbon dioxide emissions by 2.5 million tons by 2012, a 20 percent reduction below 1990 emissions, such as greening vehicle fleets, increasing energy efficiency in public and private buildings, developing renewable energy technologies like solar, wind, fuel cells and tidal power, and expanding residential and commercial recycling programs. The roadmap to achieving these goals requires the cooperation of a number of City, regional and State agencies as well as private sector partners.

Greenhouse Gas Reduction Ordinance

In May 2008, San Francisco adopted an ordinance amending its Environment Code to establish greenhouse gas emission targets and action plans, to authorize the Department of the Environment to coordinate efforts to meet these targets, and to make environmental findings (CCSF, 2008). The ordinance establishes the following greenhouse gas emission reduction limits for San Francisco and the target dates to achieve them:

- Determine 1990 City greenhouse gas emissions by 2008, the baseline level with reference to which target reductions are set;
- Reduce greenhouse gas emissions by 25 percent below 1990 levels by 2017;
- Reduce greenhouse gas emissions by 40 percent below 1990 levels by 2025; and
- Reduce greenhouse gas emissions by 80 percent below 1990 levels by 2050.

The ordinance also specifies requirements for City departments to prepare Climate Action Plans that assess and report GHG emissions and prepare recommendations to reduce emissions. As part of this, the San Francisco Planning Department is required to: (1) update and amend the City's applicable General Plan elements to include the emissions reduction limits set forth in this ordinance and policies to achieve those targets; (2) consider a project's impact on the City's GHG reduction limits specified in this ordinance as part of its review under CEQA; and (3) work with other City departments to enhance the "transit first" policy to encourage a shift to sustainable modes of transportation thereby reducing emissions and helping to achieve the targets set forth by this ordinance.

Existing CCSF GHG Reduction Actions. The City is already implementing a wide range of actions related to the reduction of GHG emissions. Some of these actions are described below (SFDE and SFPUC, 2004) and additional actions are described in the Plan.

***Transportation*.** The San Francisco Board of Supervisors passed a Resolution No. 728-97 supporting increased Corporate Average Fuel Economy (CAFE) standards in the early 1990s. In 1999, the Board adopted the Healthy Air and Smog Prevention Act, which became Chapter 4 of the City's Environment Code. This ordinance requires that all new purchases or leases of passenger vehicles and light duty trucks must either be rated as ultralow emission vehicle (ULEV) or zero emission vehicles (ZEV) (at least 10 percent were to be ZEV by July 1, 2000). Requirements were also set forth for medium and heavy-duty vehicles and motorized equipment, and for phasing out all highly polluting vehicles and equipment (SFDE and SFPUC, 2004).

The City has also contributed grant funds towards the development of three alternate fueling facilities. It continues to seek funds to expand alternate fueling infrastructure and has also been successful in developing a number of electric vehicle charging stations both in San Francisco and throughout the Bay Area. In addition, the City encourages car sharing. Several car sharing organizations in the City provide a community-wide solution to vehicle fleets. By providing a network of vehicles in locations around the city, available for reservation on an as-needed basis, residents can utilize small, fuel-efficient and electric vehicles and reduce car ownership. Car sharing is also available for use by businesses and public entities. The City requires the provision of car share parking spaces in large new residential buildings (City Planning Code Section 166). The City also limits the amount of parking allowed in new downtown residential developments (City Planning Code Section 151.1).

Solar and Energy Efficiency. San Francisco elected officials and voters have expressed strong support for renewable energy in several ways. The City funds municipal energy efficiency programs through a combination of the SFPUC's Hetch Hetchy Water and Power revenues, state grants and loans, and the City's General Fund at approximately $5.5 million annually. Alternative renewable energy funding mechanisms, which can take advantage of private investor incentives including the 30 percent federal tax credit and accelerated depreciation through acquisition of renewable power from Power Purchase Agreements, are currently being explored. In 2001, the City's Department of Environment received $7.8 million of state funds to manage an energy efficient lighting retrofit program for small businesses in San Francisco. Also in 2001, the voters approved Proposition B and H. Proposition B authorized $100 million in revenue bonds to develop solar, wind and energy efficiency projects in City facilities and Proposition H authorized the City to issue revenue bonds for private sector as well as municipal projects.

City ordinances include the Green Building Ordinance for City Buildings, and Residential Energy Conservation Ordinance (RECO); and City energy policies include those such as set forth in the Energy Policy of the City's General Plan, the 1997 Sustainability Plan, and the 2002 Electricity Resource Plan. One of the goals of the Electricity Resource Plan is to maximize energy efficiency in San Francisco. The Plan recommends that the City "periodically review and set annual targets for increasing the efficiency of electricity use and the amount of electricity produced by renewable sources of energy so that ultimately all of San Francisco's electricity needs are met with zero GHG emissions and minimal impacts on the environment." Increased energy efficiency goals included in the Climate Action Plan include 107 megawatts of electric demand reduction and 759 gigawatt-hours of energy efficiency by 2012.

The San Francisco Department of Environment (SF Environment) is developing streamlined permitting and public information systems to pave the way for accelerated construction of solar in San Francisco for both hot water heating and electricity. Permit fees are being reduced and requirements standardized (SFDE and SFPUC, 2004).

SF Environment is also promoting the integration of solar into the construction of new City facilities through its Green Building program. The SFPUC and SF Environment are cooperating to implement the Generation Solar program to facilitate the installation of solar electric systems on residential and commercial rooftops in San Francisco SFPUC provides overall oversight of the program, technical assistance, and contractor screening. SF Environment has responsibility for program marketing and proposing changes to building and planning codes, procedures, permitting and fees. See below for additional SFPUC-specific GHG emissions reduction measures (SFDE and SFPUC, 2004).

Existing SFPUC-Specific GHG Reduction Actions. As stated throughout this PEIR, the SFPUC owns and operates a gravity-driven water system. The SFPUC is also developing and energy-efficiency and renewable generation projects. To date, several renewable generation projects have been constructed and many more are in the planning, design or construction phases. For instance, in 2002, the SFPUC installed a small reciprocating engine to use biogas recovered from the Oceanside Water Treatment Control Plant. In 2003, a 2 megawatt biogas plant began operation at the Southeast Water Treatment Control Plant. Both of these plants use sewage-produced methane gas that would otherwise be flared-off. In addition, the SFPUC has completed several solar electric projects for City facilities. The first project, a 675-kilowatt solar electric photovoltaic (PV) system is located on the Moscone Convention Center's roof. This project generates 826,000 kilowatt-hours of electricity per year and provides a solar showplace for visitors. Additional solar PV projects in operation include a 255-kilowatt project that the Southeast Water Pollution Control Plant and a 245-kilowatt project at Pier 96, the Norcal recycling facility. Five other solar PV projects are currently under construction. The SFPUC has also installed pyranometers at 19 sites on City buildings and schools to collect data about the availability of sunlight, as well as instruments to measure wind speed and ambient temperature. The variability in solar incidence is based on microclimate and geography, and when used in conjunction with availability of appropriate space suggests potential future solar PV project sites.

The SFPUC also manages and implements energy efficiency projects in municipal buildings and facilities. SFPUC provides energy efficiency services such as energy audits, design, and construction management. Energy retrofit technologies include installing energy efficient equipment such as lighting, HVAC, motors, controls and energy management systems.

Municipal energy efficiency and renewable generation projects are funded by Hetch Hetchy power sales net revenue as well as state grants and loans, among other funding mechanisms. Funds that the SFPUC designates for energy projects are appropriated in a project account called The Mayor's Energy Conservation Account (MECA). MECA provides a financing mechanism whereby a loan can be made by the SFPUC to a department for the purpose of funding an energy project. For energy efficiency projects, loans can be paid back though City departments' energy savings. As of 2007, the SFPUC has invested $24 million in energy efficiency projects and estimates that it has reduced peak demand by approximately 3,800 kW and CO_2 emissions by approximately 11,000 tons/year. Municipal solar PV projects have been funded by SFPUC Power Enterprise such that client departments pay the same rate for solar power as they would normally pay for that power from Hetch Hetchy generation. To date, 2 megawatts of municipal solar plants have been installed or are under construction for an investment (before rebates) of about $20 million.

Municipal energy efficiency projects recently completed or underway include: lighting retrofits at Moscone Convention Center (North and South), San Francisco General Hospital, Mental Health Clinics, City parking garages, Golden Gate Park and West Portal Library; Department of Parking and Traffic LED traffic signal conversions; efficient refrigerators at Housing Authority facilities; motor replacements at the Southeast Wastewater Treatment Plant; and efficient lighting, HVAC, building shell, and energy management controls upgrades at the new Moscone West Convention Center (SFDE and SFPUC, 2004).

The SFPUC is also looking at several sites around the Bay Area for wind power development. The SFPUC has installed wind monitoring equipment at five sites in and around the City and additional data are being obtained for City property in the Sierra foothills.

SFPUC GHG Reduction Actions as Part of the WSIP. In addition to the actions set forth above, the SFPUC is committed to the following GHG reduction actions as part of the WSIP program.

A. The SFPUC will include the first two measures in all WSIP contractor specifications and will implement the third during project planning and design, which in addition to having other environmental benefits, would also help reduce GHG emissions.

    1. The SFPUC will require that all contractors maintain tire inflation to the manufacturers' inflation specifications.
    2. The SFPUC will implement a construction worker education program for all WSIP projects.
    3. WSIP projects that include construction of new buildings will consult with the SFPUC Power Enterprise's Energy Efficiency Group to incorporate all applicable energy efficiency measures into project design. Projects with buildings components will

attempt to maximize energy efficiency by exceeding Title 24 minimum requirements by at least 20 percent. Projects with buildings components will attempt to meet or exceed LEED Silver certification as required by the City's Green Building Ordinance.

B. Chapter 6 presents mitigation measures that would be implemented as part of the WSIP and some of these measures would also help reduce GHG emissions. They include exhaust controls (Measures 4.9-1b, 4.9-1d and 4.16-7a), waste reduction measures (Measure 4.11-2) and energy efficiency measures (Measure 4.15-2). In addition, CARB regulations (Title 13 of the California Code of Regulations, Sections 2480 and 2485), which limit idling of diesel-fueled commercial motor vehicles, would help to limit greenhouse gas emissions associated with WSIP-related construction vehicles.

4.9.3 Impacts

Significance Criteria

The CCSF has not formally adopted significance standards for impacts related to air quality, but generally considers that implementation of the proposed program would have a significant air quality impact if it were to:

- Conflict with or obstruct implementation of the applicable air quality plan (Evaluated in this section)
- Violate any air quality standard or contribute substantially to an existing or projected air quality violation (Evaluated in this section)
- Conflict with the state goal of reducing GHG emissions in California to 1990 levels by 2020, as set forth by the timetable established in AB 32, California Global Warming Solutions Act of 2006, such that the project's GHG emissions would result in a substantial contribution to global climate change (Evaluated in this section).
- Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in nonattainment under an applicable federal or state ambient air quality standard (including releasing emissions that exceed quantitative thresholds for ozone precursors) (Evaluated in this section and Section 4.16, Collective WSIP Impacts; cumulative increases are evaluated in Section 4.17, Cumulative WSIP Impacts)
- Expose sensitive receptors to substantial pollutant concentrations (Evaluated in this section)
- Create objectionable odors affecting a substantial number of people (Evaluated in this section)

Approach to Analysis

The air quality impact analysis considers construction and operational impacts associated with the proposed WSIP. Construction air emissions are evaluated in accordance with the SJVAPCD and BAAQMD guidelines for assessing and mitigating air quality impacts (SJVAPCD, 2002b; BAAQMD, 1999). Both the SJVAPCD and BAAQMD guidelines indicate that the significance of a project's impact should be evaluated based on the effectiveness of proposed measures to reduce construction-related emissions (e.g., whether control measures are implemented as part of construction). If appropriate mitigation measures are implemented for each project to control

PM_{10} emissions, both air districts consider the potentially significant project-related and cumulative impacts to be less than significant.

Both the SJVAPCD and BAAQMD guidelines also provide significance thresholds for criteria pollutant emissions associated with project operation. However, water storage, transmission, and treatment facilities are not typically a source of "traditional" air pollution emissions. Therefore, direct and secondary emissions associated with operation of the WSIP facilities are discussed qualitatively. The significance of the WSIP's cumulative operational impacts is determined based on the consistency of the WSIP with pertinent air quality plans.

Impact Summary by Region

Table 4.9-4 provides a summary of the air quality impacts associated with implementation of the WSIP.

Construction Impacts

Short-Term Increases in Pollutant Emissions

Impact 4.9-1: Construction emissions of criteria pollutants.

Construction of all WSIP facilities would generate fugitive dust[4] (including PM_{10} and $PM_{2.5}$) and other criteria pollutants, primarily as a result of a variety of construction activities, including excavation, grading, demolition, vehicle travel on paved and unpaved surfaces, and vehicle exhaust. With respect to construction-related emissions, PM_{10} is the pollutant of greatest concern to the SJVAPCD and BAAQMD. Construction-related emissions could cause substantial increases in localized concentrations of PM_{10} and could affect PM_{10} compliance with ambient air quality standards on a regional basis. Particulate emissions from construction activities could also lead to adverse health effects and nuisance concerns (e.g., reduced visibility and soiling of exposed surfaces).

Combustion emissions from construction equipment and vehicles (i.e., heavy equipment and delivery/haul trucks, worker commute vehicles, air compressors, and generators) would be generated during project construction. Emissions from construction worker commute trips would be minor compared to the emissions generated by construction equipment. Criteria pollutant emissions of ROG and NO_x from these emission sources would incrementally add to regional atmospheric loading of ozone precursors during project construction. The *BAAQMD CEQA Guidelines* recognize that construction equipment emits ozone precursors, but indicate that such emissions are included in the emission inventory that is the basis for regional air quality plans, and that construction emissions are not expected to impede the attainment or maintenance of ozone standards in the Bay Area (BAAQMD, 1999). However, the SJVAPCD indicates that

4 "Fugitive" emissions generally refer to those emissions that are released to the atmosphere by some means other than through a stack or tailpipe.

TABLE 4.9-4
POTENTIAL IMPACTS AND SIGNIFICANCE – AIR QUALITY

Projects	Project Number	Impact 4.9-1: Construction emissions of criteria pollutants	Impact 4.9-2: Exposure to diesel particulate matter during construction	Impact 4.9-3: Exposure to emissions (possibly including asbestos) from tunneling	Impact 4.9-4: Air pollutant emissions during project operation	Impact 4.9-5: Odors generated during project operation	Impact 4.9-6: Secondary emissions at power plants	Impact 4.9-7: Conflict with implementation of applicable regional air quality plans and state goals to limit GHG emissions
San Joaquin Region								
Advanced Disinfection	SJ-1	PSM	LS	N/A	LS	LS	LS	LS
Lawrence Livermore Supply Improvements	SJ-2	PSM	N/A	N/A	LS	LS	LS	LS
San Joaquin Pipeline System	SJ-3	PSM	LS	PSM	LS	N/A	LS	LS
Rehabilitation of Existing San Joaquin Pipelines	SJ-4	PSM	LS	PSM	LS	N/A	LS	LS
Tesla Portal Disinfection Station	SJ-5	PSM	LS	N/A	LS	LS	LS	LS
Sunol Valley Region								
Alameda Creek Fishery Enhancement	SV-1	PSM	LS	LS	LS	N/A	LS	LS
Calaveras Dam Replacement	SV-2	PSM	PSM	N/A	LS	N/A	LS	LS
Additional 40-mgd Treated Water Supply	SV-3	PSM	LS	LS	LS	LS	LS	LS
New Irvington Tunnel	SV-4	PSM	LS	PSM	LS	N/A	LS	LS
SVWTP – Treated Water Reservoirs	SV-5	PSM	PSM	N/A	LS	LS	LS	LS
San Antonio Backup Pipeline	SV-6	PSM	LS	LS	N/A	N/A	LS	LS
Bay Division Region								
Bay Division Pipeline Reliability Upgrade	BD-1	PSM	PSM	PSM	LS	N/A	LS	LS
BDPL Nos. 3 and 4 Crossovers	BD-2	PSM	LS	N/A	LS	N/A	LS	LS
Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault	BD-3	PSM	LS	PSM	N/A	N/A	LS	LS
Peninsula Region								
Baden and San Pedro Valve Lots Improvements	PN-1	LS	LS	N/A	LS	N/A	LS	LS
Crystal Springs/San Andreas Transmission Upgrade	PN-2	LS	LS	PSM	LS	N/A	LS	LS
HTWTP Long-Term Improvements	PN-3	LS	LS	N/A	LS	LS	LS	LS
Lower Crystal Springs Dam Improvements	PN-4	LS	LS	N/A	LS	N/A	LS	LS
Pulgas Balancing Reservoir Rehabilitation	PN-5	LS	LS	N/A	LS	N/A	LS	LS
San Francisco Region								
San Andreas Pipeline No. 3 Installation	SF-1	LS	LS	PSM	LS	LS	LS	LS
Groundwater Projects	SF-2	LS	LS	PSM	LS	LS	LS	LS
Recycled Water Projects	SF-3	LS	LS	PSM	LS	LS	LS	LS

LS = Less than Significant impact, no mitigation required
PSM= Potentially Significant impact, can be mitigated to less than significant
N/A = Not Applicable

construction projects lasting for many months in the SJVAB could exceed the air district's annual threshold for NOx emissions. In addition, sensitive receptors could be subject to elevated levels of diesel particulate matter (DPM). These impacts would be temporary but would span the duration of construction for each project, mostly one to four years depending on the project. Construction emissions associated with implementation of all the WSIP projects would span seven or eight years (approximately 2008 to 2014). Due to the long overall duration of WSIP-related construction activities and the regional extent of WSIP facilities, this PEIR quantifies construction-phase emissions by region to demonstrate the combined or collective construction impact in each region that could result from WSIP implementation.

Air pollutant emissions were estimated for each region, as shown in **Table 4.9-5**. While much of the estimated emissions are attributable to the largest WSIP projects: SJPL System (SJ-3), Calaveras Dam (SV-2), and BDPL Reliability Upgrade (BD-1), other WSIP projects would incrementally contribute to emissions listed in this table. For purposes of a worst-case analysis, simultaneous construction of all WSIP projects (listed in Table 3.10) were assumed to occur during any given year, which is unlikely to occur.

Given the length of time that construction-related emissions would occur, this PEIR compares estimated exhaust emissions to the SJVAPCD's operational significance criteria (10 tons/year, equivalent to 55 pounds per day, for ROG and NOx; 9 ppm averaged over 8 hours and 20 ppm over 1 hour for CO) and the BAAQMD's operational significance criteria (80 pounds/day for ROG, NOx, and PM_{10}; 550 pounds/day for CO).

San Joaquin Region

Impact 4.9-1: Construction emissions of criteria pollutants		
Advanced Disinfection	SJ-1	PSM
Lawrence Livermore	SJ-2	PSM
SJPL System	SJ-3	PSM
SJPL Rehabilitation	SJ-4	PSM
Tesla Portal Disinfection	SJ-5	PSM

Construction activities associated with all projects in the San Joaquin Region would result in short-term increases in suspended particulates and other criteria pollutants. This would be a *potentially significant* impact.

Table 4.9-5 shows the estimated average daily earthmoving quantities and correlating fugitive PM_{10} and equipment exhaust emissions that could occur on any given day in the San Joaquin Region. Most of the estimated construction-related air pollutant emissions in this region are attributable to the SJPL System project (SJ-3), since the majority of the surface disturbance/ excavation in this region would be associated with this project. The SJPL Rehabilitation project (SJ-4) also could contribute substantial additional emissions, but the amount cannot be quantified at this time because the extent of disturbance has not yet been determined. Emissions associated with haul truck traffic for both of these projects would add to estimated emissions (including DPM). Although the SJVAPCD has no construction significance criteria, these estimates indicate the SJVAPCD's annual threshold for NOx could be exceeded, primarily due to the long construction duration (almost three years) for the SJPL System project. Construction of the SJPL Rehabilitation project would further increase estimated emissions and the potential for exceedance of the NOx threshold. Potential air quality impacts associated with these projects

TABLE 4.9-5
WSIP CONSTRUCTION-RELATED AIR POLLUTANT EMISSIONS

Region	Average Daily Area of Disturbance (acres/day)	Average Daily Fugitive PM10 Emissions [a] (pounds/day)	Average Daily Excavation/ Spoils Volume (cubic yards)	Average Daily Equipment Emissions Associated with Earthmoving Equipment (pounds per day)[b]					
				PM10[c]	Carbon Monoxide	Reactive Organic Gases[d]	Nitrogen Oxides[e]	Sulfur Oxides	Carbon Dioxide Equiv[f]
San Joaquin Valley Air Basin									
San Joaquin Region[g]	4.1	208	1,212	6	369	25	**113**	12	7,250
SJVAPCD Significance Thresholds[h]	NA	NA	NA	NA	NA	55	55	NA	NA
San Francisco Bay Area Air Basin									
Sunol Valley Region	6.7	**342**	10,809	52	**3,288**	**219**	**1,010**	110	64,640
Bay Division Region[i]	2.3	**119**	950	5	289	19	**89**	10	5,680
Peninsula Region	0.1	3	105	1	32	2	10	1	630
San Francisco Region[j]	0.4	22	177	1	54	4	17	2	1,060
SFBAAB TOTAL	NA	**486**	NA	57	**3,663**	**244**	**1,126**	119	72,010
BAAQMD Significance Thresholds	NA	80	NA	80	550	80	80	NA	NA

NOTE: **Bold** values are in excess of SJVAPD or BAAQMD significance thresholds. Fugitive PM_{10} emissions are estimated using the CARB's construction-related emission factor of 51 pounds/acre/day of PM_{10}, as presented by the BAAQMD (1999). Equipment emissions represent a composite fleet of heavy- and light-duty construction equipment in the Bay Area, and estimates are based on BAAQMD emissions factors (1999). NA = not applicable or not available.

[a] Fugitive particulate matter (PM_{10}) emissions for all regions (except the Sunol Valley and Peninsula Regions) are based on typical trench dimensions of pipeline projects and average length of pipeline that can be constructed in one day. Since a larger construction area would result in surface disturbance (and fugitive dust) along segments that are unpaved, additional disturbance area was included for pipelines in the San Joaquin and Bay Division Regions. For the Sunol Valley and Peninsula Regions, fugitive PM_{10} emissions are estimated based on the maximum total excavation/spoils volume (see Table 3.12 in Chapter 3) that could occur on any given day due to overlapping construction schedules.

[b] Equipment emissions for all regions are based on the maximum total excavation/spoils volume that could occur on any given day due to overlapping construction schedules, averaged over each project's estimated construction duration (see Table 4.16-1). Since these estimates are daily emissions averaged over the entire construction period, actual emissions on any given day could be higher or lower than these estimates.

[c] Equipment PM_{10} exhaust emissions estimates include DPM, but do not include emissions associated with haul truck traffic.

[d] Does not include methane which is a greenhouse gas.

[e] Does not include nitrous oxide which is a greenhouse gas.

[f] Carbon dioxide equivalent greenhouse gas emissions. The calculation assumes that each cubic yard of cut and fill requires the expenditure of 0.27 gallons of diesel fuel, and that each gallon of diesel fuel combustion produces 22.15 pounds of CO2-equivalent emissions (CO2 + CH4 [GWP=21] + N2O [GWP=310]) based upon Tables C.3 and C.4 of the California Climate Action Registry. GWP is "global warming potential" which recognizes that each GHG differs in its ability to absorb heat in the atmosphere. Methane traps 21 times more heat per molecule than carbon dioxide, and nitrous oxide absorbs 310 times more heat per molecule. All GHG emissions have been quantified and weighted according to their GWP to create a CO_2-equivalent emission rate.

[g] Estimated emissions are based on the SJPL System (SJ-3) and SJPL Rehabilitation (SJ-4) projects only, because these projects represent most of this region's emissions. It is assumed that two construction crews would work on SJ-3 and one construction crew would work on SJ-4 simultaneously.

[h] As noted previously, there are no established standards or thresholds applicable to GHG emissions.

[i] Estimated emissions are based on the BDPL Reliability Upgrade project (BD-1) only, because this project represents most of this region's emissions. It is assumed that four construction crews would work simultaneously.

[j] Estimated emissions are based on construction of the SAPL 3 Installation (SF-1) and Recycled Water Projects (SF-3), because these projects represent most of this region's emissions. It is assumed that four construction crews would work simultaneously. It is possible that construction activities associated with these two projects could overlap in 2010.

would be evaluated during separate, project-level CEQA review. SFPUC Construction Measure #3, which requires preparation of a dust control plan and implementation of several dust control measures, would reduce these potentially significant impacts. However, the SJVAPCD considers construction-related emissions from all projects in this region to be mitigated to a less-than-significant level if SJVAPCD-recommended PM_{10} fugitive dust rules (collectively called Regulation VIII and included as Measure 4.9-1a) and equipment exhaust emission controls (outlined in Measure 4.9-1b) are implemented. Therefore, implementation of SFPUC Construction Measure #3 for air quality in addition to applicable SJVAPCD dust and exhaust control measures (Measures 4.9-1a and 4.9-1b) would reduce potential air quality impacts to a less-than-significant level.

Sunol Valley Region

Impact 4.9-1: Construction emissions of criteria pollutants		
Alameda Creek Fishery	SV-1	PSM
Calaveras Dam	SV-2	PSM
40-mgd Treated Water	SV-3	PSM
New Irvington Tunnel	SV-4	PSM
Treated Water Reservoirs	SV-5	PSM
SABUP	SV-6	PSM

Construction activities associated with all projects in the Sunol Valley Region would result in short-term increases in suspended particulates and other criteria pollutants. This would be a *potentially significant* impact.

Table 4.9-5 shows the estimated average daily earthmoving quantities and correlating fugitive PM_{10} and equipment exhaust emissions that could occur between approximately 2009 and 2010 during simultaneous construction of six WSIP projects in the Sunol Valley Region (Alameda Creek Fishery, SV-1; Calaveras Dam, SV-2; 40-mgd Treated Water, SV-3; New Irvington Tunnel, SV-4; Treated Water Reservoirs, SV-5; and SABUP, SV-6). Most of the estimated construction-related air pollutant emissions in this region are attributable to the Calaveras Dam project, since the majority of the surface disturbance/excavation in this region would be associated with this project. Emissions associated with haul truck traffic would add to estimated emissions (including DPM; see Impact 4.9-2). Although the BAAQMD has no construction significance criteria, these estimates indicate the BAAQMD's operational thresholds for ROG, NO_x, PM_{10}, and CO could be exceeded. Potential air quality impacts associated with the Calaveras Dam project would be evaluated in more detail in a separate, project-level EIR. SFPUC Construction Measure #3, which requires preparation of a dust control plan and implementation of several dust control measures, would reduce these potentially significant impacts. However, the BAAQMD considers construction-related emissions from all projects in this region to be mitigated to a less-than-significant level if BAAQMD-recommended dust and equipment exhaust emission controls (outlined in Measures 4.9-1c and 4.9-1d) are implemented. Therefore, it is expected that implementation of SFPUC Construction Measure #3 for air quality in addition to applicable BAAQMD dust and exhaust control measures (Measures 4.9-1c and 4.9-1d) would reduce potential air quality impacts to a less-than-significant level.

Bay Division Region

Impact 4.9-1: Construction emissions of criteria pollutants		
BDPL Reliability Upgrade	BD-1	PSM
BDPL 3 and 4 Crossovers	BD-2	PSM
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	PSM

Construction activities associated with all projects in the Bay Division Region would result in short-term increases in suspended particulates and other criteria pollutants. This would be a *potentially significant* impact.

Table 4.9-5 shows the estimated average daily earthmoving quantities and correlating fugitive PM_{10} and equipment exhaust emissions that could occur on any given day in the Bay Division Region. Most of the estimated construction-related air pollutant emissions in this region are attributable to the BDPL Reliability Upgrade project (BD-1), since the majority of the surface disturbance/excavation in this region would be associated with this project. Emissions associated with haul truck traffic would add to estimated emissions (including DPM; see Impact 4.9-2). These estimates indicate the BAAQMD's operational thresholds for PM_{10}, CO, and NOx could be exceeded. Potential air quality impacts associated with the BDPL Reliability Upgrade project would be evaluated in more detail in a separate, project-level EIR. SFPUC Construction Measure #3, which requires preparation of a dust control plan and implementation of several dust control measures, would reduce these potentially significant impacts. However, the BAAQMD considers construction-related emissions from all projects in this region to be mitigated to a less-than-significant level if BAAQMD-recommended dust and equipment exhaust emission controls (outlined in Measures 4.9-1c and 4.9-1d) are implemented. Therefore, it is expected that implementation of SFPUC Construction Measure #3 for air quality in addition to applicable BAAQMD dust and exhaust control measures (Measures 4.9-1c and 4.9-1d) would reduce potential air quality impacts to a less-than-significant level.

Peninsula Region

Impact 4.9-1: Construction emissions of criteria pollutants		
Baden and San Pedro Valve Lots	PN-1	LS
CS/SA Transmission	PN-2	LS
HTWTP Long-Term	PN-3	LS
Lower Crystal Springs Dam	PN-4	LS
Pulgas Balancing Reservoir	PN-5	LS

Construction activities associated with all projects in the Peninsula Region would result in short-term increases in suspended particulates and other criteria pollutants.

Table 4.9-5 shows the estimated average daily earthmoving quantities and correlating fugitive PM_{10} and equipment exhaust emissions that could occur on any given day within the Peninsula Region. Construction activities associated with WSIP projects in this region as well as emissions associated with haul truck traffic would contribute air pollutant emissions (including DPM; see Impact 4.9-2). SFPUC Construction Measure #3, which requires preparation of a dust control plan and implementation of several dust control measures, would reduce emission of criteria pollutants. These estimates indicate the BAAQMD's operational thresholds for ROG, NO_X, PM_{10}, and CO would not likely be exceeded in this region, and impacts would therefore be *less than significant*. However, it should be noted that construction of these five projects would add to the WSIP's combined or collective emissions contributions to the SFBAAB (see Section 4.16, Collective WSIP Impacts, for more discussion).

San Francisco Region

Impact 4.9-1: Construction emissions of criteria pollutants		
SAPL 3 Installation	SF-1	LS
Groundwater Projects	SF-2	LS
Recycled Water Projects	SF-3	LS

Construction activities associated with all projects in the San Francisco Region would result in short-term increases in suspended particulates and other criteria pollutants.

Table 4.9-5 shows the estimated average daily earthmoving quantities and correlating fugitive PM_{10} and equipment exhaust emissions that could occur on any given day within the San Francisco Region. Most of the estimated construction-related air pollutant emissions in this region are attributable to simultaneous construction of the SAPL 3 Installation (SF-1) and Recycled Water Projects (SF-3). Construction activities associated with the Groundwater Projects (SF-2) as well as emissions associated with haul truck traffic (see Impact 4.9-2) would contribute additional air pollutant emissions. SFPUC Construction Measure #3, which requires preparation of a dust control plan and implementation of several dust control measures, would reduce emission of criteria pollutants. These estimates indicate the BAAQMD's operational thresholds for ROG, NO_x, PM_{10}, and CO would not likely be exceeded in this region, and impacts would therefore be *less than significant*. However, it should be noted that construction of these three projects would add to the WSIP's combined or collective emissions contributions to the SFBAAB (see Section 4.16, Collective WSIP Impacts, for more discussion).

Impact 4.9-2: Exposure to diesel particulate matter (DPM) during construction.

Combustion emissions from construction equipment and vehicles (i.e., heavy equipment and delivery/haul trucks, worker commute vehicles, air compressors, and generators) would be generated during project construction. Onsite construction emissions are evaluated above under Impact 4.9-1. Offsite emissions would include those generated by worker vehicles as well as by diesel haul/delivery trucks used during construction, particularly trucks used to transport excavated materials from WSIP facility sites. Emissions from construction worker commute trips would be minor compared to the emissions generated by construction equipment and haul/delivery trucks. Construction emissions would result in an increase in $PM_{2.5}$ emissions in addition to PM_{10} and ozone precursors. $PM_{2.5}$ emissions of concern would be associated primarily with DPM, since particulates generated by excavation, grading, and other soil-disturbance activities are normally outside the $PM_{2.5}$-size range. Diesel exhaust particulates contain substances that are suspected carcinogens. Diesel exhaust contains both pulmonary irritants and hazardous compounds that could affect sensitive receptors such as young children, senior citizens, or those susceptible to chronic respiratory disease such as asthma, bronchitis, and emphysema.

In 2000, the CARB approved a comprehensive *Diesel Risk Reduction Plan* to reduce diesel emissions from both new and existing diesel-fueled engines. The plan focuses on reducing emissions from diesel-fueled engines (through new standards and retrofitting) and reducing the sulfur content of diesel fuel to enable the use of advanced DPM emission controls. The plan's goals are to achieve a 75 percent reduction in DPM by 2010 and an 85 percent reduction by 2020 (from the 2000 baseline). While many of the new regulations are source-based controls, in 2005 the CARB approved a regulatory measure (Section 2485 of the California Health and Safety Code) to reduce emissions of toxic and criteria pollutants by limiting the idling of new heavy-duty diesel vehicles. Idling limits are specified in Measure 4.9-1d, and WSIP projects would be required to comply with these requirements.

The SJVAPCD and BAAQMD do not have methodologies for estimating impacts from diesel exhaust or determining the significance of a project's contribution. However, a DPM air monitoring study was conducted during another water treatment facility construction project in the Bay Area (URS Corporation, 2004). This study found the average downwind exposure during the hauling of 41 loads of material (82 one-way trips) to be 1.44 micrograms per cubic meter ($\mu g/m^3$) of DPM. The upwind concentration was 0.92 $\mu g/m^3$. Therefore, 41 loads of material (82 trips) are estimated to increase the DPM exposure by 0.52 $\mu g/m^3$ over an eight-hour period. To convert this to a daily exposure, it would be approximately one-third of this value. The accumulated health risk to children and residents can be calculated as follows under a number of conservative assumptions:

RISK = (0.52 / 3) * 300 in a million * (loads/day / 41) * (days of hauling / 25,550 days in 70 years)

= DPM * Cancer Risk * daily hauling * lifetime fraction over which risk applies

A risk of 1 in a million is considered insignificant by the BAAQMD, while a risk of 10 in a million would be significant.[5] For purposes of this PEIR, a risk between 1 and 10 in a million is conservatively considered to be potentially significant. The number of loads that would cause these thresholds to be exceeded over the hauling lifetime would be as follows:

1 in a million – 20,000 loads (40,000 trips)

10 in a million – 200,000 loads (400,000 trips)

These estimates are based on very conservative assumptions, including the following:

- The receptor remains outside their home for eight hours per day for every day of hauling.
- The receptor location is downwind of and adjacent to the haul route.
- Emissions from the haul truck fleet remain at 2004 emission rates, and no cleaner, lower emission trucks are ever added to the fleet; this assumption results in very conservative estimates since DPM emission rates are estimated to decrease by nearly 50 percent between 2004 and 2012.

[5] The BAAQMD's Regulation 2, Rule 5, *New Source Review of Toxic Air Contaminants*, specifies that a cancer risk of 1 in a million or less over a 70-year-lifetime exposure period is an insignificant risk, and no further review of health-related impacts is required. If a project has a risk greater than 1 in a million, it must be further evaluated in order to determine acceptability. Factors that affect acceptability include the presence of controls on the rate of emissions, the location of the site in relation to residential areas and schools, and contaminant reductions in other media such as water. In general, projects with risks greater than 1 in a million, but less than 10 in a million, are approved if other determining factors are acceptable. Projects with risks greater than 10 in a million are generally not approved. Projects that are not approved may be reevaluated if emissions are reduced, thus reducing their risks.

Table 4.9-6 presents a range of truck trips for each WSIP project that could be associated with the hauling of excavated spoils to offsite locations for reuse or disposal. Development of the above hauling thresholds serves as a basis for this program-level analysis, and also provides guidance for a project-level assessment of impacts related to truck hauling. These thresholds clearly include a high degree of conservatism (large margin of safety). Nevertheless, there could be unique, site-specific project features (e.g., proximity to sensitive receptor(s), a combination of onsite equipment emissions and haul trucks, or high levels of other air toxics creating cumulative exposure issues) that would prompt the need for a project-level health risk assessment, even if the above thresholds were not exceeded.

TABLE 4.9-6
OFFSITE DIESEL PARTICULATE MATTER EMISSIONS

Project Number	Project Name	Excavation/ Spoils Volume (cubic yards)	Total Truck Trips (if 80% Hauled Offsite)	Exceeds 10 in a Million Threshold?	Total Truck Trips (if 50% Hauled Offsite)	Exceeds 10 in a Million Threshold?
San Joaquin Region						
SJ-1	Advanced Disinfection	TBD	TBD	TBD	TBD	TBD
SJ-2	Lawrence Livermore Supply Improvements	TBD	TBD	TBD	TBD	TBD
SJ-3	San Joaquin Pipeline System	424,000 cy	56,533	No, but exceeds the 1 in a million threshold	35,333	No
SJ-4	Rehabilitation of Existing San Joaquin Pipelines	Disposal of excavation spoils not expected	TBD	TBD	TBD	TBD
SJ-5	Tesla Portal Disinfection Station	TBD	TBD	TBD	TBD	TBD
	Total Truck Trips for San Joaquin Region		56,533+	No, but exceeds the 1 in a million threshold	35,333+	No
Sunol Valley Region						
SV-1	Alameda Creek Fishery Enhancement	TBD	TBD	TBD	TBD	TBD
SV-2	Calaveras Dam Replacement	6,300,000 cy total excavation and 4,000,000 cy spoil	533,333+	**Yes**	**333,333**	No
SV-3	Additional 40-mgd Treated Water Supply	100,000 cy	13,333	No	8,333	No
SV-4	New Irvington Tunnel	186,175 cy	24,823	No	15,515	No
SV-5	SVWTP – Treated Water Reservoirs	300,000 cy	40,000	No, but meets the 1 in a million threshold	25,000	No
SV-6	San Antonio Backup Pipeline	51,000 cy total excavation and 37,000 cy spoil	4,933	No	3,083	No
	Total Truck Trips for Sunol Valley Region		616,423+	**Yes**	385,265+	No

TABLE 4.9-6 (Continued)
OFFSITE DIESEL PARTICULATE MATTER EMISSIONS

Project Number	Project Name	Excavation/ Spoils Volume (cubic yards)	Total Truck Trips (if 80% Hauled Offsite)	Exceeds 10 in a Million Threshold?	Total Truck Trips (if 50% Hauled Offsite)	Exceeds 10 in a Million Threshold?
Bay Division Region						
BD-1	Bay Division Pipeline Reliability Upgrade	434,000 cy	57,867	No, but exceeds the 1 in a million threshold	36,167	No
	Bay Tunnel Segment	355,000 cy	47,333	No, but exceeds the 1 in a million threshold	29,583	No
BD-2	BDPL Nos. 3 and 4 Crossovers	43,500 cy	5,800	No	3,625	No
BD-3	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault	Phase B – 55,300 cy	7,373	No	4,608	No
	Total Truck Trips for Bay Division Region		118,373	No	73,983	No
Peninsula Region						
PN-1	Baden and San Pedro Valve Lots Improvements	5,000	667	No	417	No
PN-2	Crystal Springs/ San Andreas Transmission Upgrade	Not Specified (estimated to be up to 9,000 cy)	1,200	No	750	No
PN-3	HTWTP Long-Term Improvements	Not Specified	TBD	TBD	TBD	TBD
PN-4	Lower Crystal Springs Dam Improvements	21,000 cy	2,800	No	1,750	No
PN-5	Pulgas Balancing Reservoir Rehabilitation	TBD	TBD	TBD	TBD	TBD
	Total Truck Trips for Peninsula Region		4,700+	No	2,900+	No
San Francisco Region						
SF-1	San Andreas Pipeline No. 3 Installation	44,170 cy	5,889	No	3,681	No
SF-2	Groundwater Projects – Local & Regional	TBD	TBD	TBD	TBD	TBD
SF-3	Recycled Water Projects	47,200 cy	6,293	No	3,933	No
	Total Truck Trips for San Francisco Region		12,183+	No	7,614+	No

NOTE: Estimated truck trips assume each haul truck would accommodate 12 cubic yards, and 50 to 80 percent of excavation spoils would be hauled offsite for reuse or disposal. See Sections 4.16 and 4.17 for discussion of collective and cumulative DPM impacts associated with total truck trips and overlapping impacts in each region.

Air pollution studies indicate a high correlation between traffic emissions and health impacts within 1,000 feet, with the strongest association within 300 to 500 feet. Studies also show that concentrations of traffic emissions decline with distance from the road, with a dramatic decrease in the first 300 to 500 feet (up to a 70 percent decrease in one study). Based on these studies, the CARB and BAAQMD recommend that new sensitive land uses not be located within 500 feet of freeways, urban roads carrying 100,000 vehicles/day, or rural roads carrying 50,000vehicles/day (Cal-EPA and CARB, 2005). Therefore, if sensitive receptors are located more than 500 feet from a haul route, potential health effects associated with elevated DPM are considered less than significant.

San Joaquin Region

Impact 4.9-2: Exposure to DPM during construction		
Advanced Disinfection	SJ-1	LS
Lawrence Livermore	SJ-2	N/A
SJPL System	SJ-3	LS
SJPL Rehabilitation	SJ-4	LS
Tesla Portal Disinfection	SJ-5	LS

Within the San Joaquin Region, access to most of the WSIP facility sites would be provided by rural roadways, highways, or freeways. As shown in Table 4.9-6, total DPM emissions generated by haul truck traffic associated with the SJPL System project (SJ-3) as a whole would be potentially significant, since the total truck trips for the whole project indicate excess cancer risk would be greater than 1 in a million but less than 10 in a million. However, health risks associated with DPM exposure would be *less than significant*, because haul trucks would use different haul routes along the pipeline alignment and only a portion of the total number of truck trips listed in Table 4.9-6 would occur along the same route. Since DPM emissions would be dispersed along the pipeline alignment (approximately one-third along the eastern pipeline segment and two-thirds on the western pipeline segment), it is expected that the excess cancer risk at any specific receptor would be less than 1 in a million (i.e., less than 40,000 truck trips would occur over the entire construction period at a specific receptor).

The SJPL Rehabilitation project (SJ-4) would not generate significant DPM levels along haul routes since disposal of excavation spoils is not expected to be required. Potential DPM emissions associated with the Advanced Disinfection (SJ-1) and Tesla Portal Disinfection (SJ-5) projects are expected to be *less than significant* due to the limited surface disturbance associated with these projects (approximately two acres of surface disturbance is expected at each site).

The Lawrence Livermore project (SJ-2) would be located near Thomas Shaft, and there are no residential uses or other sensitive receptors in the area. Therefore, this impact would *not apply* to this project.

Sunol Valley Region

Impact 4.9-2: Exposure to DPM during construction		
Alameda Creek Fishery	SV-1	LS
Calaveras Dam	SV-2	PSM
40-mgd Treated Water	SV-3	LS
New Irvington Tunnel	SV-4	LS
Treated Water Reservoirs	SV-5	PSM
SABUP	SV-6	LS

As indicated in Table 4.9-6, DPM emissions generated by haul truck traffic would be *less than significant* (excess cancer risk would be less than 1 in a million) for all WSIP projects in this region,[6] except for the Calaveras Dam project (SV-2) and possibly for the Treated Water Reservoirs project (SV-5). Since most of the excavation spoils associated with the Calaveras Dam project would be hauled to disposal sites in the dam vicinity or the Sunol Valley, all haul truck trips would not necessarily use the entire length of Calaveras Road in the Sunol Valley. If 50 percent of the spoils were hauled offsite via the lower section of Calaveras Road, DPM emissions would remain below the significant "10 in a million" threshold but would exceed the potentially significant "1 in a million" threshold. If 80 percent of the excavation spoils were hauled offsite under the Treated Water Reservoirs project, the excess cancer risk would exceed the potentially significant "1 in a million" threshold.

DPM emissions from haul trucks would be considered *potentially significant* for the Calaveras Dam (SV-2) and Treated Water Reservoirs (SV-5) projects. However, these DPM emissions must also be evaluated at the project level to determine whether sensitive receptors could be affected by increased DPM emissions. The primary haul route for all projects in this region would be Calaveras Road in the Sunol Valley. There is one residential receptor located approximately 2,000 feet west of Calaveras Road; at this distance, potential health risks associated with DPM would be less than significant. However, there are two SFPUC Land Managers' residences, one near Calaveras Dam and the other near Alameda East Portal. Occupants of these residences could include children or the elderly, which are considered sensitive receptors. Therefore, DPM impacts from the individual and combined truck traffic associated with the Calaveras Dam and Treated Water Reservoirs projects would be *potentially significant* at these two residences. A health risk assessment would need to be completed or the residences vacated during construction of these two projects (Measure 4.9-2b) to reduce this impact to a less-than-significant level.

Bay Division Region

Impact 4.9-2: Exposure to DPM during construction		
BDPL Reliability Upgrade	BD-1	PSM
BDPL 3 and 4 Crossovers	BD-2	LS
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	LS

Since the majority of this region is urbanized and many of the WSIP projects are located in or near residential neighborhoods and schools, there is a high potential for sensitive receptors to be exposed to increased DPM levels from truck traffic on haul routes associated with all three WSIP projects in this region. As indicated

6 Although an excavation/spoils volume is not specified for the Alameda Creek Fishery project, the size of this project would indicate preliminary that DPM emissions generated by haul truck traffic would not likely exceed cancer risk of 1 in a million.

in Table 4.9-6, DPM emissions generated by haul truck traffic would be *less than significant* (excess cancer risk would be less than 1 in a million) for the BDPL 3 and 4 Crossovers (BD-2) and BDPL 3 and 4 Seismic Upgrade at Hayward Fault (BD-3) projects.

As indicated in Table 4.9-6, total DPM emissions generated by haul truck traffic associated with the pipeline and tunnel components of the BDPL Reliability Upgrade project (BD-1) would be potentially significant, since excess cancer risk would be greater than the "1 in a million" threshold but less than the "10 in a million" threshold. For the pipeline portion of this project, health risks associated with DPM exposure would be less than significant, because haul trucks would use different haul routes along the pipeline alignment and only a portion of the total number of truck trips listed in Table 4.9-6 would occur along the same route. However, truck traffic associated with the tunnel component would generate DPM emissions in the tunnel portal vicinities over the entire construction period, affecting the same sensitive receptors. Therefore, DPM emissions associated with the tunnel component of this project would be *potentially significant*, and use of soot filters on haul trucks (Measure 4.9-2a) could be required for this component (depending on the proportion of excavation spoils that would be hauled offsite) to reduce impacts to a less-than-significant level.

Peninsula Region

Impact 4.9-2: Exposure to DPM during construction		
Baden and San Pedro Valve Lots	PN-1	LS
CS/SA Transmission	PN-2	LS
HTWTP Long-Term	PN-3	LS
Lower Crystal Springs Dam	PN-4	LS
Pulgas Balancing Reservoir	PN-5	LS

Table 4.9-6 indicates that DPM emissions generated by haul truck traffic would be *less than significant* (excess cancer risk would be less than 1 in a million) for the CS/SA Transmission (PN-2) and Lower Crystal Springs Dam (PN-4) projects. Although the volume of excavation spoils has not been determined for the other three projects in this region (Baden and San Pedro Valve Lots, PN-1; HTWTP Long-Term, PN-3; and Pulgas Balancing Reservoir, PN-5), potential DPM emissions associated with each of these projects are expected to be *less than significant* (excess cancer risk would be less than 1 in a million or 40,000 total truck trips) due to the limited surface disturbance generally associated with these types of facilities. In addition, the Pulgas Balancing Reservoir project would be located on the west side of Interstate 280 (I-280), so possible haul routes to the I-280 freeway for this project would be more than 500 feet from residential receptors to the east of the freeway.

San Francisco Region

Impact 4.9-2: Exposure to DPM during construction		
SAPL 3 Installation	SF-1	LS
Groundwater Projects	SF-2	LS
Recycled Water Projects	SF-3	LS

All of the WSIP projects in this region would be located near or adjacent to sensitive receptors, and DPM increases associated with haul and delivery truck traffic could adversely affect sensitive receptors along these routes. However, as indicated in Table 4.9-6, DPM emissions generated by haul truck traffic would be *less than significant* (excess cancer risk would be less than 1 in a million) for the SAPL 3 Installation (SF-1) and Recycled Water Projects (SF-3) projects, and it is expected that the volume of excavation spoils for the Groundwater Projects (SF-2) would not be greater than estimated volumes for SF-1 or SF-3.

Impact 4.9-3: Exposure to emissions (possibly including asbestos) from tunneling.

Methane and hydrogen sulfide gases could be encountered during proposed tunneling. These gases are generated during the decomposition of organic material. Because methane is odorless, it is not expected to generate nuisance odor problems. However, if hydrogen sulfide gas is encountered, it could cause nuisance odor problems at nearby receptors. Diesel exhaust would be generated by tunnel boring equipment and the muck removal system (if muck trains are used), and diesel exhaust odors would be released into the atmosphere through the tunnel ventilation system. The potential for exposure of any nearby sensitive receptors would depend on the proximity of receptors to tunnel shafts or portals and their ventilation exhaust systems. If gases were present, Occupational Health and Safety Administration standards would require the tunnel ventilation system to reduce gas levels within the tunnel to protect workers. Residential receptors would be exposed to even lower levels of these gases, since dispersion into the atmosphere would reduce levels in the tunnel by more than tenfold, ensuring that residential exposure would be well below exposure within the tunnel. Therefore, impacts related to the exposure of nearby residential receptors to tunnel gases is expected to be less than significant.

If ultramafic rock deposits are encountered during tunneling, there would be a potential for asbestos (chrysotile) emissions from the tunnel ventilation system. If tunnel ventilation systems are required in jack-and-bore pits used in pipeline crossings (where pipelines cross under freeways, major roadways, railroads, waterways) and ultramafic rock occurs along this pipeline segment, there also would be a potential for asbestos (chrysotile) emissions from the ventilation system. Geologic mapping indicates a low potential for encountering such rock along various WSIP facility alignments (see Section 4.14, Hazards, Impact 4.14-2 for more discussion). Wherever demolition is proposed as part of WSIP implementation, asbestos could be released if any asbestos-containing building materials are present. Airborne asbestos fibers could pose a serious health threat if adequate control techniques are not carried out when the material is disturbed (see Section 4.14, Impact 4.14-5 for more discussion of this potential impact).

San Joaquin Region

Impact 4.9-3: Exposure to emissions (possibly including asbestos) from tunneling		
Advanced Disinfection	SJ-1	N/A
Lawrence Livermore	SJ-2	N/A
SJPL System	SJ-3	PSM
SJPL Rehabilitation	SJ-4	PSM
Tesla Portal Disinfection	SJ-5	N/A

The Advanced Disinfection (SJ-1), Lawrence Livermore (SJ-2), and Tesla Portal Disinfection (SJ-5) projects would not involve any tunneling or jack-and-bore construction techniques. Therefore, this impact is *not applicable* to these projects.

Construction of the SJPL System project (SJ-3) would employ jack-and-bore or microtunneling techniques where the pipeline would cross under major facilities such as freeways and aqueducts, and potentially where the pipeline would cross wetlands. Pipeline rehabilitation work under the SJPL Rehabilitation project (SJ-4) could also require the use of jack-and-bore or microtunneling techniques. If a tunnel ventilation exhaust system is required in jack-and-bore pits and is located near any residential receptors, they could be exposed to nuisance odors associated with tunnel gases or diesel exhaust. Although impacts related to health risk would be less than significant (as described above), nuisance odors (if they occur) would be *potentially significant*, but could be mitigated to a less-than-significant level through the use of water scrubbers on the tunnel ventilation system (Measure 4.9-3). No other tunneling activities would occur under the WSIP projects in this region.

Sunol Valley Region

Impact 4.9-3: Exposure to emissions (possibly including asbestos) from tunneling		
Alameda Creek Fishery	SV-1	LS
Calaveras Dam	SV-2	N/A
40-mgd Treated Water	SV-3	LS
New Irvington Tunnel	SV-4	PSM
Treated Water Reservoirs	SV-5	N/A
SABUP	SV-6	LS

The Calaveras Dam (SV-2) and Treated Water Reservoirs (SV-5) would not involve any tunneling or jack-and-bore construction techniques. Therefore, this impact is *not applicable* to these projects.

Construction of the New Irvington Tunnel project (SV-4) would require the use of a tunnel ventilation exhaust system at both tunnel portals in the Sunol Valley and Fremont. The Alameda Creek Fishery (SV-1), 40-mgd Treated Water (SV-3), and SABUP (SV-6) projects could require jack-and-bore techniques where any pipelines cross creeks or roads. In the Sunol Valley, there is one residential receptor (located west of Alameda Creek and south of the Alameda West Portal). Impacts related to health risk would be less than significant (as described above) for this receptor; it is also unlikely that tunnel-related nuisance odors associated with jack-and-bore crossings related to any of these projects would affect this receptor since there would be adequate area to provide sufficient setbacks, so this impact would be *less than significant*. However, nuisance odors associated with the New Irvington Tunnel project (if they occur) could affect this receptor. If they occur, nuisance odors would be *potentially significant*, but could be mitigated to a less-than-significant level through implementation of tunnel gas odor control measures (Measure 4.9-3). No other tunneling activities would occur under the WSIP projects in this region.

Bay Division Region

Impact 4.9-3: Exposure to emissions (possibly including asbestos) from tunneling		
BDPL Reliability Upgrade	BD-1	PSM
BDPL 3 and 4 Crossovers	BD-2	N/A
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	PSM

Construction of the BDPL Reliability Upgrade project (BD-1) would require use of a tunnel ventilation exhaust system at both tunnel shafts in Newark and east of East Palo Alto. Tunnel ventilation systems could also be required for the BDPL 3 and 4 Seismic Upgrade at Hayward Fault (BD-3), wherever jack-and-bore or microtunneling techniques are employed for major roadway and creek crossings. Residential receptors located near or adjacent to these facilities could be exposed to nuisance odors associated with tunnel gases or diesel exhaust. Impacts related to health risk would be less than significant (as described above), and nuisance odors associated with these two projects (if they occur) would be *potentially significant*, but could be mitigated to a less-than-significant level through implementation of tunnel gas odor control measures (Measure 4.9-3).

No tunneling activities would occur under the BDPL 3 and 4 Crossovers (BD-2) project, so this impact is *not applicable*.

Peninsula Region

Impact 4.9-3: Exposure to emissions (possibly including asbestos) from tunneling		
Baden and San Pedro Valve Lots	PN-1	N/A
CS/SA Transmission	PN-2	PSM
HTWTP Long-Term	PN-3	N/A
Lower Crystal Springs Dam	PN-4	N/A
Pulgas Balancing Reservoir	PN-5	N/A

Except for the CS/SA Transmission project (PN-2), no tunneling activities would occur under any other WSIP projects in this region, so this impact is *not applicable* to these projects. If jack-and-bore or microtunneling techniques are used where only pipeline facilities associated with the CS/SA Transmission project cross roadways or waterways and they are located near any sensitive receptors, they could be exposed to nuisance odors associated with tunnel gases or diesel exhaust. Implementation of gas odor control measures (Measure 4.9-3) as necessary would reduce nuisance odor impacts to a less-than-significant level.

San Francisco Region

Impact 4.9-3: Exposure to emissions (possibly including asbestos) from tunneling		
SAPL 3 Installation	SF-1	PSM
Groundwater Projects	SF-2	PSM
Recycled Water Projects	SF-3	PSM

Pipeline construction under the SAPL 3 Installation project (SF-1) would employ jack-and-bore or microtunneling techniques where pipelines cross under major roadways or creeks. If a tunnel ventilation exhaust system is required in jack-and-bore pits and is located near any sensitive receptors, they could be exposed to nuisance odors associated with tunnel gases or diesel exhaust. In addition, it is possible that pipelines proposed under the Groundwater Projects (SF-2) and Recycled Water Projects (SF-3) could require the use of jack-and-bore construction. Impacts related to health risk would be less than significant (as described above), and nuisance odors (if they occur) would be *potentially significant,* but could be mitigated to a less-than-significant level through implementation of tunnel gas odor control measures (Measure 4.9-3).

Operational Impacts

Facility Emissions

Impact 4.9-4: Air pollutant emissions during project operation.

Long-term operation of the WSIP facilities would result in minimal increases in air emissions, including criteria pollutants. Most of the power provided to WSIP projects by the SFPUC would be hydroelectric power. Since all proposed facilities would be connected to grid power, emission sources during project operations would be limited to emergency generators, use of refrigerants, and minor increases in traffic due to project operation and maintenance. Operation of emergency generators at WSIP facilities would result in an incremental short-term increase in criteria air pollutants, but only infrequently during power outages and when equipment is tested.

San Joaquin Region

Impact 4.9-4: Air pollutant emissions during project operation		
Advanced Disinfection	SJ-1	LS
Lawrence Livermore	SJ-2	LS
SJPL System	SJ-3	LS
SJPL Rehabilitation	SJ-4	LS
Tesla Portal Disinfection	SJ-5	LS

Proposed treatment and pipeline facilities in this region would be enclosed, and the potential for increases in criteria pollutants during project operations would be *less than significant*. Three of the WSIP facilities in this region (Advanced Disinfection, SJ-1; Lawrence Livermore, SJ-2; and Tesla Portal Disinfection, SJ-5) would be unmanned facilities (continuously monitored by the SCADA System), but would require a daily visit to the site by an operations representative. The SJPL System (SJ-3) and SJPL Rehabilitation (SJ-4) projects would require occasional visits by operations representatives during flow rate changes, and associated air pollutant emissions would be *less than significant*.

Sunol Valley Region

Impact 4.9-4: Air pollutant emissions during project operation		
Alameda Creek Fishery	SV-1	LS
Calaveras Dam	SV-2	LS
40-mgd Treated Water	SV-3	LS
New Irvington Tunnel	SV-4	LS
Treated Water Reservoirs	SV-5	LS
SABUP	SV-6	N/A

Except for WSIP facilities at the Sunol Valley WTP, operation of all proposed WSIP facilities in this region (associated with Alameda Creek Fishery, SV-1; Calaveras Dam, SV-2; 40-mgd Treated Water, SV-3; New Irvington Tunnel, SV-4; and Treated Water Reservoirs, SV-5) would use grid power; therefore, potential increases in criteria pollutants during project operations would be *less than significant.* No system changes would occur under the SABUP project, so potential changes in emissions during project operation would *not apply* to this project.

Operation of proposed facilities in this region would generate minor increases in maintenance-related and chemical delivery traffic; however, such minor increases in traffic would result in *less-than-significant* increases in criteria air pollutant emissions.

Bay Division Region

Impact 4.9-4: Air pollutant emissions during project operation		
BDPL Reliability Upgrade	BD-1	LS
BDPL 3 and 4 Crossovers	BD-2	LS
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	N/A

Proposed WSIP facilities in this region under the BDPL Reliability Upgrade (BD-1) and BDPL 3 and 4 Crossovers (BD-2) projects would use grid power as necessary, so potential increases in criteria pollutants during project operations would be *less than significant.* However, propane-powered emergency generators would be used to power actuators at isolation valves along the BDPL Reliability Upgrade pipeline alignment in the event that valves need to be operated during a power failure (e.g., after a major earthquake event). As stationary point sources, the emergency generators proposed under this project would require authority to construct permits and permits to operate from the BAAQMD. The permit review process would ensure that air emissions associated with these generators comply with applicable air quality standards; therefore, potential increases in criteria pollutants during project operations would be *less than significant*.

Since the overall increase in maintenance-related traffic at proposed WSIP facilities would be minimal, WSIP-related increases in criteria air pollutant emissions in this region would be *less than significant*.

The BDPL 3 and 4 Seismic Upgrade at Hayward Fault (BD-3) would not result in criteria air pollutant emissions because this project involves construction of enclosed pipelines; therefore, this impact is *not applicable*.

Peninsula Region

Impact 4.9-4: Air pollutant emissions during project operation		
Baden and San Pedro Valve Lots	PN-1	LS
CS/SA Transmission	PN-2	LS
HTWTP Long-Term	PN-3	LS
Lower Crystal Springs Dam	PN-4	LS
Pulgas Balancing Reservoir	PN-5	LS

Proposed WSIP facilities in this region (Baden and San Pedro Valve Lots, PN-1; CS/SA Transmission, PN-2; HTWTP Long-Term, PN-3; Lower Crystal Springs Dam, PN-4; and Pulgas Balancing Reservoir, PN-5) would use grid power as necessary and thus would not directly emit criteria air pollutants. During power outages, short-term increases in criteria pollutants would result from existing diesel-powered emergency generators at the Harry Tracy WTP (PN-3). The CS/SA Transmission project (PN-2) would also include use of an existing emergency generator in the event of a power outage. As stationary point sources, the existing emergency generators at the Harry Tracy WTP (under PN-3) and Crystal Springs Pump Station (under PN-2) already have permits to operate from the BAAQMD, and these permits would ensure that air emissions associated with these generators are *less than significant*.

Since the overall increase in maintenance-related traffic at proposed WSIP facilities in this region would be minimal, WSIP-related increases in criteria air pollutant emissions in this region would be *less than significant*.

San Francisco Region

Impact 4.9-4: Air pollutant emissions during project operation		
SAPL 3 Installation	SF-1	LS
Groundwater Projects	SF-2	LS
Recycled Water Projects	SF-3	LS

Proposed WSIP storage, pipeline, and well facilities in this region (SAPL 3 Installation, SF-1; Groundwater Projects, SF-2; and Recycled Water Projects, SF-3) would use grid power as necessary and thus would not directly emit criteria air pollutants. During power outages, short-term increases in criteria pollutants would result from operation of an emergency generator at the Recycled Water treatment facility (SF-3). As a stationary point source, this generator would require an authority to construct permit and permit to operate from the BAAQMD. The permit review process would ensure that air emissions associated with this facility comply with applicable air quality standards; therefore, potential increases in criteria pollutants during project operations would be *less than significant.*

Since the overall increase in maintenance-related traffic at proposed WSIP facilities in this region would be minimal, WSIP-related increases in criteria air pollutant emissions in this region would be *less than significant*.

Odors

Impact 4.9-5: Odors generated during project operation.

Nuisance odor problems are not expected to result from operation of WSIP facilities due to the low biological content (and consequent anaerobic activity) of the water as well as the enclosed nature of most proposed facilities. With the exception of filters and some basins at water treatment facilities, existing treatment, conveyance, and storage facilities are enclosed.

Filters at water treatment facilities are not typically a source of odors; odors associated with anaerobic activity do not occur since the water is aerated. However, open basins associated with backwash water processing can sometimes be sources of odor. Odors can derive from organic material suspended in the water, from outgassing of dissolved gases used for disinfection, or from sludge that has been removed from the water during treatment.

Two BAAQMD regulations prohibit the creation of an odor nuisance. Rule 1-301 prohibits the discharge of any contaminants that causes annoyance for a considerable number of people of normal sensitivity. Regulation 7 specifies odor limits for public exposure and identifies specific dilution levels that must be achieved as a function of odor emission strength. If odors were generated during the operation of any WSIP facility, enforcement of these regulations would be adequate to protect the public from impacts related to odorous emissions.

San Joaquin Region

Impact 4.9-5: Odors generated during project operation		
Advanced Disinfection	SJ-1	LS
Lawrence Livermore	SJ-2	LS
SJPL System	SJ-3	N/A
SJPL Rehabilitation	SJ-4	N/A
Tesla Portal Disinfection	SJ-5	LS

Proposed WSIP treatment facilities in this region (Advanced Disinfection, SJ-1; Lawrence Livermore, SJ-2; and Tesla Portal Disinfection, SJ-5) would be enclosed, and the odor potential would be *less than significant*. Enclosed pipelines, such as those under the SJPL System (SJ-3) and SJPL Rehabilitation (SJ-4) projects, are not a source of odors, and this impact is *not applicable*.

Sunol Valley Region

Impact 4.9-5: Odors generated during project operation		
Alameda Creek Fishery	SV-1	N/A
Calaveras Dam	SV-2	N/A
40-mgd Treated Water	SV-3	LS
New Irvington Tunnel	SV-4	N/A
Treated Water Reservoirs	SV-5	LS
SABUP	SV-6	N/A

Except for WSIP facilities at the Sunol Valley WTP, all proposed WSIP facilities in this region would have a low potential for odor generation. These projects involve storage (Calaveras Dam, SV-2) or transmission facilities (Alameda Creek Fishery, SV-1; New Irvington Tunnel, SV-4; and SABUP, SV-6), which are not typically associated with odor generation (due to the low biological content of the water or the enclosed nature of the facility). Therefore, this impact is *not applicable* to these projects.

Proposed backwash system improvements at the Sunol Valley WTP (40-mgd Treated Water, SV-3, and Treated Water Reservoirs, SV-5) could be a source of odor, depending on the design of these facilities. However, if any odors were generated by the backwash system, they would have a *less-than-significant* impact given the absence of nearby sensitive receptors (the closest and only receptor is a residence located 1.6 miles to the north).

Bay Division Region

Impact 4.9-5: Odors generated during project operation		
BDPL Reliability Upgrade	BD-1	N/A
BDPL 3 and 4 Crossovers	BD-2	N/A
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	N/A

Proposed WSIP facilities in this region (BDPL Reliability Upgrade, BD-1; BDPL 3 and 4 Crossovers, BD-2; and BDPL 3 and 4 Seismic Upgrade at Hayward Fault, BD-3) would involve pipelines and valves and would be enclosed. Therefore, there is no odor potential in this region, and this impact is *not applicable* to these projects.

Peninsula Region

Impact 4.9-5: Odors generated during project operation		
Baden and San Pedro Valve Lots	PN-1	N/A
CS/SA Transmission	PN-2	N/A
HTWTP Long-Term	PN-3	LS
Lower Crystal Springs Dam	PN-4	N/A
Pulgas Balancing Reservoir	PN-5	N/A

Except at the Harry Tracy WTP, all proposed WSIP facilities in this region would have a low potential for odor generation. These projects involve valve upgrades (Baden and San Pedro Valve Lots, PN-1), pipelines/tunnels (CS/SA Transmission, PN-2), or storage upgrades (Lower Crystal Springs Dam, PN-4; Pulgas Balancing Reservoir, PN-5), which are not typically associated with odor generation (due to the low biological content of the water or the enclosed nature of the facility). This impact is *not applicable* to these projects.

The Harry Tracy WTP does not currently generate odors, but proposed sludge-handling facility improvements at the plant under the HTWTP Long-Term project (PN-3) could be a source of odor, depending on the design of these facilities. The odor potential of proposed facilities would be assessed as part of subsequent, project-level CEQA review when project design has been completed. With compliance with BAAQMD odor control regulations (Rule 1-301 and Regulation 7), this potential impact would be *less than significant*.

San Francisco Region

Impact 4.9-5: Odors generated during project operation		
SAPL 3 Installation	SF-1	LS
Groundwater Projects	SF-2	LS
Recycled Water Projects	SF-3	LS

Proposed WSIP storage, pipeline, and well facilities in this region (SAPL 3 Installation, SF-1; Groundwater Projects, SF-2; and Recycled Water Projects, SF-3) would be enclosed, and the odor potential would be *less than significant*. No odor problems are expected at proposed Recycled Water treatment facilities (SF-3) due to the low biological content of treated/recycled water. However, if the emergency generator at this treatment facility were diesel-powered, there would be a potential for short-term nuisance diesel odors at the adjacent San Francisco Zoo during a power outage. With compliance with BAAQMD odor control regulations (Rule 1-301 and Regulation 7), this potential impact would be *less than significant*.

Secondary Emissions from Increased Electricity Demand

Impact 4.9-6: Secondary emissions at power plants.

Operation of new and expanded WSIP facilities could result in secondary emissions associated with electricity generation. Electricity is supplied by SFPUC Power Enterprise, which operates 400 megawatts of hydroelectric power generation plants. Pacific Gas and Electric Company provides transmission and distribution services. Energy production varies by season and by year, depending on hydrologic conditions. SFPUC Power Enterprise purchases power as necessary to ensure reliable electricity supply.

At present, SFPUC Power Enterprise is working with WSIP staff to identify energy efficiency in two areas: pumping energy optimization and efficient pump station design. Pumping energy optimization is aimed at designing pumping systems that reduce on-peak energy requirements for water pumping operations. With optimized pumping, pumping would shift to the off-peak and part-peak periods of each day to reduce on-peak energy consumption, while at the same time maintaining uninterrupted water delivery to end-users. This measure is projected to reduce on-peak electricity demand by 6 megawatts. Efficient pump station design focuses on incorporating efficient motors, pumps, lighting, and ventilation systems. SFPUC Power Enterprise is developing energy efficiency design guidelines to be used by WSIP staff in designing energy-efficient buildings and pump stations. Energy savings resulting from this measure are determined based on these guidelines.

All Regions

Operation of WSIP facilities proposed in all five regions would increase demand for electricity. Power is generated primarily from hydroelectric sources, although purchased power is derived from a variety of sources (hydroelectric, alternative energy, and fossil fuels). With respect to purchased power, power generation is regional in nature and could occur outside the air basin or outside California; therefore, the WSIP's incremental increase in power demand during project operations (the portion that is not from hydroelectric or alternative energy sources) is not expected to create a significant secondary air quality impact on criteria air pollutant levels specifically within the SJVAB or SFBAAB, a *less-than-significant* impact for each WSIP facility project.

Regional Air Quality Plans and Goals

Impact 4.9-7: Conflict with implementation of applicable regional air quality plans addressing criteria air pollutants and state goals for reducing GHG emissions.

Air quality planning is accomplished through regional air quality plans that address measures to reduce criteria air pollutants. Air quality planning efforts by the SJAPCD and BAAQMD would pertain to construction and operation of the WSIP. Potential increases in criteria air pollutants during construction and operation of the WSIP are quantified and consistency with state and federal standards for criteria pollutants are evaluated under Impacts 4.9-1 and 4.9-2. While construction-related emissions were determined to be potentially significant in some regions when compared to air district thresholds of significance, criteria pollutant emissions associated with operation of the WSIP were determined to be less than significant. Consistency of the WSIP with regional air quality planning efforts is discussed below by region.

State planning efforts to reduce GHG emissions (pursuant to the California Global Warming Solutions Act of 2006) would also pertain to construction and operation of the WSIP, as discussed below.

GHG Emissions During Project Construction. The WSIP's incremental increases in GHG emissions associated with construction-related traffic and off-road construction equipment would contribute to regional increases in GHG emissions and associated climate change effects (see Table 4.9-5 for GHG emission estimates by region). However, no state or regional air quality agency has adopted a methodology or quantitative threshold that can be applied to a specific development or construction project to evaluate the significance of an individual project's contribution to GHG emissions, such as the ones that exist for priority pollutants. Therefore, this analysis considers the quantity of GHGs that would be emitted with WSIP implementation in relation to the total GHG emissions in the Bay Area and the state. It also considers steps that the State intends to take to reduce GHG emissions and the actions that the CCSF and SFPUC are actively taking steps to reduce GHG emissions, such that implementation of the WSIP would not conflict with the State's goals of reducing GHG emissions to 1990 levels by 2020.

The *Bay Area Greenhouse Gas Emission Inventory Projections* (BAAQMD, 2006a) indicates that construction and mining equipment emissions currently account for approximately 4 percent of total mobile-source emissions and will continue to account for about the same proportion into the future (projected to 2016). The WSIP's combined GHG emissions from simultaneous construction projects in the San Joaquin Valley and the Bay Area Air Basins identified above would generate approximately 79,260 pounds of CO_2-equivalent GHG each work day during the construction period. For an assumed 260 work days per year, this translates into approximately 9,400 metric tons per year. The current statewide annual GHG inventory is estimated at 427,000,000 metric tons (California Energy Commission, 2006). Peak project construction activities would represent 0.0022 percent of the statewide total during the time these peak construction activities are carried out. This amount reflects peak GHG emissions from all of the WSIP projects; it is evident that GHG emissions from individual project would be extremely small.

Existing CARB regulations (Title 13 of the California Code of Regulations, Sections 2480 and 2485), which limit idling of diesel-fueled commercial motor vehicles, would help to limit GHG emissions associated with WSIP-related construction vehicles. In addition, CARB's proposed Early Action Measures (pursuant to the California Global Warming Solutions Act of 2006) include other emission reduction measures for diesel trucks and diesel off-road equipment. The CARB will review and adopt Early Action Measures by January 1, 2010, and equipment used for construction of WSIP facility improvement projects after 2010 could be subject to these requirements. Once such measures go into effect, SFPUC and construction contractors on SFPUC projects would be subject to these requirements, and the SFPUC will implement these measures are required; emissions from SFPUC construction activities would be reduced accordingly. Given the small amount of GHGs that would be emitted from individual WSIP projects during construction, continuing implementation of GHG reduction actions by the CCSF and SFPUC and additional GHG reductions actions that SFPUC would implement as part of the WSIP (see above under “Existing Setting”), the WSIP projects would not conflict with the State’s goals of reducing GHG emissions to 1990 levels by 2020.

As stated above, as part of implementation of the WSIP, the SFPUC will also be required to implement mitigation measures related to exhaust controls (Measures 4.9-1b, 4.9-1d and 4.16-7a) to address criteria pollutant emissions, waste reduction (Measure 4.11-2) to address solid waste disposal, and energy efficiency (Measure 4.15-2) to address energy use, which would further reduce GHG emissions from SFPUC construction activities.

GHG Emissions During Project Operation. Operation of WSIP facilities could result in a minor increase in the use of refrigerants and number of employee trips and chemical deliveries to facility sites and these actions could result in a minor increase in GHG emissions over current levels. These new activities and sources of GHGs would be minimal, however, because most of the WSIP facility projects involve improvements to existing operations and not entirely new operations. No state or regional air quality agency has adopted a methodology or quantitative threshold that can be applied to evaluate the significance of an individual project’s contribution to GHG emissions, such as the ones that exist for priority pollutants. The increase in GHG emissions at individual WSIP facilities during long-term operation occasioned by a small increase in vehicle trips would be a fraction of the statewide total inventory, and well below the estimated 0.0022 percent represented by construction emissions. Therefore, it is expected that increased GHG emissions from each WSIP facility operation would generally be minimal in nature.

The CARB will review and adopt Early Action Measures (pursuant to the California Global Warming Solutions Act of 2006) by January 1, 2010, and equipment used during operation of WSIP facility improvement projects after 2010 would be subject to these requirements. For example, future WSIP-related truck or vehicle operation will be required to comply with any future emissions reduction measures adopted by CARB as part of the California Global Warming Solutions Act of 2006, which would reduce the WSIP’s contribution to GHG emissions. As CARB’s Early Action Measures become effective, the SFPUC will implement them as required to reduce GHG emissions from the WSIP project operations. It is also expected that actions that the CCSF and SFPUC are taking to reduce GHG emissions may reduce GHG emissions associated with SFPUC operations and offset the minimal increases in GHG emissions associated with new operations.

Given the minimal increase in the amount of GHGs that could be emitted from the operation of individual WSIP projects, continuing implementation of GHG reduction actions by the CCSF and SFPUC, and additional GHG reductions actions that SFPUC will take as part of the WSIP project (see above under “Existing Setting”), the WSIP projects would not conflict with the State’s goals of reducing GHG emissions to 1990 levels by 2020.

As stated above, as part of implementation of the WSIP, the SFPUC will also be required to implement mitigation measures related to energy efficiency (Measure 4.15-2) to address energy use, which would further reduce GHG emissions from operation of WSIP facilities.

Secondary GHG Emissions at Power Plants. Implementation of the WSIP would also result in secondary operational increases in GHG emissions as a result of electricity generated to meet the WSIP's increase in energy demand. Although electricity for the WSIP projects would be derived primarily from hydroelectric sources, power would need to be purchased from the grid or other sources by customers of the SFPUC Power Enterprise from a variety of nonrenewable sources when less hydroelectric power is available, particularly during the summer and fall months. Electricity in the Bay Area occurs mainly at natural-gas-fired power plants, which produce about 7 percent of total GHG emissions in the Bay Area (BAAQMD, 2006a). However, since California imports about 20 to 30 percent of its total electricity (mainly from the northwestern and southwestern states), GHG emissions associated with electricity generation also occur outside the SJVAB or SFBAAB or outside of California. Therefore, the WSIP's incremental increase in power demand during project operations (the portion that is not from hydroelectric or renewable energy sources) would indirectly serve to sustain rather than reduce current GHG emissions from these emission sources.

The additional annual energy demand for all proposed WSIP projects is estimated at 39,000 megawatt-hours (MWH; see Impact 4.16-13 in Section 4.16, Collective Impacts, for more discussion). Although there would be an overall increase in demand associated the WSIP implementation, it should be noted that many individual WSIP projects would result in no increase in energy demand. The hydroelectric generating capacity of the SFPUC Power Enterprise is approximately 400 MW. The total increase in energy demand for all of the proposed WSIP projects would be met in approximately 98 hours of hydroelectric generation annually at full capacity. Except in the summer and fall when water is being stored and not being replenished, WSIP projects would be more than adequately supplied by the system. However, the 39,000 MWH used by WSIP projects would no longer be available to provide GHG-free electricity to California users. The "lost" 39,000 MWH would be offset by increased generation from fossil-fueled resources and other sources, such as hydroelectric power generated by Modesto and Turlock Irrigation Districts.

Tables C.1 and C.2 of the California Climate Action Registry (CCAR) Protocol document (CCAR, 2007) show that California power plants create approximately 806 pounds of CO_2-equivalent GHG emissions per MWH of power generated. For simplicity, it was assumed that the WSIP-diverted power would be generated somewhere within California at the above GHG-generation rate. The WSIP projects at completion are estimated to result in approximately 14,260 metric tons of CO_2-equivalent emissions by consuming hydroelectric power that is no longer available to current users. Compared to the current annual inventory of 427,000,000 metric tons in California (California Energy Commission, 2006), this represents 0.0033 percent of that inventory. Planned increases in water distribution and treatment system efficiencies will offset a limited portion of the increased power demand, but not enough to eliminate the increase in GHG emissions that would result from WSIP-diverted electrical power. Nevertheless, the total increased power demand associated with the operation of the WSIP projects is a small fraction of total state demand.

As stated above, no state or regional air quality agency has adopted a methodology or quantitative threshold that can be applied to evaluate the significance of an individual project's contribution to GHG emissions, such as the ones that exist for priority pollutants. However, it is apparent from the above analysis that the indirect effect of increased GHG emissions from power generation associated with operation of all of the proposed WSIP facilities would be minimal. It is apparent that the individual facility impacts would be even less.

As the CARB's Early Action Measures and CEC's greenhouse gases emission performance standard for local, public-owned electric utilities become effective (see discussion under Regulatory Framework, Greenhouse Gas Emissions Limits), the SFPUC will implement them as required to reduce GHG emissions from the WSIP project operations. With continuing implementation of GHG reduction actions by the CCSF and SFPUC and additional GHG reductions actions that SFPUC will take as part of the WSIP project (see above under "Existing Setting"), the WSIP projects would not conflict with the State's goals of reducing GHG emissions to 1990 levels by 2020.

As part of implementation of the WSIP, the SFPUC will also be required to implement feasible energy efficiency measures in applicable WSIP projects to address energy impacts, consistent with the *Energy Action Plan II* priorities for reducing energy usage (as specified in Measure 4.15-2).

San Joaquin Region

Although the WSIP includes facility improvement projects located in the San Joaquin Valley, operation of the WSIP would not serve future growth in the San Joaquin Valley since it is outside the SFPUC service area. Projected growth assumptions in the SFPUC service area would not be relevant to regional air quality planning efforts in the San Joaquin Valley. Therefore, consistency with SJVAPCD air quality plans related to criteria pollutants would be not applicable to this project.

Given the small amount of GHGs that would be emitted from WSIP projects in this region during construction and operation, continuing implementation of GHG reduction actions by the CCSF and SFPUC and additional GHG reductions actions that SFPUC would implement as part of the WSIP (see above under "Existing Setting"), the WSIP projects in this region would not conflict with the State's goals of reducing GHG emissions to 1990 levels by 2020 (*less than significant*).

Sunol Valley, Bay Division, Peninsula, and San Francisco Regions

The WSIP would be consistent with the BAAQMD's *Bay Area 2005 Ozone Strategy* (BAOS) (BAAQMD, 2006b), the most recently adopted regional air quality plan that pertains to the WSIP.[7] The consistency of the WSIP with the BAOS was determined by comparing the WSIP's growth assumptions with BAOS growth assumptions, which are based on ABAG population projections. Since the population growth assumed in the WSIP demand projections is generally

[7] Although the WSIP includes projects located in the San Joaquin Valley, operation of the WSIP would serve future Bay Area growth, not growth in the San Joaquin Valley. Therefore, long-term operation of the WSIP would have no direct or indirect effects on air quality planning efforts in the San Joaquin Valley.

consistent[8] with the 2030 population projections for the SFPUC service area in ABAG's *Projections 2005*, the WSIP would also be consistent with the BAOS (see Chapter 7, Growth Inducement Potential and Indirect Effects of Growth, for more discussion on the comparison of WSIP growth assumptions with ABAG projections). Therefore, the WSIP would have a *less-than-significant* impact on regional air quality planning efforts related to criteria pollutants in the Bay Area.

Given the small amount of GHGs that would be emitted from WSIP projects in these regions during construction and operation, continuing implementation of GHG reduction actions by the CCSF and SFPUC and additional GHG reductions actions that SFPUC would implement as part of the WSIP (see above under "Existing Setting"), the WSIP projects in this region would not conflict with the State's goals of reducing GHG emissions to 1990 levels by 2020 (*less than significant*).

4.9.4 References – Air Quality

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4.10 Noise and Vibration

4.10 Noise and Vibration

4.10.1 Noise Descriptors

dB, dBA

Sound is characterized by various parameters that describe the rate of oscillation of sound waves, the distance between successive troughs or crests, the speed of, and the pressure level or energy content of a given sound. The sound pressure level has become the most common descriptor used to characterize the loudness of an ambient sound, and the decibel (dB) scale is used to quantify sound intensity. Because sound can vary in intensity by over 1 million times within the range of human hearing, a logarithmic loudness scale is used to keep sound intensity numbers at a convenient and manageable level. Since the human ear is not equally sensitive to all sound frequencies within the entire spectrum, human response is factored into sound descriptions in a process called “A-weighting,” expressed as “dBA.” The dBA, or A-weighted decibel, refers to a scale of noise measurement that approximates the range of sensitivity of the human ear to sounds of different frequencies. On this scale, the normal range of human hearing extends from about 0 dBA to about 140 dBA. A 10-dBA increase in the level of a continuous noise represents a perceived doubling of loudness. The noise levels presented herein are expressed in terms of dBA, unless otherwise indicated. **Table 4.10-1** shows some representative noise sources and their corresponding noise levels in dBA.

Planning for acceptable noise exposure must take into account the types of activities and corresponding noise sensitivity in a specified location for a generalized land use type. Some general guidelines (U.S. EPA, 1974) are as follows: sleep disturbance can occur at levels above 35 dBA; interference with human speech begins at about 60 dBA; and hearing damage can result from prolonged exposure to noise levels in excess of 85 to 90 dBA.

Leq, CNEL, Ldn

Time variations in noise exposure are typically expressed in terms of a steady-state energy level (called Leq) that represents the acoustical energy of a given measurement. Leq (24) is the steady-state energy level measured over a 24-hour period. Because community receptors are more sensitive to unwanted noise intrusion during the evening and at night, state law requires that, for planning purposes, an artificial dBA increment be added to “quiet time” noise levels to form a 24-hour noise descriptor called the Community Noise Equivalent Level (CNEL). CNEL adds a 5-dBA “penalty” during the evening hours (7:00 p.m. to 10:00 p.m.) and a 10-dBA penalty during the night hours (10:00 p.m. to 7:00 a.m.). Another 24-hour noise descriptor, called the day-night noise level (Ldn), is similar to CNEL. While both add a 10-dBA penalty to all nighttime noise events between 10:00 p.m. and 7:00 a.m., Ldn does not add the evening 5-dBA penalty. In practice, Ldn and CNEL usually differ by less than 1 dBA at any given location for transportation noise sources.

TABLE 4.10-1
TYPICAL SOUND LEVELS MEASURED IN THE ENVIRONMENT

Examples of Common, Easily Recognized Sounds	Decibels (dBA)	Subjective Evaluations
Near Jet Engine	140	Deafening
Threshold of Pain	130	
Threshold of Feeling – Hard Rock Band	120	
Accelerating Motorcycle (at a few feet away)	110	
Loud Horn (at 10 feet away)	100	Very Loud
Noisy Urban Street	90	
Noisy Factory	85[a]	
School Cafeteria with Untreated Surfaces	80	Loud
Stenographic Room	70[b]	
Near Freeway Auto Traffic	60[b]	Moderate
Average Office	50[b]	
Soft Radio Music in Apartment	40	Faint
Average Residence Without Stereo Playing	30	
Average Whisper	20	Very Faint
Rustle of Leaves in Wind	10	
Human Breathing	5	
Threshold of Audibility	0	

[a] Continuous exposure above 85 dBA is likely to degrade the hearing of most people.
[b] Range of speech is 50 to 70 dBA.

SOURCE: U.S. Department of Housing and Urban Development, Office of Community Planning and Development, 1985.

Vibration

Vibrations caused by construction activities can be interpreted as energy transmitted in waves through the soil mass. These energy waves generally dissipate with distance from the vibration source (e.g., pile driving or sheetpile driving). Since energy is lost during the transfer of energy from one particle to another, vibration that is distant from a source is usually less perceptible than vibration closer to the source. However, actual human and structure response to different vibration levels is influenced by a combination of factors, including soil type, distance between source and receptor, duration, and the number of perceived events.

If great enough, the energy transmitted through the ground as vibration can result in structural damage. To assess the potential for structural damage associated with vibration, the vibratory ground motion in the vicinity of the affected structure is measured in terms of peak particle velocity (PPV) in the vertical and horizontal directions (vector sum), typically in units of inches per second (in/sec). A freight train passing at 100 feet can cause vibrations of 0.1 in/sec PPV, while a strong earthquake can produce vibrations in the range of 10 in/sec PPV. In general, cosmetic or threshold damage to residential buildings can occur at peak particle velocities over 0.5 in/sec. The term “threshold damage vibration” is defined as the highest vibration amplitude at which no cosmetic, minor, or major damage occurs, which includes “threshold cracks” or “hair-sized” cracks in room walls that occur at the lowest vibration amplitudes. Field data suggest a probability of 5 percent for cosmetic damage or threshold damage at 0.5 in/sec PPV, with the probability falling to 0 percent for vibration below 0.5 in/sec PPV (Wilson Ihrig & Associates, 2005).

An active family may produce strains in walls and ceilings that are comparable to those produced by blast vibration at 0.1 to 0.5 in/sec PPV. However, vibrations of 0.012 in/sec PPV can cause residential annoyance (Wilson Ihrig & Associates, 2005). Monitoring data for an unrelated tunnel/pipeline project in San Francisco indicated that the associated vibration was below the level of annoyance for most residents when vibration levels were maintained at 0.1 in/sec PPV or less (i.e., no complaints were received) (ESA, 1997).

Vibration thresholds vary depending on the nature of the vibration and frequency range. Controlled detonations do not generate structural damage if they produce vibrations of less than 0.5 in/sec PPV (measured at the residential building setback line at the ground surface). This level is consistent with the U.S. Bureau of Mines’ threshold cracking criteria of 0.5 in/sec PPV for low frequencies and 2.0 in/sec PPV for high frequencies. Continuous vibration caused by vibratory pile drivers, impact pile drivers, and large vibratory rollers/compactors can cause annoyance but do not cause structural damage if the continuous vibration is less than 0.2 in/sec PPV. This criterion is less than the controlled detonation vibration limit, reflecting the longer exposure time and the potential effect of structural resonances. Vibratory mechanical equipment may be operated over many minutes several times per day, and the associated response of structures can build up over several seconds due to resonance of the structure, especially during startup and shutdown of vibratory compactors. Impact pile driving, while impulsive in nature, involves repeated impacts of several hundred per day, much more than occurs for controlled detonations. Thus, the vibration limit for impact pile driving is the same as the threshold for continuous vibration (0.2 in/sec PPV) (Wilson Ihrig & Associates, 2005).

4.10.2 Setting

Existing Noise Environment and Sensitive Receptors

Human response to noise varies from individual to individual and depends on the ambient environment in which the noise is perceived. The same noise that would be highly intrusive to a sleeping person or in a quiet park might be barely perceptible at an athletic event or in the middle of a freeway at rush hour. Effects of noise at various levels can include interference with sleep, concentration, and communication; physiological and psychological stress; and hearing loss. Given these effects, some land uses are considered more sensitive to ambient noise levels than others. In general, residences and schools are among the uses considered to be the most sensitive to noise.

Certain land uses, such as residences, schools, childcare centers, churches, hospitals, and nursing homes, are considered to be sensitive receptors. The proximity of such receptors to WSIP facilities would vary with each project.

San Joaquin Region

The primary sources of noise in the vicinity of SFPUC facilities in the San Joaquin Region include traffic on state highways and major county roadways, railroad operations, airport operations, and farm equipment associated with agricultural activities. Noise levels in this region were measured to be in the range of 37 to 60 dBA (Ldn), with quieter areas located away from these noise sources (Stanislaus County, 1994).

Most of the areas adjacent to WSIP facilities in this region are undeveloped or are used for agriculture. The city of Modesto, located in the center of this region, has mainly residential, commercial, school, and park uses. There are also rural residential uses located south of Riverbank. In the western margin of this region (in the Tesla Portal vicinity), there is a private golf course (Tracy Golf and Country Club) and residential development. These residential areas as well as school uses in Modesto are considered sensitive noise receptors.

Sunol Valley Region

The southern portion of Sunol Valley and the area surrounding Calaveras Reservoir are mostly undeveloped, with a relatively quiet noise environment typical of rural areas. However, the northern portion of Sunol Valley is subject to higher noise levels due to traffic on regional roads as well as the presence of commercial nurseries and aggregate quarries. The primary sources of noise in Sunol Valley include traffic on I-680, Highway 84, and Calaveras Road, commercial nurseries along Calaveras Road, and aggregate quarries located south of I-680. Other minor sources of noise within this valley include the SFPUC's existing San Antonio Pump Station and Sunol Valley WTP. In general, noise levels exceed 75 dBA (CNEL) within approximately 200 feet of the I-680 freeway and 65 dBA (CNEL) within approximately 200 feet of Highway 84 (Alameda County, 1996).

There are no sensitive receptors in Sunol Valley, except for one residence located about a quarter mile southeast of the existing Alameda West Portal. In addition, there are rural residential uses scattered through the hills between Sunol Valley and Fremont. Residential uses on the east side of Mission Boulevard (Highway 238) are adjacent to the westernmost existing SFPUC facilities (Irvington Tunnel Portal) located in this region.

Bay Division Region

Most SFPUC facilities in the Bay Division Region are located in urbanized areas of the East Bay, South Bay, and Peninsula. The primary sources of noise in this region include traffic on freeways and local roads, aircraft, railroad operations, and stationary (industrial) sources. Major freeways that traverse this region include I-680, I-880, I-280, Highway 84 (Dumbarton Bridge), and Highway 101. There are major arterials located throughout this region. In general, noise levels adjacent to the freeways exceed 70 dBA (Ldn), while noise levels adjacent to major local roadways are generally between 60 and 70 dBA (Ldn) (City of Newark, 1992).

SFPUC facilities also cross the southern portion of San Francisco Bay and San Francisco National Wildlife Refuge. Some special-status species that use the refuge are considered to be noise-sensitive receptors during nesting or breeding season. Sensitive receptors near SFPUC facilities in this region include residential uses, schools, childcare centers, churches, and nursing homes.

Peninsula Region

The Peninsula Region spans the urbanized areas located between the Bay and I-280, but also includes the SFPUC Peninsula watershed, which is the area surrounding the Upper and Lower Crystal Springs Reservoirs and San Andreas Reservoirs. The watershed area is undeveloped, and ambient noise levels are relatively low. The primary sources of noise in this region include traffic on freeways and local roads, aircraft, railroad operations, and stationary (industrial) sources. Major freeways and highways that traverse this region include I-280, Highway 101, Highway 92, Highway 84 (Dumbarton Bridge/Woodside Road), Highway 35 (Skyline Boulevard), and Highway 82 (El Camino Real). There are major arterials throughout this region. The San Mateo County General Plan (San Mateo County, 1986) includes a Community Noise Map, which indicates noise levels exceed 60 dBA (CNEL) in areas adjacent to I-280, Highway 92, Highway 35 (Skyline Boulevard), and Edgewood Road. Sensitive receptors near existing SFPUC facilities in this region include residential uses, schools, churches, and hospitals.

San Francisco Region

Most SFPUC facilities in the San Francisco Region are located in urbanized areas of the west and south sides of the city. Proposed WSIP facilities are located as far north as Golden Gate Park, as far south as Lake Merced. The ambient noise environment within the city is dominated by traffic on freeways and local roads. A city-wide noise map prepared by the San Francisco Department of Public Health (2006) indicate that noise levels generally exceed 60 dBA (Ldn) in areas adjacent to or near major roadways such as I-280, Highway 101, Highway 1 (19th Avenue), and various arterial roadways extending through the city. While many areas in the northeastern part of the city are subject to noise levels over 60 dBA (Ldn), residential neighborhoods in the western and southern portions of the city (away from arterials and freeways) generally experience noise levels of less than 60 dBA (Ldn). Sensitive receptors near WSIP facilities in this region include residential uses, schools, and churches.

Of the proposed WSIP facilities south of San Francisco (in northern San Mateo County), there is one WSIP facility (Baden Valve Lot, SF-1) near the San Francisco International Airport and airport noise contours indicate that this site would be located near the 65-dBA CNEL noise contour (San Francisco Aircraft Noise Abatement Office, 2007).

Regulatory Framework

Local noise issues are addressed through implementation of general plan policies, including noise and land use compatibility guidelines, and through enforcement of noise ordinance standards. General plan policies provide guidelines for determining whether a noise environment is appropriate for a proposed or planned land use. Noise ordinances regulate noise sources, such as mechanical equipment and amplified sounds, as well as prescribe hours of heavy equipment operation. In most cases, noise ordinances are part of local building and zoning ordinances of other jurisdictions; these building and zoning ordinances do not apply to SFPUC projects (see Section 4.2, Plans and Policies). However, time and noise limits prescribed in local noise ordinances are used in this PEIR as criteria to determine the significance of project impacts under CEQA.

WSIP facilities (including alternative sites) would be located 7 counties and 27 cities. Noise ordinance standards that are relevant to the construction of WSIP facilities are incorporated into the significance criteria and summarized in **Table 4.10-2**.

Construction and Operational Time and Noise Limits

San Joaquin Region

WSIP projects in the San Joaquin Region would be located in unincorporated areas of Tuolumne, Stanislaus, and San Joaquin Counties, and incorporated areas of Riverbank and Modesto. Tuolumne and Stanislaus Counties do not have a noise ordinance and do not enforce any noise limits or time restrictions for construction activities. San Joaquin County limits construction activities to specific hours of the day. As shown in Table 4.10-2, noise ordinances for these counties specify noise limits for operation of stationary equipment.

Sunol Valley Region

WSIP projects in the Sunol Valley Region would be located mostly in unincorporated areas of Alameda County, but portions of two facilities would be located in Santa Clara County and the City of Fremont. As shown in Table 4.10-2, noise ordinances for these counties and cities specify time limits for construction activities and noise limits for operation of stationary equipment in or near residential zones.

Bay Division Region

WSIP projects in the Bay Division Region would be located in unincorporated areas of San Mateo County. Project facilities in this region would also be located within the following incorporated areas: Fremont, Newark, San Jose, Santa Clara, Palo Alto, East Palo Alto, Menlo Park, Atherton, Redwood City, and San Carlos. Alternative sites for some of these facilities would be located in the following incorporated areas: Milpitas, Sunnyvale, Mountain View, Los Altos, Redwood City, and Woodside. As shown in Table 4.10-2, noise ordinances for these counties and cities specify time limits for construction activities and noise limits for operation of stationary equipment in or near residential zones.

TABLE 4.10-2
PERTINENT ORDINANCE TIME LIMITS AND NOISE STANDARDS

Jurisdiction	Construction Time Limits			Ordinance Noise Limits for Various Activities in Residential Zones (dBA)[a]	
	Weekdays	Saturdays	Sundays	Day (Leq) 7 a.m. to 10 p.m.	Night (Leq) 10 p.m. to 7 a.m.
Tuolumne and Stanislaus Counties[b]	–	–	–	50	45
San Joaquin County[c]	6 a.m. to 9 p.m.	6 a.m. to 9 p.m.	6 a.m. to 9 p.m.	50	45
Alameda County[d]	7 a.m. to 7 p.m.	8 a.m. to 5 p.m.	8 a.m. to 5 p.m.	58	53
Santa Clara County[e]	7 a.m. to 7 p.m.	7 a.m. to 7 p.m.	Prohibited	60	50
San Mateo County[f]	7 a.m. to 6 p.m.	9 a.m. to 5 p.m.	Prohibited	63	58
City of Riverbank[g]	6 a.m. to 6:30 p.m.	8 a.m. to 5 p.m.	8 a.m. to 5 p.m.	50	45
City of Modesto[h]	7 a.m. to 9 p.m.	9 a.m. to 9 p.m.	9 a.m. to 9 p.m.	–	–
City of Fremont[i]	7 a.m. to 7 p.m.	9 a.m. to 6 p.m.	Prohibited	60 (Ldn)	
City of Newark[j]	7 a.m. to 6 p.m.	–	–	75 or 80 (Lmax) at 50 feet depending on equipment type; 95 (Lmax) at 50 feet for pile drivers	
City of Milpitas[k]	7 a.m. to 7 p.m.	7 a.m. to 7 p.m.	7 a.m. to 7 p.m.	–	–
City of San Jose[l]	7 a.m. to 7 p.m.	Prohibited	Prohibited	55	55
City of Santa Clara[m]	7 a.m. to 6 p.m.	9 a.m. to 6 p.m.	Prohibited	55	50
City of Sunnyvale[n]	7 a.m. to 6 p.m.	8 a.m. to 5 p.m.	Prohibited	60	45/50
City of Mountain View[o]	7 a.m. to 6 p.m.	Prohibited	Prohibited	55	50
City of Los Altos[p]	7 a.m. to 5:30 p.m.	9 a.m. to 3 p.m.	Prohibited	55	45/50
City of Palo Alto[q]	8 a.m. to 6 p.m.	9 a.m. to 6 p.m.	Prohibited	–	–
City of East Palo Alto[r]	7 a.m. to 8 p.m.	7 a.m. to 8 p.m.	7 a.m. to 8 p.m.	63	58
City of Menlo Park[s]	8 a.m. to 6 p.m.	Prohibited	Prohibited	60	50
Town of Atherton[t]	8 a.m. to 6 p.m.	Prohibited	Prohibited	60	50
City of Redwood City[u]	7 a.m. to 8 p.m.	Prohibited	Prohibited	–	–
City of San Carlos[v]	7 a.m. to 6 p.m.	9 a.m. to 5 p.m.	9 a.m. to 5 p.m.	10 dBA above ambient	
City of San Mateo[w]	7 a.m. to 7 p.m.	8 a.m. to 5 p.m.	12 p.m. to 4 p.m.	60	50 or 55
Town of Woodside[x]	7:30 a.m. to 5:30 p.m.	8 a.m. to 1 p.m.	Prohibited	55 (Ldn)	
Town of Hillsborough[y]	8 a.m. to 5 p.m.	10 a.m. to 5 p.m.	Prohibited	70 at 25 feet	–
City of Burlingame[z]	8 a.m. to 7 p.m.	8 a.m. to 7 p.m.	10 a.m. to 6 p.m.	–	–
City of Millbrae[aa]	7:30 a.m. to 7 p.m.	8 a.m. to 6 p.m.	8 a.m. to 6 p.m.	–	–
City of San Bruno[bb]	7 a.m. to 10 p.m. (85 dBA limit at 100 feet) 10 p.m. to 7 a.m. (60 dBA limit at 100 feet)			60	45
City of South San Francisco[cc]	8 a.m. to 8 p.m.	9 a.m. to 8 p.m.	10 a.m. to 6 p.m.	60	50
City of Colma[dd]	–	–	–	–	–
City of Brisbane[ee]	7 a.m. to 7 p.m.	9 a.m. to 7 p.m.	9 a.m. to 7 p.m.		
City of Daly City[ff]	6 a.m. to 10 p.m.	6 a.m. to 10 p.m.	6 a.m. to 10 p.m.	–	–
City/County of San Francisco[gg]	7 a.m. to 8 p.m. (80 dBA limit at 100 feet)			55 or 60	50 or 55

TABLE 4.10-2 (Continued)
PERTINENT ORDINANCE TIME LIMITS AND NOISE STANDARDS

– not specified
[a] In addition to residential zones, these limits could apply to school, hospital, church, or public library uses depending on the jurisdiction. These limits generally apply to operation of stationary noise sources except in the cities of Newark, Hayward, and San Bruno, where limits apply to construction noise.
[b] Noise limits specified in Tuolumne County Noise Element (Table 5.4) and Stanislaus County General Plan Noise Element (Policy Two, Table II) and apply to stationary noise sources. These counties do not have construction time limits.
[c] Section 1025.9(c)(3) of the San Joaquin County Title 9 Development Title specifies hourly limits for construction. Section 1025.9(b)(2) of the San Joaquin County Development Title specifies Leq limits for stationary noise sources.
[d] Alameda County Municipal Code, Title 6, Health and Safety, Chapter 6.60, Section 6.60.070(E) specifies hourly limits for construction. Noise limits are based on specified noise, duration, and timing limits in Section 6.60.040.
[e] Santa Clara County Code Chapter VII, Section B11-154(b)(6), Noise/Demolition.
[f] Noise limits are based on specified noise, duration, and timing limits in San Mateo County Code, Title 4, Chapter 4.88, Section 4.88.330, Exterior Noise Standards*.* Time limits are specified in San Mateo County Code, Title 4, Chapter 4.88, Section 4.88.360(e), Exemptions.
[g] Time and noise limits specified in Riverbank Municipal Code, Title IX, Chapter 93, Section 93.07(C).
[h] Modesto Municipal Code, Title 4, Chapter 9, Article 4-9.103. Although the code does not contain noise limits, the Environmental Resources Element of the Modesto General Plan specifies a maximum outdoor noise level of 60 dBA (CNEL or Ldn) in single-family residential areas or 65 dBA in multifamily residential areas.
[i] Fremont Municipal Code, Section 8-2205 specifies the above time limits for construction activities within 500 feet of residences, lodging facilities, nursing homes, or inpatient hospitals. Beyond 500 feet of these uses, construction hours are extended to 6 a.m. to 10 p.m. on weekdays and 8 a.m. to 8 p.m. on weekends. When a project is located in a right-of-way or easement or on public-owned property, these hours can be modified by the City, on balance, to minimize disruption to the community as a whole, such as to facilitate orderly flow of traffic or to reduce negative impacts on commercial or residential activity.
[j] The Noise Element of the City of Newark's General Plan serves as the City's noise ordinance, which includes peak noise (Lmax) limits for specific types of construction equipment, but no time restrictions for construction activities. However, the City limits construction to the above weekday hours for most projects requiring permits, although exceptions can be granted by the City (Fujikawa, 2006).
[k] Time limits are specified in the Milpitas Municipal Code, Title V, Chapter 213, Section V-213-3(b), Site Construction Regulations, but no noise limits are specified.
[l] Time limits specified by the San Jose Municipal Code (Chapter 20.100, Section 20.100.450) apply to any construction activity on a site located within 500 feet of a residential unit. Specified noise limit is the performance standard for residential zoning districts (Section 20.30.700).
[m] Time and noise limits specified in Santa Clara City Code, Title 9, Chapter 9.10.
[n] Time and noise limits specified in the Sunnyvale Municipal Code, Sections 16.08.110 and 19.42.030.
[o] Mountain View City Code specifies time limits in Chapter 8, Article I, Section 8.23, and noise limits for stationary equipment in Chapter 21, Article I, Section 21.26.
[p] Los Altos Municipal Code specifies time limits in Title 6, Chapter 6.16, Section 6.16.070, and exterior noise limits in Section 6.16.050. Section 6.16.070 specifies construction maximum noise levels of 75 or 80 dBA (7 a.m. to 7 p.m.) and 50 or 55 dBA (7 p.m. and 7 a.m.), depending on the residential zoning district noise limits.
[q] Construction time limits apply to residential properties and are specified in Title 9, Chapter 9.10 of the Palo Alto Municipal Code. This ordinance also limits noise from any individual piece of equipment to 110 dBA at 25 feet or outside the property plane.
[r] Time and noise limits specified in East Palo Alto Municipal Code, Title 8, Chapter 8.52.
[s] Time and noise limits specified in Menlo Park Municipal Code, Title 8, Section 8.06.030.
[t] Time and noise limits specified in Atherton Municipal Code*,* Title 8, Section 8.16.
[u] Time and noise limits specified in Redwood City Municipal Code, Chapter 24, Article II. Noise levels generated by construction activities (including demolition, alteration, repair, or remodeling) shall not exceed 110 dBA on any adjacent residential property or at 25 feet.
[v] Time and noise limits specified in the San Carlos Municipal Code, Chapter 9.3, Sections 9.30.030 and 9.30.070.
[w] Time and noise limits specified in San Mateo Municipal Code, Title VII, Chapter 7.30, Sections 7.30.040 and 7.30.060. Noise levels generated by construction activities (including demolition, alteration, repair, or remodeling) shall not exceed 90 dBA at 25 feet or outside the property plane.
[x] Time limits specified in Woodside Code of Ordinances, Chapter 151, Section 151.55. Noise limits specified in Town of Woodside General Plan Noise Element.
[y] Time limits specified in Section 8.32.040 of Hillsborough Municipal Code. This code limits construction equipment noise to 100 dBA at a distance of 25 feet from the source, and noise levels from all sources shall not exceed 100 dBA at 25 feet outside the property line plane. On Saturdays, the combined noise level from all construction activity is limited to 70 dBA at 25 feet outside the property line plane. The code limits general noise levels to 70 dBA outside the property plane on weekdays, 7 a.m. to 5 p.m.
[z] Burlingame Municipal Code, Title 10, Chapter 10.40, Section 10.40.037. Although the code does not contain noise limits, the Noise Element of the Burlingame General Plan specifies a maximum outdoor noise level of 60 dBA (CNEL) in residential areas.
[aa] Time limits specified in Millbrae Municipal Code, Title 6, Chapter 6.25, Section 6.25.050(F)(9).
[bb] San Bruno Municipal Code, Title 6, Chapter 6.16, Section 6.16.030 for noise limits in residential zone and Section 6.16.070 for construction limits.
[cc] Time and noise limits specified in South San Francisco Municipal Code, Chapter 8.32, Sections 8.32.030 and 8.32.050. Construction activities allowed during these hours if each piece of equipment produces a noise level of 90 dBA or less at 25 feet or outside of the property plane.
[dd] There is no noise ordinance for the Town of Colma. Instead, it uses the California Penal Code Section 415, "Disturbing the Peace," which prohibits any person from maliciously and willfully disturbing another person by loud and unreasonable noise.
[ee] Brisbane Municipal Code, Title 8, Chapter 8.28, Section 8.28.060 specifies time limits, and no piece of equipment shall produce a noise level of more than 83 dBA or more at 25 feet or 86 dBA outside of the property plane.
[ff] Time limits specified in Daly City Municipal Code, Title 9, Chapter 9.22, Section 9.22.030.
[gg] Time and noise limits specified in San Francisco Police Code, Article 29, Sections 2907 through 2909. Except for impact tools and equipment, powered construction equipment cannot generate noise levels in excess of 80 dBA at 100 feet. Noise limits are for fixed noise sources, with the lower limit applying to R-1 and R-2 residential zoning districts and the higher limit applying to all other residential zoning districts.

Peninsula Region

WSIP projects in the Peninsula Region would mainly be located in unincorporated areas of San Mateo County. Project facilities in this region would also be located within the following incorporated areas: South San Francisco and Daly City. Although most of these facilities would be located in unincorporated areas, a number of them would be sited adjacent to or near the cities of San Mateo, Hillsborough, Burlingame, Millbrae, and San Bruno. As shown in Table 4.10-2, noise ordinances for these counties and cities specify time limits for construction activities and noise limits for operation of stationary equipment in or near residential zones.

San Francisco Region

Most WSIP projects in the San Francisco Region would be located in San Francisco. However, two projects would have facilities located in unincorporated areas of northern San Mateo County as well as in the following incorporated areas on the Peninsula: Burlingame, Millbrae, San Bruno, South San Francisco, Colma, Brisbane, and Daly City. As shown in Table 4.10-2, noise ordinances for these counties and cities specify time limits for construction activities and noise limits for operation of stationary equipment in or near residential zones.

4.10.3 Impacts

Significance Criteria

The CCSF has not formally adopted significance standards for impacts related to noise, but generally considers that implementation of the proposed program would have a significant noise impact if it were to:

- Expose people to or generate noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies (Evaluated in this section)
- Expose people to or generate excessive groundborne vibration or groundborne noise levels (Evaluated in this section)
- Create a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project (Evaluated in this section)
- Create a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project (Evaluated in this section)
- For a project located within an area covered by an airport land use plan (or, where such a plan has not been adopted, within two miles of a public airport or public use airport), expose people residing or working in the project area to excessive noise levels (Not evaluated in this section, see Appendix B)
- For a project within the vicinity of a private airstrip, expose people residing or working in the project area to excessive noise levels (Not evaluated in this section, see Appendix B)
- Be substantially affected by existing noise levels (Not evaluated in this section, see Appendix B)

Approach to Analysis

This program-level analysis presents a screening-level analysis to determine areas of potential noise impacts based on two factors: (1) the proximity of sensitive receptors in the site vicinities; and (2) the potential for proposed activities to occur during the more sensitive nighttime hours. Both of these factors are used to define the potential for impact and the need for or feasibility of mitigation. For construction noise, the potential for impact is defined by the proximity of sensitive receptors, typical noise levels associated with construction equipment, the potential for construction noise levels to interfere with daytime and nighttime activities, and whether construction noise audible to nearby receptors will occur outside of construction time limits specified in local ordinances. For operational noise, the potential for impact is defined by the proximity of sensitive receptors to a proposed facility, and the potential for operational noise to remain within noise ordinance limits at the nearest receptors.

This section focuses on the program-level impacts that would be associated with the various types of facilities as well as each WSIP project. The final construction scheduling of specific WSIP projects could lead to combined or collective impacts resulting from construction of more than one facility. This potential effect is assessed in Section 4.16, Collective Impacts.

Another relevant factor to consider in assessing whether a noise impact is significant or not is the frequency with which noise levels associated with project construction might exceed the established standards. If exceedance of a noise standard might happen only very rarely and/or briefly, this may not constitute a significant impact. This factor of noise frequency is not considered as part of this program-level impact analysis of the WSIP projects since there is not yet enough detailed information about the construction scenario for each project to assess the potential frequency of project noise levels that might established standards. This factor will be considered as part of the separate project-level impact analysis to be conducted as appropriate for each WSIP project. Based on more detailed information about project construction activities and schedule, and site-specific information on the proximity of sensitive receptors, project-level analysis may determine that impacts considered to be potential significant and unavoidable at this program-level of review are instead significant but mitigable or less than significant.

Impact Summary by Region

Table 4.10-3 provides a summary of the noise and vibration impacts associated with implementation of the WSIP.

Construction Impacts

Short-Term Noise Increases

Impact 4.10-1: Disturbance from temporary construction-related noise increases.

Construction activities associated with implementation of the WSIP would result in temporary noise increases at sensitive receptors near facility sites. Construction noise levels would fluctuate at any given receptor depending on the type of project, construction phasing, equipment

TABLE 4.10-3
POTENTIAL IMPACTS AND SIGNIFICANCE – NOISE AND VIBRATION

Projects	Project Number	Impact 4.10-1: Disturbance from temporary construction-related noise increases	Impact 4.10-2: Temporary noise disturbance along construction haul routes	Impact 4.10-3: Disturbance due to construction-related vibration	Impact 4.10-4: Disturbance due to long-term noise increases
San Joaquin Region					
Advanced Disinfection	SJ-1	PSU	PSU	LS	LS
Lawrence Livermore Supply Improvements	SJ-2	PSU	N/A	LS	LS
San Joaquin Pipeline System	SJ-3	PSU	PSU	PSU	LS
Rehabilitation of Existing San Joaquin Pipelines	SJ-4	PSU	PSU	PSU	N/A
Tesla Portal Disinfection Station	SJ-5	PSU	PSU	LS	LS
Sunol Valley Region					
Alameda Creek Fishery Enhancement	SV-1	PSU	LS	LS	LS
Calaveras Dam Replacement	SV-2	PSU	LS	LS	N/A
Additional 40-mgd Treated Water Supply	SV-3	PSU	LS	PSU	LS
New Irvington Tunnel	SV-4	PSU	PSM	PSM	LS
SVWTP – Treated Water Reservoirs	SV-5	PSU	LS	LS	LS
San Antonio Backup Pipeline	SV-6	PSU	LS	LS	N/A
Bay Division Region					
Bay Division Pipeline Reliability Upgrade	BD-1	PSU	PSU	PSU	LS
BDPL Nos. 3 and 4 Crossovers	BD-2	PSU	PSU	PSU	N/A
Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault	BD-3	PSU	PSU	PSU	N/A
Peninsula Region					
Baden and San Pedro Valve Lots Improvements	PN-1	PSU	PSU	PSU	LS
Crystal Springs/San Andreas Transmission Upgrade	PN-2	PSU	LS	LS	LS
HTWTP Long-Term Improvements	PN-3	PSU	PSU	LS	LS
Lower Crystal Springs Dam Improvements	PN-4	PSU	LS	LS	N/A
Pulgas Balancing Reservoir Rehabilitation	PN-5	PSU	LS	LS	LS
San Francisco Region					
San Andreas Pipeline No. 3 Installation	SF-1	PSU	PSU	PSU	N/A
Groundwater Projects	SF-2	PSU	PSU	PSU	LS
Recycled Water Projects	SF-3	PSU	PSU	PSU	LS

LS = Less than Significant impact, no mitigation required
PSM= Potentially Significant impact, can be mitigated to less than significant
PSU = Potentially Significant Unavoidable impact
N/A = Not Applicable

type/duration of use, distance between the noise source and receptor, and the presence or absence of barriers between the noise source and receptor. Typical construction equipment generates maximum noise levels ranging from about 76 to 88 dBA at a distance of 50 feet from the source, with slightly higher levels of about 88 to 91 dBA for certain types of earthmoving and impact equipment. The rate of attenuation (i.e., reduction) is about 6 dBA for every doubling of distance from a point source. Noise levels from pile drivers can generate noise peaks of approximately 101 dBA at 50 feet. **Table 4.10-4** indicates noise levels at 25, 50, and 100 feet from the noise source for typical construction equipment.

TABLE 4.10-4
NOISE LEVELS AND ABATEMENT POTENTIAL OF CONSTRUCTION EQUIPMENT NOISE AT 25, 50, AND 100 FEET (IN DBA)

	Noise Level at 25 Feet		Noise Level at 50 Feet		Noise Level at 100 Feet	
Equipment	**Without Controls**[a]	**With Controls**[a]	**Without Controls**[a]	**With Control**[a]	**Without Controls**[a]	**With Controls**[a]
Earthmoving						
Front Loaders	85	81	79	75	73	69
Backhoes	86	81	80	75	74	69
Dozers	86	81	80	75	74	69
Tractors	86	81	80	75	74	69
Graders	91	81	85	75	79	69
Trucks	97	81	91	75	85	69
Materials Handling						
Concrete Mixers	91	81	85	75	79	69
Concrete Pumps	88	81	82	75	76	69
Crane, Mobile	89	81	83	75	77	69
Crane, Derrick	94	81	88	75	82	69
Stationary						
Pumps	82	81	76	75	70	69
Generators	84	81	78	75	72	69
Compressors	87	81	81	75	75	69
Impact						
Pile Drivers	107	101	101	95	95	89
Rock Drills	104	86	98	80	92	74
Jack Hammers	94	81	88	75	82	69
Pneumatic Tools	92	86	86	80	80	74
Other						
Saws	84	81	78	75	72	69
Vibrators	82	81	76	75	70	69

[a] Estimated levels can be obtained by selecting quieter procedures or machines and implementing noise-control features that do not require major redesign or extreme cost (e.g., improved mufflers, equipment redesign, use of silencers, shields, shrouds, ducts, and engine enclosures).

SOURCE: U.S. Environmental Protection Agency, 1971; U.S. Department of Transportation, Federal Transit Administration, 1995.

As stated in the first significance criterion above, a noise impact is considered significant if noise levels are in excess of the standards established in local noise ordinances. However, WSIP projects are located in over 20 different jurisdictions, each with its own limits. Some jurisdictions have noise limits but do not have time limits. Others have time limits but no construction noise limits. Given the variation in time and noise limits among jurisdictions, combined with the undetermined nature of construction hours and specific construction activities for the WSIP projects, it is not possible at the program level to accurately determine whether each WSIP project would generate noise in excess of local noise ordinance standards. This project-specific analysis will be undertaken as part of separate, project-level CEQA review.

For construction noise, a “substantial” noise increase (as stated in the fourth significance criterion) can be defined as interference with activities during the day and night. One indicator that construction noise could interfere with daytime activities would be speech interference, and an indicator that construction noise could interfere with nighttime activities would be sleep interference. This analysis uses the following criteria to define the significance of potential noise impacts:

- *Speech Interference*. Speech interference is an indicator of impact on typical daytime and evening activities. A speech interference criterion, in the context of impact duration and time of day, is used to identify substantial increases in noise from temporary construction activities. Noise peaks generated by construction equipment could result in speech interference in adjacent buildings if the noise level in the interior of the building exceeds 45 to 60 dBA.[1] A typical building can reduce noise levels by 25 dBA with the windows closed (U.S. EPA, 1974). This noise reduction could be maintained only on a temporary basis in some cases, since it assumes windows must remain closed at all times. Assuming a 25-dBA reduction with the windows closed, an exterior noise level of 70 dBA (Leq) at receptors would maintain an acceptable interior noise environment of 45 dBA. It should be noted that such noise levels would be sporadic rather than continuous in nature, because different types of construction equipment would be used throughout the construction process.

- *Sleep Interference*. Based on available sleep criteria data, an interior nighttime level of 35 dBA is considered acceptable (U.S. EPA, 1974). Assuming a 25-dBA reduction with the windows closed, an exterior noise level of 60 dBA at receptors would maintain an acceptable interior noise environment of 35 dBA. Since a 15-dBA reduction would occur with windows open, an exterior noise level of 50 dBA (Leq) would be required to maintain an acceptable interior noise environment of 35 dBA.

In general, most construction noise would exceed the speech interference criterion when heavy equipment is operated within approximately 500 feet of a sensitive receptor (distance ranges between 150 and 500 feet depending on the type of equipment operated). The sleep interference criterion would be exceeded at distances closer than approximately 3,000 feet with windows open or 900 feet with the windows closed (with operation of most types of construction equipment; greater setback distances would be required if trucks and impact equipment were to be operated at night).[2] If feasible noise controls are implemented (see Mitigation Measure 4.10-1a), most construction noise levels could be reduced to below the speech interference criterion, except when receptors are approximately 75 feet or less from construction equipment. For nighttime construction, implementation of noise controls would reduce most construction noise to below the sleep interference criterion except when construction equipment were operated within 300 feet (windows closed) or 900 feet (windows open) of sensitive receptors or when impact equipment were operated within 600 feet (windows closed) or 1,700 feet (windows open) of sensitive receptors. Estimates of typical construction noise levels at these distances (mitigated and unmitigated) are included in Appendix F and they are compared to the speech and sleep interference criteria.

1 For indoor noise environments, the highest noise level that permits relaxed conversation with 100 percent intelligibility throughout the room is 45 dBA. Speech interference is considered to become intolerable when normal conversation is precluded at 3 feet, which occurs when background noise levels exceed 60 dBA. For outdoor environments, the highest noise level that permits normal conversation at 3 feet with 95 percent sentence intelligibility is 66 dBA (U.S. EPA, 1974).

2 Whether windows can remain closed at night would depend on local climate conditions as well as duration of nighttime construction.

The construction impacts identified below for each type of facility have been developed to allow a general assessment of the nature and magnitude of potential impacts associated with the WSIP.

Pipelines. For pipelines, sensitive receptors tend to be located closer to construction activities than at facility sites (as close as 25 to 50 feet of proposed alignments in urbanized areas), and construction noise levels would exceed the speech interference criterion at distances closer than 100 feet, with or without feasible noise controls. However, because pipeline construction progresses along an alignment (rather than persisting at one location) at an average rate of approximately 120 to 160 feet per day, any given sensitive receptor would typically be subject to construction noise for about two weeks and not for the entire duration of the construction schedule. In some cases, the limited duration of exposure at a given sensitive receptor could reduce the adverse effects of these temporary noise increases to a less-than-significant level, even if noise controls cannot reduce estimated noise levels to below the speech interference criterion. However, if pipeline construction were prolonged at any one location, localized impacts could be potentially significant and unavoidable. While it is expected that most pipeline construction activities would occur during daytime hours (generally within with applicable noise ordinance time limits), the SFPUC has indicated that nighttime construction could occur at specific locations due to special construction requirements (e.g., water service must be temporarily discontinued when proposed facilities are connected to existing facilities).

Construction of jack-and-bore pits for pipeline crossings of railroads, freeways, and streets that are more than four lanes wide would pose additional noise impacts if tunnel ventilation fans, dewatering pumps, and generators are required. If any sensitive receptors are located near these pits, they could be subject to construction-related noise increases for longer durations as well as nighttime noise increases if fans, pumps, and generators are required to be operated 24 hours per day. Twenty-four-hour operation of ventilation fans, generators, and/or pumps could exceed ordinance time or noise limits, and noise controls would be required to minimize speech interference and sleep disturbance effects.

Tunnels. Noise impacts associated with tunnel construction would primarily occur at tunnel entry and exit shafts or portals, where construction staging would occur. Since tunnel construction might have to occur 24 hours per day, seven days per week, activities at these shafts/portals would often involve nighttime activities. If nighttime activities occur in tunnel portal vicinities, it could be appropriate to apply ordinance noise limits (listed in Table 4.10-2) in addition to the sleep interference criterion to evaluate the potential significance of construction noise increases. In addition to activities at tunnel shafts/portals, noise increases could occur along haul routes, since tunnel construction would entail off-hauling of materials excavated from tunnels (tunnel spoils), as well as equipment and material (e.g., tunnel lining) deliveries.

Within tunnels, the primary noise sources are typically the tunnel boring machine and tunnel muck removal system (conveyor belt and rail cars), but these sources would not be audible at the surface. However, these underground tunnel-related activities could generate groundborne noise within any overlying structures, which could result in sleep disturbance.

The primary sources of airborne noise associated with tunnel construction would be activities at tunnel shafts or portals, which could include the following with a tunnel shaft design:

- Excavation of the tunnel entry and exit shafts, which could include pile driving
- Handling and removal of excavated materials (shaft and tunnel spoils) at the tunnel entry shaft, which could include operation of a crane at the surface and a skip hoist system that moves muck from the bottom of the shaft to the surface, and front loaders that load muck into haul trucks
- Operation of a crane to lower tunnel support segments into the shaft
- Continuous operation of a ventilation fan (which could be located at the bottom of the shaft or at the surface) and dewatering pumps (at the bottom of the shaft) at the entry shaft site (24 hours per day, seven days per week)
- Continuous operation of ventilation equipment and a grout batching plant at the exit shaft (24 hours per day, seven days per week during the tunnel lining phase only)
- Operation of compressors or generators at night at the entry and exit shafts
- Possible controlled detonations during shaft construction

Potential tunnel-related noise impacts would depend on the tunnel design (below-ground shaft or surface portal), the type of tunneling and muck removal system ultimately used (dictated by whether the tunnel is gassy or potentially gassy), the extent of nighttime surface activities in the vicinity of tunnel portals/shafts (e.g., equipment repair, heavy equipment operation associated with muck removal), and the proximity of the shaft or portal (including ventilation fans, dewatering pumps, and/or generators) to sensitive receptors. Outside of the tunnel portal/shaft vicinities, the primary source of noise during tunnel construction would be haul trucks and material delivery trucks.

Other Facilities. Compared to pipeline construction noise, noise impacts associated with construction of other types of water facilities (vault, valve lot, crossover, pump station, treatment, and storage facilities) would generally affect fewer receptors because such construction would occur at discrete locations (involving smaller areas than pipelines), and many of these facilities would be located within or adjacent to existing SFPUC water facilities. Construction at some existing facilities could involve fewer earthmoving activities, limiting the potential for noise impacts associated with operation of heavy equipment and off-hauling of excavated material. The exception would be dam replacement/reconstruction projects, which could involve extensive earthmoving activities. The potential for temporary construction noise impacts would depend on the proximity of sensitive receptors, construction duration, time of day construction occurs, and extent of earthmoving activities (excavation, shoring, stockpiling of excavated materials). Installation of any above-ground facilities could also involve temporary noise increases.

San Joaquin Region

Impact 4.10-1: Disturbance from temporary construction-related noise increases		
Advanced Disinfection	SJ-1	PSU
Lawrence Livermore	SJ-2	PSU
SJPL System	SJ-3	PSU
SJPL Rehabilitation	SJ-4	PSU
Tesla Portal Disinfection	SJ-5	PSU

Within this region, construction of the SJPL System (SJ-3) and SJPL Rehabilitation (SJ-4) projects would have the potential to result in significant, short-term noise impacts. The SJPL System project's six-mile eastern pipeline segment (west of Oakdale Portal) and eastern crossover would be located in an undeveloped area, where the potential for noise impacts would be low. However, the 9.7-mile western pipeline segment located east of Tesla Portal would extend through a residential area and golf course (Tracy Golf and Country Club). These residences are located west of I-580, and the golf course spans the freeway. Residences could be within 50 feet of the pipeline alignment, depending on the pipeline location within the existing SFPUC right-of-way. (Golf course users are not considered noise-sensitive receptors.) Construction noise impacts could also occur at crossover facility sites proposed as part of this project, depending on their locations and proximity to noise-sensitive receptors.

Potential construction-related noise impacts associated with the SJPL System project would be potentially significant and evaluated in greater detail in a separate, project-level EIR. At most locations along the pipeline alignment where construction would be short in duration (two weeks or less at any given receptor), construction noise impacts could be reduced to a less-than-significant level by limiting construction activities to the daytime hours or reducing construction noise levels to meet ordinance nighttime noise limits (Measure 4.10-1a). However, because sensitive receptors could be within 50 feet of a pipeline alignment, it is possible that construction noise impacts could not be reduced to a less-than-significant level if the construction duration along this segment of the pipeline alignment lasted for longer than two weeks or occurred during nighttime hours adjacent to a residential receptor (e.g., crossover facilities, jack and bore pits). If this occurs, construction noise would be temporary but *potentially significant and unavoidable*.

Similar construction-related noise impacts could result during rehabilitation of the existing San Joaquin pipelines (SJ-4). In Modesto and Riverbank, segments of the existing pipelines are located within 25 feet of existing homes. If the pipeline segments being rehabilitated were within 25 feet of residences and the construction duration were prolonged or occurred during the nighttime hours at any such locations, it is possible that construction noise levels could not be reduced to a less-than-significant level. Therefore, this project would result in temporary but potentially significant construction noise impacts. At locations where construction would be short in duration (two weeks or less at any given receptor), daytime construction noise impacts could be reduced to a less-than-significant level by implementing noise controls to meet the speech interference criterion (Measure 4.10-1a). However, if construction activities would occur within 25 feet of a receptor for a prolonged period (over two weeks at any given receptor) or construction occurred during the nighttime hours, noise impacts would be temporary but *potentially significant and unavoidable*. When project elements and locations are defined, this project would be subject to separate, project-level CEQA review to analyze potential construction noise impacts for specific facility locations and determine if impacts could be mitigated to a less-than-significant level.

Other WSIP facilities within this region would be located at Tesla Portal (under Advanced Disinfection, SJ-1, and Tesla Portal Disinfection, SJ-5) or at Thomas Shaft (under Lawrence Livermore, SJ-2). There are no sensitive receptors located in the vicinity of Thomas Shaft and therefore, construction noise levels would result in less than significant noise impacts. The closest receptors to Tesla Portal include the SFPUC caretaker's residence at Tesla Portal and private residences located approximately 3,500 feet to the south. Since the caretaker's residence would be located adjacent to both these projects, occupants of this residence would be subject to construction noise levels in excess of speech and sleep interference criteria. Vacating this residence (Measure 4.10-1b) would reduce potentially significant noise impacts to a less-than-significant level. At private residences located at least 3,500 feet to the south, construction noise from most types of equipment would not exceed speech or sleep interference criteria. However, nighttime construction noise could still exceed the San Joaquin County nighttime ordinance limit of 45 dBA, a potentially significant impact for the Advanced Disinfection and Tesla Portal Disinfection projects. Given the distance to the nearest receptors, it is possible that this impact could be reduced to a less-than-significant level (avoiding sleep disturbance effects or reducing noise to ordinance noise limits) with implementation of noise controls (Measure 4.10-1a).

At this stage of program planning, proposed construction hours have not been determined for each WSIP project in this region, and it is possible that construction noise (audible to nearby receptors) associated with any WSIP project in this region could extend beyond the typical daytime hours (i.e., could occur during the evening or nighttime hours on weekends as well as weekdays). Therefore, the PEIR errs on the conservative side and identifies *potentially significant and unavoidable* noise impacts for any WSIP project in this region that will generate construction noise audible to nearby receptors beyond the hours specified in local noise ordinances or that cannot meet local noise limits for these hours. However, when construction hours and activities are defined for each WSIP project, separate, project-level CEQA review will be conducted to determine potential construction noise impacts for specific facility locations and whether impacts can be mitigated to a less-than-significant level.

Sunol Valley Region

Impact 4.10-1: Disturbance from temporary construction-related noise increases		
Alameda Creek Fishery	SV-1	PSU
Calaveras Dam	SV-2	PSU
40-mgd Treated Water	SV-3	PSU
New Irvington Tunnel	SV-4	PSU
Treated Water Reservoirs	SV-5	PSU
SABUP	SV-6	PSU

Most of the projects in this region would be located in Sunol Valley, which contains one private residence, two SFPUC Land Manager's residences (one adjacent to Alameda East Portal and one adjacent to Calaveras Dam), various water facilities, commercial nurseries, and quarries. The private residence is about 1,200 feet or more from the existing Alameda West Portal, and 2,000 feet from Calaveras Road.

Since the proposed New Irvington Tunnel (SV-4) entrance portal would be located closer to the private residence than the existing Alameda West Portal, there is a potential that noise impacts could occur at this residence. Depending on the type of equipment that would be operated at the tunnel portal, construction activities within 1,000 to 3,000 feet of this residence could result in potentially significant noise impacts at this residence. Although it is possible to limit nighttime use of certain types of equipment as well as require use of engine controls and sound barriers around the tunnel portal area (Measure 4.10-1a) so that construction noise levels do not cause sleep disturbance, the effectiveness of such measures cannot be determined until portal and equipment design details are determined and therefore, this impact is conservatively considered to be *potentially significant and unavoidable* in this PEIR. The SFPUC Land Manager's residence would be approximately 3,000 feet from the tunnel portal area, and this setback distance would allow construction noise levels generated beyond the time limits to be reduced by noise controls (Measure 4.10-1a) to meet ordinance nighttime noise limits (ensuring that sleep disturbance effects do not occur), reducing impacts to a less-than-significant level. The potential for noise impacts on the private residence and the SFPUC Land Manager's residence, as well as the need for noise controls would be evaluated in more detail in a separate, project-level EIR.

The New Irvington Tunnel (SV-4) exit portal would be located outside of Sunol Valley. The western exit portal of this tunnel in Fremont has the potential to cause noise impacts because it could be located near sensitive receptors. Tunnel-related noise impacts, as described above, would be associated with this project. Due to the proximity of sensitive receptors to the exit portal (less than 500 feet) and possibility of nighttime construction, it is possible that construction noise could result in sleep disturbance effects and possibly exceed the Fremont Noise Ordinance nighttime noise limit of 60 dBA (Ldn) at the closest receptors. This impact would be temporary but *potentially significant and unavoidable*. The New Irvington Tunnel project would be evaluated in a separate, project-level EIR, which would identify potential construction noise impacts at the tunnel exit portal and determine if impacts could be mitigated to a less-than-significant level.

Other WSIP projects in this region with components that could be located within 500 feet of the private residence in Sunol Valley include the pipeline proposed to extend from the Sunol Valley WTP to the Irvington Tunnel or Alameda Siphons as part of the 40-mgd Treated Water project (SV-3). If this pipeline passed closer than 500 feet from this residence, pipeline-related construction noise impacts could occur, as described above. It is also possible that facilities associated with the Alameda Creek Fishery project (SV-1) could extend through the area within 500 feet east of the residence. The potential for significant construction noise impacts on this residence due to these projects would depend on the proximity of these facilities to this residence and construction hours, and therefore, is conservatively considered potentially significant in this PEIR. Since there appears to be available space to provide sufficient setbacks from this residence, implementation of appropriate noise controls (Measure 4.10-1a) would likely reduce potentially significant noise impacts to a less-than-significant level. If nighttime construction occurs, this potentially significant impact could be reduced to a less-than-significant level by providing adequate setbacks and implementing feasible noise controls so as to reduce any construction noise levels below the sleep disturbance criterion (Measure 4.10-1a).

The Calaveras Dam project (SV-2) is located at the south end of Sunol Valley and extends southward into Calaveras Valley, where one borrow area is located at the south end of Calaveras Reservoir. There are private residences located more than 2,000 feet from the southernmost borrow area and the SFPUC Land Manager's residence is located adjacent to the Calaveras Dam. Nighttime construction activities over a two-year period would pose potentially significant noise impacts on these residential receptors. The SFPUC Land Manager's residence is proposed to be vacated, avoiding noise impacts on this receptor. Given the residential setback distances of more than 2,000 feet from project facilities, implementation of noise controls (Measure 4.10-1a) would likely be adequate to reduce potentially significant noise impacts to a less-than-significant level (avoiding sleep disturbance effects or reducing noise to meet ordinance limits). However, it should be noted that mitigated construction noise could, at times, still be noticeable to some of the closest residential receptors during the nighttime hours because ambient noise levels are so low in this area and ordinance limits are higher than ambient noise levels.

The Treated Water Reservoirs (SV-5) and SABUP (SV-6) projects are located more than 500 feet from the private residence in Sunol Valley and 300 feet from the SFPUC Land Manager's residence near Alameda East Portal. At such distances, construction noise impacts associated with this project would be potentially significant, but it is possible that these impacts could be reduced to a less-than-significant level (avoiding sleep disturbance effects or reducing noise to ordinance noise limits) with implementation of noise controls (Measure 4.10-1a).

At this stage of program planning, proposed construction hours have not been determined for each WSIP project in this region, and it is possible that construction noise (audible to nearby receptors) associated with any WSIP project in this region could extend beyond the typical daytime hours (i.e., could occur during the evening or nighttime hours on weekends as well as weekdays). Therefore, the PEIR errs on the conservative side and identifies *potentially significant and unavoidable* noise impacts for any WSIP project in this region that will generate construction noise audible to nearby receptors beyond the hours specified in local noise ordinances or that cannot meet local noise limits for these hours. However, when construction hours and activities are defined for each WSIP project, separate, project-level CEQA review will be conducted to determine potential construction noise impacts for specific facility locations and whether impacts can be mitigated to a less-than-significant level.

Bay Division Region

Impact 4.10-1: Disturbance from temporary construction-related noise increases		
BDPL Reliability Upgrade	BD-1	PSU
BDPL 3 and 4 Crossovers	BD-2	PSU
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	PSU

All of the WSIP projects in this region would involve construction activities along existing pipeline alignments or construction at discrete locations along these alignments. Pipeline-related noise impacts, as described above, would be associated with the BDPL Reliability Upgrade (BD-1) and BDPL 3 and 4 Seismic Upgrade at Hayward Fault (BD-3) projects. At receptor locations along pipeline alignments where construction would be short in duration (two weeks or less at any given receptor), construction noise impacts could likely be reduced to a less-than-significant level by implementing applicable noise controls (Measure 4.10-1a). However, because sensitive receptors would be less than 75 feet from the BDPL Reliability Upgrade (BD-1) and BDPL 3 and 4 Seismic Upgrade at Hayward Fault (BD-3) pipeline alignments, it is possible that construction noise impacts could not be reduced to a less-than-significant level if the construction duration along the pipeline alignment lasted for longer than two weeks at any one location (e.g., jack-and-bore pits) or if nighttime construction occurs. Such effects would be temporary but *potentially significant and unavoidable*. With setbacks of less than 75 feet, noise controls (Measure 4.10-1a) would not reduce nighttime construction noise to below the sleep interference criterion or ordinance nighttime noise limits.

Tunnel-related noise impacts would also occur at tunnel shafts proposed as part of the BDPL Reliability Upgrade (BD-1) in Newark and East Palo Alto. Tunnel shafts would be located 900 feet or more from the closest residential receptors; with such setbacks, it is expected that sleep disturbance effects from nighttime tunnel construction noise levels near the shafts could be reduced to a less-than-significant level by limiting equipment/truck operations or erecting sound barriers (Measure 4.10-1a) to meet nighttime ordinance noise limits at the closest receptors. However, the effectiveness of such measures cannot be determined until portal and equipment design details are determined and therefore, this impact is conservatively considered to be *potentially significant and unavoidable* in this PEIR.

Under the BDPL 3 and 4 Crossovers (BD-2) project, construction would occur at discrete locations along the pipeline alignments. Since most of the Bay Division Region is urbanized, it is possible that noise impacts could adversely affect adjacent school or residential receptors. The SFPUC has indicated that construction hours could extend beyond the daytime hours. If facilities are located within 75 feet of noise-sensitive receptors, any prolonged construction activities (longer than two weeks) and/or any nighttime construction activities would result in *potentially significant and unavoidable* noise impacts. With setbacks of less than 75 feet, noise controls (Measure 4.10-1a) would not reduce construction noise to below the sleep interference criterion or ordinance nighttime noise limits.

At this stage of program planning, proposed construction hours have not been determined for each WSIP project in this region, and it is possible that construction noise (audible to nearby receptors) associated with any WSIP project in this region could extend beyond the typical daytime hours (i.e., could occur during the evening or nighttime hours on weekends as well as weekdays). Therefore, the PEIR errs on the conservative side and identifies *potentially significant and unavoidable* noise impacts for any WSIP project in this region that will generate construction noise audible to nearby receptors beyond the hours specified in local noise ordinances or that cannot meet local noise limits for these hours. However, when construction hours and activities are defined for each WSIP project, separate, project-level CEQA review will be conducted to determine potential construction noise impacts for specific facility locations and whether impacts can be mitigated to a less-than-significant level.

Peninsula Region

Impact 4.10-1: Disturbance from temporary construction-related noise increases		
Baden and San Pedro Valve Lots	PN-1	PSU
CS/SA Transmission	PN-2	PSU
HTWTP Long-Term	PN-3	PSU
Lower Crystal Springs Dam	PN-4	PSU
Pulgas Balancing Reservoir	PN-5	PSU

The Baden and San Pedro Valve Lots project (PN-1) would be located at existing valve lots in South San Francisco and Daly City. There are residential receptors adjacent to the Baden Valve Lot in South San Francisco (PN-1), but no residential receptors in the vicinity of the San Pedro Valve Lot in Daly City (PN-1). Sensitive receptors could be less than 100 feet from proposed construction in Baden Valve Lot. While daytime construction could be mitigated to less than significant with implementation of noise controls (Measure 4.10-1a), any nighttime construction activities could result in *potentially significant and unavoidable* noise impacts if they occur within 75 feet of noise-sensitive receptors. With setbacks of less than 75 feet, noise controls (Measure 4.10-1a) would not reduce construction noise to below the sleep interference criterion (and ordinance nighttime noise limits) at the closest receptors.

One WSIP project in the Peninsula Region would be located at the Harry Tracy WTP (PN-3). The closest residential receptors are approximately 500 feet east and southeast of existing WTP facilities and 300 feet to the south. If construction activities occurred within 500 feet of existing residences, construction-related noise impacts would be potentially significant. However, implementation of appropriate noise controls (Measure 4.10-1a) would be adequate to reduce construction noise impacts to a less-than-significant level. With setbacks of 300 to 500 feet or more from these residences, it is possible that construction noise could be reduced to a less-than-significant level (reducing noise to below the sleep interference criterion or ordinance nighttime noise limits) with implementation of noise controls (Measure 4.10-1a).

Two WSIP projects in this region (CS/SA Transmission, PN-2, and Lower Crystal Springs Dam, PN-4) would be located in the vicinity of the Crystal Springs Reservoirs, west of and across I-280 from the westernmost residential neighborhoods in Belmont, Hillsborough, and Millbrae as well as unincorporated areas of San Mateo County. Residential receptors would be over 1,000 feet east of these two projects (and across a freeway), but a few residences are located approximately 500 feet to the northeast of the Crystal Springs Pump Station, at the base of Lower Crystal Springs Dam. Construction activities in this vicinity could occur under these two projects, and could extend beyond the daytime hours. With minimum residential setback distances of approximately 500 feet from these two projects, potentially significant noise impacts could be reduced to a less-than-significant level (reducing noise to below the sleep interference criterion or ordinance nighttime noise limits) with implementation of noise controls (Measure 4.10-1a).

The Pulgas Balancing Reservoir project (PN-5) would be over 6,000 feet from the closest residential receptors to the east. Given such large residential setback distances, potential noise impacts would be less than significant. However, project construction could adversely affect scheduled activities (e.g., weddings, etc.) at the nearby Pulgas Water Temple, a potentially significant impact. If the SFPUC chooses to schedule activities during project construction, appropriate noise controls (Measure 4.10-1a) could be required to reduce noise impacts to a less-than-significant level. However, this potential impact could be avoided if no Temple activities were scheduled during construction hours.

At this stage of program planning, proposed construction hours have not been determined for each WSIP project in this region, and it is possible that construction noise (audible to any nearby receptors) associated with any WSIP project in this region could extend beyond the typical daytime hours (i.e., could occur during the evening or nighttime hours on weekends as well as weekdays). Therefore, the PEIR errs on the conservative side and identifies *potentially significant and unavoidable* noise impacts for any WSIP project in this region that will generate construction noise audible to nearby receptors beyond the hours specified in local noise ordinances or that cannot meet local noise limits for these hours. However, when construction hours and activities are defined for each WSIP project, separate, project-level CEQA review will be conducted to determine potential construction noise impacts for specific facility locations and whether impacts can be mitigated to a less-than-significant level.

San Francisco Region

Impact 4.10-1: Disturbance from temporary construction-related noise increases		
SAPL 3 Installation	SF-1	PSU
Groundwater Projects	SF-2	PSU
Recycled Water Projects	SF-3	PSU

Pipeline-related noise impacts, as described above, would be associated with the SAPL 3 Installation (SF-1) project. At receptor locations along the pipeline alignment where construction would be short in duration (two weeks or less at any given receptor), construction noise impacts could likely be reduced to a less-than-significant level by implementing applicable noise controls (Measure 4.10-1a). However, because sensitive receptors would be less than 25 feet on some residential streets, it is possible that construction noise impacts could not be reduced to a less-than-significant level if the construction duration along the pipeline alignment lasted for longer than two weeks at any one location (e.g., jack-and-bore pits) or if construction occurred during the night. Such effects would be temporary but *potentially significant and unavoidable*. With setbacks of less than 75 feet, noise controls (Measure 4.10-1a) would not reduce construction noise to below the sleep interference criterion at the closest receptors.

The primary construction noise issue associated with the local and regional Groundwater Projects (SF-2) would be 24-hour drilling required as part of proposed well construction. Continuous operation of drilling equipment could exceed the sleep interference criterion (with windows closed) if sensitive receptors were located within approximately 900 feet of well sites. At setback distances of 300 feet or more, implementation of noise controls (Measure 4.10-1a) could reduce drilling noise to less than significant. However, if setbacks are less than 300 feet, sleep disturbance could still occur (with Measure 4.10-1a) and this impact, although temporary, would be *potentially significant and unavoidable*. The Groundwater Projects would be evaluated in more detail as part of separate, project-level CEQA review, which would determine if construction noise impacts could be mitigated to a less-than-significant level.

Both pipeline and facility construction noise impacts, as described above, would be associated with the Recycled Water Projects (SF-3). Sensitive receptors are located near or adjacent to proposed treatment facilities and pipelines, and therefore, construction noise impacts on these receptors would be potentially significant. If facilities are located within 75 feet of noise-sensitive receptors, construction noise (occurring for longer than two weeks or at night) could be a *potentially significant and unavoidable* impact. With setbacks of less than 75 feet, noise controls (Measure 4.10-1a) would not reduce construction noise to below the sleep interference criterion at the closest receptors.

At this stage of program planning, proposed construction hours have not been determined for each WSIP project in this region, and it is possible that construction activities and construction noise associated with any WSIP project in this region could extend beyond the typical daytime hours (i.e., could occur during the evening or nighttime hours on weekends as well as weekdays). Therefore, the PEIR errs on the conservative side and identifies *potentially significant and unavoidable* noise impacts for any WSIP project in this region that will generate construction noise audible to nearby receptors beyond the hours specified in local noise ordinances or that cannot meet local noise limits for these hours. However, when construction hours and activities are defined for each WSIP project, separate, project-level CEQA review will be conducted to determine potential construction noise impacts for specific facility locations and whether impacts can be mitigated to a less-than-significant level.

Impact 4.10-2: Temporary noise disturbance along construction haul routes.

Truck noise levels depend on vehicle speed, load, terrain, and other factors. The effects of construction-related truck traffic would depend on the level of background noise already occurring at a particular receptor site. In quiet noise environments (Leq averaging 50 dBA), one truck per hour would be noticeable, even though such a low volume would not measurably increase noise levels. In slightly noisier environments (Leq averaging 60 dBA), the threshold level is higher, and it would take 10 trucks per hour to noticeably increase the noise exposure. In moderately noisy environments (Leq averaging 70 dBA), a noise increase would be perceptible with the addition of 100 trucks per hour (Caltrans, 1998).

In quiet environments or during quieter times of the day, truck noise is mainly a single-event disturbance because, although the hourly average associated with short, single events is not very high, individual noise peaks of 80 to 85 dBA at 50 feet are common during a truck passage. In noisy environments or during less noise-sensitive hours, truck noise would be perceived as a part of the total noise environment rather than as an individual disturbance. It is important to note that haul truck volumes associated with the WSIP projects would vary from day to day, with the highest volumes generally occurring during the excavation, concrete placement, and backfilling stages of construction. When haul truck noise is considered on an hourly basis rather than as a single noise event, noise levels generated by hourly truck volumes of 80 trucks per hour or more would exceed the 70-dBA speech interference criterion at 50 feet. Any truck volume greater than 1 truck per hour would exceed the 50-dBA sleep interference criterion at 50 feet. At greater distances, higher hourly truck volumes could occur without exceeding these criteria. For example, hourly truck volumes of up to approximately 10 trucks per hour could occur at distances of approximately 200 feet or more from a receptor while not exceeding the 50-dBA sleep interference criterion.

The hours for hauling excavated materials and for deliveries have not yet been specified for several of the WSIP projects that are still under development; however, the SFPUC has indicated that truck operations could occur beyond noise ordinance time limits.

San Joaquin Region

Impact 4.10-2: Temporary noise disturbance along construction haul routes		
Advanced Disinfection	SJ-1	PSU
Lawrence Livermore	SJ-2	N/A
SJPL System	SJ-3	PSU
SJPL Rehabilitation	SJ-4	PSU
Tesla Portal Disinfection	SJ-5	PSU

Within the San Joaquin Region, access to most of the WSIP facility sites is provided by rural roadways, highways, or freeways. Depending on where pipeline rehabilitation would occur along the existing pipeline alignment, haul trucks associated with the SJPL Rehabilitation project (SJ-4) might have to use residential streets in Modesto or Riverbank to access the pipeline. For the Advanced Disinfection (SJ-1), SJPL System (SJ-3), SJPL Rehabilitation (SJ-4), and Tesla Portal Disinfection (SJ-5) projects, haul trucks would use Chrisman and Vernalis Roads to access Tesla Portal from I-580, and residential receptors along this route could be subject to noise increases from haul truck and delivery traffic. Potential haul truck noise impacts would be evaluated in more detail as part of separate, project-level CEQA review these projects. In general, if residences could be set back 50 feet or less along haul routes and any nighttime truck operations exceeded 1 truck per hour, truck noise levels could exceed the sleep interference criterion. It is possible that limiting hourly truck volumes to the daytime hours (Measure 4.10-2a) and restricting nighttime truck operations (Measure 4.10-2b) could reduce this impact to a less-than-significant level. However, since haul routes, truck volumes, and hours of truck operations are undetermined for these projects, potential noise impacts on any residential receptors located along haul routes for these four projects are conservatively considered to be *potentially significant and unavoidable*.

Haul routes to and from the Lawrence Livermore (SJ-2) project site are not located near sensitive receptors, so this impact would *not apply*.

Sunol Valley Region

Impact 4.10-2: Temporary noise disturbance along construction haul routes		
Alameda Creek Fishery	SV-1	LS
Calaveras Dam	SV-2	LS
40-mgd Treated Water	SV-3	LS
New Irvington Tunnel	SV-4	PSM
Treated Water Reservoirs	SV-5	LS
SABUP	SV-6	LS

The haul routes for most of the projects in this region would be Calaveras Road and I-680 in Sunol Valley. There is one private residence (located approximately 2,000 feet from Calaveras Road and possibly as close as 1,000 feet from the proposed tunnel portal associated with the New Irvington Tunnel project, SV-4). There is also one SFPUC Land

Manager's residence that is located approximately 200 feet from Calaveras Road, but its location uphill of this road allows topography to provide additional noise attenuation. To the south of the Sunol Valley, there are a few private residences located in Calaveras Valley at the south end of Calaveras Reservoir, more than approximately 3,000 feet from possible haul routes. With such large setback distances and expected average hourly volumes of up to 12 trucks per hour for each project, it is unlikely that noise generated by haul and delivery trucks along Calaveras Road would exceed speech or sleep interference criteria at these receptors. Therefore, this impact would be *less than significant* for all projects in this region: Alameda Creek Fishery (SV-1), Calaveras Dam (SV-2), 40-mgd Treated Water (SV-3), Treated Water Reservoirs (SV-5), and SABUP (SV-6).

The Irvington Tunnel project (SV-4) would generate substantially higher haul and delivery truck volumes than other WSIP projects in this region. Expected average hourly volumes of up to 36 trucks per hour would generate noise levels along the access road and Calaveras Road that would not exceed the speech interference criterion, but could exceed the sleep interference criterion at the SFPUC Land Manager's residence, a *potentially significant* impact. Implementation of Measure 4.10-2c, requiring this residence to be vacated during construction of this project, would reduce this impact to a less-than-significant level. Truck-related noise levels along these two roads is not expected to exceed the 50-dBA sleep interference criterion at the private residence to the south, but truck noise could increase ambient noise levels in the vicinity of this residence, which would be noticeable.

Bay Division Region

Impact 4.10-2: Temporary noise disturbance along construction haul routes		
BDPL Reliability Upgrade	BD-1	PSU
BDPL 3 and 4 Crossovers	BD-2	PSU
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	PSU

Since the majority of this region is urbanized and many of the WSIP projects are located in or near residential neighborhoods and schools, haul routes for most WSIP projects in this region could adversely affect sensitive receptors. Construction of the BDPL Reliability Upgrade project (BD-1) would expose the greatest number of residential and school receptors to noticeable noise increases due to haul truck traffic; these increases could be potentially significant if residential streets were used as haul routes. Haul routes for the BDPL 3 and 4 Crossovers (BD-2) and BDPL 3 and 4 Seismic Upgrade at Hayward Fault projects could also affect residential streets. Potential haul truck noise impacts would be evaluated in more detail as part of separate, project-level CEQA review for all projects in this region. In general, residences are set back less than 50 feet from most residential streets in this region, and any nighttime truck operations greater than 1 truck per hour could exceed the sleep interference criterion. It is possible that limiting hourly truck volumes during the day (Measure 4.10-2a) and restricting nighttime truck operations (Measure 4.10-2b) could reduce this impact to a less-than-significant level. However, since haul routes, truck volumes, and hours of truck operations are undetermined for these projects, potential noise impacts on any residential receptors located along haul routes for all projects in this region are conservatively considered to be *potentially significant and unavoidable*.

Peninsula Region

Impact 4.10-2: Temporary noise disturbance along construction haul routes		
Baden and San Pedro Valve Lots	PN-1	PSU
CS/SA Transmission	PN-2	LS
HTWTP Long-Term	PN-3	PSU
Lower Crystal Springs Dam	PN-4	LS
Pulgas Balancing Reservoir	PN-5	LS

Three of the five WSIP projects in this region would be located primarily on the west side of I-280 (CS/SA Transmission, PN-2; Lower Crystal Springs Dam, PN-4; and Pulgas Balancing Reservoir, PN-5), so haul routes to the I-280 freeway would likely be more than 225 feet from the closest residential receptors. With such large setback distances, it is unlikely that noise generated by haul and delivery trucks along haul routes would exceed speech or sleep interference criteria at the closest receptors, and noise impacts would be *less than significant*.

The remaining two projects in this region (Baden and San Pedro Valve Lots, PN-1 and HTWTP Long-Term, PN-3) would involve construction sites located in or near residential neighborhoods or schools. Noise increases associated with haul and delivery truck traffic could adversely affect sensitive receptors along these routes. In general, residences are set back less than 50 feet from most residential streets in these two neighborhoods, and any nighttime truck operations greater than 1 truck per hour could exceed the sleep interference criterion. It is possible that limiting hourly truck volumes during the day (Measure 4.10-2a) and restricting nighttime truck operations (Measure 4.10-2b) could reduce this impact to a less-than-significant level. However, since haul routes, truck volumes, and hours of truck operations are undetermined for these projects, potential noise impacts on any residential receptors located along haul routes for these two projects are conservatively considered to be *potentially significant and unavoidable*.

San Francisco Region

Impact 4.10-2: Temporary noise disturbance along construction haul routes		
SAPL 3 Installation	SF-1	PSU
Groundwater Projects	SF-2	PSU
Recycled Water Projects	SF-3	PSU

All of the WSIP projects in this region would be located near or adjacent to noise-sensitive receptors, and noise increases associated with haul and delivery truck traffic could adversely affect sensitive receptors along haul truck routes. In general, residences along most streets where project facilities would be located are set back less than 50 feet, and any nighttime truck operations greater than 1 truck per hour could exceed the sleep interference criterion. It is possible that limiting hourly truck volumes during the day (Measure 4.10-2a) and restricting nighttime truck operations (Measure 4.10-2b) could reduce this impact to a less-than-significant level. However, since haul routes, truck volumes, and hours of truck operations are undetermined for these projects, potential noise impacts on any residential receptors located along haul routes for these two projects are conservatively considered to be *potentially significant and unavoidable*.

Impact 4.10-3: Disturbance due to construction-related vibration.

Construction of WSIP facilities could cause vibration that could disturb local residents and cause cosmetic damage to buildings and structures. The second significance criterion above identifies “excessive groundborne vibration” as a significance impact. For this programmatic analysis, the following criteria were used to determine the significance of construction-related vibration effects:

- The potential for building damage, including cosmetic damage
- The exposure of people to vibration in terms of sleep disturbance or interruption of normal living activity

In general, cosmetic or threshold damage to residential buildings can occur at vibrations over 0.5 in/sec PPV, and controlled detonations would not generate structural damage if they produce vibrations of less than 0.5 in/sec PPV (measured at the residential building setback line at the ground surface). This level is consistent with the U.S. Bureau of Mines’ threshold cracking criteria of 0.5 in/sec PPV for low frequencies and 2.0 in/sec PPV for high frequencies (Wilson, Ihrig & Associates, 2005). Continuous vibration caused by vibratory pile drivers and large vibratory rollers/compactors may cause annoyance, but would not cause structural damage if the continuous vibration were less than 0.2 in/sec PPV (Wilson, Ihrig & Associates, 2005). This level is consistent with the Federal Transit Administration’s (U.S. Department of Transportation, Federal Transit Administration, 1995) recommended vibration threshold criterion of 0.2 in/sec for fragile buildings.

Much lower vibration levels (levels exceeding 0.012 in/sec PPV) can cause disturbance or annoyance and this threshold is typically applied to construction activities that occur during the more sensitive nighttime hours. Exceedance of this annoyance threshold during the nighttime hours could result in sleep disturbance, depending on proximity to the receptor.

Based on these criteria, vibration exceeding the following limits would be considered significant:

- Controlled detonations: 0.5 in/sec PPV
- Vibratory equipment and impact pile drivers: 0.2 in/sec PPV
- Activities causing annoyance (pertains to nighttime construction only): 0.012 in/sec PPV

Pipelines and Other Facilities. Table 4.10-5 presents vibration levels that could be expected at distances of 25, 50, and 100 feet from vibration sources and assumes typical construction activities and normal propagation conditions.

A threshold of 0.2 in/sec PPV is appropriate to apply to any construction activities occurring during the daytime hours. Both San Francisco and FTA measurement data presented in Table 4.10-5 demonstrate that vibration levels generated by most types of construction equipment would not exceed the 0.2 in/sec PPV threshold for continuous vibration at a distance of 25 feet, while pile-driving activities could exceed this threshold within approximately 50 feet. Impact pile-driving activities could exceed this threshold if it occurs closer than 100 feet from a receptor.

TABLE 4.10-5
VIBRATION LEVELS FOR CONSTRUCTION EQUIPMENT AT 25, 50, AND 100 FEET

	Peak Particle Velocity (PPV)		
Equipment[a]	**PPV at 25 Feet (in/sec)**	**PPV at 50 Feet (in/sec)**	**PPV at 100 Feet (in/sec)**
Pile Driver (Impact) – Upper Range	1.518	0.537	0.190
Pile Driver (Impact) – Typical	0.644	0.228	0.081
Pile Driver (Sonic) – Upper Range	0.734	0.260	0.092
Pile Driver (Sonic) – Typical	0.170	0.060	0.021
Clam Shovel Drop (Slurry Wall)	0.202	0.071	0.025
Large Bulldozer	0.089	0.031	0.011
Loaded Trucks	0.076	0.027	0.010
Jackhammer	0.035	0.012	0.004
Small Bulldozer	0.003	0.001	0.000

NOTES: Vibration levels for construction equipment at 25 feet are based on measured data near various types of equipment and assume normal propagation conditions. The following propagation adjustment was applied to estimate vibration levels at 50 and 100 feet:

$PPV_{equip} = PPV_{ref} \times (25/D)^{1.5}$

where:
PPV (equip) is the peak particle velocity in in/sec of the equipment adjusted for distance
PPV (ref) is the reference vibration levels in in/sec at 25 feet as listed above
D is the distance from the equipment to the receiver.

It should be noted that vibration propagation characteristics would depend on a number of factors, including the type and condition of geologic materials, depth of construction, and type of construction equipment and activity.

SOURCE: U.S. Department of Transportation Federal Transit Administration, 1995.

For any nighttime construction activities, it is more appropriate to apply the annoyance threshold of 0.012 in/sec PPV. Table 4.10-5 indicates that operation of most types of construction equipment at distances within 50 to 100 feet from a receptor could exceed the annoyance threshold.

Excavation activities associated with facility construction (including clearwells at treatment plants, reservoirs, and pipelines) could require sheetpile driving for shoring, which could generate perceptible vibration levels. Although vibration potential from sheetpile driving as well as other construction activities would depend on soil type and proximity to receptors, the measurements presented in Table 4.10-5 demonstrate that construction equipment can generate a wide range of vibration levels (0.003 to 1.518 in/sec, PPV at 25 feet) and can be operated in a manner that minimizes the potential for structural damage at the closest residential receptors. Measurements collected during various excavation-related construction activities (including pavement breaking, vibratory sheetpile driving, sheetpile driving by an excavator shovel, vibratory soil compaction, and earth excavation) at an unrelated project in San Francisco determined that vibration levels ranged between 0.03 to 0.38 in/sec PPV at 30 to 35 feet (ESA, 1997). When compared to vibration data presented in this table, vibration levels for sheetpile driving would be less than for pile driving (impact or sonic), but greater than levels generated by other types of construction equipment such as bulldozers, trucks, and jackhammers.

It is possible that vibration would be perceptible and could temporarily annoy the closest residents during construction of some of the WSIP projects, particularly if impact pile driving or sheetpile driving occurs. In many of the jurisdictions where WSIP projects are located, code requirements would limit vibration levels at the property line to the vibration perception threshold. Although it might not be feasible to maintain vibration levels below the perception threshold level at all receptors (even with mitigation measures), the limited duration of exposure at a given sensitive receptor[3] and restriction of construction activities to the daytime hours could help reduce such vibration annoyance effects to a less-than-significant level.

Tunnels. The primary sources of vibration associated with tunnel construction would include heavy construction equipment (e.g., bulldozers, vibratory compaction equipment, impact breakers) and mining equipment (e.g., a roadheader or a tunnel boring machine), tunnel train operations, and controlled detonations. Measurements for an unrelated tunnel project indicate that a roadheader can produce vibration levels of 0.0015 to 0.0022 in/sec PPV at 100 feet, while a tunnel train (operating at an estimated 10 miles per hour) can produce vibration levels of 0.0004 to 0.0008 in/sec PPV at 100 feet (ESA, 2003). Since tunnel construction would occur 24 hours per day, there would be a potential for annoyance, particularly during the nighttime hours. So, the lower 0.012 in/sec PPV annoyance threshold is applied as a significance threshold for tunnel construction. The potential for annoyance due to vibration would depend on the strength of rock encountered and the depth of the tunnel below ground. If receptors are located 100 feet or more from the proposed tunnel, vibration levels associated with operating tunneling equipment would likely remain below the 0.012 in/sec PPV threshold level for noticeability or annoyance.

Controlled detonations, which are produced by blasting techniques involving explosives, can be more noticeable to the public than mechanical excavation because of the intermittent, higher level noise and vibrations caused by blasting activities. Controlled detonation is performed by drilling holes in the rock face of a tunnel excavation and packing the holes with small amounts of explosive and primer. The explosives are detonated in one hole at a time, using a time delay between successive detonations; delay periods often range from 10 to 100 milliseconds, with the entire detonation event lasting no more than a few seconds. Detonations typically occur infrequently (once or twice per day), and the vibration produced by such detonations can be controlled by the delay time and the charge per delay (the amount of explosive per delay in each hole) so that cosmetic or structural damage does not occur. With vibration controls (Measures 4.10-3a and 4.10-1a), vibration levels generated by controlled detonations would be restricted so as not to cause cosmetic or structural damage, while the hours when controlled detonations could occur would be limited to the daytime hours.

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3 It is anticipated that pipeline construction would progress along an alignment (rather than persisting at one location) at a rate of approximately 120 to 160 feet per day, so that any given sensitive receptor would typically be subject to construction vibration for about two weeks.

San Joaquin Region

Impact 4.10-3: Disturbance due to construction-related vibration		
Advanced Disinfection	SJ-1	LS
Lawrence Livermore	SJ-2	LS
SJPL System	SJ-3	PSU
SJPL Rehabilitation	SJ-4	PSU
Tesla Portal Disinfection	SJ-5	LS

Pipeline construction for the SJPL System project (SJ-3) would require sheetpile driving to shore the pipeline trench, and pipeline-related vibration effects, as described above, could occur at residences located along the western pipeline segment near Tesla Portal or near crossover facilities. It is possible that rehabilitation of the existing San Joaquin Pipeline under the SJPL Rehabilitation project (SJ-4) would also require sheetpile driving for shoring. Since residences could be located as close as approximately 50 feet from the SJPL System alignment and 25 feet from the SJPL Rehabilitation project (depending on what pipeline segments were rehabilitated), vibration associated with sheetpile driving would be potentially significant. Implementation of vibration controls (Measures 4.10-3a and 4.10-3b) would reduce this potential impact to a less-than-significant level. However, if any construction activities were to generate vibration during the nighttime hours and within 100 feet of a receptor, it is possible that these measures could not reduce vibration levels sufficiently and sleep disturbance or annoyance could occur; therefore, this analysis conservatively considers this impact to be *potentially significant and unavoidable*. The potential for vibration effects would be evaluated in more detail as part of separate, project-level CEQA review for these projects.

Vibration could result if sheetpile driving is required to shore any excavations associated with proposed facilities at Tesla Portal for the Advanced Disinfection and Tesla Portal Disinfection projects (SJ-1 and SJ-5) or at Thomas Shaft for the Lawrence Livermore project (SJ-2); however, there are no sensitive receptors adjacent to these locations. Therefore, vibrations effects associated with construction of these projects would be *less than significant*.

Sunol Valley Region

Impact 4.10-3: Disturbance due to construction-related vibration		
Alameda Creek Fishery	SV-1	LS
Calaveras Dam	SV-2	LS
40-mgd Treated Water	SV-3	PSU
New Irvington Tunnel	SV-4	PSM
Treated Water Reservoirs	SV-5	LS
SABUP	SV-6	LS

There is one private residence and one SFPUC Land Manager's residence in the Sunol Valley Region, and construction activities associated with all but one of the WSIP projects in this region would be located more than 300 feet from these residences (Alameda Creek Fishery, SV-1; Calaveras Dam, SV-2; SVWTP – Treated Water Reservoirs, SV-5; and SABUP, SV-6). At distances over 100 feet, construction-related vibration effects would be *less than significant*. The only WSIP component in this region that could be implemented within 300 feet of the Sunol Valley residence is the pipeline proposed to extend from the Sunol Valley WTP to the Irvington Tunnel or Alameda Siphons under the 40-mgd Treated Water project (SV-3). If this pipeline passed within 100 feet of this residence, pipeline-related construction vibration impacts, as described above, could occur at this residence. However, it is unlikely that this pipeline alignment would pass that close to the residence. While vibration effects on this residence are expected to be less than significant if located more than 100 feet from this residence, for purposes of this analysis, this impact is considered potentially significant (since distance is currently undetermined), but could be reduced to a less-than-significant level with vibration controls (Measures 4.10-3a and 4.10-3b). However, if any construction activities were to generate vibration during the nighttime hours and within 100 feet of this residence, it is possible that these measures could not reduce vibration levels sufficiently and sleep disturbance or annoyance could occur; therefore, this analysis conservatively considers this impact to be *potentially significant and unavoidable*. The potential for vibration impacts would be evaluated in more detail as part of separate, project-level CEQA review for the 40-mgd Treated Water project, once the specific pipeline location has been determined.

The New Irvington Tunnel project (SV-4) exit portal would be located near residential receptors in Fremont, and tunnel-related construction activities would be located as close as approximately 200 to 300 feet from the nearest receptors, depending on location of staging areas, etc. At distances of 100 feet or greater, potential tunnel-related vibration effects would likely remain below the annoyance threshold and therefore, would be less than significant. Potential vibration and noise disturbance associated with tunnel-related controlled detonation activities would be *potentially significant* but reduced to a less-than-significant level by restricting these activities to the daytime hours (Measure 4.10-1a) and limiting charges to ensure that vibration does not cause cosmetic or structural damage (Measure 4.10-3a). However, potential vibration effects associated with this project would be evaluated in more detail as part of separate, project-level CEQA review to identify potential vibration impacts and ensure that impacts are adequately mitigated.

Bay Division Region

Impact 4.10-3: Disturbance due to construction-related vibration		
BDPL Reliability Upgrade	BD-1	PSU
BDPL 3 and 4 Crossovers	BD-2	PSU
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	PSU

Pipeline construction for the BDPL Reliability Upgrade project (BD-1) would require sheetpile driving to shore the pipeline trench, and pipeline-related vibration effects, as described above, could occur at residences and other structures located within 100 feet of the pipeline alignment; some residences are located as close as 10 to 25 feet from pipeline construction. Tunnel-related vibration could also occur if pile driving is required, although the proposed setbacks of 900 feet or more from the closest residential structures would minimize the potential for tunnel-related vibration impacts. Implementation of vibration controls (Measures 4.10-3a and 4.10-3b) would reduce this potential impact to a less-than-significant level. However, if any construction activities were to generate vibration during the nighttime hours and within 100 feet of a receptor, it is possible that these measures could not reduce vibration levels sufficiently and sleep disturbance or annoyance could occur; therefore, this analysis conservatively considers this impact to be *potentially significant and unavoidable*. Potential vibration and noise disturbance associated with tunnel-related controlled detonation activities would be potentially significant but reduced to a less-than-significant level by restricting these activities to the daytime hours (Measure 4.10-3c) and limiting charges to ensure that vibration does not cause cosmetic or structural damage

(Measure 4.10-3a). Potential vibration impacts would be evaluated in more detail as part of separate, project-level CEQA review.

Vibration could also result if sheetpile driving is required to shore any excavations associated with the BDPL 3 and 4 Crossovers (BD-2) and BDPL 3 and 4 Seismic Upgrade at Hayward Fault (BD-3) projects. Adverse vibration effects could result if sensitive receptors are located within 100 feet of construction. Implementation of vibration controls (Measures 4.10-3a and 4.10-3b) would reduce potentially significant vibration effects to a less-than-significant level at adjacent or nearby sensitive receptors. However, if any construction activities were to generate vibration during the nighttime hours and within 100 feet of a receptor, it is possible that sleep disturbance or annoyance could occur and therefore, this analysis conservatively considers this impact to be *potentially significant and unavoidable*. Potential vibration impacts would be evaluated in more detail as part of separate, project-level CEQA review.

Peninsula Region

Impact 4.10-3: Disturbance due to construction-related vibration		
Baden and San Pedro Valve Lots	PN-1	PSU
CS/SA Transmission	PN-2	LS
HTWTP Long-Term	PN-3	LS
Lower Crystal Springs Dam	PN-4	LS
Pulgas Balancing Reservoir	PN-5	LS

The Baden and San Pedro Valve Lots project (PN-1) would be located at the existing Baden and San Pedro Valve Lots in South San Francisco and Daly City, and proposed facilities would be located in proximity to existing adjacent structures. Vibration impacts could result if sheetpile driving is required within 100 feet of an existing sensitive receptor to shore any excavations associated with these projects. Implementation of vibration controls (Measures 4.10-3a and 4.10-3b) would reduce this potential impact to a less-than-significant level. However, if any construction activities were to generate vibration during the nighttime hours and within 100 feet of a receptor, it is possible that these measures could not reduce vibration levels sufficiently and sleep disturbance or annoyance could occur; therefore, this analysis conservatively considers this impact to be *potentially significant and unavoidable*. Potential vibration impacts would be evaluated in more detail as part of separate, project-level CEQA review.

Improvements at the Harry Tracy WTP (HTWTP Long-Term, PN-3) could generate vibration if sheetpile driving is required to shore any excavations associated with this project. However, sensitive receptors are located 300 to 500 feet from the closest receptors, which reduces the potential for annoyance due to vibration. At this distance, vibration effects would be *less than significant*.

The remaining three WSIP projects in this region (CS/SA Transmission, PN-2; Lower Crystal Springs Dam, PN-4; and Pulgas Balancing Reservoir, PN-5) would be located in the vicinity of the Crystal Springs Reservoirs, west of and across I-280 from the westernmost residential neighborhoods in Belmont, Hillsborough, Millbrae, and unincorporated areas of San Mateo County. Since the closest residential receptors would be located over 1,000 feet east of these three projects (and across a freeway), potential vibration impacts would be *less than significant*.

San Francisco Region

Impact 4.10-3: Disturbance due to construction-related vibration		
SAPL 3 Installation	SF-1	PSU
Groundwater Projects	SF-2	PSU
Recycled Water Projects	SF-3	PSU

Pipeline construction for the SAPL 3 Installation project (SF-1) could require sheetpile driving to shore the pipeline trenches or pipeline-related facilities (e.g., jack-and-bore pits), and pipeline-related vibration effects, as described above, could occur at residences and other structures located along the pipeline alignment. Due to the close proximity of sensitive receptors to sections of this pipeline alignment (potentially less than 25 feet on some residential streets), vibration effects could be perceptible and therefore potentially significant. Implementation of vibration controls (Measures 4.10-3a and 4.10-3b) would reduce this potential impact to a less-than-significant level. However, if any construction activities were to generate vibration during the nighttime hours and within 100 feet of a receptor, it is possible that these measures could not reduce vibration levels sufficiently and sleep disturbance or annoyance could occur; therefore, this analysis conservatively considers this impact to be *potentially significant and unavoidable*. Potential vibration impacts would be evaluated in more detail as part of separate, project-level CEQA review.

Vibration could also result if sheetpile driving is required to shore any excavations associated with the Groundwater Projects (SF-2) and Recycled Water Projects (SF-3). Potentially significant vibration effects could result if there are any sensitive receptors located within 100 feet of proposed facilities, and implementation of vibration controls (Measures 4.10-3a and 4.10-3b) would reduce this potential impact to a less-than-significant level. However, if any construction activities were to generate vibration during the nighttime hours and within 100 feet of a receptor, it is possible that these measures could not reduce vibration levels sufficiently and sleep disturbance or annoyance could occur; therefore, this analysis conservatively considers this impact to be *potentially significant and unavoidable*. Potential vibration impacts would be evaluated in more detail as part of separate, project-level CEQA review.

Operational Impacts

Long-Term Noise Increases

Impact 4.10-4: Disturbance due to long-term noise increases associated with operation of project facilities.

Operation of some of the WSIP facilities would result in long-term noise increases. The primary sources of noise associated with facility operation are pumps and electrical facilities (substations, transformers, and emergency generators). Such noise sources are most often associated with water treatment plants and pumping plants. The degree of impact would vary with each project and would depend on pump sizes, transformer sizes, proximity to sensitive receptors, and the extent of noise attenuation incorporated into the facility design.

For operational noise, a substantial noise increase (as stated in the first significance criterion) can be defined by whether operational noise levels are within local ordinance noise limits (see Table 4.10-2). Operational noise levels would be estimated as part of separate, project-level CEQA review for those facilities, and the potential for operational noise impacts would be assessed at that time. Potential impacts would depend on existing ambient noise levels in the project vicinities, proposed facility design, and pertinent ordinance noise limits.

Pump Stations. Operation of some WSIP facilities would include new pump stations or upgrades of existing pump stations. The primary sources of noise associated with pump stations are pumps and electrical facilities (substations, transformers, and emergency generators). As indicated in Table 4.10-4, a pump (not enclosed) typically generates noise levels of 76 dBA at 50 feet. Noise levels associated with pump stations would depend on four factors: (1) characteristics of the noise source (e.g., technology type, rated horsepower, revolutions per minute, presence or absence of pure tones, directional characteristics of the noise source, presence or absence of acoustical design features); (2) the number of noise sources clustered together; (3) the type and effectiveness of the building enclosure; and (4) operational characteristics (steady 24-hour operation, intermittent operation, variable settings at different times, etc.). Typical noise levels associated with pump stations are as follows:

- Pumps (enclosed with baffled vents): 45 to 60 dBA (Leq) at 50 feet, depending on the number and sizes of pumps (based on noise measurements collected at various pump stations)
- Transformers: 50 to 70 dBA at 50 feet, depending on the size and number (NEMA, 1994)

Treatment Facilities. Treatment facilities typically include basins, filters, and drains, which would not be major sources of noise. Noise generated by water flowing through pipes or drains would be limited to areas in the vicinity of openings or vents; since noise levels from flowing water would generally be less than ambient noise levels, these facilities would not increase noise levels beyond the treatment plant boundaries. Chemical feed systems typically operate with very small pumps and are enclosed; therefore, they typically do not affect ambient noise levels. However, if pumping facilities are located within the treatment facility, noise from pumping facilities would be a principal source of operational noise.

Storage Facilities. Storage facilities include reservoirs or basins, which are typically located entirely or partially below grade. These facilities are sometimes filled by gravity flow, although pumping facilities can be required to fill basins or reservoirs. For the WSIP, major pumping systems are considered separately when they are located at different locations (e.g., the San Antonio Pump Station is considered separate from Calaveras Dam or Sunol Valley WTP). Noise sources within these facilities could include internal pumping systems, filters, chemical feed systems, piping, valves, and electrical and instrumentation facilities. Since this equipment is typically enclosed within the facility, it does not contribute significantly to the surrounding ambient noise environment.

Pipelines, Tunnels, and Crossovers. Operation of pipelines, tunnels, crossovers, or storage facilities would not generate noise. Pipelines, tunnels, and crossovers would be located underground and/or enclosed, and these facilities generally do not include any noise-generating equipment. While there could be electrical facilities associated with some of these facilities, they are generally housed within control buildings, and these enclosed facilities are not a major source of noise.

Vaults and Valve Lots. Vaults are structures (typically concrete) that are normally partially underground and enclosed either by hatch covers or valve house buildings. Various piping and valves are located within these vaults, and the valves allow operators to control water flows through the system. Since valves are typically electric-powered, standby power must be provided so they remain operational at all times, even during power outages. Other than emergency generators, there are no major noise sources (e.g., motors, pumps, transformers) associated with these facilities.

Standby Power. WSIP implementation would include provision of standby power (propane- or diesel-fueled emergency generators) at a number of existing, proposed, and upgraded facilities to keep facilities operating during power outages, thereby reducing the potential for interruption of supply to customers. Standby power, which could be provided by permanent or portable emergency generators, is proposed at various treatment facilities, pump stations, wells, vaults, and valve lots. Emergency generators typically generate noise levels of 85 dBA at 50 feet (see Table 4.10-4). An enclosure with baffled vents for permanent standby generators could reduce generator noise by 25 to 30 dBA. These generators would be used infrequently (only during power outages and for periodic testing during the day).

San Joaquin Region

Impact 4.10-4: Disturbance due to long-term noise increases		
Advanced Disinfection	SJ-1	LS
Lawrence Livermore	SJ-2	LS
SJPL System	SJ-3	LS
SJPL Rehabilitation	SJ-4	N/A
Tesla Portal Disinfection	SJ-5	LS

Primary sources of operational noise within this region would be standby power facilities associated with the SJPL System project (SJ-3, if required for valve house, crossovers, or possible pump station) and the Tesla Portal Disinfection project (SJ-5). Transformers or substations for power generation would also be a source of operational noise associated with the Advanced Disinfection project (SJ-1). The degree of impact would depend on the locations and designs of these facilities (e.g., proximity of sensitive receptors, use of enclosures or sound barriers). Given the rural or undeveloped nature of the areas surrounding these facility sites and the distance to the closest sensitive receptors, it is expected that operational noise could be maintained at acceptable levels (within local ordinance limits) through appropriate location and design (enclosure if necessary). Standby power facilities would be operated infrequently (only during power outages and for periodic testing during the day), limiting the potential for significant noise impacts. Enclosure of these facilities typically reduces potential impacts to a less-than-significant level. With implementation of SFPUC Construction Measure #6 (compliance with local noise ordinances to the extent feasible), potential noise impacts on any affected residential receptors would be *less than significant* for these three projects. However, it should be noted that the location of power facilities for the SJPL System project have not been determined, potential operational noise impacts would be evaluated in more detail as part of separate, project-level CEQA review for this project to define design measures needed to ensure operational noise levels are maintained at acceptable levels.

The Lawrence Livermore project (SJ-2) is not located near any noise sensitive land uses; therefore, noise associated with any Lawrence Livermore facilities would be *less than significant*. No facilities under the SJPL Rehabilitation project (SJ-4) would generate noise; therefore, this impact would *not apply* to this project.

Sunol Valley Region

Impact 4.10-4: Disturbance due to long-term noise increases		
Alameda Creek Fishery	SV-1	LS
Calaveras Dam	SV-2	N/A
40-mgd Treated Water	SV-3	LS
New Irvington Tunnel	SV-4	LS
Treated Water Reservoirs	SV-5	LS
SABUP	SV-6	N/A

Potential increases in operational noise in the Sunol Valley Region could occur as a result of new pumping facilities possibly associated with the Alameda Creek Fishery project (SV-1); new pumping facilities at the Sunol Valley WTP for filter backwashing, chemical feed, etc. proposed under the 40-mgd Treated Water and Treated Water Reservoirs projects (SV-3 and SV-5); and electrical supply upgrades associated with the 40-mgd Treated Water project (SV-3). The possible provision of additional standby power facilities at a new Alameda East Portal (under New Irvington Tunnel, SV-4) would also introduce a new source of noise (emergency generators) during periodic daytime testing and power outages. The SFPUC Land Manager's residence is located approximately 300 feet north of the Alameda East Portal, while a private residence is located about a half mile to the west. With implementation of SFPUC Construction Measure #6 (compliance with local noise ordinances to the extent feasible), potential noise impacts on these residential receptors would be *less than significant.* Given the distance between noise sources and residential receptors, it is expected that operational noise could be maintained at acceptable levels (within local ordinance limits) through appropriate location and design (including enclosure, if necessary).

The Calaveras Dam (SV-2) and SABUP (SV-5) projects would essentially have no operational noise, and this impact would *not apply*.

Bay Division Region

Impact 4.10-4: Disturbance due to long-term noise increases		
BDPL Reliability Upgrade	BD-1	LS
BDPL 3 and 4 Crossovers	BD-2	N/A
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	N/A

Operational noise increases within this region would be associated with standby power for the BDPL Reliability Upgrade project (BD-1). Since these facilities could be located near noise-sensitive receptors, there would be a potential for operational noise impacts. However, operational noise sources would be limited to backup power systems, including emergency generators, which would operate only during power outages and for periodic daytime testing. With implementation of SFPUC Construction Measure #6 (compliance with local noise ordinances to the extent feasible), potential noise impacts would be *less than significant,* given the limited noise sources associated with operation of this project. Potential operational noise impacts would be evaluated in more detail as part of separate, project-level CEQA review for the BDPL Reliability Upgrade project to define design measures needed to minimize noise levels during emergency and testing conditions.

The BDPL 3 and 4 Crossovers project (BD-2) would consist of crossovers and valves, partially underground and enclosed; these facilities would not generate noise. Similarly, the BDPL 3 and 4 Seismic Upgrade at Hayward Fault (BD-3) project, as a pipeline project, would not generate operational noise. Therefore, this impact would *not apply* to these two projects.

Peninsula Region

Impact 4.10-4: Disturbance due to long-term noise increases		
Baden and San Pedro Valve Lots	PN-1	LS
CS/SA Transmission Upgrade	PN-2	LS
HTWTP Long-Term	PN-3	LS
Lower Crystal Springs Dam	PN-4	N/A
Pulgas Balancing Reservoir	PN-5	LS

Primary sources of operational noise within this region would be upgrades to existing pumping facilities (CS/SA Transmission, PN-2, and HTWTP Long-Term, PN-3), and possible electrical upgrades at the Harry Tracy WTP. The Baden and San Pedro Valve Lots project (PN-1) would consist of valves located partially underground and enclosed. Residential or school receptors are located near the HTWTP Long-Term (PN-3) and Baden Valve Lot projects. Proposed facilities at the Baden Valve Lot would also have a limited potential for noise impacts since the facilities would be enclosed. With implementation of SFPUC Construction Measure #6 (compliance with local noise ordinances to the extent feasible), potential noise impacts on these residential receptors would be *less than significant,* given the setback distances between sources and receptors or the limited noise potential associated with operation of proposed facilities. Potential operational noise impacts would be evaluated in more detail as part of separate, project-level CEQA review for these three projects to define design measures needed to ensure operational noise levels are maintained at acceptable levels.

Potential operational noise increases resulting from the provision of new chemical feed systems at the Pulgas Balancing Reservoir (PN-5) would be *less than significant* due to the absence of sensitive receptors in this vicinity and the small size of pumps that are typically associated with such facilities.

The Lower Crystal Springs Dam (PN-4) project would not generate operational noise, and operational noise impacts are *not applicable* to this project.

San Francisco Region

Impact 4.10-4: Disturbance due to long-term noise increases		
SAPL 3 Installation	SF-1	N/A
Groundwater Projects	SF-2	LS
Recycled Water Projects	SF-3	LS

Potential increases in operational noise in the San Francisco Region would be associated with wells for the Groundwater Projects (SF-2), the pumping facility for the Recycled Water Projects (SF-3), and standby power (under both the Groundwater and Recycled Water Projects). Potential impacts associated with standby power would be limited, since emergency generators would only operate during periodic daytime testing and power outages. Enclosure of these facilities typically reduces potential impacts to a less-than-significant level. With implementation of SFPUC Construction Measure #6 (compliance with local noise ordinances to the extent feasible), potential noise impacts would be *less than significant*. However, it should be noted that the location of these facilities have not yet been determined, and potential operational noise impacts would be evaluated in more detail as part of separate, project-level CEQA review for both the Groundwater and Recycled Water Projects to define design measures needed to ensure operational noise levels are maintained at acceptable levels.

Pipelines under the SAPL 3 Installation (SF-1) project would not generate operational noise. This impact would *not apply* to this project.

4.10.4 References – Noise and Vibration

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4.11 Public Services and Utilities

4.11 Public Services and Utilities

This section addresses potential impacts on public services and utilities that could occur as a result of implementation of the WSIP projects. This analysis is conducted on a program level, and each WSIP project would be subject to separate, project-level CEQA review. Public utilities discussed in this section include water, natural gas, and electricity conveyance facilities. Public services addressed in this section include law enforcement services, fire protection services, and solid waste disposal. Potential impacts on emergency response or access (i.e., disruption of emergency services due to access restrictions) are addressed in Section 4.8, Traffic, Transportation, and Circulation, and potential energy and power issues are addressed in Section 4.15, Energy Resources. Projects implemented under the WSIP that would affect school facilities are addressed in Section 4.3, Land Use and Visual Quality.

This section discusses the county and city jurisdictions where WSIP project construction would occur, or those within close proximity. Potential secondary or indirect impacts on utilities and public services that could occur as a result of population growth attributed to the WSIP projects are presented in Chapter 7.

4.11.1 Setting

The SFPUC regional water system consists of a network of facilities covering a geographic range of approximately 170 miles across central California, from the Sierra Nevada on the east to San Francisco on the west. WSIP projects are proposed within or in close proximity to the jurisdictional boundaries of the following seven counties: Alameda, San Francisco, San Joaquin, San Mateo, Santa Clara, Stanislaus, and Tuolumne. Project construction would occur in 27 cities within these counties. A detailed description of the SFPUC regional system, including facilities, locations, and operations, is provided in Chapter 3.

Water Service

The SFPUC provides water delivery services to retail and wholesale customers, primarily in San Francisco, San Mateo, Santa Clara, and Alameda Counties. The SFPUC serves about one-third of its water supplies directly to retail customers in San Francisco, and about two-thirds of its water supplies to 27 wholesale customers by contractual agreement. The wholesale customers consist of 25 cities and water districts and two private utilities in San Mateo, Santa Clara, and Alameda Counties, represented by the Bay Area Water Supply and Conservation Agency (BAWSCA). Some of these customers have sources of water in addition to what they receive from the SFPUC regional system. The SFPUC also provides service to some isolated regional retail customers along the water system, including customers in Tuolumne County. Chapter 3 provides detailed information regarding the SFPUC's overall water supply service.

Table 4.11-1 lists the major regional system customers and indicates the wholesale customers that have available water supplies from sources other than the SFPUC.

TABLE 4.11-1
SFPUC REGIONAL WATER SYSTEM CUSTOMERS

Wholesale Regional Customers[a] (BAWSCA Members)		
Peninsula	**South Bay**	**Other Major Customers**
California Water Service Company (South San Francisco* and Mid-Peninsula)	Alameda County Water District*	City and County of San Francisco
City of Brisbane	Mid-Peninsula Water District	Presidio Trust*
Guadalupe Valley Municipal Improvement District	California Water Service Company (Bear Gulch)*	San Francisco County Jail (San Bruno)
City of Burlingame	City of Hayward	San Francisco International Airport (San Mateo County)
City of Daly City*	City of Menlo Park*	Lawrence Livermore National Laboratory (Site 200/300)
City of Millbrae	City of Milpitas*	National Aeronautics and Space Administration (Santa Clara County)
City of San Bruno*	City of Mountain View*	Town of Sunol (Alameda County)
Coastside County Water District*	City of Palo Alto*	Groveland Community Services District (Tuolumne County)
Estero Municipal Improvement District (Foster City)	City Redwood City*	
North Coast County Water District	City of San Jose (North San Jose Service Area)*	
Town of Hillsborough	City of Sunnyvale*	
Westborough County Water District	City of Santa Clara*	
	City of East Palo Alto	
	Purissima Hills Water District	
	Skyline County Water District	
	Stanford University*	

* Indicates customers that currently receive additional water supplies from sources other than the SFPUC.

[a] Not shown on the table because they are not a BAWSCA member, the Cordilleras Mutual Water Association is also a wholesale customer receiving water from the SFPUC. It is a small water association serving 18 single-family homes located in San Mateo County.

SOURCES: CDM, 2005; URS, 2004a.

Natural Gas

Natural gas customers in California, including the WSIP study area, are served by a network of regional natural gas pipelines that traverse the state, crossing the state line to the southeast via San Bernardino and Riverside Counties, or to the north via Modoc County. Within northern California, natural gas pipelines are primarily owned by Pacific Gas and Electric Company (PG&E). Additional natural gas pipelines in the state are owned by Southern California Gas, San Diego Gas and Electric Company (SDG&E), Kern/Mojave, and other utility providers. Regional pipelines generally range from 2 to 42 inches in diameter. Large natural gas pipelines (33 to 42 inches in diameter), of which there are four, travel through much of the state.

PG&E owns the regional natural gas pipelines in the WSIP study area. PG&E operates natural gas and electrical transmission lines in two corridors west of the Calaveras Reservoir, and three high-pressure natural gas transmission lines in the San Antonio Valley, which is located along the Diablo Range in eastern Santa Clara County on the border of Alameda and Stanislaus Counties (SFPUC, 2001). The diameters of regional pipelines within proximity or traveling through proposed WSIP construction areas vary widely, from 2 and 42 inches (California Energy Commission, 2007a).

Petroleum

California is a major refining center for petroleum markets on the West Coast, with a combined crude oil distillation capacity of more than 1.9 million barrels per day, ranking the state third highest in the nation. California petroleum refineries are located in the San Francisco Bay Area, the Los Angeles area, and the Central Valley. A large network of crude oil pipelines connects producing areas with the major ports in Northern and Southern California. These ports receive Alaska North Slope and foreign crude oil for processing in many of the state's 21 refineries (California Energy Commission, 2007b).

The Chevron Pipeline Company operates a pipeline in the WSIP study area for the transport of refined petroleum products. The pipeline travels through the San Antonio Reservoir watershed, which is within the Alameda Creek watershed, and then crosses Alameda Creek in the Sunol Valley, for a distance of about eight miles within the Alameda watershed (SFPUC, 2001).

Electricity

A number of regional electricity transmission lines with varying levels of capacity serve the state's electricity demand. Most of California's electricity transmission lines, not including distribution lines, are owned by PG&E (approximately 58 percent of the state's transmission line mileage). Other transmission line owners in the state include Southern California Edison, SDG&E, municipal utilities, and the Western Area Power Administration.

Generally, PG&E provides electricity in the WSIP study area and also operates electrical transmission lines in two corridors west of Calaveras Reservoir (SFPUC, 2001). The Modesto and Turlock Irrigation Districts also serve Stanislaus County, while some customers choose to maintain contracts with independent power generators. Through the seven counties where WSIP project construction could occur, regional electricity transmission lines have capacities of 110 to 161 kilovolts, and 220 to 287 kilovolts (California Energy Commission, 2007a).

Law Enforcement Services

Law enforcement services in the WSIP study area are provided by a combination of county sheriff departments as well as citywide police departments (see **Table 4.11-2**). Sheriff departments typically provide law enforcement and jail services within their respective counties. In addition to law enforcement jurisdiction over unincorporated county areas, some sheriff departments, including the Stanislaus, San Joaquin, Alameda, and San Mateo County Sheriff Departments, also provide law enforcement services to certain cities within the county on a contract basis.

TABLE 4.11-2
LAW ENFORCEMENT AND FIRE PROTECTION SERVICE PROVIDERS
WITHIN THE WSIP STUDY AREA

Jurisdiction	Law Enforcement Agencies	Fire Protection Service Agencies
Alameda County		
Unincorporated areas including, San Lorenzo and Castro Valley	Alameda County Sheriff's Department	Alameda County Fire Department
	East Bay Regional Park District Police Department	East Bay Regional Park District Fire Department
Newark	Newark Police Department	Newark Fire Department
Fremont	Fremont Police Department	Fremont Fire Department
San Francisco City and County	San Francisco Sheriff's Department and Police Department	San Francisco Fire Department
San Joaquin County		
Unincorporated areas	San Joaquin County Sheriff's Department	Various Fire Districts
Riverbank	Stanislaus County Sheriff's Department	Stanislaus Consolidated Fire Protection District
Modesto	Modesto Police Department	Modesto Fire Department
San Mateo County		
Unincorporated areas	San Mateo County Sheriff's Department	San Mateo County Fire Department
East Palo Alto	East Palo Alto Police Department	Menlo Park Fire District
Menlo Park	Menlo Park Police Department	Menlo Park Fire District
Atherton	Atherton Police Department	Menlo Park Fire District
Redwood City	Redwood City Police Department	Redwood City Fire Department
San Carlos	San Carlos Police Department	Belmont-San Carlos Fire Department
Woodside	Contracted with the San Mateo County Sheriff's Department	Woodside Fire Protection District
San Mateo	San Mateo Police Department	San Mateo Fire Department
Hillsborough	Hillsborough Police Department	Central County Fire Department
Burlingame	Burlingame Police Department	Central County Fire Department
Millbrae	Millbrae Police Department	Millbrae Police Department
San Bruno	San Bruno Police Department	San Bruno Fire Department
South San Francisco	South San Francisco Police Department	South San Francisco Fire Department
Colma	Colma Police Department	Colma Fire Department
Brisbane	Brisbane Police Department	North County Fire Authority
Daly City	Daly City Police Department	North County Fire Authority
Santa Clara County		
Unincorporated areas	Santa Clara County Sheriff's Department	Santa Clara County Fire District
Milpitas	City of Milpitas Police Department	City of Milpitas Fire Department
San Jose	City of San Jose Police Department	City of San Jose Fire Department
Santa Clara	City of Santa Clara Police Department	City of Santa Clara Fire Department
Sunnyvale	Sunnyvale Department of Public Safety	Sunnyvale Department of Public Safety
Mountain View	Mountain View Police Department	Mountain View Fire Department
Los Altos	Los Altos Police Department	Santa Clara County Fire District
Palo Alto	Palo Alto Police Department	Palo Alto Fire Department
Stanislaus County		
Unincorporated areas	Stanislaus County Sheriff's Department	Various Fire Districts
Tuolumne County		
Unincorporated areas	Tuolumne County Sheriff's Department	Tuolumne County Fire Department

SOURCES: See the reference list provided at the end of this section.

Fire Protection Services

Fire protection services in the WSIP study area are provided by a number of agencies, including county fire departments, city fire departments, and fire districts (see Table 4.11-2). A number of the counties also have volunteer fire departments. The California Department of Forestry and Fire Protection (CDF) provides fire protection services for both wildland and residential/commercial areas, in addition to responding to other types of emergencies, ranging from automobile accidents to lost hikers to earthquakes. The CDF is responsible for the protection of over 31 million acres of California's privately owned wildlands and provides emergency services within 36 of California's 58 counties through local government contracts. Within the counties that would be affected by WSIP projects, the CDF has three units: the San Mateo/Santa Cruz Unit, the Santa Clara Unit, and the Tuolumne/Calaveras Unit.

Solid Waste Management

With the exception of San Francisco and Tuolumne Counties, each of the counties within the WSIP study area has active landfills. Active landfills by county include: Alameda County with two landfills (Altamont Landfill and Resource Recovery, and Vasco Road Sanitary Landfill); San Joaquin County with three landfills (Foothill Sanitary Landfill, Forward Landfill, Inc., and North County Landfill); San Mateo County with one landfill (Ox Mountain Sanitary Landfill); Santa Clara County with seven landfills (City of Palo Alto Refuse Disposal Site, Guadalupe Sanitary Landfill, Kirby Canyon Recycling and Disposal Facility, Newby Island Sanitary Landfill, Zanker Material Processing Facility, and Zanker Road Resource Recovery Operations Landfill); and Stanislaus County with two landfills (Bonzi Sanitary Landfill and Fink Road Landfill). The California Integrated Waste Management Board (CIWMB) maintains facility information and waste stream profiles for all counties and jurisdictions in the state (see Table **4.11-3**). The CIWMB, the state entity that administers the California Integrated Waste Management Act (described below), found that these jurisdictions achieved the 50 percent goal or approved their good faith effort to achieve the 50 percent goal[1] for 2002 (CIWMB, 2007a). Jurisdictions within the WSIP study area have prepared and adopted the necessary planning documents to implement the act.

Regulatory Framework

California Public Utilities Commission

The California Constitution vests the California Public Utilities Commission (CPUC) with exclusive power and sole authority to regulate privately owned and investor-owned public utilities. This exclusive power extends to all aspects of the location, design, construction, maintenance, and operation of regulated utility facilities. The CPUC has provisions that require regulated utilities to work closely with local governments and to give due consideration to their concerns.

1 The California Integrated Waste Management Act of 1989 is discussed under Regulatory Framework.

TABLE 4.11-3
ACTIVE LANDFILLS WITHIN THE WSIP STUDY AREA

Jurisdiction	Total Estimated Permitted Capacity[a] (cubic yards)	Total Estimated Capacity Used[b] (cubic yards)	% Used[b]	Remaining Estimated Capacity[a] (cubic yards)	Remaining Capacity Date[c]	% Remaining Capacity[b]	Closure Date[a]	Waste Types Accepted/Permitted
Alameda County								
Altamont Landfill and Resource Recovery	124,400,000	0	0%	124,400,000	As of 04/12/05	100%	1/1/2025	Asbestos, asbestos friable, ash, construction/demolition, contaminated soil, green materials, industrial, mixed municipal, other designated, tires, shreds
Vasco Road Sanitary Landfill	31,942,205	19,662,340	62%	12,279,865	As of 06/11/01	38%	1/1/2015	Construction/demolition, contaminated soil, green materials, industrial, mixed municipal, other designated
San Francisco City and County								
None								
San Joaquin County								
Foothill Sanitary Landfill	102,000,000	4,100,000	4%	97,900,000	As of 06/01/05	96%	1/1/2054	Agricultural, construction/demolition, industrial, mixed municipal, tires, wood waste
Forward Landfill, Inc	51,040,000	11,008,942	22%	40,031,058	As of 01/01/02	78%	1/1/2020	Agricultural, asbestos, asbestos friable, ash, construction/demolition, contaminated soil, green materials, industrial, mixed municipal, sludge (biosolids), tires, shreds
North County Landfill	17,300,000	4,060,968	23%	13,239,032	As of 09/01/04	77%	1/1/2035	Agricultural, construction/demolition, industrial, metals, mixed municipal, other designated, tires, wood waste
San Mateo County								
Ox Mountain Sanitary Landfill	37,900,000	6,746,148	18%	31,153,852	As of 01/01/00	82%	1/1/2018	Asbestos, construction/demolition, mixed municipal, other designated, sludge (biosolids), tires
Santa Clara County								
City of Palo Alto Refuse Disposal Site	7,758,854	6,969,672	90%	789,182	As of 05/01/05	10%	12/30/2011	Construction/demolition, industrial, mixed municipal
Guadalupe Sanitary Landfill	16,500,000	3,837,211	23%	12,662,789	As of 06/11/01	77%	1/1/2010	Construction/demolition, green materials, industrial, mixed municipal
Kirby Canyon Recycling and Disposal Facility	36,400,000	20,871,507	57%	15,528,493	As of 06/11/01	43%	12/31/2022	Construction/demolition, industrial, tires, green materials, mixed municipal

TABLE 4.11-3 (Continued)
ACTIVE LANDFILLS WITHIN THE WSIP STUDY AREA

Jurisdiction	Total Estimated Permitted Capacity[a] (cubic yards)	Total Estimated Capacity Used[b] (cubic yards)	% Used[b]	Remaining Estimated Capacity[a] (cubic yards)	Remaining Capacity Date[c]	% Remaining Capacity[b]	Closure Date[a]	Waste Types Accepted/Permitted
Santa Clara County (cont.)								
Newby Island Landfill	50,800,000	35,821,454	71%	14,978,546	As of 12/31/01	29%	12/31/2020	Construction/demolition, contaminated soil, green materials, industrial, mixed municipal, sludge (biosolids), tires
Zanker Material Processing Facility	540,100	41,100	8%	499,000	As of 04/01/04	92%	12/31/2018	Construction/demolition, other designated
Zanker Road Resource Recovery Operations Landfill	1,300,000	823,000	63%	477,000	As of 08/16/05	37%	01/01/2029	Construction/demolition, green materials, industrial, tires
Stanislaus County								
Bonzi Sanitary Landfill	4,171,000	3,879,876	93%	291,124	As of 05/01/05	7%	12/31/2019	Construction/demolition industrial
Fink Road Landfill	14,500,000	4,500,000	31%	10,000,000	As of 02/01/04	69%	1/1/2011	Agricultural, ash, construction/demolition, industrial, mixed municipal, sludge (biosolids), tires
Tuolumne County								
None								

[a] Capacity information from 2000 (CIWMB, 2007b). The remaining capacity of landfills in the WSIP study area that were recently closed, or that will be closed in the near future, were not included in this analysis. They are: Tri-Cities Recycling and Disposal Facility (Alameda County), Hillside Class III Disposal Site (San Mateo County), and NORCAL Waste Systems Pacheco Pass (Santa Clara County).
[b] Calculated using CIWMB 2007 data.
[c] Remaining capacity date provided by the CIWMB or local landfill operator.

California Integrated Waste Management Act of 1989

The California Integrated Waste Management Act of 1989 (Public Resources Code [PRC], Division 30), enacted through Assembly Bill (AB) 939 and modified by subsequent legislation, requires all California cities and counties to implement programs to reduce, recycle, and compost at least 50 percent of wastes by the year 2000 (PRC Section 41780). The state determines compliance with this mandate to divert 50 percent of generated waste (which includes both disposed and diverted waste) through a complex formula. This formula requires cities and counties to conduct empirical studies to establish a “base year” waste generation rate against which future diversion is measured. The actual determination of the diversion rate in subsequent years is arrived at through deduction, not direct measurement: instead of counting the amount of material recycled and composted, the city or county tracks the amount of material disposed at landfills, then subtracts the disposed amount from the base-year amount. The difference is assumed to be diverted (PRC Section 41780.2).

In the original determination of their base-year generation rate, cities and counties may not count certain diverted materials, including agricultural wastes, scrap metals, discarded major appliances, or inert solids such as rock, concrete, brick, sand, soil, fines, asphalt, and unsorted construction and demolition waste, unless the city or county can demonstrate that these materials had previously been disposed in a landfill and were now being diverted through a specific action of the city or county (PRC Section 41781.2). In subsequent years, these materials only have an impact on a city’s or county’s attainment of the diversion mandate if the materials are disposed in landfills. If they continue to be diverted, they are never accounted for.

Regulations Governing Utility Safety and Service at Construction Sites

Excavation activities are regulated through the California Occupational Health and Safety Administration Trench Construction Safety Orders. In addition, California Department of Health Services (DHS) standards require: (1) a 10-foot horizontal separation between parallel sewer and water mains; (2) a 1-foot vertical separation between perpendicular water and sewer line crossings; and (3) encasement of sewer mains in protective sleeves where a new water line crosses under or over an existing wastewater main. In the event that separation requirements cannot be maintained, the SFPUC or its contractors would obtain a DHS variance by providing sewer encasement or other measure deemed suitable by the DHS.

4.11.2 Impacts

Significance Criteria

The CCSF has not formally adopted significance standards for impacts related to public services and utilities, but generally considers that implementation of the proposed program would have a significant impact if it were to:

- Result in substantial adverse physical impacts associated with the provision of, or the need for, new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any public services such as fire protection, police protection, schools, parks, or other services (Not evaluated in this section, see Appendix B)

- Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board (Not evaluated in this section, see Appendix B)

- Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects (Evaluated in this section)

- Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects (Not evaluated in this section, see Appendix B)

- Not have sufficient water supply available to serve the project from existing entitlements and resources, or require new or expanded water supply resources or entitlements (Evaluated in this section)

- Result in a determination by the wastewater treatment provider that would serve the project that it has inadequate capacity to serve the project's projected demand in addition to the provider's existing commitments (Not evaluated in this section, see Appendix B)

- Be served by a landfill with insufficient permitted capacity to accommodate the project's solid waste disposal needs (Evaluated in this section)

- Be out of compliance with federal, state, and local statutes and regulations related to solid waste (Evaluated in this section)

Impacts from construction of new water facilities are discussed by impact topic throughout Chapter 4. The provision of adequate water supply is discussed in Chapters 3 and 5. Storm water drainage issues as they relate to effects on hydrology are addressed in Section 4.5, Hydrology and Water Quality.

This section specifically addresses impacts on public utilities and landfills. Due to the nature of the proposed program, this PEIR also applies the following additional criteria and considers implementation of WSIP to have a significant effect on services and utilities if it were to:

- Disrupt operation of or require relocation of regional or local utilities (Evaluated in this section)

Approach to Analysis

For this program-level analysis, one area of focus is the temporary construction-related impacts on utility services. In general, implementation of the WSIP projects would not have direct, long-term impacts on the demand for public utilities, with the exception of water supply service (discussed in Chapter 3) and electricity (discussed in Section 4.15, Energy Resources). Long-term electricity use would increase as needed to power new or expanded facilities. Short-term, temporary disruption of service could occur if existing utilities required relocation. The presence of existing utility systems in the vicinity of proposed WSIP projects is used as an indicator of potential impact on utilities.

The second focus of analysis is the potentially adverse temporary impact on landfill capacity due to the disposal of WSIP construction waste. The largest potential source of solid waste would be excavated soil. While it is expected that most clean soil would be recycled, reused offsite, or stockpiled and reused as backfill, this analysis assumes that a portion of soil would be disposed in landfills. The analysis includes an estimate of the available capacity of landfills in the counties within the WSIP study area and expected construction waste quantities.

Impact Summary by Region

Table 4.11-4 presents a summary of potential impacts on utilities and landfills associated with the WSIP projects. For each impact, the summary presents the expected level of significance of each potential impact for each WSIP project.

Construction Impacts

Impact 4.11-1: Potential temporary damage to or disruption of existing regional and local public utilities.

Implementation of the WSIP projects would result in new construction of or improvements to pipelines, tunnels, vaults, valve lots, crossovers, treatment facilities, and storage facilities. Construction activities associated with the WSIP projects could result in unintentional utility service disruptions, including water, sewer, storm drain, and natural gas pipelines, and electricity, telephone, and television cable service. Construction activities that could affect utilities are addressed by facility type below.

Pipelines. The open-cut or cut-and-cover construction methods for pipeline installation, repair, or replacement would have the greatest potential for disrupting existing utility services. Depending on the location of the proposed pipeline and associated staging areas, construction activities could disrupt utility services.

Regional utility lines as well as local utility connections of varying sizes traverse the WSIP study area. Given that utility corridors generally include multiple utility lines (i.e., natural gas, water, and sewer lines), construction of pipelines could interfere with existing utility services. If the specific locations of existing utilities are not identified prior to construction activities, damage to utility lines and temporary disruption of utility services could occur.

TABLE 4.11-4
SUMMARY OF IMPACTS AND SIGNIFICANCE – PUBLIC SERVICES AND UTILITIES

Projects	Project Number	Impact 4.11-1:Potential temporary damage to or disruption of existing regional or local public utilities	Impact 4.11-2 : Temporary adverse effects on solid waste landfill capacity	Impact 4.11-3: Impacts related to compliance with statutes and regulations related to solid waste	Impact 4.11-4: Impacts related to the relocation of utilities
San Joaquin Region					
Advanced Disinfection	SJ-1	LS	PSM	PSM	PSM
Lawrence Livermore Supply Improvements	SJ-2	LS	PSM	PSM	PSM
San Joaquin Pipeline System	SJ-3	PSM	PSM	PSM	PSM
Rehabilitation of Existing San Joaquin Pipelines	SJ-4	LS	PSM	PSM	PSM
Tesla Portal Disinfection Station	SJ-5	LS	PSM	PSM	PSM
Sunol Valley Region					
Alameda Creek Fishery Enhancement	SV-1	PSM	PSM	PSM	PSM
Calaveras Dam Replacement	SV-2	PSM	PSM	PSM	PSM
Additional 40-mgd Treated Water Supply	SV-3	PSM	PSM	PSM	PSM
New Irvington Tunnel	SV-4	PSM	PSM	PSM	PSM
SVWTP – Treated Water Reservoirs	SV-5	LS	PSM	PSM	PSM
San Antonio Backup Pipeline	SV-6	PSM	PSM	PSM	PSM
Bay Division Region					
Bay Division Pipeline Reliability Upgrade	BD-1	PSM	PSM	PSM	PSM
BDPL Nos. 3 and 4 Crossovers	BD-2	PSM	PSM	PSM	PSM
Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault	BD-3	PSM	PSM	PSM	PSM
Peninsula Region					
Baden and San Pedro Valve Lots Improvements	PN-1	LS	PSM	PSM	PSM
Crystal Springs/San Andreas Transmission Upgrade	PN-2	PSM	PSM	PSM	PSM
HTWTP Long-Term Improvements	PN-3	LS	PSM	PSM	PSM
Lower Crystal Springs Dam Improvements	PN-4	PSM	PSM	PSM	PSM
Pulgas Balancing Reservoir Rehabilitation	PN-5	LS	PSM	PSM	PSM
San Francisco Region					
San Andreas Pipeline No. 3 Installation	SF-1	PSM	PSM	PSM	PSM
Groundwater Projects	SF-2	PSM	PSM	PSM	PSM
Recycled Water Projects	SF-3	PSM	PSM	PSM	PSM

LS = Less than Significant impact, no mitigation required
PSM= Potentially Significant impact, can be mitigated to less than significant

All utility lines that could be disrupted during pipeline construction would be identified during the project design phase. As a condition of approval for either a utility excavation permit or an encroachment permit, the SFPUC would prepare a detailed engineering and construction plan that identifies construction techniques and protective measures to minimize impacts on utilities.

Tunnels. Unlike pipeline projects, tunnel projects are generally not expected to interfere with utility services, since new tunnels would not be constructed within utility corridors. However, potential impacts on utilities associated with tunnel construction could occur at the tunnel entry and exit portal locations, which would serve as the construction staging areas. Utilities could be adversely affected if portals were located within existing utility corridors.

Vaults, Valve Lots, and Crossover Facilities. The WSIP includes the construction of vaults, valve lots, and crossover facilities at isolated locations near existing SFPUC facilities. These new facilities would be partially or completely buried. Impacts on utilities could occur during project construction, as subsurface activity has the potential to interfere with existing utilities and could result in interruptions in service.

Pump Stations. The WSIP projects would include the construction of new pump stations and upgrades to existing pump stations. New pump stations could result in an adverse effect on the provision of utilities if construction interfered with established utility lines and interrupted services. Typically, construction would be scheduled such that service to customers could be maintained without interruption.

Treatment Facilities. The WSIP would upgrade and expand treatment facilities at two existing treatment plants as well as at the system's primary disinfection facility, in addition to constructing a new secondary disinfection facility. Upgrades at existing treatment plants would occur within the property boundaries and would not affect offsite utility services. Potential impacts associated with the provision of utilities would depend on site locations in relation to established utility lines. Typically, construction would be scheduled such that service to customers could be maintained without interruption.

Storage Facilities. WSIP projects related to water storage facilities include improvements to reservoirs and dams. For most reservoirs, construction activities would be limited to the installation of new pumping and electrical equipment; however, for the Pulgas Balancing Reservoir project (PN-5), rehabilitation work would include replacing the Pulgas Channel. Dam improvement projects include raising the dam parapet wall at Lower Crystal Springs Dam (PN-4) and replacing Calaveras Dam (SV-2). During construction at storage facilities, interruptions in water service to SFPUC customers are not expected, as the SFPUC would plan for alternative water service during project planning and construction phasing, as necessary. Also, construction would be scheduled such that service to customers could be maintained without interruption. Thus, the level of service during a planned outage would remain unchanged from existing conditions.

San Joaquin Region

Impact 4.11-1: Potential temporary damage to or disruption of existing regional and local public utilities		
Advanced Disinfection	SJ-1	LS
Lawrence Livermore	SJ-2	LS
SJPL System	SJ-3	PSM
SJPL Rehabilitation	SJ-4	LS
Tesla Portal Disinfection	SJ-5	LS

Of the projects in this region, the SJPL System project (SJ-3) would have the greatest potential to result in temporary adverse impacts on utility services. The SJPL System project would entail construction of a new pipeline and two crossover facilities. Pipeline construction (and associated staging areas) could temporarily interrupt the provision of utility services, resulting in *potentially significant* impacts. Potential impacts on services and utilities would be evaluated in more detail as part of separate, project-level CEQA review for this project. Implementation of SFPUC Construction Measure #1 (neighborhood noticing) and identification of public utility lines prior to commencing construction (Measures 4.11-1a through 4.11-1h) would reduce this impact to a less-than-significant level.

The proposed water treatment projects (Advanced Disinfection, SJ-1; Lawrence Livermore, SJ-2; and Tesla Portal Disinfection, SJ-5) and SJPL Rehabilitation project (SJ-4), would replace existing facilities with new facilities to increase system reliability and improve the supply of water to SFPUC retail and wholesale customers. These facilities would be constructed within the SFPUC's existing right-of-way on sites that already have power connections. The SFPUC would phase construction to ensure that operations would not be interrupted during construction. With implementation of SFPUC Construction Measure #1 (neighborhood noticing), potential impacts on existing regional and local public utilities from these four projects would be *less than significant*.

Sunol Valley Region

Impact 4.11-1: Potential temporary damage to or disruption of existing regional and local public utilities		
Alameda Creek Fishery	SV-1	PSM
Calaveras Dam	SV-2	PSM
40-mgd Treated Water	SV-3	PSM
New Irvington Tunnel	SV-4	PSM
Treated Water Reservoirs	SV-5	LS
SABUP	SV-6	PSM

Four of the five WSIP projects in the Sunol Valley Region (Alameda Creek Fishery, SV-1; Calaveras Dam, SV-2; the pipeline portion of the 40-mgd Treated Water project, SV-3; New Irvington Tunnel, SV-4; and SABUP, SV-6) could conflict with existing local and regional utilities. Although these water improvement projects also have the potential to disrupt water services delivered to SFPUC customers, appropriate measures would be incorporated into these projects to ensure that construction activities would not result in service interruption. While these projects have various components, the pipeline component would have the greatest potential to conflict with existing utilities. Underground utility lines in this region include the Chevron pipeline, which transports refined petroleum products, and PG&E natural gas and underground electrical transmission lines.

Construction of these four WSIP projects could cause temporary service disruptions of these water and utility lines (as described above) or potential safety hazards, resulting in *potentially significant* impacts. Implementation of SFPUC Construction Measure #1 (neighborhood noticing) and identification of public utility lines prior to commencing construction (Measures 4.11-1a through 4.11-1h) would reduce these impacts to a less-than-significant level.

The Treated Water Reservoirs project (SV-5) would be constructed in a previously undisturbed area adjacent to the Sunol Valley Water Treatment Plant, and this project is not expected to result in water or utility service interruptions. With implementation of SFPUC Construction Measure #1 (neighborhood noticing), potential impacts on existing regional and local public utilities would be *less than significant*.

Bay Division Region

Impact 4.11-1: Potential temporary damage to or disruption of existing regional and local public utilities		
BDPL Reliability Upgrade	BD-1	PSM
BDPL 3 and 4 Crossovers	BD-2	PSM
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	PSM

Construction in this region associated with pipelines, tunnels, and valve lots or vaults (as described above) would result in potential impacts on utility service. Although most construction would occur within SFPUC rights-of-way or within existing SFPUC facilities, all of the projects in this region (BDPL Reliability Upgrade, BD-1; BDPL 3 and 4 Crossovers, BD-2; and BDPL 3 and 4 Seismic Upgrade at Hayward Fault, BD-3) have the potential to traverse or encroach on existing utility corridors because much of this area is urbanized. The project could result in *potentially significant* (although temporary) service disruptions where such conflicts occur. Implementation of SFPUC Construction Measure #1 (neighborhood noticing) and identification of public utility lines prior to commencing construction (Measures 4.11-1a through 4.11-1h) would reduce these impacts to a less-than-significant level.

Peninsula Region

Impact 4.11-1: Potential temporary damage to or disruption of existing regional and local public utilities		
Baden and San Pedro Valve Lots	PN-1	LS
CS/SA Transmission	PN-2	PSM
HTWTP Long-Term	PN-3	LS
Lower Crystal Springs Dam	PN-4	PSM
Pulgas Balancing Reservoir	PN-5	LS

The CS/SA Transmission (PN-2) and Lower Crystal Springs Dam (PN-4) projects could cause temporary utility disruptions, a *potentially significant* impact. Implementation of SFPUC Construction Measure #1 (neighborhood noticing) and identification of public utility lines prior to commencing construction (Measures 4.11-1a through 4.11-1h) would reduce this impact to a less-than-significant level.

The other projects in this region (Baden and San Pedro Valve Lots, PN-1; HTWTP Long-Term, PN-3; and Pulgas Balancing Reservoir, PN-5) would involve repair, improvement, or expansion of existing water facilities and would occur in areas that are already developed with SFPUC water facilities. Therefore, these projects are not expected to cause impacts on offsite utility systems. With implementation of SFPUC Construction Measure #1 (neighborhood noticing), potential impacts on existing regional and local public utilities from these three projects would be *less than significant*.

San Francisco Region

Impact 4.11-1: Potential temporary damage to or disruption of existing regional and local public utilities		
SAPL 3 Installation	SF-1	PSM
Groundwater Projects	SF-2	PSM
Recycled Water Projects	SF-3	PSM

All three projects in this region (SAPL 3 Installation, SF-1; Groundwater Projects, SF-2; and Recycled Water Projects, SF-3) have the potential to result in temporary adverse impacts on utility services. Some components of the Groundwater and Recycled Water Projects, such as wells, storage facilities, etc., would be located in developed areas, where the potential exists for encroachment on existing utilities. Project construction (and associated staging areas) could temporarily disrupt utility services, resulting in *potentially significant* impacts. Implementation of SFPUC Construction Measure #1 (neighborhood noticing) and identification of public utility lines prior to commencing construction (Measures 4.11-1a through 4.11-1h) would reduce these impacts to a less-than-significant level.

Impact 4.11-2: Temporary adverse effects on solid waste landfill capacity.

Construction of the WSIP projects could result in the generation of a large volume of waste materials; if the total amount were disposed of in local landfills, these materials could potentially exceed the daily tonnage limit of these landfills and/or adversely affect landfill capacity. These waste materials include construction debris, demolition materials, and excavated spoils. The largest potential source of solid waste would be excavated soil. Every landfill listed in Table 4.11-3 is permitted to accept construction/demolition waste, including clean soil. Four landfills (Newby Island Landfill in Santa Clara County, Altamont Landfill and Resource Recovery and Vasco Road Sanitary Landfill in Alameda County, and Forward Landfill, Inc. in San Joaquin County) are permitted to accept contaminated soil. The specific quantity and quality of solid waste to be disposed would be determined during a condition assessment for each project. Due to the economic value of clean excavated soil and the cost of landfill disposal, this analysis assumes at least 50 percent of excavation/spoils would be diverted from landfills and reused as landfill or agricultural cover, backfilled onsite, or recycled.[2]

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[2] This rate of diversion from landfills would be consistent with the California Integrated Waste Management Act of 1989, which requires all California cities and counties to implement programs to reduce, recycle, and compost at least 50 percent of wastes by the year 2000 and divert at least 75 percent by 2010. These are general guidelines, and percentages would vary depending on waste types, etc. Also, diversion rates for the WSIP projects could vary substantially, since some projects, like Calaveras Dam (SV-2), provide for onsite disposal of most of their own spoils.

Table 4.11-5 indicates the estimated amount of excavated soils in cubic yards (whether or not demolition would be required for each project) and provides additional information on disposal. Assuming a 50 percent diversion rate, the estimated total volume of excavated material to be disposed of offsite for all WSIP projects combined would be approximately 2,903,157 cubic yards. There would be approximately 374,229,941 cubic yards of remaining capacity in nearby landfills, as identified in Table 4.11-3. The proposed volume of excavated material under the WSIP is less than approximately 1 percent of the total existing landfill capacity in the WSIP study area. Furthermore, when the estimated disposal amount for the Central Valley projects is compared to the available capacity of landfills in San Joaquin and Stanislaus Counties, these projects would account for 1 to 2 percent of capacity. The WSIP projects in the four Bay Area counties would similarly account for 1 to 2 percent of the landfill capacity in the Bay Area. However, since the exact quantity and quality of disposed material and the daily disposal rates have not yet been determined for each project, the impacts on permitted landfill capacity are conservatively considered to be *potentially significant*. Development of a waste management or recycling plan (Measure 4.11-2) would reduce this impact to a less-than-significant level.

San Joaquin Region

Impact 4.11-2: Temporary adverse effects on solid waste landfill capacity		
Advanced Disinfection	SJ-1	PSM
Lawrence Livermore	SJ-2	PSM
SJPL System	SJ-3	PSM
SJPL Rehabilitation	SJ-4	PSM
Tesla Portal Disinfection	SJ-5	PSM

Of the projects in this region, the SJPL System project (SJ-3) has the greatest potential to result in temporary adverse impacts on landfill capacity. This project would create approximately 424,000 cubic yards of excavation/spoils. Assuming a 50 percent diversion rate, the SJPL Rehabilitation project (SJ-4) could generate approximately 100,000 cubic yards. Due to the economic value of clean excavated soil, the cost of landfill disposal, and the availability of alternative receptor sites such as agricultural fields, this analysis assumes at least 50 percent of excavation/spoils generated in the San Joaquin Region would be reused onsite or used by nearby agricultural industries. This analysis also assumes that any solid waste disposal necessitated by the projects within this region would utilize nearby landfills, while spoils in other regions would use landfills in the Bay Area.

The estimated 262,000 cubic yards of solid waste generated in the San Joaquin Region would only use 1 to 2 percent of the existing regional landfill capacity in San Joaquin and Stanislaus Counties. However, since the exact quantity and quality of disposed material and daily disposal rates have not yet been determined, the impacts on permitted landfill capacity from all of the projects in the San Joaquin Region are conservatively considered to be *potentially significant*. Development of a waste management or recycling plan (Measure 4.11-2) would reduce this impact to a less-than-significant level.

TABLE 4.11-5
WSIP SPOIL ESTIMATES AND DISPOSAL SITE INFORMATION

Project No.	Project Name	Excavation/ Spoils (cubic yards)[a]	Demolition Required[a]	Disposal Information[a,b]	Offsite Disposal Estimate (cubic yards)[c]
SJ-1	Advanced Disinfection	TBD	TBD	No additional borrow or disposal sites.	Part or all of the spoils to be disposed onsite or used in nearby agricultural operations.
SJ-2	Lawrence Livermore Supply Improvements	TBD	TBD	TBD	Part or all of spoils to be disposed onsite or used in nearby agricultural operations.
SJ-3	San Joaquin Pipeline System	424,000	TBD	Clean spoils might be stockpiled on right-of-way, and adjacent owners could be allowed to move spoils to adjacent agricultural uses.	Part or all of spoils to be disposed onsite or used in nearby agricultural operations. Estimate for analysis: 50% disposed offsite = 212,000 cubic yards
SJ-4	San Joaquin Pipeline Rehabilitation	100,000	None	No additional borrow or disposal sites.	Part or all of spoils to be disposed onsite or used in nearby agricultural operations. Estimate for analysis: 50% disposed offsite = 50,000 cubic yards
SJ-5	Tesla Portal Disinfection Station	TBD	TBD	TBD	Part or all of spoils to be disposed onsite or used in nearby agricultural operations.
SV-1	Alameda Creek Fishery Enhancement	TBD	TBD	TBD	—
SV-2	Calaveras Dam Replacement	4,000,000	Yes	Seven borrow areas (totaling over 222 acres).	Most or all of spoils to be disposed of onsite. Estimate for analysis: 50% disposed offsite = 2,000,000 cubic yards
SV-3	Additional 40-mgd Treated Water Supply	100,000	No	TBD	Estimate for analysis: 50% disposed offsite = 50,000 cubic yards
SV-4	New Irvington Tunnel	186,175	Yes	Up to four spoils disposal areas are proposed. Spoils could be transported to one of these areas by conveyor belt.	Most or all of spoils to be disposed of onsite. Estimate for analysis: 50% disposed offsite = 93,087 cubic yards
SV-5	SVWTP – Treated Water Reservoirs	300,000	No	TBD	Estimate for analysis: 50% disposed offsite = 150,000 cubic yards
SV-6	San Antonio Backup Pipeline	37,000	No	Borrow/disposal sites could be located on undeveloped SFPUC land.	Estimate for analysis: 50% disposed offsite = 18,500 cubic yards

TABLE 4.11-5 (Continued)
WSIP SPOIL ESTIMATES AND DISPOSAL SITE INFORMATION

Project No.	Project Name	Excavation/ Spoils (cubic yards)[a]	Demolition Required[a]	Disposal Information[a,b]	Offsite Disposal Estimate (cubic yards)[c]
BD-1	Bay Division Pipeline Reliability Upgrade	434,000	Yes	Portions of the section of Bay Division Pipeline No. 1 between Edgewood Valve Lot and Pulgas Valve Lot would be removed. Potential disposal sites for tunnel muck include salt ponds near Dumbarton Strait and South Bay Salt Pond Restoration Project and nearby landfills.	Estimate for analysis: 50% disposed offsite = 217,000 cubic yards
BD-2	BDPL Nos. 3 and 4 Crossovers	43,500	TBD	TBD	Estimate for analysis: 50% disposed offsite = 21,750 cubic yards
BD-3	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault	55,300	No	No additional borrow or disposal sites.	Estimate for analysis: 50% disposed offsite = 27,650 cubic yards
PN-1	Baden and San Pedro Valve Lots Improvements	4,970	Yes	TBD	Estimate for analysis: 50% disposed offsite = 2,485 cubic yards
PN-2	Crystal Springs/San Andreas Transmission Upgrade	Up to 9,000 cubic yards	TBD	TBD	Estimate for analysis: 50% disposed offsite = 4,500 cubic yards
PN-3	HTWTP Long-Term Improvements	Not specified	Not specified	TBD	Unknown
PN-4	Lower Crystal Springs Dam Improvements	21,000	Yes	TBD	Estimate for analysis: 50% disposed offsite = 10,500 cubic yards
PN-5	Pulgas Balancing Reservoir Rehabilitation	TBD	TBD	N/A	Unknown
SF-1	San Andreas Pipeline No. 3 Installation	44,170	Yes	N/A	Estimate for analysis: 50% disposed offsite = 22,085 cubic yards
SF-2	Groundwater Projects	TBD	TBD	N/A	Unknown
SF-3	Recycled Water Projects	47,200	TBD	TBD	Estimate for analysis: 50% disposed offsite = 23,600 cubic yards
TOTAL					**2,903,157 cubic yards**

TBD = To be determined; N/A = Not Available or Not Applicable

[a] Information from Table C.4 in Appendix C.
[b] Information from Table C.1 in Appendix C.
[c] For this analysis, a conservative estimate was made that 50 percent of the excavated soil would be disposed of in landfills.

SOURCES: SFPUC, 2006; ESA, 2006.

Sunol Valley Region

Impact 4.11-2: Temporary adverse effects on solid waste landfill capacity		
Alameda Creek Fishery	SV-1	PSM
Calaveras Dam	SV-2	PSM
40-mgd Treated Water	SV-3	PSM
New Irvington Tunnel	SV-4	PSM
Treated Water Reservoirs	SV-5	PSM
SABUP	SV-6	PSM

The construction of a number of the WSIP projects within the Sunol Valley Region (Calaveras Dam, SV-2; 40-mgd Treated Water, SV-3; New Irvington Tunnel, SV-4; and Treated Water Reservoirs, SV-5; SABUP, SV-6) would require offsite disposal in nearby landfills. Due to the economic value of clean excavated soil and the cost of landfill disposal, the following estimates assume at least 50 percent of excavation/spoils would be diverted from landfills to be reused as landfill cover, backfill, or recycled for further use.

The Calaveras Dam project (SV-2) would generate approximately 4,000,000 cubic yards of excavation/spoils. Although most of the spoils are proposed for onsite disposal in the dam vicinity, this analysis conservatively assumes up to 2,000,000 cubic yards could be disposed of in a nearby landfill. The 40-mgd Treated Water project (SV-3) would create approximately 100,000 cubic yards of excavation/spoils, of which up to 50,000 cubic yards could be disposed of in a nearby landfill. The New Irvington Tunnel project (SV-4) would create approximately 186,175 cubic yards of excavation/spoils, of which up to 93,087 cubic yards could be disposed in a nearby landfill. The Treated Water Reservoirs (SV-5) would create approximately 300,000 cubic yards of excavation/spoils, of which up to 150,000 cubic yards could be disposed in a nearby landfill. The SABUP project (SV-6) would create approximately 37,000 cubic yards of excavation/spoils, of which up to 18,500 cubic yards could be disposed in a nearby landfill. Individual landfill disposal requirements and potential impacts of these projects would be evaluated in more detail as part of separate, project-level CEQA review. More detailed project design information would be necessary to determine the expected excavation/spoils quantities and disposal information for the Alameda Creek Fishery project (SV-1).

The estimated 2.3 million cubic yards of solid waste that would be generated from the Sunol Valley Region projects would use approximately 1 to 2 percent of the existing landfill capacity in the four Bay Area counties. However, since the exact quantity and quality of disposed material and daily disposal rates have not yet been determined, the impacts on permitted landfill capacity are conservatively considered to be *potentially significant*. However, development of a waste management or recycling plan (Measure 4.11-2) would reduce this impact to a less-than-significant level.

Bay Division Region

Impact 4.11-2: Temporary adverse effects on solid waste landfill capacity		
BDPL Reliability Upgrade	BD-1	PSM
BDPL 3 and 4 Crossovers	BD-2	PSM
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	PSM

The construction of all three WSIP projects within the Bay Division Region (BDPL Reliability Upgrade, BD-1; BDPL 3 and 4 Crossovers, BD-2; and BDPL 3 and 4 Seismic Upgrade at Hayward Fault, BD-3) would require offsite disposal in nearby landfills. Due to the economic value of clean excavated soil and the cost of landfill disposal, the following estimates assume at least 50 percent of excavation/spoils would be diverted from landfills to be reused as landfill cover, backfill, or recycled for further use.

The BDPL Reliability Upgrade project (BD-1) would create approximately 434,000 cubic yards of excavation/spoils, of which up to 217,000 cubic yards could be disposed of in a nearby landfill. The BDPL 3 and 4 Crossovers project (BD-2) would create approximately 43,500 cubic yards of excavation/spoils, of which up to 21,750 cubic yards could be disposed of in a nearby landfill. The BDPL 3 and 4 Seismic Upgrade at Hayward Fault project (BD-3) would create approximately 55,300 cubic yards of excavation/spoils, of which up to 27,650 cubic yards could be disposed of in a nearby landfill. Individual landfill disposal requirements and potential impacts of these projects would be evaluated in more detail as part of separate, project-level CEQA review for each project.

The estimated 266,400 cubic yards of solid waste generated from the Bay Division Region projects would use only 1 to 2 percent of the existing landfill capacity in the four Bay Area counties. However, since the exact quantity and quality of disposed material and daily disposal rates have not yet been determined, the impacts on permitted landfill capacity are conservatively considered to be *potentially significant*. Development of a waste management or recycling plan (Measure 4.11-2) would reduce this impact to a less-than-significant level.

Peninsula Region

Impact 4.11-2: Temporary adverse effects on solid waste landfill capacity		
Baden and San Pedro Valve Lots	PN-1	PSM
CS/SA Transmission	PN-2	PSM
HTWTP Long-Term	PN-3	PSM
Lower Crystal Springs Dam	PN-4	PSM
Pulgas Balancing Reservoir	PN-5	PSM

The construction of three WSIP projects in the Peninsula Region (Baden and San Pedro Valve Lots, PN-1; CS/SA Transmission, PN-2; and Lower Crystal Springs Dam, PN-4) would require offsite disposal in nearby landfills. Due to the economic value of clean excavated soil and the cost of landfill disposal, the following estimates assume at least 50 percent of excavation/spoils would be diverted from landfills to be reused as landfill cover, backfill, or recycled for further use.

The Baden and San Pedro Valve Lots project would create approximately 4,970 cubic yards of excavation/spoils, of which approximately 2,485 cubic yards could be disposed of in a nearby landfill. The CS/SA Transmission project would create up to 9,000 cubic yards of excavation/spoils, of which up to 4,500 cubic yards could be disposed of in a nearby landfill. The Lower Crystal Springs Dam project would create approximately 21,000 cubic yards of excavation/spoils, of which up to 10,500 cubic yards could be disposed of in a nearby landfill. Individual landfill disposal requirements and potential impacts of these projects would be evaluated in more detail as part of separate, project-level CEQA review. More detailed project design information is necessary to determine the expected excavation/spoils quantities and disposal information for the HTWTP Long-Term (PN-3) and Pulgas Balancing Reservoir (PN-5) projects.

The estimated 15,000 cubic yards of solid waste generated from the Peninsula Region projects would use only 1 to 2 percent of the existing landfill capacity in the Bay Area. However, since the exact quantity and quality of disposed material and daily disposal rates have not yet been determined, the impacts on permitted landfill capacity are conservatively considered to be *potentially significant*. Development of a waste management or recycling plan (Measure 4.11-2) would reduce this impact to a less-than-significant level.

San Francisco Region

Impact 4.11-2: Temporary adverse effects on solid waste landfill capacity		
SAPL 3 Installation	SF-1	PSM
Groundwater Projects	SF-2	PSM
Recycled Water Projects	SF-3	PSM

Two projects in the San Francisco Region (SAPL 3 Installation, SF-1, and Recycled Water Projects, SF-3) would require offsite disposal in nearby landfills. Due to the economic value of clean excavated soil and the cost of landfill disposal, the following estimates assume at least 50 percent of excavation/spoils would be diverted from landfills to be reused as landfill cover, backfill, or recycled for further use.

The SAPL 3 Installation project would create up to 44,170 cubic yards of excavation/spoils, of which up to 22,085 cubic yards could be disposed of in a nearby landfill. The Recycled Water Projects would create approximately 47,200 cubic yards of excavation/spoils, of which up to 23,600 cubic yards could be disposed of in a nearby landfill. Individual landfill disposal requirements and potential impacts of these projects would be evaluated in more detail as part of separate, project-level CEQA review. More detailed project design information is necessary to determine the expected excavation/spoils quantities and disposal information for the Groundwater Projects (SF-2).

The estimated 45,685 cubic yards of solid waste generated from the San Francisco Region projects would use only 1 to 2 percent of the existing regional landfill capacity. However, since the exact quantity and quality of disposed material and daily disposal rates have not yet been determined, the impacts on permitted landfill capacity are conservatively considered to be *potentially significant*. Development of a waste management or recycling plan (Measure 4.11-2) would reduce this impact to a less-than-significant level.

Impact 4.11-3: Impacts related to compliance with federal, state, and local statutes and regulations related to solid waste.

All Regions

The CIWMB found that the jurisdictions within the WSIP study area achieved or nearly achieved the 50 percent solid waste diversion goal for 2002 (CIWMB, 2007a). Construction of the WSIP projects would result in the generation of a large volume of waste materials; if the total amount were disposed of in local landfills, these materials could potentially exceed the daily tonnage limit of these landfills or lower diversion rates for the purpose of calculating compliance with the California Integrated Waste Management Act. The exact quantity of waste materials to be disposed of in nearby landfills (which includes construction debris, demolition materials, and excavation spoils) would not be known until each project undergoes a detailed evaluation as part of separate, project-level CEQA review. In the absence of exact disposal quantities, WSIP compliance with local plans, policies, programs, and ordinances regarding solid waste management cannot be determined. Therefore, impacts related to compliance with federal, state, and local statutes are conservatively considered to be *potentially significant*. Development of a waste management or recycling plan (Measure 4.11-2) would reduce this impact to a less-than-significant level.

Siting Impacts

Need for Relocation

Impact 4.11-4: Impacts related to the relocation of utilities.

Implementation of the WSIP would result in new construction or improvements to existing pipelines, tunnels, vaults, valve lots, crossovers, and water treatment and storage facilities. Many of these projects would occur at existing SFPUC facility sites or within SFPUC rights-of-way. Construction activities associated with the WSIP projects could affect utility infrastructure by requiring the relocation of existing facilities. The relocation of facilities could result in adverse effects related to the following environmental resource topics: hydrology, biological resources, cultural resources, traffic, and air quality, among others. All subsurface and aboveground utility lines and cables requiring relocation during construction of the WSIP projects would be identified during the predesign and permitting stages for each project.

Pipelines. Of the WSIP project types, pipeline projects have the greatest potential to require the relocation of utility lines, since construction activity would encroach on existing utility corridors. Utility corridors generally include multiple utility lines (i.e., water, sewer, storm drain, and natural gas pipelines, and electricity, telephone, and television cables). All utility lines that require relocation as a result of WSIP construction would be identified during project design.

Tunnels. Tunnel projects could require the relocation of utility lines near the tunnel entry and exit shaft/portal locations, which would serve as construction staging areas.

Vaults, Valve Lots, and Crossover Facilities. The construction of vaults, valve lots, and crossover would occur at isolated locations near existing SFPUC facilities. These facilities could require the relocation of utility lines, depending on project siting.

Other Facilities. The WSIP projects that would occur at discrete locations include pump stations, treatment facilities, and storage facilities. Upgrades at existing facilities are not expected to require the relocation of offsite utilities, since the projects would be located at existing facility sites or within the SFPUC right-of-way. These sites already include development and utility connections. For new project siting, potential impacts could result if utility lines needed to be relocated.

All Regions

All of the WSIP projects have the potential to require the relocation of subsurface or aboveground utilities and cables during construction. The extent of utility relocation cannot be determined until that time, but would be identified during the predesign and permitting stages for each project. The impact associated with the relocation of utilities could be temporary or permanent, thereby resulting in *potentially significant* impacts. Implementation of SFPUC Construction Measure #1 (neighborhood noticing) and identification of public utility lines prior to commencing construction (Measures 4.11-1a through 4.11-1h) would reduce this impact to a less-than-significant level.

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4.12 Recreational Resources

4.12 Recreational Resources

4.12.1 Setting

Regional Overview

This section provides an overview of the distribution and type of park and recreational facilities within the WSIP study area (which extends from Oakdale Portal on the SFPUC regional water system in western Tuolumne County, west to San Francisco) and describes the specific recreational facilities that lie in the immediate vicinity of WSIP projects. This section also identifies goals and policies aimed at protecting and enhancing recreational resources (including parks and recreational facilities) that have been adopted by the local jurisdictions in which portions of the WSIP projects would be located. (Chapter 5, WSIP Water Supply and System Operations, describes recreation areas, facilities, and activities east of the WSIP study area in the Tuolumne River system and the eastern end of the SFPUC regional water system.)

There is a wide variety of recreational resources in the region, from small neighborhood parks designed for local residents to large regional parks that attract tourists from across the nation or around the world. Recreational resources also include formally designated parks and trails, open spaces where dispersed activities such as hiking and bird watching can take place, as well as bodies of water where boating, fishing, or swimming can be enjoyed. The WSIP study area also includes regional amenities such as San Francisco Bay and the Bay Trail, and numerous parks and recreational facilities managed by local jurisdictions, including cities, counties, and special park and open space districts. **Figure 4.12-1** shows the locations of major parks, local parks, and other recreational resources that could be affected by the WSIP.

Description of Recreational Resources by Region

San Joaquin Region

Tuolumne County

In Tuolumne County, the existing Oakdale Portal and the easternmost portion of the proposed SJPL System project (SJ-3) are located within the San Joaquin Region. However, no significant recreational resources are located near this segment of the regional system. Chapter 5 presents more information on recreational resources in areas farther east in Tuolumne County, where the regional system begins.

Stanislaus County

Stanislaus County manages 25 park and recreational areas, including five regional parks, eight fishing access points, and 11 neighborhood parks in the unincorporated portions of the county (Stanislaus County, 2007). Only two WSIP projects—the SJPL System (SJ-3) and SJPL Rehabilitation (SJ-4)—would involve construction in Stanislaus County (segments of the San Joaquin Pipeline west of Oakdale Portal). Chapter 5 describes recreational resources along the lower Tuolumne River in Stanislaus County that could be affected by the proposed WSIP water supply or system operations.

San Joaquin County

San Joaquin County manages numerous parks and recreational facilities, including nine regional parks and 11 community and neighborhood parks. There are also two state parks in the county, as well as the San Joaquin National Wildlife Refuge. The refuge, located where the Tuolumne and Stanislaus Rivers meet the San Joaquin River, is an important wintering ground for migratory birds (San Joaquin County Parks and Recreation, 2007a; 2007b; USFWS, 2007b).

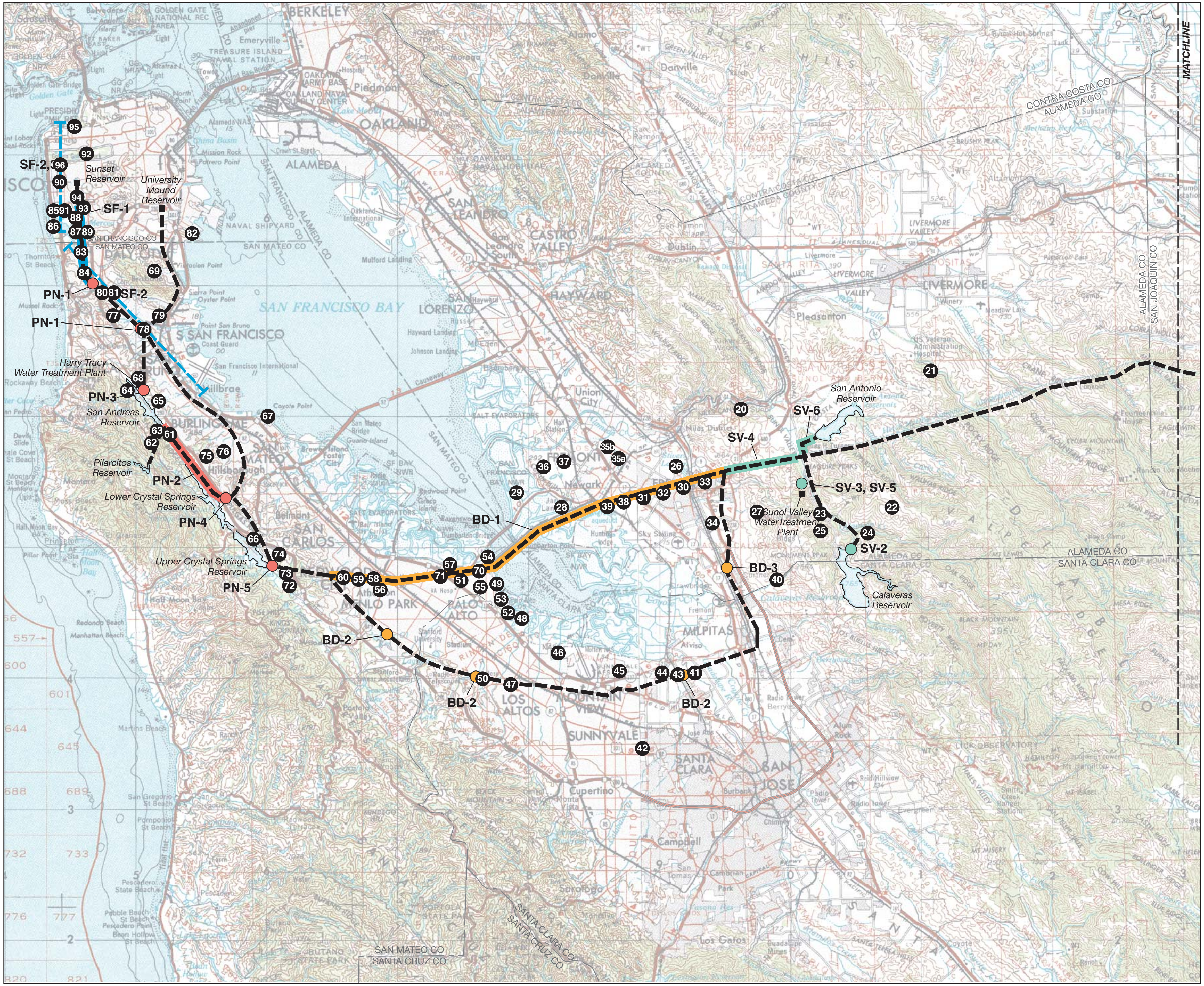
City of Modesto. The SJPL Rehabilitation project (SJ-4) could involve work on segments of pipeline that run beneath a three-mile-long linear park. This park, which extends from Semallon Drive to Sisk Road, has a developed asphalt bike path and greenway that follows the SFPUC right-of-way (Hetch Hetchy Trail). Two other city parks abut this trail: Wesson Ranch Park near the eastern end and Chrysler 99 Park near the western end. Facilities at Wesson Ranch Park include baseball and soccer fields, trails, a playground, and restrooms. Facilities at Chrysler 99 Park include a full basketball court, bleachers, and trails. Tracy Golf and Country Club. The private Tracy Golf and Country Club is located on South Chrisman Road near Tesla Portal. I-580 passes over this 18-hole golf course, creating a unique design (The Golf Courses.net, 2007). The SJPL System (SJ-3) and SJPL Rehabilitation (SJ-4) projects could affect this facility.

Sunol Valley Region

Regional Parks and Open Space

Alameda Watershed. The SFPUC-managed portion of the Alameda watershed encompasses approximately 36,000 acres of land, with 23,000 acres in Alameda County and 13,000 acres in Santa Clara County. The City and County of San Francisco (CCSF) owns about 30 percent of the watershed, including the San Antonio and Calaveras Reservoirs, where no public access is allowed. The CCSF leases some watershed land to the East Bay Regional Park District (EBRPD) for public recreational use, as described below. Policy WA10 in the SFPUC's *Alameda Watershed Management Plan* specifies certain day-use activities that are allowed by permit, including use of the Sunol Water Temple for events and supervised public access to roads and trails (SFPUC, 2001). The following projects would be located in the Alameda watershed: Alameda Creek Fishery, SV-1; Calaveras Dam, SV-2; 40-mgd Treated Water, SV-3; Treated Water Reservoirs, SV-5; and SABUP; SV-6. A portion of the Irvington Tunnel runs through Alameda watershed lands, but the New Irvington Tunnel project (SV-4) would be located outside the watershed lands. Section 5.4, Alameda Creek Watershed Streams and Reservoirs, also discusses recreational resources in the Alameda watershed.

East Bay Regional Parks. The EBRPD has jurisdiction over numerous regional parks located in Alameda and Contra Costa Counties. Several major EBRPD facilities encompassing thousands of acres of parks and open space are clustered in the East County/Sunol Valley area, including Del Valle Regional Park, Ohlone Regional Wilderness, Sunol Regional Wilderness, Vargas Plateau Regional Preserve, and Mission Peak Regional Park. The long-term goal of the EBRPD is to adopt land use plans to guide the management and use of all of its facilities. The EBRPD has adopted a land use plan for Del Valle Regional Park; other land use plans are in draft form at various stages of planning.



20 Sunol Water Temple
21 Del Valle Regional Parks
22 Ohlone Regional Wilderness
23 Sunol Regional Wilderness
24 Little Yosemite
25 Alameda Creek
26 Vargas Plateau Regional Preserve
27 Mission Peak Regional Park
28 San Francisco Bay Trail
29 Don Edwards San Francisco Bay National Wildlife Refuge
30 Central Park
31 Azeveda Park
32 Noll Park (Knoll Park)
33 Mission San Jose Park
34 Warm Springs Recreation Center (Warm Springs Park)
35a Quarry Lakes Regional Recreation Area
35b Alameda Creek Regional Trail
36 Coyote Hills Regional Park
37 Ardenwood Regional Preserve
38 Birch Grove Park
39 Ash Street Park
40 Ed R. Levin County Park
41 Lower Guadalupe River Trail
42 Central Park
43 Lick Mill Park
44 Fairway Glen Park
45 Sunnyvale Baylands Park
46 Shoreline at Mountain View Regional Park
47 Adobe Creek
48 Palo Alto Baylands Nature Preserve
49 Cooley Landing
50 Gunn High School
51 Jack Farrell Park
52 Bell Street Park
53 Martin Luther King Jr. Park
54 Costano High School
55 Cesar Chavez High School
56 Burgess Park
57 Bayfront Park
58 Fleishman Park
59 Hawes Park
60 Red Morton Park
61 Crystal Springs Golf Course
62 Fifield-Cahill Ridge Trail
63 Sawyer Camp Trail
64 Sweeny Ridge Trail
65 San Andreas Trail
66 Crystal Springs Trail
67 Coyote Point Recreational Area
68 Junipero Serra Park
69 San Bruno Mountain State and County Park
70 Ravenswood Open Space Preserve
71 Flood Park
72 Edgewood Park Nature Preserve
73 Pulgas Ridge Open Space Preserve
74 Pulgas Water Temple
75 Burlingame Country Club
76 Hillsborough Country Club
77 SFPUC Linear Park
78 Orange Memorial Park
79 Paradise Valley Park
80 Sterling Park Community Center
81 Cypress Hills Golf Course
82 Candlestick Point State Recreation Area
83 David R. Rowe Park
84 Skate Park
85 Lake Merced, Harding Park Golf Course
86 Olympic Country Club
87 Lake Merced Golf and County Club
88 San Francisco Golf Club
89 San Francisco State University
90 West Sunset Playground
91 South Sunset Playground
92 Golden Gate Park
93 San Francisco Zoo
94 Pine Lake and Stern Grove Park
95 Lincoln Park Golf Course
96 Francis Scott Key School Playground

Existing System Corridor
Existing System Facility
Proposed Facility Corridor
Proposed Facility Site
Proposed Facility, General Location

Note: See Figure 4.1-2 for full Project Names

0 5
Miles

SOURCE: Mara Feeney & Associates, 2006; ESA + Orion JV, 2006; USGS 1978

SFPUC Water System Improvement Program . 203287

Figure 4.12-1a
Parks and Recreational Resources, San Francisco, Peninsula, Bay Division, and Sunol Regions

13 Fox Grove Regional Park
14 Tuolumne River Regional Park
15 Tracy Golf and Country Club
16 Hetch Hetchy Trail Linear Park
17 Wesson Ranch Park
18 Chrysler 99 Park
19 San Joaquin National Wildlife Refuge

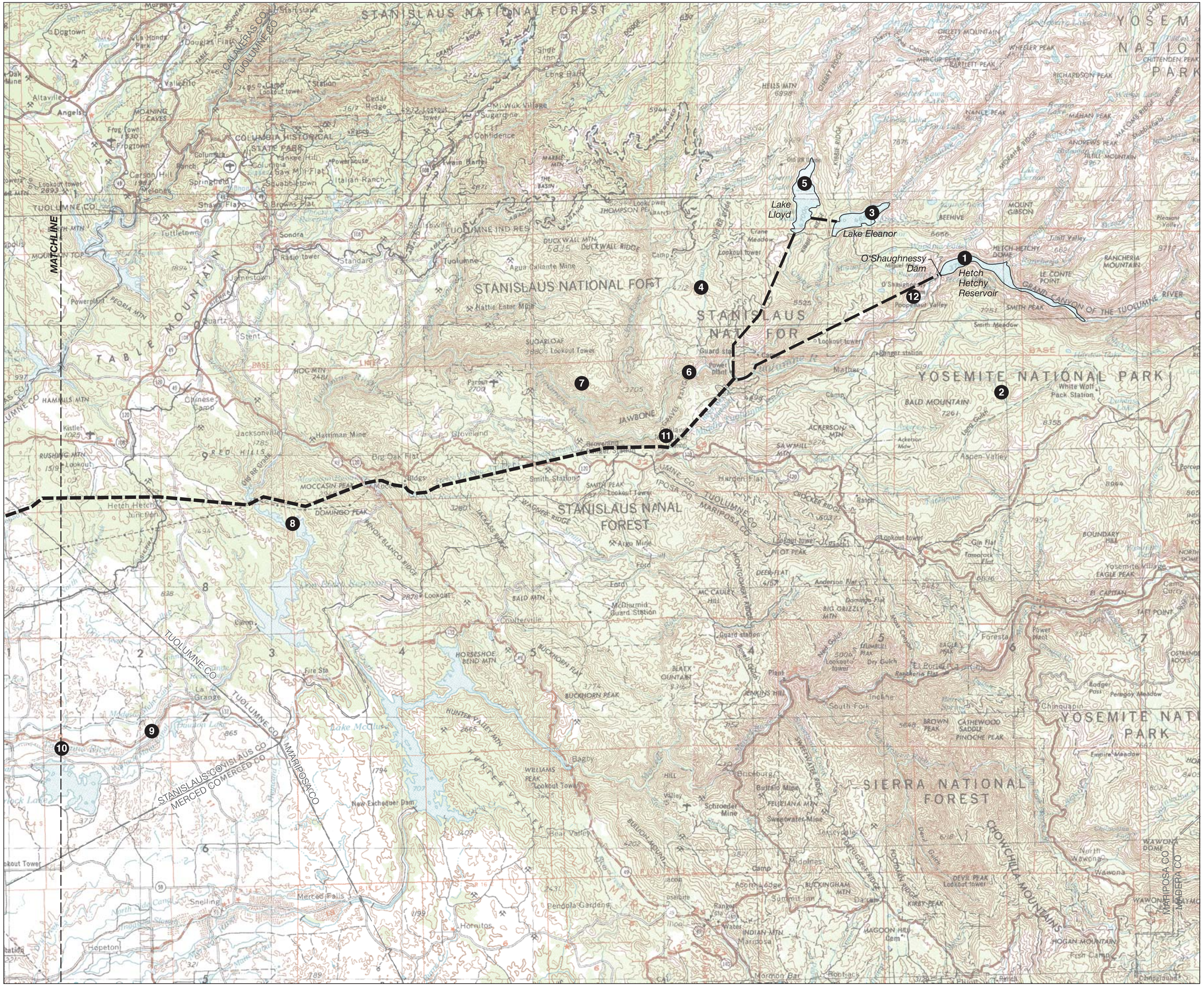
Existing System Corridor
Existing System Facility
Proposed Facility Corridor
Proposed Facility Site
Proposed Facility, General Location

Note: See Figure 4.1-2 for full Project Names

0 5
Miles

SOURCE: Mara Feeney & Associates, 2006; ESA + Orion JV, 2006; USGS 1969

Figure 4.12-1b
Parks and Recreational Resources,
San Joaquin Region



1 Hetch Hetchy Reservoir
2 Yosemite National Park
3 Lake Eleanor
4 Stanislaus National Forest
5 Cherry Reservoir (Lake Lloyd)
6 Cherry Creek Run (Tuolumne River)
7 Lumsden Run (Tuolumne River)
8 Don Pedro Reservoir and Recreation Area
9 LaGrange Regional Park
10 Turlock Lake State Recreation Area
11 Lumsden and South Fork Campgrounds
12 Poopenaut Valley

Existing System Corridor
Existing System Facility
Proposed Facility Corridor
Proposed Facility Site
Proposed Facility, General Location

Note: See Figure 4.1-2 for full Project Names

0 5
Miles

SOURCE: Mara Feeney & Associates, 2006; ESA + Orion JV, 2006; USGS 1970

SFPUC Water System Improvement Program . 203287

Figure 4.12-1c
Parks and Recreational Resources, Hetch Hetchy Region

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The 6,858-acre Sunol Regional Wilderness lies between San Antonio Reservoir and Calaveras Reservoir, with Alameda Creek running through it. Recreational activities in this wilderness area include hiking, bike riding, and horseback riding (EBRPD, 2007). Part of the Sunol Regional Wilderness is located on Alameda watershed lands leased from the CCSF. The Calaveras Dam project (SV-2) could affect this recreational area.

San Francisco Bay Area

San Francisco Bay and the Bay Trail span multiple WSIP regions.

San Francisco Bay. San Francisco Bay offers a wide variety of dispersed recreational opportunities for residents of and visitors to the counties and cities surrounding the bay. Approximately 40 publicly and privately owned marinas ring the bay, and there are numerous designated and informal access or launching points for boating, windsurfing, kayaking, jet-skiing, and swimming, as well as piers and other access locations for fishing. The preferred pipeline alignment for the BDPL Reliability Upgrade (BD-1) crosses the southern portion of San Francisco Bay, in an area used for recreational activities such as boating, kayaking, fishing, swimming, bird watching, and sightseeing.

The Bay Trail. Senate Bill 100, passed in 1987, directed the Association of Bay Area Governments (ABAG) to identify an alignment and develop a plan to create a public trail system encircling San Francisco Bay. The *Bay Trail Plan*, adopted by ABAG in 1989, proposed a continuous 400-mile corridor that would eventually link the shorelines of all nine Bay Area counties and 47 cities around San Francisco and San Pablo Bays. Since its adoption, the *Bay Trail Plan* has received widespread public support as a means of preserving and enhancing public access to the San Francisco Bay waterfront. Most of the jurisdictions along the proposed trail alignment have adopted the plan and incorporated the appropriate Bay Trail segments into their local plans and policies. When complete, the Bay Trail corridor will be 500 miles long.

Development of the Bay Trail is overseen by the Bay Trail Project, a nonprofit organization established in 1990. The Bay Trail Project does not own land or easements; instead, it encourages local jurisdictions to construct and maintain segments of the Bay Trail, often in partnership with other local nonprofit groups. Approximately 290 miles, or just over half of the envisioned trail, has been completed. Some portions of the Bay Trail are paved pathways, while others consist of dirt trails or sidewalks. The main trail, referred to as the “spine trail,” follows the San Francisco Bay shoreline to the extent possible. Where it is not able to follow the shoreline, “spur trails” provide access from the spine trail to points of interest along the waterfront. In addition, “connector trails” provide links to other nearby recreational facilities, residential neighborhoods and employment centers (Association of Bay Area Governments Bay Trail Project, 2005). Segments of the Bay Trail exist near the proposed pipeline alignments for the BDPL Reliability Upgrade (BD-1) project.

Bay Division Region

Regional Parks and Open Space

San Francisco Bay and the Bay Trail spans the WSIP's Bay Division, Peninsula, and San Francisco Regions.

Don Edwards San Francisco Bay National Wildlife Refuge. The Don Edwards San Francisco Bay National Wildlife Refuge, located on the eastern shore of San Francisco Bay, was the first urban national wildlife refuge in the United States. The refuge, established in 1974 and managed by the U.S. Fish and Wildlife Service, is located along the Pacific Flyway, which attracts millions of shorebirds and waterfowl annually. It encompasses 30,000 acres of open bay, salt pond, salt marshes, mudflats, and upland and vernal pool habitats in portions of San Mateo, Santa Clara, and Alameda Counties. The area attracts hundreds of thousands of visitors annually and offers hiking trails, boating, fishing, and hunting as well as interpretive programs, an environmental education center, and a visitor center (USFWS, 2007a). The preferred pipeline alignment for the BDPL Reliability Upgrade project (BD-1) crosses this refuge.

City of Fremont

The City of Fremont manages several recreational facilities located in or adjacent to the proposed alignment for the BDPL Reliability Upgrade project (BD-1), including Central Park, Azeveda Park, Noll Park, and Mission San Jose Park. The popular Central Park has playground areas, picnic sites, softball fields, snack bars, soccer fields, tennis courts, fishing, boat rentals, a boat launch, boat storage, walking trails, a golf driving-range, dog park, basketball courts, and a skate park. Central Park encompasses 450 acres, and Lake Elizabeth covers an additional 83 acres (City of Fremont, 2007a). Azeveda Park, located at 39450 Royal Palm Drive, is a neighborhood park and playground (City of Fremont, 2007b; Fremont Online.org, 2007a). Noll Park and Mission San Jose Parks are also neighborhood parks, located at 39600 Sundale Drive and 43545 Bryant Street, respectively. Mission San Jose Park, located behind Mission San Jose Elementary School, includes a playing field and baseball diamond (Fremont Online.org, 2007b). The BDPL Reliability Upgrade project could affect these parks. The Warm Springs Recreation Center, located at 47300 Fernald Street in Fremont, is a 6,000-square-foot center in a 12-acre park. It contains a multipurpose room and meeting room, and also has an outdoor gazebo (City of Fremont, 2007c). The BDPL 3 and 4 Seismic Upgrade at Hayward Fault (BD-3) and New Irvington Tunnel (SV-4) projects would also be located in Fremont.

City of Newark

There are 272 acres of park and recreational areas within Newark city limits and three important regional recreational areas adjacent to the city: Don Edwards San Francisco Bay National Wildlife Refuge, Coyote Hills Regional Park, and Ardenwood Regional Preserve (City of Newark, 1992). The BDPL Reliability Upgrade project (BD-1) could affect two community parks in Newark—Birch Grove Park and Ash Street Park. Birch Grove Park is located at 38080 Birch Street and contains approximately 15 acres. Facilities include play structures, a water element, a fenced softball playing field, basketball court, lighted tennis courts, picnic facilities, and restrooms (City of Newark, 2007). Ash Street Park, located at 37365 Ash Street, encompasses approximately six acres and includes play structures, softball practice fields, a basketball court, picnic facilities, restroom facilities, and a horseshoe pit. The privately operated Viola Blythe Community Center and a Head Start preschool facility are also situated on the park grounds (City of Newark, 2007). The BDPL Reliability Upgrade project could affect Birch Grove and Ash Street Parks.

Santa Clara County General Plan

The Santa Clara County General Plan envisions a “necklace of parks” composed of regional parks and community parks linked by recreational trails and scenic highways. Agencies working to achieve this goal include the Midpeninsula Regional Open Space District, the County Parks Department, the California Department of Parks and Recreation, and the Don Edwards San Francisco Bay National Wildlife Refuge (Santa Clara County, 1994). An overview of the recreational resources in Santa Clara County cities that could be affected by the WSIP projects is provided below.

City of Milpitas

Milpitas has approximately 160 acres of park and recreational facilities in the form of community, neighborhood, special-use, regional, and school parks as well as private recreational facilities. The 1,539-acre Ed R. Levin County Park, which lies on the border between Alameda and Santa Clara Counties, is partially within the city of Milpitas. This park offers areas for picnicking, fishing, hiking, cycling, horseback riding, and hang gliding (Santa Clara County Parks, 2007). An alternative site for the BDPL 3 and 4 Crossovers project (BD-2) would be located in Milpitas.

City of San Jose

San Jose has over 16,300 acres of public parkland within its sphere of influence. These parklands include federal, county, and city lands, the majority of which are County-owned hillside open space, creekside park chains, and the federally owned Don Edwards San Francisco Bay National Wildlife Refuge. The City manages approximately 4,000 acres of parks that form a “greenbelt” of open space around the urban area. Utility corridors and water supply reservoirs are an integral part of San Jose’s recreational resources (City of San Jose, 2005). The Lower Guadalupe River Trail is a six-mile trail along the Guadalupe River. The trail program is governed by the City of San Jose; however, portions of the trail extend into Santa Clara. Developed and planned portions of the trail are in the vicinity of the BDPL 3 and 4 Crossovers project (BD-2) (City of San Jose and Santa Clara Valley Water District, 2006).

City of Santa Clara

Santa Clara has 39 parks and playgrounds, providing 277 acres of municipal parkland and 458 acres of open space (City of Santa Clara, 2007). The largest park is the 52-acre Central Park. The City supports plans for a regional “park chain” along the Guadalupe River. A portion of the Hetch Hetchy Aqueduct traverses the northern part of the city, and this right-of-way corridor is designated as open space. A BDPL 3 and 4 Crossovers (BD-2) crossover facility would be located along the Guadalupe River in the vicinity of several small neighborhood parks, including Lick Mill Park and Fairway Glen Park (City of Santa Clara, 2002).

City of Sunnyvale

Sunnyvale has approximately 838 acres of parks and open space, of which 351 acres are owned by the City and 177 acres are owned by Santa Clara County (City of Sunnyvale, 1997). Sunnyvale's largest park is Baylands Park, which adjoins the Don Edwards San Francisco Bay National Wildlife Refuge. An alternative site for BDPL 3 and 4 Crossovers project (BD-2) would be located in the vicinity of this park. The Baylands Park encompasses approximately 200 acres of preserved wetlands and community park features. Over 70 acres are developed parkland, and the remainder is protected wetland. The Bay Trail passes along the north and eastern sides of the park (City of Sunnyvale, 2007).

City of Mountain View

Mountain View has 21 recreational facilities encompassing 768 acres, the largest of which is the Shoreline at Mountain View Regional Park (consisting of 662 acres). The Hetch Hetchy Aqueduct runs through the city, and Rex Manor mini-park is located along this right-of-way corridor (City of Mountain View, 1992). An alternative site for BDPL 3 and 4 Crossovers project (BD-2) would be located in Mountain View.

City of Los Altos

Los Altos has 32 acres of parks and an additional 127 acres of open space (City of Los Altos, 2002). An alternative location for one of the BDPL 3 and 4 Crossovers (BD-2) crossover facilities would be located near Adobe Creek in Los Altos, where there is a bike trail along the Hetch Hetchy Aqueduct.

City of Palo Alto

According to the City of Palo Alto, the city has a total of 4,358 acres of parkland and open space areas, including 32 urban parks encompassing approximately 200 acres and several large open-space and nature preserves. Foothill Park is approximately 1,400 acres and the Arastradero Preserve is approximately 610 acres (City of Palo Alto, 2007). The City of Palo Alto owns the wetlands south of Cooley Landing (in East Palo Alto) in the vicinity of the BDPL Reliability Upgrade (BD-1) pipeline alignment (City of Palo Alto, 1998). A BDPL Nos. 3 and 4 Crossovers (BD-2) crossover facility would be adjacent to the sports fields at Gunn High School.

City of East Palo Alto

The City of East Palo Alto owns and operates three parks, encompassing of a total of 14 acres. These parks include Jack Farrell Park, Bell Street Park, and Martin Luther King Jr. Park. Jack Farrell Park is the closest city park to the Hetch Hetchy Aqueduct (City of East Palo Alto, 1999); however, Costano School and Cesar Chavez School are also located near the aqueduct as well as near the proposed BDPL Reliability Upgrade (BD-1) alignment.

City of Menlo Park

The City of Menlo Park owns and operates approximately 231 acres of parkland. Most of its recreational facilities are concentrated at the Burgess Park Complex within the Civic Center. The largest City-maintained park is Bayfront Park, which provides 155 acres for passive recreational use (City of Menlo Park, 1994). The BDPL Reliability Upgrade project (BD-1) would be located in Menlo Park.

City of Redwood City

Redwood City owns and operates 30 parks, including small neighborhood parks, larger multi-use parks, a dog park, a skate park, and two outdoor pools (City of Redwood City, 2007a). The BDPL Reliability Upgrade project (BD-1) is in the vicinity of Fleishman Park, Hawes Park, and Red Morton Park. The 0.64-acre Fleishman Park has play equipment, a play area, picnic area, barbeque pits, and restrooms (City of Redwood City, 2007b). Hawes Park contains ball fields and restroom facilities on 1.59 acres (City of Redwood City, 2007b). Red Morton Park encompasses 30.89 acres and has pools, ball fields, play areas and equipment, picnic areas, barbeque pits, tennis courts, basketball courts, and restroom facilities (City of Redwood City, 2007b). An alternative site for the BDPL 3 and 4 Crossovers project (BD-2) could also be located in Redwood City (City of Redwood City, 1991).

Town of Atherton

The BDPL 3 and 4 Crossovers project (BD-2) would be located in Atherton.

Peninsula Region

The Peninsula Region offers numerous park and recreational facilities, including the SFPUC-managed Peninsula watershed lands, state and county parks, city parks, and numerous regional facilities managed by the Midpeninsula Regional Open Space District. Major regional recreational resources are described below, followed by brief descriptions of the park and recreational facilities in cities potentially affected by WSIP projects. (Section 5.5, San Francisco Peninsula Streams and Reservoirs, discusses recreational resources and activities within the Peninsula watershed that could be affected by the proposed WSIP water supply and system operations.)

Regional Parks and Open Space

SFPUC Peninsula Watershed and Crystal Springs Park. The 23,000-acre SFPUC-managed portion of the Peninsula watershed has limited public access but offers several popular recreational opportunities, including Crystal Springs Golf Course and two popular trails (Fifield-Cahill Ridge Trail and Sawyer Camp Trail). Since 2003, Fifield-Cahill Ridge Trail has been open to the public on a reservation-only basis, with groups of up to 20 people led by docents three days a week. When the SFPUC fenced off the watershed lands in the vicinity of Crystal Springs Reservoir, it left the six-mile Sawyer Camp Trail open to the public for non-motorized recreational use. This trail, once a notable travel route along the Peninsula, is visited by approximately 300,000 people each year (San Mateo County, 2007a). Several other public trails border the watershed area, including Sweeny Ridge Trail, San Andreas Trail, and Crystal Springs Trail (SFPUC, 2007c). Sweeny Ridge Trail is open to the public and crosses Fifield-Cahill Ridge Trail (SFPUC, 2007a). The CS/SA Transmission (PN-2), Lower Crystal Springs Dam (PN-4), and Pulgas Balancing Reservoir (PN-5) projects are located in this watershed.

Coyote Point. Coyote Point Recreational Area is a popular waterfront regional park managed by the San Mateo County Parks and Recreation Department. The park is located on San Francisco Bay in the city of San Mateo, and portions of the Bay Trail traverse the park. Activities include picnicking, swimming, kayaking, windsurfing, bicycling, jogging, fishing, boating, and sailing, as well as watching airplanes take off and land at nearby San Francisco International Airport. The Coyote Point Museum, located in the park, provides environmental education programs (San Mateo County, 2007b).

Junipero Serra Park. San Mateo County also manages the 108-acre Junipero Serra Park, located between Millbrae and San Bruno on Crystal Springs Road. Facilities include picnic areas, campsites, shelter buildings, and trails. The park is known for its spectacular views as well as spring wildflowers (San Mateo County, 2007e). The HTWTP Long-Term project (PN-3) would be adjacent to this park.

San Bruno Mountain State and County Park. San Bruno Mountain State and County Park has eight trails traversing 2,326 acres of land and 12 miles of hiking, horseback riding, and jogging trails. The park is jointly operated by the California Department of Parks and Recreation and the County Parks Department (San Mateo County, 2007f). The Groundwater Projects (SF-2) could be located near this park.

Ravenswood Open Space Preserve. Ravenswood Open Space Preserve is managed by the Midpeninsula Regional Open Space District, which manages approximately 50,000 acres of open space in 25 preserves in San Mateo and Santa Clara Counties (Midpeninsula Regional Open Space District, 2007a). Ravenswood Open Space Preserve consists of 373 acres of marshland and trails located south of the Dumbarton Bridge on San Francisco Bay, in the vicinity of the BDPL Reliability Upgrade (BD-1) pipeline alignment (Midpeninsula Regional Open Space District, 2007c).

Flood Park. Flood Park, located in Menlo Park and managed by San Mateo County, offers 21 acres of parkland, with many large native oak and bay trees. Picnicking, softball, tennis, horseshoes, volleyball, and petanque are popular activities in the park (San Mateo County, 2007d). Flood Park is adjacent to the BDPL Reliability Upgrade (BD-1) alignment.

Edgewood Park Nature Preserve. Edgewood Park Nature Preserve, managed by San Mateo County, is located in Redwood City at Edgewood and Old Stage Roads. This 467-acre park offers hiking and sightseeing and is well known for its spring wildflower blooms (San Mateo County, 2007c). This park is in the vicinity of the BDPL Reliability Upgrade (BD-1) alignment.

Pulgas Ridge Open Space Preserve. The Pulgas Ridge Open Space Preserve, managed by the Midpeninsula Open Space Regional District, is located near San Carlos, northwest of Edgewood County Park and across the Junipero Serra freeway from Pulgas Water Temple. The preserve encompasses 366 acres with three miles of trails. Some lands adjacent to Pulgas Ridge are not open to the public (Midpeninsula Regional Open Space District, 2007b).

City Parks and Recreational Facilities

City of East Palo Alto. See description under Bay Division Region, above.

City of Menlo Park. See description under Bay Division Region, above.

City of Redwood City. See description under Bay Division Region, above.

City of San Carlos. San Carlos has 15 parks totaling 143 acres. Fourteen are developed parks, providing ball diamonds, basketball courts, dog exercise areas, hiking trails, horseshoe pits, jogging paths, picnic tables, play equipment, recreation centers, soccer fields, and tennis courts. One park, the Chilton Property, is open space land. The general plan identifies three community parks and 12 neighborhood parks (City of San Carlos, 1992; 2007). The BDPL Reliability Upgrade project (BD-1) would be located in San Carlos.

Town of Woodside. A portion of the SFPUC's Peninsula watershed land lies adjacent to the town of Woodside. Woodside sponsors recreational programs and classes, but has no publicly owned recreational facilities in the vicinity of any proposed program features. An alternate site for the BDPL 3 and 4 Crossovers project (BD-2) would be located in Woodside.

City of San Mateo. The City of San Mateo owns 30 park sites, three open space areas, and two inaccessible open space areas, for a total of over 500 acres of parkland (City of San Mateo, 1991).

Town of Hillsborough. There are limited public parks and recreational facilities within Hillsborough, including two parks and a water conservation garden. The town also has 258 acres of open space that cannot be developed, improved, or sold (Town of Hillsborough, 2007b). Open space areas are not available for public access (Town of Hillsborough, 2007a). Private facilities such as the 110-acre Burlingame County Club and the Hillsborough Racquet Club provide additional recreational facilities, and many town residents have large lots with private recreational amenities. Nearby regional recreational areas and open space include Crystal Springs Reservoir and Coyote Point County Recreation Area. The CS/SA Transmission project (PN-2) would be located near the town of Hillsborough.

City of Burlingame. Burlingame has 17 parks and playgrounds, some of which are located near the CS/SA Transmission project (PN-2) (City of Burlingame, 2007). The 1.9-acre Village Park on Eastmoor Road has restroom facilities, a playground, picnic facilities, and basketball courts. The 5.9-acre Ray Park on Balboa Way provides a playground, picnic area, basketball courts, softball fields, tennis courts, and restroom facilities. The Groundwater Projects (SF-2) could also be located in Burlingame.

City of Millbrae. The City of Millbrae owns and operates 12 parks encompassing approximately 44 acres of parkland. Over 165 acres of parkland are available to city residents, when the Civic Center, the unimproved Spur Property, a portion of Junipero Serra Park, and school playgrounds and playfields are included. Millbrae's shoreline parks provide significant links to the Bay Trail (McElroy, 2001).Green Hills Park, on the corner of Ludeman Lane and Magnolia Avenue, provides picnic tables and benches, barbeque pits, and a group picnic area; other amenities include restrooms, par course, jogging path, children's play equipment, open playing field, conversation place, horseshoe pit, bocce ball court, and open space (City of Millbrae, 2007). Although the CS/SA Transmission project (PN-2) and HTWTP Long-Term (PN-3) would not be located in Millbrae, they would be close to its city limits. The Groundwater Projects (SF-2) could also be located in Millbrae.

City of San Bruno. San Bruno has 18 parks encompassing approximately 90 acres. City residents also use Junipero Serra Park and some local school grounds, although not all school grounds are available for public use (City of San Bruno, 1984). Forest Lane Park, located near I-380 and Huntington Avenue has a grassy area, basketball court, play area, and picnic and barbeque area (City of San Bruno, 2007). Although the CS/SA Transmission (PN-2) and HTWTP Long-Term (PN-3) projects would not be located in San Bruno, they would be close to its city limits. The Groundwater Projects (SF-2) could also be located in San Bruno.

City of South San Francisco. South San Francisco has approximately 320 acres of parks and open space, 70 acres of which are developed, 169 acres of open space, and 81 acres of school lands (City of South San Francisco, 1999). According to the Parks, Public Facilities and Services Element of the general plan, the overall amount of open space in the city appears adequate to meet the community's needs, but the amount of developed parkland is inadequate. The general plan proposes an additional 108 acres of parkland, including a six-acre SFPUC Linear Park in the Winston-Serra area of the city. The corridor is already under development as a linear park, from the city's western boundary to Hickey Boulevard (City of South San Francisco, 1999). The 21-acre Orange Memorial Park, located on Orange Avenue and Tennis Drive, contains a children's play area, community building, restrooms, picnic tables, picnic shelter, five tennis courts, ball fields, basketball courts, walking trails, soccer fields, an indoor swimming pool, sculpture garden, and bocce ball courts (City of South San Francisco, 2006). Paradise Valley Park provides 1.2 acres, including a children's play area, Boys Club, restrooms, picnic tables, ball fields, and basketball courts. The park is located on Hillside Boulevard (City of South San Francisco, 2006). The Baden and San Pedro Valve Lots (PN-1) and Groundwater Projects (SF-2) could affect recreational facilities in South San Francisco.

Town of Colma. Colma has three public recreational facilities occupying 0.5 acres of land. The largest is the Sterling Park Community Center. The private Cypress Hills Golf Course adds an additional 76 acres of parkland. The town's eastern border is adjacent to the San Bruno Mountain State and County Park, and the town supports access to all trails along this border. The Colma General Plan states that a pedestrian path should be considered along the San Francisco Water Company right-of-way between Serramonte Boulevard and Collins Avenue (Town of Colma, 2000). The Groundwater Projects (SF-2) would be located in Colma.

City of Brisbane. Brisbane owns very few recreational facilities, but the city is surrounded by open space for outdoor recreation (City of Brisbane, 1994). The Open Space Element of the general plan states that, although Brisbane meets or exceeds current standards for parks and open space based on acreage per thousand persons, residents desire additional open space facilities. There are numerous goals and policies in the Open Space Element, as well as in the Recreation and Community Services Element, aimed at maximizing the use of existing recreational and open spaces and developing new recreational and open spaces. The City proposes to use the lagoon, bayfront, and marsh for recreational and educational purposes, consistent with the sensitivity of the resources. The plan also states the goal of extending the trail system to include aquatic areas, creating a shoreline recreational trail along San Francisco Bay from Sierra Point to the Candlestick Point State Recreation Area, in cooperation with regional efforts. Once the water environment is determined to be safe, development of water-related passive recreation is encouraged at the Brisbane Lagoon, including public access facilities adjacent to the lagoon. Richard Firth Memorial Park, located on Glen Park Way, contains several concrete statues and a picnic area. Community Park, located at Old County Road and San Francisco Street, contains four picnic areas, restrooms, and a children's playground (City of Brisbane, 2007; Carmick, 2006). The Groundwater Projects (SF-2) could be located in Brisbane.

City of Daly City. Daly City has 71 acres of public recreation land and over 180 acres of private recreation lands. The general plan encourages the National Park Service to incorporate City-owned property along the coast into the Golden Gate National Recreation Area (City of Daly City, 1987). David R. Rowe Park on Midway Avenue provides ball fields, basketball courts, and recreational facilities for rent (Daly City Online, 2007). On the west side of I-280, a City-owned skate park on Sullivan Avenue provides skateboarding ramps and rails (SFGoKids.com, 2007). The Baden and San Pedro Valve Lots (PN-1), SAPL 3 Installation (SF-1), and Groundwater Projects (SF-2) could affect Daly City's recreational facilities.

San Francisco Region

City of San Francisco

The city, state, and federal property permanently dedicated to open space uses in San Francisco encompasses approximately 4,090 acres, or 5.5 acres per 1,000 San Francisco residents. The Recreation and Open Space Element of the San Francisco General Plan (CCSF, 1998) states a goal to increase the per capita supply of public open space within the city, but acknowledges that this is a challenge given existing development patterns, high population density, and relatively small land mass (28,918 acres). About half of the City-owned recreational and open space acreage is composed of a few large open space areas, which are enjoyed by residents throughout the city and region as well as by tourists. The other half is made up of smaller open spaces distributed throughout the city and used by residents of the immediate area. The SAPL 3 Installation (SF-1), Groundwater Projects (SF-2), and Recycled Water Projects (SF-3) would be located in San Francisco. Parks that could be affected by the WSIP projects are described below.

Golden Gate National Recreation Area (Lake Merced). The recreational areas of the Golden Gate National Recreation Area at Lake Merced are managed by the San Francisco Recreation and Park Department under an agreement with the SFPUC. This agreement was created in 1950, naming the SFPUC to manage the water aspects of Lake Merced. Lake Merced is located near Skyline and Lake Merced Boulevards and is composed of four interconnected freshwater lakes. Recreational activities include walking, jogging, and boating. Developed facilities include the Lake Merced Sports Center, the 18-hole public Harding Park Golf Course (Harding Park, 2007), the 18-hole Jack Fleming Municipal Golf Course, and the Pacific Rod and Gun Club, with skeet and trap ranges (SFPUC, 2007b). There are several other private golf clubs in the Lake Merced vicinity, including Olympic Country Club to the south, Lake Merced Golf & Country Club to the southeast, and San Francisco Golf Club to the east, as well as athletic facilities associated with San Francisco State University. The alignment for the SAPL 3 Installation (SF-1) through the San Francisco Golf Course and adjacent to the Lake Merced Golf & Country Club, and the Groundwater Projects (SF-2) could affect Harding Park Golf Course.

West Sunset Playground and Recreation Center and South Sunset Playground. The West Sunset Playground and Recreation Center, located at Ortega Street and 39th Avenue, provides two baseball fields, a softball field, basketball and tennis courts, and a soccer field. This unique, bi-level playground is heavily used by the community (Go City Kids, 2007b). The South Sunset Playground could also be affected. The Groundwater Projects (SF-2) could affect these playgrounds.

Golden Gate Park. San Francisco's Golden Gate Park provides 1,017 acres of parkland, including tennis courts, playgrounds, biking and skating facilities, a rose garden, casting ponds for anglers, the Buffalo Paddock in the northwest corner of the park, and boating facilities at Stow Lake. The park is heavily used by city residents and is also popular with regional residents and visiting tourists. Various SFPUC wells and the Golden Gate Storage Tank, involved in the Groundwater Projects (SF-2) and Recycled Water Project (SF-3), are located in the park (CCSF, 2007b; Go City Kids, 2007a).

As indicated in the Golden Gate Park Master Plan, the former Richmond-Sunset Treatment Plant, which is currently a staging area for the Recreation and Park Department, would be restored to include an additional soccer field, a picnic area, a small parking area, log storage, and reforestation areas. The site is located in the western area of Golden Gate Park (CCSF, 2007a). A Recycled Water Project (SF-3) alternative could affect this area.

San Francisco Zoo. San Francisco Zoo is one of the Bay Area's most popular cultural and recreational attractions. Recreational facilities include a carousel, a miniature steam train, several cafes, and open space. The San Francisco Recreation and Park Department works in partnership with the San Francisco Zoological Society to maintain and govern the zoo (San Francisco Zoo, 2007). The Groundwater Projects (SF-2) could affect an overflow parking lot at the zoo.

Pine Lake Park/Stern Grove. Pine Lake Park and Stern Grove, a 64-acre open space area, forms a long valley that drops 100 feet in elevation from the city street above. There are numerous recreational activities, including summer concerts, receptions, picnic events, tennis, horseshoes, and croquet. The popular "Sundays at the Grove" concert series is attended annually by more than 175,000 patrons. The park has plans for improvements, including redesign of the outdoor concert area, restoration of buildings (including historic structures), enhancement of disabled access to park facilities, lake and wildlife habitat restoration, playground and tennis courts repairs, and utility and infrastructure improvements (CCSF, 2007c). The Groundwater Projects (SF-2) could affect the park.

Lincoln Park Golf Course. Lincoln Park Golf Course was constructed in 1928 and provides the public with an 18-hole course on a native landscape of rolling hills forested with cypress and pine trees. The Recycled Water Projects (SF-3) would affect the golf course.

Regulatory Framework

Local Plans and Policies

Refer to Section 4.2, Plans and Policies, regarding the application of local land use plans and policies to implementation of the WSIP.

4.12.2 Impacts

Significance Criteria

The CCSF has not formally adopted significance standards for impacts related to recreation, but generally considers that implementation of the proposed program would have a recreational impact if it were to:

- Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated (Secondary impacts of growth are evaluated in Chapter 7, Growth-Inducement Potential and Indirect Effects of Growth)
- Include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment (Secondary impacts of growth are evaluated in Chapter 7)
- Physically degrade existing recreational resources (Evaluated in this section)

The physical degradation of existing resources could occur if the WSIP were to:

- Remove or damage existing recreational resources directly
- Cause environmental impacts (such as air quality or noise effects) that would indirectly result in deterioration in the quality of the recreational experience
- Disrupt access to existing recreation facilities (which would divide a community from some of the established amenities used by its members)

Impacts on parks are discussed in this section. Impacts on other public facilities are addressed in Section 4.3, Land Use and Visual Quality; Section 4.8, Traffic, Transportation, and Circulation; and Section 4.11, Public Services and Utilities.

Approach to Analysis

Local planning documents and maps (including topographic maps, local street maps, and maps available electronically via the internet) were reviewed to identify the recreational resources in the study area that, because of their proximity, could be directly or indirectly affected by the WSIP projects. Existing recreational plans and policy documents, as well as scoping comments received from recreational resource management agencies and other interested parties on the WSIP Draft PEIR Notice of Preparation, were also reviewed.

To determine potential direct effects of WSIP projects construction activities and/or land acquisition, project areas were compared with the locations of identified recreational resources. Potential indirect effects on recreational resources were identified through the same means, as well as by reviewing the impact findings from Section 4.3, Land Use and Visual Quality; Section 4.5, Hydrology and Water Quality; Section 4.9, Air Quality; and Section 4.10, Noise and Vibration. Indirect impacts that would typically result from other physical impacts and could adversely affect the recreational experience include the following: removal of vegetation that could alter views (Section 4.3, Land Use and Visual Quality); construction-related noise that could affect hiking or nature appreciation (Section 4.10, Noise); or impeded access to hiking trails (Section 4.8, Traffic, Transportation, and Circulation).

Impact Summary by Region

Table 4.12-1 presents a summary of potential impacts on recreational resources associated with the WSIP projects.

Construction Impacts

Impact 4.12-1: Temporary conflicts with established recreational uses during construction.

Construction activities (such as the creation of new temporary staging areas or open-trench construction of pipelines) could temporarily disrupt access to or use of recreational facilities in the WSIP study area. Construction of pipelines, tunnels, dams, and other WSIP facilities could require excavation in areas with established recreational uses or could affect access to existing parks or other recreational facilities. Construction activities that could affect recreational resources are addressed by facility type below.

Pipelines. In some of the affected jurisdictions, formal or informal linear parks or trails have been developed or are proposed for development along the SFPUC right-of-way. Other communities have designated the SFPUC right-of-way as open space. In some instances, there are recreational amenities such as private golf courses in or adjacent to the right-of-way. Since additional pipeline construction would occur along portions of this right-of-way, existing recreational facilities or uses of this area could be disrupted.

Where feasible, WSIP pipeline construction would be accomplished using standard open-cut or cut-and-cover construction methods, progressing at a rate of approximately 120 feet per day in urban areas and 160 feet per day in rural areas; where there are no obstructions or road crossings, the pipeline construction could progress at a rate of up to 300 feet per day. Staging areas would also be required for stockpiling supplies and equipment close to the construction area. Depending on the location of staging areas and the timing of pipeline construction, these activities could

TABLE 4.12-1
POTENTIAL IMPACTS AND SIGNIFICANCE – RECREATIONAL RESOURCES

Projects	Project Number	Impact 4.12-1: Temporary conflicts with established recreational uses during construction	Impact 4.12-2: Conflicts with established recreational uses due to facility siting and project operation
San Joaquin Region			
Advanced Disinfection	SJ-1	N/A	N/A
Lawrence Livermore Supply Improvements	SJ-2	N/A	N/A
San Joaquin Pipeline System	SJ-3	PSM	N/A
Rehabilitation of Existing San Joaquin Pipelines	SJ-4	PSM	N/A
Tesla Portal Disinfection Station	SJ-5	N/A	N/A
Sunol Valley Region			
Alameda Creek Fishery Enhancement	SV-1	LS	N/A
Calaveras Dam Replacement	SV-2	LS	N/A
Additional 40-mgd Treated Water Supply	SV-3	N/A	N/A
New Irvington Tunnel	SV-4	PSM	N/A
SVWTP – Treated Water Reservoirs	SV-5	N/A	N/A
San Antonio Backup Pipeline	SV-6	N/A	N/A
Bay Division Region			
Bay Division Pipeline Reliability Upgrade	BD-1	PSM	N/A
BDPL Nos. 3 and 4 Crossovers	BD-2	PSM	N/A
Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault	BD-3	N/A	N/A
Peninsula Region			
Baden and San Pedro Valve Lots Improvements	PN-1	N/A	N/A
Crystal Springs/San Andreas Transmission Upgrade	PN-2	PSM	N/A
HTWTP Long-Term Improvements	PN-3	N/A	N/A
Lower Crystal Springs Dam Improvements	PN-4	LS	N/A
Pulgas Balancing Reservoir Rehabilitation	PN-5	LS	N/A
San Francisco Region			
San Andreas Pipeline No. 3 Installation	SF-1	PSM	PSM
Groundwater Projects	SF-2	PSM	PSM
Recycled Water Projects	SF-3	PSM	PSM

LS = Less than Significant impact, no mitigation required
PSM= Potentially Significant impact, can be mitigated to less than significant
N/A = Not Applicable

cause adverse (although temporary) impacts on recreational resources, including the temporary loss of facility access, temporary removal of facilities, or the longer term loss of lawns or landscaped areas, which could take time to be restored after construction is completed.

Tunnels. Unlike pipeline construction, tunneling would not affect parks, open space, or recreational areas, except in the vicinity of the entry and exit portal locations, which would also serve as construction staging areas. Recreational resources could be adversely affected if the portals were located on or near existing parks and recreational facilities, or if access to these areas were disrupted by construction traffic or construction activities. Similarly, the noise and dust generated by tunneling and associated equipment could reduce the quality of the recreational experience at nearby facilities, depending on where the portals are sited in relation to established recreational uses.

Vaults, Valve Lots, and Crossover Facilities. These facilities would be constructed at isolated locations near existing SFPUC facilities along the regional system. Design would vary by location, but facilities would typically occupy approximately 4,000 square feet and would be partially or completely buried. Control buildings might be constructed to house associated electrical facilities, and crossover structures could require permanent discharge or drainage piping for maintenance or emergency repairs. Construction activities would generally be confined to the immediate site vicinity. If these facilities were located in or near areas of established recreational use, they could temporarily disrupt recreational resources (during construction).

Pump Stations. The WSIP includes construction of new pump stations and upgrades to existing pump stations along the regional system. Upgrading existing pump stations, which would involve removing existing equipment and replacing it with new equipment, is not likely to adversely affect recreational resources. New pump stations could adversely affect resources if they are located in areas with established recreational uses.

Treatment Facilities. The WSIP includes upgrades and expansion of existing treatment facilities at two treatment plants as well as the system's primary disinfection facility, and construction of a new secondary disinfection facility. Proposed upgrades at existing treatment plants would occur within the existing property boundaries and are not likely to affect offsite recreational resources. Impacts associated with new facility construction would depend on the site location in relation to established recreational uses in the area.

Storage Facilities. The WSIP calls for improvements to water storage facilities, including water reservoirs and dams. Some storage facility sites are open to the public, and projects located in these areas could affect recreational access. Other storage facilities are closed to the public, and projects located in these areas would not likely affect recreational facilities.

As mentioned above, a criterion for impacts on recreational resources is the disruption of access to existing recreation facilities. For this analysis, if access to a recreational site would be closed during construction, the impact would be potentially significant, even with SFPUC construction measures such as those requiring neighborhood notice and traffic plans. However, if a WSIP project would temporarily close one access route to a recreational site but another access route remained opened to the public, the impact would be less than significant.

If a WSIP project would construct facilities through or adjacent to a recreational facility and disrupt access to part or all of the recreational facility, the impact, although temporary, would be potentially significant.

If there is not enough detail about a WSIP project to assess its impacts on recreational resources, a conservation determination of potentially significant is made in this analysis.

In general, potentially significant impacts could be reduced to a less-than-significant level through coordination with golf course and other recreational facility managers (Measure 4.12-1) and implementation of various mitigation measures to address traffic, air quality, and noise issues. Recreational resources in the vicinity of the WSIP projects are identified by region below and summarized in **Table 4.12-2**.

San Joaquin Region

Impact 4.12-1: Temporary conflicts with established recreational uses during construction		
Advanced Disinfection	SJ-1	N/A
Lawrence Livermore	SJ-2	N/A
SJPL System	SJ-3	PSM
SJPL Rehabilitation	SJ-4	PSM
Tesla Portal Disinfection	SJ-5	N/A

Of the five WSIP projects in the San Joaquin Region, the SJPL System (SJ-3) and SJPL Rehabilitation (SJ-4) projects could affect recreational resources during construction.

The SJPL System (SJ-3) would construct valve houses at Oakdale and Tesla Portals, two crossover facilities, and approximately 16 to 22 miles of pipeline (a minimum of 6 miles of pipeline west of Oakdale Portal in Tuolumne and Stanislaus Counties, and 10 miles of pipeline east of Tesla Portal in Stanislaus and San Joaquin Counties, including in the vicinity of Tracy Golf and Country Club). Construction would take place over approximately three years. Most construction would occur within the existing SFPUC right-of-way, but additional right-of-way could be required. Additional land could also be acquired for power supply facilities associated with crossovers, depending on the final locations selected.

Temporary, but *potentially significant* impacts associated with the SJPL System and SJPL Rehabilitation projects could be reduced to a less-than-significant level through implementation of SFPUC Construction Measures #1, #3, #5, #6, and #10 (neighborhood notice, air quality, traffic, noise, and site restoration), mitigation measures identified in Chapter 6 (under 4.8, Traffic, Transportation, and Circulation; 4.9, Air Quality; and 4.10, Noise and Vibration), as well as coordination with golf course managers/recreational facility managers and provision of temporary access (Measure 4.12-1). These measures would provide park and recreation facility managers with an opportunity to notify recreationists of any anticipated disruption of resource access or use. Separate, project-level CEQA review would be conducted on these projects to determine if potential recreation impacts would occur and, if appropriate, to refine mitigation measures to address site-specific conditions.

The Advanced Disinfection (SJ-1) and Tesla Portal Disinfection (SJ-5) projects would install disinfection facilities at the SFPUC's existing Tesla Portal, which is currently used for water system purposes, so these projects would not affect recreational resources. New water filtration facilities for the Lawrence Livermore project (SJ-2) would be constructed at the SFPUC's existing Thomas Shaft property in San Joaquin County and would not affect existing recreational uses. Therefore, this impact would *not apply* to these projects.

TABLE 4.12-2
PUBLIC PARKS AND RECREATIONAL FACILITIES IN THE PROJECT VICINITY

Projects	Potentially Affected Recreational Resources
SJ-1: Advanced Disinfection	None
SJ-2: Lawrence Livermore Supply Improvements	None
SJ-3: San Joaquin Pipeline System	Tracy Golf and Country Club
SJ-4: Rehabilitation of Existing San Joaquin Pipelines	Tracy Golf and Country Club; Hetch Hetchy Trail Linear Park; Wesson Ranch Park and Chrysler 99 Park (in Modesto); San Joaquin National Wildlife Refuge
SJ-5: Tesla Portal Disinfection Station	None
SV-1: Alameda Creek Fishery Enhancement	Alameda Creek
SV-2: Calaveras Dam Replacement	Sunol Regional Wilderness
SV-3: Additional 40-mgd Treated Water Supply	None
SV-4: New Irvington Tunnel	Mission Peak Regional Park
SV-5: SVWTP – Treated Water Reservoirs	None
SV-6: San Antonio Backup Pipeline	None
BD-1: Bay Division Pipeline Reliability Upgrade	Don Edwards San Francisco Bay Regional Wildlife Refuge; Ravenswood Open Space Preserve; San Francisco Bay Trail; local parks in Fremont, Newark, San Mateo County, and Redwood City; numerous school properties in East Palo Alto, Fremont, Menlo Park, Newark, and Redwood City
BD-2: BDPL Nos. 3 and 4 Crossovers	Guadalupe River trails in Ulistac Natural Area; Gunn High School
BD-3: Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault	None
PN-1: Baden and San Pedro Valve Lots Improvements	None
PN-2: Crystal Springs/San Andreas Transmission Upgrade	Crystal Springs Golf Course Sawyer Camp Trail
PN-3: HTWTP Long-Term Improvements	None
PN-4: Lower Crystal Springs Dam Improvements	Trails and passive uses along Canada Road; site-seeing from the San Mateo County Bridge
PN-5: Pulgas Balancing Reservoir Rehabilitation	Pulgas Water Temple
SF-1: San Andreas Pipeline No. 3 Installation	Direct impacts on the San Francisco Golf Club; indirect impacts on Lake Merced Golf & Country Club and Daly City Skatepark
SF-2: Groundwater Projects	South Sunset Playground; West Sunset Playground; and Francis Scott Key School playground; Golden Gate Park; Lake Merced (and Harding Park Golf Course); San Francisco Zoo; and Pine Lake/Stern Grove (all in San Francisco)
SF-3: Recycled Water Projects	San Francisco Zoo; Lincoln Park

Sunol Valley Region

Impact 4.12-1: Temporary conflicts with established recreational uses during construction		
Alameda Creek Fishery	SV-1	LS
Calaveras Dam	SV-2	LS
40-mgd Treated Water	SV-3	N/A
New Irvington Tunnel	SV-4	PSM
Treated Water Reservoirs	SV-5	N/A
SABUP	SV-6	N/A

Within the Sunol Valley Region, construction of three of the proposed WSIP projects could affect recreational resources or the quality of the recreational experience in the Sunol Regional Wilderness, which lies between Calaveras and San Antonio Reservoirs. The remaining Sunol Valley Region projects would involve construction or upgrades on existing SFPUC property or at existing facilities, minimizing the potential for impacts on nearby recreational resources.

The Alameda Creek Fishery project (SV-1) would involve construction of facilities to recapture water that is released for fishery enhancement in Alameda Creek. Construction in the vicinity of Alameda Creek could temporarily disrupt access to the creek for dispersed recreational activities such as fishing or picnicking; however, since this disruption would be temporary and alternative locations for these activities are available, this impact would be *less than significant*.

The Calaveras Dam project (SV-2) is a major construction project that would replace the existing Calaveras Dam and restore the capacity of Calaveras Reservoir. Calaveras Road, designated as a scenic route by Alameda and Santa Clara Counties, would be closed to the public during an estimated three-year construction period, blocking access to the Sunol Regional Wilderness from the south during that time. Access to the Sunol Regional Wilderness from the north would remain open during project construction. Because this disruption to recreational access would be temporary and an alternate route into the wilderness area would be available, this impact would constitute a *less than significant*, indirect effect on established recreational uses. Implementation of SFPUC Construction Measures #1, #3, #5, and #6 (neighborhood notice, air quality, traffic, and noise) would also help ensure that potential impacts on this resource are less than significant.

Construction of New Irvington Tunnel (SV-4) would take place over approximately three to four years. The project would require construction of two new tunnel portals and associated construction staging areas. The new east portal would be about 75 feet south of the Alameda West Portal, and the new west portal would be about 175 feet south of the existing Irvington Portal. The project would tunnel below a portion of Mission Peak Regional Park, but is not expected to affect surface facilities. This project would end east of Mission Boulevard and would not directly affect schools in the vicinity of Mission Boulevard in Fremont. However, there could be *potentially significant*, indirect impacts on these schools associated with construction-related traffic on local roadways, air pollutant emissions, and increased noise. Implementation of the SFPUC Construction Measures #1, #3, #5, and #6 (neighborhood notice, air quality, traffic, and noise), as well as mitigation measures identified in Chapter 6 (under 4.8, Traffic, Transportation, and Circulation; 4.9, Air Quality; and 4.10, Noise and Vibration) would help to reduce potential impacts to a less-than-significant level. Two projects in this region (40-mgd Treated Water, SV-3, and Treated Water Reservoirs, SV-5) would construct new facilities or upgrade existing equipment within the fenceline of SFPUC properties. The SABUP project (SV-6) would not affect any public parks or recreational facilities. Therefore, this impact would *not apply* to these three projects.

Bay Division Region

Impact 4.12-1: Temporary conflicts with established recreational uses during construction		
BDPL Reliability Upgrade	BD-1	PSM
BDPL 3 and 4 Crossovers	BD-2	PSM
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	N/A

Of the WSIP projects proposed for construction in the Bay Division Region, the BDPL Reliability Upgrade project (BD-1) would have the greatest potential impact on recreational facilities in the area. The preferred pipeline alignment for the new Bay Division Pipeline (No. 5) would pass beneath the Don Edwards San Francisco Bay Regional Wildlife Refuge, with an approximately five-mile tunnel segment installed beneath marshlands and San Francisco Bay. The two cut-and-cover sections of pipeline (approximately seven miles from the Irvington Tunnel Portal to the Newark Valve House and nine miles from the Ravenswood Valve House to the Pulgas Tunnel Portal) would be located within the existing SFPUC right-of-way. The Ravenswood Open Space Preserve and San Francisco Bay Trail are also located in the vicinity of the Ravenswood Valve House.

Recreational amenities in the vicinity of the pipeline alignment for the BDPL Reliability Upgrade project (BD-1) include Agua Caliente Creek, Central Park, Azeveda Park, Noll Park, and Mission San Jose in Fremont; Flood Park in Menlo Park; Ash Park and Birch Grove Park in Newark; Edgewood Park, Fleishman Park, Hawes Park, and Red Morton Park in Redwood City; and local parks in San Mateo County. Recreational facilities may also be present at numerous school properties, including Chadbourne School, Durham School, Fremont School, Irvington School, Mission San Jose School, Joseph Azeveda Elementary School, and Walters Junior High School in Fremont; Cesar Chavez Academy and Costano School in East Palo Alto; Bell Haven Elementary School and James Flood Magnet School in Menlo Park; Bunker Elementary School in Newark; and Fair Oaks School, Hawes School, Gill School, and West Bay Christian Academy in Redwood City. While none of these recreational resources would be directly affected, indirect (temporary, construction-related) impacts would be *potentially significant*. Implementation of SFPUC Construction Measures #1, #3, #5, and #6 (neighborhood notice, air quality, traffic, and noise), as well as coordination with golf course/recreational facility managers (Measure 4.12-1) would reduce this impact to a less-than-significant level.

The BDPL 3 and 4 Crossovers project (BD-2) would involve construction of pipeline crossovers at three separate locations along a 32-mile stretch of the existing Bay Division Pipeline. One of these crossover locations is adjacent to the Guadalupe River in San Jose, in the recently restored Ulistac Natural Area (formerly the Fairway Glen Golf Course) across from Lick Mill Park. Another is located near Barron Creek, adjacent to the running track and sports fields at Gunn High School in Palo Alto. These track and field facilities can be used by the public when not being used for school purposes (Jacoubowsky, 2006). The third crossover would be located at Bear Gulch Reservoir in Atherton, which is not accessible to the public. All crossovers would be constructed within existing SFPUC right-of-way (with the possible exception of outfall facilities), so direct impacts on recreational facilities are not expected. However, because construction could temporarily disrupt the enjoyment of nearby recreational resources, impacts would be *potentially* *significant*. Implementation of SFPUC Construction Measures #1, #3, #5, and #6 (neighborhood notice, air quality, traffic, and noise), mitigation measures identified in Chapter 6 (under 4.8, Traffic, Transportation, and Circulation; 4.9, Air Quality; and 4.10, Noise and Vibration), as well as coordination with golf course managers/recreational facility managers (Measure 4.12-1) would help to reduce potential impacts to a less-than-significant level. These conditions and measures would provide park and recreation facility managers with an opportunity to notify recreationists of any anticipated disruption of resource access or use.

The BDPL 3 and 4 Seismic Upgrade at Hayward Fault project (BD-3) would not affect established recreational uses in the vicinity, so this impact would *not apply* to this project.

Peninsula Region

Impact 4.12-1: Temporary conflicts with established recreational uses during construction		
Baden and San Pedro Valve Lots	PN-1	N/A
CS/SA Transmission	PN-2	PSM
HTWTP Long-Term	PN-3	N/A
Lower Crystal Springs Dam	PN-4	LS
Pulgas Balancing Reservoir	PN-5	LS

Two of the proposed Peninsula Region projects would be located on SFPUC facility sites that are not accessible to the public. However, three of the WSIP projects in this region are located on or close to existing recreational facilities and thus have the potential to disrupt (directly or indirectly) established recreational uses.

The CS/SA Transmission project (PN-2) would replace approximately 1,350 feet of pipeline and renew the remaining pipeline (through lining, coating, new manholes and valves, etc.) that conveys water from Crystal Springs Reservoir to the Harry Tracy Water Treatment Plant (WTP) through San Andrea Reservoir. If the pipeline is replaced, all work would occur within SFPUC Peninsula watershed lands; however, the alignment could pass through Crystal Springs Golf Course, roughly paralleling Sawyer Camp Trail, with portions of the pipeline alignment touching the trail alignment. Construction traffic and staging areas could also affect access to and/or enjoyment of Sawyer Camp Trail and Crystal Springs Golf Course, resulting in *potentially significant* impacts. Implementation of SFPUC Construction Measures #1, #3, #5, and #6 (neighborhood notice, air quality, traffic, and noise), and coordination with golf course and other recreational facility managers to ensure facility managers notify recreationists of anticipated access or use disruptions (Measure 4.12-1) would reduce this impact to a less-than-significant level.

The Lower Crystal Springs Dam project (PN-4) would make dam safety improvements to Lower Crystal Springs Dam, including raising the dam parapet wall and lengthening the spillway crest. The areas where the improvements are proposed are not accessible to the public. The project would be coordinated with San Mateo County's replacement of the County Bridge (which is built on the crest of the dam and provides sightseeing opportunities) as well as a nearby parking lot and vista point overlooking the reservoir. Indirect impacts related to the recreational enjoyment of the area would be *less than significant*. Implementation of SFPUC Construction Measures #1, #3, #5, and #6 (neighborhood notice, air quality, traffic, and noise) would also help ensure that potential impacts related to recreational enjoyment are less than significant.

The Pulgas Balancing Reservoir project (PN-5) would replace the Pulgas Channel with an enlarged channel and replace the roof of the existing Pulgas Balancing Reservoir and associated equipment. The reservoir is located on SFPUC watershed land west of I-280 and east of Cañada Road in unincorporated San Mateo County, southeast of Pulgas Water Temple. Pulgas Channel crosses under Cañada Road and extends southwestward, near the south side of the parking lot for the water temple. Construction activities would occur over a total of four years and would be confined to the vicinity of the existing reservoir structure. Replacement of the Pulgas Channel is not expected to directly affect recreational uses in the water temple area, unless recreational parking is reduced during construction. However, if access to the temple's parking lot is restricted during channel construction, the impact on this recreational use could be *less than significant*. Implementation of SFPUC Construction Measures #1, #3, #5, and #6 (neighborhood notice, air quality, traffic, and noise) would also help ensure that potential impacts related to the recreational enjoyment of this area are less than significant.

The Baden and San Pedro Valve Lots project (PN-1) would involve seismic upgrades or repairs at valve lot locations and other facility locations (within SFPUC fencelines) that would not disrupt nearby recreational uses. The HTWTP Long-Term project (PN-3) would involve modifications at the Harry Tracy WTP and would not affect established recreational uses of the area. Therefore, this impact would *not apply* to these projects.

San Francisco Region

Impact 4.12-1: Temporary conflicts with established recreational uses during construction		
SAPL 3 Installation	SF-1	PSM
Groundwater Projects	SF-2	PSM
Recycled Water Projects	SF-3	PSM

All WSIP projects in the San Francisco Region would potentially affect parks and recreational resources.

The SAPL 3 Installation project (SF-1) would replace the Baden-Merced Pipeline in Daly City by extending San Andreas Pipeline No. 3 from the San Pedro Valve Lot to Merced Manor Reservoir in San Francisco. Following the alignment of the existing Baden-Merced Pipeline, the project would pass in the vicinity of numerous parks and recreational facilities. Project construction would occur for almost two years and would disrupt two major recreational resources, the Lake Merced Golf & Country Club and the San Francisco Golf Club. Construction would disrupt use of the San Francisco Golf Club during the construction period, since the alignment would pass directly through the course, and time would be needed to restore the greens and fairways to a usable condition after construction is completed. The pipeline alignment runs parallel to the edge of the Lake Merced Golf & Country Club and could indirectly affect use of that golf club, including parking. These impacts would be *potentially significant*; however, they would be temporary in duration and the golf courses would be restored once the pipeline is buried. Implementation of SFPUC Construction Measures #1, #3, #5, and #6 (neighborhood notice, air quality, traffic, and noise), mitigation measures identified in Chapter 6 (under 4.8, Traffic, Transportation, and Circulation; 4.9, Air Quality; and 4.10, Noise and Vibration), and coordination with golf course/recreational facility managers and provision of temporary access if applicable (Measure 4.12-1) would reduce these potential impacts to a less-than-significant level.

The Groundwater Projects (SF-2) would construct new groundwater extraction wells on properties owned by the CCSF, including the South Sunset and West Sunset Playgrounds, and the playground at Francis Scott Key School. This project would also upgrade wells at a number of city locations, including two sites in Golden Gate Park as well at Lake Merced (Harding Park Golf Course), the San Francisco Zoo, and Pine Lake at Stern Grove. These upgrades would occur intermittently over a three-year timeframe (from 2009 to 2011) and could disrupt adjacent recreational uses during this period. The Groundwater Projects would also develop approximately 7 million gallons per day (mgd) of potable groundwater in San Mateo County as part of a regional conjunctive-use project, at locations that have not yet been identified. One of the recreational sites that could be affected is the Daly City Skatepark. In the absence of more detailed project information, these potential impacts are assumed to be *potentially significant*. Implementation of SFPUC Construction Measures #1, #3, #5, and #6 (neighborhood notice, air quality, traffic, and noise), mitigation measures identified in Chapter 6 (under 4.8, Traffic, Transportation, and Circulation; 4.9, Air Quality; and 4.10, Noise and Vibration), as well as coordination with golf course/recreational facility managers (Measure 4.12-1) would reduce these potential impacts to a less-than-significant level.

The Recycled Water Projects (SF-3) would diversify San Francisco's water supply by providing 4 mgd of annual average production of recycled water. The recycled water would be stored at an existing reservoir in Golden Gate Park, and an additional storage facility could be built in the vicinity of Lincoln Park. In the absence of more detailed project information, these potential impacts are assumed to be *potentially significant*. Implementation of SFPUC Construction Measures #1, #3, #5, and #6 (neighborhood notice, air quality, traffic, and noise), mitigation measures identified in Chapter 6 (under 4.8, Traffic, Transportation, and Circulation; 4.9, Air Quality; and 4.10, Noise and Vibration), as well as coordination with golf course facility managers and provision of temporary access if applicable (Measure 4.12-1) would reduce these potential impacts to a less-than-significant level.

Operations, Siting, and Design Impacts

Long-Term Conflicts with Established Recreational Uses

Impact 4.12-2: Conflicts with established recreational uses due to facility siting and project operation.

If a WSIP project would conflict with established recreational uses by siting a permanent facility or changing a facility's operation, the impact would be potentially significant.

San Joaquin, Sunol Valley, Bay Division, and Peninsula Regions

None of the WSIP projects in the San Joaquin, Sunol Valley, Bay Division, or Peninsula Regions would cause long-term conflicts with established recreational uses, because there would be no change in permanent access to recreational facilities, and access would be restored following project construction. Therefore, this impact would *not apply* to the projects in these regions.

San Francisco Region

Impact 4.12-2: Conflicts with established recreational uses due to facility siting and project operation		
SAPL 3 Installation	SF-1	PSM
Groundwater Projects	SF-2	PSM
Recycled Water Projects	SF-3	PSM

In the San Francisco Region, new facilities could be constructed in a number of City-owned parks and recreational facilities. The SAPL 3 Installation project (SF-1) would involve construction of a pipeline and various facilities, including two new structures (up to 8 feet high). The proposed pipeline alignment would traverse the San Francisco Golf Club and would be adjacent to the Lake Merced Golf & Country Club. The Groundwater Projects (SF-2) would construct new groundwater extraction wells at South Sunset Playground and West Sunset Playground. The Recycled Water Projects (SF-3) would store recycled water at an existing reservoir in Golden Gate Park (resulting in no new impact), and possibly at a new storage facility to be constructed at Lincoln Park. The impacts from these projects would be *potentially significant*. Implementation of architectural design, landscaping, and tree removal measures to reduce visual impacts (Measures 4.3-4a, 4.3-4b, 4.3-4c, and 4.3-4d), as well as appropriate siting of proposed facilities to minimize the direct loss of recreational access (Measure 4.12-2) would reduce these potential impacts to a less-than-significant level.

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4.13 Agricultural Resources

4.13 Agricultural Resources

4.13.1 Setting

Regional Overview

California is the nation's leading agricultural producer, responsible for approximately one-eighth of the country's agricultural output. The Central Valley (comprised of the Sacramento and San Joaquin Valleys) is the most productive agricultural area of the state; all eight counties in the San Joaquin Valley are among the top 15 most productive counties in the state (Legislative Analyst's Office, 2002; Umbach, 1997).

The WSIP study area stretches from Tuolumne County in the Sierra Nevada mountains, through two counties—San Joaquin and Stanislaus—that are part of the agriculturally productive San Joaquin Valley, then through four other counties that are part of the urbanized San Francisco Bay Area. Most agricultural production occurs in the San Joaquin Region, where there are large tracts of fertile farmland. Agricultural production is much more limited in the central and western portions of the study area for a variety of reasons, including less appropriate soil types, subdivision of land into smaller parcel sizes, higher production costs, and the predominance of urban development.

San Joaquin and Stanislaus Counties are ranked among the top 10 California counties in terms of the total value of annual agricultural production, while the remaining five counties in the WSIP study area have much lower rankings, as show on **Table 4.13-1**.

TABLE 4.13-1
VALUE OF AGRICULTURAL PRODUCTION IN WSIP STUDY AREA COUNTIES, 2003

County	Value of Agricultural Production ($1,000s)	2003 Ranking
San Joaquin	1,494,693	6
Stanislaus	1,454,928	7
Santa Clara	241,043	28
San Mateo	178,039	31
Alameda	37,342	44
Tuolumne	21,705	49
San Francisco	1,891	57

SOURCE: California Department of Finance, 2004.

Farmland Mapping

The California Department of Conservation, Division of Land Resource Protection, maps important farmlands throughout California. Important farmlands are divided into the following five categories based on their suitability for agriculture:

- *Prime Farmland* is land that has the best combination of physical and chemical characteristics for crop production. It has the soil quality, growing season, and moisture supply needed to produce sustained high yields of crops when treated and managed.
- *Farmland of Statewide Importance* is land other than Prime Farmland that has a good combination of physical and chemical characteristics for crop production.
- *Unique Farmland* does not meet the criteria for Prime Farmland or Farmland of Statewide Importance but has been used for the production of specific high-economic-value crops.
- *Farmland of Local Importance* is either currently producing crops or has the capability of production, but does not meet the criteria of the categories above.
- *Grazing Land* is land on which the vegetation is suited to the grazing of livestock.

Table 4.13-2 shows the quantities of these types of agricultural lands that are currently mapped in each of the WSIP study area counties. As this table indicates, San Joaquin and Stanislaus Counties have the highest acreages of prime, unique, and important farmlands.

TABLE 4.13-2
IMPORTANT FARMLAND ACREAGE IN WSIP STUDY AREA COUNTIES, 2002

County	Prime Farmland (acres)	Farmland of Statewide Importance (acres)	Unique Farmland (acres)	Farmland of Local Importance (acres)	Grazing Land (acres)
Tuolumne	N/A	N/A	N/A	N/A	N/A
Stanislaus	260,730	30,069	61,205	29,519	374,898
San Joaquin	415,527	92,521	61,849	56,507	148,710
Alameda	6,328	1,485	2,100	0	245,728
Santa Clara	28,816	4,244	1,404	7,711	388,696
San Mateo	2,503	178	2,800	3,744	45,829
San Francisco	N/A	N/A	N/A	N/A	N/A

NOTE: Tuolumne County is not part of the California Department of Conservation's Farmland Mapping and Monitoring Program; San Francisco County is urbanized and has virtually no agricultural lands.

SOURCE: California Department of Conservation, Division of Land Resource Protection, 2002.

Description of Agricultural Resources by County in the Study Area

Tuolumne County

In 2003, Tuolumne County ranked 49th (out of 58 counties) in California for the value of its agricultural production, which was almost $22 million. The county's leading commodities include cattle, irrigated and range pasture, firewood, and apiary products. In 2004, the gross agricultural output was $28 million. Field crops in 2004 included hay (600 acres), irrigated pasture (1,200 acres), and rangeland (200,000 acres) (California Department of Finance, 2003; Tuolumne County Agricultural Commissioner, 2004).

While Tuolumne County covers the largest geographic area (1,415,781 acres) of the affected counties, it does not meet the minimum agricultural acreage requirement for inclusion of lands in the California Department of Conservation's Farmland Mapping and Monitoring Program. A total of 118,422 acres of land were enrolled in the Williamson Act in Tuolumne County in 2003 (California Department of Conservation, 2004).[1]

The WSIP projects in Tuolumne County pertain to the easternmost pipeline segment of the San Joaquin Pipeline—the SJPL System (SJ-3) and SJPL Rehabilitation (SF-4) projects. These projects are located in an area identified mainly as Grazing Land.

Stanislaus County

In 2003, Stanislaus County ranked seventh in California for the value of its agricultural production, which was almost $1.5 billion. The county's leading commodities are milk, almonds, chickens, nursery products (fruit, vine, and nut), and walnuts. In 2004, Stanislaus County had a gross agricultural income of $1.9 billion, showing a 36 percent increase from the previous year. The sectors showing the most significant gains were fruit and nut crops (approximately 43 percent) and livestock and poultry (approximately 68 percent) (California Department of Finance, 2003).

Grazing Land (38.6 percent) makes up a large portion of the county's total land area (970,169 acres). Almost 27 percent of the county (26,195 acres) is designated as Prime Farmland. The remaining important farmland is designated as Unique Farmland (6.3 percent), Farmland of Statewide Importance (3.1 percent), and Farmland of Local Importance (3.0 percent) (California Department of Conservation, 2003).

Stanislaus County had 286,957 acres of Prime Farmland and 405,546 acres of nonprime farmland enrolled in Williamson Act contracts in 2003, for a total of 692,503 acres (California Department of Conservation, 2004). However, the county has been experiencing rapid population growth and associated pressure to convert farmland to urban land uses. The county general plan anticipates an 83 percent increase in population between 1988 and 2010, requiring another 36,358 acres of urban land to accommodate this growth. As a result, it is likely that the competition between urban and agricultural land uses will increase, although County policy is to direct urban growth away from the most productive agricultural land (Stanislaus County, 1992).

There are two WSIP projects located in Stanislaus County. The SJPL System (SJ-3) would involve two pipeline segments—one at the eastern end of the county (west of Oakdale Portal) and a short segment at the western side of the county, south of the community of Vernalis. The SJPL Rehabilitation (SJ-4) project would involve the entire length of pipeline within this county, including the cities of Vernalis and Modesto.

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[1] Under a Williamson Act (Land Conservation Act of 1965) contract, the landowner agrees to limit the use of the land to agriculture and compatible uses for a period of at least 10 years. In return, the land is taxed at a rate based on the agricultural production of the land, rather than its real estate market value.

Stanislaus County attributes the success of its agricultural sector to the availability of affordable, high-quality irrigation water, much of which is taken from the Tuolumne River to irrigate farms in the Modesto-Turlock area (Stanislaus County, 1992). Irrigation water is provided through the Turlock and Modesto Irrigation Districts. These two districts, which were formed in 1887 to become the first publicly owned irrigation districts in California, are described below.

Turlock Irrigation District

Turlock Irrigation District (TID) operates about 250 miles of canals and laterals in a service area that encompasses 307 square miles. TID currently supplies irrigation water from the Tuolumne River to 5,800 growers and approximately 150,000 acres of land. TID also supplies electricity to 88,000 customers in a 662-square-mile service area.

In 1893, through its partnership with neighboring Modesto Irrigation District (MID), TID built La Grange Dam, a water diversion dam on the Tuolumne River. In 1923, the districts jointly built the original dam and powerhouse at Don Pedro Reservoir (a new Don Pedro Dam was built and the reservoir expanded substantially in 1970, in cooperation with both TID and the City and County of San Francisco [CCSF]). TID and MID share the costs and benefits of maintaining the dam and reservoir based on the areas they serve; TID receives about two-thirds of the irrigation water and power output from jointly managed facilities, and MID receives about one-third (Turlock Irrigation District, 2007).

Modesto Irrigation District

MID operates 208 miles of canals and pipelines to supply irrigation water to over 3,000 growers farming approximately 60,000 acres of land in Stanislaus County. MID also supplies electricity to about 100,000 customers in a 160-mile service area that includes the greater Modesto area, Waterford, Salida, Mountain House, and parts of Ripon, Escalon, Oakdale, and Riverbank (Modesto Irrigation District, 2007a).

For the past decade, MID has provided about half the drinking water for the city of Modesto. In 2004, MID and the City of Modesto reached an agreement that will eventually double the capacity of the Modesto Regional Water Treatment Plant. This increased capacity could allow MID to supply more water for urban uses, particularly during drought conditions, although city wells will continue to provide a substantial amount of Modesto's drinking water (Modesto Irrigation District, 2007b).

San Joaquin County

San Joaquin County has the most Prime Farmland and the highest agricultural production of any county in the study area. In 2003, it ranked sixth in California for the value of its agricultural production, which was almost $1.5 billion. The county's leading commodities include milk, grapes, almonds, tomatoes and cherries. In 2004, despite a 5 percent drop in the harvested acreage, the total production value increased 9 percent, bringing the gross agricultural production to $1.6 billion (California Department of Finance, 2003).

More than 45 percent of San Joaquin County's total land area (912,601 acres) consists of Prime Farmland. There are also substantial amounts of Farmland of Statewide Importance (10.1 percent), Unique Farmland (6.8 percent), Farmland of Local Importance (6.2 percent), and Grazing Land (16.3 percent). Almost 85 percent of the county is mapped as some type of important farmland (California Department of Conservation, 2005b).

In 2002, 812,629 acres of land were in farms, the total cropland was 574,752 acres, and the irrigated cropland comprised 520,172 acres. There were over 4,000 farms, with an average size of 202 acres. In 2003, San Joaquin County had 334,762 acres of Prime Farmland and 146,680 acres of nonprime farmland participating in the Williamson Act (California Department of Conservation, 2004). The remaining 60,131 acres of the total 541,573 acres enrolled were designated as Farmland Security Zones.[2]

Bay Area housing prices have lead to the construction of "bedroom" suburbs in outlying areas of San Joaquin County, increasing the pressure to convert farmland to urban uses. The County General Plan encourages the preservation of farmland and discourages incompatible uses in agricultural areas (San Joaquin County, 1992).

WSIP project components that are located in San Joaquin County include the westernmost portion of the proposed SJPL System project (SJ-3), which would cross Prime Farmland and the Delta-Mendota Canal before terminating at Tesla Portal, and the proposed Lawrence Livermore facility (SJ-2), located on grazing lands in the southernmost section of the county. The Advanced Disinfection (SJ-1), SJPL Rehabilitation (SJ-4), and Tesla Portal Disinfection (SJ-5) projects are also located in this county.

Alameda County

In 2003, Alameda County ranked 49th in California for the value of its agricultural production, which was approximately $37 million. Its leading commodities include nursery products, wine grapes, cattle, range pasture, alfalfa, and hay. The gross agricultural output for 2004 was $40 million, a 7.6 percent increase from 2003 (California Department of Finance, 2003).

While only about 1 percent of Alameda County's total land area (525,338 acres) is classified as Prime Farmland, almost 47 percent is devoted to Grazing Land. Farmland of Statewide Importance (0.3 percent) and Unique Farmland (0.4 percent) comprise the remainder of the important farmland in the county (California Department of Conservation, 2005a). In 2003, Alameda County enrolled a total of 134,332 acres of farmland in the Williamson Act—9,968 acres of Prime Farmland and 124,364 acres of nonprime farmland (California Department of Conservation, 2004).

[2] A Farmland Security Zone is a contract between a private landowner and a County that restricts land to agricultural or open space uses for a minimum initial term of 20 years. Like a Williamson Act contract, Farmland Security Zone contracts self-renew for an additional year annually; unless either party files a notice of nonrenewal, the contract is automatically renewed each year for the 20-year term.

All of the Sunol Valley Region projects (SV-1 through SV-6) in addition to the BDPL Reliability Upgrade project (BD-1) are located in Alameda County. The Sunol Valley Region projects are located on SFPUC watershed lands that are classified as Grazing Lands, although some areas of Unique Farmland are mapped along Alameda Creek between San Antonio Creek and the Sunol Valley Water Treatment Plant (WTP). The Bay Division Region projects lie in urbanized areas and the salt evaporators and marshlands adjacent to San Francisco Bay.

Local jurisdictions within Alameda County that are potentially affected by these WSIP project components include Fremont, and Newark. Agricultural resources in these local jurisdictions are briefly described below.

City of Fremont

The Baylands District in Fremont is planned for open space and agricultural uses, with the exception of a possible future waste facility. Salt production is considered an agricultural use, and salt ponds cover approximately 8,800 acres in Fremont. In addition, the Northern Plain Planning Area has 400 acres of privately owned farmland, including Patterson Ranch, as well as the 200-acre Ardenwood Regional Preserve, a working historic farm owned by the City and managed by the East Bay Regional Park District. The Land Use Plan for this area indicates a 150-acre open space easement for agricultural purposes; however, the City is studying potential future urban development in this area. Fremont's General Plan also states that some agricultural lands are targeted for incorporation by the National Wildlife Refuge. The Hills Area of Fremont includes lands owned by the CCSF, as well as the unincorporated Vargas Plateau East, which Fremont plans to incorporate. This area, which is designated for agricultural use by Alameda County, has productive agricultural land used for grazing, over half of which is under Williamson Act contracts (City of Fremont, 1991).

City of Newark

Although Newark is historically an agricultural area, only a small area of prime agricultural lands remains cultivated today. Over 3,000 acres of lands in the western and southwestern parts of Newark are designated as Open Spaces of Statewide Significance, and most are currently under Williamson Act contract. The Draft EIR for the general plan update (March 1992) indicates that portions of both Prime Farmland and Open Spaces of Statewide Significance will be converted to urban use at some point in the future; however, the existence of the Williamson Act contracts will hinder rapid conversion. The general plan update envisions that salt ponds will remain as resource preservation lands in the future (City of Newark, 1992).

Santa Clara County

In 2003, Santa Clara County ranked 28th in California for the value of its agricultural production, which was about $241 million. Its leading commodities were nursery crops, mushrooms, peppers, cut flowers, and cattle. In 2004, Santa Clara experienced a 7 percent increase in its agricultural production value, bringing the total to $258 million (California Department of Finance, 2003).

Just over half (51.6 percent) of Santa Clara County's 835,226 acres is mapped as important farmland. The majority (46.5 percent of all county land) is designated as Grazing Land. Prime Farmland constitutes 3.5 percent of the county's total area, followed by Farmland of Local Importance (0.9 percent), Farmland of Statewide Importance (0.5 percent), and Unique Farmland (0.2 percent). The majority of the Prime Farmland is located along the Highway 101 corridor between San Jose and Gilroy, at the southern end of the county (California Department of Conservation, 2005d). In 2003, Santa Clara County had a total of 330,769 acres under Williamson Act contracts. Of these, 11,396 acres were considered Prime Farmland, and 319,374 acres were nonprime (California Department of Conservation, 2004).

WSIP projects that lie within Santa Clara County include portions of the Bay Division Pipeline improvement projects (BDPL Reliability Upgrade, BD-1; BDPL 3 and 4 Crossovers, BD-2; and BDPL 3 and 4 Seismic Upgrade at Hayward Fault, BD-3) and the Calaveras Dam project (SV-2). The cities in Santa Clara County that could be affected by WSIP components include Milpitas, San Jose, Mountain View, Santa Clara, Sunnyvale, Los Altos, and Palo Alto. Sunnyvale, Los Altos, Palo Alto, and Santa Clara are urbanized, with few remaining agricultural lands. Agricultural resources in the other cities are briefly described below.

City of Milpitas

In Milpitas, along Coyote Creek, an area of land is used for growing a variety of truck and berry field crops, including peppers, lettuce, squash, melons, and corn (City of Milpitas, 2002).

City of San Jose

The City of San Jose, in conjunction with Santa Clara County, has policies in place to preserve its remaining agricultural land uses, including grazing, dairying, livestock raising, feedlots, orchards, row crops, nursery stock, flower growing, ancillary residential uses, ancillary commercial uses, and the processing of agricultural products. The Coyote Valley Urban Reserve allows only agricultural and rural residential land uses, and these are the predominate uses in the area (City of San Jose, 2005).

City of Mountain View

Agricultural resources in Mountain View include a community garden as well as Deer Hollow Farm, a 10-acre working farm. According to the Mountain View General Plan, the City has adopted an agricultural district to preserve land for agricultural use. Two properties (45 acres and 135 acres) in Mountain View are designated as prime agricultural lands, and seven other sites totaling 55.1 acres are designated for agricultural purposes (City of Mountain View, 1992).

San Mateo County

In 2003, San Mateo County ranked 31st in California for the value of its agricultural production, which was approximately $178 million. The county's leading commodities include nursery plants, mushrooms, cut flowers, and Brussels sprouts. The county's gross agricultural output in 2004 was $181.5 million (California Department of Finance, 2003).

Grazing Land constitutes 13 percent of San Mateo County's total land area (353,449 acres)—the majority of the important farmland mapped in the county. Farmland of Local Importance (1.1 percent), Unique Farmland (0.8 percent), Prime Farmland (0.7 percent), and Farmland of State Importance (0.1 percent) make up the remaining acreage of important farmland in the county. San Mateo County's Prime and Unique Farmland and Farmland of Statewide Importance are concentrated along the Pacific coast and coastal valleys (California Department of Conservation, 2005c). In 2003, San Mateo County enrolled 3,070 acres of Prime Farmland and 43,988 acres of nonprime farmland in the Williamson Act, for a total of 47,058 acres (California Department of Conservation, 2004).

WSIP project components that fall within San Mateo County include portions of two Bay Division Region projects (BDPL Reliability Upgrade, BD-1, and BDPL 3 and 4 Crossovers, BD-2) and all of the Peninsula Region projects (PN-1 through PN-5). Portions of the SAPL 3 Installation project (SF-1) are also located in San Mateo County.

The cities in San Mateo County that could be affected by WSIP project components include East Palo Alto, Menlo Park, Atherton, Redwood City, Woodside, San Carlos, San Mateo, Hillsborough, Burlingame, Millbrae, San Bruno, South San Francisco, Colma, Brisbane, and Daly City. Agricultural uses, where they remain in these cities, are described below.

City of East Palo Alto

Agriculture was an important part of East Palo Alto's history, and the general plan includes policies to preserve open space lands that are of economic use, in particular the Weeks and Gardens/Gateway III neighborhoods. Examples of uses on these lands are nurseries, horticulture, and community gardens. The plan states that the City will allow the establishment and continuation of these open space activities, while ensuring that the surrounding planned land uses are compatible (City of East Palo Alto, 1999).

Town of Colma

Colma contains approximately 113 acres of agricultural lands, dedicated mainly to nurseries, greenhouse operations, open field flowers, and vegetable plots. All of the agricultural land is privately maintained open space (Town of Colma, 2000).

City of Daly City

Daly City contains three neighborhoods that have agricultural lands: the Bayshore (5.50 acres), Original Daly City (0.55 acres), and Hillside (4.02 acres) neighborhoods. Included in the agricultural designation are greenhouses, row crops, cut flowers, and livestock grazing (City of Daly City, 1987).

San Francisco County

In 2003, San Francisco County ranked 57th (out of 58 counties) in California for the value of its agricultural production, which was less than $2 million. The county's leading commodities were vegetables and cut flowers (California Department of Finance, 2003). The CCSF does not participate in the Williamson Act and does not have the minimum amount of farmland required to participate in the Farmland Mapping and Monitoring Program.

Regulatory Framework

Farmland in California is protected mainly by federal and state legislation, although local policies and ordinances are also in place at the county or city level to control uses on or adjacent to farmland. The main federal legislation protecting agriculture is the Farmland Protection and Policy Act, which requires an evaluation of the relative value of farmland potentially affected by decisions sponsored in whole or part by the federal government. The Farmland Protection and Policy Act would not apply to the proposed program, however, since the WSIP is not a federal government action or program. The state and local regulatory setting for agricultural resources in the study area is described below.

California State Legislation

The California Land Conservation Act of 1965—commonly referred to as the Williamson Act—enables local governments to enter into contracts with private landowners to ensure that specific parcels are kept in agricultural or open space use as “agricultural preserves.” In return, landowners receive lower property tax assessments than they would otherwise receive. Williamson Act contracts are typically renewed annually for a term of 10 additional years.

“Agricultural preserve” is defined broadly in the Williamson Act to include areas devoted to either agricultural, recreational, or open space use, or any combination of these uses. Open space use is defined in the act as “the use or maintenance of land in a manner that preserves its natural characteristics, beauty, or openness for the benefit and enjoyment of the public, to provide essential habitat for wildlife, or for the solar evaporation of seawater in the course of salt production for commercial purposes.” The act states that contracted land in open space use must be within a scenic highway corridor, a wildlife habitat area, a salt pond, a managed wetland area, or a submerged area. Changes in the terms of a specific Williamson Act contract must go through the planning and zoning department approval process of the appropriate local jurisdiction before they can be enacted.

Williamson Act contracts may be cancelled only with the approval of a local board or council. Cancellation of the contract may occur if it is determined to be in the public interest (i.e., other public concerns outweigh the objectives of having the land under contract, and there is no other suitable land available for the proposed alternative use), or if all of the following conditions are met: (1) a notice of nonrenewal has been served; (2) the cancellation is not likely to result in the removal of adjacent lands from agricultural use; (3) the cancellation is for an alternative use that is consistent with the relevant city or county general plan; (4) cancellation will not result in discontinuous patterns of urban development; and (5) there is no suitable uncontracted land available nearby for the proposed alternative purpose. The property owner generally pays a fee of 12.5 percent of the “cancellation” value of the property once cancellation of the contract has been authorized.

Local Plans and Policies

Refer to Section 4.2, Plans and Policies, regarding the application of local land use plans and policies to implementation of the WSIP.

4.13.2 Impacts

Significance Criteria

The CCSF has not formally adopted significance standards for impacts related to agricultural resources, but generally considers that implementation of the proposed program would have a agricultural resource impact if it were to:

- Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance, as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Department of Conservation, to a non-agricultural use[3] (Evaluated in this section)
- Conflict with existing zoning for agricultural use, or a Williamson Act contract (Evaluated in this section)
- Involve other changes in the existing environment which, due to their location or nature, could result in the conversion of Farmland of Statewide Importance to non-agricultural use (Evaluated in this section)

CEQA Guidelines Section 15206 states that a project would cause a significant impact if it resulted in the cancellation of a Williamson Act contract for parcels of 100 acres or more. No comparable threshold is available in state or city guidance for the loss or conversion of Prime Farmland.

Approach to Analysis

For the purpose of this analysis, each program element was considered in relation to farmland in the immediate site vicinity to identify any potential disruption that might be caused temporarily (during project construction) or permanently (due to project siting or operations on land that is currently in agricultural use). In addition, each project component was examined for its potential to affect land under Williamson Act contract.

Impact Summary by Region

Table 4.13-3 presents a summary of potential impacts on agricultural resources associated with the WSIP projects.

[3] Based on the definition of agricultural use contained in the Williamson Act, conversion to "non-agricultural use" would mean that land previously used for producing an agricultural commodity for commercial purposes is no longer capable of serving this purpose.

TABLE 4.13-3
POTENTIAL IMPACTS AND SIGNIFICANCE – AGRICULTURAL RESOURCES

Projects	Project Number	Impact 4.13-1: Temporary conflicts with established agricultural resources	Impact 4.13-2: Conversion of farmlands to non-agricultural uses
San Joaquin Region			
Advanced Disinfection	SJ-1	N/A	N/A
Lawrence Livermore Supply Improvements	SJ-2	N/A	N/A
San Joaquin Pipeline System	SJ-3	PSM	PSM
Rehabilitation of Existing San Joaquin Pipelines	SJ-4	PSM	N/A
Tesla Portal Disinfection Station	SJ-5	N/A	N/A
Sunol Valley Region			
Alameda Creek Fishery Enhancement	SV-1	PSM	N/A
Calaveras Dam Replacement	SV-2	PSM	LS
Additional 40-mgd Treated Water Supply	SV-3	PSM	PSM
New Irvington Tunnel	SV-4	PSM	N/A
SVWTP – Treated Water Reservoirs	SV-5	N/A	PSM
San Antonio Backup Pipeline	SV-6	PSM	N/A
Bay Division Region			
Bay Division Pipeline Reliability Upgrade	BD-1	N/A	N/A
BDPL Nos. 3 and 4 Crossovers	BD-2	N/A	N/A
Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault	BD-3	N/A	N/A
Peninsula Region			
Baden and San Pedro Valve Lots Improvements	PN-1	N/A	N/A
Crystal Springs/San Andreas Transmission Upgrade	PN-2	N/A	N/A
HTWTP Long-Term Improvements	PN-3	N/A	N/A
Lower Crystal Springs Dam Improvements	PN-4	N/A	N/A
Pulgas Balancing Reservoir Rehabilitation	PN-5	N/A	N/A
San Francisco Region			
San Andreas Pipeline No. 3 Installation	SF-1	N/A	N/A
Groundwater Projects	SF-2	N/A	N/A
Recycled Water Projects	SF-3	N/A	N/A

LS = Less than Significant impact, no mitigation required
PSM= Potentially Significant impact, can be mitigated to less than significant
N/A = Not Applicable

Construction Impacts

Impact 4.13-1: Temporary conflicts with established agricultural resources.

Various elements of the WSIP have the potential to affect agricultural resources in different ways. For example, open-trench construction of pipelines could temporarily disrupt production of field crops or orchards. Other construction activities could affect agricultural resources if they disrupted access to actively farmed parcels. In some areas, the loss of even a small amount of

Prime or Unique Farmland could contribute to significant cumulative impacts on agricultural resources if other projects have removed or will remove substantial amounts of important farmland from the area. These types of potential impacts on agricultural resources associated with the WSIP projects are identified by region below.

Construction of pipelines, tunnels, dams, and other WSIP facilities could disrupt agricultural activities in the study area by excavating in areas used for agricultural purposes, by affecting access to agricultural lands, or by disrupting utilities that serve agricultural uses. This analysis considers a project's impact to be significant if it would be incompatible with existing zoning for agricultural uses in the project vicinity. Temporary environmental impacts that would occur during construction (e.g., noise, dust, traffic) or conflicts with local adopted policies are used as indicators of incompatibility. Construction activities that could affect agricultural resources are described by facility type below.

Pipelines. Depending upon the location of staging areas and the seasonal timing of pipeline construction, cut and cover construction has the potential to cause adverse (but temporary) impacts on agricultural activities, including the potential loss of seasonal crops grown within and around the right-of-way. In addition, road and utility crossings could temporarily affect access to or provision of power or water to actively farmed land. These impacts would be relatively minor (i.e., confined to a linear strip the width of pipeline right-of-way or to a temporary construction easement area) and brief (less than one growing season) and could be reduced to a less-than-significant level with appropriate mitigation measures.

Tunnels. Unlike pipeline construction, tunneling would not affect sensitive agricultural resources at the surface, except in the vicinity of entry and exit portal locations, which would serve as construction staging areas. Agricultural resources could be adversely affected if the portals were located on important farmlands, or if access to nearby farmland were disrupted by construction traffic or grading for new construction access roads. These impacts would be temporary and less than significant after implementation of normal construction mitigation measures, unless portal siting would convert important farmland or lands under Williamson Act contract to non-agricultural use.

Vaults, Valve Lots, and Crossover Facilities. These facilities would be constructed at isolated locations near existing SFPUC facilities along the regional system. Unless they occurred on important farmland or on land zoned for agricultural use or under Williamson Act contract, these facilities are unlikely to affect agricultural resources, and any impacts would be less than significant.

Pump Stations. Upgrading existing pump stations, which would involve removing equipment and replacing it with new equipment, would not affect agricultural resources. New pump stations could affect agricultural resources if they were located on important farmland or on land zoned for agricultural use or under Williamson Act contract, in which case the impacts could be potentially significant.

Treatment Facilities. The proposed upgrades at existing treatment plants would occur within the property boundaries and would not affect agricultural resources. Impacts associated with a new facility would depend on the site location in relation to important farmlands and lands under Williamson Act contracts.

Storage Facilities. The WSIP improvements to water storage facilities could temporarily disrupt agricultural activities in the area (e.g., if grazing lands are located in the vicinity of the construction project) or significantly affect agricultural resources (e.g., if the project would entail flooding important farmland, land zoned for agricultural use, or land under Williamson Act contract).

San Joaquin Region

Impact 4.13-1:	**Temporary conflicts with established agricultural resources**	
Advanced Disinfection	SJ-1	N/A
Lawrence Livermore	SJ-2	N/A
SJPL System	SJ-3	PSM
SJPL Rehabilitation	SJ-4	PSM
Tesla Portal Disinfection	SJ-5	N/A

Of the five WSIP projects within the San Joaquin Region, most construction activities would be associated with the San Joaquin Pipeline projects (SJPL System, SJ-3, and SJPL Rehabilitation, SJ-4). Pipeline and crossover construction and associated staging areas for the SJPL System project would temporarily disrupt agricultural activities in the vicinity of the two proposed pipeline segments. Construction would take place over three years. Most construction would occur within the existing SFPUC right-of-way, but up to an additional 200-foot width of temporary or additional right-of-way could be required north of the existing right-of-way. (Additional land might also be needed for crossover facilities and associated power supply facilities, depending on the final locations of these facilities. This impact is discussed under Impact 4.13-2.)

These construction activities could temporarily disrupt the production of field crops on important farmland within and adjacent to the right-of-way easement and staging areas, or cause temporary access conflicts for agricultural operators in the vicinity. Without mitigation, these temporary impacts could be *potentially significant* in some areas, especially the Prime Farmland east of Tesla Portal in the southern portions of Stanislaus and San Joaquin Counties. With implementation of SFPUC Construction Measures #1, #3, #5, and #6 (neighborhood notice, traffic, air quality, and noise); construction mitigation measures for traffic, noise, and air quality (described in Section 4.8, Transportation, Traffic, and Circulation; Section 4.9, Air Quality; and Section 4.10, Noise and Vibration); as well as supplemental noticing and soil stockpiling measures (Measure 4.13-1a), it is expected that potentially significant temporary construction impacts could be reduced to a less-than-significant level. The SJPL Rehabilitation project (SJ-4) could require pipeline rehabilitation at any location along the entire 48-mile San Joaquin Pipeline right-of-way, which extends through areas of important farmland in Stanislaus and San Joaquin Counties. Similar to the SJPL System project (SJ-3), depending on the location of construction work in relation to agricultural lands and activities, impacts could be *potentially significant*, but would likely be reduced to a less-than-significant level with implementation of SFPUC Construction Measures #1, #3, #5, and #6 (neighborhood notice, traffic, air quality, and noise); construction mitigation measures for traffic, noise, and air quality (described in Section 4.8, Transportation, Traffic, and Circulation;

Section 4.9, Air Quality; and Section 4.10, Noise and Vibration), and supplemental noticing and soil stockpiling measures (Measure 4.13-1a).

Two projects (Advanced Disinfection, SJ-1, and Tesla Portal Disinfection, SJ-5) would involve installing disinfection facilities at existing SFPUC facility sites that are currently used for water system purposes, and thus would not affect agricultural resources. The Lawrence Livermore project (SJ-2) would construct new water filtration facilities for the Lawrence Livermore Laboratory (at Thomas Shaft) in San Joaquin County and would not affect any existing agricultural uses or important farmlands. Therefore, this impact would *not apply* to these projects.

Sunol Valley Region

Impact 4.13-1:	**Temporary conflicts with established agricultural resources**	
Alameda Creek Fishery	SV-1	PSM
Calaveras Dam	SV-2	PSM
40-mgd Treated Water	SV-3	PSM
New Irvington Tunnel	SV-4	PSM
Treated Water Reservoirs	SV-5	N/A
SABUP	SV-6	PSM

Construction of the 40-mgd Treated Water (SV-3) and SABUP (SV-6) projects would include new pipelines from the Sunol Valley WTP to the Alameda Siphons or new Irvington Tunnel and from San Antonio Reservoir to the San Antonio Pump Station. Construction of these pipelines could disrupt the sensitive area of agricultural soils mapped as Unique Farmland in the bottomlands adjacent to Alameda Creek in this area (California Department of Conservation, 2002), a *potentially significant* impact. Construction of the New Irvington Tunnel project (SV-4) could also affect identified agricultural soils in the Alameda Creek vicinity, depending on the ultimate location of staging areas and access roads. In addition, depending on the design of the Alameda Creek Fishery project (SV-1), construction of facilities such as a pipeline, associated staging areas, and pump stations could also disrupt these identified agricultural soils. Such disruption would be temporary, lasting for the duration of the construction period only. Similarly, depending on design and location of staging areas, the Calaveras Dam project (SV-2) could disrupt areas used for grazing. Potential impacts of the Alameda Creek Fishery, Calaveras Dam, and New Irvington Tunnel projects on agricultural resources (including consistency with any affected Williamson Act contracts) would be evaluated in more detail as part of separate, project-level CEQA review. It is expected that these *potentially significant* impacts could be mitigated to a less-than-significant level with implementation of avoidance or soil stockpiling measures, unless other actions are required as a result of contracts affecting use of the property or under specific agreements with individual landowners (Measure 4.13-1b).

Construction of the Treated Water Reservoirs project (SV-5) would not affect identified agricultural resources in the Sunol Valley. Construction activities associated with this project (where applicable) would occur entirely within the fenceline at the existing CCSF-owned Sunol Valley WTP site, which is used for water system purposes. Therefore, this impact would *not apply* to this project.

Bay Division Region

Impact 4.13-1: Temporary conflicts with established agricultural resources		
BDPL Reliability Upgrade	BD-1	N/A
BDPL 3 and 4 Crossovers	BD-2	N/A
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	N/A

The BDPL Reliability Upgrade project (BD-1) would be located in areas that are not mapped as important farmland. The open-trench sections of the pipeline would be constructed within the existing SFPUC right-of-way through urbanized areas. Similarly, none of the proposed locations for the BDPL 3 and 4 Crossovers project (BD-2) would affect agricultural resources, and the BDPL 3 and 4 Seismic Upgrade at Hayward Fault (BD-3) would not disturb important farmlands or existing agricultural activities. Therefore, this impact would *not apply* to the projects in this region.

Peninsula Region

Impact 4.13-1: Temporary conflicts with established agricultural resources		
Baden and San Pedro Valve Lots	PN-1	N/A
CS/SA Transmission	PN-2	N/A
HTWTP Long-Term	PN-3	N/A
Lower Crystal Springs Dam	PN-4	N/A
Pulgas Balancing Reservoir	PN-5	N/A

All of the Peninsula Region projects (PN-1 through PN-5) would occur on CCSF-owned sites that are not used for agricultural activities. New controls and valves would be installed at existing SFPUC facilities in urbanized locations, which are not important farmlands. The CS/SA Transmission project (PN-2) could entail construction of a new parallel pipeline on undeveloped land within the Peninsula watershed, but would not affect important farmland or disrupt existing agricultural uses. Therefore, this impact would *not apply* to the projects in this region.

San Francisco Region

Impact 4.13-1: Temporary conflicts with established agricultural resources		
SAPL 3 Installation	SF-1	N/A
Groundwater Projects	SF-2	N/A
Recycled Water Projects	SF-3	N/A

No agricultural activities would be affected by any of the program components in the urbanized San Francisco Region. Therefore, this impact would *not apply* to the projects in this region.

Operations, Siting, and Design Impacts

Impact 4.13-2: Conversion of farmlands to non-agricultural uses.

This section addresses potential impacts on agricultural resources associated with the siting and permanent operation of WSIP facilities in each region. In some areas, the loss of Prime or Unique Farmland could contribute to significant cumulative impacts on agricultural resources if other projects in the area have removed or would remove substantial amounts of important farmland.

These types of potential impacts on agricultural resources associated with the WSIP projects are identified by region below.

San Joaquin Region

Impact 4.13-2: Conversion of farmlands to non-agricultural uses		
Advanced Disinfection	SJ-1	N/A
Lawrence Livermore	SJ-2	N/A
SJPL System	SJ-3	PSM
SJPL Rehabilitation	SJ-4	N/A
Tesla Portal Disinfection	SJ-5	N/A

Additional land might be acquired to site the SJPL System project (SJ-3) crossover facilities and associated power supply facilities. Depending on the final locations selected, the siting of these facilities could adversely affect important farmland and result in its conversion to non-agricultural use, a *potentially significant* impact. Such impacts could be reduced to a less-than-significant level by siting facilities to avoid these lands or adopting a permanent set-aside for an equivalent acreage of similarly valued farmland in the area (Measure 4.13-2). The additional land required for these facilities might be under a Williamson Act contract, but would be less than 100 acres; therefore, acquisition of these lands would not cause a significant impact as defined by CEQA.

None of the other WSIP projects in the San Joaquin Region (Advanced Disinfection, SJ-1; Lawrence Livermore, SJ-2; SJPL Rehabilitation, SJ-4; and Tesla Portal Disinfection, SJ-5) would result in the permanent conversion of important agricultural land, land zoned for agricultural use, or land under Williamson Act contract to non-agricultural use. Therefore, this impact would *not apply* to these projects.

Sunol Valley Region

Impact 4.13-2: Conversion of farmlands to non-agricultural uses		
Alameda Creek Fishery	SV-1	N/A
Calaveras Dam	SV-2	LS
40-mgd Treated Water	SV-3	PSM
New Irvington Tunnel	SV-4	N/A
Treated Water Reservoirs	SV-5	PSM
SABUP	SV-6	N/A

The Sunol Valley contains important farmland and established agricultural uses that could be affected by WSIP components in Alameda County. The Calaveras Dam project (SV-2) has the potential to submerge approximately 100 acres of grasslands, portions of which may be potential Grazing Land within the SFPUC watershed. Extensive earthmoving activities would also occur within this area, since it has been designated as a borrow area. Because this area is not currently used for agricultural activities and the soils are not prime, unique, or of statewide importance and because the land is not under a Williamson Act contract, this impact would be *less than significant*.

Under the 40-mgd Treated Water (SV-3) and Treated Water Reservoirs (SV-5) projects, proposed basins or reservoirs could require the use of approximately two acres of land adjacent to the existing Sunol Valley WTP. Depending on their design, these facilities could convert potential agricultural land, including soils mapped as Unique Farmland, to non-agricultural uses or disrupt existing agricultural uses. It is expected that avoiding the siting of facilities on these lands or adopting a permanent set-aside for an equivalent acreage of similarly valued farmland in the area (Measure 4.13-2) would reduce this *potentially significant* impact to a less-than-significant level.

The siting and operation of the remaining projects in the Sunol Valley Region (Alameda Creek Fishery, SV-1; New Irvington Tunnel, SV-4; and SABUP, SV-6) would have no effect on agricultural resources, as they would all take place within the boundaries of the existing SFPUC water system (or, in the case of pipelines, disruption would be temporary, and long-term agricultural uses would not be affected). Therefore, this impact would *not apply* to these projects.

Bay Division, Peninsula, and San Francisco Regions

Impact 4.13-2: Conversion of farmlands to non-agricultural uses		
BDPL Reliability Upgrade	BD-1	N/A
BDPL 3 and 4 Crossovers	BD-2	N/A
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	N/A
Baden and San Pedro Valve Lots	PN-1	N/A
CS/SA Transmission	PN-2	N/A
HTWTP Long-Term	PN-3	N/A
Lower Crystal Springs Dam	PN-4	N/A
Pulgas Balancing Reservoir	PN-5	N/A
SAPL 3 Installation	SF-1	N/A
Groundwater Projects	SF-2	N/A
Recycled Water Projects	SF-3	N/A

None of the proposed WSIP projects in these regions would result in the conversion of Prime or Unique Farmland or Farmland of Statewide Importance to non-agricultural uses, nor would they conflict with agricultural zoning or Williamson Act contracts. Therefore, this impact would *not apply* to the projects in these regions.

4.13.3 References – Agricultural Resources

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4.14 Hazards

4.14 Hazards

If released to the soil, groundwater, or air, hazardous materials and wastes can result in public health hazards. Hazardous materials, defined in Section 25501(h) of the California Health and Safety Code, are materials that, because of their quantity, concentration, or physical or chemical characteristics, pose a substantial present or potential hazard to human health and safety or to the environment if released to the workplace or environment. Hazardous materials have been and are commonly used in commercial, agricultural, and industrial applications as well as in residential areas to a limited extent. A waste is any material that is relinquished, recycled, or inherently waste-like. In accordance with Title 22 of the California Code of Regulations, Division 4.5, Chapter 11, a waste is considered a hazardous waste if it is toxic (causes adverse human health effects), ignitable (has the ability to burn), corrosive (causes severe burns or damage to materials), or reactive (causes explosions or generates toxic gases) in accordance with the criteria established in Article 3. Article 4 lists specific hazardous wastes and Article 5 identifies specific waste categories, including Resource Conservation and Recovery Act (RCRA) hazardous wastes, non-RCRA hazardous wastes, extremely hazardous wastes, and special wastes.

Environmental screening analyses or environmental database reviews have been performed for several WSIP projects; and the results of these analyses are described below as an indicator of the potential to encounter hazardous materials in the soil and groundwater. The types of sites identified in the environmental databases include permitted hazardous materials uses,[1] environmental cases,[2] and spill sites.[3] For projects where an environmental screening analysis or environmental database review has not been performed, general land uses are described.

4.14.1 Setting

San Joaquin Region

The San Joaquin Pipeline spans previous and current agricultural areas, where the application of pesticides and herbicides may have resulted in soil or shallow groundwater contamination. Underground fuel tanks, including heating oil or fuel tanks at individual farms, adjacent to or near the existing and proposed pipeline alignment may also have affected shallow soil or groundwater quality within the alignment.

The SJPL Rehabilitation project (SJ-4) could include assessment and rehabilitation along any section of the 48-mile San Joaquin Pipeline system. The environmental database review performed for this pipeline system in 2004 (EDR, 2004a) identified a number of permitted hazardous materials uses within 1/4 mile of the pipeline system, primarily concentrated in

1 Permitted hazardous materials uses are facilities that use hazardous materials or handle hazardous wastes but comply with current hazardous materials and hazardous waste regulations.

2 Environmental cases are sites suspected of releasing hazardous substances or that have had cause for hazardous materials investigations and are identified on regulatory agency lists. These are sites where soil and/or groundwater contamination is known or suspected to have occurred.

3 Spill sites are locations where a spill has been reported to the state or federal regulatory agencies. Such spills do not always involve a release of hazardous materials.

Modesto and to the west toward Shackelford Road. The uses considered to have the greatest potential to affect soil and groundwater quality within the pipeline right-of-way are the U.S. Army River Bank Ammunitions Plant site, located near Riverbank, and 43 historical underground storage tank sites.

The U.S. Army River Bank Ammunition Plant site, a government-owned and contractor-operated ammunitions manufacturing plant, is partially located within the San Joaquin Pipeline right-of-way. There are four unlined evaporation ponds, located approximately 1.5 miles north of the plant site and used since 1952 for the disposal of treated effluent. Cyanide, potliner wastes, and other wastes and debris were generated and reportedly disposed of in a landfill in the northeastern portion of the main plant area. Other wastes historically produced at the plant include corrosive wastes (phosphoric acid, sulfuric acid, caustic cleaners), solvents, spent pickle liquids, wastewater containing metals, and nitrates. Hexavalent chromium and cyanide have been identified in groundwater beneath the plant site and beyond the property boundaries, at maximum concentrations of 2,000 micrograms per liter (µg/L) and 9,300 µg/L, respectively. As a result, the U.S. Army Corps of Engineers has been required to permanently connect nearby residential areas relying on groundwater as the principal water source to a potable water source. This facility is a Superfund site undergoing corrective action under RCRA. A Record of Decision mandating a permanent remedy has been developed for this site. Other environmental cases identified within the pipeline corridor include six leaking underground storage tank sites, five of which are located within Modesto.

The SJPL System project (SJ-3) would include construction of a 6.4-mile-long pipeline extending from the Oakdale Portal to the west (eastern segment) and 10-mile-long pipeline extending from Tesla Portal to the east (western segment), although this latter segment could be as long as 16.3 miles. Both pipeline segments would be constructed within the existing right-of-way. The database review identified two historical underground storage tank sites within 1/4 mile of the western segment. No permitted hazardous materials uses, environmental cases, or spill sites were identified within 1/4 mile of the eastern segment.

Tesla Portal, where the Advanced Disinfection facility (SJ-1) and Tesla Portal Disinfection project (SJ-5) would be located, is in a rural area; there were no permitted hazardous materials uses, environmental cases, or spill sites identified within one mile of Tesla Portal (Vista Information Solutions, 1999a). No environmental database reviews have been conducted for the Thomas Shaft, where the Lawrence Livermore project (SJ-2) would be constructed. This site is also located in a rural area.

Gas Fields

The western segment of the San Joaquin Pipeline (SJPL System, SJ-3, and SJPL Rehabilitation, SJ-4) passes between the Vernalis and Southwest Vernalis Gas Fields. The alignment is near several plugged and abandoned gas wells in the Southwest Vernalis Field. Active gas wells in the Vernalis Field are more than one mile north of the alignment, although plugged and abandoned dry oil exploration holes are located about 1/2 mile from the alignment.

Sunol Valley Region

Most of the projects in this region would be located within Sunol Valley, which is mostly developed with water facilities, commercial nurseries, and quarries. The environmental database review conducted in 2003 for the New Irvington Tunnel project (SV-4) identified one environmental case within 1/4 mile of the Alameda West Portal (EDR, 2003a). This site had a confirmed release of hazardous materials and was also identified as a leaking underground storage tank site.

The Calaveras Test Site at the end of Marsh Road is located at the south end of Calaveras Reservoir where the Calaveras Dam project (SV-2) would be constructed. The SFPUC leased this 3.2-acre site to various operators between 1948 and 1993; during this time, the site was used for the testing and manufacturing of propellants and explosives (URS, 2004). A number of soil and groundwater investigations at this site have identified solvents, including trichloroethylene, in the groundwater. The Regional Water Quality Control Board (RWQCB) has approved monitored natural attenuation as the preferred remedial approach for the groundwater. In 1996, the plume of trichloroethene identified in the groundwater at this site extended about 730 feet to the northwest of where it originated, but by 2003 the length of the plume decreased to 570 feet. In 2006, the concentration of trichloroethene detected in groundwater was up to 11 µg/L, twice the cleanup level of 5 µg/L (Conestoga-Rovers & Associates, 2006). Solvents and semivolatile organic compounds have not been detected in Calaveras Creek or a nearby water supply well, and volatile organic compounds have not been detected in surface water samples collected from Calaveras Reservoir. Although trichloroethene concentrations have not reached cleanup levels, the RWQCB is preparing to recommend closure of the groundwater contamination case at this site (Johnson, 2007).

No hazardous materials assessments have been prepared for the Alameda Creek Fishery (SV-1), 40-mgd Treated Water (SV-3), Treated Water Reservoirs (SV-5), and SABUP (SV-6) projects, but hazardous materials are used at the Sunol Valley Water Treatment Plant (WTP), where the two treated water projects (SV-3 and SV-5) would be constructed.

Bay Division Region

The WSIP projects proposed in this region are generally located along the existing Bay Division Pipelines Nos. 1 and 2 (northern) alignment or Bay Division Pipelines Nos. 3 and 4 (southern) alignment; these pipelines span geographically different areas and are discussed separately below.

Northern Alignment

The proposed alignment for the BDPL Reliability Upgrade project (BD-1) generally follows the alignment of Bay Division Pipelines Nos. 1 and 2 and passes through residential, commercial, and industrial areas on both sides of San Francisco Bay. The environmental database review conducted for the project in 2003 identified a number of environmental cases, permitted hazardous materials uses, and spill sites within 1/4 mile of the alignment (EDR, 2003a, 2003b). On the east side of the bay, the majority of environmental cases were located in the vicinity of Cherry Street and Central

Avenue and within one mile of the proposed east tunnel portal at the Newark Valve House. Groundwater contamination by dissolved petroleum products or solvents was identified at six environmental cases located within 1/2 mile of the proposed east tunnel portal.

On the west side of the bay, the proposed west tunnel portal and Ravenswood Valve House are located at the site of the former Peninsula Sportsmen's Club. Soil at this site and sediment in the adjacent Cargill Salt Pond and levee have been contaminated by lead shot and clay pigeon debris from former skeet-shooting activities at the gun club. Although the City did not cause the contamination, as the landowner it is responsible for the cleanup in accordance with RWQCB Order No. 01-095 (RWQCB, 2001). Remediation of the site is ongoing, and complete cleanup is expected before 2009.

There are a number of leaking underground storage tank sites as well as sites with documented groundwater contamination within 1/4 mile of the remainder of the alignment on the east side of the bay. These sites are generally concentrated near Willow Road, Marsh Road, El Camino Real, and Canyon Road.

Southern Alignment

The Bay Division Pipelines Nos. 3 and No. 4 traverse the south end of the bay. WSIP projects along this alignment include the BDPL 3 and 4 Crossovers (BD-2) and BDPL 3 and 4 Seismic Upgrade at Hayward Fault (BD-3).

BDPL 3 and 4 Crossovers (BD-2) includes the construction of crossovers at the Guadalupe River, Bear Gulch Reservoir, and Barron Creek sites. Based on the 2003 environmental database review, all identified permitted hazardous materials uses were located approximately 1/4 mile from the crossover locations at Guadalupe River, and there were no identified environmental cases or spill sites within 1/4 mile (EDR, 2003a). There were two permitted hazardous materials uses within 1/4 mile of the Bear Gulch site, but no environmental cases or spill sites in this area. The Barron Creek site is near the Hillview-Porter regional groundwater plume, in which solvents have been identified. There were also two leaking underground storage tank sites and one case under the jurisdiction of the RWQCB within 1/4 mile of this site.

As part of a screening analysis, a database search was conducted to identify high- and medium-priority environmental cases[4] along Bay Division Pipelines Nos. 3 and 4, including the BDPL 3

[4] High-priority environmental cases are those sites identified as undergoing remediation or enforcement actions under the federal Superfund or RCRA regulations. These are sites identified on the National Priorities List (NPL), RCRA Corrective Action Sites, and RCRA Administrative Action Tracking System. A Record of Decision (ROD), which mandates a permanent remedy, has been developed for each of the NPL sites, and these sites are also tracked in the ROD database. Medium-priority environmental cases are those sites where a confirmed or potential release of hazardous materials has occurred and there is the potential to encounter hazardous materials during construction, but the contamination is not severe enough to warrant action under federal regulations. These include sites undergoing enforcement actions under the jurisdiction of state regulatory agencies, including the San Francisco Bay RWQCB and the California Department of Toxic Substances Control, as well as those sites tracked in the federal Comprehensive Environmental Response, Compensation, and Liability Information System as potential NPL sites. Toxic pit sites, waste management units, and sites with a reported release that could threaten a drinking water source are also included in this category.

and 4 Seismic Upgrade at Hayward Fault (BD-3) project location (EDR, 2003a). There were no high- or medium-priority environmental cases within 1/4 mile of the BD-3 improvements. Additional permitted hazardous materials uses, environmental cases, and spill sites may be located within 1/4 mile of these proposed improvements, but the existing environmental assessment only identified specific high-priority environmental cases.

Peninsula Region

The Peninsula Region includes open space lands of the Peninsula watershed as well as developed urban areas. The environmental database review conducted in 1999 for the Harry Tracy WTP, where the HTWTP Long-Term project (PN-3) would be constructed, reported a 1993 leak of motor vehicle fuel from an underground storage tank at the treatment plant (Vista Information Solutions, 1999c). The case was reported to affect soil only and was closed in 1995 after excavation and disposal of the contaminated soil. The Harry Tracy WTP site was not identified as a RCRA-permitted facility. The database review identified one leaking underground storage tank site within a one-mile radius of the site.

The Pulgas Balancing Reservoir site (PN-5) is located in a rural area. The environmental database review conducted in 1999 did not identify this site as an environmental case or a permitted hazardous materials use (Vista Information Solutions, 1999b). No environmental cases were identified within a one-mile radius of the site.

An environmental database review has not been conducted for the Baden and San Pedro Valve Lots (PN-1), CS/SA Transmission (PN-2), or Lower Crystal Springs Dam (PN-4) projects. There is a low potential to encounter soil or groundwater contamination during construction of the CS/SA Transmission and Lower Crystal Springs Dam projects because they are located on watershed land. However, there is the potential to encounter soil and groundwater contamination during the construction of the Baden and San Pedro Valve Lots project, which is partially located in urban areas.

San Francisco Region

The San Francisco Region projects are primarily located in San Francisco, although the SAPL 3 Installation (SF-1) extends to Highway 82 in Daly City, and the Regional Groundwater Projects (SF-2) are located outside of the San Francisco, in San Mateo County.

An environmental database review has been conducted for the SAPL 3 Installation project (SF-1). Environmental database reviews have not been conducted specifically for the Groundwater Projects (SF-2) or Recycled Water Projects (SF-3), although there is documented soil contamination at the Pacific Rod and Gun Club near Lake Merced, which is part of the Local Groundwater Projects. The environmental database review and Pacific Rod and Gun Club are discussed below.

San Andreas Pipeline No. 3 Installation Vicinity

Mixed residential and commercial land uses surround the southern end of the SAPL 3 Installation (SF-1) pipeline alignment for approximately 1,000 feet. The remainder of the alignment north to Sunset Reservoir traverses residential or golf course uses. The environmental database review conducted for the SAPL 3 Installation project identified leaking underground storage tank sites and additional environmental cases within 1/4 mile of the pipeline alignments under consideration (EDR, 2004b).

Pacific Rod and Gun Club

The Pacific Rod and Gun Club, located on 14 acres of property along the shores of Lake Merced (South Lake) off of John Muir Drive, has been used for skeet and trap shooting since 1928. Although the use of lead shot was discontinued in 1994 and biodegradable targets have been used since 2000, soil and sediment quality have been affected by the historical use of lead shot and clay pigeons at this facility; the primary constituents of concern are lead, arsenic, copper, and polynuclear aromatic hydrocarbons (URS, 2005).

Regulatory Framework

Hazardous materials and hazardous wastes are subject to numerous federal, state, and local laws and regulations intended to protect health and safety and the environment. The major federal, state, and regional agencies enforcing these regulations include the U.S. Environmental Protection Agency (U.S. EPA, federal); the DTSC and the RWQCB of the California Environmental Protection Agency (state); and the Bay Area Air Quality Management District (BAAQMD, regional). The state and federal regulatory framework is described in Appendix G.

In accordance Chapter 6.11 of the Health and Safety Code (Section 25404, et seq.), local regulatory agencies enforce many federal and state regulatory programs through the Certified Unified Program Agency (CUPA) program, including:

- Hazardous materials business plans (Chapter 6.95 of the Health and Safety Code, Section 25501 et seq.)
- The California accidental release prevention program for acutely hazardous materials (Chapter 6.95 of the Health and Safety Code, Section 25531 et seq.)
- State Uniform Fire Code requirements (Section 80.103 of the Uniform Fire Code as adopted by the state fire marshall pursuant to Health and Safety Code, Section 13143.9)
- Underground storage tanks (Chapter 6.7 of the Health and Safety Code, Section 25280 et seq.)
- Aboveground storage tanks (Health and Safety Code Section 25270.5[c])
- Hazardous waste generator requirements (Chapter 6.5 of the Health and Safety Code, Section 25100 et seq.)

Several county and city agencies within the WSIP study area are CUPA agencies. The environmental health departments in Tuolumne, Stanislaus, San Joaquin, Alameda, Santa Clara, and San Mateo Counties are the CUPA agencies in these counties. Local fire departments are the CUPA agencies in Newark, Fremont, and Santa Clara. Some local fire departments (Santa Clara County and Palo Alto) are participating agencies that support the CUPA agencies. The San Francisco Department of Public Health is the responsible CUPA agency in San Francisco.

Use and Storage of Hazardous Materials and Fuels

Hazardous Materials Business Plans

Businesses that handle specified quantities of chemicals are required to submit a hazardous materials business plan (HMBP) in accordance with community right-to-know laws. This plan allows local agencies to plan appropriately for a chemical release, fire, or other incident. The HMBP must include the following:

- An inventory of hazardous materials with specific quantity data, storage or containment descriptions, ingredients of mixtures, and physical and health hazard information
- Site and facility layouts that must be coded for chemical storage areas and other facility safety information
- Emergency response procedures for a release or threatened release of hazardous materials
- Procedures for immediate notification of releases to the administering agency
- Evacuation plans and procedures for the facility
- Descriptions of employee training in evacuation and safety procedures in the event of a release or threatened release of hazardous materials consistent with employee responsibilities, and proof of implementing such training on an annual basis
- Identification of local emergency medical assistance appropriate for potential hazardous materials incidents

The HMBP is filed with and administered by the CUPA agency, which ensures review by and distribution to other potentially affected agencies. The SFPUC has prepared and implemented HMBPs for its facilities that use hazardous materials above threshold limits.

California Accidental Release Program

The California Accidental Release Program (CalARP) includes regulatory requirements for facilities that handle regulated substances.[5] Ammonia and propane are regulated substances under state and federal risk management regulations. In accordance with CalARP regulations, preparation of a risk management plan (RMP) is required for the storage of regulated substances above threshold quantities. The RMP includes a hazard assessment to evaluate the potential

[5] CalARP incorporates the requirements of the Federal Risk Management Program, but is more stringent with respect to the threshold quantities of chemicals requiring risk management plans.

effects of an accidental release, a program for preventing an accidental release, and a program for responding to an accidental release. The RMP is filed with and administered by the CUPA agency, which ensures review by and distribution to other potentially affected agencies. The SFPUC has prepared and implemented RMPs for the storage of ammonia at the Harry Tracy WTP and Sunol Valley Chloramination Facility.

Aboveground Storage of Petroleum Products

The Aboveground Petroleum Storage Act of 1990 requires facilities storing petroleum products in a single tank greater than 1,320 gallons or facilities storing petroleum in aboveground tanks or containers with a cumulative storage capacity of greater than 1,320 gallons to file a storage statement with the State Water Resources Control Board (SWRCB) and prepare a spill prevention, control, and countermeasure plan. The plan must identify appropriate spill containment or equipment for diverting spills from sensitive areas, and discuss facility-specific requirements for the storage system, inspections, record keeping, security, and personnel training.

The SWRCB requires registration of an aboveground fuel storage tank at a construction site only if the tank is 20,000 gallons or larger, or if the aggregate volume of aboveground petroleum storage is over 100,000 gallons. For smaller temporary tanks used during construction, methods for controlling a release and measures to clean up an accidental release and prevent degradation of water quality are addressed in the construction stormwater pollution prevention plan prepared for the project, as described in Section 4.5, Hydrology and Water Quality.

Hazardous Materials Worker Safety Requirements

The federal Occupational Safety and Health Administration (Fed-OSHA) and the California Occupational Safety and Health Administration (Cal-OSHA) are the agencies responsible for assuring worker safety in the handling and use of chemicals in the workplace. The federal regulations pertaining to worker safety are contained in Title 29 of the Code of Federal Regulations, as authorized in the Occupational Safety and Health Act of 1970. They provide standards for safe workplaces and work practices, including standards relating to hazardous materials handling. In California, Cal-OSHA assumes primary responsibility for developing and enforcing workplace safety regulations; Cal-OSHA standards are generally more stringent than federal regulations.

The state regulations concerning the use of hazardous materials in the workplace are included in Title 8 of the California Code of Regulations, which contain requirements for safety training, availability of safety equipment, accident and illness prevention programs, hazardous substance exposure warnings, and emergency action and fire prevention plan preparation. Cal-OSHA also enforces hazard communication program regulations, which contain worker safety training and hazard information requirements, such as procedures for identifying and labeling hazardous substances, communicating hazard information relating to hazardous substances and their handling, and preparation of health and safety plans to protect workers and employees.

Control of Asbestos During Construction

The California Air Resources Board (CARB) has adopted an asbestos Airborne Toxic Control Measure (ATCM) for construction, grading, quarrying, and surface mining operations (CARB, 2002). The ATCM requires the use of best available dust mitigation measures to prevent offsite migration of asbestos-containing dust from road construction and maintenance activities, construction and grading operations, and quarrying and surface mining operations in areas of ultramafic rock,[6] serpentine,[7] or asbestos.[8] The BAAQMD implements the regulation, which became effective on July 22, 2002.

For construction projects within areas where ultramafic rock (primarily serpentinite) is mapped that disturb one acre or less of land, the ATCM requires the site operator to implement standard dust mitigation measures before construction begins, and to maintain each measure throughout the duration of the construction project. Construction activities disturbing more than one acre of asbestos-containing materials are required to prepare an asbestos dust mitigation plan specifying measures that would be taken to ensure that no visible dust crosses the property boundary. The asbestos dust mitigation plan must be submitted to and approved by the BAAQMD prior to the beginning of construction, and the site operator must ensure the implementation of all measures throughout the construction project. In addition, the BAAQMD may require air monitoring for offsite migration of asbestos dust during construction activities and may change the plan on the basis of the air monitoring results.

In the program area, naturally occurring asbestos would most likely be encountered in Franciscan ultramafic rock (primarily serpentinite) or mélange.[9] The asbestos ATCM could apply to the Calaveras Dam (SV-2), BDPL Reliability Upgrade (BD-1), CS/SA Transmission (PN-2), and Lower Crystal Springs Dam (PN-4) projects, because at least part of these projects would be located in areas where these bedrock units have been identified, as discussed in Section 4.4, Geology, Soils, and Seismicity. San Francisco Region projects could be subject to the ATCM if they would require disturbance of one of these bedrock units or would be located in areas that have been filled with materials excavated from bedrock containing serpentinite. Additional projects could be subject to the asbestos ATCM if naturally occurring asbestos were identified during construction.

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6 Ultramafic rocks are formed in high-temperature environments well below the surface of the earth.

7 Serpentine is a naturally occurring group of minerals that can be formed when ultramafic rocks are metamorphosed during uplift to the earth's surface. Serpentinite is a rock consisting of one or more serpentine minerals. This rock type is commonly associated with ultramatic rock along earthquake faults. Small amounts of chrysotile asbestos, a fibrous form of serpentine minerals, are common in serpentinite.

8 Asbestos is a term used for several types of naturally occurring fibrous materials found in many parts of California.

9 Mélange is a mixture of rock materials of differing sizes and types typically contained within a sheared matrix.

Wildland Fire

The California Public Resources Code, beginning with Section 4427, includes fire safety regulations that: restrict the use of equipment that may produce a spark, flame, or fire; require the use of spark arrestors[10] on construction equipment that use an internal combustion engine; specify requirements for the safe use of gasoline-powered tools in fire hazard areas; and specify fire suppression equipment that must be provided onsite for various types of work in fireprone areas. The Public Resources Code requirements would apply to construction activities at the SJPL System (SJ-3) and SJPL Rehabilitation (SJ-4) east segment near the Oakdale Portal and west segment near Tesla Portal; projects at the Tesla Portal (Advanced Disinfection, SJ-1, and Tesla Portal Disinfection, SJ-5); the Lawrence Livermore project (SJ-2); all of the Sunol Valley Region projects; the BDPL Reliability Upgrade project (BD-1); and the Peninsula Region projects within the Peninsula watershed (Baden and San Pedro Valve Lots, PN-1; CS/SA Transmission, PN-2; Lower Crystal Springs Reservoir, PN-4; and Pulgas Balancing Reservoir, PN-5), because these sites are in or near areas designated by the California Department of Forestry and Fire Protection (CDF) as a “Wildland Area That May Contain Substantial Forest Fire Risks and Hazards” (CDF, various dates).

Any additional requirements of the local fire agencies would also apply to projects located within a “Very High Fire Hazard Severity Zone.” The fire protection agencies may also designate new areas in their jurisdictions as “Very High Fire Severity Zones,” which could result in more WSIP projects being located in such zones and subject to local requirements for construction in these zones.

In addition, the City and County of San Francisco has identified areas of Urban-Wildland Interface in Golden Gate Park, where some Groundwater Projects (SF-2) or Recycled Water Projects (SF-3) could be located (CCSF, 2005). While not a major threat, there is the potential for an urban-wildland fire in this area.

Tunnel Classification and Safety

The California Tunnel Safety Orders (California Code of Regulations, Title 8, Subchapter 20, Article 8) require the Division of Industrial Safety to classify all tunnels or portions of tunnels into one of the following classifications before a public works project can be put out to bid:

- Nongassy, the classification assigned when there is little likelihood of encountering gas during the construction of the tunnel.
- Potentially gassy, the classification assigned when there is a possibility that flammable gas or hydrocarbons will be encountered during construction of the tunnel.
- Gassy, the classification assigned when it is likely gas will be encountered, or if monitoring indicates the presence of hazardous gases at a concentration greater than 5 percent of the lower explosive limit.

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[10] A spark arrestor is a device that prohibits exhaust gases from an internal combustion engine from passing through the impeller blades where they could cause a spark. A carbon trap is commonly used to retain carbon particles from the exhaust.

- Extra hazardous, the classification assigned to tunnels when the Division finds that there is a serious danger to the safety of employees, flammable gas or petroleum vapors emanating from the strata have been ignited in the tunnel, or monitoring indicates the presence of hazardous gases at a concentration greater than 20 percent of the lower explosive limit.

In accordance with the Tunnel Safety Orders, a tunnel is defined as an underground passageway, 30 inches in diameter or greater, that is excavated by employees working below the ground surface. Therefore, the orders would apply to tunnels proposed as part of the WSIP as well as jack-and-bore excavations that are 30 inches or more in diameter where employees work underground. A classification has not been assigned to the tunnels that would be constructed under the New Irvington Tunnel (SV-4) and BDPL Reliability Upgrade (BD-1) projects, although the New Irvington Tunnel is considered potentially gassy. Classification of these tunnels and other applicable bore excavations would be made by the Division of Industrial Safety on the basis of geologic assessments and recommendations of the SFPUC in accordance with the Tunnel Safety Orders.

The Tunnel Safety Orders require an emergency plan for all tunnel operations that includes maps, ventilation controls, firefighting equipment, rescue procedures, evacuation plans, and communications. The Tunnel Safety Orders specify ventilation requirements for all tunnels. For potentially gassy tunnels, the orders specify monitoring requirements during construction. If threshold levels of gases are exceeded, work must halt and may not resume until the Division of Industrial Safety has authorized reentry in writing. For gassy tunnels, the Tunnel Safety Orders specify monitoring requirements for explosive gases; actions to be taken in the event that explosive vapors are identified; additional requirements for ventilation; restrictions on the use of equipment with internal combustion engines and spark-producing work activities such as welding or cutting; restrictions on smoking and possession of personal sources of ignition such as lighters or matches; requirements for a “kill” button to cut off electrical equipment in the event that sufficient vapors accumulate; and provision of a refuge chamber or escape route for employee safety.

Emergency Response Procedures

The HMBPs and RMPs for the SFPUC facilities that store chemicals specify response procedures to be implemented in the event of a chemical emergency, in accordance with the applicable local regulations. These procedures include notification requirements in the event of a spill; measures to be taken to control and cleanup a spill; procedures for coordination of emergency response personnel; and procedures to be followed should emergency evacuation be required. Plant personnel maintain a comprehensive inventory of emergency response equipment at the facility, and emergency response equipment is regularly inspected and maintained. In accordance with community right-to-know laws, a copy of the HMBP or RMP is on file with the local fire department to assist them in responding to chemical emergencies at the SFPUC chemical storage facilities.

Hazardous Building Materials

Hazardous building materials are included in this discussion because some WSIP projects would involve demolition or renovation of structures that may contain such materials. Some building materials commonly used in older buildings could present a public health risk if disturbed during an accident or during demolition or renovation. Hazardous building materials include asbestos, electrical equipment such as transformers and fluorescent light ballasts that contain polychlorinated biphenyls (PCBs) or di (2 ethylhexyl) phthalate (DEHP), fluorescent lights containing mercury vapors, and lead-based paints. Asbestos and lead-based paint may also present a health risk to building occupants if the materials are in a deteriorated condition. If removed during demolition of a building, these materials would require special disposal procedures.

Asbestos is a common name for a group of naturally occurring fibrous silicate minerals that are made up of thin but strong, durable fibers. Because of its physical properties, asbestos was commonly used until the 1970s as a building material, including use as insulation material, shingles and siding, roofing felt, floor tiles, acoustical ceiling material, and automotive brakes and clutches. Asbestos is a known carcinogen and presents a public health hazard if it is present in the friable (easily crumbled) form. Long-term, chronic inhalation of high levels of asbestos can cause lung diseases such as asbestosis, mesolethioma, and lung cancer.

PCBs are mixtures of synthetic organic chemicals with physical properties ranging from oily liquids to waxy solids. Due to their nonflammability, chemical stability, high boiling point, and electrical insulating properties, PCBs were used in hundreds of industrial and commercial applications, including use in electrical, heat transfer, and hydraulic equipment; as plasticizers in paints, plastic, and rubber compounds; in pigments, dyes, and carbonless copy paper; and many others. More than 1.5 billion pounds of PCBs were manufactured in the United States before production ceased in 1977 (U.S. EPA, 2005). PCBs are a known human carcinogen; they are highly toxic substances that remain persistent in the environment, accumulate in biological systems, interfere with the reproductive system, and act as an immunosuppressant. Under Section 6(e) of the Toxic Substances Control Act, Congress began regulating the use and manufacturing of PCBs in 1976, legislating “cradle to grave” (i.e., from manufacture to disposal) management of PCBs in the United States. Because PCBs were historically used in the WSIP study area, the potential exists for leaks to have occurred.

Most fluorescent light ballasts manufactured before 1978 contain approximately 0.5 ounces of PCBs in a small capacitor, although the quantity can be up to 2 ounces. In 1978, the U.S. EPA estimated that approximately 850 million of these capacitors were in use in the United States. Ballasts manufactured after January 1, 1978 do not contain PCBs and should be labeled as such on the ballast. Between 1979 and the early 1990s, DEHP was used in place of PCBs as a dielectric fluid in some fluorescent light ballasts and other electrical equipment (Green Lights Recycling, 2007). DEHP is classified as a probable human carcinogen by the U.S. Department of Health and Human Services and as a hazardous substance by the U.S. EPA. Because of this classification, ballasts containing DEHP must be legally disposed of; ballast incineration or a combination of ballast recycling and incineration are recommended for complete destruction of DEHP.

Spent fluorescent light tubes commonly contain mercury vapors. In February 2004, regulations took effect in California that classified all fluorescent lamps and tubes as a hazardous waste. When these lamps or tubes are broken, mercury is released to the environment; mercury can also be absorbed through the lungs into the bloodstream and can be washed by rain into waterways. The mercury in urban stormwater sediment results in part from improperly discarded fluorescent lamps and tubes (CIWMB, 2007). In 2000, approximately 370 pounds of mercury were released in California due to the breakage of electric lamps and tubes during storage and transportation. It is estimated that nearly 75 million waste fluorescent lamps and tubes are generated annually in California, and these lamps and tubes contain more than half a ton of mercury.

Lead-based paint is paint that contains lead, a heavy metal historically added to paint as pigment and to speed drying, increase durability, retain a fresh appearance, and resist moisture (which causes corrosion). Because of its toxicity, paint containing more than 0.06 percent lead was banned for residential use in 1978 by the U.S. Consumer Product Safety Commission. Lead is toxic to humans, particularly young children, and can cause a range of human health effects depending on the level of exposure. When adhered to the surface of a material, lead-based paint poses little health risk. Where the paint is delaminated or chipping, it can cause a potential threat to the health of young children or other building occupants who may ingest the paint. Lead dust also presents public health risks during the demolition of structures that contain lead-based paint. Lead-based paint that has separated from a structure may also contaminate nearby soil.

4.14.2 Impacts

Significance Criteria

The CCSF has not formally adopted significance standards for impacts related to hazards, but generally considers that implementation of the proposed program would have a significant impact if it were to:

- Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials (Evaluated in this section)
- Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment (Evaluated in this section)
- Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within 1/4 mile of an existing or proposed school (Evaluated in this section)
- Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would create a significant hazard to the public or the environment (Evaluated in this section)
- For a project located within an area covered by an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, result in a safety hazard for people residing or working in the project area (Not evaluated in this section, see Appendix B)

- For a project within the vicinity of a private airstrip, result in a safety hazard for people residing or working in the project area (Not evaluated in this section, see Appendix B)

- Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan (Not evaluated in this section, see Appendix B and Section 4.8, Traffic, Transportation, and Circulation)

- Expose people or structures to a significant risk of loss, injury, or death involving fires (Evaluated in this section)

Approach to Analysis

The program-level assessment focuses on the following issues:

- The potential for encountering hazardous substances in soil and groundwater during construction at the WSIP sites, based on land uses and regulatory database searches to identify permitted hazardous materials uses and environmental cases in the vicinity of ground-disturbing activities

- The potential for encountering naturally occurring asbestos during construction of the WSIP projects

- Potential wildland fire hazards associated with project construction

- Safety risks associated with potentially gassy conditions in the proposed tunnels

- Hazardous building materials that could be encountered during demolition or renovation required for the WSIP projects

- New uses of chemicals and changes in the use of chemicals at the WSIP project sites

The level of analysis used in this program-level assessment allows for the identification of potential impacts related to each project. However, these program-level reviews would be further refined as part of separate, project-level CEQA review of individual WSIP projects, which could result in a change in significance determination.

Impact Summary by Region

Table 4.14-1 provides a summary of the hazards impacts associated with implementation of the WSIP.

TABLE 4.14-1
POTENTIAL IMPACTS AND SIGNIFICANCE – HAZARDS

Projects	Project Number	Impact 4.14-1: Potential to encounter hazardous materials in soil groundwater	Impact 4.14-2: Exposure to naturally occurring asbestos	Impact 4.14-3: Risk of fires during construction	Impact 4.14-4: Gassy conditions in tunnels	Impact 4.14-5: Exposure to hazardous building materials	Impact 4.14-6: Accidental hazardous materials release from construction equipment	Impact 4.14-7: Increased use of hazardous materials during operation	Impact 4.14-8: Emission or use of hazardous materials within 1/4 mile of a school
San Joaquin Region									
Advanced Disinfection	SJ-1	LS	N/A	LS	N/A	N/A	LS	LS	N/A
Lawrence Livermore Supply Improvements	SJ-2	LS	N/A	LS	N/A	N/A	LS	LS	N/A
San Joaquin Pipeline System	SJ-3	LS	N/A	LS	LS	PSM	LS	LS	N/A
Rehabilitation of Existing San Joaquin Pipelines	SJ-4	PSM	N/A	LS	LS	PSM	LS	N/A	N/A
Tesla Portal Disinfection Station	SJ-5	LS	N/A	LS	N/A	PSM	LS	LS	N/A
Sunol Valley Region									
Alameda Creek Fishery Enhancement	SV-1	LS	N/A	LS	LS	N/A	LS	N/A	N/A
Calaveras Dam Replacement	SV-2	LS	LS	LS	N/A	PSM	LS	N/A	N/A
Additional 40-mgd Treated Water Supply	SV-3	LS	N/A	LS	LS	N/A	LS	LS	N/A
New Irvington Tunnel	SV-4	LS	N/A	LS	LS	PSM	LS	N/A	N/A
SVWTP – Treated Water Reservoirs	SV-5	LS	N/A	LS	N/A	N/A	LS	LS	N/A
San Antonio Backup Pipeline	SV-6	LS	N/A	LS	LS	N/A	LS	N/A	N/A
Bay Division Region									
Bay Division Pipeline Reliability Upgrade	BD-1	PSM	PSM	LS	LS	PSM	LS	LS	LS
BDPL Nos. 3 and 4 Crossovers	BD-2	PSM	N/A	N/A	N/A	N/A	LS	LS	LS
Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault	BD-3	PSM	N/A	N/A	LS	N/A	LS	N/A	N/A
Peninsula Region									
Baden and San Pedro Valve Lots Improvements	PN-1	PSM	N/A	LS	N/A	PSM	LS	LS	LS
Crystal Springs/San Andreas Transmission Upgrade	PN-2	LS	LS	LS	LS	PSM	LS	N/A	N/A
HTWTP Long-Term Improvements	PN-3	LS	N/A	N/A	N/A	PSM	LS	LS	LS
Lower Crystal Springs Dam Improvements	PN-4	LS	LS	LS	N/A	PSM	LS	LS	N/A
Pulgas Balancing Reservoir Rehabilitation	PN-5	LS	N/A	LS	N/A	PSM	LS	N/A	N/A
San Francisco Region									
San Andreas Pipeline No. 3 Installation	SF-1	PSM	LS	N/A	LS	PSM	LS	N/A	N/A
Groundwater Projects	SF-2	PSM	LS	LS	LS	PSM	LS	LS	LS
Recycled Water Projects	SF-3	PSM	LS	LS	LS	PSM	LS	LS	LS

LS = Less than Significant impact, no mitigation required
PSM= Potentially Significant impact, can be mitigated to less than significant
N/A = Not Applicable

Construction Impacts

Impact 4.14-1: Potential to encounter hazardous materials in soil and groundwater.

All Facilities. If hazardous materials are present in excavated soil, groundwater, or tunnel muck, a release to the environment could occur, and construction workers and the public could be exposed to the hazardous materials in the soil and groundwater and to chemical vapors during construction. Depending on the nature and extent of any contamination encountered, adverse health effects and nuisance vapors could result if proper precautions are not taken. Contaminated soil, groundwater, or tunnel muck could also require disposal as a restricted or hazardous waste; tunnel muck could contain petroleum hydrocarbons, metals, or cement slurry, in which case it would not be suitable for disposal at unregulated local fill sites. The greatest potential for encountering contaminated soil and groundwater during construction is in areas where past or current land uses may have resulted in leaking fuel or chemical storage tanks or other releases of hazardous materials have occurred. Land uses that typically involve the handling of hazardous materials include commercial or industrial areas as well as agricultural areas, where soils may contain pesticides and herbicides. Areas with known contamination are referred to as "environmental cases."

This impact analysis evaluates the potential to encounter hazardous materials in soil, groundwater, and tunnel muck based on previous land uses and, where available, environmental database reviews conducted for specific projects. The potential to encounter hazardous materials in the soil and groundwater would be low for projects located in areas with no known historical uses of hazardous materials, or for which the environmental database review did not identify known environmental cases; in such cases, impacts related to exposure to hazardous materials in soil and groundwater would be less than significant with implementation of SFPUC Construction Measure #7 (hazardous materials). This measure would require conduct of a site assessment to evaluate the potential for soil or groundwater contamination at each site prior to construction to ensure that contaminated materials are handled in accordance with applicable laws and regulations, as well as preparation of a contingency plan specifying measures to be taken should unanticipated contamination be identified during construction. The site assessment conducted under Construction Measure #7 would analyze site-specific information, which would either confirm the program-level determination of less than significant or provide a basis to revise this determination.

Impacts related to exposure to hazardous materials in soil, groundwater, or tunnel muck would be potentially significant if a proposed project would be located in an area where past or current land uses may have resulted in leaking fuel or chemical storage tanks or other releases of hazardous materials and if, based on project information presented in Appendix C, the project could disturb contaminated soil or groundwater. In such cases, implementation of mitigation measures to control exposure to contaminants and ensure proper handling of contaminated soil would be required to reduce this impact to a less-than-significant level. These measures include preparation of a site health and safety plan (Measure 4.14-1a) and materials disposal plan (Measure 4.14-1b). If groundwater dewatering is required, impacts related to the discharge of contaminated water would be less than significant with preparation of a dewatering plan in accordance with SFPUC

Construction Measure #4 (groundwater). The site assessment conducted under Construction Measure #7 would analyze site-specific information, which would either confirm the program-level significance determination or provide a basis to revise this determination.

Pipelines, Tunnels, Reservoirs, and Lakes. In addition to the potential hazardous materials impacts identified above, construction of pipelines or tunnels at or through existing environmental cases could interfere with activities at sites that have undergone or are undergoing remediation. At environmental cases that have undergone remediation or have received regulatory closure, the regulatory agencies may have approved engineering controls (such as a cap or landscaping) to prevent unacceptable exposure to hazardous materials in the soil and groundwater, or health-based cleanup levels that are based on current land uses. Where pipeline or tunnel alignments cross these sites, construction could disturb engineering controls or expose construction workers to unsafe levels of hazardous materials.

Dewatering at tunnel portal locations or along pipeline alignments as well as increased water levels in existing reservoirs could alter groundwater flow patterns and contaminant plume migration, and potentially interfere with ongoing groundwater remediations. In addition, the higher water levels in reservoirs or lakes could cause existing environmental cases to be inundated.

Impacts related to the potential to interfere with site remediations or to inundate a known environmental case would be reduced to a less-than-significant level through coordination with the property owner (or responsible SFPUC agency) and regulatory agencies (as specified under Measure 4.14-1c, which requires the SFPUC to assess the potential to encounter unacceptable levels of hazardous materials at known environmental cases; the potential for construction activities to cause groundwater plume migration or interfere with ongoing remediations at known environmental cases; and the potential for increased water levels in reservoirs or lakes to inundate known environmental cases). If the review indicates that the project could encounter unacceptable levels of hazardous materials or interfere with a remediation, or that adverse effects such as water quality degradation could occur from inundation of an environmental case, the SFPUC would contact the site owner (or responsible SFPUC department for the Peninsula Sportsmen's Club and Pacific Rod and Gun Club) and the responsible regulatory agency to determine appropriate construction modifications or remediation measures to avoid adverse effects. The site assessment conducted under SFPUC Construction Measure #7 would analyze site-specific information, which would either confirm the program-level significance determination or provide a basis to revise this determination.

San Joaquin Region

Impact 4.14-1: Potential to encounter hazardous materials in soil and groundwater		
Advanced Disinfection	SJ-1	LS
Lawrence Livermore	SJ-2	LS
SJPL System	SJ-3	LS
SJPL Rehabilitation	SJ-4	PSM
Tesla Portal Disinfection	SJ-5	LS

Based on existing land uses in the vicinity of the Advanced Disinfection (SJ-1), Lawrence Livermore (SJ-2), and Tesla Portal Disinfection (SJ-5) projects, and previous database reviews conducted for Tesla Portal, there is a low potential to encounter hazardous materials in the soil or groundwater during construction of facilities at these locations. With implementation of SFPUC Construction Measure #7 (hazardous materials), this impact would be *less than significant* for these projects. SFPUC Construction Measure #7 requires preparation of a site assessment to evaluate the potential for soil or groundwater contamination at each site prior to construction to ensure that contaminated materials are handled in accordance with applicable laws and regulations, as well as preparation of a contingency plan identifying measures to be taken should unanticipated contamination be identified during construction.

Although there are seven historical underground storage tank sites located within 1/4 mile of the western pipeline alignment for the SJPL System project (SJ-3), there is a low potential to encounter hazardous materials in the soil and groundwater from known environmental cases because there are no documented releases of hazardous materials from these sites. Similarly, there is a low potential to encounter hazardous materials in the soil and groundwater along the eastern pipeline alignment because there are no documented hazardous materials uses or environmental cases within 1/4 mile of this alignment. Based on previous and current agricultural land uses along the pipeline, there is the potential to encounter pesticides and herbicides in the soil; however, this potential would be further evaluated in the site assessment conducted in accordance with SFPUC Construction Measure #7 (hazardous materials). Therefore, with implementation of this construction measure, it is expected that this impact would be *less than significant* for this project.

Pipeline rehabilitation could occur along any portion of the existing San Joaquin Pipeline as part of the SJPL Rehabilitation project (SJ-4). Depending on the location, hazardous materials could be encountered in the soil and groundwater, particularly in Modesto and near the U.S. Army Riverbank Ammunitions Plant. Therefore impacts related to the potential to encounter hazardous materials in the soil and groundwater are considered *potentially significant* for this project, but would be reduced to a less-than-significant level with implementation of SFPUC Construction Measure #7 (hazardous materials), as well as preparation of a site health and safety plan (Measure 4.14-1a) and materials disposal plan (Measure 4.14-1b) if contamination is identified during the site assessment conducted in accordance with SFPUC Construction Measure #7.

Pipeline rehabilitation in the vicinity of the U.S. Army Riverbank Ammunitions Plant could also interfere with ongoing remediation activities at this site, and dewatering along the pipeline alignment could enhance groundwater plume migration or interfere with remediations in Modesto and at the ammunitions plant, resulting in a *potentially significant* impact. However, this impact would be reduced to a less-than-significant level through coordination with the property owner and regulatory agencies (Measure 4.14-1c).

The western portion of the San Joaquin Pipeline alignment (SJPL System, SJ-3, and SJPL Rehabilitation, SJ-4) is near the Vernalis and Southwest Vernalis Gas Fields; during construction, potentially explosive gases could accumulate in the trench excavation. However, in compliance with the State of California Construction Safety Orders (Title 8 of the California Code of Regulations, Chapter 4, Subchapter 4), the construction contractor would be required to take adequate precautions to prevent the accumulation of unacceptable levels of explosive gases in the excavation. Compliance with these regulations would ensure potential impacts related to the accumulation of natural gas in the pipeline excavation would be less than significant.

If groundwater dewatering is required for any WSIP projects in the San Joaquin Region, impacts related to the discharge of contaminated water would be less than significant with compliance with the discharge regulations discussed in Section 4.5, Hydrology and Water Quality, and implementation of a dewatering plan in accordance with SFPUC Construction Measure #4 (groundwater).

Sunol Valley Region

Impact 4.14-1: Potential to encounter hazardous materials in soil and groundwater		
Alameda Creek Fishery	SV-1	LS
Calaveras Dam	SV-2	LS
40-mgd Treated Water	SV-3	LS
New Irvington Tunnel	SV-4	LS
Treated Water Reservoirs	SV-5	LS
SABUP	SV-6	LS

The Alameda Creek Fishery (SV-1), 40-mgd Treated Water (SV-3), New Irvington Tunnel (SV-4), Treated Water Reservoirs (SV-5), and SABUP (SV-6) projects include construction of facilities, pipelines, or tunnels. There is a low potential to encounter hazardous materials in the soil or groundwater during construction of these projects, based on existing land uses and environmental database reviews conducted for the New Irvington Tunnel project (SV-4). As described in the Setting, contaminants have been identified in the soil at the Calaveras Test Site, near the Calaveras Dam. However, excavation for the Calaveras Dam project (SV-2) would not take place within the areas of identified contamination. Therefore, with implementation of SFPUC Construction Measure #7 (hazardous materials), impacts related to the potential to encounter hazardous materials in the soil, groundwater, and tunnel muck would be *less than significant* for each of these projects.

As discussed in the Setting, a plume of trichloroethene has been identified at the Calaveras Test Site, adjacent to the Calaveras Reservoir. Raising the water level in the reservoir under the Calaveras Dam project would restore the reservoir to pre-2001 conditions and would likely result in a flatter groundwater gradient than exists under current conditions, thereby slowing the migration of trichloroethene in the groundwater and reducing risks to water quality in Calaveras Reservoir. Furthermore, groundwater quality monitoring would continue until the RWQCB grants regulatory closure of the groundwater contamination case. Therefore, impacts related to the potential to interfere with an ongoing remediation and to degrade water quality in Calaveras Reservoir would be *less than significant* for this project.

If groundwater dewatering is required for any of the Sunol Valley Region projects, impacts related to the discharge of contaminated water would be less than significant with compliance with the discharge regulations discussed in Section 4.5, Hydrology and Water Quality, and implementation of a dewatering plan in accordance with SFPUC Construction Measure #4 (groundwater).

Bay Division Region

Impact 4.14-1: Potential to encounter hazardous materials in soil and groundwater		
BDPL Reliability Upgrade	BD-1	PSM
BDPL 3 and 4 Crossovers	BD-2	PSM
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	PSM

Based on the environmental database review conducted for the Bay Division Pipelines, there is a high potential to encounter hazardous materials during construction of the BDPL Reliability Upgrade project (BD-1), particularly at the east tunnel portal (where groundwater contamination has been identified at six sites within 1/2 mile in Newark) and at the west tunnel portal (which is located on the site of a former gun club undergoing remediation by the SFPUC). Therefore, impacts related to the potential to encounter hazardous materials in soil, groundwater, and tunnel muck are considered *potentially significant*, but would be reduced to a less-than-significant level with implementation of SFPUC Construction Measure #7 (hazardous materials) as well as preparation of a site health and safety plan (Measure 4.14-1a) and materials disposal plan (Measure 4.14-1b).

Dewatering at the tunnel portal locations for the BDPL Reliability Upgrade project (BD-1) could enhance the migration of groundwater contaminant plumes or interfere with ongoing remediations at the east tunnel portal location, where there are six cases of known groundwater contamination within 1/2 mile. These effects could also occur at additional locations along the pipeline alignment where dewatering is conducted. Furthermore, although remediation of the former Peninsula Sportsmen's Club at the west tunnel portal location should be completed before construction of the BDPL Reliability Upgrade project, construction activities for this project could interfere with remediation activities if the remediation is delayed, or could encounter unacceptable levels of hazardous materials in the soil, depending on the cleanup level achieved during remediation. Therefore, impacts related to the potential to enhance groundwater plume migration or interfere with site remediations are considered *potentially significant* for this project, but would be reduced to a less-than-significant level with coordination with the property owner (or responsible SFPUC department) and regulatory agencies (Measure 4.14-1c).

The BDPL 3 and 4 Crossovers (BD-2) and BDPL 3 and 4 Seismic Upgrade at Hayward Fault (BD-3) projects would include pipeline installation, pipeline improvements, or construction of crossover facilities on the existing Bay Division Pipelines Nos. 3 and 4. A database review has not been conducted specifically for these projects. However, there is a potential to encounter hazardous materials in the soil and groundwater during construction of these projects because they are all located at least partially within commercial or industrial areas. Therefore, impacts related to the potential to encounter hazardous materials in the soil and groundwater are considered *potentially significant* for these projects, but would be reduced to a less-than-significant level with implementation of SFPUC Construction Measure #7 (hazardous materials), as well as preparation of a site health and safety plan (Measure 4.14-1a) and materials disposal plan (Measure 4.14-1b) if contamination is identified during the site assessment conducted in accordance with Construction Measure #7.

If groundwater dewatering is required for any Bay Division Region project, impacts related to the discharge of contaminated groundwater would be less than significant with compliance with the discharge regulations discussed in Section 4.5, Hydrology and Water Quality, and implementation of a dewatering plan in accordance with SFPUC Construction Measure #4 (groundwater).

Peninsula Region

Impact 4.14-1: Potential to encounter hazardous materials in soil and groundwater		
Baden and San Pedro Valve Lots	PN-1	PSM
CS/SA Transmission	PN-2	LS
HTWTP Long-Term	PN-3	LS
Lower Crystal Springs Dam	PN-4	LS
Pulgas Balancing Reservoir	PN-5	LS

No database reviews have been conducted for the Baden and San Pedro Valve Lots project (PN-1), but because these valve lots are located in an urbanized area, the potential exists to encounter hazardous materials in the soil at these sites. Therefore, impacts related to the potential to encounter hazardous materials in the soil and groundwater are considered *potentially significant*, but would be reduced to a less-than-significant level with implementation of SFPUC Construction Measure #7 (hazardous materials), as well as preparation of a site health and safety plan (Measure 4.14-1a) and materials disposal plan (Measure 4.14-1b) if contamination is identified by the site assessment conducted in accordance with Construction Measure #7.

The HTWTP Long-Term (PN-3), Lower Crystal Springs Dam (PN-4), and Pulgas Balancing Reservoir (PN-5) projects would each include construction of facilities, while the CS/SA Transmission (PN-2) project would include construction of pipelines as well. These projects are located in undeveloped watershed land or residential areas. Based on their locations as well as previous database reviews for the Harry Tracy WTP and Pulgas Balancing Reservoir, there is a low potential to encounter hazardous materials in the soil or groundwater. Therefore, with implementation of SFPUC Construction Measure #7 (hazardous materials), it is expected that impacts related to the potential to encounter hazardous materials in the soil and groundwater would be *less than significant*. This measure would require the conduct of a site assessment to evaluate the potential for soil or groundwater contamination at each site prior to construction to ensure that contaminated materials are handled in accordance with applicable laws and regulations, as well as preparation of a contingency plan identifying measures to be taken should unanticipated contamination be identified during construction.

If groundwater dewatering is required for any Peninsula Region project, impacts related to the potential to discharge contaminated groundwater would be less than significant with compliance with the discharge regulations discussed in Section 4.5, Hydrology and Water Quality, and implementation of a dewatering plan in accordance with SFPUC Construction Measure #4 (groundwater).

San Francisco Region

Impact 4.14-1: Potential to encounter hazardous materials in soil and groundwater		
SAPL 3 Installation	SF-1	PSM
Groundwater Projects	SF-2	PSM
Recycled Water Projects	SF-3	PSM

No database reviews have been conducted specifically for the Groundwater Projects (SF-2) and Recycled Water Projects (SF-3). Since these projects are located in urbanized areas, impacts related to the potential to encounter hazardous materials in soil and groundwater are considered *potentially significant* for these projects, but would be reduced to a less-than-significant level with implementation of SFPUC Construction Measure #7 (hazardous materials), as well as preparation of site health and safety plan (Measure 4.14-1a) and materials disposal plan (Measure 4.14-1b) if contamination is identified by the site assessment conducted in accordance with Construction Measure #7.

A database review conducted for the SAPL 3 Installation project (SF-1) indicated the presence of documented environmental cases along the pipeline alignment. Therefore, impacts related to the potential to encounter hazardous materials in the soil and groundwater are considered *potentially significan*t, but would be reduced to a less-than-significant level with implementation of SFPUC Construction Measure #7 (hazardous materials) as well as preparation of a site health and safety plan (Measure 4.14-1a) and materials disposal plan (Measure 4.14-1b).

According to a voluntary study performed on behalf of the SFPUC in 2004, raising the water level in Lake Merced under the Local Groundwater Projects (SF-2) would inundate a portion of the Pacific Rod and Gun Club property and could result in lead and arsenic concentrations that exceed drinking water standards, cause adverse effects on fish and other aquatic organisms, or cause adverse effects on sediment-dwelling species that would occupy the newly inundated area (URS, 2005). The results of the study suggest that before inundating the shoreline it may be necessary to perform remedial action or further assess the potential for releases of lead and arsenic into Lake Merced. Therefore, impacts related to the potential to cause adverse effects from inundation of a known environmental case are considered *potentially significant* for this project, but would be reduced to a less-than-significant level with coordination with regulatory agencies and implementation of appropriate measures to avoid adverse effects on water quality and aquatic organisms (Measure 4.14-1c).

If groundwater dewatering is required for any San Francisco Region projects, impacts related to the potential to discharge contaminated groundwater would be less than significant with compliance with the discharge regulations discussed in Section 4.5, Hydrology and Water Quality, and implementation of a dewatering plan in accordance with SFPUC Construction Measure #4 (groundwater).

Impact 4.14-2: Exposure to naturally occurring asbestos.

As discussed in the Setting, some of the pipeline, tunnel, and dam excavations traverse mapped areas of Franciscan Complex serpentinite and mélange, which commonly contain naturally occurring chrysotile asbestos (a fibrous mineral that can be a human health hazard if it becomes airborne). If serpentinite or mélange is encountered during construction, onsite workers and the surrounding population could be exposed to asbestos in airborne dust and tunnel emissions unless appropriate control measures are implemented.

Pipelines and Other Excavation Activities. Excavation in soil containing naturally occurring asbestos could produce airborne (or "fugitive") dust. However, the SFPUC would be required to comply with the asbestos ATCM (CARB's Airborne Toxic Control Measure for Construction, Grading, Quarrying, and Surface Mining Operations; see the Setting for more discussion) to prevent fugitive dust containing asbestos from migrating beyond property boundaries during excavation.

In accordance with the asbestos ATCM, for surface construction activities in the WSIP study area that would disturb rock containing naturally occurring asbestos (serpentinite and mélange) within an area of less than one acre, contractors are required to comply with the following dust mitigation measures before construction begins and to maintain each measure throughout the duration of the construction project:

- Limit construction vehicle speed at the worksite to 15 miles per hour
- Sufficiently wet all ground surfaces prior to disturbance to prevent visible dust emissions from crossing the property line
- Keep all graded and excavated areas adequately wetted during construction to prevent visible dust emissions from crossing the property line
- Adequately wet all storage piles, treat with chemical dust suppressants, or cover piles when material is not being added to or removed from the pile
- Wash down all equipment before moving from the property onto a paved public road
- Clean all visible track-out from the paved public road by street sweeping or using a vacuum equipped with a high-efficiency particulate air (HEPA) filter within 24 hours

For construction activities in the WSIP study area that would disturb more than one acre of rock containing naturally occurring asbestos (serpentinite and mélange), construction contractors are required to submit the appropriate notification forms, although an application for exemption may be filed if a registered geologist determines that there is no ultramafic rock or serpentine in the construction area. For projects of this size where ultramafic rock or serpentinite are present, contractors must prepare an asbestos dust mitigation plan specifying measures that would be taken to ensure that no visible dust crosses the property boundary during construction. The plan must specify the following measures:

- Prevent and control visible track-out from the property

- Ensure adequate wetting or covering of active storage piles
- Control disturbed surface areas and storage piles that would remain inactive for seven days
- Control traffic on onsite unpaved roads, parking lots, and staging areas, including a maximum vehicle speed of 15 miles per hour
- Control earthmoving activities
- Control offsite transport of dust emissions that contain naturally occurring asbestos-containing materials
- Stabilize disturbed areas following construction

The asbestos dust mitigation plan must be submitted to and approved by the BAAQMD prior to the beginning of construction, and the site operator must ensure the implementation of all specified dust mitigation measures throughout the construction project. In addition, the BAAQMD may require air monitoring for offsite migration of asbestos dust during construction activities and may change the plan on the basis of the air monitoring results.

For WSIP construction projects of all sizes, notification of the BAAQMD and compliance with the asbestos ATCM are required if rock containing naturally occurring asbestos (serpentinite or mélange) is identified during construction.

Tunnels. Similar to construction of pipelines and facilities, excavation of the portal areas and handling of tunnel muck outside of the tunnels could produce fugitive dust emissions. Wet conditions within the tunnels during construction would likely prevent asbestos from becoming airborne. However, in the absence of proper controls, asbestos could become airborne in emissions from the tunnel ventilation system and could expose nearby receptors to unacceptable levels of asbestos.

San Joaquin Region

Impact 4.14-2: Exposure to naturally occurring asbestos		
Advanced Disinfection	SJ-1	N/A
Lawrence Livermore	SJ-2	N/A
SJPL System	SJ-3	N/A
SJPL Rehabilitation	SJ-4	N/A
Tesla Portal Disinfection	SJ-5	N/A

None of the proposed WSIP facilities in the San Joaquin Region are expected to encounter Franciscan Complex serpentinite or mélange. Therefore, the potential for naturally occurring asbestos to become airborne during construction in these regions is considered *not applicable*. However, if naturally occurring asbestos is identified during construction, these projects would have to comply with the asbestos ATCM requirements.

Sunol Valley Region

Impact 4.14-2: Exposure to naturally occurring asbestos		
Alameda Creek Fishery	SV-1	N/A
Calaveras Dam	SV-2	LS
40-mgd Treated Water	SV-3	N/A
New Irvington Tunnel	SV-4	N/A
Treated Water Reservoirs	SV-5	N/A
SABUP	SV-6	N/A

Under the Calaveras Dam project (SV-2), construction of the new dam and haul roads would disturb Franciscan Complex serpentinite and mélange. In addition, the existing dam (which would be removed) includes materials obtained from serpentinite and mélange. However, as discussed above, compliance with the asbestos ATCM requirements would ensure that impacts related to exposure to naturally occurring asbestos would be *less than significant* for this project.

No Franciscan Complex serpentinite or mélange is mapped near the remaining projects in this region (Alameda Creek Fishery, SV-1; 40-mgd Treated Water, SV-3; New Irvington Tunnel, SV-4; Treated Water Reservoirs, SV-5; and SABUP, SV-6), so this impact would *not apply* to these projects. However, if naturally occurring asbestos is identified during construction, these projects would have to comply with the asbestos ATCM requirements.

Bay Division Region

Impact 4.14-2: Exposure to naturally occurring asbestos		
BDPL Reliability Upgrade	BD-1	PSM
BDPL 3 and 4 Crossovers	BD-2	N/A
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	N/A

The BDPL 3 and 4 Crossovers (BD-2) and BDPL 3 and 4 Seismic Upgrade at Hayward Fault (BD-3) projects are not located in areas of mapped Franciscan Complex serpentinite or mélange, so this impact would *not apply* to these projects. However, if naturally occurring asbestos is identified during construction, these projects would have to comply with the asbestos ATCM requirements.

The BDPL Reliability Upgrade project (BD-1) could encounter several hundred feet of highly weathered and intensely fractured serpentinite, sandstone, and shale of the Franciscan Complex in the tunnel approximately 1,000 feet west of the Newark Valve Lot. Construction of the tunnel portion of this project would have to comply with the asbestos ATCM for the handling of materials containing naturally occurring asbestos, including tunnel muck. In addition, operation of the tunnel ventilation system could emit airborne asbestos fibers. This *potentially significant* impact would be reduced to a less-than-significant level with implementation of a health risk screening assessment and preparation of an airborne-asbestos monitoring plan (Measure 4.14-2).

Peninsula Region

Impact 4.14-2: Exposure to naturally occurring asbestos		
Baden and San Pedro Valve Lots	PN-1	N/A
CS/SA Transmission	PN-2	LS
HTWTP Long-Term	PN-3	N/A
Lower Crystal Springs Dam	PN-4	LS
Pulgas Balancing Reservoir	PN-5	N/A

Two Peninsula Region projects located near Crystal Springs Reservoir and San Andreas Reservoir (CS/SA Transmission, PN-2, and Lower Crystal Springs Dam, PN-4) could encounter Franciscan Complex serpentinite or mélange. However, as discussed above, compliance with the asbestos ATCM would ensure that impacts related to exposure to naturally occurring asbestos are *less than significant* for these projects.

The other Peninsula Region projects are not located in Franciscan Complex serpentinite or mélange (Baden and San Pedro Valve Lots, PN-1; HTWTP Long-Term, PN-3; and Pulgas Balancing Reservoir, PN-5), so this impact would *not apply* to these projects. However, if naturally occurring asbestos is identified during construction, these projects would have to comply with the asbestos ATCM requirements.

San Francisco Region

Impact 4.14-2: Exposure to naturally occurring asbestos		
SAPL 3 Installation	SF-1	LS
Groundwater Projects	SF-2	LS
Recycled Water Projects	SF-3	LS

The three San Francisco Region projects (SAPL 3 Installation, SF-1; Groundwater Projects, SF-2; and Recycled Water Projects, SF-3) are not likely to encounter Franciscan Complex serpentinite or mélange, although naturally occurring asbestos could be encountered in fill materials within San Francisco. However, as discussed above, compliance with the asbestos ATCM would ensure that impacts related to exposure to naturally occurring asbestos would be *less than significant* for each project.

Impact 4.14-3: Risk of fires during construction.

The use of construction equipment and temporary onsite storage of diesel fuel could pose a wildland fire risk in areas classified by the CDF as a “Wildland Area That May Contain Substantial Forest Fire Risks and Hazards” or a “Very High Fire Hazard Severity Zone” or in areas identified as an Urban-Wildland Interface in the city of San Francisco. The time of the greatest fire danger is during the clearing phase, when people and machines are working among vegetative fuels that can be highly flammable; if piled onsite, the cleared vegetative materials could also become a fire fuel. Potential sources of ignition include equipment with internal combustion engines, gasoline-powered tools, and equipment or tools that produce a spark, fire, or flame. Such sources include sparks from blades or other metal parts scraping against rock, overheated brakes on wheeled equipment, friction from worn or unaligned belts and drive chains, and burned-out bearings or bushings. Sparking as a result of scraping against rock is difficult to prevent. The other hazards result primarily from poor maintenance of the equipment. Smoking by onsite construction personnel is also a potential source of ignition during construction.

Regulations governing the use of construction equipment in fireprone areas are designed to minimize the risk of wildland fires during construction activity. In accordance with the Public Resources Code, the construction contractor would be required to comply with the following legal requirements during construction activities at sites located in areas classified as a "Wildland Area That May Contain Substantial Forest Fire Risks and Hazards" or a "Very High Fire Hazard Severity Zone":

- Earthmoving and portable equipment with internal combustion engines would be equipped with a spark arrestor to reduce the potential for igniting a wildland fire (PRC Section 4442).
- Appropriate fire suppression equipment would be maintained during the highest fire danger period – from April 1 to December 1 (PRC Section 4428).
- On days when a burning permit is required, flammable materials would be removed to a distance of 10 feet from any equipment that could produce a spark, fire, or flame, and the construction contractor would maintain the appropriate fire suppression equipment (PRC Section 4427).
- On days when a burning permit is required, portable tools powered by gasoline-fueled internal combustion engines would not be used within 25 feet of any flammable materials (PRC Section 4431).

In addition, projects in the Sunol Valley Region and Peninsula Region located within the Peninsula watershed would be required to comply with fire-related policies and actions contained in the SFPUC's Alameda and Peninsula Watershed Management Plans (WMPs). The WMPs are described in Section 4.2, Plans and Policies. Action fir1 of the WMPs, which requires compliance with CDF fire prevention regulations for SFPUC vehicles and equipment as well as certification by the CDF of non-SFPUC equipment, must be implemented for these projects.

San Joaquin Region

Impact 4.14-3: Risk of fires during construction		
Advanced Disinfection	SJ-1	LS
Lawrence Livermore	SJ-2	LS
SJPL System	SJ-3	LS
SJPL Rehabilitation	SJ-4	LS
Tesla Portal Disinfection	SJ-5	LS

The Advanced Disinfection (SJ-1), Lawrence Livermore (SJ-2), and Tesla Portal Disinfection (SJ-5) projects as well as the easternmost and westernmost pipeline segments of the SJPL System (SJ-3) and SJPL Rehabilitation (SJ-4) projects are located in areas classified as a "Wildland Area That May Contain Substantial Forest Fire Risks and Hazards." However, mandatory compliance with the Public Resources Code, impacts related to wildland fires would be *less than significant* for each project.

Sunol Valley Region

Impact 4.14-3: Risk of fires during construction		
Alameda Creek Fishery	SV-1	LS
Calaveras Dam	SV-2	LS
40-mgd Treated Water	SV-3	LS
New Irvington Tunnel	SV-4	LS
Treated Water Reservoirs	SV-5	LS
SABUP	SV-6	LS

All of the Sunol Valley Region projects (Alameda Creek Fishery, SV-1; Calaveras Dam, SV-2; 40-mgd Treated Water, SV-3, New Irvington Tunnel, SV-4; Treated Water Reservoirs, SV-5; and SABUP, SV-6) are located in areas classified as a "Wildland Area That May Contain Substantial Forest Fire Risks and Hazards." However, with compliance with the Public Resources Code and Alameda WMP Action fir1 (described above), impacts related to wildland fires would be *less than significant* for each project.

Bay Division Region

Impact 4.14-3: Risk of fires during construction		
BDPL Reliability Upgrade	BD-1	LS
BDPL 3 and 4 Crossovers	BD-2	N/A
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	N/A

The Irvington Tunnel and Pulgas Portal, located at either end of the BDPL Reliability Upgrade project (BD-1), may be located in an area classified as a "Wildland Area That May Contain Substantial Forest Fire Risks and Hazards." However, with compliance with the Public Resources Code, impacts related to wildland fires would be *less than significant* for this project.

The BDPL 3 and 4 Crossovers (BD-2) and BDPL 3 and 4 Seismic Upgrade at Hayward Fault (BD-3) projects are not located in mapped areas of high wildland fire risk; therefore, this impact would *not apply* to these projects.

Peninsula Region

Impact 4.14-3: Risk of fires during construction		
Baden and San Pedro Valve Lots	PN-1	LS
CS/SA Transmission	PN-2	LS
HTWTP Long-Term	PN-3	N/A
Lower Crystal Springs Dam	PN-4	LS
Pulgas Balancing Reservoir	PN-5	LS

The Baden and San Pedro Valve Lots project (PN-1) would include construction at the Pulgas Pump Station, Pulgas Gate Shaft, and Pulgas Air Shaft, which are each located in an area classified as a "Wildland Area That May Contain Substantial Forest Fire Risks and Hazards." In addition, the CS/SA Transmission (PN-2), Lower Crystal Springs Dam (PN-4), and Pulgas Balancing Reservoir (PN-5) projects are located in areas classified as a "Wildland Area That May Contain Substantial Forest Fire Risks and Hazards." However, with compliance with the Public Resources Code and the Peninsula WMP Action fir1 (described above), impacts related to wildland fires would be *less than significant* for these projects.

The HTWTP Long-Term project (PN-3) is not located in mapped areas of high wildland fire risk, so this impact would *not apply* to this project.

San Francisco Region

Impact 4.14-3: Risk of fires during construction		
SAPL 3 Installation	SF-1	N/A
Groundwater Projects	SF-2	LS
Recycled Water Projects	SF-3	LS

Depending on the specific locations selected for components of the Groundwater Projects (SF-2), some components of this project could be located within high fire hazard zones within or outside of San Francisco, and some Recycled Water Projects (SF-3) could be located within an Urban-Wildland Interface at Golden Gate Park. However, with compliance with the Public Resources Code, impacts related to wildland fires would be *less than significant* for these projects.

The SAPL 3 Replacement project (SF-1) is not located within a mapped area of high wildland fire risk within or outside of San Francisco. Therefore, this impact would *not apply* to this project.

Impact 4.14-4: Gassy conditions in tunnels.

Gassy conditions in tunnels could increase the risk of an explosion, which would endanger construction workers and the public.

Tunnels and Pipelines. Accumulated natural gases in a tunnel, including jack-and-bore excavations that are 30 inches in diameter or larger, could cause an explosion during construction. A classification has not yet been assigned to the tunnels that would be constructed under the WSIP; however, prior to the project being put out to bid, the SFPUC would be required to file an application for gas classification with the Division of Industrial Safety in accordance with the Tunnel Safety Orders (described in the Setting). This application would be required for all tunnels and jack-and-bore excavations that are 30 inches in diameter or larger where workers would work underground. The application would be based on a detailed geotechnical characterization that would be performed for final design of the proposed tunneling project. If the tunnel is classified as potentially gassy or gassy, project construction would be performed in compliance with the Tunnel Safety Orders, which specify requirements for the monitoring of explosive vapors, ventilation, and the restriction of potential ignition sources in tunnels. The Division of Industrial Safety could require additional measures if conditions warrant and could shut down the tunneling operation if unsafe conditions were identified. Resumption of tunneling operations would not be allowed until the Division of Industrial Safety inspected the tunnel conditions and cleared the tunnel for reentry.

San Joaquin Region

Impact 4.14-4: Gassy conditions in tunnels		
Advanced Disinfection	SJ-1	N/A
Lawrence Livermore	SJ-2	N/A
SJPL System	SJ-3	LS
SJPL Rehabilitation	SJ-4	LS
Tesla Portal Disinfection	SJ-5	N/A

The SJPL System project (SJ-3) includes the installation of approximately 16 to 22 miles of pipeline and the SJPL Rehabilitation project (SJ-4) could include rehabilitation along any portion of the San Joaquin pipeline system. These projects could require tunneling using jack-and-bore construction at stream or roadway crossings. In accordance with the Tunnel Safety Orders, an assignment would be made for these tunnels prior to construction if employees would work underground. Compliance with the tunnel safety orders and any additional requirements of the Department of Industrial Safety would ensure that impacts related to a potential explosion are *less than significant* for these projects. None of the other San Joaquin Region projects (Advanced Disinfection, SJ-1; Lawrence Livermore, SJ-2; and Tesla Portal Disinfection, SJ-5) would involve tunneling, so this impact would *not apply* to these projects.

Sunol Valley Region

Impact 4.14-4: Gassy conditions in tunnels		
Alameda Creek Fishery	SV-1	LS
Calaveras Dam	SV-2	N/A
40-mgd Treated Water	SV-3	LS
New Irvington Tunnel	SV-4	LS
Treated Water Reservoirs	SV-5	N/A
SABUP	SV-6	LS

The New Irvington Tunnel project **(**SV-4) includes construction of a new 18,200-foot-long tunnel in an area considered to be potentially gassy. Tunneling using jack-and-bore construction to install pipelines beneath streams or roadways could also be required for the Alameda Creek Fishery (SV-1), 40-mgd Treated Water (SV-3), and SABUP (SV-6) projects. In accordance with the Tunnel Safety Orders, an assignment would be made for these tunnels prior to construction if employees would work underground. Compliance with the Tunnel Safety Orders and any additional requirements of the Department of Industrial Safety would ensure that impacts related to a potential explosion are *less than significant* for these projects. The other Sunol Valley Region projects (Calaveras Dam, SV-2, and Treated Water Reservoirs, SV-5) would not involve tunneling, so this impact would *not apply* to these projects.

Bay Division Region

Impact 4.14-4: Gassy conditions in tunnels		
BDPL Reliability Upgrade	BD-1	LS
BDPL 3 and 4 Crossovers	BD-2	N/A
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	LS

The BDPL Reliability Upgrade project (BD-1) includes construction of a new five-mile-long tunnel beneath San Francisco Bay. Pipelines would also be installed for this project and for the BDPL 3 and 4 Seismic Upgrade at Hayward Fault project (BD-3), which could require tunneling using jack-and-bore construction at stream and road crossings. In accordance with the Tunnel Safety Orders, an assignment would be made for these tunnels prior to construction if employees would work underground. Compliance with the Tunnel Safety Orders and any additional requirements of the Department of Industrial Safety would ensure that impacts related to a potential explosion are *less than significant* for these projects. The BDPL 3 and 4 Crossovers project (BD-2) would not involve tunneling, so this impact would *not apply* to this project.

Peninsula Region

Impact 4.14-4: Gassy conditions in tunnels		
Baden and San Pedro Valve Lots	PN-1	N/A
CS/SA Transmission	PN-2	LS
HTWTP Long-Term	PN-3	N/A
Lower Crystal Springs Dam	PN-4	N/A
Pulgas Balancing Reservoir	PN-5	N/A

Tunneling using jack-and-bore construction beneath streams and roadways could be required to install pipelines under the CS/SA Transmission project (PN-2). In accordance with the Tunnel Safety Orders, an assignment would be made for these tunnels prior to construction if employees would work underground. Compliance with the Tunnel Safety Orders and any additional requirements of the Department of Industrial Safety would ensure that impacts related to a potential explosion are *less than significant* for this project. None of the other Peninsula Region projects (Baden and San Pedro Valve Lots, PN-1; HTWTP Long-Term, PN-3; Lower Crystal Springs Dam, PN-4; and Pulgas Balancing Reservoir, PN-5) would involve tunneling, including the, so this impact would *not apply* to these projects.

San Francisco Region

Impact 4.14-4: Gassy conditions in tunnels		
SAPL 3 Installation	SF-1	LS
Groundwater Projects	SF-2	LS
Recycled Water Projects	SF-3	LS

The SAPL 3 Installation (SF-1), Groundwater Projects (SF-2), and Recycled Water Projects (SF-3) include pipeline construction and could require tunneling using jack-and-bore construction at stream or roadway crossings. In accordance with the Tunnel Safety Orders, an assignment would be made for these tunnels prior to construction if employees would work underground. Compliance with the Tunnel Safety Orders and any additional requirements of the Department of Industrial Safety would ensure that impacts related to a potential explosion are *less than significant*.

Impact 4.14-5: Exposure to hazardous building materials.

Demolition or modification of existing facilities could result in exposure to hazardous building materials. In the absence of proper abatement procedures, demolition or renovation of a structure that contains hazardous building materials can expose workers and the public to hazardous materials. The types of hazardous building materials that could be encountered during building demolition include asbestos, lead-based paint, electrical equipment containing PCBs, fluorescent tubes containing mercury vapors, and fluorescent light ballasts containing DEHP.

If friable or nonfriable asbestos is present, disturbance of the asbestos-containing materials could result in the exposure of the public or construction workers to airborne asbestos fibers, unless proper asbestos abatement precautions are taken. Similarly, if lead-based paint or other hazardous materials are present and have delaminated or chipped from the surface of the building materials, there is a potential for the release of airborne particulates unless proper abatement procedures are followed. If PCBs are present in the buildings to be demolished, leakage could expose workers to unacceptable levels of PCBs. Removal of fluorescent tubes could result in exposure to mercury vapors if the lights are broken, or to DEHP in the light ballasts.

Well-established regulatory requirements for asbestos abatement are provided in the California Health and Safety Code, Section 19827.5, and Title 8 of the California Code of Regulations, Sections 341.6 through 341.14 and 1529. The BAAQMD and San Joaquin Valley Air Pollution Control District requirements would also apply to the abatement of asbestos-containing materials. Requirements for lead-based paint abatement in residential and public use buildings are specified in Title 17 of the California Code of Regulations, Sections 35001 through 3600. However, existing state and local regulations do not address the abatement of lead-based paint in nonresidential or nonpublic buildings and other structures.[11] Because surveys have not been conducted to identify hazardous building materials in the structures that would be demolished, existing regulations do not address abatement of lead-based paint in nonresidential or public use buildings, and other hazardous building materials such as PCB- or DEHP-containing equipment and fluorescent light tubes could require disposal, this impact is considered potentially significant for projects where demolition or modifications of a structure would be required but for which hazardous building material surveys have not been completed. Additional information analyzed as part of subsequent, project-specific CEQA review for each project would either confirm the program-level determination of potentially significant or provide a basis to revise this determination.

Pump Stations, Treatment Facilities, Tunnels, and Standby Power. Construction of these permanent facilities could first require demolition of existing structures. If demolition is required, the hazardous building materials discussed above could be encountered (e.g., existing storage tanks may be painted with lead-based paint).

Reservoirs. For dam improvements, the structures that would be demolished or modified could contain lead-based paint, PCBs, or other hazardous building materials. For existing reservoirs, there may be hazardous building materials in the liner materials, roof, or piping systems.

Pipelines. The regional water system pipelines are largely constructed of steel or concrete. These pipelines have been constructed over the years using a variety of lining, coating, and joint-sealant materials, including coal tar and lead as well as other substances. While these substances do not present a hazard under current conditions, they could become hazardous if mishandled during construction. In addition, in some locations the right-of-way may have been encroached upon by structures that would need to be demolished prior to project construction, and these structures could include the hazardous building materials described above.

Valves, Vaults, and Crossover Facilities. Construction of valves, vaults, and crossover facilities would not be expected to encounter hazardous building materials.

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[11] Senate Bill 460 added text to the California Health and Safety Code specifying that lead-based paint above certain quantities cannot be disturbed without providing containment, but does not address specific requirements for abatement or containment of lead-based paint. The requirements of this bill are not enforceable through permit conditions. Title 17 of the California Code of Regulations does include requirements for the abatement of lead-based paint, but these requirements apply only to residential and public use buildings.

San Joaquin Region

Impact 4.14-5: Exposure to hazardous building materials		
Advanced Disinfection	SJ-1	N/A
Lawrence Livermore	SJ-2	N/A
SJPL System	SJ-3	PSM
SJPL Rehabilitation	SJ-4	PSM
Tesla Portal Disinfection	SJ-5	PSM

The SJPL System project (SJ-3) would require excavation along approximately 16 miles of existing right-of-way and the SJPL Rehabilitation project (SJ-4) could require access to the pipeline anywhere along the entire length. While unlikely, in some locations the right-of-way may have been encroached upon by structures that would need to be demolished. Depending on their age, these structures may contain hazardous building materials. In addition, the Tesla Portal Disinfection project (SJ-5) would include renovation of the existing chlorination system, including possible demolition of existing structures. Because no surveys have been conducted to identify hazardous building materials in these structures and the extent of demolition is currently unknown, this impact is conservatively considered to be *potentially significant* for these projects; however, if demolition does occur, this impact would be reduced to a less-than-significant level with implementation of hazardous materials building surveys and abatement (Measure 4.14-5). The other San Joaquin Region projects (Advanced Disinfection, SJ-1, and Lawrence Livermore, SJ-2) are not expected to require demolition or renovation of structures, so this impact would *not apply* to these projects.

Sunol Valley Region

Impact 4.14-5: Exposure to hazardous building materials		
Alameda Creek Fishery	SV-1	N/A
Calaveras Dam	SV-2	PSM
40-mgd Treated Water	SV-3	N/A
New Irvington Tunnel	SV-4	PSM
Treated Water Reservoirs	SV-5	N/A
SABUP	SV-6	N/A

The Calaveras Dam project (SV-2) would require demolition of the cofferdam, chemical treatment building, valve vaults, existing spillway, and portions of the outlet tower. Demolition of the existing Irvington Portal structure would also be required for the New Irvington Tunnel project (SV-4). Depending on their age, the structures that would be demolished could contain hazardous building materials. Because no surveys have been conducted to identify hazardous building materials in these structures, this impact is considered *potentially significant* for these projects, but would be reduced to a less-than-significant level with implementation of hazardous materials building surveys and abatement (Measure 4.14-5). None of the other projects in the Sunol Valley Region (Alameda Creek Fishery, SV-1; 40-mgd Treated Water, SV-3; Treated Water Reservoirs, SV-5; and SABUP, SV-6) are expected to require demolition or renovation of structures, so this impact would *not apply* to these projects.

Bay Division Region

Impact 4.14-5: Exposure to hazardous building materials		
BDPL Reliability Upgrade	BD-1	PSM
BDPL 3 and 4 Crossovers	BD-2	N/A
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	N/A

The BDPL Reliability Upgrade project (BD-1) would remove 1.4 miles of pipeline between the Edgewood Valve Lot and Pulgas Valve Lot and decommission the aboveground and submarine sections of the Bay Division Pipelines Nos. 1 and 2. In addition, pipeline installation would require excavation along approximately 16 miles of existing right-of-way and, in some locations, the right-of-way may have been encroached upon by structures that would need to be demolished. Depending on their age, these structures could contain hazardous building materials. Because no surveys have been conducted to identify hazardous building materials in these structures or pipelines, this impact is considered *potentially significant* for this project, but would be reduced to a less-than-significant level with implementation of hazardous materials building surveys and abatement (Measure 4.14-5). The BDPL 3 and 4 Crossovers (BD-2) and BDPL 3 and 4 Seismic Upgrade at Hayward Fault (BD-3) projects are not expected to require demolition or renovation of structures, so this impact would *not apply* to these projects.

Peninsula Region

Impact 4.14-5: Exposure to hazardous building materials		
Baden and San Pedro Valve Lots	PN-1	PSM
CS/SA Transmission	PN-2	PSM
HTWTP Long-Term	PN-3	PSM
Lower Crystal Springs Dam	PN-4	PSM
Pulgas Balancing Reservoir	PN-5	PSM

Removal of existing pipelines within the vaults could be required for the Baden and San Pedro Valve Lots project (PN-1). In addition, the CS/SA Transmission project (PN-2) could involve upgrades to or demolition of the Crystal Springs Pump Station, and the HTWTP Long-Term project (PN-3) could require the demolition or upgrade of structures at the Harry Tracy WTP. The Lower Crystal Springs Dam project (PN-4) would modify the spillway, parapet walls and stilling basin, and the Pulgas Balancing Reservoir project (PN-5) would modify the inlet/outlet piping and sediment catchment basin. Hazardous building materials could be present in the structures to be demolished or modified, depending on their age. Because no surveys have been conducted to identify hazardous building materials in these structures, this impact is considered *potentially significant* for these projects, but would be reduced to a less-than-significant level with implementation of hazardous materials building surveys and abatement (Measure 4.14-5).

San Francisco Region

Impact 4.14-5: Exposure to hazardous building materials		
SAPL 3 Installation	SF-1	PSM
Groundwater Projects	SF-2	PSM
Recycled Water Projects	SF-3	PSM

The SAPL 3 Installation project (SF-1) would involve construction of approximately four miles of new pipeline and removal of some existing pipeline. The Recycled Water Projects (SF-3) could require demolition of existing structures, depending on the actual location of project facilities. The need for demolition under the Groundwater Projects (SF-2) has not been determined. Because the need for demolition is uncertain and no surveys have been conducted to identify hazardous building materials in the structures that could be demolished, this impact is considered *potentially significant* for all San Francisco Region projects, but would be reduced to a less-than-significant level with implementation of hazardous materials building surveys and abatement (Measure 4.14-5).

Impact 4.14-6: Accidental hazardous materials release from construction equipment.

All Regions

Impact 4.14-6: Accidental hazardous materials release from construction equipment		
San Joaquin Region		
Advanced Disinfection	SJ-1	LS
Lawrence Livermore	SJ-2	LS
SJPL System	SJ-3	LS
SJPL Rehabilitation	SJ-4	LS
Tesla Portal Disinfection	SJ-5	LS
Sunol Valley Region		
Alameda Creek Fishery	SV-1	LS
Calaveras Dam	SV-2	LS
40-mgd Treated Water	SV-3	LS
New Irvington Tunnel	SV-4	LS
Treated Water Reservoirs	SV-5	LS
SABUP	SV-6	LS
Bay Division Region		
BDPL Reliability Upgrade	BD-1	LS
BDPL 3 and 4 Crossovers	BD-2	LS
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	LS
Peninsula Region		
Baden and San Pedro Valve Lots	PN-1	LS
CS/SA Transmission	PN-2	LS
HTWTP Long-Term	PN-3	LS
Lower Crystal Springs Dam	PN-4	LS
Pulgas Balancing Reservoir	PN-5	LS
San Francisco Region		
SAPL 3 Installation	SF-1	LS
Groundwater Projects	SF-2	LS
Recycled Water Projects	SF-3	LS

Storage and use of hazardous materials at construction sites could result in the accidental release of hazardous materials such as oil, grease, or fuel, which could enter an adjacent watercourse and degrade water quality. Many of the WSIP projects are located near creeks or storm systems that discharge to a surface water body. If accidentally released, such hazardous materials could degrade surface water quality. However, as discussed in Impact 4.5-1 in Section 4.5, Hydrology and Water Quality, impacts related to a potential release would be *less than significant* with implementation of SFPUC Construction Measure #3 (onsite air and water quality measures during construction), which requires the implementation of erosion control measures, including preparation and implementation of a stormwater pollution prevention plan (SWPPP) if required by the RWQCB. A SWPPP would be required for all projects outside of San Francisco that disturb more than one acre of land. The SWPPP would include protection measures for the temporary onsite storage of diesel fuels used during construction, including requirements for secondary containment and berming of the diesel storage area (or any chemical storage areas) to contain a potential release and to prevent any such release from reaching an adjacent waterway or stormwater collection system. The erosion control plan prepared for San Francisco projects in compliance with Article 4.1 of the San Francisco Public Works Code and for other projects in accordance with SFPUC Construction Measure #3 would also include measures to prevent a release of hazardous materials from reaching an adjacent waterway.

Furthermore, projects located within the Alameda and Peninsula watersheds would be required to implement the following watershed management plan actions pertaining to potential spills from construction equipment. (In the actions listed below, the first number is for the Alameda WMP and the second number is for the Peninsula WMP.)

- *Action haz4/haz5*: Conduct regular servicing for the SFPUC vehicle fleet and equipment so that leaks/drips/spills of contaminants are minimized. Guidelines include:
    a. Immediately report accidental spills of hazardous materials into surface waters to the Water Quality Bureau and the appropriate state agencies.
    b. Require that buckets and absorbent materials be carried in all SFPUC vehicles in case of an accident or breakdown in which vehicle-related fluids are released.
    c. Follow appropriate BMPs [best management practices] in C-6 to minimize leaching of vehicle-related contaminants into the soil or groundwater from facilities.
    d. For fire protection purposes, ensure that all vehicles and equipment are equipped with spark arrestors and each vehicle carries fire suppression equipment.
- *Action haz6/haz8*: Identify high-risk spill potential areas and implement measures (e.g., fines, barricades, etc.) to reduce the risk of hazardous spills.
- *Action haz7/haz10*: Develop spill response and containment measures for SFPUC vehicles on the watershed. These measures should be coordinated with the overall Emergency Response Plan developed in Action saf7.

Operations, Siting, and Design Impacts

Impact 4.14-7: Increased use of hazardous materials during operation.

The proposed WSIP projects would result in an increase in the quantities of chemicals stored at some of the facilities or would introduce a new use of hazardous materials. If accidentally released, these chemicals could cause human health effects to plant personnel and surrounding populations and could cause adverse environmental effects if released to the environment.

Treatment Facilities. Treatment facilities use a variety of hazardous materials for disinfection, typically ammonia and sodium hypochlorite which are incompatible materials that could pose a public health or water quality risk if mixed. Other hazardous materials such as liquid oxygen might also be used, depending on the water treatment method.

The Uniform Fire Code, Article 80, includes specific requirements for the safe storage and handling of hazardous materials. These requirements reduce the potential for a release of hazardous materials and for mixing of incompatible chemicals. Design of chemical storage facilities at the WSIP project sites would comply with the current Uniform Fire Code requirements and other applicable federal, state, and local regulations, including the following specific design features that would reduce the potential for a release of hazardous materials that could affect public health or the environment:

- Separation of incompatible materials with a noncombustible partition.
- Spill control in all storage, handling, and dispensing areas.
- Separate secondary containment for each chemical storage system. The secondary containment would hold the entire contents of the tank, plus the volume of water needed to supply the fire suppression system for a period of 20 minutes in the event of a catastrophic spill.

Liquid oxygen is an oxidizing cryogenic liquid[12] that is not toxic or flammable. However, if released, ignition of combustible materials can occur more easily in the oxygen-enriched atmosphere. National Fire Protection Association (NFPA) 50, Standard for Bulk Oxygen at Consumer Sites, specifies standards to ensure the safe storage of liquid oxygen and provide adequate separation between the storage facilities and combustibles. NFPA 50 also specifies minimum distances from nonambulatory patients, places of public assembly, public sidewalks or parked cars, and property lines for the protection of public safety. Additional standards for liquid oxygen systems are provided in Article 75 of the California Fire Code and Standard 80-2 of the Uniform Fire Code.

Incorporation of these legally required design features would reduce the potential for spills resulting from the storage and handling of hazardous materials at the treatment facilities. In addition, the SFPUC would be required by the local CUPA agency to prepare an HMBP for new facilities or update the HMBP for existing facilities to reflect the changes in hazardous materials storage.

Ammonia is a regulated substance, and subject to more stringent regulatory requirements. At the federal level, only solutions with an ammonia concentration greater than 20 percent are regulated. However, CalARP regulations apply to all ammonia solutions. The federal and state threshold quantities for ammonia are 20,000 and 500 pounds, respectively. For facilities that would use ammonia in excess of these quantities, the SFPUC would be required by the local CUPA agency to prepare an RMP for new facilities or update the RMP for existing facilities to reflect the changes in storage.

In addition, projects located in the Alameda and Peninsula watersheds would be required to comply with actions outlined in the watershed management plan pertaining to safe hazardous materials storage, as described below. Compliance with legal requirements and implementation of the actions specified in the Alameda and Peninsula WMPs would ensure that potential impacts related to a release of chemicals from WSIP facilities are less than significant.

[12] An oxidizing cryogenic liquid is one that has a normal boiling point below -150 degrees Fahrenheit and readily reacts to promote or initiate combustion of combustible materials.

Standby Power. WSIP implementation would include provision of standby power (propane-, battery-, or diesel-fueled emergency generators) at a number of facilities to keep facilities operating during power outages. Safe use of diesel, propane, and batteries would be addressed through preparation and implementation of the legally required HMBP and compliance with the Aboveground Petroleum Storage Act, discussed in the Setting. In addition to compliance with these legal requirements, projects located in the Alameda and Peninsula watersheds would be required to comply with actions outlined in the watershed management plans pertaining to aboveground storage tanks. Although propane is a federally regulated flammable substance, the quantities that would be stored are well below the federal threshold planning quantity of 10,000 pounds. Therefore, an RMP would not be required for this substance.

San Joaquin Region

Impact 4.14-7: Increased use of hazardous materials during operation		
Advanced Disinfection	SJ-1	LS
Lawrence Livermore	SJ-2	LS
SJPL System	SJ-3	LS
SJPL Rehabilitation	SJ-4	N/A
Tesla Portal Disinfection	SJ-5	LS

Hazardous materials required for the disinfection facilities for the Advanced Disinfection project (SJ-1) would depend on the treatment methods selected to achieve compliance with water quality regulations. The Tesla Portal Disinfection project (SJ-5) could require the use of new water treatment chemicals, and the Lawrence Livermore project (SJ-2) would also likely require the use of disinfection chemicals. Construction of standby power facilities for the Advanced Disinfection (SJ-1), Lawrence Livermore (SJ-2), SJPL System (SJ-3), and Tesla Portal Disinfection (SJ-5) projects would introduce the use of propane or diesel. However, impacts related to a potential release of hazardous materials would be *less than significant* for these projects with preparation and implementation of a legally required HMBP for the new uses at Thomas Shaft (under Lawrence Livermore) and revision of the existing HMBP for Tesla Portal (under Advanced Disinfection, SJPL System, and Tesla Portal Disinfection). There would be no new use of hazardous materials under the SJPL Rehabilitation project (SJ-4), so this impact would *not apply* to this project.

Sunol Valley Region

Impact 4.14-7: Increased use of hazardous materials during operation		
Alameda Creek Fishery	SV-1	N/A
Calaveras Dam	SV-2	N/A
40-mgd Treated Water	SV-3	LS
New Irvington Tunnel	SV-4	N/A
Treated Water Reservoirs	SV-5	LS
SABUP	SV-6	N/A

Increased water treatment capacity under the 40-mgd Treated Water (SV-3) and Treated Water Reservoirs (SV-5) projects would increase the use of sodium hypochlorite and introduce the use of ammonia and fluoride at the Sunol Valley WTP. Construction of standby power facilities under the Treated Water Reservoirs project (SV-5) could also require the use of diesel. However, impacts related to a potential release of hazardous materials would be *less than significant* with revision of the existing HMBP for the Sunol Valley WTP to account for changes in the storage of hazardous materials, and preparation of an RMP for new use of ammonia. Furthermore, chemical storage at the Sunol Valley Chloramination Facility would be reduced by the same amounts, and the HMBP and RMP for this facility would be revised to reflect this change in chemical storage.

In addition, the 40-mgd Treated Water (SV-3) and Treated Water Reservoirs (SV-5) projects would be required to implement actions of the Alameda WMP regarding the use of hazardous materials in the watershed. Action haz1 requires development of hazardous chemical management procedures addressing the type, use, storage, transport, and disposal of hazardous chemicals and pesticides used in watershed activities. Action haz2 requires the SFPUC to inventory and annually monitor all above- and below-ground fuel storage tanks, refueling stations, and vehicle maintenance yards within the watershed with respect to the control of vehicle-related contaminants as well as for compliance with applicable underground storage tank requirements and hazardous materials storage and handling requirements.

None of the other Sunol Valley Region projects (Alameda Creek Fishery, SV-1; Calaveras Dam, SV-2; New Irvington Tunnel, SV-4; and SABUP, SV-6) would involve a new use or change in use of hazardous materials, so this impact would *not apply* to these projects.

Bay Division Region

Impact 4.14-7: Increased use of hazardous materials during operation		
BDPL Reliability Upgrade	BD-1	LS
BDPL 3 and 4 Crossovers	BD-2	LS
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	N/A

The BDPL Reliability Upgrade project **(**BD-1) would require the storage of propane and a battery to fuel the emergency generators at the vaults and backup generators using propane or diesel could also be required for the BDPL 3 and 4 Crossovers project (BD-2). However, impacts related to a potential release from project facilities would be *less than significant* with preparation and implementation of a legally required HMBP.

The BDPL 3 and 4 Seismic Upgrade at Hayward Fault project (BD-3) would involve installation of or modifications to transmission pipelines and would not involve the use of hazardous materials during operation; therefore, this impact would *not apply* to this project.

Peninsula Region

Impact 4.14-7: Increased use of hazardous materials during operation		
Baden and San Pedro Valve Lots	PN-1	LS
CS/SA Transmission	PN-2	N/A
HTWTP Long-Term	PN-3	LS
Lower Crystal Springs Dam	PN-4	LS
Pulgas Balancing Reservoir	PN-5	N/A

The Baden and San Pedro Valve Lots project (PN-1) would add a propane tank to provide backup power for the water quality building at the Baden Valve Lot. In addition, the treatment capacity of the Harry Tracy WTP would be increased under the HTWTP Long-Term project (PN-3), potentially resulting in an increase in the use of treatment chemicals, including sodium hypochlorite and ammonia. The possible construction of standby power facilities under the HTWTP Long-Term (PN-3) and Lower Crystal Springs Dam (PN-4) projects could also require the use of diesel. However, impacts related to a potential release of hazardous materials would be *less than significant* with preparation of an HMBP or revision of the existing HMBPs as well as revision of the Harry Tracy WTP RMP to account for changes in the use of hazardous materials and regulated substances (ammonia). The Lower Crystal Springs Dam project is located in the Peninsula watershed, and the actions specified in the Peninsula WMP would apply. Action haz1 requires development of hazardous chemical management procedures addressing the type, use, storage, transport, and disposal of hazardous chemicals and pesticides used in watershed activities. Action haz2 requires the SFPUC to inventory and annually monitor all above- and below-ground fuel storage tanks, refueling stations, and vehicle maintenance yards within the watershed with respect to the control of vehicle-related contaminants, as well as for compliance with applicable underground storage tank requirements and hazardous materials storage and handling requirements.

The CS/SA Transmission (PN-2) and Pulgas Balancing Reservoir (PN-5) projects would not include a new use or change in use of hazardous materials, so this impact would *not apply* to these projects.

San Francisco Region

Impact 4.14-7: Increased use of hazardous materials during operation		
SAPL 3 Installation	SF-1	N/A
Groundwater Projects	SF-2	LS
Recycled Water Projects	SF-3	LS

Implementation of the Groundwater Projects (SF-2) and Recycled Water Projects (SF-3) could require the use of chlorination or chloramination treatment chemicals, such as sodium hypochlorite or ammonia, and other water treatment chemicals, as well as propane or diesel for backup power at the well or other locations. However, impacts related to a potential release of hazardous materials would be *less than significant* with preparation and implementation of a legally required HMBP or RMP for new uses of hazardous materials, and revision of the existing HMBP for changes in hazardous materials uses at existing facilities.

The SAPL 3 Installation project (SF-1) would not include a new use or change in use of hazardous materials, so this impact would *not apply* to this project.

Impact 4.14-8: Emission or use of hazardous materials within 1/4 mile of a school.

As discussed in Impact 4.14-7, the proposed WSIP projects would increase the quantities of chemicals stored at some of the facilities or would introduce a new use of hazardous materials. If emitted or accidentally released near a school, these chemicals could cause health effects for children.

San Joaquin Region

Impact 4.14-8: Emission or use of hazardous materials within 1/4 mile of a school		
Advanced Disinfection	SJ-1	N/A
Lawrence Livermore	SJ-2	N/A
SJPL System	SJ-3	N/A
SJPL Rehabilitation	SJ-4	N/A
Tesla Portal Disinfection	SJ-5	N/A

The Advanced Disinfection (SJ-1) and Telsa Portal Disinfection (SJ-5) projects at Tesla Portal and the Lawrence Livermore project at Thomas Shaft (SJ-2) would likely involve an increase in the use of disinfection and other water treatment chemicals. In addition, the Advanced Disinfection (SJ-1), Lawrence Livermore (SJ-2), SJPL System (SJ-3), and Tesla Portal Disinfection (SJ-5) projects would introduce the use of hazardous materials for backup power systems. However, these projects are not located within 1/4 mile of a school, so this impact would *not apply* to these projects.

There would be no change in the hazardous materials used under the SJPL Rehabilitation project (SJ-4). Therefore, this impact would *not apply* to this project.

Sunol Valley Region

Impact 4.14-8: Emission or use of hazardous materials within 1/4 mile of a school		
Alameda Creek Fishery	SV-1	N/A
Calaveras Dam	SV-2	N/A
40-mgd Treated Water	SV-3	N/A
New Irvington Tunnel	SV-4	N/A
Treated Water Reservoirs	SV-5	N/A
SABUP	SV-6	N/A

An increase in the use of water treatment chemicals would occur at the Sunol Valley WTP under the 40-mgd Treated Water (SV-3) and Treated Water Reservoir (SV-5) projects and standby power facilities would be constructed at the WTP under the Treated Water Reservoir project. However, the Sunol Valley WTP is not located within 1/4 mile of a school, so this impact would *not apply* to these projects.

There would be no change in the hazardous materials used under the other Sunol Valley Region projects (Alameda Creek Fishery, SV-1; Calaveras Dam, SV-2; New Irvington Tunnel, SV-4; and SABUP, SV-6). Therefore, this impact would *not apply* to these projects.

Bay Division Region

Impact 4.14-8: Emission or use of hazardous materials within 1/4 mile of a school		
BDPL Reliability Upgrade	BD-1	LS
BDPL 3 and 4 Crossovers	BD-2	LS
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	N/A

The Bay Division Reliability project (BD-1) would use propane or a battery for backup power supplies within approximately 1/4 mile of Mission San Jose High School, J. Haley Durham Elementary School, St. Leonard Santa Paula School, and Saint Matthias School. The BDPL 3 and 4 Crossovers project (BD-2) might also use these materials within 1/4 mile of a school. However, propane storage and battery use would be safely managed to protect public health, in accordance with the existing and future regulatory-approved HMBP. Therefore, this impact would be *less than significant* for these projects with compliance with current regulations.

There would be no change in the hazardous materials used under the BDPL 3 and 4 Seismic Upgrade at Hayward Fault project (BD-3). Therefore, this impact would *not apply* to this project.

Peninsula Region

Impact 4.14-8: Emission or use of hazardous materials within 1/4 mile of a school		
Baden and San Pedro Valve Lots	PN-1	LS
CS/SA Transmission	PN-2	N/A
HTWTP Long-Term	PN-3	LS
Lower Crystal Springs Dam	PN-4	N/A
Pulgas Balancing Reservoir	PN-5	N/A

The Baden and San Pedro Valve Lots project (PN-1) would use propane as a backup power supply for the water building at the Baden Valve Lot, within approximately 1/4 mile of Los Cerritos School, Southwood School, and South San Francisco High School. The Harry Tracy WTP is located within approximately 1/4 mile of Meadows Elementary School, and there would likely be an increase in the use of water treatment chemicals associated with the increased capacity of this treatment plant and construction of standby power facilities under the HTWTP Long-Term project (PN-3). However, hazardous materials used at these facilities would be safely managed to protect public health, in accordance with the existing and future regulatory-approved HMBPs and RMP. Therefore this impact would be *less than significant* with compliance with current regulations.

Although the Lower Crystal Springs Dam project (PN-4) could use diesel for a backup power supply, this project is not located within 1/4 mile of a school. There would be no change in the hazardous materials used under the CS/SA Transmission (PN-2) or Pulgas Balancing Reservoir (PN-5) projects. Therefore, this impact would *not apply* to these projects.

San Francisco Region

Impact 4.14-8: Emission or use of hazardous materials within 1/4 mile of a school		
SAPL 3 Installation	SF-1	N/A
Groundwater Projects	SF-2	LS
Recycled Water Projects	SF-3	LS

Both the Groundwater Projects (SF-2) and Recycled Water Projects (SF-3) could increase the use of water treatment chemicals such as sodium hypochlorite or ammonia, or require propane or diesel for backup power at the well or other locations. Specific sites for these project facilities have not been determined. However, even if located within 1/4 mile of a school, these hazardous materials would be safely managed to protect public health, in accordance with the future regulatory-approved HMBPs and RMPs. Therefore, this impact would be *less than significant* with compliance with current regulations.

The SAPL 3 Installation project (SF-1) would not include a new use or change in use of hazardous materials, so this impact would *not apply* to this project.

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4.15 Energy Resources

4.15 Energy Resources

4.15.1 Setting

Electrical Utility Providers

SFPUC Power Enterprise

SFPUC Power Enterprise (formerly part of Hetch Hetchy Water and Power Enterprise) would provide electrical power service for the WSIP facilities, primarily from power generated by the SFPUC's hydroelectric facilities in the Hetch Hetchy system. As discussed in Chapter 2, the Hetch Hetchy Project comprises 400 megawatts of hydroelectric power generation plants on the Tuolumne River and 150 miles of high-voltage transmission lines linking Hetch Hetchy power to California's electricity grid at Newark. Energy production varies by season and by year depending on hydrologic conditions. The long-term annual average production is approximately 1.7 billion kilowatt-hours (kWh); historical production has ranged from a low of 1.2 billion kWh per year to a high of 2.2 billion kWh per year (SFPUC, 2002). The total energy usage of existing facilities within the WSIP regions is nearly 44 million kWh, less than 4 percent of the historical low production rate of the Hetch Hetchy Project and less than 3 percent of the long-term annual average production rate.

SFPUC Power Enterprise provides electricity to all City and County of San Francisco (CCSF) facilities (including tenants) and to San Francisco International Airport and its tenants. SFPUC Power Enterprise also sells electricity to Norris Industries (a federal facility), provides electricity for the municipal and agricultural pumping loads of the Modesto and Turlock Irrigation Districts, and sells electricity to other public agency wholesalers. While the quantity of power produced exceeds San Francisco's municipal power needs on an annual basis, the CCSF must supplement its power sources to meet municipal demand and its contractual obligations during the summer and fall months, at which time power generation is reduced so that water can be stored.

Pacific Gas and Electric Company

Pacific Gas and Electric Company (PG&E) provides natural gas and electricity to most of Northern California. It provides SFPUC Power Enterprise with transmission and distribution services from Newark to the west, pursuant to an Interconnection Agreement regulated by the Federal Energy Regulatory Commission. Under this agreement, PG&E transmits and distributes electricity to SFPUC Power Enterprise customers, which would include the WSIP facilities.

California's Electricity Supply

California's electricity is supplied by a number of sources, including natural gas (41 percent), coal (21 percent), large hydroelectric plants (15 percent), and nuclear (13 percent) (CEC, 2005). The remaining 10 percent is supplied from geothermal, biomass, small hydroelectric, wind, and solar sources. Despite California policies aimed at diversifying the state's electrical supply, dependence on natural gas is continuing to grow, from 30 percent in 1999 to 36 percent in 2002 to 41 percent in 2004. Electricity generation accounted for 50 percent of the natural gas usage in 2004. In 2002, California imposed a requirement that electrical corporations increase procurement of eligible renewable energy resources by at least 1 percent per year so that 20 percent of its retail sales are procured from renewable resources by 2017 (Public Utilities Code, Section 399.15), and publicly owned utilities have been asked to consider establishing a similar target.

Current Energy Use

Electricity

While per capita electricity consumption in the United States has increased by nearly 50 percent over the past 30 years, per capita California energy use during this period has been approximately flat (CEC, 2005). This achievement is the result of continued progress in cost-effective building and appliance standards and ongoing enhancements in efficiency programs. These combined efforts have reduced peak capacity needs by more than 12,000 megawatts and continue to save about 40,000 gigawatt-hours (GWh) per year of electricity.

Even though California's increases in energy use are small relative to the rest of the country, electricity consumption in California grew from 250,241 GWh in 2001 to 270,927 GWh in 2004. Electricity use is forecast to grow between 1.2 and 1.5 percent annually, from 270,927 GWh in 2004 to between 310,716 and 323,372 GWh by the end of the 2016. Overall, electricity demand in California increases most dramatically in the summer, driven by high air-conditioning usage. The generation system must be able to accommodate these high summer peaks in addition to demand swings caused by weather variability and the economy. Although peak demand periods total only 50 to 100 hours per year, they impose huge burdens on the electrical system. The state's dependence on natural gas to generate electricity is escalating, as is the demand for natural gas in the residential and commercial sectors, with California's natural gas consumption second only to that of Texas.

Despite improvements in power plant licensing, energy efficiency programs, and continued technological advances, development of new energy supplies is not keeping pace with the state's increasing demand (CEC, 2005). Construction of new power plants has lagged, and the number of new plant permit applications has decreased. Transmission lines are frequently running at capacity, forcing system operators to reduce generation to avoid overloading the system, and transmission line outages sometimes result in rolling blackouts. In addition, the development of new renewable resources has been slower than anticipated, due in part to the state's complex and cumbersome approval process. Additional actions are still needed for California to achieve its full energy efficiency potential.

In September 2004, the California Public Utilities Commission (CPUC) adopted the nation's most aggressive energy savings goals for both electricity and natural gas. In achieving these targets, the state will save an additional 5,000 megawatts and 23,000 GWh per year of electricity and 450 million therms per year of natural gas by 2013.

As stated above, the Hetch Hetchy Project provides 400 megawatts of hydroelectric power that is not dependent on natural gas. SFPUC Power Enterprise customer base and generation base are distinguishable from other power supplies, and its load profile is relatively flat (i.e., not dramatically higher in the summer) because it is not driven by air-conditioning usage.

Energy Use Associated with Water Infrastructure Projects

Industrywide, California's water infrastructure uses large amounts of energy to collect and treat water; to dispose of wastewater; and to power the large pumps that move water throughout the state. However, SFPUC Water Enterprise electricity consumption is less intensive than many water providers in California because the regional water system relies on gravity, as opposed to pumping, to bring water from the Sierra Nevada to local storage facilities. Industrywide energy usage for water infrastructure accounts for nearly 20 percent of the state's electricity consumption, one-third of non-power-plant natural gas consumption, and about 88 million gallons of diesel fuel consumption (CEC, 2005). The California Energy Commission (CEC) states that, if not coordinated and properly managed on a statewide basis, water-related electricity demand could ultimately affect the reliability of the electrical system during peak demand periods when reserves are low.

Water and wastewater agencies would similarly be unable to meet the needs of their customers without adequate electricity supplies. More efficient water usage, coupled with energy efficiency improvements in the water infrastructure itself, could reduce electricity demand in this sector. The CEC recommends that the CEC, the California Department of Water Resources, the CPUC, local water agencies, and other stakeholders explore and pursue cost-effective water efficiency opportunities that would save energy and decrease the intensity of energy use in the water sector.

According to the CEC, industry experts estimate that untapped energy efficiency opportunities in water and wastewater treatment range from 5 to 30 percent. In the mid-1990s, the Electric Power Research Institute and HDR, Inc. conducted an audit of the energy savings potential of water and wastewater facilities in California. The audit indicated that over 880 GWh could be saved through implementation of a variety of measures, including load shifting and installation of high-efficiency motors and pumps. The National Resources Defense Council (NRDC) and Pacific Institute further evaluated energy usage by water and wastewater systems, assessing the intensity of energy usage for components of the water supply and treatment system and identifying areas where energy efficiency could be achieved (NRDC and Pacific Institute, 2004). The results of this study are further discussed below under Impact 4.15-2.

Regulatory Framework

National Energy Policy

The National Energy Policy, established in 2001 by the National Energy Policy Development Group, is designed to help the private sector and state and local governments promote dependable, affordable, and environmentally sound production and distribution of energy for the future (NEPDG, 2001). Key issues addressed by the energy policy are energy conservation, repair and expansion of energy infrastructure, and ways of increasing energy supplies while protecting the environment.

2005 California Energy Action Plan II

The *Energy Action Plan II* is the state's principal energy planning and policy document (CPUC and CEC, 2005). The plan continues the goals of the original *Energy Action Plan*, describes a coordinated implementation plan for state energy policies, and identifies specific action areas to ensure that California's energy is adequate, affordable, technologically advanced, and environmentally sound. In accordance with this plan, the first-priority actions to address California's increasing energy demands are energy efficiency and demand response (i.e., reduction of customer energy usage during peak periods in order to address system reliability and support the best use of energy infrastructure). Additional priorities include the use of renewable sources of power and distributed generation (i.e., the use of relatively small power plants near or at centers of high demand). To the extent that these actions are unable to satisfy the increasing energy and capacity needs, clean and efficient fossil-fired generation is supported.

The *Energy Action Plan II* includes the following energy efficiency action specific to water supply systems:

- Identify opportunities and support programs to reduce electricity demand related to the water supply system during peak hours, and opportunities to reduce the energy needed to operate water conveyance and treatment systems.

In 2002, California established its Renewable Portfolio Standard program,[1] with the goal of increasing the percentage of renewable energy in the state's electricity mix to 20 percent by 2017. The CPUC subsequently accelerated that goal to 2010 for electrical corporations, and the CEC further recommended that the state increase the target for all retail electricity sellers to 33 percent by 2020. Because much of electricity demand growth is expected to be met by increases in natural-gas-fired generation, reducing consumption of electricity and diversifying electricity generation resources are significant elements of plans to reduce natural gas demand.

Building Energy Efficiency Standards

The Energy Efficiency Standards for Residential and Nonresidential Buildings, as specified in Title 24, Part 6, of the California Code of Regulations, were established in 1978 in response to a legislative mandate to reduce California's energy consumption. The standards are updated periodically to allow consideration and possible incorporation of new energy efficiency technologies and methods. The current version of the standards was adopted in October 2005, and the CEC has begun development of an update, which is planned for adoption in 2008.

[1] The Renewable Portfolio Standard is a flexible, market-driven policy to ensure that the public benefits of wind, solar, biomass, and geothermal energy continue to be realized as electricity markets become more competitive. The policy ensures that a minimum amount of renewable energy is included in the portfolio of electricity resources serving a state or country. By increasing the required minimum amount over time, the Renewable Portfolio Standard puts the electricity industry on a path toward increasing sustainability.

California's building efficiency standards (along with those for energy-efficient appliances) have saved more than $56 billion in electricity and natural gas costs since 1978 (CEC, 2007). It is estimated that the standards will save an additional $23 billion by 2013.

San Francisco Plans

Sustainability Plan for San Francisco

The *Sustainability Plan for San Francisco* contains a set of general goals and specific objectives and actions for San Francisco to ensure that the city's current needs are met without sacrificing the ability of future generations to meet their own needs (SFDE, 1996). The major energy goals expressed in the plan are to reduce overall power use by maximizing energy efficiency; to maintain an energy supply based on renewable, environmentally sound resources; to eliminate climate-changing and ozone-depleting emissions and toxics associated with energy production and use; and to base energy decisions on the goal of creating a sustainable society.

The Energy, Climate Change and Ozone Depletion chapter of the Sustainability Plan encourages the use of solar energy (harvested directly as sunlight and converted to heat or electricity, or indirectly through wind, water, or vegetation and converted to fuel) as a path towards reducing reliance on nonrenewable fossil fuels. The plan also includes goals to develop energy efficiency requirements that exceed Title 24 standards by 25 percent; provide every building with a renewable energy provider; retrofit mechanically cooled buildings with passive cooling; provide a reliable energy supply system even in times of natural or economic disaster; and install alternative fuels for backup of electrical systems in critical buildings. Specific actions that may be related to the WSIP projects include conducting an energy efficiency audit of public facilities and developing a plan to improve energy efficiency; creating an incentive-based program for managers of city agencies to save energy; establishing city policy that requires staff in municipal facilities to turn off lights and computers when not in use; encouraging building construction that utilizes passive solar technology; and initiating demonstration projects that use solar, wind, ocean, and/or biogas energy sources.

Electricity Resource Plan

The *Electricity Resource Plan* for San Francisco presents an action plan to meet the growth in demand for electricity, as well as allow the shutdown of the Hunters Point power plant and replacement of the aging power plants at Potrero (SFDE and SFPUC, 2002). The main components of the plan include demand reduction through energy efficiency and load management; use of renewable energy resources such as solar, wind, and water; construction of medium-sized generation plants using the most efficient gas-fired generators and cogeneration plants;[2] construction of small-scale distributed generation such as fuel cells, package cogeneration plants, and micro-turbines; and improved power transmission from the Peninsula. The plan calls for a renewed commitment and an accelerated pace to achieving the goals of the 1997 Sustainability Plan, including the elimination of all fossil-fuel power; an energy supply

2 Cogeneration is the production and use of electricity and heat from the same installation.

based on renewable, environmentally sound resources; and maximum energy efficiency. Specific energy savings and production goals for each component of the *Electricity Resource Plan* are identified.

Climate Action Plan

In February 2002, the San Francisco Board of Supervisors passed the *Greenhouse Gas Emissions Reduction Resolution* (Number 158-02) committing the City and County of San Francisco to a greenhouse gas (GHG) emissions reductions goal of 20 percent below 1990 levels by the year 2012. The resolution also directs the San Francisco Department of the Environment, the SFPUC, and other appropriate City agencies to complete and coordinate an analysis and planning of a local action plan targeting GHG emission reduction activities. In September 2004, the San Francisco Department of the Environment and the SFPUC published the *Climate Action Plan for San Francisco: Local Actions to Reduce Greenhouse Emissions* (Plan) (SFDE and SFPUC, 2004). Although the San Francisco Board of Supervisors has not formally committed the City to perform the actions addressed in the Plan, and many of the actions require further development and commitment of resources, it serves as a blueprint for GHG emission reductions, and several actions are now in progress. The climate Action Plan is further discussed in Section 4.9, Air Quality.

4.15.2 Impacts

Significance Criteria

The CCSF has not formally adopted significance standards for impacts related to energy resources, but generally considers that implementation of the proposed program would have a significant energy resource impact if it were to:

- Encourage activities that resulted in the use of large amounts of fuel, water, or energy, or use these in a wasteful manner (Evaluated in this section)

Approach to Analysis

This analysis evaluates proposed WSIP projects in terms of energy demand during construction and operation and assesses the potential for long-term increases in energy demand and/or the wasteful use of energy. For energy used during construction, the analysis discusses how construction operations would be conducted to minimize the use of fuels and ensure that they are not used in a wasteful manner. For energy used during operation, the analysis identifies WSIP projects for which increases in energy demand would occur. For these projects, energy efficiency measures, consistent with the *Energy Action Plan II*, would be evaluated as part of subsequent, project-level CEQA review. Although any increase in energy demand would be considered potentially significant, implementation of measures to increase energy efficiency, to be determined on a project-by-project basis, would ensure that energy is not used in a wasteful manner and would reduce potential impacts on the state's limited energy supply and aging energy infrastructure.

Impact Summary by Region

Table 4.15-1 presents a summary of potential impacts on energy associated with the WSIP projects. For each impact, the summary presents the expected level of significance of each potential impact for each WSIP project.

TABLE 4.15-1
POTENTIAL IMPACTS AND SIGNIFICANCE – ENERGY

Projects	Project Number	4.15-1: Construction-related energy use	4.15-2: Long-term energy use during operation
San Joaquin Region			
Advanced Disinfection	SJ-1	PSM	PSM
Lawrence Livermore Supply Improvements	SJ-2	PSM	PSM
San Joaquin Pipeline System	SJ-3	PSM	PSM
Rehabilitation of Existing San Joaquin Pipelines	SJ-4	PSM	LS
Tesla Portal Disinfection Station	SJ-5	PSM	PSM
Sunol Valley Region			
Alameda Creek Fishery Enhancement	SV-1	PSM	PSM
Calaveras Dam Replacement	SV-2	PSM	N/A
Additional 40-mgd Treated Water Supply	SV-3	PSM	PSM
New Irvington Tunnel	SV-4	PSM	N/A
SVWTP – Treated Water Reservoirs	SV-5	PSM	PSM
San Antonio Backup Pipeline	SV-6	PSM	N/A
Bay Division Region			
Bay Division Pipeline Reliability Upgrade	BD-1	PSM	PSM
BDPL Nos. 3 and 4 Crossovers	BD-2	PSM	PSM
Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault	BD-3	PSM	PSM
Peninsula Region			
Baden and San Pedro Valve Lots Improvements	PN-1	PSM	N/A
Crystal Springs/San Andreas Transmission Upgrade	PN-2	PSM	PSM
HTWTP Long-Term Improvements	PN-3	PSM	PSM
Lower Crystal Springs Dam Improvements	PN-4	PSM	N/A
Pulgas Balancing Reservoir Rehabilitation	PN-5	PSM	N/A
San Francisco Region			
San Andreas Pipeline No. 3 Installation	SF-1	PSM	PSM
Groundwater Projects	SF-2	PSM	PSM
Recycled Water Projects	SF-3	PSM	PSM

LS = Less than Significant impact, no mitigation required
PSM= Potentially Significant impact, can be mitigated to less than significant
N/A = Not Applicable

Construction Impacts

Impact 4.15-1: Construction-related energy use.

Construction of the WSIP projects would require the use of fuels (primarily gas, diesel, and motor oil) for a variety of construction activities, including excavation, grading, demolition, and vehicle travel. During these activities, fuel use for construction worker commute trips would be minor compared to the fuel use by construction equipment. Although the fuels would only be used during construction of the WSIP projects, excessive idling and other inefficient site operations could result in the wasteful use of fuels. Therefore, impacts related to the wasteful use of fuels during construction would be *potentially significant* for all WSIP projects. However, certain exhaust control measures specified in Section 4.9, Air Quality, such as limiting idling time and performing low-emissions tune-ups (Measures 4.9-1b and 4.9-1d), would ensure that fuels are not used in a wasteful manner and would therefore reduce this impact to a less-than-significant level.

Operational Impacts

Impact 4.15-2: Long-term energy use during operation.

Operation of WSIP project facilities could increase the long-term consumption of energy. As stated above in the Setting, California's water infrastructure accounts for nearly 20 percent of the state's electricity consumption, one-third of non-power-plant natural gas consumption, and about 88 million gallons of diesel fuel consumption. Electricity consumption also contributes to greenhouse gas emissions and associated climate change effects (see Section 4.9, Air Quality, Impact 4.9-6, for more discussion). Furthermore, many of the peak demands for water and much the energy required to treat and transport the water coincide with peak seasonal demands experienced by electrical utilities, and can contribute to the need for rolling blackouts. Thus, reducing the energy required to move, use, and treat water would help relieve stresses on California's energy infrastructure and help California to meet its energy savings goals, while shifting loads from peak demand periods would also help relieve stresses on the system. To address these issues, SFPUC Power Enterprise is developing energy efficiency design guidelines for use by WSIP project staff in designing energy-efficient pump stations and buildings, and the SFPUC already participates in demand-shifting programs to shift more water and wastewater energy usage to off-peak hours, therefore decreasing the use of energy during peak demand periods and reducing the potential for rolling blackouts.

In their analysis of water system energy requirements, the NRDC and Pacific Institute divided the water supply/use/disposal chain into five stages: providing a source of water and conveying it to the point of use, water treatment, distribution, end use, and wastewater treatment (NRDC, 2004). Based on a San Diego case study, the NRDC concluded that end uses of water (especially clothes washing and taking showers) consume more energy than any other part of the urban water conveyance and treatment cycle (56 percent of the total energy usage in San Diego). Of the total usage, providing source water and conveyance of the water accounted for 30 percent, wastewater treatment accounted for 8 percent, distribution accounted for 5 percent, and water treatment accounted for 1 percent.

Water conservation, planned as part of the WSIP and incorporated in the estimated 2030 water demand, would save substantial amounts of energy, not only by reducing the amount of energy consumed by end-users, but also by reducing the amount of water requiring conveyance and treatment as well as the volume of wastewater requiring treatment. These measures include implementation of plumbing code changes for more efficient water use, continuation of existing conservation practices, and varying levels of additional conservation measures, depending on the system customer. In addition, the WSIP preferred water supply option includes about 4 mgd of additional water conservation measures in San Francisco not already included in the 2030 demand projection, as described in Chapter 3 of this PEIR.

The following analysis focuses on the general energy efficiency approach used by the SFPUC as well as energy consumption required for conveyance and treatment of water under the WSIP. Energy uses by end-users and for wastewater treatment are not evaluated, because the WSIP does not address these components of the water supply/use/disposal chain.

General Energy Usage and Energy Efficiency Approach. Operation of the WSIP projects would increase power consumption relative to existing conditions. Although the Hetch Hetchy Project produces far greater power than is currently used by SFPUC projects in the WSIP regions, the proposed increase in power use by the WSIP facilities could result in a higher reliance on nonrenewable energy resources; this is because less hydroelectric power would be available, particularly during the fall and summer months when power generation under the Hetch Hetchy Project is reduced and power supplies are supplemented by PG&E. However, SFPUC Water Enterprise is developing energy efficiency design guidelines and also participates in energy savings programs, such as the demand-shifting program mentioned above. Participation in demand-shifting programs along with implementation of project-specific energy efficiency measures, consistent with the *Energy Action Plan II*, would ensure that energy under the WSIP is not used in a wasteful manner.

Pump Stations. Much of the energy involved in municipal water systems is used for pumping. SFPUC Power Enterprise is working with WSIP staff to identify energy efficiency opportunities in two areas: pumping energy optimization and efficient pump station design. Pumping energy optimization, or demand shifting, is aimed at designing pumping systems that reduce on-peak energy requirements for water pumping operations. With optimized pumping, pumping operations would shift to the off-peak and part-peak periods of each day (within system constraints) to reduce on-peak energy consumption, while at the same time maintaining uninterrupted water delivery to end users. This measure is projected to reduce on-peak electricity demand by 6 megawatts.

Efficient pump station design is being addressed by incorporating efficient motors, pumps, lighting, and ventilation systems. Energy savings resulting from this measure would be determined based on the energy efficiency guidelines of SFPUC Power Enterprise. Pumping facilities (including CS/SA Transmission, PN-2; HTWTP Long-Term, PN-3; and Recycled Water Projects, SF-3) would be designed in accordance with these energy efficiency guidelines.

Water Treatment Plants. Water treatment facilities use energy to pump and process water. The amount of energy required for treatment depends on source-water quality, treatment methods used, and pumping requirements for the treated water. Energy requirements for treatment have typically been small, with the bulk of the energy used to pump raw water. Energy savings can be achieved by reducing the volume of raw water pumped (through water conservation), using energy-efficient treatment and pumping equipment, using effective instrumentation and controls, managing pumping operations, and implementing consistent repairs and maintenance of facilities to minimize power use. Other than approximately 2 percent for backwash, treated water is not pumped in the water treatment plants.

Many water suppliers are moving in the direction of using more energy-intensive treatment methods for disinfection, such as ozonation, which is currently used at one SFPUC water treatment plant. The energy required for water treatment is expected to increase over the next decade as treatment capacity expands, new water quality standards are put in place, and new treatments are developed to improve drinking water taste and color. The implementation of the Advanced Disinfection project (SJ-1), for instance, would lead to an increase in energy needs for water treatment.

Groundwater Production. The production of groundwater requires electricity to pump the groundwater from the wells and convey it to a water treatment system. The amount of energy required depends on the efficiency of the pumping equipment, the depth to groundwater, and the distance to the treatment facility. Some of this energy use could be offset, however, because less energy could be required to treat the generally high-quality groundwater. Conjunctive groundwater use, included as part of the drought supply for the WSIP preferred water supply option, would increase energy demands associated with the retrieval of accumulated water in the Westside Basin.

Recycled Water Facilities. The energy costs for water recycling include the incremental costs to treat the wastewater to the standard necessary for its intended use, and the cost of energy required to convey the water to its intended users. The amount of energy required would depend on the equipment used, the degree of treatment required, and the proximity of the treatment plant to the location where the recycled water would be used.

Pipelines and Tunnels. For the most part, WSIP pipelines and tunnels would be gravity driven and would not require power to operate. Where the pipeline would operate under pressure, a pumping plant would be required; power consumption for pumping plants is addressed above. Valve lots constructed for the pipeline systems could result in a small increase in energy demand during their operation. Valves constructed along the pipelines would require a power source for operation, typically connected to the power grid.

Backup power would typically be provided by propane, diesel, or an uninterruptible power supply, all of which are nonrenewable energy sources. However, backup power would only be used in the event of a disruption in power service. One standby power facility constructed for the BDPL Reliability Upgrade project (BD-1) would use a battery and require operation of an air conditioner to maintain an acceptable temperature for battery operation, but energy requirements for this use would be minimal. Therefore, impacts related to the use of large amounts of energy would be less than significant for the standby power facilities used on pipelines.

Crossover Facilities. Crossover facilities would use energy to switch service from one pipeline to another for maintenance or in the event that a pipeline is damaged in a natural disaster. While this use could result in a small increase in energy demand, energy efficiency measures could be employed to reduce the amount of energy required, or an alternative power supply could be utilized. Some crossovers could be hydraulically activated and would not require a power source.

San Joaquin Region

Impact 4.15-2: Long-term energy use during operation		
Advanced Disinfection	SJ-1	PSM
Lawrence Livermore	SJ-2	PSM
SJPL System	SJ-3	PSM
SJPL Rehabilitation	SJ-4	LS
Tesla Portal Disinfection	SJ-5	PSM

SFPUC Power Enterprise provides power in the San Joaquin Region, where existing power usage is 199,574 kWh. As summarized in **Table 4.15-2**, operation of new disinfection facilities at Tesla Portal under the Advanced Disinfection (SJ-1) and Tesla Portal Disinfection (SJ-5) projects could substantially increase energy consumption at this site, depending on the disinfection methods used and pumping requirements of the treatment facility. Energy usage could be as high as 28,280,000 kWh for the Advanced Disinfection project and 128,000 kWh for the Tesla Portal Disinfection project. Operation of disinfection facilities at Thomas Shaft under the Lawrence Livermore project (SJ-2) and crossover facilities for the SJPL System project (SJ-3) would also result in a small increase in energy usage (40,000 kWh for SJ-2 and 60,000 kWh for SJ-3). Implementation of these projects would increase energy usage in the San Joaquin Region by more than 100-fold over existing conditions, primarily due to the large energy consumption required for the Advanced Disinfection project. Therefore, impacts related to the use of large amounts of energy are *potentially significant* for each of these projects, particularly for the Advanced Disinfection project. However, incorporation of energy efficiency measures (Measure 4.15-2) would reduce this impact to a less-than significant-level. Energy efficiency measures would be evaluated in more detail as part of subsequent, project-level CEQA review for each project.

Although the SJPL Rehabilitation project (SJ-4) would require some electricity for the operation of valves and associated instruments, this power load would be temporary and would not be continuous, and any increase in energy demand would thus be negligible. Therefore, this impact would be *less than significant* for this project.

TABLE 4.15-2
ESTIMATED ANNUAL OPERATIONAL ENERGY DEMAND, 2030

No.	Project Name	Existing Power Supply (2005)	Estimated Increase in Annual Operational Energy Consumption, 2030		
			New or Additional Power Needed	Expected Provider	Electricity Requirement (kWh)
SJ-1	Advanced Disinfection	SFPUC	Yes	SFPUC	26,280,000
SJ-2	Lawrence Livermore Supply Improvements	SFPUC	Yes	SFPUC	40,000
SJ-3	San Joaquin Pipeline System	SFPUC	Yes	SFPUC	60,000
SJ-4	Rehabilitation of Existing San Joaquin Pipelines	SFPUC	No[a]	N/A	N/A
SJ-5	Tesla Portal Disinfection Facility	SFPUC	Yes	SFPUC	128,000
SV-1	Alameda Creek Fishery Enhancement	SFPUC	Yes	SFPUC	55,000
SV-2	Calaveras Dam Replacement	SFPUC	No	N/A	N/A
SV-3	Additional 40-mgd Treated Water Supply	SFPUC	Yes	SFPUC	TBD
SV-4	New Irvington Tunnel	SFPUC	No	N/A	N/A
SV-5	SVWTP – Treated Water Reservoirs	SFPUC	Yes	SFPUC	TBD
SV-6	San Antonio Backup Pipeline	SFPUC	No	N/A	N/A
BD-1	Bay Division Pipeline Reliability Upgrade	SFPUC	Yes	SFPUC	70,000
BD-2	BDPL Nos. 3 and 4 Crossovers	SFPUC	Yes	SFPUC	TBD
BD-3	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault	SFPUC	Yes	SFPUC	TBD
PN-1	Baden and San Pedro Valve Lots Improvements	SFPUC	No	N/A	N/A
PN-2	Crystal Springs/San Andreas Transmission Upgrade	SFPUC	Yes	SFPUC	TBD
PN-3	HTWTP Long-Term Improvements	SFPUC	Yes	SFPUC	TBD
PN-4	Lower Crystal Springs Dam Improvements	SFPUC	No	N/A	N/A
PN-5	Pulgas Balancing Reservoir Rehabilitation	SFPUC	No	N/A	N/A
SF-1	San Andreas Pipeline No. 3 Installation	SFPUC	Yes	SFPUC	8,760
SF-2	Groundwater Projects	SFPUC	Yes	SFPUC	5,100,000
SF-3	Recycled Water Projects	SFPUC	Yes	SFPUC	6,500,000 to 7,000,000

NOTES: SFPUC = SFPUC Power Enterprise; N/A = not applicable

[a] Although the SJPL Rehabilitation project (SJ-4) would require some electricity for the operation of valves and associated instruments, this power load would be temporary and would not be continuous.

Sunol Valley Region

Impact 4.15-2: Long-term energy use during operation		
Alameda Creek Fishery	SV-1	PSM
Calaveras Dam	SV-2	N/A
40-mgd Treated Water	SV-3	PSM
New Irvington Tunnel	SV-4	N/A
Treated Water Reservoirs	SV-5	PSM
SABUP	SV-6	N/A

SFPUC Power Enterprise provides power in the Sunol Valley Region, where existing power usage is 5,076,996.5 kWh. The Alameda Creek Fishery project (SV-1) would likely include a pumping plant to transport recaptured water via a pipeline to a reservoir or treatment plant; as summarized in Table 4.15-2, increased energy required for this project may be 55,000 kWh. Implementation of this project would increase energy usage in the Sunol Valley Region by approximately 1 percent over existing conditions. Although, the 40-mgd Treated Water (SV-3) and Treated Water Reservoirs (SV-5) projects would also result in increased energy use for pumping and treating water at the Sunol Valley WTP, the amount of this increase has not been determined. The increase in energy use for all three projects would be small, but because there would be an increase, impacts related to the use of energy would be *potentially significant* for each of these projects. However, incorporation of energy efficiency measures (Measure 4.15-2) and continued participation in demand-shifting programs would reduce this impact to a less-than-significant level. Incorporation of energy efficiency measures would be evaluated in the project-level CEQA documentation for each project.

There would be no increase in operational energy use for the Calaveras Dam (SV-2), New Irvington Tunnel (SV-4), and SABUP (SV-6) projects. Therefore, this impact would *not apply* to these projects.

Bay Division Region

Impact 4.15-2: Long-term energy use during operation		
BDPL Reliability Upgrade	BD-1	PSM
BDPL 3 and 4 Crossovers	BD-2	PSM
BDPL 3 and 4 Seismic Upgrade at Hayward Fault	BD-3	PSM

SFPUC Power Enterprise (through connections with PG&E) provides power in the Bay Division Region, where existing power usage is 191,438.5 kWh. The BDPL Reliability Upgrade project (BD-1) would require an estimated increase of 70,000 kWh for the operation of valving and actuators, as indicated in Table 4.15-2. The BDPL 3 and 4 Crossovers (BD-2) and BDPL 3 and 4 Seismic Upgrade at Hayward Fault (BD-3) projects would also involve an increase in energy use to operate valves and actuators, but the actual increase has not been determined. Although these facilities would only be operated during pipeline outages for planned maintenance, emergencies, or other unusual circumstances, impacts related to the use of energy would be *potentially significant* for each of these projects. However, incorporation of energy efficiency measures (Measure 4.15-2) would reduce this impact to a less-than-significant level. Potential energy demand associated with each of these projects and energy efficiency measures would be evaluated in more detail as part of the project-level CEQA review for each project.

Peninsula Region

Impact 4.15-2: Long-term energy use during operation		
Baden and San Pedro Valve Lots	PN-1	N/A
CS/SA Transmission	PN-2	PSM
HTWTP Long-Term	PN-3	PSM
Lower Crystal Springs Dam	PN-4	N/A
Pulgas Balancing Reservoir	PN-5	N/A

SFPUC Power Enterprise (through connections with PG&E) provides power in the Peninsula Region, where existing power usage is 24,423,491.5 kWh. As summarized in Table 4.15-2, the CS/SA Transmission (PN-2) and HTWTP Long-Term (PN-3) projects, both of which include construction or improvements to a pumping plant, would require an increase in operational energy use, but the amount has not been determined. Because there would be an increase in energy use, impacts related to the use of energy would be *potentially significant* for each of these projects. However, incorporation of energy efficiency measures (Measure 4.15-2) and continued participation in demand-shifting programs would reduce this impact to a less-than-significant level. Energy efficiency measures would be evaluated in the project-level CEQA documentation for each project.

There would be no increase in the use of energy during operation of the Baden and San Pedro Valve Lots (PN-1), Lower Crystal Springs Dam (PN-4), or Pulgas Balancing Reservoir (PN-5) projects. Therefore, this impact would *not apply* to these projects.

San Francisco Region

Impact 4.15-2: Long-term energy use during operation		
SAPL 3 Installation	SF-1	PSM
Groundwater Projects	SF-2	PSM
Recycled Water Projects	SF-3	PSM

SFPUC Power Enterprise (through connections with PG&E) provides power in the San Francisco Region, where existing power usage is 13,882,397 kWh. As summarized in Table 4.15-2, the SAPL 3 Installation project (SF-1) would require 8,760 kWh of energy to operate valving and monitoring stations. The Groundwater Projects (SF-2) would require up to 5,100,000 kWh to convey water for restoration of Lake Merced water levels, pump groundwater, and convey groundwater to a treatment plant; the Recycled Water Projects (SF-3) would require up to 7,000,000 kWh of electricity to operate the recycled water facility and convey the water to storage facilities and end-users.

Implementation of these projects would result in an approximately 87 percent increase in energy use in the San Francisco Region over existing conditions. Therefore, impacts related to the use of large amounts of energy are *potentially significant* for each of these projects. However, incorporation of energy efficiency measures (Measure 4.15-2) would reduce this impact to a less-than-significant level. Energy efficiency measures would be evaluated as part of project-level CEQA documentation for each project.

4.15.3 References – Energy Resources

California Energy Commission (CEC), *2005 Integrated Energy Policy Report,* November 2005.

California Energy Commission (CEC), Title 24, Part 6, of the California Code of Regulations, California's Energy Efficiency Standards for Residential and Nonresidential Buildings, available online at http://www.energy.ca.gov/title24/, June 8, 2007.

California Public Utilities Commission (CPUC) and California Energy Commission (CEC), *Energy Action Plan II,* Implementation Roadmap for Energy Policies, September 21, 2005.

National Energy Policy Development Group (NEPDG), National Energy Policy, May 2001.

National Resources Defense Council (NRDC) and Pacific Institute, *Energy Down the Drain, the Hidden Costs of California's Water Supply,* August 2004.

San Francisco Department of the Environment (SFDE), *Sustainability Plan for San Francisco,* available online at http://www.sfenvironment.com/aboutus/policy/sustain/, October 1996.

San Francisco Department of the Environment and San Francisco Public Utilities Commission (SFDE and SFPUC), *Electricity Resource Plan,* Choosing San Francisco's Energy Future, Revised December 2002.

San Francisco Department of the Environment and San Francisco Public Utilities Commission (SFDE and SFPUC), *Climate Action Plan for San Francisco,* Local Actions to Reduce Greenhouse Emissions, September 2004.

San Francisco Public Utilities Commission (SFPUC), *Long Term Strategic Plan for Capital Improvements*, May 2002.

4.16 Collective Impacts Related to WSIP Facilities

4.16 Collective Impacts Related to WSIP Facilities

4.16.1 Introduction and Approach

This analysis evaluates the potential for multiple WSIP projects to generate *collective* impacts in multiple WSIP regions or within the same WSIP region, which are the combined impacts resulting from implementation of multiple WSIP facility improvement projects. The collective impact sections presented below are organized by the same environmental resource topics analyzed in the preceding sections of Chapter 4. The analyses assume that the SFPUC would implement the measures identified to reduce the impacts of individual WSIP projects, including SFPUC standard construction measures, mitigation measures described in Chapter 6 (Measures 4.3-1 through 4.15-2), regulatory requirements of other agencies with jurisdiction over environmental resources, and, where applicable, policies of the Alameda and Peninsula Watershed Management Plans (WMPs). The overall approach to the Chapter 4 facilities impact assessment is described in Section 4.1.

Additionally, this section assesses the program-wide impacts that could result from collective WSIP facility impacts (i.e., the residual effects that are still significant after mitigation) combined with relevant residual impacts associated with the proposed water supply and system operations (as analyzed in Chapter 5, and which relate only to water quality, biological resources, recreation, and visual quality). Since there are undetermined aspects of many of the WSIP projects at this stage of program planning, this PEIR errs on the conservative side in its determination of impact of significance and assumes that separate, project-level CEQA review would confirm the existing conditions and degree of impact.

Mitigation measures that address potentially significant collective impacts are presented in Chapter 6, Mitigation Measures. These measures are numbered to correspond to the collective impact number (4.16-X) to differentiate them from program-level mitigation measures for facilities impacts, which are numbered 4.3-X through 4.15-X. In some cases, a collective mitigation measure repeats a program-level measure that was required for a specific project in Sections 4.3 through 4.15, but applies the same measure to more projects (e.g., all projects in the region or in a specific area) in order to reduce the collective impact.

4.16.2 Potential Overlap of WSIP Facility Locations and Schedules

This section compares WSIP project locations and schedules and identifies any overlap. The geographic scope of some impacts (e.g., air pollutant emissions) could extend beyond the boundary of a given WSIP region (referred to as multi-regional collective impacts). Other collective impacts (e.g., traffic) would be confined to specific areas within a particular WSIP region, where the locations and schedules of WSIP projects could overlap (referred to as localized collective impacts). The analysis evaluates the potential for residual impacts from each WSIP project (i.e., impacts after mitigation) to contribute to collective or combined effects; identifies the severity or significance of such impacts; and indicates whether mitigation is available to reduce these effects to a less-than-significant level.

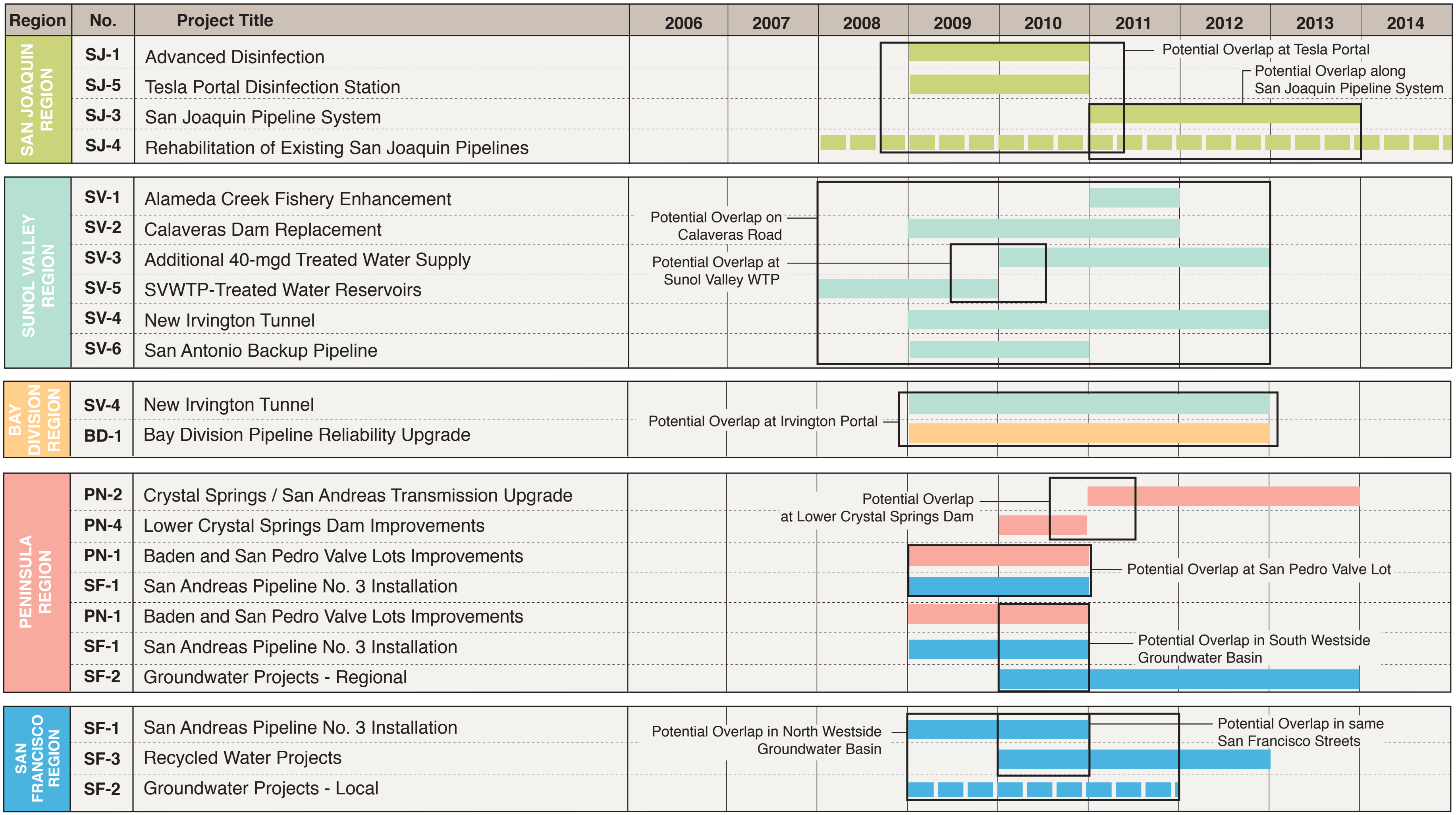
Implementation of the proposed program would result in simultaneous construction and operation of multiple WSIP projects and could cause collective impacts that are greater (more severe, more frequent, and/or longer in duration) than individual project impacts. Two types of collective impacts are evaluated in this section:

- *Multi-regional Collective Impacts*. Impacts in different WSIP regions that would occur at the same time. These impacts would not necessarily overlap geographically. Since project-related activities would occur over many regions, the multi-regional impacts represent those impacts that would span more than one region. Multi-regional impacts would only pertain to the following resource areas: hydrology and water quality (regional water bodies), biological resources (sensitive biological habitats that occur regionally), and air quality (regional air basins). There could also be multi-regional traffic impacts for drivers who commute daily through more than one region, since these motorists could encounter traffic delays from WSIP construction projects in multiple regions.

- *Localized Collective Impacts*. Projects would be considered to have a potential collective impact if they overlapped geographically (in terms of affecting the same resources) in one WSIP region, and construction would occur during the same time period. The locations of each WSIP project (see Chapter 3, Figure 3.5) and preliminary construction schedules (Figure 3.6) were compared to identify where simultaneous construction activities could occur. **Figure 4.16-1** shows the geographic areas and time periods of potential overlaps; specific overlapping projects are listed in **Table 4.16-1**.

  Geographic overlap for construction activities would occur if projects were constructed in the same location, shared the same access/haul/delivery routes, or drained to the same waterway. Schedule overlap, for the purpose of this PEIR, is defined as an overlap in the preliminary construction schedules, or preliminary construction schedules that are separated by one year or less (and could therefore overlap if construction schedules shifted by up to a year). It should be noted that this analysis would still be representative of the types of program-level impacts that could occur if construction schedules shifted by more than one year. For example, if both geographic and schedule overlap for multiple projects were to occur, a combined increase in truck traffic and other temporary construction impacts (such as noise and dust) could result. However, in all cases, the likelihood and extent of overlapping construction activities from two or more WSIP projects would vary depending on the SFPUC's ongoing and future planning (preliminary construction schedules could change over time), coordination, individual project construction phasing, and/or the intermittent nature of construction activities for some projects. In addition, the area affected by construction would shift over time for the linear WSIP projects (e.g., pipelines and aqueducts).

Specific areas of potential overlap are discussed below by region.



Note: Only WSIP projects with potential overlap are shown. See Figure 3.6 for complete construction schedule

Period Of Potential Geographic Overlap

Intermittent Construction Activities

Continuous Construction Activities

SOURCE: ESA + Orion, 2006

SFPUC Water System Improvement Program . 203287

Figure 4.16-1

Location and Years of Potentially Overlapping WSIP Construction Activities

TABLE 4.16-1
WSIP PROJECTS WITH POTENTIAL CONSTRUCTION OVERLAP

WSIP Facility	Proposed WSIP Construction Schedule (Duration)	Potentially Overlapping WSIP Projects				
		2006	2007–2008	2009–2010	2011–2012	2013–2014
San Joaquin Region						
SJ-1: Advanced Disinfection	2009–2010 (1–2 years)	None	None	*SJPL System* (*SJ-3*) SJPL Rehabilitation (SJ-4) Tesla Portal Disinfection (SJ-5)	*SJPL System* (*SJ-3*)	None
SJ-2: Lawrence Livermore Supply Improvements	2010–2011 (1 year)	None	None	None	None	None
SJ-3: San Joaquin Pipeline System	2011–2014 (3 years)	None	None	*Advanced Disinfection* (*SJ-1*) *Tesla Portal Disinfection* (*SJ-5*)	*Advanced Disinfection* (*SJ-1*) SJPL Rehabilitation (SJ-4) *Tesla Portal Disinfection* (*SJ-5*)	SJPL Rehabilitation (SJ-4)
SJ-4: Rehabilitation of Existing San Joaquin Pipelines	2007–2014 (7–8 years)	None	None	Advanced Disinfection (SJ-1) Tesla Portal Disinfection (SJ-5)	SJPL System (SJ-3)	SJPL System (SJ-3)
SJ-5: Tesla Portal Disinfection Station	2009–2011 (1–2 years)	None	None	Advanced Disinfection (SJ-1) *SJPL System* (*SJ-3*) SJPL Rehabilitation (SJ-4)	*SJPL System* (*SJ-3*)	None
Sunol Valley Region						
SV-1: Alameda Creek Fishery Enhancement[a]	2011 (1 year)	None	None	SABUP (SV-6)	Calaveras Dam (SV-2) 40-mgd Treated Water (SV-3) New Irvington Tunnel (SV-4) SABUP (SV-6)	TBD
SV-2: Calaveras Dam Replacement	2009–2011 (2–3 years)	None	None	40-mgd Treated Water (SV-3) New Irvington Tunnel (SV-4) Treated Water Reservoirs (SV-5) SABUP (SV-6)	Alameda Creek Fishery (SV-1) 40-mgd Treated Water (SV-3) New Irvington Tunnel (SV-4)	None
SV-3: Additional 40-mgd Treated Water Supply	2010–2013 (2–3 years)	None	None	Calaveras Dam (SV-2) New Irvington Tunnel (SV-4) *Treated Water Reservoirs* (*SV-5*) SABUP (SV-6)	Alameda Creek Fishery (SV-1) Calaveras Dam (SV-2) New Irvington Tunnel (SV-4)	None
SV-4: New Irvington Tunnel	2009–2013 (3–4 years)	None	None	Calaveras Dam (SV-2) 40-mgd Treated Water (SV-3) Treated Water Reservoirs (SV-5) SABUP (SV-6) BDPL Reliability Upgrade (BD-1)	Alameda Creek Fishery (SV-1) Calaveras Dam (SV-2) 40-mgd Treated Water (SV-3) BDPL Reliability Upgrade (BD-1)	None
SV-5: SVWTP – Treated Water Reservoirs	2008–2010 (2 years)	None		Calaveras Dam (SV-2) *40-mgd Treated Water* (*SV-3*) New Irvington Tunnel (SV-4) SABUP (SV-6)	None	None
SV-6: San Antonio Backup Pipeline	2009–2011 (2 years)	None	None	*Alameda Creek Fishery (SV-1)* Calaveras Dam (SV-2) 40-mgd Treated Water (SV-3) New Irvington Tunnel (SV-4) Treated Water Reservoirs (SV-5)	*Alameda Creek Fishery (SV-1)*	None

TABLE 4.16-1 (Continued)
WSIP PROJECTS WITH POTENTIAL CONSTRUCTION OVERLAP

WSIP Facility	Proposed WSIP Construction Schedule (Duration)	Potentially Overlapping WSIP Projects				
		2006	2007–2008	2009–2010	2011–2012	2013–2014
Bay Division Region						
BD-1: Bay Division Reliability Upgrade	2009–2013 (4 years)	None		New Irvington Tunnel (SV-4)	New Irvington Tunnel (SV-4)	None
BD-2: BDPL Nos. 3 and 4 Crossovers	2010–2012 (2 years)	None	None	None	None	None
BD-3: Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault	2010–2012 (1–2 years)	None	None	None	None	None
Peninsula Region						
PN-1: Baden and San Pedro Valve Lots Improvements	2009–2011 (2 years)	None	None	SAPL 3 Installation (SF-1) Groundwater Projects – Regional (SF-2)	None	None
PN-2: Crystal Springs/ San Andreas Transmission Upgrade	2011–2013 (2–3 years)	None	None	*Lower Crystal Springs Dam* (*PN-4*)	None	None
PN-3: HTWTP Long-Term Improvements	2011–2013 (2–3 years)	None	None	None	None	None
PN-4: Lower Crystal Springs Dam Improvements	2010-2011 (1 year)	None	None	*CS/SA Transmission* (*PN-2*)	None	None
PN-5: Pulgas Balancing Reservoir Rehabilitation	2007–2008, 2010–2013 (1 and 3 years)	None	None	None	None	None
San Francisco Region						
SF-1: San Andreas Pipeline No. 3 Installation	2009–2010 (2 years)	None	None	Baden and San Pedro Valve Lots (PN-1) Groundwater Projects (SF-2) Recycled Water Projects (SF-3)	None	None
SF-2: Groundwater Projects – Local and Lake Merced	2009–2012 (3 years, intermittent)	None	None	SAPL 3 Installation (SF-1) Recycled Water Projects (SF-3)	Recycled Water Projects (SF-3)	None
SF-2 Groundwater Projects – Regional	2010–2014 (4 years)	None	None	Baden and San Pedro Valve Lots (PN-1) SAPL 3 Installation (SF-1)	None	None
SF-3: Recycled Water Projects	2010–2012 (2 years for treatment facility, longer for pipelines)	None	None	SAPL 3 Installation (SF-1) Groundwater Projects (SF-2)	Groundwater Projects (SF-2)	None

NOTE: *Italicized* text indicates projects with sequential start and end dates. Although there is no overlap between the date one project ends and another project starts, sequential project schedules have some potential for overlap, since construction delays could alter schedules.

San Joaquin Region

The following potential overlaps have been identified:

- *Tesla Portal*. Up to four WSIP projects with potentially overlapping construction schedules could be built at this location. The Advanced Disinfection (SJ-1) and Tesla Portal Disinfection (SJ-5) facilities might both be built at Tesla Portal, and the construction schedules overlap in 2009 and 2010. The SJPL System (SJ-3) and SJPL Rehabilitation (SJ-4) projects would also include construction at Tesla Portal. The SJPL Rehabilitation project could overlap with the Advanced Disinfection and Tesla Portal Disinfection projects at the Tesla Portal in 2009 and 2010. The SJPL System project could also overlap with the Advanced Disinfection and Tesla Portal Disinfection projects at the Tesla Portal because the construction of the SJPL System project is scheduled to start when construction of these projects ends in 2011.

- *San Joaquin Pipeline System*. Both the SJPL System (SJ-3) and SJPL Rehabilitation (SJ-4) projects would occur along the existing San Joaquin Pipeline alignment and could overlap with each other between 2011 and 2014. However, the nature of potential overlap with construction activities under the SJPL Rehabilitation project is unknown, since the rehabilitation work would not be defined until the conditions assessment is completed.

Sunol Valley Region

The following potential overlaps have been identified:

- *Use of Calaveras Road During Construction of Multiple Projects*. Five of the Sunol Valley Region projects could be under construction between 2009 and 2010, with construction of Calaveras Dam (SV-2) extending to the end of 2011 and two projects (40-mgd Treated Water, SV-3, and New Irvington Tunnel, SV-4) extending to the end of 2012. If the construction schedule changed, the Alameda Creek Fishery project (SV-1), scheduled for 2011, could also be under construction during this time period. Four projects could be simultaneously under construction between 2011 and 2012. The actual overlap of the New Irvington Tunnel would depend on the phasing of this project, because much of the construction activity would take place in the Sunol Valley near the Alameda West Portal.

- *Sunol Valley WTP*. The 40-mgd Treated Water (SV-3) and Treated Water Reservoirs (SV-5) projects are both proposed at the Sunol Valley WTP; although the Treated Water Reservoirs project is scheduled for completion by the end of 2009, prior to the 40-mgd Treated Water project, some overlap could occur if there were construction delays. As shown in Figure 4.16-1, construction activities at the Sunol Valley WTP would be continuous for five years, from 2008 through the end of 2012.

Bay Division Region

In the Bay Division Region, the BDPL Reliability Upgrade (BD-1) and New Irvington Tunnel (SV-4) projects involve work at the Irvington Portal vicinity in Fremont, and the two project schedules overlap from 2009 through 2012. Most of the construction activity for the New Irvington Tunnel project would occur in the Sunol Valley. Under the BDPL Reliability Upgrade project, the pipeline would be constructed using cut-and-cover methods along much of the pipeline alignment, while construction activities associated with tunnel construction would occur primarily at the east tunnel portal in Newark (approximately seven miles west of the Irvington Portal) and the west tunnel portal in East Palo Alto, across San Francisco Bay. However, since the west end of the New Irvington Tunnel would connect to the east end of the BDPL Reliability Upgrade, there would necessarily be coordination and overlap in the design and construction of both projects.

Peninsula Region

The following specific overlaps have been identified:

- *Lower Crystal Springs Reservoir Area*. The CS/SA Transmission (PN-2) and Lower Crystal Springs Dam (PN-4) projects involve construction at or near Lower Crystal Springs Dam. These projects have sequential start and end dates at the end of 2010 and could overlap if construction schedules were to change, depending on the phasing of the CS/SA Transmission project.

- *San Pedro Valve Lot*. Construction at the San Pedro Valve Lot could occur under both the Baden and San Pedro Valve Lots (PN-1) and SAPL 3 Installation (SF-1) projects. Their schedules overlap for the entire two-year construction duration in 2009 and 2010. Actual overlap of these projects would depend on the phasing of the SAPL 3 Installation construction, which would take place over the entire pipeline length.

- *South Westside Groundwater Basin, San Mateo County*. The Baden and San Pedro Valve Lots project (PN-1) is in the South Westside Groundwater Basin, where the Regional Groundwater Projects (SF-2) would be constructed. Construction could overlap for one year in 2010. The actual overlap would depend on the specific locations selected for the Regional Groundwater Projects.

San Francisco Region

Specific project overlaps include:

- *San Francisco North Westside Groundwater Basin*. In San Francisco, a portion of the SAPL 3 Installation (SF-1) pipeline alignment and the Recycled Water Projects (SF-3) are located within the North Westside Groundwater Basin, where the Local Groundwater Projects (SF-2) would be constructed, and some of the facilities are within one mile of each other. The construction schedules for the SAPL 3 Installation project and the Local Groundwater Projects overlap in 2009 and 2010. The construction schedules for the Recycled Water Projects and Local Groundwater Projects overlap for two years in 2010 and 2011. The actual overlap for all projects would depend on the specific locations selected for the Local Groundwater Projects and the phasing of the SAPL 3 Installation project. In addition, construction activities under the Local Groundwater Projects would be intermittent, and there would not be continual overlap for the duration of the construction period.

- *South Westside Groundwater Basin, San Mateo County*. A portion of the SAPL 3 Installation (SF-1) pipeline alignment is located in San Mateo County within the South Westside Groundwater Basin, where the Regional Groundwater Projects (SF-2) would be constructed, and these projects could overlap for one year in 2010. The actual overlap would depend on the specific locations selected for the Regional Groundwater Projects and the phasing of the SAPL 3 Installation project.

- *San Francisco Streets*. In some San Francisco locations, the installation of recycled water pipelines under the Recycled Water Projects (SF-3) could occur in the same street alignments as pipelines for the SAPL 3 Installation project (SF-1), and construction activities could coincide in 2010.[1]

4.16.3 Collective Facility Impacts

Significance Criteria

The City and County of San Francisco (CCSF) has not formally adopted significance standards for impacts related to the combined or collective effects of a program such as the WSIP. Sections 4.3 through 4.15 present the criteria used to determine the significance of individual facility impacts under the various environmental resource topics. This assessment of collective impacts applies the same significance criteria to the same resource topics to identify the residual impacts that would remain following implementation of mitigation measures identified in Sections 4.3 through 4.15 (described in Chapter 6).

Impact Summary

Collective impacts are discussed below, and impact significance determinations by region and environmental topic are summarized in **Table 4.16-2**.

Land Use and Visual Quality

Impact 4.16-1a: Collective temporary and permanent impacts on existing land uses in the vicinity of proposed facility sites.

Multi-regional Collective Impacts

As described in Section 4.3, implementation of the WSIP could result in temporary adverse impacts on existing land uses located adjacent to proposed WSIP facility sites by causing temporary incompatibility problems or conflicts between existing uses and construction activities (e.g., disrupting use of a school or park) (Impact 4.3-1). Although temporary disruptions could occur where facility sites would be in separate discrete locations, there would be no multi-regional collective temporary disruption or division of land uses (*not applicable*).

Implementation of the WSIP could require the acquisition of easements or land, and such acquisition could result in permanent displacement of existing land uses at discrete locations adjacent to or near specific project facility sites (Impact 4.3-2). For sites that are separate from other WSIP sites, no multi-regional collective or additive permanent displacement of existing land uses would occur (*not applicable*).

[1] Note that pipelines for the Recycled Water Projects (SF-3) would carry recycled water, while pipelines for the SAPL 3 Installation project (SF-1) would carry potable water; if both types of pipes were to be installed in the same streets, the pipeline placement would require review for compliance with regulations regarding the separation of potable and recycled water pipelines.

TABLE 4.16-2
POTENTIAL COLLECTIVE IMPACTS AND SIGNIFICANCE – BY REGION

Impact Number and Topic	Multi-regional Collective Impact[a]	Localized Collective Impacts in Overlapping Areas				
		San Joaquin Region	Sunol Valley Region	Bay Division Region	Peninsula Region	San Francisco Region
4.16-1a: Land Use	N/A	N/A	N/A	PSU	LSM	N/A
4.16-1b: Visual Quality	N/A	LSM	LS	LSM	LSM	LSM
4.16-2: Geology, Soils, and Seismicity	B	N/A	N/A	N/A	N/A	N/A
4.16-3: Hydrology and Water Quality	LSM	LSM	LSM	LSM	LSM	LSM
4.16-4: Biological Resources	PSM	PSM	PSU	PSM	PSU	N/A
4.16-5: Cultural Resources	LSM	LSM	PSU	LSM	PSU	N/A
4.16-6: Traffic, Transportation, and Circulation	PSU	PSM	PSM	PSM	PSM	PSM
4.16-7: Air Quality	PSU	PSM	PSM	LSM	LS	LS
4.16-8: Noise and Vibration	N/A	PSU	PSM	PSU	PSU	PSU
4.16-9: Public Services and Utilities	LSM	N/A	N/A	N/A	N/A	N/A
4.16-10: Recreational Resources	LS	LSM	LSM	LSM	LSM	LSM
4.16-11: Agricultural Resources	LSM	N/A	N/A	N/A	N/A	N/A
4.16-12: Hazards	LS	LSM	LSM	LSM	LSM	LSM
4.16-13: Energy Resources	LSM	LSM	LSM	LSM	LSM	LSM

NOTE: The significance determinations presented in this table assume implementation of all SFPUC construction measures, regulations, and mitigation measures identified in Chapter 6.

B = Beneficial impact
N/A = Not applicable, because there is no collective or combined effect
LS = Less than Significant impact, no mitigation required
LSM = Less than Significant with program-level mitigation (Measures 4.3-1 through 4.15-2)
PSM= Potentially Significant impact, can be mitigated to a less-than-significant level with collective mitigation (Measures 4.16-1 through 4.16-9b)
PSU = Potentially Significant Unavoidable impact

[a] For Energy Resources, the significance determination includes systemwide (area encompassing the entire water system) impacts as well as impacts within the WSIP study area (area between San Francisco and Oakdale Portal)

Localized Collective Impacts

WSIP projects with overlapping sites, staging areas, and/or haul routes could exacerbate temporary community disruption impacts (e.g., traffic congestion and access constraints, dust, and noise) or collectively alter existing land use patterns. Temporary direct collective impacts would occur in overlapping areas if construction activities or staging associated with multiple WSIP projects affected the same or adjacent uses. Indirect collective impacts from overlapping projects, such as construction-related traffic conflicts on common haul routes, combined construction air pollutant emissions, and construction-related noise increases, are discussed below under the traffic, air quality, and noise discussions. Permanent collective impacts could occur in overlapping areas if multiple WSIP projects adversely affected the same land uses, especially if the same or adjacent lands or easements were required for access to more than one project.

As stated in Section 4.3, the potential for temporary land use disruption or conflicts would be low during construction of most WSIP projects, since they generally involve improvements to existing SFPUC facilities that occur within existing facility sites and SFPUC rights-of-way, or are located in areas isolated from other development. However, some project facilities would involve construction outside of CCSF-owned lands and thus would be more likely to affect existing land uses on or adjacent to lands to be acquired. When the projects identified as requiring land acquisition or staging areas (see Table C.1 in Appendix C) are considered together and then evaluated in the context of overlapping schedules (Figure 4.16-1), the potential for direct temporary or permanent collective impacts in each region would be as follows:

- *San Joaquin Region*. Two projects in this region (SJPL System, SJ-3, and Tesla Portal Disinfection, SJ-5) would require temporary land acquisition for staging areas, but there would be no permanent change in land use at Tesla Portal, which is already developed with water facilities. Since the construction schedules of these two projects would not overlap (Figure 4.16-1), no collective impacts would result from temporary changes in land use associated with each project's construction staging. Therefore, this impact would *not apply*.

- *Sunol Valley Region*. Three projects in this region (Calaveras Dam, SV-2; 40-mgd Treated Water, SV-3; and Treated Water Reservoirs, SV-5) would require temporary acquisition of land or easements for construction staging or access, and portions of their construction schedules would overlap. However, since the acquired land would not overlap geographically, no temporary or permanent collective impacts would occur in this region. Therefore, this impact would *not apply*.

- *Bay Division Region – Irvington Portal in Fremont*. Staging and access areas for both the new Irvington Tunnel portal (SV-4) and easternmost segment of the BDPL Reliability Upgrade project (BD-1) would overlap in the area east of Mission Boulevard and in the vicinity of existing homes. Since the construction schedules for these projects overlap for their entire four-year durations (2009 to 2013), it is not known whether or how long the construction activities would overlap. Both of these projects would introduce temporary staging and construction activities into a currently undeveloped area adjacent to a residential neighborhood. Such construction-related impacts would be a potentially significant collective impact. Implementation of a collective mitigation measure to coordinate staging and construction of these two projects in the Irvington Tunnel portal vicinity (Measure 4.16-1a) could reduce this collective impact; however, since the feasibility of such coordination cannot be determined at this stage of project planning, temporary impacts on residences near the Irvington Tunnel portal would be *potentially significant and unavoidable.*

  The WSIP would also develop new permanent water facilities and an access road in an undeveloped area adjacent to a residential neighborhood. Implementation of program-level measures, such as conducting siting studies to minimize permanent impacts on existing land uses and using buffer zones and visual screens (Measures 4.3-2a and 4.3-2b), would help minimize each project's impact such that the residual collective land use impact would be less than significant.

- *Peninsula Region – Lower Crystal Springs Dam Vicinity*. Construction of the CS/SA Transmission (PN-2) and Lower Crystal Springs Dam (PN-4) projects could overlap briefly between 2010 and 2011 if construction schedules were changed or delayed. Even if the schedules do not overlap, staging areas for each project or prolonged use of the same staging area in the dam vicinity for both projects could affect recreational uses if access or parking were disrupted. Implementation of measures to accommodate the displaced public parking supply for recreational visitors (Measure 4.8-4) would help minimize each project's impact such that the potential residual collective land use impact would be *less than significant with mitigation*.

- San Francisco Region. Only one project in this region (Groundwater Projects, SF-2) would require the acquisition of land or easements for staging. With only one project, there would be no overlap with any other WSIP projects in this region, and this impact would *not apply*.

Impact 4.16-1b: Collective temporary and permanent impacts on the visual character of the surrounding area.

Section 4.3 also addresses the aesthetic and visual quality impacts associated with implementation of the WSIP (Impact 4.3-3).

Multi-regional Collective Impacts

Potential visual impacts of the WSIP (e.g., temporary visual effects during construction or permanent visual effects due to proposed aboveground facilities) would be confined to specific sites and corridors within the WSIP study area. In addition, as discussed in Chapter 5, the proposed water supply and system operations would have the potential to affect visual resources associated with changes in stream flow or water levels in affected water bodies in the Tuolumne, Alameda, and Peninsula watersheds. However, these effects would also be confined to specific sites and corridors within the WSIP program area. Therefore, no multi-regional degradation of visual resources would occur (*not applicable*).

Localized Collective Impacts

Temporary and permanent collective impacts could occur where more than one WSIP project with aboveground facilities would adversely affect the same visual resource (e.g., views of natural areas, such as ridgelines and riparian corridors, from a designated scenic route), thus creating a collective visual change. When projects identified as having aboveground elements (see Table C.1, Appendix C) are considered together and then evaluated in the context of overlapping schedules (see Figure 4.16-1), the potential for collective visual impacts in each region would be as follows:

- *San Joaquin Region – Tesla Portal*. Distant views of the Tesla Portal facility are visible from I-580, a designated scenic route. The Advanced Disinfection (SJ-1) and Tesla Portal Disinfection (SJ-5) projects would collectively expand the cluster of buildings that already exists at the Tesla Portal facility. Implementation of measures pertaining to architectural siting and design (Measure 4.3-4a), revegetation and site restoration (Measure 4.3-4b), and tree care (Measure 4.3-4c) would reduce each project's impact such that the residual collective visual impact would be *less than significant with mitigation*.

- *Sunol Valley Region – Sunol Valley WTP*. There are two projects involving new aboveground facilities at the Sunol Valley WTP: 40-mgd Treated Water (SV-3) and

Treated Water Reservoirs (SV-5). Since the WTP is not visible from Calaveras Road (due to trees in the Alameda riparian corridor that block the view), proposed facilities would also not be visible from this road. In addition, the proposed water supply and system operations could affect the visual character of creeks and reservoirs in the Sunol Valley Region (see Chapter 5, Section 5.4.7); however, due to the separate viewsheds for the WTP and the creeks/reservoirs as well as the difference in impact type (i.e., the appearance of proposed structures vs. changes in stream flow and water levels), there would be no additive effects on the visual character of the area. Therefore, the collective visual impact would be *less than significant*, particularly with implementation of the SFPUC's Alameda WMP design guidelines.

- *Bay Division Region – Irvington Portal in Fremont*. The New Irvington Tunnel (SV-4) and BDPL Reliability Upgrade (BD-1) projects would overlap geographically in the vicinity of Irvington Portal (east of Mission Boulevard) in Fremont, and their schedules would coincide. The BDPL Reliability Upgrade project would have two vaults (Irvington Portal Vault and Mission Boulevard Venturi Meter Vault) in the vicinity of the new Irvington Tunnel portal. Implementation of measures for architectural siting and design (Measure 4.3-4a), revegetation and site restoration (Measure 4.3-4b), and tree care (Measure 4.3-4c) would reduce each project's impact such that the residual collective impact would be *less than significant with mitigation*.

- *Peninsula Region – Lower Crystal Springs Dam Vicinity*. Aboveground facilities associated with the CS/SA Transmission (PN-2) and Lower Crystal Springs Dam (PN-4) projects would overlap in the area below the dam and could collectively alter views from Highway 35 (Skyline Road Bridge over Lower Crystal Springs Dam) or Crystal Springs Road, both designated scenic routes. However, these views would be limited somewhat by elevational differences and intervening vegetation; furthermore, implementation of the SFPUC's Peninsula WMP design guidelines for structures and roads within the watershed plan area, in addition to mitigation measures for architectural siting and design (Measure 4.3-4a), revegetation and site restoration (Measure 4.3-4b), and tree care (Measure 4.3-4c) would reduce each project's impact such that the potential residual collective visual impact would be *less than significant with mitigation*. In addition, the proposed water supply and system operations could affect the visual character of creeks and reservoirs in the Peninsula Region (see Chapter 5, Section 5.5.7); however, due to the limited views and difference in impact type (i.e., the appearance of proposed structures vs. changes in stream flow and water levels), there would be no additive effects on the visual character of the area.

- *San Francisco Region*. Although the locations for all 16 single-story structures associated with the Groundwater Projects (SF-2) have not been determined, one of these aboveground structures could overlap with one of four new aboveground structures for the Recycled Water Projects (SF-3) in the vicinity of the San Francisco Zoo, Golden Gate Park, or other locations. Implementation of measures for architectural siting and design (Measure 4.3-4a), revegetation and site restoration (Measure 4.3-4b), and tree care (Measure 4.3-4c) would reduce each project's impact such that the residual potential collective visual impact would be *less than significant with mitigation*.

Geology, Soils, and Seismicity

Impact 4.16-2: Collective exposure of people or structures to geologic and seismic hazards.

Multi-regional Collective Impacts

One of the primary objectives of the WSIP is to ensure that sufficient water is available to customers served by the SFPUC following an earthquake on one of the regional faults. To meet this objective, the program consists of projects to strengthen and improve water system components that could be subject to seismic hazards, and to provide redundancy in the system should substantial damage and/or a failure of part of the system occur. Therefore, implementation of the WSIP would collectively result in *beneficial* effects related to the seismic safety of the regional water system.

Localized Collective Impacts

Section 4.4 presents the potential geologic and seismic impacts associated with implementation of the WSIP, which include slope instability, erosion, various seismic hazards, expansive or corrosive soils, and squeezing ground (Impacts 4.4-1 through 4.4-9). These potential impacts would be site-specific (i.e., dependent on local geologic and soil conditions) and would not be additive or collective. Therefore, the WSIP projects would not have any localized collective impacts related to geology, soils, and seismicity (*not applicable* in overlapping areas).

Hydrology and Water Quality

Impact 4.16-3: Collective WSIP impacts related to the degradation of surface waters and flooding hazards.

Multi-regional and Localized Collective Impacts

The WSIP projects would have multi-regional and localized collective impacts on hydrology or water quality if they would cause adverse impacts on the same water body or watershed or cause degradation of San Francisco Bay, which ultimately receives drainage from all of the WSIP regions. However, all discharges to surface water occurring under the WSIP would be conducted under a National Pollutant Discharge Elimination System (NPDES) permit(s) issued by the Regional Water Quality Control Board (RWQCB). These permits require compliance with water quality regulations as well as with the plans, policies, and water quality objectives and criteria of the relevant Basin Plan, including the total maximum daily load (TMDL) requirements for impaired water bodies. Compliance with permit conditions and implementation of control measures specified in the permit would ensure the protection of water quality consistent with regional goals and objectives.

Permit conditions and control measures typically include: stormwater controls or treatment of discharges to achieve the stated water quality goals (described in plans subject to RWQCB approval); self-monitoring and reporting to demonstrate compliance with these criteria; and implementation of corrective actions should permit limitations be exceeded. Furthermore, the RWQCB can amend, revoke, and reissue an NPDES permit if investigations demonstrate that the discharge could potentially cause or contribute to adverse effects on water quality and/or beneficial uses of the receiving waters. The permit can also be amended if water quality objectives change or additional pollutants could exceed water quality objectives, or to incorporate waste load allocations determined during the TMDL process. The RWQCB may also revoke the permit if the discharger fails to meet the requirements of the permit, or if the RWQCB finds that the permitted discharge endangers human health or the environment.

Therefore, with adherence to the control measures specified in NPDES permit(s), implementation of SFPUC Construction Measures #3 and #10 (onsite water quality and project site measures) and Measures 4.5-4a through 4.5-6 (described in Chapter 6), and compliance with the water quality requirements of regulatory agencies, impacts related to discharges from the WSIP projects would be reduced such that the residual contributions to multi-regional and localized collective impacts on surface waters would be *less than significant with mitigation*, as described below.

- *Construction-Phase Water Quality Impacts*. Potential water quality impacts during construction include increased erosion and sedimentation, the discharge of groundwater produced during dewatering, or the discharge of treated water (Impacts 4.5-1, 4.5-3a, and 4.5-3b). All WSIP projects would be required to implement SFPUC Construction Measure #3 (onsite air and water quality measures during construction) and to comply with applicable water quality regulations, including Article 4.1 of the San Francisco Public Works Code for projects in San Francisco and NPDES construction stormwater permitting requirements for other projects, as discussed in Section 4.5 (including implementation of stormwater pollution prevention plans and best management practices for erosion control). Such compliance is designed to achieve consistency with regional water quality objectives and criteria of the appropriate Basin Plan, which contains water quality objectives deemed protective of water quality by the State of California.

- *Flood Flow Impacts*. Construction activities in a flood zone could divert flood flows or contribute sediment or contaminants to flood flows (Impact 4.5-4); however, the WSIP projects would not be located in the same flood zones (except for possibly the Alameda Creek Fishery, SV-1, and SABUP, SV-6, projects in the Sunol Valley Region as well as the SJPL System, SJ-3, and SJPL Rehabilitation, SJ-4, projects in the San Joaquin Region), and no collective effect would occur. Where construction would occur in the same flood zone, incorporation of flood flow protection measures (Measure 4.5-4a) would reduce each project's impact such that the residual collective impact on affected flood zones would be less than significant with mitigation.

  As discussed under Impact 4.5-4, the diversion dam or concrete weir and small earthen dam that might be constructed under the Alameda Creek Fishery project (SV-1) could alter the drainage of surface flows in Alameda Creek and potentially exacerbate flooding or siltation. With implementation of a site-specific flooding analysis (Measure 4.5-4b), these potential impacts would be reduced to a less-than-significant level. There would be no collective flooding impacts associated with the 40-mgd Treated Water (SV-3) and Treated Water Reservoirs (SV-5) projects, since both projects would involve only intermittent, small-magnitude discharges to Alameda Creek and San Antonio Creek. Discharges to these two creeks under the SABUP project (SV-6) would be a continuation of an existing discharge, and no new discharges under this project would occur. Therefore, collective increases in the potential for flooding along Alameda Creek due to these projects would be less than significant with mitigation.

- *Operations-Phase Discharges from Multiple Sites to the Same Water Bodies*. The WSIP projects could contribute to multi-regional or localized collective water quality, erosion, or flooding impacts related to discharges of treated water during operation (Impact 4.5-5) as well as alteration of drainage patterns or increased impervious surfaces (Impact 4.6-6). However, any new discharges of treated water during operation would not contribute to flooding and would not degrade water quality because the discharges would be intermittent (for maintenance purposes only) and would be dechlorinated prior to discharge in compliance with NPDES permit requirements and any other applicable permitting requirements of the California Department of Fish and Game (CDFG) and U.S. Army Corps of Engineers. Implementation of these permitting requirements would ensure that the quality and beneficial uses of all receiving waters are protected such that any residual collective impacts would be less than significant.

None of the WSIP sites would collectively contribute to water quality degradation (including offsite erosion and flooding as a result of increased impervious surfaces) for the following reasons:

- Projects in the San Joaquin Region would incorporate post-construction stormwater controls, as specified in the stormwater management plan required under NPDES regulations or Measure 4.5-6.

- Projects in the Sunol Valley, Bay Division, and Peninsula Regions would comply with municipal stormwater requirements (see Section 4.5), which specify numeric design standards for sizing stormwater treatment controls; limits on increases in peak stormwater discharges from new or redevelopment sites that could increase erosion in creeks; requirements for the operation and maintenance of stormwater controls; and requirements for site design and source control measures.

- Construction of WSIP projects in the San Francisco Region would not collectively contribute to an increase in impervious surfaces. The pipelines constructed under each of the projects would be installed in existing streets, and some facilities associated with the Recycled Water Projects (SF-3) would be constructed in areas that are currently paved; therefore, no new impervious surfaces would be created. If the Groundwater Projects (SF-2) or Recycled Water Projects (SF-3) created any new impervious surfaces, the extent would be minimal and would not be expected to measurably affect the volume or frequency of combined sewer discharges.

None of the projects would collectively alter drainage patterns in such a way that would result in collective offsite flooding, erosion or sedimentation effects because all WSIP projects would be required to: (1) implement SFPUC Construction Measure #10 (project site), which would return all sites to the general condition that existed prior to construction; (2) implement erosion control measures in accordance with SFPUC Construction Measure #3 (onsite air and water quality measures during construction); and (3) comply with applicable water quality regulations, including Article 4.1 of the San Francisco Public Works Code for projects in San Francisco and NPDES construction stormwater permitting requirements for other projects, as discussed in

Section 4.5. Implementation of SFPUC Construction Measures #10 and #3 and regulatory permitting requirements would ensure that the quality and beneficial uses of all receiving waters are protected such that any residual collective impacts in the San Joaquin, Sunol Valley, Bay Division, or Peninsula Regions would be less than significant.

As described in Chapter 5, the WSIP water supply and system operations would have the potential to affect water quality and hydrology in the Tuolumne, Alameda, and Peninsula watersheds. The only potential for overlapping, collective effects due to long-term facilities impacts combined with water supply impacts would be for water bodies in the Alameda and Peninsula watersheds. However, no collective or combined impacts on water quality and hydrology would occur, since there would be no substantive overlap between affected water quality or hydrological parameters. Water quality and hydrological effects related to long-term facilities impacts (for both project-specific and collective impacts) would be associated with operations-phase discharges. On the other hand, the proposed water supply and system operations would alter stream flow and reservoir water levels, with the potential for related water quality effects on temperature, dissolved oxygen, and possibly nutrients; however, these effects would be distinct from effects related to discharges from facilities, and mitigation measures identified for the individual effects would reduce these impacts to a less-than-significant level. Therefore, multi-regional and collective impacts on water quality and hydrology would be *less than significant with mitigation.*

Biological Resources

Impact 4.16-4: Collective loss of sensitive biological resources.

Multi-regional Collective Impacts

Section 4.6 presents the potential impacts of each WSIP project on biological resources, including wetlands, sensitive habitats (as defined by the CDFG), as well as heritage trees, special-status plant and wildlife species, and riparian habitat potentially subject to state and federal protection (Impacts 4.6-1 through 4.6-3). As indicated in Section 4.6, Table 4.6-3, WSIP facility projects would affect approximately 2,000 acres considering project footprints, borrow and fill areas, spoil piles, temporary laydown areas for construction, and indirect impacts such as inundation and fugitive dust. Multi-regional collective biological impacts could occur when projects are constructed simultaneously or in close sequence, such as:

- Impacts on wildlife movement due to temporary habitat fragmentation and reduction in areas for cover or escape
- Compounded impacts on functional units of habitat as WSIP projects simplify vegetation structure and increase “edge” (the boundary between two different habitats)
- Increased habitat impacts due to the spread of weedy, non-native plant species

When these multi-regional collective facilities impacts are considered in combination with the water supply and system operation impacts on biological resources in the Alameda and Peninsula watersheds (as discussed in Chapter 5, Sections 5.4.6 and 5.5.6), there would be several instances of combined effects on reservoir and riparian vegetation. For some species, especially riparian-dependent species, construction of a WSIP facility could displace animals to habitat along streams or reservoir edges that could be of reduced quality due to WSIP-related reductions in stream flow, flooding, or channel-forming events (as described in Chapter 5). Since the PEIR's significance determination errs on the conservative side (and assumes that separate, project-level CEQA review would confirm the existing condition and effects), this impact is considered to be *potentially significant*.

Implementation of habitat compensation measures, implemented either on a project by project basis or through a coordinated program such as proposed in the SFPUC's Habitat Reserve Program (HRP) (Measure 4.16-4a) would help reduce this combined collective impact. Effective mitigation through habitat conservation could occur on SFPUC property or could require the acquisition of conservation easements and conservation lands. Although the SFPUC could provide mitigation within the watershed, this conservative analysis considers the availability of suitable land in the Bay Area for such mitigation efforts. Of an estimated 4.5 million acres of Bay Area land, 720,000 acres (16 percent) are developed and 1.1 million acres (24 percent) are in protected open space (GreenInfo Network, 2007). Although it may appear that property for land conservation is not available, competition for open lands is on a more level playing field than one might first assume. Successful conservation programs in Southern California (where regional biodiversity planning has proceeded at a faster rate than in the Bay Area) are one indicator of potential feasibility.[2] Where conservation easement or land acquisition is not feasible, another way to achieve habitat compensation goals and mitigation requirements would be to assist land trusts and other stewards in more effectively managing their lands.

Thus, even if the WSIP were to mitigate its impact at a typical replacement ratio and mitigation within SFPUC property was insufficient, such acreage could be accommodated within the regional area, thereby reducing the WSIP's potentially significant collective biological impacts to a less-than-significant level.

Localized Collective Impacts

Figure 4.16-1 indicates where projects would overlap geographically and project schedules would coincide. When overlapping areas in this figure are considered in the context of areas of known biological sensitivity, the potential for combined or collective biological impacts would be greatest in the Sunol Valley and Peninsula Regions. However, these collective impacts could

[2] In San Diego's conservation plan, for example, the reserve design included 22,083 acres of land already conserved and targeted an additional 30,884 acres for conservation. By 2001, 83 percent of that additional amount had been conserved or obligated for conservation through a combination of state, federal, and local purchases as well as exactions (Pollak, 2001). What has made the programs in Southern California viable is the private-sector economic reality that places the value of land conservation on an equal footing with development interests. Undeveloped land is likely to be sold at or above market rates to either a conservation planning entity or a private developer without prejudice. Furthermore, conservation easements present a unique opportunity for sellers who wish to preserve some use rights to properties or pass them along to heirs. A wildlife habitat easement might prohibit development, for example, but allow continued farming. There is also substantial social consensus on this aspect of implementing a program like the HRP. In August 2006, Congress approved a substantial expansion of the federal conservation tax incentive for conservation easement donations, and President Bush signed it into law.

occur in any of the regions where construction associated with overlapping projects would increase the extent of traffic, noise, and temporary habitat loss (e.g., if multiple staging areas were needed). These potential impacts are as follows:

- San Joaquin Region. The construction schedules associated with the Advanced Disinfection (SJ-1), SJPL Rehabilitation (SJ-4), and Tesla Portal Disinfection (SJ-5) projects would overlap for a brief time, and it is possible that these projects could affect the Tesla Portal vicinity at the same time (2009 and 2010). Potentially affected biological resources include grassland and wetland habitats with associated special-status species. It is also possible that construction of the SJPL System (SJ-3) and SJPL Rehabilitation (SJ-4) projects could overlap if the projects affected the same pipeline segment (2011 through 2013). Potentially affected biological resources include grassland, oak woodland, riparian, vernal pool, and wetland habitats with associated special-status species. Collective increases in haul truck traffic and noise along with increased surface disturbance for staging areas would result in *potentially significant* collective impacts if such overlaps occurred near identified sensitive biological resources. Implementation of SFPUC Construction Measure #8 (biological screening survey for each individual project) and mitigation measures for general impacts (Measures 4.6-1 through 4.6-3, including Table 4.6-4) would reduce each project's contribution to collective impacts on biological resources. These measures combined with consolidation of construction staging and access (Measure 4.16-4b) would reduce this collective impact. Because of the limited extent of project overlap in this region, the mitigation measures identified could reduce this impact to less than significant.

- Sunol Valley Region. The construction schedules for all projects in this region would overlap at various times between 2008 and 2012. Some of these projects would have the potential to contribute to collective impacts on sensitive biological resources in the Sunol Valley, while increased truck traffic on Calaveras Road, the haul route for all projects in this region, could adversely affect sensitive biological resources adjacent to Calaveras Road. Collective increases in haul truck traffic and noise along with increased surface disturbance for facility construction and staging areas would result in potentially significant collective impacts if project overlaps occurred near identified sensitive biological resources. Implementation of SFPUC Construction Measure #8 (biological screening survey for each individual project) and mitigation measures for general impacts (Measures 4.6-1 through 4.6-3, including Table 4.6-4) would reduce each project's contribution to collective impacts on biological resources. These measures combined with consolidation of construction staging and access (Measure 4.16-4b) would reduce this collective impact, but some sensitive biological resources would remain at risk. For example, a recent sighting of a San Joaquin kit fox on another SFPUC project site near Sunol suggests a small population may be reestablishing itself in the area. Such populations are more vulnerable to disturbance.[3]

  For purposes of this program-level evaluation, the collective impact of multiple WSIP project construction activities in Sunol Valley on sensitive biological resources such as listed species is considered *potentially significant and unavoidable* because of the number of WSIP projects to be implemented in this region and the extent of overlap in terms of construction activity timing and location. Further site-specific analysis for each WSIP project to be conducted as part of project-level CEQA review for each project may determine that this potentially significant collective impact can be mitigated to less than

3 A single individual was observed during nighttime surveys associated with the SFPUC Sunol / Niles Dam Removal Project in 2006. The species is not otherwise considered present in the Sunol Valley Region.

significant based on more detailed information about the project site location, schedule and construction methods.

- *Bay Division Region – Irvington Portal in Fremont*. Staging and access areas for both the new Irvington Tunnel portal (SV-4) and easternmost segment of the BDPL Reliability Upgrade project (BD-1) would overlap in the area east of Mission Boulevard and existing homes. This area is currently undeveloped, and these two projects would result in the removal of annual grassland to accommodate temporary staging areas as well as new permanent water facilities and an access road. The significance of this impact would depend on the presence of sensitive biological resources, which is not likely given the low quality of the habitat present. Implementation of SFPUC Construction Measure #8 (biological screening survey for each individual project) and mitigation measures for general impacts (Measures 4.6-1 through 4.6-3, including Table 4.6-4) would reduce each project's contribution to collective impacts on biological resources. Given the limited extent of WSIP project overlap in this region, these measures combined with coordination of construction staging and access (Measure 4.16-4b) would reduce this *potentially significant* collective impact to less than significant.

- *Peninsula Region – Lower Crystal Springs Dam Vicinity*. Staging areas for the CS/SA Transmission (PN-2) and Lower Crystal Springs Dam (PN-4) projects could overlap or affect the same areas for a longer duration. Increased traffic and the inadvertent use of road shoulders when vehicles pass could have a potentially significant collective impact on the endangered San Mateo woolly sunflower. Implementation of SFPUC Construction Measure #8 (biological screening survey for each individual project) and mitigation measures for general impacts (Measures 4.6-1 through 4.6-3, including Table 4.6-4) would reduce each project's contribution to collective impacts on biological resources. These measures combined with consolidation of construction staging and access (Measure 4.16-4b) would reduce this collective impact; however, protection of San Mateo woolly sunflower individuals would be problematic, since incidental disturbance of plants along the road shoulder would be difficult to completely avoid. Therefore, the collective impact in the Peninsula Region would be *potentially significant and unavoidable*.

- *San Francisco Region*. As indicated in Figure 4.16-1, construction of WSIP projects in this region would have the potential to overlap in San Francisco streets. Collective impacts on sensitive biological resources would not be expected (*not applicable*).

Cultural Resources

Impact 4.16-5: Collective increase in impacts related to archaeological, paleontological, and historical resources.

Section 4.7 describes potential impacts of the WSIP on paleontological and archaeological resources (Impacts 4.7-1 and 4.7-2); it also evaluates the effects of new construction on historical resources, including historic districts or contributors to historic districts (Impact 4.7-3), on individual facilities within the system (Impact 4.7-4); and on adjacent historical resources (Impact 4.7-5).

Multi-regional Collective Impacts

Multi-regional collective WSIP impacts on cultural resources are not expected to occur because the site-specific impacts of the various WSIP facility projects on individual paleontological, archaeological, or historical resources were not found to be additive. As described under Impact 4.7-4, select WSIP facility improvement projects could result in significant impacts on an individual historic facility, but the combined impacts from these projects do not represent a collective impact on historical resources. For example, the potentially significant impact on the potentially historic Irvington Portal as part of the New Irvington Tunnel project (SV–4) is distinct from the potentially significant impact on the potentially historic Crystal Springs Pump Station (PN–2); impacts on these two different historic facilities within the SFPUC regional water system do not, in combination, represent a larger, multiregional collective impact. WSIP project effects on potential paleontological and archaeological resources are similarly site-specific and considered to have a system-wide or region-wide collective effect. This impact is not applicable with respect to effects on individual resources.

Impact 4.7-3 addresses the issue of potential effects of one or more WSIP projects on the historical significance of historic districts or resources that would be contributors to a historic district. That analysis concludes that removal and replacement of the historic Calaveras Dam (SV–2) could, for example, represent a potentially significant, unavoidable impact on a historic district, if one were determined to be present. This impact would be distinct from the potentially significant impact on historic districts due to implementation of the CS/SA Transmission project (PN-2) in the vicinity of Crystal Springs Reservoir on the Peninsula.

Elsewhere, potential historic districts may have boundaries that extend beyond the WSIP regional boundaries identified in this PEIR. Such districts would be identified based on an appropriate historical context and significance, which may not correspond with the SFPUC water system regions. Implementation of SFPUC Construction Measure #9 (cultural resources) and various measures to document and protect historical resources (Measures 4.7-4a, through 4.7-4f) would reduce each project's impact on any historic districts that may be located in more than one region. Mitigation measures identified during project-level CEQA review are expected to reduce the potential collective effect of these projects to a level that is *less than significant*.

Localized Collective Impacts

In general, potential impacts on paleontological and archaeological resources (Impacts 4.7-1 and 4.7-2) would be site-specific (dependent on local conditions) and would not be additive or collective. Therefore, the WSIP projects would not have any localized collective impacts on these resources. Section 4.7 also analyzes the WSIP's potential for impacts on the historical significance of potential historic districts (Impact 4.7-3), individual facilities (Impact 4.7-4), and adjacent historical resources (Impact 4.7-5). As with impacts on paleontological and archaeological resources, impacts on historical resources are typically not additive, and thus the potential for collective impacts is generally low.

Localized collective impacts on historical resources could occur, however, when (1) multiple WSIP projects are proposed in the same general area and could each affect the same individual historic facility/resource, or (2) when multiple WSIP projects could each affect one or more facilities/resources that are part of an historic district. Figure 4.16-1 identifies where WSIP projects overlap geographically. The potential for such localized collective impacts on historical resources is discussed below by region:

- San Joaquin Region. Four of the five WSIP projects in this region (Advanced Disinfection, SJ-1; SJPL System, SJ-3; SJPL Rehabilitation, SJ-4; and Tesla Portal Disinfection, SJ-5) would overlap at or near the Tesla Portal. These projects could affect potential historical resources that could be contributors to a potential historic district associated with the implementation of John R. Freeman's plan for the development of the Hetch Hetchy system, such as the San Joaquin Pipelines, Tesla Portal, and the caretaker's residence adjacent to the proposed facilities. Implementation of SFPUC Construction Measure #9 (cultural resources) and various measures to document and protect resources (Measures 4.7-4a through 4.7-4f) would reduce each project's impact such that these projects would not have a significant, localized collective. This impact would be *less than significant.*

- Sunol Valley Region. Three projects in the region (Calaveras Dam, SV-2; New Irvington Tunnel, SV-4; and SABUP, SV-6) could result in a significant impact on the historical significance of individual facilities (Impact 4.7-4) and on adjacent historic resources (Impact 4.7-5). Implementation of SFPUC Construction Measure #9 (cultural resources) and various measures to document and protect resources (Measures 4.7-4a through 4.7-4f) would reduce each project's impact such that the residual collective impact on individual facilities would be less than significant.

  Given the concentration of water system facilities in the Sunol Valley Region that are more than 45 years old, some of which were previously identified as historical resources for the purposes of CEQA, it is possible that one or more historic districts could be present in this region. More detailed assessment to identify historic districts and potential impacts of the WSIP projects on any historic districts, if present, will occur during project-level environmental review. Because it has not been determined whether the Sunol Valley Region or a portion of this region meets the National Register criteria or California Register criteria as a historic district (or districts), or whether the WSIP projects in the Sunol Valley Region could cause a substantial adverse change to such a district(s), this PEIR conservatively considers the collective effect of the six WSIP projects in this region on historic districts to be *potentially significant and unavoidable*. Measures 4.7-4a through 4.7-4f could reduce the significance of this impact but the impact is still considered significant at the programmatic level; until project-level environmental review will further define the impact and identify additional measures to reduce this potential effect to a less-than-significant level.

- Bay Division Region – Irvington Portal in Fremont. The three WSIP projects in this region (BDPL Reliability Upgrade, BD-1; BDPL 3 and 4 Crossover, BD-2; and BDPL 3 and 4 Seismic Upgrade at Hayward Fault, BD-3) could have potentially significant impacts on the historical significance of a historic district (Impact 4.7-3), individual facilities (Impact 4.7-4), or adjacent facilities (Impact 4.7-5). These projects would be located near or adjacent to the Bay Division Pipelines and the existing Irvington Portal, both of which are potential historic facilities. One or more of the Bay Division Pipelines could be a contributor to a potential historic district related to the implementation of John R. Freeman's plan for the development of the Hetch Hetchy system. There could also be individual resources in this program that are historically significant. Implementation of SFPUC Construction Measure #9 (cultural resources) and various measures to document and protect resources (Measures 4.7-4a through 4.7-4f) would reduce each project's impact such that the potential collective effect of these projects would be *less than significant*, particularly on the Bay Division Pipeline because portions of the existing pipelines would remain following construction.

- *Peninsula Region – Lower Crystal Springs Dam Vicinity*. Potential alteration of the potentially historic Crystal Springs Pump Station (CS/SA Transmission, PN-2) and the historic Lower Crystal Springs Dam (PN-4) could have potentially significant impacts on the historical significance of the individual facilities (Impact 4.7-4) and adjacent facilities (Impact 4.7-5). Implementation of SFPUC Construction Measure #9 (cultural resources) and various measures to document and protect resources (Measures 4.7-4a through 4.7-4f) would reduce each project's impact such that the residual collective impact on individual facilities would be less than significant.

  Given the concentration of water system facilities in the Peninsula Region that are more than 45 years old, some of which were previously identified as historical resources, it is possible that a historic district, or multiple historic districts, could be present in the Peninsula Region. More detailed assessment to identify historic districts and potential impacts of the WSIP project on any historic districts, if present, will occur during project-level environmental review. Because it has not been determined whether the Peninsula Region or a portion of this region meets the National Register criteria or California Register criteria as a historic district (or districts), or whether the WSIP projects in the Peninsula Region could cause a substantial adverse change to such a district(s), this PEIR conservatively considers the collective effect of the five WSIP projects in this region on historic districts to be *potentially significant and unavoidable*. Measures 4.7-4a through 4.7-4f could reduce the significance of this impact, but the impact is still considered significant at the programmatic level; project-level environmental review will further define the impact and identify additional measures to reduce this potential effect to a less-than-significant level.

  San Francisco Region. Two of the WSIP projects in this region (SAPL 3 Installation, SF-1, and Recycled Water Projects, SF-3) could have potentially significant impacts on historical resources. The SAPL 3 Installation project could effect a historic district (Impact 4.7-3), individual facilities (Impact 4.7-4), or adjacent facilities (Impact 4.7-5). These potential resources include the Baden-Merced Pipeline. The Recycled Water projects (SF-5) has the potential to cause a substantial adverse change to an adjacent facility (Impact 4.7-5) – that is, the historic Fleishhacker Bath House, which was built in 1925, which could be indirectly affected under some project scenarios. The collective impact on historical resources is *not applicable*, however, because there would be no overlapping or collective impact in this region.

Traffic, Transportation, and Circulation

Impact 4.16-6: Collective traffic increases on local and regional roads.

As described in Section 4.8, implementation of the WSIP could cause traffic delays as a result of construction activities and construction vehicles. Construction activities would comply with the encroachment permit requirements (from Caltrans, county agencies, and/or local jurisdictions) for construction affecting public rights-of-way (Impacts 4.8-1 and 4.8-2). Implementation of traffic control plans (Measure 4.8-1) would reduce each project's individual local impacts to a less-than-significant level. However, even with mitigation, the WSIP projects together could significantly increase traffic delays *across* and *within* the five regions due to construction in public roadways and construction vehicles traveling to and from project sites.

WSIP construction activities would take place between 2007 and 2014; however, most projects would occur between 2009 and 2012, and the greatest number of projects would be under construction between 2009 and 2010 (see Table 4.16-1). Many of these projects involve construction within or across public roadways, which would temporarily reduce the available capacity and result in increased traffic delays. In addition, under many of the WSIP projects, construction vehicles would travel to and from material suppliers and excavation disposal or reuse sites. These vehicles would use the same regional freeways (e.g., Highway 101, I-5, I-580, I-680), resulting in increased truck traffic on segments where construction trucks from multiple projects overlap, and such increases could, at times, lower travel speeds on these roadways.

As described below, implementation of additional measures (appointing a traffic coordinator and preparing combined traffic control plans for the San Joaquin and Sunol Valley Regions) would reduce collective impacts within specific regions, but might not reduce multi-regional collective traffic impacts to a less-than-significant level. Traffic impacts of the individual projects would be evaluated in more detail during separate, project-level CEQA review, at which time the potential for combined or collective impacts of multiple projects would be reassessed.

Multi-regional Collective Impacts

Multi-regional collective impacts would occur when the travel routes of individual drivers cross multiple roadways affected by WSIP construction activities within one or more regions, and/or when construction vehicles use regional roadways. Multi-regional collective impacts would include increased travel times; however, the extent and duration of delays would vary depending on individual driver origins and destinations, time of travel, and use of alternate routes. Implementation of Measure 4.16-6a (identifying a program construction coordinator to coordinate project specific traffic control plans to minimize multi-regional impacts) would serve to offset the potential multi-regional collective traffic impacts, but might not reduce impacts to a less-than-significant level. Therefore, the multi-regional collective traffic impacts are considered *potentially significant and unavoidable*.

Localized Collective Impacts

Implementation of the WSIP would result in potential impacts on traffic and circulation, including increased construction vehicles and traffic delays, loss of parking, traffic safety issues, access disruption, and increased operational traffic (Impacts 4.8-1 and 4.8-3 through 4.8-6). These impacts could be collective where the construction schedules of multiple WSIP projects overlap (see Table 4.16-1).

For each WSIP project, truck trips generated by overlapping projects would be dispersed throughout the day, and construction workers for the projects would commute to and from the worksites primarily before or after peak traffic hours. The percent increase in traffic volumes caused by project-generated construction traffic on the arterials and freeways serving the WSIP project sites would not be substantial, while the project-generated trips on local serving roadways would represent a higher (more noticeable) percent increase in daily traffic volumes. Project traffic would not significantly disrupt daily traffic flow on these roadways. However, drivers would experience intermittent delays if they were traveling behind a construction truck.

Collective traffic impacts could occur if there were overlapping construction schedules in areas with limited construction access, since construction vehicles would have to share the same access route(s). The total number of vehicle trips added to the common route(s) due to concurrent construction of multiple WSIP projects could be collectively higher than the maximum number of daily and hourly vehicle trips used to determine impacts of a single WSIP project. However, because the timeframe of maximum trip generation would vary among the WSIP projects, the maximum traffic flows on the common route(s) would not necessarily be the sum of the maximum trips generated by the overlapping projects.

When overlapping areas in Figure 4.16-1 are considered in conjunction with traffic volumes on construction access roads identified in Table C.5 (Appendix C), the potential for collective traffic impacts would be as follows:

- San Joaquin Region – Tesla Portal. Construction of the SJPL System project (SJ-3) could overlap with construction of the Advanced Disinfection (SJ-1) and Tesla Portal Disinfection (SJ-5) projects. Implementation of traffic control plans for each project (Measure 4.8-1) and coordination of individual traffic control plans for projects in the Tesla Portal vicinity (Measure 4.16-6b) would reduce this *potentially significant* collective impact to a less-than-significant level.

  Construction traffic for the Advanced Disinfection (SJ-1) and Tesla Portal Disinfection (SJ-5) projects would use I-580, Chrisman Road, and Vernalis Road for site access. The number of daily truck trips associated with construction of the Advanced Disinfection project has not yet been determined, but would likely be similar to the number of truck trips generated by the Tesla Portal Disinfection project (i.e., an average of about 15 truck trips per day and a maximum of 40 truck trips per day). Although the construction schedules of these two projects could overlap, the increase in the number of daily construction vehicle trips could likely be accommodated within the existing capacity of the access routes, and the Advanced Disinfection and Tesla Portal Disinfection projects would not result in significant collective traffic impacts. With implementation of a traffic control plan for each these projects (Measure 4.8-1) and coordination of individual traffic control plans for projects in the Tesla Portal vicinity (Measure 4.16-6b), collective construction-related traffic impacts associated with these two projects would be reduced to a less-than-significant level.

- *Sunol Valley Region – Calaveras Road*. To varying degrees, the six projects in this region would utilize Calaveras Road, I-580, and I-680 for haul and delivery routes as well as site access. Current schedule projections estimate that these projects could overlap for up to two years. Accordingly, there could be significant increases in truck traffic along Calaveras Road and I-680. The volume of construction traffic would vary depending on the particular construction phase of each project. However, during a two-year period (2009 and 2010), four or five projects could overlap (different combination of projects each year; see Table C.5, Appendix C and Table F-3, Appendix F for estimated traffic volumes), resulting in periods with up to approximately 1,200 daily construction-generated vehicle trips (including inbound and outbound construction worker and construction truck trips) on Calaveras Road. It should be noted that the number of truck trips associated with the Calaveras Dam project (SV-2) might be reduced if fill materials could be found or processed in the dam vicinity.

  Increased construction vehicles on Calaveras Road between Geary Road and I-680, as well as on I-680, would increase delays due to the slower speeds and larger turning radii of trucks. The increase in truck traffic resulting from multiple projects would be considerable in relation to the capacity of Calaveras Road (one travel lane in each direction) and would result in *potentially significant* collective traffic impacts. Although I-680 has additional capacity in the vicinity of Calaveras Road, an increase in the number of trucks accessing the freeway on an uphill grade and merging with through-traffic could interfere with freeway operations.

  The entire length of Calaveras Road between I-680 and Calaveras Dam would be subject to damage due to the combined truck traffic associated with the six WSIP projects in this region. Trucks carrying sand and gravel from Sunol Valley to the dam could affect access to Sunol Regional Park.

  Implementation of traffic control plans for each project (Measure 4.8-1) along with a coordinated Sunol Valley traffic control plan (Measure 4.16-6c) would reduce this collective impact to a less-than-significant level.

- *Bay Division Region – Irvington Portal in Fremont*. The haul/delivery/site access route for the New Irvington Tunnel (SV-4) exit portal would include a new access road constructed through a residential neighborhood to connect the portal with Mission Boulevard (Highway 238) and the I-680 freeway. Due to the possible overlap in the construction schedules of the New Irvington Tunnel and BDPL Reliability Upgrade (BD-1) projects, there could be substantial increases in haul and delivery truck traffic in this area; these traffic increases could substantially affect the capacity of Mission Boulevard, a *potentially significant* collective impact. Implementation of traffic control plans for each project (Measure 4.8-1) and coordination of individual traffic control plans (Measure 4.16-6a) would reduce potential collective traffic impacts to a less-than-significant level.

- *Peninsula Region – Lower Crystal Springs Dam Vicinity*. Although construction of the CS/SA Transmission (PN-2) and Lower Crystal Springs Dam (PN-4) projects would not overlap (one project is scheduled to end just as the other begins), there is some potential for short-term combined increases in construction traffic on Crystal Springs Road near Lower Crystal Springs Reservoir. The number of daily truck trips associated with these two projects has not yet been determined, but it is expected that the number of truck trips would be similar to that generated by the Calaveras Dam project (SV-2) (i.e., up to 40 truck trips per day for each project, for a total of 80 truck trips per day). Construction vehicles associated with the HTWTP Long-Term project (PN-3) would also use Crystal Springs Road and Skyline Boulevard, although the construction schedules for all three projects are not expected to overlap. Implementing a traffic control plan for these projects (Measure 4.8-1) and coordinating individual traffic control plans (Measure 4.16-6a) would reduce any *potential significant* collective traffic impacts to a less-than-significant level.

- *San Francisco Region*. Pipeline construction associated with the SAPL 3 Installation (SF-1) and Recycled Water Projects (SF-3) could overlap in the same San Francisco streets. There could also be an overlap in vicinity of the San Francisco Zoo, which is identified as a possible site for facilities under the Groundwater Projects (SF-2) and Recycled Water Projects. The volume of overlapping construction traffic would vary depending on the location of each project (some project locations have not yet been determined) and particular construction phase of each project. However, each project is projected to result in about 20 truck trips per day. Implementing a traffic control plan for these projects (Measure 4.8-1) and coordinating individual traffic control plans (Measure 4.16-6a) would reduce any *potential significant* collective traffic impacts to a less-than-significant level. In addition, each project's construction activities would be coordinated by the San Francisco Department of Public Work's Street Construction Coordination Center (which coordinates utility excavation activities).

Air Quality

Impact 4.16-7: Collective increases in construction and/or operational emissions in the region.

Section 4.9 evaluates the air quality impacts associated with implementation of the WSIP. Potential air quality impacts include increases in dust and equipment emissions during construction, exposure to diesel particulate matter (DPM), tunnel-related emissions, operational emissions, odors, secondary emissions from power generation and conflicts with regional and statewide air quality planning (Impacts 4.9-1 through 4.9-7). Tunnel-related emissions would be site-specific and would not have a collective impact (Impact 4.9-3).

Multi-regional Collective Impacts

Criteria Pollutants

As summarized in Table 4.9-5, construction of the WSIP would result in potentially significant multi-regional collective increases in air pollutant emissions in the San Joaquin Valley Air Basin and the San Francisco Bay Area Air Basin. Table 4.9-5 indicates that onsite construction-related air pollutant emissions would exceed the applicable BAAQMD and SJVAPCD thresholds within the San Joaquin, Sunol Valley, and Bay Division regions, but not within the Peninsula and San Francisco regions. However, when emissions from all regions are considered together, construction-related emissions would be collectively significant. Implementation of the mitigation measure requiring dust and exhaust controls, but modified so it applies to all WSIP projects (Measure 4.16-7a), would be required to address the WSIP's collective impact on criteria air pollutants. Although these measures would reduce each project's impact incrementally, there would still be a residual contribution from each project to the region's nonattainment status for ozone and particulate matter (PM_{10} and $PM_{2.5}$) in both the San Francisco Bay Area and San Joaquin Valley Air Basins. Given the region's nonattainment status for ozone and particulate matter, the residual multi-regional collective impact associated construction of the WSIP as a whole is considered *potentially significant and unavoidable*.

Non-GHG air quality emissions during operation of the WSIP facility improvement projects would be required to comply with the air quality regulations of the Bay Area Air Quality Management District (BAAQMD) and San Joaquin Valley Air Pollution Control District (SJVAPCD), which would ensure consistency with regional air quality planning efforts (Impacts 4.9-4 and 4.9-5). Therefore, multi-regional collective air pollutant emissions from priority pollutants associated with operation of the WSIP as a whole would be *less than significant*.

GHG Emissions

Sources of GHGs from WSIP projects include those associated with construction equipment and increases in vehicle traffic and use of refrigerants during facility operations. However, as documented in Section 4.9 (Impact 4.9-7) increases in GHGs from construction sources associated with WSIP projects would be minimal.

The WSIP would also result in secondary operational increases in GHG emissions as a result of electricity generated to meet the WSIP's increase in energy demand (Impact 4.9-7). Although electricity for the WSIP projects would be derived primarily from hydroelectric sources, power would need to be purchased by current customers of the SFPUC Power Enterprise from the grid when less hydroelectric power is available, particularly during the summer and fall months. The WSIP's incremental increase in power demand during project operations (the portion that is not from hydroelectric or alternative energy sources) would indirectly serve to sustain rather than reduce current GHG emissions from these emission sources. The WSIP projects at completion would create approximately 14,260 metric tons of CO_2-equivalent emissions by consuming hydroelectric power that is no longer available to current users. Compared to the current annual inventory of 427,000,000 metric tons in California (California Energy Commission, 2006), this represents 0.0033 percent of that inventory. Planned increases in water distribution and treatment system efficiencies will offset a limited portion of the increased power demand, but not enough to eliminate the increase in GHG emissions that would result from WSIP-diverted electrical power. Nevertheless, the total increased power demand associated with the operation of the WSIP projects is a small fraction of total state demand.

As the CARB's Early Action Measures and CEC's greenhouse gases emission performance standard for local, public-owned electric utilities become effective (see discussion under Regulatory Framework, Greenhouse Gas Emissions Limits), the SFPUC will implement them as required to reduce GHG emissions from the WSIP project operations. Given the minimal contribution of GHG emissions from the WSIP, continuing implementation of GHG reduction actions by the CCSF and SFPUC and additional GHG reduction actions that SFPUC will take as part of the WSIP project (see above under "Existing Setting"), the WSIP projects would not conflict with the State's goals of reducing GHG emissions to 1990 levels by 2020. Therefore, residual multi-regional collective GHG emissions associated with construction and operation of the WSIP as a whole would be less than significant.

As part of implementation of the WSIP, the SFPUC will also be required to implement mitigation measures related to exhaust control (see Measures 4.9-1b, 4.9-1d, and 4.16-7a), waste reduction measures (Measure 4.11-2), and feasible energy efficiency measures in applicable WSIP projects, consistent with the *Energy Action Plan II* priorities for reducing energy usage (as specified in Measure 4.15-2). Implementation of these measures would also achieve reductions that would help minimize overall GHG emission increases. In addition, as CARB's Early Action Measures become effective, the SFPUC will implement them as required to reduce GHG emissions from the WSIP-related activities.

Localized Collective Impacts

During construction of the WSIP projects, worker vehicles and diesel haul/delivery trucks would generate offsite emissions. Localized short-term collective increases in emissions of DPM (the particulates of greatest concern) could occur in overlapping areas if construction activities associated with multiple WSIP projects affected the same access routes. As outlined in Impact 4.9-2, a cancer risk between 1 and 10 in a million is conservatively considered to be potentially significant for purposes of this PEIR (20,000 truckloads or 40,000 trips = 1 in a million; 200,000 loads or 400,000 trips = 10 in a million). Conducting a health risk screening or using soot filters on haul trucks (Measure 4.9-2a) and vacating the two SFPUC Land Managers' residences (Measure 4.9-2b) are identified in Section 4.9 for certain projects. As described below, when overlapping areas in Figure 4.16-1 are considered in conjunction with traffic volumes and construction access roads identified in Table C.5 (Appendix C), the potential for collective air quality impacts in overlapping areas could necessitate implementation of this measure for additional projects, as follows:

- <u>San Joaquin Region</u>. The haul routes for up to four WSIP projects could affect the same residents near Tesla Portal (i.e., along Chrisman and Vernalis Roads, the access route between Tesla Portal and I-580). Residents living along this route could be exposed to increases in DPM from haul truck and delivery traffic during construction of the western segments of the SJPL System (SJ-3) and SJPL Rehabilitation (SJ-4) projects, in addition to the Advanced Disinfection (SJ-1) and Tesla Portal Disinfection (SJ-5) projects if construction schedules overlapped in the Tesla Portal vicinity. Together, these four projects are not expected to generate over 40,000 truck trips on Chrisman or Vernalis Roads over the entire period of construction, but peak truck volumes could depending on the extent of excavation spoils that are hauled offsite. Most residences along these roads are set back

250 to 300 feet, reducing the potential for exposure to DPM health risks. However, if combined truck trips were to exceed 40,000 on Chrisman or Vernalis Roads, the combined or collective impacts would be *potentially significant,* and implementation of the mitigation measure requiring a health risk screening or use of soot filters on haul trucks, but modified so it applies to all projects in this region (Measure 4.16-7b), would reduce this collective impact to a less-than-significant level.

- *Sunol Valley Region*. Due to the overlap in construction schedules for proposed WSIP projects within this region, there could be significant combined or collective increases in haul and delivery truck traffic along Calaveras Road in the Sunol Valley. As indicated in Table 4.9-6, truck trips could exceed the significant "10 in a million" threshold or the potentially significant "1 in a million" threshold, depending on the proportion of excavation spoils that would be hauled offsite. Therefore, the combined or collective DPM impact would be *potentially significant* for all projects in the Sunol Valley Region. However, exposure of sensitive receptors to elevated DPM levels would be limited to occupants of the two SFPUC Land Managers' residences. Implementation of the mitigation measure requiring the two SFPUC Land Managers' residences be vacated, but modified so it applies to all projects in this region (Measure 4.16-7c), would reduce this collective impact to a less-than-significant level.

- *Bay Division Region – Irvington Portal in Fremont*. Outside of the Sunol Valley, the haul route for the New Irvington Tunnel (SV-4) exit portal would be a new access road constructed through a residential neighborhood to connect the portal with Mission Boulevard (Highway 238) and I-680. Due to the possible overlap in construction schedules for the New Irvington Tunnel and BDPL Reliability Upgrade (BD-1) projects, this neighborhood could be subject to combined DPM increases if there were any overlap in haul and delivery truck traffic for these two projects. Potential combined increases in construction traffic would be evaluated in more detail as part of separate, project-level CEQA review for these two projects. If combined truck trips were to exceed 40,000 on this access road over the entire construction period, the combined or collective impacts would be potentially significant. However, completion of a health risk screening or use of soot filters on haul trucks would be required for the BDPL Reliability Upgrade project under Measure 4.9-2a as well as at the exit portal for the New Irvington Tunnel project (SV-4) under Measure 4.16-7c (above). Therefore, implementation of this measure would reduce each project's impact such that the residual collective impact would be *less than significant with mitigation*.

- *Peninsula Region – Lower Crystal Springs Dam Vicinity*. Given the limited amounts of surface disturbance and facility construction associated with these three projects, it is expected that the combined DPM levels for this region would be *less than significant* (excess cancer risk would be less than 1 in a million, or 40,000 total truck trips).

- *San Francisco Region*. The combined increase in DPM levels associated with all three WSIP projects in this region would be *less than significant* (combined excess cancer risk would be less than 1 in a million); however, this conclusion would need to be confirmed at the project level due to the potential proximity of construction activities to sensitive receptors.

Noise and Vibration

Impact 4.16-8: Collective increases in construction-related and operational noise.

Multi-regional Collective Impacts

Section 4.10 identifies potential noise and vibration impacts associated with construction and operation of WSIP facilities. As described in Impacts 4.10-1, 4.10-3, and 4.10-4, there could be potentially significant noise and vibration impacts at most project sites. However, these potential impacts would be site-specific and would not be additive or collective. Therefore, the WSIP projects would not have a multi-regional collective impact on noise (*not applicable*). Since most construction noise impacts would be specific to each facility site, collective or overlapping noise impacts could only occur at adjoining construction sites or along common haul/delivery routes where overlapping schedules for two or more facilities with a shared haul/delivery route could result in combined noise increases. This localized issue is discussed below.

Localized Collective Impacts

Localized collective increases in noise could occur in overlapping areas if construction activities associated with multiple WSIP projects affected the same adjacent sensitive receptors or if haul/delivery trucks for multiple projects used the same access routes. When overlapping areas in Figure 4.16-1 are considered in conjunction with traffic volumes and construction access roads identified in Table C.5 (Appendix C), the potential for collective noise impacts in overlapping areas would be as follows:

- *San Joaquin Region – Tesla Portal*. Haul and delivery trucks would use Chrisman and Vernalis Roads to access Tesla Portal from I-580, and residential receptors along this route could be subject to traffic noise increases. Collective noise increases along this route could occur from overlapping construction schedules for the Advanced Disinfection and Tesla Portal Disinfection projects (SJ-1 and SJ-5). If construction of the SJPL Rehabilitation project (SJ-4) were to occur in the Tesla Portal vicinity at the same time, truck traffic on these roads could increase further. Construction of the SJPL System project (SJ-3) in the Tesla Portal vicinity would prolong the duration that construction-related truck traffic would use these two roads, but this project would not overlap with the Advanced Disinfection and Tesla Portal Disinfection projects. It is possible that implementation of the mitigation measures limiting hourly truck volumes and restricting truck operations at night (Measures 4.10-2a and 4.10-2b), but modified so they apply to all projects in this region (Measure 4.16-8a), could reduce this collective impact to a less-than-significant level. However, since truck volumes and hours of truck operations are undetermined for these projects, potential collective noise impacts on residential receptors located along this route are conservatively considered to be *potentially significant and unavoidable.*

  Collective noise impacts associated with adjoining construction sites for the Advanced Disinfection (SJ-1) and Tesla Portal Disinfection (SJ-5) projects at Tesla Portal could result in combined or prolonged construction-related noise impacts. Any construction activities associated with either the SJPL System (SJ-3) or SJPL Rehabilitation (SJ-4) projects in the Tesla Portal vicinity also could add to combined or prolonged construction-related noise impacts. Although there are no private residences near Tesla Portal (the closest residence is approximately 3,500 feet away), there is an SFPUC caretaker's residence at Tesla Portal.

Collective increases in daytime construction noise would be potentially significant for occupants of the caretaker's residence, but less than significant for private residences located to the south. While there could be potentially significant collective noise impacts on occupants of both the SFPUC caretaker's residence and private residences from any nighttime construction noise at Tesla Portal, given the distance to the nearest receptors, it is possible that this impact could be reduced to a less-than-significant level with implementation of noise controls (Measure 4.10-1a) and vacating the caretaker's residence (Measure 4.10-1b). However, since construction activities associated with any of these projects could extend beyond the typical daytime hours (during the evening or nighttime hours on weekends as well as weekdays), it is also possible that collective noise impacts could occur at both the SFPUC caretaker's residence and private residences. Therefore, the PEIR errs on the conservative side and has determined that *potentially significant and unavoidable* collective noise impacts could occur at these receptors if the hours of construction associated with these projects extended beyond the hours specified in local noise ordinances and local noise limits specified for nighttime hours cannot be met.

- *Sunol Valley Region – Calaveras Road*. Due to the overlap in construction schedules of proposed WSIP projects in this region, there could be significant collective increases in haul and delivery truck traffic along Calaveras Road in the Sunol Valley and on I-680. Collective hourly truck traffic increases (averaging 60 to 70 trucks per hour, inbound and outbound, see Table F-2, Appendix F) from these projects would not collectively cause an exceedance of the 70-dBA speech interference criterion adjacent to this road (approximately 80 trucks per hour would cause an exceedance of this criterion). However, if truck operations occurred during the nighttime hours, such collective hourly volumes would exceed the sleep interference criterion. There is one private residence 2,000 feet from Calaveras Road; at this distance, the residence would not be adversely affected by noise from daytime or nighttime collective truck traffic increases (speech or sleep interference criteria would not be exceeded and noise ordinance noise limits could feasibly be met). However, occupants of the SFPUC Land Manager's residence adjacent to Alameda East Portal could be significantly affected by collective nighttime truck noise along Calaveras Road, a *potentially significant* collective noise impact. Vacating this residence during construction of all projects in this region (Measure 4.16-8b) would reduce this potential collective noise impact to a less-than-significant level.

- *Bay Division Region – Irvington Portal in Fremont*. The haul route for the New Irvington Tunnel (SV-4) exit portal would be a new access road constructed through a residential neighborhood to connect the portal with Mission Boulevard (Highway 238) and I-680. Due to the possible overlap in construction schedules for the New Irvington Tunnel and BDPL Reliability Upgrade (BD-1) projects, there could be significant collective increases in haul and delivery truck traffic in this neighborhood. It is possible that limiting hourly truck volumes during the day (Measure 4.10-2a) and restricting nighttime truck operations (Measure 4.10-2b), but modified so they apply to both the New Irvington Tunnel and BDPL Reliability Upgrade projects (Measure 4.16-8a), could reduce this impact to a less-than-significant level. However, since haul routes, truck volumes, and hours of truck operations are undetermined for these projects, potential noise impacts on residential receptors in this area are conservatively considered to be *potentially significant and unavoidable*. The potential for such a collective noise impact would be evaluated in more detail as part of separate, project-level CEQA review for the New Irvington Tunnel and BDPL Reliability Upgrade projects.

Collective noise impacts associated with adjoining construction sites for the New Irvington Tunnel (SV-4) and BDPL Reliability Upgrade (BD-1) projects at Irvington Portal could result in combined or prolonged construction-related noise impacts. Due to the proximity of residential receptors (setbacks of less than 75 feet), *potentially significant and unavoidable* noise impacts could occur in this neighborhood if construction were prolonged (longer than two weeks), any simultaneous construction activities generated combined noise levels that exceeded the 70-dBA speech interference or 50-dBA sleep interference criteria, or construction activities extended beyond the ordinance time limits and could not meet local noise limits specified for nighttime hours.

- *Peninsula Region – Crystal Springs Road in the Lower Crystal Springs Dam Vicinity*. If construction activities associated with the CS/SA Transmission (PN-2) and Lower Crystal Springs Dam (PN-4) projects overlapped in the vicinity of Lower Crystal Springs Reservoir, there could be collective increases in haul or delivery truck traffic on Crystal Springs Road. Since truck traffic is expected to travel on I-280, collective truck traffic increases would occur primarily on the west end of this road between the pump station access road and I-280. It is possible that limiting hourly truck volumes during the day (Measure 4.10-2a) and restricting nighttime truck operations (Measure 4.10-2b), but modified so they apply to both CS/SA Transmission and Lower Crystal Springs Dam projects (Measure 4.16-8a), could reduce this impact to a less-than-significant level since the closest residential receptors are approximately 225 feet north of Crystal Springs Road. However, since haul routes, truck volumes, and hours of truck operations are undetermined for these projects, potential noise impacts on residential receptors in this area are conservatively considered to be *potentially significant and unavoidable*.

  Collective noise impacts associated with adjoining construction sites for the CS/SA Transmission (PN-2) and Lower Crystal Springs Dam (PN-4) projects in the Lower Crystal Springs Dam vicinity could result in combined or prolonged construction-related noise impacts. Since the closest residential receptors are approximately 500 feet from the Crystal Springs Pump Station, any collective increases in daytime construction noise would be less than significant. While there could be potentially significant collective noise impacts on the closest receptors from any nighttime construction noise in the Crystal Springs Pump Station vicinity, implementation of noise controls (Measure 4.10-1a) would reduce each project's impact such that the potential residual collective nighttime noise impact would be less than significant. However, since construction activities associated with these projects could extend beyond the typical daytime hours (during the evening or nighttime hours on weekends as well as weekdays), the PEIR errs on the conservative side and has determined that *potentially significant and unavoidable* collective noise impacts could occur at these receptors if the hours of construction associated with these projects extended beyond the hours specified in local noise ordinances and local noise limits specified for nighttime hours cannot be met.

- *San Francisco Region – Various Streets*. Pipeline construction associated with the SAPL 3 Installation (SF-1) and Recycled Water Projects (SF-2) could overlap in the same San Francisco streets. Such overlap could prolong the duration of construction-related noise increases (longer than two weeks) at affected sensitive receptors; however, any collective construction-related noise increases associated with these projects cannot be determined at this time and would be evaluated as part of separate, project-level CEQA review.

  There could also be a collective increase in haul/delivery trucks and associated noise if the same haul routes are used. These collective noise impacts would only occur if the construction schedules overlapped on the same streets. Since each project is projected to generate about 20 truck trips per day, collective increases from the overlap of these projects, either on San Francisco streets or near the zoo, are not expected to exceed the 70-dBA speech interference criterion in adjacent areas. However, if truck operations extended beyond the daytime and evening hours (between 10 p.m. and 7 a.m.), any collective truck traffic increases could exceed the 50-dBA sleep interference criterion, a potentially significant impact. Implementation of the mitigation measures limiting hourly truck volumes and restricting truck operations at night (Measures 4.10-2a and 4.10-2b), but modified so they apply to all projects in this region (Measure 4.16-8a), would reduce this collective impact to a less-than-significant level. However, since haul routes, truck volumes, and hours of truck operations are undetermined for these projects, potential noise impacts on residential receptors where haul routes overlap are conservatively considered to be *potentially significant and unavoidable*.

Public Services and Utilities

Impact 4.16-9: Collective impacts on utilities and landfill capacity.

Multi-regional Collective Impacts

Section 4.11 evaluates the WSIP's impact on regional landfill disposal capacity (Impact 4.11-2). Construction of WSIP projects could collectively generate approximately 2 million cubic yards of excavated materials requiring offsite disposal. When compared to the approximately 400 million cubic yards of remaining capacity in existing landfills across the WSIP study area (see Table 4.11-3), the WSIP's potential disposal requirements represent approximately 1/2 percent of the total remaining capacity. Implementation of waste reduction measures for design and construction (Measures 4.11-2a and 4.11-2b) would reduce each project's offsite disposal requirements such that the residual contributions to this collective impact would be *less than significant with mitigation*.

Localized Collective Impacts

Section 4.11 evaluates potential construction-related impacts on public utilities, including disruption of existing utilities (Impact 4.11-1) or required relocation of existing utilities (Impact 4.11-3). These potential impacts would be site-specific and would not be additive. Therefore, the WSIP projects would not result in localized collective impacts on existing public utilities (*not applicable*).

Recreational Resources

Impact 4.16-10: Collective effects on recreational resources during construction.

Multi-regional and Localized Collective Impacts

As described in Section 4.12, construction activities associated with some WSIP facilities could temporarily disrupt access to or use of recreational facilities. While implementation of the WSIP could result in the temporary closure or disruption of several recreational opportunities (displacing demand to other facilities and therefore potentially collectively increasing demand at some other regional facilities), the effects on recreational resources within the WSIP study area would be distributed over a relatively large area. Further, given the availability and diversity of recreational opportunities in the vicinity of the WSIP projects in each region as well as in the WSIP study area as a whole, the diversion of recreation users would not likely result in overcrowding or associated deterioration of recreational resources. Therefore, multi-regional collective impacts on recreational resources would be *less than significant*. Coordination with golf course and park planning staff (Measures 4.12-1 and 4.12-2) would also reduce each project's impact such that the residual contributions to localized collective impacts on recreational resources within each region would be *less than significant with mitigation*.

The WSIP water supply and system operations would have no impact on water-related recreational facilities or activities in the Alameda or Peninsula watersheds, as described in Sections 5.4.7 and 5.5.7. It would, however, affect recreational resources within the Tuolumne River watershed, as described in Section 5.3.8. Since facility impacts on recreational resources (described in Section 4.12) would not affect access to or use of the recreational resources in Yosemite National Park and the Tuolumne River watershed, no combined or collective multi-regional impacts on recreational resources in this area are expected to occur.

Agricultural Resources

Impact 4.16-11: Collective conversion of farmland to nonagricultural uses.

Multi-regional and Localized Collective Impacts

Section 4.13 identifies potential temporary and permanent impacts on agricultural resources associated with implementation of the WSIP. The permanent conversion of farmland would be site-specific and not additive or collective within the WSIP study area, since there is only one project in the San Joaquin Region and one project in the Sunol Valley Region (*not applicable* for localized overlapping impacts) that could affect agricultural resources. The SJPL System (SJ-3) and 40-mgd Treated Water (SV-3) projects could convert important farmland to nonagricultural use; since these projects are in two different regions, multi-regional collective impacts on agricultural resources could occur. Siting both of these facilities to avoid prime agricultural lands or offsetting its loss (Measure 4.13-2) would reduce each project's impact such that the residual contributions to this multi-regional collective impact would be *less than significant with mitigation*.

Hazards

Impact 4.16-12: Collective effects related to hazardous conditions and exposure to or release of hazardous materials.

Multi-regional Collective Impacts

Construction impacts associated with the potential to encounter hazardous materials or hazardous conditions, or to release hazardous materials during construction (Impacts 4.14-1, 4.14-2, and 4.14-4 through 4.14-6) would, for the most part, be site-specific and would not be additive or collective. Similarly, the potential for accidental releases of chemicals stored at the water treatment plants (Impacts 4.14-7 and 4.14-8) would also be site-specific and would not be additive or collective.

For many of the projects, soil excavated during construction could be classified as a hazardous waste, potentially requiring disposal at any of the three hazardous waste disposal facilities in California (Impact 4.14-1). With implementation of SFPUC Construction Measure #7 (hazardous materials) and preparation of a materials disposal plan (Measure 4.14-1b), project-level impacts related to disposal of hazardous wastes would be less than significant. As discussed above in Section 4.16-9, construction of the WSIP projects could collectively generate approximately 2 million cubic yards of excavated materials requiring offsite disposal. However, only a portion of that material would potentially be classified as a hazardous waste. Although project-level estimates have not been made to determine the quantity of soil that could be classified as a hazardous waste, it can be assumed based on historical land uses that the soil generated from the Peninsula and Alameda Creek watersheds would not be considered hazardous. Assuming, as a worst case, that 25 to 70 percent of the soil requiring offsite disposal from the Bay Division and San Francisco Region projects and 10 percent of the soil requiring offsite disposal from the SJPL System project (SJ-3) in the San Joaquin Region would be classified as hazardous, the total volume of soil requiring disposal as a hazardous waste could be up to 270,000 cubic yards.

The existing capacity of the three in-state hazardous waste disposal facilities is 18.8 million cubic yards, including 7.3 million cubic yards[4] at the Kettleman Hills Hazardous Waste Facility (Yarbrough, 2007), 9 million cubic yards at Buttonwillow (Buoni, 2006a), and 2.5 million cubic yards at Westmorland (Buoni, 2006b). In addition, Kettleman Hills is in the process of permitting another 15-million-cubic-yard waste disposal unit to be constructed by 2013, when the current disposal unit is scheduled for closure. Based on worst-case estimates, the WSIP's potential hazardous waste disposal requirements would represent approximately 1.5 percent of the total existing hazardous waste disposal capacity in the region, and less than 1 percent of the disposal volume expected to be available by 2013. Therefore, the WSIP's contribution to this multi-regional collective impact on hazardous waste disposal capacity would be *less than significant*.

[4] The total capacity of the Kettlemen Hills Hazardous Waste Facility includes a 5-million-cubic-yard expansion that will be constructed prior to 2013.

Localized Collective Impacts

Impact 4.14-3 describes the potential for an increased risk of wildland fires during construction in high fire hazard areas. Potential impacts at individual WSIP sites would be mitigated to a less-than-significant level through compliance with the Public Resources Code provisions governing the use of construction equipment in fire-prone areas. Because some WSIP project sites are near each other and would share access and haul/delivery routes, there could be a collective increase in fire hazards in the following overlapping areas, especially if construction were to overlap during the season of highest fire danger:

- *San Joaquin Region – Tesla and Oakdale Portals*. Potential overlap in high fire danger areas identified as "Wildland Area That May Contain Substantial Forest Fire Risks and Hazards" could occur in the San Joaquin Region at both the Tesla and Oakdale Portals. Both the Advanced Disinfection (SJ-1) and Tesla Portal Disinfection (SJ-5) projects would be constructed at Tesla Portal in 2009 and 2010, and additional construction could occur at this portal during the same timeframe as part of the SJPL Rehabilitation project (SJ-4). Both the SJPL System (SJ-3) and SJPL Rehabilitation projects could also include construction at Oakdale Portal and, depending on the phasing of both projects, could overlap at this portal for some period of time between 2011 and the end of 2013.

- *Sunol Valley Region – Sunol Valley*. All six WSIP projects in this region are located in high fire danger areas and could be under construction between 2009 and 2010, with multiple projects under construction through 2012.

- *Bay Division Region – Irvington Portal in Fremont*. The BDPL Reliability Upgrade (BD-1) and New Irvington Tunnel (SV-4) projects could overlap at the Irvington Portal for some period of time between 2009 and the end of 2012.

- *Peninsula Region – Lower Crystal Springs Dam Vicinity*. If schedules change, both the CS/SA Transmission (PN-2) and Lower Crystal Springs Dam (PN-4) projects could be under construction in 2010 and 2011 in the Peninsula Region, and construction activities for both projects would be conducted in the vicinity of the Lower Crystal Springs Dam.

The potential collective increase in wildland fire risk could place an additional burden on the local fire service provider, particularly if access for emergency vehicles were impeded. The extent of this impact would depend on the actual timing and phasing of these WSIP projects. Notification of fire departments, as required under Measure 4.8-1 as part of each project's traffic control plan, would reduce each project's impact such that all residual contributions to this collective impact in all regions would be *less than significant with mitigation*.

Energy Resources

Impact 4.16-13: Collective increases in the use of nonrenewable energy resources.

Section 4.15 describes the potential for increased electricity demand associated with construction and operation of the WSIP projects. SFPUC Power Enterprise provides the energy required to operate the SFPUC regional water system, primarily from power generated by the SFPUC's hydroelectric facilities in the Hetch Hetchy system. Within the WSIP study area, annual average energy consumption for water system operation totals approximately 44 million kilowatt-hours (kWh). Implementation of the WSIP would increase annual operational energy consumption in the WSIP study area by approximately 39 million kWh, or approximately 89 percent over existing conditions. The increase would be highest in the San Joaquin Region due to the Advanced Disinfection project (SJ-1), which could use as much as 26.5 million kWh of electricity to provide disinfection of the Hetch Hetchy water supply to meet the requirements of the Long-Term 2 Enhanced Water Treatment Rule.[5]

As discussed in Chapter 5, Section 5.3.9, changes in water releases from WSIP system operations would increase SFPUC Power Enterprise's power production from an average of 1,618 million kWh in 2005 to an average of 1,641 million kWh in 2030. With this 23 million kWh increase in power production, the net increase in energy demand for the regional system under the WSIP would be approximately 16 million kWh, which represents less than 1 percent of SFPUC Power Enterprise's 2005 average production. In addition, changes in water supply and system operations under the WSIP would affect hydroelectric power generation downstream on the Tuolumne River at the Don Pedro Power Plant, which is operated by the Turlock Irrigation District (TID) and Modesto Irrigation District (MID). The WSIP system operations would result in a decrease in hydroelectric generation from the Don Pedro Power Plant of 14 million kWh (see Impact 5.3.9-1). Combined with the 16 million kWh increase in energy demand from the WSIP, the net loss in available hydroelectric energy attributable to the WSIP would be 30 million kWh, which is less than 0.1 percent of the estimated total energy usage in the counties within the WSIP study area.[6]

Although this increased energy consumption under the WSIP is small, the WSIP would utilize more hydroelectric power generated by SFPUC Power Enterprise, making slightly less hydroelectric power available to other users during times when there is an excess of hydroelectric power, and slightly increasing demands on other energy sources during the summer and fall months when SFPUC Power Enterprise does not generate enough power to meet its municipal demand and contractual obligations. In addition, the decrease in hydroelectric generation by the Don Pedro Power Plant would require the TID and MID to rely more on other sources of energy, possibly derived from fossil fuels. Electricity generation from nonrenewable sources contributes to greenhouse gas emissions and associated global warming effects (see Air Quality Impact 4.16-7 above for more discussion).

In accordance with Appendix F of the CEQA Guidelines, a project would have an adverse environmental effect if it were to use energy in an unnecessary, wasteful, or inefficient manner. Section 15126.4(a)(1) of the CEQA Guidelines further requires that an EIR describe feasible measures to minimize the inefficient and unnecessary consumption of energy where relevant.

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5 The WSIP's collective energy impacts would be program-wide (multi-regional) rather than localized, since all WSIP projects affect the same power sources. Therefore, the WSIP projects would not result in localized collective impacts on energy (*not applicable*).

6 Total energy usage in Alameda, San Francisco, San Joaquin, San Mateo, Santa Clara, and Tuolumne Counties was 45,072 million kWh in 2000 (CEC, 2006). Assuming a 1.2 percent annual increase in energy consumption, the total usage in 2005 would have been 47,842 million kWh.

Implementation of the WSIP and the associated increase in energy demand is necessary to provide a reliable water supply of sufficient quality to meet future water quality regulations, including the Long-Term 2 Enhanced Water Treatment Rule. Furthermore, implementation of energy efficiency measures, which would be evaluated in more detail as part of project-level CEQA review for each WSIP project (Measure 4.15-2), and continued participation in demand-shifting programs, as described in Section 4.15, would ensure that energy would not be used in a wasteful or inefficient manner, and could reduce the projected increase in energy demand. The WSIP's multi-regional (program-wide) collective increase in operational energy demand would be *less than significant with mitigation*, because the increase in energy demand would be less than 1 percent of SFPUC Power Enterprise's existing average production; the increase in energy use and decrease in Don Pedro Power Plant hydroelectric production would be necessary to provide a reliable water source; and the energy would not be used in a wasteful or inefficient manner.

Construction activities associated with each WSIP project in all regions would require the use of fuels to operate construction equipment and transport employees and materials. Each project's impacts related to the wasteful use of fuels during construction would be reduced by certain exhaust control measures (limiting idling time and performing low-emissions tune-ups, as specified Measures 4.9-1b and 4.9-1d) such that the collective increase in construction-related energy consumption would be *less than significant with mitigation*.

4.16.3 References – Collective Impacts Related to WSIP Facilities

Buoni, Marianna, Telephone conversation between Marianna Buoni of Clean Harbors and Mary McDonald of Orion Environmental Associates, December 14, 2006a.

Buoni, Marianna, Telephone conversation between Marianna Buoni of Clean Harbors and Mary McDonald of Orion Environmental Associates, December 15, 2006b.

GreenInfo Network, Bay Area Protected Lands Database, Homebuilders Association of Northern California, available online at http://www.muirheritagelandtrust.org/assets/pdfs/pressarticles/Million%20Acres.pdf, accessed on June 14, 2007.

Pollak, D., *The Future of Habitat Conservation? The NCCP Experience in Southern California*, Part 2 of a series, California Research Bureau, California State Library, Sacramento, CA, 2001.

Yarbrough, Terry, Telephone conversation between Terry Yarbrough of Chemical Waste Management and Mary McDonald of Orion Environmental Associates, January 2, 2007.

4.17 Cumulative Effects

4.17 Cumulative Effects

4.17.1 Introduction and Approach

As defined in Section 15355 (CEQA Guidelines), a cumulative impact is the impact that results from implementing the proposed project together with other projects causing related impacts. The CEQA Guidelines require that EIRs discuss the cumulative impacts of a project when the project's incremental effect is "cumulatively considerable," meaning that the project's incremental effects are significant when viewed in connection with the effects of past, present, and reasonably foreseeable (i.e., probable) future projects. The discussion of cumulative impacts should include:

- Either: (1) a list of past, present, and probable future projects producing related or cumulative impacts; or (2) a summary of projections contained in an adopted general plan or similar document, or in an adopted or certified environmental document, that described or evaluated conditions contributing to a cumulative impact
- A discussion of the geographic scope of the area affected by the cumulative impact
- A summary of expected environmental effects to be produced by these projects
- Reasonable, feasible options for mitigating or avoiding the project's contribution to any significant cumulative effects

This analysis addresses the cumulative impacts associated with construction and operation of the WSIP facility improvement projects. Section 5.7 (in Chapter 5) presents the cumulative impacts associated with the WSIP's water supply and system operations. Chapter 7 discusses the cumulative effects associated with growth inducement and secondary effects of growth based on projections from adopted general plans and related environmental documents. The overall approach to the facilities impact assessment in Chapter 4 is described in Section 4.1.

This section presents an analysis of the *cumulative* impacts of the WSIP as a whole (i.e., the WSIP impacts identified in Sections 4.3 through 4.16 prior to mitigation, with the effects of mitigation measures considered in determining the significance of the WSIP's contribution of residual effects after mitigation to overall cumulative impacts) in combination with other proposed, planned, and approved projects from the past, present, and reasonably foreseeable future, including: (a) other SFPUC projects or activities in the WSIP study area, and (b) non-SFPUC projects or activities in the WSIP study area under the jurisdiction of other local agencies. The projects are listed by WSIP region in Tables 4.17-1 through 4.17-6 and are either: (1) planned, proposed, or approved but not yet constructed, or (2) recently completed or under construction (all as of July 2006).[1]

[1] Construction schedules for non-SFPUC projects were estimated based on information obtained in project-related documents such as initial studies and environmental impact reports; city, county, and regional agency websites; and interviews with representatives from local jurisdictions or regional agencies. In some cases, project schedules could not be estimated from these sources, but the projects were in sufficient stages of planning to be considered likely to start or complete construction before 2014, the planning horizon for construction of WSIP facilities. The schedules for these projects are listed as "Unknown." The estimated schedules are based on the most current information available during preparation of this PEIR (as of July 2006). However, as with all proposed development projects, estimated construction schedules are subject to revisions and delays and therefore could vary from the time periods indicated.

4.17.2 Projects Considered in Cumulative Analysis

Section 4.16 describes the collective impacts associated with construction and operation of the WSIP facilities based on the geographic scope of the affected environmental resource and the proposed project schedule. This section describes other "cumulative" projects, including past projects, projects currently under construction, and probable future projects that have or could potentially result in similar impacts as those resulting from the construction and/or operation of WSIP facility improvement projects. Cumulative projects identified by local and regional agencies as well as other projects planned or proposed by the SFPUC (including SFPUC projects funded with WSIP bond funds that are not analyzed in the PEIR for the reasons explained in Chapter 3, Section 3.1) are listed by region in **Tables 4.17-1** through **4.17-6**. The tables present the planning jurisdiction, a brief description, and the estimated construction schedule associated with each cumulative project. The tables also identify WSIP projects that could, in conjunction with the cumulative projects, contribute to cumulative effects and potential cumulative impact topics are identified.

The potential for cumulative impacts would depend on both the geographic locations and the construction schedules of the other projects. **Figure 4.17-1** shows the approximate locations of the cumulative projects listed in these tables. **Table 4.17-7** lists the potential schedule overlap between cumulative projects and WSIP projects. However, for future projects, construction schedules are often broadly estimated and may be subject to change. In addition, the construction schedules were unavailable for numerous projects listed in Tables 4.17-1 through 4.17-6; therefore, the estimated construction schedules for the projects were grouped into roughly five-year periods to determine the potential for schedule overlap with the WSIP projects.

Project information listed in Tables 4.17-1 through 4.17-6 is based on consultations with local jurisdictions within the San Joaquin, Sunol Valley, Bay Division, Peninsula, and San Francisco Regions (the local planning, community development, and public works/engineering departments of these agencies) as well as review of EIRs and information posted on agency websites. The tables include the following:

- Projects proposed by PG&E, AT&T, and other service providers
- Projects proposed by Caltrans, BART, Caltrain, and county transportation agencies
- Projects proposed by the SFPUC (including other planned water, wastewater, and power projects that are not part of the WSIP, or projects funded with WSIP bond funds that are not analyzed in the PEIR for the reasons explained in Chapter 3, Section 3.1), many of which are repair and rehabilitation projects[2]

[2] Projects listed in these tables do not necessarily represent all SFPUC repair and rehabilitation projects.

TABLE 4.17-1
CUMULATIVE PROJECTS AND IMPACTS RELATED TO WSIP FACILITIES IN THE SAN JOAQUIN REGION

Cumulative Project No.	Jurisdiction	Project Name	Project Description	Potentially Contributing WSIP Project[a]	Potential Cumulative Impact Areas	Estimated Construction Schedule[b]
Other Non-SFPUC Planned or Approved Projects in the San Joaquin Region (Public and Private Developments)						
SJC-1	City of Waterford	Waterford Government Center	Construction of new East County Sheriff's Substation, an expanded County Branch Library and City of Waterford administrative offices (Stanislaus County, 2007).	SJPL System (SJ-3), SJPL Rehabilitation (SJ-4)	Impacts on sensitive habitats and species; increased surface runoff and water quality impacts; traffic impacts on regional roads (e.g., Highways 132 and 99) and associated air quality and noise impacts	2007–2009
SJC-2	City of Waterford	Reconstruction of Western Avenue	Reconstruction of Western Avenue from Kadota Avenue south to Highway 132 (City of Waterford, 2007).	SJPL System (SJ-3), SJPL Rehabilitation (SJ-4)	Traffic impacts along the southern reconstructed segment of the roadway near Highway 132 and associated air quality and noise impacts	2007–2008
SJC-3	Stanislaus County	Grizzly Ranch	Construction of 142 estate homes, interspersed among almond grove ranches on 2,843 acres, over a 10-year buildout period (City of Waterford, 2007; Borchard, 2006).	SJPL System (SJ-3), SJPL Rehabilitation (SJ-4)	Impacts on sensitive habitats and species; increased surface runoff and water quality impacts; traffic impacts on regional roads (e.g., Highways 132 and 99) and associated air quality and noise impacts; encroachment of nonagricultural uses onto farm orchards	2007–2017
SJC-4	City of Modesto	Beard Industrial Tract	Development of ongoing medium and heavy industrial infill projects (Kachel, 2006).	SJPL System (SJ-3), SJPL Rehabilitation (SJ-4)	Impacts on sensitive habitats and species; increased surface runoff and water quality impacts; traffic impacts on regional roads (e.g., Highways 132 and 99) and associated air quality and noise impacts; conversion of farmland to nonagricultural uses	Ongoing
SJC-5	City of Oakdale	Residential Subdivision	Phased construction of 200 units west of Central Avenue (Huey, 2006).	SJPL System (SJ-3), SJPL Rehabilitation (SJ-4)	Impacts on sensitive habitats and species; increased surface runoff and water quality impacts; traffic impacts on regional roads (e.g., Highways 132 and 99) and associated air quality and noise impacts	2007–2010
SJC-6	City of Riverbank	North Corridor Expressway – Local Improvements	Extension and widening of roads (Crane Road, Sterns Avenue, and Warnerville Road) for future connections to Highway 99 as part of this countywide project (Hightower, 2006).	SJPL System (SJ-3), SJPL Rehabilitation (SJ-4)	Impacts on sensitive habitats and species; increased surface runoff and water quality impacts; traffic impacts on regional roads (e.g., Highways 132 and 99) and associated air quality and noise impacts	2009–2013

TABLE 4.17-1 (Continued)
CUMULATIVE PROJECTS AND IMPACTS RELATED TO WSIP FACILITIES IN THE SAN JOAQUIN REGION

Cumulative Project No.	Jurisdiction	Project Name	Project Description	Potentially Contributing WSIP Project[a]	Potential Cumulative Impact Areas	Estimated Construction Schedule[b]
Other Non-SFPUC Planned or Approved Projects in the San Joaquin Region (Public and Private Developments) (cont.)						
SJC-7	Stanislaus County	Kaiser Modesto Medical Center	Development of a full-service hospital facility with nursing towers, three medical office buildings, three parking garages (2,185 spaces), and a central utility plant in three phases, which began in 2004 and will be completed in 2025. Project includes replacement of the existing hospital, built to meet state seismic safety standards (City of Modesto, 2004).	SJPL System (SJ-3), SJPL Rehabilitation (SJ-4)	Impacts on sensitive habitats and species; increased surface runoff and water quality impacts; traffic impacts on regional roads (e.g., Highways 132 and 99) and associated air quality and noise impacts; and improved seismic safety and reliability of critical public facilities	Phase A: 2004–2008 Phase B: 2010–2013 Phase C: 2018–2025
SJC-8	Stanislaus County	Cornerstone Business Park	Construction of a 400,000-gross-square-foot business park with professional and medical office space adjacent to, and concurrent with, Phase A of Kaiser Medical Center (City of Modesto, 2004).	SJPL System (SJ-3), SJPL Rehabilitation (SJ-4)	Impacts on sensitive habitats and species; increased surface runoff and water quality impacts; traffic impacts on regional roads (e.g., Highways 132 and 99) and associated air quality and noise impacts	2004–2011
SJC-9	Stanislaus County/City of Modesto	Pelendale/ McHenry Specific Plan	Proposed specific plan to develop up to 386 residential units at Pelandale and McHenry Avenues on an 84.4-acre site currently occupied by commercial businesses, 15 mobile homes, and a public storage facility. The SPLJ System (SJ-3) and SJPL Rehabilitation (SJ-4) projects traverse the site from northeast to northwest. The SFPUC right-of-way is proposed for open space. Project approvals include a general plan amendment, annexation to the City of Modesto, and a permit from the SFPUC to develop within its right-of-way (City of Modesto, 2006).	SJPL System (SJ-3), SJPL Rehabilitation (SJ-4)	Increased surface runoff and water quality impacts; traffic impacts on regional roads (e.g., Highways 99 and 132) and associated air quality and noise impacts	2010–2014+
SJC-10	City of Modesto	Salida Boulevard/ Pelandale Avenue Interchange	Reconstruction of the Pelandale Avenue/Salida Boulevard Interchange (City of Salida, 2007).	SJPL System (SJ-3), SJPL Rehabilitation (SJ-4)	Construction-related traffic impacts on regional roads (e.g., Highways 132 and 99) and construction-related air quality and noise impacts	2007–2009
SJC-11	Stanislaus County	Highway 99/ Whitmore Avenue Interchange	Reconstruction of the Highway 99/Whitmore Avenue Interchange (Stanislaus County, 2007).	SJPL System (SJ-3), SJPL Rehabilitation (SJ-4)	Construction-related traffic impacts on regional roads (e.g., Highways 132 and 99) and construction-related air quality and noise impacts	TBD
SJC-12	Stanislaus County	Salida Hulling Almond Hulling Facility	Construction of relocated and expanded almond hulling and shelling facility on a 50.4-acre site (Stanislaus County, 2006).	SJPL System (SJ-3), SJPL Rehabilitation (SJ-4)	Impacts on sensitive habitats and species; increased surface runoff and water quality impacts; traffic impacts on regional roads (e.g., Highway 132) and associated air quality and noise impacts	2007–2009

TABLE 4.17-1 (Continued)
CUMULATIVE PROJECTS AND IMPACTS RELATED TO WSIP FACILITIES IN THE SAN JOAQUIN REGION

Cumulative Project No.	Jurisdiction	Project Name	Project Description	Potentially Contributing WSIP Project[a]	Potential Cumulative Impact Areas	Estimated Construction Schedule[b]
Other Non-SFPUC Planned or Approved Projects in the San Joaquin Region (Public and Private Developments) (cont.)						
SJC-13	City of Modesto	Highway 132/ Highway 99 to Morse, Nebraska, or Dakota Avenue	Construction of a portion of the Modesto Freeway on a new alignment (Stanislaus County, 2007).	SJPL System (SJ-3), SJPL Rehabilitation (SJ-4)	Impacts on sensitive habitats and species; water quality impacts; construction-related traffic impacts on regional roads (e.g., Highways 132 and 99) and associated air quality and noise impacts	TBD
SJC-14	Stanislaus County	Highway 132/ Highway 33 Widening	Widening of Highway 132/Highway 33 to the San Joaquin River to four lanes (Stanislaus County, 2007).	Advanced Disinfection (SJ-1), SJPL System (SJ-3), SJPL Rehabilitation (SJ-4), Tesla Portal Disinfection (SJ-5)	Impacts on sensitive habitats and species; increased surface runoff and water quality impacts; construction-related traffic impacts on regional roads (e.g., Highway 132) and associated air quality and noise impacts	TBD
SJC-15	Stanislaus County	West Patterson Business Park	Phased development of flex, light industrial, and distribution warehouse uses on 832 acres. The current proposal is for 2.5 million square feet on a 224-acre site within a park between I-5, the Mendota Delta, Rodgers Road, and Sperry Avenue; remaining future development unknown (City of Patterson, 2003; Simpson, 2006).	SJPL System (SJ-3), SJPL Rehabilitation (SJ-4)	Impacts on sensitive habitats and species; increased surface runoff and water quality impacts; traffic impacts on regional roads (e.g., I-5) and associated air quality and noise impacts; construction-related water quality impacts	2006–2013+
SJC-16	Stanislaus County	Patterson Gardens	Phased construction of 940 single-family units, a 47-unit senior residential neighborhood, and 300,000 square feet of commercial office and recreational uses, including a 16-acre lake on a 305-acre site partly in agricultural use. The first phase was completed and the second phase is under construction (City of Patterson, 2003; Simpson, 2006).	SJPL System (SJ-3), SJPL Rehabilitation (SJ-4)	Impacts on sensitive habitats and species; increased surface runoff and water quality impacts; traffic impacts on regional roads (e.g., I-5) and associated air quality and noise impacts; conversion of farmland to nonagricultural uses	2006–2009
SJC-17	San Joaquin County/ Stanislaus County	RMC Pacific Vernalis Quarry Mining and Reclamation Project	Proposed sand and gravel extraction and processing of construction aggregate on 688 acres, with permitted active mining for 26 to 60 years on a 659-acre site in San Joaquin County (590 acres) and Stanislaus County (98 acres) (RMC Pacific Vernalis, 2006).	Advanced Disinfection (SJ-1), SJPL System (SJ-3), SJPL Rehabilitation (SJ-4), Tesla Portal Disinfection (SJ-5)	Water quality impacts; potential ground water and water quality impacts; operational traffic impacts on regional roads (e.g., Highway 132); operational air quality and noise impacts; conversion of non-productive farmland to commercial uses	2008–2068
SJC-18	San Joaquin County	Bird Road/ Highway 132 Interchange	Replacement of four-way stop with interchange facility at the intersection of Bird Road and Highway 132 (San Joaquin Council of Governments, 2007).	Advanced Disinfection (SJ-1), SJPL System (SJ-3), SJPL Rehabilitation (SJ-4), Tesla Portal Disinfection (SJ-5)	Construction-related water quality impacts; traffic impacts on regional roads (e.g., Highway 132) and associated air quality and noise impacts	2008–2009

TABLE 4.17-1 (Continued)
CUMULATIVE PROJECTS AND IMPACTS RELATED TO WSIP FACILITIES IN THE SAN JOAQUIN REGION

Cumulative Project No.	Jurisdiction	Project Name	Project Description	Potentially Contributing WSIP Project[a]	Potential Cumulative Impact Areas	Estimated Construction Schedule[b]
Other Non-SFPUC Planned or Approved Projects in the San Joaquin Region (Public and Private Developments) (cont.)						
SJC-19	San Joaquin County	Mountain House Specific Plan I, II, and III	Long-term development of a new community on 4,360 acres consisting of 12 neighborhoods, 10 elementary schools, new community college, business park, public services, and recreation facilities and including 16,000 dwelling units, 21,600 jobs, and 39,000 residents over a 20- to 40-year buildout period (San Joaquin County, 1994; San Joaquin County, 2005).	**Indirect:** All San Joaquin Region projects	Traffic impacts on regional roads and associated air quality and noise impacts; disruption of existing established land use patterns; continuation of conversion of crop and farmlands to nonagricultural uses in San Joaquin County	2004–2024/2048
Other SFPUC Projects at Tesla Portal						
SJP-1a	CCSF (SFPUC)	Tesla Portal Erosion Repairs	Repairs to eroded areas around the portal and pipe connection as well as the road to the chemical building. Work would occur in a developed area within a fenced compound (SFPUC, 2006).	Advanced Disinfection (SJ-1), SJPL System (SJ-3), SJPL Rehabilitation (SJ-4), Tesla Portal Disinfection (SJ-5)	Possible overlap of onsite construction activities; construction-related traffic on access roads and associated air quality and noise impacts	TBD
SJP-1b	CCSF (SFPUC)	Tesla Portal Surface Drainage	Drainage improvement in an area of portal/pipeline connections, with additional pavement around the pump house (SFPUC, 2006).	Advanced Disinfection (SJ-1), SJPL System (SJ-3), SJPL Rehabilitation (SJ-4), Tesla Portal Disinfection (SJ-5)	Possible overlap of onsite construction activities; construction-related traffic on access roads and associated air quality and noise impacts; increased surface runoff	TBD
SJP-1c	CCSF (SFPUC)	Tesla Portal Utilities Building	Modification of electrical equipment inside an existing structure; wiring and conduit work (SFPUC, 2006).	Advanced Disinfection (SJ-1), SJPL System (SJ-3), SJPL Rehabilitation (SJ-4), Tesla Portal Disinfection (SJ-5)	Possible overlap of onsite construction activities; construction-related traffic on access roads and associated air quality and noise impacts	TBD
SJP-1d	CCSF (SFPUC)	Tesla Portal/ Thomas Shaft Disinfection Project	Construction of an access road and improvements to chemical storage (SFPUC, 2006).	Advanced Disinfection (SJ-1), Lawrence Livermore (SJ-2), SJPL System (SJ-3), SJPL Rehabilitation (SJ-4), Tesla Portal Disinfection (SJ-5)	Possible construction access restrictions at Tesla Portal and Thomas Shaft	TBD

TABLE 4.17-1 (Continued)
CUMULATIVE PROJECTS AND IMPACTS RELATED TO WSIP FACILITIES IN THE SAN JOAQUIN REGION

Cumulative Project No.	Jurisdiction	Project Name	Project Description	Potentially Contributing WSIP Project[a]	Potential Cumulative Impact Areas	Estimated Construction Schedule[b]
Other SFPUC Projects at Tesla Portal (cont.)						
SJP-1e	CCSF (SFPUC)	Tesla Portal Water Quality Monitoring Improvements	Addition/enhancement of water quality monitoring at the San Joaquin Valve House and Tesla Portal (SFPUC, 2006).	Advanced Disinfection (SJ-1), SJPL System (SJ-3), SJPL Rehabilitation (SJ-4), Tesla Portal Disinfection (SJ-5)	Possible overlap of onsite construction activities; construction-related traffic on access roads and associated air quality and noise impacts	TBD
Other SFPUC Projects in Thomas Shaft Vicinity						
SJP-2	CCSF (SFPUC)	Thomas Shaft SCADA Antenna Installation	Installation of Supervisory Control and Data Acquisition antenna (satellite dish) on an existing chlorine facility in a remote coastal mountain location. In-house construction, installation of antenna, minor electrical conduit, and hookup (SFPUC, 2006).	Lawrence Livermore (SJ-2)	Possible overlap of construction-related traffic on access roads to Thomas Shaft	TBD

a A WSIP facility that, in conjunction with the cumulative project, could contribute to a potential cumulative impact, depending on construction timing or affected resources.
b Construction schedules for non-SFPUC projects were estimated based on information obtained in project-related documents such as initial studies and EIRs; city, county, and regional agency websites; and interviews with representatives from local jurisdictions or regional agencies. In some cases, project schedules could not be estimated from these sources, but the projects were in sufficient stages of planning to be considered likely to start or complete construction before 2014, the planning horizon for construction of WSIP facilities. The schedules for these projects are listed as “TBD” (To Be Determined). The estimated schedules are based on the most current information available during preparation of this PEIR (as of July 2006). However, as with all proposed development projects, estimated construction schedules are subject to revisions and delays and therefore could vary from the time periods indicated.

TABLE 4.17-2
CUMULATIVE PROJECTS AND IMPACTS RELATED TO WSIP FACILITIES IN THE SUNOL VALLEY REGION

Cumulative Project No.	Jurisdiction	Project Name	Project Description	Potentially Contributing WSIP Project[a]	Potential Cumulative Impact Topics	Estimated Construction Schedule[b]
Other Non-SFPUC Planned or Approved Projects in the Sunol Valley Region (Public and Private Developments)						
SVC-1	Alameda County	Route 84 Safety Project	Safety improvement project that would realign and widen a section of State Route 84 (Niles Canyon Road) between Rosewarnes Bridge and Farwell Bridge. The project would improve sight distance and vertical clearances at bridges, and install a retaining wall along a section of Alameda Creek. Niles Canyon Road provides access to Calaveras Road from the north (Caltrans, 2004).	*Indirect*: All Sunol Valley Region projects; BDPL Reliability Upgrade (BD-1)	Impacts on sensitive habitats and species; water quality impacts on Alameda Creek; construction-related traffic on regional roads (e.g., Highway 84 and Highway 84/I-680 interchange) and associated air quality and noise impacts; wildland fire hazards	2007–2009
SVC-2	Alameda County	Route 84 Expressway	Widening of Highway 84 (Isabel Avenue) from a four- to six-lane roadway from Jack London Boulevard in Livermore through the Isabel Avenue/Vallecitos Road intersection. Project would add capacity, reduce congestion, improve local circulation, and eventually tie into the Isabel Avenue/I-580 interchange project. The project designates the Vallecitos Road portion of the new route a scenic corridor (ACTIA, 2007).	*Indirect*: All Sunol Valley Region projects	Construction-related traffic on regional roads (e.g., Vallecitos/I-680 ramps); associated air quality and noise impacts; potential visual impacts	2010–2012
SVC-3	Alameda County	Chevron Pipeline Relocation/ Watershed Protection Project	Construction and operation of a new pipeline segment (approximately 7.5 miles long), generally within the existing electrical transmission line easement extending north of San Antonio Reservoir and south of Vallecitos Road (Highway 84). Pipeline to be joined to an existing petroleum products pipeline in order to reduce the risk of water supply contamination at San Antonio Reservoir in the event of a pipeline failure within the reservoir's watershed. Relocation is a condition of Chevron's right-of-way lease agreement with the SFPUC (SFPUC, 2005a).	*Indirect*: All Sunol Valley Region projects	Impacts on sensitive habitat and species; construction-related traffic on Calaveras Road and associated air quality and noise impacts; temporary disruption to commercial businesses on Calaveras Road; wildland fire hazards; potential hazardous materials spills during pipeline relocation	TBD
SVC-4	Alameda County	Mission Valley Rock Company Quarries	Continuation and expansion of three surface mining permits (SMP) in areas east of Calaveras Road, north of I-680. SMP-24 is an existing 202-acre quarry and processing operation; the permit allows increased aggregate extraction and deepening of pits from 140 feet up to 250 feet. SMP-32 allows for new quarry operations on 240 acres with materials processed at SMP-24. SMP-33 a 31-acre quarry; the permit allows deepening of pits from 140 feet to up to 200 feet, footprint expansion by 6 acres to the east for a total of 37 acres, and materials processed at SMP-24 (SFPUC, 2005a).	*Indirect*: All Sunol Valley Region projects	Impacts on sensitive habitats and species; water quality impacts on nearby creeks (e.g., Alameda Creek); potential groundwater impacts; visual impacts from Calaveras Road, a designated scenic route; traffic impacts on regional roads (e.g., I-680) and Calaveras Road and associated air quality and noise impacts; wildland fire hazards	Ongoing to 2045+

TABLE 4.17-2 (Continued)
CUMULATIVE PROJECTS AND IMPACTS RELATED TO WSIP FACILITIES IN THE SUNOL VALLEY REGION

Cumulative Project No.	Jurisdiction	Project Name	Project Description	Potentially Contributing WSIP Project[a]	Potential Cumulative Impact Topics	Estimated Construction Schedule[b]
Other Non-SFPUC Planned or Approved Projects in the Sunol Valley Region (Public and Private Developments) (cont.)						
SVC-5	Alameda County	Sunol Valley Quarry	Expansion of existing 308.5-acre quarry to increase mining depth from 140 feet to approximately 225 feet, plus restoration of portions of Alameda and San Antonio Creeks and installation of slurry cutoff wall (SFPUC, 2005a).	*Indirect*: All Sunol Valley Region projects	Impacts on sensitive habitats and species; water quality impacts on nearby creeks; potential groundwater impacts; visual impacts from Calaveras Road; traffic impacts on regional roads (e.g., I-680) and Calaveras Road and associated air quality and noise impacts; wildland fire hazards	2009–2011
SVC-6	Alameda County	Apperson Ridge Quarry	Potential surface mining of an existing 680-acre mining leasehold (SMP-14) situated on the central portions of the 2,555-acre Apperson Ranch located about one mile east of Calaveras Road in the SFPUC Alameda watershed. No mining or extraction activities have been initiated or are likely in the near future. However, the existing permit extends for a period of 80 years (Alameda County, 1984; Jensen, 2007).	*Indirect*: All Sunol Valley Region projects	Impacts on sensitive habitats and species; water quality impacts on nearby creeks; potential groundwater impacts; visual impacts from Calaveras Road; traffic impacts on regional roads (e.g., I-680) and Calaveras Road and associated air quality and noise impacts; wildland fire hazards	TBD
Other SFPUC Projects in the Sunol Valley Water Treatment Plant Vicinity						
SVP-1a	CCSF (SFPUC)	SVWTP/HTWTP External UPS Study	External Uninterruptible Power Supply (UPS) Bypass/Replacement Study to either install external bypass switches or replace UPS. After the study, work would entail minor installation of electrical switches on plant equipment or replacement of power supplies on the same equipment (SFPUC, 2006).	*Direct*: 40-mgd Treated Water (SV-3), Treated Water Reservoirs (SV-5) *Indirect*: All Sunol Valley Region projects	Overlap of onsite construction activities; construction-related traffic on Calaveras Road and associated air quality and noise impacts; wildland fire hazards	TBD
SVP-1b	CCSF (SFPUC)	SVWTP Tank Replacement	In-kind replacement of three existing hypochlorite tanks and five alum tanks at the Sunol Valley Water Treatment Plant (WTP). Maintenance replacement of existing chemical tanks at filter plant (SFPUC, 2006).	*Direct*: 40-mgd Treated Water (SV-3), Treated Water Reservoirs (SV-5) *Indirect*: All Sunol Valley Region projects	Overlap of onsite construction activities; construction-related traffic on Calaveras Road and associated air quality and noise impacts; wildland fire hazards	TBD
SVP-1c	CCSF (SFPUC)	SVWTP Replace Valve V40	Replacement of valve V40 within filter plant compound at the Sunol Valley WTP. Maintenance/repair project (SFPUC, 2006).	*Direct*: 40-mgd Treated Water (SV-3), Treated Water Reservoirs (SV-5) *Indirect*: All Sunol Valley Region projects	Overlap of onsite construction activities; construction-related traffic on Calaveras Road and associated air quality and noise impacts; wildland fire hazards	2007

TABLE 4.17-2 (Continued)
CUMULATIVE PROJECTS AND IMPACTS RELATED TO WSIP FACILITIES IN THE SUNOL VALLEY REGION

Cumulative Project No.	Jurisdiction	Project Name	Project Description	Potentially Contributing WSIP Project[a]	Potential Cumulative Impact Topics	Estimated Construction Schedule[b]
Other SFPUC Projects in the Sunol Valley Water Treatment Plant Vicinity (cont.)						
SVP-1d	CCSF (SFPUC)	SVWTP V40–V41 Pressure Transmitters	Minor installation of pressure transmitters on valves V40 and V41 at the Sunol Valley WTP (SFPUC, 2006).	*Direct*: 40-mgd Treated Water (SV-3), Treated Water Reservoirs (SV-5) *Indirect*: All Sunol Valley Region projects	Overlap of onsite construction activities; construction-related traffic on Calaveras Road and associated air quality and noise impacts; wildland fire hazards	TBD
Other SFPUC Projects at the Alameda Portals						
SVP-2	CCSF (SFPUC)	Alameda East Portal – Chemical Piping Modification	Replacement of small high-density polyethylene piping within existing building at the Alameda East Portal, located inside off-limits, fenced-in portal compound, and relocation of existing small pumps. Minor electrical work (SFPUC, 2006).	*Direct*: SABUP (SV-6) *Indirect*: All Sunol Valley Region projects	Overlap of onsite construction activities; construction-related traffic on Calaveras Road and associated air quality and noise impacts; wildland fire hazards	TBD
SVP-3	CCSF (SFPUC)	Alameda Portal – Alameda Siphons Flow Meter Replacement	Replacement of flow meters in Alameda Siphons with more reliable meters for 69-, 91-, and 96-inch pipes. Work involves replacing small electrical devices on pipelines within existing vaults and evaluating flow meter after field-testing (SFPUC, 2006).	*Direct*: New Irvington Tunnel (SV-4), SABUP (SV-6) *Indirect*: All Sunol Valley Region projects	Overlap of on-site construction activities; construction-related traffic on Calaveras Road and associated air quality and noise impacts; wildland fire hazards	TBD
Other SFPUC Projects at the Sunol Yard						
SVP-4a	CCSF (SFPUC)	Sunol Yard Auto – Shop Remodel	Remodeling of auto shop inside existing building within maintenance yard at the Sunol Yard (SFPUC, 2006).	*Indirect*: All Sunol Valley Region projects	Construction-related traffic on regional roads and associated air quality and noise impacts; wildland fire hazards	TBD
SVP-4b	CCSF (SFPUC)	Sunol Yard New Roll-up Door at Welding Shop	Construction of an enclosure for the welding shop with a roll-up door. Work includes modification to existing building within maintenance yard (SFPUC, 2006).	*Indirect*: All Sunol Valley Region projects	Construction-related traffic on regional roads and associated air quality and noise impacts; wildland fire hazards	TBD
SVP-4c	CCSF (SFPUC)	Sunol Yard Temporary Expansion	Construction of a series of prefabricated structures to replace run-down operations shops at the Sunol Yard (SFPUC, 2006).	*Indirect*: All Sunol Valley Region projects	Construction-related traffic on regional roads and associated air quality and noise impacts; wildland fire hazards	TBD
SVP-4d	CCSF (SFPUC)	SFPUC Pipeline Repair and Readiness Improvement	This project would provide a pipe-rolling facility in the Sunol Maintenance Yard for the purpose of supplying emergency repair pipe following a major seismic event. Seven improvement/storage sites for stockpiling materials would be used. Three of these sites are currently used for materials storage and the other four were determined to	*Indirect*: All Sunol Valley Region projects	Construction-related traffic on regional roads and associated air quality and noise impacts; wildland fire hazards	2007-2008

TABLE 4.17-2 (Continued)
CUMULATIVE PROJECTS AND IMPACTS RELATED TO WSIP FACILITIES IN THE SUNOL VALLEY REGION

Cumulative Project No.	Jurisdiction	Project Name	Project Description	Potentially Contributing WSIP Project[a]	Potential Cumulative Impact Topics	Estimated Construction Schedule[b]
Other SFPUC Projects at the Sunol Yard (cont.)						
SVP-4d (cont.)			be categorically exempt from CEQA. Pipe-rolling facilities would also be installed at two other sites, but would be located within existing buildings in existing SFPUC equipment yards (SFPUC, 2005b).			
Other SFPUC Projects at the Alameda Siphons						
SVP-5a	CCSF (SFPUC)	Alameda Siphon #1 Pipeline Inspection	Alameda Siphon #1 – pipeline inspection (SFPUC, 2006).	*Direct*: New Irvington Tunnel (SV-4) *Indirect*: All Sunol Valley Region projects	Treated water discharges; construction-related traffic on Calaveras Road and associated air quality and noise impacts; wildland fire hazards	2007
SVP-5b	CCSF (SFPUC)	Alameda Siphon #3 PCCP Pipeline Inspection	Alameda Siphon #3 – PCCP (prestressed concrete cylinder pipe) pipeline inspection (SFPUC, 2006).	*Direct*: New Irvington Tunnel (SV-4) *Indirect*: All Sunol Valley Region projects	Treated water discharges; construction-related traffic on Calaveras Road and associated air quality and noise impacts; wildland fire hazards	2007
SVP-5c	CCSF (SFPUC)	Alameda Siphons Upgrade	Construction of a fourth, seismically resistant Alameda Siphon across the Sunol Valley along the same corridor as the three existing Alameda Siphons. The fourth siphon would be a redundant pipeline to the three existing siphons. The preferred project would include construction of a new siphon consisting of 3,000-foot-long, 78-inch-diameter pipeline; manifold modifications at the existing Alameda East and West Portals to allow connection of the fourth siphon; and addition of line valves on the three existing siphons or a large gate in the downstream end of the Coast Range Tunnel to allow for isolation of the fourth siphon (SFPUC, 2005b).	*Direct*: New Irvington Tunnel (SV-4) *Indirect*: All Sunol Valley Region projects	Impacts on sensitive habitats and species; treated water discharges; construction-related traffic on Calaveras Road and associated air quality and noise impacts; wildland fire hazards	2009–2011
Other SFPUC Projects in the Sunol Valley Region						
SVP-6	CCSF (SFPUC)	Turner Dam – Drainage Improvement	Improvements to alleviate local ponding at the toe of Turner Dam. Project would involve removing eroded soil and rock from dry creekbed below release valve at the base of Turner Dam and re-contouring the streambed to prevent future erosion and deposits of material (SFPUC, 2006).	*Direct*: SABUP (SV-6) *Indirect*: All Sunol Valley Region projects	Impacts on sensitive habitats and species; water quality impacts; construction-related traffic on Calaveras Road and associated air quality and noise impacts; wildland fire hazards	TBD

TABLE 4.17-2 (Continued)
CUMULATIVE PROJECTS AND IMPACTS RELATED TO WSIP FACILITIES IN THE SUNOL VALLEY REGION

Cumulative Project No.	Jurisdiction	Project Name	Project Description	Potentially Contributing WSIP Project[a]	Potential Cumulative Impact Topics	Estimated Construction Schedule[b]
Other SFPUC Projects in the Sunol Valley Region (cont.)						
SVP-7	CCSF (SFPUC)	San Antonio Reservoir Piezometer Study	Flushing and retrofit of existing piezometers at San Antonio Reservoir, and preparation of a maintenance plan for the long-term maintenance of piezometers at the facility (SFPUC, 2006).	*Direct*: SABUP (SV-6) *Indirect*: All Sunol Valley Region projects	Construction-related traffic on Calaveras Road and associated air quality and noise impacts	TBD
SVP-8	CCSF (SFPUC)	Calaveras Pipeline Inspection	Calaveras pipeline inspection (SFPUC, 2006).	*Direct*: SABUP (SV-6) *Indirect*: All Sunol Valley Region projects	Treated water discharges; construction-related traffic on Calaveras Road and associated air quality and noise impacts; wildland fire hazards	2012
SVP-9	CCSF (SFPUC)	San Antonio PCCP Pipeline Inspection	San Antonio PCCP pipeline inspection (SFPUC, 2006).	*Direct*: SABUP (SV-6) *Indirect*: All Sunol Valley Region projects	Treated water discharges; construction-related traffic on Calaveras Road and associated air quality and noise impacts; wildland fire hazards	2008
SVP-10	CCSF (SFPUC)	Sunol Effluent Pipeline Inspection	Sunol effluent pipeline inspection (SFPUC, 2006).	*Direct*: 40-mgd Treated Water (SV-3), SVWTP Treated Water Reservoirs (SV-5) *Indirect*: All Sunol Valley Region projects	Treated water discharges; construction-related traffic on Calaveras Road and associated air quality and noise impacts; wildland fire hazards	2007
SVP-11	CCSF (SFPUC Water)	Sunol & Niles Dam Removal	Removal of two obsolete dams on Alameda Creek (SFPUC, 2006).	Indirect: All Sunol Valley Region projects	Water quality impacts on Alameda Creek; impacts on sensitive habitats and species; loss of historical resources; construction-related traffic on regional roads and associated air quality and noise impacts; wildland fire hazards	Completed 2006
SVP-12	CCSF (SFPUC)	Sunol Watershed – Demolition of Unsafe Structures	Removal of abandoned buildings and water transmission facilities in the Sunol Valley and Niles Canyon to eliminate potential nuisances (facilities could attract and endanger people). Most structures are small wooden buildings and/or portions of the Sunol Aqueduct, an abandoned concrete enclosed channel through off-road areas of Niles Canyon (SFPUC, 2006).	*Indirect*: All Sunol Valley Region projects	Construction-related traffic on Highway 84 and associated air quality and noise impacts; wildland fire hazards	TBD

TABLE 4.17-2 (Continued)
CUMULATIVE PROJECTS AND IMPACTS RELATED TO WSIP FACILITIES IN THE SUNOL VALLEY REGION

Cumulative Project No.	Jurisdiction	Project Name	Project Description	Potentially Contributing WSIP Project[a]	Potential Cumulative Impact Topics	Estimated Construction Schedule[b]
Other SFPUC Projects in the Sunol Valley Region (cont.)						
SVP-13	CCSF (SFPUC)	San Antonio Pump Station Upgrade	Upgrade and rehabilitation of the San Antonio Pump Station, including replacement of three existing electric pumps with three new electric pumps; backup power for the three electric pumps; seismic retrofit of the main pump building to correct structural deficiencies; and construction of a 6.25-mVA backup transformer at the Calaveras Substation (SFPUC, 2005b).	*Direct*: SABUP (SV-6) *Indirect*: All Sunol Valley Region projects	Construction-related traffic on local access roads and associated air quality and noise impacts; wildland fire hazards	2009–2011
SVP-14	CCSF (SFPUC)	Standby Power Facilities	Construction of standby backup power at six critical facilities to allow these facilities to remain in operation during power outages and other emergency situations. Permanent engine generators would be provided at four locations, while hookups for portable engine generators would be provided at two locations. Project locations include the San Pedro Valve Lot, Millbrae Facility, San Antonio and Calaveras Reservoirs, Alameda West Portal, and Harry Tracy WTP (SFPUC, 2005b).	*Direct*: Calaveras Dam (SV-2) *Indirect*: All Sunol Valley Region projects, Baden and San Pedro Valve Lots (PN-1), HTWTP Long-Term (PN-3), SAPL 3 Installation (SF-1)	Construction-related traffic on local access roads and associated air quality and noise impacts; wildland fire hazards	2008–2010
SVP-15	CCSF (SFPUC)	Sunol Bridge Replacement	Replacement of existing wooden bridge in a remote area of East Bay Regional Park District lands (SFPUC, 2006).	*Indirect*: All Sunol Valley Region projects	Construction-related traffic on Calaveras Road and associated air quality and noise impacts; wildland fire hazards	TBD
SVP-16 **(not shown on figure)**	CCSF (SFPUC)	Alameda Watershed Habitat Conservation Plan	Preparation of a land use and biological planning document to provide comprehensive, long-term conservation measures for species listed as threatened or endangered under the endangered species acts, or for species that could be listed in the future. The plan would identify SFPUC watershed operations and maintenance activities to be covered, with the intent of mitigating the potential effects of these covered activities on covered species through implementation of a conservation program (SFPUC, 2007b).	*Indirect*: All Sunol Valley Region projects	Biological resources impacts; water quality impacts; construction-related traffic on local access roads	2008-2009

[a] A WSIP facility that, in conjunction with the cumulative project, could contribute to a potential cumulative impact, depending on construction timing or affected resources.
[b] Construction schedules for non-SFPUC projects were estimated based on information obtained in project-related documents such as initial studies and EIRs; city, county, and regional agency websites; and interviews with representatives from local jurisdictions or regional agencies. In some cases, project schedules could not be estimated from these sources, but the projects were in sufficient stages of planning to be considered likely to start or complete construction before 2014, the planning horizon for construction of WSIP facilities. The schedules for these projects are listed as "TBD" (To Be Determined). The estimated schedules are based on the most current information available during preparation of this PEIR (as of July 2006). However, as with all proposed development projects, estimated construction schedules are subject to revisions and delays and therefore could vary from the time periods indicated.

TABLE 4.17-3
CUMULATIVE PROJECTS AND IMPACTS RELATED TO WSIP FACILITIES IN THE BAY DIVISION REGION

Cumulative Project No.	Jurisdiction	Project Name	Project Description	Potentially Contributing WSIP Project[a]	Potential Cumulative Impact Topics	Estimated Construction Schedule[b]
Other Non-SFPUC Planned or Approved Projects in the Bay Division Region (Public and Private Developments)						
BDC-1	City of Fremont	BART Extension to Warm Springs	A 5.4-mile extension of the BART Fremont line to the Warm Springs district of Fremont, with an optional station in the Irvington district (ACTIA, 2007).	BDPL Reliability Upgrade (BD-1), BDPL 3 and 4 Seismic Upgrade at Hayward Fault (BD-3)	Construction-related land use impacts; increased surface runoff and water quality impacts; traffic impacts on local roads (near Paseo Padre Parkway and other nearby major arterials) and Union Pacific railroad tracks; associated air quality and noise impacts	2005–2010
BDC-2	City of Fremont	Walnut Avenue Mixed Use Project	Construction of 159 residential units and 7,000 square feet of commercial space on a 3.89-acre vacant parcel in the Central Business District (Pullen, 2005).	BDPL Reliability Upgrade (BD-1)	Increased surface runoff and water quality impacts; construction-related traffic impacts on local roads (e.g., Mowry Boulevard and Paseo Parkway) and associated air quality and noise impacts	TBD
BDC-3	City of Fremont	Patterson Ranch	Mixed-use development on a 430-acre site in northern Fremont, west of I-880; uses not established yet; replaces portion of historic Patterson Ranch (Pullen, 2005).	BDPL Reliability Upgrade (BD-1)	Impacts on sensitive habitats and species; increased surface runoff and water quality impacts; historical and cultural resource impacts; construction-related traffic impacts on regional roads (e.g., I-880 corridor) and associated air quality and noise impacts	TBD
BDC-4	City of Newark	Home Depot Project	Construction of a new store containing 107,500 square feet on a 12.25-acre site that replaces a Kmart on Thornton, east of Cedar Boulevard (City of Newark, 2007).	BDPL Reliability Upgrade (BD-1)	Construction-related traffic impacts on regional roads (e.g., I-880, I-880/Mowry Avenue interchange, BDPL alignment crossing on Cedar Boulevard at Mowry Avenue) and associated air quality and noise impacts	2006–2008
BDC-5	City of Newark	NewPark Mall Renovation	Interior and exterior mall renovation, three new restaurant sites, and the addition of a 20-screen movie theater (New Park Mall, 2007).	BDPL Reliability Upgrade (BD-1)	Construction-related traffic impacts on regional roads (e.g., I-880, I-880/Mowry Avenue interchange) and associated air quality and noise impacts	2007–2010
BDC-6	Alameda County	I-680 Smart Lanes	Construction of improvements to provide SMART lanes along I-680 from Highway 84 in Alameda County to Santa Clara County line. SMART lanes allow carpools to travel free of charge, and low-occupancy vehicles to travel for a fee (ACTIA, 2006).	New Irvington Tunnel (SV-4), BDPL Reliability Upgrade (BD-1)	Water quality impacts; traffic impacts on regional roads (e.g., I-680 corridor in Alameda County) and associated air quality and noise impacts	2007–2010
BDC-7	City of Newark	Ohlone College Newark Center for Heal Sciences and Technology	Construction of 135,000-gross-square-foot campus with capacity for 3,500 students in four buildings on an 81-acre site on Cherry Street, southwest of the BDPL No. 1 alignment, east of Mowry Avenue (Ohlone College, 2007).	BDPL Reliability Upgrade (BD-1)	Increased surface runoff and water quality impacts; construction-related traffic impacts on regional roads (e.g., I-880, I-880/Mowry Avenue interchange) and associated air quality and noise impacts	2006–2009

TABLE 4.17-3 (Continued)
CUMULATIVE PROJECTS AND IMPACTS RELATED TO WSIP FACILITIES IN THE BAY DIVISION REGION

Cumulative Project No.	Jurisdiction	Project Name	Project Description	Potentially Contributing WSIP Project[a]	Potential Cumulative Impact Topics	Estimated Construction Schedule[b]
Other Non-SFPUC Planned or Approved Projects in the Bay Division Region (Public and Private Developments) (cont.)						
BDC-8	City of Fremont	Mission Boulevard/ Warren Avenue/ I-880 Interchange Reconstruction – Phases 1b and 2	Reconstruction of interchange to improve traffic between I-880 and I-680 along Mission Boulevard. Phase 1 high-occupancy-vehicle lanes completed. Phase 1b would rebuild on-/off-ramps between Mission Boulevard and Kato Road with a landscape project. Phase 2 is a City of Fremont project to construct a grade separation at Warren Avenue for BART Warm Springs service (City of Fremont, 2007).	BDPL 3 and 4 Seismic Upgrade at Hayward Fault (BD-3)	Construction-related traffic impacts on regional roads (e.g., I-880 corridor) and associated air quality and noise impacts	Phase 1b: 2005–2008 Phase 2: TBD
BDC-9	City of Fremont	Cisco Field (Oakland A's Ballpark)	Preliminary proposal for a 32,000 to 35,000-seat open-air baseball facility with 9,000 parking spaces on a 140-acre parcel located west of I-880 near Auto Mall Parkway (Oakland Athletics, 2007).	Direct: BDPL Reliability Upgrade (BD-1), BDPL 3 and 4 Crossovers (BD-2) Indirect: All Bay Division Region projects	Increased surface runoff and water quality impacts; construction-related and operational (seasonal) traffic impacts on regional roads (e.g., I-880 and Highway 101, and major interchanges in vicinity) and associated air quality and noise impacts; potential nighttime lighting effects	2007–2010
BDC-10	North San Jose	N. Montague Expressway, West of 1st Street	Development of 620 single-family units on an 11-acre site (City of San Jose, 2007).	BDPL 3 and 4 Crossovers (BD-2)	Redirection of flood flows within 100-year floodplain between Guadalupe River and Coyote Creek; increased surface runoff and water quality impacts on Guadalupe River; construction-related traffic on regional roads and associated air quality and noise impacts; cultural (archaeological) impacts; impacts on Coyote Creek (alternate site)	2008–2010
BDC-11	North San Jose	BEA Systems North 1st Street/ Component Drive	Construction of 859,890-square-foot research and development office buildings on a 25.5-acre site (City of San Jose, 2007)	BDPL 3 and 4 Crossovers (BD-2)	Redirection of flood flows within 100-year floodplain between Guadalupe River and Coyote Creek; increased surface runoff and water quality impacts on Adobe Creek and Guadalupe River; construction-related traffic impacts on regional roads and associated air quality and noise impacts	2008–2011
BDC-12	North San Jose	Montague Expressway/ Trimble Road	Development of 208,000 square feet of research and development space in five buildings on a 6.8-acre site (City of San Jose, 2007).	BDPL 3 and 4 Crossovers (BD-2)	Redirection of flood flows within 100-year floodplain between Guadalupe River and Coyote Creek; increased surface runoff and water quality impacts on Adobe Creek and Guadalupe River; construction-related traffic impacts on regional roads and associated air quality and noise impacts	2009–2012

TABLE 4.17-3 (Continued)
CUMULATIVE PROJECTS AND IMPACTS RELATED TO WSIP FACILITIES IN THE BAY DIVISION REGION

Cumulative Project No.	Jurisdiction	Project Name	Project Description	Potentially Contributing WSIP Project[a]	Potential Cumulative Impact Topics	Estimated Construction Schedule[b]
Other Non-SFPUC Planned or Approved Projects in the Bay Division Region (Public and Private Developments) (cont.)						
BDC-13	North San Jose	Baypointe Parkway between Zanker Road and Tasman Drive	Rezoning for development of 636 attached residences and 12,000 square feet of commercial space on a 10.2-acre site (City of San Jose, 2007).	BDPL 3 and 4 Crossovers (BD-2)	Redirection of flood flows within 100-year floodplain between Guadalupe River and Coyote Creek; increased surface runoff and water quality impacts on Guadalupe River; construction-related traffic impacts on regional roads and associated air quality and noise impacts	TBD
BDC-14	North San Jose / Alviso	Los Esteros Critical Energy Facility Expansion	Expansion to convert existing simple-cycle Los Esteros facility to a combined-cycle generation station capable of producing 320 megawatts (California Energy Commission, 2006).	BDPL 3 and 4 Crossovers (BD-2)	Construction-related traffic impacts on regional roads and associated air quality and noise impacts; operational regional air quality impacts; potential water quality impacts on Coyote Creek	2007–2009
BDC-15	City of Santa Clara	49er Stadium Complex	Construction of new 49ers' football stadium complex on 40 acres northeast of existing Paramount Great American Theme Park. Conceptual design includes 68,000+ seat stadium, three-floor garage (2,000 spaces), 7,000-seat amphitheater, two eight-story office towers with ground-floor retail, and a restaurant (Forty Niners, 2007).	Direct: BDPL 3 and 4 Crossovers (BD-2) Indirect: All Bay Division Region projects	Increased surface runoff and water quality impacts; construction-related and operational traffic impacts on regional roads (e.g., I-880 and Highway 101, and major interchanges in vicinity) and associated air quality and noise impacts; potential nighttime lighting effects	2007–2012
BDC-16	City of Palo Alto	Charleston-Arastradero Corridor Project	Trial demonstration traffic-calming project on Arastradero and Charleston between Miranda Avenue and Fabian Way. A new school-only right-turn lane for westbound vehicles was constructed at Gunn Hill High School in May 2006. Final project decision in June 2008 (City of Palo Alto, 2007).	BDPL 3 and 4 Crossovers (BD-2)	Effects on operational traffic in immediate vicinity of Barron Creek site during two-year trial period; potential for permanent right-turn lane and additional traffic-calming improvements after 2008	2006–2008+
BDC-17	Cities of Redwood City, Menlo Park, Newark, Fremont	Dumbarton Rail Corridor Project	Construction of a 20.5-mile commuter rail service corridor beginning along the Southern Pacific line in Redwood City and extending east to stations in Menlo Park, Newark, and Fremont, and terminating at the Union City BART station. Service would link Caltrain, the Altamont Commuter Express, Amtrak Capitol Corridor, and BART (San Mateo County Transit Authority, 2004).	BDPL Reliability Upgrade (BD-1)	Impacts on sensitive habitats and species; water quality and flood hazards; construction-related land use, traffic, noise/vibration, and air quality impacts near at-grade crossings in Menlo Park and East Palo Alto (Marsh Road, Chilco Street [south of Belle Haven School], University Avenue, Willow Road), Newark (Cherry Street, Cedar Street), and Fremont (Blacow Road); construction-related traffic impacts on regional roads and associated air quality and noise impacts; cultural (archaeological) impacts	2008–2010

TABLE 4.17-3 (Continued)
CUMULATIVE PROJECTS AND IMPACTS RELATED TO WSIP FACILITIES IN THE BAY DIVISION REGION

Cumulative Project No.	Jurisdiction	Project Name	Project Description	Potentially Contributing WSIP Project[a]	Potential Cumulative Impact Topics	Estimated Construction Schedule[b]
Other Non-SFPUC Planned or Approved Projects in the Bay Division Region (Public and Private Developments) (cont.)						
BDC-18	City of East Palo Alto	Core Development Company	Construction of 178 condominium units on a 2.63-acre site (Banico, 2005).	BDPL Reliability Upgrade (BD-1)	Increased surface runoff and water quality impacts; construction-related traffic impacts on local roads (e.g., University Avenue, University Avenue/ Highway 101 interchange, University Avenue/Bay Expressway ramp – Highway 84) and associated air quality and noise impacts	TBD
BDC-19	City of East Palo Alto	University Palms	Construction of 183,200 square feet of office, 13,280 square feet of restaurant, and 3,280 square feet of retail space with residential units above (Banico, 2005).	BDPL Reliability Upgrade (BD-1)	Increased surface runoff and water quality impacts; construction-related traffic impacts on local/regional roads (e.g., University Avenue, University Avenue/ Highway 101 interchange, University Avenue/Bay Expressway ramp – Highway 84) and associated air quality and noise impacts	TBD
BDC-20	City of East Palo Alto	Tara Road Office Condominium	Construction of 60,000-square-foot office condominium on a 4.85-acre site, replacing salvage yards and vehicle storage area (Banico, 2005).	BDPL Reliability Upgrade (BD-1)	Increased surface runoff and water quality impacts; construction-related traffic impacts on local/regional roads (e.g., University Avenue, University Avenue/Highway 101 interchange, University Avenue/Highway 84 interchange) and associated air quality and noise impacts; hazardous materials disposal	TBD
BDC-21	City of Palo Alto	PG&E 230 kV Transmission Line	Development of 230-kilovolt transmission line extending between Highway 84 and Highway 101 in Palo Alto (Banico, 2005).	BDPL Reliability Upgrade (BD-1), BDPL 3 and 4 Crossovers (BD-2)	Impacts on sensitive habitats and species; construction-related traffic impacts on regional roads and associated air quality and noise impacts	2010–2012
BDC-22	City of Menlo Park	Independence Drive/ Constitution Drive	Development of a 514,543-square-foot office, 125-room hotel, fitness center, and restaurant facilities on two sites totaling 13.5 acres (Banico, 2005).	BDPL Reliability Upgrade (BD-1)	Increased surface runoff and water quality impacts; construction-related traffic impacts on local/regional roads (e.g., Marsh Road at crossing of BD-1 and at Highway 101/Marsh Road interchange) and associated air quality and noise impacts	2009–2012
BDC-23	City of Redwood City	Abbott Laboratories West Coast Research Center 1 Cardinal Way	Construction of a 541,077-square-foot lab and research facility on a former salt pile on Redwood City's bayfront (City of Redwood City, 2003a).	BDPL Reliability Upgrade (BD-1)	Increased surface runoff and water quality impacts; construction-related traffic impacts on local/regional roads (e.g., at Woodside Road/Highway 101 interchange) and associated air quality and noise impacts	2004–2014

TABLE 4.17-3 (Continued)
CUMULATIVE PROJECTS AND IMPACTS RELATED TO WSIP FACILITIES IN THE BAY DIVISION REGION

Cumulative Project No.	Jurisdiction	Project Name	Project Description	Potentially Contributing WSIP Project[a]	Potential Cumulative Impact Topics	Estimated Construction Schedule[b]
Other Non-SFPUC Planned or Approved Projects in the Bay Division Region (Public and Private Developments) (cont.)						
BDC-24	City of Redwood City	Kaiser Hospital Master Plan	Long-range development of approximately 960,000 gsf of medical center uses, and 1.032 gsf of parking, including replacement of existing hospital to meet state seismic safety mandate (City of Redwood City, 2003b).	BDPL Reliability Upgrade (BD-1)	Increased surface runoff and water quality impacts; construction-related traffic impacts on local/regional roads (e.g., Highway 101 interchanges with Whipple Avenue and Woodside Road) with associated air quality and noise impacts; and improved seismic safety and reliability of critical public facilities	2009-2014
BDC-25	City of Redwood City	Stanford Outpatient Center Project	Renovation and conversion of four commercial buildings in the Midpoint Technology Park office and research and development campus to create a new hospital outpatient center totaling 369,500 square feet (City of Redwood City, 2006).	BDPL Reliability Upgrade (BD-1)	Increased surface runoff and water quality impacts; construction-related traffic impacts on local/regional roads (e.g., at Woodside Road/ Highway 101 interchange) and associated air quality and noise impacts	2007-2009
BDC-26	California Department of Fish and Game and U.S. Fish and Wildlife Service	South Bay Salt Pond Restoration Project	Tidal wetland restoration project that would convert 15,100 acres of commercial salt ponds at the south end of San Francisco Bay to a mix of tidal marsh, mudflat, and other wetland habitats. The state and federal governments purchased the property from Cargill Salt. The project calls for an eight-year initial stewardship phase followed by long-tem implementation. Project is currently in the initial stages of environmental review (South Bay Salt Pond Restoration Project, 2007).	*Direct*: BDPL Reliability Upgrade (BD-1) *Indirect*: All Bay Division Region projects that affect water courses discharging into South Bay	Potential impacts (both positive and negative) on sensitive habitat and species associated with San Francisco Bay; potential construction-related effects on hydrology, sensitive habitats, and bayside recreation and open space activities during tunnel construction	2006–2014+
Other SFPUC Projects on Bay Division Pipeline Nos. 1 and 2						
BDP-1	CCSF (SFPUC)	BDPL2A Pipeline Inspection (A10 to A20)	Bay Division Pipeline 2A pipeline inspection (SFPUC, 2006).	BDPL Reliability Upgrade (BD-1); New Irvington Tunnel (SV-4)	Treated water discharges; construction-related traffic impacts on local access roads and associated air quality and noise impacts	2010–2011
BDP-2	CCSF (SFPUC)	BDPL1A Pipeline Inspection (B10 to B20)	Bay Division Pipeline 1A pipeline inspection (SFPUC, 2006).	BDPL Reliability Upgrade (BD-1); New Irvington Tunnel (SV-4)	Treated water discharges; construction-related traffic impacts on local access roads and associated air quality and noise impacts	2009
BDP-3	CCSF (SFPUC)	BDPL2B Pipeline Inspection (A20 to A30)	Bay Division Pipeline 2B pipeline inspection (SFPUC, 2006).	BDPL Reliability Upgrade (BD-1)	Treated water discharges; construction-related traffic impacts on local access roads and associated air quality and noise impacts	2008

TABLE 4.17-3 (Continued)
CUMULATIVE PROJECTS AND IMPACTS RELATED TO WSIP FACILITIES IN THE BAY DIVISION REGION

Cumulative Project No.	Jurisdiction	Project Name	Project Description	Potentially Contributing WSIP Project[a]	Potential Cumulative Impact Topics	Estimated Construction Schedule[b]
Other SFPUC Projects on Bay Division Pipeline Nos. 1 and 2 (cont.)						
BDP-4	CCSF (SFPUC)	BDPL1B Pipeline Inspection (B20 to B30)	Bay Division Pipeline 1B pipeline inspection (SFPUC, 2006).	BDPL Reliability Upgrade (BD-1)	Treated water discharges; construction-related traffic impacts on local access roads and associated air quality and noise impacts	2010
BDP-5	CCSF (SFPUC)	BDPL1C Pipeline Inspection (A41 to A50)	Bay Division Pipeline 1C pipeline inspection (SFPUC, 2006).	BDPL Reliability Upgrade (BD-1)	Treated water discharges; construction-related traffic impacts on local access roads and associated air quality and noise impacts	2007
BDP-6	CCSF (SFPUC)	BDPL2C Pipeline Inspection (B41 to B60)	Bay Division Pipeline 2C pipeline inspection (SFPUC, 2006).	BDPL Reliability Upgrade (BD-1)	Treated water discharges; construction-related traffic impacts on local access roads and associated air quality and noise impacts	2012
BDP-7	CCSF (SFPUC)	BDPL1D Pipeline Inspection (A50 to A60)	Bay Division Pipeline 1D pipeline inspection (SFPUC, 2006).	BDPL Reliability Upgrade (BD-1)	Treated water discharges; construction-related traffic impacts on local access roads and associated air quality and noise impacts	2007
BDP-8	CCSF (SFPUC)	BDPL1E Pipeline Inspection (A60 to A70)	Bay Division Pipeline 1E pipeline inspection (SFPUC, 2006).	BDPL Reliability Upgrade (BD-1)	Treated water discharges; construction-related traffic impacts on local access roads and associated air quality and noise impacts	2011
BDP-9	CCSF (SFPUC)	BDPL2D Pipeline Inspection (B60 to B70)	Bay Division Pipeline 2D pipeline inspection (SFPUC, 2006).	BDPL Reliability Upgrade (BD-1)	Treated water discharges; construction-related traffic impacts on local access roads and associated air quality and noise impacts	2006–2007
Other SFPUC Projects on Bay Division Pipeline Nos. 3 and 4						
BDP-10	CCSF (SFPUC)	BDPL3A Seismic Upgrade (C10 to C21)	Compressive slip joint repair to existing seismic joint on BDPL No. 3. Work would be conducted within existing vault in the vicinity of I-680 on-ramp (SFPUC, 2006).	BDPL Reliability Upgrade (BD-1); New Irvington Tunnel (SV-4)	Construction-related traffic impacts on local access roads and associated air quality and noise impacts	Completed 2006
BDP-11	CCSF (SFPUC)	BDPL4A Seismic Upgrade (D10 to D20)	Compressive slip-joint repair of an existing seismic joint on Bay Division Pipeline No. 4. Work would be conducted within existing vault in the vicinity of the I-680 on-ramp (SFPUC, 2006).	BDPL Reliability Upgrade (BD-1); New Irvington Tunnel (SV-4)	Construction-related traffic impacts on local access roads and associated air quality and noise impacts	2006
BDP-12	CCSF (SFPUC)	BDPL Nos. 3 and 4 Crossover/Isolation Valve at Hayward Fault	Planning, design, and construction of shutoff and crossover facilities on Bay Division Pipelines Nos. 3 and 4 they cross the Hayward fault (SFPUC, 2005b).	BDPL 3 and 4 Seismic Upgrade at Hayward Fault (BD-3)	Treated water discharges; construction-related traffic impacts on local access roads and associated air quality and noise impacts	2006–2008

TABLE 4.17-3 (Continued)
CUMULATIVE PROJECTS AND IMPACTS RELATED TO WSIP FACILITIES IN THE BAY DIVISION REGION

Cumulative Project No.	Jurisdiction	Project Name	Project Description	Potentially Contributing WSIP Project[a]	Potential Cumulative Impact Topics	Estimated Construction Schedule[b]
Other SFPUC Projects on Bay Division Pipeline Nos. 3 and 4 (cont.)						
BDP-13	CCSF (SFPUC)	BDPL3D Pipeline Inspection (C50 to C70)	Bay Division Pipeline 3D pipeline inspection (SFPUC, 2006).	BDPL 3 and 4 Crossovers (BD-2)	Treated water discharges; construction-related traffic impacts on local access roads and associated air quality and noise impacts	2008
BDP-14	CCSF (SFPUC)	BDPL4D PCCP Pipeline Inspection (D50 to D70)	Bay Division Pipeline 4D PCCP pipeline inspection (SFPUC, 2006).	BDPL 3 and 4 Crossovers (BD-2)	Treated water discharges; construction-related traffic impacts on local access roads and associated air quality and noise impacts	2008–2009
Other SFPUC Projects in the Bay Division Region						
BDP-15	CCSF (SFPUC)	Peninsula Sportsmen's Club	Environmental remediation of former gun club located in East Palo Alto (SFPUC, 2006).	BDPL Reliability Upgrade (BD-1)	Overlapping construction at project site; construction-related traffic on local access roads and associated air quality and noise impacts	2007
BDP-16 **(not shown on figure)**	CCSF (SFPUC)	New Electrical Transmission Line from Newark to San Francisco	Planning, permitting, design, and construction of 50 miles of new 115-kilovolt electrical transmission line from Newark to San Francisco, and construction of a new substation (SFPUC, 2006).	BDPL Reliability Upgrade (BD-1)	Construction-related traffic impacts on local access roads; construction air quality and noise impacts and associated air quality and noise impacts	2012–2014 (Estimated)

[a] A WSIP facility that, in conjunction with the cumulative project, could contribute to a potential cumulative impact, depending on construction timing or affected resources.
[b] Construction schedules for non-SFPUC projects were estimated based on information obtained in project-related documents such as initial studies and EIRs; city, county, and regional agency websites; and interviews with representatives from local jurisdictions or regional agencies. In some cases, project schedules could not be estimated from these sources, but the projects were in sufficient stages of planning to be considered likely to start or complete construction before 2014, the planning horizon for construction of WSIP facilities. The schedules for these projects are listed as "TBD" (To Be Determined). The estimated schedules are based on the most current information available during preparation of this PEIR (as of July 2006). However, as with all proposed development projects, estimated construction schedules are subject to revisions and delays and therefore could vary from the time periods indicated.

TABLE 4.17-4
CUMULATIVE PROJECTS AND IMPACTS RELATED TO WSIP FACILITIES IN THE PENINSULA REGION

Cumulative Project No.	Jurisdiction	Project Name	Project Description	Potentially Contributing WSIP Projects[a]	Potential Cumulative Impact Topics	Estimated Construction Schedule[b]
Other Non-SFPUC Planned or Approved Projects in the Peninsula Region (Public and Private Developments)						
PNC-1	San Mateo County	PG&E Jefferson Martin Transmission Line	Implementation of a mitigation monitoring program including restoration of wetlands, sensitive habitats, and special-status species along the eastern portion of Crystal Springs Reservoir. Transmission line completed in April 2006 (CPUC, 2003; Masuoka, 2006).	CS/SA Transmission (PN-2), Lower Crystal Springs Dam (PN-4), Pulgas Balancing Reservoir (PN-5)	Effects on wetlands, sensitive habitats and species, trails and passive uses, scenic views, scenic resources, historic resources	2006–2009+
PNC-2	San Mateo County	San Mateo County Crystal Springs Road Bridge Replacement	Seismic replacement of roadbridge on Crystal Springs Road extending across the crest of the Lower Crystal Springs Dam (PN-4). The roadbridge replacement is planned during construction of the Lower Crystal Springs Dam (PN-4) project (Clarke, 2007).	CS/SA Transmission (PN-2), Lower Crystal Springs Dam (PN-4), Pulgas Balancing Reservoir (PN-5)	Temporary construction-related traffic impacts on Highway 92 and I-280 and associated air quality and noise impacts; scenic view impacts; biological resources	2010–2011
PNC-3	City of San Bruno	The Crossings El Camino Real at I-380	Phased project on former Navy site (prior housing and administrative uses), including construction of 185-unit apartment facility (under construction); 228 units of senior apartments (under construction); and 350 units consisting of 187 condominium and 163 apartment units (approval pending) (City of San Bruno, 2006).	Baden and San Pedro Valve Lots (PN-1)	Increased surface runoff and water quality impacts; construction-related traffic impacts on local/regional roads (e.g., at I-380/El Camino Real and I-280/San Bruno interchanges) and associated air quality and noise impacts	2005–2010+
PNC-4	City of San Bruno	San Bruno Caltrain Grade Separation Project	Construction of new Caltrain station in downtown San Bruno to improve safety. Project includes elevated tracks, four street underpasses, and pedestrian underpasses to improve pedestrian bicyclists and vehicle safety at track crossings (City of San Bruno, 2006).	Baden and San Pedro Valve Lots (PN-1)	Increased surface runoff and water quality impacts; construction-related traffic impacts on local/regional roads (e.g., at I-380/El Camino Real and I-280/San Bruno interchanges) and associated air quality and noise impacts	2007–2009
Other SFPUC Projects at the Harry Tracy Water Treatment Plant						
PNP-1a	CCSF (SFPUC)	HTWTP Programmable Logic Controller Program	Work on Programmable Logic Controller (a commercial computer that controls operations within the Harry Tracy WTP filter plant) and installation of pipes in the clarifier (a sludge or treatment residuals thickening tank to help in mixing) (SFPUC, 2006).	HTWTP Long-Term (PN-3)	Construction-related traffic impacts on access roads and associated air quality and noise impacts	TBD
PNP-1b	CCSF (SFPUC)	HTWTP Power Modifications	Electrical installation for existing water pumps 101, 102, and 103 at the Harry Tracy WTP (SFPUC, 2006).	HTWTP Long-Term (PN-3)	Construction-related traffic impacts on access roads and associated air quality and noise impacts	TBD

TABLE 4.17-4 (Continued)
CUMULATIVE PROJECTS AND IMPACTS RELATED TO WSIP FACILITIES IN THE PENINSULA REGION

Cumulative Project No.	Jurisdiction	Project Name	Project Description	Potentially Contributing WSIP Projects[a]	Potential Cumulative Impact Topics	Estimated Construction Schedule[b]
Other SFPUC Projects at the Harry Tracy Water Treatment Plant (cont.)						
PNP-1c	CCSF (SFPUC)	HTWTP Water Tanks Slope Study	Study to analyze the stability of hillsides near water tanks located at the Harry Tracy WTP (SFPUC, 2006).	HTWTP Long-Term (PN-3)	Impacts on sensitive habitat and species; construction-related traffic impacts on access roads and associated air quality and noise impacts	TBD
PNP-1d	CCSF (SFPUC)	HTWTP Northern Drainage Repairs	Project would plug the northern drainage line and redirect storm water into newly constructed storm drain system. Work would include excavation of the drain line within the fenced filter plant property, which is off-limits to the public (SFPUC, 2006).	HTWTP Long-Term (PN-3)	Impacts on sensitive habitat and species; stormwater runoff impacts; construction-related traffic impacts on access roads and associated air quality and noise impacts	Completed 2006
PNP-1e	CCSF (SFPUC)	HTWTP Raw Water Pipeline #3 Inspection	Inspection of one of two pipelines supplying the Harry Tracy WTP with lake water. Small permitted discharge of lake water to creek (SFPUC, 2006).	HTWTP Long-Term (PN-3)	Treated water discharges; construction-related traffic impacts on access roads and associated air quality and noise impacts	2009
PNP-1f	CCSF (SFPUC)	HTWTP External UPS Study	Study to either install external bypass switches or replace the Uninterruptible Power Supply (UPS). After the study, work would entail minor installation of electrical switches on plant equipment or replacement of power supplies on the same equipment (SFPUC, 2006).	HTWTP Long-Term (PN-3)	Construction-related traffic impacts on access roads and associated air quality and noise impacts	TBD
PNP-1g	CCSF (SFPUC)	HTWTP – Short-Term Improvements	Replacement and upgrade of the filtration system at the Harry Tracy WTP to increase the reliability and efficiency of the treatment process during normal raw water conditions (SFPUC, 2005b).	HTWTP Long-Term (PN-3)	Construction-related traffic impacts on access roads and associated air quality and noise impacts.	2006–2010
Other SFPUC Projects in the Peninsula Region						
PNP-2	CCSF (SFPUC)	Pulgas Pump Station – Alternate Power Source	Alternatives analysis to determine best way to provide alternative power to gate valves and pressure-reducing valve in Pulgas Pump Station. Installation of electrical conduit between chemical treatment facility and pump station (SFPUC, 2006).	Pulgas Balancing Reservoir (PN-5)	Construction-related traffic impacts on access roads and associated air quality and noise impacts	TBD
PNP-3	CCSF (SFPUC)	Crystal Springs Pump Station Temperature Alarms	Construction of bearing temperature alarms, which includes minor installation of electrical sensors on existing electric pump motors in the Crystal Springs Pump Station building (SFPUC, 2006).	CS/SA Transmission (PN-2), Lower Crystal Springs Dam (PN-4)	Construction-related traffic impacts on access roads and associated air quality and noise impacts; wildland fire hazards	TBD

TABLE 4.17-4 (Continued)
CUMULATIVE PROJECTS AND IMPACTS RELATED TO WSIP FACILITIES IN THE PENINSULA REGION

Cumulative Project No.	Jurisdiction	Project Name	Project Description	Potentially Contributing WSIP Projects[a]	Potential Cumulative Impact Topics	Estimated Construction Schedule[b]
Other SFPUC Projects in the Peninsula Region (cont.)						
PNP-4	CCSF (SFPUC Water)	Pilarcitos Pipeline Inspection	Pilarcitos pipeline inspection (SFPUC, 2006).	CS/SA Transmission (PN-2)	Treated water discharges; construction-related traffic impacts on access roads and associated air quality and noise impacts; wildland fire hazards	2015
PNP-5	CCSF (SFPUC Water)	Ingoing Road and Pilarcitos Pipeline Replacement	Replacement of the Pilarcitos Pipeline west of San Andreas Dam to Portola Comfort station (SFPUC, 2006).	CS/SA Transmission (PN-2)	Impacts on sensitive habitat and species; water quality impacts; construction-related traffic impacts on access roads and associated air quality and noise impacts; wildland fire hazards	TBD
PNP-6	CCSF (SFPUC Water)	Baden Pump Station – Pump No. 3 Starter Modifications	Minor electrical modification to existing motor control starter in existing Baden Pump Station (SFPUC, 2006).	Baden and San Pedro Valve Lots (PN-1)	Construction-related traffic impacts on access roads and associated air quality and noise impacts	TBD
PNP-7	CCSF (SFPUC Water)	San Andreas Reservoir – 28" Pilarcitos Pipeline	Replacement of a section of pipeline from Pilarcitos Reservoir within the SFPUC Peninsula watershed (SFPUC, 2006).	CS/SA Transmission (PN-2)	Impacts on sensitive habitat and species; water quality impacts; construction-related traffic impacts on access roads and associated air quality and noise impacts; wildland fire hazards	2007 -2010
PNP-8	CCSF (SFPUC Water)	San Pedro Valve Lot – Drainage Improvement	Improvement of drainage at the existing San Pedro Valve Lot; all work would take place within the valve lot fence line (SFPUC, 2006).	Baden and San Pedro Valve Lots (PN-1), SAPL 3 Installation (SF-1)	Stormwater runoff impacts; construction-related traffic impacts on access roads and associated air quality and noise impacts	2006–2007
PNP-9	CCSF (SFPUC)	Adit Leak Repair – Crystal Springs Reservoir	Repair of leakage and associated damage to existing adit structures (outlet facilities) in Lower Crystal Springs Reservoir and Calaveras Dam (SFPUC, 2005b).	*Direct*: CS/SA Transmission (PN-2), Lower Crystal Springs Dam (PN-4), Calaveras Dam (SV-2) *Indirect*: All Sunol Valley Region projects	Construction-related traffic impacts on access roads and associated air quality and noise impacts; wildland fire hazards	2007–2008

TABLE 4.17-4 (Continued)
CUMULATIVE PROJECTS AND IMPACTS RELATED TO WSIP FACILITIES IN THE PENINSULA REGION

Cumulative Project No.	Jurisdiction	Project Name	Project Description	Potentially Contributing WSIP Projects[a]	Potential Cumulative Impact Topics	Estimated Construction Schedule[b]
Other SFPUC Projects in the Peninsula Region (cont.)						
PNP-10	CCSF (SFPUC)	New Crystal Springs Bypass Tunnel	Construction of a new tunnel to increase seismic reliability and increase delivery reliability, including construction of a new 4,200-foot-long, 8-foot-diameter tunnel; north and south access shafts approximately 15 and 30 feet in diameter, respectively; and north and south connection pipes, standby power facilities, and valve vaults (SFPUC, 2005b).	CS/SA Transmission (PN-2), Lower Crystal Springs Dam (PN-4)	Construction-related traffic on local access roads and associated air quality and noise impacts; wildland fire hazards; visual impacts; impacts on sensitive habitat and species	2007–2010
PNP-11	CCSF (SFPUC)	Pipeline Repair and Readiness Improvements	Purchase of materials for emergency repair and improvement of seven storage sites for stockpiling materials necessary to repair pipelines in the event of an emergency. The improvements at each of the storage sites would include grubbing, grading, surfacing, and fencing. Project locations include California Department of Forestry in Sunol (Sunol yard across the street from CDF), Cedar Court in Newark, Ravenswood in East Palo Alto (biological study complete), Donovan Quarry near Hillsborough (biological study complete), Skyline Quarry near Lower Crystal Springs Dam, and Millbrae Yard in Millbrae (SFPUC, 2005b).	BDPL Reliability Upgrade (BD-1), CS/SA Transmission (PN-2), Lower Crystal Springs Dam (PN-4) All Sunol Valley Region projects	Construction-related traffic on local access roads and associated air quality and noise impacts; wildland fire hazards	2006
PNP-12	CCSF (SFPUC Water)	Southern Fuel Break Replacement	Removal of bushes and potential fire fuels from watershed near the Filoli Estate (SFPUC, 2006).	Pulgas Balancing Reservoir (PN-5)	Impacts on sensitive habitat and species; construction-related traffic impacts on access roads and associated air quality and noise impacts	TBD
PNP-13	CCSF (SFPUC)	SA Branch Pipeline Inspection (N42 to M41)	San Andreas Branch pipeline inspection (SFPUC, 2006).	HTWTP Long-Term (PN-3)	Treated water discharges; construction-related traffic impacts on local access roads and associated air quality and noise impacts	2007 -2010
PNP-14	CCSF (SFPUC)	CSPL2 Pipeline Inspection (K10 to K20)	Crystal Springs Pipeline #2 pipeline inspection (SFPUC, 2006).	CS/SA Transmission (PN-2), Lower Crystal Springs Dam (PN-4)	Treated water discharges; construction-related traffic impacts on local access roads and associated air quality and noise impacts	2014
PNP-15	CCSF (SFPUC)	SSPL Pipeline Inspection (M10 to M31)	Sunset Supply Pipeline pipeline inspection (SFPUC, 2006).	CS/SA Transmission (PN-2), Lower Crystal Springs Dam (PN-4)	Treated water discharges; construction-related traffic impacts on local access roads and associated air quality and noise impacts	2012

TABLE 4.17-4 (Continued)
CUMULATIVE PROJECTS AND IMPACTS RELATED TO WSIP FACILITIES IN THE PENINSULA REGION

Cumulative Project No.	Jurisdiction	Project Name	Project Description	Potentially Contributing WSIP Projects[a]	Potential Cumulative Impact Topics	Estimated Construction Schedule[b]
Other SFPUC Projects in the Peninsula Region (cont.)						
PNP-16	CCSF (SFPUC)	CSPL2 Replacement	Repair and replacement of 4.8 miles of the existing Crystal Springs Pipeline No. 2 to improve seismic reliability and address security concerns (SFPUC, 2005b).	Baden and San Pedro Valve Lots (PN-1), CS/SA Transmission (PN-2), Lower Crystal Springs Dam (PN-4)	Construction-related traffic on local access roads and associated air quality and noise impacts; wildland fire hazards	2009–2011
PNP-17	CCSF (SFPUC)	CSPL2 Pipeline Inspection (K40 to K50)	Crystal Springs Pipeline #2 pipeline inspection (SFPUC, 2006).	Baden and San Pedro Valve Lots (PN-1)	Treated water discharges; construction-related traffic impacts on local access roads and associated air quality and noise impacts	2014
PNP-18	CCSF (SFPUC)	CSPL2 Pipeline Inspection (K50 to K60)	Crystal Springs Pipeline #2 pipeline inspection (SFPUC, 2006).	Baden and San Pedro Valve Lots (PN-1)	Treated water discharges; construction-related traffic impacts on local access roads and associated air quality and noise impacts	2014
PNP-19	CCSF (SFPUC)	SSPL Pipeline Inspection (M50 to M60)	Sunset Supply Pipeline pipeline inspection (SFPUC, 2006).	Baden and San Pedro Valve Lots (PN-1), SAPL 3 Installation (SF-1)	Treated water discharges; construction-related traffic impacts on local access roads and associated air quality and noise impacts	2009
PNP-20	CCSF (SFPUC)	CS/SA Pipeline (Force Main) – Temporary Drainage and Pipe Supports Repairs	Repair of supports for pipeline between Crystal Springs Pump Station and San Andreas Reservoir (SFPUC, 2006).	CS/SA Transmission (PN-2), Lower Crystal Springs Dam (PN-4)	Construction-related traffic impacts on local access roads and associated air quality and noise impacts	Completed 2005
PNP-21	CCSF (SFPUC)	CS/SAPL (Force Main) Pipeline Inspection	Crystal Springs/San Andreas Pipeline (force main) pipeline inspection (SFPUC, 2006).	CS/SA Transmission (PN-2), Lower Crystal Springs Dam (PN-4)	Treated water discharges; construction-related traffic impacts on local access roads and associated air quality and noise impacts	2014
PNP-22	CCSF (SFPUC)	SSPL Pipeline Inspection (M40 to M50)	Sunset Supply Pipeline pipeline inspection (SFPUC, 2006).	Baden and San Pedro Valve Lots (PN-1)	Treated water discharges; construction-related traffic impacts on local access roads and associated air quality and noise impacts	2021

TABLE 4.17-4 (Continued)
CUMULATIVE PROJECTS AND IMPACTS RELATED TO WSIP FACILITIES IN THE PENINSULA REGION

Cumulative Project No.	Jurisdiction	Project Name	Project Description	Potentially Contributing WSIP Projects[a]	Potential Cumulative Impact Topics	Estimated Construction Schedule[b]
Other SFPUC Projects in the Peninsula Region (cont.)						
PNP-23	CCSF (SFPUC)	CSPL1 Replacement	Removal of and/or mitigation for Crystal Springs/San Andreas pipes placed in Polhemus Creek when the bypass tunnel is completed (SFPUC, 2005b).	CS/SA Transmission (PN-2), Lower Crystal Springs Dam (PN-4)	Impacts on sensitive habitats and species; water quality; construction-related traffic impacts on local access roads and associated air quality and noise impacts	TBD
PNP-24	CCSF (SFPUC)	Baden Valve Lot and Pump Station Upgrade	Upgrade of pumps, valves, and motors; seismic upgrade of structure; construction of surge protection; construction of emergency power; and installation of perimeter improvements (SFPUC, 2007c).	Baden and San Pedro Valve Lots (PN-1)	Construction-related traffic impacts on local access roads and associated air quality and noise impacts	2002-2005 and 2007-2008
PNP-25	CCSF (SFPUC)	SAPL1 Pipeline Inspection (L40P to P48)	San Andreas Pipeline No. 1 pipeline inspection (SFPUC, 2006).	Baden and San Pedro Valve Lots (PN-1)	Treated water discharges; construction-related traffic impacts on local access roads and associated air quality and noise impacts	2007
PNP-26	CCSF (SFPUC)	SAPL2 Pipeline Inspection (R12 to R50)	San Andreas Pipeline No. 2 pipeline inspection (SFPUC, 2006).	Baden and San Pedro Valve Lots (PN-1)	Treated water discharges; construction-related traffic impacts on local access roads and associated air quality and noise impacts	TBD
PNP-27	CCSF (SFPUC)	SAPL2 Pipeline Inspection (R50 to R60)	San Andreas Pipeline No. 2 pipeline inspection (R50 to R60) (SFPUC, 2006).	Baden and San Pedro Valve Lots (PN-1), SAPL 3 Installation (SF-1)	Treated water discharges; construction-related traffic impacts on local access roads and associated air quality and noise impacts	TBD
PNP-28	CCSF (SFPUC)	SAPL3 Pipeline Inspection (T50 to T60)	San Andreas Pipeline No. 3 pipeline inspection (T50 to T60) (SFPUC, 2006).	Baden and San Pedro Valve Lots (PN-1), SAPL 3 Installation (SF-1)	Treated water discharges; construction-related traffic impacts on local access roads and associated air quality and noise impacts	2010
PNP-29	CCSF (SFPUC)	Pulgas Dechloramination Sampling Station No. 5	Installation of a new prefabricated sampling station over the existing channel to test chloramines residual before discharging to Upper Crystal Springs Reservoir (SFPUC, 2006).	Baden and San Pedro Valve Lots (PN-1), Pulgas Balancing Reservoir (PN-5)	Impacts on sensitive habitats and species; water quality; construction-related traffic impacts on local access roads and associated air quality and noise impacts	2005-2007
PNP-30	CCSF (SFPUC)	Polhemus Creek Restoration	Restoration of Polhemus Creek along Polhemus Road. Rock fill that was placed in the creek on an emergency basis in 1996 would be removed and the creekbed area would be restored (SFPUC, 2007).	CS/SA Transmission (PN-2), Lower Crystal Springs Dam (PN-4)	Impacts on sensitive habitats and species; water quality; construction-related traffic impacts on local access roads and associated air quality and noise impacts	2006–2007

TABLE 4.17-4 (Continued)
CUMULATIVE PROJECTS AND IMPACTS RELATED TO WSIP FACILITIES IN THE PENINSULA REGION

Cumulative Project No.	Jurisdiction	Project Name	Project Description	Potentially Contributing WSIP Projects[a]	Potential Cumulative Impact Topics	Estimated Construction Schedule[b]
Other SFPUC Projects in the Peninsula Region (cont.)						
PNP-31 **(not shown on figure)**	CCSF (SFPUC)	Peninsula Watershed Habitat Conservation Plan	Preparation of a land use and biological planning document to provide comprehensive, long-term conservation measures for species listed as threatened or endangered under the endangered species acts, or for species that could be listed in the future. The plan would identify SFPUC watershed operations and maintenance activities to be covered, with the intent mitigating the potential effects on covered species resulting from these covered activities through implementation of a conservation program (under preparation).	Baden and San Pedro Valve Lots (PN-1), CS/SA Transmission (PN-2), Lower Crystal Springs Dam (PN-4), Pulgas Balancing Reservoir (PN-5)	Biological resources, water quality, construction-related traffic impacts on local access roads and associated air quality and noise impacts	**Implementation within 10 years after adoption of Peninsula WMP**

a A WSIP facility that, in conjunction with the cumulative project, could contribute to a potential cumulative impact, depending on construction timing or affected resources.
b Construction schedules for non-SFPUC projects were estimated based on information obtained in project-related documents such as initial studies and EIRs; city, county, and regional agency websites; and interviews with representatives from local jurisdictions or regional agencies. In some cases, project schedules could not be estimated from these sources, but the projects were in sufficient stages of planning to be considered likely to start or complete construction before 2014, the planning horizon for construction of WSIP facilities. The schedules for these projects are listed as "TBD" (To Be Determined). The estimated schedules are based on the most current information available during preparation of this PEIR (as of July 2006). However, as with all proposed development projects, estimated construction schedules are subject to revisions and delays and therefore could vary from the time periods indicated.

TABLE 4.17-5
CUMULATIVE PROJECTS AND IMPACTS RELATED TO WSIP FACILITIES IN THE SAN FRANCISCO REGION

Cumulative Project No.	Jurisdiction	Project Name	Project Description	Potentially Contributing WSIP Project[a]	Potential Cumulative Impact Topics	Estimated Construction Schedule[b]
Other Non-SFPUC Planned or Approved Projects in the San Francisco Region (Public and Private Developments)						
SFC-1	CCSF (SFPUC)	800 Brotherhood Way	Subdivision of 8.15-acre parcel into 127 lots, including 66 single-family homes, 39 two-unit buildings, and 22 three-unit buildings (CCSF, 2007; Moitra, 2006).	SAPL 3 Installation (SF-1)	Land use effects on recreational uses (Harding Park Municipal Golf Course; construction-related traffic impacts on local streets (e.g., Brotherhood Way) and associated air quality and noise impacts	2007-2008
SFC-2	CCSF (SFPUC)	50 Thomas More Way	Addition of new classroom building and gymnasium at St. Thomas More School (CCSF, 2007; Moitra, 2006).	SAPL 3 Installation (SF-1)	Construction-related traffic impacts on local streets (e.g., Brotherhood Way) and associated air quality and noise impacts	TBD
SFC-3	CCSF (SFPUC)	Stern Grove and Pine Lake Park	Phased implementation of improvements, including redesign of concert area; restoration of historic structures, new and restored playgrounds, and activity areas; infrastructure improvements; and wildlife habitat restoration (CCSF, 2007; Moitra, 2006).	SAPL 3 Installation (SF-1)	Water quality impacts; construction-related traffic impacts on local streets (e.g., Brotherhood Way) and associated air quality and noise impacts	TBD
SFC-4	CCSF (SFPUC)	2800 Sloat Boulevard	Construction of 55-unit residential building with 48 parking spaces in underground garage, and 26,000 gross square feet of ground-floor retail (CCSF, 2007; Moitra, 2006).	SAPL 3 Installation (SF-1)	Construction-related traffic impacts on local streets and associated air quality and noise impacts	TBD
SFC-5	CCSF (SFPUC)	2750 Rivera Street	Construction of new music building with coral room, classrooms, storage, batting cages, and accessory space two blocks south of reservoir (CCSF, 2007; Moitra, 2006).	SAPL 3 Installation (SF-1), Groundwater Projects (SF-2), Recycled Water Projects (SF-3)	Construction-related traffic impacts on local streets and associated air quality and noise impacts	TBD
SFC-6	CCSF (SFPUC)	18th/19th Avenue Traffic Calming Project	Implementation of phased traffic-calming improvements on 18th and 19th Avenues, including sidewalk, intersection, median, and traffic signalization improvements (CCSF, 2007).	SAPL 3 Installation (SF-1), Groundwater Projects (SF-2), Recycled Water Projects (SF-3)	Construction-related traffic impacts on local streets (e.g., 18th and 19th Avenues) and associated air quality and noise impacts	2007-2009+
SFC-7	CCSF (SFPUC)	USF, 2130 Fulton Street	Construction of a 26,000-square-foot addition to McLaren Hall, including office, classroom, and student lounge space (CCSF, 2007; Moitra, 2006).	SAPL 3 Installation (SF-1), Recycled Water Projects (SF-3)	Construction-related traffic impacts on local streets and associated air quality and noise impacts	Under Construction

TABLE 4.17-5 (Continued)
CUMULATIVE PROJECTS AND IMPACTS RELATED TO WSIP FACILITIES IN THE SAN FRANCISCO REGION

Cumulative Project No.	Jurisdiction	Project Name	Project Description	Potentially Contributing WSIP Project[a]	Potential Cumulative Impact Topics	Estimated Construction Schedule[b]
Other SFPUC Projects near the Oceanside Water Treatment Plant						
SFP-1a	CCSF (SFPUC)	OSP HVAC Improvements	HVAC (heating, ventilation, and air conditioning) system improvements of eight process buildings, an administration building, and a parking structure (SFPUC, 2006).	SAPL 3 Installation (SF-1), Groundwater Projects (SF-2), Recycled Water Projects (SF-3)	Construction-related traffic impacts on local access roads and associated air quality and noise impacts	2005–2008
SFP-1b	CCSF (SFPUC)	OSP Digester Mixing Improvements	Modifications or upgrades to internal overflow, withdrawal lines, mixing system, gas collection, and heat exchangers (SFPUC, 2006).	SAPL 3 Installation (SF-1), Groundwater Projects (SF-2), Recycled Water Projects (SF-3)	Construction-related traffic impacts on local access roads and associated air quality and noise impacts	2008–2010
SFP-1c	CCSF (SFPUC)	SWOO Cleaning and Backflow Prevention	Engineering evaluation of saltwater and sediment intrusion and development of a methodology to clean southwest ocean outfall. Installation of backflow prevention devices to eliminate further saltwater and sediment intrusion (SFPUC, 2006).	SAPL 3 Installation (SF-1), Groundwater Projects (SF-2), Recycled Water Projects (SF-3)	Construction-related traffic impacts on local access roads and associated air quality and noise impacts	2000–2009
Other SFPUC Projects in the San Francisco Region						
SFP-2	CCSF (SFPUC)	2nd Avenue/ 4th Avenue/ 12th Avenue Sewer Replacement	Replacement of the existing sewers on 2nd Avenue from Balboa to Cabrillo Street; 4th Avenue from Geary Boulevard to Cornwall Street; 12th Avenue from Geary Boulevard to Cabrillo Street; and from Lake to California Street (SFPUC, 2006).	Recycled Water Projects (SF-3)	Construction-related traffic impacts on local access roads and associated air quality and noise impacts; potential to share same pipeline alignment	2007
SFP-3	CCSF (SFPUC)	Parker Avenue/ McAllister Street/ 17th Avenue Sewer Replacement	Replacement of the existing sewers on Parker Avenue from Geary Boulevard to Euclid Avenue; McAllister Street from Parker Avenue to Stanyan Street; and 17th Avenue from Balboa to Cabrillo Street (SFPUC, 2006).	Recycled Water Projects (SF-3)	Construction-related traffic impacts on local access roads and associated air quality and noise impacts; potential to share same pipeline alignment	Completed 2006
SFP-4	CCSF (SFPUC)	Alma Street/ Fulton Street/ Saturn Street/ Willard Street Sewer Replacement	Replacement of the existing sewers on Alma Street from Belvedere to Cole Street; Fulton Street from Stanyan Street to Arguello Boulevard; Saturn Street from Roosevelt Way to Temple Street; and Willard North Street from Turk Boulevard to Golden Gate Avenue (SFPUC, 2006).	Recycled Water Projects (SF-3)	Construction-related traffic impacts on local access roads and associated air quality and noise impacts	2006–2007

TABLE 4.17-5 (Continued)
CUMULATIVE PROJECTS AND IMPACTS RELATED TO WSIP FACILITIES IN THE SAN FRANCISCO REGION

Cumulative Project No.	Jurisdiction	Project Name	Project Description	Potentially Contributing WSIP Project[a]	Potential Cumulative Impact Topics	Estimated Construction Schedule[b]
Other SFPUC Projects in the San Francisco Region (cont.)						
SFP-5	CCSF (SFPUC)	Euclid Avenue/ Pacific Avenue/ 36th Avenue Sewer Replacement	Replacement of the existing sewers on Euclid Avenue from Jordan to Palm Avenue; Pacific Avenue from Presidio to Walnut Street; and 36th Avenue from Balboa to Cabrillo Street (SFPUC, 2006).	Recycled Water Projects (SF-3)	Construction-related traffic impacts on local access roads and associated air quality and noise impacts; potential to share same pipeline alignment	2007-2008
SFP-6	CCSF (SFPUC)	Kirkham Sewer Improvement	Project to alleviate flooding along Kirkham Street by increasing the capacity of the sewer system along Kirkham Street from 21st to 26th Avenue, Lawton Street from 21st to 23rd Avenue, Moraga Street from 22nd to 23rd Avenue, and 21st Avenue from Lawton to Moraga Street (SFPUC, 2006).	Groundwater Projects (SF-2), Recycled Water Projects (SF-3)	Construction-related traffic impacts on local access roads and associated air quality and noise impacts; potential to share same pipeline alignment	2009–2010
SFP-7	CCSF (SFPUC)	Vicente Street Sewer System Improvements – Phase I	Project to alleviate flooding along Vicente Street by increasing the capacity of the sewer system along Vicente Street from 34th to Sunset Avenue, 42nd to 44th Avenue, and 44th to 45th Avenue (SFPUC, 2006).	Groundwater Projects (SF-2), Recycled Water Projects (SF-3)	Construction-related traffic impacts on local access roads and associated air quality and noise impacts; potential to share same pipeline alignment	Completed 2005–2006
SFP-8	CCSF (SFPUC)	Vicente Street Sewer System Improvements – Phase II	Project to alleviate flooding along Vicente Street and 45th Avenue by increasing the capacity of the sewer system along Vicente Street from 26th to 32nd Avenue, Ulloa Street from 45th Avenue to the Great Highway, and at the intersection of 44th Avenue and Wawona Street (SFPUC, 2006).	Groundwater Projects (SF-2), Recycled Water Projects (SF-3)	Construction-related traffic impacts on local access roads and associated air quality and noise impacts; potential to share same pipeline alignment	Completed 2006
SFP-9	CCSF (SFPUC)	Kirkham Street/ Vicente Street/ 30th Avenue/ 48th Avenue Sewer Replacement	Replacement of the existing sewers on Kirkham Street from 10th to 11th Avenue; Vicente Street from 47th Avenue to Lower Great Highway; 30th Avenue from Taraval to Ulloa Street; 48th Avenue from Lawton to Moraga Street; and from Noriega to Ortega Street (SFPUC, 2006).	Groundwater Projects (SF-2), Recycled Water Projects (SF-3)	Construction-related traffic impacts on local access roads and associated air quality and noise impacts; potential to share same pipeline alignment	2007-2008
SFP-10	CCSF (SFPUC)	23rd Avenue/ 31st Avenue/ Arguello Boulevard/ Funston Avenue Sewer Replacement	Replacement of the existing sewers on 23rd Avenue from Taraval to Vicente Street; 31st Avenue from Santiago to Taraval Street; Arguello Boulevard from Carl to Hugo Street; Funston Avenue from Judah to Kirkham Street (SFPUC, 2006).	Groundwater Projects (SF-2), Recycled Water Projects (SF-3)	Construction-related traffic impacts on local access roads and associated air quality and noise impacts; potential to share same pipeline alignment	Completed 2005 to 2006

TABLE 4.17-5 (Continued)
CUMULATIVE PROJECTS AND IMPACTS RELATED TO WSIP FACILITIES IN THE SAN FRANCISCO REGION

Cumulative Project No.	Jurisdiction	Project Name	Project Description	Potentially Contributing WSIP Project[a]	Potential Cumulative Impact Topics	Estimated Construction Schedule[b]
Other SFPUC Projects in the San Francisco Region (cont.)						
SFP-11	CCSF (SFPUC)	Junipero Serra Sewer Improvement	Project to alleviate flooding along Junipero Serra by increasing the capacity of the sewer system along Junipero Serra from Lyndhurst to Eucalyptus (SFPUC, 2006).	SAPL 3 Installation (SF-1), Groundwater Projects (SF-2), Recycled Water Projects (SF-3)	Construction-related traffic impacts on local access roads and associated air quality and noise impacts; projects could share the same pipeline alignment	2009–2010
SFP-12	CCSF (SFPUC)	Ocean Avenue Sewer Improvement	Project to alleviate flooding in the vicinity of Ocean Avenue/Faxon Street (SFPUC, 2006).	SAPL 3 Installation (SF-1), Groundwater Projects (SF-2), Recycled Water Projects (SF-3)	Construction-related traffic impacts on local access roads and associated air quality and noise impacts; projects could share same pipeline alignment	2009–2010
SFP-13	CCSF (SFPUC)	Claremont Boulevard/ Edna Street/ Naglee Street/ Oneida Street/ Seneca Avenue Sewer Replacement	Replacement of the existing sewers on Claremont Boulevard from Granville Way to Dewey Boulevard; Edna Street from Monterey Boulevard to Joost Avenue; Naglee Street from Huron Avenue to Alemany Boulevard; Oneida Street from Cayuga Avenue to end; and Seneca Avenue from Delano to Cayuga Avenue (SFPUC, 2006).	SAPL 3 Installation (SF-1), Groundwater Projects (SF-2), Recycled Water Projects (SF-3)	Construction-related traffic impacts on local access roads and associated air quality and noise impacts; projects could share the same pipeline alignment	2006–2007
SFP-14	CCSF (SFPUC)	Streetlighting Conversion	Replacement of part of current series loop 576, located in the Lakeshore area at the end of Ocean Avenue, west of Sunset Boulevard (SFPUC, 2006).	SAPL 3 Installation (SF-1), Groundwater Projects (SF-2), Recycled Water Projects (SF-3)	Construction-related traffic impacts on local access roads and associated air quality and noise impacts	TBD
SFP-15	CCSF (SFPUC)	Brotherhood Way Sewer Improvement	Project to alleviate flooding along Brotherhood Way and St. Charles. The project involves increasing the capacity of the sewer system along Brotherhood Way between Arch and Vernon, Head and Victoria, Ramsell and Arch, St. Charles and Junipero Serra, Vernon and St. Charles, and Victoria and Ramsell (SFPUC, 2006).	SAPL 3 Installation (SF-1), Groundwater Projects (SF-2), Recycled Water Projects (SF-3)	Construction-related traffic on local access roads and associated air quality and noise impacts; projects could share the same pipeline alignment	2006–2007

TABLE 4.17-5 (Continued)
CUMULATIVE PROJECTS AND IMPACTS RELATED TO WSIP FACILITIES IN THE SAN FRANCISCO REGION

Cumulative Project No.	Jurisdiction	Project Name	Project Description	Potentially Contributing WSIP Project[a]	Potential Cumulative Impact Topics	Estimated Construction Schedule[b]
Other SFPUC Projects in the San Francisco Region (cont.)						
SFP-16	CCSF (SFPUC)	Alemany and Sickles Sewer Improvements, Phase 1	Project to address flooding complaints in the vicinity of Alemany Boulevard near the Daly City limits (SFPUC, 2006).	SAPL 3 Installation (SF-1), Groundwater Projects (SF-2), Recycled Water Projects (SF-3)	Construction-related traffic on local access roads and associated air quality and noise impacts; projects could share the same pipeline alignment	2009
SFP-17	CCSF (SFPUC)	Sunset Reservoir – North Basin	Seismic upgrades and rehabilitation of the existing Sunset Reservoir North Basin, including stabilizing the earth embankment around the reservoir in conformance with Division of Safety of Dams requirements to minimize the potential for movement during an earthquake (SFPUC, 2005b).	SAPL 3 Installation (SF-1), Groundwater Projects (SF-2), Recycled Water Projects (SF-3)	Construction-related traffic impacts on local access roads and associated air quality and noise impacts	2005–2008
SFP-18	CCSF (SFPUC)	Central Pump Station	Structural and seismic improvements to the Central Pump Station and new emergency generator system (SFPUC, 2007c).	SAPL 3 Installation (SF-1), Groundwater Projects (SF-2), Recycled Water Projects (SF-3)	Construction-related traffic impacts on local access roads and associated air quality and noise impacts	2004-2007
SFP-19	CCSF (SFPUC)	East-West Transmission Main	Construction of 4.5 miles of new underground pipeline from the Alemany Pump Station in the Potrero District to Junipero Serra Boulevard at Holloway Avenue. This pipeline connects the water supply on the east side of the city to the west (SFPUC, 2007c).	SAPL 3 Installation (SF-1), Groundwater Projects (SF-2), Recycled Water Projects (SF-3)	Construction-related traffic impacts on local access roads and associated air quality and noise impacts	2007-2009
SFP-20	CCSF (SFPUC)	Fulton at 6th Avenue – 30" Main Replacement	Replacement of deteriorated Richmond supply main along 6th Avenue between Lincoln Way and Fulton Street (SFPUC, 2007c).	Recycled Water Projects (SF-3)	Construction-related traffic impacts on local access roads and associated air quality and noise impacts	2007-2008
SFP-21	CCSF (SFPUC)	Lake Merced Pump Station Essential Upgrade	Full evaluation of pump station facilities; development of phased master plan to assist completion of future projects; assessment of San Andreas #2 supply pipeline (SFPUC, 2007c).	SAPL 3 Installation (SF-1), Groundwater Projects (SF-2), Recycled Water Projects (SF-3)	Construction-related traffic impacts on local access roads and associated air quality and noise impacts	TBD

TABLE 4.17-5 (Continued)
CUMULATIVE PROJECTS AND IMPACTS RELATED TO WSIP FACILITIES IN THE SAN FRANCISCO REGION

Cumulative Project No.	Jurisdiction	Project Name	Project Description	Potentially Contributing WSIP Project[a]	Potential Cumulative Impact Topics	Estimated Construction Schedule[b]
Other SFPUC Projects in the San Francisco Region (cont.)						
SFP-22	CCSF (SFPUC)	Lincoln Park Pump Station and Tank Upgrades	The previous pump station and tank were demolished in 2005. A new pump station is being built, including four new 10-horse power pumps, a new sprinkler system, new electrical system, water quality monitoring and disinfection systems, and new hydropneumatic pumps. A new seismically reinforced 100,000-gallon water tank is also being constructed (SFPUC, 2007c).	SAPL 3 Installation (SF-1), Groundwater Projects (SF-2), Recycled Water Projects (SF-3)	Construction-related traffic impacts on local access roads and associated air quality and noise impacts	2005–2007
SFP-23	CCSF (SFPUC)	Lincoln Way Transmission Line	Installation of 2.5 miles of new 48-inch transmission line that would supply water from Sunset Reservoir to the northern and eastern zones of the city. The transmission line would be installed from Pacheco Street at the Sunset Reservoir to 29th Avenue and along 29th Avenue to Lincoln Way (SFPUC, 2007c).	SAPL 3 Installation (SF-1), Groundwater Projects (SF-2), Recycled Water Projects (SF-3)	Construction-related traffic impacts on local access roads and associated air quality and noise impacts	Completed 2006
SFP-24	CCSF (SFPUC)	Merced Manor Reservoir	Structural and seismic improvements to the Merced Manor Reservoir located on Ocean Avenue between 22nd and 23rd Avenues. Other improvements include security upgrades, replacement of the reservoir lining, inlet/outlet valve repairs, removal of sediments, and disinfection and chlorination (SFPUC, 2007c).	SAPL 3 Installation (SF-1), Groundwater Projects (SF-2), Recycled Water Projects (SF-3)	Treated water discharges, construction-related traffic impacts on local access roads and associated air quality and noise impacts	2004-2006
Other SFPUC Projects at Various Locations						
N/A	CCSF (SFPUC)	Chemical Feed System	Installation of chemical feed systems and related sewer work at various locations to mitigate odors from storage/transport facilities. Instrumentation improvements on the existing chemical feed systems (SFPUC, 2006).	Depends on specific facility locations	Construction-related traffic impacts on local access roads and associated air quality and noise impacts	2005–2008
N/A	CCSF (SFPUC)	Major Electrical and Mechanical Equipment Reliability Improvements	Replacement of critical and aging mechanical and electrical equipment at various facilities, including pumping and treatment facilities (SFPUC, 2006).	Depends on specific facility locations	Construction-related traffic impacts on local access roads and associated air quality and noise impacts	2005–2010

TABLE 4.17-5 (Continued)
CUMULATIVE PROJECTS AND IMPACTS RELATED TO WSIP FACILITIES IN THE SAN FRANCISCO REGION

Cumulative Project No.	Jurisdiction	Project Name	Project Description	Potentially Contributing WSIP Project[a]	Potential Cumulative Impact Topics	Estimated Construction Schedule[b]
Other SFPUC Projects at Various Locations (cont.)						
N/A	CCSF (SFPUC)	Miscellaneous Odor Control Improvements	Various odor control facilities for collection system, pumping stations, and treatment facilities (SFPUC, 2006).	Depends on specific facility locations	Construction-related traffic impacts on local access roads and associated air quality and noise impacts	2010–2020
N/A	CCSF (SFPUC)	Wastewater Facilities Equipment Replacement	Ongoing replacement program for mechanical and electrical equipment to reestablish the reliability of pumping and treatment facilities (SFPUC, 2006).	Depends on specific facility locations	Construction-related traffic impacts on local access roads and associated air quality and noise impacts	Ongoing
N/A	CCSF (SFPUC)	Miscellaneous Improvements to Structurally Inadequate Sewers	Replacement/rehabilitation of existing structurally inadequate sewers in locations throughout San Francisco (SFPUC, 2006).	Depends on specific facility locations	Construction-related traffic impacts on local access roads and associated air quality and noise impacts; potential to share same pipeline alignment	Current to 2030
N/A	CCSF (SFPUC)	Miscellaneous Sewer Replacements	Ongoing sewer replacement to reestablish structural reliability and improve capacity (SFPUC, 2006).	Depends on specific facility locations	Construction-related traffic impacts on local access roads and associated air quality and noise impacts; projects could share the same pipeline alignment	Ongoing
N/A	CCSF (SFPUC)	SFPUC Sewer Master Plan	Development of a sewer master plan to develop a long-term vision and strategy for the management of the City's wastewater and storm water; address specific challenges facing the system; and maximize system reliability and flexibility. The plan will guide sewer system improvements over the next 30 years. Short-term problems with the system are being addressed through the Five-Year Wastewater Capital Improvement Program (SFPUC, 2007d).	Depends on specific facility locations	Construction-related traffic impacts on local access roads and associated air quality and noise impacts; potential to share same pipeline alignment	Ongoing
N/A	CCSF (SFPUC)	Wet Weather Improvements	Project to maximize and/or expand capacity of the collection system and wet-weather facilities to reduce street flooding and overflow discharges (SFPUC, 2006).	Depends on specific facility locations	Construction-related traffic impacts on local access roads and associated air quality and noise impacts	2010–2020
N/A	CCSF (SFPUC)	Miscellaneous Improvements to Sewerage Facilities	Replacement and upgrade of mechanical components and structures within sewage treatment plants, pumping facilities, and other sewerage facilities throughout San Francisco (SFPUC, 2006).	Depends on specific facility locations	Construction-related traffic impacts on local access roads and associated air quality and noise impacts	Current to 2030

TABLE 4.17-5 (Continued)
CUMULATIVE PROJECTS AND IMPACTS RELATED TO WSIP FACILITIES IN THE SAN FRANCISCO REGION

Cumulative Project No.	Jurisdiction	Project Name	Project Description	Potentially Contributing WSIP Project[a]	Potential Cumulative Impact Topics	Estimated Construction Schedule[b]
Other SFPUC Projects at Various Locations (cont.)						
N/A	CCSF (SFPUC)	Street Lighting Replacing and Repairs	Street lighting replacement and repair in multiple areas (SFPUC, 2006).	Depends on specific facility locations	Construction-related traffic impacts on local access roads and associated air quality and noise impacts	TBD

[a] A WSIP facility that, in conjunction with the cumulative project, could contribute to a potential cumulative impact, depending on construction timing or affected resources. Potentially cumulative projects with the Regional Groundwater Projects to be constructed under SF-2 were not identified because specific well locations have not been determined and could be anywhere in the South Westside Groundwater Basin.
[b] Construction schedules for non-SFPUC projects were estimated based on information obtained in project-related documents such as initial studies and EIRs; city, county, and regional agency websites; and interviews with representatives from local jurisdictions or regional agencies. In some cases, project schedules could not be estimated from these sources, but the projects were in sufficient stages of planning to be considered likely to start or complete construction before 2014, the planning horizon for construction of WSIP facilities. The schedules for these projects are listed as "TBD" (To Be Determined). The estimated schedules are based on the most current information available during preparation of this PEIR (as of July 2006). However, as with all proposed development projects, estimated construction schedules are subject to revisions and delays and therefore could vary from the time periods indicated.

TABLE 4.17-6
OTHER SFPUC SYSTEMWIDE CUMULATIVE PROJECTS AND IMPACTS RELATED TO WSIP FACILITIES

Cumulative Project No.	Jurisdiction	Project Name	Project Description	Potentially Contributing WSIP Project[a]	Potential Cumulative Impact Topics	Estimated Construction Schedule
CSYS-1	CCSF (SFPUC)	Installation of SCADA System – Phase 2 & System Security Upgrades	Installation of monitoring and control equipment as well as security systems at various locations throughout the regional system. The project is in the initial stages and includes preparation of a needs assessment report. The project would include installing a series of water quality and flow monitoring facilities at various locations, and developing and implementing the integration of security components at 14 critical sites in the regional system (SFPUC, 2005b).	SJPL System (SJ-3), SJPL Rehabilitation (SJ-4), BDPL Reliability Upgrade (BD-1), BDPL Nos. 3 and 4 Crossovers (BD-2), Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault (BD-3), Baden and San Pedro Valve Lots (PN-1)	Construction-related traffic impacts on local access roads and associated air quality and noise impacts	2009–2011
CSYS-2	CCSF (SFPUC)	Cross Connection Controls	Upgrade of the existing configuration for air/vacuum valves and blowoffs at approximately 30 locations along the transmission system to eliminate and prevent cross connections and backflow from unapproved sources into the water system. The project would provide compliance with California water quality regulations for cross-connections. Typical project elements would include small-diameter valve and piping reconfigurations, installation of backflow prevention devices and air gaps at blowoffs and air valves, and other site-specific system modifications as necessary (SFPUC, 2005b).	BDPL Reliability Upgrade (BD-1), BDPL Nos. 3 and 4 Crossovers (BD-2), Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault (BD-3), Baden and San Pedro Valve Lots (PN-1)	Construction-related traffic impacts on local access roads and associated air quality and noise impacts	2008
CSYS-3	CCSF (SFPUC)	Habitat Reserve Program (HRP)	The HRP is a program to develop wetland and other habitat mitigation credits required to implement WSIP projects through early habitat creation or enhancement at select mitigation sites on existing SFPUC lands or on acquired sites (under development).	All WSIP projects	Biological resources; water quality; agricultural resources	No construction required
CSYS-4	CCSF (SFPUC)	Watershed and Environmental Improvement Program (WEIP)	The WEIP would seek to identify, prioritize, protect, and restore lands within the hydrologic boundaries, which contribute to SFPUC source waters in the Alameda Creek, Peninsula, and Tuolumne River watersheds. This program would ensure the delivery of high-quality water to Bay Area communities and the preservation and restoration of significant ecological resources throughout SFPUC watershed lands (under development).	All WSIP projects	Biological resources; water quality	No construction required

TABLE 4.17-6 (Continued)
OTHER SFPUC SYSTEMWIDE CUMULATIVE PROJECTS AND IMPACTS RELATED TO WSIP FACILITIES

Cumulative Project No.	Jurisdiction	Project Name	Project Description	Potentially Contributing WSIP Project[a]	Potential Cumulative Impact Topics	Estimated Construction Schedule
CSYS-6	CCSF (SFPUC)	Expansion of Solar and Renewable Energy Generation in San Francisco	The CCSF plans to expand the San Francisco's solar and renewable energy resources, including the formation of public-private partnerships that would leverage new state legislation and available financing mechanisms to facilitate and support the development of large-scale solar and other renewable energy resources on public and private property in the city. The plan would boost solar generation from less than 2 megawatts today to nearly 35 megawatts in the future (SFPUC, 2007e).	N/A	Energy resources	TBD

[a] A WSIP facility that, in conjunction with the cumulative project, could contribute to a potential cumulative impact, depending on construction timing or affected resources.

TABLE 4.17-7
CUMULATIVE PROJECTS WITH OVERLAPPING CONSTRUCTION SCHEDULES

WSIP Facility	Proposed WSIP Project Construction Schedule (duration)	Other SFPUC Cumulative Projects with Potentially Overlapping Schedules[a,b]	Other Non-SFPUC (Public and Private) Cumulative Projects with Potentially Overlapping Schedules[a,c]
San Joaquin Region			
SJ-1: Advanced Disinfection	2009–2010 (1–2 years)	**Possibly Direct:** SJP-1a, SJP-1b, SJP-1c, SJP-1d, SJP-1e	**Direct:** SJC-17, SJC-18, **Possibly Direct:** SJC-14 **Indirect:** SJC-19
SJ-2: Lawrence Livermore Supply Improvements	2010–2011 (1 year)	**Possibly Direct:** SJP-1d, SJP-2	**Indirect:** SJC-19
SJ-3: San Joaquin Pipeline System	2011–2014 (3 years)	**Possibly Direct:** SJP-1a, SJP-1b, SJP-1c, SJP-1d, SJP-1e, CSYS-1	**Direct:** SJC-1, SJC-3, SJC-4, SJC-5, SJC-6, SJC-7, SJC-8, SJC-9, SJC-10, SJC-12, SJC-15, SJC-16, SJC-17, SJC-18 **Possibly Direct:** SJC-11, SJC-13, SJC-14 **Indirect:** SJC-19
SJ-4: Rehabilitation of Existing San Joaquin Pipelines	2007–2014 (7–8 years)	**Possibly Direct:** SJP-1a, SJP-1b, SJP-1c, SJP-1d, SJP-1e, CSYS-1	**Direct:** SJC-1, SJC-2, SJC-3, SJC-4, SJC-5, SJC-6, SJC-7, SJC-8, SJC-9, SJC-10, SJC-12, SJC-15, SJC-16, SJC-17, SJC-18 **Possibly Direct:** SJC-11, SJC-13, SJC-14 **Indirect:** SJC-19
SJ-5: Tesla Portal Disinfection Station	2009–2011 (1–2 years)	**Possibly Direct:** SJP-1a, SJP-1b, SJP-1c, SJP-1d, SJP-1e	**Direct:** SJC-17, SJC-18, **Possibly Direct:** SJC-14 **Indirect:** SJC-19
Sunol Valley Region			
SV-1: Alameda Creek Fishery Enhancement	2011 (1 year)	**Indirect:** SVP-1a, SVP-1b, SVP-1d, SVP-2, SVP-3, SVP-4a, SVP-4b, SVP-4c, SVP-5c, SVP-6, SVP-7, SVP-8, SVP-12, SVP-13, SVP-14, SVP-15, SVP-16	**Possibly Direct:** SVC-3 **Indirect:** SVC-1, SVC-2, SVC-3, SVC-4, SVC-5, SVC-6
SV-2: Calaveras Dam Replacement	2009–2011 (2–3 years)	**Direct:** SVP-14, PNP-9 **Indirect:** SVP-1a, SVP-1b, SVP-1c, SVP-1d, SVP-2, SVP-3, SVP-4a, SVP-4b, SVP-4c, SVP-4d, SVP-5a, SVP-5b, SVP-5c, SVP-6, SVP-7, SVP-8, SVP-9, SVP-10, SVP-12, SVP-13, SVP-14, SVP-15, SVP-16, PNP-9	**Indirect:** SVC-1, SVC-2, SVC-3, SVC-4, SVC-5, SVC-6
SV-3: Additional 40-mgd Treated Water Supply	2010–2013 (2–3 years)	**Possibly Direct:** SVP-1a, SVP-1b, SVP-1d **Indirect:** SVP-1a, SVP-1b, SVP-1d, SVP-2, SVP-3, SVP-4a, SVP-4b, SVP-4c, SVP-4d, SVP-5c, SVP-6, SVP-7, SVP-8, SVP-9, SVP-12, SVP-13, SVP-14, SVP-15, SVP-16, PNP-9	**Indirect:** SVC-1, SVC-2, SVC-3, SVC-4, SVC-5, SVC-6
SV-4: New Irvington Tunnel	2009–2013 (3–4 years)	**Direct:** SVP-5a, SVP-5b, SVP-5c, BDP-1, BDP-2 **Possibly Direct:** SVP-3 **Indirect:** SVP-1a, SVP-1b, SVP-1c, SVP-1d, SVP-2, SVP-3, SVP-4a, SVP-4b, SVP-4c, SVP-4d, SVP-5a, SVP-5b, SVP-5c. SVP-6, SVP-7, SVP-8, SVP-9, SVP-10, SVP-12, SVP-13, SVP-14, SVP-15, SVP-16, PNP-9	**Direct:** BDC-6 **Possibly Direct:** SVC-3 **Indirect:** SVC-1, SVC-2, SVC-3, SVC-4, SVC-5, SVC-6

**TABLE 4.17-7 (Continued)
CUMULATIVE PROJECTS WITH OVERLAPPING CONSTRUCTION SCHEDULES**

WSIP Facility	Proposed WSIP Project Construction Schedule (duration)	Other SFPUC Cumulative Projects with Potentially Overlapping Schedules[a,b]	Other Non-SFPUC (Public and Private) Cumulative Projects with Potentially Overlapping Schedules[a,c]
Sunol Valley Region (cont.)			
SV-5: SVWTP – Treated Water Reservoirs	2008–2010 (2 years)	**Direct:** SVP-1c, SVP-10 **Possibly Direct:** SVP-1a, SVP-1b, SVP-1d **Indirect:** SVP-1a, SVP-1b, SVP-1c, SVP-1d, SVP-2, SVP-3, SVP-4a, SVP-4b, SVP-4c, SVP-4d, SVP-5a, SVP-5b, SVP-5c, SVP-6, SVP-7, SVP-8, SVP-9, SVP-10, SVP-12, SVP-13, SVP-14, SVP-15, SVP-16, PNP-9, PNP-11	**Indirect:** SVC-1, SVC-2, SVC-3, SVC-4, SVC-5, SVC-6
SV-6: San Antonio Backup Pipeline	2009–2011 (2 years)	**Direct:** SVP-8, SVP-9, SVP-13 **Possibly Direct:** SVP-2, SVP-3, SVP-6, SVP-7 **Indirect:** SVP-1a, SVP-1b, SVP-1c, SVP-1d, SVP-2, SVP-3, SVP-4a, SVP-4b, SVP-4c, SVP-4d, SVP-5a, SVP-5b, SVP-5c, SVP-6, SVP-7, SVP-8, SVP-9, SVP-10, SVP-12, SVP-13, SVP-14, SVP-15, SVP-16, PNP-9	**Possibly Direct:** SVC-3 **Indirect:** SVC-1, SVC-2, SVC-3, SVC-4, SVC-5, SVC-6
Bay Division Region			
BD-1: Bay Division Reliability Upgrade	2009–2013 (4 years)	**Direct:** BDP-1, BDP-2, BDP-3, BDP-4, BDP-5, BDP-6, BDP-7, BDP-8, BDP-9, BDP-15, BDP-16, CSYS-1, CSYS-2	**Direct:** BDC-1, BDC-4, BDC-5, BDC-6, BDC-7, BDC-9; BDC-17, BDC-21, BDC-22, BDC-23, BDC-24, BDC-25, BDC-26 **Possibly Direct:** BDC-2, BDC-3, BDC-18, BDC-19, BDC-20 **Indirect:** SVC-1, BDC-9, BDC-15, BDC-26
BD-2: BDPL Nos. 3 and 4 Crossovers	2010–2012 (2 years)	**Direct:** BDP-13, BDP-14, CSYS-1, CSYS-2	**Direct:** BDC-9, BDC-10, BDC-11, BDC-12, BDC-14, BDC-15, BDC-16, BDC-21 **Possibly Direct:** BDC-13 **Indirect:** BDC-9, BDC-15, BDC-26
BD-3: Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault	2010–2012 (1–2 years)	**Direct:** BDP-12, CSYS-1, CSYS-2	**Direct:** BDC-1, BDC-8 **Indirect:** BDC-9, BDC-15, BDC-26
Peninsula Region			
PN-1: Baden and San Pedro Valve Lots Improvements	2009–2011 (2 years)	**Direct:** PNP-8, PNP-16, PNP-19, PNP-24, PNP-25, PNP-28, PNP-29, CSYS-1, CSYS-2 **Possibly Direct:** PNP-6, PNP-26, PNP-27	**Direct:** PNC-3, PNC-4
PN-2: Crystal Springs/San Andreas Transmission Upgrade	2011–2013 (2–3 years)	**Direct:** PNP-4, PNP-7, PNP-10, PNP-14, PNP-15, PNP-16, PNP-21 **Possibly Direct:** PNP-3, PNP-5, PNP-23, PNP-31	**Direct:** PNC-1, PNC-2
PN-3: HTWTP Long-Term Improvements	2011–2013 (2–3 years)	**Direct:** PNP-1e, PNP-1g, PNP-13 **Possibly Direct:** PNP-1a, PNP-1b, PNP-1c, PNP-1f	None

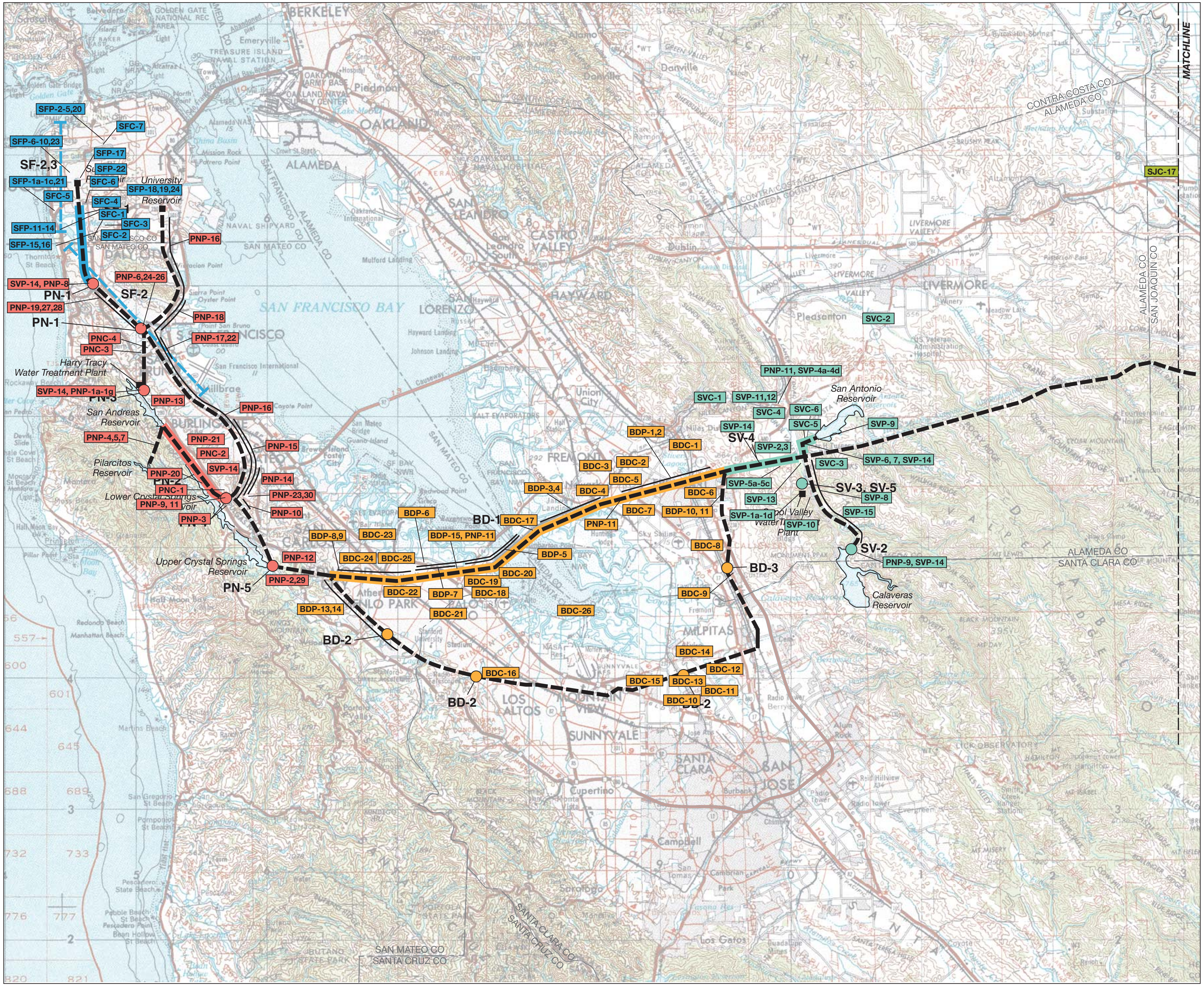
TABLE 4.17-7 (Continued)
CUMULATIVE PROJECTS WITH OVERLAPPING CONSTRUCTION SCHEDULES

WSIP Facility	Proposed WSIP Project Construction Schedule (duration)	Other SFPUC Cumulative Projects with Potentially Overlapping Schedules[a,b]	Other Non-SFPUC (Public and Private) Cumulative Projects with Potentially Overlapping Schedules[a,c]
Peninsula Region (cont.)			
PN-4: Lower Crystal Springs Dam Improvements	2010–2011 (1 year)	**Direct:** PNP-9, PNP-10, PNP-15, PNP-16 **Possibly Direct:** PNP-3, PNP-23, PNP-31	**Direct:** PNC-1, PNC-2
PN-5: Pulgas Balancing Reservoir Rehabilitation	2007–2008, 2010–2013 (1 and 3 years)	**Possibly Direct:** PNP-2, PNP-12, PNP-29, PNP-31	**Direct:** PNC-1, PNC-2
San Francisco Region			
SF-1: San Andreas Pipeline No. 3 Installation	2009–2010 (2 years)	**Direct:** PNP-8, PNP-19, PNP-28, SFP-1a, SFP-1b, SFP-1c, SFP-11, SFP-12, SFP-13, SFP15, SFP-16, SFP-17, SFP-18, SFP-19, SFP-22 **Possibly Direct:** PNP-27, SFP-14, SFP-21	**Possibly Direct:** SFC-1, SFC-2, SFC-3, SFC-4, SFC-5
SF-2: Groundwater Projects – Local and Lake Merced	2009–2012 (3 years, intermittent)	**Direct:** SFP-1a, SFP-1b, SFP-1c, SFP-6, SFP-9, SFP-11, SFP-12, SFP-13, SFP-15, SFP-16, SFP-17, SFP-18, SFP-19, SFP-22 **Possibly Direct:** SFP-14, SFP-21	**Possibly Direct:** SFC-5
SF-2: Groundwater Projects – Regional	2010–2014 (4 years)	Potentially cumulative projects not identified because specific well locations have not been selected.	
SF-3: Recycled Water Projects	2010–2012 (2 years for treatment facility, longer for pipelines)	**Direct:** SFP-1a, SFP-1b, SFP-1c, SFP-5, SFP-6, SFP-9, SFP-11, SFP-12, SFP-16, SFP-17, SFP-19, SFP-20 **Possibly Direct:** SFP-14, SFP-21	**Possibly Direct:** SFC-5

[a] Cumulative projects in the same vicinity as a WSIP facility with proposed schedules that have start or end dates within two years of each other. See Tables 4.17-1 through 4.17-6 for the names and descriptions of the potentially cumulative projects.

[b] For SFPUC projects, a project is considered to have a direct cumulative impact with a WSIP project if construction would occur at the same facility or within a distance that could result in direct physical environmental effects. Projects that could have a direct cumulative effect but don't have a defined schedule are indicated as "Possibly Direct"; these projects could possibly have overlapping construction schedules with the indicated WSIP facility, depending on the timing of construction. For the Sunol Valley Region, a project is considered to have an indirect effect if it would contribute to traffic on Calaveras Road or regional roads (Highway 84). Sunol Valley projects without a defined schedule are included in the list of indirect projects because they could cumulatively contribute to areawide or regional traffic, air quality, and noise impacts.

[c] For non-SFPUC projects (public and private), a project is considered to have a direct cumulative impact with a WSIP facility if construction would occur within a distance that could result in direct physical environmental effects. Projects that could have a direct cumulative effect but don't have a defined schedule are indicated as "Possibly Direct;" these projects could have overlapping construction schedules with the indicated WSIP facility, depending on the timing of construction. A few non-SFPUC projects that have a defined schedule are also considered to have indirect effects because the size, location, or regional attraction of these projects would contribute to areawide or regional effects, such as traffic, air quality, and noise impacts. These include SJC-19, the Mountain House development; BDC-9, Cisco Field, the proposed Oakland A's ballpark; BDC-15, the proposed 49er's Stadium Complex; and BDC-26, the South Bay Salt Pond Restoration Project, a 15,000-acre wetland restoration project.



Sunol Valley Region
Bay Division Region
Peninsula Region
San Francisco Region
San Joaquin Region
SJP-1 SFPUC Potentially Cumulative Project
SJC-1 Other Agency Potentially Cumulative Project
Existing System Corridor
Existing System Facility
Proposed Facility Corridor
Proposed Facility Site
Proposed Facility, General Location

Note: See Tables 4.16-3 through 4.16-8 for corresponding project names and descriptions.

SOURCE: ESA + Orion; SFPUC, 2006

SFPUC Water System Improvement Program . 203287

Figure 4.17-1a
Major Projects in WSIP Project Area with Potential for Cumulative Impacts

SOURCE: ESA + Orion; SFPUC, 2006

SFPUC Water System Improvement Program . 203287

Figure 4.17-2b
Major Projects in WSIP Project Area with Potential for Cumulative Impacts

As shown in Tables 4.17-1 through 4.17-6, the cumulative projects identified in the WSIP study area include development projects (e.g., residential, commercial, industrial, educational, and hospital uses), transportation infrastructure projects (e.g., freeways, roadways, and rail), and utility infrastructure projects (water, wastewater, and power facilities), with construction schedules ranging from 2006 to 2068. In these tables, the column entitled *Potential Cumulative Impact Areas* for each project presents a general list of the types of impacts that could be associated with the listed projects; no site-specific environmental review was conducted for each listed project. Additionally, the cumulative impact areas identified for the listed projects in these tables would relate mostly to construction, since the primary facility impacts associated with the WSIP would occur during construction.

Most projects' construction schedules range between 2006 and 2010, although some extend to about 2015. There are a few that extend beyond 2017 (2021 to 2048) and one project that extends to 2068.[3] Table 4.17-7 shows that construction of most WSIP projects would be underway by 2008–2010 and completed by 2012–2013, and also indicates which cumulative projects could have overlapping construction schedules with each WSIP project.
Tables 4.17-1 through 4.17-6 indicate the following:

- <u>*San Joaquin Region*</u>. There are 25 identified projects that could potentially contribute to cumulative impacts in the San Joaquin Region (Table 4.17-1). Nineteen of these projects are public or private development projects located in adjacent jurisdictions, while six are planned SFPUC infrastructure projects near Tesla Portal or Thomas Shaft. As indicated in Table 4.17-1, cumulative development in this region would involve the following: over 1,700 residential units, 700,000 square feet of commercial/office space, more than 2.5 million square feet of light/medium/heavy industrial space, expansion of agricultural operations, expansion of hospital facilities, and various highway improvements. Mountain House, a new community between Tracy and Livermore with approximately 16,000 residential units as well as commercial, educational, and business park uses, represents the largest potentially cumulative development project in the San Joaquin Region.

  Although construction schedules for a number of listed projects are unknown or yet to be determined, all but three of the projects with estimated construction schedules would be completed by 2017. The exceptions are the Kaiser Modesto Medical Center, Phase C, (completion by 2025), RMC Pacific Vernalis Quarry Mining and Reclamation Project (completion by 2068), and Mountain House (completion by 2048). Table 4.17-7 indicates that construction of up to 24 projects could directly overlap with WSIP projects in this region.

- <u>*Sunol Valley Region*</u>. There are 30 identified projects that could potentially contribute to cumulative impacts in the Sunol Valley Region (Table 4.17-2). Six of these projects are public or private development projects located in adjacent jurisdictions, while 24 are planned SFPUC infrastructure projects near the Sunol Valley Water Treatment Plant (WTP), Alameda Portals, Sunol Yard, Alameda Siphons, or the Sunol Valley Region in general. As indicated in Table 4.17-2, cumulative development in this region would involve the following: quarry expansions, road and highway improvements, and a Chevron pipeline relocation.

[3] RMC Pacific Vernalis Quarry Mining and Reclamation Project, SJC-17, a sand and gravel extraction project proposed to operate in San Joaquin and Stanislaus Counties until 2068.

Although construction schedules for a number of listed projects are unknown or yet to be determined, all but one of the projects with estimated construction schedules would be completed by 2012. The exception is Mission Valley Rock Company Quarries, which would continue to operate and expand until 2045 and beyond. Table 4.17-7 indicates that construction of up to 26 projects could directly overlap with WSIP projects in this region, while up to 37 additional projects could indirectly overlap.[4]

- *Bay Division Region*. There are 42 identified projects that could potentially contribute to cumulative impacts in the Bay Division Region (Table 4.17-3). Twenty-six of these projects are public or private development projects located in adjacent jurisdictions, while 16 are planned SFPUC infrastructure projects near the Bay Division Pipelines Nos. 1, 2, 3, or 4 or the Bay Division Region in general. As indicated in Table 4.17-2, cumulative development in this region would involve the following: over 1,500 residential units, more than 2.5 million square feet of commercial/office/research and development (R&D) space, over 2 million square feet of hospital replacement/expansion space, electricity generation and transmission facilities, rail service extension (including BART), a college campus, a major-league baseball stadium, football stadium complex, tidal wetland restoration, and various highway improvements.

  Although construction schedules for a number of listed projects are unknown or yet to be determined, all of the projects with estimated construction schedules would be completed by 2014. Table 4.17-7 indicates that construction of up to 41 projects could directly overlap with WSIP projects in this region, while up to 4 additional projects could indirectly overlap.

  Peninsula Region. There are 41 identified projects that could potentially contribute to cumulative impacts in the Peninsula Region (Table 4.17-4). Four of these projects are public or private development projects located in adjacent jurisdictions, while 37 are planned SFPUC infrastructure projects near the Harry Tracy WTP or the Peninsula Region in general. As indicated in Table 4.17-4, cumulative development in this region would involve the following: more than 700 residential units as well as commercial uses.

  Although construction schedules for a number of listed projects are unknown or yet to be determined, all but eight of the projects with estimated construction schedules would be completed by 2010. The SFPUC Sunset Supply Pipeline Inspection (M40 to M50) project, to be completed by 2021, would be the last project in the region to be constructed. Table 4.17-7 indicates that construction of up to 42 projects could directly overlap with WSIP projects in this region.

- *San Francisco Region*. There are 33 identified projects that could potentially contribute to cumulative impacts in the San Francisco Region (Table 4.17-5). Seven of these projects are public or private development projects located in adjacent jurisdictions, while 36 are planned SFPUC infrastructure projects near the San Francisco Region in general.[5] As indicated in Table 4.16-1, cumulative development in this region would involve the following: over 232 residential units, approximately 26,000 square feet of office/commercial/R&D space, expansion or improvements to parks and schools (up through college level), and traffic calming measures.

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4 See Table 4.16-9, footnotes b and c, for definitions of "direct" and "indirect."
5 Of these, 10 SFPUC projects have unknown or undefined locations. Therefore, potential overlap with these projects could not be determined.

Although construction schedules for a number of listed projects are unknown or yet to be determined, all but four of the projects with estimated construction schedules would be completed by 2014. The exceptions are four SFPUC projects involving storm drainage, wastewater, and transformer improvements that are scheduled for completion by 2030. Table 4.17-7 indicates that construction of up to 29 projects could directly overlap with WSIP projects in this region.

- *Entire Region – Systemwide*. Six identified systemwide cumulative projects involving multiple sites have the potential to overlap with many of the WSIP projects. However, construction activities associated with these projects would be very limited in terms of area (involving installation of pipe, valves, and electronic equipment at existing facilities) and timeframe, which would minimize the potential for overlap. Two of these projects are habitat protection, enhancement, or restoration projects and would not involve construction. Therefore, the potential contribution of these projects to the construction and operational impacts identified below would not be cumulatively considerable, and the projects are not considered further in this analysis.

  The WSIP PEIR Notice of Preparation (SFPUC, 2005b) identified four WSIP projects that are not considered in the cumulative impact analysis below. They are as follows:

- *Slipline Bay Division Pipeline 4 PCCP Sections (formerly BD-3)*. This project would be located along the alignment of the Bay Division Pipelines Nos. 3 and 4 and could overlap with WSIP projects also located along this alignment. However, this project consists of a conditions assessment only, and no construction activities or schedule have been identified. If the conditions assessment were to indicate the need for pipeline rehabilitation, construction would not occur until after the WSIP projects have been completed. Therefore, this project would not contribute to any cumulative impacts identified below for the WSIP and other cumulative development near WSIP projects.

- *SFPUC/EBMUD Intertie (formerly BD-5), Capuchino Valve Lot (formerly PN-3), and University Mound Reservoir (formerly SF-4)*. These projects are not contiguous with any of the WSIP facilities analyzed in Sections 4.3 through 4.15. Therefore, these projects would not contribute to any cumulative construction and operational impacts identified below for the WSIP in combination with other nearby SFPUC and non-SFPUC development projects (listed in Tables 4.17-1 through 4.17-6).

4.17.3 Cumulative Facility Impacts

In general, there are two categories of cumulative impacts that could result from implementation of the WSIP in combination with other projects identified in Tables 4.17-1 through 4.17-6: (1) direct cumulative impacts related to facility construction and operation; and (2) indirect or secondary cumulative impacts due to planned growth that would result from increased water supply. This section evaluates the direct cumulative impacts of facility construction and operation. Secondary growth impacts resulting from increased water supply are evaluated in Chapter 7, Growth Inducement Potential and Secondary Effects of Growth, which describes the environmental effects associated with planned growth (including the proposed and approved non-SFPUC projects listed in Tables 4.17-1 through 4.17-6). It should be noted that the projects listed in these tables represent recent, present, and future projects in the vicinity of WSIP facilities. This section focuses on the cumulative impacts of projects that overlap geographically and projects with overlapping schedules (shown in Table 4.17-7).

Significance Criteria

The City and County of San Francisco has not formally adopted significance standards for impacts related to cumulative effects, but generally considers that implementation of the proposed program would have significant cumulative impacts if it were to:

- Have impacts that would be individually limited but cumulatively considerable ("cumulatively considerable" means that the incremental effects of a project are significant when viewed in connection with the effects of past, present, and probable future projects)

WSIP impacts that would be "individually limited" are based on the impact analyses and significance criteria presented in Sections 4.3 through 4.15 for the various environmental resource topics.

Impact Summary

Potential cumulative impacts of the WSIP are described in this section by environmental resource topic, since the geographic scope of the impact can vary by topic. Each impact discussion below assesses the potential for the WSIP as a whole to contribute to significant cumulative impacts when considered in combination with the effects of other projects listed in Tables 4.17-1 through 4.17-6. Cumulative impact significance determinations for the entire WSIP study area are presented by environmental topic in **Table 4.17-8**.

Land Use and Visual Quality

Impact 4.17-1: Cumulative disruption of established communities, changes in existing land use patterns, and impacts on the existing visual character.

With respect to land use and visual impacts, the geographic scope of potential cumulative impacts encompasses the WSIP facility sites and immediate vicinities, including major construction staging areas (when known). However, major developments in the region are considered when characterizing overall regional changes in established land use patterns and visual quality.

Tables 4.17-1 through 4.17-6 indicate that cumulative development in the WSIP study area (including the San Joaquin, Sunol Valley, Bay Division, Peninsula, and San Francisco Regions) would result in development of over 20,000 residential units; more than 3 million square feet of commercial, office, or R&D uses; more than 2 million square feet of medical/hospital facilities; and more than 2.5 million square feet of industrial uses. Cumulative development would also include expansion of educational facilities (schools and colleges), transportation projects (including highway improvements, expansion of transit services), infrastructure improvements (including electricity generation/transmission and pipeline facilities), and quarry expansions. Such levels of development could disrupt established communities and significantly alter existing land use patterns

TABLE 4.17-8
SUMMARY OF CUMULATIVE FACILITIES IMPACTS

Impact Number and Topic	Cumulative Impacts
4.17-1a: Land Use	LS
4.17-1b: Visual Quality	LS
4.17-2: Geology, Soils, and Seismicity	B/LS
4.17-3: Hydrology and Water Quality	LS
4.17-4: Biological Resources	LS
4.17-5: Cultural Resources	PSU
4.17-6: Traffic, Transportation, and Circulation	PSU
4.17-7: Air Quality	PSU
4.17-8: Noise and Vibration	PSU
4.17-9: Public Services and Utilities	LS
4.17-10: Recreational Resources	LS
4.17-11: Agricultural Resources	LS
4.17-12: Hazards	LS
4.17-13: Energy Resources	LS

NOTE: The significance determinations presented in this table assume implementation of all SFPUC standard construction measures, federal/state/local regulations, and mitigation measures identified in Chapter 6.

B = Beneficial impact
LS = Less than Significant impact, no mitigation required
PSU = Potentially Significant Unavoidable impact

in some parts of the WSIP study area (particularly in rural areas such as the San Joaquin Region, where the Mountain House and Patterson Gardens projects are located). However, cumulative development can be expected to occur consistent with each jurisdictional agency's planned development (as specified in their general plans).

The WSIP projects would contribute incrementally to cumulative land use changes where the acquisition of easements or land could permanently displace existing land uses at discrete locations adjacent to or near specific facility sites. However, as described in Section 4.16 under Impact 4.16-1a, the WSIP would not result in a collective or additive impacts associated with land use displacement, and, as described in Section 4.3, implementation of SFPUC construction measures and Measures 4.3-1 and 4.3-2 would reduce the WSIP's potential land use impacts to a less-than-significant level. The cumulative projects listed in Tables 4.17-1 through 4.17-6 include some SFPUC infrastructure and water facilities projects similar to the proposed WSIP facilities; however, these projects would be almost entirely within existing SFPUC facility sites, would not result in land use changes, and there would be limited, if any, overlap of additional land acquisition at the same locations as the WSIP projects. Therefore, the WSIP's residual contribution to cumulative impacts on land use would not be cumulatively considerable (*less than significant*).

The cumulative projects listed in Tables 4.17-1 through 4.17-6 include numerous major development projects that could substantially alter the visual character of areas within the WSIP study area, particularly in rural areas such as the San Joaquin Region. With a few exceptions (e.g., Mountain House and Patterson Gardens, which are located in and west of the San Joaquin Region), most of the areas where cumulative development would occur are in or adjacent to urbanized areas, minimizing the potential for significant cumulative changes in visual quality. These cumulative projects would, by and large, add to the urban/developed character of the region. When considered in combination with these projects, the WSIP's incremental contribution to long-term visual impacts, with proposed mitigation (Measure 4.3-3), would not be cumulatively considerable (*less than significant*).

Geology, Soils, and Seismicity

Impact 4.17-2: Cumulative exposure of people or structures to geologic and seismic hazards.

The geographic scope of potential cumulative geologic and seismic impacts encompasses the WSIP facility sites and immediate vicinities. These types of impacts are generally site specific and depend on local geologic and soil conditions.

As described in Sections 4.4 and 4.16, the WSIP consists of projects to strengthen and improve water system components that could be subject to seismic hazards in the event of an earthquake on one of the regional faults, and to provide redundancy in the system should substantial damage and/or a failure of part of the system occur. In addition, several potentially cumulative SFPUC projects would improve the seismic safety of water system facilities, including pipeline repairs and replacements, and would therefore cumulatively contribute to *beneficial* effects related to the seismic safety of the regional water system.

Other potential geologic and seismic impacts associated with implementation of the WSIP, which include impacts related to slope instability during construction, erosion, alteration of topography, squeezing ground, and expansive or corrosive soils (Impacts 4.4-4 through 4.4-9), would be site-specific (dependent on local geologic and soil conditions) and would be less than significant or mitigated on a site-specific basis (Measures 4.4-1, 4.4-4, and 4.4-9). Similarly, impacts for the cumulative projects listed in Tables 4.17-1 through 4.17-6 would also be less than significant with compliance with applicable regulations (e.g., Uniform Building Code) or would be mitigated on a site-specific basis. With site-specific mitigation, the WSIP's contribution to any localized cumulative impacts related to geology, soils, and seismicity would not be cumulatively considerable (*less than significant*).

Hydrology and Water Quality

Impact 4.17-3: Cumulative impacts related to the degradation of water quality, alteration of drainage patterns, increased surface runoff, and flooding hazards.

The geographic scope of potential cumulative hydrology and water quality impacts encompasses the SFPUC watershed lands, the multiple creeks, streams, and associated drainage areas within the WSIP study area, as well as San Francisco Bay, which ultimately receives drainage from all WSIP regions (except for sites on the west side of San Francisco, which drain to the Pacific Ocean).

Sections 4.5 and 4.16 (Impact 4.16-4) address program-level and collective hydrology and water quality impacts associated with implementation of the WSIP. The WSIP projects in conjunction with other projects identified in Tables 4.17-1 through 4.17-6 would not result in cumulative water quality and hydrology effects related to increased erosion and sedimentation, construction-related discharges of treated water or groundwater produced during dewatering, or operational discharges of treated water (Impacts 4.5-1, 4.5-3a, 4.5-3b, and 4.5-5), because these projects would incorporate best management practices for temporary and permanent erosion control as well as for other construction-related discharges, implement an inspection and maintenance program, and include corrective actions should any permit exceedance occur in accordance with SFPUC Construction Measure #3 and National Pollutant Discharge Elimination System (NPDES) discharge regulations. As described in Section 4.5, the NPDES discharge regulations are designed to protect water quality on a regionwide basis and incorporate measures to protect beneficial uses of water bodies based on overall consideration of past, present, and future conditions within the region. With compliance with permit conditions and implementation of control measures specified in the permit, any residual impact of the WSIP on regionwide water quality would not be cumulatively considerable (*less than significant*).

The WSIP projects would contribute to a cumulative increase in impervious surfaces in each WSIP region, potentially resulting in increased discharges of stormwater and related pollutants (Impact 4.5-6). However, projects located in the Sunol Valley, Bay Division, and Peninsula Regions, which drain to lower (or south) San Francisco Bay, would be subject to municipal stormwater permitting requirements (depending on the extent of impervious surfaces created or replaced); these requirements would include incorporation of post-construction stormwater controls that (1) minimize the stormwater flow rate and quantity to prevent offsite erosion and flooding, and (2) minimize stormwater pollutant discharges to the maximum extent possible, as specified in the stormwater management plan required under NPDES regulations. With compliance with permitting requirements and implementation of control measures, any residual contribution of the WSIP to regionwide or localized cumulative water quality impacts related to an increase in impervious surfaces would not be considerable for these regions (*less than significant*). Furthermore, many of the potentially cumulative projects would involve redevelopment within an existing impervious area, and replacement of the existing impervious surfaces would trigger the need to comply with updated municipal stormwater permitting requirements and to implement improved post-construction stormwater controls. Overall, such compliance would be beneficial to water quality in San Francisco Bay and other receiving waters.

In the San Joaquin Region and parts of the San Francisco Region, municipal stormwater permitting requirements would not apply. However, in the San Joaquin Region, most of the cumulative increases in impervious surfaces would result from construction of approximately 17,700 residential units, 700,000 square feet of commercial/office space, more than 2.5 million square feet of light/medium/heavy industrial space, and various highway improvements. The increase in impervious surfaces from WSIP projects in this region would be approximately 26,000 square feet, a minor contribution when compared with the total impervious surfaces associated with cumulative development, and the WSIP projects would incorporate post-construction stormwater controls that (1) minimize the stormwater flow rate and quantity to prevent offsite erosion and flooding, and (2) minimize stormwater pollutant discharges to the maximum extent possible, as specified in the stormwater management plan required under NPDES regulations or Measure 4.5-6. The WSIP projects would contribute less than 1 percent of the impervious surfaces in the San Joaquin Region, and would incorporate post-construction stormwater management controls such that the residual effects on stormwater and related pollutants would be minimal. Therefore, the WSIP's contribution to cumulative increases in discharges of stormwater and related pollutants in the San Joaquin Region would not be considerable (*less than significant*).

Because most of San Francisco is developed with impervious surfaces, construction of new projects in the San Francisco Region would generally involve replacement of existing surfaces and would not result in an increase in stormwater flows to the city's combined sewer system. Therefore, neither the WSIP projects nor other cumulative projects would be expected to contribute to an increase in the number or frequency of combined sewer overflows. Furthermore, stormwater discharges to the combined system are regulated under San Francisco's NPDES permit in conformance with the Combined Sewer Overflow Control Policy and all new development would likely incorporate improved stormwater controls, which would reduce the rate and quantity of stormwater discharged to the combined sewer system. With compliance with the applicable permit requirements, the WSIP projects would not be expected to contribute to an increase in the number or frequency of combined sewer overflows. Therefore, the WSIP's potential impacts related to an increase in impervious surfaces would not be cumulatively considerable for the San Francisco Region (*less than significant*).

None of the WSIP projects would contribute to a cumulative impact related to the alteration of drainage patterns that would result in offsite flooding, erosion, or sedimentation (Impact 4.5-6), because all projects would be required to implement SFPUC Construction Measures #3 and #10 (onsite water quality and project site measures) as well as comply with NPDES permits, which would require implementation of temporary and permanent erosion control measures in accordance with the regulatory-approved stormwater pollution prevention plan and stormwater management plan, or comply with erosion control measures enforced through Article 4.1 of the San Francisco Public Works Code in San Francisco. Other cumulative projects would be subject to similar requirements. The WSIP's potential impacts related to an alteration of drainage patterns would not be cumulatively considerable in any of the WSIP regions.

Impacts related to the diversion of flood flows and contribution of sediments and contaminants to flood flows during construction activities (Impact 4.5-4) would be mitigated to a less-than-significant level through implementation of flood flow protection measures (Measure 4.5-4a). Although projects located within 100-year floodplains could result in cumulative flooding impacts, the SFPUC would design facilities to avoid effects on flood flows. Therefore, the WSIP's incremental contribution to flooding impacts would not be cumulatively considerable (*less than significant*). Furthermore, identified private developments would be subject to local policies, which restrict new development within 100-year floodplains and specify measures for reducing flooding impacts.

Biological Resources

Impact 4.17-4: Cumulative loss of sensitive biological resources.

The geographic scope of potential biological resources impacts encompasses the wildlife and plant habitats of affected species in the WSIP study area (including wetlands, sensitive habitats, and riparian habitat).

Section 4.6 evaluates the impacts of each WSIP project on biological resources, including wetlands, sensitive habitats as defined by the California Department of Fish and Game, as well as heritage trees, special-status plant and wildlife species, and riparian habitat potentially subject to state and federal protection. As indicated in Tables 4.17-1 through 4.17-6, there could be cumulative impacts on sensitive biological resources located throughout the WSIP study area. These tables indicate that cumulative development in the WSIP study area (including the San Joaquin, Sunol Valley, Bay Division, Peninsula, and San Francisco Regions) would result in development of over 20,000 residential units; more than 3 million square feet of commercial, office, or R&D uses; more than 2 million square feet of medical/hospital facilities; and more than 2.5 million square feet of industrial uses. Cumulative development would also include expansion of educational facilities (schools and colleges), transportation projects (including highway improvements, expansion of transit services), infrastructure improvements (including electricity generation/transmission and pipeline facilities), and quarry expansions. Past, present, and projected future development within the Bay Area and Central Valley regions has and will result in significant unavoidable impacts on biological resources, regardless of whether the WSIP is implemented or not.

The cumulative impacts on biological resources resulting from the WSIP in conjunction with projects listed in Tables 4.17-1 through 4.17-6 are best described as bioregional effects, operating beyond the level of individual plants or animals.[6] For example:

[6] This section addresses cumulative impacts within the WSIP study area, which spans from San Francisco on the west to Oakdale Portal on the east. See Section 5.7 for cumulative impacts within areas east of Oakdale Portal (Tuolumne River watershed).

- Genetic diversity impacts on small populations that become reduced and isolated by development
- Impacts on wildlife movement due to habitat fragmentation
- Suppression of natural disturbance regimes (e.g., fire, flood) as projects are constructed, operated, and maintained
- Reduced population recovery opportunities from stochastic events (e.g., random events such as disease)

Compliance with applicable state and federal regulations, general plan conservation measures, and project-specific permitting requirements would mitigate these bioregional effects to some extent. For the WSIP, implementation of mitigation measures that address wetlands and special-status species protection, habitat restoration, and tree protection (Measures 4.6-1 through 4.6-3) as well as combining habitat compensation through a coordinated program such as the Habitat Reserve Program or other means (Measure 4.16-4a) to address bioregional effects could provide additional protection of affected biological resources, thereby ensuring that the WSIP's contribution to these cumulative bioregional effects would be *less than significant*.

Tables 4.17-1 through 4.17-6 include approximately six cumulative projects in the Sunol Valley, Bay Division, and Peninsula Regions designed to restore, protect, and enhance biological resources through the implementation of conservation measures (e.g., open space acquisition) in the WSIP study area. These projects include the Alameda and Peninsula Watershed Management Plans, habitat conservation plans for the SFPUC's Alameda and Peninsula watersheds, the SFPUC's Watershed and Environmental Improvement Program, and the South Bay Salt Pond Restoration Project at the south end of San Francisco Bay. Additional enhancement, restoration, and protection projects are identified and discussed in Section 5.7, Cumulative Projects and Impacts Related to WSIP Water Supply and System Operations. Although these projects do not specifically address biological impacts of the WSIP, they would provide an overall net benefit in terms of these cumulative bioregional effects.

Cultural Resources

Impact 4.17-5: Cumulative increase in impacts on archaeological, paleontological, and historical resources.

The geographic scope of potential cumulative impacts on cultural resources encompasses the WSIP facility improvement project sites and immediate vicinities, and other SFPUC projects near WSIP sites.

As described in Section 4.7, there is a potential to encounter previously undiscovered cultural resources, including archaeological and paleontological resources, during construction of WSIP facilities; however, implementation of recommended mitigation measures would reduce impacts to a less-than-significant level. The potential to encounter cultural resources associated with the other cumulative projects listed in Tables 4.17-1 through 4.17-6 is unknown, but does exist. However, since the WSIP's impacts on archaeological and paleontological resources would be site-specific and mitigated to a less-than-significant level with implementation of Measure 4.7-1, the WSIP's contribution to any such impacts would not be cumulatively considerable (*less than significant*).

As described in Impact 4.7-4 and in Section 4.16, Collective Impacts Related to WSIP Facilities, under Impact 4.16-5, implementation of the WSIP could alter historical resources within the SFPUC regional water system, but only has the potential to cause a collective impact on historic districts (if historic districts are determined to be present) within the Sunol Valley and Peninsula Regions. As shown on the tables, the SFPUC has implemented or proposes to implement other projects along the regional water system. These other projects generally involve varying degrees of facility repair, upgrade, and improvement. None of the projects listed in the tables would cause impacts on known historical resources that could also be affected by WSIP projects.

Similar to the analysis presented in Section 4.16, the WSIP contribution to potential cumulative effects would not be cumulatively considerable in the San Joaquin and Bay Division Regions, but could be cumulatively considerable in the Sunol Valley and Peninsula Regions. In the San Joaquin and Bay Division regions, the WSIP facility improvement projects are primarily pipeline projects located within the SFPUC's existing rights-of-way; there would be little overlap in the construction impact area of these projects and those of other development and infrastructure projects in these regions. SFPUC Construction Measure #9 along with mitigation measures identified in Chapter 6 (Measures 4.7-3 and 4.7-4a through 4.7-f) address the potential cultural resource effects of the projects in these regions and would minimize the contribution of these projects to cumulative effects.

There are several WSIP projects as well as several other SFPUC projects that have been implemented or are proposed in the Sunol and Peninsula Regions. In combination, these projects could result in significant impacts on individual historical resources or on potential historic districts (if historic districts were determined to be present in either region). More detailed, site-specific analysis of individual WSIP projects will be conducted during project-level environmental review, which may support a determination that the WSIP projects in these two regions would not make a considerable contribution to cumulative effects. Until this project-level analysis is completed, this PEIR conservatively considers the potential cumulative effect of the WSIP projects in the Sunol Valley and Peninsula Regions to be *potentially significant and unavoidable.* Even if implementation of Measures 4.7-4a through 4.7-4f could reduce the severity of the impact, this PEIR conservatively considers the impact to be significant. Project-level analysis may determine that the impact is less than significant or that additional mitigation measures are available to reduce the significant impact to a less-than-significant level.

Traffic, Transportation, and Circulation

Impact 4.17-6: Cumulative traffic increases on local and regional roads.

The geographic scope of potential cumulative traffic impacts includes regional facilities (e.g., highways and freeways) and local roads providing access to WSIP sites.

Tables 4.17-1 through 4.17-6 present the planned public and private projects that could be under construction during the WSIP construction period (2007 to 2014). The majority of these projects are related to planned and proposed commercial and residential development throughout the five regions. Cumulative traffic impacts associated with these developments include temporary short-term traffic increases related to construction vehicles traveling to and from the site, as well as long-term vehicle trips generated by the new land uses. A number of projects in Tables 4.17-1 through 4.17-6 involve extension and/or widening of existing roadways (primarily within the San Joaquin Region), and capacity and safety improvements along highway corridors and at interchanges (e.g., Highways 84, 99, and 132; I-680 and I-880). These transportation projects would not generate long-term vehicle trips, but would accommodate cumulative traffic growth.

The WSIP and other cumulative development projects listed in Tables 4.17-1 through 4.17-6 would result in long-term cumulative traffic increases. Most of the cumulative operational traffic increases would be generated by the development of more than 20,000 residential units, more than 3 million square feet of commercial/office/R&D uses, more than 2 million square feet of medical/hospital facilities, and more than 2.5 million square feet of industrial uses. The WSIP-related increases in operational traffic due to increased chemical deliveries or inspections (as described in Section 4.8) would not likely be discernible from future background increases in traffic. For the majority of the WSIP facility sites, periodic operations and maintenance of the facilities would be similar to existing operations and would not result in any new vehicle trips to the area. Some new and upgraded facilities would result in additional employees (up to two per location) and increased chemical deliveries (on average about one additional delivery per day). At these locations, there would be up to three vehicle trips to and three vehicle trips from the project site on a daily basis. Because this increase in vehicle trips on the roadway network would be minimal, the WSIP's contribution to cumulative traffic increases during operation of the proposed WSIP facility improvement projects would not be cumulatively considerable (*less than significant*).

Construction of the WSIP projects would result in short-term cumulative traffic increases. These cumulative impacts would be temporary and would only occur during the WSIP construction period (2007 to 2014). The following assessment of WSIP cumulative impacts therefore focuses on the WSIP's contribution to construction-related multi-regional and localized cumulative impacts.

The WSIP projects, both individually and collectively, would contribute incrementally to cumulative construction-related impacts, particularly when travel routes of individual drivers cross multiple roadways affected by WSIP projects, other SFPUC projects, and other public and private construction projects within one or more region, and/or when construction vehicles utilize regional facilities. Cumulative impacts would include increased travel times, although the extent and duration of delay would vary depending on individual driver origins and destinations, time of travel, and use of alternate routes. Implementation of Measures 4.16-6a and 4.17-6 would serve to offset the WSIP's contribution to regionwide cumulative traffic impacts, but would not reduce impacts to a less-than-significant level. Therefore, the WSIP's contribution to regionwide cumulative traffic impacts is considered to be *potential significant and unavoidable*.

As described in Impact 4.16-6, the WSIP projects would collectively result in short-term increases in vehicle trips, increased potential for traffic safety conflicts, reduced access to and parking at adjacent land uses, disruptions to transit service, and increased wear-and-tear on designated haul routes. The localized impacts of WSIP projects would be reduced to a less-than-significant level with implementation of Measure 4.8-1, and the collective WSIP impacts would be reduced to a less-than-significant level with implementation of Measures 4.16-6a, 4.16-6b, and 4.16-6c; nonetheless, the WSIP could still contribute to localized cumulative construction-related traffic impacts when considered in combination with the projects listed in Tables 4.17-1 through 4.17-6.

These localized cumulative construction-related traffic impacts could occur as a result of: (1) cumulative projects that generate increased traffic at the same time on the same roads as the WSIP facility projects, causing increased congestion and delays; and (2) infrastructure projects in roads used by WSIP construction workers and trucks, which could affect detour routes around WSIP work zones or delay WSIP-generated vehicles past the work zones of the other projects. In addition to cumulative (additive) effects on traffic flow conditions, the WSIP and other cumulative projects could prolong the period of disruption (although not all disruption would be significant) in traffic flow on roadways affected by cumulative traffic.

The overlap of WSIP projects and other cumulative projects is presented in Table 4.17-7. The potential localized cumulative construction-related traffic impacts by region are characterized as follows:

- *San Joaquin Region*. As indicated in Table 4.16-3, development of the WSIP in conjunction with other public/private developments in this region could result in significant cumulative increases in construction-related traffic on regional roadways (e.g., Highways 132 and 99, I-5). Construction of the WSIP in combination with other SFPUC projects could result in significant cumulative increases in traffic on local roadways providing access to Tesla Portal and Thomas Shaft.

- *Sunol Valley Region*. As indicated in Table 4.17-2, development of the WSIP in conjunction with other public/private developments and SFPUC projects in this region could result in significant cumulative increases in construction-related traffic on regional roads (e.g., Calaveras Road, Highway 84, I-680). Construction of the WSIP in combination with other SFPUC projects could result in significant cumulative increases in traffic on Calaveras Road, which could conflict with businesses (nurseries, quarries) in the Sunol Valley.

- *Bay Division Region*. As indicated in Table 4.17-3, construction of the WSIP in combination with other public/private developments in this region could result in significant cumulative traffic impacts on local and regional roads (e.g., the I-880 corridor, I-680, the Highway 101 corridor including various interchanges, the University Avenue/Highway 84 interchange, and arterial streets providing access to SFPUC facilities such as Paseo Padre Parkway and Mowry Boulevard in Fremont). Cumulative construction-related traffic impacts could occur near at-grade rail crossings proposed in Fremont, Newark, East Palo Alto, and Menlo Park if the Dumbarton Rail Corridor Project was under construction or operating at the same time WSIP facilities were being constructed. Cumulative construction-related traffic impacts could occur on local access roads to SFPUC facilities wherever WSIP facility construction overlapped with other SFPUC facility construction (see Table 4.17-7).

- *Peninsula Region*. As indicated in Table 4.17-4, construction of the WSIP facilities in combination with other public/private developments in this region could result in cumulative construction-related impacts on local or regional roads (e.g., various Highway 101, I-280, and I-380 freeway interchanges). Cumulative construction-related traffic impacts could occur on local access roads to SFPUC facilities in this region where WSIP facility construction overlaps with other SFPUC facility construction (see Table 4.16-9).

- *San Francisco Region*. As indicated in Table 4.17-6, construction of the WSIP in combination with other public/private developments in this region could result in significant cumulative traffic impacts on local access streets (e.g., the Highway 101/Airport Boulevard/I-380 interchange and Oyster Point ramps, Highway 101/Bayshore Boulevard ramps, and major arterials including Bayshore Boulevard, Geneva Avenue, Brotherhood Way). Cumulative construction-related traffic impacts could occur on local access roads to SFPUC facilities in this region where WSIP facility construction overlaps with other SFPUC facility construction (see Table 4.17-7).

- *Systemwide Projects*. Construction of the systemwide projects listed in Table 4.17-6 would result in traffic increases on access routes to existing SFPUC facilities at multiple locations within the system between Oakdale Portal and the San Francisco Bay Area. In general, construction of these systemwide improvements would not occur within or across public roads. Because of the short-term nature and minimal construction activities associated with these projects, their contribution to cumulative construction-related traffic would not likely be considerable. However, given the unspecified location and timing of these projects, their potential to contribute to significant cumulative construction-related traffic impacts cannot be completely ruled out.

Given the lack of certainty about the timing of many of the projects shown in Tables 4.17-1 through 4.17-6, significant cumulative traffic and circulation impacts could occur on some roadways, such as Calaveras Road in the Sunol Valley. Implementation of traffic control plans (as specified in Measure 4.8-1) and coordination of these traffic control plans by a SFPUC WSIP construction coordinator (as specified in Measure 4.16-6a) would reduce the WSIP's contribution to cumulative impacts in overlapping areas. However, some traffic disruption and increased delays would still occur during WSIP construction, even with mitigation. When added to traffic delay and disruption effects of other projects listed in Tables 4.17-1 through 4.17-6, it is possible that significant cumulative construction-related traffic impacts on local or regional roadways could still occur.

Caltrans, county agencies, and local jurisdictions would issue encroachment permits for public and private project construction affecting public rights-of-way (e.g., roadway widening, in-road sewer replacement, interchange improvements), which would generally mitigate the construction impacts of such projects. However, because a traffic control plan might not always be required as part of every project approval, most construction traffic associated with new development might not be regulated or monitored. Significant cumulative impacts could occur during simultaneous construction of nearby projects, particularly since the SFPUC would have no control over construction schedules or traffic from other projects outside its jurisdiction. For example, construction activities of one or more projects that adversely affect roadway capacity, combined with construction vehicle traffic traveling to and from these projects and nearby development projects, could result in increased delays due to traffic diversions and substantial increases in truck traffic. Reasonably practical mitigation measures are not available to regulate construction activities of all overlapping projects within the five regions. Coordination of maintenance traffic, construction traffic generated by other SFPUC projects, and WSIP-related construction traffic (see Measure 4.17-6) would help minimize the WSIP's contribution to cumulative construction-related impacts on local and regional roadways. However, interagency coordination of construction traffic might not always be possible; therefore, these localized cumulative traffic impacts would be *potentially significant and unavoidable*.

Air Quality

Impact 4.17-7: Cumulative increases in construction and/or operational emissions in the region.

Criteria Pollutants

The geographic scope for cumulative air quality impacts is the San Joaquin Valley Air Basin and San Francisco Bay Area Air Basin for regionwide impacts, and haul routes for localized impacts.

As described in Section 4.9, potential air quality impacts associated with implementation of the WSIP include increased dust and equipment emissions during construction, exposure to diesel particulate matter (DPM), emissions from ventilation fans, emissions during operation of the WSIP facility improvement projects, odors, secondary emissions from power use, and conflicts with regional and statewide air quality planning (Impacts 4.9-1 through 4.9-7). The WSIP, in combination with other cumulative projects listed in Tables 4.17-1 through 4.17-6, would result in regionwide cumulative increases in air emissions during project operations. The majority of cumulative increases in air pollutant emissions would be due to regional traffic increases and energy use associated with development of over 20,000 residential units, more than 3 million square feet of commercial/office/R&D uses, more than 2 million square feet of medical/hospital facilities, and more than 2.5 million square feet of industrial uses. The WSIP's emissions during facility operation would be associated primarily with equipment operation, not maintenance-related traffic increases. Therefore, with required compliance of WSIP equipment with the Bay Area Air Quality Management District (BAAQMD) and the San Joaquin Valley Air Pollution Control District (SJVAPCD) air quality regulations, the WSIP's contribution to operational cumulative air quality impacts would not be considerable (see Section 4.16.2 for discussion of WSIP collective operational air quality impacts). New emissions sources during project operations would be primarily limited to minor increases in traffic due to project maintenance and emergency generators (approximately 10 generators, operating only during power outages and testing exercises).

Where construction of WSIP facility improvement projects overlaps with other cumulative projects (see Table 4.17-7), regional cumulative increases in construction-related air quality emissions in both air basins would also occur. Although both the BAAQMD and SJVAPCD consider construction-related emissions to be less than significant with implementation of each district's standard control measures (as specified in Measures 4.9-1a through 4.9-1d), there would still be a residual contribution from each project to the region's nonattainment status for ozone and particulate matter (PM_{10} and $PM_{2.5}$) in both air basins. Therefore, the WSIP's contribution to construction-related, regionwide cumulative air quality impacts on the nonattainment status for ozone and particulate matter is considered *potentially significant and unavoidable.*

When WSIP construction projects overlap with construction of other cumulative projects (see Table 4.17-7), it is possible that localized cumulative increases in DPM emissions could occur along haul routes, potentially exposing sensitive receptors to elevated DPM levels. Given the lack of certainty about the timing of many of the projects listed in these tables, it is prudent to conclude that significant cumulative increases in DPM are possible on streets that might serve as common haul routes. Coordination of all SFPUC-related maintenance traffic, construction traffic generated by other SFPUC projects, and WSIP-related construction traffic (see Measure 4.17-6) would help minimize the potential for cumulative construction-related DPM impacts on local roadways. However, the SFPUC would have no control over construction schedules or traffic from other projects outside its jurisdiction, and interagency coordination of construction traffic might not always be possible. Therefore, localized DPM impacts are considered *potentially significant and unavoidable*.

GHG Emissions

Sources of GHGs from WSIP projects, including those associated with construction equipment, increases in vehicle traffic and use of refrigerants during facility operations, and secondary operational increases in GHG emissions resulting from electricity generation would overlap with similar sources of GHG emissions from other projects. However, as documented previously, increases in GHG emissions from these sources associated with WSIP projects would be minimal and the contribution from the WSIP projects would not result in a considerable contribution to cumulative GHG emissions.

GHG emissions from peak project construction activities would represent 0.0022 percent of the statewide total of GHG emissions during the time these peak construction activities are carried out. WSIP projects largely involve improvements to existing operations and would result in few new operational activities associated with GHG emission increases.

The WSIP would also result in secondary operational increases in GHG emissions as a result of electricity generated to meet the WSIP's increase in energy demand (Impact 4.9-7). Although electricity for the WSIP projects would be derived primarily from hydroelectric sources, power would need to be purchased by current customers of the SFPUC Power Enterprise from the grid or other sources when less hydroelectric power is available, particularly during the summer and fall months. Power generation is regional in nature and could occur outside the San Francisco and San Joaquin Valley air basins or outside of California. Therefore, the WSIP's incremental increase in power demand during project operations (the portion that is not from hydroelectric or alternative energy sources) would indirectly serve to sustain rather than reduce current GHG emissions from these emission sources. The WSIP projects at completion would create approximately 14,260 metric tons of CO_2-equivalent emissions by consuming hydroelectric power that is no longer available to current users. Compared to the current annual inventory of 427,000,000 metric tons in California, this represents 0.0033 percent of that inventory. Planned increases in water distribution and treatment system efficiencies would offset a limited portion of the increased power demand, but not enough to eliminate the increase in GHG emissions that would result from WSIP-diverted electrical power. Nevertheless, the total increased power demand associated with the operation of the WSIP projects is a small fraction of total state demand.

These minor increases in GHG emissions would be offset in several ways. As the CARB's Early Action Measures and CEC's greenhouse gases emission performance standard for local, public-owned electric utilities become effective (see discussion under Regulatory Framework, Greenhouse Gas Emissions Limits), the SFPUC will implement them as required to reduce GHG emissions from the WSIP project operations. Also, continuing implementation of GHG reduction actions by the CCSF and SFPUC, and additional GHG reduction actions that SFPUC will take as part of the WSIP project (see above under "Existing Setting"), would assure that the WSIP projects would not conflict with the State's goals of reducing GHG emissions to 1990 levels by 2020. Therefore, the cumulative contribution of GHG emissions associated with the WSIP to GHG emissions from other sources as a whole would be less than significant.

As part of implementation of the WSIP, the SFPUC will be required to implement mitigation measures to address other identified impacts that would also reduce GHG emissions. They include exhaust controls (Measures 4.9-1b, 4.9-1d and 4.16-7a), waste reduction measures (Measure 4.11-2) and energy efficiency measures (Measure 4.15-2). In addition, CARB regulations (Title 13 of the California Code of Regulations, Sections 2480 and 2485), which limit idling of diesel-fueled commercial motor vehicles, would help to limit GHG emissions associated with WSIP-related construction vehicles.

Noise and Vibration

Impact 4.17-8: Cumulative increases in construction-related and operational noise.

The geographic scope of potential cumulative noise impacts encompasses the WSIP sites and their immediate vicinities as well as areas adjacent to access and haul routes to the WSIP sites.

As described in Section 4.10 and Section 4.16 (Impact 4.16-9), noise increases associated with construction and operation of proposed WSIP facilities would be specific to each facility site, except in the event that any cumulative project sites adjoined WSIP facility sites or used the same haul/delivery/access routes. Cumulative projects listed in Tables 4.17-1 through 4.17-6 would presumably be subject to applicable noise regulations (e.g., local noise ordinance and guidelines), while all WSIP projects would be required to implement noise control measures (SFPUC

Construction Measure #6, compliance with local noise ordinances to the extent feasible, and/or Measure 4.10-1a). With site-specific mitigation for all projects, regionwide or multi-regional cumulative noise impacts at any adjoining construction sites would be less than significant.

Potential cumulative impacts could occur if other cumulative projects generated truck traffic and used the same delivery/haul/access routes at the same time as the WSIP projects, causing localized cumulative construction-related noise increases. Given the lack of certainty about the timing of many of the projects in Tables 4.17-1 through 4.17-6, it is prudent to conclude that significant cumulative truck noise increases are possible on streets that might serve as common haul routes. Cumulative traffic increases on regional roadways such as freeways, highways, and arterials would not likely alter noise levels significantly along these routes (identified in Tables 4.17-1 through 4.17-6), given the high ambient noise levels that typically occur along these types of streets. However, if cumulative truck traffic increases occurred on any local residential streets providing access to SFPUC facilities, cumulative noise increases could be significant. As required in Measures 4.10-2a and 4.10-2b, limiting the hourly truck volumes and restricting truck operations on local residential streets would help reduce the WSIP's contribution to this cumulative impact. Coordination of maintenance traffic, construction traffic generated by other SFPUC projects, and WSIP-related construction traffic (see Measure 4.17-8) would help minimize the WSIP's contribution to cumulative construction-related impacts on local and regional roadways. However, interagency coordination of construction traffic might not always be possible; therefore, these localized cumulative noise impacts would be *potentially significant and unavoidable*.

Public Services and Utilities

Impact 4.17-9: Cumulative impacts related to disruption of utility service or relocation of utilities.

The geographic scope of potential cumulative public services and utilities impacts encompasses the WSIP sites, immediate vicinities, and the service areas of regional service/utility providers.

As described in Section 4.16, Impact 4.16-9, construction of the WSIP projects could disrupt utility services or require temporary or permanent relocation of utilities. Construction of other cumulative development in the region would also increase the potential for such utility impacts. These potential impacts would be site-specific rather than additive and would be mitigated on a site-specific basis (presumably including cumulative development). Therefore, the WSIP would not result in localized cumulative impacts on existing public utilities.

As discussed under Impact 4.16-9, the WSIP's demand on landfills represents less than approximately one percent of the total existing landfill capacity in the region. Therefore, the WSIP's contribution to cumulative construction-related demand on regional landfill capacity would not be cumulatively considerable, and the impact would be *less than significant*.

Recreational Resources

Impact 4.17-10: Cumulative effects on recreational resources during construction.

The geographic scope of potential cumulative recreational impacts encompasses the WSIP sites and immediate vicinities. However, major developments in the area are considered when characterizing overall cumulative regional impacts on recreational resources.

As described in Section 4.12 and Section 4.16, Impact 4.16-10, construction activities associated with some WSIP facilities could temporarily disrupt access to or use of recreational facilities within the WSIP study area. However, given the availability and diversity of recreational opportunities in the vicinity of the WSIP projects and the region as a whole, the diversion of recreationists to alternative facilities would not likely result in overcrowding and associated deterioration of recreational resources. Since the private development projects listed in Tables 4.17-1 through 4.17-6 would be located on privately owned lands, they would not likely directly affect publicly owned recreational facilities. Since the identified road improvement projects would be located in roadways, they would also not be likely to directly affect recreational facilities. However, if other SFPUC projects listed in the tables were located within recreational facilities and coincided with construction of WSIP projects, localized cumulative disruption of recreational facilities could result. Implementation of SFPUC construction measures (including advanced notification) and coordination with recreational facility managers and schools (Measures 4.12-1a and 4.12-1b) would reduce the WSIP's impact to a less-than-significant level, and any residual effects of the WSIP would not contribute considerably to any regionwide cumulative impacts on recreational resources (*less than significant*).

Agricultural Resources

Impact 4.17-11: Cumulative conversion of farmland to nonagricultural uses.

The geographic scope of potential cumulative agricultural resources impacts encompasses the WSIP sites and their immediate vicinities. However, major developments in non-urbanized areas are considered when characterizing overall cumulative regional impacts on farmland.

As described in Section 4.16, Impact 4.16-11, implementation of the WSIP would result in less-than-significant regionwide collective impacts on agricultural resources. When other cumulative development projects listed in Tables 4.17-1 through 4.17-6 are considered (specifically, the 300-acre Patterson Gardens and the 659-acre RMC Pacific Vernalis Quarry Mining and Reclamation Project, located in the San Joaquin Region), there would be a cumulative conversion of farmland to nonagricultural uses in the San Joaquin Region. While the WSIP would not contribute to any regionwide cumulative loss of farmland in the Bay Area (Sunol Valley, Bay Division, Peninsula, and San Francisco Regions), it could incrementally contribute to the regional cumulative loss of farmland in the San Joaquin Region. The regional loss of farmland in the Central Valley is a concern due to the rapid pace of urban development and associated conversion of agricultural land to nonagricultural uses. Therefore, siting WSIP facilities to avoid prime agricultural lands or to offset any loss of such lands (Measure 4.13-2) would reduce the WSIP's contribution such that its contribution to the regionwide cumulative loss of farmland would not be considerable (*less than significant*).

Hazards

Impact 4.17-12: Cumulative effects related to hazardous conditions and exposure to or release of hazardous materials.

The geographic scope of impacts associated with hazards and hazardous materials encompasses the WSIP sites and their general vicinities, particularly WSIP facilities near urbanized industrial uses and areas of wildland fire hazard.

As described in Section 4.14, the potential to encounter hazardous materials or hazardous conditions during construction would be less than significant or mitigated to a less-than-significant level at all sites through project-specific assessment of hazards and compliance with regulatory requirements. Due to the site-specific nature of hazardous materials impacts and mitigation measures, there would be no potential for cumulative effects from construction of WSIP projects in conjunction with other cumulative development listed in Tables 4.17-1 through 4.17-6.

Similarly, impacts related to the potential for accidental releases of chemicals stored at the water treatment plants would also be site-specific and not additive. Compliance with hazardous materials regulations (including preparation or updating of hazardous materials business plans at all sites, and preparation of a risk management plan for the new use of ammonia, if required, at the Sunol Valley WTP and changes to the risk management plan for changes in the use of ammonia at the Harry Tracy WTP) would ensure that site-specific impacts are less than significant.

Due to the site-specific nature of these impacts, compliance with applicable laws and regulations, and implementation of SFPUC construction measures and mitigation measures identified in Section 4.14, there would be no potential for regionwide or localized cumulative effects related to the exposure to hazardous materials during construction or operation of the WSIP projects.

As discussed in Section 4.16, Impact 4.16-12, there would be an increased risk of wildland fires during WSIP construction in high fire hazard areas. If construction of cumulative development overlapped in high fire hazard areas, there could be a cumulative increase in wildland fire risk, particularly in areas such as the Sunol Valley where access and haul roads would be shared. The potentially compounded increase in wildland fire risk could place an additional burden on local fire departments, particularly if access for emergency vehicles were impeded. With site-specific mitigation (Measure 4.8-1) and compliance with Public Resources Code provisions governing the use of construction equipment in fire-prone areas, the WSIP's residual contribution to any localized cumulative wildland fire impacts would not be considerable (*less than significant*).

Construction of the WSIP projects could also contribute to a cumulative impact related to hazardous waste disposal. However, as discussed in Impact 4.16-12, based on worst-case estimates, the WSIP's potential hazardous waste disposal requirements would represent approximately 1.5 percent of the total existing hazardous waste disposal capacity in the region, and less than 1 percent of the disposal volume expected to be available by 2013. Therefore, the WSIP's contribution to this cumulative impact on hazardous waste disposal capacity would not be considerable (*less than significant*).

Energy Resources

Impact 4.17-13: Cumulative increases in the use of nonrenewable energy resources.

As described in Section 4.15 and Section 4.16, Impact 4.16-13, existing energy consumption for operation of the SFPUC regional water system in the WSIP study area totals approximately 44 million kilowatt-hours (kWh), and operation of the WSIP facilities would increase the SFPUC's regionwide energy consumption by approximately 39 million kWh, an 89 percent increase over existing conditions. As discussed in Impact 4.16-13, the net loss in available hydroelectric energy as a result of WSIP implementation would be 30 million kWh, less than 0.1 percent of the estimated total energy usage in the counties within the WSIP study area.

The potentially cumulative SFPUC projects listed in Tables 4.17-1 through 4.17-6 would not substantially increase energy use in the WSIP region, because they would generally not involve an increase in energy use during operation of WSIP facilities, would be non-energy-intensive improvements to the water system, would be upgrades that would include energy efficiency improvements, or would include improvements to facility electrical systems. In addition, the New Electrical Transmission Line from Newark to San Francisco (BDP-16) would improve electricity transmission capabilities to San Francisco. Furthermore, future implementation of large-scale solar and other renewable energy resources on public and private property in the city under project CSYS-5 would help offset any increase in the use of hydroelectric power generated by SFPUC Power Enterprise, although the amount cannot be quantified at this time.

On the other hand, implementation of the cumulative non-SFPUC development projects listed in Tables 4.17-1 through 4.17-6 would contribute to increased energy consumption in Tuolumne, San Joaquin, Alameda, Santa Clara, San Mateo, and San Francisco Counties. However, these projects would generally not use hydroelectric power produced by SFPUC Power Enterprise and would be required to meet Energy Efficiency Standards for Residential and Nonresidential Buildings (see Section 14.15), which would ensure that energy is not used in a wasteful manner for these projects. Furthermore, the increase in energy consumption from these projects is accounted for in the 1.2 percent annual increase projected by the California Energy Commission, as discussed in Section 4.15. Because the net loss in available hydroelectric energy as a result of

WSIP implementation would be less than 0.1 percent of the estimated total energy usage in the counties within the WSIP study area, the WSIP's contribution to cumulative increases in long-term energy demand would not be considerable (*less than significant*).

Construction activities associated with WSIP projects in all regions would require the use of fuels to operate construction equipment and transport employees and materials. Implementation of exhaust control measures (limiting idling time and performing low-emissions tune-ups, as specified in Measures 4.9-1b and 4.9-1d) would ensure that fuels are not used in a wasteful or inefficient manner. Therefore, the WSIP's contribution to the regionwide cumulative increase in construction-related energy consumption would not be considerable (*less than significant*).

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ATTACHMENT 4-A
Mitigation for Chapter 4 Impacts

Introduction

Chapter 6, Mitigation Measures, presents the SFPUC construction measures and all mitigations measured identified to address significant impacts of the WSIP discussion in all impact sections of this PEIR. This attachment is an excerpt from Chapter 6 that presents the SFPUC construction measures and all mitigation measures for the PSM and PSU impacts described in Chapter 4. Mitigation measures for impacts identified in Sections 4.2 through 4.15 are presented under the respective environmental resource topic, such as Land Use or Biological Resources. Mitigation measures for collective and cumulative impacts (Sections 4.16 and 4.17) are also presented under the appropriate environmental resource topic, rather than under a separate heading, so that similar measures are grouped together. As stated above, all mitigation measures are numbered to correspond to the same impact numbers, although in some cases, the same measure would mitigate more than one impact and the numbering corresponds to the first impact identified and cross-referenced so that measures are not duplicated.

SFPUC Construction Measures

The following SFPUC standard construction measures apply to all proposed WSIP facility improvement projects. The SFPUC standard construction measures are aimed at minimizing disruptions to surrounding neighborhoods, resources, and land uses during any SFPUC construction, maintenance, or repair activity or project that requires CEQA review. As required by the SFPUC, each project must include the SFPUC standard construction measures in the construction contract or project implementation procedures, as appropriate.

Some of the SFPUC standard construction measures may not be appropriate for certain kinds of projects, but each of the measures must be addressed, either by explaining why the measure is not applicable to the particular site, undertaking the activities listed, or undertaking further investigation and developing a more detailed work plan to address the issue.

1. *Neighborhood Notice*: The SFPUC will provide reasonable advance notification to the businesses, owners and residents of adjacent areas potentially affected by the Water System Improvement Program (WSIP) projects about the nature, extent and duration of construction activities. Interim updates should be provided to such neighbors to inform them of the status of the construction.

Where schools would be affected, the SFPUC will coordinate with school facility managers to schedule construction for time periods with the least impact on school activities and facilities to ensure student safety and to minimize disruption to educational and recreational uses of the school property.

2. *Seismic and Geotechnical Studies*: Projects will incorporate review of existing information and, if necessary, new engineering investigations to provide relevant geotechnical information about the particular site and project, including a characterization of the soils at the site, and the potential for subsidence and other ground failure. Construction will address any recommendations by such geotechnical reports to ensure seismic stability and reliability of the proposed project. All SFPUC projects must be designed for seismic reliability and minimum potential water loss and property damage. All components of the water system improvement program must be designed to continue water service during a major earthquake.

3. *On-Site Air and Water Quality Measures during Construction*: All construction contractors must take measures to minimize fugitive dust and dirt emissions resulting from the construction, and implement measures to minimize any construction effects on local air and water quality, including a local storm drain system or watercourse. These measures could include preparation of a Stormwater Pollution Prevention Plan (SWPPP), if required by the California Regional Water Quality Control Board. At a minimum, construction contractors should undertake the following measures, as applicable, to minimize any adverse effects:

    - Erosion and sedimentation controls tailored to the site and project
    - Dust control plan
    - Placement of straw rolls around each of the nearby stormwater inlets;
    - Preservation of existing vegetation;
    - Installation of silt fences;
    - Use of wind erosion control (e.g. – geotextile or plastic covers on stockpiled soil);
    - Sweeping of nearby streets at least once a day; and/or;
    - Stabilization of site ingress/egress locations to minimize erosion.
    - Spraying the disturbed areas of the site, or any stockpiled soil, with water to minimize fugitive dust emissions.

4. *Groundwater*: If groundwater is encountered during any excavation activities, the construction contractor shall prepare a dewatering plan so that water is discharged to the stormwater system in compliance with the local standards and discharge permit requirements.

5. *Traffic*: Each contractor shall prepare a traffic control plan which will minimize the impacts on traffic and on-street parking on any streets affected by construction of the proposed project. As appropriate, SFPUC or the contractor will consult with local traffic and transit agencies.

6. *Noise*: The contractor will comply with local noise ordinances regulating construction noise to the extent feasible, and will undertake efforts to minimize any noise disruption to nearby neighbors and sensitive receptors during construction.

7. *Hazardous Materials*: Appropriate measures will be implemented to characterize and dispose of hazardous materials should they be encountered during excavation and construction. Contract specifications will mandate full compliance will all applicable local, state and federal regulations related to the identification, transportation and disposal of hazardous materials/soils. As necessary, a spill prevention and countermeasure plan will be prepared.

   A qualified environmental professional will conduct any necessary site assessment. The site assessment would include a regulatory database review to identify permitted hazardous materials and environmental cases in the vicinity of each project no more than three months before construction, and a review of appropriate standard information sources to determine the potential for soil or groundwater contamination to occur. Follow-up sampling would be conducted as necessary to characterize soil and groundwater quality prior to construction and, if needed, site investigations or remedial activities would e performed in accordance with applicable laws. The environmental professional would prepare a report documenting the activities performed, summarize the results and make recommendations for appropriate handling of any contaminated materials during construction. A contingency plan would also be prepared identifying measures to be taken should unanticipated contamination be identified during construction. Construction contractors will conduct asbestos and lead abatement in accordance with established regulations.

8. *Biological Resources*: As an initial matter, SFPUC project managers will screen the project site and area to determine whether biological resources may be affected by construction activities. In the event further investigation is necessary, the SFPUC will comply with all requirements for investigation, analysis and protection of biological resources. A qualified biologist must conduct any required biological screening survey. The biologist will review standard information sources to determine special status species with the potential to occur on the project site. The biologist would carry out a site survey by walking or driving over the project site, as appropriate, to note the general resources and whether any habitat for special-status species is present. The biologist would then document the survey with a brief letter report or memo, setting forth the date of the visit, whether habitat for special-status species is present, providing a map or description showing where sensitive areas exist within the site, and identifying any appropriate avoidance measures.

9. *Cultural Resources*: As an initial matter, SFPUC project managers will screen the project site and area to determine whether cultural resources, including archaeological and other historical resources, may be affected by construction activities. In the event further investigation is necessary, the SFPUC will comply with all requirements for investigation, analysis and protection of cultural resources.

   CEQA considers paleontological resources to be "cultural resources." Any screening for cultural resources would include screening for archaeological, paleontological and historic resources. For projects requiring excavation, deep grading, well drilling or tunneling into geologic material at sites identified as having high potential for encountering paleontological resources, a state-registered professional geologist or qualified professional paleontologist will conduct a site-specific evaluation of the paleontological sensitivity. The assessment will include a report of findings for the SFPUC.

   A qualified archaeologist, historian or paleontologist will conduct all cultural resources survey and screening work. Screening surveys for cultural resources would include a cultural resources records search to be conducted at the appropriate office member of the California Historical Resources Information System. A field survey will be conducted if determined necessary after the cultural resources records search. Any impacts on identified cultural resources will be avoided to the extent feasible.

Any initial historic resource screening will identify historic resources on the project site as well as adjacent to the project site.

It is possible that project work may affect accidentally discovered buried or submerged cultural resources. Any contractor must distribute the Planning Department archaeological resource "ALERT" sheet to any person involved in soil-disturbing activities. If there is any indication of an archaeological or a paleontological resource during the soils disturbing activity of the project, the contractor shall immediately suspend any soils disturbing activities in the area and notify the SFPUC of such discovery. The SFPUC will then work with the Planning Department's Environmental Review Officer to determine what additional measures should be implemented, based on reports from a qualified archaeological or paleontological consultant.

10. *Project Site*: The SFPUC will conduct construction activities on SFPUC-owned lands to the extent feasible and minimize the need for use of non-SFPUC-owned land during construction. In cases where construction easement or staging areas are needed on non-SFPUC land, the SFPUC will restore these areas to their prior condition so that the owner may return them to their prior use, unless otherwise arranged with the property owner. The site will be maintained to be clean and orderly. Construction staging areas will be sited away from public view where possible. Nighttime lighting will be directed away from residential areas.

    Upon project completion, the construction contractor will return the SFPUC project site to its general condition before construction, including re-grading of the site and re-vegetation of disturbed areas.

Mitigation Measures to Minimize Facilities Impacts

Plans and Policies (Section 4.2)

None applicable.

Land Use and Visual Resources (Section 4.3)

Program Measures

Facility Siting Studies

Measure 4.3-2: It is the policy of the SFPUC to construct and operate its facilities on SFPUC-owned lands to the extent feasible. When use of SFPUC-owned land is not feasible, and where additional permanent easement or land acquisition is required, the SFPUC will conduct project-specific facility siting studies and implement these studies' recommendations to avoid or minimize impacts on existing land uses to the maximum extent feasible. Siting studies will identify and evaluate alternative site locations, access roads, building configurations and facility operations to minimize or avoid land use impacts. The studies will also consider existing and planned land uses on and adjacent to proposed facility sites and rights-of-way on non-SFPUC-owned land. To the extent feasible, the SFPUC will implement the recommendations in the siting studies.

Architectural Design

Measure 4.3-4a: The design of permanent new, above-ground facilities will consider the existing visual character of the site and surrounding area, including the visibility of facilities and related structures from scenic highways and scenic roads. Structures will be designed to incorporate building features and design elements that are compatible with the surroundings.

Landscaping Plans

Measure 4.3-4b: The SFPUC will prepare and implement landscaping plans to restore project sites to their pre-construction condition such that short-term construction disturbance does not result in long-term visual impacts. To retain the existing visual character of the site and surrounding area, disturbed areas will be recontoured and revegetated and recontoured to pre-construction condition. Landscape vegetation will include noninvasive, and where possible, native grasses, shrubs, and trees similar to existing landscaping. The SFPUC will monitor landscape plantings annually for five years after project completion to ensure that sufficient ground coverage has developed and will implement additional measures, such as replanting or modifying irrigation systems, as determined necessary.

Landscape Screens

Measure 4.3-4c: In addition to revegetation of disturbed areas, the landscaping plans will include new plantings and landscape berms to screen views of new structures and equipment from scenic roads to the extent possible, provided that such landscaping does not affect security of SFPUC facilities.

Minimize Tree Removal

Measure 4.3-4d: The SFPUC will minimize or avoid the removal of existing trees that currently screen existing and proposed sites of WSIP facilities by modifying the proposed alignments of new temporary and permanent roads to the extent feasible. The SFPUC will consult with a qualified arborist regarding the minimum buffer zones required to prevent root damage to remaining trees and to provide the SFPUC with any necessary maintenance requirements for remaining trees. Also, the arborist will develop and assist the SFPUC in implementing an appropriate landscaping plan (see Measure 4.3-4b, above), including tree replacement, that is compatible with project operation and maintenance.

Reduce Lighting Effects

Measure 4.3-5: To the extent possible, all permanent exterior lighting will incorporate cutoff shields and non-glare fixture design. All permanent exterior lighting will be directed onsite and downward. In addition, new lighting will be oriented to ensure that no light source is directly visible from neighboring residential areas and will be installed with motion-sensor activation. In addition, highly reflective building materials and/or finishes will not be used in the designs for proposed structures, including fencing and light poles. Vegetation selected for landscaping will be selected, placed and maintained to minimize offsite light and glare in surrounding areas as part of the landscaping plans described in Measure 4.3-4b.

Collective Measures

Construction Coordination at Irvington Portal

Measure 4.16-1a: If construction schedules of multiple WSIP projects occurring at and near Irvington Portal coincide or overlap, the SFPUC will coordinate with construction contractor(s) and neighbors to minimize disturbance of residents in the adjacent neighborhood to the extent practicable. Such coordination will need to balance the duration of construction with the magnitude of construction-related impacts on the same sensitive receptors.

Geology, Soils and Seismicity (Section 4.4)

Program Measures

Quantified Landslide Analysis

Measure 4.4-1: If the screening analysis conducted in accordance with SFPUC Construction Measure #2 identifies any landslide hazards, affected WSIP facilities will, to the extent feasible, be located away from known landslides, very steep hillsides, debris-flow source areas, the mouths of steep sidehill drainages, and the mouths of canyons that drain steep terrain. However, where these landslide hazard areas cannot be avoided, a more quantified analysis (including a site-specific geologic investigation and a slope stability analysis to determine the potential for landsliding) should be performed as part of the geotechnical investigation. Recommendations identified in the site-specific geotechnical report regarding the potential for landsliding, including appropriate construction measures, will be incorporated into the project designs to minimize the potential for damage to project facilities.

Subsidence Monitoring Program

Measure 4.4-4: As part of the project-specific CEQA review for the New Irvington Tunnel (SV-4) and BDPL Reliability Upgrade (BD-1), the SFPUC will analyze the potential for ground subsidence to occur during tunneling, and will identify project-specific trigger levels that would require corrective action should subsidence occur. As determined to be necessary, the tunnel contractor will implement a subsidence monitoring program during tunneling to detect subsidence, including measurements of groundwater levels, surface and subsurface settlement, ground movement and displacement, and movement in existing infrastructure as needed. The SFPUC will implement corrective actions, such as increased tunnel support, if measured displacement reaches the specified trigger levels.

Characterize Extent of Expansive and Corrosive Soil

Measure 4.4-9: If the screening analysis conducted in accordance with SFPUC Construction Measure #2 identifies a potential for expansive or corrosive soils, the site-specific geotechnical investigation will include a characterization of the presence and extent of expansive and corrosive soil at the project facility site. The results and recommendations of the investigation will be incorporated into the final project design.

Surface Water Hydrology and Water Quality (Section 4.5)

Program Measures

Site-Specific Groundwater Analysis and Identified Measures

Measure 4.5-2: As part of the project-specific CEQA review for the New Irvington Tunnel project (SV-4), the SFPUC will inventory springs and wells in the area of the planned tunnel and conduct a project-specific analysis of the potential for tunnel dewatering to stop or decrease spring flow, lower groundwater levels in nearby wells, or to otherwise cause adverse effects on groundwater resources and beneficial uses of the groundwater. If a significant impact is identified, then measures such as altering groundwater withdrawal rates and/or providing an alternate water supply for affected users will be implemented to ensure that groundwater resources or beneficial uses are not adversely affected.

Flood Flow Protection Measures

Measure 4.5-4a: In construction contract specifications, the SFPUC will require the contractor(s) to include, in their erosion control measures or SWPPP prepared for the project, a measure prohibiting the stockpiling of soil, storage of hazardous materials, and stockpiling of construction materials in flood zones, where practical. Where construction would occur in large flood zones, making it impractical to implement this requirement, the erosion control measures or SWPPP will include measures for protecting stockpiled soil, sources of hazardous materials, and stockpiled construction materials from exposure to flood waters.

Site-Specific Flooding Analysis and Identified Measures

Measure 4.5-4b: As part of the project-specific CEQA review for the Alameda Creek Fishery (SV-1) and New Irvington Tunnel (SV-4) projects, the SFPUC will conduct a site-specific analysis of the potential for flooding as a result of project implementation. If a dam or concrete weir is installed in Alameda Creek under the Alameda Creek Fishery project, the analysis will include, at a minimum, the stream flow data and planned design and operation of the dam or weir to prevent flooding impacts. For the New Irvington Tunnel project, the analysis will include design measures needed to ensure that upstream water levels are not affected, bridge abutments are protected from damage due to flood flows and would not adversely redirect flood flows, and that bridge pilings are protected from scour.

Stormwater Treatment and Groundwater Monitoring

Measure 4.5-5: If treated stormwater is used to augment Lake Merced water levels, the project-level CEQA analysis for the Local Groundwater Projects (SF-2) will include measures to ensure that use of stormwater does not promote eutrophication of the lake and provisions for implementing these measures. The project-level CEQA analysis will also evaluate the potential for groundwater quality degradation due to the use of treated stormwater to augment lake levels. If necessary, the SFPUC will implement a groundwater monitoring program in the vicinity of Lake Merced to monitor for degradation of groundwater quality. Monitoring will include water quality sampling for total coliform bacteria, total nitrogen, nitrate, nitrite, total organic carbon, parameters for which drinking water quality criteria have been established, and any other potential pollutants of concern. The project-level CEQA documentation will identify corrective actions that would be implemented should groundwater quality degradation be identified, such as additional treatment of water used to augment water levels in Lake Merced.

Appropriate Source Control and Site Design Measures

Measure 4.5-6: For projects located in areas not covered by a municipal stormwater permit and disturbing less than one acre of land during construction, the SFPUC will implement appropriate source control and site design measures that 1) minimize the stormwater flow rate and quantity to prevent off-site erosion and flooding; and 2) minimize stormwater pollutant discharges to the maximum extent possible. These measures will ensure compliance with applicable water quality criteria and goals and protect the beneficial uses of the receiving water.

Biological Resources (Section 4.6)

Program Measures

Wetlands Assessment

Measure 4.6-1a: As part of project-specific CEQA review, a qualified wetland scientist will review project plans, airphotos, and topographic maps and conduct a site visit to determine whether wetlands are present and could be affected by the project. If the review shows that wetlands could be affected, the wetland scientist will perform a formal wetland delineation and develop mitigation as per Measure 4.6-1b, below.

Compensation for Wetlands and Other Biological Resources

Measure 4.6-1b: If the wetland delineation indicates that the WSIP project will affect jurisdictional wetlands or aquatic resources, then, in accordance with state and federal permit requirements, the SFPUC will avoid and minimize direct and indirect impacts such as erosion and sedimentation, alteration of hydrology, and degradation of water quality. As a first priority, the SFPUC will implement (1) avoidance measures. For unavoidable impacts, the SFPUC will implement (2) minimization of unavoidable impacts, (3) restoration procedures, and (4) compensatory creation or enhancement to ensure no net loss of wetland extent or function.

In addition to wetlands, the SFPUC will compensate for sensitive riparian and upland habitats and habitats which support key special-status species or other species of concern lost as a result of WSIP project construction and operation. Similar habitat will be identified, protected, restored, enhanced, created and managed off-site[1] to ensure no net loss of habitat extent or function. For each WSIP project, a qualified biologist will quantify the magnitude and extent of impacts to wetlands, sensitive habitats, and key special-status species and other species of concern, and the SFPUC will develop and implement restoration and/or compensation plans that meet the appropriate regulatory requirements and permit conditions with respect to restoration and/or compensation ratios. Compensation ratios typically range from a minimum of 1:1 for common habitats to 2:1 or higher for rare and sensitive habitats. If individual project requirements of the RWQCB, CDFG, or USFWS differ somewhat from these ratios, they are still intended to achieve the same purpose of full restoration and/or compensation, to mitigate project impacts to less than

1 Off-site means the compensatory action is located other than within the project construction footprint, but could be on lands already under SFPUC ownership. Measure 4.6-2 addresses compensatory actions to be taken within the construction footprint.

significant levels, and to ensure no net reduction in the populations of any species listed as threatened or endangered by the state or federal resource agencies.

The SFPUC will obtain required permits for each project and comply with applicable environmental regulations addressing sensitive habitats and species. Compensatory lands, including those restored or enhanced as well as those acquired or designated as protected as part of program or project mitigation, will be established in perpetuity with a commitment that such lands will not be used for any purpose that conflicts with the primary purpose of maintaining intact wildlife and plant habitat.

One alternative for implementing off-site habitat compensation is the Habitat Reserve Program (HRP) currently being developed by the SFPUC. The purpose of the HRP is to provide a comprehensive, coordinated approach to mitigation and related regulatory compliance for WSIP projects. This related SFPUC project is described further in Chapter 3.0, Section 3.11. Under the proposed HRP, the SFPUC would proceed as soon as possible with securing (through designation, management agreement, conservation easement, or acquisition of fee title) and improving lands to be used for habitat compensation so that mitigation is underway before or concurrent with habitat loss related to WSIP project activities, further ensuring no net loss of resources. CEQA environmental review for the proposed HRP will commence in 2007 and is targeted for implementation as soon as possible thereafter. Once the HRP is approved and implemented, the SFPUC will use this as one vehicle or method for implementing the mitigation requirements for individual WSIP projects. Otherwise, where appropriate and necessary, the SFPUC will develop and implement appropriate habitat compensation mitigation for individual WSIP projects.

Habitat Restoration/Tree Replacement

Measure 4.6-2: If the biological screening survey identifies sensitive habitats or heritage trees, the following measures, as modified and applied to WSIP projects, will be implemented:

- Temporarily-impacted sensitive habitats (natural communities identified as sensitive by CDFG, and USFWS-designated critical habitat) would be restored to their pre-project condition.

- If specific trees to be removed are designated as heritage trees (or similar local designation), then SFPUC will replace the trees, consistent with requirements in local ordinances. If such heritage trees occur near extensive areas of sensitive habitats, locally collected, native species will be used as replacement trees where possible.

- Where possible, the loss of sensitive habitats will be minimized by coordinating WSIP projects to make repeated use of staging/construction areas and access roads. For example, tunnel spoils could be considered for borrow material for other projects.

Protection Measures During Construction for Key Special-Status Species and Other Species of Concern

Measure 4.6-3a: The following general practice measures, as modified and applied to the WSIP projects, will be implemented if the initial biological screening survey (SFPUC Construction Measure #8) indicates the potential for the presence of key special-status species and other species of concern:

- Preconstruction surveys for key special-status species and other species of concern will be conducted by a qualified biologist to verify their presence or absence. Surveys will occur during the portion of the species’ life cycle when the species is most likely to be identified within the appropriate habitat. Key special-status species and other species of concern will be avoided during construction when possible.

- A worker awareness program (environmental education) will be developed and implemented to inform project workers of their responsibilities in regards to sensitive biological resources.

- An environmental inspector will be appointed to serve as a contact for issues that may arise concerning implementation of mitigation measures, and to document and report on adherence to these measures during construction.

- Loss of habitat will be minimized through the following measures: (1) the number and size of access routes and staging areas and the total area of the project activity will be limited to the minimum necessary to achieve the project goal; (2) the introduction or spread of invasive non-native plant species and plant pathogens will be avoided or minimized by developing and implementing a weed control plan; and (3) all areas temporarily disturbed by construction will be revegetated to pre-project or native conditions, as specified in project-specific revegetation plans.

Standard Mitigation Measures for Specific Plants and Animals

Measure 4.6-3b: Table 6-1 identifies the key special-status species mitigation measures that the program analysis indicates would apply to each WSIP project. Measures listed in **Table 6-2** (listed by species) are generic measures and will be modified to fit site-specific conditions and applied to each WSIP project wherever special-status species could be affected by the projects. Surveys required under Measure 4.6-3a will refine the list of species that could be affected by a project. Table 6-1 is intended as the minimum necessary actions. In addition to adopting the generic measures, as more site-specific information is available, project-specific CEQA analysis may identify additional measures for key special-status species and additional measures for other species.

Pipeline and Water Treatment Plant Treated Water Discharge Restrictions

Measure 4.6-4: Planned discharges of regional system water from the WSIP pipelines and water treatment plants (such as crossover facilities) to creeks, rivers or other natural water bodies will be designed to minimize impacts to riparian and aquatic resources to the extent feasible. This will include dechlorination and/or pH adjustment facilities and energy dissipation structures that avoid or reduce bank erosion. In addition, the facilities should include design features to avoid or minimize temperature effects on aquatic resources; or alternatively, whenever possible, planned discharges should be scheduled to occur in the winter, when stream flows are high and temperatures low in the receiving waters to avoid or minimize temperature effects.

TABLE 6-1 (SEE MEASURE 4.6-3b)
MITIGATION MEASURES FOR KEY SPECIAL-STATUS SPECIES

No.	Project Name	Suites of Key Special-Status Species						Individual Special-Status Species								
	Notes: **1. This table is for guidance only and is not intended as a complete list of mitigations for all projects, which must be assessed individually at the project-specific level.** **2. Standard measure B.4 (general surveys for raptors and protection of raptor nests) apply to all projects.**	Vernal Pool Invertebrates	Vernal Pool Plants	Riparian and Reservoir Species	Native Grassland Species	Salt Marsh Species	Fishes	Large-Flowered Fiddleneck	Foothill yellow-legged frog	California Red-Legged Frog	California Tiger Salamander	San Francisco Garter Snake	Alameda Whipsnake	Swainson's Hawk	Western Burrowing Owl	San Joaquin Kit Fox
SJ-1	Advanced Disinfection	I.2								RA.1	RA.2			B.1	B.2, B.3	M.2
SJ-2	Lawrence Livermore Supply Improvements	I.2						P.3		RA.1	RA.2			B.1	B.2, B.3	M.2
SJ-3	San Joaquin Pipeline System	I.2	P.1	I.1, P.2, B.5, M.3			F.1			RA.1	RA.2			B.1	B.2, B.3	M.2
SJ-4	Rehabilitation of Existing San Joaquin Pipelines	I.2	P.1	I.1, P.2 , B.5, M.3			F.1			RA.1	RA.2			B.1	B.2, B.3	M.2
SJ-5	Tesla Portal Disinfection Station	I.2								RA.1	RA.2			B.1	B.2, B.3	M.2
SV-1	Alameda Creek Fishery Enhancement			B.5			F.1		RA.1	RA.1	RA.2		RA.4		B.2, B.3	
SV-2	Calaveras Dam Replacement			B.5	I.3		F.1		RA.1	RA.1	RA.2		RA.4		B.2, B.3	
SV-3	Additional 40-mgd Treated Water Supply			B.5					RA.1	RA.1	RA.2		RA.4		B.2, B.3	
SV-4	New Irvington Tunnel			B.5			F.1		RA.1	RA.1	RA.2		RA.4		B.2, B.3	
SV-5	SVWTP – New Treated Water Reservoirs			B.5			F.1		RA.1	RA.1	RA.2		RA.4		B.2, B.3	
SV-6	San Antonio Backup Pipeline			B.5			F.1		RA.1	RA.1	RA.2		RA.4		B.2, B.3	
BD-1	Bay Division Pipeline Reliability Upgrade	I.2				B.6, B.7, M.1	F.1			RA.1	RA.2		RA.4		B.2, B.3	
BD-2	BDPL Nos. 3 and 4 Crossovers	I.2					F.1			RA.1	RA.2				B.2, B.3	
BD-3	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault									RA.1	RA.2				B.2, B.3	

TABLE 6-1 (SEE MEASURE 4.6-3b) (Continued)
MITIGATION MEASURES FOR KEY SPECIAL-STATUS SPECIES

No.	Project Name **Notes:** **1. This table is for guidance only and is not intended as a complete list of mitigations for all projects, which must be assessed individually at the project-specific level.** **2. Standard measure B.4 (general surveys for raptors and protection of raptor nests) apply to all projects.**	Suites of Key Special-Status Species: Vernal Pool Invertebrates	Vernal Pool Plants	Riparian and Reservoir Species	Native Grassland Species	Salt Marsh Species	Fishes	Individual Special-Status Species: Large-Flowered Fiddleneck	Foothill yellow-legged frog	California Red-Legged Frog	California Tiger Salamander	San Francisco Garter Snake	Alameda Whipsnake	Swainson's Hawk	Western Burrowing Owl	San Joaquin Kit Fox
PN-1	Baden and San Pedro Valve Lots Improvements									RA.1	RA.2	RA.3				
PN-2	Crystal Springs/San Andreas Transmission Upgrade			B.5						RA.1	RA.2	RA.3				
PN-3	HTWTP Long-Term Improvements															
PN-4	Lower Crystal Springs Dam Improvements			B.5	I.3, P.4		F.1			RA.1	RA.2	RA.3				
PN-5	Pulgas Balancing Reservoir Rehabilitation									RA.1	RA.2	RA.3				
SF-1	San Andreas Pipeline No. 3 Installation															
SF-2	Groundwater Projects				P.4, I.3					RA.1		RA.3				
SF-3	Recycled Water Projects				P.4, I.3					RA.1		RA.3				

Note: Project-specific CEQA documents would review recent special-status species lists relevant to the habitats present.

All codes are defined in Table 6-2.

Vernal pool invertebrates:
- Vernal pool fairy shrimp
- Conservancy fairy shrimp
- Vernal pool tadpole shrimp

Vernal pool species:
- Succulent owl's-clover
- Hoover's spurge
- Colusa grass
- San Joaquin Valley Orcutt grass
- Hairy Orcutt grass
- Greene's tuctoria

Salt marsh species:
- Western snowy plover
- California clapper rail
- California black rail
- Salt marsh harvest mouse

Riparian and Reservoir species:
- Least Bell's vireo
- Valley elderberry longhorn beetle
- Riparian woodrat
- Delta button-celery
- Bald eagle

Fishes:
- Green sturgeon (San Joaquin Valley only)
- Chinook salmon
- Central Valley DPS steelhead
- Central California Coast DPS steelhead
- Rainbow trout (Alameda watershed)

Native grassland species:
- Bay checkerspot butterfly
- Callippe silverspot butterfly
- Fountain thistle (Peninsula)
- Marin dwarf flax (Peninsula)
- San Mateo woolly sunflower (Peninsula)

TABLE 6-2 (MEASURE 4.6-3b)
STANDARD PROGRAMMATIC BIOLOGICAL RESOURCES MITIGATION MEASURES

Biological Resource Species and Status	Standard Mitigation Measures for Specific Plants and Animals
Invertebrates	
Valley Elderberry Longhorn Beetle (FT/--)	**I.1:** A biological monitor will accompany tree/brush clearing crews. The monitor will flag all elderberry shrubs in the tree clearing zone and be present during tree clearing operations in the vicinity of flagged shrubs to ensure that elderberry shrubs are not cut. If avoidance is not feasible, habitat impacts will be mitigated in accordance with the Programmatic Biological Opinion (PBO) for Valley elderberry longhorn beetle, issued by the USFWS Sacramento Field Office in 1996.
Vernal Pool Crustaceans Vernal pool fairy shrimp (FT/--) Conservancy fairy shrimp (FE/--) Vernal pool tadpole shrimp (FE/--)	**I.2:** Suitable habitat for vernal pool invertebrates will be avoided. If infeasible, impacts will be mitigated in accordance with the PBO for vernal pool invertebrates, issued by the USFWS Sacramento Field Office in 1995. Surveys may be conducted, with USFWS approval, to establish whether or not listed invertebrates are present.
Bay Checkerspot Butterfly (FT/--), Callippe Silverspot Butterfly (FE/--)	**I.3:** Suitable habitat for Bay checkerspot and Callippe silverspot butterflies will be avoided
Fishes	
Central Valley fall- and late-fall run DPSChinook salmon (FC/--) Central Valley DPS steelhead (FT/--) Green sturgeon Southern District DPS (FT/--) Central Coast DPS Steelhead (FT/--) Rainbow trout (--/--)	**F1:** For construction activity in anadromous fish-bearing streams, a biological monitor with appropriate permits will be present during all construction activities to relocate fish as necessary.
Reptiles and Amphibians	
California Red-Legged Frog (FT/CSC) Foothill yellow-legged frog (--/CSC)	**RA.1:** A PBO for construction impacts on red-legged frog was prepared by the USFWS (Federal Register, 1999). The general mitigation measures, above, and the measures listed below, are taken largely from the PBO and may be modified by a project-specific BO. The foothill yellow-legged frog has no legal protection under FESA; however, all potential FYLF habitat is also considered potential habitat for CRLF and these protection measures would be applied in any case. • The name and credentials of a biologist qualified to act as a construction monitor will be submitted to the USFWS for approval at least 15 days prior to commencement of work. • The USFWS-approved biologist will survey the site two weeks prior to the onset of work activities and immediately prior to commencing work. If frog adults, tadpoles, or eggs are found, the approved biologist will contact the USFWS to determine whether relocating any life stages is appropriate. • If worksites require dewatering, the intakes will be screened with a maximum mesh size of 5 millimeters. • The USFWS-approved biologist will remove and destroy from within the project area any individuals of non-native species, such as bullfrogs, crayfish, and centrarchid fishes, to the maximum extent possible.

TABLE 6-2 (MEASURE 4.6-3b) (Continued)
STANDARD PROGRAMMATIC BIOLOGICAL RESOURCES MITIGATION MEASURES

Biological Resource Species and Status	Standard Mitigation Measures for Specific Plants and Animals
Reptiles and Amphibians (cont.)	
California Tiger Salamander (FT/CSC)	**RA.2:** In addition to measures described for California red-legged frog, which would serve to protect California tiger salamander, the following measures will minimize adverse effects to California tiger salamander.
	• A preconstruction survey will be conducted at each site to identify suitable burrow aestivation areas. Aestivation habitat will be defined as the presence of two or more small mammal burrows greater than 1 inch in diameter within a 10-foot-diameter area and within 10 feet of proposed construction sites (i.e., the presence of a single isolated gopher hole would not be considered habitat). As feasible within the context of the work area, aestivation areas will be temporarily fenced and avoided.
	• At locations where aestivation burrows are identified and cannot be avoided, aestivation burrows will be excavated by hand prior to construction and individual animals moved to natural burrows or artificial burrows constructed of PVC pipe within 0.25 mile of the construction site.
	• To ensure compliance with these measures and minimize California tiger salamander take, a qualified biological monitor will be present during all construction operations at locations with suitable aestivation burrows. Construction sites where potential habitat has been identified will be surveyed by a qualified biologist for California tiger salamander. Surveys would be appropriately timed with respect to salamander activity and proposed construction activities.
	• Surveys would include drift fences and pitfall traps within construction sites to identify and relocate animals. Following removal of individuals, construction areas will be fenced with temporary silt fencing.
San Francisco Garter Snake (FE/CE/CP)	**RA.3:** San Francisco garter snake is a California fully protected species, and incidental taking must be avoided. Therefore, in addition to measures RA.1 and RA.2, above, for construction activities in occupied habitat the work area will be fenced with frog- and snake-proof mesh fence, or 4- x 8-foot plywood panels joined lengthwise, with escape funnels to allow egress, but not access, by San Francisco garter snake.
Alameda Whipsnake (FT/CT)	**RA.4:** Construction-related impacts on individual Alameda whipsnakes will be minimized and/or avoided through the development and implementation of an Alameda whipsnake protection and monitoring plan, to be approved by the USFWS during informal consultation under FESA. Protective measures outlined in RA.1 will apply to all areas of known or potential habitat for Alameda whipsnake. In addition, it will include:
	• Sites within Alameda whipsnake habitat will be hand-cleared, or a qualified biologist will do surveys and relocate the snake immediately prior to equipment clearing.
	• Activities that could harm or harass Alameda whipsnake will be avoided or minimized.
	• Upland habitats used by Alameda whipsnake will be restored as feasible, and lost habitat will be compensated according to an agreed-upon ratio.
Birds	
Swainson's Hawk (FSC/CT)	**B.1:** To avoid disrupting nesting Swainson's hawks, construction activities at known nesting locations will occur prior to the nesting season (March 1 through September 15). Alternatively, if construction activities take place during the nesting season, a qualified biologist will conduct a preconstruction survey no more than two weeks before the start of construction and report whether or not there are nesting Swainson's hawks within 1,320 feet of any project (access permitting). If there are nesting Swainson's hawks within the 1,320-foot buffer areas, construction will be delayed until the CDFG has been consulted to determine suitable avoidance measures. A potential avoidance measure may include delaying all construction activity within 1,320 feet of an active Swainson's hawk nest until the adult and/or juvenile hawks are no longer using the nest as the center of their activity.

TABLE 6-2 (MEASURE 4.6-3b) (Continued)
STANDARD PROGRAMMATIC BIOLOGICAL RESOURCES MITIGATION MEASURES

Biological Resource Species and Status	Standard Mitigation Measures for Specific Plants and Animals
Birds (cont.)	
Western Burrowing Owl (FSC/CSC)	**B.2:** No more than two weeks before construction, a survey for burrows and burrowing owls will be conducted by a qualified biologist within 500 feet of the project (access permitting). The survey will conform to the protocol described by the California Burrowing Owl Consortium (1993), which includes up to four surveys on different dates if there are suitable burrows present. **B.3:** If occupied owl burrows are found within the survey area, a determination will be made by a qualified biologist, in consultation with the CDFG, as to whether or not work will affect the occupied burrows or disrupt reproductive behavior. If it is determined that construction will not affect occupied burrows or disrupt breeding behavior, construction will proceed without any restriction or mitigation measures. If it is determined that construction will affect occupied burrows during August through February, the subject owls will be passively relocated from the occupied burrow(s) using one-way doors. There will be at least two unoccupied burrows suitable for burrowing owls within 300 feet of the occupied burrow before one-way doors are installed. Artificial burrows will be in place at least one-week before one-way doors are installed on occupied burrows. One-way doors will be in place for a minimum of 48 hours before burrows are excavated. If it is determined that construction will physically affect occupied burrows or disrupt reproductive behavior during the nesting season (March through July), then avoidance is the only mitigation available. Construction will be delayed within 300 feet of occupied burrows until it is determined that the subject owls are not nesting or until a qualified biologist determines that juvenile owls are self-sufficient or are no longer using the natal burrow as their primary source of shelter.
Raptors including bald eagle (FD/CE/CFP)	**B.4: Raptor nests:** • In consultation with CDFG and USFWS trees with unoccupied raptor nests (stick nests or cavities) may only be removed prior to March 1, or following the nesting season. • A survey to identify active nests will be conducted by a qualified biologist no more than two weeks before the start of construction at project sites from February 1 through July 30. • Construction activities within 0.5 mile of an active bald eagle nest may not occur between February 1 and July 31. • Active raptor nests located within 500 feet of the project will be mapped, to the extent allowed by access. • If an active raptor nest is found within 500 feet of the project, a determination will be made by a qualified biologist, in consultation with the CDFG, as to whether or not construction work will affect the active nest or disrupt reproductive behavior. • If it is determined that construction will not affect an active nest or disrupt breeding behavior, construction will proceed without any restriction or mitigation measure. • If it is determined that construction will affect an active raptor nest or disrupt reproductive behavior, then avoidance is the only mitigation available. Construction will be delayed within 300 feet of such a nest until a qualified biologist determines that the subject raptors are not nesting or until any juvenile raptors are no longer using the nest as their primary day and night roost.
Least Bell's vireo (FE/CE)	**B.5:** Protection for least Bell's vireos depend principally on seasonal avoidance of habitat during the nesting season and protection of suitable habitat. To avoid working during the active breeding season, construction activities in suitable habitat (dense willows [*Salix* sp.], mulefat [*Baccharis glutinosa*], or California wild rose [*Rosa californica*] may not proceed until July 15 unless approved by the USFWS and CDFG, as appropriate.
California Black Rail (FE/CE), California Clapper Rail (FSC/CT/CFP)	**B.6:** When working within 100 feet of salt or brackish marshland (e.g., the BDPL Reliability Upgrade, BD-1), presume presence for either species during the period from February 1 to August 31, and schedule construction to begin no earlier than September 1 and end no later than January 31.

TABLE 6-2 (MEASURE 4.6-3b) (Continued)
STANDARD PROGRAMMATIC BIOLOGICAL RESOURCES MITIGATION MEASURES

Biological Resource Species and Status	Standard Mitigation Measures for Specific Plants and Animals
Birds (cont.)	
Western Snowy Plover (FT/CSC)	**B.7:** When project activities are in or adjacent to suitable habitat (e.g., portions of the BDPL Reliability Upgrade, BD-1) no earlier than September 1 and no later than January 31, no measures are necessary; however, between March 15 and August 31 the following will be observed: • A qualified biologist will conduct preconstruction surveys two weeks and one week before the start of work. If western snowy plovers or their nests are not observed, then the project activity may proceed; or • If a western snowy plover is observed within a 50-foot perimeter of the location of the construction activity two weeks or one week before, a qualified biologist will observe the activities of the bird(s) to determine if nesting behavior is exhibited. If either nesting behavior or a nest is observed within a 50-foot perimeter of the location of the activity, then the activity will be delayed until either nesting is abandoned or completed.
Mammals	
Salt Marsh Harvest Mouse (FE/CE/CFP)	**M.1:** When project activities are in or adjacent to suitable habitat (e.g., portions of the BDPL Reliability Upgrade, BD-1), vehicles will be confined to existing roads where possible, and disturbed areas will be revegetated with brackish marsh species. Crews will use matting, pontoon boards, or other comparable methods whenever feasible to minimize impacts on vegetation. The placement of mats will be verified by a qualified biologist before their placement to minimize habitat impacts. Crews will work exclusively from mat boards and boardwalks to minimize the trampling of vegetation. A qualified biologist will be available during the course of the maintenance work. In situations where habitat is to be permanently disturbed, project-specific take avoidance measures (such as fencing and trapping to exclude salt marsh harvest mouse) will be developed, since the mouse is a California fully protected species, and incidental taking must be avoided.
San Joaquin Kit Fox (FE/CT)	**M.2:** The following reasonable and prudent measures will be followed to avoid direct or indirect project-related disturbances and impacts on San Joaquin kit fox. Prior to the commencement of construction activities, a qualified biologist will survey for potential kit fox dens within the area to be disturbed and will photograph, mark, and map the dens. Disturbance of all known San Joaquin kit fox dens will be avoided. Limited destruction of potential dens may be allowed, provided the following procedures are implemented: • Potential dens occurring within the construction area will be monitored for three days with tracking medium or an infrared beam camera to determine current usage. If no kit fox activity is observed during this period, the den would be destroyed immediately to preclude subsequent use. If kit fox activity is observed, the den will be considered a known den. • Project-related vehicles will observe a 20-mph speed limit in habitat areas except as posted on county roads and state and federal highways. Off-road traffic outside the designated project area will be prohibited. • To prevent accidental entrapment of kit fox or other animals during construction, all excavated or deep-walled holes or trenches greater than 2 feet will be covered at the end of each workday by plywood or similar materials, or provided with escape routes constructed of earth fill or wooden planks. Before such holes are filled they will be thoroughly inspected for trapped animals. • Kit foxes are attracted to den-like structures such as pipes and may enter stored pipe and become trapped or injured. All construction pipes, culverts, or similar structures with a diameter of 4 inches or greater that are stored at construction sites for one or more overnight periods will be thoroughly inspected for kit foxes before the pipe is subsequently buried, capped, or otherwise used or moved in any way.

TABLE 6-2 (MEASURE 4.6-3b) (Continued)
STANDARD PROGRAMMATIC BIOLOGICAL RESOURCES MITIGATION MEASURES

Biological Resource Species and Status	Standard Mitigation Measures for Specific Plants and Animals
Mammals	
Riparian Woodrat (FE/CSC)	**M.3:** If construction will involve surface disturbance or vegetation removal in riparian habitat in the San Joaquin Region, a biologist will carry out a preconstruction survey to determine the presence or any signs of riparian woodrat, such as stick nests. Such areas will be avoided if feasible. If avoidance is not feasible, a protection and monitoring plan will be developed and approved by the USFWS during formal consultation under FESA.
Plants	
Vernal Pool Plants Succulent Owl's-Clover ((FE/CE) Hoover's Spurge (FT/--) Colusa Grass (FT/CE) San Joaquin Valley Orcutt grass (FT/CE) Greene's Tuctoria (FE/CR) Hairy Orcutt Grass (FE/CE)	**P.1:** The avoidance measures for vernal pool crustaceans will also apply to vernal pool special-status plants. Surveys to ascertain presence are highly recommended, and if first-year surveys occur during unusually low rainfall conditions, a second year of surveys, if possible, will help to establish whether avoidance measures are needed.
Riparian Plants Delta button-celery (FSC/CE)	**P.2:** The state endangered Delta button-celery occurs on clay soils on the sparsely vegetated margins of seasonally flooded floodplains and swales. Periodic flooding maintains the species' habitat through sustenance of seasonal wetlands and reduction of competition due to scouring. If a population of this species is located in an area proposed for construction, the preferred action is to avoid it if possible. The CDFG might allow salvage and restoration of the site, since this is a species that depends on ongoing disturbance to maintain its habitat. However, such strategies generally involve several years of treatment and post-treatment monitoring, so the simplest approach is to avoid impacts if possible.
Large-Flowered Fiddleneck (FE/CE)	**P.3:** Surveys for large-flowered fiddleneck will be carried out at an appropriate time of year for projects located within the known range of the species (Corral Hollow and hills immediately to the west). Any populations found will be avoided. An approved biological monitor will be present during all surface clearing activities.
San Mateo Woolly Sunflower (FE/CE), Marin Western Flax (FT/CT) Fountain thistle (FE/CE)	**P.4:** Surveys for San Mateo woolly sunflower, fountain thistle and Marin western flax will be carried out at an appropriate time of year for projects located within the known range of the species. Any populations found will be avoided. An approved biological monitor will be present during all construction activities. A plan will be developed to protect populations located along Crystal Springs and Polhemus Roads where project-related construction vehicle traffic will occur. Where populations cannot be avoided, salvage of plants or seed will be implemented, along with a program to compensate for losses.

Status Codes: FE-Federal Endangered; FT-Federal Threatened; FC-Federal Candidate; FSC-Federal Species of Concern. FD-Federal Delisted; CE-California Endangered; CT-California Threatened; CR-California Rare; CFP-California Fully Protected

Collective Measures

Bioregional Habitat Restoration Measures

Measure 4.16-4a: Bioregional effects (those beyond the level of individual plants or animals and impacts not readily associated with any particular project) could result from the collective construction of WSIP facilities and the cumulative effects of implementing WSIP projects along with other proposed projects. Combined collective and cumulative bioregional effects that will need to be addressed as part of future mitigation efforts include the following:

- Compound impacts on functional units of habitat as WSIP projects simplify vegetation structure and increase “edge” (the boundary between two different habitats);
- Increased habitat impacts due to the spread of weedy, non-native plant species;
- Genetic diversity impacts on small populations that become reduced and isolated by development;
- Impacts on wildlife movement due to habitat fragmentation;
- Suppression of natural disturbance regimes (e.g., fire, flood) as projects are constructed, operated, and maintained; and
- Reduced population recovery opportunities from stochastic events (e.g., random events such as disease).

When implementing habitat compensation mitigation required for individual WSIP facility projects, the SFPUC shall do so in a manner that addresses the above bioregional effects and includes the following conservation principles:

- The parcels are either contiguous with other areas of relatively undisturbed habitat or are themselves large enough to support most of the species associated with the habitat;
- The distribution of mitigation lands will allow movement of plants and animals between them or from them to habitats otherwise conserved (e.g. as described in The Wilderness Society, 2001); and
- Implementation of habitat compensation mitigation for individual WSIP facility projects will be combined and implemented through a coordinated program with other mitigation efforts, such as through the Habitat Reserve Program (HRP), and shall meet these standards:
    - Long-term management of these lands stipulates maintaining natural disturbance regimes (e.g., through prescribed burning);
    - Long-term control actions for non-native species are applied; and
    - Contingencies are considered which address sharing biological materials and information with other conservation land stewards.[2] This might include

[2] For example, the California Department of Parks and Recreation (CDPR), East Bay Regional Parks District (EBRPD), and the Midpeninsula Regional Open Space District (MROSD).

restoring suitable sites with plants brought from another protected area once a weed infestation has been brought under control, or animal relocation if done strictly for the purpose of genetic diversity or recovery, and with the approval of the regulatory agencies.

Coordination of Construction Staging and Access

Measure 4.16-4b: When construction schedules for WSIP projects affecting the same areas overlap, the SFPUC will coordinate construction contractor(s) to the extent practicable to minimize surface disturbance associated with access roads, laydown areas, and staging areas.

Cultural Resources (Section 4.7)

Program Measures

Suspend Construction Work if Paleontological Resource is Identified

Measure 4.7-1: This mitigation measure builds on SFPUC Construction Measure # 9 for cultural resources, which requires that construction work will be suspended immediately if there is any indication of a paleontological resource. When a paleontological resource (fossilized invertebrate, vertebrate, plant or micro-fossil) is discovered at any of the project sites, an appointed representative of the SFPUC will notify a qualified paleontologist, who will document the discovery as needed, evaluate the potential resource, and assess the significance of the find under the criteria set forth in Section 15064.5 of the CEQA Guidelines. When a fossil is found during construction, excavations within 50 feet of the find will be temporarily halted or diverted until the discovery is examined by a qualified paleontologist, in accordance with Society of Vertebrate Paleontology standards (SVP 1995, 1996). The paleontologist will notify the SFPUC to determine procedures to be followed before construction is allowed to resume at the location of the find. If the SFPUC determines that avoidance is not feasible, the paleontologist will prepare an excavation plan for mitigating the effects of the project.

Archaeological Testing, Monitoring, and Treatment of Human Remains

Measure 4.7-2a: SPFUC Construction Measure #9 for cultural resources requires that a pre-construction screening be conducted by a qualified archaeologist. Based on the results of this screening, the Environmental Review Officer (ERO) shall determine if implementation of an archeological testing or archaeological monitoring program or both is the appropriate strategy for avoidance of potential adverse effects to significant archaeological resource. For those projects that require a federal permit and compliance with the NHPA, Section 106, the ERO will review the SHPO-approved requirements in the permit conditions and consider protective approaches that limit undue duplication of efforts.

Archeological Testing Program. The archeological consultant shall prepare and submit to the ERO for review and approval an archeological testing plan (ATP). The archeological testing program shall be conducted in accordance with the approved ATP. The ATP shall identify the property types of the expected archeological resource(s) that potentially could be adversely affected by the proposed project, the testing method to be used, and the locations recommended for testing. The purpose of the archeological testing program will be to determine to the extent possible the presence or absence of any expected archeological resources and to identify and to preliminarily evaluate the integrity and significance of the resource.

At the completion of the archeological testing program, the archeological consultant shall submit a written report of the findings to the ERO. If based on the archeological testing program the archeological consultant finds that significant archeological resources may be present, the ERO in consultation with the archeological consultant shall determine if additional measures are warranted. Additional measures that may be undertaken include additional archeological testing, archeological monitoring, preparation of an archeological research design and treatment plan, or an archeological data recovery program.

Archeological Monitoring Program. The archeological consultant shall prepare and submit to the ERO for review and approval an archeological monitoring plan (AMP). The archeological monitoring program shall be conducted in accordance with the approved AMP. The AMP shall specify what project activities in areas sensitive for buried resources shall be archeologically monitored. Project activities that may require monitoring may include the installation of pipelines and crossover facilities and certain soils-altering activities such as grading and access road construction associated with construction or improvement of water storage facilities. The archaeological monitoring program shall include the following:

- All project contractors shall be advised to be on the alert for evidence of the presence of the expected resource(s), of how to identify the evidence of the expected resource(s), and of the appropriate protocol in the event of apparent discovery of an archeological resource;

- The archeological monitor(s) shall be present on the project site according to a schedule agreed upon by the archeological consultant and the ERO until the ERO has, in consultation with project archeological consultant, determined that project construction activities are unlikely to have effects on significant archeological deposits;

- The archeological monitor shall record and be authorized to collect soil samples and artifactual/ecofactual material as warranted for analysis;

- If an intact archeological deposit is encountered, all soils-disturbing activities within the area specified in the AMP of the deposit shall cease. The archeological monitor shall be empowered to temporarily redirect demolition/excavation/pile driving/construction activities and equipment until the deposit is evaluated. The archaeological consultant shall immediately notify the ERO of the encountered archeological deposit. The archeological consultant shall make a reasonable effort to assess the identity, integrity, and significance of the encountered archeological deposit, and present the findings of this assessment to the ERO.

Whether or not significant archeological resources are encountered, the archeological consultant shall submit a written report of the findings of the monitoring program to the ERO.

Additional Requirements: the following requirements, as applicable, are requisite in implementation of either an archaeological testing or monitoring program.

Archeological Data Recovery Program. The archeological data recovery program shall be conducted in accord with an archeological data recovery plan (ADRP). The archeological consultant, project sponsor, and ERO shall meet and consult on the scope of the ADRP prior to preparation of a draft ADRP. The archeological consultant shall submit a draft ADRP to the ERO. The ADRP shall identify how the proposed data recovery program will preserve the significant information the archeological resource is expected to contain. That is, the ADRP will identify what scientific/historical research questions are applicable to the expected resource, what data classes the resource is expected to possess, and how the expected data classes would address the applicable research questions. Data recovery, in general, should be limited to the portions of the historical property that could be adversely affected by the proposed project. Destructive data recovery methods shall not be applied to portions of the archeological resources if nondestructive methods are practical.

The scope of the ADRP shall include the following elements:

- *Field Methods and Procedures*. Descriptions of proposed field strategies, procedures, and operations.
- *Cataloguing and Laboratory Analysis*. Description of selected cataloguing system and artifact analysis procedures.
- *Discard and Deaccession Policy*. Description of and rationale for field and post-field discard and deaccession policies.
- *Interpretive Program*. Consideration of an on-site/off-site public interpretive program during the course of the archeological data recovery program.
- *Security Measures*. Recommended security measures to protect the archeological resource from vandalism, looting, and non-intentionally damaging activities.
- *Final Report*. Description of proposed report format and distribution of results.
- *Curation*. Description of the procedures and recommendations for the curation of any recovered data having potential research value, identification of appropriate curation facilities, and a summary of the accession policies of the curation facilities.

Human Remains and Associated or Unassociated Funerary Objects. The treatment of human remains and of associated or unassociated funerary objects discovered during any soils disturbing activity shall comply with applicable State laws. This shall include immediate notification of the coroner of the county within which the project is located and in the event of the coroner's determination that the human remains are Native American remains, notification of the California State Native American Heritage Commission (NAHC) who shall appoint a Most Likely Descendant (MLD) (Pub. Res. Code Sec. 5097.98). The archeological consultant, project sponsor, and MLD shall make all reasonable efforts to develop an agreement for the treatment of, with appropriate dignity, human remains and associated or unassociated funerary objects (CEQA Guidelines. Sec. 15064.5(d)). The agreement should take into consideration the appropriate excavation, removal, recordation, analysis, custodianship, curation, and final disposition of the human remains and associated or unassociated funerary objects. State law allows 24 hours to reach agreement on these matters. If the MLDs do not agree on the reburial method, the Project will follow Section 5097.98(b) of the California Public resources code which states, "the landowner or his or her authorized representative shall reinter the human remains and items associated with Native American burials with appropriate dignity on the property in a location not subject to further subsurface disturbance."

Final Archeological Resources Report. The archeological consultant shall submit a Draft Final Archeological Resources Report (FARR) to the ERO that evaluates the historical significance of any discovered archeological resource and describes the archeological and historical research methods employed in the archeological testing/monitoring/data recovery program(s) undertaken. Information that may put at risk any archeological resource shall be provided in a separate removable insert within the final report. Once approved by the ERO, copies of the FARR shall be distributed as follows: the relevant California Historical Resources Information System Information Center shall receive one (1) copy and the ERO shall receive a copy of the transmittal of the FARR to the Information Center. The Major Environmental Analysis division of the Planning Department (MEA) shall receive three copies of the FARR along with copies of any formal site recordation forms (CA DPR 523 series) and/or documentation for evaluation under National Register of Historic Places/California Register of Historical Resources criteria. The SFPUC shall receive copies of the FARR as requested in number. In instances of high public interest in or the high interpretive value of the resource, the ERO may require a different final report content, format, and distribution than that presented above.

Accidental Discovery Measures

Measure 4.7-2b: SFPUC Construction Measure # 9 for cultural resources requires that construction activities be suspended immediately if there is any indication of an archaeological resource.

To avoid any potential adverse effect from the proposed project on accidentally discovered buried or submerged historical resources as defined in CEQA Guidelines Section 15064.5(a)(c), the project sponsor shall distribute the Planning Department archaeological resource "ALERT" sheet to the project prime contractor; to any project subcontractor (including demolition, excavation, grading, foundation, pile driving, etc. firms); or utilities firm involved in soil disturbing activities within the project site. Prior to any soil disturbing activities being undertaken, each contractor is responsible for ensuring that the "ALERT" sheet is circulated to all field personnel including, machine operators, field crew, pile drivers, supervisory personnel, etc. The project sponsor shall provide the Environmental Review Officer (ERO) with a signed affidavit from the responsible parties (prime contractor, subcontractor(s), and utilities firm) to the ERO confirming that all field personnel have received copies of the "ALERT" sheet.

If the ERO determines that an archeological resource may be present within the project site, the project sponsor shall retain the services of a qualified archeological consultant. The archeological consultant shall advise the ERO as to whether the discovery is an archeological resource, retains sufficient integrity, and is of potential scientific/historical/cultural significance. If an archeological resource is present, the archeological consultant shall identify and evaluate the archeological resource. The archeological consultant shall make a recommendation as to what action, if any, is warranted. Based on this information, the ERO may require, if warranted, specific additional measures to be implemented by the project sponsor.

Measures might include: preservation in situ of the archeological resource; an archaeological monitoring program; or an archeological testing program. If an archeological monitoring program or archeological testing program is required, it shall be consistent with the MEA guidelines for such programs. The ERO may also require that the project sponsor immediately implement a site security program if the archeological resource is at risk from vandalism, looting, or other damaging actions.

The project archeological consultant shall submit a Final Archeological Resources Report (FARR) to the ERO that evaluates the historical significance of any discovered archeological resource and describing the archeological and historical research methods employed in the archeological monitoring/data recovery program(s) undertaken. Information that may put at risk any archeological resource shall be provided in a separate removable insert within the final report. Once approved by the ERO, copies of the FARR shall be distributed as follows: the relevant California Historical Resources Information System Information Center shall receive one (1) copy and the ERO shall receive a copy of the transmittal of the FARR to the Information Center. The MEA shall receive three copies of the FARR along with copies of any formal site recordation forms (CA DPR 523 series) and/or documentation for nomination to the National Register of Historic Places/California Register of Historical Resources. The SFPUC shall receive copies of the FARR as requested in number. In instances of high public interest in or the high interpretive value of the resource, the ERO may require a different final report content, format, and distribution than that presented above.

Protection of Historic Districts

Measure 4.7-3: The city’s water system facilities affected by WSIP facility projects will be assessed by a qualified historian for their potential contribution to an historic district, following the guidelines identified under Impact 4.7-3. To qualify as an historic district, each resource within that potential district would need to be reliant upon the other resources within the district to be historically significant. Impacts on one resource within the potential district may or may not affect the others, and this conclusion would determine the ultimate significance of the impact.

If an historic district would be affected by one or more proposed WSIP facility projects, the SFPUC, in consultation with the ERO, will develop mitigation measures for effects with attention to the potential district as a whole, with utmost effort made to maintain the district’s function, appearance, cohesive site organization, and ability to convey historic significance. Appropriate measures may also include but not be limited to: refinement of facility sites to minimize effects on district appearance and site organization as well as visual screening efforts to reduce the impact of adding new facilities or otherwise modifying the landscape.

Should an historic district be identified at the project level, it should be recorded as such, using the four National/California Register criteria of significance to explain its historical importance as a cohesive group of resources. The district should be documented by completing the State of California Department of Parks and Recreation 523 forms, using a 523D (District) form as an umbrella record to unify the 523A (Primary Record) and 523B (Building, Structure, Object) forms completed for each individual resource within the potential district, and submitting them to SHPO.

Alternatives Identification and Resource Relocation

Measure 4.7-4a: If a project proposes to demolish or remove a historical resource, including individual historic resources and/or historic districts, the SFPUC will attempt to identify feasible project alternatives that eliminate or reduce the need for demolition or removal to the greatest extent possible. The SFPUC will pursue and implement these project alternatives to the extent feasible, consistent with the goals and objectives of the WSIP.

Relocation of a resource will always be preferable to demolition, although relocation might not mitigate impacts to a less-than-significant level. If preservation of the affected historical resource at the current site is determined to be infeasible, the structure shall, if feasible, be stabilized and relocated to other nearby sites appropriate to their historic setting and general environment. This may not be possible in some cases, like in the replacement of Calaveras Dam (if it were identified as a historical resource for the purposes of CEQA). After relocation, the resource shall be treated according to preservation, rehabilitation, or restoration standards, as appropriate, that follow the Secretary of the Interior's *Standards.* This will ensure that the building, structure, object, site, or district retains historic integrity and its historic significance (Measure 4.7-4c). If the affected historical resource can neither be preserved at its current site nor moved to an alternative site and is to be demolished, the SFPUC shall consult with local historical societies and governmental agencies regarding salvage of materials from the affected historical resource for public information or reuse in other locations. Demolition may proceed only after any significant historic features or materials have been identified, preserved (as feasible), and their removal completed.

Representative features such as aqueduct/pipe sections, valves subject to replacement, decorative elements, or plaques/inscriptions from buildings or other portions of structures demolished as a part of the WSIP projects could be preserved and displayed. Most of these types of structures are of sufficient size that they would form "monumental" commemorative structures. For example, an original pipeline valve replaced by modern equipment might be mounted and displayed on publicly accessible SFPUC property with informative placards. Such displays, if located in other jurisdictions, might be subject to those jurisdiction's requirements related to public art, safety, and liability considerations.

Historical Resources Documentation

Measure 4.7-4b: Documentation of a historical resource, including resources identified as contributors to a historic district or as individually significant, prior to demolition or removal is a standard mitigation measure. Such documentation is often tied to meeting the documentation standards of the Historic American Buildings Survey/Historic American Engineering Record (HABS/HAER). The publication *Recording Historic Structures: Historic American Buildings Survey/Historic American Engineering Record* (Burns, 1989) provides four levels of documentation corresponding to the level of importance of the historic resource to be documented. For the purpose of this PEIR, the standards for photography in Documentation Levels III and IV have been modified to allow for the use of digital photographs instead of large-format negatives.

<u>*Documentation Level I*</u>:

1. Drawings: a full set of measured drawings depicting existing or historic conditions.

2. Photographs: photographs with large-format negatives of exterior and interior views; photocopies with large-format negatives of select existing drawings or historic views where available. Photographs would follow the HABS/HAER Photographic Specifications.
3. Written data: history and description.

Documentation Level II:

1. Drawings: select existing drawings, where available, should be photographed with large-format negatives or photographically reproduced on Mylar.

2. Photographs: photographs with large-format negatives of exterior and interior views, or historic views, where available. Photographs would follow the HABS/HAER Photographic Specifications.
3. Written data: history and description.

Documentation Level III:

1. Drawings: sketch plan.
2. Photographs: digital photographs of exterior and interior views.
3. Written data: architectural data form.

Documentation Level IV:

1. Drawings: sketch plan.
2. Photographs: digital photographs of exterior and interior views.
3. HABS/HAER inventory cards.

Digital photography will follow the standards in the National Register of Historic Places and National Historic Landmarks Survey, Photo Policy Expansion, March 2005 (Table VV). Digital image files would be burned to archival-quality disks, such as the eFilm Archival Gold CD-R or DVD-R; or MAM-A Mitsui Gold Archive CD-R or DVD-R.

The SFPUC will prepare, or retain a consultant to prepare, documentation of historical resources prior to any construction work associated with demolition or removal. The appropriate level of documentation will be selected by a qualified professional who meets the standards for history, architectural history, and/or architecture (as appropriate) set forth by the Secretary of the Interior (*Secretary of the Interior's Professional Qualification Standards*, 36 CFR 61) in consultation with a preservation specialist assigned by the San Francisco Planning Department and the local jurisdiction if deemed appropriate by the Planning Department. In addition to the four levels of documentation listed above, salvage and/or interpretive display may also be required if determined appropriate. The professional in history, architectural history and/or architecture (as appropriate) will prepare the documentation and submit it for review and approval by the Planning Department's preservation specialist. One set of the documentation will be archived at each of the following repositories: San Francisco Planning Department, SFPUC, the History Room of the San Francisco Public Library and the Water Resources Center Archive at the University of California Berkeley. Additional dissemination of documentation to local historical societies or historic preservation organizations may be appropriate. The San Francisco Planning Department will identify additional appropriate recipients of historical documentation during the project-level analysis.

Secretary of the Interior's Standards for Treatment of Historic Properties

Measure 4.7-4c: Compliance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties* would reduce potential impacts associated with the alteration or modification of a historical resource (including historic districts and individually eligible resources) to a less-than-significant level. (In accordance with CEQA Section 15064.5(b)(3), a project that follows the *Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring, and Reconstructing Historic Buildings* or the *Secretary of the Interior's*

Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings is generally considered to have impacts of a less-than-significant level.)

The SFPUC will prepare materials describing and depicting the proposed project, including but not limited to plans, drawings, and photographs of existing conditions (digital, following the standards in Measure 4.7-4a as well as proposed project plans, drawings, specifications, and description). Prepared materials will be submitted to the San Francisco Planning Department. The Planning Department will review the proposed project, for compliance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties*.

If a project is determined to be inconsistent with the *Secretary of the Interior's Standards for the Treatment of Historic Properties*, the SFPUC will pursue and implement redesign of the project to the extent feasible, consistent with the goals and objectives of the WSIP, such that consistency with the standards is achieved.

Historic Resources Survey and Redesign

Measure 4.7-4d: The SFPUC will undertake a historic resources survey within a designated area of potential effect that encompasses the proposed project to identify and evaluate potential historical resources, including districts, which may exist within or partially within the project's study area or area of potential effect. The survey will be conducted by a qualified professional who meets the *Secretary of the Interior's Professional Qualification Standards* for architectural history, history, or architecture (36 CFR 61).

If a survey identifies one or more historical resources in the projects' study area, or area of potential effect (i.e. historically significant resources), the qualified professional will then assess the impact the project may have on those historical resources. If the project will cause a substantial adverse change to a historical resource, the SFPUC will prepare materials describing and depicting the proposed project, including but not limited to plans, drawings, and photographs of existing conditions (digital, following the standards in Measure 4.7-1a) as well proposed project plans, drawings, specifications, and description. Prepared materials will be submitted to the San Francisco Planning Department. The San Francisco Planning Department will assign a preservation specialist to review the proposed project, for compliance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties*.

If a project is determined to be inconsistent with the *Secretary of the Interior's Standards for the Treatment of Historic Properties*, the SFPUC will pursue and implement redesign of the project to the extent feasible, consistent with the goals and objectives of the WSIP, such that consistency with the standards is achieved.

Historic Resources Protection Plan

Measure 4.7-4e: A qualified historian will prepare a plan that specifies procedures for protecting historical resources and a monitoring method to be employed by the contractor while working near these resources. At a minimum, the plan will address the operation of construction equipment near adjacent historical resources, storage of construction materials away from adjacent resources, and education/training of construction workers about the significance of the historical resources.

Preconstruction Surveys and Vibration Monitoring

Measure 4.7-4f: If vibration-related impacts could impact historical resources, one or more geotechnical investigations by a California-licensed geotechnical engineer will be included as part of the proposed project. The SFPUC and its contractors will follow the recommendations of the final geotechnical reports regarding any excavation and construction for the project. The SFPUC will ensure that the construction contractor conducts a preconstruction survey of existing conditions and monitors the adjacent buildings for damage during construction, if recommended by the geotechnical engineer. Any preconstruction surveys and construction monitoring would include the services of a professional meeting the *Secretary of the Interior's Professional Qualification Standards* for architecture.

Traffic, Transportation, and Circulation (Section 4.8)

Program Measures

Traffic Control Plan Measures

Measure 4.8-1a: SFPUC Construction Measure #5 for traffic requires each contractor to prepare a traffic control plan to minimize traffic and on-street parking impacts on any streets affected by construction of the proposed program. SFPUC and construction contactor(s) will prepare and implement a traffic control plan, and coordinate with Caltrans and local jurisdictions, as appropriate, for affected roadways and intersections. Each project may require the implementation of different measures, depending on the project's site-specific construction details, the characteristics of the transportation network, and daily and peak hour vehicle, pedestrian and bicycle volumes. As applicable, elements of the traffic control plan could include, but are not necessarily limited to, the following:

- Circulation and detour plans will be developed to minimize impacts on local street circulation. Flaggers and/or signage will be used to guide vehicles through and/or around the construction zone.
- Truck routes designated by cities and counties will be identified in the traffic control plan. Haul routes that minimize truck traffic on local roadways and residential streets will be utilized to the extent possible.
- Sufficient staging areas will be provided for trucks accessing construction zones to minimize disruption of access to adjacent land uses, particularly at entries to onsite pipeline construction within residential neighborhoods.
- Access to driveways and private roads will be maintained by using steel trench plates. If access must be restricted for brief periods, property owners will be notified in advance.
- Construction vehicle movement will be controlled and monitored through the enforcement of standard construction specifications by onsite inspectors.
- Along major arterials, truck trips will be scheduled outside of the peak morning and evening commute hours to the extent possible.

- Lane closures will be limited during peak hours to the extent possible. Outside of allowed working hours or when work is not in progress, roads will be restored to normal operations, with all trenches covered with steel plates.

- Where possible, pipeline construction work in roadways will be limited to a width that, at a minimum, maintains alternate one-way traffic flow past the construction zone. Parking may be prohibited if necessary to facilitate construction activities or traffic movement. If the work zone width will not allow a 10-foot-wide paved travel lane, then the road will be closed to through-traffic (except emergency vehicles), and detour signing on alternative access roads will be used.

- Pedestrian and bicycle access and circulation will be maintained during project construction where safe to do so. If construction activities encroach on a bicycle lane, warning signs will be posted that indicate bicycles and vehicles are sharing the lane.

- Detours will be included for bicycles and pedestrians in all areas potentially affected by project construction.

- All equipment and materials will be stored in designated contractor staging areas on or adjacent to the worksite, in such a manner to minimize obstruction of traffic.

- Locations will be identified for parking by construction workers, either within the construction zone or, if necessary, at a nearby location with transport provided between the parking location and the worksite.

- Roadside safety protocols will be implemented. Advance "Road Work Ahead" warning signs and speed control (including signs informing drivers of state-legislated double fines for speed infractions in a construction zone) will be provided to achieve required speed reductions for safe traffic flow through the work zone.

- Construction will be coordinated with facility owners or administrators of sensitive land uses such as police and fire stations (including all fire protection agencies), transit stations, hospitals, and schools. Facility owners or operators will be notified in advance of the timing, location, and duration of construction activities and the locations of detours and lane closures.

- Construction will be coordinated with local transit service providers, including temporary relocation of bus routes or bus stops in work zones as necessary.

- Roadway right-of-ways will be repaired or restored to their original conditions or better upon completion of construction.

- To the extent applicable, the traffic control plan will conform to the *California Manual on Uniform Traffic Control Devices for Streets and Highways: Part 6 Temporary Traffic Control* and *Caltrans' 2006 Standard Plans.*

Coordination of Individual Traffic Control Plans

Measure 4.8-1b: To the extent that the adopted SFPUC Construction Measure #5 does not contain such provisions already, or the provisions are not required for a project as a result of local encroachment or right-of-way permit conditions, the contract specifications for individual contracts within a single WSIP project will include the following:

- In the event that more than one construction contract is issued for work along existing or new pipelines, and where construction could occur within and/or across multiple streets in the same vicinity, the SFPUC and construction contractor(s) will coordinate the traffic control plans in order to mitigate the impact of traffic disruption. The coordinated plan will include measures that address overlapping construction schedules and activities, truck arrivals and departures, lane closures and detours, and the adequacy of on-street staging requirements.

Accommodation of Displaced Public Parking Supply for Recreational Visitors

Measure 4.8-4: Due to the potential displacement of designated parking areas where limited parking is available for adjacent public uses, traffic control plans prepared as part of SFPUC Construction Measure #5 and Measure 4.8-1a will include an additional measure to accommodate any anticipated visitor parking demand that would be displaced by proposed projects at public recreational facilities.

Collective Measures

SFPUC WSIP Projects Construction Coordinator

Measure 4.16-6a: Due to the potential for overlapping project activities and construction vehicles to affect travel within and across the five regions, the SFPUC will identify a qualified construction coordinator responsible for coordinating the project-specific traffic control plans developed as part of Measure 4.8-1a, and for developing a public information campaign (e.g., internet website, radio and newspaper updates) to inform the public of construction activities, detour routes, and alternate routes. Throughout the seven-year construction schedule for the WSIP projects, the SFPUC construction coordinator will work with local and regional agencies to pursue additional traffic mitigation measures to minimize local and regional traffic impacts and will incorporate these measures into the project-specific traffic control plans, as appropriate.

Combined San Joaquin Traffic Control Plan

Measure 4.16-6b: Due to the potential for overlapping project schedules in the San Joaquin Region near Tesla Portal, the SFPUC will develop [or the SFPUC's construction contractor(s) will be required to develop] a San Joaquin Traffic Control Plan that coordinates the project-specific traffic control plans developed as part of Measure 4.8-1a and identifies additional measures to minimize the combined impacts of multiple WSIP project construction traffic on I-580, Chrisman Road, and Vernalis Road. As applicable, these measures will be developed consistent with the standards of San Joaquin County, Stanislaus County, and Caltrans and could include:

- Additional traffic control devices, such as traffic signals at key intersections providing access to local roadways and land uses
- Additional traffic control personnel at key locations to facilitate vehicular traffic flow during peak periods of truck activity
- Adjustments in truck arrival and departure schedules for the various facilities (e.g., staggering departures)

Combined Sunol Valley Traffic Control Plan

Measure 4.16-6c: Due to the potential for overlapping project schedules in the Sunol Valley Region as well as for construction traffic to use Calaveras Road as an access route to all projects sites, the SFPUC or its construction contractor(s) will develop a Sunol Valley Traffic Control Plan that coordinates the project-specific traffic control plans developed as part of Measure 4.8-1a and identifies additional measures to minimize the impacts of construction traffic on Calaveras Road and I-680. As applicable, these measures will be developed consistent with the standards of Alameda County and Caltrans and could include:

- Additional traffic control devices, such as traffic signals at key intersections providing access to local roadways and land uses. Traffic signals could facilitate access onto Calaveras Road at intersections and also allow for gaps in truck traffic flow to facilitate access from driveways along Calaveras Road.
- Additional traffic control personnel at key locations to facilitate vehicular traffic flow during peak periods of truck activity.
- Adjustments in truck arrival and departure schedules for the various facilities (e.g., staggering departures).
- Public information regarding periods when construction traffic on Calaveras Road would be greatest.
- Working with Caltrans to determine if warning signs, such as a “Slow Trucks” sign (California Code W51), would be appropriate to inform drivers that slow-moving trucks may interfere with the flow of traffic on I-680.

Cumulative Measures

SFPUC WSIP Projects Construction Coordinator – Other Agencies

Measure 4.17-6: As required in Measure 4.8-1, contractors will be required to submit traffic control plans to the SFPUC, and in Measure 4.16-6a, the SFPUC will be required to identify a WSIP construction coordinator who will be responsible for coordinating the project-specific traffic control plans. The SFPUC WSIP construction coordinator will also consider the effects of any traffic generated by SFPUC maintenance activities and other SFPUC projects (as listed in Tables 4.17-1 through 4.17-6). The SFPUC WSIP construction coordinator will also coordinate with Caltrans, other county agencies, and local jurisdictions responsible for reviewing and/or approving the construction of other identified private and public development projects (as listed in Tables 4.17-1 through 4.17-6) so as to minimize traffic impacts on local access roads, particularly local streets where sensitive receptors (e.g., schools, residences, or hospitals) are located.

Air Quality (Section 4.9)

Program Measures

SJVAPCD Dust Control Measures

Measure 4.9-1a: In the San Joaquin Region, the SJVAPCD has determined that compliance with the following Regulation VIII (Fugitive PM_{10} Prohibitions) and Regulation IX (Mobile and Indirect Sources, Rule 9510, where applicable) control measures would mitigate PM_{10} impacts to a less-than-significant level. The SFPUC will include these measures, where applicable, in contract specifications:

SJVAPCD Basic Control Measures (applies to all construction sites)

- All disturbed areas, including storage piles, that are not being actively utilized for construction purposes, shall be effectively stabilized of dust emissions using water, chemical stabilizer/suppressant, covered with a tarp or other suitable cover, or vegetative ground cover.
- All onsite unpaved roads and offsite unpaved access roads shall be effectively stabilized of dust emissions using water or chemical stabilizer/suppressant.
- All land clearing, grubbing, scraping, excavation, land leveling, grading, cut and fill, and demolition activities shall be effectively controlled of fugitive dust emissions utilizing application of water or by presoaking.
- When materials are transported offsite, all material shall be covered, or effectively wetted to limit visible dust emissions, and at least 6 inches of freeboard space from the top of the container shall be maintained.
- All operations shall limit or expeditiously remove the accumulation of mud or dirt from adjacent public streets at the end of each workday. The use of dry rotary brushes is expressly prohibited except where preceded or accompanied by sufficient wetting to limit the visible dust emissions. Use of blower devices is expressly forbidden.
- Following the addition of materials to, or the removal of materials from, the surface of outdoor storage piles, said piles shall be effectively stabilized of fugitive dust emissions utilizing sufficient water or chemical stabilizer/suppressant.
- Within urban areas, trackout shall be immediately removed when it extends 50 or more feet from the site and at the end of each workday.
- Any site with 150 or more vehicle trips per day shall prevent carryout and trackout.

SJVAPCD Enhanced Control Measures (also applies when required to mitigate significant PM_{10} impacts)

- Traffic speeds on unpaved roads shall be limited to 15 mph.
- Sandbags or other erosion control measures shall be installed to prevent silt runoff to public roadways from sites with a slope greater than 1 percent.

SJVAPCD Additional Control Measures (also applies to construction sites that are large in area, located near sensitive receptors, or which for any other reason warrant additional emissions reductions)

- Wheel washers shall be installed for all exiting trucks, or all trucks and equipment leaving the site shall be washed off.
- Wind breaks shall be installed at windward side(s) of construction areas.
- Excavation and grading activity shall be suspended when winds exceed 20 mph and, regardless of windspeed, an owner/operator must comply with Regulation VIII's 20 percent opacity limitation.
- The area subject to excavation, grading, and other construction activity at any one time shall be limited.

SJVAPCD Rule 9510, Indirect Source Review, Section 6.1, Construction Equipment Emissions (applies to any project subject to discretionary approval by a public agency that ultimately results in the construction of a new building, facility, or structure or reconstruction of a building, facility, or structure for the purpose of increasing capacity or activity and also involving 9,000 square feet of space).

- 6.1.1: The exhaust emissions for construction equipment greater than fifty (50) horsepower used or associated with the development project shall be reduced by the following amounts from the statewide average as estimated by the ARB:
  - 6.1.1.1: 20% of the total NO_x emissions, and
  - 6.1.1.2: 45% of the total PM_{10} exhaust emissions.
- 6.1.2: An applicant may reduce construction emissions on-site by using less-polluting construction equipment, which can be achieved by utilizing add-on controls cleaner fuels, or newer lower emitting equipment.
- 6.3: The requirements listed in Section 6.1 above can be met through any combination of on-site emission reduction measures or off-site fees.

SJVAPCD Exhaust Control Measures

Measure 4.9-1b: To limit exhaust emissions within the San Joaquin Region, the SJVAPCD specifies the following exhaust controls for heavy-duty equipment (scrapers, graders, trenchers, earthmovers, etc.). The SFPUC will include these measures, where applicable, in contract specifications:

- Alternative-fueled or catalyst-equipped diesel construction equipment shall be used.
- Idling time (e.g., 10-minute maximum) shall be minimized.
- The hours of operation of heavy-duty equipment and/or the amount of equipment in use shall be limited.

- Fossil-fueled equipment shall be replaced with electrically driven equivalents (provided they are not run via a portable generator set).
- Construction shall be curtailed during periods of high ambient pollutant concentrations; this may include ceasing construction activity during the peak hour of vehicular traffic on adjacent roadways.
- Activity management (e.g., rescheduling activities to reduce short-term impacts) shall be implemented.

BAAQMD Dust Control Measures

Measure 4.9-1c: In the Sunol Valley, Bay Division, Peninsula, and San Francisco Regions, the BAAQMD has determined that implementation of the following control measures would mitigate PM_{10} impacts to a less-than-significant level. The SFPUC will include these measures, where applicable, in contract specifications:

BAAQMD Basic Control Measures (applies to all construction sites)

- All active construction areas shall be watered at least twice daily.
- All trucks hauling soil, sand, and other loose debris shall be covered *or* all trucks shall be required to maintain at least 2 feet of freeboard on public roads.
- All unpaved access roads, parking areas, and staging areas at construction sites shall either be paved, watered three times daily, or nontoxic soil stabilizers shall be applied.
- All paved access roads, parking areas, and staging areas at construction sites shall be swept daily (with water sweepers).
- If visible soil material is carried onto adjacent public streets, adjacent streets shall be swept daily (with water sweepers).

BAAQMD Enhanced Control Measures (also applies to sites over four acres)

- All inactive construction areas (previously graded areas inactive for 10 days or more) shall be hydroseeded or nontoxic soil stabilizers shall be applied.
- Exposed stockpiles (dirt, sand, etc.) shall be enclosed, covered, and watered, or nontoxic soil binders shall be applied.
- As feasible, traffic speeds on unpaved roads shall be limited to 15 mph.
- Sandbags or other erosion control measures shall be installed to prevent silt runoff to public roadways.
- Disturbed areas shall be replanted as quickly as possible.

BAAQMD Optional Control Measures (also applies to construction sites that are large in area, located near sensitive receptors, or which for any other reason warrant additional emissions reductions)

- Wheel washers shall be installed for all exiting trucks, or all trucks and equipment leaving the site shall be washed off.
- Wind-breaks or trees/vegetative wind-breaks shall be installed at windward side(s) of construction areas.
- Excavation and grading activity shall be suspended when winds exceed 25 mph.
- The area subject to excavation, grading, and other construction activity at any one time shall be limited.

BAAQMD Exhaust Control Measures

Measure 4.9-1d: To limit exhaust emissions within the Sunol Valley, Bay Division, Peninsula, and San Francisco Extended Regions, the SFPUC will implement the following exhaust controls, where applicable:

- Grid power will be used instead of diesel generators at all construction sites where it is feasible to connect to grid power. While it may not be practical to connect to grid power for pipeline projects (since construction sites keep moving along the alignments), grid power shall be used for projects with fixed locations, such as tunnel entry and exit shafts/portals.
- All WSIP contracts specifications shall include Sections 2480 and 2485, Title 13, California Code of Regulations, which limit the idling of all diesel-fueled commercial vehicles (weighing over 10,000 pounds, both California- or non-California-based trucks) to 30 seconds at a school or five minutes at any location. In addition, the use of diesel auxiliary power systems and main engines shall be limited to five minutes when within 100 feet of homes or schools while the driver is resting.
- All WSIP contracts specifications shall include Section 93115, Title 17, California Code of Regulations, Airborne Toxic Control Measure for Stationary Compression Ignition Engines, which specifies fuel and fuel additive requirements; emission standards for operation of any stationary, diesel-fueled, compression-ignition engines; and operation restrictions within 500 feet of school grounds when school is in session.
- A schedule of low-emissions tune-ups shall be developed and such tune-ups shall be performed on all equipment, particularly for haul and delivery trucks. A log of required tune-ups shall be maintained and a copy of the log shall be submitted to the SFPUC on a monthly basis for review.
- Low-sulfur fuels shall be used in all stationary and mobile equipment.

Health Risk Screening or Use of Soot Filters

Measure 4.9-2a: If truck volumes associated with a particular project along a particular haul route exceed 40,000 truck trips over the entire construction period, a health risk screening will be completed. If a potentially significant impact is indicated, a site-specific health risk assessment (HRA) will be completed for the project. Any separate project-level analysis will consider DPM emission rates at the time of construction since emission rates are expected to decline in the future. Based on the site-specific HRA, a mitigation program will be developed implementing one or more the following methods of reducing DPM emission or exposure to a less-than-significant level:

- Modify haul routes to reduce exposure.
- Require use of biodiesel fuel, which reduces DPM emissions.
- Require new construction equipment to be utilized. Newer construction equipment is far cleaner than old equipment.
- Require that the vehicle fleet include trucks with soot filters (particulate traps) within the equipment fleet.
- Temporarily vacate affected receptors.
- Any other effective means of reducing DPM emissions or exposure.

Vacate SFPUC Land Managers' Residences in Sunol Valley

Measure 4.9-2b: The two SFPUC Land Managers' residences in the Sunol Valley will be vacated during construction of the Calaveras Dam (SV-2) or Treated Water Reservoirs (SV-5) projects. Alternatively, a health risk screening could be completed to determine health risks at these residences from either of these two projects. If a potentially significant impact is indicated, a health risk assessment will be completed, and measures will be implemented, as set forth in Measure 4.9-2a.

Tunnel Gas Odor Control

Measure 4.9-3: For any projects that would require a tunnel ventilation system, if hydrogen sulfide gas or any other odorous gases (including diesel exhaust) are encountered during tunnel excavation and become a nuisance odor problem (i.e., odor complaints are received), water scrubbers will be added to the ventilation system and appropriate chemicals will be added to remove the nuisance odors.

Collective Measures

Dust and Exhaust Control Measures for All WSIP Projects

Measure 4.16-7a: Measures 4.9-1a through 4.9-1d requires specific projects to implement dust and exhaust control measures. To address collective construction-related air quality impacts, these measures will be required for all WSIP projects as applicable and required by SJVAPCD and BAAQMD.

Health Risk Screening or Use of Soot Filters for All Projects in the San Joaquin and Sunol Valley Regions

Measure 4.16-7b: Measure 4.9-2a requires specific projects to either conduct a health risk assessment or use soot filters to reduce DPM emissions associated with haul trucks. To address collective DPM impacts, this measure will be required for all WSIP projects in the

San Joaquin and Sunol Valley Regions. This measure would only apply in the Sunol Valley Region if, under Measure 4.9-2b, the SFPUC elects not to vacate the two SFPUC Land Managers' residences in the Sunol Valley. If this requirement is applied to the New Irvington Tunnel project (SV-4), it shall be applied to both the Sunol Valley and Fremont tunnel portals, taking into account truck traffic from other WSIP projects in the vicinity of both portals.

Vacate SFPUC Land Managers' Residences for All Projects in the Sunol Valley Region

Measure 4.16-7c: Measure 4.9-2b requires the two SFPUC Land Managers' residences in the Sunol Valley to be vacated during construction of the Calaveras Dam (SV-2) and Treated Water Reservoirs (SV-5) projects. Alternatively, a health risk screening could be completed to determine health risks at these residences. If a potentially significant impact is indicated, a health risk assessment will be completed. To address collective DPM impacts, this measure will be required for all WSIP projects in the Sunol Valley Region.

Noise and Vibration (Section 4.10)

Program Measures

Noise Controls

Measure 4.10-1a: SFPUC Construction Measure #6 for noise requires compliance with local noise ordinances to the extent feasible. Many of these ordinances restrict hours when construction can occur, but do not specify noise limits for construction noise. For most projects, the SFPUC will conduct construction activities during the daytime hours to the extent feasible. However, if nighttime construction cannot be avoided, noise generated by these activities will be required to comply with applicable noise ordinance nighttime limits or not exceed 50-dBA sleep interference criterion (with windows open at night) to the extent feasible.

To ensure that construction noise impacts are mitigated to a less-than-significant level, all WSIP projects located within 500 feet of any noise-sensitive receptors (e.g., residences, schools, childcare centers, churches, hospitals, and nursing homes) will be required to implement appropriate noise controls to reduce daytime construction noise levels to meet the 70-dBA daytime speech interference criterion to the extent feasible. For nighttime construction, all WSIP projects located within 3,000 feet of any noise-sensitive receptors will be required to implement appropriate noise controls to maintain noise levels at or below any applicable ordinance nighttime noise limits or the 50-dBA nighttime sleep interference criterion to the extent feasible. Such controls could include any of the following, as appropriate:

- Best available noise control techniques (including mufflers, intake silencers, ducts, engine enclosures, and acoustically attenuating shields or shrouds) will be used for all equipment and trucks in order to minimize construction noise impacts. If feasible, construction equipment noise will not exceed the mitigated noise levels listed in **Table 4.10-4** (see measure below for limits on impact equipment).

- If impact equipment (e.g., jack hammers, pavement breakers, and rock drills) is used during project construction, hydraulically or electric-powered equipment will be used wherever feasible to avoid the noise associated with compressed-air exhaust from pneumatically powered tools. However, where use of pneumatically powered tools is unavoidable, an exhaust muffler on the compressed-air exhaust will be used (a muffler can lower noise levels from the exhaust by up to about 10 dBA). External jackets on the tools themselves will be used, where feasible, which could achieve a reduction of 5 dBA. Quieter procedures, such as drilling rather than impact equipment, will be used whenever feasible.

- Pile holes will be pre-drilled wherever feasible to reduce potential noise and vibration impacts. Where feasible, sonic or vibratory pile drivers will be used instead of impact pile drivers (sonic pile drivers are only effective in some soils).

- Pile driving activities shall be prohibited during the evening and nighttime hours (7 p.m. to 7 a.m.).

- Operation of equipment requiring use of back-up beepers will be avoided near sensitive receptors to the extent feasible during nighttime hours (10 p.m. to 7 a.m.).

- Stationary noise sources will be located as far from sensitive receptors as feasible. If they must be located near receptors, adequate muffling (with enclosures where feasible and appropriate) will be used to ensure local noise ordinance limits are met to the extent feasible. Enclosure opening or venting will face away from sensitive receptors. If any stationary equipment (e.g., ventilation fans, generators, dewatering pumps) is operated beyond the time limits specified by the pertinent noise ordinance, this equipment will conform to the affected jurisdiction's pertinent day and night noise limits to the extent feasible.

- Material stockpiles as well as maintenance/equipment staging and parking areas will be located as far as feasible from residential and school receptors.

- Wherever feasible, pipeline alignments will be located at least 100 feet away from sensitive receptors.

- Where pipeline construction zones are within 100 feet of school classrooms or childcare facilities, pipeline construction activities (or at least the noisier phases of construction) will be scheduled on weekend or school vacation days to the extent feasible, avoiding weekday hours when schools are in session. If construction must occur when school is in session, interior noise levels in classrooms will not exceed 60 dBA if possible to avoid speech interference problems, which would allow for a maximum exterior noise level of 70 to 80 dBA, depending on whether windows are open or closed.

- Given the long duration of construction activities at tunnel shafts/portals and proposed nighttime activities, tunnel-related construction activities will be designed to comply with nighttime noise limits specified in local noise ordinances. Measures that could be implemented to comply with these limits include: using quiet ventilation fans (pure tone components of fan noise will be considered), using line power instead of generators, erection of temporary sound barriers, restricting heavy equipment operation during the nighttime hours, using nonmetallic containers in the muck removal system to prevent clanging/banging noises, limiting controlled detonations in the tunnel shaft/portal vicinities to the daytime hours, retrofitting windows/doors of affected homes, and/or prohibiting use of backup alarms on equipment during the nighttime hours.

- Where controlled detonation activities will occur, surrounding cities and residents should be notified of the blasting schedule, indicating the time range when blasting could occur (hours and duration).

- Proposed jack-and-bore pits will be located as far from sensitive receptors as technically feasible. If ventilation fans, dewatering pumps, or generators are required as part of this type of pipeline crossing, such equipment will comply with daytime and nighttime noise limits specified in pertinent noise ordinances to the extent feasible (also see Measure 4.9-1d in Section 4.9, Air Quality, for additional restrictions on generator operation).

- Wherever necessary, temporary or permanent noise barriers will be erected to maintain construction noise levels at or below the 70-dBA daytime speech interference criterion and the 50-dBA nighttime sleep interference criterion.

- A designated project liaison will be responsible for responding to noise complaints during the construction phases. The name and phone number of the liaison will be conspicuously posted at construction areas and on all advanced notifications. This person will take steps to resolve complaints, including periodic noise monitoring, if necessary. Results of noise monitoring will be presented at regular project meetings with the project contractor, and the liaison will coordinate with the contractor to modify any construction activities that generated excessive noise levels to the extent feasible.

- A reporting program will be required for each project that documents complaints received, actions taken to resolve problems, and effectiveness of these actions.

Vacate SFPUC Caretaker’s Residence at Tesla Portal

Measure 4.10-1b: The SFPUC caretaker’s residence at Tesla Portal will be vacated during construction of the Advanced Disinfection (SJ-1) and Tesla Portal Disinfection (SJ-5) projects as well as those portions of the SJPL System (SJ-3) and SJPL Rehabilitation (SJ-4) projects located at Tesla Portal.

Limit Hourly Truck Volumes

Measure 4.10-2a: In addition to SFPUC Construction Measure #6 for noise, which requires compliance with local noise ordinances to the extent feasible, haul and delivery truck routes for all WSIP projects will avoid local residential streets and will follow local designated truck routes to the extent feasible. Total project-related haul and delivery truck volumes on any particular haul truck route will be limited to 80 trucks per hour.

Restrict Truck Operations

Measure 4.10-2b: Haul and delivery trucks will be prohibited from operating within 200 feet of any residential uses during the nighttime hours (10 p.m. to 7 a.m.). If there are receptors, but they are beyond 200 feet from the haul route, limited truck operations will be allowed during the more sensitive nighttime hours, but noise generated by these operations cannot exceed the 50-dBA sleep interference criterion at the closest receptors. If trucks must operate during these hours and residential uses are located within 200 feet of the haul route, deliveries will be made to staging areas outside residential areas, then transferred to the construction site during daytime hours (7 a.m. to 7 p.m.).

Vacate SFPUC Land Manager's Residence

Measure 4.10-2c: To minimize nighttime noise impacts, the SFPUC Land Manager's residence adjacent to Alameda East Portal will be vacated during off-site truck operations associated with the New Irvington Tunnel project (SV-4), if truck operations occur during the nighttime hours (10 p.m. to 7 a.m.) and are estimated to exceed the 50-dBA sleep interference criterion at this residence.

Vibration Controls to Prevent Cosmetic or Structural Damage

Measure 4.10-3a: To prevent cosmetic or structural damage to adjacent or nearby structures, the SFPUC will incorporate restrictions into all contract specifications (primarily for sheetpile driving, pile driving, or tunnel construction activities), whereby surface vibration will be limited to 0.2 in/sec PPV for continuous vibration (e.g., vibratory equipment and impact pile drivers) and 0.5 in/sec PPV for controlled detonations at the closest receptors to ensure that cosmetic or structural damage does not occur.

Limit Vibration Levels at or Below Vibration Perception Threshold

Measure 4.10-3b: For nighttime construction activities, the SFPUC will maintain vibration levels at or below the vibration perception threshold (0.012 in/sec PPV) at adjacent properties (or in accordance with local ordinances) to the extent feasible. If vibration complaints are received during facility construction, operational adjustments will be made (e.g., restricting use of equipment causing vibration disturbance during the nighttime hours or slowing the pace of its operation), as necessary, to reduce vibration annoyance effects.

Limit Tunnel-Related Detonation to Daylight Hours

Measure 4.10-3c: The SFPUC will limit controlled detonation associated with tunnel construction to the daylight hours, Monday through Saturday.

Collective Measures

Limiting Hourly Truck Volumes and Restricting Truck Operations on Haul Routes for Multiple WSIP Projects

Measure 4.16-8a: Measures 4.10-2a and 4.10-2b outline restrictions and guidelines for daytime and nighttime truck operations on local roadways. To address collective truck-related noise impacts, these measures will be applied to total haul and delivery truck volumes on any particular haul truck route that are attributable to all WSIP projects, including the Tesla Portal, Irvington Portal, Lower Crystal Springs Dam vicinities as well as haul routes in San Francisco Region. Therefore, total truck volumes from all WSIP projects on a particular route will not exceed 80 trucks per hour (so as not to exceed the 70-dBA speech interference criterion during the daytime hours) and will be restricted near sensitive receptors (to meet the 50-dBA sleep interference criterion) during the nighttime hours.

Vacate Land Manager's Residence for All Projects in Sunol Valley Region

Measure 4.16-8b: Measure 4.10-2c requires the SFPUC Land Manager's residence adjacent to Alameda East Portal to be vacated during construction truck operations associated with the New Irvington Tunnel project (SV-4). To address collective noise impacts, this residence will be vacated during construction truck operations associated with all WSIP projects in this region, if collective daytime truck volumes exceed the 70-dBA speech interference criterion (7 a.m. to 10 p.m.) or nighttime truck volumes exceed the 50-dBA sleep interference criterion (10 p.m. to 7 a.m.).

Cumulative Measures

Coordination of Truck Traffic on Local Streets

Measure 4.17-8: The SFPUC WSIP construction coordinator designated in Measure 4.17-6 will also be responsible for coordinating truck traffic generated on these same streets by SFPUC maintenance activities and other SFPUC projects (as listed in Tables 4.17-1 through 4.17-6) so that SFPUC-related truck noise increases are maintained at or below threshold levels specified in Measures 4.10-2a and 4.10-2b to the extent feasible (80 trucks per hour along a haul/delivery route and restricted nighttime truck operations).

Public Services and Utilities (Section 4.11)

Program Measures

Notify Neighbors of Potential Utility Service Disruption

Mitigation 4.11-1a: As part of the neighborhood notice, the SFPUC will notify residents and businesses in project area of potential utility service disruption two to four days in advance of construction.

Locate Utility Lines Prior to Excavation

Measure 4.11-1b: Prior to excavation, the SFPUC or its contractors will locate overhead and underground utility lines, such as natural gas, electricity, sewer, telephone, fuel, and water lines, that may be encountered during excavation work prior to opening an excavation.

Confirmation of Utility Line Information

Measure 4.11-1c: The SFPUC or its contractors will find the exact location of underground utilities by safe and acceptable means. Information regarding the size, color, and location of existing utilities must be confirmed before construction activities commence.

Safeguard Employees from Potential Accidents Related to Underground Utilities

Measure 4.11-1d: While any excavation is open, the SFPUC or its contractors will protect, support, or remove underground utilities as necessary to safeguard employees.

Notify Local Fire Departments

Measure 4.11-1e: The SFPUC or its contractors will notify local fire departments any time damage to a gas utility results in a leak or suspected leak, or whenever damage to any utility results in a threat to public safety.

Emergency Response Plan

Mitigation 4.11-f: The SFPUC will develop an emergency response plan in the event of a leak or explosion prior to commencing construction activities.

Prompt Reconnection of Utilities

Measure 4.11-2g: The SFPUC or its contractors will promptly reconnect any disconnected utility lines.

Coordinate Final Construction Plans with Affected Utilities

Measure 4.11-1h: The SFPUC or its contractors will coordinate final construction plans and specifications with affected utilities.

Waste Reduction Measures

Measure 4.11-2: The following requirements will be incorporated into contract specifications for each WSIP project:

The contractor(s) will obtain any necessary waste management permits prior to construction and will comply with conditions of approval attached to project implementation. As part of the waste management permit process, the contractor(s) will submit a solid waste recycling plan to the affected agencies. Elements of the plan will likely include, but are not necessarily limited to, the following:

- Identification of the types of debris that will be generated by the project and identify how all waste streams will be handled.
- Actions to reuse or recycle construction debris and clean excavated soil to the extent possible.
- Actions to divert at least 50% of inert solids (asphalt, brick, concrete, dirt, fines, rock, sand, soil, and stone) from disposal in a landfill.

Recreational Resources (Section 4.12)

Program Measures

Coordination with Golf Course/Recreational Facility Managers

Measure 4.12-1: Where golf courses or other recreational facilities would be directly affected by pipeline construction, the SFPUC will coordinate with facility managers to minimize adverse impacts on golfers and other recreational users.

Appropriate Siting of Proposed Facilities

Measure 4.12-2: The SFPUC will locate WSIP project facilities on park and recreation properties in consultation with park planning staff to minimize the direct loss of recreation and play space and to minimize any inconvenience to park, playground, or golf course users associated with the installation of non-recreational facilities within recreational areas.

Agricultural Resources (Section 4.13)

Program Measures

Supplemental Noticing and Soil Stockpiling

Measure 4.13-1a: For the San Joaquin Pipeline projects (SJPL System, SJ-3, and SJPL Rehabilitation, SJ-4), as part of the SFPUC Construction Measure #1 for neighborhood notice, advanced notification will include the name and number of an SFPUC staff person who can be contacted to discuss special needs and to work out accommodations to minimize temporary disruption to agricultural activities. The SFPUC will stockpile and replace topsoil in mapped areas of Prime and Unique Farmland and Farmland of Statewide Importance that would be temporarily disturbed by pipeline construction, unless other actions are required under specific agreements with individual land owners. (The SFPUC typically holds easements for work on its projects, but prior owners may have residual rights to use the rights-of-way for agricultural purposes. The SFPUC will work with farmers under the terms of these agreements.)

Avoidance or Soil Stockpiling

Measure 4.13-1b: The SFPUC will minimize any potential impacts on agricultural lands in the Sunol Valley by avoiding these resources wherever possible. Where this is not possible, topsoil along the pipeline right-of-way will be stockpiled, replaced, and hydroseeded to prevent erosion, unless other actions are required as a result of contracts affecting use of the property or under specific agreements with individual land owners.

Siting Facilities to Avoid Prime Farmland

Measure 4.13-2: The SFPUC will avoid areas identified as Prime Farmland, Unique Farmland, or Farmland of Statewide Importance in the siting of facilities for the 40-mgd Treated Water project (SV-3), Treated Water Reservoirs project (SV-5), and ancillary power supply facilities for the SJPL System project (SJ-3). If avoidance is not feasible, the SFPUC will adopt a permanent set-aside for an equivalent acreage of similarly-valued farmland in the area.

Hazards (Section 4.14)

Program Measures

Site Health and Safety Plan

Measure 4.14-1a: For all projects requiring excavation where the site assessment conducted in accordance with SFPUC Construction Measure #7 indicates the potential to encounter hazardous materials in the soil or groundwater, the contractor will prepare a site health and safety plan identifying the chemicals present, potential health and safety hazards, monitoring to be performed during site activities, soils-handling methods required to minimize the potential for exposure to harmful levels of any chemicals identified in the soil, appropriate personnel protective equipment, and emergency response procedures.

Materials Disposal Plan

Measure 4.14-1b: For all projects requiring excavation where the site assessment conducted in accordance with SFPUC Construction Measure #7 indicates the potential to encounter hazardous materials in the soil, the contractor will prepare a materials disposal plan that specifies the disposal method and approved disposal site for the soil and will provide written documentation that the disposal site will accept the waste.

Coordination with Property Owners and Regulatory Agencies

Measure 4.14-1c: Based on regulatory agency file reviews conducted in accordance with SFPUC Construction Measure #7, the SFPUC will assess the potential to encounter unacceptable levels of hazardous materials at known environmental cases, for construction activities to cause groundwater plume migration or interfere with ongoing remediations at known environmental cases, and for increased water levels in reservoirs or lakes to inundate known environmental cases. Should the review indicate that the project could encounter unacceptable levels of hazardous materials or interfere with a remediation, the SFPUC will contact the site owner (or responsible SFPUC department for the Peninsula Sportsmen’s Club and Pacific Rod and Gun Club) and responsible regulatory agency to determine appropriate construction modifications or remediation necessary to avoid adverse effects during construction and operation of the project. Construction modifications will be designed to reduce groundwater plume migration or interference with the remediation; alternatively, modifications will be made to the remediation activities during construction to reduce interference with remediation activities to avoid encountering unacceptable levels of hazardous materials. The SFPUC will implement the requirements of the responsible regulatory agency.

Health Risk Screening and Airborne Asbestos Monitoring Plan

Measure 4.14-2: For tunneling projects where soil or rock containing naturally occurring asbestos has been identified, the SFPUC will conduct a health risk screening assessment to identify acceptable levels of asbestos in tunnel emissions based on site conditions and proximity to receptors. Prior to operation of the tunnel exhaust system, the contractor will be required to prepare an airborne asbestos monitoring plan for approval by the BAAQMD. The plan will specify the identified asbestos criterion, monitoring that will be conducted to identify asbestos concentrations in tunnel emissions, sampling methods, analytical methods, and corrective actions that will be taken if the asbestos criterion is exceeded. Additional dust filtration will be added to the tunnel exhaust system if the criterion is exceeded.

Hazardous Building Materials Surveys and Abatement

Measure 4.14-5: For all WSIP projects involving demolition or renovation of existing facilities, the SFPUC will retain a registered environmental assessor or a registered engineer to perform a hazardous building materials survey for each structure prior to demolition or renovation activities. If any friable asbestos-containing materials, lead-containing materials, or hazardous components of building materials are identified, adequate abatement practices, such as containment and/or removal, will be implemented prior to demolition or renovation. Any PCB-containing equipment or fluorescent lights containing mercury vapors will also be removed and disposed of properly.

Energy Resources (Section 4.15)

Program Measures

Incorporation of Energy Efficiency Measures

Measure 4.15-2: Consistent with the Energy Action Plan II priorities for reducing energy usage, the SFPUC will ensure that energy efficient equipment is used in all WSIP projects. A repair and maintenance plan will also be prepared for each facility to minimize power use. The potential for use of renewable energy resources (such as solar power) at facility sites will be evaluated during project-specific design.

October 30, 2008

Final
Program Environmental Impact Report
Volume 3 of 8

For the
San Francisco Public Utilities Commission's
WATER SYSTEM IMPROVEMENT PROGRAM

San Francisco Planning Department File No. 2005.0159E
State Clearinghouse No. 2005092026

Draft PEIR Publication Date: June 29, 2007
Draft PEIR Public Hearing Dates:
September 5, 2007 in Sonora
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September 20, 2007 in San Francisco
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San Francisco Planning Department

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5 WSIP Water Supply and System Operations – Setting and Impacts

5.1 Introduction and Approach

CHAPTER 5

WSIP Water Supply and System Operations – Setting and Impacts

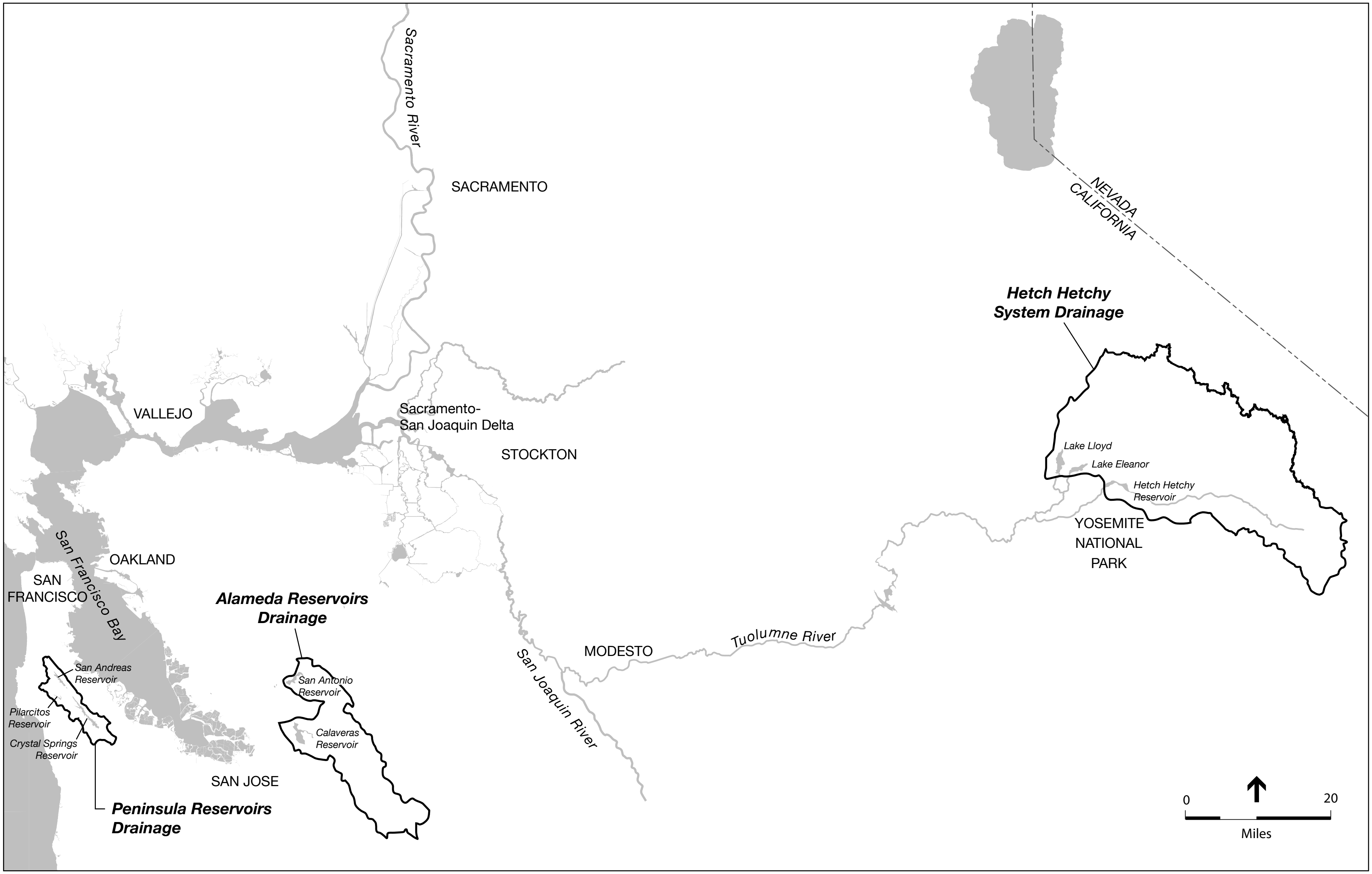
Chapter 5 Sections

5.1 Overview

5.1.1 Introduction

This chapter addresses the water supply and system operations aspects of the Water System Improvement Program (WSIP) and evaluates the potential environmental impacts of the proposed changes in water supply sources and regional water system operations. These impacts are generally distinct from the impacts associated with proposed construction and operation of the WSIP facility improvement projects described in Chapter 4, although there are some areas of overlap, which are described where appropriate. Together, Chapters 4 and 5 of this Program Environmental Impact Report (PEIR) present the impacts associated with implementation of the San Francisco Public Utilities Commission's (SFPUC) proposed program.

The impact discussions in Chapter 5 are organized by watershed and related drainages and reservoirs, rather than by environmental resource topics as in Chapter 4. This is because the water supply and system impacts are dependent on the local characteristics of each watershed and related resources. In this chapter, each watershed or water resource is discussed as a whole. There are three watershed areas of interest along the SFPUC's regional system: the Tuolumne River system, the Alameda Creek system, and the Peninsula system (including Pilarcitos Creek) (see **Figure 5.1-1**). In addition, the Westside Groundwater Basin is analyzed as a separate resource area only with respect to WSIP impacts on the groundwater resources, since the facilities-related



SOURCE: ESA + Orion

SFPUC Water System Improvement Program . 203287

Figure 5.1-1
Overview of Water Supply Watersheds
in the SFPUC Regional Water System

effects of construction and operation of the WSIP groundwater projects are evaluated in Chapter 4. Together, these watersheds and related water resources constitute the "program area" affected by the proposed water supply and system operations of the WSIP (Chapter 4, Section 4.1 defines the "study area," which encompasses the areas affected by proposed WSIP facilities).

For each watershed and related drainage area, this chapter addresses impacts on all environmental resources that could be affected by the proposed water supply option and system operations included in the proposed program: surface water hydrology, geomorphology, water quality, groundwater, fisheries and aquatic resources, riparian resources, recreational and visual resources, and, where applicable, water supplies and energy. Other resource topic areas analyzed in Chapter 4—land use, geology/soils/seismicity, cultural resources, traffic/transportation/ circulation, air quality, noise/vibration, public services and utilities, agricultural resources, and hazards—are not addressed in Chapter 5, since these resource areas would not be affected by changes in water supply and system operations (see Appendix B for more discussion).

Chapter 5 provides a *project-level* impact analysis of implementing: (1) the proposed WSIP water supply option to serve the projected 2030 average annual customer water purchase requests of 300 million gallons per day (mgd), and (2) the future regional system operations associated with meeting the WSIP's water supply and delivery reliability level of service objectives. Specifically, Chapter 5 provides a detailed analysis of the effects of increasing the average annual diversion from the Tuolumne River to serve customer purchase requests during both nondrought and drought periods through 2030. The project-level analysis evaluates the effects on the hydrology and related resources in the Tuolumne River, Alameda Creek, and Peninsula watersheds. Project-level mitigation measures have been identified, where appropriate, to address potentially significant impacts.

This detailed analysis is intended to fully address the effects of implementing the proposed WSIP water supply option through 2030 without the need for additional environmental review, with one exception. The exception that will require additional CEQA review is associated with the effects of the WSIP facility improvement project, Groundwater Projects (SF-2), on groundwater resources. The analyses in Sections 5.3 through 5.5 include the project-level impacts of taking additional water from the Tuolumne River to provide potable water from the regional system during nondrought years to serve those customers in San Mateo County that currently use groundwater from the Westside Basin; however, Chapter 5 does not evaluate the project-level impacts on the Westside Groundwater Basin of extracting the water from the basin during drought years. Section 5.6 analyzes the effects of the proposed conjunctive-use program and local groundwater projects on groundwater resources at a program-level, and subsequent project-level impact analysis of the proposed groundwater extraction activities on groundwater resources will be required, as appropriate, as specific well facilities are proposed under the WSIP facility improvement project for Groundwater Projects (SF-2).[1]

1 Chapter 4 analyzes the program-level effects of implementing facilities needed for the Groundwater Projects (SF-2) and Recycled Water Projects (SF-3), and separate, project-level CEQA review on those facilities will be required. The project-level analysis of the proposed water supply option in Chapter 5 includes the effects of incorporating recycled water into systemwide operations.

5.1.2 Chapter Organization

Chapter 5 is organized as follows. Section 5.1 provides a description of the WSIP water supply option and system operations analyzed in this chapter as well as a general discussion of the approach to the analysis and rationale used in the impact evaluation for all watersheds. It describes the modeling tool used in the analysis and the chief assumptions made regarding system operations in the future. Specific differences in approach that are unique to each watershed are described in the individual sections. In addition, this overview section presents the definitions of significance determinations used throughout the chapter.

Section 5.2 presents a review of the plans, policies, and regulatory framework as they apply to relevant water supply issues as well as to watershed management of affected resources. In addition, the general regulatory framework for water and biological resources is included in this section, and specific details applicable to each watershed are provided in subsequent sections.

Section 5.3 covers the Tuolumne River drainage from Hetch Hetchy Reservoir to the river's confluence with the San Joaquin River and, as appropriate, also discusses the Delta.

Section 5.4 addresses the portion of the Alameda Creek watershed and major tributaries where it would be affected by the regional water system.

Section 5.5 encompasses drainage areas within the SFPUC Peninsula watershed, including the watersheds of San Mateo, Pilarcitos, and San Andreas Creeks and associated reservoirs.

Section 5.6 discusses the Westside Groundwater Basin resources that could be affected by the proposed WSIP groundwater projects, including both the local project in San Francisco as well as the regional projects proposed as part of the conjunctive-use program.

Section 5.7 presents an analysis of cumulative effects associated with the water supply sources and related resources. The section describes other past, present, and reasonably foreseeable future projects that could affect the same water resources and related environmental resources as the WSIP (as described in Sections 5.3 through 5.6) and evaluates the potential cumulative effects of implementing the WSIP in combination with those projects.

5.1.3 Proposed Water Supply Option and System Operations

This section reiterates the description of the proposed water supply option, as presented in Chapter 3.0, since it is the focus of the Chapter 5 impact analysis. The proposed water supply option addresses both the delivery reliability and water supply levels of service proposed under the WSIP, which are both associated with the projected increase in customer purchase requests (demand) through the year 2030. The proposed delivery reliability level of service is to increase the reliability of the regional system to serve average day customer demand of 300 mgd under a range of operating conditions, including providing for local reservoir replenishment and during planned maintenance, unplanned outages, and loss of water from any one water source. The proposed water supply levels of service are as follows: (1) to fully meet customer purchase requests in nondrought years through the planning year 2030, estimated to be 300-mgd average annual delivery, and (2) to provide drought-year delivery with a maximum systemwide cutback of 20 percent in any one year of a drought.

Although no major changes are proposed under the WSIP with respect to regional system operations, there would be some operational refinements (described in Chapter 3, Section 3.7). The proposed facility improvements would upgrade and in some cases expand the system, allowing changes in operations that provide increased flexibility as well as increased delivery reliability. In particular, local Bay Area reservoirs would be maintained at higher water levels for longer periods of time under the WSIP than under the existing condition. By keeping water stored in local reservoirs, geographically close to the customers' demand, the SFPUC would be able to respond to service needs during a drought or other emergency, such as an unplanned facility outage.

Proposed Nondrought-Year Water Supplies

During nondrought conditions, the SFPUC proposes to serve the increased 35 mgd in average annual purchase requests through a combination of conservation, water recycling, and groundwater supply programs in San Francisco supplemented with increased diversions from the Tuolumne River. Under the proposed water supply option, the SFPUC would implement conservation, water recycling, and groundwater supply programs in the SFPUC retail service area to achieve the equivalent of 10 mgd of supply in all years (drought and nondrought).

The SFPUC proposes to serve the increase in customer purchase requests that are not served by conservation, water recycling, and groundwater supply programs through increased use of Tuolumne River water under its existing water rights and additional management of the local watershed resources with the restoration of the storage capacity of Calaveras and Crystal Springs Reservoirs. The regional system would continue to maximize its use of local watershed water supplies. This increased diversions from the Tuolumne River include additional diversions needed to serve 2030 purchase requests as well as maintaining local storage for supply reliability and implementation of Westside Basin conjunctive-use program.

Proposed Drought-Year Water Supplies

During drought years under the WSIP, the SFPUC would continue to use the nondrought-year water supplies described above and would make use of the following additional resources and measures to meet the 2030 needs:

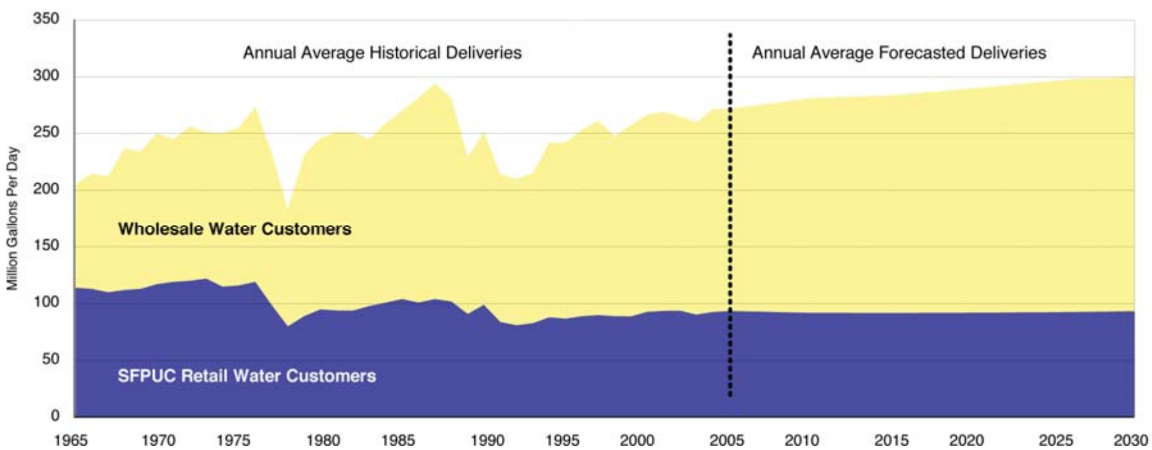
- <u>*Water transfers*</u>. Obtain up to an equivalent of 26 mgd of supplemental Tuolumne River water through water transfer agreements with TID and MID such that water would be available for diversion in drought years.
- <u>*Groundwater conjunctive-use program in the Westside Basin, San Mateo County*</u>. Utilize the extraction component of a groundwater conjunctive-use program in the Westside Groundwater Basin in northern San Mateo County to provide the equivalent of approximately 6 mgd of water during prolonged drought to groundwater pumpers. This includes providing potable water to groundwater pumpers and in-lieu groundwater recharge during nondrought years in return for reduced groundwater pumping during drought years.

- *Restoration of Calaveras and Crystal Springs Reservoir capacities*. Restore the historical operating storage capacities at Calaveras Reservoir to provide an equivalent of 7 mgd of additional water supply and at Crystal Springs Reservoir to provide an equivalent of 1 mgd of additional supply.

- *Rationing*. Implement up to 20 percent systemwide rationing if necessary in combination with use of the above supplemental water supplies.

To ensure that the water supplies would be available by 2030, the SFPUC is currently in the planning phase of the design and construction of needed facilities and is pursuing required agreements with other agencies. The SFPUC would secure these water supplies in phases as required to meet the increased customer demand between now and 2030, as reflected in **Figure 5.1-2**. Figure 5.1-2 shows the average annual historical customer deliveries as well as the projected future average annual demand. The figure indicates that between 2005 and 2030, the total customer purchase requests are estimated to increase by 35 mgd (annual average), from an annual average of 265 mgd to an annual average of 300 mgd. Retail customer demand would increase by about 1 mgd,[2] and the remaining increase would be from wholesale customers (see also Chapter 3, Table 3.4). Half of this increased demand is expected to occur before 2020, and the remaining by 2030.

This chapter evaluates the effects of implementing this proposed combination of actions and supplemental supplies to meet water supply and delivery needs and performance objectives through 2030.



SFPUC Water System Improvement Program ▪ 203287

SOURCE: SFPUC, 2007b

Figure 5.1-2 (Revised)
Annual Average Historical and
Projected Future Customer Purchase Requests

2 The SFPUC retail service area high-range purchase estimate of 91 mgd assumes that San Francisco groundwater supply would be part of the regional water system supply.

5.1.4 Approach to the Analysis

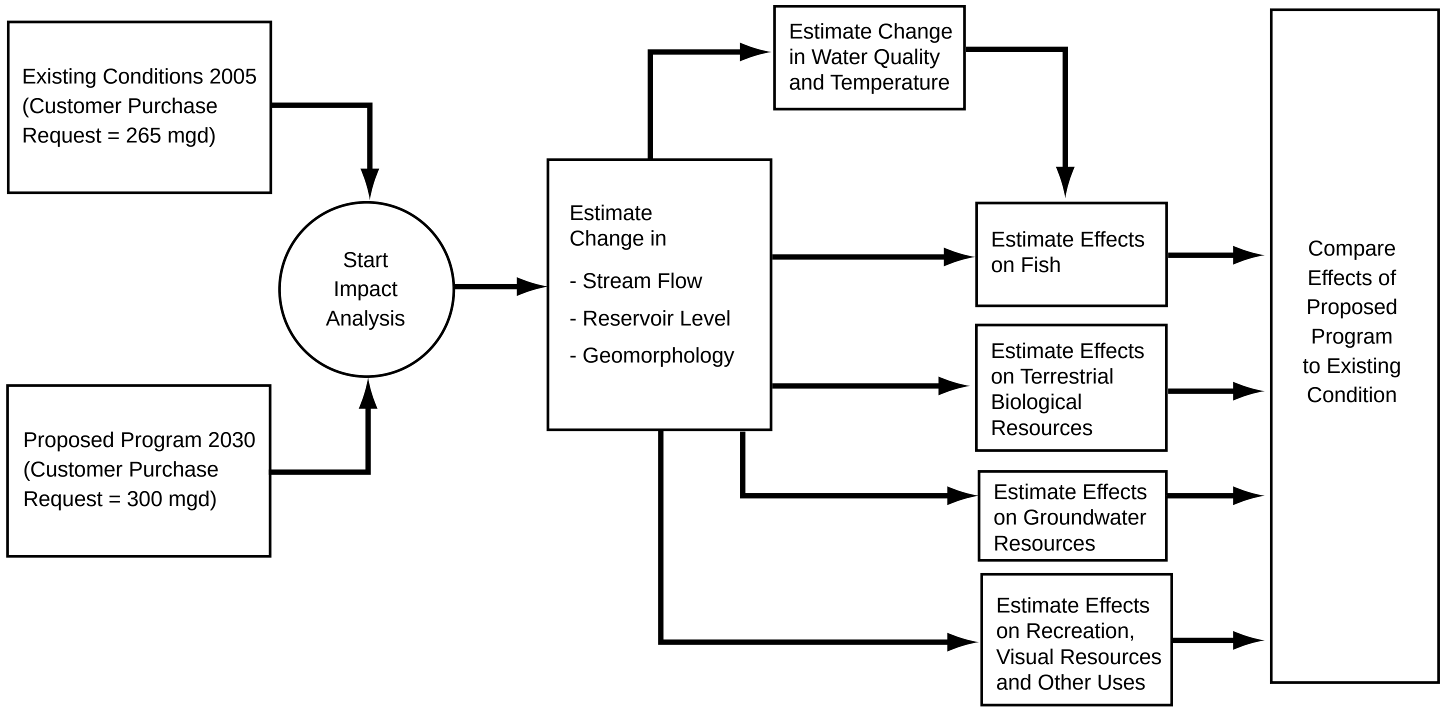
As part of WSIP implementation, additional water would be diverted from the Tuolumne River above the current average annual diversion levels in order to serve customer water delivery requirements and the other level of service goals established for the regional system through 2030. The analyses presented in Sections 5.3, 5.4, and 5.5 focus on the effects of this additional water diversion and of the related system operations needed to store and move that water from the Tuolumne River through the regional system of reservoirs and conveyance facilities to customers in the Bay Area. The analysis considers future system operations following implementation of all proposed WSIP projects in order to determine the effects that any adjustments in operations might have on the hydrology and related environmental resources in the three affected watersheds—the Tuolumne River, Alameda Creek, and Peninsula watersheds.

Relationship of Affected Resources

The basic approach to determining the potential impacts on water and related resources was the same for the three affected watersheds. First, changes in flow in the rivers and/or creeks and changes in water levels in each of the reservoirs were evaluated. These are the primary physical environmental changes that could occur with implementation of the water supply component of the WSIP, and these changes provide the basis for evaluating the potential related effects on other environmental resources. **Figure 5.1-3** depicts the interrelationships between, and among, changes in stream flow and reservoir storage levels and the potentially affected environmental resources.

Changes in stream flow under to the WSIP, which would primarily result from changes in the timing and quantity of water released from system reservoirs, were used to assess changes in the geomorphic processes for local streams (i.e., the sediment transport and channel-forming properties that define the nature of a stream course and its associated habitats). Stream flow and reservoir water level changes were then used to estimate changes in water quality. The chief water quality parameters that could be affected by changes in stream flow and reservoir levels are temperature and dissolved oxygen, and these parameters are the focus of the water quality analysis. The combination of changes in flow, reservoir levels, and water quality was then used to determine potential impacts on fisheries resources. Changes in flow and reservoir levels were also used to identify potential impacts on riparian habitat and related terrestrial biological resources. Finally, changes in flow and reservoir levels were used to identify potential impacts on water-related recreation, including whitewater rafting, boating, and fishing, and water-related visual resources. For the Tuolumne River watershed, the changes in flow and reservoir levels were also used to identify potential effects on downstream users and on energy supplies due to potential changes in hydropower generation.

The SFPUC operates and manages the regional water system (including the Tuolumne River system, the Alameda Creek system, and the Peninsula watershed system) in accordance with a complex and dynamic set of operational procedures that respond to changing climatic and hydrologic conditions, legal and regulatory requirements, water supply demands, and needs for maintenance, repair, and replacement of system facilities. In order to assess the changes to these systems that could occur under the WSIP, it was necessary to employ a computer modeling tool



SOURCE: ESA + Orion

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Figure 5.1-3
Approach to Impact Analysis on Water Resources

with the capability of addressing the many factors involved in system operations and management and thus enabling a comparison of the "before" and "after" program conditions. The modeling tool and approach used for analysis are described in the following section.

Hetch Hetchy/Local Simulation Model

The amount of water available to the SFPUC varies from year-to-year depending on meteorological conditions, water rights, and statutory and contractual obligations, including the Raker Act. The SFPUC operates its water system to meet customer water demand as fully and efficiently as it can, despite the fact that the amount of water available to it varies from year-to-year. The operations of the water system are complex, involving numerous reservoirs, pipelines, and pumping plants. The SFPUC utilizes a computerized mathematical model to assist in the evaluation of its water systems operations—the Hetch Hetchy/Local Simulation Model (HH/LSM), a water supply planning model (SFPUC, 2007a). This model is the best available tool for depicting the overall regional water system operations under a range of conditions and is similar to the models used by other water purveyors in the United States to depict their water system operations and to plan for system improvements.

A general overview of this modeling tool and the basic assumptions about the system included in the model are described in this section. **Appendix H1** provides a more detailed description of the model and how it was used for the PEIR water supply and system operations impact analysis; **Appendix H2** provides supporting details and an explanation of the 2007 raw data output from the model.

Following publication of the Draft PEIR, the SFPUC conducted updated model runs in 2008 using more recent input assumptions for several model parameters as part of its ongoing system planning and management. The revised input assumptions included: adjusted capacity for Crystal Springs Reservoir from recent survey data; more accurate assumptions for Pilarcitos facilities operations; improved data regarding the historical hydrology in the Alameda Creek watershed; updated agricultural demands in the Modesto and Turlock Irrigation Districts service area to be consistent with data used in recent statewide planning documents; and a refinement of water release protocols at Don Pedro Reservoir. Review of the 2008 model output indicated that the results are generally consistent with the 2007 results used in the Draft PEIR analysis, and that the analyses and impact determinations presented in the Draft PEIR remain valid. With one exception, no changes in the impact approach, analysis or conclusions presented in the Draft PEIR are necessary for the water supply and system operations impact assessments that were based on the 2007 results. The sole exception is the approach to the impact analysis of Pilarcitos watershed resources, for which only semi-quantitative data were previously available. Therefore, the 2008 data were used to conduct a refined impact analysis of the Pilarcitos watershed resources; no new impacts were identified. The results of the refined impact analysis for the Pilarcitos watershed are summarized in Chapter 13 (Section 13.3, pp. 13-6 to 13-7).

[The updated HH/LSM Assumptions and Results were included as an appendix to the Comments and Responses document. Please refer to Appendix O (Vol. 8).]

Representation of the Regional System in the Model

The HH/LSM incorporates detailed information about key aspects of the SFPUC regional water system, including facilities (i.e., reservoir and conveyance capacities) and operating procedures and “rules” that determine how and when water is moved through the system to customers. The operating procedures include responses to seasonal variation in demand, allocation of demand to customer groups, and procedures to maximize the use of local watershed supplies, while the rules include responses to regulatory requirements for instream flows and compliance with Raker Act obligations. As described in Chapters 2 and 3, water system operations can be generally delineated between rules and strategies affecting the operation of the Bay Area water system and rules and strategies affecting the operation of the Hetch Hetchy system. Although generally discussed separately, the two systems are integrally linked and are interdependent on each other in order to maximize water availability and quality.

For the Hetch Hetchy system, the HH/LSM integrates operations at SFPUC’s three major reservoirs in the Tuolumne River watershed—Hetch Hetchy Reservoir, Lake Lloyd, and Lake Eleanor—with the operation of TID/MID’s Don Pedro Reservoir, due to the SFPUC’s water bank account in Don Pedro Reservoir (described in Chapter 2, Section 2.5.2). The operation of these reservoirs and the water bank account is guided by two primary objectives: (1) to conserve reservoir storage so as to optimize supply to SFPUC customers, and (2) to fulfill San Francisco’s Raker Act obligation to bypass Tuolumne River flow to TID and MID. Underlying the operations at the SFPUC’s reservoirs are the minimum fishery release requirements prescribed for Hetch

Hetchy Reservoir, Lake Lloyd, and Lake Eleanor. Water that is released from San Francisco's reservoirs and not diverted to SFPUC customers, together with runoff that originates below San Francisco's reservoirs, flows to Don Pedro Reservoir. The HH/LSM simulates TID/MID's operation of Don Pedro Reservoir, including simulation of canal diversions, flood control operations, and releases to meet fishery release requirements below La Grange Dam. The model also simulates the accounting for the SFPUC's water bank account.

The model uses a watershed runoff forecasting routine (for snowmelt and rainfall) that projects the amount of runoff that can be expected to flow into each reservoir for a particular time period. Once the amount of runoff is projected, this amount is compared to the availability of reservoir storage and the anticipated releases required from the reservoir to meet downstream flow requirements and the diversions needed for water deliveries to SFPUC customers. If a reservoir is projected to spill, the model incorporates discretionary releases that the SFPUC manages to enhance hydropower generation. The model uses a monthly time step. This forecasting and decision process occurs sequentially each month of the period being modeled.

For the local Bay area system, the model depicts the regional system as a linked series of inflows, reservoirs, conveyance routes, and areas of water demand. Numerous operational constraints are incorporated, including considerations for downstream channel conveyance capacity, treatment plant capacity, and water transmission capacity. The Bay Area system is operated to maximize the efficient use of local Bay Area watershed runoff and supplemented with Tuolumne River water resources. The model establishes optimal storage levels for each Bay Area reservoir by season; this relates to how the SFPUC manages reservoir storage levels to lower reservoir storage space prior to the rainy season and then to raise the level through the dry season. In San Antonio, Crystal Springs, and San Andreas Reservoirs, the model assumes that reservoir space is filled first with Bay Area watershed runoff and then supplemented with Tuolumne River water by late spring in order to ensure maximum local reservoir storage through the summer season.

Simulation of System Operations

Simulation Period

The model simulates system operations over the course of an 82-year sequential hydrologic period from July 1920 through September 2002. The model includes actual, measured historical information about the hydrology (the amount of runoff estimated from either snowmelt and/or rainfall) that occurred in each year over the 82-year record for each of the three watershed areas under consideration: the Tuolumne River system, the Alameda Creek system, and the Peninsula watershed system. This 82-year period includes many different types and sequences of actual hydrological events, ranging from flood events to droughts of different magnitude and duration. Because natural surface water systems are dynamic and runoff and flow vary each year, and as it is not possible to predict future precipitation, it is a necessary and standard industry practice to use a long-term historical record to represent the range of hydrologic conditions that can be expected in the future. The long-term 82-year historical record is used in the model to represent the range of hydrologic conditions that could occur in the future[3] and to assess both how the

3 The potential effect of climate change on the SFPUC's regional system is addressed in Section 5.7 under Cumulative Impacts.

system would perform in terms of meeting the WSIP level of service objectives and what types of impacts the program might have under a range of conditions.

The modeling tool uses information on actual historical hydrology but does not “predict” or necessarily precisely depict the past, historical operation of the system. The historical operation of the system in an actual year will differ from the operations simulated by the model for that year as a result of day-to-day adjustments made by the system operators, who constantly modify operations throughout the year to respond to changing conditions related to weather, demand, water quality, or facilities conditions (e.g., maintenance or unplanned facilities outages). While many of these factors are built into the model, the model cannot account for all the actual operations and adjustments made throughout each year. The objective of using the modeling tool is to assess the effect of system changes on future operations over a broad range of realistic hydrologic conditions.

Hydrologic Year Definitions

As described in detail in Appendix H1, all years in the 82 years of historical hydrology were ranked and grouped into hydrologic year types according to river and creek flow. Five hydrologic categories were used to depict the range of wet to dry years, depending on the hydrologic index. The hydrologic year types are defined differently for different watershed and drainage areas affected by the WSIP (referred to as the hydrologic index) in order to accurately reflect each area’s unique hydrology. A hydrologic year is from October to September.

Hydrologic year types for the Tuolumne River above Don Pedro Reservoir are classified based on the SFPUC’s calculation of unimpaired flow[4] for the Tuolumne River at La Grange. The 20 percent of years when unimpaired inflow to Don Pedro Reservoir was lowest were designated as dry years; the next driest 20 percent of years were designated as below-normal years, and so on. This index uses the following year types: wet, above normal, normal, below normal, and dry.

Hydrologic year types for the Tuolumne River below La Grange Dam are classified according to the California Department of Water Resources’ San Joaquin River Index, which defines the following categories: wet, above normal, below normal, dry, and critically dry. This index was used to analyze Don Pedro Reservoir operations because release requirements from Don Pedro Reservoir at La Grange Dam are tied to this index.

Hydrologic year types for the Alameda Creek and Peninsula watersheds are also classified by the 20 percent grouping technique and are based on the SFPUC’s estimation of local inflow into its five San Francisco Bay Area reservoirs. Annual flow into each of the reservoirs was summed for each water year. The 20 percent of years when total runoff into the five reservoirs was lowest were designated dry years. The next driest 20 percent of years were designated below-normal years, and so on. This index uses the following year types: wet, above normal, normal, below normal, and dry.

4 The natural river flow that existed prior to the placement of upstream water diversions, storage reservoirs, or other impediments.

Model Assumptions and Output

The model evaluates system operations, performance, and effects on reservoir storage and reservoir releases (i.e., streamflow below the dam) under a given set of operating parameters utilizing the 82 years of historical hydrology. A differing set of operational objectives and/or a change in the physical configuration of the water system could result in different operations, system performance, and effects on reservoir storage and releases. The model is used to compare alternative operational objectives and system configurations. For the impact analysis presented in this chapter, the model was employed to simulate operations and the effects of those operations under an existing conditions scenario (2005) and under a WSIP scenario (2030).

Model Assumptions and Inputs

The model uses input information on key aspects of the regional water system, including the level of annual water delivery provided by the system, the maximum rationing to be allowed during a drought, and the state of the facilities (e.g., reservoir and conveyance capacities and configurations). **Table 5.1-1** summarizes the differences in key assumptions between the existing conditions and WSIP scenarios that were incorporated into the model and used in the CEQA impact analysis.

TABLE 5.1-1
MODELING ASSUMPTIONS USED IN THE CEQA ANALYSIS

Parameter	Existing Conditions Scenario	WSIP Scenario
Planning year	2005	2030
Customer purchase requests (average annual delivery) (mgd)	265 mgd	300 mgd
Average annual demand from regional system water supply sources (Tuolumne River and local watersheds)	265 mgd	290 mgd
Average annual delivery from other sources (recycled water, groundwater, conservation)	See note a	10 mgd[b]
System firm yield[c]	219 mgd	256 mgd
Maximum systemwide rationing during a drought	No policy cap – up to 25%	20%
WSIP facility improvement projects	None	All WSIP projects

[a] San Francisco and many of its retail and wholesale customers currently utilize recycled water, groundwater, and/or conservation practices to some extent, which is reflected in the 265 mgd average annual delivery.

[b] The 10 mgd reflects proposed implementation of recycled water, groundwater, and conservation projects in San Francisco to benefit the regional water system.

[c] System firm yield is defined as the average annual water delivery that can be sustained by the regional water system during an extended drought. The SFPUC uses an 8.5-year design drought for planning purposes. Due to the 2001 DSOD operational restrictions on Calaveras Dam, the system firm yield was 219 mgd as of September 2005, when the NOP for the PEIR was published. Normal system firm yield is 226 mgd, which reflects Calaveras Reservoir operating at its historical capacity.

The existing conditions scenario reflects the key information about the system for the year 2005, in accordance with CEQA guidance on the appropriate timeframe for determining the environmental baseline to be used for impact analysis.[5] The average annual water delivery from the regional system for the base year was 265 mgd. The existing conditions (2005) scenario reflects the regional system facilities as they were in 2005 (and remain today), including the restricted capacity at both Calaveras and Crystal Springs Reservoirs.

As described in Chapter 2, Section 2.2, the California Department of Water Resources, Division of Safety of Dams (DSOD) imposed operational restrictions on Calaveras Reservoir storage capacity in December 2001, which reduced the reservoir's normal capacity of 96,850 acre-feet to approximately 37,800 acre-feet. Prior to the DSOD restriction, Calaveras Reservoir had been operated at its full capacity for over 70 years (since completion of the Alameda Creek Diversion Dam and Tunnel in 1931). As a result of this restricted capacity, the SFPUC has had to significantly reduce its diversions through the Alameda Creek Diversion Dam compared to its 70 -year-long historical operations. The current capacity restriction will remain in effect—and thus the storage capacity will continue to be limited—until such time that the Calaveras Dam Replacement project (SV-2) is implemented. This project is scheduled for completion in 2012, at which time the restricted reservoir capacity will have been part of system operations for approximately 10 years. In order to present the most consistent baseline condition under CEQA, this PEIR uses an existing conditions scenario that reflects the current restriction on Calaveras Reservoir capacity, despite the fact that the reservoir had been operating at full capacity for 70 years. Implementation of the WSIP (specifically the Calaveras Dam Replacement project) would result in a change to these current operating conditions, restoring them in large part to conditions similar to the prior 70 years of operation. This PEIR examines the potential impacts of these changes.

The capacity of Crystal Springs Reservoir has been restricted since 1983 (also described in Chapter 2, Section 2.2.5); therefore, for this reservoir as well, an existing conditions scenario with restricted capacity is assumed, in compliance with CEQA.

As shown on Table 5.1-1, for the WSIP (2030) scenario, the model incorporates information about the expected average annual water delivery from the regional system in 2030, which under the WSIP is proposed to be 290 mgd. The other 10 mgd of supply needed to serve the total 2030 average annual customer purchase requests of 300 mgd is proposed to come from a combination of recycled water, groundwater, and conservation projects in San Francisco, to be implemented as part of the WSIP. The WSIP (2030) scenario also assumes that all proposed facility improvement projects have been fully implemented. This scenario thus includes the restoration of full storage capacity at Calaveras Reservoir and Crystal Springs Reservoir.

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5 CEQA Guidelines Section 15125(a) states that an EIR must include a description of the physical environmental conditions in the vicinity of the project, as they exist at the time the notice of preparation (NOP) is published, and that this environmental setting will normally constitute the baseline physical conditions against which the lead agency determines whether an impact is significant. The NOP for the WSIP PEIR was published in September 2005.

In addition to the input assumptions shown in Table 5.1-1, the model includes, for both the existing condition and WSIP scenarios, the same assumptions and rules for compliance with statutory and contractual obligations, including the Raker Act and minimum instream flow requirements.

Model Outputs

Once the operation of the regional water system was modeled under each scenario, the model provided output information about system performance under that scenario in terms of the WSIP system objectives and about the timing and amount of water in reservoir storage and released from the system reservoirs downstream. In general, the model provides information on a monthly basis. **Table 5.1-2** summarizes key output information provided by the model.

During actual system operations, operators make decisions about how much water to retain in storage and how much water to release from system reservoirs on an hourly, daily, or weekly basis in response to changing conditions. The model does not report these changes at this level of detail. Like other computer models used elsewhere in California to predict the impacts of proposed projects on complex water storage and delivery systems (e.g., the Central Valley Project and State Water Project), the HH/LSM identifies monthly levels in various storage facilities and water bodies, and does not have the necessary precision to deal with hourly, daily, or weekly operational decisions. The state of the art in modeling has not yet reached the point where such precision is possible. In most cases, however, the monthly information about changes in reservoir storage and reservoir releases downstream was adequate for the purpose of assessing the nature, magnitude, and frequency of potential physical changes and environmental impacts associated with operations under the proposed WSIP program scenario compared to the existing condition. In those cases where more detailed information is needed for impact analysis than is available from monthly data, the SFPUC system operators were consulted about daily or weekly operations and, where available, historical data on the system operation were reviewed. Thus, in these instances, the conclusions set forth in the PEIR reflect not only the results of the HH/LSM, but also input from the experienced system operators regarding how they would likely respond to the kinds of issues that might arise on a daily a weekly basis.

Model Limitations

The HH/LSM is the best available tool for depicting changes in the overall regional water system operations; however, as explained above and further explained here, in some cases, limitations inherent in the model required that the analysis be supplemented by additional data.

[Paragraph has been deleted per responses to comments or staff-initiated text changes (Vol. 7, Chapter 16).]

TABLE 5.1-2
HH/LSM OUTPUT PARAMETERS
(Data provided as monthly time step for 82 years of historical hydrology)

Feature	Output Parameter
TUOLUMNE RIVER SYSTEM	
Unimpaired Inflow (acre-feet)	Inflow to Hetch Hetchy Reservoir Inflow to Lake Lloyd Inflow to Lake Eleanor Unregulated Flow below Hetch Hetchy Reservoir
End-of-Month Storage (acre-feet)	Hetch Hetchy Reservoir Storage Lake Lloyd Storage Lake Eleanor Storage Don Pedro Water Bank Account Storage Don Pedro Reservoir Storage Total Up-Country Reservoir Storage Total Hetch Hetchy System Storage
Releases (acre-feet)	Hetch Hetchy Reservoir Release to Stream Hetch Hetchy Reservoir Release to Canyon Tunnel Lake Lloyd Release to Stream Lake Lloyd Release to Holm Powerhouse Lake Eleanor Release to Stream Lake Eleanor Tunnel to Lake Lloyd
Evaporation (acre-feet)	Hetch Hetchy Reservoir Lake Lloyd Lake Eleanor
San Joaquin Pipeline (acre-feet)	SJPL Flow from Lower Cherry Aqueduct Total SJPL
Precipitation (inches)	Hetch Hetchy Precipitation – Accumulated
Power Production (MWh)	Moccasin Powerhouse Kirkwood Powerhouse Holm Powerhouse Total
Unimpaired Runoff (acre-feet)	Unimpaired Runoff at La Grange Dam TID, MID, and SFPUC Rights and Entitlements Unimpaired Runoff Available to San Francisco
Don Pedro Operations (acre-feet)	Inflow Storage Don Pedro Reservoir Flood Control Limit Don Pedro Reservoir Evaporation (San Francisco) Total Don Pedro Reservoir Evaporation Don Pedro Reservoir Power – MWh Total MID Diversion at La Grange Dam Total TID Diversion at La Grange Dam La Grange Minimum Release Requirement Total La Grange Dam Release to River Total Release from Don Pedro Reservoir
Water Bank Account (acre-feet)	Water Bank Account Balance Water Bank Account Maximum Transfer to Water Bank Account
Miscellaneous	SFPUC Shortage Level Hetch Hetchy Minimum Stream Release (acre-feet)
LOCAL SYSTEM (ALAMEDA CREEK AND PENINSULA WATERSHEDS)	
Calaveras (MG)	Calaveras Reservoir Storage Calaveras Reservoir Inflow from Arroyo Hondo Calaveras Reservoir Inflow from Upper Alameda Creek Calaveras Reservoir Release to San Antonio Reservoir Calaveras Reservoir Release to Sunol Valley WTP Calaveras Reservoir Release to Calaveras Creek Calaveras Reservoir Spill to Calaveras Creek Calaveras Reservoir Evaporation

TABLE 5.1.2 (Continued)
HH/LSM OUTPUT PARAMETERS
(Data provided as monthly time step for 82 years of historical hydrology)

Feature	Output Parameter
San Antonio (MG)	San Antonio Reservoir Storage
	San Antonio Reservoir Inflow from San Antonio Creek
	San Antonio Reservoir Inflow from Calaveras Reservoir/SJPL
	San Antonio Reservoir Release to Sunol Valley WTP
	San Antonio Reservoir Release to San Antonio Creek
	San Antonio Reservoir Evaporation
Crystal Springs (MG)	Crystal Springs Reservoir Storage
	Crystal Springs Reservoir Inflow from San Mateo Creek
	Crystal Springs Reservoir Inflow from San Andreas Reservoir
	Crystal Springs Reservoir Inflow from Bay Division Pipelines
	Crystal Springs Reservoir Pumping to San Andreas Reservoir
	Crystal Springs Reservoir Pumping to Coastside CWD
	Crystal Springs Reservoir Release to San Mateo Creek
	Crystal Springs Reservoir Spill to San Mateo Creek
	Crystal Springs Reservoir Evaporation
San Andreas (MG)	San Andreas Reservoir Storage
	San Andreas Reservoir Inflow from Watershed
	San Andreas Reservoir Inflow from Crystal Springs, San Mateo Creek & Pilarcitos
	San Andreas Reservoir Release to Harry Tracy WTP
	San Andreas Reservoir Release to San Mateo Creek
	San Andreas Reservoir Spill to San Mateo Creek
	San Andreas Reservoir Evaporation
Pilarcitos (MG)	Pilarcitos Reservoir Storage
	Pilarcitos Reservoir Inflow
	Pilarcitos Reservoir Release to San Andreas Reservoir
	Pilarcitos Reservoir Release for Stone Dam Diversion to Coastside CWD
	Pilarcitos Reservoir Pre-Release to Pilarcitos Creek
	Pilarcitos Reservoir Spill to Pilarcitos Creek
	Pilarcitos Reservoir Evaporation
Stone Dam (MG)	Stone Dam Inflow (Accretion)
	Stone Dam Release to Coastside CWD
	Stone Dam Release to Crystal Springs Reservoir
Reservoir Storage (MG)	Total Reservoir Storage – East Bay
	Total Reservoir Storage – Peninsula
	Total Local Storage
	Maximum Targeted Total Local Storage
Demand (MGD)	Delivery to South Bay Demand Center
	Delivery to Crystal Springs Demand Center
	Delivery to San Andreas Demand Center
	Delivery to In-City Demand Center
	Total Delivery to Demand Centers (not including Coastside CWD)
Demand (MG)	Delivery to South Bay Demand Center
	Delivery to Crystal Springs Demand Center
	Delivery to San Andreas Demand Center
	Delivery to In-City Demand Center
	Total Delivery to Demand Centers (not including Coastside CWD)
San Joaquin Pipelines	SJPL Flow – MG
	SJPL Flow – MGD
SJPL (MG)	SJPL Flow to Crystal Springs Reservoir – MG
	SJPL Flow to San Antonio Reservoir – MG
West Basin Reservoir (MG)	Beginning of Month Storage
	West Basin Reservoir – Input Resulting from San Andreas Gradient Deliveries
	West Basin Reservoir – Input Resulting from Crystal Springs Gradient Deliveries
	End of Month Storage
Desalination Project (MG)	Input from Desalination Project
Treatment Plant Delivery (MGD)	Calaveras Reservoir Flow to Sunol Valley WTP
	San Antonio Reservoir Flow to Sunol Valley WTP
	Sunol Valley WTP Production
	Harry Tracy WTP Production

[yellow box] Indicates data used in the PEIR analysis

Coastside CWD = Coastside County Water District; MG = million gallons; MGD = million gallons per day; MWh = megawatt-hours; MID = Modesto Irrigation District; SJPL = San Joaquin Pipelines; TID = Turlock Irrigation District; WTP = water treatment plant.

The HH/LSM was used to estimate baseline and with-WSIP flows in the Tuolumne River, Alameda Creek, and Pilarcitos Creek. However, the model results were not solely relied upon when evaluating flows in creeks immediately downstream of SFPUC reservoirs that normally have minimal flow or are affected by SFPUC operations for time periods less than a month in duration. This is because the model uses a monthly time interval. The model does not simulate day-to-day variations in water levels or releases to a stream, but instead provides an average water level and an average release in a given month. The inability of the model to illustrate short-term variations is generally not problematic when simulating continuous phenomena like storage or water level in a reservoir or flow in a perennial stream. However, in some cases, the modeling limitation of only providing information at a monthly time interval required additional considerations, such as SFPUC operator experience and knowledge, when simulating intermittent phenomena such as infrequent spills or releases from reservoirs that may last only a few days.

Flow in San Mateo Creek downstream of Lower Crystal Springs Dam provides an example. The SFPUC system operators rarely release water from Crystal Springs Reservoir to San Mateo Creek, and flow in the creek below the dam typically occurs only from seepage from the dam and groundwater infiltration. The SFPUC operators attempt to capture and retain as much runoff as possible from the upper San Mateo Creek watershed in Crystal Springs Reservoir. In all but wet years, the SFPUC captures all of the runoff from the upper watershed. In wet months of wet years, the operators of the reservoir obtain frequent weather forecasts and manage the reservoir to capture as much runoff as possible from the sequence of winter storms that cross the watershed. The operator's decisions with respect to reservoir management are made on a day-to-day, sometimes hour-to-hour, basis. In certain circumstances during wet hydrologic conditions, the operators must release water from the reservoir to the creek due to unpredictable weather conditions and their limited ability to make further adjustments to reservoir levels and other systemwide operations. Releases from Crystal Springs Reservoir to San Mateo Creek are based on day-to-day changes in operations and thus cannot be modeled using the HH/LSM. Consequently, the model does not provide a refined prediction of the magnitude and timing of infrequent and short-term releases from the reservoir. Similarly, the model does not provide a precise prediction of the magnitude and timing of releases from San Antonio Reservoir and flow in San Antonio Creek downstream of the reservoir. However, HH/LSM results are sufficient to depict the general trends of WSIP effects on these parameters on a monthly basis.

For the reasons noted above, HH/LSM results were not used to predict the magnitude and timing of spills or releases from Crystal Springs and San Antonio Reservoirs. In addition, HH/LSM results were not used to predict the magnitude and timing of spills or releases from Crystal Springs Reservoir. In these cases, the likely effects of the WSIP were determined through a review of historical data and consultation with individuals knowledgeable about the past and predicted future reservoir operating practices as well as output from the updated 2008 HH/LSM results.

In additional instances, such as the analyses of flow effects below Hetch Hetchy Reservoir and below the Alameda Creek Diversion Dam, HH/LSM results were refined or tiered to provide additional insight into the effects of the WSIP on stream flow for time periods of less than a month.

[Additional discussion on water resources modeling was prepared as part of the Comments and Responses document. Please refer to Section 13.3, Updated Water System Assumptions and Modeling (Vol. 7, Chapter 13), and Section 14.5, Master Response on Water Resources Modeling (Vol. 7, Chapter 14).]

Use of Model Results to Show Water Supply Sources

Figures 5.1-4 and **5.1-5** present model results showing the relative contributions of the various water supply sources to the regional system for the 82-year period of hydrologic record under existing conditions (2005) and WSIP conditions (2030), respectively. The figures illustrate the combination of supply sources the regional system would use year-to-year to serve customer deliveries if it were operated over a series of years similar in terms of climate conditions to those that occurred from 1920 to 2002 under the two scenarios. The figures depict how relative contributions of water supply sources available to the SFPUC would vary from year to year and show the frequency and extent of shortages and rationing that would occur if there were dry years and drought sequences similar to those that occurred during this period.

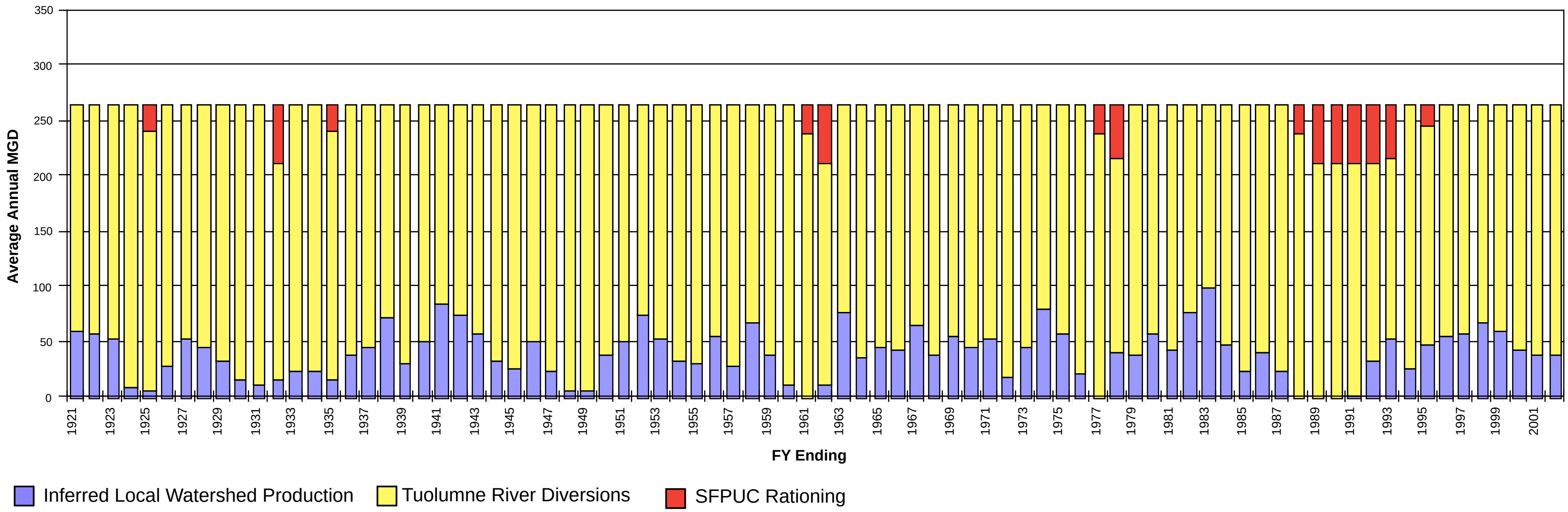
The figures indicate that there currently is, and would continue to be, a wide annual variation in the amount of water available from the various water sources under both current and future conditions. This, in turn, results in a wide variation in the changes in stream flow and reservoir water levels that would occur under the WSIP compared to the existing condition. Therefore, the impact analysis presented in this chapter addresses the effects of this range of variation in stream flow and reservoir level changes on the potentially affected watersheds and associated resources.

5.1.5 Impact Significance Determinations

The significance criteria used in this PEIR are based on San Francisco Planning Department, Major Environmental Analysis (MEA) guidance regarding the environmental effects to be considered significant. MEA guidance is, in turn, based on the CEQA Guidelines Appendix G with some modifications. In cases where potential environmental issues associated with the WSIP are identified but are not clearly addressed by MEA's guidance, additional impact significance criteria are presented. Appendix B of this PEIR presents the MEA Initial Study checklist as it applies to the WSIP, and indicates the criteria applicable to the WSIP and discussed in the various chapters in the PEIR. The significance criteria used for each environmental topic/resource area are presented in each section of Chapter 5 following the setting and before the discussion of impacts.

For the impact analyses, the following categories are used to determine impact significance:

> **Not Applicable/No Impact (N/A).** An impact is considered not applicable to the WSIP water supply or system operations if the environmental resource or impact potential does not occur within the project area or the area of potential effect. For example, an impact on a biological resource may not be applicable if the WSIP would not result in changes in stream flow for a specific reach of a creek.
>
> **Beneficial (B).** An impact is considered beneficial if it is determined that WSIP water supply or system operations would improve an environmental resource or result in a beneficial effect on the environment.
>
> **Less than Significant (LS).** This determination applies if there is a potential for limited impact, but the impact does not constitute a substantial adverse effect that qualifies under the significance criteria as a significant effect. LS impacts do not require mitigation.



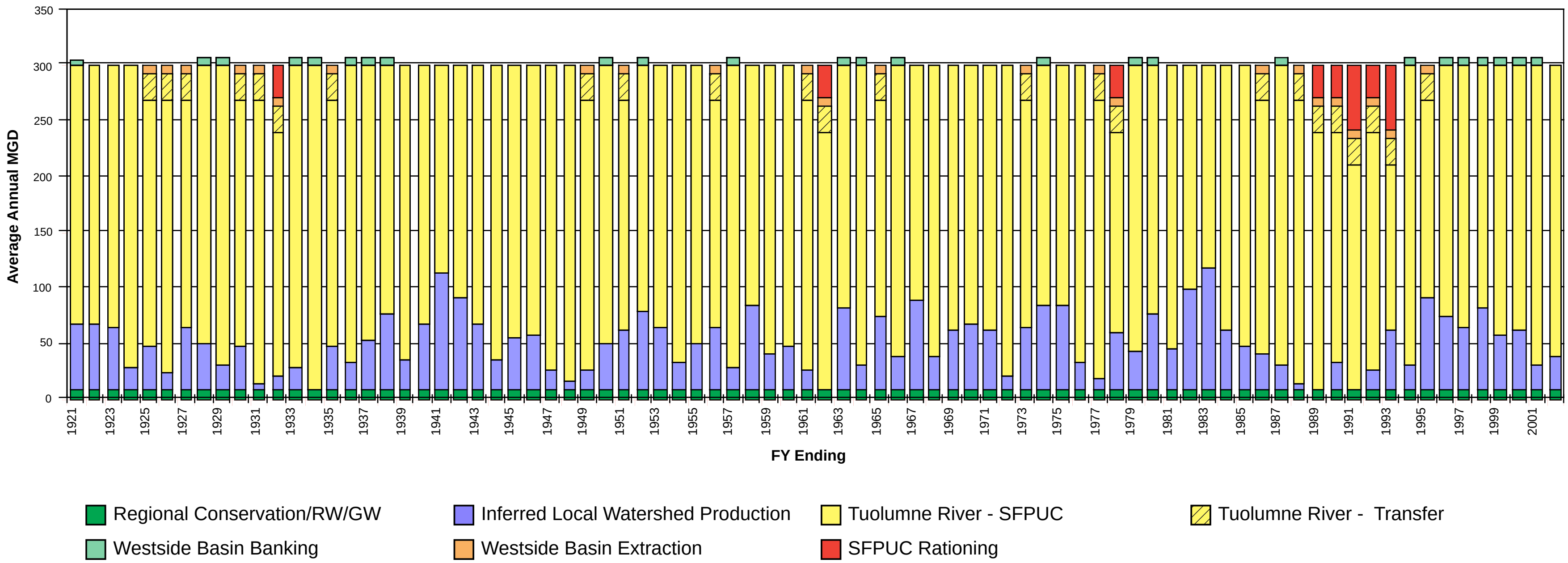
This figure illustrates what combination of supply sources the regional system would use year to year under existing conditions to meet the existing system delivery demand of 265 mgd if it were operated over a long series of years similar in terms of climate conditions to those that occurred between 1920 and 2002. This 82-year simulation illustrates how the relative contribution of water supply sources available to the SFPUC would vary year to year and shows the frequency and extent of supply shortages and rationing that would occur if there were dry years and drought periods similar to those that occurred during this historic period.

NOTES: (1) This figure illustrates a conceptual breakdown of water sources available to the SFPUC regional system. Local Watershed Production (inferred) is estimated as the difference between the amount of water delivered to system customers and the amount of water provided by the San Joaquin pipeline (Tuolumne River) and extracted from the Westside Basin groundwater aquifer. This estimate does not account for the source of Bay Area system reservoir storage used to serve deliveries or the partial use of San Joaquin pipeline deliveries for replenishment of Bay Area system reservoirs.

SOURCE: SFPUC, HH/LSM (see Appendix H)

SFPUC Water System Improvement Program . 203287

Figure 5.1-4
Water Supply Sources and Shortages – Existing Conditions (265 mgd Delivery)



This figure illustrates what combination of supply sources the regional system would use year to year under future 2030 conditions to meet the future demand of 300 mgd if it were operated over a long series of years similar in terms of climate condition to those that occurred between 1920 and 2002. This 82-year simulation illustrates how the relative contribution of water supply sources available to the SFPUC would vary year to year and shows the frequency and extent of supply shortages and rationing that would occur if there were dry years and drought periods similar to those that occurred during this historic period.

NOTES: (1) This figure illustrates a conceptual breakdown of water sources available to the SFPUC regional system. Local Watershed Production (inferred) is estimated as the difference between the amount of water delivered to system customers and the amount of water provided by the San Joaquin pipeline (Tuolumne River) and extracted from the Westside Basin groundwater aquifer. This estimate does not account for the source of Bay Area system reservoir storage used to serve deliveries or the partial use of San Joaquin pipeline deliveries for replenishment of Bay Area system reservoirs.
(2) Deliveries in excess of 300 mgd represent banking of water into the Westside Basin groundwater aquifer under the proposed Westside Basin Groundwater conjunctive use program.

SOURCE: SFPUC, HH/LSM (see Appendix H)

SFPUC Water System Improvement Program . 203287

Figure 5.1-5
Water Supply Sources and Shortages – 2030 WSIP Conditions (300 mgd Delivery)

Potentially Significant, Mitigable (PSM) / Significant Mitigable (SM). These determinations apply if there is a potential for a substantial adverse effect that meets the significance criteria, but implementation of mitigation measures would reduce the impact to a less-than-significant level. In cases where the analysis cannot conclusively determine the extent of adverse effects, the PEIR errs on the conservative side by identifying the impact as “potentially” significant; the impacts identified as "potentially significant" are treated as significant impacts in this PEIR. Similarly, “significant, mitigable” applies if there is certainty that a substantial adverse effect that meets the significance criteria would occur, but implementation of mitigation measures would reduce the impact to a less-than-significant level. In either event, the mitigation measures identified in this PEIR are expected to reduce any significant effects to a less-than-significant level.

Potentially Significant, Unavoidable (PSU) / Significant, Unavoidable (SU). These determinations apply to impacts that are potentially significant or significant, but for which there appears to be no feasible mitigation available to reduce them to a less-than-significant level. Mitigation might be available to lessen the effect of the impact, but the residual effect, even after implementation of the measure, would remain significant and therefore unavoidable. Alternatively, the PSU determination is applied in cases where mitigation might lessen the effect of an impact, but it is unknown if the mitigation could effectively reduce the impact to a less-than-significant level. When the effectiveness of a mitigation measure is unknown, the PEIR errs on the conservative side and applies this determination. The impacts identified as potentially significant are treated as significant impacts in this PEIR.

In each section of this chapter, a summary table is provided at the beginning of each impact discussion to summarize the potential impacts and to indicate the level of impact significance. The impact discussions for the WSIP water supply and system operations are organized by watershed or affected water resource. Impacts are numbered by section, and corresponding numbers are used to identify the mitigation measures presented in Chapter 6.

References – Overview

San Francisco Public Utilities Commission (SFPUC), *Water Supply System Modeling Report, Hetch Hetchy/Local Simulation Model*, 2007a.

San Francisco Public Utilities Commission (SFPUC), *Water Supply Options*, June 2007b.

5.2 Plans and Policies

5.2 Plans and Policies

Section 5.2 Subsections

5.2.1 Overview

The purpose of this section is two-fold: (1) to provide an overview of the federal, state, and local plans and policies governing the SFPUC's water supply, including water quality, water use, and natural resource protection; and (2) to describe program consistency with applicable, adopted land use and resource plans and policies relevant to the WSIP water supply option and system operations, pursuant to CEQA Guidelines Section 15125(d).

The regulatory overview for Chapter 5 is summarized in this section to avoid repetition of the general description of applicable environmental regulations in the various sections of this chapter. Because Chapter 5 is organized by watersheds and related drainage areas rather than by environmental resources, only those aspects of the regulations specifically applicable to each watershed are presented in the respective sections. For example, the regulatory overview for Chapter 5 presented in this section includes a general description of the Clean Water Act and the Porter-Cologne Water Quality Control Act, but the description of applicable water quality control plans (WQCPs), beneficial uses, and water quality objectives are described separately in Sections 5.3.3, 5.4.3, and 5.5.3 for the Tuolumne River, Alameda Creek, and Peninsula watersheds, respectively.

The analysis in this section complements that presented in Section 4.2, Plans and Policies, which focuses on land use plans and policies relevant to construction and operation of the proposed WSIP facility improvement projects. Together, Sections 4.2 and 5.2 provide an evaluation of project consistency with the overall plans and policies relevant to the proposed program.

5.2.2 Regulatory Framework

In general, implementation and enforcement responsibility of governmental regulations flows down from federal and state jurisdictions to the regional, county, and municipal levels. Although the federal government establishes programs and sets minimum standards that are applicable nationwide, state and local jurisdictions have the authority to set more stringent standards than those established under federal law. The SFPUC currently complies with all applicable federal, state, and local regulations regarding municipal water supplies and would continue to do so under the WSIP. Responsible agencies and applicable federal, state, and local statutes and agreements are discussed below. **Table 5.2-1** summarizes the applicability of the statutes and agreements to the proposed WSIP water supply and system operations.

Federal Agencies

U.S. EPA Office of Water

The U.S. Environmental Protection Agency (U.S. EPA) Office of Water, established in 1970, is the primary federal agency responsible for implementation of the Clean Water Act and Safe Drinking Water Act. The U.S. EPA Office of Water provides guidance, specifies scientific methods and data collection requirements, establishes contaminant thresholds, and provides oversight to state and local governments for compliance with the Clean Water Act and Safe Drinking Water Act.

U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers (Corps) evaluates permit applications for essentially all construction activities that occur in the nation's waters, including wetlands. Corps permits are also necessary for any work, including construction and dredging, in the nation's navigable waters. The Corps enforces the provisions of Section 404 of the Clean Water Act.

U.S. Fish and Wildlife Service

The mission of the U.S. Fish and Wildlife Service (USFWS) is to provide leadership in protecting fish and wildlife, conserving species habitats, and engaging citizens in the shared stewardship of America's natural resources. The USFWS's primary responsibilities involve the protection of migratory birds, endangered species, certain marine animals, and freshwater and anadromous fish through various regulations, including the Federal Endangered Species Act, the Federal Power Act, and Section 404 of the Clean Water Act.

National Marine Fisheries Service

The National Marine Fisheries Service (NMFS) is the primary federal agency involved with the stewardship of marine resources and their habitats through science-based conservation and management. The NMFS receives its ocean stewardship responsibilities under many federal laws, including the Federal Endangered Species Act, Section 404 of the Clean Water Act, and the Federal Power Act.

The Department of the Interior and the Department of Agriculture

The Department of the Interior (DOI) and the Department of Agriculture are the primary federal agencies involved with regulation under and enforcement of the Raker Act (see Chapter 2, Section 2.4.2, for further description of the Raker Act).

TABLE 5.2-1
APPLICABLE FEDERAL, STATE, AND LOCAL STATUTES AND AGREEMENTS

Statute or Agreement / Responsible Agency[a]	Summary Description	Associated Statutes and Plans	Applicability to WSIP Water Supply and System Operations Issues
Federal			
Clean Water Act / U.S. EPA, Corps, USFWS, NMFS	Primary federal law governing water quality. Prescribes basic federal laws for regulating discharges of pollutants into waters of the U.S., including establishing water quality standards for contaminants in surface waters, establishing wastewater and effluent discharge limits from various industry categories, and imposing requirements for controlling nonpoint-source pollution.	Section 303(d), Section 404, various others	Discussed and analyzed by watershed in Sections 5.3.3, 5.3.6, 5.4.3, 5.4.6, 5.5.3, and 5.5.6.
Safe Drinking Water Act / U.S. EPA	Sets health-based standards for drinking water quality to protect against naturally occurring and man-made contaminants that can be found in drinking water.	National Primary and Secondary Drinking Water Regulations	Described in Chapter 2, Section 2.4.1, regarding existing system, and in Chapter 3, Section 3.5.1, regarding proposed program.
Raker Act / U.S. Congress	Granted the City and County of San Francisco (CCSF) rights-of-way to certain public lands, including public lands in Yosemite National Park and Stanislaus National Forest, to develop water and power.		Described in Chapter 2, Section 2.4.2, and in Chapter 3, Sections 3.6 and 3.7, regarding existing and proposed water supply and operations.
Wilderness Act / U.S. Congress	Established the National Wilderness Preservation System to be composed of federally owned lands designated by Congress as wilderness areas, to be administered in such a manner that will leave them unimpaired for future use.	National Wilderness Preservation System	Designation of the 459-square-mile Tuolumne River watershed above Hetch Hetchy Reservoir as a wilderness area provides unique measures of protection to the watershed. Discussed in Section 5.2.3.
Wild and Scenic Rivers Act / BLM, NPS, USFS	Preserves the free-flowing characteristics and outstanding values of designated rivers while allowing uses compatible with the management goals of that river.	Management plans and concept plans for designated rivers	Described in Section 5.2.3 and evaluated in Section 5.2.4 for consistency. Discussed and analyzed in Section 5.3.7 regarding biological resources, as well as in Section 5.3.8 regarding visual resources.
Endangered Species Act / USFWS, NMFS	Provides broad protection for species of fish, wildlife, and plants that are listed as threatened or endangered in the U.S. or elsewhere.	Habitat conservation plans	Discussed by watershed in Sections 5.3, 5.4, and 5.5, under Fisheries and Terrestrial Biological Resources.
New Don Pedro Project FERC Settlement Agreement / FERC	Established a revised instream flow schedule for New Don Pedro Project operation and outlined a strategy for recovery of Tuolumne River Chinook salmon.	Habitat Restoration Plan for the Lower Tuolumne River Corridor (guidance document)	Discussed in Chapter 2, Section 2.5, under Institutional Considerations, in Chapter 3, Section 3.8, regarding proposed operations, and Sections 5.3.6, Fisheries, and 5.3.7, Biological Resources.

TABLE 5.2-1 (Continued)
APPLICABLE FEDERAL, STATE, AND LOCAL STATUTES AND AGREEMENTS

Statute or Agreement / Responsible Agency[a]	Summary Description	Associated Statutes and Plans	Applicability to WSIP Water Supply and System Operations Issues
State of California			
California Water Code / DWR and SWRCB	Contains the basic provisions regarding management of the state's water resources as well as the legislative findings for the California Water Plan.	California Water Plan, Water Reuse Law, California Recycling Act, Urban Water Management Planning Act, Wholesale Regional Water System Security and Reliability Act, etc.	Used in ongoing management and operation of the regional water system as well as in development of the WSIP.
California Water Code, Sections 10610–10656, Urban Water Management Planning Act / DWR	Requires urban water suppliers that provide water to 3,000 or more customers, or that provide over 3,000 acre-feet of water annually, to prepare an urban water management plan (UWMP) every five years.	UWMPs prepared by the CCSF and applicable Bay Area Water Supply and Conservation Agency (BAWSCA) members	Information in the UWMPs of the CCSF and BAWSCA members was used in the development of the WSIP 2030 level of service for water supply, as discussed in Chapter 3, Section 3.4.4, and Chapter 7; the San Francisco UWMP is analyzed in Section 5.2.
California Water Code, Sections 73500–73514, Wholesale Regional Water System Security and Reliability Act (AB 1823) / California legislature / DHS	Requires the SFPUC to operate the regional water system in a manner that will not adversely affect the water system. Includes the Water First Policy, which specifies that the CCSF shall assign higher priority to the delivery of water to the Bay Area than to the generation of electrical power.	WSIP (referred to as a capital improvement program in the legislation but renamed as the WSIP)	Part of WSIP development, goals, objectives, and operations, as described in Chapter 2, Section 2.4, and Chapter 3, Sections 3.4 and 3.7.
Porter-Cologne Water Quality Control Act / SWRCB, RWQCBs	Established SWRCB and RWQCBs as the principal state agencies with primary responsibility for the coordination and control of water quality. Established a comprehensive program for the protection of water quality and beneficial uses of water. Applies to surface waters (including wetlands), groundwater, and point and nonpoint sources of pollution.	Water quality control plans (WQCPs) designate legally binding beneficial uses of water for water bodies, including wetlands, assign water quality objectives (criteria) to protect those uses, and establish appropriate implementation programs.	Discussed and analyzed by watershed in Sections 5.3, 5.4, and 5.5, in the Surface Water Quality and Groundwater sections.
California Safe Drinking Water Act / DHS	Strengthens minimum requirements found in the federal Safe Drinking Water Act. Establishes drinking water standards that are at least as stringent as, and sometimes more stringent than, those established under the federal act.	Drinking water requirements, including Primary and Secondary Maximum Contaminant Levels	Discussed in Chapter 2, Section 2.4.1, and Chapter 3, Section 3.5.1, pertaining to WSIP water quality objectives.
San Joaquin River Agreement / SWRCB	Provides the basis for the development of the Vernalis Adaptive Management Program (VAMP) study and identifies where the water to support the VAMP study would be obtained.	Vernalis Adaptive Management Program (Experimental study)	Discussed in Sections 5.2 and 5.3.1.
McAteer-Petris Act / BCDC	Promotes responsible planning and regulation of San Francisco Bay. Establishes BCDC as the agency responsible for carrying out the provisions of the act and of the SF Bay Plan.	San Francisco Bay Plan	Described in Section 5.2.3 and evaluated in Section 5.2.4 for consistency. Analyzed in Section 5.3.3.

TABLE 5.2-1 (Continued)
APPLICABLE FEDERAL, STATE, AND LOCAL STATUTES AND AGREEMENTS

Statute or Agreement / Responsible Agency[a]	Summary Description	Associated Statutes and Plans	Applicability to WSIP Water Supply and System Operations Issues
State of California (cont.)			
California Fish and Game Code / Fish and Game Commission and CDFG	Provides a system for the restoration and preservation of California's fish and wildlife resources	California Endangered Species Act (CESA), California Environmental Quality Act (CEQA), Lake and Streambed Alterations	CEQA review of the proposed water supply and system operations aspects of the WSIP is presented in Chapter 5, including the impacts of the WSIP on species listed under CESA, as discussed in Sections 5.3.7, 5.4.6, and 5.5.6.
Regional and Local			
San Francisco City Charter / CCSF	Establishes many of the procedures and requirements for initiative ordinances and declarations of policy.	San Francisco General Plan San Francisco Sustainability Plan SFPUC Alameda Watershed Management Plan SFPUC Peninsula Watershed Management Plan SFPUC Stewardship Policy	Sets forth guidance and authority of the SFPUC for construction, management, supervision, maintenance, extension, expansion, and operation of the regional water system.

[a] Responsible agencies are as follows:

BLM = Bureau of Land Management
CCSF = City and County of San Francisco
Corps = U.S. Army Corps of Engineers
DHS = California Department of Health Services
DWR = California Department of Water Resources
FERC = Federal Energy Regulatory Commission
NMFS = National Marine Fisheries Service
NPS = National Park Service
RWQCB = Regional Water Quality Control Board
SFPUC = San Francisco Public Utilities Commission
SWRCB = State Water Resources Control Board
U.S. EPA = U.S Environmental Protection Agency
USFS = U.S. Forest Service
USFWS = U.S. Fish and Wildlife Service

Bureau of Land Management

The Bureau of Land Management (BLM), an agency within the U.S. Department of the Interior, administers America's public lands within a framework of numerous laws, including the federal Wild and Scenic Rivers Act. The BLM manages a wide variety of resources and uses, including fish and wildlife habitat, wilderness areas, timber, and archaeological, paleontological, and historical sites.

National Park Service

The National Park Service (NPS) is a bureau of the U.S. Department of the Interior. The NPS is responsible for the oversight of nearly 400 natural, cultural, and recreational sites across the nation, including scenic rivers and trails. The NPS is also responsible for the management of Yosemite National Park, administration of the designated wild and scenic reaches of the Tuolumne River under the Wild and Scenic Rivers Act, and preparation of the *Tuolumne Wild and Scenic River Comprehensive Management Plan* and the *Tuolumne Meadows Concept Plan* (both in development).

Federal Statutes and Agreements

Clean Water Act

The Clean Water Act, enacted by Congress in 1972 and amended several times since inception, is the primary federal law regulating water quality in the U.S. and forms the basis for several state and local laws throughout the country. Its objective is to reduce or eliminate water pollution in the nation's rivers, streams, lakes, and coastal waters. The Clean Water Act prescribes the basic federal laws for regulating discharges of pollutants into waters of the U.S., including setting water quality standards for contaminants in surface waters, establishing wastewater and effluent discharge limits from various industry categories, and imposing requirements for controlling nonpoint-source pollution. At the federal level, the Clean Water Act is administered by the U.S. EPA. At the state and regional levels, the act is administered and enforced by the State Water Resources Control Board (SWRCB) and the Regional Water Quality Control Boards (RWQCBs).

Section 404 of the Clean Water Act established a program to regulate the discharge of dredged or fill material into waters of the U.S., including wetlands. Activities in waters of the U.S. regulated under this program include the placement of fill for development, water resource, infrastructure, and mining projects. Section 404 requires a permit before dredged or fill material may be discharged into waters of the U.S., unless the activity is exempt from Section 404 regulation. Under Section 401 of the Clean Water Act, every applicant for a federal permit for any activity that may affect waters of the state must obtain a water quality certification that the proposed activity will comply with state water quality standards.

Safe Drinking Water Act

The Safe Drinking Water Act, passed by Congress in 1974 for the purpose of protecting public health, regulates public drinking water supplies derived from various sources, including rivers, lakes, reservoirs, springs, and groundwater wells. The federal Safe Drinking Water Act is implemented by the U.S. EPA. The Safe Drinking Water Act is discussed in more detail in Chapter 2, Section 2.4.1.

National Forest Management Act

The National Forest Management Act, enacted by Congress in 1976, is the primary statute governing the administration of national forests. The act requires the Secretary of Agriculture to assess forest lands, and to develop and implement a resource management plan for each unit of the National Forest System. The management plans must: ensure consideration of both economic and environmental factors; provide for wildlife and fish; provide for the diversity of plant and animal communities; ensure timber harvesting will occur only where water quality and fish habitat are adequately protected from serious detriment; and ensure clearcutting and other harvesting will occur only where it may be done in a manner consistent with the protection of soil, watersheds, fish, wildlife, recreation, aesthetic resources, and regeneration of the timber resource. The management plans must be updated at least once every 15 years. In the overall WSIP region, the Sierra Nevada Framework is the management plan governing Stanislaus National Forest. The provisions of the Sierra Nevada Framework are implemented by the U.S. Forest Service.

Raker Act

The Raker Act, passed by Congress in 1913, granted to the City and County of San Francisco (CCSF) rights-of-way to certain public lands, including public lands in Yosemite National Park and Stanislaus National Forest, to develop water and power. (See Chapter 2, Section 2.4.2, for further description.)

Wilderness Act

The Wilderness Act,[1] enacted by Congress in 1964, established a National Wilderness Preservation System composed of federally owned and designated wilderness areas. The purpose of the National Wilderness Preservation System is to preserve wilderness areas for future use and enjoyment. Human activities in designated wilderness areas are limited to those that leave no long-term impact on the land or that have little or no effect on the natural resources of the area. With limited exceptions, no commercial enterprises or permanent roads are allowed within a wilderness area.

The portion of the Tuolumne River watershed that drains into Hetch Hetchy Reservoir (459 square miles) is entirely within Yosemite National Park, and approximately 95 percent of the watershed is federally designated wilderness. This designation provides unique measures of protection to the watershed. The NPS manages Yosemite National Park to preserve the resources that contribute to Yosemite's uniqueness and attractiveness in accordance with the goals and principles of the 1964 Wilderness Act (USFS, 1986).

Wild and Scenic Rivers Act

In 1968, Congress enacted the Wild and Scenic Rivers Act[2] for the purpose of preserving the free-flowing characteristics and outstanding values of designated rivers while allowing uses compatible with the management goals of designated rivers. Specifically, designation as a Wild and Scenic River prohibits the federal government from licensing or permitting hydroelectric dams or major diversions along the designated reaches. The act also provides for the management of federal public lands within the corridor of the designated river. Segments are classified into one of three designations that are based on the level of existing development (and not on a description of any particular values): *wild* segments are wild, unroaded, and undeveloped; *scenic* segments are generally undeveloped, but may have occasional road crossings and riverside structures that are visually screened from the river; and *recreational* segments are generally developed with roads, bridges, and structures (Friends of the River, 2007).

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1 The Wilderness Act of 1964, Pubic Law Sections 88–577; 16 United States Code Sections 1131–1136.

2 The California Wild and Scenic Rivers Act of 1972 (Public Resources Code, Sections 5093.50 et seq.), modeled after the federal Wild and Scenic Rivers Act, does not designate any rivers that would be affected by WSIP projects.

In 1984, Congress designated 83 miles of the main stem of the Tuolumne River, from its source to Don Pedro Reservoir, as a wild and scenic river, as shown in **Figure 5.2-1**. The classification and mileage of the designated reach is as follows: 47 miles wild, 23 miles scenic, and 13 miles recreational. A total of 54 miles of the designated river are located within Yosemite National Park (not including Hetch Hetchy Reservoir, which was excluded from the designation), and 29 miles of the designated river are located outside of Yosemite National Park (USFWS, 2007). In accordance with the Wild and Scenic Rivers Act, federal agencies are required to prepare a comprehensive management plan for designated rivers within three years of designation to guide future management decisions. The designation does not affect any rights, obligations, privileges, or benefits granted under the Raker Act. The NPS administers wild and scenic rivers that flow wholly or partly within the boundaries of the national park system; the Secretary of Agriculture administers wild and scenic rivers that flow wholly or partly within the boundaries of national forests.

Endangered Species Act

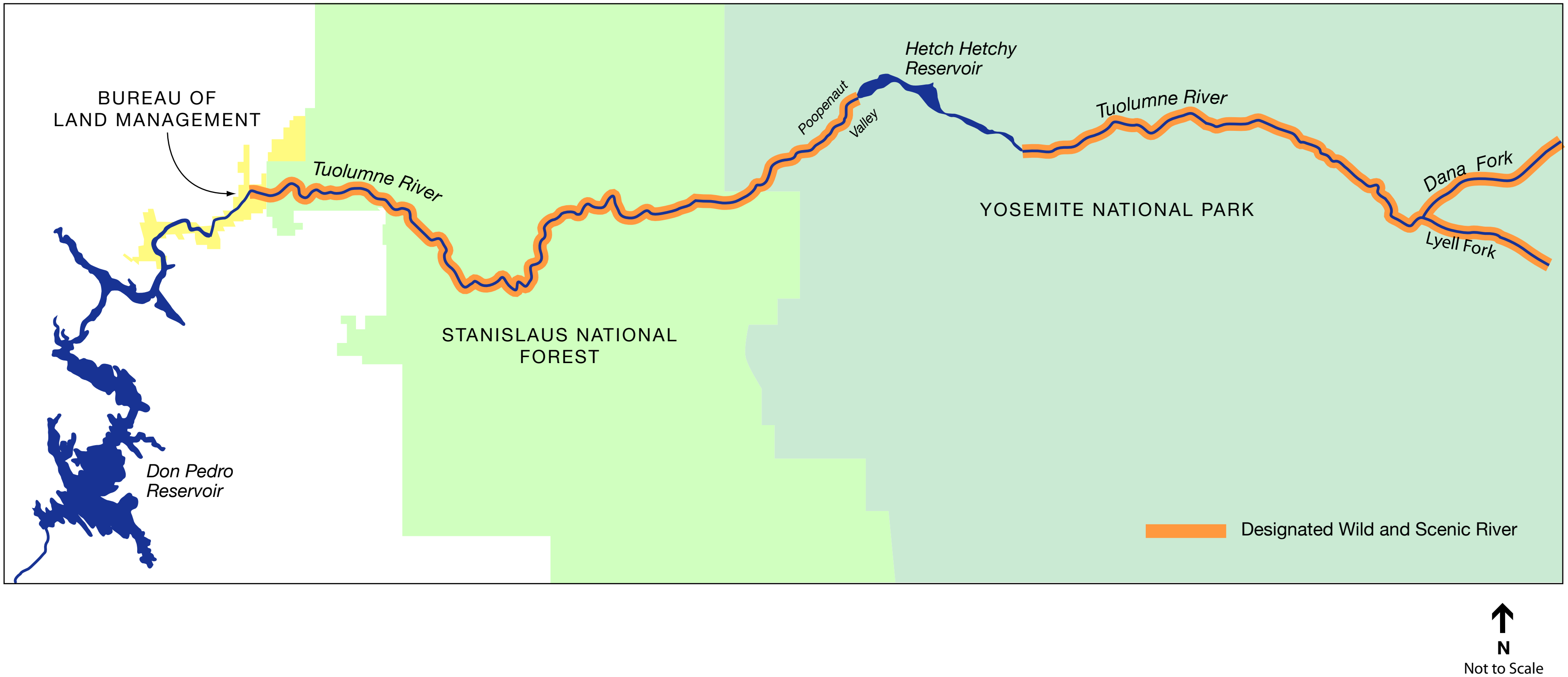
The Federal Endangered Species Act of 1973 provides broad protection for species of fish, wildlife, and plants that are listed as threatened or endangered in the U.S. or elsewhere. Provisions of the act provide for the listing of species, preparation of recovery plans, and designation of critical habitat for listed species. Federal agencies must follow the act's provisions when taking actions that may jeopardize listed species. The Federal Endangered Species Act is enforced by the USFWS and NMFS. The California Endangered Species Act generally parallels the main provisions of the federal law and is administered by the California Department of Fish and Game (CDFG).

Federal Power Act

The Federal Power Act of 1920 requires hydropower project owners to obtain a license from the Federal Energy Regulatory Commission (FERC). Among other purposes, FERC is charged with protecting fish and wildlife, including related spawning grounds and habitat, as well as mitigating impacts on recreation. The Federal Power Act authorizes the USFWS and NMFS to issue mandatory fishway prescriptions to ensure adequate protection, mitigation, and enhancement of fish and wildlife and their habitats. The Hetch Hetchy Project is statutorily exempt from provisions of the Federal Power Act. The Don Pedro Project is subject to FERC jurisdiction for its hydropower operations.

New Don Pedro Project FERC Settlement Agreement

Executed in 1995 by Tuolumne River stakeholder groups, the FERC Settlement Agreement established a revised instream flow schedule for New Don Pedro Project operation and outlined a strategy for recovery of Tuolumne River Chinook salmon (TID/MID, 1996). The revised flow schedule and a monitoring program were subsequently ordered by FERC in 1996, when FERC amended the license for the New Don Pedro Project to incorporate the settlement agreement flow schedules. The agreement requires implementation of measures to improve Chinook salmon habitat and increase populations, including increased flows, habitat rehabilitation and improvement, and measures to improve smolt survival. The FERC order required TID and MID



SOURCE: ESA + Orion

SFPUC Water System Improvement Program . 203287

Figure 5.2-1
Tuolumne River, Wild and Scenic River Designation

to file a 10-year report on the success of the flow modifications, and non-flow mitigation measures were reevaluated in 2005 (TID/MID, 2005). In 2000, the Tuolumne River Technical Advisory Committee (TRTAC), completed the *Habitat Restoration Plan for the Lower Tuolumne River Corridor* (TRTAC, 2000) as the primary planning product of the Settlement Agreement. The restoration plan is to be used by the Tuolumne River Technical Advisory Committee to help fulfill its obligations to FERC under the Settlement Agreement. It is a technical resource document intended to aid in identifying areas of potential habitat improvement and to provide guidance for restoring or rehabilitating these areas (see Section 5.2.3 for further description of the plan). The restoration plan has not been formally adopted by any federal, state or local agency.

State Agencies

California Department of Water Resources

The Department of Water Resources (DWR) is responsible for the overall management of California's water resources. Duties performed by the DWR include, but are not limited to, developing strategies for managing the state's water resources, including updates of the *California Water Plan*; operating and maintaining the State Water Project; and providing policy direction and legislative guidance on water and energy issues.

The DWR owns and operates Del Valle Reservoir in the Alameda Creek watershed. The DWR constructed this facility primarily for flood control and recreational purposes as well as to provide regulatory flows in the South Bay Aqueduct (DWR, 1997). Since 1969, through a series of agreements among the DWR, Alameda County Water District, and Zone 7 Water Agency, local water has been stored for later release and subsequent beneficial use by the water districts under their SWRCB permits. The disposition of stored local inflow is determined by the districts. Water can be released into Arroyo del Valle, released into the South Bay Aqueduct, exchanged for an equivalent amount of South Bay Aqueduct water, or any combination of the foregoing (DWR, 1997). Under the current agreement, the DWR is allowed to use local inflow at times when the districts cannot use all or part of this supply.

California Department of Health Services

The California Department of Health Services (DHS) is responsible for the enforcement of the Safe Drinking Water Act and regulation of public water systems through the Drinking Water Program. DHS activities include field inspections of water systems, source water assessments, issuance of operating permits, review of plans and specifications for new facilities, enforcement actions for noncompliance with laws and regulations, and promotion of water system security. The DHS also regulates the use of recycled water by establishing water quality standards and treatment reliability criteria for recycled water under Title 22 of the California Code of Regulations.

California Fish and Game Commission

The California Fish and Game Commission (Commission) has the statutory authority to formulate guidance policies for the California Department of Fish and Game (CDFG). The Commission has over 200 powers and duties listed in the statutes of the Fish and Game Code. Principal among these are legislatively granted powers for the regulation of the sport take and possession of birds, mammals, fish, amphibians, and reptiles. The Commission oversees the establishment of wildlife areas and ecological reserves and regulates their use, and prescribes the terms and conditions under which permits or licenses may be issued by the CDFG. A primary responsibility of the Commission is to afford an opportunity for full public input and participation in the decision- and policy-making process of adopting regulations or taking other actions related to the well-being of California's fish and wildlife resources.

The Commission sets policy for the CDFG, while the CDFG is the lead state agency charged with implementing, safeguarding, and regulating the uses of fish and wildlife.

California Department of Fish and Game

The mission of the CDFG is to manage California's diverse fish, wildlife, and plant resources, and the habitats upon which they depend, for their ecological values and for their use and enjoyment by the public. The CDFG enforces multiple programs dedicated to the conservation and preservation of habitats and species in California, including the California Endangered Species Act (CESA), California Environmental Quality Act (CEQA), and California Fish and Game Code. Under CESA, the CDFG is responsible for consulting with state lead agencies to determine if their actions would affect a state-listed threatened or endangered species. Under CEQA, the CDFG is responsible for consulting with lead and responsible agencies and providing the requisite biological expertise to review and comment upon environmental documents and impacts arising from project activities. The CDFG is also responsible for enforcing the provisions of the California Fish and Came Code.

State Water Resources Control Board

The SWRCB, created in 1967, has the primary authority over state water rights and water quality policy. The SWRCB is responsible for the enforcement of the Porter-Cologne Water Quality Control Act (Division 7 of the California Water Code), which deals with potential discharges into water bodies that could result in adverse impacts on water quality. The regulations enacted by the SWRCB are enforced by the nine regional boards at the local and regional level.

California Regional Water Quality Control Boards

The mission of the California RWQCBs is to develop and enforce water quality objectives and implementation plans that will best protect the beneficial uses of the state's waters, recognizing local differences in climate, topography, geology, and hydrology. The RWQCBs engage in a number of water quality functions in their respective regions. One of the most important is preparing and periodically updating WQCPs. The San Francisco Bay and Central Valley RWQCBs are the relevant boards reviewing WSIP projects.

State Statutes and Agreements

California Fish and Game Code

The Fish and Game Code provides a system for the protection of California's fish and wildlife resources and includes: provisions related to fish and wildlife protection and conservation; fish and game management; wetlands mitigation banking; endangered species; and operation of dams, conduits, and screens.

California Water Code

The California Water Code contains the fundamental provisions related to management of the state's water resources. The California Water Code requires that water resources of the state be put to beneficial use to the fullest possible extent, and that waste, unreasonable use, or unreasonable method of use be prevented. Acts contained under the California Water Code relevant to the WSIP include the Water Reuse Law, Urban Water Management Planning Act, California Water Recycling Act, and Wholesale Regional Water System Security and Reliability Act.

Urban Water Management Planning Act

The Urban Water Management Planning Act, enacted in 1983 by the state legislature, requires urban water suppliers that provide water to 3,000 or more customers, or that provide over 3,000 acre-feet of water annually, to prepare an urban water management plan (UWMP). UWMPs are updated every five years and must describe and evaluate existing and planned sources of water supply; discuss the reliability of the water supply with respect to seasonal or climatic shortages; describe demand management measures to be implemented by the water supplier; and provide an implementation strategy and schedule for any future planned water supply projects and water supply programs. The act is administered by the DWR (California Water Code Sections 10620–10621).

Wholesale Regional Water System Security and Reliability Act and Water First Policy

California Assembly Bill No. 1823 (AB 1823), known as the Wholesale Regional Water System Security and Reliability Act, imposed various requirements on wholesale water systems. The bill, adopted in 2002, required the SFPUC, acting on behalf of the CCSF, to adopt a capital improvement program by February 1, 2003; to adopt an emergency response plan by September 1, 2003; to distribute available water during any interruption to customers on an equitable basis; to continue operating reservoirs in Tuolumne County in a manner that ensures hydroelectric power generation does not cause any reasonably anticipated impacts on water service; and to assign a higher priority to water Bay Area deliveries than to power generation (California Water Code Sections 73500–73514). The act also includes the SFPUC's Water First Policy.

The Water First Policy, contained in Section 73504(b) of the California Water Code, was formally established in the San Francisco City Charter following adoption of AB 1823 by the state legislature and approval of Proposition E by San Francisco voters. Under this policy, the SFPUC must place water service to the Bay Area before the generation of hydroelectric power. (See Chapter 2, Section 2.4.3 for additional information on AB 1823.)

McAteer-Petris Act

The McAteer-Petris Act was passed by the state legislature in 1965 to promote responsible planning and regulation of San Francisco Bay. The act designates the San Francisco Bay Conservation and Development Commission (BCDC) as the agency responsible for maintaining and carrying out the provisions of the act and the SF Bay Plan (for additional information on the act, see Chapter 4, Section 4.2, p. 4.2-8).

Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Control Act was passed by the state legislature in 1969 and is the primary statute covering the quality of waters in California. The act specifies water quality provisions and discharge requirements for regulating the discharge of waste that could affect the quality of state waters. Under the act, the SWRCB has the ultimate authority over state water rights and water quality policy. The nine RWQCBs are responsible for the oversight of water quality on a day-to-day basis at the local and regional level.

California Safe Drinking Water Act

The California Safe Drinking Water Act, administered by the DHS, strengthens the minimum requirements found in the federal Safe Drinking Water Act and establishes drinking water standards that are at least as stringent as, and sometimes more stringent than, those established under the federal act. California’s development of drinking water standards for MTBE is an example of its more aggressive standards.

San Joaquin River Agreement

The 1995 Water Quality Control Plan (WQCP) for the San Francisco/Sacramento–San Joaquin Delta Estuary included water quality and flow objectives pertaining to the San Joaquin River basin. Disputes over the science supporting the flow objective for the San Joaquin River as measured in Vernalis (shown in Section 5.3, Figure 5.3-1) led to the development of an experimental program to develop an adaptive fishery management plan and the water supplies to support that plan. The San Joaquin River Agreement, adopted by the SWRCB in April 1998, provided the basis for development of the Vernalis Adaptive Management Program (VAMP) and identified where much of the water to support the VAMP study would be obtained (specifically, from the San Joaquin River Group Authority). The VAMP is an experimental management program designed to protect juvenile Chinook salmon migrating from the San Joaquin River through the Delta (San Joaquin River Group Authority, 1999). The VAMP study is summarized below in Section 5.2.3 and discussed in more detail in Section 5.3.1.

Local and Regional Agencies

City and County of San Francisco

As a department of the CCSF, the SFPUC has authority over the management, use, and control of the regional water system pursuant to the San Francisco City Charter, Section 8B.121. Chapter 3, Section 3.3, presents the mission of the SFPUC relative to the objectives of the WSIP, and Section 3.13 describes the role of the CCSF and its various departments with respect to the actions and approvals required for adoption of the WSIP.

San Francisco Bay Conservation and Development Commission

The San Francisco Bay Conservation and Development Commission (BCDC) is the agency responsible for maintaining and carrying out the provisions of the McAteer-Petris Act and the SF Bay Plan. In the public interest, BCDC is authorized to control bay filling and dredging and bay-related shoreline development. Due to the regulatory authority of the State Water Resources Control Board (SWRCB), San Francisco Bay Regional Water Quality Control Board, U.S. Environmental Protection Agency, and the U.S. Army Corps of Engineers, BCDC's scope of authority over water quality issues is limited. (For additional information on BCDC's regulatory authority, see Chapter 4, Section 4.2, p. 4.2-8.)

Alameda Creek Watershed Regional Agencies

In addition to the CCSF, three regional resource agencies have jurisdiction within the Alameda Creek watershed. There are no local or regional resource agencies with jurisdiction over areas within the Tuolumne and Peninsula watersheds or the Westside Groundwater Basin (beyond those described in Chapter 3, Section 3.13, related to the conjunctive-use program) that could be affected by the proposed water supply and system operations.

Alameda County Flood Control and Water Conservation District

The Alameda County Flood Control and Water Conservation District (ACFCWCD) works specifically to protect county citizens from flooding hazards. The ACFCWCD is responsible for planning, designing, and inspecting flood control projects; maintaining flood control infrastructure; assisting in planning new developments to preserve the integrity of the flood control system; and providing public outreach and enforcement of pollution control regulations governing county waterways.

Zone 7 Water Agency

Zone 7 Water Agency, one of 10 active zones of the ACFCWCD, covers the eastern portion (425 square miles) of Alameda County, including Pleasanton, Livermore, and Dublin. Zone 7's entire service area lies within the Alameda Creek watershed. Unlike the other zones, Zone 7 was created by state law and has its own board of directors. Zones 7's water resource management responsibilities include providing a wholesale treated drinking water supply, monitoring and protecting surface water and groundwater quality, operating and maintaining a water treatment system, and managing floodwaters and stormwater for public safety and protection of property. In September 2005, Zone 7 adopted the updated *Urban Water Management and Water Shortage Contingency Plan*, which addresses operations as well as water supply and demand.

Zone 7 is the water quality management agency for the Alameda Creek watershed above the town of Niles. The agency does not generally participate in the management of SFPUC lands, with the exception of managing groundwater activities and monitoring development in the Zone 7 service area for erosion potential and channel capacity impacts through the CEQA process.

Zone 7 also serves as a water wholesaler, with supplies originating from local groundwater sources, imported water from the State Water Project, and local water stored in Del Valle Reservoir. The agency is also responsible for mitigating flood hazards in its service area and has undertaken channelization projects on sections of Arroyo de la Laguna, Arroyo del Valle, and Arroyo Mocho.

East Bay Regional Park District

The East Bay Regional Park District's (EBRPD) Sunol and Ohlone Regional Wilderness preserves are within the watersheds of Alameda Creek (below Calaveras Reservoir) and San Antonio Reservoir, respectively. Watershed management activities in these preserves can affect water quality in those receiving waters. The EBRPD has worked with the SFPUC on a number of fish enhancement projects in the watershed, including cattle fencing to keep livestock out of sensitive riparian areas.

Local Regulation

The only local regulation relevant to the WSIP is the San Francisco City Charter.

San Francisco City Charter

The San Francisco City Charter was adopted on November 7, 1995, and became effective July 1, 1996. In November 2002, the voters adopted Proposition E, which amended the charter as it relates to the SFPUC. The charter establishes many of the procedures and requirements for initiative ordinances and declarations of policy. Where the charter does not address a particular aspect of the initiative process, applicable provisions of California law apply. As specified in Section 8B.122 of the charter, the SFPUC is required to develop, periodically update, and implement programs consistent with the following goals and objectives related to water resources:

(1) Provide water and clean water services to San Francisco and water service to its wholesale customers while maintaining stewardship of the system by the City;

(2) Establish equitable rates sufficient to meet and maintain operation, maintenance, and financial health of the system;

(3) Provide reliable water and clean water services and optimize the systems' ability to withstand disasters;

(4) Protect and manage lands and natural resources used by the SFPUC to provide utility services consistent with applicable laws in an environmentally sustainable manner. Operate hydroelectric generation facilities in a manner that causes no reasonably anticipated adverse impacts on water service and habitat;

(5) Develop and implement priority programs to increase and to monitor water conservation and efficiency systemwide;

(6) Utilize state-of-the-art innovative technologies where feasible and beneficial;

(7) Develop and implement a comprehensive set of environmental justice guidelines for use in connection with its operations and projects in the city;

(8) Create opportunities for meaningful community participation in development and implementation of the SFPUC's policies and programs; and

(9) Improve drinking water quality with a goal of exceeding applicable drinking water standards if feasible.

5.2.3 Relevant Plans, Policies, and Planning Actions

U.S. Forest Service, Sierra Nevada Framework

In January 2001, the U.S. Forest Service adopted the Sierra Nevada Forest Plan Amendment (SNFPA or Sierra Nevada Framework), a plan for the management of 11 national forests and 11.5 million acres of national forest land in the Sierra Nevada mountain range, including Stanislaus National Forest. In January 2004, in response to concerns about the flexibility and compatibility of the SNFPA with other programs related to wildland fire management, the U.S. Forest Service amended the Sierra Nevada Framework to provide additional provisions for fire and fuels treatments. The amended Framework outlines procedures used to manage and protect forests, wildlife habitats, and communities from a variety of threats, including catastrophic fires, and provides a programmatic framework within which project-level decisions are designed and implemented. Key aspects of the SNFPA include: a commitment to restoration and protection of old-growth forest habitat; protection of all trees greater than 30 inches on 11 million of the 11.5 million acres of public land managed by the U.S. Forest Service; designation of riparian conservation areas; improvement and protection of suitable habitat for California spotted owl (*Strix occidentalis occidentalis*), northern goshawk (*Accipiter gentiles*), and willow flycatcher (*Empidonax traillii*); adoption of an integrated vegetation management strategy with the primary objective of protecting communities and modifying landscape-scale fire behavior to reduce the size and severity of fires; and provisions for increased land use management, including grazing, timber production, road construction, and recreation activities. The SNFPA is administered by the U.S. Forest Service (USDA Forest Service, 2004). As no WSIP facility improvement projects are proposed within Stanislaus National Forest, and the resources protected by the SNFPA would not be affected by the WSIP water supply and system operations, the WSIP would be consistent with the provisions of the SNFPA.

Regional Natural Resource Protection Plans

Many of the federal and state statutes and agreements summarized in Section 5.2.2 form the basis for development of the regional natural resource protection plans and policies described in this section. These plans and policies play an important role in the SFPUC's current and future operation of the regional water system by establishing guidelines for the protection of fish, wildlife, and riparian habitat and by setting enforceable water quality objectives/criteria for surface waters potentially affected by the regional water system. As indicated below, the plans and policies are in various stages of development; only some of the plans and policies are adopted and many are either under development or in a study or experimental stage.

Bay Delta Conservation Plan

The Bay Delta Conservation Plan (BDCP) is an effort driven by Delta water users to provide for the conservation and management of certain aquatic species, both listed and non-listed, and their habitats, while providing for regulatory assurances related to water supply reliability and water quality for the Sacramento–San Joaquin River Delta. Activities that would be covered under the BDCP include water supply operations related to the State Water Project and the Central Valley Project, and the power plant operations of the Mirant Corporation. Under the BDCP, water users would pay for new infrastructure, wetlands restoration, and other related projects in return for guaranteed stable water supplies. As the BDCP is still under development and is not yet adopted, no determination regarding potential conflicts of the WSIP with its provisions has been made.

Tuolumne Wild and Scenic River Management Plan

The *Tuolumne Wild and Scenic River Management Plan* (Wild and Scenic Plan) was approved in 1986 and is administered by the U.S. Forest Service, Pacific Southwest Region. The Wild and Scenic Plan, applicable only to the 29 miles of the Tuolumne Wild and Scenic River located outside of Yosemite National Park (see Figure 5.2-1), provides direction for managing the use of federal lands within the boundaries of the designated corridor and for protecting the unique qualities of the designated river. The Wild and Scenic Plan does not apply to the exercise of the CCSF's water rights under the existing Raker Act grant, as stated in the Wild and Scenic Rivers Act (Section 3 [a] [53] Tuolumne, California) as follows: "Nothing in this section is intended or shall be construed to affect any rights, obligations, privileges, or benefits granted under any prior authority of law including chapter 4 of the Act of December 13, 1913, commonly referred to as the Raker Act (38 Stat. 242) and including any agreement or administrative ruling entered into or made effective before the enactment of this paragraph [September 28, 1984]."

The Wild and Scenic Plan includes general management objectives and guidelines applicable to the entire designated corridor as well as reach-specific management prescriptions and recreational improvement opportunities assigned to particular management areas. All land uses within the designated corridor are subject to the provisions of the Wild and Scenic Plan. Selected management objectives, standards, and guidelines applicable to the entire designated corridor are listed below.

Management Objectives

Physical Setting Opportunities – Fish and Wildlife

1. Provide habitat for management of indicator species including threatened, endangered, and sensitive species. These include peregrine falcon, bald eagle, mule deer, western gray squirrel, yellow warbler, and Sierra Nevada red fox.

Physical Setting Opportunities – Timber

1. Manage vegetation to protect and enhance Wild and Scenic River values, placing special emphasis on protecting streamside vegetation.

Physical Setting Opportunities – Water

1. Maintain or improve the existing high water quality for fisheries, aesthetics, and other ecological considerations. Give priority to protection of water quality in cases of conflict with other resource uses. Prevent alteration of natural channels or stream banks that would significantly affect the free-flow of water, the appearance of the stream, fish habitat, or water quality.

Physical Setting Opportunities – Lands

2. Work with proponents and operators of hydroelectric projects outside of the corridor to provide mitigation to eliminate or minimize adverse environmental impacts and to provide for recreation opportunities created by the project that will meet the objectives of this management plan.

Managerial Setting Opportunities

5. Manage the Tuolumne Wild and Scenic River and its immediate environment to preserve its free-flowing condition and to protect its outstandingly remarkable values.[3] Provide opportunities for public recreation and other resources based on the classification of each river segment.

Standards and Guidelines

Fish and Wildlife

- <u>Fish and Wildlife Habitat Coordination (C1-WS)</u>. Maintain and enhance habitat for fish and wildlife species.

- <u>Stream Fisheries Habitat Improvement and Maintenance (C2-WS)</u>. Provide medium- to high-quality habitat for resident trout species (rainbow, brown, and brook) according to the habitat capability model.

- <u>Riparian and Meadow Vegetation Management (C4-WS)</u>. Provide cover and forage for fish and wildlife species associated with riparian habitats by maintaining medium- to high-habitat quality according to the Habitat Quality Criteria for Riparian Habitat.

Specific impacts on potentially affected resources covered in this plan—including water, fish and wildlife, vegetation, recreational, and visual resources—resulting from implementation of the proposed WSIP water supply and system operations are analyzed in this chapter in the corresponding subsections of Section 5.3.

Tuolumne Wild and Scenic River Comprehensive Management Plan, General Management Plan for Yosemite National Park, and Wilderness Management Plan

The NPS is currently in the process of preparing a comprehensive management plan for the 54 miles of designated wild and scenic river within Yosemite National Park, as mandated by the Wild and Scenic Rivers Act. This reach of designated river includes portions of the river extending from the Tioga Pass Entrance and Lyell Canyon to the Poopenaut Valley, as shown in Figure 5.2-1. The lands immediately surrounding Hetch Hetchy Reservoir are not included in the plan area; environmental stewardship of these lands is the responsibility of the SFPUC and is performed in coordination with the NPS, as described in Chapter 2, Section 2.3.8. However, the six-mile reach of the Tuolumne River, downstream of Hetch Hetchy Reservoir, that passes through the Poopenaut Valley is covered under this plan.

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3 Outstandingly remarkable values are defined by the Wild and Scenic Rivers Act as the unique characteristics that make a river worthy of special protection.

The intended purpose of the plan currently under development, known as the *Tuolumne Wild and Scenic River Comprehensive Management Plan* (Tuolumne River Plan), is to establish the overall goals and vision for the river corridor. It will provide broad, conceptual-level management objectives that may amend the *General Management Plan for Yosemite National Park* (1980) for the river corridor. The Tuolumne River Plan is not intended to include specific implementation strategies or plans. Concurrent with the Tuolumne River Plan, the NPS is also developing an implementation plan for Tuolumne Meadows that will be guided by the Tuolumne River Plan. Public scoping related to development of the two plans was completed in September 2006, and the draft environmental impact statement is scheduled for release in 2008, with the final report expected in 2009 (NPS, 2006b, 2007).

As part of the development of the Tuolumne River Plan, the NPS developed a draft report entitled *Tuolumne Wild and Scenic River Outstandingly Remarkable Values* (NPS, 2006a). This report presents the proposed revision of the outstandingly remarkable values for the portion of the Tuolumne Wild and Scenic River within Yosemite National Park. Outstandingly remarkable values are identified for natural (ecologic, hydrologic, geologic, and biologic), sociocultural (prehistoric, historic, scenic, and recreational), and scientific values by river segment and for the corridor as a whole. A final report will incorporate comments received during public scoping and review of the draft Tuolumne River Plan and become the foundation for the final Tuolumne River Plan. The *Outstandingly Remarkable Values* includes specific description of cultural, historic, hydrologic, geologic, biologic, scenic, and recreational attributes of the reach of the Tuolumne River below Hetch Hetchy Reservoir, including the Poopenaut Valley, potentially affected by the proposed water supply and system operations.

Much of the area around the Tuolumne River is federally designated as wilderness and is covered under the NPS's *Wilderness Management Plan*. The general guidance and direction for the *Wilderness Management Plan* currently derive from the *General Management Plan for Yosemite National Park*, the Wilderness Act, and NPS policy. When the *Wilderness Management Plan* is updated, the NPS will incorporate guidance and direction established by the Tuolumne River Plan.

Although the Tuolumne River Plan is still under development, specific impacts on potentially affected resources to be covered in the plan—including water, biological, recreational, and visual resources—resulting from implementation of the proposed WSIP water supply and system operations are analyzed in this chapter in the corresponding subsections of Section 5.3.

Vernalis Adaptive Management Program

The VAMP, a product of the San Joaquin River Agreement and officially initiated as part of SWRCB Decision 1641, is a 12-year experimental adaptive management program to study the effects of alterations in San Joaquin River flows and Delta pumping rates on the migration of salmon within the San Joaquin River basin. Under the VAMP, a barrier was installed at the head of Old River, and different amounts of water are released down the San Joaquin River, curtailing exports from the Delta by the State Water Project and Central Valley Project to varying degrees for one month in the spring when juvenile salmon are migrating. Information on the effects of different river flow and export rates on migrating salmon is being gathered and may be used to establish future standards for their protection. The VAMP is administered by the parties to the San Joaquin River Agreement, including the U.S. Bureau of Reclamation, DWR, CDFG, USFWS, and San Joaquin River Group Authority.

The VAMP is discussed in this chapter because the WSIP would affect flows in the Tuolumne River, a tributary to the San Joaquin River and the Sacramento–San Joaquin Delta. Specific impacts on potentially affected resources covered in this plan—including flows in the San Joaquin River—resulting from implementation of the proposed WSIP water supply and system operations are discussed in Section 5.3.1 of this chapter. The VAMP is not an adopted plan, but rather a temporary experimental program; however, it is expected that either the VAMP or a "VAMP-like" program will be continued when the current program expires.

Habitat Restoration Plan for the Lower Tuolumne River Corridor

Under the 1995 FERC Settlement Agreement (described above and in Chapter 2, Section 2.5.2), the TRTAC is responsible for developing and implementing a Chinook salmon restoration plan and salmon management and habitat restoration activities as part of the strategy to address a decline in fall-run Chinook salmon in the lower Tuolumne River (FERC, 1996). The *Habitat Restoration Plan for the Lower Tuolumne River Corridor* (TRTAC, 2000) is a technical resource document, not an adopted plan, intended to aid the TRTAC in identifying areas of potential habitat improvement and in restoring or rehabilitating these areas.

The restoration plan integrates salmon ecology and geomorphic and hydrologic processes into a riverwide and reach-specific plan. The plan includes goals and strategies to guide future management, specific monitoring objectives, a comprehensive list of all potential restoration sites and actions, and conceptual designs for 14 high-priority restoration projects.

The restoration plan describes how cumulative water storage and diversion projects in the lower Tuolumne River watershed have led to a reduction in annual water yield below La Grange Dam, reductions in the magnitude and variability of the annual hydrograph,[4] and a reduction in the magnitude, duration, and frequency of winter floods. The restoration plan promotes the recovery of Chinook salmon and the river's natural animal and plant communities through the reestablishment of fluvial geomorphic functions, processes, and characteristics. The plan includes the following riverwide restoration goals for the Tuolumne River:

- A continuous river floodway from La Grange Dam to the confluence of the San Joaquin River
- A continuous riparian corridor from La Grange Dam to the San Joaquin River confluence, with a minimum width of 500 feet and a width of up to 2,000 feet near the San Joaquin River
- A dynamic alluvial channel maintained by flood hydrographs of variable magnitude and frequency adequate to periodically initiate geomorphic processes
- The establishment of variable stream flows to benefit salmon and other aquatic resources

[4] A chart that illustrates the pattern of flow in a stream as a function of time.

- Chinook salmon habitat created and maintained by natural processes, sustaining a resilient, naturally reproducing Chinook salmon population
- Self-sustaining, dynamic, native woody riparian vegetation
- Continual revision of the adaptive management program, addressing areas of scientific uncertainty that will improve our understanding of river ecosystem processes and refine future restoration and management

Specific impacts on potentially affected resources covered in this plan—including water, geomorphological, biological, recreational, and visual resources—resulting from implementation of the proposed WSIP water supply and system operations are addressed in this chapter in the corresponding subsections of Section 5.3, and information from this plan is used as a resource for mitigation strategies.

Water Quality Control Plans

Each RWQCB is required to develop, adopt, and implement a Water Quality Control Plan (WQCP), also known as a Basin Plan, for its respective region. The WQCP is the master policy document that contains descriptions of the legal, technical, and programmatic bases of water quality regulation. WQCPs identify beneficial uses of surface waters and groundwater within the corresponding region; specify water quality objectives and standards for both surface water and groundwater; and develop the actions necessary to maintain the standards in order to control nonpoint and point sources of pollutants to the state's waters.

WQCPs are adopted and amended by the RWQCBs and approved by the SWRCB. Adoption of or revisions to the surface water objectives/standards contained in the WQCPs are subject to U.S. EPA approval. All discretionary projects requiring permits from the RWQCB (i.e., waste discharge requirements and National Pollutant Discharge Elimination System permits) must implement WQCP requirements, taking into consideration the beneficial uses to be protected.

Two adopted WQCPs govern the management of surface and ground waters that could be affected by proposed WSIP system operations. The Central Valley WQCP covers the Sacramento and San Joaquin River basins, including the Tuolumne River watershed. The San Francisco Bay/Delta WQCP covers those portions of Alameda, Contra Costa, Marin, Napa, San Mateo, San Francisco, Santa Clara, Solano, and Sonoma Counties that drain to the San Francisco Bay Estuary, including the Delta, as well as areas draining to the Pacific Ocean; this plan includes the Alameda Creek watershed, the Peninsula watershed (including San Mateo and Pilarcitos Creeks), and the Westside Groundwater Basin. Water objectives/standards contained in the WQCPs are enforceable against the SFPUC. Specific impacts on water quality associated with implementation of the proposed WSIP water supply and system operations are analyzed by watershed in Sections 5.3.3, 5.4.3, and 5.5.3 of this chapter.

San Francisco Bay Plan

The SF Bay Plan, completed and adopted by BCDC in 1968, is an enforceable plan that guides the protection and use of San Francisco Bay and its shoreline. For a discussion of the SF Bay Plan's applicability to individual WSIP facility projects, see Section 4.2 (Vol. 2, Chapter 4, p. 4.2-16).

The SF Bay Plan is founded on the belief that water quality in San Francisco Bay will be maintained at levels sufficiently high to protect the beneficial uses of the bay. The SF Bay Plan includes findings and policies related to freshwater inflow and changes in salinity. The freshwater inflow findings contained in the SF Bay Plan stress the importance of maintaining a balance between fresh and saltwater. The related policies assert that the impact of freshwater diversions should be monitored by the SWRCB to ensure compliance with water quality standards.

Regional Habitat Conservation Plans

Habitat conservation plans (HCPs) are land use and biological planning documents that provide comprehensive, long-term conservation measures for species listed as threatened or endangered under the California and Federal Endangered Species Acts, or for species that could be listed in the future. One adopted HCP covering an area that could be affected by WSIP implementation was identified (see separate discussion below of SFPUC HCPs). In 1995, the City of Waterford prepared an HCP for the incidental take of valley elderberry longhorn beetle (VELB) on the Tuolumne River at the discharge point of its wastewater treatment facility, located between La Grange Dam and the city of Modesto. The HCP involved the removal of about 150 elderberry bushes on five acres and the installation of over 800 small bushes.

Alameda Creek Watershed Management Planning Efforts

Multiple stakeholders in the Alameda Creek watershed area, including the SFPUC, Alameda County Water District, ACFCWCD, Zone 7, EBRPD, and various environmental interest groups, are involved in ongoing planning efforts to manage the Alameda Creek watershed. Although no specific plans have been adopted, planning efforts include the development of a comprehensive management plan for the watershed; the plan, which is being prepared in conjunction with the Alameda Creek Fisheries Restoration Workgroup, will focus on restoring steelhead to the Alameda Creek watershed. In October 2006, 17 public agencies and nonprofit organizations[5] signed a formal agreement to collaborate on stream flow requirements for steelhead, other native fish and wildlife, and drinking water supplies (Alameda Creek Fisheries Restoration Workgroup, 2006). This planning effort is discussed in the Alameda Creek watershed fisheries section and in cumulative analysis of the WSIP water supply and system operations, in Sections 5.4.5 and 5.7, respectively.

[5] Participating organizations in the Alameda Creek Fisheries Restoration Workgroup include: the Alameda County Water District, Alameda County Flood Control and Water Conservation District, Alameda Creek Alliance, Coastal Conservancy, Zone 7, Pacific Gas and Electric Company, SFPUC, Alameda County Resource Conservation District, American Rivers, California Department of Fish and Game, East Bay Regional Park District, National Marine Fisheries Service, Natural Resources Defense Council, San Francisco Bay Regional Water Quality Control Board, U.S. Army Corps of Engineers, U.S. Natural Resources Conservation Service, and U.S. Fish and Wildlife Service.

Pilarcitos Creek Watershed Restoration Plan

Developed in coordination with the California Department of Fish and Game, Regional Water Quality Control Board, and a citizen's advisory committee, the *Pilarcitos Creek Restoration Plan* (Philip William & Associates, Ltd., 1996) details the major issues of concern regarding Pilarcitos Creek and its tributaries, and prioritizes alternatives to significantly enhance the physical and biological attributes of the watershed. The alternatives involve reducing sedimentation in the creek and its tributaries, enhancing fish migration and rearing and riparian habitat, and providing educational resources. Not an adopted plan, this document and its subsequent updates serve as a guide to restoration projects and related activities in the Pilarcitos watershed. It is considered in this chapter with respect to providing documentation of existing conditions in the Pilarcitos watershed and potential mitigation strategies for potential impacts associated with the WSIP water supply option and system operations.

Pilarcitos Creek Integrated Watershed Management Plan

The Pilarcitos Creek Restoration Workgroup[6] is currently developing the *Pilarcitos Creek Integrated Watershed Management Plan*, the intended purpose of which is to "determine how to more effectively manage the competing beneficial uses of water from Pilarcitos Creek and promote balanced solutions that satisfy environmental, public health, recreational, and economic interests. An important component of the plan will be an assessment of existing conditions and a strategy for addressing the actions necessary for the protection and restoration of [steelhead trout] and other species of concern that depend on aquatic and riparian habitats throughout the watershed" (San Mateo County Resource Conservation District, 2006). The plan will build on the 1996 *Pilarcitos Creek Restoration Plan*, and a Memorandum of Understanding has been developed among the 19 participants in the workgroup to outline the process for developing the plan (Pilarcitos Creek Restoration Workgroup, 2007). It is expected that the *Pilarcitos Creek Integrated Watershed Management Plan* will be completed in 2008. This plan is considered in the cumulative analysis of the WSIP water supply and system operations, as discussed in Section 5.7.

City and County of San Francisco Plans and Policies

Chapter 4, Section 4.2, Plans and Policies, provides an overview of the relationship of CCSF planning documents to the WSIP and discusses the specific CCSF plans and policies that pertain to the WSIP facility improvement projects. This section focuses on those plans and polices that relate to the WSIP water supply and system operations.

San Francisco General Plan

Section 4.2.2 provides an overview of the San Francisco General Plan. Although the majority of policies contained in the general plan were developed for lands within San Francisco and are not generally relevant to extraterritorial lands, several policies and objectives provided in the Environmental Protection Element are relevant to the proposed operational changes and sources of water supply under the WSIP. The Fresh Water sub-element of the Environmental Protection Element of the San Francisco General Plan includes objectives aimed at the protection of freshwater resources (Objective 6) in conjunction with responsible utilization of these resources for water supply (Objective 5). Policies associated with the reliability of the regional water system include Policy 5.1 and Policy 5.2. Policy 5.3 and Policy 5.4 address water quality; Policy 6.1 specifies the continued implementation of a leak detection program; and Policy 6.2 deals with water reclamation. The Flora and Fauna sub-element of the Environmental Protection Element deals with the protection of plant and animal life (Objective 8) and specifies the protection of plant and animal species and their habitats through coordination with animal protection programs (Policy 8.1, Policy 8.2, Policy 8.3). Specific impacts on potentially affected

6 Participating organizations in the Pilarcitos Creek Restoration Workgroup include: the SFPUC, California State Parks, San Mateo County Resource Conservation District, San Francisco Bay Regional Water Quality Control Board, Pilarcitos Creek Advisory Council, City of Half Moon Bay, Coastside County Water District, Committee for Green Foothills, Gulf of the Farallones National Marine Sanctuary, Half Moon Bay Fishermans Association, Midpeninsula Regional Open Space District, California Department of Fish and Game, Monterey Bay National Marine Sanctuary, National Marine Fisheries Service, Peninsula Open Space Trust, Pilarcitos Creek Advisory Committee, San Mateo County Farm Bureau, Sewer Authority Mid-Coastside, and Surfrider Foundation–San Mateo Chapter.

resources covered in this plan—including water and biological resources—resulting from implementation of the WSIP water supply and system operations are analyzed by watershed in the corresponding sections of this chapter.

San Francisco Sustainability Plan

The San Francisco Board of Supervisors endorsed the *San Francisco Sustainability Plan* in 1997, but has not committed the City to perform the actions addressed in the plan. The plan serves as a blueprint for sustainability, with many of its individual proposals requiring further development and public comment. The underlying goals of the plan are to maintain the physical resources and systems that support life in San Francisco and to create a social structure that will allow such maintenance. The plan is divided into 15 topic areas, 10 that address specific environmental issues (air quality; biodiversity; energy, climate change, and ozone depletion; food and agriculture; hazardous materials; human health; parks, open spaces and streetscapes; solid waste; transportation; and water and wastewater), and five that are broader in scope and cover many issues (economy and economic development, environmental justice, municipal expenditures, public information and education, and risk management). Under the topic "Water," there are goals addressing water reuse, water quality, adequacy of water supply, groundwater supply, and infrastructure. Each topic area in the plan has a set of indicators to be used over time in determining whether San Francisco is moving in a sustainable direction in that particular area (CCSF, 1997).

Specific impacts on potentially affected resources addressed in this plan—including water and groundwater resources—resulting from implementation of the WSIP water supply and system operations are analyzed by watershed in the corresponding sections of this chapter.

San Francisco Urban Water Management Plan

As discussed in *2005 Urban Water Management Plan for the City and County of San Francisco*, approximately 96 percent of the city's total water supply is provided by the SFPUC regional water system. The remaining 4 percent of the water demand is met through locally produced, nonpotable groundwater and secondary-treated recycled water used for irrigation. San Francisco overlies all or part of seven groundwater basins. Of these, only the Westside Basin and the Lobos Basin are considered adequate for municipal supplies. Groundwater pumped from wells located in Golden Gate Park and at the San Francisco Zoo is used by the Recreation and Park Department for irrigation. Tertiary-treated recycled water from the SFPUC's Southeast Water Pollution Control Plant is used on a limited basis for washdown operations.

The 2005 UWMP identifies various local water supply plans and programs that represent potential options to maximize resources and minimize the need to import water. These include ongoing implementation of water conservation programs; implementation of the *Recycled Water Master Plan* (SFPUC, 2006a), which explores additional opportunities for recycled water use in San Francisco; and implementation of the *Draft North Westside Basin Groundwater Management Plan*, which identifies several new local groundwater projects to produce an additional 2 million gallons per day of groundwater for potable purposes (SFPUC, 2005).

Information in the UWMPs of both the retail and wholesale customers of the regional water system, including the CCSF and applicable Bay Area Water Supply and Conservation Agency members, was used in the development of the WSIP level of service water supply goal for 2030.

SFPUC Watershed Management Plans

The SFPUC has adopted watershed management plans for CCSF-owned lands in the Alameda and Peninsula watersheds to provide a policy framework for activities and actions on watershed lands. Watershed lands are managed by the SFPUC Natural Resources Division, Land and Resource Management Section. The plans provide goals, policies, and management actions that address watershed activities and reflect the unique qualities of each watershed. Changes in system operations proposed under the WSIP would be required to conform to the goals, policies, and management actions contained in the Alameda and Peninsula Watershed Management Plans (WMPs) as well as applicable environmental codes and regulations. Specific impacts on affected resources covered in these plans—including water, biological, recreational, and visual resources—resulting from implementation of the WSIP water supply and system operations are analyzed for the Alameda and Peninsula watersheds in the corresponding sections of this chapter.

For both watershed plans, the SFPUC considers water quality protection as the first and foremost goal. The goals and policies are organized around the primary goal of water quality protection and six secondary goals pertaining to water supply, natural resource protection, watershed protection, land use compatibility, fiscal management, and public awareness. The primary and secondary goals were established by the Watershed Planning Committee, a group of SFPUC division and department representatives who assisted in plan development and review. The primary and secondary goals in common to both watershed management plans are as follows:

- *Primary Goal*: Maintain and Improve Source Water Quality to Protect Public Health and Safety
- *Secondary Goals*:
  - Maximize water supply
  - Preserve and enhance the ecological and cultural resources of the watershed
  - Protect the watersheds, adjacent urban areas, and the public from fire and other safety hazards
  - Continue existing compatible uses and provide opportunities for potential compatible uses on watershed lands, including educational, recreational, and scientific uses
  - Provide a fiscal framework that balances financial resources, revenue-generating activities, and overall benefits and an administrative framework that allows implementation of the watershed management plans
  - Enhance public awareness of water quality, water supply, conservation, watershed protection issues

Alameda Watershed Management Plan

The SFPUC's Alameda WMP is described in Chapter 4, Section 4.2, in the context of WSIP facilities improvement projects located in the Alameda watershed. The Alameda watershed lands are shown in Figure 2.2. The Alameda WMP provides a policy framework for the SFPUC to make consistent decisions about the activities, practices, and procedures that are appropriate on CCSF-owned lands in the Alameda watershed to protect the watershed and ensure a pure and reliable supply for San Francisco. The plan applies best management practices for the protection of water and natural resources and their conservation, enhancement, restoration, and maintenance and is intended to be used by the SFPUC as watershed management implementation guidelines.

Peninsula Watershed Management Plan

The SFPUC's Peninsula WMP is described in Chapter 4, Section 4.2, in the context of WSIP facilities improvement projects located in the Peninsula watershed. The Peninsula watershed lands are shown in Figure 2.3.The Peninsula WMP was developed in the same manner as the Alameda WMP and consists of the same primary and secondary goals as those contained in the Alameda WMP; however, some policies contained in the plan have been formulated to address the specific management issues of the Peninsula watershed.

SFPUC Habitat Conservation Plans

As part of watershed management plan implementation, the SFPUC is in the process of developing HCPs for the Alameda and Peninsula watersheds, as discussed in Chapter 4, Section 4.2. Both watersheds contain known habitat for sensitive species, and the HCPs are being developed in compliance with federal and state regulations for endangered species protection. The draft HCP for the Alameda watershed is scheduled for public review in 2007, and the draft HCP for the Peninsula watershed is scheduled for public review in 2008. Both plans will require preparation of a joint environmental impact report/environmental impact statement before the SFPUC can consider adoption and begin implementation. (See Chapter 4, Section 4.2, for additional information regarding the development of HCPs for the SFPUC Alameda and Peninsula watersheds.)

Although the HCPs are still under development, specific WSIP impacts on the resources anticipated to be covered in the plans—particularly steelhead and other federal- or state-listed biological resources—are analyzed for the Alameda and Peninsula watersheds in the corresponding sections of this chapter.

SFPUC Water Enterprise Environmental Stewardship Policy

Adopted in June 2006, the Water Enterprise Environmental Stewardship Policy established the long-term management direction for CCSF-owned lands and natural resources affected by operation of the SFPUC regional water system within the Tuolumne River, Alameda Creek, and Peninsula watersheds (SFPUC, 2006b). It also addresses rights-of-way and properties in urban surroundings under SFPUC management. The policy includes the following specifically relevant to the proposed water supply and system operations:

- The SFPUC will proactively manage the watersheds under its responsibility in a manner that maintains the integrity of the natural resources, restores habitats for native species, and enhances ecosystem function.
- To the maximum extent practicable, the SFPUC will ensure that all operations of the SFPUC water system (including water diversion, storage, and transport), construction and maintenance of infrastructure, land management policies and practices, purchase and sale of watershed lands, and lease agreements for watershed lands protect and restore native species and the ecosystems that support them.
- It is the policy of the SFPUC to operate the SFPUC water system in a manner that protects and restores native fish and wildlife downstream of SFPUC dams and water diversions, within SFPUC reservoirs, and on SFPUC watershed lands.
- Releases from SFPUC reservoirs will mimic the variation of the seasonal hydrology (e.g., magnitude, timing, duration, and frequency) of their corresponding watersheds in order to sustain the aquatic and riparian ecosystems upon which these native fish and wildlife species depend (consistent with the SFPUC mission, existing agreements, and applicable state and federal laws).
- The SFPUC will actively monitor the health of the terrestrial and aquatic habitats, both under SFPUC ownership and affected by SFPUC operations, in order to continually improve ecosystem health.

The Environmental Stewardship Policy calls for implementation and update of the Alameda and Peninsula WMPs (described above), development of habitat conservation plans for the Alameda and Peninsula watersheds (described above), and development and implementation of the Watershed Environmental Improvement Program (described in Chapter 3, Section 3.12, WSIP-Related Activities), as well as specific integration of this policy into the WSIP and individual infrastructure projects.

General Plans of Potentially Affected Counties

Chapter 4, Section 4.2.2, describes the applicability of city and county general plan policies to the WSIP facility improvement projects; much of that discussion also applies to the proposed WSIP water supply and system operations. No local agency approvals other than those of the CCSF are expected to be needed for the proposed water supply and system operations (see Chapter 3, Section 3.13). Any county required to determine consistency of a part of the WSIP with their general plan pursuant to California Government Code 65402(b) would be notified by the SFPUC prior to implementation. Notwithstanding the limited authority of cities and counties over implementation of the WSIP, where CCSF-owned facilities are sited and operated outside of San Francisco, the SFPUC seeks to work cooperatively with cities and counties to avoid conflicts with local plans and policies. For the WSIP, a key issue for local agencies that receive all or part of their water from the SFPUC is whether the WSIP adequately addresses community goals regarding water service for existing and future land uses; this topic is addressed in Section 4.2.3. A second issue of importance to local agencies is whether implementation of the WSIP would be consistent with community goals regarding resource protection. Counties in which WSIP operations could result in surface water or groundwater hydrology impacts and/or secondary biological effects include the following:

- Tuolumne
- Stanislaus
- Alameda
- San Joaquin
- Santa Clara
- San Mateo

Table 5.2-2 presents an overview of policies and goals from these counties' general plans that address water resources management and biological resources. The issues shown in the table are addressed in the impact analyses presented in Chapter 5. The only significance criterion applicable to the impact analysis in Chapter 5 regarding WSIP compatibility with certain aspects of local land use plans and polices is "Conflict with the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or state habitat conservation plan." This impact is analyzed in Sections 5.3.7, 5.4.6, and 5.5.6, Terrestrial Biological Resources in the Tuolumne, Alameda Creek, and Peninsula watersheds, respectively.

TABLE 5.2-2
SUMMARY OF GENERAL PLAN POLICIES OF COUNTIES WITH SURFACE WATER AND GROUNDWATER RESOURCES POTENTIALLY AFFECTED BY THE PROPOSED WSIP WATER SUPPLY AND SYSTEM OPERATIONS

Resource Area	Summary Description of General Plan Policy
Water Resources Management	Preserve water resources for all beneficial uses of water; ensure the adequate quantity and quality of water for municipal and industrial uses, agriculture, recreation, fish and wildlife, and Delta outflows for salinity repulsion.
	Recognize surface water resources of state and national significance for which environmental and scenic values must be protected; minimize alteration of natural water bodies; support "properly timed, sufficient flows" in rivers.
	Protect groundwater resources.
Biological Resources	Develop comprehensive watershed management plans to assure that cumulative impacts on water quality, reservoir operations, and watershed resources are addressed and mitigated.
	Recognize and protect resources of significant biological and ecological importance; protect habitats of rare and endangered fish and wildlife species; maintain adequate stream/river flows for salmon migration; protect fish and wildlife habitat and recreational uses when implementing water diversion projects; require that water projects contain safeguards to protect fish and wildlife; design public projects to avoid damage to freshwater and stream environments; require mitigation of impacts on sensitive areas (e.g., riparian habitats, vernal pools, rare plants, flyways, and other waterfowl habitats); restore freshwater habitats.
	Protect and restore natural resources like wetlands and riparian areas; achieve a "no net loss" of wetland areas through avoidance, protection, and appropriate mitigation; protect riparian habitat along rivers and natural waterways; address potential impacts on waterways and wetlands resulting from increased erosion and siltation.

Specific impacts on affected resources addressed in these plans—including water, biological, recreational, and visual resources—resulting from implementation of the WSIP water supply and system operations are analyzed by watershed in the corresponding sections of this chapter.

5.2.4 Plan Consistency Evaluation

The evaluation of plan/policy consistency in this section is based on the applicability of adopted plans and policies to the proposed WSIP water supply and system operations and associated effects. The consistency evaluation in this PEIR represents the best attempt to advise the decision-makers as to whether the proposed program is consistent with applicable *adopted* land use and resource plans and policies. No consistency determination is made for draft plans/policies, plans in development, guidance/planning documents, or agreements. However, the resources addressed in the draft plans/policies or guidance/planning documents are evaluated in the impact analyses in the appropriate sections of this chapter. In general, implementation of the WSIP would be consistent with natural resource and other applicable plans described in Section 5.2.3, particularly with respect to the WSIP sustainability goal of managing natural resources and physical systems to protect watershed ecosystems and with implementation of mitigation measures identified in this PEIR.

Consistency with Regional Natural Resource Protection Plans

WQCPs [water quality control plans] identify water quality issues and prescribe enforceable water quality objectives/criteria for specific water bodies and their tributaries. Because these standards are based on designated beneficial uses of the respective waterways, violation of the water quality objectives/criteria can adversely affect fish, wildlife, and other protected resources. SFPUC operations currently comply with water quality standards contained in the WQCPs, and the WSIP goals and objectives would be consistent with the applicable WQCPs. Further, as future SFPUC operations would be consistent with the water quality standards contained in the WQCPs, SFPUC operations would also be consistent with the SF Bay Plan freshwater inflow policies. The potential impacts of WSIP implementation on water quality in the Tuolumne River watershed and Sacramento–San Joaquin Delta, Alameda Creek watershed, Peninsula watershed, and Westside Groundwater Basin are analyzed in Sections 5.3.3, 5.4.3, 5.5.3, and 5.6, respectively.

One adopted HCP covering an area that could be affected by WSIP implementation was identified; this plan was prepared by the City of Waterford for the incidental take of valley elderberry longhorn beetle (VELB) on the Tuolumne River at a location between La Grange Dam and Modesto. The goals and objectives of the WSIP would be consistent with this HCP, and, as described in Section 5.3.7, implementation of the WSIP would not adversely affect the VELB or elderberry population in this plan area.

Consistency with CCSF Plans and Policies

San Francisco General Plan

The San Francisco General Plan provides general environmental resource policies related to the protection of natural resources, including freshwater resources. The WSIP goals and objectives would be consistent with the goals and objectives of this plan, and more specifically with policies related to freshwater resources. The impact analyses presented in Sections 5.3 through 5.7 of this chapter assess the potential for physical environmental impacts from implementation of the WSIP water supply and system operations. The impact analyses identify a variety of potentially significant physical impacts under all environmental topics, but, as described in those sections, many of these impacts would be reduced to a less-than-significant level with implementation of mitigation measures and compliance with applicable regulations, as outlined in Chapter 6.

San Francisco Sustainability Plan

The *San Francisco Sustainability Plan* was developed for the purpose of addressing San Francisco's long-term environmental sustainability. Water supply goals relevant to the WSIP deal with ensuring a sustainable and adequate water supply; maximizing public health by providing safe drinking water; ensuring public input into the water planning process; restoring and enhancing groundwater supplies; and upgrading infrastructure in a timely and environmentally sound manner. The WSIP water supply and system operations, and particularly the WSIP sustainability objective, would be consistent with the goals of the Sustainability Plan. The WSIP would be consistent with goals pertaining to increasing water reuse, ensuring an adequate water supply under normal and extraordinary conditions, restoring groundwater supplies, and upgrading infrastructure.

San Francisco Urban Water Management Plan

The *2005 Urban Water Management Plan for the City and County of San Francisco* evaluates regional water system reliability and the SFPUC's existing and planned sources of water supply. The plan describes demand management measures to be implemented and provides an implementation strategy and schedule for future planned projects and schedules. Information in the UWMP was used in the development of WSIP levels of service and complements the operational strategy and future water supplies proposed under the WSIP. Therefore, the WSIP is and would be inherently consistent with the UWMP.

Consistency with Adopted SFPUC Plans and Policies

Alameda and Peninsula Watershed Management Plans

Watershed management plans prepared by the SFPUC for the purpose of water resource management and planning provide much of the framework used in the development of various components of the WSIP. The Peninsula and Alameda WMPs are designed to improve the SFPUC's ability to protect its overall watershed as well as the specific resources that make up the watershed. The WMPs include goals and policies related to maximizing the local water supply and improving source water quality to protect public health and safety; these goals are aligned with the goals of the WSIP. As part of implementing the WMPs, the SFPUC Natural Resources Division will review WSIP activities proposed within these watersheds for conformity with the WMPs as well as for compliance with environmental codes and regulations; thus, changes in system operations proposed under the WSIP would be reviewed for conformity with the goals, policies, and management actions contained in the Alameda and Peninsula WMPs. Overall, the WSIP would be consistent with the WMPs. Potential impacts of WSIP system operations on water quality and biological resources in the Alameda and Peninsula watersheds are described in Sections 5.4 and 5.5 of this chapter.

SFPUC Water Enterprise Environmental Stewardship Policy

The WSIP would be consistent with the underlying goals of the Water Enterprise Environmental Stewardship Policy, particularly with respect to the WSIP sustainability goal and the WSIP objective to manage natural resources and physical systems to protect watershed ecosystems. The Stewardship Policy implementation strategy specifically calls for integration of the policy into the WSIP. However, implementation of the proposed water supply and system operations would affect stream flow in the Tuolumne River, Alameda Creek, and Peninsula watersheds, as analyzed and described in Sections 5.3.1, 5.4.1, and 5.5.1. This operational change and resultant effects on stream flow could in turn affect native fish and wildlife downstream of SFPUC dams and water diversions, within SFPUC reservoirs, and on SFPUC watershed lands. Impacts on fisheries and the terrestrial biological resources in the Tuolumne River, Alameda Creek, and Peninsula watersheds are analyzed in Sections 5.3.6, 5.3.7, 5.4.5, 5.4.6, 5.5.5, and 5.5.6. Mitigation measures described in Chapter 6 identify operational approaches to managing releases from SFPUC reservoirs and other measures to reduce impacts on fisheries and other biological resources.

Consistency of WSIP Operations with the General Plans of Potentially Affected Counties

Overall, the WSIP water supply and system operations would be generally consistent with the community goals related to water resources protection described above. Through preparation of this PEIR and attendant scoping and public outreach efforts, the CCSF has systematically identified significant environmental impacts associated with the WSIP as well as feasible measures and alternatives to avoid or substantially lessen such effects. The impact analyses presented in this PEIR reflect the intent of general plan policies related to the protection of water resources. As detailed throughout the rest of Chapter 5, most of the environmental impacts associated with the proposed water supply and system operations would be reduced to a less-than-significant level with measures proposed as part of the WSIP or otherwise committed to by the SFPUC.

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5.3 Tuolumne River System and Downstream Water Bodies

5.3 Tuolumne River System and Downstream Water Bodies

Section 5.3 Subsections

5.3.1 Stream Flow and Reservoir Water Levels

The following setting section describes the streams and reservoirs in the Tuolumne River watershed and downstream that could be affected by the WSIP. The impact section (Section 5.3.1.2) provides a description of the changes in stream flow and reservoir water levels that would result from implementation of the WSIP.

5.3.1.1 Setting

The Tuolumne River flows from the crest of the Sierra Nevada westward to its confluence with the San Joaquin River. The San Joaquin River flows north to the Sacramento–San Joaquin Delta. Water from the Delta discharges to the San Francisco Bay Estuary and the Pacific Ocean.

Surface water bodies in the Tuolumne River system that could be affected by the proposed program include the Tuolumne River, Cherry Creek, Eleanor Creek, and a quarter-mile reach of Moccasin Creek. Several reservoirs could be affected by the WSIP, including Hetch Hetchy Reservoir, Lake Lloyd, Lake Eleanor, and Don Pedro Reservoir. Because the Tuolumne River drains to the San Joaquin River and the Sacramento–San Joaquin Delta, these water bodies could also be affected by the WSIP. The proposed program could affect flow in the streams and water levels and water quality in the reservoirs.

Tuolumne River

General Description

The Tuolumne River rises in Yosemite National Park and flows approximately 130 miles to its confluence with the San Joaquin River about 10 miles west of the city of Modesto. Its headwaters are streams that descend the slopes of Mount Lyell and Mount Dana in the Sierra Nevada and join to form the river itself at Tuolumne Meadows. The Tuolumne River drains an area of 1,958 square miles. Its watershed is shown in **Figure 5.3.1-1**.

From Tuolumne Meadows (at an elevation of 8,600 feet above sea level), the river descends rapidly through a deep canyon in wilderness areas of Yosemite National Park to Hetch Hetchy Reservoir (at an elevation of about 3,500 feet). Six miles below O'Shaughnessy Dam, which impounds Hetch Hetchy Reservoir, the Tuolumne River leaves Yosemite National Park and enters the Stanislaus National Forest. Except for a short reach at Early Intake Reservoir, the river flows unimpeded through a deep canyon for approximately 40 miles, from O'Shaughnessy Dam to the upstream end of Don Pedro Reservoir.

Don Pedro Reservoir is at an elevation of about 500 feet. Several tributaries, including Cherry Creek, Jawbone Creek, the Clavey River, the North Fork of the Tuolumne River, and Turnback Creek, join the river from the north between Hetch Hetchy and Don Pedro Reservoirs. The South Fork of the Tuolumne joins the river from the south. Moccasin Creek and Woods Creek drain directly into Don Pedro Reservoir.

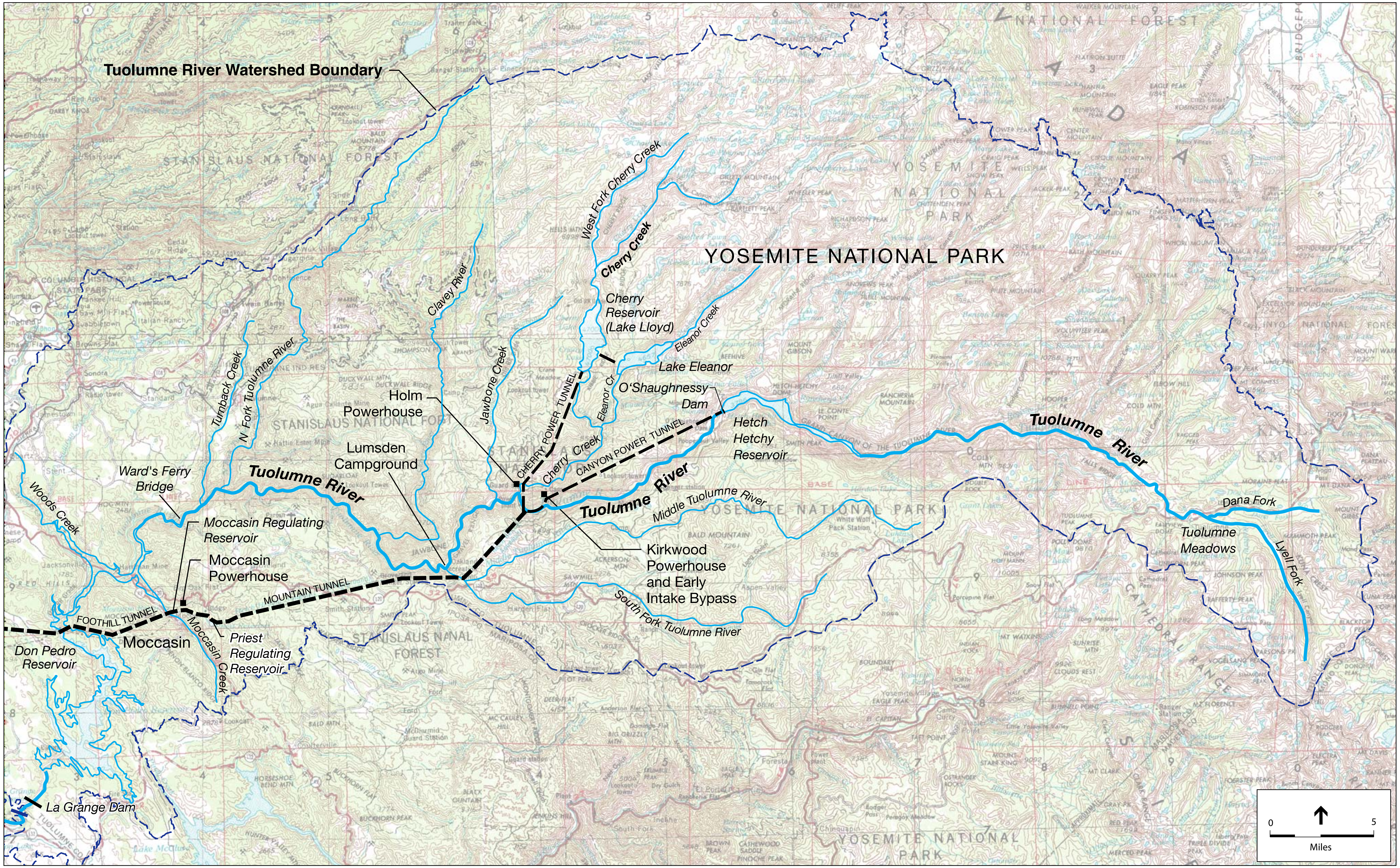
Below Don Pedro Reservoir, the Tuolumne River flows 2.3 miles to La Grange Dam, where water is diverted into two irrigation canals. Below La Grange Dam, the Tuolumne River descends through the Sierra Nevada foothills to the floor of the San Joaquin Valley and on to its confluence with the San Joaquin River, which is at an elevation of about 60 feet above sea level. This reach of the river flows through land used primarily for irrigated agriculture. A major tributary, Dry Creek, joins the river from the north in the city of Modesto.

Runoff in the Tuolumne River basin is produced by rainfall and snowmelt. Rainfall runoff occurs primarily in the Sierra foothills and the valley floor between December and March. Runoff from the upper basin is produced by snowmelt and occurs primarily between April and July. Annual runoff in the Tuolumne River basin is highly variable. Average annual "unimpaired" runoff[1] at Don Pedro Reservoir is estimated to be about 1.85 million acre-feet for the period from 1918 to 1991. The maximum estimated value is 3.84 million acre-feet in 1969, and the minimum is 0.39 million acre-feet in 1977 (Beck, 1992).

Stream Flow and Water System Operations

Flow in the Tuolumne River remained unaffected by humans until the 1860s, when water from the lower reaches of the river began to be diverted for agricultural irrigation. In 1871, a private company constructed Wheaton Dam near the site of present-day La Grange Dam. Wheaton Dam was used to divert water into irrigation canals. In 1887, the newly formed Turlock Irrigation District (TID) and Modesto Irrigation District (MID) constructed a new diversion dam, La Grange Dam, to replace Wheaton Dam (TID/MID, 2005).

1 Unimpaired flow at a point on a river is the flow that would have occurred if there were no upstream water diversions or storage reservoirs. For the Tuolumne River, it is roughly equivalent to "natural flow"; that is, the flow that would have occurred prior to Euro-American settlement.



SOURCE: ESA+Orion, 2006; USGS 1970

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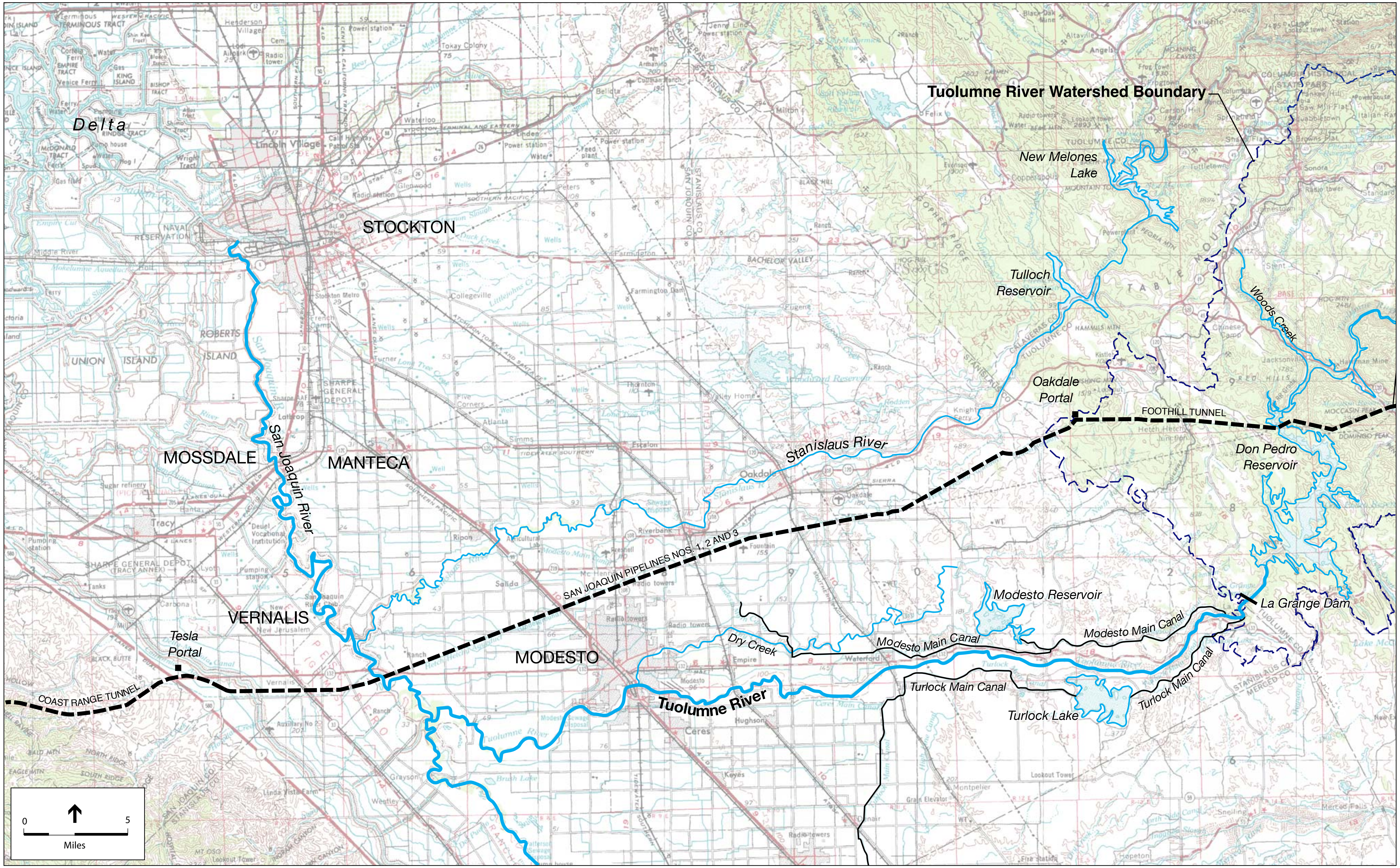
Figure 5.3.1-1a
Tuolumne River Watershed,
Headwaters to Don Pedro Reservoir



SOURCE: ESA+Orion, 2006; USGS 1970

SFPUC Water System Improvement Program . 203287

Figure 5.3.1-1b
Tuolumne River Watershed,
Don Pedro Reservoir to San Joaquin River

Early in the 20th century, development of the Tuolumne River accelerated. In 1918, the City and County of San Francisco (CCSF) completed Lake Eleanor, a reservoir on Eleanor Creek. Eleanor Creek is a tributary of Cherry Creek, which is itself a tributary of the Tuolumne River. Hetch Hetchy Reservoir and the original Don Pedro Reservoir, on the main stem of the river, were completed in 1923 (Hetch Hetchy by the CCSF and Don Pedro Reservoir by TID and MID). Hetch Hetchy Reservoir was expanded in 1938. In 1955, the CCSF completed Lake Lloyd on Cherry Creek. In 1971, TID and MID completed the new Don Pedro Reservoir, a much larger reservoir two miles downstream of the site of the original Don Pedro Reservoir (SFPUC, 2005).

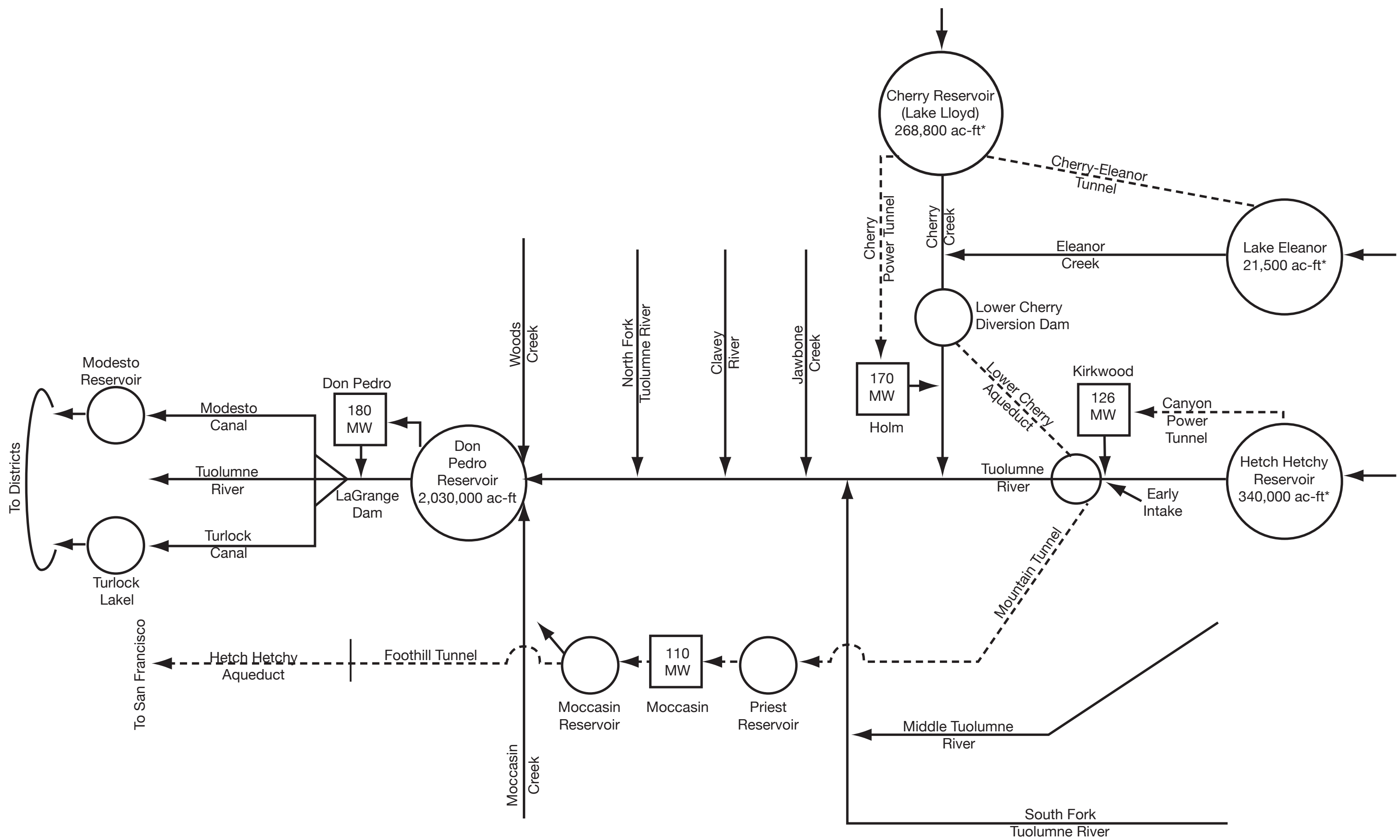
Hetch Hetchy Reservoir, Lake Eleanor, and Lake Lloyd are owned by the CCSF and operated by the SFPUC, and Don Pedro Reservoir is owned and operated by TID and MID. The CCSF paid a portion of the construction costs of Don Pedro Reservoir and in return has indirect access to, and control of, a portion of the storage capacity of the reservoir by means of a water banking arrangement with the districts.[2]

Figure 5.3.1-2 is a diagrammatic representation of the natural features of the Tuolumne River showing the water and hydropower facilities that affect flow in the river. The figure also shows the approximate storage capacity of the reservoirs and the electrical generation capacity of the hydropower facilities.

The SFPUC diverts water from Hetch Hetchy Reservoir in the upper Tuolumne River basin and conveys it to the Bay Area in the Hetch Hetchy Aqueduct. The Hetch Hetchy Aqueduct consists of a series of facilities extending from Hetch Hetchy Reservoir to Crystal Springs Reservoir in San Mateo County (see Figure 2.1 in Chapter 2). Water leaves Hetch Hetchy Reservoir in the Canyon Power Tunnel, which delivers water to Kirkwood Powerhouse at Early Intake. Water leaving the powerhouse is either returned to the Tuolumne River or discharged into the Mountain Tunnel. The Mountain Tunnel conveys water to Priest Reservoir and Moccasin Powerhouse. Water discharged from Moccasin Powerhouse is either returned to the Tuolumne River via Moccasin Reservoir and Moccasin Creek or discharged to the Foothill Tunnel for conveyance to the Bay Area. Priest and Moccasin Reservoirs are small reservoirs used to control flow into Moccasin Powerhouse and regulate discharge of water to Moccasin Creek.

The SFPUC diverts an average of 244,000 acre-feet per year (afy) (218 million gallons per day [mgd]) from the Tuolumne River at Hetch Hetchy Reservoir and uses it for municipal water supply to about 2.4 million people in Tuolumne, Alameda, Santa Clara, San Mateo, and San Francisco Counties. Additional water is diverted at Hetch Hetchy Reservoir for hydropower generation at Kirkwood Powerhouse, but is returned to the Tuolumne River below Early Intake. The water diverted by the SFPUC for water supply represents about 32.5 percent of the average annual unimpaired runoff at Hetch Hetchy Reservoir, which is estimated to be 749,607 acre-feet. **Figure 5.3.1-3** shows the historical record of water storage in Hetch Hetchy Reservoir, as reflected in water levels, from 1989 to 2005.

2 The SFPUC does not have direct access to its portion of storage in Don Pedro Reservoir. Instead, the SFPUC diverts water at Hetch Hetchy Reservoir by withholding water that TID and MID are entitled to receive under the Raker Act, thereby reducing the SFPUC's storage in Don Pedro Reservoir.

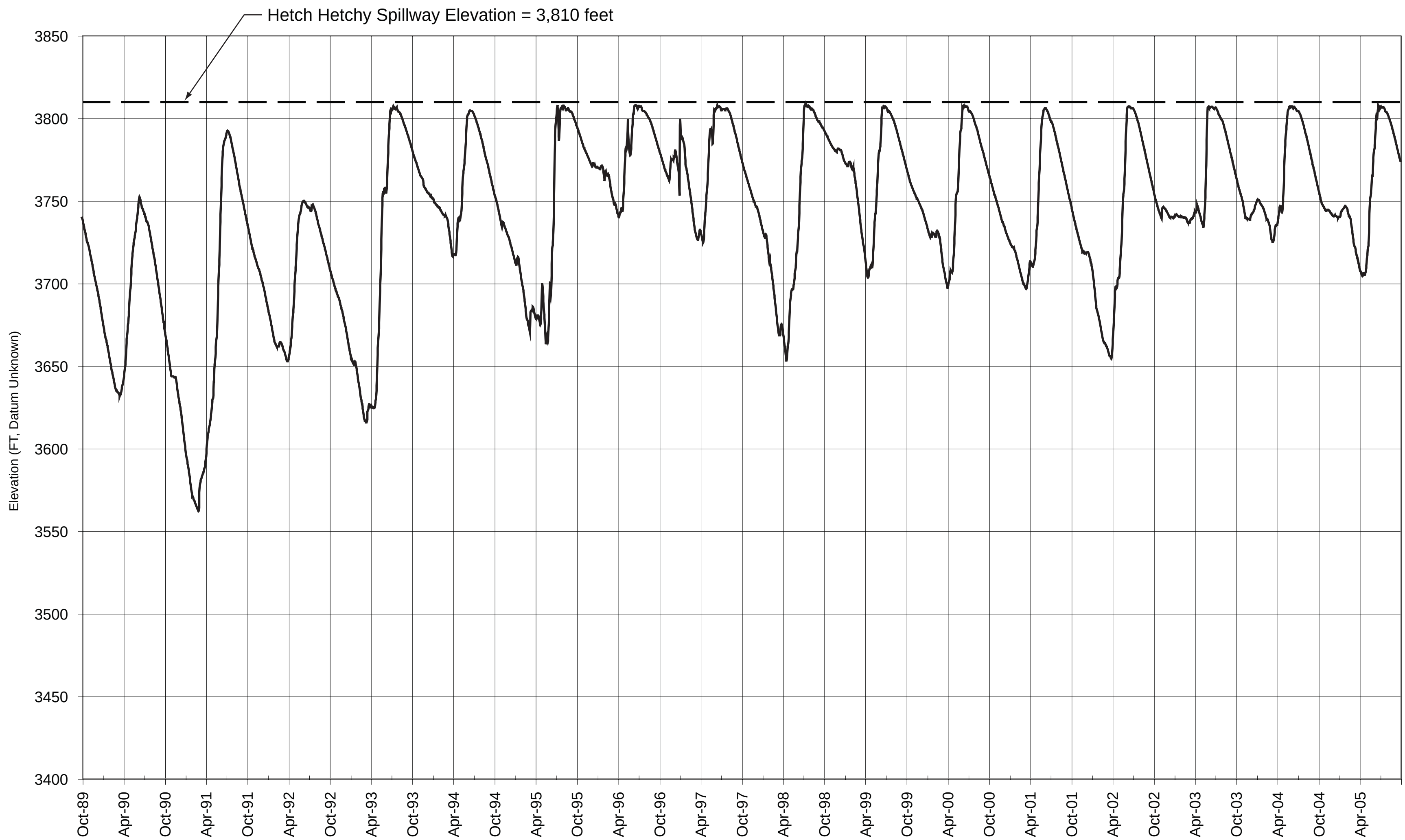


Districts = Turlock Irrigation District and Modesto Irrigation District

*Reservoir capacities without flashboards installed and with drum gates lowered.

SOURCE: Beck, 1992; SFPUC, 2004

Figure 5.3.1-2
Tuolumne River Schematic
Showing Water and Hydropower Facilities



SOURCE: SFPUC, 2007

SFPUC Water System Improvement Program . 203287

Figure 5.3.1-3
Hetch Hetchy Reservoir, Historical Water Levels, 1989 to 2005

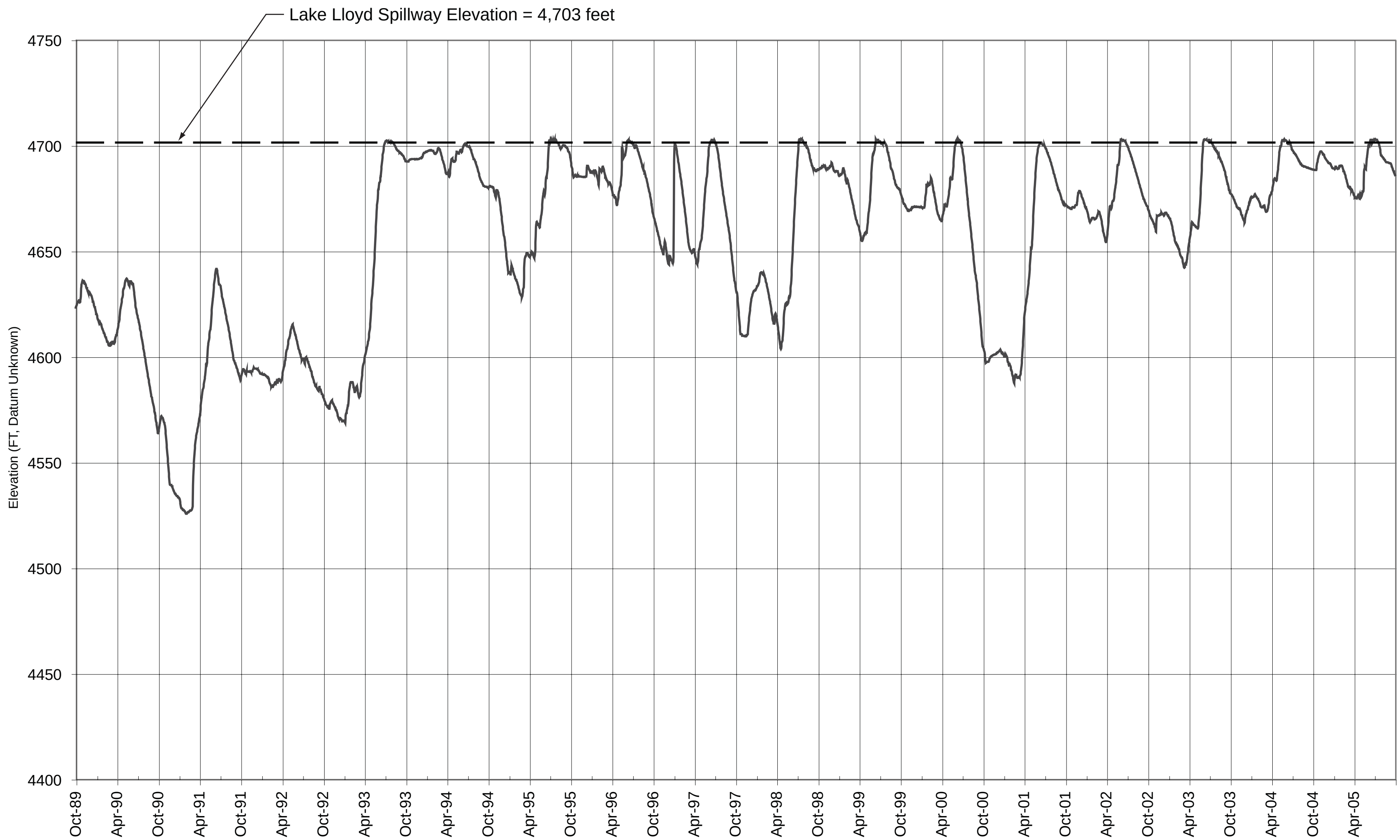
The SFPUC uses most of the water impounded in Lake Lloyd to generate electrical power at Holm Powerhouse. Water released from the powerhouse returns to Cherry Creek and is used to satisfy TID's and MID's flow entitlement. Water impounded in Lake Eleanor is conveyed to Lake Lloyd and then to Holm Powerhouse for electric power generation. **Figures 5.3.1-4** and **5.3.1-5** show the historical record of water storage in Lake Lloyd and Lake Eleanor, respectively, as reflected in water levels, from 1989 to 2005.

TID and MID divert water from the Tuolumne River at La Grange Dam. Water is conveyed to users in the two districts' service areas via the Modesto and Turlock Canals. Most of the users of water from the two canals are farmers, but some water is used for municipal supply by the city of Modesto. TID and MID divert an annual average of about 867,000 acre-feet from the Tuolumne River. **Figure 5.3.1-6** shows the historical record of water storage in Don Pedro Reservoir, as reflected in water levels, from 1989 to 2005. Average annual unimpaired runoff at La Grange Dam is estimated to be 1,850,000 acre-feet. Thus, TID and MID currently divert 49.6 percent of the estimated average unimpaired flow of the Tuolumne River at La Grange. Together, the SFPUC, TID, and MID divert and use about 62.8 percent of the estimated average unimpaired flow of the Tuolumne River at La Grange.

Table 5.3.1-1 shows monthly average flows in the Tuolumne River below Hetch Hetchy Reservoir, below La Grange Dam, and at Modesto under current conditions, calculated from stream gaging records. Monthly average flows below Hetch Hetchy Reservoir range from 382 to 2,293 cubic feet per second (cfs) and peak in the late spring and early summer as the snow in the Sierra Nevada melts. Monthly average flows in the Tuolumne River below La Grange range from 243 to 1,884 cfs. Monthly average flows in the river at Modesto range from 431 to 2,236 cfs. Monthly average flows below La Grange and at Modesto peak in the late winter and early spring as a result of rainfall runoff and releases from Don Pedro Reservoir. Water may be released from Don Pedro Reservoir in the late winter and spring to provide capacity in the reservoir for floodwaters and snowmelt.

Reservoirs and diversions have altered the magnitude and seasonal patterns of flow in the Tuolumne River. Prior to construction of the reservoirs, the river experienced large and sustained flows in the spring as snow melted at higher elevations in the watershed. Now a portion of the spring flows is stored in the reservoirs for later municipal or agricultural use. Peak flows below reservoirs, particularly the large Don Pedro Reservoir, are greatly reduced from their historical value. The two-year return-period flood flow in the Tuolumne River downstream of La Grange Dam is 4,100 cfs; its predevelopment value was 21,000 cfs. The 20-year return-period flood flow on the Tuolumne River downstream of La Grange Dam is 11,000 cfs; its predevelopment value was 59,000 cfs (FERC, 1996).

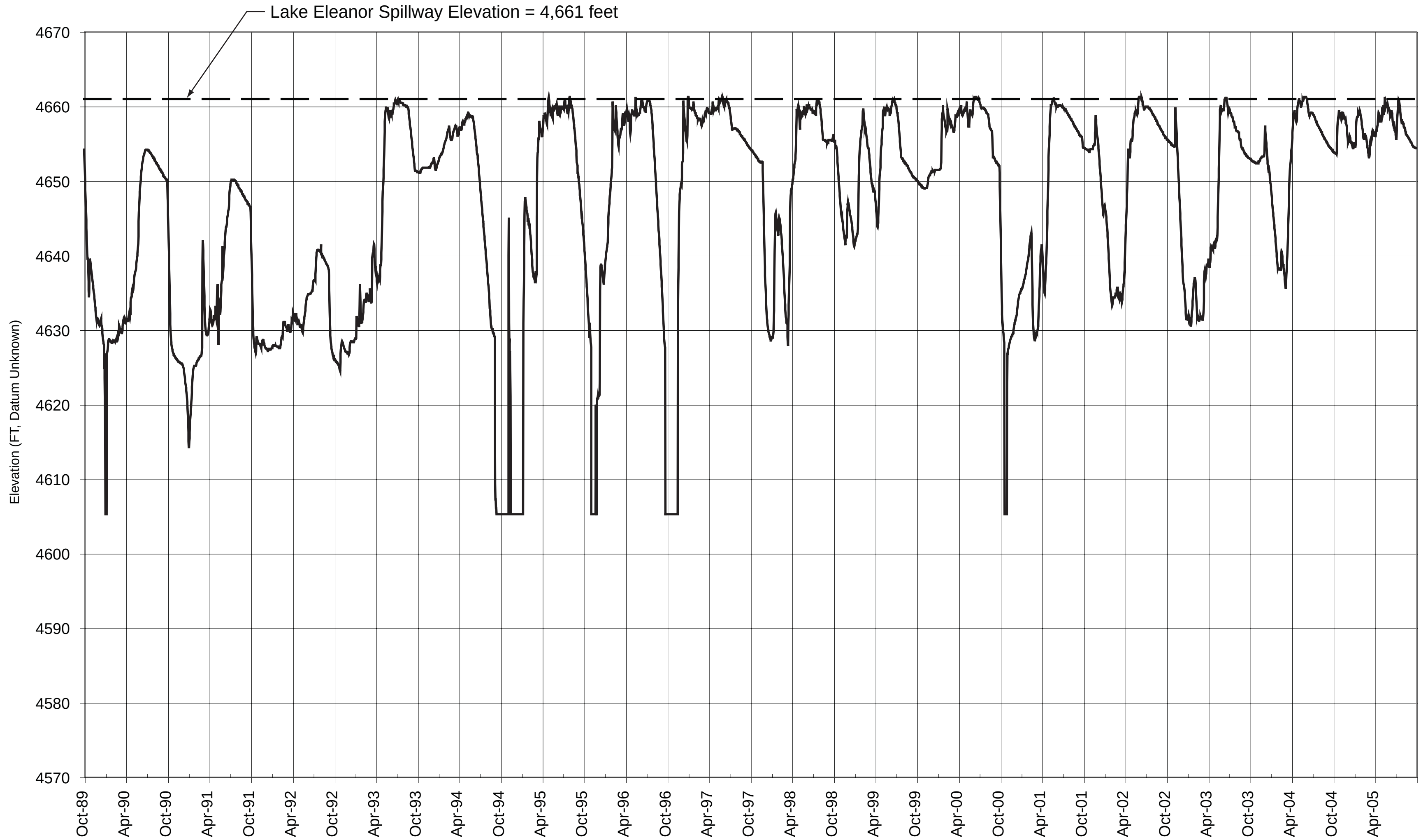
As discussed below, various regulations and agreements require that reservoir operators maintain minimum flows in the Tuolumne River and its tributaries downstream of dams. During the late summer and early fall, the required minimum flows may be greater than those that occurred prior to development.



SOURCE: SFPUC, 2007

SFPUC Water System Improvement Program . 203287

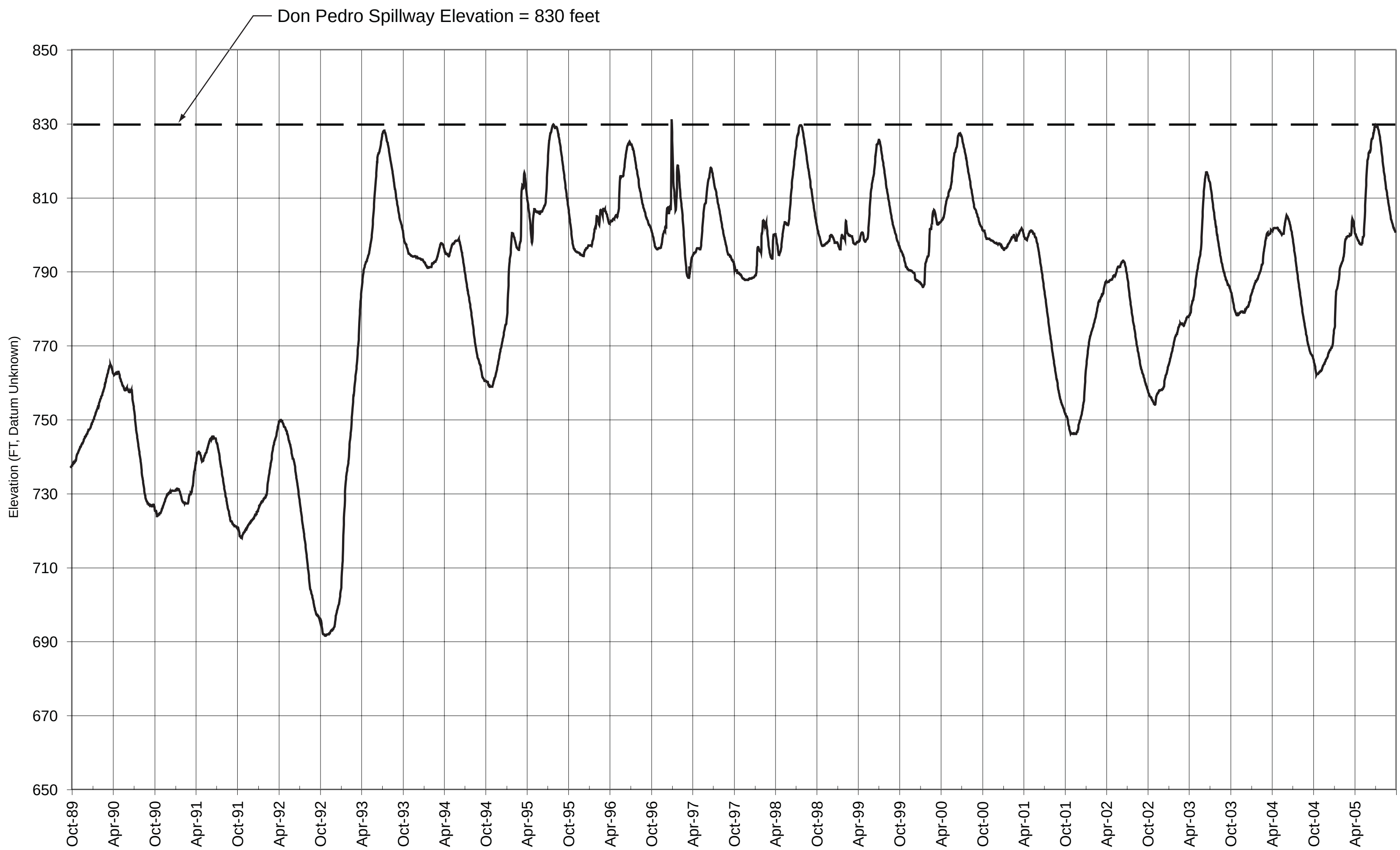
Figure 5.3.1-4
Lake Lloyd, Historical Water Levels, 1989 to 2005



SOURCE: SFPUC, 2007

SFPUC Water System Improvement Program . 203287

Figure 5.3.1-5
Lake Eleanor, Historical Water Levels, 1989 to 2005



SOURCE: SFPUC, 2007

SFPUC Water System Improvement Program . 203287

Figure 5.3.1-6
Don Pedro Reservoir, Historical Water Levels, 1989 to 2005

TABLE 5.3.1-1
MEAN MONTHLY STREAM FLOWS AT SELECTED LOCATIONS ON WATERWAYS POTENTIALLY AFFECTED BY THE WSIP
(cubic feet per second)

Location	Tuolumne River below Hetch Hetchy	Tuolumne River below La Grange	Tuolumne River at Modesto	San Joaquin River at Newman	San Joaquin River at Vernalis	Delta Freshwater Outflow
Period	1937–2003	1974–2004	1974–2004	1942–2004	1943–2004	1984–2004
January	384	1,484	1,840	2,334	5,353	44,035
February	351	1,884	2,236	3,249	6,947	61,511
March	374	1,845	2,209	3,186	7,061	50,090
April	565	1,591	1,835	2,989	6,586	25,326
May	1,344	1,417	1,644	2,847	6,730	21,166
June	2,293	694	899	2,274	5,181	13,077
July	1,116	438	615	1,008	2,322	8,715
August	461	243	431	510	1,496	6,075
September	402	498	711	600	1,880	6,427
October	385	681	937	704	2,422	6,946
November	382	368	724	679	2,386	11,394
December	403	854	1,142	1,189	3,710	23,820

SOURCES: USGS, 2005a, 2005b, 2005c; DWR, 2007.

Minimum Releases to Support Fisheries

Dams and reservoirs alter the pattern of flow in the streams they impound. Depending on their size and type of use, these facilities can completely eliminate flow in the streams below the dams. The owners of some dams and reservoirs, including the SFPUC, MID, and TID, have agreed to make minimum releases to stream channels below dams to support fish and aquatic life.

Below Hetch Hetchy Reservoir. In accordance with an agreement with the U.S. Department of the Interior, the SFPUC releases a minimum stream flow from Hetch Hetchy Reservoir.[3] Minimum flow requirements depend on the hydrologic year type and are shown in **Table 5.3.1-2**. Releases in normal, dry, and critical years total at least 59,235, 50,019, and 35,215 acre-feet. The SFPUC must release an additional 64 cfs into the river below Hetch Hetchy Reservoir when the diversion through Canyon Tunnel exceeds 920 cfs. Finally, the agreement provides for an additional supplemental release, depending on hydrologic year type, subject to the completion of a fish habitat study and the determination of appropriate timing for the release. Once made, releases cannot be diverted below O'Shaughnessy Dam (i.e., at Early Intake); they flow down the Tuolumne River, are supplemented by tributary flow and releases at Kirkwood Powerhouse, and enter Don Pedro Reservoir.

3 Stipulation for the Amendment of Rights-of-Way for Canyon Power Project Approved by Secretary of the Interior on May 26, 1961, to fulfill the conditions set forth in Provision 6 of said Amended Permit, dated January 31, 1985, *as modified by*, Modification for Kirkwood Powerhouse Unit No.3 to Stipulation for Amendment of Rights-of-Way for Canyon Power Project Approved by Secretary of the Interior on May 26, 1961, to fulfill the conditions set forth in Provision 6 of said Amended Permit, as dated March 10, 1987.

TABLE 5.3.1-2
SCHEDULE OF AVERAGE DAILY MINIMUM REQUIRED RELEASES TO SUPPORT FISHERIES BELOW O'SHAUGHNESSY DAM

	Year Type A		Year Type B		Year Type C
Month	Release	Criteria[a,b]	Release	Criteria[a,b]	Release
January	50 cfs	8.80 inches	40 cfs	6.10 inches	35 cfs
February	60 cfs	14.00 inches	50 cfs	9.50 inches	35 cfs
March	60 cfs	18.60 inches	50 cfs	14.20 inches	35 cfs
April	75 cfs	23.00 inches	65 cfs	18.00 inches	35 cfs
May	100 cfs	26.60 inches	80 cfs	19.50 inches	50 cfs
June	125 cfs	28.45 inches	110 cfs	21.25 inches	75 cfs
July	125 cfs	575,000 acre-feet	110 cfs	390,000 acre-feet	75 cfs
August	125 cfs	640,000 acre-feet	110 cfs	400,000 acre-feet	75 cfs
September 1–14	100 cfs		80 cfs		75 cfs
September 15–30	80 cfs		65 cfs		50 cfs
October	60 cfs		50 cfs		35 cfs
November	60 cfs		50 cfs		35 cfs
December	50 cfs		40 cfs		35 cfs

[a] Precipitation indicators in inches are cumulative, measured at Hetch Hetchy Reservoir, starting October 1. For example, if October 1 through December 31 precipitation is greater than or equal to 8.80 inches, refer to year type A schedule for January.
[b] Runoff indicators in acre-feet are the calculated inflow into Hetch Hetchy Reservoir commencing on the previous October 1 of each year.

SOURCE: See Footnote 3, page 5.3.1-12.

Below Lake Lloyd. The minimum required stream flow below Lake Lloyd is 5 cfs from October through June and 15 cfs from July through September.

Below Lake Eleanor. In years when no pumping occurs between Lake Eleanor and Lake Lloyd, the minimum required stream flow below Lake Eleanor is 5 cfs from October through June and 15.5 cfs from July through September. In years when pumping occurs, the minimum required stream flow is 5 cfs from November through February, 10 cfs from March 1 through April 14, 20 cfs from April 15 through September 15, and 10 cfs from September 16 through October.

Below Don Pedro Reservoir/La Grange Dam. TID and MID are required to maintain minimum stream flows in the Tuolumne River at La Grange Bridge below Don Pedro Reservoir and La Grange Dam as a condition of their license to operate the Don Pedro Project (issued by the Federal Energy Regulatory Commission, or FERC). Minimum required releases are 100 to 300 cfs from October 1 to 15 and 150 to 300 cfs from October 16 to May 31, depending on hydrologic conditions. From June 1 to September 30, the minimum required releases range from 50 to 250 cfs depending on hydrologic conditions. Additional pulse releases must be made to assist upstream migrating adult Chinook salmon and downstream migrating juveniles. Minimum annual releases from La Grange Dam, including the pulse releases, vary from at least 94,000 acre-feet in critically dry years to approximately 300,000 acre-feet in above-normal and wet years. A detailed minimum stream flow schedule is shown in **Table 5.3.1-3**.

TABLE 5.3.1-3
MINIMUM STREAM FLOW REQUIREMENTS – TUOLUMNE RIVER AT LA GRANGE BRIDGE

Schedule	Days per Year	Critical Year and Below	Median Critical Year	Intermediate Critical – Dry Year	Median Dry	Intermediate Dry – Below-Normal Year	Median Below-Normal Year	All Years above Median Below-Normal Years
Occurrence		**6.4%**	**8.0%**	**6.1%**	**10.8%**	**9.1%**	**10.3%**	**49.3%**
October 1 – October 15	15	100 cfs 2,975 ac-ft	100 cfs 2,975 ac-ft	150 cfs 4,463 ac-ft	150 cfs 4,463 ac-ft	180 cfs 5,355 ac-ft	200 cfs 5,950 ac-ft	300 cfs 8,926 ac-ft
Attraction Pulse Flow		None	None	None	None	1,676 ac-ft	1,736 ac-ft	5,950 ac-ft
October 16 – May 31	228	150 cfs 67,835 ac-ft	150 cfs 67,835 ac-ft	150 cfs 67,835 ac-ft	150 cfs 67,835 ac-ft	180 cfs 81,402 ac-ft	175 cfs 79,140 ac-ft	300 cfs 135,669 ac-ft
Outmigration Pulse Flow		11,091 ac-ft	20,091 ac-ft	32,619 ac-ft	37,060 ac-ft	35,920 ac-ft	60,027 ac-ft	89,882 ac-ft
June 1 – September 30	122	50 cfs 12,099 ac-ft	50 cfs 12,099 ac-ft	50 cfs 12,099 ac-ft	75 cfs 18,149 ac-ft	75 cfs 18,149 ac-ft	75 cfs 18,149 ac-ft	250 cfs 60,496 ac-ft
Volume (ac-ft)	365	94,000	103,000	117,016	127,507	142,502	165,002	300,923

SOURCE: FERC, 1996.

[Additional discussion on flows in the Tuolumne River was prepared in response to comments on the Draft PEIR. Please refer to Section 14.6, Master Response on Upper Tuolumne River Issues, and Section 14.7, Master Response on Lower Tuolumne River Issues (Vol. 7, Chapter 14).]

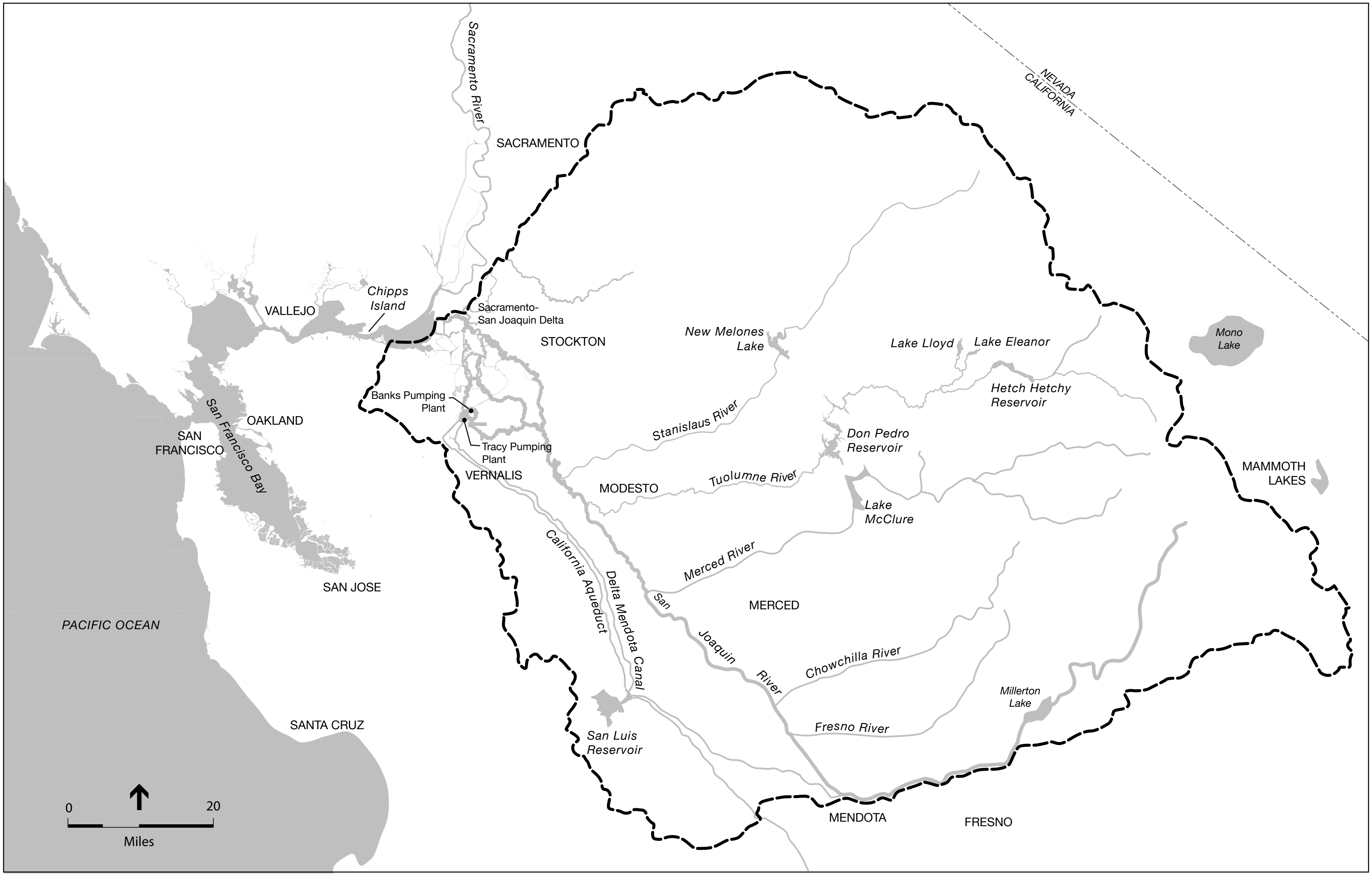
San Joaquin River

General Description

The San Joaquin River rises in the Sierra Nevada west of Mammoth Lakes and drains an area of approximately 13,500 square miles. The river flows southwestward, through the Sierra foothills, to the floor of the San Joaquin Valley near the city of Fresno. After reaching the valley floor, it turns and flows northwest for about 100 miles to the Sacramento–San Joaquin Delta. Several major tributaries join the San Joaquin River from the east, including the Fresno, Chowchilla, Merced, Tuolumne, and Stanislaus Rivers. The San Joaquin River watershed is shown in **Figure 5.3.1-7**.

Stream Flow and Water System Operations

Flow in the San Joaquin River is controlled by releases from Millerton Lake on the main stem of the river and from several reservoirs on the San Joaquin's tributaries. Millerton Lake is part of the federal Central Valley Project. It is impounded by Friant Dam, which was completed in 1942. The Central Valley Project's Friant-Kern and Madera Canals convey most of the runoff from the San Joaquin River drainage above Millerton Reservoir to agricultural and urban water users. The U.S. Bureau of Reclamation (USBR) releases enough water at Friant Dam to maintain a flow of 5 cfs past Gravelly Ford, which is 35 miles below the dam, to meet downstream riparian water rights. The reach of the river between Gravelly Ford and Mendota is essentially dry, except when flood releases are being made. In the future, flow will be restored in the San Joaquin River between Friant Dam and the confluence with the Merced River in accordance with a recent settlement agreement between the USBR and an environmental advocacy organization, the Natural Resources Defense Council.



SOURCE: ESA + Orion

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Figure 5.3.1-7
San Joaquin River Watershed

The San Joaquin River gains water as it flows toward the Sacramento–San Joaquin Delta from agricultural irrigation return flows and tributaries. Flow in the San Joaquin River at Newman upstream of the river's confluence with the Tuolumne River averaged 1,789 cfs based on stream flow gaging records for the period between 1942 and 2004. Flow in the San Joaquin River at Vernalis, upstream of the Delta and downstream of the Tuolumne River confluence, averaged 4,328 cfs based on stream flow gaging records for the period between 1942 and 2004. Mean monthly stream flows at Newman and Vernalis are shown in Table 5.3.1-1. The highest flows occur in February, March, April, and May and the lowest in August and September. A substantial proportion of the increase in San Joaquin River flow between Newman and Vernalis is contributed by the Tuolumne River, which has an average annual flow of 1,265 cfs as measured at Modesto.

Sacramento–San Joaquin Delta

General Description

The Sacramento–San Joaquin Delta is a 600-square-mile area of channels and islands at the confluence of the Sacramento and San Joaquin Rivers. Freshwater draining from a 41,300-square-mile watershed enters the Delta from the Sacramento and San Joaquin Rivers and several smaller rivers. Some of the freshwater is diverted from the Delta channels for municipal and agricultural purposes. The remainder flows through the Delta to the San Francisco Bay Estuary.

The Delta is a tidal region. Every 12.4 hours, the tides cause water to move in and out of the Delta. Most of the time, tides cause a five- to eight-mile back and forth movement of water in the western part of the Delta. The average tidal flow into the Delta on the flood tide and out of the Delta on the ebb tide is 170,000 cfs (Miller, 1993). The movement of freshwater through the Delta is superimposed on the tidal flows. Typical freshwater flows are much smaller than tidal flows, usually in the range of 5 to 15 percent of the tidal flows.

Stream Flow and Water System Operations

On average, about 21 million acre-feet of water reaches the Delta annually, but actual inflow varies widely from year to year and within the year. In 1977, a year of extraordinary drought, Delta inflow totaled 5.9 million acre-feet. In 1983, an exceptionally wet year, Delta inflow was about 70 million acre-feet. On a seasonal basis, average monthly flow into the Delta varies by more than a factor of 10 between the highest month in the winter or spring and the lowest month in the fall (SWRCB, 1997).

The Sacramento River, which enters the Delta from the north, contributes an average of 77 percent of the inflow to the Delta. The San Joaquin River, which enters the Delta from the south, contributes about 15 percent of the inflow. The remainder is contributed by the Mokelumne, Cosumnes, and Calaveras Rivers, which enter the Delta from the east (DWR, 1998).

Most of the Delta islands are used to grow crops. Delta farmers divert water directly from the Delta channels to irrigate their land. A portion of the diverted water is returned to the Delta channels as agricultural return. The average annual net diversion of water for irrigation within the Delta is estimated to be 960,000 acre-feet (San Francisco Estuarine Project, 1992).

California's two largest engineered water systems, the Central Valley Project and the State Water Project, also divert water from the Delta. The Central Valley Project diverts water from Old River in the south Delta at the Jones Pumping Plant (formerly Tracy Pumping Plant) and exports it to Central Valley Project contractors via the Delta-Mendota Canal. Contra Costa Water District, a Central Valley Project contractor, diverts its water from Old River and Rock Slough in the south Delta and Mallard Slough in the west Delta. The State Water Project diverts water from Old River at the Banks Pumping Plant and exports it to customers via the California Aqueduct, the South Bay Aqueduct, and the Central Coast Aqueduct. The State Water Project diverts smaller amounts of water from Barker Slough in the north Delta to serve customers in Napa and Solano Counties. Between 1995 and 2004, the State Water Project diverted an average of 2.4 million afy from the Delta. The Central Valley Project diverts an average of 1.7 million afy from the Delta.

Delta freshwater outflow, commonly referred to simply as Delta outflow, is roughly equal to Delta inflow minus net water diversions in the Delta for use in the Delta and diversions for export. Like Delta inflow, Delta outflow varies widely from month to month and from year to year. Between 1984 and 2004, Delta outflow averaged 16.9 million acre-feet. The greatest annual Delta outflow in the period was 43.5 million acre-feet in 1998. The smallest Delta outflow in the period was 3.9 million acre-feet in 1990 (DWR, 2007). Average monthly Delta outflow for the same period is shown in Table 5.3.1-1. The largest Delta outflow typically occurs in January, February, and March, when surface runoff is high and demand for irrigation water is low. The smallest Delta outflow typically occurs in July, August, September, and October.

The diversion of water by the Central Valley Project, State Water Project, and others in the south Delta as well as upstream depletion of San Joaquin River flows affect the pattern of flow in the Delta channels. Historically, net flow in the Delta channels was toward the San Francisco Bay Estuary. Now, because freshwater inflow to the south Delta from the San Joaquin River is small relative to the diversions at the Banks and Tracy Pumping Plants, net flow in many south Delta channels reverses during summer and fall. Flow in the lower San Joaquin River and the south Delta channels is directed upstream toward the pumping plants rather than downstream toward the estuary (Miller, 1993).

The diminution of flow and flow reversals in the lower San Joaquin River as a result of water diversions by the State Water Project and Central Valley Project are harmful to migrating salmon. In 1990, the California Department of Water Resources (DWR) began installing temporary barriers in several waterways in the south Delta to improve conditions for migrating salmon. Temporary barriers have been placed across the Grant Line Canal, Middle River, and Old River. The purpose of the barriers is to control water levels for irrigators, improve water quality, and direct more water down the lower San Joaquin River for downstream migrating juvenile salmon in the spring and upstream migrating adults in the fall. It is expected that permanent operable barriers will replace the temporary barriers in the future years.

Flow Objectives for the Sacramento–San Joaquin Delta

As noted above, the Sacramento–San Joaquin Delta lies at the heart of California's natural and manmade water systems. The Delta's physical complexity and competing interests for water make management of the Delta difficult. Since water quality objectives alone are insufficient to protect the Delta, regulators have also established objectives for flow. These objectives have been the subject of much controversy and have frequently been revised. Some issues remain unresolved, including the degree to which parties that divert water upstream of the Delta are responsible for meeting Delta objectives. Resolution of these issues could affect all upstream diverters, including the SFPUC, TID, and MID.

The State Water Resources Control Board (SWRCB) is the agency responsible both for setting water quality objectives for the Delta and for issuing and administering water-rights permits in California. The degree to which parties that divert water upstream of the Delta are responsible for maintenance of Delta water quality and flow objectives may ultimately be resolved through a water-rights proceeding.

Water-Rights Decisions

In 1997, the SWRCB began examining long-term alternatives that would enable compliance with the flow objectives for the Delta. Water rights proceedings to determine responsibility for meeting the flow objectives began in 1998 (see Section 5.3.3 for more detail). The water-rights proceedings were to be conducted in eight phases. The SWRCB's policy in the water-rights proceedings was to encourage water agencies to resolve among themselves the responsibilities for meeting the objectives in the 1995 Water Quality Control Plan (WQCP) and to bring their proposals to the SWRCB for approval. In 1999, the SWRCB published a final EIR on the WQCP, which presented the environmental effects of a range of alternatives but did not identify a preferred alternative (SWRCB, 1999).

In late 1999, following Phases 1 through 7 of the Bay-Delta water rights proceedings, the SWRCB issued Water Rights Decision 1641. The SWRCB revised D-1641 in early 2000 by issuing Order WR 2000-02, and again in 2001 by issuing Order WR 2001-05. D-1641 and Order WR 2001-05 contain the water-right requirements to implement the flow objectives for the Delta. D-1641 includes both long-term and temporary requirements that will remain in effect for up to 35 years. Order WR 2001-05 called for partial implementation of the requirements.

In D-1641 and Order WR 2001-05, the SWRCB assigned responsibilities to water-rights holders for specified periods, including the USBR and DWR, in certain watersheds tributary to the Delta. The SWRCB accepted with modifications the proposals made by some water agencies and groups of water agencies with respect to their responsibilities for meeting flow objectives in the Delta. The responsibilities of various parties, including water users in the Sacramento, San Joaquin, Mokelumne, Calaveras, and Cosumnes River watersheds, were defined in D-1641. These responsibilities require that the water users in these watersheds contribute specified amounts of water to protect water quality or implement agreements (including the San Joaquin River Agreement, as described below), and that the USBR and/or DWR ensure the objectives are met in the Delta.

Phase 8 of the water-rights proceedings would have ultimately determined the responsibilities of the Sacramento Valley water-rights holders for meeting the objectives in the 1995 WQCP. The SWRCB's Order WR 2001-05 stayed Phase 8 of the proceedings and required the USBR and DWR to continue to meet certain objectives in the 1995 WQCP until adoption of another decision assigning responsibility for meeting the objectives. During 2002, the USBR, DWR, Sacramento Valley upstream water users, and certain downstream users negotiated a settlement in lieu of continuing Phase 8 of the water-rights proceedings. Beginning in December 2002, the parties to the negotiations executed the Sacramento Valley Water Management Agreement, or Short Term Settlement Agreement. The agreement establishes a planning process for actions that would help meet objectives in the Delta.

Vernalis Adaptive Management Program

Shortly after the Bay-Delta WQCP was published, an association of users of San Joaquin River water filed suit against the SWRCB, challenging the flow objectives in the WQCP. The association claimed that the flow objectives were based on an inadequate understanding of the relationship between flow and salmon survival. In an effort to settle the issue out of court, the San Joaquin River interests collaborated with other water users, environmental groups, and government agencies to develop an alternative that would provide an equivalent level of fishery protection to that provided by the Bay-Delta WQCP. The result was the San Joaquin River Agreement, of which the Vernalis Adaptive Management Program (VAMP) was a key component (San Joaquin River Group Authority, 2007).

The VAMP is an experimental management program designed to protect juvenile Chinook salmon migrating from the San Joaquin River through the Delta. The San Joaquin River Agreement, including the VAMP, was submitted to the SWRCB as a proposal. It was accepted by the SWRCB and made a part of D-1641. In February 2006, however, the Third Appellate District overturned that part of D-1641 and ordered to SWRCB to commence further proceedings to either assign responsibility for meeting the Vernalis pulse-flow objectives in full or to modify those objectives. In December 2006, the SWRCB adopted amendments to the 1995 Bay-Delta WQCP, including allowing for staged implementation through the San Joaquin River Agreement until December 2011.

The VAMP provides for a 31-day pulse flow in the San Joaquin River at Vernalis, together with a reduction in State Water Project and Central Valley Project exports from the south Delta. The pulse usually occurs from mid-April to mid-May, but its timing may be adjusted based on hydrology and fishery conditions. The effects of different flow rates in the lower San Joaquin River and different State Water Project and Central Valley Project export rates on juvenile and smolt Chinook salmon survival are being studied as part of the VAMP. The VAMP is scheduled to end in 2011.

5.3.1.2 Impacts

Significance Criteria

The CCSF has not formally adopted significance standards for impacts related to stream flow and reservoir water levels, but generally considers that implementation of the proposed program would have a significant impact if it were to:

- Substantially alter stream flows such that they are outside of the range of pre-project conditions and result in adverse hydrologic effects

The stream flow significance threshold is based on the fact that natural stream flows and controlled reservoir levels have varied substantially in the past 50 years, and such variations are a part of the existing baseline. Therefore, variations substantially outside of these past levels due to implementation of the proposed program that would result in an adverse hydrologic effect (such as flooding, dewatering, drainage alteration, or erosion, among others) would be considered a significant direct impact.

This PEIR also considers indirect impacts due to changes in stream flows and reservoir levels. However, for organizational purposes, the indirect impacts are not described in this section of this chapter, but rather in the sections describing the resources that would be indirectly affected by changes in flows and reservoir levels. These include geomorphology, surface water quality, surface water supplies, groundwater, fisheries, terrestrial biological resources, and recreational and visual resources. It should be noted that there might be cases where significant indirect impacts could result from less-than-significant direct flow impacts.

Approach to Analysis

Changes in flow in rivers and streams and changes in reservoir storage and water levels attributable to the WSIP were estimated using the Hetch Hetchy/Local Simulation Model (HH/LSM). An overview of the model is presented in Section 5.1. The HH/LSM simulates water deliveries, reservoir storage, and releases to rivers under different conditions using hydrologic data from the 82-year period 1920 to 2002. Detailed information on the model and the assumptions that underlie it is provided in Appendix H.

The following section addresses the impacts of the WSIP on water levels in Hetchy Hetchy and Don Pedro Reservoirs and flow along the Tuolumne River. WSIP impacts on flow along the San Joaquin River and Sacramento-San Joaquin Delta are also described. In applying the above significance criteria, very infrequent changes in reservoir levels and/or flow are not generally considered to generate a significant effect.

Impact Summary

Table 5.3.1-4 presents a summary of the impacts on stream flow and reservoir levels in the Tuolumne River system and downstream water bodies that could result from implementation of the proposed water supply and system operations.

TABLE 5.3.1-4
SUMMARY OF IMPACTS – STREAM FLOW IN THE TUOLUMNE RIVER SYSTEM AND DOWNSTREAM WATERBODIES

Impact	Significance Determination
Impact 5.3.1-1: Effects on flow along the Tuolumne River below O'Shaughnessy Dam	LS
Impact 5.3.1-2: Effects on flow along Cherry Creek below Cherry Dam	LS
Impact 5.3.1-3: Effects on flow along Eleanor Creek below Eleanor Dam	LS
Impact 5.3.1-4: Effects on flow along the Tuolumne River below La Grange Dam	LS
Impact 5.3.1-5: Effects on flow along the San Joaquin River and the Sacramento–San Joaquin Delta	LS

LS = Less than Significant impact, no mitigation required

Impact Discussion

Impact 5.3.1-1: Effects on flow along the Tuolumne River below O'Shaughnessy Dam.

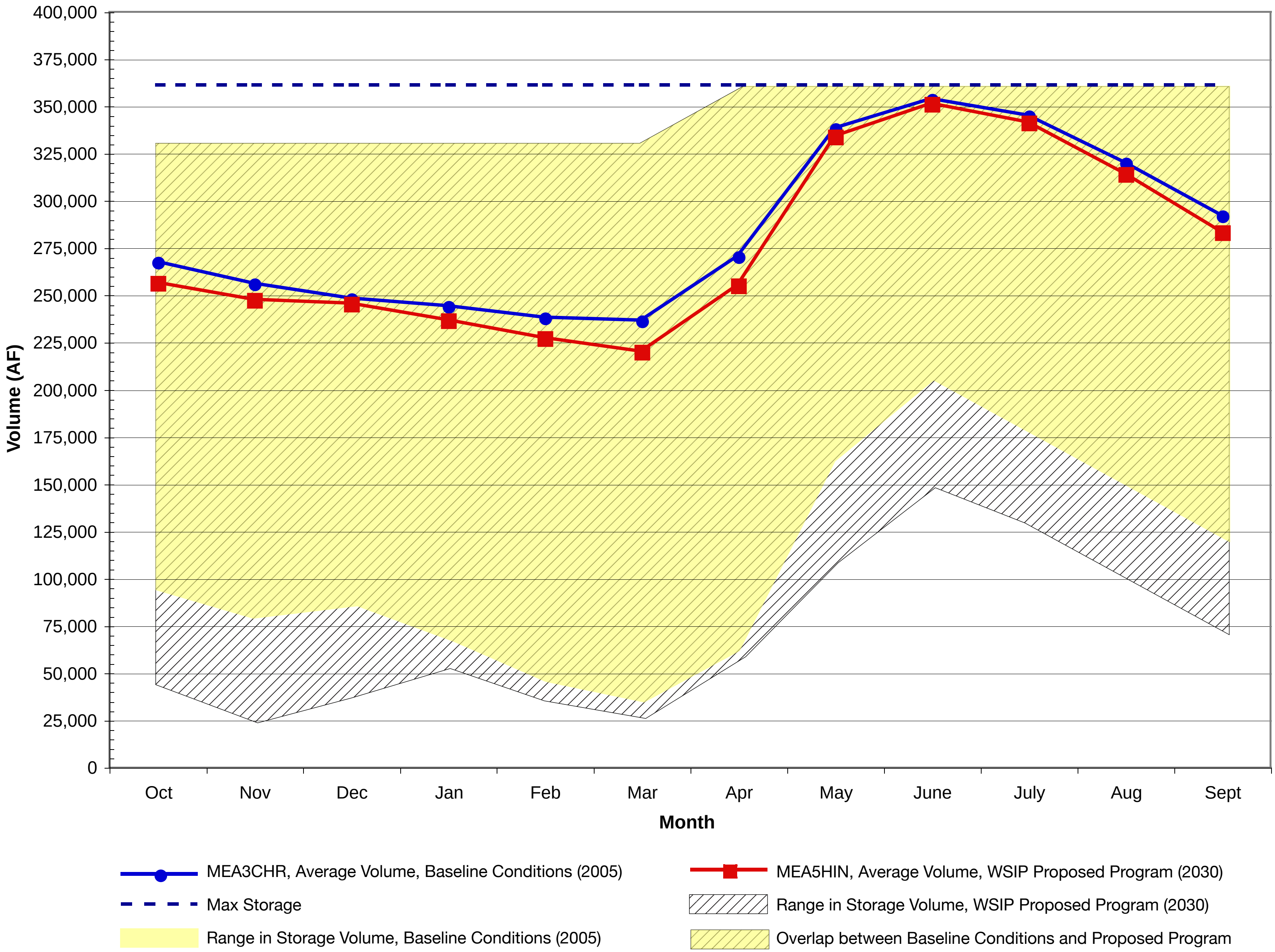
Reservoir Operations

Hetch Hetchy Reservoir stores water from the upper reaches of the Tuolumne River within Yosemite National Park. During the snowmelt season the reservoir is filled. During the rest of the year, when flow into the reservoir is reduced, the reservoir is drawn down to meet water demand in the service areas of the SFPUC and its customers, instream flow release requirements, and, if necessary, TID's and MID's Raker Act entitlements. Most years, the SFPUC is able to completely refill the reservoir during the snowmelt season. One of the SFPUC's operating goals is to fill the reservoir by the end of June. The WSIP would not change this or any of the SFPUC's other operational goals for Hetch Hetchy Reservoir, but it would affect water levels in the reservoir and the magnitude and timing of releases to the Tuolumne River.

Water Storage and Water Levels in Hetch Hetchy Reservoir

The WSIP would reduce average monthly storage in Hetch Hetchy Reservoir compared to the existing condition. **Figure 5.3.1-8** shows average monthly storage and the range of monthly storage in the reservoir with the WSIP and under existing conditions. The decrease in storage is primarily attributable to increased water demand in the service areas of the SFPUC and its customers. As demand increases, so would diversions of water from Hetch Hetchy Reservoir to supply the SFPUC's customers. Because of the decrease in storage in Hetch Hetchy Reservoir with the WSIP, monthly average water levels would fall by 1 to 10 feet compared to the existing condition.

Figure 5.3.1-9 shows modeled chronological storage in Hetch Hetchy Reservoir and releases to the Tuolumne River using hydrology from the 82-year period 1920 to 2002. The figure compares the WSIP 2030 condition to the existing condition. It shows that, under the existing condition, the SFPUC normally fills Hetch Hetchy Reservoir in the spring and early summer and draws from



SOURCE: SFPUC, HH/LSM (see Appendix H)

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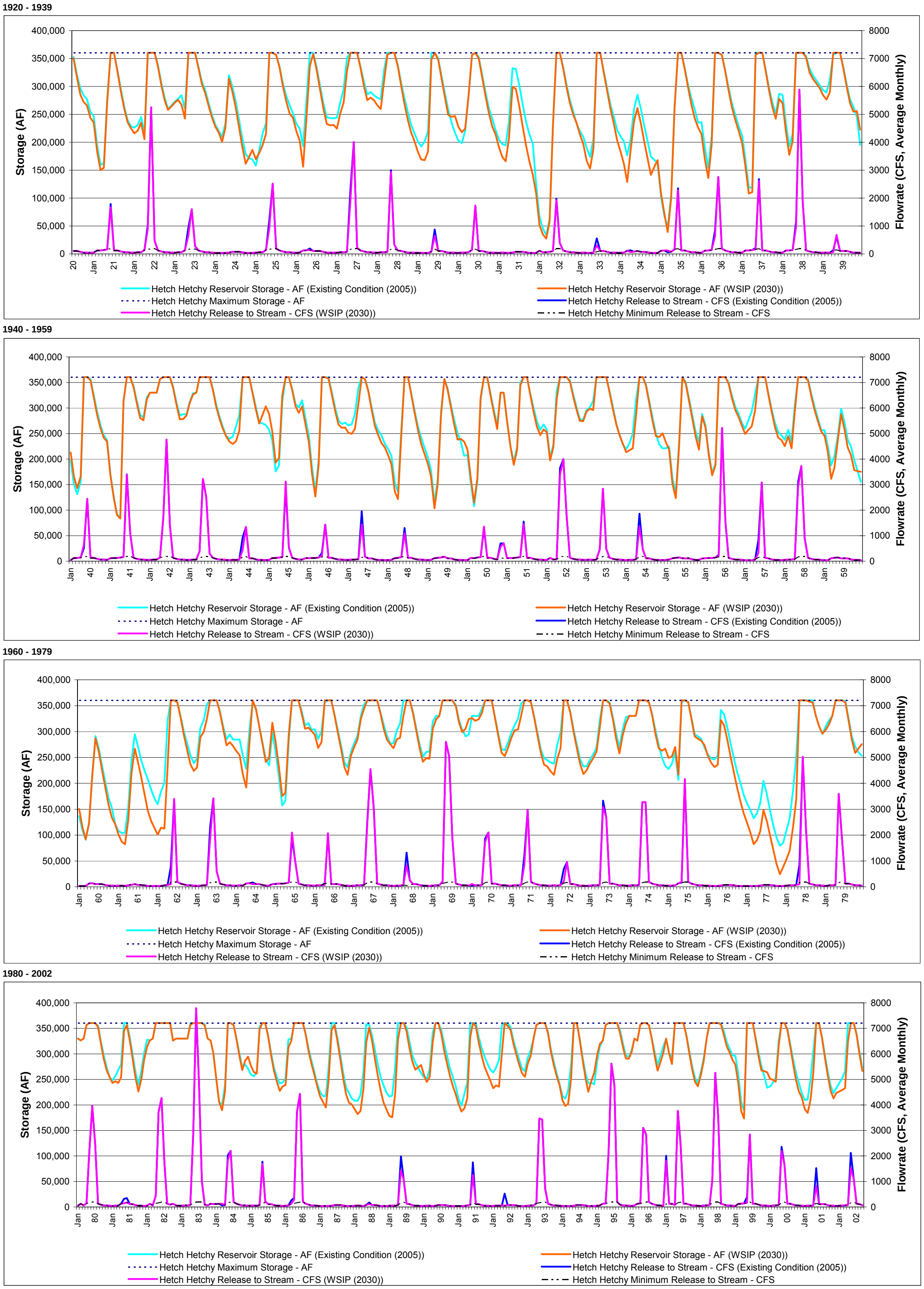
Figure 5.3.1-8
Average Monthly Storage Volume,
Hetch Hetchy Reservoir



SOURCE: SFPUC, HH/LSM (see Appendix H).

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Figure 5.3.1-9
Hetch Hetchy Storage and Releases to the Tuolumne River

storage to meet water demand in the summer, fall, and winter. In the early spring, the SFPUC may additionally draw water from the reservoir for power generation, provided it is confident that the coming snowmelt will fill the reservoir.

In the future with the WSIP, the SFPUC would continue to fill the reservoir in the spring and early summer and draw it down during the rest of the year, but the magnitude of the drawdown would be greater than under the existing condition. The reductions in storage and the lowering of water levels attributable to the WSIP would be the greatest in dry years. In average dry years, Hetch Hetchy Reservoir would be drawn down 18 feet more in March (just before refilling begins) than under the existing condition. The WSIP would lower water levels in Hetch Hetchy Reservoir in some months of severe droughts by up to 64 feet compared to the existing condition.

Beginning in July, when the reservoir is usually full, the rate of drawdown with the WSIP would be greater than under the existing condition. As shown in Figure 5.3.1-8, the difference in storage between the two scenarios would increase steadily through the summer, fall, and winter in most years. The pattern would be altered every five years when, with the WSIP, the SFPUC would take a portion of the conveyance system between Hetch Hetchy Reservoir and the Bay Area out of service so it can be maintained. During maintenance, water demand in the Bay Area would be met from local reservoirs, and drawdown of Hetch Hetchy Reservoir would cease for several weeks. On completion of maintenance, drawdown of Hetch Hetchy Reservoir would recommence at an accelerated rate as water is moved to storage in the local reservoirs. The WSIP would not alter water levels in Hetch Hetchy Reservoir such that they would be substantially outside the range experienced under the existing condition. Under the existing condition and in almost all years, the reservoir fills to its maximum capacity of 360,400 acre-feet in the spring and early summer and then is drawn down through the rest of the year. Maximum storage corresponds with a water surface level of 3,806 feet above mean sea level. Only rarely does storage in the reservoir decline below 150,000 acre-feet. A storage capacity of 150,000 acre-feet corresponds with a water surface level of 3,684 feet above mean sea level. Thus, under the existing condition and almost all of the time, the water level fluctuates between 3,806 feet and 3,684 feet, a range of 122 feet. With the WSIP, the water level in Hetch Hetchy Reservoir would fluctuate within the same range almost all of the time.

Occasionally in extended droughts, storage in Hetch Hetchy Reservoir would be drawn down severely. Under the existing condition, the water level in the reservoir would be drawn down to 3,573 feet, or 233 feet below the maximum, once in the 82-year hydrologic record. With the WSIP, the water level would be drawn down to 3,562 feet, or 244 feet below the maximum, once in the hydrologic record. Thus, water levels with the WSIP would remain substantially within the same range as occurs under the existing condition, although very infrequently water levels would decline slightly below the lower end of the range.

Flow in the Tuolumne River Between O'Shaugnessy Dam and Early Intake

Figure 5.3.1-9 shows the frequency and magnitude of modeled chronological releases from Hetch Hetchy Reservoir to the Tuolumne River under the existing condition and with the WSIP. Under the existing condition, releases to the Tuolumne River are at least equal to the required releases to support fisheries shown in Table 5.3.1-2. In many years, the volume of spring snowmelt from the watershed upstream of Hetch Hetchy Reservoir exceeds the capacity of the reservoir and the SFPUC's ability to divert water through Canyon Tunnel. Water that cannot be stored or diverted through Canyon Tunnel is released to the Tuolumne River. Occasionally, during the winter, the SFPUC will release excess inflow produced by warm storms to the Tuolumne River.

In the future with the WSIP, the SFPUC would draw the reservoir down farther in most years than it would under the existing condition. Consequently, with the WSIP, the SFPUC would capture a greater proportion of spring runoff to refill the reservoir. As a result, the volume of water released to the Tuolumne River would be reduced compared to the existing condition.

This circumstance is illustrated by the hydrology that occurred in 1991 and 1992. As shown in Figure 5.3.1-9, by the end of the 1991 conditions, Hetch Hetchy Reservoir would be drawn down to a lower level after WSIP implementation than it would under the existing condition. To refill the reservoir in the fairly dry spring of 1992, the SFPUC would have to capture a larger portion of the spring runoff, with the consequence that releases from the reservoir and flow in the Tuolumne River below the reservoir would be reduced, as indicated in the figure.

Table 5.3.1-5 shows average monthly flows in the Tuolumne River immediately below Hetch Hetchy Reservoir in different hydrologic year types for the existing condition and after WSIP implementation. The percentage change in average monthly flow attributable to the WSIP is also shown in the table. The WSIP would have little or no effect on average monthly flow in most summer, fall, and winter months in all hydrologic year types. In most summer, fall, and winter months, only the required fishery release would be made under the existing condition and with the WSIP. With the WSIP, the number of months in which only the required fishery release would be made would increase slightly. Under the existing condition, the model indicates that the minimum release would be made 85.1 percent of the time (837 months in the 984-month hydrologic record); with the WSIP the minimum release would be made 85.7 percent of the time (843 months in the 984-month hydrologic record).

The WSIP would result in reductions in average monthly flow of up to 30 percent in April, May, and June when the SFPUC fills Hetch Hetchy Reservoir with snowmelt. The greatest percentage reduction in flow would occur in normal, below-normal, and dry years because, in these year types, a greater proportion of the snowmelt currently released to the river would be needed to fill the reservoir. For example, in May of an average dry year, flow in the Tuolumne River below O'Shaughnessy Dam would be 224 cfs under the existing condition; with the WSIP it would be 157 cfs, a reduction of 30 percent.

In individual months in the 82-year hydrologic simulation, the absolute and percentage changes in flow in the Tuolumne River below O'Shaughnessy Dam attributable to the WSIP vary widely. The chronological analysis shows that the maximum percentage reduction in average monthly flow would be 80 to 90 percent, occurring three times in the 82-year hydrologic simulation. For example, under the existing condition, May 1992 flow would be 520 cfs; with the WSIP it would be 50 cfs. Reductions in average monthly flow of 30 percent or more would occur in some months of 20 springs in the 82-year simulation, or about once in every four springs on average.

TABLE 5.3.1-5
ESTIMATED AVERAGE MONTHLY FLOWS FOR THE TUOLUMNE RIVER BELOW O'SHAUGNESSSY DAM UNDER VARIOUS CONDITIONS
(cubic feet per second)

	Wet	Above Normal	Normal	Below Normal	Dry	All
Existing Condition (2005)						
Oct	55	55	54	55	53	54
Nov	51	96	54	55	53	62
Dec	51	88	50	46	44	56
Jan	180	66	51	43	40	75
Feb	88	88	74	51	44	69
Mar	93	86	74	63	50	73
Apr	148	131	98	91	64	107
May	2,518	1,273	1,479	758	224	1,245
June	4,534	3,092	1,913	768	168	2,091
July	2,034	379	167	113	86	548
Aug	184	125	122	111	86	125
Sept	90	89	86	73	65	81
Future with WSIP (2030)						
Oct	55	55	54	55	53	54
Nov	51	89	54	55	53	61
Dec	51	88	50	46	44	56
Jan	167	66	55	43	40	74
Feb	88	88	74	51	44	69
Mar	84	94	74	63	50	73
Apr	144	131	98	88	56	103
May	2,416	1,187	1,260	564	157	1,111
June	4,548	3,095	1,907	709	139	2,075
July	2,034	379	167	113	86	548
Aug	184	125	122	111	86	125
Sept	89	89	86	73	65	81

Difference and Percent Change, Existing Condition (2005) vs WSIP (2030)

	Wet		Above Normal		Normal		Below Normal		Dry		All	
Oct	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]
Nov	0	[0%]	-8	[-8%]	0	[0%]	0	[0%]	0	[0%]	-2	-[3%]
Dec	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]
Jan	-12	-[7%]	0	[0%]	4	[8%]	0	[0%]	0	[0%]	-2	-[2%]
Feb	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]
Mar	-9	-[9%]	8	[9%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]
Apr	-4	-[3%]	0	[0%]	0	[0%]	-4	-[4%]	-8	-[12%]	-3	-[3%]
May	-103	-[4%]	-86	-[7%]	-220	-[15%]	-195	-[26%]	-67	-[30%]	-134	-[11%]
June	14	[0%]	3	[0%]	-6	[0%]	-59	-[8%]	-29	-[17%]	-16	-[1%]
July	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]
Aug	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]
Sept	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]

Key
- > 0% (blue)
- < 0 to -5% (yellow)
- < -5% (orange)

SOURCE: SFPUC, HH/LSM (see Appendix H).

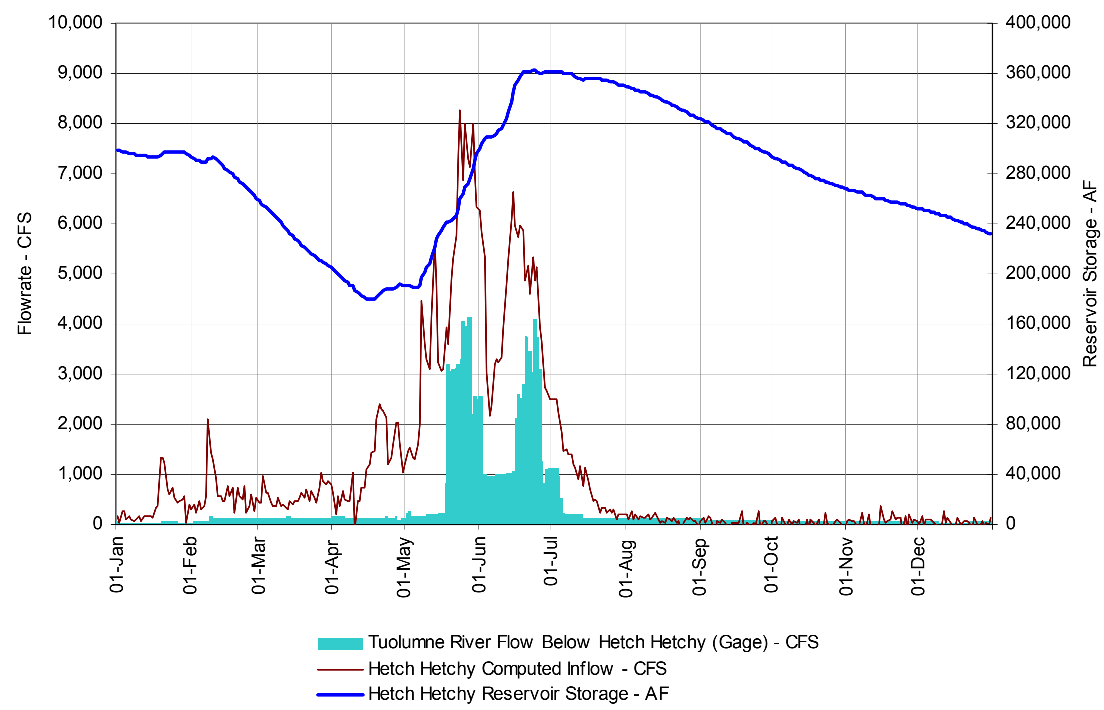
The results presented above are described in terms of average monthly flows because the HH/LSM is a monthly time-step model. The SFPUC's actual operational decisions may occur in smaller time increments, perhaps daily or weekly, depending on meteorological and operational circumstances. For example, if inflow to Hetch Hetchy Reservoir increases rapidly, operators may decide to adjust the rate at which water is routed to Canyon Tunnel or released to the river several times within a month. These within-month operational changes cannot be simulated with the HH/LSM, nor can the model be used to estimate the effects of the WSIP on peak flows in the river, because the peaks may only last for a few hours or days.

Insight into the effects of the WSIP on peak flows below O'Shaughnessy Dam can be obtained by examination of operational data. **Figure 5.3.1-10** shows actual data for 1999, an above-normal year; the greatest effects on peak flows would occur in wet and above-normal years. The figure shows storage in Hetch Hetchy Reservoir falling in the first four months of the year because the rate of withdrawal from the reservoir exceeds the rate of inflow into the reservoir. In April, inflow into the reservoir increases and continues to do so through May. In June, inflow into the reservoir decreases from its peak but remains considerable. Storage in the reservoir increases from its minimum value of about 190,000 acre-feet in mid-April to its maximum value of 360,000 acre-feet in mid-June. The SFPUC reacted to increasing reservoir inflow and diminishing reservoir storage around the middle of May by increasing releases to the Tuolumne River. Measured flow in the Tuolumne River below O'Shaughnessy Dam shows a number of step increases and decreases in flow during May and June lasting several days, as operators balanced reservoir inflow, gains in storage, and releases to the river in response to changing conditions.

If the WSIP had been in place in 1999, and water demand was at 2030 levels, storage in mid-April in Hetch Hetchy Reservoir would have been about 175,000 acre-feet. With the WSIP, operators would need to capture 185,000 acre-feet of runoff to fill the reservoir. Under the existing condition, the operators had to capture 160,000 acre-feet. Needing to capture a higher proportion of runoff with the WSIP than under the existing condition, operators would likely delay releases of water to the Tuolumne River by two to three days. After the initial delay, the releases to the river with the WSIP would follow the same pattern as under the existing condition and would be of a similar magnitude.

The pattern and magnitude of releases from Hetch Hetchy Reservoir to the Tuolumne River with the WSIP in any particular year would depend on meteorological and operational circumstances, as they do under the existing condition. Under the existing condition, there would be no releases from the reservoir to the river in excess of the minimum required release in 15 years of the 82-year hydrologic record. With the WSIP, there would be no releases above the minimum required in 18 years of the 82-year hydrologic record. In years when a release above the minimum required is made, the WSIP would delay the release of water and reduce the total volume of releases to the river in the snowmelt period compared to the existing condition. The WSIP would delay the release of water in excess of minimum requirements by an average of one to two days and could delay the release by up to eight days.[4] The infrequent large peak flows (greater than

[4] The estimates of delay in spring releases are based on the assumption that operators would release water from Hetch Hetchy Reservoir at a rate of 3,000 cfs. A review of past practice indicates that this springtime release rate is typical. If the release rate were to be reduced, as might happen in a dry year, the delay would be extended.



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SOURCE: SFPUC, HH/LSM (see Appendix H).

Figure 5.3.1-10
Hetch Hetchy Reservoir Storage and Inflow, Calendar Year 1999

5,000 cfs) in the river below O'Shaughnessy Dam produced by rapidly melting abundant snowpack would not be affected by the WSIP. Peak flows in years when runoff is less (dry years) might be reduced by the WSIP, depending on decisions made by reservoir operators.

Impact Conclusions

The WSIP would not alter stream flow in the Tuolumne River below O'Shaughnessy Dam such that it would be substantially outside the range experienced under the existing condition, nor would the flow alterations result in adverse hydrologic effects or be sufficient to change the character of the river. Large, infrequent peak flows under the existing condition and with the WSIP would be similar in magnitude. Minimum flows are the subject of an agreement with the U.S. Department of the Interior and would be the same with the WSIP as under the existing condition. The Department of the Interior could increase the minimum flows in the future based on the fish habitat study referred to above. Overall, the effects of the WSIP on flow along the Tuolumne River below O'Shaughnessy Dam would be *less than significant*, and no mitigation measures would be required.

[Additional discussion on impacts on flow in the upper Tuolumne River was prepared in response to comments on the Draft PEIR. Please refer to Section 14.6, Master Response on Upper Tuolumne River Issues (Vol. 7, Chapter 14).]

Impact 5.3.1-2: Effects on flow along Cherry Creek below Cherry Dam.

Reservoir Operations

Lake Lloyd stores water from the upper reaches of Cherry Creek. During the snowmelt season the reservoir is filled. During the rest of the year, when flow into the lake is reduced, the reservoir is drawn down to generate hydroelectric power at the Holm Powerhouse. The releases, which are sized and timed for power generation purposes, also provide opportunities for river rafting and contribute to the releases that the SFPUC must make to satisfy TID's and MID's flow entitlements. Most years, the SFPUC is able to completely refill the lake during the snowmelt season. The WSIP would not change the SFPUC's operational goals for Lake Lloyd, and it would have little or no effect on water levels in the lake and the magnitude and timing of releases to Cherry Creek.

Water Storage and Water Levels in Lake Lloyd

The WSIP would not alter water levels in Lake Lloyd such that they would be substantially outside the range experienced under the existing condition. The WSIP would reduce year-round average monthly storage in Lake Lloyd by about 1,000 acre-feet and average monthly water levels by about 1 foot. Most of the time, storage in Lake Lloyd would be the same with the WSIP as under the existing condition. Infrequent reductions in storage attributable to the WSIP would occur at the end of dry periods, similar to the period that occurred between 1987 and 1992. At the end of dry periods, the SFPUC might release additional water from Lake Lloyd to offset the WSIP-induced reduction in releases from Hetch Hetchy Reservoir. The releases would be needed to satisfy TID's and MID's flow entitlements.

Flow in Cherry Creek

Releases from Lake Lloyd with the WSIP and under the existing condition would be the same and would be at least equal to the fishery release schedule. Thus, the WSIP would have no effect on flow in Cherry Creek.

Impact Conclusions

The WSIP would not alter releases from Lake Lloyd to Cherry Creek. Adverse impacts on flow in Cherry Creek would be *less than significant*, and no mitigation measures would be required.

Impact 5.3.1-3: Effects on flow along Eleanor Creek below Eleanor Dam.

Reservoir Operations

Lake Eleanor stores water from the upper reaches of Eleanor Creek; it fills in the winter and spring of each year and is drawn down in the summer as water is transferred to the lake. The WSIP would not change the SFPUC's operational goals for Lake Eleanor, and it would have little effect on water levels in the lake and the magnitude and timing of releases to Eleanor Creek.

Water Storage and Water Levels in Lake Eleanor

The WSIP would have essentially no effect on monthly storage or water levels in Lake Eleanor compared to the existing condition. The only change in modeled chronological storage using hydrology from the period 1920 to 2002 occurs during the last year of the 1987–1992 drought. Under 2002 conditions with the WSIP, additional water would be transferred from Lake Eleanor to supplement storage in Lake Lloyd. Such a transfer would occur very infrequently. The WSIP would not alter water levels in Lake Eleanor such that they would be substantially outside the range experienced under the existing condition.

Flow in Eleanor Creek below Eleanor Dam

Releases from Lake Eleanor with the WSIP and under the existing condition would be the same and would be at least equal to the fishery release schedule. Thus, the WSIP would have no effect on flow in Eleanor Creek.

Impact Conclusions

The WSIP would not alter releases to Eleanor Creek. Adverse impacts on flow in Eleanor Creek would be *less than significant*, and no mitigation measures would be required.

Impact 5.3.1-4: Effects on flow along the Tuolumne River below La Grange Dam.

Reservoir Operations

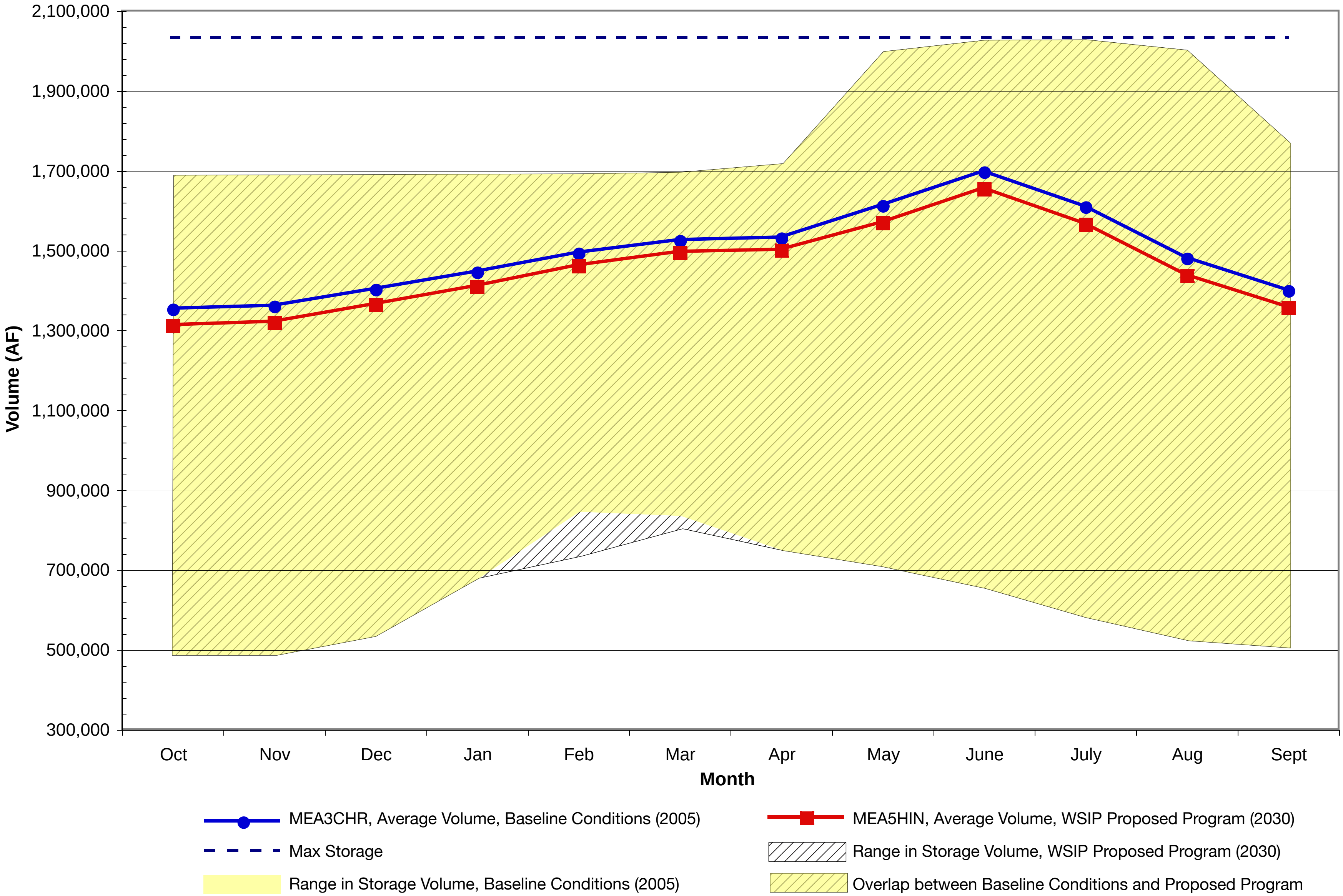
Don Pedro Reservoir, operated by TID, stores water from the upper Tuolumne River. Under typical conditions, the reservoir begins to fill with rainfall runoff from lower elevations in November and continues to fill through the winter and spring with a combination of rainfall runoff and snowmelt from higher elevations. The reservoir is drawn down from June through October to meet demand for irrigation supply in the TID and MID service areas.

Don Pedro Reservoir is a multipurpose facility that provides water supply and flood control benefits as well as recreational opportunities. To provide a prescribed level of downstream flood protection, storage space must be kept available in Don Pedro Reservoir to store floods that might occur. The space maintained in the reservoir for floodwater is referred to as the "flood control reservation." It increases from zero on September 8 to 340,000 acre-feet on October 7. The reservation is maintained at 340,000 acre-feet until April 27, after which it declines to zero again by June 3.

The WSIP would not change TID's operational goals for Don Pedro Reservoir or the flood control reservation requirements, but it would affect water levels in the reservoir and the magnitude and timing of releases to the Tuolumne River.

Water Storage and Water Levels in Don Pedro Reservoir

The WSIP would reduce average monthly storage in Don Pedro Reservoir year-round compared to the existing condition. **Figure 5.3.1-11** shows the average monthly storage and the range of monthly storage in the reservoir with the WSIP and under the existing condition. The



SOURCE: SFPUC, HH/LSM (see Appendix H)

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Figure 5.3.1-11
Average Monthly Storage Volume,
Don Pedro Reservoir

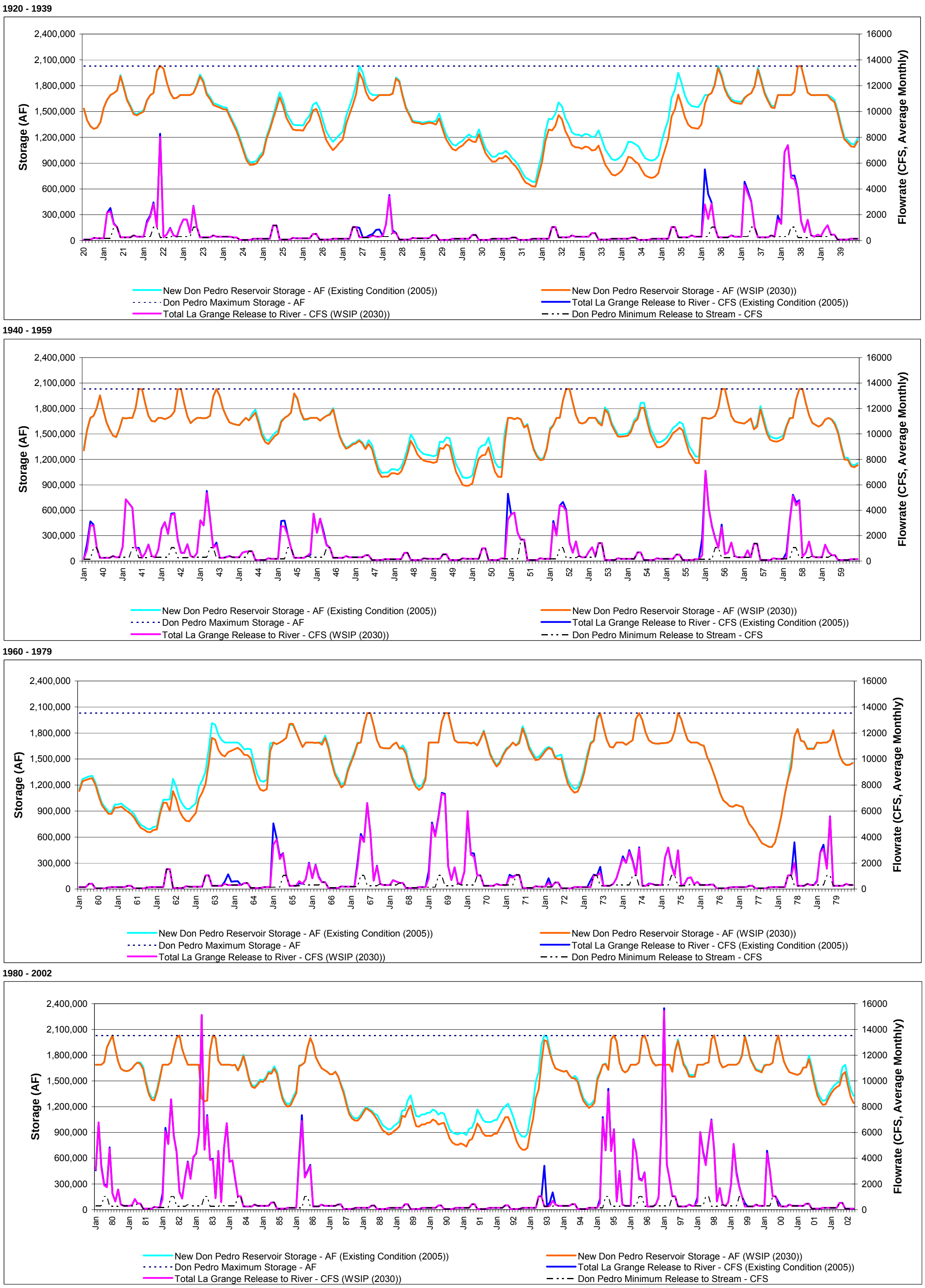
decrease in stored volume is primarily attributable to increased water demand in the service areas of the SFPUC and its customers. As demand increases, so do diversions of water at Hetch Hetchy Reservoir for delivery to the Bay Area. As a result, less water flows down the Tuolumne River to Don Pedro Reservoir. Because of the decrease in stored volume in Don Pedro Reservoir with the WSIP, monthly average water levels would fall by 1 to 10 feet compared to the existing condition.

Figure 5.3.1-12 shows modeled chronological storage in Don Pedro Reservoir and releases to the Tuolumne River at La Grange Dam using hydrology from the period 1920 to 2002. The figure compares the WSIP to the existing condition. It shows that, under the existing condition, TID and MID fills Don Pedro Reservoir in the winter and draws from storage to meet agricultural water demand in the summer and early fall. Because the storage capacity of Don Pedro Reservoir is greater than the average volume of runoff produced in its watershed, TID and MID is unable to fill the reservoir completely every year. Currently, TID and MID is able to fill to its allowable October to April maximum storage capacity about 51 percent of the time and to its maximum physical capacity about 27 percent of the time. In the future with the WSIP, these values would be reduced to 48 percent and 21 percent.

The reductions in stored volume and lowering of water levels attributable to the WSIP would be greatest in critically dry years, particularly following a sequence of dry years. In average critically dry years, Don Pedro Reservoir would be drawn down 10 feet more in September than under the existing condition. The WSIP would lower water levels in Don Pedro Reservoir in some months during severe droughts by up to 27 feet compared to the existing condition.

The WSIP would not alter water levels in Don Pedro Reservoir such that they would be substantially outside the range experienced under the existing condition. Almost all of the time, storage in Don Pedro Reservoir fluctuates between its maximum capacity of 2,080,000 acre-feet, which corresponds with a water level of 834 feet above mean sea level, and 900,000 acre-feet, which corresponds with a water level of 714 feet. Thus, under the existing condition and almost all of the time, the water level fluctuates between 834 feet and 714 feet, a range of 120 feet. With the WSIP, the water level in Don Pedro Reservoir would fluctuate within the same range almost all of the time.

Occasionally, in extended droughts, storage in Don Pedro Reservoir would be drawn down severely. Under the existing condition, the water level in the reservoir would be drawn down to 643 feet, or 191 feet below the maximum, once in the 82-year hydrologic record. With the WSIP, the water level would be drawn down to essentially the same level once in the 82-year hydrologic record, but it would never be drawn down below that level. Thus, water levels with the WSIP would remain substantially within the same range as occurs under the existing condition.



SOURCE: SFPUC, HH/LSM (see Appendix H).

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Figure 5.3.1-12
Don Pedro Storage and La Grange Releases to the Tuolumne River

Flow in the Tuolumne River below La Grange Dam

Figure 5.3.1-12 shows the frequency and magnitude of modeled chronological releases from La Grange to the Tuolumne River under the existing condition and with the WSIP. Under the existing condition, releases to the Tuolumne River are at least equal to the fishery release schedule shown in Table 5.3.1-3. In most below-normal or drier years, almost all the winter and spring runoff from the watershed upstream of Don Pedro is captured in the reservoir. In years when the reservoir fills, usually wet or above-normal years, excess water is released to the Tuolumne River.

In the future with the WSIP, MID and TID would draw Don Pedro Reservoir down farther in many years than it would under the existing condition as shown in Figure 5.3.1-12. Consequently, MID and TID would have to capture a greater proportion of spring runoff to refill the reservoir with the WSIP. As a result, the volume of water released to the Tuolumne River would be reduced compared to the existing condition but would be at least equal to the required releases to support fisheries shown in Table 5.3.1-3.

Average monthly flows in the Tuolumne River immediately below La Grange Dam in different hydrologic year types for the existing condition and with the WSIP are shown in **Table 5.3.1-6**. The percentage change in average monthly flow attributable to the WSIP is also shown in the table. The WSIP would have little or no effect on average monthly flow in most summer, fall, and winter months in all hydrologic year types. The WSIP would have no effect on average monthly flow in any months of critically dry years or in most summer months of dry, below-normal, and above-normal years. Only the required fishery release would be made in these months under the existing condition and with the WSIP. With the WSIP, the number of months in which only the required fishery release would be made would increase slightly. Under the existing condition, the model indicates that the minimum release would be made 72.9 percent of the time (717 months in the 984-month hydrologic record); with the WSIP the minimum release would be made 74.6 percent of the time (734 months in the 984-month hydrologic record).

The WSIP would typically result in reductions of less than 10 percent in average monthly flow in the Tuolumne River below La Grange Dam in the November through June period when TID fills Don Pedro Reservoir, although reductions in average monthly flow could be as high as 25 percent. Reductions in flow would occur in some months of all year types, except for critically dry years. For example, in June of an average above-normal year, flow in the Tuolumne River below La Grange Dam would be 408 cfs under the existing condition; with the WSIP it would be 306 cfs, a reduction of 25 percent.

The absolute and percentage changes in flow in the Tuolumne River below La Grange Dam in individual months of wet, above-normal, below-normal, and dry years in the 82-year hydrologic simulation attributable to the WSIP vary widely. The chronological analysis shows that the maximum percentage reduction in average monthly flow attributable to the WSIP would be about 92 percent, occurring in one month in the 82-year hydrologic simulation. In that month, June 1993, the flow below La Grange Dam under the existing condition would be 3,409 cfs; with the WSIP it would be 250 cfs. Reductions in average monthly flow of 30 percent or more would occur in some months of 17 springs in the 82-year simulation, or about once in every four springs on average.

TABLE 5.3.1-6
ESTIMATED AVERAGE MONTHLY FLOWS FOR THE TUOLUMNE RIVER BELOW LA GRANGE DAM UNDER VARIOUS CONDITIONS
(cubic feet per second)

	Wet	Above Normal	Below Normal	Dry	Critical Dry	All
Existing Condition (2005)						
Oct	431	298	294	351	236	333
Nov	374	507	314	324	195	350
Dec	857	1,230	422	292	204	654
Jan	2,161	1,257	318	285	189	1,022
Feb	3,493	2,381	647	478	188	1,723
Mar	4,096	1,969	654	421	189	1,806
Apr	3,424	1,568	958	497	344	1,613
May	3,161	1,348	943	497	344	1,489
June	3,633	408	75	73	50	1,180
July	1,300	240	75	73	50	463
Aug	516	240	75	73	50	233
Sept	1,299	249	75	73	50	464
Future with WSIP (2030)						
Oct	429	292	284	337	236	327
Nov	371	515	270	260	195	334
Dec	790	1,111	370	272	204	599
Jan	2,023	1,272	318	262	189	981
Feb	3,400	2,152	630	432	188	1,638
Mar	3,990	1,708	630	421	189	1,718
Apr	3,350	1,539	943	497	344	1,584
May	3,081	1,346	943	497	344	1,465
June	3,369	306	75	73	50	1,082
July	1,282	240	75	73	50	457
Aug	503	240	75	73	50	229
Sept	1,263	240	75	73	50	452
Difference and Percent Change, Existing Condition (2005) vs WSIP (2030)						
Oct	-2 [0%]	-6 -[2%]	-9 -[3%]	-14 -[4%]	0 [0%]	-5 -[2%]
Nov	-3 -[1%]	8 [2%]	-44 -[14%]	-64 -[20%]	0 [0%]	-16 -[4%]
Dec	-67 -[8%]	-119 -[10%]	-52 -[12%]	-20 -[7%]	0 [0%]	-55 -[8%]
Jan	-138 -[6%]	14 [1%]	0 [0%]	-23 -[8%]	0 [0%]	-41 -[4%]
Feb	-93 -[3%]	-229 -[10%]	-16 -[3%]	-47 -[10%]	0 [0%]	-85 -[5%]
Mar	-107 -[3%]	-261 -[13%]	-24 -[4%]	0 [0%]	0 [0%]	-89 -[5%]
Apr	-74 -[2%]	-28 -[2%]	-15 -[2%]	0 [0%]	0 [0%]	-30 -[2%]
May	-81 -[3%]	-2 [0%]	0 [0%]	0 [0%]	0 [0%]	-24 -[2%]
June	-264 -[7%]	-102 -[25%]	0 [0%]	0 [0%]	0 [0%]	-98 -[8%]
July	-19 -[1%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	-5 -[1%]
Aug	-13 -[2%]	-1 [0%]	0 [0%]	0 [0%]	0 [0%]	-4 -[2%]
Sept	-36 -[3%]	-9 -[4%]	0 [0%]	0 [0%]	0 [0%]	-12 -[3%]

Key
- > 0%
- < 0 to -5%
- < -5%

SOURCE: SFPUC, HH/LSM (see Appendix H).

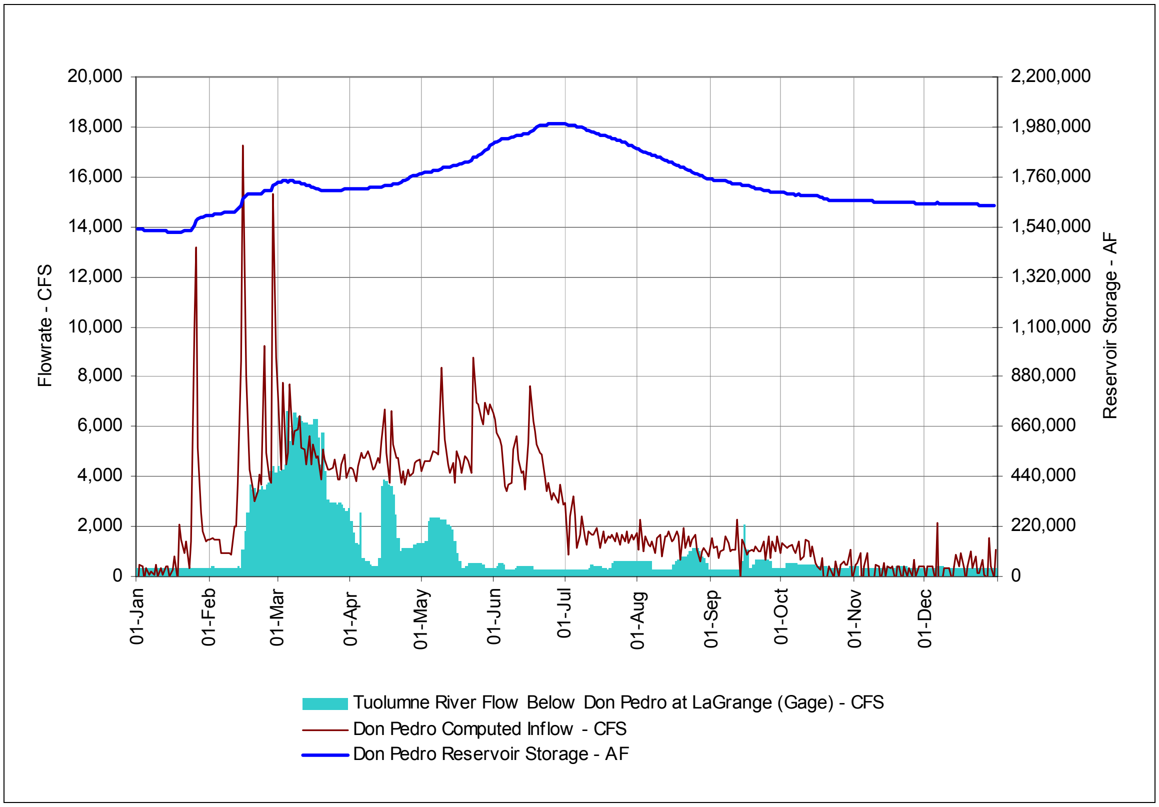
The results presented above are described in terms of average monthly flows because the HH/LSM is a monthly time-step model. TID's actual operational decisions may occur in smaller time steps, perhaps daily or weekly, depending on meteorological and operational circumstances. These within-month operational changes cannot be simulated with the HH/LSM, nor can the model be used to estimate the effects of the WSIP on peak flows in the river, because the peaks may only last for a few hours or days.

Insight into the effects of the WSIP on peak flows below La Grange Dam can be obtained by examining operational data. **Figure 5.3.1-13** shows actual data for 2000, an above-normal year; the greatest effects on peak flows would occur in wet and above-normal years. The figure shows storage in Don Pedro Reservoir falling slightly in the first half of January and then increasing to a maximum of about 2 million acre-feet at the end of June, as first rainfall runoff and then snowmelt enters the reservoir. Through January and the first half of February, TID added to storage in the reservoir and released only the minimum required to the Tuolumne River below La Grange Dam. In mid-February, faced with increasing quantities of rainfall runoff, the operators began to release water to the Tuolumne River in excess of the minimum required in order to maintain the required flood control storage reservation. Releases in excess of the minimum continued though March, April, and the first half of May. Beginning in April, the required flood control reservation decreased, enabling TID to add more water to storage. In mid-May, the operators reduced releases to the river, which remained at or close to the minimum for the remainder of the year. Measured flow in the Tuolumne River below La Grange Dam shows a number of step increases and decreases in flow from mid-February to mid-May lasting several days, as operators sought to balance reservoir inflow, gains in storage, and releases to the river in response to changing conditions.

If the WSIP had been in place in 1999, and water demand was at 2030 levels, storage during December in Don Pedro Reservoir (its seasonal low point) would have been about 1,600,000 acre-feet, similar to but less than under the existing condition. Needing to capture a slightly higher proportion of runoff with the WSIP than under the existing condition, operators would likely delay releases of water to the lower Tuolumne River in excess of minimum requirements by a few days. After the initial delay, the releases to the river with the WSIP would follow the same pattern as under the existing condition and would be of a similar magnitude.

The pattern and magnitude of releases from La Grange Dam to the Tuolumne River with the WSIP in any particular year would depend on meteorological and operational circumstances, as they do under the existing condition. Under the existing condition, there would be no releases from the dam to the river in excess of the minimum required release in 31 years of the 82-year hydrologic record. With the WSIP, there would be no releases above the minimum required in 33 years of the hydrologic record. In years when a release above the minimum required is made, the WSIP would delay the release of water and reduce the total volume of releases to the river in the winter and spring compared to the existing condition.

Releases from Don Pedro Reservoir and La Grange Dam follow a different pattern than releases from Hetchy Hetchy Reservoir. Hetch Hetchy Reservoir typically receives most of its water from



SOURCE: SFPUC, HH/LSM (see Appendix H).

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Figure 5.3.1-13
Don Pedro Reservoir Storage and Inflow, Calendar Year 2000

snowmelt between early May and late July. Don Pedro Reservoir receives runoff over a longer period from both winter rainstorms and snowmelt. Furthermore, unlike Hetch Hetchy Reservoir, Don Pedro Reservoir is used to reduce downstream flooding. As a consequence, management of Don Pedro Reservoir is complex, and releases from the reservoir often occur in a series of pulses rather than in single episode as typically occurs at Hetch Hetchy Reservoir. In years when several pulse releases above the minimum required are made, the WSIP might eliminate one or more of the pulse releases and would delay others by several days or weeks.

After an unusual series of dry years, when Don Pedro Reservoir is drawn down substantially farther with the WSIP than under the existing condition, winter and spring releases above the minimum required would occasionally be eliminated or almost eliminated. This circumstance is illustrated by the sequence of hydrologic conditions that occurred between 1986 and 1993. Although the WSIP would commonly reduce winter and spring flow in the river below La Grange Dam, it would not affect very infrequent large peak flows produced primarily by rainstorms.

Impact Conclusions

The WSIP would not alter stream flow in the Tuolumne River below La Grange Dam such that it would be substantially outside the range experienced under the existing condition, nor would the flow alterations result in adverse hydrologic effects or be sufficient to change the character of the river. Large, infrequent peak flows under the existing condition and with the WSIP would be similar in magnitude. Minimum flows are the subject of an agreement with the FERC and would the same with the WSIP as under the existing condition.

Overall, the effects of the WSIP on flow along the Tuolumne River below La Grange Dam would be *less than significant*, and no mitigation measures would be required.

[Additional discussion on impacts on flow in the lower Tuolumne River was prepared in response to comments on the Draft PEIR. Please refer to Section 14.7, Master Response on Lower Tuolumne River Issues (Vol. 7, Chapter 14).]

Impact 5.3.1-5: Effects on flow along the San Joaquin River and the Sacramento–San Joaquin Delta.

The Tuolumne River joins the San Joaquin River about 50 miles downstream of La Grange Dam. The reductions in flow in the Tuolumne River below La Grange Dam attributable to the WSIP are shown in Table 5.3.1-6. The WSIP would reduce flows in the Tuolumne River between La Grange Dam and its confluence with the San Joaquin River, and in the San Joaquin River from the confluence to the Delta. Most of the reductions in flow would occur from January through June in wet or above-normal years, when flow in the San Joaquin River is at its seasonal maximum. The greatest reductions would occur in years following extended droughts when storage in Don Pedro Reservoir is being replenished. For example, under hydrologic conditions that prevailed in February 1936, average monthly flow in the San Joaquin River between the Tuolumne and Stanislaus River confluences would be reduced from about 10,000 cfs to 7,500 cfs under the WSIP compared to existing conditions. Similarly, under June 1993 conditions, average monthly flows would be reduced from about 7,000 cfs to 3,500 cfs. Flow reductions of these magnitudes would be rare events occurring four or five times in the 82-year period of hydrologic record.

The SWRCB has established flow objectives for the San Joaquin River at Vernalis, just upstream of the Sacramento–San Joaquin Delta. Almost all of the time, the reductions in San Joaquin River flow attributable to the WSIP would not be sufficient to cause flow in the river at Vernalis to fall below the objective. Very infrequently, following protracted droughts, reductions in San Joaquin River flow attributable to the WSIP would be sufficient to cause flow in the river at Vernalis to fall below the objective. Under these circumstances, the USBR, the agency responsible for compliance with objectives for the San Joaquin River, would be expected to increase releases from New Melones Reservoir on the Stanislaus River to meet the flow objectives at Vernalis. Thus, the WSIP would not alter flow in the San Joaquin River below its confluence with the Tuolumne River such that it would be substantially outside the range experienced under existing conditions nor result in a violation of flow objectives.

The reductions in flow in the Tuolumne River below La Grange Dam attributable to the WSIP would also reduce inflow to the Sacramento–San Joaquin Delta. The SWRCB has established objectives for Delta outflow as measured at Chipps Island, just upstream of Suisun Bay. Almost all of the time, the reductions in Delta inflow attributable to the WSIP would not be sufficient to cause Delta outflow to fall below the objective. Very infrequently, following protracted droughts, reductions in Delta inflow attributable to the WSIP would be sufficient to cause Delta outflow to fall below the objective. Under these circumstances, the USBR and DWR, the respective operators of the Central Valley Project and State Water Project, would be expected to decrease their diversions so that the Delta outflow objectives were met. Thus, the WSIP would not alter flow in the Sacramento–San Joaquin Delta such that it would be substantially outside the range experienced under the existing condition.

Overall, the effects of the WSIP on flow along San Joaquin River and in the Delta would be *less than significant*, and no mitigation measures would be required. Additional information on the effects of the WSIP on flows in the San Joaquin River and the Delta is provided in Section 5.3.4.

[Additional discussion on effects of WSIP on the San Joaquin River and Delta was prepared in response to comments on the Draft PEIR. Please refer to Section 14.8, Master Response on Delta and San Joaquin River Issues (Vol. 7, Chapter 14).]

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5.3.2 Geomorphology

Channel morphology, or river form, reflects the interactions among watershed geology, flow, the supply of sediment and large woody debris, tectonic uplift and subsidence, and glacial advances and retreats. River channels are in a state of dynamic equilibrium with their watersheds. Although they may change each year, particularly in response to high flows, their characteristics remain stable in the medium term, provided conditions in the watershed also remain stable. When conditions in a watershed change, the dynamic equilibrium is disturbed, and river form will adjust to the new watershed condition (Knighton, 1984).

Over the last century, flow in the Tuolumne River between Hetch Hetchy Reservoir and Don Pedro Reservoir and below La Grange Dam has been progressively reduced by dam operations and the diversion of water for hydropower generation, flood control, and municipal and agricultural water supply. The WSIP would cause further changes in river flow over the next 25 years, as described in Section 5.3.1. Thus, WSIP-induced changes in river flow have the potential to further affect river channel characteristics.

5.3.2.1 Setting

The Tuolumne River drains a 1,960-square-mile watershed on the western slope of the Sierra Nevada range and is the largest of three major tributaries to the San Joaquin River. The river originates in Yosemite National Park and flows southwest to its confluence with the San Joaquin River, approximately 10 miles west of the city of Modesto. Deep canyons, granite river channels, and forested, mountainous terrain characterize the watershed between its crest and La Grange Dam. Near the town of La Grange, the river exits the Sierra Nevada foothills and flows through a gently sloping alluvial valley that is incised into Pleistocene alluvial fans.

Upper Tuolumne River and Tributaries

Upstream of Don Pedro Reservoir, the Tuolumne River and its tributaries flow through steep narrow valleys that confine the river channel. In most of this reach, the river channel is steep and alternates between bedrock chutes,[1] boulder cascades, and pools. Except in the Poopenaut Valley (a 2.5-mile reach below O'Shaughnessy Dam) and downstream of the Clavey River confluence, alluvial deposits are limited to small or medium-sized patches associated with flow obstructions (such as boulders and bedrock outcrops). For the first 2.5 miles below O'Shaughnessy Dam, the Tuolumne River flows through a U-shaped glaciated valley. The river channel is V-shaped and sinuous in the approximately 10 miles of river from the Poopenaut Valley to Early Intake. While the average channel gradient in this reach of the river is steep (averaging 2 percent), subreach-scale variation in channel gradient and valley confinement provides very diverse channel morphology. Channel morphology in this reach ranges from the low-gradient, sand-bedded channel and broad wetland meadow of the Poopenaut Valley to the steep, bedrock-confined channel found in most of the rest of the Tuolumne River (McBain & Trush and RMC, 2006).

1 A chute in this context is an inclined trough or channel feature such as a waterfall or rapid.

From Early Intake, the river flows about 10 miles to its confluence with the South Fork of the Tuolumne River. The river is confined in a deeply incised, V-shaped canyon with steep, competent side slopes. Channel gradient in this reach also averages about 2 percent, but is as steep as 4 percent in one section. For most of its length, the channel consists of a series of pools separated by steep cascades over boulders. Alluvial bars and side-channels are present throughout the reach where the valley widens or where bedrock constraints reduce channel gradient.

From the South Fork confluence to the upper end of Don Pedro Reservoir, the average channel gradient decreases to less than 1 percent. In the upper section of this reach, from the confluence with the South Fork to the confluence with the Clavey River, the river channel consists of boulder cascades separated by medium-length pools. Downstream of the Clavey River confluence, the channel gradient decreases, and the channel becomes semi-alluvial. Large boulder bars are common.

Cherry Creek is a tributary to the Tuolumne River. From Cherry Dam, Cherry Creek flows about 12 miles to its confluence with the Tuolumne River (1.3 miles downstream of Early Intake). For most of this length, Cherry Creek is confined within a narrow bedrock canyon, and channel gradient is steep (5 percent). The bed consists primarily of boulders and bedrock, although a large volume of sand is stored in pools. Immediately downstream of the dam, however, the channel alternates between low-gradient, gravel-bedded reaches separated by steep, bedrock chutes. In the gravel-bedded reaches of the upper five-mile reach between the dam and the confluence with Eleanor Creek, riparian and upland vegetation has encroached onto formerly active alluvial bars since completion of Cherry Dam.

Eleanor Creek flows into Cherry Creek seven miles upstream of the Tuolumne River and extends 3.5 miles from Eleanor Dam to Cherry Creek. For most of its length, Eleanor Creek flows through a steep bedrock canyon, and the channel is a series of pools and falls. The average channel gradient is 6 percent.

A common perception is that bedrock channel morphology is static compared to alluvial channels and therefore relatively insensitive to flow and sediment supply changes (e.g., Montgomery and Buffington, 1997). Bedrock channels, however, are often highly dynamic depositional environments; though principally erosional, they also exhibit abundant depositional features. Large, geomorphically derived hydraulic controls, such as width constrictions or expansions and resistant bedrock outcrops, remain stable over decades or centuries and define an overall limit for coarse sediment deposition in each segment of the bedrock channel. These geomorphic controls induce coarse depositional features that in turn perform as smaller hydraulic controls to induce finer and more transitory secondary depositional features. The occurrence of smaller hydraulic controls within larger hydraulic controls gives rise to a complex, nested depositional channel morphology that provides diverse aquatic and riparian habitats (McBain and Trush, 2004).

Short channel segments where channel gradient decreases and/or valley width increases may support unique and/or more diverse aquatic and riparian communities. These atypical channel segments exhibit prominent depositional features, such as alluvial bars, side channels, and limited floodplains. While these alluvial subreaches and patches constitute a small portion of the channel in this reach, they provide important establishment sites for riparian vegetation, habitat for aquatic flora and fauna and native amphibians, and low-velocity rearing habitat for juvenile fish.

Sediment is supplied to bedrock rivers primarily through “mass wasting.” Hill-slope mass wasting, such as rock falls and bedrock shearing from canyon walls, episodically delivers coarse sediment of sufficient volume and/or caliber to create large depositional features in the channel or to function as large-scale hydraulic controls capable of generating other prominent depositional features. Bedrock rivers have a huge potential transport capacity for coarse sediment, but a small storage capacity for coarse and fine sediment. Hydraulic complexity and channel form, expressed as nested hydraulic controls in a variable flow regime, exert the greatest control on storage capacity. The annual coarse bedload[2] transported may fluctuate dramatically without significantly affecting the volume of coarse sediment stored in a channel segment. Although storage capacity is low, the ecological implications for maintaining these limited depositional features can be great.

In bedrock rivers, diverse erosional and depositional features are created and maintained by a broad range of floods. For example, sand patches are scoured and deposited during small floods, while boulder ribs are mobilized only during very large, infrequent floods. Flow thresholds that mobilize depositional features in bedrock rivers are not well understood. Recent, though limited, observations of the Clavey River (a tributary to the Tuolumne River) suggest that:

- Common small floods that occur every one to three years scour and deposit sand at pools and bars
- Moderate-sized floods that occur every 12 to 17 years move gravel and cobbles, reshape side channels, and may move large woody debris
- Very large floods that occur every 70 to 100 years erode large bars, remove and create side channels, and move large boulders over short distances

Tuolumne River from La Grange Dam to the San Joaquin River

Near the town of La Grange, the Tuolumne River exits the Sierra Nevada foothills and flows through a gently sloping alluvial valley incised into Pleistocene alluvial fans. The valley walls confine the river corridor to as narrow as 500 feet near Waterford, about 20 miles downstream of La Grange, whereas the river reaches downstream of Modesto are virtually unconfined. In some locations, bedrock outcrops control the gradient of the river; in others, the bedrock is up to 50 feet below the riverbed.

Within the alluvial valley, the river can be divided into two geomorphic units defined by channel slope and bed composition: the gravel-bedded reach, which extends about 28 miles from La Grange Dam to below Geer Road, and the sand-bedded reach, which extends about 24 miles from below Geer Road to the confluence with the San Joaquin River. The gravel-bedded reach has moderate slopes (0.03–0.15 percent), and extensive alteration of the channel and floodplain

2 Refers to the amount of cobbles, gravel, and sand transported along the stream bottom (as opposed to suspended in the stream flow).

has occurred as a result of past gold dredging operations and past and current aggregate mining. Channel gradient decreases to less than 0.03 percent in the sand-bedded reach, and the channel is characterized by a meandering, alternate bar morphology. Under current conditions, coarse sediment sources are limited to tributaries downstream of La Grange Dam and to bed and bank erosion, so little coarse sediment enters the lower river. Most of the sediment that is currently contributed to the channel downstream of the dam consists of sand and finer-sized particles. While dams have eliminated upstream sediment supply, gold dredging and aggregate mining have removed sediment stored in the river channel and floodplain. Since sediment supply to the lower river has been cut off by upstream dams, the river cannot recover from past in-channel dredging and mining.

Operation of Don Pedro Reservoir has reduced the magnitude of peak flow in the lower river, and the reduction in peak flows has altered channel characteristics below La Grange Dam. Flood releases from the reservoir are dictated by three factors:

- Maximum releases through the dam outlet works (14,000 cfs)
- U.S. Army Corps of Engineers flood control rules, which limit flows to 9,000 cfs, as measured at the Modesto gauge (which includes inflows from Dry Creek)
- Maximum release capacity through the powerhouse turbines (5,500 cfs)

A number of agencies and nonprofit groups, including the SFPUC, TID, MID, U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), California Department of Fish and Game (CDFG), Friends of the Tuolumne, and the Tuolumne River Preservation Trust, are cooperating in efforts to restore the lower Tuolumne River corridor. In 2000, the Tuolumne River Technical Advisory Committee completed the *Habitat Restoration Plan for the Lower Tuolumne River Corridor* (McBain & Trush, 2000). The goal of the plan is to improve the river's value as fish and wildlife habitat. The plan recommends several measures to improve ecological function in the lower river, including increased frequency and magnitude of high flows, channel reconstruction, and coarse and fine sediment management. Recommended increases in flood flows, which would be achieved through revisions to operating criteria during flood control release periods, would increase the magnitude of bankfull[3] flows to more effectively move sediment. Of the 14 channel restoration projects identified in the plan, two have been constructed, two will be constructed in 2007, and three have complete designs and are in various stages of funding and implementation planning. Peak flows below La Grange Dam are usually in the range of 5,000 to 5,500 cfs as a result of reservoir releases for power generation purposes. Consequently, all of these restoration projects are designed to function based on a bankfull flow and two-year flood of 5,000 cfs (McBain *et al*., 2004).

3 A bankfull channel conveys commonly occurring flows, with larger flows spilling over the banks and onto the floodplain.

5.3.2.2 Impacts

Significance Criteria

The CCSF has not formally adopted significance standards for impacts related to geomorphology, but generally considers that implementation of the proposed program would have a significant impact if it were to:

- Substantially change the topography such that ecological, hydrologic or aesthetic functions are adversely affected, or substantially change any unique geologic or physical features of the site or area

- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of the stream or river, in a manner that would result in substantial erosion or siltation or adversely affect the ecological, hydrologic or aesthetic functions of the site or area

Although the "substantial change in topography" criterion is typically applied to upland areas, it is considered applicable to stream channel/bank topography in this instance because of the sensitivity of the resources that depend on the topography of those features (i.e., riparian vegetation and fisheries).

Approach to Analysis

This impact section presents a discussion of the potential changes in sediment transport and geomorphology that could result from WSIP-related changes in stream flow, reservoir storage, and reservoir water levels, as described in Section 5.3.1. A qualitative assessment of potential effects was conducted based on generalized channel bed/bank characteristics and a consideration of the program-induced changes in stream flow. No modeling or field measurements have been performed to estimate program-generated changes in sediment transport in the Tuolumne River system.

As indicated in Section 5.3.1, the WSIP would have no effect on flow in Cherry Creek or Eleanor Creek. Consequently, the impact analysis focuses on the Tuolumne River between Hetch Hetchy Reservoir and the confluence with the San Joaquin River, a reach of the river that would be affected by WSIP-induced changes in stream flow.

Impact Summary

Table 5.3.2-1 presents a summary of the impacts on sediment transport and geomorphology in the Tuolumne River system and downstream water bodies that could result from implementation of the proposed water supply and system operations.

TABLE 5.3.2-1
SUMMARY OF IMPACTS –
GEOMORPHOLOGY OF THE TUOLUMNE RIVER SYSTEM AND DOWNSTREAM WATERBODIES

Impact	Significance Determination
Impact 5.3.2-1: Effects on sediment transport and channel characteristics between O'Shaughnessy Dam and Don Pedro Reservoir	LS
Impact 5.3.2-2: Effects on sediment transport and channel characteristics below La Grange Dam	LS

LS = Less than Significant impact, no mitigation required

Impact Discussion

Impact 5.3.2-1: Effects on sediment transport and channel characteristics between O'Shaughnessy Dam and Don Pedro Reservoir.

Sediment transport and channel characteristics are primarily influenced by peak flows rather than by smaller common flows. As noted above, studies of the Clavey River indicate that peak flows that occur every one to three years produce enough energy to move sand; peak flows that occur every 12 to 17 years produce enough energy move gravel and cobbles; and peak flows that occur every 70 to 100 years produce enough energy to move boulders. Although the relationship between peak flows and the transport of sand, gravel, and boulders for the Clavey River cannot be directly applied to the main stem of the Tuolumne River, it provides an indication of the frequency of peak flows that mobilize depositional features in steep, mountain streams.

As discussed in Section 5.3.1 and illustrated in Figure 5.3.1-9, the WSIP would have little effect on the very large and infrequent floods in the Tuolumne River between O'Shaughnessy Dam and Don Pedro Reservoir that are capable of moving boulders and altering the characteristics of the bedrock channels. When the volume of runoff from the watershed above Hetch Hetchy Reservoir is great, the reservoir fills rapidly, after which all flow in excess of the capacity of the reservoir and Mountain Tunnel is released to the river. Under these conditions, the WSIP would extend the reservoir refill period and delay releases from the reservoir slightly (for a few days), after which releases to the river would follow the same pattern as they do under the existing condition. Because the WSIP would not affect the frequency or magnitude of large and infrequent floods, it would have a less-than-significant effect on the bedrock channel characteristics of the Tuolumne River below O'Shaughnessy Dam, and no mitigation measures would be required.

Flow in the Tuolumne River between O'Shaughnessy Dam and Early Intake consists predominantly of controlled releases from Hetch Hetchy Reservoir, except during large storms or snowmelt runoff. Under certain conditions (e.g., in normal hydrologic years that follow extended droughts), the WSIP could reduce the magnitude and duration of bankfull peak flows that are released from the reservoir every one to three years. As shown Figure 5.3.1-9, reductions in peak flows of this type occur infrequently in the 82-year hydrologic record. Thus, the WSIP could affect the rate and amount of sediment deposition and erosion in side channels and in the vicinity of the few streamside meadows that exist in this reach of the river. However, because the changes in peak flow would occur infrequently, they would not be expected to result in a substantial change in erosion or siltation rates. The impact would be *less than significant*, and mitigation measures would not be required.

[Additional discussion on impacts on geomorphology in the upper Tuolumne River was prepared in response to comments on the Draft PEIR. Please refer to Section 14.6, Master Response on Upper Tuolumne River Issues Issues (Vol. 7, Chapter 14).]

Impact 5.3.2-2: Effects on sediment transport and channel characteristics below La Grange Dam.

As noted above, the bankfull peak flows that occur every one to three years are the primary channel-forming events in the reach of the Tuolumne River below La Grange Dam, although larger floods are also important. The WSIP would have little effect on very large and infrequent floods within the Tuolumne River below La Grange Dam, such as the flood that occurred in 1997, but could affect the magnitude of the bankfull peak flows.

The WSIP would increase the drawdown of Don Pedro Reservoir by a small amount each year and by a considerable amount in an extended drought. To refill the reservoir in the winter and spring, TID and MID would capture a larger proportion of runoff than it does under the existing condition. In some years, when runoff is great compared to the storage deficit, the WSIP might extend the reservoir refill period and delay releases from Don Pedro Reservoir by several days, after which releases from the reservoir would follow the same pattern as they do under the existing condition. Under these conditions, the WSIP would have little or no effect on channel geomorphology. Occasionally, refilling the reservoir would require most or all runoff in excess of the minimum required fish release, and flows below La Grange Dam would be substantially reduced compared to the existing condition. In these years, sediment transport in the river below La Grange Dam would be reduced. However, because WSIP-induced changes in peak flow would occur infrequently, they would not be expected to result in a substantial change in erosion rates, siltation rates, or channel form. The impact would be *less than significant*, and mitigation measures would not be required.

[Additional discussion on impacts on geomorphology in the lower Tuolumne River was prepared in response to comments on the Draft PEIR. Please refer to Section 14.7, Master Response on Lower Tuolumne River Issues (Vol. 7, Chapter 14).]

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5.3.3 Surface Water Quality

The following setting section describes surface water quality in streams and reservoirs in the Tuolumne watershed and downstream water bodies that could be affected by the WSIP. The impact section (Section 5.3.3.2) provides a description of the changes in water quality in streams and reservoirs that would result from WSIP-induced changes in stream flow and reservoir water levels.

5.3.3.1 Setting

The Tuolumne River flows from the crest of the Sierra Nevada westward to its confluence with the San Joaquin River. The San Joaquin River flows north to the Sacramento–San Joaquin Delta. Water from the Delta discharges to the San Francisco Bay Estuary and the Pacific Ocean. The Tuolumne River system and downstream water bodies are shown in Figure 5.1-1. Beneficial uses of the Tuolumne River, as designated in the *Water Quality Control Plan for the Sacramento and San Joaquin River Basins*, include the following:

- Source to (New) Don Pedro Reservoir: Municipal and Domestic Supply (MUN); Agricultural Supply (AGR); Hydropower Generation (POW); Water Contact Recreation (REC-1); Non-water Contact Recreation (REC-2); Warm Freshwater Habitat (WARM); Cold Freshwater Habitat (COLD); and Wildlife Habitat (WILD)
- New Don Pedro Reservoir: MUN (Potential); POW; REC-1; REC-2; WARM; COLD; and WILD
- New Don Pedro Dam to San Joaquin River: MUN (Potential); AGR; REC-1; REC-2; WARM; COLD; Migration of Aquatic Organisms (MIGR); Spawning, Reproduction, and/or Early Development (SPWN); and WILD

The WSIP would affect flow in the Tuolumne River, the San Joaquin River, and the Sacramento–San Joaquin Delta as well as water levels in Hetch Hetchy Reservoir and Don Pedro Reservoir, as described in Section 5.3.1. WSIP-induced changes in flow and water levels could affect water quality in these streams and reservoirs. The WSIP would have minor effects on flow in Eleanor and Cherry Creeks and on water levels in Lake Eleanor and Lake Lloyd, but the changes would be too small to affect water quality.

The water supply and system operations components of the WSIP would not involve the discharge of pollutants into water bodies and therefore would have a limited potential to affect water quality. WSIP-related changes in water quality, such as changes in water temperature or dissolved oxygen, would stem from changes in stream flow and changes in water levels in reservoirs. Accordingly, the water quality data presented in this section are limited to those water quality characteristics that could be altered by elements of the proposed program or that are needed to provide a general understanding of potentially affected water bodies.

Tuolumne River

Water quality in the upper Tuolumne River basin is excellent. The Tuolumne River drainage above Hetch Hetchy Reservoir lies entirely within the less developed parts of Yosemite National

Park. The combination of a high-altitude granitic drainage basin and minimal human influences results in river water that is cold, clear, and free of contaminants. Water quality in Hetch Hetchy Reservoir is also excellent. Plant nutrients such as nitrogen and phosphorus are typically near or below detection limits, and dissolved oxygen concentrations are typically at or near saturation. Total dissolved solids concentrations are less than 10 milligrams per liter (mg/L), and average total organic carbon concentrations are less than 2 mg/L. The SFPUC samples water quality at various depths in Hetch Hetchy Reservoir. As shown in **Table 5.3.3-1**, monthly water temperatures at a depth of 140 feet below the water surface for the period from 1997 to the present ranged between 6.5 and 13.8 degrees Celsius (°C). This depth, which is approximately the middle of the water column, is representative of water released to the Tuolumne River.

TABLE 5.3.3-1
SUMMARY OF TEMPERATURE DATA (°C), HETCH HETCHY RESERVOIR

Year	Flow Index[a]	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1997	109.6	6.5	–	–	–	–	–	11.7	12.0	12.3	12.7	13.8	11.4
1998	119.7	8.0	7.1	6.6	6.7	7.1	–	10.6	12.0	12.2	12.7	12.8	–
1999	110.2	8.3	7.5	7.1	7.1	7.5	9.2	11.0	11.4	11.8	–	–	11.7
2000	107.4	9.8	8.9	7.6	7.7	8.5	9.8	11.2	11.6	12.0	12.4	12.3	11.1
2001	74.6	–	6.9	6.7	7.0	8.4	10.0	10.4	10.7	–	11.1	11.4	–
2002	93.4	8.2	6.5	6.5	7.3	8.0	–	10.8	11.1	11.5	11.7	–	11.7
2003	100.9	9.1	7.7	–	7.5	8.0	10.2	11.4	11.8	12.1	12.5	–	12.1
2004	89.7	9.1	–	7.1	7.4	8.9	10.6	11.1	11.4	11.7	11.9	12.1	9.6
2005	117.2	7.5	6.8	7.0	7.0	7.5	9.5	11.6	12.0	12.5	12.8	13.0	11.7
avg	–	8.3	7.3	6.9	7.2	8.0	9.9	11.1	11.6	12.0	12.2	12.6	11.3

[a] Flow Index is the year's total runoff as a percentage of the long-term average.

SOURCES: SFPUC (raw data); Merritt-Smith Consultants (data reduction).

Water quality in the reach of the Tuolumne River between Hetch Hetchy and Don Pedro Reservoirs is very good, but its dissolved mineral and plant nutrient content increases somewhat in a downstream direction. MID samples water from the outlet of Modesto Reservoir on the Modesto Canal. The samples are reasonably representative of water quality in the Tuolumne River at La Grange Dam. Total dissolved solids have been measured twice daily since 1997. These data show total dissolved solids concentrations that range from 15 to 26 mg/L, with an average of about 20 mg/L.

Below Don Pedro Reservoir, Tuolumne River water quality deteriorates somewhat as a result of agricultural irrigation return flow, urban and agricultural runoff, and recreation in and around the river and in Don Pedro Reservoir itself. In the warmer months, water temperature increases in a downstream direction as the river leaves the foothills of the Sierra Nevada and flows on to the floor of the San Joaquin Valley. Total dissolved solids content and turbidity also increase in a downstream direction.

Water temperature at several stations on the Tuolumne River downstream of La Grange Dam has been recorded for many years, but most intensively and reliably in the last decade in the course of a 2005 TID/MID study. La Grange Dam is located at river mile (RM) 52.2; that is, it is 52.2 miles upstream of the Tuolumne River's confluence with the San Joaquin River. Daily average water temperature at RM 51.8, about one-half mile below La Grange Dam, was usually in the range of 9 to 14 °C between 1996 and 2004. Daily average temperature at RM 36.7, about 15 miles below La Grange Dam, was usually in the range of 9 to 26 °C, and at RM 3.4, about 50 miles below La Grange Dam, was usually in the range of 9 to 29 °C. Daily average wintertime water temperature is similar for the entire river reach from La Grange Dam to the confluence with the San Joaquin River. The maximum temperatures experienced in the summer and fall from 1996 to 2004 at several locations are shown in **Table 5.3.3-2**. Seasonal variation at RM 43.4, about nine miles below La Grange Dam is shown in **Figure 5.3.3-1**.

TABLE 5.3.3-2
MAXIMUM SUMMER–FALL WATER TEMPERATURES IN THE TUOLUMNE RIVER FROM LA GRANGE DAM TO MODESTO[a]
1996–2004

Year	Water Year Type	Maximum Water Temperature (Summer–Fall) (°C rounded to nearest 0.5)				
		RM 49	RM 43.4	RM 36.7	RM 23.6	RM 3.4
1996	AN-W	18.5	**21**	**25**	NA	**29**
1997	AN-W	16	**20**	**23**	**26**	**28**
1998	W	14	16	17	**21**	**23**
1999	BN-AN	16	18	**23**	**27**	**29**
2000	BN-AN	NA	19	**23**	**27**	**28**
2001	D	**22**	**28**	**30**	**31**	NA
2002	D	**20**	**26**	**30**	**30**	**31**
2003	BN	16	19	**23**	**26**	**30**
2004	D	18	**24**	**27**	**30**	NA

[a] La Grange Dam is located approximately at RM 49 and Modesto at RM 3.4.

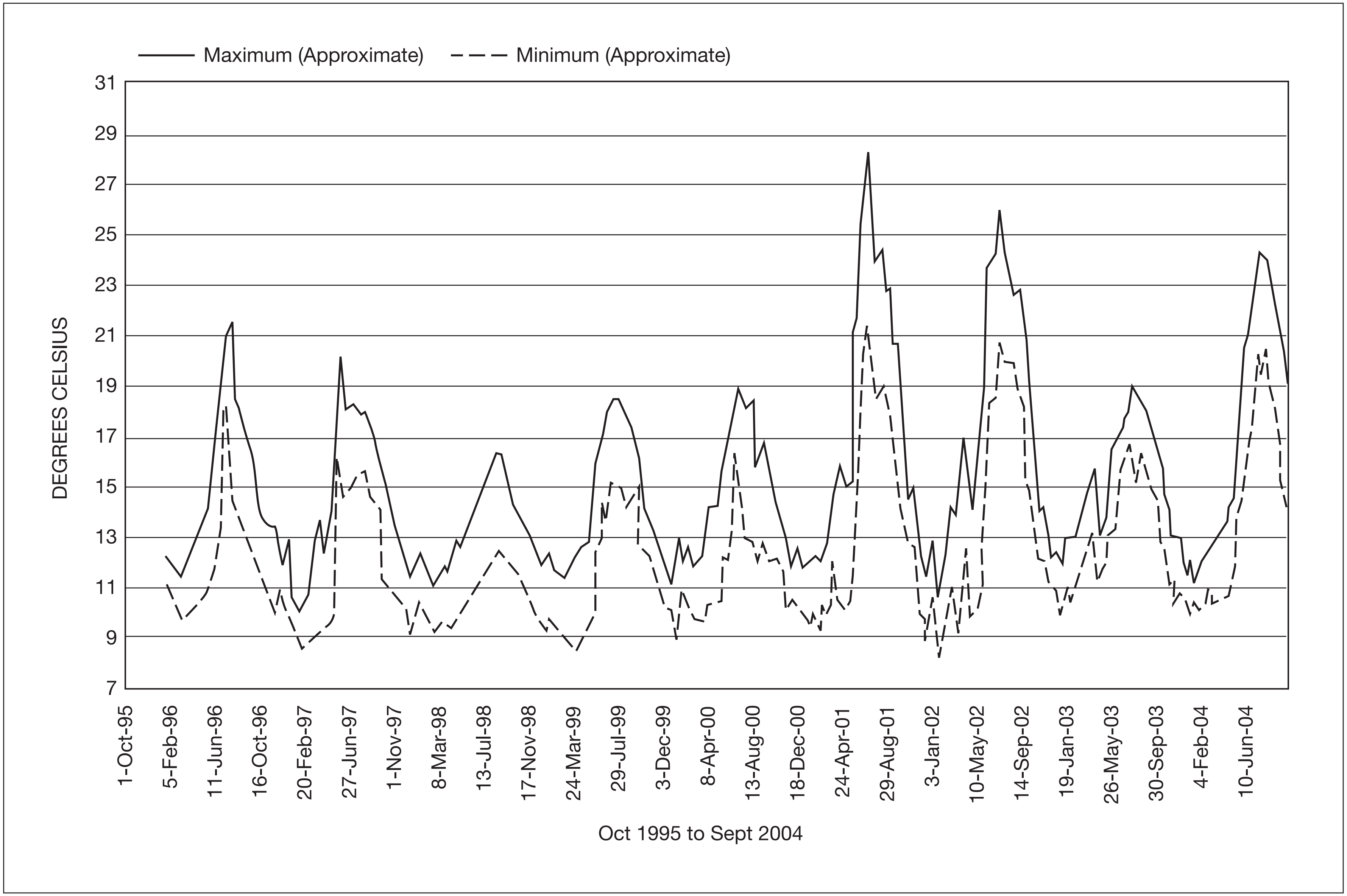
W = wet; AN = above normal; BN = below normal; D = dry; C = critically dry; RM = river mile
Temperatures ≥20 °C are shown in **bold** type.

The TID/MID study describes some general trends in water temperature:

- In all year types from 1996 to 2004, releases from Don Pedro Reservoir varied seasonally from a low of about 8 °C to a high of about 16 °C, with low temperatures occurring during the spring snowmelt and the highest temperatures occurring in late summer.
- In the reaches below Don Pedro Reservoir and La Grange Dam (RM 51.8 to RM 36.7), there is a clear relationship between hydrologic year type (and thus flow) and river temperatures during the summer and fall. This probably reflects the influence of surface-area-to-volume relationships. The effect becomes increasingly pronounced from upstream to downstream due to high summer temperatures in the San Joaquin Valley (Table 5.3.3-2). Even in wet years, peak summer temperatures in the reach downstream of RM 23.6 are above 20 °C. In all but the summer of 1998 following the extremely wet 1997/1998 floods, peak water temperatures exceed 20 °C up to RM 36.7.
- In downstream reaches of the river (RM 23.6 and below), the period of average daily temperatures in excess of 21 to 23 °C is frequently two to four months long.

The water temperature data from TID/MID(2005) are generally consistent with those reported in a 1996 FERC study. The FERC report notes that water temperature in the river is probably affected by the lack of riparian shade, and that leakage of water from diversion reservoirs and upwelling of groundwater probably provide some pockets of cool water in the summer.

Some water quality characteristics in the Tuolumne River are affected by reservoir operations and by changes in river flow attributable to water supply and hydropower generation activities. Primary among them is water temperature, which in turn may affect dissolved oxygen content. Water temperature in flowing streams depends on the water source, air temperature, flow, surface area, and exposure to solar radiation. Reductions in stream flow when air temperature is high usually



SOURCE: Turlock and Modesto Irrigation Districts

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Figure 5.3.3-1
Tuolumne River Water Temperature at River Mile 43.4

result in increases in water temperature. Storage of water in reservoirs may increase or decrease water temperatures. Hetch Hetchy and Don Pedro Reservoirs fill with cool water in the winter and spring. During the summer, water near the surface is heated by solar radiation, but because the reservoirs are deep they retain a large volume of cool water nearer the bottom. The boundary between the warmer surface waters and cooler waters below is referred to as the thermocline. The portions of the reservoir above and below the thermocline are referred to respectively as the epilimnion and the hypolimnion. The thermocline is quite distinct in most deep reservoirs in the Sierra Nevada and is typically at a depth of 25 to 50 feet below the water surface. **Figure 5.3.3-2** shows typical August temperature profiles for Hetch Hetchy and Don Pedro Reservoirs in August. Typical summertime water temperatures in the epilimnion and hypolimnion at Hetch Hetchy Reservoir are 20 °C and 10 °C, respectively. Corresponding values for Don Pedro Reservoir are 27 °C and 12 °C.

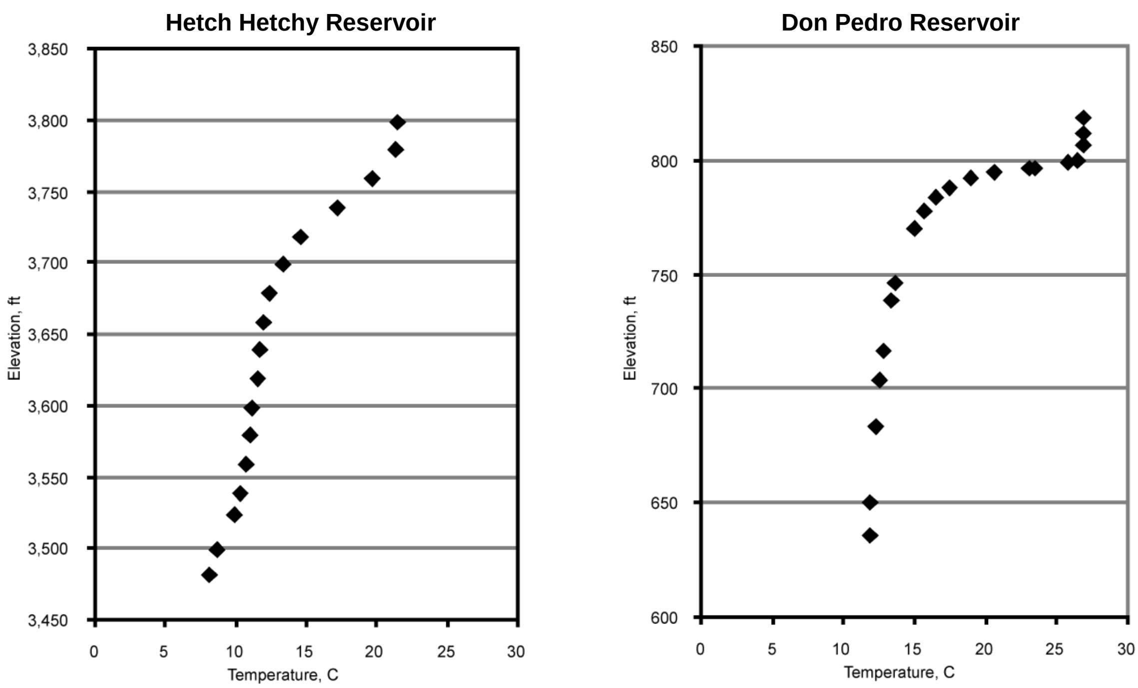

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Figure 5.3.3-2
Typical Summertime Water Temperature Gradient in Hetch Hetchy and Don Pedro Reservoirs

Water is typically released to streams from outlets near the bottom of reservoirs. If water is released from a reservoir in the summer from below the thermocline, it is typically cooler than stream water would be if the reservoir did not exist. When reservoirs are drawn down in the late summer and fall, the thermocline moves downward, closer to the reservoir outlet. Releases from reservoirs at such times may be a mixture of cool bottom water and warmer water from nearer the surface, with a consequent increase in water temperature in the stream below the reservoir.

San Joaquin River

Water quality in the San Joaquin River at Vernalis is shown in **Table 5.3.3-3**. Vernalis is located just upstream of the Sacramento–San Joaquin Delta and about 10 miles downstream of the San Joaquin River's confluence with the Tuolumne River. The total dissolved solids and total organic carbon concentrations in the San Joaquin River are high for natural waters and are considerably higher than for Tuolumne River water. The total dissolved solids concentration (a measure of dissolved minerals) averages 380 mg/L, and the total organic carbon concentration (a measure of dissolved and particulate organic matter) averages 3.6 mg/L. The total dissolved solids concentration in San Joaquin River water at Patterson, about 10 miles upstream from the San Joaquin River and Tuolumne River confluence, averages more than 600 mg/L. The improvement in San Joaquin River water quality between Patterson and Vernalis is attributable to mixing with higher quality water from the Tuolumne and Stanislaus Rivers.

TABLE 5.3.3-3
WATER QUALITY DATA SUMMARY, SAN JOAQUIN RIVER AT VERNALIS
ABOVE NORMAL (2000)/DRY (2002)

	Average Total Organic Carbon (mg/L)	Average Total Dissolved Solids (mg/L)	Average Nitrate (NO_3) (mg/L)	Average Total Phosphorus (mg/L)	pH
October	3.0/3.4	350/410	9.8/8.5	–	–
November	3.4/2.8	350/260	7.8/6.0	–	–
December	3.1/3.5	480/410	9.1/6.2	–	–
January	2.7/3.3	500/460	5.8/6.5	–	–
February	6.0/4.0	420/590	8.4/6.7	–	–
March	4.5/4.0	150/590	4.0/11.2	–	–
April	3.5/3.9	250/550	3.2/6.8	–	–
May	2.5/2.5	180/230	4.0/3.7	–	–
June	2.6/2.7	260/290	5.2/6.6	–	–
July	3.4/4.0	370/390	8.9/6.5	–	–
August	3.5/4.3	350/410	8.6/6.0	–	–
September	3.1/4.2	260/450	6.6/8.2	–	–
Average (1999–2003)	3.6	380	6.9	0.23	7.8

SOURCE: DWR 2003; 2005.

The primary causes of degraded water quality in the San Joaquin River are the unsolved agricultural drainage problem in the San Joaquin Valley, urban wastewater and stormwater discharges, discharges from wildlife refuges, and flow depletion in some months of some years. Inadequate drainage and accumulating salts have been persistent problems in parts of the San Joaquin Valley for more than a century. Farmers in arid areas must apply irrigation water to their crops in excess of crop needs to flush salts out of the root zone. In parts of the valley, this practice has caused shallow groundwater levels to rise close to the ground surface. To prevent land from becoming unproductive, farmers install tile drains under their fields in an effort to lower groundwater levels and remove salt from the soil. The tile drains convey saline water to perimeter ditches, which are typically routed to the nearest natural stream channel. In the San Joaquin Valley, the natural channels are tributary to the San Joaquin River or Tulare Lake. In the 1960s and 1970s, the USBR attempted to solve the drainage problem in the San Joaquin Valley by constructing an agricultural drainage system for the valley that routed drainage water away from the San Joaquin River. The project was only partially built and failed to solve the problem (U.S. Department of the Interior/California Resources Agency, 1990).

Sacramento–San Joaquin Delta

Water quality in the Delta is governed by the Delta's complex hydrodynamics. Freshwater enters the Delta from its tributary rivers and, with the tides, saline water enters the Delta from Suisun Bay, the northern reach of the San Francisco Bay Estuary. When freshwater flow through the Delta is great, saline water is repelled and the waters of the Delta exhibit little salinity. When freshwater flow is small, tidal flow enables saline water to penetrate into the Delta. Under these circumstances, water quality in some parts of the Delta becomes brackish and unsuitable (or less suitable) for use as a source of potable and irrigation water. The reversal of flow in the lower San Joaquin River and many south Delta channels as a result of water diversion by the State Water Project and Central Valley Project increases the tendency for saline water to penetrate into the Delta.

Table 5.3.3-4 shows water quality characteristics at selected locations in the Delta. In general, water quality in the Delta declines in a southerly and westerly direction. This is illustrated by the pattern of chloride concentrations. For Sacramento River water entering the Delta from the north, the chloride content is low. Chloride, a constituent of seawater, enters the Delta from the west. The chloride concentration at the State Water Project's Banks Pumping Plant is higher than in the Sacramento River because low-chloride Sacramento River water mixes with saline water entering from Suisun Bay. Water quality at the Banks Pumping Plant, one of the two large pumping plants in the south Delta, is shown in **Table 5.3.3-5**.

The water quality parameters in Delta waters that are of greatest concern to municipal water supply agencies are total dissolved solids (salinity), bromide, and total organic carbon content. Elevated salinity levels in drinking water supplies may make it unpalatable. Farmers are also concerned about salinity because elevated levels may make water unsuitable for irrigating certain salt-sensitive crops.

Organic carbon compounds are present in water in the form of microscopic plants and animals and the products of bacterial degradation of plant and animal material. Total organic carbon levels rise in the Delta in the winter and spring primarily as a result of the drainage of peat soils on the Delta islands. Organic carbon reacts with chemicals used to disinfect drinking water to form trihalomethanes and other disinfection byproducts. Trihalomethanes are known to cause cancer in humans and are regulated under the Safe Drinking Water Act. Bromine also reacts with organic matter and disinfection agents to form trihalomethanes and other brominated disinfection byproducts. Saline water from San Francisco Bay is the main source of bromine in the Delta.

Diminution of flow and flow reversal in the lower San Joaquin River as a result of water diversions by the State Water Project and the Central Valley Project are harmful to migrating salmon. In 1990, DWR began installing temporary barriers in several waterways in the south Delta to improve conditions for migrating salmon. Temporary barriers have been placed across

TABLE 5.3.3-4
WATER QUALITY CHARACTERISTICS AT SELECTED STATIONS WITHIN THE DELTA

Location	Sacramento River at Green's Landing	North Bay Aqueduct at Barker Slough	Banks Pumping Plant	Contra Costa Intake at Rock Slough	San Joaquin River at Vernalis
Mean Total Dissolved Solids (mg/L)	100	192	258	305	459
Mean Electrical Conductivity (μS/cm)	160	332	482	533	749
Mean Bromide, Dissolved (mg/L)	0.018	0.015	0.269	0.455	0.313
Mean Total Organic Carbon (mg/L)	2.5	5.3	3.7	3.4	3.9
Mean Chloride, Dissolved (mg/L)	6.8	26	81	109	102

NOTE: Sampling period varies, depending on the location and constituent, but is generally between 1990 and 1998.

mg/L = milligrams per liter
μS/cm = microsiemens per centimeter

SOURCE: CALFED, 2000.

TABLE 5.3.3-5
WATER QUALITY DATA SUMMARY, BANKS PUMPING PLANT
ABOVE NORMAL (2000)/DRY (2002)

	Total Organic Carbon (mg/L)	Total Dissolved Solids (mg/L)	Nitrate (NO_3) (mg/L)	Total Phosphorus (mg/L)	pH
October	2.9/2.8	310/420	1.4/1.6	0.08/0.11	–
November	2.4/2.5	240/310	1.6/3.2	0.07/0.08	–
December	3.2/4.4	390/290	2.9/3.8	0.08/0.10	–
January	4.0/8.5	260/230	3.2/6.5	0.07/0.12	–
February	6.3/4.3	220/270	5.2/4.2	0.17/0.09	–
March	3.8/3.8	150/240	2.8/3.4	0.10/0.12	–
April	3.2/3.5	160/180	1.5/1.8	0.08/0.10	–
May	5.2/3.5	210/240	2.9/2.8	0.09/0.13	–
June	3.1/3.3	160/190	1.3/1.8	0.10/0.13	–
July	2.3/2.3	120/190	1.0/1.0	0.10/0.10	–
August	2.4/2.0	110/310	0.4/0.9	0.09/0.10	–
September	2.2/2.3	180/410	0.9/0.8	0.08/0.09	–
Annual Average (1999–2003)	3.5	233	2.5	0.11	7.4

SOURCES: DWR, 2003; 2005.

the Grant Line Canal, Middle River, and Old River. The purpose of the barriers is to control water levels for irrigators, improve water quality, and direct more water down the lower San Joaquin River for downstream migrating juvenile salmon in the spring and upstream migrating adults in the fall. It is expected that permanent operable barriers will replace the temporary barriers in the next few years.

Beneficial Uses and Water Quality Objectives

Water quality is regulated in California pursuant to the federal Clean Water Act and California's Porter-Cologne Water Quality Control Act of 1969. Responding to public concern in California, state legislators enacted a law designed to curb water pollution several years before passage of the Clean Water Act. The Porter-Cologne Act established regional water quality control boards and gave them defined responsibilities for water quality management.

The Porter-Cologne Act requires the regional water quality control boards to prepare regional WQCPs, often referred to as basin plans. The WQCPs must identify present and future beneficial uses of California's waters and establish water quality objectives to protect them. California's beneficial use designations and water quality objectives are the functional equivalent of the federal ambient water quality standards. After passage of the Federal Water Pollution Control Act Amendments in 1972, later known as the Clean Water Act, California's water quality objectives served as federal water quality standards, following review and approval by the U.S. Environmental Protection Agency (U.S. EPA).

WQCPs are adopted and amended by the regional water quality control boards and are subject to CEQA review. WQCPs, and amendments to WQCPs, do not become effective until approved by the SWRCB. Adoption or revision of surface water objectives/standards is subject to the approval of the U.S. EPA. The regional WQCPs complement statewide WQCPs adopted by the SWRCB, such as the WQCP for temperature control and the WQCP for ocean waters.

Two WQCPs govern management of surface and ground waters that could be affected by the WSIP. The Central Valley WQCP covers the Sacramento and San Joaquin River basins, including an area bounded on the east by the crests of the Sierra Nevada and Cascade Range and on the west by the Coast Ranges and Klamath Mountains. The San Francisco Bay/Delta WQCP covers those portions of Alameda, Contra Costa, Marin, Napa, San Mateo, San Francisco, Santa Clara, Solano, and Sonoma Counties that drain to the San Francisco Bay Estuary, including the Delta.

Each WQCP identifies existing and potential beneficial uses of surface waters and establishes water quality objectives within its part of California. Surface waters in the WQCP areas are in compliance with objectives, except for those waters contained in the SWRCB's Section 303(d) list of impaired water bodies.

Section 303(d) of the Clean Water Act requires that states periodically prepare a list of surface water bodies that do not meet ambient water quality standards after conventional water pollution control measures have been applied. The states must then establish the total maximum daily loads of pollutants that can be discharged to the water body without violating ambient water quality standards. Pollutant discharges must be cut back until they are in compliance with the total maximum daily loads.

Tuolumne River

Water quality objectives for the San Joaquin River Basin, including the Tuolumne River from the town of Waterford to La Grange Dam, are shown in **Table 5.3.3-6**. The only numerical water quality objective for the Tuolumne River is the objective for dissolved oxygen, which applies to

TABLE 5.3.3-6
PERTINENT WATER QUALITY OBJECTIVES FOR THE SAN JOAQUIN RIVER BASIN

Parameter	Water Body	Beneficial Use	Water Quality Objective
Dissolved Oxygen	San Joaquin River (Turner Cut to Stockton)	Chinook Salmon	6.0 mg/L (September 1 to November 30) and 5.0 mg/L (December 1 to August 30)
	Other Delta Waters	WARM COLD SPWN	5.0 mg/L 7.0 mg/L 7.0 mg/L
	Tuolumne River (Waterford to La Grange)		8.0 mg/L (or >95% saturation) (October 15 to June 15)
Salinity	San Joaquin River (Antioch Water Works)	MUN IND	Chloride: Maximum mean daily >150 mg/L Number of days per year <150 mg/L: Wet – 240 (66%) Above Normal – 190 (52%) Below Normal – 175 (48%) Dry – 165 (45%) Critical – 155 (42%)
	San Joaquin River (at Vernalis)	AGR	Electrical conductivity (maximum 30-day average): 0.7 (April 1 to August 31) 1.0 (September 1 to March 31)
Temperature	San Joaquin River (at Vernalis)	Chinook Salmon	April 1 to June 30 September 1 to November 3 Average daily water temperature may not be elevated by controllable factors above 68 °F.
	All	COLD WARM	Maximum 5 °F increase, as specified in Central Valley RWQCB objectives

Key: MUN (Municipal and Domestic Supply; AGR (Agriculture); IND (Industrial Use); WARM (Warm Freshwater Habitat); COLD (Cold Freshwater Habitat); SPWN (Fish Spawning).

SOURCE: SWRCB, 1995.

most of the river below La Grange Dam between October 15 and June 15. The objective is intended to protect spawning salmonids and their eggs.

Impaired water bodies on the Tuolumne River are shown in **Table 5.3.3-7**. Don Pedro Reservoir is listed under Section 303(d) for mercury. The elevated mercury concentrations are a result of past gold mining in the Tuolumne River watershed. The reach of the river below Don Pedro Reservoir is listed for pesticides and unknown toxicity.

San Joaquin River

Water quality objectives for the San Joaquin River are shown in Table 5.3.3-6. The objectives include dissolved oxygen and water temperature objectives designed to protect migrating Chinook salmon and salinity objectives designed to protect municipal, industrial, and agricultural water supplies. As shown in Table 5.3.3-7, the San Joaquin River is listed as impaired under Section 303(d) for mercury, boron, various pesticides, salinity, and unknown toxicity.

Sacramento–San Joaquin Delta

As noted above, the Sacramento–San Joaquin Delta lies at the heart of California’s natural and manmade water systems. The Delta’s physical complexity and competing interests for water

TABLE 5.3.3-7
SECTION 303(d) LIST OF IMPAIRED WATER BODIES

Segment Name	Pollutant	Potential Source	Total Maximum Daily Load Priority
Don Pedro Reservoir	Mercury	Resource Extraction	Low
Tuolumne River (Don Pedro Reservoir to San Joaquin River)	Diazanon	Agriculture	Medium
	Group A Pesticides	Agriculture	Low
	Unknown Toxicity	Source Unknown	Low
San Joaquin River (Merced River to Vernalis)	Boron	Agriculture	High
	Chlorpyrifos	Agriculture	High
	DDT	Agriculture	Low
	Diazinon	Agriculture	High
	Electrical Conductivity	Agriculture	High
	Group A Pesticides	Agriculture	Low
	Mercury	Resource Extraction	Medium
	Unknown Toxicity	Source Unknown	Low
Sacramento–San Joaquin River Delta	Chlorpyrifos	Agriculture/Urban Runoff	High
	DDT	Agriculture	Low
	Diazinon	Agriculture/Urban Runoff	High
	Electrical Conductivity	Agriculture	Medium
	Group A Pesticides	Agriculture	Low
	Mercury	Resource Extraction	Medium
	Unknown Toxicity	Source Unknown	Low
	Exotic Species (proposed)	Ballast Water	NA

SOURCE: SWRCB, 1995.

make management of the Delta difficult. Water quality and flow objectives for the Delta have been the subject of much controversy and have frequently been revised. Some issues remain unresolved, including the degree to which parties that divert water upstream of the Delta are responsible for meeting Delta objectives. Resolution of these issues could affect all upstream diverters, including the SFPUC, TID, and MID.

The San Francisco Region WQCP, published in the early 1970s, designated beneficial uses and water quality objectives for both San Francisco Bay and the Delta. In 1978, a WQCP for the Sacramento–San Joaquin Delta and Suisun Marsh was published. In 1991, a WQCP for salinity in the San Francisco Bay/Sacramento–San Joaquin Delta Estuary (Bay-Delta estuary) was published. When the Monterey Agreement was signed in December 1994, the beneficial uses and water quality objectives contained in the 1978 and 1991 WQCPs were in effect. In May 1995, as the first elements of the Monterey Amendment were being implemented, the SWRCB adopted a new WQCP for San Francisco Bay and the Delta that superseded both the 1978 and 1991 plans (SWRCB, 1995).

The SWRCB is responsible for issuing and administering water-rights permits in California. In 1978, the SWRCB adopted Water Rights Decision 1485 (D-1485), which established minimum flows in the Delta and limited exports of water by the State Water Project and Central Valley Project. The purpose of D-1485 was to ensure compliance with then-current water quality objectives. D-1485 superseded all earlier water-rights decisions for State Water Project and Central Valley Project operations in the Delta. Various interests filed lawsuits challenging D-1485. In 1986, a ruling known as the Racanelli Decision affirmed the SWRCB's broad authority and obligation to establish water quality objectives and set water-rights permit terms that provide reasonable protection to the beneficial uses of Delta waters (DWR, 1998). In 1987, the SWRCB began hearings to adopt new Delta objectives and a new water-rights decision.

Although the SWRCB adopted new water quality and flow objectives in 1995 as part of the 1995 Bay-Delta WQCP, D-1485 remained in effect until 1999.

Water Quality and Flow Objectives. The WQCP for San Francisco Bay and the Delta, published in 1995, included water quality and flow objectives for the Delta. A draft EIR on the WQCP was published in 1997 (SWRCB, 1997). In the EIR, the SWRCB acknowledged that the flow objectives can only be achieved by limiting diversions of water in the Sacramento and San Joaquin River watersheds and within the Delta itself. The EIR noted that the SWRCB intended to implement the objectives, to the extent feasible, through amendments to the permits of water-rights holders in the Central Valley. However, the EIR also noted that some of the objectives cannot reasonably be achieved through changes to water-rights permits exclusively. Water quality and the health of aquatic resources in the Delta and San Francisco Bay are dependent on many factors outside the regulatory authority of the SWRCB. These factors include salt buildup in the San Joaquin Valley, introduction of non-native aquatic species, legal and illegal fishing, and degradation of upstream spawning habitat for fish that migrate through the Delta.

In the years following publication of the WQCP, most of the objectives of the WQCP were implemented through biological opinions issued by the USFWS and the NMFS pursuant to the Federal Endangered Species Act and through D-1485 and SWRCB Order WR 98-9. Under the biological opinions, D-1485, and WR 98-9, responsibility for meeting most of the objectives was assigned to the State Water Project and the Central Valley Project (SWRCB, 1999).

The SWRCB established separate Delta water quality objectives for municipal and industrial, agricultural, and fish and wildlife beneficial uses. The objectives for municipal and industrial beneficial uses require that certain chloride levels be maintained at certain locations in the Delta during certain hydrologic year types. The objectives for agricultural beneficial uses require that certain electrical conductivity levels be maintained at certain locations in the Delta during certain months of the year. The objectives for fish and wildlife beneficial uses require that certain electrical conductivity levels be maintained at certain locations in the Delta during certain months of the year. They also require that certain minimum levels of Delta outflow and maximum levels of export by the State Water Project and Central Valley Project be maintained during certain hydrologic year types.

5.3.3.2 Impacts

Significance Criteria

The CCSF has not formally adopted significance standards for impacts related to surface water quality, but generally considers that implementation of the proposed program would have a significant impact if it were to:

- Substantially impair a water body's ability to support beneficial uses designated by the State Water Resources Control Board or Regional Water Quality Control Board
- Otherwise substantially degrade water quality

Approach to Analysis

This section describes the impacts of the WSIP on surface water quality in the Tuolumne River watershed. The changes in surface water quality would result from WSIP-induced changes in stream flow and reservoir water levels. The effects of the WSIP on stream flow and reservoir water levels are described in Section 5.3.1. In general, effects are found to be significant if they would frequently exceed water quality objectives. Very infrequent exceedances of water quality objectives would not be considered significant here because the exceedances would not substantially impair designated beneficial uses or substantially degrade water quality.

Changes in flow in rivers and streams and changes in reservoir storage and water levels attributable to WSIP implementation were estimated using the HH/LSM. An overview of the model is presented in Section 5.1. Detailed information on the model and the assumptions that underlie it is provided in Appendix H. A second model, VR_Temp, was used to assess the effects of the WSIP on water temperature in the Tuolumne River below La Grange Dam. It is also described in Appendix H.

Beth Neilson at Utah State University and Dr. Steve Chapra at Tufts University developed VR_Temp for application to the Virgin River in Utah. VR_Temp is a one-dimensional, surface heat balance and kinematic flow routing model developed based on the derivations found in Chapra (1997). The model is able to estimate maximum daily water temperatures and was constructed to allow different input time steps for meteorological data as well as point and distributed inflow sources. The model allows a single stream or river segment to be divided into computational cells or elements; stream networks are not modeled and tributaries are treated as a time-series input. VR_Temp was adapted for use on the Tuolumne River by Mike Deas for Merritt-Smith Consultants.

Impact Summary

Table 5.3.3-8 presents a summary of the impacts on surface water quality in the Tuolumne River system and downstream water bodies that could result from implementation of the proposed water supply and system operations.

TABLE 5.3.3-8
SUMMARY OF IMPACTS – SURFACE WATER QUALITY
IN THE TUOLUMNE RIVER SYSTEM AND DOWNSTREAM WATER BODIES

Impact	Significance Determination
Impact 5.3.3-1: Effects on water quality in Hetch Hetchy Reservoir and along the Tuolumne River below O'Shaughnessy Dam	LS
Impact 5.3.3-2: Effects on water quality in Don Pedro Reservoir and along the Tuolumne River below La Grange Dam	LS
Impact 5.3.3-3: Effects on water quality along the San Joaquin River and the Sacramento–San Joaquin Delta	LS

LS = Less than Significant impact, no mitigation required

Impact Discussion

Impact 5.3.3-1: Effects on water quality in Hetch Hetchy Reservoir and along the Tuolumne River below O'Shaughnessy Dam.

The primary water quality parameters of concern in Hetch Hetchy Reservoir and the Tuolumne River below the reservoir are water temperature and dissolved oxygen. Most fish species that inhabit the reservoir and the Tuolumne River below O'Shaughnessy Dam are adapted to cool temperatures and well-oxygenated water. Water entering Hetch Hetchy Reservoir in the spring is cold and well oxygenated. Rising air temperatures and solar radiation in the summer heat the surface waters of the reservoir, but deeper water (25 to 50 feet below the surface) remains cold. The oxygen content of deeper waters declines somewhat through the summer as a result of biochemical reactions, but oxygen depletion is limited by the lack of plant nutrients in Hetch Hetchy water. The reductions in storage and water levels in Hetch Hetchy Reservoir attributable to the proposed program under average (or even average dry) conditions would be too small to have much effect on water temperature or dissolved oxygen content. Because the WSIP would have little effect on reservoir water quality, it would have little effect on the quality of water released from the reservoir to the Tuolumne River below the reservoir.

However, reductions in storage and water levels could have a greater effect on reservoir water quality and the quality of water released to the Tuolumne River during extremely dry periods. As noted above and shown diagrammatically in Figure 5.3.3-2, deep reservoirs in the Sierra Nevada stratify in the summer. Normally, water released from Hetch Hetchy Reservoir to the Tuolumne River is drawn from the cool pool of water below the thermocline. If the reservoir is drawn down sufficiently, releases to the river could exhaust the pool of cool water, and warmer water from above the thermocline would be released.

Conditions that would result during droughts similar to those that occurred in 1923–1935, 1986–1993, and 1976–1977 were examined using the HH/LSM with the proposed program and under existing conditions. In a drought similar to the 1986–1993 drought, the water level in Hetch

Hetchy Reservoir would never be drawn down sufficiently to affect water temperature in the Tuolumne River below the reservoir. In a drought similar to the 1923–1935 drought, the water level in Hetch Hetchy Reservoir would be drawn down to very low levels in January through April of the tenth year of the drought. However, in these months the reservoir is not stratified and so the drawdown would have little or no effect on downstream water temperatures.

In a drought similar to the 1976–1977 drought, the water level in Hetch Hetchy Reservoir would be drawn down to very low levels in October through January of the second and third years of the drought with the WSIP, as shown in Figure 5.3.1-9. In October and November, the reservoir would normally be stratified; that is, water above the thermocline, which would be at a depth of about 60 to 80 feet, would be 10 or 12 °C warmer than water below the thermocline. The drawdown in September and October would destratify the reservoir and would result in an increase in the temperature of water released to the Tuolumne River, from about 8 °C to perhaps 14 to 18 °C. This phenomenon would occur in a drought similar to the 1976–1977 drought under the existing condition as well as with the proposed program. However, as shown in Figure 5.3.1-9, the drawdown in Hetch Hetchy Reservoir with the WSIP would be greater than under the existing condition, and thus the adverse water quality effects would likely last longer by several days or weeks.

The dissolved oxygen content of water released from Hetch Hetchy Reservoir varies depending on water temperature and the depth from which it is drawn. Most of the time, the water drawn from the reservoir is well oxygenated. Any water with depleted oxygen levels is rapidly reoxygenated as a result of its turbulent release to the Tuolumne River. The WSIP would have little or no effect on dissolved oxygen levels in water released to river.

Water quality in the Tuolumne River would occasionally be affected by WSIP-induced changes in the temperature of releases from Hetch Hetchy Reservoir, as described above. It could also be affected by WSIP-induced changes in stream flow in the Tuolumne River below Hetch Hetchy Reservoir. However, the effects of the two phenomena would not coincide because the former would occur in early fall and the latter in the late spring and early summer.

The proposed program would have little or no effect on flow below Hetch Hetchy Reservoir in most summer, fall, and winter months, as described previously, and consequently would have little or no effect on water temperature. Water temperature would only be affected if the WSIP resulted in a substantial reduction in flow at a time when air temperatures and solar radiation are sufficient to heat the diminished flowing stream. **Table 5.3.3-9** shows the five months in the 964-month hydrologic record during which the WSIP would reduce flows in the river substantially; as the table indicates, the proposed program would reduce flow by 50 percent or more compared to the existing condition and would reduce flows to below 200 cfs. All five occurrences would be in the month of May.

Even in the fairly extreme conditions shown in Table 5.3.3-9, it is questionable whether water temperatures in the Tuolumne River below Hetch Hetchy Reservoir would become elevated compared to the existing condition. In May, average daily air temperatures are moderate and accumulated snow is melting. Snowmelt runoff into the Tuolumne River, both directly and from

TABLE 5.3.3-9
AVERAGE FLOWS FOR CONDITIONS WHERE WATER TEMPERATURES COULD BE ADVERSELY AFFECTED (TUOLUMNE RIVER BELOW HETCH HETCHY)
(cubic feet per second)

Date	Existing Condition	Proposed Program	Difference
May 1962	777	100	-677
May 1978	857	100	-757
May 1981	413	144	-169
May 1992	530	50	-470
May 1999	383	164	-219

SOURCE: SFPUC, HH/LSM (see Appendix H).

tributaries (including Cherry Creek and the Clavey River) between Hetch Hetchy Reservoir and Don Pedro Reservoir would minimize any temperature increases resulting from WSIP-induced reductions in flow.

In general, the WSIP would have very little effect on water quality in Hetch Hetchy Reservoir or the Tuolumne River below the reservoir. WSIP-induced reductions in flow in the Tuolumne River below the reservoir would occur primarily in May and would not be expected to result in sufficient changes in water temperature to affect the river's ability to support its designated beneficial uses, including support of a coldwater fishery. On very rare occasions under existing conditions and during extreme droughts (once in the 82-year hydrologic record), warm water is released from Hetch Hetchy Reservoir to the Tuolumne River. At such times, the water quality objective that limits increases in water temperature to 5 degrees Fahrenheit (°F) to protect coldwater fish would likely be exceeded. With the WSIP, the release of warm water would continue to be a rare occurrence (once in the 82-year hydrologic record), but the period during which warm water would be released from Hetch Hetchy Reservoir, and the water quality objective exceeded, would be extended by several days or weeks.

Exceedances of the water quality objective that limits temperature changes have probably occurred very infrequently under the existing condition (modeling indicates that it may have occurred once in the 82-year period of hydrologic record). In the future with the WSIP, very infrequent exceedances of the water quality objective would continue to occur, but could last longer by several days or weeks than under the existing condition. Infrequent exceedances of the standard would not substantially affect the Tuolumne River's ability to support its designated beneficial uses, including support of a coldwater fishery. This is because, during times when an exceedance of the objective occurred, water temperatures would still remain within an acceptable range for coldwater fish (see Section 5.3.6). Thus, the impact of the WSIP on water quality in Hetch Hetchy Reservoir and the Tuolumne River would be *less than significant*, and no mitigation measures would be required.

[Additional discussion on impacts on water quality in the upper Tuolumne River was prepared in response to comments on the Draft PEIR. Please refer to Section 14.6, Master Response on Upper Tuolumne River Issues Issues (Vol. 7, Chapter 14).]

Impact 5.3.3-2: Effects on water quality in Don Pedro Reservoir and along the Tuolumne River below La Grange Dam.

The primary water quality parameter of concern in Don Pedro Reservoir is water temperature. Like Hetch Hetchy Reservoir, Don Pedro Reservoir stratifies in the summer months. If the WSIP caused the reservoir to be greatly drawn down, then it would adversely affect water temperature in the Tuolumne River below La Grange Dam. Reservoir drawdown would be at its greatest during extended dry periods.

Conditions that would result in Don Pedro Reservoir during droughts similar to those that occurred in 1923–1935, 1986–1993, and 1976–1977 were examined using the HH/LSM. As indicated in Figure 5.3.1-12, although Don Pedro Reservoir would be drawn down greatly in each of the droughts, storage in the reservoir would never decrease much below 500,000 acre-feet. **Table 5.3.3-10** compares storage in Don Pedro Reservoir in the 1923–1935 and 1986–1993 droughts with the proposed program and under existing conditions. It also shows the elevation of the thermocline and the volume of the cool water pool under both conditions. Although the WSIP would lower the elevation of the thermocline when storage in the reservoir is at a minimum, the thermocline would still be considerably above the elevation of the outlet from Don Pedro

TABLE 5.3.3-10
COMPARISON OF STORAGE, COOL WATER POOL VOLUMES, AND DEPTH TO THERMOCLINE FOR DON PEDRO RESERVOIR UNDER EXISTING CONDITIONS AND WITH THE WSIP

Drought Conditions	Minimum Storage (acre-feet)		Cool Water Pool (acre-feet)		Thermocline Elevation (feet msl)	
	Existing	WSIP	Existing	WSIP	Existing	WSIP
1923–1935	680,066	623,932	360,000	320,000	614	604
1986–1994	823,654	695,955	450,000	370,000	636	616

SOURCE: Merritt-Smith Consultants (raw data).

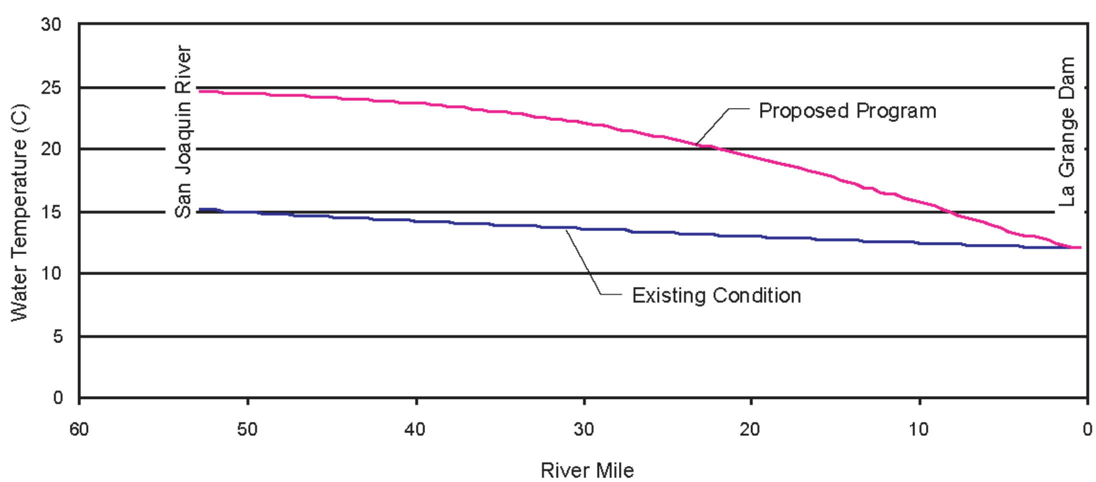
Reservoir. The outlet is an 18.5-foot-diameter tunnel with a crest elevation of 543.5 feet above mean sea level (msl). Releases from the reservoir with the WSIP in place would still be from the cool water pool below the thermocline. Thus, the changes in water level in Don Pedro Reservoir attributable to the proposed program would not increase the temperature of water released to the Tuolumne River below La Grange Dam.

Although water temperature in the Tuolumne River would not be affected by WSIP-induced changes in releases from Don Pedro Reservoir, it could be affected by WSIP-induced changes in stream flow. The proposed program would have little effect on flow below Don Pedro Reservoir in most summer, fall, and winter months, but it could cause reductions in flow of up to 95 percent compared to the existing condition under certain circumstances. For example, under hydrologic conditions similar to those that occurred in June 1999, the release to the Tuolumne River under the existing condition would be 523 cfs; with the WSIP it would be 250 cfs, a reduction of 52 percent.

Most of the large-percentage reductions in flow in the Tuolumne River below La Grange Dam would occur in April, May, and June following dry periods, when Don Pedro Reservoir would be drawn down. Reductions in flow in the late spring and early summer as a result of the proposed program could affect water temperatures under certain circumstances. These circumstances might include reductions in flow of 50 percent or more and flows of less than 400 cfs that result from WSIP-induced flow reductions. The results of the simulation of flows below La Grange Dam using 82 years of hydrologic data were examined to determine how frequently these circumstances occur. The analysis indicates that there are only three months over the 984-month hydrologic record when the circumstances would occur, and thus the condition has the potential to occur very infrequently.

The VR_Temp model was used to examine the effects on water temperature of WSIP-induced reductions in flow below La Grange Dam. Two conditions were simulated: the June 1993 and June 1999 events. The June 1993 event is an extreme event with over a 90 percent reduction in flow. Such a reduction only occurs once in the 82-year hydrologic record, as shown in Figure 5.3.1-12. The June 1999 event is less extreme than the June 1993 event, but it would still be rare. It involves a reduction in flow of 50 percent.

Water released from La Grange Dam in June is considerably cooler than the average daily air temperature. As water flows downstream, its temperature increases. The smaller the thermal mass of the water, the faster its temperature increases. **Figure 5.3.3-3** shows estimated mean daily water temperature in the Tuolumne River between La Grange Dam and the confluence with the San Joaquin River under June 1993 conditions with the proposed program and under existing conditions. Water temperature rises more rapidly with the proposed program than under existing conditions. Mean daily temperature in the Tuolumne River just upstream of the confluence with the San Joaquin River would be about 10 °C higher with the WSIP than under current conditions.

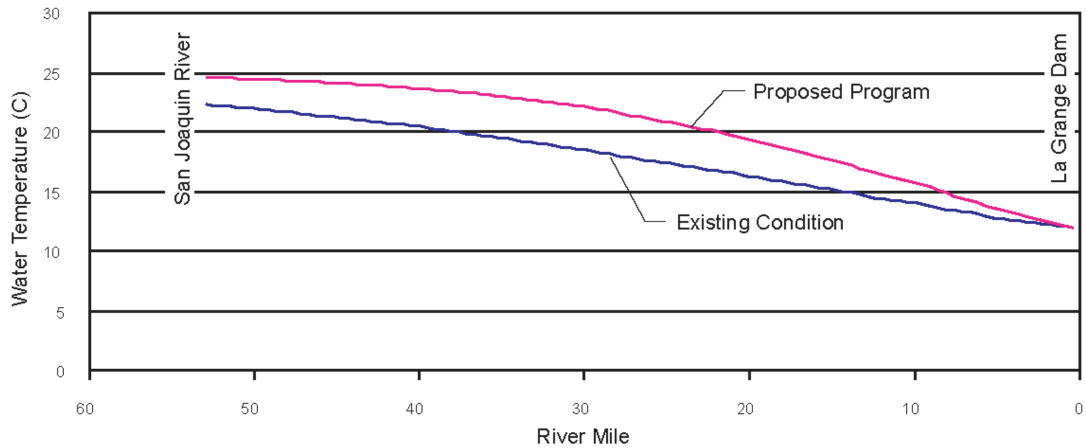


SFPUC Water System Improvement Program ▪ 203287

SOURCE: Merritt-Smith Consultants (raw data)

Figure 5.3.3-3
Longitudinal Profile of Simulated Mean Daily Water Temperature from La Grange Dam to the San Joaquin River, June 1993

Figure 5.3.3-4 shows similar information for June 1999 conditions. In this case, the temperature increase produced by the WSIP at the confluence with the San Joaquin River would be about 2°C.



SFPUC Water System Improvement Program ▪ 203287

SOURCE: Merritt-Smith Consultants (raw data)

Figure 5.3.3-4
Longitudinal Profile of Simulated Mean Daily Water Temperature from La Grange Dam to the San Joaquin River, June 1999

Almost all of the time, WSIP-induced flow reductions in the Tuolumne River below La Grange Dam would have no effect on water temperature. On infrequent occasions, 12 months in the 82-year period of hydrologic record, WSIP-induced flow reductions would cause mean daily temperature increases in the Tuolumne River of 1 or 2 °C. On very rare occasions, one month in the 82-year period of hydrologic record, WSIP-induced flow reductions would cause mean daily temperature increases of 10 °C.

Water quality objectives for the Tuolumne River require that water temperatures not be increased by more than 5 °F (2.8 °C). The WSIP would comply with this objective almost all of the time. On rare occasions, estimated at three or four months in the 82-year period of hydrologic record, there would be exceedances of the objective, but these rare exceedances would not impair the river's ability to support the designated beneficial uses that the objective is designed to protect, including coldwater fisheries. Consequently, this impact would be *less than significant*, and no mitigation measures would be required.

[Additional discussion on impacts on water quality in the lower Tuolumne River was prepared in response to comments on the Draft PEIR. Please refer to Section 14.7, Master Response on Lower Tuolumne River Issues (Vol. 7, Chapter 14).]

Impact 5.3.3-3: Effects on water quality along the San Joaquin River and the Sacramento–San Joaquin Delta.

The Tuolumne River joins the San Joaquin River about 50 miles downstream of La Grange Dam. The reductions in flow in the Tuolumne River below La Grange Dam attributable to the WSIP (as shown in Table 5.3.1-6) would reduce flows in the Tuolumne River between La Grange Dam and its confluence with the San Joaquin River, and in the San Joaquin River from the confluence to the Delta. There is a potential for reductions in flow to affect water quality. However, most of the reductions in flow would occur from February through June in wet or above-normal years when flow in the San Joaquin River is at its seasonal maximum. As a consequence, most of the time, WSIP-induced changes in flow would have little effect on water quality in the San Joaquin River.

The SWRCB has established water quality objectives for the San Joaquin River at Vernalis, just upstream of the Sacramento–San Joaquin Delta. The objectives are expressed in term of electroconductivity, a measure of salinity. The salinity of river water at Vernalis becomes elevated when flow in the river is insufficient to repel saltwater entering from Suisun Bay. Almost all of the time, the reductions in San Joaquin River flow attributable to the WSIP would not be sufficient to cause salinity in the river at Vernalis to rise above the objective. Very infrequently, following protracted droughts, reductions in San Joaquin River flow attributable to the WSIP could be sufficient to cause salinity in the river at Vernalis to rise above the objective. Under these circumstances, the USBR, the agency responsible for compliance with objectives for the San Joaquin River, would increase releases from New Melones Reservoir on the Stanislaus River to meet the water quality objectives at Vernalis. Thus, the WSIP would not alter water quality in the San Joaquin River below its confluence with the Tuolumne River such that it would be substantially outside the range experienced under the existing condition. The impact would be *less than significant*, and no mitigation measures would be required.

The reductions in flow in the Tuolumne River below La Grange Dam attributable to the WSIP would also reduce inflow to the Sacramento–San Joaquin Delta. The changes in Delta inflow as a result of the WSIP would be too small to have much effect on water quality in the Delta, particularly as the changes would occur when flow through the Delta is at its seasonal maximum. The impact would be *less than significant*, and no mitigation measures would be required.

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5.3.4 Surface Water Supplies

The following setting section describes downstream water users whose water supply could be affected by the WSIP. The impact section (Section 5.3.4.2) provides a description of the changes in water availability and quality for downstream users resulting from WSIP-induced changes in stream flow.

5.3.4.1 Setting

The Tuolumne River flows from the crest of the Sierra Nevada westward to its confluence with the San Joaquin River. The San Joaquin River flows north to the Sacramento–San Joaquin Delta. Water from the Delta discharges to the San Francisco Bay Estuary and the Pacific Ocean. Because the WSIP would result in increased diversions of water from the Tuolumne River at Hetch Hetchy Reservoir, high in the Tuolumne River watershed, flow in the Tuolumne and San Joaquin Rivers and inflow to the Sacramento–San Joaquin Delta would be decreased in some months of some hydrologic year types. The changes in flow attributable to the WSIP are described in Section 5.3.1.

A number of water agencies and other diverters obtain their water supplies from the Tuolumne and San Joaquin Rivers and from the Delta. The water supplies of these agencies and other diverters could potentially be affected by the WSIP. Water agencies and others divert water from the rivers and the Delta in accordance with riparian water rights, pre-1914 appropriative water rights, and appropriative water-rights permits granted by the SWRCB.

In California, two doctrines govern surface water rights, the riparian doctrine and the doctrine of prior appropriation. A riparian water right is the right to use water for a reasonable and beneficial purpose as a result of the ownership of property that abuts a natural waterway. An appropriative water right is the right to use a specific quantity of water for a reasonable purpose at a specific location. The historical principle underlying the appropriation doctrine is "first-in-time, first-in-right." An entity that first appropriates and uses water for a reasonable beneficial purpose has a right that is superior to the rights of later appropriators. When water is short and insufficient to meet the needs of all holders of appropriative water rights, the rights of senior water-rights holders must be satisfied before those of junior water-rights holders.

Prior to 1914, an entity followed certain procedures to obtain an appropriative water right but did not need to obtain a permit from the State of California. A change in state law in 1914 provided that all water within the state is the property of the people of the state and made it a requirement that appropriators obtain a permit to divert surface water. San Francisco holds pre-1914 rights to divert water from the Tuolumne River. The SWRCB does not regulate pre-1914 water rights.

Two of California's largest water storage and conveyance projects, the federal Central Valley Project and the State Water Project, divert water from the Delta. The USBR, which operates the Central Valley Project, and the DWR, which operates the State Water Project, hold post-1914 appropriative rights to divert water from the Delta. These rights are junior to San Francisco's Tuolumne River water rights.

Because of the size of the diversions made by the Central Valley Project and State Water Project, the nature of their authorizing legislation, and the priority of their water rights, the SWRCB assigned unique responsibilities to the USBR and DWR for compliance with Delta water quality and flow objectives. The USBR and DWR must operate the Central Valley Project and State Water Project in a manner that maintains compliance with Delta objectives. They are not permitted to fully exercise their water rights in the Delta if to do so would cause a violation of Delta water quality or flow objectives.

San Joaquin River and Sacramento–San Joaquin Delta

The San Joaquin River rises in the Sierra Nevada and drains an area of 13,500 square miles. After reaching the floor of the San Joaquin Valley near Fresno, the river flows westward towards the community of Mendota, then northwest for about 100 miles to the Sacramento–San Joaquin Delta. Some reaches of the river upstream and downstream of Mendota are dry, except when flood releases are made from Millerton Reservoir. The river begins to flow again generally downstream of the Mariposa Bypass as it gains water from agricultural irrigation, wildlife area management return flows, and tributaries. Major tributaries that join the San Joaquin River upstream of its confluence with the Delta include the Merced, Tuolumne, and Stanislaus Rivers. The San Joaquin River watershed is shown in Figure 5.3.1-7.

State Water Project

The State Water Project is California's second-largest water project; it operates Oroville Reservoir, with a capacity of about 3.5 million acre-feet, on the Feather River. Water from Oroville Reservoir is released to the Feather River and flows downstream to the Sacramento River and the Delta. Water is diverted from the south Delta at the State Water Project's Banks Pumping Plant and conveyed southward in the California Aqueduct to the State Water Project's contractors and to San Luis Reservoir, a joint-use facility of the Central Valley and State Water Projects. On average, the State Water Project delivers 2.4 million acre-feet each year for municipal and agricultural use, almost all of which is diverted from the Delta at the Banks Pumping Plant.

Central Valley Project

The Central Valley Project is California's largest water project. On average, the Central Valley Project delivers 5.6 million acre-feet of water each year for agricultural, wildlife management, and municipal use.

North of the Delta, the Central Valley Project operates reservoirs on the Sacramento, Trinity, and American Rivers. Shasta Reservoir, on the upper Sacramento River, has a capacity of 4.5 million acre-feet. Claire Engle Lake is located on the Trinity River, which flows to the Klamath River and to the Pacific Ocean near the California/Oregon border. Claire Engle Lake has a capacity of 2.4 million acre-feet. Water from the lake is diverted through a tunnel to the Sacramento River, where it combines with releases from Shasta Reservoir. Folsom Reservoir is located on the American River and has a capacity of 1 million acre-feet. Releases from all three reservoirs flow downstream to the Delta.

Water is diverted from the south Delta at the Central Valley Project's Tracy Pumping Plant and conveyed southward to Central Valley Project contractors on the western side of the San Joaquin Valley via the Delta-Mendota Canal and for delivery to San Luis Reservoir. The Central Valley Project's diversions at the Tracy Pumping Plant average about 1.7 million acre-feet per year. Smaller amounts of Central Valley Project water are diverted at the State Water Project's Banks Pumping Plant and conveyed southward in the California Aqueduct. The USBR supplies water to Central Valley Project contractors on the eastern side of the San Joaquin Valley from Millerton Reservoir on the San Joaquin River and several other reservoirs on tributaries of the San Joaquin River, including New Melones Reservoir on the Stanislaus River.

Flow and Water Quality Objectives for the San Joaquin River and the Delta

The SWRCB has established numerous flow and water quality objectives for the San Joaquin River at Vernalis and for the Sacramento–San Joaquin Delta. These objectives are prescribed in Decision 1641. Illustrative of these objectives are the flow and quality objectives for the San Joaquin River at Vernalis shown in **Table 5.3.4-1**. Outflow requirements from the Delta could be the specific flow objectives or the required flow to maintain salinity objectives at certain locations in the Delta. Specific flow objectives at Chipps Island are shown in **Table 5.3.4-2**.

TABLE 5.3.4-1
FLOW AND WATER QUALITY OBJECTIVES FOR SAN JOAQUIN RIVER AT VERNALIS

Year Type	Dates	Minimum Monthly Average Flow (cfs)[a]
Wet, above normal	February – April 14	2,130 or 3,420
Below normal, dry	February 1 – April 14	1,420 or 2,280
Critical	February 1 – April 14	710 or 1,140
Wet	April 15 – May 15	7,330 or 8,620
Above normal	April 15 – May 15	5,730 or 7,020
Below normal	April 15 – May 15	4,620 or 5,480
Dry	April 15 – May 15	4,020 or 4,880
Critical	April 15 – May 15	3,110 or 3,540
Wet, above normal	May 16 – June 30	2,130 or 3,420
Below normal, dry	May 16 – June 30	1,420 or 2,280
Critical	May 16 – June 30	710 or 1,140
All	October	1,000
All Years	April – August	0.7 mmhos/cm[b]
All Years	September – March	1.0 mmhos/cm[b]

[a] The higher flow objective applies when the 2 parts per thousand isohaline is required to be at or west of Chipps Island. An isohaline is a line drawn through places that have equal values of water salinity. The April 15–May 15 flow objective is currently replaced by the protocols of the San Joaquin River Agreement and the Vernalis Adaptive Management Program, which provides flows during this period ranging between 3,200 cfs and 7,000 cfs.
[b] The water quality objective is to be met on a 30-day running average of mean daily water electroconductivity, which provides a measure of water salinity. The units of electroconductivity are millisiemens per centimeter.

SOURCE: SWRCB, 1995.

TABLE 5.3.4-2
FLOW OBJECTIVES FOR SACRAMENTO–SAN JOAQUIN DELTA

Year Type	Dates	Minimum Monthly Delta Outflow (cfs)[a]
All	January	4,500[b]
All	February – June	7,100[c]
Wet, above normal	July	8,000
Below normal	July	6,500
Dry	July	5,000
Critical	July	4,000
Wet, above normal, below normal	August	4,000
Dry	August	3,500
Critical	August	3,000
All	September	3,000
Wet, above normal, below normal, dry	October	4,000
Critical	October	3,000
Wet, above normal, below normal, dry	November – December	4,500
Critical	November – December	3,500

[a] Flow as determined by the Net Delta Outflow Index. For the May–January objectives, if the value is less than or equal to 5,000 cfs, the 7-day running average shall not be less than 1,000 cfs below the value; if the value is greater than 5,000 cfs, the 7-day running average shall not be less than 80 percent of the value.
[b] The objective is increased to 6,000 cfs if the best available estimate of unimpaired Delta inflow for December is greater than 800,000 acre-feet.
[c] The minimum Delta outflow required may be reduced under certain conditions described in the San Francisco Bay–Delta Water Quality Control Plan.

5.3.4.2 Impacts

Significance Criteria

The CCSF has not formally adopted significance standards for impacts related to water supplies, but generally considers that implementation of the proposed program would have a significant water supply impact if it were to:

- Result in substantial adverse changes in operations or substantial decreases in water deliveries for water users, as measured by significant changes in reservoir storage, timing or rate of river flows, or water quality
- Violate any water quality standards or otherwise substantially degrade water quality

Approach to Analysis

Changes in flow in rivers and streams and changes in reservoir storage and water levels in the Tuolumne River watershed attributable to the WSIP were estimated using the HH/LSM. An overview of the model is presented in Section 5.1. The HH/LSM simulates water deliveries, reservoir storage, and releases to rivers under different conditions using hydrologic data from the period 1920 to 2002. Detailed information on the model and the assumptions that underlie it is provided in Appendix H. Changes in stream flow were then used to estimate the effects on water availability and water quality for downstream users.

Impact Summary

Table 5.3.4-3 presents a summary of the impacts on the water supply of downstream users that could result from implementation of the proposed program.

TABLE 5.3.4-3
SUMMARY OF IMPACTS – SURFACE WATER SUPPLIES OF DOWNSTREAM USERS

Impact	Significance Determination
Impact 5.3.4-1: Effects on Tuolumne River, San Joaquin River, and Stanislaus River water users	LS
Impact 5.3.4-2: Effects on Delta water users	LS

LS = Less than Significant impact, no mitigation required

Impact Discussion

Impact 5.3.4-1: Effects on Tuolumne River, San Joaquin River, and Stanislaus River water users.

Like the CCSF, TID and MID hold pre-1914 rights to Tuolumne River water. When the federal government passed the Raker Act in 1913, it granted the CCSF the rights-of-way and public lands necessary to construct the Hetch Hetchy system. The Raker Act includes various conditions, one of which is that the CCSF must recognize TID's and MID's prior rights to water from the Tuolumne River. In the same year the Raker Act was passed, the CCSF reached agreement with TID and MID on the amount of water needed to satisfy their prior water rights. All of the SFPUC's existing water supply facilities are operated in compliance with the provisions of the Raker Act and would continue to be operated in compliance with the act after the WSIP has been implemented. Consequently, the WSIP would have no adverse effect on the availability of Tuolumne River water to TID and MID or on the quality of water available to them.

Changes in flow in the Tuolumne River below La Grange Dam attributable to the WSIP would affect flows in the San Joaquin River from its confluence with the Tuolumne River to the Delta. The Delta standards include flow and quality objectives for the San Joaquin River at Vernalis, just upstream of the point where the San Joaquin River flows into the Delta. Very infrequently, following protracted droughts, reductions in San Joaquin River flow attributable to the WSIP could make it necessary for the USBR, the agency responsible for compliance with water quality and flow objectives for the San Joaquin River, to increase releases from New Melones Reservoir to meet the objectives at Vernalis.

As described in Section 5.3.1, under existing conditions in the majority of years classified as below-normal or drier, almost all of the winter and spring runoff from the watershed upstream of Don Pedro Reservoir on the Tuolumne River is captured in the reservoir. Only the minimum required releases to the Tuolumne River below La Grange Dam are made. The WSIP would have no effect on flow in the Tuolumne River below La Grange Dam or the San Joaquin River in months when only the minimum flows are currently released. In years when the reservoir fills, usually wet or above-normal years, excess water is released in some months to the Tuolumne River. In the future with the WSIP, TID and MID would draw Don Pedro Reservoir down farther in most years than they would under the existing condition, and consequently a greater proportion of spring runoff would be needed to refill the reservoir. As a result, the volume of excess water released to the Tuolumne River would be reduced in all wet years, most above-normal years, and occasional below-normal and dry years.

Table 5.3.4-4 shows the change in modeled releases from La Grange Dam attributable to the WSIP for the 82-year hydrologic simulation, by year type and descending order of wetness. The magnitudes of modeled releases with and without the WSIP are shown in Table 5.3.1-6. Flow in the Tuolumne River below La Grange Dam and flow in the San Joaquin River below its confluence with the Tuolumne River would reflect the changes. As shown in the table, most of the changes in releases and the greatest changes in releases would occur in wet and above-normal years following a series of dry years. Many of the changes are small in magnitude compared to the required minimum stream flow releases shown in Table 5.3.1-3. Furthermore, most of the changes in releases would occur from February through June of the affected years, with an occasional occurrence during other months. When they occur, the changes in average monthly flows are usually in the hundreds of cubic feet per second (an average monthly flow of 100 cfs is equal to a monthly volume of about 6,000 acre-feet). Occasionally, changes are in the range of 1,000 cfs to a little over 3,000 cfs. The greatest changes would potentially occur infrequently during wetter years following protracted droughts.

The changes in flow described above would affect the Tuolumne River below La Grange Dam and the San Joaquin River below its confluence with the Tuolumne River. **Table 5.3.4-5** shows measured flows in the San Joaquin River at Vernalis for the period 1969 through 2002, arranged by descending order of wetness. As can be seen by the record, average monthly flows in the San Joaquin River vary seasonally and by year type. During wet years in February through June (the period when WSIP effects would mostly occur), flows generally range from a low of 5,000 cfs to over 40,000 cfs. During the summer, flows can diminish to as low as 1,500 cfs. During above-normal years in February through March (the period when WSIP effects mostly occur within this year type), flows are generally in excess of 7,000 cfs. A comparison between Tables 5.3.4-4 and 5.3.4-5 indicates that, although flows would be reduced with the WSIP, they would still exceed the flow objectives during wet and above-normal hydrologic conditions. Typically, during wet and above-normal years, there is sufficient tributary flow in the San Joaquin River basin to meet water quality objectives at Vernalis. Under these conditions, the USBR does not need to release water from New Melones Reservoir on the Stanislaus River to meet flow or water quality objectives at Vernalis.

As noted above, if the WSIP caused flow in the San Joaquin River at Vernalis to fall below the flow objective or caused water quality at Vernalis to fall below objectives, the USBR would have to increase releases from New Melones Reservoir or other San Joaquin Valley Central Valley Project facilities to compensate. During wet and above-normal years, when most of the effects of the WSIP would be felt, flow and water quality objectives at Vernalis would be met and the USBR would not have to release extra water from the reservoir. Thus, the WSIP would have no

TABLE 5.3.4-4
AVERAGE MONTHLY CHANGES IN TUOLUMNE RIVER FLOW BELOW LA GRANGE DAM ATTRIBUTABLE TO THE WSIP
(cubic feet per second)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year Type
1983	-48	-31	43	0	0	0	0	-94	-46	-37	0	-38	Wet
1969	0	0	0	-549	-129	-106	-130	-84	-84	-37	0	0	Wet
1995	0	0	0	0	-339	-132	0	-211	-62	-37	0	-38	Wet
1938	0	0	-306	0	0	0	-154	-295	-84	-37	0	0	Wet
1998	0	0	0	-327	0	-112	-149	-40	-63	-37	0	0	Wet
1982	0	0	0	-453	-244	-15	0	-46	-46	-37	0	-75	Wet
1967	0	0	0	0	0	-354	-168	-133	0	-37	0	-38	Wet
1952	0	0	0	0	-219	-133	0	-346	-84	-37	0	0	Wet
1958	0	0	0	0	-405	-148	-102	-252	-48	-37	0	0	Wet
1980	0	0	0	76	0	-139	-84	-84	-84	-37	0	0	Wet
1978	0	0	0	0	0	0	0	0	-1,583	0	0	0	Wet
1922	0	0	0	0	-157	-95	-124	-92	-245	0	-11	-27	Wet
1956	0	0	-1,350	0	0	-71	-47	0	-223	-37	0	0	Wet
1942	0	0	0	-61	0	-62	-93	-46	-46	-37	0	0	Wet
1941	0	0	0	2	-9	-5	-8	0	-121	0	-11	-27	Wet
1986	0	0	0	0	-291	-463	-190	-84	-84	0	0	0	Wet
1993	0	0	0	0	0	0	0	0	-3,159	0	-275	-659	Wet
1997	0	-38	0	-196	0	0	0	0	0	0	0	0	Wet
1996	0	0	0	0	-65	0	-114	-37	-37	0	0	0	Wet
1943	0	0	0	0	0	-159	-84	0	-170	0	0	-38	Wet
1937	0	0	0	0	-268	-213	-60	0	0	0	0	0	Wet
1974	0	0	0	-186	0	-139	-93	-93	-74	0	0	-38	Wet
1975	0	0	0	0	0	0	-139	0	-2	0	-11	-27	Wet
1965	0	0	0	-1,630	-110	-219	-29	0	0	0	0	150	Wet
1936	0	0	0	0	-2,702	-1,935	-85	0	0	0	0	0	AN
1984	-98	0	0	0	0	64	0	0	0	0	0	0	AN
1979	0	0	0	-110	0	-325	-37	-37	0	0	0	0	AN
1945	0	0	0	0	-394	-488	-3	0	0	0	0	0	AN
1999	0	0	0	0	0	-186	-52	0	-273	0	0	0	AN
1963	0	0	0	0	0	0	0	0	0	0	0	0	AN
1927	0	0	0	0	0	0	0	0	-737	0	-10	-161	AN
1935	0	0	0	0	0	0	0	0	0	0	0	0	AN
1946	0	137	0	0	0	-215	-64	0	0	0	0	0	AN
1973	0	0	0	0	0	-513	-63	0	-474	0	0	0	AN
1932	0	0	0	0	0	0	0	0	0	0	0	0	AN
2000	0	0	0	0	-205	0	0	0	-248	0	0	0	AN
1940	0	0	0	0	-464	-317	-74	0	0	0	0	0	AN
1923	0	0	0	0	0	0	-37	0	0	0	0	0	AN
1921	0	0	0	0	-2	-256	-62	0	0	0	0	0	AN
1970	0	0	0	352	-128	-262	0	0	0	0	0	0	AN
1951	0	0	-2,021	0	0	0	0	0	0	0	0	0	AN
1962	0	0	0	0	0	0	0	0	0	0	0	0	BN
1953	0	0	0	0	0	0	0	0	0	0	0	0	BN
1957	0	0	0	0	0	0	0	0	0	0	0	0	BN
1925	0	0	0	0	0	0	0	0	0	0	0	0	BN
1971	0	0	0	0	-159	-97	0	0	0	0	0	0	BN
1950	0	0	0	0	0	0	0	0	0	0	0	0	BN
1944	0	0	0	0	0	0	0	0	0	0	0	0	BN
1954	0	0	0	0	0	0	0	0	0	0	0	0	BN
1948	0	0	0	0	0	0	0	0	0	0	0	0	BN
1928	-112	-526	-557	0	0	-87	-181	0	0	0	0	0	BN
1949	0	0	0	0	0	0	0	0	0	0	0	0	BN
1966	0	0	-71	0	-38	-99	0	0	0	0	0	0	BN
1933	0	0	0	0	0	0	0	0	0	0	0	0	Dry
1981	0	0	0	0	0	0	0	0	0	0	0	0	Dry
1985	0	0	0	0	0	0	0	0	0	0	0	0	Dry
2002	0	0	0	0	0	0	0	0	0	0	0	0	Dry
1926	0	0	0	0	0	0	0	0	0	0	0	0	Dry
1955	0	0	0	0	0	0	0	0	0	0	0	0	Dry
1959	0	0	0	0	0	0	0	0	0	0	0	0	Dry
1968	0	0	0	0	0	0	0	0	0	0	0	0	Dry
1939	0	0	0	0	0	0	0	0	0	0	0	0	Dry
2001	0	0	0	0	0	0	0	0	0	0	0	0	Dry
1964	-182	-832	-255	-295	-294	0	0	0	0	0	0	0	Dry
1947	0	0	0	0	0	0	0	0	0	0	0	0	Dry
1972	0	0	0	0	-313	0	0	0	0	0	0	0	Dry
1994	0	0	0	0	0	0	0	0	0	0	0	0	Critical
1930	0	0	0	0	0	0	0	0	0	0	0	0	Critical
1929	0	0	0	0	0	0	0	0	0	0	0	0	Critical
1989	0	0	0	0	0	0	0	0	0	0	0	0	Critical
1991	0	0	0	0	0	0	0	0	0	0	0	0	Critical
1987	0	0	0	0	0	0	0	0	0	0	0	0	Critical
1960	0	0	0	0	0	0	0	0	0	0	0	0	Critical
1976	0	0	0	0	0	0	0	0	0	0	0	0	Critical
1992	0	0	0	0	0	0	0	0	0	0	0	0	Critical
1990	0	0	0	0	0	0	0	0	0	0	0	0	Critical
1988	0	0	0	0	0	0	0	0	0	0	0	0	Critical
1934	0	0	0	0	0	0	0	0	0	0	0	0	Critical
1924	0	0	0	0	0	0	0	0	0	0	0	0	Critical
1961	0	0	0	0	0	0	0	0	0	0	0	0	Critical
1931	0	0	0	0	0	0	0	0	0	0	0	0	Critical
1977	0	0	0	0	0	0	0	0	0	0	0	0	Critical

NOTES: Hydrologic year types were determined based on DWR's San Joaquin River Basin Index.
Year Types: Wet, AN – Above Normal, BN – Below Normal, Dry, and Critical

SOURCE: SFPUC, HH/LSM (see Appendix H).

TABLE 5.3.4-5
RECORDED SAN JOAQUIN RIVER FLOW AT VERNALIS (1969–2002)
(cubic feet per second)

Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Year Type
1983	8,179	6,974	16,494	19,068	31,604	40,035	36,447	31,771	26,083	19,227	9,035	11,310	Wet
1969	1,384	1,604	2,533	13,815	32,554	30,874	22,117	24,613	27,887	5,803	2,325	3,255	Wet
1995	1,370	1,288	1,295	4,599	6,559	14,612	19,933	22,187	14,011	9,881	3,925	4,734	Wet
1998	2,706	1,981	2,116	6,025	28,121	19,352	21,937	17,948	17,760	13,193	5,442	5,758	Wet
1982	1,386	1,564	1,852	3,889	6,645	10,062	22,963	18,654	7,584	6,163	4,017	6,129	Wet
1980	2,790	2,311	2,487	13,069	18,776	25,297	10,249	9,912	5,305	3,384	1,969	3,802	Wet
1978	246	430	506	2,276	7,319	11,475	20,030	19,119	7,069	1,908	1,418	2,730	Wet
1986	2,072	1,929	2,205	2,060	8,744	25,035	19,590	8,764	6,233	2,894	3,183	4,181	Wet
1993	849	956	982	4,120	3,035	2,702	3,421	3,610	2,341	1,510	1,998	2,771	Wet
1997	2,691	2,715	12,192	30,377	35,057	13,035	4,728	4,785	2,647	1,756	1,875	2,069	Wet
1996	5,692	2,428	2,250	2,431	11,473	15,071	7,500	8,422	3,739	2,209	2,034	2,164	Wet
1974	2,546	2,281	3,586	7,781	5,094	4,817	5,850	4,106	3,860	1,636	1,615	2,846	Wet
1975	3,497	3,891	4,162	3,766	6,212	5,685	3,957	3,972	5,708	1,718	1,680	2,652	Wet
1984	13,316	10,675	19,126	25,632	10,833	7,502	4,285	3,240	2,297	1,904	2,179	2,917	AN
1979	3,327	3,498	2,812	5,233	7,138	8,652	3,506	2,524	2,254	1,334	1,451	1,841	AN
1999	6,153	3,290	4,331	4,730	11,696	8,332	6,437	5,551	3,016	2,094	1,969	2,037	AN
1973	1,992	2,216	2,502	4,059	7,988	7,611	4,203	2,937	2,576	1,082	1,067	1,471	AN
2000	2,532	2,158	1,688	2,136	7,559	12,098	5,013	4,814	2,772	1,898	2,171	2,330	AN
1970	4,462	4,628	4,012	11,116	9,191	7,180	1,673	2,393	2,704	1,330	1,044	1,319	AN
1971	1,466	1,655	5,044	5,204	4,391	2,589	1,961	1,833	2,322	1,066	892	1,097	BN
1981	4,072	3,278	2,949	3,251	2,879	3,122	2,532	1,967	1,499	1,265	1,269	1,181	Dry
1985	3,814	2,822	4,771	4,065	3,241	2,736	2,466	2,132	1,748	2,557	2,601	1,925	Dry
2002	2,003	2,096	2,064	2,662	1,898	2,134	2,598	2,739	1,407	1,227	1,116	1,175	Dry
2001	2,826	2,526	2,238	2,442	3,092	3,430	3,008	3,527	1,549	1,400	1,330	1,376	Dry
1972	2,253	1,646	2,398	3,117	2,701	1,380	1,037	744	587	481	543	1,563	Dry
1994	3,041	1,759	1,628	1,773	1,987	2,206	1,863	1,973	1,109	1,135	867	869	Critical
1989	1,127	1,274	1,372	1,255	1,234	2,023	1,915	1,949	1,583	1,284	1,169	1,353	Critical
1991	993	1,115	918	816	758	1,779	1,168	1,049	568	594	537	574	Critical
1987	3,741	2,808	3,706	2,305	2,136	3,415	2,867	2,178	1,990	1,632	1,627	1,597	Critical
1976	4,543	3,906	3,745	3,326	2,115	1,823	1,293	939	798	671	1,055	1,067	Critical
1992	788	1,084	895	959	2,091	1,470	1,418	892	481	447	483	635	Critical
1990	1,401	1,404	1,381	1,242	1,365	1,760	1,309	1,279	1,116	1,009	1,033	876	Critical
1988	1,370	1,548	1,278	1,483	1,389	2,241	2,146	1,781	1,711	1,357	1,557	1,452	Critical
1977	1,274	1,136	965	1,091	789	524	212	400	118	93	124	179	Critical

NOTES: Hydrologic year types were determined based on DWR's San Joaquin River Basin Index. Flows in some years do not meet current flow objectives, because the flow objectives did not come into effect until 1999.
Year Types: Wet, AN – Above Normal, BN – Below Normal, Dry, and Critical

SOURCES: U.S. Geological Survey (http://waterdata.usgs.gov/nwis/sw).

effect on the availability of Stanislaus River water to the USBR and the water supply agencies that receive water from New Melones Reservoir, except possibly on rare occasions following protracted droughts.

As indicated in Table 5.3.4-4, in many years and during certain seasons, the WSIP would not alter flow in the Tuolumne River below La Grange Dam and would, in turn, have no effect on flow in the San Joaquin River. Thus, under these conditions, the WSIP would have no effect on water availability or quality at the intakes of water agencies and diverters that use San Joaquin River water. In some wet and above-normal years, the WSIP would have an effect on flow in the San Joaquin River between the confluence with the Tuolumne River and the confluence with the Delta. Because the changes in San Joaquin River flow would be small in most wet and above-normal years, and because the changes would occur in periods when flow in the river is at its seasonal maximum, the effects of the flow changes on water quality would also be small. Water quality is at its seasonal best during the period when the WSIP-induced changes in flow would occur, and thus the quality of water at water agencies' and irrigators' diversion points would not change appreciably. All water quality objectives would be met, and specifically by releases from New Melones Reservoir or other San Joaquin Valley Central Valley Project facilities, if such action were necessary.

The WSIP would have a less-than-significant impact on water quality and the availability of water at water agencies' and irrigators' diversion points on the Tuolumne, Stanislaus, and San Joaquin Rivers. Therefore, WSIP impacts on Tuolumne, Stanislaus, and San Joaquin River water users would be *less than significant*, and no mitigation measures would be required.

Impacts 5.3.4-2: Effects on Delta water users.

Changes in flow in the Tuolumne River below La Grange Dam attributable to the WSIP would affect Sacramento–San Joaquin Delta inflow. The Delta standards include flow objectives for Delta outflow, and outflow at times is required for maintenance of water quality objectives within the Delta. Reductions in Delta inflow attributable to the WSIP could make it necessary for the DWR and USBR, the agencies responsible for compliance with objectives for the Delta, to increase reservoir releases and/or decrease diversions at the Banks and Tracy Pumping Plants to meet the objectives. At other times, the DWR and USBR could be limited in their export capacity by an objective that relates allowable export to Delta inflow.

Table 5.3.4-4 shows the changes in releases from La Grange Dam attributable to the WSIP. The changes would be reflected downstream as a change in Delta inflow. As shown in the table, most of the changes in releases and the greatest changes in releases would occur in wet and above-normal years. Furthermore, most of the changes in releases would occur from February through June of the affected years, with an occasional occurrence during other months. When they occur, the changes in average monthly flows are usually in the hundreds of cubic feet per second.

Occasionally, changes are in the range of 1,000 cfs to a little over 3,000 cfs. The greatest changes would potentially occur infrequently during wetter years following protracted droughts.

The WSIP would increase the SFPUC's diversions from the Tuolumne River almost every year, which would result in a decrease in inflow to Don Pedro Reservoir almost every year. During protracted droughts, WSIP-induced reductions in storage in Don Pedro Reservoir would accumulate for several years. When the drought ends, a large volume of water would be needed to refill or partially refill Don Pedro Reservoir. Much or all of the winter and spring runoff would be retained in Don Pedro Reservoir, and only minimum required releases would be made below La Grange Dam. Under these fairly rare conditions, WSIP-induced reductions in flow in the Tuolumne River below La Grange and in the San Joaquin River compared to the existing condition would be in the range 1,000 to 3,000 cfs.

Delta inflow varies widely from year-to-year and depends on hydrologic conditions and the magnitude of diversions upstream of the Delta. Delta outflow depends on hydrologic conditions, the magnitude of diversions upstream of the Delta, and the magnitude of diversions within the Delta, including diversions by the State Water Project and Central Valley Project.

Certain objectives for Delta outflow are shown in Table 5.3.4-2. The table is not an exhaustive compilation of all requirements for flow, nor does it specify the amount of flow needed to meet water quality objectives for the Delta.

Compliance with Delta outflow objectives is the responsibility of the DWR and the USBR and is achieved by releasing water from reservoirs upstream of the Delta or by limiting pumping at the Banks and Tracy Pumping Plants. When Delta inflow exceeds the sum of the Delta outflow objectives and the water needs of the State Water Project, Central Valley Project, and other diverters, the Delta is regarded as in "excess conditions." When the Delta is in excess conditions, there are no limits on pumping as a result of the export limits that are a part of D-1641. Exports are limited to 35 percent of Delta inflow from February through June and to 65 percent of Delta inflow from July through January. When Delta inflow is generally equal to the sum of the Delta outflow objectives and the water needs of the State Water Project, Central Valley Project, and other diverters, the Delta is regarded as in "balanced conditions."

The Delta is typically in excess conditions from December through May and balanced conditions from June through November. However, Delta inflow can vary by a factor of 10 or more, so there is considerable year-to-year variability in the periods of excess and balanced conditions.

The WSIP would typically reduce Delta inflow in wet and above-normal years when the Delta is in excess conditions and Delta outflow is so great that the export limits do not limit pumping by the State Water Project and Central Valley Project. Under these conditions, the WSIP would reduce Delta inflow and outflow by the same amount, but would have no effect on the State Water Project's and Central Valley Project's ability to pump water from the Delta. There could be rare occasions when the WSIP would reduce Delta inflow during excess conditions but when the export limits do affect pumping by the State Water Project and Central Valley Project. Under these conditions, the WSIP would reduce Delta outflow and could potentially reduce pumping by the State Water Project and Central Valley Project by 35 percent of the WSIP-induced reduction in Delta inflow. However, the State Water Project and Central Valley Project may choose to comply with the export limits by releasing more water from upstream reservoirs rather than by limiting pumping.

In the winter and spring of wet and above-normal years, when the effects of the WSIP on Delta inflow would be felt, Delta outflow would typically be in the range of 13,000 to 63,000 cfs. In almost all cases, the reduction in Delta ouflow attributable to the WSIP would be less than 500 cfs, a small proportion of total outflow. In very rare circumstances, during a wetter year that follows a multi-year drought period (six or more years), the WSIP-induced reduction in Delta inflow would be greater than 500 cfs, in the range 1,000 to 3,000 cfs.

When the Delta is in balanced conditions, the DWR and USBR must balance reservoir releases and pumping at the Banks and Tracy Pumping Plants in order to meet the Delta objectives. There could be occasions between June and September during some wet and above-normal years when WSIP-induced reductions in Delta inflow would occur during balanced conditions in the Delta. Under these rare circumstances, the State Water Project and Central Valley Project would have to increase releases from upstream reservoirs or curtail pumping in order to meet flow objectives for the Delta.

WSIP-induced decreases in Delta inflow would not lead to violations of Delta objectives. The State Water Project and Central Valley Project, the parties responsible for compliance with Delta standards, would react to changes in Delta inflow and ensure that the standards were met. WSIP-induced decreases in Delta inflow would not necessarily lead to reductions in water deliveries by the State Water Project and Central Valley Project. Table 5.3.4-4 shows the reductions in flow below La Grange Dam attributable to the WSIP, which would also be reflected as WSIP-induced reductions in Delta inflow. The inflow difference that would occur when the Delta is in balanced conditions and when pumping might be curtailed to comply with export limits would typically amount to an annual volume of 20,000 acre-feet, a small fraction of the average annual Delta inflow of about 21 million acre-feet. A WSIP-induced reduction in Delta inflow would likely be compensated for by releases from upstream reservoirs. In any particular year, the Delta inflow difference attributable to the WSIP would contribute to an increase in risk to water deliveries in a subsequent year, and would only be realized in a series of dry years.

Given the very small magnitude and low frequency of potential effects on Delta flows, the impact of the WSIP on water availability and quality at water agencies' and other diverters' diversion points in the Delta would be *less than significant*, and no mitigation measures would be required.

[Additional discussion on Delta water users was prepared in response to comments on the Draft PEIR. Please refer to Section 14.8, Master Response on Delta and San Joaquin River Issues (Vol. 7, Chapter 14).]

References – Surface Water Supplies

State Water Resources Control Board (SWRCB), *Water Quality Control Plan for San Francisco Bay/Sacramento–San Joaquin Delta Estuary*, 1995.

5.3.5 Groundwater

The following setting section identifies groundwater bodies in the Tuolumne River watershed that could be affected by the WSIP; they include those that are hydraulically connected to the Tuolumne River and its tributaries. The impact section (Section 5.3.5.2) provides a description of the changes in groundwater levels and quality that would result from WSIP-induced changes in stream flow.

5.3.5.1 Setting

The Tuolumne River flows from the crest of the Sierra Nevada westward to its confluence with the San Joaquin River. The San Joaquin River flows north to the Sacramento–San Joaquin Delta. The Tuolumne River system and downstream water bodies are shown in Figure 5.3.1-1. Unless otherwise designated by the California Regional Water Quality Control Board, all groundwaters in the Central Valley region are considered to be suitable or potentially suitable, at a minimum, for municipal and domestic supply, agricultural supply, industrial service supply, and industrial process supply.

From Hetch Hetchy Reservoir to Don Pedro Reservoir, the Tuolumne River flows through a deep canyon in mountainous terrain. The hydrogeologic units underlying the river exhibit low permeability. There are no large groundwater bodies along this reach of the river. Below Don Pedro Reservoir, the Tuolumne River flows through the Sierra Nevada foothills and on to the floor of the San Joaquin Valley. Permeable hydrogeologic units of the San Joaquin Valley Groundwater Basin underlie the foothills and valley floor.

This section is focused on the effects of WSIP-induced flow and water quality changes on groundwater bodies along the reach of the Tuolumne River between La Grange Dam and the confluence with the San Joaquin River. As described in Section 5.3.1, the proposed program would alter flows and water quality in the Tuolumne River and, to a lesser extent, in the San Joaquin River and Delta. Because a dynamic balance exists between rivers and the groundwater basins they flow through, changes in river flow can affect groundwater levels and quality. The San Joaquin Valley Groundwater Basin is bounded on the west by the Coast Ranges, on the south by the San Emigdio and Tehachapi Mountains, on the east by the Sierra Nevada, and on the north by the Delta and Sacramento Valley. Within this basin, the Modesto Groundwater Subbasin lies between the Stanislaus River to the north, the Tuolumne River to the south, the San Joaquin River to the west, and the Sierra Nevada to the east. The Turlock Groundwater Subbasin shares the east and west boundaries with the Modesto Groundwater Subbasin, with the Tuolumne River forming the northern boundary and the Merced River forming the southern boundary (USGS, 2004).

Modesto Groundwater Subbasin

The Modesto Subbasin covers approximately 385 square miles, with lands primarily in the Modesto Irrigation District (MID), Oakdale Irrigation District, and the city of Modesto. The aquifer system is complex; primary hydrogeologic units include both consolidated and unconsolidated sedimentary deposits. The consolidated deposits lie in the eastern portion of the subbasin and include the Ione, Valley Springs, and Mehrten Formations; of these three, the Mehrten Formation is a high-yielding aquifer. Unconsolidated deposits include continental and alluvium deposits and are the main water-yielding units; Corcoran Clay separates older and younger alluvium, with generally unconfined conditions above and confined conditions below.[1] Groundwater recharge is primarily from deep percolation of applied irrigation water, canal seepage from irrigation facilities, seepage from Modesto Reservoir, and precipitation. The primary groundwater discharge is from extensive pumping for agricultural and municipal uses. Groundwater flow is primarily to the southwest; on average, water levels within the subbasin declined nearly 15 feet from 1970 through 2000 (DWR, 2003).

In general, groundwater quality is suitable for most urban and agricultural uses but is subject to some impairment. Total dissolved solids levels typically range from 200 to 500 milligrams per liter, with substantially higher levels along the east side of the subbasin (DWR, 2003). Other water quality impairment results from elevated levels of radionuclides, pesticides (especially dibromochloropropane, or DBCP), volatile organic compounds, hardness, chlorides, boron, nitrate, iron, and manganese. Localized areas of contamination from gasoline and solvents are also present (Stanislaus and Tuolumne Rivers Groundwater Basin Association, 2005).

Groundwater wells provide approximately 60 percent Modesto's municipal water supply; the remainder is provided by treated surface water from the Tuolumne River. As of 2000, the City operated 118 municipal wells, although several wells had been taken out of service due to water quality concerns (City of Modesto, 2000). The City has calculated its municipal safe yield from the groundwater basin to be 50,000 acre-feet per year.

Turlock Groundwater Subbasin

The Turlock Subbasin covers an area of about 542 square miles and includes lands in the city of Turlock, the Turlock Irrigation District (TID), the Ballico-Cortez Water District, the Eastside Water District, and a small portion of the MID. In general, the characteristics of the Turlock Subbasin are similar to those in the Modesto Subbasin. On average, water levels in the subbasin declined nearly 7 feet between 1970 and 2000 (DWR, 2003).

The City of Turlock obtains its drinking water from the lower confined aquifer, beneath the Corcoran Clay, and presently meets all municipal demands from groundwater wells. The City plans to develop additional sources of supply in the future, which could include using recycled wastewater, withdrawing water from the shallow unconfined aquifer for sub-potable uses, constructing new wells, and purchasing treated water from TID for potable uses (City of Turlock, 2005).

Tuolumne River/Groundwater Interaction

Based on groundwater-level monitoring data, the Tuolumne River is generally a "gaining" river[2] for most of its length between La Grange Dam and its confluence with the San Joaquin River. However, this situation is reversed for an approximately five-mile-long reach near central

1 The permeable materials that surround an unconfined aquifer allow the water table to fluctuate in response to recharge (precipitation in the wet season) and discharge (evapotranspiration in the dry season). A confined aquifer lies below impermeable materials and, as a result, is not recharged directly from above.

2 A gaining river receives water from the groundwater.

Modesto, where a pumping depression has formed; and this reach is considered a "losing" reach[3] (Stanislaus and Tuolumne Rivers Groundwater Basin Association, 2005). The gaining and losing reaches likely change depending upon the season and hydrologic year type.

Beneficial Uses and Water Quality Objectives

The Central Valley Regional Water Quality Control Board, which has regulatory authority over water bodies in the Central Valley watershed, has prepared the *Water Quality Control Plan* (Basin Plan) to implement plans, policies, and other provisions for water quality management. The Basin Plan establishes beneficial uses for the groundwater basin; these include Municipal and Domestic Supply (MUN), Agricultural Supply (AGR), Industrial Service Supply (IND), and Industrial Process Supply (PRO) (SWRCB, 1995).

5.3.5.2 Impacts

Significance Criteria

The City and County of San Francisco has not formally adopted significance standards for impacts related to groundwater, but generally considers that implementation of the proposed program would have a significant groundwater impact if it were to:

- Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of preexisting nearby wells would drop to a level that would not support existing land uses or planned uses for which permits have been granted)
- Substantially impair a water body's ability to support beneficial uses designated by the State Water Resources Control Board or Regional Water Quality Control Board
- Otherwise substantially degrade water quality

Approach to Analysis

Information on potentially affected groundwater bodies was obtained from published sources and through interviews with individuals who are knowledgeable about the hydrogeology of the area or involved with groundwater management in the potentially affected area. Impact assessments were performed by reviewing WSIP-induced changes in stream flow and examining their potential to affect groundwater levels or quality.

Impact Summary

Table 5.3.5-1 presents a summary of the impacts on groundwater bodies in the Tuolumne River watershed that could result from implementation of the proposed water supply and system operations.

[3] A losing river reach loses water to the groundwater.

TABLE 5.3.5-1
SUMMARY OF IMPACTS – GROUNDWATER BODIES IN THE TUOLUMNE RIVER WATERSHED

Impact	Significance Determination
Impact 5.3.5-1: Alteration of stream flows along the Tuolumne River, which could affect local groundwater recharge and groundwater levels	LS
Impact 5.3.5-2: Alteration of stream flows along the Tuolumne River, which could affect local groundwater quality	LS

LS = Less than Significant impact, no mitigation required

Impact Discussion

Impact 5.3.5-1: Alteration of stream flows along the Tuolumne River, which could affect local groundwater recharge and groundwater levels.

At present, the reach of the Tuolumne River below La Grange Dam generally gains flow for most of its length, except for the reach in the vicinity of Modesto, where a groundwater pumping depression exists, causing the river to lose flow. The proposed program would result in lowered stream flows in the Tuolumne River in the winter and spring, as compared to existing conditions and described in Section 5.3.1. This means that there could be a slight increase in groundwater discharge to the river in the areas where the river is gaining flow, due to the slight drop in surface water level. Correspondingly, there would be a slight reduction in the loss of stream flow to the groundwater basin in the vicinity of Modesto, where a pumping depression exists. This effect would be minor, and effects on groundwater levels would be limited to the shallow, unconfined aquifer in the vicinity of the river, which is not used as a source of municipal water supply. In addition, these effects could largely cancel each other out, as discharge of groundwater to the river would be increased in some reaches, and percolation to shallow groundwater would be increased in another. The WSIP would have little or no effect on groundwater levels and would not affect the production rate of existing wells in the vicinity. Overall, considering the scale of water resource development in the area, the withdrawals for agricultural and municipal supply, and variations in the hydrologic cycle, the effects of the WSIP on groundwater levels and groundwater recharge would be *less than significant*, and no mitigation measures would be required.

Impact 5.3.5-2: Alteration of stream flows along the Tuolumne River, which could affect local groundwater quality.

As described above, any effects on groundwater would be slight and would be limited to the shallow, unconfined aquifer in the vicinity of the bed of the Tuolumne River; this aquifer is not used as a source of municipal water supply, but rather for agricultural or other sub-potable uses. As such, any effects on groundwater quality are expected to be minimal, and no adverse effects on any identified beneficial uses of the groundwater basin would occur. The effects of the WSIP on local groundwater quality in groundwater bodies adjacent to the Tuolumne River below La Grange Dam would be *less than significant*, and no mitigation measures would be required.

References – Groundwater

California Department of Water Resources (DWR), *Bulletin 118: California's Groundwater*, Updated October 2003.

City of Modesto, *2000 Urban Water Management Plan*, 2000.

City of Turlock, *Urban Water Management Plan*, 2005.

Stanislaus and Tuolumne Rivers Groundwater Basin Association, *Integrated Regional Groundwater Management Plan*, Final Draft, June 2005.

State Water Resources Control Board (SWRCB), *Water Quality Control Plan for San Francisco Bay/Sacramento–San Joaquin Delta Estuary*, 1995.

U.S. Geological Survey (USGS), *Hydrogeologic Characterization of the Modesto Area, San Joaquin Valley, California*, Scientific Investigations Report 2004-5232, 2004.

5.3.6 Fisheries

The following setting section describes the fisheries resources in the Tuolumne River watershed that could be affected by the WSIP. The impact section (Section 5.3.6-2) provides a description of the changes in fisheries resources that would result from WSIP-induced changes in stream flow and reservoir water levels.

5.3.6.1 Setting

The Tuolumne River flows from the crest of the Sierra Nevada westward to its confluence with the San Joaquin River. The San Joaquin River flows north to the Sacramento–San Joaquin Delta. Water from the Delta discharges to the San Francisco Bay Estuary and the Pacific Ocean. The Tuolumne River system and downstream water bodies are shown in Figure 5.3.1-1 in Section 5.3.1, Stream Flow and Reservoir Water Levels.

Because the WSIP would affect flows in the Tuolumne River (as discussed in Section 5.3.1), this section examines potential effects on the aquatic resources in the Tuolumne River between Hetch Hetchy Reservoir and the San Joaquin River, the San Joaquin River itself, and the Sacramento–San Joaquin Delta. This analysis examined the aquatic habitats of the three tributary streams (Cherry, Eleanor, and Moccasin Creeks) as well as water storage in several reservoirs (Hetch Hetchy Reservoir, Lake Lloyd, Lake Eleanor, and Don Pedro Reservoir) that feed the Tuolumne River; hydrologic and operational modeling indicates that the WSIP would not affect Moccasin or Eleanor Creeks, and that the effects on Cherry Creek would be minimal to none.

The headwaters of the Tuolumne River are at an elevation of approximately 13,000 feet above mean sea level. As the river moves downstream from the headwaters, it flows westerly across the Tuolumne Meadows in Yosemite National Park and into Hetch Hetchy Valley. The upper Tuolumne River in the reach downstream of Hetch Hetchy Reservoir is a high-elevation, relatively steep-gradient river located on the western slope of the southern Sierra Nevada mountains.

Tuolumne River Between Hetch Hetchy and Don Pedro Reservoirs

General Description of Aquatic Habitat

In 1923, the Hetch Hetchy Valley was dammed by O'Shaughnessy Dam, which created Hetch Hetchy Reservoir. Downstream of O'Shaughnessy Dam, the Tuolumne River is characterized by a series of pools, cascades, riffles,[1] and pocket water (USFWS, 1992a). The river passes through an extremely deep gorge downstream of Poopenaut Valley and flows to the upper reaches of Don Pedro Reservoir.

Flow in the Tuolumne River is regulated, to a large extent, by operations of Hetch Hetchy Reservoir and minimum stream flow releases from O'Shaughnessy Dam. The hydrology of the river downstream of Hetch Hetchy Reservoir is characterized by relatively stable releases

[1] A stretch of choppy water caused by stones or other objects in a river or stream.

between the fall and spring, followed by a substantial increase in flow during the late spring and summer months (May–July) in response to snowmelt runoff. The SFPUC makes minimum releases from Hetch Hetchy Reservoir to support resident fisheries downstream of O'Shaughnessy Dam (see Table 5.3.1-2, Section 5.3.1). The SFPUC has initiated a fishery monitoring program within the river to assess potential effects of project operations on habitat quality and availability for resident trout and other fish species that over time will provide additional site-specific information on the effects of seasonal and interannual variation in stream flows on fishery populations inhabiting the river (Hanson, 2007).

Flows in the Tuolumne River downstream of its confluence with Cherry Creek are manipulated during the summer months to provide sufficient flow for whitewater rafting. The SFPUC releases pulses of water from Lake Lloyd via Holm Powerhouse to support rafting for several hours on most summer days. Short-duration increases and decreases in flows associated with whitewater rafting influence habitat conditions for resident trout and may affect the vulnerability of trout and other fish to stranding and habitat displacement as flows quickly change within the reach. Because the releases for whitewater rafting would be the same with and without the proposed program, this section does not evaluate the effects of flow fluctuations on habitat selection, habitat quality, growth, and survival, or associated effects on the macroinvertebrate community that trout rely on as a primary food resource.

Resident Fish and their Habitat

The Tuolumne River downstream of Hetch Hetchy Reservoir supports a resident community of fish, including rainbow trout, brown trout, California roach, sculpin, and suckers (USFWS, 1992b). The USFWS (1990; cited in USFWS, 1992b) conducted fishery surveys within the river and estimated that approximately 7,000 adult rainbow and brown trout inhabited the 12.1-mile reach between O'Shaughnessy Dam and Early Intake. Field observations within the river made at various times between October 20, 1987 and June 14, 1990 have confirmed successful reproduction, rearing, and maintenance of adult populations of both rainbow and brown trout.

The USFWS (1992b) documented the preliminary results of an instream flow field study designed to provide information on the relationship between habitat and instream flows for various life-history stages of rainbow and brown trout. Rainbow trout spawning within the Tuolumne River downstream of Hetch Hetchy Reservoir occurs primarily between mid-February and mid-June, with juvenile emergence occurring from about mid-March to early July. Juvenile and adult rearing occurs within the river throughout the year. Brown trout spawning occurs primarily in November and December, with juvenile emergence between April and September followed by juvenile and adult rearing throughout the year. In developing release recommendations, the USWFS considered the seasonal timing of spawning activity and other life-history stages within the river as well as the effects of seasonal water temperatures on habitat suitability for trout.

As part of the stream flow study, the USFWS identified 12 habitat types within the river reach extending from O'Shaughnessy Dam downstream to Early Intake, which included deep pools, shallow pools, pocket waters, cascades, cascades/deep pools, cascades/pocket waters, chutes, riffles, runs, glides, side channels, and backwaters. Among the habitat types, deep pools, shallow pools, pocket waters, runs, riffles, and cascades/pocket water represented 93.9 percent of the total habitat surveyed. Steep-gradient, high-velocity cascades, chute habitats, and a combination of cascades/deep pool habitats represented 4.6 percent of the river reach surveyed. Low-gradient glides, side channels, and backwater habitats represented 1.5 percent of the river habitat area. The results of habitat typing are characteristic of high-gradient, high-elevation Sierra streams and rivers that support populations of trout and other resident species. Among the habitat types observed within the river, deep pools, runs and riffles, and pocket waters are typically the most suitable for resident trout, and these habitat types were present in a majority of the reaches surveyed. The stream flow study did not identify physical habitat as a major limiting factor, although seasonal water temperatures were identified as a factor affecting both brown and rainbow trout within the river.

The quality and suitability of habitat for resident trout depend on various environmental factors, including seasonal stream flow, stream gradient, stream cover, habitat diversity and complexity, water depths, water velocities, and water quality. Trout are coldwater fishes; therefore, seasonal water temperatures within many stream and river systems in California affect habitat suitability. Optimum water temperatures for juvenile and adult trout growth are typically 13 to 21 °C. Trout experience increasing levels of stress, reduced growth rates, increased susceptibility to disease, and, under severe conditions, mortality within the temperature range of 21 to 28 °C. Water temperatures in excess of 28 °C are unsuitable for trout. Incubating trout eggs are more sensitive to elevated water temperatures than either juvenile or adult trout; suitable temperatures for trout egg incubation are approximately 8 and 18 °C, with mortality increasing rapidly at higher temperatures.

Water temperatures within the Tuolumne River between Hetch Hetchy and Don Pedro Reservoirs during the summer months (June–July) have been observed to exceed the maximum daily temperatures of 21 °C, although nighttime temperatures during the summer months are lower. Winter water temperatures are typically low and may be limiting successful egg incubation and hatching for brown trout, which spawn during the winter. The recommended instream flows developed by the USFWS (1992b) therefore included consideration of both physical habitat and seasonal water temperatures.

Tuolumne River Tributaries and Lakes: Hetch Hetchy Reservoir to Don Pedro Reservoir

The rivers, lakes, and reservoirs within the Sierra Nevada provide habitat for a diverse assemblage of native and introduced fish species. Moyle et al. (1996) report that 40 species of native fish inhabit the range, of which 22 are reported for the Sacramento–San Joaquin drainage. The abundance, species composition, and geographic distribution of fish within the watersheds have been influenced by a number of factors. The construction and operation of water impoundments designed for water supply, flood protection, and hydroelectric power generation have affected hydrologic conditions within many of these watersheds as well as modified fishery habitat and limited migration and movement of fish from one part of the watershed to another. The introduction of non-native species, many of which were planted in watersheds to support recreational fisheries, has resulted in substantial changes to the fishery communities. The production and planting of fish, such as various species of trout, to support local recreational fisheries has also affected the aquatic communities within many areas of the upper Tuolumne River watershed and elsewhere within the range. Inventories of fish species inhabiting the water bodies between Hetch Hetchy and Don Pedro Reservoirs have been fairly limited in recent years; the fish surveys that were conducted have been primarily limited to direct visual observations (Knapp and MSI, 1996). Fish species found in the Tuolumne River watershed above La Grange Dam are listed in **Table 5.3.6-1**.

Hetch Hetchy Reservoir, Lake Lloyd, and Lake Eleanor

Although a variety of fish inhabit the Tuolumne River upstream of and within Hetch Hetchy Reservoir, various species of trout that support local recreational fisheries have received the greatest attention. Rainbow trout, brown trout, and eastern brook trout have been reported to inhabit Hetch Hetchy Reservoir (Johnston, 1985). Resident trout within the upper watershed and reservoir include fish planted from hatchery production to support local recreational fisheries. The condition of the trout populations upstream of Hetch Hetchy Reservoir prior to the completion of O'Shaughnessy Dam is unknown, except that the populations are thought to have included both hatchery plantings and native stocks (Snyder, 1993). It is unclear whether or not anadromous[2] salmon or steelhead historically migrated upstream through the Hetch Hetchy reach of the river prior to the construction of the dam, since a number of natural impediments and barriers to passage exist within the watershed that are thought to have prevented access to upstream habitats (Snyder, 1993).

Similarly, it is unclear whether rainbow trout were native to the Hetch Hetchy Reservoir area prior to the construction of O'Shaughnessy Dam. While historical literature suggests that rainbow trout are native, other sources indicate that trout planting during the 19th century resulted in a population that would otherwise not exist (Moyle, 1976). It is also possible that impediments to passage may have prevented the migration of steelhead/rainbow trout upstream to the Hetch Hetchy Reservoir site on the Tuolumne River but that such impediments were not present on the Merced River, thus enabling rainbow trout to establish themselves in Yosemite (Moyle, 1999; cited in Cherrigan, 1999). Waterfalls just below the Hetch Hetchy Reservoir site would have prevented the upstream migration, and other sources have noted that this reach of the Tuolumne River was fishless (Muir, 1902).

Lake Eleanor, which was completed in 1917, is located on Eleanor Creek and is hydraulically connected to Lake Lloyd. Surveys of the lake conducted by the CDFG in the 1960s and 1970s indicated the presence of suckers, brown trout, rainbow trout, and sunfish, among other species. The fish population within Lake Eleanor probably parallels that at Cherry Lake due to its hydraulic connection (CDFG, 2006b), although recent published data on fisheries at these reservoirs are limited (Knapp and MSI, 1996).

2 Anadromous fish species migrate from the ocean to spawn in freshwater streams and rivers.

TABLE 5.3.6-1
FISH SPECIES KNOWN TO INHABIT TUOLUMNE RIVER TRIBUTARIES, HETCH HETCHY AND DON PEDRO RESERVOIRS, LAKE LLOYD, AND LAKE ELEANOR[a]

			Reservoirs				Tributaries (Upper Tuolumne River)		
Common Name	**Scientific Name**	**Native (N) Introduced (I)**	**Don Pedro Reservoir**	**Hetch Hetchy Reservoir**	**Lake Lloyd**	**Lake Eleanor**	**Cherry Creek**	**Moccasin Creek**	**Eleanor Creek**
Rainbow trout/steelhead	*Oncorhynchus mykiss*	?[b]	x	x	x	x	x	x	x
German brown trout	*Salmo trutta*	I	x	x	x	x		x	x
Eastern brook trout	*Salvelinus fontinalis*	I	x	x	x	x		x	
Golden trout[c]	*Oncorhynchus aguabonita*	I			x	x			
Lake trout	*Salvelinus namaycush*	I			x	x			
Largemouth bass	*Micropterus salmoides*	I	x						
Smallmouth bass	*Micropterus dolomieu*	I	x						
Sacramento sucker	*Catostomus occidentalis*	N			x	x	x	x	x
Green sunfish	*Lepomis cyanellus*	I	x						
Black crappie	*Pomoxis nigromaculatus*	I	x						
Bluegill	*Lepomis macrochirus*	I	x						
Golden shiner	*Notemigonus crysoleucas*	I	x		x	x			
Threadfin shad	*Dorosoma petenense*	I	x						
Riffle sculpin	*Cottus gulosus*	N					x		
California roach	*Lavinia symmetricus*	I					x		
Coho salmon	*Oncorhynchus kisutch*	I	x						
King (Chinook) salmon	*Oncorhynchus tschywstcha*	I	x[d]						
Kokanee salmon	*Oncorhynchus nerka*	I	x		x	x			
Channel catfish	*Ictalurus punctatus*	I	x						

NOTE: Fish populations in the interconnected Lake Lloyd and Lake Eleanor are known to be the same (CDFG, 2006b).

a This table is principally based on unpublished CDFG data.
b It is not clear whether the California-native steelhead/rainbow trout was introduced to the area or planted early on to establish a fish population.
c Among the fish species present in the watershed, only golden trout has been identified by the CDFG as a species of special concern.
d Don Pedro Reservoir is regularly planted with hatchery-reared Chinook salmon.

SOURCES: Bacher, 1999; CDFG, 2006a, 2006b; USDA, 2007.

Lake Lloyd is located on Cherry Creek. The principal fish species found in Lake Lloyd include rainbow trout, brown trout, and brook trout (CDFG, 1987; Dirksen and Reeves, 1990; DWR, 1993). Golden shiner, green sunfish, and an abundance of Sacramento sucker also inhabit the lake. Salmon are probably not present in Lake Lloyd today—previous populations of salmon were a product of hatchery planting that occurred until the 1970s to support local recreational fisheries in the lake. Salmon were documented in the lake during gillnet surveys conducted by the CDFG in the 1960s and 1970s (CDFG, unpubl. data; CDFG, 2006b).

Eleanor and Cherry Creeks

Cherry Creek, a tributary to the main stem Tuolumne River about one mile below Early Intake, has a fishery population comprised mostly of rainbow trout (CDFG, 2006a). It has been hypothesized that Cherry Creek may have provided habitat for historical populations of steelhead and/or spring-run Chinook salmon. Major dams and reservoirs downstream within the Tuolumne River currently prevent anadromous fish such as steelhead and salmon from accessing the upper parts of the watershed. Sacramento sucker, riffle sculpin, and California roach have been observed during stream surveys between Early Intake and Preston Falls and have been observed within Cherry Creek as well, particularly in the reaches closest to the confluence of the Tuolumne River where water temperatures become warmer (CDFG, 2006a).

Eleanor Creek fish populations are mostly comprised of brown trout and rainbow trout (CDFG, 2006a). The creek is not stocked, although a hatchery was operated on Frog Creek until the 1950s. The trout raised in the hatchery originated from Lake Eleanor (CDFG, 2006a). Suckers, sculpin, and roach may also be present in Eleanor Creek and would be expected to occur in greater abundance farther downstream towards the confluence of Cherry Creek, where water temperatures become slightly warmer.

Moccasin Creek

Moccasin Creek, a tributary located downstream from the confluence of the Tuolumne River and Cherry Creek, has a fishery community consisting of California roach, Sacramento sucker, sculpin, and rainbow trout (CDFG, unpubl. data). Moccasin Creek is stocked with hatchery-reared rainbow trout on a weekly basis during trout season to support a local recreational fishery, and is considered a popular angling location (CDFG, 2006a). Each year this hatchery raises more than 1 million catchable rainbow trout, which are then planted in 40 heavily fished lakes and streams in the region. This hatchery also produces more than 1 million trout fingerlings for aerial planting in alpine lakes (Moyle et al., 1996).

Don Pedro Reservoir

The principal fish species in Don Pedro Reservoir are game fish, including trout (e.g., rainbow, brown, and brook trout), catfish, bluegill, crappie, sunfish, coho salmon, king and kokanee salmon, and largemouth and smallmouth bass (CDFG, 1987; Dirksen and Reeves, 1990; DWR, 1993). The salmon fishery population supports a local recreational fishery within the reservoir based on annual stocking conducted by the CDFG. Salmon species such as kokanee salmon (landlocked sockeye salmon) have proven sustainable through ecosystem management, including successful reproduction by the reservoir population. Threadfin shad and plankton also exist in abundant quantities in the lake. No special-status species are known to inhabit the reservoir (TID, 2005).

Species Life Histories

Steelhead/Rainbow Trout (*Oncorhynchus mykiss*).[3] Anadromous trout populations can convert to the resident form when drought events or the damming of rivers block their access to the ocean. Conversely, resident trout populations can become anadromous if ocean access becomes available. It is typical for both life-history patterns to occur in the same stream, and anadromous parents can produce offspring of both varieties. It has been speculated that a food-availability-related trigger determines whether a particular fish will emigrate to the ocean or remain in the stream; according to this hypothesis, if there is abundant food in the stream and a fish is growing at a rapid rate, it may remain in the stream. If food is limited and growth is slow, the fish will have a tendency to emigrate. A variety of biological and environmental factors, in addition to food supply, affect the migratory patterns and life history of steelhead/rainbow trout within a river.

This dual life-history pattern of steelhead and rainbow trout makes the species more adaptable to changing environmental conditions. At the southernmost limits of steelhead distribution, this adaptability is particularly important due to the unstable, variable climatic and hydrologic conditions.

Most steelhead spawn from December through April in small streams and tributaries where cool, well-oxygenated water is available year-round. The female selects a site with gravel substrate where there is good flow through the gravel. She digs a nest, called a redd, and deposits eggs, which the male then fertilizes. These eggs are covered by gravel and cobbles when the female excavates another redd slightly upstream.

The length of time it takes for eggs to hatch is heavily dependent on water temperature. In hatcheries with carefully controlled conditions, steelhead eggs hatch after 30 days at a temperature of 11 °C. The optimal temperature for egg incubation is between 7 and 10 °C. Eggs hatch sooner in warmer water, but the young fish are smaller and generally have lower survival rates. If the temperature goes too high, eggs will not hatch at all. After hatching, the developing steelhead (called “alevins”) remain in the gravel for another four to six weeks. During this time, they obtain nutrients from a yolk sack attached to their body. When they emerge from the gravel, they are called fry, and are able to catch their own food.

Newly emerged fry move to shallow, protected areas of the stream (usually in the stream margins). They establish and defend feeding areas. Most juveniles can be found in riffles, although larger ones will move to pools or deep runs.

Resident rainbow trout support one of the most popular recreational fisheries within lakes and streams in the higher elevation areas of California. Because of the popularity of this species, the

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[3] Rainbow trout and steelhead are the same species of trout (*Oncorhynchus mykiss*). Rainbow trout spend their whole life in freshwater; steelhead spend much of their life in the ocean but return to freshwater to spawn.

CDFG produces juvenile, sub-catchable, and catchable rainbow trout in hatcheries and plants them in lakes, reservoirs, and streams, primarily during the spring, summer, and fall. Rainbow trout are also able to successfully reproduce in many of the streams and lakes where water temperatures and other environmental conditions are suitable.

German Brown Trout (*Salmo trutta*). Brown trout live in cold or cool streams, rivers, lakes, and impoundments and are known to be more tolerant of siltation and higher water temperatures than a species such as brook trout. They are also somewhat tolerant of acidity and are adaptable to stream changes.

Brown trout prefer temperatures similar to those preferred by rainbow trout, with upper tolerance limits of about 24 to 27 °C. Lower critical levels for trout are not as well known and tend to vary based on acclimation, exemplified by studies showing that hatchery-reared salmon tend to prefer warmer temperatures, perhaps due to hatchery conditions.

Brown trout spawn in the fall and early winter, a little later than brook trout, when water temperatures are in the mid- to high 40s. Eggs are deposited in a stream gravel depression that the female prepares with swimming actions of her fins and body. Large females produce 4,000 to 12,000 eggs. Several males may accompany the female during spawning. The eggs hatch the following spring, with no parental attention. Brown trout eat aquatic and terrestrial insects, crayfish and other crustaceans, and especially fish. The big ones may also eat small mammals (like mice), salamanders, frogs, and turtles. Large brown trout feed mainly at night, especially during the summer. Their life span in the wild can be 10 to 12 years. Brown trout support a popular recreational fishery.

Eastern Brook Trout (*Salvelinus fontinalis*). Brook trout, an introduced species in California, originated from northeastern America (Knapp and MSI, 1996). Brook trout range in size from 5 to 8 inches in length and usually spawn between September and December. The females lay eggs in the gravel of coldwater streams, such as in the mountains. After hatching, young brook trout feed on zooplankton, while adult fish feed mainly on insects and aquatic invertebrates. Adults also tend to eat small frogs, fish, and snails. Brook trout generally do not live past the age of four. Brook trout are a popular recreational species.

Golden trout (*Oncorhynchus aguabonita*). Wild naturally reproducing populations of golden trout inhabit the Sierran streams. Golden trout are also raised in hatcheries, and most fish are released in selected water bodies during the spring. Some fish are kept in the hatcheries for broodstock. Anglers fishing for golden trout typically use bait such as worms small spinner baits and flies.

Largemouth Bass (*Micropterus Salmoides*). Largemouth bass (commonly known by anglers as black bass) eat minnows, carp, and practically any other available fish species including their own. Young largemouth fall prey to larger bass, crappie, bluegill, and other predatory fish. Both largemouth and smallmouth bass are parasitized by the bass tapeworm, black spot, and yellow grub, none of which pose a threat to human health.

Largemouth bass live in shallow water habitats among reeds, water lilies, and other vegetation; they are adapted to warm waters of 27 to 28 °C and are seldom found deeper than 20 feet. They prefer clear waters with no noticeable current and do not tolerate excessive turbidity and siltation. In winter they dwell on or near the lake bottom, but stay fairly active throughout the season.

Like smallmouth bass, largemouth bass spawn in late spring or early summer. The male constructs a nest on rocky or gravelly bottoms, although occasionally the eggs are deposited on leaves and rootlets of submerged vegetation. The eggs, which are smaller than those of the smallmouth bass, hatch in three to four days. The fry rise up out of the nest in five to eight days and form a tight school. This school feeds over the nest and later the nursery area while the male stands guard. The school breaks up about a month after hatching, when the fry are about an inch long. Largemouth bass support an active recreational fishery in lakes and reservoirs.

Smallmouth Bass (*Micropterus dolomieu*). Smallmouth bass prefer deep, cool water lakes, cool streams, and gravel substrate habitat. Smallmouth bass spawn in spring; when water temperatures approach 16 °C, males move into spawning areas. Nests are usually located near the shore in lakes, or downstream from boulders or some other obstruction that offers protection against strong currents in streams. Hatching time is typically about 10 days if water temperatures are around 10 °C, but fish can hatch in two to three days if temperatures are warmer. Males guard the eggs for about a month, until fry begin to disperse. Like largemouth bass, fry begin to feed on zooplankton, switching to insect larvae and finally fish and crayfish as they grow.

Golden Shiner (*Notemigonus crysoleucas*). Golden shiners are a deep-bodied minnow species with a distinctive golden-olive/silvery color. Their fins may appear from golden brown to orange-reddish in hue. Older fish have a more golden color than their younger, silvery counterpart. This species has a distinctive scaleless strip on its underside between the pelvic fin and the bottom. Golden shiners are common in medium to large bodies of slow-moving or standing water, including reservoirs, and require good water quality and aquatic vegetation to thrive. They prefer quiet, clear water over sand-, gravel-, or organic-debris-covered bottoms. They spawn over a variety of materials, including sand, gravel, vegetation, and other objects. Anglers do not target golden shiners, although shiners are considered effective bait for a wide variety of species and are easy to keep alive. Golden shiners are collected with a dip net or seine.

Kokanee Salmon (*Oncorhynchus nerka*). Also known as sockeye, these fishes are unique in that they require a lake to rear in as fry, which means that the river system they choose to spawn in must have a lake. They can adapt to a range of water velocities and substrates. Juveniles rear for one or two years in a lake, although they are also found in the inlet and outlet streams of the lake. The fry are often preyed on by resident lake fish, and because they use freshwater year-round, the fry are susceptible to low water quality. Sockeye salmon feed on zooplankton within the lake. Because of the popularity of sockeye salmon as a recreational sport species in cooler mountain lakes and reservoirs, the CDFG plants hatchery-produced young sockeye salmon in a number of Sierran lakes each year. In many of the lakes, sockeye salmon are not able to successfully reproduce, so some populations are supported by annual juvenile plantings from the hatcheries.

Green Sunfish (*Lepomis cyanellus*). Native to the eastern United States, these fishes inhabit quiet pools and backwaters of sluggish streams, lakes, and ponds. Green sunfish spawn in spring and summer, hatching in about two days. They deposit their eggs in a single or colonial nest made by the male, often on fine gravel or sandy silt in shallow water near cover. They prefer warm streams and slow-moving to sedentary waters, ponds, and shallow weedy margins of lakes. They can usually be found in the vicinity of weed beds (Moyle, 1976).

Threadfin Shad (***Dorosoma petenense***)**.** This non-native fish species occurs mainly in freshwater in large rivers, reservoirs, lakes, and swamps, although it is also found in estuarine waters. Threadfin shad are typically found within the top 5 feet of the water column and spawn at approximately 7 °C. This species breeds in the spring and autumn in freshwater, near or over plants or other objects, and their eggs adhere to aquatic vegetation. Anglers also use threadfin shad as baitfish (Moyle, 1976).

California Roach (*Lavinia symmetricus*). Considered a minnow, this species prefers lower elevation streams, particularly sections that dwindle to seasonal pools. Roaches are usually the most abundant fish in the middle-elevation zones of local creeks. California roaches feed on invertebrates and filamentous (threadlike) algae (Moyle, 1976).

Riffle Sculpin (*Cottus gulosus*). This species spawns mostly in small streams with sandy to rocky bottoms. Riffle sculpin tend to inhabit sand and gravel riffles of headwaters and creeks and are also found in sand-gravel runs and backwaters of small to large rivers. They demonstrate resiliency and can withstand substantial changes in habitat. Within California, riffle sculpin are an abundant species (Moyle, 1976).

Sacramento Sucker (*Catostomus occidentalis*). Sacramento suckers prefer tributary streams with gravel or cobble. Foothill streams usually have two subpopulations: a resident one and one that migrates into the creek to spawn in the spring then returns to the river, although some may strand in low-water years. Suckers use their specialized mouths to scrape aquatic insects from the substratum. Spawning typically occurs in waters with temperatures ranging from approximately 6 to 10 °C in February to June, although the species is tolerant of a wide range of temperature conditions.

Bluegill (***Lepomis macrochirus***)**.** Originally introduced into California waters in 1908, bluegill have become a favorite of many anglers, and populations exist in mountain lakes as high as 5,000 feet. They breed in large colonies in which big, dark-colored males vigorously defend nests, embryos, and young against predators and other males. One problem for nesting males of this species is that small males often hang out near the nests and sneak or streak in to spawn (Moyle, 1976). Bluegill support a popular sport fishery, particularly in low- to mid-elevation lakes and reservoirs.

Coho Salmon (*Oncorhynchus kisutch*). Coho salmon, commonly known as silver salmon, occur naturally only in the Pacific Ocean and its tributary drainage, although it can also be found in some freshwater areas, including the Great Lakes. Adult coho salmon are usually 18 to 24 inches long and weigh 8 to 12 pounds. Adults in the ocean are steel blue to slightly green in color, with silver sides, white bellies, and small black spots on the back. Historically, coho salmon (along with other species) was a staple in the diet of several Native American tribes, which would also trade it with tribes farther inland. Coho salmon produced in hatcheries have been planted as juveniles in a number of coldwater lakes and reservoirs to support local recreational fisheries.

Black Crappie (*Pomoxis nigromaculatus*). Spawning varies according to latitude. In the northern states this species usually spawns in May and June. In the South, spawning takes place earlier in the year, beginning as early as March. Favorable spawning temperatures range from 18 to 20 ºC. The male sweeps out a nest in sand or fine gravel and guards the nest and defends the young until they start to feed.

Channel Catfish (*Ictalurus punctatus*). Channel catfish are freshwater fish, native to the central and eastern United States and southern Canada. In California, they were planted in Stockton in about 1874. These fish are readily distinguished by their scaleless bodies; broad, flat heads; sharp, heavy pectoral and dorsal spines; and long, whisker-like barbels[4] around the mouth. They are mostly nocturnal and use their barbels to locate food in the dark recesses of deep water. They prefer water temperatures of about 21 °C. Although this catfish does well in many muddy, dirt-bottom lakes, it prefers a clear, warm-water lake with a sandy bottom.

Lake Trout (*Salvelinus namaycush*). Lake trout prefer deep, coldwater lakes. They spawn in the fall, but the time varies among lakes and depends on such factors as latitude, weather, and the size and topography of the lake. Spawning most often occurs over a large boulder or rubble lake bottom at depths of less than 40 feet, and sometimes as shallow as 1 foot for inland lakes. Spawning takes place at night when the trout scatter their eggs over a rocky lake bottom; the eggs remain among the rocks for weeks and hatch the following spring. Lake trout support an active recreational fishery in a number of lakes and reservoirs.

King (Chinook) Salmon (*Oncorhynchus tshawytscha*). Fall-run Chinook salmon are anadromous, with spawning and juvenile rearing occurring within freshwater rivers and streams and juvenile and adult rearing occurring within coastal marine waters; however, Chinook salmon that are landlocked and/or hatchery-reared are not anadromous and not capable of natural reproduction. (Anglers commonly refer to landlocked, hatchery-reared salmon as king salmon). Native, non-hatchery-reared adult fall-run Chinook salmon migrate from the coastal marine waters upstream through San Francisco Bay, Suisun Bay, and the central Delta during late summer and early fall (approximately late July through early December). Adult fall-run Chinook salmon then migrate upstream to areas characterized by suitable spawning conditions, which include the availability of clean spawning gravels, cold water (considered to be less than 13 °C, and relatively high water velocities. Fall-run Chinook salmon spawning is similar to that described for other Chinook salmon, including the creation of redds where eggs are deposited and incubate. Fall-run Chinook salmon spawning occurs between October and December, with the greatest spawning activity typically in November and early December.

[4] A long, thin, fleshy growth projecting from the mouths or nostrils of some fishes.

The lower Tuolumne River supports a population of anadromous fall-run Chinook salmon. These fish support an active recreational fishery within both ocean and inland waters. Juvenile Chinook salmon produced in fish hatcheries are also planted in mid- to high-elevation lakes and reservoirs to support recreational fisheries.

Tuolumne River Below Don Pedro Reservoir

Aquatic Habitat

Aquatic habitats in the Tuolumne River downstream of La Grange Dam are influenced by a number of factors, many of them related to former gold mining and gravel mining. From La Grange Dam to RM 25, a distance of about 25 miles, the river flows through the Sierra foothills into the alluvial San Joaquin Valley. In the first 10 miles downstream of the dam, the channel is constrained by extensive fields of dredge tailings that include large cobbles to finer sediments. These tailings, which extend to Roberts Ferry (approximately RM 40), restrict river meander and access to alluvial sediments, thus reducing the delivery of gravel to the river. Some sections of the river are armored by cobbles, and replenishment of smaller gravels is necessary. Riparian vegetation in this reach is also limited by the dredge tailings. In some reaches upstream of Roberts Ferry, the interaction of modified flow regimes and areas of dredge tailings has altered channel characteristics and flow regimes, creating areas of lake-cascade habitat instead of the pool-riffle habitat typical of the pre-mining channels.

Downstream of Roberts Ferry, the lower gradient river meanders through low hills and valleys bordered by grazing land, tree crops, and irrigated row crops. In this reach, the river passes through several large gravel-mining pits, in part due to failure of the levees separating the river from these pits during the floods of 1997 (TID/MID, 2005). At approximately RM 25, the river is generally channelized and flows through sandy loam soils. In this lower reach, the channel is characterized by slow-velocity run habitat with a sandy-silty bottom and no riffles; the area is not suitable for salmonid spawning, and no spawning was observed during the 1996–2005 survey period.

Substantial habitat restoration has occurred in the lower Tuolumne River under the FERC Settlement Agreement (FSA) (see Chapter 2 for a description of the agreement). In 2000 the Tuolumne River Technical Advisory Committee completed a report titled “Habitat Restoration Plan for the Lower Tuolumne River Corridor” that provides guidance on the priorities and design of habitat enhancement projects to benefit salmon and other aquatic resources (McBain and Trush 2000). The plan identifies several measures to improve the ecological functions of the lower river including increasing the frequency of periodic high flows, channel reconstruction, and gravel and sediment management. A total of 14 channel restoration projects have been identified in the plan. Two of the projects have been completed and two additional projects will be constructed in 2007. Other planned restoration actions under the FSA include:

- Additional riffle cleaning to remove fine sediments from potential salmon spawning habitats
- Construction of a sedimentation basin on Gasburg Creek upstream of La Grange Dam

- Placement of up to 300,000 cubic yards of screened aggregate in the reach between La Grange Dam and Roberts Ferry
- Rehabilitation of pool-riffle habitats in areas now characterized as lake-cascade habitat

The effectiveness of recent riparian restoration has not been fully evaluated, in part because the restoration at such sites as the pool downstream of Fox Grove County Park is relatively immature.

Chinook Salmon

General Description. Chinook salmon are present in the major San Joaquin River tributaries, including the Tuolumne River, which supports a fall run of Chinook salmon. Based on a literature review for the 1996 FERC report, adults begin to arrive in the Tuolumne River in October, and the spawning run continues into January; spawning occurs primarily in October through January but can extend into March. Most egg incubation occurs from October through March but can extend into May. Juveniles begin to emerge from spawning gravels in December. The period of juvenile rearing ranges from January through June (FERC, 1996).

There is no fish hatchery on the Tuolumne River, but Tuolumne River Chinook salmon stocks have been influenced by fish straying from other Central Valley hatcheries and by releases of large quantities of hatchery juveniles and smolts in the river for smolt survival tests. Tuolumne River Chinook salmon are probably not a unique stock (FERC, 1996). Recovery of coded-wire-tagged fish indicates that Chinook salmon stocked in the Tuolumne River are contributing to the ocean commercial and recreational fishery and to adults returning to the river to spawn.

The general trends in the life history of Tuolumne River Chinook salmon are subject to substantial variation, probably depending on flow and water temperature (FERC, 1996), ocean rearing conditions, recreational and commercial harvest, and other factors. The extent of this variation is shown in the *2005 Ten Year Summary Report for the Don Pedro Project* (TID/MID, 2005). From 1998 to 2002, sampling of juveniles using rotary screw traps was extended to cover the period from late January through as late as June 30. This sampling found that the peak period of juvenile migration at the lower rotary screw traps varied by year:

Year	Period of Peak Juvenile Catch in Rotary Screw Traps at River Mile 5
1998	February 15 – March 15
1999	January 25 – February 15
2000	February 15 – March 1
2001	February 15 – March 18
2002	April 15 – May 10

Variable juvenile migration times may reflect variability in spawning and incubation times and/or variation in the duration of juvenile rearing based on flow and temperature conditions. In 2000 and 2001, juveniles were captured at RM 5 over a period of more than three months. In other years, juvenile emigration appears to have occurred over a shorter period of time. At various life-history stages, Chinook salmon may therefore be found in the Tuolumne River from October through May, although there is also some potential for a small number of juveniles to oversummer in cooler reaches of the river (FERC, 1996). In 1994, the USFWS (FERC, 1996) evaluated habitat availability by life-history stage and determined that:

- For spawning, habitat was optimized at flows of about 150 to 350 cfs, which optimized depth over spawning riffles.
- For juvenile rearing, habitat was optimized at low flows (50 to 150 cfs), which optimized low-velocity habitat.
- For egg rearing, habitat was optimized at flows from about 100 cfs to 800 cfs, which defined the optimal amount of riffle and run habitat and minimized the conversion of runs to pools.

Population Trends. TID/MID (2005) summarizes 1971–2004 population trends for adult Chinook salmon in the Tuolumne River and notes that the return of adult salmon to the river follows the general pattern observed in other major San Joaquin River tributaries:

- From 1971 through 2004, the estimated number of adult salmon returning to the Tuolumne River ranged from a low of 77 fish to a high of 40,332 fish (see **Table 5.3.6-2**).
- During the period of record, there were two periods when the CDFG carcass counts built up to peaks of over 5,000 carcasses, with intervening periods where runs declined to below 100 carcasses.
- Estimates of adult escapement based on carcass counts begin to build during years characterized by higher precipitation and flow (and the associated somewhat cooler water temperatures), and to decline with the onset of drought conditions and warmer water temperatures.
- Tagged carcasses (hatchery fish) accounted for 6.4 to 65 percent of the total carcass count, with an average of about 38 percent of carcasses carrying hatchery tags.
- The percentage of females ranged from 25 to 67 percent, with an average of 51 percent. Females made up less that 35 percent of the total carcass count in only 4 of 33 years (all of which were dominated by two-year-old fish).
- Based on redd (salmon nests) counts from 1981 to 2003, spawning is concentrated in the reaches between RM 34 and La Grange Dam (RM 52.2), with the density of redds greatest between RM 47 and La Grange Dam. In this reach, the average redds per mile was about 85, while in the reaches downstream, average redd count over the 24-year period of record was 18.5 redds per mile.
- Reach 2, from RM 47.4 to 50.5 (3.1 miles), contributed from 17 to 42 percent of the total run during 1981 to 2003, while the longer Reach 3 (RM 42.0 to 47.4; 5.4 miles) contributed from 13 to 36 percent of the total run during the same period.
- There was virtually no spawning activity below Fox Grove (RM 24.1), except in 1988 and 1989 when 30 redds were counted in this downstream reach.

TABLE 5.3.6-2
TUOLUMNE RIVER SPAWNING SURVEY SUMMARY

Year	Carcass Count	% Female	Estimated Run
1971	2,283	58	21,885
1972	537	52	5,100
1973	351	59	1,989
1974	90	55	1,150
1975	130	60	1,600
1976	336	51	1,700
1977	45	62	450
1978	116	67	1,300
1979	305	51	1,184
1980	248	61	559
1981	5,819	44	14,253
1982	2,135	60	7,126
1983	1,280	25	14,836
1984	3,841	34	13,689
1985	11,651	56	40,322
1986	2,463	48	7,288
1987	5,280	31	14,751
1988	3,011	60	6,349
1989	625	52	1,274
1990	37	32	96
1991	30	45	77
1992	55	43	132
1993	187	61	431
1994	215	50	513
1995	461	54	928
1996	1,301	35	4,362
1997	1,520	59	7,548
1998	2,712	51	8,967
1999	3,980	46	7,730
2000	6,884	63	17,873
2001	5,400	54	9,222
2002	4,702	54	7,125
2003	1,489	60	2,961
2004	1,224		1,900

SOURCE: TID/MID, 2005.

The TID/MID (2005) data are generally consistent with data from FERC (1996) in that they indicate a majority of spawning occurs in the 15-mile reach below La Grange Dam. Although the nine-year data set from 1996 through 2004 is too small to be the basis for long-term trend analysis, it is noteworthy that the dry years from 2001 to 2005 do not show the dramatic declines in carcass counts and estimated runs that characterized previous dry periods—possibly a function of the minimum release provisions of the FSA, ocean rearing conditions, or other factors.

Spawning. The distribution of Chinook salmon spawning and rearing is strongly influenced by the availability of spawning gravels, with spawning often concentrated in areas at the head of riffles where subsurface flows increase water flows and oxygen through the gravel (FERC, 1996).

Chinook salmon spawning takes place in a variety of habitats that vary in terms of depth, velocity, and substrate (Healey, 1991; cited in FERC, 1996). Spawning can occur within substrates ranging from fine to coarse gravel, as well as over a wide range of water temperatures; however, optimum spawning temperatures are probably in the 8 to 16 °C range. In the Tuolumne River, this temperature range occurs most consistently in the 15-mile reach below La Grange Dam. The distribution and quality of spawning habitat changes in response to flow, as evidenced by major shifts in the distribution of spawning gravels during the 1997 flood, which involved flood-control releases of over 50,000 cfs. TID/MID (2005) compared the estimated area of riffles in the reaches of the river below La Grange Dam for the years 1988 and 2000. In the three upper reaches of the river, the total area of riffle habitat decreased by over four acres (a loss of 15 percent), much of which was attributed to scour during the 1997 floods. However, the general distribution of riffle habitat was not substantially altered. The area of lost riffle habitat was replaced in 2002 and 2003 when the CDFG placed approximately 27,000 cubic yards of gravel in the reach below La Grange Dam. Further riffle restoration activities are projected to restore approximately 70 to 100 additional acres of riffle habitats.

Restoration activities, such as construction of pool-riffle habitats, incidentally reduce the total area of wetted channel, thus reducing the total area of juvenile rearing habitat while likely increasing food production (insects and other macroinvertebrates) and usable rearing floodplain habitat during higher flows (TID/MID, 2005). Post-restoration monitoring of spawning and juvenile rearing suggests that, based on redd counts, spawning has doubled on reconstructed riffle areas.

Juvenile Rearing. When juveniles emerge from the gravel they initially prefer pool habitats, with the distribution in pools affected by fish size (and thus dominance relationships). Habitat selection appears to be determined by food availability and other habitat characteristics, and dominant juveniles tend to select rearing locations at the head of pools where feeding is optimized (Chapman and Bjornn, 1969; cited in FERC, 1996). Larger juveniles can adapt to greater depth and higher velocity flow, and thus juveniles may move into riffle habitats as they grow. Juveniles can rear successfully over a wide range of temperatures, depending on food availability. Optimal rearing temperatures are generally considered to be 12 to 18 °C, but juveniles can thrive at warmer temperatures when food supplies are abundant enough to offset the increased metabolic rates associated with rearing in warmer water. Optimal temperatures are generally found in the 25 miles immediately downstream of La Grange Dam, but in very wet years may extend to the confluence with the San Joaquin River, at least into the late spring (TID/MID, 2005).

From 1986 to 2004, juvenile rearing was evaluated at 12 Tuolumne River seining locations, from the Old La Grange Bridge (RM 50.5) to the Shiloh Bridge (RM 3.4), with some sites monitored for only a portion of the 19-year period. The TID/MID data do not show any clear trend in the number of juveniles captured by seine netting before and after implementation of the FSA, although densities (fish per unit of seined volume) were marginally higher following FSA implementation. The 1986–1995 studies and 1996–2004 FSA monitoring data show expected trends in juvenile rearing and behavior:

- Young juveniles (fry typically less than approximately 45 millimeters) make up a majority of juveniles captured in January and February, with larger juveniles in excess of 65 millimeters (fingerlings and smolts) beginning to dominate captures by April.
- There are moderately strong relationships between the peak salmon juvenile density and average January 15 to March 15 salmon juvenile density and the estimated number of female spawners.

The seining data suggest a relatively stable egg-to-juvenile survival rate over a wide range of returning adult salmon abundances. The calculated relationship would be stronger if data from the very dry year of 1994 (pre-FSA) and the very wet year of 1997 were omitted from the analysis, which may indicate that egg-to-juvenile survival rates are not generally affected by variable flow. The survival of incubation eggs and juveniles is sensitive to very high flows that scour and erode spawning redds, as occurred in 1997.

The timing of juvenile movement downstream (based on rotary-screw-trap operations at lower screw traps) varied considerably from year to year; TID/MID noted that high variability in trap results makes it difficult to estimate juvenile production, and production estimates from the 1995–2004 monitoring vary by two orders of magnitude. Some preliminary mark-recapture studies of juvenile survival by river reach suggest that survival is substantially higher in the upstream spawning areas than it is in the lower reaches. Predation[5] by adult striped bass and other fish has been identified as one of the factors affecting juvenile survival within the river.

TID/MID also addressed the potential for juvenile stranding as a result of flow fluctuations, an issue of some importance since one goal of restoration is to increase areas of floodplain that may be accessed for rearing. The post-FSA stranding surveys indicated that stranding was a complex phenomenon, probably related to:

- Salmon density
- Flow reduction and the minimum flow in the fluctuation cycle, which determines the amount of potential stranding area exposed
- Salmon use of particular low-lying locations
- Slope and substrate of the channel

However, monitoring in 2005 found little post-FSA stranding and noted that restoration areas have been designed to minimize the potential for stranding (primarily by manipulating the slope of the accessible floodplain).

[Additional discussion on Chinook salmon in the lower Tuolumne River was prepared in response to comments on the Draft PEIR. Please refer to Section 14.7, Master Response on Lower Tuolumne River Issues (Vol. 7, Chapter 14).]

5 The act of preying on another animal or animals.

Steelhead/Rainbow Trout

Steelhead/rainbow trout oversummer in natal streams and require relatively cooler water temperatures than Chinook salmon. Water temperatures in the lower Tuolumne River are in the 25 to 30 °C range for an extended period of time during the summer in many locations (TID/MID, 2005) and are unsuitable for steelhead. Only in the reach immediately downstream of La Grange Reservoir are water temperatures suitable for steelhead rearing. Temperatures in the San Joaquin River during the spring and summer are consistently higher than temperatures farther upstream in the Tuolumne River (see Figure 5.3.1-4) (TID/MID, 2005) and may preclude successful out-migration of juveniles. FERC (1996) concluded that no significant populations of steelhead/rainbow trout are present in the lower Tuolumne River system.

The results of rainbow trout surveys from 1982 to 2004 show rainbow trout were not found below RM 38 during this period (TID/MID, 2005). In addition, only 10 of the fish identified in this extended period of snorkel survey were in excess of 400 millimeters in length, suggesting that large anadromous steelhead probably occur in the system very infrequently. A vast majority of rainbow trout observed during snorkel surveys were found above RM 45. Nevertheless, post-1995 monitoring suggests that the range of rainbow trout in the Tuolumne River has been moderately extended downstream as a result of the FSA flow regimes. Prior to 1998, rainbow trout had not been found below RM 47. Following implementation of the FSA flow regimes, the species was found with greater frequency downstream in the reach from RM 47 to RM 38, even in the dry 2001–2004 period.

[Additional discussion on steelhead in the lower Tuolumne River was prepared in response to comments on the Draft PEIR. Please refer to Section 14.7, Master Response on Lower Tuolumne River Issues (Vol. 7, Chapter 14).]

Other Fish Species

The lower Tuolumne River supports a number of native and non-native fish species, as shown in **Table 5.3.6-3**. From the perspective of salmon management, the most important are largemouth and smallmouth bass and striped bass due to the potential for predation, particularly on outmigrating juveniles (Orr, 1997; Cohen and Moyle, 2004).

Largemouth and Smallmouth Bass. Non-native largemouth and smallmouth bass have colonized the lower Tuolumne River, taking advantage of the low-velocity, and pond-like habitats of the river that are particularly found below RM 25. In these reaches, bass are present in relatively high abundance and feed actively during the spring out-migration of juvenile Chinook salmon. Both the low flow and high water temperatures in this reach stress juvenile salmon and enhance predation by the bass. Typical of centrarchids, smallmouth and largemouth bass are thick-bodied fish that rely on an ambush strategy for foraging. Their swimming speed over distance is low, and their ability to sustain speed is limited by their metabolism and body configuration.

TID/MID (2005) monitored largemouth and smallmouth bass in the Tuolumne River system from 1996 to 2004 and concluded:

- The population was depleted during the 1997 floods, but recovered slowly until 2003 when it reached its previous level.
- Largemouth bass are more abundant than smallmouth bass.

TABLE 5.3.6-3
NON-SALMONID SPECIES PRESENT IN THE LOWER TUOLUMNE RIVER

Species	Scientific Name	Native (N) or Introduced (I)	Observed in 1996–2004 Surveys			
			Snorkel	Upper RST	Lower RST	Seine
Pacific lamprey	*Lampetra tridentata*	N	X	X	X	X
River lamprey	*Lampetra ayresi*	N		X		
White sturgeon	*Acipenser transmontanus*	N				
American shad	*Alosa sapidissima*	I		X	X	
Threadfin shad	*Dorosoma petenense*	I		X	X	X
Common carp	*Cyprinus carpio*	I	X	X	X	
Goldfish	*Carassius auratus*	I		X	X	
Golden shiner	*Notemigonus crysoleucas*	I		X	X	X
Hitch	*Lavinia exilicauda*	N		X	X	
Sacramento blackfish	*Orthodon microlepidotus*	N			X	
Splittail	*Pogonichthys macrolepidotus*	N			X	
Hardhead	*Mylopharodon conocephalus*	N	X	X	X	X
Sacramento pikeminnow	*Ptychocheilus Grandis*	N	X	X	X	X
Red shiner	*Cyprinella Lutrensis*	I		X	X	X
Fathead minnow	*Pimephales promelas*	I				X
Sacramento sucker	*Catostomus occidentalis*	N	X	X	X	X
White catfish	*Ictalurus catus*	I	X			X
Brown bullhead	*Ictalurus nebulosus*	I		X	X	
Black bullhead	*Ictalurus melas*	I		X	X	
Channel catfish	*Ictalurus punctatus*	I		X	X	X
Wagasaki	*Hypomesus nipponensis*	I			X	
Inland silversides	*Menidia beryllina*	I			X	X
Western mosquitofish	*Gambusia affinis*	I	X	X	X	X
Prickly sculpin	*Cottus asper*	N		X	X	X
Riffle sculpin	*Cottus gulosus*	N	X	X	X	X
Striped bass	*Morone saxatilis*	I		X	X	X
Black crappie	*Pomoxis nigromaculatus*	I		X	X	
White crappie	*Pomoxis annularis*	I		X	X	
Warmmouth	*Lepomis gulosus*	I		X	X	
Green sunfish	*Lepomis Cyanellus*	I		X	X	X
Bluegill	*Lepomis macrochirus*	I	X	X	X	X
Redear sunfish	*Lepmois microlopus*	I	X	X	X	X
Largemouth bass	*Micropterus salmoides*	I	X	X	X	X
Smallmouth bass	*Micropterus dolomieui*	I	X	X	X	X
Bigscale logperch	*Percina macrolepida*	I		X	X	X
Tule perch	*Hysterocarpus traski*	N				

RST=rotary screw traps.

SOURCE: TID/MID, 2005.

- The restoration of pool-pond area downstream of Fox Grove County Park did not reduce largemouth bass density and may have increased smallmouth bass density at the site.
- Habitat modeling indicated that velocity is the key factor limiting bass habitat.
- Habitat modeling indicated that a flow of 300 cfs or higher would create limiting velocities for bass in the reach downstream of Fox Grove County Park after restoration, compared to a limiting velocity of 2,000 cfs for pre-project conditions.

Bass density could thus be reduced by recontouring the channel to enhance riffle and run habitats, combined with manipulation of flow to increase velocities. Restoration that increases the area of riffle habitat would therefore be expected to benefit out-migrating juvenile salmon.

Other Species. Based on surveys conducted from 1981 to 2004, including the TID/MID surveys conducted from 1996 to 2004 (Table 5.3.6-3), the lower Tuolumne River supports a relatively complex assemblage of fish, only 14 of 38 being native to the region. The non-natives were introduced for a variety of commercial and sport purposes, beginning in 1871 with the introduction of American shad and continuing into the 1970s with the introduction of the inland silversides as a mosquito-control fish. A majority of the introduced species are warmwater fish that thrive in the lower reaches of the rivers and in the Sacramento–San Joaquin Delta.

As the table indicates, many of the introduced fish species are more widely distributed in the lower Tuolumne River than some of the native species. TID/MID (2005) notes that warmwater introduced species were particularly well distributed in the lower 31 miles of the river, and that native species were dominant only in the short reach upstream of RM 50. The distribution of species responded to flow, with native fish whose life history involves use of riffles for spawning becoming more abundant in the year following a high-flow year.

San Joaquin River and Sacramento–San Joaquin Delta

General Ecological Description

The Sacramento–San Joaquin Delta is a 600-square-mile area of channels and islands at the confluence of the Sacramento and San Joaquin Rivers. Freshwater draining from a 41,300-square-mile watershed enters the Delta from the Sacramento and San Joaquin Rivers and several smaller rivers. Some of the water is diverted from the Delta channels for municipal and agricultural purposes. The remainder flows through the Delta to the San Francisco Bay Estuary.

The Delta is a tidal region. Every 12.4 hours, the tides cause water to move in and out of the Delta. Most of the time, tides cause a five- to eight-mile back-and-forth movement of water in the western part of the Delta. The movement of freshwater through the Delta is superimposed on the tidal flows. Typical freshwater flows are much smaller than tidal flows, usually in the range of 5 to 15 percent of the tidal flows (see Section 5.3.1).

The Bay-Delta estuary is a complex estuarine ecosystem (i.e., a transition zone between inland sources of freshwater and saltwater from the ocean). Along the salinity gradient extending from the Golden Gate upstream into the Delta, the species composition of the aquatic community changes dramatically, although the basic functional relationships among organisms (e.g., predator/prey, etc.) remain similar throughout the system. The primary energy input to the system is solar radiation, which is used, along with nutrients, by the primary producers (phytoplankton, vascular plants, and macroalgae) to convert inorganic carbon to organic matter through photosynthesis. Zooplankton (e.g., copepods, cladocerans, and mysid shrimp) prey on the phytoplankton. The vascular plants and macroalgae are grazed on and also produce detritus, which is decomposed by microbes and consumed by detritivores (e.g., polychaete worms, amphipods, cladocerans, and a diverse group of other fish and macroinvertebrates). The primary consumers are in turn preyed on by secondary consumers, consisting mainly of invertebrates (e.g., polychaete worms, snails, copepods, mysid shrimp, bay shrimp, and crabs) and fishes (northern anchovy, Pacific herring, topsmelt, white croaker, flatfish, gobies, sculpin, shad, juvenile Chinook salmon, and a variety of other resident and migratory fish species). These species in turn are preyed on by top consumers such as fish (striped bass, catfish, sturgeon, halibut, sharks, and rays), marine mammals, birds, and man. The role of a species in the food web may be different at different lifestages, or a species may utilize various levels of the food web simultaneously.

Fishery sampling within the Bay-Delta estuary has shown that 55 fish species inhabit the estuary (Baxter et al., 1999), of which approximately one-half are non-native, introduced species. Many of the fish species inhabiting the estuary, such as striped bass and American shad, were purposefully introduced to provide recreational and commercial fishing opportunities. A number of the fish species have been introduced accidentally to the estuary through movement among connecting waterways (e.g., threadfin shad and inland silversides). In recent years, a number of fish and macroinvertebrate species have been accidentally introduced into the estuary, primarily from the Orient, through ballast water discharges from commercial cargo ships (e.g., yellowfin and chameleon gobies). In addition, an estimated 100 macroinvertebrates have also been introduced, primarily through ballast water discharge, into the estuary (Carlton, 1979). These introductions of non-native fish and macroinvertebrates have contributed to a substantial change in the species composition, predator/prey interactions, and competitive interactions affecting the population dynamics of native species. Many of the introduced fish and macroinvertebrates have colonized and inhabit the lower San Joaquin River and Delta.

The lower San Joaquin River and Delta provide habitat to a diverse assemblage of resident and migratory estuarine organisms. The biological environment is a complex community of plants and animals inhabiting the saltwater, estuarine (brackish water), and freshwater habitats within the Bay-Delta estuary. This section provides a brief summary of information available on the aquatic plants, phytoplankton, zooplankton, bottom-dwelling macroinvertebrates, and common fish populations inhabiting the Bay-Delta estuary.

Fish

Fish species may utilize the estuary for any or all of their life-history stages. They may have planktonic, bottom-dwelling, and open-water life histories. The majority of fish species inhabiting the estuary have planktonic larval stages; as plankton they feed on zooplankton and in some cases phytoplankton. Many of these species forage on plankton during the larval and early juvenile lifestages, and then as juveniles and adults become more selective predators and feed on large invertebrates and fish. Bottom-dwelling fish such as sturgeon, flatfish, gobies, sculpin, and croaker are planktivorous as larvae but begin to feed on invertebrates as juveniles. Many smaller fish, including smelt, silversides, northern anchovy, and Pacific herring, are planktivorous throughout their lives.

Some estuarine fish do not rely on plankton as a major food source at any lifestage. Live-bearing surfperch, for example, predominantly feed on invertebrates such as mollusks, crustaceans, and polychaetes throughout their life. Sturgeon and sharks feed on invertebrates by shoveling through the substrate, and also feed on fish and large invertebrates in the water column. Many freshwater fish prey primarily on bottom-dwelling and drifting insect larvae and crustaceans, because zooplankton abundance is low in the swifter flowing freshwater sloughs and rivers.

The abundance and species composition of fish inhabiting the estuary vary in response to salinity gradients (Baxter et al., 1999). The most abundant fish inhabiting the high-salinity areas of the Central Bay include the schooling, bottom-dwelling forage fish such as northern anchovy, Pacific herring, topsmelt, jacksmelt, and true smelt (whitebait, surf smelt, and night smelt). Other members of the Central Bay fish community include flatfish, rockfish, surfperch, gobies, and sharks. In the low-salinity areas of Suisun Bay and the Delta, the most abundant fish include striped bass, prickly sculpin, staghorn sculpin, threadfin shad, yellowfin goby, and starry flounder. Anadromous fish species such as Chinook salmon, steelhead, American shad, striped bass, and sturgeon utilize the entire estuarine system as a migration corridor and foraging habitat.

Factors affecting the abundance and geographic distribution of fish within the estuary include water velocities, substrate, salinity gradients, water temperature, and food availability. Many of the fish species that inhabit the estuary reside in coastal marine waters and enter the estuary on a seasonal basis for foraging or reproduction. The seasonal cycles of fish abundance vary in response to migration patterns, reproductive cycles, foraging patterns, and environmental conditions occurring within both the estuary and coastal marine waters.

The fish community inhabiting the estuary is diverse and dynamic. The abundance of species can fluctuate substantially within and among years (Baxter et al., 1999) in response to both population dynamics and environmental conditions. Life-history strategies and habitat requirements also vary substantially among species within the fish community. Information on the fish community in the Delta is available from monitoring conducted by the CDFG and USFWS in addition to fish salvage monitoring at the State Water Project and Central Valley Project export facilities in the south Delta. The following sections briefly describe the species composition of the fish community in the lower San Joaquin River and Delta in the vicinity of the WSIP facilities. Information is also presented on habitat types that occur within the estuary, and habitat functions that affect species composition and habitat use. Information on habitat functions and analysis of the available fishery information was used to assess the potential adverse impacts of proposed program operations (e.g., changes in Delta hydrology) on the fish community inhabiting the lower San Joaquin River and Delta.

In recent years, the bottom-dwelling fish community, including delta and longfin smelt and other species, has experienced a significant decline in abundance. State and federal resource agencies are currently evaluating various factors that could be contributing to the decline. Hypotheses include the effects of losses at water diversions, changes in Delta hydrology, the effects of pollutants on survival, and the effects of introduced species on the Delta food web. The importance of these factors in the decline in fish abundance has not been determined.

Among the seasonal inhabitants, many species use the Bay-Delta estuary as a spawning area and/or juvenile nursery habitat on either an obligatory or nonobligatory basis (Baxter et al., 1999). For obligate species, reproduction and rearing of juveniles occurs almost exclusively within a bay or estuarine environment. Nonobligate species may or may not inhabit the estuary during any given year. The occurrence of nonobligate species varies substantially from one year to the next within the Bay-Delta estuary. These species are typically found in the more marine areas of the estuary and are not generally abundant upstream within Suisun Bay or the marsh. Opportunistic species use the Bay-Delta estuary as an extension of their habitat based on the suitability of environmental conditions. Many species that inhabit coastal marine waters, such as northern anchovy, may opportunistically move into the estuary when conditions are favorable for reproduction, juvenile rearing, and foraging. Several freshwater or low-saline species, such as white catfish and threadfin shad, may opportunistically use habitats within Suisun Bay, San Pablo Bay, or Central Bay during periods of high freshwater outflow from the river systems that results in lower salinity and more suitable habitat conditions for these species farther downstream within the system (Baxter et al., 1999).

Anadromous species such as Chinook salmon and steelhead spawn within freshwater portions of rivers and creeks tributary to the Bay-Delta estuary, including the Tuolumne River. Juvenile rearing habitat for these species is also present primarily within the freshwater or low-saline portions of the system. Juvenile Chinook salmon and steelhead emigrate from freshwater habitat and move downstream through the estuary, which is used primarily as a migratory corridor and short-term foraging habitat as the fish move into coastal waters for rearing. Adult Chinook salmon and steelhead subsequently migrate back upstream to spawn, again using the Bay-Delta estuary as a migratory corridor. Other anadromous species such as striped bass may inhabit freshwater, estuarine, and marine waters over an extended period of time as both juveniles and adults.

The open waters of the lower San Joaquin River and Delta serve as a migratory route for several species of anadromous fish whose adults migrate to the freshwater reaches of the tributary rivers to spawn and whose juveniles migrate downstream to return to the ocean. These fish include steelhead, Chinook salmon, white and green sturgeon, and striped bass. In addition, the main channel and adjacent areas support populations of resident species, including Sacramento pikeminnow, white catfish, and threadfin shad.

Regulatory Setting

Special-Status Species

A variety of special-status fish species, several of which have been listed for protection under the Federal and/or California Endangered Species Acts, are present in the Delta and the San Joaquin and Tuolumne Rivers. Special-status fish species that occur in the lower San Joaquin River and Delta include steelhead, green sturgeon, delta smelt, Chinook salmon, Sacramento splittail, and longfin smelt. Several special-status species use the Delta as a migratory corridor. The winter-run Chinook salmon is federally and state-listed as endangered. The spring-run Chinook salmon is federally and state-listed as threatened. The fall/late-fall-run Central Valley Chinook salmon is a federal candidate species and California species of special concern. The Distinct Population Segment of Central Valley steelhead is federally listed as threatened. Fall/late-fall-run Central Valley Chinook salmon use the lower San Joaquin River as a migratory corridor and spawn in the Tuolumne River below La Grange Dam. In addition, delta smelt, a federally and state-listed threatened species, and Sacramento splittail, a California species of special concern and formerly a federal threatened species, have been documented within the lower San Joaquin River and Delta (USFWS, 2003). The NMFS recently listed green sturgeon as a threatened species. Although the distribution of green sturgeon in the lower San Joaquin River is poorly understood, the species is known to reside within the Delta.

Essential Fish Habitat

The Pacific Fisheries Management Council has designated Central San Francisco Bay, Suisun Bay, and the Delta as Essential Fish Habitat (EFH) to protect and enhance habitat for coastal marine fish and macroinvertebrate species that support commercial fisheries. The major rivers tributary to the Delta, including the San Joaquin and Tuolumne Rivers, have also been identified as EFH for Pacific salmon. The amended Magnuson-Stevens Fishery Conservation and Management Act, also known as the Sustainable Fisheries Act (Public Law 104-297), requires all federal agencies to consult with the Secretary of Commerce on activities or proposed activities authorized, funded, or undertaken by that agency that may adversely affect EFH of commercially managed marine and anadromous fish species (Office of Habitat Conservation, 1999). The EFH provisions of the Sustainable Fisheries Act are designed to protect fishery habitat from being lost due to disturbance and degradation. The act requires that EFH must be identified for all species that are federally managed by the Pacific Fisheries Management Council.

5.3.6.2 Impacts

Significance Criteria

The CCSF has not formally adopted significance standards for impacts related to fisheries, but generally considers that implementation of the proposed program would have a significant fisheries impact if it were to:

- Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the CDFG, NMFS, or USFWS
- Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites
- Have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below

self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of an endangered, rare or threatened species

Approach to Analysis

The effects of the WSIP on river flow and reservoir water levels were determined using the HH/LSM. An overview of the model is presented in Section 5.1; detailed information on the model and the assumptions that underlie it is provided in Appendix H. The effects of the WSIP on stream flow and reservoir water levels are evaluated in Section 5.3.1 and were used as the basis for assessing the WSIP's effects on fisheries and aquatic resources. In addition, the effects on water temperature due to WSIP-induced changes in flow in the Tuolumne River below La Grange Dam were determined using a temperature model and are described in Section 5.3.3.
A professional fish biologist assessed the effects of flow, reservoir level, and water temperature changes on aquatic life.

Impact Summary

Table 5.3.6-4 presents a summary of the impacts on fisheries in the Tuolumne River system and downstream water bodies that could result from implementation of the proposed water supply and system operations.

TABLE 5.3.6-4
SUMMARY OF IMPACTS –
FISHERIES IN TUOLUMNE RIVER SYSTEM AND DOWNSTREAM WATER BODIES

Impact	Significance Determination
Impact 5.3.6-1: Effects on fishery resources in Hetch Hetchy Reservoir	LS
Impact 5.3.6-2: Effects on fishery resources along the Tuolumne River between Hetch Hetchy Reservoir and Don Pedro Reservoir	LS
Impact 5.3.6-3: Effects on fishery resources in Don Pedro Reservoir	LS
Impact 5.3.6-4: Effects on fishery resources along the Tuolumne River below La Grange Dam	PSM
Impact 5.3.6-5: Effects on fishery resources along the San Joaquin River	LS

LS = Less than Significant impact, no mitigation required
PSM = Potentially Significant impact, can be mitigated to less than significant

Impact Discussion

Impact 5.3.6-1: Effects on fishery resources in Hetch Hetchy Reservoir.

Hetch Hetchy Reservoir provides habitat for resident fish, including trout. Rainbow, brown, and eastern brook trout support a popular recreational fishery. Operational modeling (presented in Section 5.3.1) indicates that increased water demand under the WSIP would result in a general reduction in water storage elevations in Hetch Hetchy Reservoir of 1 to 10 feet in most months, and to a larger degree in some months of a severe drought. Hetch Hetchy Reservoir typically undergoes a substantial change in storage volume throughout the year, with a general declining trend during the fall and winter followed by a substantial increase in storage during the spring and summer in response to snowmelt runoff (Figure 5.3.1-8). The fish community inhabiting the reservoir typically experiences a wide range of habitat conditions under both existing and proposed future operations. Given the range of natural variation in seasonal storage within the reservoir under existing conditions and the incremental changes predicted to occur under the WSIP, impacts on resident fish habitat within the reservoir under future conditions would be *less than significant*, and no mitigation is required.

Impact 5.3.6-2: Effects on fishery resources along the Tuolumne River between Hetch Hetchy Reservoir and Don Pedro Reservoir.

The Setting section describes the aquatic habitat and fishery resources in the Tuolumne River below Hetch Hetchy Reservoir; the resident fish species present in the river include rainbow trout, brown trout, California roach, sculpin, and suckers. Instream habitat conditions for resident trout and other fish species inhabiting the Tuolumne River downstream of Hetch Hetchy Reservoir are supported through the maintenance of minimum stream flows. The minimum flow requirements below Hetch Hetchy are described in Section 5.3.1.1 and shown in Table 5.3.1-2. The SFPUC operates all facilities such that these release requirements are met.

Hydrologic modeling (see Section 5.3.1) shows that WSIP operations would have little or no effect on average monthly flow in most summer, fall, and winter months in all hydrologic year types. In these months, the required fishery release would be made under the existing condition and with the WSIP. With the WSIP, the number of months in which only the required fishery release would be made would increase slightly. The modeling analysis indicates that, under the existing condition, the minimum flow release would be made 85.1 percent of the time (837 months in the 984-month hydrologic record), while under the WSIP the minimum flow release would be made 85.4 percent of the time (in 6 more months, or 843 months in the 984-month hydrologic record). Minimum release requirements would be maintained under all conditions. The WSIP would have a less-than-significant effect on river flows and, in turn, on fisheries in these months.

In spring months (April, May, and June), however, operation of the regional water system under the WSIP would reduce average monthly flows between 4 and 30 percent as the SFPUC refills Hetch Hetchy Reservoir with snowmelt. The greatest percentage reduction would occur in normal, below-normal, and dry years because, in these year types, a greater proportion of the snowmelt currently released by the SFPUC to the river would be needed to refill the reservoir. Actual flow reductions in any single spring month during the different hydrologic year types would vary widely. As discussed previously, the modeling tool used for this analysis reports information in a monthly time-step; it cannot provide weekly or daily information about flow releases. In reality, the flow reduction would not occur evenly over a month, but instead would be the result of SFPUC reservoir operators delaying the start of spring flow releases from Hetch Hetchy Reservoir by a few days in an effort to gauge and balance reservoir refill with releases of excess snowmelt. After the initial delay of releases from the reservoir under WSIP operations, and once the SFPUC determined that adequate reservoir refill would be achieved by July, the SFPUC would resume releases for the remainder of the spring and early summer, following a similar pattern of frequency and magnitude as under existing conditions.

Many of the resident fish spawn during the spring months, but the delayed rise in flow would not be expected to have a significant effect on rainbow trout and other resident fish during the spring spawning season. The delay in spring flow releases under the WSIP would typically be on the order of days and would be within the natural interannual variation that has occurred in the past. Resident rainbow trout, and other fish species, have evolved and adapted to short-duration variation in environmental conditions. The short-duration delay in increasing stream flows above the minimum flows would be a less than significant impact on habitat conditions and the biological response of resident trout and other fish species. Adverse impacts on fishery habitat quality and availability for resident rainbow trout related to the minor delay in increased flows would be less than significant.

With respect to potential water quality and temperature effects on fisheries (as discussed in Section 5.3.3), the WSIP would have no effect or a less-than-significant effect on temperature and dissolved oxygen in Hetch Hetchy Reservoir and downstream on the Tuolumne River in most months and year types. During some extremely dry periods under both existing conditions and with the WSIP, reductions in storage in Hetch Hetchy Reservoir might result in the release of warmer water from the reservoir at times when the reservoir is stratified (warmer water at the top and colder water below). Analysis of the droughts that occurred in 1923–1935, 1976–1977, and 1986–1993 indicates that this situation could occur in a drought similar to the 1976–1977 drought, but did not occur in the two other extended drought scenarios.

Under conditions similar to those of the 1976–1977 drought, with reduced water in storage during the dry period, water released downstream to the river in September and October could eventually come from the warmer water layer on the surface of the reservoir, which could be 10 to 12 °C warmer than the colder water initially released from the lower level of the reservoir. Release of this warmer water could increase the temperature in the river from about 8 °C to perhaps 14 to 18 °C. This situation would occur in a drought similar to the 1976–1977 drought under existing conditions as well as with the WSIP. However, since reservoir drawdown in Hetch Hetchy Reservoir would be greater with the WSIP than under existing conditions, the adverse water quality effects would be similar to those under the existing condition but would last longer under the WSIP.

This potential temperature effect would result in a less-than-significant impact on the fisheries in this reach of the river for several reasons. First, it would occur very infrequently; review of the historical hydrology indicates that this situation would not occur in all drought periods but only those, such as the 1976–1977 drought, where reservoir drawdown reaches levels low enough in September and October (when the reservoir would be stratified) to result in the release of the warmer surface water. Over the modeled 82-year hydrologic record this condition occurred only once. Although this temperature increase would exceed the 5 °F limit for temperature change specified in the Central Valley RWQCB objectives for coldwater fishery beneficial uses, the resulting temperatures of 14 to 18 °C would not exceed the suitable temperature range for juvenile and adult trout (13 to 21 °C). The rainbow trout fishery would be the most sensitive to the temperature increase. Also, this temperature effect would not occur during the spawning months of the year (a sensitive stage in the fishery life cycle), but rather during the adult and juvenile rearing period. This very infrequent temperature effect would not result in a significant impact on fishery populations.

Potential impacts to resident fish population inhabiting the river are *less than significant*, and no mitigation is required.

Impact 5.3.6-3: Effects on fishery resources in Don Pedro Reservoir.

Don Pedro Reservoir supports a diverse assemblage of resident fish (Table 5.3.6-1), including rainbow, brown, and brook trout, largemouth and smallmouth bass, sunfish, shad, and several species of fish such as Chinook salmon, coho salmon, and kokanee that are reared in hatcheries and planted in the reservoir to support recreational fisheries. Operational modeling (presented in Section 5.3.1) indicates that reservoir storage under the WSIP would be reduced year-round (Figure 5.3.1-11). As a result of increased deliveries under the WSIP, inflows to Don Pedro Reservoir would be reduced, causing a reduction in storage elevations within the reservoir of 1 to 10 feet in most months, and to a larger degree in some months of a severe drought. Don Pedro Reservoir typically undergoes a substantial change in storage volume throughout the year, with a general increasing trend during the fall, winter, and early summer followed by a substantial decline in storage during the late summer and early fall (Figure 5.3.1-11). The typical variation in reservoir conditions within a year is substantially greater than the change expected to occur under WSIP operations. The fish community inhabiting the reservoir typically experiences a wide range of habitat conditions under both existing and proposed future operations. Given the range of natural variation in seasonal storage within the reservoir under existing conditions and the incremental changes predicted to occur under the WSIP, impacts on resident fish habitat within the reservoir under future conditions would be *less than significant*, and no mitigation is required.

Impact 5.3.6-4: Effects on fishery resources along the Tuolumne River below La Grange Dam.

Changes in reservoir operations, coldwater pool availability, and instream flow releases have the potential to affect the quality and availability of habitat for resident and anadromous fish species. Chinook salmon is the species of most concern in this reach of the river. On the Tuolumne River downstream of La Grange Dam, fall-run Chinook salmon use the river for migration, spawning, egg incubation, and juvenile rearing. Steelhead, which is a federally listed threatened species, may inhabit the river in low abundance. These two are the more sensitive fish species in this reach of the river and thus are the focus of this impact analysis; impacts on these species are representative of potential effects on the other species present in this reach. Potential mechanisms for adverse effects on fishery habitat include:

- Reductions in adult salmon attraction and migration flows
- Reductions in stream flows resulting in dewatering of incubating eggs
- Reductions in stream flows resulting in reductions in physical habitat for juvenile rearing
- Reductions in reservoir storage volume and coldwater pool availability resulting in elevated downstream water temperatures
- Reductions in stream flows and/or increases in seasonal water temperatures affecting juvenile emigration

The potential for each of these mechanisms to adversely affect fishery habitat as a result of proposed operations was assessed based on the reservoir storage information and monthly instream flows presented in Section 5.3.1 and the water quality/temperature effects assessment presented in Section 5.3.3.

The potential flow changes on the lower Tuolumne River under the WSIP, as discussed in Section 5.3.1, can be summarized as follows. Under existing conditions, in most below-normal or drier years, almost all of the winter and spring runoff from the watershed upstream of Don Pedro is captured in the reservoir. In years when the reservoir fills, usually wet or above-normal years, excess water is released to the Tuolumne River. In the future with the WSIP, Don Pedro Reservoir would be drawn down farther in most years than it would under the existing condition. Consequently, TID would have to capture a greater proportion of spring runoff to refill the reservoir with the WSIP. As a result, the volume of water released to the Tuolumne River would be reduced compared to the existing condition. The flow reductions that would occur under WSIP operations would primarily take place during the December to June period, when TID fills Don Pedro Reservoir.

The WSIP would have little or no effect on average monthly flow in the lower river in most summer, fall, and winter months in all hydrologic year types. The WSIP would have no effect on average monthly flow in any months of critically dry years or in most summer months of dry, below-normal, and above-normal years (see Table 5.3.1-6). Only the required fishery releases are made in these months under the existing condition, and this would remain the case under the WSIP. The WSIP would result in reductions in average monthly flow in the Tuolumne River below La Grange Dam in the November through June period in non-critically dry years. As shown in Table 5.3.1-6, reductions in flow would occur in some months of all year types except for critically dry years. Looking at monthly flows averaged by year type, the greatest average monthly reduction would be a 25 percent flow reduction in June of an above-normal year. The analysis of the 82-year hydrologic record indicates that reductions of 30 percent or more could occur in some months of 18 years out of 82, or about once in every four springs on average. A maximum flow reduction ranging from 80 to 95 percent was projected to occur once in the 82-year hydrologic simulation.

As discussed previously, the modeling tool used for this analysis reports information on a monthly time-step. As a result, while the model describes the nature and magnitude of monthly flow changes that could occur under the WSIP compared to existing conditions, it does not show the specific daily or weekly changes in reservoir operations made by the operators. The predicted flow changes would not occur uniformly over an entire month. The flow reductions on the lower Tuolumne River under the WSIP would result from Don Pedro Reservoir operators adjusting the timing and duration of reservoir releases by a matter of days as they balance reservoir refill objectives with flood control and fishery release requirements.

Adult fall-run Chinook salmon migrate upstream from September through December. Minimum instream flows in the Tuolumne River were established as part of the FSA to provide suitable habitat conditions for adult Chinook salmon migrating upstream. Minimum instream flows would continue to be maintained under the WSIP. Although flows in the lower river would be reduced in some months, the remaining flows are suitable for adult migration. Flow reductions under the WSIP would have a less-than-significant effect on adult migration.

Chinook salmon spawning and egg incubation typically occurs from approximately mid-October through March. If there were a substantial reduction in flows during egg incubation, the redds could be dewatered, resulting in mortality. During the spawning season, average monthly flows generally show an increasing trend throughout the egg incubation period under both existing conditions and with the WSIP. Although the WSIP would reduce flow relative to existing conditions, the flow reductions would not be expected to result in an increased risk of redd dewatering. Since flows during the egg incubation period are increasing under both existing and future WSIP conditions, it is expected (based on the monthly average flow estimates) that impacts on egg incubation, hatching, and fry emergence would be minor. Instream flows under existing conditions are managed on a daily basis to reduce the risk of redd dewatering. It is assumed they would be managed in the same way with the WSIP. Thus, it flow reductions under the WSIP are not anticipated to have a significant effect on incubating eggs.

Juvenile Chinook salmon rearing occurs in the lower Tuolumne River from January through May. WSIP-induced changes in river flow that are projected to occur during the juvenile Chinook salmon rearing are typically less than 10 percent of the existing baseline flows (Table 5.3.1-6), with some exceptions where a higher-percentage flow reduction could occur. Instream flow studies have been conducted on the lower river to identify the relationship between stream flow and juvenile salmon rearing habitat (USFWS, 1994). The results of these analyses were used to identify minimum instream flow requirements. The minimum instream flows would be maintained under both existing and proposed operations. In some years, the projected flow reductions would not substantially reduce rearing habitat (based on an examination of the predicted changes in stream flow during the juvenile rearing period and the flow/habitat relationships for the river), and the WSIP would have a less-than-significant effect on the salmon fishery. However, in some years, when the flow reductions are more substantial, the WSIP changes would adversely affect juvenile fall-run Chinook salmon rearing habitat.

Fall-run Chinook salmon juvenile out-migration occurs during February and March (fry) and April and May (smolts). The predicted stream flows under existing and proposed operations during the juvenile emigration period show that stream flow reductions are typically less than 10 percent when compared to the existing baseline flows. As noted above, minimum stream flow requirements identified for the river would continue to be met under both existing and proposed operations. Based on the magnitude of the stream flow changes, it is not expected that flow reductions under the WSIP would result in significant adverse impacts on juvenile fall-run Chinook salmon migration.

The largest percentage reductions in Tuolumne River stream flow downstream of La Grange Dam under WSIP operations are expected to occur in June (Table 5.3.1-6). Flow reductions in June would likely result in seasonally elevated water temperatures and a corresponding reduction in the linear extent of suitable habitat for steelhead/rainbow trout rearing. Steelhead/rainbow trout rear within the river system throughout the year. Seasonally elevated water temperatures affect habitat suitability during summer months. Although steelhead are not abundant in the Tuolumne River, these changes in stream flow and water temperature could affect habitat quality and availability for summer rearing. Changes in flow in June of average wet years (-7 percent) would have a minor effect on steelhead/rainbow trout because river flow under both existing and proposed conditions would be in excess of 1,000 cfs. The average monthly flow reduction in June of above-normal hydrologic years (-25 percent) represents a change in flow from 408 cfs under existing conditions to 306 cfs with the WSIP. A reduction in average monthly flow in June of approximately 102 cfs would cause a moderate change in habitat conditions, potentially affecting oversummering steelhead/rainbow trout as well as reducing physical habitat within the river for other aquatic species.

As discussed in Section 5.3.3 regarding water quality and temperature, the proposed program would not result in changes in reservoir storage that would adversely affect the extent of the coldwater pool available for release to the lower river. Based on the results of these analyses, it was concluded that the WSIP would not affect seasonal temperatures in water released to the river from Don Pedro Reservoir. Almost all of the time, WSIP-induced flow reductions in the Tuolumne River below La Grange Dam would have no effect on water temperature. As described in Section 5.3.3, on infrequent occasions, WSIP-induced flow reductions could cause temperature increases in early summer (June) in the Tuolumne River downstream near the confluence with the San Joaquin River. Water released from La Grange Dam in June is considerably cooler than the average daily air temperature. As water flows downstream, its temperature increases. Water temperature modeling projected that mean daily temperature increases of 1 or 2 °C could occur infrequently in the Tuolumne River downstream near the confluence with the San Joaquin River (see Section 5.3.3). On very rare occasions, WSIP-induced flow reductions would cause mean daily temperature increases of 10 °C downstream near the San Joaquin River confluence. This occurred in only one month in the modeled simulation of WSIP operations over the 82-year hydrologic record.

Overall, the flow reductions coupled with the projected infrequent water temperature increases that could result under the WSIP would have an adverse impact on habitat conditions for juvenile salmonids. The flow reductions would reduce available habitat in the entire reach of the river used by juvenile salmonids below La Grange Dam. The elevated temperatures, although infrequent, would truncate the length of the river reach suitable for juvenile salmonids. These adverse effects on flows and temperature in the river under the WSIP would not substantially alter or degrade salmonid habitat in most years or jeopardize the continuation of the salmonid populations in the lower Tuolumne River. However, WSIP effects on flow and temperature would infrequently contribute to potentially significant effects on the fishery resources. The *Habitat Restoration Plan for the Lower Tuolumne River Corridor* (McBain and Trush, 2000) establishes goals for fishery habitat restoration, and the NMFS and others have identified goals for fishery enhancement on the lower river. The WSIP's small but incremental contribution to adverse effects on the lower river would make planned restoration of habitat and fishery resources more difficult. As a result, the impact of the WSIP on these fishery resources in the lower Tuolumne River would be *potentially significant*. Implementation of Measure 5.3.6-4a, Avoidance of Flow Changes By Reducing Demand for Don Pedro Reservoir Water, would reduce this impact to less than significant. This measure involves some uncertainty because its implementation depends on the SFPUC reaching agreement with MID/TID and possibly other water agencies. If this measures proves to be infeasible, the SFPUC will implement Measure 5.3.6-4b, Fishery Habitat Enhancement, to enhance fishery habitat in the lower Tuolumne River. Implementation of Measure 5.3.6-4a or 5.3.6-4b would reduce these adverse impacts to a *less-than-significant* level.

[Additional discussion on Mitigation Measures 5.3.6-4a and 5.3.6-4b was prepared in response to comments on the Draft PEIR. Please refer to Section 14.7, Master Response on Lower Tuolumne River Issues (Vol. 7, Chapter 14).]

Impact 5.3.6-5: Effects on fishery resources along the San Joaquin River.

The lower San Joaquin River provides habitat for a diverse assemblage of fish, including catfish, largemouth bass, striped bass, shad, and many others. The lower river also serves as the migratory corridor for the upstream passage of adult salmon and steelhead and the downstream passage of juveniles. Although water quality (e.g., electrical conductivity, dissolved oxygen, etc.) and other factors affect habitat for these species within the San Joaquin River, seasonal flow and water temperatures have been identified as important environmental parameters affecting the health and survival of migrating salmonids.

For the San Joaquin River and its tributaries, a relationship has been established between spring flow and the subsequent survival and contribution of adults to the salmon population (USFWS, 1994). A reduction in river flow during the spring rearing and juvenile emigration period would result in an incremental contribution to reduced juvenile survival and a small incremental contribution to the cumulative reduction in juvenile survival and subsequent adult population abundance. Increased water temperatures, particularly during the late spring juvenile salmonid migration period (April–May), would also be expected to adversely affect juvenile salmon survival.

Hydrologic modeling has shown that the WSIP would affect habitat conditions within the lower San Joaquin River as a result of changes in Don Pedro Reservoir storage. This potential adverse effect of WSIP operations on fishery habitat within the lower river would be greatest during the summer months (e.g., June, July, etc.) at the end of a prolonged drought, when the reservoir storage volume would be lowest and water temperatures greatest. Inflow to the lower San Joaquin River from the Tuolumne River would not be less than the minimum stream flow specified in the FERC license for the Don Pedro Project. As a result of this minimum flow requirement, the WSIP would not have a significant impact on flows, particularly during drought conditions.

WSIP operations (as discussed above) would reduce inflow to the reservoir and, as a result, increase the seasonal (summer) temperatures in water released from the reservoir, which would also affect water temperature within the lower San Joaquin River. Under low-flow summer conditions, particularly during a drought, water temperatures increase rapidly with distance downstream of a dam and reach thermal equilibrium with ambient air temperatures. As discussed in Measure 5.3.6-4a, the SFPUC would attempt to enter into a water transfer agreement with MID/TID or other water provider that would reduce the potential for adverse impacts on habitat conditions within the Tuolumne River that would also extend downstream to the San Joaquin River. The effectiveness of increased storage in reducing water temperatures is greatest during the spring, but is reduced during the summer as air temperatures increase. As a result, water temperatures in the lower San Joaquin River could increase during the summer months in years following an extended drought, although these conditions are expected to occur infrequently. Increased water temperatures during the summer of an extended drought would not be expected to result in significant adverse impacts on salmon or steelhead migrating downstream within the San Joaquin River, since the migration would occur earlier in the year and ambient water temperatures within the river might already be elevated to a level that is highly stressful or potentially lethal to juvenile salmonids. To the extent that infrequent reductions in flow and corresponding increases in water temperature occur during the spring (April-June) WSIP operations would contribute to adverse impacts on habitat conditions for downstream migrating Chinook salmon and steelhead. However, this potential impact would occur so infrequently that it does not represent a significant impact to fishery resources. Other fish species inhabiting the river, such as largemouth bass and striped bass, are tolerant of elevated water temperatures and would not likely be affected. As a result, the impacts of WSIP operations on habitat conditions for fish within the lower San Joaquin River would be *less than significant,* and no mitigation would be required.

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5.3.7 Terrestrial Biological Resources

The following setting section describes terrestrial biological resources in the Tuolumne River watershed that could be affected by the WSIP. The impact section (Section 5.3.7-2) provides a description of the changes in terrestrial biological resources that would result from WSIP-induced changes in stream flow and reservoir water levels.

5.3.7.1 Setting

Riparian and wetland habitats form an important element in the ecology of most landscapes, whether in the Sierra Nevada or the Central Valley. This analysis deals only with those species and communities that have an essential requirement for stream or meadow conditions and whose range includes the Tuolumne River. Approximately 17 percent of Sierran plant species, 21 percent of vertebrate species, and, by definition, all aquatic invertebrate species in streams are closely associated with or dependent on riparian or wet areas (Sierra Nevada Ecosystem Project, 1996a). While Tuolumne River water does reach the San Joaquin River and the Delta, at that distance it is subject to so many other inputs and impacts, and at such larger scales, that an assessment of the biological impacts due to the WSIP alone would be speculative. As a result, this discussion focuses on the Tuolumne River from Hetch Hetchy Reservoir downstream to the confluence with the San Joaquin River, and the Tuolumne's two major mountain tributaries, Cherry Creek and Eleanor Creek.

In Chapter 4, the term "key special-status species" is used to indicate those species (principally but not exclusively those listed under the California or Federal Endangered Species Acts) that would be subject to a significant impact at the programmatic level. For all proposed WSIP projects analyzed in Chapter 4, separate, project-level CEQA review would be performed. This chapter (Chapter 5) uses a slightly expanded set of groupings. The term "sensitive habitats" has the same definition throughout this PEIR, although in Chapter 5 the term refers mainly to riparian, wetland, and associated upland habitats that could be affected by WSIP-induced changes in reservoir water levels. Because the analysis in Chapter 5 must sometimes address project-level impacts of the WSIP and no further CEQA review would be performed, two additional categories were developed to ensure that no impact category is left unaddressed: "other species of concern," which is the broader suite of species appearing on the CDFG's Special Animals or Special Plants list (CDFG, 2007) or the California Native Plant Society's (CNPS) Lists 1 or 2 (CNPS, 2001). All other biological resources are included in the widest category, "common habitats and species." This latter category evaluates project-level impacts that are great enough in scale to potentially affect species and habitats of widespread distribution (e.g., annual grasslands).

The sections that follow describe the existing conditions for terrestrial riparian resources associated with the Tuolumne River portion of the Hetch Hetchy system. Section 4.6, Biological Resources, Figure 4.6-1 shows the habitat types found along the Tuolumne River within the WSIP program area. Habitat types are broader groupings than natural communities, but are useful when describing both wildlife and vegetation resources together.

Hetch Hetchy Reservoir, the Tuolumne River, and its Tributaries from O'Shaughnessy Dam to Don Pedro Reservoir

O'Shaughnessy Dam is located in a glacial valley dominated by walls of smooth, mostly unvegetated granite. Essentially no marsh or meadow habitat has formed around the perimeter of Hetch Hetchy Reservoir because of the steep granite slopes and annual fluctuations in reservoir water levels. The vegetation around the reservoir is generally mapped as foothill woodland and lower montane coniferous forest (NPS, 2007).

The Tuolumne River below O'Shaughnessy Dam flows through the transition from a glacially carved, U-shaped valley to a river-incised, V-shaped canyon. The stairstep morphology typical of formerly glaciated streams is evident for several miles below the reservoir; there are long reaches of low relief, sometimes with extensive gravel bars, punctuated by short, steeper sections with boulders and exposed bedrock channel. The Tuolumne River below O'Shaughnessy Dam represents the lowest-elevation evidence of glaciation found anywhere in the western Sierra (NPS, 2006). The stairstep morphology combined with exceptional water quality, a seasonal flood regime, and a largely undisturbed river corridor sustains systems that are remarkable in their size and diversity (NPS, 2006). Upslope from the narrow riparian zone, the Tuolumne River canyon has a largely unvegetated section of bare granite rock scoured during high flows following rain-on-snow precipitation events. The most recent of these events took place in 1982 and January 1997. The Tuolumne River below O'Shaughnessy Dam contains extensive sections of bedrock channel confined in a narrow canyon, with a riparian zone consisting of interrupted bands of white alder (*Alnus rhombifolia*) and dusky willow (*Salix melanopsis*) with very limited understory. The riparian strip is wider and contains more extensive stands along gravel bars found on the larger river bends. Alternating with the low-diversity bedrock channel portions of the river are areas of higher species diversity on alluvial fans and terraces where tributary streams with a natural hydrograph[1] empty into the river (McBain and Trush, 2007).

The Poopenaut Valley, about two miles below the dam, represents a low-elevation limit of glaciation. The substrate in the Poopenaut Valley is primarily decomposed granite with a high proportion of sand and gravel particles. The Poopenaut Valley supports stands of tule bulrush, wet and dry meadow, willow and woodland habitats, hanging ponds, and seasonal pools (NPS, 2006). The National Park Services considers the low-elevation meadow and wetland complex of the Poopenaut Valley to be an "outstandingly remarkable value" of the Tuolumne Wild and Scenic River (NPS, 2006). The presence of hanging ponds suggests that less-pervious, possibly fine-textured layers may be present in the valley alluvium.

Lake Lloyd is situated in a steep-sided valley and has little meadow development around its perimeter. Lake Eleanor is similarly situated, but contains some gradual slopes around the periphery that support seasonal wetland vegetation. These reservoirs are also bordered by foothill woodland and lower montane coniferous forest. Lake Lloyd and Lake Eleanor are similar in that their annual fluctuations expose a broad, essentially unvegetated strip below the maximum reservoir elevation.

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1 The pattern of flow in a stream over time.

Cherry Creek is a steep, rapidly flowing tributary to the Tuolumne River. Cherry Creek has experienced riparian encroachment because of diversions at Lake Lloyd. Montane black cottonwood (*Populus trichocarpa*) forest with frequent Jeffrey pines (*Pinus jeffreyi*) now occupies most of the former stream channel. Eleanor Creek is a major tributary of Cherry Creek. It supports a narrow band of riparian habitat typical of mid- to high-elevation streams, with minimal riparian vegetation encroachment into the channel (McBain and Trush, 2007).

The Tuolumne River above Don Pedro Reservoir supports a diverse assemblage of Great Valley mixed riparian forest and scrub with species similar to those found in the riparian systems of the valley floor, although the habitat in this area is confined to rather narrow canyons.

Don Pedro Reservoir and Tuolumne River below La Grange Dam

Don Pedro Reservoir is situated in the lower Sierra Nevada foothills at an elevation of 900 to 1,000 feet. The surrounding area consists of foothill woodland typically dominated by gray pine (*Pinus sabiniana*) and blue oak (*Quercus douglasii*) with a grass understory. Due to the sloping terrain and large seasonal drawdown, very little wetland habitat is present on the margins of this reservoir.

This discussion of the current setting for the lower Tuolumne River draws heavily from the *Habitat Restoration Plan for the Lower Tuolumne River Corridor* (McBain and Trush, 2000). The restoration plan was developed after the 1995 FERC Settlement Agreement (FSA) to help the parties select and design restoration projects (see Chapter 2 for a description of the original FERC license for the New Don Pedro Project and the subsequent settlement agreement related to instream flows in the lower river).

The lower Tuolumne River extends for 52 river miles, from La Grange Dam to the confluence with the San Joaquin River. Its floodplain terraces extend up to several miles in width. Backwater channels and old oxbows are evidence of channel-forming processes that characterized historical, unimpaired flows. Prior to flow and sediment regulation, the stream flows of the Tuolumne River downstream of La Grange Dam within a given year and between years varied from 100 cfs in summer months to peak winter floods exceeding 100,000 cfs; these flows created variable and complex local channel morphologies and regularly occupied the full width of the floodplain.

Today, about 67 percent of the lower Tuolumne River water is diverted. Low flows are maintained at regulated levels, but the high flows have been greatly diminished and are dictated by flood control requirements. The lower Tuolumne River has experienced substantial encroachment from agriculture, grazing, and gravel mining

The previous alteration of physical and ecological characteristics of the lower Tuolumne River has changed the ability of the floodplain to support and sustain riparian habitat and ecological processes. The lower Tuolumne River is currently unable to mobilize its bed particles as a result of reduced flow magnitudes, among other factors. In most alluvial rivers with unimpaired flow regimes, floods with recurrence intervals of 1.5 to 2.5 years typically inundate floodplains. In the lower Tuolumne, the 1.5-year recurrence flood at the La Grange gaging station (RM 51.6) decreased from 8,600 cfs to 3,000 cfs following construction of Don Pedro Reservoir, with a consequent reduction in the frequency and amplitude of bed mobilization. McBain and Trush (2000) noted that the reduction in flows has prevented the formation of any distinct post-FSA floodplains.

Historically, willow scrub occupied the actively accumulating gravel beds and sandbars of river meanders. Broad riparian forests dominated by Fremont cottonwood (*Populus fremontii*) occupied the lower floodplain terraces. Backwater channels and oxbows (river meanders cut off from the main channel) supported a variety of seasonal and perennial wetlands dominated by shrubs, grasses, grasslike plants, and forbs. Valley oak (*Quercus lobata*) woodlands occupied the upper floodplain terraces (Conard et al., 1977).

The total historical acreage of riparian vegetation in the Tuolumne River corridor between La Grange Dam and the San Joaquin River has diminished from approximately 13,000 or more acres to less than 2,200 acres. Fremont cottonwood is commonly observed within the lower Tuolumne River corridor, but nearly all stands and individuals are old and dying, with little or no natural regeneration. Valley oaks are also found throughout the Tuolumne River corridor. Because valley oaks are not as dependent on fluvial processes for regeneration, their regeneration in the river corridor is more successful. McBain and Trush observed that where the floodplain has not experienced land use encroachment, relict riparian vegetation fragments of a much larger ecosystem are detectable.

McBain and Trush attributed the change of dominant tree species at the channel margins to the decrease in channel slope and transition from gravel-bedded to sand-bedded substrate. They concluded that, on the lower Tuolumne River, riparian regeneration (particularly Goodding's black willow (*Salix gooddingii*) and Fremont cottonwood) depends on a migrating channel that creates floodplain surfaces, flood inundation every 1.5 to 5 years, and gently receding flows following the spring snowmelt. The elimination of post-FSA floods exceeding 10,000 cfs has allowed narrow-leaf willow (*Salix exigua*), box elder (*Acer negundo* var. *californicum*), and white alder to establish and caused drier conditions on the former floodplains. As a result, the Fremont cottonwood and valley oak are beginning to die of old age.

Natural Communities, including Sensitive Natural Communities

Considering its length and elevational range, the Tuolumne River in the WSIP program area supports relatively few riparian natural communities. The California Natural Diversity Database (CNDDB) (CDFG, 2006a) lists all but the montane meadow community as sensitive. However, as indicated above, the National Park Service considers the low-elevation montane meadow in the Poopenaut Valley to be an outstandingly remarkable value of the Tuolumne Wild and Scenic River area (NPS, 2006). The natural communities along the Tuolumne River are briefly described below.

- **White alder riparian forest** is a streamside deciduous riparian forest strongly dominated by white alder with a shrubby, deciduous understory. A common associated tree species in the upper Tuolumne area is dusky willow. This natural community is associated with rapidly flowing, well-aerated perennial streams with coarse streambed sediments. White alder riparian forest is found extensively along most of the Tuolumne River below O'Shaughnessy Dam.

- **Montane meadow** is a dense herbaceous natural community dominated by sedges (*Carex* spp.) along with rushes (*Juncus* spp.), perennial grasses, and herbs. It is found on fine-textured, more or less permanently moist or wet soils. Unlike most natural communities identified by Holland (1986), montane meadow actually consists of many vegetation series dominated by a number of grass-like species associated with a wide range of elevations, soils, and hydrologic conditions. The Poopenaut Valley is considered to be an exceptional example of a low-elevation montane meadow.

- **Montane black cottonwood riparian forest** is a dense riparian forest dominated by black cottonwood with emergent Jeffrey pine. Shrub cover is fairly high, and herb cover is typically very high. Montane black cottonwood forest is found on high-flow streams below about 7,000 feet in the mid-Sierra Nevada. Small remnants of this natural community are found in the Poopenaut Valley. It is also found along Cherry Creek, where water diversions have resulted in substantial encroachment by Jeffrey pine.

- **Great Valley mixed riparian forest** is a tall, winter-deciduous, broadleaved riparian forest. Natural examples of this community include box elder, California black walnut (*Juglans hindsii* var. *californica*), California sycamore (*Platanus racemosa*), and several willow species (*Salix* spp.). The understory is a dense tangle of shade-tolerant shrubs, and California grape (*Vitis californica*) is also found in well-developed forests. Great Valley mixed riparian forest is found all along the lower Tuolumne River as well as the lower elevations of the river above Don Pedro Reservoir.

- **Great Valley cottonwood riparian forest** is similar to the preceding natural community. It is strongly dominated by Fremont cottonwood with some Goodding willow. This community is typically found on the largest streams in the Central Valley that provide ample subsurface irrigation even when the channel is dry. Great Valley cottonwood riparian forest is typically inundated yearly during spring, and cottonwood regeneration is dependent on freshly deposited, fine-textured alluvium and on the gradual ebbing of spring flows as the tiny cottonwood seedlings develop their root systems. Remnants of this community are still found along the lower Tuolumne River, although natural recruitment (i.e., growth of new vegetation) has essentially ceased.

- **Great Valley valley oak riparian forest** is a medium to tall, broadleaved, winter-deciduous, closed-canopy riparian forest dominated by valley oak. This community is found on the higher river terraces that receive periodic flooding and annual inputs of sediment. This community has become rare primarily through encroachment by agriculture, mining, and other human uses, although the cessation of flooding and sediment deposition has limited natural reproduction of the dominant species.

[Additional discussion on streamside meadows in the upper Tuolumne River watershed was prepared in response to comments on the Draft PEIR. Please refer to Section 14.6, Master Response on Upper Tuolumne River Issues (Vol. 7, Chapter 14).]

Key Special-Status Species and Other Species of Concern

Tables 5.3.7-1 and **5.3.7-2** present key special-status plant and animal species and other species of concern along the Tuolumne River that could be affected by the WSIP. Although the watershed as a whole supports a larger assemblage of species, the key special-status species and other species of concern considered here are limited to those that depend on riparian and river-associated habitats. Riparian, wet meadow, seep, or marsh plants were included if they appeared on CNDDB records for the 21 U.S. Geological Survey 7.5-minute quadrangles that encompass

TABLE 5.3.7-1
POTENTIAL FOR OCCURRENCE OF KEY SPECIAL-STATUS PLANTS AND PLANT SPECIES OF CONCERN IN THE WSIP TUOLUMNE WATERSHED PROGRAM AREA[a]

			WSIP Program Area	
Common Name *Scientific Name*	**CNPS Status[b]**	**Habitat**	Upper Tuolumne River	Lower Tuolumne River
Shore sedge *Carex limosa*	List 2	Bogs, fens, marshes, swamps, seeps, upper and lower montane coniferous forest	Potential	
Mariposa clarkia *Clarkia biloba ssp. australis*	List 1B	Chaparral and cismontane woodland, riparian ecotone	Potential	
Delta button-celery *Eryngium racemosum*	List 1B	Riparian scrub		Potential
Knotted rush *Juncus nodosus*	List 2	Meadows and seeps, marshes and swamps; lake margins and mesic sites	Potential	
Pansy monkeyflower *Mimulus pulchellus*	List 1B	Open sandy benches, wet meadows	Known, Poopenaut Valley	
Slender-stemmed monkeyflower *Mimulus filicaulis*	List 1B	Moist meadows, seeps in lower montane coniferous forest	Potential	
White beaked-rush *Rhynchospora alba*	List 2	Bogs, fens, marshes, swamps	Potential	
Brownish beaked rush *Rhynchospora capitellata*	List 2	Meadows, seeps, marsh, swamps, upper and lower montane coniferous forest	Potential	

[a] In this document, CNPS-listed species with no federal or state listing status are considered plant species of concern; no key special-status plants are known to occur in the Tuolumne project area.
[b] California Native Plant Society species codes are as follows:
List 1B: Rare and endangered.
List 2: Rare but not endangered.

SOURCES: CDFG, 2006b; CNPS, 2001.

the Tuolumne River from O'Shaughnessy Dam to the confluence with the San Joaquin River, Lake Lloyd, Cherry Creek, Lake Eleanor, and Eleanor Creek (CDFG, 2006b). The list of animals was compiled from the 2005 California Gap Analysis Project[2] species dependent on valley foothill riparian, montane riparian, and fresh emergent wetland habitat types. The list was then compared with CNDDB records for the 21 quadrangles encompassing the WSIP program area, and additional locality data were obtained by reviewing 2007 species occurrence records from the University of California Museum of Vertebrate Zoology. Figure 4.6-2 in Chapter 4 show the distribution of federally designated critical habitats for species listed under the Federal Endangered Species Act within the WSIP program area.

2 The Gap Analysis Project provides regional assessments of the conservation status of native vertebrate species and natural land cover types and facilitates the application of this information to land management activities. The Gap Analysis Project is conducted as state-level projects and is coordinated by the U.S. Geological Survey Biological Resources Division.

TABLE 5.3.7-2
POTENTIAL FOR OCCURRENCE OF KEY SPECIAL-STATUS ANIMALS AND ANIMAL SPECIES OF CONCERN IN THE WSIP TUOLUMNE WATERSHED PROGRAM AREA

			WSIP Program Area	
Common Name *Scientific Name*	**USFWS/ CDFG Status[a]**	**Habitat**	**Tuolumne River watershed from O'Shaughnessy Dam to Don Pedro Reservoir**	**Tuolumne River from Don Pedro Reservoir to San Joaquin River**
Reptiles and Amphibians				
California tiger salamander *Ambystoma californiense*	FT/CSC*	Seasonal freshwater ponds with little or no emergent vegetation		Potential
Western spadefoot *Spea hammondii*	–/CSC	Seasonal ponds such as vernal pools surrounded by grassland		Potential
California red-legged frog *Rana aurora draytonii*	FT/CSC*	Slow-moving streams and ponds	Potential	Potential
Foothill yellow-legged frog *Rana boylii*	–/CSC*	Shallow, moving water with sunny banks	Potential	
Mountain yellow-legged frog *Rana muscosa*	–/CSC	Fast-moving mountain streams	Potential	
Western pond turtle *Clemmys marmorata*	–/CSC	Permanent water such as streams or ponds	Present	Present
Birds				
Double-crested cormorant *Phalacrocorax auritus* (rookery site)	–/CSC	Colonial nester on coastal cliffs and along lake margins; forages in open water		Potential
White-faced ibis *Plegadis chihi* (rookery site)	–/CSC	Forages in shallow water; winters in Central Valley		Potential
Cooper's hawk *Accipiter cooperi*	–/CSC	Nests in deciduous riparian vegetation and oaks	Potential	Potential
Northern goshawk *Accipiter gentilis*	–/CSC	Nests and forages in dense conifer and mixed forest	Potential	
Sharp-shinned hawk *Accipiter striatus*	–/CSC	Nests in deciduous riparian vegetation and oaks	Potential	Potential
Golden eagle *Aquila chrysaetos*	FP/CSC	Nests on cliffs and in large trees; forages from the air on large prey	Potential	
Ferruginous hawk *Buteo regalis* (wintering)	–/CSC	Roosts in large trees and forages over open ground; winters in Central Valley		Potential
Swainson's hawk *Buteo swainsoni* (nesting)	–/CT*	Nests in large trees; forages over open ground		Present
Great gray owl *Strix nebulosa*	–/CSC	Nests in dense forest; forages in meadows and openings	Potential	
Northern harrier *Circus cyaneus*	–/CSC	Nests and forages in wet meadows		Potential
White-tailed kite *Elanus leucurus* (nesting)	FP/CSC	Nests in large trees; forages for small animals over open country		Potential
Bald eagle *Haliaeetus leucocephalus* (nesting and wintering)	FPD/CE*	Nests on cliffs or in large trees, usually near rivers and lakes; forages on fish when available, also carrion and small mammals	Present	Potential
Osprey *Pandion haliaetus* (nesting)	–/CSC	Nests atop large trees or snags near water; diet almost entirely fish	Potential	Potential

TABLE 5.3.7-2 (Continued)
POTENTIAL FOR OCCURRENCE OF KEY SPECIAL-STATUS ANIMALS AND ANIMAL SPECIES OF CONCERN IN THE WSIP TUOLUMNE WATERSHED PROGRAM AREA

			WSIP Program Area	
Common Name *Scientific Name*	**USFWS/ CDFG Status[a]**	**Habitat**	**Tuolumne River watershed from O'Shaughnessy Dam to Don Pedro Reservoir**	**Tuolumne River from Don Pedro Reservoir to San Joaquin River**
Birds (cont.)				
Merlin *Falco columbarius*	–/CSC	Winter visitor in foothills, valleys		Potential
Prairie falcon *Falco mexicanus* (nesting)	–/CSC	Usually nests on cliffs; forages in open country for small birds and mammals		Potential
American peregrine falcon *Falco peregrinus anatum*	FD/CE*	Nests in cliffs and outcrops; forages near wetlands and other water	Potential	Potential
California black rail *Laterallus jamaicensis coturniculus*	FP/CT*	Mainly nests in saltmarsh but may also occur in freshwater and brackish marshes at low elevations		Potential
Greater sandhill crane *Grus canadensis tabida* (nesting and wintering)	FP/CT*	Winters in Central Valley; roosts in shallow water; forages in fields and marshes		Potential
Long-billed curlew *Numenius americanus* (nesting)	–/CSC	Winters in Central Valley, foraging in grasslands and marshes		Potential
Short-eared owl *Asio flammeus* (nesting)	–/CSC	Nests and forages in open or marshy ground	Potential	Potential
Long-eared owl *Asio otus* (nesting)	–/CSC	Roosts and nests in dense trees; forages in open country for small vertebrates		Potential
Burrowing owl *Athene cunicularia*	--/CSC*	Grasslands and open areas; nests in burrows created by digging mammals, sometimes on streambanks		Potential
California spotted owl *Strix occidentalis occidentalis*	–/CSC	Nests in dense forest; forages at night for small mammals	Potential	
Vaux's swift *Chaetura vauxi*	–/CSC	Nests in hollow trees; forages over open water, woodlands	Potential	Potential
Black swift *Cypseloides niger* (nesting)	–/CSC	Nests on sheltered cliffs, often near streams; feeds on flying insects	Present	Potential
Willow flycatcher Empidonax traillii (nesting)	–/CE*	Nests in deciduous shrubs or trees, often willows; forages on insects	Potential	
Loggerhead shrike *Lanius ludovicianus* (nesting)	–/CSC	Open country for hunting; nests in riparian woodland and open woodlands		Potential
Purple martin *Progne subis*	–/CSC	Nests in tree cavities, forages on flying insects	Potential	
Bank swallow *Riparia riparia*	–/CT*	Colonial nester in riparian cliffs; forages on flying insects		Low Potential
Yellow warbler *Dendroica petechia brewsteri*	–/CSC	Nests in low trees and shrubs in riparian zone; forages on various insects	Potential	Potential
Yellow-breasted chat *Icteria virens* (nesting)	–/CSC	Nests low in very dense riparian scrub; forages on insects and fruit	Potential	Potential
Tricolored blackbird *Agelaius tricolor* (nesting)	–/CSC	Colonial nester in emergent vegetation; forages over open water		Potential

TABLE 5.3.7-2 (Continued)
POTENTIAL FOR OCCURRENCE OF KEY SPECIAL-STATUS ANIMALS AND ANIMAL SPECIES OF CONCERN IN THE WSIP TUOLUMNE WATERSHED PROGRAM AREA

			WSIP Program Area	
Common Name *Scientific Name*	**USFWS/ CDFG Status[a]**	**Habitat**	**Tuolumne River watershed from O'Shaughnessy Dam to Don Pedro Reservoir**	**Tuolumne River from Don Pedro Reservoir to San Joaquin River**
Mammals				
Pallid bat *Antrozous pallidus*	–/CSC	Roosts in trees; forages over grassland	Potential	Potential
Pacific western big-eared bat *Corynorhinus (=Plecotus) townsendii*	–/CSC	Roosts in caves and buildings; forages in open country	Potential	Potential
Spotted bat *Euderma maculatum*	–/CSC	Requires rocky cliffs for breeding and roosting, forages primarily on moths	Potential	
Small-footed myotis *Myotis ciliolabrum*	–/CSC	Roosts in caves and trees; forages in open country		Potential
Long-eared myotis *Myotus evotis*	–/CSC	Roosts in hollow trees and buildings; forages at streams and ponds	Potential	Potential
Fringed myotis *Myotis thysanodes*	–/CSC	Roosts in hollow trees and buildings; forages at forest edge	Potential	Potential
Long-legged myotis *Myotis volans*	–/CSC	Roosts in caves, old buildings, and under bark	Potential	Potential
Yuma myotis *Myotis yumanensis*	–/CSC	Roosts in riparian vegetation; forages over open water	Potential	Potential
Western mastiff bat *Eumops perotis*	–/CSC	Roosts on cliff faces and cracks in boulders; forages on moths, crickets, and beetles	Potential	
Sierra Nevada snowshoe hare *Lepus americanus tahoensis*	–/CSC	Inhabits creekside willow thickets	Low potential	
Sierra Nevada mountain beaver *Aplodontia rufa californica*	–/CSC	Inhabits creekside thickets; forages on forbs, twigs, and fruits	Low potential	
Sierra Nevada red fox *Vulpes vulpes necator*	–/CT*	High-elevation forest and scrub dweller; forages for rodents, birds, berries, and insects	Low potential	
Pacific fisher *Martes pennanti* (*pacifica*)	FC/CSC	Inhabits mid-elevation forests; forages mostly on small mammals	Potential	
American marten *Martes americanus*	–/CSC	Inhabits dense forests; forages on small mammals	Potential	
American badger *Taxidea taxus*	–/CSC	Lives in open country; forages on burrowing animals, roots, and berries	Potential	Potential

[a] Federal (USFWS) and state (CDFG) protection status codes are as follows:
FC: Federal candidate for listing
FE: Federal endangered
FT: Federal threatened
FD: Federal delisted
FPD: Federal proposed for delisting
CE: California endangered
CT: California threatened
CSC: California species of special concern
CP: California fully protected

* Indicates key special-status species, defined here to mean federal- or state-listed as endangered or threatened. All other species listed here are defined as species of concern.

SOURCES: CDFG, 2006a, 2006b.

Plants

High-elevation plants. No key special-status plants are known to occur in habitats associated with the Tuolumne River or its tributaries in the WSIP program area. Several plant species of concern occur in montane meadows and seeps, including the pansy monkeyflower (*Mimulus pulchellus*, a CNPS List 1B plant). This species grows at the margins of wet meadows and open sandy benches. Several populations of pansy monkeyflower have been reported in the Poopenaut Valley at the edges of the meadow vegetation (CDFG, 2006a). Several other species are known to be present in wet meadows, bogs, seeps, and moist meadows. They have not been reported from this portion of the Tuolumne River watershed, but suitable habitat could be present at the Poopenaut Valley. They include slender-stemmed monkeyflower (*Mimulus filicaulis*, CNPS List 1B), shore sedge (*Carex limosa*, CNPS List 2), knotted rush (*Juncus nodosus*, CNPS List 2), white beaked-rush (*Rhynchospora alba*, CNPS List 2), and brownish beaked rush (*Rhynchospora capitellata,* CNPS List 2) (CDFG, 2006a).

Mariposa clarkia (*Clarkia biloba ssp. australis,* CNPS List 1B) grows in chaparral and cismontane woodland, sometimes on the edge of riparian habitats, in the lower Sierra Nevada at elevations below 3,000 feet.

Don Pedro Reservoir and La Grange Dam to the San Joaquin River. Delta button-celery (*Eryngium racemosum*, CNPS List 1B) grows in riparian scrub in the lower elevations of the Central Valley. Suitable habitat is present in the lowest portions of the Tuolumne River near the confluence with the San Joaquin River, although the nearest known records are from the floodplains of the San Joaquin River several miles to the north and south of the confluence with the Tuolumne River.

Reptiles and Amphibians

Hetch Hetchy Reservoir to Don Pedro Reservoir. California red-legged frog (*Rana aurora draytonii,* federal threatened, California species of special concern) is known to occur in lowlands and foothills in or near permanent sources of water with dense, shrubby, or emergent vegetation. This species has been reported from Woods Creek, a tributary to Don Pedro Reservoir in Tuolumne County, and it may once have ranged into the vicinity of the Tuolumne River (CDFG, 2006b). Foothill yellow-legged frog (*Rana boylii,* California species of special concern) is found in small permanent streams above about 660 feet in the mid-Sierra (Jennings and Hayes, 1994). Suitable habitat could be present along the Tuolumne River and its tributaries. Western pond turtle (*Clemmys marmorata,* California species of special concern) is a thoroughly aquatic turtle that inhabits permanent ponds, rivers, and even ditches. The CNDDB (CDFG, 2006b) has a record of this species at O'Shaughnessy Dam.

Mountain yellow-legged frog (*Rana muscosa*, California species of special concern) is associated with sunny, high-elevation streams that often have vegetation and sloping banks. There are no CNDDB records from the Tuolumne River watershed below O'Shaughnessy Dam. Habitat in the Poopenaut Valley and along Cherry Creek and Eleanor Creek could be suitable for this species. Although these areas are lower than the currently documented known elevation limit for this species, museum records indicate that this species historically had a lower elevational range (Jennings and Hayes, 1994). The nearest known localities for mountain yellow-legged frog are Crane Flat, Tamarack Flat, and Lake Vernon in Yosemite National Park (Museum of Vertebrate Zoology, 2007).

Don Pedro Reservoir and La Grange Dam to the San Joaquin River. California tiger salamander (*Ambystoma californiense*, federal threatened, California species of special concern) inhabits long-standing or permanent ponds and uplands that contain burrows during the dry season. It is limited to the valley floor and nearby terraces, and a number of historical records document its presence on the valley floor and floodplain of the Tuolumne River in eastern Stanislaus County. California red-legged frog could occur in suitable habitat throughout this portion of the WSIP program area, although it is more likely to be present on the terraces and foothills rather than the valley floor. Western pond turtle could occur anywhere along the Tuolumne River and at Don Pedro Reservoir; there are several recent records from several locations in the WSIP program area. Western spadefoot toad (*Spea hammondii*, California species of special concern) is typically found in association with vernal pools, but may have occurred in seasonal wetlands on floodplains as well. It is known primarily from the valley floor within the program area.

Birds

Entire Tuolumne River WSIP program area. Cooper's hawk (*Accipiter cooperi*, California species of special concern) inhabits open woodland and riparian forest, where it preys on songbirds and small mammals. Sharp-shinned hawk (*Accipiter striatus*, California species of special concern) is found in more dense forest than is Cooper's hawk, where it feeds primarily on small birds. Golden eagle (*Aquila chrysaetos*, California species of special concern) nests on cliffs and in large trees. It is likely to forage over large areas of the program area, except for the valley floor. Bald eagle (*Haliaeetus leucocephalus*, federal delisted, California endangered) nests on cliffs and in large trees, and forages on and near lakes. Suitable habitat is present at Don Pedro Reservoir, and one pair recently nested at Lake Lloyd.

Northern harrier (*Circus cyaneus*, California species of special concern) nests and forages in wet meadows over a wide elevational range that apparently includes all of the program area. Short-eared owl (*Asio flammeus*, California species of special concern) nests and forages in open or marshy ground. It apparently is resident in the higher Sierra Nevada and winters at low elevations in the Central Valley. Long-eared owl (*Asio otus*, California species of special concern) nests in dense trees and forages in open country. Its distributional range includes all of California. Yellow warbler (*Dendroica petechia brewsteri*, California species of special concern) nests in dense riparian vegetation and is found in suitable habitat throughout California. Prairie falcon (*Falco mexicanus*, California species of special concern) usually nests on cliffs and forages in open country, but could also nest in tall riparian trees. American peregrine falcon (*Falco peregrinus anatum*, federal delisted, California endangered) nests on cliffs and outcrops and forages in open country, often near meadows or marshes where small birds are abundant. There are no CNDDB records of species occurrence in the program area, but suitable habitat may be present.

Hetch Hetchy Reservoir to Don Pedro Reservoir. Northern goshawk (*Accipiter gentilis,* California species of special concern) is found in dense forest, where it forages on flying squirrels, birds, ducks, and even hares. Its elevational range may be higher than the WSIP program area, as there are no CNDDB records of species occurrence in the program area. California spotted owl (*Strix occidentalis occidentalis*, California species of special concern) inhabits thickly wooded forests, including riparian forests where it forages on small mammals such as squirrels. Great gray owl (*Strix nebulosa*, California endangered) nests in dense forest and forages in forest openings or meadows. There are several recent records indicating its occurrence in Yosemite National Park down to Pine Mountain Lake. Suitable habitat may be present within the program area. Vaux's swift (C*haetura vauxi*, California species of special concern) nests in hollow trees and forages near water. Although there are no CNDDB records of species occurrence near the program area, habitat appears suitable along much of the mountainous portion of the Tuolumne River. Black swift (*Cypseloides niger,* California species of special concern) nests on cliffs near water and forages for insects. It is reported to occur along the Tuolumne River between Tuolumne Meadows and Hetch Hetchy Reservoir (NPS, 2006). Willow flycatcher (*Empidonax trailii*, California endangered) nests and forages in dense riparian thickets and meadows in mountainous areas. Purple martin (*Progne subis*, California species of special concern) is found in mountain forests, especially near water. Suitable habitat is present in this portion of the Tuolumne River.

Don Pedro Reservoir and from La Grange Dam to the San Joaquin River. Double-crested cormorant (*Phalacrocorax auritus*, California species of special concern) nests in rookeries on cliffs and along lake margins, and forages for fish. Its wintering range includes the Central Valley. White-faced ibis (*Plegadis chihi,* California species of special concern) and greater sandhill crane (*Grus canadensis tabida,* California threatened) winters in the Central Valley, foraging in shallow water along the floodplains of the major rivers. White-tailed kite (*Elanus leucuru*s, California species of special concern) nests in trees and forages over open country. It is found mainly in the lower elevations of the program area. California black rail (*Laterallus jamaicensis coturniculus*, California threatened) is a marsh-dwelling species known primarily to occur in salt marsh, but is occasionally found inland in low-elevation marshes. Long-billed curlew (*Numenius americanus*, California species of special concern) winters in the Central Valley and forages in grassland and marshes, including floodplains. Burrowing owl (*Athene cunicularia,* California species of concern) nests in burrows that are created by digging mammals. Sometimes these burrows are located on streambanks, edges of canals, or other areas near riparian habitats. Burrowing owls are found in low-elevation areas such as the Central Valley.

Yellow-breasted chat (*Icteria virens*, California species of special concern) nests low in dense riparian vegetation, breeding in low elevations in California. Tricolored blackbird (*Agelaius tricolor,* California species of special concern) nests and forages near marshes with emergent vegetation. It is found on the valley floor, and the CNDDB has several records of breeding colonies in or near the program area. Ferruginous hawk (*Buteo regalis*, California species of special concern) winters in the Central Valley. Swainson's hawk (*Buteo swainsoni*, California threatened) nests in tall trees and forages in grassland and farmland, primarily in the Central Valley. Some known locations for this species are along the Tuolumne River. Osprey (*Pandion* *haliaetus*, California species of special concern) nests in flat-topped trees and snags near water and feeds on fish (primarily in lakes). There are no known records of this species along the Tuolumne River, although it may have once occurred there. Merlin (*Falco columbarius,* California species of special concern) is a winter visitor to the Central Valley.

Loggerhead shrike (*Lanius ludovicianus,* California species of special concern) nests in riparian woodland and forages over open grasslands, meadows, and marshes. It is resident in the Central Valley and would be expected to occur near the Tuolumne River. Bank swallow (*Riparia riparia,* California threatened) nests in banks along large rivers and forages over open water. Although this species may have once been present along the Tuolumne River, there are no current records for this species within the program area.

Mammals

Entire Tuolumne River WSIP program area. American badger (*Taxidea taxus,* California species of special concern) may be found in riparian habitats and open country throughout the program area. Several species of bats (all California species of special concern) could occur within the program area, generally roosting in riparian trees. Pallid bat (*Antrozous pallidus*) and Pacific western big-eared bat (*Corynorhinus* (*=Plecotus*) *townsendii*) roost in trees and forage over open grasslands.

Hetch Hetchy Reservoir to Don Pedro Reservoir. Sierra Nevada snowshoe hare (*Lepus americanus tahoensis*, California species of special concern), Sierra Nevada mountain beaver (*Aplodontia rufa californica*, California species of special concern), and Sierra Nevada red fox (*Vulpes vulpes necator,* California species of special concern) inhabit riparian and forest habitats higher in elevation than the program area. American marten (*Martes americanus*, California species of special concern) and Pacific fisher (*Martes pennanti pacifica,* California species of special concern) live and forage in dense forest at mid- to high elevations in the Sierra Nevada.

Spotted bat (*Euderma maculatum*, California species of special concern) and western mastiff bat (*Eumops perotis*, California species of special concern) primarily nest on cliffs and forage in openings, sometimes near water. These species are reported to occur near the Tuolumne River between Tuolumne Meadows and Hetch Hetchy Reservoir (NPS, 2006) and may also be present along the Tuolumne River below O'Shaughnessy Dam.

Don Pedro Reservoir and from La Grange Dam to the San Joaquin River. All of the bat species except spotted bat and western mastiff bat could occur in this portion of the Tuolumne River. In addition, American badger is likely to occur throughout this portion of the Tuolumne River.

5.3.7.2 Impacts

Significance Criteria

The CCSF has not formally adopted significance standards for impacts related to terrestrial biological resources, but generally considers that implementation of the proposed program would have a significant biological impact if it were to:

- Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the CDFG or USFWS
- Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the CDFG or USFWS
- Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including but not limited to marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means
- Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites
- Have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, or substantially reduce the number or restrict the range of an endangered, rare or threatened species
- Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance
- Conflict with the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or state habitat conservation plan, including the *Tuolumne Wild and Scenic River Management Plan* (USFS, 1986)

Approach to Analysis

The assessment of WSIP impacts on terrestrial biological resources is based primarily on the extent to which altered water system operations would change the existing habitat near reservoirs and creeks. This section reviews changes in hydrology (discussed in Section 5.3.1) and analyzes the related effects on riparian and wetland habitats, key special-status species, other species of concern, and common habitats and species. The discussion of riparian and wetland habitats addresses the second and third significance criteria listed above. “Key special-status species” include species that are formally listed as endangered or threatened under the California or Federal Endangered Species Acts, as well as a few other species (such as foothill yellow-legged frog and burrowing owl) that are afforded some degree of legal protection and have a high risk of local population decline or extirpation. The key special-status species discussion addresses the first significance criterion. “Other species of concern” and “common habitats and species” are more general categories relevant to the fourth and fifth significance criteria. Consistency with biological resources planning for the Tuolumne Wild and Scenic River (the last criterion) is discussed below under Impact 5.3.7-7.

River Hydrology and Riparian Ecology

At any point in a watershed, riparian ecological resources react primarily to two factors in the stream channel: geomorphic and hydrologic processes. Individual riparian species are adapted to a range of physical conditions along gradients of water table depth, soil moisture, and frequency and type of disturbance (Kondolf et al., 1996). Most riparian species depend on open sites created by flood flows for the recruitment of new individuals, and on minimum flows and the gradual return to base flows to provide subsurface soil moisture. Local climate, hydrology, geology, and geomorphology play an important role in determining the abundance, distribution, composition, and overall condition of the riparian habitat along a watercourse. The interrelationships between physical channel processes and riparian vegetation vary along the length of a stream and from river to river (Kondolf et al., 1996; McBain and Trush, 2007).

The effects of diversions on riparian ecology are complex. Reductions in stream flow generally lower species diversity and facilitate riparian encroachment into the active channel (Sierra Nevada Ecosystem Project, 1996b). Diversions and releases vary by site conditions and from year to year. Conditions may improve for one plant species and not another, and may vary from site to site along a reach of stream. Changes in riparian vegetation, in turn, affect the availability of food, cover, and structure for animal species that depend on the habitat. Moreover, causative factors tend to blur together with time: habitat structure and diversity represent an integration of influences spanning many decades. The adjustment to a substantially different flow regime requires many years, since some changes can affect the recruitment of long-lived plant species.

An assessment of impacts is complicated in an already stressed system, because some species may be at a critical stage in which further stress could cause the decline, reproductive failure, or local extirpation of mature individuals, even though they may appear robust and superficially able to adapt to change. Taking this into account, the analysis presented in this section is conservative, using reasonable worse case assumptions about the potential WSIP impacts to terrestrial biological resources that could result from program changes on reservoirs and streams.

Peak Flows

One of the most important influences on riparian structure and function is the magnitude and frequency of flood flows (also referred to as peak flows). Peak flows direct channel processes such as meandering, the formation of gravel bars, and sediment transport (Busch and Scott, 1995). Peak flows also play an important role in determining the period of saturation in the root zone during high water, which can result in a stratification of plant species along a fine topographic/soil moisture gradient up to the floodplain. Peak flows move and remove vegetation, creating open sites for the establishment of seedlings; some woody species that are uprooted or felled can later re-sprout. First, erosion of stream banks during floods carries away the vegetation. The removal or death of some plants during peak flows then creates opportunities for other plants to grow, ensuring regeneration and contributing to a structurally diverse canopy: sediment deposition can bury and damage some plants that may be able to re-sprout above the new surface, and can provide fresh substrate for other plants to thrive where competition had been reduced (Kattelmann and Embury, 1996).

Major flood events that recur only every few decades can have lasting effects on the channel form. In river systems such as the Tuolumne, very high periodic peak flows scour the channel and canyon walls for a considerable height. Many riparian species depend on such periodic disturbance for recruitment (Friedman and Lee, 2002). In meadow systems, peak flows serve a similar function, depositing sediment, facilitating channel migration, removing decadent vegetation, and creating open sites.

Diversions that reduce peak flows tend to reduce sediment transport and habitat complexity. Meandering and channel-forming processes are constrained. Without the scouring effects of high flows, riparian vegetation can encroach onto formerly active depositional surfaces (McBain and Trush, 2007). A reduction in open sand and gravel bars reduces the habitat for animal species such as foothill yellow-legged frog. Diminished cobble surface reduces the areas suitable for macroinvertebrate production, thus reducing the food supply for amphibians, bats, and many species of birds (McBain and Trush, 2007). In meadow systems, reduced peak flows reduce sediment deposition and limit the formation of openings and the removal of older vegetation.

Sustained High Flows

While peak flows are the most dramatic channel-forming events, sustained high spring flows mobilize sediment, and, as the flows recede, fresh sediment deposits are exposed. These regularly recurring high-flow events are the 1.5- to 2.5-year flows that define ordinary high water and facilitate sediment transport. Low flows and depth to groundwater determine the distribution of riparian vegetation according to ecological requirements. Channel width, meander wavelength, and rate of channel migration are all highly sensitive to discharge. Thus, a reduction in flows constrains the dynamic formation and movement of backchannel ponds, fresh sediment deposits, and other physical variation.

Meadow systems depend on sustained high flows to recharge groundwater, which determines the extent and composition of different sub-habitats such as wet meadows, dry meadows, and seasonal ponds. Wildlife respond to channel-forming processes and the microhabitats they create, and to the variety of structure and species diversity in the riparian vegetation. In addition, aquatic-dependent species such as frogs are directly affected by high flows during the breeding season, when tadpoles and eggs may be entrained and washed downstream.

Diversions that reduce high flows also reduce suitable sites for the recruitment of many riparian species, thus restricting their extent and abundance. The lack of dynamic deposition also allows upland vegetation to encroach into the riparian corridor and onto formerly active bar surfaces. An example of this phenomenon is Cherry Creek below Lake Lloyd, where encroachment has allowed Jeffrey pines to become established in the riparian zone. Reduced high flows also tend to reduce the available habitat and productivity of benthic macroinvertebrates, a food source for many riparian wildlife. Meadows affected by diversions tend to experience encroachment from upland vegetation.

The Hydrograph

The reproductive cycle of each riparian tree species is specifically tied to the timing of soil and moisture conditions that depend on the stream hydrograph (McBain and Trush, 2007). Many riparian tree species such as willows and cottonwood release large numbers of tiny seeds during a brief period in spring. These seeds are viable, or capable of germination, for only a few weeks. Their establishment depends on moist, bare soil for a period of several weeks or months while the seedling's root system develops to the depth of sustained groundwater. Each species of tree, shrub, and herb has evolved adaptations to ensure a place in the range of soil, moisture, and light conditions found in the highly dynamic riparian habitat.

Diversions that delay the highest spring flows can reduce or eliminate the required germination conditions for species adapted to early seed dispersal and germination events. A reduction in flows on the "receding limb" of the hydrograph can cause exposed sediment bars to dry out before seedlings establish their root system, thus resulting in mortality. Although very high flows can be detrimental for amphibians or other wildlife that may be swept away, a reduction in spring high flows can reduce the available extent and duration of breeding habitat.

Abrupt Changes in the Hydrograph

In a natural stream, water recedes gradually from high flows. Under a diversion scenario, these changes in flow can be much more abrupt. Especially when the flows are diminished rapidly, seedlings can become desiccated and die, and amphibian and invertebrate larvae can become stranded and die (McBain and Trush, 2007). The pattern and timing of stream releases is especially important for aquatic-dependent wildlife. Rapid increases in flow during managed releases can result in scouring and entrainment.

Terrestrial wildlife are also affected by an altered hydrograph resulting from diversions. Many animal species depend on specific plant species or vegetation structure for the completion of their life cycle; for example, willow flycatcher requires low, dense shrubby vegetation for nesting, and yellow-billed cuckoo requires large quantities of insect larvae as forage. Many insect species also have specific relationships with plant species to complete their life cycle; for example, Valley elderberry longhorn beetle requires blue elderberry shrubs of a particular stem diameter in which to lay its eggs. Alteration of the species composition, extent, or structure of the riparian habitat has direct impacts on some species, and indirect impacts on other species that depend on these species. In return, the riparian vegetation itself may be altered if the habitat is insufficient to sustain animal populations of pollinators, seed dispersers, or insectivores that keep the system in balance.

Minimum Flows

Minimum flows are a determining factor in maintaining groundwater levels. Some riparian species, such as alders, require year-round flowing water, while most others depend on groundwater, the extent of which depends to a large degree on sustained minimum flows. While the pattern of the hydrograph governs recruitment of riparian vegetation, minimum flows can determine the survival of established vegetation. Minimum flows also determine the extent and duration of surface water habitat for aquatic-phase vertebrate and invertebrate species. Similarly, these effects are also important for maintaining the extent and diversity of meadow habitats.

Diversions that substantially reduce minimum flows can cause encroachment by upland vegetation, reduction in the extent of riparian vegetation, and an overall reduction in species diversity and stand structure. Over time, constrained physical conditions reduce the micro-habitats required for the establishment of different riparian species, with an eventual reduction in riparian plant species diversity and structure. Reduced summertime flows also tend to result in higher stream temperatures. Although increased temperature does not affect riparian vegetation, it can adversely effect vertebrate and invertebrate populations, which tend to be more sensitive to water temperature. Since these effects reduce the food base and extent of riparian habitat, they also tend to result in a reduction in the species diversity and abundance of vertebrate riparian wildlife.

Sustained minimum flows deepen the stream channel, further limiting channel migration. In addition, these flows alter growing conditions, favoring plant species that require permanently flowing water for germination, establishment, and growth, such as white alder and willow. If minimum flow releases convert a seasonal stream into a perennial stream, a narrow band of water-dependent species may form along the stream.

Reservoirs

Seasonal wetlands, perennial freshwater marsh, and riparian habitats around reservoirs depend on the season, duration, and elevational range of prevailing water levels. The lower-elevation ecological range of terrestrial plants is limited by inundation, and the upper range is constrained by the limits of water availability. The more consistent the water level from year to year and throughout a season, the more favorable the conditions are for perennial freshwater marsh and a resulting overall high species diversity for both animals and plants.

The more the pattern of water levels approximates a natural regime (i.e., highest levels in spring, with a gradual reduction through the summer and fall), the greater the diversity of habitats and species. Some plant species are limited by sustained inundation when the reservoir is maintained at its highest levels, and some plants are limited by drought when the reservoir is maintained at its lowest levels. Conversely, highly variable water levels decrease plant species diversity, and annual, weedy species become more prevalent. When a reservoir is operated at a higher or lower water level, habitats respond by migrating to the appropriate elevation. Similarly, the structure and composition of riparian and wetland habitats also respond to the timing and duration of maximum and minimum reservoir elevations. Reservoir operations often expose compact, bare, gravelly soil below the sustained high water line. This area generally supports only a sparse cover of weedy annual plants, and the habitat has little value for wildlife.

While the scientific literature presents numerous approaches to assessing and predicting potential effects on riparian ecosystems resulting from water diversions and other hydrologic manipulations (e.g., Kondolf et al., 1996), many of the suggested methods amount to extensive interdisciplinary research projects.[3] The implementation of such studies is beyond the typical scope of an impact analysis under CEQA. Therefore, the following assessment, based on a review of the scientific literature, is a conservative presumption of effects on the riparian vegetation of the Tuolumne River that might be expected to occur as a result of the WSIP.

Impact Summary

Table 5.3.7-3 presents a summary of the impacts on terrestrial biological resources in the Tuolumne River system and downstream water bodies that could result from implementation of the proposed water supply and system operations.

TABLE 5.3.7-3
SUMMARY OF IMPACTS –
TERRESTRIAL BIOLOGICAL RESOURCES IN THE TUOLUMNE RIVER WATERSHED

Impacts on Terrestrial Biological Resources	Sensitive Habitats	Key Special-Status Species	Other Species of Concern	Common Habitats and Species
Impact 5.3.7-1: Impacts on riparian habitat and related biological resources in Hetch Hetchy Reservoir and along the bedrock channel portions of the Tuolumne River from O'Shaughnessy Dam to Don Pedro Reservoir	LS	LS	LS	LS
Impact 5.3.7-2: Impacts on alluvial features that support meadow and riparian habitat along the Tuolumne River from O'Shaughnessy Dam to Don Pedro Reservoir	PSM	PSM	PSM	PSM
Impact 5.3.7-3: Impacts on biological resources in Lake Eleanor and along Eleanor Creek	LS	LS	LS	LS
Impact 5.3.7-4: Impacts on biological resources in Lake Lloyd and along Cherry Creek	LS	LS	LS	LS
Impact 5.3.7-5: Impacts on biological resources in Don Pedro Reservoir	LS	LS	LS	LS
Impact 5.3.7-6: Impacts on biological resources along the Tuolumne River below La Grange Dam	PSM	PSM	PSM	PSM
Impact 5.3.7-7: Conflicts with the provisions of adopted conservation plans or other approved biological resources plans for the Tuolumne Wild and Scenic River	LS			

LS = Less than Significant impact, no mitigation required
PSM= Potentially Significant impact, can be mitigated to less than significant

[3] For example, in a baseline analysis and long-term monitoring study conducted along Bishop Creek, California, the authors conclude: "Collection of data over the next thirty years will result in an evaluation of the effects of streamflow alteration on the riparian ecosystem on a time scale more suitable for ecological interpretation" (Nachlinger et al., 1989).

Impact Discussion

Impact 5.3.7-1: Impacts on riparian habitat and related biological resources in Hetch Hetchy Reservoir and along the bedrock channel portions of the Tuolumne River from O'Shaughnessy Dam to Don Pedro Reservoir.

Sensitive Habitats

The WSIP would not affect the maximum elevation of Hetch Hetchy Reservoir, and little wetland habitat has developed around the periphery of the reservoir because of the granite substrate and existing large annual fluctuations in storage. Although annual fluctuations in reservoir storage would be greater under the WSIP, the impact on riparian and wetland habitats around and above Hetch Hetchy Reservoir would be less than significant.

Under the WSIP, the delay in snowmelt releases to the Tuolumne River below O'Shaughnessy Dam could incrementally reduce the extent and frequency of germination events, seedling survivorship, plant growth rates, and species diversity in riparian habitats. In the bedrock channel portions of the river, encroachment of riparian vegetation into the channel would be minimal. Riparian tree structure is already limited, and channel incision in the bedrock channel would be insignificant.

Studies supported by the SFPUC are currently underway to assess the physical and ecological conditions in the upper river. Given the dynamic hydrology, steep banks, and rocky substrate, there are few sensitive receptors for impact, since tree structure and channel incision are resistant to change. The effects of the WSIP in the confined bedrock channel portions of the upper river area would be relatively small and therefore difficult to quantify. As a result, this impact would be less than significant for the bedrock channel portions of the Tuolumne River and Hetch Hetchy Reservoir.

Thus, the effects of the WSIP on sensitive habitats would be *less than significant*, and no mitigation measures would be required.

Key Special-Status Species

No key special-status species are reported to occur at Hetch Hetchy Reservoir. The Tuolumne River between O'Shaughnessy Dam and Don Pedro Reservoir supports or has historically supported foothill yellow-legged frog and may support California red-legged frog. It contains only marginal habitat for willow flycatcher (see also Impact 5.3.7-2). Since changes in the structure and diversity of the riparian habitat at the reservoir and in the bedrock channel portion of the river would be less than significant, this impact would also be *less than significant*. No mitigation measures would be required.

Other Species of Concern

Species of concern potentially using Hetch Hetchy Reservoir and the bedrock channel reaches of this section of the Tuolumne River include Cooper's hawk, sharp-shinned hawk, California spotted owl, great gray owl, Vaux's swift, black swift, purple martin, yellow warbler, and several bat species, including spotted bat and mastiff bat. Since the changes in the structure and diversity of the riparian habitat at the reservoir and in the bedrock channel portion of the river are expected to be less than significant, this impact would also be *less than significant*. No mitigation measures would be required.

Common Habitats and Species

Impacts of the WSIP on common habitats and species around Hetch Hetchy Reservoir and in the bedrock channel portion of the Tuolumne River below O'Shaughnessy Dam would be minimal and *less than significant;* no mitigation measures would be required.

Impact Conclusions

Overall, implementation of the proposed WSIP water supply and system operations would result in *less than significant* impacts on terrestrial biological resources in this portion of the WSIP program area. No mitigation measures would be required.

Impact 5.3.7-2: Impacts on alluvial features that support meadow and riparian habitat along the Tuolumne River from O'Shaughnessy Dam to Don Pedro Reservoir.

Sensitive Habitats

The alluvial area supporting the largest wetland complex in this section of the Tuolumne River is the Poopenaut Valley, although smaller alluvial areas downstream, where larger tributaries empty into the Tuolumne River, also support riparian and/or wetland habitats. A delay in snowmelt releases, reduction in flows, and the resulting reduction in meadow groundwater recharge under the WSIP could contribute to a reduction in wetland habitats and encroachment of upland vegetation. All habitats could experience a reduction in their extent as well as in germination events and stand diversity. All wetland and riparian habitats in the Poopenaut Valley are considered sensitive, including seasonal wetlands, wet meadows, hanging ponds, tule bulrush stands, dry meadows, and willow communities. Similarly, the extent and diversity of sensitive wetland and riparian areas on alluvial features farther downstream along the Tuolumne River would be affected by a reduction in the quantity and timing of releases from O'Shaughnessy Dam. This impact would be *potentially significant*.

Key Special-Status Species

Key special-status species potentially using meadows and riparian habitats on alluvial deposits in this portion of the Tuolumne River include foothill yellow-legged frog and potentially California red-legged frog in the lower section of this portion of the Tuolumne River. Potential habitat may be present for willow flycatcher in dense riparian scrub. A reduction in wetland and riparian habitat would reduce suitable breeding habitat for these species, populations of which are already critically reduced in the Sierra Nevada (Jennings and Hayes, 1994). This impact would be *potentially significant*.

Other Species of Concern

Pansy monkeyflower is present at the edges of wet meadows in the Poopenaut Valley. A reduction in wet meadow habitat and upland species encroachment could reduce suitable habitat for this species. Several other plant species of concern could occur in wetlands and riparian edges in this portion of the Tuolumne River (see Table 5.3.7-2). A reduction in the extent and diversity of wetland and riparian habitats could reduce suitable habitat for these plants. A number of animal species of concern depend on meadows and diverse riparian habitats. Mountain yellow-legged frog has not been documented in the Poopenaut Valley, but may have occurred there historically, and suitable habitat may still be present. Western pond turtle, Vaux's swift, black swift, spotted bat, and mastiff bat are known to occur in this reach of the Tuolumne River. Other species likely to be present are Cooper's hawk, sharp-shinned hawk, northern goshawk, northern harrier, California spotted owl, great gray owl, purple martin, willow flycatcher, Pacific fisher, and several bat species. Because of the potential for a reduction in habitat quality and extent, the impact on species of concern would be *potentially significant*.

Common Habitats and Species

The habitats that could be affected by the WSIP are all considered sensitive; no impacts on common habitats would occur. However, a large number of common animal species depend on meadows and larger riparian areas in the mid-elevation Sierra Nevada for food and cover. From a regional perspective, incremental impacts on meadow habitats could have a *potentially significant* impact on common wildlife species.

Impact Conclusions

Overall, implementation of the proposed WSIP water supply and system operations could result in potentially significant impacts on terrestrial biological resources due to potential effects on riparian habitat and species of concern. Implementation of Measure 5.3.7-2, Controlled Releases to Recharge Groundwater in Streamside Meadows and Other Alluvial Deposits, would manage releases from Hetch Hetchy reservoir to recharge riverside meadows, including the Poopenaut Valley. In combination with the groundwater and plant population monitoring being carried out in accordance with Provision 6 of the amended permit for the Canyon Power Project (March 1987) and further adjustment of controlled releases, timing, and magnitude in collaboration with the USFWS, it is expected that meadow conditions in the Poopenaut Valley will be maintained in the current state or improved. Therefore, controlled releases under Measure 5.3.7-2, if timed properly and of adequate volume, would be sufficient to fully mitigate these impacts to less-than-significant.

[Additional discussion on Mitigation Measure 5.3.7-2 was prepared in response to comments on the Draft PEIR. Please refer to Section 14.6, Master Response on Upper Tuolumne River Issues (Vol. 7, Chapter 14).]

Impact 5.3.7-3: Impacts on biological resources in Lake Eleanor and along Eleanor Creek.

Sensitive Habitats

Lake Eleanor supports limited wetland habitats. The WSIP would not change the level and pattern of reservoir storage in Lake Eleanor, except that increased transfers to Lake Lloyd could occur during extended droughts. This change under the WSIP could slightly reduce the extent and quality of potential suitable habitat for wetland species. Riparian habitats along Eleanor Creek would be unaffected because the quantity and timing of releases would be essentially the same as under existing conditions. Overall, impacts on sensitive riparian and wetland habitats due to the WSIP would be *less than significant*, and no mitigation measures would be required.

Key Special-Status Species

There are no records indicating the presence of key special-status species in Lake Eleanor and Eleanor Creek. However, habitat in Eleanor Creek appears to be suitable for foothill yellow-legged frog. Since habitat changes are predicted to be small, any potential effects on this species and its habitat would be *less than significant*, and no mitigation measures would be required.

Other Species of Concern

Species of concern potentially using the riparian habitats associated with Lake Eleanor and Eleanor Creek are similar to those for the Tuolumne River below O'Shaughnessy Dam. They include western pond turtle, mountain yellow-legged frog, Cooper's hawk, sharp-shinned hawk, California spotted owl, great gray owl, Vaux's swift, black swift, purple martin, willow flycatcher, and several bat species. Since WSIP-induced impacts on habitat are predicted to be very small, the impact on species of concern would also be *less than significant*, and no mitigation measures would be required.

Common Habitats and Species

Potential impacts of the WSIP on common habitats and species are expected to be *less than significant*, and no mitigation measures would be required.

Impact Conclusions

Overall, the impacts on terrestrial biological resources due to implementation of the proposed WSIP water supply and system operations would be *less than significant*, and no mitigation measures would be required.

Impact 5.3.7-4: Impacts on biological resources in Lake Lloyd and along Cherry Creek.

Sensitive Habitats

Lake Lloyd would experience a small decrease in average reservoir water levels under the WSIP, but this lake contains little wetland habitat. The WSIP would increase releases somewhat during dry years, which could benefit riparian habitats along Cherry Creek. Overall, impacts on sensitive riparian and wetland habitats would be *less than significant*, and no mitigation measures would be required.

Key Special-Status Species

There are no records indicating the presence of key special-status species in Lake Lloyd or Cherry Creek. However, habitat in Cherry Creek appears to be suitable for foothill yellow-legged frog. Since habitat changes are predicted to be small, any potential effects on this species and its habitat would be *less than significant*, and no mitigation measures would be required.

Other Species of Concern

Species of concern potentially using the riparian habitats associated with Lake Lloyd and Cherry Creek are similar to those for the Tuolumne River below O'Shaughnessy Dam. They include western pond turtle, mountain yellow-legged frog, Cooper's hawk, sharp-shinned hawk, western spotted owl, great gray owl, Vaux's swift, black swift, purple martin, willow flycatcher, and several bat species. Since WSIP-induced impacts on habitat are predicted to be very small, the impact on species of concern would also be *less than significant,* and no mitigation measures would be required.

Common Habitats and Species

Potential impacts of the WSIP on common habitats and species are expected to be *less than significant*, and no mitigation measures would be required.

Impact Conclusions

Overall, impacts on terrestrial biological resources due to implementation of the proposed WSIP water supply and system operations would be *less than significant*, and no mitigation measures would be required.

Impact 5.3.7-5: Impacts on biological resources in Don Pedro Reservoir.

Sensitive Habitats

Because riparian and wetland habitat at Don Pedro Reservoir is limited, the impact on sensitive habitats due to the increased drawdown under the WSIP would be *less than significant*, and no mitigation measures would be required.

Key Special-Status Species

Very limited potential habitat for California red-legged frog is present at Don Pedro Reservoir, and no other key special-status species are known to occur there. As a result, the impact on key special-status species at Don Pedro Reservoir would be *less than significant*, and no mitigation measures would be required.

Other Species of Concern

Western pond turtle could be affected by an incremental reduction in the quality and extent of habitat due to increased drawdown. An incremental but small reduction in habitat could occur for several bat species, bird species such as osprey, and bald eagle. Because of the very limited reduction in potentially suitable habitat for species of concern, this incremental impact would be *less than significant*, and no mitigation measures would be required.

Common Habitats and Species

The increased reservoir drawdown under the WSIP would not reduce any common habitats; therefore, the impact on common species would be *less than significant*, and no mitigation measures would be required.

Impact Conclusions

Overall, impacts on terrestrial biological resources at Don Pedro Reservoir due to implementation of the proposed WSIP water supply and system operations would be *less than significant*, and no mitigation measures would be required.

Impact 5.3.7-6: Impacts on biological resources along the Tuolumne River below La Grange Dam.

Sensitive Habitats

Slightly delayed spring releases as well as reductions in average peak flows and total flow in the Lower Tuolumne River (especially during and following an extended drought) would incrementally affect riparian communities through upland encroachment into the riparian habitat and riparian encroachment into the channel. Existing conditions have already eliminated conditions for Fremont cottonwood regeneration and reduced the species diversity and variety of riparian vegetation stand structure. The proposed flows under the WSIP could further reduce stand diversity and variation in structure and further reduce or eliminate suitable conditions for recruitment of some riparian species. The degree of potential impact on riparian habitat due to the WSIP is difficult to quantify. However, because it would result in an incremental adverse change in a severely stressed system, the impact of the WSIP is considered *potentially significant*.

Key Special-Status Species

The WSIP would incrementally reduce habitat for some species that depend on the riparian habitats in the lower Tuolumne River, such as California tiger salamander, Valley elderberry longhorn beetle, and Swainson’s hawk. Because of the known presence of key special-status species and the very limited amount of remaining suitable habitat along the Tuolumne River, this incremental impact would be *potentially significant.*

Other Species of Concern

Several species of concern could be affected by the incremental reduction in riparian habitat quality and extent under the WSIP. These species include western pond turtle, several bat species, and a wide variety of riparian- and marsh-associated bird species. Because of the known presence of species of concern and the very limited amount of remaining suitable habitat along the Tuolumne River, this incremental impact would be *potentially significant.*

Common Habitats and Species

Potential impacts of the WSIP on common habitats are expected to be less than significant. However, many common species depend on riparian habitats, and their populations would be incrementally affected by the alteration of habitat. As a result, this impact would be *potentially significant*.

Impact Conclusions

Overall, implementation of the proposed WSIP water supply and system operations would result in *potentially significant* impacts on terrestrial biological resources due to potential effects on riparian habitat, other species of concern, and common habitats and species. If feasible, implementation of Measure 5.3.6-4a, Avoidance of Flow Changes by Reducing Demand for Don Pedro Reservoir Water, would result in reduced demand on Don Pedro Reservoir water. The result would offset the reduction in inflow to Don Pedro Reservoir attributable to the WSIP and the release pattern from La Grange Dam would be the same or similar to the existing condition. If fully implemented, this measure would reduce the potential impact of the WSIP on riparian resources to less than significant and no further mitigation would be required.

Due to some uncertainty regarding negotiations with MID/TID that would be necessary to implement Measure 5.3.6-4a, Avoidance of Flow Changes by Reducing Demand for Don Pedro Reservoir Water, this measure may not be feasible. In the event that Measure 5.3.6-4a is deemed infeasible, implementation of Measure 5.3.7-6, Lower Tuolumne River Riparian Habitat Enhancement, which would require SFPUC to implement riparian habitat enhancement actions on the lower Tuolumne River, would reduce the impact of WSIP operations on riparian resources on the lower Tuolumne River to a less-than-significant level.

Impact 5.3.7-7: Conflicts with the provisions of adopted conservation plans or other approved biological resources plans for the Tuolumne Wild and Scenic River.

The U.S. Forest Service identified the Tuolumne River as a Wild and Scenic River and has developed a management plan for the 29 miles of the Tuolumne River downstream of the Yosemite National Park boundary to Don Pedro Reservoir (shown in Figure 5.2-1). The *Tuolumne Wild and Scenic River Management Plan* (Wild and Scenic Plan), approved in 1986 and administered by the U.S. Forest Service, calls for providing cover and forage habitat for fish and riparian-associated wildlife species by maintaining medium to high habitat quality according to the certain habitat quality criteria. Specific guidelines include maintaining and enhancing habitat for threatened, endangered, and sensitive indicator species, including peregrine falcon, bald eagle, mule deer, western gray squirrel, yellow warbler, and Sierra Nevada red fox and protecting streamside vegetation (USFS, 1986).

The Wild and Scenic Plan does not apply to the exercise of the CCSF’s water rights under the existing Raker Act grant, as stated in the Wild and Scenic Rivers Act (Section 3 [a] [53] Tuolumne, California) as follows: “Nothing in this section is intended or shall be construed to affect any rights, obligations, privileges, or benefits granted under any prior authority of law including chapter 4 of the Act of December 13, 1913, commonly referred to as the Raker Act (38 Stat. 242) and including any agreement or administrative ruling entered into or made effective before the enactment of this paragraph [September 28, 1984].” However, although SFPUC’s operations are exempt from the provisions of the Wild and Scenic Plan, WSIP impacts on biological resources, including those specifically addressed in the Wild and Scenic Plan, are evaluated in this PEIR under CEQA.

Potential WSIP impacts on sensitive habitats and associated species of concern along the reach of the Tuolumne River covered by the Wild and Scenic Plan are included in the analyses presented in Impacts 5.3.7-1 and 5.3.7-2. As noted under Impact 5.3.7-1, impacts on riparian habitat and related biological resources along the bedrock channel portions of this reach of the Tuolumne River would be less than significant. As described in Impact 5.3.7-2, the changes in streamflow associated with implementation of the WSIP could affect streamside vegetation on alluvial features that support meadow and riparian habitats along this reach of the river; however, for the reach of the Tuolumne River downstream of the Yosemite National Park boundary to Don Pedro Reservoir, there are no notable alluvial features that support meadow and riparian habitats. Furthermore, this reach of the river receives inflow from numerous side tributaries, including Cherry Creek, which would mask any WSIP-related changes in streamflow, and no noticeable changes on sensitive habitats and associated species of concern along the reach of the Tuolumne River covered by the Wild and Scenic Plan would be expected. Therefore, impacts related to the potential conflicts related to the provisions of the adopted Wild and Scenic Plan are considered *less than significant*.

The National Park Service (NPS) has identified the Tuolumne River, and specifically the Poopenaut Valley, as an outstandingly remarkable value of the Tuolumne Wild and Scenic River corridor in Yosemite National Park (NPS, 2006). The *Tuolumne Wild and Scenic River Draft Report, Outstandingly Remarkable Values* (NPS, 2006) calls for maintaining and enhancing riparian and meadow habitats within the Tuolumne River corridor. This report is part of the NPS’s ongoing development of the management plan for the designated wild and scenic reaches of the Tuolumne River within Yosemite Park, including the Poopenaut Valley. Since this plan is still under development and not yet adopted, no impact determination is made regarding conflicts with any of its provisions.

Impacts related to the potential conflicts related to the provisions of adopted conservation plans are therefore considered *less than significant*.

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5.3.8 Recreational and Visual Resources

The following setting section describes recreational and visual resources in the Tuolumne River watershed that could be affected by the WSIP. The impact section (Section 5.3.8.2) provides a description of the changes in recreational opportunities and visual quality that would result from WSIP-induced changes in stream flow and reservoir water levels.

5.3.8.1 Setting

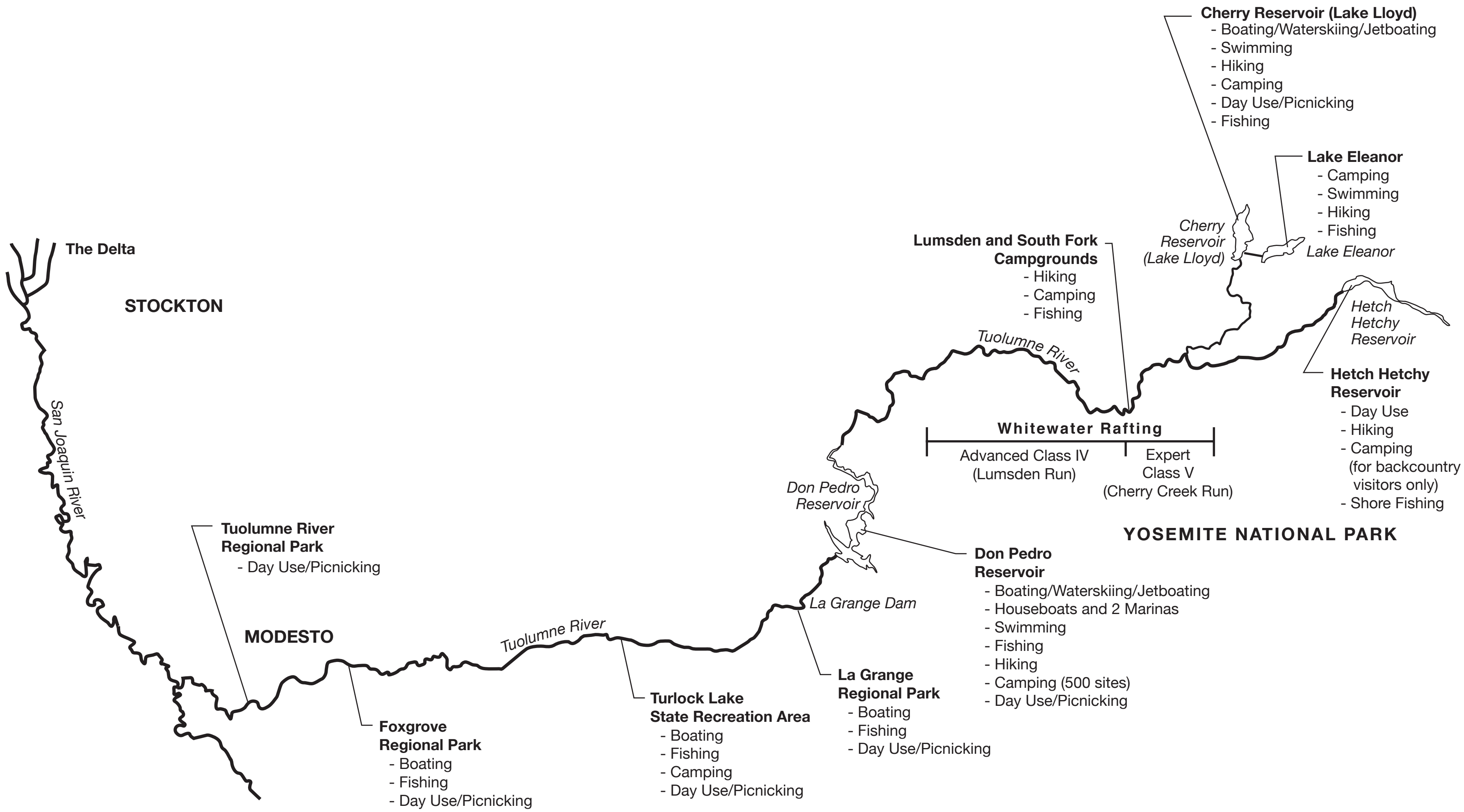
Recreational activities and facilities are dispersed throughout the Tuolumne River system (except for whitewater boating, which is limited to the upper reaches of the river above Don Pedro Reservoir). Water recreational activities in the Tuolumne River, other than whitewater rafting, include boating (often consisting of “flatwater” river kayaking or rafting), fishing, and swimming. Boating recreation is generally limited to sections of the river with suitable river access (e.g., boat ramps for hard-bottomed boats). Both fishing and swimming within the Tuolumne River is regulated. Swimming is generally discouraged due to the often hazardous currents.

Off-water river-related recreation consists of hiking, picnicking, and camping. Hiking occurs throughout the Tuolumne River system in several forms, including both vigorous trail walking and more casual sightseeing or nature viewing. Picnicking is a common activity at nearly all of the region’s recreation sites, but overnight camping along the river is mainly limited to developed campsites. Recreational resources are identified by location in order to delineate the specific impacts of the WSIP within the Tuolumne River system (see **Figure 5.3.8-1**).

Yosemite National Park and the Hetch Hetchy Watershed

Hetch Hetchy Reservoir

Hetch Hetchy Reservoir and the associated watershed lands lie mainly in Yosemite National Park. The park encompasses approximately 1,170 square miles, and about half of this area lies within Tuolumne County (the remainder is in Mariposa and Merced Counties). Yosemite receives about 4 million visitors a year and offers a wide variety of recreational activities, including camping, hiking, mountain climbing, fishing, and river rafting. The headwaters of the Tuolumne River lie within the park. The Hetch Hetchy Reservoir watershed encompasses the 459 square miles that make up the Tuolumne River watershed. There are numerous recreational facilities and activities in the watershed above Hetch Hetchy Reservoir at Tuolumne Meadows and the Glen Aulin High Sierra Camp. Tuolumne Meadows attracts by far the greatest amount of recreational use in the watershed at its large developed campground, visitor center, trailheads, and Tuolumne Meadows Lodge. Glen Aulin High Sierra Camp also generates substantial recreational use. There is also considerable backcountry visitation within the Hetch Hetchy watershed above the reservoir. Between 1990 and 2005, annual overnight use was approximately 40,000 user nights in the backcountry wilderness of the Hetch Hetchy watershed (NPS, 2006c). However, since no program-related changes would occur upstream of the reservoir, wilderness users who only visit the Hetch Hetchy watershed backcountry (i.e., do not hike along the reservoir or downstream along the Tuolumne River) would not be affected by the WSIP.



SOURCE: ESA + Orion

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Figure 5.3.8-1
Principal Recreational Resources
Tuolumne River System

Hetch Hetchy Reservoir sits in a dramatic valley of steep, glacier-eroded mountains. Dispersed and scrubby vegetation is predominantly clustered around the flatter portions and fissures of the surrounding mountainsides. Due to the steep slopes, most of the surrounding rock faces are bare granite rock. Around the lakeside, scoured whiter rings (referred to as the “bathtub ring”) are periodically visible when the water level falls. While no recreational activities are permitted on the Hetch Hetchy Reservoir due to water quality restrictions, hiking is permitted within the watershed area, overnight backpacking is allowed with a wilderness permit, and visitors with a valid California fishing license, who comply with the rainbow trout catch-and-release policy, are allowed to fish from the reservoir shoreline. Considerable day use of the reservoir occurs from early May to early October, except during the hottest periods of late July and August when visitation typically decreases. A walk-in campsite operates at Hetch Hetchy for backpackers hiking in and out of the backcounty. Swimming in the off-reservoir streams is currently permitted, but the National Park Service is in the process of promulgating a regulation that would prohibit body contact in the tributaries within one mile of the reservoir in accordance with the sanitary provisions of the Raker Act. The road to Hetch Hetchy is generally open year-round during daylight hours, except on occasion during the winter and spring when it is closed due to extreme weather conditions (NPS, 2007).[1]

Only limited and partial past visitation data for the Hetch Hetchy entrance gate and backcounty use are available. Annual visitation frequently fluctuates considerably between years, often due to weather conditions. Over the last five years, visitation has generally averaged approximately 14,300 vehicles annually; in 2005, the number of vehicles using the entrance increased to nearly 22,000, likely due to the increased media attention on the reservoir. Based on an assumption of 2.5 visitors per vehicle, average visitation through the Hetch Hetchy entrance was approximately 35,750 visitors annually between 2000 and 2005. In comparison, visitation between 1990 and 1995 was approximately 50 percent higher, averaging 21,056 vehicles per year between April and early November. According to National Park Service staff, the majority of day-use visitors to Hetch Hetchy Reservoir and Tuolumne River trails use this entrance.

Statistics on wilderness permits for backcounty use fluctuate greatly and are considered less reliable measurements of visitor use, since not all visitors using the backcountry obtain permits. Nonetheless, based on the available wilderness permit data for 2003 to 2005, approximately 2,345 backcountry visitor permits were issued from the Hetch Hetchy location. It is estimated that these backcountry visitors stayed an average of 2.3 nights in the area (NPS, 2006a), accounting for about 5,400 user nights. Since these permits were obtained from the Hetch Hetchy location, it is presumed that the majority of these permits were likely used to hike and camp in the Hetch Hetchy area.

While a small number of other backcountry users may have obtained their permits from other park wilderness offices or from U.S. Forest Service (USFS) locations, this number, according to park staff, would represent a very small proportion of backcountry users along the Tuolumne River below Hetch Hetchy Reservoir or around the reservoir itself.

1 Due to safety concerns, access to the O’Shaughnessy Dam parking lot is limited to 8:00 a.m. to sunset, and no overnight parking is permitted.

Lake Eleanor

Lake Eleanor, another SFPUC system reservoir, also lies within Yosemite National Park. Lake Eleanor has a 79-square-mile watershed along Eleanor Creek. The lake measures three miles long and one mile wide and is situated at an elevation of 4,660 feet. Activities at and around the lake include camping, fishing, swimming, nonmotorized boating, and hiking. Trailheads connect this area to the Emigrant Wilderness, Hetch Hetchy Reservoir, and the rest of Yosemite National Park. No visitor counts are available specifically for Lake Eleanor; however, due to its lack of direct road access, Lake Eleanor is a far less popular recreational destination than Hetch Hetchy Reservoir, which better accommodates day use (NPS, 2006b).

The visual setting for Lake Eleanor is characterized by open vistas of mixed conifer forest covering most of the gradually sloped surrounding mountains. These hills and low mountains are less dramatic than those around Hetch Hetchy Reservoir, but are generally more forested.

Poopenaut Valley

All of the Tuolumne River within the Poopenaut Valley downstream to the western park boundary is classified as Wild, apart for the first mile below the O'Shaughnessy Dam (which is classified as Scenic). While there is limited hiking and other recreational access to the Wild section of the river, the *Tuolumne Wild and Scenic River Study Final EIS and Study Report* (U.S. DOI and USDA, 1979) found this segment of the river to have numerous "outstandingly remarkable values," including Scenic, Recreation, Geological, Wildlife, Historic, and Scientific values. The Tuolumne River's outstanding scenic values in this segment are based on the stunning views of verdant meadows, a glacially carved bedrock valley, large river pools, dramatic canyon walls, and a constricted slot canyon below the Poopenaut Valley (NPS, 2006d). The river's outstanding recreational values are based its opportunities for recreation in a largely undisturbed, low-elevation riparian environment dominated by natural scenery and soundscapes. In addition, the recreational opportunities are considered unique for the Sierra Nevada as a result of the rarity of such low-elevation designated wilderness.

Stanislaus National Forest

The Stanislaus National Forest, which is managed by the USFS, encompasses almost 900,000 acres to the west of Yosemite National Park. It stretches through Tuolumne, Calaveras, and Alpine Counties in a wide band from the Mokelumne River on the north to the Merced River on the south. Recreational opportunities in the Stanislaus National Forest include river rafting, hiking, and fishing. A 29-mile stretch of the Tuolumne Wild and Scenic River (described below) lies within the Stanislaus National Forest (USFS, 2007a).

Lake Lloyd, another part of the SFPUC water system, is the largest lake in the Stanislaus National Forest. It has a 114-square-mile watershed along Cherry Creek, mainly in the Emigrant Wilderness, and numerous recreational activities are permitted (SFPUC, 2007). The lake is 3.8 miles long and one mile wide and lies at an elevation of 4,702 feet. The lake is impounded by an earthen dam that was constructed in 1954 (SFPUC, 2007). Fishing and boating are common activities, as are camping, hiking, swimming, waterskiing, and jet-boating. There are

46 campsites in the Cherry Valley Campground, and shoreline boat-in camping is popular. Fish species targeted by anglers include several species of trout (rainbow trout, eastern brook trout, and German brown trout) as well as some sockeye (kokanee) salmon (Fish Sniffer, 2006).

The visual setting for Lake Lloyd is similar to that of the neighboring Lake Eleanor, generally consisting of mixed conifer forest on the surrounding High Sierra mountains. The lake is open year-round; however, the access road to Lake Lloyd can experience closures in the winter (USFS, 2007b).

Upper Tuolumne River Corridor

In 1984, Congress designated the Tuolumne River as one of the nation's Wild and Scenic Rivers. The river provides an abundance of recreational opportunities, including fishing, hiking, and whitewater rafting. In total, 83 miles of the Tuolumne River have been classified as Wild (47 miles), Scenic (23 miles), or Recreation (13 miles) (NPS, 2006c), as shown in Figure 5.2-1. Most of the river corridor within the 29 miles of the Tuolumne Wild and Scenic River located outside of Yosemite National Park is classified as Wild. The one-mile stretch of river between Early Intake and Cherry Creek is classified as Recreational because a road parallels it, and the four miles of river starting about a mile above the Lumsden Bridge is recognized as Scenic.

Whitewater rafting is the primary water recreation activity in the Tuolumne River corridor above Don Pedro Reservoir and is discussed in the section below. Other water and off-water recreational resources are discussed separately following the whitewater recreation discussion.

Whitewater Recreational Resources

There are two whitewater boating runs in the Tuolumne River watershed. The Cherry Creek Run extends from just above the Cherry Creek/Tuolumne River confluence to Lumsden Campground, and the Lumsden Run extends from Lumsden Campground to the Wards Ferry Bridge, just upstream of Don Pedro Reservoir. Both runs are located within the jurisdiction of the Groveland Ranger District of the Stanislaus National Forest and managed under the 1986 USFS *Tuolumne Wild and Scenic River Management Plan*.

Cherry Creek Run

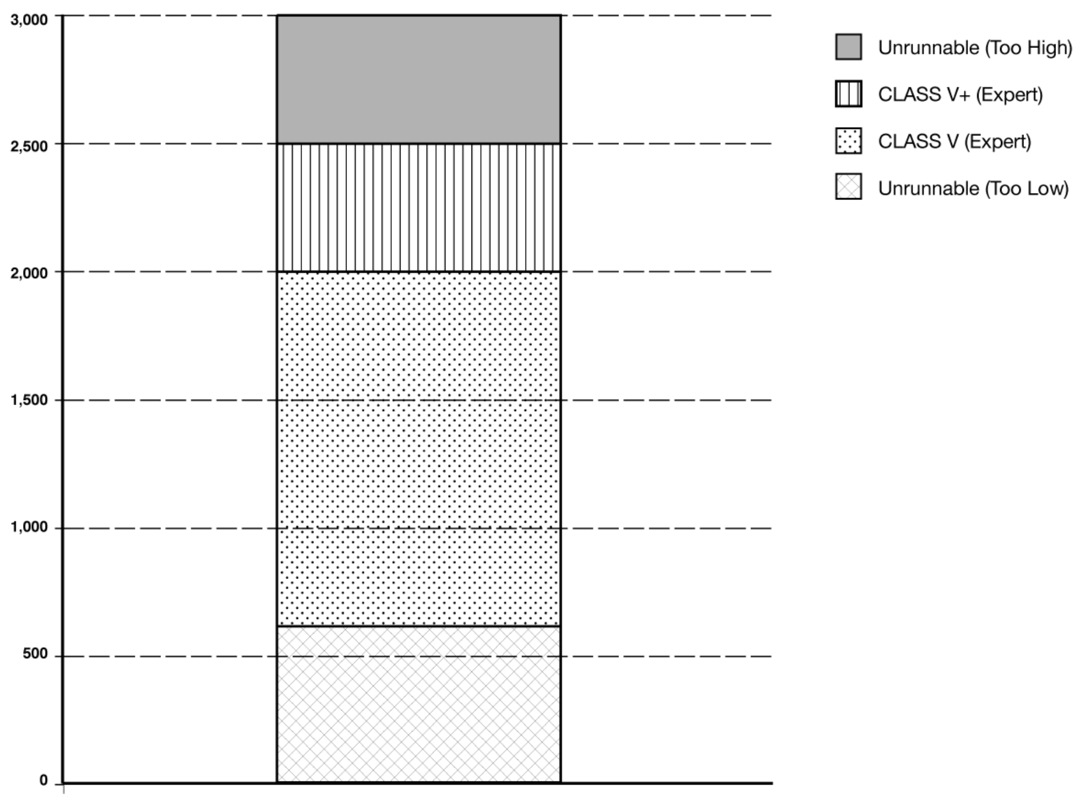
This nine-mile run begins at Holm Powerhouse on Cherry Creek and ends at Lumsden Campground on the Tuolumne River. The Cherry Creek Run is one of the most difficult whitewater boating runs on the West Coast, and is probably the most challenging run in the country that has regularly scheduled commercial boating trips. The Cherry Creek Run is suitable solely for expert boaters and can only be run during low summer flows. The run's excellent scenery, outstanding rapids, and relative proximity to the Bay Area and Sacramento make it California's most popular Class V (expert) run (Cassady, 1995). It is commonly considered to be the initiation run for boaters ready to transition from Class IV to Class V (Holbeck, 1998).

The run's gradient generally falls 110 feet per mile, although one section consists of a 200-foot descent over the course of one river mile. However, the rapids are generally formed from large, round granite boulders that are relatively forgiving for boaters and less likely to result in entrapment hazards than other comparable runs. The typical whitewater boating condition thresholds for the Cherry Creek Run are shown in **Table 5.3.8-1** and **Figure 5.3.8-2**.

TABLE 5.3.8-1
WHITEWATER RAFTING CONDITION THRESHOLDS FOR THE CHERRY CREEK RUN

River Flows	Rating	User Type
600–1,500 cfs	Class V	Expert
1,500–2,000 cfs	Class V+	Expert +
> 2,000 cfs	Unrunnable	NA

SOURCE: All-Outdoors California Whitewater Rafting, 2007.



SOURCE: Cassady, 1995; Holbeck 1998..

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Figure 5.3.8-2
Whitewater Rafting Condition Thresholds for the Cherry Creek Run

The Cherry Creek Run is predominantly used by private kayakers in the mid- and late summer, when it is one of the few remaining suitable expert runs in the country. Earlier in the year, flows are generally above 2,000 cfs and the run is unsafe.

Lumsden Run

The lower 18-mile run on the main fork of the Tuolumne River extends from Lumsden Campground to Ward's Ferry Bridge. This stretch of the river is generally known as the Lumsden Run (Rosekrans et al., 2004). The Lumsden Run is a premier California whitewater boating run that is famous within the rafting and kayaking community. It is typically rated as a Class IV+ run and provides a high-quality experience for boaters. The Lumsden Run offers the opportunity for an overnight trip, which is rare in the central Sierra region. The run's beautiful scenery, wilderness solitude, and challenging rapids within easy driving distances from Sacramento and the Bay Area make it a popular whitewater boating location for both private and commercial boaters.

The run's gradient generally falls 40 feet per mile through difficult boulder slalom rapids. The typical whitewater boating conditions for the Lumsden Run are shown in **Table 5.3.8-2** and **Figure 5.3.8-3**.

TABLE 5.3.8-2
WHITEWATER RAFTING CONDITION THRESHOLDS FOR THE LUMSDEN RUN

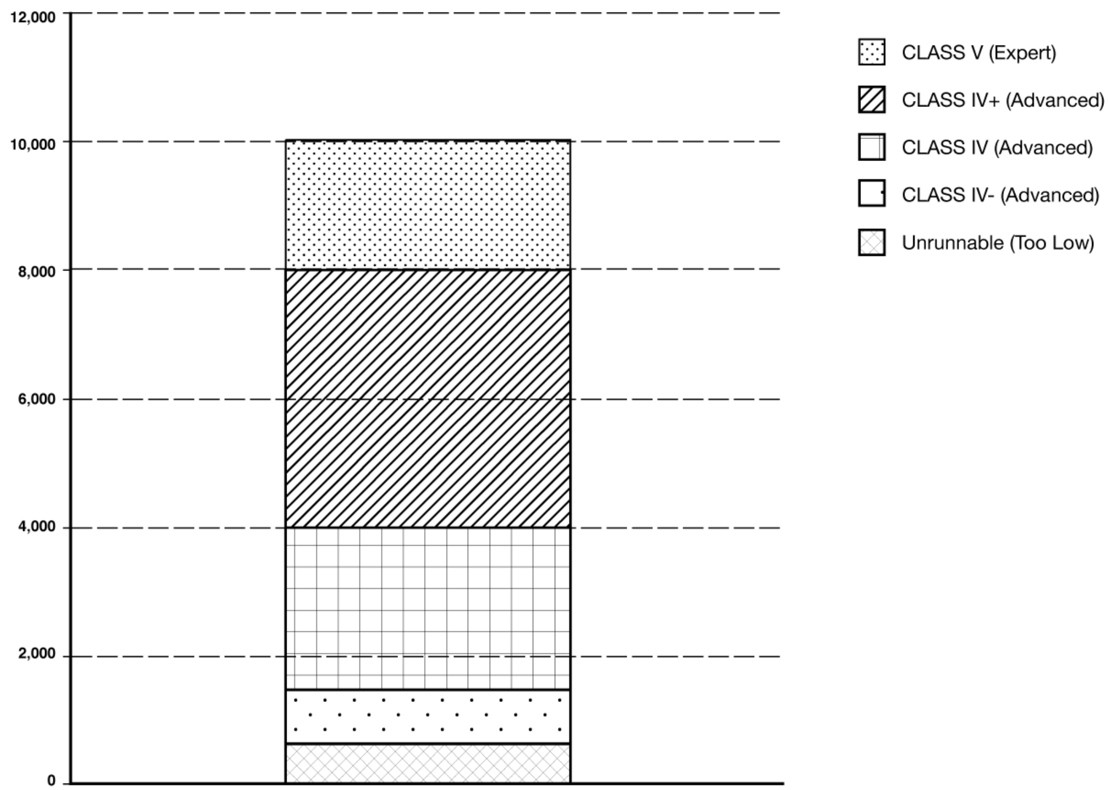
River Flows	Rating	User Type
600–1,500 cfs	Class IV-	Advanced
1,500–4,000 cfs	Class IV	Advanced
4,000–8,000 cfs	Class IV+	Advanced
> 8,000 cfs	Class V	Expert

SOURCE: All-Outdoors California Whitewater Rafting, 2007.

Current Operating Conditions

The 1995 FERC Settlement Agreement (see Chapter 2 for a description of the agreement) requires the SFPUC to consult, cooperate, and communicate with whitewater recreational interests regarding releases from the Hetch Hetchy system, but does not require the SFPUC to schedule releases for the purpose of maintaining or enhancing whitewater recreation. However, subject to the availability of water and hydropower needs, the SFPUC attempts to accommodate whitewater recreation in the Tuolumne River below its reservoirs by "shaping" releases from Holm Powerhouse on Cherry Creek, upstream of its confluence with the Tuolumne River. These "pulse" releases enable whitewater rafting during the summer season when flows are otherwise insufficient (see **Figure 5.3.8-4**).

The SFPUC meets annually with whitewater recreation representatives to develop, to the degree practicable, a schedule of releases for whitewater recreation. The schedule of these releases is developed in accordance with the duration of expected spills below the Hetch Hetchy systems' Tuolumne River watershed reservoirs and the projected availability of water in Lake Lloyd and



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SOURCE: Cassady, 1995; Holbeck 1998..

Figure 5.3.8-3
Whitewater Rafting Condition Thresholds for the Lumsden Run

Lake Eleanor beyond the amount necessary to maintain the SFPUC's water deliveries from its Tuolumne River reservoirs. The need to divert Cherry Creek water to Early Intake through the Lower Cherry Aqueduct for water supply use in the Bay Area in emergencies and extreme droughts as well as the expected price of energy and maintenance projects are also considered in establishing the schedule of releases for whitewater recreation.

The primary considerations in scheduling releases are the needs to maintain water supply, undertake maintenance, and deliver water in emergencies. The SFPUC maintains high levels of carryover storage in Lake Lloyd and Lake Eleanor because releases from these reservoirs can be used to meet TID's and MID's Raker Act water entitlements in the event that the SFPUC's storage in its water bank in Don Pedro Reservoir is exhausted. This enables continued water deliveries to Bay Area customers from Hetch Hetchy Reservoir. This operational strategy is consistent with the SFPUC's obligation to operate the Hetch Hetchy system for "water first."

The price of energy is also a consideration in establishing the annual schedule of boating releases. Once Hetch Hetchy Reservoir, Lake Lloyd, and Lake Eleanor have finished spilling spring and early summer runoff, which typically occurs by July 1, releases to streams are reduced to the minimum required flow. Flow in the Tuolumne River consists of the minimum releases from the

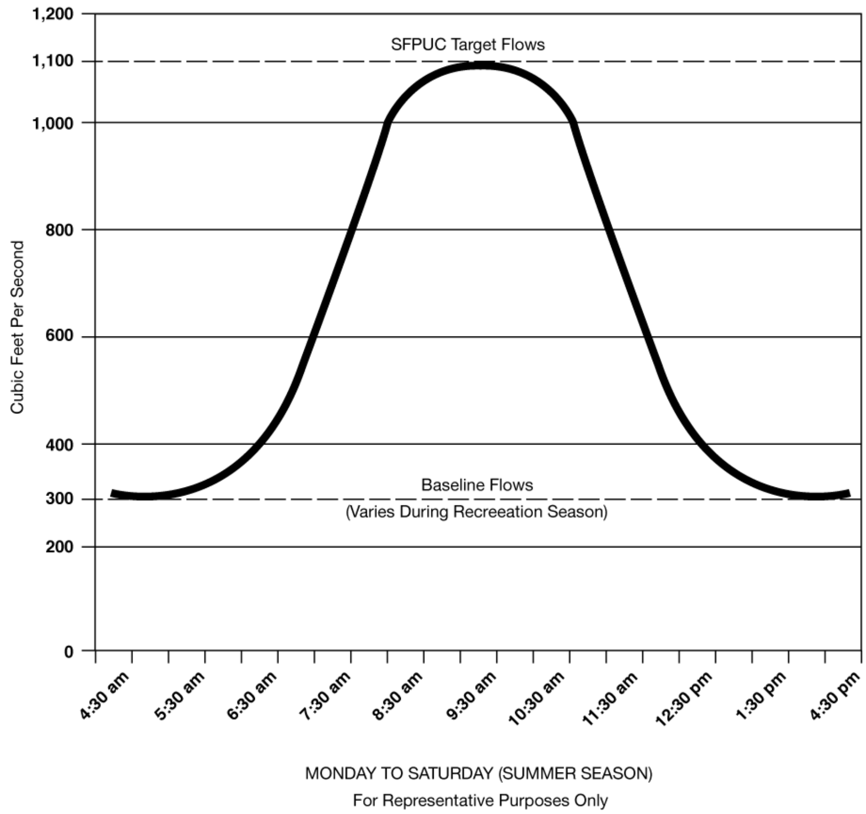

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Figure 5.3.8-4
Example of a Pulse Release
for Whitewater Recreation

reservoirs, tributary flow, and releases from Holm, Kirkwood, and Moccasin Powerhouses. Hydropower generation at Kirkwood and Mocassin Powerhouses is limited to that which is incidental to water deliveries to the Bay Area. In a typical year, hydropower from the two powerhouses is insufficient to meet the SFPUC's peak municipal and retail power demand for several months beginning at the end of June, and the SFPUC must purchase power. When the SFPUC chooses to generate hydropower at the Holm Powerhouse, it must offer some electrical power to TID and MID at an agreed upon price for their municipal needs and agricultural pumping.

Energy prices are at their seasonal maximum during the summer and fall, because the cheapest source of energy (i.e., hydropower) is no longer plentiful. In addition, the price of energy rises during the day to a peak price around midday, when energy use is the highest. If the SFPUC were to operate solely to meet its own municipal and retail demand for energy or to maximize revenue from hydropower sales, it would generate hydropower during the midday period only. To deliver a pulse flow to Lumsden Campground for boaters by 9:30 a.m., the SFPUC must begin hydropower generation at Holm Powerhouse by 7:00 a.m. Were the SFPUC to operate solely in its own interest, it would not begin generation until late morning. Operating Holm Powerhouse early in the morning to produce boating flows represents both lost revenues as well as exposure to higher energy costs when the SFPUC must purchase energy to meet its needs in the middle of the day.

Scoping comments received in response to the Notice of Preparation for this PEIR (see Appendix A) included expressions of concern that the WSIP could further restrict the quality of whitewater rafting on the Tuolumne River by reducing water release hours or flows, or by shortening the length of the summer rafting season.

Since the 1995 FERC Settlement Agreement, representatives for the commercial boating community have met annually with SFPUC staff to collaborate in determining operating and flow management schedules that can better accommodate whitewater recreation downstream of Hetch Hetchy Reservoir and Lake Lloyd. While commercial users have generally adapted their trips and operations to conform to the flow conditions, reductions in water releases (typically resulting in an earlier ending to the whitewater recreation season) inevitably reduce the commercial operators' earnings. The highest demand for whitewater use of the Tuolumne River is during the Memorial to Labor Day season. In addition, there is also considerable and frequently unmet whitewater recreational demand for the early to mid-September shoulder season. In May and early June, the colder water and weather as well as the often higher river flows are less attractive to many whitewater boaters. Furthermore, later in the summer season many other rivers are no longer runnable. As a result, the late summer whitewater opportunities on the Tuolumne River are generally in greatest demand and offer users particularly high-quality whitewater recreation experiences (Welch, 2006).

A 1,100-cfs flow at Lumsden Campground is the minimum required for whitewater paddle boats and oar boats; a 900-cfs flow is the minimum required for kayaks, and a 1,500- to 2,000-cfs flow is considered optimal. The commercial outfitters prefer an eight-hour release, but a four-hour release allows them to launch one-, two- and three-day trips. One-day trips launch first and ride the pulse down to Wards Ferry; two-day trips launch next and run nine miles down river; and three-day trips launch last and ride five miles down river. Launches of two- and three-day trips from riverside campgrounds are staged to avoid congestion at rapids.

In recent years, the water releases to the river have generally been in a daily three- to four-hour pulse release timed to reach the upper reaches of the rafting runs in the mid-morning. According to representatives of the commercial users, three hours represents a minimum adequate duration for whitewater recreation, as launchings and all associated recreation must occur during the flow of released water down the river (Welch, 2006). If the duration of flow is insufficient, crowding can decrease the quality of the recreational experience for some users. A longer duration water release pulse would provide more opportunities for users to spread out their river use and take greater advantage of the off-river hiking and other recreational opportunities.

Due to the demand for power generated from the Lake Lloyd's water releases, the weekday water releases may be larger than the Saturday releases. Typically, no water releases occur on Sunday, and, as a result, the Tuolumne River is mostly unrunnable on Sunday. Many commercial operators have adapted their weekend trips to include an off-river hiking day on Sunday. However, the absence of a Sunday release has a greater impact on private users, who generally value weekend recreational opportunities for whitewater use of the river.

Whitewater Recreational Use

As shown in **Table 5.3.8-3**, whitewater use of the Tuolumne River varies considerably from year to year. Over the last 10 years, an average of 6,000 people per year boated on the river. In recent years, use has been limited by the water release schedules from Hetch Hetchy Reservoir and Lake Lloyd. In 2005, water releases were halted on August 21 so that maintenance could be performed on upstream dam facilities. According to commercial boaters, many additional river trips would otherwise have occurred on the Lumsden Run. In 2001, during the height of the California energy crisis, water releases were only delivered between July 2 and August 11. The shortened rafting season resulted in many trip cancellations during June and later in August and early September of that year.

TABLE 5.3.8-3
ANNUAL BOATER USE ON THE TUOLUMNE RIVER
(1984–2005)

Year	Lumsden Run			Cherry Creek Run			Total		
	Commercial	Private	Total	Commercial	Private	Total	Commercial	Private	Total
1984	3,751	4,410	8,161	86	390	476	3,837	4,800	8,637
1985	3,536	3,540	7,076	366	620	986	3,902	4,160	8,062
1986	3,729	3,240	6,969	90	290	380	3,819	3,530	7,349
1987[a]	–	–	–	–	–	–	–	–	–
1988	1,778	1,605	3,383	37	410	447	1,815	2,015	3,830
1989	2,725	2,469	5,194	138	428	566	2,863	2,897	5,760
1990	3,012	2,120	5,132	169	519	688	3,181	2,639	5,820
1991	2,049	2,437	4,486	123	506	629	2,172	2,943	5,115
1992	2,801	2,164	4,965	218	664	882	3,019	2,828	5,847
1993	4,149	3,051	7,200	182	564	746	4,331	3,615	7,946
1994	3,641	3,323	6,964	294	1,169	1,463	3,935	4,492	8,427
1995	2,940	1,829	4,769	141	560	701	3,081	2,389	5,470
1996	3,095	2,600	5,695	141	614	755	3,236	3,214	6,450
1997	3,722	3,181	6,903	264	1,297	1,561	3,986	4,478	8,464
1998	2,729	1,572	4,301	102	964	1,066	2,831	2,536	5,367
1999	3,087	1,858	4,945	111	593	704	3,198	2,451	5,649
2000	4,446	2,615	7,061	254	1,282	1,536	4,700	3,897	8,597
2001	1,676	1,344	3,020	164	1,071	1,235	1,840	2,415	4,255
2002	2,999	2,211	5,210	150	1,311	1,461	3,149	3,522	6,671
2003	2,639	1,676	4,315	140	730	870	2,779	2,406	5,185
2004	2,634	1,899	4,533	161	513	674	2,795	2,412	5,207
2005	2,516	1,302	3,818	109	362	471	2,625	1,664	4,289
Average (1995–2005)	**2,953**	**2,008**	**4,961**	**158**	**845**	**1,003**	**3,111**	**2,853**	**5,964**

[a] Drought conditions prevented whitewater recreation in 1997.

SOURCE: USFS Groveland Ranger District, 2006b.

The majority of Tuolumne River whitewater recreation occurs on the Lumsden Run; only 17 percent of whitewater users boated the Cherry Creek Run. Since many visitors take multiple day trips down the Lumsden Run, this run accounts for an even greater proportion of whitewater recreation user days. The length of stay for both private and commercial users on the Lumsden Run averages 1.8 days. Between 1995 and 2005, the total whitewater user days on the Tuolumne River averaged 9,930 per year, of which the Lumsden Run accounted for 90 percent of the user days.

The majority of whitewater river use on the Tuolumne is by rafters. Only limited statistics on kayak use are available, but the number of annual commercial kayak trips is very small (Welch, 2006). In 2005, total kayak use among private users was approximately 44 percent, which is equivalent to 17 percent of all boaters. Although late summer rafting use was reduced due to the cessation of water releases in late August 2005, this proportion of kayak use is considered generally representative of typical river use.

A USFS analysis of Tuolumne River whitewater recreation between 1980 and 2000 concluded that total boater use on the Lumsden Run appeared to be stable, although use fluctuated considerably from year to year. Private boater use on the Lumsden Run was found to be decreasing. Over the 20-year study period, boating use was found to be relatively evenly split between commercial and private users, although since 1992 commercial use has been consistently higher than private use (this trend continued through 2005) (Norman, 2001). Between 1998 and 2000, the analysis also found commercial use to be about 30 percent higher than private use. This trend has also generally continued in the subsequent years.

While the USFS determined there were no statistically significant trends in total use (as can be seen in Table 5.3.8-3), peak use levels (6,900 users or more) have been attained periodically over the last 20 years (1984–1986, 1992–1993, 1997, and 2000) that are far higher than the average use levels between 2001 and 2005. Over the last five years, total use of the Lumsden Run has averaged 4,180 users. While reductions in river flows and releases have contributed to lower use numbers, a reduction in Groveland ranger staff since 1999 has significantly reduced permit compliance monitoring at Meral's Pool. Therefore, actual private boater levels may be significantly higher than reported. USFS analysis for a comparable management situation in Georgia determined that additional non-permit use was about 25 percent of permit use levels (Norman, 2001).

For the Cherry Creek Run, private use was found to be steadily increasing, while commercial use remains limited and stable.

The USFS statistical analysis found no significant correlation between seasonal flow averages and the private or commercial use levels for either of the two runs. However, this analysis did not examine actual daily flow levels. On high-demand weekend days, flow levels could affect user demand. However, only limited monthly river use data are available from the USFS. **Table 5.3.8-4** shows the reported monthly private boater use on the Lumsden and Cherry Creek Runs.

TABLE 5.3.8-4
PRIVATE BOATER USE BY MONTH
(1990–2002)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Lumsden Run													
May	598	783	868	515	841	76	231	321	268	273	283	297	345
June	783	786	678	476	812	255	603	757	110	204	500	47	706
July	395	582	459	839	678	246	850	901	217	821	813	680	576
August	165	286	0	614	471	887	443	850	752	407	635	320	547
September	21	0	0	302	111	365	226	303	225	153	384	0	34
Total	**1,962**	**2,437**	**2,005**	**2,746**	**2,913**	**1,829**	**2,353**	**3,132**	**1,572**	**1,858**	**2,615**	**1,344**	**2,208**
Cherry Creek Run													
May	139	48	14	5	0	0	0	0	10	0	0	40	12
June	149	112	176	263	0	0	0	8	0	6	0	33	60
July	159	213	186	44	298	0	132	450	0	206	422	555	385
August	68	116	288	224	413	297	292	433	395	194	421	443	718
September	4	17	0	291	69	263	190	406	559	193	433	0	136
Total	**519**	**506**	**664**	**827**	**780**	**560**	**614**	**1,297**	**964**	**599**	**1,276**	**1,071**	**1,311**

SOURCE: USFS Groveland Ranger District, 2006b.

The USFS analysis determined that the highest private boater demand for whitewater recreational use of the Lumsden Run occurred in drier years earlier in the season (typically May through July), while in wet years, the highest demand occurred in the summer during the months of July and August. However, rather than reflecting user preferences, this finding may simply represent the availability of adequate water flows for recreational use of the river.

Commercial Rafting. Commercial rafting on the Tuolumne River began in the 1970s under permits issued by the Stanislaus National Forest. Commercial use of both the Cherry Creek and Lumsden Runs is allowed only through special-use permits issued by the USFS. There are seven commercial outfitters permitted to operate commercial rafting trips down the river. Total commercial use by these outfitters is limited to two commercial trips per day. Each of these trips is limited to a maximum of 26 passengers (each trip typically includes six guides, so there are 20 customers per commercial trip). The Groveland Ranger District is responsible for administration and oversight of the commercial operators. Although a few commercial trips are taken down Cherry Creek Run each year, the vast majority of commercial rafting occurs on the Lumsden Run (approximately 95 percent of passengers). Furthermore, since many of the commercial trips are multiday trips, an even greater proportion of the commercial operators' revenues are based on Lumsden rafting trips (USFS, 2007b).

Most of the rafting companies also operate trips on other rivers in California, although a few are small companies that primary rely on Tuolumne River trips for the majority of their business. Several of the Tuolumne operators are large rafting companies that offer river trips throughout the West and even internationally.

Commercial use has declined in recent years, in part due to the reduced water releases and flow conditions. Between 2001 and 2005, commercial use of the Tuolumne River averaged 2,640 boaters and 4,620 user days, which represents a decrease of approximately 15 percent from the 1995 to 2005 average commercial boating levels of 3,111 users (see Table 5.3.8-3).

Private Rafting. Rafters wishing to run the Lumsden and Cherry Creek Runs are required to obtain a private boater permit by telephone or in person from the USFS Groveland Ranger Station. Permits can be booked in advance and are limited to a maximum of 90 people launching per day for the Lumsden Run. There are currently no limits on private use of the Cherry Creek Run.

Private use has declined in recent years, in part due to the reduced water releases and flow conditions. Between 2001 and 2005, private boater use of the Tuolumne River averaged 2,485 passengers and 3,760 user days. During that period, private boater use of the Lumsden Run averaged 1,690 passengers and 2,960 user days. This recent decline in total private boaters is about 13 percent of the 1995 to 2005 average levels.

Other Water and Off-Water Recreational Resources

In addition to whitewater use, recreationists also hike, camp, and fish within the Tuolumne River above Don Pedro Reservoir. While a major proportion of whitewater users participate in these other recreational activities as part of their trip, many park visitors come solely to enjoy the area's non-whitewater resources. Due to its relatively remote location, many visitors camp overnight in the area as part of their trip. The majority of camping along this section of the Tuolumne River occurs at designated sites. There are three developed campgrounds along the National Forest portion of the Wild and Scenic Tuolumne River corridor. Camping is free, but the campgrounds are only open from April to October. Access to the three developed campgrounds is via a five-mile-long steep dirt road that is unsuited to trailers or motor homes. The Lumsden Bridge Campground offers the farthest upstream opportunity for developed camping. There are nine campsites, two vault toilets, grills, and tables for users at the campsite. The South Fork Campground, located near the confluence of the Tuolumne River and its south fork tributary, is approximately two miles below the Lumsden Bridge Campground site. The South Fork Campground has eight campsites, two vault toilets, grills, and tables for users. The Lumsden Campground is located a mile downstream of the South Fork Campground and consists of 11 campsites with grills and tables. There are also four vault toilets at the site.

Over a dozen undeveloped campsites are dispersed along the Tuolumne River below the Meral's Pool launch site. These sites are used by whitewater boaters as well as hikers in the area. However, hiking use along the river within most of the Tuolumne River valley is relatively limited, since there are no improved trails and the hiking conditions are difficult.

Below Hetch Hetchy Reservoir, the principal hiking trails along the Tuolumne River are the Preston Flat and Tuolumne River Canyon Trails. The Preston Flat Trail parallels the north side of the Tuolumne River upstream from the Early Intake. The trail is 4.5 miles long and is of average difficulty, with an elevation gain of 400 feet over its course. The trail generally runs near the riverside and is predominantly used by anglers to access the river. Most trail use occurs at the start of the trout season and during the late spring and early summer, when wildflowers are present and the weather is not too hot. However, even during the most popular periods, trail use is typically only about 30 to 40 visitors per day. While the canyon is generally sparsely forested, sections of the north side are moderately to densely vegetated, especially near the river's edge (USFS, 2006b).

The Tuolumne River Canyon Trail is considerably more strenuous and hiked less frequently. The trail starts a half mile from the Lumsden boat launch and follows the south side of the Tuolumne River down to its confluence with the Clavey Trail. The trail is six miles long and generally runs along the canyon sides several hundred feet above the riverbed. The steep slopes of the canyon are sparsely vegetated, although during the late spring and early summer wildflowers cover much of the hillsides.

The area's visual resources generally consist of a narrow and rocky riparian valley with limited vegetation. Much of the mostly steep-walled, V-shaped canyon is bare of vegetation. Some trees grow within the narrow floodplain on the river's edge. Along much of the river's course, a narrow band of trees stands along the riverside, while larger groupings of trees and other vegetation are occasionally present at the outer bends for river where adequate river sediment has accumulated. When the river contains sufficient flow, it provides an abundant variety of water forms, including rapids, cascades, waterfalls, and pools. When flow is sufficient, these water forms as well as the dramatic geological formations define the visual setting throughout most of the Tuolumne River's course.

Don Pedro Reservoir and Recreation Area

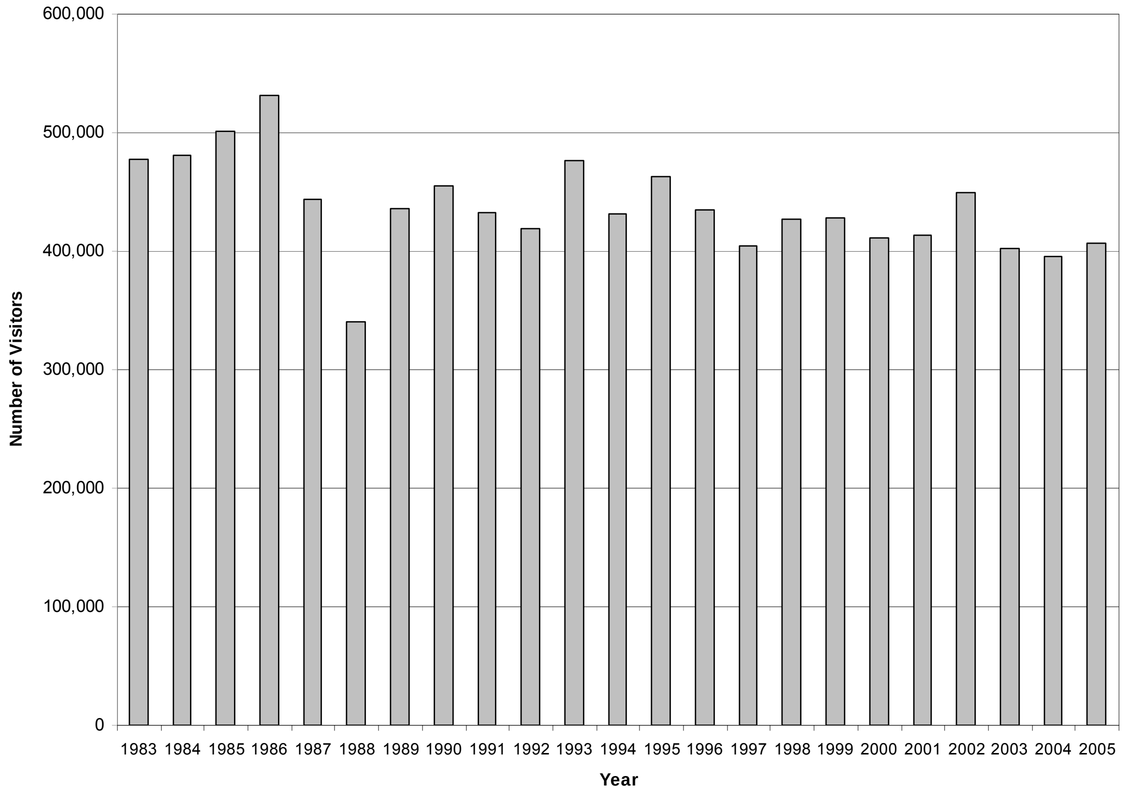
The Don Pedro Reservoir and Recreation Area is located on the Tuolumne River near the western border of Tuolumne County. The reservoir is primarily managed by the Don Pedro Lake Recreation Agency and TID. The Don Pedro Recreation Agency is an independent agency supervised by a board of directors made up of representatives from the TID, MID, and SFPUC. TID provides administrative support and day-to-day supervision. The reservoir provides 160 miles of shoreline and 13,000 surface acres of water at its maximum pool elevation of 830 feet above mean sea level (msl). Don Pedro Reservoir is the fifth largest reservoir in California.

Water recreation at Don Pedro Reservoir includes boating, swimming, waterskiing, jet skiing, windsurfing, sailing, house-boating, fishing, and boat-in camping. Boat launch facilities are located at the Fleming Meadows Recreation Area on the southern shoreline, Blue Oaks Recreation Area on the southwestern shoreline, and Moccasin Point Recreation Area on the northeastern arm of Moccasin Bay. Two full-service marinas (i.e., with docks, boat slips, mooring areas, and provisions) are located at the Flushing Meadows and Moccasin Point Recreation Areas. In addition, there are 257 privately owned houseboats and 20 rental houseboats on Don Pedro Reservoir (USBR, 1999).

Boating and waterskiing take place throughout the reservoir; swimming occurs mainly at the Fleming Meadows swimming lagoon, a two-acre pool separated from the main reservoir. The lagoon has a maximum depth of 6 feet and is surrounded by a sandy beach area. Anglers fish from the shore and boats, mainly for non-native bass, trout, salmon, crappie, bluegill, and catfish. The CDFG plants the lake with species such as brook trout from the San Joaquin River Hatchery, and sub-catchable rainbow and brown trout from the Moccasin Creek Hatchery, which is upstream from Don Pedro Reservoir on Moccasin Creek.

Off-water recreation at Don Pedro Reservoir includes picnicking, camping, and sightseeing. There are a total of 550 campsites at the Fleming Meadows, Blue Oaks, and Moccasin Point Recreation Areas (Don Pedro Recreation Agency, 2007). Don Pedro is by far the largest and most popular recreation destination along the Tuolumne River system. **Figure 5.3.8-5** shows visitation at Don Pedro Reservoir since 1983. Annual visitation at the reservoir is typically more than 400,000 visitors, and even exceeded half a million in 1985 and 1986. Between 1983 and 1999, average reservoir visitation averaged approximately 446,000 per year. However, visitation has declined slightly since that time, averaging approximately 413,800 since 2000. Don Pedro Reservoir attracts considerable visitation from the Bay Area and Sacramento, and many visitors stay for several days or a week at a time (Jackson, 2006).

Beach use at Don Pedro Reservoir generally begins to decline once its elevation falls below 790 feet msl (i.e., 40 feet below its maximum pool elevation of 830 feet msl). Use of the reservoir



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SOURCE: Don Pedro Recreation Agency, 2006.

Figure 5.3.8-5
Don Pedro Reservoir Annual Visitation

declines moderately until the 750-foot level, below which use then begins to decrease more considerably. The Fleming Meadows boat ramp is out of operation when water levels fall below 600 feet msl (minimum pool). Between 710 feet and 600 feet msl, five of the reservoirs boat ramps are lost. The Moccasin Point boat ramp cannot be used below an elevation of 722 feet msl, and the Blue Oaks boat ramp cannot be used below 726 feet msl. The Fleming Meadows and Moccasin Point marina operations are limited when water levels fall below 600 and 630 feet msl, respectively. The swimming lagoon is used at all reservoir water surface elevations because it is separated from the main reservoir, and water is pumped from the reservoir into the lagoon to maintain water levels (USBR, 1997).

Don Pedro Reservoir's visual setting is characterized by its numerous long expanses of flatwater that stretch through a series of narrow valleys and inlets. The Sierra Nevada foothills surround the reservoir, rising gradually from its shoreline and giving wide and open views. The hillsides are largely covered by trees interspersed with grassland areas that remain unvegetated during the dry summer months. As the water level falls, an unvegetated ring around the entire reservoir is clearly visible.

Stanislaus County

The Tuolumne River continues through Stanislaus County for approximately 52 miles below Don Pedro Reservoir to the confluence with the San Joaquin River. This reach crosses mainly private open space and grazing lands, City of Modesto property, and several public parks. The principal recreational resources related to the Tuolumne River are described below.

Water recreation includes fishing, boating, rafting, and some swimming. These activities are dispersed along the river corridor and primarily depend on the availability of river access. No single public agency has comprehensively estimated recreational use along the river and, as a result, there is very limited recreation data for this reach of the river. Nonetheless, as with most recreational activities, summer is the peak season, and the majority of use occurs between Memorial Day and Labor Day. During the nonpeak season, winter and early spring use of the river is very limited.

The primary game fish in this stretch of the Tuolumne River are rainbow and brown trout, largemouth and smallmouth bass, striped bass, and Chinook salmon. The fishing season is from late April to mid-October; anglers are required to use barbless hooks and to release their trout catches, and are permitted to keep one salmon if it is caught in the lower reaches of the river. Between mid-October and the end of December, the CDFG increases enforcement of its fishing regulations at popular local fishing sites to protect the winter salmon run (CDFG, 2006a). The USBR has determined flow thresholds for boating recreation on the lower Tuolumne River. According to the USBR, the optimal flow range for boating activities is from 400 to 700 cfs. For swimming use, the optimal flows are between 200 and 600 cfs. Critical flows for power boating on the river occur below 500 cfs, and for canoeing and kayaking occur below 150 cfs (USBR, 1999).

La Grange Regional Park

La Grange Regional Park consists of 700 acres at 11 different sites, including an off-highway vehicle park, a Kiwanis Youth Camp, and the Joe Domecq Wilderness Area. The park has a boat ramp and a riverside picnic area as well as 225 acres of mostly undeveloped river plain areas along the Tuolumne River. Other park facilities include parking, restrooms, gravel beach area for swimming, trails and pathways, and handicapped access. Overnight camping is prohibited within the park. The majority of fishing and other river-related uses within the park take place at the Basso Bridge site, where there are approximately two acres of parkland on the river. Fishing at the river is prohibited between mid-October and the end of December to protect adult spawning salmon (Stanislaus County Department of Parks and Recreation, 2006). The visual setting of La Grange Regional Park is characterized by wide forested floodplain terraces, with some open space and turf areas. The river runs wide along major portions of its course downstream. Other parts of the park include less vegetated areas located on the dredge tailings from former gold mining operations (mostly on the northern side of the river).

Turlock Lake State Recreation Area

Turlock Lake State Recreation Area is located on the south side of the Tuolumne River, approximately 25 miles east of Modesto. Turlock Lake has 26 miles of shoreline and a surrounding area of 228 acres that is leased from TID. All of the park's 63 campsites are located in the northern area overlooking or near the Tuolumne River. Although no recreational vehicle hookups are provided, the campsites can accommodate 27-foot vehicles; each site is equipped with a grill, table, and food locker and is near to potable water, showers, and flush toilet facilities (California Department of Parks and Recreation, 2006). The park's annual visitation over the last few years has been approximately 69,000 visitors, of which more than three-quarters were day users.

There is about a mile of Tuolumne River shoreline within the park; however, the majority of the park's recreational facilities and opportunities are located lakeside. While park users can access the river, there is no beach area and most visitors instead recreate at the lake. Relatively few park visitors fish in the river due to CDFG regulations, which do not apply on the nearby Lake Turlock. The primary river-related recreation at the park occurs during the late summer, when park visitors occasionally "float" the river with inflatable rafts or inner tubes. In contrast, Turlock Lake offers a wide range of recreational opportunities, including camping, fishing, picnicking, swimming, boating, and water skiing. Lakeside recreational facilities consist of two formal picnic areas (each with nearby parking and toilet facilities), a boat launching ramp, and a swim area (although no lifeguards are on duty). As a result, the majority of the non-camping recreational use is lake-related.

The park's visual setting is similar to that of La Grange Regional Park, comprising a primarily open view of the flat, forested river floodplain within mostly undeveloped land. The river and its adjacent sloughs are forested by numerous native tree species, including interior live oak, cottonwood, and white alder. The broad riparian areas are also vegetated with underbrush that provides habitat for many birds and animals.

Fox Grove Regional Park

Fox Grove Regional Park encompasses approximately 64 acres along a one-mile river frontage, providing fishing access to the Tuolumne River. The park has a boat ramp, river access, barbecues, and picnic tables, and disabled access to the park is provided. The river runs deeper at Fox Grove than at the area's other popular river and fishing access site at Basso Bridge; as a result, flat-bottomed boat use is typically allowed at Fox Grove throughout the summer. Public access to the site is generally prohibited by the Stanislaus County Department of Parks and Recreation between mid-October and the end of December to protect the winter salmon run (Stanislaus County Department of Parks and Recreation, 2006). The visual setting at Fox Grove Regional Park is very similar to that at Turlock Lake State Recreation Area.

Tuolumne River Regional Park

The proposed Tuolumne River Regional Park lies along a seven-mile stretch of the Tuolumne River and encompasses approximately 500 acres of land (EDAW, 2005). Stanislaus County, the City of Modesto, and the City of Ceres have partnered to commence development of this project, and park plans are currently in environmental review. The majority of the parkland is located on the north side of the river, with the exception of Mancini Park and a series of small, riverfront parcels near the western end of the park.

Approximately 180 acres of the parkland has already been developed for recreational purposes, including open lawn areas within mature tree canopies as well as park amenities (e.g., park benches, picnic tables, trails, restrooms, and parking areas). The Dryden and Modesto Municipal Golf Courses are included as part of the city of Modesto's greenway areas for the park. The privately owned River Oaks Golf Course is also located along the southern bank of the river east of the Modesto Airport. However, recreational use of these golf courses is sport-focused and therefore non-river-related.

The eastern section of the park near the Modesto Airport is already developed for park use. The neighboring 50-acre Legion Park has mowed lawns, picnic tables, barbecue sites, and restrooms and is occasionally used for community special events such as the annual Cinco de Mayo celebration and Scottish Games. Mancini Park is located on the southern bank of the river and consists of 25 acres, including a children's play area, ball field, restrooms, and parking area. There is no river access from the park, and the remaining 320 acres are unimproved open space. The developed parkland areas include open space and turfed areas with scattered trees that provide shade. Sections of the park are heavily vegetated by trees and underbush that hide much of the nearby housing and other urban development. However, the majority of the undeveloped areas contain little vegetation, with much of the land consisting of denuded open or disked farmland (Tuolumne River Regional Park, 2007).

Future development of the park, proposed under the *Tuolumne River Regional Park Master Plan*, aims to restore a continuous riparian corridor along the river as well as develop a riverside bicycle and pedestrian trail. The plan also proposes to add river access at Legion Park and develop a regional sports complex in the Carpenter Road area (although this development is to be planned and approved separately from the master plan). The majority of the master plan's future park improvements would be located at the Gateway parcel site. These planned improvements include a river promenade trail and internal trail system, multi-use meadows suitable for community events and informal park activities, wetland areas for stormwater runoff, removal of Dennett Dam, a pedestrian bridge connection to the western parkland across Dry Creek, new parking, an "amphimeadow" (a grassy, outdoor amphitheater within a natural, meadow-like setting), and river access piers. Special events at the amphimeadow, construction of the river piers, and Dennet Dam removal are planned as subsequent projects to the master plan.

5.3.8.2 Impacts

Significance Criteria

The CCSF has not formally adopted significance standards for impacts related to recreational and visual resources, but generally considers that implementation of the proposed program would have a significant impact if it were to:

Recreation

- Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated (Secondary impacts of growth are evaluated in Chapter 7, Growth-Inducement Potential and Indirect Effects of Growth)
- Include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment (Secondary impacts of growth are evaluated in Chapter 7)
- Physically degrade existing recreational resources

The first two criteria do not apply to the analysis of the proposed water supply and system operations component of the WSIP presented in this section of the PEIR, because these components of the proposed program would not increase the use of existing parks, nor would they require the construction or expansion of recreational facilities. Therefore, only the third criterion (potential physical degradation of existing recreational resources) is considered in the impact analysis below. The physical degradation of existing resources could occur if the WSIP were to:

- Remove or damage existing recreational resources
- Cause environmental impacts (such as air quality or noise effects) that would indirectly result in deterioration in the quality of the recreational experience
- Disrupt access to existing recreational facilities (which would divide a community from some of the established amenities used by its members)

While impeding a visitor's ability to participate in recreational activities does not in itself qualify as an environmental effect under CEQA, visitor use impacts can serve as indicators of physical changes to a recreational resource.

For visual resources, significant impacts could occur if the WSIP were to:

Visual Quality

- Have a substantial adverse effect on a scenic vista
- Substantially damage scenic resources, including but not limited to trees, rock outcroppings, and other features of the built or natural environment, that contribute to a scenic public setting
- Substantially degrade the existing visual character or quality of the site and its surroundings

Approach to Analysis

The analysis of impacts on recreation generally distinguishes between recreational activities associated with the rivers and reservoirs (e.g., swimming, boating, and fishing) and off-water recreation (e.g., hiking, picnicking, and camping). However, recreational activities are not separately identified, except for whitewater rafting, which is discussed separately and in greater detail due to the potential magnitude of impacts and the unique factors related to this recreational use of the Tuolumne River.

River-related recreational use within the Tuolumne River system predominantly occurs during the summer season between Memorial Day and Labor Day. In addition, there are relatively short shoulder seasons after mid-April and late October. During the off-season from November to mid-April, there is very limited river-related recreational use. Therefore, the primary focus of this impact analysis is on the summer season, when the majority of recreational activity occurs.

This analysis also considers potential visual impacts of the WSIP. Due to the Tuolumne River's limited accessibility and visibility, any visual or aesthetic changes to the river would predominantly affect recreation users; therefore, this analysis evaluates potential program-related changes in the quality of the visual experience for recreation users. The predominant visual effect that could occur at reservoirs under the WSIP involves the "bathtub ring" at reservoirs that are also used for recreational purposes. The bathtub ring refers to the exposed shoreline below the maximum water surface elevation, which is usually devoid of vegetation. This effect is a normal and unavoidable occurrence at reservoirs as water levels decline. Nonetheless, the WSIP would reduce reservoir water levels for longer periods and thus could diminish aesthetic values at program area reservoirs. The magnitude, incidence, and duration of future changes in the reservoirs' aesthetic values are qualitatively assessed as part of this analysis.

As noted above, the changes in river recreation that could result from the WSIP are consequences of changes in stream flow and reservoir water levels. These WSIP-induced changes in stream flow and reservoir water levels were estimated using the HH/LSM. An overview of the model is presented in Section 5.1. Detailed information on the model and the assumptions that underlie it is provided in Appendix H.

Impact Summary

Table 5.3.8-5 presents a summary of the impacts on recreational and visual resources in the Tuolumne River system that could result from implementation of the proposed water supply and system operations.

**TABLE 5.3.8-5
SUMMARY OF IMPACTS –
RECREATIONAL AND VISUAL RESOURCES IN THE TUOLUMNE RIVER SYSTEM**

Impact	Significance Determination
Impact 5.3.8-1: Effects on reservoir recreation due to changes in water system operations	LS
Impact 5.3.8-2: Effects on river recreation due to changes in water system operations	LS
Impact 5.3.8-3: Effects on the aesthetic values of the Tuolumne Wild and Scenic River	LS

LS = Less than Significant impact, no mitigation required

Impact Discussion

Impact 5.3.8-1: Effects on reservoir recreation due to changes in water system operations.

Lake Eleanor

The WSIP would have very little effect on water levels or water quality in Lake Eleanor, as described in Sections 5.3.1 and 5.3.3. Therefore, recreational impacts at Lake Eleanor would be less than significant.

Hetch Hetchy Reservoir

The WSIP would result in an average monthly lowering of reservoir water levels by an additional 1 to 10 feet over the course of the year compared to the existing condition. During the primary recreation season (between Memorial Day and Labor Day), the WSIP-related decrease in reservoir depth would be less than 5 feet from current levels except in critically dry years, when up to a 10-foot drop in reservoir levels would be expected. In average wet to normal hydrologic years, no change in reservoir levels would occur during the months of May through July; therefore, under these conditions, no recreational impact would result.

Off-water activities such as hiking and camping are the predominant recreational use at Hetch Hetchy Reservoir, since no swimming or boating is permitted. During the summer season for non-dry years, the drop in reservoir levels would increase the size of the “bathtub ring” visible to hikers by up to 4 feet; however, this increase would not likely be perceptible to most hikers, even in foreground views. Furthermore, during most of the year, Hetch Hetchy Reservoir would appear as it does a week or so earlier under current operating conditions. Between October and late December, visual conditions at the reservoir would be typical of those seen a month later under current conditions.

Only during the period between January and March would average reservoir levels at Hetch Hetchy fall lower than they normally do under the current operating conditions. On average, the maximum extra decrease in reservoir depth would be 10 feet in March, which would represent an approximate 15 percent increase to the reservoir’s current average 65-foot drawdown. This additional drawdown could be noticeable in foreground views; however, in views across the reservoir, the increase would likely be imperceptible to most hikers. This visual impact would only occur during the off-season, when visitation to the reservoir is low. Furthermore, the bathtub ring is a typical feature of an operating reservoir and would be a familiar sight for hikers at the reservoir. Therefore, recreational impacts at Hetch Hetchy Reservoir would be less than significant.

Lake Lloyd

The potential WSIP-related impacts on Lake Lloyd would be limited. During normal and below-normal hydrologic years, no changes in the reservoir’s current operations would occur, and no recreational impacts would result.

During wet or above-normal hydrologic years, future reservoir depths would generally be reduced by 1 or 2 feet; this reduction in the reservoir’s depth (less than 1 percent) would be imperceptible to recreational users. Furthermore, no reservoir level reductions would occur during the months of June through September, when the majority of the recreational use occurs. Therefore, no impacts on recreation would result.

During the summer season of critically dry hydrologic years, Lake Lloyd's depth would be expected to decrease by a maximum of 3 or 4 feet from current levels. However, this drop in reservoir levels (less than 2 percent) would be imperceptible to water and off-water recreational users. Furthermore, the conditions for fish species inhabiting the lake would not be affected by the WSIP. These non-native fish species are acclimated to the water-level fluctuations that occur in the reservoir, and thus impacts on the lake's recreational fishery are expected to be less than significant. Use of Lake Lloyd by other water recreationists for swimming or boating would also not be impaired. Therefore, recreational impacts at Lake Lloyd would be less than significant.

Don Pedro Recreation Area

With an average of more than 400,000 visitors a year, Don Pedro Reservoir is the most popular recreational resource in the Tuolumne River system that could be affected by the WSIP. The program's proposed increase in water withdrawals from the Tuolumne River would result in lower reservoir levels, varying on average up to 4 to 6 feet lower during above-normal or wet hydrologic years over the course of the year.

During below-normal, dry, and critically dry hydrologic years, water levels in Don Pedro Reservoir would be expected to fall up to 7 to 10 feet below current levels during the May to September recreational season. The reservoir's full depth is 530 feet (with a dead pool depth[2] of 230 feet below the maximum pool level). The average decrease in water levels from current levels would be less than 1 percent, and the decrease during dry years would be approximately 2.1 percent. Given the large annual fluctuation in the reservoir's depth both during the year and between years, these decreases in reservoir levels are likely to be barely perceptible to most recreational users. Water level changes are more likely to be noticed by on-water recreational users than by off-water recreationists at the reservoir.

Past recreational studies of Don Pedro Reservoir identified a threshold of 490 feet (i.e., a 40-foot decrease from the maximum elevation) below which recreational use of the beaches declined. However, only at levels below 450 feet (i.e., 80 feet below maximum pool) would recreational use decrease considerably. All of Don Pedro's recreational facilities nonetheless remain fully operational until the reservoir depth falls to 426 feet (i.e., 104 feet below maximum pool), at which point the Blue Oaks boat ramp is no longer operational, and 422 feet (i.e., 108 feet below maximum pool), at which point the Moccasin Point boat ramp is no longer operational (USBR, 1997). Critical thresholds are also reached when water levels decrease to the point that reservoir water levels recede from hiking trails, campsites, and picnic areas. A water-level decrease below the 426-foot threshold would impair use of the lake and limit reservoir access.

Under the proposed water withdrawal schedule (as shown in **Figure 5.3.8-6**), even at its lowest levels during the months of October and November, Don Pedro Reservoir would typically remain

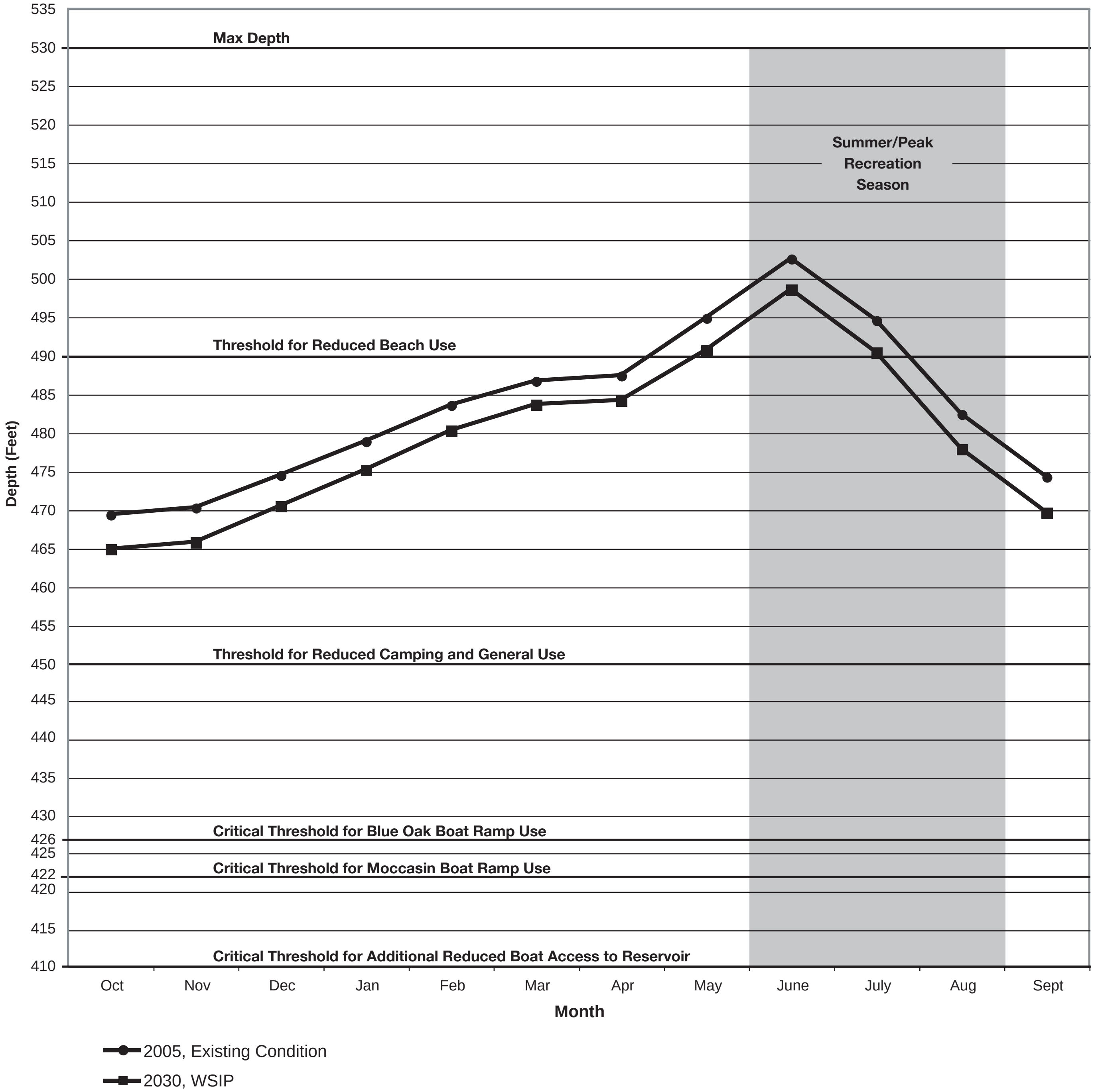
2 Dead pool is the depth beyond which the reservoir cannot be drained.

more than 15 feet above the 450-foot threshold, below which recreational use would begin to decline significantly. Average annual reservoir levels would be 490 feet or above during the summer months of June and July, when the majority of recreational use occurs; this level is more than 40 feet above the threshold for significant recreation impacts and 64 feet above facility-use impacts. In August, the reservoir's levels would typically fall an additional 4 feet with the WSIP, but would still be 488 feet—well above the 450 foot-threshold level. Because future reservoir levels in most years are expected to remain well above the threshold for adverse effects on recreational visitation, no significant impacts on recreational use at Don Pedro Reservoir are expected.

However, following a succession of dry years, the reduction in summer storage in Don Pedro Reservoir could increase the likelihood of adverse recreation impacts. Effects on Don Pedro's water levels associated with WSIP operational changes for the summer recreation season (i.e., June through August) were projected based on the available 82-year hydrologic record. Currently, out of 82 years, there were 13 months during the summer period (June through August) when water levels at Don Pedro Reservoir would have been below the 426-foot threshold (at which the Blue Oaks boat ramp becomes unusable). Under the proposed program, the incidence would increase to 24 summer months over the 82-year period. The 12-month increase represents an approximate doubling in the amount of time boat ramp facilities would be physically impaired (equivalent to 1 out of every 20 years). However, at reservoir depths below the 450-foot threshold, boat ramp use would be reduced but would continue to be possible. At 422 feet, the Moccasin Point ramp would not be usable. Another boat ramp access point would be unavailable at 410 feet. Currently, reservoir levels would fall below this threshold a projected 9 summer months out of 82 years. Under the WSIP, future Don Pedro levels would fall below this threshold for 13 summer months—an increase of 4 months.

Therefore, future operations under the WSIP are expected to reduce access to boating facilities. However, given the limited frequency of the impacts (which would occur only in extended drought periods) and the limited lost boating ramp use (since both marinas and most boat ramps would continue to function adequately), the impact on boating due to Don Pedro's increased vulnerability to drought effects would be less than significant.

Recreational fishing would not be affected by the WSIP, as the non-native fish populations in Don Pedro Reservoir can tolerate the changes in reservoir levels. Largemouth bass and bluegill, which are a popular catch for anglers, use the lakeshore as spawning ground during the springtime; however, effects on fishing as a result of the WSIP would be less than significant.



SFPUC Water System Improvement Program . 203287

SOURCE: ESA, 2006

Figure 5.3.8-6
Don Pedro Reservoir Annual Average Reservoir Depth and Recreational Uses

Off-water activities such as hiking and camping are more indirectly related to reservoir levels. The program-related drop in reservoir levels would increase the size of the bathtub ring visible to hikers, campers, and other reservoir users by up to 7 feet in foreground views (i.e., during the summer season of drier-than-average hydrologic years). This increase would likely be noticeable only to reservoir users who are very familiar with the reservoir. Furthermore, during most of the year, Don Pedro Reservoir would appear as it does two weeks or so earlier under current operating conditions. Between October and late December, visual conditions at the reservoir would be typical of those seen a month later under current conditions.

Only during the period between October and November would average reservoir levels at Don Pedro fall lower than they do under current operations. The visual impact associated with the bathtub ring would occur in the off-peak season only, when visitation to the reservoir is low. On average, the decrease in reservoir depth would be approximately 4 feet, which would represent a less than 10 percent increase in the reservoir's current average 45-foot drawdown over the year. This additional drawdown could be noticeable in foreground views; however, in views across the reservoir, the increase would not likely be very noticeable to most reservoir users. Furthermore, the bathtub ring is a typical feature of an operating reservoir and would be a familiar sight for frequent visitors to the reservoir. If fish were spawning along the reservoir shoreline during the spring, the increase in reservoir drawdown would have the potential to affect only a limited number of spawning grounds. Therefore, recreational impacts at Don Pedro Reservoir associated with WSIP operational changes would be less than significant.

Summary of Impacts

Overall, implementation of the proposed WSIP water supply and system operations would result in *less than significant* impacts on reservoir recreation.

Impact 5.3.8-2: Effects on river recreation due to changes in water system operations.

Diversion of additional water from the Tuolumne River as a result of the WSIP could affect the availability of water for whitewater rafting uses in the upper reaches of the river. It could also decrease stream flow in lower reaches of the river, thereby reducing opportunities for (and the quality of recreational experiences at) existing and planned parks and recreational facilities located at the river's edge, such as the Tuolumne River Parkway, a 500-acre parkway to be sited along a seven-mile stretch of the Tuolumne River in the Modesto area.

Whitewater Recreation

Hetch Hetchy Reservoir and Lake Lloyd are usually drawn down to their seasonal minimum in the spring. The SFPUC captures some of the late spring/early summer snowmelt runoff to refill the reservoirs and releases the rest to the Tuolumne River and Cherry Creek.

Flow in the Tuolumne River just below the confluence with Cherry Creek, and just downstream of the launching point for the Cherry Creek whitewater run, consists of releases and spills from

Hetch Hetchy Reservoir, Lake Lloyd, and Lake Eleanor; releases from Holm and Kirkwood Powerhouses; and tributary flow. Flow at this location is at its seasonal minimum in October. Flow typically increases through the winter and early spring and then increases sharply in the May and June with the snowmelt.

Hetchy Hetchy Reservoir would be drawn down farther in the spring with the WSIP than it is under the existing condition because diversions at Hetch Hetchy Reservoir would increase to meet 2030 water demand in the Bay Area. A greater proportion of the spring runoff would be needed to refill the reservoir than under the existing condition. As a result, with the WSIP, the onset of large releases from Hetch Hetchy Reservoir would be delayed by an average of one to two days (and up to eight days) and the total volume of releases would be reduced. After the large releases begin, releases during the rest of the year would be similar with the WSIP and under the existing condition.

Table 5.3.8-6 shows flows just below the Cherry Creek confluence under the existing condition and with the WSIP. The table slightly understates flow at this location because it does not include the small amount of inflow from tributaries between Hetch Hetchy Reservoir and Cherry Creek.

The WSIP would have very little effect on flow below the Cherry Creek confluence in wet and above-normal years. It would result in reductions in average monthly flow of up to 14 percent in May of normal, below-normal, and dry years. The reductions would manifest themselves as a delay in the onset of large snowmelt flows. This situation can best be illustrated with a simplified example. Under the existing condition, flow might be 1,000 cfs for the first five days in May and then 5,000 cfs for the remaining 26 days, for an average monthly flow of 4,354 cfs. With the WSIP, flow might be 1,000 cfs for the first 10 days of May and then 5,000 cfs for the remaining 21 days, for an average monthly flow of 3,709 cfs.

Currently, whitewater recreation on the upper river from mid-June through the summer is generally only possible due to SFPUC releases from Holm Powerhouse. For rafting flows, the SFPUC attempts to provide up to 1,100 cfs on the Tuolumne River at Lumsden for about four hours in the morning, from Monday through Saturday and on holiday weekends.

Tables 5.3.8-7 and **5.5.8-8** show flows in the Tuolumne River below the Cherry Creek confluence under the existing condition and with the WSIP for the 82-year hydrologic record. Although the flows shown in the tables understate actual flows at Lumsden Campground because they do not include tributary flows, they provide insight into the effects of the WSIP on whitewater rafting.

Under the existing condition and in May, the first month the weather is warm enough for whitewater rafting, flows below Cherry Creek would exceed 1,100 cfs in 74 years of the 82-year hydrologic record. A flow of 1,100 cfs in the Tuolumne River below Cherry Creek, and at least that at Lumsden Campground, would be suitable for rafting without a pulse release from Holm Powerhouse. With the WSIP and in May, flows below Cherry Creek would exceed 1,100 cfs in 72 years of the 82-year hydrologic record. Under the existing condition and in June, flows in the Tuolumne River below Cherry Creek would exceed 1,100 cfs in 64 years of the 82-year hydrologic

TABLE 5.3.8-6
ESTIMATED AVERAGE MONTHLY FLOWS IN THE TUOLUMNE RIVER IMMEDIATELY BELOW THE CHERRY CREEK CONFLUENCE UNDER VARIOUS CONDITIONS
(cubic feet per second)

	Wet		Above Normal		Normal		Below Normal		Dry		All	
Existing Condition (2005)												
Oct	264		181		198		169		207		203	
Nov	318		570		203		197		112		283	
Dec	1,135		775		511		430		357		641	
Jan	1,305		835		572		285		218		641	
Feb	1,351		1,345		1,086		539		462		956	
Mar	1,408		1,240		1,140		819		593		1,040	
Apr	1,540		1,546		1,370		1,296		911		1,335	
May	5,057		3,444		3,486		2,448		1,111		3,105	
June	7,742		5,398		3,648		1,887		636		3,857	
July	4,028		1,401		670		300		225		1,313	
Aug	609		307		300		273		242		345	
Sept	491		379		380		365		335		390	
Future with WSIP (2030)												
Oct	264		179		198		164		207		202	
Nov	318		563		203		197		112		281	
Dec	1,100		746		507		429		358		627	
Jan	1,290		853		603		278		216		646	
Feb	1,339		1,324		1,086		544		477		953	
Mar	1,406		1,276		1,141		857		617		1,060	
Apr	1,526		1,540		1,353		1,247		907		1,316	
May	4,920		3,359		3,221		2,239		960		2,936	
June	7,715		5,380		3,642		1,770		610		3,817	
July	4,028		1,401		670		312		219		1,314	
Aug	609		307		300		265		242		343	
Sept	490		379		380		361		321		386	
Difference and Percent Change, Existing Condition (2005) vs WSIP (2030)												
Oct	0	[0%]	-2	-[1%]	0	[0%]	-5	-[3%]	0	[0%]	-1	[0%]
Nov	0	[0%]	-7	-[1%]	0	[0%]	0	[0%]	0	[0%]	-2	-[1%]
Dec	-35	-[3%]	-29	-[4%]	-4	-[1%]	-1	[0%]	1	[0%]	-14	-[2%]
Jan	-15	-[1%]	18	[2%]	31	[5%]	-7	-[2%]	-2	-[1%]	5	[1%]
Feb	-12	-[1%]	-21	-[2%]	0	[0%]	5	[1%]	15	[3%]	-3	[0%]
Mar	-2	[0%]	36	[3%]	1	[0%]	38	[5%]	24	[4%]	20	[2%]
Apr	-14	-[1%]	-6	[0%]	-17	-[1%]	-49	-[4%]	-4	[0%]	-19	-[1%]
May	-137	-[3%]	-85	-[2%]	-265	-[8%]	-209	-[9%]	-151	-[14%]	-169	-[5%]
June	-27	[0%]	-18	[0%]	-6	[0%]	-117	-[6%]	-26	-[4%]	-40	-[1%]
July	0	[0%]	0	[0%]	0	[0%]	12	[4%]	-6	-[3%]	1	[0%]
Aug	0	[0%]	0	[0%]	0	[0%]	-8	-[3%]	0	[0%]	-2	-[1%]
Sept	-1	[0%]	0	[0%]	0	[0%]	-4	-[1%]	-14	-[4%]	-4	-[1%]

Note: The data represent the summation of releases to rivers/creeks from: Hetch Hetchy Reservoir, Lake Eleanor, Lake Lloyd, Holm Powerhouse, and Kirkwood Powerhouse. The flow data are incomplete and do not include accretions from the watersheds below the dams. These accretions would remain constant under all modeling scenarios. Actual Tuolumne River flow at the Cherry Creek confluence would be greater than the values presented.

Key
- (light blue) > 0%
- (yellow) < 0 to -5%
- (orange) < -5%

TABLE 5.3.8-7
FLOW IN THE TUOLUMNE RIVER IMMEDIATELY BELOW THE CHERRY CREEK CONFLUENCE UNDER EXISTING CONDITIONS (cubic feet per second)

YEAR TYPE	WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
W	1983	1,823	603	1,102	1,010	1,012	1,279	1,045	5,134	12,573	8,389	2,555	573
W	1995	169	364	552	810	1,012	1,878	1,644	5,104	9,666	8,172	1,547	427
W	1969	138	475	1,000	1,182	1,012	1,025	1,978	8,994	8,566	3,774	318	390
W	1982	286	1,146	1,092	1,010	1,850	1,025	2,563	6,957	7,108	3,536	459	947
W	1938	140	115	1,906	365	1,713	1,801	1,809	4,043	9,599	3,606	344	397
W	1998	169	116	170	624	1,012	1,074	1,059	3,047	9,964	6,628	488	508
W	1997	167	621	1,449	6,087	1,381	1,662	1,372	6,358	4,437	592	308	432
W	1956	111	104	3,085	1,849	1,713	1,787	1,705	2,334	8,063	3,095	387	375
W	1967	67	408	1,007	657	1,012	1,025	1,045	4,626	7,832	5,542	468	390
W	1980	314	248	449	2,225	1,448	1,025	1,690	4,576	7,092	4,556	423	451
W	1986	296	198	954	622	1,989	2,688	2,176	6,547	7,111	1,407	325	463
W	1952	140	179	1,010	1,010	1,713	1,025	1,242	6,176	6,620	3,736	374	429
W	1978	78	81	552	789	1,012	1,025	1,045	3,423	8,499	3,955	383	801
W	1965	124	219	3,031	1,786	1,713	1,788	1,665	1,937	3,812	2,626	617	458
W	1958	152	131	251	286	1,012	1,202	1,045	5,980	7,121	2,553	404	398
W	1993	45	79	552	567	1,012	1,210	1,548	5,678	5,808	2,274	348	409
AN	1941	130	98	536	1,786	1,616	1,587	1,473	2,131	5,868	2,612	315	381
AN	1951	336	3,770	3,000	1,786	1,713	993	1,753	1,561	2,772	286	299	368
AN	1922	123	70	118	197	1,012	1,025	1,800	3,497	8,836	2,037	329	400
AN	1984	324	2,087	2,143	1,695	1,571	1,255	1,116	3,862	3,636	811	303	396
AN	1943	133	553	514	740	1,012	1,270	2,262	5,643	4,513	1,414	304	378
AN	1942	142	201	851	1,010	1,012	1,025	1,424	3,733	7,124	3,091	321	385
AN	1996	153	71	444	467	1,746	1,450	1,994	6,410	4,970	1,274	324	418
AN	1974	169	1,158	515	700	1,012	1,068	1,045	5,398	5,608	1,063	299	312
AN	1940	380	87	886	401	1,670	1,752	1,630	3,226	4,582	309	298	363
AN	1936	176	114	93	348	1,703	1,745	1,926	3,566	5,189	1,138	302	386
AN	1932	101	59	1,400	1,570	1,212	1,187	1,116	1,709	3,709	1,743	313	410
AN	1935	153	226	552	1,663	1,429	546	1,361	2,067	5,002	869	305	383
AN	1999	181	311	415	529	1,713	1,801	1,774	2,751	5,305	617	300	371
AN	1945	160	417	466	451	1,277	1,801	1,714	2,141	5,607	1,803	308	388
AN	1927	117	332	508	515	1,012	1,025	1,045	4,174	6,480	1,481	319	413
AN	1963	210	70	605	134	1,321	530	1,045	4,395	5,704	1,747	267	299
AN	1975	86	70	130	204	832	1,025	1,800	2,279	6,856	1,516	314	401
N	1973	140	133	1,000	1,010	1,012	1,025	1,044	5,434	3,784	274	279	287
N	1921	387	269	358	412	1,713	1,752	1,672	1,778	4,417	718	302	399
N	1937	139	71	157	118	1,702	1,697	1,565	2,627	4,945	542	298	391
N	1970	317	147	721	1,525	1,012	1,025	1,045	3,473	3,301	452	276	340
N	2000	113	118	102	562	1,012	1,025	1,234	5,205	3,566	315	310	422
N	1925	241	231	995	789	1,000	1,025	1,836	3,169	3,984	1,060	358	418
N	1979	125	103	139	523	1,012	1,025	1,061	5,984	3,772	362	328	445
N	1946	562	499	1,280	894	1,713	1,726	1,630	2,098	3,167	311	296	386
N	1923	144	147	377	615	1,012	778	1,790	2,842	3,496	1,626	317	493
N	1962	109	55	552	359	845	1,025	1,319	2,618	5,524	1,083	287	340
N	1971	113	418	670	645	1,012	1,025	1,045	2,772	4,409	973	280	337
N	1950	114	105	260	115	1,694	1,651	1,586	2,044	3,415	398	303	383
N	1953	138	91	150	603	794	1,015	1,205	2,082	4,557	1,852	309	385
N	1928	266	514	594	253	625	1,014	1,096	4,870	1,461	248	277	347
N	1954	138	115	123	126	469	1,057	1,543	4,393	1,984	266	282	356
N	2002	127	238	692	607	756	374	1,245	4,386	2,587	238	294	357
BN	1957	192	172	170	175	659	1,000	1,035	2,669	5,325	391	146	326
BN	1948	386	155	779	248	153	971	1,450	1,925	3,303	546	296	386
BN	1989	114	131	552	567	616	849	1,442	3,824	2,567	288	296	493
BN	1966	134	535	1,010	282	817	799	1,446	3,323	234	146	247	348
BN	1944	153	100	108	152	832	1,015	1,035	2,843	2,543	625	282	354
BN	1949	137	91	100	96	148	1,710	1,661	2,177	1,817	239	283	364
BN	1985	276	417	789	167	519	745	1,127	3,335	1,111	233	292	385
BN	1972	70	195	318	702	725	746	854	2,249	2,158	213	258	298
BN	1930	110	60	800	449	678	572	858	1,186	2,944	299	281	391
BN	1964	195	674	342	362	499	280	1,471	2,025	1,657	276	278	352
BN	1955	116	109	220	290	817	1,200	1,320	1,742	1,140	270	281	347
BN	1926	238	135	181	240	232	1,256	2,080	2,114	576	217	277	351
BN	1933	127	70	314	45	689	108	1,638	1,519	2,259	333	281	394
BN	1991	133	45	552	234	88	304	1,035	1,893	2,778	356	289	360
BN	2001	194	131	136	187	388	1,057	1,052	3,773	278	246	305	388
BN	1947	182	258	391	472	519	668	1,045	3,418	916	216	277	338
BN	1960	122	68	557	186	787	640	1,478	1,594	480	207	279	336
D	1981	70	70	98	113	669	794	1,838	2,048	1,358	248	322	417
D	1968	99	76	145	193	786	822	1,035	2,816	1,163	211	271	264
D	1959	75	86	71	355	781	1,068	1,728	1,656	761	219	275	603
D	1939	287	199	365	227	534	980	1,616	1,608	136	186	279	362
D	1929	134	78	86	87	191	594	1,005	1,356	2,399	270	279	361
D	1990	568	179	557	263	616	437	597	1,295	929	304	111	326
D	1992	154	166	557	318	616	572	1,208	2,208	570	618	111	92
D	1994	177	74	118	105	241	645	968	1,414	935	181	241	312
D	1988	158	121	552	567	626	319	411	397	528	204	241	314
D	1934	139	71	188	289	402	1,428	872	714	466	178	243	344
D	1961	116	104	1,000	314	335	184	608	359	230	185	250	321
D	1976	588	220	443	175	186	351	554	329	141	171	294	402
D	1987	188	76	76	86	236	440	1,042	655	243	172	248	324
D	1931	143	116	779	187	607	296	361	329	100	112	241	333
D	1924	266	101	121	76	331	506	570	357	119	166	241	293
D	1977	152	50	552	130	231	61	159	232	101	167	233	298

Notes: The data represent the summation of releases to rivers/creeks from: Hetch Hetchy Reservoir, Lake Eleanor, Lake Lloyd, Holm Powerhouse, and Kirkwood Powerhouse. The flow data are incomplete and do not include accretions from the watersheds below the dams. These accretions would remain constant under all modeling scenarios. Actual Tuolumne River flow at the Cherry Creek confluence would be greater than the values presented. Year Types: Wet, AN – Above Normal, BN – Below Normal, Dry, and Critical

TABLE 5.3.8-8
FLOW IN THE TUOLUMNE RIVER IMMEDIATELY BELOW THE CHERRY CREEK CONFLUENCE WITH THE WSIP (cubic feet per second)

YEAR TYPE	WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
W	1983	1,823	603	1,102	1,010	1,012	1,279	1,045	5,086	12,573	8,389	2,555	573
W	1995	169	364	552	810	1,012	1,952	1,644	5,104	9,666	8,172	1,547	427
W	1969	138	475	1,000	1,182	1,012	1,025	1,978	8,994	8,566	3,774	318	390
W	1982	286	1,146	1,092	1,010	1,606	1,025	2,563	6,957	7,108	3,536	459	947
W	1938	140	115	1,917	365	1,713	1,801	1,779	3,832	9,599	3,606	344	397
W	1998	169	116	170	624	1,012	1,074	1,059	3,047	9,964	6,628	488	508
W	1997	167	621	1,449	5,891	1,381	1,849	1,212	6,358	4,437	592	308	432
W	1956	111	104	2,917	1,849	1,713	1,778	1,695	2,282	8,063	3,095	387	375
W	1967	67	408	1,007	657	1,012	1,025	1,045	4,493	7,832	5,542	468	390
W	1980	314	248	449	2,403	1,448	1,025	1,690	4,576	7,092	4,556	423	451
W	1986	296	198	863	653	2,054	2,496	2,110	6,547	7,111	1,407	325	463
W	1952	140	179	1,010	1,010	1,713	1,025	1,242	5,913	6,620	3,736	374	429
W	1978	78	81	552	789	1,012	1,025	1,045	2,100	8,499	3,955	383	796
W	1965	124	219	2,949	1,786	1,713	1,801	1,714	1,974	4,034	2,626	617	458
W	1958	152	131	251	286	1,012	1,202	1,045	5,776	7,121	2,553	404	398
W	1993	45	79	325	314	1,011	1,107	1,545	5,678	5,162	2,274	348	409
AN	1941	130	98	536	1,786	1,609	1,581	1,464	2,125	5,848	2,612	315	381
AN	1951	336	3,641	3,000	1,786	1,713	1,101	1,740	1,582	2,653	286	299	368
AN	1922	123	70	118	197	1,012	1,025	1,800	3,331	8,836	2,037	329	400
AN	1984	288	2,087	2,143	1,695	1,571	1,414	1,150	3,671	3,636	811	303	396
AN	1943	133	553	514	740	1,012	1,235	2,262	5,643	4,513	1,414	304	378
AN	1942	142	201	851	1,010	1,012	1,025	1,424	3,733	7,124	3,091	321	385
AN	1996	153	71	444	467	1,682	1,450	1,994	6,410	4,970	1,274	324	418
AN	1974	169	1,158	515	700	1,012	1,068	1,045	5,398	5,608	1,063	299	312
AN	1940	380	87	650	543	1,702	1,793	1,665	3,407	4,582	309	298	363
AN	1936	176	114	93	348	1,696	1,700	1,879	3,314	5,189	1,138	302	386
AN	1932	101	59	774	1,522	1,140	1,123	1,070	1,693	3,665	1,743	313	410
AN	1935	153	226	552	1,680	1,450	1,005	1,314	2,030	4,684	869	305	383
AN	1999	181	311	415	529	1,713	1,801	1,738	2,500	5,303	617	300	371
AN	1945	160	417	466	451	1,522	1,801	1,749	2,172	5,829	1,803	308	388
AN	1927	117	332	615	515	1,012	1,025	1,045	3,772	6,387	1,481	319	413
AN	1963	210	70	862	336	817	530	1,045	3,945	5,704	1,747	267	299
AN	1975	86	70	130	204	832	1,025	1,800	2,377	6,922	1,516	314	401
N	1973	140	133	1,000	1,010	1,012	1,025	1,044	5,200	3,784	274	279	287
N	1921	387	269	358	412	1,713	1,730	1,647	1,757	4,303	718	302	399
N	1937	139	71	157	118	1,673	1,665	1,536	2,552	4,878	542	298	391
N	1970	317	147	721	1,963	1,012	1,025	1,045	3,337	3,301	452	276	340
N	2000	113	118	102	562	1,012	1,096	1,234	5,038	3,566	315	310	422
N	1925	241	231	995	789	1,000	1,025	1,792	2,868	3,984	1,060	358	418
N	1979	125	103	139	523	1,012	1,025	1,061	5,984	3,772	362	328	445
N	1946	562	499	1,280	894	1,713	1,698	1,603	1,956	3,167	311	296	386
N	1923	144	147	377	615	1,012	778	1,790	2,565	3,496	1,626	317	493
N	1962	109	55	552	359	845	1,025	1,319	1,229	5,524	1,083	287	340
N	1971	113	418	670	645	1,012	1,025	1,045	2,399	4,409	973	280	337
N	1950	114	105	200	175	1,713	1,674	1,608	2,060	3,501	398	303	383
N	1953	138	91	150	603	794	1,015	1,051	2,077	4,557	1,852	309	385
N	1928	266	514	594	253	625	1,014	1,045	4,811	1,461	248	277	347
N	1954	138	115	123	126	469	1,071	1,580	3,889	1,984	266	282	356
N	2002	127	238	692	607	756	374	1,245	3,811	2,587	238	294	357
BN	1957	192	172	170	175	659	1,000	1,035	2,153	5,325	391	146	326
BN	1948	386	155	779	248	153	978	1,405	1,888	3,101	546	296	386
BN	1989	114	131	552	567	616	849	1,236	3,299	2,567	288	296	493
BN	1966	134	535	1,010	282	817	799	1,027	3,385	234	146	247	348
BN	1944	153	100	108	152	832	1,015	1,035	2,344	2,543	625	282	354
BN	1949	137	91	100	96	148	1,679	1,626	2,155	1,699	239	283	364
BN	1985	276	417	789	167	519	745	1,127	3,255	1,111	233	292	385
BN	1972	70	195	318	702	725	746	854	1,770	2,158	213	258	298
BN	1930	110	60	800	449	678	572	858	1,214	2,944	299	281	391
BN	1964	195	674	342	362	499	374	1,470	1,859	1,157	276	278	352
BN	1955	116	109	220	290	817	1,295	1,318	1,714	991	270	281	347
BN	1926	238	135	181	240	232	1,514	1,994	1,985	359	217	277	351
BN	1933	127	70	314	45	689	268	1,585	1,466	1,973	333	281	394
BN	1991	45	45	527	106	60	304	1,035	1,943	2,231	562	146	297
BN	2001	194	131	136	187	388	1,057	1,052	3,080	278	246	305	388
BN	1947	182	258	391	472	519	668	1,045	2,906	916	216	277	338
BN	1960	122	68	557	186	896	712	1,490	1,644	508	207	279	336
D	1981	70	70	98	113	669	794	1,838	1,878	1,169	248	322	417
D	1968	99	76	145	193	786	822	1,035	2,330	1,163	211	271	264
D	1959	75	86	71	355	781	1,318	1,666	1,420	761	219	275	603
D	1939	287	199	365	227	534	980	1,162	1,670	136	186	279	362
D	1929	134	78	86	87	191	594	1,005	1,092	2,190	270	279	361
D	1990	568	179	557	263	616	437	597	1,155	1,300	304	111	92
D	1992	154	166	557	318	616	572	1,729	1,899	608	618	111	92
D	1994	177	74	118	105	241	645	968	961	935	181	241	312
D	1988	158	121	552	567	870	319	317	359	135	123	241	314
D	1934	139	71	211	266	405	1,549	898	400	436	178	243	344
D	1961	116	104	1,000	314	335	184	608	359	230	185	250	321
D	1976	588	220	443	175	186	351	554	329	141	171	294	402
D	1987	188	76	76	86	236	440	1,042	591	228	172	248	324
D	1931	143	116	779	187	607	296	361	329	100	112	241	333
D	1924	266	101	121	76	331	506	570	357	119	166	241	293
D	1977	152	50	552	130	231	61	159	232	101	167	233	298

Notes: The data represent the summation of releases to rivers/creeks from: Hetch Hetchy Reservoir, Lake Eleanor, Lake Lloyd, Holm Powerhouse, and Kirkwood Powerhouse. The flow data are incomplete and do not include accretions from the watersheds below the dams. These accretions would remain constant under all modeling scenarios. Actual Tuolumne River flow at the Cherry Creek confluence would be greater than the values presented. Year Types: Wet, AN – Above Normal, BN – Below Normal, Dry, and Critical record. With the WSIP and in June, flows below Cherry Creek would also exceed 1,100 cfs in 64 years of the 82-year hydrologic record. Thus, during May and June, the high flow months, the WSIP would have very little effect on the number of days flow in the river is suitable for rafting and would have very little effect on the need for pulse releases from Holm Powerhouse.

Typically, inflow to the SFPUC's reservoirs in the Tuolumne River watershed is much diminished by mid-July, and large releases to the Tuolumne River have ended. Only the minimum required releases are made through the rest of the summer and early fall. Under the existing condition and in July, flows in the Tuolumne River below Cherry Creek would exceed 1,100 cfs in 28 years of the 82-year hydrologic record. With the WSIP and in July, flows below Cherry Creek would also exceed 1,100 cfs in 28 years of the 82-year hydrologic record. Under the existing condition and with the WSIP in August, flows below Cherry Creek would exceed 1,100 cfs in two years of the 82-year hydrologic record. Under the existing condition and with the WSIP in September, flows below Cherry Creek would never exceed 1,100 cfs in the 82-year hydrologic record. During many Julys, almost all Augusts, and all Septembers, releases from Holm Powerhouse would be needed to provide suitable flows for rafting under the existing condition and with the WSIP. There would be no appreciable increase in the amount of time releases would need to be made from Holm Powerhouse to provide rafting flows with the WSIP. Thus, the WSIP would have a less-than-significant effect on whitewater rafting in the Tuolumne River between the Cherry Creek confluence and Don Pedro Reservoir, and no mitigation measures would be necessary.

Comparison of the modeled controlled releases from Lake Lloyd, Lake Eleanor, and Holm Powerhouse for the existing condition and with the WSIP indicates that changes in the average monthly flow below Holm Powerhouse would occur in one or more months in 18 percent of the years in the 82-year hydrologic record. The WSIP would result in both increased and decreased flow rates; in some cases, flow would increase and decrease within the same year. These modeled changes primarily reflect slight changes in reservoir operations that may not occur during actual operations. The changes identified in the model occur rarely, and it is concluded that flow in Cherry Creek below Holm Powerhouse would be the same under either condition. Thus, the WSIP would have a less-than-significant effect on flows in the short section of the Cherry Creek Run between Holm Powerhouse and the confluence with the Tuolumne River, and no mitigation measures would be needed.

Other River Recreation Upstream of Don Pedro Reservoir

Non-rafting recreation on the Tuolumne River is limited. A majority of campers and hikers along the river are also on river rafting trips; therefore, any reductions in whitewater recreation would likely result in a related decrease in non-rafting recreational use.

However, as discussed in the Setting, some non-rafting visitors choose to recreate along the upper Tuolumne River despite the limited developed hiking trails and other recreational resources. The majority of recreational opportunities for these visitors are off-water activities, although a number of the visitors to this reach do partake in fishing. However, because no change in the flow releases for July through August are expected, no WSIP-related recreational impacts on river flow levels would occur during the peak recreational period.

Due to the considerable variance in the upper Tuolumne flow rates both seasonally and daily (as a result of the pulse releases), the relatively minor changes in river flow levels associated with the WSIP, predominantly in May and June, would be imperceptible to visitors. Therefore, impacts on non-rafting recreation along the upper Tuolumne River would be less than significant.

River Recreation Below La Grange Dam

Under existing conditions, most of the time (717 months in the 984-month hydrologic record) flow in the Tuolumne River below La Grange Dam consists of the minimum required instream flows. In average critically dry years, the releases made from La Grange Dam are those needed to sustain the minimum required instream flows. In other hydrologic year types, releases in excess of minimum flows are made primarily between November and June.

Don Pedro Reservoir would be drawn down farther in the spring with the WSIP than it is under the existing condition because diversions at Hetch Hetchy Reservoir would increase to meet 2030 water demand in the Bay Area and inflow to Don Pedro Reservoir would be reduced. A greater proportion of the winter and spring runoff would be needed to refill the reservoir than under the existing condition. As a result, with the WSIP, the onset of releases above from La Grange Dam above the minimum required would be delayed, and the total volume of releases would be reduced. After releases in excess of the minimum required begin, releases during the rest of the year would be similar with the WSIP and under the existing condition.

The effects of the WSIP on average monthly flows in the Tuolumne River below La Grange Dam in different year types are shown in Table 5.3.1-6. During the summer recreational season, when the majority of river-related recreation occurs, the WSIP would have no effect on releases from La Grange Dam in average below-normal, dry, and critically dry years. Therefore, the WSIP would have no effect on river recreation in these year types.

During average wet and above-normal years, the WSIP would reduce flow in some summer months by up to 25 percent. The greatest effect would be in June of average above-normal years, when a 25 percent reduction would occur. The next greatest proportional reduction in flow (7 percent) would occur in June of average wet years. Nonetheless, the resulting flow conditions with the WSIP in wet and above-normal years would still be appreciably higher than the typical flow conditions that now occur at that time of the year. The WSIP-induced decrease in flow in wet and above-normal years would not likely reduce accessibility or use of the area’s recreational resources.

Below Don Pedro Reservoir, recreational use of the Tuolumne River is limited. The river’s flow conditions, limited public access, as well as county and other agency regulations limit the type and level of river recreation. The Tuolumne County Recreation Department generally discourages swimming in the river at La Grange and Fox Grove Regional Parks due to dangerous undercurrents and the absence of lifeguard supervision. Although the CDFG annually restocks the river with fish, fishing in the Tuolumne River is regulated. Only barbless hooks and “catch and release” fishing is generally permitted, and no fishing is allowed during certain winter periods to protect the fall run of spawning adult Chinook salmon (CDFG, 2006b). Furthermore, the minimum instream flows for salmon and other fish populations would be maintained within the lower river to protect fishery habitat.

As discussed in the Setting, many local residents participate in off-water recreation in the parks along the Tuolumne River. However, this recreational use is generally independent of river flow conditions, which park visitors expect to vary considerably during the summer season. Future minimum flow conditions would be maintained under all circumstances during the summer season. Therefore, impacts river recreation along the Tuolumne River below La Grange Dam would be less than significant.

Summary of Impacts

Overall, implementation of the proposed WSIP water supply and system operations would result in *less than significant* impacts on river recreation.

Impact 5.3.8-3: Effects on the aesthetic values of the Tuolumne Wild and Scenic River.

Increasing the Hetch Hetchy system's reliance on Tuolumne River water sources could affect future stream flows within the Wild and Scenic sections of the Tuolumne River below O'Shaughnessy Dam, thereby degrading the river's visual resources. Such an impact, if it were to occur, could contravene policies of the *Tuolumne Wild and Scenic River Management Plan* (USFS, 1988) with respect to maintaining and improving the appearance of the stream and its water quality for aesthetic purposes. Reduction in the river's free-flowing condition could also diminish the management plan's policy to protect the river's outstandingly remarkable values.

Current flow conditions in the Tuolumne River vary considerably as a result of natural variations in rainfall and snowmelt in addition to the existing operation of the Hetch Hetchy system. Stream flow is only one of several qualities contributing to the river's scenic values. Other components of the river corridor's setting and scenery include geological and biological resources, which may be independent of and/or unaffected by WSIP changes in the water release schedule.

WSIP-induced changes in Tuolumne River flows would be greatest directly below O'Shaughnessy Dam. The effect of the WSIP would decrease in a downstream direction as more tributary flow and runoff enter the river, increasing river flow. As shown in Table 5.3.1-5, in most months of most hydrologic year types, flows in the Tuolumne River below O'Shaughnessy Dam with the WSIP and under the existing condition would be the same. In some months, usually in the spring, flows with the WSIP would be reduced compared to the existing condition. Average flows in May of all years would be 11 percent lower than under the existing condition. During average below-normal and dry years, the reduction in flows would be up to 30 percent in May. The WSIP would typically delay the initial spring release of water from Hetch Hetchy Reservoir by a few days, lengthening the period in which only the minimum required flow is released to the river by a few days. With the WSIP in place, flow in the Tuolumne River would remain within the range experienced under the existing condition. WSIP-related flow reductions would likely not be noticeable to most of the relatively few recreational users that hike along the Tuolumne River within the Wild sections of the Poopenaut Valley below the dam.

In addition, observers of the Tuolumne River's visual conditions are almost entirely recreational visitors. Although late-spring recreational use along the Wild and Scenic section of the river does occur, the greatest recreational use is during the summer season between Memorial Day and Labor Day. As a result, most recreationists would experience the Tuolumne River's Wild and Scenic visual resources during this period, when conditions would not be affected by the WSIP. In addition, a major proportion of the river users are whitewater rafters who also recreate on the river during the pulse flow releases, which would therefore reduce the period of time when visitors could observe any reductions to the Tuolumne's water flow conditions during non-pulse flows.

As a result, any future WSIP reductions in stream flow within the Tuolumne River would likely be imperceptible to or unobserved by most visitors. Therefore, impacts on the visual resources of the Tuolumne Wild and Scenic River would be *less than significant*, and no mitigation measures would be required.

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5.3.9 Energy Resources

This section describes the potential effects of the WSIP water supply and systemwide operations on energy resources. The impact section (Section 5.3.9.2) provides a description of the changes in hydropower generation and energy consumption that would result from implementation of the proposed program. For a discussion of overall energy production and use by the WSIP, see Chapter 4, Section 4.15.

5.3.9.1 Setting

There are four major hydropower generation facilities on the Tuolumne River. Three, the Holm, Kirkwood, and Moccasin Powerhouses, are owned by the CCSF and operated by the SFPUC. The fourth, Don Pedro Power Plant, is owned by TID and MID and operated by TID. Hydropower facilities convert the energy of flowing or falling water into electrical power. Water released from a reservoir flows through a tunnel or pipeline to a powerhouse where it rotates one or more turbines. The spinning turbines drive electricity power generators.

Water is released from Lake Lloyd and flows to Holm Powerhouse though the Cherry Power Tunnel. Holm Powerhouse is equipped with two turbine and generator sets with a maximum generation capacity of 170 megawatts (MW). After passage through the turbines, water is released from Holm Powerhouse to Cherry Creek.

Water is diverted from Hetch Hetchy Reservoir and flows to Kirkwood Powerhouse through the Canyon Tunnel. Kirkwood Powerhouse is equipped with three turbine and generator sets with a maximum generation capacity of 126 MW. After passage through the turbines, most of the water from Kirkwood Powerhouse enters Mountain Tunnel, which conveys it to Priest Regulating Reservoir. The remainder is released to the Tuolumne River.

Water is released from Priest Regulating Reservoir and flows to Moccasin Powerhouse in the Moccasin Power Tunnel. Moccasin Powerhouse is equipped with two turbine and generator sets with a maximum generation capacity of 110 MW. After passage through Mocassin Powerhouse, water is discharged to Moccasin Reregulating Reservoir. Most of the water is diverted from the reregulating reservoir into Foothill Tunnel and conveyed to the Bay Area for water supply. Some water is discharged to Moccasin Creek, which discharges to Don Pedro Reservoir.

Water stored in Don Pedro Reservoir is conveyed through Don Pedro Dam in two tunnels to the Don Pedro Powerhouse, which is located at the base of the dam. The powerhouse is equipped with two turbine and generator sets with a capacity of 161 MW. After passage through the turbines, water is released from the powerhouse to the Tuolumne River.

The amount of hydropower generated at facilities on the Tuolumne River in any particular year depends on hydrologic conditions in that year and in preceding years. On average, and under current conditions, the hydropower facilities produce about 2.2 million megawatt-hours (MWh) (see Appendix H2-1).

The regulatory framework for energy use in the area served by the WSIP is described in Chapter 4, Section 4.15. It includes the National Energy Policy, the state's Energy Action Plan II and building energy efficiency standards, and San Francisco's Sustainability Plan, Electricity Resource Plan, and Climate Action Plan.

5.3.9.2 Impacts

Significance Criteria

The CCSF has not formally adopted significance standards for impacts related to energy resources, but generally considers that implementation of the proposed program would have a significant energy resource impact if it were to:

- Encourage activities that result in the use of large amounts of fuel, water, or energy, or use these resources in a wasteful manner
- Reduce the production of renewable energy

Approach to Analysis

Changes in river flow, reservoir storage, and hydropower generation rates attributable to the WSIP were estimated using the Hetch Hetchy/Local Simulation Model. Detailed information on the model is provided in Appendix H.

Impact Summary

Table 5.3.9-1 presents a summary of the impacts on energy resources along the Tuolumne River that could result from implementation of the proposed water supply and system operations.

TABLE 5.3.9-1
SUMMARY OF IMPACTS – ENERGY RESOURCES ALONG THE TUOLUMNE RIVER SYSTEM

Impact	Significance Determination
Impact 5.3.9-1: Effects on hydropower generation at facilities along the Tuolumne River	B

B = Beneficial impact

Impact Discussion

Impact 5.3.9-1: Effects on hydropower generation at facilities along the Tuolumne River.

On average under current conditions, the SFPUC's hydropower facilities on the Tuolumne River generate 1,618,180 MWh of electricity each year. With the WSIP, this amount would rise to an average of 1,641,257 MWh, an increase of about 23,000 MWh or 1.4 percent. The increase in hydropower generation is attributable to the increase in diversion of water from Hetch Hetchy

Reservoir to meet water demand in the Bay Area. En route to the Bay Area, the water generates hydropower at the Kirkwood and Moccasin Powerhouses.

On average under current conditions, TID's and MID's facilities generate 590,180 MWh of electricity per year. With the WSIP, this amount would be reduced to an average of 576,046 MWh, a decrease of about 14,000 MWh or 2.4 percent. The decrease in hydropower generation is attributable to reduced inflow to Don Pedro Reservoir because of increased upstream diversion and a slightly lowered average water level in the reservoir.

Overall, the WSIP would increase hydropower generation on the Tuolumne River by an average of about 9,000 MWh, or 0.4 percent. Thus, the impact of the WSIP on the production of renewable energy from the Tuolumne River would be *beneficial*.

5.4 Alameda Creek Watershed Streams and Reservoirs

5.4 Alameda Creek Watershed Streams and Reservoirs

Section 5.4 Subsections

5.4.1 Stream Flow and Reservoir Water Levels

The following setting section describes the streams and reservoirs in the Alameda Creek watershed that could be affected by the WSIP. The impact section (Section 5.4.1.2) provides a description of the changes in stream flow and reservoir water levels that would result from implementation of the WSIP.

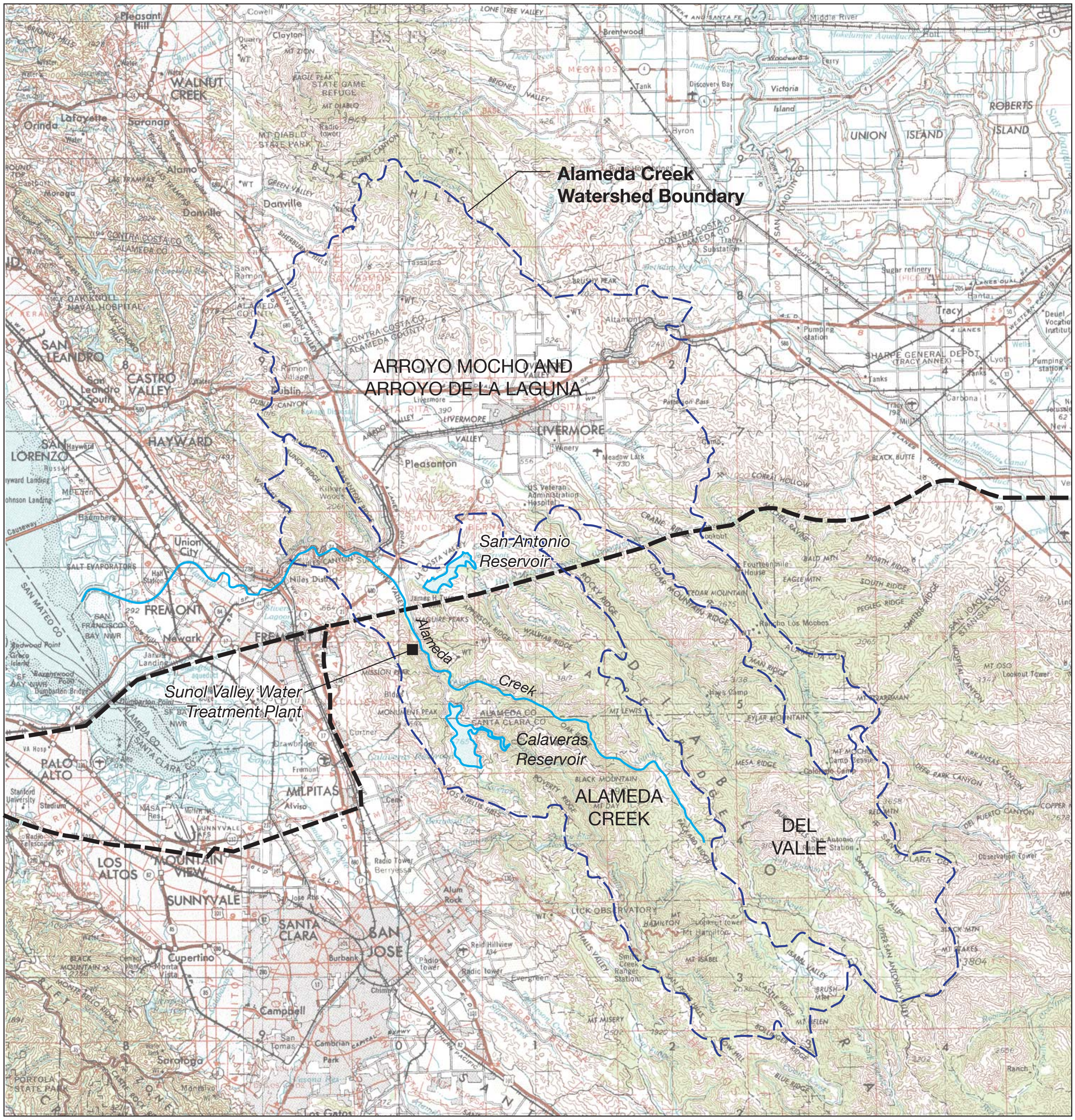
5.4.1.1 Setting

Watershed Overview

The Alameda Creek watershed covers an area of about 633 square miles in the East Bay, 30 miles southeast of San Francisco (**Figure 5.4.1-1**). Precipitation in the watershed is primarily in the form of rainfall, most of which falls in the November through March rainy season. Average annual precipitation ranges from about 20 to 25 inches per year; precipitation is heaviest in the west at higher elevations, and lowest in the eastern part of the watershed and at lower elevations.

There are two major drainage basins within the greater watershed: the Livermore Drainage Unit (shown as Arroyo Mocho and Arroyo de la Laguna in Figure 5.4.1-1) and the southern Alameda Creek watershed (also referred to as the Sunol Drainage Unit). The southern Alameda Creek watershed occupies about 175 square miles between Pleasanton to the north and Mount Hamilton to the south, spanning Alameda and Santa Clara Counties. Natural drainage is from the hills toward San Francisco Bay via Alameda Creek. The City and County of San Francisco (CCSF) owns 56 square miles (36,000 acres), or a little less than one-third, of the southern Alameda Creek watershed (shown in Chapter 2, Figure 2.2). The natural hydrology of the Alameda Creek watershed has been altered by water supply activities as well as by development and flood control.

Alameda Creek flows through a series of alluvial valleys linked by narrow bedrock-channel corridors. Alameda Creek is usually a perennial stream in the upper parts of the watershed, but in



Watershed Boundary

Existing System Corridor

0 20

Miles

SOURCE: ESA + Orion; USGS 1969

SFPUC Water System Improvement Program . 203287

Figure 5.4.1-1
Alameda Creek Drainage Area

the Sunol Valley and other alluvial flats, a high rate of infiltration and through-flow (water flowing through sediments) typically results in a dry creekbed during the summer months. The creek then resurfaces as pools in the confined bedrock canyons. Many of the tributaries that supply flows to the creek are historically intermittent and can be isolated from the main stem beginning in early to mid-summer (Gunther et al., 2000). The primary exception to this is Arroyo Hondo, which has year-round flow in many locations. In addition to fluctuations in stream flow caused by varying levels of surface water runoff, flows in Alameda Creek tributaries also vary greatly with rising and falling water tables in the area (Gunther et al., 2000). For the period from 1970 through 2003, Alameda Creek had an annual mean flow of 139 cubic feet per second (cfs), ranging from 31.5 cfs in the critically dry year of 1977 to 621 cfs in 1983. Mean flows are not indicative of daily flows, which can rise and fall dramatically depending on storm events. The highest peak flow (measured at the Niles gaging station) was 17,900 cfs on February 3, 1998. The total average annual runoff is 100,900 acre-feet (USGS, 2005a).

The SFPUC manages the Alameda Creek watershed portion of the regional system with the primary objective of conserving local watershed runoff for delivery to customers. Therefore, the Alameda reservoirs are managed to capture winter and early spring runoff in order to maximize storage and water delivery to customers during the winter months, while Hetch Hetchy runoff is stored for summer and fall delivery. This interconnectivity of the Alameda and Hetch Hetchy systems provides for substantial flexibility in operations, which are described in Chapter 2 and in this section.

The proposed WSIP system operations would affect the two SFPUC reservoirs in this watershed—Calaveras and San Antonio Reservoirs—as well as some reaches of Alameda Creek and its tributaries. These creeks and facilities are shown on **Figure 5.4.1-2**. Within the CCSF-owned watershed, Calaveras Creek and Arroyo Hondo drain directly to Calaveras Reservoir, and Alameda Creek flow is diverted into Calaveras Reservoir via the Alameda Creek Diversion Tunnel through operation of the Alameda Creek Diversion Dam (diversion dam). Farther downstream, San Antonio Creek drainage flows to San Antonio Reservoir, which is also used to store water from the Hetch Hetchy system and, periodically, water from Calaveras Reservoir. Downstream of its confluence with San Antonio Creek, Alameda Creek continues flowing through the Sunol Valley and then through Niles Canyon, eventually draining to San Francisco Bay. The drainage areas of each of these sub-watersheds of Alameda Creek are shown in **Table 5.4.1-1**.

Alameda Creek below the diversion dam conveys flows through the Sunol Valley, then to Niles Canyon and eventually to San Francisco Bay. As shown in Figures 5.4.1-1 and 5.4.1-2, tributaries include Calaveras Creek, which conveys releases from Calaveras Reservoir; Welch Creek, which flows into Alameda Creek near the Sunol Valley Water Treatment Plant (WTP); San Antonio Creek, which conveys releases from San Antonio Reservoir; Arroyo de la Laguna, which conveys flows from the Livermore Drainage Unit and Del Valle Drainage Unit; and Stoneybrook Creek, which enters Alameda Creek from the north within Niles Canyon.

TABLE 5.4.1-1
AREAS OF ALAMEDA CREEK SUB-WATERSHEDS IN THE WSIP STUDY AREA

	Sub-Watershed Area	
	Acres	**Square Miles**
Calaveras Reservoir	**62,662**	**97.9**
Arroyo Hondo	51,969	81.2
Calaveras Creek	10,693	16.7
Upper Alameda Creek (above diversion dam)	**21,679**	**33.9**
Mid Alameda Creek	**19,488**	**30.5**
Diversion dam to USGS gage at Calaveras Creek confluence	4,553	7.1
Calaveras Creek confluence gage to San Antonio Creek confluence	10,189	16
San Antonio Creek confluence to Arroyo de la Laguna confluence	4,746	7.4
San Antonio Reservoir	**24,645**	**38.5**

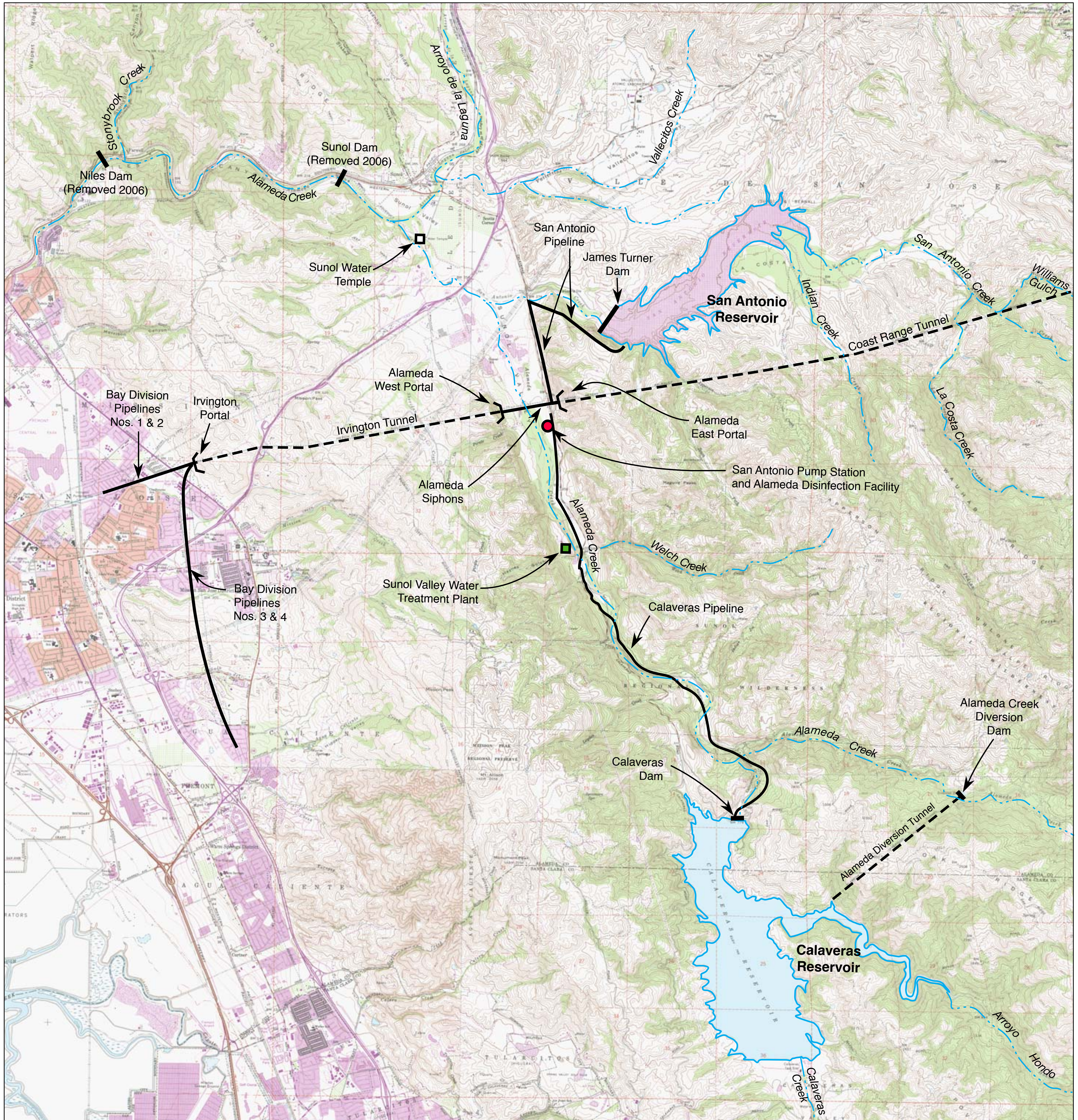
SOURCE: EDAW, 2007.

The reach of Alameda Creek through the Sunol Valley has a low gradient, with an elevation change of about 80 feet in five river miles. The creek channel is wide and braided in places; long sections have very shallow depths of water when flows are below about 75 cfs (Entrix, 2004). The Sunol Valley is broad but is bordered in parts by steep slopes (Center for Ecosystem Management and Restoration, 2002).

The reach of Alameda Creek through Niles Canyon, which starts downstream of the confluence with Arroyo de la Laguna, is constrained on both sides by steep canyon walls. There are several instream structures in this reach, including a culvert at the Stoneybrook Creek confluence and a U.S. Geological Survey (USGS) weir (Center for Ecosystem Management and Restoration, 2002). In 2006, the SFPUC completed removal of the Sunol and Niles Dams as part of an effort to restore creek flows and fish habitat along this reach of Alameda Creek; these facilities were historical parts of the regional water system that were built prior to construction of the Hetch Hetchy system.

After exiting Niles Canyon, Alameda Creek is contained within a flood control channel for 12 miles until it reaches San Francisco Bay. The Alameda County Water District (ACWD) manages this part of the creek for water supply, and the Alameda County Flood Control and Water Conservation District (ACFCWCD) maintains the channel for flood control purposes. Three large, inflatable rubber dams span the width of the channel and divert water to several hundred acres of ponds (former gravel quarries), where water percolates to recharge the underlying Niles Cone Groundwater Basin, a major source of water supply for the ACWD (ACWD, 2007). A flow control structure known as the BART weir (owned by the ACFCWCD and located where the BART and railroad tracks cross Alameda Creek in Fremont) provides structural protection of the footings of the BART and railroad bridge crossing and is a barrier to fish passage along this reach.

Mean annual precipitation over lower portions of the Alameda Creek drainage is about 20 inches.



SOURCE: ESA + Orion; USGS 1969

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Figure 5.4.1-2
Alameda Watershed Facilites

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Calaveras Reservoir and Creek

Calaveras Reservoir

Calaveras Reservoir was constructed between 1913 and 1925 with a storage capacity of 96,800 acre-feet, corresponding to a spillway elevation of 756 ft (USGS datum). Since December 2001, in response to safety concerns about the seismic stability of the dam and mandates from the California Department of Water Resources, Division of Safety of Dams (DSOD), the SFPUC has operated Calaveras Reservoir with the goal of holding the maximum water level at about 705 feet or below (USGS datum), which is approximately 37,800 acre-feet (roughly 40 percent of its maximum capacity). Because of heavy spring rains, Calaveras Reservoir has reached elevations of 720 to 736 feet for a few months during the springs of 2005, and 2006, as shown on **Figure 5.4.1-3**.

The natural drainage basin contributing to the Calaveras Reservoir drainage includes the Arroyo Hondo and Calaveras Creek Subbasins as well as local drainage areas along the west shore of the reservoir, with a total area of approximately 98 square miles. Stream flows within the Calaveras Reservoir drainage are highest during the winter and early spring rainy season and are minimal in summer and early fall. Calaveras Creek and Arroyo Hondo provide an average combined inflow to Calaveras Reservoir of about 36,000 acre-feet per year (afy) (nearly 12 billion gallons per year) (Bookman-Edmonston Engineering, Inc., 1995). Under pre-2002 conditions,[1] diversions from Alameda Creek added an average of approximately 6,000 afy (about 17 percent) to inflows into Calaveras Reservoir.

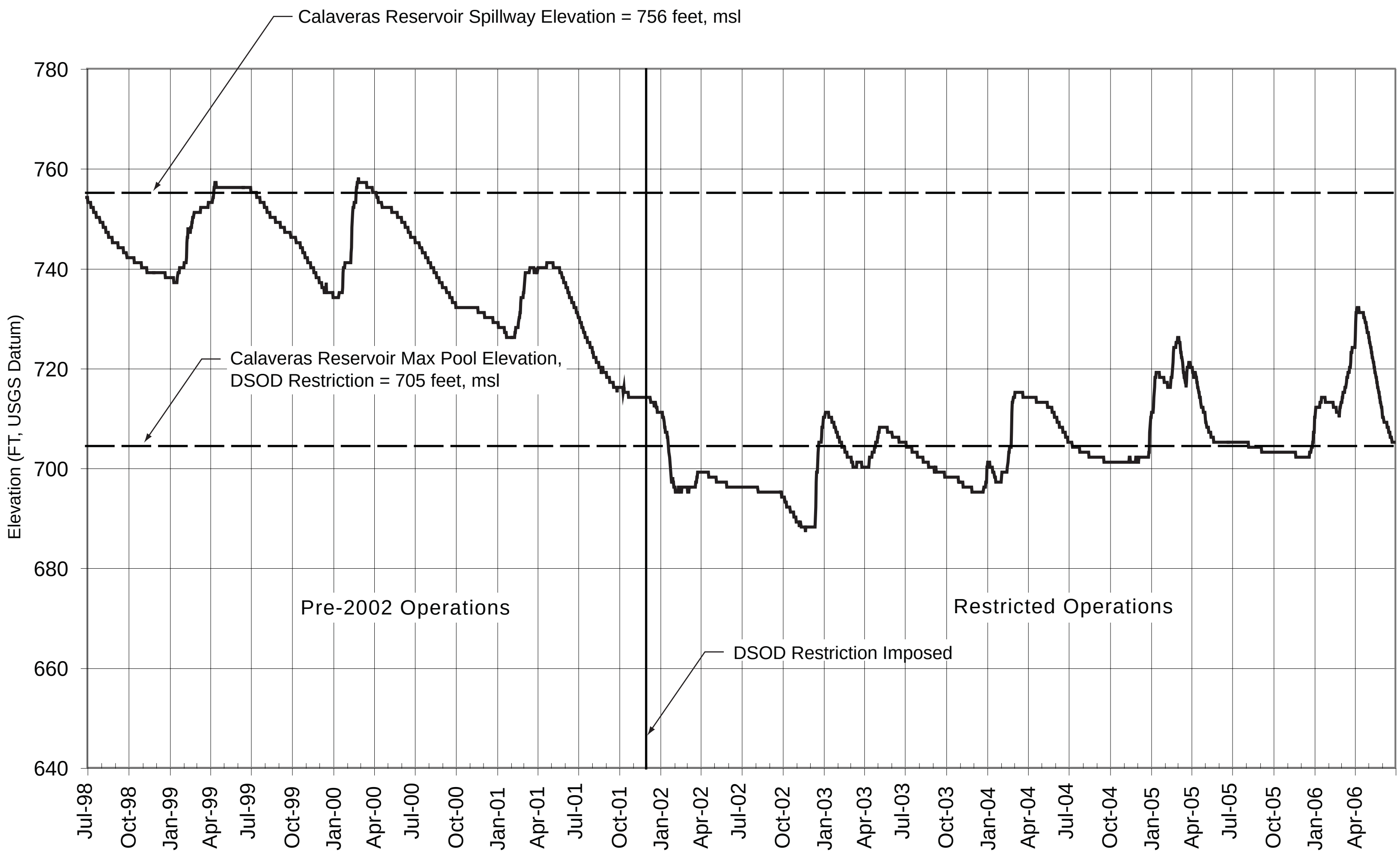
Water from the 35 square miles that drains into Alameda Creek upstream of the diversion dam can be diverted to Calaveras Reservoir through the Alameda Creek Diversion Tunnel. As shown in Figure 5.4.1-2, the diversion tunnel is situated about two miles upstream from the confluence with Calaveras Creek. At this overflow-type diversion, stream flow backs up behind an impoundment, flows into a short canal, and then enters the diversion tunnel if the diversion dam gates are open. During these conditions, flow in Alameda Creek in excess of the capacity of the diversion tunnel flows over the diversion dam and continues down Alameda Creek.

Much of the land surrounding Calaveras Reservoir is eroded or highly susceptible to erosion, and the subbasins of Calaveras Creek and Arroyo Hondo also contain eroded and steep soils. Above the diversion dam, slopes along Alameda Creek are eroded or severely eroded, with slope angles as high as about 45 percent (San Francisco Planning Department, 1999).

The SFPUC operates Calaveras Reservoir to meet the following objectives:

- Maximize storage within the reservoir to meet potential drought and water supply needs
- Maximize conservation of runoff on a long-term basis
- Meet short-term water supply operational requirements

1 Calaveras Reservoir operations before the 2001 DSOD restrictions are referred to throughout this document as "pre-2002 operations"; pre-2002 conditions are associated with pre-2002 operations.



SOURCE: SFPUC, HH/LSM (see Appendix H)

Figure 5.4.1-3
Calaveras Reservoir, Historical Water Levels, 1998 to 2006

Normal releases from Calaveras Reservoir are made through the intake tower. Under pre-2002 conditions, water could be withdrawn from three reservoir depths, corresponding to the elevations of the intake openings (adits) in the intake tower. However, the top adit is above the 705-foot restricted reservoir level; therefore, under current conditions, water can only be drawn from the lower two adits. Water from the tower's vertical conduit is conveyed through the 4.1-mile-long Calaveras Pipeline to the Sunol Valley WTP.

Water from Calaveras Reservoir is treated at the Sunol Valley WTP before entering the transmission system. Water flows from the reservoir to the treatment plant by gravity. The Sunol Valley WTP treats the water, which then travels by gravity to the transmission system at the Alameda Siphon No. 2. System operators have also transferred water from Calaveras Reservoir to San Antonio Reservoir as part of DSOD-restricted operations, in addition to making deliveries to the Sunol Valley WTP and releases via the cone valve.

Before December 2001, the reservoir would typically be operated to fill by the end of the rainy season in normal or wet years. The reservoir would be drawn down 15,000 to 20,000 acre-feet by early winter to ensure sufficient capacity to capture winter runoff. During a drought or water supply emergency, the reservoir would be drawn down farther to meet SFPUC water supply needs.

Following periods of heavy inflow, reservoir storage rises temporarily; at such times, the SFPUC employs "best efforts" to lower the level by releasing water to the regional system, and, if necessary, discharging excess inflow to Calaveras Creek. Average monthly storage in Calaveras Reservoir under restricted operations ranges from about 28,000 to 38,000 acre-feet in all conditions and months. As indicated in Figure 5.4.1-3, recent historical elevations in Calaveras Reservoir have varied from about 690 to 755 feet, with maximum post-2001 elevations of up to 736 feet. The SFPUC has also maintained a minimum water level elevation of 690 feet in accordance with a 1991 letter sent to the California Department of Fish and Game (CDFG) (SFPUC, 2005), as described in Chapter 2, Section 2.5.3.

In 1997, the CCSF and CDFG signed a Memorandum of Understanding (MOU) regarding releases of water from Calaveras Reservoir and maintenance of minimum storage levels from July through October to enhance fishery habitat, improve the coldwater fishery resources downstream of Calaveras Dam, and enhance warm-water fisheries in the lower reach of the creek. The SFPUC agreed to use best efforts to maintain at least 30,000 acre-feet in the reservoir (690-foot elevation) as well as to release up to 6,300 afy from Calaveras Reservoir. The MOU indicated possible year-round releases if target flows below the confluence of Alameda and Calaveras Creeks were not met. However, implementation of the 1997 MOU instream flow requirement below Calaveras Reservoir is currently on hold and hindered by the lack of sufficient cold-water storage in Calaveras Reservoir. (MOU flows are shown below in Table 5.4.1-9.)

Calaveras Creek Below Calaveras Dam

As part of system operations, the SFPUC can make releases from Calaveras Reservoir to Calaveras Creek, which then flow to Alameda Creek. Controlled emergency releases and other controlled releases (i.e., for fish studies) can be made through the dam outlet works, which can release up to about 1,100 cfs. Uncontrolled releases are conveyed to Calaveras Creek through the spillway structure. Spillway discharges could exceed 33,000 cfs if the reservoir were to fill to an elevation near the top of the dam.

Uncontrolled releases (spills) over the Calaveras Dam spillway have been infrequent. Recorded spills since 1938 have occurred in the following water years: 1941, 1945, 1952, 1956, 1958, 1965, 1967, 1969, and 1996–2000, as shown in **Table 5.4.1-2**.

TABLE 5.4.1-2
HISTORICAL CALAVERAS RESERVOIR SPILLWAY RELEASES (UNCONTROLLED)

Date	Average Daily Spill (cfs)
02/18/41 – 03/21/41	438
03/30/41 – 04/21/41	518
04/09/45 – 05/05/45	137
01/11/52 – 02/20/52	634
02/28/52 – 03/06/52	49
03/08/52 – 04/09/52	379
04/27/52 – 05/26/52	128
01/18/56 – 02/09/56	515
02/23/56 – 05/06/56	254
03/17/58 – 05/29/58	574
04/12/65 – 05/08/65	431
04/03/67 – 05/15/67	540
02/25/69 – 05/15/69	378
01/28/96 – 04/30/96	506
01/03/97 – 02/22/97	592
02/06/98 – 06/17/98	439
04/13/99 – 07/02/99	31
02/24/00 – 03/30/00	497

SOURCE: SFPUC, 2006.

The spillway has not been used since the 2001 DSOD restrictions were placed on reservoir storage. Reservoir storage rises temporarily following periods of heavy inflow, and the SFPUC attempts to lower the reservoir level by releasing water to the Sunol Valley WTP and occasionally discharging water through the cone valve to Calaveras Creek. **Table 5.4.1-3** summarizes the releases made through the cone valve since the imposition of DSOD restrictions. As stated above, 1997 MOU fishery releases from Calaveras Reservoir are on hold due to the lack of sufficient cold-water storage in the reservoir.

Alameda Creek Above the Diversion Dam

Alameda Creek above the diversion dam has a reach length of about 14.9 miles, with an average slope of about 125 feet per mile. The average annual stream flow in Alameda Creek at the diversion dam has been estimated at 12,000 acre-feet (Bookman-Edmonston Engineering, Inc., 1995). As shown in **Table 5.4.1-4**, upper Alameda Creek is “flashy”; the creek has brief periods

TABLE 5.4.1-3
APPROXIMATE CALAVERAS CONE VALVE RELEASES SINCE 2001 (CONTROLLED)

Dates	Release
12/2001 – 02/2002	37,385 acre-feet at @ 375 cfs
03/2005 – 05/2005	33,574 acre-feet at @ 373 cfs
03/2006 – 06/2006	65,402 acre-feet at @ 336 cfs
Cone valve closed 6/23/2006	

NOTE: Variations in the identified release rates have occurred within these times periods.

SOURCE: SFPUC, 2006.

of high flows interspersed with longer periods of low flows. Because the table shows daily means, it substantially understates the "flashiness" of the creek, where peak flows may occur for a few hours or less. As indicated on **Table 5.4.1-5**, measured peak flows at the diversion dam have exceeded 650 cfs on 48 days in the past 11 years, or an average of about four days per year. Despite the rarity of these flows, they constitute a substantial amount of stream flow volumes.

Alameda Creek Between the Diversion Dam and Calaveras Creek Confluence

Alameda Creek from the diversion dam to Calaveras Creek is 2.85 miles long with an average slope of 190 feet per mile. This reach has areas of boulders and pools with a segment of gorge carved through sandstone deposits, including the "Little Yosemite" area. Peak flows typically occur in the December through May rainy season. Minimal flows occur from July through October.

The diversion dam includes a dam/spillway, a sluice gate at the bottom of the dam that is used annually to wash out sediments that have accumulated behind the dam, as well as to pass flows when the tunnel gates are closed, a diversion sluiceway that directs water to the diversion gates, and a second sluice gate in the diversion sluiceway. The entire facility is remote (accessed via an unpaved road from the Sunol Regional Wilderness staging area) and, due to a lack of power availability, the gates must be manually operated. There is a gaging station in Alameda Creek immediately upstream of the diversion dam; the nearest Alameda Creek station below the diversion dam is immediately downstream of the creek's confluence with Calaveras Creek.

Prior to 2002, most of the flows were diverted to Calaveras Reservoir via the diversion tunnel. The maximum capacity of the diversion tunnel is about 650 cfs. Typical operation involves opening the diversion tunnel gates in early winter and leaving them open throughout the rainy season, except when Calaveras Reservoir is full. To avoid the need to spill water from Calaveras Reservoir when it is full, the SFPUC closes the gates at the diversion tunnel so that stream flow in Alameda Creek continues down its natural course. The diversion dam does not divert all flows when the diversion gates are open; due to through-flow as well as seepage through the dam and its sluice gates, flows of less than 1 cfs (and possibly somewhat higher) flow through the dam and down the creek.

TABLE 5.4.1-4
HISTORICAL RECORD OF ALAMEDA CREEK FLOW ABOVE THE DIVERSION DAM
(cubic feet per second)

Day of month	Maximum of Daily Mean Values for 11 Years of the Hydrologic Record (October 10, 1994 – September 30, 2005)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	533	212	121	75	54	14	5.8	2.6	1.4	0.74	0.83	18
2	868	387	94	60	52	13	5.8	2.4	1.3	0.99	0.82	126
3	525	1,120	89	72	208	13	5.7	2.3	1.3	0.97	0.83	63
4	234	562	392	77	133	13	5.5	2.1	1.3	0.92	0.84	18
5	521	518	463	65	84	12	4.9	2.0	1.4	0.88	0.84	300
6	211	666	238	67	64	12	4.5	2.0	1.4	0.78	0.84	89
7	432	900	168	84	45	13	4.3	2.0	1.3	0.62	1.0	124
8	447	679	163	110	29	13	4.3	1.9	1.4	0.64	84	170
9	395	628	202	135	22	12	4.3	1.9	1.5	0.64	54	43
10	1,200	229	817	80	19	12	4.2	1.9	1.5	0.64	3.9	601
11	476	121	599	225	18	11	4.1	1.8	1.3	0.81	1.6	222
12	621	253	354	180	23	11	4.0	1.8	1.2	0.92	1.5	242
13	264	483	243	123	91	10	3.8	1.8	0.95	0.80	1.4	187
14	395	672	164	91	77	9.6	3.7	1.8	0.92	0.80	1.3	206
15	637	274	134	73	66	12	3.5	1.7	1.1	0.80	1.1	204
16	457	288	116	64	49	18	3.5	1.8	0.89	0.80	1.4	584
17	175	151	104	56	39	13	3.3	1.8	0.84	0.71	354	267
18	358	264	94	51	35	11	3.2	1.8	1.1	0.76	68	74
19	461	848	88	47	32	10	3.1	1.8	0.87	0.77	21	161
20	479	733	311	43	29	9.5	3.0	1.7	0.87	0.81	25	443
21	290	863	367	39	26	8.8	3.0	1.7	1.1	0.75	13	602
22	715	545	1,090	37	25	8.1	3.0	1.7	1.1	0.76	62	591
23	754	430	903	36	23	7.6	3.0	1.6	1.2	0.77	55	224
24	693	268	495	36	22	7.1	3.0	1.6	1.2	0.80	23	104
25	792	206	281	43	20	7.0	3.0	1.6	1.3	1.5	13	63
26	679	552	180	68	19	6.8	2.9	1.6	1.4	1.0	34	50
27	616	408	126	46	18	6.4	2.8	1.6	1.4	0.92	36	45
28	376	243	203	142	20	6.2	2.8	1.5	1.4	0.92	11	101
29	263	177	146	83	23	6.1	2.8	1.5	1.4	1.4	7.8	324
30	127	–	107	64	18	5.8	3.1	1.4	1.4	1.2	20	452
31	414	–	79	–	15	–	2.7	1.4	–	0.95	–	470

Note: Flows in excess of 650 cfs are shaded; flows above 650 cfs flow past the diversion dam to the downstream reaches of Alameda Creek.

SOURCE: USGS, 2005b.

Diversions have substantially changed the hydrograph (i.e., a graph that shows the pattern of flows—both peak volumes and duration) of this reach of Alameda Creek. Pre- and post-diversion downstream flows in a typical above-normal-water-year storm are discussed below in Section 5.4.1.2, Impacts (see Figures 5.4.1-9, 5.4.1-10, and 5.4.1-11). Nearly all of the downstream flows below 650 cfs were diverted from the creek, and the peak flows were halved. The resulting hydrograph was that of a much smaller storm in a dry year. The effect of diversions on smaller storms (those with instantaneous flows of less than 650 cfs) was even more dramatic, with nearly all flows being removed from the creek downstream. The creek segment below the diversion dam essentially reverted to very low-flow conditions during these lesser storm events.

TABLE 5.4.1-5
NUMBER OF DAYS ALAMEDA CREEK EXCEEDED 650-CFS FLOW, MEASURED ABOVE THE DIVERSION DAM – 1997 TO 2007

Water Year	Hydrologic Year Type	Ranking	Number of Days with Flow Rates Exceeding 650 cfs
1997	Wet	10	11
1998	Wet	2	14
1999	Above Normal	32	2
2000	Above Normal	30	8
2001	Below Normal	50	0
2002	Below Normal	57	0
2003	N/A	N/A	2
2004	N/A	N/A	0
2005	N/A	N/A	6
2006	N/A	N/A	4
2007	N/A	N/A	1

SOURCE: USGS, 2005b.

The SFPUC estimates that, prior to lowering Calaveras Reservoir water levels (pre-2002 conditions), about 8,000 afy had been diverted from Alameda Creek to Calaveras Reservoir in years with normal rainfall, with lesser diversions in dry and below-normal years. In wet years following drought periods, higher diversion quantities could occur, and in dry years, diversions could be much lower.

As a result of Calaveras Reservoir's restricted capacity, the SFPUC has had to significantly reduce its diversions through the Alameda Creek Diversion Dam compared to its 70-year historical operation. Since 2002, both the total quantities of diverted flows and the number of days of diversions have been substantially reduced. In addition, SFPUC records indicate that the diversion valves were only opened for about 35 days in 2002 (November 13 to December 18), about 80 days in 2003 (February 13 to May 2), and 25 days in 2004 (September 29 to October 24), and were not opened for over two years (between late October 2004 and early March 2007). As a result, most flows in Alameda Creek bypassed the diversion dam and continued on into this reach between 2002 and March 2007.

Alameda Creek Below the Calaveras Creek Confluence

Alameda Creek between Calaveras Creek and San Antonio Creek is about 3.3 miles long, with an average slope of 22 feet per mile. Except for the infrequent periods of releases and/or spills from Calaveras Reservoir (see Tables 5.4.1-2 and 5.4.1-3), flows in Alameda Creek below its confluence with Calaveras Creek are similar to, but slightly greater than, those described above for Alameda Creek at the diversion dam. Typical flows are discussed below in Section 5.4.1.2, Impacts.

San Antonio Reservoir

The James H. Turner Dam, which impounds San Antonio Reservoir, was constructed in 1965, approximately one mile upstream of San Antonio Creek's confluence with Alameda Creek and approximately 2.5 miles southeast of the town of Sunol. Above its toe, the dam is about 190 feet high and has a crest elevation of 468 feet (USGS datum).

The catchment area of the reservoir is about 40 square miles. The CCSF owns most of the drainage area north and northeast of San Antonio Reservoir (as shown in Chapter 2, Figure 2.2). These lands extend eastward to include the downstream portions of each of the major contributing creeks (Indian Creek, La Costa Creek, and Williams Gulch, shown in Figure 5.4.1-2) and are considered part of the primary watershed of the reservoir. The upstream portions of the tributaries, however, are outside of CCSF ownership and include large areas of eroded and erodible lands. Stream flows into San Antonio Reservoir are highest during the winter and spring rainy season and become insignificant in summer and early fall. Average annual stream flow into San Antonio Reservoir has been estimated at 7,200 acre-feet (Bookman-Edmonston Engineering, Inc., 1995).

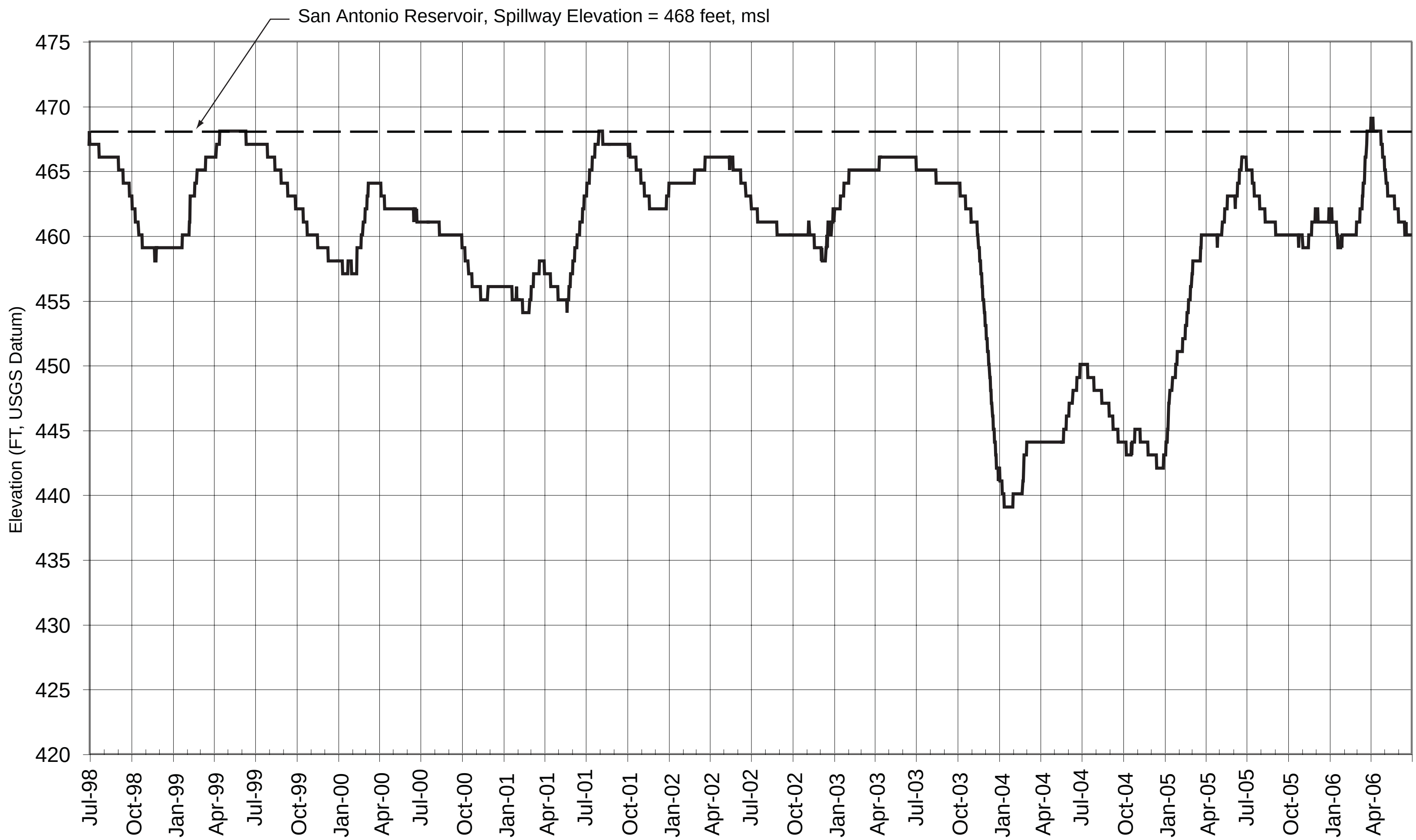
As described above, San Antonio Reservoir normally receives inflow from the San Antonio Creek watershed and imported water from the Hetch Hetchy Aqueduct (as described in Chapter 2, Section 2.2.3). In addition, the reservoir has been used to store South Bay Aqueduct emergency water, groundwater (influenced by surface water) pumped from the infiltration galleries at the Sunol Water Temple, and Calaveras Reservoir surplus flows. The initial capacity of the reservoir was 50,300 acre-feet. Sedimentation since its construction has reduced its maximum capacity by about 2 percent, to roughly 49,500 acre-feet. Average monthly storage in San Antonio Reservoir does not vary substantially from month to month or year to year, ranging from about 39,000 to 50,300 acre-feet in all conditions and months. As shown in **Figure 5.4.1-4**, reservoir levels have ranged from about 440 to 468 feet. The average annual rainfall near San Antonio Reservoir is about 20 inches per year (San Francisco Planning Department, 1999).

Reservoir Operations

The SFPUC operates San Antonio Reservoir to receive and store dechlorinated water from the Hetch Hetchy Aqueduct as well as local watershed runoff. Hetch Hetchy water can be stored in San Antonio Reservoir by diverting it from the Alameda Siphons via the San Antonio Pump Station through the San Antonio Pipeline. Although not part of normal operations, surplus water from Calaveras Reservoir can flow by gravity through the Calaveras and San Antonio Pipelines to be stored in San Antonio Reservoir.

Water from San Antonio Reservoir is treated at the Sunol Valley WTP before entering the transmission system. San Antonio Reservoir water can flow to the Sunol Valley WTP by gravity when the water level in the reservoir is above 445 feet. Below this elevation, the water must be pumped via the San Antonio Pump Station. The Sunol Valley WTP treats the water before it reenters the system by gravity-flow through the Alameda Siphons.

As part of system operations, the SFPUC can make releases from San Antonio Reservoir to San Antonio Creek, which then flow to Alameda Creek. Controlled releases through the



SOURCE: SFPUC, HH/LSM (see Appendix H)

Figure 5.4.1-4
San Antonio Reservoir, Historical Water Levels, 1998 to 2006

emergency discharge valve on Turner Dam and uncontrolled releases (spills over the spillway) are discharged to San Antonio Creek. Uncontrolled releases flow over the spillway structure, an 80-foot-long weir with a crest elevation of 468 feet. The SFPUC estimates the spillway capacity at 13,500 cfs for a reservoir water level of 480 feet.

San Antonio Creek Below San Antonio Reservoir

Modeled uncontrolled releases from San Antonio Reservoir to San Antonio Creek average about 1,000 afy, ranging from no releases in below-normal and dry years to about 3,200 acre-feet in very wet years. Actual dam operation makes adjustments to prevent spill such that less water is spilled than predicted by the model. Currently, there are no releases from June through December; the highest releases typically occur in February and March. For much of the year, this stream reach is dry. San Antonio Creek joins Alameda Creek in the lower reaches of the Sunol Valley in the vicinity of the quarries and upstream of Arroyo de la Laguna.

Alameda Creek Below the San Antonio Creek Confluence

The reach of Alameda Creek through the Sunol Valley (both upstream and downstream of the confluence with San Antonio Creek) has a low gradient, with an elevation change of about 80 feet in five river miles. The Sunol Valley is broad but is bordered in parts by steep slopes (Center for Ecosystem Management and Restoration, 2002). In the lower reaches of the Sunol Valley, Alameda Creek is bordered by numerous gravel quarries, and much of the flow in the creek is lost to groundwater.

Since October 1999, the USGS has monitored mean daily flows in Alameda Creek downstream of Welch Creek, at about the location of the Sunol WTP. Mean daily flows generally range from near zero during dry months to above 1,000 cfs in wet months. The highest mean daily flow recorded prior to lowering Calaveras Reservoir water levels was 1,070 cfs in late March. The highest mean daily flow since 2002 was 1,340 cfs in early April. During the month of May, flow rates are usually in the order of 50–100 cfs, decreasing to 20–50 cfs in June and 0–20 between July and November.

Peak flows in Alameda Creek at Welch Creek increased substantially after the closure of the diversion tunnel. In 2000 (a wet year), a peak flow rate of 2,910 cfs was recorded. If the tunnel intake had been closed, the flow would have been about 650 cfs greater.

5.4.1.2 Impacts

Significance Criteria

The CCSF has not formally adopted significance standards for impacts related to stream flow, but generally considers that implementation of the proposed program would have a significant impact if it were to:

- Substantially alter stream flows such that they are outside the range of pre-WSIP conditions and result in substantial hydrologic changes

In addition to direct impacts resulting from changes in stream flows and reservoir levels, this PEIR also considers indirect impacts. These include impacts related to geomorphology, surface water quality, groundwater, fisheries, terrestrial biological resources, and recreational and visual resources. Each of these topics is discussed in its own section in this chapter. It should be noted that there might be cases in which significant indirect impacts could result from less-than-significant direct impacts.

Approach to Analysis

As discussed above in Section 5.4.1.1, DSOD-imposed restrictions on Calaveras Reservoir capacity substantially altered SFPUC operations and, as a result, changed the hydrologic conditions in Alameda Creek, Calaveras Creek, and Calaveras Reservoir (i.e., flow diversions from Alameda Creek have been reduced or halted and reservoir levels lowered). These hydrologic conditions will continue until the Calaveras Dam project (SV-2) is implemented, which would restore the original reservoir capacity. Therefore, these hydrologic conditions will have occurred for 10 years or more (from 2002 through approximately 2012, the target date for reservoir refill). Once the dam is rebuilt and the reservoir refilled, the SFPUC would reinitiate operations that are similar to those it implemented prior to the DSOD restrictions, and the hydrologic conditions in Alameda Creek and Calaveras Reservoir would return to those that existed prior to the DSOD restrictions; that is, the SFPUC would again divert substantial flow from Alameda Creek to the reservoir and would maintain the reservoir water levels near the maximum storage level.

The SFPUC operates the Alameda Creek Diversion Dam to divert water from Alameda Creek into Calaveras Reservoir when such water can be stored. The SFPUC closes the ACDD Tunnel when diversions are not needed. As a result of the 2001 DSOD restriction on Calaveras Reservoir, the SFPUC has had to reduce the volume of water stored in Calaveras and has therefore significantly reduced its diversions through the Alameda Creek Diversion Dam by closing the tunnel more frequently compared to its 70-year historic operation. Upon completion of the Calaveras Dam Replacement project (SV-2), the SFPUC would no longer have DSOD restrictions on storage level in Calaveras Reservoir. Compared to historical operations with full storage capacity at Calaveras, the SFPUC plans to maintain Calaveras Reservoir at a higher elevation over long periods of time, and as a result the diversion tunnel would be closed more often than historically and there would be more occasions when water bypasses the Alameda Creek Diversion Dam into Alameda Creek (see Appendix H2-2, Table 2.7-7).

For the purpose of impact analysis, CEQA Guidelines Section 15125(a)[2] considers the existing conditions baseline to be those conditions in existence at the time the environmental review is initiated, as marked by issuance of the notice of preparation (NOP). For the WSIP, the existing baseline used for the impact analysis reflects the range of hydrologic conditions that have resulted since the DSOD restrictions were imposed in December 2001 and continued through issuance of the NOP in 2005, and which are expected to continue until such time that a restored reservoir

[2] CEQA Guidelines Section 15125(a) states that an EIR must include a description of the physical environmental conditions in the vicinity of the project as they exist at the time the NOP is published, and that this environmental setting will normally constitute the baseline physical conditions by which the lead agency determines whether an impact is significant.

begins refilling. This PEIR does not use the historical range of hydrologic conditions that existed prior to the DSOD restriction as the basis of impact analysis of the WSIP impacts on stream flow.

The following section addresses the impacts of the WSIP on water levels in Calaveras and San Antonio Reservoirs and flow along Calaveras, Alameda, and San Antonio Creeks. In applying the above significance criteria, very infrequent changes in reservoir levels and/or flow are not generally considered to generate a significant effect. Changes in stream flow and changes in reservoir storage and water levels attributable to the WSIP were estimated using the Hetch Hetchy/Local Simulation Model (HH/LSM). An overview of the model is presented in Section 5.1.4. Detailed information on the model and its underlying assumptions is provided in Appendix H.

This section compares modeled existing (2005) hydrologic conditions (with Calaveras Reservoir operated at its restricted capacity and assuming current operational priorities) to modeled post-WSIP 2030 conditions. The WSIP 2030 conditions assume full implementation of all proposed WSIP facility improvement projects, including the Calaveras Dam (SV-2) and Alameda Creek Fishery (SV-1) projects, as well as implementation of fishery releases and downstream recapture of those releases. In some cases, patterns from actual flow data were used to supplement results from the modeled data in order to provide additional detail and context for assessing potential impacts. Stream reaches are discussed separately below, and their interrelationships are highlighted.

Impact Summary

Table 5.4.1-6 presents a summary of the impacts on stream flow in the Alameda Creek watershed that could result from implementation of the proposed water supply and system operations.

TABLE 5.4.1-6
SUMMARY OF IMPACTS – STREAM FLOW IN ALAMEDA CREEK WATERSHED

Impact	Significance Determination
Impact 5.4.1-1: Effects along Calaveras Creek below Calaveras Reservoir	LS
Impact 5.4.1-2: Effects on flow along Alameda Creek below the diversion dam	SU
Impact 5.4.1-3: Effects in San Antonio Reservoir and along San Antonio Creek	LS
Impact 5.4.1-4: Effects on flow along Alameda Creek below the confluence of San Antonio Creek	LS

LS = Less than Significant impact, no mitigation required
SU = Significant Unavoidable impact

Impact 5.4.1-1: Effects along Calaveras Creek below Calaveras Reservoir.

Calaveras Reservoir is currently operated to conserve local watershed runoff for integration into the SFPUC regional water supply; however, due to DSOD restrictions, the water level in Calaveras Reservoir has been considerably lower since the end of 2001 than in previous years.

Reservoir storage is constrained to approximately 37,800 acre-feet (except on a temporary basis), about 40 percent of its design capacity. Under the WSIP, Calaveras Reservoir would be restored to its full design capacity (approximately 96,800 acre-feet), which would allow the SFPUC to maximize the use of local watershed supplies. Furthermore, fishery releases from the proposed bypass flow structure at the Alameda Creek Diversion Dam and/or from the reservoir and flow recapture would be implemented under the WSIP in accordance with the 1997 MOU (compliance with the 1997 MOU is measured below the confluence of Alameda and Calaveras Creeks). The fishery releases from the diversion dam bypass flow structure to Alameda Creek and from Calaveras Reservoir to Calaveras Creek would be recaptured downstream and returned to the SFPUC water supply in compliance with the 1997 MOU.

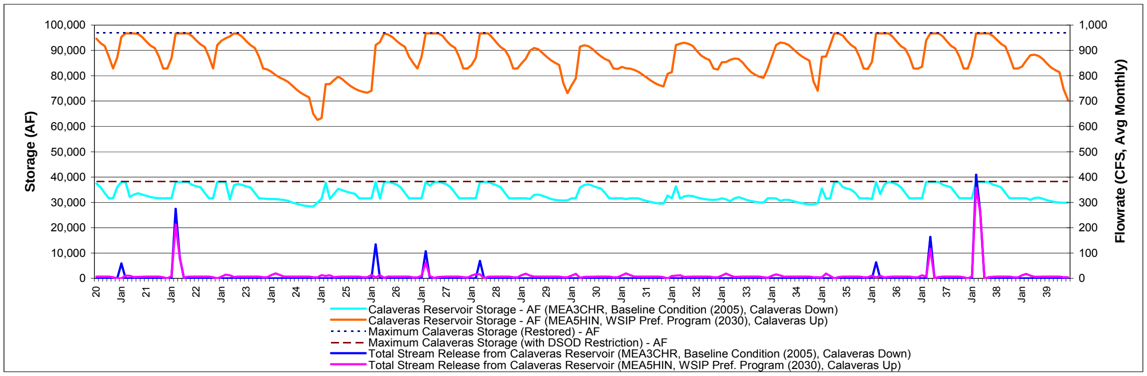
Under existing and future modeled conditions, yearly Calaveras Reservoir storage operations are typically cyclical: the reservoir fills in the late winter/early spring and is depleted during the summer. During a drought, reservoir storage is further depleted by the slow, successive drawdown of reservoir storage that occurs due to required releases and the drafting of supplies to the Sunol Valley WTP that exceed runoff to the reservoir. The reservoir then refills after the drought, as the SFPUC strives to conserve local watershed runoff. Both the annual range and year-to-year range of variation in reservoir water levels would increase as the storage capacity of Calaveras Reservoir is restored.

Figure 5.4.1-5 illustrates the modeled chronological storage and stream releases from Calaveras Reservoir for both the existing condition and the WSIP using hydrologic data from the period 1920 to 2002. Releases to Calaveras Creek from Calaveras Reservoir represent both controlled releases through the cone valve and uncontrolled releases over the spillway. The graphs also show how peak flows in Calaveras Creek downstream of the dam tend to correspond to periods when Calaveras Reservoir is operating at or near capacity. This figure assumes the SFPUC would make fishery releases in compliance with the 1997 MOU from Calaveras Reservoir only and does not account for the proposed bypass flows from the diversion dam; this represents a worst-case condition for the range of fluctuation in Calaveras Reservoir water levels.

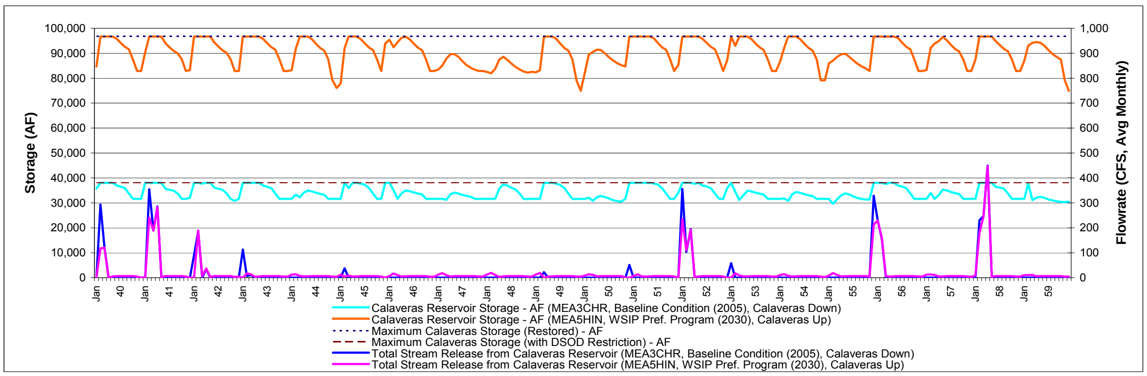
As illustrated in the graphs, the most notable change that would occur under WSIP operations is that Calaveras Reservoir would be operated at a higher water surface elevation than at present; as the graphs show, the brown line (2030 WSIP conditions) is consistently at a much higher level than the blue line (existing conditions) for the 82-year period. Reservoir storage and water levels also show greater variation than under existing conditions, as illustrated by the wider range of fluctuation of the brown line (2030 WSIP conditions) compared to the blue line (existing conditions). The graphs also show that the restored reservoir storage would reduce peak releases (and therefore flows) into Calaveras Creek downstream of the dam under all but the heaviest wet-year storms; the releases are represented by the blue line (existing conditions) and magenta line

(2030 WSIP conditions) along the bottom of each graph, with the magenta line generally lower than the blue line except in the wettest years. Under actual operations to date, storage in the reservoir under restricted conditions has at times exceeded the DSOD target; as a result, more water has been temporarily held in storage than the model indicates (see Figure 5.4.1-3) and fewer releases have actually occurred than predicted by the model. This is because the model

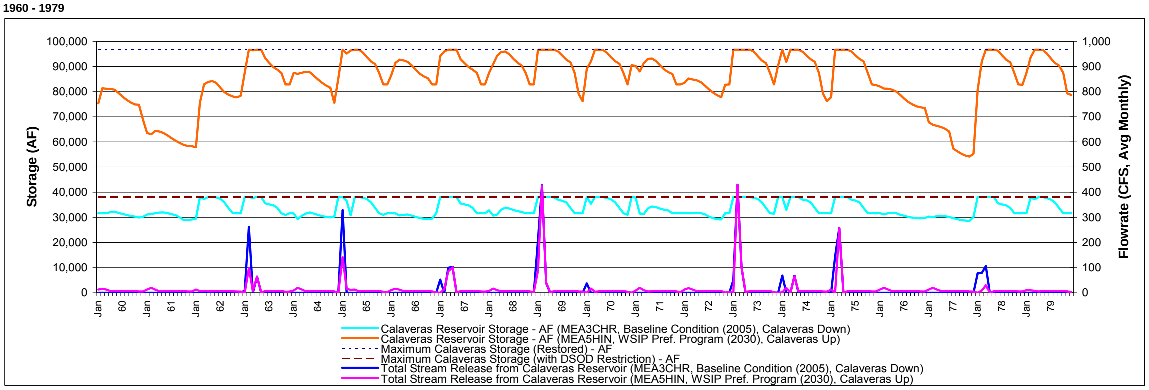
1920 - 1939



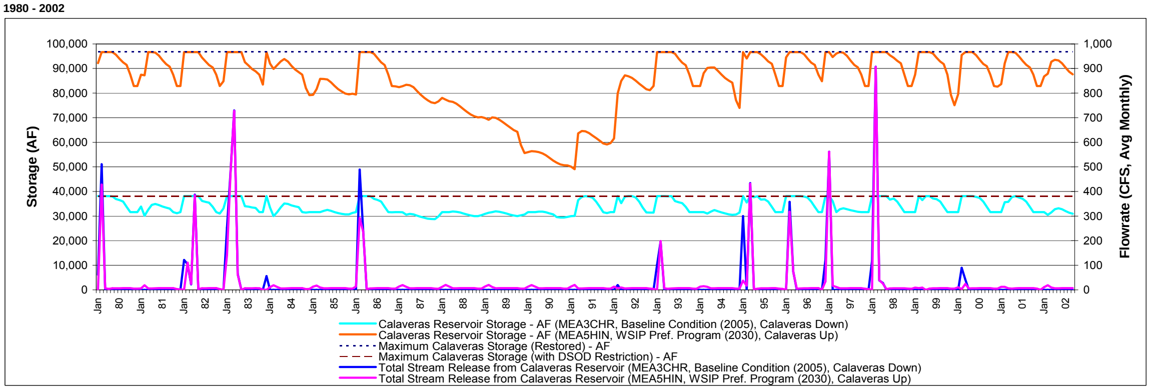
1940 - 1959



1960 - 1979



1980 - 2002



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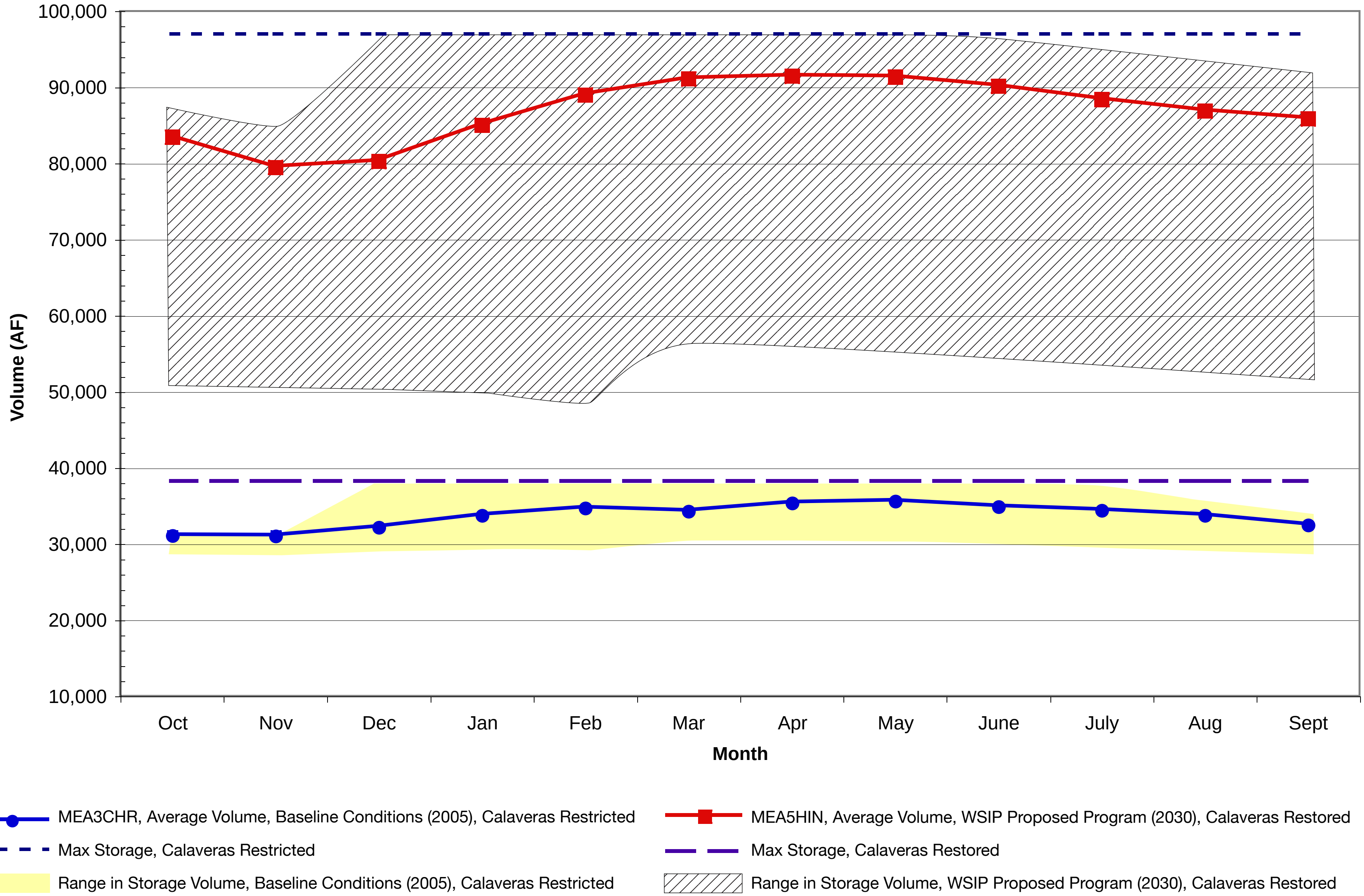
SOURCE: SFPUC, HH/LSM (see Appendix H).

Figure 5.4.1-5
Calaveras Storage and Releases to Calaveras Creek



SOURCE: SFPUC, HH/LSM (see Appendix H)

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Figure 5.4.1-6
Average Monthly Storage Volume,
Calaveras Reservoir

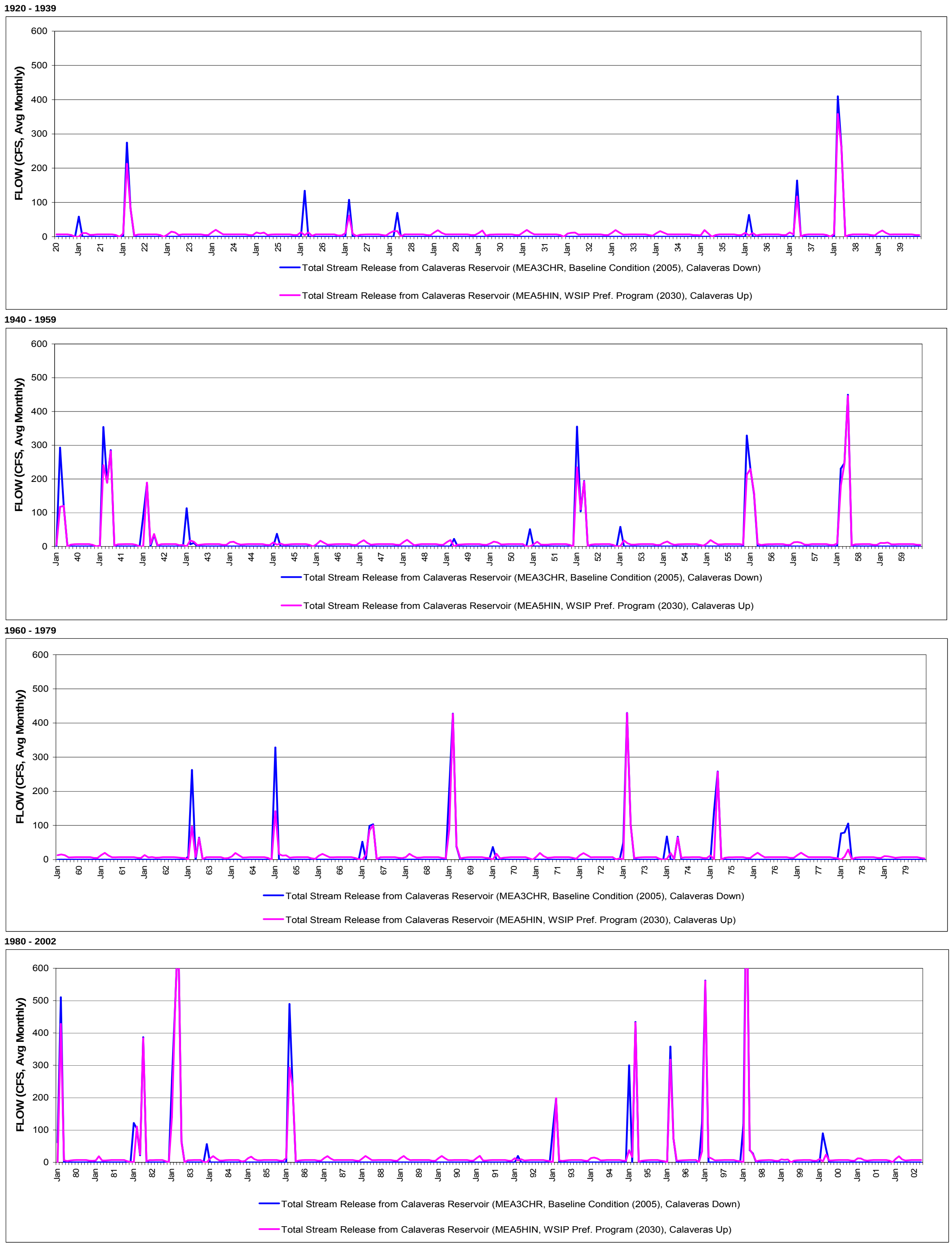
imposes absolute rules, whereas under actual conditions, the SFPUC operators must adjust operations in response to many real-time factors.

Figure 5.4.1-6 presents the estimated change in average monthly reservoir water surface elevation under existing conditions and after implementation of the WSIP. This figure assumes the SFPUC would make fishery releases in compliance with the 1997 MOU from Calaveras Reservoir only and does not account for the proposed bypass flows from the diversion dam; this represents a worst-case condition for the range of fluctuation in Calaveras Reservoir water levels. The water level in Calaveras Reservoir would be higher year-round with the WSIP; the increase in average monthly storage would be mostly attributable to completion of the Calaveras Dam project (SV-2) and the removal of the DSOD storage limitations. During rainy months, the reservoir water level would be kept near the wintertime storage objective, or roughly 20 to 30 feet higher than under existing conditions. The average water surface elevation would be substantially greater than under current conditions, but only 6 to 12 feet higher than pre-2002 conditions (prior to the DSOD restrictions).

With implementation of the WSIP, the change in operation of Calaveras Reservoir storage would affect hydrologic conditions elsewhere in the watershed. As described below, the restored capacity of Calaveras Reservoir would affect the operation of the Alameda Creek Diversion Dam and Tunnel, and thus the inflow to Calaveras Reservoir and flow to Alameda Creek below the diversion dam. The proposed bypass structure at the Alameda Creek Diversion Dam and the restored storage capacity would also allow for implementation of the 1997 MOU-required releases from either the new bypass structure or Calaveras Reservoir in support of fisheries.

Compared to existing conditions, the WSIP would change the nature of releases from Calaveras Reservoir to Calaveras Creek. With implementation of the fishery releases from the new bypass flow structure at the diversion dam and from Calaveras Reservoir (up to 6,300 afy), there would at times be releases from the reservoir under the WSIP that are not made under existing conditions. These flows would be gaged and maintained below the confluence of Alameda and Calaveras Creeks. Contributing to these flows would be: (1) flows that spill past the Alameda Creek Diversion Dam, (2) unregulated runoff from accretions (inflow) between the diversion dam and the Calaveras Creek confluence, (3) unregulated runoff between Calaveras Dam and the confluence, (4) operational releases from Calaveras Reservoir for reservoir regulation purposes, and (5) operational releases from the Alameda Creek Diversion Dam to support fishery releases when there is available flow in Alameda Creek.

Figure 5.4.1-7 illustrates the modeled chronological releases of water below Calaveras Dam to Calaveras Creek for both existing conditions and with the WSIP; this figure assumes the SFPUC would make fishery releases in compliance with the 1997 MOU from Calaveras Reservoir only and does not account for the proposed bypass flows from the diversion dam. Operational releases from Calaveras Reservoir occur in about 50 percent of the years under the modeled existing condition and in about 35 percent of the years under the WSIP (with the exception of 1997 MOU releases, which would occur in all years), with most of these years being classified as above-normal or wet. **Table 5.4.1-7** shows the releases from the reservoir for various representative hydrologic year types and assumes the SFPUC would make fishery releases in compliance with the 1997 MOU from Calaveras Reservoir only and does not account for the proposed bypass flows from the diversion dam. As shown in the table, releases with the WSIP would be substantially diminished in the winter months of normal, above-normal, and wet years, with up to a 70 percent reduction. This reduction in the frequency and magnitude of releases would primarily result from removal of the DSOD storage constraint following construction of the Calaveras Dam project (SV-2). With greater operational capacity, more local runoff would be stored and used for water supply. During all months of below-normal and dry years and the majority of months in normal, above-normal, and wet years, the volume of releases would remain nearly the same or would be slightly diminished with the WSIP compared to existing conditions. However, in several scenarios, releases would be eliminated under WSIP operations.



SOURCE: SFPUC, HH/LSM (see Appendix H).

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Figure 5.4.1-7
Chronological Modeled Releases of Water Below Calaveras Dam

TABLE 5.4.1-7
ESTIMATED AVERAGE MONTHLY RELEASES FROM CALAVERAS RESERVOIR TO CALAVERAS CREEK
(cubic feet per second)

	Wet	Above Normal	Normal	Below Normal	Dry	All
Existing Condition (2005 Operations and Facilities)						
Oct	0	0	0	0	0	0
Nov	0	0	0	0	0	0
Dec	28	3	4	0	0	7
Jan	150	44	6	0	0	40
Feb	297	105	16	0	0	83
Mar	162	50	6	0	0	43
Apr	84	8	0	0	0	18
May	0	0	0	0	0	0
June	0	0	0	0	0	0
July	0	0	0	0	0	0
Aug	0	0	0	0	0	0
Sept	0	0	0	0	0	0
WSIP (2030)						
Oct	7	7	7	7	7	7
Nov	4	4	5	5	5	5
Dec	17	3	3	4	5	6
Jan	83	13	9	11	13	25
Feb	270	65	13	16	19	76
Mar	163	46	9	10	12	48
Apr	85	11	4	6	6	22
May	4	5	6	6	7	6
June	7	7	7	7	7	7
July	7	7	7	7	7	7
Aug	7	7	7	7	7	7
Sept	7	7	7	7	7	7

Difference and Percent Change, Existing Condition (2005) vs WSIP (2030)

	Wet		Above Normal		Normal		Below Normal		Dry		All	
Oct	7	*	7	*	7	*	7	*	7	*	7	*
Nov	4	*	4	*	5	*	5	*	5	*	5	*
Dec	-11	-[39%]	0	[0%]	-1	-[25%]	4	*	5	*	-1	-[14%]
Jan	-67	-[45%]	-31	-[70%]	3	[50%]	11	*	13	*	-15	-[38%]
Feb	-27	-[9%]	-40	-[38%]	-3	-[19%]	16	*	19	*	-7	-[8%]
Mar	1	[1%]	-4	-[8%]	3	[50%]	10	*	12	*	5	[12%]
Apr	1	[1%]	3	[38%]	4	*	6	*	6	*	4	[22%]
May	4	*	5	*	6	*	6	*	7	*	6	*
June	7	*	7	*	7	*	7	*	7	*	7	*
July	7	*	7	*	7	*	7	*	7	*	7	*
Aug	7	*	7	*	7	*	7	*	7	*	7	*
Sept	7	*	7	*	7	*	7	*	7	*	7	*

* Indicates a release under the "WSIP (2030)" condition where no release under "Existing Condition (2005)" currently exists.

NOTE: "Existing Condition (2005)" is based on model run MEA3CHR. "WSIP (2030)" is based on model run MEA5HIN. An overview of the model runs is presented in Section 5.1. Detailed information on the models and underlying assumptions is provided in Appendix H.

Key
- > 0%
- < 0 to -5%
- < -5%

SOURCE: SFPUC, HH/LSM (see Appendix H).

With implementation of the WSIP, summer base flows (flows that occur in the absence of any recent rainfall) in Calaveras Creek below the dam would increase due to the required fishery releases below Calaveras Dam (shown in Table 5.4.1-5). The maximum supplemental release of 6,300 afy might not be needed in every year due to other flows reaching the confluence, including bypass flows at the Alameda Creek Diversion Dam.

Impact Conclusions

As indicated in the relevant tables and figures, the WSIP would substantially reduce average flows in Calaveras Creek below Calaveras Dam in the winter and early spring months of wet and above-normal precipitation years. The proposed program would also increase flows due to fishery releases in the summer months. As indicated on Figure 5.4.1-7, the changes in flow due to the WSIP would occur in years with above-normal rainfall only, and the reduced winter flows would still remain in the range of existing flows; therefore, the impact would be *less than significant*, and no mitigation measures would be required. The new summer instream releases in Calaveras Creek would constitute a beneficial flow impact.

Impact 5.4.1-2: Effects on flow along Alameda Creek below the diversion dam.

The diversion of flows from Alameda Creek at the diversion dam affects two reaches of the creek: the reach between the diversion dam and the confluence with Calaveras Creek and the reach below the confluence with Calaveras Creek. Both reaches are discussed in this impact analysis.

Between the Diversion Dam and the Calaveras Creek Confluence

The Alameda Creek Diversion Dam and Tunnel divert water from the upper Alameda Creek watershed to Calaveras Reservoir. Inflow at the diversion dam is diverted into the tunnel up to the maximum capacity of the tunnel, which is estimated at about 650 cfs. Inflow to the diversion dam that exceeds the tunnel capacity (or when the tunnel gates are closed) flows past the diversion dam and continues downstream in Alameda Creek. As described above, diversions from Alameda Creek to Calaveras Reservoir have been substantially reduced because of the DSOD restrictions on Calaveras Reservoir. Currently, as indicated on Figure 5.4.1-3, Calaveras Reservoir is often filled near, or above, the maximum permitted storage level with runoff from its natural drainage and, at these times, has no capacity to accept diversions from Alameda Creek. Therefore, while the DSOD restrictions on Calaveras Dam are in effect, the SFPUC is unable to capture most local watershed runoff from upper Alameda Creek, and post-2002 flows in Alameda Creek below the diversion dam have been substantially greater than they were prior to 2002.

Modeling of future operations under the WSIP indicates that diversions would primarily occur during the December through May rainy season. The greatest diverted/reduced stream flow quantities would occur from December through March. **Figure 5.4.1-8** shows the modeled chronological average monthly spill of water past the diversion dam for the period from 1920 to 2002. As illustrated in the figure, the number of occurrences and magnitude of flows continuing down Alameda Creek past the diversion dam would be reduced with the WSIP due to more

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SOURCE: SFPUC, HH/LSM (see Appendix H).

Figure 5.4.1-8
Flows in Alameda Creek Below the Diversion Dam

frequent diversions to Calaveras Reservoir. Flows past the diversion dam would be reduced in wet, above normal, and normal year types, although when flow is available, the SFPUC would allow for minimum bypass flows consistent with the requirements of the 1997 CDFG MOU.

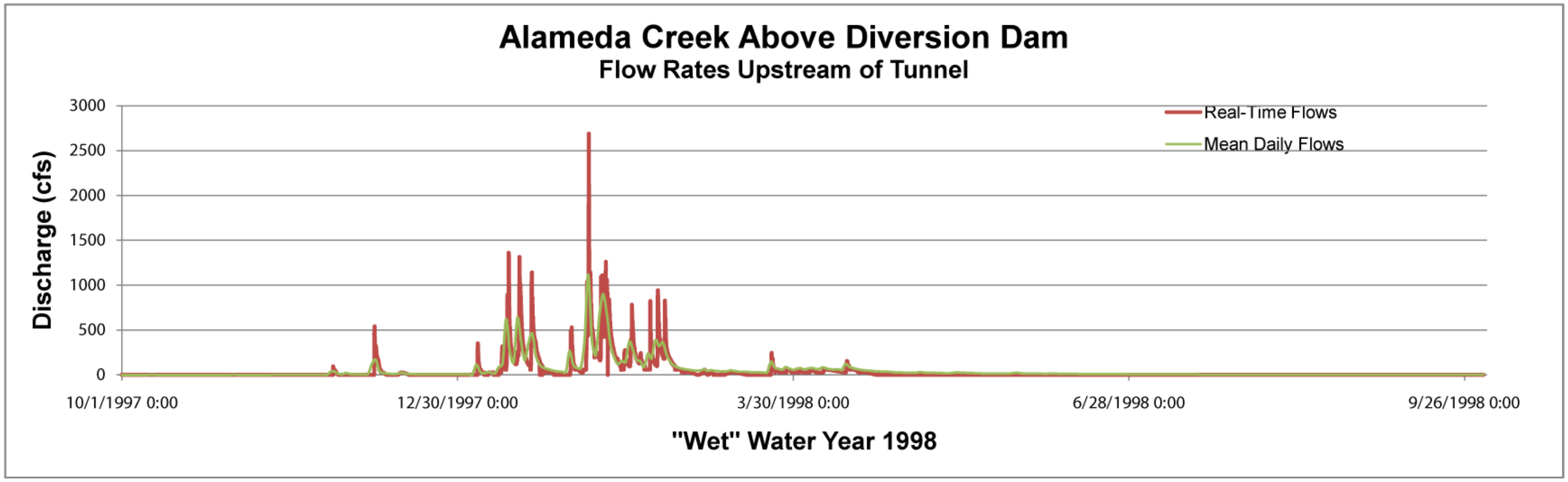
As described in Section 5.4.1.1, Setting, instantaneous gage data (15-minute readings) for the period from 1997 through 2007 indicate that flows greater than 650 cfs in Alameda Creek above the diversion dam have occurred an average of about four days per year (a total of 48 days over the 11-year period) and, in one-quarter of those years, did not occur at all. These instantaneous readings show that flows in excess of 650 cfs occur more frequently than is indicated by the daily mean flow data shown in Table 5.4.1-4. This is because many of the peak flows last for a few hours only and are obscured by 24-hour means. Daily means also underrepresent the actual volumes of water passing the diversion dam. As indicated in **Figures 5.4.1-9** and **5.4.1-10**, under the WSIP in a typical above-normal rainfall year, there would be only a few days per year when flows above the minimal seepage levels (approximately 1 cfs) would reach Alameda Creek below the diversion dam (the primary exceptions being when Calaveras Reservoir is full and diversions cease, and when large storms result in runoff substantially over 650 cfs). However, as indicated on these graphs, substantial volumes of water (sometimes over 1,000 cfs) would still flow down the creek during these peak events. The existing diversion dam facilities seep, and therefore, summer and fall base flows of less than about 1 cfs continue down the creek and these flows would be expected to continue down the creek under the WSIP via the new bypass facilities.

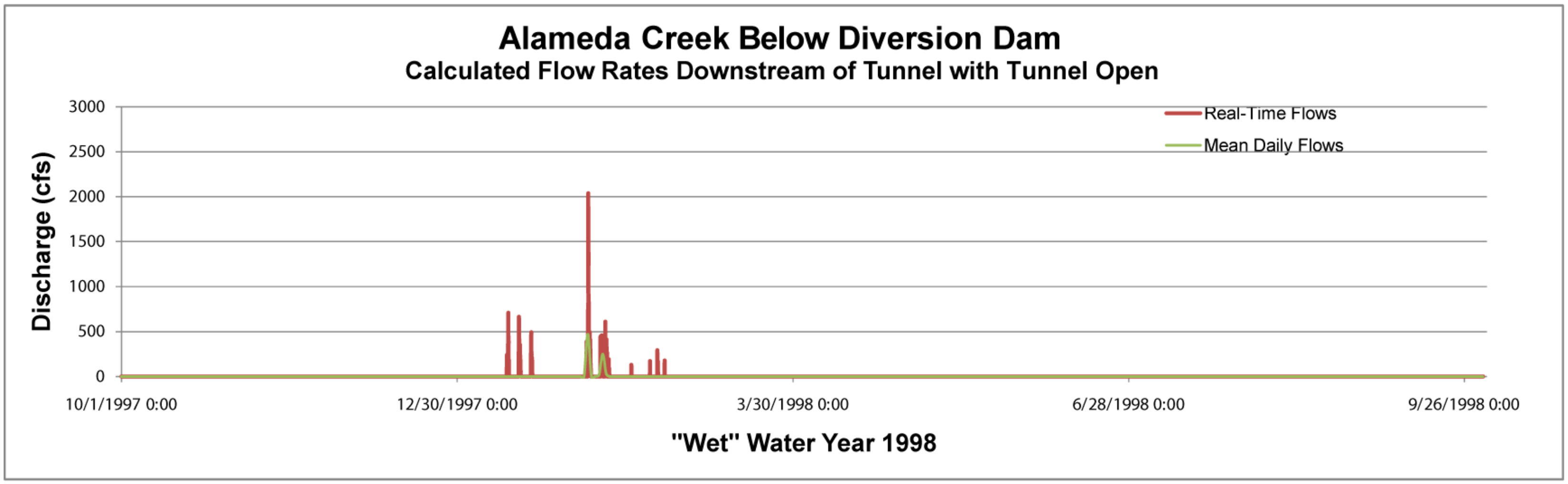
On a storm-by-storm basis, even when stream flows exceed 650 cfs, WSIP diversions would substantially reduce the flows and alter the hydrograph, leaving only brief periods of high flows in major storm events, as shown on Figures 5.4.1-5 and **5.4.1-11**. The graphs show that flows below 650 cfs (which make up several hours of the typical large storm) would be eliminated, and that flows above 650 cfs would be substantially reduced in all but the heaviest storms compared to existing conditions. Both duration and magnitude of flows in the creek downstream of the diversion dam would be substantially reduced during storm events such that, with the proposed program, flows from major storms would resemble those currently occurring during much smaller storm events, and smaller storms would not result in any flows at all.

Alameda Creek Below the Calaveras Creek Confluence

The total flow at the confluence of Alameda and Calaveras Creeks is the combination of total releases/spills from Calaveras Dam, flow spilled past the Alameda Creek Diversion Dam, and the unregulated runoff occurring between the confluence and the diversion dam and Calaveras Dam. However, because most of the flows from Arroyo Hondo and Calaveras Creek are retained in Calaveras Reservoir for water supply storage, the vast majority of Alameda Creek flows in this reach originate above the diversion dam (except when Calaveras spills or makes large releases). This is shown on **Figure 5.4.1-12**, which compares graphs of flows in Alameda Creek in an above-normal year, as gaged above the diversion dam, and below the Calaveras Creek confluence. The graphs indicate that, with the exception of one spike (which may be due to releases from Calaveras Reservoir or an erroneous gage reading), flows above the diversion dam were very similar to those measured just below the Calaveras confluence.

Table 5.4.1-8 presents modeled flow data for the Calaveras confluence in terms of the monthly average flow within year type. As shown in the table, there would be a substantial reduction (up





Upper graphic – SOURCE: USGS, 2005b
Lower graphic – SOURCE: USGS, 2005c

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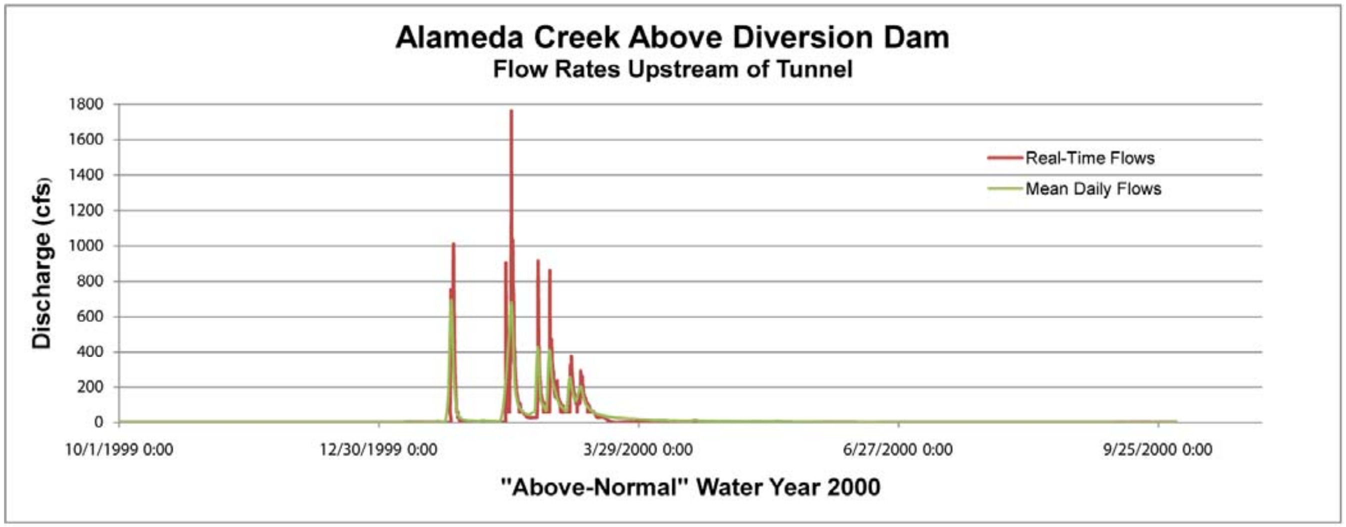
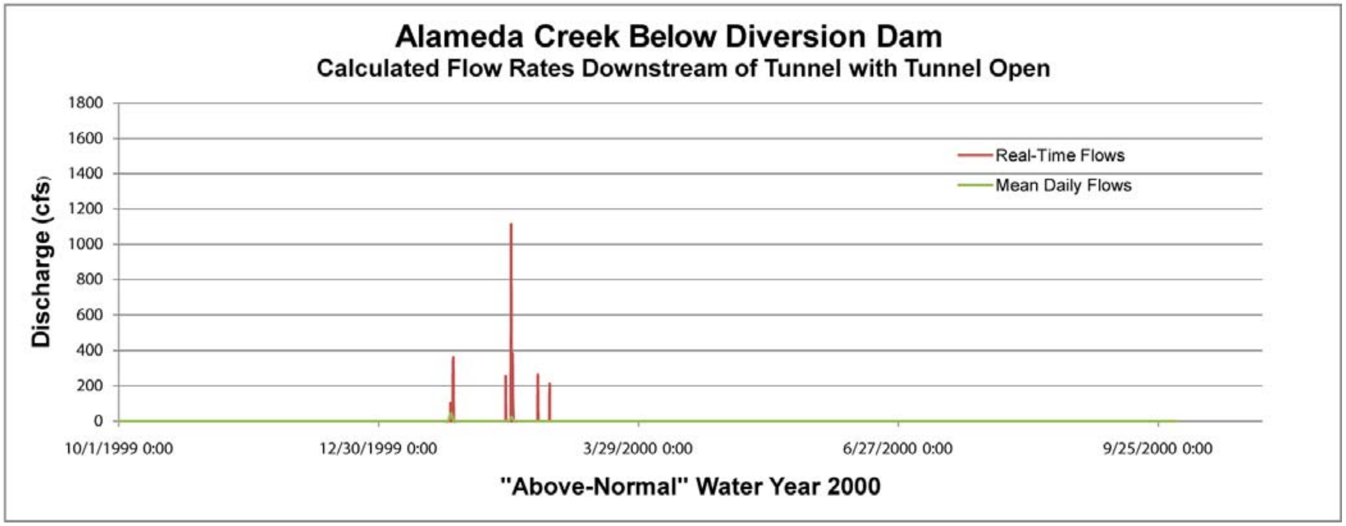
Figure 5.4.1-9
Alameda Creek Above and Below the Diversion Dam –
Flow Rates Upstream and Downstream of the Diversion Tunnel During “Wet” Water Years





Upper graphic – SOURCE: USGS, 2005b
Lower graphic – SOURCE: USGS, 2005c

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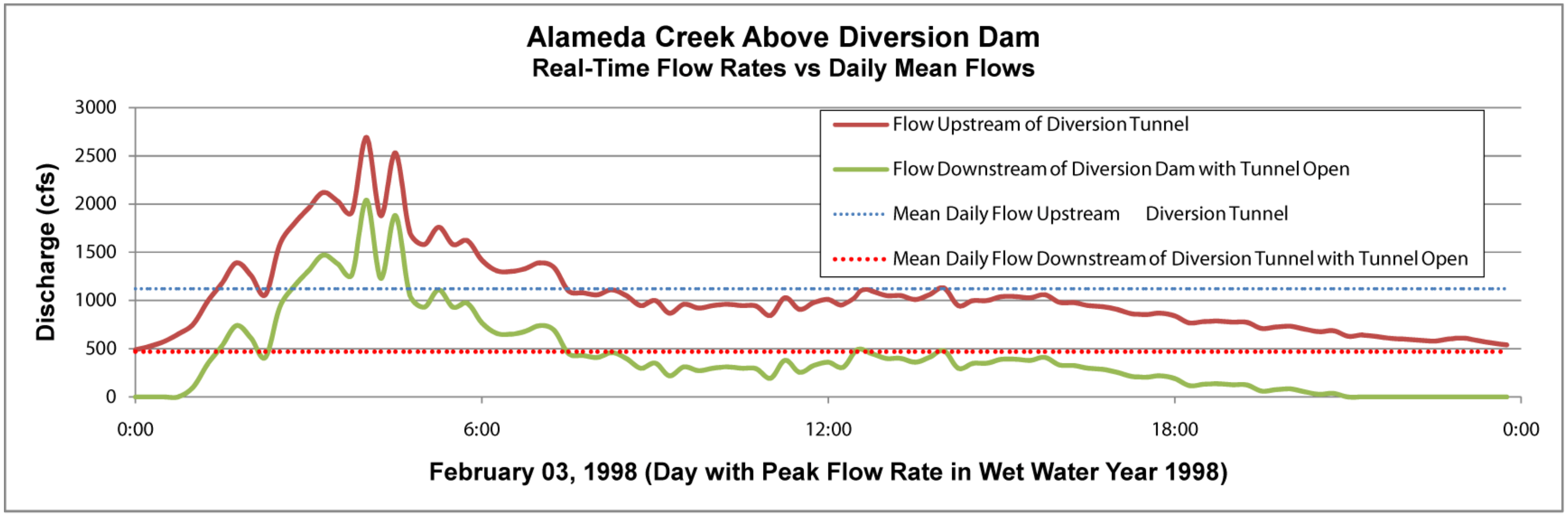
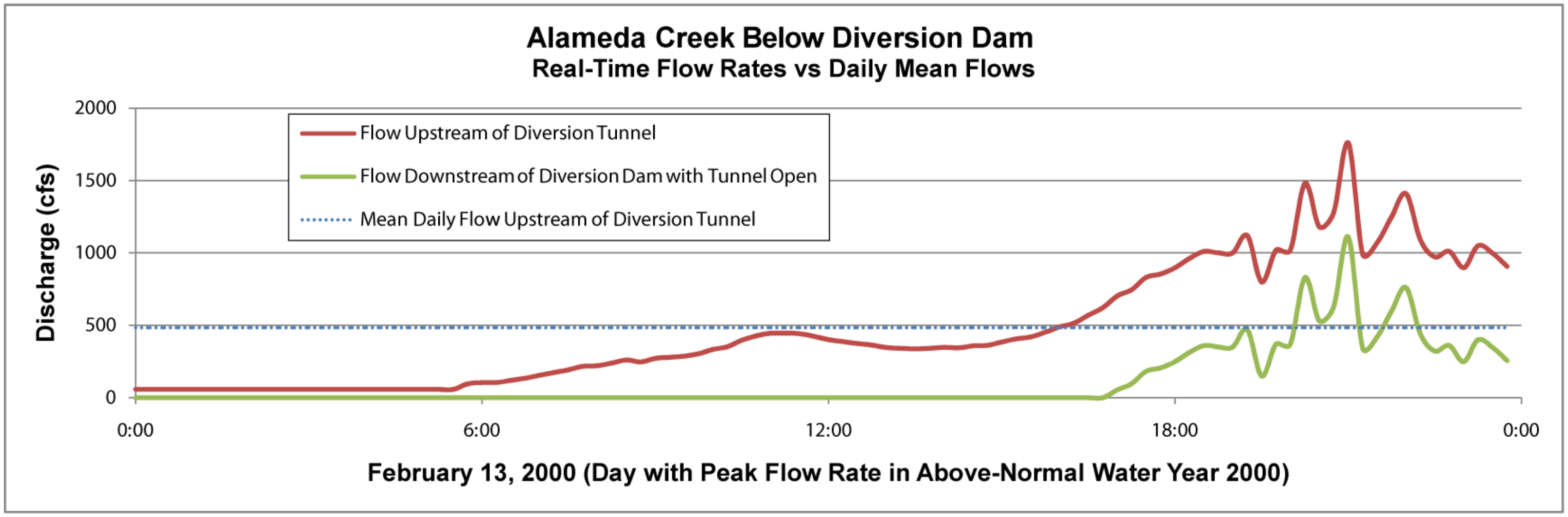
Figure 5.4.1-10
Alameda Creek Above and Below the Diversion Dam –
Flow Rates Upstream and Downstream of Tunnel During “Above-Normal” Water Years





Upper graphic – SOURCE: USGS, 2005b
Lower graphic – SOURCE: USGS, 2005c

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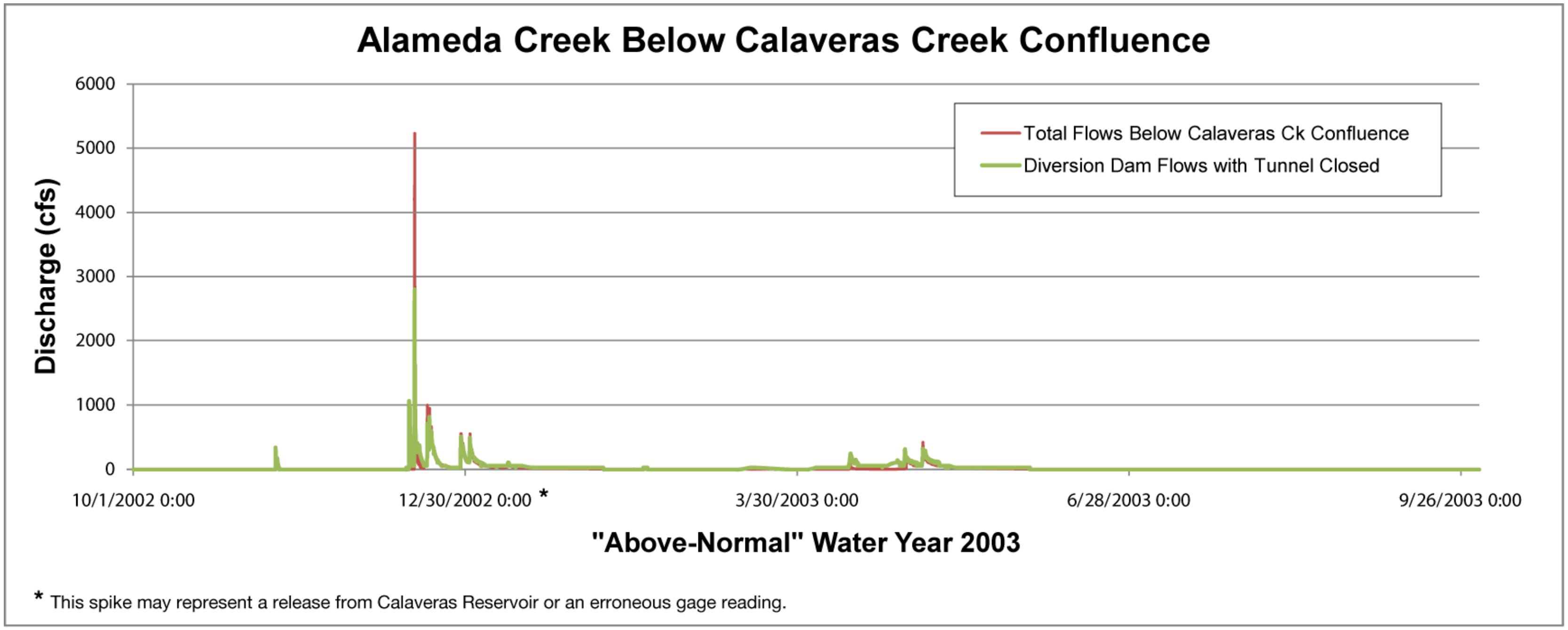
Figure 5.4.1-11
Alameda Creek Above and Below the Diversion Dam – Real-Time Flow Rates vs Daily Mean Flows



SOURCE: USGS, 2005d

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Figure 5.4.1-12
Alameda Creek Below the Calaveras Creek Confluence

TABLE 5.4.1-8
ESTIMATED AVERAGE MONTHLY FLOW IN
ALAMEDA CREEK BELOW THE CALAVERAS CREEK CONFLUENCE
(cubic feet per second)

	Wet	Above Normal	Normal	Below Normal	Dry	All
Existing Condition (2005)						
Oct	0	0	0	0	0	0
Nov	1	1	0	0	0	1
Dec	56	26	22	1	1	21
Jan	280	114	24	3	1	84
Feb	463	214	55	6	4	147
Mar	272	110	26	7	1	82
Apr	144	25	5	1	1	35
May	5	2	1	1	0	2
Jun	1	0	0	0	0	0
Jul	0	0	0	0	0	0
Aug	0	0	0	0	0	0
Sep	0	0	0	0	0	0
WSIP (2030)						
Oct	7	7	7	7	7	7
Nov	5	5	5	5	5	5
Dec	45	18	13	5	5	17
Jan	199	64	18	14	13	61
Feb	434	151	36	22	23	132
Mar	272	106	22	16	13	85
Apr	145	32	9	7	7	40
May	9	7	7	7	7	7
Jun	7	7	7	7	7	7
Jul	7	7	7	7	7	7
Aug	7	7	7	7	7	7
Sep	7	7	7	7	7	7

Difference and Percent Change, Existing Condition (2005) vs WSIP (2030)

	Wet		Above Normal		Normal		Below Normal		Dry		All	
Oct	7	*	7	*	7	*	7	*	7	*	7	*
Nov	4	[400%]	4	[400%]	5	*	5	*	5	*	4	[400%]
Dec	-11	-[20%]	-8	-[31%]	-9	-[41%]	4	[400%]	4	[400%]	-4	-[19%]
Jan	-81	-[29%]	-50	-[44%]	-6	-[25%]	11	[367%]	12	[1,200%]	-23	-[27%]
Feb	-29	-[6%]	-63	-[29%]	-19	-[35%]	16	[267%]	19	[475%]	-15	-[10%]
Mar	0	[0%]	-4	-[4%]	-4	-[15%]	9	[129%]	12	[1,200%]	3	[4%]
Apr	1	[1%]	7	[28%]	4	[80%]	6	[600%]	6	[600%]	5	[14%]
May	4	[80%]	5	[250%]	6	[600%]	6	[600%]	7	*	5	[250%]
June	6	[600%]	7	*	7	*	7	*	7	*	7	*
July	7	*	7	*	7	*	7	*	7	*	7	*
Aug	7	*	7	*	7	*	7	*	7	*	7	*
Sept	7	*	7	*	7	*	7	*	7	*	7	*

NOTE: "Existing Condition (2005)" is based on model run MEA3CHR. "WSIP (2030)" is based on model run MEA5HIN. An overview of the model runs is presented in Section 5.1. Detailed information on the models and underlying assumptions is provided in Appendix H.

Key:

* Indicates a release under the "WSIP (2030)" condition where no release under "Current Condition (2005) currently exists.

(blue)	> 0%
(yellow)	< 0 to -5%
(orange)	< -5%

SOURCE: SFPUC, HH/LSM (See Appendix H)

to 44 percent) in wintertime flow at the confluence during normal, above-normal and wet years. As with the upstream reach, peak flows would also be substantially reduced, primarily as a result of renewed upstream diversions. However, overall flows would be increased due to fishery releases.

Figure 5.4.1-13 illustrates the modeled chronological stream flows at the confluence for both the existing condition and with the WSIP. As shown in the figure, flow is low in many years under both existing and WSIP conditions, with rapid spikes in flow during and immediately following episodes of high rainfall. However, except in times of spills or winter releases from Calaveras Reservoir, winter and early spring flows in Alameda Creek at Calaveras Creek would be substantially reduced due to the reinstated large-scale diversions from Alameda Creek (described above). As shown in Figure 5.4.1-11, although the effects of reduced diversions would occasionally be damped by releases from Calaveras Reservoir, renewed diversions would continue to substantially reduce rainy season flows in Alameda Creek at and below its confluence with Calaveras Creek.

Under the WSIP, the SFPUC would augment flow below the confluence of Calaveras and Alameda Creeks by bypassing/releasing water from the Alameda Creek Diversion Dam and Calaveras Reservoir; as a result, there would be an increase in flow at the confluence in April to November of wet and above-normal rainfall years and in all instances of other years. The target flow rates in Alameda Creek are shown in **Table 5.4.1-9**. The proposed program includes facilities (as part of the Calaveras Dam project, SV-2) to provide the 1997 MOU-required releases. In addition, the SFPUC is developing alternative means of recapturing a portion of the water released downstream of the Sunol Valley WTP as part of the Alameda Creek Fishery project (SV-1).

TABLE 5.4.1-9
MINIMUM FLOWS BELOW THE CONFLUENCE OF ALAMEDA AND CALAVERAS CREEKS

Period	5-Day Running Average (cfs)	Minimum Daily (cfs)
November 1 – January 14	5	4.5
January 15 – March 15	20	18
March 16 – October 31	7	6.3

cfs = cubic feet per second

SOURCE: CDFG, 1997.

Impact Conclusions

Implementation of the WSIP would increase diversions from Alameda Creek to Calaveras Reservoir, nearly eliminating the low and moderate (1 to 650 cfs) flows in Alameda Creek downstream of the diversion dam that currently occur when the diversion gates are closed, and substantially reducing many higher (greater than 650 cfs) flows. Under the WSIP, flows in Alameda Creek in the reach below the diversion dam to the Calaveras Creek confluence and in the reach below the confluence would be substantially reduced compared to the conditions in

SOURCE: SFPUC, HH/LSM (see Appendix H).

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Figure 5.4.1-13
Flow in Alameda Creek below the Calaveras Creek Confluence

existence since December 2001, when the DSOD imposed storage capacity restrictions on Calaveras Reservoir. This reduction of stream flows and alteration of the stream hydrograph is considered a substantial hydrologic effect and, as a result, this impact is *significant and unavoidable*. Measure 5.4.1-2, Diversion Tunnel Operation, requires the SFPUC to close the diversion dam and cease Alameda Creek diversions to Calaveras Reservoir as soon as possible each year, once the reservoir is at desired levels, such that the later-season storm flows not needed to refill Calaveras Reservoir are allowed to flow down Alameda Creek past the diversion dam to the lower reaches. Although this measure could help reduce the impact, it would not fully mitigate it; therefore, this impact would remain significant and unavoidable for the reaches of Alameda Creek below the diversion dam to its confluence with Calaveras Creek and below the confluence. However, after implementation of the WSIP, flow in this 2.85-mile reach of Alameda Creek would approximate conditions experienced between 1935 and 2001. In addition, in some years, flows in Alameda Creek below the diversion dam would be greater due to revised reservoir operations. The reestablishment of the diversions is necessary to achieve the SFPUC water supply objectives, and full mitigation could not be accomplished without foregoing the needed diversions.

This impact conclusion applies only to flow effects and not to the indirect impacts associated with these flow changes. Indirect effects are addressed in subsequent sections of this chapter; as discussed, these effects are either less than significant, or mitigation has been identified to reduce them to a less-than-significant level.

As a result of the 2001 DSOD restriction on Calaveras Reservoir, the SFPUC has had to reduce the volume of water stored in Calaveras and has therefore significantly reduced its diversions through the Alameda Creek Diversion Dam by closing the tunnel more frequently compared to its 70-year historic operation. Upon completion of the Calaveras Dam Replacement project (SV-2), the SFPUC would no longer have DSOD restrictions on storage levels in Calaveras Reservoir. Compared to historical operations with full storage capacity at Calaveras, the SFPUC plans to maintain Calaveras Reservoir at a higher elevation over longer periods of time, and as a result the Alameda Creek Diversion Tunnel would be closed more often than historically and there would be more occasions when water bypasses the diversion dam into Alameda Creek (see Appendix H2-2, Table 2.7-7). Therefore, in the reach below the confluence with Calaveras Creek, the increased dry-season releases that would occur under the WSIP in accordance with the 1997 MOU would be a beneficial effect.

Impact 5.4.1-3: Effects in San Antonio Reservoir and along San Antonio Creek.

The overall operation of San Antonio Reservoir with the WSIP would remain the same as under existing conditions. San Antonio Reservoir would continue to be operated to conserve local watershed runoff for integration into the SFPUC water supply and, when possible, would continue to store imported water from the Hetch Hetchy system to maximize carryover storage. As described below, the HH/LSM indicates small changes in reservoir releases; however, those changes are within the range of operator discretion, and actual operations may be closer to existing operations.

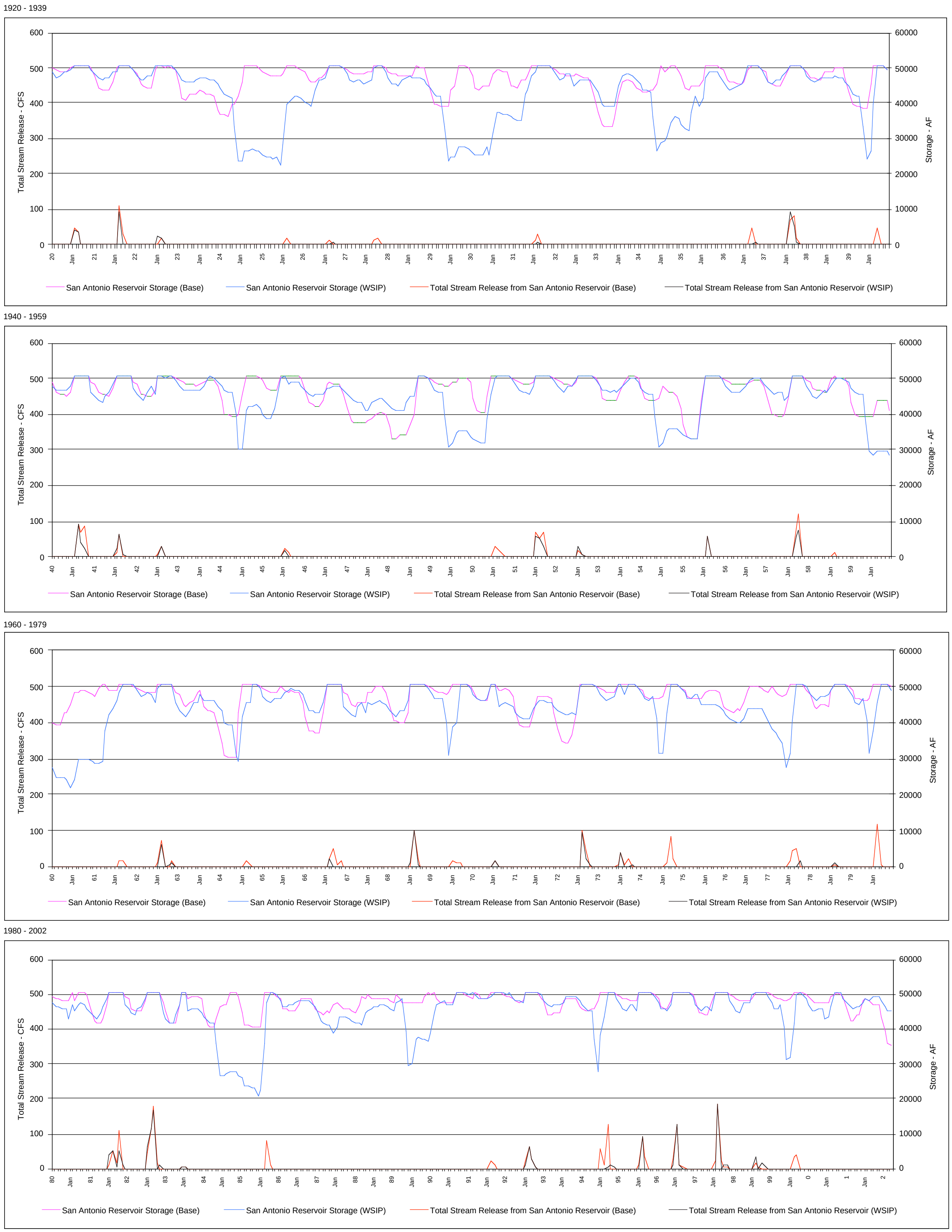
Figure 5.4.1-14 illustrates the modeled chronological operation of San Antonio Reservoir for both the existing condition and with the WSIP. The figure shows the reservoir's storage, inflow from the Hetch Hetchy system, and releases to San Antonio Creek for each condition.

WSIP operations involve keeping local reservoirs higher for delivery reliability and system maintenance purposes. This supply would be used to maintain the Sunol Valley WTP's minimum throughput of 20 mgd and to satisfy water demand in excess of Hetch Hetchy flows. Every fifth year storage levels would drop when planned maintenance for the Mountain Tunnel would reduce Hetch Hetchy flows to the Bay Area during the winter. During this period, San Antonio Reservoir would be drawn to replace the flows not provided from the Hetch Hetchy system. The reservoir would refill to typical operating levels within one to two years after the maintenance period.

The change in operation of San Antonio Reservoir storage would result in minor changes to other components of watershed hydrology. As described below, the increased storage in San Antonio Reservoir would affect the operation of diversions to the Sunol Valley WTP and imports from Hetch Hetchy. The increased storage capacity would also affect the release of spills from San Antonio Reservoir and subsequently the downstream flows in Alameda Creek.

As indicated in the table, the WSIP would have a minimal effect on flow in San Antonio Creek. The proposed program would result in minor increases and decreases in winter and spring flows in some above-normal years. Occasionally, the WSIP could result in spills to San Antonio Creek that would not occur under existing conditions.

Figure 5.4.1-15 illustrates the modeled chronological release of water below Turner Dam under the existing condition and with the WSIP. Releases from San Antonio Reservoir to San Antonio Creek have historically been rare and would continue to be rare with the WSIP. Releases past the dam are modeled to occur at about the same frequency with the WSIP—mostly in above-normal or wet years. It should be noted that under actual operations, these changes in modeled average monthly flows could take the form of a few days of larger releases.



Note: This figure is revised to reflect updated HH/LSM modeling (see Appendix O).

SOURCE: SFPUC, HH/LSM

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Figure 5.4.1-14 (Revised)
Chronological Operation of San Antonio Reservoir

SOURCE: SFPUC, HH/LSM (see Appendix H).

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Figure 5.4.1-15
San Antonio Reservoir Releases to San Antonio Creek

Table 5.4.1-10 presents the modeled average monthly releases from San Antonio Reservoir under the existing condition and with the WSIP. The table also shows the difference in flow between the existing and WSIP conditions. Differences in releases could occur during the rainy season; the magnitude of the differences varies greatly compared to modeled existing flows, sometimes increasing and sometimes decreasing. Although the model predicts small releases in wet months, in reality the projected releases of less than an average monthly flow of 35 cfs (2,000 acre-feet) could likely be avoided through flexibility in actual day-to-day operations that cannot be represented by the HH/LSM (meaning that there would have been no flow released under those circumstances).

Impact Conclusions

Because the modeled flow changes in San Antonio Creek are within the current range and would be quite small, this impact would be *less than significant*, and no mitigation measures would be required.

Impact 5.4.1-4: Effects on flow along Alameda Creek below the confluence of San Antonio Creek.

The flow at the confluence of Alameda and San Antonio Creeks is a function of: (1) flows arriving at the confluence of Alameda and Calaveras Creeks, which are dependent on releases from Calaveras Dam, flow spilled past the Alameda Creek Diversion Dam, and the unregulated runoff occurring between the confluence and the diversion dam and Calaveras Dam, (2) unregulated runoff from the watershed between the two confluences, and (3) flow entering Alameda Creek from San Antonio Creek, which is regulated by releases from Turner Dam. In addition, the creek can seasonally either lose (dry season) or gain (rainy season) flows to and from the groundwater and nearby gravel pits. Depending on its design and location, the recapture facility to be constructed under the Alameda Creek Fishery project (SV-1) could also draw groundwater flows from the creek.

Figure 5.4.1-16 illustrates the modeled flow at the confluence during the various rainfall scenarios for the existing condition and with the WSIP. **Table 5.4.1-11** presents modeled flows at the confluence in terms of the average monthly flow within hydrologic year type. As shown in the figure and table, there would be a substantial (8 to 52 percent) reduction in flow volumes at the confluence during January, February, and March of normal or wetter years, depending on the rainfall distribution. The majority of this effect would occur due to the reduction in spills from Calaveras Reservoir and increased diversions from the Alameda Creek Diversion Dam during these periods. However, in April of normal years, the modeled data indicate a moderate increase in total flow volumes (about 14 percent), again due to the change in operation of Calaveras Reservoir, as described above.

TABLE 5.4.1-10
ESTIMATED AVERAGE MONTHLY RELEASES FROM SAN ANTONIO RESERVOIR TO SAN ANTONIO CREEK
(cubic feet per second)

	Wet		Above Normal		Normal		Below Normal		Dry		All	
Existing Condition (2005)												
Oct	0		0		0		0		0		0	
Nov	0		0		0		0		0		0	
Dec	0		0		0		0		0		0	
Jan	9		0		0		0		0		2	
Feb	42		16		0		0		0		11	
Mar	40		14		0		0		0		11	
Apr	22		0		0		0		0		4	
May	1		1		0		0		0		0	
June	0		0		0		0		0		0	
July	0		0		0		0		0		0	
Aug	0		0		0		0		0		0	
Sept	0		0		0		0		0		0	
WSIP (2030)												
Oct	0		0		0		0		0		0	
Nov	0		0		0		0		0		0	
Dec	1		0		0		0		0		0	
Jan	17		7		2		0		0		5	
Feb	57		18		0		0		0		15	
Mar	24		4		0		0		0		5	
Apr	10		0		1		0		0		2	
May	2		1		0		0		0		1	
June	0		0		0		0		0		0	
July	0		0		0		0		0		0	
Aug	0		0		0		0		0		0	
Sept	0		0		0		0		0		0	
Difference and Percent Change, Existing Condition (2005) vs WSIP (2030)												
Oct	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]
Nov	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]
Dec	1	*	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]
Jan	8	[89%]	7	*	2	*	0	[0%]	0	[0%]	3	[150%]
Feb	15	[36%]	2	[13%]	0	[0%]	0	[0%]	0	[0%]	4	[36%]
Mar	-16	-[40%]	-10	-[71%]	0	[0%]	0	[0%]	0	[0%]	-6	-[55%]
Apr	-12	-[55%]	0	[0%]	1	*	0	[0%]	0	[0%]	-2	-[50%]
May	1	[100%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	1	*
June	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]
July	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]
Aug	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]
Sept	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]

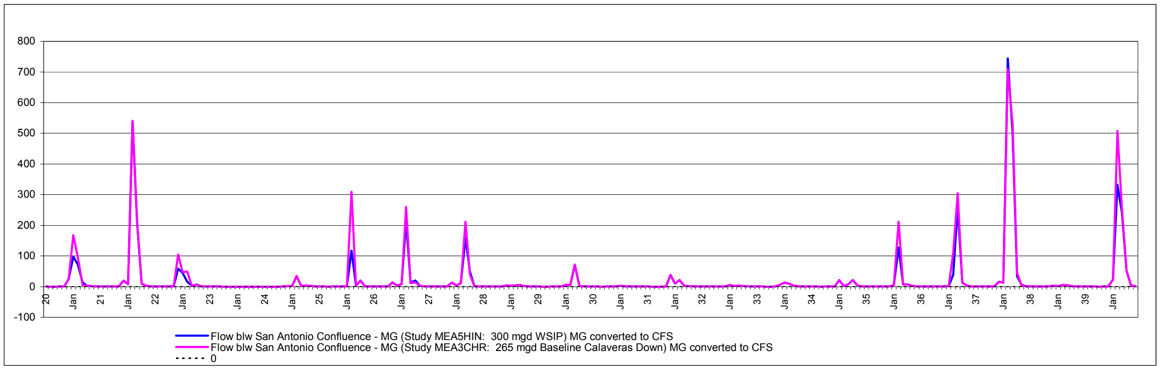
* Indicates a release under the "WSIP (2030)" condition where no release under "Existing Condition (2005)" currently exists.

NOTE: "Existing Condition (2005)" is based on model run MEA3CHR. "WSIP (2030)" is based on model run MEA5HIN. An overview of the model runs is presented in Section 5.1. Detailed information on the models and underlying assumptions is provided in Appendix H.

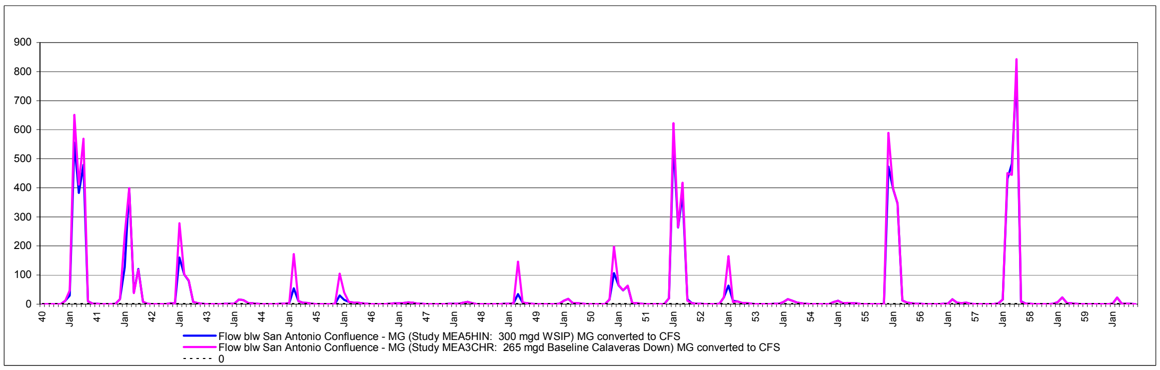
Key
- > 0%
- < 0 to -5%
- < -5%

SOURCE: SFPUC, HH/LSM (see Appendix H).

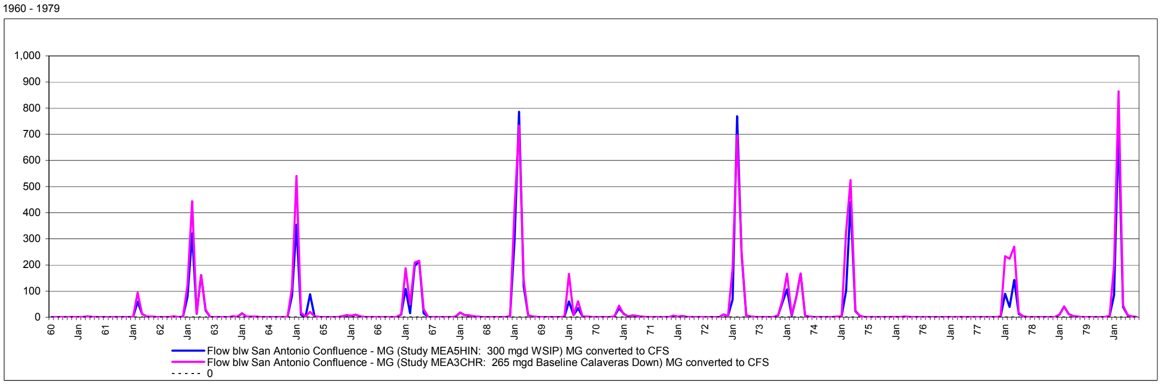
1920 - 1939



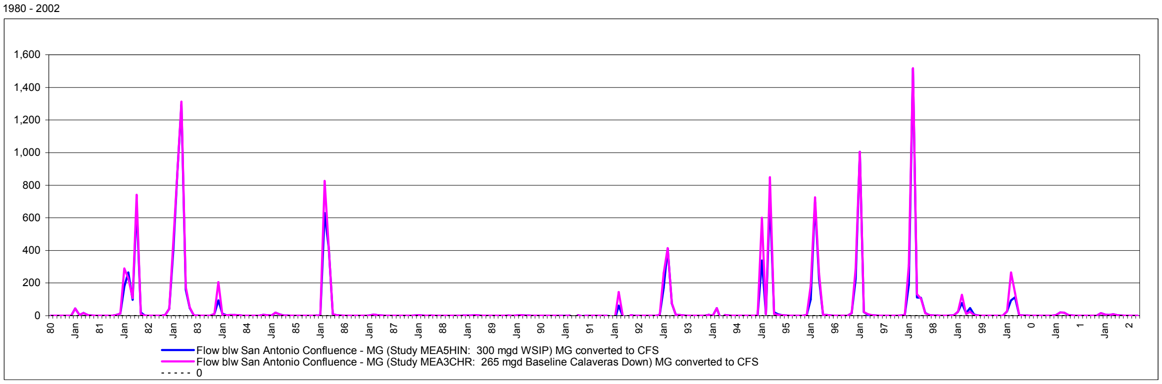
1940 - 1959



1960 - 1979



1980 - 2002



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SOURCE: SFPUC, HH/LSM (see Appendix H)

Figure 5.4.1-16
Chronological Flows in Alameda Creek at the Confluence with San Antonio Creek

TABLE 5.4.1-11
ESTIMATED AVERAGE MONTHLY FLOW IN ALAMEDA CREEK BELOW THE SAN ANTONIO CREEK CONFLUENCE
(cubic feet per second)

	Wet		Above Normal		Normal		Below Normal		Dry		All	
Existing Condition (2005)												
Oct	0		0		0		0		0		0	
Nov	2		2		1		1		0		1	
Dec	61		30		25		2		1		24	
Jan	303		122		28		5		1		91	
Feb	523		242		61		10		5		167	
Mar	326		132		30		10		2		99	
Apr	176		29		7		2		1		42	
May	9		4		2		1		1		3	
June	1		1		0		0		0		0	
July	0		0		0		0		0		0	
Aug	0		0		0		0		0		0	
Sept	0		0		0		0		0		0	
WSIP (2030)												
Oct	0		0		0		0		0		0	
Nov	2		2		1		1		0		1	
Dec	50		19		13		2		1		17	
Jan	229		75		14		5		1		64	
Feb	505		174		29		10		5		143	
Mar	308		113		18		10		2		89	
Apr	162		35		8		2		1		41	
May	9		4		2		1		1		3	
June	1		1		0		0		0		0	
July	0		0		0		0		0		0	
Aug	0		0		0		0		0		0	
Sept	0		0		0		0		0		0	
Difference and Percent Change, Existing Condition (2005) vs WSIP (2030)												
Oct	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]
Nov	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]
Dec	-11	-[18%]	-11	-[37%]	-12	-[48%]	0	[0%]	0	[0%]	-7	-[29%]
Jan	-74	-[24%]	-47	-[39%]	-14	-[50%]	0	[0%]	0	[0%]	-27	-[30%]
Feb	-18	-[3%]	-68	-[28%]	-32	-[52%]	0	[0%]	0	[0%]	-24	-[14%]
Mar	-18	-[6%]	-19	-[14%]	-12	-[40%]	0	[0%]	0	[0%]	-10	-[10%]
Apr	-14	-[8%]	6	[21%]	1	[14%]	0	[0%]	0	[0%]	-1	-[2%]
May	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]
June	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]
July	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]
Aug	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]
Sept	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]

NOTE: "Existing Condition (2005)" is based on model run MEA3CHR. "WSIP (2030)" is based on model run MEA5HIN. An overview of the model runs is presented in Section 5.1. Detailed information on the models and underlying assumptions is provided in Appendix H.

Key
- > 0%
- < 0 to -5%
- < -5%

SOURCE: SFPUC, HH/LSM (see Appendix H).

Impact Conclusions

Flow in Alameda Creek below the confluence of San Antonio Creek would be altered as a result of the WSIP in winter months of normal or wetter years; however, the change in flows would be substantially dampened by inflows from other tributaries in the Sunol Valley and would not result in any adverse hydrologic effects. Therefore, impacts on Alameda Creek below the confluence of San Antonio Creek would be *less than significant*, and no mitigation measures would be required.

There would be no change in flows in most other months of normal or wetter years and in all months of drier years, because the fishery releases would be recaptured at a location upstream from the confluence of Alameda and San Antonio Creeks.

[Additional discussion on flow in lower Alameda Creek was prepared in response to comments on the Draft PEIR. Please refer to Section 14.9, Master Response on Alameda Creek Fishery Issues (Vol. 7, Chapter 14) and to Appendix N, Technical Memorandum—Estimation of Flow Changes in Lower Alameda Creek with Implementation of the WSIP (Vol. 8).]

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5.4.2 Geomorphology

The following setting section describes the geomorphology of the streams in the Alameda Creek watershed that could be affected by the WSIP. The impact section (Section 5.4.2.2) provides a description of the changes in stream channel form and erosion that would result from WSIP-induced changes in stream flow, as described in Section 5.4.1.

5.4.2.1 Setting

Geomorphology and Sediment Transport

The SFPUC's Alameda watershed upstream of Niles Canyon is comprised of two general landform (geomorphic) regions: the "canyon areas" above the Sunol Valley WTP, and the Sunol Valley. The geomorphology of the canyon areas can be further divided into reservoirs and stream channels. The fluvial geomorphologic conditions[1] of each of these areas are summarized below.

The Sunol Valley has lower gradients than the canyon reaches, and the channel bed and banks are primarily comprised of sediments. There are several grade controls (where erosion is restricted by a solid feature such as a bedrock outcrop, weir, or dam) in the Sunol Valley and downstream; two of these, Sunol and Niles Dams, were recently lowered by the SFPUC to calculated pre-dam streambed elevations. A bedrock outcrop about 1,000 feet below the Sunol Dam site also controls channel morphology and stream downcutting (Weiss Associates, 2004).

An average of approximately 270,000 tons (160,000 cubic yards) of sediment is transported by Alameda Creek annually. At the Sunol dam site, these sediments are about one-quarter to one-third sand and two-thirds to three-quarters gravel. These sediments are transported by high flows in the creek; for example, it has been estimated that the 3.5-year flow in Alameda Creek at the Sunol Dam site (approximately 7,000 cfs) transports a volume of sediment equal to about 25 percent of the average annual sediment load in the creek (Weiss Associates, 2004). Sediment transport curves developed by Weiss Associates for Alameda Creek near Niles indicate minimal sediment transport with flows of less than 20 cfs, and an increase from 10 to 1,000 tons/day when stream flows increase from 100 to 1,000 cfs. At 2,000 cfs, sediment loads approach 10,000 tons/day. At Niles Canyon, there is virtually no bedload transport[2] with flows under 1,000 cfs, and 2,500 to 6,000 tons/day with flows of 10,000 cfs (Weiss Associates, 2004).

The ACFCWCD removes about 300,000 cubic yards of sediments from their flood control channel downstream of Niles Canyon every 10 years; this constitutes about 19 percent of the total creek sediment load. The remaining sediments deposit in parts of the flood control channel that are not subject to maintenance and/or are eventually transported to San Francisco Bay (Weiss Associates, 2004). It should be noted that these are long-term averages, and annual sediment loads could vary widely depending on runoff events and watershed conditions.

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1 The term "fluvial geomorphologic conditions" refers to changes in the shape of the stream channels and associated erosional and depositional features (e.g., canyons, streambeds, stream banks, floodplains), and the hydrologic and geologic processes and conditions contributing to or affecting those changes.

2 Bedload refers to the amount of sediment, cobbles, gravel, and rocks transported along the stream bottom (as opposed to suspended in the stream flow).

Much of this sediment is generated in the Vallecitos, Arroyo Mocho, Arroyo Valle, and Arroyo de la Laguna watersheds, outside of the SFPUC watersheds. These watersheds include large alluvial valleys, where erosion due to natural channel meandering as well as land management practices can generate substantial sediment volumes. Although substantial sediment generation can occur from the steep slopes in the upper watersheds (upstream of Calaveras and San Antonio Dams), much of this sediment is trapped behind these dams.

The stream channel portions of the canyon areas include stretches of bedrock channels interspersed with lower gradient areas, such as the Calaveras Valley, where the channel bottom and sides are comprised primarily of sediments. Substantial quantities of sediment have accumulated in Calaveras and San Antonio Reservoirs. In the upstream reach of Alameda Creek, the SFPUC discharges approximately 900 cubic yards per year of sediment accumulated behind the Alameda Creek Diversion Dam via 50-cfs flow releases through the sluice gates. This indicates that, in the narrower, steeper reaches of the creek, smaller flows are adequate to transport accumulated suspended sediments. Such smaller flows may also affect the local geomorphic conditions of the small alluvial flats, banks, and terraces adjacent to the stream channels above Sunol Valley.

5.4.2.2 Impacts

Significance Criteria

The CCSF has not formally adopted significance standards for impacts related to geomorphology, but generally considers that implementation of the proposed program would have a significant impact if it were to:

- Substantially change the topography such that ecological, hydrologic, or aesthetic functions are adversely affected, or substantially change any unique geologic or physical features of the site or area
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation or adversely affect the ecological, hydrologic, or aesthetic functions of the site or area

Although the “substantial change in topography” criterion is typically applied to upland areas, it is considered applicable to stream channel/bank topography in this instance because of the sensitivity of the resources that depend on the topography of those features (i.e., riparian vegetation and fisheries). For a stream channel, the relevant aspect of topography to be evaluated are those associated with channel form and the related movement and distribution of sediment.

Approach to Analysis

This impact section discusses projected changes in sediment transport and geomorphology, reservoir storage, and related reservoir water levels resulting from WSIP implementation. In addition to potential direct impacts, these sediment transport changes could cause indirect environmental impacts in areas for which the CEQA Guidelines Appendix G identifies significance criteria, including flooding potential, erosion, water quality, fisheries, aquatic and riparian resources and related special-status species, and recreation and visual resources. These potential impacts are addressed in the respective sections of this PEIR.

This assessment of potential effects is based on generalized channel bed/bank characteristics and consideration of proposed changes in stream flow that would result from the WSIP.

Impact Summary

Table 5.4.2-1 presents a summary of the impacts on sediment transport and geomorphology in the Alameda Creek watershed that could result from implementation of the proposed water supply and system operations.

TABLE 5.4.2-1
SUMMARY OF IMPACTS – GEOMORPHOLOGY OF THE ALAMEDA CREEK WATERSHED

Impact	Significance Determination
Impact 5.4.2-1: Effects on channel formation and sediment transport along Calaveras Creek	LS
Impact 5.4.2-2: Effects on channel formation and sediment transport along Alameda Creek downstream of the diversion dam and downstream of the San Antonio Creek confluence.	LS
Impact 5.4.2-3: Effects on channel formation and sediment transport along San Antonio Creek downstream of San Antonio Reservoir	LS

LS = Less than Significant impact, no mitigation required

Impact 5.4.2-1: Effects on channel formation and sediment transport along Calaveras Creek.

There are currently no uncontrolled releases (spills) from Calaveras Reservoir. With the WSIP, uncontrolled releases would occur during heavy rains, particularly later in the rainfall season when the reservoir is full. Therefore, the WSIP could result in increased erosion, sediment transport, and deposition downstream of Calaveras Dam during heavy rainfall events compared to existing conditions. However, these higher flows, and therefore sediment transport, are similar to the long-term conditions that formed the current channel. Therefore, impacts on channel formation and sediment transport along Calaveras Creek would be *less than significant*, and no mitigation measures would be required.

Impact 5.4.2-2: Effects on channel formation and sediment transport along Alameda Creek downstream of the diversion dam and downstream of the San Antonio Creek confluence.

Increased use of the diversion tunnel under the WSIP would reduce peak flows in Alameda Creek downstream of the diversion dam by up to 650 cfs compared to existing conditions; lesser flows (under 500 to 600 cfs) would also be diverted, which could reduce erosion, sediment transport, and deposition in the channel reach downstream of the diversion dam. However, substantial quantities of sediments would still be transported down the creek by high flows (over 650 cfs) during heavy rains. The annual sluicing of sediments accumulated behind the diversion dam would continue with the WSIP. Therefore, this impact would be *less than significant*, and no mitigation measures would be required.

Implementation of the WSIP would reduce flow in Alameda Creek downstream of the San Antonio Creek confluence in winter months of normal to wet years, ranging from a -18 percent decrease to a +13 percent increase in flow at the USGS Niles gage station. In the majority of winter months (December to March), flows at this location would decrease, but in April and May the flows would exhibit small to moderate increases. Although implementation of the WSIP would result in additional flow in Alameda Creek in summer months as part of the 1997 CDFG MOU releases, these additional flows would not mobilize significant amounts of sediment and could be recaptured at a location downstream of the Sunol Valley WTP. This net decrease in flow in Alameda Creek below the San Antonio Creek confluence when compared to the existing condition would likely result in a slight decrease in the amount of sediment transported in Niles Canyon and lower Alameda Creek and would therefore decrease sediment and debris loading on lower Alameda Creek facilities.

As noted in Impacts 5.4.2-1 and 5.4.2-3, flows and the resulting impacts on geomorphology upstream of the San Antonio Creek confluence are expected to be within the range of conditions that have been experienced since development of water supply and flood control facilities in the upper and lower Alameda Creek watershed. Therefore, implementation of the WSIP would not significantly alter bed or channel form or introduce substantial new sources of sediment.

As a result of this net decrease in sediment transport in Niles Canyon and the less-than-significant impacts in upper Alameda Creek, the impact related to geomorphologic characteristics and sediment transport along Alameda Creek downstream of the San Antonio Creek confluence would be *less than significant*. It should also be noted that the Arroyo de la Laguna watershed is the major contributor to sediment supply in Niles Canyon and lower Alameda Creek.

[Additional discussion on geomorphology in Alameda Creek downstream of the diversion dam was prepared in response to comments on the Draft PEIR. Please refer to Section 15.2, response to the letter from the Regional Water Quality Control Board, San Francisco Bay Region, (Vol. 7, Chapter 15).]

Impact 5.4.2-3: Effects on channel formation and sediment transport along San Antonio Creek downstream of San Antonio Reservoir.

Current spills from San Antonio Reservoir are minimal and would continue to be minimal. Therefore, impacts on fluvial geomorphologic characteristics would be *less than significant*, and no mitigation measures would be required.

References – Geomorphology

Weiss Associates, *Final Report for Channel Geomorphology Study, Niles and Sunol Dam Removal Project*, Alameda County, California. October 12, 2004.

5.4.3 Surface Water Quality

The following setting section describes surface water quality in streams and reservoirs in the Alameda Creek watershed that could be affected by the WSIP. The impact section (Section 5.4.3.2) provides a description of the changes in water quality in streams and reservoirs that would result from WSIP-induced changes in stream flow and reservoir water levels.

5.4.3.1 Setting

Calaveras Reservoir

Calaveras Reservoir collects and stores water from the local watershed; this water is subsequently treated at the Sunol Valley WTP and distributed for municipal use. Reservoir inflow is dominated by winter rainfall events. Because the reservoir stores local runoff only, water quality is fairly consistent. However, the reservoir stratifies during the warm months, which leads to changes in water quality depending on the time of year and depth within the reservoir. When the reservoir stratifies during the late summer and fall, the bottom, lower layer (the "hypolimnion") is aerated to increase oxygen levels, thereby reducing the concentrations of dissolved iron, manganese, and hydrogen sulfide in the raw water (Weiss Associates, 2003).

Calaveras Reservoir exhibits characteristics typical of "mesotrophic"[1] waters, which include the following:

- Moderate nutrient levels and microbiological activity
- Oxygen concentrations that may vary considerably
- Variable light penetration
- Shallow to deep lake with sloping sides
- Potentially fertile soils, heavily vegetated and/or disturbed watershed (SFPUC, 2002)

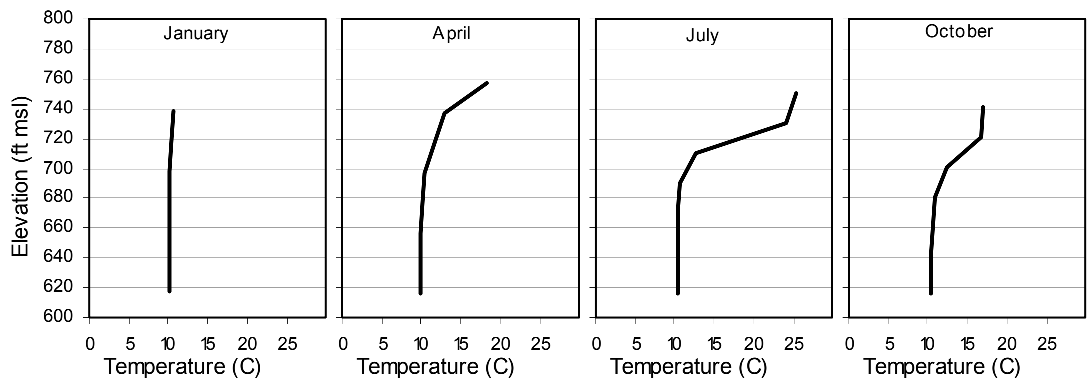
The biggest water quality concerns in the reservoir are turbidity and algae control. Algal blooms can result in consumer complaints regarding odor and taste and can also limit production at the Sunol Valley WTP due to increases in filter head loss. Several algal blooms have caused the reservoir to be temporarily removed from production, and an algae bloom in October 2003 was treated with copper sulfate. The reservoir is sampled every two weeks for basic water quality parameters; algal growth is usually indicated by increasing surface dissolved oxygen (DO) levels and a rise in pH, with June and October generally being the months of greatest concern. Problems with algal growth often resolve themselves as zooplankton feed on the algae; however, zooplankton may not be completely effective in controlling blue-green algae (SFPUC, 2002). The growth of blue green algae is occasionally managed with low doses of copper sulfate, which is the only herbicide used in the reservoir. Treatment with copper sulfate can reduce DO levels associated with the decay of dead algae (SFPUC, 2002).

Reservoir water temperature is considered a key water quality parameter with respect to aquatic life. Calaveras Reservoir water temperatures are typically isothermal[2] during December through

1 The ratio of watershed to surface area is 60:1, which places the lake in the "potentially mesotrophic" group.

February, which indicates complete mixing of the reservoir. From March through November, the reservoir typically stratifies, with the most intense period between June and October; during this time, the thermocline[3] is 20 to 40 feet below the water surface, with water temperatures reaching 24 to 26 degrees Celsius (°C) in the upper level of the water (the "epilimnion"), and 10 to 14 °C in the hypolimnion (Weiss Associates, 2003).[4]

Figure 5.4.3-1 presents water temperature profiles for Calaveras Reservoir during 1998. These data were collected before the DSOD limited the operational capacity of the reservoir due to seismic concerns, and thus represent a "full" reservoir.



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SOURCE: SFPUC, HH/LSM (Appendix H)

Figure 5.4.3-1
Temperature Profiles for Calaveras Reservoir, 1998

Water quality conditions in the reservoir are shown in **Table 5.4.3-1**. When Calaveras Reservoir is isothermal, DO concentrations are near saturation; however, when the reservoir stratifies, DO concentrations in the hypolimnion historically dropped to less than 1 mg/L while remaining near saturation in the epilimnion. The values for pH ranged from 6.6 to 8.3, and turbidity remained below 5 nephelometric turbidity units (NTU) throughout most of the year. The SFPUC commissioned a feasibility study to select a technology for effectively maintaining the DO concentration within the hypolimnion at levels protective of water quality (DO > 2 mg/L) and fish habitat (DO > 5 mg/L) (Merritt-Smith Consultants, 2003). The technology selected was an "unconfined small bubble soaker hose diffuser" consisting of approximately 1,000 feet of diffuser operated from a liquid oxygen supply based on the lake shoreline. The oxygen is distributed along the full length of the line deep within the reservoir during operation, thus spreading the oxygen

2 Refers to constant temperature in the water column; this conditions is present when the reservoir is not stratified, typically during the winter months.
3 The boundary between the warmer surface waters and cooler waters below.
4 To convert Fahrenheit to Celsius (Centigrade), subtract 32 and divide by 1.8. To convert Celsius (Centigrade) to Fahrenheit, multiply by 1.8 and add 32.

TABLE 5.4.3-1
SUMMARY OF WATER QUALITY IN CALAVERAS RESERVOIR

Parameter	Value	Status
Nitrate – winter average (mg/L)	0.13	Mesotrophic[c] to Eutrophic[d]
Orthophosphate – winter average (mg/L)	0.018	Mesotrophic
Total Phosphorus – winter average (mg/L)	0.06	Mesotrophic to Eutrophic
Secchi Depth[a] – growth season average (feet)	22.2	
Secchi Depth – growth season minimum (feet)	13.0	Mesotrophic
Chlorophyll *a* – annual average (µg/L)	4	Eutrophic
Chlorophyll *a* – annual peak (µg/L)	18	Eutrophic
Anoxia[b] presence	None	Eutrophic
Anoxia duration (days)	0	Mesotrophic to Eutrophic
Anoxic extent (acre-feet)	0	Eutrophic

µg/L = micrograms per liter; mg/L = milligrams per liter

a Secchi depth is a parameter used to determine the clarity of surface waters. High secchi depth readings indicate clearer water that allows sunlight to penetrate deeper.
b Anoxia generally refers to low-oxygen conditions in the hypolimnion.
c A body of water that has a moderate amount of dissolved nutrients.
d A body of water that is rich in dissolved nutrients (as phosphates) that stimulate the growth of aquatic plant life, resulting in the depletion of dissolved oxygen.
SOURCE: SFPUC, 2002.

over a large area to achieve high oxygen transfer efficiencies and reduce oxygen expenditures. The oxygenation system has been implemented in Calaveras Reservoir and maintains DO values in the hypolimnion at between 2 and 5 mg/L (Merritt-Smith Consultants, 2003).

Calaveras Reservoir under low storage conditions remains sufficiently deep (approximately 80 to 90 feet) to experience persistent seasonal thermal stratification. The reservoir becomes strongly stratified by late June and generally develops a thermocline at approximately 30 feet of depth, with the hypolimnion occupying the bottom 40 or so feet of the reservoir profile. The historical depth to the thermocline was similar, but the reservoir maintained a notably deeper hypolimnion.

San Antonio Reservoir

San Antonio Reservoir receives both local runoff (including inflow from Calaveras Reservoir) and Hetch Hetchy water, and its water quality is therefore more variable than that of Calaveras Reservoir. Like Calaveras Reservoir, San Antonio Reservoir exhibits characteristics typical of mesotrophic[5] waters; however, the moderate algal biomass present in San Antonio Reservoir is more typical of eutrophic[6] waters (SFPUC, 2002).

As in Calaveras Reservoir, the biggest water quality concerns in San Antonio Reservoir are turbidity and algae control; the SFPUC has occasionally applied copper sulfate to control algal blooms in San Antonio Reservoir, –but has ceased use of copper sulfate until it receives

5 The ratio of watershed to surface area is 30:1, which places the lake in the “potentially mesotrophic” group.
6 Generally warm and shallow waters, with high nutrient levels and high microbiological activity.

applicable permits from the Regional Water Quality Control Board (RWQCB). **Table 5.4.3-2** summarizes San Antonio Reservoir's water quality parameters, including the nutrient status and associated level of microbiological activity.

TABLE 5.4.3-2
SUMMARY OF WATER QUALITY IN SAN ANTONIO RESERVOIR

Parameter	Value	Status
Nitrate – winter average (mg/L)	0.104	Mesotrophic
Orthophosphate – winter average (mg/L)	0.028	Mesotrophic
Total Phosphorus – winter average (mg/L)	0.060	Eutrophic
Secchi Depth[a] – growth season average (feet)	11.8	
Secchi Depth – growth season minimum (feet)	3.8	Eutrophic
Chlorophyll *a* – annual average (µg/L)	3.187	Eutrophic
Chlorophyll *a* – annual peak (µg/L)	14.68	Eutrophic
Anoxia[b] presence	Regularly	Eutrophic
Anoxia duration	Average approximately 90 days/year	Mesotrophic to Eutrophic
Anoxic extent	Entire hypolimnion	Eutrophic

µg/L = micrograms per liter; mg/L = milligrams per liter

[a] Secchi depth is a parameter used to determine the clarity of surface waters. High secchi depth readings indicate clearer water that allows sunlight to penetrate deeper.
[b] Anoxia generally refers to low-oxygen conditions in the hypolimnion.

SOURCE: SFPUC, 2002.

Occasional transfers of large quantities of South Bay Aqueduct water into San Antonio Reservoir have degraded the reservoir water by adding contaminants, including total dissolved solids, total organic carbon, and bromides. The last such transfer, which occurred during the 1990–1991 drought, significantly degraded water quality in the Alameda system.

Alameda Creek Below the Diversion Dam

Water quality in Alameda Creek is generally good and is protective of beneficial uses. In terms of aquatic life, the key water quality parameter is temperature, which is directly related to hydrologic flow conditions. **Table 5.4.3-3** summarizes weekly water temperature data collected by the ACWD near Sunol, above Arroyo de la Laguna, from 1997 through 2005. Average monthly water temperatures show an expected seasonal trend (i.e., cooler during the winter and warmer during the summer).

Water temperatures in Alameda Creek have been shown to vary widely in Niles Canyon, with average daily temperatures generally peaking in late August in the 20 to 30 °C range (68 to 86 degrees Fahrenheit), and daily temperature fluctuations ranging between 1 and 11 °C, depending on geographic location and the degree of riparian shading (San Francisco Planning Department, 2005).

TABLE 5.4.3-3
SUMMARY OF TEMPERATURE DATA, ALAMEDA CREEK NEAR SUNOL, 1997–2005
(degrees Celsius)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1997	10	13	15	18	21	23	–	–	–	–	–	10
1998	11	11	14	16	16	18	23	26	22	15	13	11
1999	7	11	13	16	17	23	–	–	–	–	–	–
2000	13	13	15	16	22	25	22	21	–	18	13	11
2001	10	11	17	18	22	–	–	–	–	–	15	12
2002	12	12	13	17	18	21	19	22	21	21	15	10
2003	–	–	–	–	–	–	–	22	–	–	–	12
2004	13	12	15	16	18	20	19	–	–	–	–	–
2005	9	13	12	13	18	22	23	24	21	19	14	11
Average	11	12	14	16	19	22	21	23	21	18	14	11

SOURCES: ACWD (raw data provided by Laura Hidas); Merritt Smith Consulting (data reduction). Note that ACWD temperature data may not have been subject to the rigorous QA/QC procedures required for scientific studies, and therefore should be used only to indicate general conditions (unless otherwise specified by the ACWD).

Water temperatures in Niles Canyon reflect seasonal meteorological conditions, with cool temperatures in winter, warm temperatures in summer, and intermediate temperatures in the spring and fall. Under predevelopment conditions, a naturally high groundwater table in the Sunol Valley may have provided base flow during the low-flow periods. Subsurface accretions such as these can provide thermal benefits during summer periods, because groundwater temperatures tend to be relatively constant at approximately the mean annual air temperature of the local area (Holmes, 2000). The degree of predevelopment groundwater/stream interaction is unknown, and the extent of any potential thermal benefit is likewise uncertain. Nonetheless, under current conditions, the flow of subsurface water into mining pits during gravel mining operations has lowered the groundwater table to the extent that Alameda Creek at the head of Niles Canyon may retain only very low flows during the summer period (Bookman-Edmonston Engineering, Inc., 1995). A review of temperature studies presented by Hanson (2003) indicates that water temperatures in Alameda Creek are at or close to the equilibrium temperature (i.e., in equilibrium with the atmosphere) by the time flows reach Niles Canyon. Thus, in summer periods, water temperatures typically exceed 25 ^{o}C for multiple consecutive days. Although there is topographic and riparian shading in the canyon, local meteorological conditions are not sufficiently moderated by these shading sources to provide consistently low water temperatures through the summer. There are most likely local cool patches where hyporheic flow (water that interchanges between the stream and subsurface media) provides some moderation of water temperatures. However, such areas are not believed to be widespread or to provide extensive, persistent cool water. Summer and fall flows in Alameda Creek and its tributaries are at their seasonal low. Thus, flows in Alameda Creek below its confluence with Arroyo de la Laguna tend to be warm during these periods, because coldwater sources are largely unavailable in these reaches and base flows are low during this time of year, allowing waters to warm towards their natural temperature in equilibrium with meteorological conditions. In addition, flows in Arroyo de la Laguna appears to be higher in total dissolved solids (TDS) than the flows in Alameda Creek originating from the watershed upstream of Arroyo de la Laguna (RWQCB, 2008).

Increased flows may moderate maximum daily temperatures by increasing the thermal mass of the stream (i.e., the quantity of cooler water in the stream that would be subject to warming by the air).

Table 5.4.3-4 provides a summary of TDS data for the same location and period as for temperature, above. Unlike temperature, TDS does not exhibit a seasonal trend. TDS is an indicator of the overall content of inorganic materials in the water. As shown in the table, TDS is well below the secondary maximum contaminant level for drinking water (established to protect aesthetic quality) of 500 mg/L. Nitrate averages were 0.8 mg/L (as N) over the 1997–2005 period; the primary drinking water standard is 10 mg/L.

TABLE 5.4.3-4
SUMMARY OF TDS DATA, ALAMEDA CREEK NEAR SUNOL, 1997–2005
(milligrams per liter)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1997	–	–	190	266	280	268	–	–	–	–	–	306
1998	233	148	180	195	235	260	279	284	283	309	233	381
1999	313	228	259	276	309	298	–	–	–	–	–	–
2000	361	286	209	305	304	315	319	320	–	331	359	367
2001	486	389	361	367	355	–	–	–	–	–	338	277
2002	186	258	273	278	278	278	291	260	323	334	368	332
2003	–	–	–	–	–	–	–	365	–	–	–	407
2004	313	299	366	307	322	343	348	–	–	–	–	–
2005	246	297	205	192	247	256	290	281	304	302	337	314
Average	305	272	255	273	291	288	305	302	303	319	327	341

SOURCES: ACWD (raw data provided Laura Hidas); Merritt Smith Consulting (data reduction). Note that ACWD TDS data may not have been subject to the rigorous QA/QC procedures required for scientific studies, and therefore should be used only to indicate general conditions (unless otherwise specified by the ACWD).

Regulatory Considerations

As described in Section 5.2, the San Francisco Bay RWQCB regulates water quality in the San Francisco Bay region under the Porter-Cologne Water Quality Control Act. Beneficial uses of surface waters in the Alameda Creek watershed as well as impaired water bodies are shown in **Table 5.4.3-5**. The beneficial uses of the water bodies generally apply to all tributaries.

5.4.3.2 Impacts

Significance Criteria

The CCSF has not formally adopted significance standards for impacts related to surface water quality, but generally considers that implementation of the proposed program would have a significant surface water quality impact if it were to:

- Substantially impair a water body's ability to support beneficial uses designated by the State Water Resources Control Board or Regional Water Quality Control Board
- Otherwise substantially degrade water quality

TABLE 5.4.3-5
ALAMEDA DRAINAGE WATER QUALITY REGULATIONS

Water Body	
	Designated Beneficial Uses
Alameda Creek	AGR, COLD, GWR, MIGR, REC-1, REC-2, SPWN, WARM, WILD
Arroyo Hondo	COLD, FRSH, MUN, REC-1, REC-2, SPWN, WARM, WILD
Calaveras Reservoir	COLD, MUN, REC-1 (limited), REC-2, SPWN, WARM, WILD
San Antonio Reservoir	COLD, MUN, REC-1 (limited), REC-2, SPWN, WARM, WILD
	Clean Water Act Section 303(d) List of Impaired Water Bodies
Alameda Creek	Pollutant: Diazinon Potential Sources: Urban runoff/storm sewers Total Maximum Daily Load Priority: High

Beneficial Uses Key:

MUN (Municipal and Domestic Supply); AGR (Agriculture); REC-1 (Body Contact Recreation); REC-2 (Noncontact Recreation); WARM (Warm Freshwater Habitat); COLD (Cold Freshwater Habitat); MIGR (Fish Migration); SPWN (Fish Spawning); WILD (Wildlife Habitat); NAV (Navigation); GWR (Groundwater Recharge); FRSH (Freshwater Replenishment); SHELL (Shellfish Harvesting); COMM (Ocean, Commercial, and Sport Fishing); EST (Estuarine Habitat); IND (Industrial Service Supply).

SOURCE: SWRCB, 2003.

Approach to Analysis

Changes in water quality are based on qualitative analyses of potential water quality effects due to changes in flows within creeks and changes in reservoir levels, as predicted by the HH/LSM. An overview of the model is presented in Section 5.1, and the model assumptions are provided in Appendix H.

Impact Summary

Table 5.4.3-6 presents a summary of the impacts on surface water quality in the Alameda Creek watershed that could result from implementation of the proposed water supply and system operations.

TABLE 5.4.3-6
SUMMARY OF IMPACTS – SURFACE WATER QUALITY
IN ALAMEDA CREEK WATERSHED STREAMS AND RESERVOIRS

Impact	Significance Determination
Impact 5.4.3-1: Effects on water quality in Calaveras Reservoir	LS
Impact 5.4.3-2: Effects on water quality in San Antonio Reservoir	LS
Impact 5.4.3-3: Effects on water quality along Calaveras, San Antonio, and Alameda Creeks	LS

LS = Less than Significant impact, no mitigation required

Impact Discussion

Impact 5.4.3-1: Effects on water quality in Calaveras Reservoir.

Under the WSIP, Calaveras Reservoir would be replaced and its original capacity restored (see Chapter 3 for a description of reservoir operations under the WSIP). Compared with existing conditions, the reservoir would be maintained at a higher storage level. In addition, the new dam outlet works would allow greater flexibility to manage both in-pool and downstream conditions by providing a wider range of controlled releases, selective withdrawal, and improved spill management. Maintaining higher overall storage compared with DSOD-imposed levels would create a larger hypolimnion, leading to similar or greater cold/cool water volumes.

Temperature. The temperature impact under proposed operations is expected to be minimal. Maintaining higher overall storage volumes would create a larger hypolimnion, leading to similar or greater cold/cool water volume. Historical summer cool water pool volumes on the order of 25,000 to 35,000 acre-feet could again be expected with the proposed program. Seasonal thermal stratification dynamics would follow a similar pattern, with the onset of stratification occurring in April, and fall destratification largely complete by November. April through October stream releases would average approximately 3,800 acre-feet (13 percent of the cool water pool[7]). In all hydrologic year types except for the wettest years, the April through October release volume would range from approximately 2,850 to 3,050 acre-feet (9 to 10 percent of the cool water pool), while in the wettest year the release volume would be approximately 7,400 acre-feet (25 percent of the cool water pool). These release volumes would not deplete the cool water pool and would not lead to substantial changes in the thermal structure of the reservoir.

Dissolved Oxygen. Historically (i.e., before the 2002 DSOD restriction), Calaveras Reservoir experienced seasonal anoxia (DO concentrations less than 2 mg/L) during summer and early fall thermal stratification. In an effort to maintain aquatic habitat for fish and to minimize water quality impacts under this reduced reservoir storage condition, an oxygenation system was installed to ensure DO concentrations of up to 5 mg/L in the hypolimnion during summer periods. The oxygenation system has the flexibility to be operated in a larger reservoir and would continue to be operated when the dam is replaced. Thus, DO conditions would be equal to or improved over the existing condition, with DO concentrations maintained to eliminate low-oxygen conditions in the hypolimnion.

Water Quality – Nutrients. As described above in Section 5.4.3.1, Setting, Calaveras Reservoir is mesotrophic; implementation by the SFPUC of oxygenation technology has maintained or improved water quality within the reservoir and would continue to do so under the WSIP. Proposed reservoir storage and operations would not affect the maintenance of water quality; with the oxygenation system in place, overall nutrient levels would likely be lower and algal biomass reduced compared with existing conditions. Furthermore, the restored reservoir capacity would result in greater natural sedimentation relative to the current condition, which would attenuate turbidity spikes during heavy runoff.

7 The assumed cool water pool volume is 30,000 acre-feet.

Impact Conclusions

Overall, implementation of the proposed WSIP water supply and system operations would maintain or improve water quality parameters in Calaveras Reservoir. Therefore, impacts on water quality in Calaveras Reservoir would be *less than significant*, and no mitigation measures would be required.

Impact 5.4.3-2: Effects on water quality in San Antonio Reservoir.

Under the WSIP, controlled releases from San Antonio Reservoir would be maintained at zero, while uncontrolled releases (spills) would be reduced under future operations (compared with the modeled existing condition). As noted above, drawdown would be less (i.e., the reservoir would generally be maintained at a higher storage volume); supply to the Sunol Valley WTP would change from historical operations, with larger inflows in the rainy season and lower inflows in the dry season. Maintaining higher overall storage could create a slightly larger hypolimnion, leading to similar or larger cold/cool water volumes during summer periods.

Temperature. The temperature impact under proposed operations is expected to be minimal. Maintaining higher overall storage would create a larger hypolimnion, leading to similar or larger cold/cool water volumes. Historical summer cool water pool volumes were on the order of 12,000 to 20,000 acre-feet and are expected to be similar under future operations. Seasonal thermal stratification dynamics would follow a similar pattern, with the onset of seasonal stratification occurring in April, and fall destratification largely complete by November.

Dissolved Oxygen. Historically, San Antonio reservoir experienced seasonal anoxia (DO concentrations less than 2 mg/L) during summer and early fall thermal stratification. DO conditions are expected to be similar under future operations.

Water Quality – Nutrients. As described above in Section 5.4.3.1, San Antonio Reservoir is mesotrophic; Merritt-Smith Consultants (2003) determined that oxygenation was an appropriate measure to maintain and possibly improve this status. However, this technology has not been implemented. Future operations are expected to minimize inputs of lower quality water from State Water Project sources (i.e., the Delta), which could improve reservoir water quality. Overall nutrient and algae levels under the WSIP are expected to be similar to current conditions.

Impact Conclusions

Overall, implementation of the proposed WSIP water supply and system operations would maintain water quality parameters in San Antonio Reservoir. Therefore, impacts on water quality in San Antonio Reservoir would be *less than significant*, and no mitigation measures would be required.

Impact 5.4.3-3: Effects on water quality along Calaveras, San Antonio, and Alameda Creeks.

Calaveras Creek

The primary source of Calaveras Creek flow is Calaveras Reservoir releases. There are no appreciable tributaries between Calaveras Dam and the Alameda Creek confluence.

Temperature. Water temperatures under future operations are expected to be similar to existing conditions. Winter temperatures are expected to be low due to seasonally wet and cool conditions. During the warmer periods of the year, water temperatures are expected to be similar in normal, above-normal, and wet years because release quantities would be the same. In below-normal and dry years, water temperatures are expected to be similar or lower under future operations because flows would be increased, while release temperatures would stay approximately the same. This increased flow would not lead to an appreciable thermal benefit far downstream, because eventually the waters would warm, attaining equilibrium with local meteorological conditions (see Alameda Creek, below).

Studies conducted for the 1997 MOU between the CDFG and CCSF contemplated that a 7-cfs release from Calaveras Reservoir would result in cooler temperatures for the upper half of the stream reach between the Alameda/Calaveras Creek confluence and the Sunol Valley WTP. Furthermore, the existing oxygenation system, which is also planned to be used in future operations, would maintain desired DO conditions in reservoir waters, which would further enhance DO conditions in the downstream reach. If MOU releases are from Alameda Creek upstream of Calaveras Creek, then Calaveras Creek would not receive the temperature benefits of these releases, and temperatures would remain as in the base case.

Dissolved Oxygen. DO conditions below Calaveras Dam would depend on water quality conditions in the reservoir. Because oxygenation has been implemented in Calaveras Reservoir since 2002 and would continue to be implemented with the WSIP, DO conditions downstream of the dam would be similar to current conditions.

Water Quality – Nutrients. Any improvements in water quality conditions in Calaveras Reservoir would also occur in released waters downstream of the dam. The trapping of nutrients in the reservoir sediments upstream could reduce nutrients in downstream waters. In addition, oxidation of ammonia to nitrate in the reservoir ("nitrification") would minimize the potential for excess ammonia releases from the reservoir. These benefits would maintain low oxygen demands (due to the nitrification of ammonia to nitrate) as well as a low potential for un-ionized ammonia, which can be harmful to aquatic life.

San Antonio Creek

The WSIP would not change release mechanisms at the Turner Dam on San Antonio Reservoir. Controlled releases would be maintained at zero, while modeled uncontrolled releases would increase in January and February, but decrease in March and April. Because reservoir temperature, DO, and levels of nutrients and associated constituents are not expected to change, significant adverse impacts related to these water quality parameters are not expected.

Alameda Creek

Two reaches of Alameda Creek are discussed below:

- Reach 1 – from the diversion tunnel to Alameda Creek's confluence with Calaveras Creek
- Reach 2 – from the confluence with Calaveras Creek downstream

Reach 1

Temperature. Water temperatures in Alameda Creek in the vicinity of the diversion dam reflect seasonal meteorological conditions (cool winter, warm summer, and intermediate spring and fall temperatures). Reach 1 would experience lower flows under future operations. The bulk of the flow changes would occur from December through April, with modest changes in May during the wetter years. In general, Alameda Creek flows below the diversion tunnel to the creek's confluence with Calaveras Creek would be lower under future operations.

Dissolved Oxygen. Although minimal DO data exist for Alameda Creek throughout much of its watershed, DO conditions in the creek are presumed to be consistent with other wildland creeks of the Bay Area (i.e., near saturation and in equilibrium with the atmosphere). Under future operations, these conditions are not expected to change.

Water Quality – Nutrients. Alameda Creek upstream of the diversion dam is largely an undeveloped watershed with no storage reservoirs. This fact, coupled with flow changes that would be largely limited to December through April (when primary production is low), suggests that water quality impacts due to future operations are not likely to change nutrient conditions in this reach.

Settleable Materials, Suspended Materials, and Turbidity. Sections 5.4.1.1 and 5.4.2.1 describes the SFPUC flushing activities intended to remove accumulations of coarse sediment to protect the facility, maintain storage capacity (and thus diversion capacity) above the Alameda Creek Diversion Dam, and support downstream geomorphic processes by passing sediment. The flushing procedure involves opening the sluice gates to flush coarse sediments from upstream of the diversion dam. Sediment flushing discharges approximately 900 cubic yards of sediment from behind the diversion dam each year, and typically occurs in February. This sediment typically consists of sands and gravels. Operations normally occur over a 48-hour period during high-flow events to develop the necessary velocity to mobilize the coarse sediments behind the dam. Flushing operations occur whether or not flows from the creek are being diverted to the diversion tunnel. The sluice gates remain closed year-round, except during the sluicing procedure. If water is not diverted via the diversion gates to the reservoir, the entire volume of the creek flows through the sluice gates in the dam or over the top of the dam. It is assumed that these SFPUC sediment flushing activities and sluice gate operations would continue under the WSIP.

Three water quality parameters—settleable materials, suspended materials, and turbidity—could be affected by changes in the Alameda Creek Diversion Dam operations and sediment flushing procedures. It is likely that more sediment would be transported to Calaveras Reservoir with the WSIP than under current conditions because of increased flows diverted to Calaveras Reservoir. Many of these sediments would settle out in the reservoir, reducing the overall quantity of sediments in the creek. Therefore, less sediment would be available for transport (either in flows over the dam or via sluicing/flushing operations) down Alameda Creek compared to the existing condition. Therefore, the sluicing/flushing procedures under the WSIP would have less-than-significant water quality impacts with respect to settleable materials, suspended materials, and turbidity.

Reach 2

Temperature. Below the Alameda Creek confluence with Calaveras Creek, lower Calaveras Creek temperatures associated with future operations of Calaveras Dam would also affect Alameda Creek temperatures. The effects would be moderated because of mixing with Alameda Creek flows. Cooler waters in Calaveras Creek would commingle with Alameda Creek flows and generally approach equilibrium temperature in response to local meteorological conditions as waters traversed this reach. During winter periods, water temperatures would be the same under future conditions. During summer periods, flows from Calaveras Creek might be less than equilibrium temperature (i.e., cooler than Alameda Creek waters) at the confluence. The result is that proposed Calaveras Creek flows could reduce Alameda Creek water temperatures; however, it is likely that these waters would warm towards equilibrium over the next several miles.

Dissolved Oxygen. Both Alameda and Calaveras Creeks are expected to have DO conditions at or near saturation under existing and future conditions. Deviations from saturation concentration could occur in response to primary production (photosynthesis and respiration of algae), but these conditions are not expected to change under proposed operations. Overall, DO conditions in Alameda Creek are not expected to change substantially under future operations.

Water Quality – Nutrients. Any reduction in nutrients and algae in Calaveras Reservoir would also occur in released waters downstream of the dam, and potentially in Alameda Creek as well. The impact of these reductions in Alameda Creek below the confluence of Calaveras Creek is uncertain. Nutrient and algae conditions in Alameda Creek are expected to be similar under future operations.

As described above, the WSIP would not substantially degrade water quality parameters in Alameda and Calaveras Creeks; therefore, impacts on these conditions would be less than significant.

Impact Conclusions

Overall, impacts on water quality along Calaveras, San Antonio, and Alameda Creeks would be *less than significant*, and no mitigation measures would be required.

[Additional discussion on water quality in Alameda Creek downstream of the diversion dam was prepared in response to comments on the Draft PEIR. Please refer to Section 15.2, response to the letter from the Regional Water Quality Control Board, San Francisco Bay Region, (Vol. 7, Chapter 15)]

References – Surface Water Quality

Alameda County Water District (ACWD), website, http://www.acwd.org/sources_of_supply.php5, accessed June 11, 2007.

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5.4.4 Groundwater

The primary groundwater resources in the Alameda Creek watershed are in the Livermore and Sunol Valleys, and farther downstream in the Niles Cone area near the town of Niles. In CCSF-owned watershed areas upstream of the Livermore and Sunol Valleys, small amounts of localized groundwater can be found in the shallow alluvial areas that are interspersed with steeper bedrock sections along watercourses. Groundwater in these areas is often through-flow associated with flows in the streams. Because the proposed program would not affect upstream areas in the Livermore Valley or lower areas in the Niles Cone (which is below the SFPUC's infiltration galleries), this section focuses on describing the groundwater conditions and potential WSIP impacts in the Sunol Valley.

5.4.4.1 Setting

Local Geology

The Alameda Creek watershed generally comprises northwest-trending ridges and intervening valleys, the orientations of which are strongly controlled by the structural grain of the underlying bedrock (refer to Chapter 4, Section 4.3, Geology, Soils, and Seismicity). For the purposes of visualizing the groundwater system in the program area, the geologic units can be divided into two main types. The deepest bedrock is characterized by well-compacted and lithified marine sedimentary rocks (Panoche Formation). Because of their compact nature, low permeability, and strong structural deformation, these rocks are considered non-water-bearing or, at best, very low water-yielding (Ludhorff and Scalmanini, 1993).

In contrast, the younger surficial deposits are unconsolidated to only slightly compacted. These units are nonmarine, alluvial fan, and stream channel deposits of interbedded gravel, sand, silt, and clay beds. The lower portion of this sequence, the Livermore Gravels, is more consolidated than the upper portion and is less water-bearing. The upper coarser-grained sand and gravel beds have high porosity and permeability and are considered water-bearing and high water-yielding. The upper alluvial deposits range from 30 to 60 feet thick and probably constitute the most significant groundwater aquifer in the program area (Luhdorff and Scalmanini, 1993).

Hydrogeology

The upper aquifer described above is "unconfined," meaning that the water table fluctuates in response to recharge (precipitation in the wet season) and discharge (evapotranspiration[1] in the dry season). Significant alluvial deposits have been removed by gravel mining upstream from the location of the former Sunol Dam.

Historical groundwater observations by quarry operators suggest that the majority of groundwater inflow occurs from the upper alluvium within about 50 feet of the ground surface (Luhdorff and Scalmanini, 1993). The water-bearing capability and permeability of the deeper zone, the

1 The return of water from the soil and from plants to the atmosphere by evaporation and transpiration.

Livermore Gravels, is lower than that of the shallow alluvium. The contact between the relatively impermeable Livermore Gravels and the highly permeable shallower zone decreases the potential for recharge of the Livermore Gravels via alluvium. Prior to development, groundwater recharge of Sunol Valley alluvium occurred primarily as seepage from the Alameda Creek stream channel and percolation of direct precipitation. Groundwater levels would have been highest during and just after the rainy season and lowest during summer and until the beginning of the wet season. Discharge from the basin would have consisted primarily of groundwater seepage to the channels of Alameda Creek and Arroyo de la Laguna at the downstream end of the valley (Bookman-Edmonston Engineering, Inc., 1995). Prior to construction of Sunol Dam, which artificially raised the water table, groundwater levels in the downstream end of the valley were lower than those observed today.

Sunol Infiltration Galleries

Sunol Dam was built around 1899 by the Spring Valley Water Company to maintain hydraulic head[2] within the shallow alluvium upstream of the dam, adjacent to and underlying the Alameda Creek bed. These deposits host the Sunol infiltration galleries. The infiltration galleries are comprised of a series of concrete tunnels along with perforated pipe placed in the shallow alluvium under Alameda Creek, perpendicular to the creek banks; the galleries provide a location for temporary aquifer recharge (deposit) and recovery (withdrawal) (see **Figure 5.4.4-1**). Historically, surface water from Alameda Creek, particularly peak storm flows, were detained behind both permanent and temporary dams and seeped into the gravels for recovery by the infiltration galleries. The infiltration galleries were not designed to “draw down” groundwater levels, but rather to intercept surface water from Alameda Creek. In this way, short-duration high flows in Alameda Creek resulting from heavy rainfall events were diverted and temporarily stored before being recovered over a longer time period by the infiltration galleries. Dependable yield from the infiltration galleries was 5 mgd, but under flood conditions the fully operational galleries could produce well over 20 mgd (SFPUC, 1960).

After completion of the Calaveras Pipeline in 1934, flows of stored water from Calaveras Reservoir were reduced, and the yield of the infiltration galleries declined. Recharge to the galleries was further reduced in 1965 when construction of San Antonio Dam eliminated supply from San Antonio Creek. In addition, beginning in the late 1960s, gravel mining began altering groundwater flow patterns in the valley. As a result of the quarry operations, groundwater levels in portions of the valley are lower than during the first half of the last century, and flows formerly captured and diverted into the infiltration galleries have decreased in recent years (Bookman-Edmonston Engineering, Inc., 1995). Sunol Dam was removed in September 2006. Removal of this dam is likely to further decrease flows captured in the infiltration galleries.

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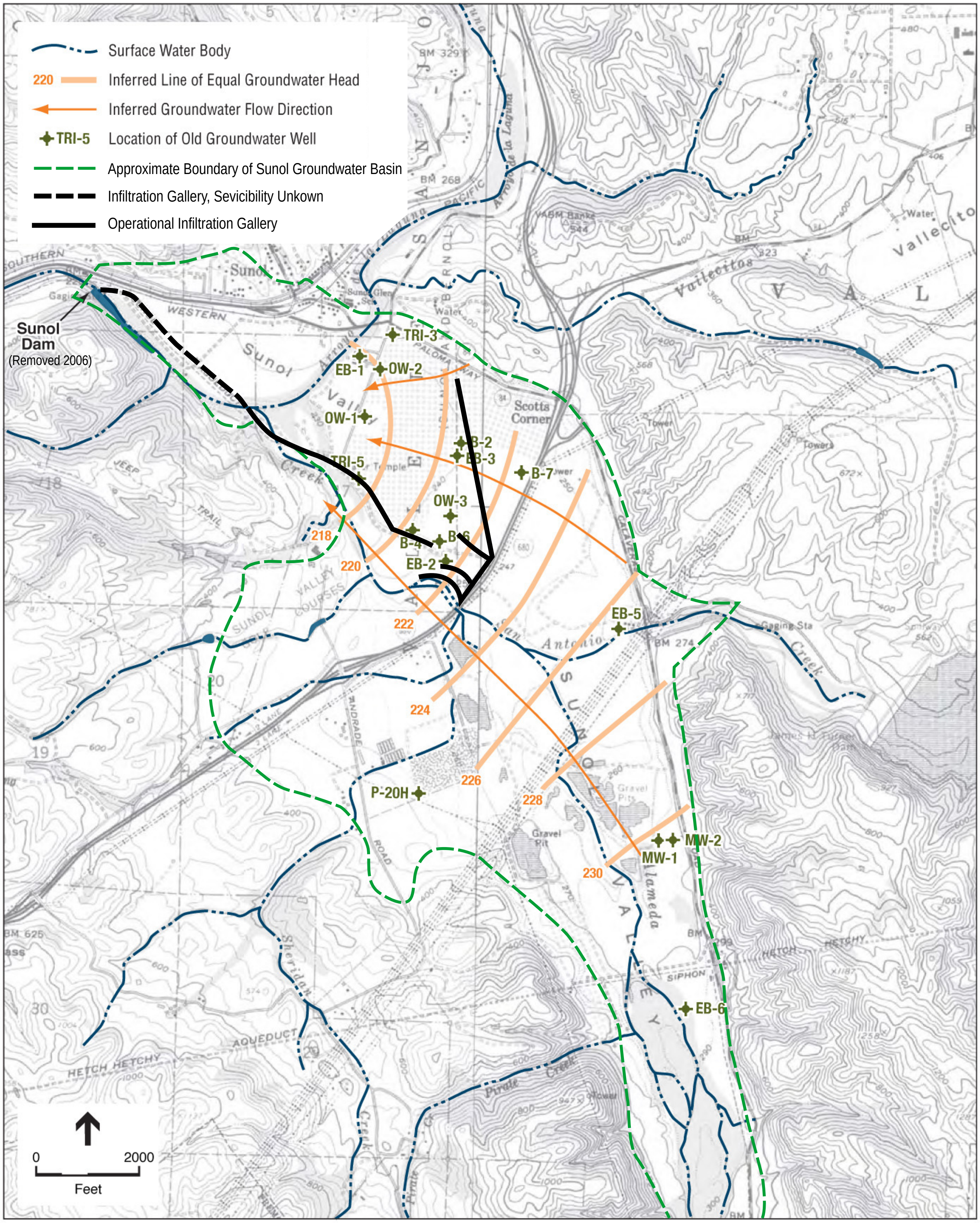
[2] Hydraulic head is the pressure of the water column and elevation difference. Fluids flow down a hydraulic gradient, from points of higher to lower hydraulic head.



SOURCE: Hydroconsult Engineers, Inc., 2005;
Adapted from Luhdorff and Scalmanini, 1993.
Maptech USGS base map

SFPUC Water System Improvement Program . 203287

Figure 5.4.4-1
Sunol Groundwater Basin Groundwater Elevations and Flow Directions

Other than the infiltration galleries, only incidental groundwater development, consisting of a small number of wells for water supply, occurred in the Sunol Valley until recent times. The Sunol Valley Golf Course uses up to 1 mgd of local groundwater. The SFPUC recently installed a new irrigation supply system for the golf course.

Groundwater Observations

Available groundwater data for the Sunol Valley are limited. Investigations conducted in 1986 by the ACWD and in 1989 by the Mission Valley Rock Company involved the installation of several small-diameter monitoring wells throughout the valley. Water levels were measured at the time of installation, but since then have not been routinely measured. Luhdorff and Scalmanini measured water levels in existing wells several times in 1992 and 1993. The ground surface elevations of the wells were estimated, either by survey or reference to available topographic maps.

Generally, comparison of seasonally collected water levels showed relatively small variations from spring to fall. Luhdorff and Scalmanini (1993) concluded that overall groundwater levels in the Sunol Valley range from 20 to 30 feet below ground surface, with probable localized depressions around gravel quarries. The inferred groundwater level contours, using 1992 data, approximately parallel the ground surface contours of the valley floor, and generally indicate a direction of groundwater flow parallel to Alameda Creek. As indicated in Figure 5.4.4-1, groundwater levels are lowest at the northwestern end of the valley, near the Sunol Water Temple, and are highest in the southern, upper end of the Sunol Valley. Groundwater was thus determined to flow in a northwesterly direction, with a focus at the entrance to Niles Canyon.

Geomatrix Consultants measured levels in the three groundwater monitoring wells installed in the shallow alluvium deposits (to an approximate depth of 25 feet) and in Alameda Creek above Sunol Dam between April 2004 and April 2005 (San Francisco Planning Department, 2005). The data indicate a steady decline in groundwater levels adjacent to Sunol Dam (approximately 300 feet from the dam) over the summer months (a 5- to 6-foot decline in six months). As noted above, Sunol Dam was recently removed, which eliminates its influence on groundwater levels and is projected to lower those levels by about 5 feet in the vicinity of the dam.

Groundwater between Interstate 680 and the entrance to Niles Canyon flows to the northwest, gradually sweeping to a southwest flow direction in the immediate vicinity of Sunol Dam (see Figure 5.4.4-1). The presence and flow direction of groundwater is complicated by the infiltration galleries, stream confluences, and, formerly, the Sunol Dam. Comparison of ground surface contour values with the inferred water table surface suggests that Alameda Creek is a “losing” waterway for the majority of its course through the Sunol Valley (i.e., water from Alameda Creek recharges the groundwater table via infiltration through the streambed). However, in the vicinity of the confluence between Arroyo de la Laguna and Alameda Creek, this recharge relationship reverses, with groundwater beginning to contribute to Alameda Creek flow. This portion of Alameda Creek is thus classified as a “gaining” stream. By Sunol Dam, groundwater to creek discharge is well established.

Groundwater in the northwesternmost portion of the Sunol Valley is recharged to a large degree by flow from Arroyo de la Laguna. Arroyo de la Laguna, as it crosses the Sunol Valley on its way to the confluence with Alameda Creek, recharges the general groundwater table to the northwest, and the general groundwater table and infiltration galleries to the southeast. In this capacity, Arroyo de la Laguna has the potential to act as an intermediate sub-groundwater divide.

Groundwater in Niles Canyon

The local hydrogeology in Niles Canyon is best envisioned as occurring in two separate and distinct geological units. The broader, and from a resource perspective, lesser aquifer is contained within the Panoche Formation bedrock. The other aquifer is hosted in alluvial deposits immediately beneath and adjacent to Alameda Creek. The alluvial deposits form the floodplain adjacent to the creek; however, the floodplain is limited in extent by the bedrock slopes of Niles Canyon.

The shallow alluvial aquifer system is well connected to surface water in Alameda Creek. It is reasonable to assume that the amount of groundwater in the shallow aquifer is dependent on the water level in Alameda Creek, and that there is a shallow groundwater gradient directing flow toward Alameda Creek. The shallow groundwater gradient could change on a short-term basis as the limited aquifer responds to precipitation and recharge of shallow groundwater, and as the water level in Alameda Creek fluctuates. The range of seasonal groundwater fluctuation at the site of Niles Dam is expected to be about 1 to 3 feet. The floodplain at Niles Dam was slightly elevated from the water table year-round, producing a condition that may help support a riparian community. Niles Dam was removed in September 2006. The removal of this dam is expected to slightly lower groundwater levels.

The bedrock is not considered a significant aquifer host due to the expected low yields. Furthermore, groundwater in the bedrock would not be strongly influenced by changes and fluctuations in Alameda Creek hydrology, as the hydraulic connection between the two is likely limited.

Groundwater Quality

Groundwater within the Sunol Valley area is calcium-magnesium bicarbonate water, with concentrations of individual constituents at generally low levels. Total dissolved solids are low (from about 350 to 500 mg/L), as are nitrate concentrations (from 1 to 6 mg/L), with the exception of some localized and elevated nitrate and total dissolved solids concentrations in shallow groundwater due to historical agricultural practices (Bookman-Edmonston Engineering, Inc., 1995).

5.4.4.2 Impacts

Significance Criteria

The CCSF has not formally adopted significance standards for impacts related to groundwater, but generally considers that implementation of the proposed program would have a significant groundwater impact if it were to:

- Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of preexisting nearby wells would drop to a level that would not support existing land uses or planned uses for which permits have been granted)
- Substantially impair a water body's ability to support beneficial uses designated by the State Water Resources Control Board or Regional Water Quality Control Board
- Otherwise substantially degrade water quality

Approach to Analysis

Information on potentially affected groundwater bodies was obtained from published sources and through interviews with individuals who are knowledgeable about the hydrogeology of the area or involved with groundwater management in the potentially affected area. Impact assessments were performed by reviewing WSIP-induced changes in stream flow and examining their potential to affect groundwater levels or quality.

Impact Summary

Table 5.4.4-1 presents a summary of the impacts on groundwater bodies in the Alameda Creek watershed that could result from implementation of the proposed water supply and system operations.

TABLE 5.4.4-1
SUMMARY OF IMPACTS –
GROUNDWATER BODIES IN THE ALAMEDA CREEK WATERSHED

Impact	Significance Determination
Impact 5.4.4-1: Changes in groundwater levels, flows, quality, and supplies	LS

LS = Less than Significant impact, no mitigation required

Impact 5.4.4-1: Changes in groundwater levels, flows, quality, and supplies.

Compared to current conditions, increased diversions and storage under the WSIP would reduce peak flows in Alameda Creek between the diversion dam and the confluence with San Antonio Creek. Seasonally, the WSIP would reduce flows in the high-flow months and increase flows in the low-flow months due to fishery releases. It would also increase storage in Calaveras Reservoir. The overall effect of these changes in groundwater supplies downstream in the Sunol aquifer areas is expected to be minor (either slightly positive or slightly negative), depending on the year's rainfall and seasonal conditions. The WSIP would reduce potential infiltration in the Sunol groundwater basin by reducing peak flows in wet years. Impacts on groundwater in the Niles Cone would be less than significant because flows in Alameda Creek downstream of Niles Canyon would be maintained within the range of flows experienced since the Niles Cone began to be managed and utilized as a water supply resource. The program's minor changes in groundwater levels would not affect groundwater quality. This impact would be *less than significant*, and no mitigation measures would be required.

References – Groundwater

Bookman-Edmonston Engineering, Inc., prepared for San Francisco Water Department, *Alameda Creek Water Resources Study*, Appendix A-5 of the *Alameda Watershed Management Plan*, 1995.

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San Francisco Public Utilities Commission (SFPUC), Sunol Filter Beds and Pleasanton Well Field. Available online at http://sfwater.org/printContent.cfm/C_ID/797/, accessed January 11, 2005, Drawing F-342A, Niles Canyon Properties Sunol Portion, May 1960.

5.4.5 Fisheries

The following setting section describes the fishery resources within the streams and reservoirs of the Alameda Creek watershed that could be affected by the WSIP. The impact section (Section 5.4.5.2) provides a description of the effects of WSIP-induced changes in stream flow and reservoir levels on fishery resources.

5.4.5.1 Setting

Alameda Creek and some of its major tributaries historically contained populations of anadromous steelhead and resident rainbow trout (*Oncorhynchus mykiss*) that supported a local recreational fishery. As described below, water supply projects, gravel mining, urban development, and flood control modifications have reduced this historical fishery; however populations of these and other fish species still inhabit certain reaches of Alameda Creek and its tributaries.

Aquatic Habitats

Alameda Creek flows from its headwaters at Oak Ridge to South San Francisco Bay. The creek has historically been divided into three distinct reaches: upper Alameda Creek and its tributaries, Niles Canyon reach and tributaries such as Arroyo del la Laguna, and lower Alameda Creek. Alameda Creek is characterized by long runs and glides and relatively short, shallow riffles (Hanson Environmental, 2002a). Alameda Creek and its tributaries have highly variable seasonal streamflows (see Section 5.4.1 for further description of stream flow).

The substrate ranges from silt and sand with small cobbles to gravel and larger boulders. The lower reach of the creek is characterized by extensive urban development and has been channelized (rip-rapped) for floodwater conveyance. Portions of Alameda Creek are shaded by mixed riparian forest at the margins of the creek. This vegetation is extensive in the Niles Canyon reach, where it occupies the first terrace from the edge of the creek (i.e., ordinary high water) to approximately 6 to 8 feet above ordinary high water (San Francisco Planning Department, 2005).

Flows in the mainstem Alameda Creek and its tributaries are flashy with high flows during the winter and spring and low flows during the summer and fall. In the past, portions of Alameda Creek, particularly the Niles Canyon, Sunol Valley, and lower reach have had low and intermittent streamflows during the summer of dry years. Similar intermittent stream flow conditions have occurred in the tributaries, with the greatest frequency of intermittent flows occurring in the lower elevation alluvial sections during dry years. The seasonal hydrology of Alameda Creek has changed over the past several decades with the addition of upstream storage reservoirs and flow augmentation from managed releases from the State Water Project's South Bay Aqueduct for groundwater recharge and deliveries to local urban communities.

In addition, major alterations to the creek and its tributaries, including the channelization of the lower 12 miles of the creek for flood control; the construction of San Antonio, Calaveras, and Del Valle Reservoirs for water supply; and the construction of a concrete drop structure to stabilize the channel around the Fremont BART weir have made spawning habitat within the watershed inaccessible for some returning anadromous fishes such as steelhead and Chinook salmon (*Oncorhynchus tshawytscha*) (Gunther et al., 2000).

Upper Alameda Creek

Upper reaches of Alameda Creek include higher elevation steeper gradient stream reaches typically bordered by riparian vegetation. Summer water temperatures are typically cooler than those observed further downstream. Bedrock outcroppings influence channel features in several areas including the Little Yosemite reach. The upper reach supports a reproductive population of resident rainbow trout.

Niles Canyon

Prior to the development of water conveyance facilities, Alameda Creek in Niles Canyon was likely an intermittent to perennial stream characterized by low flows during late summer and fall. Aquatic habitats within Niles Canyon likely functioned as a migratory corridor for anadromous fishes such as steelhead and Pacific lamprey (*Petromyzon marinus)* (Gunther et al., 2000). SFPUC fishery monitoring has documented successful lamprey spawning and rearing within Niles Canyon in recent years (ACA, 2004). However, construction and operation of dams, diversions, and other structures that function as fish migration barriers (e.g., the Sunol and Niles Dams and the grade control structure at the BART weir) have prevented anadromous fishes such as steelhead migrating into Alameda Creek and through Niles Canyon from reaching coldwater habitat further upstream within the watershed (Gunther et al., 2000). The Sunol and Niles Dams were partially removed in September 2006, eliminating them as obstacles to fish passage.

The Alameda County Water District (ACWD) augments summer flows, particularly summer releases from Del Valle Reservoir through Arroyo de la Laguna into Niles Canyon. Although the stream temperatures within the reach are probably higher than predevelopment flows, augmented flows potentially provide atypical fast-water habitat that may provide habitat and food for native and non-native fishes. Thus, some evidence suggests that suitable steelhead/rainbow trout habitat occurs in Niles Canyon (Gunther et al., 2000; Smith, 1999; and McEwan, 1999). Results of water temperature monitoring within the Niles Canyon reach of Alameda Creek during 2001-2002 (Hanson Environmental, 2002) showed summer temperatures in excess of 75 °F which would significantly affect the ability of juvenile and adult steelhead/rainbow trout to oversummer within the canyon reach. Monitoring conducted by Hanson Environmental in 2001 and 2002 also shows that water in Alameda Creek is in thermal equilibrium by the time it flows to the Niles Canyon reach of the river, likely due to the prolonged solar warming occurring from the Sunol Regional Wilderness to the Niles Canyon reach. More suitable summer water temperatures were observed further upstream.

Arroyo de la Laguna, Arroyo Mocho, and Arroyo Valle

Arroyo de la Laguna, Arroyo Mocho, and Arroyo Valle are major tributaries to Alameda Creek that drain watersheds in the Livermore-Amador Valley. These tributary creeks are characterized by highly variable seasonal hydrology. Land use changes over the past 150 years have substantially altered the characteristics and hydrology of these creeks. The creeks have been modified to provide flood control capacity within the urbanized areas of the valley and are also used for water conveyance and groundwater recharge. Arroyo Valle and Arroyo Mocho historically supported resident trout fisheries in the upper watersheds, primarily through routine fingerling plantings from hatcheries including the Mount Whitney Hatchery. Adult steelhead were periodically caught in Arroyo Valle and lower Alameda Creek, although the occurrence of records of adult steelhead in Arroyo Valle suggests that only a small number of fish may have occurred (on an infrequent basis) within this portion of the watershed, periodically under favorable environmental and hydrologic conditions (Hanson et al., 2004). No records of adult steelhead being caught by recreational anglers were found for Arroyo Mocho. It is unlikely that either watershed historically provided consistent suitable habitat conditions for steelhead passage, spawning, and/or juvenile rearing to support self-sustaining populations. Arroyo Mocho channel form would have made adult steelhead migration unlikely prior to channelization based upon historic geomorphic conditions within the lower reaches of the Arroyo Mocho channel. Historically, steelhead passage in Arroyo Valle occurred infrequently, in response to high flow events that provided suitable surface water connectivity between Arroyo Valle and lower Alameda Creek.

Arroyo Hondo

Arroyo Hondo, a tributary to Calaveras Creek upstream from Calaveras Reservoir, is known to contain self-sustaining populations of resident rainbow trout. These resident trout populations may have been derived from coastal steelhead trapped in the upper watershed after Calaveras Dam was constructed (Gunther et al., 2000). The trout spawn and rear in the lower mile of Arroyo Hondo, and then some return to Calaveras Reservoir or remain in Arroyo Hondo where they reside for the rest of the year (Entrix, 2003; SFPUC, 2003). Spawning habitat for the reservoir population may be limited by a historic landslide that prevents upstream migration and spawning at locations more than one mile upstream from Calaveras Reservoir (SFPUC, 2004). Resident rainbow trout also successfully spawn and rear in Arroyo Hondo upstream of the landslide.

Currently, the SFPUC conducts two annual fishery monitoring projects in Arroyo Hondo, an expanded aquatic resource monitoring project, and a predation study. The SFPUC plans to begin a reservoir trout population size study in 2007.

Lower Alameda Creek

The lower reach of Alameda Creek is characterized by in stream pools formed by inflatable rubber dams used to convey water from the creek into lateral gravel quarry pits used for groundwater recharge by ACWD. The rubber dams are typically deflated during periods of high flows and increased turbidity. Substrate is typically fine sand and silt. Summer water temperatures are relatively high. The reach provides habitat for warmwater fish such as largemouth bass. The lower 12 miles of the creek is primarily managed as a flood control facility. The channel is armored by riprap. Sediment removal and channel regrading is periodically required to maintain flood conveyance capacity.

Steelhead/Rainbow Trout

Regulatory Status

Steelhead/rainbow trout[1] is a federally listed threatened species (NMFS, 2006). Critical habitat, which was designated for this species by the National Marine Fisheries Service (NMFS) in February 2000, included the Alameda Creek watershed. However, in April 2002 NMFS withdrew the critical habitat designation pending further economic impact analysis (NMFS, 2002). In September 2003, the NMFS formally withdrew the critical habitat designation for the Central California Coast ESU as well as 18 other ESUs (NMFS, 2002). In June 2004, the NMFS proposed including resident rainbow trout in the Central California Coast ESU due to genetic similarities between resident and migratory trout within the Alameda Creek watershed upstream of ACWD Rubber Dam 1 (NMFS, 2004). The NMFS subsequently determined that resident rainbow trout inhabiting Alameda Creek should not be included in the ESU for anadromous steelhead (NMFS, 2006). Instead, NMFS determined to list as threatened only those rainbow trout/steelhead that exist below the lowest impassible barriers in the Alameda Creek watershed (i.e., the BART Weir). Thus, the resident rainbow trout that occur in the creek above the BART Weir are not designated as a listed species.

The SFPUC would be required to obtain a Clean Water Act Section 404 permit from the US Army Corps of Engineers (USACE) to construct the Calaveras Dam Replacement project (SV-2) downstream of the existing dam. Before issuing a Section 404 permit, the USACE is required under Section 7 of the ESA to consult with NMFS and the USFWS on designated species to obtain a biological opinion of no jeopardy and an incidental take statement. NMFS also advised the SFPUC that while the USACE would need to initiate a Section 7 consultation with NMFS on the Calaveras Dam Replacement project, it was unlikely that operation of Calaveras Dam would adversely affect steelhead in the area below the BART Weir by making conditions unsuitable for successful steelhead spawning, egg incubation, or juvenile rearing. For this reason, NMFS advised that the steelhead issues above the BART Weir would not be addressed in the Calaveras Dam Replacement project Section 7 consultation, and that incidental take coverage for steelhead in the upper watershed would have to be obtained through a habitat conservation plan (HCP) or through a re-initiated USACE consultation on the Calaveras Dam Replacement project after the lower passage problems are remedied.

Life History

O. mykiss have a dynamic life history. All *O. mykiss* hatch in the gravel substrate of coldwater streams. After hatching, the young fry emerge from the gravel and start feeding in the stream. Some begin to disperse downstream in the months following their emergence, but most continue to rear in the stream. Following a rearing period of at least one year, juveniles follow a variety of life-history patterns, including residents (nonmigratory) at one extreme and individuals that migrate to the open ocean (anadromous) at another extreme. Intermediate life-history patterns include fish that migrate within the stream (potamodromous), fish that migrate only as far as estuarine habitat, and fish that migrate to near-shore ocean areas.

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1 Rainbow trout and steelhead are the same species of trout (*O. mykiss*). The freshwater variety are rainbow trout, and trout that migrate from the ocean to spawn in freshwater (i.e., anadromous) are steelhead.

Juveniles that become migratory typically do so after one or two years of rearing, but sometimes longer. Physiological changes in these fish (called smolts) ultimately allow them to make a transition from freshwater to seawater. Smolts migrate to the ocean, spend a variable amount of time there (typically one to two years), grow rapidly, and return to spawn, generally in the stream where they hatched. Steelhead are unusual among the other Pacific salmonids in that they do not all die after spawning. Some return immediately to the ocean, and others return after holding for a period in freshwater. Within a given stream, some *O. mykiss* do not migrate to the sea, and the proportion may vary considerably depending on local circumstances. These fish reach sexual maturity and spawn without entering the ocean and are often known as resident or stream rainbow trout (Gunther et al., 2000).

Anadromous steelhead exhibit two basic life-history forms. Stream-maturing steelhead enter spawning streams before they are sexually mature, generally during the period between spring and early fall, and spend several months in the stream before they are ready to spawn. Ocean-maturing steelhead enter spawning streams during the fall and winter in a fully mature state and spawn relatively soon after entering freshwater (Gunther et al., 2000). Both forms may occur in the same river system with little or no genetic distinction. Details on the life history of steelhead inhabiting the Alameda Creek watershed are unknown, however the low summer flows and seasonally elevated water temperatures within many of the reaches may have limited opportunities for stream-maturing adult steelhead to have successfully oversummered in many areas. Steelhead habitat requirements are associated with distinct life-history stages, including migration from the ocean to inland reproductive and rearing habitats, spawning and egg incubation, rearing, and seaward migration of smolts and spawned adults. Habitat requirements and life-history timing can vary widely over the steelhead's natural range (Barnhart, 1986; Pearcy, 1992; and Busby et al., 1996; cited in Gunther et al., 2000).

Resident and Migratory Populations

Populations of resident rainbow trout have been reported above the Calaveras Reservoir on several occasions since 1905, in Arroyo Hondo, Isabel Creek, and Smith Creek (Leidy, 1984). Young-of-year *O. mykiss* have been observed in Stonybrook Creek and Sinbad Creek, tributaries to Alameda Creek (Gunther et al., 2000). However, electrofishing in Sinbad Creek in 1997 and 1998 failed to capture any *O. mykiss*. Stonybrook Creek is regarded as potential *O. mykiss* habitat based on the presence of several age classes of resident individuals, including young-of-year (Gunther et al., 2000).

There is some evidence that a native, locally adapted *O. mykiss* stock survives in the Alameda Creek watershed (Gunther et al., 2000). Resident rainbow trout were collected below Niles Dam in 1927 and in Stonybrook Creek, a tributary to Alameda Creek, in 1955. Sampling by the ACWD in 1999 documented the presence of reproducing populations of resident trout in Arroyo Mocho and two tributaries to Alameda Creek, Welch and Pirate Creeks (Buchan et al., 1999). Recent sampling by the East Bay Regional Park District documented the presence of reproducing trout populations in Stonybrook Creek and Alameda Creek in the Sunol Regional Wilderness (Leidy, 2003).

Sightings of migratory steelhead have been reported downstream of the BART weir. In recent years, individual steelhead were captured near the BART weir by citizen groups and released at the mouth of Niles Canyon upstream of the ACWD inflatable diversion dams. One of these fish, a pregnant female, was tracked to Stonybrook Creek, upstream of Niles Dam (Gunther et al., 2000). There are also reports of migratory steelhead spawning in Alameda Creek downstream of the middle inflatable dam, and in 1998 fertilized eggs were collected from the area immediately downstream of the BART weir. The eggs hatched successfully, and the resulting fry were released into Alameda Creek in Sunol Park (Gunther et al., 2000).

Genetic testing by Nielson (2003) was based on a small sample size, but suggests that the present self-sustaining populations of resident rainbow trout may have been derived from migratory steelhead that were isolated in the upper part of the watershed by natural processes or by construction of Calaveras Dam (NMFS, 2004). The presence of migratory barriers, notably the BART weir, prevents upstream movement of migratory steelhead.

Temperature is an important factor affecting habitat quality and availability for migratory and resident trout, particularly during the oversummer rearing period (Gunther et al., 2000; Hanson Environmental 2002b). Temperature in Alameda Creek is discussed in Section 5.4.3. The upper lethal temperature for Pacific salmonids is in the range 23.9 to 25 °C for continuous long-term exposure (Gunther et al., 2000). Some researchers indicate an upper lethal temperature for Pacific salmonids as low as 22.9 °C (Hanson, 2003); however, steelhead can survive for short periods at elevated temperatures, especially if abundant food and dissolved oxygen exists. Recent temperature data suggest that summer and early-fall temperatures in Niles Canyon are within the range considered to be highly stressful or unsuitable for juvenile steelhead (Hanson Environmental, 2002b).

Spawning

The presence of self-sustaining resident rainbow trout populations with multiple age class structure within the watershed provides evidence of consistent successful reproduction (Gunther et al., 2000). The best potential spawning (and rearing) habitat in the watershed exists in the upper reaches of Alameda Creek, upstream tributaries, and the Arroyo Mocho canyon.

Steelhead/rainbow trout, like all Pacific salmon, select spawning sites with specific features. These features include gravel substrate with sufficient flow velocity to maintain circulation through the gravel and provide a clean, well-oxygenated environment for incubating eggs. Preferred gravel substrate is in the range of 0.25 to 2.5 inches in diameter, and flow velocity is in the range of 1 to 3 feet per second. Steelhead will use substrate with larger gravel (up to 4 inches) than will resident trout. Sites with preferred features for spawning occur most frequently in the pool tail/riffle head areas, where flow accelerates out of the pool into the higher gradient section below. In such an area, the female steelhead will create a pit, or redd, by undulating her tail and body against the substrate. This process also disturbs fine sediment in the substrate and lifts it into the current to be carried downstream, cleaning the nest area. Survival of fertilized eggs through hatching and emergence from the gravel is most often limited by radical changes in flow that can dislodge eggs from the substrate, result in sedimentation, or dewater incubation sites (Gunther et al., 2000).

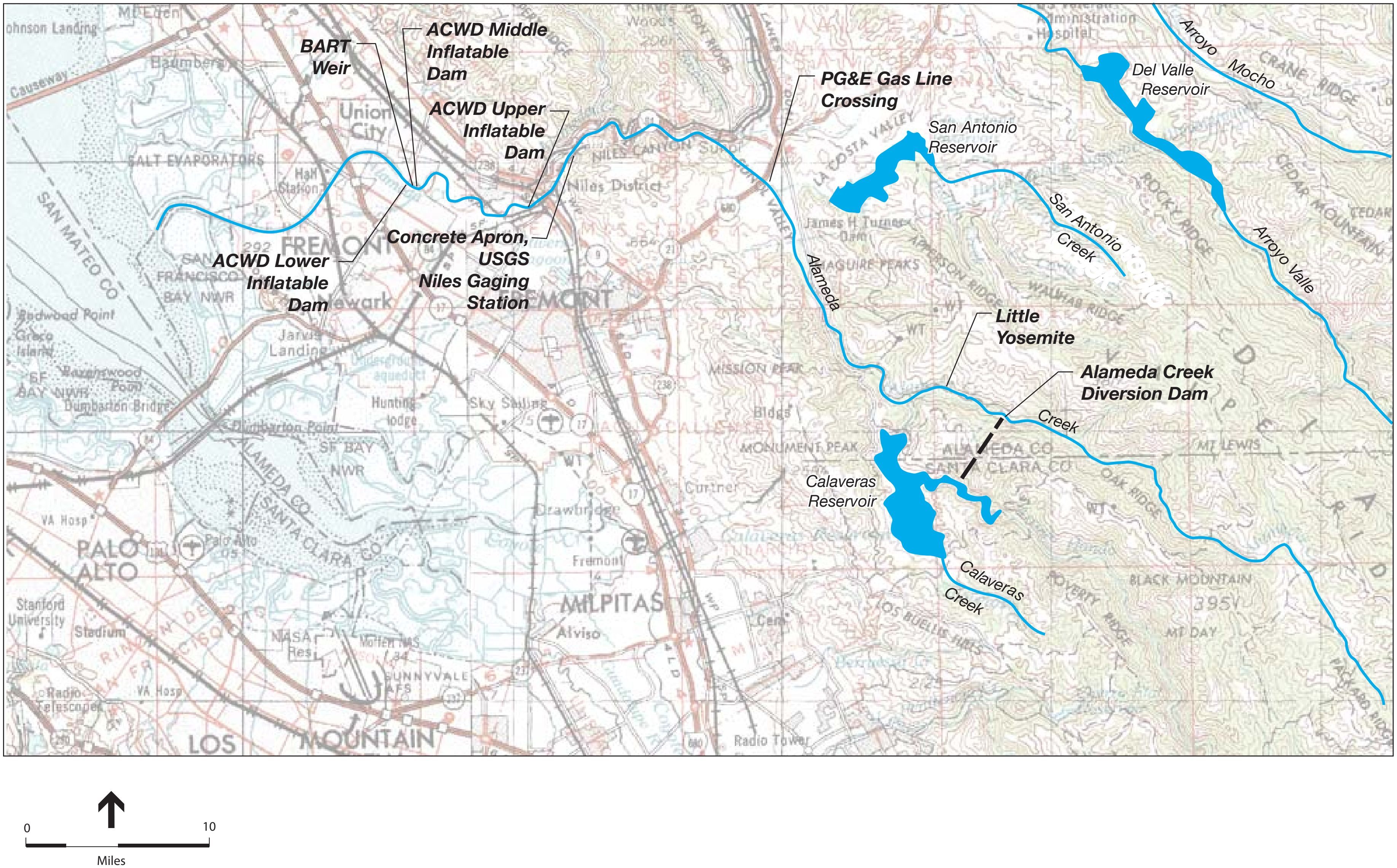
Areas of the watershed that support resident trout all show evidence of successful spawning, as indicated by the presence, abundant in places, of young-of-year trout. Suitable substrate conditions for spawning and egg incubation are found at some level in all stream reaches potentially supporting steelhead. Given the high potential fecundity of steelhead, factors other than availability of spawning habitat are likely to be more limiting; however, reconnaissance surveys conducted to date are not of sufficient detail to quantify the overall extent and quality of suitable substrate (Gunther et al., 2000). It is possible that more detailed observations would reveal opportunities for improving spawning habitat and enhancing production of steelhead juveniles. However, the availability of spawning habitat does not appear to preclude steelhead from completing their life cycle in the Alameda Creek watershed (Gunther et al., 2000).

Juvenile Rearing

Rearing habitat is limited in most of the areas potentially supporting steelhead by low summer stream flow and exposure to seasonally elevated water temperatures (Gunther et al., 2000). This natural condition under which steelhead in these reaches evolved has been exacerbated by urban development. However, areas exist with suitable water temperature for rearing *O. mykiss*, particularly in the upper canyon reaches of the creek and larger tributaries (Gunther et al., 2000; Hanson Environmental 2002b). In some of the stream reaches supporting the greatest numbers of resident trout, low summer stream flow results in relatively small, infrequent, isolated pools (e.g., the reach of Alameda Creek located upstream and downstream of the diversion dam). More pools or larger pools would be expected to allow greater numbers of trout to survive the low-flow period (Gunther et al., 2000), but this is a natural condition in these reaches and one to which steelhead/rainbow trout have adapted. Availability of late-summer habitat may limit the abundance of steelhead/rainbow trout within the watershed, but it does not preclude them from completing their life cycle (Gunther et al., 2000).

Rainbow Trout/Steelhead Migration and Barriers

As described above, Alameda Creek historically hosted a steelhead run, with spawning occurring in the upper reaches of the watershed. That steelhead run was eliminated by the placement of several obstructions to migration within the Alameda Creek channel over the past century. These obstructions include the Alameda County Flood Control and Water Conservation District’s BART Weir located about 9.5 miles upstream from the creek’s confluence with San Francisco Bay; Alameda County Water District (ACWD) rubber dams (ranging in location from about two miles upstream of the Bay to just below Niles Canyon), the USGS gaging station weir in Niles Canyon, and the PG&E drop structure in the Sunol Valley (see **Figure 5.4.5-1**). In addition, the Calaveras, San Antonio, and Alameda Creek Diversion Dams (all owned by the City and County of San Francisco and operated by the SFPUC) and Del Valle Dam (owned and operated by the California Department of Water Resources) are all impassable barriers in the upper part of the watershed. The SFPUC removed above-ground portions of two relict diversion dams located on the creek (Sunol Dam and Niles Dam) in September 2006. Other migration barriers along the creek also have been or are in the process of being removed: two swimming hole dams in the Sunol Regional Wilderness park were removed in the past few years; and the ACWD is



SOURCE: ESA + Orion; USGS 1969

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Figure 5.4.5-1
Potential Barriers to Fish Migration in Alameda Creek Watershed

evaluating plans to remove or provide fish passage at their rubber dams and is currently installing a positive barrier fish screen on an unscreened diversion from the creek.

Despite the recent removal of these structures, currently, steelhead can migrate upstream only as far as the BART Weir. Since 2000, up to seven fish have been found at the base of the BART Weir annually during the migration season. (The area below the weir is monitored by the Alameda Creek Alliance for migrating fish). When found, these steelhead are collected, transported upstream, and released into the creek near Niles Canyon where several have been observed migrating upstream into tributary creeks. The NFMS rule regarding the listing of Alameda Creek steelhead as threatened under the Federal ESA (California Central Coast Distinct Population Segment), finalized in January 2006, applies only to the anadromous form of *O. mykiss* and therefore is limited to populations below the BART Weir.

Steelhead will not have unimpeded access to the upper Alameda Creek Watershed until passage is provided at the remaining downstream barriers to fish migration. The locations of passage barriers within the watershed are shown in Figure 5.4.5-1. These barriers and the status of planning to address passage at these locations is described below:

- Alameda County Flood Control and Water Conservation District's BART Weir – several studies have been conducted regarding potential designs to provide passage at this location. The most recent effort is a report (Wood Rogers, 2006) that outlines options ranging from total removal of the structure ("roughened channel") to three ladder and screen alternatives. The range of low flows estimated to allow suitable passage for adult steelhead among these four options is 10–50 cfs. However, other barriers (e.g., ACWD middle and upper rubber dams, PG&E Drop Structure – see below) within Alameda Creek may be impassable at these low flows. On July 31, 2007, the Alameda County Flood Control and Water Conservation District and the ACWD entered into an agreement to design a fish passage facility over the BART weir and the middle inflatable dam in the Alameda County Flood Control Channel to improve steelhead passage within the Alameda Creek watershed.

- ACWD middle and upper rubber dams – design of fish passage options and/or operational changes are being studied. There is currently no schedule or budget, and environmental review has yet to begin. (CH2MHill, 2001)

- USGS Niles gaging station weir/concrete apron – has been identified as potential barrier (passage impediment) at some flow levels. The Northern California Council Federation of Fly Fishers (NCCFFF) has developed a preliminary study (Federation of Fly Fishers, 2004), which includes a preliminary finding that the apron/weir fails to comply with existing fish passage criteria and would be a severe impediment to upstream migration of steelhead. However, this conclusion has been questioned by other experts, and NCFFF is continuing its studies.

- PG&E Drop Structure – protects a natural gas pipeline under the creek. No studies have been conducted to date regarding fish passage options, and there is no schedule or budget for this project. The SFPUC proposed to coordinate planning for a passage project at this location with PG&E in its Sunol Valley Quarry request for proposals. The SFPUC has yet to make a selection from those responding to the RFP, but the selected entity will be required to provide funds towards this effort.

- The SFPUC's Alameda Creek Diversion Dam could block migration to any migrating steelhead that travel upstream of the Little Yosemite area.

- A number of low-flow passage impediments exist within Alameda Creek including shallow riffles, short falls and bedrock plunge pools, and other small structures.

The SFPUC also is conducting preliminary studies of passage issues in the watershed: (1) natural barriers in the watershed, including the landslide in the Arroyo Hondo above Calaveras Reservoir, and the Little Yosemite reach of Alameda Creek; (2) Calaveras Dam; (3) Alameda Creek Diversion Dam; and (4) critical riffles on Alameda Creek, focusing on the Sunol Valley/Quarry reach.

In addition, the Calaveras, San Antonio, and Alameda Creek Diversion Dams (all owned by the City and County of San Francisco and operated by the SFPUC) and Del Valle Dam (owned and operated by the California Department of Water Resources) are all impassable barriers in the upper part of the watershed. The SFPUC removed above-ground portions of two relict diversion dams located on the creek (Sunol Dam and Niles Dam) in September 2006.

Flows to Support Rainbow Trout/Steelhead

In addition to migration barriers, reduced winter and spring flows in Alameda Creek above the BART Weir also would limit migration and spawning if steelhead were to gain access upstream. The Alameda Creek Fisheries Restoration Workgroup (Workgroup), formed for the purpose of restoring steelhead to Alameda Creek, will be undertaking a series of flow studies to determine the flows necessary to support steelhead in the watershed. The Workgroup includes the SFPUC, Alameda County Flood Control and Water Conservation District, Alameda County Resource Conservation District, ACWD, Alameda Creek Alliance, California State Coastal Conservancy, California Department of Fish and Game, East Bay Regional Park District, National Marine Fisheries Service (NMFS), Natural Resources Defense Council, Pacific Gas and Electric Company (PG&E), and the Zone 7 Water Agency (Zone 7).

These agencies developed a Memorandum of Understanding (MOU) in April 2006 that describes the commitment and process to jointly fund and conduct flow studies to estimate the range, magnitude, timing, duration, frequency and location of flows necessary to restore steelhead within the creek, while also considering other native fishes and riparian communities, in the Alameda Creek watershed while minimizing the potential impacts to agencies responsible for supplying drinking water to Bay Area communities. In December 2006, a consultant was selected to manage the flow studies.

These flow studies are intended to result in a flow strategy that will meet with approval from the state and federal regulatory agencies and satisfy regulatory requirements. This strategy, when combined with other aspects of a fisheries restoration program, is intended to provide long-term assurances and certainties for restoring and maintaining native fishes, as well as providing water agencies and other utilities and special districts with long-term assurances and certainties for continued water supply and other infrastructure operations in the watershed. The flow studies are being conducted in three phases:

Phase 1 will include a review of relevant existing information on hydrologic and geomorphic conditions and fish habitat in the watershed. Based on this foundation, the Workgroup will agree on a detailed work plan for the tasks needed to estimate the range, magnitude, timing, duration, frequency and location of flows necessary to restore a population of steelhead to the creek (while also considering their effects on other native fishes and riparian communities). That work plan, scheduled to be completed by June 2007, will be conducted in the second phase of the studies.

Phase 2 will focus on developing a common understanding of the existing conditions in the watershed and collecting the additional data necessary to estimate the flows needed to restore steelhead in the Alameda Creek watershed. This assessment will be based on the review of existing hydrologic and geomorphic conditions and the estimated flows needed to support steelhead throughout their lifecycle in the watershed. Results from Phase 2 will form the foundation from which flow proposals that will support steelhead can be developed and analyzed. The Workgroup currently anticipates that Phase 2 will be completed by January 2009.

The scope and schedule for Phase 3 will be determined following completion of Phases 1 and 2, and is expected to include the development and analyses of specific flow alternatives, including operational, engineering, and natural resource strategies, with the intent of achieving the restoration goals identified in Phase 2.

The SFPUC plans to incorporate these strategies into its Alameda Watershed Habitat Conservation Plan, which will provide coverage for regional water system operations within the Alameda Creek Watershed under the Federal Endangered Species Act (ESA, Section 10) for covered species, including steelhead.

The design of the fish passage projects, particularly for the BART Weir and the ACWD rubber dams, would be closely coordinated with the Workgroup's flow studies. Passage alternatives range from total removal of barriers to ladder/screen construction projects, and the flows required to provide passage at different times of the year would vary widely until a specific design is selected for each location. It is also critical for these designs to be considered in the context of existing and future water supply operations by ACWD, SFPUC, and Zone 7.

Potential Steelhead Restoration

For the purposes of full disclosure, the PEIR provides this discussion of steelhead in lower Alameda Creek, and the potential for steelhead to be restored to the upper reaches of Alameda Creek (above the BART weir). However, because this steelhead access does not currently exist and there is no current steelhead migration above the BART weir, the potential impact on steelhead migration, spawning, or juvenile rearing upstream of the BART weir as a result of WSIP implementation is not analyzed in this section, which addresses WSIP impacts relative to existing conditions, but instead is analyzed as a future, cumulative impact in Section 5.7.3.

[Additional discussion on steelhead fishery in Alameda Creek was prepared in response to comments on the Draft PEIR. Please refer to Section 14.9, Master Response on Alameda Creek Fishery Issues (Vol. 7, Chapter 14).]

Other Fish Species

Chinook Salmon

Chinook salmon remains within archaeological sites in the lower Alameda Creek floodplain (Gunther et al., 2000). These fish could have been captured in San Francisco Bay or other locations and transported to the site. Historically, Alameda Creek could have supported small runs of Chinook salmon, as have been observed in other South Bay tributaries. In recent years, small numbers of Chinook salmon adults have been recovered from the Alameda Creek flood control channel downstream of the BART weir, as well as from other streams tributary to South San Francisco Bay that were not previously known to support salmon runs. It is generally believed that management of hatchery production has resulted in salmon straying to streams that have not traditionally supported them (Gunther et al., 2000).

Other Species

Approximately seventeen native fish species have been collected in nontidal portions of the Alameda Creek watershed during the past century (**Table 5.4.5-1**). Several other species may also have occurred in the watershed based on collections in tidal portions, evidence from archaeological investigations, and other accounts. Many collections include widely distributed species typical of streams in the region, such as California roach (*Hesperoleucus symmetricus*), hitch (*Lavinia exilicauda*), Sacramento sucker, Sacramento pikeminnow (*Ptychocheilus grandis*), steelhead/rainbow trout, Pacific lamprey (*Lampeta tridentata*), and prickly sculpin (*Cottus asper*) (Gunther et al., 2000). Two species, speckled dace (*Rhinichthys Osculus*) and riffle sculpin (*Leptocottus armatus*), have appeared in only one or two collections. Speckled dace were reported to occur in Arroyo Hondo and Isabel Creek (two Calaveras Creek tributaries above Calaveras Reservoir) by Snyder in 1905, and in Alameda Creek at the confluence with Calaveras Creek by Shapovalov in 1938 (Leidy, 1984).

In surveys conducted between 1972 and 1977, Scoppettone and Smith (1978; Gunther et al., 2000) did not find speckled dace in these areas. Riffle sculpin collected in Alameda Creek at the junction with Calaveras Creek in 1938 by Shapovalov (Gunther et al., 2000) is the only report of the species in the Alameda Creek watershed. Scoppettone and Smith (1978) sampled for riffle sculpin at sites with cool, permanent water in Isabel, Smith, Arroyo Hondo, Arroyo Mocho, and Alameda Creek, but found none. Of the 15 remaining species, all were collected as recently as 2002 (Leidy, 2007). The SFPUC has also conducted an annual fishery survey within the watershed since 1998.

The two species not collected in 1981 were Pacific lamprey and Sacramento blackfish (Gunther et al., 2000). Pacific lamprey have been recently netted in the flood control channel section. Sacramento blackfish have been reported in the ACWD quarry lakes. Sacramento perch, one of the species collected in 1981, are native to California. Aceituno et al. (1976) believed that Sacramento perch were stocked in Calaveras Reservoir some time after 1925 and spread to the stream from there. However, Gobalet (1990) reports Sacramento perch from fish remains at an archaeological site adjacent to Arroyo de la Laguna. In any case, the species has been collected in Niles Canyon since 1953 and currently maintains populations in the off-channel percolation ponds adjacent to the flood control channel (Gunther et al., 2000).

[Additional discussion on other fish species and aquatic habitat in Alameda Creek was prepared in response to comments on the Draft PEIR. Please refer to Section 14.9, Master Response on Alameda Creek Fishery Issues (Vol. 7, Chapter 14).]

TABLE 5.4.5-1
FISH SPECIES OBSERVED IN THE ALAMEDA CREEK WATERSHED

Common Name *Scientific Name*	**1905 Synder**	**1927 Follet**	**1934 Seale**	**1938 Shapovalov**	**1953 Follett**	**1955 Follett**	**1957–1958 Follett**	**1961 Hopkirk**	**1972 Follet**	**1973 CDFG**	**1977 Scoppettone and Smith**	**1984 Leidy**	**2007 Leidy**
Native Species													✓
Pacific lamprey (*Petromyzon marinus*)						✓	✓			✓			✓
California roach (*Hesperoleucus symmetricus*)	✓		✓				✓	✓			✓	✓	✓
Hitch (*Lavinia exilicauda*)	✓		✓			✓			✓	✓		✓	✓
Sacramento blackfish (*Orthodon microlepidotus*)			✓			✓	✓	✓	✓	✓			✓
Sacramento squawfish (pikeminnow) (*Ptychocheilus grandis*)	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓	✓
Speckled dace (*Rhinichthys Osculus*)				✓									
Sacramento sucker (*Catostomus occidentalis*)	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓
Steelhead/rainbow trout (*Oncorhynchus mykiss*)		✓				✓	✓				✓		✓
Threespine stickleback (*Gasterosteus aculeatus*)			✓							✓		✓	✓
Sacramento perch (*Archoplites interruptus*)					✓	✓	✓		✓	✓	✓	✓	✓
Prickly sculpin (*Cottus asper*)	✓	✓	✓			✓	✓			✓	✓	✓	✓
Riffle sculpin (*Leptocottus armatus*)				✓									✓
Tule perch (*Hysterocarpus traski*)	✓	✓	✓									✓	✓
Hardhead (*Mylopharodon conocephalus)*													✓

TABLE 5.4.5-1 (Continued)
FISH SPECIES OBSERVED IN THE ALAMEDA CREEK WATERSHED

Common Name *Scientific Name*	1905 Synder	1927 Follet	1934 Seale	1938 Shapovalov	1953 Follett	1955 Follett	1957–1958 Follett	1961 Hopkirk	1972 Follet	1973 CDFG	1977 Scoppettone and Smith	1984 Leidy	2007 Leidy
Native Species (cont.)													✓
Chinook salmon (*Oncorhynchus tshawytscha*)													✓
Shiner perch (*Cymatogaster aggregata*)													✓
Longjaw mudsucker (*Gillichthys mirabilis*)													✓
Staghorn sculpin (*Leptocottus armatus*)													✓
Starry flounder (*Platichthys stellatus*)													✓
Introduced													
Goldfish (*Carassius auratus*)										✓			✓
Carp (*Cyprinus carpio*)						✓	✓		✓	✓	✓	✓	✓
Golden shiner (*Notemigonus crysoleucas*)												✓	✓
White catfish (*Ictalurus catus*)						✓							✓
Black bullhead (*Ictalurus melas*)												✓	✓
Brown bullhead (*Ictalurus nebulosus*)							✓	✓					✓
Mosquito fish (*Gambusia affinis*)								✓		✓	✓	✓	✓
Inland silverside (*Menidia beryllina*)												✓	✓
Green sunfish (*Lepomis cyanellus*)								✓		✓		✓	✓
Bluegill (*Lepomis macrochirus*)					✓	✓	✓				✓		✓

TABLE 5.4.5-1 (Continued)
FISH SPECIES OBSERVED IN THE ALAMEDA CREEK WATERSHED

Common Name ***Scientific Name***	**1905 Synder**	**1927 Follet**	**1934 Seale**	**1938 Shapovalov**	**1953 Follett**	**1955 Follett**	**1957–1958 Follett**	**1961 Hopkirk**	**1972 Follet**	**1973 CDFG**	**1977 Scoppettone and Smith**	**1984 Leidy**	**2007 Leidy**
Introduced (cont.)													
Smallmouth bass (*Micropterus dolomieui*)					✓			✓				✓	✓
Largemouth bass (*Micropterus salmoides*)					✓			✓				✓	✓
Black Crappie (*Pomoxis nigromaculatus*)								✓					✓
Bigscale logperch (*Percina macrolepida*)												✓	✓
Threadfiin shad (*Dorosoma petenense*)													✓
Channel catfish *(Ictalurus punctatus)*													✓
Rainwater killfish *(Lucania parva)*													✓
Striped bass *(Morone saxatilis)*													✓
Redear sunfish *(Lepomis microlophus)*													✓
Redeye bass *(Micropterus coosae)*													✓
Yellowfin goby *(Acanthogobius flavimanus)*													✓

SOURCE: Gunther et al., 2000; Leidy, 2007.

5.4.5.2 Impacts

Significance Criteria

The City and County of San Francisco has not formally adopted significance standards for impacts related to fisheries, but generally considers that implementation of the proposed program would have a significant fisheries impact if it were to:

- Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the CDFG or USFWS
- Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites
- Have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of an endangered, rare, or threatened species

Approach to Analysis

The effects of the WSIP on river flow and water levels in reservoirs were determined using the Hetch Hetchy/Local Simulation Model, as described in Section 5.4.1. A professional fish biologist assessed the effects of flow, reservoir level, and water temperature changes on fishery resources in the Alameda Creek watershed.

As described in Section 5.1.3, Approach to Analysis for Chapter 5 Water Supply and System Operations, and further discussed in Section 5.4.1, the existing conditions baseline used for impact analysis is based on current flow conditions in Alameda Creek that have occurred since the beginning of 2002 as a result of the DSOD restrictions on the storage capacity of Calaveras Reservoir. The proposed future condition assumes full implementation of the WSIP, including restoration of Calaveras Reservoir storage.

Impact Summary

Table 5.4.5-2 presents a summary of the impacts on aquatic habitats and fishery resources that could result from implementation of the proposed WSIP water supply and system operations.

Impact Discussion

Impact 5.4.5-1: Effects on fishery resources in Calaveras Reservoir.

The storage volume within Calaveras Reservoir under proposed WSIP operations would typically be substantially greater than under current conditions. This increase in storage offers the potential

TABLE 5.4.5-2
SUMMARY OF IMPACTS –
FISHERIES IN ALAMEDA CREEK WATERSHED STREAMS AND RESERVOIRS

Impact	Significance Determination
Impact 5.4.5-1: Effects on fishery resources in Calaveras Reservoir	B
Impact 5.4.5-2: Effects on fishery resources along Calaveras Creek below Calaveras Dam and along Alameda Creek below confluence with Calaveras Creek	B
Impact 5.4.5-3: Effects on fishery resources along Alameda Creek downstream of Alameda Creek Diversion Dam	PSM
Impact 5.4.5-4: Effects on fishery resources in San Antonio Reservoir	B
Impact 5.4.5-5: Effects on fishery resources along San Antonio Creek below San Antonio Reservoir	LS
Impact 5.4.5-6: Effects on fishery resources along Alameda Creek below confluence with San Antonio Creek	LS

LS = Less than Significant impact, no mitigation required
PSM = Potentially Significant impact, can be mitigated to less than significant
B = Beneficial impact

for increased coldwater pool volume, which could benefit coldwater fish species downstream of the reservoir. A greater coldwater pool volume within the reservoir is expected to sustain colder temperatures, particularly during summer months, and improve the quality and availability of habitat downstream of the dam. In addition, increased reservoir storage would increase the volume of habitat available for resident fish species inhabiting the reservoir, including both warmwater and coldwater fish species. The increased reservoir habitat may increase the abundance of non-native predators such as largemouth bass that prey on resident native species.

The increase in reservoir elevation under the proposed program could also provide greater opportunities for connectivity and migration of fish between the reservoir and upstream tributary habitat. As a result of these factors, increased reservoir storage under proposed operations is considered a *beneficial impact* on fishery resources.

Impact 5.4.5-2: Effects on fishery resources along Calaveras Creek below Calaveras Dam and along Alameda Creek below confluence with Calaveras Creek.

Under existing conditions, no instream flow releases have been specifically made to support fishery habitat within either Calaveras or Alameda creeks downstream of Calaveras Dam. As part of the proposed WSIP operations, instream flow releases would be made consistent with the 1997 MOU. Providing instream flow releases represents an environmental benefit to habitat quality and availability for resident rainbow trout and other fish inhabiting Calaveras Alameda creeks. As noted above, the Workgroup is identifying flow studies and analyses that may be used in the future to refine streamflow conditions within the creek. As a result of providing instream flow releases under the WSIP, the proposed program provides an environmental benefit to fishery habitat. Therefore, the proposed operations would have a less-than-significant impact, and in some cases a beneficial impact, on fishery resources in this reach of the creek.

Hydrologic modeling indicates that, in general, releases from Calaveras Dam to Calaveras Creek would be altered under WSIP operations in two ways. Under current conditions (with Calaveras Reservoir operating below design levels), peak winter flows, typically in the range of 300 to 400 cfs, that are made through controlled releases from the cone valve at the dam during January and February, are generally greater than winter flows would be under future operations with the WSIP. Under the proposed operations, instream flow releases from Calaveras Dam to Calaveras Creek would include summer releases that would not occur under current operations. Changes in instream flow releases to Calaveras Creek have the potential to support riparian vegetation along the stream channel. Instream flow releases would occur between the confluence of Calaveras and Alameda Creeks and further downstream to provide habitat for resident trout and other fishery resources. These flows are proposed to be recaptured downstream. A reduction in the magnitude of peak winter flows under the WSIP when compared to current peak flows was considered in the geomorphic analysis (Section 5.4.2) to be less than significant because high flow that could transport substantial quantities of sediment would still occur during heavy rains. The changes in flow conditions under the WSIP throughout the year, including increased average winter releases or bypasses and year-round releases or bypasses, would provide a fishery benefit through increased habitat quality and availability within Alameda Creek downstream of the confluence with Calaveras Creek compared to existing conditions.

Instream flow releases predicted to occur under WSIP operations year-round, including instream flow releases in the summer under the WSIP, would result in *beneficial impacts* on habitat quality and availability for fishery resources within Calaveras and Alameda creeks compared to existing conditions.

Impact 5.4.5-3: Effects on fishery resources along Alameda Creek downstream of Alameda Creek Diversion Dam.

Alameda Creek within the reach between the diversion dam and the confluence with Calaveras Creek provides habitat for spawning and oversummering resident trout. Flows during the summer months are very low and stream habitat is fragmented. The natural low-flow summer conditions also occurred prior to construction of the diversion dam. During the low-flow period, trout and other fishes reside primarily in isolated pools. Alluvial gravels provide substrate for trout spawning, and the occurrence of multiple age classes of trout within the area demonstrates successful reproduction.

Due to restricted storage in Calaveras Reservoir, the SFPUC is generally not diverting most of the winter and spring flows to the reservoir, and those flows continue to flow down Alameda Creek past the diversion dam. As detailed in Section 5.4.1, the diversion dam has been operated infrequently during the past five years while Calaveras Reservoir storage has been reduced but is anticipated to be operated far more frequently in the future after Calaveras Reservoir storage is returned to normal operating levels. Under existing conditions, the flows in the creek support fishery habitat downstream of the diversion dam over the past five years and are expected to continue until Calaveras Reservoir storage is restored in approximately 2012.

As described in Section 5.4.1, under the WSIP, reservoir operations would be restored, and the diversion dam would be operated to divert most flows that currently flow down upper Alameda Creek (up to a maximum diversion of approximately 650 cfs) through the diversion tunnel and into the reservoir. Under the proposed program, the SFPUC would construct a bypass flow structure at the Alameda Creek Diversion Dam and would implement bypass flows consistent with the 1997 CDFG MOU when flows are available to support fishery habitat downstream of the dam. The proposed diversion of most Alameda Creek flows below 650 cfs would result in a significant change in hydrologic conditions in Alameda Creek downstream of the diversion dam when compared to existing conditions. Diversion of most or all flows during the late winter and spring months could adversely affect the ability of resident rainbow trout to spawn and for eggs to successfully incubate in this reach, although the proposed bypass flows at the diversion dam would reduce the severity of this effect. In the future, with Calaveras Reservoir storage operating at higher levels for longer periods under the WSIP, diversions to storage are expected to be reduced and the frequency and magnitude of spills from the reservoir increased.

The diversion dam is equipped with control gates but does not include a positive barrier fish screen or other protective devise that would exclude trout or other fish from being entrained through the diversion structure into Calaveras Reservoir. Trout and other fish species inhabit Alameda Creek upstream of the diversion dam and may be diverted from the creek into the reservoir under the WSIP, preventing fish passage to downstream reaches of Alameda Creek. Calaveras Reservoir provides habitat and therefore fish diverted from Alameda Creek may not be lost from the population but rather would inhabit the reservoir. Passage through the diversion dam, however, has the potential to result in increased stress, physical abrasion, and vulnerability of fish to predation mortality within the reservoir, and other potentially adverse effects. Passage of fish over the diversion dam downstream in Alameda Creek may also result in stress and potential injury to trout and other fish species. No studies have been conducted to document the frequency or significance of entrainment of fish from Alameda Creek into Calaveras Reservoir or the potential significance of future changes in the diversion structure operations under the proposed project conditions for affecting fish entrainment. Based upon results of hydrologic and operational modeling that demonstrate future conditions with the proposed program would substantially increase the frequency and magnitude of water diverted from Alameda Creek through the diversion dam, and results of studies documenting the vulnerability of fish to entrainment at unscreened water diversions, the potential impact of operating the unscreened diversion dam on fishery resources in the future is considered potentially significant.

CDFG Code Section 5980 contains requirements for water diversions greater than 250 cfs that do not affect listed salmonid species that applies to the Alameda Creek Diversion Dam. This code section requires diversion operators to provide an intake screen or other suitable method for avoiding and minimizing fish entrainment, if needed. The code section stipulates that CDFG may have partial responsibility for funding the design and construction of a fish screen. The CDFG code also provides opportunities for a water diversion operator to consult with CDFG, using information on the diversion and adjacent habitat conditions, to determine whether or not a fish screen would be required.

These impacts of diversion dam operations on trout spawning and egg incubation during the winter and spring, and on the increased vulnerability to entrainment from Alameda Creek into Calaveras Reservoir under the WSIP, are potentially significant compared to existing conditions with Alameda Creek flows bypassing the diversion tunnel to a much greater degree. Although trout and other fish passing through or over the diversion dam would be vulnerable to stress and injury, fish entrained into the diversion dam would be removed from Alameda Creek, but would be able to inhabit Calaveras Reservoir.

A reduction in peak flows in the future with Calaveras Reservoir in full operation also has the potential to affect the frequency and magnitude of channel-forming flows that support geomorphic processes within the creek; however, this effect on fishery habitat is considered less-than-significant because flows in excess of about 650 cfs would be bypassed at the diversion dam and continue downstream within Alameda Creek. As discussed in Section 5.4.2 (Geomorphology) this effect is considered to be less than significant because high flows would continue to be produced by heavy rains within the watershed, as would the sediment-clearing sluicing flows. At the same time, the diversion of higher flows up to about 650 cfs at the diversion dam could provide a fishery benefit by reducing the likelihood that eggs incubating in redds downstream of the diversion dam would be vulnerable to scour and erosion and would be expected to contribute to improved reproductive success of those fish spawning within the reach.

In the summer season, the SFPUC operations under the DSOD restrictions imposed in December 2001 and facilities on Alameda Creek allow seepage and through-flow to occur through the diversion dam and down the creek. This practice allows adequate flows to support oversummering of resident trout in Alameda Creek between the diversion dam and confluence with Calaveras Creek. The proposed program would continue this practice, therefore potential impacts on habitat during the summer would be less-than-significant.

Overall, WSIP-related impacts on fishery habitat along Alameda Creek immediately downstream of the diversion dam would be *potentially significant*, despite proposed implementation of bypass flows at the diversion dam. Implementation of Measure 5.4.5-3a: Minimum Flows for Resident Trout on Alameda Creek, which would require the SFPUC to develop operational guidelines and implement minimum instream flow requirements for Alameda Creek downstream of the diversion dam from December through April to support resident trout spawning and egg incubation, would reduce this impact to a less-than-significant level. Measure 5.4.5-3a in conjunction with the proposed bypass flows at the diversion dam may be sufficient to fully mitigate WSIP effects on resident trout in Alameda Creek, including the effects of entrainment through the diversion tunnel. If, after monitoring of this measure and adaptive management of the minimum flow requirements, the monitoring indicates that WSIP effects are not fully mitigated, then the SFPUC also will implement Measure 5.4.5-3b: Alameda Diversion Dam Diversion Restrictions or Fish Screens, to either modify seasonal diversions schedules to minimize impacts on fish or screen its diversion facilities. This measure may be refined as it would be developed in more detail and implemented as part of the Calaveras Dam (SV-2) project.

Impact 5.4.5-4: Effects on fishery resources in San Antonio Reservoir.

Average storage volumes and reservoir elevations in San Antonio Reservoir under proposed operations would typically be slightly greater than under current conditions. Increased reservoir storage volume would increase the volume of habitat available for resident fish species inhabiting the reservoir, including both warmwater and coldwater fish species. The increased reservoir habitat may increase the abundance of non-native predators such as largemouth bass that prey on resident native species. The increase in storage elevations under the proposed program could also provide greater opportunities for connectivity and migration of fish between the reservoir and upstream tributary habitat. As a result of these factors, increased reservoir storage under proposed operations is considered a *beneficial impact* on fishery resources.

Impact 5.4.5-5: Effects on fishery resources along San Antonio Creek below San Antonio Reservoir.

Hydrologic modeling indicates a generally similar seasonal pattern in the magnitude of instream flow releases from San Antonio Reservoir to San Antonio Creek under existing conditions and with the WSIP. Proposed WSIP operations would result, on average, in slightly higher releases during the winter months (December–February) and a reduction in stream flow releases during the spring months (March–April) compared to existing conditions, while neither current nor projected future WSIP operations are anticipated to provide summer and fall base flows. The seasonal change in the timing of releases to San Antonio Creek is not expected to result in a significant impact to fishery resources. Since neither the WSIP nor current conditions provide summer and fall base flows within the creek, impacts to fishery resources are comparable under both existing and proposed operations. Therefore, impacts to fishery resources related to changes in releases from San Antonio Reservoir to San Antonio Creek would be *less than significant*, and no mitigation measures would be required.

Impact 5.4.5-6: Effects on fishery resources along Alameda Creek below confluence with San Antonio Creek.

Releases from San Antonio Reservoir to San Antonio Creek and subsequently into Alameda Creek have historically been rare under baseline conditions and would continue to be rare with the WSIP. Releases past the dam are modeled to occur in about 20 percent of the years under the existing condition and at approximately the same frequency with the WSIP, mostly in above-normal or wet years. The WSIP would have no effect on flow in San Antonio Creek in dry, below-normal, and normal years. WSIP operations would generally reduce flows in the winter and early spring of some wet years, and occasionally in the winter of some above-normal years. Occasionally, the WSIP could result in spills to San Antonio Creek that would not occur under existing conditions. These occasional spills would be the result of the reservoir being drawn less often due to the restoration of Calaveras Reservoir storage capacity and the recapture of the 1997 MOU-flows. Since there would be only minor changes in flows within San Antonio Creek, and the contribution of San Antonio Creek flows to fishery habitat downstream within Alameda Creek between current and future WSIP operations, potential impacts on fishery resources and their habitat along Alameda Creek downstream of the confluence with San Antonio Creek would be *less than significant*, and no mitigation measures would be required.

[Additional discussion on impacts on fisheries in lower Alameda Creek was prepared in response to comments on the Draft PEIR. Please refer to Section 14.9, Master Response on Alameda Creek Fishery Issues (Vol. 7, Chapter 14).]

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5.4.6 Terrestrial Biological Resources

Operation of WSIP projects in the Alameda Creek watershed would alter the pattern of water levels in Calaveras and San Antonio Reservoirs as well as alter flows in Alameda and Calaveras Creeks. This section focuses on possible impacts on sensitive natural communities, key special-status species, and species of concern that could result from these changes. Although many terrestrial animal species may use riparian and aquatic systems intermittently for food, water, or cover, this discussion focuses on those species that depend on the riparian ecosystem for essential breeding and/or foraging habitat.

5.4.6.1 Setting

Overview

The Alameda Creek watershed provides habitat for a variety of wildlife. Grassland communities cover more than 50 percent of the watershed, and woodlands cover about 22 percent. Other habitats include freshwater marshes, where streams discharge into reservoirs, and brush, scrub, and chaparral communities in the flatter, drier, or steeper lands (SFPUC, 2007).

Ridgelands and open water make the area an attractive winter foraging and resting habitat for migrating and resident bird species, drawing birds of prey, waterfowl, and perching birds. In total, the watershed contains more than 17 types of wildlife habitat that support a range of animals, including tule elk, black-tailed deer, coyote, mountain lions, and bald eagles.

Alameda Creek Above the Alameda Creek Diversion Dam

The riparian resources along upper Alameda Creek are varied. Alameda Creek is usually a perennial stream above the diversion dam. It flows through relatively narrow alluvial valleys that support California sycamore (*Platanus racemosa*) alluvial woodland, and through narrower, more rocky areas that support bands of Central Coast arroyo willow (*Salix lasiolepis*) riparian forest and white alder (*Alnus rhombifolia*) riparian forest, bordered by coast live oak (*Quercus agrifolia*) woodland, mixed evergreen forest/oak woodland, and Diablan sage scrub.

Alameda Creek from the Diversion Dam to the Confluence with Calaveras Creek

Below the diversion dam, Alameda Creek passes through a steeply sloping, narrow bedrock channel section that supports a band of Central Coast arroyo willow riparian forest and white alder riparian forest. These forests are bordered by coast live oak woodland contained within a confined, rocky canyon. Near the confluence with Calaveras Creek, the canyon opens into a broader floodplain supporting an open California sycamore alluvial woodland and valley oak (*Quercus lobata*) savanna.

Calaveras Reservoir

Upland vegetation surrounding Calaveras Reservoir consists primarily of non-native annual grassland, coast live oak, and mixed evergreen forest and woodland, in addition to a small amount of Diablan sage scrub. An area of serpentine grassland, a sensitive natural community, is found on the east side of Calaveras Reservoir between the dam and Arroyo Hondo. A number of perennial, ephemeral, and intermittent streams enter the reservoir, and many support narrow bands of central coast arroyo willow riparian forest. The largest tributary stream, Arroyo Hondo, is a perennial stream that supports one of the largest stands of white alder riparian forest in the Alameda watershed. Small areas of freshwater marsh and seep habitat often occur at the mouth of intermittent and perennial streams where the groundwater reaches the surface and meets the reservoir level. A small, apparently relict stand of willows persists at the mouth of Calaveras Creek, well above the currently maintained reservoir levels. A large area of seasonal wetland is present in the southern, shallow edge of Calaveras Reservoir. This area may have supported perennial freshwater marsh when the reservoir was maintained at higher levels. Between the currently maintained reservoir elevation and the historically maintained maximum reservoir elevation, wave erosion has left a strip of soil with coarse surface sediments. This area is relatively bare and mainly supports weedy annual plants.

Calaveras Creek

Calaveras Creek from the dam to the confluence with Alameda Creek is situated in a deep, shaded canyon with well-developed riparian vegetation. Although mapped as sycamore alluvial woodland (SFPUC, 2001), riparian vegetation along the creek also includes arroyo willow riparian forest and other species such as Fremont cottonwood (*Populus fremontii*) and valley oak.

Alameda Creek from Calaveras Creek to the Confluence with San Antonio Creek

From the confluence with Calaveras Creek to the confluence with San Antonio Creek, Alameda Creek begins as a broader watercourse with widely arcing bends and a continuous mixed-species riparian canopy composed of arroyo willow riparian forest and white alder riparian forest, with occasional Fremont cottonwoods (*Populus fremontii*), valley oaks, box elder (*Acer negundo* var. *californica*), and sycamores. Some large areas of valley oak savanna are associated with alluvial terraces along this section of the creek (SFPUC, 2001). During the summer months, surface water is present in pools, especially from the confluence with Calaveras Creek to the Sunol Valley WTP. From the Sunol Valley WTP to San Antonio Creek, Alameda Creek is situated in a quarter-mile-wide valley with a broad, cobbly floodplain that support sycamore alluvial woodland on the coarser soils, valley oak savanna on the finer soils, and narrow bands of arroyo willow scrub near the channel. Alameda Creek flows in this reach during the winter and spring rainy season, but dries up completely during the summer and fall due to high infiltration rates, especially in the lower portion of the reach. Portions of the former floodplain in the lower section of this reach have been developed as nurseries and aggregate quarries.

San Antonio Reservoir

Upland vegetation surrounding San Antonio Reservoir is primarily non-native annual grassland. North-facing slopes on the south side of San Antonio Reservoir support mixed evergreen and coast live oak woodland. Where minor tributaries enter San Antonio Reservoir, narrow bands of coast live oak riparian forest follow the watercourse and streambanks. On larger tributaries such as Indian Creek and San Antonio Creek, well-developed stands of sycamore alluvial woodland, valley oak savanna, and possibly white alder riparian forest line the channels. Some areas of emergent vegetation are found at the mouths of the larger creeks. As is typical for reservoirs operated for water storage, a strip of unvegetated, wave-terraced soil is exposed when water levels fall below the usual maximum.

San Antonio Creek

San Antonio Creek below the dam supports native vegetation for a little over a mile (to Calaveras Road) before entering the highly disturbed gravel extraction area. The creek supports a diverse assemblage of central coast arroyo willow scrub in the upper section nearest the dam, and sycamore alluvial woodland in the section farther downstream. The creek flows little if at all, so the riparian vegetation is fed primarily by seepage. As with most sycamore alluvial woodland, the channel-forming processes needed for stand regeneration are no longer present, and all of the trees are large and mature with no evident recruitment.

Alameda Creek Below San Antonio Creek

Below the confluence with San Antonio Creek, Alameda Creek first passes through aggregate quarries. No vegetation and little flow occur in this area. Below the gravel quarries, Alameda Creek passes the Sunol Water Temple. In this area, the creek supports arroyo willow riparian forest, coast live oak riparian forest, and sycamore alluvial woodland before entering Niles Canyon—a broad, rocky canyon with an intermittent riparian canopy of mixed willows, cottonwoods, sycamores, and valley oaks. This section of Alameda Creek, below the confluence with Arroyo de la Laguna, flows year-round. The majority of dry-season flow below Sunol is derived from releases of South Bay Aqueduct water destined for groundwater recharge at the mouth of Niles Canyon.

Natural Communities, including Sensitive Natural Communities

Section 4.6, Biological Resources, presents a general discussion of wildlife habitats and sensitive natural communities. Figure 4.6-2b shows the distribution of habitat types in the Alameda watershed. Section 4.6 also provides additional detail specific to the Alameda watershed, including information on common or widespread natural communities. Roughly half of the Alameda watershed supports grassland, primarily non-native grassland. Diablan sage scrub is found on steep, rocky, exposed uplands with little soil development. Sheltered or drier sites with more soil development support forest and woodlands, while riparian forest and scrub are found along the major watercourses. The *Alameda Watershed Management Plan Environmental Impact Report* (San Francisco Planning Department, 2000) identified 18 natural community types within the watershed, six of which the California Natural Diversity Database (CNDDB) lists as sensitive (CDFG, 2006). Ten natural communities are found within the WSIP program area, of which six are considered sensitive. **Table 5.4.6-1** presents the name, status, and occurrence of natural communities within the program area in the Alameda watershed. These communities are briefly described in the paragraphs that follow.

- **Grasslands.** Serpentine grassland is specifically associated with soils derived from serpentine rock. These grasslands are characterized by a relatively high proportion of native species, many perennial grasses, and relatively low productivity. Typical perennial grasses

TABLE 5.4.6-1
POTENTIAL FOR OCCURRENCE OF NATURAL COMMUNITIES IN THE ALAMEDA WATERSHED WSIP PROGRAM AREA

Natural Community[a]	Alameda Creek above diversion dam	Calaveras Reservoir	Alameda Creek from diversion dam to confluence with Calaveras Creek	Calaveras Creek	Alameda Creek below confluence with Calaveras Creek	San Antonio Reservoir	San Antonio Creek	Alameda Creek below San Antonio Creek
Grasslands								
Serpentine grassland*		X						
Non-native grassland		X				X		
Chaparral and Scrub								
Diablan sage scrub	X	X						
Forest and Woodland								
Mixed evergreen forest/coast live oak woodland	X	X	X			X		
Valley oak woodland and savanna	X		X		X	X		
Central coast arroyo willow riparian forest*	X	X	X	X	X	X	X	X
Sycamore alluvial woodland*	X		X	X	X	X	X	X
White alder riparian forest*	X	X	X		X	X		
Central coast live oak riparian forest*						X		X
Marsh								
Coastal and valley freshwater marsh		X				X		

[a] An asterisk (*) indicates a sensitive natural community, as identified in the California Natural Diversity Database (CDFG, 2006).

include purple needlegrass (*Nassella pulchra*), pine bluegrass (*Poa secunda*), fescue (*Festuca* spp.), and junegrass (*Koeleria cristata*). Within the program area, serpentine grassland is found on the eastern shoreline of Calaveras Reservoir and on the ridge south of the reservoir west of Calaveras Creek. Non-native grassland is dominated by a variety of non-native annual grasses such as brome (*Bromus* spp.), oats (*Avena* spp.), and wild barley (*Hordeum* spp.) as well as herbs such as filaree (*Erodium* spp.), with less abundant native annual and perennial grasses and herbs.

Non-native grassland is the most common natural community on the watershed, bordering most of San Antonio Reservoir and much of the southern half of Calaveras Reservoir. It also adjoins riparian habitats along the creeks. Non-native grassland is dominated by a variety of non-native annual grasses and herbs, with less abundant native annual and perennial grasses and herbs. Small areas of valley needlegrass grassland may also be present in rocky areas, but were too small to map (Jones and Stokes, 2003).

- **Diablan sage scrub (or north coast scrub).** This shrub-dominated community is typically found on steep, rocky, exposed slopes. In the watershed, this community is dominated by coyote brush (*Baccharis pilularis*), poison-oak (*Toxicodendron diversilobum*), bush monkeyflower (*Mimulus aurantiacus*), and California sage (*Artemisia californica*) in various proportions. Diablan sage scrub is found along the Arroyo Hondo arm on the eastern side of Calaveras Reservoir, and in small areas on the western side of the reservoir.

- **Forests and woodlands.** Mixed evergreen forest and coast live oak woodland are the most abundant forest communities on the watershed. These communities are typically found in less-exposed areas that have deeper soils than the scrub and grassland communities. Mixed evergreen forest is dominated by coast live oak, California bay (*Umbellularia californica*), and sometimes madrone (*Arbutus menziesii*), Douglas-fir (*Pseudotsuga menziesii*), and big-leaf maple (*Acer macrophyllum*). It tends to form a closed canopy with a shrubby or grassy understory. Coast live oak woodland is dominated by a single species, coast live oak. Coast live oak can form a nearly closed canopy forest in favorable sites with deep soils and ample soil moisture, or an open woodland with a grassy understory in drier areas. These communities are found in nearly all of the sheltered canyons and north-facing slopes in the watershed, including extensive areas along the shore of Calaveras Reservoir and smaller areas on the south side of San Antonio Reservoir.

  Valley oak woodland is limited primarily to the deep alluvial soils found along the floodplains of the major drainages such as Alameda Creek. It consists of an open canopy of a single tree species, valley oak, with an understory resembling non-native grassland.

- **Riparian forests.** Central coast arroyo willow riparian forest occurs in moist canyons, usually with perennial stream flow or seepage. It is a dense, broadleaved, winter-deciduous forest dominated by arroyo willow, which grows as a large, tree-like shrub. This is the most common riparian type on smaller streams in the Central Coast of California, and it is found in sections of Alameda Creek, Arroyo Hondo, and San Antonio Creek as well as various unnamed tributaries. It requires the least amount of groundwater and surface flow of any of the riparian communities discussed in this section.

  Sycamore alluvial woodland is an open woodland dominated by California sycamore. It is found along streams with very high peak flows and broad floodplains composed mainly of cobbles and other coarse material. Sycamore alluvial woodland in the Alameda watershed is best developed on the broad floodplain of Alameda Creek in the Sunol Valley, although examples also exist along San Antonio Creek.

  White alder riparian forest is a medium-tall, broadleaved, deciduous streamside forest; it is dominated by white alder and has a shrubby, deciduous understory. It is found along flowing perennial streams with coarse sediments such as Alameda Creek and Arroyo Hondo.

  Central coast live oak riparian forest is an evergreen riparian forest dominated by coast live oak. This community is present along the lower sections of Alameda Creek near the Sunol Water Temple and in Niles Canyon.

- **Marshes.** Coastal and valley freshwater marsh is a wetland community dominated by usually dense stands of perennial, emergent grass and grass-like plants up to 15 feet tall. Coastal and valley freshwater marsh is found in areas that are permanently flooded by fresh water. Small examples of this community are found around the perimeter of the reservoirs, where seepage from streams allows for this community to develop.

Seasonal wetland is not recognized by Holland (1986) as a natural community because it typically develops where managed hydrology creates an environment that is flooded or saturated for extended periods and then dries, but the inundation occurs for a shorter time, in a different season, or more irregularly than is required for development of freshwater marsh. The species found in seasonal wetland are variable, but non-native annuals in the grass, sunflower, and buckwheat families often dominate this vegetation type.

Key Special-Status Species and Other Species of Concern

Appendix D presents a list of key special-status plant and animal species and other species of concern considered in the preparation of the PEIR for the *Alameda Watershed Management Plan* (San Francisco Planning Department, 2000). Although very inclusive, the plan concludes that most of the species are unlikely to occur in the watershed because of distributional range or habitat requirements. Section 4.6, Figure 4.6-2b shows the location of federally designated critical habitats in the Alameda watershed. The following key special-status plant and animal species and species of concern (see **Tables 5.4.6-2** and **5.4.6-3**) could be affected by WSIP operations due to their potential to occur in the watershed and their proximity, association, or dependence on reservoirs or streams:

- **Serpentine-associated plants.** Most beautiful jewel-flower (*Streptanthus albidus* ssp. *peramoenus*; California Native Plant Society [CNPS] List 1B) was observed by EDAW (in prep.) during 2006 botanical surveys for the Calaveras Dam project (SV-2). It was located in the serpentine grassland east of Calaveras Reservoir, but was not within the maximum water surface elevation. Suitable serpentine habitat is present in the Alameda watershed for the following species, but none were found during detailed botanical surveys for the Calaveras Dam project (May, 2006): Santa Clara red ribbons (*Clarkia concinna* ssp. *automixa*, CNPS List 1B), Presidio clarkia (*Clarkia franciscana*, federal endangered, California endangered, CNPS List 1B), Fragrant fritillary (*Fritillaria liliacea*, CNPS List 1B), Chaparral harebell (*Campanula exigua*, CNPS List 1B), Mt. Hamilton thistle (*Cirsium fontinale* var. *camplyon*, CNPS List 1B), and Santa Clara Valley dudleya (*Dudleya setchellii*, federal endangered, CNPS List 1B). No suitable habitat was found within the maximum elevation of Calaveras Reservoir or within the riparian habitats potentially affected by WSIP operations.

- **Grassland, scrub, and woodland plants.** Diablo helianthella (*Helianthella castanea*, CNPS List 1B) grows in openings in forest, chaparral, coastal scrub, riparian woodland, and sheltered grasslands. EDAW mapped four occurrences of this species in the Calaveras Reservoir (SV-2) construction area (May, 2006), but not within the area that would be affected by reservoir operations. Suitable habitat is present in the Alameda watershed for the following species, but none were found during detailed botanical surveys for the Calaveras Dam project (May, 2006), and no suitable habitat was present within the maximum elevation of Calaveras Reservoir or within the riparian habitats potentially affected by WSIP operations: bent-flowered fiddleneck (*Amsinckia lunaris*, CNPS List 1B), which occurs in woodland and grassland; big-scale balsamroot (*Balsamorhiza macrolepis* var. *macrolepis*, CNPS List 1B), which grows in chaparral, cismontane woodland, and grasslands, and sometimes in serpentine soils; robust spineflower (*Chorizanthe robusta* var. *robusta*, federal endangered, CNPS List 1B), which is found on sandy or gravelly substrates in woodland openings and coastal scrub; Mt. Hamilton coreopsis (*Coreopsis hamiltonii*, CNPS List 1B), which grows in rocky sites in woodlands (although the Alameda watershed is generally lower in elevation than the species' known range); Hospital Canyon larkspur (*Delphinium californicum* ssp. *interius*, CNPS List 1B), which

TABLE 5.4.6-2
POTENTIAL FOR OCCURRENCE OF KEY SPECIAL-STATUS PLANTS AND PLANT SPECIES OF CONCERN IN THE WSIP ALAMEDA WATERSHED PROGRAM AREA

			WSIP Program Area[a]			
Common Name *Scientific Name*	**USFWS/CDFG/ CNPS Status[b]**	**Habitat**	**Calaveras and Alameda Creek below Diversion**	**Calaveras Reservoir**	**San Antonio Creek**	**San Antonio Reservoir**
Bent-flowered fiddleneck *Amsinckia lunaris*	–/–/1B	Woodland and valley grassland		Potential nearby		Potential nearby
Big-scale balsamroot *Balsamorhiza macrolepis* var. *macrolepis*	–/–/1B	Chaparral, woodland, and grassland, sometimes in serpentinite		Potential nearby		Potential nearby
Chaparral harebell *Campanula exigua*	–/–/1B	Chaparral or rocky (usually serpentinite) areas		Potential nearby		
Robust spineflower *Chorizanthe robusta* var. *robusta*	FE–/1B*	Sandy or gravelly soil in woodland openings or scrub		Potential nearby		
Mt. Hamilton thistle *Cirsium fontinale* var. *campylon*	–/–/1B	Serpentine seeps		Potential nearby		
Presidio clarkia *Clarkia franciscana*	FE/CE/1B*	Serpentine grasslands		Potential nearby		
Mt. Hamilton coreopsis *Coreopsis hamiltonii*	–/–/1B	Rocky sites in woodland		Potential nearby		
Hospital Canyon larkspur *Delphinium californicum ssp. interius*	–/–/1B	Openings in chaparral habitat, woodland		Potential nearby		Potential nearby
Santa Clara Valley dudleya *Dudleya setchellii*	FE/–/1B*	Rocky serpentinite areas in woodland and grassland		Potential nearby		
Fragrant fritillary *Fritillaria liliacea*	–/–/1B	Clay soils, often on serpentine soils		Potential nearby		
Diablo helianthella *Helianthella castanea*	–/–/1B	Openings in woodland, chaparral, shady grassland		Potential nearby		Potential nearby
Hall's bush mallow *Malacothamnus hallii*	–/–/1B	Chaparral and coastal scrub		Potential nearby		Potential nearby
Maple-leaved checkerbloom *Sidalcea malvaeflora*	–/–/1B	Upland forest, coastal scrub, often in disturbed areas		Potential nearby		Potential nearby
Most beautiful jewel-flower *Streptanthus albidus var. peramoenus*	–/–/1B	Serpentine soils in chaparral, woodland, and grassland		Present nearby		

[a] The WSIP program area is the extent that could be affected by program operations, such as below maximum reservoir elevations, or within riparian areas where changes in flows could affect habitat.
[b] Federal (USFWS), state (CDFG), and CNPS protection status codes are as follows:

FC:	Federal candidate for listing	CE:	California endangered
FE:	Federal endangered	CT:	California threatened
FT:	Federal listed as threatened	1B:	CNPS List 1B, rare and endangered
FD:	Federal delisted	–	Indicates no federal or state protection

* Indicates key special-status plants, defined here to mean federal- or state-listed as endangered or threatened.

SOURCES: CDFG, 2006, 2007; USFWS, 2007; May, 2006.

TABLE 5.4.6-3
POTENTIAL FOR OCCURRENCE OF KEY SPECIAL-STATUS ANIMALS AND ANIMAL SPECIES OF CONCERN IN THE WSIP ALAMEDA WATERSHED PROGRAM AREA

			WSIP Program Area[a]			
Common Name *Scientific Name*	**USFWS/CDFG Status[b]**	**Habitat**	**Calaveras and Alameda Creek below Diversion**	**Calaveras Reservoir**	**San Antonio Creek**	**San Antonio Reservoir**
Invertebrates						
Bay checkerspot butterfly *Euphyhydras editha bayensis*	FT/–*	Serpentine bunchgrass and valley needlegrass grassland		Poor-quality habitat nearby		
Callippe silverspot butterfly *Speyeria callippe callippe*	FE/–*	Grasslands with *Viola pedunculata* and nearby adult nectar sources		Population with characteristics “near to” those of species present		
Reptiles and Amphibians						
California tiger salamander *Ambystoma californiense*	FT/CSC*	Ponds for breeding and grassland burrows for retreat	Present	Present	Potential	Potential
California red-legged frog *Rana aurora draytonii*	FT/CSC*	Slow-moving streams and ponds	Present	Present	Potential	Potential
Foothill yellow-legged frog *Rana boylii*	–/CSC*	Shallow, moving water with sunny banks	Present	Present, Arroyo Hondo		
Western pond turtle *Clemmys marmorata*	–/CSC	Permanent water, streams, ponds	Present	Present	Potential	Potential
Alameda whipsnake *Masticophis lateralis euryxanthus*	FT/CT*	Coastal scrub and chaparral	Nearby	Nearby	Nearby	Nearby
Birds						
Osprey *Pandion haliaetus* (nesting)	–/CSC	Open water, large trees and snags		Potential		Potential
White-tailed kite *Elanus leucurus* (nesting)	FP/–	Forages in open meadows, grasslands; nests in moderately tall trees				
Bald eagle *Haliaeetus leucocephalus* (nesting and wintering)	FD/CE, FP*	Forages in large bodies of water or rivers with adjacent snags or large, tall trees		Present		Potential
Northern harrier *Circus cyaneus* (nesting)	–/CSC	Forages and nests in marshes, moist grasslands, and meadows		Potential		Potential

TABLE 5.4.6-3 (Continued)
POTENTIAL FOR OCCURRENCE OF KEY SPECIAL-STATUS ANIMALS AND ANIMAL SPECIES OF CONCERN IN THE WSIP ALAMEDA WATERSHED PROGRAM AREA

			WSIP Program Area[a]			
Common Name *Scientific Name*	**USFWS/CDFG Status[b]**	**Habitat**	**Calaveras and Alameda Creek below Diversion**	**Calaveras Reservoir**	**San Antonio Creek**	**San Antonio Reservoir**
Birds (cont.)						
Sharp-shinned hawk *Accipiter striatus* (nesting)	–/CSC	Forages in woodlands; nests in coniferous or mixed forests	Potential	Potential	Potential	Potential
Cooper's hawk *Accipiter cooperii* (nesting)	–/CSC	Forages in many habitats; nests in forest and woodland	Potential	Potential	Potential	Potential
Ferruginous hawk *Buteo regalis* (wintering)	–/CSC	Forages in open grasslands	Potential nearby	Potential nearby	Potential nearby	Potential nearby
Golden eagle *Aquila chrysaetos* (nesting and wintering)	FP/CSC, FP	Forages in open grassland; nests in large trees, on cliffs or embankments	Potential nearby	Potential nearby	Potential nearby	Potential nearby
American peregrine falcon *Falco peregrinus anatum* (nesting)	FD/CE, FP*	Forages for birds in open areas; nests on cliffs		Potential		Potential
Prairie falcon *Falco mexicanus* (nesting)	–/CSC	Forages in open areas; nests on cliffs or ledges	Potential nearby	Potential nearby	Potential nearby	Potential nearby
Burrowing owl *Athene cunicularia* (burrowing sites)	–/CSC*	Open grasslands with available burrows	Potential nearby	Potential nearby	Potential nearby	Potential nearby
Long-eared owl *Asio otus* (nesting)	–/CSC	Dense riparian and oak woodlands	Potential	Potential	Potential	Potential
Loggerhead shrike *Lanius ludovicianus* (nesting)	–/CSC	Grasslands and open woodlands with scattered shrubs	Potential nearby	Potential nearby	Potential nearby	Potential nearby
California horned lark *Eremophila alpestris actia* (nesting)	–/CSC	Grasslands, especially sparsely vegetated or barren areas	Potential nearby	Potential nearby	Potential nearby	Potential nearby
Bell's sage sparrow *Amphispiza belli belli* (nesting)	–/CSC	Semi-open dry chaparral and coastal sage scrub	Potential nearby	Potential nearby	Potential nearby	Potential nearby

TABLE 5.4.6-3 (Continued)
POTENTIAL FOR OCCURRENCE OF KEY SPECIAL-STATUS ANIMALS AND ANIMAL SPECIES OF CONCERN IN THE WSIP ALAMEDA WATERSHED PROGRAM AREA

			WSIP Program Area[a]			
Common Name *Scientific Name*	**USFWS/CDFG Status[b]**	**Habitat**	**Calaveras and Alameda Creek below Diversion**	**Calaveras Reservoir**	**San Antonio Creek**	**San Antonio Reservoir**
Birds (cont.)						
Tricolored blackbird *Agelaius tricolor* (nesting)	–/CSC	Colonial nester in dense freshwater marsh or riparian vegetation with access to insect prey		Potential		Potential
Mammals						
Pallid bat *Antrozous pallidus*	–/CSC	Roosts in trees; forages over grassland	Potential nearby	Potential nearby	Potential nearby	Potential nearby
Pacific western big-eared bat *Corynorhinus (=Plecotus) townsendii*	–/CSC	Roosts in caves and buildings; forages in open country	Potential nearby	Potential nearby	Potential nearby	Potential nearby
Western mastiff bat *Eumops perotis californicus*	–/CSC	Requires cliff faces with high vertical drop; may roost in trees	Potential nearby	Potential nearby	Potential nearby	Potential nearby
American badger *Taxidea taxus*	–/CSC	Drier open grassland, shrub, and forest habitats with friable soils	Potential nearby	Potential nearby	Potential nearby	Potential nearby

[a] The WSIP program area is the extent that could be affected by program operations, such as below maximum reservoir elevations, or within riparian areas where changes in flows could affect habitat.
[b] Federal (USFWS) and state (CDFG) protection status codes are as follows:
FC: Federal candidate for listing
FE: Federal endangered
FT: Federal threatened
FD: Federal delisted
CE: California endangered
CT: California threatened
CSC: California species of special concern
FP: California fully protected
– Indicates no federal or state protection

* Indicates key special-status animals, defined here to mean federal- or state-listed as endangered or threatened.

SOURCES: San Francisco Planning Department, 2000; Leeman, 2006; Jennings and Hayes, 1994; CDFG, 2006.

grows in openings in chaparral habitat and cismontane woodland; Hall's bush mallow (*Malacothamnus hallii*, CNPS List 1B), which grows in chaparral and coastal scrub; and maple-leaved checkerbloom (*Sidalcea malvaeflora*, CNPS List 1B), which grows in upland forest and coastal scrub, often in disturbed sites. All of these species have a low to moderate potential to occur at the perimeter of San Antonio Reservoir, but no suitable habitat is present within the maximum water surface elevation of the reservoir.

- **Perennial grassland invertebrates.** Callippe silverspot butterfly (*Speyeria callippe callippe*, federal endangered) requires grasslands supporting the larval foodplant Johnny-jump-up (*Viola pedunculata*) and adult nectar sources such as California buckeye (*Aesculus californica*) nearby. Entomological Consulting Services (2004) found a population of Callippe silverspots on the watershed that is intermediate in appearance between the listed subspecies and a related, non-endangered subspecies. The author concluded that these populations should be protected, but should be considered "near to" the Callippe silverspot. Bay checkerspot butterfly (*Euphydryas editha editha*, federal endangered) occurs on serpentine grasslands supporting native plantain (*Plantago erecta*) and annual owl's-clover (*Castilleja* spp.). Entomological Consulting Services (2005) carried out intensive surveys for Bay checkerspot butterfly in 2004 and 2005. The species was not found, and the author concluded that habitat quality on the watershed for this species was poor.

- **Reptiles and amphibians.** California tiger salamander (*Ambystoma californiense*, federal threatened, California species of special concern) and California red-legged frog (*Rana aurora draytonii*, federal threatened, California species of special concern) are known to occur in several locations in the Alameda watershed. California tiger salamander breeds in vernal pools and permanent ponds or lakes and estivate in burrows in adjacent uplands. The species is known to breed around the perimeter of Calaveras Reservoir and in Calaveras Creek below the dam (Leeman, 2006). Suitable habitat is also present in stock ponds and possibly San Antonio Reservoir and Alameda and San Antonio Creeks. California red-legged frog breeds in still or slow-moving water such as the edges of reservoirs, often with emergent vegetation. This species has been documented in Alameda Creek below Calaveras Creek and in stock ponds in several locations in the Alameda watershed. Suitable habitat is also present at San Antonio Creek and San Antonio Reservoir.

  Foothill yellow-legged frog (*Rana boylii*, California species of special concern) breeds in shallow, flowing streams with cobbles, sunny banks, and some riffles. The species is known to breed in Alameda Creek between the diversion tunnel and the gravel mines at the lower end of the Sunol Valley, as well in Arroyo Hondo (Leeman, 2006). The Alameda watershed may support one of the largest areas of suitable habitat for this species in the Bay Area.

  Western pond turtle (*Actinemys = Clemmys marmorata*, California species of special concern) breeds in Alameda Creek below the confluence with Calaveras Creek where water is present year-round, in Arroyo Hondo, in side channels of Alameda Creek below the Sunol Water Temple, and in at least one other pond within the watershed.

  Alameda whipsnake (*Masticophis lateralis euryxanthus*, federal threatened, California threatened) is known to be present in many localities within the Alameda watershed. It inhabits coastal scrub and nearby grassland and woodland habitats. Suitable habitat is present on the perimeter of Calaveras and San Antonio Reservoirs, but not within the maximum water surface elevation.

- **Riparian-associated birds.** Several bird species of concern are closely associated with the riparian and wetland habitats in the Alameda watershed. Riparian trees have a moderate potential to support nesting and foraging Cooper's hawk (*Accipiter cooperi*, California species of special concern) and sharp-shinned hawk (*A. striatus*, California species of special concern). Long-eared owl (*Asio otus*, California species of special concern) nests in dense riparian and oak woodlands. Suitable habitat is present throughout the program area in the Alameda watershed.

- **Marsh- and lake-dependent birds.** Tricolored blackbird (*Agelaius tricolor*, California species of special concern) nests in freshwater emergent vegetation. Although no colonies are known to occur in the Alameda watershed, suitable habitat may be present on the margins of Calaveras and San Antonio Reservoirs. Northern harrier (*Circus cyaneus*, California species of special concern) nests and forages in wet meadows and pastures; a limited amount of habitat is present within the watershed, primarily in the vicinity of San Antonio and Calaveras Reservoirs. Bald eagle (*Haliaeetus leucocephalus*, federal endangered – delisted and California endangered) and osprey (*Pandion haliaetus*, California species of special concern) forage in lakes and reservoirs and nest in large trees nearby. A pair of nesting bald eagles was recently reported in the Alameda watershed, and the species could breed or winter near San Antonio and Calaveras Reservoirs. Peregrine falcon (*Falco peregrinus anatum*, federal delisted, California endangered) nests in cliffs and outcrops and forages near wetlands and open water. Loggerhead shrike (*Lanius ludovicianus*, California species of special concern) nests in riparian and other woodlands and forages over open country. It may be present throughout the Alameda watershed in suitable habitat.

- **Upland birds.** Burrowing owl (*Speotyto = Athene cunicularia*, California species of special concern) lives in mammal burrows in open, sloping grasslands. The range of this species includes the Alameda watershed. Ferruginous hawk (*Buteo regalis*, California species of special concern) winters in the Bay Area, where it forages in open grasslands and agricultural fields. Suitable habitat may be present in the extensive watershed grasslands, including those near the reservoirs. Golden eagle (*Aquila chrysaetos*, California species of special concern) forages in open grasslands and agricultural areas, and nests in large trees. It has been known to breed in the Alameda watershed and may forage near San Antonio and Calaveras Reservoirs. Foraging habitat may be present throughout the Alameda watershed. Prairie falcon (*Falco mexicanus*, California species of special concern) nests in cliffs or ledges and forages over grasslands. Suitable habitat is present within the Alameda watershed, including near San Antonio and Calaveras Reservoirs and within the Sunol Valley. California horned lark (*Eremophilus alpestris actia*, California species of special concern) nests in sparse grasslands and barren areas. Suitable habitat may be present in the grasslands near the reservoirs and in the Sunol Valley. Bell's sage sparrow (*Amphispiza belli belli*, California species of special concern) nests in chaparral and coastal scrub. Suitable habitat may be present near the reservoirs.

- **Mammal species.** Pallid bat (*Antrozous pallidus*, California species of special concern) roosts in trees and forages over open grassland and could occur throughout the watershed. Pacific western (Townsend's) big-eared bat (*Corynorhinus townsendii*) roosts in caves and buildings and forages in open country. Suitable habitat is present near both Calaveras and San Andreas Reservoirs and the open areas of the Sunol Valley. Western mastiff bat (*Eumops perotis californicus*, California species of special concern) roosts on cliffs and forages in open country. Its primary foraging area in the vicinity of the program area would be near Calaveras and San Antonio Reservoirs.

5.4.6.2 Impacts

Significance Criteria

The CCSF has not formally adopted significance standards for impacts related to terrestrial biological resources, but generally considers that implementation of the proposed program would have a significant biological impact if it were to:

- Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the CDFG or USFWS
- Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the CDFG or USFWS
- Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including but not limited to marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means
- Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites
- Have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, or substantially reduce the number or restrict the range of an endangered, rare or threatened species
- Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance
- Conflict with the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or state habitat conservation plan

Approach to Analysis

The assessment of WSIP operational impacts on terrestrial biological resources focuses primarily on the extent to which proposed operations would change the existing habitat near reservoirs and creeks. Operational changes consist of increased diversions from Alameda Creek during late fall, winter, and early spring; increased releases to Calaveras Creek to maintain minimum flows; and changes in the elevation, annual range, and seasonal timing of reservoir levels. An overview of the general types of effects of stream diversions on riparian ecological resources is provided in Section 5.3.7. An assessment of the changes in hydrology in the Alameda Creek watershed under the WSIP is presented in Section 5.4.1.

This section discusses impacts on riparian and wetland habitats, key special-status species, other species of concern, and common habitats and species. The discussion of riparian and wetland habitats addresses the second and third significance criteria listed above. “Key special-status species” include species that are formally listed as endangered or threatened under the state or federal endangered species acts, as well as a few other species (such as burrowing owl and foothill yellow-legged frog) that are afforded some degree of legal protection and have a high risk of local population decline or extirpation. The key special-status species discussion addresses the first significance criterion. “Other species of concern” and “common habitats and species” are more general categories relevant to the fourth and fifth significance criteria.

As discussed in Section 5.1, the existing conditions baseline setting used in the PEIR for impact analysis reflects the current flow conditions in Alameda Creek since DSOD imposed storage restrictions on Calaveras Reservoir in December 2001, which substantially reduced SFPUC’s typical diversions from the creek to the reservoir. Section 5.4.1, above, further describes current flow conditions in Alameda Creek and how they changed in 2002 from the previous 70 years of SFPUC diversion. Riparian stand structure, especially when dominated by long-lived trees, responds slowly to changes in stream flow. Riparian structure today is the result of physical responses that have prevailed over the lifetime of the plants. In general, plants are most vulnerable during germination and establishment; if conditions become less favorable afterward, individuals may continue to persist but without successful recruitment. Therefore, the condition, distribution, and abundance of short-lived or young plants reflect existing stream flow conditions; those of moderately aged trees and shrubs reflect a combination of both older (pre-2002) and existing flow conditions; and those of old trees, such as mature California sycamores and valley oaks, reflect a combination of pre-Calaveras Reservoir, pre-2002 (prior to DSOD restrictions on Calaveras Reservoir storage), and existing operations. The impact analysis uses the existing conditions (2005) baseline but the history of flows in Alameda Creek is discussed in the impact analysis where appropriate because of the role of historic flows in shaping existing resources such as the riparian vegetation.

Impact Summary

Table 5.4.6-4 presents a summary of the impacts on terrestrial biological resources in the Alameda Creek watershed that could result from implementation of the proposed water supply and system operations.

Impact Discussion

Impact 5.4.6-1: Effects on riparian habitat and related biological resources in Calaveras Reservoir.

Sensitive Habitats

Impact of Higher Storage Levels. Calaveras Reservoir is surrounded by wetland and upland habitats that formed since December 2001, when the reservoir storage levels were lowered. These habitats, in turn, are surrounded by well-established riparian, grassland, woodland, and scrub habitats growing above the high-water elevation. Under the WSIP, restoring the original storage capacity of Calaveras Reservoir would result in the inundation and permanent loss of the seasonal wetlands, seeps, perennial freshwater marsh, and riparian habitat that have formed since 2002. Prior to 2002, these areas were regularly inundated, sometimes for several months at a time.

TABLE 5.4.6-4
SUMMARY OF IMPACTS –
TERRESTRIAL BIOLOGICAL RESOURCES IN THE ALAMEDA CREEK WATERSHED

Impacts	Sensitive Habitats	Key Special-Status Species	Other Species of Concern	Common Habitats and Species
Impact 5.4.6-1: Effects on riparian habitat and related biological resources in Calaveras Reservoir	PSM	PSM	LS	LS
Impact 5.4.6-2: Effects on riparian habitat and related biological resources along Alameda Creek, from below the diversion dam to the confluence with Calaveras Creek	LS	PSM	LS	N/A
Impact 5.4.6-3: Effects on riparian habitat and related biological resources along Calaveras Creek, from Calaveras Reservoir to the confluence with Alameda Creek	LS	PSM	LS	LS
Impact 5.4.6-4: Effects on riparian habitat and related biological resources along Alameda Creek, from the confluence with Calaveras Creek to the confluence with San Antonio Creek	LS	PSM	LS	LS
Impact 5.4.6-5: Effects on riparian habitat and related biological resources in San Antonio Reservoir	LS	LS	LS	LS
Impact 5.4.6-6: Effects on riparian habitat and related biological resources along San Antonio Creek between Turner Dam and the confluence with Alameda Creek	LS	LS	LS	N/A
Impact 5.4.6-7: Effects on riparian habitat and related biological resources along Alameda Creek below the confluence with San Antonio Creek	LS	LS	LS	N/A
Impact 5.4.6-8: Conflicts with the provisions of adopted conservation plans or other approved biological resource plans	LS			

LS = Less than Significant impact, no mitigation required
PSM= Potentially Significant impact, can be mitigated to less than significant
N/A = Not Applicable

The Calaveras Dam project (SV-2) would not raise the maximum reservoir levels any higher than historical levels. Therefore, no sensitive upland habitats or riparian habitats higher than the spillway elevation would be inundated. Areas of well-developed riparian forest along Calaveras Creek and Arroyo Hondo above Calaveras Reservoir would therefore not be affected by the proposed WSIP operations. However, because seasonal wetlands, seeps, and other wetland features below the current maximum reservoir elevation would be inundated, the impact on sensitive habitats of restoring reservoir levels at Calaveras Reservoir is *potentially significant*. Although the impact of fluctuating reservoir elevation is discussed for other reservoirs, this impact is not applicable to Calaveras Reservoir because wetlands within the existing operational range would be inundated and lost.

Impacts of Periodic Drawdowns. Under the WSIP, the reservoir would be lowered by up to 20 feet for an extended period during systemwide maintenance (every five years), which could affect riparian and freshwater marsh habitats that depend on sustained moist soil or standing water. However, the existing riparian and wetland habitats above the spillway elevation have tolerated an extended drawdown since December 2001 and can be expected to tolerate periodic drawdowns of shorter duration, such as those proposed under the WSIP. Some studies have suggested that occasional, appropriately timed dewatering can enhance wetland diversity by providing unusual opportunities for germination and establishment (e.g., Schneider, 1994); however, lowering the reservoir level would not necessarily benefit freshwater marsh or riparian vegetation. These potentially beneficial and adverse impacts are relatively minor; the impact of reservoir operations would be less than significant.

Key Special-Status Species

Key special-status species potentially affected by Calaveras Reservoir operations under the WSIP include California red-legged frog, foothill yellow-legged frog, California tiger salamander, and bald eagle. Suitable upland habitat is not present within the operational area of Calaveras Reservoir for other key special-status species discussed in this section, such as Callippe silverspot butterfly, Alameda whipsnake, burrowing owl, and peregrine falcon.

In a study of water level fluctuations for a similar reservoir project in Washington State (but applicable here), Devine Tarbell & Associates (2006) examined the effect of modest daily fluctuations on the two most vulnerable impact receptors: amphibians and waterbirds. First, the study authors note that littoral wetlands (those on or near the shore) are well suited to handling changes in soil moisture and water content that are of short duration. The study evaluated seven species of common amphibians and made several observations. Amphibian eggs are generally laid in shallow water or are attached to vegetation high in the water column. As such, water level fluctuations of even a few inches can expose developing eggs to desiccation, freezing, or increased predation. However, the authors conclude that minor fluctuations are likely less important than other factors governing habitat suitability in habitats connected to the reservoir, such as the presence of predatory fish, wave action, scant vegetative cover, and water temperature. Put another way, lakeside species are adapted to varying water levels, which occur in natural water bodies as well as managed ones.

Restoring the operational capacity of Calaveras Reservoir under the WSIP would result in the inundation and loss of poor-quality upland habitat for California tiger salamander and California red-legged frog. Habitat below the pre-2002 maximum reservoir level was not considered part of the designated critical habitat for California tiger salamander; no critical habitat for California red-legged frog is present in this area. Due to the low quality of upland habitat that would be inundated by restoring Calaveras Reservoir to its former levels, this impact would be less than significant.

Higher reservoir levels under the WSIP would reduce the duration of flowing water in Arroyo Hondo and Calaveras Creek. Arroyo Hondo is a perennial stream and has high-quality habitat for foothill yellow-legged frogs in the well-developed riparian sections above the maximum spillway elevation. Arroyo Hondo has about 10,000 linear feet of stream channel habitat between the DSOD-mandated maximum reservoir elevation and the spillway elevation. Actual reservoir elevations have varied considerably since December 2001, and have sometimes been held 20 to 30 feet higher than the DSOD-mandated level, occasionally reducing this habitat to about a mile. Although Arroyo Hondo is a perennial stream above the former maximum reservoir elevation, the CDFG observed in August 2004 that the section below this elevation was dry (CDFG, 2005), indicating it was not perennial in this section (CDFG, 2005). Yellow-legged frogs have been observed in this section of Arroyo Hondo (between the DSOD maximum and the pre-2002 maximum) since 2002. Although the habitat is of limited quality and apparently intermittent as well, it is occupied by foothill yellow-legged frogs and is of considerable length. Therefore, this impact would be *potentially significant.*

Bald eagle would not be affected by reservoir operations, except that eagle foraging can be enhanced by the shallower water and concentration of fish that occurs during drawdowns.

Other Species of Concern

No plant species of concern would be inundated as a result of Calaveras Reservoir operations under the WSIP. Wildlife species of concern in and near Calaveras Reservoir include western pond turtle, several raptor species that forage in grasslands, songbirds that nest and forage in riparian or marsh habitat, and bat species that roost in riparian habitat or forage over water. Because potential changes to grassland, riparian, and marsh habitats are minor, this impact would be *less than significant*, and no mitigation measures would be required.

Common Habitats and Species

Operation of Calaveras Dam and Reservoir under the WSIP would inundate low-diversity, weedy upland vegetation with little habitat value for wildlife. It would not interfere substantially with the movement of any native wildlife species or wildlife nursery sites, nor would it cause a plant or wildlife population to drop below self-sustaining levels. Impacts related to this loss of low-quality habitat would be *less than significant*, and no mitigation measures would be required.

Impact Conclusions

Overall, implementation of the proposed WSIP water supply and system operations would result in *potentially significant* impacts on sensitive habitats and key special-status species, especially foothill yellow-legged frog. Implementation of Measure 5.4.6-1, Compensation for Impacts on Terrestrial Biological Resources, which involves the creation, preservation, and enhancement of wetland habitat elsewhere within the Alameda watershed, including riparian habitat, would reduce this impact to a less-than-significant level.

Impact 5.4.6-2: Effects on riparian habitat and related biological resources along Alameda Creek, from below the diversion dam to the confluence with Calaveras Creek.

Sensitive Habitats

Sensitive habitats in this reach of Alameda Creek include several riparian forest communities, including Central Coast arroyo willow riparian forest, white alder riparian forest, and sycamore alluvial woodland. Most of this reach is a steeply sloping, confined bedrock channel, and the hydrograph is flashy. Most of the structure and species composition of the riparian habitat is the result of conditions that prevailed prior to 2002.

Flow Impacts. After the new Calaveras Dam is fully operational and the Alameda Creek Diversion Dam can be operated to maximum capacity, flows in Alameda Creek below the diversion dam would be reduced in frequency, duration, and magnitude compared with existing conditions. Peak flows would be diminished when the diversion tunnel is open, which would be most of the winter rainfall season. Under the WSIP, sediment would continue to be cleared annually from the diversion dam and transported downstream, much as under existing conditions. Because flow in Alameda Creek is rainfall-based, the receding flows decline rapidly, and the hydrograph pattern is not as important to riparian vegetation as with snowmelt-based systems. Compared with existing conditions, the pattern and duration of minimum flows in Alameda Creek would be about the same.

For the most part, the composition and structure of the existing riparian communities are a function of the flow conditions that prevailed before the DSOD imposed operational restrictions on the reservoir. The existing sycamore alluvial woodland and valley oak woodland formed under unimpaired flow conditions prior to construction of Calaveras Dam in 1925, and the willow and alder riparian forests formed under pre-2002 Calaveras Dam operations. Therefore, it is more useful to assess the impact of the WSIP by comparing future conditions with the conditions under which these riparian communities formed. Under pre-2002 conditions, as much flow as possible was diverted from Alameda Creek into the diversion tunnel, and, under the WSIP, as much flow as possible would again be diverted. The pattern and quantity of flows in Alameda Creek would be nearly the same as under pre-2002 conditions. The slight increase in late-winter flows under some hydrologic year types would not have a detectable effect on riparian habitat. Neither existing nor future conditions appear to be suitable for stand regeneration of sycamore alluvial woodland or valley oak woodland. A return to the pre-2002 pattern of diversions from Alameda Creek would return flow conditions to those under which the riparian forest and scrub formed; therefore, the impact of the WSIP on the extent, structure, composition, and sustainability of these habitats would be *less than significant*, and no mitigation measures would be required.

Key Special-Status Species

California red-legged frog and foothill yellow-legged frog currently occupy this section of Alameda Creek. Under the WSIP, there would be a substantial reduction in total winter flows compared with existing conditions. Reductions in the highest peak flows could reduce the extent of scouring that removes egg masses and tadpoles, which would be beneficial. However, the general reduction in flow would reduce the total available aquatic breeding habitat for these species and would also reduce the area suitable for producing their food sources, such as benthic macroinvertebrates. Although there could be both beneficial and adverse impacts on habitat for California red-legged frog and foothill yellow-legged frog, the reduction in aquatic breeding habitat would be a *potentially significant* impact.

Other Species of Concern

No plant species of concern would be affected by WSIP operations in this section of Alameda Creek. A number of raptor, songbird, and mammal species of concern could be affected in this section of Alameda Creek. Although the WSIP would reduce flows compared to the existing condition, prevailing habitat conditions are not expected to change because they are more a result of the slightly lower pre-2002 flows. This impact would be *less than significant*, and no mitigation measures would be required.

Common Habitats and Species

The more common upland habitats and species would not be affected by WSIP operational changes in this area. In this reach, the WSIP would not interfere substantially with the movement of any native wildlife species or wildlife nursery sites, nor would it cause a plant or wildlife population to drop below self-sustaining levels. Therefore, this impact would *not apply* to common habitats and species.

Impact Conclusions

Overall, implementation of the proposed WSIP water supply and system operations would result in *potentially significant* impacts on terrestrial biological resources due to a potential reduction in aquatic breeding habitat for key special-status species. Measure 5.4.1-2, Diversion Tunnel Operation, calls for operation of the diversion tunnel in a manner that ensures that flows not required to maintain storage in Calaveras Reservoir are passed down Alameda Creek at the diversion dam. Measure 5.4.5-3a, Minimum Flows for Resident Trout on Alameda Creek, calls for developing and implementing an operational plan to provide minimum bypass flows below the diversion dam to support habitat for rainbow trout and other native stream-dependent species from December through April. Implementation of these measures would ensure that minimum flows in Alameda Creek are allowed to pass by the diversion dam. Taken together, these measures would reduce adverse impacts on key special-status species to a less-than-significant level.

Impact 5.4.6-3: Effects on riparian habitat and related biological resources along Calaveras Creek, from Calaveras Reservoir to the confluence with Alameda Creek.

Sensitive Habitats

Sensitive habitats in Calaveras Creek below Calaveras Dam consist of riparian habitats such as Central Coast arroyo willow riparian forest and sycamore alluvial woodland. For the most part, Calaveras Creek is situated in a confined canyon with a bedrock channel. In addition to groundwater contributions to flow and input from lateral tributaries, releases from Calaveras under existing conditions consist of several weeks of releases averaging 300 to 400 cfs.

Impacts from Winter Flows. Compared with the existing condition, high-flow winter releases into Calaveras Creek under the WSIP would decrease, especially during normal, above-normal, and wet years. Since 2002, no spills have occurred, but cone valve releases of 325 to 375 cfs have occurred during certain high rainfall periods. The confined bedrock channel already limits channel-forming processes and opportunities for riparian regeneration. The reduction of flows in Calaveras Creek would incrementally reduce suitable habitat for riparian vegetation, but the change would be so small as to be impossible to quantify. As a result, the impact would be less than significant.

Similar to Alameda Creek below the diversion dam, most of the existing riparian habitat is the result of flow conditions that prevailed before December 2001, so pre-2002 flow conditions are considered in this impact analysis. Under the WSIP, spills are projected to occur slightly more frequently, but might be smaller in magnitude relative to pre-2002 operations. Under pre-2002 conditions and under the proposed program, the SFPUC would operate Calaveras Reservoir to retain as much water as operationally feasible, minimizing releases and spills to Calaveras Creek. Although there could be some slight changes in the pattern of releases and spills in Calaveras Creek under the WSIP, the overall pattern and quantity of high winter releases and spills would remain very similar to pre-2002 conditions, and the impact on riparian habitats would be less than significant.

Flows in Calaveras Creek below Calaveras Dam would be altered in two ways during the two- to five-year period when the reservoir is being refilled. First, there would be no cone valve releases into Calaveras Creek below the dam. Second, the SFPUC would initiate required minimum instream flow releases (see Table 5.4.1-9) when construction of the new Calaveras Dam is completed. When flows at the confluence of Alameda and Calaveras Creeks fall below the minimum required flow, generally during protracted dry periods, releases would be made from Calaveras Dam or upstream on Alameda Creek. These releases would ensure that existing riparian habitat would be sustained; therefore, impacts on riparian habitats related to filling the reservoir would be *less than significant*, and no mitigation measures would be required.

Impacts from Minimum Flows. Under the WSIP, minimum flows may be maintained year-round, depending if flow releases are from Calaveras Reservoir or from upstream on Alameda Creek. Sustained minimum flows during the dry season could slightly increase groundwater recharge. It could also facilitate the conversion from riparian habitats that require only seasonally flowing water to those that require permanent flowing water, such as alder riparian forest. This potential replacement of one sensitive riparian habitat with another one (with no change in the total extent of riparian habitat) would be *less than significant*.

Impacts from Changes to Pattern of High-Flow Releases. The proposed new Calaveras Dam would be equipped with several means by which to release large volumes of water into Calaveras Creek, allowing for greater control over released flow levels than at present. Peak releases into Calaveras Creek could be greater than under existing conditions because the improved outlet works would be fully operational, which could enhance channel-forming processes. However, the narrow canyon, confined riparian zone, and bedrock channel are limiting factors. There might be slight changes in the pattern of high-flow releases due to the operational goal of maintaining Calaveras Reservoir as full as feasible. However, these changes would be relatively small and would not substantially alter the dynamics of the riparian habitats in Calaveras Creek. Therefore, impacts on sensitive habitats related to changes in the pattern of high-flow releases would be *less than significant*, and no mitigation measures would be required.

Key Special-Status Species

Impact of Changed Minimum and High Flows. Potentially affected key special-status species are California red-legged frog and foothill yellow-legged frog, which could breed in Calaveras Creek. No critical habitat is present in Calaveras Creek below Calaveras Dam. Average winter flows under the WSIP would be lower than under existing conditions, especially during wet and above-normal rainfall years, thus reducing the available breeding and foraging habitat. The WSIP would maintain minimum flows year-round, which would be beneficial in providing more sustained aquatic habitat for breeding and foraging. The peak flows might not be greatly reduced and therefore might not reduce entrainment and scouring.

Impact of Changed Pattern of Releases. A description of operational releases has not been developed at the program level. The rate at which flows are increased during releases and the magnitude of recurring controlled releases are important to breeding amphibians; gradual increases in flows allow adults and juveniles to seek sheltered sites, while rapid increases in flow can wash them downstream. The highest flows can cause significant scouring, resulting in losses of egg masses and tadpoles. At the program level, these impacts are conservatively considered *potentially significant*, because the outlet works at Calaveras Dam would have the capacity for greater releases with more rapid ramping up. Depending on the timing and volume of these releases, they could increase the risk of washing away adults, eggs, or tadpoles.

Other Species of Concern

No plant species of concern would be affected by WSIP operations in the vicinity of Calaveras Creek below the reservoir. Potential changes in riparian habitat could result in a minor change in breeding habitat for riparian-nesting birds such as raptors, egrets, and songbird species of concern. Although there could be some change in the structure and species composition of the riparian habitats, the overall extent would not change. Therefore, this impact would be *less than significant*, and no mitigation measures would be required.

Common Habitats and Species

The WSIP would not interfere substantially with the movement of any native wildlife species or wildlife nursery sites, nor would it cause a plant wildlife population to drop below self-sustaining levels. Impacts on common habitats and species would be *less than significant*, and no mitigation measures would be required.

Impact Conclusions

Overall, implementation of the proposed WSIP water supply and system operations would result in *potentially significant* impacts on terrestrial biological resources in Calaveras Creek, but only with respect to high flows and the resulting loss of frog eggs or egg masses. Measure 5.4.6-3, Operational Procedures for Calaveras Dam Releases, requires the development of procedures to manage releases from Calaveras Dam so as to minimize habitat impacts and maximize benefits by mimicking the natural regime to the extent possible. The measure would include procedures for increasing and decreasing the rate of releases. With implementation this measure, impacts on terrestrial biological resources in this reach of Calaveras Creek would be reduced to a less-than-significant level.

Impact 5.4.6-4: Effects on riparian habitat and related biological resources along Alameda Creek, from the confluence with Calaveras Creek to the confluence with San Antonio Creek.

Sensitive Habitats

Sensitive riparian communities in this section of Alameda Creek include sycamore alluvial woodland, Central Coast arroyo willow riparian forest, valley oak woodland, and white alder riparian forest. The WSIP would substantially reduce winter flows compared to those under existing conditions (they would be similar to, but slightly muted from, flows in the reach directly below the diversion dam). The change in flows would have no effect on the woodland communities; for stand regeneration, sycamore woodland requires flows similar to unimpaired flows. The slight potential reduction in flows (as it relates to stand regeneration for willow and alder riparian forest) would be offset by increased summer flows under the 1997 MOU. Sustained winter and summer minimum flows could facilitate the conversion of existing riparian habitats, such as sycamore alluvial woodland and valley oak woodland, to alder- and willow-dominated habitats, but the extent of this potential impact would be small. Channel incision is not expected to be an important factor because of the large cobble content of the substrate. Overall, these impacts would offset one another; as a result, the impact on sensitive habitats would be *less than significant*, and no mitigation measures would be required.

Key Special-Status Species

This section of Alameda Creek supports California red-legged frog and foothill yellow-legged frog. Flow in this section of Alameda Creek would be lower than under existing conditions but higher than under pre-2002 conditions. Impacts on these species could be both beneficial and adverse, depending on annual rainfall and localized site conditions along the creek. Compared with existing conditions, lower winter flows could improve breeding conditions in the short term but reduce the total available breeding habitat and habitat for macroinvertebrate food resources. Compared with pre-2002 conditions, higher winter flows could cause some breeding losses, but would improve long-term habitat conditions because of greater aquatic habitat complexity. Sustained minimum flows would generally provide more consistent breeding habitat. In general, impacts on key special-status species would be both beneficial and adverse and would likely depend on year-to-year conditions and site-to-site conditions within this reach of the creek. Because of the uncertainty, the potential impact of releases on breeding amphibians is considered *potentially significant*. Alameda whipsnake would not be affected by WSIP operations along Alameda Creek.

Other Species of Concern

No plant species of concern would be affected by WSIP operations in this section of Alameda Creek. A less-than-significant change in the structure and diversity of riparian habitat would not substantially alter the extent or quality of breeding habitat for songbirds, raptors, and mammals. The overall impact on habitat would be less than significant, so the impact on species of concern would be *less than significant.* No mitigation measures would be required.

Common Habitats and Species

Common upland habitats would not be affected by changes in stream flows resulting from WSIP operations. Since the overall extent of riparian habitat is expected to be about the same (even if the structure and composition changes), impacts on common species would be *less than significant*. No mitigation measures would be required.

Impact Conclusions

Overall, implementation of the proposed WSIP water supply and system operations would result in *potentially significant* impacts on key special-status species. Measure 5.4.6-3, Operational Procedures for Calaveras Dam Releases, would require the development of procedures to manage releases from Calaveras Dam so as to minimize amphibian breeding habitat impacts and maximize benefits by mimicking the natural regime to the extent possible. Implementation of this measure would reduce impacts on key special-status species on this reach of Alameda Creek. Measure 5.4.5-3a, Minimum Flows for Resident Trout on Alameda Creek, would ensure adequate flows in Alameda Creek below the diversion dam during December through April. Taken together, these measures would reduce impacts on key special-status species in this portion of Alameda Creek to a less-than-significant level.

Impact 5.4.6-5: Effects on riparian habitat and related biological resources in San Antonio Reservoir.

Sensitive Habitats

Sensitive habitats that could be affected by operations of San Antonio Reservoir include small areas of freshwater marsh and riparian scrub on gently sloping reservoir margins. The maximum reservoir levels would not change. No upland habitats would be affected. As discussed in Section 5.4.1, storage levels at San Antonio Reservoir would drop every fifth year for planned system maintenance. The reservoir would be refilled to typical operating levels within one to two years after the maintenance period. The depth and duration of drawdown would be within the range of historic operating conditions. Thus, WSIP impacts on riparian and freshwater marsh habitat along the margins of San Antonio Reservoir would be *less than significant*, and no mitigation measures would be required.

[Paragraph has been deleted per responses to comments or staff-initiated text changes (Vol. 7, Chapter 16).]

Key Special-Status Species

WSIP operations at San Antonio Reservoir would not result in impacts on upland habitats, and therefore no impacts on Alameda whipsnake would occur. Key special-status species that could be affected by WSIP operations at San Antonio Reservoir include California red-legged frog and California tiger salamander. However, impacts on riparian scrub and freshwater marsh habitat would be less than significant, and therefore impacts on the habitat of California red-legged frog and California tiger salamander would be *less than significant*, and no mitigation measures would be required.

Other Species of Concern

San Antonio Reservoir maximum water surface elevation would not change, and fluctuations in water level that would occur would be within the historic operating range. As noted in the discussion of Calaveras Reservoir, studies of amphibians and breeding birds at a similar reservoir project in Washington State found little change in habitat suitability with relatively minor fluctuations in reservoir elevation. As a result, WSIP-related impacts on other species of concern in San Antonio Reservoir would be *less than significant*, and no mitigation measures would be required.

Finally, waterfowl and other littoral species could be temporarily displaced from preferred habitat during drawdowns; however, the availability of numerous alternative food resources and the minor change in reservoir operations support a determination of a negligible effect.

Common Habitats and Species

No impacts on upland habitats would occur. There could be a slight reduction in the extent of weedy habitat around the periphery of the reservoir below the maximum reservoir elevation. This impact would be *less than significant*, and no mitigation measures would be required.

Impact Conclusions

Overall, impacts on terrestrial biological resources in the San Antonio Reservoir area due to implementation of the proposed WSIP operations would be *less than significant*, and no mitigation measures would be required.

Impact 5.4.6-6: Effects on riparian habitat and related biological resources along San Antonio Creek between Turner Dam and the confluence with Alameda Creek.

Sensitive Habitats

Sensitive habitats along San Antonio Creek include sycamore alluvial woodland and willow scrub and mixed riparian habitats. Releases into San Antonio Creek would be rare, similar to existing conditions. As a result, no change in conditions for riparian and wetland habitats would occur; the impact of the WSIP would be *less than significant*, and no mitigation measures would be required.

Key Special-Status Species

Any impacts on habitat for key special-status species (e.g., California red-legged frog) would be minimal, and the effect on breeding habitat would be *less than significant*. No mitigation measures would be required.

Other Species of Concern

Due to the lack of change from existing conditions, impacts on common species at risk would be *less than significant*, and no mitigation measures would be required.

Common Habitats and Species

No impacts on common habitats would occur as a result of WSIP changes in the operation of Turner Dam. The operational changes in this reach would not interfere substantially with the movement of any native wildlife species or wildlife nursery sites, nor would it cause a plant or wildlife population to drop below self-sustaining levels. Therefore, this impact would *not apply* to common habitats and species.

Impact Conclusions

Overall, impacts on terrestrial biological resources in San Antonio Creek due to implementation of the proposed WSIP water supply and system operations would be *less than significant*, and no mitigation measures would be required.

Impact 5.4.6-7: Effects on riparian habitat and related biological resources along Alameda Creek below the confluence with San Antonio Creek.

Sensitive Habitats

Flow in Alameda Creek between San Antonio Creek and Arroyo de la Laguna would be reduced during the winter months, especially during normal and wetter rainfall years. However, changes in flow would be buffered by other stream inputs from this point downstream. Judged against the baseline of current conditions, impacts on riparian and wetland habitats in this reach of Alameda Creek would be *less than significant*, and no mitigation measures would be required.

Key Special-Status Species

There would be little alteration in habitat for identified key special-status species due to WSIP-related operational changes. As a result, impacts on key special-status species would be *less than significant*, and no mitigation measures would be required.

Other Species of Concern

Potential impacts of WSIP operations on species of concern would be *less than significant*, for the same reasons described above for riparian and wetland habitats. No mitigation measures would be required.

Common Habitats and Species

Because flow changes in this reach of Alameda Creek would be minimal during normal to wet years, there would be limited impacts on terrestrial ecological resources. Thus, common habitats and species would not be affected, and this impact would *not apply*.

Impact Conclusions

Overall, impacts on terrestrial biological resources in Alameda Creek below San Antonio Creek due to implementation of the proposed WSIP water supply and system operations would be *less than significant*, and no mitigation measures would be required.

Impact 5.4.6-8: Conflicts with the provisions of adopted conservation plans or other approved biological resources plans.

The only plan relevant to proposed WSIP operations is the *Alameda Watershed Management Plan*. The WSIP program as a whole would be consistent with the provisions of this plan, which places priority on resource protection while ensuring that the objective of delivering adequate, high-quality water is met. The SFPUC is currently preparing a habitat conservation plan for the Alameda watershed; however, WSIP operations are not considered in this plan, which covers only existing operations. Therefore, impacts related to conflicts with adopted plans would be *less than significant*.

References – Terrestrial Biological Resources

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5.4.7 Recreational and Visual Resources

Chapter 4, Section 4.12, Recreational Resources, provided a general overview of the park and recreational facilities and resources in the WSIP study area and near proposed facility projects. This section discusses specific recreational resources and activities within the Alameda Creek watershed that could be affected by the proposed water supply and system operations. Thus, the analysis deals primarily with water-related recreation, including fishing, swimming, boating, rafting, or activities such as scenic viewing, walking, hiking, or camping adjacent to water bodies.

5.4.7.1 Setting

The three main water features within the Alameda Creek watershed are San Antonio Reservoir, Calaveras Reservoir, and Alameda Creek. The natural drainage basin for Calaveras Reservoir includes Arroyo Hondo and Calaveras Creek from the southeast and local drainage areas along the west shore of the reservoir. The natural drainage basin for San Antonio Reservoir, which is the same as the watershed for San Antonio Creek, includes the tributary sub-drainage basins for Indian Creek, La Costa Creek, and Williams Gulch. Alameda Creek also receives limited surface flows from Calaveras Creek, Arroyo Hondo, and San Antonio Creek, as well as flows and runoff from tributary drainages in the Diablo Range and Livermore Valley. Farther downstream, Alameda Creek receives additional flows from Arroyo de la Laguna and Vallecitos Creek. The two reservoirs, as well as much of the rest of the Alameda Creek watershed, are located within the SFPUC Alameda watershed. This watershed is described below under Alameda Creek. The visual quality, recreational uses, and facilities associated with each water feature, including both SFPUC-managed and other uses and facilities, are described below (SFPUC, 2001).

Alameda Creek Recreation and Visual Quality

Alameda Creek runs through several local parks, municipalities (including Alameda County), and the cities of Fremont and Union City. Alameda Creek also runs through the Sunol Regional Wilderness and is adjacent to the Vargas Plateau Regional Preserve, Quarry Lakes Regional Recreation Area, and Coyote Hills Regional Park, all of which are operated by the EBRPD. The recreational uses of the creek are described below.

SFPUC Alameda Watershed

The CCSF owns about 30 percent of Alameda Creek's natural watershed (see Figure 5.4.1-1 in Section 5.4.1). The CCSF-owned portion of the Alameda Creek watershed encompasses approximately 36,000 acres of land, with 23,000 acres in Alameda County and 13,000 acres in Santa Clara County (see Figure 5.4.1-2 in Section 5.4.1). Visually, these areas range from steeply sloped, heavily vegetated semi-wilderness areas to industrialized and gravel mining areas in developed valleys. The CCSF leases some of its upper watershed land to the East Bay Regional Park District (EBRPD) for public recreational use, as described below. Public access to interior parts of the CCSF-owned watershed lands, including stretches of Alameda Creek, is prohibited because of the risk of fire and potential degradation of water quality and natural resources. The creek within these watershed lands is therefore not used for boating, fishing, swimming, or other water-related recreation. However, the SFPUC, which manages the watershed lands, does allow access to some internal fire roads and trails by permit for research or educational purposes to groups accompanied by volunteer leaders (SFPUC, 2001; 2007).

Sunol Water Temple. The Sunol Water Temple, a pavilion and temple situated over a convergence of the infiltration galleries and the downstream end of the defunct Pleasanton-Sunol pipeline, is located within the SFPUC Alameda watershed and adjacent to Alameda Creek. The temple is a destination for picnickers and tourists as a scenic and historic landmark and is open to the public at specified hours. It is also available for public events by SFPUC permit (SFPUC, 2001).

Sunol Regional Wilderness

The 6,858-acre Sunol Regional Wilderness, part of the Sunol-Ohlone Regional Park managed by the EBRPD, lies between San Antonio Reservoir and Calaveras Reservoir, with Alameda Creek running along its eastern edge (see Figure 4.12-1, in Section 4.12). A portion of the Sunol Regional Wilderness is located on SFPUC Alameda watershed lands leased by the EBRPD. Aesthetically, this parkland is comprised of undeveloped canyon, streamside, and ridgeline areas; some of the ridges offer expansive views of the surrounding areas.

The Sunol Regional Wilderness includes more than 26 miles of hiking, equestrian, and biking trails, including the Ohlone Wilderness Regional Trail (see below). Facilities and programs include picnic areas, barbeque pits, group and backpack camps, a visitor's center, naturalist-led activities, and equestrian facilities. At least one camping area is situated next to Alameda Creek. Little Yosemite, a scenic gorge on Alameda Creek, is located within the Sunol Regional Wilderness. Swimming is permitted within the wilderness area, except in Little Yosemite. Other water sports, including boating, rafting, and canoeing, are generally not feasible in this portion of Alameda Creek due to the creek's water level, and fishing is not allowed in creek (EBRPD, 2007a).

Ohlone Wilderness Regional Trail

The Ohlone Wilderness Regional Trail, managed by the EBRPD, is a 28-mile trail for hikers and equestrians (no bicycles or motor vehicles are permitted) that stretches across and connects four regional parks and wilderness areas, including Ohlone Regional Wilderness, Mission Peak Regional Preserve, Sunol Regional Wilderness, and Del Valle Regional Park. It also passes through two watershed areas leased from the CCSF. The trail crosses Alameda Creek within the Sunol Regional Wilderness. This trail affords both secluded canyon views and expansive ridge-top vistas.

Alameda Creek Regional Trail

The Alameda Creek Regional Trail follows the banks of Alameda Creek in southern Alameda County from the mouth of Niles Canyon (in the Niles District of Fremont) westward to San Francisco Bay for a distance of 12 miles. The trail runs on both sides of the creek; on the north side of the creek, it is an unpaved trail for pedestrians, equestrians, and cyclists, and on the south side is a paved trail for pedestrians and cyclists only. Motor vehicles are not allowed on the trail. This trail includes views of both semi-natural and urban landscapes.

The trail is accessible from several thoroughfares in the Fremont, Union City, and Newark areas. It provides access to Coyote Hills Regional Park (from the south side of the creek only) and

Quarry Lakes Regional Recreation Area (from both sides of the creek). The Alameda Creek Stables Staging Area, Beard Staging Area, Isherwood Staging Area, and Niles Staging Area are stationed along the trail, providing facilities such as restrooms, picnic areas, and drinking fountains (EBRPD, 2007b).

Vargas Plateau Regional Preserve

The Vargas Plateau Regional Preserve, managed by the EBRPD, is located adjacent to the SFPUC Alameda watershed along a common boundary line on the east side of the preserve. Its northern boundary touches Alameda Creek for a distance of about 2,500 feet. A portion of the decommissioned Sunol Aqueduct crosses the park within a utility easement. Currently, the preserve is not suitable for active public use due to the lack of public road access, the need to protect natural or man-made resources, and other factors related to public safety and access. The EBRPD is currently in the process of adopting the *Vargas Plateau Regional Park Land Use Plan*, which would create a regional park that provides trails, outdoor recreation, campgrounds, and nature appreciation areas (EBRPD, 2007e).

Quarry Lakes Regional Recreation Area

Quarry Lakes Regional Recreation Area, managed by the EBRPD, borders the north side of Alameda Creek for approximately 1.8 miles in the city of Fremont. The Alameda Creek Trail is accessible from several points in the recreation area. The recreation area has several lakes; public access is provided to these lakes for fishing, swimming, and boating (EBRPD, 2007c). The lakes afford open-space and water-feature views for park users.

Coyote Hills Regional Park

Coyote Hills Regional Park, managed by the EBRPD, borders the south side of Alameda Creek for approximately 1.1 miles in the city of Fremont (see Figure 4.12-1 in Section 4.12). The Alameda Creek Trail is accessible from several points in the park. The park provides naturalist programs, a visitor center, group campgrounds, several miles of trails, cultural artifact displays, and a boardwalk through marshlands. Nature viewing and hiking are encouraged within the park (EBRPD, 2007d).

Don Edwards San Francisco Bay National Wildlife Refuge

The Don Edwards San Francisco Bay National Wildlife Refuge borders Alameda Creek as it approaches San Francisco Bay (see Figure 4.12-1 in Section 4.12). The wildlife refuge, managed by the USFWS, includes trails and nature viewing. One of the refuge's stated goals is to provide opportunities for wildlife-oriented recreation and nature study (USFWS, 2007). The wildlife refuge provides views of the bay and associated wetland areas as well as of the nearby salt ponds.

Other Access to Alameda Creek

Other recreational facilities in Fremont and Union City that either abut or provide access to Alameda Creek and the Alameda Creek Trail include Shinn Pond, Niles Community Park, Kaiser Pond, the Model Mariners boat club, Rancho Arroyo Park, William Cann Park, and David Jones Park (EBRPD, 2007b).

San Antonio and Calaveras Reservoirs

San Antonio and Calaveras Reservoirs are located entirely within the SFPUC Alameda watershed. As mentioned above, public access to interior parts of the Alameda watershed lands is prohibited, and the reservoirs are not available for water-related recreation; however, the SFPUC does allow access to some internal fire roads and trails by permit for research or educational purposes to groups accompanied by volunteer leaders (SFPUC, 2001). Both reservoirs appear as visually prominent water features in views from surrounding ridges.

Regulatory Considerations

As discussed in Chapter 4, Section 4.2, Plans and Policies, the *Alameda Watershed Management Plan* includes the following policy related to visual quality:

- *Policy WA 9*: If new facilities require additional new locations, require that view shed studies be conducted to minimize, eliminate or conceal the violation of scenic values.

However, the WSIP water supply and system operations analyzed in this section would not require any new facilities, other than those already discussed and analyzed in Section 4.3, Land Use and Visual Quality. Therefore, this policy is not addressed further in this section.

5.4.7.2 Impacts

Significance Criteria

The CCSF has not formally adopted significance standards for impacts related to recreational or visual resources, but generally considers that implementation of the proposed program would have a significant impact on these resources if it were to:

Recreation

- Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated (Secondary impacts of growth are evaluated in Chapter 7, Growth-Inducement Potential and Indirect Effects of Growth)
- Include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment (Secondary impacts of growth are evaluated in Chapter 7)
- Physically degrade existing recreational resources

The physical degradation of existing resources could occur if the WSIP were to: (1) remove or damage existing recreational resources; (2) cause environmental impacts (such as air quality or noise effects) that would indirectly cause a deterioration in the quality of the recreational experience; or (3) disrupt access to existing recreational facilities (which would divide a community from some of the established amenities used by its members).

Visual Quality

- Have a substantial adverse effect on a scenic vista
- Substantially damage scenic resources, including but not limited to trees, rock outcroppings, and other features of the built or natural environment that contribute to a scenic public setting
- Substantially degrade the existing visual character or quality of the site and its surroundings

Approach to Analysis

The WSIP would change water levels in reservoirs and alter flow in streams in the Alameda watershed. WSIP-induced changes in reservoir water levels and stream flow in the Alameda Creek watershed were estimated using the HH/LSM (see Appendix H). WSIP-induced changes in reservoir water levels and stream flow were estimate semi-quantitatively. A specialist in recreational and visual resources assessed the impacts of the WSIP on these environmental elements based on the estimated WSIP-induced changes in reservoir water levels and stream flow (see Section 5.4.1).

Impact Summary

Table 5.4.7-1 presents a summary of the impacts on recreational and visual resources in the Alameda Creek watershed that could result from implementation of the proposed water supply and system operations.

TABLE 5.4.7-1
SUMMARY OF IMPACTS –
RECREATIONAL AND VISUAL RESOURCES IN THE ALAMEDA CREEK WATERSHED

Impact	Significance Determination
Impact 5.4.7-1: Effects on recreational facilities and/or activities	LS
Impact 5.4.7-2: Visual effects on scenic resources or the visual character of water bodies	LS

LS = Less than Significant impact, no mitigation required

Impact Discussion

Impact 5.4.7-1: Effects on recreational facilities and/or activities.

The WSIP would not affect water-related recreational facilities or activities in the Alameda Creek watershed. As described above in Section 5.4.7.1, Setting, water recreation is not allowed on the SFPUC reservoirs; because there would be no change to this policy under the WSIP, impacts on recreation would not occur as a result of water level changes in the reservoir. With respect to recreation in and along the creeks in the watershed there is either: (1) no or only very limited water recreation occurring at present, and/or (2) the WSIP-related flow changes described in Section 5.4.1 would not change creek flows to an extent that existing recreational use would be affected. The proposed program would reduce peak flows along Alameda Creek in the Sunol Regional Wilderness in the winter and early spring months. The reduced flows would somewhat degrade the recreational experience for hikers on the trails near (or with views of) Alameda Creek, however, with the proposed minimum flows for resident trout on Alameda Creek to be released from the Alameda Creek Diversion Dam when such flows are present, this would be a *less-than-significant* impact.

Impact 5.4.7-2: Visual effects on scenic resources or the visual character of water bodies.

As described in Section 5.4.1, changes in stream flow and reservoir water levels under the WSIP are not beyond the range of flow and water level variation that occurs now. The reductions in peak flows in average, above-average, and wet years under the proposed program would not be visually apparent to most recreational users and others viewing the creeks and reservoirs. The main exception would be the reductions in peak flows in Alameda Creek in the Sunol Regional Wilderness, including the scenic Little Yosemite area, during winter and spring months. Reduced peak flows in Alameda Creek in the Little Yosemite area would somewhat degrade the visual character Alameda Creek, however, with the proposed minimum flows for resident trout on Alameda Creek to be released from the Alameda Creek Diversion Dam when such flows are present, this would be a *less-than-significant* impact.

Proposed summer releases to support fisheries would increase flows in Calaveras Creek and downstream in Alameda Creek and would have a beneficial visual effect, because the releases would enhance the creek's appearance in the summer months when recreational use is highest. Therefore, no significant adverse visual impacts would occur, and no mitigation is required.

References – Recreational and Visual Resources

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5.5 San Francisco Peninsula Streams and Reservoirs

5.5 San Francisco Peninsula Streams and Reservoirs

Section 5.5 Subsections

5.5.1 Stream Flow and Reservoir Water Levels

The following setting section describes the streams and reservoirs on the San Francisco Peninsula that could be affected by the WSIP. The impact section (Section 5.5.1.2) provides a description of the changes in stream flow and reservoir water levels that would result from implementation of the WSIP.

5.5.1.1 Setting

The SFPUC operates four water supply reservoirs on the San Francisco Peninsula: Pilarcitos, Upper and Lower Crystal Springs, and San Andreas Reservoirs. The Spring Valley Water Company built the reservoirs between 1864 and 1890. The four reservoirs and two streams (San Mateo Creek and Pilarcitos Creek) on the Peninsula could be affected by the WSIP. San Mateo Creek, and its tributary San Andreas Creek, flow southward in the rift valley formed by the San Andreas fault and then turn east, flowing to San Francisco Bay. Pilarcitos Creek also flows southward, but it turns to the west and flows to the Pacific Ocean. **Figure 5.5.1-1** shows the boundaries of the drainage areas of the four Peninsula reservoirs, and **Figure 5.5.1-2** shows the SFPUC regional facilities associated with these reservoirs. The SFPUC's water supply facilities on the San Francisco Peninsula lie within two watersheds, the San Mateo Creek and Pilarcitos Creek watersheds, which are referred to collectively as the Peninsula watershed.

San Mateo Creek

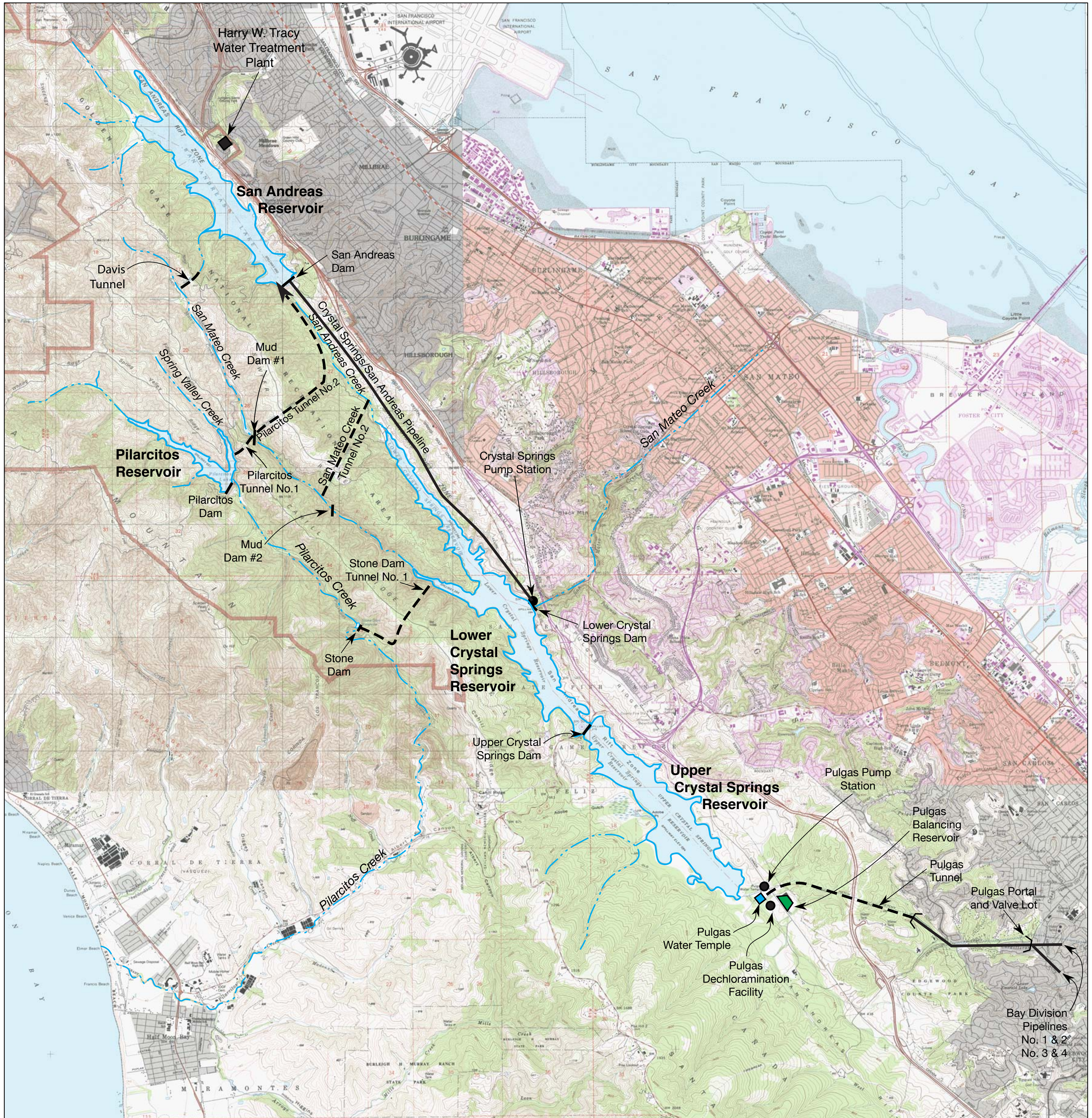
General Description

San Mateo Creek, and its major tributary San Andreas Creek, rises in the Coast Range mountains west of the city of Millbrae. San Mateo and San Andreas Creeks are fed by rainfall, which varies with altitude and is in the range of 25 to 40 inches annually. Almost all of the rainfall occurs between October and April.

SOURCE: ESA + Orion; USGS 1978

SFPUC Water System Improvement Program . 203287

Figure 5.5.1-1
Peninsula Watersheds and Drainages



SOURCE: ESA + Orion; USGS 1978

SFPUC Water System Improvement Program . 203287

Figure 5.5.1-2
Peninsula Watershed Facilites and Flow Locations Analyzed

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The upper reaches of San Mateo Creek and all reaches of San Andreas Creek are in undeveloped land, most of which is owned by the City and County of San Francisco (CCSF). The lower reaches of San Mateo Creek below Lower Crystal Springs Dam flow through a densely developed urban area to San Francisco Bay, about 1.6 miles north of the Hayward–San Mateo Bridge. The main tributary of San Mateo Creek downstream of Lower Crystal Springs Dam is Polhemus Creek.

Stream Flow and Water System Operations

Flow in San Mateo and San Andreas Creeks was first affected by water system operations in 1870 when San Andreas Dam was built in the upper reaches of San Andreas Creek. The dam impounds San Andreas Reservoir. Upper Crystal Springs Dam was built just upstream of the confluence of San Andreas Creek and San Mateo Creek in 1877 and formed Upper Crystal Springs Reservoir. In 1890, Lower Crystal Springs Dam was built on San Mateo Creek downstream of Upper Crystal Springs Reservoir, forming Lower Crystal Springs Reservoir. In 1924, culverts were built through Upper Crystal Springs Dam to hydraulically link Upper and Lower Crystal Springs Reservoirs. The current maximum capacities of San Andreas and Crystal Springs Reservoirs are 19,000 and 56,800 acre-feet, respectively. (The California Department of Water Resources, Division of Safety of Dams, currently restricts Crystal Springs Reservoir storage). **Figures 5.5.1-3** and **5.5.1-4** show historical water surface elevations in San Andreas and Crystal Springs Reservoirs between 1998 and 2006.

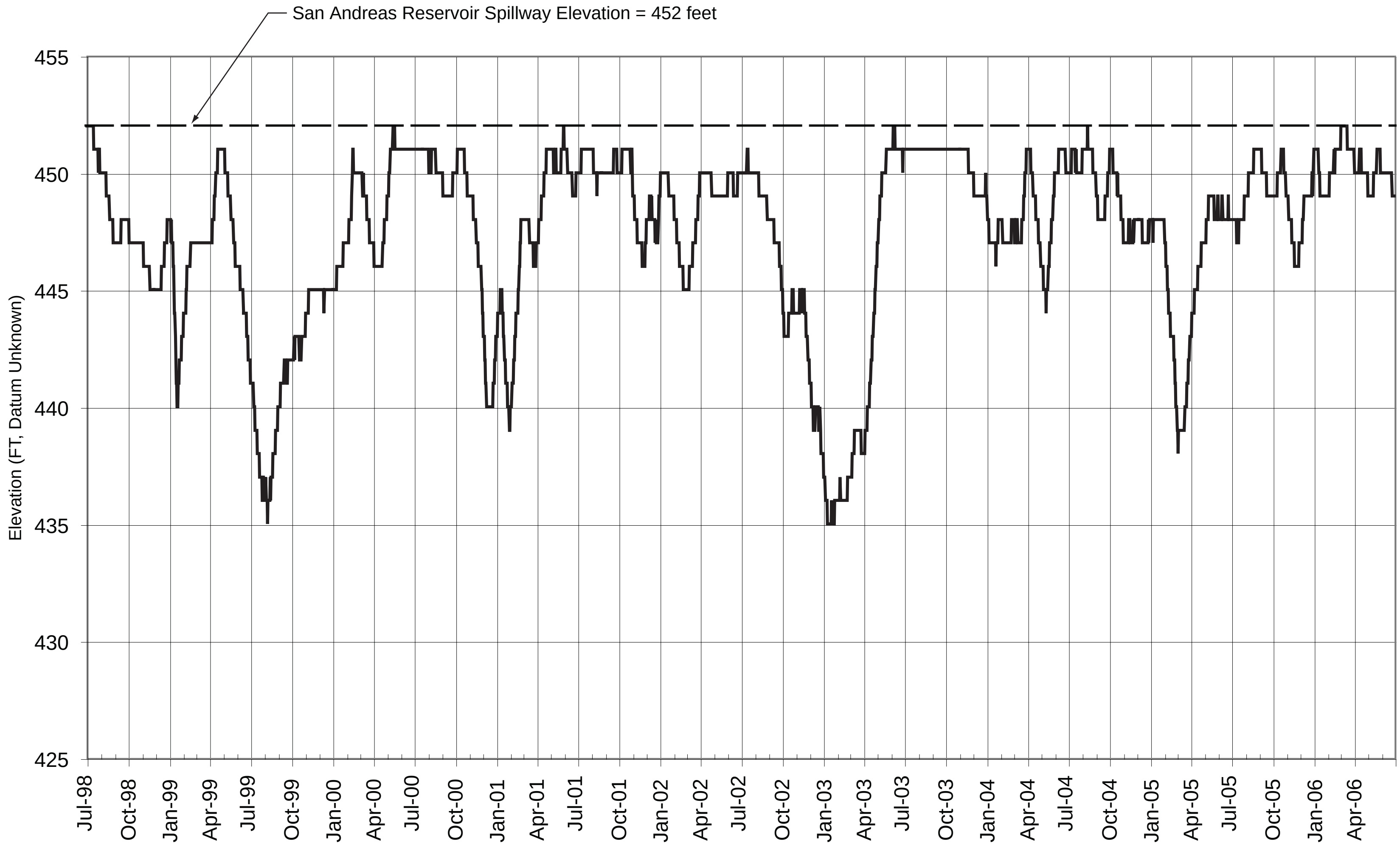
San Andreas and Crystal Springs Reservoirs serve as terminal reservoirs for the SFPUC water system. They not only capture local runoff but also store water conveyed from the Tuolumne River, the Alameda Creek watershed, and Pilarcitos Creek; consequently, the reservoirs are larger than would be necessary if their sole purpose were to capture runoff from local watersheds. The reservoirs on San Andreas and San Mateo Creeks eliminate flow in the creeks immediately below the dams, except for occasional spills or releases from the reservoirs and seepage through the dams. The creeks gain flow in a downstream direction as a result of tributary flow from surface and groundwater sources. No measurements of flow in either creek are available.

Although flood reduction was not one of the original purposes of the CCSF's reservoirs in the San Mateo Creek watershed, Crystal Springs Reservoir reduces peak flow in the creek most of the time. Space for floodwaters is provided in the reservoir when major storms are expected. Once the space allocated for flood storage is filled, uncontrolled flow over the spillway at Lower Crystal Springs Dam can occur, or controlled releases can be made from outlets equipped with valves. Before the valves are opened, the SFPUC considers potential downstream effects. The dam is operated so that peak flows do not increase above the peak flows that would have existed had the reservoirs not been constructed.

Pilarcitos Creek/Pilarcitos Reservoir

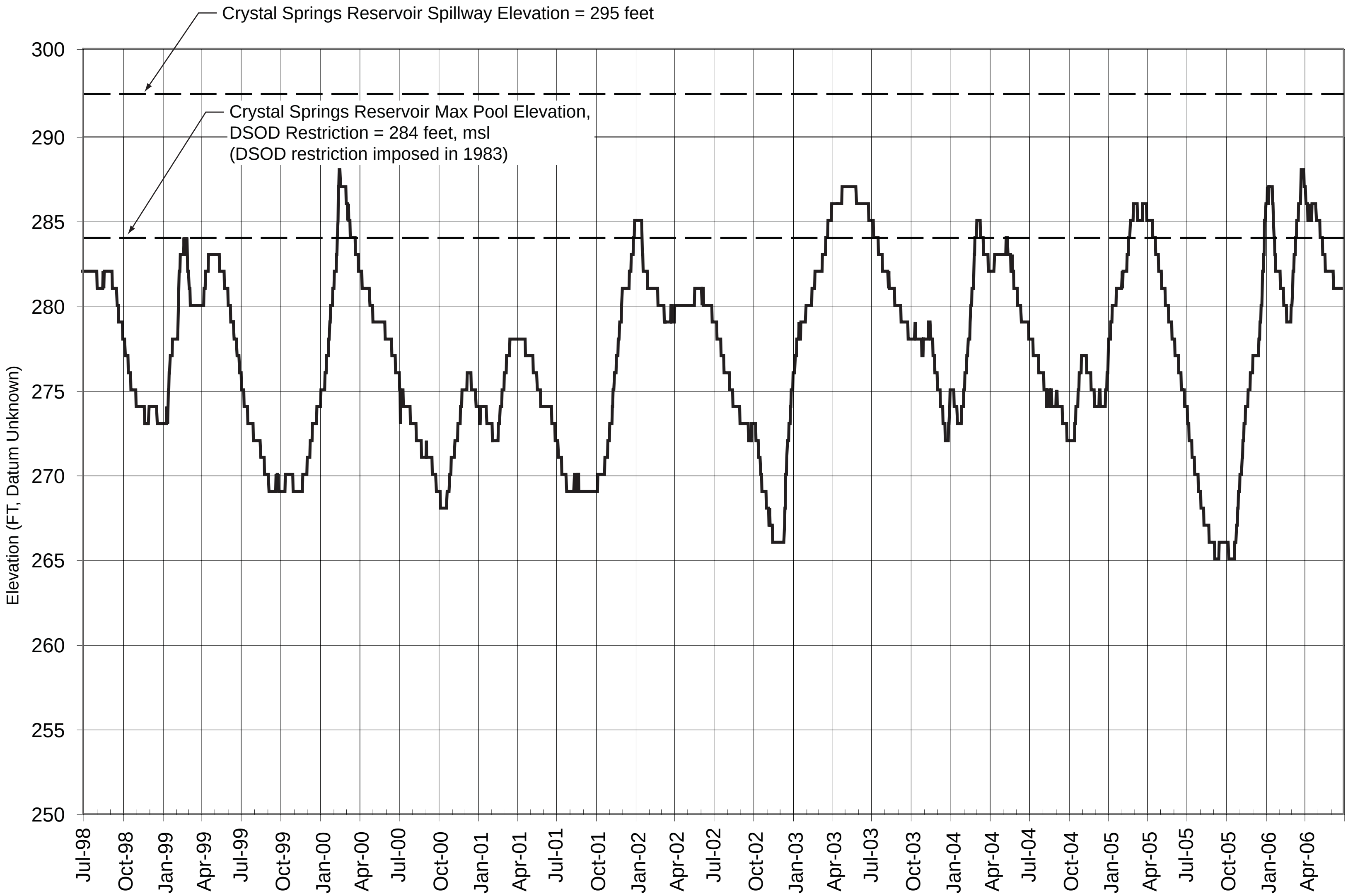
General Description

Pilarcitos Creek rises on the eastern flanks of Montara Mountain in the Coast Ranges. The creek flows southward through the mountains before turning westward and discharging to the Pacific Ocean at Half Moon Bay, as shown in **Figure 5.5.1-5**. Rainfall in the Pilarcitos Creek watershed



SOURCE: SFPUC, HH/LSM (see Appendix H)

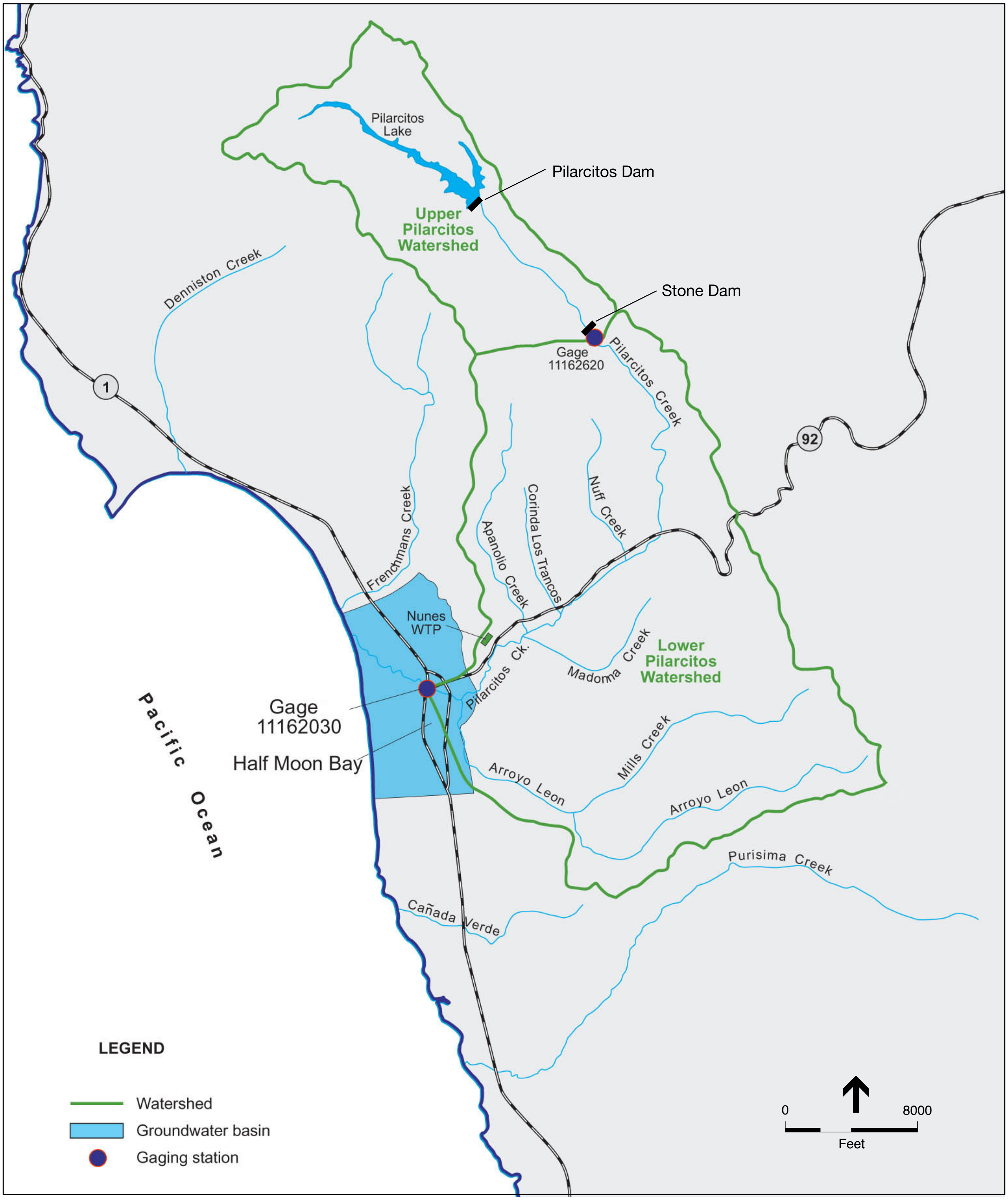
Figure 5.5.1-3
San Andreas Reservoir, Historical Water Levels, 1998 to 2006



SOURCE: SFPUC, HH/LSM (see Appendix H)

SFPUC Water System Improvement Program . 203287

Figure 5.5.1-4
Crystal Springs Reservoir, Historical Water Levels, 1998 to 2006



SOURCE: Todd Engineers

SFPUC Water System Improvement Program . 203287

Figure 5.5.1-5
Pilarcitos Creek Watershed

is variable, ranging from 26 inches annually at the coast to 42 inches near Pilarcitos Reservoir. The approximately 27-square-mile Pilarcitos Creek watershed consists primarily of relatively rugged uplands, characterized by shrubs and grasslands. The CCSF owns substantial portions of the upper watershed, and the Peninsula Open Space Trust protects large areas of the lower watershed above Arroyo Leon. Developed lands within the watershed are primarily agricultural and are located along the lower reaches of the stream corridors. Residential land uses are also present in the watershed, generally along roadways. Other land uses include a cemetery on Highway 92 at Skyline Boulevard, a sanitary landfill in upper Corrida Los Trancos Canyon, and a quarry in Nuff Creek Canyon.

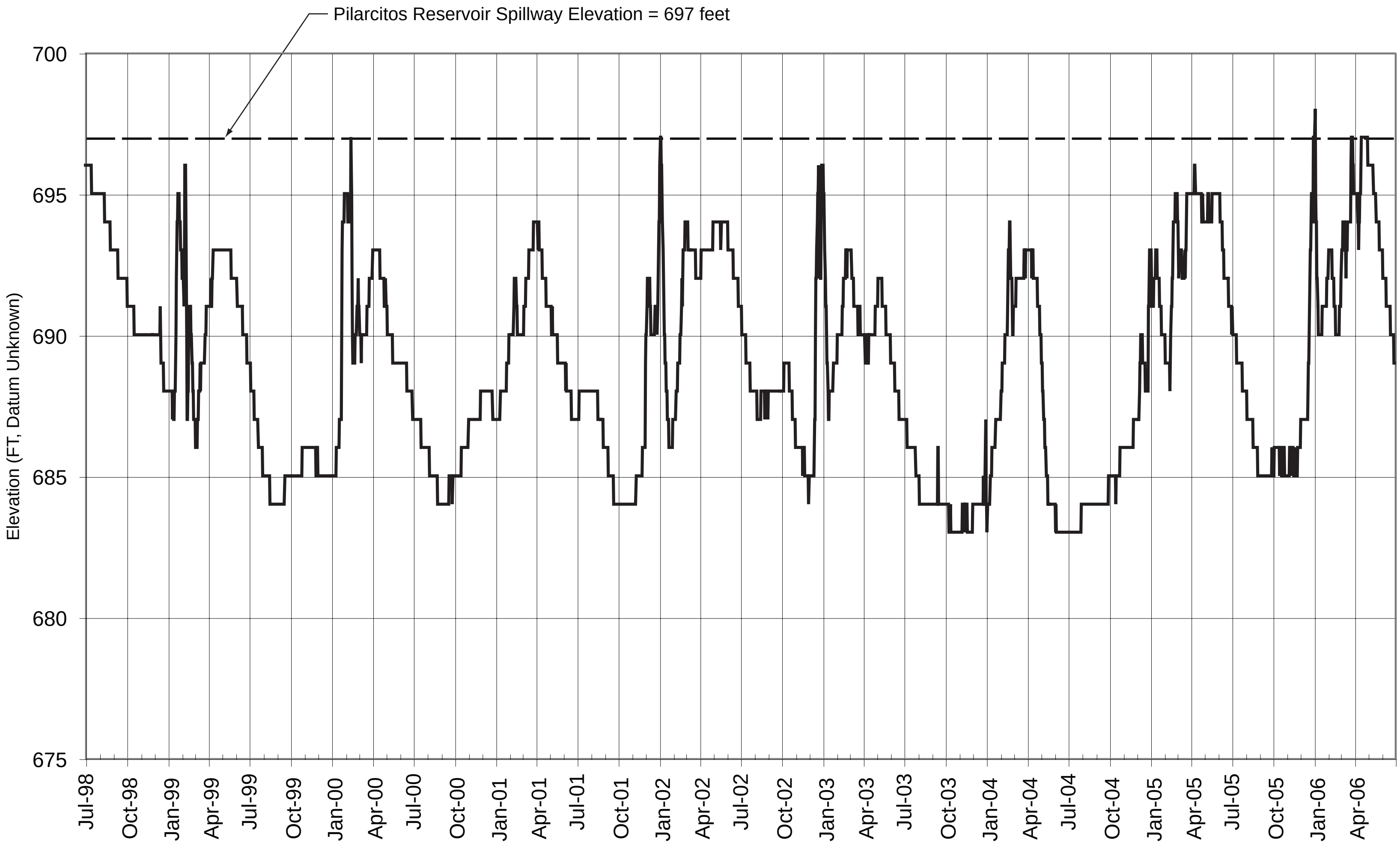
Stream Flow and Water System Operations

Flow in Pilarcitos Creek was first affected by water system operations in 1864 when Pilarcitos Dam was built, and again in 1871 when Stone Dam was built. Pilarcitos Dam impounds Pilarcitos Reservoir, which has a maximum capacity of 3,100 acre-feet of water. Stone Dam, which is about two miles downstream of Pilarcitos Reservoir, is essentially a diversion dam; it impounds about 15 acre-feet of water.

Local runoff from an approximately six-square-mile watershed is Pilarcitos Reservoir's only source of water. Inflow to the reservoir occurs predominantly from rainfall during December through April. Annual runoff to Pilarcitos Reservoir is quite variable and has ranged from almost nothing to more than 15,000 acre-feet. Average annual runoff is estimated to be approximately 4,000 acre-feet per year. Tributaries that join Pilarcitos Creek between Pilarcitos Reservoir and Stone Dam contribute an average annual of about 1,850 acre-feet per year.

The SFPUC uses Pilarcitos Reservoir to store water for use by the Coastside County Water District (Coastside CWD) and to store and divert water for its own use. During the winter months, the SFPUC typically diverts most of the runoff into Pilarcitos Reservoir from the Pilarcitos Creek watershed to its reservoirs in the San Mateo Creek watershed, primarily to San Andreas Reservoir, but also to Crystal Springs Reservoirs. At the end of the rainy season, diversions from Pilarcitos Creek to San Andreas Reservoir are curtailed, with the goal of filling Pilarcitos Reservoir by the late spring. As indicated in **Figure 5.5.1-6**, which shows historical water surface elevations in Pilarcitos Reservoir from 1998 to 2006, the reservoir refills or almost refills in the winter or spring of most years. After the reservoir has filled, the SFPUC attempts to limit releases from Pilarcitos Reservoir to that amount requested by Coastside CWD to meet its water needs. However, at times, additional water may be released from Pilarcitos Reservoir and diverted to Crystal Springs Reservoir at Stone Dam or released from Stone Dam (see discussion below regarding experimental releases from Stone Dam to Pilarcitos Creek).

The SFPUC releases water from Pilarcitos Reservoir to Pilarcitos Creek during the summer for use by Coastside CWD and during the winter diverts water from Pilarcitos Reservoir to San Andreas Reservoir through Pilarcitos Tunnels No. 1 and 2. It can also divert water from Pilarcitos Reservoir to Crystal Springs Reservoir through Pilarcitos Tunnel No. 1 and from Stone Dam to Crystal Springs Reservoir through Stone Dam Tunnel No. 1; this is less desirable than transfers to San Andreas Reservoir, however, because San Andreas Reservoir is at a higher elevation than Crystal Springs Reservoir. Any water diverted from Pilarcitos Creek to Crystal Springs Reservoir must ultimately be pumped to San Andreas Reservoir before it is treated and delivered to retail customers. Consequently, the SFPUC only diverts water from the Pilarcitos Creek watershed to



SOURCE: SFPUC, 2007

Figure 5.5.1-6
Pilarcitos Reservoir, Historical Water Levels, 1998 to 2006

Crystal Springs Reservoir when the available water at Pilarcitos Reservoir exceeds the conveyance capacity of Pilarcitos Tunnels No. 1 and 2, or when water is available as result of tributary flow between Pilarcitos Reservoir and Stone Dam.

Water released from Pilarcitos Reservoir flows down Pilarcitos Creek to Stone Dam. Water is diverted at Stone Dam into a tunnel and pipeline that leads to Stone Dam Tunnel No. 1. Coastside CWD has a turnout from the pipeline just upstream of Stone Dam Tunnel No. 1. Coastside CWD's own pipeline, which has a maximum capacity of about 2 million gallons per day (mgd), conveys water from this turnout to the Nunes Water Treatment Plant and on to its service area.

Coastside CWD supplies water to the city of Half Moon Bay and several unincorporated communities, including El Granada, Miramar, and Princeton-by-the Sea. Its water sources are surface water from Denniston Creek, two groundwater wellfields, and the SFPUC. Coastside CWD's total water demand currently averages 2.5 mgd, but varies seasonally. Demand in December, January, and February is about 1.6 mgd, and in July and August is about 3.2 mgd. Coastside CWD meets its customers' water demand from its own water sources to the degree it can, and then supplements its own supplies with water from the SFPUC.

Because Coastside CWD's own water sources produce only a modest amount of water, Coastside CWD supplements its own water supplies with water from the SFPUC year-round. In the winter months, when demand in the Coastside CWD service area is at its seasonal minimum, Coastside CWD obtains 0.5 to 1 mgd from the SFPUC. In the summer when demand is at its seasonal maximum, Coastside CWD obtains 1.5 to 3 mgd from the SFPUC.

When Coastside CWD needs water from the SFPUC, it requests that the SFPUC release water from Pilarcitos Dam for diversion by Coastside CWD at Stone Dam. During the summer months, Coastside CWD is unable to receive enough water from the Pilarcitos Creek watershed to meet its need for supplemental water supplies. This may be because (1) Pilarcitos Reservoir is drawn down and the SFPUC is unable to release enough water down Pilarcitos Creek to meet Coastside CWD's needs or (2) the capacity of the upper portion of the pipeline from Stone Dam to the Nunes Water Treatment Plant is insufficient to convey the needed volume of water to the Coastside CWD, even when sufficient water is available from the Pilarcitos Creek watershed. Under these circumstances, Coastside CWD activates a pump to lift water out of Crystal Springs Reservoir to a ridge-top storage tank; from there, the water is conveyed to the Nunes Water Treatment Plant.

Currently, and in a normal year, about half the water from the upper Pilarcitos Creek watershed is diverted to San Andreas and Crystal Springs Reservoirs; the other half is released down Pilarcitos Creek and diverted for use by Coastside CWD at Stone Dam. Currently, approximately three-quarters of Coastside CWD's water supply is provided by the SFPUC, either from Pilarcitos Creek or Crystal Springs Reservoir.

Flow in Pilarcitos Creek between Pilarcitos Reservoir and Stone Dam consists of tributary flow from surface and groundwater sources, releases from the reservoir to supply Coastside CWD, and occasional spills from Pilarcitos Reservoir in wet periods. During the dry season, and until recently, no intentional releases were made from Stone Dam to Pilarcitos Creek, and flow in the creek immediately below the dam consisted only of leakage through the spillway boards and seepage through the dam. Currently, experimental releases of a few cubic feet per second (cfs) are being made as part of a study of aquatic resources. In the wet months of wet years, spills over Stone Dam to Pilarcitos Creek are frequent. A tributary adds water to Pilarcitos Creek about one-tenth of a mile below Stone Dam in all but a few months of the driest years.

Flow in Pilarcitos Creek is measured at two gages—one just below Stone Dam, and the other near the creek mouth at Half Moon Bay. Flow measured at the gage in Half Moon Bay varies seasonally, with average monthly flow reaching a seasonal maximum of 53 cfs in February and a seasonal minimum of less than 1 cfs in August and September. Flow varies greatly from year to year. In 1976 and 1977, two very dry years, average monthly flow in the creek did not exceed 2.5 cfs. In 1998, a very wet year, a monthly average flow of 329 cfs was recorded.

Minimum Instream Flow Requirements

No releases are required from Crystal Springs, San Andreas, and Pilarcitos Reservoirs to maintain minimum stream flows in San Mateo, San Andreas, and Pilarcitos Creeks.

5.5.1.2 Impacts

Significance Criteria

The CCSF has not formally adopted significance standards for impacts related to stream flow and reservoir levels, but generally considers that implementation of the proposed program would have a significant impact if it were to:

- Substantially alter stream flows such that they are outside of the range of pre-WSIP conditions and result in adverse hydrologic effects

The stream flow significance threshold is based on the fact that natural stream flows have varied substantially in the past 50 years, and that such variations are a part of the existing baseline. Therefore, variations substantially outside of these past levels due to implementation of the proposed program that would result in adverse hydrologic effects (such as flooding, dewatering, erosion, or drainage alteration, among others) would be considered a significant direct impact.

In addition to direct impacts resulting from changes in stream flows and reservoir levels, this PEIR also considers indirect impacts. However, for organizational purposes, the indirect impacts are not described in this section of the document, but rather in the sections describing the resources that would be indirectly affected by changes in steam flows and reservoir levels. These include geomorphology, surface water quality, groundwater, fisheries, terrestrial biological resources, recreation, and visual resources. It should be noted that there might be cases in which significant indirect impacts could result from less-than-significant direct impacts.

Approach to Analysis

Changes in reservoir storage and water levels attributable to the WSIP in the San Mateo Creek watershed and changes in reservoir storage, water levels and stream flows in the Pilarcitos Creek watershed attributable to the WSIP were estimated using the Hetch Hetchy/Local Simulation Model (HH/LSM). An overview of the model is provided in Section 5.1. Detailed information on the model and the assumptions that underlie it are provided in Appendix H. Stream flows in San Mateo Creek and stream flows and changes in reservoir storage and water levels for the Pilarcitos Creek watershed were estimated semi-quantitatively based on results from the model in addition to interviews with individuals knowledgeable about historical, current and expected future (with-WSIP) water system operations. Information on the limitations of the HH/LSM and reasons for using supplemental information are provided in Section 5.1. Information on current and expected future operations in the Pilarcitos Creek watershed is provided in Appendix H2-3 and H2-7.

Total water demand in the Coastside CWD service area is expected to increase from an annual average of 2.7 mgd in 2005 to an annual average of about 3.2 mgd in 2030. Coastside CWD intends to meet future demand by increasing its purchase request from the SFPUC. The SFPUC and Coastside CWD are currently discussing how the SFPUC might meet the increased purchase request, but no decision on a course of action has yet been made. However, in order to perform a conservative assessment of potential environmental impacts, a course of action was assumed that would have greater environmental consequences for Pilarcitos Reservoir and Pilarcitos Creek than other possible courses of action. Under the assumed scenario, the SFPUC would supply water to Coastside CWD from both Pilarcitos Creek and Crystal Springs Reservoir, as it does currently, but it would take more water from both sources. Most of the additional water would come from Crystal Springs Reservoir.[1] The SFPUC already takes all of the water from the Pilarcitos Creek watershed upstream of Stone Dam in normal, below-normal, and dry years, so any further use of Pilarcitos Creek water would come at the expense of spills from Stone Dam in the wet months of wet years.

Meeting Coastside CWD's future purchase requests might require the construction of new facilities. The environmental impacts of the new facilities are not analyzed in this PEIR, but would be addressed during subsequent, project-level CEQA review. The project-level review would occur after the SFPUC determines how it will meet Coastside CWD's 2030 purchase request, but before the facilities are constructed. However, it is expected that any construction impacts could be reduced to a less-than-significant level by conventional and project-specific construction mitigation measures.

Impact Summary

Table 5.5.1-1 presents a summary of the impacts on stream flow in Peninsula watershed water bodies that could result from implementation of the proposed water supply and system operations.

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1 Increased diversions of water from Crystal Springs Reservoir could in turn increase diversions of water from the Tuolumne River. Chapter 8 provides an analysis of the environmental effects of several variants of the proposed program. The environmental analysis of Variant 1, which would involve meeting all of the additional purchase requests from the Tuolumne River, provides an indication of the likely effects of increased diversions from the Tuolumne River, as would occur (but on a much smaller scale) under this scenario.

TABLE 5.5.1-1
SUMMARY OF IMPACTS – STREAM FLOW IN SAN FRANCISCO PENINSULA STREAMS

Impact	Significance Determination
Impact 5.5.1-1: Effects on flow along San Mateo Creek	LS
Impact 5.5.1-2: Effects on flow along Pilarcitos Creek	LS

LS = Less than Significant impact, no mitigation required

Impact Discussion

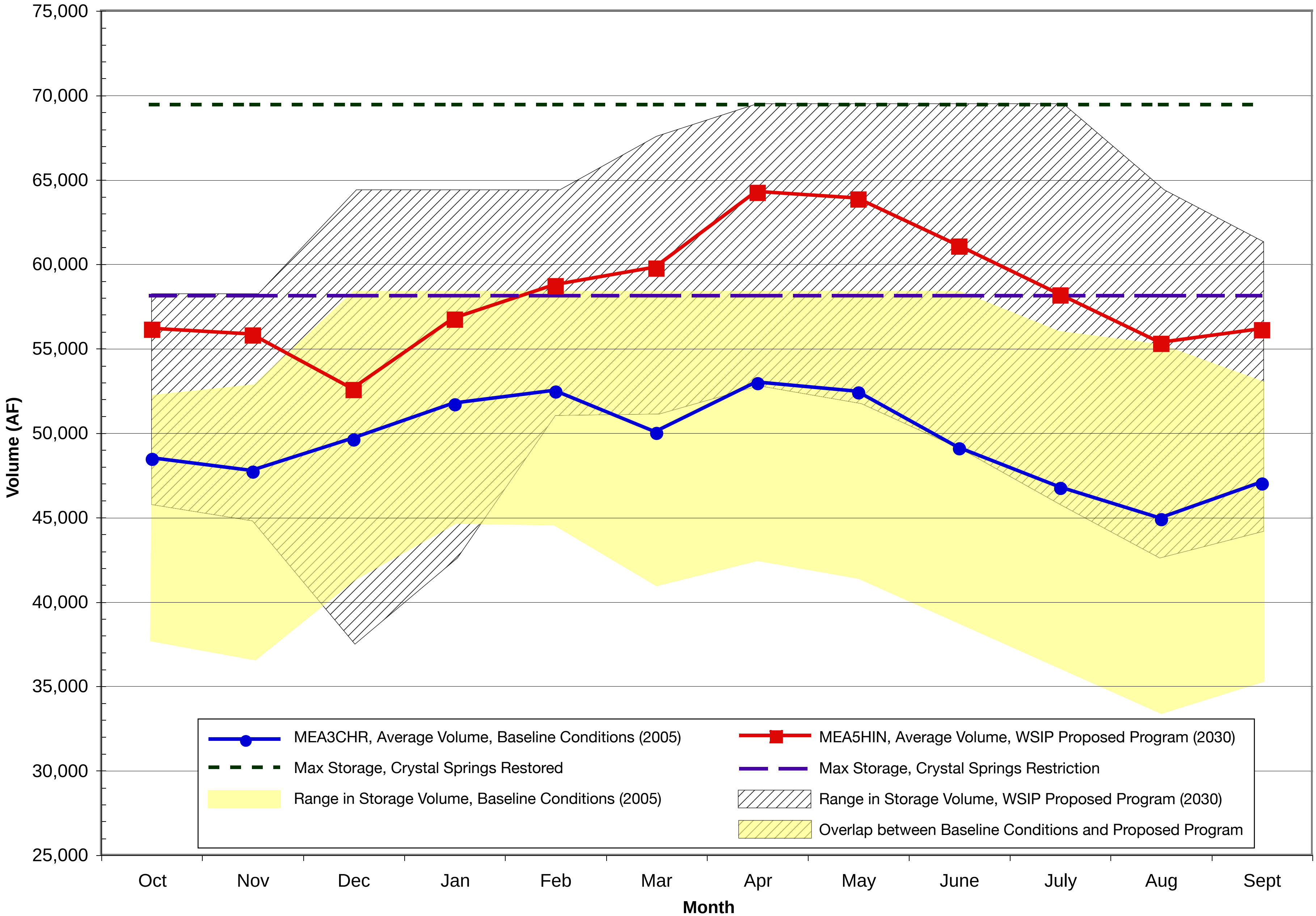
Impact 5.5.1-1: Effects on flow along San Mateo Creek.

Reservoir Operations

Crystal Springs and San Andreas Reservoirs store water from their local watersheds and water imported from the Tuolumne River and Pilarcitos Creek. The reservoirs are filled during the rainy season in the Bay Area and the snowmelt season in the Sierra Nevada. During the summer, when local demand exceeds the supply of water that can be delivered from the Tuolumne River, water is drawn from Crystal Springs and San Andreas Reservoirs to meet part of the demand. Storage in the reservoirs is replenished in the following winter, spring, and early summer. The reservoirs are operated to minimize spills from Crystal Springs Reservoir to San Mateo Creek. The WSIP would not change the SFPUC’s operational goals for Crystal Springs and San Andreas Reservoirs, but it would affect water levels in the reservoirs and could affect the volume of spills from Crystal Springs Reservoir to San Mateo Creek.

Water Storage and Water Levels in Crystal Springs and San Andreas Reservoirs

The proposed program would increase average monthly storage in Crystal Springs Reservoir year-round compared to the existing condition. **Figure 5.5.1-7** shows average monthly storage in the reservoir. The increase in average monthly storage would mostly be attributable to the Lower Crystal Springs Dam project (PN-4), but also to improvements to the SFPUC regional water system as a whole. The improvements to Crystal Springs Dam are part of the WSIP and would allow the reservoir to be operated at its full capacity of 68,000 acre-feet, or 22.2 billion gallons. The Division of Safety of Dams currently limits the maximum storage capacity in Crystal Springs Reservoir to 56,800 acre-feet (18.5 billion gallons) due to concerns regarding the ability of the dam spillway to safely pass the largest floods that could occur in the watershed. The other system improvements, also a part of the WSIP, would increase the SFPUC’s ability to convey Tuolumne River water across the San Joaquin Valley and thus improve its ability to maintain storage in Crystal Springs Reservoir. With the WSIP, storage in the reservoir would typically fluctuate during the year between full and 58,000 acre-feet (19 billion gallons), except during maintenance of the conveyance components of the Hetch Hetchy system (primarily



SOURCE: SFPUC, HH/LSM (see Appendix H)

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Figure 5.5.1-7
Average Monthly Storage Volume, Crystal Springs Reservoir

Mountain Tunnel and the San Joaquin Valley Pipeline) and during years of little local inflow or curtailed imports from the Tuolumne River.

Because the WSIP would restore Crystal Springs Reservoir storage, average monthly water levels would rise by 2 to 8 feet compared to the existing condition, with an average increase of 5 feet. The average monthly water levels with the WSIP would fluctuate more than under the existing condition. Currently, the difference between the annual average monthly maximum and minimum water levels is 7 feet; with the WSIP it would be 9 feet. The increased fluctuation would be due in part to periodic drawdown of storage in Crystal Springs Reservoir during maintenance of the conveyance components of the Hetch Hetchy system, as described below.

Figure 5.5.1-8 shows chronological modeled storage in Crystal Springs Reservoir using hydrology data from the period 1920 to 2002. The figure compares the WSIP to the existing condition and shows that Crystal Springs Reservoir storage with the WSIP would be greater in most years. The exception occurs every fifth year, as maintenance of the conveyance components of the Hetch Hetchy system would reduce the importation of water and require that water be withdrawn from local storage to meet water deliveries. Although maintenance is predicted to occur every five years, flexibility in the schedule could shift the years in which maintenance occurs. Maintenance would occur during the months of October, November, and December, when the demand for water is at its seasonal minimum. During these months, water levels in Crystal Springs Reservoir would fall by as much as 16 feet, and then recover when maintenance is completed.

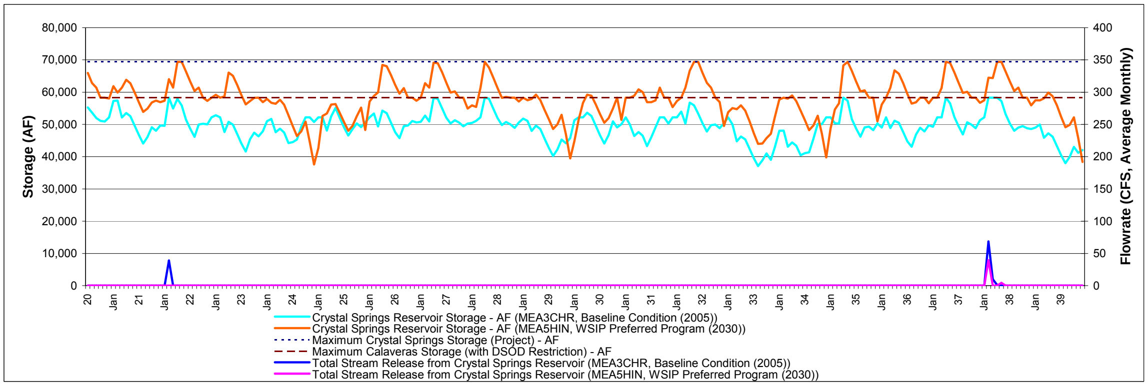
Average monthly storage in San Andreas Reservoir is shown in **Figure 5.5.1-9** with the WSIP and under the existing condition. Under both scenarios, storage in the reservoir would typically fluctuate during the year between the full capacity of 19,000 acre-feet (6.2 billion gallons) and 17,200 acre-feet (5.6 billion gallons). Average monthly water levels with the WSIP and under existing conditions would be within a foot or two of each other, except during maintenance activities, as described below.

With implementation of the WSIP, storage in San Andreas Reservoir would be drawn down in every fifth year for planned maintenance of the conveyance components of the Hetch Hetchy system. When maintenance occurs, it would be in the months of October, November, and December. During these months, water levels in San Andreas Reservoir would fall by as much as 14 feet, and then recover when maintenance is completed.

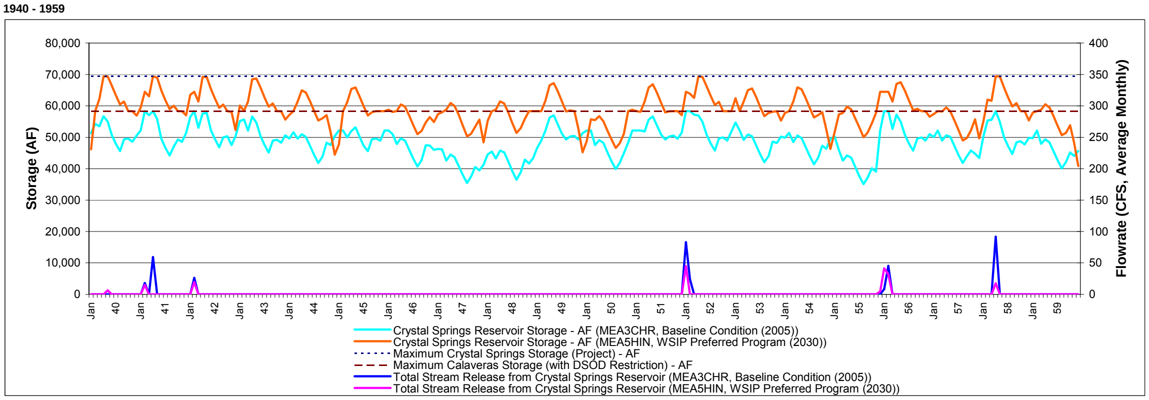
Flow in San Mateo Creek

The SFPUC attempts to capture as much runoff as possible from the upper San Mateo Creek watershed in San Andreas and Crystal Springs Reservoirs. Most of the time, the SFPUC captures all of the runoff from the upper watershed, and no water is released to San Mateo Creek below Crystal Springs Dam. During the rainy season, the operators of the reservoir obtain frequent weather forecasts and manage the reservoir to capture as much runoff as possible from the sequence of winter storms that cross the watershed. The operators' decisions with respect to reservoir management are made on a day-to-day, sometimes hour-to-hour basis. In some

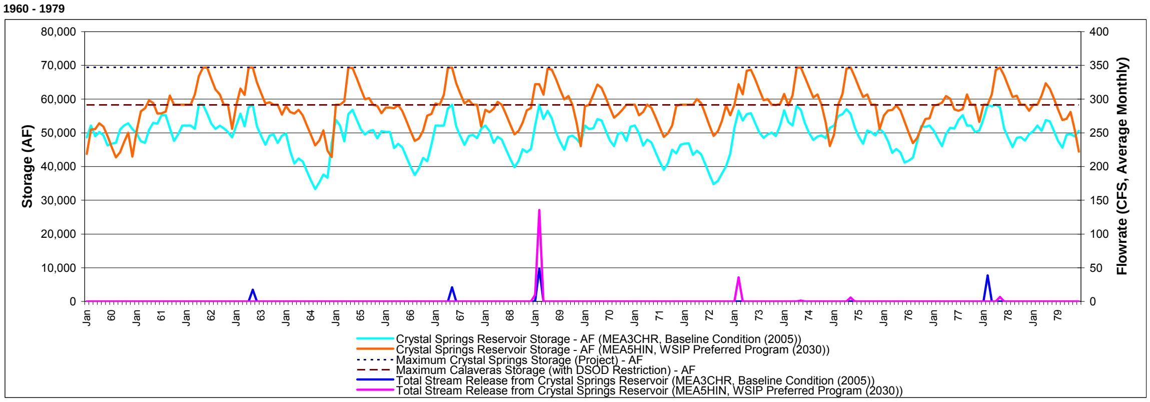
1920 - 1939



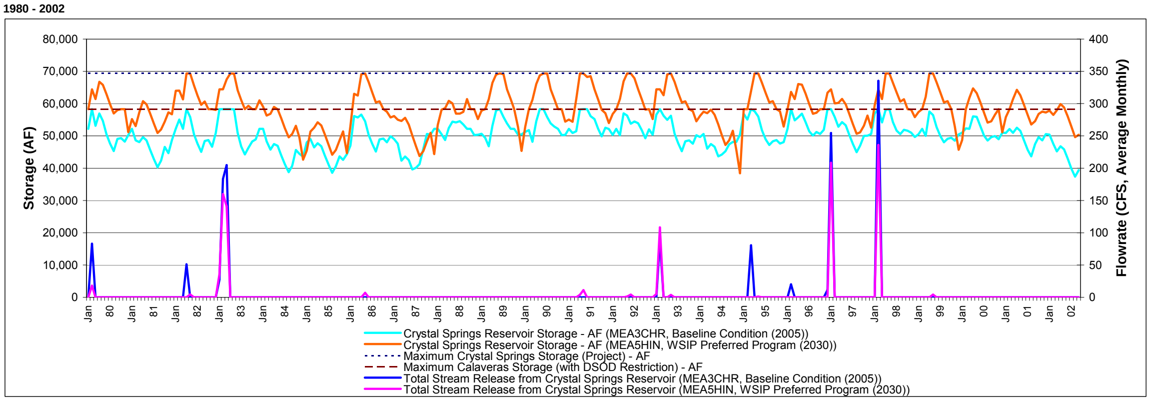
1940 - 1959



1960 - 1979



1980 - 2002



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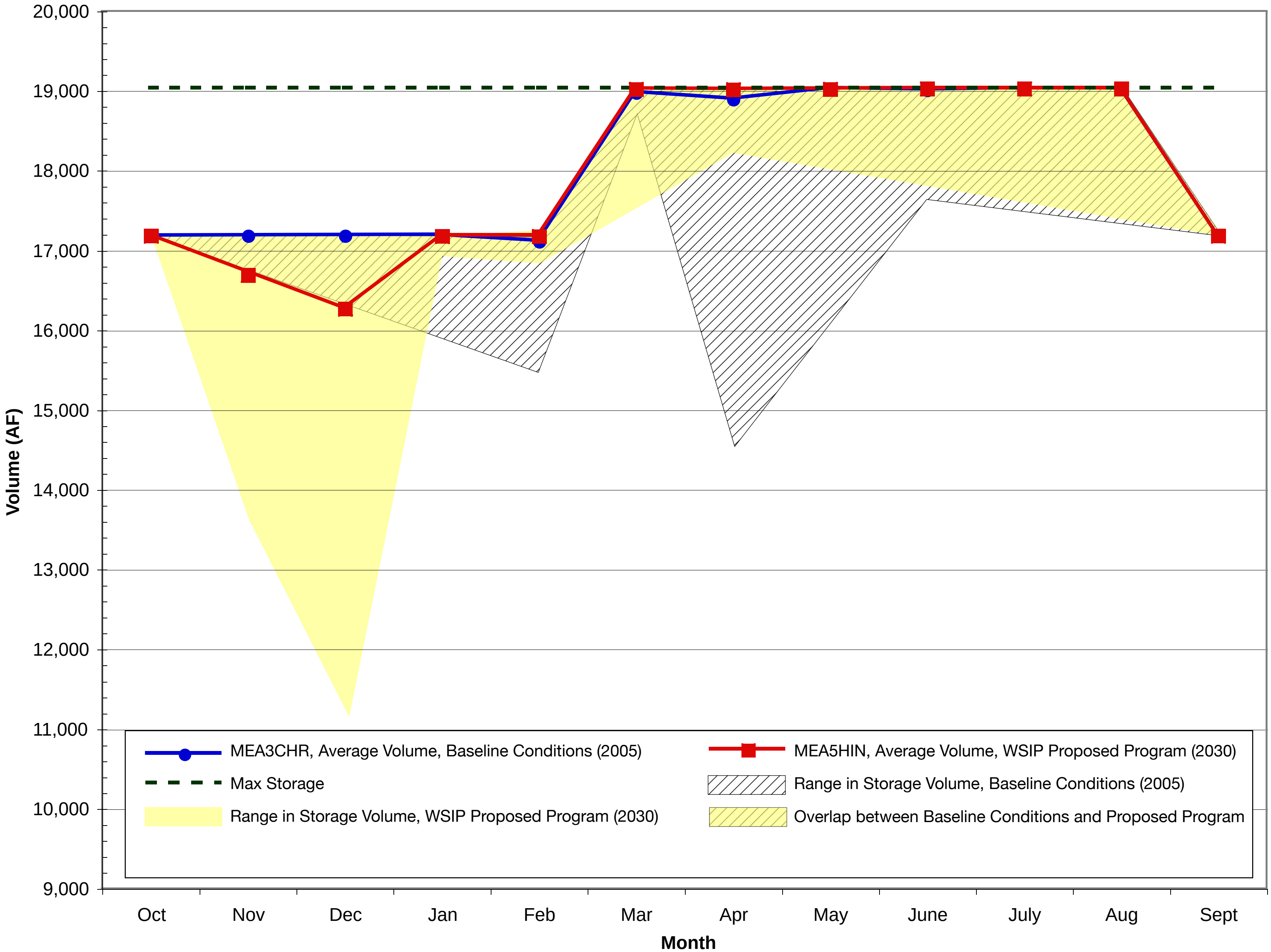
SOURCE: SFPUC, HH/LSM (see Appendix H).

Figure 5.5.1-8
Crystal Springs Storage and Releases to San Mateo Creek



SOURCE: SFPUC, HH/LSM (see Appendix H)

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Figure 5.5.1-9 (Revised)
Average Monthly Storage Volume,
San Andreas Reservoir

circumstances, the operators are unable to capture all of the runoff due to the unpredictability of the weather. Releases to the creek only occur when runoff cannot be contained in the reservoirs or conveyed to customers after treatment at the Harry Tracy Water Treatment Plant.

As a consequence of the reservoir operations described above, no releases are usually made from Crystal Springs Reservoir in dry, below-normal, and normal hydrologic years, and flow in San Mateo Creek immediately below Lower Crystal Springs Dam typically occurs only as a result of groundwater infiltration and seepage around the dam. Occasionally in wet months of wet and above-normal years, the SFPUC releases water from the reservoir, thus increasing flow in San Mateo Creek. As the creek flows toward San Francisco Bay, it gains flow from tributaries, groundwater infiltration, and discharges of urban stormwater. There is no stream gage on San Mateo Creek, so actual flows are not known. When the infrequent releases from Crystal Springs Reservoir occur, they probably represent a substantial proportion of flow in the creek. In the dry season, flow in the nontidal reach of the creek is minimal, consisting primarily of groundwater infiltration and urban stormwater associated with car washing and over-irrigation of landscaping.

With the WSIP in place, the SFPUC would operate the reservoirs in the San Mateo Creek watershed as they are currently operated. Releases to San Mateo Creek would occur infrequently, as they do under the existing condition, and would be of a similar magnitude.

Impact Conclusions

The WSIP would not alter the character of San Mateo Creek immediately below Lower Crystal Springs Dam—it is an intermittent stream under the existing condition and would remain so with the WSIP. Releases to the creek are infrequent under the existing condition and would remain so with the WSIP. The total volume of releases might be somewhat higher or lower than under the existing condition depending on circumstances, but the range of flows with the WSIP would be similar to those under the existing condition. Adverse impacts on flow along San Mateo Creek would be *less than significant*, and no mitigation measures would be required.

Impact 5.5.1-2: Effects on flow along Pilarcitos Creek.

Reservoir Operations

Pilarcitos Reservoir fills with runoff from the upper Pilarcitos Creek watershed. It receives only local runoff and cannot be filled with imported water. Water from the upper Pilarcitos Creek watershed is diverted to Crystal Springs and San Andreas Reservoirs for use by the SFPUC and is used to supply water to the Coastside CWD. Coastside CWD diverts water from Pilarcitos Creek at Stone Dam, about two miles below Pilarcitos Reservoir. During the rainy season, flow in Pilarcitos Creek at Stone Dam is sufficient to meet the Coastside CWD's needs. During the drier months, when creek flow below Pilarcitos Reservoir subsides, the SFPUC releases water from the reservoir for diversion by Coastside CWD. Pilarcitos Reservoir is drawn down in the drier months and then refilled in the rainy season. Pilarcitos Reservoir and Stone Dam are typically operated to minimize spills from Stone Dam to Pilarcitos Creek, although small experimental releases are currently being made as part of a study of aquatic resources. The WSIP would not change the SFPUC's operational goals for Pilarcitos Reservoir and Stone Dam, but, assuming implementation of the scenario described earlier, the program would affect water levels in the reservoir and flow in Pilarcitos Creek, both between Pilarcitos Reservoir and Stone Dam and below Stone Dam.

Water Storage and Water Levels in Pilarcitos Reservoir

Seasonal changes in storage and water surface elevation in Pilarcitos Reservoir under the existing condition are shown in Figure 5.5.1-6. **Figure 5.5.1-10** shows chronological modeled storage in Pilarcitos Reservoir using hydrology data from the period 1920 to 2002. The figure compares the WSIP to the existing condition. With the WSIP, storage in the reservoir would follow a similar seasonal pattern as under the existing condition, but would average somewhat less than under the existing condition and would be drawn down more rapidly in some years in the late spring and summer. The increased rate of drawdown is primarily attributable to increased water demand in the Coastside CWD service area, which is served by releases from the reservoir, and increased transfers of water to the San Mateo Creek watershed. As water demand increases in the Coastside CWD service area, additional water would be drawn from Pilarcitos Reservoir to meet demand, although diversion of water from Pilarcitos Creek to Coastside CWD is currently limited to a maximum of 2 mgd because of pipeline capacity. The HH/LSM assumes that when Coastside CWD's monthly demand from Pilarcitos Creek exceeds 2 mgd the SFPUC serves Coastside CWD from Crystal Springs Reservoir. Additional water would also be transferred from the Pilarcitos Creek watershed to the SFPUC's reservoirs in the San Mateo Creek watershed with the WSIP than under the existing condition. This is because with the WSIP more reservoir capacity in the San Mateo Creek watershed would be available at times when water is available from Pilarcitos Creek.

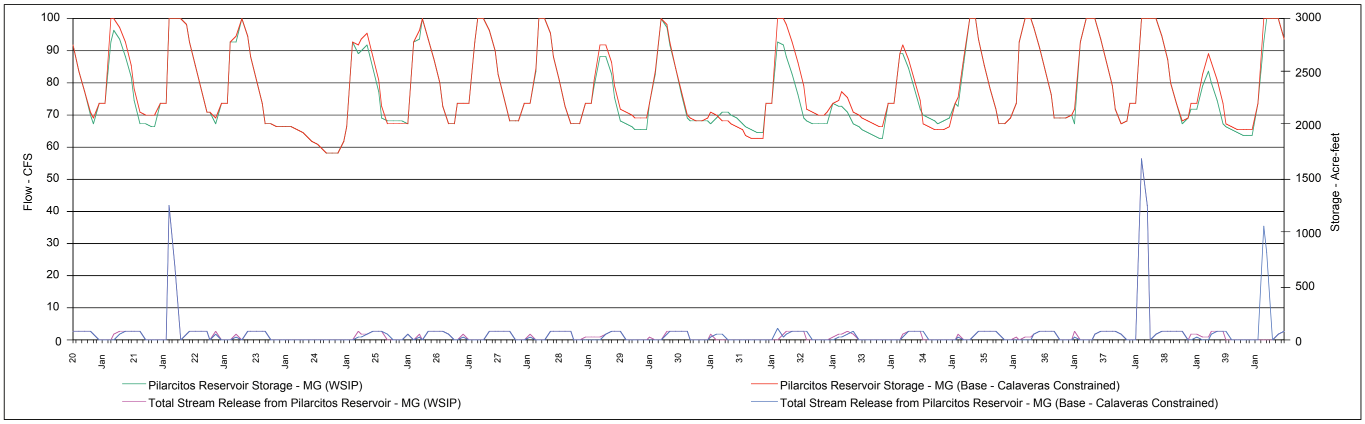
Under existing conditions and in most years, storage in Pilarcitos Reservoir becomes depleted by the late summer, and the only releases made to Pilarcitos Creek are the consequence of inflow from groundwater and tributary streams. Depletion of the reservoir in dry periods would occur earlier in the year with the WSIP.

Flow in Pilarcitos Creek between Pilarcitos Reservoir and Stone Dam

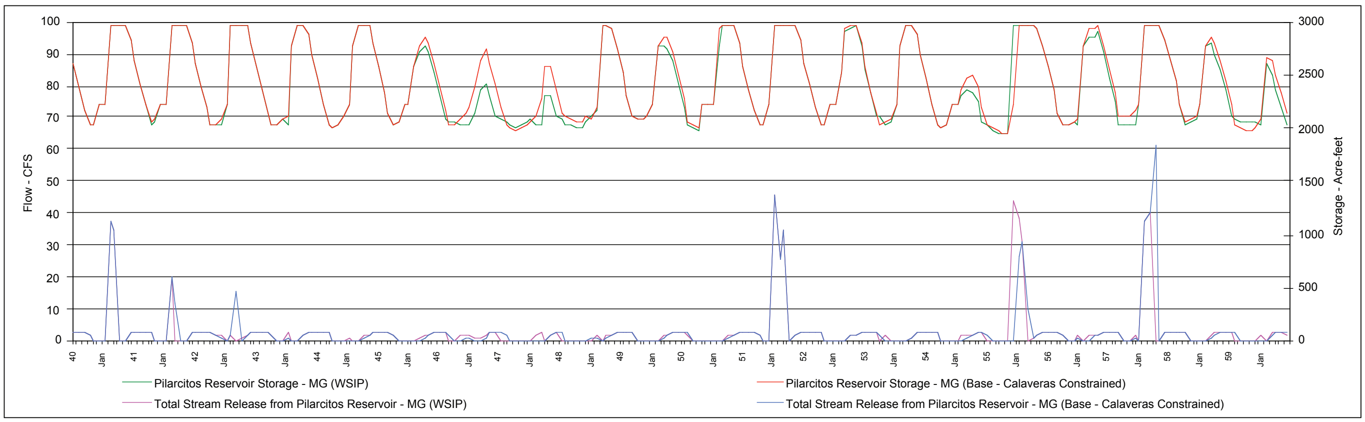
Releases to Pilarcitos Creek from Pilarcitos Reservoir under the existing condition and with the WSIP are shown in Figure 5.5.1-10. In normal, below normal, and dry years, the WSIP would have little or no effect on releases to Pilarcitos Creek from the reservoir. In average wet years and with the WSIP, releases would be reduced by about 6 percent. In average above normal years and with the WSIP, releases would be reduced by about 34 percent. The differences between releases under the existing condition and with the WSIP are shown in **Table 5.5.1-2** in every month for the period 1921 through 2002. Negative values indicate the months in which releases to the creek with the WSIP would be less than under the existing condition.

Under the existing condition, releases are typically made from Pilarcitos Reservoir to the creek to provide water to Coastside CWD, with the releases rising to the capacity of Coastside CWD's delivery pipeline in the summer when water demand is at its seasonal maximum. No releases are

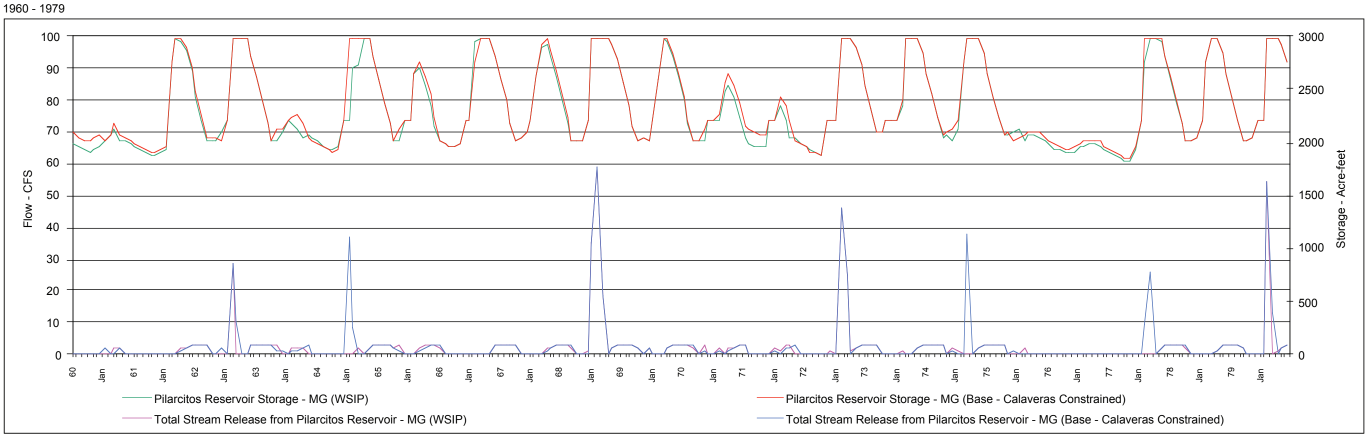
1920 - 1939



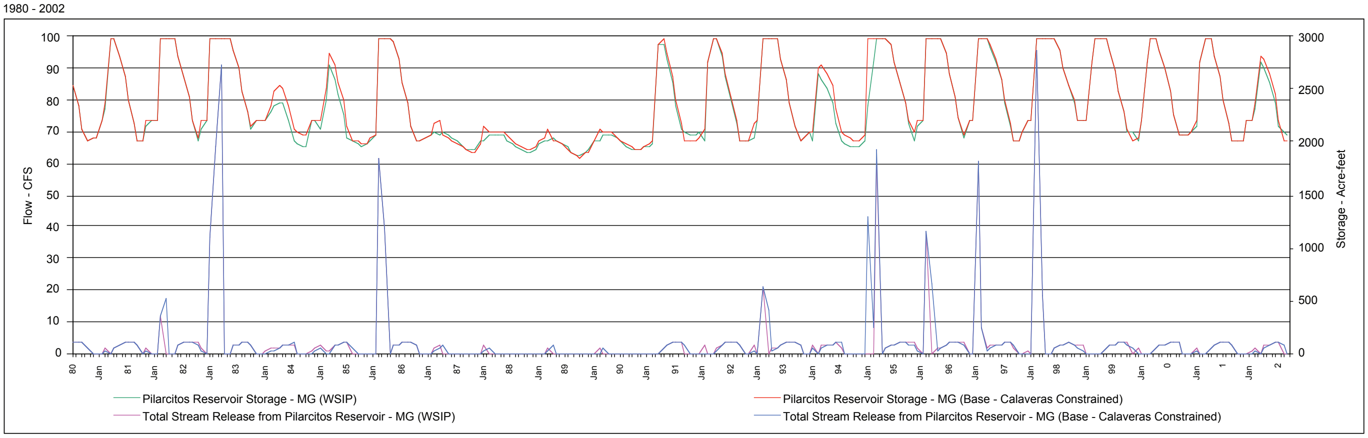
1940 - 1959



1960 - 1979



1980 - 2002



SOURCE: SFPUC, HH/LSM (see Appendix H)

SFPUC Water System Improvement Program . 203287

Figure 5.5.1-10 (New)
Pilarcitos Reservoir Storage and Stream Release

TABLE 5.5.1-2 (New)
AVERAGE MONTHLY CHANGES IN PILARCITOS CREEK FLOW BELOW PILARCITOS RESERVOIR ATTRIBUTABLE TO THE WSIP
(CUBIC FEET PER SECOND)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year Type
1983	6	4	0	74	131	182	0	0	5	5	6	6	Wet
1998	0	0	2	0	192	37	0	0	3	5	5	6	Wet
1958	0	0	5	0	74	81	-62	0	5	6	6	6	Wet
1941	4	0	0	0	76	69	0	0	5	6	6	6	Wet
1982	0	4	0	0	23	-17	0	0	5	6	6	6	Wet
1995	0	0	0	-43	-8	118	0	2	4	5	6	6	Wet
1956	0	0	131	90	62	-10	3	4	5	6	6	6	Wet
1952	4	0	0	92	51	70	0	4	5	6	6	6	Wet
1938	4	0	0	0	112	84	0	3	5	6	6	6	Wet
1997	6	0	0	122	16	4	5	5	6	6	6	3	Wet
1969	0	0	3	70	119	37	1	4	5	6	6	6	Wet
1973	0	0	3	0	92	51	2	4	5	6	6	6	Wet
1986	0	0	0	0	123	79	0	4	5	6	6	6	Wet
1980	0	0	2	0	109	-13	2	4	5	6	6	6	Wet
1942	6	0	0	0	41	-12	0	0	5	6	6	6	Wet
1967	0	0	0	0	0	0	0	0	5	6	6	6	Wet
1963	0	0	-2	0	57	-10	0	0	5	6	6	6	AN
1940	0	0	0	0	-36	-27	0	4	5	6	6	6	AN
1965	0	0	0	-37	-9	5	0	4	5	6	6	6	AN
1996	6	7	4	0	77	-22	3	4	5	6	6	6	AN
1922	0	0	0	0	83	46	0	4	6	6	6	6	AN
1975	6	0	6	4	0	-38	0	3	5	6	6	6	AN
1974	0	2	0	0	4	0	0	3	5	6	6	6	AN
1978	0	0	0	0	-9	-26	0	4	5	6	6	6	AN
1993	0	0	7	0	43	-13	3	4	6	6	6	6	AN
1951	0	0	0	0	0	0	4	4	5	6	6	6	AN
1943	5	4	5	0	3	-16	1	4	5	6	6	6	AN
1927	0	0	4	0	0	0	0	5	6	6	6	6	AN
1937	0	0	0	8	0	0	0	4	6	6	6	6	AN
2000	6	-2	5	0	0	0	4	5	6	6	6	6	AN
1921	7	4	0	0	0	4	5	5	6	6	5	0	AN
1999	6	7	5	0	0	0	0	3	5	6	6	6	AN
1923	0	6	0	0	0	5	0	5	6	6	6	5	AN
1953	6	0	0	0	1	0	4	4	6	6	6	6	NORMAL
1928	0	0	1	4	1	0	0	5	6	6	6	5	NORMAL
1970	4	0	4	0	0	0	4	5	6	6	6	4	NORMAL
1984	6	0	0	2	4	4	4	4	6	4	0	0	NORMAL
1946	3	0	0	0	0	4	4	4	6	6	6	-2	NORMAL
1926	0	0	0	5	0	5	0	5	6	6	6	4	NORMAL
1936	3	0	0	2	0	2	2	4	6	6	6	6	NORMAL
1945	0	0	0	4	0	0	3	4	6	6	6	6	NORMAL
1971	0	7	0	0	5	2	4	5	6	6	0	0	NORMAL
1935	0	0	0	0	5	0	0	3	6	6	6	6	NORMAL
1932	0	0	0	0	-4	5	6	6	6	6	-3	0	NORMAL
1979	5	0	0	0	0	0	3	5	6	6	6	5	NORMAL
1962	0	0	0	0	0	0	5	5	6	6	6	5	NORMAL
1949	0	0	0	-1	4	0	3	4	6	6	6	6	NORMAL
1992	0	0	0	7	0	0	5	6	6	6	6	4	NORMAL
1981	3	0	0	0	4	0	4	5	6	6	6	4	NORMAL
2001	0	0	0	4	0	0	4	5	6	6	6	4	BN
1930	0	0	0	2	1	0	5	5	6	6	6	0	BN
1954	-2	6	0	0	0	0	3	5	6	6	6	6	BN
1968	5	0	0	0	0	2	4	5	6	6	6	4	BN
1959	6	0	0	0	0	5	5	5	6	6	-2	0	BN
1925	0	0	0	0	0	6	4	3	6	6	6	-2	BN
1944	4	0	0	6	0	0	4	5	6	6	6	6	BN
2002	0	0	0	0	4	0	5	5	6	6	-3	0	BN
1950	0	0	0	0	0	5	4	5	6	6	3	0	BN
1966	4	7	0	1	0	5	6	6	6	2	0	0	BN
1955	0	0	0	0	4	4	4	5	6	-2	0	0	BN
1957	4	0	0	5	0	4	4	3	6	6	6	6	BN
1934	0	0	1	0	0	5	6	6	6	-3	0	0	BN
1985	0	2	4	6	1	1	6	5	6	6	-2	0	BN
1991	0	0	0	0	0	0	5	6	6	6	6	-2	BN
1929	0	0	2	3	3	2	4	6	6	6	0	0	BN
1964	5	7	-1	0	5	6	5	-3	0	0	0	0	BN

TABLE 5.5.1-2 (New) (Continued)
AVERAGE MONTHLY CHANGES IN PILARCITOS CREEK FLOW BELOW PILARCITOS RESERVOIR ATTRIBUTABLE TO THE WSIP
(cubic feet per second)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year Type
1947	0	6	4	4	4	3	4	5	6	-3	-2	0	DRY
1994	4	0	0	6	0	6	5	5	6	2	0	0	DRY
1939	6	0	4	5	2	4	5	6	6	-2	0	0	DRY
1948	0	0	0	0	6	9	1	4	6	-3	0	0	DRY
1960	0	0	0	6	0	6	6	6	4	0	0	0	DRY
1972	0	0	1	5	3	7	6	-3	0	0	0	0	DRY
1933	0	0	0	2	5	5	5	3	0	0	0	0	DRY
1961	0	0	0	-2	0	5	3	0	0	0	0	0	DRY
1990	0	0	0	0	5	-1	0	0	0	0	0	0	DRY
1987	4	0	0	0	5	5	-2	0	0	0	0	0	DRY
1988	0	0	0	7	-1	0	0	0	0	0	0	0	DRY
1989	0	0	0	0	0	5	-2	0	0	0	0	0	DRY
1931	0	0	0	6	-1	-1	0	0	0	0	0	0	DRY
1976	6	0	-2	0	6	0	0	0	0	0	0	0	DRY
1977	0	0	0	0	0	0	0	0	0	0	0	0	DRY
1924	0	0	0	0	0	0	0	0	0	0	0	0	DRY

NOTES: Hydrologic year types were determined by rank ordering of total SFPUC Bay Area reservoir inflow.
Year Types: Wet, AN -- Above Normal, Normal, BN -- Below Normal, and Dry

SOURCE: SFPUC, HH/LSM (see Appendix H)

made if the runoff from tributary streams between Pilarcitos Reservoir and Stone Dam is sufficient to meet demand in the Coastside CWD service area, although spills from the reservoir may occur if it is full. With the WSIP, releases would follow the same seasonal pattern of water demand as under the existing condition, but the releases would be at the capacity of Coastside CWD's delivery pipeline more of the time in order to meet increased water demand in the Coastside CWD service area.

Under the existing condition during normal, below-normal, and dry years, storage in Pilarcitos Reservoir is routinely drawn down so far by late summer that the releases do not meet Coastside CWD's needs. During these times, Coastside CWD activates a pump and draws water from Crystal Springs Reservoir. This would occur more frequently in the future with the WSIP, given the expected increase in Coastside CWD's water demand.

Most runoff into Pilarcitos Reservoir occurs between November and April. In normal, above-normal, and wet years, when the reservoir is full and runoff exceeds the capacity of the diversion tunnels to San Andreas and Crystal Springs Reservoirs, or those reservoirs are full, the reservoir spills to Pilarcitos Creek.

As shown in Figure 5.5.1-10, the WSIP would not affect wintertime spills in most years, but it would reduce spills in some wet and above normal years. Occasionally (for example, under 1940, 1943, 1965 and 1976 hydrologic conditions), wintertime spills that occur under the existing condition would be completely or almost completely eliminated with the WSIP.

The WSIP would increase flow in Pilarcitos Creek immediately below Pilarcitos Reservoir in some late spring and summer months of most hydrologic year types as a result of increased releases from the reservoir to meet Coastside CWD's needs. The increases are shown as positive values in April, May, June and July in Table 5.5.1-2. In the summer months of some years, Pilarcitos Reservoir would become depleted earlier in the year with the WSIP than it does under the existing condition. Coastside CWD would activate its pumps and draw water from Crystal Springs Reservoir earlier in the year than it does under the existing condition. At such times, there would be no releases from Pilarcitos Reservoir to the creek except for dry season inflow to the reservoir. Flow in the creek below the reservoir would be the same as under the existing condition, consisting of inflow releases, seepage from the dam, infiltration from groundwater, and tributary flow. The period of minimal flow below Pilarcitos Reservoir would be extended with the WSIP, because the reservoir would be drawn down to its minimum elevation earlier in the year. Table 5.5.1-2 shows negative values in some years between May and September. These are months in which releases from Pilarcitos Reservoir occur under the existing condition but which would be reduced or eliminated under the WSIP.

Flow in Pilarcitos Creek Below Stone Dam

Under the existing condition, water occasionally spills over Stone Dam to Pilarcitos Creek. There is little flow in Pilarcitos Creek immediately below Stone Dam most of the time, and no flow in dry periods. Spills over Stone Dam occur when releases from Pilarcitos Reservoir and runoff into Pilarcitos Creek between the reservoir and Stone Dam exceed the capacity of the diversion at Stone Dam. Occasional spills over Stone Dam would continue under the WSIP. The volume of spills would be reduced by the additional amount of Pilarcitos Creek water the SFPUC supplies to Coastside CWD or diverts to its reservoirs in the San Mateo Creek watershed.

Spills at Stone Dam typically occur when Pilarcitos Reservoir is full, Coastside CWD's demand is met, and the SFPUC cannot transfer water to the San Mateo Creek watershed, either because available water in the Pilarcitos Creek watershed exceeds the capacity of the SFPUC's tunnels to San Andreas and Crystal Springs Reservoirs, or those reservoirs are already full. Spills very rarely occur in dry and below normal years under the existing condition and would very rarely occur with the WSIP. With the WSIP, average annual spills in wet, above normal and normal years would be reduced by about 11, 60, and 25 percent, respectively, compared to the existing condition.

Because most flow from the upper watershed of Pilarcitos Creek is diverted for municipal water supply, most of the flow in the creek below Stone Dam is supplied by runoff from the lower watershed. For example, in the four-month period between January and April of 1998 (a wet year), total measured flow in Pilarcitos Creek at Half Moon Bay, near the mouth of the creek, was about 32,300 acre-feet (equivalent to a continuous flow of 136 cfs). At a gage that records both spills at Stone Dam and flow in a Pilarcitos Creek tributary downstream of the dam, flow was measured at 10,500 acre-feet (equivalent to a continuous flow of 44.2 cfs) for the same period. Thus, spills in 1998 over Stone Dam represented less than one-third of total flow in Pilarcitos Creek.

Impact Conclusions

The WSIP would not alter the character of Pilarcitos Creek immediately below Stone Dam. Flow in the creek immediately below the dam is intermittent under the existing condition and would continue to be intermittent with the WSIP, so no adverse hydrologic effects would occur. With the WSIP, total spills to the creek immediately below Stone Dam would be reduced, but the magnitude of the flows in the lower reaches of the creek would be similar to those under existing conditions. Therefore, adverse impacts on water levels in Pilarcitos Reservoir and on flow along Pilarcitos Creek below Stone Dam would be *less than significant*, and no mitigation measures would be required.

Flow in Pilarcitos Creek immediately below Pilarcitos Reservoir would be the same or greater with the WSIP than under the existing condition most of the time. In dry periods and in the summer, releases to the creek from Pilarcitos Reservoir would be reduced to dry-season reservoir inflow at an earlier date than under the existing condition. The creek's character in the reach immediately below Pilarcitos Reservoir would not be altered from its existing condition. The creek experiences minimal flow in most summers under the existing condition and would continue to do so with the WSIP. Therefore, this impact would be *less than significant*, and no mitigation measures would be required.

References – Stream Flow and Reservoir Water Levels

Todd Engineers, *Lower Pilarcitos Creek Groundwater Basin Study*, 2003.

5.5.2 Geomorphology

The following setting section describes the geomorphology of the streams on the San Francisco Peninsula that could be affected by the WSIP. The impact section (Section 5.5.2.2) provides a description of the changes in stream channel form and erosion and siltation rates that would result from WSIP-induced changes in stream flow, as described in Section 5.5.1.

5.5.2.1 Setting

Geomorphology

The geomorphology of the SFPUC Peninsula watershed is defined by the San Andreas fault and its associated steep terrain, northwest-trending ridges and valleys, and ongoing uplifting and erosional processes. Fifield and Cahill Ridges divide the two principal watersheds, San Mateo Creek to the east and Pilarcitos Creek to the west. The San Mateo Creek watershed above Crystal Springs Dam is 22.5 square miles in size, in addition to the 4.4-square-mile watershed above San Andreas Reservoir. The Pilarcitos Creek watershed above Pilarcitos Reservoir is 3.8 square miles.

San Mateo Creek below Crystal Springs Dam initially flows eastward through a steep canyon for about 1.5 miles, then enters the broad, gently sloping lands surrounding San Francisco Bay. The canyon itself is rather narrow, but contains several alluvial terraces for most of its length. In the canyon, San Mateo Creek has a 1 percent slope. It passes through Franciscan Complex sandstone and some serpentine, then through the Colma Formation, a Pleistocene formation of marine and nonmarine sands and clays, and the recent Temescal Formation, which is composed primarily of fine-textured sand. The channel in San Mateo Creek canyon is primarily riffle and pool. The creek channel is comparatively deep and broad for the current flow due to the high historical unimpaired flows. The channel bed is composed primarily of sand and silt, with some gravel deposits. Below the canyon, San Mateo Creek is a meandering channel with a slope of about 0.25 percent. This reach of the creek has been highly modified and constrained by urbanization. The creek flows through several culverts before discharging to San Francisco Bay.

Above Crystal Springs Dam, San Andreas Creek empties into San Andreas Reservoir. Its natural course below the dam follows a straight, narrow valley along the San Andreas fault southeasterly into Lower Crystal Springs Reservoir. San Mateo Creek itself originates to the southwest, in the steep country between Fifield and Sawyer Ridges. It follows a relatively straight course for nearly eight miles before emptying into Lower Crystal Springs Reservoir. The creek’s slope varies from about 1 percent in the upper reaches and about 2 percent in the narrow canyon before it enters the reservoir. From the southeast, Laguna Creek is the principal tributary to Upper Crystal Springs Reservoir, which is connected via culverts with Lower Crystal Springs Reservoir. Rainfall within the watershed ranges from about 30 to 40 inches per year (USDA, 1961).

The northern portion of the upper San Mateo Creek watershed is steep and rugged. Like the Pilarcitos Creek watershed, average hillslope gradients range from 3:1 to 1:1 (horizontal to vertical ratio), while the southern portion of the watershed has average gradients ranging from

5:1 to 3:1 (San Francisco Planning Department, 2001). The San Andreas Creek and San Mateo Creek watersheds are composed of Franciscan Complex sedimentary and metamorphic rocks. Sandstone, shale, chert, and conglomerate marine deposits are predominant to the southwest of the San Andreas fault, while metamorphosed Franciscan rock, such as serpentine, is widespread on the northeastern side of the fault. The watershed surrounding Upper Crystal Springs Reservoir is composed of Butano Formation, Eocene marine sedimentary rocks such as fine-textured sandstones and shale (Jennings and Burnett, 1961).

Sediment transport thresholds and rates have not been monitored or evaluated in these reaches. No sediment transport data have been quantified for these watersheds. However, the steep slopes are inherently highly erodible, and natural landslides are an important landscape-forming influence. This watershed has been unaffected by livestock grazing and wildfire for many decades. The SFPUC has constructed and maintains a system of sediment catchment basins around the reservoirs to capture the incoming sediment.

Pilarcitos Creek originates in between Fifield Ridge and the western Coast Ranges. It follows the Pilarcitos fault, parallel to and west of the San Andreas fault. Three unnamed tributaries flow into Pilarcitos Reservoir through relatively low-gradient valleys consisting of Farallone coarse sandy loam. Below the reservoir, Pilarcitos Creek flows in a southeasterly direction past Stone Dam, eventually emptying into the Pacific Ocean near Half Moon Bay. The upper reaches above Pilarcitos Reservoir are composed of Franciscan Complex volcanic, metavolcanic (metamorphosed volcanic rock), and sedimentary Cretaceous rock. Below the dam, Mesozoic granite underlies the western side of the creek, and Franciscan Complex bedrock underlies the eastern side (Jennings and Burnett, 1961). The corresponding soils are Hugo and Josephine loam and Sheridan coarse sandy loam.

Slopes in the Pilarcitos Creek watershed have average gradients ranging from 3:1 to 1:1 (San Francisco Planning Department, 2001). The slopes in the canyon below Pilarcitos Dam are extremely steep. For about a mile downstream from Pilarcitos Dam, Pilarcitos Creek has a slope of about 1 percent. Soils are mapped as a gravelly substrate with no further classification (USDA, 1961). There is very little terracing in the narrow valley, and bedrock is frequently exposed. Average annual rainfall is 45 inches at Pilarcitos Reservoir, and the typical five-year storm brings 3.6 inches of rainfall in 24 hours (USDA, 1961).

5.5.2.2 Impacts

Significance Criteria

The CCSF has not formally adopted significance standards for impacts related to geomorphology, but generally considers that implementation of the proposed program would have a significant impact if it were to:

- Substantially change the topography such that ecological, hydrologic, or aesthetic functions are adversely affected, or substantially change any unique geologic or physical features of the site or area

- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of the stream or river, in a manner that would result in substantial erosion or siltation or adversely affect the ecological, hydrologic, or aesthetic functions of the site or area

Although the “substantial change in topography” criterion is typically applied to upland areas, it is considered applicable to stream channel/bank topography in this instance because of the sensitivity of the resources that depend on the topography of these features (i.e., riparian vegetation and fisheries). For a stream channel, the relevant aspect of topography to be evaluated are those associated with channel form and the related movement and distribution of sediment.

Approach to Analysis

This impact section presents a discussion of projected changes in sediment transport and geomorphology based on changes in stream flow, reservoir storage, and related reservoir water levels that would result from WSIP implementation, as described in Section 5.5.1. A qualitative assessment of potential effects was conducted based on generalized channel bed/bank characteristics and consideration of proposed changes in stream flow that would result from implementation of the WSIP.

Impact Summary

Table 5.5.2-1 presents a summary of the impacts on sediment transport and geomorphology in the Peninsula watershed that could result from implementation of the proposed water supply and system operations.

TABLE 5.5.2-1
SUMMARY OF IMPACTS – GEOMORPHOLOGY
OF SAN FRANCISCO PENINSULA STREAMS AND RESERVOIRS

Impact	Significance Determination
Impact 5.5.2-1: Changes in sediment transport and channel morphology in the Peninsula watershed	LS

LS = Less than Significant impact, no mitigation required

Impact Discussion

Impact 5.5.2-1: Changes in sediment transport and channel morphology in the Peninsula watershed.

Changes in storage and water levels in reservoirs in the San Mateo Creek watershed attributable to the WSIP were estimated using the HH/LSM. An overview of the model is presented in Section 5.1. Detailed information on the model and the assumptions that underlie it is provided in Appendix H. Changes in stream flow and reservoir storage and water levels in the Pilarcitos

Creek watershed attributable to the WSIP were estimated semi-quantitatively by reviewing historical data and consulting with individuals knowledgeable about past and expected future reservoir operations.

Releases to San Mateo Creek downstream of Lower Crystal Springs Dam are expected to be approximately the same with the WSIP as they are under the existing condition. Thus, the WSIP would have no effect on channel-forming events and sediment transport in this already highly impaired creek.

Implementation of the WSIP would also result in higher average reservoir levels in Upper and Lower Crystal Springs Reservoirs, which in turn would cause tributary streams to deposit their sediment at correspondingly higher elevations. The amount of incoming sediment would not be affected. The reservoir level at San Andreas Reservoir is projected to change very little, so no impact on sediment transport and channel morphology would occur, even at the mouths of tributary streams.

Increased releases from Pilarcitos Reservoir into Pilarcitos Creek in most spring and early summer months would increase sediment transport and channel-forming processes in the creek compared to the existing condition. The projected lower flows in the summer months of dry years would reduce sediment transport and channel-forming processes compared to the existing condition. Both the increases and decreases in sediment transport would be small and relatively inconsequential, because channel form is largely a function of the magnitude and frequency of occasional large winter flows, which would not be affected by the WSIP.

Under the WSIP, spills over Stone Dam in the wet months of above-normal and wet years would be reduced in frequency and magnitude. This could in turn reduce sediment movement and channel-forming processes in the reach of Pilarcitos Creek immediately below the dam, but with decreasing effect in a downstream direction as tributaries add flow to the creek.

WSIP-induced changes in flow in San Mateo and Pilarcitos Creeks and the changes in reservoir level in Pilarcitos, San Andreas, and Upper and Lower Crystal Springs Reservoirs would result in small incremental reductions or no change in sediment transport and channel-forming processes.

The projected changes in flow would result in insignificant changes in topography, drainage patterns, erosion, and siltation in and away from the creeks and reservoirs in the Peninsula watershed. Therefore, impacts on fluvial geomorphologic characteristics in the Peninsula watershed would be *less than significant*, and no mitigation is required.

References – Geomorphology

Jennings, Charles W. and John Burnett, *Geologic Map of California, San Francisco Sheet*, California Department of Natural Resources, Sacramento, 1961.

San Francisco Planning Department, *Peninsula Watershed Management Plan EIR*, prepared by Environmental Science Associates for the San Francisco Planning Department, 2001.

U.S. Department of Agriculture (USDA), *Soil Survey, San Mateo Area*, 1961.

5.5.3 Surface Water Quality

The following setting section describes surface water quality in streams and reservoirs on the San Francisco Peninsula that could be affected by the WSIP. The impact section (Section 5.5.3.2) provides a description of the changes in water quality in streams and reservoirs that would result from WSIP-induced changes in stream flow and reservoir water levels.

5.5.3.1 Setting

The SFPUC operates four reservoirs on the Peninsula: the Pilarcitos, Upper and Lower Crystal Springs, and San Andreas Reservoirs. The Upper and Lower Crystal Springs Reservoirs function as a single water body. The WSIP could affect water quality in the reservoirs. Water quality in two streams on the San Francisco Peninsula could also be affected by the WSIP. They are San Mateo Creek and Pilarcitos Creek, both of which rise in the Coast Range mountains. San Mateo Creek, and its tributary San Andreas Creek, flow southward in the rift valley formed by the San Andreas fault and then turn east, flowing to San Francisco Bay. Pilarcitos Creek also flows southward, but it turns to the west and flows to the Pacific Ocean.

Crystal Springs Reservoir, San Andreas Reservoir, and San Mateo Creek

Water quality in San Andreas and Crystals Springs Reservoirs reflects that of its sources—local runoff, Alameda Creek, Pilarcitos Creek, and the Tuolumne River. Because the Tuolumne River is the source of most of the water, it is the predominant influence on water quality in the reservoirs. Water quality is generally very good, exhibiting low concentrations of total dissolved solids and plant nutrients (nitrates and phosphates).

Crystal Springs Reservoir stratifies in the summer months; that is, the upper part of the reservoir (the "epilimnion") warms, while water in the lower part of the reservoir (the "hypolimnion") remains cool. The dividing line between the two zones is called the thermocline and is typically 25 to 50 feet below the surface of the reservoir. The two zones do not mix, and water in the hypolimnion becomes depleted of oxygen. As air temperatures drop in the fall and water in the epilimnion cools, the reservoir "turns over." The reservoir then destratifies and water in the two zones mixes.

Although nutrient concentrations in the reservoirs are low, they are sufficient to support the growth of algae in the summer months. Algae in a water source can make water treatment more difficult and cause taste and odor problems with finished water. In 2005, the SFPUC changed the method it uses to disinfect water in order to comply with drinking water standards. Formerly, the SFPUC disinfected water with chlorine; now it uses chloramine, a chemical compound that contains both chlorine and ammonia. Ammonia is a form of nitrogen that rapidly decomposes in natural waters to another form of nitrogen called nitrate. Past studies have shown that the growth of algae in Crystal Springs Reservoir is limited by a lack of nitrogen and phosphorus, both of which are plant nutrients; therefore, an increase in the concentration of either could increase the growth of algae. To avoid the discharge of nitrogen and the possible consequent increase in algae concentration in Crystal Springs Reservoir, the SFPUC constructed dechloramination facilities at the same time it constructed chloramination facilities. The dechloramination facilities completely remove the chlorine and remove most of the ammonia from water before it is discharged to Crystal Springs Reservoir. The use of chloramine as a disinfectant has resulted in a small increase in the concentration of nitrate in Crystal Springs Reservoir (SFPUC, 2006).

When Lower Crystal Springs Reservoir spills, water quality in San Mateo Creek is very similar to reservoir water quality. However, most of the time, when creek flow immediately below Lower Crystal Springs Dam consists of seepage from the dam and inflow from the ground, the quality of water in the creek is lower than that in the reservoir. **Table 5.5.3-1** shows water quality at three locations along San Mateo Creek below Lower Crystal Springs Dam as measured between May 2003 and February 2004. Water quality at the Polhemus sampling station 0.7 mile below Lower Crystal Springs Dam was generally good, with a total dissolved solids concentration in the range 124 to 211 milligrams per liter (mg/L) and dissolved oxygen concentrations at or near saturation. Water quality deteriorated as San Mateo Creek flowed through the urban areas to San Francisco Bay. Total dissolved solids concentrations at the Gateway Park station, 5.1 miles downstream of Crystal Springs Dam, were in the range of 332 to 427 mg/L, except on one occasion when sampling results were affected by the tide. Late-summer and fall dissolved oxygen concentrations were at about 50 percent saturation.

Pilarcitos Reservoir and Pilarcitos Creek

Water quality in Pilarcitos Reservoir is good because the Pilarcitos Creek watershed above the reservoir is largely undeveloped. Plant nutrient concentrations in Pilarcitos Reservoir water are low, but 50 to 100 percent greater than in the water stored in the San Andreas and Crystal Springs Reservoirs. Summertime algae concentrations in Pilarcitos Reservoir are also greater than those in Crystal Springs and San Andreas Reservoirs.

Like Crystal Springs Reservoir, Pilarcitos Reservoir stratifies in the summer months. Water in the bottom part of the reservoir becomes depleted of oxygen.

Beneficial Uses and Water Quality Objectives

Pursuant to the federal Clean Water Act and the Porter-Cologne Water Quality Control Act, the San Francisco Bay Regional Water Quality Control Board has designated beneficial uses that Crystal Springs, San Andreas, and Pilarcitos Reservoirs and San Mateo and Pilarcitos Creeks must support. Designated existing beneficial uses for Crystal Springs, San Andreas, and Pilarcitos Reservoirs are municipal and domestic water supply (MUN), non-water-contact recreation (REC-2), cold freshwater habitat (COLD), warm freshwater habitat (WARM), fish spawning (SPWN), wildlife habitat (WILD), and rare and endangered species (RARE). Pilarcitos Reservoir is listed as having water-contact recreation as a limited beneficial use.

Existing designated beneficial uses for San Mateo Creek are freshwater replenishment (FRSH), SPWN, and RARE. Potential beneficial uses of San Mateo Creek are water contact recreation (REC-1), REC-2, and COLD. Current designated beneficial uses of Pilarcitos Creek are agricultural water supply (AGR), MUN, COLD, WARM, SPWN, RARE, WILD, and migration of aquatic organisms (MGR). Potential designated uses of Pilarcitos Creek are REC-1 and REC-2.

TABLE 5.5.3-1
WATER QUALITY IN SAN MATEO CREEK BELOW CRYSTAL SPRINGS RESERVOIR

Water Quality Parameter (Median Values)	Monitoring Station		
	Polhemus	**Arroyo Court Park**	**Gateway Park**
Distance downstream of Crystal Spring Dam, miles	0.7	4.2	5.1
Median Electrical Conductivity, µS/cm (total dissolved solids, mg/L)			
May 2003	230 (133)	514 (298)	607 (352)
Aug 2003	214 (124)	551 (320)	737 (427)
Oct 2003	183 (106)	493 (286)	27,600 (16,000)[a]
Feb 2004	364 (211)	681 (395)	572 (332)
Dissolved Oxygen, mg/L (% of saturation)			
May 2003	10.8 (101%)	5.5 (52%)	9.5 (91%)
Aug 2003	7.9 (85%)	7.2 (76%)	3.8 (43%)
Oct 2003	8.2 (83%)	9.4 (92%)	4.3 (46%)
Feb 2004	10.4 (91%)	11.8 (102%)	10.8 (93%)
Temperature, °C			
May 2003	13	13	13
Aug 2003	19	18	19
Oct 2003	16	15	16
Feb 2004	9	9	9

[a] This measurement was influenced by the tidal incursion of saline water.
°C = degrees Celsius
mg/L = milligrams per liter
µS/cm = microsiemens per centimeter

SOURCE: SFPUC, 2004.

Prior to being discharged into Upper Crystal Springs Reservoir, Hetch Hetchy system water that has been disinfected with chloramine is treated to remove chlorine and ammonia and to adjust its pH. Chloramine contains chlorine and ammonia, both of which are toxic to aquatic organisms. The Regional Water Quality Control Board has established a discharge limit of 0.0 mg/L for chlorine residual, which includes both free chlorine[1] and chloramine. In order to meet this limit, the SFPUC neutralizes the chloramine residual in Hetch Hetchy water before it is discharged to the two reservoirs, thus eliminating toxicity to aquatic life. However, some residual ammonia remains after neutralization (SFPUC, 2006).

1 Free chlorine consists of a compound, hypochlorous acid, and the hypochlorite ion, both of which form when chlorine gas is added to water.

Unlike chlorine, ammonia is regulated as a water quality objective for receiving waters. Ammonia exists in two forms in water: un-ionized and ionized forms. Un-ionized ammonia is toxic, whereas its ionized form is relatively harmless. The water quality objective for ammonia is specified as un-ionized ammonia (the toxic form), and the water quality objective of 0.40 mg/L of un-ionized ammonia as nitrogen applies. The relative concentration of the two forms of ammonia depends on the pH and temperature of the water. The un-ionized (toxic) form increases as the temperature and pH increase. In the temperature and pH range of natural waters, the nontoxic form of ammonia predominates; in most instances, ammonia in discharges is diluted or degraded to a nontoxic form fairly rapidly. In the SFPUC water supply, the maximum total ammonia concentration before dechloramination is about 0.5 mg/L. When added to Crystal Springs Reservoir under typical receiving-water conditions (pH = 8.5, and water temperature = 24 °C), the maximum resulting concentration of un-ionized ammonia would be about 0.07 mg/L, which is well below the objective of 0.40 mg/L. However, because water is dechloraminated prior to discharge into the reservoir, the actual concentrations of un-ionized ammonia would be close to zero.

5.5.3.2 Impacts

Significance Criteria

The CCSF has not formally adopted significance standards for impacts related to surface water quality, but generally considers that implementation of the proposed program would have a significant surface water quality impact if it were to:

- Substantially impair a water body's ability to support beneficial uses designated by the State Water Resources Control Board or Regional Water Quality Control Board
- Otherwise substantially degrade water quality

Approach to Analysis

Changes in reservoir storage and water levels in the San Mateo Creek watershed and changes in reservoir storage, water levels and stream flows in the Pilarcitos Creek watershed attributable to the WSIP were estimated using the HH/LSM. An overview of the model is presented in Section 5.1. Detailed information on the model and the assumptions that underlie it are provided in Appendix H. Changes in stream flows in the San Mateo Creek watershed attributable to the WSIP were estimated semi-quantitatively in consultation with individuals knowledgeable about historical, current, and expected future (with-WSIP) water system operations.

Impact Summary

Table 5.5.3-2 presents a summary of the impacts on the water quality of Peninsula watershed streams and reservoirs that could result from implementation of the proposed water supply and system operations.

TABLE 5.5.3-2
SUMMARY OF IMPACTS – WATER QUALITY
OF SAN FRANCISCO PENINSULA STREAMS AND RESERVOIRS

Impact	Significance Determination
Impact 5.5.3-1: Effects on water quality in Crystal Springs Reservoir, San Andreas Reservoir, and San Mateo Creek	LS
Impact 5.5.3-2: Effects on water quality in Pilarcitos Reservoir and along Pilarcitos Creek	PSM

LS = Less than Significant impact, no mitigation required
PSM = Potentially Significant impact, can be mitigated to less than significant

Impact Discussion

Impact 5.5.3-1: Effects on water quality in Crystal Springs Reservoir, San Andreas Reservoir, and San Mateo Creek.

Crystal Springs and San Andreas Reservoirs

The proposed program would affect water quality in Crystal Springs and San Andreas Reservoirs. Average monthly storage would increase in Crystal Springs Reservoir by 5 to 10 percent. The reservoir would capture more local runoff and hold more water from the Hetch Hetchy system. However, the proportions of local runoff and Hetch Hetchy water in the reservoir with the WSIP would remain about the same most of the time compared to existing conditions.

It is possible, however, that with the WSIP the proportion of Hetch Hetchy water in Crystal Springs Reservoir could increase at times relative to existing conditions, particularly in the winter. An increase in the proportion of Hetch Hetchy water, which is disinfected with chloramine, would increase the concentration of nitrogen to the reservoir. Although the SFPUC removes chlorine and ammonia, the constituents of chloramine, from Hetch Hetchy water before it is discharged into Crystal Springs Reservoir, the removal of ammonia is not complete, and so some nitrogen is added to the reservoir. As noted earlier, the nitrate concentration has risen in Crystal Springs Reservoir waters since chloramine disinfection was initiated. If the proportion of Hetch Hetchy water placed in Crystal Springs Reservoir increased as a result of the WSIP, then the rate of discharge of nitrogen into the reservoir would also increase. The increase in nitrogen concentration in the reservoir would have the potential to increase the growth of algae.

The increase in storage and water level in Upper Crystal Springs Reservoir could increase the stability of thermal stratification. The increase in storage would be a result of restored capacity in Crystal Springs Reservoir and improvements to the conveyance components of the Hetch Hetchy system that would enable the SFPUC to refill local reservoirs with Tuolumne River water more reliably than under the existing condition. More stable thermal stratification combined with the input of oxygen-demanding substances associated with chloramination and dechloramination could deplete oxygen levels below the thermocline to a greater degree than under existing conditions. Under oxygen-depleted conditions, nutrients are released from the sediments at the bottom of the reservoir. If the proposed program increased the volume of oxygen-depleted water at the bottom of the reservoir, it could increase the release of phosphorus. Increased release of phosphorus and increased phosphorus concentrations in reservoir water would have the potential to increase the growth of algae.

Studies completed over the last several years indicate that the growth of algae in Crystal Springs Reservoir has historically been limited by both nitrogen and phosphorus concentrations. After the SFPUC began disinfecting Hetch Hetchy water with chloramine, the nitrogen concentration in the reservoir increased, and the concentration of phosphorus in reservoir water became the factor limiting the growth of algae. Thus, the addition of more nitrogen as a result of a WSIP-induced increase in the proportion of Hetch Hetchy water in Crystal Springs Reservoir would not alone increase the growth of algae. Increased phosphorus concentrations in the reservoir as a result of the more stable thermal stratification induced by the WSIP would increase the growth of algae.

The WSIP would have very little effect on average monthly storage in San Andreas Reservoir. The proportion of local runoff and Hetch Hetchy water is expected to remain the same as under existing conditions.

The WSIP could have a minor effect on water quality in Crystal Springs Reservoir and a negligible effect on water quality in San Andreas Reservoir. Any water quality changes would be too small to affect beneficial uses. If water quality changes in Upper Crystal Springs Reservoir resulted in increased growth of algae, water treatment could become more difficult and expensive. Adverse impacts of the WSIP on water quality in Crystal Springs and San Andreas Reservoirs would be less than significant, and no mitigation is required.

San Mateo Creek

Most of the time, flow in San Mateo Creek immediately below Lower Crystal Springs Dam is very low and consists of seepage through and around the dam. Occasionally, in wet months of wet and above-normal years, the SFPUC releases water to the creek from the dam. The creek then gains water from tributaries, groundwater, and urban runoff as it flows to San Francisco Bay. Water quality is good immediately below the dam and deteriorates in a downstream direction.

Under current conditions, the releases from Crystal Springs Reservoir in the winter and spring months of wet and above-normal years probably affect water quality in San Mateo Creek in two ways. The releases have a direct and beneficial effect on water quality during the releases themselves because a higher proportion of stream flow consists of high-quality Crystal Springs Reservoir water. The second effect of the releases is to contribute to periodic large “flushing flows” that serve to wash debris and accumulated organic matter out of the stream and into San Francisco Bay. In California’s Mediterranean climate, leaves, lawn clippings, and the detritus of urban life tend to accumulate in the beds of urban streams during the dry summer months. The accumulated organic matter has an adverse effect on water quality, depleting the dissolved oxygen content of stream water and producing plant nutrients. Wintertime flushing flows remove some of the organic matter, reducing its ability to adversely affect water quality.

Under current conditions, releases of high-quality Crystal Springs Reservoir water occur about 10 percent of the time, with beneficial effects on creek water quality. With the WSIP, releases would also occur about 10 percent of the time and at about the same magnitude. Water quality in the creek would be improved by the releases, as it is under the current condition.

Impact Summary

Overall, impacts of the WSIP on water quality in Crystal Springs and San Andreas Reservoirs and in San Mateo Creek would be *less than significant*, and no mitigation is required.

Impact 5.5.3-2: Effects on water quality in Pilarcitos Reservoir and along Pilarcitos Creek.

Pilarcitos Reservoir

Figure 5.5.1-6 shows recent past storage levels in Pilarcitos Reservoir from 1998 to 2006. Under the existing condition, the reservoir is drawn down through the summer, reaching minimum storage in October and November, just before the rainy season begins. With the WSIP, drawdown would occur more rapidly in some years. The more rapid drawdown attributable to the proposed program could cause the reservoir to destratify earlier than under existing conditions. This would not adversely affect water quality; in fact, mechanical destratification in the fall has been recommended to the SFPUC as a means of improving water quality (SFPUC, 2002).

One of the beneficial uses of Pilarcitos Reservoir is cold freshwater habitat (COLD). Because water is released from Pilarcitos Reservoir near the surface, a pool of cool water is retained through the summer near the bottom of the reservoir and below the lowest release point. Under the WSIP, the volume of the pool of cool water below the thermocline would be reduced compared to the existing condition, but would never be exhausted (for the reason noted above). However, the ability of Pilarcitos Reservoir to support the COLD beneficial use under the WSIP could be reduced. This impact would be potentially significant.

Pilarcitos Creek Between Pilarcitos Reservoir and Stone Dam

The WSIP could affect water quality in Pilarcitos Creek between Pilarcitos Reservoir and Stone Dam in two ways – by altering the quality of water released from Pilarcitos Reservoir to the creek and by altering flow in the creek. As discussed above, with the WSIP in place, the volume of the pool of cool water in Pilarcitos Reservoir below the thermocline would be reduced earlier in the year in some years compared to the existing condition, but the quality of water released to Pilarcitos Creek from the reservoir would change little.

The WSIP would increase flow in this reach of the creek in most spring and summer months compared to the existing condition because larger volumes of water would be released from Pilarcitos Reservoir to meet the Coastside CWD's water demand. This increased flow would generally have a beneficial effect on water quality, because water temperature in the spring and summer months would not rise as rapidly in the stream as it flows from the foot of Pilarcitos Dam to Stone Dam as it does under the existing condition. On the other hand, during dry years the

WSIP would extend the period in which no releases are made from Pilarcitos Reservoir to Pilarcitos Creek compared to the existing condition. This is because increased releases to meet Coastside's demand would deplete storage in Pilarcitos Reservoir earlier than under the existing condition. Water quality in the reach of Pilacitos Creek between Pilarcitos Reservoir and Stone Dam could deteriorate as a result. Creek flow would consist only of seepage from Pilarcitos Reservoir, groundwater infiltration, and tributary flow, none of which would be expected to contribute much water to the stream during the summer of a dry year for a longer period with the WSIP than under the existing condition. Water in the creek immediately below Pilarcitos Reservoir at such times could be reduced to isolated pools. Water temperature in the pools could rise, although the extensive vegetative cover in this reach of the creek would likely limit the potential for any such increase.

The proposed program would also reduce flow in Pilarcitos Creek between Pilarcitos Reservoir and Stone Dam in wet months of some wet years. It is not expected that the wet-year flow reductions would have an adverse effect on water quality in the stream because, during the winter, water in the creek would be cool and well oxygenated.

Two of the beneficial uses of Pilarcitos Creek are cold freshwater habitat (COLD) and migration of aquatic organisms (MGR). The MGR beneficial use cannot currently be supported in Pilarcitos Creek above Stone Dam because the dam prevents fish passage. The WSIP would extend the period in which releases from Pilarcitos Reservoir would be eliminated in the summer of dry years, which would degrade water quality in the creek between the reservoir and Stone Dam and reduce the creek's ability to support the COLD beneficial use. This impact would be potentially significant.

Pilarcitos Creek Below Stone Dam

The proposed program would have no effect on flow in Pilarcitos Creek below Stone Dam in dry and below-normal years, and consequently would have no effect on water quality in those hydrologic year types. There is no flow in the creek immediately below Stone Dam in dry and below-normal years under existing conditions, and there would be no flow with the proposed program.

With the WSIP, less water would pass over Stone Dam in winters of wet, above normal, and normal years than it does under the existing condition. It is unlikely that the reductions in spill over Stone Dam would have much effect on water quality in Pilarcitos Creek below Stone Dam. The reductions in spills would occur in months of wet, above normal, and normal years when runoff from the Pilarcitos Creek watershed below Stone Dam would be high. For this reason, the effect of the flow reductions on water quality in the creek below Stone Dam would be minor.

Two of the beneficial uses of Pilarcitos Creek are cold freshwater habitat (COLD) and migration of aquatic organisms (MGR). Because the proposed program would have little effect on water quality in Pilarcitos Creek below Stone Dam, impacts on water quality in Pilarcitos Creek below Stone Dam would be less than significant.

Impact Summary

The adverse impacts of the WSIP on water quality along Pilarcitos Creek between Pilarcitos Reservoir and Stone Dam would be *potentially significant*; however implementation of Measure 5.5.3-2a Low-head Pumping Station at Pilarcitos Reservoir, would restore flow to this reach of Pilarcitos Creek in the late summer and reduce the impact to a less than significant level.

The adverse impacts of the WSIP on water quality in Pilarcitos Reservoir would also be potentially significant. Furthermore, Measure 5.5.3-2a, Low-head Pumping Station at Pilarcitos Reservoir, would exacerbate adverse impacts on water quality at the reservoir by lowering the water level in some summers. Implementation of Measure 5.5.3-2b, Aeration System at Pilarcitos Reservoir, would improve water quality and reduce impacts in the reservoir to a less than significant level.

References – Surface Water Quality

San Francisco Public Utilities Commission (SFPUC), *Reservoir Water Quality Management Plans*, prepared for the SPFUC by Merritt Smith Consulting in cooperation with Malcom Pirnie, Olivia Chen Consultants, Water Resources Engineering, Inc., and Alex Horne Associates, March 2002.

San Francisco Public Utilities Commission (SFPUC), unpublished, Water Quality Monitoring Data for San Mateo Creek Watershed, 2004.

San Francisco Public Utilities Commission (SFPUC), *Water Quality Investigation and Assessment: Impacts of Chloramination and Associated Water Quality Implications at Crystal Springs*, prepared by Merritt Smith Consulting, 2006.

5.5.4 Groundwater

The following setting section identifies groundwater bodies in the Peninsula watershed that could be affected by the WSIP. The impact section (Section 5.5.4.2) provides a description of the changes in groundwater levels and quality that would result from WSIP-induced changes in stream flow.

5.5.4.1 Setting

The upper reaches of the San Mateo and Pilarcitos Creek watersheds are composed primarily of non-water-bearing igneous, metamorphic, and sedimentary rocks, together with recent alluvium and colluvium.[1] The main groundwater-bearing units associated with San Mateo and Pilarcitos Creeks are in their lower watersheds. Groundwaters in the lower San Mateo Creek watershed are not used for municipal water supply. Groundwaters in the lower Pilarcitos Creek provide a portion of Coastside CWD's municipal supply (Coastside CWD, 2005).

Within the lower Pilarcitos Creek watershed, the main water-bearing units are the marine terrace deposits, which are sand and gravel deposits ranging from 30 to 60 feet thick. The aquifer is bounded on the east by bedrock and on the west by the Pacific Ocean, and is underlain by the relatively impermeable Purisima Formation. Within this groundwater basin, flow is from east to west, discharging to the ocean. Total aquifer storage is estimated at 10,600 acre-feet (Todd Engineers, 2003). Percolation of Pilarcitos Creek flow is an important part of overall local aquifer recharge.

Groundwater quality is of concern in the lower Pilarcitos Creek groundwater basin, especially with respect to iron and manganese; in addition, the water is hard. Seawater intrusion is not considered a problem in the basin, but slightly elevated salt contents were probably incorporated into the aquifer during its formation. A summary of local groundwater quality is presented in **Table 5.5.4-1**; the table provides an average from a sampling program of five wells in the lower Pilarcitos Creek groundwater basin.

5.5.4.2 Impacts

Significance Criteria

The CCSF has not formally adopted significance standards for impacts related to groundwater, but generally considers that implementation of the proposed program would have a significant groundwater impact if it were to:

- Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of preexisting nearby wells would drop to a level that would not support existing land uses or planned uses for which permits have been granted)

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1 Alluvium consists of unconsolidated mixtures of gravel, sand, clay, and silt and is typically deposited by streams. Colluvium is a loose deposit of rock debris accumulated through the action of gravity at the base of a cliff or slope.

TABLE 5.5.4-1
SUMMARY OF GROUNDWATER QUALITY PARAMETERS, LOWER PILARCITOS CREEK BASIN

Parameter	Average Value (mg/L, unless otherwise noted)
Total Hardness	228
Alkalinity	184
pH Units	6.9
Total Dissolved Solids	426
Calcium	43
Sodium	60
Bicarbonate	188
Sulfate	50
Chloride	93
Iron	7.5
Manganese	0.61
Nitrate	8.7
Boron	0.166
Arsenic	0.0030

SOURCE: Todd Engineers, 2003.

- Substantially impair a water body's ability to support beneficial uses designated by the State Water Resources Control Board or Regional Water Quality Control Board
- Otherwise substantially degrade water quality

Approach to Analysis

Information on potentially affected groundwater bodies was obtained from published sources related to hydrogeology and groundwater management in the potentially affected area. Impact assessments were performed by reviewing WSIP-induced changes in stream flow and examining their potential to affect groundwater levels or quality.

Impact Summary

Table 5.5.4-2 presents a summary of the impacts on groundwater bodies in the Peninsula watershed that could result from implementation of the proposed water supply and system operations.

TABLE 5.5.4-2
SUMMARY OF IMPACTS – GROUNDWATER BODIES IN PENINSULA WATERSHED

Impact	Significance Determination
Impact 5.5.4-1: Alteration of stream flows along Pilarcitos Creek, which could affect groundwater levels and water quality	LS

LS = Less than Significant impact, no mitigation required

Impact Discussion

Impact 5.5.4-1: Alteration of stream flow along Pilarcitos Creek, which could affect groundwater levels and water quality.

As discussed in Impact 5.5.1-2, the proposed program would have very little effect on flow in Pilarcitos Creek below Stone Dam. There would be some reduction in wintertime spills over the dam in wet and above-normal years as a result of the WSIP, but the reduction would be too small to have an appreciable effect on groundwater recharge in the lower Pilarcitos Creek watershed. Under the existing condition and with the proposed program, the upper Pilarcitos Creek watershed contributes very little flow to the lower watershed. Most wintertime flow in the stream originates below Stone Dam, and this stream flow is the primary source of groundwater recharge. Overall, the effects of the WSIP on groundwater levels and groundwater quality would be *less than significant*, and no mitigation measures would be required.

References – Groundwater

Coastside County Water District (Coastside CWD), *2005 Urban Water Management Plan*, 2005.

Todd Engineers, *Lower Pilarcitos Creek Groundwater Basin Study*, 2003.

5.5.5 Fisheries

The following setting section describes the fishery resources within the streams and reservoirs of the San Francisco Peninsula that could be affected by the WSIP. The impact section (Section 5.5.5.2) provides a description of the effects of WSIP-induced changes in stream flow and reservoir levels on fishery resources.

5.5.5.1 Setting

Water Development

The Crystal Springs, San Andreas, and Pilarcitos Reservoirs are located in the Peninsula watershed at the base of San Mateo, Pilarcitos, and San Andreas Creeks, which are fed by coastal mountain drainage headwaters. Crystal Springs and Pilarcitos Reservoirs are stratified and become slightly anoxic during the late summer and fall, while San Andreas Reservoir remains well mixed. Water flow in San Mateo Creek below Crystal Springs Reservoir is dependent on stormwater runoff from the watershed below Lower Crystal Springs Dam, seepage from the dam, and groundwater infiltration. Water flow in Pilarcitos Creek below Stone Dam is similarly dependent on stormwater runoff from the watershed below Stone Dam and groundwater infiltration. Releases from Crystal Springs Reservoir and Stone Dam historically have occurred only in wet months of wet years. The SFPUC permits only limited recreational activity on its lands and reservoirs within the Peninsula watershed; water-contact activities, fishing, and boating on the reservoirs are not allowed.

Aquatic Habitat

San Mateo Creek

San Mateo Creek and its tributary watersheds, including San Andreas Creek, are tributary to the southern portion of San Francisco Bay. San Mateo Creek enters South San Francisco Bay approximately 1.6 miles south of the Hayward–San Mateo Bridge. Stream flows and associated fishery habitat within the San Mateo Creek watershed are affected by seasonal patterns in local rainfall and runoff as well as by San Andreas Dam (constructed in 1870), Upper Crystal Springs Reservoir (constructed in 1877), and Lower Crystal Springs Dam (constructed in 1890). Crystal Springs Reservoir is a barrier to upstream migration by Central California Coast anadromous steelhead. Central California Coast steelhead, which inhabit tributaries to South San Francisco Bay as well as coastal watersheds, have been listed by the National Marine Fisheries Service (NMFS) as a threatened species under the Federal Endangered Species Act. The common species inhabiting the watershed include steelhead/rainbow trout and threespine stickleback (Leidy *et al.* 2005); other species present include suckers, tule perch, and sculpin (RWQCB, 2002). Other fish species recently documented in San Mateo Creek include sculpin, which are found to inhabit the upper part of the watershed, and suckers, carp, and stickleback, which are found within the lower reaches of the creek (Taylor, 2002; Leidy, 2002).

The San Mateo Creek watershed originates in undeveloped lands flowing downstream through urbanized areas adjacent to South San Francisco Bay. The creek corridor within this downstream urban region has been highly modified. The upstream impoundments, in combination with channel modifications within the downstream reaches, are intended in part to provide flood control protection for urban areas. Changes in channel structure and function as a result of both reservoir impoundments and channel modifications have affected instream habitat for steelhead and other fish species.

In 1860, prior to construction San Andreas and Upper and Lower Crystal Springs Reservoirs, steelhead/rainbow trout were collected from San Mateo Creek (Leidy *et al.*, 2005). Leidy (1984) and Smith (1991) collected rainbow trout within San Mateo Creek both upstream and downstream of Lower Crystal Springs Reservoir. Leidy *et al.* (2005) concluded that San Mateo Creek historically supported resident rainbow trout populations, and that small numbers of anadromous steelhead may have utilized the creek downstream of Crystal Springs Reservoir as spawning and juvenile rearing habitat. For purposes of management under the Federal Endangered Species Act, the NMFS defines “steelhead” to include resident rainbow trout inhabiting streams and rivers downstream of impassable reservoirs (including Crystal Springs Dam) and other barriers to migration. Therefore, trout inhabiting the stream upstream of the dam are considered to be resident rainbow trout, while trout downstream of the dam (which could potentially migrate successfully to the ocean) are considered to be steelhead. Fishery studies conducted within other watersheds tributary to South San Francisco Bay have also reported small populations of both spawning and rearing adult steelhead (and in some tributaries, fall-run Chinook salmon). Modification of many of these tributaries, including the lower reaches of San Mateo Creek, present impediments or barriers to upstream access by migrating salmonids and have therefore affected the ability of many of the tributary streams to successfully support populations of anadromous steelhead. Streambank erosion into the creek within the lower reaches may also be contributing to compromised steelhead habitat quality. Potentially compromised water quality in this reach of the creek may have decreased substrate quality, increased temperatures, and reduced dissolved oxygen levels, which can reduce habitat for both salmonids, resident fish populations, and other benthic macroinvertebrate species (RWQCB, 2002). Local watershed groups and state and federal resource agencies are currently developing habitat enhancement measures for San Mateo Creek and other South San Francisco Bay tributaries to enhance access to suitable spawning and juvenile rearing habitat and to improve overall fishery habitat conditions within these small streams.

Pilarcitos Creek

Pilarcitos Creek, a small coastal stream approximately 12 miles long, flows into the Pacific Ocean near Half Moon Bay. Two impoundments regulate flow within Pilarcitos Creek: Pilarcitos Dam and Reservoir, located 10.8 miles upstream (constructed in 1866), and Stone Dam, located 8.5 miles upstream (constructed in 1874). Pilarcitos Creek and Spring Valley Creek provide water supplies to Pilarcitos Reservoir, which can convey water through a tunnel into San Andreas Reservoir and Lower Crystal Springs Reservoir. A total of six small tributaries—four of which enter Pilarcitos Creek in the reach between Pilarcitos Dam and Stone Dam, and two located downstream of Stone Dam—provide additional inflow to Pilarcitos Creek. Water can be diverted from Stone Dam to Lower Crystal Springs Reservoir, and also to the Coastside County Water District. Flow within Pilarcitos Creek downstream of Stone Dam, which has no outlet structure other than a flashboard weir and spillway, primarily originates as tributary inflow.

Stone Dam has been identified as a barrier that prohibits access by anadromous steelhead to upstream habitat. Therefore, Pilarcitos Creek has been characterized as having two separate fishery habitat reaches: the anadromous salmonid reach located downstream of Stone Dam and a resident trout reach located upstream of Stone Dam. The NMSF has expressed interest in developing fish passage opportunities at Stone Dam that would allow anadromous steelhead access to upstream habitat for spawning and juvenile rearing. Alternatives identified for providing upstream access at Stone Dam include complete dam removal, partial dam removal, or construction and operation of a fish ladder.

Information on seasonal stream flows within Pilarcitos Creek downstream of Stone Dam is available from the U.S. Geological Survey Gaging Station No. 11162620. Flow at the gaging station reflects the effects of the upstream impoundments and water diversions on Pilarcitos Creek. Flow within the creek downstream of Stone Dam shows a typical seasonal pattern within coastal watersheds, with consistently low flows during the spring, summer, and early fall (April–November) and higher stream flows during the winter months (December–March) in response to rainfall and runoff. The highest average monthly flows and peak daily flows have occurred during January and February. Peak daily flows during January and February have exceeded 90–100 cfs, with corresponding average monthly flows of approximately 7 cfs in January and 15 cfs in February. Average monthly flows during the spring, summer, and fall within Pilarcitos Creek downstream of Stone Dam typically range from approximately 0.1 to 0.5 cfs. The increased flows during January and February within the tributaries and watershed generally correspond with the seasonal life history of Central California Coast anadromous steelhead, with adult upstream migration and juvenile downstream migration during the winter.

Pilarcitos Creek is characterized by a moderately steep stream gradient downstream of Stone Dam. The substrate within the creek is predominantly fine sediment, sand, and small gravel. Although present, boulders and bedrock outcroppings are rare. Upstream and downstream of Stone Dam, reaches of the creek are characterized predominantly by run habitat and, to a lesser extent, pools and riffles. During the summer months, pool habitat is typically shallow (generally less than 1.5 feet deep). Pilarcitos Creek to the Highway 92 crossing has an adequate riparian corridor, with instream cover provided by overhead vegetation, undercut banks, and other structures. From that point downstream, the creek traverses agricultural and residential areas, and riparian habitat in these areas is limited.

Several barriers or impediments to fish movement have been identified within Pilarcitos Creek, including culverts that would prevent or impede migration under low-flow conditions but would potentially be passable at higher flows. As noted above, Stone Dam is a complete barrier to anadromous steelhead migration at all flow levels within Pilarcitos Creek. Pilarcitos Dam is also a barrier to fish movement within the creek. Several additional passage impediments, such as low-flow riffles, limit fish movement within the creek under low-flow conditions, but are expected to be passable at higher stream flows such as those occurring during the winter.

Another possible factor in reducing available fishery habitat within Pilarcitos Creek, particularly for steelhead, is increased sedimentation and siltation, which may limit spawning grounds and reduce the ability of fishes to capture their prey (RWQCB, 2001). Although these effects have not been quantified, there is a linkage between degradation of steelhead habitat and sedimentation within this watershed. Future studies by stakeholders and others may provide more conclusive data on the extent and effects of sedimentation within the creek (RWQCB, 2001).

Results of limited fishery sampling within Pilarcitos Creek during the mid-1990s (Balance Hydrologics, 1997) confirm that steelhead/rainbow trout successfully spawn and rear within reaches of Pilarcitos Creek both upstream and downstream of Stone Dam. Evidence of multiple year-classes (based on length frequency analysis) confirms successful rearing and oversummering of salmonids within the creek. The relative contribution of resident rainbow trout and anadromous steelhead to the population of fish inhabiting Pilarcitos Creek has not been determined. In addition to steelhead/rainbow trout, other resident fish species such as sculpin are expected to inhabit the creek. Specific instream flows needed to support resident fish populations downstream of Pilarcitos Reservoir or anadromous steelhead downstream of Stone Dam have not been identified.

Pilarcitos Reservoir

Pilarcitos Reservoir, at the base of Pilarcitos Creek, is one of three reservoirs in the Peninsula watershed; it contains populations of rainbow trout, Sacramento sucker, tule perch, and various species of sculpin (RWQCB, 2002). In 1931, Pilarcitos Reservoir was documented as having a good trout population (Skinner, 1962). During the Depression, bass were introduced to the reservoir to serve as a food source and are thought to have contributed to the decline of native fish due to predation. Conditions within Pilarcitos Reservoir are stratified and anoxic during the late summer and fall.

Crystal Springs Reservoir

Water from San Mateo Creek and Pilarcitos Creek can be diverted into Crystal Springs Reservoir, a lake that has been a designated fish and game refuge for many years (Skinner, 1962). A number of important and sensitive fish species are present within the reservoir, including such native fishes as rainbow trout. Crystal Springs Reservoir also contains populations of Sacramento sucker, tule perch, and various species of sculpin (RWQCB, 2002). During the Depression, bass were introduced to Crystal Springs Reservoir to serve as a food source; this planting of largemouth bass, the first in California, is thought to have contributed to the decline of native fish due to predation. Although rainbow trout have been collected throughout the reservoir, native fish species such as Sacramento sucker, tule perch, and various sculpin species appear to be either absent or few in number. Sacramento sucker and tule perch are not listed as threatened or endangered species; however, their decline as a result of the presence and operation of the reservoirs indicates their sensitivity to environmental disturbances. A variety of factors are thought to affect the abundance of resident fish within the reservoir, including predation by species such as largemouth bass and seasonal water quality conditions. Crystal Springs Reservoir exhibits stratification and anoxic conditions in late summer and fall.

San Andreas Reservoir

San Andreas Reservoir contains populations of rainbow trout, Sacramento sucker, tule perch, and various species of sculpin (RWQCB, 2002). Bass were also introduced to this reservoir during the Depression to serve as a food source and are thought to have contributed to the decline of native fish due to predation. San Andreas Reservoir, much like Crystal Springs Reservoir, contains a population of warmwater fishes (Skinner, 1962). San Andreas Reservoir remains well mixed, with relatively good water quality for fishery populations throughout the year.

5.5.5.2 Impacts

Significance Criteria

The CCSF has not formally adopted significance standards for impacts related to fisheries, but generally considers that implementation of the proposed program would have a significant fisheries impact if it were to:

- Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service

- Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites

- Have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of an endangered, rare, or threatened species

Approach to Analysis

Changes in reservoir storage and water levels in the San Mateo Creek watershed and changes in reservoir storage, water levels and stream flows in the Pilarcitos Creek watershed attributable to the WSIP were estimated using the HH/LSM. An overview of the model is presented in Section 5.1. Detailed information on the model and the assumptions that underlie it are provided in Appendix H. Changes in flow in streams in the San Mateo Creek watershed attributable to the WSIP were estimated semi-quantitatively based on interviews with individuals knowledgeable about the historical, current, and expected future (with-WSIP) water system operations.

Impact Summary

Table 5.5.5-1 presents a summary of the impacts on water bodies in the Peninsula watershed that could result from implementation of the proposed water supply and system operations.

TABLE 5.5.5-1
SUMMARY OF IMPACTS – FISHERIES
IN SAN FRANCISCO PENINSULA STREAMS AND RESERVOIRS

Impact	Significance Determination
Impact 5.5.5-1: Effects on fishery resources in Crystal Springs Reservoir (Upper and Lower)	PSU
Impact 5.5.5-2: Effects on fishery resources in San Andreas Reservoir	LS
Impact 5.5.5-3: Effects on fishery resources along San Mateo Creek	LS
Impact 5.5.5-4: Effects on fishery resources in Pilarcitos Reservoir	PSM*
Impact 5.5.5-5: Effects on fishery resources along Pilarcitos Creek below Pilarcitos Reservoir	PSM

LS = Less than Significant impact, no mitigation required
PSM = Potentially Significant impact, can be mitigated to less than significant
PSU = Potentially Significant impact, unavoidable

* Based on the refined Pilarcitos watershed impact analysis (see Section 13.3), this impact is PSM due to adverse effects that would result from implementing replacement Measure 5.5.3-2a.

Impact Discussion

Impact 5.5.5-1: Effects on fishery resources in Crystal Springs Reservoir (Upper and Lower).

Results of hydrologic modeling indicate that average monthly storage within Crystal Springs Reservoir would be greater under proposed WSIP operations than under existing conditions. An increase in storage within the reservoir offers the potential for increased coldwater pool volume within the reservoir hypolimnion, which could benefit coldwater fish species inhabiting the stream downstream of the reservoir. In addition, increased reservoir storage would provide an increase in the volume of habitat available for resident fish species inhabiting the reservoir, including both warmwater and coldwater fish species. The increase in storage elevation under the WSIP could also provide greater opportunities for connectivity and migration of fish between the reservoir and upstream tributary habitat. As a result of these factors, increased reservoir storage under proposed operations is considered a beneficial impact on fishery resources.

Only minor changes in water quality conditions would occur within Crystal Springs Reservoir under proposed WSIP operations compared to existing conditions (see Section 5.5.1). Based on the general similarity in water quality conditions with and without the proposed program, potential changes in water quality in Crystal Springs Reservoir and related impacts on fishery resources would be less than significant.

Restoring the levels of the reservoir under the Lower Crystal Springs Dam Improvements project (PN-4) would eliminate approximately 750 linear feet of trout spawning habitat from Laguna and San Mateo Creeks, the two named tributaries to the reservoir, resulting in a total loss of approximately 1,500 linear feet of spawning habitat. However, upstream areas may provide suitable replacement habitat to support the population and this prospect is currently under evaluation in the project-level CEQA review for the Lower Crystal Springs Dam Improvements project. Thus, implementation of Measure 5.5.5-1, Create New Spawning Habitat Above Crystal Springs Reservoir, if feasible, may reduce this impact to less than significant. The project-level CEQA review for the Lower Crystal Springs Dam Improvements project will further evaluate the severity of this impact and the efficacy of Measure 5.5.5-1. To be conservative, at the program-level of analysis, this impact is considered *potentially significant and unavoidable*.

Impact 5.5.5-2: Effects on fishery resources in San Andreas Reservoir.

Results of hydrologic modeling indicate that average monthly storage in San Andreas Reservoir would be similar under proposed operations and existing conditions. Reservoir storage would continue to fluctuate seasonally, as under existing conditions. Based on the similarity of water storage operations, potential impacts on resident fishery resources within San Andreas Reservoir under proposed operations are considered less than significant.

Only minor changes in water quality conditions would occur within San Andreas Reservoir under proposed WSIP operations compared to existing conditions (see Section 5.5.1). Based on the general similarity in water quality conditions with and without the proposed program, potential changes in water quality in San Andreas Reservoir and related impacts on fishery resources would be *less than significant*, and no mitigation measures would be required.

Impact 5.5.5-3: Effects on fishery resources along San Mateo Creek.

San Mateo Creek is an intermittent stream and would remain so under the proposed program. Similar to existing conditions, no releases would be made under the proposed program from Crystal Springs Reservoir to San Mateo Creek in normal, below-normal, or dry years. In wet and above-normal years, releases to the creek would be similar to those under existing conditions. The upper third of San Mateo Creek downstream of the reservoir provides suitable fishery habitat, while the lower creek reaches serve only as a potential migratory corridor. Since actual operations and fishery habitat conditions on San Mateo Creek would be comparable under existing and proposed operations, impacts on fisheries in San Mateo Creek would be *less than significant*, and no mitigation measures would be required.

Impact 5.5.5-4: Effects on fishery resources in Pilarcitos Reservoir.

Storage in Pilarcitos Reservoir varies seasonally. The reservoir typically fills in the winter and is drawn down in the late spring and summer. By late summer, releases from the reservoir are typically limited to reservoir inflow. The volume of habitat available for resident aquatic species varies seasonally from about 3,000 acre-feet in the winter and spring to 1,600 acre-feet in the late summer or fall.

With the WSIP, the reservoir would be drawn down more rapidly and earlier in the season than under the existing condition. The period in which the reservoir would be at its minimum elevation would be extended by days or weeks. The volume of habitat available for resident aquatic species would be at its minimum. Because the WSIP would cause the volume of water stored within Pilarcitos Reservoir to reach its seasonal minimum several days or weeks earlier in the year than under the existing condition, it would also be expected to reduce the coldwater pool volume within the reservoir hypolimnion to its seasonal minimum earlier in the year. This could in turn have an adverse effect on resident coldwater species in the reservoir. However, because water is released from close to the surface of the reservoir, a cool water pool is usually retained below the level of the outlet. Overall, the impacts of the proposed program on resident aquatic species in Pilarcitos Reservoir would be *less than-significant.*

Implementation of Measure 5.5.3-2a, Low-head Pumping Station at Pilarcitos Reservoir, would reduce the storage volume in Pilarcitos Reservoir by about 350 acre-feet in the late summer and fall of about one in four years. In these years, the seasonal minimum storage volume in Pilarcitos Reservoir would be 1,600 to 1,700 acre-feet. However, implementation of Measure 5.5.3-2b, Aeration System at Pilarcitos Reservoir, would improve water quality at such times as the reservoir was drawn down. The periodic reduction in volume of water available to aquatic species, attributable to Measure 5.5.3-2a, coupled with the improvement in water quality attributable to Measure 5.5.3-2b would have a *less-than-significant* impact on resident aquatic species.

Impact 5.5.5-5: Effects on fishery resources along Pilarcitos Creek below Pilarcitos Reservoir.

Pilarcitos Creek Below Pilarcitos Reservoir

Flow in Pilarcitos Creek would increase during many spring and early summer months as a result of the WSIP; however, flow reductions would occur during the summer of dry years. Under the WSIP, instream flow releases (other than dam seepage and reservoir inflow) would cease in Pilarcitos Creek downstream of Pilarcitos Reservoir during summer months of dry years at an earlier date than under the existing condition. Flow reductions in Pilarcitos Creek downstream of Pilarcitos Reservoir under the WSIP would result in potentially significant impacts on resident trout, other resident fish species and aquatic resources.

In addition, as described above, releases from Pilarcitos Reservoir to Pilarcitos Creek are made from close to the surface of the reservoir, so summer and fall releases under existing conditions are warm. With the proposed program in place, summer and fall releases would also be warm (possibly warmer at times), because Pilarcitos Reservoir would be drawn down several days or weeks earlier than under the existing condition. Exposure to higher water temperatures in the late summer and fall could significantly affect habitat quality and availability for coldwater fish species inhabiting Pilarcitos Creek below Pilarcitos Reservoir, including resident trout. This would be a potentially significant impact.

Pilarcitos Creek Below Stone Dam

Pilarcitos Creek supports a population of anadromous steelhead. The creek channel is used as a migration corridor for upstream migration of adults and downstream migration of both adults and juvenile steelhead between approximately December 1 and May 31. Under the proposed WSIP, winter flows within the creek below Stone Dam, during normal or wetter hydrologic years, would be reduced. Although no specific barriers to passage have been identified downstream of Stone Dam, this reduction in peak winter flows could potentially adversely impact steelhead migratory passage and spawning at critical riffles and gravel bars due to the shallow nature of these habitat types.

Currently, there are occasional spills over Stone Dam when releases from Pilarcitos Reservoir and runoff into Pilarcitos Creek above Stone Dam exceed the capacity of the diversion at the dam. The spills occur in the winter months of wet, above normal and normal years. With implementation of the proposed program, occasional spills over Stone Dam would continue but with reduced frequency and magnitude. The volume of spills in average wet, above normal, and normal years would be reduced by 11, 60, and 25 percent, respectively.

Approximately, one-third of the Pilarcitos Creek watershed lies upstream of Stone Dam, and most of the runoff from the watershed is used for municipal water supply by the SFPUC and Coastside CWD. Spills over Stone Dam currently provide up to 15 percent of the flow in the lower reach of Pilarcitos Creek in Half Moon Bay, based on data from gages just downstream of Stone Dam and in Half Moon Bay.

With the WSIP, spills would be reduced and flow in Pilarcitos Creek would be reduced in the winter months, when occasional large flows are important to migratory fish. The effects of the reduced spills would be primarily felt in the reach of Pilarcitos Creek from Stone Dam to the first major downstream tributary at Albert Canyon. The reduction in flows due to the WSIP and related impacts on fish habitat would be potentially significant. In addition, the National Marine Fisheries Service has raised concerns regarding stream flows in Pilarcitos Creek below Stone Dam, and the SFPUC is currently making experimental summer releases and undertaking studies in an effort to address these concerns.

Impact Conclusions

Overall, impacts on fishery resources along Pilarcitos Creek between Pilarcitos Reservoir and Stone Dam related to reduced flows, degraded water quality and elevated temperatures in the late summer and fall would be *potentially significant*. Implementation of Measures 5.5.3-2a, Low-head Pumping Station at Pilarcitos Reservoir, and Measure 5.5.3-2b, Aeration System at Pilarcitos Reservoir, would reduce this potential impact to a less-than-significant level.

Impacts on fishery resources in Pilarcitos Creek below Stone Dam related to reduced wintertime flows would be *potentially significant*. Implementation of Measure 5.5.5-5, Establish Flow Criteria, Monitor and Augment Flow, would reduce this potential impact to a *less-than-significant* level.

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5.5.6 Terrestrial Biological Resources

The following setting section describes the terrestrial biological resources within the streams and reservoirs of the San Francisco Peninsula that could be affected by the WSIP. The impact section (Section 5.5.6.2) provides a description of the effects of WSIP-induced changes in stream flow and reservoir levels on terrestrial biological resources.

5.5.6.1 Setting

The Peninsula watershed is a unique ecological resource that hosts extensive and varied habitats in a predominantly urbanized region. It supports the highest concentration of rare, threatened, and endangered species in the entire Bay Area (SFPUC, 1994; 2006). The watershed supports over 550 species of plants (Oberlander, 1953). A high diversity of animals can also be found in the Peninsula watershed, including many that require large areas of contiguous, relatively undisturbed habitat such as mountain lions, deer, bobcats, coyotes, bald eagles, and golden eagles. Due to the extent and variety of habitats, total vertebrate species diversity is likely to include virtually all species found in upland and freshwater habitats in San Mateo County.

This assessment of impacts focuses on sensitive natural communities such as riparian communities and wetlands, and on special-status species (excluding fish) specifically associated with streams and reservoirs that could be affected by WSIP operations. This section distinguishes between WSIP projects for which separate, project-level CEQA analysis would address operational impacts in greater detail (such as the Lower Crystal Springs Dam project [PN-4], which would affect Upper and Lower Crystal Springs Reservoirs and San Mateo Creek below the dam), and projects for which no further CEQA analysis would take place (such as the operation of San Andreas and Pilarcitos Reservoirs and Pilarcitos Creek).

Figure 4.6-1 in Section 4.6, Biological Resources, shows the habitat types found in the Peninsula watershed within the WSIP program area. Habitat types are broader groupings than natural communities, but are useful when describing both wildlife and vegetation resources together.

San Mateo Creek

Immediately below Crystal Springs Dam, seepage supports a small area of freshwater marsh. Below this, San Mateo Creek flows through a steep, largely undeveloped canyon where it supports a well-developed central coast arroyo willow (*Salix lasiolepis*) riparian forest, with coast live oak (*Quercus agrifolia*) riparian forest farther downstream. Coast live oak woodland, mixed evergreen forest, and coastal scrub grow on the adjacent uplands. San Mateo Creek then flows through the town of Hillsborough and the city of San Mateo, emptying into San Francisco Bay south of Coyote Point. In this section the creek is not culverted, but is closely surrounded by urbanization.

Riparian processes along San Mateo Creek have already been considerably affected by the presence of the Crystal Springs Dam. Sediment supply and base flows have been cut off to lower San Mateo Creek, and the magnitude of peak flows at all recurrence intervals has been greatly diminished. Stream releases are infrequent under existing conditions and occur only when runoff into Crystal Springs Reservoir cannot be contained by available storage or conveyed elsewhere. There are no releases during the summer months, and none during normal, below-normal, and dry years.

Upper and Lower Crystal Springs Reservoirs

Lower Crystal Springs Reservoir is surrounded primarily by oak woodland and Douglas-fir (*Pseudotsuga menziesii*) forest on the western side, with oak woodland, serpentine grassland, valley needlegrass grassland, and non-native grassland on the eastern side. Lower Crystal Springs Reservoir supports a large area of valley and foothill freshwater marsh on its northwestern tip where San Andreas Creek enters the reservoir (referred to as Tracy Lake). This area currently supports more extensive freshwater marsh than it did in the 1950s, when Crystal Springs Dam was operated at full capacity (Oberlander, 1953). White alder riparian forest extends to Lower Crystal Springs Reservoir along San Mateo Creek. Central coast arroyo willow riparian forest is present along the smaller creeks, sometimes expanding where creeks enter the reservoir.

Upper Crystal Springs Reservoir is surrounded primarily by coast live oak woodland, with extensive areas of serpentine and valley needlegrass grassland and small areas of northern coastal scrub on the eastern side. Large areas of arroyo willow riparian forest and freshwater marsh are found at Adobe Marsh and at the mouth of Laguna Creek at the southeastern end. The overall extent of current freshwater marsh wetland vegetation surrounding Upper Crystal Springs Reservoir is less than existed historically, and many areas have converted to arroyo willow riparian forest (Oberlander, 1953; San Francisco Planning Department, 2001).

San Andreas Reservoir

San Andreas Reservoir is surrounded primarily by northern coastal scrub. In the absence of fire, a coast live oak tree layer is developing within the scrub on deeper soils. The eastern edge of the reservoir supports non-native grassland and exotic forests dominated by Monterey pine (*Pinus radiata*) and eucalyptus (*Eucalyptus* sp.). Some small areas of native grassland may also be present. The two northern arms of the reservoir support some of the largest freshwater marshes in the watershed. Depending on elevation, these marshy areas variously support cattails, bulrushes, spikerush, rush, and other emergent species. Historically, the freshwater marsh wetland was less extensive on the eastern arm of the upper portion of the reservoir; in 1993, this area was mapped as open water. The western upper arm of the reservoir supported more extensive freshwater marsh wetland. The truncated shoreline mapped by Oberlander (1953) suggests that there may have been an impoundment in this area that functioned to increase the extent of freshwater marsh.

Pilarcitos Creek and Reservoir

The vegetation above Pilarcitos Dam consists mostly of coastal scrub, with areas of Douglas-fir and redwood (*Sequoia sempervirens*) forest and mixed evergreen/coast live oak forest in the deeper and more sheltered slopes. A small area of freshwater marsh was mapped by Oberlander (1953) on the southern arm of the reservoir. Central coast arroyo willow riparian forest lines the major tributaries to Pilarcitos Reservoir for a considerable distance upstream. Below Pilarcitos Dam, Pilarcitos Creek follows a deep canyon heavily wooded with Douglas-fir forest. A well-developed white alder (*Alnus rhombifolia*) riparian forest grows along the creek between Pilarcitos Dam and Stone Dam. Below Stone Dam, Pilarcitos Creek is lined with central coast arroyo willow riparian forest.

Natural Communities, including Sensitive Natural Communities

The *Peninsula Watershed Management Plan Environmental Impact Report* (San Francisco Planning Department, 2001) identified 14 natural communities occurring within the watershed, eight of which are listed as sensitive in the California Natural Diversity Database (CNDDB) (CDFG, 2006). Eleven natural communities, including all eight of the sensitive natural communities, occur adjacent to San Andreas, Pilarcitos, and Upper and Lower Crystal Springs Reservoirs and associated creeks. The natural community name, CNDDB code, sensitivity, and occurrence within the WSIP program area are presented in **Table 5.5.6-1** and briefly described below. More detail will be provided in the project-specific EIR for the Lower Crystal Springs Dam project (PN-4).

TABLE 5.5.6-1
POTENTIAL FOR OCCURRENCE OF NATURAL COMMUNITIES IN AND NEAR THE WSIP IN THE PENINSULA WATERSHED

	WSIP Program Location		
Natural Community	**Upper/Lower Crystal Springs Reservoirs and San Mateo Creek (PN-4)**	**San Andreas Reservoir**	**Pilarcitos Reservoir and Pilarcitos Creek**
Serpentine grassland	X		
Valley needlegrass grassland	X	X	
Non-native grassland	X	X	
Northern mixed chaparral	X	X	
Northern coastal scrub	X	X	X
Mixed evergreen forest/coast live oak woodland	X	X	X
Douglas-fir forest/redwood forest	X		X
Non-native forests	X	X	
Central coast arroyo willow riparian forest	X	X	X
White alder riparian forest			X
Central coast live oak riparian forest	X		
Coastal and valley freshwater marsh	X	X	X

[a] California Natural Diversity Database code; asterisk (*) indicates sensitive natural community (CDFG, 2006).

Grasslands

Serpentine grassland and valley needlegrass grassland are found on the open ridges of the Peninsula watershed, often on less fertile soils. Serpentine grassland is specifically associated with soils derived from serpentine rock. Both grasslands are characterized by a high proportion of native species, many perennial grasses, and low productivity. Typical perennial grasses include needlegrass (*Nassella* spp.), pine bluegrass (*Poa secunda*), fescue (*Festuca* spp.), and junegrass (*Koeleria cristata*). Within the WSIP study area, extensive areas of serpentine grassland are found along the eastern shores of Upper and Lower Crystal Springs Reservoirs. Valley needlegrass grassland is found on the eastern shores of San Andreas Reservoir and Upper and Lower Crystal Springs Reservoirs. Disturbed Valley needlegrass grassland may also be present in San Mateo Canyon below Crystal Springs Dam.

Non-native grassland is found in many areas with a history of disturbance. It is dominated by a variety of non-native annual grasses such as brome (*Bromus* spp.), oats (*Avena* spp.), and wild barley (*Hordeum* spp.) as well as herbs such as filaree (*Erodium* spp.), with less abundant native annual and perennial grasses and herbs. This community is found along the shores of San Andreas Reservoir and Upper and Lower Crystal Springs Reservoirs.

Chaparral and Scrub

Northern mixed chaparral and northern coastal scrub are shrub-dominated communities typically found on steep, rocky, exposed slopes. Both tend to form dense, rather impenetrable stands that are regenerated by periodic wildfires. On the Peninsula watershed, northern mixed chaparral is dominated by scrub oak (*Quercus dumosa*), chamise (*Adenostoma fascicularis*), and several species of ceanothus (*Ceanothus* spp.). Northern coastal scrub is dominated by coyote brush (*Baccharis pilularis*), poison-oak (*Toxicodendron diversilobum*), and bush monkeyflower (*Mimulus aurantiacus*). Northern coastal scrub is found on much of the western shore of San Andreas Reservoir, the shores of most of the upper, northern branches of Pilarcitos Reservoir, and in small areas around Upper and Lower Crystal Springs Reservoirs.

Forests and Woodlands

Mixed evergreen forest and coast live oak woodland are the most abundant forest communities on the watershed. These communities are typically found in more sheltered sites that have deeper soils than scrubs and grasslands. Mixed evergreen forest is dominated by coast live oak, California bay (*Umbellularia californica*), madrone (*Arbutus menziesii*), Douglas-fir, and big-leaf maple (*Acer macrophyllum*). It tends to form a closed canopy with shrubby or grassy understory and is found in more sheltered sites such as canyons. Coast live oak woodland is dominated by a single species, coast live oak, which forms a nearly closed canopy forest in favorable sites with deep soils and ample soil moisture, or open woodland with a grassy understory in drier areas. Mixed evergreen forest and coast live oak are found in nearly all of the deep canyons on the east side of San Andreas and Crystal Springs Reservoirs, and most of the sheltered western sides of these reservoirs. A small stand is also found on the west side of Pilarcitos Reservoir. Douglas-fir forest and redwood forest are tall, dense, forests dominated by Douglas-fir and coast redwood. Some of the largest old-growth stands in the Bay Area are found on the eastern slopes of the larger ridges in the Peninsula watershed. These communities extend to the shores of Pilarcitos

Reservoir. Small areas of Douglas-fir forest also occur on the western shore of Lower Crystal Springs Reservoir.

Riparian Forests

Central coast arroyo willow riparian forest occurs in moist canyons, usually with perennial stream flow or seepage. It is a dense, broadleaved, winter-deciduous forest dominated by arroyo willow (*Salix lasiolepis*), which grows as a large, tree-like shrub. This common riparian natural community is found in sections of Pilarcitos Creek both above Pilarcitos Reservoir and below Stone Dam, on the major tributaries draining into San Andreas and Upper and Lower Crystal Springs Reservoirs, and in portions of San Mateo Creek below Crystal Springs Dam. White alder riparian forest is a medium-tall, broadleaved, deciduous streamside forest dominated by white alder (*Alnus rhombifolia*) with a shrubby, deciduous understory. It is found along rapidly flowing perennial streams with coarse sediments and is more typical of the North Coast. It is found along Pilarcitos Creek between Pilarcitos Dam and Stone Dam and in San Mateo Creek between Mud Dam and Lower Crystal Springs Reservoir. Central coast live oak riparian forest is an evergreen riparian forest dominated by coast live oak. This community may be present in portions of San Mateo Creek below Crystal Springs Dam.

Coastal and Valley Freshwater Marsh

Coastal and valley freshwater marsh is a wetland community dominated by usually dense stands of perennial, emergent grass and grass-like plants up to 15 feet tall. Typical species include cattails (*Typha* spp.), tule (*Scirpus* spp.), rushes (*Juncus* spp.), and sedges (*Carex* spp.). Coastal and valley freshwater marsh is found in areas that are permanently flooded or saturated. Examples of this community are found around the perimeter of all of the reservoirs in the Peninsula watershed, usually in areas of gentle topography and fine-textured alluvial soils where streams deposit sediment. Upper and Lower Crystal Springs Reservoirs and San Andreas Reservoir support extensive areas of freshwater marsh, while Pilarcitos Reservoir has little of this habitat.

Key Special-Status Species and Other Species of Concern

The name and status of key plant and animal special-status species and species of concern with the potential to occur within the WSIP program area on the Peninsula watershed, based on the EIR for the *Peninsula Watershed Management Plan* (San Francisco Planning Department, 2001), are shown in Appendix D. **Tables 5.5.6-2** and **5.5.6-3** present the name, status, habitat, and potential for occurrence of key plant and animal species that could be affected by WSIP projects in the Peninsula watershed; these species are further discussed in the text below.

Because of proposed changes in the operation of Upper and Lower Crystal Springs Reservoirs and the presence of extensive serpentine grassland habitats along their shores, many species could be affected by the Lower Crystal Springs Dam project (PN-4). These species are discussed briefly below and will be described in more detail in the project-specific EIR. The consultant team (Lebednik, 2006) provided preliminary survey results of 2006 wildlife and botanical surveys for the Lower Crystal Springs Dam project area.

TABLE 5.5.6-2
KEY SPECIAL-STATUS PLANTS AND PLANT SPECIES OF CONCERN IN THE WSIP PENINSULA WATERSHED OPERATIONAL AREA

			Potential to Occur, by WSIP Operational Area[a]		
Common Name *Scientific Name*	**USFWS/CDFG/ CNPS Status**[b]		**Upper/Lower Crystal Springs Reservoirs, San Mateo Creek**	**San Andreas Reservoir**	**Pilarcitos Reservoir and Creek**
San Mateo thorn-mint *Acanthomintha duttonii*	FE/CE/1B*	Open areas in serpentine clay soils	Low potential		
Franciscan onion *Allium peninsulare* var. *franciscanum*	–/–/1B	Woodland, grassland, clay soils, often on serpentine	Present		
Bent-flowered fiddleneck *Amsinckia lunaris*	–/–/1B	Woodland and valley grassland	Potential	Potential	Potential
Fountain thistle *Cirsium fontinale var. fontinale*	FE/CE/1B*	Serpentine seeps	Present		
San Francisco collinsia *Collinsia multicolor*	–/–/1B	Closed-cone coniferous forest, coastal scrub, sometimes serpentinite	Present		
Western leatherwood *Dirca occidentalis*	–/–/1B	Mesic sites in forest, woodland, and scrub	Present	Potential	Potential
San Mateo woolly sunflower *Eriophyllum latilobum*	FE/CE/1B*	Openings in oak woodland on serpentine	Present		
Fragrant fritillary *Fritillaria liliacea*	–/–/1B	Clay soils, often on serpentine	Present nearby		
Marin western flax *Hesperolinon congestum*	FT/CT/1B*	Grassland and chaparral, often on serpentine	Present		
Hillsborough chocolate lily *Fritillaria biflora* var. *ineziana* (=*F. grayiana*)	–/–/1B	Woodland and grassland, often on serpentine	Low potential		
Crystal Springs lessingia *Lessingia arachnoidea*	–/–/1B	Woodland, scrub, grassland, usually on serpentine	Present		
Arcuate bush mallow *Malacothamnus arcuatus* (=*M. fasciculatus*)	–/–/1B	Chaparral on gravelly alluvium	Present	Potential	Potential
Dudley's lousewort *Pedicularis dudleyi*	–/CR/1B*	Maritime chaparral, north coast coniferous forest, and cismontane woodland; deep shady woods of redwood forests	Low potential		Potential
White-rayed pentachaeta *Pentachaeta bellidiflora*	FE/CE/1B*	Open dry rocky slopes and grassy areas, usually on serpentine soils	Low potential		

[a] The WSIP operational area is the extent that could be affected by program operations, such as below reservoir maximum elevations, or within riparian areas where changes in flows could affect habitat.
[b] Federal (USFWS), state (CDFG), and California Native Plant Society protection status codes are as follows:

FC: Federal candidate for listing
FE: Federal endangered
FT: Federal threatened
FD: Federal delisted
CE: California endangered
CT: California threatened
CR: California rare
1B: California Native Plant Society rare and endangered
– Indicates no federal or state protection

* Indicates key special-status species, defined as having a state or federal listing as rare, threatened, or endangered.

SOURCES: CDFG, 2007; CNPS, 2006; Lebednik, 2006.

TABLE 5.5.6-3
KEY SPECIAL-STATUS ANIMALS AND ANIMAL SPECIES OF CONCERN IN THE WSIP PENINSULA WATERSHED OPERATIONAL AREA

Common Name *Scientific Name*	**USFWS/CDFG Status**[b]	**Habitat**	**WSIP Operational Area**[a] **Upper/Lower Crystal Springs Reservoirs, San Mateo Creek**	**San Andreas Reservoir**	**Pilarcitos Reservoir and Creek**
Invertebrates					
Bay checkerspot butterfly *Euphyhydras editha bayensis*	FT/–*	Serpentine bunchgrass and valley needlegrass grassland	Low potential		
Mission blue butterfly *Plebejus (=Icaricia) icarioides bayensis*	FE/–*	Grasslands supporting *Lupinus albifrons, L. variicolor,* and *L. formosus* larval host plants		Potential	
Reptiles and Amphibians					
California red-legged frog *Rana aurora draytonii*	FT/CSC*	Slow-moving streams and ponds	Present	Present	Present
Foothill yellow-legged frog *Rana boylii*	–/CSC*	Shallow, moving water with sunny banks	Potential in tributary streams	Potential	Potential
Western pond turtle *Emys marmorata*	–/CSC	Permanent water such as streams or ponds	Present	Potential	Potential
San Francisco garter snake *Thamnophis sirtalis tetrataenia*	FE/CE, FP*	Freshwater marshes, ponds, and slow-moving streams with dense cover	Present	Present	Present
Birds					
Cooper's hawk *Accipiter cooperi*	–/CSC	Nests in deciduous riparian vegetation and oaks	Potential	Potential	Potential
Sharp-shinned hawk *Accipiter striatus*	–/CSC	Nests in deciduous riparian vegetation and oaks	Potential	Potential	Potential
Tricolored blackbird *Agelaius tricolor*	–/CSC	Colonial nester in emergent vegetation; forages over open water	Present	Potential	
Bell's sage sparrow *Amphispiza belli belli*	–/CSC	Nests in chaparral and coastal scrub	Potential	Potential	Potential
Marbled murrelet *Brachyramphus marmoratus*	FT/CE*	Nests high in old-growth conifers; feeds on near-shore fish			Present nearby
Vaux's swift *Chaetura vauxi*	–/CSC	Nests in hollow trees; forages over open water, woodlands	Present	Potential	Potential
Northern harrier *Circus cyaneus*	–/CSC	Nests and forages in wet meadows	Potential	Potential	
Merlin *Falco columbarius*	–/CSC	Winter visitor in foothills, valleys	Potential	Potential	Potential
Peregrine falcon *Falco peregrinus anatum*	FD/CE, FP*	Nests in cliffs and outcrops; forages near wetlands and other water	Potential	Potential	Potential

TABLE 5.5.6-3 (Continued)
KEY SPECIAL-STATUS ANIMALS AND ANIMAL SPECIES OF CONCERN IN THE WSIP PENINSULA WATERSHED OPERATIONAL AREA

			WSIP Operational Area[a]		
Common Name ***Scientific Name***	**USFWS/CDFG Status[b]**	**Habitat**	**Upper/Lower Crystal Springs Reservoirs, San Mateo Creek**	**San Andreas Reservoir**	**Pilarcitos Reservoir and Creek**
Saltmarsh common yellowthroat *Geothlypis trichas sinuosa*	–/CSC	Nests and forages in riparian scrub	Present	Potential	
Loggerhead shrike *Lanius ludovicianus*	–/CSC	Open country for hunting; nests in riparian woodland and open woodlands	Potential	Potential	Potential
California black rail *Laterallus jamaicensis coturniculus*	–/CT*	Mainly nests in saltmarsh but may also occur in freshwater and brackish marshes at low elevations	Potential	Potential	
Double-crested cormorant *Phalcrocorax auritus*	–/CSC	Colonial nester on coastal cliffs and along lake margins; forages in open water	Present	Potential	
Bank swallow *Riparia riparia*	–/CSC	Colonial nester in riparian cliffs	Potential	Potential	
Mammals					
Pallid bat *Antrozous pallidus*	–/CSC	Roosts in trees; forages over grassland	Potential		
Pacific western big-eared bat *Corynorhinus (=Plecotus) townsendii*	–/CSC	Roosts in caves and buildings; forages in open country	Potential	Potential	
Small-footed myotis *Myotis ciliolabrum*	–/CSC	Roosts in caves and trees; forages in open country	Potential	Potential	Potential
Long-eared myotis *Myotus evotis*	–/CSC	Roosts in hollow trees and buildings; forages at streams and ponds	Potential	Potential	Potential
Fringed myotis *Myotis thysanodes*	–/CSC	Roosts in hollow trees and buildings; forages at forest edge	Potential	Potential	Potential
Long-legged myotis *Myotis volans*	–/CSC	Roosts in caves, old buildings and under bark	Potential	Potential	Potential
Yuma myotis *Myotis yumanensis*	–/CSC	Roosts in riparian vegetation; forages over open water	Potential	Potential	Potential
San Francisco dusky-footed woodrat *Neotoma fuscipes annectens*	–/CSC	Many forest habitats, especially with oaks	Present	Potential	Potential

[a] The WSIP operational area is the extent that could be affected by program operations, such as areas below maximum reservoir water levels, or within riparian areas where changes in flows could affect habitat.
[b] Federal (USFWS) and state (CDFG) protection status codes are as follows:
FC: Federal candidate for listing
FE: Federal endangered
FT: Federal threatened
FD: Federal delisted
CE: California endangered
CT: California threatened
CP: California fully protected
CSC: California species of special concern
– Indicates no federal or state protection
* Indicates key special-status species, defined as having a state or federal listing as endangered or threatened.

SOURCES: CDFG, 2007; Lebednik, 2006.

Serpentine-Associated Plants

Several upland special-status plants occur in serpentine-influenced habitats near the margins of Upper and Lower Crystal Springs Reservoirs, especially on the eastern side of Upper Crystal Springs Reservoir, where a large serpentine outcrop adjoins the reservoir. Franciscan onion (*Allium peninsulare* var. *franciscanum*, federal species of concern, CNPS List 1B), fountain thistle (*Cirsium fontinale* var. *fontinale*, federal endangered, California endangered), Marin western flax (*Hesperolinon congestum*, federal threatened, California threatened), and Crystal Springs lessingia (*Lessingia arachnoidea*, federal species of concern, CNPS List 1B) have been observed in serpentine grassland below the elevation of 291 feet along the eastern shoreline of Upper Crystal Springs Reservoir (Lebednik, 2006). San Mateo thorn-mint (*Acanthomintha duttonii*, federal endangered, California endangered), Hillsborough chocolate lily (*Fritillaria grayiana*, CNPS List 1B), fragrant fritillary (*Fritillaria liliacea*, CNPS List 1B), and white-rayed pentachaeta (*Pentachaeta bellidiflora*, federal endangered, California endangered, CNPS List 1B) are known to occur in serpentine grasslands near Upper Crystal Springs Reservoir, but have not been identified in the WSIP program area during recent protocol-level surveys. San Mateo woolly sunflower (*Eriophyllum latilobum*, federal endangered, California endangered, CNPS List 1B) is known to occur serpentine soils in woodland openings in San Mateo Canyon.

Other Upland Plants

Western leatherwood (*Dirca occidentalis*, CNPS List 1B) occurs in woodland, forest, and scrub habitats in many localities in the Peninsula watershed, and suitable habitat is present in the vicinity of all three reservoirs. Arcuate bush mallow (*Malacothamnus fasciculatus=M. arcuatus*, CNPS List 1B) grows in chaparral on gravelly alluvium. It was observed on the shore of Upper and Lower Crystal Springs Reservoirs in 2006, and suitable habitat may also be present in coastal scrub near the other reservoirs. Although not observed during 2006 field surveys (Lebednik, 2006), suitable habitat is present in the vicinity of Upper and Lower Crystal Springs Reservoirs for bent-flowered fiddleneck (*Amsinckia lunaris*, CNPS List 1B) and for Dudley's lousewort (*Pedicularis dudleyi*, federal species of concern, California rare, CNPS List 1B) near Upper and Lower Crystal Springs Reservoirs and Pilarcitos Reservoir and Creek.

Perennial Grassland Invertebrates

Bay checkerspot butterfly (*Euphyhydras editha bayensis*, federal threatened), is discussed in Chapter 4, Section 4.6. It is believed to be extirpated from the Peninsula watershed lands. Mission blue butterfly (*Icaricia icarioides missionensis*, federal endangered) is found in native grasslands and coastal scrub, where it depends on three perennial species of lupine (*Lupinus* spp.) for its larval foodplant. This species was originally believed to be restricted to San Francisco as far south as San Bruno Mountain; however, a population was discovered in the vicinity of San Andreas Dam in 1985 (San Francisco Planning Department, 2001). It is not known to occur in the vicinity of Upper and Lower Crystal Springs Reservoirs, but foodplants were observed in this area during surveys in 2006 (Lebednik, 2006).

Aquatic-Dependent Reptiles and Amphibians

California red-legged frog (*Rana aurora draytonii*, federal threatened, California species of special concern) is discussed in Section 4.6. According to recent surveys (LSA, in prep.), the distribution of California red-legged frog in the Peninsula watershed is patchy despite the presence of widespread, apparently suitable habitat. Within the WSIP program area, the species is known to occur in Upper and Lower Crystal Springs Reservoirs and Tracy Lake, San Andreas Reservoir, Stone Dam, Pilarcitos Creek, San Mateo Creek below Crystal Springs Dam, and on the parapet of the dam itself, as well as in many other localities within the Peninsula watershed (CDFG, 2006; Swaim, 2006; CDFG, 2007).

Foothill yellow-legged frog (*Rana boylii*, federal species of concern, California species of special concern) is a stream-dwelling species, preferring shallow, flowing water, preferentially in small to moderate sized streams. Although this species is historically known to occur in low-elevation streams in the Sierra Nevada, Transverse Ranges, and Coast Ranges northward to Oregon, its current distribution is not well known. There are historical records for many streams on the San Francisco Peninsula, including some in or near the Peninsula watershed (Swaim, 2006), but the current extent of the species in the Peninsula watershed is not known. Potential habitat may be present in Pilarcitos Creek and the tributaries to San Andreas and Upper and Lower Crystal Springs Reservoirs. Western pond turtle (*Actinemys = Clemmys marmorata*, federal species of concern, California species of special concern) lives in permanent water such as lakes, ponds, and deep areas in streams. It requires logs, rocks, or emergent vegetation for basking. Western pond turtle is known to occur in Upper and Lower Crystal Springs Reservoirs, and suitable habitat is present at San Andreas Reservoir and Pilarcitos Reservoir.

San Francisco garter snake (*Thamnophis sirtalis tetrataenia*, federal endangered, California endangered) is discussed in Section 4.6. Within the WSIP program area on the Peninsula watershed, this species is known to occur in San Andreas Reservoir, Upper and Lower Crystal Springs Reservoirs, the Pulgas Water Temple, the upper headwaters of Pilarcitos Creek, the vicinity of Pilarcitos Reservoir, and at Stone Dam.

Marbled Murrelet

The marbled murrelet (*Brachyramphus marmoratus*, federal threatened) is a small, diving seabird that nests in large trees in coniferous forests as much as 50 miles inland, and forages on small fish and invertebrates in near-shore marine waters. A nesting murrelet was detected in 1998 and 2003 on the west side of Pilarcitos Creek within designated critical habitat for the species.

Riparian-Dependent Birds

Several bird species of special concern are closely associated with the riparian habitats in the WSIP program area. Riparian trees throughout the watershed have a moderate potential to support nesting and foraging Cooper's hawk (*Accipiter cooperi*, California species of special concern) and sharp-shinned hawk (*A. striatus*, California species of special concern). The riparian vegetation at the southern end of Upper Crystal Springs Reservoir supports a breeding population of saltmarsh common yellowthroat (*Geothlypis trichas sinuosa*, California species of special concern). Suitable habitat may also be present at San Andreas Reservoir. Loggerhead shrike

(*Lanius ludovicianus*, California species of special concern) nests in riparian and other woodlands and forages over open country. It may be present throughout the Peninsula watershed in suitable habitat.

Marsh- and Lake-Dependent Birds

Tricolored blackbird (*Agelaius tricolor*, California species of special concern) has been observed during the breeding period in the vicinity of Upper and Lower Crystal Springs Reservoirs and thus may breed there. Suitable habitat may also be present at San Andreas Reservoir. Northern harrier (*Circus cyaneus*, California species of special concern) nests and forages in wet meadows and pastures such as those found at San Andreas Reservoir and Upper and Lower Crystal Springs Reservoirs. California black rail (*Laterallus jamaicensis coturniculus*, California threatened) generally breeds in saltmarsh habitat, but sometimes breeds in freshwater marsh at low elevations. Suitable habitat may be present at Upper and Lower Crystal Springs Reservoirs and San Andreas Reservoir. Double-crested cormorant (*Phalacrocorax auritus*, California species of special concern) nests in rookeries on cliffs and along lake margins, and forages for fish. It has been observed at Crystal Springs Reservoir and may also forage at San Andreas Reservoir. The bank swallow (*Riparia riparia,* California threatened) nests in banks along large rivers and forages over open water. Although there are no current records for this species in the Peninsula watershed, it may forage at Crystal Springs and San Andreas Reservoirs. Peregrine falcon (*Falco peregrinus anatum*, federal delisted, California endangered) nests in cliffs and outcrops and forages near wetlands and open water. Foraging habitat may be present throughout the Peninsula watershed, especially near Crystal Springs and San Andreas Reservoirs.

Upland Birds

Bell’s sage sparrow (*Amphispiza belli belli*, California species of special concern) nests in chaparral and coastal scrub. Suitable habitat may be present on the shores of all of the reservoirs. Vaux’s swift (*Chaetura vauxi*, California species of special concern) nests in hollow trees and forages over woodlands and open water. The species was observed at Upper and Lower Crystal Springs Reservoirs, and suitable habitat may be present near San Andreas and Pilarcitos Reservoirs. Merlin (*Falco columbarius*, California species of special concern) is a winter visitor and may forage in all project areas.

Mammals

Pallid bat (*Antrozous pallidus*, California species of special concern) roosts in trees and forages over open grassland. The species could occur throughout the watershed, but foraging areas within the WSIP program area would be found primarily along the shores of Upper and Lower Crystal Springs Reservoirs. Pacific western big-eared bat (*Corynorhinus townsendii*) roosts in caves and buildings and forages in open country. Suitable habitat is present at Upper and Lower Crystal Springs Reservoirs and San Andreas Reservoir. Small-footed myotis (*Myotis ciliobabrum*, California species of special concern) roosts in trees as well as old buildings and caves and forages in open country. Like the pallid bat, the primary foraging areas near the WSIP program area would be along the shores of Upper and Lower Crystal Springs Reservoirs, but roosting habitat would be present throughout the program area within the Peninsula watershed. Long-eared myotis (*Myotis evotis*, California species of special concern) roosts in hollow trees and forages along rivers, streams, and ponds. It would be expected to occur throughout the WSIP program area in the Peninsula watershed. Fringed myotis (*Myotis thysanodes*, California species of special concern) roosts in trees and forages at the forest edge. It would be expected to occur throughout the WSIP program area. Long-legged myotis *(Myotis volans*) roosts in hollow trees and feeds primarily in open areas. Suitable roosting habitat could be present throughout the WSIP program area in the Peninsula watershed, but foraging areas would be present primarily at the margins of San Andreas and Upper and Lower Crystal Springs Reservoirs. Yuma myotis (*Myotis yumanensis*, California species of special concern) roosts in trees and crevices and forages over emergent vegetation and still water. It would be most likely to occur near the reservoirs—Pilarcitos, San Andreas, and Upper and Lower Crystal Springs.

The San Francisco dusky-footed woodrat (*Neotoma fuscipes annectens,* California species of special concern) inhabits oak woodlands where it forages primarily on oak leaves. Suitable habitat is present in oak woodlands throughout the Peninsula watershed.

5.5.6.2 Impacts

Significance Criteria

The CCSF has not formally adopted significance standards for impacts related to terrestrial biological resources, but generally considers that implementation of the proposed program would have a significant biological impact if it were to:

- Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the CDFG or USFWS
- Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the CDFG or USFWS
- Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including but not limited to marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means
- Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites
- Have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, or reduce the number or restrict the range of a rare or endangered plant or animal
- Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance

- Conflict with the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or state habitat conservation plan

Approach to Analysis

The assessment of WSIP operational impacts on terrestrial biological resources is based primarily on the extent to which altered operations would change the existing habitat near reservoirs and creeks. Operational changes consist of increased diversions during winter high flows, increased releases to streams to maintain minimum flows, and changes in the elevation, annual range, and seasonal timing of reservoir water levels. Section 5.5.1 presents an assessment of the changes in hydrology in the Peninsula watershed that would occur under the WSIP.

This section discusses impacts related to sensitive habitats, key special-status species, other species of concern, and common habitats and species. The discussion of riparian and wetland habitats addresses the second and third significance criteria listed above. "Key special-status species" include species that are formally listed as endangered or threatened under the state or federal endangered species acts, as well as a few other species (such as foothill yellow-legged frog) that are afforded some degree of legal protection and have a high risk of local population decline or extirpation. The key special-status species discussion addresses the first significance criterion. "Other species of concern" and "common habitats and species" are more general categories relevant to the fourth and fifth significance criteria.

There would be no impacts related to conflicts with local policies or ordinances protecting biological resources or the provisions of a habitat conservation plan (the last two significance criteria). The SFPUC has prepared a management plan for the Peninsula watershed and is preparing a habitat conservation plan, but the WSIP would be consistent with their provisions.

The responses of terrestrial biological resources to changes in stream and reservoir operations are complex in both space and time. This section describes the general impacts associated with certain categories of operational changes to reservoirs and streams. The project EIR for the Lower Crystal Springs Dam project (PN-4) would address operational impacts in detail. The other Peninsula Region projects would have limited, if any, operational impacts on creeks and reservoirs. Potential impacts on San Andreas Reservoir, Pilarcitos Reservoir, and Pilarcitos Creek are analyzed in this PEIR at a project level because the operational effects on these facilities would not be analyzed in a project-specific EIR.

Unlike the Alameda Creek watershed and Calaveras Reservoir, which have experienced DSOD-mandated operational changes for a relatively short period of time, Crystal Springs Reservoir has been maintained at lower, DSOD-mandated water levels since 1983—nearly 25 years. The freshwater marsh and riparian habitats have adapted to the prevailing conditions, and no reference to earlier operational conditions is required in this assessment of impacts.

Impact Summary

Table 5.5.6-4 presents a summary of the impacts on terrestrial biological resources in the Peninsula watershed that could result from implementation of the proposed water supply and system operations.

TABLE 5.5.6-4
SUMMARY OF IMPACTS –
TERRESTRIAL BIOLOGICAL RESOURCES IN THE PENINSULA WATERSHED

Impacts	Sensitive Habitats	Key Special-Status Species	Other Species of Concern	Common Habitats and Species
Impact 5.5.6-1: Impacts on biological resources in Upper and Lower Crystal Springs Reservoirs	PSM	PSM	PSM	PSM
Impact 5.5.6-2: Impacts on biological resources in San Andreas Reservoir	LS	LS	LS	LS
Impact 5.5.6-3: Impacts on biological resources along San Mateo Creek below Lower Crystal Springs Dam	LS	LS	LS	LS
Impact 5.5.6-4: Impacts on biological resources in Pilarcitos Reservoir	LS	PSM*	LS	LS
Impact 5.5.6-5: Impacts on biological resources along Pilarcitos Creek below Pilarcitos Reservoir	LS	LS	LS	LS
Impact 5.5.6-6: Impacts on biological resources along Pilarcitos Creek below Stone Dam	LS	LS	LS	LS
Impact 5.5.6-7: Conflicts with the provisions of adopted conservation plans or other approved biological resource plans	LS			

LS = Less than Significant impact, no mitigation required
PSM= Potentially Significant impact, can be mitigated to less than significant

* Based on the refined Pilarcitos watershed impact analysis (see Section 13.3), this impact is PSM due to adverse effects that would result from implementing replacement Measure 5.5.3-2a.

Impact Discussion

Impact 5.5.6-1: Impacts on biological resources in Upper and Lower Crystal Springs Reservoirs.

Sensitive Habitats

Elevating the average storage and reservoir levels under the WSIP would inundate all existing freshwater marsh and riparian habitats below an elevation of 283 feet, resulting in the loss of these sensitive habitats. Freshwater marsh would become established at higher elevations in response to higher reservoir levels. As the reservoir fills, there could be a short-term reduction in the overall extent of freshwater marsh, although the greater perimeter of the reservoir at the higher levels could eventually support an increase in the extent of these habitats. This impact would be potentially significant.

Under the WSIP, the average monthly water levels in Crystal Springs Reservoir would fluctuate more than under the existing condition. This increased fluctuation would be due in part to periodic drawdown (up to 16 feet) for Hetch Hetchy system maintenance, which would occur approximately every five years. This drawdown would expose deep-water emergent vegetation such as cattails and tules and could dry the soils supporting shallow emergent vegetation and wet meadow vegetation. However, the maintenance would be scheduled during the onset of cool fall or early winter weather (October–December), when wetland vegetation is entering its winter dormancy period. Provided the reservoir was refilled during the winter, impacts on sensitive habitats related to this change in operations would be less than significant, and no mitigation measures would be required.

Other than the periodic drawdown, the annual range of fluctuation in reservoir water levels would be similar to levels under existing conditions; therefore, the impact on riparian and wetland resources would be less than significant, and no mitigation measures would be required.

The WSIP proposes to maintain maximum reservoir water levels for longer periods during the summer than under existing conditions. This operational strategy could favor perennial freshwater marsh habitats over willow scrub, but any such effect cannot be quantified at the program level of analysis. Therefore, this PEIR conservatively considers this impact to be potentially significant.

Sensitive upland habitats would be affected by the higher reservoir water levels. Maximum water levels would be sustained higher and longer with the WSIP than under existing conditions (or before the DSOD-imposed operational restrictions). Habitats and species that could not tolerate these longer periods of inundation would be lost, including oak woodland, mixed evergreen forest, serpentine grassland, and valley needlegrass grassland. This impact would be potentially significant.

The EIR for the Lower Crystal Springs Dam project (PN-4) will provide a more detailed analysis of project impacts, including a determination of the acreage of sensitive upland, wetland, and riparian habitat that would be affected by the change in reservoir water levels. However, this PEIR conservatively considers the effects of the WSIP on sensitive upland, wetland, and riparian habitats to be *potentially significant*.

Key Special-Status Species

Proposed operation of Upper and Lower Crystal Springs Reservoirs under the WSIP would affect several key special-status species. Populations of serpentine-associated fountain thistle and Marin western flax would be inundated and their habitat potentially permanently lost. At the program level of analysis, this impact is considered potentially significant. More detailed impact analysis will be conducted as part of the project-level CEQA review for the Lower Crystal Springs Dam project (PN-4).

WSIP-related operations could also affect San Francisco garter snake and California red-legged frog in several ways. Direct mortality by drowning could occur if the reservoir level is raised while San Francisco garter snakes are in hibernation. Both species would experience a loss of habitat throughout Upper and Lower Crystal Springs Reservoirs when existing freshwater marsh vegetation is inundated. Once freshwater marsh wetland is established at higher levels, the WSIP could increase the extent of available habitat for California red-legged frog and San Francisco garter snake. However, raising the water level in reservoirs could permit largemouth bass (*Micropterus salmoides*) and other predators to gain access to habitat for San Francisco garter snake and California red-legged frog in areas that are currently isolated due to elevational barriers. Examples include Tracy Lake in the northern arm of Lower Crystal Springs Reservoir, and the proposed Laguna Creek sedimentation basin at the southern end of Upper Crystal Springs Reservoir. Thus, at the program level of analysis, potentially significant adverse and beneficial impacts on habitat for special-status species would be expected to occur due to higher and more variable water levels in Upper and Lower Crystal Springs Reservoirs. Impacts will be analyzed in more detail in the project-specific EIR for the Lower Crystal Springs Dam project (PN-4).

Annual summer drawdown has been cited as a potential problem for San Francisco garter snakes because the exposed, unvegetated shoreline separates emergent vegetation foraging habitat from water and protective cover (Barry, no date). Hydrologic models of the proposed program indicate that summer drawdown would be about the same as the current pattern, except for the drawdown that would occur for periodic maintenance. San Francisco garter snakes usually enter their winter hibernation period by mid-November (Barry, no date). Because the drawdown period overlaps somewhat with the active period of this species, this impact would be potentially significant with respect to foraging habitat for both adult and young garter snakes.

Other key special-status species that could be affected by reservoir operations under the WSIP include peregrine falcon and black rail. Both species utilize freshwater marsh habitats, but to a limited degree. Therefore, impacts on these species due to alteration of habitats would be less than significant.

Overall, the effects of the WSIP on key special-status species would be *potentially significant.*

Other Species of Concern

The loss of existing habitat and ultimate establishment of habitat at higher elevations would also affect a number of reptile, bird, and bat species of concern that depend on freshwater marsh and riparian habitat. Those that depend on freshwater marsh habitat would experience a loss of habitat when the reservoir level is raised, but would ultimately benefit when freshwater marsh becomes established at higher elevations. Such species include western pond turtle, tricolored blackbird, saltmarsh yellowthroat, northern harrier, Vaux’s swift, and double-crested cormorant, all known to occur at the reservoirs. Individuals of these species could be directly affected by a rise in water level during the breeding season, and a temporary loss of suitable habitat could result if wetland vegetation changes occur. Both of these changes would result in potentially significant impacts.

Bird and mammal species of concern that depend on large trees and woodland for nesting, roosting, or foraging would be adversely affected by the loss of upland trees along the shoreline. Such species include Cooper’s hawk, sharp-shinned hawk, loggerhead shrike, several bat species, and San Francisco dusky-footed woodrat. Species of concern that depend on grassland and coastal scrub, including Bell’s sage sparrow and pallid bat, could be affected by the loss of these habitats when reservoir water levels are raised. Due to the extent of habitat and the number of species that would be affected, impacts on species of concern due to the loss of upland habitat would be potentially significant.

Serpentine- and grassland-associated plant species of concern and their habitats could be lost due to increased water levels at Upper and Lower Crystal Springs Reservoirs, depending on species tolerance for extended inundation, saturation of the seed bank, and the length of inundation. Species that could be affected include Franciscan onion, Crystal Springs lessingia, western leatherwood, and arcuate bush mallow. San Francisco collinsia would potentially be affected by loss of forested or coastal scrub habitat. Impacts due to the loss of habitat and populations of these species of concern would be potentially significant.

Overall, the effects of the WSIP on other species of concern would be *potentially significant*.

Common Habitats and Species

The WSIP proposes to maintain Upper and Lower Crystal Springs Reservoirs at maximum levels for longer periods during the summer than under existing conditions, and for longer periods than under the DSOD imposed operational restrictions. Many upland plant species can tolerate inundation for brief periods, especially during their winter dormant period, but lack adaptations for surviving extended flooding during their period of active growth. Longer periods of maximum reservoir levels may result in mortality of valley oaks, coast live oaks, and other upland species at elevations below 283 feet. The loss of common upland habitats and species at the periphery of Upper and Lower Crystal Springs Reservoirs is considered a *potentially significant* impact because of the extent of area involved.

Impact Conclusions

Impacts on sensitive habitats, key special-status species, species of concern, and common habitats and species at Upper and Lower Crystal Springs Reservoirs would be *potentially significant*. For all resources except plant species adapted to serpentine seeps, such as the fountain thistle, implementation of Measure 5.5.6-1a, Adaptive Management of Freshwater Marsh and Wetlands at Upper and Lower Crystal Springs Reservoirs, and Measure 5.5.6-1b, Compensation for Impacts on Terrestrial Biological Resources, would be sufficient to fully mitigate impacts of the WSIP. For the fountain thistle (key special-status species) and other plant species adapted to serpentine seeps, the additional implementation of Measure 5.5.6-1c, Compensation for Serpentine Seep-Related Special-Status Plants, would reduce the impact to a less-than-significant level.

Impact 5.5.6-2: Impacts on biological resources in San Andreas Reservoir.

Sensitive Habitats

With the WSIP, San Andreas Reservoir would be maintained in much the same pattern as it is under existing conditions, and operation of the reservoir would not substantially affect sensitive freshwater marsh habitats. Every fifth year, the reservoir would be drawn down for maintenance during the winter months, when freshwater marsh vegetation is not typically in active growth. As a result, impacts on sensitive habitat at San Andreas Reservoir would be *less than significant*.

Key Special-Status Species

Since the composition and extent of emergent vegetation is not expected to change significantly at San Andreas Reservoir as a result of WSIP operations, impacts on San Francisco garter snake and California red-legged frog would be *less than significant*. Since the maximum reservoir water level would not change, no impact would occur on key terrestrial upland special-status species such as Mission blue butterfly.

Other Species of Concern

Since changes in the extent and composition of freshwater emergent and upland habitat are expected to be minimal, no impact would occur on upland plant species such as western leatherwood, and arcuate bush mallow. Likewise, any impact on western pond turtle, foraging and roosting bats, tricolored blackbird, northern harrier, merlin, peregrine falcon, Vaux’s swift, saltmarsh yellowthroat, and double-crested cormorant would be *less than significant*.

Common Habitats and Species

Impacts on common habitats and species would be *less than significant*, since the extent and composition of upland and wetland habitats are expected to remain stable.

Impact Conclusions

Impact on sensitive habitats, key special-status species, species of concern, and common habitats and species at San Andreas Reservoir would be *less than significant*.

Impact 5.5.6-3: Impacts on biological resources along San Mateo Creek below Lower Crystal Springs Dam.

Sensitive Habitats

Under the WSIP, Crystal Springs Dam and Reservoir would be operated in much the same way as under existing conditions with respect to maximizing storage and minimizing releases to San Mateo Creek. Because the volume, magnitude, and frequency of releases are projected to be much the same as at present, the impact of the WSIP on riparian vegetation in San Mateo Creek would be *less than significant*.

Key Special-Status Species

Section 4.6, Biological Resources, discusses impacts on freshwater-marsh-dwelling species (such as California red-legged frog) due to the alteration of freshwater marsh habitat immediately below the dam. Since releases from Crystal Springs Dam to San Mateo Creek are projected to be much the same as under existing conditions, any impacts on aquatic-dependent key special-status species would be *less than significant*. WSIP operations would not affect key special-status plants such as San Mateo woolly sunflower.

Other Species of Concern

Any impacts on riparian- and creek-associated species of concern (such as western pond turtle) would be so small as to not be quantifiable and would therefore be *less than significant*.

Common Habitats and Species

Operations under the WSIP would not affect common upland habitats. The impacts on common species would be *less than significant*.

Impact Conclusions

Impacts of WSIP operations on sensitive habitats and key special-status species at San Mateo Creek would be *less than significant*.

Impact 5.5.6-4: Impacts on biological resources in Pilarcitos Reservoir.

Sensitive Habitats

The earlier drawdown of the reservoir under the WSIP would not increase the extent of unvegetated, weedy, or seasonal wetland areas below the maximum water levels, although these areas would be exposed several days or weeks earlier than under the existing condition in some years. This impact would be less-than-significant.

Key Special-Status Species

Proposed operations with the WSIP at Pilarcitos Reservoir would have no effect on the extent of suitable habitat at the reservoir for California red-legged frog and San Francisco garter snake. Similarly, the extent and condition of adjacent upland vegetation would not be affected by the proposed reservoir operations. As a result, the WSIP would have no effect on species such as the marbled murrelet that nest or forage in upland habitats adjacent to the reservoir.

Other Species of Concern

Proposed operations at Pilarcitos Reservoir could slightly reduce the extent of suitable habitat for western pond turtle, Vaux’s swift, Yuma myotis, long-eared myotis, and bird species that forage over open water and emergent vegetation, but this impact would be *less than significant*. However, the extent and condition of adjacent upland vegetation would not be affected by the proposed reservoir operations. As a result, this impact would not apply to nesting or foraging upland habitats for species such as Cooper’s hawk, sharp-shinned hawk, Bell’s sage sparrow, Vaux’s swift, merlin, peregrine falcon, loggerhead shrike, special-status bat species, San Francisco dusky-footed woodrat, and western leatherwood.

Common Habitats and Species

No impact on common habitats would occur as a result of WSIP operations. The potential impact on common species that depend on water levels in Pilarcitos Reservoir and flow in Pilarcitos Creek would be *less than significant*.

Impact Conclusions

Impacts of the WSIP on sensitive habitats, key special-status species, other species of concern, and common habitats and species at Pilarcitos Reservoir would be *less than significant.* However, implementation of Measure 5.5.3-2a, Low-head Pumping Station at Pilarcitos Reservoir, would lower the water level in the reservoir by 3 or 4 feet in some summers. This could have a potentially significant impact on the extent of suitable habitat at the reservoir for California red-legged frog and the San Francisco garter snake. Implementation of Measure 5.5.3-2c, Habitat Monitoring and Compensation, would reduce this impact to a less-than-significant level.

Impact 5.5.6-5: Impacts on biological resources along Pilarcitos Creek below Pilarcitos Reservoir.

Sensitive Habitats

Under the WSIP, flow in Pilarcitos Creek between Pilarcitos Reservoir and Stone Dam would increase in some spring months, a beneficial impact. In the summer months of some drier years, the period during which releases from Pilarcitos Reservoir would be limited to reservoir inflow would be extended, potentially for up to three months. Because willows exist in the riparian forest in this section, it is apparent that the riparian forest is adapted to periods without flowing water. The channel-forming processes in Pilarcitos Creek would be reduced insignificantly under the WSIP. Thus, some changes in flow would be beneficial and some adverse. The overall impact on sensitive riparian habitat is considered *less than significant.*

Key Special-Status Species

Flows in Pilarcitos Creek below Pilarcitos Dam would have a minor impact on riparian habitat; therefore, the impact on habitat for foothill yellow-legged frog would be *less than significant*.

Other Species of Concern

Proposed operations at Pilarcitos Reservoir could slightly reduce the extent of suitable habitat for western pond turtle, Vaux's swift, Yuma myotis, long-eared myotis, and bird species that forage over open water and emergent vegetation, but this impact would be less than significant. However, the extent and condition of adjacent upland vegetation would not be affected by the proposed reservoir operations. As a result, this impact would not apply to nesting or foraging upland habitats for species such as Cooper's hawk, sharp-shinned hawk, Bell's sage sparrow, Vaux's swift, merlin, peregrine falcon, loggerhead shrike, special-status bats, San Francisco dusky-footed woodrat, western leatherwood, and Dudley's lousewort.

Flows in Pilarcitos Creek below Pilarcitos Dam and below Stone Dam would have a less-than-significant impact on riparian habitat; therefore, the impact on habitat for foothill yellow-legged frog and any special-status birds and bats that forage over streams would be less than significant.

Overall, WSIP impacts on other species of concern would be *less than significant*.

Common Habitats and Species

No impacts on common habitats would occur as a result of WSIP operations. The potential impact on common species that depend on water levels in Pilarcitos Reservoir and flow in Pilarcitos Creek would be *less than significant*.

Impact Conclusions

Impacts on sensitive riparian habitat at Pilarcitos Creek between Pilarcitos Reservoir and Stone Dam would be *less than significant*.

Impact 5.5.6-6: Impacts on biological resources along Pilarcitos Creek below Stone Dam.

Sensitive Habitats

The central coast arroyo willow riparian forest below Stone Dam, which relies on seepage and on the contribution of tributary creeks, would not be significantly affected by the WSIP. The overall reduction in high winter flows would result in a slight incremental reduction in channel-forming processes, but the overall impact on sensitive riparian resources along Pilarcitos Creek below Stone Dam would be *less than significant*.

Key Special-Status Species

Flows in Pilarcitos Creek below Stone Dam would have a minor impact on riparian habitat; therefore, the impact on habitat for foothill yellow-legged frog would be *less than significant*.

Other Species of Concern

Flows in Pilarcitos Creek below Stone Dam would have a minor impact on riparian habitat; therefore, the impact on habitat for foothill yellow-legged frog and any special-status birds and bats that forage over streams would be *less than significant*.

Common Habitats and Species

No impacts on common habitats would occur as a result of WSIP operations. The potential impact on common species that depend on water levels in Pilarcitos Reservoir and flow in Pilarcitos Creek would be *less than significant*.

Impact Conclusions

Impacts on biological resources along Pilarcitos Creek below Stone Dam would be *less than significant*, and no mitigation measures would be required.

Impact 5.5.6-7: Conflicts with the provisions of adopted conservation plans or other approved biological resources plans.

The only plan relevant to proposed WSIP operations is the *Peninsula Watershed Management Plan*. The WSIP program as a whole would be consistent with the provisions of this plan, which places priority on resource protection while ensuring that the objective of delivering adequate, high-quality water is met. The SFPUC is currently preparing a habitat conservation plan for the Peninsula watershed; however, WSIP operations are not considered in this plan, which covers only existing operations. Therefore, impacts related to conflicts with adopted plans would be *less than significant.*

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5.5.7 Recreational and Visual Resources

Chapter 4, Section 4.12, Recreational Resources, provided a general overview of the park and recreational facilities and resources near proposed WSIP facility projects. This section discusses specific recreational resources and activities within the Peninsula watershed that could be affected by the proposed water supply and system operations. The discussion focuses primarily on water-related recreation, including fishing, swimming, boating, rafting, or activities such as scenic viewing, walking, hiking, or camping adjacent to water bodies, that could be affected by the WSIP.

5.5.7.1 Setting

The water features of interest for this analysis are the four SFPUC Peninsula reservoirs (Upper Crystal Springs Reservoir, Lower Crystal Springs Reservoir, San Andreas Reservoir, and Pilarcitos Reservoir) and San Mateo and Pilarcitos Creeks. All four reservoirs and portions of the two creeks are located within the SFPUC Peninsula watershed, as shown on Figure 5.5.1-2. The recreational uses and visual resources in the Peninsula watershed that could be affected by the WSIP water supply or system operations are described below.

As described in Section 4.2, Plans and Policies, and 4.3, Land Use and Visual Quality, the Peninsula watershed area is protected by two easements that were established through a four-party agreement among the CCSF, the U.S. Department of the Interior, the California Department of Transportation, and San Mateo County. The scenic and recreation easement covers 4,000 acres located in the eastern periphery of the watershed, generally along the I-280 corridor and adjacent to the communities to the east. The easement abuts Upper and Lower Crystal Springs Reservoirs and the southern end of San Andreas Reservoir. Recreational activities are permitted in this easement area, but are limited to those considered compatible with water quality protection. Portions of these reservoirs are visible from trails within the easement, but public access to the four reservoirs is prohibited, along with all forms of water sports. The scenic easement, which covers 19,000 acres, does not permit recreational activities. This area encompasses the four reservoirs and a stretch of Pilarcitos Creek (SFPUC, 2002). Only a very short stretch of San Mateo Creek is located within the scenic easement; the rest of the creek is outside of both easements and outside of Peninsula watershed lands.

The *Peninsula Watershed Management Plan* also prohibits recreational activities that are detrimental to watershed resources, including swimming, boating, fishing, and hiking at or near the shoreline (SFPUC, 2002).

Recreational Uses

Public trails in the watershed provide both recreational opportunities and scenic views of the Upper Crystal Springs, Lower Crystal Springs, Pilarcitos, and San Andreas Reservoirs. The trails are generally located between the reservoirs and I-280, along the eastern edge of the watershed, where they are easily accessible from the adjacent communities. They are available to the public for hiking, running, bicycling, rollerblading, and horseback riding (though horseback riding and bicycles are allowed only on certain designated trails).

Sawyer Camp Trail

When the SFPUC fenced off the watershed lands in the vicinity of Crystal Springs Reservoir, it left the six-mile Sawyer Camp Trail open to the public for nonmotorized recreational use. This trail, once the main highway between San Francisco and Half Moon Bay, is visited by approximately 300,000 people each year. The trail parallels Crystal Springs and San Andreas Reservoirs and is currently managed by San Mateo County under the name Crystal Springs Park. San Mateo County envisions the Sawyer Camp Trail as an uninterrupted multi-use route from San Bruno to Woodside (San Mateo County, 2007).

San Andreas Trail

The San Andreas Trail extends from San Bruno Avenue on the north to Hillcrest Boulevard on the south, where it connects to the Sawyer Camp Trail. In its northerly section, this popular trail provides scenic views of San Andreas Reservoir. A portion of the trail is paved and is heavily used by bicyclists, joggers, and hikers (San Mateo County, 2006).

Sweeney Ridge Trail

The Sweeney Ridge Trail, which extends from the end of Sneath Lane in San Bruno to the San Francisco Bay Discovery Site (a National Historic Landmark), provides views of the northern watershed and San Francisco Bay (San Mateo County, 2006).

Fifield-Cahill Ridge Trail

Since 2003, the Fifield-Cahill Ridge Trail has been open to the public on a reservation-only basis, with groups of up to 20 people led by docents three days a week. This trail segment is the SFPUC-managed component of the 400-mile-long Bay Area Ridge Trail (SFPUC 2007b).

Connector Trails

Numerous connector trails cross I-280 and provide linkages to communities to the east such as San Mateo, Belmont, and Redwood City. In addition, portions of the San Andreas Reservoir are visible from Junipero Serra County Park (located to the northeast of SFPUC Peninsula watershed).

Pulgas Water Temple

The Pulgas Water Temple is located south of the Upper Crystal Springs Reservoir, east of Cañada Road. It consists of a Roman Renaissance–style structure and pool, surrounded by manicured lawns, landscaping, and a parking lot. The site is open to the public on weekdays and for special events such as weddings, as well as on weekends (SPFUC, 2007c).

Crystal Springs Golf Course

There is one golf course within the watershed, the Crystal Springs Golf Course, but it does not offer any forms of water recreation to the public.

Pilarcitos Creek

Pilarcitos Creek starts at Pilarcitos Reservoir within the SFPUC Peninsula watershed. No water recreation or access to this reservoir is allowed. The creek runs south until it reaches Highway 92, then runs west to its mouth on the Pacific Ocean within Half Moon Bay State Beach. No organized recreational activities are established within or adjacent to the creek in the upper watershed. However, trails within Half Moon Bay State Beach run adjacent to and across Pilarcitos Creek, and the public is allowed access to portions of this stretch of the creek (Bay Area Hiker, 2007).

San Mateo Creek

San Mateo Creek starts at Lower Crystal Springs Reservoir within the SFPUC Peninsula watershed (see above for a description of activities allowed within the watershed). The creek runs east through the town of Hillsborough and city of San Mateo to San Francisco Bay. The San Mateo Creek Trail, maintained by San Mateo County, runs adjacent to the creek for several miles. The creek is not part of any City-managed recreation facility until it reaches San Mateo's Shoreline Parks on San Francisco Bay. Shoreline Parks, which includes Ryder Park and Seal Point Park, includes amenities such as trails, picnic areas, play areas, and an outdoor classroom. These parks incorporate the natural features of the creek and shoreline to some extent and provide some wilderness-based recreation, but are primarily paved and developed. The creek does not appear to be used for any purpose other than as a scenic resource (City of San Mateo, 2007).

Crystal Springs, Pilarcitos, and San Andreas Reservoirs

These reservoirs are located entirely within the SFPUC Peninsula watershed lands. As mentioned above, public access to the interior portion of these watershed lands is prohibited, and the reservoirs are not available for water-related recreation.

Visual Quality Considerations

Due to its use for water collection and storage, the Peninsula watershed area has been protected from urbanization. A wide variety of habitats exist on the watershed due to its diversity of climate, topography, geology and soils. These include old growth Douglas fir forests, grasslands dominated by native bunchgrasses, areas of coastal scrub and chaparral, stream corridors, and wetlands (SFPUC, 2007a). While many of the SFPUC facilities located within the Peninsula watershed are aboveground structures, they are typically screened with existing vegetation and blend with the watershed's landscape. The reservoirs appear as visually prominent water features in views from nearby trails and surrounding ridges as well as from I-280 and Highway 92.

The provisions of the scenic and scenic and recreation easements include the following:

- Except as required to accomplish the improvements hereinafter permitted or as otherwise permitted to the Grantor hereunder, the general topography of the landscape shall be maintained in its present condition and so substantial excavation or topographic changes shall be made without the concurrence of a regional representative of the Department of the Interior…

- Except as required to accomplish the purposes and uses herein permitted to Grantor, there shall be no cutting or permitting of cutting, destroying or removing any timber or brush without the concurrence in writing by a regional representative of the Department of the Interior…

As discussed in Chapter 4, Section 4.2, Plans and Policies, the *Peninsula Watershed Management Plan* includes the following policy related to visual quality:

- *Policy WA 9*: If new facilities require additional new locations, require that view shed studies be conducted to minimize, eliminate or conceal the violation of scenic values.

However, the proposed WSIP water supply and system operations analyzed in this section would not require any new facilities, other than those already discussed and analyzed in Section 4.3, Land Use and Visual Quality. Therefore, this policy is not addressed further in this section.

5.5.7.2 Impacts

Significance Criteria

The CCSF has not formally adopted significance standards for impacts related to recreation or visual resources, but generally considers that implementation of the proposed program would have a significant impact on these resources if it were to:

<u>*Recreation*</u>

- Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated (Secondary impacts of growth are evaluated in Chapter 7, Growth-Inducement Potential and Indirect Effects of Growth)

- Include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment (Secondary impacts of growth are evaluated in Chapter 7)

- Physically degrade existing recreational resources

The physical degradation of existing resources could occur if the WSIP were to: (1) remove or damage existing recreational resources directly; (2) cause environmental impacts (such as air quality or noise effects) that would indirectly result in deterioration in the quality of the recreational experience; or (3) disrupt access to existing recreation facilities (which would divide a community from some of the established amenities used by its members).

<u>*Visual Quality*</u>

- Have a substantial adverse effect on a scenic vista
- Substantially damage scenic resources, including but not limited to trees, rock outcroppings, and other features of the built or natural environment that contribute to a scenic public setting
- Substantially degrade the existing visual character or quality of the site and its surroundings

Approach to Analysis

The WSIP would change water levels in reservoirs and alter flow in streams in the Peninsula watershed. WSIP-induced changes in reservoir water levels in the San Mateo Creek watershed were estimated using the HH/LSM (see Appendix H). WSIP-induced changes in reservoir water levels in the Pilarcitos Creek watershed and stream flow in the Pilarcitos Creek and San Mateo Creek watersheds were estimate semi-quantitatively. A specialist in recreation and visual resources assessed the impacts of the WSIP on these environmental elements using the estimated WSIP-induced changes in reservoir water levels and stream flow (see Section 5.5.1).

Impact Summary

Table 5.5.7-1 presents a summary of the impacts on recreational and visual resources in the Peninsula watershed that could result from implementation of the proposed water supply and system operations.

TABLE 5.5.7-1
SUMMARY OF IMPACTS – RECREATIONAL AND VISUAL RESOURCES IN THE PENINSULA WATERSHED

Impact	Significance Determination
Impact 5.5.7-1: Effects on recreational facilities and/or activities	LS
Impact 5.5.7-2: Visual effects on scenic resources or the visual character of water bodies	LS

LS = Less than Significant impact, no mitigation required

Impact Discussion

Impact 5.5.7-1: Effects on recreational facilities and/or activities.

The WSIP would have no impact on water-related recreational facilities or other recreational activities in the Peninsula watershed. As described in the Setting, no water recreation is allowed on the SFPUC reservoirs; because there would be no change to this policy under the WSIP, no impacts on recreation would occur as a result of water level changes in the Peninsula reservoirs. In addition, new trails are prohibited at or near the shoreline, so no land-based recreation would be affected. With respect to recreation in and along the creeks in the watershed, there is either (1) no or only very limited water recreation occurring at present, and/or (2) the WSIP-related flow changes described in Section 5.5.1 would not appreciably change creek flows to an extent that existing recreational use would be affected. The changes in stream flow or reservoir levels would not physically degrade existing recreational resources. Therefore, impacts on recreation associated with the proposed WSIP system operations would be *less than significant*, and no mitigation is required.

Impact 5.5.7-2: Visual effects on scenic resources or the visual character of water bodies.

As described in Section 5.5.1 flow changes and reservoir water level changes that would occur under the WSIP in the future are not beyond the range of flow and water level variation that occurs now. The Lower Crystal Springs Dam Improvements project (PN-4) would restore the historic reservoir capacity and would raise the water level to historic conditions. The reservoir is visible from a number of trails, parks, and scenic roads. However, while the higher reservoir water level could change the visual appearance at close range, it would not change the scenic quality of the reservoir, either at close range or from distant viewpoints. Therefore, visual impacts associated with the proposed WSIP system operations would be *less than significant*, and no mitigation is required.

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5.6 Westside Groundwater Basin Resources

5.6 Westside Groundwater Basin Resources

This section describes the potential effects of the WSIP water supply and system operations and associated WSIP projects on the Westside Groundwater Basin and related water resources, including Lake Merced. The proposed water supply sources under the WSIP include 10 million gallons per day (mgd) of supply every year in all years (including nondrought periods) from implementation of conservation, water recycling, and groundwater supply programs in San Francisco; in addition, the proposed water supply option includes a long-term conjunctive-use program in the San Mateo County portion of the Westside Groundwater Basin, referred to as the South Westside Groundwater Basin, as part of the drought-year water supply for the regional system. The recycled water and groundwater components of this supply would be achieved through two WSIP projects, the Local and Regional Groundwater Projects (SF-2) and the Recycled Water Projects (SF-3), which are described in Chapter 3. The potential effects of the WSIP on the Westside Groundwater Basin and related resources are discussed in the context of ongoing activities in this area occurring among the SFPUC, City of Daly City, California Water Service Company (Cal Water, the municipal water purveyor to South San Francisco), and the City of San Bruno.

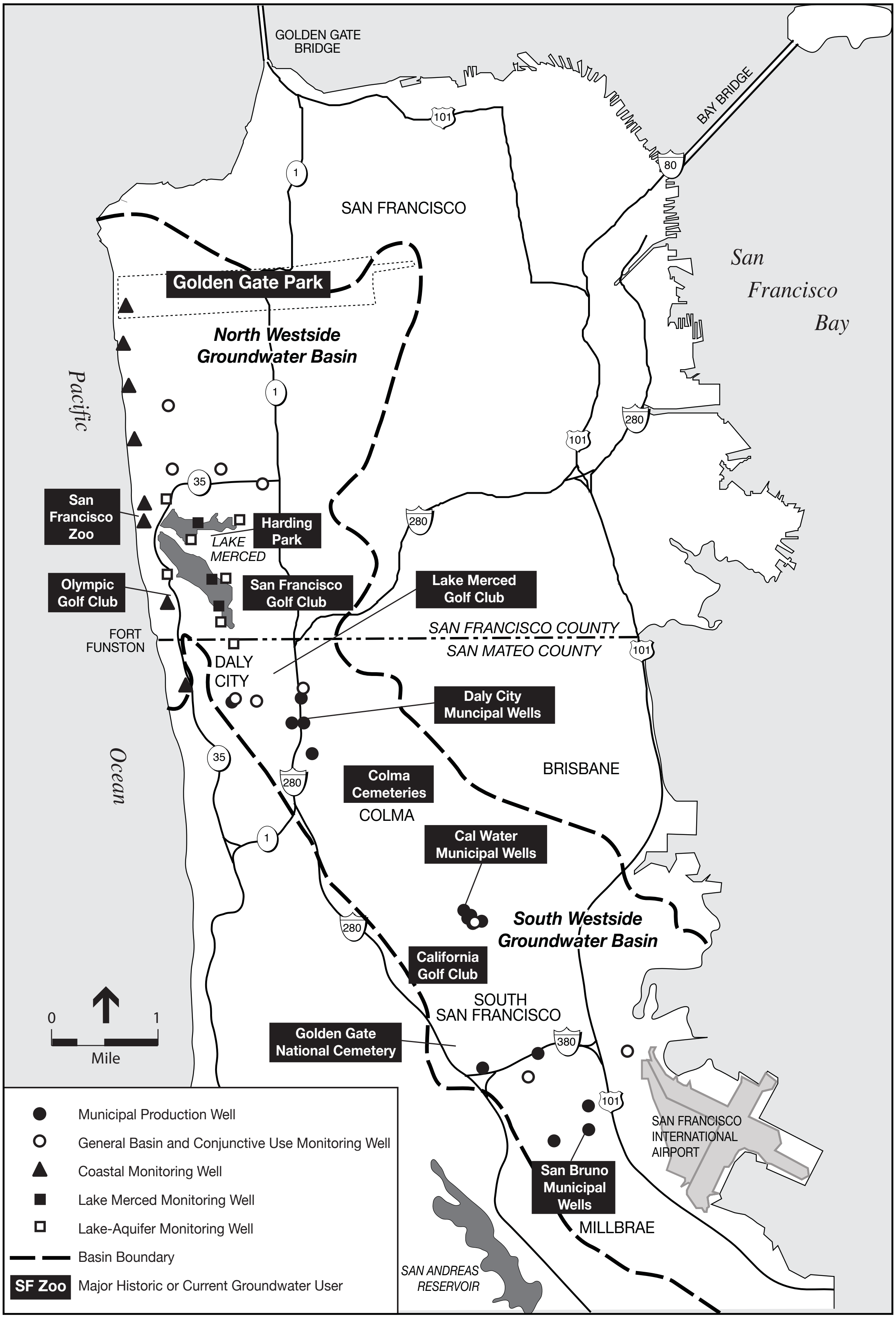
5.6.1 Setting

5.6.1.1 Westside Groundwater Basin

The Westside Groundwater Basin extends from San Francisco south to San Mateo County (**Figure 5.6-1**). With an area of about 45 square miles, this groundwater basin is the largest in San Francisco. The Westside Groundwater Basin is separated from the Lobos Basin to the north by a northwest-trending bedrock ridge through the northeastern part of Golden Gate Park (DWR, 2006). San Bruno Mountain and San Francisco Bay form the eastern boundary, and the San Andreas fault and Pacific Ocean form the western boundary. The southern limit of the Westside Groundwater Basin is defined by an area of high bedrock that separates it from the San Mateo Plain Groundwater Basin. The basin opens to the Pacific Ocean on the northwest and San Francisco Bay on the southeast. The portion of the Westside Groundwater Basin north of the San Francisco/San Mateo County line is referred to as the North Westside Groundwater Basin. The portion of the Westside Groundwater Basin south of the San Francisco/San Mateo County line is referred to as the South Westside Groundwater Basin.

Geology

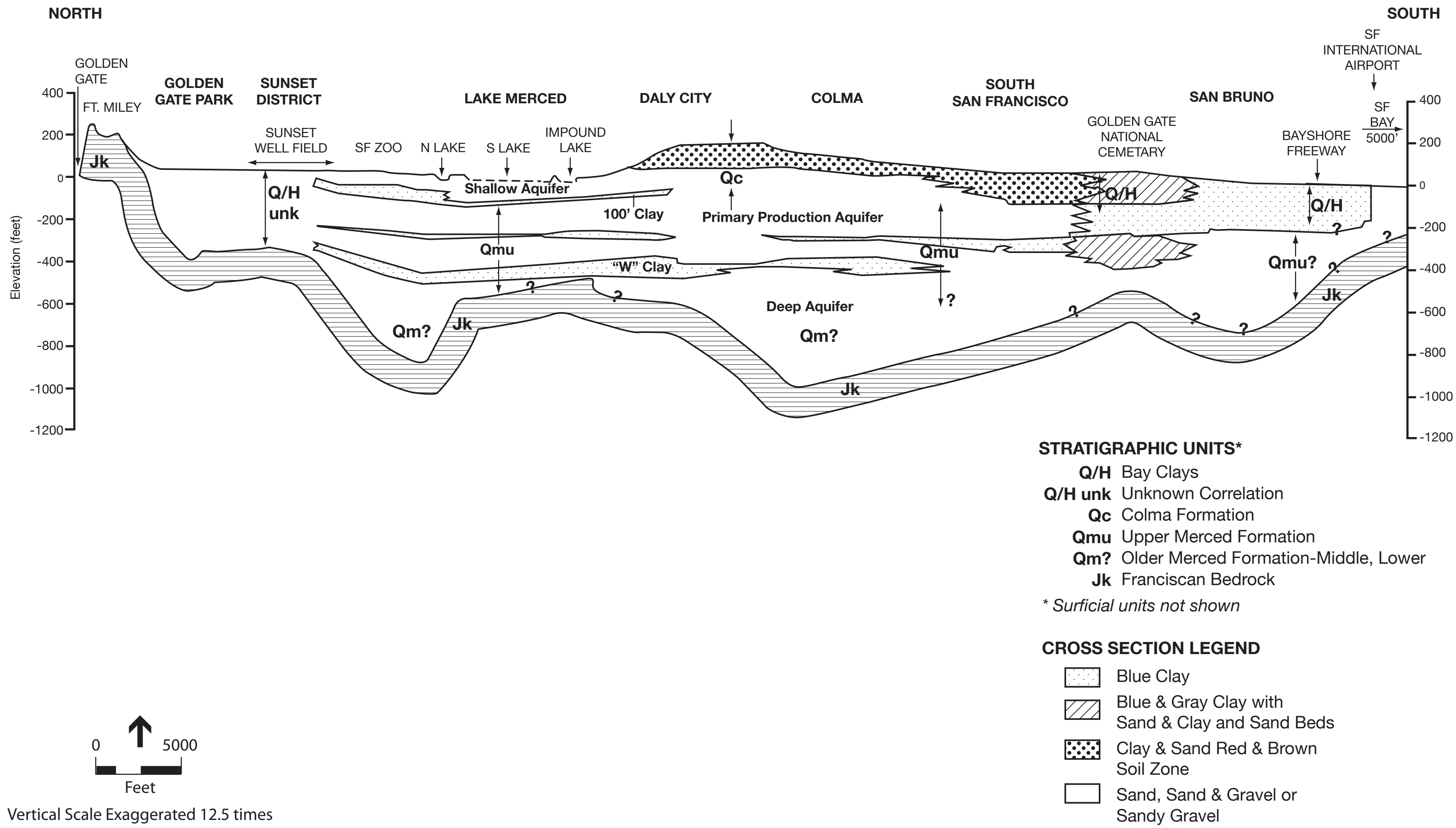
The four major geologic units in the Westside Groundwater Basin are the Mesozoic-age Franciscan Complex, Pleistocene-age Merced and Colma Formations, and the Pleistocene to recent Dune Sands, as illustrated in **Figure 5.6-2** (Luhdorff and Scalmanini, 2006). There are also minor but widespread units of recent alluvium along historical stream channels.



SOURCE: Luhdorff & Scalmanini, 2006; ESA

SFPUC Water System Improvement Program . 203287

Figure 5.6-1
Westside Groundwater Basin Monitoring Network and Major Production Areas



SOURCE: Luhdorff & Scalamanini, 2006

SFPUC Water System Improvement Program . 203287

Figure 5.6-2
Regional Cross Section
Through Westside Groundwater Basin

Exposed in the low hills east and northeast of Lake Merced, the Franciscan Complex forms the basement rock for the aquifer system.[1] The surface of the bedrock slopes southwestward to Daly City, occurring at depths of almost 600 feet near the center of Lake Merced and nearly 1,000 feet beneath the southern portion of Daly City (SFPUC, 2005).

The Merced Formation comprises three units (lower, middle, and upper) and is the deepest water-bearing formation overlying the basement rock. The upper unit consists of a sequence of thin-bedded beach, dune, estuarine, and fluvial deposits of weakly consolidated fine sandstone with some gravel and mudstone beds. This unit is up to approximately 500 feet thick and is the primary water-producing aquifer in the basin (the primary production aquifer). The middle and lower units of the Merced Formation form the deep aquifer in the basin within the San Francisco and Daly City areas and are composed of fine sandstone, siltstone, and mudstone.

The majority of the surficial geologic units in the North Westside Groundwater Basin are composed of the Colma Formation and Dune Sands, which form the basin's shallow aquifer system. The Colma Formation is a surficial unit consisting of fine-grained sand with some clay, sand, and gravel beds of fluvial, floodplain, alluvial fan, and dune sand origin. Dune Sands are also a surficial unit of fine-grained sands with some clay soil horizons. The separation between these units and the Merced Formation is not clearly defined, thus preventing an accurate measurement of their thickness.

Aquifer System

The portion of the Westside Groundwater Basin beneath San Francisco (the North Westside Groundwater Basin), has an area of approximately 14 square miles; it extends from Golden Gate Park to the San Francisco/San Mateo County line in the vicinity of Lake Merced and from the Pacific Ocean to inland bedrock exposures generally associated with Mount Sutro and Mount Davidson (SFPUC, 2005). This portion of the basin is characterized by relatively shallow depths to groundwater (5 to 60 feet) and, in the vicinity of Lake Merced and the San Francisco Zoo, is comprised of three aquifers[2] (see Figure 5.6-2). The shallow, unconfined aquifer in the Lake Merced area extends from the water table to the top of the "-100 ft clay" -- a clay layer at approximately 100 feet below sea level that separates the shallow aquifer from the underlying primary production aquifer in the Lake Merced area (Luhdroff and Scalmanini, 2006). The elevation of the water table in this area varies between 10 and 20 feet above mean sea level (msl).[3] The primary production aquifer (the main target for municipal and irrigation pumping in the basin) overlies the W-Clay, and the deep aquifer underlies the W-Clay. The -100-foot clay and W-Clay are aquitards[4] and appear to thin and pinch out beneath the Sunset District.

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1 Basement rock is impermeable bedrock that restricts groundwater flow, forming the vertical boundaries of a groundwater basin, and sometimes the lateral boundary.

2 An aquifer is a geologic unit, typically composed of sand and gravel, that transmits and stores water and yields a substantial quantity of water to a well. In the Westside Groundwater Basin, aquifer materials are typically medium sand to fine sand.

3 Under a program of managed lake levels, future conditions are expected to be closer to the higher value in the range (i.e., 20 feet above msl).

4 An aquitard is a fine-grained unit (such as clay or silt) that restricts the vertical movement of groundwater. Where groundwater occurs beneath an aquitard, the aquifer is considered confined.

Two surface water features, Lake Merced and Pine Lake, are incised in the shallow aquifer. The lakes are in hydraulic continuity with the shallow groundwater, and water levels in the lakes generally reflect the shallow groundwater level. In the vicinity of Lake Merced, the primary production aquifer is confined. It is separated from the shallow aquifer by the -100-foot clay, and lower water levels in the primary production aquifer indicate the potential for flow from the shallow aquifer to the primary production aquifer.

The South Westside Groundwater Basin has an area of approximately 31 square miles (SFPUC, 2005) and is effectively the portion of the Westside Groundwater Basin that underlies Daly City, Colma, South San Francisco, San Bruno, Millbrae, and parts of Burlingame and Hillsborough. The northern portion of the South Westside Groundwater Basin which is beneath Daly City, Colma, South San Francisco, and San Bruno, is characterized by greater depths to groundwater (which can be over 300 feet). The -100-foot clay is absent in the Daly City area, and the aquifer system is composed of the primary production aquifer and deep aquifer (Luhdorff and Scalmanini, 2006). In the South San Francisco area, the W-Clay is absent, and the primary production aquifer is split into shallow and deep units separated by a fine-grained unit at an elevation of approximately 300 feet below mean sea level (msl). The primary production aquifer in the San Bruno area is at an elevation of less than 200 feet below msl and underlies a thick surficial fine-grained unit.

5.6.1.2 Monitoring Network and Program

There has been no regular historical analysis or reporting on groundwater conditions in the Westside Groundwater Basin (Luhdorff and Scalmanini, 2006). Over the last several years, however, the SFPUC, the City of Daly City, Cal Water, and the City of San Bruno have substantially increased data collection efforts and cooperative management of groundwater and interrelated surface water resources in the basin. Initial cooperative efforts among these four entities have included increased monitoring of groundwater and lake level elevations in the North Westside Groundwater Basin and the initiation of a semiannual basinwide monitoring program in the spring of 2000.

The San Mateo County Environmental Health Division managed the semiannual monitoring program until 2004, at which time the program was merged into the ongoing cooperative basinwide monitoring program. The basinwide monitoring program initially focused on the Lake Merced area, but has been expanded to include more of the basin as well as monitoring of coastal monitoring wells. The basinwide monitoring program currently includes semiannual to annual monitoring of the monitoring well network shown in Figure 5.6-1, which consists of 28 dedicated monitoring wells. Data from the monitoring program are used to evaluate coastal conditions and the potential for seawater intrusion, to define lake-aquifer interaction, and to assess general conditions in the basin resulting from ongoing pumping, the In-Lieu Recharge Demonstration Study (described in Section 5.6.1.9), and the recycled water program. Water-level measurements are collected manually on a quarterly or semiannual basis in some wells, or daily (or more frequently) through the use of electronic pressure transducers in other wells. The first comprehensive hydrogeologic report for the basin describes conditions in 2005 (Luhdorff and

Scalmanini, 2006), and further reports are intended to be prepared on an annual or biennial basis and serve as regular and complete reporting on all aspects of ongoing groundwater management activities in the Westside Groundwater Basin.

5.6.1.3 Groundwater Uses

While there has been some groundwater development in the North Westside Groundwater Basin (primarily for nonpotable irrigation), the South Westside Groundwater Basin has historically been the primary groundwater production area and continues to be used for a number of purposes. Major groundwater production areas in the Westside Groundwater Basin are shown in Figure 5.6-1 and discussed below.

North Westside Groundwater Basin

By the early 1900s, wells were drilled north, east, and south of Lake Merced for farming and drinking water supply (Luhdorff and Scalmanini, 2006). During that time, the Spring Valley Water Company had two wells located near the Lake Merced outlet that pumped about 0.1 mgd, or 100 acre-feet per year (afy).[5] At that time, the total of Lake Merced, Sunset District, and Golden Gate Park pumpage averaged 0.4 mgd (400 to 500 afy). In the early 1930s, the San Francisco Board of Public Works installed production wells in the Sunset District as an emergency water supply. Between 1930 and 1935, these wells pumped an average of 5 mgd (5,600 afy) from the Sunset District as an emergency water supply, but were discontinued after Hetch Hetchy water became available in the mid-1930s.

In 2005, groundwater in the North Westside Groundwater Basin was used for irrigation and other nonpotable uses, primarily 1.0 mgd (1,100 afy) at Golden Gate Park[6] and 0.4 mgd (400 afy) at the San Francisco Zoo. In addition, less than 0.02 mgd (13 afy) is used for other purposes, including 8 afy at the Edgewood School, and 5 afy in Stern Grove (Luhdorff and Scalmanini, 2006). As of 2005, there are no other substantial users of the North Westside Groundwater Basin.

South Westside Groundwater Basin

Groundwater in the South Westside Groundwater Basin has been principally used for municipal and irrigation supply. Groundwater has been a source of water supply to Daly City, South San Francisco (through Cal Water), and San Bruno for about 50 years. Production well locations for each of these municipalities and other groundwater production areas are shown in Figure 5.6-1. Total pumping for metered municipal and estimated irrigation uses reached a combined maximum of approximately 12.8 mgd (14,300 afy) in the 1960s (Luhdorff and Scalmanini, 2006). As indicated in **Figure 5.6-3** and discussed below, total pumping from the South Westside Groundwater Basin (including municipal and irrigation uses) was about 4.1 mgd (4,600 afy) in

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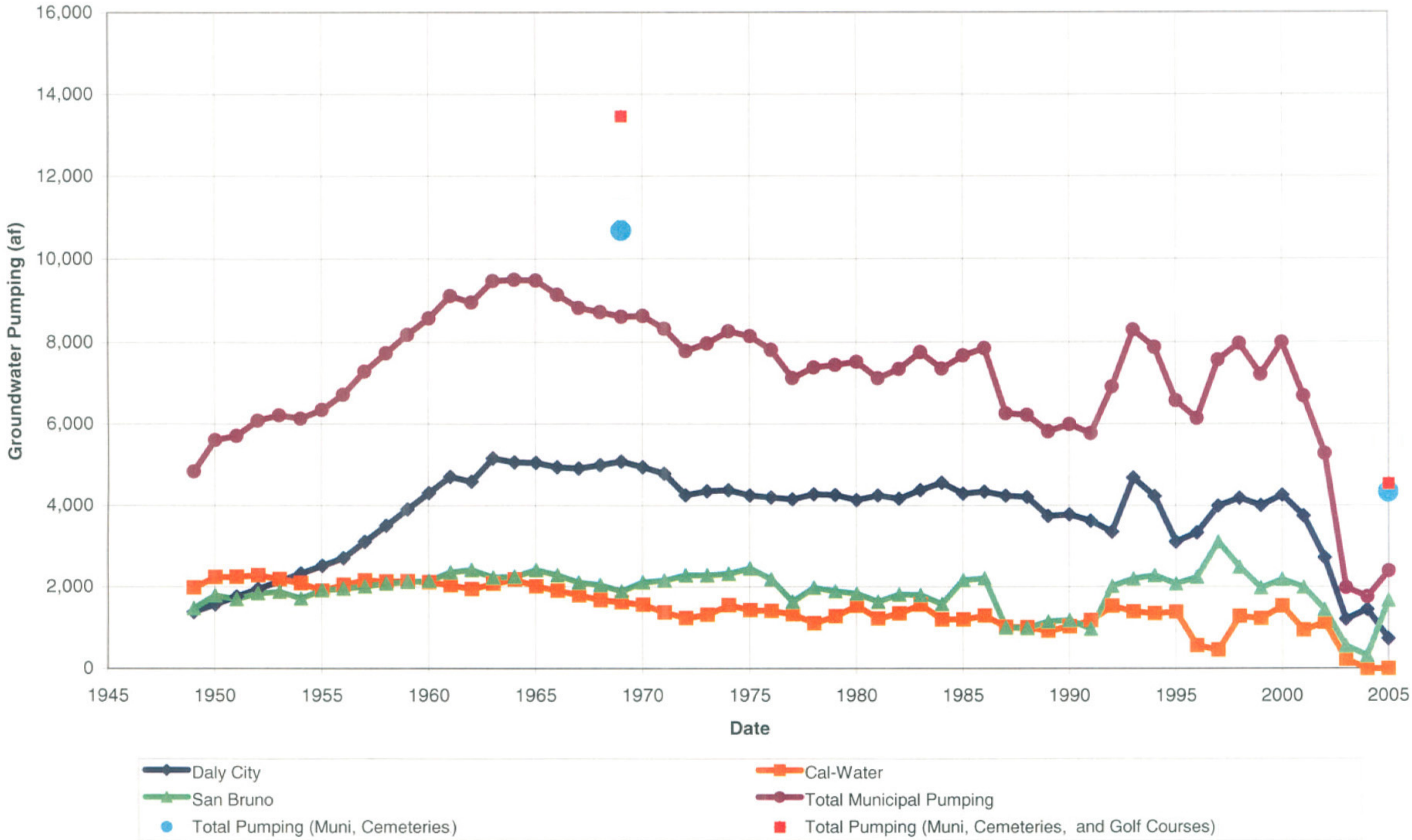
[5] One acre-foot is the volume of water required to cover one acre of land to a depth of 1 foot, or 325,851 gallons. The unit "acre-feet per year" is the number of acre-feet of water used in one year.

[6] Historical pumping rates for the Golden Gate Park wells are estimated. Recent installation of flow meters on two of the wells will allow more accurate measurement of the pumping rates of these wells in the future.



SOURCE: Luhdorff & Scalmanini, 2006

SFPUC Water System Improvement Program . 203287

Figure 5.6-3
Historical Pumping in the South Westside Groundwater Basin

2005. The major reasons for lower pumping in 2005 were that nearly all irrigation pumping around Lake Merced was replaced with recycled water and there was a temporary reduction in municipal pumping as part of the In-Lieu Recharge Demonstration Study (described in Section 5.6.1.9). In addition, there are some private wells within the basin, but the estimated amount of pumping by private well owners is small compared to municipal and irrigation pumping.

Municipal Pumping

Historical municipal groundwater pumping by Daly City, Cal Water, and San Bruno, shown in Figure 5.6-3, reached a high of approximately 8 mgd (9,000 afy) in the mid-1960s and ranged between approximately 5.4 mgd (6,000 afy) and 7.1 mgd (8,000 afy) from the mid-1970s until 2001 (Luhdorff and Scalmanini, 2006). During implementation of the In-Lieu Recharge Demonstration Study from 2002 to 2005 (described in Section 5.6.1.9), total municipal pumping was decreased to an average of approximately 1.8 mgd (2,000 afy), as shown in **Figure 5.6-4**. Although the In-Lieu Recharge Demonstration Study has ended, Daly City continued to receive system water from the SFPUC in lieu of groundwater pumping under the conditions of a term sheet implemented in 2004 (SFPUC, 2004). In 2005, Daly City pumped approximately 0.6 mgd (700 afy) of groundwater. As of 2006, Cal Water had not resumed pumping and San Bruno had resumed pumping at rates of approximately 1.5 mgd (1,700 afy).

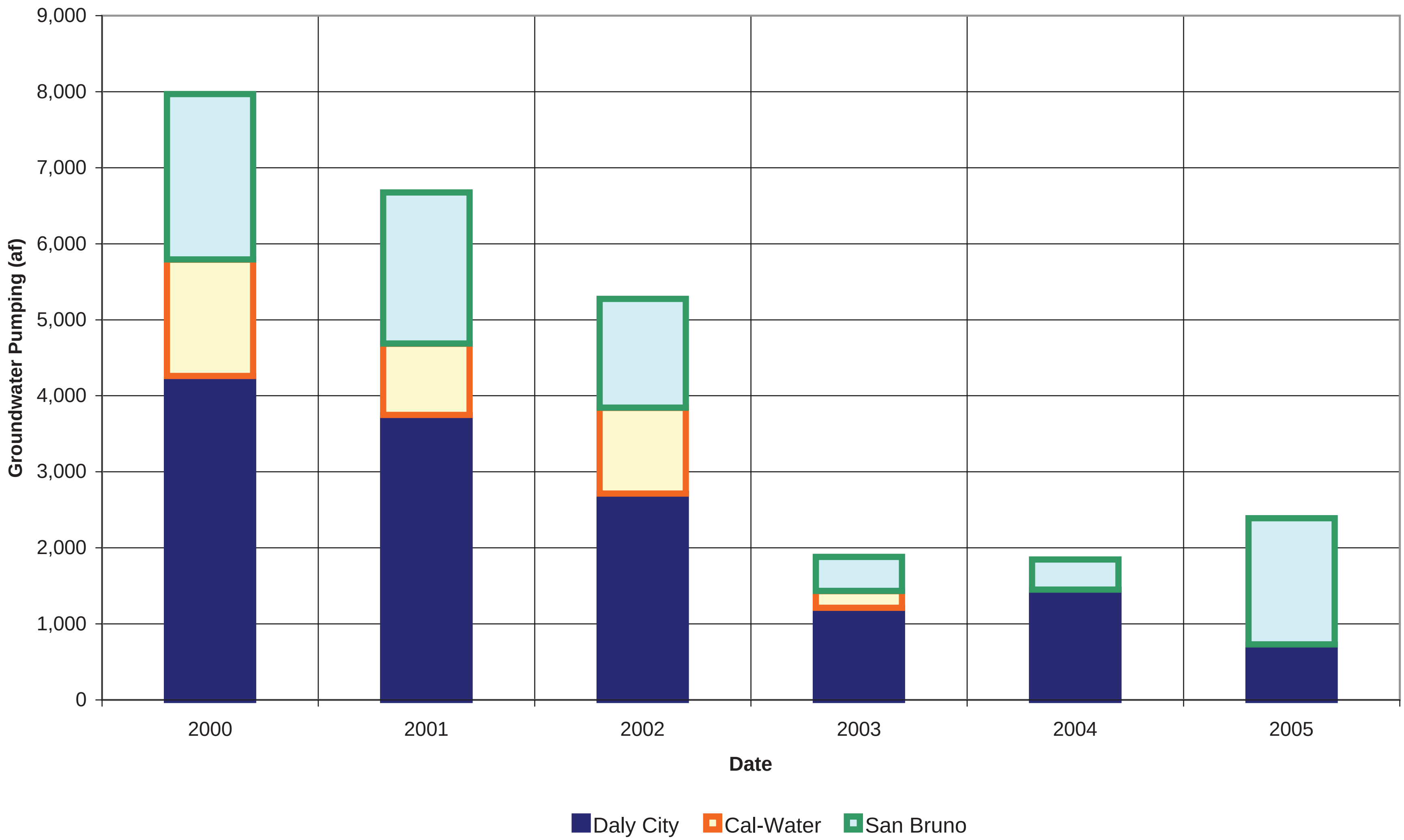
Irrigation Pumping

Historical golf course and cemetery irrigation in the 1960s was previously estimated at about 4.7 mgd (5,300 afy) of groundwater,[7] and irrigation for three golf courses in the vicinity of Lake Merced (the Olympic Club, San Francisco Golf Club, and Lake Merced Golf Club) accounted for approximately 2.1 mgd (2,235 afy) of this amount (Luhdorff and Scalmanini, 2006). In 2005, irrigation pumping at these three golf courses was reduced to approximately 0.04 mgd (45 afy) when recycled water was made available from north San Mateo County (Daly City) as a substitute irrigation supply.

Other continued uses of irrigation pumping in the South Westside Groundwater Basin in 2005 were consistent with historical pumping rates and are estimated at up to 2.1 mgd (2,400 afy) of irrigation pumping for cemeteries in Colma, and 0.1 mgd (120 to 150 afy) of irrigation pumping for the California Golf Club[8] in South San Francisco (Luhdorff and Scalmanini, 2006). The Golden Gate National Cemetery in San Bruno has historically used groundwater for irrigation, but the cemetery has not been irrigated using groundwater for over 20 years (Schem, 2007).

7 Historical irrigation pumping amounts were estimated. Recent metered use of recycled water at the Lake Merced area golf courses indicates that actual usage may have been less than previously estimated. Therefore, estimates of historical unmetered irrigation pumping may be high.

8 2005 estimated pumping rates for the California Golf Club were reduced from the historical estimate of 665 afy to 120–150 afy based on information on actual water use rates at the Lake Merced area golf courses obtained when metered recycled water was provided to these golf courses.



SOURCE: Luhdorff & Scalmanini

SFPUC Water System Improvement Program . 203287

Figure 5.6-4
Recent Municipal Pumping in
Westside Groundwater Basin

In all, irrigation pumping in the South Westside Groundwater Basin has recently been estimated at approximately 2.3 mgd (2,600 afy) in 2005 —a reduction of 2.4 mgd (2,700 afy) from a high of approximately 4.7 mgd (5,300 afy) in the 1960s. The principal reduction in irrigation pumping has been as a result of replacement of recycled water for irrigation purposes at the Lake Merced area golf courses.

Pumping from Private Wells

There are over 90 backyard wells in Hillsborough residential areas; most were installed during the 1987–1992 drought and serve multiple adjoining lots. In 2003, total pumping from these wells was estimated at 0.27 mgd (300 afy) (Yates, 2003). There are not likely a large number of private wells in the San Bruno to Daly City portion of the South Westside Groundwater Basin, which typically has small lot sizes with limited irrigation areas. Also, San Mateo County requires well setbacks from sewer lines, which make small lots more difficult to permit for water wells.

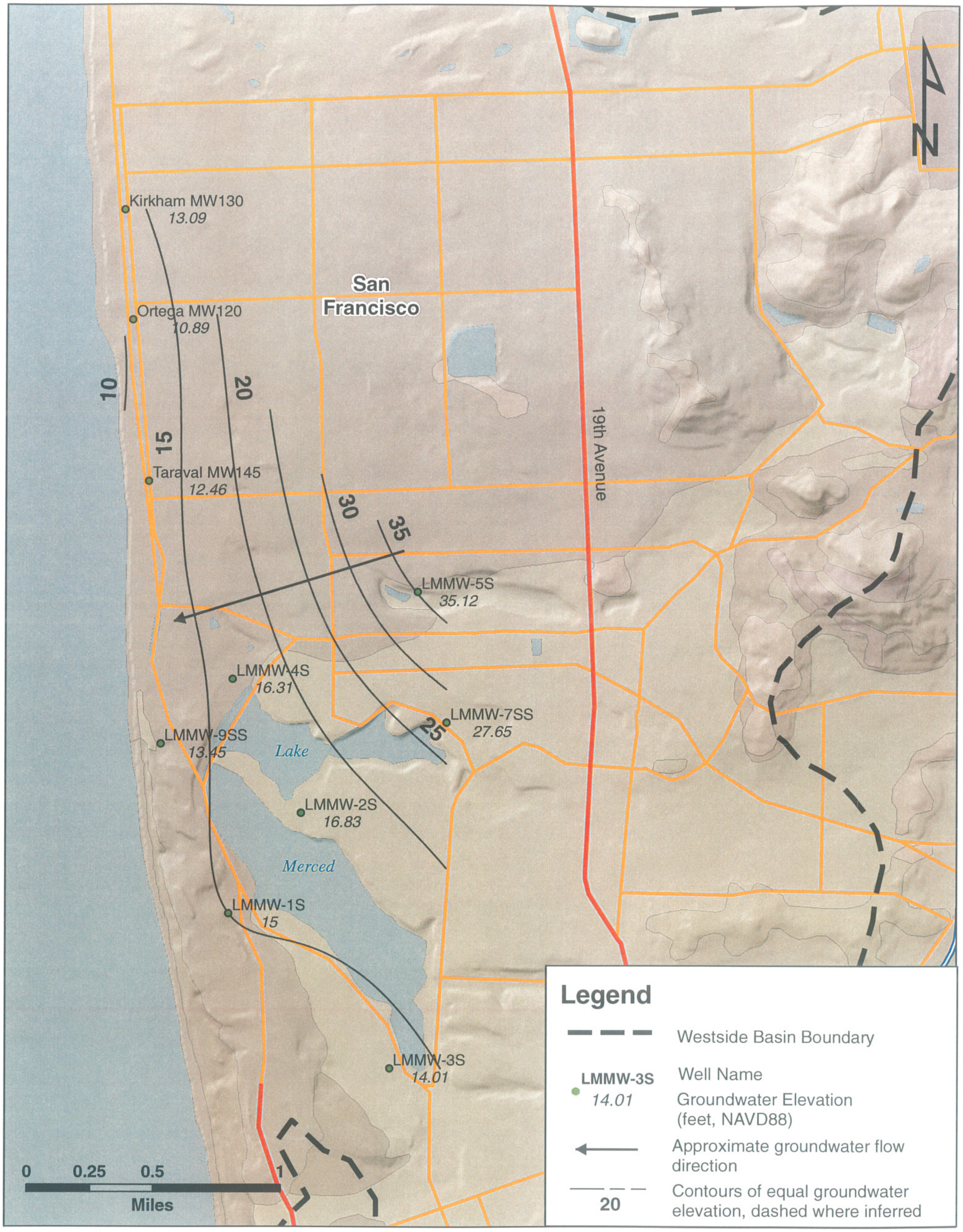
5.6.1.4 Groundwater Levels and Flow Directions

North Westside Groundwater Basin

Prior to the early 1940s, water levels in the North Westside Groundwater Basin and in the northern portions of San Mateo County were above sea level, with a northwesterly gradient in the shallow and primary production aquifers (SFPUC, 2005). Based on regular monitoring of water levels in the North Westside Groundwater Basin since 2004 (see Section 5.6.1.2), groundwater levels remain above sea level in both aquifers, with the exception of primary production aquifer groundwater levels in the vicinity of the San Francisco Zoo. At the zoo, groundwater levels range from slightly above to slightly below sea level, probably due to pumping at the zoo (Luhdorff and Scalmanini, 2006).

Groundwater levels generally increased through 2005, most notably in the primary production aquifer in the vicinity of the zoo. The increase is possibly due to decreased pumping from this aquifer including reduced golf course irrigation pumping in the vicinity of Lake Merced and reduced municipal pumping in the South Westside Groundwater Basin under the In-Lieu Recharge Demonstration Study (discussed in Section 5.6.1.9). In 2005, the groundwater flow direction in both the shallow and primary production aquifers of the North Westside Groundwater Basin was westerly (see **Figures 5.6-5** and **5.6-6**); groundwater elevations ranged from 9 to 35 feet above msl in the shallow aquifer and from 5 to an estimated 100 feet above msl in the primary production aquifer.

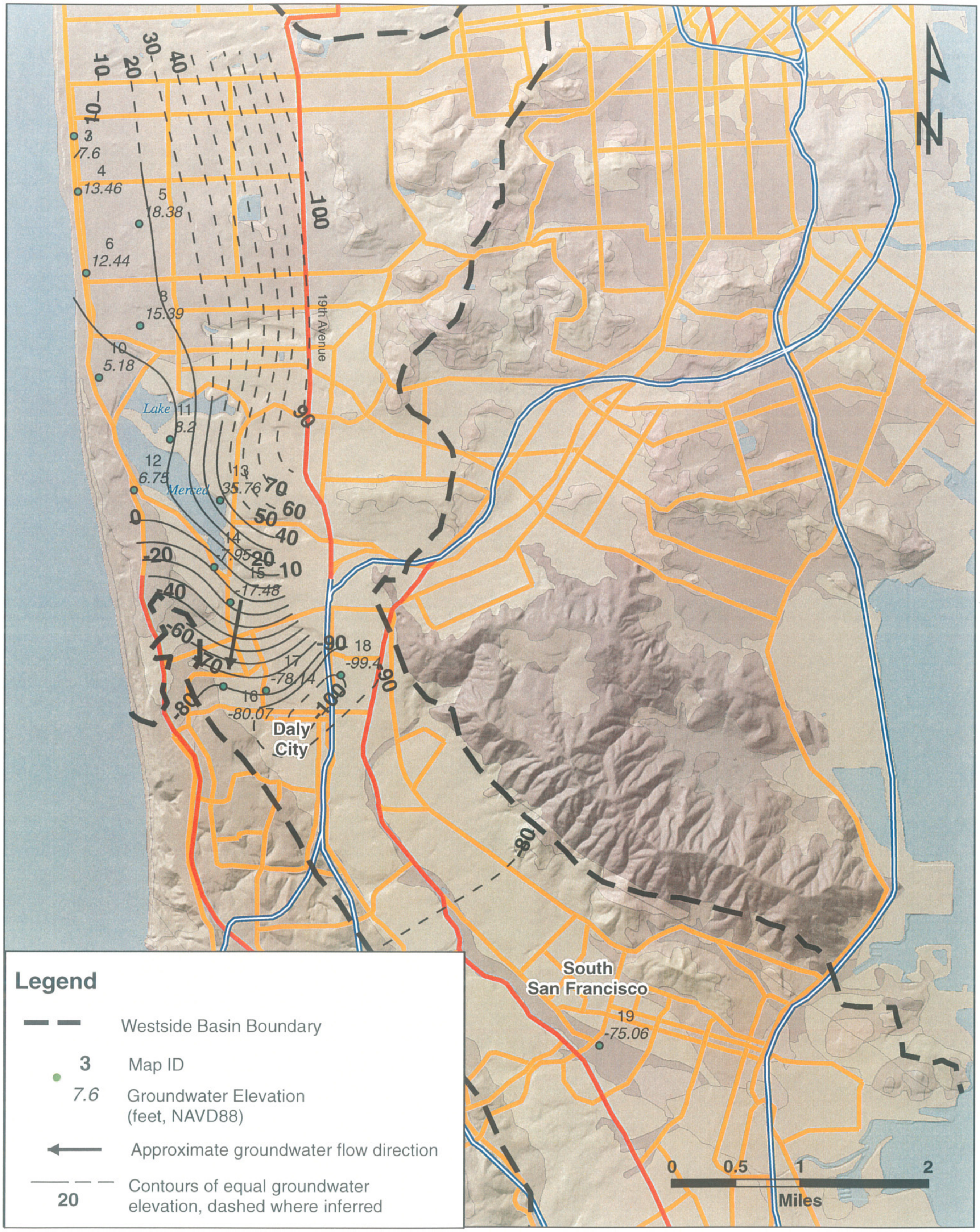
Coastal monitoring wells at Fort Funston and Thornton Beach indicate groundwater elevations above sea level in both the primary production and deep aquifer (the shallow aquifer is not present in this area). The aquifers at these locations appear to be hydraulically separated from the main portion of the Westside Groundwater Basin by faults and resultant steeply dipping geologic units, which act as hydraulic barriers to flow.



SOURCE: Luhdorff & Scalmanini, 2006

SFPUC Water System Improvement Program . 203287

Figure 5.6-5
Contours of Equal Groundwater Elevations
Shallow Aquifer, Spring 2005



SOURCE: Luhdorff & Scalmanini, 2006

SFPUC Water System Improvement Program . 203287

Figure 5.6-6
Contours of Equal Groundwater Elevations
Primary Production Aquifer, Spring 2005

South Westside Groundwater Basin

Beginning in the 1950s and 1960s, groundwater levels in the South Westside Groundwater Basin declined to below sea level. This decline continued through the 1970s, after which groundwater levels stabilized at elevations of more than 100 feet below msl, resulting in vacated aquifer storage of up to 75,000 acre-feet in the Daly City, South San Francisco, and northern San Bruno areas (Kirker, Chapman & Associates, 1972; Luhdorff and Scalmanini, 2005).

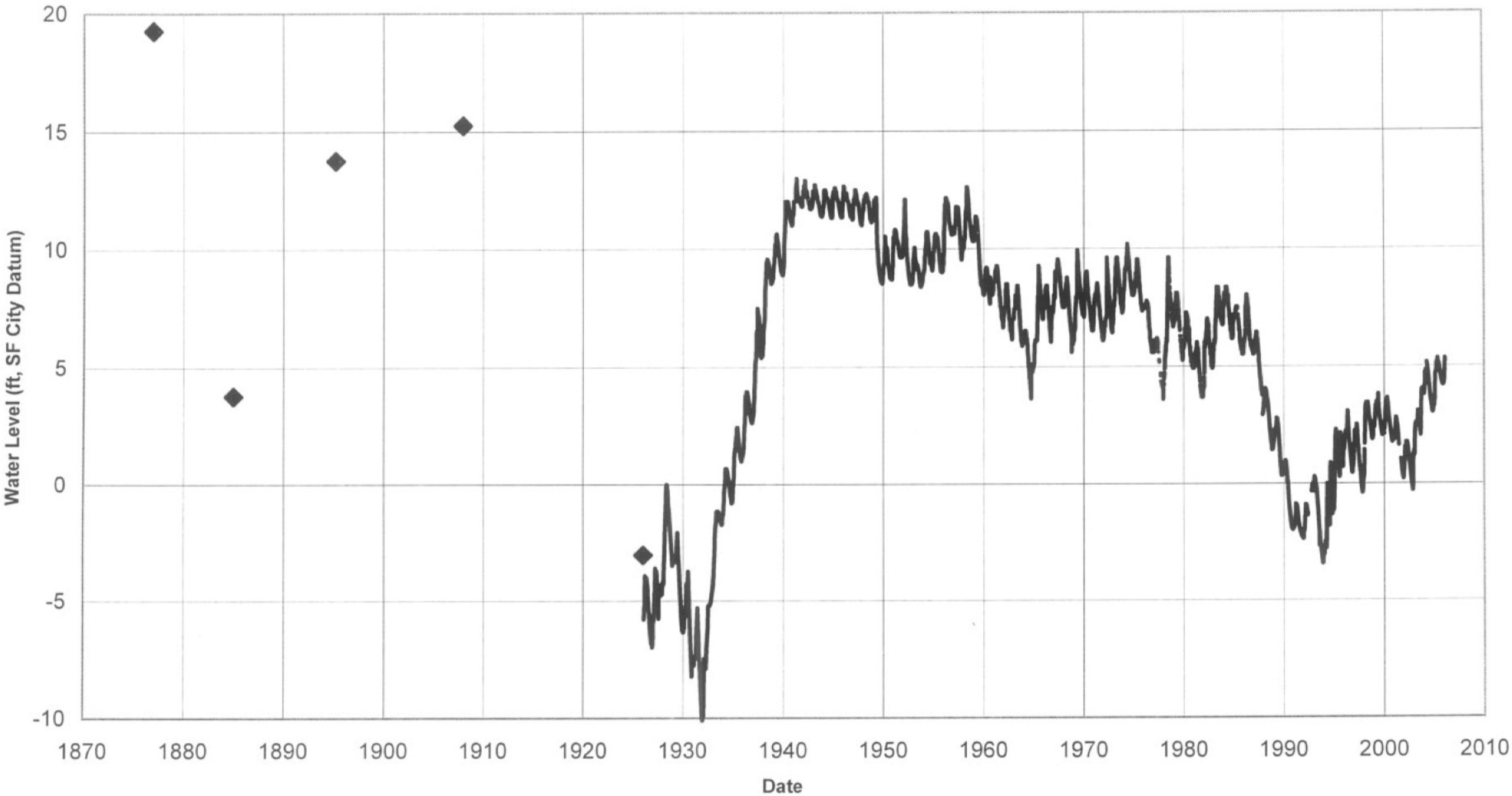
In 2005, groundwater elevations in the primary production aquifer in the South Westside Groundwater Basin ranged from approximately 8 feet below msl immediately south of Lake Merced to 102 feet below msl in Daly City and 75 feet below msl in South San Francisco (see Figure 5.6-6); groundwater flow in the vicinity of Lake Merced continued to be southerly and the steepest groundwater gradient was between Lake Merced and Daly City (Luhdorff and Scalmanini, 2006). On the bay side, groundwater levels in the primary production aquifer beneath San Bruno were approximately 180 feet below msl in 2005.

5.6.1.5 Lake Merced

The San Francisco Recreation and Park Department manages the recreational areas of the lake under a 1950 agreement with the SFPUC (SFPUC, 2007). The SFPUC manages the water aspects of the lake and has the ability to pump untreated water from South Lake into the SFPUC distribution system in an emergency. At one time, Lake Merced served as a municipal water supply source, with a water treatment plant on the north end of the Lake. The Lake has also served as an emergency water supply. However, Lake Merced has not been used as a potable water supply since the 1930s. Refer to Table 4.5-1 for a description of the existing beneficial uses of Lake Merced.

Lake Merced is now comprised of four lake bodies (North Lake, East Lake, South Lake, and Impound Lake), but until the early 1900s was one continuous body of water fed by local runoff and springs (Luhdorff and Scalmanini, 2006). The lake had an outlet to the Pacific Ocean through a stream at the northwestern end of North Lake. The primary sources of recharge to the lake bodies have historically been from spring discharge from the shallow aquifer, local runoff, and precipitation.

Lake Merced water levels have fluctuated greatly over the years and were substantially lowered by diversions in the 1920s and early 1930s during drought conditions (see **Figure 5.6-7**). Lake levels increased between the 1930s and 1960, but began declining again in 1960 and were experiencing an accelerated decline by the late 1980s. San Francisco and other stakeholders in the Westside Groundwater Basin have conducted investigations into the declining lake levels and concluded that the reduction in water levels since the 1960s is likely due to a number of factors, including groundwater pumping in the primary production aquifer and increased urbanization, which has reduced historical recharge to the lake from natural springs and diverted stormwater runoff from the lake to the combined sewer system (SFPUC, 2005).



SOURCE: Luhdorff & Scalmanini, 2006

SFPUC Water System Improvement Program . 203287

Figure 5.6-7
Long-Term Lake Level Hydrograph
Lake Merced (South Lake)

This reduction in subsurface recharge and runoff to the lake has resulted in a long-term decline in water levels and, in the short term, lake levels that are more sensitive to fluctuations in precipitation. In addition, lowered water levels in the shallow aquifer have caused a shift in the shallow groundwater flow direction (from northwesterly to southwesterly) and a corresponding reversal of current flow direction through the lake, away from the historical northwesterly lake outlet.

Public agencies and community members have generally agreed that higher water levels are desirable for Lake Merced. Between 2002 and the spring of 2004, water levels were restored to about 4 feet City Datum,[9] primarily through three additions of dechlorinated SFPUC system water (Luhdorff and Scalmanini, 2004). By December 2005, the lake elevation had further increased to about 5.5 feet City Datum, or nearly 17 feet above msl, due to above-average rainfall and the addition of a total of 34 acre-feet of treated stormwater delivered via the Vista Grande Canal as part of a Daly City pilot program to explore other potential sources for restoring lake levels. (Luhdorff and Scalmanini, 2006). Implementation of the In-Lieu Recharge Demonstration Study (described in Section 5.6.1.9) and local replacement of groundwater pumping with recycled water for irrigation at three Lake Merced area golf courses in the South Westside Groundwater Basin (described in Section 5.6.1.3) also indirectly contributed to the increase in Lake Merced water levels. The 2005 water level was the highest water level in almost 20 years. During the water additions, it was confirmed that Lake Merced is well connected to the shallow aquifer, but that large amounts of shallow groundwater did not percolate to the primary production aquifer (Luhdorff and Scalmanini, 2004).

The In-Lieu Recharge Demonstration Study and local replacement of groundwater pumping with recycled water for irrigation at three Lake Merced area golf courses in the South Westside Groundwater Basin have also resulted in an increase in groundwater levels in the primary production aquifer in the vicinity of Lake Merced. In 2005, groundwater levels in the shallow aquifer were in the range of 12 to 18 feet above msl; in the underlying primary production aquifer, groundwater elevations were deeper - in the range of 18 feet below to 8 feet above msl (Luhdorff and Scalmanini, 2006). Deeper groundwater levels in the primary production aquifer indicate a potential for flow from the shallow aquifer/lake system toward the underlying aquifer, from which nearby production wells withdraw water.

In July 2004, the SFPUC prepared the *Lake Level Management Plan*, which proposed to maintain the lake elevation between 3 and 5 feet City Datum through 2007 while a long-term plan is being developed to maintain the lake at an elevation (or range) to be determined. Since 2003, the SFPUC has maintained the lake levels between 3 and 5 feet City Datum through the activities described above. The SFPUC has not finalized all the details of the long-term plan, but has proposed 8.5 feet City Datum as the recommended lake elevation to be maintained by seasonal additions of supplemental water as required, allowing for seasonal lake level variations. Additional studies are underway under the Local Groundwater Projects (SF-2) to complete the evaluation of supplemental water sources to maintain the lake at the desired level.

9 San Francisco City Datum is a reference datum that has been used by San Francisco for surveying purposes since the early 1900s. To convert to the North American Vertical Datum of 1988 (approximately mean sea level), add 11.37 feet to City Datum.

5.6.1.6 Pine Lake

Pine Lake, one of San Francisco's few natural lakes, is located north/northeast of Lake Merced in the westernmost portion of Stern Grove and Pine Lake Park (Luhdorff and Scalmanini, 2006). It is a small, shallow lake approximately three acres in size. The lake has historically been overgrown with aquatic plants, which have been periodically removed. The San Francisco Recreation and Park Department is implementing a park improvement program for the Stern Grove and Pine Lake area. In November and December 2004, the San Francisco Department of Public Works augmented lake levels using groundwater pumped from a nearby well as part of a study to evaluate the rate of lake level decline following the addition of water. The study concluded that the lake level could be maintained at 31.5 feet by augmenting the lake with approximately 0.08 mgd of water from the existing well to make up for the loss of lake water, and that regular water additions might not be required in the rainy season (Bennett Consulting Group, 2005). During the test, the shallow groundwater elevation rose nearly 7 feet and stabilized at 31.6 feet msl, at which point it did not fluctuate in response to changes in lake levels. The Department of Public Works plans to begin full-scale replenishment of Pine Lake with groundwater from the primary production aquifer in May 2007 (Mosqueda, 2007).

5.6.1.7 Seawater Intrusion

Seawater or saltwater intrusion refers to the migration of higher density saltwater into a freshwater aquifer, which can occur when groundwater levels are lowered by pumping or other means. Seawater intrusion becomes an environmental problem when saltwater reaches a pumped well, making it unsuitable for its intended purpose, or when inland surface water features are affected by the saltwater, compromising habitats or beneficial uses of the surface water.

Coastal monitoring to the west of Lake Merced and north to Golden Gate Park indicates groundwater elevations above sea level and chloride concentrations of less than 40 milligrams per liter (mg/L), except near the zoo, where chloride concentrations are as high as 71 mg/L; based on these results, seawater intrusion is not occurring along the western boundary of the Westside Groundwater Basin (Luhdorff and Scalmanini, 2006). Even though the shallow aquifer in the North Westside Groundwater Basin is in direct connection with the ocean near the coastline, limited development of this portion of the groundwater basin and a groundwater gradient towards the ocean have prevented seawater intrusion in this area, with the exception of temporary effects on the shallow aquifer that occurred during dewatering for construction of the Oceanside Water Pollution Control Plant in the mid-1990s.[10]

Along the coastline to the south of Lake Merced, including Fort Funston and Thornton Beach, it appears that faulting and steeply dipping beds of the Merced Formation provide a physical barrier between the South Westside Groundwater Basin aquifer system and the Pacific Ocean; this barrier has prevented seawater intrusion, despite the fact that groundwater levels in Daly City

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10 Dewatering for construction of the Oceanside Water Pollution Control Plant resulted in a temporary reversal of groundwater gradients, allowing seawater to intrude into the shallow aquifer. However, once dewatering stopped, the induced landward gradient that allowed seawater to migrate into the shallow aquifer reversed, and the natural outflow of freshwater to the ocean resumed.

were lowered to over 120 feet below msl prior to implementation of the In-Lieu Recharge Demonstration Study (described in Section 5.6.1.9).

Seawater intrusion has not been documented along the bay side of the South Westside Groundwater Basin, although groundwater levels were over 200 feet below msl in the primary production aquifer prior to implementation of the In-Lieu Recharge Demonstration Study. It is understood that seawater intrusion in this area is impeded by a thick sequence of bay mud deposits that extend from San Francisco Bay into San Bruno and by a subsurface bedrock ridge below San Francisco International Airport that provides a further barrier to seawater intrusion. The City of San Bruno constructed two monitoring well clusters in 2006 along the bay side that have provided additional geologic information and allow for monitoring of groundwater levels and groundwater quality at different depths along the bay margin.

5.6.1.8 Groundwater Quality

With the exception of manganese and nitrate, groundwater quality in the Westside Groundwater Basin generally meets primary and secondary drinking water standards (Luhdorff and Scalmanini, 2006). In the North Westside Groundwater Basin, nitrate concentrations in the primary production aquifer have exceeded the primary maximum contaminant level of 45 mg/L in the Edgewood School production well and Elk Glen 2 well. In the South Westside Groundwater Basin, nitrate has exceeded this drinking water standard in the South San Francisco and Daly City areas.

In the North Westside Groundwater Basin, manganese concentrations have exceeded the secondary maximum contaminant level of 0.05 mg/L in the Edgewood School production well, the test well at the South Sunset Playground, in monitoring wells near the Central and Lake Merced Pump Stations, and in Golden Gate Park. In the South Westside Groundwater Basin, manganese has exceeded the secondary drinking water standard in San Bruno and Daly City in the untreated groundwater, but the water is treated to meet secondary standards prior to use in the water supply.

5.6.1.9 In-Lieu Recharge Demonstration Study

In the fall of 2002, Cal Water and the Cities of San Bruno and Daly City implemented the In-Lieu Recharge Demonstration Study in conjunction with the SFPUC to evaluate the potential increase in groundwater storage that could be achieved if groundwater pumping were replaced with system water from the SFPUC. As part of this project, each municipality reduced or stopped groundwater pumping. By the spring of 2005, groundwater levels in the primary production aquifer had risen but were still below sea level (Luhdorff and Scalmanini, 2005). The increased groundwater levels resulted in a flatter hydraulic gradient between Lake Merced and Daly City, and the total increase in groundwater storage was approximately 13,000 acre-feet through March 2005 (6,300 acre-feet in the Daly City area, 3,600 acre-feet in the South San Francisco area, and 3,000 acre-feet in the San Bruno area). These results indicate that in-lieu recharge can be employed to add water to storage in the northern part of the South Westside Basin, thus making use of the available aquifer storage for development of a large-scale conjunctive-use program.

5.6.1.10 Groundwater Management

Final Draft North Westside Groundwater Basin Management Plan

In April 2005, the SFPUC prepared the *Final Draft North Westside Groundwater Basin Management Plan* (Groundwater Management Plan) (SFPUC, 2005) which addresses monitoring and stewardship of the groundwater basin and describes potential groundwater supply projects in the North Westside Groundwater Basin. At this time, the SFPUC does not propose to formally adopt the plan but is instead using the plan to help develop specific projects for implementation. The SFPUC is further developing the potential groundwater projects under the WSIP (local portion of Groundwater Projects, SF-2) through the preparation of a conceptual engineering report. The Groundwater Management Plan sets forth the following four management objectives, or goals, to address stewardship of the North Westside Groundwater Basin:

Goal 1: Development of Local Groundwater for San Francisco Water Supply
Goal 2: Avoidance of Overdraft and Saltwater Intrusion
Goal 3: Protection of Interrelated Surface Water Resources
Goal 4: Preservation of Groundwater Quality

The following 13 interrelated elements specified in the plan address these goals:

Element 1: Monitoring of Groundwater Levels, Quality, Production, and Subsidence. Expansion of the existing monitoring of groundwater levels, quality, and production to provide basic data on which to assess the condition of the groundwater basin and to assess the impacts of groundwater production on groundwater levels, groundwater quality, subsidence, and on surface waters.

Element 2: Monitoring and Management of Surface Water Resources. Continued and possibly expanded monitoring of surface water levels and quality, most notably at Lake Merced, to further the understanding of their interaction with groundwater.

Element 3: Determination of Basin Yield and Avoidance of Overdraft. Determination of the yield of the basin on both a regular (average annual) and an intermittent (dry year or emergency) basis in order to accomplish one of the primary objectives for the basin: that it be operated within its safe yield and thus not be overdrafted, and that it be effectively sustained as an ongoing reliable water supply without depletion of groundwater storage or degradation of quality.

Element 4: Development of Groundwater to Augment SFPUC Municipal Water Supplies. Exploration and development of groundwater for regular and dry period/emergency water supply, including possible development of water supply well sites in Golden Gate Park, in the Sunset District, near Stern Grove (Pine Lake), and in the vicinity of Lake Merced.

Element 5: Initiation of Conjunctive-Use Operations. Future pursuit of conjunctive-use program in the basin as a component or extension of the conjunctive use activities that have been initiated on a demonstration basis since late 2002 in the southern part of the basin, in Daly City, South San Francisco, and San Bruno, subject to agreement with these entities. A conjunctive use program would ideally take advantage of any vacated storage space by purposely recharging it with surplus surface water when it is available in wet years, and thus allowing the stored water to be recaptured by pumping during dry periods when surface supplies are decreased.

Element 6: Integration of Recycled Water. Incorporation of recycled water as a component of the nonpotable water supply in the basin, initially for recently initiated golf course irrigation and subsequently for other nonpotable uses, in order to reduce groundwater pumping for nonpotable uses and thus provide increased groundwater availability for regular as well as dry-period/emergency water supply.

Element 7: Development and Continuation of Local, State, and Federal Agency Relationships. Development and continuation of relationships with local, state, and federal agencies, primarily to continue cooperative efforts in the overall basin toward integrated data collection, initiation of conjunctive use, and development of supplemental water for augmentation of Lake Merced.

Element 8: Continuation of Public Education and Water Conservation Program. Continuation of public education and water conservation programs, primarily to inform interested groups on technical and related details about surface and groundwater details, to solicit public input to lake management and conjunctive-use planning, and to obtain community support for basin management actions.

Element 9: Identification and Management of Recharge Areas and Wellhead Protection Areas. Identification and management of recharge and wellhead protection areas.

Element 10: Identification of Well Construction, Abandonment, and Destruction Policies. Continued implementation of well construction, abandonment, and destruction policies, pursuant to the San Francisco Well Ordinance.

Element 11: Identification and Mitigation of Soil and Groundwater Contamination. Identification and mitigation of soil and groundwater contamination.

Element 12: Groundwater Management Reports. Preparation of regular and ad-hoc reports to complement a number of technical reports that have been prepared over the last decade on groundwater in the Westside Basin and its interrelationship with Lake Merced.

Element 13: Provisions to Update the Management Plan. Provisions to update the groundwater management plan, a recognition that the currently drafted plan reflects the most updated understanding of the occurrence of groundwater in the basin, but that the plan's elements could result in knowledge that suggests a change in currently planned management actions. This plan is intended to be a flexible document which can be updated to modify its existing elements and/or incorporate new elements as appropriate in order to recognize and respond to future groundwater and surface water conditions.

Maintenance of Lake Merced water levels and development of the North Westside Groundwater Basin as a municipal water supply under the Local Groundwater Projects (SF-2) would fulfill Elements 2 and 4 of the Groundwater Management Plan. Implementation of a long-term conjunctive-use program in the South Westside Groundwater Basin under the Regional Groundwater Projects (SF-2) would fulfill Element 5. Furthermore, implementation of the Recycled Water Projects (SF-3) would fulfill Element 6, increase groundwater availability in the North Westside Groundwater Basin, and alleviate demands on surface water supplies for irrigation purposes. The Groundwater Management Plan also contains elements specifying that the Groundwater and Recycled Water Projects would be implemented in a manner that preserves the quantity and quality of groundwater in the Westside Groundwater Basin, as well as requiring regular communication of results to the public, environmental groups, and local, state, and federal agencies, and obtaining input from these entities.

5.6.1.11 Regulatory Framework

Groundwater Quality

The Porter-Cologne Water Quality Control Act (Division 7 of the California Water Code) provides the basis for water quality regulation in California. The act allows the state to adopt water quality control plans, which serve as the legal, technical, and programmatic basis of water quality regulation for a region. The *Water Quality Control Plan for the San Francisco Bay Basin*, known as the Basin Plan, was adopted in 1995 (with subsequent amendments) and is administered by the Regional Water Quality Control Board (RWQCB), San Francisco Bay Region (RWQCB, 1995).

The Basin Plan identifies the Westside Groundwater Basin as a “significant groundwater basin.”[11] Agricultural water supply is identified as an existing beneficial use of the aquifer; municipal and domestic water supply, industrial process water supply, and industrial service water supply are identified as potential beneficial uses. However, groundwater has served municipal and industrial purposes in the Westside Groundwater Basin for decades. The beneficial uses serve as a basis for establishing water quality objectives and discharge prohibitions. The RWQCB is charged with protecting these uses from pollution and nuisance.

The Basin Plan also addresses groundwater protection and management. The groundwater program goals include: (1) identify and update beneficial uses and water quality objectives for each groundwater basin; (2) regulate activities that affect or have the potential to affect the beneficial uses of groundwater in the region; and (3) prevent future impacts on the groundwater resource through local and regional planning, management, and education.

California has adopted the “Statement of Policy with Respect to Maintaining High Quality of Waters in California,” known as the Antidegradation Policy, which prohibits actions that tend to degrade the quality of groundwater. The San Francisco Bay RWQCB performs oversight of this policy. The policy requires the continued maintenance of existing high-quality water and outlines the conditions under which a change in water quality is allowable. The conditions for an allowable change in water quality include the following:

- A change must be consistent with maximum benefit to the people of the state.
- A change must not unreasonably affect present and anticipated beneficial uses of water.
- A change must not result in water quality less than that prescribed in water quality control plans or policies.

[11] The San Francisco Bay RWQCB adopted groundwater basin plan amendments at its April 19, 2000 board meeting. These amendments are still subject to approval by the State Water Resources Control Board and the State Office of Administrative Law. Designation as a significant groundwater basin is based on the adopted groundwater basin plan amendments.

Wellhead Protection

In 1999, the California Department of Health Services established the Drinking Water Source Assessment and Protection (DWSAP) program to protect sources of drinking water, in accordance with Section 11672.60 of the California Health and Safety Code. The DWSAP program includes both a source water assessment program and a wellhead protection program as required by the federal Safe Drinking Water Act.

The DWSAP program includes two components: a mandated drinking water source assessment and a voluntary source water protection program. The drinking water source assessment is the first step and includes a delineation of the area around a drinking water source through which contaminants might move and reach that drinking water supply; an inventory of possible contaminating activities that might lead to a release of microbial or chemical contaminants within the delineated area; and a determination of possible contaminating activities to which the drinking water source is most vulnerable. Source water protection is not a mandated element of the DWSAP program, but is required for a complete wellhead protection program. To address this, the second step in the DWSAP program is the voluntary development and implementation of a source water protection program, which affords a public water system or community the opportunity to build on work performed for the drinking water source assessment.

Well Permitting Requirements

The agencies responsible for permitting well construction within the Westside Groundwater Basin are the San Francisco Department of Public Health (North Westside Groundwater Basin) and the City of Daly City and San Mateo County Environmental Health Division (South Westside Groundwater Basin). San Francisco and San Mateo County well permitting regulations contain conditions to ensure that basin overdraft would not occur as a result of construction of a new well. Chapter 13.20 of the Daly City Municipal Code specifies well permitting requirements for Daly City. Although this code does not include provisions related to overdraft of the Westside Groundwater Basin, Section 13.20.070 allows for denial of a permit when the request is judged not to be in the public interest.

In accordance with Article 12B of the San Francisco Health Code, the Department of Public Health refers permit applications for water wells to the San Francisco Planning Department for an environmental determination under CEQA. Following CEQA review, the applicant must obtain approval from the SFPUC authorizing the withdrawal of groundwater. For the purposes of managing groundwater resources in San Francisco, the operator of the well must comply with any conditions or restrictions on use of the water well imposed by the SFPUC or as mitigation measures by the Planning Department. Failure to reach an agreement with the SFPUC for the operation of a proposed water well would result in denial of the water well permit application by the Department of Public Health, and failure to comply with the conditions or restrictions on use of the water well would result in revocation of the permit.

In accordance with Section 4.68.225 of the San Mateo County Code, the San Mateo County Environmental Health Division would not grant a well permit for a large well[12]

[12] A large well means any individual well that pumps an amount equal to or greater than 50 gallons per minute or 1,000 gallons per day, or multiple small wells on the same land use parcel which cumulatively pump an amount equal to or greater than 50 gallons per minute or 1,000 gallons per day.

that could potentially cause overdraft of the South Westside Groundwater Basin or be located in an area subject to a specific and localized groundwater problem. The Environmental Health Division could also deny, revoke, or suspend a permit for a large well to avoid pollution or contamination of water resources.

5.6.2 Impacts

5.6.2.1 Significance Criteria

The City and County of San Francisco has not formally adopted significance standards for impacts related to groundwater, but generally considers that implementation of the proposed program would have a significant impact on groundwater if it were to:

- Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of preexisting nearby wells would drop to a level that would not support existing land uses or planned uses for which permits have been granted)
- Potentially result in onsite or offsite land subsidence that would cause substantial structural damage, increased flooding, or altered drainage patterns
- Violate any water quality standards or waste discharge requirements
- Otherwise substantially degrade water quality

Criteria for evaluating the depletion of groundwater resources are based on whether groundwater pumping would reduce groundwater levels to a degree such that adverse effects would occur, including saltwater intrusion, effects on surface water resources, or land subsidence. Criteria for evaluating groundwater quality are based on beneficial uses and water quality objectives established by the RWQCB in the Basin Plan, as authorized under the Porter-Cologne Water Quality Control Act and Clean Water Act. In addition, for groundwater to be used as a public water supply, groundwater quality evaluation criteria are based on the California Drinking Water Standards, as established by the state and federal Safe Drinking Water Acts.

5.6.2.2 Approach to Analysis

This section assesses program-level impacts of the proposed water supply option with respect to the recycled water and groundwater projects in San Francisco and the Westside Basin conjunctive use program on the groundwater resources of the Westside Groundwater Basin and associated surface water resources. The analysis is based on the WSIP proposed actions as implemented through Local and Regional Groundwater Projects (SF-2) and Recycled Water Projects (SF-3) based on project description information presented in Chapter 3 and Appendix C. It also identifies groundwater management activities planned as part of the projects or proposed as mitigation measures to ensure that impacts on groundwater and associated surface water resources are less than significant. Potential impacts and their significance determinations are summarized in

Table 5.6-1. More detailed analysis of the Groundwater and Recycled Water Projects will be conducted during subsequent, project-level environmental review. Chapter 4, Section 4.5 evaluates the program-level impacts related to construction and operation (not including long term operational effects on groundwater resources) of the Groundwater and Recycled Water Projects.

Impact Summary

Table 5.6-1 presents a summary of the impacts on Westside Groundwater Basin groundwater and surface water resources that could result from implementation of the proposed water supply and system operations.

TABLE 5.6-1
SUMMARY OF IMPACTS – WESTSIDE GROUNDWATER BASIN

	Significance Determination	
Impact	**North Westside Groundwater Basin**	**South Westside Groundwater Basin**
Impact 5.6-1: Basin overdraft due to pumping from the Westside Groundwater Basin	PSM	LS
Impact 5.6-2: Changes in water levels in Lake Merced and other surface water features, including Pine Lake, due to decreased groundwater levels in the Westside Groundwater Basin	PSM	N/A
Impact 5.6-3: Seawater intrusion due to decreased groundwater levels in the Westside Groundwater Basin	PSM	LS
Impact 5.6-4: Land subsidence due to decreased groundwater levels in the Westside Groundwater Basin if the historical low water levels are exceeded	LS	LS
Impact 5.6-5: Contamination of drinking water due to groundwater pumping in the Westside Groundwater Basin	PSM	PSM
Impact 5.6-6: Drinking water contaminants above maximum contaminant levels and adverse effects of adding treated groundwater to the distribution system	LS	LS

LS = Less than Significant impact, no mitigation required
PSM = Potentially Significant impact, can be mitigated to less than significant
N/A = Not Applicable

Impact Discussion

Impact 5.6-1: Basin overdraft due to pumping from the Westside Groundwater Basin.

Excessive groundwater pumping that results in a prolonged and continual lowering of groundwater levels is referred to as basin overdraft. Overdraft in the Westside Groundwater Basin could cause a number of deleterious effects, including decreased water levels in surface waters (such as Lake Merced), seawater intrusion, and/or land subsidence. Management of groundwater resources entails implementing an operating strategy that limits and/or spatially distributes groundwater pumping so that overdraft conditions and related adverse effects do not occur in the groundwater basin.

North Westside Groundwater Basin

The proposed water supply option would include installation of up to four primary production and deep aquifer production wells in San Francisco to provide a total of 2 mgd of annualized production rate, as implemented through Local Groundwater Projects (part of SF-2). Candidate well sites include the Lake Merced Pump Station, South Sunset Playground, West Sunset Playground, and Golden Gate Park. Alternate locations under consideration are the Central Pump Station and the Francis Scott Key Annex. In addition, other sites may be identified during project design and would be evaluated during project-level environmental review. Existing irrigation wells at the San Francisco Zoo, Golden Gate Park, and/or other locations would provide an additional production rate of 2 mgd of water supply for the regional system once recycled water is available to provide replacement irrigation water at these sites (to be developed under the Recycled Water Projects, SF-3). The San Francisco Zoo well was modified and commissioned for emergency use in 2006, and an existing well at Golden Gate Park could also be modified to provide emergency supply to local residents in the event of a major earthquake or other disaster. Once these projects are implemented, up to 0.5 mgd (560 afy) of pumping for nonpotable uses would continue in the North Westside Groundwater Basin for uses such as irrigation of sensitive plants in Golden Gate Park and water for some animal exhibits at the San Francisco Zoo.[13]

With full implementation of the WSIP, production of up to 4 mgd (4,500 afy) under the Local Groundwater Projects (SF-2) and continued nonpotable pumping of 0.5 mgd (560 afy) would be the major groundwater use in the North Westside Groundwater Basin once irrigation pumping is replaced with recycled water at the San Francisco Zoo and Golden Gate Park; thus, the maximum total annual pumping by 2030 is estimated to be 5,060 afy. Based on water years 1987 and 1988, the annual recharge to this basin was estimated at 4,850 afy (Phillips et al., 1993). However, this analysis was done during the first two-years of an on-going drought and therefore is considered to be a low estimate of groundwater recharge to the North Westside Groundwater Basin relative to average conditions. Estimates of recharge to the basin are being refined as part of ongoing groundwater modeling efforts on behalf of the SFPUC, and this analysis indicates that recharge to the basin could range from about 4,850 afy to 6,950 afy (Luhdroff and Scalmanini, 2007).

The total proposed pumping rate of 4.5 mgd (5,060 afy) would be within the range of recharge to the groundwater basin. However, because it exceeds the lower end of the range, and the studies indicating the range have not been completed at this program-level of analysis, potential impacts related to depletion of groundwater resources in the North Westside Groundwater Basin would be considered *potentially significant*. Under this program-level determination, implementation of Measure 5.6-1, Groundwater Monitoring to Determine Basin Safe Yield, would reduce this impact to a less-than-significant level. This measure requires determination of the basin's yield on both a regular (average annual) and an intermittent (dry-year or emergency) basis, in accordance with Element 3 of the Groundwater Management Plan, as well as implementation of water level

[13] Pumping rates for nonpotable purposes may actually be less than estimated if recycled water is found to be of suitable quality for these uses.

and quality monitoring, as specified in Element 1 of the Groundwater Management Plan. The measure is designed to have the SFPUC monitor the effects of pumping from the North Westside Groundwater Basin, and to use the monitoring data to inform decisions regarding appropriate pumping patterns to avoid overdraft and the undesirable effects associated with overdraft. The SFPUC would undertake a more detailed analysis of the basin yield and may refine the mitigation as part of the project-level CEQA review on the Local Groundwater Projects (SF-2).

Emergency groundwater pumping rates could temporarily exceed the average sustainable yield of the aquifer. During emergencies, the potential for adverse pumping effects would depend on the magnitude and duration of the emergency event, but any effects on groundwater that did occur would be localized and short term. They would not be of a long-term nature that would result in overdraft. In addition, wells installed under the Local Groundwater Projects (SF-2) would be located and operated to avoid interference[14] with the operation of existing wells at Golden Gate Park, the San Francisco Zoo, Edgewood School, and Stern Grove (Pine Lake), the current users of groundwater in the North Westside Groundwater Basin. Ultimately, however, most of water supplied by the Golden Gate Park and San Francisco Zoo wells would be replaced with recycled water produced under the Recycled Water Projects (SF-3).

South Westside Groundwater Basin

As discussed in the Setting, municipal and irrigation pumping has historically reduced groundwater levels in the South Westside Groundwater Basin to elevations of 100 to 200 feet below msl, resulting in an estimated 75,000 acre-feet of vacated aquifer storage in the Daly City, South San Francisco, and northern San Bruno areas. Under the WSIP's proposed water supply option (i.e., Regional Groundwater Projects, SF-2), the SFPUC would implement a long-term conjunctive-use program in coordination with Daly City, Cal Water, and San Bruno (referred to as the participating pumpers) to take advantage of this vacated aquifer storage and to increase groundwater levels in the South Westside Groundwater Basin.

Under this program, the SFPUC would provide potable water from the regional system to the participating pumpers during nondrought conditions when there are sufficient surface water supplies to substitute for groundwater currently used for municipal purposes. As a result, the participating pumpers would reduce their groundwater pumping by a comparable amount and allow the groundwater basin to recharge naturally. Therefore, during nondrought years, there would be a larger quantity of groundwater in the South Westside Groundwater Basin due to the in-lieu recharge resulting from deliveries of SFPUC system water and correspondingly reduced groundwater pumping. This increased quantity of groundwater basin during nondrought years is referred to as "banked" water. During drought conditions, the SFPUC would be able to reduce the quantity of SFPUC system water delivered to the participating pumpers, and the stored groundwater, or banked water, would be available for local use to supplement supplies from the regional water system.

As part of the proposed program, the SFPUC and the participating pumpers would enter into an operating agreement(s) specifying the terms and conditions of groundwater storage and

[14] Well interference is the lowering of groundwater levels in one well due to pumping-induced drawdown in another well, thus reducing the capacity of the well or lowering water levels below the intake interval.

withdrawals (see Chapter 3, Section 3.14, Required Actions and Approvals) to ensure that adverse conditions do not occur under the Regional Groundwater projects (SF-2). Under the proposed agreement(s) the SFPUC would have a right to store up to 61,000 acre-feet of groundwater in the South Westside Groundwater Basin. The SFPUC would construct about 10 new groundwater production wells in San Mateo County with the capacity to develop about 7 mgd (or nearly 8,100 afy) of potable groundwater as a supplemental drought-year supply for the participating pumpers. [15] During drought conditions, the participating pumpers would be able to pump the amount of surface water delivered by the SFPUC during nondrought years, the banked quantity of groundwater. Because groundwater withdrawals would be restricted to the amount of water banked under the Regional Groundwater projects, groundwater levels as a result of implementation of the proposed conjunctive-use program would be expected to be consistently in a range higher than those that have resulted from long-term historical groundwater pumping.

The proposed operating agreement(s) would also specify that an operating committee be established to develop annual operating maintenance plans and an annual operating schedule projecting groundwater storage and/or extraction from the SFPUC's storage account. The operating committee would be composed of representatives from the SFPUC and the participating pumpers and would also provide an accounting of water stored in and extracted from the SFPUC storage account and confirm compliance with water delivery accounting.

The conjunctive-use program would consider the potential effects of all other pumpers in the South Westside Groundwater Basin, particularly the participating pumpers as well as irrigation pumping by cemeteries and golf courses. Monitoring and modeling would also be conducted to assess the conjunctive-use program's performance and to identify and avoid potential problems. Based on monitoring data and modeling results, conjunctive-use management strategies would be adjusted and implemented as necessary to avoid adverse conditions.

Overall, the conjunctive-use program under the Regional Groundwater Projects (SF-2) would be designed to take advantage of vacated aquifer storage that has become available as a result of historical groundwater pumping in the South Westside Groundwater Basin. An operating agreement(s) would be executed with the participating pumpers outlining allowable operating parameters for pumping during drought periods to avoid long-term adverse conditions; an operating committee would be formed to develop annual operating maintenance plans as well as an annual operating schedule; and groundwater monitoring and modeling would be conducted to identify the potential for adverse conditions and inform decisions to modify the recharge or pumping strategy in response to changing conditions over time. Therefore, programmatic impacts related to basin overdraft and associated adverse conditions are considered *less than significant* for the South Westside Groundwater Basin. The SFPUC would conduct a more detailed analysis

[15] As described in Chapter 3, Section 3.6, the proposed water supply option under the WSIP assumes the use of the extraction component of the conjunctive-use program during drought years. The program is being designed to provide an extraction capacity of approximately 8,100 acre-feet of water during a drought year (an equivalent of about 7 mgd). The initiation of the extraction component of the conjunctive use program occurs as the first response to an anticipated drought. However, the realization of a drought does not typically occur until the second year of a dry sequence, thus in the 8.5-year Design Drought groundwater pumping would only occur for 7.5 years. Although pumping over this 7.5 year period would be about 7 mgd, the equivalent amount of pumping over 8.5 years is 6 mgd.

of the conjunctive-use program as part of the project-level CEQA review on the Regional Groundwater Projects (SF-2).

Impact 5.6-2: Changes in water levels in Lake Merced and other surface water features, including Pine Lake, due to decreased groundwater levels in the Westside Groundwater Basin.

North Westside Groundwater Basin

As discussed in the Setting, water levels in Lake Merced have declined over the past 50 years, and Pine Lake has also experienced water level declines. Investigation by the SFPUC into the interrelationship between these lakes and groundwater has been a major focus over the past 5 to 10 years, and has included installation of dedicated monitoring facilities in the individual Lake Merced lakes as well as numerous monitoring wells around and near Lake Merced and Pine Lake. Analysis of the lake-aquifer system at Lake Merced to date indicates that the lake system can be separately managed by adding water to achieve a desired lake level, or range of levels, while also pumping from the underlying primary production aquifer (SFPUC, 2005).

The Local Groundwater Projects under SF-2 would include the addition of some combination of treated stormwater, recycled water, groundwater, and/or dechlorinated SFPUC system water to restore and maintain Lake Merced at the desired level(s). Maintenance of water levels would be expected to beneficially affect the North Westside Groundwater Basin by contributing additional recharge to the shallow aquifer. Furthermore, implementation of the long-term conjunctive-use project (the Regional Groundwater Projects under SF-2) and cessation of irrigation pumping in the vicinity of Lake Merced (already accomplished, as described in the Setting) would allow groundwater levels in the primary production aquifer to the south of Lake Merced to rise, which would reduce the long-term effects of historical groundwater pumping on groundwater levels in the shallow aquifer.

Because the primary production aquifer is not in direct hydraulic connection with the shallow aquifer in the Lake Merced vicinity or with Lake Merced, proposed pumping from the primary production aquifer under Local Groundwater Projects (SF-2) is not expected to have a direct effect on lake levels, but could potentially cause an indirect effect. Shallow groundwater levels could decline due to flow from the shallow aquifer under Lake Merced toward the primary production aquifer in which future production wells would be completed under the proposed program. Therefore, the potential to adversely affect water levels in Lake Merced and other surface water features would be *potentially significant*, but would be reduced to a less-than-significant level with implementation of Measure 5.6-1, Groundwater Monitoring to Determine Basin Safe Yield, and Measure 5.6-2, Implementation of a Lake Level Management Plan. Measure 5.6-1 includes groundwater and surface water monitoring as specified in Elements 1 and 2 of the Groundwater Management Plan to monitor the effects of groundwater pumping on surface water features. The monitoring data would be used to inform decisions regarding the alteration of pumping patterns to avoid undesirable effects on surface water features. Measure

5.6-2 includes development and implementation of a lake level management plan identifying strategies for altering pumping patterns or lake augmentation to maintain Lake Merced water levels within the desired long-term range, should monitoring conducted under Measure 5.6-1 indicate the potential for adverse effects on lake levels due to groundwater pumping. The SFPUC would coordinate the implementation of both measures. The SFPUC would undertake a more detailed analysis of the lake-aquifer relationship and may refine the mitigation as part of the project-level CEQA review on the Local Groundwater Projects.

South Westside Groundwater Basin

There are no major surface features in the South Westside Groundwater Basin that would be affected by decreased groundwater levels. Therefore, impacts on the water levels of water surface features in the South Westside Groundwater Basin would *not apply*.

Impact 5.6-3: Seawater intrusion due to decreased groundwater levels in the Westside Groundwater Basin.

Seawater intrusion (the movement of saline water into a freshwater aquifer) can occur in coastal aquifers such as the Westside Groundwater Basin, where shallow aquifers are hydraulically connected with the ocean or bay. Intrusion of saltwater into a freshwater aquifer degrades water quality for most beneficial uses and, depending on the degree of salinity, can render the aquifer unusable. Once freshwater aquifers are affected by saltwater intrusion, it is difficult and costly to reclaim the aquifer.

North Westside Groundwater Basin

In the North Westside Groundwater Basin, the shallow aquifer is in direct connection with the ocean from approximately Lake Merced to the north, as discussed in the Setting. Dewatering of this aquifer during construction of the Oceanside Water Pollution Control Plant caused temporary seawater intrusion in the shallow aquifer; however, once the dewatering stopped, the induced landward gradient that resulted in seawater migration into the shallow aquifer reversed, and the natural outflow of freshwater to the ocean resumed.

Because the shallow aquifer is in direct connection with the ocean and groundwater pumping would lower groundwater levels, impacts related to the potential to cause seawater intrusion in the North Westside Groundwater Basin would be *potentially significant*, but would be reduced to a less-than-significant level through implementation of Measure 5.6-1, Groundwater Monitoring to Determine Basin Safe Yield. This measure requires groundwater level and quality monitoring in accordance with Element 1 of the Groundwater Management Plan, including monitoring of the coastal monitoring well network in the western part of the basin along the Old Great Highway (at Kirkham, Ortega, and Taraval Streets; the Oceanside Water Pollution Control Plant; and the San Francisco Zoo). This monitoring would provide an early indication of whether seawater intrusion is occurring and would be used to inform decisions regarding the alteration of groundwater pumping strategies to avoid seawater intrusion.

Although emergency groundwater pumping could temporarily lower groundwater levels in the primary production aquifer, the potential for seawater intrusion to occur would depend on the magnitude and duration of the emergency event, and any effects on groundwater would be short term. In the event that groundwater gradients were temporarily induced landward, they would be restored toward the ocean once pumping returned to normal levels, and the temporary reversal of gradient would not be likely to cause long-term seawater intrusion. The SFPUC will undertake a more detailed analysis of the potential for seawater intrusion and may refine the mitigation as part of the project-level CEQA review on the Local Groundwater Projects (SF-2).

South Westside Groundwater Basin

Although groundwater levels in the South Westside Groundwater Basin have been lowered to depths of up to 200 feet below msl in some areas over the past 50 years, seawater intrusion into the aquifer system has not been detected. As discussed in the Setting, this is attributed to faulting and folding of the Merced Formation along the western border with the Pacific Ocean and the presence of bedrock and bay mud along the eastern border with the bay. In-lieu recharge of groundwater resulting from deliveries of SFPUC system water under the long-term conjunctive-use program (the Regional Groundwater Projects under SF-2), and correspondingly reduced groundwater pumping when SFPUC system water is available, would result in higher groundwater levels in the South Westside Groundwater Basin during nondrought periods, which would further reduce the potential for seawater intrusion.

As discussed in Impact 5.6-1, an operating agreement(s) would be executed with each participating pumper involved in the long-term conjunctive-use program (the Regional Groundwater Projects under SF-2); under the proposed agreement(s), participating pumpers would be able to extract groundwater up to the amount of water stored via in-lieu recharge as a result of surface water previously delivered by the SFPUC during nondrought years. Because the participating pumpers would not pump more than the banked quantity of groundwater, groundwater levels would be expected to be consistently in a range higher than those that have resulted from long-term historical groundwater pumping. For this reason, and because historical pumping has not caused seawater intrusion into the primary production aquifer, seawater intrusion under the long-term conjunctive-use program is not expected. Therefore, programmatic impacts related to seawater intrusion in the South Westside Groundwater Basin are considered *less than significant*. The SFPUC would conduct a more detailed analysis of the conjunctive-use program as part of the project-level CEQA review on the Regional Groundwater Projects.

Impact 5.6-4: Land subsidence due to decreased groundwater levels in the Westside Groundwater Basin if the historical low water levels are exceeded.

The groundwater within aquifers and aquitards helps support the weight of the overlying sediments, because the water contained in the pore spaces of sediments creates an internal water pressure. Land subsidence (i.e., the lowering of ground surface elevations caused by the compaction of sediments) can occur if groundwater pumping reduces the water pressure within the pore spaces of the saturated sediments, causing them to compress. The type and degree of subsidence depends on the presence of fine-grained sediments and the extent that water pressure is reduced by groundwater pumping.

Under some conditions, this process would reverse when the groundwater is replenished and the pore pressure increases; this type of subsidence is known as elastic or temporary subsidence. Under conditions of elastic subsidence, the compaction is relatively small and is reversed when pore pressures increase with rising water levels. In general, subsidence in coarse-grained materials of aquifers is elastic.

Under certain conditions, however, groundwater pumping can result in a permanent change in the structure of the sediments, known as inelastic subsidence, and cause an unrecoverable compaction of the aquifer system. Inelastic subsidence occurs when the water pressure in fine-grained sediments (such as clay beds) separating groundwater aquifers is reduced beyond historical lows, resulting in a permanent change in the intergranular structure of the sediments that cannot be reversed when water levels recover. The compressibility of sediments under inelastic conditions is much greater than under elastic conditions, and the subsidence associated with inelastic conditions may require decades to millennia to complete.

In the event of permanent, inelastic subsidence, the ground surface elevation would gradually decrease over a widespread area overlying the affected groundwater basin. Depending on where inelastic subsidence occurred, potential effects could include increased flooding, greater backflushing of surface waters from the bay or ocean, saltwater intrusion in shallow aquifers, submergence of existing marshlands, or changes in gradients within canals and other gravity-flow features. Damage to infrastructure and public and private structures would not be expected, because subsidence effects would occur on a gradual, widespread basis. Subsidence has not been noted in the Westside Groundwater Basin despite heavy pumping in the South Westside Groundwater Basin in the past.

North Westside Groundwater Basin

It is unlikely that inelastic subsidence would occur in the North Westside Groundwater Basin because the formations comprising the aquifers of the North Westside Groundwater Basin are primarily composed of sands and dewatering of the fine-grained aquitards separating the aquifers would not be expected. Therefore, impacts related to the potential for land subsidence are considered *less than significant.* The SFPUC will undertake a more detailed analysis of the potential for subsidence as part of the project-level CEQA review on the Local Groundwater Projects (SF-2).

South Westside Groundwater Basin

Land subsidence is not expected to occur with implementation of the Regional Groundwater Projects (SF-2) in the South Westside Groundwater Basin. During nondrought years, municipal groundwater pumping would be reduced by increased delivery of SFPUC system water, thereby increasing groundwater storage in the primary production aquifer as described in Impact 5.6-1. During drought years, groundwater withdrawals under the Regional Groundwater Projects would be limited to the banked quantity of water stored through in-lieu recharge. Therefore, because groundwater levels associated with the Regional Groundwater Projects would likely be higher than historical lows, the potential for land subsidence would be low, and impacts related to land subsidence in the South Westside Groundwater Basin would be *less than significant.* The SFPUC would conduct a more detailed analysis of the conjunctive-use program as part of the project-level CEQA review on the Regional Groundwater Projects (SF-2).

Impact 5.6-5: Contamination of drinking water due to groundwater pumping in the Westside Groundwater Basin.

During operation, groundwater production wells constructed under the Local and Regional Groundwater Projects (SF-2) could induce migration of chemical or microbiological contamination from sources surrounding the wells, potentially resulting in an exceedance of drinking water standards in the groundwater. However, under the California Department of Health Services DWSAP program, described in the Setting, the SFPUC would develop a drinking water source assessment. At a minimum, the assessment would include a delineation of the area around the well(s) through which contaminants might move and reach the well(s), referred to as the groundwater protection zone; an inventory of possible contaminating activities that could lead to a release of microbiological or chemical contaminants within the delineated area; and a determination of the potentially contaminating activities to which the well(s) are most vulnerable. Groundwater protection zones would be established on the basis of average well discharge volumes and groundwater flow directions. In accordance with the DWSAP program, the drinking water source assessment would be updated every five years.

The second step in the DWSAP program is the voluntary development and implementation of a source water protection program. Development of this program is not mandated under the DWSAP program, but protection of water quality is an important component of a complete wellhead protection program for the protection of drinking water quality. Until production well locations are selected and a drinking water source assessment performed, the potential for contamination of a drinking water well cannot be fully evaluated. Therefore, impacts related to potential contamination of a drinking water source are considered *potentially significant* for the Local and Regional Groundwater Projects (SF-2); however, impacts would be reduced to a less-than-significant level with implementation of Measure 5.6-5, Drinking Water Source Assessments for Groundwater Wells, which would require development and implementation of a source water protection program for wells that are considered vulnerable to contamination. Implementation of the source water protection program would serve to prevent contamination of the drinking water supply. The SFPUC would undertake a more detailed analysis of the potential for contamination of a drinking water source and may refine the mitigation as part of the project-level CEQA review on the Local and Regional Groundwater Projects (SF-2).

Impact 5.6-6: Drinking water contaminants above maximum contaminant levels and adverse effects of adding treated groundwater to the distribution system.

As discussed in the Setting, nitrate and manganese levels exceed primary and secondary drinking water standards in some areas of the Westside Groundwater Basin. However, as described in Chapter 3, the groundwater developed for potable uses under the WSIP would be treated or blended with system water to meet all primary and secondary drinking water standards. Therefore, programmatic impacts related to exceedances in drinking water standards would be *less than significant*. The SFPUC would undertake a more detailed analysis of the need for treatment and proposed treatment methods as part of the project-level CEQA review on the Local and Regional Groundwater Projects (SF-2).

Although treated groundwater from the Local and Regional Groundwater Project (SF-2) wells would meet all primary and secondary drinking water standards, including those for nitrate and manganese, the water quality would differ from that currently in the SFPUC regional water system. The blending of groundwater in the system could result in changes in water quality, such as changes in taste and odor; however, the potential for these effects would depend on the quality of the groundwater produced, treatment methods, and proposed blending operations. In any event, the SFPUC would continue to meet all drinking water standards in the use of groundwater to supplement its current supply during both nondrought and drought periods. Therefore, impacts related to the blending of treated groundwater with SFPUC system water are expected to be *less than significant.* The SFPUC would undertake a more detailed analysis of the potential water quality effects related to the blending of treated groundwater with SFPUC system water as part of the project-level CEQA review on the Local and Regional Groundwater Projects.

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5.7 Cumulative Projects and Impacts Related to WSIP Water Supply and System Operations

5.7 Cumulative Projects and Impacts Related to WSIP Water Supply and System Operations

5.7.1 Introduction and Approach

5.7.1.1 CEQA Statutory Guidance

Cumulative impacts, as defined in Section 15355 of the CEQA Guidelines, refer to two or more individual effects which, when considered together, are "considerable" or which compound or increase other environmental impacts. The cumulative impact from multiple projects is the total change in the environment that could result from the incremental impact of the proposed project in combination with impacts of other closely related past, present, or reasonably foreseeable (i.e., probable) future projects. Pertinent guidance for cumulative impact analysis is given in Sections 15065(a) and 15130 of the CEQA Guidelines:

- An EIR [environmental impact report] shall discuss cumulative impacts of a project when the project's incremental effect is "cumulatively considerable" (i.e., the incremental effects of an individual project are significant when viewed in connection with the effects of past, current, and probable future projects, including those outside the control of the agency, if necessary).
- An EIR should not discuss impacts that do not result in part from the project evaluated in the EIR.
- A project's contribution is less than cumulatively considerable, and thus not significant, if the project is required to implement or fund its fair share of a mitigation measure or measures designed to alleviate the cumulative impact.
- The discussion of impact severity and likelihood of occurrence need not be as detailed as for effects attributable to the project alone.
- The focus of analysis should be on the cumulative impact to which the identified other projects contribute, rather than attributes of other projects that do not contribute to the cumulative impact.

In accordance with CEQA Guidelines Section 15130(a), if a project has an incremental effect that is not cumulatively considerable, then that effect need not be considered significant; however, the EIR must describe the basis for determining that the incremental effect is not cumulatively considerable. The discussion of cumulative impacts must reflect the severity of the impacts and the likelihood of their occurrence, but need not provide as much detail as is provided for the effects of the project alone. The CEQA Guidelines require that the discussion of cumulative impacts include:

- Either: (1) a list of past, present, and probable future projects producing related or cumulative impacts; or (2) a summary of projections contained in an adopted general plan or similar document, or in an adopted or certified environmental document, that described or evaluated conditions contributing to a cumulative impact.
- A discussion of the geographic scope of the area affected by the cumulative impact.
- A summary of expected environmental effects to be produced by these projects.

- Reasonable, feasible options for mitigating or avoiding the project's contribution to any significant cumulative effects.

5.7.1.2 Approach

This analysis of cumulative effects addresses water resources and related environmental resources discussed in Chapter 5. This analysis employs the list-based approach, and the list includes other SFPUC projects or activities as well as other non-SFPUC projects or activities under the jurisdiction of various local agencies. The following factors were used to determine an appropriate list of projects to be considered in this cumulative analysis:

- *Geographic Scope and Location* – a relevant project is located within a defined geographic scope for the cumulative effect.

- *Similar Environmental Impacts* – a relevant project contributes to effects on resources that would also be affected by the proposed program. This analysis considers potential effects on water resources and the related environmental resources discussed in Chapter 5: hydrology, geomorphology, surface water quality, groundwater, fisheries, terrestrial biological resources associated with water resources (e.g., wetlands and riparian areas and the habitats and species they support), and recreational and visual resources.

Geographic Scope

The potential effects of the WSIP on water resources and related environmental resources are discussed in Sections 5.3, 5.4, 5.5, and 5.6 for four distinct geographic areas within the overall regional system: the Tuolumne River system (and related downstream water bodies), the Alameda Creek watershed system, the Peninsula watershed system, and the Westside Groundwater Basin. This analysis of cumulative effects is organized by the same four geographic areas. Other past, present, and probable future projects within these geographic areas are considered in this analysis if those projects have had or could have similar impacts on water resources and related environmental resources in those areas.

Similar Environmental Impacts

Past, present, and future projects or activities are considered in this analysis if they have contributed or would contribute to effects on resources also affected by the WSIP. The following environmental resources and geographic areas affected by the proposed program were used to screen potential projects for inclusion in the cumulative analysis. If a project would not contribute to effects on the resources analyzed in Chapter 5 (i.e., hydrology, geomorphology, surface water quality, groundwater, fisheries, terrestrial biological resources, recreational and visual resources or energy), it was not included in the cumulative analysis. In particular, the cumulative analysis focused on the following types of projects or activities:

- Projects or activities that would affect flow in a stream, creek, or river, including additional diversions or changes in diversions, removal or installation of obstructions/barriers or flow impediments, or flood or erosion control projects

- Projects or activities that would alter the volume, timing, or duration of releases from the reservoirs or otherwise affect water levels
- Projects or activities that would degrade, improve, restore, or protect water quality or degrade, improve, restore, or protect biological resources (including fisheries) along or in an affected stream, creek, river, or associated watershed
- Projects or activities that would alter groundwater withdrawal or recharge

Assessment of Cumulative Effects

Cumulative impacts are analyzed based on the CEQA guidance described above in Section 5.7.1.1 and are organized by geographic area (i.e., watershed or subarea within a watershed or Westside Groundwater Basin). The cumulative analysis first describes relevant projects for each geographic area and includes the major past/present projects and activities on the water bodies within the watersheds or groundwater basin affected by the WSIP, followed by probable future projects in that same area. For each watershed, these projects include past and present activities related to water supply and hydropower development as well as probable future projects related to watershed restoration and enhancement; similarly, for the Westside Groundwater Basin, past, present, and future projects include activities related to groundwater withdrawal or replenishment. The analysis then describes the effects of past and present projects on each resource area within each geographic area. Since many of these past water system/water supply projects are still in operation today, the existing environmental conditions reflect the cumulative effects of these past projects and their present operations; these conditions also form the basis for the analysis of the WSIP impacts described in Sections 5.3 through 5.6 as well as the basis for assessing the effects of probable future projects and cumulative impacts.

The analysis then discusses the potential effects of probable future projects and describes the cumulative impacts of past, present, and probable future projects together with impacts of the WSIP. Finally, the analysis determines whether the additional contribution of WSIP impacts to the cumulative effects of past, present, and probable future projects on an environmental resource is cumulatively considerable. As described above, "cumulatively considerable" means that the incremental effects of the proposed program would be significant when viewed in combination with the effects of past, present, and probable future projects.

The WSIP's contribution to cumulative impacts is considered prior to mitigation, but the effects of recommended mitigation measures identified in Sections 5.3 through 5.6 and described in Chapter 6 are assessed in determining the significance of overall cumulative impacts. The incremental contribution of the program's residual effects after mitigation to the overall cumulative impact is then analyzed to determine if it would be cumulatively considerable. If the WSIP's contribution to cumulative effects is determined to be cumulatively considerable (i.e., significant) even with implementation of measures identified in Section 5.3 through 5.6, then additional mitigation measures are identified to reduce the WSIP's contribution to cumulative effects. In other words, the analysis assumes that the proposed measures identified in Sections 5.3 through 5.6 would be needed to address not only water supply and system operations impacts, but also the WSIP's incremental contribution to any significant cumulative effects.

For each geographic area, the cumulative impact analysis includes a summary table showing the components considered in the analysis as well as the results of the analysis for each resource area. For each resource topic the table first summarizes the effects of past and present projects without the WSIP and represents the existing condition against which all other impacts are compared. The effects of the past plus present projects and/or activities and operations are described as having either moderately or substantially altered natural environmental conditions as a relative measure of the change that has occurred over time. (There were no cases where there had been little or no change from natural conditions over time, thus these terms are not used.). Next, the table summarizes the findings of the WSIP impact analyses presented in Sections 5.3 through 5.6, both prior to and after mitigation. Then, the table presents a summary of the potential effects of probable future projects, followed by the cumulative impacts of past, present, and probable future projects combined with the WSIP impacts after mitigation. Finally, the table indicates whether the WSIP's contribution to cumulative impacts would be cumulatively considerable. In the case where no other future projects would contribute to cumulative impacts (other than the WSIP), there is no additional cumulative impact and the WSIP's contribution to cumulative impacts would not be applicable (since the cumulative impact would be the same as the direct impact of the program as analyzed in the previous sections of Chapter 5).

5.7.2 Cumulative Effects on the Tuolumne River System and Downstream Water Bodies

The effects of past, present, and future projects are described separately for the Tuolumne River corridor above and including Don Pedro Reservoir, the Tuolumne River corridor between Don Pedro Reservoir and the confluence with the San Joaquin River, and the San Joaquin River downstream to the Sacramento–San Joaquin Delta. The cumulative impacts of all projects including the WSIP, and the WSIP's contribution to cumulative impacts, are summarized at the end of each of these subsections.

5.7.2.1 Relevant Projects

Tuolumne River – Hetch Hetchy Reservoir to Don Pedro Reservoir

Past and Present Projects

Development of various components of the SFPUC regional water and power system has substantially affected environmental resources in the Tuolumne River corridor upstream of Don Pedro Reservoir. These facilities, built over a period ranging from 90 to 20 years ago, have been in continuous operation. Existing environmental conditions in this corridor reflect the past and ongoing operation of these facilities. These water system components, shown in Section 5.3, Figure 5.3.1, include:

- O'Shaughnessy Dam and Hetch Hetchy Reservoir
- Cherry Dam and Lake Lloyd
- Eleanor Dam and Lake Eleanor
- Holm and Kirkwood Powerhouses
- Cherry and Canyon Power Tunnels
- Mountain Tunnel

Lake Eleanor, Hetch Hetchy Reservoir, and Lake Lloyd were completed and put into service in 1918, 1923, and 1956, respectively. Various improvements to the reservoirs, tunnels, and powerhouses were made between the 1920s and the present. Use of the facilities has increased over the same time period to keep pace with the demand for water in the Bay Area.

Land use in the Tuolumne River watershed upstream of Don Pedro Dam has not changed considerably from conditions that existed prior to Euro-American settlement. Water projects developed by agencies other than the SFPUC on the South Fork of the Tuolumne River are small and do not have much effect on the river system beyond their immediate vicinity.

Future Projects

Four future SFPUC projects/actions and two future non-SFPUC projects/actions could affect this reach of the Tuolumne River corridor:

- Hetch Hetchy Communications System Upgrade Project
- Hetch Hetchy Repair and Rehabilitation Program
- Discretionary fishery flow releases from Hetch Hetchy Reservoir
- SFPUC Watershed and Environmental Improvement Program
- Don Pedro Pumped Storage Project
- Tuolumne Wild and Scenic River Comprehensive Management Plan

In addition to the listed projects, the SFPUC would conduct routine maintenance on its facilities in the Tuolumne River corridor.

Hetch Hetchy Communications System Upgrade Project. The Hetch Hetchy Communications System Upgrade Project would replace and improve an aging communications system in Tuolumne and Stanislaus Counties and expand coverage to the O'Shaughnessy Dam, Lake Lloyd, and Lake Eleanor areas (SFPUC, 2007). Additionally, a Federal Communications Commission rule (Section 101.69 et seq.) requires SFPUC Power Enterprise (formerly part of Hetch Hetchy Water and Power Enterprise) to vacate use of its current operating frequencies in the 2-gigahertz band when an emerging technology licensee needs these frequencies. The SFPUC would undertake the project in partnership with the National Park Service and the U.S. Forest Service. The project would improve communication facilities at 26 developed sites and add communication facilities at three undeveloped sites. New communication towers and equipment shelters would be built at the three undeveloped sites: the Cherry Tower, Burnout Ridge, and Poopenaut Pass sites.[1] In addition, the proposed project would remove communications equipment at three locations.

Hetch Hetchy Repair and Rehabilitation Program. The SFPUC has developed the Repair and Rehabilitation Program for its facilities in the Tuolumne River corridor. Several projects have been scheduled for implementation between 2008 and 2012. They include repairing Early Intake Dam, lining Moccasin Reservoir, improving and enlarging the Lower Cherry Aqueduct, and

[1] Cherry Tower, Burnout Ridge, and Poopenaut Pass are not formal names adopted by the U.S. Forest Service, National Park Service, or any other local, state, or federal entity. These names were given solely to identify precise locations for project purposes.

expanding the Moccasin Creek bypass (SFPUC, 2006). Likely future projects that have not yet been scheduled include repair of existing roads and bridges and implementation of a vegetation management program for water and power rights-of-way and areas surrounding Priest and Moccasin Reservoirs.

Discretionary Fishery Releases from Hetch Hetchy Reservoir. As described in Chapter 2, Section 2.5.3, an agreement between the City and County of San Francisco (CCSF) and the U.S. Department of the Interior (DOI) provided for several supplemental releases of water from Hetch Hetchy Reservoir, in addition to the current required minimum releases (shown in Table 5.3.1-2), to support resident trout populations. As agreed, the SFPUC releases an extra 64 cubic feet per second (cfs) at Hetch Hetchy Reservoir on any day that flow in Canyon Tunnel exceeds 920 cfs. Also, the U.S. Fish and Wildlife Service (USFWS), an agency within the DOI, has the discretion to require this additional water to be released from Hetch Hetchy Reservoir in an amount varying from 4,400 to 15,000 acre-feet, depending on hydrologic conditions, for the benefit of resident trout. If shown to be necessary for fish habitat, the USFWS may also seek to have additional water released in wetter hydrologic year types under certain conditions (CCSF, 1987).

In March 1987, the CCSF and DOI agreed on the amounts and a procedure for determining whether supplemental flow releases were necessary. The agreement provided for a study of the relationship between the resident trout population and stream flow below O'Shaughnessy Dam. The study was intended to establish whether additional releases were actually needed and, if so, the appropriate timing of such releases. The SFPUC made supplemental releases as part of the experimental program to study the relationship between the flow rate in the river, the depth of water in the channel, and the extent of trout habitat. The USFWS produced a draft study in 1992 that called for the release of greater amounts of water, but did not provide guidance on the timing of releases. The CCSF provided comments on this draft study questioning the basis of some of the recommendations, and matters were left unresolved. Beginning in 2005, the SFPUC began working again with the USFWS to resolve issues regarding these additional releases (4,400 – 15,000 acre-feet). The SFPUC has produced two documents to supplement the 1992 draft study: the *Upper Tuolumne River: Available Data Sources, Field Work Plan and Initial Hydrology Analysis* (October 2005) and the *Upper Tuolumne River: Description of River Ecosystem and Recommended Monitoring Actions* (April 2007).

The SFPUC plans to build on this foundation and work collaboratively with the USFWS to pursue the recommendations in these reports; develop and test hypotheses by conducting field work; and reach agreement on these supplemental releases by 2009. For the purpose of this cumulative analysis, the supplemental or discretionary flow releases were modeled using the amounts from the 1987 release schedule (4,400 to 15,000 acre-feet, see Table 5.3.1-2) and conservation assumptions for the timing of releases in combination with full implementation of the WSIP under the 2030 conditions. These assumptions represent a potential worst-case scenario for use in the impact assessment, but may not reflect the ultimate release requirements if any are determined to be necessary.

Watershed and Environmental Improvement Program. The SFPUC is developing this program to protect and restore lands and natural resources critical to the operation of the SFPUC regional water system. As described in Chapter 3, the program could include ecosystem and habitat protection, improvements, and restoration and would address such issues as fish passage, riparian habitat degradation, and sensitive species recovery in the Tuolumne, Alameda, and Peninsula watersheds. Program planning is in progress, and initial activities include field surveys and information gathering on current ecological and geomorphic conditions in the Tuolumne River from O'Shaughnessy Dam to Don Pedro Reservoir, Cherry Creek downstream of Cherry Dam, and Eleanor Creek downstream of Eleanor Dam (McBain & Trush, 2006). However, no specific projects or actions affecting Hetch Hetchy Reservoir or the Tuolumne River below the reservoir have been identified.

Don Pedro Pumped Storage Project. The Turlock Irrigation District (TID) and Modesto Irrigation District (MID) are considering the possibility of constructing a pumped storage project. As envisaged, water would be pumped from Don Pedro Reservoir to a new adjacent reservoir at a higher elevation at times when electrical power is inexpensive. Water would be released from the new reservoir and conveyed back to Don Pedro Reservoir via a new hydroelectric power plant at times when the demand for electrical power is high and the value of the power is at its greatest. Two potential sites for the upper reservoir have been identified. Reservoir capacity would be 30,000 acre-feet or 14,000 acre-feet. If TID and MID choose to proceed with the project it would take ten years to complete (Morris, 2006).

Tuolumne Wild and Scenic River Comprehensive Management Plan. The National Park Service is currently preparing a plan for the 54 miles of the Tuolumne River designated as wild and scenic within Yosemite National Park. Even though Hetch Hetchy Reservoir and the lands immediately surrounding it would not be subject to the future management plan, the plan will include reaches of the Tuolumne River immediately upstream and downstream of the reservoir. This plan is currently under development, and no specific projects or actions affecting the reservoir or the Tuolumne River downstream of the reservoir have been identified. Therefore, this plan was not included in the modeling for the cumulative analysis, but it is assumed that implementation of the plan would result in beneficial effects on environmental resources.

Tuolumne River – Don Pedro Reservoir to the San Joaquin River

Past and Present Projects

Projects and activities that have substantially affected environmental quality in the Tuolumne River corridor below Don Pedro Reservoir between La Grange Dam and the river's confluence with the San Joaquin River include:

- Don Pedro Reservoir
- La Grange Diversion Dam
- Modesto and Turlock Canals
- Historical dredging for gold
- Gravel mining
- River channelization and development of floodplains for agricultural and urban use

- 1995 Federal Energy Regulatory Commission Settlement Agreement (New Don Pedro Project, P-2299-024)

Beginning in 1871, diversion dams with minimal storage capacity were built on the Tuolumne River in the vicinity of the present La Grange Dam. La Grange Dam itself was completed in 1893. The original Don Pedro Reservoir, which was built upstream of La Grange Dam, was put into service in 1923 and expanded to its current capacity in 1971. Since the 1870s, TID and MID have diverted water from the Tuolumne River into canals at or near the site of La Grange Dam. The canals deliver water to farmers for agricultural irrigation. In the last decade, MID began treating some canal water and providing it for municipal water supply. The canal system has been progressively expanded and improved since the 1870s. The volume of diverted water increased over many decades, but is now stable and unlikely to increase in the future.

Flow in the reach of the Tuolumne River between La Grange Dam and the San Joaquin River confluence is not only affected by Don Pedro Reservoir and the diversions into the Modesto and Turlock Canals, but also by upstream components of the SFPUC regional water system described above. They include O'Shaughnessy Dam and Hetch Hetchy Reservoir, Cherry Dam and Lake Lloyd, Eleanor Dam and Lake Eleanor, Holm and Kirkwood Powerhouses, Cherry and Canyon Power Tunnels, and Mountain Tunnel.

The Federal Energy Regulatory Commission (FERC) regulates most hydropower projects. The New Don Pedro Project includes both a reservoir and a hydropower component and operates in accordance with a FERC license. In 1996, FERC ordered new minimum releases, which are shown in Table 5.3.1-3.

Gold mining in the mid-19th century and gravel mining in the 20th century occurred throughout the Tuolumne River corridor. Gravel mining in the riverbed itself was discontinued in the 1970s but continues in the floodplain. Levee construction and conversion of floodplain lands to agricultural and urban use occurred primarily in the last 50 years.

Future Projects

Future plans, projects, and regulatory changes that could affect the Tuolumne River between Don Pedro Reservoir and the confluence with the San Joaquin River include:

- TID Infiltration Gallery Project
- TID Regional Surface Water Supply Project
- 1995 FERC Settlement Agreement
- New Don Pedro Project FERC relicensing
- Expansion of MID municipal water treatment plant

TID Infiltration Gallery Project. TID began development of the Infiltration Gallery Project in the 1990s. The project consists of an infiltration gallery, a raw water pump station, and a pipeline to TID's Ceres Main Canal. The infiltration gallery is an array of perforated pipes installed in the Tuolumne River bed just west of the Geer Road Bridge. The infiltration gallery was built in 2003 with a capacity of 100 cfs, but the pump station and pipeline have not yet been built. Once completed, the project would move the point of diversion for some of TID's Tuolumne River water downstream from La Grange Dam to the infiltration gallery near the Geer Road Bridge. Water that would otherwise be diverted at La Grange Dam would flow downstream to the infiltration gallery and be pumped into the Ceres Main Canal. The purpose of the project is to increase flow in the 26-mile reach of the Tuolumne River between La Grange Dam and Geer Road Bridge in order to improve conditions for aquatic life (EIP Associates, 2006).

TID Regional Surface Water Supply Project. TID is currently proposing a Regional Surface Water Supply Project, which would consist of a water treatment plant and about 20 miles of treated water pipeline to deliver water to the cities of Ceres, Hughson, Keyes, South Modesto, and Turlock. The treatment plant would be located adjacent to the existing infiltration gallery (see above) and would obtain water from it. Up to 66 cfs, or 42.5 million gallons per day (mgd), of water would be released from La Grange Dam and diverted from the Tuolumne River at the infiltration gallery for treatment and municipal use. The releases would be above and beyond already required flow releases to the lower river. The treatment plant would provide the base load water supply to cities in the TID service area. Peak daily and seasonal water demand would be met by supplementing water from the treatment plant with water from wells. By 2030, it is expected that the treatment plant would run continuously at 42.5 mgd (Brown and Caldwell, 2003; Selsky, 2006).

In 2030, 66 cfs would be released from La Grange Dam year-round to supply water to the downstream infiltration gallery and the treatment plant. An additional 34 cfs could be released from La Grange Dam during the irrigation season, diverted at the infiltration gallery, and conveyed to the Ceres Main Canal for agricultural use. The release for agricultural purposes would likely extend from mid-March to mid-October.

1995 FERC Settlement Agreement. The 1995 FERC Settlement Agreement included provisions intended to improve conditions in the Tuolumne River below La Grange Dam. Although some improvement projects have been completed, others would be completed in the future.

TID and MID, the owners and operators of Don Pedro Reservoir, have a legal and historical role as managers of flow in the lower Tuolumne River. Sharing in the responsibility for stewardship of the river's natural resources are several state and federal resource agencies, public utilities, and private organizations that are signatories to the 1995 FERC Settlement Agreement. The signatories are TID, MID, the California Department of Fish and Game (CDFG), the USFWS, FERC, the National Marine Fisheries Service, the CCSF, the San Francisco Bay Area Water Users Association (now the Bay Area Water Supply and Conservation Agency), Friends of the Tuolumne, the Tuolumne River Preservation Trust, Tuolumne River Expeditions, and the California Sports Fishing Protection Alliance.

The FERC Settlement Agreement created the Tuolumne River Technical Advisory Committee (TRTAC) to coordinate and administer restoration and management activities on the lower Tuolumne River. The TRTAC includes the FERC Settlement Agreement signatories and other interested groups. The TRTAC developed the *Habitat Restoration Plan for the Lower Tuolumne River Corridor* (TRTAC, 2000) to identify and implement high-priority restoration projects focused on improving conditions for the Chinook salmon population. The restoration plan is a technical resource designed to help the TRTAC fulfill its obligations under the FERC Settlement Agreement.

The restoration plan accepts that the Tuolumne River is a managed system, and that it is not possible to return the river to its pre-Euro-American settlement condition. Instead, the plan seeks to reverse more than a century of environmental degradation by identifying and implementing various improvement projects to restore the ecological health and integrity of the lower Tuolumne River. Plan recommendations include establishing a minimum 500-foot-wide riparian corridor along the river, removing levees and non-native vegetation, and reconstructing the river channel and terraces to match the current flow regime. Other recommendations involve reducing sand input to the river, providing additional spawning gravel, and restoring riparian vegetation. The plan identified 14 high-priority restoration projects, of which two have been implemented (see Section 5.2 for further description of the plan) (TID and MID, 2005).

New Don Pedro FERC Relicensing. The FERC will need to relicense the New Don Pedro Project in 2016 (see Chapter 2, Section 2.5 for a description of the New Don Pedro Project). Data gathered as required under the 1995 FERC settlement agreement, and the effectiveness of restoration measures, will be considered during the relicensing process. The current minimum flow requirements will also be reevaluated. Although the conditions of the new license are not known, it is likely that the minimum flow requirements will remain the same or will increase.

Expansion of MID Municipal Treatment Plant. MID owns and operates a 40-mgd municipal water treatment plant that obtains water from Modesto Reservoir. Modesto Reservoir is located north of the Tuolumne River and is supplied with water from the Tuolumne River via the Modesto Canal. Tuolumne River water is diverted into the Modesto Canal at La Grange Dam, and treated water is delivered to the city of Modesto. MID intends to increase the capacity of the treatment plant to 60 mgd in the near future (Jones and Stokes, 2004).

Downstream Water Bodies: the San Joaquin River, Stanislaus River, and Delta

This section discusses the projects that affect flow contributions to the San Joaquin River and the Delta downstream of the Tuolumne River or otherwise have or might affect water quality and/or aquatic ecosystem resources (i.e., species or habitats) in these water bodies.

Past and Present Projects

Past and present actions that have substantially affected the San Joaquin and Stanislaus Rivers include local water diversions, major water supply and flood control projects, gravel mining operations, and agricultural activities.

San Joaquin River. Friant Dam, which created Millerton Lake, was completed in 1942 as part of the federal Central Valley Project. The Central Valley Project's Friant-Kern and Madera Canals convey most of the runoff from the San Joaquin River drainage above Millerton Reservoir to agriculture and urban water users. The U.S. Bureau of Reclamation (USBR) releases enough water from the dam to maintain a flow of 5 cfs past Gravelly Ford, which is 35 miles below the dam, to meet downstream riparian water rights. The reach of the river between Gravelly Ford and Mendota is essentially dry, except when flood releases are being made.

As described in Section 5.3.1, the San Joaquin River gains waters as it flows toward the Sacramento–San Joaquin Delta from agricultural irrigation return flows and tributaries (see Figure 5.3.1-7). Stream flow gaging records for the period 1942 to 2004 indicate that flow in the San Joaquin River at Newman, upstream of the river's confluence with the Tuolumne River, averaged 1,789 cfs, and that flow in the San Joaquin River at Vernalis, upstream of the Delta and downstream of the Tuolumne River confluence, averaged 4,328 cfs. A substantial proportion of the increase in San Joaquin River flow between Newman and Vernalis is contributed by the Tuolumne River, which has an average annual flow of 1,265 cfs as measured at Modesto.

Stanislaus River. New Melones Reservoir was completed by the U.S. Army Corps of Engineers (Corps) in 1978 and approved for filling in 1983. The reservoir has a storage capacity of 2.4 million acre-feet per year (afy) and provides for both water supply and flood control. New Melones Reservoir, located approximately 60 miles upstream from the confluence of the Stanislaus and San Joaquin Rivers, is operated by the USBR as part of the Central Valley Project. The USBR provides water to Central Valley Project water supply contractors from this river. Flow in the lower Stanislaus River is primarily controlled by releases from the reservoir. The USBR makes releases from New Melones Reservoir to meet senior water-right obligations to Oakdale Irrigation District and South San Joaquin Irrigation District, to satisfy downstream riparian water rights, and to meet instream requirements for water quality, fisheries, and wildlife.

Under Section 3406 (b)(2) of the Central Valley Project Improvement Act (enacted by Congress in 1992), the DOI has the responsibility to dedicate and manage 800,000 afy of Central Valley Project water for fishery, wildlife, and habitat restoration purposes. Program objectives include improving habitat conditions for anadromous fish[2] in Central Valley Project rivers, streams, and the Bay-Delta to help meet the Anadromous Fish Recovery Program doubling goals. The Stanislaus River is one of the rivers controlled by the Central Valley Project. Under this program, the USBR releases water to the lower Stanislaus River to assist anadromous fish. The USBR has initiated an effort to revise its current interim plan of operation for New Melones Reservoir in consideration of changing conditions that have occurred in the basin and other directives.

Sacramento–San Joaquin Delta. One hundred fifty years ago, a network of levees was developed in the Sacramento–San Joaquin Delta to prevent flooding of the fertile farmland. While most of these islands continue to be used for agriculture, residential development is also occurring within and around the Delta. Delta farmers divert water directly from the Delta channels to irrigate their land. A portion of the diverted water is returned to the Delta channels as agricultural return.

California's two largest engineered water systems, the Central Valley Project and the State Water Project, also divert water from the Delta. The Central Valley Project diverts water from Old River

2 Anadromous fish hatch (rear) in freshwater, migrate to the ocean (saltwater) to grow and mature, and migrate back to freshwater to spawn and reproduce.

in the south Delta at the Tracy Pumping Plant and exports it to Central Valley Project contractors via the Delta-Mendota Canal. Contra Costa Water District, a Central Valley Project contractor, diverts its water from Old River and Rock Slough in the south Delta and Mallard Slough in the west Delta. The State Water Project diverts water from Old River at the Banks Pumping Plant and exports it to customers via the California Aqueduct, the South Bay Aqueduct, and the Central Coast Aqueduct. The State Water Project diverts smaller amounts of water from Barker Slough in the north Delta to serve customers in Napa and Solano Counties. Between 1995 and 2004, the State Water Project diverted an average of 2.6 million afy from the Delta. The Central Valley Project diverted an average of 2.5 million afy from the Delta.

Future Projects

There are numerous proposed programs and projects that, if implemented, could affect the San Joaquin or Stanislaus Rivers and/or the Delta and contribute to either beneficial and/or adverse cumulative effects on the water resources and/or the associated ecosystem resources. **Table 5.7-1** summarizes these programs and projects. These programs and projects are categorized by whether they would affect one or more of the three environmental issues affected by the WSIP: water supply/supply reliability, water quality, and/or aquatic resources (habitat and species). A few of these proposed programs and projects have been approved and are being implemented; many more are under study and may or may not be approved for implementation. As noted in the table, many of these programs are specifically designed to improve environmental conditions in the rivers or Delta and most of them could contribute to both beneficial and adverse cumulative effects on environmental resources in these rivers or the Delta.

San Joaquin River. As shown in Table 5.7-1, there are almost a dozen proposed future programs, projects, and actions that would directly affect surface waters, water quality, and related aquatic resources in the San Joaquin River, as well as others listed under the Delta Region that might indirectly affect the river depending on how they are implemented. As summarized in the table, several of these programs are intended to improve conditions in the river with respect to water quality and aquatic habitats, and some are also intended to improve water supply management and supply reliability. Notable among these potential projects is the recently established San Joaquin River Restoration Settlement, which is described in more detail below.

In September 2006, a settlement agreement among the USBR, the Friant Water Users Authority (Friant), and the Natural Resource Defense Council was approved to restore flows and salmon habitat in the San Joaquin River between Friant Dam and the confluence with the Merced River and to improve water reliability for water users. The settlement agreement provides opportunities for Friant Division long-term water contractors to mitigate water supply impacts resulting from water releases called for under the agreement. The settlement agreement requires specific releases of water from Friant Dam to the confluence of the Merced River, designed primarily to meet the various life-stage needs of spring- and fall-run Chinook salmon (USBR, 2007). The release schedule assumes continuation of the current average Friant Dam releases of 116,741 acre-feet, with additional flow requirements depending on the hydrologic year type. For example, approximately 247,000 acre-feet would be released in most dry years, whereas about 555,000 acre-feet would be released in wet years.

TABLE 5.7-1
PROJECTS THAT COULD CONTRIBUTE TO CUMULATIVE EFFECTS ON THE SAN JOAQUIN RIVER AND/OR DELTA

			Areas of Potential Effect Relevant to the WSIP (Adverse and/or Beneficial)			
Project Name	**Description**	**Project Sponsor / Partners**	**Water Supply / Reliability**	**Water Quality**	**Habitat / Species**	**Potential Effects / Status**
San Joaquin River Watershed						
San Joaquin River TMDL for salt and boron	Basin Plan amendment for control of salt and boron discharge into the lower San Joaquin River. Water quality objectives and implementation are yet to be completed.	Central Valley RWQCB		X		Would likely reduce saline discharges to the San Joaquin River, but may be deleterious to flow and salinity concentration conditions. Technical TMDL Report completed in January 2002. Notice of Determination (NOD) for the San Joaquin River at Vernalis Salt and Boron TMDL and Basin Plan Amendment submitted in 2006. Schedule has been deferred. (Central Valley RWQCB, 2007)
San Joaquin River TMDL for Dissolved Oxygen in the Stockton Deepwater Ship Channel	Basin Plan amendment containing a dissolved oxygen TMDL that apportions responsibility to parties attributable to the factors of cause. Implementation yet to be completed.	Central Valley RWQCB		X		Beneficial water quality effect. Removal of oxygen demanding substances, aeration and flow augmentation will likely be tools to meet TMDL.
New Melones Revised Operation Plan	Modify current interim operational plan in consideration of evolving San Joaquin and Stanislaus River conditions, directives and requirements.	USBR	X	X	X	May change priorities of New Melones Reservoir operation.
San Joaquin Valley Drainage Implementation Program	Management of agricultural drainage discharge to the San Joaquin River. Incorporated into the San Luis Drainage Feature Re-evaluation Program.	San Joaquin River Exchange Contractors, Panoche, Westlands and Broadview Water Districts		X		Intended to reduce water quality impacts on the San Joaquin River. Final report released in 2000 followed by a new Drainage Management Strategy in 2000 to implement the updated recommendations (DWR, 2007a).
San Luis Drainage Feature Re-evaluation Program	Intended to address drainage management and disposal from the San Luis Unit.	USBR	X	X		Will reduce various constituent discharges to the San Joaquin River. Final report released in 2006. Record of Decision (ROD) released in 2007 (USBR, 2007b).
Upper San Joaquin River Basin Storage Investigation (CALFED Program)	Evaluation of potential for increasing storage in the Upper San Joaquin Watershed to increase water supply, storage capacity, and flood control, as well as improve water quality and wildlife habitat.	USBR, DWR and partners	X	X	X	Could contribute to both beneficial and adverse environmental effects on the San Joaquin River. Environmental document and feasibility study anticipated in 2009 (USBR and DWR, 2006).

TABLE 5.7-1 (Continued)
PROJECTS THAT COULD CONTRIBUTE TO CUMULATIVE EFFECTS ON THE SAN JOAQUIN RIVER AND/OR DELTA

Project Name	Description	Project Sponsor / Partners	Areas of Potential Effect Relevant to the WSIP (Adverse and/or Beneficial)			Potential Effects / Status
			Water Supply / Reliability	Water Quality	Habitat / Species	
San Joaquin Valley Water Transfers	San Joaquin River Exchange Contractors Water Authority 2005 – 2014 transfer program of up to 130 TAF/year of substitute water to other CVP contractors. Water to be also transferred for delivery to San Joaquin Valley wetland habitat areas and/or to the EWA program as replacement water for CVP contracts.	USBR, San Joaquin River Exchange Contractors Water Authority	X	X	X	Could benefit Central Valley and Delta ecosystems. As of 2003, the feasibility studies and project identifications were still underway (CALFED, 2003).
San Joaquin River Restoration Settlement (Friant Settlement Legislation)	Agreement restoring water flow for salmon along with channel improvements in San Joaquin River downstream of Friant Dam to the confluence with the Merced River. Goal is to maximize flows for fish survival while meeting the supply obligations to San Joaquin River water users. Projects to restore flow will be implemented in phases.	USBR, DWR, Friant Users Water Authority, Natural Resources Defense Council	X		X	Intended to have a beneficial effect on fish habitat and fishery resources in the San Joaquin River. May incidentally increase Delta inflow and thus benefit Delta resources. Depending on how management goal is met, projects under this program might contribute in some ways to adverse effects on the Delta.
Delta-Mendota Canal Recirculation Feasibility Study	Feasibility study of recirculating/augmenting water from the Delta through CVP facilities to the San Joaquin River to enhance flow, reduce salinity, and reduce reliance on New Melones Reservoir for meeting water quality and fishery flow objectives.	USBR, DWR		X	X	This project is intended to contribute to beneficial effects on San Joaquin River water quality and fish habitat. A NOI/NOP was released in March 2007. The final feasibility report and EIS/EIR is expected in 2009 (USBR, 2007d).
Stockton Delta Water Supply Project	New supplemental water supply for Stockton diverted from the San Joaquin River. The project includes a new intake structure, pipelines and water treatment plant as well as a groundwater recharge / conjunctive use element.	City of Stockton	X	X		Would contribute to cumulative adverse effects of water diversion on the Delta. Stockton certified the Final EIR in 2005, and is currently designing and permitting the project for construction.
Lower San Joaquin River Flood Improvement Project	Improve flood control capacity on the lower San Joaquin River and enhance ecosystem structure and function on the lower river and south Delta.	DWR, USBR, South Delta Water Agency			X	Intended to provide environmental benefits to lower the San Joaquin River and south Delta; could also involve potential adverse effects on habitat depending on the nature of proposed actions. Project plan development to occur in 2007/2008. Environmental documents and feasibility study scheduled for completion in 2010.

TABLE 5.7-1 (Continued)
PROJECTS THAT COULD CONTRIBUTE TO CUMULATIVE EFFECTS ON THE SAN JOAQUIN RIVER AND/OR DELTA

			Areas of Potential Effect Relevant to the WSIP (Adverse and/or Beneficial)			
Project Name	**Description**	**Project Sponsor / Partners**	**Water Supply / Reliability**	**Water Quality**	**Habitat / Species**	**Potential Effects / Status**
Delta Region						
Shasta Reservoir Enlargement	Expand Shasta Reservoir to increase storage upstream of the Delta. Alternatives range from reservoir reoperation, and dam modification to raising the dam 6.5 feet. Project could increase water supplies available for export	USBR	X	X		Could contribute to both beneficial and adverse effects on the Delta by providing greater flexibility to release additional water from the reservoir for water quality and/or habitat or species benefit and by increasing potential supply exports from the Delta. Project is in the planning stages; environmental document anticipated in 2008.
Upstream of Delta Off-stream Storage (Sites Reservoir)	Develop new off-stream storage reservoir upstream of the Delta to increase water supply reliability, improve water quality in the Delta, and improve fish migration on the Sacramento River	DWR, USBR	X	X	X	Could contribute to both beneficial and adverse effects on the Delta by providing greater flexibility to release additional water from the reservoir for water quality and/or habitat or species benefit and by increasing potential supply exports from the Delta. NOP/NOI issued in November 2001; environmental document anticipated in late 2008.
In-Delta Storage Program (Delta Wetlands Project)	Develop storage in the Delta (on Delta islands). This could reduce flows in the Delta by capturing peak flow through the Delta during high flow periods and releasing it later in the year when exports are needed.	CALFED and DWR	X	X	X	Could contribute to both beneficial and adverse effects on the Delta by providing additional flexibility to release additional water from the reservoir for water quality and/or habitat or species benefit and by increasing potential supply exports from the Delta. EIR/EIS for Delta Wetlands Project completed in 2000. DWR issued 2004 Feasibility Report and 2006 supplemental report.
Los Vaqueros Reservoir Expansion Project	Expand the existing Los Vaqueros Reservoir to improve water supply reliability and water quality for Bay Area water users, while enhancing the Delta environment.	CCWD, USBR, DWR	X	X	X	Could contribute to both beneficial and adverse effects on the Delta by reducing impacts of water diversions on fish, providing environmental water, and improving water supply reliability. NOP/NOI released in 2006; Draft EIS/EIR anticipated early 2008.

TABLE 5.7-1 (Continued)
PROJECTS THAT COULD CONTRIBUTE TO CUMULATIVE EFFECTS ON THE SAN JOAQUIN RIVER AND/OR DELTA

Project Name	Description	Project Sponsor / Partners	Areas of Potential Effect Relevant to the WSIP (Adverse and/or Beneficial)			Potential Effects / Status
			Water Supply / Reliability	Water Quality	Habitat / Species	
South Delta Improvements Program (SDIP)	Series of actions: physical/structural improvements and operational changes to maximize SWP diversion capacity and improve conditions for fish, increase supply for downstream agriculture, and improve water quality and reliability of supply.	DWR, USBR	X	X	X	Could contribute to both beneficial and adverse effects on the Delta by increasing Delta water diversions and, at the same time, reducing impacts of water diversions on fish and improving water quality. Final EIS/EIR released in 2006. Stage 1 physical/structural improvements to be considered for approval first; then Stage 2 to consider increasing water deliveries.
Rock Slough and Old River Water Quality Improvement Projects	Two projects relocating agricultural drainage discharge points to improve water quality.	CALFED, CCWD		X		Would contribute to cumulative beneficial effects on Delta water quality.
Delta Cross Channel Reoperation and Through-Delta Facility (TDF)	Study of whether changes in operation of the Delta Cross Channel could benefit fish and water quality. Includes looking at a screened Through-Delta Facility for conveyance of up to 4,000 cfs.	CALFED, USBR, DWR	X	X	X	Could contribute to both beneficial and adverse effects on the Delta by altering Delta diversions and flow patterns to benefit fish and water quality and improve water supply reliability. A final report is anticipated in fall 2008 (Bagheban, 2007).
North Delta Flood Control and Ecosystem Restoration Project	Feasibility study of floodway improvements in the North Delta to provide conveyance, flood control, and ecosystem benefits.	DWR, U.S. Army Corps of Engineers			X	Would provide flood control and ecosystem benefits but could also contribute to some adverse effects on the Delta associated with construction of proposed projects such as bridge replacement, dredging, or island bypass systems. DWR and the Corps are conducting a feasibility study. An NOI/NOP was released in 2003. Final EIR/EIS anticipated in late spring 2008. Construction is expected to be complete by 2011 (DWR, 2007b).
Delta-Mendota Canal/California Aqueduct Intertie	Connection between the two facilities would increase water supply reliability for SWP and CVP.	DWR, USBR	X			Could increase average daily pumping for Delta water diversions into the Delta Mendota Canal. Project included in the USBR's Operations Criteria and Plan; Draft EIS anticipated in 2007 (USBR, 2007b).

TABLE 5.7-1 (Continued)
PROJECTS THAT COULD CONTRIBUTE TO CUMULATIVE EFFECTS ON THE SAN JOAQUIN RIVER AND/OR DELTA

Project Name	Description	Project Sponsor / Partners	Areas of Potential Effect Relevant to the WSIP (Adverse and/or Beneficial)			Potential Effects / Status
			Water Supply / Reliability	Water Quality	Habitat / Species	
Bay Area Water Quality and Supply Reliability Program	Program to work towards creating coordinated water delivery operations and regional exchange projects to improve water quality and supply reliability.	Various Bay Area water agencies	X	X		Several projects in various stages of development, as described in the *Bay Area Integrated Regional Management Plan*, released November 2006. Projects could contribute to both beneficial and adverse cumulative effects on the Delta.
South Bay Aqueduct Improvement and Enlargement Project	Project to upgrade and increase the size of the South Bay Aqueduct water delivery infrastructure.	DWR	X			Not expected to contribute to cumulative adverse Delta effects. Project EIR confirmed in June 2005; project under construction (DWR, 2005).
Sacramento Valley Water Management Program (Phase 8)	Program to resolve water quality and water rights issues arising from need to meet the flow-related water quality objectives of the 1995 Bay-Delta Water Quality Control Plan and the SWRCB's Phase 8 Water Rights hearing process. Short-term program includes actions and projects that would also improve water management and develop additional supplies.	USBR, DWR and agencies representing Sacramento River and Delta water users	X	X	X	Intended to benefit water quality in the Delta, and, in turn, ecosystem resources. This project would contribute to beneficial cumulative effects to the Delta. An NOI/NOP and Scoping Report were published in 2003 (DWR, 2007c).
Long-Term CVP and SWP Operations Criteria and Plan (OCAP) - ESA Reconsultation	Sets standards for operation of the integrated SWP and CVP. OCAP and associated Biological Opinions set operating terms and conditions, including the instream habitat conditions to be maintained. Due to both environmental and regulatory changes since the last OCAP update in 2004, the USBR has requested reinitiation of the Section 7 Endangered Species Act consultation with the USFWS and NMFS.	DWR, USBR	X	X	X	Could contribute to both beneficial and adverse cumulative effects on the Delta. The Biological Opinions are expected to be complete by mid-2008 (MWD, 2007).
Central Valley Project Long-Term Contract Renewals	Renewal of the CVP long-term service contracts. Process includes a current water needs assessment for each contractor. Decisions issued to date for Sacramento Division, Sacramento River Settlement Contracts, Delta-Mendota Canal Division, Friant Division and several individual contracts. Others ongoing, to be completed after the Long-term OCAP.	DWR, USBR	X			Could contribute to both beneficial and adverse cumulative effects on the Delta and San Joaquin River.

TABLE 5.7-1 (Continued)
PROJECTS THAT COULD CONTRIBUTE TO CUMULATIVE EFFECTS ON THE SAN JOAQUIN RIVER AND/OR DELTA

			Areas of Potential Effect Relevant to the WSIP (Adverse and/or Beneficial)			
Project Name	**Description**	**Project Sponsor / Partners**	**Water Supply / Reliability**	**Water Quality**	**Habitat / Species**	**Potential Effects / Status**
Sacramento River Water Reliability Study	Implementation of a water supply consistent with the Water Forum objectives of establishing a Sacramento River diversion to meet the Placer-Sacramento region's water supply needs and to promote ecosystem preservation along the American River.	Reclamation, Place County Water Agency (PCWA), cities of Roseville and Sacramento, Sacramento Suburban Water District	X		X	Could contribute to both beneficial and adverse cumulative effects on the Delta. Reclamation and PCWA issued NOI/NOP in 2003; environmental documentation in preparation.
Environmental Water Account (EWA) Water Purchase Program	The EWA provides protection to the fish of the Bay-Delta estuary at no uncompensated water cost to CVP or SWP water users. The program involves water supplies to replace water supply otherwise lost through changes in CVP or SWP operations	CALFED	X	X	X	Intended to contribute to beneficial effects on Delta fisheries. In a transitional phase as the short-term part sunsets at the end of 2007. Exploration of a transitional phase or long-term phase is underway. EIS/EIR is in preparation on the Long-term EWA program. Intended to contribute to cumulative beneficial effects on the Delta resources.
Freeport Regional Water Project	Partnership between the two agencies to build infrastructure for sharing of regional supply with a Sacramento River diversion. The project will supply EBMUD customers in dry years.	EBMUD and Sacramento County Water Agency (SCWA)	X			Could contribute to adverse effects on the Delta. The Final EIR certified in 2004; the USBR issued the ROD in 2005. Project beginning construction.
Oroville Facilities FERC Relicensing	Process required to renew the existing FERC license that expires in 2007 for DWR's Oroville Facilities (part of the SWP), operated primarily for water supply but also for power generation, flood control, environmental protection, recreation, and salinity control in the Delta.	DWR	X	X	X	This project has mitigation and license conditions intended to benefit fish and wildlife habitat and resources such that continued facilities operation should not contribute to adverse cumulative effects in the Delta. FERC issued Draft EIS in 2006. Final EIS issued in May 2007 (DWR, 2007d).
Monterey Amendment/Settlement Agreement	Amendments to DWR's SWP contracts. Notably, the Monterey Agreement revised water allocation procedures during shortages, transferred water from agricultural to municipal contractors and transferred the Kern Water Bank lands from state to local ownership.	DWR	X		X	Could contribute to adverse cumulative effects on the Delta. NOP was issued in 2003 and Draft EIR is expected to be released in 2007.
CVPIA Water Acquisition Program	This program provides water to protect federal wildlife habitat/reserves in the Central Valley.	USBR			X	Contributes to cumulative beneficial effects on fish and wildlife habitat in the Central Valley – wildlife refuges.

TABLE 5.7-1 (Continued)
PROJECTS THAT COULD CONTRIBUTE TO CUMULATIVE EFFECTS ON THE SAN JOAQUIN RIVER AND/OR DELTA

Project Name	Description	Project Sponsor / Partners	Areas of Potential Effect Relevant to the WSIP (Adverse and/or Beneficial)			Potential Effects / Status
			Water Supply / Reliability	Water Quality	Habitat / Species	
Delta Improvements Package	A set of programs under CALFED to improve water supply reliability, improve water quality, and increase environmental protection. It outlines the conditions under which the SWP would be allowed to increase permitted export pumping to 8,500 cfs.	CALFED		X	X	Intended to contribute to beneficial effects on the Delta and San Joaquin River.
Contra Costa Water District Alternative Intake Project	Drinking water quality project to relocate some of CCWD's existing water diversions to a new intake on Victoria Canal, which provides better water quality. No diversion increase.	CCWD		X		Project would not result in significant adverse effects on the Delta resources. Final EIS/EIR completed in 2006. This project is in the permitting and design phase.
CALFED Ecosystem Restoration Program	Program with actions to improve habitat and water quality in various regions of the Sacramento-San Joaquin water system.	CALFED		X	X	Could contribute to cumulative benefits for fish and wildlife species, habitats, and ecological processes.
Bay Delta Habitat Conservation Plan	Conservation planning process underway to develop a habitat conservation plan/natural resources conservation plan to cover species in the Bay-Delta region and secure permits from agencies.	Resources Agency			X	Intended to protect Delta species. A MOA was issued in 2006. The plan is expected to be complete by 2009 (Resources Agency, 2007).
Trinity River Mainstream Fishery Restoration Program	Program to alleviate fish impacts due to CVP deliveries from the Trinity River, by increasing flow in the Trinity River, resulting in less water being imported to the Central Valley	USBR			X	Intended to benefit fishery resources in the Trinity River. This program could contribute to adverse cumulative effects on the Delta. Final EIS and ROD were issued in 2000; following resolution of litigation the ROD is now being implemented.
Isolated Delta Facility	Facility to convey water around the Delta for local supply and export through a hydraulically isolated channel. Represents substantial changes in CVP/SWP operations to benefit Delta environmental resources, water quality and water reliability		X	X	X	This project includes elements intended to benefit the Delta environment, such as eliminating flow reversals in the south Delta. It could contribute to both beneficial and adverse effects on the Delta and San Joaquin River.

TABLE 5.7-1 (Continued)
PROJECTS THAT COULD CONTRIBUTE TO CUMULATIVE EFFECTS ON THE SAN JOAQUIN RIVER AND/OR DELTA

Project Name	Description	Project Sponsor / Partners	Areas of Potential Effect Relevant to the WSIP (Adverse and/or Beneficial)			Potential Effects / Status
			Water Supply / Reliability	Water Quality	Habitat / Species	
Dry Year Water Purchase Program	Instituted in 2001 to facilitate dry year water transfers among the CVP, SWP and third parties to reduce the hardship of water shortages and help public agencies throughout the state supplement their water supplies in dry years. The DWR provided transfers of 138.8 TAF from willing sellers in 2001, 22 TAF in 2002 and very little in 2003 and 2004. Mandatory reductions in California's use of Colorado River water could increase demand for water south of the Delta and increase acquisitions under the Dry Year Program	DWR	X			Could contribute to adverse effects in the Delta as a result of increased supply deliveries during dry years that would, in turn, reduce Delta inflow.
Davis-Woodland Water Supply Project	Provide a reliable water supply for future needs, improve water quality for drinking water purposes, and improve the quality of treated wastewater effluent discharged by the project partners. Project partners would divert up to 46.1 TAF/year of surface water from the Sacramento River and convey it for treatment and use in the cities of Davis and Woodland.	City of Davis, City of Woodland, University of California, Davis	X	X		Could contribute to adverse effects. The additional water provided by this project would be commingled with the cities' existing groundwater supply, which would subsequently improve drinking water quality. The DEIR was released April 2007.
Yuba River Accord	Three separate but interrelated agreements that would establish higher instream flow requirements to protect lower Yuba River fish species. Improved water supply reliability for the DWR and USBR, including a commitment of 60,000 acre-feet per year for the EWA and up to an additional 140,000 acre-feet of water in dry years for the SWP and CVP. Improved water supply reliability for Yuba County's farmers.	USBR, DWR, Yuba County Water Agency	X		X	Pilot program for 2007 is underway. NOI/NOP issued in 2005. Draft EIS/EIR due in 2007. (Yuba County Water Agency, 2007).

CCWD = Contra Costa Water District
CVP = Central Valley Project
CVPIA = Central Valley Project Improvement Act
DEIR = Draft Environmental Impact Report
DWR = California Department of Water Resources
EBMUD = East Bay Municipal Utility District
EIR/EIS = Environmental Impact Report / Environmental Impact Statement
EWA = Environmental Water Account
FERC = Federal Energy Regulatory Commission
NMFS = National Marine Fisheries Service
NOA = Notice of Availability
NOI = Notice of Intent
NOP = Notice of Preparation
OCAP = Operations Criteria and Plan
ROD = Record of Decision
RWQCB = Regional Water Quality Control Board
SWP = State Water Project
SWRCB = State Water Resources Control Board
TAF = thousand acre-feet
TMDL = total maximum daily load
USBR = U.S. Bureau of Reclamation
USFWS = U.S. Fish and Wildlife Service

Modeling studies completed by Friant concluded that implementation of the settlement agreement would be expected to reduce deliveries to Friant Division long-term water contractors by an average of about 170,000 afy (15 percent). Friant plans to develop and implement tools as part of the agreement to reduce or avoid water supply impacts by utilizing surplus water primarily to enhance groundwater programs, and also by developing programs to return water to Friant water users through recapture, recirculation, transfers, and exchanges. Thus, in the future, the San Joaquin River will carry more flow downstream toward the Delta than it does today, although some of the proposed releases might be recaptured and recirculated before they reach the Delta or even the confluence with the Tuolumne River.

The parties to the settlement agreement have filed a joint motion seeking U.S. District Court approval to implement the agreement. In addition, because the DOI will have primary responsibility for implementing the agreement, federal legislation is being proposed to authorize the DOI to implement the settlement agreement.

Stanislaus River. The USBR will continue to operate New Melones Reservoir for water supply and flood control purposes and to implement Central Valley Project Improvement Act Section 3406 (b)(2) water releases to improve habitat conditions for anadromous fish. Although no specific future projects were identified on this river, as noted in Table 5.7-1, projects such as the Delta-Mendota Canal Recirculation Feasibility Study might affect the Stanislaus River by reducing the need for the USBR to make releases from New Melones Reservoir to meet water quality and/or fisheries objectives downstream on the San Joaquin River or in the Delta.

Sacramento–San Joaquin Delta. As Table 5.7-1 illustrates, numerous future projects and activities affecting the Delta have been proposed—many sponsored under state and federal programs to improve and enhance the Delta for multiple objectives, including habitat and species protection and restoration, improved water quality, increased water supply and supply reliability, and Delta levee protection. Approximately 16 of these projects include enhancement of the Delta ecosystem resources as one of the key objectives. Twenty-seven of these programs target improving conditions to support water supply uses and reliability, while 26 projects are also specifically intended to improve water quality. Select relevant projects from among those listed on Table 5.7-1 are referenced below in the impact discussion to represent how these future projects might affect cumulative conditions in the Delta.

5.7.2.2 Cumulative Impacts

Significance Criteria

The CCSF has not formally adopted significance standards for impacts related to cumulative effects, but generally considers that implementation of the proposed program would have significant cumulative impacts if it were to:

- Have impacts that would be individually limited, but cumulatively considerable (“cumulatively considerable” means that the incremental effects of a project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.)

Impacts associated with the proposed program that would be “individually limited” are based on the impact analyses presented in Section 5.3 and the significance criteria presented in that section for the various environmental resource topics.

Approach to Analysis and Impact Summary

Cumulative impacts are analyzed based on the CEQA guidance and approach described above in Section 5.7.1. Cumulative impacts are discussed below, and impact significance determinations are summarized in **Table 5.7-2**.

TABLE 5.7-2
SUMMARY OF CUMULATIVE IMPACTS IN THE TUOLUMNE RIVER SYSTEM AND DOWNSTREAM WATER BODIES RELATED TO WSIP WATER SUPPLY AND SYSTEM OPERATIONS

	Significance Determination						
Impact	Hydrology	Geomorphology	Surface Water Quality	Groundwater	Fisheries	Terrestrial Biology	Recreation / Visual Quality
5.7.2-1: Cumulative impacts on the Tuolumne River from Hetch Hetchy Reservoir to Don Pedro Reservoir	LS	LS	LS	LS	LS	LS	LS
5.7.2-2: Cumulative impacts on the Tuolumne River from Don Pedro Reservoir to the San Joaquin River	LS	LS	LS	LS	LS	LS	LS
5.7.2-3: Cumulative impacts on the San Joaquin River, Stanislaus River, and Delta	LS	LS	LS	LS	LS	LS	LS

NOTE: Significance determinations presented in this table assume implementation of all mitigation measures presented in Chapter 5, Section 5.3, and described in Chapter 6.

LS = Less than Significant, no mitigation required

Because impacts on stream flow and reservoir levels are related to effects on other environmental resources (see Section 5.1), the cumulative impacts in this section are organized by geographic area rather than by environmental topic in order to characterize the overall effects on the affected water body. In determining the significance of cumulative impacts, it is assumed that mitigation measures identified in Section 5.3 and described in Chapter 6 would be implemented, and any residual effects after mitigation are considered in combination with the effects of past, other current and probable future projects. The incremental contribution of the program’s residual effects to the overall cumulative impact is then examined to determine whether it would be “cumulatively considerable.”

Tuolumne River – Hetch Hetchy Reservoir to Don Pedro Reservoir

Impact 5.7.2-1: Cumulative impacts on the Tuolumne River from Hetch Hetchy Reservoir to Don Pedro Reservoir.

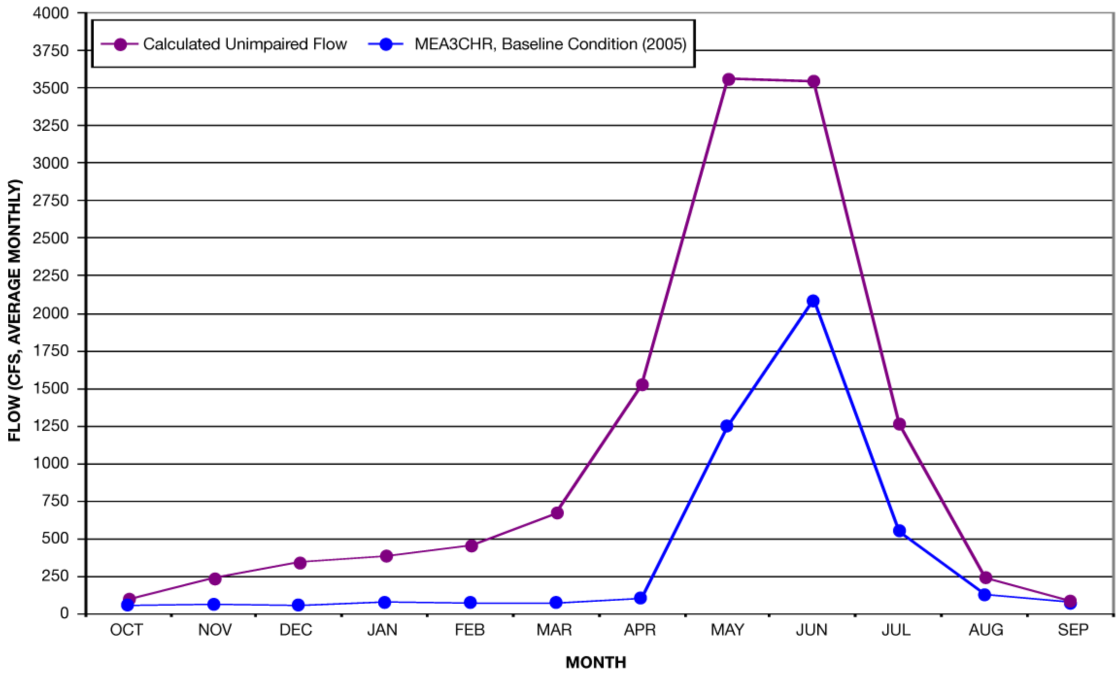
Effect of Past and Present Projects

Hydrology. Construction and operation of the SFPUC regional water system has substantially altered the hydrology of the Tuolumne River below Hetch Hetchy Reservoir. Average annual "unimpaired flow" in the Tuolumne River at Hetch Hetchy Reservoir is estimated to be about 750,000 acre-feet (Beck, 1992). Unimpaired flow is the flow in the river that would have occurred if there were no upstream water diversions or storage reservoirs. For the Tuolumne River, unimpaired flow is roughly equivalent to "natural flow"; that is, the flow that would have occurred prior to Euro-American settlement.

Currently, the SFPUC diverts about 63 percent of the average annual unimpaired flow of the river at Hetch Hetchy Reservoir (472,500 afy) for water supply and hydropower generation. About half of the water diverted at Hetch Hetchy Reservoir is conveyed to the Bay Area and used for municipal water supply. Most of the other half is used to generate electrical power at the Kirkwood Powerhouse and then is discharged back to the river at Early Intake, about 10 miles downstream of Hetch Hetchy Reservoir. About 5 percent of the water diverted at Hetch Hetchy Reservoir is discharged to Moccasin Creek, which flows to Don Pedro Reservoir. Thus, operation of the regional water system currently reduces average annual flow in the Tuolumne River immediately below Hetch Hetchy Reservoir to 37 percent of its historical value. The percentage reduction in flow decreases in a downstream direction as tributaries add flow and diverted water is returned to the river at Early Intake and Don Pedro Reservoir. Downstream, at Don Pedro Reservoir, the current SFPUC diversion represents approximately 13 percent of unimpaired flows. The relationship between the water supply facilities and the river is shown diagrammatically in Figure 5.3.1-2.

Operation of the regional water system has not only altered the total volume of flow in the river, but has also altered the pattern of flow. **Figure 5.7-1** shows the average monthly unimpaired and current flow in the Tuolumne River below Hetch Hetchy Reservoir. Operation of the reservoir has resulted in the delay of springtime flow increases and a reduction in peak flows.

The construction of Lake Lloyd and Lake Eleanor altered the hydrology of Cherry and Eleanor Creeks, respectively. Lake Lloyd retains snowmelt, which would have otherwise flowed downstream in Cherry Creek to the Tuolumne River. Most of the retained water is conveyed to Holm Powerhouse via the Cherry Power Tunnel and released to the creek just above its confluence with the Tuolumne River. Snowmelt stored in Lake Eleanor is conveyed in a tunnel to Lake Lloyd. The operations of the two reservoirs have resulted in decreases in both peak flow and total flow in Cherry and Eleanor Creeks below the dams.



SFPUC Water System Improvement Program ▪ 203287

Figure 5.7-1
Current and Unimpaired Average Monthly Flows
in the Tuolumne River Below Hetch Hetchy Reservoir

In summary, past construction and continued operation of the regional water system has had a substantial effect on the hydrology of Cherry Creek, Eleanor Creek, and the Tuolumne River between Hetch Hetchy and Don Pedro Reservoirs. A substantially smaller total annual volume of water flows down the rivers and creeks compared to unimpaired conditions. Peak flows have been much reduced, and seasonal flow patterns have been altered. The hydrologic changes have had an adverse effect on the river's aquatic and riparian wildlife habitat, as described below.

Geomorphology. River channels exist in a state of dynamic equilibrium with their watersheds. When conditions in the watershed change, the dynamic equilibrium is disturbed, and river channel geomorphology, or "form," adjusts to the new conditions. From the beginning of the 20th century to the present, the SFPUC has built new water system facilities and increased diversions to keep pace with municipal water and power demands; these facilities and operations have progressively altered conditions in the watershed, primarily by reducing river flow. The form of the river channel continues to adjust to the changing conditions.

Peak, or flood, flows are the predominant influence on river channel geomorphology. Hetch Hetchy Reservoir and the associated diversions have had a substantial effect on the magnitude, duration, and frequency of flood flows. **Table 5.7-3** shows the estimated magnitude of flood peaks in the Tuolumne River below Hetch Hetchy Reservoir before and after completion of the reservoir. The table shows that peak flows with a given frequency of occurrence were reduced by

TABLE 5.7-3
ESTIMATED FLOOD PEAKS IN THE TUOLUMNE RIVER BELOW HETCH HETCHY RESERVOIR
(cubic feet per second)

Recurrence Interval (Years)	Pre–Hetch Hetchy Reservoir	Post–Hetch Hetchy Reservoir[c]	Percent Change
1.5	8,294[a]	3,455	-58
2.33	8,500[a]	5,734	-33
5	10,147[a]	8,281	-18
10	15,660[b]	10,056	-36
25	31,795[b]	13,044	-59
50	33,504[b]	14,918	-55

[a] Calculated from measured flows at Hetch Hetchy (1911–1922).
[b] Estimated using data from the Merced River.
[c] Calculated from measured flows below O'Shaughnessy Dam (1939–2002).

SOURCE: RMC Water and Environment and McBain and Trush, 2006.

18 to 59 percent following construction of the reservoir. For example, the peak flow expected to occur once in every 50 years without Hetch Hetchy Reservoir would be about 33,500 cfs, and with the reservoir in place is about 15,000 cfs, a reduction of 55 percent.

River channel form also depends on the free downstream movement of bedload (i.e., the silt, sand, gravel, and boulders transported by the stream). Hetch Hetchy Reservoir and Lakes Lloyd and Eleanor prevent the downstream movement of bedload. River channels deprived of bedload are subject to more erosion than those with a normal supply.

In summary, past construction and continued operation of the regional water system has had a substantial adverse effect on the geomorphology of the Tuolumne River and its tributaries. Channel-forming peak flows in the river are substantially smaller than under unimpaired conditions, and the reservoirs prevent the downstream movement of bedload, which leads to erosion in the river reaches below dams.

Surface Water Quality. Although past and present projects have had a substantial effect on stream flow and geomorphological conditions in the Tuolumne River between Hetch Hetchy and Don Pedro Reservoirs, they have probably not had much effect on water quality. Water quality in the Tuolumne River prior to construction and operation of the regional water system was excellent, and it remains so under existing conditions.

The capture and storage of water in Hetch Hetchy Reservoir and Lakes Lloyd and Eleanor affect the temperature of water in the reservoirs and in the streams below the reservoirs. It also reduces the dissolved oxygen content of water in the reservoirs, although any oxygen depletion is rapidly corrected by the release of turbulent water to the streams below the reservoirs, which enables rapid re-aeration. The temperature of surface waters in the reservoirs rises in the spring and summer with exposure to solar radiation, but the deeper waters remain cool. Almost all of the time, water is released from the reservoirs from the cooler pool of deep water, so water temperature in the streams below the reservoirs is probably similar to historical temperatures and may even be lower at times.

The reduction in flow in the river as a result of past and present projects causes water temperature to rise more rapidly in the early summer months than under unimpaired conditions. Solar radiation heats streams with low flows more rapidly than streams with greater flows. However, any changes in temperature attributable to past and present projects has not lessened the Tuolumne River's ability to support its beneficial uses, as designated by the Central Valley Regional Water Quality Control Board.

Groundwater. From Hetch Hetchy Reservoir to Don Pedro Reservoir, the Tuolumne River flows through a deep canyon in mountainous terrain. Most of the bed of the river is exposed rock. There are no large groundwater bodies, but small groundwater bodies are probably associated with limited alluvial deposits and a few riverside meadows, such as the meadow in the Poopenaut Valley. Changes in the surface water hydrology of the river attributable to past and present projects have probably had no effect on groundwater quality. By delaying the advent of large spring flows in the river and reducing the magnitude of peak flows, past and present projects have reduced the frequency and extent of flooding of the few riverside meadows, which has probably reduced groundwater levels underlying the meadows.

Fisheries. Past and present projects have substantially reduced stream flow in the Tuolumne River between Hetch Hetchy and Don Pedro Reservoirs in most months. The reduction in stream flow has reduced the extent of spawning habitat for resident trout. The variability of daily flows as a result of hydropower operations, and flow shaping to facilitate river rafting, has also reduced the suitability of the river as habitat for trout by increasing the risk of stranding and causing possible unintended downstream movement of juvenile fish. The construction of dams and reservoirs has decreased the ability of river fish to move upstream and downstream, but has increased the availability of habitat for fish that are adapted to life in lakes. Overall, past construction and continued operation of the regional water system has had a substantial adverse effect on the fishery resources of the Tuolumne River between Hetch Hetchy and Don Pedro Reservoirs.

Terrestrial Biology. When Hetch Hetchy Reservoir and Lakes Lloyd and Eleanor were built, a large area of terrestrial wildlife habitat within river canyons was inundated. Changes in river hydrology attributable to past and present projects probably damaged some riparian areas and streamside meadows, but other riparian habitats may have expanded as the river channel adjusted to the new flow regime. Overall, past construction and continued operation of the regional water system has had a substantial adverse effect on the terrestrial biological resources of the Tuolumne River corridor between Hetch Hetchy and Don Pedro Reservoirs.

Recreation and Visual Quality. Changes in river hydrology attributable to past and present projects may have improved whitewater recreation by reducing the magnitude of the unrunnable spring flood flows and extending the season in which the river can be run by commercial rafters. The changes in river hydrology that have reduced fish habitat may have also reduced angling success.

When the regional water system was built, sections of scenic river canyons were inundated to form artificial lakes. A vegetation-free zone extends around the perimeter of the lakes in the area and is visible when the reservoir is drawn down. The lakes provide a different visual experience than the canyons they replaced. The reduction in flow in the river as a result of past and present projects has also altered the appearance of the river corridor in some months. Dams and associated water and power facilities have introduced prominent man-made features into an entirely undeveloped scenic area. Overall, past construction and continued operation of the regional water system has had a substantial adverse effect on the visual resources of the Tuolumne River corridor between Hetch Hetchy and Don Pedro Reservoirs.

Potential Effects of Future Projects

This section describes the potential effects of the following projects: Hetch Hetchy Communications System Upgrade Project, the Hetch Hetchy Repair and Rehabilitation Program, discretionary fishery releases from Hetch Hetchy Reservoir, the SFPUC's Watershed and Environmental Improvement Program, the Don Pedro Pumped Storage Project, and the Tuolumne Wild and Scenic River Comprehensive Management Plan.

The Hetch Hetchy Communications System Upgrade Project is currently undergoing environmental review, and it is expected that the potential adverse impacts resulting from construction of the project would be reduced to a less-than-significant level through implementation of conventional construction mitigation measures. The communications upgrade project would not be expected to have long-term significant adverse effects on the environment.

The Hetch Hetchy Repair and Rehabilitation Program consists of a number of small projects that would be implemented over a several-year period. The projects could have short-term adverse impacts on water quality, fisheries, terrestrial biological, and other environmental resources during the construction period. However, adverse impacts would likely be reduced to a less-than-significant level through implementation of conventional construction mitigation measures, including the SFPUC standard construction measures. The project would not likely cause any long-term adverse environmental impacts.

The discretionary fishery releases from Hetch Hetchy Reservoir could have an effect on hydrology, water quality, fisheries, and terrestrial biological resources. However, the releases would be expected to have little or no effect on geomorphology, groundwater, and recreational and visual resources.

Even though no specific actions have been identified, it is expected that the Tuolumne Wild and Scenic River Comprehensive Management Plan would have a beneficial impact on hydrology, geomorphology, groundwater, surface water quality, fisheries, terrestrial biological resources, and visual resources. Similarly, the SFPUC's Watershed and Environmental Improvement Program would result in beneficial impacts on the same resources.

The Don Pedro Pumped Storage Project is defined only in concept, so its potential environmental impacts can only be described in general terms. The project would involve large-scale construction in the vicinity of Don Pedro Reservoir. Most, and perhaps all, of the short-term construction impacts would be reduced to a less-than-significant level through implementation of conventional construction mitigation measures. The project would inundate several hundred acres of undeveloped land and would require the construction of a dam several hundred feet high and more than 1,000 feet long, a combined powerhouse and pump station, pipelines, and electrical power transmission lines. Once complete, the project would likely be a prominent landscape feature and have long-term adverse impacts on visual quality. The project would have no effect on flow in the Tuolumne River and little effect on water levels in Don Pedro Reservoir.

Hydrology. The current daily minimum required releases from Hetch Hetchy Reservoir to the Tuolumne River are shown in Section 5.3.1, Table 5.3.1-2. As described in Section 5.3, the analysis of the direct impacts of the WSIP assumed that the same minimum releases would be required in 2030. For the cumulative impact analysis, it was also assumed that the discretionary flow releases would increase the required minimum releases from Hetch Hetchy Reservoir in July, August, and September.

Although USFWS did not establish the specific months for release, July through September are analyzed here as reasonable assumptions because they represent the summer season when trout could likely benefit from additional flow (as snowmelt releases from the reservoir diminish) and they represent the months when additional releases would have the greatest potential effect on water supply. The effect on water supply would reduce the amount of water in reservoir storage and require capture of more snowmelt the following spring to refill the reservoir. Additional flow releases in these three summer months were analyzed to assess the potential effects of such a release on top of WSIP operation.

Table 5.7-4 shows the estimated minimum required releases with the addition of the discretionary flow releases under three different hydrologic conditions. These hydrologic conditions are referred to as Type A, Type B, and Type C and are defined in Table 5.3.1-2 and the accompanying text. The assumption that the discretionary releases would be made in the summer was based on the fact that early discussions between the SFPUC and the USFWS envisaged a summer release. It is only an assumption, however, because the SFPUC and USFWS are currently engaged in studies designed to determine whether a release is needed to improve conditions for resident trout and, if needed, when the releases should be made.

A discretionary release from Hetch Hetchy Reservoir at any time of the year except in the spring would be made by drawing water from storage in the reservoir and thus would lower water levels in the reservoir compared to the existing condition (without the discretionary release). Water drawn as a result of the discretionary release would need to be replaced in the subsequent spring. If it is ultimately decided that the discretionary release should be made in the spring, then in some years, target flows below Hetch Hetchy Reservoir might be achievable without drawing the reservoir down, because enough snowmelt would be available in some years to both refill the reservoir and make the releases.

TABLE 5.7-4
HETCH HETCHY RESERVOIR MODELED MINIMUM STREAM RELEASES WITH DISCRETIONARY FLOW FISHERY RELEASES[a,b]
(all values in acre-feet)

	Type A			Type B			Type C		
Month	Release	Discretionary Release	Total Release	Release	Discretionary Release	Total Release	Release	Discretionary Release	Total Release
October	3,689	0	3,689	3,074	0	3,074	2,152	0	2,152
November	3,570	0	3,570	2,975	0	2,975	2,083	0	2,083
December	3,074	0	3,074	2,460	0	2,460	2,152	0	2,152
January	3,074	0	3,074	2,460	0	2,460	2,152	0	2,152
February	3,362	0	3,362	2,802	0	2,802	1,961	0	1,961
March	3,689	0	3,689	3,074	0	3,074	2,152	0	2,152
April	4,463	0	4,463	3,868	0	3,868	2,083	0	2,083
May	6,149	0	6,149	4,919	0	4,919	3,074	0	3,074
June	7,438	0	7,438	6,545	0	6,545	4,463	0	4,463
July	7,686	6,000	13,686	6,764	2,600	9,364	4,612	1,800	6,412
August	7,686	6,000	13,686	6,764	2,500	9,264	4,612	1,800	6,412
September	5,316	3,000	8,316	4,284	1,400	5,684	3,669	800	4,469
Total	**59,196**	**15,000**	**74,196**	**49,989**	**6,500**	**56,489**	**35,165**	**4,400**	**39,565**

[a] If the July 1 first-of-month storage at Hetch Hetchy Reservoir is less than 210,000 acre-feet, the fishery release schedule would not require a discretionary release.
[b] If diversion into Canyon Power Tunnel exceeds 920 cfs, the flow release is increased by 64 cfs, or up to 3,928 acre-feet per month. This is not included in this table.

Compared to the existing condition, the assumed discretionary flow releases would increase flow in the Tuolumne River immediately below Hetch Hetchy Reservoir by 22 to 78 percent in July, August, and September, with the percentage increase depending on hydrologic conditions. Because the release would increase drawdown of Hetch Hetchy Reservoir during the summer months (except during very dry or very wet years), it would increase the amount of water needed to refill the reservoir in a subsequent spring, thus delaying and reducing the duration of high spring flows in the river below the reservoir compared to the existing condition.

The effects of the assumed summertime discretionary release on the timing of spring releases from Hetch Hetchy Reservoir would be similar in kind to those of the WSIP. The assumed summertime discretionary flow releases would reduce spring releases to the Tuolumne River below Hetch Hetchy Reservoir by an annual average of about 4,100 acre-feet because more snowmelt would need to be captured to refill the reservoir after the previous years' summertime releases. Because more snowmelt would need to be captured to refill the reservoir after the previous years' summertime releases, the reduction in annual releases would range from zero in some years up to about 18,400 acre-feet. The reduction in release would manifest itself as a delay in spring releases of up to about three days, after which the release pattern would be the same as under the existing condition. A delay in spring releases of only up to three days would not represent a substantial change in the timing of spring flows in the river. Under existing conditions, the beginning of the higher spring releases varies by a few days from year to year depending on year type. This small delay in spring releases would result in less-than-significant hydrology effects compared to the existing condition.

It is expected that the SFPUC and USFWS will consider the findings of this impact analysis as they evaluate how and if to implement these discretionary flow releases to benefit resident fish. While a release of additional flow in summer months could benefit fish in that summer, it results in potentially adverse effects in the following spring. Although this adverse effect is found to be less than significant, the USFWS may want to modify the timing of such releases, if warranted, to minimize any potential adverse effects.

Surface Water Quality. Water for the assumed summertime discretionary flow releases would be drawn from the pool of cool water deep within Hetch Hetchy Reservoir. Water temperature in the stream increases in a downstream direction below the release point under the influence of solar radiation. Greater flow in the stream in the summer months would retard the rate of temperature increase. Overall, the discretionary fishery releases would have a modestly beneficial effect on water quality.

Fisheries. The increase in summer flow and decrease in water temperature that would result from the discretionary flow releases would likely benefit resident fish in the reach of the river below Hetch Hetchy Reservoir during the summer. The delay of a few days in large spring releases from Hetch Hetchy Reservoir that would occur as a result of the summertime discretionary flow releases would have a minor adverse effect on the availability of spawning habitat for resident trout. Overall, the assumed summertime discretionary fishery releases would likely have a beneficial effect on fish and fish habitat, although, as noted earlier, studies are in progress to determine whether the releases would be beneficial and, if so, how they should be implemented.

Terrestrial Biology. The Tuolumne River between Hetch Hetchy and Don Pedro Reservoirs lies within a deep canyon and flows primarily over a rock bed; nonetheless, there are a number of locations where alluvial materials have accumulated and riparian vegetation has become established. The vegetation depends on groundwater that is recharged during large springtime flows. As a result of the assumed summertime discretionary flow releases, the commencement of the large spring releases from Hetch Hetchy Reservoir would be delayed for a few days and reduced in duration in some years, which could adversely affect groundwater recharge and riparian vegetation in riverside meadows and alluvial deposits. Because of the sensitivity of plant species in riverside meadows, the adverse impacts of reduced groundwater recharge could be significant if the discretionary releases were implemented as modeled here based on the initial assumptions. However, adverse impacts on plant species in riverside meadows are unlikely to be acceptable to USFWS. It is expected that the USFWS will consider the findings of this impact analysis on the proposed discretionary releases and incorporate them into current studies regarding how and if to implement these releases. As discussed above, the USFWS did not previously specify that these releases must be made in July through September. Because of the potential effect that a delay in spring releases might have on riverside meadows along the Tuolumne River below Hetch Hetchy, it is assumed that the USFWS would modify the release schedule to avoid this potential impact or otherwise incorporate measures to reduce such effects to a less-than-significant level (such as the action proposed in WSIP Measure 5.3.7-2, Controlled Releases to Recharge Groundwater in Streamside Meadows and Other Alluvial Deposits). It is assumed that the USFWS would require that any discretionary releases be made in a manner that would not be injurious to special status plants. Therefore, it is assumed that the impacts of discretionary releases on meadow plants would be less than significant.

Recreation and Visual Quality. The Hetch Hetchy Communications System Upgrade Project would include three new microwave towers and equipment shelters at undeveloped sites. One site would be located on land owned by the CCSF below Cherry Dam, one at Burnout Ridge in the Stanislaus National Forest, and one at Poopenaut Pass in Yosemite National Park. The preliminary analysis indicates that the visual impact of the new towers in the Tuolumne River corridor can be reduced to a less-than-significant level through implementation of appropriate mitigation measures (SFPUC, 2007).

The assumed summertime discretionary flow release would make it slightly easier to maintain adequate flows between the Cherry Creek confluence and Don Pedro Reservoir for rafting. This could result in a slight increase in the length of the rafting season, a modestly beneficial effect. If it is ultimately determined that the discretionary releases should be made at some time other than the summer, then they would have no effect on the rafting season.

Cumulative Effects and WSIP Contribution

Table 5.7-5 summarizes the effects of past and present projects, the impacts of the WSIP, the effects of probable future projects, and the combined impacts of the WSIP plus probable future projects on the Tuolumne River between Hetch Hetchy Reservoir and La Grange Dam. Past and present projects have substantially altered the hydrology, geomorphology, fisheries, and terrestrial biology of this river reach compared to pre-Euro-American settlement conditions.

Water quality, groundwater, and visual and recreational resources have been moderately altered. The existing condition, which serves as the baseline for the analysis of the WSIP, reflects the substantial environmental changes that have occurred as a result of the past and present projects. Because past and present actions have altered this river reach, some of the reach’s environmental resources are more sensitive to small adverse changes than they would be if the reach had remained relatively unaltered from pre-Euro-American settlement conditions.

As described in Section 5.3, the WSIP would have a less-than-significant adverse impact on hydrology, geomorphology, surface water quality, groundwater, fisheries, and recreational and visual resources. It would have a less-than-significant impact on terrestrial biological resources after mitigation (Measure 5.3.7-2). As described in the previous section, probable future projects would have less-than-significant impacts on hydrology, geomorphology, surface water quality, groundwater, terrestrial biological resources, and recreation and visual resources. These projects would have beneficial impacts on fisheries.

TABLE 5.7-5
CUMULATIVE EFFECTS ON THE TUOLUMNE RIVER BETWEEN HETCH HETCHY AND DON PEDRO RESERVOIRS

Resource	Effects of Past and Present Projects	Impacts of WSIP (prior to mitigation/after mitigation)	Effects of Future Projects	Cumulative Impact (WSIP after mitigation + Future Projects)	WSIP Contribution Cumulatively Considerable?
Hydrology	SA	LS	LS	LS	No
Geomorphology	SA	LS	LS	LS	No
Surface Water Quality	MA	LS	LS	LS	No
Groundwater	MA	LS	LS	LS	No
Fisheries	SA	LS	B	LS	No
Terrestrial Biology	SA	PSM/LS	LS	LS	No
Recreation/Visual Quality	MA	LS	LS	LS	No

B = Beneficial impact
LS = Less than Significant, no mitigation required
PSM/LS = Potentially Significant but reduced to Less than Significant with mitigation
SA = Substantially Altered
MA = Moderately Altered

When the WSIP and foreseeable future projects are considered together, none of their cumulative effects would rise to a level of significance. Even though past and present projects have moderately to substantially altered the environmental resources along this reach of the Tuolumne River, the cumulative impacts of the WSIP after mitigation combined with the effects of future projects would not result in a substantial or noticeable change from the existing condition. In particular, the WSIP's impacts on terrestrial biology would be expected to be substantially avoided with implementation of Measure 5.3.7-2. Further, as described under Terrestrial Biology on the previous page, it is expected that the USFWS would require that future discretionary releases be made in a manner that is protective of biological resources. Thus, the cumulative impact on terrestrial biology would be considered less than significant. Because there are no significant cumulative impacts, no mitigation measures beyond Measure 5.3.7-2 would be necessary.

Tuolumne River – Don Pedro Reservoir to the San Joaquin River

Impact 5.7.2-2: Cumulative impacts on the Tuolumne River from Don Pedro Reservoir to the San Joaquin River.

Effect of Past and Present Projects

Hydrology. Construction and operation of the SFPUC regional water system and TID's and MID's water supply facilities, including Don Pedro Reservoir, La Grange Dam, and the Turlock and Modesto Canals, have substantially altered the hydrology of the Tuolumne River below La Grange Dam. Average annual unimpaired flow in the Tuolumne River at La Grange Dam is estimated to be about 1,850,000 acre-feet (Beck, 1992). Currently, the SFPUC, TID, and MID divert an average of about 63.8 percent of the unimpaired flow of the river at La Grange Dam for municipal and agricultural water supply. The SFPUC's upstream diversion reduces flow at La Grange Dam by about 298,500 afy, and TID and MID divert about 867,000 afy below the dam. Operation of the water supply facilities reduces average annual flow in the Tuolumne River below La Grange Dam to 36.2 percent of the unimpaired value. The percentage reduction in flow decreases in a downstream direction as groundwater infiltration, spills from irrigation canals, agricultural tailwater discharges, and tributaries add water to the river.

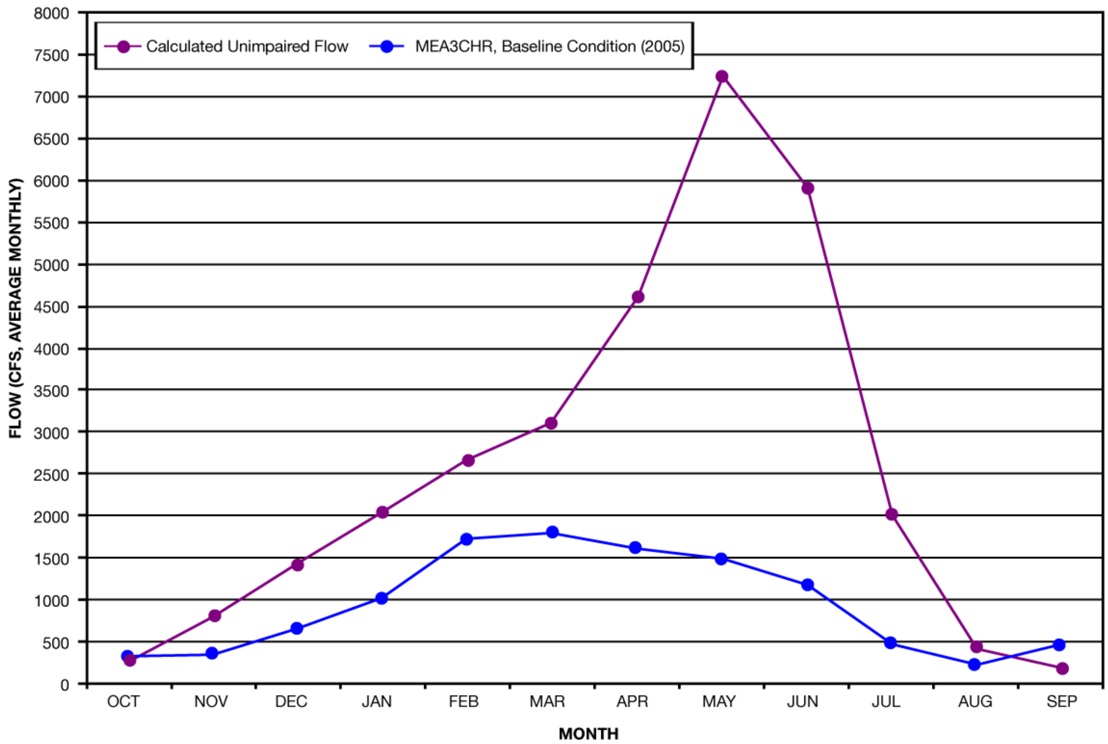
Operation of SFPUC, TID, and MID reservoirs and diversions has not only altered the total volume of flow in the river, but has also altered the pattern of flow. **Figure 5.7-2** shows the average monthly unimpaired and current flow in the Tuolumne River below La Grange Dam. The effect of upstream reservoirs and diversions is an overall reduction in flow, particularly in March through June, as well as a shifting in the seasonal occurrence of peak flows.

In summary, past construction and continued operation of the upstream reservoirs and diversions has had a substantial adverse effect on the hydrology of the Tuolumne River below La Grange Dam. The river is substantially smaller than under historical unimpaired conditions, and its flow regime is managed to provide water supply and hydropower.

Geomorphology. The river channel downstream of La Grange Dam has been modified by past gold and aggregate mining, agricultural and urban development within the river corridor, and past and present municipal and agricultural water supply operations. Gold mining involved dredging the sand and gravel from the riverbed and floodplain, extracting the gold, and piling the unwanted materials (referred to as tailings) along the river corridor. Mid- and late-19th century gold mining and the resulting tailings primarily affected a 10-mile reach of the river between La Grange Dam and Roberts Ferry. Some of the tailings were removed and used to construct Don Pedro Dam.

Instream and offstream gravel mining in a 16-mile reach of river corridor between Roberts Ferry and the community of Empire has created a number of water-filled pits. In addition, from Roberts Ferry to the confluence with the San Joaquin River, the Tuolumne River channel is confined by streamside agricultural and urban development and is often separated from the floodplain by privately owned levees. From the late 19th century to the present, the SFPUC, TID, and MID have built water system facilities and increased diversions to keep pace with water demand; these facilities and operations have progressively changed the magnitude and pattern of river flow. The channel of the Tuolumne River, greatly altered by mining and agricultural and urban development, is continually adjusting its form in response to these flow changes.

Peak, or flood, flows are the predominant influence on river channel geomorphology. The reservoirs and associated diversions on the Tuolumne River have had a substantial effect on the magnitude, duration, and frequency of flood flows. **Table 5.7-6** shows the estimated magnitude of flood peaks in the Tuolumne River below La Grange Dam before and after completion of Don Pedro Reservoir. The table shows that peak flows with a given frequency of occurrence were all reduced by 70 to 75 percent following construction of Don Pedro Reservoir. For example, the



SFPUC Water System Improvement Program ▪ 203287

Figure 5.7-2
Current and Unimpaired Average Monthly Flows in the Tuolumne River Below La Grange Dam

TABLE 5.7-6
ESTIMATED FLOOD PEAKS IN THE TUOLUMNE RIVER BELOW LA GRANGE DAM
(cubic feet per second)

Recurrence Interval (Years)	Pre–Don Pedro Reservoir[a]	Post–Don Pedro Reservoir[b]	Percent Change
1.5	8,360	2,400	-71
2.0	12,100	3,350	-72
5.0	25,000	6,700	-73
10	36,000	9,900	-73
25	54,000	15,200	-72

[a] Estimated from measured flows below La Grange Dam (1897–1969).
[b] Estimated from measured flows below La Grange Dam (1970–2002), but excluding the January 1997 flood.

SOURCE: RMC Water and Environment and McBain and Trush, 2006.

peak flow expected to occur once in every 25 years without Hetch Hetchy and Don Pedro Reservoirs would be about 54,000 cfs; with the reservoirs in place, it is about 15,200 cfs, a reduction of 72 percent.

River channel form also depends on the free downstream movement of bedload; that is, the silt, sand, gravel and boulders transported by the stream. Don Pedro Reservoir and La Grange Dam prevent the downstream movement of bedload from the watershed above Don Pedro Reservoir.

In summary, past construction and continued operation of water storage and diversion facilities has had a substantial adverse effect on the geomorphology of the Tuolumne River and its tributaries. Channel-forming peak flows in the river are substantially smaller than under historical unimpaired conditions, and the reservoirs prevent the downstream movement of bedload.

Surface Water Quality. Although past and present projects have had a substantially adverse effect on stream flow and geomorphological conditions in the Tuolumne River between Don Pedro Reservoir and the San Joaquin River confluence, they have probably not had much effect on water quality. Water quality in the Tuolumne River prior to construction and operation of the reservoirs and diversions was excellent, and it remains good under the existing condition. Surface runoff from agricultural fields and urban areas and the discharge of groundwater contaminated with agricultural chemicals has caused some deterioration, particularly below the river’s confluence with Dry Creek. The Central Valley Regional Water Quality Control Board has listed the lower Tuolumne River as impaired by diazanon and other pesticides. However, a recent study indicated that plant nutrient and pesticide concentrations are still very low (Stillwater Sciences, 2004).

As noted above, the capture and storage of water in reservoirs affects the temperature of water in both the reservoirs and the streams below the reservoirs. Because Don Pedro Reservoir is large, water is always released to the Tuolumne River from the cool pool of water deep within the reservoir. The water temperature in the river below La Grange Dam is probably similar to historical unimpaired conditions in the winter and spring, but may be cooler in the summer and early fall.

Because solar radiation heats small streams more rapidly than larger ones, the reduction in flow as a result of past and present projects and activities causes water temperatures under current conditions to rise more rapidly than under historical unimpaired conditions. In portions of the river, the past artificial widening of the river channel and the clearing of riparian vegetation has further accelerated the rate of temperature increase. The changes in water temperature attributable to past and present projects and activities have reduced but not eliminated the Tuolumne River’s ability to support coldwater fish species, as reflected in the COLD beneficial use designation. The changes have probably limited the length of the river reach below La Grange Dam that is suitable for coldwater fish.

Groundwater. Much of the Tuolumne River between La Grange Dam and the confluence with the San Joaquin River flows over water-bearing alluvial deposits. The Modesto Groundwater Subbasin lies to the north of the river, and the Turlock Groundwater Subbasin lies to the south. Historically, the river recharged the groundwater basins in a short reach below La Grange Dam, and elsewhere groundwater discharged to the river. The same overall pattern of groundwater recharge and discharge to the river occurs under current conditions, but groundwater levels and quality have been affected by agricultural and urban development. About half of the Tuolumne River’s unimpaired flow at Don Pedro Reservoir is diverted at La Grange Dam and applied to crops. A portion of the applied water percolates into the groundwater, raising levels in the upper aquifer and probably increasing discharge to the river. However, because some farmers and most municipalities obtain some or all of their water supplies from wells, groundwater levels have become depleted in some areas. As a result, in a five-mile-long reach of the river in Modesto, the river discharges to the groundwater basin rather than gaining from it.

Some of the fertilizers and pesticides applied to agricultural lands have percolated into the groundwater, and groundwater quality has deteriorated compared to historical conditions. Overall, past and present projects have both raised and lowered groundwater levels and caused groundwater quality to deteriorate substantially.

Fisheries. Past and present water projects prevent the downstream movement of bedload from the upper watershed to the Tuolumne River channel below La Grange Dam and have substantially reduced the volume and changed the pattern of stream flow in the river between the dam and the San Joaquin River confluence. Mining and agriculture have greatly altered the characteristics of the river channel. These changes have substantially reduced the extent and suitability of spawning and rearing habitat for migratory salmonids. The variability of daily flows as a result of hydropower operations has also reduced the suitability of habitat for fish by increasing the risk of stranding and causing unintended downstream movement of juvenile fish.

Prior to large-scale water development on the San Joaquin River and its tributaries, an estimated 300,000 to 500,000 salmon returned to the San Joaquin River watershed each year (Brown and Moyle, 1993). A substantial fraction of the salmon run probably returned to the Tuolumne River. In 1944, long after La Grange Dam had blocked access to the upper river, 130,000 spawners returned to the river (CDFG, 1946; Fry, 1961). Between 1971 and 2004, salmon runs averaged about 6,700 per year. The decline is probably due to many factors, including ocean conditions and increased levels of salmon fishing as well as cumulative habitat degradation as a result of water projects and other development in the Sacramento–San Joaquin Delta, the Tuolumne River drainage basin, and other parts of the San Joaquin River drainage basin. Overall, the past river channel modification and the construction and continued operation of the water supply facilities have had a substantial adverse effect on the fishery resources of the Tuolumne River between Don Pedro Reservoir and the San Joaquin River confluence.

Terrestrial Biology. When Don Pedro Reservoir was built (in 1923) and later expanded (in the late 1960s), large areas of terrestrial wildlife habitat within the canyons formed by the Tuolumne River and its tributaries upstream of the dam site were inundated. Gold mining more than a century ago and subsequent gravel mining and clearing of land for agriculture destroyed most of the riparian forest along the Tuolumne River corridor below La Grange Dam. Changes in river hydrology attributable to past and present water supply projects have also contributed to the destruction of the riparian forest. Overall, past mining, current agricultural activities, and the construction and continued operation of water supply facilities have had a substantial adverse effect on the terrestrial biological resources of the Tuolumne River corridor between La Grange Dam and the San Joaquin River.

Recreation and Visual Quality. When Don Pedro Reservoir was built and expanded, scenic river canyons were inundated to form an artificial lake. A vegetation-free zone extending around the perimeter of the reservoir is visible when the reservoir is drawn down. The reservoir has a different scenic value than the canyons it replaced.

Historically, a band of riparian forest up to five miles wide followed the Tuolumne River corridor from La Grange Dam to the confluence with the San Joaquin River. Almost all of the forest was destroyed by gold and gravel mining or cleared to make room for agriculture. The diminution of flow in the river as a result of past and present water supply projects has also contributed to the loss of riparian vegetation. Overall, past and present activities have altered the character and appearance of the river corridor from continuous riparian forest to a patchwork of open river channel, tailings, agricultural and urban lands, and forest remnants.

Potential Effects of Future Projects

This section describes the potential effects of the following projects: TID Infiltration Gallery Project, TID Regional Surface Water Supply Project, 1995 FERC Settlement Agreement, New Don Pedro Project FERC relicensing, and the expansion of the MID municipal water treatment plant.

The TID Infiltration Gallery Project and the TID Regional Surface Water Supply Project would result in an increase in flow in a 25-mile reach of the Tuolumne River below La Grange Dam that would likely have beneficial effects on biological resources. Flow requirements for the lower Tuolumne River below La Grange Dam will also be reexamined during the New Don Pedro Project FERC relicensing process in 2016; during this process, the current flow release schedules may be retained or modified. The 1995 FERC Settlement Agreement has led to the development of a habitat restoration plan which, if implemented, would benefit biological resources in the river corridor between La Grange Dam and the confluence with the San Joaquin River. None of these projects would be expected to have adverse environmental effects.

The existing 30-mgd capacity MID municipal water treatment plant is located adjacent to Modesto Reservoir, and it obtains its water supply from the reservoir. The Tuolumne River supplies water to Modesto Reservoir via the Modesto Canal. Water is diverted into the Modesto Canal at La Grange Dam. The supplemental EIR on the proposed expansion of the MID treatment plant indicates that the existing plant is operated in a way that does not increase the rate of diversion of water from the Tuolumne River at La Grange Dam. The supplemental EIR notes that this is possible because the increased use of water for municipal purposes in the MID service area is offset by a reduction in agricultural use as agricultural lands are converted to urban uses. The expanded treatment plant would be operated in the same way as the existing plant. Like the existing plant, the expanded plant would not alter the total volume of water diverted by MID at La Grange Dam, but it would slightly alter the seasonal pattern of diversions and releases to the Tuolumne River at La Grange. The supplemental EIR on the expansion project indicates that there would be no substantial changes in releases to the Tuolumne River from La Grange Dam as a result of the project (Jones and Stokes, 2004).

Hydrology. The Infiltration Gallery Project as originally envisaged would have changed the point of diversion for some of TID's agricultural water supply. Water that would otherwise have been diverted at La Grange Dam and conveyed to farmers in the Turlock Canal would be released at the dam and allowed to flow downstream in the Tuolumne River to the infiltration gallery near the Geer Road Bridge, at which point it would be pumped into the Ceres Main Canal. The Infiltration Gallery Project would have increased flow in the Tuolumne River between La Grange Dam and the Geer Road Bridge by about 100 cfs between mid-March and mid-October.

It is now likely that the original Infiltration Gallery Project will be modified to supply water to a TID-owned municipal water treatment plant that is a part of TID's Regional Surface Water Supply Project. With the modified project in place, water that would otherwise have been diverted at La Grange Dam and conveyed to farmers would be released at the dam and allowed to flow downstream in the Tuolumne River to the infiltration gallery. Up to 66 cfs would be diverted from the river and pumped to the new municipal water treatment plant year-round. Another 34 cfs might be diverted from mid-March to mid-October and pumped to the Ceres Main Canal for agricultural use. The Infiltration Gallery/Regional Surface Water Supply Project would increase flow in the reach of the Tuolumne River between La Grange Dam and the Geer Road Bridge by 66 cfs from mid-October to mid-March, and by 100 cfs from mid-March to mid-October.

Flow in the river under the existing condition and with the Infiltration Gallery/Regional Surface Water Supply Project in place, and the difference between the two, are shown in **Tables 5.7-7** and **5.7-8**. For Table 5.7-7, it was assumed that the additional flow would be 66 cfs year-round. For Table 5.7-8, it was assumed that there would be 66 cfs of additional flow from October through March, and 100 cfs of additional flow from April through September. The Infiltration Gallery/Regional Surface Water Supply Project would increase flow in this reach of the river every month compared to the existing condition. The greatest increases would occur during June, July, August, and September of average below-normal, dry, and critically dry years, when only the minimum required amount of water is currently released from La Grange Dam. In these months, assuming only municipal diversions, the Infiltration Gallery/Regional Surface Water Supply Project would about double the volume of flow in the river and thus would have a substantial beneficial impact on hydrology. If the Infiltration Gallery/Regional Surface Water Supply Project involves the diversion of water for both municipal and agricultural use, then it would more than double the volume of flow in the river in the summer of average below-normal, dry, and critically dry years.

The New Don Pedro Project is scheduled for relicensing by FERC in 2016. The current minimum fishery release requirements for the Tuolumne River below La Grange Dam will be reexamined during the relicensing process. The minimum required fishery releases could be retained or modified (it is unlikely they would be decreased). If summertime minimum releases are increased, then large spring releases could be delayed while TID and MID replenish storage in Don Pedro Reservoir. The impacts on overall hydrology would be minor and probably beneficial.

TABLE 5.7-7
FLOW IN THE TUOLUMNE RIVER BELOW LA GRANGE DAM –
EXISITING CONDITION PLUS INFILTRATION GALLERY PROJECT (66 cfs year-round)

	Wet		Above Normal		Below Normal		Dry		Critical Dry		All	
Existing Condition (2005)												
Oct	431		298		294		351		236		333	
Nov	374		507		314		324		195		350	
Dec	857		1,230		422		292		204		654	
Jan	2,161		1,257		318		285		189		1,022	
Feb	3,493		2,381		647		478		188		1,723	
Mar	4,096		1,969		654		421		189		1,806	
Apr	3,424		1,568		958		497		344		1,613	
May	3,161		1,348		943		497		344		1,489	
June	3,633		408		75		73		50		1,180	
July	1,300		240		75		73		50		463	
Aug	516		240		75		73		50		233	
Sept	1,299		249		75		73		50		464	
Difference and Percent Change, Existing Condition vs Existing plus La Grange Release (66 cfs)												
Oct	64	[15%]	64	[22%]	64	[22%]	64	[18%]	64	[27%]	64	[19%]
Nov	67	[18%]	67	[13%]	67	[21%]	67	[21%]	67	[34%]	67	[19%]
Dec	64	[8%]	64	[5%]	64	[15%]	64	[22%]	64	[32%]	64	[10%]
Jan	64	[3%]	64	[5%]	64	[20%]	64	[23%]	64	[34%]	64	[6%]
Feb	71	[2%]	71	[3%]	71	[11%]	71	[15%]	71	[38%]	71	[4%]
Mar	64	[2%]	64	[3%]	64	[10%]	64	[15%]	64	[34%]	64	[4%]
Apr	67	[2%]	67	[4%]	67	[7%]	67	[13%]	67	[19%]	67	[4%]
May	64	[2%]	64	[5%]	64	[7%]	64	[13%]	64	[19%]	64	[4%]
June	67	[2%]	67	[16%]	67	[89%]	67	[91%]	67	[133%]	67	[6%]
July	64	[5%]	64	[27%]	64	[86%]	64	[88%]	64	[129%]	64	[14%]
Aug	64	[12%]	64	[27%]	64	[86%]	64	[88%]	64	[129%]	64	[28%]
Sept	67	[5%]	67	[27%]	67	[89%]	67	[91%]	67	[133%]	67	[14%]

Key
> 0%
< 0 to -5%
< -5%

NOTE: "Existing Condition (2005)" is based on model run MEA3CHR. An overview of the model runs is presented in Section 5.1. Detailed information on the models and underlying assumptions is provided in Appendix H.

Geomorphology. The habitat restoration plan for the lower Tuolumne River, a part of the 1995 FERC Settlement Agreement, includes a number of recommendations which, if implemented, would improve stream channel geomorphology between La Grange Dam and the confluence with the San Joaquin River. As described above, past and present projects and actions have radically altered the flow regime of the river and the physical characteristics of the river channel. The dynamic equilibrium between river flow and channel characteristics has been thoroughly and continually disturbed over the past 140 years. The habitat restoration plan recommends a series of actions to accelerate the development of a river channel that is in balance with its current flow regime. These recommendations include shaping releases from La Grange Dam to provide specified peak flows every few years, adding gravel, removing levees and reconstructing the river channel, and restoring riparian vegetation. Overall, the habitat restoration plan would have a substantial beneficial impact on stream channel geomorphology.

TABLE 5.7-8
FLOW IN THE TUOLUMNE RIVER BELOW LA GRANGE DAM –
EXISTING CONDITION PLUS INFILTRATION GALLERY PROJECT (66 cfs winter, 100 cfs summer)

	Wet		Above Normal		Below Normal		Dry		Critical Dry		All	
Existing Condition (2005)												
Oct	431		298		294		351		236		333	
Nov	374		507		314		324		195		350	
Dec	857		1,230		422		292		204		654	
Jan	2,161		1,257		318		285		189		1,022	
Feb	3,493		2,381		647		478		188		1,723	
Mar	4,096		1,969		654		421		189		1,806	
Apr	3,424		1,568		958		497		344		1,613	
May	3,161		1,348		943		497		344		1,489	
June	3,633		408		75		73		50		1,180	
July	1,300		240		75		73		50		463	
Aug	516		240		75		73		50		233	
Sept	1,299		249		75		73		50		464	
Difference and Percent Change, Existing Condition vs Existing plus La Grange Release (66 and 100 cfs)												
Oct	64	[15%]	64	[22%]	64	[22%]	64	[18%]	64	[27%]	64	[19%]
Nov	67	[18%]	67	[13%]	67	[21%]	67	[21%]	67	[34%]	67	[19%]
Dec	64	[8%]	64	[5%]	64	[15%]	64	[22%]	64	[32%]	64	[10%]
Jan	98	[5%]	98	[8%]	98	[31%]	98	[34%]	98	[52%]	98	[10%]
Feb	107	[3%]	107	[4%]	107	[17%]	107	[22%]	107	[57%]	107	[6%]
Mar	98	[2%]	98	[5%]	98	[15%]	98	[23%]	98	[52%]	98	[5%]
Apr	101	[3%]	101	[6%]	101	[11%]	101	[20%]	101	[29%]	101	[6%]
May	98	[3%]	98	[7%]	98	[10%]	98	[20%]	98	[28%]	98	[7%]
June	101	[3%]	101	[25%]	101	[134%]	101	[138%]	101	[202%]	101	[9%]
July	98	[8%]	98	[41%]	98	[130%]	98	[134%]	98	[195%]	98	[21%]
Aug	64	[12%]	64	[27%]	64	[86%]	64	[88%]	64	[129%]	64	[28%]
Sept	67	[5%]	67	[27%]	67	[89%]	67	[91%]	67	[133%]	67	[14%]

Key
> 0%
< 0 to -5%
< -5%

NOTE: "Existing Condition (2005)" is based on model run MEA3CHR. An overview of the model runs is presented in Section 5.1. Detailed information on the models and underlying assumptions is provided in Appendix H.

Surface Water Quality. Water for the Infiltration Gallery/Regional Surface Water Supply Project would be drawn from the pool of cool water deep within Don Pedro Reservoir. Water temperature in the stream increases in a downstream direction below the release point from the reservoir under the influence of solar radiation. Greater flow in the stream in the summer months would retard the rate of temperature increase. Overall, the Infiltration Gallery/Regional Surface Water Supply Project would have a modestly beneficial effect on water quality.

Fisheries. The habitat restoration plan, a part of the 1995 FERC Settlement Agreement, and the Infiltration Gallery/Regional Surface Water Supply Project would both improve conditions for coldwater fish in the Tuolumne River between La Grange Dam and the San Joaquin River confluence. Construction of a more natural river channel that is in balance with its flow regime, the addition of gravel, and the restoration of the riparian forest as part of the habitat restoration plan would improve the quality of habitat for salmonids. Increases in river flow as a result of the Infiltration Gallery/Regional Surface Water Supply Project would increase the extent of spawning and rearing habitat for salmonids. Increased flow would also extend the length of the river reach in which water remains at a suitable temperature for salmonids. Increased flow in May would aid out-migration by juvenile Chinook salmon. Increased flow in June, July, August, and September would aid oversummering steelhead. Overall, future projects are likely to have a substantial beneficial effect on the fishery resources of the Tuolumne River between La Grange Dam and the San Joaquin River confluence.

Terrestrial Biology. The habitat restoration plan, a part of the 1995 FERC Settlement Agreement, would improve conditions for both terrestrial wildlife and vegetation in the Tuolumne River corridor between La Grange Dam and the San Joaquin River confluence. Construction of a more natural river channel that is in balance with its flow regime and the planting of native vegetation as part of the habitat management plan would help restore and maintain the riparian forest along the river corridor. The restored riparian forest would provide improved habitat for birds, mammals, and amphibians. Increased summertime flow in the river between La Grange Dam and Geer Road would have a modest beneficial effect on the survival of riparian vegetation. Overall, future projects are likely to have a substantial beneficial effect on the terrestrial biological resources of the Tuolumne River corridor between La Grange Dam and the San Joaquin River confluence.

Cumulative Effects and WSIP Contribution

Table 5.7-9 summarizes the effects of past and present projects, the impacts of the WSIP, the effects of probable future projects, and the combined impacts of the WSIP plus probable future projects on the Tuolumne River between La Grange Dam and the San Joaquin River confluence. Past and present projects have substantially altered the hydrology, geomorphology, groundwater, fisheries, terrestrial biology, and visual and recreational resources of this river reach compared to pre-Euro-American settlement conditions. Water quality has been moderately altered. The existing condition, which serves as the baseline for the analysis of the WSIP, reflects the substantial environmental changes that have occurred as a result of past and present projects. Because past and present actions have drastically altered this river reach, some of the reach’s environmental resources are more sensitive to small adverse changes than they would be if the reach had remained relatively unaltered from pre-Euro-American settlement conditions.

As described in Section 5.3, the WSIP would have a less-than-significant adverse impact on hydrology, geomorphology, surface water quality, groundwater, and recreational and visual resources. It would have less-than-significant impacts on fisheries and terrestrial biological resources after mitigation (Measure 5.3.6-4a, Avoidance of Flow Changes by Reducing Demand for Don Pedro Reservoir Water, or Measures 5.3.6-4b, Fishery Habitat Enhancement, and 5.3.7-6, Lower Tuolumne River Riparian Habitat Enhancement). As described in the previous section, probable future projects would have potentially adverse but less-than-significant impacts or beneficial effects on hydrology, geomorphology, surface water quality, groundwater, fisheries, terrestrial biology, and recreational and visual resources.

TABLE 5.7-9
CUMULATIVE EFFECTS ON THE TUOLUMNE RIVER BETWEEN LA GRANGE DAM AND THE SAN JOAQUIN RIVER

Resource	Effects of Past and Present Projects	Impacts of WSIP (prior to mitigation/after mitigation)	Effects of Future Projects	Cumulative impact (WSIP after mitigation + Future Projects)	WSIP Contribution Cumulatively Considerable?
Hydrology	SA	LS	B	LS	No
Geomorphology	SA	LS	B	LS	No
Surface Water Quality	MA	LS	B	LS	No
Groundwater	SA	LS	LS	LS	No
Fisheries	SA	PSM/LS	B	LS	No
Terrestrial Biology	SA	PSM/LS	B	LS	No
Recreation/Visual Quality	SA	LS	B	LS	No

B = Beneficial impact
LS = Less than Significant, no mitigation required
PSM/LS = Potentially Significant but reduced to Less than Significant with mitigation
SA = Substantially Altered
MA = Moderately Altered

As noted above, many of the foreseeable future projects would have beneficial environmental effects. Two of the foreseeable future projects, the Infiltration Gallery Project and the Regional Surface Water Supply Project, would produce environmental benefits by increasing flow in the reach of the river between La Grange Dam and Roberts Ferry. **Tables 5.7-10** and **5.7-11** show the cumulative effects of the Infiltration Gallery/Regional Surface Water Supply Project and the WSIP on flow in the Tuolumne River below La Grange Dam. For Table 5.7-10, it was assumed that the Infiltration Gallery Project would add 66 cfs year-round. For Table 5.7-11, it was assumed that the Infiltration Gallery/Regional Surface Water Supply Project would add 66 cfs of flow from October through March, and 100 cfs of flow from April through September.

The WSIP would have no effect on flow in the river below La Grange Dam in critically dry years, but would result in infrequent reductions in flow in below-normal and dry years. The Infiltration Gallery/Regional Surface Water Supply Project and the WSIP together would increase flow in the river in almost every month of below-normal, dry, and critically dry years compared to the existing condition. The Infiltration Gallery/Regional Surface Water Supply Project would more than offset the infrequent WSIP-induced reductions in flow in below-normal and dry years.

The WSIP alone would reduce flows in the river in most months of average above-normal years, and in all months of average wet years, compared to the existing condition. The Infiltration Gallery/Regional Surface Water Supply Project and the WSIP together would result in flow reductions of a lesser magnitude in average above-normal and wet years than would the WSIP alone.

Thus, as shown in Table 5.7-9, when the WSIP and future projects are considered together, none of their cumulative effects would rise to a level of significance. Even though past and present projects have moderately to substantially altered the environmental resources along this reach of

TABLE 5.7-10
FLOW IN THE TUOLUMNE RIVER BELOW LA GRANGE DAM –
WSIP PLUS INFILTRATION GALLERY PROJECT (66 cfs year-round)

	Wet		Above Normal		Below Normal		Dry		Critical Dry		All	
Existing Condition (2005)												
Oct	431		298		294		351		236		333	
Nov	374		507		314		324		195		350	
Dec	857		1,230		422		292		204		654	
Jan	2,161		1,257		318		285		189		1,022	
Feb	3,493		2,381		647		478		188		1,723	
Mar	4,096		1,969		654		421		189		1,806	
Apr	3,424		1,568		958		497		344		1,613	
May	3,161		1,348		943		497		344		1,489	
June	3,633		408		75		73		50		1,180	
July	1,300		240		75		73		50		463	
Aug	516		240		75		73		50		233	
Sept	1,299		249		75		73		50		464	
Difference and Percent Change, Existing Condition vs Cumulative												
Oct	64	[15%]	60	[20%]	55	[19%]	54	[15%]	67	[29%]	61	[18%]
Nov	80	[22%]	81	[16%]	27	[9%]	3	[1%]	67	[34%]	58	[16%]
Dec	0	[0%]	-56	-[5%]	16	[4%]	45	[15%]	64	[32%]	10	[2%]
Jan	-87	-[4%]	74	[6%]	68	[22%]	42	[15%]	64	[34%]	19	[2%]
Feb	-22	-[1%]	-162	-[7%]	43	[7%]	30	[6%]	71	[38%]	-15	-[1%]
Mar	-60	-[1%]	-201	-[10%]	62	[9%]	69	[16%]	64	[34%]	-27	-[1%]
Apr	-9	[0%]	24	[2%]	51	[5%]	67	[13%]	67	[19%]	33	[2%]
May	-35	-[1%]	62	[5%]	64	[7%]	64	[13%]	64	[19%]	35	[2%]
June	-221	-[6%]	-50	-[12%]	67	[89%]	67	[91%]	67	[133%]	-42	-[4%]
July	47	[4%]	64	[27%]	64	[86%]	64	[88%]	64	[129%]	59	[13%]
Aug	52	[10%]	64	[27%]	64	[86%]	64	[88%]	64	[129%]	61	[26%]
Sept	91	[7%]	57	[23%]	67	[89%]	67	[91%]	67	[133%]	72	[15%]

Key
> 0%
< 0 to -5%
< -5%

NOTE: "Existing Condition (2005)" is based on model run MEA3CHR. The Cumulative scenario is based on model run MEA5ix. An overview of the model runs is presented in Section 5.1. Detailed information on the models and underlying assumptions is provided in Appendix H.

the Tuolumne River, the cumulative impacts of the WSIP after mitigation combined with the effects of future projects would not result in a substantial or noticeable change from the existing condition. In particular, the WSIP's impacts on fisheries and terrestrial biology would be expected to be avoided with implementation of Measure 5.3.6-4a, or would be substantially reduced with implementation of Measures 5.3.6-4b and 5.3.7-6. Since the implementation of future projects would be expected to be beneficial to both fisheries and terrestrial biology, the combined cumulative impacts on fisheries and terrestrial biology would be considered less than significant. Because there are no significant cumulative impacts, no mitigation measures beyond Measure 5.3.6-4a or Measures 5.3.6-4b and 5.3.7-6 would be necessary.

TABLE 5.7-11
FLOW IN THE TUOLUMNE RIVER BELOW LA GRANGE DAM –
WSIP PLUS INFILTRATION GALLERY PROJECT (66 cfs winter, 100 cfs summer)

	Wet	Above Normal	Below Normal	Dry	Critical Dry	All
Existing Condition (2005)						
Oct	431	298	294	351	236	333
Nov	374	507	314	324	195	350
Dec	857	1,230	422	292	204	654
Jan	2,161	1,257	318	285	189	1,022
Feb	3,493	2,381	647	478	188	1,723
Mar	4,096	1,969	654	421	189	1,806
Apr	3,424	1,568	958	497	344	1,613
May	3,161	1,348	943	497	344	1,489
June	3,633	408	75	73	50	1,180
July	1,300	240	75	73	50	463
Aug	516	240	75	73	50	233
Sept	1,299	249	75	73	50	464

Difference and Percent Change, Existing Condition vs Cumulative (66 and 100 cfs)

	Wet		Above Normal		Below Normal		Dry		Critical Dry		All	
Oct	64	[15%]	60	[20%]	55	[19%]	54	[15%]	67	[29%]	61	[18%]
Nov	80	[22%]	81	[16%]	27	[9%]	3	[1%]	67	[34%]	58	[16%]
Dec	0	[0%]	-56	-[5%]	16	[4%]	45	[15%]	64	[32%]	10	[2%]
Jan	-54	-[3%]	107	[8%]	102	[32%]	75	[26%]	98	[52%]	52	[5%]
Feb	14	[0%]	-125	-[5%]	79	[12%]	66	[14%]	107	[57%]	21	[1%]
Mar	-27	-[1%]	-167	-[9%]	95	[15%]	102	[24%]	98	[52%]	7	[0%]
Apr	25	[1%]	58	[4%]	86	[9%]	101	[20%]	101	[29%]	67	[4%]
May	-2	[0%]	95	[7%]	98	[10%]	98	[20%]	98	[28%]	68	[5%]
June	-187	-[5%]	-16	-[4%]	101	[134%]	101	[138%]	101	[202%]	-8	-[1%]
July	80	[6%]	98	[41%]	98	[130%]	98	[134%]	98	[195%]	92	[20%]
Aug	52	[10%]	64	[27%]	64	[86%]	64	[88%]	64	[129%]	61	[26%]
Sept	91	[7%]	57	[23%]	67	[89%]	67	[91%]	67	[133%]	72	[15%]

Key
> 0%
< 0 to -5%
< -5%

NOTE: "Existing Condition (2005)" is based on model run MEA3CHR. The Cumulative scenario is based on model run MEA5ix. An overview of the model runs is presented in Section 5.1. Detailed information on the models and underlying assumptions is provided in Appendix H.

Downstream Water Bodies: the San Joaquin River, Stanislaus River, and Delta

Impact 5.7.2-3: Cumulative impacts on the San Joaquin River, Stanislaus River, and Delta.

As discussed in Section 5.3, the WSIP would result in less-than-significant impacts on the San Joaquin River, Stanislaus River, and/or Delta in the areas of hydrology, water quality, water supply, and fisheries; therefore, these issue areas are discussed below. The WSIP would have no effect on these downstream water bodies in the areas of geomorphology, groundwater, terrestrial biology, recreation, or visual resources; therefore, these issue areas are not discussed further.

Effect of Past and Present Projects

Hydrology. Past water and flood control project development on the San Joaquin River has substantially altered the river hydrology. The river between Gravelly Ford and Mendota is essentially dry, except when flood releases are being made. Past water and flood control project developments on the major tributaries to the San Joaquin River, including the Merced, Tuolumne, and Stanislaus Rivers, have also affected the hydrology of the San Joaquin River. The past activities of hydraulic mining in the Sierra foothills, levee construction, major water supply project development and operation in the Delta and upstream of the Delta, and ship channel development and maintenance have in combination substantially altered Delta hydrology.

The diversion of water by the Central Valley Project, State Water Project, and others in the south Delta as well as upstream depletion of San Joaquin River flows affect the pattern of flow in the Delta channels. Historically, net flow in the Delta channels was toward the San Francisco Bay Estuary. Now, because freshwater inflow to the south Delta from the San Joaquin River is small relative to the diversions at the Banks and Tracy Pumping Plants, net flow in many south Delta channels reverses during summer and fall. Flow in the lower San Joaquin River and the south Delta channels is directed upstream toward the pumping plants rather than downstream toward the estuary (Miller, 1993).

The diminution of flow and flow reversals in the lower San Joaquin River as a result of water diversions by the State Water Project and Central Valley Project are harmful to migrating salmon. In 1990, the California Department of Water Resources (DWR) began installing temporary barriers in several waterways in the south Delta to improve conditions for migrating salmon. Temporary barriers have been placed across the Grant Line Canal, Middle River, and Old River. The purpose of the barriers is to control water levels for irrigators, improve water quality, and direct more water down the lower San Joaquin River for downstream migrating juvenile salmon in the spring and for upstream migrating adults in the fall. It is expected that permanent operable barriers will replace the temporary barriers in the next few years.

Water Quality. As described in Section 5.3.3, San Joaquin River water quality has been degraded by a combination of agricultural drainage, past mining activity, wastewater and urban stormwater runoff, wildlife refuge discharge, and flow depletion in some months of some years. Inadequate drainage and accumulating naturally-occurring salts have been persistent problems in parts of the San Joaquin Valley for more than a century. The San Joaquin River has levels of total dissolved solids and total organic carbon that are high for natural waters and are considerably higher than for Tuolumne River water. The river is listed as an impaired water body for mercury, boron, various pesticides, salinity, and unknown toxicity. Both the Tuolumne River and the Stanislaus River contribute higher quality water to the San Joaquin River as it flows into the Delta.

Water quality in the Delta is governed by the Delta's complex hydrodynamics, which mix the freshwater entering the system from upstream tributary rivers with the saline water that enters from Suisun Bay. When freshwater flow is small, tidal flow enables saline water to penetrate into the Delta. Under these circumstances, water quality in some parts of the Delta becomes brackish. The reversal of flow in the lower San Joaquin River and many south Delta channels as a result of water diversion by the State Water Project and Central Valley Project increases the tendency for saline water to penetrate into the Delta. Water quality in the Delta generally declines in a southerly and westerly direction. Delta water quality is also affected by agricultural drainage, urban runoff, wastewater discharges, and high organic carbon input from drainage off the peat soils on the Delta islands.

Fisheries. As described in Section 5.3.6, the lower San Joaquin River and Delta provide habitat to a diverse assemblage of resident and migratory estuarine organisms. The biological environment is a complex community of plants and animals inhabiting the saltwater, estuarine (brackish water), and freshwater habitats within the Bay-Delta estuary.

Fishery sampling within the Bay-Delta estuary has shown that 55 fish species inhabit the estuary (Baxter et al., 1999), of which approximately one-half are non-native, introduced species. Many of the fish species inhabiting the estuary, such as striped bass and American shad, were purposefully introduced to provide recreational and commercial fishing opportunities. A number of the fish species have been introduced accidentally into the estuary through movement among connecting waterways (e.g., threadfin shad and inland silversides). In recent years, a number of fish and macroinvertebrate species have been accidentally introduced into the estuary, primarily from the Orient, through ballast water discharges from commercial cargo ships (e.g., yellowfin and chameleon gobies). In addition, an estimated 100 macroinvertebrates have also been introduced, primarily through ballast water discharge, into the estuary (Carlton, 1979). These introductions of non-native fish and macroinvertebrates have contributed to a substantial change in the species composition, predator/prey interactions, and competitive interactions affecting the population dynamics of native species. Many of the introduced fish and macroinvertebrates have colonized and inhabit the lower San Joaquin River and Delta.

In recent years, the bottom-dwelling fish community, including delta and longfin smelt and other species, has experienced a significant decline in abundance. State and federal resource agencies are currently evaluating various factors that could be contributing to the decline. Hypotheses include the effects of losses at water diversions, changes in Delta hydrology, the effects of pollutants on survival, and the effects of introduced species on the Delta food web. The importance of these factors in the decline in fish abundance has not been determined.

A variety of special-status fish species, several of which have been listed for protection under the Federal and/or California Endangered Species Acts, are present in the Delta and the San Joaquin and Tuolumne Rivers. Special-status fish species that occur in the lower San Joaquin River and Delta include steelhead, green sturgeon, delta smelt, Chinook salmon, Sacramento splittail, and longfin smelt. Several special-status species use the Delta as a migratory corridor. The winter-run Chinook salmon is federally and state-listed as endangered. The spring-run Chinook salmon is federally and state-listed as threatened. The fall/late-fall-run Central Valley Chinook salmon is a federal candidate species and California species of special concern. The Distinct Population Segment of Central Valley steelhead is federally listed as threatened. Fall/late-fall-run Central Valley Chinook salmon use the lower San Joaquin River as a migratory corridor and spawn in the Tuolumne River below La Grange Dam. The Evolutionarily Significant Unit of Central Valley steelhead may also spawn in the Tuolumne River in small numbers. In addition, delta smelt, a federally and state-listed threatened species, and Sacramento splittail, a California species of special concern and formerly a federal threatened species, have been documented within the lower San Joaquin River and Delta (USFWS, 2003). The NMFS recently listed green sturgeon as a threatened species. Although the distribution of green sturgeon in the lower San Joaquin River is poorly understood, the species is known to reside within the Delta.

The Pacific Fisheries Management Council has designated Central San Francisco Bay, Suisun Bay, and the Delta as Essential Fish Habitat (EFH) to protect and enhance habitat for coastal marine fish and macroinvertebrate species that support commercial fisheries. The major rivers tributary to the Delta, including the San Joaquin and Tuolumne Rivers, have also been identified as EFH for Pacific salmon. The amended Magnuson-Stevens Fishery Conservation and Management Act, also known as the Sustainable Fisheries Act (Public Law 104-297), requires all federal agencies to consult with the Secretary of Commerce on activities or proposed activities authorized, funded, or undertaken by that agency that may adversely affect EFH of commercially managed marine and anadromous fish species.

Potential Effects of Future Projects

San Joaquin River. As shown in Table 5.7-1, above, of the 11 potential future projects affecting the San Joaquin River directly, five are proposed primarily to improve environmental conditions in the river, including water quality and habitat quality. These projects that will benefit the river environment include the TMDL (total daily maximum load) programs being implemented by the Regional Water Quality Control Board, the San Luis Drainage Feature Re-evaluation Program (which will reduce agricultural drainage to the river), the San Joaquin River Restoration Settlement, and the Delta-Mendota Canal Recirculation Feasibility Study. Other projects propose to improve water supply benefits and reliability, but also generally incorporate measures to protect or enhance the river's environmental resources. The projects could contribute to both adverse and beneficial cumulative effects on the San Joaquin River. Overall, future projects affecting the San Joaquin River could result in both beneficial and potentially significant adverse effects on the river's water resources, supply, quality, and aquatic fishery resources.

Stanislaus River. Existing water supply diversions for agricultural, municipal and industrial use will continue. Continuation of the USBR's water releases in compliance with the Central Valley Project Improvement Act Section (b)(2) water requirements as well as continued implementation of the Vernalis Adaptive Management Program (VAMP) (through 2012 with possible renewal/extension), both of which are intended to improve habitat conditions for anadromous fish, would provide overall environmental benefit in the areas of hydrology, water quality, fisheries and, potentially visual resources as well. The USBR's proposal to revise its operation plan for the New Melones Reservoir could modify current reservoir release patterns and quantities with potential adverse effects. It is expected that mitigation would be required for any potentially significant effects.

Sacramento-San Joaquin Delta. Implementation of the regulatory water quality and flow objectives for the Delta limits the potential for future cumulative flow impacts and water quality effects in the Delta and related impacts on biological resources that could be associated with these physical effects. The USBR and DWR, through the Central Valley Project and State Water Project, respectively, remain largely responsible for meeting these Delta environmental standards through adjustments in their diversions and/or reservoir operations. In addition, as shown on Table 5.7-1, several proposed future projects target improvement of Delta environmental conditions, such as the Environmental Water Account, the South Delta Improvements Program – Phase I, the OCAP ESA Reconsultation, the CVPIA Water Acquisition Program, and the Bay-Delta Habitat Conservation Plan, among others. Several other projects have multiple-purpose objectives to increase water supply and/or improve supply reliability while also improving environmental conditions in the Delta, such as the Delta Cross Channel Reoperation and Through-Delta Facility, the Los Vaqueros Reservoir Expansion Project, or the Upstream of Delta Offstream Storage (Sites Reservoir). These two types of projects are intended to result in beneficial effects to the Delta environment. Other projects are primarily water supply and water reliability projects, including the Freeport Regional Water Project, Stockton Delta Water Project, and Sacramento River Water Reliability Study Project; these could result in some additional adverse impacts on the Delta, although mitigation has been or is expected to be imposed to address these impacts.

The potential cumulative effects on the Delta are strictly limited by existing regulations that have established both water quality and flow objectives for the Delta that must be met. These regulatory requirements are described in the setting discussions in Sections 5.3.1 and 5.3.3, above. In summary, the State Water Resources Control Board (SWRCB) established water quality objectives for the Delta in the 1995 Water Quality Control Plan; it also established flow objectives and adopted Water Rights Decision 1641 and subsequent orders to update and clarify responsibilities among water-rights holders for implementing the flow objectives. In D-1641 and Order WR 2001-05, the SWRCB assigned responsibilities to water-rights holders for specified periods, including the USBR and DWR, in certain watersheds tributary to the Delta. The SWRCB accepted with modifications the proposals made by some water agencies and groups of water agencies with respect to their responsibilities for meeting flow objectives in the Delta. The responsibilities of various parties, including water users in the Sacramento, San Joaquin, Mokelumne, Calaveras, and Cosumnes River watersheds, were defined in D-1641. These responsibilities require that the water users in these watersheds contribute specified amounts of water to protect water quality, and that the USBR and/or DWR ensure the objectives are met in the Delta.

As a result of existing regulations coupled with future projects intended to benefit the Delta environment, future cumulative effects on the Delta would be both beneficial and adverse.

Cumulative Effects and WSIP Contribution

Table 5.7-12 summarizes the effects of past and present projects, the impacts of the WSIP, the effects of probable future projects, and the combined impacts of the WSIP plus probable future projects on the San Joaquin River, Stanislaus River, and Delta. Past and present projects have substantially altered the hydrology, geomorphology, water quality, groundwater, fisheries, terrestrial biology, and visual and recreational resources of these water bodies compared to pre-Euro-American settlement conditions. The existing condition, which serves as the baseline for the analysis of the WSIP, reflects the substantial environmental changes that have occurred as a result of the past and present projects.

TABLE 5.7-12
CUMULATIVE EFFECTS ON THE SAN JOAQUIN RIVER, STANISLAUS RIVER, AND DELTA

Resource	Effects of Past and Present Projects	Impacts of WSIP (prior to mitigation/after mitigation)	Effects of Future Projects	Cumulative Impact(WSIP after mitigation + Future Projects)	WSIP Contribution Cumulatively Considerable?
Hydrology	SA	LS	B/PSM	B/PSM	No
Surface Water Quality	SA	LS	B/PSM	B/PSM	No
Water supply	MA	LS	B/PSM	B/PSM	No
Fisheries	SA	LS	B/PSM	B/PSM	No

B = Beneficial impact
LS = Less than Significant, no mitigation required
PSM/LS = Potentially Significant but reduced to Less than Significant with mitigation
SA = Substantially Altered
MA = Moderately Altered

As discussed in Section 5.3, the WSIP would result in less-than-significant impacts on the San Joaquin River, Stanislaus River, and/or Delta in the areas of hydrology, water quality, water supply, and fisheries. The WSIP would have no effect on these downstream water bodies in the areas of geomorphology, groundwater, terrestrial biology, recreation or visual resources.

As described in the previous section, probable future projects would have both beneficial effects and potentially significant effects on hydrology, surface water quality, water supply, and fisheries. Some future projects could contribute further to significant adverse effects on the San Joaquin River and downstream to the Delta. The WSIP would have a less-than-significant effects on the San Joaquin and Stanislaus Rivers and the Delta. As summarized below, the WSIP's contribution to adverse cumulative effects would be less than cumulatively considerable.

As discussed in Impact 5.3.1-5, the WSIP would reduce flows in the lower Tuolumne River and, in turn, downstream in the San Joaquin River and to the Delta primarily between February and June in wet or above-normal years, when flow in the San Joaquin is at its seasonal maximum. Very infrequently (observed once over the modeled 82-year period of hydrologic record), following a protracted drought, flow reductions in the San Joaquin River attributable to the WSIP would be sufficient to cause flow in the river at Vernalis to fall below the flow objective established for that location. This would, in turn, cause salinity levels to increase above the objective established for that location. However, as required by regulation, under these circumstances, the USBR would increase flow releases from New Melones Reservoir on the Stanislaus River (or, in the future, implement an alternate means of providing additional flows) to meet the Vernalis flow and salinity objectives. Thus, flow and water quality objectives would continue to be met under the WSIP.

Similarly, with respect to the Delta, in most years, the flow reduction attributable to the WSIP would not be sufficient to cause Delta outflow to fall below the regulatory objective. Only very infrequently (observed once over the modeled 82-year period of hydrologic record), following a protracted drought, would the reduction in flow due to the WSIP have the potential to result in Delta outflow below the objective. However, in accordance with SWRCB regulation, the USBR and DWR would be required to decrease diversions or otherwise adjust their operations to maintain the Delta outflow standards. Thus, with WSIP implementation, both the San Joaquin River flow and salinity objectives and the Delta outflow objectives would be met. Therefore, the WSIP's contribution to potential cumulative flow effects on the San Joaquin or in the Delta would be less than cumulatively considerable.

As discussed in Impact 5.3.4-1, the WSIP would have a less-than-significant effect on water availability and water quality affecting water use by other diverters on the Stanislaus River or San Joaquin River. Very infrequently, following a protracted drought, the USBR might be required to release additional flows from New Melones Reservoir (or implement an alternate means of augmenting flow) to maintain flow and water quality objectives at Vernalis and in the Delta, but this would not have a significant effect on water supply. No other new significant diversions from the Tuolumne or Stanislaus Rivers have been proposed that would result in additional cumulative effects on water supply availability for existing users. On the San Joaquin River, additional water supply diversions are being implemented such as the Stockton Delta Water Supply Project, and studies such as the Upper San Joaquin Storage Investigation are underway to evaluate the potential for expanding supply storage. As indicated in Table 5.7-1, other projects are proposed to improve supply availability for San Joaquin River users through revised water management and other actions.

As discussed in Impact 5.3.4-2, under most conditions the WSIP would have no effect on water supply availability from the Delta, and only on rare occasions would the WSIP reduce Delta inflow during excess conditions[3] but when the export limits do affect State Water Project and Central Valley Project pumping. Rather than reducing pumping for supply deliveries in that same year to compensate for the WSIP effects, the USBR and/or DWR could release additional water from storage to maintain flow objectives and pumping for deliveries; however, this would contribute to an increased risk to water delivery reliability in a subsequent year, if reservoir storage did not refill and thus compensate for the additional release. The WSIP's contribution to this increased risk to supply availability is small and less than cumulatively considerable; the potential Delta inflow difference caused by the WSIP would be typically 20,000 afy, a fraction (less than 0.001 percent) of the total average inflow of about 21 million acre-feet.

The cumulative effect of other past and present projects and regulatory actions has reduced supply availability for Delta water users, primarily for the State Water Project contractors and Central Valley Project contractors, as they represent the more junior water rights holders to Delta water. Some future projects would contribute to this cumulative effect as more senior water rights holders exercise their rights, and as area-of-origin water rights claims to the Delta and tributaries

[3] Excess conditions refers to conditions when Delta outflow exceeds the maximum flow required to comply with SWRCB flow and water quality objectives for the San Francisco Bay / Sacramento-San Joaquin Delta Estuary.

are pursued. At the same time, other future projects, such as the South Delta Improvement Project, the Environmental Water Account, the Los Vaqueros Reservoir Expansion Project, the Delta Cross Channel Reoperation, and the Delta-Mendota Canal / California Aqueduct Intertie, seek to improve water supply reliability for Delta water users. As shown in Table 5.7-12, the cumulative effects of potential future projects on Delta water supply availability reflect a mix of both potentially beneficial and significant, adverse impacts.

As discussed in Impact 5.3.6-5, with mitigation, the WSIP would have a less-than-significant effect on fishery resources along the San Joaquin River and a negligible effect downstream in the Delta. For the San Joaquin River and its tributaries, a relationship has been established between spring flow and the subsequent survival and contribution of adults to the salmon population (USFWS, 1994). A reduction in river flow during the spring rearing and juvenile emigration period would result in an incremental contribution to reduced juvenile survival and a small incremental contribution to the cumulative reduction in juvenile survival and subsequent adult population abundance. Increased water temperatures, particularly during the late spring juvenile salmonid migration period (April–May), would also be expected to adversely affect juvenile salmon survival. The WSIP could contribute to flow reductions that would result in corresponding temperature increases in some summer flows following a protracted drought; however, these infrequent temperature increases would not be expected to result in significant adverse effects on salmon or steelhead migrating downstream within the San Joaquin River, since the migration would occur earlier in the year and ambient water temperatures within the river might already be elevated (as a result of low flow drought conditions).

In the future, implementation of TID's Infiltration Gallery Project would contribute additional flows to a segment of the lower Tuolumne River, but these flows would be recaptured upstream of the confluence with the San Joaquin River. Under the FERC relicensing process for the Don Pedro Project, scheduled to occur in 2016, fishery release requirements for the lower Tuolumne River will be reviewed. It is speculative, at this time, to assess how these flow requirements might change.

5.7.3 Cumulative Effects on Alameda Creek Watershed Streams and Reservoirs

5.7.3.1 Relevant Projects

Past and Present Projects

A number of existing facilities under the jurisdiction of the SFPUC, the Alameda County Water District (ACWD), Zone 7 Water Agency, the Alameda County Flood Control and Water Conservation District (ACFCWCD), and the California Department of Water Resources (DWR), among others, affect environmental conditions in the Alameda Creek watershed upstream, adjacent to, and downstream of the proposed WSIP projects. Although built in the past, these existing facilities continue to operate and thus affect current conditions. The major facilities, shown in **Figure 5.7-3**, include:

- Calaveras Dam and Reservoir
- Turner Dam and San Antonio Reservoir
- Del Valle Reservoir/South Bay Aqueduct
- Alameda Creek Diversion Dam and Tunnel
- BART weir
- Sunol infiltration galleries (refer to description in Section 5.4.4)
- ACWD's upper, middle, and lower inflatable dams
- ACWD and Sunol groundwater wells
- Gravel mining operations and quarries
- ACFCWCD channelization projects

Calaveras Dam was constructed between 1913 and 1925, while Turner and Del Valle Dams were constructed in the late 1960s. Calaveras Reservoir was operated at its full 96,800-acre-foot capacity for over 75 years before being restricted to a capacity of 37,800 acre-feet in late 2001. The Sunol infiltration galleries and Sunol Dam were constructed in 1901. The other listed facilities were constructed between 1910 and the present. Use of the water supply facilities, with the exception of the infiltration galleries, has increased over the same time period to keep pace with water demand in the Bay Area. Through mid-2006, the SFPUC owned two smaller dams on Alameda Creek, Niles and Sunol Dams, which were removed in 2006. Groundwater pumping and extraction via near-surface wells and infiltration facilities has been ongoing for many decades in both the Sunol area and the Niles Cone area downstream of the SFPUC facilities. Lands within the CCSF-owned Alameda watershed are managed in accordance with the SFPUC's *Alameda Watershed Management Plan* (Alameda WMP), as described in Sections 4.2 and 5.2 of this PEIR.

As described in Section 5.4, the roughly 175-square-mile Alameda Creek watershed upstream of Calaveras, San Antonio, and Del Valle Reservoirs has remained mostly undeveloped. However, urbanization, quarrying, and other land use activities have altered major portions of the Alameda Creek watershed. About 400 square miles of the overall 625-square-mile Alameda Creek watershed drains into Arroyo de la Laguna to the north and east of the SFPUC lands. This area has been heavily urbanized, resulting in significantly increased peak flows and major inputs of urban pollutants. Similarly, the Bay Plain downstream of Niles Canyon has also experienced extensive urbanization.

Future Projects

Reasonably foreseeable future projects affecting stream flow or related resources in the Alameda Creek watershed are listed in **Table 5.7-13** and shown in Figure 5.7-3. Table 5.7-13 presents other SFPUC projects in the watershed; even though the SFPUC's Alameda WMP is currently being implemented, it is included in this list because it encompasses numerous future sub-projects and activities. The replacement of Calaveras Dam just downstream from the current dam (Calaveras Dam, SV-2) and the recapture facility (Alameda Creek Fishery, SV-1) are considered part of the WSIP and therefore are not included on the cumulative projects table. In addition to the listed projects, the SFPUC would conduct routine maintenance on its facilities in the Alameda watershed. Table 5.7-13 also presents non-SFPUC projects planned or proposed by other agencies or organizations.

Most of the projects on both tables are habitat or watershed enhancement projects or plans intended to reverse some of the degradation of watershed resources resulting from a century of urban development. The list includes over a dozen projects that are in various stages of planning and implementation by public agencies, citizens' groups, and quarry operators. These projects range from removing dams, weirs, culverts, pipelines, and screens that block fish passage to restoring and protecting habitat and fish flows. The SFPUC's projects identified in the table include the Alameda WMP and related activities and two WSIP-related activities, the Watershed and Environmental Improvement Program and the Habitat Reserve Program (both described in Chapter 3, Section 3.12).

Many of the non-SFPUC projects are part of Zone 7's Stream Management Master Plan for Alameda Creek and ACWD's Alameda Creek steelhead restoration program. The list also includes a major flood detention project (the Chain of Lakes project, part of Zone 7's Master Plan) in the Arroyo de la Laguna watershed, levee improvements, and two quarries. Table 5.7-13 includes summary descriptions of each project, the affected watershed or water body, and the potential cumulative impact areas that could be compounded due to identified impacts of the WSIP.

5.7.3.2 Cumulative Impacts

Significance Criteria

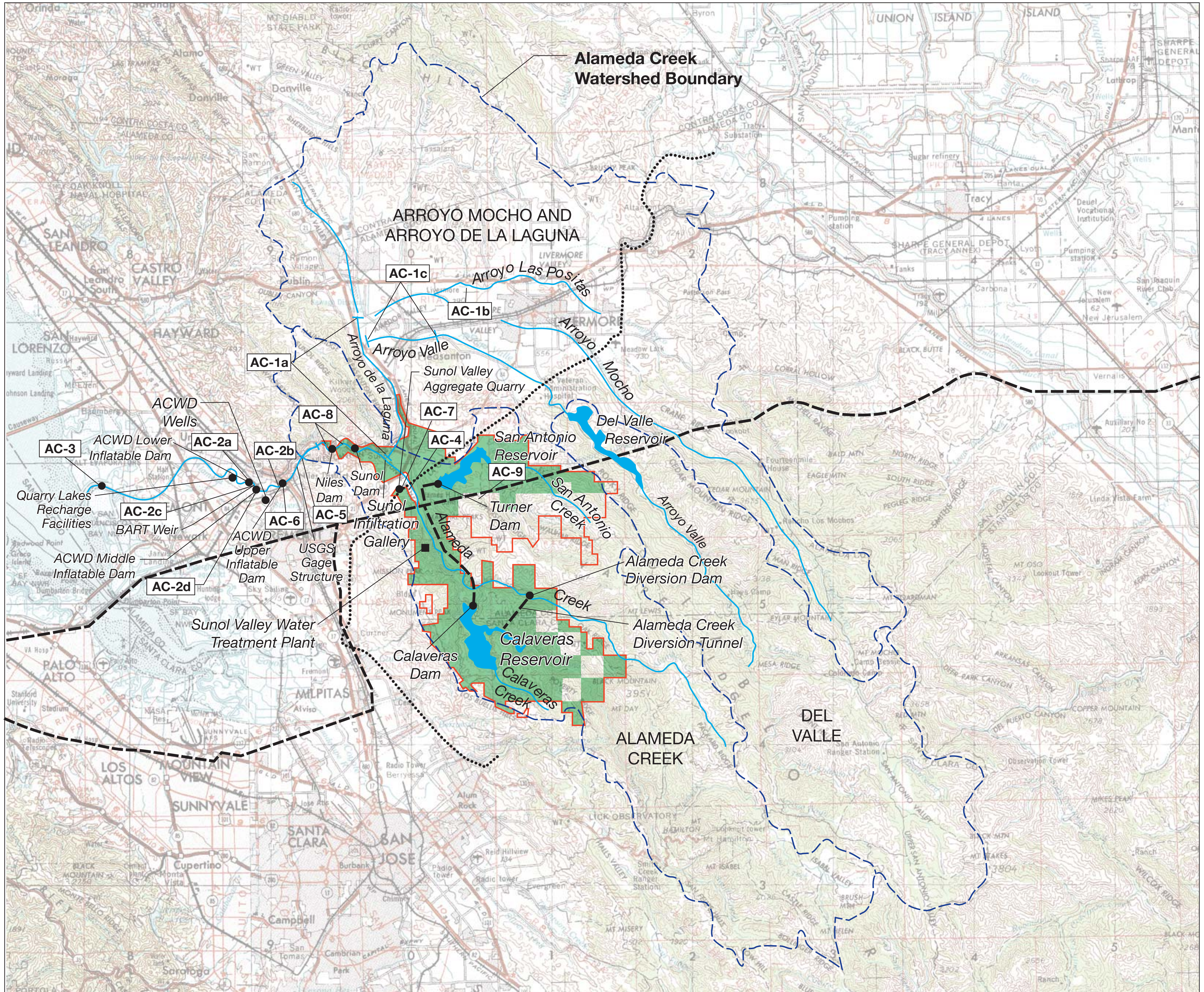
The CCSF has not formally adopted significance standards for impacts related to cumulative effects, but generally considers that implementation of the proposed program would have significant cumulative impacts if it were to:

- Have impacts that would be individually limited, but cumulatively considerable ("cumulatively considerable" means that the incremental effects of a project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)

Impacts associated with the proposed program that would be "individually limited" are based on the impact analyses presented in Section 5.4 and the significance criteria presented in that section for the various environmental resource areas.

Approach to Analysis and Impact Summary

Cumulative impacts are analyzed based on the CEQA guidance and approach described above in Section 5.7.1. Cumulative impacts are discussed below, and impact significance determinations are summarized in **Table 5.7-14**.



Watershed Boundary

Existing SFPUC System Corridor

AP-1 Other SFPUC Project

AC-1 Non-SFPUC Project

CCSF Ownership (also project boundary for AP-1, AP-2, AP-3)

HCP Study Area (also project boundary for AP-1a)

DWR South Bay Aqueduct

See Table 5.7-13 for names and descriptions of projects

Cumulative Project No.	Plan/Project Name
OTHER SFPUC PROJECTS (not shown on figure as watershed wide)	
AP-1	Alameda Watershed Management Plan (WMP)
AP-1a	Alameda Watershed Habitat Conservation Plan (sub-project of Alameda WMP)
AP-2	Watershed and Environmental Improvement Program (WSIP-related activity)
AP-3	Habitat Reserve Program (WSIP-related activity)
NON-SFPUC PROJECTS	
AC-1	Zone 7 Stream Management Master Plan (SMMP)
AC-1a	Arroyo de la Laguna Reach 10 Improvements (sub-project of Zone 7 SMMP)
AC-1b	Chain of Lakes (sub-project of Zone 7 SMMP)
AC-1c	Lower Arroyo del Valle Restoration and Enhancement (sub-project of Zone 7 SMMP)
AC-2	Alameda Creek Steelhead Restoration
AC-2a	Rubber Dam 2 Decommissioning and Foundation Modification Project (sub-project of Alameda Creek Steelhead Restoration)
AC-2b	Alameda Creek Pipeline No. 1 Fish Screen (sub-project of Alameda Creek Steelhead Restoration)
AC-2c	BART Weir (sub-project of Alameda Creek Steelhead Restoration Efforts)
AC-2d	Middle Inflatable Dam Modification
AC-3	Alameda Creek – Levee Reconfiguration
AC-4	PG&E Gas Line Crossing
AC-5	Stonybrook Creek Culvert Removal
AC-6	Upper Inflatable Dam Fish Passage Project
AC-7	Sunol Valley Aggregate Quarry – SMP 30
AC-8	Section 1135 Alameda Creek Flood Control Project Fish Passage Modifications
AC-9	Apperson Ridge Quarry

0 20 Miles

SOURCE: ESA + Orion

SFPUC Water System Improvement Program . 203287

Figure 5.7-3 (Revised)
Future Projects in the Alameda Creek Watershed Considered in the Cumulative Analysis

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TABLE 5.7-13
FUTURE PROJECTS IN THE ALAMEDA CREEK WATERSHED CONSIDERED IN THE CUMULATIVE ANALYSIS

Cumulative Project No.	Plan/Project Name	Jurisdiction	Project Description	Affected Watershed/ Water Body	Potential Cumulative Impact Areas	Status/Schedule
OTHER SFPUC PROJECTS						
AP-1	Alameda Watershed Management Plan (WMP)[a]	SFPUC	Provides a policy framework for the SFPUC to make consistent decisions about the activities, practices, and procedures that are appropriate on SFPUC watershed lands. Included in the plan are several management actions designed to implement the established goals and policies for water quality, water supply, and ecological enhancement.	CCSF-owned lands in Alameda Creek watershed	Beneficial impacts on terrestrial biological resources, fisheries, and surface water quality	Plan adopted in 2000, implementation ongoing
AP-1a	Alameda Watershed Habitat Conservation Plan (sub-project of Alameda WMP)[a]	SFPUC	Develop a comprehensive, multi-species habitat conservation plan for species of concern in the watershed, including steelhead.	Alameda Creek watershed – Alameda Creek, San Antonio Creek, Calaveras Creek, Arroyo Hondo, and Arroyo de la Laguna and tributary streams and reservoirs	Beneficial impacts on terrestrial biological resources and fisheries	Phase 2 – indicates implementation within 10 years of adoption of Alameda WMP
AP-2	Watershed and Environmental Improvement Program (WSIP-related activity)	SFPUC	Protect and restore lands and natural resources critical to operation of the SFPUC's regional water system. The program could include water quality, ecosystem and habitat protection, improvements, and restoration and would address such issues as fish passage, riparian habitat degradation, and sensitive species recovery.	CCSF-owned lands in Alameda Creek watershed	Beneficial impacts on terrestrial biological resources, fisheries, and surface water quality	Program funded but still under development; includes implementation of actions in the WMP
AP-3	Habitat Reserve Program (WSIP-related activity)	SFPUC	Develop and enhance wetlands and other habitats to be applied toward mitigation of impacts on biological resources resulting from implementation of the WSIP.	CCSF-owned lands in the Alameda and Peninsula watersheds; also includes locations in the San Joaquin Valley	Beneficial long-term impacts on terrestrial biological resources, and surface water quality, but short-term construction impacts; possible impacts on agricultural resources depending on the site	Program in development, with environmental review scheduled from 2007 to 2008 and implementation between 2008 and 2010

[a] SFPUC, *Alameda Watershed Management Plan,* Final Draft. April 2001.
[b] Bay Area Watershed Management, Habitat Protection & Restoration Plan, Watershed Project Inventory Master Table. April 6, 2006.

TABLE 5.7-13 (Continued)
FUTURE PROJECTS IN THE ALAMEDA CREEK WATERSHED CONSIDERED IN THE CUMULATIVE ANALYSIS

Cumulative Project No.	Plan/Project Name	Jurisdiction and/or Project Sponsor	Project Description	Affected Watershed/ Water Body	Potential Cumulative Impact Areas	Status/Schedule
NON-SFPUC PROJECTS						
AC-1	Zone 7 Stream Management Master Plan (SMMP)[a]	Zone 7 Water Agency	Involves 45 individual projects with the primary purpose of providing flood protection within arroyos, creeks, and streams in the greater Alameda Creek watershed in partnership with local agencies, including the SFPUC. In addition to flood control, the projects strive to meet regional resource area goals and objectives to the extent possible. Only SMMP projects with the potential to contribute to cumulative impacts are addressed in this analysis.	Alameda Creek watershed – Alameda Creek, Arroyo de la Laguna, Arroyo Mocho, Arroyo del Valle, Arroyo Las Positas, Alamo Canal	Beneficial impacts on surface water quality, hydrology (regional flooding), terrestrial biological resources, and fisheries	Varies by project
AC-1a	Arroyo de la Laguna Reach 10 Improvements (sub-project of Zone 7 SMMP)[a]	Zone 7 Water Agency	Improvements along Reach 10 of Arroyo de la Laguna include bank stabilization and protection features, enhancement of stream corridor and riparian habitat, and removal of barriers to steelhead fish migration along creeks.	Arroyo de la Laguna	Beneficial impacts on hydrology (flood protection and drainage), erosion, surface water quality, and habitat	Estimated construction schedule is 2008–2010
AC-1b	Chain of Lakes (sub-project of Zone 7 SMMP)[a]	Zone 7 Water Agency	Provides 5,000 acre-feet of flood retention and storage in the Sunol-Niles area and the Livermore Valley.	Arroyo Las Positas, Arroyo Mocho	Beneficial impacts on hydrology (flood protection and drainage), water supply, and surface water quality	Began operation in 2005, with total project completed in 2030
AC-1c	Lower Arroyo del Valle Restoration and Enhancement (sub-project of Zone 7 SMMP)[a]	Zone 7 Water Agency	Remove three fish barriers, modify flap gates, and improve riparian vegetation.	Lower Arroyo del Valle	Beneficial impacts on hydrology (flood protection and drainage), fisheries, and habitat	Unknown
AC-2	Alameda Creek Steelhead Restoration[b]	Alameda County Water District (ACWD)	In 2005, ACWD received $1 million from the National Fish and Wildlife Foundation to initiate two projects that will improve steelhead migration in Alameda Creek. ACWD's two projects are part of a much larger effort by multiple agencies, including the SFPUC, to improve fish passage in the Alameda Creek watershed. In June 2007, ACWD began installing a fish screen as part of this effort.	Alameda Creek watershed – Alameda Creek Flood Control Channel	Beneficial impacts on fisheries	Unknown
AC-2a	Rubber Dam 2 Decommissioning and Foundation Modification Project (sub-project of Alameda Creek Steelhead Restoration)[b]	ACWD	Remove the fabric portion of the Rubber Dam 2 and a section of the dam's foundation to improve steelhead migration in Alameda Creek. Located in Fremont within the Alameda Creek Flood Control Channel adjacent to the Quarry Lakes Regional Recreational Area.	Alameda Creek	Beneficial impacts on fisheries	Mitigated Negative Declaration (MND) adopted June 2006 Estimated construction schedule: 2007–2009

TABLE 5.7-13 (Continued)
FUTURE PROJECTS IN THE ALAMEDA CREEK WATERSHED CONSIDERED IN THE CUMULATIVE ANALYSIS

Cumulative Project No.	Plan/Project Name	Jurisdiction and/or Project Sponsor	Project Description	Affected Watershed/ Water Body	Potential Cumulative Impact Areas	Status/Schedule
NON-SFPUC PROJECTS (cont.)						
AC-2b	Alameda Creek Pipeline No. 1 Fish Screen (sub-project of Alameda Creek Steelhead Restoration)[b]	ACWD	Install a diversion screen to eliminate the potential for out-migrating juvenile steelhead at the intake location of Alameda Creek Pipeline No. 1.	Alameda Creek	Beneficial impacts on fisheries	MND adopted June 2006 Estimated construction schedule 2007–2009
AC-2c	BART Weir (sub-project of Alameda Creek Steelhead Restoration Efforts)	Alameda County Flood Control and Water Conservation District (ACFCWCD)	Modify flood control drop structure (the BART weir) to allow for fish passage.	Alameda Creek	Beneficial impacts on fisheries	Feasibility study completed in 2006; project currently in preliminary design phase.
AC-2d	Middle Inflatable Dam Modification (sub-project of Alameda Creek Steelhead Restoration)[c]	ACWD	Modify middle inflatable dam (adjacent to BART weir) to allow for fish passage. Could result in taking inflatable dam out of commission (used for redundancy).	Alameda Creek	Beneficial impacts on fisheries	Unknown
AC-3	Alameda Creek – Levee Reconfiguration[j]	ACFCWCD	Reconfigure levee at mouth of Alameda Creek.	Arroyo Las Positas – Alameda Creek watershed	Beneficial impacts on habitat and flood control	Unknown
AC-4	PG&E Gas Line Crossing[e]	PG&E	Modify the cement-armored PG&E gas pipeline crossing of Alameda Creek in the Sunol Valley above the confluence with San Antonio Creek, which likely poses a barrier to fish migration at most water flows. This project involves modification of the concrete mat or construction of a fish ladder to allow fish passage.	Alameda Creek	Beneficial impacts on fisheries	Scheduled for completion by 2009
AC-5	Stonybrook Creek Culvert Removal[f]	Caltrans	Remove culvert and design/install new creek crossing (two county-owned culverts and one Caltrans culvert).	Alameda Creek	Beneficial impacts on fisheries	Unknown
AC-6	Upper Inflatable Dam Fish Passage Project[g]	Alameda Creek Alliance	Install pool and weir ladder in the right north channel.	Alameda Creek	Beneficial impacts on fisheries	Unknown

TABLE 5.7-13 (Continued)
FUTURE PROJECTS IN THE ALAMEDA CREEK WATERSHED CONSIDERED IN THE CUMULATIVE ANALYSIS

Cumulative Project No.	Plan/Project Name	Jurisdiction and/or Project Sponsor	Project Description	Affected Watershed/ Water Body	Potential Cumulative Impact Areas	Status/Schedule
NON-SFPUC PROJECTS (cont.)						
AC-7	Sunol Valley Aggregate Quarry – SMP 30[h]	Sunol Valley Aggregate Quarry	Continued mining under current permit in the near term, with planned expansion to increase mining depth. Project would restore portions of the Alameda Creek and San Antonio Creek banks and install a slurry cutoff wall.	Alameda and San Antonio Creeks	Would affect groundwater flow pattern. Installation of the slurry cutoff wall is expected to benefit creek flow hydrology by reducing seepage to the quarry pits; no adverse impacts on creek flows expected. Planned creek bank restoration would also benefit riparian habitat.	Near-term continuation of quarry operations; expansion of quarry and other activities in 2009–2011
AC-8	Section 1135 Alameda Creek Flood Control Project Fish Passage Modifications[j]	U.S. Army Corps of Engineers, ACFCWCD	Study concepts include potential fishways at BART weir and middle and upper ACWD inflatable dams, and four fish screens at Shinn Pond Diversion 1 and 2, Kaiser Pond Diversion, and Alameda Creek Pipeline Intake.	Alameda Creek, approximately 1.25 miles downstream of Niles Dam site and 4.75 miles downstream of Sunol Dam site	Beneficial impacts on fisheries	Project schedule unknown
AC-9	Apperson Ridge Quarry[i]	Oliver de Silva, Inc.	Surface mining permit for the operation of 680-acre hard rock quarry and associated manufacturing facilities located on the Apperson Ranch (a.k.a. Diamond A. Ranch) on Apperson Ridge in the Sunol area.	East of Sunol Valley, midway between Sunol Regional Wilderness and San Antonio Reservoir	EIR identified potential impacts on water quality due to increased erosion and sedimentation, detrimental impacts on wildlife habitat (i.e., San Antonio tule elk herd); and potential impacts on well yields in the Welch Creek area	EIR prepared in 1984; project approved by Alameda County in 1984; implementation schedule unknown

[a] ESA, *Zone 7 Stream Management Master Plan*. Final MEIR. August 2006.
[b] ACWD, "Alameda Creek Watershed Steelhead Restoration Efforts." Online. Accessed December 12, 2006. Available: http://www.acwd.org/engineering/projects.php5?goback=news/index.php5
[c] (1) Bay Area Watershed Plan, Watershed Project Inventory Master Table. April 6, 2006. (2) ACFCWCD, Lower Alameda Creek/BART Weir Fish Passage Assessment, Draft Alternatives Evaluation Report. August 2006.
[d] Bay Area Watershed Plan, Watershed Project Inventory Master Table. April 6, 2006.
[e] Alameda Creek Alliance, "Fish Passage Projects, Sunol Valley." Online. Accessed December 14, 2006. Available: http://www.alamedacreek.org/Fish_Passage/Sunol%20Valley/Sunol%20Valley.htm
[f] (1) Bay Area Watershed Plan, Watershed Project Inventory Master Table. April 6, 2006. (2) Alameda Creek Alliance, "Fish Passage Projects, Stonybrook Creek." Online. Accessed December 14, 2006. Available: http://www.alamedacreek.org/Fish_Passage/Stonybrook/Stonybrook%20Creek.htm
[g] Bay Area Watershed Plan, Watershed Project Inventory Master Table. April 6, 2006.
[h] ESA, *Sunol/Niles Dam Removal Project Final Environmental Impact Report*. State Clearinghouse No. 2004072049. Certified April 6, 2006.
[i] Alameda County Planning Department, *SMP-17 Apperson Ridge Quarry, Draft Environmental Impact Report, Volume 1: Text,* 1984.

TABLE 5.7-14
SUMMARY OF CUMULATIVE IMPACTS IN THE ALAMEDA CREEK WATERSHED RELATED TO WSIP WATER SUPPLY AND SYSTEM OPERATIONS

	Significance Determination						
Impact	Hydrology	Geomorphology	Surface Water Quality	Groundwater	Fisheries	Terrestrial Biology	Recreational / Visual Quality
5.7.3-1: Cumulative effects on the Alameda Creek watershed	N/A	LS	LS	LS	LS	LS	LS

NOTE: Significance determinations presented in this table assume implementation of all mitigation measures presented in Chapter 5, Section 5.4, and described in Chapter 6.

LS = Less than Significant, no mitigation required
N/A = Not Applicable

Because impacts on stream flow and reservoir levels are related to effects on other environmental resources (see Section 5.1), the cumulative impacts in this section are organized by geographic area rather than by environmental topic in order to characterize the overall effects on the affected water body. In determining the significance of cumulative impacts, it is assumed that mitigation measures identified in Section 5.4 and described in Chapter 6 would be implemented, and any residual effects after mitigation are considered in combination with the effects of past, other current, and probable future projects. The incremental contribution of the program's residual effects to the overall cumulative impact is then examined to determine whether it would be "cumulatively considerable."

The WSIP would increase summer flow releases from Calaveras Reservoir, reduce rainy season flows in upper Alameda Creek below the diversion dam, and substantially raise the water level in Calaveras Reservoir compared to existing conditions. However, as described below, the proposed program, in combination with the cumulative projects identified in the tables above, would not have significant adverse environmental effects beyond the program effects already described for the WSIP in Section 5.4.

Alameda Creek Watershed

Impact 5.7.3-1: Cumulative effects on the Alameda Creek watershed.

Effect of Past and Present Projects

Hydrology. Construction and operation of the SFPUC regional water system and the State of California's Del Valle Reservoir have substantially altered the hydrology of the Alameda Creek watershed. Peak flows in the various upstream tributaries to Alameda Creek have been substantially reduced by reservoir operations.

Development has also greatly altered the Alameda Creek watershed. Major alterations include channelization of the lower 12 miles of the creek for flood control; construction of Turner, Calaveras, and Del Valle Dams for water supply; and construction of a concrete drop structure to stabilize the channel around the Fremont BART weir. As described above, the Arroyo de la Laguna watershed, which constitutes nearly two-thirds of the entire Alameda Creek watershed, has been extensively altered by urbanization and quarrying.

Since 1931, following construction of the Alameda Creek Diversion Dam and Tunnel, the SFPUC has diverted flows and drainage from the southern Alameda Creek watershed into Calaveras Reservoir for municipal water supply. For about 70 years, from 1931 to 2001, the SFPUC diverted substantial flows from Alameda Creek above the diversion dam to Calaveras Reservoir. However, as described in Section 5.4.1, the SFPUC reduced the diversions from Alameda Creek into Calaveras Reservoir in December 2001 due to interim California Division of Safety of Dams (DSOD) operational restrictions on Calaveras Reservoir. The SFPUC currently diverts a small percentage of the unimpaired flow of Alameda Creek above the diversion dam, as well as nearly all of the flow of Arroyo Hondo, to Calaveras Reservoir. The DWR also diverts a substantial portion of the flow from Arroyo del Valle. The water diverted from the Alameda Creek watershed is conveyed to the Bay Area and used for municipal water supply.

Flows to Alameda Creek from portions of the watershed upstream of Arroyo del Valle and from the Arroyo de la Laguna watershed have been affected by urban development and groundwater withdrawal, but are not diverted to any large dams/reservoirs. The lower reach of the creek is characterized by extensive urban development and has been channelized (rip-rapped) for floodwater conveyance.

In summary, past construction and continued operation of the regional water system have had a substantial adverse effect on the hydrology of portions of Alameda Creek, Arroyo Hondo, Calaveras Creek, and San Antonio Creek. These streams are managed for water supply and flood control and carry flows that are substantially reduced compared to historical conditions.

Geomorphology. Stream channels exist in a state of dynamic equilibrium with their watersheds. When conditions in the watershed change, the dynamic equilibrium is disturbed, and the river channel form will adjust to the new watershed condition. Water resources development, flood control structures, gravel mining, and urbanization have progressively changed conditions in the Alameda Creek watershed; only the headwater watersheds (above the dams) and Niles Canyon stream reaches retain any semblance of pre-Euro-American settlement conditions.

The SFPUC reservoirs served as catchments for sediments from the San Antonio and Arroyo Hondo/Calaveras Creek upper watersheds; however, these watersheds contribute a small percentage of the sediment supply to Alameda Creek. Extensive quarrying and urban development have also interrupted sediment flow to the creek. The recent removal of Niles and Sunol Dams in 2006 will allow for the release of small amounts of additional sediments to the lower portion of Alameda Creek over time. The ACFCWCD periodically removes accumulated sediments from the lower, channelized reach of Alameda Creek.

Surface Water Quality. Water quality in the headwater areas of Alameda Creek and its tributaries, above the water development facilities, has likely been minimally affected relative to natural conditions. However, urban development has introduced large quantities of urban runoff pollutants such as oil and grease, herbicides, and pesticides into Alameda Creek and its tributaries both north and east of the Sunol Valley (i.e., in the San Ramon and Livermore Valleys) and in the main stem of Alameda Creek downstream of SFPUC facilities. Increased runoff in the Arroyo de la Laguna watershed resulting from urbanization has also resulted in increased sediment generation. In addition, the diminution of flow in the creeks immediately downstream of the dams as a result of past and present projects causes water temperature and dissolved oxygen to rise more rapidly than under historical conditions. On occasion, the SFPUC also stores and mixes Tuolumne River water with local water in San Antonio Reservoir, and the State of California mixes South Bay Aqueduct water with local sources in Del Valle Reservoir, altering the water quality characteristics of the local watershed but not necessarily degrading water quality.

In summary, past construction and continued operation of the regional water system combined with urban development in the watershed have had a substantial adverse effect on water quality in Alameda Creek downstream of the SFPUC facilities.

Groundwater. As described in Section 5.4.4, primary groundwater resources in the Alameda Creek watershed are in the Livermore and Sunol Valleys, downstream of the major SFPUC facilities. Major groundwater withdrawal projects managed by the ACWD (in the Niles Cone) and Zone 7 Water Agency (in the Sunol and Arroyo de la Laguna groundwater basins) have been developed in the Pleasanton area, the Sunol Valley, and the Niles Cone. Groundwater withdrawal in these areas has lowered water tables and resulted in groundwater quality degradation. The ACWD and Zone 7 have implemented groundwater recharge projects in these areas to assist in restoring groundwater conditions.

Fisheries. Section 5.4.5 provides a detailed description of the existing condition of fishery resources in the Alameda Creek watershed, depicting the effects of past and present projects. Alameda Creek historically hosted a steelhead run, with spawning occurring in the upper reaches of the watershed. This steelhead run was eliminated over the past century by the placement of several obstructions to migration within the Alameda Creek channel. Major alterations to Alameda creek and its tributaries (including the channelization of the lower 12 miles of the creek for flood control; the construction of San Antonio, Calaveras, and Del Valle Reservoirs for water supply; and the construction of a concrete drop structure to stabilize the channel around the Fremont BART weir) have made spawning habitat within the watershed inaccessible for some returning anadromous fishes such as steelhead and Chinook salmon (Gunther et al., 2000). Construction and operation of dams, diversions, and other structures that function as fish migration barriers (e.g., the Sunol and Niles Dams and the grade control structure at the BART weir) have prevented anadromous fishes migrating into Alameda Creek and through Niles Canyon from reaching coldwater habitat farther upstream within the watershed (Gunther et al., 2000). The Sunol and Niles Dams were partially removed in September 2006, eliminating them as obstacles to fish passage. Despite the recent removal of these structures, steelhead can currently migrate upstream only as far as the BART weir.

The upper reach of Alameda Creek supports a reproductive population of resident rainbow trout. Arroyo Hondo, a tributary to Calaveras Creek upstream from Calaveras Reservoir, is known to contain self-sustaining populations of resident rainbow trout. Populations of resident rainbow trout have been reported above Calaveras Reservoir on several occasions since 1905, in Arroyo Hondo, Isabel Creek, and Smith Creek (Leidy, 1984; cited in ESA, 2005). Young-of-year trout have been observed in Stonybrook Creek and Sinbad Creek, tributaries to Alameda Creek (Gunther et al., 2000). There is some evidence that a native, locally adapted trout stock survives in the Alameda Creek watershed (Gunther et al., 2000).

Terrestrial Biology. Construction of the regional water system combined with urban development in the lower watershed has had a substantial adverse effect on terrestrial biological resources in the Alameda Creek watershed. The creation of reservoirs in the upper watershed of Alameda Creek and its major tributaries as part of the regional water system and other water systems resulted in the inundation of substantial areas of land. These areas were probably occupied by native grassland, chaparral and scrub, mixed evergreen forest, and riparian forest. However, development of the reservoirs has resulted in replacement of upland habitats with creation of riparian, wetlands and freshwater marsh habitat around the periphery of the reservoirs. The characteristics and extent of the wetlands and related habitats have varied historically due to changes in the operating levels of the reservoirs.

The lower watershed was historically occupied by grassland, oak woodland forest, and riparian forest. However, urban development, gravel mining, grazing, and flood control projects have affected much of the terrestrial biological resources of the lower watershed, except in Niles Canyon; at present, non-native grassland is the most common natural community on the SFPUC Alameda watershed. The current status of wildlife and natural communities is described in more detail in Section 5.4.6.

Recreational and Visual Quality. Changes in stream hydrology attributable to past and present projects have affected visual quality due to reduced flows in scenic areas of the watershed (i.e., Little Yosemite); in addition, water supply facilities, mining, flood control projects, and urbanization have changed the entire visual character of the lower reaches of Alameda Creek. Upstream of the dams on Alameda, Calaveras, and Del Valle Creeks, the watersheds retain much of their predevelopment visual character. The East Bay Regional Park District has enhanced recreational resources in the watershed by constructing trails and visitor facilities (including major park facilities at Del Valle Reservoir).

Potential Effects of Future Projects

The planned and reasonably foreseeable future projects in the watershed would have primarily beneficial effects on the environmental resources of the watershed. As described above, many of the proposed projects (shown as Projects AC-1, 1a, 1c, 2, 2a, 2b, 2c, 2d, 3, 4, 5, 6, and 8, and AP-1, 1a, 2, and 3 on Figure 5.7-3) would remove fish migration barriers from Alameda Creek and its major tributaries, enhance fish and riparian habitat, reduce sedimentation, and increase infiltration and retention of unnaturally high peak runoff resulting from urbanization. The proposed Chain of Lakes project (AC-1b) would provide recharge for Zone 7's Arroyo de la

Laguna groundwater basin and would both reduce peak flows and capture substantial quantities of sediments, thereby preventing their transport downstream. The Sunol Valley Aggregate Quarry project (AC-7) would continue current mining but would include a slurry cutoff wall that is expected to reduce seepage from Alameda and San Antonio Creeks to the quarry pits, thereby benefiting riparian habitats and fisheries. Project AC-9, the Apperson Ridge Quarry, would permit a hard-rock mine in the ridges in the upper end of the San Antonio Creek watershed. Depending on how this project is implemented, it could adversely affect water quality downstream, although implementation of conventional mitigation measures would likely mitigate water quality impacts to a less-than-significant level. Overall, the future cumulative projects would not substantially affect hydrology, geomorphology, water quality, groundwater, fisheries, riparian habitat, or visual quality/recreational resources.

Cumulative Effects and WSIP Contribution

Table 5.7-15 summarizes the effects of past and present projects, the impacts of the WSIP, the effects of probable future projects, and the combined impacts of the WSIP plus probable future projects on the Alameda Creek watershed. Past and present projects have substantially altered the hydrology, geomorphology, surface water quality, groundwater, fisheries, and terrestrial biology of this portion of the Alameda Creek watershed compared to pre-Euro-American settlement conditions. Visual and recreational resources have been moderately altered. The existing condition, which serves as the baseline for the analysis of the WSIP, reflects the substantial environmental changes that have occurred as a result of the past projects. Because past and present actions have drastically altered the Alameda Creek watershed, some of the environmental resources are more sensitive to small adverse changes than they would be if the watershed had remained relatively unaltered from pre-Euro-American settlement conditions.

TABLE 5.7-15
CUMULATIVE EFFECTS ON THE ALAMEDA CREEK WATERSHED

Resource	Effects of Past and Present Projects	Impacts of WSIP (prior to mitigation/ after mitigation)	Effects of Other Future Projects	Cumulative Impact (WSIP after mitigation + Future Projects)	WSIP Contribution Cumulatively Considerable?
Hydrology	SA	SU/SU[a]	N/A	N/A	No
Geomorphology	SA	LS	LS	LS	No
Surface Water Quality	SA	LS	LSM	LS	No
Groundwater	SA	LS	LS	LS	No
Fisheries	SA	PSM/LS[a]	B	LS	No
Terrestrial Biology	SA	PSM/LS[a]	B	LS	No
Recreational/Visual Quality	MA	LS	LS	LS	No

[a] Pertains to impacts on Alameda Creek downstream of the diversion dam. No other future project would add to this impact.

B = Beneficial impact
LS = Less than Significant, no mitigation required
LSM = Less than Significant with standard mitigation
PSM/LS = Potentially Significant impact, but reduced to Less than Significant with mitigation
SU = Significant, Unavoidable impact, even with implementation of mitigation measures
N/A = Not Applicable
SA = Substantially Altered
MA = Moderately Altered

As described in Section 5.4, the WSIP would have a less-than-significant adverse effect on geomorphology, surface water quality, and groundwater levels. However, because the proposed program would substantially reduce and alter flow patterns in Alameda Creek below the diversion dam, the WSIP itself could have significant adverse effects on hydrology, fisheries, and terrestrial biological resources in this stretch of the creek. With the exception of the hydrological impact in Alameda Creek below the diversion dam (and below the Calaveras Creek confluence), which would remain significant even with mitigation, the program impacts would be reduced to a less-than-significant level with implementation of mitigation measures described in Chapter 6 (Measures 5.4.5-3a, Minimum Flows for Resident Trout on Alameda Creek; 5.4.5-3b, Alameda Diversion Dam Restrictions or Fish Screens; 5.4.6-1, Compensation for Impacts on Terrestrial Biological Resources; and 5.4.6-3, Operational Procedures for Calaveras Dam Releases). As described above, most other foreseeable future projects are likely to have beneficial or less-than-significant impacts on geomorphology, surface water quality, groundwater levels and quality, fisheries, terrestrial biological resources, and recreational and visual resources in the Alameda Creek watershed.

The Apperson and Sunol quarry projects could create adverse water quality effects downstream in San Antonio Creek and Reservoir, but compliance with applicable water quality regulations coupled with implementation of conventional mitigation measures is expected to reduce these efforts to less than significant. Similarly, implementation of the physical components of many of the watershed and fish passage improvement projects could result in temporary increases in sedimentation and short-term water quality effects. Such short-term impacts are typically mitigated to a less-than-significant level by project-specific mitigation measures and best management practices. In the long term, these improvement projects, in combination with the WSIP fishery releases from Calaveras Reservoir, would result in beneficial cumulative effects on geomorphology, surface water quality, groundwater, fisheries, terrestrial biological resources, and recreational/visual resources and would likely offset any adverse effects from the proposed quarry projects.

Implementation of the WSIP would substantially reduce flows in the reach of Alameda Creek from the diversion dam to below its confluence with Calaveras Creek compared to existing conditions (Impact 5.4.1-2). This impact was determined to be significant and unavoidable, even with implementation of Measure 5.4.1-2 (Diversion Tunnel Operation) and bypass flows included as part of the protective measures in the Calaveras Dam Replacement project (SV-2). However, no other past, present, or future projects were identified that would further reduce the stream flow in this reach of Alameda Creek, and some of the projects listed in Table 5.7-13 could enhance the flow. Thus, there would be no adverse cumulative impact on hydrology associated with past, present, and future projects, and the WSIP's contribution to the cumulative impact on hydrology is not applicable.

Due to agreements and ongoing actions regarding the implementation of fish passage improvement projects in lower Alameda Creek (as described in Section 5.4.5 of the PEIR), it is possible that steelhead will be restored to the Alameda Creek watershed reaches upstream of the BART weir by 2030. More specifically, steelhead may be restored during construction or operation of the Calaveras Dam Replacement project (SV-2) under the WSIP. In response to this scenario, the SFPUC has modified the WSIP program description—mainly that of the Alameda Creek Fishery Enhancement (SV-1) and Calaveras Dam Replacement (SV-2) projects—to incorporate protective measures for steelhead in the event that man-made barriers in Alameda Creek have been successfully removed and that steelhead migration, spawning, and rearing have been restored in Alameda Creek above the BART weir. The protective measures incorporated into the operations of the Calaveras Dam Replacement project would address future-occurring steelhead and would provide for a range of minimum bypass flows and releases at the Alameda Creek Diversion Dam and Calaveras Dam to support steelhead migration, spawning, and rearing. The program as revised, and with implementation of mitigation measures identified in the PEIR, which together include minimum bypass flows to support the various life stages and habitat requirements for steelhead, would have a less-than-significant contribution to cumulative impacts on fishery resources in the Alameda Creek watershed. Please refer to Chapter 14, Section 14.9, of the PEIR for further discussion.

In summary, when the WSIP and future projects are considered together, none of their cumulative effects would rise to a level of significance. Even though past and present projects have moderately to substantially altered the environmental resources along this reach of Alameda Creek, the cumulative impacts of the WSIP after mitigation combined with the effects of future projects would not result in a substantial or noticeable change from the existing condition.

As stated previously, the WSIP's impacts on fisheries, terrestrial biology, and recreational/visual resources would be substantially reduced with implementation of Measures 5.4.5-3a, 5.4.5-3b, 5.4.6-1, and 5.4.6-3. Since the implementation of future projects would be expected to be beneficial to fisheries, terrestrial biology, and recreational/visual resources, the combined cumulative impacts on these resources with the WSIP after mitigation would be considered less than significant. Because there are no significant cumulative impacts, no mitigation measures beyond Measures 5.4.1-2, 5.4.5-3a, 5.4.5-3b, 5.4.6-1, and 5.4.6-3 would be necessary.

5.7.4 Cumulative Effects on San Francisco Peninsula Streams and Reservoirs

5.7.4.1 Relevant Projects

Past and present projects have affected streams, stream flow, and related environmental resources on the San Francisco Peninsula. The WSIP and other foreseeable future projects could also affect streams, stream flow, and related environmental resources. Foreseeable future projects, other than facility improvement projects included in the WSIP, are listed in **Table 5.7-16** and shown in **Figure 5.7-4**. They include both SFPUC and non-SFPUC projects.

San Mateo Creek Watershed

Past and Present Projects

Components of the SFPUC regional water system have substantially affected environmental quality in the San Mateo Creek watershed (shown in Section 5.5, Figure 5.5.1-1). Although built in the past, these components continue to operate and thus affect current conditions. These and other past projects and activities that affect the San Mateo Creek watershed include:

- San Andreas Reservoir
- Crystal Springs Reservoir
- Creek modifications in the lower watershed
- Urban development in the lower watershed
- Jefferson Martin Transmission Line

San Andreas Dam impounds San Andreas Reservoir and was built in 1870. Upper and Lower Crystal Springs Dams were built in 1877 and 1890 and together impound Crystal Springs Reservoir. The dams were built by the Spring Valley Water Company and later purchased by the CCSF. Various improvements to the reservoirs and associated conveyance and water treatment facilities have been made to accommodate increased demand for water and more stringent drinking water standards.

Land use in the San Mateo Creek watershed (which drains to San Andreas and Crystal Springs Reservoirs) has not changed much from conditions that existed prior to Euro-American settlement. The CCSF owns most of the land that drains to the two reservoirs; this land is almost

TABLE 5.7-16
FUTURE PROJECTS IN THE PENINSULA WATERSHED CONSIDERED IN THE CUMULATIVE ANALYSIS

Cumulative Project No.	Jurisdiction and/or Project Sponsor	Project Name	Project Description	Affected Water Body/ Watershed	Potential Cumulative Impact Areas	Status
OTHER SFPUC PROJECTS						
PP-1	SFPUC	Peninsula Watershed Management Plan (WMP)[a]	Provides a policy framework for the SFPUC to make consistent decisions about the activities, practices, and procedures that are appropriate on SFPUC watershed lands. Included in the plan are several management actions designed to implement the established goals and policies for water quality, water supply, and ecological enhancement.	CCSF-owned lands in the Peninsula watershed, including portions of San Mateo Creek watershed and Pilarcitos Creek watershed	Beneficial impacts on terrestrial biological resources, fisheries, and surface water quality	Plan adopted in 2001, implementation ongoing
PP-1a	SFPUC	Peninsula Watershed Habitat Conservation Plan (sub-project of Peninsula WMP)[a]	Develop a comprehensive, multi-species habitat conservation plan for species of concern in the watershed.	CCSF-owned lands in the Peninsula watershed	Beneficial impacts on biological resources	Phase 2 – indicates implementation within 10 years of adoption of the Peninsula WMP
PP-2	SFPUC	Watershed and Environmental Improvement Program(WSIP-related activity)	Protect and restore lands and natural resources critical to the operation of the SFPUC regional water system. The program could include ecosystem and habitat protection, improvements, and restoration and would address such issues as fish passage, riparian habitat degradation, and sensitive species recovery.	CCSF-owned lands in the Peninsula watershed	Beneficial impacts on terrestrial biological resources, fisheries, and surface water quality	Program funded but still under development; includes implementation of actions in the WMP
PP-3	SFPUC	Habitat Reserve Program (WSIP-related activity)	Develop and enhance wetlands and other habitats, to be applied toward mitigation of impacts on biological resources due to implementation of the WSIP.	CCSF-owned lands in the Alameda and Peninsula watersheds; also includes locations in the Tuolumne River watershed	Beneficial long-term impacts on terrestrial biological resources, fisheries, and surface water quality, but short-term construction impacts	Program in development, with environmental review scheduled from 2007 to 2008 and implementation between 2008 and 2010

TABLE 5.7-16 (Continued)
FUTURE PROJECTS IN THE PENINSULA WATERSHED CONSIDERED IN THE CUMULATIVE ANALYSIS

Cumulative Project No.	Jurisdiction and/or Project Sponsor	Project Name	Project Description	Affected Water Body/ Watershed	Potential Cumulative Impact Areas	Status
NON-SFPUC PROJECTS						
PC-1	San Mateo County	Lower Crystal Springs Dam Road Reconstruction	Reconstruct road over Crystal Springs Dam	Crystal Springs Reservoir/San Mateo Creek	Minor adverse impacts on water quality during construction period	Unknown.
PC-2	San Mateo County Resource Conservation District (on behalf of the Pilarcitos Creek Restoration Workgroup)	Pilarcitos Creek Integrated Watershed Management Plan[b]	Intended purpose is to determine how to more effectively manage the competing beneficial uses of water from Pilarcitos Creek and promote balanced solutions that satisfy environmental, public health, recreational, and economic interests.	Pilarcitos Creek Watershed	Beneficial effects on fisheries, water quality, terrestrial biology	Currently under development; San Mateo Resource Conservation District sent out a Request for Proposals in November 2006
PC-3	City of San Mateo	San Mateo Creek Mouth Improvements	Consists of raising the north and south banks at the mouth of San Mateo Creek to meet requirements of the Federal Emergency Management Agency.	San Mateo Creek	Potential impact on hydrology (flood control) and biological resources	Needs funding

[a] SFPUC, *Peninsula Watershed Management Plan*, 2001.
[b] San Mateo Resource Conservation District, Personal telephone communication between Kelly Nelson, of San Mateo Resource Conservation District, and Kelly White, of ESA. November 22, 2006.

entirely undeveloped and public access is very limited. The CCSF's watershed lands in the San Mateo Creek watershed are managed in accordance with the *Peninsula Watershed Management Plan* (Peninsula WMP), as described in Sections 4.2 and 5.2 of this PEIR. In 2006, Pacific Gas and Electric Company constructed an electrical power transmission line, the Jefferson Martin Transmission Line, along the eastern side of Crystal Springs Reservoir.

In the last 150 years, land use in the portion of the creek's watershed below Lower Crystal Springs Dam has been almost completely converted to urban uses. With the exception of a two-mile-long reach immediately below the dam, the San Mateo Creek channel has been progressively modified over many years to accommodate urban runoff and prevent flooding of lands adjacent to the creek. In the last five years, the City of San Mateo and Caltrans have completed several projects that enable the creek to convey the 100-year flood flows[4] without damage. These projects include the construction of two sections of floodwall near the Highway 101 crossing and replacement of the culverts at Norfolk Street and Highway 101 (Chan, 2006).

Future Projects

Reasonably foreseeable future projects by the SFPUC or others that could affect stream flow or related resources in the San Mateo Creek watershed are shown in Table 5.7-16. They include the Peninsula Watershed Habitat Conservation Plan, the Watershed and Environmental Improvement Program, and the Habitat Reserve Program. The SFPUC is preparing the habitat conservation plan for the watershed lands on the Peninsula, pursuant to the Federal Endangered Species Act. It will specify the actions necessary to protect listed species that are present within Peninsula watershed lands. Even though the Peninsula WMP is currently being implemented, it is included in the list of future SFPUC projects because it encompasses future sub-projects and activities. In addition, the SFPUC would conduct routine maintenance on its facilities in the Peninsula watershed.

One future project by another agency has been identified that would affect the upper San Mateo Creek watershed. San Mateo County plans to reconstruct the roadway that crosses Crystal Springs Dam. In the lower San Mateo Creek watershed, one project has been identified—the City of San Mateo's proposed project to raise the levees near the mouth of the creek (Chan, 2006). This flood control project would be designed to meet the requirements of the Federal Emergency Management Agency, but funding for the project has yet to be obtained, and the construction schedule for the project is unknown. Implementation of the CS/SA Transmission (PN-2), Lower Crystal Springs Dam (PN-4), and Pulgas Balancing Reservoir (PN-5) projects are considered part of the WSIP and are therefore not included in the list of cumulative projects.

Pilarcitos Creek Watershed

Past and Present Projects

Components of the SFPUC regional water system have substantially affected environmental quality in the Pilarcitos Creek corridor. Although built in the past, these components continue to

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4 The 100-year flood is the flood estimated to occur once every 100 years.

PP-1 Other SFPUC Project

PC-1 Non-SFPUC Project

CCSF Ownership (also project boundary for PP-1, PP-2, PP-3)

Pilarcitos Creek Watershed Boundary (also project boundary for PC-2)

See Table 5.7-16 for names and descriptions of projects

Cumulative Project No.	Plan/Project Name
OTHER SFPUC PROJECTS	
PP-1	Peninsula Watershed Management Plan (WMP)
PP-1a	Peninsula Watershed Habitat Conservation Plan (sub-project of Peninsula WMP)
PP-2	Watershed and Environmental Improvement Program (WSIP-related activity)
PP-3	Habitat Reserve Program (WSIP-related activity)
NON-SFPUC PROJECTS	
PC-3	Lower Crystal Springs Dam Road Reconstruction
PC-2	Pilarcitos Creek Integrated Watershed Management Plan
PC-3	San Mateo Creek Mouth Improvements

SOURCE: ESA + Orion

SFPUC Water System Improvement Program . 203287

Figure 5.7-4 (Revised)
Future Projects in the Peninsula Watershed Considered in the Cumulative Analysis

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operate and thus affect current conditions. These and other projects and activities that affect Pilarcitos Creek include:

- Pilarcitos Reservoir
- Stone Dam
- Pilarcitos wells
- Highway 92
- Urban and agricultural development in the lower watershed

The Spring Valley Water Company built Pilarcitos Reservoir and Stone Dam in 1864 and 1871, respectively. They were subsequently purchased by the CCSF. The SFPUC uses Pilarcitos Reservoir to store and divert water from the Pilarcitos Creek watershed to the San Mateo Creek watershed. Stone Dam is used to divert water to the San Mateo Creek watershed and to the Coastside County Water District (Coastside CWD).

Land use in the Pilarcitos Creek watershed draining to Pilarcitos Reservoir and above Stone Dam has not changed much from conditions that existed prior to Euro-American settlement. The CCSF owns most of the Pilarcitos Creek watershed lands; these lands are undeveloped, and public access is very limited. The CCSF's lands in the Pilarcitos Creek watershed are managed in accordance with the Peninsula WMP, as described in Sections 4.2 and 5.2 of this PEIR.

Most land in the Pilarcitos Creek watershed downstream of Pilarcitos Reservoir remains undeveloped, but some floodplain lands near Half Moon Bay are used for agriculture, and portions of the watershed near the creek's mouth are used for urban purposes. Pilarcitos Creek itself has been adversely affected by the construction and improvement of Highway 92, which parallels about five miles of the creek, and by adjacent urban and agricultural development. A recent Caltrans project restored fish passage at two locations along the Highway 92 alignment. The Coastside CWD obtains some of its water supply from wells in the Pilarcitos Creek corridor.

Future Projects

Reasonably foreseeable future projects by the SFPUC or others that could affect stream flow or related resources in the Pilarcitos Creek watershed are shown in Table 5.7-16. They include the Peninsula Watershed Habitat Conservation Plan, the Watershed and Environmental Improvement Program, the Habitat Reserve Program, and the Peninsula WMP.

As shown in Table 5.7-16, several agencies in addition to the SFPUC have expressed interest in improving Pilarcitos Creek and its migratory fishery. The San Francisco Bay Regional Water Quality Control Board and CDFG commissioned a creek restoration plan in 1996 (Phillip Williams and Associates, 1996). The San Mateo Resource Conservation District is also preparing an integrated watershed plan for the Pilarcitos Creek watershed (Nelson, 2006).

Coastside CWD has evaluated the possibility of installing more wells in the Pilarcitos Creek corridor. Although the installation of additional wells was shown to be technically and economically feasible, Coastside CWD is not currently planning to move forward with the project (Schmidt, 2006).

5.7.4.2 Cumulative Impacts

Significance Criteria

The CCSF has not formally adopted significance standards for impacts related to cumulative effects, but generally considers that implementation of the proposed program would have significant cumulative impacts if it were to:

- Have impacts that would be individually limited, but cumulatively considerable ("cumulatively considerable" means that the incremental effects of a project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)

Impacts associated with the proposed program that would be "individually limited" are based on the impact analyses presented in Section 5.5 and the significance criteria presented in that section for the various environmental resource areas.

Approach to Analysis and Impact Summary

Cumulative impacts are analyzed based on the CEQA guidance and approach described above in Section 5.7.1. Cumulative impacts are discussed below, and impact significance determinations are summarized in **Table 5.7-17**.

TABLE 5.7-17
SUMMARY OF CUMULATIVE IMPACTS IN THE PENINSULA WATERSHED RELATED TO WSIP WATER SUPPLY AND SYSTEM OPERATIONS

	Significance Determination						
Impact	Hydrology	Geomorphology	Surface Water Quality	Groundwater	Fisheries	Terrestrial Biology	Recreation / Visual Quality
5.7.4-1: Cumulative effects on the San Mateo Creek watershed	LS	LS	LS	LS	LS	LS	LS
5.7.4-2: Cumulative effects on the Pilarcitos Creek watershed	LS	LS	LS	LS	LS	LS	LS

NOTE: Significance determinations presented in this table assume implementation of all mitigation measures as they are presented in Chapter 5, Section 5.5, and described in Chapter 6.

LS = Less than Significant, no mitigation required

Because impacts on stream flow and reservoir levels are related to effects on other environmental resources (see Section 5.1), the cumulative impacts in this section are organized by geographic area (i.e., San Mateo Creek watershed and Pilarcitos Creek watershed) rather than by environmental topic in order to characterize the overall effects on the affected water body. In determining the significance of cumulative impacts, it is assumed that mitigation measures identified in Section 5.5 and described in Chapter 6 would be implemented, and any residual effects after mitigation are considered in combination with the effects of past, other current, and probable future projects. The incremental contribution of the program's residual effects to the overall cumulative impact is then examined to determine whether it would be "cumulatively considerable."

San Mateo Creek Watershed

Impact 5.7.4-1: Cumulative effects on the San Mateo Creek watershed.

Effect of Past and Present Projects

Hydrology. Components of the SFPUC regional water system in the San Mateo Creek watershed, including construction and operation of dams and reservoirs, have substantially altered the hydrology of San Mateo Creek. Construction of Lower Crystal Springs Dam separated the lower reaches of San Mateo Creek from about 80 percent of its tributary watershed in all but the wettest months of wet years. Under pre-Euro-American settlement conditions, some flow from the upper watershed probably reached the lower reaches in all but the driest months of the driest years. Under current conditions, releases from Lower Crystal Springs Dam occur only in the wettest months of wet years. The average annual release of water from the upper watershed to the lower reaches of San Mateo Creek is about one-tenth of the discharge that would occur if Crystal Springs and San Andreas Reservoirs did not exist.

Most of the time, flow into the reach of San Mateo Creek below Lower Crystal Springs Dam consists of seepage around the dam, infiltration from groundwater and, during and after storms, surface water runoff. Urban development in the watershed of the lower creek has probably increased the volume and speed of runoff into the creek compared to historical conditions. The replacement of vegetation and permeable soils with impermeable roofs, roads, and parking lots increases the volume of runoff in a given storm, and the replacement of natural tributary drainage channels with underground storm sewers reduces the time stormwater runoff takes to get to the mainstream channel.

In summary, past construction and continued operation of the regional water system combined with urban development in the lower watershed has had a substantial adverse effect on the hydrology of San Mateo Creek. Creek flow has been substantially reduced from historical conditions, and the creek's flow regime is managed for water supply in the upper watershed and for flood control and storm drainage purposes in the lower watershed.

Geomorphology. Crystal Springs and San Andreas Reservoirs and their associated diversions have substantially altered the magnitude, duration, and frequency of flood flows, which are the predominant influence on channel form. Currently, the 100-year return-period flow in San Mateo Creek immediately below Lower Crystal Springs Dam is estimated to be 1,320 cfs and would consist of a release from the dam and uncontrolled flow over the spillway. Under undeveloped conditions, it is estimated that the 100-year return-period flow in the creek was between 4,000 and 5,000 cfs. For more than 100 years, lower San Mateo Creek has been adjusting its channel form in response to the flow regime created by the regional water system and the lack of bedload transport from the upper watershed.

Channel adjustment in response to the altered flow regime is primarily occurring in the first two miles of San Mateo Creek below Lower Crystal Springs Dam. The channel in this reach of creek retains it natural form, much of it lying within a canyon. Below this reach, the creek channel has been modified to accommodate and accelerate the downstream movement of flood flows to San Francisco Bay. The creek consists of an earthen channel, with concrete floodwalls in places, and two long culverts under El Camino Real and Highway 101.

In summary, past construction and continued operation of the regional water system and channel modification to reduce flood hazards has had a substantial adverse effect on the geomorphology of San Mateo Creek. Channel-forming peak flows in the creek are substantially smaller than under historical conditions, the reservoirs prevent the downstream movement of bedload, and the lower reaches of the creek are confined within a flood control channel.

Surface Water Quality. The creation of reservoirs in the upper watershed as part of the regional water system and the blending of local and Tuolumne River water in the reservoirs have altered the chemical characteristics of water in the upper San Mateo Creek watershed. Although the water has been altered from its historical character, water quality in the upper watershed remains very good and is sufficient to support all designated beneficial uses.

Water quality in the lower reaches of San Mateo Creek has been adversely affected by the hydrologic changes attributable to the regional water system. Most of the time under the existing condition, flow in the creek below Lower Crystal Springs Dam is limited to seepage around the dam. Water quality in the creek below the dam site was undoubtedly better under historical conditions, since at least some flow reached the lower creek from the upper watershed in all but the driest months of the driest years. When no water reaches the creek from its upper watershed, detention time in the creek becomes extended and water is confined in pools, which causes water temperature to rise and dissolved oxygen levels to decline.

Water quality in the lower reaches of the creek has also been adversely affected by the discharge of urban runoff into the creek. Rainfall on roofs, streets, and parking lots washes accumulated debris and chemicals into the city storm sewers, which drain to San Mateo Creek. Water in urban creeks, such as the lower reaches of San Mateo Creek, typically contains higher levels of metals, plant nutrients, and pesticides than creeks in undeveloped areas.

In summary, past construction and continued operation of the regional water system combined with urban development in the lower watershed has had a substantial adverse effect on water quality in lower San Mateo Creek. Creek flow has been substantially reduced from historical conditions; this reduced flow coupled with the discharge of polluted urban runoff into the creek has caused water quality to deteriorate.

Groundwater. The creation of reservoirs in the upper watershed as part of the regional water system has raised groundwater levels in the vicinity of the reservoirs. Urban development overlies much of the lower San Mateo Creek watershed. Groundwater quality has probably declined relative to historical conditions because chemicals associated with residential, commercial, and industrial activities have percolated into the shallow groundwater basin.

Fisheries. San Mateo Creek historically supported resident rainbow trout populations. Small numbers of anadromous steelhead may have used the creek downstream of Lower Crystal Springs Dam for spawning and juvenile rearing habitat. The construction of reservoirs between 1860 and 1890 inundated instream fish habitat, created a complete barrier to fish migration, and excluded steelhead from the upper watershed. The reduction in flow in lower San Mateo Creek as a result of the regional water system has reduced the extent and quality of habitat for resident trout and steelhead in the canyon below Lower Crystal Springs Dam.

Downstream of the canyon, channel modifications designed to reduce flood hazards have introduced barriers to fish migration. Channel modifications and the discharge of contaminants in urban runoff have greatly reduced the quality of instream habitat.

In summary, past construction and continued operation of the regional water system combined with urban development in the lower watershed has had a substantial adverse effect on fish habitat in San Mateo Creek. The current extent and quality of fish habitat is reduced relative to historical conditions.

Terrestrial Biology. Construction of the regional water system combined with urban development in the lower watershed has had a substantial adverse effect on terrestrial biological resources in the San Mateo Creek watershed. The creation of reservoirs in the upper watershed of San Mateo Creek as part of the regional water system inundated about 2.5 square miles of land, which was probably occupied by native grassland, chaparral and scrub, mixed evergreen forest, and riparian forest. The lower watershed was occupied grassland, mixed evergreen forest, and riparian forest and, close to San Francisco Bay, tidal salt marsh. Urban development has destroyed most of the terrestrial biological resources of the lower watershed, except in the canyon immediately downstream of Lower Crystal Springs Dam. However, development of the reservoirs has resulted in the replacement of upland habitats with riparian, wetland, and freshwater marsh habitat around the periphery of the reservoir. The characteristics and extent of the wetlands and related habitats have varied historically due to the changes in operating levels of Crystal Springs Reservoir.

Recreation and Visual Quality. Construction of regional water system components combined with urban development in the lower watershed has had a substantial effect on visual quality in the San Mateo Creek watershed. When the components of the regional water supply system were built, parts of the natural landscape in the upper San Mateo Creek watershed were inundated to form artificial lakes. A muddy, vegetation-free zone extending around the perimeter of the lakes is inundated at times and becomes visible when the reservoir is drawn down. These artificial lakes have a different scenic value than the natural grassland and forest they replaced. Similarly, the grassland, riparian forest, and wetlands of the lower San Mateo Creek watershed have been largely converted to an urban landscape, which has less scenic value than the natural landscape it replaced.

Potential Effects of Future Projects

The SFPUC's Peninsula Watershed Habitat Conservation Plan, Watershed and Environmental Improvement Program, Habitat Reserve Program, and Peninsula WMP would have beneficial impacts on the biological resources in the upper San Mateo Creek watershed. The only other identified future project that could adversely affect the upper San Mateo Creek watershed is San Mateo County's planned reconstruction of the roadway on Lower Crystal Springs Dam. It is expected that mitigation measures implemented during construction of the project would avoid significant impacts to environmental resources. Ongoing repair and maintenance activities for the SFPUC's water supply facilities will be necessary in the future, but these activities would be conducted consistent with management guidelines in the Peninsula WMP as well as in compliance with environmental regulations and the recently adopted Water Enterprise Environmental Stewardship Policy (SFPUC, 2006). Consequently, future projects would not be expected to have a significant adverse effect on hydrology, geomorphology, surface water quality, groundwater levels and quality, fisheries, terrestrial biological resources, or recreation and visual resources in the upper San Mateo Creek watershed.

Urban development and redevelopment is likely to continue in the lower San Mateo Creek watershed in accordance with city and county general plans. The creek channel may be further modified to reduce flooding in the future. One future flood control project has been identified. Although current regulations limit the environmental impacts of flood reduction projects and urban development/redevelopment compared to levels permitted in the past, some minor incremental impacts are likely to result from the increasingly dense urban environment and a more confined creek.

Cumulative Effects and WSIP Contribution

Table 5.7-18 summarizes the effects of past and present projects, the impacts of the WSIP, the effects of probable future projects, and the combined impacts of the WSIP plus probable future projects on the San Mateo Creek watershed. Past and present projects have substantially altered the hydrology, geomorphology, surface water quality, groundwater, fisheries, and terrestrial biology of the watershed compared to pre-Euro-American settlement conditions. Visual and recreational resources have been moderately altered. The existing condition, which serves as the baseline for the analysis of the WSIP, reflects the substantial environmental changes that have occurred as a result of the past projects. Because past and present actions have altered the watershed, some of the watershed's environmental resources are more sensitive to small adverse changes than they would be if the reach had remained relatively unaltered from pre-Euro-American settlement conditions.

As described in Section 5.5, the WSIP would have a less-than-significant adverse impact on hydrology, geomorphology, surface water quality, groundwater, and recreational and visual resources. It would have a less-than-significant impact on terrestrial biological resources after mitigation (Measures 5.5.6-1a, Adaptive Management of Freshwater March and Wetlands at Upper and Lower Crystal Springs Reservoirs; 5.5.6-1b, Compensation for Impacts on Terrestrial Biological Resources; and 5.5.6-1c, Compensation for Serpentine Seep-Related Special-Status Plants). Most aspects of the WSIP would have less than significant effects on fisheries in

TABLE 5.7-18
CUMULATIVE EFFECTS ON THE SAN MATEO CREEK WATERSHED

Resource	Effects of Past and Present Projects	Impacts of WSIP (prior to mitigation/after mitigation)	Effects of Future Projects	Cumulative Impacts of WSIP (after mitigation) + Future Projects	WSIP Contribution Cumulatively Considerable?
Hydrology	SA	LS	LS	LS	No
Geomorphology	SA	LS	LS	LS	No
Surface Water Quality	SA	LS	LS	LS	No
Groundwater	SA	LS	LS	LS	No
Fisheries	SA	PSU[a]/unknown	LS	B/LS	No
Terrestrial Biology	SA	PSM/LS	B	LS	No
Recreation/Visual Quality	MA	LS	LS	LS	No

[a] Pertains to potential inundation of trout spawning habitat in tributaries to Crystal Springs Reservoir. No other future project would add to this impact.

B = Beneficial impact
LS = Less than Significant, no mitigation required
PSM/LS = Potentially Significant but reduced to Less-than-Significant with mitigation
PSU = Potentially Significant and Unavoidable
SA = Substantially Altered
MA = Moderately Altered

the San Mateo Creek watershed except one. Increasing the water level in Crystal Springs Reservoir would inundate trout spawning habitat in segments of two creeks tributary to the reservoir. It is expected that mitigation to provide compensatory replacement habitat will be feasible, but until site-specific evaluation of this measure is completed (as part of the project-level CEQA review now in progress for the Lower Crystal Springs Replacement Project, PN-4), this impact is considered potentially significant and unavoidable. No other future project would add to this impact, thus, there is no cumulative impact. As described in the previous section, probable future projects would have overall beneficial effects and possibly some less-than-significant impacts associated with specific projects on hydrology, geomorphology, surface water quality, groundwater, fisheries, terrestrial biological resources, and recreational and visual resources.

When the WSIP and foreseeable future projects are considered together, none of their cumulative effects would rise to a level of significance. Even though past and present projects have moderately to substantially altered the environmental resources along San Mateo Creek, the cumulative impacts of the WSIP after mitigation combined with the effects of future projects would not result in a substantial or noticeable change from the existing/historical condition. Because there are no significant cumulative impacts, no mitigation measures beyond Measures 5.5.6-1a, 5.5.6-1b, and 5.5.6-1c would be necessary.

Pilarcitos Creek Watershed

Impact 5.7.4-2: Cumulative effects on the Pilarcitos Creek watershed.

Effect of Past and Present Projects

Hydrology. Construction and operation of SFPUC regional water system components have substantially altered the hydrology of Pilarcitos Creek. The construction of Pilarcitos Reservoir and Stone Dam effectively reduced the size of the Pilarcitos Creek watershed by about 25 percent. Runoff from the 25 percent of the watershed above Stone Dam is diverted to the San Mateo Creek watershed and to Coastside CWD rather than flowing down Pilarcitos Creek to the Pacific Ocean.

Prior to construction of Pilarcitos Reservoir and its associated diversion, flow in the reach of Pilarcitos Creek between the reservoir and the future Stone Dam site was likely considerable in the rainy months. Flow probably declined through the summer and may have dried up completely at times. Currently, the reservoir and diversion reduce flow in the rainy months relative to historical conditions. Releases from the reservoir through the summer to supply water to Coastside CWD probably increase flow relative to unimpaired conditions.

Prior to construction of Stone Dam, flow in the reach of Pilarcitos Creek below the dam site was likely considerable in the rainy season and minimal in the dry summer months. Most of the time and under the existing condition, flow in the creek immediately below Stone Dam consists only of leakage and seepage around the dam. The creek gains flow from tributaries beginning a few hundred yards below the dam. In wet months of wet years, water occasionally spills over Stone Dam to Pilarcitos Creek and flows to the Pacifica Ocean.

Flow in Pilarcitos Creek has also been affected by the installation of wells in the downstream end of the creek corridor. Creeks in rocky terrain often flow over beds of sand and gravel that have been deposited by the creek over time. The deposits of sand and gravel are saturated with water and are hydraulically connected to the overlying stream. The groundwater flowing in these deposits is referred to as underflow. Coastside CWD operates several wells close to the lower reaches of Pilarcitos Creek that pump water from the underflow. Because surface flow in the creek and underflow are hydraulically connected, operation of the wells has the potential to reduce stream flow.

Coastside CWD obtains an average of 53 million gallons per year, 3 percent of its water supply, from its wells adjacent to Pilarcitos Creek. Operation of the wells is only permitted between November and March, when creek flow is at its seasonal maximum, and the total extraction volume is limited to 117 million gallons per year (Coastside CWD, 2006). Average annual flow in Pilarcitos Creek is 3.7 billion gallons per year (USGS, 2006). Because of the small quantities involved and the prohibition on pumping in the low-flow months, the wells have a minimal effect on the hydrology of Pilarcitos Creek.

Geomorphology. As noted above, peak or flood flows are the predominant influence on channel geomorphology. Pilarcitos Reservoir and Stone Dam and their associated diversions have substantially altered the magnitude, duration, and frequency of flood flows in the reaches of the creek downstream of these structures. Peak flows in Pilarcitos Creek between Pilarcitos Reservoir and Stone Dam have been substantially reduced. Peak flows in Pilarcitos Creek immediately below Stone Dam have also been substantially reduced, but the effects diminish in a downstream direction as tributaries add flow to the main stem of the creek.

In addition to reducing peak flows, Pilarcitos and Stone Dams also prevent the downstream movement of sediment. For more than 100 years, Pilarcitos Creek has been adjusting its channel form in response to the flow regime created by the regional water system and the lack of bedload transport from the upper watershed.

Surface Water Quality. Pilarcitos Reservoir and Stone Dam and their associated diversions have affected the flow regime in Pilarcitos Creek, which has in turn affected water quality. Reductions in stream flow typically result in increased water temperature. Storage in reservoirs increases water temperature in the upper portion of the water column and preserves a pool of cool water in the summer. Storage may also reduce dissolved oxygen concentrations, particularly near the bottom of reservoirs. Although it has been altered from its historical character, water quality in the Pilarcitos Creek watershed remains good and is sufficient to support all designated beneficial uses. Some deterioration in water quality has probably occurred in the farthest downstream reaches of the creek due to runoff from agricultural fields and urban areas.

Groundwater. The creation of reservoirs in the upper watershed as part of the regional water system has raised groundwater levels in the vicinity of the reservoirs. Urban development and agricultural fields overlie the farthest downstream reaches of the Pilarcitos Creek watershed. Groundwater quality has probably declined in this area relative to historical conditions because chemicals associated with residential and agricultural activities have percolated into the shallow groundwater basin.

Fisheries. Construction of Pilarcitos Reservoir in 1864 inundated instream fish habitat in the upper reaches of Pilarcitos Creek, and construction of Stone Dam in 1871 created a complete barrier to fish migration into the upper watershed. With Stone Dam in place, anadromous salmonids were excluded from the upper reaches of the creek, which led to the development of two separate fish populations: resident trout in the creek above Stone Dam and anadromous salmonids below the dam. The current summertime releases from Pilarcitos Reservoir to Pilarcitos Creek to supply water to Coastside CWD probably increase flow relative to unimpaired conditions and thus may benefit resident trout in the reach of the creek between Pilarcitos Reservoir and Stone Dam.

The reduction in flow in Pilarcitos Creek below Stone Dam as a result of the regional water system has reduced the extent and quality of habitat for resident trout and steelhead. In addition to these adverse effects on fish habitat, fish passage may be limited at times by road culverts. The discharge of sediment into the creek due to highway maintenance and agricultural activities has degraded the quality of spawning habitat.

Terrestrial Biology. Construction of the regional water system combined with urban development and agricultural activities in the lower watershed has had an adverse effect on terrestrial biological resources in the upper Pilarcitos Creek watershed. The creation of Pilarcitos Reservoir inundated upland, riparian, and other wetland habitats along the historical creek channel, but resulted in the creation of riparian, freshwater marsh, and other wetlands around the periphery of the reservoir. Operation of the regional water system has increased summertime flows in Pilarcitos Creek between Pilarcitos Reservoir and Stone Dam, which may have contributed to the development of the white alder riparian forest along this reach of the creek. Operation of the regional water system has also reduced and altered the seasonal pattern of flow below Stone Dam, which in turn has probably reduced the extent and quality of riparian vegetation, although these effects diminish downstream as tributaries add water to the creek. Road construction, agriculture, and urban development in the lower watershed of the creek have reduced the extent and quality of riparian vegetation, and associated wildlife habitat, from their historical condition.

Recreation and Visual Quality. Construction of the regional water system combined with urban development has had some adverse effect on visual quality in parts of the Pilarcitos Creek watershed. When the regional water system was built, a small area of natural landscape in the upper Pilarcitos Creek watershed was inundated to form an artificial lake. A muddy, vegetation-free zone extending around the perimeter of the lake is inundated at times and becomes visible when the reservoir is drawn down. Pilarcitos Reservoir has a different scenic value than the landscape of coastal scrub it replaced. Road construction, agriculture, and urban development have reduced the visual quality of the lower Pilarcitos Creek watershed.

Potential Effects of Future Projects

The SFPUC's Peninsula Watershed Habitat Conservation Plan, Watershed and Environmental Improvement Program, Habitat Reserve Program, and Peninsula WMP would have beneficial impacts on the biological resources in the upper Pilarcitos Creek watershed. No other future projects have been identified that would affect the upper Pilarcitos Creek watershed above Stone Dam (within CCSF-owned watershed lands). Ongoing repair and maintenance activities for the SFPUC's facilities will be necessary in the future, but these activities would be conducted consistent with management guidelines in the Peninsula WMP as well as in compliance with environmental regulations and the recently adopted Water Enterprise Environmental Stewardship Policy (SFPUC, 2006). Consequently, future projects would not be expected to have a significant adverse effect on hydrology, geomorphology, surface water quality, groundwater levels and quality, fisheries, terrestrial biological resources, or recreational and visual resources in the upper San Mateo Creek watershed.

Urban development and redevelopment is likely to continue in the lower Pilarcitos Creek watershed below Stone Dam (outside of CCSF-owned watershed lands) in accordance with city and county general plans. Although current regulations limit the environmental impacts of development and redevelopment projects compared to levels permitted in the past, some minor incremental impacts are likely to result from the increasingly dense urban coastal zone.

As shown in Table 5.7-16, several future projects address habitat improvement and restoration in the lower Pilarcitos Creek watershed, including improving Pilarcitos Creek and its migratory fishery. These projects or activities resulting from associated planning activities are likely to be beneficial to the environment.

Cumulative Effects and WSIP Contribution

Table 5.7-19 summarizes the effects of past and present projects, the impacts of the WSIP, the effects of probable future projects, and the combined impacts of the WSIP plus probable future projects on the Pilarcitos Creek watershed. Past and present projects have substantially altered the hydrology, geomorphology, fisheries, and terrestrial biology of the watershed compared to pre-Euro-American settlement conditions. Surface water quality, groundwater, and visual and recreational resources have been moderately altered. The existing condition, which serves as the baseline for the analysis of the WSIP, reflects the substantial environmental changes that have occurred as a result of the past projects. Because past and present actions have altered the watershed, some of the watershed's environmental resources are more sensitive to small adverse changes than they would be if the reach had remained relatively unaltered from pre-Euro-American settlement conditions.

TABLE 5.7-19
CUMULATIVE EFFECTS ON THE PILARCITOS CREEK WATERSHED

Resource	Effects of Past and Present Projects	Impacts of WSIP (prior to mitigation/after mitigation)	Effects of Future Projects	Cumulative Impacts of WSIP (after mitigation) + Future Projects	WSIP Contribution Cumulatively Considerable?
Hydrology	SA	LS	LS	LS	No
Geomorphology	SA	LS	LS	LS	No
Surface Water Quality	MA	PSM/LS	B/LS	LS	No
Groundwater	MA	LS	B/LS	LS	No
Fisheries	SA	PSM/LS	B	LS	No
Terrestrial Biology	SA	PSM/LS	B	LS	No
Recreation/Visual Quality	MA	LS	LS	LS	No

B = Beneficial impact
LS = Less than Significant, no mitigation required
PSM/LS = Potentially Significant but reduced to Less-than-Significant with mitigation
SA = Substantially Altered
MA = Moderately Altered

As described in Section 5.5, the WSIP would have a less-than-significant adverse impact on hydrology, geomorphology, groundwater, and recreational and visual resources. It would have a less-than-significant impact on surface water quality, fisheries, and terrestrial biological resources after mitigation (Measure 5.5.3-2, Revised Operations Plan for Pilarcitos Watershed Facilities). As described in the previous section, probable future projects would have primarily beneficial effects on hydrology, geomorphology, surface water quality, groundwater, fisheries, terrestrial biology, and recreational and visual resources.

When the WSIP and foreseeable future projects are considered together, none of their cumulative effects would rise to a level of significance. Even though past and present projects have moderately to substantially altered environmental resources along Pilarcitos Creek, the cumulative impacts of the WSIP after mitigation, combined with the effects of future projects, would not result in a substantial or noticeable change from the existing condition. Because there are no significant cumulative impacts, no mitigation measures beyond Measure 5.5.3-2 would be necessary.

5.7.5 Cumulative Effects on Westside Groundwater Basin Resources

This section describes the cumulative effects on groundwater resources in the Westside Groundwater Basin due to implementation of past, present, and reasonably foreseeable future projects or activities in combination with the WSIP water supply and system operations, including operations associated with the Local and Regional Groundwater Projects (SF-2) and Recycled Water Projects (SF-3) evaluated in Section 5.6. These are the only components of the proposed program expected to affect this groundwater basin.

5.7.5.1 Relevant Projects

North Westside Groundwater Basin

Past and Present Projects

As discussed in Section 5.6, San Francisco has intermittently used groundwater from the North Westside Groundwater Basin as a drinking water and irrigation supply since the early 1900s (Luhdorff & Scalmanini, 2006). By the early 1900s, wells had been constructed to the north, east, and south of Lake Merced for farming and drinking water supply. During that time, the Spring Valley Water Company had two wells located near the Lake Merced outlet that pumped about 0.1 mgd, or 100 afy, and the total of Lake Merced, Sunset District, and Golden Gate Park pumping averaged 0.4 mgd (400 to 500 afy). In the early 1930s, the San Francisco Board of Public Works installed production wells in the Sunset District as an emergency water supply. These wells pumped an average of about 5 mgd between 1930 and 1935, but were discontinued after Hetch Hetchy water became available in the mid-1930s.

In 2005, groundwater was used for irrigation and other nonpotable uses, primarily 1.0 mgd (1,100 afy) at Golden Gate Park[5] and 0.4 mgd (400 afy) at the San Francisco Zoo. In addition, less than 0.02 mgd (13 afy) is used for other purposes, including 8 afy at Edgewood School and 5 afy in Stern Grove (Luhdorff & Scalmanini, 2006). As of 2005, there are no other substantial users of North Westside Groundwater Basin water.

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[5] Historical pumping rates for the Golden Gate Park wells were estimated for this analysis. The recent installation of flow meters on two of the wells will allow for more accurate measurement of pumping rates in the future.

Future Projects

In addition to two of the WSIP facility improvement projects, the only identified probable future project in the North Westside Groundwater Basin is the San Francisco Public Works Department's restoration of Pine Lake using groundwater from the primary production aquifer (Pine Lake is described in Section 5.6.1.6). The Pine Lake project calls for pumping of up to 0.08 mgd (90 afy) of groundwater from an existing well for restoration of Pine Lake beginning in May 2007 (Mosqueda, 2007).

The two WSIP facility improvement projects that would affect the North Westside Groundwater Basin are the Recycled Water Projects (SF-3) and Local Groundwater Projects (part of SF-2). Under the Recycled Water Projects, described in Chapter 3, Section 3.8, approximately 1.4 mgd (1,500 afy) of groundwater pumping would be replaced by recycled water for irrigation at the San Francisco Zoo and Golden Gate Park. Once this project is implemented, up to 0.5 mgd (560 afy) of pumping for nonpotable uses would continue in the North Westside Groundwater Basin for such purposes as irrigation of sensitive plants in Golden Gate Park and water for some animal exhibits at the San Francisco Zoo.[6] Under the Local Groundwater Projects, also described in Chapter 3, Section 3.8, up to 4 mgd (4,500 afy) would be pumped for municipal supply, including development of 2 mgd of groundwater from new wells, and use or replacement of existing irrigation and nonpotable wells for an additional 2 mgd. The Local Groundwater Projects also includes the addition of treated stormwater, recycled water, groundwater, and/or dechlorinated SFPUC system water to Lake Merced.

South Westside Groundwater Basin

Past and Present Projects

As discussed in Section 5.6, historical groundwater pumping in the South Westside Groundwater Basin resulted in a decline in groundwater levels to more than 100 feet below sea level from Daly City (immediately south of Lake Merced) to San Bruno. This decline contributed to a change in the direction of groundwater flow in the vicinity of Lake Merced from a northwesterly to a southwesterly direction. Although saltwater intrusion and land subsidence have not been observed, there has been public concern that this decline in water levels contributed to decreased water levels in Lake Merced. Efforts to restore groundwater levels in the South Westside Groundwater Basin and reduce potential effects on Lake Merced water levels have included the In-Lieu Recharge Demonstration Study implemented by the SFPUC, Daly City, California Water Service Company (Cal Water) in South San Francisco, and San Bruno, and the replacement of irrigation pumping in the vicinity of Lake Merced with recycled water from northern San Mateo County (Daly City), as discussed below.

Groundwater in the South Westside Groundwater Basin is primarily used for municipal and irrigation purposes. As indicated in Section 5.6, Figure 5.6-3, the total estimated and metered pumping for these uses reached a combined maximum of approximately 12.8 mgd (14,300 afy)[7]

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[6] Pumping rates for nonpotable purposes may actually be less than estimated if recycled water is found to be of suitable quality for these uses.

[7] This pumping level has been adjusted to exclude pumping in Golden Gate Park, which is located in the North Westside Groundwater Basin.

in the 1960s (Luhdorff & Scalmanini, 2006). In addition, there are some private wells within the basin. As discussed below, total pumping from the South Westside Groundwater Basin (including municipal and irrigation uses) was about 4.1 mgd (4,600 afy) by 2005 because nearly all irrigation pumping around Lake Merced was replaced with recycled water and because of a temporary reduction in municipal pumping as part of the In-Lieu Recharge Demonstration Study.

Municipal Pumping. Historical municipal groundwater pumping by Daly City, Cal Water, and San Bruno, as shown in Figure 5.6-3, reached a high of approximately 8 mgd (9,000 afy) in the mid-1960s and ranged between approximately 5.4 mgd (6,000 afy) and 7.1 mgd (8,000 afy) from the mid-1970s until 2001 (Luhdorff & Scalmanini, 2006). During implementation of the In-Lieu Recharge Demonstration Study from 2002 to 2005, as described in Section 5.6, total municipal pumping was decreased to an average of approximately 1.8 mgd (2,000 afy), as shown in Figure 5.6-3 (Luhdorff & Scalmanini, 2006). As a result of this demonstration study, the total increase in groundwater storage in the South Westside Groundwater Basin was approximately 13,000 acre-feet, including 6,300 acre-feet in the Daly City area, 3,600 acre-feet in the South San Francisco area, and 3,000 acre-feet in the San Bruno area (Luhdorff & Scalmanini, 2005).

Although the In-Lieu Recharge Demonstration Study ended in 2005, Daly City did not resume full-scale pumping and continued to receive system water from the SFPUC in lieu of groundwater pumping. In 2005, Daly City pumped approximately 0.6 mgd (700 afy) of groundwater. As of 2006, Cal Water had not resumed pumping since cessation of the In-Lieu Recharge Demonstration Study, and San Bruno had resumed pumping at rates of approximately 1.5 mgd (1,700 afy).

Irrigation Pumping. Historical golf course and cemetery irrigation in the 1960s was previously estimated at about 4.7 mgd (5,300 afy) of groundwater,[8] and irrigation for three golf courses in the vicinity of Lake Merced (the Olympic Club, San Francisco Golf Club, and Lake Merced Golf Club) accounted for approximately 2.1 mgd (2,235 afy) of this amount. In 2005, irrigation pumping at these three golf courses was reduced to approximately 0.04 mgd (45 afy) when recycled water was made available from north San Mateo County (Daly City) as a substitute irrigation supply.

Other irrigation pumping rates in the South Westside Groundwater Basin in 2005 are consistent with historical pumping rates and are estimated at up to 2.1 mgd (2,400 afy) for cemeteries in Colma, 0.1 mgd (120 to 150 afy) for the California Golf Club[9] in San Bruno, and an undetermined amount for the Golden Gate National Cemetery in San Bruno (Luhdorff & Scalmanini, 2006).

In all, irrigation pumping in the South Westside Groundwater Basin has recently been estimated at 2.3 mgd (2,600 afy) in 2005—a reduction of 2.4 mgd (2,700 afy) from a high of approximately

[8] Historical irrigation pumping amounts were estimated for this analysis. Recent metered use of recycled water at the Lake Merced area golf courses indicates that actual usage may have been less than previously estimated. Therefore, estimates of historical unmetered irrigation pumping may be high.

[9] 2005 estimated pumping rates for the California Golf Club were reduced, from the historical estimate of 665 afy to 120–150 afy, based on information on actual water use rates at the Lake Merced area golf courses obtained when metered recycled water was provided to these golf courses.

4.7 mgd (5,300 afy) in the 1960s—primarily due to the replacement of recycled water for irrigation purposes at the Lake Merced area golf courses.

Pumping from Private Wells. There are over 90 backyard wells in Hillsborough residential areas; most were installed during the 1987–1992 drought and serve multiple adjoining lots. In 2003, total pumping from these wells was estimated at 0.27 mgd (300 afy) (Yates, 2003). There are not likely a large number of private wells in the San Bruno to Daly City portion of the South Westside Groundwater Basin, which typically has small lot sizes with limited irrigation areas. Also, San Mateo County requires well setbacks from sewer lines, which make small lots more difficult to permit for water wells.

Future Projects

In the future, the South Westside Groundwater Basin would continue to be used for municipal and irrigation uses, as well as by private well owners, as described below. With the exception of these uses, the proposed WSIP conjunctive-use program associated with the Regional Groundwater Projects (part of SF-2), and negligible irrigation pumping by the City of Burlingame, no other reasonably foreseeable future projects were identified in the South Westside Groundwater Basin.

Municipal Pumping. Planned groundwater uses for municipal purposes through 2030 are described in the urban water management plans (UWMPs) prepared for each municipality in the South Westside Groundwater Basin, as summarized below:

- In its 2005 UWMP, the City of Daly City estimates that future municipal groundwater pumping under the WSIP conjunctive-use program (Regional Groundwater Projects, SF-2) would range from 1.34 mgd (1,501 afy) during a nondrought year when surface water is supplied by the SFPUC to 3.76 mgd (4,212 afy) during a drought year when the city is also allowed to pump its banked groundwater (City of Daly City, 2005). These projected pumping volumes are presented in Table 4-4 of the 2005 UWMP.

- The 2006 UWMP for the South San Francisco Water District does not yet reflect long-term participation in the SFPUC's proposed conjunctive-use program, but participation in this program is expected to be included in the next revision of its UWMP. In its 2006 UWMP, Cal Water estimates that groundwater usage will be 1.37 mgd per year (1,534 afy) between 2010 and 2030 (California Water Service Company, 2006).

- The 2007 UWMP for the San Bruno does not yet reflect long-term participation in the SFPUC's proposed conjunctive-use program, but, if approved, participation in this program is expected to be included in the next revision of its UWMP. In its 2007 UWMP, the City of San Bruno estimates that overall, groundwater usage will decrease from 2.5 mgd (2,800 afy) in 2010 to zero in 2030 through implementation of conservation measures and increased purchases from the SFPUC. In a drought year, groundwater use between 2010 and 2030 is projected to range from 0.80 mgd (896 afy) to a maximum of 2.5 mgd (2,800 afy) (City of San Bruno, 2007).

- In its 2006 UWMP, the City of Burlingame estimates that it may use less than 0.01 mgd (11 afy) of groundwater for irrigation purposes between 2010 and 2030 (City of Burlingame, 2005). This amount would have negligible effects on the groundwater basin during nondrought or drought years compared to pumping by Daly City, South San Francisco, and San Bruno.

- Hillsborough and Millbrae do not currently utilize or plan to utilize groundwater as a water source (BAWSCA, 2006; City of Millbrae, 2005).

Irrigation Pumping. It is expected that the existing irrigation uses of South Westside Groundwater Basin groundwater described above would continue in the future at approximately 2.3 mgd (2,600 afy). As described further in Chapter 7 (see Table 7.2), there are no planned recycled water projects in South San Francisco, San Bruno, Burlingame, Millbrae, or Daly City that would replace groundwater for irrigation (other than Daly City's replacement of irrigation pumping at the Lake Merced area golf courses with recycled water, as described above).

Pumping from Private Wells. At a minimum, water usage by private well owners would continue at the current rate of approximately 0.27 mgd (300 afy), and it is possible that new private wells could be permitted in the future.

5.7.5.2 Cumulative Impacts

Significance Criteria

The CCSF has not formally adopted significance standards for impacts related to cumulative effects, but generally considers that implementation of the proposed program would have significant cumulative impacts if it were to:

- Have impacts that would be individually limited, but cumulatively considerable ("cumulatively considerable" means that the incremental effects of a project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.)

Impacts associated with the proposed program that would be "individually limited" are based on the impact analyses presented in Section 5.6 and the significance criteria presented in that section for the various environmental resource areas.

Approach to Analysis and Impact Summary

Cumulative impacts are analyzed based on the CEQA guidance described above in Section 5.7.1. For this groundwater analysis, as described in Section 5.6, a potentially significant effect would occur if withdrawal of groundwater would result in overdraft conditions and related adverse effects, including saltwater intrusion, land subsidence, and/or effects on interrelated surface water features, or if it would adversely affect groundwater quality. The analysis describes the effects of past and present projects on the groundwater basin, and since many projects are still in operation today, the existing environmental conditions reflect the cumulative effects of these past projects and their present operations. These existing conditions form the basis for analysis of the WSIP impacts described in Section 5.6 as well as the basis for assessing the effects of probable future projects and cumulative impacts. The analysis then describes the cumulative impacts on groundwater resources of past, present, and probable future projects together with impacts of the

WSIP. The WSIP's contribution to cumulative impacts is considered prior to mitigation, but the effects of mitigation measures identified in Section 5.6 and described in Chapter 6 are assessed in determining the significance of overall cumulative impacts. Based on this analysis, the WSIP's contribution to the cumulative effect is then evaluated to determine if it is "cumulatively considerable." Impacts are discussed separately for the North and South Westside Groundwater Basins.

Cumulative impacts are discussed below, and impact significance determinations are summarized in **Table 5.7-20**.

TABLE 5.7-20
SUMMARY OF CUMULATIVE IMPACTS IN THE WESTSIDE GROUNDWATER BASIN RELATED TO WSIP WATER SUPPLY AND SYSTEM OPERATIONS

Impact	Significance Determination
5.7.5-1: Cumulative impacts on the North Westside Groundwater Basin	LS
5.7.5-2: Cumulative impacts on the South Westside Groundwater Basin	LS

NOTE: Significance determinations presented in this table assume implementation of all mitigation measures as they are presented in Chapter 5, Section 5.6 and described in Chapter 6.

LS = Less than Significant, no mitigation required

North Westside Groundwater Basin

Impact 5.7.5-1: Cumulative impacts on the North Westside Groundwater Basin.

As discussed above, future groundwater pumping in the North Westside Groundwater Basin would include up to 0.5 mgd (560 afy) of pumping for nonpotable uses once the Recycled Water Projects (SF-3) are implemented, up to 4 mgd (4,500 afy) of pumping for municipal supply under the Local Groundwater Projects (SF-2), and up to 0.08 mgd (90 afy) of groundwater from an existing well to restore water levels in Pine Lake. The Local Groundwater Projects also include the addition of treated stormwater, recycled water, groundwater, and/or dechlorinated SFPUC system water to Lake Merced to achieve the desired lake level, or range of levels.

With implementation of the WSIP projects and pumping for restoration of Pine Lake in combination with ongoing pumping in the basin, total future, cumulative groundwater withdrawals from the North Westside Groundwater Basin would be up to approximately 4.6 mgd (5,150 afy). This cumulative, maximum level of pumping would be within the range of recharge to the basin (4,850 afy to 6,950 afy), but would exceed the lower end of the range. However, cumulative impacts related to the potential for basin overdraft and associated adverse effects on surface water resources, saltwater intrusion, and land subsidence in the North Westside Groundwater Basin would be considered less than significant, assuming implementation of Measure 5.6-1 (Groundwater Monitoring to Determine Basin Safe Yield) and Measure 5.6-2 (Implementation of a Lake Level Management Plan). Measure 5.6-1 requires the SFPUC to continue ongoing studies (including groundwater and lake level monitoring programs to determine the safe yield of the North Westside Groundwater Basin) and to use this monitoring data to inform decisions regarding appropriate pumping patterns to avoid overdraft and the related undesirable effects. Measure 5.6-2 requires the SFPUC to prepare and implement a lake level management plan identifying strategies to alter pumping patterns or lake level augmentation to maintain Lake Merced within the desired long-term range, should monitoring conducted under Measure 5.6-1 indicate the potential for adverse effects on lake levels due to groundwater pumping. With implementation of these measures, to be coordinated by the SFPUC and subject to separate project-level CEQA review prior to implementation of the Local Groundwater Projects (SF-2) and Recycled Water Projects (SF-3), groundwater pumping attributable to the proposed program and the Pine Lake project would not result in overdraft of the North Westside Groundwater Basin or related adverse effects. Therefore, the WSIP in combination with the Pine Lake project would have less-than-significant cumulative impacts on the groundwater basin. No additional mitigation beyond Measures 5.6-1 and 5.6-2 would be necessary.

In addition, the San Francisco Department of Public Health, the agency responsible for permitting water wells in San Francisco, would not grant a permit for a new well unless measures were in place to avoid adverse effects on the groundwater basin. In accordance with Article 12B of the San Francisco Health Code, as discussed in Section 5.6, the Department of Public Health would ensure that any permit application for a water well would undergo CEQA environmental review and receive SFPUC approval prior to issuance of the permit. The operator of the well would be required to comply with any conditions or restrictions on use of the water well imposed by the SFPUC and/or as mitigation measures under CEQA. With implementation of these well permitting requirements, including review by the SFPUC, potential cumulative impacts on groundwater resources and interrelated surface water features of the North Westside Groundwater Basin would be less than significant.

South Westside Groundwater Basin

Impact 5.7.5-2: Cumulative impacts on the South Westside Groundwater Basin.

Future and continuing projects identified in the northern portion of the South Westside Groundwater Basin include the WSIP conjunctive-use program (the regional component of SF-2), municipal pumping by the participating pumpers, and continued irrigation pumping at 2,600 afy. To the south of this area, future pumping includes up to approximately 0.27 mgd (300 afy) of pumping from private wells and negligible irrigation pumping by the City of Burlingame. As discussed in Section 5.6, impacts related to the potential for basin overdraft, saltwater intrusion, and land subsidence would be less than significant for the conjunctive-use program under the Regional Groundwater Projects (SF-2) because, under the WSIP, the SFPUC, Daly City, Cal Water, and San Bruno would enter into an operating agreement(s) that would restrict pumping under the conjunctive-use program to water banked as a result of reductions in pumping in nondrought years. With implementation of the proposed operating agreement(s):

- Groundwater levels would increase and there would be a larger quantity of water in the South Westside Groundwater Basin during nondrought years due to the in-lieu recharge resulting from deliveries of SFPUC system water and correspondingly reduced groundwater pumping.
- Under the proposed conjunctive-use program, the participating pumpers collectively would not be allowed to pump more than the quantity of banked groundwater resulting from the in-lieu delivery of SFPUC system water.

Although in a drought year, pumping under the Regional Groundwater Projects, in combination with municipal pumping by the participating pumpers could temporarily exceed historic high groundwater withdrawal rates, the proposed operating agreement(s), executed between the SFPUC and the participating pumpers, would outline allowable operating parameters for pumping during drought years to avoid adverse long-term conditions; an operating committee would be formed to develop annual operating maintenance plans as well as an annual operating schedule; and groundwater monitoring and modeling would be conducted to identify the potential for adverse conditions and inform decisions to modify the recharge or pumping strategy in response to changing conditions over time.

Implementation of the proposed conjunctive-use program should result in higher average groundwater levels in the northern portion of the South Westside Groundwater Basin as a result of the coordinated use of surface water and groundwater. Implementation of the operating agreement(s) would ensure that impacts related to basin overdraft, saltwater intrusion, and land subsidence would be less than significant. Because there are no other planned future uses of groundwater in this portion of the basin, other than the those existing uses described above that would continue, and impacts of the WSIP would be less than significant due to implementation of the proposed operating agreement(s), cumulative groundwater impacts would be less than significant.

Furthermore, as discussed in Section 5.6, the San Mateo County Environmental Health Division would not grant a well permit for a large well[10] that could potentially cause overdraft of the South Westside Groundwater Basin or be located in an area subject to a specific and localized groundwater problem. Thus, groundwater pumping under the WSIP would not contribute to cumulative impacts related to basin overdraft and associated adverse conditions and no mitigation would be necessary. Therefore, WSIP effects on groundwater resources in the South Westside Groundwater Basin would not be cumulatively considerable and would be considered *less than significant*.

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10 A large well means any individual well that pumps an amount equal to or greater than 50 gallons per minute or 1,000 gallons per day, or multiple small wells on the same land use parcel which cumulatively pump an amount equal to or greater the 50 gallons per minute or 1,000 gallons per day.

5.7.6 Climate Change and Global Warming

The issue of global warming/climate change has become an important factor in water resources planning in California, and it is being considered during planning for the SFPUC regional water system. There is evidence that increasing concentrations of greenhouse gases[11] have caused and will continue to cause a rise in temperatures around the world, which will result in a wide range of changes in climate patterns. Climate scientists agree that a warming trend occurred during the latter part of the 20th century and will likely continue through the 21st century. These changes will have a direct effect on water resources in California, and numerous studies on climate and water in California have been conducted to determine the potential impacts.

A literature review of recent studies on global warming was conducted for this PEIR to identify the current status of available information and to determine potential impacts of global warming on implementation of the WSIP. **Table 5.7-21** summarizes the major articles reviewed that are relevant to global warming and the SFPUC regional water system.

Based on these articles, global warming could result in the following types of water resources impacts in California, including impacts on the SFPUC regional water system and associated watersheds:

- Reductions in the average annual snowpack due to a rise in the snowline and a shallower snowpack in the low- and medium-elevation zones, such as in the Tuolumne River basin, and a shift in snowmelt runoff to earlier in the year
- Changes in the timing, intensity, and variability of precipitation, and an increased amount of precipitation falling as rain instead of as snow
- Long-term changes in watershed vegetation and increased incidence of wildfires that could affect water quality
- Sea level rise and an increase in saltwater intrusion
- Increased water temperatures with accompanying adverse effects on some fisheries
- Increases in evaporation and concomitant increased irrigation need
- Changes in urban and agricultural water demand

However, other than the general trends listed above, there is no clear scientific consensus on exactly how global warming will quantitatively affect California water supplies, and current models of California water systems generally do not reflect the potential effects of global warming. The Hetch Hetchy/Local Simulation Model (HH/LSM) used in the PEIR for the water supply and system operations analysis remains the best available tool for assessing the impacts of the WSIP.

[11] Greenhouse gases are gaseous constituents in the atmosphere that contribute to the “greenhouse effect,” and include carbon dioxide, methane, nitrous oxide, ozone, and water vapor. The greenhouse effect occurs when greenhouse gases absorb radiant energy from the sun, trap the radiation reflected back from the earth’s surface, and warm the surrounding atmosphere. Human activities such as deforestation and the burning of fossil fuels have increased the levels of greenhouse gases in the atmosphere, particularly carbon dioxide, resulting in a warming trend in atmospheric temperatures around the world.

TABLE 5.7-21
ANNOTATED BIBLIOGRAPHY ON CLIMATE CHANGE/GLOBAL WARMING

Author, Title, Date	Summary and Relevance to Regional Water System
California Department of Water Resources, *Technical Memorandum Report: Progress on Incorporating Climate Change into Management of California's Water Resources,* July 2006.	This report is DWR's response to the governor's 2005 order establishing targets for greenhouse gas emissions and requiring biennial reporting by state agencies. This report describes progress made in the effort to incorporate climate change into water resources planning and management tools and methodologies.
California Department of Water Resources, *California Water Plan Update 2005*, Volume 4, Maurice Roos, "Accounting for Climate Change," 2005.	Evidence that climate change will have significant effects on water resources in California has continued to accumulate in recent years. Some of the more important changes would arise from temperature increases, which would raise snow elevations in temperate zones and change the pattern of runoff from mountain watersheds, thereby affecting reservoir operation. Other consequences include: a rise in sea level, which could adversely affect the Sacramento–San Joaquin River Delta, a major source of water supply for the state; possibly more extreme precipitation and flood events; changes in water consumption by crops and wildlands; and water temperature problems for anadromous fish.
California Energy Commission, California Climate Change Center, *Climate Warming and Water Supply Management in California,* March 2006.	A modeled future dry climate scenario is compared with a future normal climate scenario that follows historical trends for population growth through 2050. Effects on the overall economy from the drier scenario would not be drastic for urban areas but would severely affect rural and agricultural regions.
California Energy Commission, *Climate Change Impacts and Adaptation in California,* June 2005.	This report presents a short review of literature on climate change impacts and adaptation options for California. Future changes in precipitation cannot be accurately determined at this time. However, it is predicted that precipitation will shift towards falling more as rain than as snow, which would increase flood frequencies. Runoff/snowpack melting would increase in the winter season and decrease in the spring and summer due to general atmospheric warming. Many sources reviewed came from the California Energy Commission's Public Interest Energy Research program.
California Energy Commission, prepared by the University of California, Berkeley, *Climate Change and Water Supply Reliability,* March 2005a.	The purpose of the study was to assess impacts of climate change on urban and agricultural water agencies. It describes preliminary work on methods for measuring current water supply reliability and methods for projecting changes in supply reliability caused by climate change. This research differs from other studies in that researchers gathered and analyzed data from individual water districts. This analysis is relevant because there is considerable heterogeneity among water districts in California with regard to source of water, the nature and age of water rights, cost of operations, finances, price structures, and other terms of service.
California Energy Commission, prepared by Pacific Institute, *Climate Change and California Water Resources: A Survey and Summary of the Literature,* August 2005b.	This study surveyed existing literature related to impacts of climate change on California water resources. It provides recommendations for future water management under warming conditions.
California Energy Commission, Center for Environmental and Water Resource Engineering, Department of Civil and Environmental Engineering, Department of Agricultural and Resource Engineering, University of California, Davis, *Climate Warming & California's Water Future,* March 20, 2003.	Effects of climate change on the long-term performance and management of California's water system are examined. Modeling took into account potential changes in the water management system, including changes in population, land use, and agricultural practices.
California Environmental Protection Agency, California Climate Change Center, *Our Changing Climate, Assessing the Risks to California,* August 2006.	This study summarizes recent findings of the California Climate Change Center's "Climate Scenarios," a project analyzing a range of impacts that projected warming would have on California. One section focused specifically on water resources.

TABLE 5.7-21 (Continued)
ANNOTATED BIBLIOGRAPHY ON CLIMATE CHANGE/GLOBAL WARMING

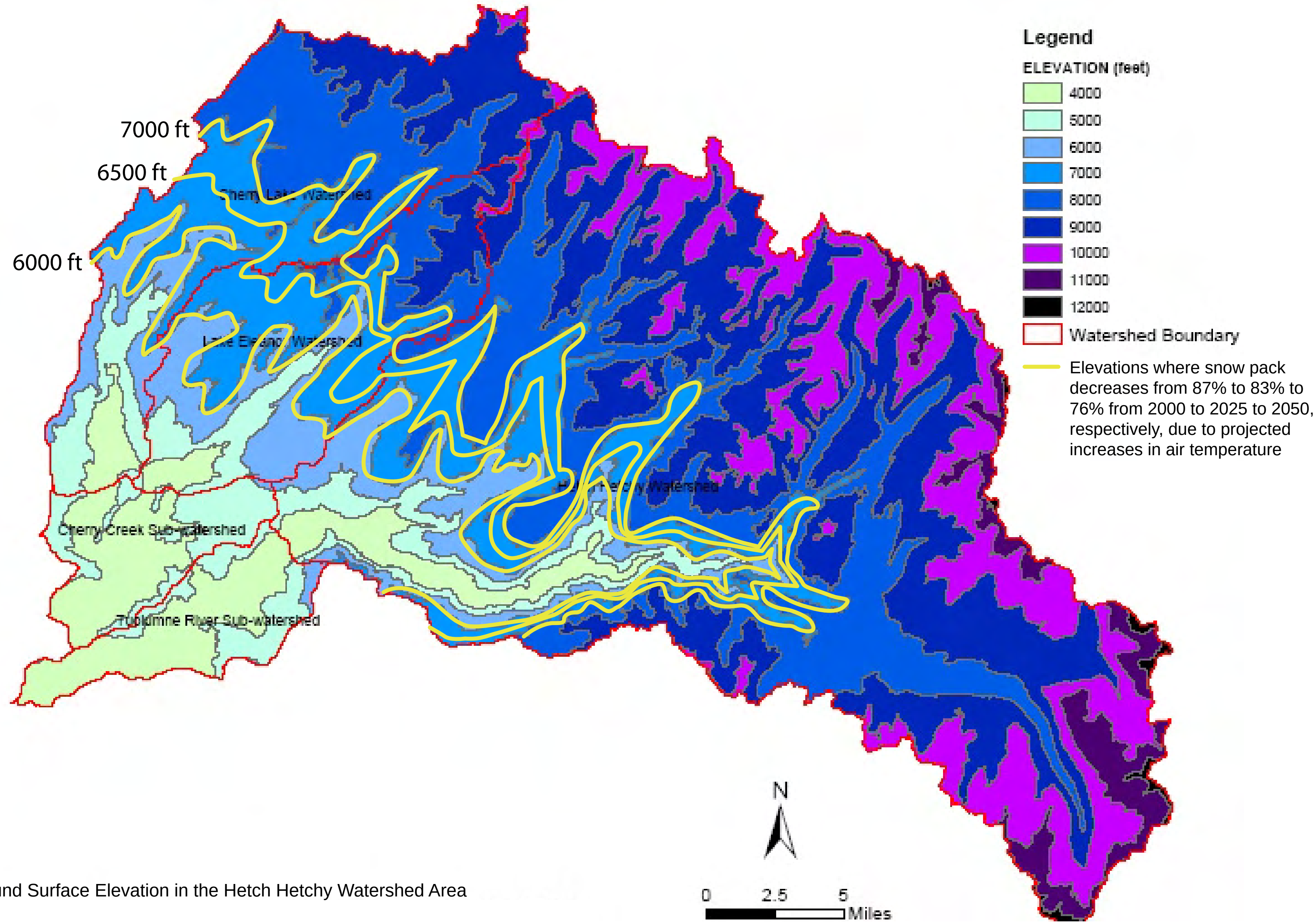
Author, Title, Date	Summary and Relevance to Regional Water System
Hayhoe, Katharine et al., "Emission Pathways, Climate Change, and Impacts on California," Proceedings of the National Academy of Sciences, August 24, 2004.	This study looked at the magnitude of future climate change in California using the highest and lowest United Nations Intergovernmental Panel on Climate Change emissions pathways.
Miller, Norman et al., *Journal of the American Water Resources Association,* "Potential Impacts of Climate Change on California Hydrology," August 2003.	Hydrologic calculations were performed for a set of California river basins that extend from the coastal mountains and Sierra Nevada northern region to the southern Sierra Nevada region. Results indicate that for all snow-producing cases, a larger proportion of the stream flow volume will occur earlier in the year. The amount and timing is dependent on the characteristics of each basin, particularly the elevation. Increased temperatures lead to a higher freezing line, and therefore less snow accumulation and increased melting below the freezing height.
San Francisco Public Utilities Commission, Special Commission Meeting, "Discussion of Global Warming Impacts: San Francisco Water System," available online at http://sanfrancisco.granicus.com/ViewPublisher.php?view_id=22, August 8, 2006.	Introductory discussion of global warming by the commission. Three main topics were discussed: (1) impacts on SFPUC water supply storage due to possible loss of snowpack; (2) impacts related to a rise in sea level and effects on sewage treatment plants in San Francisco; and (3) effects due to changes in the intensity and duration of storms and potential flooding. The SFPUC has established climate change as an area for discussion for years to come. Current operation of the Hetch Hetchy system is able to accommodate a range of climate conditions; however, the SFPUC has started preliminary studies to look at warming patterns and effects on the system.

SOURCE: ESA+Orion, 2006.

Nevertheless, independent of the HH/LSM, SFPUC staff performed an initial evaluation of the effect on the regional water system of a 1.5-degree Celsius (^{o}C) temperature rise between 2000 and 2025 (SFPUC, 2006a). The temperature rise of 1.5 ^{o}C is based on a consensus among many climatologists that current global climate modeling suggests a 3 ^{o}C rise will occur between 2000 and 2050 and a rise of 6 ^{o}C will occur by 2100. The evaluation predicts that an increase in temperature of 1.5 ^{o}C will raise the snowline approximately 500 feet every 25 years.

The elevation of the watershed draining into Hetch Hetchy Reservoir ranges from 3,800 to 12,000 feet above mean sea level, with about 87 percent of the watershed area above 6,000 feet, as shown in **Figure 5.7-5**. In 2000 (a normal hydrologic year in the 82-year period of historical record), the average snowline in this watershed was approximately 6,000 feet during the winter months. Therefore, the SFPUC evaluation indicates that a rise in temperature of 1.5 ^{o}C between 2000 and 2025 will result in less or no snowpack between 6,000 and 6,500 feet and faster melting of the snowpack above 6,500 feet. Similarly, a temperature rise of 1.5 ^{o}C between 2025 and 2050 will result in less or no snowpack between 6,500 and 7,000 feet and faster melting of the snowpack above 7,000 feet. The change in snowline that would result from the projected rise in temperature between 2000 and 2050 is highlighted in Figure 5.7-5.

The SFPUC climate change modeling indicates that about 7 percent of the runoff currently draining into Hetch Hetchy Reservoir will shift from the spring and summer seasons to the fall and winter seasons in the Hetch Hetchy basin by 2025. This percentage is within the current



Ground Surface Elevation in the Hetch Hetchy Watershed Area

SOURCE: SFPUC, 2006

Figure 5.7-5
Projected Decreases in Snow Pack in the Hetch Hetchy Watershed Due to Climate Change, 2000 to 2050

interannual variation in runoff and is within the range accounted for during normal runoff forecasting and existing reservoir management practices. The additional change between 2025 and 2030 will not be detectible. The predicted shift in runoff timing is similar to the results found by other researchers modeling water resource impacts in the Sierra Nevada due to warming trends associated with climate change.

Based on these preliminary studies and the results of the literature review, the potential impacts of global warming on the regional water system are not expected to affect the proposed WSIP operations through 2030, either directly or in combination with the cumulative projects previously described. This is because the predicted changes in stream flow and reservoir water levels in the Hetch Hetchy watershed attributable to climate change during this period are within the same range that occurs under both the existing and proposed operations and management of the system. SFPUC hydrologists are involved in ongoing monitoring and research regarding climate change trends and will continue to monitor the changes and predictions, particularly as these changes relate to the proposed operations and management of the regional water system.

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ATTACHMENT 5-A
Mitigation for Chapter 5 Impacts

Introduction

This attachment is an excerpt from Chapter 6, Mitigation Measures, that presents all mitigation measures for impacts described in Chapter 5. Mitigation measures for PSM, PSU, and SU impacts identified in Sections 5.3 through 5.6 are presented under the respective environmental resource topic, such as Fisheries or Terrestrial Biological Resources. No PSM, PSU, or SU cumulative impacts related to WSIP water supply and system operations were identified (Section 5.7). All mitigation measures are numbered to correspond to the same impact numbers, although in some cases, the same measure would mitigate more than one impact and the numbering corresponds to the first impact identified and cross-referenced so that measures are not duplicated.

Mitigation Measures to Minimize Water Supply and System Operations Impacts

Plans and Policies (Section 5.2)

System Measures

None required.

Tuolumne River System and Downstream Water Bodies

Stream Flow and Reservoir Water Levels (Section 5.3.1)

System Measures

None required.

Geomorphology (Section 5.3.2)

System Measures

None required.

Surface Water Quality (Section 5.3.3)

System Measures

None required.

Surface Water Supplies (Section 5.3.4)

System Measures

None required.

Groundwater (Section 5.3.5)

System Measures

None required.

Fisheries (Section 5.3.6)

System Measures

Overview of Measures 5.3.6-4a, 5.3.6-4b, and 5.3.7-6

The SFPUC will attempt to implement Measure 5.3.6-4a as described below, which could mitigate both Impacts 5.3.6-4 and 5.3.7-6 to a less than significant level. Measure 5.3.6-4a involves some uncertainty because its implementation depends on the SFPUC negotiating and reaching agreement with MID/TID and possibly other water agencies. If Measure 5.3.6-4a proves to be infeasible, the SFPUC will implement Measure 5.3.6-4b to lessen fisheries impacts and Measure 5.3.7-6 to lessen impacts on riparian vegetation.

Avoidance of Flow Changes by Reducing Demand for Don Pedro Reservoir Water

Measure 5.3.6-4a: The SFPUC will pursue a water transfer arrangement with MID/TID and/or other water agencies such that the water acquired is developed through actions that result in reduction of demand on Don Pedro Reservoir as a result of conservation, improved delivery efficiency, inter-agency transfer of conserved water, or use of an alternative supply such as groundwater. The TID and MID would deliver less water from Don Pedro Reservoir. The consequent increase in water storage in Don Pedro Reservoir would offset the reduction in inflow to Don Pedro Reservoir attributable to the WSIP. The release pattern from La Grange Dam would be the same or similar to the existing condition thus lessening or eliminating Impacts 5.3.6-4 and 5.3.7-6. The actions necessary to reduce demand for Don Pedro Reservoir water may themselves have environmental effects. See Section 6.5 for a review of potential environmental effects associated with the expected actions of this mitigation measure. Further environmental review would be undertaken prior to approving a specific water transfer agreement.

Fishery Habitat Enhancement

Measure 5.3.6-4b: If Measure 5.3.6-4a is not implemented, then the SFPUC will mitigate potential fishery effects on the lower Tuolumne River by implementing (or funding) one of the following two habitat enhancement actions that are designed to sustain fishery resources under the river's flow regime, which are consistent with the Habitat Restoration Plan for the Lower Tuolumne River Corridor: gravel augmentation/habitat enhancement to provide salmonid spawning and rearing habitat, or isolating or filling a captured former gravel quarry pit along the river that provides habitat for salmonid predators.

The gravel augmentation/habitat enhancement project will be implemented to increase salmonid spawning success and to improve the survival of rearing salmonids in the reach of the river downstream of La Grange Dam. Spawning success will be improved by the addition of suitable gravel to the stream channel. Other habitat features will be created to provide cover for juvenile salmonids and to increase the availability of substrate for macroinvertebrates that would be used as food by rearing juvenile salmon and steelhead. The gravel augmentation/habitat enhancement project will involve the planning, design, permitting, purchase, placement, and monitoring of suitable gravel and associated habitat enhancements at three riffle locations within the spawning reach between Basso Bridge and La Grange Dam. The three locations will meet the criteria for suitable habitat as described in the Habitat Restoration Plan for the Lower Tuolumne River Corridor. The gravel will preferentially be rounded river rock of native origin that would be sized and pre-washed before placement into the river. The gravel augmentation/habitat enhancement project will also involve the addition of large woody debris and boulders to create increased habitat complexity and diversity at each of the three enhancement sites. After construction of the gravel augmentation/habitat enhancement project, it will be surveyed to establish its baseline condition. A survey of the three sites will be made at a minimum of five-year intervals by a qualified fisheries biologist. The fisheries biologist will determine whether the three sites continue to meet established criteria for salmonid spawning and rearing habitat. If the sites do not meet the criteria, as part of its long-term operations, the SFPUC will make the improvements necessary to return it to the baseline conditions.

As an alternative to the gravel augmentation project, the SFPUC will remove from the lower river channel one of the former gravel quarry pits that has been "captured" by the river and acts as predator zones for fish such as largemouth and striped bass to prey on rearing and emigrating juvenile salmonids. Removal could be accomplished by filling the pit or installing a levee berm around the pit to isolate it permanently from the river channel. The SFPUC could implement this action directly or fund implementation by another entity involved in river restoration.

The performance standard for gravel pit removal would be an established permanent reduction in area of salmonid predator habitat. The SFPUC will monitor the pit removal project at five-year intervals. If floods have eroded the fil1 or damaged the levees in a manner that restores salmonid predator habitat, the SFPUC will make the necessary repairs. The SFPUC will continue periodic monitoring and repair as part of long-term system operations.

Terrestrial Biological Resources (Section 5.3.7)

System Measures

Controlled Releases to Recharge Groundwater in Streamside Meadows and Other Alluvial Deposits

Measure 5.3.7-2: To mitigate for potential WSIP effects on meadow resources along the Tuolumne River below Hetch Hetchy Reservoir, the SFPUC will manage releases from Hetch Hetchy Reservoir during the spring to recharge groundwater in the riverside meadows in the Poopenaut Valley and streamside alluvial deposits. The goal of the release pattern will be to approximate conditions characteristic of most Sierra meadows, which are mainly wetlands or semi-wetlands supporting a cover of both emergent wetlands plants and upland vegetation (Ratliff, 1982), and which depend on precipitation and upslope flows to recharge the upper soil layers with water (Ratliff, 1985). The performance standard to be achieved by this measure is no net loss of the extent, diversity, and condition of the existing meadow and wetland vegetation types in the Poopenaut Valley.

The SFPUC will manage reservoir releases for this purpose by releasing the expected available volume of water in the reservoir in a pattern that provides flows of a magnitude that inundate the meadows and streamside alluvial deposits for as long as possible. For example, rather than making releases at a constant rate each day (e.g., releasing 1,000 cfs for seven days), the SFPUC could release the same volume of water but with varying cfs rates, creating flow pulses to meet the objective.

As part of this measure the SFPUC will gather baseline data regarding the extent, species composition and condition of the existing meadow vegetation within the Poopenaut Valley. Some of these environmental baseline data may be available as a result of current study efforts in the Poopenaut Valley.[1] As needed, the SFPUC will augment this information by carrying out vegetation composition surveys in the meadow before implementing the WSIP and at 5 year intervals after WSIP implementation to assess the efficacy of mitigation releases in maintaining or improving the percentage cover of meadow species as described by Ratliff (1985). The basic methodology for baseline vegetation survey and subsequent mitigation monitoring will be generally accepted quantitative vegetation sampling methods to permit statistical comparison of vegetation composition over time, as well as mapping the meadow vegetation in the Poopenaut Valley. The SFPUC will retain the services of a qualified biologist to assist in shaping the releases from Hetch Hetchy Reservoir in consideration of baseline and future meadow vegetation data. If a significant decline in the extent or diversity of native meadow vegetation occurs, releases will be modified as needed to achieve the mitigating effect of sustaining the existing meadow communities.

Avoidance of Flow Changes by Reducing Demand for Don Pedro Reservoir Water

See **Measure 5.3.6-4a** in the Fisheries section, above. This measure also addresses impact 5.3.7-6 Impacts on biological resources along the Tuolumne River below La Grange. The SFPUC will attempt to implement Measure 5.3.6-4a as described above, which could mitigate both Impacts 5.3.6-4 and 5.3.7-6 to a less than significant level. Measure 5.3.6-4a involves some uncertainty because its implementation depends on the SFPUC negotiating and reaching agreement with MID/TID and possibly other water agencies. If Measure 5.3.6-4a proves to be infeasible, the SFPUC will implement Measure 5.3.6-4b to lessen fisheries impacts and Measure 5.3.7-6 to lessen impacts on riparian vegetation.

Lower Tuolumne River Riparian Habitat Enhancement

Measure 5.3.7-6: To mitigate the WSIP effects on riparian vegetation, the SFPUC will both protect and enhance one mile of riparian vegetation along the contemporary floodplain of the lower Tuolumne River. This will include funding the acquisition of fee title to or a conservation easement over riparian land totaling one mile (consisting of one or multiple sites) in order to permanently protect that land, and also funding riparian enhancement and on-going vegetation management to maintain the enhanced riparian values in perpetuity along one mile of river. The enhancement and management may be carried out along one river mile either on the land acquired by the SFPUC as described above or on land already under the permanent management of a public agency or conservation organization.

The SFPUC will implement this measure consistent with the Habitat Restoration Plan for the Lower Tuolumne River Corridor (McBain and Trush, 2000) and in coordination with the Tuolumne River Technical Advisory Committee. The SFPUC will also strive to

[1] In 2006 the SFPUC, National Park Service (and USFWS) began a collaborative study effort in the Poopenaut Valley. The effort has led to geomorphology test releases in May 2006, fieldwork in the channel in 2006 and 2007 to examine sediment transport and deposition relationships with flow. Two transects with ten recording piezometers have been installed across the meadow to measure groundwater recharge and drainage patterns. Supplementary stream staff gages have been installed to allow manual readings during high flows. Surveys have been done of the meadow to define the topography and the location and elevation of the piezometers. Infiltration of water from the stream to the meadow soils will be monitored during high flows to develop a better understanding of groundwater dynamics in the meadow so that reservoir operations, flow pulses, and minimum streamflow releases can be managed to improve meadow conditions within the constraints of water supply and facility limitations.

implement these projects in partnership with those groups currently working to restore riparian floodplains on the lower Tuolumne River.

The SFPUC may implement riparian enhancement in accordance with site locations and plans already developed as part of the Habitat Restoration Plan for the Lower Tuolumne River Corridor or on other appropriate sites along the river. For sites that haven't already had plans developed, a riparian enhancement plan will be prepared for each. The plan shall include, but not be limited to, the following:

- Clearly stated objectives and goals consistent with the Habitat Restoration Plan for the Lower Tuolumne River Corridor (McBain and Trush, 2000).
- Location, size, and type of mitigation actions proposed.
- Documentation of performance and monitoring standards.
- Performance and monitoring standards shall indicate success criteria to be met within 5 years for vegetation, removal of exotic species, etc. Adaptive management standards shall include contingency measures that shall outline clear steps to be taken if and when it is determined, through monitoring or other means, that the enhancement or restoration techniques are not meeting success criteria.
- Documentation of the necessary long-term management and maintenance requirements, and provisions for sufficient funding.

Recreational and Visual Resources (Section 5.3.8)

System Measures

None required.

Energy Resources (Section 5.3.9)

System Measures

None required.

Alameda Creek Watershed Streams and Reservoirs

Stream Flow and Reservoir Water Levels (Section 5.4.1)

System Measures

Diversion Tunnel Operation

Measure 5.4.1-2: The SFPUC will establish and implement written operational criteria for the Alameda Creek Diversion Dam that directs that the diversion dam and tunnel shall be operated to pass flows down Alameda Creek when diversion of those flows is not required to maintain desired levels in Calaveras Reservoir in order to provide the maximum possible days of winter and spring flows in Alameda Creek below the diversion dam.

This measure reinforces the way the SFPUC generally operates the diversion tunnel now: that diversion gates are closed in the spring once desired Calaveras Reservoir storage have been reached. However, at times additional flows have been diverted from Alameda Creek after reservoir storage levels have been achieved such that the “excess” water has subsequently been released from the reservoir to maintain the appropriate water level. This measure would formalize Alameda Creek diversion procedures to maintain flows in Alameda Creek to the extent they are not needed to achieve required reservoir storage. This measure would reduce the flow reduction impact but not to a level that is less than significant.

Geomorphology (Section 5.4.2)

System Measures

None required.

Surface Water Quality (Section 5.4.3)

System Measures

None required.

Groundwater (Section 5.4.4)

System Measures

None required.

Fisheries (Section 5.4.5)

System Measures

Minimum Flows for Resident Trout on Alameda Creek

Measure 5.4.5-3a: The SFPUC shall develop and carry out as part of the implementation of the Calaveras Dam Replacement (SV-2) project, an operational plan to implement minimum bypass flows when precipitation generates runoff into the creek below the diversion dam to the Calaveras Creek confluence from December 1 through April 30 to support spawning and egg incubation for resident trout as well as breeding habitat for other native stream-dependent amphibians. This is the period when winter precipitation typically would produce flows for spawning and egg incubation and breeding habitat for other native stream-dependent species. The operational plan will identify the specific minimum flow requirements to support resident trout spawning and egg incubation, and a detailed monitoring plan to survey and document trout spawning and egg incubation and any diversion facility modifications that are needed to implement the minimum stream flows. This measure will be implemented in conjunction with the proposed bypass flows at the diversion dam to meet the 1997 CDFG MOU flow requirements.

Minimum flow requirements to support resident trout spawning and egg incubation vary depending on stream reach conditions. Although site-specific studies are needed to determine an appropriate minimum flow requirement for each specific creek reach, based on the general size and characteristics of the Alameda Creek channel immediately downstream of the diversion structure it has been suggested that a minimum flow on the order of 10 cfs may be needed to support trout spawning and egg incubation. The SFPUC's Natural Resources Division will complete the site-specific studies needed to determine the appropriate minimum stream flow for this reach of the creek; studies may show that the minimum flow requirement is more or less than 10 cfs. This minimum flow requirement would be met when precipitation would naturally generate runoff in the creek (below the diversion dam) under unimpaired conditions between December 1 and April 30. When precipitation generates runoff in the creek, the SFPUC shall provide for bypass of flow up to the required minimum flow amount. The operational plan will allow for adapting minimum flow amounts to support resident trout spawning and egg incubation and other native stream-dependent species based on the monitoring results and best available scientific information.

The monitoring plan will be provided to appropriate resource agencies for review and comment and will subsequently be implemented by the SFPUC's Natural Resources Division staff. Monitoring results shall be provided to the resource agencies as requested. Monitoring shall occur for a minimum of five years and a maximum of ten years following completion of the Calaveras Dam Replacement project. At the completion of the monitoring period the SFPUC shall produce a draft comprehensive report describing the methods, data collected, and results used to assess the performance of the minimum streamflow in providing suitable habitat for resident trout spawning and egg incubation.

The Alameda Creek Fisheries Restoration Workgroup is currently overseeing collaborative studies to better characterize the flow-habitat relationships for trout spawning within Alameda Creek, and the SFPUC is providing staff and funding to support this effort. Information from these studies will also be used in developing the specific range of minimum stream flows needed to support suitable habitat within the reach below the diversion dam to the Calaveras Creek confluence.

This measure addresses two areas of impact to the resident trout fishery in Alameda Creek below the diversion dam. First, it addresses the decrease in flow below the diversion dam that would occur under the WSIP as a result of re-instituting flow diversions to Calaveras Reservoir once the dam is replaced (WSIP Project SV-2) and current DSOD storage capacity restrictions are removed. Second, it addresses the loss of fish from the lower creek system that would result from fish entrainment through the unscreened diversion tunnel to Calaveras Reservoir. Providing for minimum stream flows in Alameda Creek below the diversion dam, as required by the mitigation measure, would support resident trout spawning and egg incubation and it is expected that this measure would be sufficient to sustain the trout population in this reach of the creek. This would fully address/mitigate for both areas of WSIP impact to the resident trout fishery below the diversion dam. If monitoring indicates that this measure is adequate to sustain the resident trout population below the diversion dam, then no additional mitigation action would be required. If monitoring indicates that this measure does not sustain the resident trout fishery in this reach, then the SFPUC shall either modify the minimum stream flow to enhance downstream habitat conditions to fully meet the mitigation requirement or also implement Measure 5.4.5-3b Diversion Restrictions or Fish Screens.

Alameda Diversion Dam Diversion Restrictions or Fish Screens

Measure 5.4.5-3b: If, after 10 years of monitoring results for Measure 5.4.5-3a, Minimum Flows for Resident Trout in Alameda Creek, indicate that the measure does not sustain the resident trout population in Alameda Creek below the diversion dam, then the SFPUC shall also implement additional measures as follows: either implement seasonal restrictions on Alameda Creek diversions to Calaveras Reservoir to protect the downstream resident trout fishery during the critical spawning period (December 1 through April 30) or install and operate a fish passage barrier to “screen” the diversion facility (screening could consist of a behavioral barrier, such as electrical or sound barrier that deters fish, or a physical barrier – such as a screen facility).

SFPUC shall consult with the appropriate resource agencies, including CDFG, to first review the monitoring results for Measure 5.4.5-3a and determine the need for any further mitigation actions. If needed, SFPUC will consult with the appropriate resource agencies to develop appropriate seasonal restrictions on diversions. This could involve establishing a set annual time period for diversion restrictions or annual monitoring of fishery conditions that would then trigger implementation of diversion restrictions.

Alternatively, the SFPUC will implement a fish passage barrier if determined to be feasible. During the 10-year monitoring and evaluation period for Measure 5.4.5-3a, the SFPUC will evaluate the feasibility of installing and operating a fish passage barrier. The feasibility study will include an engineering evaluation of the existing site and diversion structure, access for construction and power supplies to the site, the application of various alternative designs, and identification of a preferred design if determined to be feasible. If it is determined that a fish passage barrier is needed to protect resident trout at the diversion structure then engineering design will be completed and be sufficiently detailed to allow permitting and completion of construction within a period of 24 months after the date that the additional mitigation is determined to be required.

Terrestrial Biological Resources (Section 5.4.6)

System Measures

Compensation for Impacts on Terrestrial Biological Resources

Measure 5.4.6-1: This measure mitigates for water supply and systemwide operation effects on resources within the Alameda Creek watershed. These impacts would occur primarily through operation of the Calaveras Dam Replacement project (SV-2).

The SFPUC will compensate for sensitive wetland, riparian and upland habitats and habitats which support key special-status species or other species of concern lost as a result of WSIP system operation. Similar habitat will be identified, protected, restored, enhanced, created and managed off-site[2] to ensure no net loss of habitat extent or function. A qualified biologist will quantify the magnitude and extent of impacts to wetlands, sensitive habitats, and key special-status species and other species of concern, and the SFPUC will develop and implement mitigation and compensation plans that meet the appropriate regulatory requirements and permit conditions with respect to compensation ratios, other

2 Off-site means the compensatory action is located other than within the project construction footprint, but could be on lands already under SFPUC ownership. Measure 4.6-2 addresses compensatory actions to be taken within the construction footprint.

conservation measures and management requirements to mitigate project impacts to less than significant levels.

The SFPUC will obtain required permits and comply with applicable environmental regulations addressing sensitive habitats and species. Compensatory lands—including those restored or enhanced as well as those acquired or designated as protected as part of program mitigation--will be established in perpetuity with a commitment that such lands will not be used for any purpose that conflicts with the primary purpose of maintaining intact wildlife and plant habitat.

One alternative for implementing such habitat compensation is the Habitat Reserve Program (HRP) currently being developed by the SFPUC. The purpose of the HRP is to provide a comprehensive, coordinated approach to mitigation and related regulatory compliance for WSIP projects and operations. This related SFPUC project is described further in Chapter 3.0, Section 3.12.3. Under the proposed HRP, the SFPUC would proceed as soon as possible with identifying, securing (through designation, management agreement, conservation easement, or acquisition of fee title) and improving lands to be used for habitat compensation so that mitigation is underway concurrent with habitat loss related to WSIP program activities, further ensuring no net loss of resources. The proposed HRP is scheduled for CEQA environmental review in 2007 and is targeted for implementation as soon as possible thereafter. Once the HRP is approved and implemented, the SFPUC will use this as one vehicle or method for implementing the mitigation requirements for individual WSIP projects. Otherwise, where appropriate and necessary, the SFPUC will develop and implement appropriate habitat compensation mitigation for individual WSIP projects and their associated operational impacts.

Operational Procedures for Calaveras Dam Releases

Measure 5.4.6-3: During project-level CEQA review on the Calaveras Dam Replacement project (SV-2), the SFPUC will develop operational procedures for managing planned releases from Calaveras Dam to minimize habitat impacts on amphibians, their egg masses, and tadpoles. The goal of such releases, apart from benefits to fish, is to mimic a more natural pattern of hydrology regime as much as possible. The procedures will specify the minimum amount and frequency of planned releases and the rate of the increase and decrease of any individual release event. One of the specific goals of such releases would be to reduce the risk of mortality to breeding amphibians. Such operational procedures will be developed prior to completion of construction of the Calaveras Dam Replacement project. In addition, instream flow releases required under CDFG agreement with SFPUC (see Table 5.4.1-9) would begin upon completion of construction.

Recreational and Visual Resources (Section 5.4.7)

System Measures

None required.

San Francisco Peninsula Streams and Reservoirs

Stream Flow and Reservoir Water Levels (Section 5.5.1)

System Measures

None identified.

Geomorphology (Section 5.5.2)

System Measures

None required.

Surface Water Quality (Section 5.5.3)

[Paragraph has been deleted per responses to comments or staff-initiated text changes (Vol. 7, Chapter 16).]

System Measures

Low-head Pumping Station at Pilarcitos Reservoir

Measure 5.5.3-2a: The SFPUC shall install a permanent low-head pumping station at Pilarcitos Reservoir which would enable the SFPUC to access and use an additional 350 acre-feet of water from Pilarcitos Reservoir. In years when the WSIP would cause releases from Pilarcitos Reservoir to Pilarcitos Creek to be reduced to reservoir inflow earlier in the summer than under the existing condition (about 25 percent of years in the hydrologic record), the SFPUC will use the pumping station to augment flow in Pilarcitos Creek with water from the reservoir. The pumping station will draw water from the cool pool of water below the thermocline during times when the reservoir is stratified. The pumping station outlet will be designed to ensure that water discharged to the creek is adequately aerated.

Aeration System at Pilarcitos Reservoir

Measure 5.5.3-2b: The SFPUC shall install a permanent aeration system at Pilarcitos Reservoir. The SFPUC will operate the aeration system as necessary to avoid anoxic conditions and maintain good water quality conditions at the reservoir.

Groundwater (Section 5.5.4)

System Measures

None required.

Fisheries (Section 5.5.5)

System Measures

Create New Spawning Habitat Above Crystal Springs Reservoir

Measure 5.5.5-1: The SFPUC will survey the extent and quality of fish spawning habitat that could potentially be lost due to inundation and, if feasible, create new spawning habitat at a higher elevations. The specifics of this mitigation measure will be determined as part of project-level CEQA review for the Lower Crystal Springs Dam Improvements project (PN-4).

Establish Flow Criteria, Monitor and Augment Flow

Measure 5.5.5-5: The SFPUC shall develop a monitoring and operations plan for Stone Dam to ensure WSIP-related flow reductions downstream of Stone Dam do not impair steelhead passage and spawning during the winter months of normal and wetter hydrologic years. This operational plan will provide for minimum stream flows to support existing adult steelhead passage and spawning downstream of Stone Dam, in the reach between Stone Dam and the confluence with the tributary at Albert Canyon, approximately 3.5 miles downstream. Downstream of Albert Canyon, WSIP flow reductions are unlikely to cause a significant impact to steelhead migration and spawning due to contributing flows from numerous downstream tributaries being sufficient to maintain adult upstream passage and spawning conditions within the creek. Monitoring and implementation of the operational plan will occur when precipitation generates runoff into Pilarcitos Creek below Stone Dam from December 1 through April 30 of normal and wetter years. This monitoring and operations plan will be established within five years of the approval of the PEIR.

Specific instream flows needed to support anadromous steelhead downstream of Stone Dam have not yet been identified. Suitable instream flows for steelhead passage on Pilarcitos Creek may be defined as providing a water depth of at least 0.6 feet over 25 percent of the total wetted channel cross-sectional area with 10 percent being contiguous. In cooperation with CDFG and NMFS, the SFPUC will identify up to five critical riffles, downstream of Stone Dam and upstream of Albert Canyon that may cause a passage impediment/barrier to steelhead migration at reduced flows as defined by the water depth criterion above. Such habitat types will be selected for survey because they represent the shallowest habitat type and thus would most likely represent low flow passage barriers under WSIP-related reduced flow scenarios. This monitoring plan will survey and document the critical riffles identified to determine physical conditions (e.g., depth, velocity, and top width of the channel) present at various flow levels. The SFPUC will measure the stage-discharge relationship at each of the five critical riffles and identify the minimum stream flow that meets the steelhead passage criterion at the most restrictive of the five riffle locations.

The SFPUC will calibrate and validate the flow measurements made at the existing flow monitoring gage (USGS Gage 11162620) located immediately downstream of Stone Dam. The SFPUC will then develop a statistical relationship between the flow measurements at the existing gage and the flow at the most restrictive critical riffle downstream of Stone Dam to establish minimum average daily flows necessary to meet steelhead passage criterion. The SFPUC will monitor average daily flows at the stream flow gage during the period from December 1 through April 30 each year. If average daily flow, as measured at the gage, indicates that the minimum stream flow at the downstream critical riffle is not met, the SFPUC will release bypass flows from Stone Dam at a rate sufficient to meet the minimum stream flow for steelhead passage at a release rate up to, but not exceeding, the average daily inflow into Pilarcitos Reservoir as determined by SFPUC operators.

The SFPUC's Natural Resources Division will complete the site-specific studies needed to determine the appropriate minimum stream flow for the most restrictive critical riffle identified during monitoring. This minimum flow criterion will be met when WSIP diversions occur between December 1 and April 30 of normal and wetter hydrologic years. The operational plan will allow for adapting minimum flow amounts to support steelhead migration based on the monitoring results and best available scientific information. Monitoring and flow management will be continued for a minimum period of five years and a maximum period of ten years, at which time the SFPUC will prepare a technical report describing results of the stream flow monitoring, identifying whether or not operation of Stone Dam reduced passage flows below the minimum criteria, and identifying, if needed, an appropriate bypass flow for future operations at Stone Dam (a minimum flow below which water could not be diverted to storage between December and April 30). The technical report will be provided to CDFG and NMFS.

Terrestrial Biological Resources (Section 5.5.6)

System Measures

Habitat Monitoring and Compensation

Measure 5.5.3-2c The SFPUC shall compensate for reduced productivity and diversity of San Francisco garter snake (SFGS) and California red-legged frog (CRLF) wetland habitat which could occur as a result of greater variability, extent and duration in drawdowns at Pilarcitos Reservoir as a result of implementation of Revised Measure 5.5.3-2a (Low-head Pumping Station at Pilarcitos Reservoir). To offset the potential loss of habitat quality, the SFPUC will develop an adaptive management plan for managing and maintaining freshwater marsh and other wetlands around the periphery of Pilarcitos Reservoir. This adaptive management plan would include pre- implementation monitoring and post-implementation monitoring for up to 10 years to ensure that habitat is sustained at Pilarcitos Reservoir, to achieve no net loss of habitat and value for SFGS and CRLF habitat and document changes (if any) in extent or quality of the habitat attributable to operation of the low-head pumping station.

In the event that habitat is reduced, one alternative for implementing such habitat compensation is the Habitat Reserve Program (HRP) currently being developed by the SFPUC. The purpose of the HRP is to provide a comprehensive, coordinated approach to mitigation and related regulatory compliance for WSIP projects and operations. The HRP is described further in the PEIR, Chapter 3.0, Section 3.12.3. Under the proposed HRP, the SFPUC would proceed as soon as possible with identifying, securing (through designation, management agreement, conservation easement, or acquisition of fee title) and improving lands to be used for habitat compensation so that mitigation is underway concurrent with habitat loss related to WSIP program activities, further ensuring no net loss of resources. The proposed HRP is undergoing CEQA environmental review in 2008 and 2009 and is targeted for implementation as soon as possible thereafter. Once the HRP is approved and implemented, the SFPUC will use this as one vehicle or method for implementing the mitigation requirements for WSIP-related activities. Otherwise, where appropriate and necessary, the SFPUC will develop and implement appropriate habitat compensation mitigation for WSIP system operational effects on Pilarcitos Reservoir, independent of the HRP.

Adaptive Management of Freshwater Marsh and Wetlands at Upper and Lower Crystal Springs Reservoirs

Measure 5.5.6-1a: To offset the loss of wetlands, a qualified professional will develop an adaptive management plan for managing and maintaining freshwater marsh and other wetlands around the periphery of Upper Crystal Springs, and Lower Crystal Springs Reservoirs. This adaptive management plan may include the following:

- Gradually raise the reservoir elevations at appropriate times of year to maintain continuous freshwater marsh and riparian habitat along the shorelines to reduce potentially adverse effects to San Francisco garter snakes and California red-legged frogs.

- Identify feasible measures to help to moderate the effects of reservoir drawdown, increase the extent of reservoir margins with the potential to support freshwater marsh vegetation, and investigate the effectiveness for the management and control of predatory aquatic species such as largemouth bass and bullfrogs.

- Perform monitoring and review to ensure that habitat is sustained at Upper and Lower Crystal Springs Reservoirs and elsewhere, as appropriate, to achieve no net loss of habitat and value for freshwater marsh, wetlands, and special-status species.
- Observe all appropriate protective measures to avoid "take" of San Francisco garter snake. In the event that the mitigation measures above cannot be followed, the SFPUC will prepare a sensitive species relocation plan, which would be approved by both the CDFG and USFWS. Such a plan would detail how underground refugia would be excavated, identify suitable relocation areas, etc.

Compensation for Impacts on Terrestrial Biological Resources

Measure 5.5.6-1b: This measure mitigates for water supply and systemwide operation effects on resources within the Peninsula watershed. These impacts would occur primarily through operation of the Upper and Lower Crystal Springs Reservoir facilitated by the Crystal Springs Dam Improvements project (PN-9).

The SFPUC will compensate for sensitive wetland, riparian and upland habitats and habitats which support key special-status species or other species of concern lost as a result of WSIP system operation. Similar habitat will be identified, protected, restored, enhanced, created and managed off-site[3] to ensure no net loss of habitat extent or function. Similarly, in the event of the loss of large, mature oaks and oak woodland, creation and/or restoration of oak woodland elsewhere will be implemented to compensate for the loss of these common upland habitats. A qualified biologist will quantify the magnitude and extent of impacts to wetlands, sensitive habitats, other upland habitats, and key special-status species and other species of concern, and the SFPUC will develop and implement mitigation and compensation plans that meet the appropriate regulatory requirements and permit

[3] Off-site means the compensatory action is located other than within the project construction footprint, but could be on lands already under SFPUC ownership. Measure 4.6-2 addresses compensatory actions to be taken within the construction footprint.

conditions with respect to compensation ratios, other conservation measures and management requirements to mitigate project impacts to less than significant levels.

The SFPUC will obtain required permits and comply with applicable environmental regulations addressing sensitive habitats and species. Compensatory lands—including those restored or enhanced as well as those acquired or designated as protected as part of program mitigation--will be established in perpetuity with a commitment that such lands will not be used for any purpose that conflicts with the primary purpose of maintaining intact wildlife and plant habitat.

One alternative for implementing such habitat compensation is a Habitat Reserve Program (HRP) currently being developed by the SFPUC. The purpose of the HRP is to provide a comprehensive, coordinated approach to mitigation and related regulatory compliance for WSIP projects and operations. This related SFPUC project is described further in Chapter 3.0, Section 3.11. Under the proposed HRP, the SFPUC would proceed as soon as possible with identifying, securing (through designation, management agreement, conservation easement, or acquisition of fee title) and improving lands to be used for habitat compensation so that mitigation is underway concurrent with habitat loss related to WSIP program activities, further ensuring no net loss of resources. The proposed HRP is scheduled for CEQA environmental review in 2007 and targeted for implementation as soon as possible thereafter. Once the HRP is approved and implemented, the SFPUC will use this as one vehicle or method for implementing the mitigation requirements for individual WSIP projects. Otherwise, where appropriate and necessary, the SFPUC will develop and implement appropriate habitat compensation mitigation for individual WSIP projects and operational effects.

Compensation for Serpentine Seep-Related Special Status Plants

Measure 5.5.6-1c: The SFPUC will develop and implement a plan to protect, create, and restore habitat for plant species adapted to serpentine seeps, particularly fountain thistle, around Upper and Lower Crystal Springs Reservoirs. The plan will also include control of pampas grass and any other invasive plant species within the serpentine seep habitat.

Recreational and Visual Resources (Section 5.5.7)

System Measures

None required.

Westside Groundwater Basin Resources (Section 5.6)

System Measures

Groundwater Monitoring to Determine Basin Safe Yield

Measure 5.6-1: The SFPUC will continue ongoing studies, including the existing groundwater and lake level monitoring programs, to determine the safe yield of the North Westside Groundwater Basin in order to avoid overdraft and associated effects including adverse effects on surface water features and seawater intrusion. Using this data, the SFPUC will develop and implement a plan identifying appropriate pumping patterns to avoid overdraft and the undesirable effects associated with overdraft. The plan will establish both a regular (average annual) and an intermittent (dry year or emergency) yield as well as a strategy for modifying pumping patterns such that the pumping levels can be sustained as an ongoing reliable water supply without depletion of groundwater storage or degradation of water quality.

Implementation of a Lake Level Management Plan

Measure 5.6-2: The SFPUC will develop and implement a lake level management plan identifying strategies for altering pumping patterns or lake augmentation to maintain Lake Merced water levels within the desired long-term range should monitoring conducted under Measure 5.6-1 indicate the potential for adverse effects on lake levels due to groundwater pumping. The SFPUC will coordinate the implementation of this measure with Measure 5.6-1.

Drinking Water Source Assessments for Groundwater Wells

Measure 5.6-5: As required by the California Department of Health Services and incorporated as part of the WSIP, the SFPUC will prepare drinking water source assessments for groundwater wells constructed under the Local and Regional Groundwater Projects (SF-2) and will update these assessments every five years. If the assessment indicates no potential for contamination, then no mitigation is required. However, for wells that are considered vulnerable to contamination on the basis of the drinking water source assessment, the SFPUC will develop and implement a source water protection program specifying actions and a program to be implemented to prevent contamination of the drinking water source.

The source water protection program could include nonregulatory components such as watershed restoration, stormwater monitoring, groundwater monitoring, and public education to protect drinking water quality. Land use planning, permitting, and possibly more restrictive regulatory methods may also be implemented by the local municipality where a threat to drinking water quality is indicated, and management of potential sources of microbiological or direct chemical contamination to eliminate or reduce the risk of contamination of the water supply may be considered. The SFPUC will encourage public participation in the development of the program and will update the program every five years along with the drinking water source assessments.

Cumulative Projects and Impacts Related to WSIP Water Supply and System Operations (Section 5.7)

Cumulative System Measures

None required.

References

See Chapter 6 for references.

October 30, 2008

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WATER SYSTEM IMPROVEMENT PROGRAM

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CHAPTER 6
Mitigation Measures

6.1 Introduction

This chapter presents mitigation measures for impacts associated with implementation of the proposed program as identified in Chapters 4 and 5 of this PEIR. Chapter 4 identifies impacts that would be associated with construction and operation of WSIP facility improvement projects, while Chapter 5 identifies impacts that would result from the proposed water supply and system operations. In these chapters, the level of significance is indicated for each impact; these determinations are one of the following: N/A (not applicable), B (Beneficial, no mitigation required), LS (Less than Significant, no mitigation required), PSM/SM (Potentially Significant/Significant, can be mitigated to less than significant), LSM (Less than Significant, since it would be mitigated with program-level mitigation measures) PSU/SU (Potentially Significant Unavoidable/Significant and Unavoidable, where mitigation would not necessarily reduce the impact to less than significant). The significance determinations are based on the potential effects of the proposed program as they relate to the significance criteria listed in Chapters 4 and 5, with consideration of how SFPUC construction measures and regulatory requirements may reduce the severity of the effect. Mitigation measures are then identified for all impacts determined to be PSM as well as for impacts determined to be PSU or SU, to the extent that any feasible mitigation would be available. The detailed descriptions of all mitigation measures are included in this chapter.

Section 6.2 of this chapter presents the SFPUC construction measures that will be applied to all WSIP facility improvement projects; Section 6.3 describes the mitigation measures to minimize facilities-related impacts; and Section 6.4 describes the mitigation measures to minimize water supply and system operations impacts. All mitigation measures are numbered to correspond to impact numbers presented in Chapters 4 and 5; in some cases where the same measure would mitigate more than one impact, the measure number corresponds to the first impact identified. In a few cases, implementation of the mitigation measures in and of themselves could result in additional environmental effects, and therefore, Section 6.5 includes a general description of impacts of those mitigation measures. Section 6.6 presents summary tables of all impacts and mitigation measures, showing which measures apply to which impact.

For the facilities-related mitigations, Section 6.3 presents the detailed text of the mitigation measures by environmental topic for all PSM/SM and PSU/SU impacts identified in the Chapter 4 analysis. The summary tables in Section 6.6 list all impacts analyzed in Chapter 4 and provides the mitigation information as applicable to each facility improvement project, including the impact statement, the significance determination, applicable SFPUC construction measure, PEIR mitigation measure, and regulations that reduce the severity of the impact. For some projects, an identified impact would not apply (N/A). For some projects, the impact would be LS with implementation of applicable SFPUC construction measures, though in a few cases, the identified impact would be LS without implementation of the SFPUC construction measures. For impacts determined to be PSM/SM, the mitigation measures described in Section 6.3 must be implemented to reduce potentially significant impacts to a less-than-significant level. For impacts determined to be PSU or SU, implementation of mitigation measures would still be required, but it has been determined that these measures would not reduce the identified impact to a less-than-significant level.[1] Section 6.3 identifies the appropriate program-level mitigation measures in general terms, referred to as “Program Measures,” that would apply to impacts identified for individual facilities improvement projects. Section 6.3 also presents “Collective Measures” and “Cumulative Measures,” which would reduce collective and cumulative impacts, respectively, and would apply to the WSIP by region or as a whole.

For the water supply/system operations mitigations, Section 6.4 presents the detailed text of the mitigation measures by watershed/groundwater basin for all PSM/SM and PSU/SU impacts identified in the Chapter 5 analysis. The summary tables in Section 6.6 list all impacts analyzed in Chapter 5 together with the significance determinations and the mitigation measures for PSM, PSU, and SU impacts. Similar to the facilities impact analysis, for impacts determined to be PSM, the mitigation measures described in Section 6.4 must be implemented to reduce potentially significant impacts to a less-than-significant level. For impacts determined to be PSU and SU, implementation of mitigation measures would still be required, but it has been determined that these measures would not reduce the identified impact to a less-than-significant level.[2] Section 6.4 identifies water supply/system operations mitigation measures which apply to the WSIP as a whole and are referred to as “System Measures.”

CEQA Section 15126.4 states that an EIR shall distinguish between the mitigation measures which are proposed by project sponsor to be included in the project and the measures that are identified in the EIR as proposed by the lead agency. At this time, the SFPUC intends to incorporate all mitigation measures presented in this PEIR into the implementation of the WSIP, if approved, and therefore all measures are considered to be proposed by the project sponsor except in the following cases:

- If any of the project-level EIRs completed on WSIP facility improvement projects finds a different impact determination and deems a PEIR mitigation measures unnecessary

- If any of the project-level EIRs determines that a project-specific mitigation measure would be more appropriate than a PEIR mitigation measure once the impact is more fully analyzed with additional project-level details

In the above cases, the SFPUC may not need to provide mitigation due to less-than-significant impact findings, or may chose to implement alternative mitigation measures identified in the project-level EIRs.

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1 In some cases, a mitigation measure may reduce an impact but because there is no definitive threshold, a less-than-significant determination cannot be made.
2 *Ibid*.

6.2 SFPUC Construction Measures

The following SFPUC standard construction measures apply to all proposed WSIP facility improvement projects. The SFPUC standard construction measures are aimed at minimizing disruptions to surrounding neighborhoods, resources, and land uses during any SFPUC construction, maintenance, or repair activity or project that requires CEQA review. As required by the SFPUC, each project must include the SFPUC standard construction measures in the construction contract or project implementation procedures, as appropriate.

Some of the SFPUC standard construction measures may not be appropriate for certain kinds of projects, but each of the measures must be addressed, either by explaining why the measure is not applicable to the particular site, undertaking the activities listed, or undertaking further investigation and developing a more detailed work plan to address the issue.

1. *Neighborhood Notice*: The SFPUC will provide reasonable advance notification to the businesses, owners and residents of adjacent areas potentially affected by the Water System Improvement Program (WSIP) projects about the nature, extent and duration of construction activities. Interim updates should be provided to such neighbors to inform them of the status of the construction.

   Where schools would be affected, the SFPUC will coordinate with school facility managers to schedule construction for time periods with the least impact on school activities and facilities to ensure student safety and to minimize disruption to educational and recreational uses of the school property.

2. *Seismic and Geotechnical Studies*: Projects will incorporate review of existing information and, if necessary, new engineering investigations to provide relevant geotechnical information about the particular site and project, including a characterization of the soils at the site, and the potential for subsidence and other ground failure. Construction will address any recommendations by such geotechnical reports to ensure seismic stability and reliability of the proposed project. All SFPUC projects must be designed for seismic reliability and minimum potential water loss and property damage. All components of the water system improvement program must be designed to continue water service during a major earthquake.

3. *On-Site Air and Water Quality Measures during Construction*: All construction contractors must take measures to minimize fugitive dust and dirt emissions resulting from the construction, and implement measures to minimize any construction effects on local air and water quality, including a local storm drain system or watercourse. These measures could include preparation of a Stormwater Pollution Prevention Plan (SWPPP), if required by the California Regional Water Quality Control Board. At a minimum, construction contractors should undertake the following measures, as applicable, to minimize any adverse effects:

   - Erosion and sedimentation controls tailored to the site and project
   - Dust control plan
   - Placement of straw rolls around each of the nearby stormwater inlets;
   - Preservation of existing vegetation;
   - Installation of silt fences;

- Use of wind erosion control (e.g. – geotextile or plastic covers on stockpiled soil);
- Sweeping of nearby streets at least once a day; and/or;
- Stabilization of site ingress/egress locations to minimize erosion.
- Spraying the disturbed areas of the site, or any stockpiled soil, with water to minimize fugitive dust emissions.

4. *Groundwater*: If groundwater is encountered during any excavation activities, the construction contractor shall prepare a dewatering plan so that water is discharged to the stormwater system in compliance with the local standards and discharge permit requirements.

5. *Traffic*: Each contractor shall prepare a traffic control plan which will minimize the impacts on traffic and on-street parking on any streets affected by construction of the proposed project. As appropriate, SFPUC or the contractor will consult with local traffic and transit agencies.

6. *Noise*: The contractor will comply with local noise ordinances regulating construction noise to the extent feasible, and will undertake efforts to minimize any noise disruption to nearby neighbors and sensitive receptors during construction.

7. *Hazardous Materials*: Appropriate measures will be implemented to characterize and dispose of hazardous materials should they be encountered during excavation and construction. Contract specifications will mandate full compliance will all applicable local, state and federal regulations related to the identification, transportation and disposal of hazardous materials/soils. As necessary, a spill prevention and countermeasure plan will be prepared.

   A qualified environmental professional will conduct any necessary site assessment. The site assessment would include a regulatory database review to identify permitted hazardous materials and environmental cases in the vicinity of each project no more than three months before construction, and a review of appropriate standard information sources to determine the potential for soil or groundwater contamination to occur. Follow-up sampling would be conducted as necessary to characterize soil and groundwater quality prior to construction and, if needed, site investigations or remedial activities would e performed in accordance with applicable laws. The environmental professional would prepare a report documenting the activities performed, summarize the results and make recommendations for appropriate handling of any contaminated materials during construction. A contingency plan would also be prepared identifying measures to be taken should unanticipated contamination be identified during construction. Construction contractors will conduct asbestos and lead abatement in accordance with established regulations.

8. *Biological Resources*: As an initial matter, SFPUC project managers will screen the project site and area to determine whether biological resources may be affected by construction activities. In the event further investigation is necessary, the SFPUC will comply with all requirements for investigation, analysis and protection of biological resources. A qualified biologist must conduct any required biological screening survey. The biologist will review standard information sources to determine special status species with the potential to occur on the project site. The biologist would carry out a site survey by walking or driving over the project site, as appropriate, to note the general resources and whether any habitat for special-status species is present. The biologist would then document the survey with a brief letter report or memo, setting forth the date of the visit, whether habitat for special-status

species is present, providing a map or description showing where sensitive areas exist within the site, and identifying any appropriate avoidance measures.

9. *Cultural Resources*: As an initial matter, SFPUC project managers will screen the project site and area to determine whether cultural resources, including archaeological and other historical resources, may be affected by construction activities. In the event further investigation is necessary, the SFPUC will comply with all requirements for investigation, analysis and protection of cultural resources.

CEQA considers paleontological resources to be "cultural resources." Any screening for cultural resources would include screening for archaeological, paleontological and historic resources. For projects requiring excavation, deep grading, well drilling or tunneling into geologic material at sites identified as having high potential for encountering paleontological resources, a state-registered professional geologist or qualified professional paleontologist will conduct a site-specific evaluation of the paleontological sensitivity. The assessment will include a report of findings for the SFPUC.

A qualified archaeologist, historian or paleontologist will conduct all cultural resources survey and screening work. Screening surveys for cultural resources would include a cultural resources records search to be conducted at the appropriate office member of the California Historical Resources Information System. A field survey will be conducted if determined necessary after the cultural resources records search. Any impacts on identified cultural resources will be avoided to the extent feasible.

Any initial historic resource screening will identify historic resources on the project site as well as adjacent to the project site.

It is possible that project work may affect accidentally discovered buried or submerged cultural resources. Any contractor must distribute the Planning Department archaeological resource “ALERT” sheet to any person involved in soil-disturbing activities. If there is any indication of an archaeological or a paleontological resource during the soils disturbing activity of the project, the contractor shall immediately suspend any soils disturbing activities in the area and notify the SFPUC of such discovery. The SFPUC will then work with the Planning Department’s Environmental Review Officer to determine what additional measures should be implemented, based on reports from a qualified archaeological or paleontological consultant.

10. *Project Site*: The SFPUC will conduct construction activities on SFPUC-owned lands to the extent feasible and minimize the need for use of non-SFPUC-owned land during construction. In cases where construction easement or staging areas are needed on non-SFPUC land, the SFPUC will restore these areas to their prior condition so that the owner may return them to their prior use, unless otherwise arranged with the property owner. The site will be maintained to be clean and orderly. Construction staging areas will be sited away from public view where possible. Nighttime lighting will be directed away from residential areas.

Upon project completion, the construction contractor will return the SFPUC project site to its general condition before construction, including re-grading of the site and re-vegetation of disturbed areas.

6.3 Mitigation Measures to Minimize Facilities Impacts

This section presents all mitigation measures for PSM/SM and PSU/SU impacts described in Chapter 4. Mitigation measures for impacts identified in Sections 4.2 through 4.15 are presented under the respective environmental resource topic, such as Land Use or Biological Resources. Mitigation measures for collective and cumulative impacts (Sections 4.16 and 4.17) are also presented under the appropriate environmental resource topic, rather than under a separate heading, so that similar measures are grouped together. As stated above, all mitigation measures are numbered to correspond to the same impact numbers, although in some cases, the same measure would mitigate more than one impact and the numbering corresponds to the first impact identified and cross-referenced so that measures are not duplicated.

6.3.1 Plans and Policies

None applicable.

6.3.2 Land Use and Visual Resources

Program Measures

Facility Siting Studies

Measure 4.3-2: It is the policy of the SFPUC to construct and operate its facilities on SFPUC-owned lands to the extent feasible. When use of SFPUC-owned land is not feasible, and where additional permanent easement or land acquisition is required, the SFPUC will conduct project-specific facility siting studies and implement these studies' recommendations to avoid or minimize impacts on existing land uses to the maximum extent feasible. Siting studies will identify and evaluate alternative site locations, access roads, building configurations and facility operations to minimize or avoid land use impacts. The studies will also consider existing and planned land uses on and adjacent to proposed facility sites and rights-of-way on non-SFPUC-owned land. To the extent feasible, the SFPUC will implement the recommendations in the siting studies.

Architectural Design

Measure 4.3-4a: The design of permanent new, above-ground facilities will consider the existing visual character of the site and surrounding area, including the visibility of facilities and related structures from scenic highways and scenic roads. Structures will be designed to incorporate building features and design elements that are compatible with the surroundings.

Landscaping Plans

Measure 4.3-4b: The SFPUC will prepare and implement landscaping plans to restore project sites to their pre-construction condition such that short-term construction disturbance does not result in long-term visual impacts. To retain the existing visual character of the site and surrounding area, disturbed areas will be recontoured and revegetated and recontoured to pre-construction condition. Landscape vegetation will include noninvasive, and where possible, native grasses, shrubs, and trees similar to existing landscaping. The SFPUC will monitor landscape plantings annually for five years after project completion to ensure that sufficient ground coverage has developed and will implement additional measures, such as replanting or modifying irrigation systems, as determined necessary.

Landscape Screens

Measure 4.3-4c: In addition to revegetation of disturbed areas, the landscaping plans will include new plantings and landscape berms to screen views of new structures and equipment from scenic roads to the extent possible, provided that such landscaping does not affect security of SFPUC facilities.

Minimize Tree Removal

Measure 4.3-4d: The SFPUC will minimize or avoid the removal of existing trees that currently screen existing and proposed sites of WSIP facilities by modifying the proposed alignments of new temporary and permanent roads to the extent feasible. The SFPUC will consult with a qualified arborist regarding the minimum buffer zones required to prevent root damage to remaining trees and to provide the SFPUC with any necessary maintenance requirements for remaining trees. Also, the arborist will develop and assist the SFPUC in implementing an appropriate landscaping plan (see Measure 4.3-4b, above), including tree replacement, that is compatible with project operation and maintenance.

Reduce Lighting Effects

Measure 4.3-5: To the extent possible, all permanent exterior lighting will incorporate cutoff shields and non-glare fixture design. All permanent exterior lighting will be directed onsite and downward. In addition, new lighting will be oriented to ensure that no light source is directly visible from neighboring residential areas and will be installed with motion-sensor activation. In addition, highly reflective building materials and/or finishes will not be used in the designs for proposed structures, including fencing and light poles. Vegetation selected for landscaping will be selected, placed and maintained to minimize offsite light and glare in surrounding areas as part of the landscaping plans described in Measure 4.3-4b.

Collective Measures

Construction Coordination at Irvington Portal

Measure 4.16-1a: If construction schedules of multiple WSIP projects occurring at and near Irvington Portal coincide or overlap, the SFPUC will coordinate with construction contractor(s) and neighbors to minimize disturbance of residents in the adjacent neighborhood to the extent practicable. Such coordination will need to balance the duration of construction with the magnitude of construction-related impacts on the same sensitive receptors.

6.3.3 Geology, Soils and Seismicity

Program Measures

Quantified Landslide Analysis

Measure 4.4-1: If the screening analysis conducted in accordance with SFPUC Construction Measure #2 identifies any landslide hazards, affected WSIP facilities will, to the extent feasible, be located away from known landslides, very steep hillsides, debris-flow source areas, the mouths of steep sidehill drainages, and the mouths of canyons that drain steep terrain. However, where these landslide hazard areas cannot be avoided, a more quantified analysis (including a site-specific geologic investigation and a slope stability analysis to determine the potential for landsliding) should be performed as part of the geotechnical investigation. Recommendations identified in the site-specific geotechnical report regarding the potential for landsliding, including appropriate construction measures, will be incorporated into the project designs to minimize the potential for damage to project facilities.

Subsidence Monitoring Program

Measure 4.4-4: As part of the project-specific CEQA review for the New Irvington Tunnel (SV-4) and BDPL Reliability Upgrade (BD-1), the SFPUC will analyze the potential for ground subsidence to occur during tunneling, and will identify project-specific trigger levels that would require corrective action should subsidence occur. As determined to be necessary, the tunnel contractor will implement a subsidence monitoring program during tunneling to detect subsidence, including measurements of groundwater levels, surface and subsurface settlement, ground movement and displacement, and movement in existing infrastructure as needed. The SFPUC will implement corrective actions, such as increased tunnel support, if measured displacement reaches the specified trigger levels.

Characterize Extent of Expansive and Corrosive Soil

Measure 4.4-9: If the screening analysis conducted in accordance with SFPUC Construction Measure #2 identifies a potential for expansive or corrosive soils, the site-specific geotechnical investigation will include a characterization of the presence and extent of expansive and corrosive soil at the project facility site. The results and recommendations of the investigation will be incorporated into the final project design.

6.3.4 Surface Water Hydrology and Water Quality

Program Measures

Site-Specific Groundwater Analysis and Identified Measures

Measure 4.5-2: As part of the project-specific CEQA review for the New Irvington Tunnel project (SV-4), the SFPUC will inventory springs and wells in the area of the planned tunnel and conduct a project-specific analysis of the potential for tunnel dewatering to stop or decrease spring flow, lower groundwater levels in nearby wells, or to otherwise cause adverse effects on groundwater resources and beneficial uses of the groundwater. If a significant impact is identified, then measures such as altering groundwater withdrawal rates and/or providing an alternate water supply for affected users will be implemented to ensure that groundwater resources or beneficial uses are not adversely affected.

Flood Flow Protection Measures

Measure 4.5-4a: In construction contract specifications, the SFPUC will require the contractor(s) to include, in their erosion control measures or SWPPP prepared for the project, a measure prohibiting the stockpiling of soil, storage of hazardous materials, and stockpiling of construction materials in flood zones, where practical. Where construction would occur in large flood zones, making it impractical to implement this requirement, the erosion control measures or SWPPP will include measures for protecting stockpiled soil, sources of hazardous materials, and stockpiled construction materials from exposure to flood waters.

Site-Specific Flooding Analysis and Identified Measures

Measure 4.5-4b: As part of the project-specific CEQA review for the Alameda Creek Fishery (SV-1) and New Irvington Tunnel (SV-4) projects, the SFPUC will conduct a site-specific analysis of the potential for flooding as a result of project implementation. If a dam or concrete weir is installed in Alameda Creek under the Alameda Creek Fishery project, the analysis will include, at a minimum, the stream flow data and planned design and operation of the dam or weir to prevent flooding impacts. For the New Irvington Tunnel project, the analysis will include design measures needed to ensure that upstream water levels are not affected, bridge abutments are protected from damage due to flood flows and would not adversely redirect flood flows, and that bridge pilings are protected from scour.

Stormwater Treatment and Groundwater Monitoring

Measure 4.5-5: If treated stormwater is used to augment Lake Merced water levels, the project-level CEQA analysis for the Local Groundwater Projects (SF-2) will include measures to ensure that use of stormwater does not promote eutrophication of the lake and provisions for implementing these measures. The project-level CEQA analysis will also evaluate the potential for groundwater quality degradation due to the use of treated stormwater to augment lake levels. If necessary, the SFPUC will implement a groundwater monitoring program in the vicinity of Lake Merced to monitor for degradation of groundwater quality. Monitoring will include water quality sampling for total coliform bacteria, total nitrogen, nitrate, nitrite, total organic carbon, parameters for which drinking water quality criteria have been established, and any other potential pollutants of concern. The project-level CEQA documentation will identify corrective actions that would be implemented should groundwater quality degradation be identified, such as additional treatment of water used to augment water levels in Lake Merced.

Appropriate Source Control and Site Design Measures

Measure 4.5-6: For projects located in areas not covered by a municipal stormwater permit and disturbing less than one acre of land during construction, the SFPUC will implement appropriate source control and site design measures that 1) minimize the stormwater flow rate and quantity to prevent off-site erosion and flooding; and 2) minimize stormwater pollutant discharges to the maximum extent possible. These measures will ensure compliance with applicable water quality criteria and goals and protect the beneficial uses of the receiving water.

6.3.5 Biological Resources

Program Measures

Wetlands Assessment

Measure 4.6-1a: As part of project-specific CEQA review, a qualified wetland scientist will review project plans, airphotos, and topographic maps and conduct a site visit to determine whether wetlands are present and could be affected by the project. If the review shows that wetlands could be affected, the wetland scientist will perform a formal wetland delineation and develop mitigation as per Measure 4.6-1b, below.

Compensation for Wetlands and Other Biological Resources

Measure 4.6-1b: If the wetland delineation indicates that the WSIP project will affect jurisdictional wetlands or aquatic resources, then, in accordance with state and federal permit requirements, the SFPUC will avoid and minimize direct and indirect impacts such as erosion and sedimentation, alteration of hydrology, and degradation of water quality. As a first priority, the SFPUC will implement (1) avoidance measures. For unavoidable impacts, the SFPUC will implement (2) minimization of unavoidable impacts, (3) restoration procedures, and (4) compensatory creation or enhancement to ensure no net loss of wetland extent or function.

In addition to wetlands, the SFPUC will compensate for sensitive riparian and upland habitats and habitats which support key special-status species or other species of concern lost as a result of WSIP project construction and operation. Similar habitat will be identified, protected, restored, enhanced, created and managed off-site[3] to ensure no net loss of habitat extent or function. For each WSIP project, a qualified biologist will quantify the magnitude and extent of impacts to wetlands, sensitive habitats, and key special-status species and other species of concern, and the SFPUC will develop and implement restoration and/or compensation plans that meet the appropriate regulatory requirements and permit conditions with respect to restoration and/or compensation ratios. Compensation ratios typically range from a minimum of 1:1 for common habitats to 2:1 or higher for rare and sensitive habitats. If individual project requirements of the RWQCB, CDFG, or USFWS differ somewhat from these ratios, they are still intended to achieve the same purpose of full restoration and/or compensation, to mitigate project impacts to less-than-significant levels, and to ensure no net reduction in the populations of any species listed as threatened or endangered by the state or federal resource agencies.

The SFPUC will obtain required permits for each project and comply with applicable environmental regulations addressing sensitive habitats and species. Compensatory lands, including those restored or enhanced as well as those acquired or designated as protected as part of program or project mitigation, will be established in perpetuity with a commitment that such lands will not be used for any purpose that conflicts with the primary purpose of maintaining intact wildlife and plant habitat.

3 Off-site means the compensatory action is located other than within the project construction footprint, but could be on lands already under SFPUC ownership. Measure 4.6-2 addresses compensatory actions to be taken within the construction footprint.

One alternative for implementing off-site habitat compensation is the Habitat Reserve Program (HRP) currently being developed by the SFPUC. The purpose of the HRP is to provide a comprehensive, coordinated approach to mitigation and related regulatory compliance for WSIP projects. This related SFPUC project is described further in Chapter 3.0, Section 3.11. Under the proposed HRP, the SFPUC would proceed as soon as possible with securing (through designation, management agreement, conservation easement, or acquisition of fee title) and improving lands to be used for habitat compensation so that mitigation is underway before or concurrent with habitat loss related to WSIP project activities, further ensuring no net loss of resources. CEQA environmental review for the proposed HRP will commence in 2007 and is targeted for implementation as soon as possible thereafter. Once the HRP is approved and implemented, the SFPUC will use this as one vehicle or method for implementing the mitigation requirements for individual WSIP projects. Otherwise, where appropriate and necessary, the SFPUC will develop and implement appropriate habitat compensation mitigation for individual WSIP projects.

Habitat Restoration/Tree Replacement

Measure 4.6-2: If the biological screening survey identifies sensitive habitats or heritage trees, the following measures, as modified and applied to WSIP projects, will be implemented:

- Temporarily-impacted sensitive habitats (natural communities identified as sensitive by CDFG, and USFWS-designated critical habitat) would be restored to their pre-project condition.

- If specific trees to be removed are designated as heritage trees (or similar local designation), then SFPUC will replace the trees, consistent with requirements in local ordinances. If such heritage trees occur near extensive areas of sensitive habitats, locally collected, native species will be used as replacement trees where possible.

- Where possible, the loss of sensitive habitats will be minimized by coordinating WSIP projects to make repeated use of staging/construction areas and access roads. For example, tunnel spoils could be considered for borrow material for other projects.

Protection Measures During Construction for Key Special-Status Species and Other Species of Concern

Measure 4.6-3a: The following general practice measures, as modified and applied to the WSIP projects, will be implemented if the initial biological screening survey (SFPUC Construction Measure #8) indicates the potential for the presence of key special-status species and other species of concern:

- Preconstruction surveys for key special-status species and other species of concern will be conducted by a qualified biologist to verify their presence or absence. Surveys will occur during the portion of the species' life cycle when the species is most likely to be identified within the appropriate habitat. Key special-status species and other species of concern will be avoided during construction when possible.

- A worker awareness program (environmental education) will be developed and implemented to inform project workers of their responsibilities in regards to sensitive biological resources.

- An environmental inspector will be appointed to serve as a contact for issues that may arise concerning implementation of mitigation measures, and to document and report on adherence to these measures during construction.

- Loss of habitat will be minimized through the following measures: (1) the number and size of access routes and staging areas and the total area of the project activity will be limited to the minimum necessary to achieve the project goal; (2) the introduction or spread of invasive non-native plant species and plant pathogens will be avoided or minimized by developing and implementing a weed control plan; and (3) all areas temporarily disturbed by construction will be revegetated to pre-project or native conditions, as specified in project-specific revegetation plans.

Standard Mitigation Measures for Specific Plants and Animals

Measure 4.6-3b: Table 6.1 identifies the key special-status species mitigation measures that the program analysis indicates would apply to each WSIP project. Measures listed in **Table 6.2** (listed by species) are generic measures and will be modified to fit site-specific conditions and applied to each WSIP project wherever special-status species could be affected by the projects. Surveys required under Measure 4.6-3a will refine the list of species that could be affected by a project. Table 6.1 is intended as the minimum necessary actions. In addition to adopting the generic measures, as more site-specific information is available, project-specific CEQA analysis may identify additional measures for key special-status species and additional measures for other species.

Pipeline and Water Treatment Plant Treated Water Discharge Restrictions

Measure 4.6-4: Planned discharges of regional system water from the WSIP pipelines and water treatment plants (such as crossover facilities) to creeks, rivers or other natural water bodies will be designed to minimize impacts to riparian and aquatic resources to the extent feasible. This will include dechlorination and/or pH adjustment facilities and energy dissipation structures that avoid or reduce bank erosion. In addition, the facilities should include design features to avoid or minimize temperature effects on aquatic resources; or alternatively, whenever possible, planned discharges should be scheduled to occur in the winter, when stream flows are high and temperatures low in the receiving waters to avoid or minimize temperature effects.

Collective Measures

Bioregional Habitat Restoration Measures

Measure 4.16-4a: Bioregional effects (those beyond the level of individual plants or animals and impacts not readily associated with any particular project) could result from the collective construction of WSIP facilities and the cumulative effects of implementing WSIP projects along with other proposed projects. Combined collective and cumulative bioregional effects that will need to be addressed as part of future mitigation efforts include the following:

- Compound impacts on functional units of habitat as WSIP projects simplify vegetation structure and increase “edge” (the boundary between two different habitats);
- Increased habitat impacts due to the spread of weedy, non-native plant species;
- Genetic diversity impacts on small populations that become reduced and isolated by development;

TABLE 6.1 (SEE MEASURE 4.6-3b)
MITIGATION MEASURES FOR KEY SPECIAL-STATUS SPECIES

No.	Project Name Notes: 1. This table is for guidance only and is not intended as a complete list of mitigations for all projects, which must be assessed individually at the project-specific level. 2. Standard measure B.4 (general surveys for raptors and protection of raptor nests) apply to all projects.	Suites of Key Special-Status Species						Individual Special-Status Species								
		Vernal Pool Invertebrates	Vernal Pool Plants	Riparian and Reservoir Species	Native Grassland Species	Salt Marsh Species	Fishes	Large-Flowered Fiddleneck	Foothill yellow-legged frog	California Red-Legged Frog	California Tiger Salamander	San Francisco Garter Snake	Alameda Whipsnake	Swainson's Hawk	Western Burrowing Owl	San Joaquin Kit Fox
SJ-1	Advanced Disinfection	I.2								RA.1	RA.2			B.1	B.2, B.3	M.2
SJ-2	Lawrence Livermore Supply Improvements	I.2						P.3		RA.1	RA.2			B.1	B.2, B.3	M.2
SJ-3	San Joaquin Pipeline System	I.2	P.1	I.1, P.2, B.5, M.3			F.1			RA.1	RA.2			B.1	B.2, B.3	M.2
SJ-4	Rehabilitation of Existing San Joaquin Pipelines	I.2	P.1	I.1, P.2, B.5, M.3			F.1			RA.1	RA.2			B.1	B.2, B.3	M.2
SJ-5	Tesla Portal Disinfection Station	I.2								RA.1	RA.2			B.1	B.2, B.3	M.2
SV-1	Alameda Creek Fishery Enhancement			B.5			F.1		RA.1	RA.1	RA.2		RA.4		B.2, B.3	
SV-2	Calaveras Dam Replacement			B.5	I.3		F.1		RA.1	RA.1	RA.2		RA.4		B.2, B.3	
SV-3	Additional 40-mgd Treated Water Supply			B.5					RA.1	RA.1	RA.2		RA.4		B.2, B.3	
SV-4	New Irvington Tunnel			B.5			F.1		RA.1	RA.1	RA.2		RA.4		B.2, B.3	
SV-5	SVWTP – New Treated Water Reservoirs			B.5			F.1		RA.1	RA.1	RA.2		RA.4		B.2, B.3	
SV-6	San Antonio Backup Pipeline			B.5			F.1		RA.1	RA.1	RA.2		RA.4		B.2, B.3	
BD-1	Bay Division Pipeline Reliability Upgrade	I.2				B.6, B.7, M.1	F.1			RA.1	RA.2		RA.4		B.2, B.3	
BD-2	BDPL Nos. 3 and 4 Crossovers	I.2					F.1			RA.1	RA.2				B.2, B.3	
BD-3	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault									RA.1	RA.2				B.2, B.3	

TABLE 6-1 (SEE MEASURE 4.6-3b) (Continued)
MITIGATION MEASURES FOR KEY SPECIAL-STATUS SPECIES

No.	Project Name **Notes:** **1. This table is for guidance only and is not intended as a complete list of mitigations for all projects, which must be assessed individually at the project-specific level.** **2. Standard measure B.4 (general surveys for raptors and protection of raptor nests) apply to all projects.**	Suites of Key Special-Status Species						Individual Special-Status Species								
		Vernal Pool Invertebrates	Vernal Pool Plants	Riparian and Reservoir Species	Native Grassland Species	Salt Marsh Species	Fishes	Large-Flowered Fiddleneck	Foothill yellow-legged frog	California Red-Legged Frog	California Tiger Salamander	San Francisco Garter Snake	Alameda Whipsnake	Swainson's Hawk	Western Burrowing Owl	San Joaquin Kit Fox
PN-1	Baden and San Pedro Valve Lots Improvements									RA.1	RA.2	RA.3				
PN-2	Crystal Springs/San Andreas Transmission Upgrade			B.5						RA.1	RA.2	RA.3				
PN-3	HTWTP Long-Term Improvements															
PN-4	Lower Crystal Springs Dam Improvements			B.5	I.3, P.4		F.1			RA.1	RA.2	RA.3				
PN-5	Pulgas Balancing Reservoir Rehabilitation									RA.1	RA.2	RA.3				
SF-1	San Andreas Pipeline No. 3 Installation															
SF-2	Groundwater Projects				P.4, I.3					RA.1		RA.3				
SF-3	Recycled Water Projects				P.4, I.3					RA.1		RA.3				

Note: Project-specific CEQA documents would review recent special-status species lists relevant to the habitats present.

All codes are defined in Table 6-2.

Vernal pool invertebrates:
- Vernal pool fairy shrimp
- Conservancy fairy shrimp
- Vernal pool tadpole shrimp

Vernal pool species:
- Succulent owl's-clover
- Hoover's spurge
- Colusa grass
- San Joaquin Valley Orcutt grass
- Hairy Orcutt grass
- Greene's tuctoria

Salt marsh species:
- Western snowy plover
- California clapper rail
- California black rail
- Salt marsh harvest mouse

Riparian and Reservoir species:
- Least Bell's vireo
- Valley elderberry longhorn beetle
- Riparian woodrat
- Delta button-celery
- Bald eagle

Fishes:
- Green sturgeon (San Joaquin Valley only)
- Chinook salmon
- Central Valley DPS steelhead
- Central California Coast DPS steelhead
- Rainbow trout (Alameda watershed)

Native grassland species:
- Bay checkerspot butterfly
- Callippe silverspot butterfly
- Fountain thistle (Peninsula)
- Marin dwarf flax (Peninsula)
- San Mateo woolly sunflower (Peninsula)

TABLE 6-2 (MEASURE 4.6-3b) STANDARD PROGRAMMATIC BIOLOGICAL RESOURCES MITIGATION MEASURES

Biological Resource Species and Status	Standard Mitigation Measures for Specific Plants and Animals
Invertebrates	
Valley Elderberry Longhorn Beetle (FT/--)	**I.1:** A biological monitor will accompany tree/brush clearing crews. The monitor will flag all elderberry shrubs in the tree clearing zone and be present during tree clearing operations in the vicinity of flagged shrubs to ensure that elderberry shrubs are not cut. If avoidance is not feasible, habitat impacts will be mitigated in accordance with the Programmatic Biological Opinion (PBO) for Valley elderberry longhorn beetle, issued by the USFWS Sacramento Field Office in 1996.
Vernal Pool Crustaceans Vernal pool fairy shrimp (FT/--) Conservancy fairy shrimp (FE/--) Vernal pool tadpole shrimp (FE/--)	**I.2:** Suitable habitat for vernal pool invertebrates will be avoided. If infeasible, impacts will be mitigated in accordance with the PBO for vernal pool invertebrates, issued by the USFWS Sacramento Field Office in 1995. Surveys may be conducted, with USFWS approval, to establish whether or not listed invertebrates are present.
Bay Checkerspot Butterfly (FT/--), Callippe Silverspot Butterfly (FE/--)	**I.3:** Suitable habitat for Bay checkerspot and Callippe silverspot butterflies will be avoided
Fishes	
Central Valley fall- and late-fall run DPSChinook salmon (FC/--) Central Valley DPS steelhead (FT/--) Green sturgeon Southern District DPS (FT/--) Central Coast DPS Steelhead (FT/--) Rainbow trout (--/--)	**F1:** For construction activity in anadromous fish-bearing streams, a biological monitor with appropriate permits will be present during all construction activities to relocate fish as necessary.
Reptiles and Amphibians	
California Red-Legged Frog (FT/CSC) Foothill yellow-legged frog (--/CSC)	**RA.1:** A PBO for construction impacts on red-legged frog was prepared by the USFWS (Federal Register, 1999). The general mitigation measures, above, and the measures listed below, are taken largely from the PBO and may be modified by a project-specific BO. The foothill yellow-legged frog has no legal protection under FESA; however, all potential FYLF habitat is also considered potential habitat for CRLF and these protection measures would be applied in any case. • The name and credentials of a biologist qualified to act as a construction monitor will be submitted to the USFWS for approval at least 15 days prior to commencement of work. • The USFWS-approved biologist will survey the site two weeks prior to the onset of work activities and immediately prior to commencing work. If frog adults, tadpoles, or eggs are found, the approved biologist will contact the USFWS to determine whether relocating any life stages is appropriate. • If worksites require dewatering, the intakes will be screened with a maximum mesh size of 5 millimeters. • The USFWS-approved biologist will remove and destroy from within the project area any individuals of non-native species, such as bullfrogs, crayfish, and centrarchid fishes, to the maximum extent possible.

TABLE 6-2 (MEASURE 4.6-3b) (Continued)
STANDARD PROGRAMMATIC BIOLOGICAL RESOURCES MITIGATION MEASURES

Biological Resource Species and Status	Standard Mitigation Measures for Specific Plants and Animals
Reptiles and Amphibians (cont.)	
California Tiger Salamander (FT/CSC)	**RA.2:** In addition to measures described for California red-legged frog, which would serve to protect California tiger salamander, the following measures will minimize adverse effects to California tiger salamander. • A preconstruction survey will be conducted at each site to identify suitable burrow aestivation areas. Aestivation habitat will be defined as the presence of two or more small mammal burrows greater than 1 inch in diameter within a 10-foot-diameter area and within 10 feet of proposed construction sites (i.e., the presence of a single isolated gopher hole would not be considered habitat). As feasible within the context of the work area, aestivation areas will be temporarily fenced and avoided. • At locations where aestivation burrows are identified and cannot be avoided, aestivation burrows will be excavated by hand prior to construction and individual animals moved to natural burrows or artificial burrows constructed of PVC pipe within 0.25 mile of the construction site. • To ensure compliance with these measures and minimize California tiger salamander take, a qualified biological monitor will be present during all construction operations at locations with suitable aestivation burrows. Construction sites where potential habitat has been identified will be surveyed by a qualified biologist for California tiger salamander. Surveys would be appropriately timed with respect to salamander activity and proposed construction activities. • Surveys would include drift fences and pitfall traps within construction sites to identify and relocate animals. Following removal of individuals, construction areas will be fenced with temporary silt fencing.
San Francisco Garter Snake (FE/CE/CP)	**RA.3:** San Francisco garter snake is a California fully protected species, and incidental taking must be avoided. Therefore, in addition to measures RA.1 and RA.2, above, for construction activities in occupied habitat the work area will be fenced with frog- and snake-proof mesh fence, or 4- x 8-foot plywood panels joined lengthwise, with escape funnels to allow egress, but not access, by San Francisco garter snake.
Alameda Whipsnake (FT/CT)	**RA.4:** Construction-related impacts on individual Alameda whipsnakes will be minimized and/or avoided through the development and implementation of an Alameda whipsnake protection and monitoring plan, to be approved by the USFWS during informal consultation under FESA. Protective measures outlined in RA.1 will apply to all areas of known or potential habitat for Alameda whipsnake. In addition, it will include: • Sites within Alameda whipsnake habitat will be hand-cleared, or a qualified biologist will do surveys and relocate the snake immediately prior to equipment clearing. • Activities that could harm or harass Alameda whipsnake will be avoided or minimized. • Upland habitats used by Alameda whipsnake will be restored as feasible, and lost habitat will be compensated according to an agreed-upon ratio.
Birds	
Swainson's Hawk (FSC/CT)	**B.1:** To avoid disrupting nesting Swainson's hawks, construction activities at known nesting locations will occur prior to the nesting season (March 1 through September 15). Alternatively, if construction activities take place during the nesting season, a qualified biologist will conduct a preconstruction survey no more than two weeks before the start of construction and report whether or not there are nesting Swainson's hawks within 1,320 feet of any project (access permitting). If there are nesting Swainson's hawks within the 1,320-foot buffer areas, construction will be delayed until the CDFG has been consulted to determine suitable avoidance measures. A potential avoidance measure may include delaying all construction activity within 1,320 feet of an active Swainson's hawk nest until the adult and/or juvenile hawks are no longer using the nest as the center of their activity.

TABLE 6-2 (MEASURE 4.6-3b) (Continued)
STANDARD PROGRAMMATIC BIOLOGICAL RESOURCES MITIGATION MEASURES

Biological Resource Species and Status	Standard Mitigation Measures for Specific Plants and Animals
Birds (cont.)	
Western Burrowing Owl (FSC/CSC)	**B.2:** No more than two weeks before construction, a survey for burrows and burrowing owls will be conducted by a qualified biologist within 500 feet of the project (access permitting). The survey will conform to the protocol described by the California Burrowing Owl Consortium (1995), which includes up to four surveys on different dates if there are suitable burrows present. **B.3:** If occupied owl burrows are found within the survey area, a determination will be made by a qualified biologist, in consultation with the CDFG, as to whether or not work will affect the occupied burrows or disrupt reproductive behavior. If it is determined that construction will not affect occupied burrows or disrupt breeding behavior, construction will proceed without any restriction or mitigation measures. If it is determined that construction will affect occupied burrows during August through February, the subject owls will be passively relocated from the occupied burrow(s) using one-way doors. There will be at least two unoccupied burrows suitable for burrowing owls within 300 feet of the occupied burrow before one-way doors are installed. Artificial burrows will be in place at least one-week before one-way doors are installed on occupied burrows. One-way doors will be in place for a minimum of 48 hours before burrows are excavated. If it is determined that construction will physically affect occupied burrows or disrupt reproductive behavior during the nesting season (March through July), then avoidance is the only mitigation available. Construction will be delayed within 300 feet of occupied burrows until it is determined that the subject owls are not nesting or until a qualified biologist determines that juvenile owls are self-sufficient or are no longer using the natal burrow as their primary source of shelter.
Raptors including bald eagle (FD/CE/CFP)	**B.4: Raptor nests:** • In consultation with CDFG and USFWS trees with unoccupied raptor nests (stick nests or cavities) may only be removed prior to March 1, or following the nesting season. • A survey to identify active nests will be conducted by a qualified biologist no more than two weeks before the start of construction at project sites from February 1 through July 30. • Construction activities within 0.5 mile of an active bald eagle nest may not occur between February 1 and July 31. • Active raptor nests located within 500 feet of the project will be mapped, to the extent allowed by access. • If an active raptor nest is found within 500 feet of the project, a determination will be made by a qualified biologist, in consultation with the CDFG, as to whether or not construction work will affect the active nest or disrupt reproductive behavior. • If it is determined that construction will not affect an active nest or disrupt breeding behavior, construction will proceed without any restriction or mitigation measure. • If it is determined that construction will affect an active raptor nest or disrupt reproductive behavior, then avoidance is the only mitigation available. Construction will be delayed within 300 feet of such a nest until a qualified biologist determines that the subject raptors are not nesting or until any juvenile raptors are no longer using the nest as their primary day and night roost.
Least Bell's vireo (FE/CE)	**B.5:** Protection for least Bell's vireos depend principally on seasonal avoidance of habitat during the nesting season and protection of suitable habitat. To avoid working during the active breeding season, construction activities in suitable habitat (dense willows [*Salix* sp.], mulefat [*Baccharis glutinosa*], or California wild rose [*Rosa californica*] may not proceed until July 15 unless approved by the USFWS and CDFG, as appropriate.
California Black Rail (FE/CE), California Clapper Rail (FSC/CT/CFP)	**B.6:** When working within 100 feet of salt or brackish marshland (e.g., the BDPL Reliability Upgrade, BD-1), presume presence for either species during the period from February 1 to August 31, and schedule construction to begin no earlier than September 1 and end no later than January 31.

TABLE 6-2 (MEASURE 4.6-3b) (Continued)
STANDARD PROGRAMMATIC BIOLOGICAL RESOURCES MITIGATION MEASURES

Biological Resource Species and Status	Standard Mitigation Measures for Specific Plants and Animals
Birds (cont.)	
Western Snowy Plover (FT/CSC)	**B.7:** When project activities are in or adjacent to suitable habitat (e.g., portions of the BDPL Reliability Upgrade, BD-1) no earlier than September 1 and no later than January 31, no measures are necessary; however, between March 15 and August 31 the following will be observed: • A qualified biologist will conduct preconstruction surveys two weeks and one week before the start of work. If western snowy plovers or their nests are not observed, then the project activity may proceed; or • If a western snowy plover is observed within a 50-foot perimeter of the location of the construction activity two weeks or one week before, a qualified biologist will observe the activities of the bird(s) to determine if nesting behavior is exhibited. If either nesting behavior or a nest is observed within a 50-foot perimeter of the location of the activity, then the activity will be delayed until either nesting is abandoned or completed.
Mammals	
Salt Marsh Harvest Mouse (FE/CE/CFP)	**M.1:** When project activities are in or adjacent to suitable habitat (e.g., portions of the BDPL Reliability Upgrade, BD-1), vehicles will be confined to existing roads where possible, and disturbed areas will be revegetated with brackish marsh species. Crews will use matting, pontoon boards, or other comparable methods whenever feasible to minimize impacts on vegetation. The placement of mats will be verified by a qualified biologist before their placement to minimize habitat impacts. Crews will work exclusively from mat boards and boardwalks to minimize the trampling of vegetation. A qualified biologist will be available during the course of the maintenance work. In situations where habitat is to be permanently disturbed, project-specific take avoidance measures (such as fencing and trapping to exclude salt marsh harvest mouse) will be developed, since the mouse is a California fully protected species, and incidental taking must be avoided.
San Joaquin Kit Fox (FE/CT)	**M.2:** The following reasonable and prudent measures will be followed to avoid direct or indirect project-related disturbances and impacts on San Joaquin kit fox. Prior to the commencement of construction activities, a qualified biologist will survey for potential kit fox dens within the area to be disturbed and will photograph, mark, and map the dens. Disturbance of all known San Joaquin kit fox dens will be avoided. Limited destruction of potential dens may be allowed, provided the following procedures are implemented: • Potential dens occurring within the construction area will be monitored for three days with tracking medium or an infrared beam camera to determine current usage. If no kit fox activity is observed during this period, the den would be destroyed immediately to preclude subsequent use. If kit fox activity is observed, the den will be considered a known den. • Project-related vehicles will observe a 20-mph speed limit in habitat areas except as posted on county roads and state and federal highways. Off-road traffic outside the designated project area will be prohibited. • To prevent accidental entrapment of kit fox or other animals during construction, all excavated or deep-walled holes or trenches greater than 2 feet will be covered at the end of each workday by plywood or similar materials, or provided with escape routes constructed of earth fill or wooden planks. Before such holes are filled they will be thoroughly inspected for trapped animals. • Kit foxes are attracted to den-like structures such as pipes and may enter stored pipe and become trapped or injured. All construction pipes, culverts, or similar structures with a diameter of 4 inches or greater that are stored at construction sites for one or more overnight periods will be thoroughly inspected for kit foxes before the pipe is subsequently buried, capped, or otherwise used or moved in any way.

TABLE 6-2 (MEASURE 4.6-3b) (Continued)
STANDARD PROGRAMMATIC BIOLOGICAL RESOURCES MITIGATION MEASURES

Biological Resource Species and Status	Standard Mitigation Measures for Specific Plants and Animals
Mammals (cont.)	
Riparian Woodrat (FE/CSC)	**M.3:** If construction will involve surface disturbance or vegetation removal in riparian habitat in the San Joaquin Region, a biologist will carry out a preconstruction survey to determine the presence or any signs of riparian woodrat, such as stick nests. Such areas will be avoided if feasible. If avoidance is not feasible, a protection and monitoring plan will be developed and approved by the USFWS during formal consultation under FESA.
Plants	
Vernal Pool Plants Succulent Owl's-Clover ((FE/CE) Hoover's Spurge (FT/--) Colusa Grass (FT/CE) San Joaquin Valley Orcutt grass (FT/CE) Greene's Tuctoria (FE/CR) Hairy Orcutt Grass (FE/CE)	**P.1:** The avoidance measures for vernal pool crustaceans will also apply to vernal pool special-status plants. Surveys to ascertain presence are highly recommended, and if first-year surveys occur during unusually low rainfall conditions, a second year of surveys, if possible, will help to establish whether avoidance measures are needed.
Riparian Plants Delta button-celery (FSC/CE)	**P.2:** The state endangered Delta button-celery occurs on clay soils on the sparsely vegetated margins of seasonally flooded floodplains and swales. Periodic flooding maintains the species' habitat through sustenance of seasonal wetlands and reduction of competition due to scouring. If a population of this species is located in an area proposed for construction, the preferred action is to avoid it if possible. The CDFG might allow salvage and restoration of the site, since this is a species that depends on ongoing disturbance to maintain its habitat. However, such strategies generally involve several years of treatment and post-treatment monitoring, so the simplest approach is to avoid impacts if possible.
Large-Flowered Fiddleneck (FE/CE)	**P.3:** Surveys for large-flowered fiddleneck will be carried out at an appropriate time of year for projects located within the known range of the species (Corral Hollow and hills immediately to the west). Any populations found will be avoided. An approved biological monitor will be present during all surface clearing activities.
San Mateo Woolly Sunflower (FE/CE), Marin Western Flax (FT/CT) Fountain thistle (FE/CE)	**P.4:** Surveys for San Mateo woolly sunflower, fountain thistle and Marin western flax will be carried out at an appropriate time of year for projects located within the known range of the species. Any populations found will be avoided. An approved biological monitor will be present during all construction activities. A plan will be developed to protect populations located along Crystal Springs and Polhemus Roads where project-related construction vehicle traffic will occur. Where populations cannot be avoided, salvage of plants or seed will be implemented, along with a program to compensate for losses.

Status Codes: FE-Federal Endangered; FT-Federal Threatened; FC-Federal Candidate; FSC-Federal Species of Concern. FD-Federal Delisted; CE-California Endangered; CT-California Threatened; CR-California Rare; CFP-California Fully Protected

- Impacts on wildlife movement due to habitat fragmentation;

- Suppression of natural disturbance regimes (e.g., fire, flood) as projects are constructed, operated, and maintained; and

- Reduced population recovery opportunities from stochastic events (e.g., random events such as disease).

When implementing habitat compensation mitigation required for individual WSIP facility projects, the SFPUC shall do so in a manner that addresses the above bioregional effects and includes the following conservation principles:

- The parcels are either contiguous with other areas of relatively undisturbed habitat or are themselves large enough to support most of the species associated with the habitat;

- The distribution of mitigation lands will allow movement of plants and animals between them or from them to habitats otherwise conserved (e.g. as described in The Wilderness Society, 2001); and

- Implementation of habitat compensation mitigation for individual WSIP facility projects will be combined and implemented through a coordinated program with other mitigation efforts, such as through the Habitat Reserve Program (HRP), and shall meet these standards:

    - Long-term management of these lands stipulates maintaining natural disturbance regimes (e.g., through prescribed burning);

    - Long-term control actions for non-native species are applied; and

    - Contingencies are considered which address sharing biological materials and information with other conservation land stewards.[4] This might include restoring suitable sites with plants brought from another protected area once a weed infestation has been brought under control, or animal relocation if done strictly for the purpose of genetic diversity or recovery, and with the approval of the regulatory agencies.

Coordination of Construction Staging and Access

Measure 4.16-4b: When construction schedules for WSIP projects affecting the same areas overlap, the SFPUC will coordinate construction contractor(s) to the extent practicable to minimize surface disturbance associated with access roads, laydown areas, and staging areas.

[4] For example, the California Department of Parks and Recreation (CDPR), East Bay Regional Parks District (EBRPD), and the Midpeninsula Regional Open Space District (MROSD).

6.3.6 Cultural Resources

Program Measures

Suspend Construction Work if Paleontological Resource is Identified

Measure 4.7-1: This mitigation measure builds on SFPUC Construction Measure # 9 for cultural resources, which requires that construction work will be suspended immediately if there is any indication of a paleontological resource. When a paleontological resource (fossilized invertebrate, vertebrate, plant or micro-fossil) is discovered at any of the project sites, an appointed representative of the SFPUC will notify a qualified paleontologist, who will document the discovery as needed, evaluate the potential resource, and assess the significance of the find under the criteria set forth in Section 15064.5 of the CEQA Guidelines. When a fossil is found during construction, excavations within 50 feet of the find will be temporarily halted or diverted until the discovery is examined by a qualified paleontologist, in accordance with Society of Vertebrate Paleontology standards (SVP 1995, 1996). The paleontologist will notify the SFPUC to determine procedures to be followed before construction is allowed to resume at the location of the find. If the SFPUC determines that avoidance is not feasible, the paleontologist will prepare an excavation plan for mitigating the effects of the project.

Archaeological Testing, Monitoring, and Treatment of Human Remains

Measure 4.7-2a: SPFUC Construction Measure #9 for cultural resources requires that a pre-construction screening be conducted by a qualified archaeologist. Based on the results of this screening, the Environmental Review Officer (ERO) shall determine if implementation of an archaeological testing or archaeological monitoring program or both is the appropriate strategy for avoidance of potential adverse effects to significant archaeological resource. For those projects that require a federal permit and compliance with the NHPA, Section 106, the ERO will review the SHPO-approved requirements in the permit conditions and consider protective approaches that limit undue duplication of efforts.

Archaeological Testing Program. The archaeological consultant shall prepare and submit to the ERO for review and approval an archaeological testing plan (ATP). The archaeological testing program shall be conducted in accordance with the approved ATP. The ATP shall identify the property types of the expected archaeological resource(s) that potentially could be adversely affected by the proposed project, the testing method to be used, and the locations recommended for testing. The purpose of the archaeological testing program will be to determine to the extent possible the presence or absence of any expected archaeological resources and to identify and to preliminarily evaluate the integrity and significance of the resource.

At the completion of the archaeological testing program, the archaeological consultant shall submit a written report of the findings to the ERO. If based on the archaeological testing program the archaeological consultant finds that significant archaeological resources may be present, the ERO in consultation with the archaeological consultant shall determine if additional measures are warranted. Additional measures that may be undertaken include additional archaeological testing, archaeological monitoring, preparation of an archaeological research design and treatment plan, or an archaeological data recovery program.

Archaeological Monitoring Program. The archaeological consultant shall prepare and submit to the ERO for review and approval an archaeological monitoring plan (AMP). The archaeological monitoring program shall be conducted in accordance with the approved AMP. The AMP shall specify what project activities in areas sensitive for buried resources shall be archaeologically monitored. Project activities that may require monitoring may include the installation of pipelines and crossover facilities and certain soils-altering activities such as grading and access road construction associated with construction or improvement of water storage facilities. The archaeological monitoring program shall include the following:

- All project contractors shall be advised to be on the alert for evidence of the presence of the expected resource(s), of how to identify the evidence of the expected resource(s), and of the appropriate protocol in the event of apparent discovery of an archaeological resource;

- The archaeological monitor(s) shall be present on the project site according to a schedule agreed upon by the archaeological consultant and the ERO until the ERO has, in consultation with project archaeological consultant, determined that project construction activities are unlikely to have effects on significant archaeological deposits;

- The archaeological monitor shall record and be authorized to collect soil samples and artifactual/ecofactual material as warranted for analysis;

- If an intact archaeological deposit is encountered, all soils-disturbing activities within the area specified in the AMP of the deposit shall cease. The archaeological monitor shall be empowered to temporarily redirect demolition/excavation/pile driving/construction activities and equipment until the deposit is evaluated. The archaeological consultant shall immediately notify the ERO of the encountered archaeological deposit. The archaeological consultant shall make a reasonable effort to assess the identity, integrity, and significance of the encountered archaeological deposit, and present the findings of this assessment to the ERO.

Whether or not significant archaeological resources are encountered, the archaeological consultant shall submit a written report of the findings of the monitoring program to the ERO.

Additional Requirements: the following requirements, as applicable, are requisite in implementation of either an archaeological testing or monitoring program.

Archaeological Data Recovery Program. The archaeological data recovery program shall be conducted in accord with an archaeological data recovery plan (ADRP). The archaeological consultant, project sponsor, and ERO shall meet and consult on the scope of the ADRP prior to preparation of a draft ADRP. The archaeological consultant shall submit a draft ADRP to the ERO. The ADRP shall identify how the proposed data recovery program will preserve the significant information the archaeological resource is expected to contain. That is, the ADRP will identify what scientific/historical research questions are applicable to the expected resource, what data classes the resource is expected to possess, and how the expected data classes would address the applicable research questions. Data recovery, in general, should be limited to the portions of the historical property that could be adversely affected by the proposed project. Destructive data recovery methods shall not be applied to portions of the archaeological resources if nondestructive methods are practical.

The scope of the ADRP shall include the following elements:

- *Field Methods and Procedures*. Descriptions of proposed field strategies, procedures, and operations.
- *Cataloguing and Laboratory Analysis*. Description of selected cataloguing system and artifact analysis procedures.
- *Discard and Deaccession Policy*. Description of and rationale for field and post-field discard and deaccession policies.
- *Interpretive Program*. Consideration of an on-site/off-site public interpretive program during the course of the archaeological data recovery program.
- *Security Measures*. Recommended security measures to protect the archaeological resource from vandalism, looting, and non-intentionally damaging activities.
- *Final Report*. Description of proposed report format and distribution of results.
- *Curation*. Description of the procedures and recommendations for the curation of any recovered data having potential research value, identification of appropriate curation facilities, and a summary of the accession policies of the curation facilities.

Human Remains and Associated or Unassociated Funerary Objects. The treatment of human remains and of associated or unassociated funerary objects discovered during any soils disturbing activity shall comply with applicable State laws. This shall include immediate notification of the coroner of the county within which the project is located and in the event of the coroner's determination that the human remains are Native American remains, notification of the California State Native American Heritage Commission (NAHC) who shall appoint a Most Likely Descendant (MLD) (Pub. Res. Code Sec. 5097.98). The archaeological consultant, project sponsor, and MLD shall make all reasonable efforts to develop an agreement for the treatment of, with appropriate dignity, human remains and associated or unassociated funerary objects (CEQA Guidelines. Sec. 15064.5(d)). The agreement should take into consideration the appropriate excavation, removal, recordation, analysis, custodianship, curation, and final disposition of the human remains and associated or unassociated funerary objects. State law allows 24 hours to reach agreement on these matters. If the MLDs do not agree on the reburial method, the Project will follow Section 5097.98(b) of the California Public resources code which states, "the landowner or his or her authorized representative shall reinter the human remains and items associated with Native American burials with appropriate dignity on the property in a location not subject to further subsurface disturbance."

Final Archaeological Resources Report. The archaeological consultant shall submit a Draft Final Archaeological Resources Report (FARR) to the ERO that evaluates the historical significance of any discovered archaeological resource and describes the archaeological and historical research methods employed in the archaeological testing/monitoring/data recovery program(s) undertaken. Information that may put at risk any archaeological resource shall be provided in a separate removable insert within the final report. Once approved by the ERO, copies of the FARR shall be distributed as follows: the relevant California Historical Resources Information System Information Center shall receive one (1) copy and the ERO shall receive a copy of the transmittal of the FARR to the Information Center. The Major Environmental Analysis division of the Planning Department (MEA) shall receive three copies of the FARR along with copies of any formal site recordation forms (CA DPR 523 series) and/or documentation for evaluation under National Register of Historic Places/California Register of Historical Resources criteria. The SFPUC shall receive copies of the FARR as requested in number. In instances of high public interest in or the high interpretive value of the resource, the ERO may require a different final report content, format, and distribution than that presented above.

Accidental Discovery Measures

Measure 4.7-2b: SFPUC Construction Measure # 9 for cultural resources requires that construction activities be suspended immediately if there is any indication of an archaeological resource.

To avoid any potential adverse effect from the proposed project on accidentally discovered buried or submerged historical resources as defined in CEQA Guidelines Section 15064.5(a)(c), the project sponsor shall distribute the Planning Department archaeological resource “ALERT” sheet to the project prime contractor; to any project subcontractor (including demolition, excavation, grading, foundation, pile driving, etc. firms); or utilities firm involved in soil disturbing activities within the project site. Prior to any soil disturbing activities being undertaken, each contractor is responsible for ensuring that the “ALERT” sheet is circulated to all field personnel including, machine operators, field crew, pile drivers, supervisory personnel, etc. The project sponsor shall provide the Environmental Review Officer (ERO) with a signed affidavit from the responsible parties (prime contractor, subcontractor(s), and utilities firm) to the ERO confirming that all field personnel have received copies of the “ALERT” sheet.

If the ERO determines that an archaeological resource may be present within the project site, the project sponsor shall retain the services of a qualified archaeological consultant. The archaeological consultant shall advise the ERO as to whether the discovery is an archaeological resource, retains sufficient integrity, and is of potential scientific/historical/cultural significance. If an archaeological resource is present, the archaeological consultant shall identify and evaluate the archaeological resource. The archaeological consultant shall make a recommendation as to what action, if any, is warranted. Based on this information, the ERO may require, if warranted, specific additional measures to be implemented by the project sponsor.

Measures might include: preservation in situ of the archaeological resource; an archaeological monitoring program; or an archaeological testing program. If an archaeological monitoring program or archaeological testing program is required, it shall be consistent with the MEA guidelines for such programs. The ERO may also require that the project sponsor immediately implement a site security program if the archaeological resource is at risk from vandalism, looting, or other damaging actions.

The project archaeological consultant shall submit a Final Archaeological Resources Report (FARR) to the ERO that evaluates the historical significance of any discovered archaeological resource and describing the archaeological and historical research methods employed in the archaeological monitoring/data recovery program(s) undertaken. Information that may put at risk any archaeological resource shall be provided in a separate removable insert within the final report. Once approved by the ERO, copies of the FARR shall be distributed as follows: the relevant California Historical Resources Information System Information Center shall receive one (1) copy and the ERO shall receive a copy of the transmittal of the FARR to the Information Center. The MEA shall receive three copies of the FARR along with copies of any formal site recordation forms (CA DPR 523 series) and/or documentation for nomination to the National Register of Historic Places/California Register of Historical Resources. The SFPUC shall receive copies of the FARR as requested in number. In instances of high public interest in or the high interpretive value of the resource, the ERO may require a different final report content, format, and distribution than that presented above.

Protection of Historic Districts

Measure 4.7-3: The city's water system facilities affected by WSIP facility projects will be assessed by a qualified historian for their potential contribution to an historic district, following the guidelines identified under Impact 4.7-3. To qualify as an historic district, each resource within that potential district would need to be reliant upon the other resources within the district to be historically significant. Impacts on one resource within the potential district may or may not affect the others, and this conclusion would determine the ultimate significance of the impact.

If an historic district would be affected by one or more proposed WSIP facility projects, the SFPUC, in consultation with the ERO, will develop mitigation measures for effects with attention to the potential district as a whole, with utmost effort made to maintain the district's function, appearance, cohesive site organization, and ability to convey historic significance. Appropriate measures may also include but not be limited to: refinement of facility sites to minimize effects on district appearance and site organization as well as visual screening efforts to reduce the impact of adding new facilities or otherwise modifying the landscape.

Should an historic district be identified at the project level, it should be recorded as such, using the four National/California Register criteria of significance to explain its historical importance as a cohesive group of resources. The district should be documented by completing the State of California Department of Parks and Recreation 523 forms, using a 523D (District) form as an umbrella record to unify the 523A (Primary Record) and 523B (Building, Structure, Object) forms completed for each individual resource within the potential district, and submitting them to SHPO.

Alternatives Identification and Resource Relocation

Measure 4.7-4a: If a project proposes to demolish or remove a historical resource, including individual historic resources and/or historic districts, the SFPUC will attempt to identify feasible project alternatives that eliminate or reduce the need for demolition or removal to the greatest extent possible. The SFPUC will pursue and implement these project alternatives to the extent feasible, consistent with the goals and objectives of the WSIP.

Relocation of a resource will always be preferable to demolition, although relocation might not mitigate impacts to a less-than-significant level. If preservation of the affected historical resource at the current site is determined to be infeasible, the structure shall, if feasible, be stabilized and relocated to other nearby sites appropriate to their historic setting and general environment. This may not be possible in some cases, like in the replacement of Calaveras Dam (if it were identified as a historical resource for the purposes of CEQA). After relocation, the resource shall be treated according to preservation, rehabilitation, or restoration standards, as appropriate, that follow the Secretary of the Interior's *Standards*. This will ensure that the building, structure, object, site, or district retains historic integrity and its historic significance (Measure 4.7-4c). If the affected historical resource can neither be preserved at its current site nor moved to an alternative site and is to be demolished, the SFPUC shall consult with local historical societies and governmental agencies regarding salvage of materials from the affected historical resource for public information or reuse in other locations. Demolition may proceed only after any significant historic features or materials have been identified, preserved (as feasible), and their removal completed.

Representative features such as aqueduct/pipe sections, valves subject to replacement, decorative elements, or plaques/inscriptions from buildings or other portions of structures demolished as a part of the WSIP projects could be preserved and displayed. Most of these types of structures are of sufficient size that they would form "monumental" commemorative structures. For example, an original pipeline valve replaced by modern equipment might be mounted and displayed on publicly accessible SFPUC property with informative placards. Such displays, if located in other jurisdictions, might be subject to those jurisdiction's requirements related to public art, safety, and liability considerations.

Historical Resources Documentation

Measure 4.7-4b: Documentation of a historical resource, including resources identified as contributors to a historic district or as individually significant, prior to demolition or removal is a standard mitigation measure. Such documentation is often tied to meeting the documentation standards of the Historic American Buildings Survey/Historic American Engineering Record (HABS/HAER). The publication *Recording Historic Structures: Historic American Buildings Survey/Historic American Engineering Record* (Burns, 1989) provides four levels of documentation corresponding to the level of importance of the historic resource to be documented. For the purpose of this PEIR, the standards for photography in Documentation Levels III and IV have been modified to allow for the use of digital photographs instead of large-format negatives.

Documentation Level I:

1. Drawings: a full set of measured drawings depicting existing or historic conditions.
2. Photographs: photographs with large-format negatives of exterior and interior views; photocopies with large-format negatives of select existing drawings or historic views where available. Photographs would follow the HABS/HAER Photographic Specifications.
3. Written data: history and description.

Documentation Level II:

1. Drawings: select existing drawings, where available, should be photographed with large-format negatives or photographically reproduced on Mylar.

2. Photographs: photographs with large-format negatives of exterior and interior views, or historic views, where available. Photographs would follow the HABS/HAER Photographic Specifications.
3. Written data: history and description.

Documentation Level III:

1. Drawings: sketch plan.

2. Photographs: digital photographs of exterior and interior views.
3. Written data: architectural data form.

Documentation Level IV:

1. Drawings: sketch plan.
2. Photographs: digital photographs of exterior and interior views.
3. HABS/HAER inventory cards.

Digital photography will follow the standards in the National Register of Historic Places and National Historic Landmarks Survey, Photo Policy Expansion, March 2005 (Table VV). Digital image files would be burned to archival-quality disks, such as the eFilm Archival Gold CD-R or DVD-R; or MAM-A Mitsui Gold Archive CD-R or DVD-R.

The SFPUC will prepare, or retain a consultant to prepare, documentation of historical resources prior to any construction work associated with demolition or removal. The appropriate level of documentation will be selected by a qualified professional who meets the standards for history, architectural history, and/or architecture (as appropriate) set forth by the Secretary of the Interior (*Secretary of the Interior's Professional Qualification Standards*, 36 CFR 61) in consultation with a preservation specialist assigned by the San Francisco Planning Department and the local jurisdiction if deemed appropriate by the Planning Department. In addition to the four levels of documentation listed above, salvage and/or interpretive display may also be required if determined appropriate. The professional in history, architectural history and/or architecture (as appropriate) will prepare the documentation and submit it for review and approval by the Planning Department's preservation specialist. One set of the documentation will be archived at each of the following repositories: San Francisco Planning Department, SFPUC, the History Room of the San Francisco Public Library and the Water Resources Center Archive at the University of California Berkeley. Additional dissemination of documentation to local historical societies or historic preservation organizations may be appropriate. The San Francisco Planning Department will identify additional appropriate recipients of historical documentation during the project-level analysis.

Secretary of the Interior's Standards for Treatment of Historic Properties

Measure 4.7-4c: Compliance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties* would reduce potential impacts associated with the alteration or modification of a historical resource (including historic districts and individually eligible resources) to a less-than-significant level. (In accordance with CEQA Section 15064.5(b)(3), a project that follows the *Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring, and Reconstructing Historic Buildings* or the *Secretary of the Interior's Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings* is generally considered to have impacts of a less-than-significant level.)

The SFPUC will prepare materials describing and depicting the proposed project, including but not limited to plans, drawings, and photographs of existing conditions (digital, following the standards in Measure 4.7-4a as well as proposed project plans, drawings, specifications, and description). Prepared materials will be submitted to the San Francisco

Planning Department. The Planning Department will review the proposed project, for compliance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties*.

If a project is determined to be inconsistent with the *Secretary of the Interior's Standards for the Treatment of Historic Properties*, the SFPUC will pursue and implement redesign of the project to the extent feasible, consistent with the goals and objectives of the WSIP, such that consistency with the standards is achieved.

Historic Resources Survey and Redesign

Measure 4.7-4d: The SFPUC will undertake a historic resources survey within a designated area of potential effect that encompasses the proposed project to identify and evaluate potential historical resources, including districts, which may exist within or partially within the project's study area or area of potential effect. The survey will be conducted by a qualified professional who meets the *Secretary of the Interior's Professional Qualification Standards* for architectural history, history, or architecture (36 CFR 61).

If a survey identifies one or more historical resources in the projects' study area, or area of potential effect (i.e. historically significant resources), the qualified professional will then assess the impact the project may have on those historical resources. If the project will cause a substantial adverse change to a historical resource, the SFPUC will prepare materials describing and depicting the proposed project, including but not limited to plans, drawings, and photographs of existing conditions (digital, following the standards in Measure 4.7-1a) as well proposed project plans, drawings, specifications, and description. Prepared materials will be submitted to the San Francisco Planning Department. The San Francisco Planning Department will assign a preservation specialist to review the proposed project, for compliance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties*.

If a project is determined to be inconsistent with the *Secretary of the Interior's Standards for the Treatment of Historic Properties*, the SFPUC will pursue and implement redesign of the project to the extent feasible, consistent with the goals and objectives of the WSIP, such that consistency with the standards is achieved.

Historic Resources Protection Plan

Measure 4.7-4e: A qualified historian will prepare a plan that specifies procedures for protecting historical resources and a monitoring method to be employed by the contractor while working near these resources. At a minimum, the plan will address the operation of construction equipment near adjacent historical resources, storage of construction materials away from adjacent resources, and education/training of construction workers about the significance of the historical resources.

Preconstruction Surveys and Vibration Monitoring

Measure 4.7-4f: If vibration-related impacts could impact historical resources, one or more geotechnical investigations by a California-licensed geotechnical engineer will be included as part of the proposed project. The SFPUC and its contractors will follow the recommendations of the final geotechnical reports regarding any excavation and construction for the project. The SFPUC will ensure that the construction contractor conducts a preconstruction survey of existing conditions and monitors the adjacent buildings for damage during construction, if recommended by the geotechnical engineer. Any preconstruction surveys and construction monitoring would include the services of a professional meeting the *Secretary of the Interior's Professional Qualification Standards* for architecture.

6.3.7 Traffic, Transportation, and Circulation

Program Measures

Traffic Control Plan Measures

Measure 4.8-1a: SFPUC Construction Measure #5 for traffic requires each contractor to prepare a traffic control plan to minimize traffic and on-street parking impacts on any streets affected by construction of the proposed program. SFPUC and construction contactor(s) will prepare and implement a traffic control plan, and coordinate with Caltrans and local jurisdictions, as appropriate, for affected roadways and intersections. Each project may require the implementation of different measures, depending on the project's site-specific construction details, the characteristics of the transportation network, and daily and peak hour vehicle, pedestrian and bicycle volumes. As applicable, elements of the traffic control plan could include, but are not necessarily limited to, the following:

- Circulation and detour plans will be developed to minimize impacts on local street circulation. Flaggers and/or signage will be used to guide vehicles through and/or around the construction zone.
- Truck routes designated by cities and counties will be identified in the traffic control plan. Haul routes that minimize truck traffic on local roadways and residential streets will be utilized to the extent possible.
- Sufficient staging areas will be provided for trucks accessing construction zones to minimize disruption of access to adjacent land uses, particularly at entries to onsite pipeline construction within residential neighborhoods.
- Access to driveways and private roads will be maintained by using steel trench plates. If access must be restricted for brief periods, property owners will be notified in advance.
- Construction vehicle movement will be controlled and monitored through the enforcement of standard construction specifications by onsite inspectors.
- Along major arterials, truck trips will be scheduled outside of the peak morning and evening commute hours to the extent possible.
- Lane closures will be limited during peak hours to the extent possible. Outside of allowed working hours or when work is not in progress, roads will be restored to normal operations, with all trenches covered with steel plates.

- Where possible, pipeline construction work in roadways will be limited to a width that, at a minimum, maintains alternate one-way traffic flow past the construction zone. Parking may be prohibited if necessary to facilitate construction activities or traffic movement. If the work zone width will not allow a 10-foot-wide paved travel lane, then the road will be closed to through-traffic (except emergency vehicles), and detour signing on alternative access roads will be used.

- Pedestrian and bicycle access and circulation will be maintained during project construction where safe to do so. If construction activities encroach on a bicycle lane, warning signs will be posted that indicate bicycles and vehicles are sharing the lane.

- Detours will be included for bicycles and pedestrians in all areas potentially affected by project construction.

- All equipment and materials will be stored in designated contractor staging areas on or adjacent to the worksite, in such a manner to minimize obstruction of traffic.

- Locations will be identified for parking by construction workers, either within the construction zone or, if necessary, at a nearby location with transport provided between the parking location and the worksite.

- Roadside safety protocols will be implemented. Advance “Road Work Ahead” warning signs and speed control (including signs informing drivers of state-legislated double fines for speed infractions in a construction zone) will be provided to achieve required speed reductions for safe traffic flow through the work zone.

- Construction will be coordinated with facility owners or administrators of sensitive land uses such as police and fire stations (including all fire protection agencies), transit stations, hospitals, and schools. Facility owners or operators will be notified in advance of the timing, location, and duration of construction activities and the locations of detours and lane closures.

- Construction will be coordinated with local transit service providers, including temporary relocation of bus routes or bus stops in work zones as necessary.

- Roadway right-of-ways will be repaired or restored to their original conditions or better upon completion of construction.

- To the extent applicable, the traffic control plan will conform to the *California Manual on Uniform Traffic Control Devices for Streets and Highways: Part 6 Temporary Traffic Control* and *Caltrans’ 2006 Standard Plans*.

Coordination of Individual Traffic Control Plans

Measure 4.8-1b: To the extent that the adopted SFPUC Construction Measure #5 does not contain such provisions already, or the provisions are not required for a project as a result of local encroachment or right-of-way permit conditions, the contract specifications for individual contracts within a single WSIP project will include the following:

- In the event that more than one construction contract is issued for work along existing or new pipelines, and where construction could occur within and/or across multiple streets in the same vicinity, the SFPUC and construction contractor(s) will coordinate the traffic control plans in order to mitigate the impact of traffic disruption. The coordinated plan will include measures that address overlapping construction schedules and activities, truck arrivals and departures, lane closures and detours, and the adequacy of on-street staging requirements.

Accommodation of Displaced Public Parking Supply for Recreational Visitors

Measure 4.8-4: Due to the potential displacement of designated parking areas where limited parking is available for adjacent public uses, traffic control plans prepared as part of SFPUC Construction Measure #5 and Measure 4.8-1a will include an additional measure to accommodate any anticipated visitor parking demand that would be displaced by proposed projects at public recreational facilities.

Collective Measures

SFPUC WSIP Projects Construction Coordinator

Measure 4.16-6a: Due to the potential for overlapping project activities and construction vehicles to affect travel within and across the five regions, the SFPUC will identify a qualified construction coordinator responsible for coordinating the project-specific traffic control plans developed as part of Measure 4.8-1a, and for developing a public information campaign (e.g., internet website, radio and newspaper updates) to inform the public of construction activities, detour routes, and alternate routes. Throughout the seven-year construction schedule for the WSIP projects, the SFPUC construction coordinator will work with local and regional agencies to pursue additional traffic mitigation measures to minimize local and regional traffic impacts and will incorporate these measures into the project-specific traffic control plans, as appropriate.

Combined San Joaquin Traffic Control Plan

Measure 4.16-6b: Due to the potential for overlapping project schedules in the San Joaquin Region near Tesla Portal, the SFPUC will develop [or the SFPUC's construction contractor(s) will be required to develop] a San Joaquin Traffic Control Plan that coordinates the project-specific traffic control plans developed as part of Measure 4.8-1a and identifies additional measures to minimize the combined impacts of multiple WSIP project construction traffic on I-580, Chrisman Road, and Vernalis Road. As applicable, these measures will be developed consistent with the standards of San Joaquin County, Stanislaus County, and Caltrans and could include:

- Additional traffic control devices, such as traffic signals at key intersections providing access to local roadways and land uses
- Additional traffic control personnel at key locations to facilitate vehicular traffic flow during peak periods of truck activity
- Adjustments in truck arrival and departure schedules for the various facilities (e.g., staggering departures)

Combined Sunol Valley Traffic Control Plan

Measure 4.16-6c: Due to the potential for overlapping project schedules in the Sunol Valley Region as well as for construction traffic to use Calaveras Road as an access route to all projects sites, the SFPUC or its construction contractor(s) will develop a Sunol Valley Traffic Control Plan that coordinates the project-specific traffic control plans developed as part of Measure 4.8-1a and identifies additional measures to minimize the impacts of construction traffic on Calaveras Road and I-680. As applicable, these measures will be developed consistent with the standards of Alameda County and Caltrans and could include:

- Additional traffic control devices, such as traffic signals at key intersections providing access to local roadways and land uses. Traffic signals could facilitate access onto Calaveras Road at intersections and also allow for gaps in truck traffic flow to facilitate access from driveways along Calaveras Road.
- Additional traffic control personnel at key locations to facilitate vehicular traffic flow during peak periods of truck activity.
- Adjustments in truck arrival and departure schedules for the various facilities (e.g., staggering departures).
- Public information regarding periods when construction traffic on Calaveras Road would be greatest.
- Working with Caltrans to determine if warning signs, such as a “Slow Trucks” sign (California Code W51), would be appropriate to inform drivers that slow-moving trucks may interfere with the flow of traffic on I-680.

Cumulative Measures

SFPUC WSIP Projects Construction Coordinator – Other Agencies

Measure 4.17-6: As required in Measure 4.8-1, contractors will be required to submit traffic control plans to the SFPUC, and in Measure 4.16-6a, the SFPUC will be required to identify a WSIP construction coordinator who will be responsible for coordinating the project-specific traffic control plans. The SFPUC WSIP construction coordinator will also consider the effects of any traffic generated by SFPUC maintenance activities and other SFPUC projects (as listed in Tables 4.17-1 through 4.17-6). The SFPUC WSIP construction coordinator will also coordinate with Caltrans, other county agencies, and local jurisdictions responsible for reviewing and/or approving the construction of other identified private and public development projects (as listed in Tables 4.17-1 through 4.17-6) so as to minimize traffic impacts on local access roads, particularly local streets where sensitive receptors (e.g., schools, residences, or hospitals) are located.

6.3.8 Air Quality

Program Measures

SJVAPCD Dust Control Measures

Measure 4.9-1a: In the San Joaquin Region, the SJVAPCD has determined that compliance with the following Regulation VIII (Fugitive PM_{10} Prohibitions) and Regulation IX (Mobile and Indirect Sources, Rule 9510, where applicable) control measures would mitigate PM_{10} impacts to a less-than-significant level. The SFPUC will include these measures, where applicable, in contract specifications:

SJVAPCD Basic Control Measures (applies to all construction sites)

- All disturbed areas, including storage piles, that are not being actively utilized for construction purposes, shall be effectively stabilized of dust emissions using water, chemical stabilizer/suppressant, covered with a tarp or other suitable cover, or vegetative ground cover.
- All onsite unpaved roads and offsite unpaved access roads shall be effectively stabilized of dust emissions using water or chemical stabilizer/suppressant.
- All land clearing, grubbing, scraping, excavation, land leveling, grading, cut and fill, and demolition activities shall be effectively controlled of fugitive dust emissions utilizing application of water or by presoaking.
- When materials are transported offsite, all material shall be covered, or effectively wetted to limit visible dust emissions, and at least 6 inches of freeboard space from the top of the container shall be maintained.
- All operations shall limit or expeditiously remove the accumulation of mud or dirt from adjacent public streets at the end of each workday. The use of dry rotary brushes is expressly prohibited except where preceded or accompanied by sufficient wetting to limit the visible dust emissions. Use of blower devices is expressly forbidden.
- Following the addition of materials to, or the removal of materials from, the surface of outdoor storage piles, said piles shall be effectively stabilized of fugitive dust emissions utilizing sufficient water or chemical stabilizer/suppressant.
- Within urban areas, trackout shall be immediately removed when it extends 50 or more feet from the site and at the end of each workday.
- Any site with 150 or more vehicle trips per day shall prevent carryout and trackout.

SJVAPCD Enhanced Control Measures (also applies when required to mitigate significant PM_{10} impacts)

- Traffic speeds on unpaved roads shall be limited to 15 mph.
- Sandbags or other erosion control measures shall be installed to prevent silt runoff to public roadways from sites with a slope greater than 1 percent.

<u>SJVAPCD Additional Control Measures</u> (also applies to construction sites that are large in area, located near sensitive receptors, or which for any other reason warrant additional emissions reductions)

- Wheel washers shall be installed for all exiting trucks, or all trucks and equipment leaving the site shall be washed off.
- Wind breaks shall be installed at windward side(s) of construction areas.
- Excavation and grading activity shall be suspended when winds exceed 20 mph and, regardless of windspeed, an owner/operator must comply with Regulation VIII's 20 percent opacity limitation.
- The area subject to excavation, grading, and other construction activity at any one time shall be limited.

<u>SJVAPCD Rule 9510, Indirect Source Review, Section 6.1, Construction Equipment Emissions</u> (applies to any project subject to discretionary approval by a public agency that ultimately results in the construction of a new building, facility, or structure or reconstruction of a building, facility, or structure for the purpose of increasing capacity or activity and also involving 9,000 square feet of space).

- 6.1.1: The exhaust emissions for construction equipment greater than fifty (50) horsepower used or associated with the development project shall be reduced by the following amounts from the statewide average as estimated by the ARB:
  - 6.1.1.1: 20% of the total NO_x emissions, and
  - 6.1.1.2: 45% of the total PM_{10} exhaust emissions.
- 6.1.2: An applicant may reduce construction emissions on-site by using less-polluting construction equipment, which can be achieved by utilizing add-on controls cleaner fuels, or newer lower emitting equipment.
- 6.3: The requirements listed in Section 6.1 above can be met through any combination of on-site emission reduction measures or off-site fees.

SJVAPCD Exhaust Control Measures

Measure 4.9-1b: To limit exhaust emissions within the San Joaquin Region, the SJVAPCD specifies the following exhaust controls for heavy-duty equipment (scrapers, graders, trenchers, earthmovers, etc.). The SFPUC will include these measures, where applicable, in contract specifications:

- Alternative-fueled or catalyst-equipped diesel construction equipment shall be used.
- Idling time (e.g., 10-minute maximum) shall be minimized.
- The hours of operation of heavy-duty equipment and/or the amount of equipment in use shall be limited.

- Fossil-fueled equipment shall be replaced with electrically driven equivalents (provided they are not run via a portable generator set).
- Construction shall be curtailed during periods of high ambient pollutant concentrations; this may include ceasing construction activity during the peak hour of vehicular traffic on adjacent roadways.
- Activity management (e.g., rescheduling activities to reduce short-term impacts) shall be implemented.

BAAQMD Dust Control Measures

Measure 4.9-1c: In the Sunol Valley, Bay Division, Peninsula, and San Francisco Regions, the BAAQMD has determined that implementation of the following control measures would mitigate PM_{10} impacts to a less-than-significant level. The SFPUC will include these measures, where applicable, in contract specifications:

BAAQMD Basic Control Measures (applies to all construction sites)

- All active construction areas shall be watered at least twice daily.
- All trucks hauling soil, sand, and other loose debris shall be covered *or* all trucks shall be required to maintain at least 2 feet of freeboard on public roads.
- All unpaved access roads, parking areas, and staging areas at construction sites shall either be paved, watered three times daily, or nontoxic soil stabilizers shall be applied.
- All paved access roads, parking areas, and staging areas at construction sites shall be swept daily (with water sweepers).
- If visible soil material is carried onto adjacent public streets, adjacent streets shall be swept daily (with water sweepers).

BAAQMD Enhanced Control Measures (also applies to sites over four acres)

- All inactive construction areas (previously graded areas inactive for 10 days or more) shall be hydroseeded or nontoxic soil stabilizers shall be applied.
- Exposed stockpiles (dirt, sand, etc.) shall be enclosed, covered, and watered, or nontoxic soil binders shall be applied.
- As feasible, traffic speeds on unpaved roads shall be limited to 15 mph.
- Sandbags or other erosion control measures shall be installed to prevent silt runoff to public roadways.
- Disturbed areas shall be replanted as quickly as possible.

BAAQMD Optional Control Measures (also applies to construction sites that are large in area, located near sensitive receptors, or which for any other reason warrant additional emissions reductions)

- Wheel washers shall be installed for all exiting trucks, or all trucks and equipment leaving the site shall be washed off.
- Wind-breaks or trees/vegetative wind-breaks shall be installed at windward side(s) of construction areas.
- Excavation and grading activity shall be suspended when winds exceed 25 mph.
- The area subject to excavation, grading, and other construction activity at any one time shall be limited.

BAAQMD Exhaust Control Measures

Measure 4.9-1d: To limit exhaust emissions within the Sunol Valley, Bay Division, Peninsula, and San Francisco Regions, the SFPUC will implement the following exhaust controls, where applicable:

- Grid power will be used instead of diesel generators at all construction sites where it is feasible to connect to grid power. While it may not be practical to connect to grid power for pipeline projects (since construction sites keep moving along the alignments), grid power shall be used for projects with fixed locations, such as tunnel entry and exit shafts/portals.
- All WSIP contracts specifications shall include Sections 2480 and 2485, Title 13, California Code of Regulations, which limit the idling of all diesel-fueled commercial vehicles (weighing over 10,000 pounds, both California- or non-California-based trucks) to 30 seconds at a school or five minutes at any location. In addition, the use of diesel auxiliary power systems and main engines shall be limited to five minutes when within 100 feet of homes or schools while the driver is resting.
- All WSIP contracts specifications shall include Section 93115, Title 17, California Code of Regulations, Airborne Toxic Control Measure for Stationary Compression Ignition Engines, which specifies fuel and fuel additive requirements; emission standards for operation of any stationary, diesel-fueled, compression-ignition engines; and operation restrictions within 500 feet of school grounds when school is in session.
- A schedule of low-emissions tune-ups shall be developed and such tune-ups shall be performed on all equipment, particularly for haul and delivery trucks. A log of required tune-ups shall be maintained and a copy of the log shall be submitted to the SFPUC on a monthly basis for review.
- Low-sulfur fuels shall be used in all stationary and mobile equipment.

Health Risk Screening or Use of Soot Filters

Measure 4.9-2a: If truck volumes associated with a particular project along a particular haul route exceed 40,000 truck trips over the entire construction period, a health risk screening will be completed. If a potentially significant impact is indicated, a site-specific health risk assessment (HRA) will be completed for the project. Any subsequent project-level analysis will consider DPM emission rates at the time of construction since emission rates are expected to decline in the future. Based on the site-specific HRA, a mitigation program will be developed implementing one or more the following methods of reducing DPM emission or exposure to a less-than-significant level:

- Modify haul routes to reduce exposure.
- Require use of biodiesel fuel, which reduces DPM emissions.
- Require new construction equipment to be utilized. Newer construction equipment is far cleaner than old equipment.
- Require that the vehicle fleet include trucks with soot filters (particulate traps) within the equipment fleet.
- Temporarily vacate affected receptors.
- Any other effective means of reducing DPM emissions or exposure.

Vacate SFPUC Land Managers’ Residences in Sunol Valley

Measure 4.9-2b: The two SFPUC Land Managers’ residences in the Sunol Valley will be vacated during construction of the Calaveras Dam (SV-2) or Treated Water Reservoirs (SV-5) projects. Alternatively, a health risk screening could be completed to determine health risks at these residences from either of these two projects. If a potentially significant impact is indicated, a health risk assessment will be completed, and measures will be implemented, as set forth in Measure 4.9-2a.

Tunnel Gas Odor Control

Measure 4.9-3: For any projects that would require a tunnel ventilation system, if hydrogen sulfide gas or any other odorous gases (including diesel exhaust) are encountered during tunnel excavation and become a nuisance odor problem (i.e., odor complaints are received), water scrubbers will be added to the ventilation system and appropriate chemicals will be added to remove the nuisance odors.

Collective Measures

Dust and Exhaust Control Measures for All WSIP Projects

Measure 4.16-7a: Measures 4.9-1a through 4.9-1d requires specific projects to implement dust and exhaust control measures. To address collective construction-related air quality impacts, these measures will be required for all WSIP projects as applicable and required by SJVAPCD and BAAQMD.

Health Risk Screening or Use of Soot Filters for All Projects in the San Joaquin and Sunol Valley Regions

Measure 4.16-7b: Measure 4.9-2a requires specific projects to either conduct a health risk assessment or use soot filters to reduce DPM emissions associated with haul trucks. To address collective DPM impacts, this measure will be required for all WSIP projects in the

San Joaquin and Sunol Valley Regions. This measure would only apply in the Sunol Valley Region if, under Measure 4.9-2b, the SFPUC elects not to vacate the two SFPUC Land Managers' residences in the Sunol Valley. If this requirement is applied to the New Irvington Tunnel project (SV-4), it shall be applied to both the Sunol Valley and Fremont tunnel portals, taking into account truck traffic from other WSIP projects in the vicinity of both portals.

Vacate SFPUC Land Managers' Residences for All Projects in the Sunol Valley Region

Measure 4.16-7c: Measure 4.9-2b requires the two SFPUC Land Managers' residences in the Sunol Valley to be vacated during construction of the Calaveras Dam (SV-2) and Treated Water Reservoirs (SV-5) projects. Alternatively, a health risk screening could be completed to determine health risks at these residences. If a potentially significant impact is indicated, a health risk assessment will be completed. To address collective DPM impacts, this measure will be required for all WSIP projects in the Sunol Valley Region.

6.3.9 Noise and Vibration

Program Measures

Noise Controls

Measure 4.10-1a: SFPUC Construction Measure #6 for noise requires compliance with local noise ordinances to the extent feasible. Many of these ordinances restrict hours when construction can occur, but do not specify noise limits for construction noise. For most projects, the SFPUC will conduct construction activities during the daytime hours to the extent feasible. However, if nighttime construction cannot be avoided, noise generated by these activities will be required to comply with applicable noise ordinance nighttime limits or not exceed 50-dBA sleep interference criterion (with windows open at night) to the extent feasible.

To ensure that construction noise impacts are mitigated to a less-than-significant level, all WSIP projects located within 500 feet of any noise-sensitive receptors (e.g., residences, schools, childcare centers, churches, hospitals, and nursing homes) will be required to implement appropriate noise controls to reduce daytime construction noise levels to meet the 70-dBA daytime speech interference criterion to the extent feasible. For nighttime construction, all WSIP projects located within 3,000 feet of any noise-sensitive receptors will be required to implement appropriate noise controls to maintain noise levels at or below any applicable ordinance nighttime noise limits or the 50-dBA nighttime sleep interference criterion to the extent feasible. Such controls could include any of the following, as appropriate:

- Best available noise control techniques (including mufflers, intake silencers, ducts, engine enclosures, and acoustically attenuating shields or shrouds) will be used for all equipment and trucks in order to minimize construction noise impacts. If feasible, construction equipment noise will not exceed the mitigated noise levels listed in **Table 4.10-4** (see measure below for limits on impact equipment).

- If impact equipment (e.g., jack hammers, pavement breakers, and rock drills) is used during project construction, hydraulically or electric-powered equipment will be used wherever feasible to avoid the noise associated with compressed-air exhaust from pneumatically powered tools. However, where use of pneumatically powered tools is unavoidable, an exhaust muffler on the compressed-air exhaust will be used (a

- muffler can lower noise levels from the exhaust by up to about 10 dBA). External jackets on the tools themselves will be used, where feasible, which could achieve a reduction of 5 dBA. Quieter procedures, such as drilling rather than impact equipment, will be used whenever feasible.

- Pile holes will be pre-drilled wherever feasible to reduce potential noise and vibration impacts. Where feasible, sonic or vibratory pile drivers will be used instead of impact pile drivers (sonic pile drivers are only effective in some soils).

- Pile driving activities shall be prohibited during the evening and nighttime hours (7 p.m. to 7 a.m.).

- Operation of equipment requiring use of back-up beepers will be avoided near sensitive receptors to the extent feasible during nighttime hours (10 p.m. to 7 a.m.).

- Stationary noise sources will be located as far from sensitive receptors as feasible. If they must be located near receptors, adequate muffling (with enclosures where feasible and appropriate) will be used to ensure local noise ordinance limits are met to the extent feasible. Enclosure opening or venting will face away from sensitive receptors. If any stationary equipment (e.g., ventilation fans, generators, dewatering pumps) is operated beyond the time limits specified by the pertinent noise ordinance, this equipment will conform to the affected jurisdiction’s pertinent day and night noise limits to the extent feasible.

- Material stockpiles as well as maintenance/equipment staging and parking areas will be located as far as feasible from residential and school receptors.

- Wherever feasible, pipeline alignments will be located at least 100 feet away from sensitive receptors.

- Where pipeline construction zones are within 100 feet of school classrooms or childcare facilities, pipeline construction activities (or at least the noisier phases of construction) will be scheduled on weekend or school vacation days to the extent feasible, avoiding weekday hours when schools are in session. If construction must occur when school is in session, interior noise levels in classrooms will not exceed 60 dBA if possible to avoid speech interference problems, which would allow for a maximum exterior noise level of 70 to 80 dBA, depending on whether windows are open or closed.

- Given the long duration of construction activities at tunnel shafts/portals and proposed nighttime activities, tunnel-related construction activities will be designed to comply with nighttime noise limits specified in local noise ordinances. Measures that could be implemented to comply with these limits include: using quiet ventilation fans (pure tone components of fan noise will be considered), using line power instead of generators, erection of temporary sound barriers, restricting heavy equipment operation during the nighttime hours, using nonmetallic containers in the muck removal system to prevent clanging/banging noises, limiting controlled detonations in the tunnel shaft/portal vicinities to the daytime hours, retrofitting windows/doors of affected homes, and/or prohibiting use of backup alarms on equipment during the nighttime hours.

- Where controlled detonation activities will occur, surrounding cities and residents should be notified of the blasting schedule, indicating the time range when blasting could occur (hours and duration).

- Proposed jack-and-bore pits will be located as far from sensitive receptors as technically feasible. If ventilation fans, dewatering pumps, or generators are required as part of this type of pipeline crossing, such equipment will comply with daytime and nighttime noise limits specified in pertinent noise ordinances to the extent feasible (also see Measure 4.9-1d in Section 4.9, Air Quality, for additional restrictions on generator operation).

- Wherever necessary, temporary or permanent noise barriers will be erected to maintain construction noise levels at or below the 70-dBA daytime speech interference criterion and the 50-dBA nighttime sleep interference criterion.

- A designated project liaison will be responsible for responding to noise complaints during the construction phases. The name and phone number of the liaison will be conspicuously posted at construction areas and on all advanced notifications. This person will take steps to resolve complaints, including periodic noise monitoring, if necessary. Results of noise monitoring will be presented at regular project meetings with the project contractor, and the liaison will coordinate with the contractor to modify any construction activities that generated excessive noise levels to the extent feasible.

- A reporting program will be required for each project that documents complaints received, actions taken to resolve problems, and effectiveness of these actions.

Vacate SFPUC Caretaker's Residence at Tesla Portal

Measure 4.10-1b: The SFPUC caretaker's residence at Tesla Portal will be vacated during construction of the Advanced Disinfection (SJ-1) and Tesla Portal Disinfection (SJ-5) projects as well as those portions of the SJPL System (SJ-3) and SJPL Rehabilitation (SJ-4) projects located at Tesla Portal.

Limit Hourly Truck Volumes

Measure 4.10-2a: In addition to SFPUC Construction Measure #6 for noise, which requires compliance with local noise ordinances to the extent feasible, haul and delivery truck routes for all WSIP projects will avoid local residential streets and will follow local designated truck routes to the extent feasible. Total project-related haul and delivery truck volumes on any particular haul truck route will be limited to 80 trucks per hour.

Restrict Truck Operations

Measure 4.10-2b: Haul and delivery trucks will be prohibited from operating within 200 feet of any residential uses during the nighttime hours (10 p.m. to 7 a.m.). If there are receptors, but they are beyond 200 feet from the haul route, limited truck operations will be allowed during the more sensitive nighttime hours, but noise generated by these operations cannot exceed the 50-dBA sleep interference criterion at the closest receptors. If trucks must operate during these hours and residential uses are located within 200 feet of the haul route, deliveries will be made to staging areas outside residential areas, then transferred to the construction site during daytime hours (7 a.m. to 7 p.m.).

Vacate SFPUC Land Manager's Residence

Measure 4.10-2c: To minimize nighttime noise impacts, the SFPUC Land Manager's residence adjacent to Alameda East Portal will be vacated during off-site truck operations associated with the New Irvington Tunnel project (SV-4), if truck operations occur during the nighttime hours (10 p.m. to 7 a.m.) and are estimated to exceed the 50-dBA sleep interference criterion at this residence.

Vibration Controls to Prevent Cosmetic or Structural Damage

Measure 4.10-3a: To prevent cosmetic or structural damage to adjacent or nearby structures, the SFPUC will incorporate restrictions into all contract specifications (primarily for sheetpile driving, pile driving, or tunnel construction activities), whereby surface vibration will be limited to 0.2 in/sec PPV for continuous vibration (e.g., vibratory equipment and impact pile drivers) and 0.5 in/sec PPV for controlled detonations at the closest receptors to ensure that cosmetic or structural damage does not occur.

Limit Vibration Levels at or Below Vibration Perception Threshold

Measure 4.10-3b: For nighttime construction activities, the SFPUC will maintain vibration levels at or below the vibration perception threshold (0.012 in/sec PPV) at adjacent properties (or in accordance with local ordinances) to the extent feasible. If vibration complaints are received during facility construction, operational adjustments will be made (e.g., restricting use of equipment causing vibration disturbance during the nighttime hours or slowing the pace of its operation), as necessary, to reduce vibration annoyance effects.

Limit Tunnel-Related Detonation to Daylight Hours

Measure 4.10-3c: The SFPUC will limit controlled detonation associated with tunnel construction to the daylight hours, Monday through Saturday.

Collective Measures

Limiting Hourly Truck Volumes and Restricting Truck Operations on Haul Routes for Multiple WSIP Projects

Measure 4.16-8a: Measures 4.10-2a and 4.10-2b outline restrictions and guidelines for daytime and nighttime truck operations on local roadways. To address collective truck-related noise impacts, these measures will be applied to total haul and delivery truck volumes on any particular haul truck route that are attributable to all WSIP projects, including the Tesla Portal, Irvington Portal, Lower Crystal Springs Dam vicinities as well as haul routes in San Francisco Region. Therefore, total truck volumes from all WSIP projects on a particular route will not exceed 80 trucks per hour (so as not to exceed the 70-dBA speech interference criterion during the daytime hours) and will be restricted near sensitive receptors (to meet the 50-dBA sleep interference criterion) during the nighttime hours.

Vacate Land Manager's Residence for All Projects in Sunol Valley Region

Measure 4.16-8b: Measure 4.10-2c requires the SFPUC Land Manager's residence adjacent to Alameda East Portal to be vacated during construction truck operations associated with the New Irvington Tunnel project (SV-4). To address collective noise impacts, this residence will be vacated during construction truck operations associated with all WSIP projects in this region, if collective daytime truck volumes exceed the 70-dBA speech interference criterion (7 a.m. to 10 p.m.) or nighttime truck volumes exceed the 50-dBA sleep interference criterion (10 p.m. to 7 a.m.).

Cumulative Measures

Coordination of Truck Traffic on Local Streets

Measure 4.17-8: The SFPUC WSIP construction coordinator designated in Measure 4.17-6 will also be responsible for coordinating truck traffic generated on these same streets by SFPUC maintenance activities and other SFPUC projects (as listed in Tables 4.17-1 through 4.17-6) so that SFPUC-related truck noise increases are maintained at or below threshold levels specified in Measures 4.10-2a and 4.10-2b to the extent feasible (80 trucks per hour along a haul/delivery route and restricted nighttime truck operations).

6.3.10 Public Services and Utilities

Program Measures

Notify Neighbors of Potential Utility Service Disruption

Mitigation 4.11-1a: As part of the neighborhood notice, the SFPUC will notify residents and businesses in project area of potential utility service disruption two to four days in advance of construction.

Locate Utility Lines Prior to Excavation

Measure 4.11-1b: Prior to excavation, the SFPUC or its contractors will locate overhead and underground utility lines, such as natural gas, electricity, sewer, telephone, fuel, and water lines, that may be encountered during excavation work prior to opening an excavation.

Confirmation of Utility Line Information

Measure 4.11-1c: The SFPUC or its contractors will find the exact location of underground utilities by safe and acceptable means. Information regarding the size, color, and location of existing utilities must be confirmed before construction activities commence.

Safeguard Employees from Potential Accidents Related to Underground Utilities

Measure 4.11-1d: While any excavation is open, the SFPUC or its contractors will protect, support, or remove underground utilities as necessary to safeguard employees.

Notify Local Fire Departments

Measure 4.11-1e: The SFPUC or its contractors will notify local fire departments any time damage to a gas utility results in a leak or suspected leak, or whenever damage to any utility results in a threat to public safety.

Emergency Response Plan

Mitigation 4.11-f: The SFPUC will develop an emergency response plan in the event of a leak or explosion prior to commencing construction activities.

Prompt Reconnection of Utilities

Measure 4.11-2g: The SFPUC or its contractors will promptly reconnect any disconnected utility lines.

Coordinate Final Construction Plans with Affected Utilities

Measure 4.11-1h: The SFPUC or its contractors will coordinate final construction plans and specifications with affected utilities.

Waste Reduction Measures

Measure 4.11-2: The following requirements will be incorporated into contract specifications for each WSIP project:

The contractor(s) will obtain any necessary waste management permits prior to construction and will comply with conditions of approval attached to project implementation. As part of the waste management permit process, the contractor(s) will submit a solid waste recycling plan to the affected agencies. Elements of the plan will likely include, but are not necessarily limited to, the following:

- Identification of the types of debris that will be generated by the project and identify how all waste streams will be handled.
- Actions to reuse or recycle construction debris and clean excavated soil to the extent possible.
- Actions to divert at least 50% of inert solids (asphalt, brick, concrete, dirt, fines, rock, sand, soil, and stone) from disposal in a landfill.

6.3.11 Recreational Resources

Program Measures

Coordination with Golf Course/Recreational Facility Managers

Measure 4.12-1: Where golf courses or other recreational facilities would be directly affected by pipeline construction, the SFPUC will coordinate with facility managers to minimize adverse impacts on golfers and other recreational users.

Appropriate Siting of Proposed Facilities

Measure 4.12-2: The SFPUC will locate WSIP project facilities on park and recreation properties in consultation with park planning staff to minimize the direct loss of recreation and play space and to minimize any inconvenience to park, playground, or golf course users associated with the installation of non-recreational facilities within recreational areas.

6.3.12 Agricultural Resources

Program Measures

Supplemental Noticing and Soil Stockpiling

Measure 4.13-1a: For the San Joaquin Pipeline projects (SJPL System, SJ-3, and SJPL Rehabilitation, SJ-4), as part of the SFPUC Construction Measure #1 for neighborhood notice, advanced notification will include the name and number of an SFPUC staff person who can be contacted to discuss special needs and to work out accommodations to minimize temporary disruption to agricultural activities. The SFPUC will stockpile and replace topsoil in mapped areas of Prime and Unique Farmland and Farmland of Statewide Importance that would be temporarily disturbed by pipeline construction, unless other actions are required under specific agreements with individual land owners. (The SFPUC typically holds easements for work on its projects, but prior owners may have residual rights to use the rights-of-way for agricultural purposes. The SFPUC will work with farmers under the terms of these agreements.)

Avoidance or Soil Stockpiling

Measure 4.13-1b: The SFPUC will minimize any potential impacts on agricultural lands in the Sunol Valley by avoiding these resources wherever possible. Where this is not possible, topsoil along the pipeline right-of-way will be stockpiled, replaced, and hydroseeded to prevent erosion, unless other actions are required as a result of contracts affecting use of the property or under specific agreements with individual land owners.

Siting Facilities to Avoid Prime Farmland

Measure 4.13-2: The SFPUC will avoid areas identified as Prime Farmland, Unique Farmland, or Farmland of Statewide Importance in the siting of facilities for the 40-mgd Treated Water project (SV-3), Treated Water Reservoirs project (SV-5), and ancillary power supply facilities for the SJPL System project (SJ-3). If avoidance is not feasible, the SFPUC will adopt a permanent set-aside for an equivalent acreage of similarly-valued farmland in the area.

6.3.13 Hazards

Program Measures

Site Health and Safety Plan

Measure 4.14-1a: For all projects requiring excavation where the site assessment conducted in accordance with SFPUC Construction Measure #7 indicates the potential to encounter hazardous materials in the soil or groundwater, the contractor will prepare a site health and safety plan identifying the chemicals present, potential health and safety hazards, monitoring to be performed during site activities, soils-handling methods required to minimize the potential for exposure to harmful levels of any chemicals identified in the soil, appropriate personnel protective equipment, and emergency response procedures.

Materials Disposal Plan

Measure 4.14-1b: For all projects requiring excavation where the site assessment conducted in accordance with SFPUC Construction Measure #7 indicates the potential to encounter hazardous materials in the soil, the contractor will prepare a materials disposal plan that specifies the disposal method and approved disposal site for the soil and will provide written documentation that the disposal site will accept the waste.

Coordination with Property Owners and Regulatory Agencies

Measure 4.14-1c: Based on regulatory agency file reviews conducted in accordance with SFPUC Construction Measure #7, the SFPUC will assess the potential to encounter unacceptable levels of hazardous materials at known environmental cases, for construction activities to cause groundwater plume migration or interfere with ongoing remediations at known environmental cases, and for increased water levels in reservoirs or lakes to inundate known environmental cases. Should the review indicate that the project could encounter unacceptable levels of hazardous materials or interfere with a remediation, the SFPUC will contact the site owner (or responsible SFPUC department for the Peninsula Sportsmen's Club and Pacific Rod and Gun Club) and responsible regulatory agency to determine appropriate construction modifications or remediation necessary to avoid adverse effects during construction and operation of the project. Construction modifications will be designed to reduce groundwater plume migration or interference with the remediation; alternatively, modifications will be made to the remediation activities during construction to reduce interference with remediation activities to avoid encountering unacceptable levels of hazardous materials. The SFPUC will implement the requirements of the responsible regulatory agency.

Health Risk Screening and Airborne Asbestos Monitoring Plan

Measure 4.14-2: For tunneling projects where soil or rock containing naturally occurring asbestos has been identified, the SFPUC will conduct a health risk screening assessment to identify acceptable levels of asbestos in tunnel emissions based on site conditions and proximity to receptors. Prior to operation of the tunnel exhaust system, the contractor will be required to prepare an airborne asbestos monitoring plan for approval by the BAAQMD. The plan will specify the identified asbestos criterion, monitoring that will be conducted to identify asbestos concentrations in tunnel emissions, sampling methods, analytical methods, and corrective actions that will be taken if the asbestos criterion is exceeded. Additional dust filtration will be added to the tunnel exhaust system if the criterion is exceeded.

Hazardous Building Materials Surveys and Abatement

Measure 4.14-5: For all WSIP projects involving demolition or renovation of existing facilities, the SFPUC will retain a registered environmental assessor or a registered engineer to perform a hazardous building materials survey for each structure prior to demolition or renovation activities. If any friable asbestos-containing materials, lead-containing materials, or hazardous components of building materials are identified, adequate abatement practices, such as containment and/or removal, will be implemented prior to demolition or renovation. Any PCB-containing equipment or fluorescent lights containing mercury vapors will also be removed and disposed of properly.

6.3.14 Energy Resources

Program Measures

Incorporation of Energy Efficiency Measures

Measure 4.15-2: Consistent with the Energy Action Plan II priorities for reducing energy usage, the SFPUC will ensure that energy efficient equipment is used in all WSIP projects. A repair and maintenance plan will also be prepared for each facility to minimize power use. The potential for use of renewable energy resources (such as solar power) at facility sites will be evaluated during project-specific design.

6.4 Mitigation Measures to Minimize Water Supply and System Operations Impacts

This section presents all mitigation measures for impacts described in Chapter 5. Mitigation measures for impacts identified in Sections 5.3 through 5.6 are presented under the respective geographic area (i.e., watershed or groundwater basin). In some cases, a mitigation measure would mitigate more than one impact, and the mitigation measure numbering corresponds to the first impact identified. Impact and mitigation summary tables for Section 5.3, Tuolumne River Watershed and Downstream Waterbodies; Section 5.4, Alameda Creek Watershed Streams and Reservoirs; Section 5.5, San Francisco Peninsula Streams and Reservoirs; and Section 5.6, Westside Groundwater Basin, are presented in Section 6.6.

6.4.1 Plans and Policies

System Measures

None required.

6.4.2 Tuolumne River System and Downstream Water Bodies

Stream Flow and Reservoir Water Levels

System Measures

None required.

Geomorphology

System Measures

None required.

Surface Water Quality

System Measures

None required.

Surface Water Supplies

System Measures

None required.

Groundwater

System Measures

None required.

Fisheries

System Measures

Overview of Measures 5.3.6-4a, 5.3.6-4b, and 5.3.7-6

The SFPUC will attempt to implement Measure 5.3.6-4a as described below, which could mitigate both Impacts 5.3.6-4 and 5.3.7-6 to a less than significant level. Measure 5.3.6-4a involves some uncertainty because its implementation depends on the SFPUC negotiating and reaching agreement with MID/TID and possibly other water agencies. If Measure 5.3.6-4a proves to be infeasible, the SFPUC will implement Measure 5.3.6-4b to lessen fisheries impacts and Measure 5.3.7-6 to lessen impacts on riparian vegetation.

Avoidance of Flow Changes by Reducing Demand for Don Pedro Reservoir Water

Measure 5.3.6-4a: The SFPUC will pursue a water transfer arrangement with MID/TID and/or other water agencies such that the water acquired is developed through actions that result in reduction of demand on Don Pedro Reservoir as a result of conservation, improved delivery efficiency, inter-agency transfer of conserved water, or use of an alternative supply such as groundwater. The TID and MID would deliver less water from Don Pedro Reservoir. The consequent increase in water storage in Don Pedro Reservoir would offset the reduction in inflow to Don Pedro Reservoir attributable to the WSIP. The release pattern from La Grange Dam would be the same or similar to the existing condition thus lessening or eliminating Impacts 5.3.6-4 and 5.3.7-6. The actions necessary to reduce demand for Don Pedro Reservoir water may themselves have environmental effects. See Section 6.5 for a review of potential environmental effects associated with the expected actions of this mitigation measure. Further environmental review would be undertaken prior to approving a specific water transfer agreement.

Fishery Habitat Enhancement

Measure 5.3.6-4b: If Measure 5.3.6-4a is not implemented, then the SFPUC will mitigate potential fishery effects on the lower Tuolumne River by implementing (or funding) one of the following two habitat enhancement actions that are designed to sustain fishery resources under the river's flow regime, which are consistent with the Habitat Restoration Plan for the Lower Tuolumne River Corridor: gravel augmentation/habitat enhancement to provide salmonid spawning and rearing habitat, or isolating or filling a captured former gravel quarry pit along the river that provides habitat for salmonid predators.

The gravel augmentation/habitat enhancement project will be implemented to increase salmonid spawning success and to improve the survival of rearing salmonids in the reach of the river downstream of La Grange Dam. Spawning success will be improved by the addition of suitable gravel to the stream channel. Other habitat features will be created to provide cover for juvenile salmonids and to increase the availability of substrate for macroinvertebrates that would be used as food by rearing juvenile salmon and steelhead. The gravel augmentation/habitat enhancement project will involve the planning, design, permitting, purchase, placement, and monitoring of suitable gravel and associated habitat enhancements at three riffle locations within the spawning reach between Basso Bridge and La Grange Dam. The three locations will meet the criteria for suitable habitat as described in the Habitat Restoration Plan for the Lower Tuolumne River Corridor. The gravel will preferentially be rounded river rock of native origin that would be sized and pre-washed before placement into the river. The gravel augmentation/habitat enhancement project will also involve the addition of large woody debris and boulders to create increased habitat complexity and diversity at each of the three enhancement sites. After construction of the gravel augmentation/habitat enhancement project, it will be surveyed to establish its baseline condition. A survey of the three sites will be made at a minimum of five-year intervals by a qualified fisheries biologist. The fisheries biologist will determine whether the three sites continue to meet established criteria for salmonid spawning and rearing habitat. If the sites do not meet the criteria, as part of its long-term operations, the SFPUC will make the improvements necessary to return it to the baseline conditions.

As an alternative to the gravel augmentation project, the SFPUC will remove from the lower river channel one of the former gravel quarry pits that has been "captured" by the river and acts as predator zones for fish such as largemouth and striped bass to prey on rearing and emigrating juvenile salmonids. Removal could be accomplished by filling the pit or installing a levee berm around the pit to isolate it permanently from the river channel. The SFPUC could implement this action directly or fund implementation by another entity involved in river restoration.

The performance standard for gravel pit removal would be an established permanent reduction in area of salmonid predator habitat. The SFPUC will monitor the pit removal project at five-year intervals. If floods have eroded the fil1 or damaged the levees in a manner that restores salmonid predator habitat, the SFPUC will make the necessary repairs. The SFPUC will continue periodic monitoring and repair as part of long-term system operations.

Terrestrial Biological Resources

System Measures

Controlled Releases to Recharge Groundwater in Streamside Meadows and Other Alluvial Deposits

Measure 5.3.7-2: To mitigate for potential WSIP effects on meadow resources along the Tuolumne River below Hetch Hetchy Reservoir, the SFPUC will manage releases from

Hetch Hetchy Reservoir during the spring to recharge groundwater in the riverside meadows in the Poopenaut Valley and streamside alluvial deposits. The goal of the release pattern will be to approximate conditions characteristic of most Sierra meadows, which are mainly wetlands or semi-wetlands supporting a cover of both emergent wetlands plants and upland vegetation (Ratliff, 1982), and which depend on precipitation and upslope flows to recharge the upper soil layers with water (Ratliff, 1985). The performance standard to be achieved by this measure is no net loss of the extent, diversity, and condition of the existing meadow and wetland vegetation types in the Poopenaut Valley.

The SFPUC will manage reservoir releases for this purpose by releasing the expected available volume of water in the reservoir in a pattern that provides flows of a magnitude that inundate the meadows and streamside alluvial deposits for as long as possible. For example, rather than making releases at a constant rate each day (e.g., releasing 1,000 cfs for seven days), the SFPUC could release the same volume of water but with varying cfs rates, creating flow pulses to meet the objective.

As part of this measure the SFPUC will gather baseline data regarding the extent, species composition and condition of the existing meadow vegetation within the Poopenaut Valley. Some of these environmental baseline data may be available as a result of current study efforts in the Poopenaut Valley[5]. As needed, the SFPUC will augment this information by carrying out vegetation composition surveys in the meadow before implementing the WSIP and at 5 year intervals after WSIP implementation to assess the efficacy of mitigation releases in maintaining or improving the percentage cover of meadow species as described by Ratliff (1985). The basic methodology for baseline vegetation survey and subsequent mitigation monitoring will be generally accepted quantitative vegetation sampling methods to permit statistical comparison of vegetation composition over time, as well as mapping the meadow vegetation in the Poopenaut Valley. The SFPUC will retain the services of a qualified biologist to assist in shaping the releases from Hetch Hetchy Reservoir in consideration of baseline and future meadow vegetation data. If a significant decline in the extent or diversity of native meadow vegetation occurs, releases will be modified as needed to achieve the mitigating effect of sustaining the existing meadow communities.

Avoidance of Flow Changes by Reducing Demand for Don Pedro Reservoir Water

See **Measure 5.3.6-4a** in the Fisheries section, above. This measure also addresses impact 5.3.7-6 Impacts on biological resources along the Tuolumne River below La Grange. The SFPUC will attempt to implement Measure 5.3.6-4a as described above, which could mitigate both Impacts 5.3.6-4 and 5.3.7-6 to a less than significant level. Measure 5.3.6-4a involves some uncertainty because its implementation depends on the SFPUC negotiating and reaching agreement with MID/TID and possibly other water agencies. If Measure 5.3.6-4a proves to be infeasible, the SFPUC will implement Measure 5.3.6-4b to lessen fisheries impacts and Measure 5.3.7-6 to lessen impacts on riparian vegetation.

Lower Tuolumne River Riparian Habitat Enhancement

Measure 5.3.7-6: To mitigate the WSIP effects on riparian vegetation, the SFPUC will both protect and enhance one mile of riparian vegetation along the contemporary floodplain of the lower Tuolumne River. This will include funding the acquisition of fee title to or a conservation easement over riparian land totaling one mile (consisting of one or multiple sites) in order to permanently protect that land, and also funding riparian enhancement and on-going vegetation management to maintain the enhanced riparian values in perpetuity along one mile of river. The enhancement and management may be carried out along one river mile either on the land acquired by the SFPUC as described above or on land already under the permanent management of a public agency or conservation organization.

The SFPUC will implement this measure consistent with the Habitat Restoration Plan for the Lower Tuolumne River Corridor (McBain and Trush, 2000) and in coordination with the Tuolumne River Technical Advisory Committee. The SFPUC will also strive to

5 In 2006 the SFPUC, National Park Service (and USFWS) began a collaborative study effort in the Poopenaut Valley. The effort has led to geomorphology test releases in May 2006, fieldwork in the channel in 2006 and 2007 to examine sediment transport and deposition relationships with flow. Two transects with ten recording piezometers have been installed across the meadow to measure groundwater recharge and drainage patterns. Supplementary stream staff gages have been installed to allow manual readings during high flows. Surveys have been done of the meadow to define the topography and the location and elevation of the piezometers. Infiltration of water from the stream to the meadow soils will be monitored during high flows to develop a better understanding of groundwater dynamics in the meadow so that reservoir operations, flow pulses, and minimum streamflow releases can be managed to improve meadow conditions within the constraints of water supply and facility limitations.

implement these projects in partnership with those groups currently working to restore riparian floodplains on the lower Tuolumne River.

The SFPUC may implement riparian enhancement in accordance with site locations and plans already developed as part of the Habitat Restoration Plan for the Lower Tuolumne River Corridor or on other appropriate sites along the river. For sites that haven't already had plans developed, a riparian enhancement plan will be prepared for each. The plan shall include, but not be limited to, the following:

- Clearly stated objectives and goals consistent with the Habitat Restoration Plan for the Lower Tuolumne River Corridor (McBain and Trush, 2000).
- Location, size, and type of mitigation actions proposed.
- Documentation of performance and monitoring standards.
- Performance and monitoring standards shall indicate success criteria to be met within 5 years for vegetation, removal of exotic species, etc. Adaptive management standards shall include contingency measures that shall outline clear steps to be taken if and when it is determined, through monitoring or other means, that the enhancement or restoration techniques are not meeting success criteria.
- Documentation of the necessary long-term management and maintenance requirements, and provisions for sufficient funding.

Recreational and Visual Resources

System Measures

None required.

Energy Resources

System Measures

None required.

6.4.3 Alameda Creek Watershed Streams and Reservoirs

Stream Flow and Reservoir Water Levels

System Measures

Diversion Tunnel Operation

Measure 5.4.1-2: The SFPUC will establish and implement written operational criteria for the Alameda Creek Diversion Dam that directs that the diversion dam and tunnel shall be operated to pass flows down Alameda Creek when diversion of those flows is not required to maintain desired levels in Calaveras Reservoir in order to provide the maximum possible days of winter and spring flows in Alameda Creek below the diversion dam.

This measure reinforces the way the SFPUC generally operates the diversion tunnel now: that diversion gates are closed in the spring once desired Calaveras Reservoir storage have been reached. However, at times additional flows have been diverted from Alameda Creek after reservoir storage levels have been achieved such that the “excess” water has subsequently been released from the reservoir to maintain the appropriate water level. This measure would formalize Alameda Creek diversion procedures to maintain flows in Alameda Creek to the extent they are not needed to achieve required reservoir storage. This measure would reduce the flow reduction impact but not to a level that is less than significant.

Geomorphology

System Measures

None required.

Surface Water Quality

System Measures

None required.

Groundwater

System Measures

None required.

Fisheries

System Measures

Minimum Flows for Resident Trout on Alameda Creek

Measure 5.4.5-3a: The SFPUC shall develop and carry out as part of the implementation of the Calaveras Dam Replacement (SV-2) project, an operational plan to implement minimum bypass flows when precipitation generates runoff into the creek below the diversion dam to the Calaveras Creek confluence from December 1 through April 30 to support spawning and egg incubation for resident trout as well as breeding habitat for other native stream-dependent amphibians. This is the period when winter precipitation typically would produce flows for spawning and egg incubation and breeding habitat for other native stream-dependent species. The operational plan will identify the specific minimum flow requirements to support resident trout spawning and egg incubation, and a detailed monitoring plan to survey and document trout spawning and egg incubation and any diversion facility modifications that are needed to implement the minimum stream flows. This measure will be implemented in conjunction with the proposed bypass flows at the diversion dam to meet the 1997 CDFG MOU flow requirements.

Minimum flow requirements to support resident trout spawning and egg incubation vary depending on stream reach conditions. Although site-specific studies are needed to determine an appropriate minimum flow requirement for each specific creek reach, based on the general size and characteristics of the Alameda Creek channel immediately downstream of the diversion structure it has been suggested that a minimum flow on the order of 10 cfs may be needed to support trout spawning and egg incubation. The SFPUC's Natural Resources Division will complete the site-specific studies needed to determine the appropriate minimum stream flow for this reach of the creek; studies may show that the minimum flow requirement is more or less than 10 cfs. This minimum flow requirement would be met when precipitation would naturally generate runoff in the creek (below the diversion dam) under unimpaired conditions between December 1 and April 30. When precipitation generates runoff in the creek, the SFPUC shall provide for bypass of flow up to the required minimum flow amount. The operational plan will allow for adapting minimum flow amounts to support resident trout spawning and egg incubation and other native stream-dependent species based on the monitoring results and best available scientific information.

The monitoring plan will be provided to appropriate resource agencies for review and comment and will subsequently be implemented by the SFPUC's Natural Resources Division staff. Monitoring results shall be provided to the resource agencies as requested. Monitoring shall occur for a minimum of five years and a maximum of ten years following completion of the Calaveras Dam Replacement project. At the completion of the monitoring period the SFPUC shall produce a draft comprehensive report describing the methods, data collected, and results used to assess the performance of the minimum streamflow in providing suitable habitat for resident trout spawning and egg incubation.

The Alameda Creek Fisheries Restoration Workgroup is currently overseeing collaborative studies to better characterize the flow-habitat relationships for trout spawning within Alameda Creek, and the SFPUC is providing staff and funding to support this effort. Information from these studies will also be used in developing the specific range of minimum stream flows needed to support suitable habitat within the reach below the diversion dam to the Calaveras Creek confluence.

This measure addresses two areas of impact to the resident trout fishery in Alameda Creek below the diversion dam. First, it addresses the decrease in flow below the diversion dam that would occur under the WSIP as a result of re-instituting flow diversions to Calaveras Reservoir once the dam is replaced (WSIP Project SV-2) and current DSOD storage capacity restrictions are removed. Second, it addresses the loss of fish from the lower creek system that would result from fish entrainment through the unscreened diversion tunnel to Calaveras Reservoir. Providing for minimum stream flows in Alameda Creek below the diversion dam, as required by the mitigation measure, would support resident trout spawning and egg incubation and it is expected that this measure would be sufficient to sustain the trout population in this reach of the creek. This would fully address/mitigate for both areas of WSIP impact to the resident trout fishery below the diversion dam. If monitoring indicates that this measure is adequate to sustain the resident trout population below the diversion dam, then no additional mitigation action would be required. If monitoring indicates that this measure does not sustain the resident trout fishery in this reach, then the SFPUC shall either modify the minimum stream flow to enhance downstream habitat conditions to fully meet the mitigation requirement or also implement Measure 5.4.5-3b Diversion Restrictions or Fish Screens.

Alameda Diversion Dam Diversion Restrictions or Fish Screens

Measure 5.4.5-3b: If, after 10 years of monitoring results for Measure 5.4.5-3a, Minimum Flows for Resident Trout in Alameda Creek, indicate that the measure does not sustain the resident trout population in Alameda Creek below the diversion dam, then the SFPUC shall also implement additional measures as follows: either implement seasonal restrictions on Alameda Creek diversions to Calaveras Reservoir to protect the downstream resident trout fishery during the critical spawning period (December 1 through April 30) or install and operate a fish passage barrier to "screen" the diversion facility (screening could consist of a behavioral barrier, such as electrical or sound barrier that deters fish, or a physical barrier – such as a screen facility).

SFPUC shall consult with the appropriate resource agencies, including CDFG, to first review the monitoring results for Measure 5.4.5-3a and determine the need for any further mitigation actions. If needed, SFPUC will consult with the appropriate resource agencies to develop appropriate seasonal restrictions on diversions. This could involve establishing a set annual time period for diversion restrictions or annual monitoring of fishery conditions that would then trigger implementation of diversion restrictions.

Alternatively, the SFPUC will implement a fish passage barrier if determined to be feasible. During the 10-year monitoring and evaluation period for Measure 5.4.5-3a, the SFPUC will evaluate the feasibility of installing and operating a fish passage barrier. The feasibility study will include an engineering evaluation of the existing site and diversion structure, access for construction and power supplies to the site, the application of various alternative designs, and identification of a preferred design if determined to be feasible. If it is determined that a fish passage barrier is needed to protect resident trout at the diversion structure then engineering design will be completed and be sufficiently detailed to allow permitting and completion of construction within a period of 24 months after the date that the additional mitigation is determined to be required.

Terrestrial Biological Resources

System Measures

Compensation for Impacts on Terrestrial Biological Resources

Measure 5.4.6-1: This measure mitigates for water supply and systemwide operation effects on resources within the Alameda Creek watershed. These impacts would occur primarily through operation of the Calaveras Dam Replacement project (SV-2).

The SFPUC will compensate for sensitive wetland, riparian and upland habitats and habitats which support key special-status species or other species of concern lost as a result of WSIP system operation. Similar habitat will be identified, protected, restored, enhanced, created and managed off-site[6] to ensure no net loss of habitat extent or function. A qualified biologist will quantify the magnitude and extent of impacts to wetlands, sensitive habitats, and key special-status species and other species of concern, and the SFPUC will develop and implement mitigation and compensation plans that meet the appropriate regulatory requirements and permit conditions with respect to compensation ratios, other

[6] Off-site means the compensatory action is located other than within the project construction footprint, but could be on lands already under SFPUC ownership. Measure 4.6-2 addresses compensatory actions to be taken within the construction footprint.

conservation measures and management requirements to mitigate project impacts to less than significant levels.

The SFPUC will obtain required permits and comply with applicable environmental regulations addressing sensitive habitats and species. Compensatory lands—including those restored or enhanced as well as those acquired or designated as protected as part of program mitigation--will be established in perpetuity with a commitment that such lands will not be used for any purpose that conflicts with the primary purpose of maintaining intact wildlife and plant habitat.

One alternative for implementing such habitat compensation is the Habitat Reserve Program (HRP) currently being developed by the SFPUC. The purpose of the HRP is to provide a comprehensive, coordinated approach to mitigation and related regulatory compliance for WSIP projects and operations. This related SFPUC project is described further in Chapter 3.0, Section 3.12.3. Under the proposed HRP, the SFPUC would proceed as soon as possible with identifying, securing (through designation, management agreement, conservation easement, or acquisition of fee title) and improving lands to be used for habitat compensation so that mitigation is underway concurrent with habitat loss related to WSIP program activities, further ensuring no net loss of resources. The proposed HRP is scheduled for CEQA environmental review in 2007 and is targeted for implementation as soon as possible thereafter. Once the HRP is approved and implemented, the SFPUC will use this as one vehicle or method for implementing the mitigation requirements for individual WSIP projects. Otherwise, where appropriate and necessary, the SFPUC will develop and implement appropriate habitat compensation mitigation for individual WSIP projects and their associated operational impacts.

Operational Procedures for Calaveras Dam Releases

Measure 5.4.6-3: During project-level CEQA review on the Calaveras Dam Replacement project (SV-2), the SFPUC will develop operational procedures for managing planned releases from Calaveras Dam to minimize habitat impacts on amphibians, their egg masses, and tadpoles. The goal of such releases, apart from benefits to fish, is to mimic a more natural pattern of hydrology regime as much as possible. The procedures will specify the minimum amount and frequency of planned releases and the rate of the increase and decrease of any individual release event. One of the specific goals of such releases would be to reduce the risk of mortality to breeding amphibians. Such operational procedures will be developed prior to completion of construction of the Calaveras Dam Replacement project. In addition, instream flow releases required under CDFG agreement with SFPUC (see Table 5.4.1-9) would begin upon completion of construction.

Recreational and Visual Resources

System Measures

None required.

6.4.4 San Francisco Peninsula Streams and Reservoirs

Stream Flow and Reservoir Water Levels

System Measures

None identified.

Geomorphology

System Measures

None required.

Surface Water Quality

System Measures

Low-head Pumping Station at Pilarcitos Reservoir

Measure 5.5.3-2a: The SFPUC shall install a permanent low-head pumping station at Pilarcitos Reservoir which would enable the SFPUC to access and use an additional 350 acre-feet of water from Pilarcitos Reservoir. In years when the WSIP would cause releases from Pilarcitos Reservoir to Pilarcitos Creek to be reduced to reservoir inflow earlier in the summer than under the existing condition (about 25 percent of years in the hydrologic record), the SFPUC will use the pumping station to augment flow in Pilarcitos Creek with water from the reservoir. The pumping station will draw water from the cool pool of water below the thermocline during times when the reservoir is stratified. The pumping station outlet will be designed to ensure that water discharged to the creek is adequately aerated.

Aeration System at Pilarcitos Reservoir

Measure 5.5.3-2b: The SFPUC shall install a permanent aeration system at Pilarcitos Reservoir. The SFPUC will operate the aeration system as necessary to avoid anoxic conditions and maintain good water quality conditions at the reservoir.

Groundwater

System Measures

None required.

Fisheries

System Measures

Create New Spawning Habitat Above Crystal Springs Reservoir

Measure 5.5.5-1: The SFPUC will survey the extent and quality of fish spawning habitat that could potentially be lost due to inundation and, if feasible, create new spawning habitat at a higher elevations. The specifics of this mitigation measure will be determined as part of project-level CEQA review for the Lower Crystal Springs Dam Improvements project (PN-4).

Establish Flow Criteria, Monitor and Augment Flow

Measure 5.5.5-5: The SFPUC shall develop a monitoring and operations plan for Stone Dam to ensure WSIP-related flow reductions downstream of Stone Dam do not impair steelhead passage and spawning during the winter months of normal and wetter hydrologic years. This operational plan will provide for minimum stream flows to support existing adult steelhead passage and spawning downstream of Stone Dam, in the reach between Stone Dam and the confluence with the tributary at Albert Canyon, approximately 3.5 miles downstream. Downstream of Albert Canyon, WSIP flow reductions are unlikely to cause a significant impact to steelhead migration and spawning due to contributing flows from numerous downstream tributaries being sufficient to maintain adult upstream passage and spawning conditions within the creek. Monitoring and implementation of the operational plan will occur when precipitation generates runoff into Pilarcitos Creek below Stone Dam from December 1 through April 30 of normal and wetter years. This monitoring and operations plan will be established within five years of the approval of the PEIR.

Specific instream flows needed to support anadromous steelhead downstream of Stone Dam have not yet been identified. Suitable instream flows for steelhead passage on Pilarcitos Creek may be defined as providing a water depth of at least 0.6 feet over 25 percent of the total wetted channel cross-sectional area with 10 percent being contiguous. In cooperation with CDFG and NMFS, the SFPUC will identify up to five critical riffles, downstream of Stone Dam and upstream of Albert Canyon that may cause a passage impediment/barrier to steelhead migration at reduced flows as defined by the water depth criterion above. Such habitat types will be selected for survey because they represent the shallowest habitat type and thus would most likely represent low flow passage barriers under WSIP-related reduced flow scenarios. This monitoring plan will survey and document the critical riffles identified to determine physical conditions (e.g., depth, velocity, and top width of the channel) present at various flow levels. The SFPUC will measure the stage-discharge relationship at each of the five critical riffles and identify the minimum stream flow that meets the steelhead passage criterion at the most restrictive of the five riffle locations.

The SFPUC will calibrate and validate the flow measurements made at the existing flow monitoring gage (USGS Gage 11162620) located immediately downstream of Stone Dam. The SFPUC will then develop a statistical relationship between the flow measurements at the existing gage and the flow at the most restrictive critical riffle downstream of Stone Dam to establish minimum average daily flows necessary to meet steelhead passage criterion. The SFPUC will monitor average daily flows at the stream flow gage during the period from December 1 through April 30 each year. If average daily flow, as measured at the gage, indicates that the minimum stream flow at the downstream critical riffle is not met, the SFPUC will release bypass flows from Stone Dam at a rate sufficient to meet the minimum stream flow for steelhead passage at a release rate up to, but not exceeding, the average daily inflow into Pilarcitos Reservoir as determined by SFPUC operators.

The SFPUC's Natural Resources Division will complete the site-specific studies needed to determine the appropriate minimum stream flow for the most restrictive critical riffle identified during monitoring. This minimum flow criterion will be met when WSIP diversions occur between December 1 and April 30 of normal and wetter hydrologic years. The operational plan will allow for adapting minimum flow amounts to support steelhead migration based on the monitoring results and best available scientific information.

Monitoring and flow management will be continued for a minimum period of five years and a maximum period of ten years, at which time the SFPUC will prepare a technical report describing results of the stream flow monitoring, identifying whether or not operation of Stone Dam reduced passage flows below the minimum criteria, and identifying, if needed, an appropriate bypass flow for future operations at Stone Dam (a minimum flow below which water could not be diverted to storage between December and April 30). The technical report will be provided to CDFG and NMFS.

Terrestrial Biological Resources

System Measures

Habitat Monitoring and Compensation

Measure 5.5.3-2c The SFPUC shall compensate for reduced productivity and diversity of San Francisco garter snake (SFGS) and California red-legged frog (CRLF) wetland habitat which could occur as a result of greater variability, extent and duration in drawdowns at Pilarcitos Reservoir as a result of implementation of Revised Measure 5.5.3-2a (Low-head Pumping Station at Pilarcitos Reservoir). To offset the potential loss of habitat quality, the SFPUC will develop an adaptive management plan for managing and maintaining freshwater marsh and other wetlands around the periphery of Pilarcitos Reservoir. This adaptive management plan would include pre- implementation monitoring and post-implementation monitoring for up to 10 years to ensure that habitat is sustained at Pilarcitos Reservoir, to achieve no net loss of habitat and value for SFGS and CRLF habitat and document changes (if any) in extent or quality of the habitat attributable to operation of the low-head pumping station.

In the event that habitat is reduced, one alternative for implementing such habitat compensation is the Habitat Reserve Program (HRP) currently being developed by the SFPUC. The purpose of the HRP is to provide a comprehensive, coordinated approach to mitigation and related regulatory compliance for WSIP projects and operations. The HRP is described further in the PEIR, Chapter 3.0, Section 3.12.3. Under the proposed HRP, the SFPUC would proceed as soon as possible with identifying, securing (through designation, management agreement, conservation easement, or acquisition of fee title) and improving lands to be used for habitat compensation so that mitigation is underway concurrent with habitat loss related to WSIP program activities, further ensuring no net loss of resources. The proposed HRP is undergoing CEQA environmental review in 2008 and 2009 and is targeted for implementation as soon as possible thereafter. Once the HRP is approved and implemented, the SFPUC will use this as one vehicle or method for implementing the mitigation requirements for WSIP-related activities. Otherwise, where appropriate and necessary, the SFPUC will develop and implement appropriate habitat compensation mitigation for WSIP system operational effects on Pilarcitos Reservoir, independent of the HRP.

Adaptive Management of Freshwater Marsh and Wetlands at Upper and Lower Crystal Springs Reservoirs

Measure 5.5.6-1a: To offset the loss of wetlands, a qualified professional will develop an adaptive management plan for managing and maintaining freshwater marsh and other wetlands around the periphery of Upper Crystal Springs, and Lower Crystal Springs Reservoirs. This adaptive management plan may include the following:

- Gradually raise the reservoir elevations at appropriate times of year to maintain continuous freshwater marsh and riparian habitat along the shorelines to reduce potentially adverse effects to San Francisco garter snakes and California red-legged frogs.
- Identify feasible measures to help to moderate the effects of reservoir drawdown, increase the extent of reservoir margins with the potential to support freshwater

marsh vegetation, and investigate the effectiveness for the management and control of predatory aquatic species such as largemouth bass and bullfrogs.

- Perform monitoring and review to ensure that habitat is sustained at Upper and Lower Crystal Springs Reservoirs and elsewhere, as appropriate, to achieve no net loss of habitat and value for freshwater marsh, wetlands, and special-status species.
- Observe all appropriate protective measures to avoid "take" of San Francisco garter snake. In the event that the mitigation measures above cannot be followed, the SFPUC will prepare a sensitive species relocation plan, which would be approved by both the CDFG and USFWS. Such a plan would detail how underground refugia would be excavated, identify suitable relocation areas, etc.

Compensation for Impacts on Terrestrial Biological Resources

Measure 5.5.6-1b: This measure mitigates for water supply and systemwide operation effects on resources within the Peninsula watershed. These impacts would occur primarily through operation of the Upper and Lower Crystal Springs Reservoir facilitated by the Crystal Springs Dam Improvements project (PN-9).

The SFPUC will compensate for sensitive wetland, riparian and upland habitats and habitats which support key special-status species or other species of concern lost as a result of WSIP system operation. Similar habitat will be identified, protected, restored, enhanced, created and managed off-site[7] to ensure no net loss of habitat extent or function. Similarly, in the event of the loss of large, mature oaks and oak woodland, creation and/or restoration of oak woodland elsewhere will be implemented to compensate for the loss of these common upland habitats. A qualified biologist will quantify the magnitude and extent of impacts to wetlands, sensitive habitats, other upland habitats, and key special-status species and other species of concern, and the SFPUC will develop and implement mitigation and compensation plans that meet the appropriate regulatory requirements and permit

[7] Off-site means the compensatory action is located other than within the project construction footprint, but could be on lands already under SFPUC ownership. Measure 4.6-2 addresses compensatory actions to be taken within the construction footprint.

conditions with respect to compensation ratios, other conservation measures and management requirements to mitigate project impacts to less than significant levels.

The SFPUC will obtain required permits and comply with applicable environmental regulations addressing sensitive habitats and species. Compensatory lands—including those restored or enhanced as well as those acquired or designated as protected as part of program mitigation--will be established in perpetuity with a commitment that such lands will not be used for any purpose that conflicts with the primary purpose of maintaining intact wildlife and plant habitat.

One alternative for implementing such habitat compensation is a Habitat Reserve Program (HRP) currently being developed by the SFPUC. The purpose of the HRP is to provide a comprehensive, coordinated approach to mitigation and related regulatory compliance for WSIP projects and operations. This related SFPUC project is described further in Chapter 3.0, Section 3.11. Under the proposed HRP, the SFPUC would proceed as soon as possible with identifying, securing (through designation, management agreement, conservation easement, or acquisition of fee title) and improving lands to be used for habitat compensation so that mitigation is underway concurrent with habitat loss related to WSIP program activities, further ensuring no net loss of resources. The proposed HRP is scheduled for CEQA environmental review in 2007 and targeted for implementation as soon as possible thereafter. Once the HRP is approved and implemented, the SFPUC will use this as one vehicle or method for implementing the mitigation requirements for individual WSIP projects. Otherwise, where appropriate and necessary, the SFPUC will develop and implement appropriate habitat compensation mitigation for individual WSIP projects and operational effects.

Compensation for Serpentine Seep-Related Special Status Plants

Measure 5.5.6-1c: The SFPUC will develop and implement a plan to protect, create, and restore habitat for plant species adapted to serpentine seeps, particularly fountain thistle, around Upper and Lower Crystal Springs Reservoirs. The plan will also include control of pampas grass and any other invasive plant species within the serpentine seep habitat.

Recreational and Visual Resources

System Measures

None required.

6.4.5 Westside Groundwater Basin Resources

System Measures

Groundwater Monitoring to Determine Basin Safe Yield

Measure 5.6-1: The SFPUC will continue ongoing studies, including the existing groundwater and lake level monitoring programs, to determine the safe yield of the North Westside Groundwater Basin in order to avoid overdraft and associated effects including adverse effects on surface water features and seawater intrusion. Using this data, the SFPUC will develop and implement a plan identifying appropriate pumping patterns to avoid overdraft and the undesirable effects associated with overdraft. The plan will establish both a regular (average annual) and an intermittent (dry year or emergency) yield as well as a strategy for modifying pumping patterns such that the pumping levels can be sustained as an ongoing reliable water supply without depletion of groundwater storage or degradation of water quality.

Implementation of a Lake Level Management Plan

Measure 5.6-2: The SFPUC will develop and implement a lake level management plan identifying strategies for altering pumping patterns or lake augmentation to maintain Lake Merced water levels within the desired long-term range should monitoring conducted under Measure 5.6-1 indicate the potential for adverse effects on lake levels due to groundwater pumping. The SFPUC will coordinate the implementation of this measure with Measure 5.6-1.

Drinking Water Source Assessments for Groundwater Wells

Measure 5.6-5: As required by the California Department of Health Services and incorporated as part of the WSIP, the SFPUC will prepare drinking water source assessments for groundwater wells constructed under the Local and Regional Groundwater Projects (SF-2) and will update these assessments every five years. If the assessment indicates no potential for contamination, then no mitigation is required. However, for wells that are considered vulnerable to contamination on the basis of the drinking water source assessment, the SFPUC will develop and implement a source water protection program specifying actions and a program to be implemented to prevent contamination of the drinking water source.

The source water protection program could include nonregulatory components such as watershed restoration, stormwater monitoring, groundwater monitoring, and public education to protect drinking water quality. Land use planning, permitting, and possibly more restrictive regulatory methods may also be implemented by the local municipality where a threat to drinking water quality is indicated, and management of potential sources of microbiological or direct chemical contamination to eliminate or reduce the risk of contamination of the water supply may be considered. The SFPUC will encourage public participation in the development of the program and will update the program every five years along with the drinking water source assessments.

6.4.6 Cumulative Projects and Impacts Related to WSIP Water Supply and System Operations

System Measures

None required.

6.5 Impacts of Mitigation Measures

CEQA Section 15126.4 states that "if a mitigation measure would cause one or more significant effect in addition to those that would be caused by the project as proposed, the effects of the mitigation measure shall be discussed but in less detail than the significant effects of the project as proposed." This section identifies which mitigation measures described in Sections 6.3 and 6.4 above may result in significant effects independent of the identified WSIP impacts, and describes the general nature of those effects. This discussion includes the following categories of mitigation measures:

- Measures that would involve designated long-term use of lands for mitigation purposes. This includes mitigation measures requiring habitat compensation through creation, restoration, and enhancement of habitat as well as permanent set-aside for farmlands
- Measures that would involve construction or operation in sensitive habitats
- Measures that would affect SFPUC regional system water supply sources, potentially reducing overall supply available for customers. This includes mitigation measures requiring increased streamflow releases from storage reservoirs, reduced diversions to storage reservoirs, or reduced groundwater pumping.
- Measures that would involve water transfers from other agencies, with potential to affect other water sources and associated resources or other water users.

Prior to implementation of these types of measures, project-level CEQA review would be conducted as necessary to identify if and what impacts would be associated with these measures in and of themselves. Even though the objective of these measures is to reduce environmental impacts, additional mitigation actions may be necessary during the construction and/or operation of these measures depending on the specific design and location. However, the mitigation measures described in this section and the associated CEQA review are not integral to the approval and adoption of the overall WSIP as a comprehensive program and policy. In some cases, CEQA review of these measures may be incorporated as part of the subsequent project-level environmental review of individual facility improvement projects, while in other cases, as described above for those measures, the measures are optional approaches to avoiding or reducing significant impacts and the SFPUC may elect to implement the alternative approach such that CEQA review would be superfluous.

6.5.1 Measures that Designate Land for Mitigation Purposes

Depending on the actual design of the measure, the following PEIR mitigation measures could be in this category: Measure 4.6-1b (Compensation for Wetlands and Other Biological Resources); Measure 4.13-2 (Siting Facilities to Avoid Prime Farmland); Measure 4.16-4a (Bioregional Habitat Restoration Measures); Measure 5.3.7-6 (Lower Tuolumne River Riparian Habitat Enhancement); Measure 5.4.6-1 (Compensation for Impacts on Terrestrial Biological Resources); Measure 5.5.6-1b (Compensation for Impacts on Terrestrial Biological Resources); and Measure 5.5.6-1c (Compensation for Serpentine Seep-Related Special Status Plants). In general, the types of potential impacts associated with long-term designation of lands for mitigation purposes include:

- *Land use*: change existing character of the land; result in short-term disruption to nearby land uses during construction; and displace existing land uses (similar to Impacts 4.3-1 and 4.3-2, which could be mitigated through siting measures similar to Measure 4.3-2). In particular, habitat compensation could affect existing agricultural uses (similar to Impact 4.13-2, which could be mitigated through measures similar to Measure 4.13-2, avoidance of Prime Farmland)

- *Biological resources*: convert existing habitat types to other types, although habitat compensation would be expected to result in long-term benefit to biological resources; result in short-term disruption to existing biological resources during construction (similar to Impact 4.6-2, which could be mitigated through habitat protection/restoration measures similar to Measure 4.6-2, including construction timing restrictions to avoid impacts on sensitive species)

- *Geology*: change the topography or physical features of a site (which could be mitigated through standard engineering and design measures to avoid substantial changes to unique geologic or physical features)

- *Water quality and hydrology*: alter drainage patterns due to changes in grading and vegetation; result in erosion and sedimentation during construction (similar to Impacts 4.5-1 and 4.5-6, which could be mitigated through standard construction measures for erosion and sedimentation control as well as through compliance with water quality regulations)

- *Traffic, air quality, noise*: temporary construction impacts related to increased truck traffic on local streets, increased dust, and construction noise (similar to Impacts 4.8-1, 4.8-2, 4.8-3, 4.9-1, 4.9-2, 4.10-1 and 4.10-2, which could be mitigated through standard construction measures, compliance with air quality regulations, and traffic, dust and noise control measures similar to Measures 4.8-1a, 4.9-1a, 4.9-1b, 4.9-1c, 4.9-1c, 4.9-1d, 4.10-1a, 4.10-2a, and 4.10-2b)

- *Agricultural resources*: convert prime farmland to non-agricultural uses (similar to Impact 4.13-2, which could be mitigated through measures similar to Measure 4.13-2, avoidance with Prime Farmland); conflict with existing zoning for agricultural uses

As indicated above, standard mitigation approaches are available, and implementation of those measures as well as any applicable water quality or biological resource permit conditions could reduce these impacts to less than significant.

6.5.2 Measures that Involve Sensitive Habitats or Cultural Resources

Depending on the actual design of the measure, the following PEIR mitigation measures could be in this category: Measure 5.3.6-4b (Fishery Habitat Enhancement Projects); Measure 5.3.7-6 (Lower Tuolumne River Riparian Habitat Enhancement); Measure 5.4.5-3a (Minimum Flows for Resident Trout on Alameda Creek, which would requiring modifying the Alameda Creek Diversion Dam to allow bypass flows); Measure 5.4.5-3b (Alameda Diversion Dam Diversion Restrictions or Fish Screens, but only the fish passage barrier or screening option); and

Measure 5.5.5-1 (Create New Spawning Habitat Above Crystal Springs Reservoir). In general, the types of potential impacts associated with measures that involve construction or operation in sensitive habitats include:

- *Biological resources*: convert existing habitat types to other types, although habitat compensation would be expected to result in long-term benefit to biological resources; result in short-term disruption to existing biological resources during construction (similar to Impacts 4.6-1 and 4.6-2, which could be mitigated through habitat protection/restoration measures similar to Measures 4.6-1a, 4.6-1b, and 4.6-2, including construction timing restrictions to avoid impacts on sensitive species)

- *Cultural resources*: alteration of existing structures with potential historic significance such as the Alameda Creek Diversion Dam (similar to Impact 4.7-4 which could be mitigated through historic protection and documentation measures similar to Measures 4.7-4a, 4.7-4b, 4.7-4c, 4.7-4d, and 4.7-4e) or the accidental discovery of cultural resources (similar to Impacts 4.7-1 and 4.7-2, which could be mitigated through paleontological and archaeological measures similar to Measures 4.7-1, 4.7-2a, and 4.7-2b)

- *Geology*: change the topography or physical features of a site (which could be mitigated through standard engineering and design measures to avoid substantial changes to unique geologic or physical features)

- *Water quality and hydrology*: alter drainage patterns due to changes in grading and vegetation; result in erosion and sedimentation during construction; place structures within a 100-year flood hazard area (similar to Impacts 4.5-1 and 4.5-6, which could be mitigated through standard construction measures for erosion and sedimentation control and implementation of water quality and flood protection measures required under applicable permit conditions)

- *Traffic, air quality, noise*: temporary construction impacts related to increased truck traffic on local streets, increased dust, and construction noise (similar to Impacts 4.8-1, 4.8-2, 4.8-3, 4.9-1, 4.9-2, 4.10-1 and 4.10-2, which could be mitigated through standard construction measures, compliance with air quality regulations, and traffic, dust and noise control measures similar to Measures 4.8-1a, 4.9-1a, 4.9-1b, 4.9-1c, 4.9-1c, 4.9-1d, 4.10-1a, 4.10-2a, and 4.10-2b)

As indicated above, standard mitigation approaches are available, and implementation of those measures as well as any applicable water quality or biological resource permit conditions could reduce these impacts to less than significant.

6.5.3 Measures that Affect SFPUC Supply Sources

The following PEIR mitigation measures would be in this category: Measure 5.4.5-3a (Minimum Flows for Resident Trout on Alameda Creek); Measure 5.4.6-3 (Operational Procedures for Calaveras Dam Releases); Measure 5.5.3-2 (Revised Operations Plan for Pilarcitos Watershed Facilities); Measure 5.6-1 (Groundwater Monitoring to Determine Basin Safe Yield); and Measure 5.6-2 (Implementation of Lake Level Management Plan). These measures could have the effect of reducing available local water supply sources needed to meet customer demands and to achieve WSIP goals, objectives, and levels of service. Measures 5.4.5-3a and 5.4.6-3 could reduce storage in Calaveras Reservoir; Measure 5.5.3-2 would limit use of Pilarcitos watershed supplies to current levels and, in turn, may require additional supply from other regional system sources; and Measure 5.6-1 could result in reduced levels of groundwater pumping from the North Westside Groundwater Basin. Depending on the magnitude of these measures, the SFPUC may need to increase use of other water supply sources in order to serve the 300 mgd average annual customer purchase requests in 2030 and to meet the water supply level of service performance objectives of the WSIP.

One possibility could be increased use of water supplies from Hetch Hetchy Reservoir, resulting in potential impacts on the Tuolumne River similar to those discussed in Chapter 5 and Chapter 8 (under Variant 1, All Tuolumne). Other possible alternative water sources and their potential impacts are discussed in Chapters 8 and 9. These include potable water from desalination, increased levels of conservation and water recycling, or other water sources. However, at this time, the timing as well as the magnitude of the potential effects of these measures are unknown, and the actual impact on other SFPUC supply sources could be less than significant if the change is within the typical inter-annual variation of SFPUC customer water deliveries. Other intervening factors, such as results of groundwater monitoring under Measure 5.6-1 or the planned Habitat Conservation Plan for fish in Alameda Creek, could reduce the estimated severity of the potential impacts and obviate or override the need for these measures.

6.5.4 Measures that Affect Other Water Sources

The following PEIR mitigation measure would be in this category: Measure 5.3.6-4a (Avoidance of Flow Changes by Reducing Demand for Don Pedro Reservoir Water). At this time, it is unknown what sources of water or water users could be affected by a water transfer arrangement with TID, MID, or other agency or agencies that involves use only of conserved water. Supplemental water could be made available as a result of:

- Water use efficiency and conservation for agricultural, residential and commercial users
- Land use changes, either agricultural to urban, or more water intensive (e.g., pasture) to less intensive (e.g., orchard)
- Conjunctive use of groundwater
- Recycled water
- Tiered water pricing
- Land fallowing of agricultural lands.

In general, the types of potential environmental impacts associated with water transfers from these types of sources include:

- *Land use*: reduced agricultural activity (similar or related to Impact 4.3-2 which could be mitigated through siting measures similar to Measure 4.3-2)
- *Biological resources*: indirect effects on aquatic and/or terrestrial biological resources due to possible reductions in irrigation/drainage system return flows, reductions in discharges

of treated wastewater, changes in land use from more water intensive uses to less water intensive uses, or lowered groundwater tables (similar to Impacts 4.6-1, 4.6-2, 4.6-3, and 4.6-4 which could be mitigated through habitat protection/restoration measures similar to Measures 4.6-1a, 4.6-1b, 4.6-2, 4.6-3a, 4.6-3b, and 4.6-4)

- *Water quality and hydrology*: reduced groundwater recharge due to agricultural water conservation practices such as lining irrigation canals or conversion to drip irrigation, or land use changes (similar to Impact 4.5-2 which could be mitigated through groundwater protection measures similar to Measure 4.5-2)
- *Agricultural resources*: reduced agricultural activity due to farming; potential conversion of idle agricultural land to other uses (similar to Impact 4.13-2, which could be mitigated through measures similar to Measure 4.13-2, avoidance of Prime Farmland)
- *Noise*: increased noise from use of pumps for conjunctive-use groundwater program (similar to Impact 4.10-4, which could be mitigated through standard construction measures for noise controls)
- *Energy*: increased use of energy for conjunctive-use groundwater or recycled water programs (similar to Impact 4.15-2 for the Groundwater Projects, SF-2) and Recycled Water Projects, SF-3, which could be mitigated through energy efficiency measures similar to Measure 4.15-2)
- *Air Quality*: increased particulate emissions from on-farm efficiency measures like land leveling (which could be mitigated through standard dust control measures similar to those listed in Measure 4.9-1a)

As indicated above, standard mitigation approaches are available, and implementation of those measures as well as any applicable water quality or biological resource permit conditions could reduce these impacts to less than significant.

6.6 Summary Tables of All Impacts and Mitigation Measures

TABLE 6.3
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SAN JOAQUIN REGION PROJECTS (SJ-1 through SJ-5)

IMPACT	Advanced Disinfection SJ-1	Lawrence Livermore Supply Improvements SJ-2	San Joaquin Pipeline System SJ-3	Rehabilitation of Existing San Joaquin Pipelines SJ-4	Tesla Portal Disinfection Station SJ-5
4.3 Land Use and Visual Quality					
Impact 4.3-1: Temporary disruption or displacement of existing land uses during construction	LS	LS	PSM	PSM	LS
Regulations					
None applicable.					
SFPUC Construction Measures					
No. 1: Neighborhood Notice	N/A	N/A	X	X	N/A
No. 3: On-Site Air and Water Quality Measures during Construction	N/A	N/A	X	X	N/A
No. 5: Traffic	N/A	N/A	X	X	N/A
No. 6: Noise	N/A	N/A	X	X	N/A
No. 10: Project Site	N/A	N/A	X	X	N/A
PEIR Mitigation Measures					
Traffic, Transportation, and Circulation Measures (4.8-1a and 4.8-1b); Air Quality Measures (4.9-1a thru 4.9-1d, 4.9-2a and 4.9-2b); Noise Measures (4.10-1a, 4.10-1b, 4.10-2a thru 4.10-2c, 4.10-3a thru 4.10-3c); and Recreational Resources Measure (4.12-1)	N/A	N/A	X	X	N/A
Impact 4.3-2: Permanent displacement or long-term disruption of existing land uses	LS	N/A	PSU	N/A	LS
Regulations					
None applicable.					
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
4.3-2: Facility Siting Studies	N/A	N/A	X	N/A	N/A
Impact 4.3-3: Temporary construction impacts on scenic vistas or visual character	LS	LS	LS	LS	LS
Regulations					
None applicable.					
SFPUC Construction Measures					
No. 10: Project Site	X	X	X	X	X
PEIR Mitigation Measures					
None required.					

TABLE 6.3 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SAN JOAQUIN REGION PROJECTS (SJ-1 through SJ-5)

IMPACT	Advanced Disinfection SJ-1	Lawrence Livermore Supply Improvements SJ-2	San Joaquin Pipeline System SJ-3	Rehabilitation of Existing San Joaquin Pipelines SJ-4	Tesla Portal Disinfection Station SJ-5
Impact 4.3-4: Permanent adverse impacts on scenic vistas or visual character	PSM	LS	LS	N/A	PSM
Regulations					
None applicable.					
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
4.3-4a: Architectural Design	X	N/A	N/A	N/A	X
4.3-4b: Landscaping Plans	X	N/A	N/A	N/A	X
4.3-4c: Landscape Screens	X	N/A	N/A	N/A	X
4.3-4d: Minimize Tree Removal	X	N/A	N/A	N/A	X
Impact 4.3-5: New permanent sources of light glare	PSM	PSM	PSM	PSM	PSM
Regulations					
None applicable.					
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
4.3-5: Reduce Lighting Effects	X	X	X	X	X
4.4 Geology, Soils, and Seismicity					
Impact 4.4-1: Slope instability during construction	LS	PSM	N/A	N/A	LS
Regulations					
None applicable.					
SFPUC Construction Measures					
No. 2: Seismic and Geotechnical Studies	X	X	N/A	N/A	X
PEIR Mitigation Measures					
4.4-1: Quantified Landslide Analysis	N/A	X	N/A	N/A	N/A
Impact 4.4-2: Erosion during construction	LS	LS	LS	LS	LS
Regulations					
NPDES stormwater requirements	X	X	X	X	X
SFPUC Construction Measures					
No. 3: On-Site Air and Water Quality Measures during Construction	X	X	X	X	X

TABLE 6.3 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SAN JOAQUIN REGION PROJECTS (SJ-1 through SJ-5)

IMPACT	Advanced Disinfection SJ-1	Lawrence Livermore Supply Improvements SJ-2	San Joaquin Pipeline System SJ-3	Rehabilitation of Existing San Joaquin Pipelines SJ-4	Tesla Portal Disinfection Station SJ-5
PEIR Mitigation Measures					
None required.					
Impact 4.4-3: Substantial alteration of topography	LS	LS	LS	LS	LS
Regulations					
None applicable.					
SFPUC Construction Measures					
No. 10: Project Site	X	X	X	X	X
PEIR Mitigation Measures					
None required.					
Impact 4.4-4: Squeezing ground and subsidence during tunneling	N/A	N/A	N/A	N/A	N/A
Regulations					
None applicable.					
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
4.4-4: Subsidence Monitoring Program	N/A	N/A	N/A	N/A	N/A
Impact 4.4-5: Surface fault rupture	LS	LS	LS	LS	LS
Regulations					
SFPUC General Seismic Design Requirements	X	X	X	X	X
SFPUC Construction Measures					
No. 2: Seismic and Geotechnical Studies	X	X	X	X	X
PEIR Mitigation Measures					
None required					
Impact 4.4-6: Seismically induced groundshaking	LS	LS	LS	LS	LS
Regulations					
SFPUC General Seismic Design Requirements	X	X	X	X	X
SFPUC Construction Measures					
No. 2: Seismic and Geotechnical Studies	X	X	X	X	X
PEIR Mitigation Measures					
None required.					

TABLE 6.3 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SAN JOAQUIN REGION PROJECTS (SJ-1 through SJ-5)

IMPACT	Advanced Disinfection SJ-1	Lawrence Livermore Supply Improvements SJ-2	San Joaquin Pipeline System SJ-3	Rehabilitation of Existing San Joaquin Pipelines SJ-4	Tesla Portal Disinfection Station SJ-5
Impact 4.4-7: Seismically induced ground failure, including liquefaction and settlement	LS	LS	LS	LS	LS
Regulations					
SFPUC General Seismic Design Requirements	X	X	X	X	X
SFPUC Construction Measures					
No. 2: Seismic and Geotechnical Studies	X	X	X	X	X
PEIR Mitigation Measures					
None required.					
Impact 4.4-8: Seismically induced landslides or other slope failures	LS	LS	N/A	N/A	LS
Regulations					
SFPUC General Seismic Design Requirements	X	X	N/A	N/A	X
SFPUC Construction Measures					
No. 2: Seismic and Geotechnical Studies	X	X	N/A	N/A	X
PEIR Mitigation Measures					
None required.					
Impact 4.4-9: Expansive or corrosive soils	PSM	PSM	PSM	PSM	PSM
Regulations					
California Building Code	X	X	X	X	X
SFPUC Construction Measures					
No. 2: Seismic and Geotechnical Studies	X	X	X	X	X
PEIR Mitigation Measures					
4.4-9: Characterize Extent of Expansive and Corrosive Soil	X	X	X	X	X
4.5 Surface Water Hydrology and Water Quality					
Impact 4.5-1: Degradation of water bodies as a result of erosion and sedimentation or a hazardous materials release during construction	LS	LS	LS	LS	LS
Regulations					
NPDES stormwater requirements	X	X	X	X	X
Encroachment permitting requirements	N/A	N/A	X	N/A	N/A
SFPUC Construction Measures					
No. 3: On-Site Air and Water Quality Measures During Construction	X	X	X	X	X

TABLE 6.3 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SAN JOAQUIN REGION PROJECTS (SJ-1 through SJ-5)

IMPACT	Advanced Disinfection SJ-1	Lawrence Livermore Supply Improvements SJ-2	San Joaquin Pipeline System SJ-3	Rehabilitation of Existing San Joaquin Pipelines SJ-4	Tesla Portal Disinfection Station SJ-5
PEIR Mitigation Measures					
None required.					
Impact 4.5-2: Depletion of groundwater resources	LS	N/A	LS	LS	LS
Regulations					
None applicable.					
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
4.5-2: Site-Specific Groundwater Analysis and Identified Measures	N/A	N/A	N/A	N/A	N/A
Impact 4.5-3a: Degradation of water quality due to construction dewatering discharges	LS	N/A	LS	LS	LS
Regulations					
NPDES discharge requirements	X	N/A	X	X	X
Waste Discharge Requirements	X	N/A	X	X	X
SFPUC Construction Measures					
No. 4: Groundwater	X	N/A	X	X	X
PEIR Mitigation Measures					
None required.					
Impact 4.5-3b: Degradation of water quality due to construction-related discharges of treated water	LS	LS	LS	LS	LS
Regulations					
NPDES discharge requirements	X	X	X	X	X
Waste Discharge Requirements	X	X	X	X	X
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
None required.					
Impact 4.5-4: Flooding and water quality impacts associated with impeding or redirecting flood flows	N/A	N/A	PSM	PSM	N/A
Regulations					
None applicable.					

TABLE 6.3 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SAN JOAQUIN REGION PROJECTS (SJ-1 through SJ-5)

IMPACT	Advanced Disinfection SJ-1	Lawrence Livermore Supply Improvements SJ-2	San Joaquin Pipeline System SJ-3	Rehabilitation of Existing San Joaquin Pipelines SJ-4	Tesla Portal Disinfection Station SJ-5
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
4.5-4a: Flood Flow Protection Measures	N/A	N/A	X	X	N/A
4.5-4b: Site-Specific Flooding Analysis and Identified Measures	N/A	N/A	N/A	N/A	N/A
Impact 4.5-5: Degradation of water quality and increased flows due to discharges to surface water during operation	N/A	N/A	LS	N/A	N/A
Regulations					
NDPES discharge requirements	N/A	N/A	X	N/A	N/A
Waste Discharge Requirements	N/A	N/A	X	N/A	N/A
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
4.5-5: Stormwater Treatment and Groundwater Monitoring	N/A	N/A	N/A	N/A	N/A
Impact 4.5-6: Degradation of water quality as a result of alteration of drainage patterns or an increase in impervious surfaces	LS	PSM	LS	LS	LS
Regulations					
NPDES stormwater requirements	X	X	X	X	X
SFPUC Construction Measures					
No. 10: Project Site	X	X	X	X	X
PEIR Mitigation Measures					
4.5-6: Appropriate Source Controls and Site Design Measures	N/A	X	N/A	N/A	N/A
4.6 Biological Resources					
Impact 4.6-1: Impacts on wetlands and aquatic resources	PSM	PSM	PSM	PSM	PSM
Regulations					
Clean Water Act - Section 404	X	X	X	X	X
SFPUC Construction Measures					
No. 8: Biological Resources	X	X	X	X	X
PEIR Mitigation Measures					
4.6-1a: Wetlands Assessment	X	X	X	X	X
4.6-1b: Compensation for Wetlands and Other Biological Resources	X	X	X	X	X

TABLE 6.3 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SAN JOAQUIN REGION PROJECTS (SJ-1 through SJ-5)

IMPACT	Advanced Disinfection SJ-1	Lawrence Livermore Supply Improvements SJ-2	San Joaquin Pipeline System SJ-3	Rehabilitation of Existing San Joaquin Pipelines SJ-4	Tesla Portal Disinfection Station SJ-5
Impact 4.6-2: Impact to sensitive habitats, common habitats, and heritage trees	PSM	PSM	PSM	PSM	PSM
Regulations					
None applicable.					
SFPUC Construction Measures					
No. 8: Biological Resources	X	X	X	X	X
PEIR Mitigation Measures					
4.6-2: Habitat Restoration/Tree Replacement	X	X	X	X	X
Biological Resources Measure 4.6-1b	X	X	X	X	X
Impact 4.6-3: Impact on key special-status species – direct mortality and/or habitat effects	PSM	PSM	PSM	PSM	PSM
Regulations					
Federal Endangered Species Act	X	X	X	X	X
California Endangered Species Act	X	X	X	X	X
California Native Plant Protection Act	X	X	X	X	X
SFPUC Construction Measures					
No. 8: Biological Resources	X	X	X	X	X
PEIR Mitigation Measures					
4.6-3a: Protection Measures During Construction for Key Special-Status Species and Other Species of Concern	X	X	X	X	X
4.6-3b: Standard Mitigation Measures for Key Special Status Plants and Animals	X	X	X	X	X
Biological Resources Measure 4.6-1b	X	X	X	X	X
Impact 4.6-4: Water discharge effects on riparian and/or aquatic resources	LS	LS	PSM	PSM	LS
Regulations					
Waste Discharge Requirements	X	X	X	X	X
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
4.6-4 Pipeline and Water Treatment Plant Treated Water Discharge Restrictions	N/A	N/A	X	X	N/A

TABLE 6.3 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SAN JOAQUIN REGION PROJECTS (SJ-1 through SJ-5)

IMPACT	Advanced Disinfection SJ-1	Lawrence Livermore Supply Improvements SJ-2	San Joaquin Pipeline System SJ-3	Rehabilitation of Existing San Joaquin Pipelines SJ-4	Tesla Portal Disinfection Station SJ-5
Impact 4.6-5: Conflict with adopted conservation plans or other approved biological resources plans	N/A	N/A	PSM	PSM	N/A
Regulations					
None applicable.					
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
Biological Resources Measures 4.6-1a, 4.6-1b, 4.6-2, 4.6-3a, and 4.6-3b	N/A	N/A	X	X	N/A
4.7 Cultural Resources					
Impact 4.7-1: Impacts on paleontological resources	PSM	LS	PSM	PSM	PSM
Regulations					
Paleontological Resources Preservation Act	X	X	X	X	X
SFPUC Construction Measures					
No. 9: Cultural Resources	X	X	X	X	X
PEIR Mitigation Measures					
4.7-1: Suspend Construction Work if Paleontological Resource is Identified	X	N/A	X	X	X
Impact 4.7-2: Impacts on archaeological resources	PSM	PSM	PSM	PSM	PSM
Regulations					
California Health and Safety Code	X	X	X	X	X
SFPUC Construction Measures					
No. 9: Cultural Resources	X	X	X	X	X
PEIR Mitigation Measures					
4.7-2a: Archaeological Testing, Monitoring, and Treatment of Human Remains	X	X	X	X	X
4.7-2b: Accidental Discovery Measures	X	X	X	X	X
Impact 4.7-3: Impacts on historical significance of a historic district or a contributor to a historic district	PSM	N/A	PSM	PSM	N/A
Regulations					
National Historic Preservation Act	X	N/A	X	X	N/A
SFPUC Construction Measures					
None applicable.					

TABLE 6.3 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SAN JOAQUIN REGION PROJECTS (SJ-1 through SJ-5)

IMPACT	Advanced Disinfection SJ-1	Lawrence Livermore Supply Improvements SJ-2	San Joaquin Pipeline System SJ-3	Rehabilitation of Existing San Joaquin Pipelines SJ-4	Tesla Portal Disinfection Station SJ-5
PEIR Mitigation Measures					
4.7-3: Protection of Historic Districts	X	N/A	X	X	N/A
Cultural Resources Measures 4.7-4a thru 4.7-4f	X	N/A	X	X	N/A
Impact 4.7-4: Impacts on the historical significance of individual facilities resulting from demolition or alteration	PSM	N/A	PSM	PSM	N/A
Regulations					
National Historic Preservation Act	X	N/A	X	X	N/A
SFPUC Construction Measures					
No. 9: Cultural Resources	X	N/A	X	X	N/A
PEIR Mitigation Measures					
4.7-4a: Alternatives Identification and Resource Relocation	X	N/A	X	X	N/A
4.7-4b: Historical Resources Documentation	X	N/A	X	X	N/A
4.7-4c: Secretary of the Interior's Standards for Treatment of Historic Properties	X	N/A	X	X	N/A
4.7-4d: Historic Resources Survey and Redesign	X	N/A	X	X	N/A
4.7-4e: Historic Resources Protection Plan	X	N/A	X	X	N/A
4.7-4f: Pre-construction Surveys and Vibration Monitoring	X	N/A	X	X	N/A
Impact 4.7-5: Impacts on adjacent historic architectural resources	LS	LS	PSM	PSM	PSM
Regulations					
National Historic Preservation Act	X	X	X	X	X
SFPUC Construction Measures					
No. 9: Cultural Resources	X	X	X	X	X
PEIR Mitigation Measures					
Cultural Resources Measures 4.7-4a thru 4.7-4f	N/A	N/A	X	X	X
4.8 Traffic, Transportation, and Circulation					
Impact 4.8-1: Temporary reduction in roadway capacity and increased traffic delays	LS	LS	PSM	PSM	LS
Regulations					
City and county encroachment permits.	X	X	X	X	X
SFPUC Construction Measures					
No. 5: Traffic	X	X	X	X	X
PEIR Mitigation Measures					

TABLE 6.3 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SAN JOAQUIN REGION PROJECTS (SJ-1 through SJ-5)

IMPACT	Advanced Disinfection SJ-1	Lawrence Livermore Supply Improvements SJ-2	San Joaquin Pipeline System SJ-3	Rehabilitation of Existing San Joaquin Pipelines SJ-4	Tesla Portal Disinfection Station SJ-5
4.8-1a: Traffic Control Plan Measures	N/A	N/A	X	X	N/A
4.8-1b: Coordination of Individual Traffic Control Plans	N/A	N/A	N/A	N/A	N/A
Impact 4.8-2: Short-term traffic increases on roadways	PSM	PSM	PSM	PSM	PSM
Regulations					
City and county encroachment permits.	X	X	X	X	X
SFPUC Construction Measures					
No. 5: Traffic	X	X	X	X	X
PEIR Mitigation Measures					
Traffic, Trasportation, and Circulation Measure 4.8-1a	X	X	X	X	X
Traffic, Transportation, and Circulation Measure 4.8-1b	N/A	N/A	X	X	N/A
Impact 4.8-3: Impaired access to adjacent roadways and land uses	LS	LS	PSM	PSM	LS
Regulations					
City and county encroachment permits.	X	X	X	X	X
SFPUC Construction Measures					
No. 5: Traffic	X	X	X	X	X
PEIR Mitigation Measures					
Traffic, Transportation, and Circulation Measure 4.8-1a	N/A	N/A	X	X	N/A
Impact 4.8-4: Temporary displacement of on-street parking	LS	LS	LS	PSM	LS
Regulations					
City and county encroachment permits.	X	X	X	X	X
SFPUC Construction Measures					
No. 5: Traffic	X	X	X	X	X
PEIR Mitigation Measures					
4.8-4: Accommodation of Displaced Public Parking Supply for Recreational Visitors	N/A	N/A	N/A	N/A	N/A
Traffic, Trasportation, and Circulation Measure 4.8-1a	N/A	N/A	N/A	X	N/A
Impact 4.8-5: Increased traffic safety hazards during construction	PSM	PSM	PSM	PSM	PSM
Regulations					
City and county encroachment permits.	X	X	X	X	X
SFPUC Construction Measures					
No. 5: Traffic	X	X	X	X	X

TABLE 6.3 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SAN JOAQUIN REGION PROJECTS (SJ-1 through SJ-5)

IMPACT	Advanced Disinfection SJ-1	Lawrence Livermore Supply Improvements SJ-2	San Joaquin Pipeline System SJ-3	Rehabilitation of Existing San Joaquin Pipelines SJ-4	Tesla Portal Disinfection Station SJ-5
PEIR Mitigation Measures					
Traffic, Trasportation, and Circulation Measure 4.8-1a	X	X	X	X	X
Impact 4.8-6: Long-term traffic increases during facility operation	LS	LS	LS	LS	LS
Regulations					
None applicable.					
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
None required.					
4.9 Air Quality					
Impact 4.9-1: Construction emissions of criteria pollutants	PSM	PSM	PSM	PSM	PSM
Regulations					
None applicable.					
SFPUC Construction Measures					
No. 3: On-Site Air and Water Quality Measures during Construction	X	X	X	X	X
PEIR Mitigation Measures					
4.9-1a: SJVAPCD Dust Control Measures	X	X	X	X	X
4.9-1b: SJVAPCD Exhaust Control Measures	X	X	X	X	X
4.9-1c: BAAQMD Dust Control Measures	N/A	N/A	N/A	N/A	N/A
4.9-1d: BAAQMD Exhaust Control Measures	N/A	N/A	N/A	N/A	N/A
Impact 4.9-2: Exposure to diesel particulate matter during construction	LS	N/A	LS	LS	LS
Regulations					
California Health and Safety Code, Section 2485 – reduces emissions of toxic and criteria pollutants by limiting the idling of new heavy-duty diesel vehicles	X	N/A	X	X	X
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
4.9-2a: Health Risk Screening or Use of Soot Filters	N/A	N/A	N/A	N/A	N/A
4.9-2b: Vacate SFPUC Land Managers' Residences in Sunol Valley	N/A	N/A	N/A	N/A	N/A
Impact 4.9-3: Exposure to emissions (possibly including asbestos) from tunneling	N/A	N/A	PSM	PSM	N/A
Regulations					

TABLE 6.3 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SAN JOAQUIN REGION PROJECTS (SJ-1 through SJ-5)

IMPACT	Advanced Disinfection SJ-1	Lawrence Livermore Supply Improvements SJ-2	San Joaquin Pipeline System SJ-3	Rehabilitation of Existing San Joaquin Pipelines SJ-4	Tesla Portal Disinfection Station SJ-5
OSHA standards for worker safety during tunneling	N/A	N/A	X	X	N/A
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
4.9-3: Tunnel gas odor control	N/A	N/A	X	X	N/A
Impact 4.9-4: Air pollutant emissions during project operation	LS	LS	LS	LS	LS
Regulations					
None applicable.					
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
None required.					
Impact 4.9-5: Odors generated during project operation	LS	LS	N/A	N/A	LS
Regulations					
None applicable.					
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
None required.					
Impact 4.9-6: Secondary emissions at power plants	LS	LS	LS	LS	LS
Regulations					
None applicable.					
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
None required.					
Impact 4.9-7: Conflict with implementation of applicable regional air quality plans addressing criteria air pollutants and state goals for reducing GHG emissions.	N/A	N/A	N/A	N/A	N/A
Regulations					
None applicable.					

TABLE 6.3 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SAN JOAQUIN REGION PROJECTS (SJ-1 through SJ-5)

IMPACT	Advanced Disinfection SJ-1	Lawrence Livermore Supply Improvements SJ-2	San Joaquin Pipeline System SJ-3	Rehabilitation of Existing San Joaquin Pipelines SJ-4	Tesla Portal Disinfection Station SJ-5
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
None required.					
4.10 Noise and Vibration					
Impact 4.10-1: Disturbance from temporary construction-related noise increases	PSU	PSU	PSU	PSU	PSU
Regulations					
None applicable.					
SFPUC Construction Measures					
No. 6: Noise	X	N/A	X	X	X
PEIR Mitigation Measures					
4.10-1a: Noise Controls	X	N/A	X	X	X
4.10-1b: Vacate SFPUC Caretaker's Residence at Tesla Portal	X	N/A	N/A	N/A	X
Impact 4.10-2: Temporary noise disturbance along construction haul routes	PSU	N/A	PSU	PSU	PSU
Regulations					
None applicable.					
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
4.10-2a: Limit Hourly Truck Volumes	X	N/A	X	X	X
4.10-2b: Restrict Truck Operations	X	N/A	X	X	X
4.10-2c: Vacate SFPUC Land Manager's Residence	N/A	N/A	N/A	N/A	N/A
Impact 4.10-3: Disturbance due to construction-related vibration	LS	LS	PSU	PSU	LS
Regulations					
None applicable.					
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
4.10-3a: Vibration Controls to Prevent Cosmetic or Structural Damage	N/A	N/A	X	X	N/A

TABLE 6.3 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SAN JOAQUIN REGION PROJECTS (SJ-1 through SJ-5)

IMPACT	Advanced Disinfection SJ-1	Lawrence Livermore Supply Improvements SJ-2	San Joaquin Pipeline System SJ-3	Rehabilitation of Existing San Joaquin Pipelines SJ-4	Tesla Portal Disinfection Station SJ-5
4.10-3b: Limit Vibration Levels at or Below Vibration Perception Threshold	N/A	N/A	X	X	N/A
4.10-3c: Limit Tunnel-Related Detonation to Daylight Hours	N/A	N/A	N/A	N/A	N/A
Impact 4.10-4: Disturbance due to long-term noise increases	LS	LS	LS	N/A	LS
Regulations					
None applicable.					
SFPUC Construction Measures					
No. 6: Noise	X	N/A	X	N/A	X
PEIR Mitigation Measures					
None required.					
4.11 Public Services and Utilities					
Impact 4.11-1: Potential temporary damage to or disruption of existing regional or local public utilities	LS	LS	PSM	LS	LS
Regulations					
OSHA Construction Safety Orders	X	X	X	X	X
DHS separation standards	X	X	X	X	X
SFPUC Construction Measures					
No. 1: Neighborhood Notice	X	X	X	X	X
PEIR Mitigation Measures					
4.11-1a: Notify Neighbors of Potential Utility Service Disruption	N/A	N/A	X	N/A	N/A
4.11-1b: Locate Utility Lines Prior to Excavation	N/A	N/A	X	N/A	N/A
4.11-1c: Confirmation of Utility Line Information	N/A	N/A	X	N/A	N/A
4.11-1d: Safeguard Employees from Potential Accidents Related to Underground Utilities	N/A	N/A	X	N/A	N/A
4.11-1e: Notify Local Fire Departments	N/A	N/A	X	N/A	N/A
4.11-1f: Emergency Response Plan	N/A	N/A	X	N/A	N/A
4.11-1g: Prompt Reconnection of Utilities	N/A	N/A	X	N/A	N/A
4.11-1h: Coordinate Final Construction Plans with Affected Utilities	N/A	N/A	X	N/A	N/A
Impact 4.11-2: Temporary adverse effects on solid waste landfill capacity	PSM	PSM	PSM	PSM	PSM
Regulations					
California Integrated Waste Management Act of 1989	X	X	X	X	X
SFPUC Construction Measures					
None applicable.					

TABLE 6.3 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SAN JOAQUIN REGION PROJECTS (SJ-1 through SJ-5)

IMPACT	Advanced Disinfection SJ-1	Lawrence Livermore Supply Improvements SJ-2	San Joaquin Pipeline System SJ-3	Rehabilitation of Existing San Joaquin Pipelines SJ-4	Tesla Portal Disinfection Station SJ-5
PEIR Mitigation Measures					
4.11-2: Waste Reduction Measures	X	X	X	X	X
Impact 4.11-3: Impacts related to compliance with statutes and regulations related to solid waste	PSM	PSM	PSM	PSM	PSM
Regulations					
California Integrated Waste Management Act of 1989	X	X	X	X	X
SFPUC Construction Measures					
None applicable.	X	X	X	X	X
PEIR Mitigation Measures					
Public Services and Utilities Measure 4.11-2	X	X	X	X	X
Impact 4.11-4: Impacts related to the relocation of utilities	PSM	PSM	PSM	PSM	PSM
Regulations					
None applicable.					
SFPUC Construction Measures					
No. 1: Neighborhood Notice	X	X	X	X	X
PEIR Mitigation Measures					
Public Services and Utilities Measures 4.11-1a thru 4.11-1h	X	X	X	X	X
4.12 Recreational Resources					
Impact 4.12-1: Temporary conflicts with established recreational uses during construction	N/A	N/A	PSM	PSM	N/A
Regulations					
None applicable.					
SFPUC Construction Measures					
No. 1: Neighborhood Notice	N/A	N/A	X	X	N/A
No. 3: On-Site Air and Water Quality Measures during Construction	N/A	N/A	X	X	N/A
No. 5: Traffic	N/A	N/A	X	X	N/A
No. 6: Noise	N/A	N/A	X	X	N/A
No. 10: Project Site	N/A	N/A	X	X	N/A
PEIR Mitigation Measures					
4.12-1: Coordination with Golf Course/Recreational Facility Managers	N/A	N/A	X	X	N/A
Traffic, Transportation, and Circulation Measures (4.8-1a and 4.8-1b); Air Quality Measures (4.9-1a, 4.9-1b, 4.9-2a, 4.9-2b); and Noise Measures (4.10-1a, 4.10-1b, 4.10-2a thru 4.10-2c, and 4.10-3a thru 4.10-3b)	N/A	N/A	X	X	N/A

TABLE 6.3 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SAN JOAQUIN REGION PROJECTS (SJ-1 through SJ-5)

IMPACT	Advanced Disinfection SJ-1	Lawrence Livermore Supply Improvements SJ-2	San Joaquin Pipeline System SJ-3	Rehabilitation of Existing San Joaquin Pipelines SJ-4	Tesla Portal Disinfection Station SJ-5
Impact 4.12-2: Conflicts with established recreational uses due to facility siting and project operation	N/A	N/A	N/A	N/A	N/A
Regulations					
None applicable.					
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
4.12-2: Appropriate Siting of Proposed Facilities	N/A	N/A	N/A	N/A	N/A
4.13 Agricultural Resources					
Impact 4.13-1: Temporary conflicts with established agricultural resources	N/A	N/A	PSM	PSM	N/A
Regulations					
None applicable.					
SFPUC Construction Measures					
No. 1: Neighborhood Notice	N/A	N/A	X	X	N/A
No. 3: On-Site Air and Water Quality Measures during Construction	N/A	N/A	X	X	N/A
No. 5: Traffic	N/A	N/A	X	X	N/A
No. 6: Noise	N/A	N/A	X	X	N/A
PEIR Mitigation Measures					
4.13-1a: Supplemental Noticing and Soil Stockpiling	N/A	N/A	X	X	N/A
4.13-1b: Avoidance or Soil Stockpiling	N/A	N/A	N/A	N/A	N/A
Traffic, Transportation, and Circulation Measures (4.8-1a and 4.8-1b); Air Quality Measures (4.9-1a thru 4.9-1d, and 4.9-2a and 4.9-2b); and Noise Measures (4.10-1a, 4.10-b, 4.10-2a thru 4.10-2c, and 4.10-3a thru 4.10-3c)	N/A	N/A	X	X	N/A
Impact 4.13-2: Conversion of farmlands to non-agricultural uses	N/A	N/A	PSM	N/A	N/A
Regulations					
California Land Conservation Act of 1965 (Williamson Act)	N/A	N/A	X	N/A	N/A
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
4.13-2: Siting Facilities to Avoid Prime Farmland	N/A	N/A	X	N/A	N/A

TABLE 6.3 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SAN JOAQUIN REGION PROJECTS (SJ-1 through SJ-5)

IMPACT	Advanced Disinfection SJ-1	Lawrence Livermore Supply Improvements SJ-2	San Joaquin Pipeline System SJ-3	Rehabilitation of Existing San Joaquin Pipelines SJ-4	Tesla Portal Disinfection Station SJ-5
4.14 Hazards					
Impact 4.14-1: Potential to encounter hazardous materials in soil and groundwater	LS	LS	LS	PSM	LS
Regulations					
None applicable.					
SFPUC Construction Measures					
No. 4: Groundwater	X	N/A	X	X	X
No. 7: Hazardous Materials	X	X	X	X	X
PEIR Mitigation Measures					
4.14-1a: Site Health and Safety Plan	N/A	N/A	N/A	X	N/A
4.14-1b: Materials Disposal Plan	N/A	N/A	N/A	X	N/A
4.14-1c: Coordination with Property Owners and Regulatory Agencies	N/A	N/A	N/A	X	N/A
Impact 4.14-2: Exposure to naturally occurring asbestos	N/A	N/A	N/A	N/A	N/A
Regulations					
Asbestos Airborne Toxic Control Measure					
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
4.14-2: Health Risk Screening and Airborne Asbestos Monitoring Plan	N/A	N/A	N/A	N/A	N/A
Impact 4.14-3: Risk of fires during construction	LS	LS	LS	LS	LS
Regulations					
Public Resources Code fire safety regulations	X	X	X	X	X
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
None required.					
Impact 4.14-4: Gassy conditions in tunnels	N/A	N/A	LS	LS	N/A
Regulations					
Tunnel Safety Orders	N/A	N/A	X	X	N/A

TABLE 6.3 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SAN JOAQUIN REGION PROJECTS (SJ-1 through SJ-5)

IMPACT	Advanced Disinfection SJ-1	Lawrence Livermore Supply Improvements SJ-2	San Joaquin Pipeline System SJ-3	Rehabilitation of Existing San Joaquin Pipelines SJ-4	Tesla Portal Disinfection Station SJ-5
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
None required.					
Impact 4.14-5: Exposure to hazardous building materials	N/A	N/A	PSM	PSM	PSM
Regulations					
California Code of Regulations, Title 8 – asbestos abatement	N/A	N/A	X	X	X
California Code of Regulations Title 17 – lead-based paint regulations	N/A	N/A	X	X	X
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
4.14-5: Hazardous Building Materials Surveys and Abatement	N/A	N/A	X	X	X
Impact 4.14-6: Accidental hazardous materials release from construction equipment	LS	LS	LS	LS	LS
Regulations					
NPDES stormwater requirements	X	X	X	X	X
SFPUC Construction Measures					
No. 3: On-site Air and Water Quality Measures During Construction	X	X	X	X	X
PEIR Mitigation Measures					
None required.					
Impact 4.14-7: Increased use of hazardous materials during operation	LS	LS	LS	N/A	LS
Regulations					
Risk Management regulations (HMBP)	X	X	X	N/A	X
Risk Management regulations (RMP)	N/A	N/A	N/A	N/A	N/A
Aboveground storage tank regulations	X	X	X	N/A	X
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
None required.					
Impact 4.14-8: Emission or use of hazardous materials within ¼ mile of a school	N/A	N/A	N/A	N/A	N/A

TABLE 6.3 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SAN JOAQUIN REGION PROJECTS (SJ-1 through SJ-5)

IMPACT	Advanced Disinfection SJ-1	Lawrence Livermore Supply Improvements SJ-2	San Joaquin Pipeline System SJ-3	Rehabilitation of Existing San Joaquin Pipelines SJ-4	Tesla Portal Disinfection Station SJ-5
Regulations					
Risk Management regulations (HMBP)	N/A	N/A	N/A	N/A	N/A
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
None required.					
4.15 Energy					
Impact 4.15-1: Construction-related energy use	PSM	PSM	PSM	PSM	PSM
Regulations					
None applicable.					
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
Air Quality Measures 4.9-1b and 4.9-1d	X	X	X	X	X
Impact 4.15-2: Long-term energy use during operation	PSM	PSM	PSM	LS	PSM
Regulations					
None applicable.					
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
4.15-2: Incorporation of Energy Efficiency Measures	X	X	X	N/A	X

LS = Less than Significant impact, no mitigation required
PSM= Potentially Significant impact, can be mitigated to less than significant
PSU = Potentially Significant Unavoidable impact
X = Applicable
N/A = Not Applicable

TABLE 6.4
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SUNOL VALLEY REGION PROJECTS (SV-1 through SV-6)

IMPACT	Alameda Creek Fishery Enhancement SV-1	Calaveras Dam Replacement SV-2	Additional 40-mgd Treated Water Supply SV-3	New Irvington Tunnel SV-4	SVWTP – Treated Water Reservoirs SV-5	San Antonio Backup Pipeline SV-6
4.3 Land Use and Visual Quality						
Impact 4.3-1: Temporary disruption or displacement of existing land uses during construction	LS	LS	LS	PSU	LS	LS
Regulations						
None applicable.						
SFPUC Construction Measures						
No. 1: Neighborhood Notice	N/A	N/A	N/A	X	N/A	N/A
No. 3: On-Site Air and Water Quality Measures during Construction	N/A	N/A	N/A	X	N/A	N/A
No. 5: Traffic	N/A	N/A	N/A	X	N/A	N/A
No. 6: Noise	N/A	N/A	N/A	X	N/A	N/A
No. 10: Project Site	N/A	N/A	N/A	X	N/A	N/A
PEIR Mitigation Measures						
See Traffic Measure (4.8-1), Air Quality Measures (4.9-1 and 4.9-2), Noise Measures (4.10-1 through 4.10-3).	N/A	N/A	N/A	X	N/A	N/A
Impact 4.3-2: Permanent displacement or long-term disruption of existing land uses	N/A	N/A	PSU	LS	N/A	PSU
Regulations						
None applicable.						
SFPUC Construction Measures						
None applicable.						
PEIR Mitigation Measures						
4.3-2: Facility Siting Studies	N/A	N/A	X	N/A	N/A	X
Impact 4.3-3: Temporary construction impacts on scenic vistas or visual character	LS	LS	LS	LS	LS	LS
Regulations						
None applicable.						
SFPUC Construction Measures						
No. 10: Project Site	X	X	X	X	X	X
PEIR Mitigation Measures						
None required.						

TABLE 6.4 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SUNOL VALLEY REGION PROJECTS (SV-1 through SV-6)

IMPACT	Alameda Creek Fishery Enhancement SV-1	Calaveras Dam Replacement SV-2	Additional 40-mgd Treated Water Supply SV-3	New Irvington Tunnel SV-4	SVWTP – Treated Water Reservoirs SV-5	San Antonio Backup Pipeline SV-6
Impact 4.3-4: Permanent adverse impacts on scenic vistas or visual character	PSM	PSU	LS	PSM	LS	PSM
Regulations						
Watershed Management Plans and Actions						
Des5: Design Guidelines	X	X	X	X	X	X
SFPUC Construction Measures						
None applicable.						
PEIR Mitigation Measures						
4.3-4a: Architectural Design	X	X	N/A	X	N/A	X
4.3-4b: Landscaping Plans	X	X	N/A	X	N/A	X
4.3-4c: Landscape Screens	X	X	N/A	X	N/A	X
4.3-4d: Minimize Tree Removal	X	X	N/A	X	N/A	X
Impact 4.3-5: New permanent sources of light glare	PSM	PSM	PSM	PSM	PSM	PSM
Regulations						
None applicable.						
SFPUC Construction Measures						
None applicable.						
PEIR Mitigation Measures						
4.3-5: Reduce Lighting Effects	X	X	X	X	X	X
4.4 Geology, Soils, and Seismicity						
Impact 4.4-1: Slope instability during construction	PSM	PSM	PSM	PSM	PSM	PSM
Regulations						
Watershed Management Plan Policies and Actions:						
No. S5: avoid landslides and slopes greater than 30%	X	X	X	X	X	X
No. S6: conduct inspections	X	X	X	X	X	X
SFPUC Construction Measures						
No. 2: Seismic and Geotechnical Studies	X	X	X	X	X	X
PEIR Mitigation Measures						
4.4-1: Quantified Landslide Analysis	X	X	X	X	X	X

TABLE 6.4 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SUNOL VALLEY REGION PROJECTS (SV-1 through SV-6)

IMPACT	Alameda Creek Fishery Enhancement SV-1	Calaveras Dam Replacement SV-2	Additional 40-mgd Treated Water Supply SV-3	New Irvington Tunnel SV-4	SVWTP – Treated Water Reservoirs SV-5	San Antonio Backup Pipeline SV-6
Impact 4.4-2: Erosion during construction	LS	LS	LS	LS	LS	LS
Regulations						
NPDES stormwater requirements	X	X	X	X	X	X
SFPUC Construction Measures						
No. 3: On-Site Air and Water Quality Measures during Construction	X	X	X	X	X	X
PEIR Mitigation Measures						
None required.						
Impact 4.4-3: Substantial alteration of topography	LS	LS	LS	LS	LS	LS
Regulations						
Watershed Management Plan Policies and Actions:						
No. des5: follow design guidelines	N/A	X	N/A	N/A	N/A	N/A
SFPUC Construction Measures						
No. 3: On-Site Air and Water Quality Measures during Construction	N/A	X	N/A	X	N/A	N/A
No. 10: Project Site	X	X	X	X	X	X
PEIR Mitigation Measures						
None required.						
Impact 4.4-4: Squeezing ground and subsidence during tunneling	N/A	N/A	N/A	PSM	N/A	N/A
Regulations						
None applicable.						
SFPUC Construction Measures						
None applicable.						
PEIR Mitigation Measures						
4.4-4: Subsidence Monitoring Program	N/A	N/A	N/A	X	N/A	N/A
Impact 4.4-5: Surface fault rupture	LS	LS	LS	LS	LS	LS
Regulations						
SFPUC General Seismic Design Requirements	X	X	X	X	X	X
Watershed Management Plan Policies and Actions:						
No. S4: avoid active fault zones and traces	X	X	X	X	X	X
No. S6: conduct inspections	X	X	X	X	X	X

TABLE 6.4 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SUNOL VALLEY REGION PROJECTS (SV-1 through SV-6)

IMPACT	Alameda Creek Fishery Enhancement SV-1	Calaveras Dam Replacement SV-2	Additional 40-mgd Treated Water Supply SV-3	New Irvington Tunnel SV-4	SVWTP – Treated Water Reservoirs SV-5	San Antonio Backup Pipeline SV-6
SFPUC Construction Measures						
No. 2: Seismic and Geotechnical Studies	X	X	X	X	X	X
PEIR Mitigation Measures						
None required.						
Impact 4.4-6: Seismically induced groundshaking	LS	LS	LS	LS	LS	LS
Regulations						
SFPUC General Seismic Design Requirements	X	X	X	X	X	X
SFPUC Construction Measures						
No. 2: Seismic and Geotechnical Studies	X	X	X	X	X	X
PEIR Mitigation Measures						
None required.						
Impact 4.4-7: Seismically induced ground failure, including liquefaction and settlement	LS	LS	LS	LS	LS	LS
Regulations						
SFPUC General Seismic Design Requirements	X	X	X	X	X	X
SFPUC Construction Measures						
No. 2: Seismic and Geotechnical Studies	X	X	X	X	X	X
PEIR Mitigation Measures						
None required.						
Impact 4.4-8: Seismically induced landslides or other slope failures	LS	LS	LS	LS	LS	LS
Regulations						
SFPUC General Seismic Design Requirements	X	X	X	X	X	X
Watershed Management Plan Policies and Actions:						
No. S5: avoid landslides and slopes greater than 30%	X	X	X	X	X	X
No. S6: conduct inspections	X	X	X	X	X	X
SFPUC Construction Measures						
No. 2: Seismic and Geotechnical Studies	X	X	X	X	X	X
PEIR Mitigation Measures						
None required.						

TABLE 6.4 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SUNOL VALLEY REGION PROJECTS (SV-1 through SV-6)

IMPACT	Alameda Creek Fishery Enhancement SV-1	Calaveras Dam Replacement SV-2	Additional 40-mgd Treated Water Supply SV-3	New Irvington Tunnel SV-4	SVWTP – Treated Water Reservoirs SV-5	San Antonio Backup Pipeline SV-6
Impact 4.4-9: Expansive or corrosive soils	PSM	PSM	PSM	PSM	PSM	PSM
Regulations						
California Building Code	X	X	X	X	X	X
SFPUC Construction Measures						
No. 2: Seismic and Geotechnical Studies	X	X	X	X	X	X
PEIR Mitigation Measures						
4.4-9: Characterize Extent of Expansive and Corrosive Soil	X	X	X	X	X	X
4.5 Surface Water Hydrology and Water Quality						
Impact 4.5-1: Degradation of water bodies as a result of erosion and sedimentation or a hazardous materials release during construction	LS	LS	LS	LS	LS	LS
Regulations						
NPDES stormwater requirements	X	X	X	X	X	X
Encroachment permitting requirements	X	N/A	X	N/A	N/A	X
Watershed Management Plans and Actions:						
Aqu1: locate outside of high water quality vulnerability zone if possible	X	X	X	X	X	X
Aqu5: rehabilitate shoreline area	X	X	X	N/A	N/A	X
Veg4: grading plan	X	X	X	X	X	X
Veg7: follow erosion control BMPs	X	X	X	X	X	X
Veg13: minimize disturbance of serpentine bedrock	N/A	X	N/A	N/A	N/A	N/A
SFPUC Construction Measures						
No. 3: On-site Air and Water Quality Measures During Construction	X	X	X	X	X	X
PEIR Mitigation Measures						
None required.						
Impact 4.5-2: Depletion of groundwater resources	LS	LS	N/A	PSM	N/A	LS
Regulations						
None applicable.						
SFPUC Construction Measures						
None applicable.						
PEIR Mitigation Measures						
4.5-2: Site-Specific Groundwater Analysis and Identified Measures	N/A	N/A	N/A	X	N/A	N/A

TABLE 6.4 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SUNOL VALLEY REGION PROJECTS (SV-1 through SV-6)

IMPACT	Alameda Creek Fishery Enhancement SV-1	Calaveras Dam Replacement SV-2	Additional 40-mgd Treated Water Supply SV-3	New Irvington Tunnel SV-4	SVWTP – Treated Water Reservoirs SV-5	San Antonio Backup Pipeline SV-6
Impact 4.5-3a: Degradation of water quality due to construction dewatering discharges	LS	LS	N/A	LS	N/A	LS
Regulations						
NPDES discharge requirements	X	X	N/A	X	N/A	X
SFPUC Construction Measures						
No.4: Groundwater	X	X	N/A	X	N/A	X
PEIR Mitigation Measures						
None required.						
Impact 4.5-3b: Degradation of water quality due to construction-related discharges of treated water	N/A	N/A	LS	LS	LS	LS
Regulations						
NPDES discharge requirements	N/A	N/A	X	X	X	X
Watershed Management Plans and Actions:						
Fis6: dechlorinate water before discharge	N/A	N/A	X	X	X	X
SFPUC Construction Measures						
None applicable.						
PEIR Mitigation Measures						
None required.						
Impact 4.5-4: Flooding and water quality impacts associated with impeding or redirected flood flows.	PSM	N/A	N/A	PSM	N/A	PSM
Regulations						
None applicable.						
SFPUC Construction Measures						
None applicable.						
PEIR Mitigation Measures						
4.5-4a: Flood Flow Protection Measures	X	N/A	N/A	X	N/A	X
4.5-4b: Site Specific Flooding Analysis and Identified Measures	X	N/A	N/A	X	N/A	N/A
Impact 4.5-5: Degradation of water quality and increased flows due to discharges to surface water during operation	N/A	N/A	LS	N/A	LS	LS
Regulations						
NPDES discharge requirements	N/A	N/A	X	N/A	X	X
Watershed Management Plans and Actions:						

TABLE 6.4 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SUNOL VALLEY REGION PROJECTS (SV-1 through SV-6)

IMPACT	Alameda Creek Fishery Enhancement SV-1	Calaveras Dam Replacement SV-2	Additional 40-mgd Treated Water Supply SV-3	New Irvington Tunnel SV-4	SVWTP – Treated Water Reservoirs SV-5	San Antonio Backup Pipeline SV-6
Fis6: dechlorinate water before discharge	N/A	N/A	X	N/A	X	X
SFPUC Construction Measures						
None applicable.						
PEIR Mitigation Measures						
4.5-5: Stormwater Treatment and Groundwater Monitoring	N/A	N/A	N/A	N/A	N/A	N/A
Impact 4.5-6: Degradation of water quality as a result of alteration of drainage patterns or an increase in impervious surfaces	LS	LS	LS	LS	LS	LS
Regulations						
NPDES stormwater requirements	X	X	X	X	X	X
Watershed Management Plans and Actions:						
Sto1: stormwater drainage and collection	X	X	X	X	X	N/A
SFPUC Construction Measures						
No. 10: Project Site	X	X	X	X	X	X
PEIR Mitigation Measures						
4.5-6: Appropriate Source Control and Site Design Measures	N/A	N/A	N/A	N/A	N/A	N/A
4.6 Biological Resources						
Impact 4.6-1: Impacts on wetlands and aquatic resources	PSM	PSM	PSM	PSM	PSM	PSM
Regulations						
Clean Water Act – Section 404	X	X	X	X	X	X
SFPUC Construction Measures						
No. 8: Biological Resources	X	X	X	X	X	X
PEIR Mitigation Measures						
4.6-1a: Wetlands Assessment	X	X	X	X	X	X
4.6-1b: Compensation for Wetlands and Other Biological Resources	X	X	X	X	X	X
Impact 4.6-2: Impact to sensitive habitats, common habitats, and heritage trees	PSM	PSM	PSM	PSM	PSM	PSM
Regulations						
None applicable.						
SFPUC Construction Measures						
No. 8: Biological Resources	X	X	X	X	X	X

TABLE 6.4 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SUNOL VALLEY REGION PROJECTS (SV-1 through SV-6)

IMPACT	Alameda Creek Fishery Enhancement SV-1	Calaveras Dam Replacement SV-2	Additional 40-mgd Treated Water Supply SV-3	New Irvington Tunnel SV-4	SVWTP – Treated Water Reservoirs SV-5	San Antonio Backup Pipeline SV-6
PEIR Mitigation Measures						
4.6-2: Habitat Restoration/Tree Replacement	X	X	X	X	X	X
See Biological Resources Measure 4.6-1b.	X	X	X	X	X	X
Impact 4.6-3: Impact on key special-status species – direct mortality and/or habitat effects	PSM	PSM	PSM	PSM	PSM	PSM
Regulations						
Federal Endangered Species Act	X	X	X	X	X	X
California Endangered Species Act	X	X	X	X	X	X
California Native Plant Protection Act	X	X	X	X	X	X
SFPUC Construction Measures						
No. 8: Biological Resources	X	X	X	X	X	X
PEIR Mitigation Measures						
4.6-3a: Protection Measures During Construction for Key Special-Status Species and Other Species of Concern	X	X	X	X	X	X
4.6-3b: Standard Mitigation Measures for Specific Plants and Animals	X	X	X	X	X	X
See Biological Resources Measure 4.6-1b.	X	X	X	X	X	X
Impact 4.6-4: Water discharge effects on riparian and/or aquatic resources	LS	LS	LS	PSM	LS	LS
Regulations						
Waste Discharge Requirements	N/A	N/A	X	X	X	X
Watershed Management Plans and Actions:						
Fis 6: Identify and adopt alternative nontoxic management practices for the protection of aquatic resources	X	X	X	X	X	X
SFPUC Construction Measures						
None applicable.						
PEIR Mitigation Measures						
4.6-4: Pipeline and Water Treatment Plant Water Discharge Restoration	N/A	N/A	N/A	X	N/A	N/A
Impact 4.6-5: Conflict with adopted conservation plans or other approved biological resources plans	LS	LS	LS	LS	LS	LS
Regulations						
None applicable.						

TABLE 6.4 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SUNOL VALLEY REGION PROJECTS (SV-1 through SV-6)

IMPACT	Alameda Creek Fishery Enhancement SV-1	Calaveras Dam Replacement SV-2	Additional 40-mgd Treated Water Supply SV-3	New Irvington Tunnel SV-4	SVWTP – Treated Water Reservoirs SV-5	San Antonio Backup Pipeline SV-6
SFPUC Construction Measures						
No. 8 Biological Resources	X	X	X	X	X	X
PEIR Mitigation Measures						
See Biological Resources Measures 4.6-1a, 4.6-1b, 4.6-2, and 4.6-3a, 4.6-3b	X	X	X	X	X	X
4.7 Cultural Resources						
Impact 4.7-1: Impacts on paleontological resources	PSM	PSM	PSM	PSM	PSM	PSM
Regulations						
Paleontological Resources Preservation Act	X	X	X	X	X	X
SFPUC Construction Measures						
No. 9: Cultural Resources	X	X	X	X	X	X
PEIR Mitigation Measures						
4.7-1: Suspend Construction Work if Paleontological Resource is Identified	X	X	X	X	X	X
Impact 4.7-2: Impacts on archaeological resources	PSM	PSM	PSM	PSM	PSM	PSM
Regulations						
California Health and Safety Code	X	X	X	X	X	X
SFPUC Construction Measures						
No. 9: Cultural Resources	X	X	X	X	X	X
PEIR Mitigation Measures						
4.7-2a: Archaeological Testing, Monitoring, and Treatment of Human Remains	X	X	X	X	X	X
4.7-2b: Accidental Discovery Measures	X	X	X	X	X	X
Impact 4.7-3: Impacts on historical significance of a historic district or a contributor to a historic district	N/A	PSU	N/A	PSM	N/A	PSM
Regulations						
National Historic Preservation Act	N/A	X	N/A	X	N/A	X
SFPUC Construction Measures						
None applicable.						
PEIR Mitigation Measures						
4.7-3: Protection of Historic Districts	N/A	X	N/A	X	N/A	X
4.7-4a: Alternatives Identification and Resource Relocation	N/A	X	N/A	X	N/A	X
4.7-4b: Historical Resources Documentation	N/A	X	N/A	X	N/A	X

TABLE 6.4 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SUNOL VALLEY REGION PROJECTS (SV-1 through SV-6)

IMPACT	Alameda Creek Fishery Enhancement SV-1	Calaveras Dam Replacement SV-2	Additional 40-mgd Treated Water Supply SV-3	New Irvington Tunnel SV-4	SVWTP – Treated Water Reservoirs SV-5	San Antonio Backup Pipeline SV-6
4.7-4c: Secretary of the Interior's Standards for Treatment of Historic Properties	N/A	X	N/A	X	N/A	X
4.7-4d: Historic Resources Survey and Redesign	N/A	X	N/A	X	N/A	X
4.7-4e: Historic Resources Protection Plan	N/A	X	N/A	X	N/A	X
4.7-4f: Pre-construction Surveys and Vibration Monitoring	N/A	X	N/A	X	N/A	X
Impact 4.7-4: Impacts on the historical significance of individual facilities resulting from demolition or alteration	N/A	PSU	N/A	PSU	N/A	PSM
Regulations						
National Historic Preservation Act	N/A	X	N/A	X	N/A	X
SFPUC Construction Measures						
No. 9: Cultural Resources	N/A	X	N/A	X	N/A	X
PEIR Mitigation Measures						
4.7-4a: Alternatives Identification and Resource Relocation	N/A	X	N/A	X	N/A	X
4.7-4b: Historical Resources Documentation	N/A	X	N/A	X	N/A	X
4.7-4c: Secretary of the Interior's Standards for Treatment of Historic Properties	N/A	X	N/A	X	N/A	X
4.7-4d: Historic Resources Survey and Redesign	N/A	X	N/A	X	N/A	X
4.7-4e: Historic Resources Protection Plan	N/A	X	N/A	X	N/A	X
4.7-4f: Pre-construction Surveys and Vibration Monitoring	N/A	X	N/A	X	N/A	X
Impact 4.7-5: Impacts on adjacent historic architectural resources	LS	PSM	LS	PSM	LS	PSM
Regulations						
National Historic Preservation Act	X	X	X	X	X	X
SFPUC Construction Measures						
No. 9: Cultural Resources	X	X	X	X	X	X
PEIR Mitigation Measures						
4.7-4a: Alternatives Identification and Resource Relocation	N/A	X	N/A	X	N/A	X
4.7-4b: Historical Resources Documentation	N/A	X	N/A	X	N/A	X
4.7-4c: Secretary of the Interior's Standards for Treatment of Historic Properties	N/A	X	N/A	X	N/A	X
4.7-4d: Historical Resources Survey and Redesign	N/A	X	N/A	X	N/A	X
4.7-4e: Historic Resources Protection Plan	N/A	X	N/A	X	N/A	X
4.7-4f: Preconstruction Surveys and Vibration Monitoring	N/A	X	N/A	X	N/A	X

TABLE 6.4 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SUNOL VALLEY REGION PROJECTS (SV-1 through SV-6)

IMPACT	Alameda Creek Fishery Enhancement SV-1	Calaveras Dam Replacement SV-2	Additional 40-mgd Treated Water Supply SV-3	New Irvington Tunnel SV-4	SVWTP – Treated Water Reservoirs SV-5	San Antonio Backup Pipeline SV-6
4.8 Traffic, Transportation, and Circulation						
Impact 4.8-1: Temporary reduction in roadway capacity and increased traffic delays	LS	PSM	LS	LS	LS	PSM
Regulations						
City and county encroachment permits.	X	X	X	X	X	X
SFPUC Construction Measures						
No. 5: Traffic	X	X	X	X	X	X
PEIR Mitigation Measures						
4.8-1a: Traffic Control Plan Measures	N/A	X	N/A	N/A	N/A	X
4.8-1b: Coordination of Individual Traffic Control Plans	N/A	N/A	N/A	N/A	N/A	N/A
Impact 4.8-2: Short-term traffic increases on roadways	PSM	PSM	PSM	PSM	PSM	PSM
Regulations						
City and county encroachment permits.	X	X	X	X	X	X
SFPUC Construction Measures						
No. 5: Traffic	X	X	X	X	X	X
PEIR Mitigation Measures						
4.8-1a: Traffic Control Plan Measures	X	X	X	X	X	X
Impact 4.8-3: Impaired access to adjacent roadways and land uses	LS	PSM	LS	LS	LS	LS
Regulations						
City and county encroachment permits.	X	X	X	X	X	X
SFPUC Construction Measures						
No. 5: Traffic	X	X	X	X	X	X
PEIR Mitigation Measures						
4.8-1a: Traffic Control Plan Measures	N/A	X	N/A	N/A	N/A	N/A
Impact 4.8-4: Temporary displacement of on-street parking	LS	LS	LS	LS	LS	LS
Regulations						
City and county encroachment permits.	X	X	X	X	X	X
SFPUC Construction Measures						
No. 5: Traffic	X	X	X	X	X	X

TABLE 6.4 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SUNOL VALLEY REGION PROJECTS (SV-1 through SV-6)

IMPACT	Alameda Creek Fishery Enhancement SV-1	Calaveras Dam Replacement SV-2	Additional 40-mgd Treated Water Supply SV-3	New Irvington Tunnel SV-4	SVWTP – Treated Water Reservoirs SV-5	San Antonio Backup Pipeline SV-6
PEIR Mitigation Measures						
4.8-4: Accommodation of Displaced Public Parking Supply for Recreational Visitors	N/A	N/A	N/A	N/A	N/A	N/A
Impact 4.8-5: Increased traffic safety hazards during construction	PSM	PSM	PSM	PSM	PSM	PSM
Regulations						
City and county encroachment permits.	X	X	X	X	X	X
SFPUC Construction Measures						
No. 5: Traffic	X	X	X	X	X	X
PEIR Mitigation Measures						
4.8-1a: Traffic Control Plan Measures	X	X	X	X	X	X
Impact 4.8-6: Long-term traffic increases during facility operation	N/A	N/A	LS	N/A	LS	N/A
Regulations						
None applicable.						
SFPUC Construction Measures						
None applicable.						
PEIR Mitigation Measures						
None required.						
4.9 Air Quality						
Impact 4.9-1: Construction emissions of criteria pollutants	PSM	PSM	PSM	PSM	PSM	PSM
Regulations						
None applicable.						
SFPUC Construction Measures						
No. 3: On-Site Air and Water Quality Measures during Construction	X	X	X	X	X	X
PEIR Mitigation Measures						
4.9-1a: SJVAPCD Dust Control Measures	N/A	N/A	N/A	N/A	N/A	N/A
4.9-1b: SJVAPCD Exhaust Control Measures	N/A	N/A	N/A	N/A	N/A	N/A
4.9-1c: BAAQMD Dust Control Measures	X	X	X	X	X	X
4.9-1d: BAAQMD Exhaust Control Measures	X	X	X	X	X	X

TABLE 6.4 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SUNOL VALLEY REGION PROJECTS (SV-1 through SV-6)

IMPACT	Alameda Creek Fishery Enhancement SV-1	Calaveras Dam Replacement SV-2	Additional 40-mgd Treated Water Supply SV-3	New Irvington Tunnel SV-4	SVWTP – Treated Water Reservoirs SV-5	San Antonio Backup Pipeline SV-6
Impact 4.9-2: Exposure to diesel particulate matter during construction	LS	PSM	LS	LS	PSM	LS
Regulations						
California Health and Safety Code, Section 2485 – Reduces emissions of toxic and criteria pollutants by limiting the idling of new heavy-duty diesel vehicles	X	X	X	X	X	X
SFPUC Construction Measures						
None applicable.						
PEIR Mitigation Measures						
4.9-2a: Health Risk Screening or Use of Soot Filters	N/A	N/A	N/A	N/A	N/A	N/A
4.9-2b: Vacate SFPUC Land Managers' Residences in Sunol Valley	N/A	X	N/A	N/A	X	N/A
Impact 4.9-3: Exposure to emissions (possibly including asbestos) from tunneling	L/S	N/A	L/S	PSM	N/A	LS
Regulations						
OSHA standards for worker safety during tunneling	X	N/A	X	X	N/A	X
SFPUC Construction Measures						
None applicable.						
PEIR Mitigation Measures						
4.9-3: Tunnel Gas Odor Control	N/A	N/A	N/A	X	N/A	N/A
Impact 4.9-4: Air pollutant emissions during project operation	LS	LS	LS	LS	LS	N/A
Regulations						
None applicable.						
SFPUC Construction Measures						
None applicable.						
PEIR Mitigation Measures						
None required.						
Impact 4.9-5: Odors generated during project operation	N/A	N/A	LS	N/A	LS	N/A
Regulations						
BAAQMD Rule 1-301 – Prohibits the discharge of any contaminants that causes annoyance for a considerable number of people of normal sensitivity	X	X	X	X	X	X
BAAQMD Regulation 7 – Specifies odor limits for public exposure and identifies specific dilution levels that must be achieved as a function of odor emission strength	X	X	X	X	X	X

TABLE 6.4 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SUNOL VALLEY REGION PROJECTS (SV-1 through SV-6)

IMPACT	Alameda Creek Fishery Enhancement SV-1	Calaveras Dam Replacement SV-2	Additional 40-mgd Treated Water Supply SV-3	New Irvington Tunnel SV-4	SVWTP – Treated Water Reservoirs SV-5	San Antonio Backup Pipeline SV-6
SFPUC Construction Measures						
None applicable.						
PEIR Mitigation Measures						
None required.						
Impact 4.9-6: Secondary emissions at power plants	LS	LS	LS	LS	LS	LS
Regulations						
None applicable.						
SFPUC Construction Measures						
None applicable.						
PEIR Mitigation Measures						
None required.						
Impact 4.9-7: Conflict with implementation of applicable regional air quality plans addressing criteria air pollutants and state goals for reducing GHG emissions.	LS	LS	LS	LS	LS	LS
Regulations						
None applicable.						
SFPUC Construction Measures						
None applicable.						
PEIR Mitigation Measures						
None required.						
4.10 Noise and Vibration						
Impact 4.10-1: Disturbance from temporary construction-related noise increases	PSU	PSU	PSU	PSU	PSU	PSU
Regulations						
None applicable.						
SFPUC Construction Measures						
No. 6: Noise	X	X	X	X	X	X
PEIR Mitigation Measures						
4.10-1a: Noise Controls	X	X	X	X	X	X
4.10-1b: Vacate SFPUC Caretaker's Residence at Tesla Portal	N/A	N/A	N/A	N/A	N/A	N/A

TABLE 6.4 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SUNOL VALLEY REGION PROJECTS (SV-1 through SV-6)

IMPACT	Alameda Creek Fishery Enhancement SV-1	Calaveras Dam Replacement SV-2	Additional 40-mgd Treated Water Supply SV-3	New Irvington Tunnel SV-4	SVWTP – Treated Water Reservoirs SV-5	San Antonio Backup Pipeline SV-6
Impact 4.10-2: Temporary noise disturbance along construction haul routes	LS	LS	LS	PSM	LS	LS
Regulations						
None applicable.						
SFPUC Construction Measures						
None applicable.						
PEIR Mitigation Measures						
4.10-2a: Limiting Hourly Truck Volumes	N/A	N/A	N/A	N/A	N/A	N/A
4.10-2b: Restricting Truck Operations	N/A	N/A	N/A	N/A	N/A	N/A
4.10-2c: Vacate SFPUC Land Manager's Residence	N/A	N/A	N/A	X	N/A	N/A
Impact 4.10-3: Disturbance due to construction-related vibration	LS	LS	PSU	PSM	LS	LS
Regulations						
None applicable.						
SFPUC Construction Measures						
None applicable.						
PEIR Mitigation Measures						
4.10-3a: Vibration Controls to Prevent Cosmetic or Structural Damage	N/A	N/A	X	X	N/A	N/A
4.10-3b: Limit Vibration Levels at or Below Vibration Perception Threshold	N/A	N/A	X	N/A	N/A	N/A
4.10-3c: Limit Tunnel-Related Detonation to Daylight hours	N/A	N/A	N/A	N/A	N/A	N/A
Impact 4.10-4: Disturbance due to long-term noise increases	LS	N/A	LS	LS	LS	N/A
Regulations						
None applicable.						
SFPUC Construction Measures						
No. 6: Noise	X	N/A	X	X	N/A	X
PEIR Mitigation Measures						
None required.						
4.11 Public Services and Utilities						
Impact 4.11-1: Potential temporary damage to or disruption of existing regional or local public utilities	PSM	PSM	PSM	PSM	LS	PSM
Regulations						
OSHA Construction Safety Orders	X	X	X	X	X	X

TABLE 6.4 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SUNOL VALLEY REGION PROJECTS (SV-1 through SV-6)

IMPACT	Alameda Creek Fishery Enhancement SV-1	Calaveras Dam Replacement SV-2	Additional 40-mgd Treated Water Supply SV-3	New Irvington Tunnel SV-4	SVWTP – Treated Water Reservoirs SV-5	San Antonio Backup Pipeline SV-6
DHS separation standards	X	X	X	X	X	X
SFPUC Construction Measures						
No. 1: Neighborhood Notice	X	X	X	X	X	X
PEIR Mitigation Measures						
4.11-1a: Notify Neighbors of Potential Utility Service Disruption	X	X	X	X	N/A	X
4.11-1b: Locate Utility Lines Prior to Excavation	X	X	X	X	N/A	X
4.11-1c: Confirmation of Utility Line Information	X	X	X	X	N/A	X
4.11-1d: Safeguard Employees from Potential Accidents Related to Underground Utilities	X	X	X	X	N/A	X
4.11-1e: Notify Local Fire Departments	X	X	X	X	N/A	X
4.11-1f: Emergency Response Plan	X	X	X	X	N/A	X
4.11-1g: Prompt Reconnection of Utilities	X	X	X	X	N/A	X
4.11-1h: Coordinate Final Construction Plans with Affected Utilities	X	X	X	X	N/A	X
Impact 4.11-2: Temporary adverse effects on solid waste landfill capacity	PSM	PSM	PSM	PSM	PSM	PSM
Regulations						
California Integrated Waste Management Act of 1989	X	X	X	X	X	X
SFPUC Construction Measures						
None applicable.						
PEIR Mitigation Measures						
4.11-2: Waste Reduction Measures	X	X	X	X	X	X
Impact 4.11-3: Impacts related to compliance with statutes and regulations related to solid waste	PSM	PSM	PSM	PSM	PSM	PSM
Regulations						
California Integrated Waste Management Act of 1989	X	X	X	X	X	X
SFPUC Construction Measures						
None applicable.						
PEIR Mitigation Measures						
4.11-2: Waste Reduction Measures	X	X	X	X	X	X

TABLE 6.4 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SUNOL VALLEY REGION PROJECTS (SV-1 through SV-6)

IMPACT	Alameda Creek Fishery Enhancement SV-1	Calaveras Dam Replacement SV-2	Additional 40-mgd Treated Water Supply SV-3	New Irvington Tunnel SV-4	SVWTP – Treated Water Reservoirs SV-5	San Antonio Backup Pipeline SV-6
Impact 4.11-4: Impacts related to the relocation of facilities	PSM	PSM	PSM	PSM	PSM	PSM
Regulations						
None applicable.						
SFPUC Construction Measures						
No. 1: Neighborhood Notice	X	X	X	X	X	X
PEIR Mitigation Measures						
4.11-1a: Notify Neighbors of Potential Utility Service Disruption	X	X	X	X	X	X
4.11-1b: Locate Utility Lines Prior to Excavation	X	X	X	X	X	X
4.11-1c: Confirmation of Utility Line Information	X	X	X	X	X	X
4.11-1d: Safeguard Employees from Potential Accidents Related to Underground Utilities	X	X	X	X	X	X
4.11-1e: Notify Local Fire Departments	X	X	X	X	X	X
4.11-1f: Emergency Response Plan	X	X	X	X	X	X
4.11-1g: Prompt Reconnection of Utilities	X	X	X	X	X	X
4.11-1h: Coordinate Final Construction Plans with Affected Utilities	X	X	X	X	X	X
4.12 Recreational Resources						
Impact 4.12-1: Temporary conflicts with established recreational uses during construction	LS	LS	N/A	PSM	N/A	N/A
Regulations						
None applicable.						
SFPUC Construction Measures						
No. 1: Neighborhood Notice	X	X	N/A	X	N/A	N/A
No. 3: On-Site Air and Water Quality Measures during Construction	X	X	N/A	X	N/A	N/A
No. 5: Traffic	X	X	N/A	X	N/A	N/A
No. 6: Noise	X	X	N/A	X	N/A	N/A
PEIR Mitigation Measures						
4.12-1: Coordination with Golf Course/Recreational Facility Managers	N/A	N/A	N/A	N/A	N/A	N/A
See Traffic Measures (4.8-1), Air Quality Measures (4.9-1 and 4.9-2), and Noise Measures (4.10-1 through 4.10-3).	N/A	N/A	N/A	X	N/A	N/A

TABLE 6.4 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SUNOL VALLEY REGION PROJECTS (SV-1 through SV-6)

IMPACT	Alameda Creek Fishery Enhancement SV-1	Calaveras Dam Replacement SV-2	Additional 40-mgd Treated Water Supply SV-3	New Irvington Tunnel SV-4	SVWTP – Treated Water Reservoirs SV-5	San Antonio Backup Pipeline SV-6
Impact 4.12-2: Conflicts with established recreational uses due to facility siting and project operation	N/A	N/A	N/A	N/A	N/A	N/A
Regulations						
None applicable.						
SFPUC Construction Measures						
None applicable.						
PEIR Mitigation Measures						
4.12-2: Appropriate Siting of Proposed Facilities	N/A	N/A	N/A	N/A	N/A	N/A
4.13 Agricultural Resources						
Impact 4.13-1: Temporary conflicts with established agricultural resources	PSM	PSM	PSM	PSM	N/A	PSM
Regulations						
None applicable.						
SFPUC Construction Measures						
No. 1: Neighborhood Notice	X	X	X	N/A	N/A	X
No. 3: On-Site Air and Water Quality Measures during Construction	X	X	X	N/A	N/A	X
No. 5: Traffic	X	X	X	N/A	N/A	X
No. 6: Noise	X	X	X	N/A	N/A	X
PEIR Mitigation Measures						
4.13-1a: Supplemental Noticing and Soil Stockpiling	N/A	N/A	N/A	N/A	N/A	N/A
4.13-1b: Avoidance or Soil Stockpiling	X	X	X	X	N/A	X
Impact 4.13-2: Conversion of farmlands to nonagricultural uses	N/A	LS	PSM	N/A	PSM	N/A
Regulations						
California Land Conservation Act of 1965 (Williamson Act)	N/A	N/A	X	N/A	X	N/A
SFPUC Construction Measures						
None applicable.						
PEIR Mitigation Measures						
4.13-2: Siting Facilities to Avoid Prime Farmland	N/A	N/A	X	N/A	X	N/A

TABLE 6.4 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SUNOL VALLEY REGION PROJECTS (SV-1 through SV-6)

IMPACT	Alameda Creek Fishery Enhancement SV-1	Calaveras Dam Replacement SV-2	Additional 40-mgd Treated Water Supply SV-3	New Irvington Tunnel SV-4	SVWTP – Treated Water Reservoirs SV-5	San Antonio Backup Pipeline SV-6
4.14 Hazards						
Impact 4.14-1: Potential to encounter hazardous materials in soil and groundwater	LS	LS	LS	LS	LS	LS
Regulations						
None applicable.						
SFPUC Construction Measures						
No. 4: Groundwater	X	X	N/A	X	N/A	X
No. 7: Hazardous Materials	X	X	X	X	X	X
PEIR Mitigation Measures						
4.14-1a: Site Health and Safety Plan	N/A	N/A	N/A	N/A	N/A	N/A
4.14-1b: Materials Disposal Plan	N/A	N/A	N/A	N/A	N/A	N/A
4.14-1c: Coordination with Property Owners and Regulatory Agencies	N/A	N/A	N/A	N/A	N/A	N/A
Impact 4.14-2: Exposure to naturally occurring asbestos	N/A	LS	N/A	N/A	N/A	N/A
Regulations						
Asbestos Airborne Toxic Control Measure	N/A	X	N/A	N/A	N/A	N/A
SFPUC Construction Measures						
None applicable.						
PEIR Mitigation Measures						
4.14-2: Health Risk Screening and Airborne Asbestos Monitoring Plan	N/A	N/A	N/A	N/A	N/A	N/A
Impact 4.14-3: Risk of fires during construction	LS	LS	LS	LS	LS	LS
Regulations						
Public Resources Code fire safety regulations	X	X	X	X	X	X
Watershed Management Plan Policies and Actions:						
Fir1: compliance with California Division of Forestry regulations	X	X	X	X	X	X
SFPUC Construction Measures						
None applicable.						
PEIR Mitigation Measures						
None required.						

TABLE 6.4 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SUNOL VALLEY REGION PROJECTS (SV-1 through SV-6)

IMPACT	Alameda Creek Fishery Enhancement SV-1	Calaveras Dam Replacement SV-2	Additional 40-mgd Treated Water Supply SV-3	New Irvington Tunnel SV-4	SVWTP – Treated Water Reservoirs SV-5	San Antonio Backup Pipeline SV-6
Impact 4.14-4: Gassy conditions in tunnels	LS	N/A	LS	LS	N/A	LS
Regulations						
Tunnel Safety Orders	X	N/A	X	X	N/A	X
SFPUC Construction Measures						
None applicable.						
PEIR Mitigation Measures						
None required.						
Impact 4.14-5: Exposure to hazardous building materials	N/A	PSM	N/A	PSM	N/A	N/A
Regulations						
California Code of Regulations, Title 8 – asbestos abatement	N/A	X	N/A	X	N/A	N/A
California Code of Regulations Title 17 – lead-based paint regulations	N/A	X	N/A	X	N/A	N/A
SFPUC Construction Measures						
None applicable.						
PEIR Mitigation Measures						
4.14-5: Hazardous Building Materials Surveys and Abatement	N/A	X	N/A	X	N/A	N/A
Impact 4.14-6: Accidental hazardous materials release from construction equipment	LS	LS	LS	LS	LS	LS
Regulations						
NPDES stormwater requirements	X	X	X	X	X	X
Watershed Management Plan Policies and Actions:						
Haz4: minimize leaks, drips, and spills of contaminants	X	X	X	X	X	X
Haz6: implement measures to reduce risk of hazardous spills	X	X	X	X	X	X
Haz7: develop spill response and containment measures	X	X	X	X	X	X
SFPUC Construction Measures						
No. 3: On-site Air and Water Quality Measures During Construction	X	X	X	X	X	X
PEIR Mitigation Measures						
None required.						
Impact 4.14-7: Increased use of hazardous materials during operation	N/A	N/A	LS	N/A	LS	N/A
Regulations						
Risk management regulations (HMBP)	N/A	N/A	X	N/A	X	N/A

TABLE 6.4 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SUNOL VALLEY REGION PROJECTS (SV-1 through SV-6)

IMPACT	Alameda Creek Fishery Enhancement SV-1	Calaveras Dam Replacement SV-2	Additional 40-mgd Treated Water Supply SV-3	New Irvington Tunnel SV-4	SVWTP – Treated Water Reservoirs SV-5	San Antonio Backup Pipeline SV-6
Risk management regulations (RMP)	N/A	N/A	X	N/A	X	N/A
Aboveground storage tank regulations	N/A	N/A	N/A	N/A	X	N/A
Watershed Management Plan Policies and Actions:						
Haz1: development of hazardous chemical management procedures	N/A	N/A	X	N/A	X	N/A
Haz2: inventory and monitor above and below ground fuel storage tanks	N/A	N/A	X	N/A	X	N/A
SFPUC Construction Measures						
None applicable.						
PEIR Mitigation Measures						
None required.						
Impact 4.14-8: Emission of use of hazardous materials within ¼ mile of a school	N/A	N/A	N/A	N/A	N/A	N/A
Regulations						
None applicable.						
SFPUC Construction Measures						
None applicable.						
PEIR Mitigation Measures						
None required.						
4.15 Energy						
Impact 4.15-1: Construction-related energy use	PSM	PSM	PSM	PSM	PSM	PSM
Regulations						
None applicable.						
SFPUC Construction Measures						
None applicable.						
PEIR Mitigation Measures						
See Air Quality Measures (4.9-1b and 4.9-1d).	X	X	X	X	X	X
Impact 4.15-2: Long-term energy use during operation	PSM	N/A	PSM	N/A	PSM	N/A
Regulations						
None applicable.						
SFPUC Construction Measures						
None applicable.						

TABLE 6.4 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SUNOL VALLEY REGION PROJECTS (SV-1 through SV-6)

IMPACT	Alameda Creek Fishery Enhancement SV-1	Calaveras Dam Replacement SV-2	Additional 40-mgd Treated Water Supply SV-3	New Irvington Tunnel SV-4	SVWTP – Treated Water Reservoirs SV-5	San Antonio Backup Pipeline SV-6
PEIR Mitigation Measures						
4.15-2: Incorporation of Energy Efficiency Measures	X	N/A	X	N/A	X	N/A

LS = Less than Significant impact, no mitigation required
PSM= Potentially Significant impact, can be mitigated to less than significant
PSU = Potentially Significant Unavoidable impact
X = Applicable
N/A = Not Applicable

TABLE 6.5
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF BAY DIVISION REGION PROJECTS (BD-1 through BD-3)

IMPACT	Bay Division Pipeline Reliability Upgrade BD-1	BDPL Nos. 3 and 4 Crossovers BD-2	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault BD-3
4.3 Land Use and Visual Quality			
Impact 4.3-1: Temporary disruption or displacement of existing land uses during construction	PSM	PSM	LS
Regulations			
None applicable.			
SFPUC Construction Measures			
No. 1: Neighborhood Notice	X	X	X
No. 3: On-Site Air and Water Quality Measures during Construction	X	X	X
No. 5: Traffic	X	X	X
No. 6: Noise	X	X	X
No. 10: Project Site	X	X	X
PEIR Mitigation Measures			
See Traffic Measure (4.8-1), Air Quality Measures (4.9-1 and 4.9-2), and Noise Measures (4.10-1 through 4.10-3).	X	X	N/A
Impact 4.3-2: Permanent displacement or long-term disruption of existing land uses	PSU	LS	N/A
Regulations			
None applicable.			
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
4.3-2: Facility Siting Studies	X	N/A	N/A
Impact 4.3-3: Temporary construction impacts on scenic vistas or visual character	LS	LS	LS
Regulations			
None applicable.			
SFPUC Construction Measures			
No. 10: Project Site	X	X	X
PEIR Mitigation Measures			
None required.			
Impact 4.3-4: Permanent adverse impacts on scenic vistas or visual character	PSM	PSM	N/A
Regulations			
None applicable.			

TABLE 6.5 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF BAY DIVISION REGION PROJECTS (BD-1 through BD-3)

IMPACT	Bay Division Pipeline Reliability Upgrade BD-1	BDPL Nos. 3 and 4 Crossovers BD-2	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault BD-3
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
4.3-4a: Architectural Design	X	X	N/A
4.3-4b: Landscaping Plans	X	X	N/A
4.3-4c: Landscape Screens	X	X	N/A
4.3-4d: Minimize Tree Removal	X	X	N/A
Impact 4.3-5: New permanent sources of light glare	PSM	PSM	PSM
Regulations			
None applicable.			
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
4.3-5: Reduce Lighting Effects	X	X	X
4.4 Geology, Soils, and Seismicity			
Impact 4.4-1: Slope instability during construction.	LS	N/A	N/A
Regulations			
None applicable.			
SFPUC Construction Measures			
No. 2: Seismic and Geotechnical Studies	X	N/A	N/A
PEIR Mitigation Measures			
4.4-1: Quantified Landslide Analysis	N/A	N/A	N/A
Impact 4.4-2: Erosion during construction.	LS	LS	LS
Regulations			
NPDES stormwater requirements	X	X	X
SFPUC Construction Measures			
No. 3: On-Site Air and Water Quality Measures during Construction	X	X	X
PEIR Mitigation Measures			
None required.			

TABLE 6.5 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF BAY DIVISION REGION PROJECTS (BD-1 through BD-3)

IMPACT	Bay Division Pipeline Reliability Upgrade BD-1	BDPL Nos. 3 and 4 Crossovers BD-2	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault BD-3
Impact 4.4-3: Substantial alteration of topography.	LS	LS	LS
Regulations			
None applicable.			
SFPUC Construction Measures			
No. 10: Project Site	X	X	X
PEIR Mitigation Measures			
None required.			
Impact 4.4-4: Squeezing ground and subsidence during tunneling	PSM	N/A	N/A
Regulations			
None applicable.			
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
4.4-4: Subsidence Monitoring Program	X	N/A	N/A
Impact 4.4-5: Surface fault rupture.	LS	LS	LS
Regulations			
SFPUC General Seismic Design Requirements	X	X	X
SFPUC Construction Measures			
No. 2: Seismic and Geotechnical Studies	X	X	X
PEIR Mitigation Measures			
None required.			
Impact 4.4-6: Seismically induced groundshaking	LS	LS	LS
Regulations			
SFPUC General Seismic Design Requirements	X	X	X
SFPUC Construction Measures			
No. 2: Seismic and Geotechnical Studies	X	X	X
PEIR Mitigation Measures			
None required.			

TABLE 6.5 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF BAY DIVISION REGION PROJECTS (BD-1 through BD-3)

IMPACT	Bay Division Pipeline Reliability Upgrade BD-1	BDPL Nos. 3 and 4 Crossovers BD-2	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault BD-3
Impact 4.4-7: Seismically induced ground failure, including liquefaction and settlement	LS	LS	LS
Regulations			
SFPUC General Seismic Design Requirements	X	X	X
SFPUC Construction Measures			
No. 2: Seismic and Geotechnical Studies	X	X	X
PEIR Mitigation Measures			
None required.			
Impact 4.4-8: Seismically induced landslides or other slope failures.	LS	N/A	N/A
Regulations			
SFPUC General Seismic Design Requirements	X	N/A	N/A
SFPUC Construction Measures			
No. 2: Seismic and Geotechnical Studies	X	N/A	N/A
PEIR Mitigation Measures			
None required.			
Impact 4.4-9: Expansive or corrosive soils.	PSM	PSM	PSM
Regulations			
California Building Code	X	X	X
SFPUC Construction Measures			
No. 2: Seismic and Geotechnical Studies	X	X	X
PEIR Mitigation Measures			
4.4-9: Characterize Extent of Expansive and Corrosive Soil	X	X	X
4.5 Surface Water Hydrology and Water Quality			
Impact 4.5-1: Degradation of water bodies as a result of erosion and sedimentation or a hazardous materials release during construction	LS	LS	LS
Regulations			
NPDES stormwater requirements	X	X	X
Encroachment permitting requirements	X	N/A	N/A
SFPUC Construction Measures			
No. 3: On-sire Air and Water Quality Measures During Construction	X	X	X

TABLE 6.5 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF BAY DIVISION REGION PROJECTS (BD-1 through BD-3)

IMPACT	Bay Division Pipeline Reliability Upgrade BD-1	BDPL Nos. 3 and 4 Crossovers BD-2	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault BD-3
PEIR Mitigation Measures			
None required.			
Impact 4.5-2: Depletion of groundwater resources	LS	LS	LS
Regulations			
None applicable.			
SFPUC Construction Measures			
None required.			
PEIR Mitigation Measures			
4.5-2: Site-Specific Groundwater Analysis and Identified Measures	N/A	N/A	N/A
Impact 4.5-3a: Degradation of water quality due to construction dewatering discharges	LS	LS	LS
Regulations			
NPDES discharge requirements	X	X	X
SFPUC Construction Measures			
No. 4: Groundwater	X	X	X
PEIR Mitigation Measures			
None required.			
Impact 4.5-3b: Degradation of water quality due to construction-related discharges of treated water	LS	LS	LS
Regulations			
NPDES discharge requirements	X	X	X
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
None required.			
Impact 4.5-4: Flooding and water quality impacts associated with impending or redirecting flood flows	PSM	PSM	N/A
Regulations			
None applicable.			
SFPUC Construction Measures			
None applicable.			

TABLE 6.5 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF BAY DIVISION REGION PROJECTS (BD-1 through BD-3)

IMPACT	Bay Division Pipeline Reliability Upgrade BD-1	BDPL Nos. 3 and 4 Crossovers BD-2	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault BD-3
PEIR Mitigation Measures			
4.5-4a: Flood Flow Protection Measures	X	X	N/A
4.5-4b: Site Specific Flooding Analysis and Identified Measures	N/A	N/A	N/A
Impact 4.5-5: Degradation of water quality and increased flows due to discharges to surface water during operation	LS	LS	N/A
Regulations			
NPDES discharge requirements	X	X	N/A
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
4.5-5: Stormwater Treatment and Groundwater Monitoring	N/A	N/A	N/A
Impact 4.5-6: Degradation of water quality as a result of alteration of drainage patterns or an increase in impervious surfaces	LS	LS	LS
Regulations			
NPDES stormwater requirements	X	X	X
SFPUC Construction Measures			
No. 10: Project Site	X	X	X
PEIR Mitigation Measures			
4.5-6: Appropriate Source Control and Site Design Measures	N/A	N/A	N/A
4.6 Biological Resources			
Impact 4.6-1: Impact on wetlands and aquatic resources	PSM	PSM	PSM
Regulations			
Clean Water Act – Section 404	X	X	X
SFPUC Construction Measures			
No. 8: Biological Resources	X	X	X
PEIR Mitigation Measures			
4.6-1a: Wetlands Assessment	X	X	X
4.6-1b: Compensation for Wetlands and Other Biological Resources	X	X	X

TABLE 6.5 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF BAY DIVISION REGION PROJECTS (BD-1 through BD-3)

IMPACT	Bay Division Pipeline Reliability Upgrade BD-1	BDPL Nos. 3 and 4 Crossovers BD-2	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault BD-3
Impact 4.6-2: Impact to sensitive habitats, common habitats, and heritage trees	PSM	PSM	PSM
Regulations			
None applicable.			
SFPUC Construction Measures			
No. 8: Biological Resources – biological screening survey	X	X	X
PEIR Mitigation Measures			
4.6-2: Habitat Restoration/Tree Replacement	X	X	X
See Biological Resources Measure 4.6-1b.	X	X	X
Impact 4.6-3: Impact on key special-status species – direct mortality and/or habitat effects	PSM	PSM	PSM
Regulations			
Federal Endangered Species Act	X	X	X
California Endangered Species Act	X	X	X
Native Plant Protection Act	X	X	X
SFPUC Construction Measures			
No. 8: Biological Resources	X	X	X
PEIR Mitigation Measures			
4.6-3a: Protection Measures During Construction for Key Special-Status Species and Other Species of Concern	X	X	X
4.6-3b: Standard Mitigation Measures for Specific Plants and Animals	X	X	X
See Biological Resources Measreu 4.6-1b.	X	X	X
Impact 4.6-4: Water discharge effects on riparian and/or aquatic resources	PSM	PSM	LS
Regulations			
Waste Discharge Requirements	X	X	X
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
4.6-4: Pipeline and Water Treatment Plant Treated Water Discharge Restrictions	X	X	N/A
Impact 4.6-5: Conflict with adopted conservation plans or other approved biological resources plans	N/A	N/A	N/A
Regulations			
None applicable.			

TABLE 6.5 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF BAY DIVISION REGION PROJECTS (BD-1 through BD-3)

IMPACT	Bay Division Pipeline Reliability Upgrade BD-1	BDPL Nos. 3 and 4 Crossovers BD-2	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault BD-3
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
None required.			
4.7 Cultural Resources			
Impact 4.7-1: Impacts on paleontological resources	LS	LS	PSM
Regulations			
Paleontological Resources Preservation Act	X	X	X
SFPUC Construction Measures			
No. 9: Cultural Resources	X	X	X
PEIR Mitigation Measures			
4.7-1: Suspend Construction Work if Paleontological Resource is Identified	N/A	N/A	X
Impact 4.7-2: Impacts on archaeological resources	PSM	PSM	PSM
Regulations			
California Health and Safety Code	X	X	X
SFPUC Construction Measures			
No. 9: Cultural Resources	X	X	X
PEIR Mitigation Measures			
4.7-2a: Archaeological Testing, Monitoring, and Treatment of Human Remains	X	X	X
4.7-2b: Accidental Discovery Measures	X	X	X
Impact 4.7-3: Impacts on historical significance of a historic district or a contributor to a historic district	PSM	PSM	PSM
Regulations			
National Historic Preservation Act	X	X	X
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
4.7-3: Protection of Historic Districts	X	X	X
4.7-4a: Alternatives Identification and Resource Relocation	X	X	X
4.7-4b: Historical Resources Documentation	X	X	X

TABLE 6.5 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF BAY DIVISION REGION PROJECTS (BD-1 through BD-3)

IMPACT	Bay Division Pipeline Reliability Upgrade BD-1	BDPL Nos. 3 and 4 Crossovers BD-2	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault BD-3
4.7-4c: Secretary of the Interior's Standards for Treatment of Historic Properties	X	X	X
4.7-4d: Historical Resources Survey and Redesign	X	X	X
4.7-4e: Historic Resources Protection Plan	X	X	X
4.7-4f: Pre-construction Surveys and Vibration Monitoring	X	X	X
Impact 4.7-4: Impacts on the historical significance of individual facilities resulting from demolition or alteration	PSM	PSM	PSM
Regulations			
National Historic Preservation Act	X	X	X
SFPUC Construction Measures			
No. 9: Cultural Resources	X	X	X
PEIR Mitigation Measures			
4.7-4a: Alternatives Identification and Resource Relocation			
4.7-4b: Historical Resources Documentation	X	X	X
4.7-4c: Secretary of the Interior's Standards for Treatment of Historic Properties	X	X	X
4.7-4d: Historic Resources Survey and Redesign	X	X	X
4.7-4e: Historic Resources Protection Plan	X	X	X
4.7-4f: Pre-construction Surveys and Vibration Monitoring	X	X	X
Impact 4.7-5: Impacts on adjacent historic architectural resources	PSM	PSM	PSM
Regulations			
National Historic Preservation Act	X	X	X
SFPUC Construction Measures			
No. 9: Cultural Resources	X	X	X
PEIR Mitigation Measures			
4.7-4a: Alternatives Identification and Resource Relocation	X	X	X
4.7-4b: Historical Resources Documentation	X	X	X
4.7-4c: Secretary of the Interior's Standards for Treatment of Historic Properties	X	X	X
4.7-4d: Historical Resources Survey and Redesign	X	X	X
4.7-4e: Historic Resources Protection Plan	X	X	X
4.7-4f: Preconstruction Surveys and Vibration Monitoring	X	X	X

TABLE 6.5 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF BAY DIVISION REGION PROJECTS (BD-1 through BD-3)

	Bay Division Pipeline Reliability Upgrade	BDPL Nos. 3 and 4 Crossovers	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault
IMPACT	**BD-1**	**BD-2**	**BD-3**
4.8 Traffic, Transportation, and Circulation			
Impact 4.8-1: Temporary reduction in roadway capacity and increased traffic delays	PSM	LS	PSM
Regulations			
City and county encroachment permits.	X	X	X
SFPUC Construction Measures			
No. 5: Traffic	X	X	X
PEIR Mitigation Measures			
4.8-1a: Traffic Control Plan Measures	X	N/A	X
4.8-1b: Coordination of Individual Traffic Control Plans	X	N/A	N/A
Impact 4.8-2: Short-term traffic increases on roadways	PSM	PSM	PSM
Regulations			
City and county encroachment permits, if applicable	X	X	X
SFPUC Construction Measures			
No. 5: Traffic	X	X	X
PEIR Mitigation Measures			
4.8-1a: Traffic Control Plan Measures	X	X	X
4.8-1b: Coordination of Individual Traffic Control Plans	X	N/A	N/A
Impact 4.8-3: Impaired access to adjacent roadways and land uses	PSM	PSM	PSM
Regulations			
City and county encroachment permits.	X	X	X
SFPUC Construction Measures			
No. 5: Traffic	X	X	X
PEIR Mitigation Measures			
4.8-1a: Traffic Control Plan Measures	X	X	X
Impact 4.8-4: Temporary displacement of on-street parking	PSM	LS	PSM
Regulations			
City and county encroachment permits.	X	X	X
SFPUC Construction Measures			
No. 5: Traffic	X	X	X

TABLE 6.5 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF BAY DIVISION REGION PROJECTS (BD-1 through BD-3)

IMPACT	Bay Division Pipeline Reliability Upgrade BD-1	BDPL Nos. 3 and 4 Crossovers BD-2	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault BD-3
PEIR Mitigation Measures			
4.8-1a: Traffic Control Plan Measures	X	N/A	X
4.8-4: Accommodation of Displaced Public Parking Supply for Recreational Visitors	N/A	N/A	N/A
Impact 4.8-5: Increased traffic safety hazards during construction	PSM	PSM	PSM
Regulations			
City and county encroachment permits.	X	X	X
SFPUC Construction Measures			
No. 5: Traffic	X	X	X
PEIR Mitigation Measures			
4.8-1a: Traffic Control Plan Measures	X	X	X
Impact 4.8-6: Long-term traffic increases during facility operation	LS	LS	LS
Regulations			
None applicable.			
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
None required.			
4.9 Air Quality			
Impact 4.9-1: Construction emissions of criteria pollutants	PSM	PSM	PSM
Regulations			
None applicable.			
SFPUC Construction Measures			
No. 3: On-Site Air and Water Quality Measures during Construction	X	X	X
PEIR Mitigation Measures			
4.9-1a: SJVAPCD Dust Control Measures	N/A	N/A	N/A
4.9-1b: SJVAPCD Exhaust Control Measures	N/A	N/A	N/A
4.9-1c: BAAQMD Dust Control Measures	X	X	X
4.9-1d: BAAQMD Exhaust Control Measures	X	X	X

TABLE 6.5 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF BAY DIVISION REGION PROJECTS (BD-1 through BD-3)

IMPACT	Bay Division Pipeline Reliability Upgrade BD-1	BDPL Nos. 3 and 4 Crossovers BD-2	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault BD-3
Impact 4.9-2: Exposure to diesel particulate matter during construction	PSM	LS	LS
Regulations			
California Health and Safety Code, Section 2485 – Reduces emissions of toxic and criteria pollutants by limiting the idling of new heavy-duty diesel vehicles	X	X	X
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
4.9-2a: Health Risk Screening or Use of Soot Filters	X	N/A	N/A
4.9-2b: Vacate SFPUC Land Managers' Residences in Sunol Valley	N/A	N/A	N/A
Impact 4.9-3: Exposure to emissions (possibly including asbestos) from tunneling	PSM	N/A	PSM
Regulations			
OSHA standards for worker safety during tunneling	X	N/A	X
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
4.9-3: Tunnel Gas Odor Control	X	N/A	X
Impact 4.9-4: Air pollutant emissions during project operations	LS	LS	N/A
Regulations			
None applicable.			
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
None required.			
Impact 4.9-5: Odors generated during project operation	N/A	N/A	N/A
Regulations			
BAAQMD Rule 1-301 – Prohibits the discharge of any contaminants that causes annoyance for a considerable number of people of normal sensitivity	X	X	X
BAAQMD Regulation 7 – Specifies odor limits for public exposure and identifies specific dilution levels that must be achieved as a function of odor emission strength	X	X	X
SFPUC Construction Measures			
None applicable.			

TABLE 6.5 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF BAY DIVISION REGION PROJECTS (BD-1 through BD-3)

IMPACT	Bay Division Pipeline Reliability Upgrade BD-1	BDPL Nos. 3 and 4 Crossovers BD-2	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault BD-3
PEIR Mitigation Measures			
None required.			
Impact 4.9-6: Secondary emissions at power plants	LS	LS	LS
Regulations			
None applicable.			
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
None required.			
Impact 4.9-7: Conflict with implementation of the applicable air quality plan	LS	LS	LS
Regulations			
None applicable.			
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
None required.			
4.10 Noise and Vibration			
Impact 4.10-1: Disturbance from temporary construction-related noise increases	PSU	PSU	PSU
Regulations			
None applicable.			
SFPUC Construction Measures			
No. 6: Noise	X	X	X
PEIR Mitigation Measures			
4.10-1a: Noise Controls	X	X	X
4.10-1b: Vacate SFPUC Caretaker's Residence at Tesla Portal	N/A	N/A	N/A
Impact 4.10-2: Temporary noise disturbance along construction haul routes	PSU	PSU	PSU
Regulations			
None applicable.			
SFPUC Construction Measures			
None applicable.			

TABLE 6.5 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF BAY DIVISION REGION PROJECTS (BD-1 through BD-3)

IMPACT	Bay Division Pipeline Reliability Upgrade BD-1	BDPL Nos. 3 and 4 Crossovers BD-2	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault BD-3
PEIR Mitigation Measures			
4.10-2a: Limiting Hourly Truck Volumes	X	X	X
4.10-2b: Restricting Truck Operations	X	X	X
4.10-2c: Vacate SFPUC Land Manager's Residence	N/A	N/A	N/A
Impact 4.10-3: Disturbance due to construction-related vibration	PSU	PSU	PSU
Regulations			
None applicable.			
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
4.10-3a: Vibration Controls to Prevent Cosmetic or Structural Damage	X	X	X
4.10-3b: Limit Vibration Levels at or Below Vibration Perception Threshold	X	X	X
4.10-3c: Limit Tunnel-Related Detonation to Daylight Hours	X	N/A	N/A
Impact 4.10-4: Disturbance due to long-term noise increases	LS	N/A	N/A
Regulations			
None applicable.			
SFPUC Construction Measures			
No. 6: Noise	X	N/A	N/A
PEIR Mitigation Measures			
None required.			
4.11 Public Services and Utilities			
Impact 4.11-1: Potential temporary damage to or disruption of existing regional or local public utilities	PSM	PSM	PSM
Regulations			
OSHA Construction Safety Orders	X	X	X
DHS separation standards	X	X	X
SFPUC Construction Measures			
No. 1: Neighborhood Notice	X	X	X
PEIR Mitigation Measures			
4.11-1a: Notify Neighbors of Potential Utility Service Disruption	X	X	X
4.11-1b: Locate Utility Lines Prior to Excavation	X	X	X

TABLE 6.5 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF BAY DIVISION REGION PROJECTS (BD-1 through BD-3)

IMPACT	Bay Division Pipeline Reliability Upgrade BD-1	BDPL Nos. 3 and 4 Crossovers BD-2	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault BD-3
4.11-1c: Confirmation of Utility Line Information	X	X	X
4.11-1d: Safeguard Employees from Potential Accidents Related to Underground Utilities	X	X	X
4.11-1e: Notify Local Fire Departments	X	X	X
4.11-1f: Emergency Response Plan	X	X	X
4.11-1g: Prompt Reconnection of Utilities	X	X	X
4.11-1h: Coordinate Final Construction Plans with Affected Utilities	X	X	X
Impact 4.11-2: Temporary adverse effects on solid waste landfill capacity	PSM	PSM	PSM
Regulations			
California Integrated Waste Management Act of 1989	X	X	X
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
4.11-2: Waste Reduction Measures	X	X	X
Impact 4.11-3: Impacts related to compliance with statutes and regulations related to solid waste	PSM	PSM	PSM
Regulations			
California Integrated Waste Management Act of 1989	X	X	X
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
4.11-2: Waste Reduction Measures	X	X	X
Impact 4.11-4: Impacts related to the relocation of utilities	PSM	PSM	PSM
Regulations			
None applicable.			
SFPUC Construction Measures			
No. 1: Neighborhood Notice	X	X	X
PEIR Mitigation Measures			
4.11-1a: Notify Neighbors of Potential Utility Service Disruption	X	X	X
4.11-1b: Locate Utility Lines Prior to Excavation	X	X	X
4.11-1c: Confirmation of Utility Line Information	X	X	X
4.11-1d: Safeguard Employees from Potential Accidents Related to Underground Utilities	X	X	X
4.11-1e: Notify Local Fire Departments	X	X	X

TABLE 6.5 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF BAY DIVISION REGION PROJECTS (BD-1 through BD-3)

IMPACT	Bay Division Pipeline Reliability Upgrade BD-1	BDPL Nos. 3 and 4 Crossovers BD-2	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault BD-3
4.11-1f: Emergency Response Plan	X	X	X
4.11-1g: Prompt Reconnection of Utilities	X	X	X
4.11-1h: Coordinate Final Construction Plans with Affected Utilities	X	X	X
4.12 Recreational Resources			
Impact 4.12-1: Temporary conflicts with established recreational uses during construction	PSM	PSM	N/A
Regulations			
None applicable.			
SFPUC Construction Measures			
No. 1: Neighborhood Notice	X	X	N/A
No. 3: On-Site Air and Water Quality Measures during Construction	X	X	N/A
No. 5: Traffic	X	X	N/A
No. 6: Noise	X	X	N/A
PEIR Mitigation Measures			
4.12-1: Coordination with Golf Course/Recreational Facility Managers	X	X	N/A
See Traffic Measures (4.8-1), Air Quality Measures (4.9-1 and 4.9-2), and Noise Measures (4.10-1 through 4.10-3).	X	X	N/A
Impact 4.12-2: Conflicts with established recreational uses due to facility siting and project operation	N/A	N/A	N/A
Regulations			
None applicable.			
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
4.12-2: Appropriate Siting of Proposed Facilities	N/A	N/A	N/A
4.13 Agricultural Resources			
Impact 4.13-1: Temporary conflicts with established agricultural resources	N/A	N/A	N/A
Regulations			
None applicable.			
SFPUC Construction Measures			
None applicable.			

TABLE 6.5 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF BAY DIVISION REGION PROJECTS (BD-1 through BD-3)

IMPACT	Bay Division Pipeline Reliability Upgrade BD-1	BDPL Nos. 3 and 4 Crossovers BD-2	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault BD-3
PEIR Mitigation Measures			
4.13-1a: Supplemental Noticing and Soil Stockpiling	N/A	N/A	N/A
4.13-1b: Avoidance or Soil Stockpiling	N/A	N/A	N/A
Impact 4.13-2: Conversion of farmlands to nonagricultural uses	N/A	N/A	N/A
Regulations			
None applicable.			
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
4.13-2: Siting Facilities to Avoid Prime Farmland	N/A	N/A	N/A
4.14 Hazards			
Impact 4.14-1: Potential to encounter hazardous materials in soil or groundwater	PSM	PSM	PSM
Regulations			
None applicable.			
SFPUC Construction Measures			
No. 4: Groundwater	X	X	X
No. 7: Hazardous Materials	X	X	X
PEIR Mitigation Measures			
4.14-1a: Site Health and Safety Plan	X	X	X
4.14-1b: Materials Disposal Plan	X	X	X
4.14-1c: Coordination with Property Owners and Regulatory Agencies	X	N/A	N/A
Impact 4.14-2: Exposure to naturally occurring asbestos	PSM	N/A	N/A
Regulations			
Asbestos Airborne Toxic Control Measure	X	N/A	N/A
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
4.14-2: Health Risk Screening and Airborne Asbestos Monitoring Plan	X	N/A	N/A

TABLE 6.5 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF BAY DIVISION REGION PROJECTS (BD-1 through BD-3)

IMPACT	Bay Division Pipeline Reliability Upgrade BD-1	BDPL Nos. 3 and 4 Crossovers BD-2	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault BD-3
Impact 4.14-3: Risk of fires during construction	LS	N/A	N/A
Regulations			
Public Resources Code fire safety regulations	X	N/A	N/A
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
None required.			
Impact 4.14-4: Gassy conditions in tunnels.	LS	N/A	LS
Regulations			
Tunnel Safety Orders	X	N/A	X
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
None required.			
Impact 4.14-5: Exposure to hazardous building materials.	PSM	N/A	N/A
Regulations			
California Code of Regulations, Title 8 – asbestos abatement	X	N/A	N/A
California Code of Regulations Title 17 – lead-based paint regulations	X	N/A	N/A
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
4.14-5: Hazardous Building Materials Surveys and Abatement	X	N/A	N/A
Impact 4.14-6: Accidental hazardous materials release from construction equipment.	LS	LS	LS
Regulations			
NPDES stormwater requirements	X	X	X
SFPUC Construction Measures			
No. 3: On-site Air and Water Quality Measures During Construction	X	X	X
PEIR Mitigation Measures			
None required.			

TABLE 6.5 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF BAY DIVISION REGION PROJECTS (BD-1 through BD-3)

IMPACT	Bay Division Pipeline Reliability Upgrade BD-1	BDPL Nos. 3 and 4 Crossovers BD-2	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault BD-3
Impact 4.14-7: Increased use of hazardous materials during operation	LS	LS	N/A
Regulations			
Risk management regulations (HMBP)	X	X	N/A
Risk management regulations (RMP)	N/A	N/A	N/A
Aboveground storage tank regulations	X	X	N/A
SFPUC Standard Measures Construction Measures			
None applicable.			
PEIR Mitigation Measures			
None required.			
Impact 4.14-8: Emission or use of hazardous materials within ¼ mile of a school	LS	LS	N/A
Regulations			
Risk management regulations (HMBP)	X	X	N/A
Risk management regulations (RMP)	N/A	N/A	N/A
Aboveground storage tank regulations	X	N/A	N/A
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
None required.			
4.15 Energy			
Impact 4.15-1: Construction-related energy use	PSM	PSM	PSM
Regulations			
None applicable.			
SFPUC Standard Construction Measures			
None applicable.			
PEIR Mitigation Measures			
See Air Quality measures (4.9-1b and 4.9-1d).	X	X	X
Impact 4.15-2: Long-term energy use during operation	PSM	PSM	PSM
Regulations			
None applicable.			
SFPUC Standard Construction Measures			
None applicable.			

TABLE 6.5 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF BAY DIVISION REGION PROJECTS (BD-1 through BD-3)

	Bay Division Pipeline Reliability Upgrade	BDPL Nos. 3 and 4 Crossovers	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault
IMPACT	**BD-1**	**BD-2**	**BD-3**
PEIR Mitigation Measures			
4.15-2: Incorporation of Energy Efficiency Measures	X	X	X

LS = Less than Significant impact, no mitigation required
PSM= Potentially Significant impact, can be mitigated to less than significant
PSU = Potentially Significant Unavoidable impact
X = Applicable
N/A = Not Applicable

TABLE 6.6
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF PENINSULA REGION PROJECTS (PN-1 through PN-5)

IMPACT	Baden and San Pedro Valve Lots Improvements PN-1	Crystal Springs / San Andreas Transmission Upgrade PN-2	HTWTP Long-Term Improvements PN-3	Lower Crystal Springs Dam Improvements PN-4	Pulgas Balancing Reservoir Rehabilitation PN-5
4.3 Land Use and Visual Quality					
Impact 4.3-1: Temporary disruption or displacement of existing land uses during construction	LS	LS	LS	LS	LS
Regulations					
None applicable.					
SFPUC Construction Measures					
No. 1: Neighborhood Notice	X	X	X	X	X
No. 3: On-Site Air and Water Quality Measures during Construction	X	X	X	X	X
No. 5: Traffic	X	X	X	X	X
No. 6: Noise	X	X	X	X	X
No. 10: Project Site	X	X	X	X	X
PEIR Mitigation Measures					
None required.					
Impact 4.3-2: Permanent displacement or long-term disruption of existing land uses	N/A	PSU	N/A	N/A	N/A
Regulations					
None applicable.					
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
4.3-2: Facility Siting Studies	N/A	X	N/A	N/A	N/A
Impact 4.3-3: Temporary construction impacts on scenic vistas or visual character	LS	LS	LS	LS	LS
Regulations					
None applicable.					
SFPUC Construction Measures					
No. 10: Project Site	X	X	X	X	X
PEIR Mitigation Measures					
None required.					

TABLE 6.6 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF PENINSULA REGION PROJECTS (PN-1 through PN-5)

IMPACT	Baden and San Pedro Valve Lots Improvements PN-1	Crystal Springs / San Andreas Transmission Upgrade PN-2	HTWTP Long-Term Improvements PN-3	Lower Crystal Springs Dam Improvements PN-4	Pulgas Balancing Reservoir Rehabilitation PN-5
Impact 4.3-4: Permanent adverse impacts on scenic vistas or visual character	LS	PSM	PSM	PSM	PSM
Regulations					
Watershed Management Plans and Actions		X		X	X
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
4.3-4a: Architectural Design	N/A	X	X	X	X
4.3-4b: Landscaping Plans	N/A	X	X	X	X
4.3-4c: Landscape Screens	N/A	X	X	X	X
4.3-4d: Minimize Tree Removal	N/A	X	X	X	X
Impact 4.3-5: New permanent sources of light glare	PSM	PSM	PSM	PSM	PSM
Regulations					
None applicable.					
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
4.3-5: Reduce Lighting Effects	X	X	X	X	X
4.4 Geology, Soils, and Seismicity					
Impact 4.4-1: Slope instability during construction	LS	LS	PSM	LS	PSM
Regulations					
Watershed Management Plan Policies and Actions:					
No. S5: avoid landslides and slopes greater than 30%	N/A	X	N/A	X	X
No. S6: conduct inspections	N/A	X	N/A	X	X
SFPUC Construction Measures					
No. 2: Seismic and Geotechnical Studies	X	X	X	X	X
PEIR Mitigation Measures					
4.4-1: Quantified Landslide Analysis	N/A	N/A	X	N/A	X
Impact 4.4-2: Erosion during construction	LS	LS	LS	LS	LS
Regulations					
NPDES stormwater requirements	X	X	X	X	X

TABLE 6.6 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF PENINSULA REGION PROJECTS (PN-1 through PN-5)

IMPACT	Baden and San Pedro Valve Lots Improvements PN-1	Crystal Springs / San Andreas Transmission Upgrade PN-2	HTWTP Long-Term Improvements PN-3	Lower Crystal Springs Dam Improvements PN-4	Pulgas Balancing Reservoir Rehabilitation PN-5
SFPUC Construction Measures					
No. 3: On-Site Air and Water Quality Measures during Construction	X	X	X	X	X
PEIR Mitigation Measures					
None required.					
Impact 4.4-3: Substantial alteration of topography	LS	LS	LS	LS	LS
Regulations					
None applicable.					
SFPUC Construction Measures					
No. 10: Project Site	X	X	X	X	X
PEIR Mitigation Measures					
None required.					
Impact 4.4-4: Squeezing ground and subsidence during tunneling	N/A	N/A	N/A	N/A	N/A
Regulations					
None applicable.					
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
4.4-4: Subsidence Monitoring Program	N/A	N/A	N/A	N/A	N/A
Impact 4.4-5: Surface fault rupture	LS	LS	LS	LS	LS
Regulations					
SFPUC General Seismic Design Requirements	X	X	X	X	X
Watershed Management Plan Policies and Actions:					
No. S4: avoid active fault zones and traces	N/A	X	N/A	N/A	N/A
No. S6: conduct inspections	N/A	X	N/A	N/A	N/A
SFPUC Construction Measures					
No. 2: Seismic and Geotechnical Studies	N/A	X	N/A	N/A	N/A
PEIR Mitigation Measures					
None required.					

TABLE 6.6 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF PENINSULA REGION PROJECTS (PN-1 through PN-5)

IMPACT	Baden and San Pedro Valve Lots Improvements PN-1	Crystal Springs / San Andreas Transmission Upgrade PN-2	HTWTP Long-Term Improvements PN-3	Lower Crystal Springs Dam Improvements PN-4	Pulgas Balancing Reservoir Rehabilitation PN-5
Impact 4.4-6: Seismically induced groundshaking	LS	LS	LS	LS	LS
Regulations					
SFPUC General Seismic Design Requirements	X	X	X	X	X
SFPUC Construction Measures					
No. 2: Seismic and Geotechnical Studies	X	X	X	X	X
PEIR Mitigation Measures					
None required.					
Impact 4.4-7: Seismically induced ground failure, including liquefaction and settlement	LS	LS	LS	LS	LS
Regulations					
SFPUC General Seismic Design Requirements	X	X	X	X	X
SFPUC Construction Measures					
No. 2: Seismic and Geotechnical Studies	X	X	X	X	X
PEIR Mitigation Measures					
None required					
Impact 4.4-8: Seismically induced landslides or other slope failures	LS	LS	LS	LS	LS
Regulations					
SFPUC General Seismic Design Requirements	X	X	X	X	X
Watershed Management Plan Policies and Actions:					
No. S5: avoid landslides and slopes over 30%	N/A	N/A	N/A	N/A	X
No. S6: conduct inspections	N/A	N/A	N/A	N/A	X
SFPUC Construction Measures					
No. 2: Seismic and Geotechnical Studies	X	X	X	X	X
PEIR Mitigation Measures					
None required.					
Impact 4.4-9: Expansive or corrosive soils	PSM	PSM	PSM	PSM	PSM
Regulations					
California Building Code	X	X	X	X	X
SFPUC Construction Measures					
No. 2: Seismic and Geotechnical Studies	X	X	X	X	X

TABLE 6.6 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF PENINSULA REGION PROJECTS (PN-1 through PN-5)

IMPACT	Baden and San Pedro Valve Lots Improvements PN-1	Crystal Springs / San Andreas Transmission Upgrade PN-2	HTWTP Long-Term Improvements PN-3	Lower Crystal Springs Dam Improvements PN-4	Pulgas Balancing Reservoir Rehabilitation PN-5
PEIR Mitigation Measures					
4.4-9: Characterize Extent of Expansive and Corrosive Soil	X	X	X	X	X
4.5 Surface Water Hydrology and Water Quality					
Impact 4.5-1: Degradation of water bodies as a result of erosion and sedimentation or a hazardous materials release during construction	LS	LS	LS	LS	LS
Regulations					
NPDES stormwater requirements	X	X	X	X	X
Encroachment permitting requirements	N/A	N/A	N/A	X	X
Watershed Management Plans and Actions:					
Aqu1: locate outside of high water quality vulnerability zone if possible	X	X	N/A	X	X
Aqu5: rehabilitate shoreline area	N/A	N/A	N/A	X	X
Veg4: grading plan	X	X	N/A	X	X
Veg9: follow erosion control BMPs	X	X	N/A	X	X
Veg17: Minimize disturbance of serpentine bedrock	N/A	X	N/A	X	N/A
SFPUC Construction Measures					
No. 3: On-site and Water Quality Measures During Construction	X	X	X	X	X
PEIR Mitigation Measures					
None required.					
Impact 4.5-2: Depletion of groundwater resources	LS	LS	LS	LS	LS
Regulations					
None applicable.					
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
4.5-2: Site-Specific Groundwater Analysis and Identified Measures	N/A	N/A	N/A	N/A	N/A
Impact 4.5-3a: Degradation of water quality due to construction dewatering discharges	LS	LS	LS	LS	LS
Regulations					
NPDES discharge requirements	X	X	X	X	X
SFPUC Construction Measures					
No. 4: Groundwater	X	X	X	X	X

TABLE 6.6 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF PENINSULA REGION PROJECTS (PN-1 through PN-5)

IMPACT	Baden and San Pedro Valve Lots Improvements PN-1	Crystal Springs / San Andreas Transmission Upgrade PN-2	HTWTP Long-Term Improvements PN-3	Lower Crystal Springs Dam Improvements PN-4	Pulgas Balancing Reservoir Rehabilitation PN-5
PEIR Mitigation Measures					
None required.					
Impact 4.5-3b: Degradation of water quality due to construction-related discharges of treated water	N/A	N/A	LS	N/A	LS
Regulations					
NPDES discharge requirements	N/A	N/A	X	N/A	X
Watershed Management Plans and Actions:					
Fis6: dechlorinate water before discharge	N/A	N/A	N/A	N/A	X
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
None required.					
Impact 4.5-4: Flooding and water quality impacts associated with impeding or redirecting flood flows	N/A	N/A	N/A	N/A	N/A
Regulations					
None applicable.					
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
4.5-4a: Flood Flow Protection Measures	N/A	N/A	N/A	N/A	N/A
4.5-4b: Site-Specific Flooding Analysis and Identified Measures	N/A	N/A	N/A	N/A	N/A
Impact 4.5-5: Degradation of water quality and increased flows due to discharges to surface water during operation	N/A	LS	LS	N/A	LS
Regulations					
NPDES discharge requirements	N/A	X	X	N/A	X
Watershed Management Plans and Actions:					
Fis6: dechlorinate water before discharge	N/A	X	N/A	N/A	X
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
4.5-5: Stormwater Treatment and Groundwater Monitoring	N/A	N/A	N/A	N/A	N/A

TABLE 6.6 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF PENINSULA REGION PROJECTS (PN-1 through PN-5)

IMPACT	Baden and San Pedro Valve Lots Improvements PN-1	Crystal Springs / San Andreas Transmission Upgrade PN-2	HTWTP Long-Term Improvements PN-3	Lower Crystal Springs Dam Improvements PN-4	Pulgas Balancing Reservoir Rehabilitation PN-5
Impact 4.5-6: Degradation of water quality as a result of alteration of drainage patterns or an increase in impervious surfaces	LS	LS	LS	LS	LS
Regulations					
NPDES stormwater requirements	X	X	X	X	X
Watershed Management Plans and Actions:					
Sto1: stormwater drainage and collection	X	X	N/A	X	X
SFPUC Construction Measures					
No. 10: Project Site	X	X	X	X	X
PEIR Mitigation Measures					
4.5-6: Appropriate Source Control and Site Design Measures	N/A	N/A	N/A	N/A	N/A
4.6 Biological Resources					
Impact 4.6-1: Impact on wetlands and aquatic resources	LS	PSM	LS	PSM	PSM
Regulations					
Clean Water Act – Section 404	X	X	X	X	X
SFPUC Construction Measures					
No. 8: Biological Resources	X	X	X	X	X
PEIR Mitigation Measures					
4.6-1a: Wetlands Assessment	N/A	X	N/A	X	X
4.6-1b: Compensation for Wetlands and Other Biological Resources	N/A	X	N/A	X	X
Impact 4.6-2: Impacts on sensitive habitats, common habitats, and heritage trees	PSM	PSM	LS	PSM	PSM
Regulations					
None applicable.					
SFPUC Construction Measures					
No. 8: Biological Resources	X	X	X	X	X
PEIR Mitigation Measures					
4.6-2: Habitat Restoration/Tree Replacement	N/A	X	N/A	X	X
See Biological Resources Measure 4.6-1b.	N/A	X	N/A	X	X

TABLE 6.6 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF PENINSULA REGION PROJECTS (PN-1 through PN-5)

IMPACT	Baden and San Pedro Valve Lots Improvements PN-1	Crystal Springs / San Andreas Transmission Upgrade PN-2	HTWTP Long-Term Improvements PN-3	Lower Crystal Springs Dam Improvements PN-4	Pulgas Balancing Reservoir Rehabilitation PN-5
Impact 4.6-3: Impact on key special-status species – direct mortality and/or habitat effects	PSM	PSM	LS	PSM	PSM
Regulations					
Federal Endangered Species Act	X	X	X	X	X
California Endangered Species Act	X	X	X	X	X
Native Plant Protection Act	X	X	X	X	X
SFPUC Construction Measures					
No. 8: Biological Resources	X	X	X	X	X
PEIR Mitigation Measures					
4.6-3a: Protection Measures During Construction for Key Special-Status Species and Other Species of Concern	X	X	N/A	X	X
4.6-3b: Standard Mitigation Measures for Specific Plants and Animals	X	X	N/A	X	X
See Biological Resources Measure 4.6-1b.	X	X	X	X	X
Impact 4.6-4: Water discharge effects on riparian and/or aquatic resources	LS	LS	LS	LS	LS
Regulations					
Waste Discharge Requirements	X	N/A	X	N/A	X
Watershed Management Plans and Actions:					
Fis 6: Identify and adopt alternative nontoxic management practices for the protection of aquatic resources	X	X	X	X	X
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
4.6-4: Treated Water Discharge Restrictions	N/A	N/A	N/A	N/A	N/A
Impact 4.6-5: Conflict with adopted conservation plans or other approved biological resources plans	LS	LS	N/A	LS	LS
Regulations					
None applicable.					
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
See Biological Resources Measures 4.6-1a, 4.6-1b, 4.6-2, 4.6-3a, 4.6-3b.	X	X		X	X

TABLE 6.6 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF PENINSULA REGION PROJECTS (PN-1 through PN-5)

IMPACT	Baden and San Pedro Valve Lots Improvements PN-1	Crystal Springs / San Andreas Transmission Upgrade PN-2	HTWTP Long-Term Improvements PN-3	Lower Crystal Springs Dam Improvements PN-4	Pulgas Balancing Reservoir Rehabilitation PN-5
4.7 Cultural Resources					
Impact 4.7-1: Impacts on paleontological resources	PSM	LS	PSM	LS	PSM
Regulations					
Paleontological Resources Preservation Act	X	X	X	X	X
SFPUC Construction Measures					
No. 9: Cultural Resources	X	X	X	X	X
PEIR Mitigation Measures					
4.7-1: Suspend Construction Work if Paleontological Resource is Identified	X	N/A	X	N/A	X
Impact 4.7-2: Impacts on archaeological resources	PSM	PSM	PSM	PSM	PSM
Regulations					
California Health and Safety Code	X	X	X	X	X
SFPUC Construction Measures					
No. 9: Cultural Resources	X	X	X	X	X
PEIR Mitigation Measures					
4.7-2a: Archaeological Testing, Monitoring, and Treatment of Human Remains	X	X	X	X	X
4.7-2b: Accidental Discovery Measures	X	X	X	X	X
Impact 4.7-3: Impacts on historical significance of a historic district or a contributor to a historic district	N/A	PSU	N/A	PSM	N/A
Regulations					
National Historic Preservation Act	N/A	X	N/A	X	N/A
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
4.7-3: Protection of Historic Districts	N/A	X	N/A	X	N/A
4.7-4a: Alternatives Identification and Resource Relocation	N/A	X	N/A	X	N/A
4.7-4b: Historical Resources Documentation	N/A	X	N/A	X	N/A
4.7-4c: Secretary of the Interior's Standards for Treatment of Historic Properties	N/A	X	N/A	X	N/A
4.7-4d: Historic Resources Survey and Redesign	N/A	X	N/A	X	N/A
4.7-4e: Historic Resources Protection Plan	N/A	X	N/A	X	N/A
4.7-4f: Pre-construction Surveys and Vibration Monitoring	N/A	X	N/A	X	N/A

TABLE 6.6 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF PENINSULA REGION PROJECTS (PN-1 through PN-5)

IMPACT	Baden and San Pedro Valve Lots Improvements PN-1	Crystal Springs / San Andreas Transmission Upgrade PN-2	HTWTP Long-Term Improvements PN-3	Lower Crystal Springs Dam Improvements PN-4	Pulgas Balancing Reservoir Rehabilitation PN-5
Impact 4.7-4: Impacts on the historical significance of individual facilities resulting from demolition or alteration	N/A	PSU	N/A	PSU	N/A
Regulations					
National Historic Preservation Act	N/A	X	N/A	X	N/A
SFPUC Construction Measures					
No. 9: Cultural Resources	N/A	X	N/A	X	N/A
PEIR Mitigation Measures					
4.7-4a: Alternatives Identification and Resource Relocation	N/A	X	N/A	X	N/A
4.7-4b: Historical Resources Documentation	N/A	X	N/A	X	N/A
4.7-4c: Secretary of the Interior's Standards for Treatment of Historic Properties	N/A	X	N/A	X	N/A
4.7-4d: Historic Resources Survey and Redesign	N/A	X	N/A	X	N/A
4.7-4e: Historic Resources Protection Plan	N/A	X	N/A	X	N/A
4.7-4f: Pre-construction Surveys and Vibration Monitoring	N/A	X	N/A	X	N/A
Impact 4.7-5: Impacts on adjacent historic architectural resources	LS	PSM	LS	PSM	PSM
Regulations					
National Historic Preservation Act	X	X	X	X	X
SFPUC Construction Measures					
No. 9: Cultural Resources	X	X	X	X	X
PEIR Mitigation Measures					
4.7-4a: Alternatives Identification and Resource Relocation	N/A	X	N/A	X	X
4.7-4b: Historical Resources Documentation	N/A	X	N/A	X	X
4.7-4c: Secretary of the Interior's Standards for Treatment of Historic Properties	N/A	X	N/A	X	X
4.7-4d: Historical Resources Survey and Redesign	N/A	X	N/A	X	X
4.7-4e: Historic Resources Protection Plan	N/A	X	N/A	X	X
4.7-4f: Preconstruction Surveys and Vibration Monitoring	N/A	X	N/A	X	X
4.8 Traffic, Transportation, and Circulation					
Impact 4.8-1: Temporary reduction in roadway capacity and increased traffic delays	LS	PSM	LS	PSM	PSM
Regulations					
City and county encroachment permits, if applicable	X	X	X	X	X
SFPUC Construction Measures					
No. 5: Traffic	X	X	X	X	X

TABLE 6.6 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF PENINSULA REGION PROJECTS (PN-1 through PN-5)

IMPACT	Baden and San Pedro Valve Lots Improvements PN-1	Crystal Springs / San Andreas Transmission Upgrade PN-2	HTWTP Long-Term Improvements PN-3	Lower Crystal Springs Dam Improvements PN-4	Pulgas Balancing Reservoir Rehabilitation PN-5
PEIR Mitigation Measures					
4.8-1a: Traffic Control Plan Measures	N/A	X	N/A	X	X
4.8-1b: Coordination of Individual Traffic Control Plans	N/A	N/A	N/A	N/A	N/A
Impact 4.8-2: Short-term traffic increases on roadways	LS	PSM	PSM	PSM	PSM
Regulations					
City and county encroachment permits.	X	X	X	X	X
SFPUC Construction Measures					
No. 5: Traffic	X	X	X	X	X
PEIR Mitigation Measures					
4.8-1a: Traffic Control Plan Measures	N/A	X	X	X	X
4.8-1b: Coordination of Individual Traffic Control Plans	N/A	X	X	X	N/A
Impact 4.8-3: Impaired access to adjacent roadways and land uses during construction	LS	LS	LS	PSM	LS
Regulations					
City and county encroachment permits, if applicable	X	X	X	X	X
SFPUC Construction Measures					
No. 5: Traffic	X	X	X	X	X
PEIR Mitigation Measures					
4.8-1a: Traffic Control Plan Measures	N/A	N/A	N/A	X	N/A
Impact 4.8-4: Temporary displacement of on-street parking	LS	LS	LS	PSM	PSM
Regulations					
City and county encroachment permits.	X	X	X	X	X
SFPUC Construction Measures					
No. 5: Traffic	X	X	X	X	X
PEIR Mitigation Measures					
4.8-1a: Traffic Control Plan Measures	N/A	N/A	N/A	X	X
4.8-4: Accommodation of Displaced Public Parking Supply for Recreational Visitors	N/A	N/A	N/A	X	X
Impact 4.8-5: Increased traffic safety hazards during construction	PSM	PSM	PSM	PSM	PSM
Regulations					
City and county encroachment permits, if applicable	X	X	X	X	X

TABLE 6.6 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF PENINSULA REGION PROJECTS (PN-1 through PN-5)

IMPACT	Baden and San Pedro Valve Lots Improvements PN-1	Crystal Springs / San Andreas Transmission Upgrade PN-2	HTWTP Long-Term Improvements PN-3	Lower Crystal Springs Dam Improvements PN-4	Pulgas Balancing Reservoir Rehabilitation PN-5
SFPUC Construction Measures					
No. 5: Traffic	X	X	X	X	X
PEIR Mitigation Measures					
4.8-1a: Traffic Control Plan Measures	X	X	X	X	X
Impact 4.8-6: Long-term traffic increases during facility operation	LS	LS	LS	LS	LS
Regulations					
None applicable.					
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
None required.					
4.9 Air Quality					
Impact 4.9-1: Construction emissions of criteria pollutants	LS	LS	LS	LS	LS
Regulations					
None applicable.					
SFPUC Construction Measures					
No. 3: On-Site Air and Water Quality Measures during Construction	X	X	X	X	X
PEIR Mitigation Measures					
4.9-1a: SJVAPCD Dust Control Measures	N/A	N/A	N/A	N/A	N/A
4.9-1b: SJVAPCD Exhaust Control Measures	N/A	N/A	N/A	N/A	N/A
4.9-1c: BAAQMD Dust Control Measures	N/A	N/A	N/A	N/A	N/A
4.9-1d: BAAQMD Exhaust Control Measures	N/A	N/A	N/A	N/A	N/A
Impact 4.9-2: Exposure to diesel particulate matter during construction	LS	LS	LS	LS	LS
Regulations					
California Health and Safety Code, Section 2485 – reduces emissions of toxic and criteria pollutants by limiting the idling of new heavy-duty diesel vehicles	X	X	X	X	X
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
4.9-2a: Health Risk Screening or Use of Soot Filters	N/A	N/A	N/A	N/A	N/A

TABLE 6.6 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF PENINSULA REGION PROJECTS (PN-1 through PN-5)

IMPACT	Baden and San Pedro Valve Lots Improvements PN-1	Crystal Springs / San Andreas Transmission Upgrade PN-2	HTWTP Long-Term Improvements PN-3	Lower Crystal Springs Dam Improvements PN-4	Pulgas Balancing Reservoir Rehabilitation PN-5
4.9-2b: Vacate SFPUC Land Managers' Residences in Sunol Valley	N/A	N/A	N/A	N/A	N/A
Impact 4.9-3: Exposure to emissions (possibly including asbestos) from tunneling	N/A	PSM	N/A	N/A	N/A
Regulations					
OSHA standards for worker safety during tunneling	N/A	N/A	N/A	N/A	N/A
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
4.9-3: Tunnel Gas Odor Control	N/A	X	N/A	N/A	N/A
Impact 4.9-4: Air pollutant emissions during project operation	LS	LS	LS	LS	LS
Regulations					
None applicable.					
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
None required.					
Impact 4.9-5: Odors generated during project operation	N/A	N/A	LS	N/A	N/A
Regulations					
BAAQMD Rule 1-301 – prohibits the discharge of any contaminants that causes annoyance for a considerable number of people of normal sensitivity	X	X	X	X	X
BAAQMD Regulation 7 – specifies odor limits for public exposure and identifies specific dilution levels that must be achieved as a function of odor emission strength	X	X	X	X	X
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
None required.					
Impact 4.9-6: Secondary emissions at power plants	LS	LS	LS	LS	LS
Regulations					
None applicable.					
SFPUC Construction Measures					
None applicable.					

TABLE 6.6 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF PENINSULA REGION PROJECTS (PN-1 through PN-5)

IMPACT	Baden and San Pedro Valve Lots Improvements PN-1	Crystal Springs / San Andreas Transmission Upgrade PN-2	HTWTP Long-Term Improvements PN-3	Lower Crystal Springs Dam Improvements PN-4	Pulgas Balancing Reservoir Rehabilitation PN-5
PEIR Mitigation Measures					
None required.					
Impact 4.9-7: Conflict with implementation of the applicable air quality plan	LS	LS	LS	LS	LS
Regulations					
None applicable.					
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
None required.					
4.10 Noise and Vibration					
Impact 4.10-1: Disturbance from temporary construction-related noise increases	PSU	PSU	PSU	PSU	PSU
Regulations					
None applicable.					
SFPUC Construction Measures					
No. 6: Noise	X	X	X	X	X
PEIR Mitigation Measures					
4.10-1a: Noise Controls	X	X	X	X	X
4.10-1b: Vacate SFPUC Caretaker's Residence at Tesla Portal	N/A	N/A	N/A	N/A	N/A
Impact 4.10-2: Temporary noise disturbance along construction haul routes	PSU	LS	PSU	LS	LS
Regulations					
None applicable.					
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
4.10-2a: Limiting Hourly Truck Volumes	X	N/A	X	N/A	N/A
4.10-2b: Restricting Truck Operations	X	N/A	X	N/A	N/A
4.10-2c: Vacate SFPUC Land Manager's Residence	N/A	N/A	N/A	N/A	N/A

**TABLE 6.6 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF PENINSULA REGION PROJECTS (PN-1 through PN-5)**

IMPACT	Baden and San Pedro Valve Lots Improvements PN-1	Crystal Springs / San Andreas Transmission Upgrade PN-2	HTWTP Long-Term Improvements PN-3	Lower Crystal Springs Dam Improvements PN-4	Pulgas Balancing Reservoir Rehabilitation PN-5
Impact 4.10-3: Disturbance due to construction-related vibration	PSU	LS	LS	LS	LS
Regulations					
None applicable.					
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
4.10-3a: Vibration Controls to Prevent Cosmetic or Structural Damage	X	N/A	N/A	N/A	N/A
4.10-3b: Limit Vibration Levels at or Below Vibration Perception Threshold	X	N/A	N/A	N/A	N/A
4.10-3c: Limit Tunnel-Related Detonation to Daylight Hours	N/A	N/A	N/A	N/A	N/A
Impact 4.10-4: Disturbance due to long-term noise increases	LS	LS	LS	N/A	LS
Regulations					
None applicable.					
SFPUC Construction Measures					
No. 6: Noise	X	X	X	N/A	N/A
PEIR Mitigation Measures					
None required.					
4.11 Public Services and Utilities					
Impact 4.11-1: Potential temporary damage to or disruption of existing regional or local public utilities	LS	PSM	LS	PSM	LS
Regulations					
OSHA Construction Safety Orders	X	X	X	X	X
DHS separation standards	X	X	X	X	X
SFPUC Construction Measures					
No. 1: Neighborhood Notice	X	X	X	X	X
PEIR Mitigation Measures					
4.11-1a: Notify Neighbors of Potential Utility Service Disruption	N/A	X	N/A	X	N/A
4.11-1b: Locate Utility Lines Prior to Excavation	N/A	X	N/A	X	N/A
4.11-1c: Confirmation of Utility Line Information	N/A	X	N/A	X	N/A
4.11-1d: Safeguard Employees from Potential Accidents Related to Underground Utilities	N/A	X	N/A	X	N/A
4.11-1e: Notify Local Fire Departments	N/A	X	N/A	X	N/A

TABLE 6.6 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF PENINSULA REGION PROJECTS (PN-1 through PN-5)

IMPACT	Baden and San Pedro Valve Lots Improvements PN-1	Crystal Springs / San Andreas Transmission Upgrade PN-2	HTWTP Long-Term Improvements PN-3	Lower Crystal Springs Dam Improvements PN-4	Pulgas Balancing Reservoir Rehabilitation PN-5
4.11-1f: Emergency Response Plan	N/A	X	N/A	X	N/A
4.11-1g: Prompt Reconnection of Utilities	N/A	X	N/A	X	N/A
4.11-1h: Coordinate Final Construction Plans with Affected Utilities	N/A	X	N/A	X	N/A
Impact 4.11-2: Temporary adverse effects on solid waste landfill capacity	PSM	PSM	PSM	PSM	PSM
Regulations					
California Integrated Waste Management Act of 1989	X	X	X	X	X
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
4.11-2: Waste Reduction Measures	X	X	X	X	X
Impact 4.11-3: Impacts related to compliance with statutes and regulations related to solid waste	PSM	PSM	PSM	PSM	PSM
Regulations					
California Integrated Waste Management Act of 1989	X	X	X	X	X
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
4.11-2: Waste Reduction Measures	X	X	X	X	X
Impact 4.11-4: Impacts related to the relocation of utilities	PSM	PSM	PSM	PSM	PSM
Regulations					
None applicable.					
SFPUC Construction Measures					
No. 1: Neighborhood Notice	X	X	X	X	X
PEIR Mitigation Measures					
4.11-1a: Notify Neighbors of Potential Utility Service Disruption	X	X	X	X	X
4.11-1b: Locate Utility Lines Prior to Excavation	X	X	X	X	X
4.11-1c: Confirmation of Utility Line Information	X	X	X	X	X
4.11-1d: Safeguard Employees from Potential Accidents Related to Underground Utilities	X	X	X	X	X
4.11-1e: Notify Local Fire Departments	X	X	X	X	X
4.11-1f: Emergency Response Plan	X	X	X	X	X

TABLE 6.6 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF PENINSULA REGION PROJECTS (PN-1 through PN-5)

IMPACT	Baden and San Pedro Valve Lots Improvements PN-1	Crystal Springs / San Andreas Transmission Upgrade PN-2	HTWTP Long-Term Improvements PN-3	Lower Crystal Springs Dam Improvements PN-4	Pulgas Balancing Reservoir Rehabilitation PN-5
4.11-1g: Prompt Reconnection of Utilities	X	X	X	X	X
4.11-1h: Coordinate Final Construction Plans with Affected Utilities	X	X	X	X	X
4.12 Recreational Resources					
Impact 4.12-1: Temporary conflicts with established recreational uses during construction	N/A	PSM	N/A	LS	LS
Regulations					
None applicable.					
SFPUC Construction Measures					
No. 1: Neighborhood Notice	N/A	X	N/A	X	X
No. 3: On-Site Air and Water Quality Measures during Construction	N/A	X	N/A	X	X
No. 5: Traffic	N/A	X	N/A	X	X
No. 6: Noise	N/A	X	N/A	X	X
PEIR Mitigation Measures					
4.12-1: Coordination with Golf Course/Recreational Facility Managers	N/A	X	N/A	N/A	N/A
See Traffic Measures (4.8-1), Air Quality Measures (4.9-1 and 4.9-2), and Noise Measures (4.10-1 through 4.10-3).	N/A	X	N/A	N/A	N/A
Impact 4.12-2: Conflicts with established recreational uses due to facility siting and project operation	N/A	N/A	N/A	N/A	N/A
Regulations					
None applicable.					
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
4.12-2: Appropriate Siting of Proposed Facilities	N/A	N/A	N/A	N/A	N/A
4.13 Agricultural Resources					
Impact 4.13-1: Temporary conflicts with established agricultural resources	N/A	N/A	N/A	N/A	N/A
Regulations					
None applicable.					
SFPUC Construction Measures					
None applicable.					

TABLE 6.6 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF PENINSULA REGION PROJECTS (PN-1 through PN-5)

IMPACT	Baden and San Pedro Valve Lots Improvements PN-1	Crystal Springs / San Andreas Transmission Upgrade PN-2	HTWTP Long-Term Improvements PN-3	Lower Crystal Springs Dam Improvements PN-4	Pulgas Balancing Reservoir Rehabilitation PN-5
PEIR Mitigation Measures					
4.13-1a: Supplemental Noticing and Soil Stockpiling	N/A	N/A	N/A	N/A	N/A
4.13-1b: Avoidance or Soil Stockpiling	N/A	N/A	N/A	N/A	N/A
Impact 4.13-2: Conversion of farmlands to nonagricultural uses	N/A	N/A	N/A	N/A	N/A
Regulations					
None applicable.					
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
4.13-2: Siting Facilities to Avoid Prime Farmland	N/A	N/A	N/A	N/A	N/A
4.14 Hazards					
Impact 4.14-1: Potential to encounter hazardous materials in soil and groundwater	PSM	LS	LS	LS	LS
Regulations					
None applicable.					
SFPUC Construction Measures					
No. 4: Groundwater	X	X	X	X	X
No.7: Hazardous Materials	X	X	X	X	X
PEIR Mitigation Measures					
4.14-1a: Site Health and Safety Plan	X	N/A	N/A	N/A	N/A
4.14-1b: Materials Disposal Plan	X	N/A	N/A	N/A	N/A
4.14-1c: Coordination with Property Owners and Regulatory Agencies	N/A	N/A	N/A	N/A	N/A
Impact 4.14-2: Exposure to naturally occurring asbestos	N/A	LS	N/A	LS	N/A
Regulations					
Asbestos Airborne Toxic Control Measure	N/A	X	N/A	X	N/A
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
4.14-2: Health Risk Screening and Airborne Asbestos Monitoring Plan	N/A	N/A	N/A	N/A	N/A

TABLE 6.6 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF PENINSULA REGION PROJECTS (PN-1 through PN-5)

IMPACT	Baden and San Pedro Valve Lots Improvements PN-1	Crystal Springs / San Andreas Transmission Upgrade PN-2	HTWTP Long-Term Improvements PN-3	Lower Crystal Springs Dam Improvements PN-4	Pulgas Balancing Reservoir Rehabilitation PN-5
Impact 4.14-3: Risk of fires during construction	LS	LS	N/A	LS	LS
Regulations					
Public Resources Code fire safety regulations	X	X	N/A	X	X
Watershed Management Plan Policies and Actions:					
Fir1: compliance with California Division of Forestry regulations	X	X	N/A	X	X
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
None required.					
Impact 4.14-4: Gassy conditions in tunnels	N/A	LS	N/A	N/A	N/A
Regulations					
Tunnel Safety Orders	N/A	X	N/A	N/A	N/A
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
None required.					
Impact 4.14-5: Exposure to hazardous building materials	PSM	PSM	PSM	PSM	PSM
Regulations					
California Code of Regulations, Title 8 – asbestos abatement	X	X	X	X	X
California Code of Regulations Title 17 – lead-based paint regulations	X	X	X	X	X
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
4.14-5: Hazardous Building Materials Surveys and Abatement	X	X	X	X	X

TABLE 6.6 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF PENINSULA REGION PROJECTS (PN-1 through PN-5)

IMPACT	Baden and San Pedro Valve Lots Improvements PN-1	Crystal Springs / San Andreas Transmission Upgrade PN-2	HTWTP Long-Term Improvements PN-3	Lower Crystal Springs Dam Improvements PN-4	Pulgas Balancing Reservoir Rehabilitation PN-5
Impact 4.14-6: Accidental hazardous materials release from construction equipment	LS	LS	LS	LS	LS
Regulations					
NPDES stormwater requirements	X	X	X	X	X
Watershed Management Plan Policies and Actions:					
Haz5: minimize leaks, drips, and spills of contaminants	X	X	N/A	X	X
Haz8: implement measures to reduce risk of hazardous spills	X	X	N/A	X	X
Haz10: develop spill response and containment measures	X	X	N/A	X	X
SFPUC Construction Measures					
No. 3: On-site Air and Water Quality Measures During Construction	X	X	X	X	X
PEIR Mitigation Measures					
None required.					
Impact 4.14-7: Increased use of hazardous materials during operation	LS	N/A	LS	LS	N/A
Regulations					
Risk management regulations (HMBP)	X	N/A	X	X	N/A
Risk management regulations (RMP)	N/A	N/A	X	N/A	N/A
Aboveground storage tank regulations	N/A	N/A	X	X	N/A
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
None required.					
Impact 4.14-8: Emission or use of hazardous materials within ¼ mile of a school	LS	N/A	LS	N/A	N/A
Regulations					
Risk management regulations (HMBP)	X	N/A	X	N/A	N/A
Risk management regulations (RMP)	N/A	N/A	X	N/A	N/A
Aboveground storage tank regulations	N/A	N/A	N/A	N/A	N/A
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
None required.					

TABLE 6.6 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF PENINSULA REGION PROJECTS (PN-1 through PN-5)

IMPACT	Baden and San Pedro Valve Lots Improvements PN-1	Crystal Springs / San Andreas Transmission Upgrade PN-2	HTWTP Long-Term Improvements PN-3	Lower Crystal Springs Dam Improvements PN-4	Pulgas Balancing Reservoir Rehabilitation PN-5
4.15 Energy					
Impact 4.15-1: Construction-related energy use	PSM	PSM	PSM	PSM	PSM
Regulations					
None applicable.					
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
See Air Quality measures (4.9-1b and 4.9-1d).	X	X	X	X	X
Impact 4.15-2: Long-term energy use during operation	N/A	PSM	PSM	N/A	N/A
Regulations					
None applicable.					
SFPUC Construction Measures					
None applicable.					
PEIR Mitigation Measures					
4.15-2: Incorporation of Energy Efficiency Measures	N/A	X	X	N/A	N/A

LS = Less than Significant impact, no mitigation required
PSM= Potentially Significant impact, can be mitigated to less than significant
PSU = Potentially Significant Unavoidable impact
X = Applicable
N/A = Not Applicable

TABLE 6.7
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SAN FRANCISCO REGION PROJECTS (SF-1 through SF-3)

IMPACT	San Andreas Pipeline No. 3 Installation SF-1	Groundwater Projects SF-2	Recycled Water Projects SF-3
4.3 Land Use and Visual Quality			
Impact 4.3-1: Temporary disruption or displacement of existing land uses during construction	PSM	PSM	PSM
Regulations			
None applicable.			
SFPUC Construction Measures			
No. 1: Neighborhood Notice	X	X	X
No. 3: On-Site Air and Water Quality Measures during Construction	X	X	X
No. 5: Traffic	X	X	X
No. 6: Noise	X	X	X
No. 10: Project Site	X	X	X
PEIR Mitigation Measures			
See Traffic Measure (4.8-1), Air Quality Measures (4.9-1 and 4.9-2), Noise Measures (4.10-1 through 4.10-3).	X	X	X
Impact 4.3-2: Permanent displacement or long-term disruption of existing land uses	N/A	PSU	PSU
Regulations			
None applicable.			
SFPUC Construction Measures			
No. 6: Noise	N/A	X	X
No. 10: Project Site	N/A	X	X
PEIR Mitigation Measures			
4.3-2: Facility Siting Studies	N/A	X	X
Impact 4.3-3: Temporary construction impacts on scenic vistas or visual character	LS	LS	LS
Regulations			
None applicable.			
SFPUC Construction Measures			
No. 10: Project Site	X	X	X
PEIR Mitigation Measures			
None required.			
Impact 4.3-4: Permanent adverse impacts on scenic vistas or visual character	PSM	PSM	PSM
Regulations			
None applicable.			

TABLE 6.7 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SAN FRANCISCO REGION PROJECTS (SF-1 through SF-3)

IMPACT	San Andreas Pipeline No. 3 Installation SF-1	Groundwater Projects SF-2	Recycled Water Projects SF-3
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
4.3-4a: Architectural Design	X	X	X
4.3-4b: Landscaping Plans	X	X	X
4.3-4c: Landscape Screens	X	X	X
4.3-4d: Minimize Tree Removal	X	X	X
Impact 4.3-5: New permanent sources of light glare	PSM	PSM	PSM
Regulations			
None applicable.			
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
4.3-5: Reduce Lighting Effects	X	X	X
4.4 Geology, Soils, and Seismicity			
Impact 4.4-1: Slope instability during construction	LS	PSM	PSM
Regulations			
None applicable.			
SFPUC Construction Measures			
No. 2: Seismic and Geotechnical Studies	X	X	X
PEIR Mitigation Measures			
4.4-1: Quantified Landslide Analysis	N/A	X	X
Impact 4.4-2: Erosion during construction	LS	LS	LS
Regulations			
NPDES stormwater regulations	X	X	N/A
San Francisco Public Works Code Article 4.1	X	X	X
SFPUC Construction Measures			
No. 3: On-Site Air and Water Quality Measures during Construction	X	X	X
PEIR Mitigation Measures			
None required.			

**TABLE 6.7 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SAN FRANCISCO REGION PROJECTS (SF-1 through SF-3)**

IMPACT	San Andreas Pipeline No. 3 Installation SF-1	Groundwater Projects SF-2	Recycled Water Projects SF-3
Impact 4.4-3: Substantial alteration of topography	LS	LS	LS
Regulations			
None applicable.			
SFPUC Construction Measures			
No. 10: Project Site	X	X	X
PEIR Mitigation Measures			
None required.			
Impact 4.4-4: Squeezing ground and subsidence during tunneling	N/A	N/A	N/A
Regulations			
None applicable.			
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
4.4-4: Subsidence Monitoring Program	N/A	N/A	N/A
Impact 4.4-5: Surface fault rupture	LS	LS	LS
Regulations			
SFPUC General Seismic Design Requirements	X	X	X
SFPUC Construction Measures			
No. 2: Seismic and Geotechnical Studies	X	X	X
PEIR Mitigation Measures			
None required.			
Impact 4.4-6: Seismically induced groundshaking	LS	LS	LS
Regulations			
SFPUC General Seismic Design Requirements	X	X	X
SFPUC Construction Measures			
No. 2: Seismic and Geotechnical Studies	X	X	X
PEIR Mitigation Measures			
None required.			
Impact 4.4-7: Seismically induced ground failure, including liquefaction and settlement	LS	LS	LS
Regulations			
SFPUC General Seismic Design Requirements	X	X	X

TABLE 6.7 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SAN FRANCISCO REGION PROJECTS (SF-1 through SF-3)

IMPACT	San Andreas Pipeline No. 3 Installation SF-1	Groundwater Projects SF-2	Recycled Water Projects SF-3
SFPUC Construction Measures			
No. 2: Seismic and Geotechnical Studies	X	X	X
PEIR Mitigation Measures			
None required			
Impact 4.4-8: Seismically induced landslides or other slope failures	LS	LS	LS
Regulations			
SFPUC General Seismic Design Requirements	X	X	X
SFPUC Construction Measures			
No. 2: Seismic and Geotechnical Studies	X	X	X
PEIR Mitigation Measures			
None required.			
Impact 4.4-9: Expansive or corrosive soils	PSM	PSM	PSM
Regulations			
California Building Code	X	X	X
SFPUC Construction Measures			
No. 2: Seismic and Geotechnical Studies	X	X	X
PEIR Mitigation Measures			
4.4-9: Characterize Extent of Expansive and Corrosive Soil	X	X	X
4.5 Surface Water Hydrology and Water Quality			
Impact 4.5-1: Degradation of water bodies as a result of erosion and sedimentation or a hazardous materials release during construction	LS	LS	LS
Regulations			
San Francisco Public Works Code Article 4.1	X	X	X
NPDES stormwater requirements	X	X	N/A
SFPUC Construction Measures			
No. 3: On-Site Air and Water Quality Measures During Construction	X	X	X
PEIR Mitigation Measures			
None required.			
Impact 4.5-2: Depletion of groundwater resources	LS	N/A	LS
Regulations			
None applicable.			

TABLE 6.7 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SAN FRANCISCO REGION PROJECTS (SF-1 through SF-3)

IMPACT	San Andreas Pipeline No. 3 Installation SF-1	Groundwater Projects SF-2	Recycled Water Projects SF-3
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
4.5-2: Site-Specific Groundwater Analysis and Identified Measures	N/A	N/A	N/A
Impact 4.5-3a: Degradation of water quality due to construction dewatering discharges	LS	N/A	LS
Regulations			
NPDES discharge requirements	X	N/A	N/A
San Francisco Public Works Code Article 4.1	X	N/A	X
SFPUC Construction Measures			
No. 4: Groundwater	X	N/A	X
PEIR Mitigation Measures			
None required.			
Impact 4.5-3b: Degradation of water quality due to construction-related discharges of treated water	LS	N/A	N/A
Regulations			
NPDES discharge requirements	X	N/A	N/A
San Francisco Public Works Code Article 4.1	X	N/A	N/A
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
None required.			
Impact 4.5-4: Flooding and water quality impacts associated with impeding or redirecting flood flows	N/A	PSM	N/A
Regulations			
None applicable.			
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
4.5-4a: Flood Flow Protection Measures	N/A	X	N/A
4.5-4b: Site Specific Flooding Analysis and Identified Measures	N/A	N/A	N/A

TABLE 6.7 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SAN FRANCISCO REGION PROJECTS (SF-1 through SF-3)

IMPACT	San Andreas Pipeline No. 3 Installation SF-1	Groundwater Projects SF-2	Recycled Water Projects SF-3
Impact 4.5-5: Degradation of water quality and increased flows due to discharges to surface water during operation	N/A	PSM	LS
Regulations			
San Francisco Public Works Code Article 4.1	N/A	N/A	X
NPDES discharge regulations	N/A	X	X
RWQCB General Water Reuse Order	N/A	N/A	X
CCSF Reclaimed Water Ordinance	N/A	N/A	X
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
4.5-5: Stormwater Treatment and Groundwater Monitoring	N/A	X	N/A
Impact 4.5-6: Degradation of water quality as a result of alteration of drainage patterns or an increase in impervious surfaces	LS	LS	LS
Regulations			
NPDES stormwater requirements	X	X	N/A
San Francisco Public Works Code Article 4.1	X	X	X
SFPUC Construction Measures			
No. 3: On-Site Air and Water Quality Measures During Construction	X	X	X
No. 10: Project Site	X	X	X
PEIR Mitigation Measures			
4.5-6: Appropriate Source Control and Site Design Measures	N/A	N/A	N/A
4.6 Biological Resources			
Impact 4.6-1: Impact on wetlands and aquatic resources	PSM	PSM	PSM
Regulations			
Clean Water Act – Section 404	X	X	X
SFPUC Construction Measures			
No. 8: Biological Resources	X	X	X
PEIR Mitigation Measures			
4.6-1a: Wetlands Assessment	X	X	X
4.6-1b: Compensation for Wetlands and Other Biological Resources	X	X	X

TABLE 6.7 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SAN FRANCISCO REGION PROJECTS (SF-1 through SF-3)

IMPACT	San Andreas Pipeline No. 3 Installation SF-1	Groundwater Projects SF-2	Recycled Water Projects SF-3
Impact 4.6-2: Impact to sensitive habitats, common habitats, and heritage trees	PSM	PSM	PSM
Regulations			
None applicable.			
SFPUC Construction Measures			
No. 8: Biological Resources	X	X	X
PEIR Mitigation Measures			
4.6-2: Habitat Restoration/Tree Replacement	X	X	X
See Biological Resources Measure 4.6-1b.	X	X	X
Impact 4.6-3: Impact on key special-status species – direct mortality and/or habitat effects	LS	LS	LS
Regulations			
None applicable.			
SFPUC Construction Measures			
No. 8: Biological Resources	X	X	X
PEIR Mitigation Measures			
4.6-3a: Protection Measures During Construction for Key Special-Status Species and Other Species of Concern	N/A	N/A	N/A
4.6-3b: Standard Mitigation Measures for Specific Plants and Animals	N/A	N/A	N/A
Impact 4.6-4: Water discharge effects on riparian and/or aquatic resources	N/A	N/A	N/A
Regulations			
None applicable.			
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
4.6-4: Treated Water Discharge Restrictions	N/A	N/A	N/A
Impact 4.6-5: Conflict with adopted conservation plans or other approved biological resources plans	N/A	N/A	N/A
Regulations			
None applicable.			
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
None required.			

TABLE 6.7 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SAN FRANCISCO REGION PROJECTS (SF-1 through SF-3)

IMPACT	San Andreas Pipeline No. 3 Installation SF-1	Groundwater Projects SF-2	Recycled Water Projects SF-3
4.7 Cultural Resources			
Impact 4.7-1: Impacts on paleontological resources	PSM	PSM	PSM
Regulations			
Paleontological Resources Preservation Act	X	X	X
SFPUC Construction Measures			
No. 9 Cultural Resources	X	X	X
PEIR Mitigation Measures			
4.7-1: Suspend Construction Work if Paleontological Resource is Identified	X	X	X
Impact 4.7-2: Impacts on archaeological resources	PSM	PSM	PSM
Regulations			
California Health and Safety Code	X	X	X
SFPUC Construction Measures			
No. 9: Cultural Resources	X	X	X
PEIR Mitigation Measures			
4.7-2a: Archaeological Testing, Monitoring, and Treatment of Human Remains	X	X	X
4.7-2b: Accidental Discovery Measures	X	X	X
Impact 4.7-3: Impacts on historical significance of a historic district or a contributor to a historic district	PSM	N/A	N/A
Regulations			
National Historic Preservation Act	X	N/A	N/A
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
4.7-3: Protection of Historic Districts	X	N/A	N/A
4.7-4a: Alternatives Identification and Resource Relocation	X	N/A	N/A
4.7-4b: Historical Resources Documentation	X	N/A	N/A
4.7-4c: Secretary of the Interior's Standards for Treatment of Historic Properties	X	N/A	N/A
4.7-4d: Historic Resources Survey and Redesign	X	N/A	N/A
4.7-4e: Historic Resources Protection Plan	X	N/A	N/A
4.7-4f: Pre-construction Surveys and Vibration Monitoring	X	N/A	N/A

TABLE 6.7 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SAN FRANCISCO REGION PROJECTS (SF-1 through SF-3)

IMPACT	San Andreas Pipeline No. 3 Installation SF-1	Groundwater Projects SF-2	Recycled Water Projects SF-3
Impact 4.7-4: Impacts on the historical significance of individual facilities resulting from demolition or alteration	PSM	N/A	LS
Regulations			
National Historic Preservation Act	X	N/A	X
SFPUC Construction Measures			
No. 9: Cultural Resources	X	N/A	X
PEIR Mitigation Measures			
4.7-4a: Alternatives Identification and Resource Relocation	X	N/A	N/A
4.7-4b: Historical Resources Documentation	X	N/A	N/A
4.7-4c: Secretary of the Interior's Standards for Treatment of Historic Properties	X	N/A	N/A
4.7-4d: Historic Resources Survey and Redesign	X	N/A	N/A
4.7-4e: Historic Resources Protection Plan	X	N/A	N/A
4.7-4f: Pre-construction Surveys and Vibration Monitoring	X	N/A	N/A
Impact 4.7-5: Impacts on adjacent historic architectural resources	PSM	LS	PSM
Regulations			
National Historic Preservation Act	X	X	X
SFPUC Construction Measures			
No. 9: Cultural Resources	X	X	X
PEIR Mitigation Measures			
4.7-4a: Alternatives Identification and Resource Relocation	X	N/A	X
4.7-4b: Historical Resources Documentation	X	N/A	X
4.7-4c: Secretary of the Interior's Standards for Treatment of Historic Properties	X	N/A	X
4.7-4d: Historical Resources Survey and Redesign	X	N/A	X
4.7-4e: Historic Resources Protection Plan	X	N/A	X
4.7-4f: Preconstruction Surveys and Vibration Monitoring	X	N/A	X
4.8 Traffic, Transportation, and Circulation			
Impact 4.8-1: Temporary reduction in roadway capacity and increased traffic delays	PSM	PSM	PSM
Regulations			
City and county encroachment permits.	X	X	X
SFPUC Construction Measures			
No. 5: Traffic	X	X	X

TABLE 6.7 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SAN FRANCISCO REGION PROJECTS (SF-1 through SF-3)

IMPACT	San Andreas Pipeline No. 3 Installation SF-1	Groundwater Projects SF-2	Recycled Water Projects SF-3
PEIR Mitigation Measures			
4.8-1a: Traffic Control Plan Measures	X	X	X
4.8-1b: Coordination of Individual Traffic Control Plans	X	N/A	N/A
Impact 4.8-2: Short-term increases on roadways	PSM	LS	PSM
Regulations			
City and county encroachment permits.	X	X	X
SFPUC Construction Measures			
No. 5: Traffic	X	X	X
PEIR Mitigation Measures			
4.8-1a: Traffic Control Plan Measures	X	N/A	X
4.8-1b: Coordination of Individual Traffic Control Plans	X	N/A	X
Impact 4.8-3: Impaired access to adjacent roadways and land uses	PSM	PSM	PSM
Regulations			
City and county encroachment permits.	X	X	X
SFPUC Construction Measures			
No. 5: Traffic	X	X	X
PEIR Mitigation Measures			
4.8-1a: Traffic Control Plan Measures	X	X	X
Impact 4.8-4: Temporary displacement of on-street parking	PSM	PSM	PSM
Regulations			
City and county encroachment permits.	X	X	X
SFPUC Construction Measures			
No. 5: Traffic	X	X	X
PEIR Mitigation Measures			
4.8-1a: Traffic Control Plan Measures	X	X	X
4.8-4: Accommodation of Displaced Public Parking Supply for Recreational Visitors	N/A	N/A	N/A
Impact 4.8-5: Increased traffic safety hazards during construction	PSM	PSM	PSM
Regulations			
City and county encroachment permits.	X	X	X
SFPUC Construction Measures			
No. 5: Traffic	X	X	X

TABLE 6.7 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SAN FRANCISCO REGION PROJECTS (SF-1 through SF-3)

IMPACT	San Andreas Pipeline No. 3 Installation SF-1	Groundwater Projects SF-2	Recycled Water Projects SF-3
PEIR Mitigation Measures			
4.8-1a: Traffic Control Plan Measures	X	X	X
Impact 4.8-6: Long-term traffic increases during facility operation	N/A	LS	LS
Regulations			
None applicable.			
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
None required.			
4.9 Air Quality			
Impact 4.9-1: Construction emissions of criteria pollutants	LS	LS	LS
Regulations			
None applicable.			
SFPUC Construction Measures			
No. 3: On-Site Air and Water Quality Measures during Construction	X	X	X
PEIR Mitigation Measures			
4.9-1a: SJVAPCD Dust Control Measures	N/A	N/A	N/A
4.9-1b: SJVAPCD Exhaust Control Measures	N/A	N/A	N/A
4.9-1c: BAAQMD Dust Control Measures	N/A	N/A	N/A
4.9-1d: BAAQMD Exhaust Control Measures	N/A	N/A	N/A
Impact 4.9-2: Exposure to diesel particulate matter during construction	LS	LS	LS
Regulations			
California Health and Safety Code, Section 2485 – Reduces emissions of toxic and criteria pollutants by limiting the idling of new heavy-duty diesel vehicles	X	X	X
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
4.9-2a: Health Risk Screening or Use of Soot Filters	N/A	N/A	N/A
4.9-2b: Vacate SFPUC Land Managers' Residences in Sunol Valley	N/A	N/A	N/A

TABLE 6.7 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SAN FRANCISCO REGION PROJECTS (SF-1 through SF-3)

IMPACT	San Andreas Pipeline No. 3 Installation SF-1	Groundwater Projects SF-2	Recycled Water Projects SF-3
Impact 4.9-3: Exposure to emissions (possibly including asbestos) from tunneling	PSM	PSM	PSM
Regulations			
OSHA standards for worker safety during tunneling	X	X	X
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
4.9-3: Tunnel Gas Odor Control	X	X	X
Impact 4.9-4: Air pollutant emissions during project operation	LS	LS	LS
Regulations			
None applicable.			
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
None required.			
Impact 4.9-5: Odors generated during project operation	LS	LS	LS
Regulations			
BAAQMD Rule 1-301 – Prohibits the discharge of any contaminants that causes annoyance for a considerable number of people of normal sensitivity	X	X	X
BAAQMD Regulation 7 – Specifies odor limits for public exposure and identifies specific dilution levels that must be achieved as a function of odor emission strength	X	X	X
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
None required.			
Impact 4.9-6: Secondary emissions at power plants	LS	LS	LS
Regulations			
None applicable.			
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
None required.			

TABLE 6.7 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SAN FRANCISCO REGION PROJECTS (SF-1 through SF-3)

IMPACT	San Andreas Pipeline No. 3 Installation SF-1	Groundwater Projects SF-2	Recycled Water Projects SF-3
Impact 4.9-7: Conflict with implementation of the applicable air quality plan	LS	LS	LS
Regulations			
None applicable.			
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
None required.			
4.10 Noise and Vibration			
Impact 4.10-1: Disturbance from temporary construction-related noise increases	PSU	PSU	PSU
Regulations			
City and County of San Francisco Noise Ordinance (Police Code, Article 29) time and noise limits for construction activities.	X	X	X
SFPUC Construction Measures			
No. 6: Noise	X	X	X
PEIR Mitigation Measures			
4.10-1a: Noise Controls	X	X	X
4.10-1b: Vacate SFPUC Caretaker's Residence at Tesla Portal	N/A	N/A	N/A
Impact 4.10-2: Temporary noise disturbance along construction haul routes	PSU	PSU	PSU
Regulations			
None applicable.			
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
4.10-2a: Limiting Hourly Truck Volumes	X	X	X
4.10-2b: Restricting Truck Operations	X	X	X
4.10-2c: Vacate SFPUC Land Manager's Residence	N/A	N/A	N/A
Impact 4.10-3: Disturbance due to construction-related vibration	PSU	PSU	PSU
Regulations			
None applicable.			
SFPUC Construction Measures			
None applicable.			

TABLE 6.7 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SAN FRANCISCO REGION PROJECTS (SF-1 through SF-3)

IMPACT	San Andreas Pipeline No. 3 Installation SF-1	Groundwater Projects SF-2	Recycled Water Projects SF-3
PEIR Mitigation Measures			
4.10-3a: Vibration Controls to Prevent Cosmetic or Structural Damage	X	X	X
4.10-3b: Limit Vibration Levels at or Below Vibration Perception Threshold	X	X	X
4.10-3b: Limit Tunnel-Related Detonation to Daylight Hours	N/A	N/A	N/A
Impact 4.10-4: Disturbance due to long-term noise increases	N/A	LS	LS
Regulations			
None applicable.			
SFPUC Construction Measures			
No. 6: Noise	N/A	X	X
PEIR Mitigation Measures			
None required.			
4.11 Public Services and Utilities			
Impact 4.11-1: Potential temporary damage to or disruption of existing regional or local public utilities	PSM	PSM	PSM
Regulations			
OSHA Construction Safety Orders	X	X	X
DHS separation standards	X	X	X
SFPUC Construction Measures			
No. 1: Neighborhood Notice	X	X	X
PEIR Mitigation Measures			
4.11-1a: Notify Neighbors of Potential Utility Service Disruption	X	X	X
4.11-1b: Locate Utility Lines Prior to Excavation	X	X	X
4.11-1c: Confirmation of Utility Line Information	X	X	X
4.11-1d: Safeguard Employees from Potential Accidents Related to Underground Utilities	X	X	X
4.11-1e: Notify Local Fire Departments	X	X	X
4.11-1f: Emergency Response Plan	X	X	X
4.11-1g: Prompt Reconnection of Utilities	X	X	X
4.11-1h: Coordinate Final Construction Plans with Affected Utilities	X	X	X
Impact 4.11-2: Temporary adverse effects on solid waste landfill capacity	PSM	PSM	PSM
Regulations			
California Integrated Waste Management Act of 1989	X	X	X

TABLE 6.7 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SAN FRANCISCO REGION PROJECTS (SF-1 through SF-3)

IMPACT	San Andreas Pipeline No. 3 Installation SF-1	Groundwater Projects SF-2	Recycled Water Projects SF-3
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
4.11-2: Waste Reduction Measures	X	X	X
Impact 4.11-3: Impacts related to compliance with statutes and regulations related to solid waste	PSM	PSM	PSM
Regulations			
California Integrated Waste Management Act of 1989	X	X	X
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
4.11-2: Waste Reduction Measures	X	X	X
Impact 4.11-4: Impacts related to the relocation of utilities	PSM	PSM	PSM
Regulations			
None applicable.			
SFPUC Construction Measures			
No. 1: Neighborhood Notice	X	X	X
PEIR Mitigation Measures			
4.11-1a: Notify Neighbors of Potential Utility Service Disruption	X	X	X
4.11-1b: Locate Utility Lines Prior to Excavation	X	X	X
4.11-1c: Confirmation of Utility Line Information	X	X	X
4.11-1d: Safeguard Employees from Potential Accidents Related to Underground Utilities	X	X	X
4.11-1e: Notify Local Fire Departments	X	X	X
4.11-1f: Emergency Response Plan	X	X	X
4.11-1g: Prompt Reconnection of Utilities	X	X	X
4.11-1h: Coordinate Final Construction Plans with Affected Utilities	X	X	X
4.12 Recreational Resources			
Impact 4.12-1: Temporary conflicts with established recreational uses during construction	PSM	PSM	PSM
Regulations			
None applicable.			
SFPUC Construction Measures			
No. 1: Neighborhood Notice	X	X	X

TABLE 6.7 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SAN FRANCISCO REGION PROJECTS (SF-1 through SF-3)

IMPACT	San Andreas Pipeline No. 3 Installation SF-1	Groundwater Projects SF-2	Recycled Water Projects SF-3
No. 3: On-Site Air and Water Quality Measures during Construction	X	X	X
No. 5: Traffic	X	X	X
No. 6: Noise	X	X	X
PEIR Mitigation Measures			
4.12-1: Coordination with Golf Course/Recreational Facility Managers	X	X	X
See Traffic Measures (4.8-1), Air Quality Measures (4.9-1 and 4.9-2), and Noise Measures (4.10-1 through 4.10-3).	X	X	X
Impact 4.12-2: Conflicts with established recreational uses due to facility siting and project operation	PSM	PSM	PSM
Regulations			
None applicable.			
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
4.12-2: Appropriate Siting of Proposed Facilities	X	X	X
See Land Use and Visual Quality Measures (4.3-4).	X	X	X
4.13 Agricultural Resources			
Impact 4.13-1: Temporary conflicts with established agricultural resources	N/A	N/A	N/A
Regulations			
None applicable.			
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
4.13-1a: Supplemental Noticing and Soil Stockpiling	N/A	N/A	N/A
4.13-1b: Avoidance or Soil Stockpiling	N/A	N/A	N/A
Impact 4.13-2: Conversion of farmlands to nonagricultural uses	N/A	N/A	N/A
Regulations			
None applicable.			
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
4.13-2: Siting Facilities to Avoid Prime Farmland	N/A	N/A	N/A

TABLE 6.7 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SAN FRANCISCO REGION PROJECTS (SF-1 through SF-3)

IMPACT	San Andreas Pipeline No. 3 Installation SF-1	Groundwater Projects SF-2	Recycled Water Projects SF-3
4.14 Hazards			
Impact 4.14-1: Potential to encounter hazardous materials in soil and groundwater	PSM	PSM	PSM
Regulations			
None applicable.			
SFPUC Construction Measures			
No. 4: Groundwater	X	N/A	X
No. 7: Hazardous Materials	X	X	X
PEIR Mitigation Measures			
4.14-1a: Site Health and Safety Plan	X	X	X
4.14-1b: Materials Disposal Plan	X	X	X
4.14-1c: Coordination with Property Owners and Regulatory Agencies	N/A	X	N/A
Impact 4.14-2: Exposure to naturally occurring asbestos	LS	LS	LS
Regulations			
Asbestos Airborne Toxic Control Measure	X	X	X
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
4.14-2: Health Risk Screening and Airborne Asbestos Monitoring Plan	N/A	N/A	N/A
Impact 4.14-3: Risk of fires during construction	N/A	LS	LS
Regulations			
Public Resources Code fire safety regulations	N/A	X	X
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
None required.			
Impact 4.14-4: Gassy conditions in tunnels	LS	LS	LS
Regulations			
Tunnel Safety Orders	X	X	X
SFPUC Construction Measures			
None applicable.			

TABLE 6.7 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SAN FRANCISCO REGION PROJECTS (SF-1 through SF-3)

IMPACT	San Andreas Pipeline No. 3 Installation SF-1	Groundwater Projects SF-2	Recycled Water Projects SF-3
PEIR Mitigation Measures			
None required.			
Impact 4.14-5: Exposure to hazardous building materials	PSM	PSM	PSM
Regulations			
California Code of Regulations, Title 8 – asbestos abatement	X	X	X
California Code of Regulations Title 17 – lead-based paint regulations	X	X	X
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
4.14-5: Hazardous Building Materials Surveys and Abatement	X	X	X
Impact 4.14-6: Accidental hazardous materials release from construction equipment	LS	LS	LS
Regulations			
NPDES stormwater requirements	X	X	N/A
San Francisco Public Works Code Article 4.1	X	X	X
SFPUC Construction Measures			
No. 3: On-Site Air and Water Quality Measures During Construction	X	X	X
PEIR Mitigation Measures			
None required.			
Impact 4.14-7: Increased use of hazardous materials during operation	N/A	LS	LS
Regulations			
Risk management regulations (HMBP)	N/A	X	X
Risk management regulations (RMP)	N/A	X	X
Aboveground storage tank regulations	N/A	X	X
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
None required.			
Impact 4.14-8: Emission or use of hazardous materials within ¼ mile of a school	N/A	LS	LS
Regulations			
Risk management regulations (HMBP)	N/A	X	X
Risk management regulations (RMP)	N/A	X	X

TABLE 6.7 (continued)
IMPACT AND MITIGATION SUMMARY FOR FACILITY CONSTRUCTION AND OPERATION OF SAN FRANCISCO REGION PROJECTS (SF-1 through SF-3)

IMPACT	San Andreas Pipeline No. 3 Installation SF-1	Groundwater Projects SF-2	Recycled Water Projects SF-3
Aboveground storage tank regulations	N/A	X	X
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
None required.			
4.15 Energy			
Impact 4.15-1: Construction-related energy use	PSM	PSM	PSM
Regulations			
None applicable.			
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
See Air Quality Measures (4.9-1b and 4.9-1d).	X	X	X
Impact 4.15-2: Long-term energy use during operation	PSM	PSM	PSM
Regulations			
None applicable.			
SFPUC Construction Measures			
None applicable.			
PEIR Mitigation Measures			
4.15-2: Incorporation of Energy Efficiency Measures	X	X	X

LS = Less than Significant impact, no mitigation required
PSM= Potentially Significant impact, can be mitigated to less than significant
PSU = Potentially Significant Unavoidable impact
X = Applicable
N/A = Not Applicable

TABLE 6.8
SUMMARY OF COLLECTIVE IMPACTS AND MITIGATION RELATED TO WSIP FACILITIES

IMPACT	Multi-Regional Collective Impact	San Joaquin Region	Sunol Valley Region	Bay Division Region	Peninsula Region	San Francisco Region
Land Use and Visual Quality						
Impact 4.16-1a: Collective temporary and permanent impacts on existing land uses in the vicinity of proposed facility sites	N/A	N/A	N/A	PSU	LSM	N/A
Collective PEIR Mitigation Measures						
4.16-1a: Construction Coordination at Irvington Portal	N/A	N/A	N/A	X	N/A	N/A
Impact 4.16-1b: Collective temporary and permanent impacts on the visual character of the surrounding area	N/A	LSM	LS	LSM	LSM	LSM
Collective PEIR Mitigation Measures						
None required.						
Geology, Soils, and Seismicity						
Impact 4.16-2: Collective exposure of people or structures to geologic and seismic hazards	B	N/A	N/A	N/A	N/A	N/A
Collective PEIR Mitigation Measures						
None required.						
Hydrology and Water Quality						
Impact 4.16-3: Collective WSIP impacts related to the degradation of surface waters and flooding hazards	LSM	LSM	LSM	LSM	LSM	LSM
Collective PEIR Mitigation Measures						
None required.						
Biological Resources						
Impact 4.16-4: Collective loss of sensitive biological resources	PSM	PSM	PSU	PSM	PSU	N/A
Collective PEIR Mitigation Measures						
4.16-4a: Bioregional Habitat Restoration Measures	X	N/A	N/A	N/A	N/A	N/A
4.16-4b: Coordination of Construction Staging and Access	N/A	X	X	X	X	N/A
Cultural Resources						
Impact 4.16-5: Collective impacts related to archaeological, paleontological, and historical resources	LSM	LSM	PSU	LSM	PSU	N/A
Collective PEIR Mitigation Measures						
No additional mitigation measures identified.						
Traffic, Transportation, and Circulation						
Impact 4.16-6: Collective traffic increases on local and regional roads	PSU	PSM	PSM	PSM	PSM	PSM
Collective PEIR Mitigation Measures						
Measure 4.16-6a: SFPUC WSIP Projects Construction Coordinator	N/A	N/A	X	X	X	X

TABLE 6.8 (continued)
SUMMARY OF COLLECTIVE IMPACTS AND MITIGATION RELATED TO WSIP FACILITIES

IMPACT	Multi-Regional Collective Impact	San Joaquin Region	Sunol Valley Region	Bay Division Region	Peninsula Region	San Francisco Region
Measure 4.16-6b: Combined San Joaquin Traffic Control Plan	X	N/A	N/A	N/A	N/A	N/A
Measure 4.16-6c: Combined Sunol Valley Traffic Control Plan	N/A	X	N/A	N/A	N/A	N/A
Air Quality						
Impact 4.16-7: Collective increases in construction and/or operational emissions in the region	PSU	PSM	PSM	LSM	LS	LS
Collective PEIR Mitigation Measures						
Measure 4.16-7a: Dust and Exhaust Control Measures for All WSIP Projects	X	N/A	N/A	N/A	N/A	N/A
Measure 4.16-7b: Health Risk Screening or Use of Soot Filters for All Projects in the San Joaquin and Sunol Valley Regions	N/A	X	X	N/A	N/A	N/A
Measure 4.16-7c: Vacate SFPUC Land Managers' Residences for All Projects in the Sunol Valley Region	N/A	N/A	X	N/A	N/A	N/A
Noise and Vibration						
Impact 4.16-8: Collective increases in construction-related and operational noise	N/A	PSU	PSM	PSU	PSU	PSU
Collective PEIR Mitigation Measures						
Measure 4.16-8a: Limiting Hourly Truck Volumes and Restricting Truck Operations on Haul Routes for Multiple WSIP Projects	N/A	X	N/A	X	X	X
Measure 4.16-8b: Vacate Land Manager's Residence for All Projects in Sunol Valley Region	N/A	N/A	X	N/A	N/A	N/A
Public Services and Utilities						
Impact 4.16-9: Collective impacts on utilities and landfill capacity	LSM	N/A	N/A	N/A	N/A	N/A
Collective PEIR Mitigation Measures						
None required.						
Recreational Resources						
Impact 4.16-10: Collective effects on recreational resources during construction	LS	LSM	LSM	LSM	LSM	LSM
Collective PEIR Mitigation Measures						
None required.						
Agricultural Resources						
Impact 4.16-11: Collective conversion of farmland to nonagricultural uses	LSM	N/A	N/A	N/A	N/A	N/A
Collective PEIR Mitigation Measures						
None required.						

TABLE 6.8 (continued)
SUMMARY OF COLLECTIVE IMPACTS AND MITIGATION RELATED TO WSIP FACILITIES

IMPACT	Multi-Regional Collective Impact	San Joaquin Region	Sunol Valley Region	Bay Division Region	Peninsula Region	San Francisco Region
Hazards						
Impact 4.16-12: Collective effects related to hazardous conditions and exposure to or release of hazardous materials	LS	LSM	LSM	LSM	LSM	LSM
Collective PEIR Mitigation Measures						
None required.						
Energy Resources						
Impact 4.16-13: Collective increases in the use of nonrenewable energy resources	LSM	LSM	LSM	LSM	LSM	LSM
Collective PEIR Mitigation Measures						
None required.						

LS = Less than Significant impact, no mitigation required
PSM= Potentially Significant impact, can be mitigated to less than significant
PSU = Potentially Significant Unavoidable impact
X = Applicable
N/A = Not Applicable
B = Beneficial Impact

TABLE 6.9
SUMMARY OF CUMULATIVE IMPACTS AND MITIGATION RELATED TO WSIP FACILITIES

IMPACT	Significance Determination
Land Use and Visual Quality	
Impact 4.17-1: Cumulative disruption of established communities, changes in existing land use patterns, and impacts on the existing visual character	LS
Cumulative PEIR Mitigation Measures	
None required	
Geology, Soils, and Seismicity	
Impact 4.17-2: Cumulative exposure of people or structures to geologic and seismic hazards	B/LS
Cumulative PEIR Mitigation Measures	
None required.	
Hydrology and Water Quality	
Impact 4.17-3: Cumulative impacts related to the degradation of water quality, alteration of drainage patterns, increased surface runoff, and flooding hazards	LS
Cumulative PEIR Mitigation Measures	
None required.	
Biological Resources	
Impact 4.17-4: Cumulative loss of sensitive biological resources	LS
Cumulative PEIR Mitigation Measures	
None required.	
Cultural Resources	
Impact 4.17-5: Cumulative increase in impacts on archaeological, paleontological, and historical resources	PSU
Cumulative PEIR Mitigation Measures	
No additional mitigation measures identified.	
Traffic, Transportation, and Circulation	
Impact 4.17-6: Cumulative traffic increases on local and regional roads	PSU
Cumulative PEIR Mitigation Measures	
Measure 4.17-6: SFPUC WSIP Projects Construction Coordinator – Other Agencies	X
Air Quality	
Impact 4.17-7: Cumulative increases in construction and/or operational emissions in the region	PSU
Cumulative PEIR Mitigation Measures	
No additional mitigation measures identified.	

TABLE 6.9 (continued)
SUMMARY OF CUMULATIVE IMPACTS AND MITIGATION RELATED TO WSIP FACILITIES

IMPACT	Significance Determination
Noise and Vibration	
Impact 4.17-8: Cumulative increases in construction-related and operational noise	PSU
Cumulative PEIR Mitigation Measures	
Measure 4.17-8: Coordination of Truck Traffic on Local Streets	X
Public Services and Utilities	
Impact 4.17-9: Cumulative impacts related to disruption of utility service or relocation of utilities	LS
Cumulative PEIR Mitigation Measures	
None required.	
Recreational Resources	
Impact 4.17-10: Cumulative effects on recreational resources during construction	LS
Cumulative PEIR Mitigation Measures	
None required.	
Agricultural Resources	
Impact 4.17-11: Cumulative conversion of farmland to nonagricultural uses	LS
Cumulative PEIR Mitigation Measures	
None required.	
Hazards	
Impact 4.17-12: Cumulative effects related to hazardous conditions and exposure to or release of hazardous materials	LS
Cumulative PEIR Mitigation Measures	
None required.	
Energy Resources	
Impact 4.17-13: Cumulative increases in the use of nonrenewable energy resources	LS
Cumulative PEIR Mitigation Measures	
None required.	

LS = Less than Significant impact, no mitigation required
PSM= Potentially Significant impact, can be mitigated to less than significant
PSU = Potentially Significant Unavoidable impact
X = Applicable
N/A = Not Applicable
B = Beneficial Impact

TABLE 6.10
IMPACT AND MITIGATION SUMMARY FOR THE TUOLUMNE RIVER SYSTEM AND DOWNSTREAM WATER BODIES RELATED TO WATER SUPPLY AND SYSTEM OPERATIONS

IMPACT	Significance Determination	Mitigation Measure Required
5.3.1 Stream Flow and Reservoir Water Levels		
Impact 5.3.1-1: Effects on flow along the Tuolumne River below O'Shaughnessy Dam	LS	
PEIR Mitigation Measures		
None required.		
Impact 5.3.1-2: Effects on flow along Cherry Creek below Cherry Dam	LS	
PEIR Mitigation Measures		
None required.		
Impact 5.3.1-3: Effects on flow along Eleanor Creek below Eleanor Dam	LS	
PEIR Mitigation Measures		
None required.		
Impact 5.3.1-4: Effects on flow along the Tuolumne River below La Grange Dam	LS	
PEIR Mitigation Measures		
None required.		
Impact 5.3.1-5: Effects on flow along the San Joaquin River and the Sacramento-San Joaquin Delta	LS	
PEIR Mitigation Measures		
None required.		
5.3.2 Geomorphology		
Impact 5.3.2-1: Effects on sediment transport and channel characteristics between O'Shaughnessy Dam and Don Pedro Reservoir	LS	
PEIR Mitigation Measures		
None required.		
Impact 5.3.2-2: Effects on sediment transport and channel characteristics below La Grange Dam	LS	
PEIR Mitigation Measures		
None required.		
5.3.3 Surface Water Quality		
Impact 5.3.3-1: Effects on water quality in Hetch Hetchy Reservoir and along the Tuolumne River below O'Shaughnessy Dam	LS	
PEIR Mitigation Measures		
None required.		

TABLE 6.10 (continued)
IMPACT AND MITIGATION SUMMARY FOR THE TUOLUMNE RIVER SYSTEM AND DOWNSTREAM WATER BODIES RELATED TO WATER SUPPLY AND SYSTEM OPERATIONS

IMPACT	Significance Determination	Mitigation Measure Required
Impact 5.3.3-2: Effects on water quality in Don Pedro Reservoir and along the Tuolumne River below La Grange Dam	LS	
PEIR Mitigation Measures		
None required.		
Impact 5.3.3-3: Effects on water quality along the San Joaquin River and the Sacramento-San Joaquin Delta	LS	
PEIR Mitigation Measures		
None required.		
5.3.4 Surface Water Supplies		
Impact 5.3.4-1: Effects on Tuolumne River, San Joaquin River, and Stanislaus River water users	LS	
PEIR Mitigation Measures		
None required.		
Impact 5.3.4-2: Effects on Delta water users	LS	
PEIR Mitigation Measures		
None required.		
5.3.5 Groundwater		
Impact 5.3.5-1: Alteration of stream flows along the Tuolumne River, which could affect local groundwater recharge and groundwater levels	LS	
PEIR Mitigation Measures		
None required.		
Impact 5.3.5-2: Alteration of stream flows along the Tuolumne River, which could affect local groundwater quality	LS	
PEIR Mitigation Measures		
None required.		
5.3.6 Fisheries		
Impact 5.3.6-1: Effects on fishery resources in Hetch Hetchy Reservoir	LS	
PEIR Mitigation Measures		
None required.		
Impact 5.3.6-2: Effects on fishery resources along the Tuolumne River between Hetch Hetchy Reservoir and Don Pedro Reservoir	LS	
PEIR Mitigation Measures		
None required.		

TABLE 6.10 (continued)
IMPACT AND MITIGATION SUMMARY FOR THE TUOLUMNE RIVER SYSTEM AND DOWNSTREAM WATER BODIES RELATED TO WATER SUPPLY AND SYSTEM OPERATIONS

IMPACT	Significance Determination	Mitigation Measure Required
Impact 5.3.6-3: Effects on fishery resources in Don Pedro Reservoir	LS	
PEIR Mitigation Measures		
None required.		
Impact 5.3.6-4: Effects on fishery resources along the Tuolumne River below La Grange Dam	PSM	5.3.6-4a or 5.3.6-4b
PEIR Mitigation Measures		
5.3.6-4a: Avoidance of Flow Changes by Reducing Demand for Don Pedro Reservoir Water		X
5.3.6-4b: Fishery Habitat Enhancement		X
Impact 5.3.6-5: Effects on fishery resources along the San Joaquin River	LS	
PEIR Mitigation Measures		
None required.		
5.3.7 Terrestrial Biological Resources		
Impact 5.3.7-1: Impacts on riparian habitat and related biological resources in Hetch Hetchy Reservoir and along the bedrock channel portions of the Tuolumne River from O'Shaughnessy Dam to Don Pedro Reservoir		
Sensitive Habitats	LS	
Key Special-status Species	LS	
Other Species of Concern	LS	
Common Habitats and Species	LS	
PEIR Mitigation Measures		
None required.		
Impact 5.3.7-2: Impacts on alluvial features that support meadow and riparian habitat along the Tuolumne River from O'Shaughnessy Dam to Don Pedro Reservoir		
Sensitive Habitats	PSM	5.3.7-2
Key Special-status Species	PSM	5.3.7-2
Other Species of Concern	PSM	5.3.7-2
Common Habitats and Species	PSM	5.3.7-2
PEIR Mitigation Measures		
5.3.7-2: Controlled Releases to Recharge Groundwater in Streamside Meadows and Other Alluvial Deposits		X
Impact 5.3.7-3: Impacts on biological resources in Lake Eleanor and along Eleanor Creek		
Sensitive Habitats	LS	
Key Special-status Species	LS	
Other Species of Concern	LS	

TABLE 6.10 (continued)
IMPACT AND MITIGATION SUMMARY FOR THE TUOLUMNE RIVER SYSTEM AND DOWNSTREAM WATER BODIES RELATED TO WATER SUPPLY AND SYSTEM OPERATIONS

IMPACT	Significance Determination	Mitigation Measure Required
Common Habitats and Species	LS	
PEIR Mitigation Measures		
None required.		
Impact 5.3.7-4: Impacts on biological resources in Lake Lloyd and along Cherry Creek		
Sensitive Habitats	LS	
Key Special-status Species	LS	
Other Species of Concern	LS	
Common Habitats and Species	LS	
PEIR Mitigation Measures		
None required.		
Impact 5.3.7-5: Impacts on biological resources in Don Pedro Reservoir		
Sensitive Habitats	LS	
Key Special-status Species	LS	
Other Species of Concern	LS	
Common Habitats and Species	LS	
PEIR Mitigation Measures		
None required.		
Impact 5.3.7-6: Impacts on biological resources along the Tuolumne River below La Grange Dam		
Sensitive Habitats	PSM	5.3.6-4a or 5.3.7-6
Key Special-status Species	PSM	5.3.6-4a or 5.3.7-6
Other Species of Concern	PSM	5.3.6-4a or 5.3.7-6
Common Habitats and Species	PSM	5.3.6-4a or 5.3.7-6
PEIR Mitigation Measures		
5.3.6-4a: Avoidance of Flow Changes by Reducing Demand for Don Pedro Reservoir Water		X
5.3.7-6: Lower Tuolumne River Riparian Habitat Enhancement		X
Impact 5.3.7-7: Conflicts with the provisions of adopted conservation plans or other approved biological resources plans for the Tuolumne Wild and Scenic River	LS	
PEIR Mitigation Measures		
None required.		

TABLE 6.10 (continued)
IMPACT AND MITIGATION SUMMARY FOR THE TUOLUMNE RIVER SYSTEM AND DOWNSTREAM WATER BODIES RELATED TO WATER SUPPLY AND SYSTEM OPERATIONS

IMPACT	Significance Determination	Mitigation Measure Required
5.3.8 Recreational and Visual Resources		
Impact 5.3.8-1: Effects on reservoir recreation due to changes in water system operations	LS	
PEIR Mitigation Measures		
None required.		
Impact 5.3.8-2: Effects on river recreation due to changes in water system operations	LS	
PEIR Mitigation Measures		
None required.		
Impact 5.3.8-3: Effects on the aesthetic values of the Tuolumne Wild and Scenic River	LS	
PEIR Mitigation Measures		
None required.		
5.3.9 Energy Resources		
Impact 5.3.9-1: Effects on hydropower generation at facilities along the Tuolumne River	B	
PEIR Mitigation Measures		
None required.		

LS = Less than Significant impact, no mitigation required
PSM= Potentially Significant impact, can be mitigated to less than significant
PSU = Potentially Significant Unavoidable impact
X = Applicable
N/A = Not Applicable

TABLE 6.11
IMPACT AND MITIGATION SUMMARY FOR ALAMEDA CREEK WATERSHED STREAMS AND RESERVOIRS RELATED TO WATER SUPPLY AND SYSTEM OPERATIONS

IMPACT	Significance Determination	Mitigation Measure Required
5.4.1 Stream Flow and Reservoir Water Levels		
Impact 5.4.1-1: Effects on flow along Calaveras Creek below Calaveras Reservoir	LS	
PEIR Mitigation Measures		
None required.		
Impact 5.4.1-2: Effects on flow along Alameda Creek below the diversion dam	SU	5.4.1-2
PEIR Mitigation Measures		
5.4.1-2 – Diversion Tunnel Operation		X
Impact 5.4.1-3: Effects in San Antonio Reservoir and along San Antonio Creek	LS	
PEIR Mitigation Measures		
None required.		
Impact 5.4.1-4: Effects on flow along Alameda Creek below the confluence of San Antonio Creek	LS	
PEIR Mitigation Measures		
None required.		
5.4.2 Geomorphology		
Impact 5.4.2-1: Effects on channel formation and sediment transport along Calaveras Creek	LS	
PEIR Mitigation Measures		
None required.		
Impact 5.4.2-2: Effects on channel formation and sediment transport along Alameda Creek downstream of the diversion dam	LS	
PEIR Mitigation Measures		
None required.		
Impact 5.4.2-3: Effects on channel formation and sediment transport along San Antonio Creek downstream of San Antonio Reservoir	LS	
PEIR Mitigation Measures		
None required.		
5.4.3 Surface Water Quality		
Impact 5.4.3-1: Effects on water quality in Calaveras Reservoir	LS	
PEIR Mitigation Measures		
None required.		

TABLE 6.11 (continued)
IMPACT AND MITIGATION SUMMARY FOR ALAMEDA CREEK WATERSHED STREAMS AND RESERVOIRS RELATED TO WATER SUPPLY AND SYSTEM OPERATIONS

IMPACT	Significance Determination	Mitigation Measure Required
Impact 5.4.3-2: Effects on water quality in San Antonio Reservoir	LS	
PEIR Mitigation Measures		
None required.		
Impact 5.4.3-3: Effects on water quality along Calaveras, San Antonio, and Alameda Creeks	LS	
PEIR Mitigation Measures		
None required.		
5.4.4 Groundwater		
Impact 5.4.4-1: Changes in groundwater levels, flows, quality, and supplies	LS	
PEIR Mitigation Measures		
None required.		
5.4.5 Fisheries		
Impact 5.4.5-1: Effects on fishery resources in Calaveras Reservoir	B	
PEIR Mitigation Measures		
None required.		
Impact 5.4.5-2: Effects on fishery resources along Calaveras Creek below Calaveras Dam and along Alameda Creek below confluence with Calaveras Creek	B	
PEIR Mitigation Measures		
None required.		
Impact 5.4.5-3: Effects on fishery resources along Alameda Creek downstream of Alameda Creek Diversion Dam	PSM	5.4.5-3a or 5.4.5-3b
PEIR Mitigation Measures		
5.4.5-3a: Minimum Flows for Resident Trout on Alameda Creek		X
5.4.5-3b: Alameda Diversion Dam Restrictions or Fish Screens		X
Impact 5.4.5-4: Effects on fishery resources in San Antonio Reservoir	B	
PEIR Mitigation Measures		
None required.		
Impact 5.4.5-5: Effects on fishery resources along San Antonio Creek below San Antonio Reservoir	LS	
PEIR Mitigation Measures		
None required.		

TABLE 6.11 (continued)
IMPACT AND MITIGATION SUMMARY FOR ALAMEDA CREEK WATERSHED STREAMS AND RESERVOIRS RELATED TO WATER SUPPLY AND SYSTEM OPERATIONS

IMPACT	Significance Determination	Mitigation Measure Required
Impact 5.4.5-6: Effects on fishery resources along Alameda Creek below confluence with San Antonio Creek	LS	
PEIR Mitigation Measures		
None required.		
5.4.6 Terrestrial Biological Resources		
Impact 5.4.6-1: Effects on riparian habitat and related biological resources in Calaveras Reservoir		
Sensitive Habitats	PSM	5.4.6-1
Key Special-status Species	PSM	5.4.6-1
Other Species of Concern	LS	
Common Habitats and Species	LS	
PEIR Mitigation Measures		
5.4.6-1: Compensation for Impacts on Terrestrial Biological Resources		X
Impact 5.4.6-2: Effects on riparian habitat and related biological resources along Alameda Creek, from below the diversion dam to the confluence with Calaveras Creek		
Sensitive Habitats	LS	
Key Special-status Species	PSM	5.4.1-2 and 5.4.5-3a
Other Species of Concern	LS	
Common Habitats and Species	N/A	
PEIR Mitigation Measures		
5.4.1-2: Diversion Tunnel Operation		X
5.4.5-3a: Minimum Flows for Resident Trout on Alameda Creek		X
Impact 5.4.6-3: Effects on riparian habitat and related biological resources along Calaveras Creek, from Calaveras Reservoir to the confluence with Alameda Creek		
Sensitive Habitats	LS	
Key Special-status Species	PSM	5.4.6-3
Other Species of Concern	LS	
Common Habitats and Species	LS	
PEIR Mitigation Measures		
5.4.6-3: Operational Procedures for Calaveras Dam Releases		X

TABLE 6.11 (continued)
IMPACT AND MITIGATION SUMMARY FOR ALAMEDA CREEK WATERSHED STREAMS AND RESERVOIRS RELATED TO WATER SUPPLY AND SYSTEM OPERATIONS

IMPACT	Significance Determination	Mitigation Measure Required
Impact 5.4.6-4: Effects on riparian habitat and related biological resources along Alameda Creek, from the confluence with Calaveras Creek to the confluence with San Antonio Creek		
Sensitive Habitats	LS	
Key Special-status Species	PSM	5.4.6-3 and 5.4.5-3a
Other Species of Concern	LS	
Common Habitats and Species	LS	
PEIR Mitigation Measures		
5.4.6-3: Operational Procedures for Calaveras Dam Releases		X
5.4.5-3a: Minimum Flows for Resident Trout on Alameda Creek		X
Impact 5.4.6-5: Effects on riparian habitat and related biological resources in San Antonio Reservoir		
Sensitive Habitats	LS	
Key Special-status Species	LS	
Other Species of Concern	LS	
Common Habitats and Species	LS	
PEIR Mitigation Measures		
None required.		
Impact 5.4.6-6: Effects on riparian habitat and related biological resources along San Antonio Creek between Turner Dam and the confluence with Alameda Creek		
Sensitive Habitats	LS	
Key Special-status Species	LS	
Other Species of Concern	LS	
Common Habitats and Species	N/A	
PEIR Mitigation Measures		
None required.		
Impact 5.4.6-7: Effects on riparian habitat and related biological resources along Alameda Creek below the confluence with San Antonio Creek		
Sensitive Habitats	LS	
Key Special-status Species	LS	
Other Species of Concern	LS	
Common Habitats and Species	N/A	
PEIR Mitigation Measures		
None required.		

TABLE 6.11 (continued)
IMPACT AND MITIGATION SUMMARY FOR ALAMEDA CREEK WATERSHED STREAMS AND RESERVOIRS RELATED TO WATER SUPPLY AND SYSTEM OPERATIONS

IMPACT	Significance Determination	Mitigation Measure Required
Impact 5.4.6-8: Conflicts with the provisions of adopted conservation plans or other approved biological resource plans	LS	
PEIR Mitigation Measures		
None required.		
5.4.7 Recreational and Visual Resources		
Impact 5.4.7-1: Effects on recreational facilities and/or activities	LS	
PEIR Mitigation Measures		
None required.		
Impact 5.4.7-2: Visual effects on scenic resources or visual character of the water bodies	LS	
PEIR Mitigation Measures		
None required.		

LS = Less than Significant impact, no mitigation required
PSM= Potentially Significant impact, can be mitigated to less than significant
PSU = Potentially Significant Unavoidable impact
X = Applicable
N/A = Not Applicable

TABLE 6.12
IMPACT AND MITIGATION SUMMARY FOR THE SAN FRANCISCO PENINSULA STREAMS AND RESERVOIRS RELATED TO WATER SUPPLY AND SYSTEM OPERATIONS

IMPACT	Significance Determination	Mitigation Measure Required
5.5.1 Stream Flow and Reservoir Water Levels		
Impact 5.5.1-1: Effects on flow along San Mateo Creek	LS	
PEIR Mitigation Measures		
None required.		
Impact 5.5.1-2: Effects on flow along Pilarcitos Creek	LS	
PEIR Mitigation Measures		
None required.		
5.5.2 Geomorphology		
Impact 5.5.2-1: Changes in sediment transport and channel morphology in the Peninsula watershed	LS	
PEIR Mitigation Measures		
None required.		
5.5.3 Surface Water Quality		
Impact 5.5.3-1: Effects on water quality in Crystal Springs Reservoir, San Andreas Reservoir, and San Mateo Creek	LS	
PEIR Mitigation Measures		
None required.		
Impact 5.5.3-2: Effects on water quality in Pilarcitos Reservoir and along Pilarcitos Creek	PSM	5.5.3-2
PEIR Mitigation Measures		
5.5.3-2: Revised Operations Plan for Pilarcitos Watershed Facilities		X
5.5.4 Groundwater		
Impact 5.5.4-1: Alteration of stream flows along Pilarcitos Creek, which could affect groundwater levels and water quality	LS	
PEIR Mitigation Measures		
None required.		
5.5.5 Fisheries		
Impact 5.5.5-1: Effects on fishery resources in Crystal Springs Reservoir (Upper and Lower)	PSU	5.5.5-1
PEIR Mitigation Measures		
5.5.5-1: Create New Spawning Habitat Above Crystal Springs Reservoir		X

TABLE 6.12 (continued)
IMPACT AND MITIGATION SUMMARY FOR THE SAN FRANCISCO PENINSULA STREAMS AND RESERVOIRS RELATED TO WATER SUPPLY AND SYSTEM OPERATIONS

IMPACT	Significance Determination	Mitigation Measure Required
Impact 5.5.5-2: Effects on fishery resources in San Andreas Reservoir	LS	
PEIR Mitigation Measures		
None required.		
Impact 5.5.5-3: Effects on fishery resources along San Mateo Creek	LS	
PEIR Mitigation Measures		
None required.		
Impact 5.5.5-4: Effects on fishery resources in Pilarcitos Reservoir	PSM	5.5.3-2
PEIR Mitigation Measures		
5.5.3-2: Revised Operations Plan for Pilarcitos Watershed Facilities		X
Impact 5.5.5-5: Effects on fishery resources along Pilarcitos Creek below Pilarcitos Reservoir	PSM	5.5.3-2
PEIR Mitigation Measures		
5.5.3-2: Revised Operations Plan for Pilarcitos Watershed Facilities		X
5.5.6 Terrestrial Biological Resources		
Impact 5.5.6-1: Impacts on biological resources in Upper and Lower Crystal Springs Reservoirs:		
Sensitive Habitats	PSM	5.5.6-1a and 5.5.6-1b
Key Special-status Species	PSM	5.5.6-1a, 5.5.6-1b, and 5.5.6-1c
Other Species of Concern	PSM	5.5.6-1a and 5.5.6-1b
Common Habitats and Species	PSM	5.5.6-1a and 5.5.6-1b
PEIR Mitigation Measures		
5.5.6-1a: Adaptive Management of Freshwater Marsh and Wetlands at Upper and Lower Crystal Springs Reservoirs		X
5.5.6-1b: Compensation for Impacts on Terrestrial Biological Resources		X
5.5.6-1c: Compensation for Serpentine Seep-Related Special-Status Plants		X
Impact 5.5.6-2: Impacts on biological resources in San Andreas Reservoir		
Sensitive Habitats	LS	
Key Special-status Species	LS	
Other Species of Concern	LS	
Common Habitats and Species	LS	

TABLE 6.12 (continued)
IMPACT AND MITIGATION SUMMARY FOR THE SAN FRANCISCO PENINSULA STREAMS AND RESERVOIRS RELATED TO WATER SUPPLY AND SYSTEM OPERATIONS

IMPACT	Significance Determination	Mitigation Measure Required
PEIR Mitigation Measures		
None required.		
Impact 5.5.6-3: Impacts on biological resources along San Mateo Creek below Lower Crystal Springs Dam		
Sensitive Habitats	LS	
Key Special-status Species	LS	
Other Species of Concern	LS	
Common Habitats and Species	LS	
PEIR Mitigation Measures		
None required.		
Impact 5.5.6-4: Impacts on biological resources in Pilarcitos Reservoir		
Sensitive Habitats	LS	
Key Special-status Species	PSM	5.5.3-2
Other Species of Concern	LS	
Common Habitats and Species	LS	
PEIR Mitigation Measures		
5.5.3-2: Revised Operations Plan for Pilarcitos Watershed Facilities		X
Impact 5.5.6-5: Impacts on biological resources along Pilarcitos Creek below Pilarcitos Reservoir		
Sensitive Habitats	PSM	5.5.3-2
Key Special-status Species	LS	
Other Species of Concern	LS	
Common Habitats and Species	LS	
PEIR Mitigation Measures		
5.5.3-2: Revised Operations Plan for Pilarcitos Watershed Facilities		X
Impact 5.5.6-6: Impacts on biological resources along Pilarcitos Creek below Stone Dam		
Sensitive Habitats	LS	
Key Special-status Species	LS	
Other Species of Concern	LS	
Common Habitats and Species	LS	
PEIR Mitigation Measures		
None required.		

TABLE 6.12 (continued)
IMPACT AND MITIGATION SUMMARY FOR THE SAN FRANCISCO PENINSULA STREAMS AND RESERVOIRS RELATED TO WATER SUPPLY AND SYSTEM OPERATIONS

IMPACT	Significance Determination	Mitigation Measure Required
Impact 5.5.6-7: Conflicts with the provisions of adopted conservation plans or other approved biological resource plans	LS	
PEIR Mitigation Measures		
None required.		
5.5.7 Recreational and Visual Resources		
Impact 5.5.7-1: Effects on recreational facilities and/or activities	LS	
PEIR Mitigation Measures		
None required.		
Impact 5.5.7-2: Visual effects on scenic resources or the visual character of water bodies	LS	
PEIR Mitigation Measures		
None required.		

LS = Less than Significant impact, no mitigation required
PSM= Potentially Significant impact, can be mitigated to less than significant
PSU = Potentially Significant Unavoidable impact
X = Applicable
N/A = Not Applicable

TABLE 6.13
IMPACT AND MITIGATION SUMMARY FOR WESTSIDE GROUNDWATER BASIN RESOURCES

IMPACT	Significance Determination	Mitigation Measure Required
Impact 5.6-1: Basin overdraft due to pumping from the Westside Groundwater Basin		
North Westside Groundwater Basin	PSM	5.6-1
South Westside Groundwater Basin	LS	
PEIR Mitigation Measures		
5.6-1: Groundwater Monitoring to Determine Basin Safe Yield		X
Impact 5.6-2: Changes in water levels in Lake Merced and other surface water features, including Pine Lake, due to decreased groundwater levels in the Westside Groundwater Basin		
North Westside Groundwater Basin	PSM	5.6-1, 5.6-2
South Westside Groundwater Basin	N/A	
PEIR Mitigation Measures		
5.6-1: Groundwater Monitoring to Determine Basin Safe Yield		X
5.6-2: Implementation of a Lake Level Management Plan		X
Impact 5.6-3: Seawater intrusion due to decreased groundwater levels in the Westside Groundwater Basin		
North Westside Groundwater Basin	PSM	5.6-1
South Westside Groundwater Basin	LS	
PEIR Mitigation Measures		
5.6-1: Groundwater Monitoring to Determine Basin Safe Yield		X
Impact 5.6-4: Land subsidence due to deceased groundwater levels in the Westside Groundwater Basin if the historic low water levels are exceeded		
North Westside Groundwater Basin	LS	
South Westside Groundwater Basin	LS	
PEIR Mitigation Measures		
None required.		
Impact 5.6-5: Contamination of drinking water due to groundwater pumping in the Westside Groundwater Basin		
North Westside Groundwater Basin	PSM	5.6-5
South Westside Groundwater Basin	PSM	5.6-5
PEIR Mitigation Measures		
5.6-5: Drinking Water Source Assessments for Groundwater Wells		X
Impact 5.6-6: Drinking water contaminants above maximum contaminant levels and adverse effects of adding treated groundwater to the distribution system		
North Westside Groundwater Basin	LS	
South Westside Groundwater Basin	LS	

TABLE 6.13 (continued)
SUMMARY OF IMPACTS AND MITIGATION MEASURES FOR WESTSIDE GROUNDWATER BASIN RESOURCES

IMPACT	Significance Determination	Mitigation Measure Required
PEIR Mitigation Measures		
None required.		

LS = Less than Significant impact, no mitigation required
PSM= Potentially Significant impact, can be mitigated to less than significant
PSU = Potentially Significant Unavoidable impact
X = Applicable
N/A = Not Applicable

TABLE 6.14
SUMMARY OF CUMULATIVE IMPACTS AND MITIGATION RELATED TO WSIP WATER SUPPLY AND SYSTEM OPERATIONS ON THE TUOLUMNE RIVER, ALAMEDA CREEK, AND PENINSULA WATERSHEDS

IMPACT	Hydrology	Geomorphology	Surface Water Quality	Groundwater	Fisheries	Terrestrial Biology	Recreation / Visual Quality
5.7.2 Cumulative Effects on the Tuolumne River System and Downstream Water Bodies							
Impact 5.7.2-1: Cumulative impacts on the Tuolumne River from Hetch Hetchy Reservoir to Don Pedro Reservoir	LS	LS	LS	LS	LS	LS	LS
Cumulative PEIR Mitigation Measures							
None required.							
Impact 5.7.2-2: Cumulative impacts on the Tuolumne River from Don Pedro Reservoir to the San Joaquin River	LS	LS	LS	LS	LS	LS	LS
Cumulative PEIR Mitigation Measures							
None required.							
Impact 5.7-2-3: Cumulative impacts on the San Joaquin River, Stanislaus River, and Delta	LS	LS	LS	LS	LS	LS	LS
Cumulative PEIR Mitigation Measures							
None required.							
5.7.3 Cumulative Effects on Alameda Creek Watershed							
Impact 5.7.3-1: Cumulative effects on the Alameda Creek watershed	N/A	LS	LS	LS	LS	LS	LS
Cumulative PEIR Mitigation Measures							
None required.							
5.7.4 Cumulative Effects on Peninsula Watershed							
Impact 5.7.4-1: Cumulative effects on the San Mateo Creek watershed	LS	LS	LS	LS	LS	LS	LS
Cumulative PEIR Mitigation Measures							
None required.							

TABLE 6.14 (continued)
SUMMARY OF CUMULATIVE IMPACTS AND MITIGATION MEASURES RELATED TO WSIP WATER SUPPLY AND SYSTEM OPERATIONS ON THE TUOLUMNE RIVER, ALAMEDA CREEK, AND PENINSULA WATERSHEDS

IMPACT	Hydrology	Geomorphology	Surface Water Quality	Groundwater	Fisheries	Terrestrial Biology	Recreation / Visual Quality
Impact 5.7.4-2: Cumulative effects on the Pilarcitos Creek watershed	LS	LS	LS	LS	LS	LS	LS
Cumulative PEIR Mitigation Measures							
None required.							

LS = Less than Significant impact, no mitigation required
PSM= Potentially Significant impact, can be mitigated to less than significant
PSU = Potentially Significant Unavoidable impact
X = Applicable
N/A = Not Applicable

TABLE 6.15
SUMMARY OF CUMULATIVE IMPACTS AND MITIGATION RELATED TO
WSIP WATER SUPPLY AND SYSTEM OPERATIONS FOR WESTSIDE GROUNDWATER BASIN

IMPACT	Significance Determination
Impact 5.7.5-1: Cumulative impacts on the North Westside Groundwater Basin	LS
Cumulative PEIR Mitigation Measures	
None required.	
Impact 5.7.5-1: Cumulative impacts on the South Westside Groundwater Basin	LS
Cumulative PEIR Mitigation Measures	
None required.	

References – Mitigation Measures

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7 Growth-Inducement Potential and Indirect Effects of Growth

CHAPTER 7

Growth-Inducement Potential and Indirect Effects of Growth

7.1 Overview and Summary

7.1.1 Approach to Analysis and Chapter Organization

This chapter analyzes the growth inducement potential and associated secondary effects of growth impacts of the San Francisco Public Utilities Commission's (SFPUC's) Water System Improvement Program (WSIP), as required by the California Environmental Quality Act (CEQA). CEQA requirements, other laws and regulations pertinent to land use and water supply planning, and how the project's growth inducing impacts were assessed, are discussed below.

CEQA Requirements

CEQA requires that an environmental impact report (EIR) evaluate the growth-inducing impacts of a proposed project[1]. A growth-inducing impact is defined as follows:

> [T]he ways in which the proposed project could foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment. Included in this are projects which would remove obstacles to population growth…. It must not be assumed that growth in any area is necessarily beneficial, detrimental, or of little significance to the environment.

Regulatory Context for Water Supply and Land Use Planning

The SFPUC does not have authority to make land use decisions in its service area. It cannot approve or deny development proposals; that is the responsibility of the cities and counties to which the SFPUC provides water. However, the SFPUC and its wholesale customers are required, through laws and agreements, to provide water service. Numerous laws are intended to ensure that water supply planning like the WSIP and land use planning (such as the approval of, or establishment of constraints to, development) proceed in an orderly fashion. The laws and agencies described below provide the regulatory and planning context for coordination among water agencies and cities and counties, and yield key documents (e.g., general plans and regional projections) used in this analysis.

- *General Plan Requirements*. Pursuant to state law[2], each city and county is required to adopt a comprehensive, long-term general plan for the physical development of the jurisdiction. The general plan is a statement of development policies and is required to include land use, circulation, housing, conservation, open space, noise, and safety elements. The land use element designates the proposed general distribution, location, and extent of land uses and includes a statement of the standards of population density and building intensity recommended for lands covered by the plan. The city or county is required to prepare the water section of the conservation element in coordination with any countywide water agency and with all districts and/or city agencies that develop, serve, control, or conserve water for that jurisdiction. The water section must include discussion and evaluation of water supply and demand information contained in any applicable urban water management plan that has been submitted to the city or county by a water agency.

- *Urban Water Management Planning Act*. Every urban water supplier is required to prepare an urban water management plan (UWMP) for the purpose of "actively pursu[ing] the efficient use of available supply."[3] In preparing the UWMP, the water supplier is required to coordinate with other appropriate agencies, including other water suppliers that share a common source, water management agencies, and relevant public agencies. When a city or county proposes to adopt or substantially amend a general plan, the water agency is required to provide the planning agency with the current version of the adopted UWMP, the current version of the water agency's capital improvement program or plan, and other information about the system's sources of water supply. The Urban Water Management Planning Act requires urban water suppliers, as part of their long-range planning activities,

1 CEQA Guidelines Section 15126.2(d).
2 California Government Code, Section 65300 *et seq*.
3 California Water Code, Section 10610.2 *et seq.*

to make every effort to ensure the appropriate level of reliability in their water service sufficient to meet the needs of their various categories of customers during normal, dry, and multiple dry water years.

- *Senate Bills 610 and 221*. In 2001, the California legislature adopted two bills pertaining to coordination between land use and water supply planning and decision making:

  - *Senate Bill (SB) 610*. Pursuant to SB 610[4], CEQA review for most large projects[5] is required to include a water supply assessment. The water supply assessments must address whether existing water supplies will suffice to serve the proposed project and other planned development over a 20-year period in average, dry, and multiple-dry year conditions, and must set forth a plan for finding additional supplies necessary to serve the proposed project. Cities and counties can approve projects notwithstanding identified water supply shortfalls provided that they address such shortfalls in their findings.

  - *SB 221*. Pursuant to SB 221[6], land use agencies must require, at the time the subdivision map is considered for approval, that an applicant for a large subdivision[7] demonstrate that sufficient water supply is available to support the development. Proof of available supply must be based on written verification from the applicable public water system and must be supported by substantial evidence (which may include the public water system's UWMP). Water supply verification should require a showing of "real" water as a condition of final subdivision map approval.

The Association of Bay Area Governments

A key regional agency involved in forecasting growth in the SFPUC service area is the Association of Bay Area Governments (ABAG). An advisory organization, ABAG is the official regional planning agency of the San Francisco Bay Region; its mission is to strengthen cooperation and coordination among local governments. Since its inception (1961), ABAG has examined regional issues such as housing, transportation, economic development, and the environment. ABAG members include the nine Bay-Area counties and 99 of 101 cities within the Bay Area, and represent nearly all of the Bay Area's population. ABAG's biennial *Projections* series provides long-term population and economic forecasts through a series of computer models. ABAG's model results are relied on by transportation and air quality agencies, water agencies, local governments, and others. ABAG forecasts are cited by many jurisdictions in their general plans, and were selected by many SFPUC water customers to forecast future water demand.

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4 Codified at California Water Code Sections 10631, 10656, 10910, 10911, 10912, and 10915.

5 Large projects include residential developments with more than 500 units; retail uses with more than 500,000 square feet of floor space; office buildings with more than 250,000 square feet of floor space; hotels or motels with more than 500 rooms; industrial uses occupying more than 40 acres or having more than 650,000 square feet of floor area; and mixed-use projects that include any use or combination as large as the above uses.

6 Codified at California Business and Professional Code Section 65867.5 and Government Code Sections 66455.3 and 66473.7.

7 A large subdivision is defined as more than 500 dwelling units.

Approach to Analysis and Chapter Organization

On the basis of the CEQA definition of growth stated above, assessing the growth-inducement potential of the WSIP involves answering the question: *Would construction and/or operation of planned improvements proposed as part of the WSIP directly or indirectly support economic or population growth or residential construction?*

By removing the lack of a reliable water supply and supply system as one potential obstacle to growth within the SFPUC service area, the WSIP would have an indirect growth-inducing effect according to the CEQA definition above.[8] Implementation of the WSIP would improve supply reliability for existing water system customers and meet customer purchase requests through the year 2030, as discussed in Chapter 3. Meeting additional purchase requests would provide water to serve additional residential and business customers in the existing SFPUC service area. A variety of factors influence new development or population growth in the area served by SFPUC water, including economic conditions of the region, adopted growth management policies in the affected communities, and the availability of adequate infrastructure (e.g., water service, sewer service, public schools, and roadways, etc.), with economic factors generally the lead driver. While water service is only one of many factors affecting the growth potential of a community, it is one of the chief public services needed to support urban development, and lack of a reliable water supply as well as a service capacity deficiency could constrain future development.

Pursuant to CEQA, growth *per se* is not assumed to be necessarily beneficial, detrimental, or of little significance to the environment; it is the secondary, or indirect, effects of growth that can cause adverse changes to the physical environment. The indirect effects of population and/or economic growth and accompanying development can include increased demand on community services and public service infrastructure; increased traffic and noise; degradation of air and water quality; and conversion of agricultural land and open space to urban uses. Local land use plans (e.g., general plans and specific plans) of the jurisdictions served by the SFPUC establish land use development patterns and growth policies that are intended to allow for the orderly expansion of urban development supported by adequate public services, including water supply, roadway infrastructure, sewer service, and solid waste service. Local jurisdictions conduct CEQA environmental review on their general and specific plans to assess the secondary effects of their planned growth. A project that would induce growth that is inconsistent with local land use plans and policies could indirectly cause adverse environmental impacts, as well as impacts on public services, that the local land use jurisdictions have not previously addressed in the CEQA review of their land use plans and development proposals.

[8] The WSIP would not *directly* induce growth as it does not involve the development of new housing to attract additional population, nor would it indirectly induce growth by establishing substantial permanent or even short-term construction employment opportunities that could stimulate population growth. Construction of the WSIP projects is not expected to involve employment opportunities substantially beyond what would normally be available to construction workers in the area, and workers are expected to be drawn from the local labor pool.

To assess the growth inducement potential of the WSIP and characterize the secondary effects of growth, this chapter also investigates the following questions:

- *What assumptions did the SFPUC and its wholesale customers make regarding growth (population and employment) in projecting future (2030) total water demand and customer purchases from the SFPUC?*
- *Are these assumptions consistent with forecasts prepared and used by local and regional planning agencies (e.g., ABAG, counties and cities) within the service area? What are the growth trends in the Bay Area region?*
- *Are there any notable inconsistencies between the population and employment forecasts used by the SFPUC and the wholesale customers and those of the local and regional planning agencies that suggest that the water supply planning efforts are inconsistent with land use planning efforts?*
- *Is the level of growth projected for 2030 consistent with that identified and planned for in existing adopted general plans?*
- *What are the potential environmental impacts (secondary effects) associated with growth projected to occur in the service area? Have these impacts been evaluated in previous CEQA review documents on existing general and specific plans?*
- *What mitigation measures and findings have the local jurisdictions adopted as part of approving their future growth plans?*

The issues raised in these questions are addressed through the following analyses (the section where the analyses can found is indicated in parentheses); a summary of the chapter's conclusions follows in Section 7.1.2.

- *SFPUC Projections (Section 7.2)*. Accurate demand projections are important in ensuring that future water supplies will be adequate while not surpassing the needs of planned growth. SFPUC and its customers used computer models to forecast future water demand. Section 7.2 presents an overview of the SFPUC water service area, and describes key factors (assumptions, inputs, and methodologies) used in estimating future demand that relate to growth and inform comparisons between water demand and land use planning projections. These factors include baseline population, methodology used to determine existing water usage by land use/account type, the current water supply agreement between the SFPUC and its wholesale customers, and assumptions regarding future land use patterns, water conservation and recycling, and water from other (non-SFPUC) sources through 2030. The demand estimates, in conjunction with estimates of savings from conservation and use of other water sources, provide the basis for the 2030 purchase estimates.
- *Growth Inducement Potential (Section 7.3)*. This section analyzes the WSIP's growth inducement potential: whether the demand to be met by the WSIP would be consistent with local plans and policies or could contribute to growth in the service area beyond that called for in the existing general plan. To gauge the consistency of the WSIP with growth planned in the jurisdictions served by the SFPUC, the analysis compares the growth assumed in the SFPUC projections with growth forecasts (a) developed by ABAG and (b) reflected in adopted land use plans in the service area. With respect to ABAG, this section also

describes ABAG's changing expectations about growth as reflected in its updated projections issued in 2002, 2003 and 2005.

- *Indirect Effects of Growth (Section 7.4)*. Growth (whether planned or unplanned) can cause environmental impacts. Section 7.4 describes the potential impacts of growth that could be supported, in part, by implementation of the WSIP. This section also identifies measures adopted to reduce, eliminate or otherwise mitigate the impacts of planned growth.

7.1.2 Summary of Conclusions

The following bullet items highlight the key findings of this chapter.

Service Area Characteristics, Growth Trends, and Policies

A review of historical growth trends of a selection of jurisdictions in the service area, based primarily on information in general plans and Bay Area Water Supply and Conservation Association (BAWSCA) profiles, shows that:

- Cities in the service area are largely urbanized, most having experienced their most rapid growth in the postwar decades through the 1970s.
- Milpitas and East Palo Alto have experienced high rates of growth more recently.
- San Francisco's population fluctuated somewhat but on average has been essentially stable over the past 50 years.
- Many jurisdictions cannot grow laterally and their general plans include policies to manage growth; many general plans identify strategies consistent with "smart growth" principles, such as encouraging infill development and the redevelopment of previously developed areas, as means to accommodate future growth.
- The SFPUC's wholesale customers vary widely, in a variety of ways: by size, overall demand projected for 2030, the change that the 2030 demand represents in absolute terms and as a percentage of 2001 demand, and the degree to which the customers depend on the SFPUC for their water supply. As such, the WSIP would remove growth obstacles to varying degrees within the service area.

Growth Assumptions Used to Develop 2030 Water Demand and Purchase Requests Compared with ABAG Growth Projections

As discussed in Sections 7.2.2 through 7.3.2, each SFPUC wholesale customer selected a published source for growth projections to use in developing its service area's projections for total water demand in 2030 and subsequently identified its estimated level of water purchase in 2030 from the SFPUC. The majority of customers (about two-thirds) selected the most current ABAG projections available at the time (*Projections 2002*); while the others (about one third) selected other published sources (such as Urban Water Management Plans) for their population growth projections. *Projections 2002* was used by for almost all of the employment growth projections. These customer-selected growth projections were compared to ABAG's most recent projections series, *Projections 2005*.

- The growth assumptions used to derive the 2030 water demand estimates and subsequently the water customer purchase requests from the SFPUC are generally consistent with the most recent ABAG projections for jurisdictions in the service area. For the most part, the analysis demonstrates that, compared to the forecasts in ABAG's *Projections 2005*, the customer-selected projections used to derive water demand in the wholesale and retail service areas indicate:
  - somewhat less growth in employment and population (fewer added jobs and residents) through 2030, due largely to the expectation of more existing jobs in the area in 2005 than ABAG's *Projections 2005* estimates
  - more total employment in 2030 than ABAG's *Projections 2005* projects by about 5 percent overall
  - less total population in 2025 and 2030 by about 5 percent overall
- The growth that would be supported by the WSIP is generally consistent with current ABAG 2005 projections for jurisdictions in the service area. Because of differences in geographic area covered by most of the water customers and the jurisdictions they serve, they do not match exactly, and a few cannot be reasonably compared.

Growth Assumptions Used to Develop 2030 Water Demand and Purchase Requests Compared with General Plan Growth Assumptions

As discussed in Section 7.3.3, the existing, adopted general plans for cities within the SFPUC wholesale customer service area and for San Francisco were reviewed to compare the level of growth projected in these land use plans with that reflected in the growth assumptions used in the WSIP planning studies. The key findings of this review are:

- The horizon years for projections in the general plans considered in the analysis vary from 2005 to 2025; none of the plans extend out to 2030, which is the WSIP planning horizon. Due to the WSIP's longer planning horizon, in some areas the WSIP could support a degree of growth that has not been addressed in adopted land use plans.
- Comparison of the growth assumed in the development of the WSIP demand projections with growth forecasted in locally adopted land use plans indicates that much of the WSIP-related growth has been addressed in the adopted plans. A comparison of general plan projections with those selected by the water customers shows that:
  - The population growth assumed in the demand projections for most (15 of 19) of the water customers for which comparable general plan projections are available is similar to the growth anticipated in the general plans of the cities served by them.
  - The employment growth assumed in the demand projections for most (11 of 16) of the water customers for which comparable general plan projections are available are

generally consistent with (within 20 percent of) the employment growth anticipated in the general plans of the cities served by them. This general consistency was found despite the extraordinary job growth that occurred as a result of the economic boom in the 1990s, which was substantially reflected in employment projections used for the water demand projections (*Projections 2002)* but was not reflected to the same degree in earlier projections series used for many of the general plan employment estimates.

– The employment growth assumed for four wholesale customers is substantially greater (between 20 and 70 percent greater) than the growth anticipated in the respective general plans, due to the economic boom that occurred in the 1990s in the Bay Area, which affected various jurisdictions differently. This difference in growth assumptions suggests that a degree of commercial and industrial growth assumed in the demand projections is not fully addressed in the respective general plans.

- The general plans of jurisdictions in the SFPUC service area vary substantially in age, whereas the ABAG projections are updated every two years.

Indirect Effects of Growth

The indirect effects of growth expected in the general plans of jurisdictions in the service area have been identified in the EIRs prepared for those plans. A table of impacts commonly identified as significant and unavoidable and those commonly identified as significant but mitigable is presented in Section 7.4.

- The most commonly identified significant and unavoidable impacts of growth are:
  - Increased traffic congestion
  - Deterioration of air quality
  - Cumulative effects of increased air pollutant emissions and noise
- Mitigation measures have been adopted by local jurisdictions as part of their general plan approval processes to address the secondary effects of planned growth. These measures are summarized in Appendix E.
- Two cities identified increased demand for potable water supply as a significant and unavoidable effect of growth; the WSIP would address this issue in those two cities.
- Overriding considerations commonly adopted by the decision-making bodies in adopting their general plans include the following:
  - Accommodation of growth in an orderly, fiscally sound manner
  - Economic diversification and job generation
  - Creation of housing, furtherance of regional housing share objectives, and provision of affordable housing

  - Improvements of the local jobs/housing balance
  - Increased sales revenue and positive fiscal impact
  - Promotion of alternative modes of travel to reduce reliance on private vehicles
  - Establishment of policies to preserve natural areas and open space lands

- For many cities that receive water from the SFPUC regional system, the supply to be provided under the WSIP supports and is consistent with the planned growth reflected in their existing adopted general plans. For other communities, it appears that the WSIP supply (in combination with other supply sources available to those communities), could serve a level of growth beyond that identified in the existing general plans. In those cases, secondary effects of such growth could include impacts related to increased density and impacts related to development of new land areas.

  - Density related impacts could include, e.g., increased traffic congestion, air pollution, traffic noise, construction noise, and demand on public services.
  - Land area related impacts could include, e.g., loss of open space and agricultural land, loss of wildlife habitat, potential impacts on cultural resources, and interference with groundwater recharge and degradation of water quality due to increases in impervious surface area.

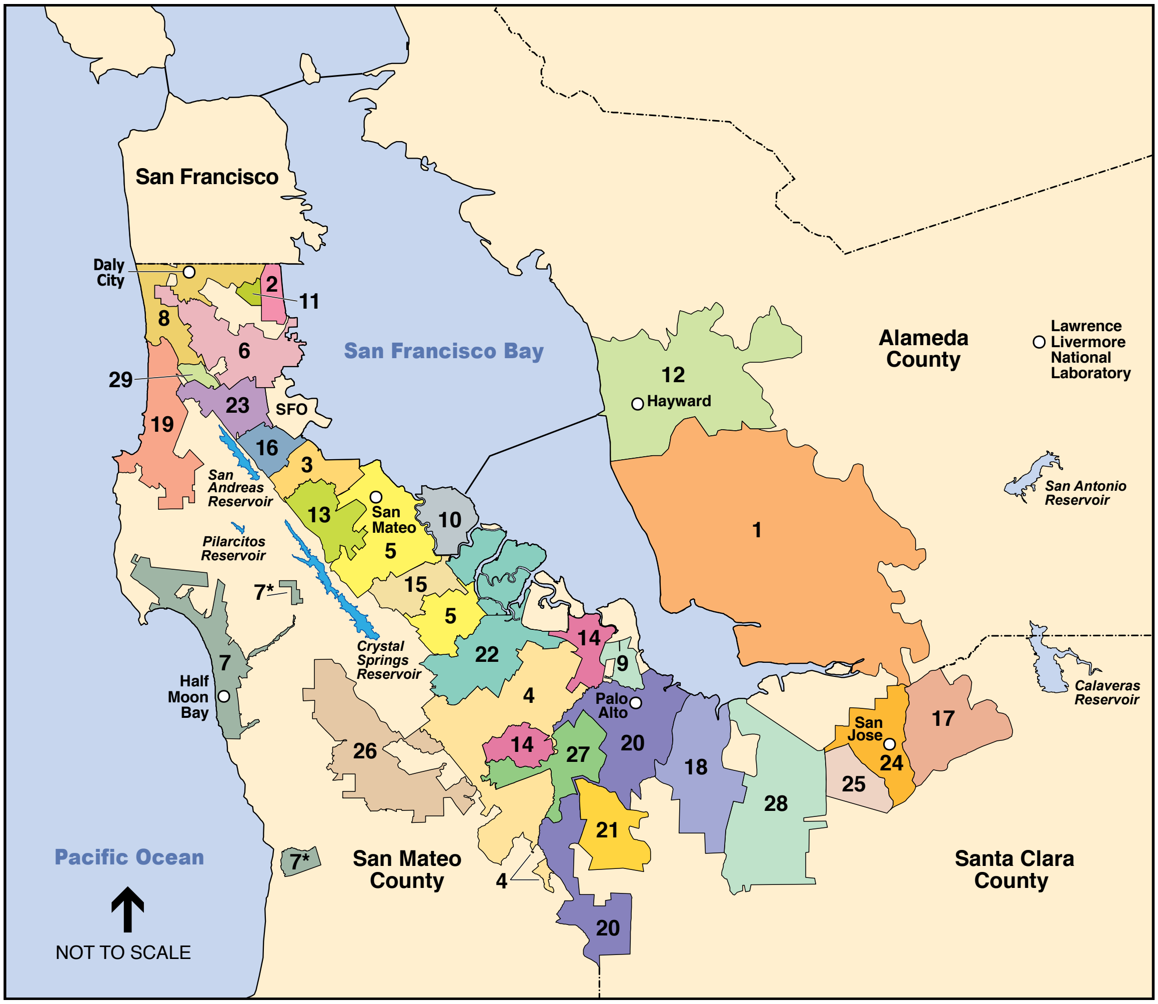
7.2 SFPUC Regional Water System: Customers and Water Demand Projections

7.2.1 SFPUC Service Area

The SFPUC serves retail customers in San Francisco and in Tuolumne County, and primarily wholesale customers in San Mateo, Santa Clara, and Alameda Counties (see Chapter 3, Program Description). **Figure 7.1** shows the SFPUC regional water service area, including the wholesale customers. **Figure 7.2** shows the city and county boundaries of the jurisdictions served by the wholesale customers. **Table 7.1** shows the jurisdictions served by the SFPUC's 27 wholesale customers.[9] Some of the water districts encompass more than one jurisdiction; Table 7.1 shows the percentage of the water district that is located within applicable jurisdictional boundaries. For about half the wholesale customers, the SFPUC is one of several sources of supply.[10]

9 There are 27 wholesale customers, but California Water Service Company (CWS), which is counted as one customer, serves three distinct subgroups—Bear Gulch District, Mid-Peninsula District, and South San Francisco District—which are tracked separately in the SFPUC reports. One former wholesale customer, Los Trancos County Water District, which was purchased by CWS and is now part of the Bear Gulch District, is also tracked separately in most of the SFPUC reports. Therefore, Table 7.1 lists 30 rather than 27 wholesale customer entities.

10 In 2001, the base year used for the demand projections, 14 of the 27 wholesale customers relied on other supply sources for at least some of their water (URS, 2004a).



Legend
(Wholesale customers and members of Bay Area Water Supply and Conservation Agency)

1 Alameda County Water District
2 City of Brisbane
3 City of Burlingame
4 CWS – Bear Gulch
5 CWS – Mid-Peninsula
6 CWS – South San Francisco
7 Coastside County Water District
8 City of Daly City
9 City of East Palo Alto
10 Estero Municipal Improvement District
11 Guadalupe Valley Municipal Improvement District
12 City of Hayward
13 Town of Hillsborough
14 City of Menlo Park
15 Mid-Peninsula Water District
16 City of Millbrae
17 City of Milpitas
18 City of Mountain View
19 North Coast County Water District
20 City of Palo Alto
21 Purissima Hills Water District
22 City of Redwood City
23 City of San Bruno
24 City of San Jose (North)
25 City of Santa Clara
26 Skyline County Water District
27 Stanford University
28 City of Sunnyvale
29 Westborough Water District

* Portions of Coastside County Water District not served by the SFPUC regional water system.

NOTE: For the purposes of this PEIR, the California Water Service (CWS) Company is a single wholesale customer with three different water service districts.

SFPUC Water System Improvement Program . 203287

SOURCE: BAWSCA, 2006a

Figure 7.1 (Revised)
SFPUC Water Service Area -
San Francisco and SFPUC Wholesale Customers

SOURCE: US Census Bureau, 2005

SFPUC Water System Improvement Program Program EIR, Case No. 2005.0159E . 203287

Figure 7.2
City/County Jurisdictions Served by SFPUC and Its Wholesale Customers

TABLE 7.1
JURISDICTIONS SERVED BY SFPUC WHOLESALE CUSTOMERS

Wholesale Customer	Jurisdictions Served (Percentage of Wholesale Customer Service Area in Jurisdictional Boundary [each totals 100%[a]])
Alameda County Water District	Fremont (65%) Newark (14%) Union City (21%)
City of Brisbane	Brisbane (100%)
City of Burlingame	Burlingame (98%) Other Unincorporated San Mateo County (2%)
CWS–Bear Gulch District[b]	Atherton (11%) Menlo Park (28%) Portola Valley (6.7%) Woodside (6.6%) Other Unincorporated San Mateo County (47.7%)
CWS–Mid-Peninsula District[b]	San Mateo (77%) San Carlos (23%)
CWS–South San Francisco District[b]	South San Francisco (91%) Colma (2%) Daly City (0.1%) Other Unincorporated San Mateo County (7%)
Coastside County Water District	Half Moon Bay (65%) Half Moon Bay Unincorporated (35%)
City of Daly City	Daly City (100%)
City of East Palo Alto	East Palo Alto (100%)
Estero MID[c]	Foster City (90%) San Mateo (10%)
Guadalupe Valley MID[c]	Brisbane[d] (100%)
City of Hayward	Hayward (100%)
Town of Hillsborough	Hillsborough (100%)
Los Trancos County Water District[e]	Portola Valley (10%) Other Unincorporated Mateo County (90%)
City of Menlo Park	Menlo Park (100%)
Mid-Peninsula Water District	Belmont (95%) Other Unincorporated San Mateo County (4%) San Carlos (1%)
City of Millbrae	Millbrae (100%)
City of Milpitas	Milpitas (100%)
City of Mountain View	Mountain View (100%)
North Coast County Water District	Pacifica (98%) Other Unincorporated San Mateo County (2%)
City of Palo Alto	Palo Alto (100%)
Purissima Hills Water District	Los Altos Hills (96.8%) Other Unincorporated Santa Clara County (3.2%)
City of Redwood City	Redwood City (91%) San Carlos (0.1%) Woodside (5.9%) Other Unincorporated San Mateo County (3.3%)
City of San Bruno	San Bruno (98%) Other Unincorporated San Mateo County (2%)
City of San Jose (North)	San Jose (100%)
City of Santa Clara	Santa Clara (100%)
Skyline County Water District	Woodside (63.6%) Other Unincorporated San Mateo County (36.4%)
Stanford University	Not applicable[f]
City of Sunnyvale	Sunnyvale (100%)
Westborough Water District	South San Francisco (100%)

a Due to rounding, totals may not be exactly 100%.
b CWS = California Water Service Company.
c MID = Municipal Improvement District.
d Guadalupe Valley MID is within the city of Brisbane.
e Los Trancos County Water District was purchased by CWS and is now part of the CWS–Bear Gulch District. Jurisdictions served are shown here for informational purposes.
f The Stanford University water system serves the Stanford campus only, primarily the central campus, rather than any distinct jurisdictions. The central campus is located in unincorporated Santa Clara County adjacent to the city of Palo Alto.

SOURCE: URS, 2004a.

Because water demand is projected to remain constant from 2000 to 2030 for the generally small and discrete retail customers located outside San Francisco (e.g., Lawrence Livermore National Laboratory, the community of Sunol, and the Groveland Community Services District), this analysis assumes that the potential for the WSIP to induce growth in these areas is negligible; therefore, the analysis focuses on the program's growth-inducement potential in the Bay Area in the areas served by the SFPUC's wholesale customers and in San Francisco.

SFPUC Wholesale Customers' Master Sales Agreement

As described in Chapter 2, Existing Regional Water System, the SFPUC holds contractual agreements with its wholesale customers. Wholesale water rates are set in accordance with the 1984 Settlement Agreement and Master Sales Water Contract (Master Sales Agreement) between the City and County of San Francisco and each of the wholesale customers (City and County of San Francisco, et al., 1984). The current master contract expires in 2009. Under the Master Sales Agreement, the City and County of San Francisco is required to supply up to 184 mgd (the "Supply Assurance") on an annual average basis to the wholesale customers collectively, subject to reductions in the event of a drought, water shortage, earthquake, or other natural disaster, and for rehabilitation and maintenance of the system. The agreement requires that wholesale customers employ best efforts to use all sources of water owned or controlled by them, including groundwater. The SFPUC and each of the wholesale customers, except for San Jose and Santa Clara, have negotiated individual supply assurance contracts (individual supply assurances) that cumulatively total 184 mgd. San Jose and Santa Clara do not have supply assurance contracts with the SFPUC.

In general, the individual supply assurances specify the amount of water a customer is entitled to purchase from the SFPUC according to a multi-step formula and multi-step vesting process. The contracts with Hayward and the Estero Municipal Improvement District (Estero MID) are exceptions to this type of contract, as they do not specify a quantified limit on purchases from the SFPUC. A specified amount of the total 184 mgd is set aside for growth in consumption by Hayward and Estero MID.[11] If the combined usage by Hayward and Estero MID exceeds this amount, the Master Sales Agreement provides a method for proportional reduction in the other water customers' supply guarantee (Bay Area Water Users Association [BAWUA], 1993; BAWSCA, 2006b).

The individual supply assurances for the wholesale customers under the current Master Sales Agreement are shown in Appendix E, Section E.1. Of the 23 wholesale customers that have individual supply assurance contracts with a specified quantity, 12 submitted 2030 purchase estimates (discussed in Section 7.2.2, below) that exceed their current individual supply assurance, while 11 submitted purchase estimates that are less than or equal to their current individual supply assurance. Consistent with CEQA requirements, the existing base year (2001) demand, not the supply assurances, is considered the baseline for the analysis presented in this

[11] A 1993 memorandum from BAWSCA (then BAWUA) to its member agencies regarding allocation of the supply assurance indicated that the combined usage for Hayward and Estero MID at the time was 21.782 mgd, and that an additional 6.2 mgd was set aside to allow for growth in Hayward and Estero MID consumption (BAWUA, 1993) for a total of 28 mgd. The current BAWSCA annual survey (BAWSCA, 2006b) shows combined usage in FY 2004/2005 of 24.10 mgd for Hayward and Estero MID and a reserve amount of 3.9 mgd (equaling the same combined amount allocated for Hayward and Estero MID (28 mgd) as in the 1993 memorandum).

chapter. The information on current supply assurances is presented for informational purposes. BAWSCA estimates that, excluding Santa Clara and San Jose (which, as noted, do not have supply assurance contracts), wholesale customer purchases from the SFPUC will approach the current 184 mgd wholesale customer supply assurance by about 2020, and that, including San Jose and Santa Clara, purchases from the SFPUC will approach 184 mgd by about 2008 (BAWSCA, 2006b).

7.2.2 Demand Projections

Future water demand projections for both retail and wholesale customers were developed using end-use demand models that break down total water use, by water service account, to specific end uses such as toilets, faucets, and irrigation. Projections for the wholesale service area were developed in close consultation with the wholesale customers, who provided critical inputs to the demand model – including selection of the source of population and employment projections to be used – and subsequently submitted statements concurring with the demand projections. Most (about two-thirds) of the customers selected ABAG's *Projections 2002* as the source of population projections used in their demand model;[12] other customers selected the BAWSCA annual survey, urban water management plans, or city planning sources for growth projections. Projections for San Francisco were developed based on information provided by the San Francisco Planning Department.

To develop yearly projections to 2030, the population and employment increase for each five- or ten-year increment was divided evenly and applied yearly throughout the five- or ten-year period to form a linear yearly projection between increments. The selected projections were then input into the demand model, which applied the growth rate from the selected projection to growth in the applicable water customer accounts. In general, population projections were used as the source of growth rates for residential, institutional, and other miscellaneous water accounts and employment projections were applied to commercial and industrial accounts.

Table 7.2 shows the 2030 water demand projections for the SFPUC wholesale and retail service area. The 2030 demand projections take into account expected growth in population and employment, the influence of plumbing codes (which include water efficiency requirements), and assumptions about rates of water fixture replacement. Thus, the 2030 demand projections factor in some "passive" water savings due to plumbing code changes, as well as the effects of conservation savings accrued prior to the base year. As part of WSIP planning, the SFPUC also undertook studies to determine the potential for continuation of existing conservation programs as well as additional conservation programs and recycled water projects that could be implemented to offset demand for potable water supplies. These studies, and the wholesale and retail service area demand studies, are described in detail in Appendix E, Section E.2.

[12] Because *Projections 2002* provides forecasts only to 2025, population and employment projections for 2025-2030 were estimated using the 2020-2025 population/employment growth rate, which was applied to the 2025 estimate and carried forward linearly at that rate to 2030.

TABLE 7.2
SUMMARY OF 2030 DEMAND PROJECTIONS, WATER SUPPLY ASSUMPTIONS, AND SFPUC PURCHASE ESTIMATES

	A	B	C	D	E	F	G	H	I	J
Customer	**2030 Projected Demand (with Plumbing Code Savings) (mgd[a])**	**2030 Projected Conservation Savings (mgd[a])**	**2030 Demand Adjusted for Conservation (mgd[a])**	**2030 Projected Use of Recycled Water (mgd[a])**	**2030 Projected Use of Ground-water Sources (mgd[a])**	**2030 Projected Use of Other Surface Water Sources (mgd[a])**	**2030 Projected Demand Adjusted for Use of Other Sources and Conservation (mgd[a])**	**2030 Purchase Estimates (mgd[a])**	**Percent of Total 2030 Demand (with Plumbing Code Savings) met by SFPUC Purchases**	**Percent of 2030 Demand Adjusted for Conservation met by SFPUC Purchases**
			(A - B)				**(C - D - E - F)**		**(H/A)**	**(H/C)**
Alameda County Water District	59.3	3.16	56.14	1.40	13.98	27.00	13.76	13.76	23%	25%
City of Brisbane	0.93	0.04	0.89				0.89	0.89	96%	100%
City of Burlingame	4.9	0.20	4.7				4.70	4.70	96%	100%
CWS–Bear Gulch District[b,c]	14.06	0.93	13.13			1.37	11.76	11.76	84%	90%
CWS–Mid-Peninsula District[b]	18.1	0.86	17.24				17.24	17.24	95%	100%
CWS–South San Francisco District[b]	9.9	0.56	9.34		1.37		7.97	7.97	81%	85%
Coastside County Water District[d]	3.2	0.18	3.02		0 – 0.30	0 – 0.48	2.24 – 3.02	2.24 – 3.02	70 – 94%	74 – 100%
City of Daly City[e]	9.1	0.44	8.66		1.34 – 3.76		4.90 – 7.32	4.90 – 7.32	54 – 80%	57 – 85%
City of East Palo Alto	4.8	0.16	4.64				4.64	4.64	97%	100%
Estero MID[f]	6.8	0.00 – 0.60	6.2 – 6.8				6.20 – 6.80	6.20 – 6.80	91 – 100%	100%
Guadalupe Valley MID[f]	0.81	0.10	0.71				0.71	0.71	88%	100%
City of Hayward	28.7	0.76	27.95				27.95	27.95	97%	100%
Town of Hillsborough	3.9	0.20	3.7				3.70	3.70	95%	100%
City of Menlo Park	4.7	0.16	4.54				4.54	4.54	97%	100%
Mid-Peninsula Water District	3.8	0.10	3.70				3.70	3.70	97%	100%
City of Millbrae[g]	3.3	0.08 – 0.11	3.19 – 3.27				3.19 – 3.22	3.19	97%	99 – 100%
City of Milpitas	17.7	0.61	17.09	1.77		7.13	8.19	8.20	46%	48%
City of Mountain View	14.8	0.24 – 1.21	13.59 – 14.56		0.05	1.30	12.24 – 13.21	13.20	89%	91 – 97%
North Coast County Water District	3.8	0.00 – 0.19	3.62 – 3.80				3.62 – 3.80	3.61 – 3.80	95 – 100%	100%
City of Palo Alto[h]	14.4	0.60	13.76	0.76			13.00	13.00	91%	94%
Purissima Hills Water District	3.3	0.08	3.22				3.22	3.22	98%	100%
City of Redwood City[i]	13.4	0.59 – 1.02	12.38 – 12.81	0 – 1.00			11.38 – 12.81	11.60 – 12.60	87 – 94%	94 – 98%
City of San Bruno	4.5	0.19	4.32				4.32	4.30	96%	100%
City of San Jose (North)[j]	6.5	0.16	6.34				6.34	6.34	98%	100%
City of Santa Clara	33.9	1.00	32.90	4.00	19.99	4.00	4.91	4.90	14%	15%
Skyline County Water District	0.31	0.01	0.30				0.30	0.30	97%	100%
Stanford University	6.8	0.70	6.10			1.90	4.20	4.20	62%	69%
City of Sunnyvale	26.8	0.70	26.10	1.50	2.60	9.90	12.10	12.10	45%	46%
Westborough Water District[k]	1.03	see note k	1.03				1.03	1.03	100%	100%
Total, Wholesale Service Area	**324**	**13 – 15**	**308 – 311**	**9.4 – 10.4**	**39.3 – 42.1**	**52.6 – 53.1**	**203 – 209**	**204 – 209**	**63 – 65%**	**66 – 67%**
SFPUC Retail Service Area[l]	**93.4**	**0 – 4**	**89.4 – 93.4**	**0 – 4**	**2.5 – 4.5**	**0**	**81 – 91**	**80 – 91**	**86 – 97%**	**89 – 97%**
TOTAL	**417**	**13 – 19**	**398 – 404**	**9.4 – 14.4**	**41.8 – 46.6**	**52.6 – 53.1**	**284 – 300**	**284 – 300**	**68 – 72%**	**71 – 74%**

NOTE: Numbers may not sum due to rounding.
a mgd = million gallons per day.
b CWS = California Water Service Company.
c CWS–Bear Gulch District includes the former Los Trancos County Water District.
d The upper range purchase estimate assumes loss of all local water sources (surface water and groundwater) and the lower range estimate assumes continuation of local sources; both estimates assume Level B water conservation.
e The purchase estimate range reflects a range of potential groundwater usage established under a pilot project, from the sustainable yield (3.76 mgd) to the lowest annual production yield (1.34 mgd), according to Daly City's best estimate of 2030 water purchases (SFPUC, 2004).
f MID = Municipal Improvement District.
g 2030 conservation savings is based on URS 2004c and the City's UWMP as confirmed by the City (Popp, 2007).
h 2030 demand and conservation savings are based on information provided by the City of Palo Alto to the SFPUC (City of Palo Alto, 2005a).
i In November 2005, Redwood City informed the SFPUC that it would be purchasing its low-range estimate of 11.6 mgd due to anticipated implementation of 1 mgd of recycled water in 2030 (City of Redwood City, 2005a). The high-range purchase estimate total of 300 mgd published in URS 2004b remains the SFPUC 2030 purchase estimate total for planning purposes, to be consistent with the previous and ongoing WSIP studies. The purchase estimate range originally submitted apparently reflects the average of the City's estimated conservation savings range plus the originally estimated range of recycled water use.
j Portion of north San Jose only.
k Demand and purchase estimates are based on Westborough Water District's 2005 UWMP, as requested by the District in a letter to the SFPUC (Westborough Water District, 2007). The UWMP discusses ongoing and planned future demand management programs but does not quantify conservation savings in relation to the demand and purchase estimate. The District's original estimate of water purchases indicated conservation savings of 0.020 mgd (SFPUC 2004).
l The low range of the SFPUC retail customer purchase estimate reflects the identified groundwater, recycled water, and conservation programs totaling 10 mgd in San Francisco that are included as part of the WSIP proposed water supply option.

SOURCES: URS, 2004a; URS, 2004b; URS, 2004c; URS, 2006; SFPUC, 2004; SFPUC, 2007; City of Palo Alto, 2005a; Popp, 2007; City of Redwood City, 2005a; Westborough Water District, 2005 ; Westborough Water District 2007.

2030 Purchase Estimates

Each wholesale customer is responsible for its own water management planning decisions and for determining the percentage of its future water demand that it desires to meet with SFPUC supplies. Following completion of 2030 demand modeling and the conservation potential and recycled water potential studies, the wholesale customers considered conservation potential and other water supply sources and submitted purchase estimates for SFPUC water for 2030 (URS, 2004b). The purchase estimates include the effects of continuing current conservation programs and additional conservation programs that the SFPUC and/or its wholesale customers plan to implement, as well as the use of recycled water and other supply sources (see Table 7.2). Conservation and demand management programs are an integral component of water suppliers' supply portfolio, as shown in Table 7.2. Table 7.2 shows the percentage of total 2030 demand met by purchases from the SFPUC for each customer and also shows the percentage of all "physical" water supply sources (including recycled water) met by SFPUC purchases (i.e., the percentage of demand after conservation savings are taken into account). As shown, purchases from the SFPUC in 2030 of 300 mgd represent approximately 72 percent of the total SFPUC service area demand (with plumbing code savings) and about 74 percent of demand adjusted for additional conservation.[13] **Figure 7.3** depicts historical water deliveries for the wholesale and retail service areas as well as the projected demand on the SFPUC system (i.e., estimated purchases) to 2030.

Change in Water Demand and Purchases from Base Year

Table 7.3 shows the base-year demand estimates for each wholesale customer and the retail service area (2001 and 2000, respectively), the 2000/2001 purchases from the SFPUC, and the change in demand and purchases forecasted for 2030. The base-year demand estimate is based on actual consumption data (adjusted for unaccounted-for water[14]) and therefore reflects the effects of conservation programs implemented to date. As Table 7.3 shows, overall customer demand (wholesale and retail customers) in the service area is expected to increase by about 51 mgd in 2030 and purchases from the SFPUC regional water system are expected to increase by about 24-39 mgd from the base year 2000/2001. As shown in the table, essentially no change is projected in total demand for the SFPUC retail service area, which is predominantly the City and County of San Francisco. For purposes of planning future 2030 water delivery requirements for the regional system, the SFPUC selected the high range purchase estimates of 300 mgd as the target goal for the average annual water delivery by 2030. This is an increase of approximately 39 mgd from the 2001 deliveries and 35 mgd from the current normal-year average annual demand estimates.

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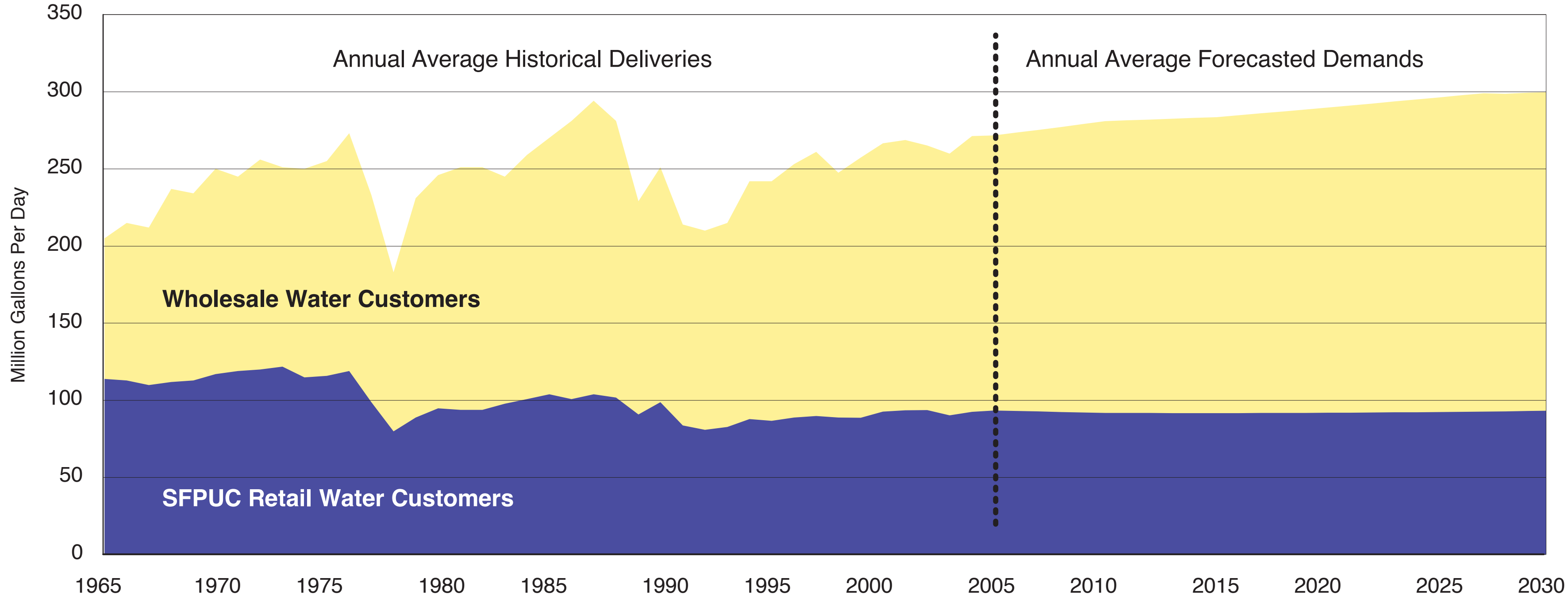
[13] The demand studies also calculated the effects of plumbing codes (which include efficiency requirements) on water savings, and found that a total savings of 35.7 mgd is expected to be achieved in 2030 as a result of plumbing code requirements. Table E.2.4 in Appendix E.2 shows 2030 plumbing code savings for the retail service area and each wholesale customer.

[14] Unaccounted-for water refers to the difference between total water produced in a system and total water billed to customers (i.e., water consumed). Unaccounted-for water includes water delivery system leaks, water not billed or tracked in the system, such as water used for fire fighting and system flushing, and any unauthorized use.



SOURCE: SFPUC, 2005

SFPUC Water System Improvement Program . 203287

Figure 7.3

Total SFPUC Water System Demands:
Historical and Projected Water Purchases

TABLE 7.3
SUMMARY OF BASE-YEAR AND PROJECTED 2030 DEMAND AND PURCHASE ESTIMATES

Customer	Base-Year (2001) Demand Estimate (mgd[a])[b]	Fiscal Year 2001/2002 Purchases from the SFPUC (mgd[a])	Percent of 2001 Demand Met by Purchases from the SFPUC[c]	2030 Projected Demand (with Plumbing Code) (mgd[a])	Projected Change in Demand from 2001 (mgd[a])	Projected Percent Change in Demand from 2001	2030 Purchase Estimates (mgd[a])	Change in Water Purchases from the SFPUC 2001–2030 (mgd[a])	Percent Change in Purchases 2001–2030 (mgd[a])
Alameda County Water District	51.1	11.99	24.3%	59.3	8.20	16%	13.76	1.77	15%
City of Brisbane	0.44	0.39	100%	0.93	0.49	111%	0.89	0.50	128%
City of Burlingame	4.8	4.64	100%	4.9	0.12	3%	4.70	0.06	1%
CWS–Bear Gulch District[d]	13.4	11.12	90.6%	13.9	0.48	4%	11.60	0.48	4%
CWS–Mid-Peninsula District[d]	17.2	16.75	100%	18.1	0.94	5%	17.24	0.49	3%
CWS–South San Francisco District[d]	8.9	7.56	88.9%	9.9	1.00	11%	7.97	0.41	5%
Coastside County Water District	2.6	1.8	70.3%	3.2	0.63	25%	2.24 – 3.02	0.44 – 1.22	24 – 68%
City of Daly City	8.7	5.08	63.6%	9.1	0.44	5%	4.90 – 7.32	-0.18 – 2.24	-4 – 44%
City of East Palo Alto	2.5	2.04	100%	4.8	2.30	92%	4.64	2.60	127%
Estero MID[e]	5.8	5.62	100%	6.8	0.98	17%	6.20 – 6.80	0.58 – 1.18	10 – 21%
Guadalupe Valley MID[e]	0.32	0.3	100%	0.81	0.49	153%	0.71	0.41	138%
City of Hayward	19.3	17.61	100%	28.7	9.40	49%	27.95	10.34	59%
Town of Hillsborough	3.7	3.56	100%	3.9	0.20	5%	3.70	0.14	4%
Los Trancos County Water District[f]	0.11	0.11	100%	0.14	0.03	32%	0.16	0.05	45%
City of Menlo Park	4.1	3.57	96%	4.7	0.61	15%	4.54	0.97	27%
Mid-Peninsula Water District	3.7	3.46	100%	3.8	0.15	4%	3.70	0.24	7%
City of Millbrae	3.1	2.47	100%	3.3	0.17	5%	3.19	0.72	29%
City of Milpitas	12.0	6.83	59.3%	17.7	5.74	48%	8.20	1.37	20%
City of Mountain View	13.3	10.97	89.4%	14.8	1.53	12%	13.20	2.23	20%
North Coast County Water District	3.6	3.45	100%	3.8	0.17	5%	3.61 – 3.80	0.16 – 0.35	5 – 10%
City of Palo Alto[g]	14.2	13.19	99.4%	14.4	0.20	1%	13.00	-0.19	-1%
Purissima Hills Water District	2.2	2.2	100%	3.3	1.12	51%	3.22	1.02	46%
City of Redwood City[h]	11.9	11.64	100%	13.4	1.54	13%	11.60 – 12.60	-0.04 - 0.96	0 – 8%
City of San Bruno	4.4	2.7	64.4%	4.5	0.07	2%	4.30	1.60	59%
City of San Jose (North)[i]	5.2	4.42	96%	6.5	1.31	25%	6.34	1.92	43%
City of Santa Clara	25.8	3.84	16.2%	33.9	8.10	31%	4.90	1.06	28%
Skyline County Water District	0.17	0.17	100%	0.31	0.14	82%	0.30	0.13	76%
Stanford University	3.9	2.36	68%	6.8	2.94	76%	4.20	1.84	78%
City of Sunnyvale	24.8	9.69	43.6%	26.8	1.99	8%	12.10	2.41	25%
Westborough Water District[j]	1.02	1.02	100%	1.03	0.01	1%	1.03	0.01	1%
Total, Wholesale Service Area	**272**	**171**	**63%**	**324**	**52**	**19%**	**204 – 209**	**34 – 38**	**20 – 23%**
SFPUC Retail Service Area	**93.6**	**90**	**96%**	**93.4**	**-0.2**	**-0.2%**	**80 – 91**	**-10 – 1**	**-11 – 1%**
TOTAL	**366**	**261**	**71%**	**417**	**51**	**14%**	**284 – 300**	**24 – 39**	**9 – 15%**

NOTE: Numbers may not sum due to rounding.

a mgd = million gallons per day.
b Demand estimates shown here include unaccounted-for water, which is the difference between total water produced and total water billed to customers (water consumed). Unaccounted-for water includes fire fighting use, maintenance requirements, system flushing, leaks, and any unauthorized use.
c Based on URS 2004b.
d CWS = California Water Service Company.
e MID = Municipal Improvement District.
f The former Los Trancos County Water District is now part of CWS–Bear Gulch District; information presented here reflects information in background reports (URS, 2004a, 2004b).
g 2030 demand is based on information provided by the City of Palo Alto to the SFPUC (City of Palo Alto, 2005a).
h In November 2005, Redwood City informed the SFPUC that it would be purchasing its low range estimate of 11.6 mgd due to anticipated implementation of 1 mgd of recycled water in 2030 (City of Redwood City, 2005a). The high-range purchase estimate total published in URS 2004b of 300 mgd remains the SFPUC 2030 purchase estimate for planning purposes to be consistent with the previous and ongoing WSIP studies.
i Portion of north San Jose only.
j Demand and purchase estimates are based on Westborough Water District's 2005 UWMP, as requested by the district in a letter to the SFPUC (Westborough Water District, 2007). Base year demand shown here is based on 2001 total water production presented in the UWMP (which is equal to 2001-02 purchases from the SFPUC).

SOURCES: URS, 2004a; URS, 2004b; URS, 2006, City of Palo Alto, 2005a; City of Redwood City, 2005a, Westborough Water District, 2005; Westborough Water District 2007.

7.3 Growth Inducement Analysis

As discussed in the approach to analysis, above, evaluation of the WSIP's growth-inducing impacts involves considering whether the growth that would be supported by implementation of the WSIP is planned growth, anticipated by the land use planning agencies in the areas served by SFPUC water and reflected in their adopted general plans. This section compares the population and employment projections used in the water demand models (referred to herein as customer-selected projections) with the population and employment projections of the regional planning agency, ABAG, and the projections in the general plans (or related land use planning documents) of cities in the service area. The water customers' UWMPs (which have been prepared since the demand studies for the wholesale and retail service areas [URS, 2004a, Hannaford and Hydroconsult, 2004] were completed) are also compared with the population projections used in the demand model. These comparisons establish whether the employment and population growth that the SFPUC and its water customers used as a basis to derive their water demand projections is also forecasted by ABAG and anticipated by local jurisdictions in their general plans. The major conclusions of these comparisons are summarized in Section 7.1, above.

7.3.1 Analysis Assumptions

Use of Demand Model Population and Employment Assumptions

While the 2030 water demand projections are based on projected growth in residential and non-residential water accounts and cannot be directly correlated to demographic projections (because they include various customer-specific model inputs and adjustments), the customer-selected population and employment projections provide a basis of comparison with other growth forecasts for the area. The projections of employment and population selected by the wholesale customers and the SFPUC as the basis for growth in water accounts and future water demand are shown in **Table 7.4** and summarized by county in **Table 7.5**. Wholesale customers are sorted by county to facilitate the analysis of consistency of these projections with ABAG's projections.

Geographic Areas

ABAG projections are published for cities and their planning areas and for unincorporated county areas. The boundaries of most of the water customer service areas are not congruent with city boundaries (as shown in Table 7.1). Therefore, in order to evaluate the consistency of the customer-selected projections with ABAG projections, the ABAG city and county jurisdiction information had to be made to "fit" the wholesale customer service area boundaries. For purposes of comparing population and employment projections this analysis uses the following assumptions about the correspondence between wholesale customers' service areas and "ABAG jurisdictions."[15] Because there is no "perfect fit" between the wholesale customer service area

[15] For this analysis, ABAG's projections for subregional study areas, rather than projections for the cities as defined by their corporate limits, were used. The subregional study areas include the named incorporated city and any adjacent unincorporated area within the city's planning area.

TABLE 7.4
EMPLOYMENT AND POPULATION PROJECTIONS USED FOR WATER DEMAND ESTIMATES[a]

	Employment			Population		
	2001	**2030**	**% Change**	**2001**	**2030**	**% Change**
Alameda County						
Alameda County Water District	151,092	221,858	46.8%	316,523	379,931	20.0%
Hayward	87,473	113,843	30.1%	140,439	162,757	15.9%
Santa Clara County						
Milpitas	53,566	76,129	42.1%	62,756	88,841	41.6%
Mountain View	75,629	95,669	26.5%	71,160	81,670	14.8%
Palo Alto	105,432	114,224	8.3%	59,954	69,199	15.4%
Purissima Hills Water District	420	457	8.8%	6,032	6,763	12.1%
San Jose (North)	2,500	3,353	34.1%	11,098	13,686	23.3%
Santa Clara	138,163	177,027	28.1%	104,349	140,698	34.8%
Stanford University	na	na	na	19,738	27,924	41.5%
Sunnyvale	125,476	168,950	34.6%	131,365	151,610	15.4%
San Mateo County						
Brisbane	3,789	19,575	416.6%	3,174	4,606	45.1%
Burlingame	31,205	36,160	15.9%	30,154	34,967	16.0%
CWS – Bear Gulch District[b]	42,899	47,774	11.4%	66,197	73,719	11.4%
CWS – Mid-Peninsula District[b]	79,493	100,568	26.5%	120,856	139,834	15.7%
CWS – South San Francisco District[b]	49,288	62,344	26.5%	49,207	59,584	21.1%
Coastside County Water District	5,402	6,795	25.8%	18,319	24,973	36.3%
Daly City	26,941	33,981	26.1%	106,117	115,651	9.0%
East Palo Alto	3,289	8,673	163.7%	24,395	32,712	34.1%
Estero MID[c]	24,318	31,840	30.9%	34,568	40,096	16.0%
Guadalupe Valley MID[c]	4,442	5,668	27.6%	446	1,558	249.3%
Hillsborough	1,216	1,380	13.5%	11,618	12,708	9.4%
Los Trancos County Water District[d]	na	na	na	740	1,094	47.8%
Menlo Park	10,053	13,287	32.2%	12,153	13,655	12.4%
Mid-Peninsula Water District	14,705	22,221	51.1%	26,443	27,997	5.9%
Millbrae	6,664	8,009	20.2%	21,460	25,174	17.3%
North Coast County Water District	5,797	7,478	29.0%	40,457	47,829	18.2%
Redwood City	66,389	83,678	26.0%	81,888	93,535	14.2%
San Bruno	16,622	25,770	55.0%	40,727	48,229	18.4%
Skyline County Water District	224	224	0.0%	1,210	2,683	121.7%
Westborough Water District[e]	1,610	1,631	1.3%	13,056	14,300	9.5%
Total Wholesale Customers	**1,134,097**	**1,488,566**	**31.3%**	**1,626,599**	**1,937,983**	**19.1%**
San Francisco[f]	**638,840**	**795,400**	**24.5%**	**760,075**	**849,942**	**11.8%**
Total Area Served	**1,772,937**	**2,283,966**	**28.8%**	**2,386,674**	**2,787,925**	**16.8%**

[a] For all customers, a variable annual growth rate for population and employment was established for use in the model, based on annual interpolations from 5 or 10-year incremental demographic projections published by the selected projection sources.
[b] CWS = California Water Service Company.
[c] MID = Municipal Improvement District.
[d] The former Los Trancos County Water District is now part of CWS–Bear Gulch District; information presented here reflects information in background reports.
[e] Population estimates from Westborough Water District's 2005 Urban Water Management Plan.
[f] Estimates for 2001 for San Francisco were interpolated linearly for the PEIR analysis from estimates for 2000 and 2005 presented in the SFPUC technical memorandum (Hannaford and Hydroconsult, 2004).

SOURCE: Hannaford and Hydroconsult, 2004; URS, 2004a; Westborough Water District, 2005; Mundie & Associates, 2006.

TABLE 7.5
EMPLOYMENT AND POPULATION PROJECTIONS USED FOR WATER DEMAND ESTIMATES: SUMMARY BY COUNTY[a]

	Employment			Population		
	2001	2030	% change	2001	2030	% change
Wholesale Customers						
Alameda County	238,565	335,701	41%	456,962	542,688	19%
Santa Clara County	501,186	635,809	27%	466,452	580,391	24%
San Mateo County[b]	394,346	517,056	31%	703,185	814,904	16%
Total Wholesale Customers	1,134,097	1,488,566	31%	1,626,599	1,937,983	19%
Retail Customers						
San Francisco (City and County)[c]	638,840	795,400	25%	760,075	849,942	12%
Total	1,772,937	2,283,966	29%	2,386,674	2,787,925	17%

a Figures shown by county are the projections used in demand modeling for the water customers in that county, not the county as a whole. (The SFPUC serves a limited portion of Alameda County and Santa Clara County, which are predominately served by East Bay Municipal Utilities District and Santa Clara Valley Water District, respectively.)
b Population estimates for San Mateo County include updated figures for Westborough Water District from its Urban Water Management Plan.
c Estimates for 2001 for San Francisco interpolated linearly for the PEIR analysis from estimates for 2000 and 2005 presented in the SFPUC technical memorandum (Hannaford and Hydroconsult, 2004).

SOURCES: Hannaford and Hydroconsult, 2004; URS, 2004a; Westborough Water District, 2005; Mundie & Associates, 2006.

boundaries and the ABAG city and county jurisdiction boundaries, the population and employment projections will differ somewhat simply as a result of this imperfect geographic fit.

- Wholesale customers that serve most or all of one or more cities are assumed to correspond to those cities.
- Wholesale customers that serve most or all of a city plus smaller portions (i.e., less than half) of other cities and any unincorporated county areas are assumed to correspond only to the cities they serve most or all of.
- ABAG does not provide separate or segregable projections for most unincorporated county areas. Therefore, unincorporated areas served by wholesale customers are not captured in the correspondence established for this analysis. (The exception to this is unincorporated Half Moon Bay, for which ABAG provides separate projections and which is assumed, along with the incorporated city, to correspond to the Coastside County Water District service area).[16]

Refer to Appendix E, Section E.3 (Table E.3.A.2 of Attachment E.3.A) for the list of ABAG jurisdictions assumed in this analysis to correspond to respective water customer service areas and vice versa. The same correspondence between service areas and cities is also assumed for the comparison of water customer-selected projections with growth projections in the general plans of jurisdictions in the SFPUC service area.

16 Because this analysis uses ABAG's subregional study area projections, the projections may include population and employment forecasts for some portion of the unincorporated areas within a wholesale customer's service area. However, it is not known whether, or the degree to which, the unincorporated areas served by a wholesale customer encompass the same geography as the unincorporated areas within the corresponding ABAG subregional study area. With the exception of unincorporated Half Moon Bay, unincorporated areas are identified as "nonsegregable unincorporated areas" in Table E.3.A.1 of Appendix E (Section E.3, Attachment E.3.A) and are assumed not to be captured in the correspondence established for this analysis.

Time Periods

The base year for the wholesale water customers' projections is 2001 and the base year for the retail customer's (i.e., San Francisco's) projections is 2000. Projections for both the wholesale customers and San Francisco extend through 2030. ABAG projections are provided in five-year intervals (for the first year of each decade as well as mid-decade); *Projections 2003* and *Projections 2005* provide forecasts through 2030, but *Projections 2002* extends only through 2025.

To establish a consistent time period for comparison in this PEIR analysis, the customer-selected projections from the respective base years (2000 and 2001) through 2030 presented in the SFPUC's published demand studies were interpolated to establish estimates for 2005 and 2025. An estimate for 2001 was interpolated for the retail service area, from the 2000 base year population and employment estimates, to establish a consistent base year. The years 2005, 2025, and 2030 were then used to evaluate consistency between the customer projections and the ABAG projections. The base year estimates for 2001 and projections for 2005, 2025, and 2030 are shown in Appendix E, Section E.3 (Table E.3.4).

7.3.2 ABAG Projections

Every two years ABAG publishes regional projections of employment and population growth for the nine-county San Francisco Bay Area. These projections are the most comprehensive set of employment and population projections that cover the area served by the SFPUC. *Projections 2002* and *Projections 2003* (ABAG, 2001; ABAG, 2002) were reviewed in preparation of this analysis. ABAG's most recent projections set, *Projections 2005* (ABAG, 2004) is the basis for the comparison presented here. The sidebar reviews the findings of a comparison between ABAG *Projections 2002*, *2003*, and *2005*.

ABAG projections are used for various planning purposes by many of the cities in the nine-county area covered by ABAG. Many of the SFPUC wholesale customers selected the ABAG's *Projections 2002* (the projections set that was current at the time) for use in the water demand model. Since that set was published, ABAG has issued two subsequent sets of projections—*Projections 2003* and *Projections 2005.* These two subsequent projections incorporate a fundamental shift in ABAG's projections methodology. Rather than taking existing local land use policy as a given (as had previously been the case), in the projections following *Projections 2002* ABAG assumes that local policy will be amended in the future to adopt "smart growth" principles. Specifically, the projections assume that higher density growth will be focused in urban core areas, and that more housing will be produced in those areas, compared to that previously assumed. The result of these assumptions is to increase the expected population in already developed areas. Most of the SFPUC service area is located in such already developed areas. Another difference reflected in *Projections 2003* and *Projections 2005* is more current and accurate reflection of effects of the dot com recession, especially the estimates of employment in 2005.

To assess whether ABAG's changing assumptions about future growth principals in the region combined with the updated information on current population and employment levels would result in substantially revised estimates of population or employment levels in the areas served by SFPUC water by 2030, an analysis was undertaken to compare the three sets of projections. First *Projections 2002* was compared to *Projections 2003* and then *Projections 2003* was compared to *Projections 2005*.

Based on the improved understanding of the extent of job and population losses that had been sustained in the first part of the decade, employment and population estimates for 2005 in *Projections 2003* are lower than had been projected in *Projections 2002*, and lower still in *Projections 2005*. At the same time, as might be expected from the assumption of more growth occurring in the urban core areas with the adoption and implementation of smart growth principles that ABAG assumes will occur, *Projections 2003* and *Projections 2005* have somewhat steeper growth curves between the present and 2030. Nevertheless, the general trends for the three are similar. The net result of the two principal changes in the later projection sets (that is, lower current population and employment estimates combined with more growth between now and 2030) is that the estimates for the WSIP horizon year of 2030 are similar among all three sets of ABAG projections. (Although *Projections 2002* only extends to 2025, projections for WSIP planning were extrapolated to 2030.) Section 7.3 text includes the key points from the comparison of the projections used in the demand study with ABAG *Projections 2005* projections. More detailed information on the comparison of the three ABAG projection sets is presented in Appendix E, Section E.3. Figures E.3.1 and E.3.2 in Appendix Section E.3 illustrate the differences in forecasted growth rates for the nine Bay Area counties and the four counties of the SFPUC service area reflected in the three projections sets.

Employment Projections

Table 7.6 compares the water customer-selected employment projections to the ABAG *Projections 2005* forecasts for the corresponding geographic areas for the years 2005, 2025, and 2030. The projections selected by the individual water customers (and interpolations for 2005 and 2025 prepared for this analysis) are shown in Table E.3.4 in Appendix E.3; Table 7.6 groups the projections by county. As shown, for the service area as a whole, the customer-selected employment projections forecast about 5 percent more jobs in 2030 than does *Projections 2005*. Thus, on the whole, the projections used in the water demand analysis remain generally consistent with current regional employment growth projections. The table supports the following observations:

- On a countywide basis, customer-selected projections of total employment in 2005 are consistently higher than *Projections 2005* estimates for 2005. The customer-selected projections were prepared a number of years prior to 2005, and therefore these 2005 employment estimates are truly forecasts. The *Projections 2005* estimates for 2005, in contrast, are based on observed data that reflect a more recent understanding of the impact of the "dot com bust" on the Bay Area economy. That is, the higher estimates of the customer-selected projections for 2005 reflect the experience of economic growth experienced by many Bay Area jurisdictions in the 1990s, without the benefit of information about the extent to which a slow down in employment growth occurred in the late 1990s and early 2000s. In contrast, *Projections 2005*, which was prepared a short time before 2005, reflects observed data on the continuing effects of the economic slow down, and shows lower 2005 employment estimates. Nevertheless, because *Projections 2005* also forecasts more growth in employment (i.e., more added jobs) between 2005 and 2030 than do the customer-selected projections, overall employment predicted by *Projections 2005* in 2030 (relying on more accurate 2005 estimates), is within a few percentage points of the overall employment predicted in 2030 by the customer-selected projections (relying on projected 2005 numbers).

- Water customer-selected employment projections for 2030 for Alameda and San Mateo County jurisdictions and San Francisco are generally consistent with (within 10 percent of) *Projections 2005*. Customer-selected projections for Santa Clara County jurisdictions are higher than *Projections 2005*. Customer-selected projections for 2025 are also generally consistent with *Projections 2005* for Alameda County jurisdictions and San Francisco.

- In each county, the numbers of new jobs expected in the customer-selected projections between 2005 and 2030 are smaller than the numbers forecasted in *Projections 2005*. The additional new job growth in *Projections 2005* reflects an increased understanding of the job loss that occurred between 2000 and 2005 combined with the expectation that, over the long term, the losses will be recovered and new jobs will be attracted to the area (but not enough new jobs to attain the totals that were predicted in *Projections 2002*).

- In each county, the customer-selected projection sources show employment growing at a slower rate during the 2005-2030 period as compared to the average rate of change

TABLE 7.6
COMPARISON OF EMPLOYMENT PROJECTIONS:
SFPUC CUSTOMERS AND ABAG *PROJECTIONS 2005* (SUMMARY BY COUNTY)[a,b]

	2005	2025	2030	Change 2005–2030
SFPUC Customer-selected Projections				
Alameda County	251,963	318,953	335,701	83,738
Santa Clara County	519,755	612,598	635,809	116,054
San Mateo County	411,273	495,898	517,056	105,783
Total Wholesale Customers	1,182,991	1,427,449	1,488,566	305,575
San Francisco (City and County)	656,480	770,500	795,400	138,920
Total	1,839,471	2,197,949	2,283,966	444,495
ABAG *Projections 2005*				
Alameda County	212,560	308,120	329,800	117,240
Santa Clara County	393,700	512,830	544,610	150,910
San Mateo County	309,470	435,600	469,900	160,430
Total Wholesale Customers	915,730	1,256,550	1,344,310	438,580
San Francisco (City and County)	575,800	776,100	829,090	253,290
Total	1,491,530	2,032,650	2,173,400	681,870
Customer-selected Projections as a Percentage of ABAG *Projections 2005*				
Alameda County	119%	104%	102%	71%
Santa Clara County	132%	119%	117%	77%
San Mateo County	133%	114%	110%	66%
Total Wholesale Customers	129%	114%	111%	70%
San Francisco (City and County)	114%	99%	96%	55%
Total	123%	108%	105%	65%

a Includes only those portions of each county served by SFPUC wholesale water customers or served directly by the SFPUC (i.e., San Francisco); see Appendix E, Section E.3 (Table E.3.A.2 of Attachment E.3.A) for correspondence assumed between ABAG jurisdictions and water customer service areas. (The SFPUC serves a limited portion of Alameda County and Santa Clara County, which are predominately served by East Bay Municipal Utilities District and Santa Clara Valley Water District, respectively.)

b Wholesale customer-selected projections for 2005 and 2025 interpolated linearly for the PEIR from estimates for 2001 and 2030 presented in the Wholesale Customer Demand Projections Technical Report (URS, 2004a).

SOURCES: Hannaford and Hydroconsult, 2004; URS, 2004a; ABAG, 2004; Mundie & Associates, 2006

predicted in *Projections 2005* for the same period.[17] The growth rate in the customer-selected projection sources (e.g., *Projections 2002*) is what was used in the model to help forecast future water demand. (Note that the estimates of employment in 2005 provided in *Projections 2005* are noticeably lower than the customers' estimates of employment for that same year. This accounts for the fact that even though the average rate of change is faster in *Projections 2005,* as compared to the customer-selected projection sources, the number of jobs in 2030 in the customer-selected projections is higher than those in *Projections 2005*. (See Tables E.3.37 and E.3.38 in Appendix E, Section E.3, for employment and population growth rates in *Projection 2005* and the water customer projections, respectively.)

17 This comparison refers to the average rate of change over the 25-year period (2005-2030) reflected in Table 7.6. To predict non residential water use, the change in base year and projected employment through 2030 was used to develop annual growth rates for each customer. The demand model applied this annual growth rate to base year non-residential water use to estimate future water use.

- For Santa Clara County the customer-selected projections predicted 17 percent more jobs in 2030 than are currently forecasted by ABAG in *Projections 2005*. Similar to the other counties, customer-selected projections expect fewer *new* jobs through 2030 than are forecasted in *Projections 2005*; however, because the number of jobs estimated for 2005 was more than 30 percent higher than the number estimated in *Projections 2005*, the expectations of future total employment remain higher than the ABAG forecast. Similarly, for San Mateo County, the customer-selected projections predicted 14 percent more jobs in 2025 than are forecasted by ABAG in *Projections 2005*. As in the other counties, the customer-selected projections expect fewer new jobs through 2025 than are forecasted in *Projections 2005*. However, because the number of jobs estimated for 2005 was more than 30 percent higher than the number estimated in *Projections 2005*, the expectations of future total employment remain higher than estimated in *Projections 2005*. By 2030, because of the faster rate of job growth reflected in *Projections 2005* (compared with the customer-selected projections), the difference in expected jobs is narrowed to 10 percent.

- Overall, the job projections selected by the wholesale customers are about 11 percent higher in 2030 than those of *Projections 2005*, and projections selected by San Francisco are about 4 percent lower than those of *Projections 2005*. With less than 10 percent variation for the service area as a whole, the employment projections used in the water demand studies remain consistent with ABAG's current long-term projections for job growth within the regional service area.

Population

Table 7.7 compares the population projections used by the SFPUC and its wholesale customers to develop future water demand projections to the ABAG *Projections 2005* forecasts for the corresponding geographic areas, for 2005, 2025, and 2030. The projections selected by the individual water customers (and the interpolations for 2005 and 2025 done for this analysis) are shown in Table E.3 4 in Appendix E, Section E.3; Table 7.7 groups the projections by county. As shown, for the service area as a whole, the customer-selected projections forecast about 5 percent less population in 2030 than does *Projections 2005*. Thus, on the whole, the projections used in the water demand analysis remain consistent with current regional population projections. Table 7.7 supports the following conclusions:

- On a countywide basis, water customer projections of total population in 2005 are about the same as (within 5 percent of) *Projections 2005* estimates for 2005.

- *Projections 2005* population estimates for 2025 and 2030 are also similar to, although consistently higher (by 4 percent and 5 percent, respectively) than, the customer-selected projections in those years. The difference is likely attributable in large part to the extent of ABAG's smart growth assumptions, which would locate approximately 150,000 additional households (compared to *Projections 2002*) in the more urban communities of the Bay Area between 2010 and 2030.

- The numbers of new residents expected in the customer-selected projections between 2005 and 2030 are smaller in all counties than the numbers expected by *Projections 2005*.

TABLE 7.7
COMPARISON OF POPULATION PROJECTIONS:
SFPUC CUSTOMERS AND ABAG *PROJECTIONS 2005* (SUMMARY BY COUNTY)[a,b]

	2005	2025	2030	Change 2005–2030
SFPUC Customer-selected Projections				
Alameda County	468,786	527,908	542,688	73,902
Santa Clara County	482,168	560,746	580,391	98,223
San Mateo County[c]	718,517	795,642	814,904	96,387
Total Wholesale Customers	1,669,471	1,884,296	1,937,983	268,512
San Francisco (City and County)	772,470	834,448	849,942	77,472
Total	2,441,941	2,718,744	2,787,925	345,984
ABAG *Projections 2005*				
Alameda County	473,900	552,700	576,200	102,300
Santa Clara County	463,100	561,700	585,100	122,000
San Mateo County	716,100	818,800	840,900	124,800
Total Wholesale Customers	1,653,100	1,933,200	2,002,200	349,100
San Francisco (City and County)	798,000	890,400	924,600	126,600
Total	2,451,100	2,823,600	2,926,800	475,700
Customer-selected Projections as a Percentage of ABAG *Projections 2005*				
Alameda County	99%	96%	94%	72%
Santa Clara County	104%	100%	99%	81%
San Mateo County	100%	97%	97%	77%
Total Wholesale Customers	101%	97%	97%	77%
San Francisco (City and County)	97%	94%	92%	61%
Total	99%	96%	95%	73%

a Includes only those portions of each county served by SFPUC wholesale water customers or served directly by the SFPUC (i.e., San Francisco); see Appendix E, Section E.3 (Table E.3.A.2 of Attachment E.3.A) for the correspondence assumed between ABAG jurisdictions and water customer service areas.
b Wholesale customer-selected projections for 2005 and 2025 interpolated linearly for the PEIR analysis from estimates for 2001 and 2030 presented in the Wholesale Customer Demand Projections Technical Report (URS, 2004a).
c Estimates for San Mateo County include updated figures for the Westborough Water District from its Urban Water Management Plan.

SOURCES: Hannaford and Hydroconsult, 2004; URS, 2004a; ABAG, 2004; Westborough Water District, 2005; Mundie & Associates, 2006.

- On a countywide basis, the customer-selected projection sources show population growing at a slower rate during the 2005-2030 period as compared to the average rate of change predicted in *Projections 2005* for the same period.[18] The growth rate in the customer-selected projection sources (e.g., *Projections 2002*) is what was used in the model to help forecast future water demand. (See Tables E.3.37 and E.3.38 in Appendix E, Section E.3, for employment and population growth rates in *Projection 2005* and the water customer projections, respectively.)

18 This comparison refers to the average rate of change over the 25-year period (2005-2030) reflected in Table 7.7. To predict residential water use, the change in base year and projected population through 2030 was used to develop annual growth rates for each customer. The demand model applied this annual growth rate to base year residential water use (and other non-industrial and non-commercial water use) to estimate future water use.

7.3.3 General Plan Projections

Comparison of General Plan and Demand Study Projections

A comparison for consistency between the growth projections used as the basis for water demand and purchase requests estimates in the WSIP planning studies and the growth projections presented in the general plans of jurisdictions in the SFPUC service area helps determine whether the growth that would be supported by implementation of the WSIP would be planned growth reflected in adopted general plans, or is somehow more than or different from what is called for in current general plans (in terms of amount and/or location). The general plans of 21 cities that are served in whole or part by SFPUC and its wholesale customers have population projections that are generally comparable to the water customer-selected population projections.[19,20]

Table 7.8 presents a comparison of the population projections selected by the water customers for use in the WSIP demand models with the population projected in the general plan for the respective cities. The table shows the difference (in number and percentage) in projected population from these two sources. Because the general plans vary considerably in age and have a range of projection years, none of which extends to 2030, ABAG's *Projections 2005* forecasts for 2030 are also included in the table for reference. The population projections assumed in the water customers' UWMPs, which were prepared more recently than the demand forecasts, also are included for reference. The comparison indicates the following:

- The population projections used for two of the wholesale customers (East Palo Alto and Sunnyvale) in the water demand studies are less than (from 2 to 6 percent less) the projections assumed in the general plans of the jurisdictions served by them.

- The population projections assumed for 13 of the water customers (ACWD, CWS-South San Francisco in combination with Westborough Water District, Daly City, Hayward, Hillsborough, Mid-Peninsula Water District, Millbrae, Mountain View, Palo Alto, San Bruno, San Francisco, and Santa Clara) are higher but within 1 to 10 percent of the projections presented in the respective general plans.

- Based on the two summary points above, the population growth assumed in the demand models for most of the water customers (17 of 20), for which comparable general plan projections are available, is similar to the growth anticipated in the general plans of the cities served by them. That is, the growth assumed in the demand models would be planned growth that is reflected in currently adopted general plans.

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19 General plans with projection years earlier than 2005 were not considered comparable to the 2030 population and employment projections used in the water demand studies. In addition, a few general plans did not include population or employment estimates in a form that could be compared to the customer-selected projections (e.g., where population growth is considered in terms of needed new housing units without information on assumed household size from which population estimates could be derived). Several wholesale customers' service areas do not correspond to jurisdictional boundaries closely enough to allow meaningful comparisons; refer to the discussion of correspondence between water customers and jurisdictions in Appendix E.3 and the correspondence assumptions shown in Table E.3.A.2 of Attachment E.3.A, Appendix E.3. The 21 cities, served by 19 water customers, represent approximately two-thirds of 32 cities served by the SFPUC regional system.

20 The 21 cities are served by 18 wholesale customers and the SFPUC (for the retail service area), referred to collectively here as 19 water customers.

TABLE 7.8
COMPARISON OF WATER DEMAND POPULATION ESTIMATES AND GENERAL PLAN POPULATION ESTIMATES

Customer	UWMP Population in 2030	*Projections 2005* Population in 2030	Water Customer-Selected Population Projection for 2030	General Plan Population Projection for General Plan Projection Year[a]	General Plan Projection Year[a]	Difference: Water Customer Population and General Plan Population	% Difference (Water Customer Population and General Plan Population)
Customer-selected projection less than or equal to general plan projection							
City of East Palo Alto	32,712	43,600	32,712	34,600	2020	-1,888	-5.5%
City of Sunnyvale[b]	159,100	159,100	151,610	154,600	2020	-2,990	-1.9%
Customer-selected projection 1–10% greater than general plan projection							
Alameda County Water District	405,900	404,700	379,931	359,113		20,818	5.8%
Fremont	*257,100*	*257,200*		*229,213*	2020		
Newark	*53,500*	*53,400*		*49,800*	2020		
Union City	*95,300*	*94,100*		*80,100*	2020		
CWS–South San Francisco District and Westborough Water District[c, d]	83,450	73,660	73,884	68,685	2020	5,199	7.6%
City of Daly City	115,651	127,200	115,651	113,000	2020	2,651	2.3%
City of Hayward	162,800	171,500	162,757	160,300	2025	2,457	1.5%
Town of Hillsborough		11,800	12,708	11,800	2025	908	7.7%
Mid-Peninsula Water District[e]	28,930	28,800	27,997	27,800	2010	197	0.7%
City of Millbrae	24,200	24,500	25,174	24,860	2015	314	1.3%
City of Mountain View	81,700	89,600	81,670	75,200	2010	6,470	8.6%
City of Palo Alto	69,199	92,200	69,199	62,880	2010	6,319	10.0%
City of San Bruno	See note f	50,700	48,229	46,400	2020	1829	3.9%
City and County of San Francisco[g]	849,942	903,300	849,942	811,100	2020	38,842	4.8%
City of Santa Clara	140,698	142,100	140,698	129,900	2010	10,798	8.3%
Customer-selected projection more than 10% greater than general plan projection							
City of Burlingame[g,h]	31,900	31,900	34,967	31,500	2010	3,467	11.0%
City of Milpitas[i]	91,400	91,400	88,841	94,400	2020	5,559	-5.9%
Coastside County Water District[j]	24,973	27,100	24,973	21,065	2020	3,908	18.6%
Estero Municipal Improvement District (MID)[j,k]	40,866	32,500	40,096	30,803	2010	9,293	30.2%

NOTE: Most wholesale customer service areas are not contiguous with city limits (or with the city and its planning area), and therefore the population projections from the jurisdictions' general plans and ABAG should be considered as general comparisons only. The following are not included, because the water service area and jurisdictional boundaries are not comparable or the general plan of the corresponding jurisdiction does not provide a comparable population projection: Brisbane, CWS–Bear Gulch, CWS–Mid-Peninsula, Menlo Park, North Coast County Water District, Purissima Hills Water District, Redwood City, San Jose North, Skyline County Water District, and Stanford University.

a The general plan population projection and projection year are the most distant population projection and the year of the most distant population projection available in the general plan or general plan element.
b The service area of Sunnyvale's water district is contiguous with the city limits; however, another water utility (CWS) serves several small areas within the city.
c CWS = California Water Service Company.
d CWS–South San Francisco serves South San Francisco, Colma, a small portion of Daly City, and the unincorporated area of Broadmoor. The water customer estimate for the Westborough Water District is from the district's Urban Water Management Plan. The general plan figure is the combined total projected population in the South San Francisco and Colma general plans (67,400 and 1,285 respectively); the general plan projection year shown (2020) is for South San Francisco, the projection year for Colma is 2005. The *Projections 2005* figure is for South San Francisco and Colma (71,800 and 1,860, respectively).
e The Mid-Peninsula Water District serves Belmont, portions of San Carlos, and unincorporated areas of San Mateo County. The general plan figure is for the city of Belmont, from the 2002 housing element.
f The San Bruno UWMP (City of San Bruno,2007) shows two population projections for 2030: 50,700, based on ABAG's *Projections 2005*, and 48,229, based on the City's Adjusted Draft General Plan.
g UWMP and *Projections 2005* figures are for household population, since the customer-selected figure is for household population.
h Burlingame's water system also serves portions of unincorporated Burlingame and a few properties in the city of San Mateo and town of Hillsborough.
i The general plan population is based on the 2002 Milpitas General Plan.
j The general plan figure is for the city of Half Moon Bay only, from the 1993 Half Moon Bay Local Coastal Program Land Use Plan (Table 9.3, Chapter 9, page 189). In addition to incorporated Half Moon Bay, the Coastside County Water District serves unincorporated areas of Half Moon Bay and the unincorporated communities of El Granada, Miramar, and Princeton by the Sea.
k Estero MID serves Foster City and a portion of the city of San Mateo. The general plan figure is for Foster City.

SOURCES: ABAG, 2004; ACWD, 2005; CWS-South San Francisco, 2006; City and County of San Francisco, 2004; City of Belmont, 2002a; City of Burlingame, 2002a; City of Burlingame, 2005; City of Daly City, 2004a; City of Daly City, 2005; City of East Palo Alto, 1999a; City of East Palo Alto, 2006; City of Foster City, 2001a; City of Fremont, 2003a; City of Half Moon Bay, 1993; City of Hayward, 2002a; City of Hayward, 2005; City of Millbrae, 1998a; City of Millbrae, 2005; City of Milpitas, 2002a; City of Milpitas, 2005; City of Mountain View, 2002a; City of Mountain View, 2005; City of Newark, 2002a; City of Palo Alto, 1998a; City of Palo Alto, 2005b; City of San Bruno, 2003a; City of San Bruno, 2007; City of Santa Clara, 2002a; City of Santa Clara, 2005; City of South San Francisco, 2002a; City of Sunnyvale, 2002a; City of Sunnyvale, 2005; City of Union City, 2002a; Coastside County Water District, 2005; Estero MID, 2005; Hannaford and Hydroconsult, 2004; Mid-Peninsula Water District, 2006; SFPUC, 2005; Town of Colma, 1999a; Town of Hillsborough, 2002a; URS, 2004a, Westborough Water District, 2005.

- The population projections assumed by four of the water customers (Burlingame, Coastside County Water District, Estero Municipal Improvement District, and Milpitas) appear to be more than 10 percent greater than the projections assumed in the respective general plans. The difference in these projections results from the longer 2030 planning horizon used for water planning and differences in the geographic area covered by the two sets of projections. Based on the difference in projections, however, the growth assumed in the demand models of these wholesale customers does not appear to be fully addressed in the general plans of the cities served by these customers.

- Two of the four customers assuming greater population growth than is reflected in the respective general plan also show somewhat greater growth than is forecasted in *Projections 2005*. Both of these customers (Burlingame and Estero MID) serve unincorporated areas outside the city's jurisdictional boundaries and ABAG subregional areas. In addition, Estero MID serves a non-segrable part of the city of San Mateo that is not included with the *Projections 2005* forecast for Foster City used in this comparison. The other customer (Coastside County Water District) assumes less growth than is forecasted in *Projections 2005* for 2030.

Compared to the population forecasts, fewer general plans (or general plan elements) prepared by jurisdictions served by the wholesale customers include comparable employment forecasts. The general plans of 18 cities that are served in whole or part by 16 SFPUC water customers have employment projections that are generally comparable to the water customer-selected employment projections.[21] **Table 7.9** presents a comparison of the employment projections selected by the water customers for use in the WSIP demand models with the employment projected in the general plan for the respective cities. The table shows the difference (in number and percentage) in employment estimates in these two sources. Because the general plans vary considerably in age and have a range of projection years, ABAG's *Projections 2005* forecasts for 2030 are included in the table for reference. The comparison indicates the following:

- The employment projections assumed for four wholesale customers are lower than the projections in their respective general plans. The projection for Millbrae is substantially less (33 percent); the combined projection for CWS-South San Francisco and Westborough Water District is about 10 percent less, and the projection for Daly City is slightly less (1 percent).

- The employment growth assumed for eight water customers is greater than but within 20 percent of the growth assumed in the respective general plans. The water customer-selected employment projections of two wholesale customers (Hayward, and Hillsborough) and of San Francisco are within 10 percent of the projections assumed in their respective general plans, and the customer-selected projections of five wholesale customers (Milpitas, Mountain View, Palo Alto, Santa Clara, and Sunnyvale) are 10 to 20 percent greater than the projections assumed in the respective general plan.

[21] General plans with projection years earlier than 2005 were not considered comparable to the employment projections used in the demand studies. A few general plans did not include population or employment estimates in a form that could dependably be compared to the customer-selected projections (e.g., where employment growth [additional jobs] is discussed without the baseline employment levels being provided). Several wholesale customers have service areas that do not correspond to jurisdictional boundaries closely enough to allow meaningful comparisons with the general plan projections. Table E.3.A.2 of Attachment E.3.A, Appendix E.3, shows the jurisdictions that are assumed to correspond to wholesale customers for purpose of comparing population and employment projections

TABLE 7.9
COMPARISON OF WATER DEMAND EMPLOYMENT ESTIMATES AND GENERAL PLAN EMPLOYMENT ESTIMATES

Customer	*Projections 2005* Employment in 2030	Water Customer Selected Employment Projection for 2030	General Plan Employment Projection for General Plan Projection Year[a]	General Plan Projection Year[a]	Difference: Water Customer Employment and General Plan Employment	% Difference (Water Customer Employment and General Plan Employment)
Customer-selected projection less than or equal to general plan projection						
City of Daly City	29,830	33,981	34,260	2020	-279	-1%
City of Millbrae	9,960	8,009	12,006	2015	-3,997	-33%
CWS–South San Francisco District and Westborough Water District[b,c]	56,080	63,975	71,400	2020	-7,425	-10%
Customer-selected projection 1–20% greater than general plan projection						
City of Hayward	100,430	113,843	108,830	2025	5,013	5%
Town of Hillsborough	2,030	1,380	1,360	2025	20	1%
City of Milpitas	68,940	76,129	65,200	2010	10,929	17%
City of Mountain View	81,110	95,669	84,810	2010	10,859	13%
City of Palo Alto	117,090	114,224	98,500	see note d	15,724	16%
City and County of San Francisco	829,090	795,400	745,600	2020	49,800	7%
City of Santa Clara	152,670	177,027	151,280	2010	25,747	17%
City of Sunnyvale[e]	123,020	168,950	152,730	2020	16,220	11 %
Customer-selected projection more than 20% greater than general plan projection						
Alameda County Water District	229,370	221,858	177,800		44,058	25%
Fremont	*160,410*		*130,530*	2020		
Newark	*24,960*		*26,560*	2020		
Union City	*44,000*		*20,710*	2020		
Subtotal: Fremont, Newark, Union City	*229,370*		*177,800*			
City of East Palo Alto	6,110	8,673	5,940	2010	2,733	46%
Estero Municipal Improvement District (MID)[f]	21,110	31,840	18,760	2010	13,080	70%
City of San Bruno	28,400	25,770	19,180	2020	6,590	34%

NOTE: Most wholesale customer service areas are not contiguous with city limits (or with the city and its planning area), and therefore the employment projections from the jurisdictions' general plans and ABAG should be considered as general comparisons only. The following are not included, because the water service area and jurisdictional boundaries are not comparable or the general plan of the corresponding jurisdiction does not provide a comparable employment projection: Brisbane, Burlingame, CWS–Bear Gulch, CWS–Mid-Peninsula, Coastside County Water District, Daly City, East Palo Alto, Guadalupe Valley MID, Menlo Park, Mid-Peninsula Water District, North Coast County Water District, Purissima Hills Water District, Redwood City, San Jose North, Skyline County Water District, and Stanford University.

a The general plan projection and projection year are the most distant employment projection and the year of the most distant employment projection available in the general plan or general plan element.
b CWS = California Water Service Company.
c CWS–South San Francisco serves South San Francisco, Colma, a small portion of Daly City, and the unincorporated area of Broadmoor.
d Employment estimate for Palo Alto is based on the Housing Element 1999-2006 (City of Palo Alto 2002) estimate that the city will "eventually contain 98,000 to 99,000 jobs within the next several years if the economy recovers in the near term."
e The service area of Sunnyvale's water district is contiguous with the city limits; however, another water utility (CWS) serves several small areas within the city.
f Estero MID serves Foster City and a portion of the city of San Mateo. The general plan figure is for Foster City.

SOURCES: City and County of San Francisco, 2004;City of Daly City, 2004a; City of East Palo Alto, 2001a; City of Foster City, 2001a; City of Fremont, 2003a; City of Hayward, 2002a; City of Millbrae, 1998a; City of Milpitas, 2002b; City of Mountain View, 2002a; City of Newark, 2002a; City of Palo Alto, 2002; City of San Bruno, 2003a; City of Santa Clara, 2002a; City of South San Francisco, 2002a; City of Sunnyvale, 2002a; City of Union City, 2002a; Hannaford and Hydroconsult, 2004; Town of Hillsborough, 2002a; URS, 2004a.

- The employment growth assumed for the remaining four water customers (ACWD, East Palo Alto, Estero Municipal Improvement District, and San Bruno) are between 25 and 70 percent greater than the projections assumed in the respective general plans. The difference in these projections results primarily from the longer 2030 planning horizon used for water planning and, for Estero MID, differences in the geographic area covered by the two sets of projections. Based on the difference in projections, however, the employment growth assumed in the demand models of these wholesale customers does not appear to be fully addressed in the general plans of the cities served by these customers.

These observations, in turn, suggest the following:

- The employment growth assumed in the demand models of most (12 of 16) of the water customers for which comparable general plan projections are available is greater than the growth anticipated in the general plans of the cities served by them. For all but four, however, the difference in projection is less than 20 percent. The reasons for differences between general plan and demand study employment projections included the following:

  – *Differences in horizon years*. For the employment projections surveyed, none of the general plan's horizon years extend to 2030; five of the general plan horizon years are 2010.

  – *Differences in base years*. In almost all cases the demand study projections were prepared after the general plans projections. As a result, the demand study projections reflect to a greater extent the economic boom of the 1990s than do the projections in the general plans. That is, the projections vary as a result of when they were prepared, especially with respect to the economic growth that occurred in the 1990s. For the most part, general plans were prepared before the extent of the economic boom in the 1990s was fully appreciated, and have not been updated to reflect the economic growth that occurred during that period. In two cases (Palo Alto and Estero MID), the demand study's 2001 estimate is greater than the general plan's estimate for 2010. The region subsequently experienced substantial job losses from the "dot com bust" in the first part of this decade; therefore, demand study projections prepared before the "bust" was fully understood somewhat over projected 2005 job levels, compared with ABAG's *Projections 2005*. *Projections 200*5 forecasts substantial recovery over time, however, and by 2030 the employment projections selected for use in the demand study are fairly consistent with those of *Projections 2005* for most jurisdictions.

  – *Differences in the extent to which certain jurisdictions were impacted by the economic boom and subsequent recession.* The three series of ABAG projections reviewed for this analysis reflect evolving information about the extent of job gains and losses in bay area jurisdictions in the late 1990s and early 2000s. Some jurisdictions have sustained successive and substantial job losses whereas others experienced fewer losses or losses have been offset by a degree of economic recovery. The net effect of the two cycles has been that over the WSIP planning horizon, employment expectations, as reflected in projections selected by the water customers, are for the most part generally consistent with the projections presented in jurisdictions' general plans. The projections selected by four wholesale customers, however, are 25 to 70 percent greater than the projections of the respective general plans. Although the relationship between water use and non-residential development depends upon the type of commercial or industrial development that occurs, given the difference in employment assumptions, it is likely that the impacts of employment growth assumed in the WSIP demand forecasts in the jurisdictions served by these wholesale customers has not been fully analyzed in the respective general plan impact analyses.

7.3.4 Growth in Water Demand Compared with Growth in Population and Employment

The relationship between the growth in water demand and growth in population and employment within a water service area is not linear. Because of differences in water use rates for a water agency's different retail customers, depending on such factors as types and sizes of residences, types of businesses, and a range of other variables that can affect consumption rates, a direct per capita or per job relationship is not expected between water demand and the population and employment within a service area.[22] As such, growth in water demand by 2030 would not be expected to track directly with population and employment growth. In addition, differences would be expected between the different wholesale water customers as a result of additional variables including climate and housing density. In general, water demand within the SFPUC service area as a whole would be expected to grow somewhat more slowly than population and employment due to the increasing efficiency of water fixtures expected from plumbing code requirements.

A comparison of the percent change in the SFPUC wholesale customers' water demand projected for 2030 (from Table 7.3) and percent change in population and employment (from Table 7.4) is shown in **Table 7.10** for each wholesale customer and the retail service area. The data presented reflect considerable variability between the water customers; for most the increase in projected water demand is smaller than the increase in projected population or job growth. The exceptions to this are noted and discussed in the customer summaries in Section 7.3.6.

7.3.5 Growth Trends in the Service Area

As part of the review of general plans for the comparisons presented above, a selection of general plans from cities in each of the counties in the SFPUC service area were reviewed in greater depth to ascertain a better understanding of historical growth trends in the service area. The general plans of the following cities were reviewed: East Palo Alto, Fremont, Hayward, Milpitas, Newark, Redwood City, San Francisco, San Mateo, Santa Clara, South San Francisco, Sunnyvale, Union City. These jurisdictions represent a range of sizes and include some of the larger cities and some of the cities projecting relatively substantial increases in water demand by 2030. Information provided in BAWSCA profiles of its member agencies supplemented the review, which is described in more detail in Appendix E, Section E.4 of this PEIR.

The results of this review indicate the following population growth trends in the region:

- Cities in the service area are largely urbanized, most having experienced their most rapid growth in the postwar decades through the 1970s.
- Milpitas and East Palo Alto have experienced high rates of growth more recently.
- San Francisco's population has fluctuated somewhat but on average has been essentially stable over the past 50 years

[22] As described in Section 7.2.2 and in more detail in Appendix E, Section E.2, the SFPUC expressly did not take a per capita approach to projecting 2030 demand, but rather undertook a detailed demand study utilizing actual account data in end-use demand models, which broke down total water use, by water service account, to specific end uses in each wholesale customer service area and San Francisco.

TABLE 7.10
PERCENT CHANGE IN POPULATION, EMPLOYMENT, AND WATER DEMAND 2001 – 2030

Customer	Customer's Demand as Percentage of Total 2030 Demand (%)	Percent Change in		
		Employment (%)	Population (%)	Water Demand (%)
Alameda County Water District	14.2	47	20	16
City of Brisbane	0.2	417	45	111
City of Burlingame	1.2	16	16	3
CWS–Bear Gulch District[a]	3.3	11	11	4
CWS–Mid-Peninsula District[a]	4.3	27	16	5
CWS–South San Francisco District[a]	2.4	27	21	11
Coastside County Water District	0.8	26	36	25
City of Daly City	2.2	26	9	5
City of East Palo Alto	1.2	164	34	92
Estero MID[b]	1.6	31	16	17
Guadalupe Valley MID[b]	0.2	28	249	153
City of Hayward	6.9	30	16	49
Town of Hillsborough	0.9	14	9	5
Los Trancos County Water District[c]	0.0	NA	48	32
City of Menlo Park	1.1	32	12	15
Mid-Peninsula Water District	0.9	51	6	4
City of Millbrae	0.8	20	17	5
City of Milpitas	4.2	42	42	48
City of Mountain View	3.5	27	15	12
North Coast County Water District	0.9	29	18	5
City of Palo Alto	3.4	8	15	1
Purissima Hills Water District	0.8	9	12	51
City of Redwood City	3.2	26	14	13
City of San Bruno	1.1	55	18	2
City of San Jose (North)	1.6	34	23	25
City of Santa Clara	8.1	28	35	31
Skyline County Water District	0.1	0	122	82
Stanford University	1.6	NA	42	76
City of Sunnyvale	6.4	35	15	8
Westborough Water District	0.2	1	10	1
Total, Wholesale Service Area	**78**	**31**	**19**	**19**
SFPUC Retail Service Area	**22**	**25**	**12**	**-0.2**
TOTAL	**100**	**29**	**17**	**14**

NA = Not applicable; the former Los Trancos County Water District had only residential accounts and Stanford University used other parameters, such as increase in building square footage, to forecast growth in non-residential accounts.

[a] CWS = California Water Service Company
[b] MID = Municipal Improvement District
[c] The former Los Trancos County Water District is now part of CWS–Bear Gulch District; information presented here reflects information in background reports.

SOURCES: URS, 2004a; Hannaford and Hydroconsult, 2004; City of Palo Alto, 2005a; Westborough Water District, 2005.

General plans include policies to manage growth, and many identify strategies consistent with "smart growth" principles, such as encouraging infill development and the redevelopment of previously developed areas, as means to accommodate future growth.

7.3.6 Customer-Specific Summaries

This section summarizes for each wholesale customer and San Francisco the following key information regarding both (1) their water demand and the growth projections used in forecasting that demand, and (2) the consistency between the growth called for in the adopted general plans and that which could be supported by the WSIP.

Summary of Customer-Specific Review

The combined total 2030 water demand for San Francisco and the wholesale customers, taking into account projected plumbing code savings, is 417 mgd. To meet the customer purchase requests, the SFPUC regional water system would provide 284 – 300 mgd,[23] or about 68 – 72 percent of this total 417 mgd service area demand and about 71 – 74 percent of remaining demand after planned conservation programs have been implemented. SFPUC water would supplement other supply sources used by some of its water customers of groundwater, other surface water supplies, and recycled water, as well as conservation savings (refer to Table 7.2).

Overall, the estimated water demand from the SFPUC regional water system through 2030 is about 14 percent higher than 2001 levels. As the summaries by water customer presented below indicate, the increased water that would be available as a result of the WSIP would enable growth to varying degrees in the SFPUC service area. As the summaries and information presented in this chapter indicate, the water customers vary in size, their overall projected demand for 2030, the change the 2030 demand represents in absolute terms (i.e., in mgd) and as a percentage of 2001 demand, and the degree to which they depend on the SFPUC for their water supply. Not surprisingly, considering the different jurisdictions within the service area, expectations about future growth and growth-related constraints and opportunities also vary somewhat. However, the jurisdictions have much in common with respect to growth and growth management. The SFPUC service area is largely urbanized; many of the jurisdictions served cannot grow laterally (because they are bordered by other cities, the bay, and/or protected areas) and have identified infill development, redevelopment, and increasing densities as approaches to accommodating future growth. Such growth is consistent with ABAG principles of smart growth and is, in general, the kind of growth that the WSIP would have the potential to induce or support.

As discussed below, the growth that would be supported by the SFPUC regional water system under the WSIP is generally consistent with ABAG projections for jurisdictions in the service area. Because of differences in the geographic area covered by most of the water customers and the jurisdictions they serve, the population projections of ABAG, general plans, and the SFPUC wholesale and retail demand studies are not expected to match exactly. However, the comparisons presented below do show reasonably consistent expectations in most areas.

[23] As previously noted and discussed in more detail in Chapter 3 of this PEIR, for planning purposes the high range purchase estimate of 300 mgd was selected as the target goal for the average annual water delivery by 2030.

The age of the jurisdictions' general plans vary considerably, as previously noted. Due to the WSIP's longer planning horizon (especially considering the age of some of the local general plans), the WSIP would support a degree of growth that has not been addressed in adopted general plans. The effects of planned growth and growth that is not addressed in adopted land use plans of jurisdictions in the SFPUC service area are discussed in Section 7.4, below.

Customer Summaries

Each customer summary provides the following:

- Total 2030 demand
- Change in demand from 2001 (mgd and percent)
- Percent of projected demand that would be met by the SFPUC
- Customer's 2030 purchase estimate
- Change in purchases from the SFPUC from 2001 (mgd and percent)
- Customer's current supply assurance
- How projected growth in population and employment compares with growth in water demand
- Consistency of population and employment (for general plans that present employment projection data) assumed in developing water demand with projected growth contained in general plans.

The discussion of individual customers presented in this section indicates that different ABAG series result in markedly different projections for some jurisdictions. For an illustration of the differences in growth rates forecasted for the nine Bay Area counties and the four counties of the SFPUC service reflected in ABAG's last three projections sets, see Figures E.3.1 and E.3.2 in Appendix E, Section E.3.2.

Unless otherwise specified, the ABAG projections referenced in this section are from *Projections 2005* (ABAG, 2004). The demand study referenced is the *SFPUC Wholesale Customer Water Demand Projections Technical Report* (URS, 2004a), except for the discussion of the SFPUC retail service area. The source of retail service area demand information is the report entitled *City and County of San Francisco Retail Water Demands and Conservation Potential* (Hannaford and Hydroconsult, 2004).

ACWD

The ACWD's total 2030 water demand, based on the demand study and taking into account plumbing code savings, is 59.3 mgd. This represents a 16 percent increase in total service area demand over the 2001 base-year demand estimate. ACWD uses multiple supply sources to meet its water demand. In 2030, ACWD projects it will purchase about 23 percent of its water demand and about 25 percent of remaining demand from the SFPUC after conservation has been implemented. The SFPUC portion of ACWD's supply would supplement ACWD's projected conservation savings and use of groundwater, other surface water supplies, and recycled water (refer to Table 7.2) to meet future demand increases. ACWD's 2030 estimated purchase of 13.76 mgd from the SFPUC represents a 1.77 mgd, or 15 percent, increase over its 2001 purchases. ACWD's current water supply assurance is 13.76 mgd.

Population projections used in the demand study are generally consistent with the growth cited in the general plans of the three cities served by ACWD (Fremont, Newark, and Union City) and the growth projected for the three cities by ABAG. The population projections used in the demand study for 2030 are approximately 6 percent higher than those presented in the cities' general plans (combined), which is likely attributable to the longer planning horizon of the WSIP (2030 compared to 2020 for the general plans). The population estimate in the demand study is approximately 6 percent less than is projected in ABAG's *Projections 2005* for the three cities in 2030.

The employment projection used in the demand study is about 25 percent higher than the (combined) employment projections cited in the cities' general plans, but is generally consistent with (about 3 percent less than) the combined ABAG *Projections 2005* employment projection for the three cities. This may be partially attributable to the longer planning horizon of the WSIP (and ABAG). The projections in Table 7.9 indicate that the ABAG projections for Fremont are 23 percent higher than the general plan projection; the ABAG projection for Newark is about 6 percent less than the general plan projection; and the ABAG projection for Union City is more than double that of the general plan. Business and industrial demand accounts for approximately 20 percent of ACWD's projected 2030 demand (SFPUC, 2006).

City of Brisbane

Brisbane's total 2030 water demand, taking into account plumbing code savings, is 0.93 mgd. This represents a 111 percent increase in total service area demand over the 2001 base-year demand estimate. The SFPUC is Brisbane's only source of potable water supply. In 2030, Brisbane projects it will purchase 96 percent of its total water demand from the SFPUC and 100 percent of demand after conservation has been implemented, based on Brisbane's purchase estimate (refer to Table 7.2). Brisbane's 2030 estimated purchase of 0.89 mgd from the SFPUC represents a 0.50 mgd, or 128 percent, increase over its 2001 purchases. Brisbane's current water supply assurance is 0.46 mgd.

The projected 111 percent increase in service area demand for Brisbane is apparently primarily due to the city's expectation of substantial job growth in the 2001- 2030 planning period. The demographic projections used in the demand model, which were provided by the City of Brisbane, assume a 45 percent increase in population and a 417 percent increase in employment by 2030.

Both the City of Brisbane water district and Guadalupe Valley MID provide water to the city of Brisbane; therefore, this discussion combines the 2030 projections used in the demand study for both customers to allow a comparison with projections developed for the city. The 2030 population assumed for Brisbane in the demand study is 4,606. The combined population projection used in the demand study for 2030 for the two districts is 6,164, which is 18 percent higher than the population projected by ABAG for Brisbane of 5,240 (ABAG, 2004). The Brisbane General Plan, adopted in 1994, does not have a comparable population projection. The 1999–2006 housing element cites an ABAG estimate of 4,010 for 2005, but does not project beyond that year.

The combined employment projection for the two water customers is about 24 percent higher than ABAG's *Projections 2005* forecast for Brisbane in 2030. The combined projections for the two water districts represent a 139 percent increase in jobs from 2005[24] to 2030. This projected increase, while substantial, is slightly lower than the 149 percent increase predicted for Brisbane by *Projections 2005* for the same period.

Both water districts are operated by the City of Brisbane and both used city population and employment projections as the source of projections in the water demand study. If a water customer selected a projection source other than ABAG for the demand study, they were asked to provide the source and the reason the source was more appropriate for them than ABAG.[25] Brisbane noted that ABAG projections do not divide the city's population into the two separate water districts. The selected population projections were based on the number of available units in each district under the zoning ordinance and population density assumptions (persons per unit) using information from the Brisbane Building and Planning Department and the housing element, and an additional population estimate based on the 2000 U.S. Census data. The city identified 1,366 additional units for the two districts (660 in the Brisbane service area and 706 in the Guadalupe Valley service area) with an assumed density factor of 2.2 persons per unit, for a projected additional population of 3,005 above the initial population of 3,159. Thus, the projection used appears to be consistent with existing planning and zoning within the City.

City of Burlingame

Burlingame's total 2030 water demand, taking into account plumbing code savings, is 4.9 mgd. This represents a 3 percent increase in total service area demand over the 2001 base-year demand estimate. The SFPUC is Burlingame's only source of potable water supply. In 2030, Burlingame estimates it will purchase 96 percent of its total water demand from the SFPUC and 100 percent of demand after conservation has been implemented, based on Burlingame's purchase estimate (refer to Table 7.2). Burlingame's 2030 estimated purchase of 4.70 mgd from the SFPUC represents a 0.06 mgd, or 1 percent, increase over its 2001 purchases. Burlingame's current water supply assurance is 5.23 mgd.

Burlingame's water demand projections assumes 16 percent growth in population and 16 percent growth in employment by 2030. The population projection used for Burlingame in the demand study is about 11 percent higher than the growth cited in the 2002 general plan housing element for 2010, and 10 percent higher than the 2030 population estimated in ABAG's *Projections 2005* for the city and its sphere of influence. Because the housing element projection only extends to

24 The 2005 estimates were interpolated from the employment figures in the SFPUC demand study for this analysis, as shown in Table E.3.4 of Appendix E, Section E.3.

25 The request for projection source information was part of the SFPUC Capital Improvement Project Wholesale Customer Demand Projections/DSS Modeling Wholesale Customer Population Projection Selection Form submitted by each wholesale customer.

2010, it would be expected to be less than the population for 2030 used to derive water demand projections. The difference between the customer-selected projections used in the demand study and ABAG projections apparently stems from ABAG's lowered expectations about population growth in Burlingame. The demand study cites as its source ABAG *Projections 2002*, which expected more growth in the city than does *Projections 2005*. For example, *Projections 2002* forecasted a 2025 population of 33,600, and *Projections 2005* forecasts a 2025 population of 31,700, and the population now expected in *Projections 2005* in 2030 was expected in 2015 in *Projections 2002*. (*Projections 2002* does not provide 2030 estimates for a direct comparison of projections for 2030.) Burlingame's UWMP, published in 2005, cites *Projections 2005* as the projection source and uses the lower 2030 population estimate of 31,900. In addition, 2 percent of Burlingame's water service area is unincorporated San Mateo County, for which segregable ABAG and San Mateo County General Plan projections are not available.

Given the moderate expectations for growth assumed in the demand model (16 percent over 29 years), the revisions to ABAG's expectations of growth for the region, and the much shorter planning horizon contained in the city's housing element, the growth assumed in the demand model is generally consistent with the local and regional planning agencies.

CWS–Bear Gulch District

The total 2030 water demand estimated for the CWS–Bear Gulch District, taking into account plumbing code savings, is 14.06 mgd. This estimate includes the projected 2030 demand of 0.14 mgd of the former Los Trancos County Water District, which is now part of CWS–Bear Gulch, and represents a 4 percent increase in total service area demand over the 2001 base-year demand estimate. CWS–Bear Gulch District uses multiple services to meet its water demand. In 2030, CWS–Bear Gulch estimates it will purchase about 84 percent of the district's total water demand from the SFPUC and about 90 percent of remaining demand after conservation has been implemented, based on CWS–Bear Gulch District's purchase estimate (refer to Table 7.2). CWS–Bear Gulch District's 2030 estimated purchase of 11.76 mgd (including the former Los Trancos district) from the SFPUC represents a 0.53 mgd, or 5 percent, increase over the combined CWS–Bear Gulch and Los Trancos County Water District 2001 purchases. The current water supply assurance for the three CWS districts combined (i.e., including CWS-Mid Peninsula and CWS–South San Francisco) is 35.5 mgd.

Because the CWS–Bear Gulch District serves many communities, including Atherton, Menlo Park, Portola Valley, part of Woodside, and areas of unincorporated San Mateo County (i.e., the communities of West Menlo Park, Ladera, North Fair Oaks, and Menlo Oaks), its population projections are not comparable to those of ABAG or the respective jurisdictions' general plans.

The CWS–Bear Gulch District's UWMP, published in December 2005, shows a much lower 2030 population estimate (59,220) than the customer-selected estimate shown in the demand study (73,719). The UWMP's estimate of the district's 2004 population, 54,350, is also substantially lower than the 2001 base-year population of 66,197 used in the demand study. The differences appear to result from the different methods used to estimate the population of the service area, which, as noted, serves parts of a number of incorporated cites and unincorporated parts of the county. The UWMP states that the population estimates are different because “initial conditions for the DSS model hav[e] changed since the DSS model was first created and when [the UWMP] was written.” The UWMP notes that, although the “initial conditions” for the two estimates changed, the rates of growth of both projections are similar. A comparison of expected growth from 2004 to 2030 in the UWMP, based on the estimates cited above, shows the population is expected to grow by about 9 percent, and the expected growth from 2001 to 2030 in the wholesale demand study is about 11 percent. Based on a comparison of the SFPUC’s share of the UWMP’s planned 2030 water supply and the 2030 purchase estimate, no change is expected in water demand. The UWMP estimates 14,708 acre-feet per year, or about 11.76 mgd, from the SFPUC. This is equivalent to the combined 2030 purchase estimates of CWS–Bear Gulch (11.6 mgd) and the former Los Trancos County Water District.

CWS–Mid-Peninsula District

The total 2030 water demand estimated for the CWS–Mid-Peninsula District, taking into account plumbing code savings, is 18.1 mgd. This represents a 5 percent increase in total service area demand over the 2001 base-year demand estimate. The SFPUC is CWS-Mid Peninsula’s only source of potable water supply. In 2030, CWS–Mid-Peninsula District estimates it will purchase about 95 percent of its total water demand from the SFPUC and 100 percent of demand remaining after conservation has been implemented, based on CWS-Mid-Peninsula District’s purchase estimate (refer to Table 7.2). CWS–Mid-Peninsula District’s 2030 estimated purchase of 17.24 mgd from the SFPUC represents a 0.49 mgd, or 3 percent, increase over its 2001 purchases. The current combined water supply assurance for the three CWS districts is 35.5 mgd.

Because the CWS–Mid-Peninsula District serves portions of San Carlos and San Mateo and adjacent unincorporated areas of San Mateo County, including the Highlands and Palomar Park, its population and employment projections are not comparable to those of ABAG or the respective jurisdiction’s general plans since they cover different geographic areas.

CWS–South San Francisco District

The CWS–South San Francisco District’s 2030 water demand, taking into account plumbing code savings, is 9.9 mgd. This represents an 11 percent increase in total service area demand over the 2001 base-year demand estimate. CWS–South San Francisco District’s uses multiple supply sources to meet its water demand. In 2030, CWS–South San Francisco estimates it will purchase about 81 percent of its total demand from the SFPUC and about 85 percent of the district’s remaining demand after conservation has been implemented, based on CWS–South San Francisco’s purchase estimate (refer to Table 7.2). CWS–South San Francisco District’s 2030 estimated purchase of 7.97 mgd from the SFPUC represents a 0.41 mgd, or 5 percent, increase over its 2001 purchases. The current combined water supply assurance for the three CWS districts is 35.5 mgd.

Both CWS–South San Francisco and Westborough County Water District provide water to South San Francisco; therefore, this discussion combines the 2030 population projections for the two water customers to allow a comparison with the city’s general plan and ABAG projections for the city. (The 2030 customer-selected projection for CWS-South San Francisco [59,584] is based on the 2004 demand study. The 2030 projection for Westborough [14,300] is from Westborough's 2005 UWMP, based on a letter from the water district to the SFPUC [Westborough Water District, 2007] indicating that the population estimates in the UWMP more accurately reflect the district's service area than did the population estimates used in the demand study.) The combined estimated 2030 population to be served by the two wholesale customers (73,884) is about 8 percent higher than that projected in the general plan and about the same as (0.3 percent higher than) ABAG's 2030 projections for the city.

The combined employment projection for the two water customers in the demand study is about 10 percent lower than the employment projection cited in the city's general plan, and about 14 percent higher than ABAG's *Projections 2005* 2030 projections.

Coastside County Water District

The Coastside County Water District's (Coastside CWD) total 2030 water demand, taking into account plumbing code savings, is 3.2 mgd. This represents a 25 percent increase in total service area demand over the 2001 base-year demand estimate. Coastside CWD uses multiple sources to meet its water demand. In 2030, Coastside CWD estimates it will purchase 70 to 94 percent of its total water demand from the SFPUC and 74 to 100 percent of remaining demand after conservation has been implemented, based on Coastside CWD's purchase estimate (refer to Table 7.2). Coastside CWD's 2030 estimated purchase of 2.24 – 3.02 mgd from the SFPUC represents a 0.44 – 1.22 mgd, or 24 – 68 percent, increase over its 2001 purchases. The high-end of its purchase estimate range assumes loss of all local water sources (i.e., groundwater and other surface water). Coastside CWD's current water supply assurance is 2.18 mgd.

The customer-selected population projection used for Coastside CWD in the demand study is 19 percent higher than the population of 21,065 for 2020 cited in Half Moon Bay's 1993 Local Coastal Program Land Use Plan (which serves as the general plan), and about 8 percent lower than the 2030 ABAG projections for Half Moon Bay and unincorporated Half Moon Bay. In addition to the city itself, Coastside CWD serves unincorporated areas of Half Moon Bay and the unincorporated communities of El Granada, Miramar, and Princeton by the Sea. The difference in geographic area covered by the land use plan and the water district may account for the differences in the population projections. In addition, some of the district's increase in SFPUC water purchase is needed to replace existing local supplies that, because of water quality concerns, are no longer suitable for use.

The 2030 employment projection used for Coastside CWD in the demand study is about 20 percent less than the combined *Projections 2005* employment forecasts for Half Moon Bay and unincorporated Half Moon Bay for 2030 (8,490). The 1993 Local Coastal Program Land Use Plan does not have a comparable employment projection.

Half Moon Bay currently is in the process of updating its general plan. According to information about the public review draft available on the city's website, the updated general plan will incorporate provisions of Measure D, a growth control measure adopted by voters in 1999.

Measure D limits residential growth in the city to 1 percent per year, with an optional 50 percent additional growth (i.e., 1.5 percent) allowed in the downtown area (City of Half Moon Bay, 2005a). A 1991 growth control measure, Measure A, was incorporated into the adopted 1993 Land Use Plan; however, Measure D further restricts residential growth (City of Half Moon Bay, 2005b). The Draft Local Coastal Program Amendment posted on the city's website states that ABAG's *Projections 2005* expects 820 new households for Half Moon Bay by 2025, reflecting a 1.1 percent annual growth rate, and another 200 units in the unincorporated coastside area. The draft plan states that ABAG's projection for Half Moon Bay and unincorporated Half Moon Bay shows a combined population of about 26,500 in 2025 (City of Half Moon Bay, 2005c).

City of Daly City

Daly City's total 2030 water demand, taking into account plumbing code savings, is 9.1 mgd. This represents a 5 percent increase in total service area demand over the 2001 base-year demand estimate. Daly City uses multiple supply sources to meet its water demand. In 2030, Daly City estimates it will purchase 54 to 80 percent of its total water demand from the SFPUC and 57 to 85 percent of remaining demand after conservation has been implemented, based on Daly City's purchase estimate (refer to Table 7.2). Daly City's 2030 estimated purchase of 4.90 – 7.32 mgd from the SFPUC represents a -0.18 – 2.24 mgd, or -4 – 44 percent, change from its 2001 purchases. The purchase estimate range reflects a range of potential groundwater usage established under a pilot project, from the sustainable yield (3.76 mgd) to the lowest annual production yield (1.34 mgd). Daly City's current water supply assurance is 4.29 mgd.

The customer-selected population projection used for Daly City in the demand study is about the same as (2 percent higher than) the buildout population cited in the city's general plan, and 9 percent lower than the 2030 population projected by ABAG.

The employment projection for Daly City in the demand study is about the same as (1 percent less than) the employment projection cited in the city's general plan, and about 14 percent higher than the ABAG *Projections 2005* employment projection.

City of East Palo Alto

East Palo Alto's total 2030 water demand, taking into account plumbing code savings, is 4.8 mgd. This represents a 92 percent increase in total service area demand over the 2001 base-year demand estimate. The SFPUC is East Palo Alto's only source of potable water supply. In 2030, East Palo Alto estimates it will purchase 97 percent of its total water demand from the SFPUC and 100 percent of remaining demand after conservation has been implemented, based on East Palo Alto's purchase estimate (refer to Table 7.2). East Palo Alto's 2030 estimated purchase of 4.64 mgd from the SFPUC represents a 2.60 mgd, or 127 percent, increase over its 2001 purchases. East Palo Alto's current water supply assurance is 1.96 mgd.

East Palo Alto's customer-selected projections used to derive water demand assume 34 percent growth in population and 164 percent growth in employment by 2030. Besides the projected population and employment growth assumed in the demand model, the projected 92 percent increase in demand reflects expected new commercial and residential development having higher per-account water use rates than existing accounts. To accommodate this new development, two new account categories were created for the demand model, as follows:

- a new commercial account category was created to represent additional water demand of 1.2 mgd from new commercial uses, which are assumed to have a use rate of 5,000 gallons per account per day, in the Ravenswood Business District
- a new residential account category was created to represent additional water demand of 0.3 mgd from new single-family residences in the Ravenswood Business District

In more general terms the East Palo Alto's Urban Water Management Plan attributes the near doubling of demand by 2030 to a shift in development density in the city. The UWMP states that the city is shifting from traditional single family dwelling units to higher density multiple-family units that is expected to substantially increase water demand without a commensurate increase in the number of water connections.

The population projection used for East Palo Alto in the demand study is about 6 percent less than the growth expected by 2020 in the city's general plan and 25 percent less than that projected by ABAG's *Projections 2005* for East Palo Alto in 2030. This substantial difference is likely due to adjustments made to the demand study projections to account for the portion of residential customers in East Palo Alto that are served by two other water districts (which are not BAWSCA members and do not receive SFPUC water): the Palo Alto Mutual Water Company and the O'Connor Tract Mutual Cooperative Water Company. According to the demand study, the single- and multi-family residential accounts served by these two water companies were subtracted from the total population served by East Palo Alto (URS, 2004a).

The customer-selected employment projection for East Palo Alto used in the demand study is substantially higher (about 46 percent) than the employment projection cited in the city's general plan (and about 42 percent higher than the ABAG *Projections 2005* employment projection). A combination of the following factors likely accounts for the difference:

- The Ravenswood Business District, a proposal to amend the general plan and zoning ordinance to redevelop 146 acres in the northeast section of East Palo Alto, is not reflected in the general plan projections but is reflected in the WSIP projections. The city began preparing an environmental impact report on the Ravenswood Business District in 2002; as then envisioned, the development would have resulted in an estimated 1,800 jobs above general plan employment projections.[26] Economic changes have likely slowed the pace at which revitalization can occur in East Palo Alto, and the Ravenswood Business District is currently being redefined.
- The difference is partially attributable to the longer planning horizon of the WSIP (2030 versus 2010) and changing expectations about employment growth as reflected in different

[26] The Ravenswood Business District area identified in the administrative draft EIR for the project consists of about 146 acres of land, exclusive of streets. Existing land uses within the area include a variety of industrial, commercial, residential, and agricultural uses; approximately 45 acres are vacant and undeveloped.

ABAG projections series. The customer-selected projection is consistent with (about 6 percent less than) *Projections 2002* employment forecasts for 2030.

- The base year employment projection identified in the general plan is 2,760 for year 2000; the base year employment estimate in the demand study is 3,289 for year 2001. The latter estimate may more accurately reflect the substantial increases in job growth that occurred in the late 1990s.

Commercial and industrial demand accounts for approximately 41 percent of East Palo Alto's projected 2030 demand (SFPUC, 2006).

Estero MID

The Estero MID service area includes Foster City and a part of the City of San Mateo. Estero's total 2030 water demand, taking into account plumbing code savings, is 6.8 mgd. This represents a 17 percent increase in total service area demand over the 2001 base-year demand estimate. The SFPUC is Estero MID's only source of potable water supply. In 2030, Estero MID estimates it will purchase 91 – 100 percent of its total water demand from the SFPUC and 100 percent of remaining demand after conservation has been implemented, based on Estero MID's purchase estimate (refer to Table 7.2). Estero MID's 2030 estimated purchase of 6.20 – 6.80 mgd from the SFPUC represents a 0.58 – 1.18 mgd, or 10 – 21 percent, increase over its 2001 purchases. Estero MID's water supply assurance contract does not specify a limit on purchase.

The customer-selected 2030 population projection used for Estero MID in the demand study is 30 percent higher than the population projection in the Foster City General Plan housing element (adopted in 2001),[27] and about 23 percent higher than the 2030 Foster City population estimated by ABAG in *Projections 2005*. The difference between the demand study and general plan projections is probably due both to the general plan's horizon year of 2010 and the fact that Estero MID serves more than Foster City. (According to the wholesale customer demand study, about 10 percent of the water district is within the city of San Mateo and 90 percent is within Foster City. However, a comparison of the population estimates used for the demand study with the 2000 census for Foster City and ABAG's near term and 2030 projections indicates a population difference of about 20 percent between the water district and Foster City, as discussed below.)

A comparison of Estero's 2001 base-year population (34,568) with the 2000 census population for Foster City (28,756) (U.S. Census Bureau, 2000) shows that the population of the Estero MID service area was roughly 20 percent higher than Foster City's for the base year. A comparison of the population estimates used for Estero in the demand study with *Projections 2005* estimates for Foster City shows that the district's 2001 base-year population is about 20 percent higher than the 2000 population,[28] 16 percent higher than the projection for 2005, and, as noted, about 23 percent higher than ABAG's projection for 2030. This fairly consistent relationship between Foster City

[27] The General Plan land use element (amended in 1999) also includes population and employment projections. The land use element projects a 2005 population of 31,471, slightly higher than the later housing element projection for 2010, and 27 percent less than the 2030 population forecast used in the demand study.

[28] *Projections 2005* shows the 2000 census figure for Foster City.

and Estero population estimates suggests that the difference between the demand study and ABAG projections for 2030 is due to the difference in geographic area covered by the two sets of projections. Similarly, this difference in geographic area partially accounts for the difference between the water customer’s projected 2030 population and the Foster City General Plan population at buildout. As noted, another important difference is in the shorter-term planning horizon (2010) used in the General Plan projection. Residential demand accounts for a little more than half (52 percent) of Estero’s 2030 demand (SFPUC, 2006).

The customer-selected employment projection for Estero MID in the demand study is substantially higher (about 70 percent) than the employment projection cited in Foster City’s 2001 housing element[29] and the ABAG *Projections 2005* employment projection (about 51 percent higher). As with the population projections, the difference is due to the difference in the geographic area covered by the sets of projections and, for the general plan, the longer planning horizon of the WSIP (2030 versus 2010). An additional factor contributing to the difference between employment projections is the more dynamic nature of employment in the area (compared to population) in the late 1990s and early 2000s. The Foster City housing element employment projection is based on ABAG’s *Projections 2000* (ABAG, 1999), whereas the demand study used the employment projections in *Projections 2002*. A comparison of these two ABAG projections sets show that *Projections 2002* expected continued strong job growth in Foster City into the future (15 to 18 percent more jobs in 2005, 2010, 2015, and 2020 than were projected for those years in *Projections 2000*). The influence of the economic boom on *Projections 2002* thus contributed to some of the difference between the general plan and water demand study projections.

Projections 2005, by contrast, reflects improving information about the effects of dramatic job losses that were incurred in the area, with job forecasts for Foster City 23 to 33 percent lower than those of *Projections 2002* for the years that can be compared (2005, 2010, 2015, 2020, and 2025). *Projections 2005* employment forecasts for San Mateo also are 15 to 30 percent lower than those in *Projections 2002*, for the years that can be compared. This would account for the greater difference between customer-selected and ABAG employment projections than would be expected due to differences in geographic area covered by the two projections. As discussed in Section 7.3.2, above, *Projections 2005* forecasts a greater increase in jobs over time than was forecasted in *Projections 2002*, so that by 2025 (the last year the two sets can be compared) there is less difference between projections than there is in the near-term.

Commercial/institutional and industrial demand accounts for approximately 12 percent of Estero’s projected 2030 demand (SFPUC, 2006).

29 The General Plan land use element (amended in 1999) also includes employment projections. The land use element projects a 2010 employment projection of 21,460, somewhat higher than the later housing element projection, and about 48 percent less than the 2030 employment forecast used in the demand study.

Guadalupe Valley MID

Guadalupe Valley MID serves part of the City of Brisbane. The district's total 2030 water demand, taking into account plumbing code savings, is 0.81 mgd. This represents a 153 percent increase in total service area demand over the 2001 base-year demand estimate. The SFPUC is Guadalupe Valley MID's only source of potable water supply. In 2030, Guadalupe Valley MID estimates it will purchase 88 percent of its total water demand from the SFPUC and 100 percent of remaining demand after conservation has been implemented, based on Guadalupe Valley's purchase estimate (refer to Table 7.2). Guadalupe Valley MID's 2030 estimated purchase of 0.71 mgd from the SFPUC represents a 0.41 mgd, or 138 percent, increase over its 2001 purchases. Guadalupe Valley MID's current water supply assurance is 0.52 mgd.

The projected 153 percent increase in service area demand for Guadalupe Valley MID is apparently due to the City of Brisbane's expectation of substantial population growth in the 2001-2030 in the area served by this water district. The demographic projections used in the demand model, which were provided by Brisbane, assume a 249 percent increase in population and a 28 percent increase in employment by 2030.

The customer-selected projections used for Guadalupe Valley MID in the demand study assume a population of 1,558 in 2030 and 5,668 jobs. Since Guadalupe Valley MID serves only part of Brisbane, the population and employment projections used in the demand study are not comparable to the city as a whole. Refer to the discussion under Brisbane for a comparison of combined water district projections with general plan and ABAG projections.

City of Hayward

Hayward's total 2030 water demand, based on the demand study and taking into account plumbing code savings, is 28.7 mgd. This represents a 49 percent increase in total service area demand over the 2001 base-year demand estimate. The SFPUC is Hayward's only source of potable water supply. In 2030, Hayward estimates it will purchase 97 percent of its total water demand from the SFPUC and 100 percent of remaining demand after conservation has been implemented, based on Hayward's purchase estimate (refer to Table 7.2). Hayward's 2030 estimated purchase of 27.95 mgd from the SFPUC represents a 10.34 mgd, or 59 percent, increase over its 2001 purchases. Hayward's water supply assurance contract does not specify a limit on purchases.

The percentage increase in water demand for Hayward projected for 2030 (49 percent) is considerably greater than the projected growth in both population and employment assumed in the demand model (16 percent and 30 percent, respectively). Given both the substantial increase in total demand projected for Hayward (9.4 mgd) and the substantial difference in the expected demand and population and employment growth rates, this discrepancy warrants additional discussion.

Hayward residents have among the lowest rates of per capita water use compared with residents in other communities served by the SFPUC. This is a consequence of past development patterns that have included high density development with little or no landscaping. The general plan states that during development surges that occurred from the 1950's to mid 1980's, because few development standards existed, "some apartment buildings were poorly designed with as many units as possible loaded on the site… and there was little or no play space for children…" (City of Hayward, 2002a). In addition, single family homes typically were located on smaller lots compared with other parts of the Bay Area and many had minimal, if any, landscaping. The city currently expects that new housing developed in the city will have higher water use rates due to comparatively larger lots with more landscaping. The city is also encouraging renovation efforts that include landscaping common areas within neighborhoods and assisting homeowners with rehabilitating their private properties. As a result, per capita water use rates are expected to increase somewhat (City of Hayward, 2005). According to the general plan, city planners also are encouraging development consistent with smart growth principles, including infill development and higher densities in urban core areas. Because of the city's experience with poorly planned, designed, and constructed high density development in the past, the city has met with some resistance regarding higher densities. However, successful transit oriented developments have demonstrated that well planned development can accommodate higher densities without diminishing quality of life for resident.

The demand model incorporated adjustments in recognition of these factors. The higher water demand projected for 2030 results from adjustments made to account for expected changes in water usage for new and existing residential accounts, as well as changes expected in some industrial accounts. To accommodate the anticipated changes, in response to input from the city, the demand model was adjusted to include several new account categories, as follows:

- A new category of residential account was created to accommodate the addition of more than 2,000 new homes the city expects to be developed. These new residences are expected to be on larger lots than existing housing, include more landscaping, and have a higher per capita water use rate.
- A new account category was created for newly renovated single family homes, which have more landscaping than previously and use more water.
- Based on the city's general plan, which indicates that the city expects to attract high technology manufacturing industries, a new account category was added for higher-demand commercial and industrial uses. The higher water demand expected from this new industrialization was incorporated into the model.

Hayward's demand model also was adjusted to increase the expected percentage of unaccounted-for water in its system. The five-year average for the Hayward water system was 7.2 percent. A 9 percent unaccounted-for water was used in the demand study because Hayward's unaccounted-for water includes water used for hydrant flushing and other maintenance purposes. Although many agencies categorize these uses as "other," Hayward does not. Because these types of uses are difficult to anticipate, Hayward adjusted its unaccounted-for water to 9 percent, consistent with its 2001 UWMP (URS, 2004a). The SFPUC reviewed each of the requests for adjustments against current billing records and other documentation, including the city's Water Master Plan and general plan, before making a determination that the requested adjustments were reasonable.

The customer-selected population projection used for Hayward in the demand study is generally consistent with the growth cited in the city's general plan and the growth expected by ABAG. The 2030 Hayward population used in the demand study is approximately 2 percent higher than the population identified in the city's general plan and about 5 percent lower than projected by ABAG.

The employment projection for Hayward in the demand study is generally consistent with (about 5 percent higher than) the employment projection cited in the city's general plan and about 13 percent higher than ABAG's *Projections 2005* 2030 projections.

Town of Hillsborough

Hillsborough's total 2030 water demand, taking into account plumbing code savings, is 3.9 mgd. This represents a 5 percent increase in total service area demand over the 2001 base-year demand estimate. The SFPUC is Hillsborough's only source of potable water supply. In 2030, Hillsborough estimates it will purchase 95 percent of its total water demand from the SFPUC and 100 percent of remaining demand after conservation has been implemented, based on Hillsborough's purchase estimate (refer to Table 7.2). Hillsborough's 2030 estimated purchase of 3.70 mgd from the SFPUC represents a 0.14 mgd, or 4 percent, increase over its 2001 purchases. Hillsborough's current water supply assurance is 4.09 mgd.

The customer-selected population projection used for Hillsborough in the demand study is generally consistent with the growth identified in the city's general plan and the growth expected by ABAG. The 2030 Hillsborough population used in the demand study is approximately 8 percent higher than both the population identified in the city's general plan (for 2025) and that projected for 2030 by ABAG. The difference between the demand study and ABAG 2030 projections is probably due to the fact that the Hillsborough's water service area includes a portion of unincorporated San Mateo County, in addition to the town itself. A comparison of Hillsborough's 2001 base-year population for the water demand projections with ABAG projections for 2000 and 2005 show that the difference in ABAG and Hillsborough projections is about the same in the base year as in 2030: Hillsborough's 2001 population is about 7 percent higher than ABAG's 2000 population and 6 percent higher than ABAG's 2005 population. This suggests that the difference between the projections may be due to differences in the geographic area covered.

The employment projection for Hillsborough used in the demand study is about the same as (1 percent more than) the projection for 2025 in the town's general plan. The projection is considerably less (32 percent) than ABAG's projection for 2030.

City of Menlo Park

The City of Menlo Park, represented by the Menlo Park Municipal Water District estimates a total 2030 water demand, taking into account plumbing code savings, of 4.7 mgd. This represents a 15 percent increase in total service area demand over the 2001 base-year demand estimate. The SFPUC is Menlo Park's only source of potable water supply. In 2030, Menlo Park estimates it will purchase 97 percent of the water district's total water demand from the SFPUC and

100 percent of remaining demand after conservation has been implemented, based on Menlo Park's purchase estimate (refer to Table 7.2). Menlo Park's 2030 estimated purchase of 4.54 mgd from the SFPUC represents a 0.97 mgd, or 27 percent, increase over its 2001 purchases. Menlo Park's current water supply assurance is 4.46 mgd.

Because the water district serves less than half of the city, the population projection used for Menlo Park in the demand study is not directly comparable to general plan or ABAG projections for the city. Nevertheless, the 2030 water demand population projection is consistent with growth identified in the city's general plan, assuming the district would serve the same percentage of the city's population. In 2001, the water district served 12,153—or 39 percent—of the city's more than 30,785[30] residences. The customer-selected population used in the demand study for 2030 (13,655) is 39 percent of the general plan buildout population (35,285, projected for 2010). ABAG projects a population for Menlo Park of 41,100 in 2030, 16 percent more than the population projected at general plan buildout. (The CWS–Bear Gulch District, discussed above, and O'Connor Water District, which is not an SFPUC customer, serve the remaining portions of Menlo Park.)

Mid-Peninsula Water District

The Mid-Peninsula Water District primarily serves the City of Belmont, although it also serves a small part of unincorporated San Mateo County and the City of San Carlos. Mid-Peninsula's total 2030 water demand, taking into account plumbing code savings, is 3.8 mgd. This represents a 4 percent increase in total service area demand over the 2001 base-year demand estimate. The SFPUC is the Mid-Peninsula Water District's only source of potable water supply. In 2030, the District estimates it will purchase 97 percent of its total water demand from the SFPUC and 100 percent of remaining demand after conservation has been implemented, based on Mid-Peninsula's purchase estimate (refer to Table 7.2). Mid-Peninsula Water District's 2030 estimated purchase of 3.70 mgd from the SFPUC represents a 0.24 mgd, or 7 percent, increase over its 2001 purchases. Mid-Peninsula Water District's current water supply assurance is 3.89 mgd.

The customer-selected population projection used for the Mid-Peninsula Water District in the demand study is about the same as (approximately 1 percent higher than) the projection cited in the 2002 Belmont housing element for 2010, and 3 percent lower than the 2030 population projected by ABAG for Belmont.

The employment projection for Mid-Peninsula Water District in the demand study is substantially higher (about 58 percent) than ABAG's *Projections 2005* projections for Belmont in 2030. The difference is due to the lower number of jobs estimated for Belmont in the near term in *Projections 2005*, compared with the customer-selected projections used in the demand study, as a consequence of the substantial job losses sustained in the area in the first part of this decade. The projections used in the demand study expected almost twice as many jobs in 2005 as are estimated in *Projections 2005* (15,742 compared to 8,190).[31] Because *Projections 2005* forecasts

30 This was the city's population in 2000 according to the U.S. Census.
31 The demand study estimate for 2005 was interpolated for this PEIR analysis from the employment figures in the SFPUC demand study; refer to Table E.3.4 of Appendix E, Section E.3.

a higher rate of subsequent job growth (a 72 percent increase in jobs compared to a 41 percent increase assumed in the demand study projections), by 2030 the difference in total jobs forecasted by the two projections is less than in the near term.

City of Millbrae

Millbrae's total 2030 water demand, taking into account plumbing code savings, is 3.3 mgd. This represents a 5 percent increase in total service area demand over the 2001 base-year demand estimate. The SFPUC is Millbrae's only source of potable water supply. In 2030, Millbrae estimates it will purchase 97 percent of its total water demand from the SFPUC and 99 – 100 percent of remaining demand after conservation has been implemented, based on Millbrae's purchase estimate (refer to Table 7.2). Millbrae's 2030 estimated purchase of 3.19 mgd from the SFPUC represents a 0.72 mgd, or 29 percent, increase over its 2001 purchases. Millbrae's current water supply assurance is 3.15 mgd.

The population projection used for Millbrae in the demand study is generally consistent with the growth identified in the city's general plan and the 2030 population projected by ABAG. The 2030 Millbrae population used in the demand study is approximately 1.3 percent higher than the population cited in the city's general plan, and 3 percent higher than the 2030 Millbrae population projected by ABAG.

The employment projection for Millbrae in the demand study is about 33 percent lower than the employment projection cited in the city's general plan and about 20 percent lower than ABAG's *Projections 2005* employment projection.

City of Milpitas

Milpitas' total 2030 water demand, taking into account plumbing code savings, is 17.7 mgd. This represents a 48 percent increase in total service area demand over the 2001 base-year demand estimate. Milpitas uses multiple supply sources to meet its water demand. In 2030, Milpitas estimates it will purchase about 46 percent of its total 2030 water demand from the SFPUC and about 48 percent of remaining demand after conservation has been implemented, based on Milpitas' purchase estimate. The SFPUC portion of Milpitas' supply would supplement the city's use of recycled water and other surface water supplies in addition to the conservation savings (refer to Table 7.2). Milpitas' 2030 estimated purchase of 8.20 mgd from the SFPUC represents a 1.37 mgd, or 20 percent, increase over its 2001 purchases. Milpitas' current water supply assurance is 9.23 mgd.

The projected percentage increase in water demand for Milpitas in 2030 (48 percent) is somewhat greater than the projected growth in both population and employment assumed in the demand models (42 percent growth projected for each category). Given the relatively substantial increase in total service area demand for Milpitas (5.74 mgd) this discrepancy in demand and demographic growth rates warrants additional discussion. Several new billing account categories were created in the demand model for Milpitas to reflect observed changes in land use and water consumption rates. All new single family residential accounts (above those existing in 2001) were placed into a new single family residential category that assumes larger homes with higher outdoor water usage. It was assumed that these accounts use approximately 50 percent more water than existing accounts; all of the additional water usage was allocated to outdoor use. In addition, based on information in the city's Water Master Plan and conversations with the wholesale customer, the model also included a new commercial category, which was assumed to have higher water usage than existing accounts. All new commercial accounts (above those existing in 2001) were placed in this category. Therefore, the differences in rates of increase (in demand compared with population and employment) do not indicate inconsistencies between the city's water supply and land use planning efforts. The city's estimated 2030 purchase from the SFPUC (which, as noted in the preceding paragraph, is 20 percent above 2001 purchases) does not reflect the growth in total demand.

The customer-selected population projection used for Milpitas in the demand study is approximately 15 percent greater than the growth identified in the city's general plan and is generally consistent with (about 3 percent less than) the growth projected by ABAG. The City of Milpitas is currently preparing a Transit Area Specific Plan that is expected, upon adoption, to result in a buildout population of 95,014, somewhat greater than the population projection used in the demand study (Williams, 2007).

The employment projection for Milpitas in the demand study is about 17 percent higher than the employment projection cited in the city's general plan, and about 10 percent higher than the ABAG *Projections 2005* employment projection.

City of Mountain View

Mountain View's total 2030 water demand, taking into account plumbing code savings, is 14.8 mgd. This represents a 12 percent increase in total service area demand over the 2001 base-year demand estimate. Mountain View uses multiple supply sources to meet its water demand. In 2030, Mountain View estimates it will purchase 89 percent of its total water demand from the SFPUC and 91 – 97 percent of remaining demand after conservation has been implemented, based on Mountain View's purchase estimate (refer to Table 7.2). Mountain View's 2030 estimated purchase of 13.20 mgd from the SFPUC represents a 2.23 mgd, or 20 percent, increase over its 2001 purchases. Mountain View's current water supply assurance is 13.46 mgd.

The customer-selected population projection used for Mountain View in the demand study is 9 percent higher than the buildout population identified in the city's general plan, and 9 percent lower than the 2030 population projected by ABAG. The difference between the demand study and general plan projections may be attributable to the general plan's horizon year of 2010.

The employment projection for Mountain View in the demand study is about 13 percent higher than the employment projection cited in the city's general plan, and about 18 percent higher than the ABAG employment projection.

North Coast County Water District

The North Coast County Water District primarily serves the city of Pacifica; a small part of its service area encompasses a portion of unincorporated San Mateo County. North Coast County's total 2030 water demand, taking into account plumbing code savings, is 3.8 mgd. This represents a5 percent increase in total service area demand over the 2001 base-year demand estimate. The SFPUC is North Coast's only source of potable water supply. In 2030, the District estimates it will purchase 95-100 percent of its total water demand from the SFPUC and remaining 100 percent of demand after conservation has been implemented, based on North Coast's purchase estimate (refer to Table 7.2). North Coast County's 2030 estimated purchase of 3.61 – 3.80 mgd from the SFPUC represents a 0.16 – 0.35 mgd, or 5 – 10 percent, increase over its 2001 purchases. North Coast County's current water supply assurance is 3.84 mgd.

The customer-selected population projection used for North Coast County Water District in the demand study (47,829) is 13 percent higher than the 2030 Pacifica population projected by ABAG (42,200). The difference in the projections is apparently due to ABAG's lowered expectations of population growth in Pacifica. The demand study cites as its source ABAG *Projections 2002*, which expected more growth in Pacifica than does *Projections 2005*. (For example, *Projections 2002* estimated a population of 44,300 in 2025, whereas *Projections 2005* estimates a 2025 population of 41,700. North Coast County's UWMP, published in December 2005, uses a 2030 population estimate of 42,100, which is similar to ABAG's. The UWMP also forecasts somewhat lower water demand in 2030 than did the wholesale customer demand study (3.46 compared to 3.80 mgd). According to the UWMP, the "source of the discrepancy appears to be differing data for the District's base year, and differences in ABAG *Projections 2002* and *Projections 2005*" (North Coast County Water District, 2005). The Pacifica General Plan (which appears to date from 1980, except for a 1992 housing element) does not provide a comparable population projection.

The employment projection for North Coast in the demand study is 12 percent less than the ABAG *Projections 2005* employment projection for Pacifica.

City of Palo Alto

Palo Alto's total 2030 water demand, taking into account plumbing code savings, is 14.36 mgd based on the City's 2005 UWMP, as requested by the City in a letter to the SFPUC (City of Palo Alto, 2005). This represents a 1 percent increase in total service area demand over the 2001 base-year demand estimate. The SFPUC is Palo Alto's only source of potable water supply. In 2030, Palo Alto estimates it will purchase 91 percent of its total water demand from the SFPUC, and 94 percent of remaining demand after conservation has been implemented, based on the city's purchase estimate. The SFPUC portion of Palo Alto's supply would supplement the city's projected conservation savings and use of recycled water (refer to Table 7.2). Palo Alto's 2030 estimated purchase of 13.00 mgd from the SFPUC represents a -0.19 mgd, or 1 percent, decrease from its 2001 purchases. Palo Alto's current water supply assurance is 17.07 mgd.

The customer-selected population projection used for Palo Alto in the demand study is 10 percent higher than the buildout population identified in the city's general plan; the projection is not comparable to ABAG's projections for Palo Alto, since the wholesale demand projection does not include Stanford University (a distinct SFPUC wholesale customer), whereas ABAG does include the university. The difference between the demand study and general plan projections may be attributable to the general plan's horizon year of 2010.

The employment projection for Palo Alto in the demand study is about 16 percent higher than the employment projection cited in the city's general plan, but slightly lower than (by about 2 percent) than the ABAG employment projection for 2030.

Purissima Hills Water District

The Purissima Hills Water District serves about two-thirds of the Town of Los Altos Hills and a small part of adjacent unincorporated Santa Clara County. The total 2030 water demand estimated for the water district, taking into account plumbing code savings, is 3.3 mgd. This represents a 51 percent increase in total service area demand over the 2001 base-year demand estimate. The SFPUC is Purissima Hills Water District's only source of potable water supply. In 2030, the District estimates it will purchase 98 percent of its total water demand from the SFPUC and 100 percent of remaining demand after conservation has been implemented, based on Purissima Hills' purchase estimate (see Table 7.2). Purissima Hills' 2030 estimated purchase of 3.22 mgd from the SFPUC represents a 1.02 mgd, or 46 percent, increase over its 2001 purchases. Purissima Hills' current water supply assurance is 1.62 mgd.

Because the Purissima Hills Water District serves only part of the town's residences and some unincorporated county areas, the population projection used for the district in the demand study is not comparable to general plan or ABAG projections for the town. Nevertheless, the 2030 water demand population projection for the water district is consistent with growth identified in the town's 2002 Housing Element (Town of Los Altos Hills, 2002), assuming the district would serve the same percentage of the town's population. In 2001, the Purissima Hills Water District served 6,032—or 64 percent—of the approximately 9,455 residences estimated for the town and its sphere of influence in 2000. The customer-selected population projection used in the demand study (6,763) is 64 percent of the projection shown in the Housing Element (10,500 projected for 2025). Both the demand study and Housing Element projections reflect an annual population growth rate of approximately 0.4 percent. ABAG projects a population for Los Altos Hills of 10,700 in 2030, 2 percent more than the Housing Element population projection for 2025. The Housing Element cites ABAG projections for employed residences (and indicates some reservations about these ABAG projections) but does not provide projections for jobs with which to compare the demand study employment (job) projections.

Although the water district projects a 51 percent increase in water demand, that increase is not reflected in expected population and employment growth. The population and employment estimates used in the demand model indicate a 12 percent increase in population and a 9 percent increase in employment from 2001 to 2030. The demand model for the Purissima Hills Water District includes a "new/renovated single family residential" account category that has a much higher water use rate (1,605 gallons per day per account), than does the "old single family residential" category (716 gallons per day per account), which accounts for the substantial increase in water demand compared to projected population and employment growth.

City of Redwood City

The City of Redwood City provides water to Redwood City as well as to part of San Carlos, part of Woodside, and part of unincorporated San Mateo County. Redwood City's total 2030 water demand, taking into account plumbing code savings, is 13.4 mgd. This represents a 13 percent increase in total service area demand over the 2001 base-year demand estimate. The SFPUC is Redwood City's only source of potable water supply.

In 2030, Redwood City estimates it will purchase 87 percent of its total water demand from the SFPUC, and 92 percent of remaining demand after conservation has been implemented, based on Redwood City's purchase estimate and subsequent communication with the SFPUC. Redwood City's 2030 estimated purchase of 11.60 mgd from the SFPUC represents essentially no change (-0.04 mgd) from its 2001 purchases. In the purchase estimate originally submitted to the SFPUC in 2004, Redwood City estimated it would purchase 11.60 – 12.60 mgd, which corresponds to 87 – 94 percent of its total 2030 demand and 94 – 98 percent of remaining demand after conservation has been implemented. The estimated purchases of 11.60 – 12.60 mgd from the SFPUC represent a -0.04 – 0.96 mgd change from the City's 2001 purchases (refer to Table 7.2). Subsequently, in 2005, Redwood City informed the SFPUC that it would be purchasing its low range estimate (11.6 mgd) due to the estimated use of 1 mgd of recycled water in 2030. Redwood City's current water supply assurance is 10.93 mgd.

The customer-selected population projection used for Redwood City in the demand study is 24 percent lower than ABAG's 2030 population projection of 122,300 for the city and its sphere of influence. The 2030 Redwood City population used in the demand study is approximately 7 percent more than the 2020 projection shown in the city's Downtown Precise Plan, which cites ABAG's *Projections 2005* forecast for 2020 for the city within its jurisdictional boundary. The city's water service area includes only a portion of the city's sphere of influence (Bonte, 2006), which probably accounts for the difference between the ABAG projection for the city and its sphere of influence and that assumed in the demand study. ABAG's 2030 projection of 94,300 for Redwood City within the city limits only is within 1 percent of the demand study projection. Because the population projection included in the city's 1990 general plan is for 2000 (earlier than 2005), it is not considered comparable to the 2030 WSIP population projection for this analysis. According to the city, the 2003 UWMP was selected for use in the demand study because the UWMP contained the most current population and employment projections at the time.

The employment projection for Redwood City in the demand study is about 9 percent higher than the *Projections 2005* employment projection for 2030. The City's general plan does not have a comparable employment projection.

City of San Bruno

San Bruno's total 2030 water demand, taking into account plumbing code savings, is 4.5 mgd. This represents a 2 percent increase in total service area demand over the 2001 base-year demand estimate. In 2030, the SFPUC will be San Bruno's only source of potable supply, although in the past the City has used other sources of water supply. In 2030, San Bruno estimates it will purchase 96 percent of its total water demand from the SFPUC and 100 percent of remaining demand after conservation has been implemented, based on San Bruno's purchase estimate (refer to Table 7.2). San Bruno's 2030 estimated purchase of 4.30 mgd from the SFPUC represents a 1.60 mgd, or 59 percent, increase over its 2001 purchases. San Bruno's current water supply assurance is 3.25 mgd.

The customer-selected population projection used for San Bruno in the demand study is about 4 percent higher than the projection for 2020 cited in the city's 2003 general plan housing element and 5 percent lower than the 2030 population projected by ABAG. The general plan, adopted in 1984, does not include comparable projections; the City of San Bruno is currently working on a general plan update.

The employment projection used for San Bruno in the demand study is about 34 percent higher than the projection for 2020 cited in the city's 2003 general plan housing element, but about 9 percent lower than the 2030 ABAG employment projection. The demand study employment projection is based on the city's 2001 draft general plan. The draft general plan had not been adopted at the time of Draft PEIR publication, so the housing element provides the city's published employment projections. Base year employment estimates in the 2003 housing element and 2001 draft general plan are similar (16,500 and 16,600, respectively). The sources of the job estimates for the housing element and draft general plan are ABAG *Projections 2000* and *Projections 2002*, respectively. The housing element indicates an expected annual growth rate for the period 2000-2020 of 0.8 percent, whereas the draft general plan indicates an expected annual growth rate for the period 2000-2020 of 1.7 percent. (This average annual growth rate for the 2000–2020 period was applied to the 2020 to 2030 period for the WSIP forecasts). Consequently, the differences in the forecasts are a direct reflection of the shifting expectations in the two ABAG Projections series, with *Projections 2002* forecasts reflecting more of the economic boom that occurred in the late 1990s and early part of the 2000s in the Bay Area, as well as the 10-year difference in the horizon year. Commercial demand accounts for approximately 20 percent of San Bruno's projected 2030 demand (SFPUC 2006b).

City of San Jose (North)

The San Jose Municipal Water District–North (San Jose North) serves part of the northern San Jose/Alviso area of the city. The district's total 2030 water demand, taking into account plumbing code savings, is 6.5 mgd. This represents a 25 percent increase in total service area demand over the 2001 base-year demand estimate. In 2030, the SFPUC will be San Jose's only source of potable supply, although in the past the City has used other sources of water supply. In 2030, the District estimates it will purchase 98 percent of its total water demand from the SFUPC and 100 percent of remaining demand after conservation has been implemented, based on

San Jose North's purchase estimate (refer to Table 7.2). San Jose's 2030 estimated purchase of 6.34 mgd from the SFPUC represents a 1.92 mgd, or 43 percent, increase over its 2001 purchases. San Jose does not have a water supply assurance contract with the SFPUC.

The customer-selected projections used in the demand study for San Jose assume 23 percent growth in population and 34 percent growth in employment by 2030. Because this water district only serves part of the northern section of San Jose, the population projection used for San Jose North in the demand study is not comparable to projections contained in the city's general plan or ABAG projections for San Jose.

City of Santa Clara

Santa Clara's total 2030 water demand, taking into account plumbing code savings, is 33.9 mgd. This represents a 31 percent increase in total service area demand over the 2001 base-year demand estimate. Santa Clara uses multiple supply sources to meet its water demand. In 2030, Santa Clara estimates it will purchase about 14 percent of its total 2030 water demand from the SFPUC and about 15 percent of remaining demand after conservation has been implemented, based on the City's purchase estimate. The SFPUC portion of Santa Clara's supply would supplement the city's conservation savings and use of recycled water, groundwater, and other surface water supplies (refer to Table 7.2). Santa Clara's 2030 estimated purchase of 4.90 mgd from the SFPUC represents a 1.06 mgd, or 28 percent, increase over its 2001 purchases. Santa Clara does not have a water supply assurance contract with the SFPUC.

The customer-selected population projection used for Santa Clara in the demand study is generally consistent with the growth cited in the city's general plan and the growth projected by ABAG. The 2030 population estimated in the demand study is approximately 8 percent higher than that cited in the city's general plan, which may be attributable to the longer planning horizon of the WSIP (2030 compared to 2010 for the general plan). The 2030 Santa Clara population estimated in the demand study is about 1 percent less than the population projected by ABAG.

The employment projection used for Santa Clara in the demand study is 17 percent higher than the projection in the City's general plan (for 2010) and 16 percent higher than the ABAG 2030 employment projection.

Skyline County Water District

Skyline County Water District serves part of the town of Woodside and part of unincorporated San Mateo County along Highway 35 (Skyline Boulevard), from Highway 84 to Highway 92. Skyline County's total 2030 water demand, taking into account plumbing code savings, is 0.31 mgd. This represents an 82 percent increase in total service area demand over the 2001 base-year demand estimate. The SFPUC is Skyline County's only source of potable water supply. In 2030, Skyline estimates it will purchase about 97 percent of the district's total water demand from the SFPUC and 100 percent of remaining demand after conservation has been implemented, based on Skyline's purchase estimate (see Table 7.2). Skyline's 2030 estimated purchase of

0.30 mgd from the SFPUC represents a 0.13 mgd, or 76 percent, increase over its 2001 purchases. Skyline's current water supply assurance is 0.18 mgd.

Because Skyline County Water District serves part of Woodside and a portion of unincorporated San Mateo County, the population projection used for the district in the demand study is not comparable to either general plan or ABAG projections. The water district selected historical data—the BAWSCA annual survey—as its source for population projections. The district stated that, because of the limited development potential in the district—much of which is owned by the Mid-Peninsula Regional Open Space Authority and San Mateo County Parks and Recreation Department—it expected less growth than was projected for the greater San Francisco Bay Area. Nevertheless, the demand model estimates show a district population in 2030 that is more than twice that in 2001 (an increase from 1,210 to 2,683, or 122 percent). This substantial increase (in contrast to the stated low expectations of growth) is apparently due to the possibility that three other water districts—the Kings Mountain Water Company, the Skylonda Mutual Water Company, and the Cuesta La Honda Water Company—may become part of Skyline County Water District. The Skyline County Water District notes that growth in the areas served by these water companies is also constrained by publicly owned open space lands (Skyline County Water District, 2003). No change is projected in the number of jobs in the district.

Stanford University

Stanford University's total 2030 water demand, taking into account plumbing code savings, is 6.8 mgd. This represents a 76 percent increase in total service area demand over the 2001 base-year demand estimate. Stanford uses multiple supply sources to meet its water demand. In 2030, Stanford estimates it will purchase about 62 percent of its total 2030 water demand from the SFPUC and about 69 percent of remaining demand after conservation has been implemented, based on Stanford's purchase estimate. The SFPUC portion of Stanford's supply would supplement the university's use of other surface water supplies in addition to the conservation savings (refer to Table 7.2). Stanford's 2030 estimated purchase of 4.20 mgd from the SFPUC represents a 1.84 mgd, or 78 percent, increase over its 2001 purchases. Stanford's current water supply assurance is 3.03 mgd.

The customer-selected population projection used for Stanford in the demand study assumes 42 percent growth in population; the demand projections for Stanford did not include assumptions about employment growth. Stanford has special water account categories to reflect that it is a university rather than a city or water district. Besides residential categories (i.e., student and faculty housing), account categories include construction projections and medical school, commercial space, and academic occupants. The demand model added a special "lake water" billing category account in order to include lake water that is used for irrigation of the campus in order to more accurately reflect the actual total demand on campus. According to the demand study the effect of this specific change was to increase total demand. The Stanford Community Plan (adopted in 2000) includes an Academic Growth Boundary (AGB) which limits development on the campus. The AGB, which applies the concept of urban growth boundaries promoted in the Santa Clara County General Plan to the campus setting, limits development to the area within the AGB. The AGB is established for 25 years, during which time it may only be modified by a fourth-fifths vote of all members of the county board of supervisors.

City of Sunnyvale

Sunnyvale's total 2030 water demand, taking into account plumbing code savings, is 26.8 mgd. This represents an 8 percent increase in total service area demand over the 2001 base-year demand estimate. Sunnyvale uses multiple supply sources to meet its water demand. In 2030, Sunnyvale estimates it will purchase about 45 percent of its total 2030 water demand from the SFPUC and about 46 percent of remaining demand after conservation has been implemented, based on Sunnyvale's purchase estimate. The SFPUC portion of Sunnyvale's supply would supplement the city's conservation savings and use of recycled water, groundwater, and other surface water supplies (refer to Table 7.2). Sunnyvale's 2030 estimated purchase of 12.10 mgd from the SFPUC represents a 2.41 mgd, or 25 percent, increase over its 2001 purchases. Sunnyvale's current water supply assurance is 12.58 mgd.

The customer-selected population projection used for Sunnyvale in the demand study is generally consistent with the growth cited in the city's general plan and the growth projected by ABAG. The 2030 Sunnyvale population estimated in the demand study is approximately 2 percent less than that cited in the general plan and about 5 percent less than projected by ABAG.

The employment projection for Sunnyvale in the demand study is about 11 percent higher than the employment projection cited in the city's general plan, and about 37 percent higher than the ABAG *Projections 2005* employment projection.

Westborough Water District

The Westborough Water District's total 2030 water demand and 2030 purchase estimate are based on the district's 2005 UWMP, as requested by the district and described below in this summary (Westborough Water District, 2005; Westborough Water District, 2007). Based on the UWMP, the district's 2030 water demand, taking into account plumbing code savings, is 1.03 mgd. This represents a 1 percent increase (0.01 mgd) in total service area demand over the 2001 base-year demand estimate. The SFPUC is Westborough's only source of potable water supply. In 2030, Westborough estimates it will purchase 100 percent of its total water demand from the SFPUC. Westborough's 2030 purchase estimate of 1.03 mgd is 1 percent higher (0.01 mgd) than its 2001 purchases. Although this purchase estimate does not explicitly include quantified conservation savings, the UWMP describes demand management programs that the district is currently implementing, those it plans to continue, and two new programs it plans to start during the 2006-2010 UWMP planning period. The purchase estimate originally submitted by the district indicated conservation savings of 0.02 mgd. Westborough's current water supply assurance is 1.32 mgd.

The district's total 2030 water demand, taking into account plumbing code savings, was calculated in the demand study to be 0.88 mgd. This represented an 11 percent decrease in total service area demand over the 2001 base-year demand estimate. In 2004, following completion of the demand, conservation, and other related studies, Westborough submitted a purchase estimate of 1.2 mgd, an 18 percent increase over 2001 purchases, and 36 percent greater than the demand study's projected demand. Demand estimates in Westborough's UWMP, which was published in December 2005, differ from these demand study projections. In February 2007 Westborough Water District formally submitted a request to the SFPUC (Westborough Water District, 2007) that the district's calculation of future water demands in 2030 of 1.03 mgd, as cited in the UWMP, be used in SFPUC planning efforts.

The updated UWMP projection of 1.03 mgd demand and purchases in 2030 is 17 percent higher than was projected in the SFPUC demand study and 17 percent lower than the purchase estimate originally submitted by the district. The UWMP attributes the difference between its projected 2030 demand and the demand developed in the DSS model to "differing assumptions about the District's base year, and projected population" (Westborough Water District, 2005). The UWMP base year population estimates for 1990 and 2000 are from U.S. Census data for Census Tracts 6025 and 6026. The 2000 population is 13,033 and the projected 2030 population is 14,300 (a 10 percent increase) compared with the estimated 2001 base year population of 10,017 and 2030 projected population of 10,146 (a 1 percent increase) used in the demand study. (The BAWSCA [then BAWUA] annual survey was the source of population projections selected by Westborough Water District for the modeling exercise [URS, 2004a].)

Based on the information presented in the UWMP and the February 2007 letter from the Westborough Water District to the SFPUC, this PEIR uses the demand, purchase, and population estimates presented in the UWMP. To be consistent with previous and ongoing WSIP studies, the high-range purchase estimate total published in URS 2004b of 300 mgd, based on the previously submitted purchase estimates of Westborough and the other water customers, remains the SFPUC's 2030 purchase estimate for planning purposes.

Since the Westborough Water District serves only part of South San Francisco, the population projection used in the demand study is not comparable to that of the city as a whole. Refer to the discussion under CWS–South San Francisco for a comparison of combined water district projections with those of the city's general plan and ABAG.

SFPUC Retail Service Area

The total 2030 water demand for San Francisco and the rest of the retail service area, taking into account plumbing code savings, is approximately 93.4 mgd. This represents a 0.2 percent decrease in total service area demand from the 2001 base-year estimate. The SFPUC regional water system is currently the only source of potable water supply for San Francisco and for the SFPUC's other major retail customers. In 2030, the SFPUC regional water system would provide about 86– 97 percent of total SFPUC retail service area water demand and 89 – 97 percent after conservation has been implemented. San Francisco's 2030 estimated purchase of 80 – 91 mgd from the regional water system represents a 10 percent decrease to 1 percent increase compared to 2001 SFPUC regional water system purchases. The low range of the purchase estimate would be supplemented by identified groundwater, recycled water and conservation programs totaling

10 mgd in San Francisco that are included as part of the WSIP proposed water supply option (refer to Table 7.2).

San Francisco's water demand projections are based on demographic projections that assume 12 percent growth in population and 25 percent growth in employment by 2030. The population projection used for San Francisco in the retail demand study is generally consistent with the growth cited in the city's general plan, and somewhat less consistent with the growth projected by ABAG. The 2030 population for San Francisco estimated in the demand study is approximately 5 percent more than indicated in the city's general plan and about 8 percent less than projected by ABAG in *Projections 2005* for 2030. At the time ABAG's draft *Projections 2005* was distributed to jurisdictions for review in 2004, the CCSF informed ABAG that San Francisco expects less growth by 2030 than is forecasted in *Projections 2005* and cited the estimates in the CCSF's 2002 Land Use Allocation as more realistic (Macris, 2004). The 2030 household population shown in SFPUC's UWMP, which were linearly extrapolated from City Planning estimates for 2000 and 2025, are the same as the population projection used in the demand study (849,942) (SFPUC, 2005).

The employment projection used for San Francisco in the retail demand study is about 7 percent higher than the employment projection citied in the city's general plan for 2020, and about 4 percent lower than the ABAG *Projections 2005* employment projection.

7.4 Indirect Effects of Growth

The WSIP would support planned growth and growth that is projected to occur in the service area by ABAG. Most of the projected population growth and much of the employment growth that would be supported by the SFPUC regional water system under the WSIP has been addressed in the adopted general plans of jurisdictions within the service area. The impacts of planned growth are identified and evaluated in the EIRs and other CEQA documents prepared by the jurisdictions for their general plans and related land use plans (such as general plan elements and specific plans that general plans are subsequently amended to incorporate). This section presents a summary of the impacts associated with planned growth in the service area and the mitigation measures adopted by the jurisdictions to reduce or eliminate those impacts. It includes a summary of the impacts commonly found to be mitigable and those commonly found not to be mitigable to a less-than-significant level. It also includes a summary of overriding considerations that were commonly identified by city councils in adopting land use plans despite the plans' unavoidable significant impacts. The WSIP would also support a degree of growth that, while consistent with the projections of the regional planning agency (ABAG), is not covered in adopted land use plans because the WSIP projections reflect more recent employment trends (i.e., the substantial job growth that occurred in the Bay Area in the latter part of the 1990s) than do most of the general plans and the WSIP planning horizon is longer than the planning horizon of the general plans. Therefore, this section also qualitatively describes the impacts that could result from growth supported by the WSIP beyond what has already been evaluated in the CEQA review of the adopted land use plans. Finally, as a means of gauging whether the impacts of projects developed in the planning area subsequent to adoption of the current general plans are being mitigated as prescribed in the general plan EIRs, a review of the EIRs for several large projects was undertaken and is summarized in this section.

7.4.1 Impacts

Significance Criteria

The EIRs prepared for the local general plans and related planning documents of the jurisdictions in the SFPUC service area evaluated the environmental effects associated with growth projected in the respective general plans. The impact findings identified in these environmental documents are incorporated by reference into this PEIR pursuant to CEQA Guidelines Section 15150 and are summarized here. Please see Section 1.3.5 in PEIR Chapter 1, Introduction, for a list of locations where documents incorporated by reference are available for public review.

Approach to Analysis

This section provides a summary overview of the potential indirect effects of growth that could result from implementation of approved land use plans of the jurisdictions served by SFPUC water. In addition, this section reviews the role of the SFPUC and the jurisdictions in the wholesale service area in addressing these effects; provides a discussion of the key regional growth issues in the SFPUC service area; and reviews recent examples of environmental analyses conducted at the project level within the SFPUC service area.

Impact 7-1: The WSIP would support planned growth in the SFPUC service area, although it appears that some growth would occur irrespective of the WSIP due to increased water delivery efficiencies (e.g., plumbing code changes), conservation, and other water supply sources. Planned growth would in turn result in indirect effects. In most cases, the effects of planned population and employment growth have been identified and addressed in the EIRs for the general plans and associated area plans and specific plans adopted by the jurisdictions in the service area. Some of the identified indirect effects of growth are significant and unavoidable; others are significant but can be mitigated.

In some areas the WSIP could support a degree of population and/or employment above that planned for in jurisdictions' adopted general plans, as indicated by a comparison of the levels of growth assumed in WSIP demand studies and general plan documents. In some jurisdictions (Foster City, Half Moon Bay, and Burlingame), the WSIP could support more population growth than is forecasted in adopted general plans. In some jurisdictions (East Palo Alto, Foster City, San Bruno, Fremont, Newark and Union City), the WSIP could support more employment growth than is forecasted in adopted general plans of the respective jurisdictions. To the extent that growth supported by the WSIP has not been fully analyzed in EIRs for the general plans and related land use plans of the jurisdictions served by SFPUC water, due to the WSIP's longer planning horizon, the WSIP would have impacts that are similar to, but potentially more severe than, the impacts identified in local general plan CEQA documents. To the extent the WSIP would support employment growth not fully anticipated in the general plans of jurisdictions in the service area because the general plans were prepared before the extent of the economic boom was realized, the WSIP would have impacts associated with economic development and higher numbers of

employees within the service area that are potentially new or more severe than impacts previously identified. These impacts would include traffic, air quality, noise, and demands on public services resulting from an influx of commuters from out of the area to jobs within the service area, and impacts resulting from increased demand for housing and other services within the service area to better accommodate the workforce. In addition, although the general plan EIRs reviewed for this PEIR were prepared prior to the passage of the California Global Warming Solutions Act of 2006 and do not include assessments of impacts from greenhouse gas emissions, it is expected that planned growth in the area could result in a significant and unavoidable contribution to increases in greenhouse gas emissions (e.g., from increased fossil fuel use for transportation and construction, increased industrial and commercial activities, residential energy use, operation of power plants, and oil refining).

Potentially significant unavoidable impacts as a result of planned growth in the SFPUC service area have been identified in the following areas: traffic congestion, air pollution, traffic noise, construction noise, increased demand for public schools and other public services, loss of recreational opportunities and impacts on visual quality resulting from the loss of open space, cumulative effects on overutilized parks, loss of wildlife habitat and wetlands, cumulative impacts on cultural resources, increased flooding potential, increased urban runoff pollutants, seismic hazards, induced population growth, failure to meet housing demand for projected population growth, exposure of new development to contaminated soil or groundwater, insufficient water supply, insufficient wastewater disposal capacity, loss of agricultural resources, land use conflicts, conflicts with existing land use plans or policies, and changes in density, scale, and character of an area.

Impacts from growth in years beyond that evaluated in the EIRs for adopted land use plans would occur due to an increased density of development or the use of additional land area. Impacts from increased density could include additional traffic congestion, air pollution, noise, and demand on public services; land area (or “footprint”) impacts could include the loss of agricultural resources and open space, impacts on wildlife habitat and other biological resources, disturbance of cultural resources, increased soil erosion, and water quality impacts from increased urban runoff. In addition, to the extent that a water supply shortage is identified as a future impact, the WSIP would address the need for additional water supply.

The program would support much of the planned growth in the jurisdictions served by SFPUC water. In general, development planned and approved through the general plan process in the SFPUC service area would have environmental impacts. The environmental consequences of this planned growth have been largely addressed in local plans and the associated CEQA review as well as in other, project-specific documentation. In a number of jurisdictions, negative declarations or mitigated negative declarations were prepared for general plans and related planning documents that were found not to have significant environmental effects. The analysis presented in this section focuses on the significant effects of growth identified in general plan, area plan, and specific plan EIRs. These EIRs substantially address the impacts and mitigation measures identified in the mitigated negative declarations.

The planning documents and associated environmental documents listed below were reviewed for this analysis. The EIRs and City Council and Board of Supervisor findings resolutions are summarized in this PEIR (in this chapter and Appendix E, Section E.5) and are incorporated by reference pursuant to CEQA Guidelines Section 15150. Please see Section 1.3.5 in PEIR Chapter 1, Introduction, for a list of locations where documents incorporated by reference are available for public review. In addition to listed planning documents and EIRs, statements of overriding considerations adopted in conjunction with adoption of the general plans were also reviewed.

- Town of Atherton General Plan Revisions (2002a, 2002b, 2002c)
- City of Belmont General Plan (1982), San Juan Hills Area Plan EIR (1988a, 1988b), Western Hills Area Plan EIR (1990a, 1990b), Downtown Specific Plan (1995), Peninsula Corridor Specific Plan (2003), Housing Element, (2002a, 2002b, 2002c)
- City of Brisbane General Plan and EIR (1994a, 1994b, 1994c, 1994d), Housing Element (2002)
- City of Burlingame General Plan (1969, amended through 2002), Housing Element and Negative Declaration (2002a, 2002b, 2002c), Bayfront Specific Plan and Mitigated Negative Declaration (2004a, 2004b, 2004c), North Burlingame / Rollins Road Specific Plan and Negative Declaration (2004d, 2004e, 2004f)
- Town of Colma General Plan and Negative Declaration (1999a, 1999b, 1999c, 1999d)
- City of Daly City General Plan Land Use and Circulation Elements (1987a, 1987b), Housing Element and Negative Declaration (2004a, 2004b)
- City of East Palo Alto General Plan and EIR (1999a, 1999b, 1999c), Housing Element (2001a, 2001b)
- City of Foster City General Plan (1993, amended through 2001) and EIR (1993a, 1993b, 1993c, 1993d), Housing Element and Mitigated Negative Declaration (2001a, 2001b, 2001c)
- City of Fremont General Plan (1991, amended through September 1996) and EIR (1991a, 1991b, 1991c), Housing Element, Land Use Element Revisions, and Negative Declaration (2003a, 2003b, 2003c)
- City of Half Moon Bay Local Coastal Program Land Use Plan (1993)
- City of Hayward General Plan and EIR (2002a, 2002b, 2002c)
- Town of Hillsborough General Plan (2005) and Negative Declaration (2004), Housing Element and Negative Declaration (2002a, 2002b)
- Town of Los Altos Hills General Plan (1975), General Plan Path Element (1996), 2002 Housing Element (2002), Circulation Element (1999), Land Use Element (n.d.) and Open Space and Recreation Element (2007)
- City of Menlo Park General Plan Policy Document and Background Report and EIR (1994a, 1994b)

- City of Millbrae General Plan and EIR (1998a, 1998b), Millbrae Station Area Specific Plan and EIR (1998c, 1998d)

- City of Milpitas, 1994 General Plan and Negative Declaration (1994a, 1994b), 2002 Update of the 1994 General Plan, Housing Element, and Negative Declaration (2002a, 2002b, 2002c. 2002d); Midtown Milpitas Specific Plan EIR (2002e, 2002f, 2002g, 2002h)

- City of Mountain View General Plan (1992a, 1992b, 1992c), Housing Element and Initial Study (2002a, 2002b), Residential Neighborhood Chapter (2002c)

- City of Newark General Plan Update Project 2007 and EIR (1992a, 1992b, 1992c, 1992d, 1992e), Housing Element (2002a), Housing Element Negative Declaration and Negative Declaration Addendum (2002b)

- City of Pacifica General Plan (2001)

- City of Palo Alto Comprehensive Plan 1998–2010 and EIR (1998a, 1998b, 1998c), Housing Element (2002)

- Town of Portola Valley General Plan (1998, except for Housing Element, which appears to be 1990)

- City of Redwood City General Plan (1990a, 1990b), Downtown Precise Plan and EIR (2007a, 2007b, 2007c, 2007d)

- City of San Bruno General Plan and EIR (1984a, 1984b), Housing Element and Resolutions approving Housing Element and its Negative Declaration (2003a, 2003b, 2003c)

- City of San Carlos General Plan (1992); Housing Element, Draft Negative Declaration, and Resolution adopting Housing Element (2001a, 2001b, 2001c);Circulation Element and Negative Declaration (2005a, 2005b).

- City and County of San Francisco General Plan (1998), Housing Element (2004)

- City of San Jose 2020 General Plan (amended to May 2005) and EIR (1994a, 1994b), Housing Element (2003)

- City of San Mateo General Plan and EIR (1990a, 1990b, 1990c), Housing Element (2001) and Negative Declaration, (n.d.), and Circulation Element (2005) and Negative Declaration (n.d.)

- County of San Mateo General Plan and Board of Supervisors Resolution Adopting Findings Pursuant to the Final EIR (1986a, 1986b)

- City of Santa Clara General Plan 1990-2005 and City Council Resolution and Related Findings Certifying the Final EIR (1992a, 1992b, 1992c, 1992d, 1992e), General Plan 2000-2010 (including amendments since 1992) and City Council Resolution Adopting a Negative Declaration and General Plan Amendment (2002a, 2002b)

- County of Santa Clara General Plan and EIR (1994a, 1994b, 1994c), Housing Element (2003)

- City of South San Francisco General Plan (1999a, 1999b, 1999c) and Housing Element (2002a, 2002b)
- Stanford University Community Plan and EIR (County of Santa Clara, 2000a, 2000b, 2000c, 2000d, 2000e)
- City of Sunnyvale General Plan Elements: Housing and Community Revitalization Sub-element of the General Plan (2002a, 2002b), Land Use and Transportation Element of the General Plan (1997a, 1997b), Water Resources Sub-element of the General Plan (1996a, 1996b)
- City of Union City General Plan, Housing Element, and EIR (2002a, 2002b, 2002c, 2002d, 2002e, 2002f)
- Town of Woodside General Plan and Negative Declaration (1988a, 1988b), Housing Element (2002, 2003)

Table 7.11 summarizes the environmental effects associated with planned growth in the program area, as identified in the general plan, area plan, and specific plan EIRs for the jurisdictions in the SFPUC wholesale customer and retail service areas. Because the table reflects the determinations of multiple jurisdictions, some impacts are listed as both significant and unavoidable and significant but mitigable, reflecting differences in the jurisdictions in the service area. Appendix E, Section E.5, Table E.5.1 presents a more detailed summary of the relevant growth impacts and mitigation measures identified in the EIRs for these local land use plans. These environmental impacts are the indirect effects of growth supported by the WSIP.[32]

Significant and Unavoidable Impacts

The environmental effects of growth most commonly identified as significant and unavoidable in the service area are increased traffic, cumulative traffic impacts, deterioration of air quality, the cumulative effects of increased air pollutant emissions, and noise impacts, primarily as a result of increased traffic. Traffic and air quality effects are discussed in greater detail below under “Key Regional Effects of Growth.”

The WSIP would address a significant unavoidable impact that was identified by two cities: increased demand for potable water supply. The WSIP provides for increased supply and related water treatment facility and storage upgrades to reliably meet projected demand (i.e., projected retail demand and projected wholesale customer purchase requests) to 2030. The SFPUC’s role in addressing this indirect effect of growth is discussed at the end of this subsection.

[32] To assess whether mitigation measures identified in general plan EIRs to reduce growth-related impacts are in fact being applied at the project level, a review of the EIRs of several current major projects in the service area was undertaken. The review indicated that the mitigation measures identified in general plan EIRs to reduce the adverse impacts of growth are being applied at the project level. Information on the review of the project EIRs is presented in Appendix E.6.

TABLE 7.11
SIGNIFICANT IMPACTS ASSOCIATED WITH PLANNED GROWTH IN THE PROGRAM AREA

Significant and Unavoidable Impacts

- Impacts due to the loss of open space (to development) on visual quality
- Alteration of the visual setting or degradation of existing views, and cumulative visual quality impacts
- Conversion of agricultural land to nonagricultural uses
- Cumulative loss of agricultural land
- Increases in air pollutant emissions and/or ozone precursors or violation of air quality standards
- Cumulative air quality impacts
- Impacts on natural habitat, including individual or cumulative loss of wetlands
- Cumulative impacts on cultural resources
- Exposure to seismic or geologic hazards
- Cumulative impacts on soil resources
- Exposure to soil or groundwater contamination
- Cumulative effects from increased exposure to man-made hazards
- Increases in impervious surfaces and/or alterations to drainage resulting in exposure to flood hazards and/or the need for new drainage facilities
- Water pollution from stormwater runoff
- Land use impacts
- Cumulative impacts from the depletion of nonrenewable resources and the alteration of landforms
- Noise impacts, including increases in traffic noise, exposure to construction noise, and exposure to aircraft noise
- Impacts related to population growth (directly or indirectly induced) and jobs/housing balance
- Increased demand for schools and/or other public facilities
- Loss of recreational open space
- Cumulative impacts on recreational facilities
- Local and regional traffic impacts
- Cumulative traffic impacts
- Impacts on landfill capacity
- Increases in water demand
- Large and wasteful increase in energy consumption and cumulative energy-related impacts

Significant but Mitigable Impacts

- Impacts on scenic resources, including resources within a scenic highway
- Creation of new source(s) of light and glare
- Alteration of visual setting or degradation of existing views
- Conversion of agricultural land to nonagricultural uses
- Conflicts between agricultural uses and adjacent land uses
- Construction-related air quality impacts
- Exposure of new sensitive land uses to toxic air contaminants and/or odor emissions sources
- Increases in air pollutant emissions
- Conflicts with, or obstruction of, the implementation of an applicable air quality attainment plan or related plan
- Impacts on/loss of special-status species
- Impacts on biological resources due to individual or cumulative impacts on wetlands, riparian habitat, or other sensitive habitat
- Conflicts with local policies or ordinances protecting biological resources
- Disruption of wildlife migration or travel corridors
- Cumulative impacts on biological resources
- Individual or cumulative impacts on historical, archaeological, and/or paleontological resources
- Disturbance of human remains

TABLE 7.11 (Continued)
SIGNIFICANT IMPACTS ASSOCIATED WITH PLANNED GROWTH IN THE PROGRAM AREA

Significant but Mitigable Impacts (continued)

- Exposure to seismic, geological, or soils-related hazards
- Exposure to flooding due to levee or dam failure
- Increased risk of wildland fires
- Release of or exposure to hazardous materials
- Increased risk of structural fires and degree of damage from industrial chemical fires
- Impacts related to emergency response
- Degradation of surface water and/or groundwater quality
- Construction impacts on water quality
- Increased surface runoff and flood hazard
- Incompatible and/or inappropriate land uses; conflicts between adjacent land uses
- Loss of agricultural land or premature urbanization of rural areas
- Inefficient land use patterns
- Intensification of land uses
- Exposure to excessive noise levels or groundborne vibration
- Permanent or substantial temporary or periodic increases in ambient noise levels
- Construction noise impacts
- Increased traffic noise
- Increased demand for housing and related impacts on housing affordability
- Increased demand for special housing needs
- Substantial population and/or job growth
- Jobs/housing imbalances, oversupply of jobs
- Increased demand for and/or impacts on public services and facilities, including increased need for new fire and police facilities, schools, parks, and other public facilities
- Increased demand for new or expanded recreational facilities
- Loss or degradation of recreational open space
- Local and regional traffic impacts
- Congestion impacts on transit service and bicyclists
- Construction traffic impacts
- Increased traffic safety concerns
- Impacts on landfill capacity or demand for solid waste services
- Increased demand for new or expanded water and wastewater facilities
- Need for new or expanded stormwater drainage facilities
- Increased demand on water supply
- Increased demand for public utilities
- Increased demand for energy

SOURCES: City of Belmont, 1988a; 1990a; City of Brisbane, 1994b; City of East Palo Alto, 1999a; City of Foster City, 1993b; City of Fremont, 1991b; City of Fremont 1991c; City of Hayward, 2002b; City of Menlo Park, 1994b; City of Millbrae, 1998b; City of Millbrae, 1998d; City of Milpitas, 2002e; City of Mountain View, 1992b; City of Newark, 1992b; City of Palo Alto, 1998b; City of Redwood City, 2007a; City of San Bruno, 1984a; City of San Jose, 1994b; City of San Mateo, 1990b; City of Santa Clara, 1992b; City of Union City, 2002c; County of San Mateo, 1986b; County of Santa Clara, 1994b; County of Santa Clara, 2000b.

Measures to partially mitigate traffic impacts identified in the EIRs include participation in regional transportation planning, implementation of local and regional transit/transportation plans, promotion of alternative modes of transportation, implementation of roadway- and intersection-specific improvements (e.g., adding various combinations of turn lanes and through lanes and expanding intersection capacity), and encouragement of higher density development and supportive uses around transit stations. Measures to partially mitigate air quality impacts identified in the EIRs include participation in regional planning efforts to improve air quality, requiring measures to reduce construction emissions (both equipment emissions and dust), and implementation of many of the same (or similar) measures adopted to improve traffic impacts, such as encouraging alternative forms of transportation, improving roadways to maintain efficient vehicular movement, and encouraging higher density infill development and mixed uses. Measures to partially mitigate noise impacts identified in the EIRs include adoption and enforcement of noise ordinances, requiring the use of construction practices to protect sensitive receptors, and requiring project-specific review of noise impacts and project mitigation measures such as setbacks, buffering, and insulation. (Refer to Appendix E, Section E.5 for a more detailed summary of the mitigation measures.)

Overriding Considerations

Jurisdictions may approve land use plans that would result in significant unavoidable impacts by adopting statements of overriding considerations pursuant to CEQA; these statements provide the rationale for approving a plan despite its significant unavoidable impacts. In the SFPUC service area, some jurisdictions have determined that certain social, economic, and/or other considerations outweigh the adverse environmental effects. These considerations are summarized in **Table 7.12**. Of the key overriding considerations identified in the table, the following considerations were commonly identified by the local jurisdictions in the region:

- Accommodation of growth in an orderly, fiscally sound manner
- Economic diversification and job generation
- Creation of housing, furtherance of regional housing share objectives, and provision of affordable housing
- Improvement of the local jobs/housing balance
- Increased sales revenue and positive fiscal impact
- Promotion of alternative modes of travel to private vehicles; reduction in reliance on private vehicles
- Establishment of policies to preserve natural areas and open space lands

Impacts Commonly Identified as Significant but Mitigable

Impacts commonly identified as significant but mitigable by jurisdictions in the service area include obstruction of views or alteration of the visual setting; construction-related air quality impacts; adverse impacts on habitat and wetlands; impacts on historical, archaeological, or paleontological resources, including potential disturbance of unknown cultural resources; exposure to seismic and geologic hazards; creation of a hazard related to the use or transport of

TABLE 7.12
KEY OVERRIDING CONSIDERATIONS FOR SIGNIFICANT UNAVOIDABLE IMPACTS OF PLANNED GROWTH AND DEVELOPMENT

- Compliance with legal mandates to adopt and maintain a comprehensive long-term plan
- Provision of a database and statement of policies to guide decision-making
- Policies that assure adequate mitigation of land use impacts
- Realization of a comprehensively planned community that provides for a logical extension of services, including law enforcement, fire protection, parks, and public utilities
- Provision of coordinated guidance in addressing the impacts of new development and redevelopment within the urban area while not substantially increasing traffic, noise, and seismic impacts compared to existing trends
- Policies and strategies to alleviate some environmental effects that are not otherwise addressed in routine land use planning or through the existing general plan elements
- Strengthened community and neighborhoods, protection of neighborhoods from commercial encroachment, and encouragement of participation in community and governmental activities
- Facilitation of public participation and the continuation of the city's desire to provide leadership on issues of regional interest
- Protection of community character
- Enhanced public facilities and programs
- Improvement of infrastructure
- Expanded opportunities for economic activities and development; increased economic vitality
- Economic growth that supplies jobs for existing and future residents while protecting environmental resources and prudently managing traffic capacity
- Economic benefits, including increases in new jobs, sales tax revenues, and property tax revenues
- Creation of new sources of employment and income to the city
- Increased diversity of employment opportunities
- Provision of a wide range of new employment opportunities and shopping opportunities
- Improvement of jobs/housing balance and provision of more opportunities for revenue-generating uses
- Balance of residential and commercial interests
- Increased housing opportunities
- Increased diversity of housing types, including affordable housing
- Achievement of affordable housing goals and maintenance of social diversity while protecting environmental resources
- Targeting of state-mandated "fair share" requirements for new housing units as a goal, including creation of affordable housing to help maintain the city's economic base without incurring even greater adverse impacts on the area's air quality due to greater commute distances required for local employees
- Increase in the amount of affordable housing and the ability of the city to contribute its fair share of regional housing opportunities
- Alternatives to residential infill within existing residential neighborhoods that are affected by airport noise would create more adverse impacts than new residential infill
- Encouragement and support of school districts to take specific mitigatory action(s), where appropriate
- Improved transportation and circulation systems
- Reduction of reliance on the automobile
- Enhanced transit-oriented development at transit hubs
- Improved local and regional transit connections through development of intermodal facility and high-density office and residential uses in transit station area
- Long-term preservation and maintenance of sensitive ecosystems, open space, and aquatic resources
- Policies, programs, and land use designations that enhance the preservation of natural resources
- Installation of open space, park, recreation, and resource protection amenities
- Environmental benefits resulting from incorporation of innovative and extensive environmental mitigation
- Designation of new areas and retention of substantial existing areas of land for open space, and provision of neighborhood and community parks for a variety of open space and recreational opportunities for the city and region
- Providing for recreational needs of the existing and future population
- Impacts that cannot feasibly be mitigated to a less-than-significant level would occur whether or not the general plan or any feasible alternative were adopted
- Policies that direct future urban development into the cities
- Policies that minimize the potential loss of rural open space surrounding urban areas within the county
- Providing for planned urban expansion, in contrast to urban sprawl, thereby decreasing demand for government revenues for public infrastructure and services
- Enhanced cultural, recreational, and educational facilities and a modern government center, enabling the city to provide more efficient service in an inviting setting

SOURCES: City of Belmont, 1988b; City of Belmont,1990b; City of Brisbane, 1994d; City of East Palo Alto, 1999c; City of Foster City, 1993d; City of Fremont, 1991c; City of Hayward, 2002c; City of Menlo Park, 1994b; City of Milpitas, 2002f; City of Mountain View, 1992c; City of Newark, 1992c; City of Palo Alto, 1998c; City of Redwood City, 2007c; City of San Bruno, 1984b; City of San Mateo, 1990c; City of Santa Clara, 1992b; City of Union City, 2002e; County of Santa Clara, 1994c; County of Santa Clara, 2000e;.

hazardous materials; exposure of people and property to flooding; water quality impacts; land use incompatibilities; increased noise, including ambient noise levels and short-term construction noise; increased housing demand; increased demand for public services, including fire and police protection, schools, recreational facilities, and other public services; and increased need for new or expanded water or wastewater treatment facilities. Appendix E, Section E.5, Table E.5.1 summarizes these impacts. The WSIP addresses water supply needs reflected in the retail demand studies and wholesale customer purchase estimates (discussed further in the following section).

Impacts of Planned Growth to 2030

As discussed above (and in Chapter 3, Program Description), the WSIP would meet the SFPUC's regional water system purchase requests in the wholesale and retail service areas to the year 2030. The demand projections for the retail service area and each wholesale customer service area were developed using a detailed end-use model that employed ABAG's population and employment projections or the projections of a limited number of other local agencies. Thus, the projections reflect the future growth expectations of the regional planning agency or other agencies with knowledge of the service area.

In most cases, the levels of population growth reflected in the 2030 water customer-selected population projections are generally consistent with the population growth projected in the respected general plans, as indicated by the general plans' projected population (see Table 7.8). That growth, therefore, has been addressed in the adopted general plans, and the growth-related impacts have been analyzed in the general plans' impact analyses. The additional availability of water and improved water supply reliability through the WSIP would support a portion of this growth. In a few cases, the general plans do not project population growth into the future to the degree assumed in the WSIP. In these cases, the WSIP would support a degree of population growth beyond the level that is projected in the adopted general plans.

For the most part, the employment growth reflected in the 2030 water customer-selected population projections also is generally consistent with the employment growth projected in the respected general plans, as indicated by the general plans' projected employment shown in Table 7.9. However, there has been much more recent employment growth, and greater fluctuations in employment levels, in the region compared with populations. As a consequence, not all of the employment growth reflected in water customer-selected projections is reflected in the general plans of respective jurisdictions. Therefore, while much of the employment growth expected in the area has been addressed in the adopted general plans, the WSIP would support a degree of employment growth that has not been addressed in the jurisdictions' general plans nor have the impacts associated with such growth been fully analyzed in the CEQA documents prepared for the planning documents.

Two principal factors account for the discrepancy between WSIP population projections and those of general plans in the service area. One is the WSIP's 2030 planning horizon, which extends farther into the future than the general plan horizons of jurisdictions served by SFPUC water.[33] The other is the age of some jurisdictions' general plans, several of which were adopted more than 10 years ago.

The above two factors, and a third, are the principal factors that account for the discrepancy between WSIP employment projections and those of general plans in the service area. The third factor is the economic boom and recession that occurred in the Bay Area in the 1990s and first half of the current decade. Phenomenal job growth occurred during the "dot com boom" was not captured in projections prepared prior to this boom, while the extent of job losses in early 2000s was not fully capture in projections prepared in the early 2000s. As the comparison of the last three ABAG projections sets suggest, although there are differences between the individual projections, by 2030 a similar level of employment is expected for the area as a whole.

The impact discussion in the previous section describes the indirect effects of planned growth in the service area; these effects were identified and evaluated in the EIRs produced for the general plans and related land use planning documents that guide the nature and extent of development in the service area. As noted above, however, the effects of greenhouse gas emissions were not addressed in these prior EIRs. Given that the WSIP projections extend beyond the projections of many adopted general plans, especially in terms of expected employment growth, this analysis also considers the potential impacts of growth that could occur beyond the projections indicated in local general plans and related land use plans. In contemplating the potential impacts of growth beyond the previously evaluated growth, it is important to consider the following:

- Most of the service area is urbanized; many of the jurisdictions experienced peak growth periods in previous decades, with slowing growth rates in more recent decades. Urban areas provide less opportunity for substantial growth beyond existing city limits or spheres of influence. Thus, these communities are subject to certain physical constraints (such as neighboring jurisdictions) that would preclude major changes from current planning policies and growth trends.

- Various jurisdictions have identified increased densities and infill development as important means to accommodate future development. In addition to constraints on available land and fewer options to grow laterally, more compact development is being adopted by some jurisdictions in recognition of its value in supporting public transit systems. The promotion of public transit, in turn, is increasingly recognized as a way to alleviate traffic problems in the region. Infill development is generally consistent with ABAG assumptions about smart growth. Given such trends in current planning documents and the promotion of smart growth principles by the regional planning agency, it is reasonable to assume that as general plans are updated to guide future growth (i.e., through the 2030 WSIP buildout), city planners will continue to seek solutions to planning issues that minimize the extent of adverse environmental effects.

- Notwithstanding the constraints to lateral expansion that exist for many jurisdictions, some jurisdictions abut less-developed unincorporated county lands; therefore, at least some jurisdictions could conceivably annex portions of adjacent unincorporated areas to accommodate the jurisdiction's anticipated development.

33 As discussed in Section 7.2, water agencies typically have a longer planning horizon than do local land use planning agencies because of the time required to plan, permit, and construct water supply infrastructure.

Based on the above considerations, the growth supported by the WSIP beyond the level evaluated in adopted land use plans would likely have impacts related to increased density or the development of new land areas, potentially resulting in impacts that are more severe than those identified in the EIRs of adopted land use plans and plan elements.

- Impacts from increased density of development include increased traffic congestion, air pollution, traffic noise, construction noise, and increased demand on public services. On the other hand, it should be noted that accommodating growth by increasing the density of development can help offset some of these identified impacts if it provides sufficient density to support development of public transit or neighborhood retail businesses that help reduce dependency on the use of private vehicles.

- Land area impacts include the loss of open space and agricultural land, loss of wildlife habitat and related impacts on biological resources, potential impacts on cultural resources, and increased impervious surface area, resulting in interference with groundwater recharge and the degradation of surface water quality from polluted runoff.

- Because the WSIP impacts would be similar in kind to those identified in jurisdictions' general plan and plan element EIRs, albeit potentially more severe, the mitigation measures identified in the general plan EIRs (summarized in Appendix E, Section E.5) should apply to such impacts and would serve to reduce them.

- Impacts from employment growth beyond that evaluated in jurisdictions' general plans include increased traffic, especially if workers would be commuting from outside the bay area to new jobs forecasted to occur by 2030; air quality and noise impacts as a result of the increased traffic, and impacts on various public services.

Project-Level Impacts of Growth

As part of this PEIR analysis a selection of EIRs of major projects currently being undertaken in the SFPUC service area were reviewed. The purpose of the review was to assess whether, at least for the small selection of EIRs reviewed, the mitigation measures identified in general plan EIRs were being implemented at the project level. The specific impacts of a project necessarily depend on its particular circumstances, such as the location and nature of the project. Nevertheless, the review indicated that in these instances mitigation measures are being identified to reduce the impacts of growth consistent with measures identified in the general plan EIRs. A summary of the project review and table of impacts and mitigation measures associated with each is included in Appendix E, Section E.6, of this PEIR.

WSIP Role in Addressing the Indirect Effects of Growth

Three jurisdictions in the SFPUC service area identified demand on existing water supply as a significant or significant unavoidable impact. This section summarizes the water supply impacts and mitigation measures identified by these jurisdictions in their general plans and associated EIRs. However, the demand projections in these general plan EIRs are somewhat outdated in that their horizon years are 2000 and 2005, and actual demand (according to 2001 records) has proven to be somewhat different from the EIR projections. The WSIP would help to meet the future demand of these jurisdictions to 2030 (as currently projected by the water agencies that serve them).

The Foster City *General Plan Revision* EIR (1993b) identified increased water demand resulting from future development as a significant and unavoidable cumulative impact. Estero MID, which provides water service to Foster City, obtains all of its water from the SFPUC. The EIR projected that cumulative water demands on the SFPUC system would exceed the system's capacity. As mitigation, the EIR identified a measure requiring new projects to pay fair share contributions to infrastructure improvements, and a measure requiring water conservation in existing and new development; however, the EIR concluded that the impact could not be fully mitigated through these measures. The WSIP would help meet increased demand projected by Estero MID, thus alleviating an impact related to insufficient supply. However, the timeline and current demand estimates have been substantially revised since the general plan EIR was published. The 1993 EIR projected water demand requirements to the year 2000 and estimated that average daily demand that year would be about 7.2 mgd. By contrast, the SFPUC's wholesale demand study cites an Estero MID 2001 demand of 5.8 mgd, and projects its 2030 demand at 6.8 mgd—less than was estimated in the General Plan than for 2000.

The *City of San Mateo Proposed General Plan Revisions EIR* (1990b) also identified inadequate water supply as a significant unavoidable impact. San Mateo receives water from the CWS–Mid-Peninsula District and Estero MID; 77 percent of CWS-Mid Peninsula District service area is within San Mateo and 10 percent of the Estero MID service area is within San Mateo. Both water agencies obtain all of their water from the SFPUC. The EIR projected that San Mateo's demand would increase from 10.2 mgd in 1988 to 12.1 mgd in 2005, and that the existing 1990 water supply contract (of 184 mgd for the wholesale service area as a whole) would not be adequate to meet the needs of the wholesale service area in 2005. As mitigation, the EIR specified conservation measures (i.e., requiring new development to install water-saving bathroom fixtures and use drip irrigation) and inquiry into the use of groundwater for irrigation of public parks and facilities.

As it turned out, 2001 purchases for the wholesale service area totaled 171 mgd (URS, 2004b), somewhat less than the 184 mgd contract limit the general plan EIR indicated would be inadequate to meet service area demand in 2005. In addition, according to the latest BAWSCA annual survey (BAWSCA, 2006b), purchases of SFPUC water for the wholesale service area in FY 2004/2005 totaled 167 mgd. The wholesale demand study estimated base year (2001) demand for the CWS–Mid-Peninsula District to be 17.9 mgd and 2005 demand to be 17.5 mgd, and projected that 2030 demand would increase to 18.1 mgd. The 2001 demand for Estero MID was estimated at 5.8 mgd, 2005 demand at 6 mgd, and 2030 demand at 6.8 mgd. Based on these numbers and San Mateo's share of the total (based on the percentage of these two wholesale customers within the San Mateo jurisdictional boundary), 2001 demand for San Mateo was approximately 13.8 mgd and estimated demand for 2005 was 14.1 mgd, somewhat higher than was projected for 2005 in the 1990 EIR. Assuming the current proportion of service from the two districts, San Mateo's projected demand for 2030 would be approximately 14.8 mgd. Obviously, the WSIP was not available to mitigate the impact of insufficient water supply projected in the general plan EIR for 2005; it is, however, designed to address projected future capacity shortfalls in the wholesale service area and to meet 2030 purchase requests of the two districts serving San Mateo.

The *City of Fremont General Plan Final Program EIR* (1991b) identifies effects on water supply due to increases in population and employment as a significant but mitigable impact. However, the focus of the impact and its mitigation is on the share of the city's supply from the State Water Project. As mitigation, the EIR identifies general plan policies intended to conserve water, and also recommends that Fremont work with area cities and water districts to find a means of increasing the state's water supply for the area. The ACWD, the wholesale customer that serves Fremont, Newark, and Union City, projects an increase in purchases from the SFPUC of only 1.8 mgd above the FY 2001/2002 purchase of 11.99 mgd (to 13.76 in 2030), although the total projected increase in demand for ACWD is 8.2 mgd. The WSIP would meet the ACWD's 2030 purchase estimate.

Key Regional Effects of Planned Growth

This section provides a summary discussion of the key regional effects in the SFPUC service area identified in general plan EIRs, which concern traffic, air quality, and water quality.

Traffic and Circulation

Planned growth in the SFPUC service area is expected to significantly affect local and regional transportation systems, including roadways, highways, transit, and pedestrian and bicycle facilities. Transportation impacts as a result of planned growth in the service area include the following (see Appendix E, Section E.5):[34]

- Increased traffic relative to existing traffic and the capacity of the street system (significant and unavoidable)
- Degradation of levels of service on area roads or highways (significant and unavoidable)
- Increased vehicle delays at area intersections and impacts on intersections in adjacent cities (significant and unavoidable)
- Declines of average speeds on individual roadway segments (significant but mitigable)
- Cumulative traffic impacts on roadway segments and/or intersections (significant and unavoidable)
- Traffic safety impacts (significant and unavoidable)
- Impacts on parking capacity (significant but mitigable)
- Traffic congestion interference with transit service and/or bicycle levels of service (significant but mitigable)
- Constraints on providing for bicycle and pedestrian travel as a result of increased competition for use of roads and highways by motor vehicles (significant but mitigable)

[34] The most severe level of impact cited by any jurisdiction is indicated; the same impact may have a less severe (or no) effect in some jurisdictions.

- Loss of homes due to road widening (significant and unavoidable)
- Construction traffic impacts (significant but mitigable)

As mitigation for traffic and circulation impacts, the general plan EIRs of numerous jurisdictions specify coordination and cooperation with other agencies to develop or improve regional transportation facilities. The following is an overview of the agencies responsible for transportation planning in the four counties of the SFPUC service area.

Transportation planning is addressed at the regional level by the Metropolitan Transportation Commission (MTC), the agency responsible for transportation planning, coordination, and financing for the nine-county Bay Area. California state law requires every county that includes an urbanized area to develop, and update biennially, a congestion management program (CMP). The congestion management agency (CMA) of each county is responsible for developing the CMP. In order to receive state and federal funds, transportation projects must be recommended by that county's CMA as part of its CMP. The CMAs for each of the four counties are as follows: the Alameda County Congestion Management Agency, the Santa Clara Valley Transportation Authority, the City/County Association of Governments of San Mateo County, and the San Francisco County Transportation Authority.

The MTC is responsible for updating the regional transportation plan, a comprehensive, long-range document that charts the future development of mass transit, highway, airport, seaport, railroad, bicycle, and pedestrian facilities. The current plan, *Transportation 2030*, promotes smart growth development patterns through programs that link transportation and land use decisions.

Air Quality

The four counties served by the SFPUC are located in the San Francisco Bay Area Air Basin (SFBAAB). The SFBAAB lies to the west of the Coast Range mountains, which, in the Bay Area, split into western and eastern ranges. San Francisco Bay lies between the two ranges. Air flows into the SFBAAB from the west at the Golden Gate, and then flows out of the SFBAAB to the east at the Carquinez Strait (where it enters the neighboring San Joaquin Valley Air Basin). The SFPUC service area is located in 3 of 11 climatological regions of the SFBAAB: West Alameda, Santa Clara Valley, and Peninsula. Of these, air pollution potential is highest in the Santa Clara Valley, where high summer temperatures, stable air, and the surrounding mountains combine to promote ozone formation. There are also many emissions sources within and upwind of these areas. West Alameda has a relatively high pollution potential during the summer and fall. Planned growth in the SFPUC service area is expected to significantly affect air quality within the air basin. Impacts on air quality as a result of planned growth in the service area include the following (see Appendix E, Section E.5):[35]

- Increases in air emissions and/or ozone precursors (significant and unavoidable)

[35] The most severe level of impact cited by any jurisdiction is indicated; the same impact may have a less severe (or no) effect in some jurisdictions.

- Periodic construction- and/or demolition-related air quality impacts (significant but mitigable)
- Violation of stationary source air quality standard or contribution to an existing or projected air quality violation (significant and unavoidable)
- Increases in exhaust emissions from traffic (significant and unavoidable)
- Cumulative impacts on regional air quality in the Bay Area (significant and unavoidable)
- Exposure of new sensitive land uses to toxic air contaminant or local odor emissions sources (significant and unavoidable)
- Conflicts with, or obstruction of, the implementation of an applicable air quality attainment plan or congestion management plan (significant but mitigable)

With respect to federal air quality standards, the SFBAAB is designated as nonattainment for ozone, unclassified for fine particulate matter, and attainment for other applicable criteria pollutants. With respect to state air quality standards, the SFBAAB is designated as nonattainment for ozone and particulate matter, unclassified for hydrogen sulfide, and attainment for other criteria pollutants.

The Bay Area Air Quality Management District (BAAQMD) is the regional agency responsible for air quality regulation within the SFBAAB. The BAAQMD's *Clean Air Plan* (CAP), last adopted in 2000, applies control measures to stationary and mobile sources and outlines transportation control measures. Although the 2000 CAP is an ozone plan, it includes attainment planning for particulate matter as an informational item. The 1997 CAP and 2000 CAP included 19 transportation control measures, many of which were partially implemented between 1998 and 2000. The 2000 CAP continues to implement and expand key mobile-source programs included in the 1997 CAP.

In response to the federal designation as nonattainment for ozone, the BAAQMD, ABAG, and MTC prepared and adopted an ozone attainment plan to meet the federal standard. The current plan, adopted in 2001, updates and supplements the previous (1999) ozone attainment plan and contains control strategies for stationary and mobile sources. To achieve compliance with the state and federal ozone standards, in September 2005 the BAAQMD, MTC, and ABAG prepared the draft *Bay Area 2005 Ozone Strategy*. This document shows how the San Francisco Bay Area will achieve compliance with the state and federal ozone standards, reduce transport of ozone to neighboring air basins, and fulfill California Clean Air Act planning requirements for the state ozone standard. The draft ozone strategy includes stationary-source control measures, mobile-source control measures, and transportation control measures. (Refer to Section 4.9, Air Quality, for more information.)

The BAAQMD reviews proposed development projects and has permit authority over most types of stationary emission sources. The BAAQMD can impose emission limits, set fuel or material specifications, or establish operational limits to reduce air emissions. The BAAQMD also regulates new or expanding stationary sources of toxic air contaminants. Measures identified in the general plan EIRs to mitigate air quality impacts include working with the BAAQMD to include specific measures in the CAP, but more commonly involve transportation issues and the promotion of alternative modes of transportation.

As discussed under Impact 7.1, above, it is expected that planned growth in the existing SFPUC service area also could contribute to significant increases in greenhouse gas (GHG) emissions. Since the California Global Warming Solutions Act of 2006 (AB 32) was recently codified (in September 2006), the general plan EIRs reviewed for this PEIR do not address the impact of planned growth on GHG emissions and climate change. Because AB 32 limits statewide GHG emissions to 1990 levels, increases in GHG emissions associated with planned growth could impede achievement of mandated future reductions in GHG emissions, which would be a potentially significant and unavoidable impact. AB 32 requires the California Air Resources Board (CARB) to establish a GHG emissions cap for 2020 as well as to adopt Early Action Measures and a plan to ensure that emissions reductions (as mandated by AB 32) will be achieved. All future growth will be required to comply with the CARB's adopted measures by January 1, 2011 (enforced by January 1, 2012). Adherence to these measures will presumably achieve reductions that would help minimize overall GHG emissions increases. However, there is insufficient information available at this programmatic level of analysis to determine the extent of GHG emissions that may result from planned growth in the SFPUC service area and the relationship between CARB's Early Action Measures and growth-related sources of GHG emissions.

Hydrology and Water Quality

Planned growth in the SFPUC service area is expected to significantly affect hydrology and water quality. These impacts include the following (see Appendix E, Section E.5):[36]

- Degradation of surface water and/or groundwater quality (significant but mitigable)
- Increases in impervious surfaces and/or alteration of area drainage resulting in flood hazards and/or the need for new drainage facilities (significant and unavoidable)
- Exposure to people and property to flooding (significant but mitigable)
- Flood hazards, including hazards related to potential dam failure (significant but mitigable)
- Water pollution from stormwater runoff (significant and unavoidable)
- Erosion and sedimentation impacts from increased runoff from inadequately designed drainage systems (significant but mitigable)
- Increased demand on groundwater resources (significant but mitigable)
- Increased frequency and severity of downstream flooding due to increase in impervious surfaces from cumulative development (significant but mitigable)

[36] The most severe level of impact cited by any jurisdiction is indicated; the same impact may have a less severe (or no) effect in some jurisdictions.

The California State Water Resources Control Board and the nine Regional Water Quality Control Boards (RWQCBs) implement and enforce the National Pollutant Discharge Elimination System (NPDES) program, which was established to protect water quality under the federal Clean Water Act. Water quality is regulated at the state level under the Porter-Cologne Water Quality Control Act through standards and objectives set forth in water quality control plans, known as basin plans. The San Francisco Bay RWQCB regulates water quality in the SFPUC service area through its basin plan, which was adopted in 1995. Stormwater in Alameda, Santa Clara, and San Mateo Counties is managed in accordance with an NPDES permit from the San Francisco Bay RWQCB. The NPDES permit includes a comprehensive plan to reduce the discharge of pollutants and requires participating communities to implement an approved stormwater management plan. The stormwater programs incorporate construction controls, stormwater ordinances and other regulatory approaches, public education and industrial outreach, inspections, wet-weather monitoring, and special studies. In 2003, the San Francisco Bay RWQCB updated provisions in its municipal stormwater permits to require that new development and redevelopment projects incorporate treatment measures and other source control and site design features to reduce the level of pollutants in stormwater discharges and to manage runoff flows. Mitigation measures typically identified in general plan EIRs in the SFPUC service area include requiring development projects to incorporate best management practices consistent with the NPDES permit, identify and remediate drainage system deficiencies, and implement erosion and sediment control plans for construction projects.

Conclusion: Indirect Effects of Growth Supported by the WSIP

As indicated above, the WSIP would indirectly contribute to environmental impacts caused by growth; some of these impacts would be unavoidable.

The WSIP would support some of the growth that is reflected in the adopted land use plans of jurisdictions in the SFPUC service area. The EIRs prepared for general plans and related land use plans in the service area identified impacts of planned growth and mitigation measures to reduce the identified impacts. Some of the impacts of planned growth cannot be reduced to a less-than-significant level. In these cases, the respective decision-making body (e.g., city council) identified overriding considerations that justified adoption of the general plan despite its adverse impacts. Due to the longer planning horizon of the WSIP and relative age of some of the adopted general plans, and differing expectations about the level of job growth that will occur in the coming decades, not all of the growth that the WSIP would in part support has been addressed in adopted land use plans or evaluated in the plans’ CEQA documents. Therefore, the WSIP could result in impacts that are somewhat more severe than those identified in the general plan EIRs, although it is likely that the impacts would be similar in kind to those previously identified. Potential impacts beyond those previously identified would generally be related either to increased density of development or to the conversion of less developed areas to urban uses. The measures specified in adopted general plans to mitigate the impacts of growth should also serve to reduce impacts of the WSIP.

The key regional effects of planned growth relate to air quality, traffic congestion, and water quality. Regional agencies, including the MTC, BAAQMD, and RWQCB, and the jurisdictions in the service area, are working both regionally and locally to address these impacts.

By providing water to support planned growth, the WSIP would help to mitigate the environmental impact identified in general plan EIRs for some jurisdictions in the service area of insufficient water supply.

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8 WSIP Variants and Impact Analysis

CHAPTER 8
WSIP Variants and Impact Analysis

8.1 Overview

The San Francisco Public Utilities Commission (SFPUC) has requested that this Program Environmental Impact Report (PEIR) include environmental analysis of three variants to the Water System Improvement Program (WSIP or proposed program). The WSIP variants are variations of the proposed program which are designed to meet or exceed all WSIP goals and objectives but differ with respect to water supply source or drought-year level of service. The variants are not necessarily intended to be alternatives to the proposed program that would lessen or avoid environmental impacts as required by the California Environmental Quality Act (CEQA); the CEQA alternatives are described and analyzed in Chapter 9.

Subsequent to the publication of the Draft PEIR, the SFPUC requested that the PEIR address a fourth variant. Please refer to Chapter 13 (Vol. 7) of the PEIR, Section 13.4 for a description and analysis of the fourth variant, the *Phased WSIP Variant*. This chapter describes and analyzes the potential environmental effects of three WSIP variants: *WSIP Variant 1 – All Tuolumne*; *WSIP Variant 2 – Regional Desalination for Drought*; and *WSIP Variant 3 – 10% Rationing*. The variants include the same fundamental facility components and operation/maintenance plan as the proposed WSIP. The major difference between the variants and the proposed program is either in the proposed source(s) of water supply or in the drought-year rationing level of service. To implement these differences, the variants would involve some variation in the extent of facility improvement projects needed. The descriptions and assumptions of the WSIP variants presented in this chapter are based on the report entitled *Water Supply Options* (SFPUC, 2007) and related supporting documentation. **Table 8.1** summarizes and compares the key components of the proposed program and the three variants.

The WSIP variants are designed to meet or exceed all of the goals, objectives, and levels of service of the proposed program as described in Chapter 3, Program Description, Tables 3.2 and 3.5. Thus, all variants are designed to serve the 2030 customer purchase request (regional water system demand) of 300 million gallons per day (mgd) on an average annual basis. **Table 8.2** compares the level of service performance among existing conditions, the proposed program, and the three variants. As shown on this table, while the proposed program and all the variants would meet the WSIP minimum levels of service, some would provide slightly better performance than others with respect to water supply service during drought sequences (discussed in more detail below).

The environmental impact analysis for the WSIP variants presented in this chapter is adapted from Chapter 4, WSIP Facility Projects – Settings and Impacts, Chapter 5, WSIP Water Supply and System Operations – Settings and Impacts, and Chapter 7, Growth-Inducement Potential and Indirect Effects of Growth, of this PEIR. The analysis is based on the same setting information included in those chapters and, for Variant 2, supplemented with information relevant to the regional desalination facility, and uses the same approach to the analysis. Impacts associated with facilities-related construction and operations are discussed separately from impacts associated with water supply and system operations, and the impact analysis and significance determinations are relative to the existing condition (2005) baseline. For the common elements, the variant analysis refers to the same impacts and mitigation measures described in Chapters 4, 5, and 6, supplemented where appropriate with additional impacts and mitigation measures. As described in more detail below, the variants would result in the same impacts as the proposed program for most impact areas. Therefore, to avoid redundancy, this chapter refers extensively to the analyses in Chapters 4 and 5 and focuses on the impacts that differ from those identified for the proposed program, summarizing which impacts would or would not occur under the three variants and augmenting the analysis where appropriate.

Variants 1 and 3 would include all the same or fewer facility improvement projects as the WSIP. Therefore, the basis for the facility impacts of Variants 1 and 3 rely on the detailed analysis presented in Chapter 4 for the proposed program. The basis for the discussion of impacts under Variant 2 also relies on the analysis presented in Chapter 4, however, this variant would require an additional major facility improvement project—the regional desalination project—which is still in the preliminary planning and development phase and lacks site-specific design and siting information. Therefore, the facility impact analysis for the regional desalination project under Variant 2 is also preliminary and at a much more general level of detail than the analysis in Chapter 4. For all three variants, though, the evaluation of potential impacts on water resources due to the water supply and system operations variations relies on the detailed analysis for the proposed program in Chapter 5 and compares the relative impacts of the variants to the impacts identified for the proposed program.

TABLE 8.1
SUMMARY DESCRIPTION OF THE WSIP VARIANTS

Program Element	Existing Condition	Proposed Program	Variant 1 – All Tuolumne	Variant 2 – Regional Desalination for Drought	Variant 3 – 10% Rationing
Planning Year	2005	2030	2030	2030	2030
Customer Purchase Request (annual average)	265 mgd	300 mgd	300 mgd	300 mgd	300 mgd
Water Supply Sources[a] (during nondrought and drought periods)	▪ Local watersheds (with Calaveras and Lower Crystal Springs Reservoirs operating at reduced levels based on Department of Safety of Dams restrictions) ▪ Tuolumne River	▪ Local watersheds (with Calaveras and Lower Crystal Springs Reservoirs restored) ▪ Tuolumne River, with 27 mgd increased average annual diversion ▪ Recycled water/groundwater/ additional conservation in San Francisco, 10 mgd	▪ Local watersheds (with Calaveras and Lower Crystal Springs Reservoirs restored) ▪ Tuolumne River, with 32 mgd increased average annual diversion	▪ Local watersheds (with Calaveras and Lower Crystals Springs Reservoirs restored) ▪ Tuolumne River, with 20 mgd increased average annual diversion ▪ Recycled water/groundwater/ additional conservation in San Francisco, 10 mgd	Same as proposed program[b]
Supplemental Dry-Year Water Supply Sources (for implementation during drought periods)	None	▪ Additional Tuolumne River diversions from Turlock and Modesto Irrigation District (TID and MID) transfers of 23 mgd (average over design drought) ▪ Westside Basin conjunctive use, 6 mgd (average over design drought)	Same as proposed program	▪ Potable water from regional desalination plant, 23 mgd (average over design drought) ▪ Westside Basin conjunctive use, 6 mgd (average over design drought)	▪ Additional Tuolumne River diversions from TID and MID transfers of 35 mgd (average over design drought) ▪ Westside Basin conjunctive use, 6 mgd (average over design drought)
Maximum Drought Rationing Policy	No defined limit but assumed incidental rationing of up to 25%	20%	Same as proposed program	Same as proposed program	10%
System Firm Yield	219 mgd	256 mgd	Same as proposed program	Same as proposed program	268 mgd
WSIP Facility Improvement Projects	None	All projects listed in Chapter 3, Table 3.10	Same as proposed program except two projects would not be implemented: Local Groundwater Projects (part of SF-2) and Recycled Water Projects (SF-3)	Same as proposed program	Same as proposed program
Other Facility Improvements	None	None	None	Bay Area Regional Desalination Plant(s) and associated pumping plant(s) and pipelines needed for intertie facilities	None

TABLE 8.1 (Continued)
SUMMARY DESCRIPTION OF THE WSIP VARIANTS

Program Element	Existing Conditions	Proposed Program	Variant 1 – All Tuolumne	Variant 2 – Regional Desalination for Drought	Variant 3 – 10% Rationing
Delivery, Operations, and Maintenance	(see Chapter 2, Section 2.3)	(see Chapter 3, Section 3.8)	Same as proposed program	Same as proposed program except, during drought periods, the SFPUC would receive water from the Bay Area regional desalination plant through transfer with other Bay Area water agencies	Same as proposed program except, during drought periods, the maximum rationing would be 10%
Permits and Approvals	(see Chapter 2, Sections 2.4 and 2.5)	(see Chapter 3, Section 3.12)	Same as proposed program	Same as proposed program except: ▪ Agreements with partners in Bay Area regional desalination project ▪ See Table 8.4 for list of potential permits for the Bay Area regional desalination plant ▪ Transfer agreements with TID and MID not needed	Same as proposed program except: ▪ Transfer agreements with TID and MID would be for 35 mgd instead of 23 mgd during droughts

[a] The amount of water from the various sources listed represent the average annual amount as modeled over the 82-year period of hydrologic record using the Hetch Hetchy/Local Simulation Model. In order to maximize use of available water sources under each scenario, the model uses slight variations in levels of service performance during drought years for the different scenarios, affecting the average annual amount of water diverted from the Tuolumne River. Therefore, the average annual diversions from the Tuolumne River under each scenario cannot be directly compared to each other. Thus, when comparing the average annual Tuolumne River diversions under Variant 1 with that of the proposed program, there would be an additional 5 mgd (average annual increase) diverted from the Tuolumne River coupled with a slightly reduced level of service (i.e., slightly more frequent drought rationing) instead of 10 mgd of recycled water/groundwater/conservation; however, both scenarios would still meet the WSIP level of service objectives. Refer to Table 8.2 for description of the level of service performance for the different scenarios.

[b] Under Variant 3, the water supply sources would be the same as the proposed program, but there would be slightly increased diversions from Tuolumne River during drought periods, but this slight increase is not apparent in the average annual diversion values.

SOURCE: SFPUC, 2006.

TABLE 8.2
WSIP VARIANTS – TUOLUMNE RIVER DIVERSIONS AND LEVEL OF SERVICE PERFORMANCE

System Operating Parameter	Existing Conditions	Proposed Program	WSIP Variant 1 – All Tuolumne	WSIP Variant 2 – Regional Desalination for Drought	WSIP Variant 3 – 10% Rationing
Estimated Tuolumne River Diversions over 82-Year Period of Hydrologic Record					
Average Annual Increase by the SFPUC	N/A	27 mgd	32 mgd	20 mgd	27 mgd[a]
Average Annual Diversions by the SFPUC	218 mgd	245 mgd	250 mgd	238 mgd	245 mgd[a]
Drought-Year Shortages based on 82-Year Period of Hydrologic Record					
Years of Shortages (10% Shortage)	6 out of 82 years (1 in 14 years)	6 out of 82 years (1 in 14 years)	8 out of 82 years (1 in 10 years)	Same as proposed program	8 out of 82 years (1 in 10 years)
Years of Shortages (20% Shortage)	8 out of 82 years (1 in 10 years)	2 out of 82 years (1 in 41 years)	6 out of 82 years (1 in 14 years)	Same as proposed program	None
Number of Years Drought-Year Supplies Triggered[b]	N/A	24	26	23	25
Drought-Year Shortages during 8.5-Year Design Drought					
Years of Shortages (10% Shortage)	1 year	3 years	2 years	Same as proposed program	6.5 years
Years of Shortages (20% Shortage)	5 years	3.5 years	5.5 years	Same as proposed program	None
Years of Shortages (25% Shortage)	1.5 years	None	Same as proposed program	Same as proposed program	Same as proposed program
Water Quality					
Complies with current and foreseeable future federal and state water quality requirements?	Yes for current requirements, no for foreseeable future requirements.	Yes, all supplies would meet water quality requirements.	Same as proposed program	Same as proposed program	Same as proposed program
Provides clean, unfiltered water from Hetch Hetchy Reservoir; filtered water from other watersheds?	Yes	Yes, filtration avoidance for Hetch Hetchy supply would be maintained.	Same as proposed program	Same as proposed program	Same as proposed program
Continued implementation of watershed protection measures?	Yes, ongoing implementation of Peninsula and Alameda Watershed Management Plans, and Hetch Hetchy watershed protection agreement with the U.S. National Park Service.	Yes, existing activities augmented by implementation of the Watershed and Environmental Improvement Program and PEIR mitigation measures.	Same as proposed program	Same as proposed program	Same as proposed program
Seismic Reliability					
Complies with current seismic standards?	System complies with seismic standards applicable at the time facilities were constructed, but some system components no longer comply with current seismic standards.	Yes, all WSIP projects would be designed to meet current seismic standards.	Same as proposed program	Same as proposed program	Same as proposed program
Capable of delivering basic service to all regions in the service area 24 hours following a major earthquake?[c]	No	Yes, seismic upgrades implemented as part of WSIP would allow system to accommodate 229 mgd demand within 24 hours.	Same as proposed program	Same as proposed program	Same as proposed program
Facilities restored to meet average-day demand within 30 days of a major earthquake?	No	Yes, seismic upgrades implemented as part of WSIP would allow system to accommodate 300 mgd demand within 30 days.	Same as proposed program	Same as proposed program	Same as proposed program
Delivery Reliability					
Provides operational flexibility to allow for planned maintenance without service interruptions?	Limited to parts of the system	Yes, program would include complete planned maintenance program.	Same as proposed program	Same as proposed program	Same as proposed program
Provides operational flexibility and system capacity to replenish local reservoirs, as needed?	Limited ability	Yes, program would provide operational flexibility and system capacity to replenish local reservoirs.	Same as proposed program	Same as proposed program	Same as proposed program
Capable of minimizing risk of service interruption due to unplanned facility upsets or outages?	Limited ability	Yes, maintenance program would incorporate provisions for unplanned facility upsets or outages.	Same as proposed program	Same as proposed program	Same as proposed program
Capable of serving average 2030 demand of 300 mgd with one planned shutdown of a major facility and one unplanned facility outage?	No	Yes	Same as proposed program	Same as proposed program	Same as proposed program

TABLE 8.2 (Continued)
WSIP VARIANTS – TUOLUMNE RIVER DIVERSIONS AND LEVEL OF SERVICE PERFORMANCE

	Existing Conditions	Proposed Program	WSIP Variant 1 – All Tuolumne	WSIP Variant 2 – Regional Desalination for Drought	WSIP Variant 3 – 10% Rationing
Water Supply					
Capable of reliably serving average 2030 demand of 300 mgd during nondrought years?	No, although the system could occasionally serve 300 mgd during nondrought years, it could not reliably deliver this amount.	Yes, system would be capable of reliably serving average annual purchase requests of 300 mgd during nondrought years.	Same as proposed program	Same as proposed program	Same as proposed program
Meets drought-year delivery needs through 2030 while limiting rationing to 20% during 8.5-year design drought?	No	Yes, rationing would not exceed 20% during an 8.5-year design drought.	Same as proposed program	Same as proposed program	Yes, rationing would not exceed 10% during the 8.5-year design drought.
Meets system firm yield of 256 mgd?	No	Yes, system firm yield objective would be achieved.	Same as proposed program	Same as proposed program	Yes, system firm yield objective would be 268 mgd, surpassing WSIP objective
Diversifies water supply options during nondrought and drought periods and improves use of new water sources, including groundwater, recycled water, additional conservation, and water transfers?	No	Yes, the proposed program includes 10 mgd of recycling, groundwater, and additional conservation in all years and relies on groundwater from conjunctive-use program and water transfers during drought years.	Not during normal (nondrought) years except for the use of surface supplies to offset groundwater use to support the conjunctive-use program. Yes during drought years, since groundwater from conjunctive-use program and water transfers would be utilized.	Yes, includes 10 mgd of recycling, groundwater and additional conservation in all years and relies on desalination, and conjunctive use during drought years.	Same as proposed program

[a] Because of the reduced level of rationing, Variant 3 – 10% Rationing would result in slightly increased average annual Tuolumne River diversions over the 82-year hydrologic record compared to the proposed program, but due to rounding, the levels of diversion appear to be the same.
[b] The number of times over the 82-year hydrologic record that drought-year supplies would be used to augment supplies. See Table 8.1 for the source of drought-year supplies under existing conditions, the proposed program, and the variants.
[c] Basic service is defined as average winter-month usage with a regional performance objective of 229 mgd. The performance objective is to provide delivery to at least 70 percent of the turnouts in each region (104 mgd for East/South Bay; 44 mgd for Peninsula; and 81 mgd for San Francisco).

This chapter is organized as follows. Each of the three variants and its associated facilities-related impacts are described in detail in Sections 8.2, 8.3, and 8.4, respectively; these sections provide the facilities impact analysis for the variants, similar to Chapter 4. Section 8.5 evaluates the impacts resulting from water supply and system operations for all variants, similar to Chapter 5. As with the proposed program, the Hetch Hetchy/Local Simulation Model (HH/LSM) water supply planning model (described in Chapter 3, Section 3.4 and detailed in Appendix H) was used to evaluate the performance of the three variants relative to the goals and objectives of the WSIP, based on historical hydrologic data for the 82-year period from 1920 to 2002, as well as to predict the impacts of water supply and system operations on the affected water resources. The last section, Section 8.6, presents a comparison of the major impacts of the proposed program and the three variants.

8.2 WSIP Variant 1 – All Tuolumne

8.2.1 Description

Water Supply

The water supply for *WSIP Variant 1 – All Tuolumne* would be identical to that proposed for the WSIP, except that to accommodate the estimated 35-mgd average annual increase in purchase request (from 265 to 300 mgd) by the year 2030, customers would be served entirely with additional water from the Tuolumne River watershed. The water supply would not include the 10 mgd from implementation of the Recycled Water Projects (SF-3), Local Groundwater Projects[1] (a component of SF-2, Groundwater Projects), and additional conservation programs in San Francisco in the WSIP proposed water supply option. In all other respects, *WSIP Variant 1 – All Tuolumne* would include the same water supply sources as the proposed program. During all hydrologic year types, this variant would continue to maximize use of local water supplies from the Alameda and Peninsula watersheds and would accommodate the remaining purchase requests from Tuolumne River diversions. During extended dry-year sequences, supplemental water would be obtained from Tuolumne River diversions through transfers from the Turlock Irrigation District (TID) and Modesto Irrigation District (MID) as well as through implementation of a conjunctive-use program in the Westside Groundwater Basin, identical to the WSIP. Using the HH/LSM, the SFPUC determined that the average annual Tuolumne River diversion could increase by 32 mgd under this variant compared to existing (2005) conditions and by 5 mgd[2] compared to the proposed program.

1 The Local Groundwater Projects involve the development of 4 mgd of new potable water groundwater sources in San Francisco. About 2 mgd of local groundwater would be developed from four new groundwater wells; 2 mgd would be obtained by converting groundwater currently used for irrigation to a potable supply and meeting the irrigation demands previously met by groundwater with recycled water.

2 When comparing the Tuolumne River diversions under Variant 1 with the proposed program, there would be an additional 5 mgd (average annual) diverted from the Tuolumne River coupled with a slightly reduced level of service (i.e., slightly more frequent drought rationing) instead of 10 mgd of recycled water/groundwater/additional conservation. Refer to Table 8.2 for description of the level of service performance for the different scenarios.

Regional Water System Operations

Under *WSIP Variant 1 – All Tuolumne*, the operation, maintenance, and delivery strategy of the SFPUC regional water system would be essentially identical to that proposed under the WSIP (see Chapter 3, Section 3.8, Proposed System Operations Strategy). Specific operating procedures, however, would vary slightly due to the absence of local recycled and groundwater supplies in San Francisco and the increased use of Tuolumne River water supplies to accommodate the 2030 customer demands. The differences in operating procedures between this variant and the proposed program and the effects of this variant on water resources are discussed in more detail in Section 8.5, below.

Level of Service Performance

WSIP Variant 1 – All Tuolumne would achieve all of the proposed WSIP level of service performance goals through 2030, as shown in Table 8.2. However, as shown in the table, even though it would achieve the performance goals, this variant would have different implications in terms of its performance during the design drought when compared to the WSIP. These differences are due to minor variations in the assumptions used to model the operating strategy required to provide customer water deliveries during the design drought, and actual operations during a drought sequence would likely be similar for Variant 1 and the proposed program.

As shown in Table 8.2, modeling results indicate that the proposed program would perform slightly better than Variant 1 with respect to drought response. While both the proposed program and Variant 1 would limit rationing to 20 percent during drought sequences, *WSIP Variant 1 – All Tuolumne* would result in an estimated slight increase in the number of drought-year shortages compared to the WSIP. When modeled over the 82-year period of hydrologic record (1920–2002), Variant 1 would trigger the drought response program 26 times in the 82-year period, with rationing required in 14 of those years; this compares to 24 times that the drought response program would be triggered under the proposed program, with rationing in 8 of the years. Another way of indicating the difference in level of service performance is to consider that, when modeled over the 8.5-year design drought, Variant 1 would require 2 years of rationing at 10 percent and 5.5 years at 20 percent (7.5 out of 8.5 years subject to rationing), while the proposed program would require 3 years of rationing at 10 percent and 3.5 years at 20 percent (6.5 out of 8.5 years subject to rationing). The slight increase in severity of rationing is due to absence of the 10 mgd from implementation of the Recycled Water Projects (SF-3), Local Groundwater Projects (a component of SF-2, Groundwater Projects), and additional conservation programs in San Francisco. Instead of serving a net 290 mgd demand with system resources (300 mgd purchase request less 10 mgd of recycling, groundwater and additional conservation projects in San Francisco), the regional system would serve a 300 mgd demand, requiring a greater level of rationing to deliver the same amount of water.

Facility Requirements

WSIP Variant 1 – All Tuolumne would require the construction of nearly all of the same facility improvement projects as the proposed program. Under this variant, the Recycled Water Projects (SF-3) and Local Groundwater Projects in San Francisco (a component of SF-2, Groundwater Projects) would not be constructed. All other WSIP projects would be constructed and implemented as described in Chapter 3, Section 3.9, Proposed Facility Improvement Projects.

Institutional Requirements

WSIP Variant 1 – All Tuolumne would involve the same institutional requirements as the proposed program, as described in Chapter 3, Section 3.12, Required Actions and Approvals, except that the SFPUC would not need permits for the recycled water or groundwater projects in San Francisco.

8.2.2 Setting

The regional setting for facility improvement projects for *WSIP Variant 1 – All Tuolumne* is the same as the regional setting for the WSIP study area described in Chapter 4, extending from Oakdale Portal in Tuolumne County west along the regional water system to its terminus in San Francisco. Similarly, the regional setting for potentially affected watersheds and drainages, including the Tuolumne River, Alameda Creek, and Peninsula watersheds, is the same as that described for the proposed program in Chapter 5.

8.2.3 Impact Analysis – Facilities Construction and Operation

Under *WSIP Variant 1 – All Tuolumne*, potential impacts related to the construction and operation of WSIP facilities would be the same in all respects as those described for the proposed program in Chapter 4, except for impacts associated with the Recycled Water Projects (SF-3) and Local Groundwater Projects in San Francisco (a component of SF-2, Groundwater Projects). The Recycled Water Projects includes two recycled water projects scheduled to occur from 2010 to 2012: a series of recycled water treatment/storage/transmission facilities along the westside of San Francisco and the Harding Park/Lake Merced project. Since these projects would not be constructed under *WSIP Variant 1 – All Tuolumne*, no impacts associated with the Recycled Water Projects would occur, and the associated mitigation measures would not be required.

The Groundwater Projects (SF-2) includes three groundwater projects scheduled for construction from 2009 to 2014: the Lake Merced, other Local Groundwater, and Westside Groundwater Basin conjunctive-use projects. Under the variant, only the Lake Merced and Westside Groundwater Basin conjunctive-use components would be constructed; therefore, impacts associated with the other Local Groundwater component would not occur.

This variant would have slightly fewer environmental impacts than those associated with WSIP facilities construction and operation, particularly in the west side of San Francisco; as a result, there would be fewer impacts contributing to cumulative facilities impacts in the San Francisco Region of the regional water system. However, in all other respects, this variant would result in the same facilities-related cumulative impacts as those identified and described in Chapter 4 for the proposed program. **Table 8.3** identifies the impacts that would occur under *WSIP Variant 1 – All Tuolumne* related to facilities construction and operation.

Impacts associated with water supply and systemwide operations for all of the variants are discussed below in Section 8.5. The growth-inducement potential of Variant 1 as well as the indirect environmental effects associated with growth would be identical to those described for the proposed program in Chapter 7.

8.2.4 Mitigation Measures – Variant 1

Nearly all mitigation measures for facilities-related impacts identified for the proposed program and described in Chapter 6 would apply to Variant 1. Table 8.3 summarizes the facilities-related impacts of Variant 1; where applicable, the corresponding mitigation measures are presented in Chapter 6. Variant 1 would require slightly fewer mitigation measures compared to the proposed program, since the Recycled Water Projects (SF-3) and other Local Groundwater Projects in San Francisco (a component of SF-2, Groundwater Projects) would not be constructed. Mitigation measures related to water resources impacts applicable to Variant 1 would be identical to those for the proposed program, as described in Chapters 5 and 6 and discussed below in Section 8.5.

8.3 WSIP Variant 2 – Regional Desalination for Drought

8.3.1 Description

Water Supply

The water supply for *WSIP Variant 2 – Regional Desalination for Drought* would be identical to that proposed for the WSIP, except that during drought years the SFPUC would receive water from a proposed regional desalination plant instead of water transfers from TID and MID. Under this variant, the SFPUC, through its participation in the Bay Area Regional Desalination Project (BARDP) (a description of the BARDP is provided below under Facility Requirements), would receive additional water supply of up to 26 mgd during drought periods (an average annual yield of 23 mgd over the 8.5-year design drought), either directly or indirectly, from one or two regional desalination plants to meet the WSIP water supply and firm yield objectives. As described below under Facility Requirements, the BARDP would include facilities and institutional arrangements for a regional desalination plant(s) as well as those required for water transfers and conveyance to the participating agencies. The SFPUC would not need to develop water transfers agreements with TID and MID for supplemental water during drought periods under this variant, thereby reducing the overall increase in average annual diversion from the Tuolumne River by the SFPUC.

TABLE 8.3
SUMMARY OF FACILITY CONSTRUCTION AND OPERATION IMPACTS FOR WSIP VARIANTS

Impact	Variants 1, 2, and 3																				Variant 1 only	Variants 2 and 3 only		Variant 2 only[a]
	Advanced Disinfection	Lawrence Livermore Supply Improvements	San Joaquin Pipeline System	Rehabilitation of Existing San Joaquin Pipelines	Tesla Portal Disinfection Station	Alameda Creek Fishery Enhancement	Calaveras Dam Replacement	Additional 40-mgd Treated Water Supply	New Irvington Tunnel	SVWTP – Treated Water Reservoirs	San Antonio Backup Pipeline	Bay Division Pipeline Reliability Upgrade	BDPL Nos. 3 and 4 Crossovers	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault	Baden and San Pedro Valve Lots Improvements	Crystal Springs/San Andreas Transmission Upgrade	HTWTP Long-Term Improvements	Lower Crystal Springs Dam Improvements	Pulgas Balancing Reservoir Rehabilitation	San Andreas Pipeline No. 3 Installation	Groundwater Projects – Lake Merced and Regional Components Only	Groundwater Projects	Recycled Water Projects	Regional Desalination for Drought
	SJ-1	SJ-2	SJ-3	SJ-4	SJ-5	SV-1	SV-2	SV-3	SV-4	SV-5	SV-6	BD-1	BD-2	BD-3	PN-1	PN-2	PN-3	PN-4	PN-5	SF-1	SF-2	SF-2	SF-3	VA-2
Land Use and Visual Quality																								
Impact 4.3-1: Temporary disruption or displacement of existing land uses during construction.	LS	LS	PSM	PSM	LS	LS	LS	LS	PSU	LS	LS	PSM	PSM	LS	LS	LS	LS	LS	LS	PSM	PSM	PSM	PSM	PSM
Impact 4.3-2: Permanent displacement or long-term disruption of existing land uses.	LS	N/A	PSU	N/A	LS	N/A	N/A	PSU	LS	N/A	PSU	PSU	LS	N/A	N/A	PSU	N/A	N/A	N/A	N/A	PSM	PSU	PSU	PSM
Impact 4.3-3: Temporary construction impacts on scenic vistas or visual character.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	PSM
Impact 4.3-4: Permanent adverse impacts on scenic vistas or visual character.	PSM	LS	LS	N/A	PSM	PSM	PSU	LS	PSM	LS	PSM	PSM	PSM	N/A	LS	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM
Impact 4.3-5: New permanent sources of light glare.	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM
Geology, Soils, and Seismicity																								
Impact 4.4-1: Slope instability during construction.	LS	PSM	N/A	N/A	LS	PSM	PSM	PSM	PSM	PSM	PSM	LS	N/A	N/A	LS	LS	PSM	LS	PSM	LS	PSM	PSM	PSM	PSM
Impact 4.4-2: Erosion during construction.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	PSM
Impact 4.4-3: Substantial alteration of topography.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	PSM
Impact 4.4-4: Squeezing ground and subsidence during tunneling.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	PSM	N/A	N/A	PSM	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	PSM
Impact 4.4-5: Surface fault rupture.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	PSM	LS	LS	PSM
Impact 4.4-6: Seismically induced groundshaking.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	PSM
Impact 4.4-7: Seismically induced ground failure, including liquefaction and settlement.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	PSM	LS	LS	PSM
Impact 4.4-8: Seismically induced landslides or other slope failures.	LS	LS	N/A	N/A	LS	LS	LS	LS	LS	LS	LS	LS	N/A	N/A	LS	LS	LS	LS	LS	LS	PSM	LS	LS	PSM
Impact 4.4-9: Expansive or corrosive soils.	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM
Hydrology and Water Quality																								
Impact 4.5-1: Degradation of water bodies as a result of erosion and sedimentation or a hazardous materials release during construction.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	PSM
Impact 4.5-2: Depletion of groundwater resources.	LS	N/A	LS	LS	LS	LS	LS	N/A	PSM	N/A	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	N/A	N/A	LS	PSM
Impact 4.5-3a: Degradation of water quality due to construction dewatering discharges.	LS	N/A	LS	LS	LS	LS	LS	N/A	LS	N/A	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	N/A	N/A	LS	PSM
Impact 4.5-3b: Degradation of water quality due to construction-related discharges of treated water.	LS	LS	LS	LS	LS	N/A	N/A	LS	LS	LS	LS	LS	LS	LS	N/A	N/A	LS	N/A	LS	LS	N/A	N/A	N/A	PSM
Impact 4.5-4: Flooding and water quality impacts associated with impeding or redirecting flood flows.	N/A	N/A	PSM	PSM	N/A	PSM	N/A	N/A	PSM	N/A	PSM	PSM	PSM	N/A	N/A	N/A	N/A	N/A	N/A	N/A	PSM	PSM	N/A	PSM
Impact 4.5-5: Degradation of water quality and increased flows due to discharges to surface water during operation.	N/A	N/A	LS	N/A	N/A	N/A	N/A	LS	N/A	LS	LS	LS	LS	N/A	N/A	LS	LS	N/A	LS	N/A	N/A	PSM	LS	N/A

TABLE 8.3 (Continued)
SUMMARY OF FACILITY CONSTRUCTION AND OPERATION IMPACTS FOR WSIP VARIANTS

Impact	Variants 1, 2, and 3																				Variant 1 only	Variants 2 and 3 only		Variant 2 only[a]
	Advanced Disinfection	Lawrence Livermore Supply Improvements	San Joaquin Pipeline System	Rehabilitation of Existing San Joaquin Pipelines	Tesla Portal Disinfection Station	Alameda Creek Fishery Enhancement	Calaveras Dam Replacement	Additional 40-mgd Treated Water Supply	New Irvington Tunnel	SVWTP – Treated Water Reservoirs	San Antonio Backup Pipeline	Bay Division Pipeline Reliability Upgrade	BDPL Nos. 3 and 4 Crossovers	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault	Baden and San Pedro Valve Lots Improvements	Crystal Springs/San Andreas Transmission Upgrade	HTWTP Long-Term Improvements	Lower Crystal Springs Dam Improvements	Pulgas Balancing Reservoir Rehabilitation	San Andreas Pipeline No. 3 Installation	Groundwater Projects – Lake Merced and Regional Components Only	Groundwater Projects	Recycled Water Projects	Regional Desalination for Drought
	SJ-1	SJ-2	SJ-3	SJ-4	SJ-5	SV-1	SV-2	SV-3	SV-4	SV-5	SV-6	BD-1	BD-2	BD-3	PN-1	PN-2	PN-3	PN-4	PN-5	SF-1	SF-2	SF-2	SF-3	VA-2
Impact 4.5-6: Degradation of water quality as a result of alteration of drainage patterns or an increase in impervious surfaces.	LS	PSM	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	PSM
Impact V-1: Discharge of brine concentrate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	PSU
Biological Resources																								
Impact 4.6-1: Impacts on wetlands and aquatic resources.	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	LS	PSM	LS	PSM	PSM	PSM	PSM	PSM	PSM	PSM
Impact 4.6-2: Impacts on sensitive habitats, common habitats, and heritage trees.	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	LS	PSM	PSM	PSM	PSM	PSM	PSM	PSM
Impact 4.6-3: Impacts on key special-status species – direct mortality and/or habitat effects.	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	LS	PSM	PSM	LS	PSM	LS	LS	PSU
Impact 4.6-4: Water discharge effects on riparian and/or aquatic resources.	LS	LS	PSM	PSM	LS	LS	LS	LS	PSM	LS	LS	PSM	PSM	LS	LS	LS	LS	LS	LS	N/A	N/A	N/A	N/A	PSU
Impact 4.6-5: Conflicts with adopted conservation plans or other approved biological resources plans	N/A	N/A	PSM	PSM	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	PSM
Cultural Resources																								
Impact 4.7-1: Impacts on paleontological resources.	PSM	LS	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	LS	LS	PSM	PSM	LS	PSM	LS	PSM	PSM	PSM	PSM	PSM	PSM
Impact 4.7-2: Impacts on archaeological resources.	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM
Impact 4.7-3: Impacts on historical significance of a historic district or a contributor to a historic district.	PSM	N/A	PSM	PSM	N/A	N/A	PSU	N/A	PSM	N/A	PSM	PSM	PSM	PSM	N/A	PSU	N/A	PSM	N/A	PSM	N/A	N/A	N/A	N/A
Impact 4.7-4: Impacts on the historical significance of individual facilities resulting from demolition or alteration.	PSM	N/A	PSM	PSM	N/A	N/A	PSU	N/A	PSU	N/A	PSM	PSM	PSM	PSM	N/A	PSU	N/A	PSU	N/A	PSM	N/A	N/A	LS	PSM
Impact 4.7-5: Impacts on adjacent historic architectural resources.	LS	LS	PSM	PSM	PSM	LS	PSM	LS	PSM	LS	PSM	PSM	PSM	PSM	LS	PSM	LS	PSM	PSM	PSM	LS	LS	PSM	N/A
Traffic, Transportation, and Circulation																								
Impact 4.8-1: Temporary reduction in roadway capacity and increased traffic delays.	LS	LS	PSM	PSM	LS	LS	PSM	LS	LS	LS	PSM	PSM	LS	PSM	LS	PSM	LS	PSM	PSM	PSM	LS	PSM	PSM	PSM
Impact 4.8-2: Short-term traffic increases on roadways.	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	LS	PSM	PSM	PSM	PSM	PSM	LS	LS	PSM	PSM
Impact 4.8-3: Impaired access to adjacent roadways and land uses.	LS	LS	PSM	PSM	LS	LS	PSM	LS	LS	LS	LS	PSM	PSM	PSM	LS	LS	LS	PSM	LS	PSM	LS	PSM	PSM	PSM
Impact 4.8-4: Temporary displacement of on-street parking.	LS	LS	LS	PSM	LS	LS	LS	LS	LS	LS	LS	PSM	LS	PSM	LS	LS	LS	PSM	PSM	PSM	LS	PSM	PSM	PSM
Impact 4.8-5: Increased traffic safety hazards during construction.	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM
Impact 4.8-6: Long-term traffic increases during facility operation.	LS	LS	LS	LS	LS	N/A	N/A	LS	N/A	LS	N/A	LS	LS	LS	LS	LS	LS	LS	LS	N/A	LS	LS	LS	PSM
Air Quality																								
Impact 4.9-1: Construction emissions of criteria pollutants.	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	LS	LS	LS	LS	LS	LS	PSM	LS	LS	PSM
Impact 4.9-2: Exposure to diesel particulate matter during construction.	LS	N/A	LS	LS	LS	LS	PSM	LS	LS	PSM	LS	PSM	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	PSM
Impact 4.9-3: Exposure to emissions (possibly including asbestos) from tunneling.	N/A	N/A	PSM	PSM	N/A	LS	N/A	LS	PSM	N/A	LS	PSM	N/A	PSM	N/A	PSM	N/A	N/A	N/A	PSM	PSM	PSM	PSM	PSM
Impact 4.9-4: Air pollutant emissions during project operation.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	N/A	LS	LS	N/A	LS	LS	LS	LS	LS	LS	LS	LS	LS	PSM

TABLE 8.3 (Continued)
SUMMARY OF FACILITY CONSTRUCTION AND OPERATION IMPACTS FOR WSIP VARIANTS

Impact	Variants 1, 2, and 3																				Variant 1 only	Variants 2 and 3 only		Variant 2 only[a]
	Advanced Disinfection	Lawrence Livermore Supply Improvements	San Joaquin Pipeline System	Rehabilitation of Existing San Joaquin Pipelines	Tesla Portal Disinfection Station	Alameda Creek Fishery Enhancement	Calaveras Dam Replacement	Additional 40-mgd Treated Water Supply	New Irvington Tunnel	SVWTP – Treated Water Reservoirs	San Antonio Backup Pipeline	Bay Division Pipeline Reliability Upgrade	BDPL Nos. 3 and 4 Crossovers	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault	Baden and San Pedro Valve Lots Improvements	Crystal Springs/San Andreas Transmission Upgrade	HTWTP Long-Term Improvements	Lower Crystal Springs Dam Improvements	Pulgas Balancing Reservoir Rehabilitation	San Andreas Pipeline No. 3 Installation	Groundwater Projects – Lake Merced and Regional Components Only	Groundwater Projects	Recycled Water Projects	Regional Desalination for Drought
	SJ-1	**SJ-2**	**SJ-3**	**SJ-4**	**SJ-5**	**SV-1**	**SV-2**	**SV-3**	**SV-4**	**SV-5**	**SV-6**	**BD-1**	**BD-2**	**BD-3**	**PN-1**	**PN-2**	**PN-3**	**PN-4**	**PN-5**	**SF-1**	**SF-2**	**SF-2**	**SF-3**	**VA-2**
Impact 4.9-5: Odors generated during project operation.	LS	LS	N/A	N/A	LS	N/A	N/A	LS	N/A	LS	N/A	N/A	N/A	N/A	N/A	N/A	LS	N/A	N/A	LS	LS	LS	LS	PSM
Impact 4.9-6: Secondary emissions at power plants.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	PSM
Impact 4.9-7: Conflict with implementation of applicable regional air quality plans addressing criteria air pollutants and state goals for reducing emissions.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	PSM
Noise and Vibration																								
Impact 4.10-1: Disturbance from temporary construction-related noise increases.	PSU	PSU	PSU	PSU	PSU	PSU	PSU	PSU	PSU	PSU	PSU	PSU	PSU	PSU	PSU	PSU	PSU	PSU	PSU	PSU	PSU	PSU	PSU	PSM
Impact 4.10-2: Temporary noise disturbance along construction haul routes.	PSU	N/A	PSU	PSU	PSU	LS	LS	LS	PSM	LS	LS	PSU	PSU	PSU	PSU	LS	PSU	LS	LS	PSU	PSM	PSU	PSU	PSM
Impact 4.10-3: Disturbance due to construction-related vibration.	LS	LS	PSU	PSU	LS	LS	LS	PSU	PSM	LS	LS	PSU	PSU	PSU	PSU	LS	LS	LS	LS	PSU	PSM	PSU	PSU	PSM
Impact 4.10-4: Disturbance due to long-term noise increases.	LS	LS	LS	N/A	LS	LS	N/A	LS	LS	LS	N/A	LS	N/A	N/A	LS	LS	LS	N/A	LS	N/A	LS	LS	LS	PSM
Public Services and Utilities																								
Impact 4.11-1: Potential temporary damage to or disruption of existing regional or local public utilities.	LS	LS	PSM	LS	LS	PSM	PSM	PSM	PSM	LS	PSM	PSM	PSM	PSM	LS	PSM	LS	PSM	LS	PSM	PSM	PSM	PSM	PSM
Impact 4.11-2: Temporary adverse effects on solid waste landfill capacity.	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM
Impact 4.11-3: Impacts related to compliance with statutes and regulations related to solid waste.	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM
Impact 4.11-4: Impacts related to the relocation of utilities.	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM
Recreational Resources																								
Impact 4.12-1: Temporary conflicts with established recreational uses during construction.	N/A	N/A	PSM	PSM	N/A	LS	LS	N/A	PSM	N/A	N/A	PSM	PSM	N/A	N/A	PSM	N/A	LS	LS	PSM	PSM	PSM	PSM	PSM
Impact 4.12-2: Conflicts with established recreational uses due to facility siting and project operation.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	PSM	PSM	PSM	PSM	PSM
Agricultural Resources																								
Impact 4.13-1: Temporary conflicts with established agricultural resources.	N/A	N/A	PSM	PSM	N/A	PSM	PSM	PSM	PSM	N/A	PSM	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Impact 4.13-2: Conversion of farmlands to nonagricultural uses.	N/A	N/A	PSM	N/A	N/A	N/A	LS	PSM	N/A	PSM	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hazards																								
Impact 4.14-1: Potential to encounter hazardous materials in soil or and groundwater.	LS	LS	LS	PSM	LS	LS	LS	LS	LS	LS	LS	PSM	PSM	PSM	PSM	LS	LS	LS	LS	PSM	PSM	PSM	PSM	PSM
Impact 4.14-2: Exposure to naturally occurring asbestos.	N/A	N/A	N/A	N/A	N/A	N/A	LS	N/A	N/A	N/A	N/A	PSM	N/A	N/A	N/A	LS	N/A	LS	N/A	LS	LS	LS	LS	PSM
Impact 4.14-3: Risk of fires during construction.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	N/A	N/A	LS	LS	N/A	LS	LS	N/A	LS	LS	LS	PSM
Impact 4.14-4: Gassy conditions in tunnels.	N/A	N/A	LS	LS	N/A	LS	N/A	LS	LS	N/A	LS	LS	N/A	LS	N/A	LS	N/A	N/A	N/A	LS	LS	LS	LS	PSM
Impact 4.14-5: Exposure to hazardous building materials.	N/A	N/A	PSM	PSM	PSM	N/A	PSM	N/A	PSM	N/A	N/A	PSM	N/A	N/A	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM

TABLE 8.3 (Continued)
SUMMARY OF FACILITY CONSTRUCTION AND OPERATION IMPACTS FOR WSIP VARIANTS

Impact	Variants 1, 2, and 3																				Variant 1 only	Variants 2 and 3 only		Variant 2 only[a]
	Advanced Disinfection	Lawrence Livermore Supply Improvements	San Joaquin Pipeline System	Rehabilitation of Existing San Joaquin Pipelines	Tesla Portal Disinfection Station	Alameda Creek Fishery Enhancement	Calaveras Dam Replacement	Additional 40-mgd Treated Water Supply	New Irvington Tunnel	SVWTP – Treated Water Reservoirs	San Antonio Backup Pipeline	Bay Division Pipeline Reliability Upgrade	BDPL Nos. 3 and 4 Crossovers	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault	Baden and San Pedro Valve Lots Improvements	Crystal Springs/San Andreas Transmission Upgrade	HTWTP Long-Term Improvements	Lower Crystal Springs Dam Improvements	Pulgas Balancing Reservoir Rehabilitation	San Andreas Pipeline No. 3 Installation	Groundwater Projects – Lake Merced and Regional Components Only	Groundwater Projects	Recycled Water Projects	Regional Desalination for Drought
	SJ-1	SJ-2	SJ-3	SJ-4	SJ-5	SV-1	SV-2	SV-3	SV-4	SV-5	SV-6	BD-1	BD-2	BD-3	PN-1	PN-2	PN-3	PN-4	PN-5	SF-1	SF-2	SF-2	SF-3	VA-2
Impact 4.14-6: Accidental hazardous materials release from construction equipment.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	PSM
Impact 4.14-7: Increased use of hazardous materials during operation.	LS	LS	LS	N/A	LS	N/A	N/A	LS	N/A	LS	N/A	LS	LS	N/A	LS	N/A	LS	LS	N/A	N/A	LS	LS	LS	PSM
Impact 4.14-8: Emission or use of hazardous materials within 1/4 mile of a school.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	LS	LS	N/A	LS	N/A	LS	N/A	N/A	N/A	LS	LS	LS	PSM
Energy Resources																								
Impact 4.15-1: Construction-related energy use.	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM	PSM
Impact 4.15-2: Long-term energy use during operation.	PSM	PSM	PSM	LS	PSM	PSM	N/A	PSM	N/A	PSM	N/A	PSM	PSM	PSM	N/A	PSM	PSM	N/A	N/A	PSM	PSM	PSM	PSM	PSU
Collective Facilities Impacts																								
Impact 4.16-1a: Collective temporary and permanent impacts on existing land uses in the vicinity of proposed facility sites.	N/A					N/A						PSU			LSM					N/A				N/A
Impact 4.16-1b: Collective temporary and permanent impacts on the visual character of the surrounding area.	LSM					LS						LSM			LSM					LSM				N/A
Impact 4.16-2: Collective exposure of people or structures to geologic and seismic hazards.	N/A					N/A						N/A			N/A					N/A				N/A
Impact 4.16-3: Collective WSIP impacts related to the degradation of surface waters and flooding hazards.	LSM					LSM						LSM			LSM					LSM				LSM
Impact 4.16-4: Collective loss of sensitive biological resources.	PSM					PSU						PSM			PSU					N/A				PSM
Impact 4.16-5: Collective increase in impacts related to archaeological, paleontological, and historical resources.	LSM					PSU						LSM			PSU					N/A				N/A
Impact 4.16-6: Collective traffic increases on local and regional roads.	PSM					PSM						PSM			PSM					PSM				PSU
Impact 4.16-7: Collective increases in construction and/or operational emissions in the region.	PSM					PSM						LSM			LS					LS				PSU
Impact 4.16-8: Collective increases in construction-related and operational noise.	PSU					PSM						PSU			PSU					PSU				N/A
Impact 4.16-9: Collective impacts on utilities and landfill capacity.	N/A					N/A						N/A			N/A					N/A				LSM
Impact 4.16-10: Collective effects on recreational resources during construction.	LSM					LSM						LSM			LSM					LSM				LSM
Impact 4.16-11: Collective conversion of farmland to nonagricultural uses.	N/A					N/A						N/A			N/A					N/A				LSM
Impact 4.16-12: Collective effects related to hazardous conditions and exposure to or release of hazardous materials.	LSM					LSM						LSM			LSM					LSM				LSM
Impact 4.16-13: Collective increases in the use of nonrenewable energy resources.	LSM					LSM						LSM			LSM					LSM				LSM

TABLE 8.3 (Continued)
SUMMARY OF FACILITY CONSTRUCTION AND OPERATION IMPACTS FOR WSIP VARIANTS

<table>
<tr><th rowspan="3">Impact</th><th colspan="20">Variants 1, 2, and 3</th><th>Variant 1 only</th><th colspan="2">Variants 2 and 3 only</th><th>Variant 2 only[a]</th></tr>
<tr><th>Advanced Disinfection</th><th>Lawrence Livermore Supply Improvements</th><th>San Joaquin Pipeline System</th><th>Rehabilitation of Existing San Joaquin Pipelines</th><th>Tesla Portal Disinfection Station</th><th>Alameda Creek Fishery Enhancement</th><th>Calaveras Dam Replacement</th><th>Additional 40-mgd Treated Water Supply</th><th>New Irvington Tunnel</th><th>SVWTP – Treated Water Reservoirs</th><th>San Antonio Backup Pipeline</th><th>Bay Division Pipeline Reliability Upgrade</th><th>BDPL Nos. 3 and 4 Crossovers</th><th>Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault</th><th>Baden and San Pedro Valve Lots Improvements</th><th>Crystal Springs/San Andreas Transmission Upgrade</th><th>HTWTP Long-Term Improvements</th><th>Lower Crystal Springs Dam Improvements</th><th>Pulgas Balancing Reservoir Rehabilitation</th><th>San Andreas Pipeline No. 3 Installation</th><th>Groundwater Projects – Lake Merced and Regional Components Only</th><th>Groundwater Projects</th><th>Recycled Water Projects</th><th>Regional Desalination for Drought</th></tr>
<tr><th>SJ-1</th><th>SJ-2</th><th>SJ-3</th><th>SJ-4</th><th>SJ-5</th><th>SV-1</th><th>SV-2</th><th>SV-3</th><th>SV-4</th><th>SV-5</th><th>SV-6</th><th>BD-1</th><th>BD-2</th><th>BD-3</th><th>PN-1</th><th>PN-2</th><th>PN-3</th><th>PN-4</th><th>PN-5</th><th>SF-1</th><th>SF-2</th><th>SF-2</th><th>SF-3</th><th>VA-2</th></tr>
<tr><td colspan="25">Cumulative Facilities Impacts</td></tr>
<tr><td>Impact 4.17-1: Cumulative disruption of established communities, changes in existing land use patterns, and impacts on the existing visual character.</td><td colspan="23">LS</td><td>PS</td></tr>
<tr><td>Impact 4.17-2: Cumulative exposure of people or structures to geologic and seismic hazards.</td><td colspan="23">B/LS</td><td>PS</td></tr>
<tr><td>Impact 4.17-3: Cumulative impacts related to the degradation of water quality, alteration of drainage patterns, increased surface runoff, and flooding hazards.</td><td colspan="23">LS</td><td>PS</td></tr>
<tr><td>Impact 4.17-4: Cumulative loss of sensitive biological resources.</td><td colspan="23">LS</td><td>PS</td></tr>
<tr><td>Impact 4.17-5: Cumulative increase in impacts on archaeological, paleontological, and historical resources.</td><td colspan="23">PSU</td><td>PS</td></tr>
<tr><td>Impact 4.17-6: Cumulative traffic increases on local and regional roads.</td><td colspan="23">PSU</td><td>PS</td></tr>
<tr><td>Impact 4.17-7: Cumulative increases in construction and/or operational emissions in the region.</td><td colspan="23">PSU</td><td>PS</td></tr>
<tr><td>Impact 4.17-8: Cumulative increases in construction-related and operational noise.</td><td colspan="23">PSU</td><td>PS</td></tr>
<tr><td>Impact 4.17-9: Cumulative impacts related to disruption of utility service or relocation of utilities.</td><td colspan="23">LS</td><td>PS</td></tr>
<tr><td>Impact 4.17-10: Cumulative effects on recreational resources during construction.</td><td colspan="23">LS</td><td>PS</td></tr>
<tr><td>Impact 4.17-11: Cumulative conversion of farmland to nonagricultural uses.</td><td colspan="23">LS</td><td>PS</td></tr>
<tr><td>Impact 4.17-12: Cumulative effects related to hazardous conditions and exposure to or release of hazardous materials.</td><td colspan="23">LS</td><td>PS</td></tr>
<tr><td>Impact 4.17-13: Cumulative increases in the use of nonrenewable energy resources.</td><td colspan="23">LS</td><td>PS</td></tr>
</table>

NOTE: Shaded boxes indicate where potential impacts and/or significance levels for the variant differ from those of the proposed program.

[a] The regional desalination plant and associated facilities under Variant 2 could result in additional impacts that are not shown in the table but would be determined during project-level environmental review when more detailed siting, design, construction and operation information is available. As discussed further in the text, additional potentially significant impacts could include: water quality and aquatic resources impacts due to disposal of brine concentrate; water quality and aquatic resources impacts due construction and operation of intake and outfall structures; potential for impacts associated with seiche, tsunami or mudflow; and potential cumulative impacts associated with increased salinity in the Delta due to increased diversion of freshwater inflow from the Tuolumne River coupled with discharge of brine concentrate.

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During nondrought years, similar to the proposed program, the SFPUC would accommodate the projected increase of 35 mgd in purchase requests through 2030 by implementing additional conservation programs, Recycled Water Projects (SF-3), and Local Groundwater Projects in San Francisco (a component of SF-2, Groundwater Projects) and by diverting additional surface water from the Tuolumne River. On an average annual basis over the 82-year period of hydrologic record, Variant 2 would result in a 20-mgd increase in diversions from the Tuolumne River over the existing condition, 7 mgd less than the proposed program. During drought years, the increase in system firm yield through 2030 would be met through potable water produced by the BARDP combined with the Westside Groundwater Basin conjunctive-use project (a component of SF-2, Groundwater Projects) along with the yield associated with the restoration of storage capacity in Calaveras and Crystal Springs Reservoirs as part of the WSIP facility improvement projects. During the 8.5-year design drought, the average annual yield from the BARDP would be 23 mgd; average annual yield from the Westside Groundwater Basin conjunctive-use project would be 6 mgd, which is the same as under the proposed program.

Regional Water System Operations

Under *WSIP Variant 2 – Regional Desalination for Drought*, the operation, maintenance, and delivery strategy of the SFPUC regional water system would be essentially the same as that proposed under the WSIP during nondrought periods (see Chapter 3, Section 3.8, Proposed System Operations Strategy). However, during drought periods under this variant, the BARDP would supplement the water supply sources in addition to the Westside Basin conjunctive-use project. During drought periods, the SFPUC would receive water from a regional desalination plant or plants through water transfers from other Bay Area water supply agencies; water transfer facilities and operations would be developed as needed as part of the BARDP. The differences in regional system operating procedures between this variant and the proposed program are discussed in more detail in Section 8.5, below.

Level of Service Performance

As indicated in Table 8.2, *WSIP Variant 2 – Regional Desalination for Drought* would achieve all of the proposed level of service performance goals through 2030. However, as shown in the table, even though it would achieve the performance goals, this variant would have slightly different implications in terms of its performance during drought years when compared to the proposed program. These differences are due to minor variations in the assumptions used to model the operating strategy required to provide customer water deliveries during the design drought, and actual operations during a drought sequence would likely be similar for Variant 2 and the proposed program.

Modeling results indicate that Variant 2 would perform slightly better than the proposed program with respect to drought response. When modeled over the 82-year period of hydrologic record (1920–2002), under Variant 2 the drought response program would be triggered 23 times in the 82-year period, with rationing required in 8 of those years; this compares to 24 times under the WSIP that the drought response program would be needed, also with rationing in 8 of the years. Both Variant 2 and the proposed program would perform similarly during the design drought sequence. As stated above, these minor differences are due to the modeling assumptions, and there would likely be no noticeable differences between Variant 2 and the proposed program during actual operations.

This level of service analysis for Variant 2 assumes full implementation of the BARDP and does not incorporate any evaluation of feasibility or reliability associated with the BARDP. Feasibility and reliability studies associated with the BARDP are being conducted as part of that planning effort (see below under “Development of BARDP”) and are not available at this time.

Facility Requirements

Under *WSIP Variant 2 – Regional Desalination for Drought*, all of the same facility improvement projects would be implemented as those proposed under the WSIP, as described in Chapter 3, Section 3.9, Proposed Facility Improvement Projects. In addition, Variant 2 would require construction of one or two Bay Area regional desalination plants and associated conveyance and delivery facilities, as described below.

Bay Area Regional Desalination Project

The BARDP involves a partnership among regional water agencies, including the SFPUC, Contra Costa Water District (CCWD), East Bay Municipal Utility District (EBMUD), and Santa Clara Valley Water District (SCVWD), for the purpose of developing desalination as a regional water supply to improve supply reliability for over 5 million people served by the four agencies. The proposed BARDP would develop and implement one or two desalination plants and associated facilities capable of producing about 65 to 71 mgd of potable water from ocean water, seawater, or brackish water. The BARDP would benefit participating agencies by allowing them to either directly receive desalination product water into their water systems or to receive transfers from other agencies that directly receive desalination product water. However, the institutional commitments and arrangements to implement a full-scale desalination plant as well as the necessary technical and feasibility studies have not been completed.

Development of the BARDP

A pre-feasibility study has been completed for the BARDP facility (URS, 2003). In 2005, the agencies received a grant from the California Department of Water Resources to complete a feasibility study to evaluate the institutional feasibility for the BARDP, and in 2006 the participating agencies received a second grant from the California Department of Water Resources to construct a desalination pilot plant (EBMUD, 2006). The pre-feasibility study included a review of the participating agencies and their water needs, a summary of recent desalination projects, preliminary identification of permitting requirements, an overview of the desalination process and product water quality issues, and a preliminary siting study identifying three possible locations for a regional desalination plant. The pilot plant would test technologies and methods for intake of source water, pretreatment, brine disposal, and other processes required for a full-scale plant. The pilot plant and related studies are scheduled to be implemented from 2007 to 2009.

The participating agencies are currently preparing a feasibility study for the project. Elements of the feasibility study include an analysis of the institutional issues for implementation of the full-scale BARDP, assessment of site and infrastructure options for the three short-listed sites, preparation of preliminary site layouts for a single large facility and a smaller facility, preparation of a detailed scope of environmental analysis for the development of a full-scale BARDP, public outreach, and preparation of the feasibility study report. If the feasibility study and pilot testing demonstrate the viability of the project, it is expected that environmental review would occur in 2009, design in 2010, and construction of the full-scale BARDP in 2012. The pilot plant has not been designed, and the CEQA and permitting processes have not begun.

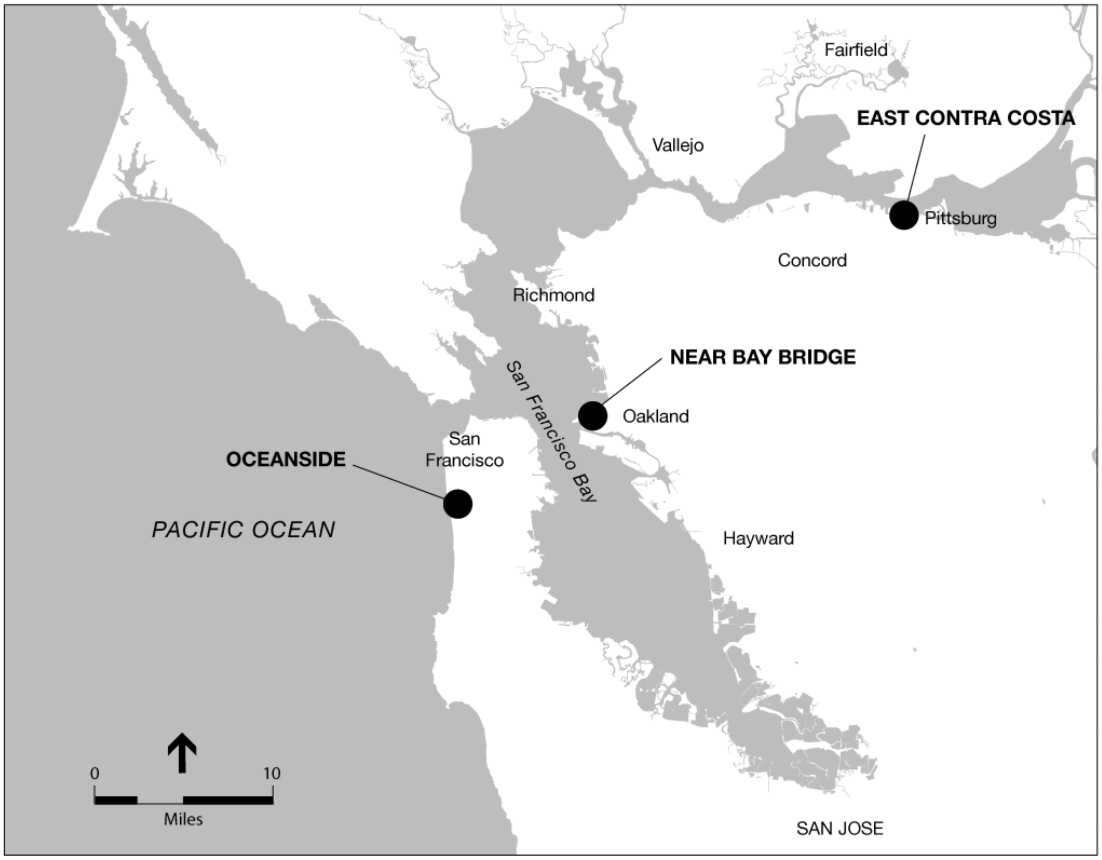
For the purposes of the programmatic review of WSIP Variant 2 in this PEIR, the conclusions developed in the *Bay Area Regional Desalination Project Pre-Feasibility Final Report* (URS, 2003) and *Bay Area Regional Desalination Project, Grant Proposal for Proposition 50 Chapter 6(a) Funding* (EBMUD, 2006) are summarized below and used to make broad assumptions regarding the facility requirements of the desalination plant needed in Variant 2. However, extensive technical studies are still necessary to identify the appropriate site(s) and to develop the conceptual engineering for a desalination project in the Bay Area. The preliminary assumptions are subject to change pending further investigations, design and siting of the plant, pilot plant test results, as well as clarification of institutional uncertainties. If the BARDP is to be implemented, site-specific environmental review will be required prior to project approval.

Preliminary Description of BARDP

The studies cited above and completed to date have identified three possible locations for a regional desalination plant: the Oceanside site in San Francisco, Bay Bridge site in Oakland, and East Contra Costa site near Pittsburg in eastern Contra Costa County. The preferred project would consist of a 65 to 71 mgd desalination plant(s) located at one or two of these three sites, as shown in **Figure 8.1**. Currently, the pilot plant and top-ranked site for the regional plant is the East Contra Costa site, which is generally located along the industrial shoreline area of eastern Contra Costa County, as shown in **Figure 8.2**.

The desalination plant would use brackish or saline water as source water and produce potable drinking water that meets all drinking water standards; the potable water or "product water" produced from the plant would be of similar quality to the water that is currently being provided to customers by the participating municipal utilities that would receive the product water in their distribution systems. The conceptual processes for the desalination plant include filtration to remove suspended solids, a dual-stage reverse-osmosis[3] system to remove salts, and post-treatment to stabilize and disinfect the water to make it suitable for mixing in drinking water systems. Depending on the site(s) selected for the development of the full-scale BARDP, the desalination project may require multiple components, including raw water supply/intake facilities, process and treatment facilities, and concentrate disposal facilities/outfall structures. To

3 Reverse osmosis is a process to remove salt from water whereby pressure is applied to water with higher salt concentration in order to force it to flow across a membrane towards water with lower salt concentration. The majority of total dissolved solids remain on the side of the membrane with the higher salt concentration.



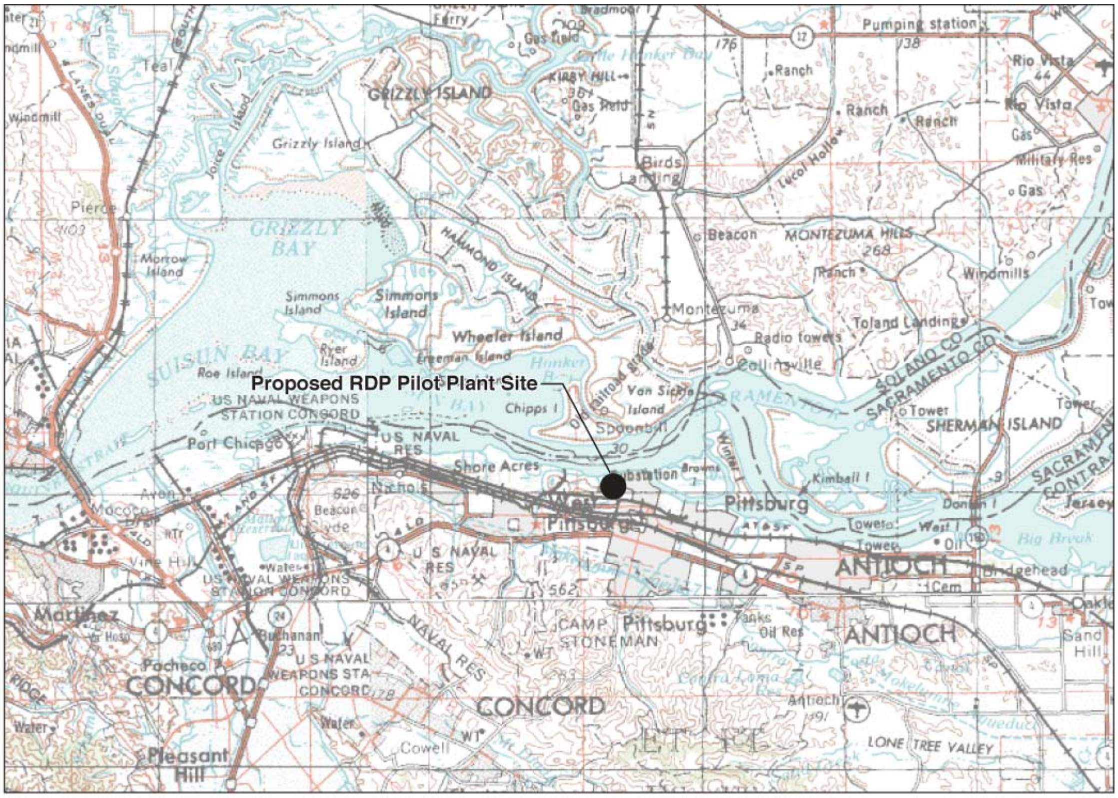
SOURCE: URS, June 2005, Bay Area Regional Desalination Project, Conveyance Options Evaluation.

SFPUC Water System Improvement Program . 203287

Figure 8.1
Potential Sites for Regional Desalination Plant

convey the product water from the desalination plant to the water supply agencies, transmission pipelines and pump station(s) would also be required. It is assumed that the BARDP would use or modify existing distribution and transmission facilities to the extent possible.

For the East Contra Costa site, it is estimated that a booster pump station and about two miles of pipeline would be needed to connect to the existing transmission facilities of the CCWD, EBMUD, or both. Energy consumption for a desalination plant at the East Contra Costa site is estimated at 7,500 kilowatt-hours per million gallons of product water, depending on the site and the size of the plant. Energy consumption at the Bay Bridge site in Oakland is estimated at 19,000 kilowatt-hours per million gallons of product water, and at the Oceanside site in San Francisco is estimated at 22,000 kilowatt-hours per million gallons of product water. At both the Oakland and San Francisco sites, further studies are needed to determine the extent and nature of additional water conveyance, transfer, or delivery facilities. Depending on the final site selected, it might be possible to modify some facilities that are already present at the site (such as intake structures, outfall structures, or energy facilities), in which case new facilities would not be needed as part of either the desalination plant or the associated conveyance or delivery facilities.



SOURCE: East Bay Municipal Utility District, 2006, Bay Area Regional Desalination Project, Grant Proposal for Proposition 50 Chapter 6(a) Funding

SFPUC Water System Improvement Program . 203287

Figure 8.2
Location of Regional Desalination Project Pilot Plant

Proposed operation of the regional desalination plant(s) would be developed as part of the technical studies and would depend on numerous factors, including the site(s) selected, final design of the plant, and institutional agreements among participating agencies.

Under this variant, the SFPUC would receive transfer water from other Bay Area water agencies in all cases, except if the facility were located in San Francisco. As a possible operating scenario, during drought years the SFPUC could receive an equivalent share of its BARDP water in the form of a surface water transfer from EBMUD. Potable water received from EBMUD could be conveyed to the SFPUC/EBMUD intertie located in the city of Hayward. The water received through the intertie, up to 26 mgd, would then be conveyed into the SFPUC regional system through the Bay Division Pipelines.[4] Alternatively, in the event that a facility is located in San Francisco, the SFPUC could receive water directly from the desalination plant.

4 Use of the SFPUC/EBMUD intertie for drought supply would require further environmental review, since the intertie project description only included use for emergencies and critical maintenance.

Institutional Requirements

Implementation of the *WSIP Variant 2 – Regional Desalination Project* would have all of the same institutional requirements as the proposed program, except that it would not require the transfer agreements with TID and MID for the supplemental dry-year supply, and it would require additional institutional agreements for the BARDP. In addition to the institutional agreement among the participating agencies, the BARDP would require various agreements, permits, and approvals for construction and operation. The BARDP would require interagency cooperation to cover environmental/construction costs and transfer agreements among participating agencies involved in water transfers. A preliminary list of operating permits and approvals from federal, state, and local regulatory agencies that may apply to the BARDP is presented in **Table 8.4**, below. A subset of these permits and regulatory approvals may be applicable, depending on the site(s) selected for the development of the BARDP. Although not shown in the table, the BARDP would also be subject to requirements of CEQA, and possibly the National Environmental Policy Act (NEPA) if federal agencies become involved; however, the lead agency or agencies for the CEQA and NEPA processes would not be identified until institutional agreements among the participating agencies are developed.

8.3.2 Setting

The regional setting for *WSIP Variant 2 – Regional Desalination for Drought* is the same as the regional setting for the WSIP study area described in Chapters 4 and 5, except for the BARDP component described below. The BARDP setting includes the facilities setting extending from Oakdale Portal in Tuolumne County west along the regional system to its terminus in San Francisco, as well as the water resources setting encompassing the Tuolumne River, Alameda Creek, and Peninsula watersheds.

The regional setting for the BARDP desalination plant and associated facilities described below is based on the East Contra Costa site since it is the site selected for pilot testing. However, the final site for the regional desalination plant has not been selected and is pending the completion of ongoing studies, including the feasibility study and pilot plant project. For the purposes of providing a general review in this PEIR for review of WSIP Variant 2, it is assumed that the BARDP site would be located in eastern Contra Costa County.

The East Contra Costa site is located in an unincorporated area of Contra Costa County between Pittsburg and Antioch. The Suisun Bay and New York Slough are located to the north and northeast of the county’s shoreline. The potential sites for the desalination plant are located in generally industrial areas that include such facilities as the PG&E Pittsburg Substation, the Delta Diablo Sanitation District facilities, and Mirant Pittsburg Power Plant. One possible site would be co-located with an existing power plant, sharing its intake and outfall structures.

Potentially affected waters in the vicinity of the proposed BARDP include Suisun Bay and New York Slough, both tributaries to San Pablo Bay. Suisun Bay receives flow from the Sacramento and San Joaquin Rivers. Due to freshwater inflow from rivers, the salinity of water in Suisun Bay is generally lower than in downstream waters such as San Pablo Bay (Contra Costa

TABLE 8.4
PRELIMINARY PERMITS AND APPROVALS FOR THE BAY AREA REGIONAL DESALINATION PROJECT

Agency/Requirement(s)	Activities Subject to Requirement	Relevance to the BARDP
FEDERAL		
U.S. Army Corps of Engineers: Clean Water Act, Section 404 Permit, Rivers and Harbors Act of 1899, Section 10	Filling of wetlands or surface waters	Intake and outfall structures, pipelines (creek crossings)
U.S. Fish and Wildlife Service: Federal Endangered Species Act, Section 7 Consultation	Effects on federally listed species and habitat	Desalination plant and associated facilities, concentrated salt discharge from reverse-osmosis process
National Marine Fisheries Service: Federal Endangered Species Act, Section 7	Effects on federally listed fish species	Desalination plant and associated facilities, concentrated salt discharge from reverse-osmosis process
STATE		
California Coastal Commission: California Coastal Act, Coastal Development Permit	Development in coastal zone, including tidelands, submerged lands, and public trust lands	Desalination plant and associated facilities, pipelines
California Department of Fish and Game: Streambed Alteration Agreement	Changes in natural condition of streams, lakes, and rivers	Pipelines (creek crossings)
California Endangered Species Act, Section 2081 Agreement	Effects on state-listed species and habitats	Facility construction and operations
California Department of Health Services: Drinking Water Permit Source Water Assessment and Protection Plan	Drinking water permit	Desalination plant and facilities for new water supply source
California State Lands Commission	Offshore components on any ungranted tidelands	Intake and outfall structures
California State Water Resources Control Board	Water-rights permit	Desalination plant for new water supply source
California Regional Water Quality Control Board, San Francisco Bay Region: Clean Water Act, Section 401 Water Quality Certification	Activities affecting surface water quality	Pipelines (creek crossings) All proposed facilities
National Pollutant Discharge Elimination System Permit or Waste Discharge Requirements for discharge of brine	Operation of plant for discharge of brine	
National Pollutant Discharge and Elimination System Permit for Stormwater	Construction and operation activities	
State Historic Preservation Office	Any activities affecting potentially historic resources	Use of existing, potentially historic structures or facilities
REGIONAL		
San Francisco Bay Conservation and Development Commission	Activities affecting the San Francisco Bay shoreline	Intake and outfall structures

NOTE: Federal and state environmental review requirements under NEPA and CEQA not shown on this table since federal involvement and NEPA requirements are currently unknown and state lead agency under CEQA is also unknown.

County and City of Pittsburg, 2001). Extensive marsh and wetland areas along Suisun Bay provide habitat for a variety of plant and wildlife species.

8.3.3 Impact Analysis – Facilities Construction and Operation

Under *WSIP Variant 2 – Regional Desalination for Drought*, facilities construction and operation impacts would consist of WSIP facilities impacts, BARDP impacts, and the cumulative and growth impacts of both.

WSIP Facilities Impacts

Potential impacts related to the construction and operation of WSIP facilities would be the same in all respects for Variant 2 as those described for the proposed program in Chapter 4. These impacts are summarized in Table 8.3.

Bay Area Regional Desalination Project Impacts

The impact analysis for the BARDP in the context of Variant 2 is based on the general project description provided above, including descriptions from the pre-feasibility study (URS, 2003) and the pilot plant grant application (EBMUD, 2006). However, since the BARDP is still in the conceptual planning phase, detailed project information has not yet been developed for its design, construction, or operation, and CEQA environmental documentation has not been completed (or even started). Therefore, for the purpose of this PEIR, a conceptual-level, generalized impact analysis of the BARDP is presented based on the BARDP assumptions described above. The formal CEQA environmental review of the BARDP will be conducted at a time deemed appropriate by the participating agencies and under the purview of the designated CEQA lead agency. The impact discussion presented below is intended solely to provide a basis for comparing potential environmental impacts at a programmatic level among the proposed program and three variants; the impacts and their significance determinations are based on limited, preliminary information and the actual project-specific impact assessment will be conducted during formal CEQA environmental review of the BARDP.

Chapter 4 includes programmatic impact analyses and mitigation measures for the construction and operation of generic facility types, including pipelines, pump stations, and treatment facilities. Much of this information is applicable to the regional desalination plant and associated facilities, and the reader is referred to Chapter 4 for those discussions. In general, due to the preliminary nature of the project design, uncertainty regarding site locations, and lack of site- and project-specific information, most of the potential impacts associated with construction and operation of a desalination plant and related facilities are considered potentially significant at this conceptual level of analysis. However, in most cases, it is presumed that potential impacts could be avoided or reduced to a less-than-significant level through careful site selection and site layout, appropriate project design, and environmentally-sensitive construction and operation techniques or through implementation of mitigation measures, as described below.

Plans and Policies

The pre-feasibility study identified three options for BARDP institutional arrangements: (1) contracting among the participating agencies, with one being the lead agency, (2) creating a joint powers authority among the participating agencies, or (3) each participating agency contracting with a third party such as the California Department of Water Resources or the U.S. Bureau of Reclamation. The specific plans and policies applicable to the BARDP would depend on the institutional arrangements for its construction and operation as well as on the final project location.

Based on the identification of a preliminary site along the eastern Contra Costa County shoreline, the Bay Conservation and Development Commission's (BCDC) *San Francisco Bay Plan* was reviewed for relevant goals and policies applicable to the construction and operation of a desalination plant (BCDC, 2005).

The *San Francisco Bay Plan* guides conservation of San Francisco Bay waters and development of its shoreline. The Bay Plan includes specific policies applicable to geographic segments of the bay shoreline, although none are identified in the vicinity of the East Contra Costa site. The Bay Plan includes the following policies relevant to desalination:

> Policy 10: Desalination projects should be located, designed, and operated in a manner that: (a) avoids or minimizes to the greatest practicable extent adverse impacts on fish, other aquatic organisms, and wildlife and their habitats; (b) ensures that the discharge of brine into the bay is properly diluted and rapidly disperses into the bay waters to minimize impacts; and (c) is consistent with the discharge requirements of the Regional Water Quality Control Board.
>
> Policy 11: Because desalination plants do not need to be located in the bay or directly on the shoreline: (a) no bay fill should be approved for desalination plants except for a minor amount of fill needed for pipelines, fish screening devices, and other directly related facilities that provide bay water to a plant and discharge diluted brine from the plant back into the bay; and (b) maximum feasible public access consistent with the project should be included as part of any desalination project that uses bay waters.

It is presumed that the final design of the BARDP would be consistent with the *San Francisco Bay Plan*. Similarly, it is assumed that project planning, site selection, and design of the BARDP would be consistent with other applicable land use plan policies, if any, although in the absence of site-specific information there remains the potential for conflicts with adopted plans.

Land Use and Visual Quality

In the process of selecting the preliminary site along the eastern Contra Costa County shoreline, potential sites considered for the desalination plant were generally limited to those with compatible land uses (e.g., sites with existing industrial or utility uses such as refineries, wastewater treatment plants, power plants, or airports). Some open space/marsh sites adjacent to existing industrial uses were also considered. However, pending final site selection for the plant and associated facilities, potential land use and visual impacts are considered to be similar to those described in Chapter 4, Section 4.3 (Impacts 4.3-1 to 4.3-5). These impacts include the potential for temporary conflicts with established uses during construction, permanent displacement of existing land uses, temporary or permanent degradation of visual resources/scenic views, and new sources of light and glare. In the absence of a specific site location and project design, these impacts are considered potentially significant. It is presumed that implementation of appropriate site selection, design measures, construction techniques, and mitigation measures could avoid land use and visual impacts or reduce them to a less-than-significant level.

Geology, Soils, and Seismicity

At any of the identified BARDP sites, there would be a potential for seismic and/or geologic hazards. The final site selection for the desalination plant and associated facilities would include geotechnical investigations. These studies would be performed to determine the engineering suitability and feasibility of the site as well as appropriate design measures to minimize geologic hazards. Thus, as standard practice, the design and construction of the desalination plant and associated facilities would incorporate and implement recommendations from the geotechnical investigations. In addition, the facilities would be designed and constructed consistent with current building and seismic codes as well as applicable regulations (see Chapter 4, Section 4.4).

However, until the final sites are selected for the plant and associated facilities and preliminary engineering design completed, potential geology, soils, and seismicity impacts (Impacts 4.4-1 to 4.4-9) would be considered potentially significant. Similar to potential geologic and seismic impacts described in Chapter 4, impacts of the BARDP could be avoided or reduced to a less-than-significant level by implementing recommendations from the geotechnical investigations, complying with applicable building codes and regulations, and implementing appropriate site selection, design measures, and construction techniques.

Water Quality and Hydrology

Construction impacts associated with the desalination facilities would be similar to those described in Chapter 4, Section 4.5 (Impacts 4.5-1, 4.5-2, and 4.5-3); these impacts are related to the potential for water quality degradation from erosion and sedimentation, short-term depletion of groundwater resources from construction dewatering, and construction discharges to surface waters and would be considered potentially significant. Depending on the site selected for the BARDP, there could be impacts associated with flooding similar to those for WSIP facilities (Impact 4.5-4), but either site selection or incorporation of flood protection measures could reduce these impacts to less than significant. Similarly, implementation of the associated mitigations requiring preparation of erosion control plans and compliance with National Pollutant Discharge Elimination System (NPDES) construction permits could reduce these impacts to a less-than-significant level. Construction activities associated with the installation of intake structures, outfalls, or other facilities in the ocean or bay could result in potentially significant water quality impacts not discussed in Chapter 4; these include temporary disturbance of bottom sediments and potential degradation of water quality from chemicals in sediments or construction materials. It is presumed that implementation of appropriate site selection, design measures, construction techniques, and site-specific mitigation measures as well as compliance with applicable water quality regulations could avoid these impacts or reduce them to a less-than-significant level.

The operational impact associated with increased impervious surfaces would be similar to that described in Chapter 4, Section 4.5 (Impact 4.5-6); this impact and would be considered potentially significant but could be mitigated with site-specific management practices and control measures similar to those described in Chapter 6. In the absence of siting and design information, the BARDP is considered to have potentially significant long-term impacts associated with flooding, seiche, tsunami, and mudflow hazards (unlike the WSIP projects), although it is presumed that implementation of appropriate site selection, design measures, construction techniques, and mitigation measures could avoid these impacts or reduce them to a less-than-significant level. Impact 4.5-5 regarding discharges of treated water for some of the WSIP facilities would not apply to the BARDP.

One water quality impact that is unique to the operation of a desalination plant and not discussed in Chapter 4 involves the disposal of brine concentrate, a waste product from the desalination process that contains the chemicals and minerals removed from seawater or brackish water to produce potable water. The brine concentrate or "reject water" from the desalination process is likely to have a salt content approximately twice that of bay or ocean waters and therefore would be denser and less buoyant than the receiving waters. The concentrate could also have higher concentrations of metals and other potentially toxic constituents than are present in the bay or ocean. Disposal of the brine concentrate through either an existing outfall or a new outfall built for the plant could result in significant localized water quality impacts (as well as associated biological resource impacts, as discussed separately below). Detailed studies will be required to determine if disposal of the brine concentrate would be consistent with applicable water quality objectives and criteria, including criteria for toxic pollutants.

The design and operation of the outfall structure would require regulatory permitting through the NPDES program and approval by the California Regional Water Quality Control Board; furthermore, siting a desalination plant on the eastern Contra Costa County shoreline would require disposal to the Delta, which has more stringent discharge standards than those for the bay or ocean. To avoid significant water quality impacts, site-specific studies to determine the hydraulics and dilution of brine concentrate would be needed to ensure appropriate mixing in the outfall structure during a range of diurnal, tidal, and seasonal conditions and to protect aquatic resources that could be affected by the discharge. In order for the BARDP to be feasible, it would have to incorporate design and operation measures that ensure regulatory compliance with discharge requirements for long-term protection of water quality. Although it is possible that appropriate design and operation of the BARDP along with compliance with water quality regulations and implementation of mitigation measures could reduce potentially significant water quality impacts, due to the limited information available and unknown status of project details, water quality impacts are considered potentially significant and unavoidable in order to be conservative in this preliminary evaluation. The CEQA environmental review of the BARDP will provide a detailed impact analysis based on project-specific information and determine if there are feasible mitigation measures to reduce impacts to a less-than-significant level. The diversion of brackish water from this zone and discharge of higher-salinity concentrate could result in a cumulative effect on the Delta and upstream users. The daily tidal exchange of water through this area is so great that the discharge of concentrate from the BARDP alone would not present a regional salinity issue, but its contribution to salinity changes in the context of past, present, and proposed water diversion projects in the Delta and upstream rivers tributary to the Delta needs further evaluation. This potential cumulative effect is considered to be potentially significant but mitigable through design and operation measures or other compensatory actions to offset potential salinity effects.

Biological Resources

Construction and operation of the desalination plant and associated facilities could result in potentially significant impacts on biological resources, depending on the final sites selected, the design of the proposed facilities, and other project characteristics to be determined. Although the preliminary site location for the desalination plant along the eastern Contra Costa County shoreline includes previously disturbed areas in predominantly industrial use, some of the area may include marshes, wetlands, or other sensitive habitat. Potential impacts of the desalination facilities on wetlands, sensitive habitats, special-status species, and other aquatic resources would be similar to those described in Chapter 4, Section 4.6 (Impacts 4.6-1 to 4.6-4), although the types of habitat and affected species would be different. Similarly, depending on the final site selection and the ultimate project design, the BARDP could result in conflicts with adopted conservation plans or other approved biological resources plans (Impact 4.6-5). In the absence of more detailed project information, these impacts would all be considered potentially significant. However, in most cases, it is presumed that implementation of appropriate site selection, design measures, construction techniques, and mitigation measures involving compliance with permit requirements of the appropriate resource agencies could avoid these impacts or reduce them to a less-than-significant level.

In addition to the biological resources impacts discussed in Chapter 4, the BARDP would result in significant impacts on marine or other aquatic resources associated with construction and operation of both the intake and outfall structures. Construction of these facilities would result in disturbance and displacement of these resources. Operation of the intake facility could result in the incidental entrapment or entrainment of fish and other aquatic organisms, potentially including special-status species. Discharge of brine concentrate through the outfall would affect bottom-dwelling aquatic organisms sensitive to extreme salinity or temperature changes and could also affect many filter-feeding animals.[5] As discussed above under Hydrology and Water Quality, in order to be feasible the BARDP would have to incorporate design and operation measures that ensure regulatory compliance with intake and discharge requirements. In addition to ensuring protection of water quality for aquatic habitats, the BARDP will be required to comply with any other permit conditions for potentially affected special-status species or sensitive habitats. Although potential aquatic resources (including special-status species) and associated water quality impacts for the BARDP could possibly be mitigated through design/operation and mitigation measures and regulatory compliance, this impact is considered

5 Filter feeders are animals that feed by straining suspended matter and food particles from water.

potentially significant and unavoidable in order to be conservative in this preliminary evaluation. The CEQA environmental review of the BARDP will provide a detailed impact analysis based on project-specific information and determine if there are feasible mitigation measures to reduce impacts to a less-than-significant level.

Cultural Resources

Unlike other facilities proposed under the WSIP, the desalination plant would not be a component of the SFPUC regional water system and therefore would not be associated with its historic properties. However, due to uncertainty regarding the location of the BARDP as well as whether or not the plant would utilize existing structures or facilities, it is premature to conclude that the project would not affect historic, archaeological, or paleontological resources. In the absence of more detailed project information, impacts on cultural resources (similar to Impacts 4.7-1, 4.7-2, 4.7-4 and 4.7-6 described in Chapter 4) would be considered potentially significant. However, it is presumed that implementation of appropriate site selection, design measures, construction techniques, and mitigation measures involving the appropriate resource agencies could avoid impacts or reduce them to a less-than-significant level.

Traffic, Transportation, and Circulation

Chapter 4, Section 4.8 presents a general description of the types of construction and operation impacts on traffic, transportation, and circulation for treatment plants, pipelines, and pump stations. These include construction-related effects on roadway capacity, traffic delays, impaired access to adjacent land uses, displacement of parking, and increased traffic safety hazards as well as long-term traffic increases during facility operation. Similar types of impacts (Impacts 4.8-1 to 4.8-6) would be expected during construction and operation of the BARDP and associated facilities. In the absence of more detailed project information, impacts on traffic, transportation, and circulation would be considered potentially significant. However, implementation of appropriate site selection, design measures, construction techniques, and mitigation measures could avoid impacts or reduce them to a less-than-significant level.

Air Quality

The preliminary site for the BARDP is located in the San Francisco Bay Area Air Basin, as described in Chapter 4, Section 4.9, and would be subject to the same air quality conditions and regulations. Air quality impacts similar to those described in Chapter 4 for pipelines, treatment facilities, and pump stations (Impacts 4.9-1 to 4.9-7) related to construction and operational air quality emissions and odors could also occur with the BARDP. In addition, increased energy demand for long-term operation of a desalination plant could indirectly result in increased use of fossil fuels and emissions of greenhouse gases. In the absence of more detailed project information, air quality impacts would be considered potentially significant. However, it is presumed that implementation of appropriate site selection, design measures, construction techniques, and mitigation measures as well as compliance with applicable air quality regulations could avoid these impacts or reduce them to a less-than-significant level.

Noise and Vibration

Construction and operation of the BARDP could result in similar types of noise and vibration impacts as those described in Chapter 4, Section 4.10 (Impacts 4.10-1 to 4.10-4), although operation of the desalination plant could have different noise characteristics than those associated with a water treatment plant. Based on preliminary siting of the facility within or near existing industrial and utility uses, it is likely that the desalination plant site would not be located in proximity to sensitive receptors. However, in the absence of more detailed project information, impacts related to temporary and/or long-term increases in noise and vibration would be considered potentially significant. It is presumed that implementation of appropriate site selection, design measures, construction techniques, and mitigation measures (including measures to assure compliance with local noise ordinances) could avoid these impacts or reduce them to a less-than-significant level.

Public Services and Utilities

Implementation of the BARDP would not increase the demand for municipal water supply, wastewater capacity, or governmental services such as schools or parks. The BARDP design would include onsite storm drainage facilities, which would be required to comply with the local storm drainage district as well as any applicable NPDES permit requirements; however, depending on the site, it is not expected that expansion of existing storm drainage facilities would be required. The long-term solid waste disposal needs would depend on the final design and operational characteristics of the BARDP facilities and would include the ongoing disposal of pretreatment sludge generated by the desalination process. The design of BARDP facilities would likely include fire protection and security features, so the demand for fire protection or police protection services is not expected to increase. However, in the absence of more detailed project information, impacts on public services and utilities would be considered potentially significant. It is presumed that implementation of design measures, construction techniques, and mitigation measures (including compliance with regulations related to solid waste) could avoid these impacts or reduce them to a less-than-significant level.

Recreational Resources

Implementation of the BARDP would not increase demand for recreational facilities, include new recreational facilities, or require expansion of existing recreational facilities. Based on the assumption that the BARDP facilities would be sited on or near compatible land uses, such as sites with existing industrial or utility uses, this project is not likely to be located in the immediate vicinity of existing recreational resources. However, there are established recreational uses along the eastern Contra Costa County shoreline, including marinas and boat ramps, as well as water-based recreational uses in the Delta that could be affected by the BARDP and any associated intake and/or outfall structures. Recreational resources would be identified following specific site selection. In the absence of more detailed project information, impacts on recreational resources would be considered potentially significant. It is presumed that implementation of design measures, construction techniques, and mitigation measures could avoid these impacts or reduce them to a less-than-significant level.

Agricultural Resources

Based on a preliminary site on the eastern Contra Costa County shoreline near Pittsburg, the BARDP would not affect any farmlands, as no agricultural activity occurs in the vicinity. However, the California Department of Conservation maps indicate important farmland is present in some parts of eastern Contra Costa County (California Department of Conservation, 2004). Therefore, until the BARDP site is identified, agricultural resources impacts would be considered potentially significant but mitigable with appropriate site selection.

Hazards

The BARDP would be subject to the same hazardous materials regulatory framework as that described in Chapter 4, Section 4.14. Similar to the WSIP facilities, construction and operation of the BARDP could result in hazardous materials impacts. Due to the industrial nature of the site vicinity in eastern Contra Costa County, there is a potential to encounter hazardous materials in soil and groundwater during construction. If the BARDP were co-located with an existing facility or required the demolition of existing structures, hazardous building materials could be encountered. Operation of the desalination plant would likely require the handling and storage of hazardous materials, which could expose the public or the environment to hazardous materials. Therefore, construction and operation of the BARDP could result in similar types of hazardous materials impacts as those described in Impacts 4.14-1 to 4.14-3 and 4.14-5 to 4.14-8 (Impacts 4.14-3 and 4.14-4 do not apply, since the site is not located within a wildland fire area and no tunnel construction is proposed). In the absence of more detailed project information, these hazardous materials impacts would be considered potentially significant; however, it is presumed that implementation of appropriate site selection, design measures, construction techniques, and mitigation measures as well as compliance with all applicable federal, state, and local hazardous materials regulations could avoid these potential impacts or reduce them to a less-than-significant level.

Energy Resources

Implementation of the BARDP would result in the substantial use of nonrenewable energy resources during both construction and operation. In the pre-feasibility study, energy consumption for operation of the desalination plant was estimated to range from 7,500 to 22,000 kilowatt-hours per million gallons of product water, depending on the site selected for the BARDP. Even though these estimates are subject to change pending more detailed project design, the desalination plant would require extensive power consumption for long-term operations. Energy-intensive processes include pumping raw water to the filtration system, filtration, reverse-osmosis, and product water pumping. The project would result in the long-term use of large amounts of energy, and more detailed studies would be needed as part of project feasibility and design to determine the extent of available power, energy conservation measures to be incorporated into project design, and the impact of plant operation in the context of regional energy availability. The use of conventional energy sources has a limited range of available mitigation options. However, the development of the BARDP includes the exploration and investigation of energy-saving technologies and the use of alternative energy sources for BARDP operation. If conventional energy sources were used, the energy impacts would likely be potentially significant and unavoidable, although some of the impacts could potentially be mitigated through project design. Due to the unknown effectiveness of energy-saving technologies as applied to the BARDP, and in the absence of more detailed information, energy impacts would be considered potentially significant and unavoidable in order to be conservative in this preliminary evaluation. The CEQA environmental review of the BARDP will provide a detailed impact analysis based on project-specific information and determine if there are feasible mitigation measures to reduce impacts to a less-than-significant level.

Cumulative and Growth Impacts

This variant would generally result in the same facilities-related cumulative impacts as those identified and described in Chapter 4, Section 4.17, for the WSIP facilities, independent of the BARDP. When the BARDP is included as part of the WSIP under Variant 2, the combined impacts of the BARDP described above together with the WSIP facilities impacts described in Chapter 4 would constitute the collective impact. The BARDP would not contribute to any overlapping impacts due to the distance between the SFPUC facilities from the East Contra Costa site, but it would contribute to multi-regional impacts, exacerbating the collective impacts described in Chapter 4, Section 16. When considered in terms of cumulative impacts, Variant 2 would result in the same cumulative impacts as those identified for the proposed program augmented by the additional cumulative impacts of the BARDP due to its contribution to other past, present and reasonably foreseeable future projects in the vicinity of the East Contra Costa site. Implementation of the BARDP in combination with the WSIP would contribute additional cumulative facilities-related impacts in the eastern Contra Costa County region (or wherever the final site(s) is located); the extent of that contribution would be determined based on more specific project design, siting, and scheduling information in the project EIR for the BARDP. In addition, Variant 2 would contribute to cumulative long-term energy impacts in Northern California when considered in combination with the increased energy demands associated with the BARDP plus the WSIP facilities, as described in Section 4.15. The extent of the additional contribution to cumulative energy impacts of Variant 2 compared to the proposed program would be due to the BARDP’s contribution to long-term energy demands, and the associated implications with respect to regional energy resources (including the potential to increase emissions of greenhouse gases); this additional contribution would be evaluated based on more detailed project design and siting in the project-specific EIR for the BARDP.

Impacts associated with the SFPUC water supply and systemwide operations for all of the variants are discussed below in Section 8.5. Although the BARDP in itself could have implications with respect to growth inducement, within the context of WSIP Variant 2, the BARDP would serve only as a supplemental dry-year and emergency water supply. Therefore, the growth-inducement potential of Variant 2 as well as the indirect environmental effects associated with growth would be identical to those described for the proposed program in Chapter 7. The growth-inducement potential of the BARDP as a whole and the project’s indirect environmental effects would be evaluated as part of the formal CEQA review of the BARDP.

8.3.4 Mitigation Measures – Variant 2

All mitigation measures for WSIP facilities-related impacts identified for the proposed program and described in Chapter 6 would apply to Variant 2, in addition to the mitigation measures associated with the BARDP to be developed when the project-specific CEQA review is conducted. Table 8.3 identifies the facilities-related impacts of Variant 2; where applicable, the corresponding mitigation measures are presented in Chapter 6. In some instances, the same programmatic mitigation measures for the WSIP facilities could apply to the BARDP, although more comprehensive mitigation requirements would be developed as part of the project-level CEQA review of the BARDP, which will identify site-specific measures to reduce the identified impacts.

Mitigation measures related to water resources impacts on the Tuolumne River, Alameda, and Peninsula watersheds and the Westside Groundwater Basin applicable to Variant 2 would be identical to those for the proposed program, as described in Chapters 5 and 6 and discussed below in Section 8.5.

8.4 WSIP Variant 3 – 10% Rationing

8.4.1 Description

Water Supply

The water supply for *WSIP Variant 3 – 10% Rationing* would be identical to that under the proposed program, except that additional supplies from TID and MID transfers would be needed during drought years. This variant would reduce the maximum rationing during drought years from 20 to 10 percent, effectively modifying the WSIP system performance objective for dry-year delivery and increasing the system firm yield to 268 mgd (compared to 256 mgd for the proposed program). During nondrought and drought years, this variant would accommodate the projected increase in purchase requests through 2030 (35 mgd) in the same manner as the proposed program: surface water from the Tuolumne River, Alameda, and Peninsula watersheds; and implementation of additional conservation programs, Recycled Water Projects (SF-3), and Local Groundwater Projects in San Francisco (part of SF-2, Groundwater Projects). Under Variant 3, drought-year demand would additionally be served through the Westside Groundwater Basin conjunctive-use project (a component of SF-2, Groundwater Projects) and through TID and MID transfers, similar to the proposed program (except with an increase in TID and MID transfers). *WSIP Variant 3 – 10% Rationing* would require additional annual average TID and MID transfers of up to 12 mgd during the 8.5-year design drought (35 mgd compared to 23 mgd under the proposed program). Using the HH/LSM, the SFPUC determined that the average annual Tuolumne River diversion would be slightly greater under Variant 3 when compared to the proposed program due to the additional transfers during drought sequences; however, when presented in terms of the number of million gallons per day, both Variant 3 and the proposed program would result in an average annual diversion from the Tuolumne River of about 27 mgd over the 82-year period of hydrologic record.

Regional Water System Operations

Under *WSIP Variant 3 – 10% Rationing*, the operation, maintenance, and delivery strategy of the SFPUC regional water system would be identical to that proposed under the WSIP at all times, except during drought years. During an extended dry period, the SFPUC would implement the same drought response program as that described for the WSIP in Chapter 3, Section 3.8.1, except that the maximum rationing would be 10 percent. During extended drought sequences following implementation of the supplemental dry-year supplies (TID and MID transfers and Westside Basin conjunctive-use program), the SFPUC would limit rationing to 10 percent on a systemwide basis. In order to implement this variant, the SFPUC would need to establish a transfer agreement with TID and MID for 35 mgd (compared to 23 mgd for the proposed program).

Level of Service Performance

WSIP Variant 3 – 10% Rationing would achieve all of the proposed level of service performance goals through 2030, as indicated in Table 8.2, and would exceed the WSIP level of service for drought-year rationing. However, as shown in the table, even though it would achieve the performance goals, this variant would have different implications in terms of its performance during the design drought when compared to the WSIP.

Modeling results indicate that under Variant 3, rationing would occur slightly more frequently than under the proposed program. However, Variant 3 would reduce the degree of rationing during the design drought. When modeled over the 82-year period of hydrologic record (1920–2002), Variant 3 would trigger the drought response 25 times in the 82-year period, with rationing required in 8 of those years; this compares to 24 times that the drought response program would be triggered under the proposed program, with rationing in 8 of the years. The minor difference is due to the modeling assumptions, and there would likely be no noticeable difference between Variant 3 and the proposed program during actual operations in terms of the frequency of drought response actions. When modeled over the 8.5-year design drought, Variant 3 would require 6.5 years of rationing at 10 percent (6.5 out of 8.5 years subject to rationing), while the proposed program would require 3 years of rationing at 10 percent and 3.5 years at 20 percent (6.5 out of 8.5 years subject to rationing).

Facility Requirements

The facility requirements under *WSIP Variant 3 – 10% Rationing* would be identical to those of the proposed program, as described in Section 3.9, Proposed Facility Improvement Projects. All facilities proposed under the WSIP would be required, and no additional facilities would be needed.

Institutional Requirements

WSIP Variant 3 – 10% Rationing would require the same type of agreements with TID and MID to secure water transfers as those needed under the proposed program. The only difference is in the quantity of water subject to the transfer agreement for Variant 3, which would be an annual average of 35 mgd over the design drought compared to 23 mgd for the proposed program. No other institutional requirements are expected.

8.4.2 Setting

The regional setting for facility improvement projects for *WSIP Variant 3 – 10% Rationing* is the same as the regional setting for the WSIP study area described in Chapter 4, extending from Oakdale Portal in Tuolumne County west along the regional water system to its terminus in San Francisco. Similarly, the regional setting for potentially affected watersheds and drainages, including the Tuolumne River, Alameda Creek, and Peninsula watersheds, is the same as that described for the proposed program in Chapter 5.

8.4.3 Impact Analysis – Facility Construction and Operations

Table 8.3 identifies the impacts that would occur under *WSIP Variant 3 – 10% Rationing* related to facilities construction and operations. All facilities-related impacts would be the same in all respects as those identified for the proposed program and described in Chapter 4, including the cumulative impacts. All of the same mitigation measures presented in Chapter 6 would be required. No additional impacts would result.

Impacts associated with water supply and systemwide operations for Variant 3 are discussed below in Section 8.5. The growth-inducement potential of Variant 3 as well as the indirect environmental effects associated with growth would be similar to those described for the proposed program in Chapter 7. The overall availability and reliability of water supply is the most relevant factor influencing future growth and development, as discussed in Chapter 7, with the difference in rationing policy during drought sequences between the proposed project and Variant 3 not likely a significant factor affecting growth.

8.4.4 Mitigation Measures – Variant 3

All mitigation measures for facilities-related impacts identified for the proposed program and described in Chapter 6 would apply to Variant 3. Table 8.3 summarizes the facilities-related impacts of Variant 3; where applicable, the corresponding mitigation measures are presented in Chapter 6. No additional facilities-related mitigation measures would be required. Mitigation measures related to water resources impacts applicable to Variant 3 would be identical to those for the proposed program, as described in Chapters 5 and 6 and discussed below in Section 8.5.

8.5 All Variants – Impacts of Water Supply and System Operations

This section presents the impacts resulting from water supply and system operations for all variants, similar to the analysis presented in Chapter 5 for the proposed program. The WSIP variants would meet the need for additional water in 2030 through different combinations of water from the Tuolumne River, additional conservation, recycling, groundwater and desalination. Under all variants, the SFPUC would continue to use water supplies from the Bay Area watersheds to the maximum extent practical, but the contribution from the Bay Area watersheds would be almost the same for the WSIP and the three variants. As described previously in Sections 8.2, 8.3, and 8.4, the regional water system would be operated somewhat differently under each of the three variants to accommodate the various mixes of water sources and different shortage criteria.

The variants would alter the way the regional water system would be operated, which would, in turn, affect water levels in reservoirs on the Tuolumne River and its tributaries and in the Alameda and Peninsula watersheds. Altered operation of the regional water system would also affect flow in streams in the Tuolumne River, Alameda, and Peninsula watersheds. As described in Chapter 5 for the WSIP, the other environmental impacts of the variants would result from variant-induced changes in water levels in reservoirs and flow in streams. The variants would have minor differences in effects on the Westside Groundwater Basin compared to the WSIP.

As discussed in Sections 8.2, 8.3, and 8.4 and presented in Table 8.2, all three variants would achieve the WSIP levels of service, but they would vary slightly from each other and from the proposed program with respect to their predicted performance during drought periods. Water rationing would occur about the same frequency but would be slightly more severe with Variant 1 than with the WSIP. Rationing would occur with about the same frequency and severity under Variant 2, and with about the same frequency but with less severity under Variant 3. Consequently, it should be noted that the environmental impacts of the variants are not associated with a common and equal level of water supply service.

Similar to the analysis for the proposed program in Chapter 5, the SFPUC applied the HH/LSM to the variants, and model results were used to predict potential impacts of the variants on water resources in the Tuolumne River, Alameda, and Peninsula watersheds. The model output was used to provide quantitative estimates of changes that would occur with implementation of the variants compared to the existing condition. The model was employed to estimate flow in streams and rivers and water levels in reservoirs with each of the three variants in place. Technical specialists then assessed the effects of variant-induced changes in stream flows and reservoir levels on geomorphology, water quality, groundwater, fisheries, terrestrial wildlife and vegetation, and recreation in the three affected watersheds. Impacts on the Westside Groundwater Basin due to the variants were evaluated based on a qualitative comparison with impacts identified for the proposed program.

The environmental impacts of water supply and system operations under the variants on resources in the Tuolumne River, Alameda, and Peninsula watersheds compared to the existing condition are summarized in **Tables 8.5**, **8.6**, and **8.7**, respectively. For comparative purposes, the tables also present the water resources impacts of the WSIP compared to the existing condition (summarizing the analysis in Chapter 5 of this PEIR). Significance determinations were made for the impacts of the variants and are shown in the tables following the narrative descriptions. Impacts on reservoir water levels and stream flow in each watershed, which were used as the basis for analysis of all other environmental impacts of water system operations under the variants, are discussed in detail below for each variant. The impacts are assessed before mitigation measures have been applied.

Similarly, the environmental impacts of water supply and system operations under the variants on the Westside Groundwater Basin compared to the existing condition are summarized in **Table 8.8**, and the cumulative impacts under the variants are summarized in **Table 8.9**.

Tables 8-5, 8-6, 8-7, 8-8, and 8-9 use several standard phrases to indicate how the impacts of a variant compare to the impacts of the proposed program. In these tables, the phrase “same as the proposed program” is used when an impact of a variant is identical or almost identical to that of the proposed program. The phrase “similar to the proposed program” is used when an impact of a variant is similar in character to that of the proposed program and the magnitude of the impact is close to but not identical to the impact of the proposed program. The phrases “similar to but greater than the proposed program” and “similar to but less than the proposed program” are used when an impact of a variant is similar in character to that of the proposed program but the magnitude of the impact is discernibly greater than or less than the impact of the proposed program, although as explained below, the degree of variance is generally small.

In general, the impacts of the variants compared to the existing condition are quite similar to those of the WSIP compared to the existing condition. Although some of the impacts of the variants differ somewhat from those of the WSIP (sometimes greater and sometimes less severe), the magnitude of the differences is generally small. With the exception of impacts on the North Westside Groundwater Basin under Variant 1 (Impacts 5.6-1, 5.6-2, and 5.6-3), the significance determinations made for the variants are the same as those for the WSIP. Under Variant 1, Local Groundwater Projects would not be implemented, and there would be no wells developed in the North Westside Groundwater Basin. Therefore, the PSM impacts on the North Westside Groundwater Basin under the proposed program would be not applicable under Variant 1. In all other cases, impacts determined to be less than significant for the WSIP are also less than significant for the variants and impacts determined to be potentially significant for the WSIP are also potentially significant for the variants. Similarly, with the exception of measures associated with the North Westside Groundwater Basin, all mitigation measures identified for the proposed program in Chapter 5 and described in Chapter 6 would be similar for all variants.

TABLE 8.5
SUMMARY OF WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR THE WSIP VARIANTS COMPARED TO EXISTING CONDITION – TUOLUMNE WATERSHED

Impact	Proposed Program	Variant 1 – All Tuolumne	Variant 2 – Regional Desalination for Drought	Variant 3 – 10% Rationing
Section 5.3.1, Stream Flow and Reservoir Water Levels				
Impact 5.3.1-1: Effects on flow along the Tuolumne River below O'Shaughnessy Dam	Would reduce average monthly storage in Hetch Hetchy Reservoir year-round and would lower monthly average water levels by up to 10 feet with the greatest reduction just prior to snowmelt runoff. Would have little or no effect on average monthly flow in this reach of the Tuolumne River in most summer, fall and winter months of all hydrologic year types. Would reduce average monthly flow in some spring months with the greatest reductions (up to 30%) occurring in dry years. Would reduce average spring monthly flow by up to 90% very infrequently. Flow reductions would manifest themselves as delays in spring releases from Hetch Hetchy Reservoir above minimum required for up to 8 days. Could affect peak flows. (LS)	Would reduce average monthly storage in Hetch Hetchy Reservoir year-round and would lower monthly average water levels by up to 12 feet with the greatest reduction just prior to snowmelt runoff. Would have little or no effect on average monthly flow of this reach of the Tuolumne River in most summer, fall and winter months of all hydrologic year types. Would reduce average monthly flow in some spring months with the greatest reductions (up to 33%) occurring in dry years. Would reduce average monthly flow by up to 90% very infrequently. Flow reductions would manifest themselves as delays in spring releases from Hetch Hetchy Reservoir above minimum required by up to 9 days. Could affect peak flows. (LS)	Would reduce average monthly storage in Hetch Hetchy Reservoir year-round and would lower monthly average water levels by up to 7 feet with the greatest reduction just prior to snowmelt runoff. Would have little or no effect on average monthly flow of this reach of the Tuolumne River in most summer, fall and winter months of all hydrologic year types. Would reduce average monthly flow up to in some spring months with the greatest reductions (up to 30%) occurring in dry years. Would reduce average monthly flow by up to 90% very infrequently. Flow reductions would manifest themselves as delays in spring releases from Hetch Hetchy Reservoir above minimum required by up to 7 days. Could affect peak flows. (LS)	Would reduce average monthly storage in Hetch Hetchy Reservoir year-round and would lower monthly average water levels by up to 10 feet with the greatest reduction just prior to snowmelt runoff. Would have little or no effect on average monthly flow of this reach of the Tuolumne River in most summer, fall and winter months of all hydrologic year types. Would reduce average monthly flow up to 30% in some spring months. Would reduce average monthly flow by up to 90% very infrequently. Flow reductions would manifest themselves as delays in spring releases from Hetch Hetchy Reservoir above minimum required by up to 10 days. Could affect peak flows. (LS)
Impact 5.3.1-2: Effects on flow along Cherry Creek below Cherry Dam	Water levels in Lake Lloyd would not be altered such that they would be substantially outside the range experienced under the existing condition. Would reduce year-round average monthly storage in Lake Lloyd by about 1,000 AF and average monthly water levels by about 1 foot. Would have little or no effect on magnitude and timing of releases to Cherry Creek. (LS)	Would reduce average monthly storage in Lake Lloyd by about 1,000 AF and average monthly water levels by about 1 foot. Would not alter releases to Cherry Creek. (LS)	Would alter average water levels by about 1 foot. Would not alter releases to Cherry Creek. (LS)	Would not alter water levels or alter releases to Cherry Creek. (LS)

TABLE 8.5 (Continued)
SUMMARY OF WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR THE WSIP VARIANTS COMPARED TO EXISTING CONDITION — TUOLUMNE WATERSHED

Impact	Proposed Program	Variant 1 – All Tuolumne	Variant 2 – Regional Desalination for Drought	Variant 3 – 10% Rationing
Section 5.3.1, Stream Flow and Reservoir Water Levels (cont.)				
Impact 5.3.1-3: Effects on flow along Eleanor Creek below Eleanor Dam	Would have little effect on water levels in Lake Eleanor. Change in storage would be limited to infrequent transfers to Lake Lloyd and periods of severe drought. Would have little or no effect on magnitude and timing of releases to Eleanor Creek. (LS)	Would not alter water levels or releases. (LS)	Would not alter water levels or releases. (LS)	Would not alter water levels or release. (LS)
Impact 5.3.1-4: Effects on flow along the Tuolumne River below La Grange Dam	Would reduce average monthly storage in Don Pedro Reservoir in most months and would lower average monthly water levels by up to 10 feet and by as much as 27 feet in severe droughts. Would have little or no effect on average monthly flow in most summer months of all hydrologic year types. Would reduce average monthly flow below La Grange Dam in some months between November and June by up to 25%. Maximum percentage reduction in average monthly flow would be 92%, occurring very infrequently (one month in the 82-year hydrologic simulation). Flow reductions would manifest themselves as delays in spring releases from Don Pedro Reservoir above minimum required. In years when several spring pulse releases above the minimum required are made, the WSIP may eliminate one or more of the pulse releases and would delay others by several days or weeks. Could affect peak flows. (LS)	Would reduce average monthly storage in Don Pedro Reservoir almost year-round and would lower average monthly water levels by up to 12 feet. Would lower water levels by as much as 37 feet in severe droughts. Would have little or no effect on average monthly flow in most summer months of all hydrologic year types. Would reduce average monthly flow below La Grange Dam in some months between November and June by up to 32%. Would reduce average monthly flow by up to 95% very infrequently. Flow reductions would manifest themselves as delays in spring releases from Don Pedro Reservoir above minimum required. Would delay spring releases above minimum required by up to several weeks. Delays would be similar to but slightly greater than with WSIP. (LS)	Would reduce average monthly storage in Don Pedro Reservoir almost year-round and would lower average monthly water levels by up to 6 feet. Would lower water levels by as much as 16 feet in severe droughts. Would have little or no effect on average monthly flow in most summer months of all hydrologic year types. Would reduce average monthly flow below La Grange Dam up to 21% in some months between November and June. Would reduce monthly flow by up to 80% very infrequently. Flow reductions would manifest themselves as delays in spring releases from Don Pedro Reservoir above minimum required. Would delay spring releases above minimum required by up to several days. Delays would be less than with WSIP. (LS)	Would reduce average monthly storage in Don Pedro Reservoir year-round and would lower average monthly water levels by up to 11 feet. Would lower water levels by as much as 38 feet in severe droughts. Would have little or no effect on average monthly flow in most summer months of all hydrologic year types. Would reduce average monthly flow below La Grange Dam in some months between November and June by up to 25%. Would reduce average monthly flow by up to 95% very infrequently. Flow reductions would manifest themselves as delays in spring releases from Don Pedro Reservoir above minimum required. Would delay spring releases above minimum required by up to several weeks. Delays would be similar to WSIP. (LS)

TABLE 8.5 (Continued)
SUMMARY OF WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR THE WSIP VARIANTS COMPARED TO EXISTING CONDITION — TUOLUMNE WATERSHED

Impact	Proposed Program	Variant 1 – All Tuolumne	Variant 2 – Regional Desalination for Drought	Variant 3 – 10% Rationing
Section 5.3.1, Stream Flow and Reservoir Water Levels (cont.)				
Impact 5.3.1-5: Effects on flow along the San Joaquin River and the Sacramento-San Joaquin Delta.	Most WSIP-induced flows in the Tuolumne River between La Grange Dam and its confluence with the San Joaquin River would occur from January through June in wet or above-normal years. The greatest reductions would occur in years following extended droughts when storage in Don Pedro Reservoir is being replenished and could result in a average monthly flow reduction of up to 25 to 50% along the San Joaquin River between the Tuolumne and Stanislaus River confluences. Flow reductions of these magnitudes would be rare events occurring four to five times in the 82-year period of hydrologic record. Overall, the WSIP would not cause an alteration of flows along the San Joaquin River or in the Sacramento-San Joaquin Delta such that it would be substantially outside the range experienced under existing condition. (LS)	Similar to but slightly greater than proposed program (LS)	Similar to proposed but less than proposed program (LS)	Similar to proposed program (LS)
Section 5.3.2, Geomorphology				
Impact 5.3.2-1: Effects on sediment transport and channel characteristics between O'Shaughnessy Dam and Don Pedro Reservoir	Would have little effect on the very large and infrequent floods between O'Shaughnessy Dam and Don Pedro Reservoir that are capable of moving boulders and altering the characteristics of bedrock channels. Infrequent reductions in duration and magnitude of peak flows could affect sediment deposition and erosion in side channels and meadows and groundwater levels in riparian zones. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)
Impact 5.3.2-2: Effects on sediment transport and channel characteristics below La Grange Dam	Would have little effect on very large and infrequent floods below La Grange Dam, but would result in infrequent reduction in duration and magnitude of peak flows could affect sediment deposition and erosion in main channel and groundwater levels in riparian zones. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)

TABLE 8.5 (Continued)
SUMMARY OF WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR THE WSIP VARIANTS COMPARED TO EXISTING CONDITION — TUOLUMNE WATERSHED

Impact	Proposed Program	Variant 1 – All Tuolumne	Variant 2 – Regional Desalination for Drought	Variant 3 – 10% Rationing
Section 5.3.3, Surface Water Quality				
Impact 5.3.3-1: Effects on water quality in Hetch Hetchy Reservoir and along the Tuolumne River below O'Shaughnessy Dam	Changes in reservoir levels would have little effect on temperature in Hetch Hetchy Reservoir in all year types. Would have little effect on temperature or dissolved oxygen along the Tuolumne River below O'Shaughnessy Dam in most year types. During extreme droughts (once in 82-year hydrologic record), warmer water released to the river would result in prolonged violations of the water quality objectives for temperature. However, water temperatures would still remain within an acceptable range for coldwater fish and would not substantially affect the river's ability to support COLD beneficial use designation. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)
Impact 5.3.3-2: Effects on water quality in Don Pedro Reservoir and along the Tuolumne River below La Grange Dam	Changes in reservoir levels would have little effect on temperature in Don Pedro Reservoir in all year types. Releases from the reservoir would still be from the cool water pool below the thermocline. Thus, no increase in water released to the Tuolumne River below La Grange Dam would occur. Would have little effect on temperature in the river below the reservoir most of the time, but on infrequent occasions would cause mean daily temperature increases of 1 or 2 °C and, on very rare occasions, increases of 10 °C at confluence with San Joaquin River. Although these very rare occasions would result in violations of water quality objectives for water temperatures, they would not impair the river's ability to support the designated beneficial uses, including coldwater fisheries. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)
Impact 5.3.3-3: Effects on water quality along the San Joaquin River and the Sacramento-San Joaquin Delta	Very infrequently following protracted droughts, flow reductions could cause salinity, expressed in terms of electroconductivity, to rise above established water quality objectives for the San Joaquin River at Vernalis. Under these circumstances the USBR, the agency responsible for compliance with these objectives, would increase releases from New Melones Reservoir to compensate for the reduction in flow and related impacts on water quality.	Similar to proposed program (LS)	Similar to proposed program (LS)	Similar to proposed program (LS)

TABLE 8.5 (Continued)
SUMMARY OF WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR THE WSIP VARIANTS COMPARED TO EXISTING CONDITION — TUOLUMNE WATERSHED

Impact	Proposed Program	Variant 1 – All Tuolumne	Variant 2 – Regional Desalination for Drought	Variant 3 – 10% Rationing
Section 5.3.3, Surface Water Quality (cont.)				
Impact 5.3.3-3 (cont.)	WSIP-related changes in Delta inflow would occur when flow through the Delta is at its seasonal maximum and would be too small to adversely affect water quality. (LS)			
Section 5.3.4, Surface Water Supplies				
Impact 5.3.4-1: Effects on Tuolumne River, San Joaquin River, and Stanislaus River water users	Under the WSIP, SFPUC's water supply facilities would continue to be operated in compliance with the provisions of the Raker Act, which requires that the SFPUC operate its water facilities so as to not infringe on the established water rights of TID and MID. Thus, the WSIP would have no adverse effect on the availability of Tuolumne River water to TID and MID or on the quality of water available to them. During most year types the WSIP would have no effect on the availability of Stanislaus River water to the USBR and other water supply agencies that receive water from New Melones Reservoir. On rare occasions following protracted droughts, WSIP-induced flow reductions along the San Joaquin River could cause flows to fall below established flow and water quality objectives at Vernalis, and the USBR would be required to increase releases from New Melones Reservoir or other San Joaquin Valley CVP facilities to compensate for these reduction in flows. Availability and quality of water at water agencies' and irrigators' diversion points along the San Joaquin, and Stanislaus Rivers would not be changed appreciably. (LS)	Similar to proposed program. (LS)	Similar to but less than proposed program. (LS)	Similar to proposed program. (LS)
Impact 5.3.4-2: Effects on Delta water users	Under rare circumstances, small reductions in Delta inflow between June and September of wet and above normal years would reduce water availability at the SWP and CVP diversion points. (LS)	Similar to proposed program. (LS)	Similar to but less than proposed program. (LS)	Similar to proposed program. (LS)

TABLE 8.5 (Continued)
SUMMARY OF WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR THE WSIP VARIANTS COMPARED TO EXISTING CONDITION — TUOLUMNE WATERSHED

Impact	Proposed Program	Variant 1 – All Tuolumne	Variant 2 – Regional Desalination for Drought	Variant 3 – 10% Rationing
Section 5.3.5, Groundwater				
Impact 5.3.5-1: Alteration of stream flows along the Tuolumne River, which could affect local groundwater recharge and groundwater levels	Would result in slight increases in groundwater discharge to the Tuolumne River along some reaches below La Grange Dam and reductions in stream flow to the groundwater basin along other reaches. Overall, the WSIP would have little or no effect on groundwater levels and groundwater recharge. The production rate of existing wells would not be affected. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)
Impact 5.3.5-2: Alteration of stream flows along the Tuolumne River, which could affect local groundwater quality	Effects on groundwater quality would be slight and limited to a shallow, unconfined aquifer located along the Tuolumne River in the vicinity of Modesto that is only used for sub-potable uses. No adverse effects on identified beneficial uses of groundwater basin would result. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)
Section 5.3.6, Fisheries				
Impact 5.3.6-1: Effects on fishery resources in Hetch Hetchy Reservoir	WSIP-related reductions in seasonal storage within Hetch Hetchy Reservoir would fall within the existing range of natural variation in seasonal storage volumes. No adverse impacts on resident fish habitat within the reservoir would occur. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)
Impact 5.3.6-2: Effects on fishery resources along the Tuolumne River between Hetch Hetchy Reservoir and Don Pedro Reservoir	Little or no change on fisheries in most summer, fall and winter months. In spring months, average monthly flows would be reduced by 4 to 30 percent and the start of large spring releases from Hetch Hetchy Reservoir could be delayed by several days. These reductions and delays in spring flows would be within the natural interannual variation that has occurred in the past and would not adversely affect fishery resources along this stretch of the Tuolumne River. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)
Impact 5.3.6-3: Effects on fishery resources in Don Pedro Reservoir	WSIP-related reductions in seasonal storage within Don Pedro Reservoir would fall within the existing range of natural variation in seasonal storage volumes. No adverse impacts on resident fish habitat within the reservoir would occur. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)

**TABLE 8.5 (Continued)
SUMMARY OF WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR THE
WSIP VARIANTS COMPARED TO EXISTING CONDITION — TUOLUMNE WATERSHED**

Impact	Proposed Program	Variant 1 – All Tuolumne	Variant 2 – Regional Desalination for Drought	Variant 3 – 10% Rationing
Section 5.3.6, Fisheries (cont.)				
Impact 5.3.6-4: Effects on fishery resources along the Tuolumne River below La Grange Dam	In wet or above-normal years when Don Pedro Reservoir is being filled, changes in the timing and duration of releases from the reservoir would decrease average monthly flows along the lower Tuolumne River beneath La Grange Dam. The greatest average flow reductions would occur during June and could potentially result in elevated water temperatures. Changes to stream flow and water temperature would result in a reduction in the linear extent of suitable habitat for rearing Chinook salmon and oversummering steelhead/rainbow trout, potentially adversely affecting these fish populations in the lower Tuolumne River. (PSM)	Similar to than proposed program. (PSM)	Similar to but less than proposed program. (PSM)	Similar to proposed program. (PSM)
Impact 5.3.6-5: Effects on fishery resources along the San Joaquin River	During certain drought conditions, WSIP operations would reduce inflow to Don Pedro Reservoir and, as a result, increase the seasonal (summer) temperatures of water released from the reservoir, which would also affect water temperature along the lower San Joaquin River. However, the greatest flow reductions would occur after most out-migrating juvenile Chinook salmon have left the San Joaquin River. Other fish species inhabiting the river are tolerant of elevated water temperatures and would not likely be affected. (LS)	Similar to proposed program. (LS)	Similar to but less than proposed program. (LS)	Similar to proposed program. (LS)
Section 5.3.7, Terrestrial Biological Resources				
Impact 5.3.7-1: Impacts on riparian habitat and related biological resources in Hetch Hetchy Reservoir and along the bedrock channel portions of the Tuolumne River below O'Shaughnessy Dam to Don Pedro Reservoir				
• Sensitive Habitats	Riparian and meadow habitat in Hetch Hetchy Reservoir is already limited and would not be significantly affected by predicted annual fluctuations in reservoir storage. Along the upper Tuolumne River, the dynamic hydrology regime, steep banks, and rocky substrate limits riparian tree structure and minimizes the encroachment of riparian vegetation into the channel. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)

TABLE 8.5 (Continued)
SUMMARY OF WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR THE WSIP VARIANTS COMPARED TO EXISTING CONDITION — TUOLUMNE WATERSHED

Impact	Proposed Program	Variant 1 – All Tuolumne	Variant 2 – Regional Desalination for Drought	Variant 3 – 10% Rationing
Section 5.3.7, Terrestrial Biological Resources (cont.)				
Impact 5.3.7-1 (cont.)				
• Key Special Status Species	Changes to habitat in the reservoir and along the upper Tuolumne River would be minimal and would not significantly alter the composition, extent, and structure of special-status species. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)
• Other Species of Concern	Changes to habitat in the reservoir and along the upper Tuolumne River would be minimal and would not significantly alter the composition, extent, and structure of other species of concern. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)
• Common Habitats and Species	Effects on common habitats and species in the reservoir and along the upper Tuolumne River would be minimal. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)
Impact 5.3.7-2: Impacts on alluvial features that support meadow and riparian habitat along the Tuolumne River from O'Shaughnessy Dam to Don Pedro Reservoir				
• Sensitive Habitats	Delayed snowmelt releases, reductions in flow, and the resulting reduction in groundwater recharge would result in a reduction in the extent and diversity of wetland and riparian habitats, including sensitive wetland and riparian habitats in the Poopenaut Valley. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)
• Key Special Status Species	A reduction in wetland and riparian habitat would reduce suitable breeding habitat for key-special status species potentially occurring along this reach (e.g. foothill yellow-legged frog, California red-legged frog, and the willow flycatcher), the populations of which are already critically reduced in the Sierra Nevada. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)
• Other Species of Concern	A reduction in the extent and diversity of wetland and riparian habitats would reduce habitat quality and extent for animal and plant species of concern. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)

TABLE 8.5 (Continued)
SUMMARY OF WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR THE WSIP VARIANTS COMPARED TO EXISTING CONDITION — TUOLUMNE WATERSHED

Impact	Proposed Program	Variant 1 – All Tuolumne	Variant 2 – Regional Desalination for Drought	Variant 3 – 10% Rationing
Section 5.3.7, Terrestrial Biological Resources (cont.)				
Impact 5.3.7-2 (cont.)				
• Common Habitats and Species	All habitats affected by the WSIP are considered sensitive. A large number of common animal species depend on sensitive meadows and larger riparian areas potentially affected by the WSIP for food and cover. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)
Impact 5.3.7-3: Impacts on biological resources in Lake Eleanor and along Eleanor Creek				
• Sensitive Habitats	Increased transfers to Lake Lloyd during extended droughts could slightly reduce the extent and quality of wetland habitat in Lake Eleanor. Quantity and timing of releases to Eleanor Creek would be similar to existing conditions and would not affect sensitive riparian habitats. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)
• Key Special Status Species	Effects on habitat in Lake Eleanor and along Eleanor Creek would be minimal and would not significantly affect key special status species, including foothill yellow-legged frog. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)
• Other Species of Concern	Minimal effects on riparian habitats in Lake Eleanor and along Eleanor Creek resulting from the WSIP would not adversely affect other species of concern. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)
• Common Habitats and Species	Effects on common habitats and species in Lake Eleanor and along Eleanor Creek would be incremental and small. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)
Impact 5.3.7-4: Impacts to biological resources in Lake Lloyd and along Cherry Creek				
• Sensitive Habitats	Change in monthly water levels would be minimal and would not significantly affect surrounding vegetation and wetland habitats. During dry years, small increases in releases to Cherry Creek would benefit riparian habitats. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)

TABLE 8.5 (Continued)
SUMMARY OF WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR THE WSIP VARIANTS COMPARED TO EXISTING CONDITION — TUOLUMNE WATERSHED

Impact	Proposed Program	Variant 1 – All Tuolumne	Variant 2 – Regional Desalination for Drought	Variant 3 – 10% Rationing
Section 5.3.7, Terrestrial Biological Resources (cont.)				
Impact 5.3.7-4 (cont.)				
• Key Special Status Species	Effects on habitat in Lake Lloyd and Cherry Creek would be minimal and would not significantly affect key special status species, including foothill yellow-legged frog. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)
• Other Species of Concern	Changes riparian habitats associated with Lake Lloyd and Cherry Creek would be minimal. No adverse effects on other species of concern occur. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)
• Common Habitats and Species	Effects on common habitats and species would be minimal. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)
Impact 5.3.7-5: Impacts on biological resources in Don Pedro Reservoir				
• Sensitive Habitats	Large fluctuations in reservoir storage levels under existing conditions have precluded the development of riparian and wetland habitats in Don Pedro Reservoir. Thus, WSIP-induced changes in reservoir levels would have a minimal effect on sensitive habitats. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)
• Key Special Status Species	Due to very limited potential habitat for California red-legged frog in Don Pedro Reservoir, impacts on this key special-status species would be minimal. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)
• Other Species of Concern	Would result in an incremental reduction in the quality and extent of habitat for other species of concern, including western pond turtle, several bat and bird species, and bald eagle. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)
• Common Habitats and Species	Increased drawdown of Don Pedro Reservoir would not affect common habitats. Thus, impacts to common species would be minimal. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)

TABLE 8.5 (Continued)
SUMMARY OF WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR THE WSIP VARIANTS COMPARED TO EXISTING CONDITION — TUOLUMNE WATERSHED

Impact	Proposed Program	Variant 1 – All Tuolumne	Variant 2 – Regional Desalination for Drought	Variant 3 – 10% Rationing
Section 5.3.7, Terrestrial Biological Resources (cont.)				
Impact 5.3.7-6: Impacts on biological resources along the Tuolumne River below La Grange Dam				
• Sensitive Habitats	Delayed spring releases and reductions in average and total flow (particularly during and following an extended drought) below La Grange Dam would reduce or eliminate suitable conditions for recruitment of some riparian species along the river. (PSM)	Similar to proposed program. (PSM)	Similar to but less than proposed program. (PSM)	Similar to proposed program. (PSM)
• Key Special Status Species	Because of the known presence of key special-status species and the very limited amount of remaining suitable habitat along this reach of the Tuolumne River, this incremental impact would be potentially significant. (PSM)	Similar to proposed program. (PSM)	Similar to but less than proposed program. (PSM)	Similar to proposed program. (PSM)
• Other Species of Concern	Species of concern that would be adversely affected by changes in the extent and quality of suitable riparian habitat include western pond turtle, several bat species, and a wide variety of riparian- and marsh-associated bird species. (PSM)	Similar to proposed program. (PSM)	Similar to but less than proposed program. (PSM)	Similar to proposed program. (PSM)
• Common Habitats and Species	The populations of common species that depend on riparian habitat could be adversely affected by the alteration of habitat. (PSM)	Similar to proposed program. (PSM)	Similar to but less than proposed program. (PSM)	Similar to proposed program. (PSM)
Impact 5.3.7-7: Conflicts with the provisions of adopted conservation plans or other approved biological resources plans for the Tuolumne Wild and Scenic River	The Tuolumne River Wild and Scenic Plan does not apply to the exercise of CCSF's water rights under the Raker Act. Implementation of the WSIP would not conflict with any adopted conservation plan or biological resources plan. (LS).	Same as proposed program (LS)	Same as proposed program (LS)	Same as proposed program (LS)

TABLE 8.5 (Continued)
SUMMARY OF WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR THE WSIP VARIANTS COMPARED TO EXISTING CONDITION — TUOLUMNE WATERSHED

Impact	Proposed Program	Variant 1 – All Tuolumne	Variant 2 – Regional Desalination for Drought	Variant 3 – 10% Rationing
Section 5.3.8, Recreation and Visual Resources				
Impact 5.3.8-1: Effects on reservoir recreation due to changes in water system operations	During the primary recreation season (between Memorial Day and Labor Day), average monthly water levels in Hetch Hetchy Reservoir would be lowered by less than 5 feet compared to the existing condition except in critically dry years, when up to a 10-foot drop in reservoir levels would be expected. This drop in reservoir levels would not likely be perceptible to most hikers. Only during the off-season when visitation to the reservoir is low (between January and March) would the increased drawdown be noticeable. There would be no WSIP-induced changes in water levels in Lake Eleanor and minimal changes in water levels in Lake Lloyd. There would be no effect on recreation. During prolonged drought periods, drawdown of water levels at Don Pedro Reservoir would exceed the 450-foot threshold level for recreational uses, potentially impairing the use of boat ramp facilities. When compared to the existing condition, the frequency of these incidences would increase from 13 to 24 summer months over the 82-year hydrologic record. These infrequent events would not significantly affect boating facilities. Non-native fish populations in Don Pedro Reservoir can tolerate the changes in reservoir levels and, thus, no effects on fishing activities would result. Visual impacts associated with reservoir drawdown would not be noticeable to most recreational users. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)
Impact 5.3.8-2: Effects on river recreation due to changes in water system operations	With the WSIP, the onset of large releases from Hetch Hetchy Reservoir in the early spring would be delayed by up to 8 days and the total volume of releases reduced. However, during the rest of the year, the WSIP would have very little effect on the number of days flow in the river is suitable for whitewater rafting and would have very little effect on the need for scheduled releases from Holm Powerhouse.	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)

TABLE 8.5 (Continued)
SUMMARY OF WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR THE WSIP VARIANTS COMPARED TO EXISTING CONDITION — TUOLUMNE WATERSHED

Impact	Proposed Program	Variant 1 – All Tuolumne	Variant 2 – Regional Desalination for Drought	Variant 3 – 10% Rationing
Section 5.3.8, Recreation and Visual Resources (cont.)				
Impact 5.3.8-2 (cont.)	Relatively minor changes in upper Tuolumne River flow associated in May and June would be imperceptible to visitors. No change in flow releases during the peak recreational period (July through August) would occur. With the WSIP, the onset of releases from La Grange Dam above the minimum flow requirements would be delayed, and the total volume of releases would be reduced. Releases during the rest of the year would be similar to those under the existing condition. Minimum flow conditions would be maintained under all circumstances during summer. (LS)			
Impact 5.3.8-3: Effects on aesthetic values of the Tuolumne Wild and Scenic River	During below-normal and dry years, WSIP-induced reductions in flow would result in a reduction of flows of up to 30 percent in May. However, because flow in the upper river would remain within the range experienced under the existing condition, WSIP-related flow reductions would likely be imperceptible to or unobserved by visitors. (LS)	Same as proposed program (LS)	Same as proposed program (LS)	Same as proposed program (LS)
Section 5.3.9, Energy Resources				
Impact 5.3.9-1: Effects on hydropower generation at facilities along the Tuolumne River	Increased diversions from Hetch Hetchy Reservoir would increase the SFPUC's average annual hydropower generation by about 1.4 percent (23,000 MWh). The resultant reduction in inflow to Don Pedro Reservoir would decrease MID/TID's average annual hydropower generation by approximately 2.4 percent (14,000 MWh). Overall, hydropower generation on the Tuolumne River would be increased by about 0.4 percent (9,000 MWh). (B)	Similar to proposed program. (B)	Similar to proposed program. (B)	Similar to proposed program. (B)

LS = Less than Significant, no mitigation required.
SM or PSM = Significant or Potentially Significant, can be Mitigated to less than significant.
SU or PSU = Significant Unavoidable or Potentially Significant Unavoidable, cannot be mitigated to less than significant.
B = Beneficial

TABLE 8.6
SUMMARY OF WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR THE WSIP VARIANTS COMPARED TO EXISTING CONDITIONS – ALAMEDA WATERSHED

Impact	Proposed Program	Variant 1 – All Tuolumne	Variant 2 – Regional Desal for Drought	Variant 3 – 10% Rationing
Section 5.4.1, Stream Flow and Reservoir Water Levels				
Impact 5.4.1-1: Effects along Calaveras Creek below Calaveras Reservoir	Under the WSIP, the restored capacity of Calaveras Reservoir would change the nature of releases from the reservoir to Calaveras Creek. Changes in reservoir operation would result in substantial flow reductions along Calaveras Creek below Calaveras Dam in winter and early spring of wet and above-normal precipitation years. Reduced winter flows would remain in the range of existing flows. Instream fishery releases to Calaveras Creek in summer months would be beneficial. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)
Impact 5.4.1-2: Effects on flow along Alameda Creek below the diversion dam	In all year types, system operations under the WSIP would increase diversions from Alameda Creek to Calaveras Reservoir between the months of December and May, nearly eliminating low and moderate (1 to 650 cfs) flows in Alameda Creek downstream of the diversion dam and substantially reducing many higher (greater than 650 cfs) flows that have occurred since 2002. The resultant reduction in stream flows and alteration of the stream hydrograph is considered an adverse effect. (SU)	Same as proposed program (SU)	Same as proposed program (SU)	Same as proposed program (SU)
Impact 5.4.1-3: Effects in San Antonio Reservoir and along San Antonio Creek	Typically, San Antonio Reservoir would remain slightly higher than under existing conditions. Every fifth year, during planned maintenance for the Mountain Tunnel, the reservoir would be drawn to replace flows not provided by the Hetch Hetchy system, resulting in lower water levels and increased reservoir storage for one to two years after the maintenance period. With the exception of occasional operational changes due to maintenance, the proposed program would result in minor increases and decreases in winter and spring flows along San Antonio Creek in some wet and above-normal years but flows would remain within range of existing conditions. (LS)	Similar to proposed program (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)
Impact 5.4.1-4: Effects on flow along Alameda Creek below the confluence of San Antonio Creek	Would result in a substantial reduction (8 to 52 percent) in flow volumes during January, February, and March of normal or wetter years and a moderate increase (about 14 percent) in flow volumes in April of normal years. These changes in flow would be dampened by inflows from other tributaries in the Sunol Valley and would not result in adverse hydrologic effects. (LS)	Similar to proposed program (LS)	Similar to proposed program (LS)	Similar to proposed program (LS)

TABLE 8.6 (Continued)
SUMMARY OF WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR THE WSIP VARIANTS COMPARED TO EXISTING CONDITIONS – ALAMEDA WATERSHED

Impact	Proposed Program	Variant 1 – All Tuolumne	Variant 2 – Regional Desal for Drought	Variant 3 – 10% Rationing
Section 5.4.2, Geomorphology				
Impact 5.4.2-1: Effects on channel formation and sediment transport along Calaveras Creek	Would increase erosion, sediment transport, and deposition along Calaveras Creek during heavy rainfall (compared to existing condition). However, this sediment transport would be similar to the long-term conditions that formed the current channel. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)
Impact 5.4.2-2: Effects on channel formation and sediment transport along Alameda Creek downstream of the diversion dam	Would reduce peak flows in Alameda Creek downstream of the diversion dam through increased use of the diversion tunnel. High flows (up to 650 cfs) and annual sluicing would still transport substantial quantities of sediment downstream. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)	Similar to proposed program. (LS)
Impact 5.4.2-3: Effects on channel formation and sediment transport along San Antonio Creek downstream of San Antonio Reservoir	Flows and associated geomorphic changes would be within the range of historical flows and changes. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)
Section 5.4.3, Surface Water Quality				
Impact 5.4.3-1: Effects on water quality in Calaveras Reservoir	Increased reservoir storage would result in minimal changes in temperature. The existing oxygenation system, sized to be operated in a larger reservoir, would maintain or improve DO concentrations, nutrient levels, and algal biomass when compared to existing conditions. Turbidity would be lowered due to the larger storage capacity. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)
Impact 5.4.3-2: Effects on water quality in San Antonio Reservoir	Proposed program would maintain higher overall storage, leading to similar or larger cold/cool water volumes and minimal changes in temperature. Overall DO conditions, nutrient, and algae levels are expected to be similar to existing conditions. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)
Impact 5.4.3-3: Effects on water quality along Calaveras, San Antonio, and Alameda Creeks	Under future operations, water temperatures and DO conditions along Calaveras Creek would be similar to existing conditions. The trapping of nutrients in the reservoir would reduce nutrients in downstream waters and the oxidation of ammonia would reduce the potential for excess ammonia releases from the reservoir.	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)

TABLE 8.6 (Continued)
SUMMARY OF WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR THE WSIP VARIANTS COMPARED TO EXISTING CONDITIONS – ALAMEDA WATERSHED

Impact	Proposed Program	Variant 1 – All Tuolumne	Variant 2 – Regional Desal for Drought	Variant 3 – 10% Rationing
Section 5.4.3, Surface Water Quality (cont.)				
Impact 5.4.3-3 (cont.)	Release mechanisms from San Antonio Reservoir would remain unchanged. Thus, the temperature, DO conditions, and levels of nutrients of associated constituents in downstream waters would be similar to existing conditions. Would lower water temperatures in Alameda Creek from the vicinity of the diversion tunnel to several miles downstream of the confluence with Calaveras Creek. DO conditions and nutrient levels would be similar to the existing condition. (LS)			
Section 5.4.4, Groundwater				
Impact 5.4.4-1: Changes in groundwater levels, flows, quality, and supplies	Changes in stream flows would result in minimal changes in the groundwater levels of Sunol Valley groundwater resources. Groundwater quality would not be affected. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)
Section 5.4.5, Fisheries				
Impact 5.4.5-1: Effects on fishery resources in Calaveras Reservoir	The increase in reservoir storage would result in increased coldwater pool volume, which would increase the volume of habitat available for coldwater and warmwater resident fish species. Elevated reservoir water levels could improve connectivity and migration of fish between the reservoir and upstream tributaries. (B)	Similar to proposed program. (B)	Similar to proposed program. (B)	Similar to proposed program. (B)
Impact 5.4.5-2: Effects on fishery resources along Calaveras Creek below Calaveras Dam and along Alameda Creek below confluence with Calaveras Creek	Year-round fishery releases from Calaveras Reservoir to Calaveras Creek, including summer base flows that do not occur under the existing condition, would improve habitat quality and availability for resident rainbow trout and other fish inhabiting Calaveras and Alameda creeks. (B)	Similar to proposed program. (B)	Similar to proposed program. (B)	Similar to proposed program. (B)
Impact 5.4.5-3: Effects on fishery resources along Alameda Creek downstream of the Alameda Creek Diversion Dam	Following implementation of the Calaveras Dam Replacement Project (SV-2), operation of Calaveras Reservoir and the Alameda Creek Diversion Dam would be restored to pre-2002 conditions. A substantial increase in diversions from Alameda Creek to Calaveras Reservoir would reduce flows in this stretch	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)

TABLE 8.6 (Continued)
SUMMARY OF WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR THE WSIP VARIANTS COMPARED TO EXISTING CONDITIONS – ALAMEDA WATERSHED

Impact	Proposed Program	Variant 1 – All Tuolumne	Variant 2 – Regional Desal for Drought	Variant 3 – 10% Rationing
Section 5.4.5, Fisheries (cont.)				
Impact 5.4.5-3 (cont.)	of the creek. Diversion of most or all flows during late winter and spring months would reduce the ability of resident rainbow trout to spawn and for eggs to incubate. In addition, the increased diversion of flows to the reservoir would divert fish from Alameda Creek to the reservoir, prevent fish passage to downstream reaches of Alameda Creek, and increase the potential for fish entrainment since there are currently no screens on the diversion. (PSM)			
Impact 5.4.5-4: Effects on fishery resources in San Antonio Reservoir	Slight increases in storage and water levels in San Antonio Reservoir would increase the coldwater pool volume in the reservoir and increase coldwater and warmwater habitat in the reservoir, provide greater opportunities for connectivity and migration of fish between the reservoir and upstream habitat, and benefit coldwater fish species downstream. (B)	Similar to proposed program. (B)	Similar to proposed program. (B)	Similar to proposed program. (B)
Impact 5.4.5-5: Effects on fishery resources along San Antonio Creek below San Antonio Reservoir	Releases to San Antonio Creek from San Antonio Reservoir would be similar to existing conditions but with slightly greater total releases in winter and spring. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)
Impact 5.4.5-6: Effects on fishery resources along Alameda Creek below confluence with San Antonio Creek	Minor changes in flows along San Antonio Creek would result in minimal effects on the contribution of San Antonio Creek flows to downstream fishery habitat along Alameda Creek. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)
Section 5.4.6, Terrestrial Biological Resources				
Impact 5.4.6-1: Effects on riparian habitat and related biological resources in Calaveras Reservoir				
• Sensitive Habitats	Increased reservoir storage elevations would result in the inundation and permanent loss of seasonal wetlands, seeps, perennial freshwater marsh, and riparian habitat that have established since 2002. (PSM)	Same as proposed program. (PSM)	Same as proposed program. (PSM)	Same as proposed program. (PSM)

TABLE 8.6 (Continued)
SUMMARY OF WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR THE WSIP VARIANTS COMPARED TO EXISTING CONDITIONS – ALAMEDA WATERSHED

Impact	Proposed Program	Variant 1 – All Tuolumne	Variant 2 – Regional Desal for Drought	Variant 3 – 10% Rationing
Section 5.4.6, Terrestrial Biological Resources (cont.)				
Impact 5.4.6-1 (cont.)				
• Key Special Status Species	Since 2002, yellow-legged frogs have occupied approximately 10,000 linear feet of stream channel along Arroyo Hondo between the maximum reservoir elevation mandated by the DSOD and the spillway elevation. Higher maintained reservoir levels would reduce the length of this high-quality habitat along the creek and adversely affect existing populations of foothill yellow-legged frog, (PSM)	Same as proposed program. (PSM)	Same as proposed program. (PSM)	Same as proposed program. (PSM)
• Other Species of Concern	No plant species would be inundated under future conditions. Potential changes to grassland, riparian, and marsh habitats associated with wildlife species of concern in and near Calaveras Reservoir would be minor. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)
• Common Habitats and Species	Raised reservoir elevations would inundate low-diversity, weedy, upland vegetation within the “bathtub ring” that provides little habitat value. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)
Impact 5.4.6-2: Effects on riparian habitat and related biological resources along Alameda Creek, from below the diversion dam to the confluence with Calaveras Creek				
• Sensitive Habitats	Composition and structure of sensitive riparian habitats along this reach of Alameda Creek is the result of prevailing conditions prior to 2002. A return to the pre-2002 diversions from Alameda Creek would return flow conditions to those under which these habitats formed. No significant alteration of structure, composition, or diversity of riparian habitats would occur. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)
• Key Special Status Species	A reduction in the frequency, duration, and magnitude of flows below the diversion dam would reduce the total available aquatic breeding habitat and food sources for California red-legged frog and foothill yellow-legged frog populations that currently occupy this reach of Alameda Creek. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)

TABLE 8.6 (Continued)
SUMMARY OF WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR THE WSIP VARIANTS COMPARED TO EXISTING CONDITIONS – ALAMEDA WATERSHED

Impact	Proposed Program	Variant 1 – All Tuolumne	Variant 2 – Regional Desal for Drought	Variant 3 – 10% Rationing
Section 5.4.6, Terrestrial Biological Resources (cont.)				
Impact 5.4.6-2 (cont.)				
• Other Species of Concern	Because the prevailing riparian habitats along this reach are the result of pre-2002 flows, adverse impacts to raptor, songbird, and mammal species of concern would be minimal. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)
• Common Habitats and Species	Implementation of the WSIP would not affect common upland habitats and species in this area. (N/A)	Similar to proposed program. (N/A)	Similar to proposed program. (N/A)	Similar to proposed program. (N/A)
Impact 5.4.6-3: Effects on riparian habitat and related biological resources along Calaveras Creek, from Calaveras Reservoir to the confluence with Alameda Creek				
• Sensitive Habitats	Following completion of the Calaveras Dam Replacement Project (SV-2), there would be no cone valve releases into Calaveras Creek below the dam during the two- to five-year period when the reservoir is being refilled. However, minimum instream flow releases below Calaveras Dam would ensure that existing riparian vegetation along this reach is sustained even during protracted dry periods. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)
• Key Special Status Species	Future outlet works at Calaveras Dam would have the capacity to make higher volume releases than under existing conditions. Depending on the timing and volume of operational releases, they could adversely affect the reproductive success of special status amphibian species along this reach (e.g. California red-legged frog and foothill yellow-legged frog). (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)
• Other Species of Concern	Potential changes in the structure and species composition of breeding habitat for riparian-nesting birds such as raptors, egrets, and songbird species of concern in the vicinity of Calaveras Creek below the reservoir would be minimal. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)
• Common Habitats and Species	Little change in extent and condition of common habitats and species. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)

TABLE 8.6 (Continued)
SUMMARY OF WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR THE WSIP VARIANTS COMPARED TO EXISTING CONDITIONS – ALAMEDA WATERSHED

Impact	Proposed Program	Variant 1 – All Tuolumne	Variant 2 – Regional Desal for Drought	Variant 3 – 10% Rationing
Section 5.4.6, Terrestrial Biological Resources (cont.)				
Impact 5.4.6-4: Effects on riparian habitat and related biological resources along Alameda Creek, from Calaveras Creek to San Antonio Creek				
• Sensitive Habitats	Changes in winter and summer flows along Alameda Creek would affect existing riparian communities along this reach, but the extent of this potential impact would be small. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)
• Key Special Status Species	Depending on annual rainfall and localized site conditions along this creek segment, changes in winter and summer flows along this reach could result in both beneficial and adverse impacts on habitat for California red-legged frogs and foothill yellow-legged frog populations. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)
• Other Species of Concern	Minor changes in the structure and diversity of riparian habitat in this section of the creek would not substantially alter the extent or quality of breeding habitat for songbirds, raptors, and mammals. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)
• Common Habitats and Species	Common upland habitats would be unaffected. The overall extent of riparian habitat would be similar to the existing condition. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)
Impact 5.4.6-5: Effects on riparian habitat and related biological resources in San Antonio Reservoir				
• Sensitive Habitats	The average range of reservoir elevations under the WSIP would be slightly less than existing and any loss of existing perennial freshwater marsh or riparian scrub would be balanced by development of similar habitat at higher elevations. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)
• Key Special Status Species	Negligible changes in the extent of riparian scrub and freshwater marsh habitat resulting from future reservoir operations would not significantly affect habitat conditions for California red-legged frog and California tiger salamander at San Antonio Reservoir. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)

TABLE 8.6 (Continued)
SUMMARY OF WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR THE WSIP VARIANTS COMPARED TO EXISTING CONDITIONS – ALAMEDA WATERSHED

Impact	Proposed Program	Variant 1 – All Tuolumne	Variant 2 – Regional Desal for Drought	Variant 3 – 10% Rationing
Section 5.4.6, Terrestrial Biological Resources (cont.)				
Impact 5.4.6-5 (cont.)				
• Other Species of Concern	Apart from maintenance drawdown every five years, only minimal changes in reservoir levels would result. During drawdown periods, waterfowl and other littoral species could be temporarily displaced from preferred habitat. This would be a negligible effect. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)
• Common Habitats and Species	Minor changes in reservoir levels would result in negligible impacts on common habitats and species. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)
Impact 5.4.6-6: Effects on riparian habitat and related biological resources along San Antonio Creek between Turner Dam and the confluence with Alameda Creek				
• Sensitive Habitats	Releases to San Antonio Creek would be rare and similar to existing conditions. No notable change in conditions for riparian and wetland habitats are anticipated. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)
• Key Special Status Species	Impacts on California red-legged frog habitat would be minimal. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)
• Other Species of Concern	Future conditions along this section of San Antonio Creek would be similar to existing conditions and would have no effect on habitat of other species of concern. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)
• Common Habitats and Species	Common habitats and species would be unaffected. (N/A)	Same as proposed program. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)
Impact 5.4.6-7: Effects on riparian habitat and related biological resources along Alameda Creek below the confluence with San Antonio Creek				
• Sensitive Habitats	WSIP-induced reductions in flow along Alameda Creek below the confluence with San Antonio Creek would be buffered by other stream inputs downstream. Minimal impacts on habitat would result. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)

TABLE 8.6 (Continued)
SUMMARY OF WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR THE WSIP VARIANTS COMPARED TO EXISTING CONDITIONS – ALAMEDA WATERSHED

Impact	Proposed Program	Variant 1 – All Tuolumne	Variant 2 – Regional Desal for Drought	Variant 3 – 10% Rationing
Section 5.4.6, Terrestrial Biological Resources (cont.)				
Impact 5.4.6-7 (cont.)				
• Key Special Status Species	Little habitat for key special-status species exists along this reach of Alameda Creek. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)
• Other Species of Concern	Minimal impacts on other species of concern. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)
• Common Habitats and Species	Would result in minimal flow changes during normal to wet years and limited impacts on terrestrial ecological resources. (N/A)	Same as proposed program. (N/A)	Same as proposed program. (N/A)	Same as proposed program. (N/A)
Impact 5.4.6-8: Conflicts with the provisions of adopted conservation plans or other approved biological resources plans	Proposed program as a whole was found to be consistent with the provisions of the Alameda WMP. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)
Section 5.4.7 Recreation and Visual Resources				
Impact 5.4.7-1: Effects on recreation facilities and/or activities	Under both existing and future conditions, water recreation is prohibited in SFPUC reservoirs. Thus, changes in reservoir water levels would not adversely affect recreation. Operations under the WSIP would substantially reduced flows along Alameda Creek in the Sunol Regional Wilderness during winter and early spring months and adversely affect the recreational experience of hikers; however, with the changes in project description for the Calaveras Dam Replacement (SV-2) project, bypass flows would be reduced from the diversion dam when flows are present. (LS)	Same as proposed program (LS)	Same as proposed program (LS)	Same as proposed program (LS)
Impact 5.4.7-2: Visual effects on scenic resources or visual character of water bodies	Apart from raised water levels in Calaveras Reservoir and substantial reductions in flows along Alameda Creek in the Sunol Regional Wilderness area during winter and spring months, changes in stream flow and reservoir elevations in the Alameda watershed would not be apparent to most recreational users. WSIP-induced reductions in stream flows along Alameda Creek would substantially change quality of visual resources in the Sunol Regional Wilderness area; however, with the changes in project description for the Calaveras Dam Replacement (SV-2) project, bypass flows would be reduced from the diversion dam when flows are present. (LS)	Same as proposed program (LS)	Same as proposed program (LS)	Same as proposed program (LS)

LS = Less than Significant, no mitigation required.
SM or PSM = Significant or Potentially Significant, can be Mitigated to less than significant.
SU or PSU = Significant Unavoidable or Potentially Significant Unavoidable, cannot be mitigated to less than significant.
B = Beneficial

TABLE 8.7
SUMMARY OF WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR THE WSIP VARIANTS COMPARED TO EXISTING CONDITION – PENINSULA WATERSHED

Impact	Proposed Program	Variant 1 – All Tuolumne	Variant 2 – Regional Desalination for Drought	Variant 3 – 10% Rationing
Section 5.5.1, Stream Flow and Reservoir Water Levels				
Impact 5.5.1-1: Effects on flow along San Mateo Creek	In most years, WSIP improvements to Lower Crystal Springs Dam would raise average monthly water levels in Crystal Springs Reservoir by 2 to 8 feet. Every fifth year, planned system maintenance would reduce importation of water from the Tuolumne River and would require that water be withdrawn from Crystal Springs Reservoir to meet water deliveries. Maintenance activities would decrease water levels by as much as 16 feet during the months of October, November and December. Little change in average monthly storage and water levels in San Andreas Reservoir compared to existing condition. Maintenance activities would decrease water levels by as much as 14 feet during the months of October, November and December. Under the WSIP, Crystal Springs Reservoir would be operated as it is currently operated and releases to San Mateo Creek would occur infrequently, as they do under the existing condition, and would be of a similar magnitude. San Mateo Creek is currently an intermittent stream and would remain so under the proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program (LS)
Impact 5.5.1-2: Effects on flow along Pilarcitos Creek	Increased water demand in the Coastside CWD service area would result in increased releases from Pilarcitos Reservoir. The reservoir would be drawn down more rapidly than under the existing condition. In some late spring and summer months of most hydrologic year types, the WSIP would result in increased flow in Pilarcitos Creek immediately below Pilarcitos Reservoir. In summer months of dry years, there would be almost no releases to the creek as occurs under the existing condition. The period without flow or with very low flow would be extended. Similar to existing conditions, flow in Pilarcitos Creek immediately below Stone Dam would be intermittent. Under the WSIP, total spills from Stone Dam to the creek would be reduced, but the magnitude of the flows in lower reaches of the creek would be similar to existing conditions. (LS)	Similar to but greater than with proposed program because lowered water levels in Crystal Springs Reservoir would enable greater diversions from Pilarcitos Creek and less spills at Stone Dam. (LS)	Similar to proposed program.(LS)	Similar to proposed program. (LS)
Section 5.5.2, Geomorphology				
Impact 5.5.2-1: Changes in sediment transport and channel morphology in the Peninsula watershed	Changes in flow along Pilarcitos Creeks and reservoir levels in Pilarcitos, San Andreas, and Crystal Springs Reservoirs would result in small incremental changes in sediment transport and channel-forming processes. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program (LS)

TABLE 8.7 (Continued)
SUMMARY OF WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR THE WSIP VARIANTS COMPARED TO EXISTING CONDITION – PENINSULA WATERSHED

Impact	Proposed Program	Variant 1 – All Tuolumne	Variant 2 – Regional Desalination for Drought	Variant 3 – 10% Rationing
Section 5.5.3, Surface Water Quality				
Impact 5.5.3-1: Effects on water quality in Crystal Springs Reservoir, San Andreas Reservoir, and San Mateo Creek	Under future conditions, increased water storage and water levels in Crystal Springs Reservoir would increase phosphorous and nitrogen concentrations, which could increase the growth of algae in reservoir water. However, any changes in water quality would be minor and would not affect beneficial uses. Water storage and water levels in San Andreas Reservoir would be similar to the existing condition. Changes in water quality would be negligible. Releases of high-quality Crystal Springs Reservoir water would occur at about the same frequency and magnitude as under current conditions and would not affect water quality in San Mateo Creek. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)
Impact 5.5.3-2: Effects on water quality in Pilarcitos Reservoir and along Pilarcitos Creek	Proposed operations would generally be within the same range as existing conditions although replacement Measure 5.5.3-2a would cause Pilarcitos Reservoir to be drawn down earlier in the summer compared to existing conditions. Water temperature could increase and dissolved oxygen content could be reduced. During dry years summertime releases from Pilarcitos Reservoir to Pilarcitos Creek would be eliminated or reduced to a low level for a longer period of time with the WSIP, which would increase the temperature of instream flows between Pilarcitos Creek and Stone Dam and reduce the creek's ability to support designated cold freshwater habitat along this reach. Slight reductions in spill over Stone Dam would be minor and would not adversely affect water quality along Pilarcitos Creek. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)
Section 5.5.4, Groundwater				
Impact 5.5.4-1: Alteration of stream flows along Pilarcitos Creek, which could affect groundwater levels and water quality	Reduction in flows along Pilarcitos Creek below Stone Dam would be too small to have appreciable effect on groundwater recharge in lower Pilarcitos Creek watershed and would not affect groundwater quality. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)

TABLE 8.7 (Continued)
SUMMARY OF WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR THE WSIP VARIANTS COMPARED TO EXISTING CONDITION – PENINSULA WATERSHED

Impact	Proposed Program	Variant 1 – All Tuolumne	Variant 2 – Regional Desalination for Drought	Variant 3 – 10% Rationing
Section 5.5.5, Fisheries				
Impact 5.5.5-1: Effects on fishery resources in Crystal Springs Reservoir (Upper and Lower)	Increased storage in Crystal Springs Reservoir would increase the volume of coldwater and warmwater habitat for resident fish species and provide greater opportunities for connectivity and migration of fish between the reservoir and upstream tributary habitat. However, elevated water levels in Crystal Springs Reservoir would inundate approximately 1,500 linear feet of trout spawning habitat upstream of the reservoir along Laguna and San Mateo Creeks.(PSU)	Same as proposed program. (PSU)	Same as proposed program. (PSU)	Same as proposed program. (PSU)
Impact 5.5.5-2: Effects on fishery resources in San Andreas Reservoir	Average monthly storage and water levels would be similar to existing conditions. Minor changes in water quality would not adversely affect fishery resources. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)
Impact 5.5.5-3: Effects on fisheries resources along San Mateo Creek	Stream flow in San Mateo Creek would be similar to existing conditions. Overall, fishery habitat conditions along San Mateo Creek would be comparable to existing conditions. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)
Impact 5.5.5-4: Effects on fisheries resources in Pilarcitos Reservoir	Proposed operations would be within the same range as existing conditions although replacement Measure 5.5.3-2a would cause Pilarcitos Reservoir to be drawn down earlier in the summer compared to existing conditions. This would reduce the volume and quality of coldwater habitat available for resident fish species. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)
Impact 5.5.5-5: Effects on fishery resources along Pilarcitos Creek below Pilarcitos Reservoir	Under the WSIP, the extended period of no or very little flow in Pilarcitos Creek below Pilarcitos Reservoir during summer months of dry years would result in significant impacts on resident trout, other resident fish species and aquatic resources, and habitat quality and availability for anadromous steelhead. Increased drawdown of Pilarcitos Reservoir would increase the temperature of releases in summer and fall and reduce the quality and availability of habitat for coldwater fish species. A reduction in the frequency and magnitude of spills over Stone Dam would reduce flows along the lower reach. Reduced instream flows during winter months would adversely affect migratory fish habitat. (PSM)	Similar to proposed program but fishery effects would be greater because spills over Stone Dam would be less. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)

TABLE 8.7 (Continued)
SUMMARY OF WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR THE WSIP VARIANTS COMPARED TO EXISTING CONDITION – PENINSULA WATERSHED

Impact	Proposed Program	Variant 1 – All Tuolumne	Variant 2 – Regional Desalination for Drought	Variant 3 – 10% Rationing
Section 5.5.6, Terrestrial Biological Resources				
Impact 5.5.6-1: Impacts on biological resources in Upper and Lower Crystal Springs Reservoirs				
• Sensitive Habitats	Implementation of the Lower Crystal Springs Dam Improvements project (PN-4) would raise average monthly water levels in Crystal Springs Reservoir and result in a short-term reduction in the overall extent of freshwater marsh as the reservoir fills. Proposed changes in operations would maintain maximum reservoir levels during summer for longer periods than under existing conditions, which could affect the composition and structure of riparian habitats. In addition, sensitive upland habitats that are unable to tolerate these longer periods of inundation would be lost. (PSM)	Same as proposed program (PSM)	Same as proposed program (PSM)	Same as proposed program (PSM)
• Key Special Status Species	Elevated reservoir levels would inundate existing populations of special status plant species, including serpentine-associated fountain thistle and Marin western flax, and their habitat could be permanently lost. The extent of available habitat for San Francisco garter snake and California red-legged frog would be temporarily reduced during reservoir refill, but wetland habitat that would establish at higher elevations could potentially be more extensive. Raised reservoir levels would provide greater opportunities for largemouth bass and other predators to access frogs and snakes. Periodic drawdown during planned maintenance could adversely affect San Francisco garter snake foraging habitat. (PSM)	Same as proposed program (PSM)	Same as proposed program (PSM)	Same as proposed program (PSM)
• Other Species of Concern	Changes in wetland habitat due to reservoir refill and proposed operations would adversely affect reptile and bird species of concern, particularly if permanent changes in the composition of wetland vegetation occur. Permanent loss of upland habitat, including upland trees, grassland, and coastal scrub, would result in significant impacts on several bird and mammal species of concern. Serpentine- and grassland-associated plant species unable to tolerate extended periods of inundation would be lost. (PSM)	Same as proposed program (PSM)	Same as proposed program (PSM)	Same as proposed program (PSM)
• Common Habitats and Species	Due to the extent of area involved, impacts on common habitats and species would be significant. (PSM)	Same as proposed program (PSM)	Same as proposed program (PSM)	Same as proposed program (PSM)

**TABLE 8.7 (Continued)
SUMMARY OF WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR THE
WSIP VARIANTS COMPARED TO EXISTING CONDITION – PENINSULA WATERSHED**

Impact	Proposed Program	Variant 1 – All Tuolumne	Variant 2 – Regional Desalination for Drought	Variant 3 – 10% Rationing
Section 5.5.6, Terrestrial Biological Resources (cont.)				
Impact 5.5.6-2: Impacts on biological resources in San Andreas Reservoir				
• Sensitive Habitats	Minor changes in reservoir levels and operation would not substantially affect sensitive habitats. Minimal impacts would occur during maintenance drawdown. (LS)	Same as proposed program (LS)	Same as proposed program (LS)	Same as proposed program (LS)
• Key Special Status Species	Minor changes in reservoir levels and operation would not significantly affect the composition and extent of suitable wetland habitat for San Francisco garter snake and California red-legged frog. No impacts on terrestrial upland special-status species such as Mission blue butterfly would result. (LS)	Same as proposed program (LS)	Same as proposed program (LS)	Same as proposed program (LS)
• Other Species of Concern	Minor changes in monthly reservoir levels would not significantly affect habitat for other bird, mammal, reptile, and amphibian species of concern. (LS)	Same as proposed program (LS)	Same as proposed program (LS)	Same as proposed program (LS)
• Common Habitats and Species	Impacts on common habitats and species would be negligible. (LS)	Same as proposed program (LS)	Same as proposed program (LS)	Same as proposed program (LS)
Impact 5.5.6-3: Impacts on biological resources along San Mateo Creek below Lower Crystal Springs Dam				
• Sensitive Habitats	At the program level, potential changes in the structure and extent of freshwater marsh below the dam due to reduced instream flows would be significant. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program (LS)
• Key Special Status Species	Alterations in the extent and quality of freshwater marsh habitat for California red-legged frog could be significant. No key special-status plant species would be affected. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program (LS)
• Other Species of Concern	Impacts on riparian- and creek-associated species of concern would be minimal. (LS)	Same as proposed program (LS)	Same as proposed program (LS)	Same as proposed program (LS)
• Common Habitats and Species	Impacts on common upland habitats would be minimal. (LS)	Same as proposed program (LS)	Same as proposed program (LS)	Same as proposed program (LS)

TABLE 8.7 (Continued)
SUMMARY OF WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR THE WSIP VARIANTS COMPARED TO EXISTING CONDITION – PENINSULA WATERSHED

Impact	Proposed Program	Variant 1 – All Tuolumne	Variant 2 – Regional Desalination for Drought	Variant 3 – 10% Rationing
Section 5.5.6, Terrestrial Biological Resources (cont.)				
Impact 5.5.6-4: Impacts on biological resources in Pilarcitos Reservoir				
• Sensitive Habitats	Reduced water elevations could slightly reduce the extent of areas supporting sensitive freshwater marsh habitat. (LS)	Similar to proposed program (LS)	Same as proposed program (LS)	Similar to proposed program (LS)
• Key Special Status Species	Proposed operations would be within the same range as existing conditions, although replacement Measure 5.5.3-2a would cause Pilarcitos Reservoir to be drawn down earlier in the summer compared to existing conditions. This would reduce the extent of suitable habitat for California red-legged frog and San Francisco garter snake. Special status species that utilize adjacent upland vegetation would not be affected. (PSM)	Similar to proposed program (PSM)	Similar to proposed program (PSM)	Similar to proposed program (PSM)
• Other Species of Concern	The extent of suitable riparian habitat for reptile and bird species of concern would be slightly reduced. Species of concern that utilize adjacent upland vegetation would not be affected. (LS)	Similar to proposed program (LS)	Similar to proposed program (LS)	Similar to proposed program (LS)
• Common Habitats and Species	Changes in reservoir elevations would minimally affect common habitats and species. (LS)	Same as proposed program (LS)	Same as proposed program (LS)	Same as proposed program (LS)
Impact 5.5.6-5: Impacts on biological resources along Pilarcitos Creek below Pilarcitos Reservoir				
• Sensitive Habitats	Proposed operations would result in flows within the range of historical conditions, to which sensitive habitats have adapted. (LS)	Similar to proposed program (LS)	Similar to proposed program (LS)	Similar to proposed program (`LS)
• Key Special Status Species	Changes to suitable riparian habitat for foothill yellow-legged frog would be minimal. (LS)	Same as proposed program (LS)	Same as proposed program (LS)	Same as proposed program (LS)
• Other Species of Concern	Would result in slight reduction in extent of suitable for bird, mammal, and reptile species of concern that utilize open water and emergent vegetation. (LS)	Similar to proposed program (LS)	Similar to proposed program (LS)	Similar to proposed program (LS)
• Common Habitats and Species	Changes in operations would result in minor impacts to common species. (LS)	Same as proposed program (LS)	Same as proposed program (LS)	Same as proposed program (LS)
Impact 5.5.6-6: Impacts on biological resources along Pilarcitos Creek below Stone Dam				
• Sensitive Habitats	Slight incremental reduction in channel-forming processes and riparian habitat quality due to reduced stream flow. (LS)	Similar to but greater than proposed program because spills reduced compared to proposed program (LS)	Similar to proposed program (LS)	Similar to proposed program (LS)

TABLE 8.7 (Continued)
SUMMARY OF WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR THE WSIP VARIANTS COMPARED TO EXISTING CONDITION – PENINSULA WATERSHED

Impact	Proposed Program	Variant 1 – All Tuolumne	Variant 2 – Regional Desalination for Drought	Variant 3 – 10% Rationing
Section 5.5.6, Terrestrial Biological Resources (cont.)				
Impact 5.5.6-6 (cont.)				
• Key Special Status Species	Slight reduction in habitat quality for foothill yellow-legged frog due to reduced stream flow. (LS)	Similar to but greater than proposed program (LS**)**	Similar to proposed program (LS)	Similar to proposed program (LS)
• Other Species of Concern	Slight reduction in habitat quality for amphibian and bird species of concern due to reduced stream flow. (LS)	Similar to proposed program (LS)	Similar to proposed program (LS)	Similar to proposed program (LS)
• Common Habitats and Species	Changes in operations would result in minor impacts to common species. (LS)	Same as proposed program (LS)	Same as proposed program (LS)	Same as proposed program (LS)
Impact 5.5.6-7: Conflicts with the provisions of adopted conservation plans or other approved biological resource plans	Proposed program as a whole was found to be consistent with the provisions of the Peninsula WMP. (LS)	Same as proposed program (LS)	Same as proposed program (LS)	Same as proposed program (LS)
Section 5.5.7 Recreational and Visual Resources				
Impact 5.5.7-1: Effects on recreational facilities and/or activities	The WSIP would have no impact on water-related recreational facilities or other recreational activities in the Peninsula watershed. (LS)	Same as proposed program (LS)	Same as proposed program (LS)	Same as proposed program (LS)
Impact 5.5.7-2: Visual effects on scenic resources or the visual character of water bodies	Although elevated water levels in Crystal Springs Reservoir could change the visual appearance of the reservoir at close range, it would not change the scenic quality of the reservoir, either at close range or from distant viewpoints. (LS)	Same as proposed program (LS)	Same as proposed program (LS)	Same as proposed program (LS)

LS = Less than Significant, no mitigation required.
SM or PSM = Significant or Potentially Significant, can be Mitigated to less than significant.
SU or PSU = Significant Unavoidable or Potentially Significant Unavoidable, cannot be mitigated to less than significant.

TABLE 8.8
SUMMARY OF WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR THE WSIP VARIANTS COMPARED TO EXISTING CONDITION — WESTSIDE GROUNDWATER BASIN

Impact	Proposed Program	Variant 1 – All Tuolumne	Variant 2 – Regional Desalination for Drought	Variant 3 – 10% Rationing
Section 5.6, Westside Groundwater Basin				
Impact 5.6-1: Basin overdraft due to pumping from the Westside Groundwater Basin				
• North Westside Groundwater Basin	Proposed pumping could cause basin overdraft and result in potentially adverse impacts to groundwater resources. (PSM)	No impact because local groundwater projects would not be implemented. (N/A)	Same as proposed program. (PSM)	Same as proposed program. (PSM)
• South Westside Groundwater Basin	Proposed pumping in the South Westside Groundwater Basin for the regional conjunctive use program would comply with an operational agreement(s) to limit pumping to the "banked" quantity of water stored through in-lieu recharge so that pumping would not cause basin overdraft. (LS)	Similar to the proposed program (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)
Impact 5.6-2: Changes in water levels in Lake Merced and other surface water features, including Pine Lake, due to decreased groundwater levels in the Westside Groundwater Basin				
• North Westside Groundwater Basin	Although pumping from the primary production aquifer would not have a direct effect on lake levels, it could potentially indirectly cause shallow groundwater levels to decline due to vertical leakage and affect water levels in Lake Merced and other surface water features. (PSM)	No impact because local groundwater projects would not be implemented. (N/A)	Same as proposed program. (PSM)	Same as proposed program. (PSM)
• South Westside Groundwater Basin	No major surface features in the South Westside Groundwater Basin would be affected by decreased groundwater levels. (N/A)	Same as proposed program. (N/A)	Same as proposed program. (N/A)	Same as proposed program. (N/A)
Impact 5.6-3: Seawater intrusion due to decreased groundwater levels in the Westside Groundwater Basin				
• North Westside Groundwater Basin	The shallow aquifer is in direct connection with the ocean from approximately Lake Merced to the north, and pumping could potentially cause saltwater intrusion. (PSM)	No impact because local groundwater projects would not be implemented. (N/A)	Same as proposed program. (PSM)	Same as proposed program. (PSM)
• South Westside Groundwater Basin	Saltwater intrusion in this aquifer has not been detected. Proposed pumping in the South Westside Groundwater Basin for the regional conjunctive use program would comply with an operational agreement(s) to limit pumping to the "banked" quantity of water stored through in-lieu recharge so that pumping would not cause basin overdraft or saltwater intrusion. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)
Impact 5.6-4: Land subsidence due to decreased groundwater levels in the Westside Groundwater Basin if the historical low water levels are exceeded				
• North Westside Groundwater Basin	Land subsidence would not be expected because the aquifer materials are primarily composed of sands and dewatering of the fine-grained aquitards separating the aquifers would not occur (LS)	No impact because local groundwater projects would not be implemented. (N/A)	Same as proposed program. (LS)	Same as proposed program. (LS)

TABLE 8.8 (Continued)
SUMMARY OF WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR THE WSIP VARIANTS COMPARED TO EXISTING CONDITION — WESTSIDE GROUNDWATER BASIN

Impact	Proposed Program	Variant 1 – All Tuolumne	Variant 2 – Regional Desalination for Drought	Variant 3 – 10% Rationing
Section 5.6, Westside Groundwater Basin (cont.)				
Impact 5.6-4 (cont.)				
• South Westside Groundwater Basin	Proposed pumping in the South Westside Groundwater Basin for the regional conjunctive use program would comply with an operational agreement(s) to limit pumping to the "banked" quantity of water stored through in-lieu recharge so that groundwater pumping would not cause basin overdraft or land subsidence. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)
Impact 5.6-5: Contamination of drinking water due to groundwater pumping in the Westside Groundwater Basin				
• North Westside Groundwater Basin	Until production well locations are selected and a drinking water source assessment performed, the potential for contamination of drinking water well cannot be evaluated. As a result, the potential for contamination is considered significant. (PSM)	No impact because local groundwater projects would not be implemented. (N/A)	Same as proposed program. (PSM)	Same as proposed program. (PSM)
• South Westside Groundwater Basin	Until production well locations are selected and a drinking water source assessment performed, potential for contamination of drinking water well cannot be evaluated. As a result, the potential for contamination is considered significant. (PSM)	Same as proposed program. (PSM)	Same as proposed program. (PSM)	Same as proposed program. (PSM)
Impact 5.6-6: Drinking water contaminants above maximum contaminant levels and adverse effects of adding treated groundwater to the distribution system				
• North Westside Groundwater Basin	Groundwater quality may exceed drinking water standards, but groundwater would be treated or blended with other waters such that the product water would meet drinking water standards. (LS)	No impact because local groundwater projects would not be implemented. (N/A)	Same as proposed program. (LS)	Same as proposed program. (LS)
• South Westside Groundwater Basin	Groundwater quality may exceed drinking water standards, but groundwater would be treated or blended with other waters such that the product water would meet drinking water standards. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)

TABLE 8.9
SUMMARY OF WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR THE WSIP VARIANTS COMPARED TO EXISTING CONDITION — CUMULATIVE WATER SUPPLY IMPACTS

Impact	Proposed Program	Variant 1 – All Tuolumne	Variant 2 – Regional Desalination for Drought	Variant 3 – 10% Rationing
Section 5.7, Cumulative Impacts Related to Water Supply and System Operations				
Impact 5.7.2-1: Tuolumne River – Hetch Hetchy Reservoir to Don Pedro Reservoir.	Contribution to impacts on hydrology, geomorphology, surface water quality, groundwater, fishery resources, and recreation/visual quality would not be cumulatively considerable. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)
	Contribution to impacts on montane meadow habitat in Poopenaut Valley would be cumulatively considerable. (PSU)	Similar to but greater than proposed program. (PSU)	Similar to but less than proposed program. (PSU)	Similar to but greater than proposed program. (PSU)
Impact 5.7.2-2: Tuolumne River – Don Pedro Reservoir to San Joaquin River.	Contribution to impacts on hydrology, surface water quality, groundwater, fishery resources, terrestrial biological resources, and recreation/visual quality would not be cumulatively considerable. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)
Impact 5.7.2-3: San Joaquin River, Stanislaus River, and Delta.	Contribution to impacts on hydrology, surface water quality, water supply availability, and fishery resources would not be cumulatively considerable. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)
Impact 5.7.3-1: Alameda Creek watershed.	No cumulative impact on hydrology. (N/A)	Same as proposed program (N/A)	Same as proposed program (N/A)	Same as proposed program (N/A)
	Contribution to impacts on geomorphology, surface water quality, groundwater, terrestrial biological resources, and recreation/visual quality would not be cumulatively considerable. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)
Impact 5.7.4-1: San Mateo Creek watershed.	Contribution to impacts on hydrology, geomorphology, surface water quality, groundwater, fishery, terrestrial biological resources, and recreation/visual quality would not be cumulatively considerable. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)
Impact 5.7.4-2: Pilarcitos Creek watershed.	Contribution to impacts on hydrology, geomorphology, surface water quality, groundwater, fishery, terrestrial biological resources, and recreation/visual quality would not be cumulatively considerable. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)
Impact 5.7.5-1: North Westside Groundwater Basin.	Contribution to basin overdraft would not be cumulatively considerable. (LS)	Similar to but less than the proposed program. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)
Impact 5.7.5-2: South Westside Groundwater Basin.	Contribution to basin overdraft would not be cumulatively considerable. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)

8.5.1 Water Supply Impacts of Variant 1

With *WSIP Variant 1 – All Tuolumne*, the water supply strategy would be the same as the proposed program, except to meet the estimated 35-mgd average annual increase in purchase request (from 265 to 300 mgd) by the year 2030, customers would be served entirely with additional water from the Tuolumne River watershed. As with the proposed program, a transfer from TID and MID and implementation of the Westside Basin conjunctive-use program would provide water during droughts. No additional water would be obtained from groundwater, additional conservation, or recycling projects in San Francisco.

Tuolumne River Watershed

With Variant 1, an annual average of 2.2 percent more water would be diverted from the Tuolumne River as compared to the WSIP.

Water levels in Lake Lloyd and Lake Eleanor would be essentially the same with Variant 1 and the WSIP. Releases from the reservoirs to Cherry and Eleanor Creeks would also be the same with Variant 1 and the WSIP.

Most of the time, more water would be diverted from the Tuolumne River at Hetch Hetchy Reservoir with Variant 1 than with the WSIP; as a result, storage in the reservoir would be drawn down farther just before the advent of the spring snowmelt. A greater proportion of snowmelt runoff would be needed to refill the reservoir, and consequently releases to the Tuolumne River in the spring would be delayed and reduced. The delay in release would usually be greater with Variant 1 than with the WSIP. Almost all of the differences in releases between Variant 1 and the WSIP would occur in May and June, with the greatest differences occurring in below-normal and dry years. With Variant 1, average monthly flow in some spring months would be 33 percent less than under the existing condition; the corresponding value with the WSIP would be 30 percent. The greatest reduction in average monthly flow in the 82-year period of hydrologic record would be 90 percent with both Variant 1 and the WSIP. The minimum required release below Hetch Hetchy Reservoir would be maintained or exceeded in all circumstances.

With Variant 1, more water would be diverted at Hetch Hetchy Reservoir and less would flow downstream to Don Pedro Reservoir than with the WSIP. Because of this reduction in inflow Don Pedro Reservoir would be drawn down farther with Variant 1 than it would with the WSIP. In a subsequent period, a higher proportion of winter and spring runoff would need to be captured to replenish Don Pedro Reservoir with Variant 1 than with the WSIP, and releases to the Tuolumne River below La Grange would be reduced. Most of the reductions in releases would occur between December and March in wet, above-normal, and below-normal years. With Variant 1, average monthly flow in some months between November and June would be 32 percent less than under the existing condition; the corresponding value with the WSIP would be 25 percent less. The greatest reduction in average monthly flow in the 82-year period of hydrologic record would be about 95 percent with both Variant 1 and the WSIP.

Alameda Watershed

The effects of Variant 1 in the Alameda watershed would be very similar to those of the WSIP. The magnitude and timing of diversions from Alameda Creek to Calaveras Reservoir and spills to Alameda Creek past the diversion dam would be the same with Variant 1 and the WSIP.

Storage in Calaveras and San Antonio Reservoirs and releases to Calaveras and San Antonio Creeks would be the same with Variant 1 and the WSIP most of the time. Storage in the two reservoirs would be drawn down more with Variant 1 than with the WSIP.

Seasonal summertime peak demand in 2030 in the Bay Area will exceed the capacity of the conveyance system from the Tuolumne River. Because of this, with the WSIP, water must be drawn from the local reservoirs to supplement the supply from the Tuolumne River. The need to draw water from local reservoirs during summertime peak demand would be greater with Variant 1 than with the WSIP. With the WSIP, additional conservation and recycling projects would effectively reduce demand for water in the Bay Area. Because Variant 1 does not include additional conservation and recycling projects, the demand for water in the Bay Area would be greater than it is for the WSIP. To meet the greater demand in the Bay Area, the local reservoirs would be drawn down further than they would be with the WSIP. Occasionally, with Variant 1, storage in Calaveras and San Antonio Reservoirs would exceed storage under the WSIP during periods when rationing is occurring or when the Westside Basin Groundwater Program is providing more water with the variant than with the WSIP. The changes in storage in the reservoirs with Variant 1 compared to the WSIP would have little or no effect on releases to Calaveras and San Antonio Creeks.

Peninsula Watershed

Storage in Crystal Springs Reservoir would be drawn down more with Variant 1 than with the WSIP fairly frequently, for the same reason noted above for Calaveras Reservoir. At certain times with Variant 1, the capacity of the conveyance system would limit the amount of water that could be conveyed from the Tuolumne River, and demand in the Bay Area would be met from local reservoirs, including Crystal Springs Reservoir. Average storage in Crystal Springs Reservoir with Variant 1 would be about 475 million gallons (1,457 acre-feet) less than with the WSIP. Because Crystal Springs Reservoir would be operated at a lower level with Variant 1, more storage capacity would be available in the reservoir to accommodate runoff during sudden storms. Releases to San Mateo Creek currently occur intermittently, primarily in wet and above-normal years, and would continue to do so with Variant 1 and with the WSIP. Current average wet-year releases are estimated to be 2.06 billion gallons (6,336 acre-feet). Releases with Variant 1 would be less frequent and smaller in magnitude than with the WSIP. Average wet-year releases to the creek would total 0.99 billion gallons (3,049 afy) with Variant 1; with the WSIP they would total 1.43 billion gallons (4,397 afy). In all cases, the estimated releases from Crystal Springs Reservoir are probably greater than the actual releases that occur because some model does not capture all of the operational flexibility available to system operators to minimize reservoir releases.

Storage in Pilarcitos Reservoir and releases to Pilarcitos Creek below the reservoir would be similar to but not identical with Variant 1 and the WSIP. Average storage in Pilarcitos Reservoir would be slightly greater for Variant 1, and releases to Pilarcitos Creek slightly less than for the WSIP. The reason for the difference is that rationing would be slightly more severe with Variant 1 than with the WSIP (See Table 8-2). Because Coastside County Water District would be subject to slightly more severe rationing with Variant 1 than with the WSIP slightly less water would be released from Pilarcitos Reservoir to serve Coastside's needs.

Spills to Pilarcitos Creek over Stone Dam currently occur primarily in wet and above-normal years and would continue to do so with Variant 1 and with the WSIP. Current average wet-year releases are estimated to be 2.29 billion gallons (7,065 acre-feet). Releases with the WSIP would be less frequent and smaller in magnitude than under the existing condition. With Variant 1 they would be less than with the WSIP. This is because with Variant 1, Crystal Springs Reservoir would be operated at a lower level than with the WSIP, enabling greater diversions from Pilarcitos Creek.

Westside Groundwater Basin

Under Variant 1, the Local Groundwater Projects (part of SF-2) would not be implemented, although the regional conjunctive-use project would continue to be implemented. In the absence of the Local Groundwater Projects, there would be no increase in pumping in the North Westside Groundwater Basin, and pumping rates would remain at about 2.5 mgd, well within the safe yield of the basin. However, without the Local Groundwater Projects, the monitoring and management of groundwater production would not occur, and the existing monitoring network would not be expanded. Overall, as shown in Table 8.8, impacts on the North Westside Groundwater Basin would be less for Variant 1 compared to the proposed program. Effects on the South Westside Groundwater Basin would be almost identical for Variant 1 and the proposed program, since both would rely on the Westside Basin conjunctive-use program as a supplemental dry-year water supply for an average of 6 mgd over the design drought. However, extraction of supplemental supplies would occur slightly more frequently with the variant in anticipation of drought.

Cumulative Water Supply Impacts

As shown in Table 8.9, cumulative water supply impacts associated with Variant 1 would be similar to those identified for the proposed program and described in Chapter 5, Section 5.7. However, due to the increased diversion from the Tuolumne River, the contribution to cumulative impacts on the terrestrial biological resources in the Poopenaut Valley would be greater than that for the WSIP. On the other hand, under Variant 1, the Local Groundwater Projects in San Francisco (part of SF-2) would not be implemented, so that the contribution to cumulative impacts related to basin overdraft in the North Westside Groundwater Basin would be less than that for the WSIP.

8.5.2 Water Supply Impacts of Variant 2

With *WSIP Variant 2 – Regional Desalination for Drought*, almost all of the additional water needed in 2030 under normal hydrologic conditions would be obtained from the Tuolumne River or from groundwater, additional conservation, and recycling in San Francisco. A small amount would come from the Bay Area watersheds through restoration of Calaveras and Crystal Springs Reservoirs. During droughts, up to 23 mgd (25,765 afy) of water would be provided from a regional desalination plant under Variant 2. Variant 2 would operate the same way as the WSIP under normal conditions, but during droughts water from the desalination plant would substitute for the water that would be transferred from TID and MID with the WSIP.

Tuolumne River Watershed

With Variant 2, about the same amount of water would be diverted from the Tuolumne River in wet, above-normal, below-normal, and dry years as with the WSIP. Much less water would be diverted in critically dry years. Average annual diversions from the Tuolumne River with Variant 2 would be 2.9 percent less than with the WSIP.

Water levels in Lake Lloyd and Lake Eleanor would be essentially the same with Variant 2 and the WSIP. Releases from the reservoirs to Cherry and Eleanor Creeks would also be the same with Variant 2 and the WSIP.

Most of the time, the same amount of water would be diverted from the Tuolumne River at Hetch Hetchy Reservoir with Variant 2 as it would with the WSIP; as a result, storage in the reservoir would be about the same with Variant 2 and the WSIP. Releases to the Tuolumne River below Hetch Hetchy Reservoir would also be about the same most of the time.

Differences would occur both during and following droughts under Variant 2. During droughts, the SFPUC would take water from the desalination plant in the Bay Area, rather than taking water from the Tuolumne River via a transfer from MID and TID. Consequently, larger amounts of water would be retained in storage in Hetch Hetchy Reservoir during droughts under Variant 2 than with the WSIP, and a smaller proportion of the spring snowmelt would be needed to refill the reservoir. As a result, releases to the Tuolumne River from Hetch Hetchy Reservoir in years following droughts would be greater with Variant 2 than with the WSIP and would be less delayed than with the WSIP. However, the differences in releases would be relatively small. With both Variant 2 and the WSIP, average monthly flow in some spring months would be 30 percent less than under the existing condition. The greatest reduction in average monthly flow in the 82-year period of hydrologic record would be 90 percent with both Variant 2 and the WSIP.

With Variant 2, storage in Don Pedro Reservoir would be almost the same as with the WSIP most of the time. During droughts under Variant 2, the SFPUC would obtain water from a desalination plant in the Bay Area. During droughts under the WSIP, Don Pedro Reservoir would be drawn down to supply water needed by the SFPUC, TID, and MID. In a series of dry years, water deficiencies would accumulate and Don Pedro Reservoir would be drawn down much farther than it is under the existing condition. With Variant 2, water deficiencies would accumulate in

Don Pedro Reservoir in a series of dry years, but to a lesser degree than with the WSIP. A smaller proportion of winter and spring runoff would need to be captured to refill Don Pedro Reservoir with Variant 2 than with the WSIP. Releases to the Tuolumne River below La Grange Dam would be greater with Variant 2 than with the WSIP. With Variant 2, average monthly flow in some months between November and June would be 21 percent less than under the existing condition. The corresponding value with the WSIP would be 25 percent less. The greatest reduction in average monthly flow in the 82-year period of hydrologic record with Variant 2 would be 78 percent; with the WSIP it would be 92 percent.

Alameda Watershed

The effects of Variant 2 in the Alameda watershed would be very similar to those of the WSIP. The magnitude and timing of diversions from Alameda Creek to Calaveras Reservoir and spills to Alameda Creek over the diversion dam would be the same with Variant 2 and the WSIP. Storage in Calaveras and San Antonio Reservoirs and releases to Calaveras and San Antonio Creeks would be the same with Variant 2 as with the WSIP.

Peninsula Watershed

Storage in Crystal Springs Reservoir would be greater at times with Variant 2 than with the WSIP. On occasion, Crystal Springs Reservoir would be drawn down with the WSIP, because the need for water in the Bay Area exceeds the amount of water that can be conveyed to the Bay Area from the Tuolumne River. This would include the occasions every five years when the conveyance system from the Tuolumne River would be shut down for a few weeks for maintenance. Because the desalination plant would meet some of the demand for water in the Bay Area during droughts, drawdown of Crystal Springs Reservoir would be less at times with Variant 2 than with the WSIP.

Average storage in Crystal Springs Reservoir with Variant 2 would be about 330 million gallons (1,014 acre-feet) more than with the WSIP. Because Crystal Springs Reservoir would be operated at a higher level with Variant 2, less storage capacity would be available in the reservoir to accommodate runoff during sudden storms. Releases to San Mateo Creek with Variant 2 would be more frequent and greater in magnitude than with the WSIP. Current total average wet year releases are estimated to be 2.06 billion gallons (6,336 acre-feet). Average wet-year releases to the creek would total 1.96 billion gallons (6,017 acre-feet) with Variant 2; with the WSIP they would total 1.43 billion gallons (4,397 acre-feet). In all cases, the estimated releases from Crystal Springs Reservoir are probably greater than the actual releases that occur because some model does not capture all of the operational flexibility available to system operators to minimize reservoir releases.

Storage in Pilarcitos Reservoir and releases to Pilarcitos Creek below the reservoir would be the same with Variant 2 and the WSIP. Spills to Pilarcitos Creek over Stone Dam currently occur primarily in wet and above-normal years and would continue to do so with Variant 2 and with the WSIP. Current average wet-year releases are estimated to be 2.29 billion gallons (7,065 acre-feet). Releases with Variant 2 would be similar in magnitude to those with the WSIP but slightly less than under the existing condition.

Westside Groundwater Basin

As shown in Table 8.8, effects on both the North and South Westside Groundwater Basins would be the same for Variant 2 and the proposed program. Both Variant 2 and the proposed program would rely on an annual average of 10 mgd of recycled water/groundwater/additional conservation projects in San Francisco during drought and nondrought periods. Similarly, both Variant 2 and the proposed program would rely on the Westside Basin conjunctive-use program as a supplemental dry-year water supply for an average of 6 mgd over the design drought.

Cumulative Water Supply Impacts

As shown in Table 8.9, cumulative water supply impacts associated with Variant 2 would be similar to those identified for the proposed program and described in Chapter 5, Section 5.7. However, due to the decreased diversion from the Tuolumne River, the contribution to cumulative impacts on the terrestrial biological resources in the Poopenaut Valley and other similar habitats below O'Shaughnessy Dam would be less than that for the WSIP. All other cumulative impacts would be similar to those for the WSIP.

8.5.3 Water Supply Impacts of Variant 3

With *WSIP Variant 3 – 10% Rationing*, almost all of the additional water needed in 2030 under normal hydrologic conditions would be obtained from the Tuolumne River or from groundwater, additional conservation, and recycling in San Francisco. A small amount would come from the Bay Area watersheds through restoration of Calaveras and Crystal Springs Reservoirs. Variant 3 would operate in the same way as the WSIP under normal conditions, but rationing during droughts would be limited to 10 percent rather than the 20 percent permitted with the WSIP. As with the WSIP, a transfer of water from TID and MID would provide water during droughts. Because rationing would be limited to 10 percent, the transfer from TID and MID would have to be greater with Variant 3 than with the WSIP. With Variant 3, the transfers would be 35 mgd (39,207 afy); with the WSIP they would be 23 mgd (25,765 afy).

Tuolumne River Watershed

With Variant 3, slightly more water would be diverted from the Tuolumne River than with the WSIP.

Because almost the same amount of water would be diverted from the Tuolumne River at Hetch Hetchy Reservoir with Variant 3 as it would with the WSIP, storage in the reservoir would be almost the same with Variant 3 and the WSIP. Releases to the Tuolumne River below Hetch Hetchy Reservoir would also be about the same. With both Variant 3 and the WSIP, average monthly flow in some spring months would be 30 percent less than under the existing condition. Compared to the existing condition, the delay in springtime releases from Hetch Hetchy

Reservoir with Variant 3 and the WSIP would be very similar. The greatest reduction in average monthly flow in the 82-year period of hydrologic record would be 90 percent with both Variant 3 and the WSIP.

Water levels in Lake Lloyd and Lake Eleanor would be essentially the same with Variant 3 and the WSIP. Releases from the reservoirs to Cherry and Eleanor Creeks would also be the same with Variant 3 and the WSIP.

With Variant 3, storage in Don Pedro Reservoir would be almost the same as with the WSIP most of the time. As with the WSIP, additional water would be obtained with Variant 3 via a transfer from TID and MID, although with Variant 3 the transfer would be larger. The effect of the transfer would be to draw down storage in Don Pedro Reservoir. In most years, the effect of the increased drawdown attributable to Variant 3 would be small relative to the size of the reservoir. Its effect on releases to the river below La Grange Dam would also be small. In a series of dry years, water deficiencies would accumulate and Don Pedro Reservoir would be drawn down farther with Variant 3 than it would be with the WSIP. A greater proportion of winter and spring runoff would need to be captured to refill Don Pedro Reservoir with Variant 3 than with the WSIP. Releases to the Tuolumne River below La Grange Dam would be somewhat less during droughts than with the WSIP in years following droughts, but the difference would be too small to have much effect on long-term averages. With both Variant 3 and the WSIP, average monthly flow in some months between November and June would be 30 percent less than under the existing condition. The greatest reduction in average monthly flow in the 82-year period of hydrologic record would be 92 percent with Variant 3 and with the WSIP.

Alameda Watershed

The effects of Variant 3 in the Alameda watershed would be very similar to those of the WSIP. The magnitude and timing of diversions from Alameda Creek to Calaveras Reservoir and spills to Alameda Creek over the diversion dam would be the same with Variant 3 and the WSIP. Storage in Calaveras and San Antonio Reservoirs and releases to Calaveras and San Antonio Creeks would be the same with Variant 3 and the WSIP.

Peninsula Watershed

Storage in Crystal Springs Reservoir would be slightly greater at times with Variant 3 than with the WSIP. Average storage in Crystal Springs Reservoir with Variant 3 would be about 112 million gallons (344 acre-feet) more than with the WSIP. Because Crystal Springs Reservoir would be operated at a slightly higher level with Variant 3, less storage capacity would be available in the reservoir to accommodate runoff during sudden storms. Releases to San Mateo Creek with Variant 3 would be slightly more frequent and slightly greater in magnitude than with the WSIP. Current total average wet year releases are estimated to be 2.06 billion gallons (6,336 acre-feet). Average wet-year releases to the creek would total 1.5 billion gallons (4,623 acre-feet) with Variant 3; with the WSIP they would total 1.43 billion gallons (4,397 acre-feet). In all cases, the estimated releases from Crystal Springs Reservoir are probably greater than actual releases because some of the modeled releases would likely be avoided by reservoir operators.

Storage in Pilarcitos Reservoir and releases to Pilarcitos Creek below the reservoir would be similar but not identical under Variant 3 and WSIP. With Variant 3, storage in Pilarcitos Reservoir and releases to Pilarcitos Creek would differ slightly from those with the WSIP because the Coastside County Water District would be subject to a different pattern of shortages/rationing during droughts. Spills to Pilarcitos Creek over Stone Dam currently occur primarily in wet and above-normal years and would continue to do so with Variant 3 and with the WSIP. Current average wet-year releases are estimated to be 2.29 billion gallons (7,065 acre-feet). Releases with Variant 3 would be similar in magnitude to those with the WSIP but slightly less than under the existing condition.

Westside Groundwater Basin

As shown in Table 8.8, effects on both the North and South Westside Groundwater Basins would be the same for Variant 2 and the proposed program. Both Variant 2 and the proposed program would rely on an annual average of 10 mgd of recycled water/groundwater/additional conservation projects in San Francisco during drought and nondrought periods. Similarly, both Variant 2 and the proposed program would rely on the Westside Basin conjunctive-use program as a supplemental dry-year water supply for an average of 6 mgd over the design drought.

Cumulative Water Supply Impacts

As shown in Table 8.9, cumulative water supply impacts associated with Variant 3 would be similar to those identified for the proposed program and described in Chapter 5, Section 5.7. However, due to the slightly increased diversion from the Tuolumne River, the contribution to cumulative impacts on the terrestrial biological resources in the Poopenaut Valley and other similar habitats below O'Shaughnessy Dam would be slightly greater than that for the WSIP. All other cumulative impacts would be similar to those for the WSIP.

8.6 Comparison of the Proposed Program and Variants

Table 8.10 summarizes the major impacts of the variants and compares them to those of the proposed program. The table focuses on the significant unavoidable or potentially significant unavoidable impacts identified in Chapters 4, 5 and 7 for the proposed program and indicates the same for each variant. The table distinguishes between facilities-related impacts (under the general categories of construction, footprint, and operational impacts) and water supply and system operation impacts. With the exception of the BARDP component of Variant 2, all three variants would have the same significant unavoidable or potentially significant unavoidable impacts as the proposed program, although in some cases, there would be slight differences in severity of the impact. The greatest differences among the proposed program and the variants are associated with facilities-related impacts of the BARDP; other differences in facilities-related impacts are minor. Similarly, as stated previously, although the water supply and system operations impacts of the variants differ somewhat from those of the proposed program, the magnitude of the differences is small and not sufficient to change either the significance determinations or the mitigation measures identified for the WSIP.

TABLE 8.10
COMPARISON OF MAJOR IMPACTS – PROPOSED PROGRAM AND VARIANTS

Impact Area	Proposed Program	Variant 1 – All Tuolumne	Variant 2 – Regional Desalination for Drought	Variant 3 – 10% Rationing
Facilities-Related Impacts	All potential impacts could be reduced to less than significant with implementation of mitigation measures, except for potentially significant and unavoidable impacts below:	Same impacts as proposed program in all respects, except there would be fewer impacts on the west side of San Francisco because Recycled Water (SF-3) and Local Groundwater Projects (part of (SF-2) would not be implemented.	Same impacts as proposed program in all respects except there would be additional impacts associated with implementation of a regional desalination plant, including additional potentially significant and unavoidable impacts below.	Same impacts as proposed program in all respects.
▪ Construction impacts associated with construction activities	▪ Disruption of land uses during construction (PSU for New Irvington Tunnel, SV-4) ▪ Construction-related noise increases (PSU for all projects) and temporary noise disturbance along haul routes (PSU for Advanced Disinfection, SJ-1; San Joaquin Pipeline System, SJ-3; Rehabilitation of Existing San Joaquin Pipelines, SJ-4; Tesla Portal Disinfection Station, SJ-5; Bay Division Pipeline Reliability Upgrade, BD-1; BDPL Nos. 3 and 4 Crossovers, BD-2; Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault, BD-3; Baden and San Pedro Valve Lots Improvements, PN-1; HTWTP Long-Term Improvements, PN-3; San Andreas Pipeline No. 3 Installation, SF-1; Groundwater Projects, SF-2; and Recycled Water Projects, SF-3) ▪ Construction-related vibration disturbance (PSU for San Joaquin Pipeline System, SJ-3; Rehabilitation of Existing San Joaquin Pipelines, SJ-4; Additional 40-mgd Treated Water Supply, SV-3; Bay Division Pipeline Reliability Upgrade, BD-1; BDPL Nos. 3 and 4 Crossovers, BD-2; Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault, BD-3; Baden and San Pedro Valve Lot Improvements, PN-1; San Andreas Pipeline No. 3 Installation, SF-1; Groundwater Projects, SF-2; and Recycled Water Projects, SF-3) ▪ Collective, multi-regional increase in construction traffic (PSU) ▪ Cumulative traffic increases on local and regional roads (PSU) ▪ Collective, multi-regional increase in construction-related air pollutant emissions (PSU)	Same as proposed program except for PSU construction noise impact associated with Local Groundwater Projects, SF-2, and Recycled Water Projects, SF-3, would not occur.	Same as proposed program plus additional impacts associated with BARDP construction.	Same as proposed program.

TABLE 8.10 (Continued)
COMPARISON OF MAJOR IMPACTS – PROPOSED PROGRAM AND VARIANTS

Impact Area	Proposed Program	Variant 1 – All Tuolumne	Variant 2 – Regional Desalination for Drought	Variant 3 – 10% Rationing
▪ Construction impacts associated with construction activities (cont.)	▪ Cumulative impacts on cultural resources (PSU) ▪ Cumulative increases in construction-related air pollutant emissions (PSU) ▪ Localized, cumulative increases in emissions of diesel particulate matter (PSU) ▪ Collective, overlapping construction noise in San Joaquin, Bay Division, Peninsula, and San Francisco regions (PSU) ▪ Cumulative increases in construction-related noise and vibration (PSU) ▪ Collective impacts on land uses during construction in Bay Division Region (PSU) ▪ Collective impacts on land uses during construction in Bay Division Region (PSU)			
▪ Footprint impacts associated with siting of facilities	▪ Permanent displacement or long-term disruption of existing land uses (PSU for San Joaquin Pipeline System, SJ-3; Additional 40-mgd Treated Water Supply, SV-3; San Antonio Backup Pipeline, SV-6; Bay Division Pipeline Reliability Upgrade, BD-1; Crystal Springs/ San Andreas Transmission Upgrade, PN-2; Groundwater Projects, SF-2; and Recycled Water Projects, SF-3). ▪ Impacts on scenic resources associated with new permanent aboveground structures (PSU for Calaveras Dam Replacement, SV-2) ▪ Impacts on the historical significance of a historic district or a contributor to a historic district (PSU for Calaveras Dam Replacement, SV-2 and Crystal Springs/San Andreas Transmission Upgrade, PN-2), and impacts on historical significance of individual facilities (PSU for Calaveras Dam Replacement, SV-2; New Irvington Tunnel, SV-4; Crystal Springs/San Andreas Transmission Upgrade, PN-2; and Lower Crystal Springs Dam Improvements, PN-4).	Same as proposed program.	Same as proposed program plus additional footprint and siting impacts associated with the BARDP: ▪ Effects of BARDP construction on sensitive aquatic habitats and species and possibly special-status species (PSU)	Same as proposed program.

TABLE 8.10 (Continued)
COMPARISON OF MAJOR IMPACTS – PROPOSED PROGRAM AND VARIANTS

Impact Area	Proposed Program	Variant 1 – All Tuolumne	Variant 2 – Regional Desalination for Drought	Variant 3 – 10% Rationing
▪ Footprint impacts associated with siting of facilities (cont.)	▪ Collective impacts on sensitive biological resources in Sunol Valley and Peninsula regions (PSU) ▪ Collective impacts on cultural resources in Sunol Valley and Peninsula regions (PSU)			
▪ Operational impacts	No PSU or SU operational impacts.	Same as proposed program.	▪ Effects of BARDP operation on water quality associated with discharge of brine concentrate (PSU) ▪ Long-term effects of BARDP operation on sensitive biological resources, including special-status marine species (PSU) ▪ Long-term energy demand of BARDP (PSU)	Same as proposed program.
Water Supply and System Operations Impacts	All impacts could be reduced to less than significant with implementation of mitigation measures, except for potentially significant and unavoidable impacts below:			
Tuolumne River Watershed	No significant and unavoidable impacts	Similar impacts to proposed program.	Similar impacts to proposed program.	Similar impacts to proposed program.
Alameda Creek Watershed	Reduction in flow in Alameda Creek between the diversion dam and confluence with Calaveras Creek. (SU)	Similar impacts to proposed program.	Similar impacts to proposed program.	Similar impacts to proposed program.
Peninsula Watershed (San Mateo Creek and Pilarcitos Creek Watersheds)	Effects on fishery resources in Crystal Springs Reservoir. (PSU)	Similar impacts to proposed program.	Similar impacts to proposed program.	Similar impacts to proposed program
Westside Groundwater Basin	No significant and unavoidable impacts.	Same impacts as proposed program on South Westside Groundwater Basin, but PSM impacts on North Westside Groundwater Basin would be avoided	Same impacts as proposed program.	Same impacts as proposed program

TABLE 8.10 (Continued)
COMPARISON OF MAJOR IMPACTS – PROPOSED PROGRAM AND VARIANTS

Impact Area	Proposed Program	Variant 1 – All Tuolumne	Variant 2 – Regional Desalination for Drought	Variant 3 – 10% Rationing
Growth Inducement	Indirect effects of growth include the following significant and unavoidable impacts: ▪ Loss of open space (to development) on visual quality ▪ Alteration of the visual setting or degradation of existing views and cumulative visual quality impacts ▪ Conversion of agricultural land to nonagricultural uses ▪ Cumulative loss of agricultural land ▪ Increases in air pollutant emissions and/or ozone precursors or violation of air quality standards ▪ Cumulative air quality impacts ▪ Impacts on natural habitat ▪ Individual or cumulative loss of wetlands ▪ Cumulative impacts on cultural resources ▪ Exposure to seismic or geologic hazards ▪ Exposure to soil or groundwater contamination ▪ Cumulative effects from increased exposure to man-made hazards ▪ Increases in impervious surfaces and/or alterations to drainage resulting in exposure to flood hazards and/or the need for new drainage facilities ▪ Water pollution from stormwater runoff ▪ Land use impacts ▪ Cumulative impacts from the depletion of nonrenewable resources and the alteration of landforms ▪ Noise impacts, including increases in traffic noise, exposure to construction noise, and exposure to aircraft noise ▪ Impacts related to population growth (directly or indirectly induced) and jobs/housing balance	Same impacts as proposed program.	Same impacts as proposed program, plus growth-inducement effects associated with the BARDP.	Same impacts as proposed program

TABLE 8.10 (Continued)
COMPARISON OF MAJOR IMPACTS – PROPOSED PROGRAM AND VARIANTS

Impact Area	Proposed Program	Variant 1 – All Tuolumne	Variant 2 – Regional Desalination for Drought	Variant 3 – 10% Rationing
Growth Inducement (cont.)	▪ Increased demand for schools and/or other public facilities ▪ Loss of recreational open space ▪ Cumulative impacts on recreational facilities ▪ Local and regional traffic impacts ▪ Cumulative traffic impacts ▪ Impacts on landfill capacity ▪ Increases in water demand ▪ Large and wasteful increase in energy consumption and cumulative energy-related impacts ▪ Greenhouse gas emissions			

With respect to facilities-related impacts, all three variants would have essentially the same impacts and require the same mitigation measures as described for the 22 WSIP facility improvement projects evaluated in Chapter 4. Variant 1 would have slightly fewer impacts than the proposed program or Variant 3, because the Recycled Water Projects (SF-3) and Local Groundwater Projects (part of SF-2) would not be implemented. Variant 3 would have the identical facilities-related impacts as the proposed program. Variant 2 would have the most impacts due to implementation of the BARDP in addition to the WSIP facility improvement projects. Construction and operation of the BARDP would result in other environmental effects not related to the WSIP projects, including potentially significant and unavoidable impacts associated with water quality, biological resources, and long-term energy consumption, as described above in Section 8.3, and would also require additional mitigation measures beyond those described for the proposed program.

With respect to water supply and system operations, all three variants would result in similar impacts to those of the proposed program with two exceptions. First, the difference in significance determination would be the potentially significant but mitigable impacts on the North Westside Groundwater Basin associated with the proposed program; under Variant 1, this impact would be avoided since local groundwater projects would not be implemented. Second, Variant 2 would result in potentially significant impacts on another water (either San Francisco Bay or the Pacific Ocean) and related resources, in addition to all of the impacts identified for the WSIP. As described above, for impacts on all other water resources, there would be some degree of difference in physical effects among the variants and the proposed program, with some greater and some lesser effects on different aspects of the affected water resources, but these differences do not appear sufficient to warrant a change in impact significance. Similar mitigation strategies would be required for the variants and the proposed program, although there could be slight differences in the specific design and implementation of the mitigation measures under each variant.

The variants and the proposed program would have the same impacts related to growth inducement and indirect effects of growth, as described previously in this chapter. In addition, with the exception of the BARDP component of Variant 2, the variants would have the same areas of controversy, the same unavoidable effects, and the same irreversible environmental changes as the proposed program.

References – WSIP Variants and Impact Analysis

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9 CEQA Alternatives

CHAPTER 9
CEQA Alternatives

9.1 Introduction

9.1.1 CEQA Guidance for Alternatives Analysis

The California Environmental Quality Act (CEQA) Guidelines, Section 15126.6(a), state that an environmental impact report (EIR) must describe and evaluate a reasonable range of alternatives to the proposed project that would feasibly attain most of the project's basic objectives, but that would avoid or substantially lessen any significant adverse environmental effects of the project. An EIR is not required to consider every conceivable alternative to a proposed project. Rather, it must consider a reasonable range of potentially feasible alternatives that will foster informed decision-making and public participation. CEQA Guidelines Section 15126.6(e) states that, "The specific alternative of 'no project' shall also be evaluated along with its impact" (which, in the case of this Program EIR, is referred to as the No *Program* Alternative). The EIR must evaluate the comparative merits of the alternatives and include sufficient information about each alternative to allow meaningful evaluation, analysis, and comparison with the proposed project.

9.1.2 WSIP Goals and Objectives

Program alternatives were evaluated for their ability to attain most of the basic objectives of the proposed Water System Improvement Program (WSIP or program), consistent with CEQA. The WSIP goals, objectives, and proposed levels of service (presented in Chapter 3, Program Description, Section 3.3) are repeated here for ease of reference. The goals and objectives, based on a planning horizon through 2030, are founded on two fundamental principles pertaining to the existing regional water system: (1) maintaining a clean, unfiltered water source from the Hetch Hetchy system, and (2) maintaining a gravity-driven system. The overall goals of the WSIP for the regional water system are to:

- Maintain high-quality water
- Reduce vulnerability to earthquakes
- Increase delivery reliability and improve the ability to maintain the system
- Meet customer water supply purchase requests in nondrought and drought periods
- Enhance sustainability in all system activities
- Achieve a cost-effective, fully operational system

To further these program goals, the WSIP includes objectives that address system performance in the areas of water quality, seismic reliability, delivery reliability, and water supply through the year 2030. The system performance objectives provide design guidelines for facility improvement projects and provide the basis for the proposed system operations and water supply option. **Table 9-1** presents the WSIP goals and objectives, and **Table 9-2** summarizes and compares the levels of service under the existing condition and the proposed program.

9.1.3 Organization of this Chapter

This chapter presents the key alternatives analysis and results, then describes the background process and evaluation that led to those results, as follows:

- Section 9.2 presents the alternatives selected for inclusion in the PEIR based on CEQA criteria. The section describes each alternative, including the No Program Alternative, and discusses San Francisco Public Utilities Commission (SFPUC) actions as well as possible wholesale customer actions associated with each alternative. For each alternative, the section also describes feasibility issues associated with its implementation, as well as its ability to meet WSIP objectives and its effectiveness in avoiding or reducing environmental impacts. Section 9.2 then compares the environmental effects of each alternative with the effects of the WSIP.

- Section 9.3 summarizes and compares the alternatives, identifying trade-offs and the environmentally superior alternative.

- Section 9.4 describes the process used to identify program alternatives. It summarizes the significant adverse impacts of the WSIP, identifies strategies to avoid or substantially lessen these effects that could be implemented through an alternative to the WSIP rather

TABLE 9-1
WSIP GOALS AND OBJECTIVES

Program Goal	System Performance Objective
Water Quality – *maintain high water quality*	▪ Design improvements to meet current and foreseeable future federal and state water quality requirements. ▪ Provide clean, unfiltered water originating from Hetch Hetchy Reservoir and filter all other surface water sources. ▪ Continue to implement watershed protection measures.
Seismic Reliability – *reduce vulnerability to earthquakes*	▪ Design improvements to meet current seismic standards. ▪ Deliver basic service to the three regions in the service area (East/South Bay, Peninsula, and San Francisco) within 24 hours after a major earthquake. Basic service is defined as average winter-month usage, and the performance objective for the regional system is 229 million gallons per day (mgd). The performance objective is to provide delivery to at least 70 percent of the turnouts (i.e., water diversion point) in each region, with 104, 44, and 81 mgd delivered to the East/South Bay, Peninsula, and San Francisco regions, respectively. ▪ Restore facilities to meet average-day demand of 300 mgd within 30 days after a major earthquake.
Delivery Reliability – *increase delivery reliability and improve ability to maintain the system*	▪ Provide operational flexibility to allow planned maintenance shutdown of individual facilities without interrupting customer service. ▪ Provide operational flexibility to minimize the risk of service interruption due to unplanned facility upsets or outages. ▪ Provide operational flexibility and system capacity to replenish local reservoirs as needed. ▪ Meet the estimated average annual demand of 300 mgd for 2030 under the conditions of one planned shutdown of a major facility for maintenance concurrent with one unplanned facility outage.
Water Supply – *meet customer water needs in nondrought and drought periods*	▪ Meet average annual water purchase requests of 300 mgd from retail and wholesale customers during nondrought years for system demands through 2030. ▪ Meet dry-year delivery needs through 2030 while limiting rationing to a maximum 20 percent systemwide reduction in water service during extended droughts. ▪ Diversify water supply options during nondrought and drought periods. ▪ Improve use of new water sources and drought management, including use of groundwater, recycled water, conservation, and transfers.
Sustainability – *enhance sustainability in all system activities*	▪ Manage natural resources and physical systems to protect watershed ecosystems. ▪ Meet, at a minimum, all current and anticipated legal requirements for protection of fish and other wildlife habitat. ▪ Manage natural resources and physical systems to protect public health and safety.
Cost-effectiveness – *achieve a cost-effective, fully operational system*	▪ Ensure cost-effective use of funds. ▪ Maintain gravity-driven system. ▪ Implement regular inspection and maintenance program for all facilities.

SOURCE: SFPUC, 2005 and 2006.

TABLE 9-2
EXISTING AND PROPOSED REGIONAL SYSTEM LEVELS OF SERVICE[a]

Operating Parameter	Existing Level of Service (2005)	Proposed Level of Service with WSIP (2030)
Water Quality	Meet all existing local, state, and federal water quality requirements	Meet all local, state, and federal water quality requirements in 2030
Seismic Response After Major Earthquake	Not defined	Provide basic service[b] of 229 mgd within 24 hours; average-day service of 300 mgd within 30 days
Delivery During System Maintenance	Not defined	Average day demand of 300 mgd
Average Annual Water Supply	265 mgd	300 mgd
Regional System Firm Yield[c]	219 mgd	256 mgd
Drought-Year Rationing	No maximum limit to rationing	Up to 20 percent systemwide rationing

a Level of service flow rates are defined on a systemwide basis and are not specific to any customer turnout (i.e., water diversion point).
b Basic service is defined as winter-month demand, estimated to be 229 mgd systemwide in 2030.
c System firm yield is defined as the average annual water delivery that can be sustained by the regional water system during an extended drought. The SFPUC uses an 8.5-year design drought for planning purposes. Currently, due to operating restrictions imposed on Calaveras Dam by the California Division of Safety of Dams in December 2001, the system firm yield is reduced from its normal system firm yield of 226 mgd to about 219 mgd.

SOURCE: SFPUC, 2006.

than through mitigation measures, and reviews suggestions and concepts for alternatives that were raised during the scoping period. Section 9.4 presents the rationale and screening process used for accepting or rejecting potential alternatives and summarizes the reasons for eliminating alternatives from further consideration.

- Section 9.5 provides additional background information about and more detail on the reasons for rejecting alternative concepts identified in Section 9.4 that were considered but rejected either as part of the WSIP development process or as part of the CEQA alternatives analysis process.

9.2 Alternatives Analysis

9.2.1 Selected Alternatives for Comparative Analysis

In accordance with CEQA, appropriate alternatives for EIR analysis are those that meet most of a project's basic objectives *and* avoid or substantially lessen the significant environmental impacts of the proposed project. As described in more detail in Section 9.4, several steps were taken to identify potential alternatives and assemble a reasonable range of alternatives for evaluation in the PEIR in comparison in the WSIP, including:

1. Review the significant effects resulting from the WSIP and identify possible strategies to avoid or lessen such impacts.

2. Review ideas and alternative concepts suggested during the PEIR scoping process.

3. Categorize and evaluate strategies and concepts for the ability to both meet the basic project objectives and avoid or lessen significant impacts.

4. Develop preliminary alternatives based on strategies and concepts retained from preliminary screening. Evaluate feasibility with respect to technical, institutional, cost, and regulatory considerations.

5. Select and refine a final set of alternatives for CEQA analysis.

From this process seven alternatives, in addition to the required No Program Alternative, were selected for further evaluation and comparison to the WSIP. Together, this set of eight alternatives represents a broad range of options in terms of how key aspects of the proposed program could be implemented. Each alternative in the set differs from the WSIP in one or more of the following important ways:

- *Demand level served*. The WSIP plans to meet an average annual delivery requirement of 300 mgd by 2030 reflecting the customer purchase request increase of 35 mgd over current average annual demand. Two alternatives do not fully satisfy customer purchase requests in 2030.

- *Water supply source(s) / level of additional Tuolumne River diversion*. The WSIP proposes to increase Tuolumne River diversion under the CCSF's existing water rights coupled with development of additional recycled water, conservation, and local groundwater in San Francisco, a conjunctive groundwater use program in the Westside Basin (San Mateo County), and acquisition of a dry-year surface water transfer. Two alternatives include a smaller increase in diversion of Tuolumne River water compared to the WSIP and two alternatives include no increase in Tuolumne River water diversion; one of these alternatives looks at demand management strategies (conservation and water recycling) while the other evaluates an alternative supply source – seawater desalination. Another alternative considers a new point of diversion on the lower Tuolumne River, which, although it is still Tuolumne River water, represents an alternative source of supply in terms of shifting from a Sierra Nevada supply source to a Central Valley supply source.

- *Level of drought rationing.* As part of implementing the WSIP the SFPUC proposes to meet an objective of up to 20 percent maximum systemwide rationing in any year of a drought. Two alternatives require higher levels of rationing.

- *Facilities – number of projects required / extent of facilities construction.* The WSIP includes implementation of 22 facility improvement projects evaluated in this PEIR. One alternative, the No Program Alternative, includes only a few of these facility improvement projects. Seven of the eight alternatives include all 22 of the facility improvement projects plus additional required facilities ranging from a new desalination plant and transmission pipelines to additional recycled water treatment plants, groundwater wells, and distribution facilities.

As noted in Section 9.4, many other alternative concepts were identified that would modify the WSIP in one of the key areas identified in the bullet list above. However, the set of eight alternatives selected for further evaluation was judged to best represent the range of identified strategies and concepts. For example, a Delta water supply source was one of the supply source concepts proposed as an alternative to increasing diversion from the Tuolumne River. However, an alternative to divert water off the lower Tuolumne River better represents the concept of diverting, in effect, Tuolumne River water from a point downstream in the valley, lower in the watershed. Similarly, a seawater desalination alternative is included in the range of alternatives evaluated as a supply source alternative that involves no additional Tuolumne River water. Section 9.4, below, describes the alternatives development and screening process in further detail and explains the reasons for eliminating various strategies and concepts from further evaluation.

This section evaluates the comparative merits of the selected alternatives relative to the WSIP. Since the alternatives are generally conceptual, the evaluation is based on the available information and reasonable assumptions about how each alternative would be implemented. For each alternative, this section presents the following:

- Description of the alternative, including associated facility improvement projects, water supply sources, and system operations. The descriptions include SFPUC actions as well as reasonable expectations regarding the wholesale customer actions that would occur under each alternative. The description includes a review of potential feasibility issues as well.

- Ability to meet primary WSIP goals and objectives

- Environmental impacts of each alternative compared to those of the WSIP. This section is divided into three groups: facility impacts (construction and operation), water supply and system operations impacts, and growth-inducement impacts. Under the facility impacts, impacts associated with each alternative are compared to those described in Chapter 4 of this PEIR for the proposed WSIP facility improvement projects; additionally, impacts of other facilities that would or could be required under an alternative but not under the WSIP are described, along with associated potential impacts on other water bodies and associated resources not affected by the WSIP. Under the water supply and system operations impacts, the potential impacts within the SFPUC regional system under each alternative are compared to those analyzed for the WSIP in Chapter 5 of this PEIR.[1] The comparative evaluation of growth-inducement impacts is discussed based on the analysis presented in Chapter 7 of this PEIR.

Table 9-3 identifies the eight CEQA alternatives evaluated in detail in this PEIR. There are seven main alternatives but there are also two variations of the Aggressive Conservation / Water Recycling and Local Groundwater Alternative that are each evaluated in detail in comparison to the WSIP; thus these are counted as two separate alternatives, for a total of eight. The table provides a brief description of each alternative and highlights how it differs from the WSIP and what impact areas it is intended to address.

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[1] The potential impacts of the WSIP on water supply and system operations were determined based on modeling results of the Hetch Hetchy/Local Simulation Model, as described in Section 5.1. Modeling results for the CEQA alternatives are discussed in Appendices H1 through H3. It should be noted that development of the conceptual alternatives continued after the performance of modeling for the CEQA alternatives; however, results presented in this PEIR are adequate to assess the comparative impacts of the alternatives and the WSIP. In particular, the modeling results of the CEQA alternatives do not account for restoration of the historical capacity of Crystal Springs Reservoir (i.e., implementation of the Lower Crystal Springs Dam project, PN-4) and the associated 1 mgd of system firm yield; however, the comparative analysis qualitatively addresses the change in system operations that would occur with implementation of PN-4.

TABLE 9-3
SELECTED ALTERNATIVES FOR CEQA ANALYSIS

Alternative / Description	How Does This Alternative Differ From The WSIP?	What WSIP Impacts Is The Alternative Intended to Address?
No Program –SFPUC would implement only those WSIP facility improvement projects driven by regulatory requirements or existing agreements with regulatory agencies. It would endeavor to meet increasing customer purchase requests through the year 2030 by diverting additional Tuolumne River water only when available under CCSF's existing water rights. The wholesale customers would have to pursue supplemental supply sources and/or conservation measures to make up the supply shortfall/reduced reliability under this alternative.	▪ *2030 Avg. Annual Delivery Target:* Same ▪ *Supply Sources*: Tuolumne River. No dry-year water transfer, Westside Groundwater basin, or 10 mgd recycled water / conservation / groundwater in SF ▪ *Additional Tuolumne River diversion*: Less ▪ *Level of Rationing*: Allow for greater than 20% systemwide rationing ▪ *Facility projects*: Fewer	▪ Required by CEQA ▪ Fewer facilities construction impacts (fewer facilities would be constructed)
No Purchase Request Increase – SFPUC would implement all of the proposed WSIP facility improvement projects but would limit wholesale customers' future purchases to the terms of the existing Master Water Sales Agreement instead of providing all of their 2030 purchase requests. The wholesale customers would have to pursue supplemental supply sources and/or conservation measures to make up the supply shortfall under this alternative.	▪ *2030 Avg. Annual Delivery Target:* Less ▪ *Supply Sources*: Same ▪ *Additional Tuolumne River diversion*: Less ▪ *Level of Rationing*: Same ▪ *Facility projects*: Same	▪ Growth inducement potential and associated secondary effects of growth ▪ Impacts on Pilarcitos Creek
Aggressive Conservation/Water Recycling and Local Groundwater – The SFPUC would implement all of the proposed WSIP facility improvement projects and endeavor to serve the projected 2030 delivery target of 300 mgd solely through additional conservation, water recycling, and local groundwater projects. A maximum of 19 mgd of the 25 mgd projected annual average increase in purchase requests might be met through such local projects, as feasible. Since this alternative would not meet the full 2030 customer purchase request, the SFPUC would have to either (a) limit future deliveries to the level that can be met under this alternative (estimated to be 294 mgd or less) or (b) supplement supply to make up the delivery shortfall. Two variations of this alternative are evaluated as follows: ***No Supplemental Tuolumne River Supply*** – The SFPUC would not provide supplemental water from the Tuolumne River to augment this alternative to meet the 2030 customer purchase requests of 300 mgd. ***With Supplemental Tuolumne River Supply*** – The SFPUC would supplement this alternative with additional Tuolumne River diversions under its existing water rights.	***No Supplemental Tuolumne River Supply*** ▪ *2030 Avg. Annual Delivery Target:* Less ▪ *Supply Sources*: More recycled water and local groundwater. No additional Tuolumne River; no dry-year water transfer; no Westside Groundwater Basin ▪ *Additional Tuolumne River diversion*: None ▪ *Level of Rationing*: Requires greater than 20 percent rationing ▪ *Facility projects*: Same ***With Supplemental Tuolumne River Supply*** ▪ *2030 Avg. Annual Delivery Target:* Same ▪ *Supply Sources*: More recycled water and local groundwater. Less additional Tuolumne River; no dry-year water transfer; no Westside Groundwater Basin ▪ *Additional Tuolumne River diversion*: Less ▪ *Level of Rationing*: Same	▪ Impacts on the Tuolumne River, Alameda Creek and Peninsula Watershed water resources including Pilarcitos Creek

TABLE 9-3 (continued)
SELECTED ALTERNATIVES FOR CEQA ANALYSIS

Alternative / Description	How Does This Alternative Differ From The WSIP?	What WSIP Impacts Is The Alternative Intended to Address?
Lower Tuolumne River Diversion – The SFPUC would implement all of the proposed WSIP facility improvement projects and would serve the projected increase in customer purchase requests through 2030 through diversions on the lower Tuolumne River per an agreement with the Turlock and Modesto Irrigation Districts (TID and MID) and construction of conveyance and treatment facilities to blend the new supply into the regional system.	▪ *2030 Avg. Annual Delivery Target:* Same ▪ *Supply Sources*: Same but new Tuolumne River diversion point ▪ *Additional Tuolumne River diversion*: Same ▪ *Level of Rationing*: Same ▪ *Facility projects*: More	▪ Impacts on the Tuolumne River
Year-round Desalination at Oceanside – The SFPUC would implement all of the proposed WSIP facility improvement projects and construct a 25-mgd desalination plant in San Francisco at Oceanside to serve the projected increase in customer purchase requests through 2030. The plant would provide year-round supplies during all hydrologic year types to blend into the regional system.	▪ *2030 Avg. Annual Delivery Target:* Same ▪ *Supply Sources*: Desalinated seawater ▪ *Additional Tuolumne River diversion*: None ▪ *Level of Rationing*: Same ▪ *Facility projects*: More	▪ Impacts on the Tuolumne River, Alameda Creek and Peninsula watershed water resources including Pilarcitos Creek
Regional Desalination for Drought – The SFPUC would implement all of the proposed WSIP facility improvement projects and would partner with other Bay Area water agencies to develop a regional desalination plant that would provide supplemental supply to the SFPUC during drought years.	▪ *2030 Avg. Annual Delivery Target:* Same ▪ *Supply Sources*: Desalinated brackish bay water ▪ *Additional Tuolumne River diversion*: Less ▪ *Level of Rationing*: Same ▪ *Facility projects*: More	▪ Impacts on the Tuolumne River, Alameda Creek and Peninsula watershed water resources including Pilarcitos Creek
Modified WSIP – The SFPUC would implement all of the proposed facility improvement projects. This alternative would modify proposed system operations to minimize environmental effects and increase conservation, water recycling and local groundwater development as part of the water supply option.	▪ *2030 Avg. Annual Delivery Target:* Same ▪ *Supply Sources*: Additional conservation, water recycling and/or local groundwater ▪ *Additional Tuolumne River diversion*: Similar ▪ *Level of Rationing*: Same ▪ *Facility projects*: Additional regional water recycling and groundwater facilities ▪ Modifies proposed system operations	▪ Impacts on the Tuolumne River, Alameda Creek and Peninsula watershed water resources including Pilarcitos Creek and Crystal Springs Reservoir

The following series of tables provides summary information about key aspects of each alternative in comparison to the proposed WSIP and supports the description and evaluation of each of the eight alternatives that follows in this section. The tables provide summary information and evaluations that are explained in detail in the text.

Table 9-4 describes the characteristics of each of these alternatives in comparison with existing conditions and the proposed program. **Table 9-5** indicates the estimated average annual diversions from the Tuolumne River that would occur under each alternative compared to the WSIP over the modeled 82-year period of hydrologic record and presents estimates of the extent of drought-year shortages associated with each alternative based on modeling results. Two estimates of drought-year shortages are presented. First presented is the total number of years over the modeled 82-year hydrologic record that there would be shortages of 10, 20, and/or greater than 20 percent. Second, the table shows the number of years during the 8.5-year design drought that shortages of 10, 20, or greater than 20 percent would occur. The information in these two tables is used to evaluate how each alternative performs with respect to some of the key level of service goals and system performance objectives established for the WSIP. This information is also used in the subsequent discussion of the extent to which each alternative meets the program objectives. **Table 9-6** summarizes the ability of each alternative to meet the objectives established by the SFPUC for the WSIP. This table uses the following terms to simplify and abbreviate the detailed information provided on each alternative in the following sections:

> "Yes" indicates that an alternative fully meets one of the specific sub-objectives.
>
> "No" indicates that an alternative does not meet the sub-objective.
>
> "Partial" indicates that an alternative could meet the sub-objective in part but it would not fully meet the sub-objective of a level of service equivalent to the WSIP; this may be because the alternative would only serve a reduced 2030 delivery target, and/or would increase the facility requirements.
>
> "Uncertain" reflects the fact that there are questions about supply availability and reliability in addition to outstanding feasibility, cost, regulatory and public acceptance issues.

With respect to environmental impacts, **Tables 9-7**, **9-8**, and **9-9** summarize the comparison of significant water supply and system impacts (identified in Chapter 5) between the proposed WSIP and each alternative. No tables are used to illustrate how the alternatives compare to the WSIP in terms of impacts resulting from facility improvement projects or growth inducement potential and the associated secondary effects of growth, but these topics are evaluated for each alternative in the following text.

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TABLE 9-4
DESCRIPTION OF CEQA ALTERNATIVES

					Aggressive Conservation/Water Recycling and Local Groundwater Alternative					
Program Element	**Existing Condition**	**Proposed Program**	**No Program Alternative**	**No Purchase Request Increase Alternative**	**No Supplemental Tuolumne River Water**	**With Supplemental Tuolumne River Water**	**Lower Tuolumne River Diversion Alternative**	**Year-round Desalination at Oceanside Alternative**	**Regional Desalination for Drought Alternative (Variant 2)**	**Modified WSIP Alternative**
Planning Year	2005	2030	2030	2030	2030	2030	2030	2030	2030	2030
Target Delivery Level (annual average)	265 mgd	300 mgd	300 mgd	275 mgd	300 mgd	300 mgd	300 mgd	300 mgd	300 mgd	300 mgd
Water Supply Sources (during nondrought and drought periods)	▪ Local watersheds (with Calaveras and Lower Crystal Springs Reservoirs operating at reduced levels based on Division of Safety of Dams restrictions) ▪ Tuolumne River	▪ Local watersheds (with Calaveras and Lower Crystal Springs Reservoirs restored) ▪ Tuolumne River, with increased average annual diversions ▪ Recycled water/ groundwater/additional conservation in San Francisco, 10 mgd	▪ Local watersheds (with Calaveras and Lower Crystal Springs Reservoirs restored) ▪ Tuolumne River, with increased average annual diversions	▪ Local watersheds (with Calaveras and Lower Crystal Springs Reservoirs restored) ▪ Tuolumne River, with increased average annual diversions ▪ Recycled water/ groundwater/additional conservation in San Francisco, 10 mgd ▪ *Wholesale customers expected to pursue supplemental supply or conservation to make up for 2030 supply shortfall*	▪ Local watersheds (with Calaveras and Lower Crystal Springs Reservoirs restored) ▪ Tuolumne River, with no increase in average annual diversions ▪ Recycled water/ groundwater/additional conservation in San Francisco, 10 mgd ▪ Regional recycled water/ groundwater/ conservation in service area outside of San Francisco, 19 mgd ▪ *Wholesale customers expected to pursue supplemental supply (e.g., water transfer) to make up for 2030 supply shortfall*	▪ Local watersheds (with Calaveras and Lower Crystal Springs Reservoirs restored) ▪ Tuolumne River (during nondrought years), with increased average annual diversions ▪ Recycled water/ groundwater/additional conservation in San Francisco, 10 mgd ▪ Regional recycled water/ groundwater/ conservation in service area outside of San Francisco, 19 mgd ▪ *Wholesale customers expected to pursue supplemental supply (e.g., water transfer) to make up for 2030 supply shortfall*	▪ Local watersheds (with Calaveras and Lower Crystal Springs Reservoirs restored) ▪ Tuolumne River, with increased average annual diversions ▪ Recycled water/ groundwater/additional conservation in San Francisco, 10 mgd	▪ Local watersheds (with Calaveras and Lower Crystal Springs Reservoirs restored) ▪ Tuolumne River, with no increase in average annual diversion ▪ Recycled water/ groundwater/additional conservation in San Francisco, 10 mgd ▪ Potable water from SFPUC desalination plant	▪ Local watersheds (with Calaveras and Lower Crystal Springs Reservoirs restored) ▪ Tuolumne River, with increased average annual diversions ▪ Recycled water/ groundwater/additional conservation in San Francisco, 10 mgd	▪ Local watersheds (with Calaveras and Lower Crystal Springs Reservoirs restored, but with managed use of the restored historical capacity of Lower Crystal Springs Reservoir) ▪ Tuolumne River, with increased average annual diversions ▪ Recycled water/ groundwater/additional conservation in San Francisco, 10 mgd ▪ 5 – 10 mgd of regional recycled water / groundwater / conservation in regional service area
Supplemental Dry-Year Water Supply Sources (for implementation during drought periods only)	None	▪ Additional Tuolumne River diversions from Turlock and Modesto Irrigation District (TID and MID) transfers of 23 mgd (average over design drought) ▪ Westside Basin conjunctive use, 6 mgd (average over design drought)	None ▪ *Wholesale customers expected to pursue supplemental dry-year supply (e.g., water transfer) to make up for drought period supply shortfalls*	▪ Additional Tuolumne River diversions from TID and MID transfers of 1 mgd (average over design drought) ▪ Westside Basin conjunctive use, 6 mgd (average over design drought) ▪ *Wholesale customers expected to pursue supplemental dry-year supply (e.g., water transfer) to make up for drought period supply shortfalls*	None ▪ *Wholesale customers expected to pursue supplemental dry-year supply (e.g., water transfer) to make up for drought period supply shortfalls*	None ▪ *Wholesale customers expected to pursue supplemental dry-year supply (e.g., water transfer) to make up for drought period supply shortfalls*	▪ Additional Tuolumne River diversions from TID and MID transfers of 23 mgd ▪ Westside Basin conjunctive use, 6 mgd (average over design drought)	▪ Westside Basin conjunctive use, 6 mgd (average over design drought)	▪ Potable water from regional desalination plant, 23 mgd (average over design drought) ▪ Westside Basin conjunctive use, 6 mgd (average over design drought)	▪ Additional Tuolumne River diversions from TID and MID transfers of 23 mgd – conserved water only[1] ▪ Westside Basin conjunctive use, 6 mgd (average over design drought)
Maximum Drought Rationing Policy	No defined limit, but assumed incidental rationing of up to 25%	20%	No defined limit, but assumes 30% would be needed during design drought conditions	20% at reduced target delivery level	25%	20%	20%	20%	20%	20%
System Firm Yield	219 mgd	256 mgd	226 mgd	233 mgd	226 mgd	226 mgd	256 mgd	256 mgd	256 mgd	~ 256 mgd
WSIP PEIR Facility Improvement Projects	None	All projects	▪ Advanced Disinfection (SJ-1) ▪ Alameda Creek Fishery Enhancement (SV-1) ▪ Calaveras Dam Replacement (SV-2) ▪ SVWTP – Treated Water Reservoirs (SV-5)	All projects, but facilities reevaluated and sized appropriately for a reduced target delivery level	All projects, but facilities reevaluated and sized appropriately for a reduced target delivery level	All projects, but facilities reevaluated and sized appropriately given the different supply sources	All projects, but facilities reevaluated and sized appropriately given the different supply sources	All projects, but facilities reevaluated and sized appropriately given the different supply sources	All projects	All projects

TABLE 9-4 (Continued)
DESCRIPTION OF CEQA ALTERNATIVES

Program Element	Existing Condition	Proposed Program	No Program Alternative	No Purchase Request Increase Alternative	Aggressive Conservation/Water Recycling and Local Groundwater Alternative: No Supplemental Tuolumne River Water	Aggressive Conservation/Water Recycling and Local Groundwater Alternative: With Supplemental Tuolumne River Water	Lower Tuolumne River Diversion Alternative	Year-round Desalination at Oceanside Alternative	Regional Desalination for Drought Alternative (Variant 2)	Modified WSIP Alternative
WSIP PEIR Facility Improvement Projects (cont.)			▪ Lower Crystal Springs Dam Improvements (PN-4)							
Other Facility Improvements	None	None	None by the SFPUC *Wholesale customers expected to develop other facilities or projects to secure supplemental supply to improve water supply reliability, including drought supplies*	None by the SFPUC *Wholesale customers expected to develop other facilities or projects to meet additional demands*	Additional regional and local recycled water and groundwater projects in the wholesale customer service area, outside of San Francisco. *Wholesale customers expected to develop other facilities or projects to meet additional demands*	Additional regional and local recycled water and groundwater projects in the wholesale customer service area, outside of San Francisco	▪ Intake pipeline in lower Tuolumne River and pumping plant ▪ 2.5-mile raw water pipeline ▪ Lower Tuolumne River water treatment plant ▪ Treated water pump station	▪ SFPUC desalination plant in San Francisco and associated seawater intake structure, intake pipeline, pump stations, and treatment facilities ▪ Treated water pump station ▪ 2.4-mile treated water pipeline	▪ Bay Area regional desalination plant(s) and associated pumping plant(s) and pipelines needed for intertie facilities	▪ Alameda Creek bypass structure ▪ Additional facilities for regional recycled water/ groundwater/ conservation projects in the wholesale service area
Delivery, Operations, and Maintenance	As described in Chapter 2, Section 2.3	Improved to meet WSIP goals and objectives (as described in Chapter 3, Section 3.8)	Similar to existing conditions, except increased frequency of shortages and need for rationing; during drought years, rationing could be up to 30% Lack of comprehensive maintenance program and likely increased emergency repairs and replacement projects.	Similar to proposed program (but adjusted for the reduced target delivery level)	Similar to proposed program, except increased water demands served with regional recycled water, conservation and groundwater projects that would require operation and maintenance by wholesale customers in coordination with the SFPUC	Similar to proposed program, except increased water demands served with regional recycled water, conservation and groundwater projects that would require operation and maintenance by wholesale customers in coordination with the SFPUC	Similar to proposed program, except for additional operation and maintenance requirements for lower Tuolumne River diversion, conveyance, treatment, and blending facilities.	Similar to proposed program, except for additional operation and maintenance requirements for desalination and blending facilities. Customers on the westside of San Francisco would receive predominantly desalinated water.	Same as proposed program except for participation in additional operation and maintenance requirements for regional desalination facilities and any interties or transfers among the participating agencies.	Similar to proposed program, but with modified operations, specifically at the Alameda Creek Diversion Tunnel and at Crystal Springs Reservoir
Permits, Approvals, and other Decisions/Actions	As described in Chapter 2, Sections 2.4 and 2.5	▪ San Francisco Planning Commission certifies final PEIR ▪ SFPUC adopts CEQA findings/mitigation monitoring and reporting program and approves and adopts the WSIP ▪ Water transfer agreements with TID and MID ▪ Operating agreements with Daly City, San Bruno, and California Water Service Company for Westside Basin conjunctive-use program ▪ Water sales agreements with retail and wholesale customers (see Chapter 3, Section 3.13)	Same as existing conditions, except SFPUC would be required to submit an explanation describing reason for change in the proposed program to the California Department of Health Service and Seismic Safety Commission for AB 1823 compliance	Same as proposed program except: ▪ Transfer agreements with TID and MID for 1 mgd instead of 23 mgd during drought years ▪ Agreements with California Department of Health Services for any new drinking water sources developed by wholesale customers that would be introduced into the regional system	Same as proposed program except: ▪ Addition of various permits and agreements with wholesale customers to develop and implement recycled water, conservation, and groundwater projects ▪ No agreements with Daly City, San Bruno, and California Water Service. There would be no Westside Basin conjunctive-use program ▪ No water transfer agreements with TID and MID ▪ Agreements with California Department of Health Services for any new drinking water sources	Same as proposed program except: ▪ Addition of various permits and agreements with wholesale customers to develop and implement recycled water, conservation, and groundwater projects ▪ No agreements with Daly City, San Bruno, and California Water Service, There would be no Westside Basin conjunctive-use program ▪ No water transfer agreements with TID and MID ▪ Agreements with California Department of Health Services for any new drinking water sources	Same as proposed program except: ▪ The State Water Resources Control Board could require additional water appropriation permit or license ▪ Right-of-way purchase and permits to construct pipelines through levees, access the river, and protect the river and fish ▪ Agreement/coordination with TID/MID regarding operational schedule for releases at La Grange Dam ▪ Agreements with California Department of Health Services for any new drinking water sources	Same as proposed program except: ▪ Brine disposal would require a National Pollutant Discharge Elimination System permit ▪ Watershed sanitary survey needed, in accordance with California Department of Health regulations ▪ Impingement and entrainment study for the California Coastal Commission would be required to determine impacts on aquatic resources ▪ Project review and approval by the U.S. Army Corps of Engineers ▪ Agreements with California Department of Health Services for any new drinking water sources. ▪ No water transfer agreements with TID and MID	Same as proposed program except: ▪ Agreements with partners in Bay Area regional desalination project ▪ See Table 8.4 for a list of potential permits for the Bay Area regional desalination plant ▪ No water transfer agreements with TID and MID ▪ Agreements with California Department of Health Services for any new drinking water sources	Same as proposed program except: ▪ Agreements for participation in regional recycled water / conservation/ local groundwater projects that could offset SFPUC supply

Italic text indicates expected action by wholesale customers.

[1] In this alternative the water transfer of conserved water would be acquired for use every year, not just for dry-year supplement; this would avoid all impacts below La Grange Dam associated with the SFPUC's increased diversion of Tuolumne River water.

SOURCE: SFPUC, 2007b.

TABLE 9-5
AVERAGE ANNUAL TUOLUMNE RIVER DIVERSIONS AND DROUGHT-YEAR SHORTAGES FOR THE CEQA ALTERNATIVES (2030)

	Estimated Tuolumne River Diversions Over the 82-Year Period of Hydrologic Record		**Drought-Year Shortages Based on 82-Year Period of Hydrologic Record**				**Drought-Year Shortages During Design Drought (8.5 years)**		
Program/Alternative	Average Annual Increase by the SFPUC[1] (mgd)	Average Annual Diversions by the SFPUC (mgd)	Years of Shortages (10% Shortage)	Years of Shortages (20% Shortage)	Years of Shortages >20% Shortage)	No. of Years Drought-Year Supplies Triggered	Years of Shortages (10% Shortage)	Years of Shortages (20% Shortage)	Years of Shortages (25% to 30% Shortage)
Existing Conditions	N/A	218	6 out of 82 (1 in 14 years)	8 out of 82 (1 in 10 years)	None	N/A	1	5	1.5
Proposed Program	27	245	6 out of 82 (1 in 14 years)	2 out of 82 (1 in 41 years)	None	24	3	3.5	None
No Program Alternative	8	226	24 out of 82 (1 in 3 years)	10 out of 82 (1 in 8 years)	8 out of 82 (1 in 10 years)	No drought supplies. Rationing would be needed 42 out of 82 years	0	1	6.5
No Purchase Request Increase Alternative	3	221	9 out of 82 (1 in 9 years)	2 out of 82 (1 in 41 years)	None	17	3	3.5	None
Aggressive Conservation/Water Recycling and Local Groundwater Alternative – No Supplemental Tuolumne River Water	0	218	N/A	N/A	15 at 25%	There are no supplemental drought supplies	N/A	N/A	7.5
Aggressive Conservation/Water Recycling and Local Groundwater Alternative – With Supplemental Tuolumne River Water	5	223	7 out of 82 (1 in 12 years)	8 out of 82 (1 out of 10 years)	None	There are no supplemental drought supplies	1	6.5	None
Lower Tuolumne River Diversion	27	245	6 out of 82 (1 in 14 years)	2 out of 82 (1 in 41 years)	None	24	3	3.5	None
Year-round Desalination at Oceanside Alternative	0	218	6 out of 82 (1 in 14 years)	2 out of 82 (1 in 41 years)	None	24	3	3.5	None
Regional Desalination for Drought Alternative (Variant 2)	20	238	6 out of 82 (1 in 14 years)	2 out of 82 (1 in 41 years)	None	23	3	3.5	None
Modified WSIP Alternative (assumes no reduction in WSIP levels of service performance	~27	~245	Approximately the same as the WSIP				Approximately the same as the WSIP		None

[1] Represents the difference in average annual diversion modeled over 82-year historical hydrology, but does not represent year-to-year variation. Thus, even with zero average annual increase in diversions, there would still be year-to-year variations in diversions compared to the existing condition due primarily to modified system operations for maintenance and implementation of the conjunctive use program.

TABLE 9-6
SUMMARY OF ABILITY OF ALTERNATIVES TO MEET PROGRAM OBJECTIVES[1]

Objectives	Proposed Program	No Program Alternative	No Purchase Request Increase Alternative	Aggressive Conservation/Water Recycling and Local Groundwater Alternative		Lower Tuolumne River Diversion Alternative	Year-round Desalination at Oceanside Alternative	Regional Desalination for Drought Alternative	Modified WSIP Alternative
				No Supplemental Tuolumne River Water	With Supplemental Tuolumne River Water				
Water Quality									
Design improvements to meet current and foreseeable future federal and state water quality requirements?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Provide clean, unfiltered water originating from Hetch Hetchy Reservoir and filter all other surface water sources?	Yes	Yes	Yes	Yes	Yes	Partial	Yes	Yes	Yes
Continue to implement watershed protection measures?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Seismic Reliability									
Complies with current seismic standards?	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Capable of delivering basic service to all regions in the service area following a major earthquake?	Yes	No	Partial	Uncertain	Uncertain	Uncertain	Yes	Yes	Yes
Facilities restored to meet average-day demand within 30 days of a major earthquake?	Yes	No	Partial	Partial	Partial	Partial	Yes	Yes	Yes
Delivery Reliability									
Provides operational flexibility to allow for planned maintenance without service interruptions?	Yes	No	Yes	Yes	Yes	Partial	Partial	Yes	Yes
Provides operational flexibility and system capacity to replenish local reservoirs, as needed?	Yes	No	Yes	Uncertain	Uncertain	Uncertain	Yes	Yes	Yes
Capable of minimizing risk of service interruption due to unplanned facility upsets or outages?	Yes	No	Yes	Uncertain	Uncertain	Uncertain	Yes	Yes	Yes

TABLE 9-6 (continued)
SUMMARY OF ABILITY OF ALTERNATIVES TO MEET PROGRAM OBJECTIVES

Objectives	Proposed Program	No Program Alternative	No Purchase Request Increase Alternative	Aggressive Conservation/Water Recycling and Local Groundwater Alternative: No Supplemental Tuolumne River Water	Aggressive Conservation/Water Recycling and Local Groundwater Alternative: With Supplemental Tuolumne River Water	Lower Tuolumne River Diversion Alternative	Year-round Desalination at Oceanside Alternative	Regional Desalination for Drought Alternative	Modified WSIP Alternative
Delivery Reliability (cont.)									
Capable of serving average 2030 demand of 300 mgd with one planned shutdown of a major facility and one unplanned facility outage?	Yes	No	Partial	Uncertain	Uncertain	Uncertain	Yes	Yes	Yes
Water Supply									
Meets average annual purchase requests of 300 mgd during nondrought years for system demands through 2030?	Yes	Partial	No, 275 mgd	No, 294 mgd	Yes	Yes	Yes	Yes	Yes
Meets 20% systemwide rationing limit during droughts?	Yes	No	Partial	No	Uncertain	Yes	Yes	Yes	Yes
Meets system firm yield of 256 mgd?	Yes	No	No	No	No	Yes	Yes	Yes	Yes
Diversifies water supply options during nondrought and drought periods?	Yes	No	Yes	Partial	Partial	Yes	Yes	Yes	Yes
Improves use of new water sources and drought management, including use of groundwater, recycled water, conservation, and transfers?	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sustainability									
Manages natural resources and physical systems to protect watershed ecosystems?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Meets current and anticipated legal requirements for protection of fish and other wildlife habitat?	Yes	Yes	Yes	Yes	Yes	Uncertain	Uncertain	Uncertain	Yes
Manages natural resources and physical systems to protect public health and safety?	Yes	No	Yes	Yes	Yes	Uncertain	Uncertain	Uncertain	Yes

TABLE 9-6 (continued)
SUMMARY OF ABILITY OF ALTERNATIVES TO MEET PROGRAM OBJECTIVES

Objectives	Proposed Program	No Program Alternative	No Purchase Request Increase Alternative	Aggressive Conservation/Water Recycling and Local Groundwater Alternative: No Supplemental Tuolumne River Water	Aggressive Conservation/Water Recycling and Local Groundwater Alternative: With Supplemental Tuolumne River Water	Lower Tuolumne River Diversion Alternative	Year-round Desalination at Oceanside Alternative	Regional Desalination for Drought Alternative	Modified WSIP Alternative
Cost-effectiveness									
Ensure cost-effective use of funds?	Yes	No and likely greater cost	Unknown, but greater cost	Unknown, but greater cost	Unknown, but greater cost	Unknown, but greater cost	Unknown, but greater cost	Unknown, but greater cost	Same, but greater cost
Maintains gravity-driven system?	Yes	Yes	Yes	Partial	Partial	Partial	Partial	Partial	Partial
Implement regular inspection and` maintenance program for all facilities?	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes

NOTES: 1. This assessment is based on SFPUC actions under each alternative only and does not account for the actions that BAWSCA and/or the wholesale customers might take in order to make up for any shortfall in the regional system's ability to meet the program objectives. See text for full discussion of ability of each alternative to meet objectives. In general, the terms in the table are used as follows:

Yes: Indicates that the alternative would fully meet the sub-objective at an equivalent level to the WSIP.

Partial: Indicates that the alternative could meet the objective in part, but it would not fully meet the objective at an equivalent level to the WSIP, due to variation associated with an alternative such as the reduced delivery targets, increased facility requirements and associated issues.

No: Indicates the alternative would not meet the sub-objective.

Uncertain: Indicates that there are outstanding questions regarding supply availability and reliability; feasibility, cost or other issues that require further study; and/or institutional, regulatory or permitting issues to be resolved.

TABLE 9-7
SUMMARY OF SIGNIFICANT WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR CEQA ALTERNATIVES – TUOLUMNE RIVER WATERSHED

Impact	Proposed Program	No Program Alternative	No Purchase Request Increase Alternative	Aggressive Conservation/Water Recycling and Local Groundwater Alternative		Lower Tuolumne River Diversion Alternative	Year-round Desalination at Oceanside Alternative	Regional Desalination for Drought Alternative	Modified WSIP Alternative
				No Supplemental Tuolumne River Water	**With Supplemental Tuolumne River Water**				
Section 5.3.6, Fisheries									
Impact 5.3.6-4: Effects on fishery resources along the Tuolumne River below La Grange Dam									
	In wet or above-normal years when Don Pedro Reservoir is being filled, changes in the timing and duration of releases from the reservoir would decrease average monthly flows along the lower Tuolumne River beneath La Grange Dam. The greatest average flow reductions would occur during June and could potentially result in elevated water temperatures. Changes to stream flow and water temperature would result in a reduction in the linear extent of suitable habitat for rearing Chinook salmon and oversummering steelhead/rainbow trout, potentially adversely affecting these fish populations in the lower Tuolumne River. (PSM)	Similar to but less than proposed program. (PSM)	Similar to but much less than proposed program. (LS)	Similar to existing condition. (LS)	Similar to but much less than proposed program. (LS)	Similar to proposed program. (PSM)	Similar to existing condition. (LS)	Similar to but less than proposed program (PSM)	Similar to existing condition (LS)
Section 5.3.7, Terrestrial Biological Resources									
Impact 5.3.7-2: Impacts on meadow / alluvial features along the Tuolumne River below O'Shaughnessy Dam									
▪ Sensitive habitats	Delayed snowmelt releases, reductions in flow, and the resulting reduction in groundwater recharge would result in an incremental reduction in the extent and diversity of wetland and riparian habitats, including sensitive wetland and riparian habitats in the Poopenaut Valley. (PSM)	Similar to but less than proposed program. (PSM)	Similar to but less than proposed program. (PSM)	Similar to but less than proposed program. (PSM)	Similar to but less than proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to but less than proposed program. (PSM)	Similar to proposed program (PSM)	Similar to proposed program (PSM)
▪ Key special status species	A reduction in wetland and riparian habitat would reduce suitable breeding habitat for key special-status species potentially occurring along this reach (e.g., foothill yellow-legged frog, California red-legged frog, and willow flycatcher), the populations of which are already critically reduced in the Sierra Nevada. (PSM)	Similar to but less than proposed program. (PSM)	Similar to but less than proposed program. (PSM)	Similar to but less than proposed program. (PSM)	Similar to but less than proposed program. (PSM)	Similar proposed program. (PSM)	Similar to but less than proposed program. (PSM)	Similar to proposed program (PSM)	Similar to proposed program (PSM)
▪ Other species of concern	A reduction in the extent and diversity of wetland and riparian habitats would reduce habitat quality and extent for animal and plant species of concern. (PSM)	Similar to but less than proposed program. (PSM)	Similar to but less than proposed program. (PSM)	Similar to but less than proposed program. (PSM)	Similar to but less than proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to but less than proposed program. (PSM)	Similar to proposed program (PSM)	Similar to proposed program (PSM)
▪ Common habitats and species	All habitats affected by the WSIP are considered sensitive. A large number of common animal species depend on sensitive meadows and larger riparian areas potentially affected by the WSIP for food and cover. (PSM)	Similar to but less than proposed program. (PSM)	Similar to but less than proposed program. (PSM)	Similar to but less than proposed program. (PSM)	Similar to but less than proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to but less than proposed program. (PSM)	Similar to proposed program (`PSM)	Similar to proposed program (PSM)
Impact 5.3.7-6: Impacts on biological resources along Tuolumne River below La Grange Dam									
▪ Sensitive habitats	Delayed spring releases and reductions in average and total flow (particularly during and following an extended drought) below La Grange Dam would reduce or eliminate suitable conditions for recruitment of some riparian species along the river. (PSM)	Similar to but less than proposed program. (PSM)	Similar to but much less than proposed program. (LS)	Similar to existing condition. (LS)	Similar to but much less than proposed program. (LS)	Similar to proposed program. (PSM)	Similar to existing condition. (LS)	Similar to but less than proposed program (PSM)	Similar to existing condition (LS)
▪ Key special status species	Because of the known presence of key special-status species and the very limited amount of remaining suitable habitat along this reach of the Tuolumne River, this incremental impact would be potentially significant. (PSM)	Similar to but less than proposed program. (PSM)	Similar to but much less than proposed program. (LS)	Similar to existing condition. (LS)	Similar to but much less than proposed program. (LS)	Similar to proposed program. (PSM)	Similar to existing condition. (LS)	Similar to but less than proposed program (PSM)	Similar to existing condition (LS)
▪ Other species of concern	Species of concern that would be adversely affected by changes in the extent and quality of suitable riparian habitat include western pond turtle, several bat species, and a wide variety of riparian- and marsh-associated bird species. (PSM)	Similar to but less than proposed program. (PSM)	Similar to but much less than proposed program. (LS)	Similar to existing condition. (LS)	Similar to but much less than proposed program. (LS)	Similar to proposed program. (PSM)	Similar to existing condition. (LS)	Similar to but less than proposed program (PSM)	Similar to existing condition (LS)
▪ Common habitats and species	The populations of common species that depend on riparian habitat could be adversely affected by the alteration of habitat. (PSM)	Similar to but less than proposed program. (PSM)	Similar to but much less than proposed program. (LS)	Similar to existing condition. (LS)	Similar to but much less than proposed program. (LS)	Similar to proposed program. (PSM)	Similar to existing condition. (LS)	Similar to but less than proposed program (PSM)	Similar to existing condition (LS)

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SU or PSU = Significant Unavoidable or Potentially Significant Unavoidable, cannot be mitigated to less than significant

TABLE 9-8
SUMMARY OF SIGNIFICANT WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR CEQA ALTERNATIVES – ALAMEDA WATERSHED

Impact	Proposed Program	No Program Alternative	No Purchase Request Increase Alternative	Aggressive Conservation/Water Recycling and Local Groundwater Alternative		Lower Tuolumne River Diversion Alternative	Year-round Desalination at Oceanside Alternative	Regional Desalination for Drought Alternative	Modified WSIP Alternative
				No Supplemental Tuolumne River Water	With Supplemental Tuolumne River Water				
Section 5.4.1, Stream Flow and Reservoir Water Levels									
Impact 5.4.1-2: Effects on flow along Alameda Creek below diversion dam.									
	In all year types, system operations under the WSIP would increase diversions from Alameda Creek to Calaveras Reservoir between the months of December and May, nearly eliminating low and moderate (1 to 650 cubic feet per second) flows in Alameda Creek downstream of the diversion dam and substantially reducing many higher (greater than 650 cubic feet per second) flows that have occurred since 2002. The resultant reduction in stream flows and alteration of the stream hydrograph is considered an adverse effect. (SU)	Similar to proposed program, but winter diversions from Alameda Creek would be greater. (SU)	Similar to proposed program, but winter diversions would be slightly less. (SU)	Similar to proposed program, but winter diversions would be slightly less. (SU)	Similar to proposed program, but winter diversions would be slightly less. (SU)	Similar to proposed program. (SU)	Similar to proposed program. (SU)	Similar to proposed program (SU)	Similar to proposed program (SU)
Section 5.4.5, Fisheries									
Impact 5.4.5-3: Effects on fishery resources.									
	Following implementation of the Calaveras Dam Replacement project (SV-2), operation of Calaveras Reservoir and the Alameda Creek Diversion Dam would be restored to pre-2002 conditions. A substantial increase in diversions from Alameda Creek to Calaveras Reservoir would reduce flows in this stretch of the creek. Diversion of most or all flows during late winter and spring months would reduce the ability of resident rainbow trout to spawn and for eggs to incubate. In addition, the increased diversion of flows to the reservoir would divert fish from Alameda Creek to the reservoir, prevent fish passage to downstream reaches of the creek, and increase the potential for fish entrainment since there are currently no screens on the diversion. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program (PSM)	Much less than proposed program (LS)
Section 5.4.6, Terrestrial Biological Resources									
Impact 5.4.6-1: Impacts on riparian habitat and related biological resources in Calaveras Reservoir.									
▪ Sensitive Habitats	Increased reservoir storage elevations would result in inundation and permanent loss of seasonal wetlands, seeps, perennial freshwater marsh, and riparian habitat that have established since 2002. (PSM)	Same as proposed program. (PSM)	Same as proposed program. (PSM)	Same as proposed program. (PSM)	Same as proposed program. (PSM)	Same as proposed program. (PSM)	Same as proposed program. (PSM)	Same as proposed program (PSM)	Same as proposed program (PSM)
▪ Key Special Status species	Since 2002, yellow-legged frogs have occupied approximately 10,000 linear feet of stream channel along Arroyo Hondo between the maximum reservoir elevation mandated by the Division of Safety of Dams and the spillway elevation. Higher maintained reservoir levels would reduce the length of this high-quality habitat along the creek and adversely affect existing populations of foothill yellow-legged frog. (PSM)	Same as proposed program. (PSM)	Same as proposed program. (PSM)	Same as proposed program. (PSM)	Same as proposed program. (PSM)	Same as proposed program. (PSM)	Same as proposed program. (PSM)	Same as proposed program (PSM)	Same as proposed program (PSM)
Impact 5.4.6-2: Effects on riparian habitat and related biological resources along Alameda Creek from below the diversion dam to the confluence with Calaveras Creek.									
▪ Key special status species	A reduction in the frequency, duration, and magnitude of flows below the diversion dam would reduce the total available aquatic breeding habitat and food sources for California red-legged frog and foothill yellow-legged frog populations that currently occupy this reach of Alameda Creek. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program (PSM)	Similar to proposed program (PSM)
Impact 5.4.6-3: Effects on riparian habitat and related biological resources along Calaveras Creek from Calaveras Reservoir to the confluence with Alameda Creek.									
▪ Key special status species	Future outlet works at Calaveras Dam would have the capacity to make higher volume releases than under existing conditions. Depending on the timing and volume of operational releases, they could adversely affect the reproductive success of special-status amphibian species along this reach (e.g., California red-legged frog and foothill yellow-legged frog). (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program (PSM)	Similar to proposed program (PSM)
Impact 5.4.6-4: Effects on riparian habitat and related biological resources along Alameda Creek from Calaveras Creek to San Antonio Creek,									
▪ Key special status species	Depending on annual rainfall and localized site conditions along this creek segment, changes in winter and summer flows along this reach could result in both beneficial and adverse impacts on habitat for California red-legged frog and foothill yellow-legged frog populations. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program (PSM)	Similar to proposed program (PSM)

TABLE 9-8 (continued)
SUMMARY OF SIGNIFICANT WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR CEQA ALTERNATIVES – ALAMEDA WATERSHED

Impact	Proposed Program	No Program Alternative	No Purchase Request Increase Alternative	Aggressive Conservation/Water Recycling and Local Groundwater Alternative: No Supplemental Tuolumne River Water	Aggressive Conservation/Water Recycling and Local Groundwater Alternative: With Supplemental Tuolumne River Water	Lower Tuolumne River Diversion Alternative	Year-round Desalination at Oceanside Alternative	Regional Desalination for Drought Alternative	Modified WSIP Alternative
Section 5.4.7, Recreational and Visual Resources									
Impact 5.4.7-1: Effects on recreation									
	Operations under the WSIP would substantially reduce flows along Alameda Creek in the Sunol Regional Wilderness during winter and early spring months and adversely affect the recreational experience of hikers; however, with the changes in project description for the Calaveras Dam Replacement (SV-2) project, bypass flows would be reduced from the diversion dam when flows are present. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)	Same as proposed program (LS)	Same as proposed program (LS)
Impact 5.4.7-2: Visual effects									
	WSIP-induced reductions in stream flows along Alameda Creek would substantially change the quality of visual resources in the Sunol Regional Wilderness; however, with the changes in project description for the Calaveras Dam Replacement (SV-2) project, bypass flows would be reduced from the diversion dam when flows are present. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)	Same as proposed program. (LS)	Same as proposed program (LS)	Same as proposed program (LS)

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TABLE 9-9
SUMMARY OF SIGNIFICANT WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR CEQA ALTERNATIVES – PENINSULA WATERSHED

Impact	Proposed Program	No Program Alternative	No Purchase Request Increase Alternative	Aggressive Conservation/Water Recycling and Local Groundwater Alternative: No Supplemental Tuolumne River Water	Aggressive Conservation/Water Recycling and Local Groundwater Alternative: With Supplemental Tuolumne River Water	Lower Tuolumne River Diversion Alternative	Year-round Desalination at Oceanside Alternative	Regional Desalination for Drought Alternative	Modified WSIP Alternative
Section 5.5.3, Surface Water Quality									
Impact 5.5.3-2: Water quality in Pilarcitos Reservoir									
	Proposed operations would generally be within the same range as existing conditions although replacement Measure 5.5.3-2a would cause Pilarcitos Reservoir to be drawn down earlier in the summer compared to existing conditions. Water temperature could increase and dissolved oxygen content could be reduced. During dry years, summertime releases from Pilarcitos Reservoir to Pilarcitos Creek would be eliminated or reduced to a low level for a longer period of time with the WSIP, which would increase the temperature of instream flows between Pilarcitos Creek and Stone Dam and reduce the creek's ability to support designated cold freshwater habitat along this reach. (PSM)	Similar to proposed program. (PSM)	Similar to but much less than proposed program. (LS)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program (PSM)	Similar to but much less than proposed program (LS)
Section 5.5.5, Fisheries									
Impact 5.5.5-1: Effects on fishery resources in Crystal Springs Reservoir									
	Elevated water levels in Crystal Springs Reservoir would inundate approximately 1,500 linear feet of trout spawning habitat upstream of the reservoir along Laguna and San Mateo Creeks. (PSU)	Same as proposed program. (PSU)	Same as proposed program. (PSU)	Same as proposed program. (PSU)	Same as proposed program. (PSU)	Same as proposed program. (PSU)	Same as proposed program. (PSU)	Same as proposed program (PSU)	Similar to proposed program (PSU)
Impact 5.5.5-4: Effects on fisheries resources in Pilarcitos Reservoir									
	Proposed operations would be within the same range as existing conditions although replacement Measure 5.5.3-2a would cause Pilarcitos Reservoir to be drawn down earlier in the summer compared to existing conditions. This would reduce the volume and quality of coldwater habitat available for resident fish species. (PSM)	Similar to proposed program. (PSM)	Similar to but much less than proposed program. (LS)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program (PSM)	Similar to existing condition (LS)
Impact 5.5.5-5: Effects on fisheries resources along Pilarcitos Creek below Pilarcitos Reservoir									
	Under the WSIP, the extended period of no or very little flow in Pilarcitos Creek below Pilarcitos Reservoir during summer months of dry years would result in significant impacts on resident trout, other resident fish species and aquatic resources, and habitat quality and availability for anadromous steelhead. Increased drawdown of Pilarcitos Reservoir would increase the temperature of releases in summer and fall and reduce the quality and availability of habitat for coldwater fish species. A reduction in the frequency and magnitude of spills over Stone Dam would reduce flows along the lower reach. Reduced instream flows during winter months would adversely affect migratory fish habitat. (PSM)	Similar to proposed program. (PSM)	Similar to but less than proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program (PSM)	Similar to existing condition (LS)
Section 5.5.6, Terrestrial Biological Resources									
Impact 5.5.6-1: Impacts on biological resources in Upper and Lower Crystal Springs Reservoirs									
▪ Sensitive Habitats	Implementation of the Lower Crystal Springs Dam Improvements project (PN-4) would raise average monthly water levels in Crystal Springs Reservoir and result in a short-term reduction in the overall extent of freshwater marsh as the reservoir fills. Proposed changes in operations would maintain maximum reservoir levels during summer for longer periods than under existing conditions, which could affect the composition and structure of riparian habitats. In addition, sensitive upland habitats that are unable to tolerate these longer periods of inundation would be lost. (PSM)	Same as proposed program. (PSM)	Same as proposed program. (PSM)	Same as proposed program. (PSM)	Same as proposed program. (PSM)	Same as proposed program. (PSM)	Same as proposed program. (PSM)	Same as proposed program (PSM)	Similar to pre-1983 conditions (LS)
▪ Key special status species	Elevated reservoir levels would inundate existing populations of special-status plant species, including serpentine-associated fountain thistle and Marin western flax, and their habitat could be permanently lost. The extent of available habitat for San Francisco garter snake and California red-legged frog would be temporarily reduced during reservoir refill, but wetland habitat that would establish at higher elevations could potentially be more extensive. Raised reservoir levels would provide greater opportunities for largemouth bass and other predators to access frogs and snakes. Periodic drawdown during planned maintenance could adversely affect San Francisco garter snake foraging habitat. (PSM)	Same as proposed program. (PSM)	Same as proposed program. (PSM)	Same as proposed program. (PSM)	Same as proposed program. (PSM)	Same as proposed program. (PSM)	Same as proposed program. (PSM)	Same as proposed program (PSM)	Similar to pre-1983 conditions (LS)

TABLE 9-9 (Continued)
SUMMARY OF SIGNIFICANT WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR CEQA ALTERNATIVES – PENINSULA WATERSHED

Impact	Proposed Program	No Program Alternative	No Purchase Request Increase Alternative	Aggressive Conservation/Water Recycling and Local Groundwater Alternative		Lower Tuolumne River Diversion Alternative	Year-round Desalination at Oceanside Alternative	Regional Desalination for Drought Alternative	Modified WSIP Alternative
				No Supplemental Tuolumne River Water	With Supplemental Tuolumne River Water				
Section 5.5.6, Terrestrial Biological Resources (cont.)									
▪ Other species of concern	Changes in wetland habitat due to reservoir refill and proposed operations would adversely affect reptile and bird species of concern, particularly if permanent changes in the composition of wetland vegetation occur. Permanent loss of upland habitat, including upland trees, grassland, and coastal scrub, would result in significant impacts on several bird and mammal species of concern. Serpentine- and grassland-associated plant species unable to tolerate extended periods of inundation would be lost. (PSM)	Same as proposed program. (PSM)	Same as proposed program. (PSM)	Same as proposed program. (PSM)	Same as proposed program. (PSM)	Same as proposed program. (PSM)	Same as proposed program. (PSM)	Same as proposed program (PSM)	Similar to pre-1983 conditions (LS)
▪ Common Habitats and species	Due to the extent of area involved, impacts on common habitats and species would be significant. (PSM)	Same as proposed program. (PSM)	Same as proposed program. (PSM)	Same as proposed program. (PSM)	Same as proposed program. (PSM)	Same as proposed program. (PSM)	Same as proposed program. (PSM)	Same as proposed program (PSM)	Similar to pre-1983 conditions (LS)
Impact 5.5.6-4: Impacts on biological resources in Pilarcitos Reservoir									
▪ Key special status species	Proposed operations would be within the same range as existing conditions, although replacement Measure 5.5.3-2a would cause Pilarcitos Reservoir to be drawn down earlier in the summer compared to existing conditions. This would reduce the extent of suitable habitat for California red-legged frog and San Francisco garter snake. Special-status species that utilize adjacent upland vegetation would not be affected. (PSM)	Similar to proposed program. (PSM)	Similar to but much less than proposed program. (LS)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program (PSM)	Similar to existing condition (LS)
Impact 5.5.6-5: Impacts on biological resources along Pilarcitos Creek									
▪ Sensitive habitats	Proposed operations would result in flows within the range of historical conditions, to which sensitive habitats have adapted. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program. (LS)	Similar to proposed program (LS)	Similar to proposed program (LS)

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9.2.2 No Program Alternative

The No Program Alternative is the scenario that would most likely unfold between now and 2030 if the WSIP were not implemented. CEQA Guidelines Section 15126.6(e) provides the following guidance on the "no project" alternative:

- The specific alternative of "no project" shall also be evaluated along with its impact. The purpose of describing and analyzing a no project alternative is to allow decision-makers to compare the impacts of approving the proposed project with the impact of not approving the proposed project.
- The no project alternative is not the baseline for determining whether the proposed project's environmental impacts may be significant, unless it is identical to the existing environmental setting analysis, which does establish that baseline.
- The no project analysis shall discuss the existing conditions at the time the Notice of Preparation is published as well as what would be reasonably expected to occur in the foreseeable future if the project were not approved, based on current plans and consistent with available infrastructure and community services.
- When the proposed project is the revision of an ongoing operation, the no project alternative will be the continuation of the existing operation into the future.
- If the proposed project is a development project on identifiable property, the no project alternative is the circumstance under which the project does not proceed.

Consistent with the above guidance, the No Program Alternative reflects continued operation of the regional system and system upgrades and maintenance as well as implementation of actions that are reasonably expected to occur if the WSIP as a comprehensive program or policy is not approved. Compared to the WSIP this alternative would develop less in terms of new water supplies for the regional system and would implement far fewer of the proposed facility improvement project.

Description of SFPUC and Wholesale Customer Actions

SFPUC Actions

Under the No Program Alternative, the SFPUC would continue to rely on water supply sources from local watersheds and the Tuolumne River. Similar to existing conditions, the SFPUC would have no supplemental dry-year water supply sources and there would be no diversification of water supply sources from groundwater development, recycled water projects, water transfers, or additional conservation beyond what is occurring now and what is mandated by regulation (i.e., the plumbing code). This alternative assumes that the SFPUC would endeavor to serve the projected 2030 increase in purchase requests when water is available. The additional water demand would be served from increased diversions from the Tuolumne River under the City and County of San Francisco's (CCSF) existing water rights as well as increased use of local watershed supplies, primarily associated with the restoration of Calaveras and Lower Crystal Springs Reservoirs (discussed below). Under the No Program Alternative, the SFPUC would continue its existing operation of the regional water system and associated facilities, including compliance with all regulatory requirements and ongoing system maintenance. Thus, under this alternative, it is assumed that by 2030 the SFPUC would implement the following WSIP facility improvement projects that have been mandated or previously agreed to by regulatory agencies:

- *Advanced Disinfection (SJ-1)*. This project must be implemented to comply with the Long Term 2 Enhanced Surface Water Treatment Rule under the federal Safe Drinking Water Act.

- *Alameda Creek Fishery (SV-1)*. This water recapture project would ensure compliance with the 1997 Memorandum of Understanding (MOU) between the SFPUC and California Department of Fish and Game (described in Chapter 2, Section 2.5.3) following completion of the Calaveras Dam project (SV-2). The MOU, which stipulates the magnitude and timing of flows released from Calaveras Reservoir for the purpose of improving habitat conditions for fisheries along Alameda and Calaveras Creeks, also states that the water released to meet minimum flow requirements may be recaptured downstream for consumptive use in the SFPUC service area. Although the Alameda Creek Fishery project would not in itself increase the firm yield of the system, it is necessary to avoid the loss of yield associated with fishery releases from Calaveras Reservoir.

- *Calaveras Dam (SV-2)*. The existing dam is currently operating under California Division of Safety of Dams (DSOD) interim restrictions, as described in Chapter 2, Section 2.2.3. The DSOD restrictions include maximum operating levels, with the provision that the SFPUC pursue an aggressive schedule for remediation of Calaveras Dam. Therefore, long-term operation of the reservoir at this restricted level is not an option (Verigin, 2003). The proposed replacement dam would not increase the delivery capacity of the regional water system above its historical (pre-2002) value and would restore the reservoir's operating storage to the level allowed before the DSOD placed restrictions on the reservoir. Use of local watershed supplies provided by Calaveras Dam and Reservoir is a fundamental part of the SFPUC's existing system operations, and restoring Calaveras Reservoir to historical storage levels is thus considered a continuation of the existing operation into the future.

- *Treated Water Reservoirs (SV-5)*. This project is needed in order to comply with requirements of the California Department of Health Services for water quality and public health purposes.

- *Lower Crystal Springs Dam (PN-4)*. The DSOD has placed operational restrictions on Lower Crystal Springs Dam due to concerns regarding the ability of the dam to provide adequate protection from the probable maximum flood (described in Chapter 2, Section 2.2.5). The DSOD has indicated that if the SFPUC does not implement improvements to the dam, it would likely impose further, more severe restrictions on reservoir operations due to updated calculations of the probable maximum flood (Mavroudis, 2007). The extent of these more severe restrictions would result in substantial adverse effects on water supply and delivery reliability and reduce existing water quality reliability, severely limiting continuation of existing system operations into the future.

Implementation of the above projects would be subject to environmental review under CEQA as determined by the San Francisco Planning Department. However, if any of the regional system facilities were to fail in the future, such as in the event of an earthquake or other disaster, the SFPUC would proceed with the necessary emergency repairs/replacements, which may not be subject to CEQA, and those repairs or replacements would be conducted on an individual basis and not as part of a comprehensive and coordinated program. The No Program Alternative also assumes that the SFPUC would proceed with implementation of other capital improvement projects and related activities funded under the WSIP but not considered part of the program analyzed in this PEIR (as described in Chapter 3, Sections 3.13 and 3.4.6). Under the No Program Alternative, it is assumed that the SFPUC would continue to maintain water sales agreements with wholesale and retail customers to meet the supply assurance of 184 mgd and make further sales to the wholesale customers on an interruptible, as-available basis to reduce the rate impact on City retail customers.

If the SFPUC were to adopt a change in the proposed program, such as the No Program Alternative, the CCSF would be required to submit an explanation to the California Department of Health Services and the Seismic Safety Commission as described in Assembly Bill No. 1823 (the Wholesale Regional Water System Security and Reliability Act).

Wholesale Customer Actions

As described in more detail below under Ability to Meet Program Objectives, the regional water system would have reduced seismic, delivery, and water supply reliability under the No Program Alternative compared to the WSIP. According to hydrologic modeling, regional system customers could experience water shortages as often as every one in two years (refer to Table 9-5) compared to one in ten years for the proposed program, and wholesale customers (as well as retail customers) would likely need to implement water rationing, up to 30 percent.

The wholesale customers have obligations, through laws, contracts, and other legal instruments, to provide water service to their customers. The ability of wholesale customers to impose limits on urban growth as a means of controlling demand is limited. Consequently, in the absence of reliable water service from the SFPUC, the wholesale customers would likely pursue other projects, either individually or collectively,[2] to meet their water needs for both drought and nondrought periods. Numerous factors inhibit the ability of the wholesale customers to address the decreased reliability associated with this alternative, including the following:

- The WSIP addresses sudden (emergency) as well as gradual changes in water availability. The ability of the wholesale customers to meaningfully influence the reliability of their water supplies is very limited in the event of emergency conditions (for example, if part of the regional system failed due to an earthquake). Under the No Program Alternative, most of the key projects needed to improve the seismic reliability would not be implemented.

- Water demand among all customers is highest when supplies are most constrained (i.e., during dry years and warm-weather periods) and therefore more difficult to secure. Securing water supplies in California is increasingly difficult, particularly in dry years, as overall demand increases and conflicts among competing interests for water supply arise.

- A major new water supply project can take as many as 20 to 25 years to complete (Johnson and Loux, 2004).

[2] Bay Area Water Supply and Conservation Agency (BAWSCA) has the authority to pursue and secure water supplies on behalf of the SFPUC wholesale customers (its members) as well as to coordinate recycled water and conservation projects to benefit its members. While it is likely that BAWSCA would lead any effort to secure water supplies, either BAWSCA or individual SFPUC wholesale customer agencies could pursue such actions.

- Some wholesale customers are wholly reliant on SFPUC for water, whereas others have multiple sources of supplies. Customers with diverse water supply portfolios would likely have more flexibility to augment supplies from sources other than the SFPUC. Under existing conditions, the SFPUC meets more than 50 percent of the demand for all but three of the wholesale customers; 16 wholesale customers rely entirely on the SFPUC for water purchases to meet existing demand.

- The wholesale customers' purchase requests already include a foreseeable level of increased conservation and recycling in addition to existing conservation and recycling. (The next subsection describes the opportunities for, and challenges to implementing, aggressive conservation and recycling programs.)

- The current urban water management plans for the wholesale customers do not address the issue of developing substitute supplemental supplies, since the customers anticipate receiving and have requested supplemental supply from the SFPUC.

In short, the ability of the wholesale customers to develop additional water supplies is uncertain, and further studies would be required to evaluate technical and institutional feasibility. Determining (a) the specific projects that each wholesale customer would pursue and (b) the likelihood that the wholesale customers could successfully implement the projects is speculative and outside the control of the SFPUC. A discussion of representative projects that the wholesale customers might pursue is presented below. This discussion is intended to provide decision-makers and other interested parties with information about the potential options that exist, the challenges associated with each, and attendant environmental impacts.

The basic water management strategies that the wholesale customers could pursue to offset the severely reduced reliability under the No Program Alternative involve increasing supplies and decreasing demand. Among the options associated with these strategies are water purchases or transfers, groundwater management/use, aggressive recycling and conservation, and desalination. Water purchases/transfers and conjunctive use are discussed below. Currently, some of the wholesale customers are already actively developing recycled water/groundwater/ conservation projects to address their increasing demands and it is assumed that the wholesale customers will continue to do so in the future. Additional aggressive recycling, groundwater, and conservation is described separately under its own alternative (presented in Section 9.2.4). Similarly, there are two separate alternatives addressing desalination (presented in Sections 9.2.6 and 9.2.7).

Regarding water purchases or transfers, statewide trends indicate that while urban water use is increasing, agricultural water use is decreasing, in part because agricultural water users are selling water rights or contracts to urban agencies (Department of Water Resources, 2005). Potential sources of supplies for the wholesale customers include water-rights holders north of the Delta, in the Delta, or south of the Delta. The agencies with the rights to the greatest quantities of water in the state, the U.S. Bureau of Reclamation (USBR) and California Department of Water Resources (DWR), would not be sources of new water supply contracts/agreements because of their commitments to existing contractors and to the protection, restoration, and enhancement of fish and wildlife habitat. Challenges to water purchases and transfers pertain to restrictions associated with entitlements, contracts, and water rights; permitting requirements; effects caused by the cessation of water application to an area (e.g., land fallowing, economic impacts); Delta pumping restrictions; and wheeling arrangements[3] (Johnson and Loux, 2004). Existing water delivery infrastructure could theoretically be used through agreements with other agencies (such DWR, USBR, SFPUC, East Bay Municipal Utility District, Alameda County Water District, or Santa Clara Valley Water District) to convey water to the wholesale customers, if and when system capacity is available. Construction or expansion of interties or connecting pipelines in urban areas would likely be required.

A supplemental water supply must be available concurrent with annual and seasonal demands or must be stored during periods of adequate supply and low demand. An agency could pursue its own storage project, either through conjunctive use of a groundwater basin or through construction of a new storage facility. Conjunctive use of a groundwater basin is likely a potential option only for agencies that currently utilize groundwater. Review of current urban water management plans for the wholesale customers indicates that seven customers currently rely on groundwater for part of their supply; however, the ability of these agencies to implement additional conjunctive-use projects beyond any existing or planned projects to help offset any supply shortfall under this alternative is uncertain. Challenges to implementing conjunctive-use projects pertain to the sustainable yield of the groundwater basin, restrictions on appropriative rights, and existing regional and local groundwater management policies, ordinances, and practices. Regarding construction of new storage facilities for surface water supplies, very few agencies have constructed major reservoirs in Northern California in recent decades due to ecological impacts, cost, availability of suitable sites, and other issues, although several proposals to increase storage at existing reservoirs that provide water to the Bay Area are currently under study. The ability of a wholesale customer to acquire, through agreements with other agencies, use of a portion of an existing storage facility is uncertain; the terms of such agreements favor the dry-year and seasonal supply needs of the reservoir owner/operator. A key issue associated with use of existing storage is whose water spills first and is therefore “lost” before it can be used.

Feasibility Issues

While the No Program Alternative would present no engineering or technical feasibility issues, it would raise some fundamental institutional issues regarding the ability of the SFPUC to fulfill its basic mission to provide reliable, high quality and affordable water to its customers. The No Program Alternative would place the regional system at significant risk to seismic hazards, increased facility failures, and increased supply shortages on a day-to-day basis, as well as result in prolonged service disruptions to many customers in the event of an earthquake or other emergency due to inadequate facility redundancy and operational flexibility. The SFPUC customers would likely seek alternatives, as described above, and it is unlikely that the public would support this alternative. In addition, this alternative could add substantial long-term costs due to the increased likelihood of facility failures and increased need for emergency repairs or replacement in the event of an earthquake or other emergency. This unknown and likely substantial additional cost raises questions about cost and financing feasibility and customer rate impacts.

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[3] Wheeling arrangements are agreements to use existing infrastructure owned by a third party to transport/convey water from a source to a customer.

The feasibility of rationing at levels of 20 percent or more and the effects of such rationing are key issues facing the regional system customers raised by the No Program Alternative and several of the other alternatives that require the wholesale customers to address average annual supply shortfalls and/or less dry-year reliability from the regional system on top of being prepared for dry-year rationing. Since the last drought (1987 – 1992), the state's population has increased and the amount of agricultural plantings that require water during drought years (i.e., vineyards and orchards) has increased. At the same time virtually all of the State's largest water agencies have implemented conservation and other demand management actions. Residential, commercial and industrial sectors have reduced water demand through conservation, and to a lesser extent, water recycling. The SFPUC wholesale customers already implement some level of conservation and some have existing water recycling projects; they have factored additional conservation and water recycling into their projections and used these as the basis for determining their 2030 purchase request from the SFPUC regional system. To the extent that water conservation is already being practiced and will increase in the future, the more difficult it will be to implement adequate cutbacks in water use in the future to achieve the rationing that may be required during a drought period. Demand hardening refers to the increasing difficulty and expense of achieving short-term water conservation levels during shortages as more long-term conservation measures are implemented and water-use efficiency is maximized. As described by the California Department of Water Resources, demand hardening:

> "occurs when agencies implement water conservation programs that result in permanent reductions in water use, such as retrofitting plumbing fixtures or installing low-water-use landscaping. These measures lessen agencies ability to implement rationing to reduce water use during droughts, and can result in great impacts to urban water users (e.g., loss of residential landscaping) when rationing is imposed. For example, the extensive Los Angeles retrofit program helped the city maintain reductions in urban per capita water use it achieved during the last drought. These permanent water use reductions will make it more difficult for the city to duplicate its previous 15 percent water use reduction goal during a future drought" (Department of Water Resources (DWR), 2005)

With respect to the effects of droughts and rationing on customers, droughts gradually affect water service. The socioeconomic effects of drought-related shortages depend on many factors, including the frequency, size, and duration of the supply shortage; types of water use affected; the options available to an agency and water users for managing shortages; the drought management strategies implemented, customer response to drought management strategies, and the costs of contingency water management and losses associated with shortages (DWR, 2000). From a statewide perspective, examples of drought impacts include (DWR, 2000):

- Lost jobs and revenue in landscaping / nursery industries
- Homeowner costs for replacing lawns and landscaping
- Unemployment and other socioeconomic impacts in farming-dependent communities
- Increased wildfire damages
- Widespread loss of trees in the Sierra Nevada
- Declines in fish populations

- Lost revenues to water-based recreation business
- Reduced hydroelectric power generation

The most recent prolonged drought lasted six years (1987 – 1992). Much of the information available about the economic consequences of this drought focuses on the agricultural sector. At the time, little information was available on the comprehensive, statewide impacts to urban customers from droughts. The California Urban Water Agencies (CUWA) formed in 1990 in part to study such effects and to promote the need for reliable, high quality water supplies for current and future urban water users. CUWA commissioned several reports on the adverse consequences of drought to urban customers.[4] Findings from those studies, as well as other literature reviewed are summarized in the following bullet item list. The experiences among water suppliers and their customers during the 1987-1992 drought varied considerably:

- *Distribution of Water Shortage Impacts.* Water shortages were not evenly distributed throughout the state. The cumulative deficit was worst in the Central Coast region. The degree of water shortage varied among agencies and, although target cutbacks ranged from 15 to 30 percent, there were differences between planned and actual cutbacks.

- *Drought Management Strategies.* The different drought management policies implemented by water suppliers created different consumption patterns and attendant economic losses.[5] For example, the City of Santa Barbara implemented mandatory conservation directives with steeply rising tiered water rates, resulting in a 62 percent reduction in consumption for single-family residences; neighboring Goleta Water District implemented quantity restrictions and higher flat rates for water, resulting in a 40 percent reduction in consumption for single-family residences (Rand, 1993).

- *Impacts Among Customer Types*. Cutbacks were not evenly distributed among residential, commercial, and industrial customers. Residential customers typically were cut back more than industrial or commercial users, although the horticulture sector of commercial customers suffered substantial losses.

- *Exterior and Interior Water Use.* Urban rationing programs typically shift the worst impacts to residential exterior and commercial landscaping uses and away from industrial use, commercial non-landscaping use, and residential interior use (DWR, 2005). Consequently a 30 percent shortage overall can translate to a 35 percent shortage for residential users, for example.

- *Other effects.* Because there was an economic recession in 1990-1991, water use and production output reductions in the commercial and industrial sectors during these years may not have been due to drought.

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4 The CUWA-commissioned studies include: *Assessment of the Economic Impacts of California's Drought on Urban Areas, A Research Agenda* (RAND, 1993); *Drought Management Policies and Economic Effects in Urban Areas of California, 1987 – 1992* (RAND, 1996); *Cost of Industrial Water Shortages* (Wade, et al, 1991); *The Value of Water Supply Reliability: Results of a Contingent Valuation Survey of Residential Customers* (Barakat & Chamberlin, Inc, August 1994); Water Reliability Analysis and Planning (WRAP) (Barakat & Chamberlin, Inc, August 1993); and *CUWA Survey of 1991 Drought Management Measures*, June 1991.

5 Examples of the drought management policies implemented during the 1987 – 1992 drought include: quantity restrictions, type-of-use restrictions, public education programs, device distribution program (e.g., low-flow shower heads), price increases, supply augmentation strategies (greater groundwater pumping, greater use of recycled water, and water transfers) (Rand, 1993).

According to DWR, genuine health and safety concerns (i.e., running out of water for drinking, sanitation, and firefighting) during the past recorded droughts generally have been limited to small, rural communities relying on marginal water sources. Estimated losses to residences from droughts vary, and studies of actual monetary losses sustained by residential customers are uncommon. A survey of impacts to residents in Alameda County Water District, which modeled household response to steeply increasing water rate structure, calculated average welfare losses per household in the range of $14-$23 per household for the period July 1991 to December 1992.

Because of the challenges in quantifying economic losses in the residential sector, CUWA determined that contingent valuation, or willingness to pay, was the best available method for studying residential water shortage losses. Contingency valuation is based on estimating how much people will pay for something that is not available on the private market, in this case, how much people are willing to pay to avoid water shortages of varying magnitude and frequency (Barakat and Chamberlain, 1994). Using the willingness to pay methodology, the 1994 survey found concluded that California residents were willing to pay $12 to $17 more per month per household for water to avoid the kinds of water shortages that occurred in the 1987–1992 drought. An estimate of impacts to Orange County residents used the same methodology to estimate economic losses by residents from 20 percent cutbacks over three years at about $13 billion in 2002 dollars (Orange County Business Council, 2003). As noted in DWR (2005), property values for residential users and their quality of life may be lower in an area with less reliable dry-year water services if the expected cost of shortage-related landscaping replacement is high enough to discourage planting high-investment landscaping.

Based on data collected in a 1990 industry survey, the report *Cost of Industrial Water Shortages* (Spectrum Economics, Inc., 1991) indicated that direct losses in industry production from a 30 percent shortage in 1990 dollars would be $0.93 billion for Alameda County, $5.3 billion for Santa Clara County, $0.9 billion for San Francisco County, and $7.6 billion for San Mateo County. In May 2005, BAWSCA submitted a report to the SFPUC regarding the economic consequences to the Bay Area of water shortages (Wade, 2005). The report, which advocates that the SFPUC reconsider the 20 percent maximum systemwide rationing goal established for the WSIP, characterizes water use in the industrial sector of wholesale customer communities as follows:

> The companies that account for the majority of industrial sector water use are those in the computer equipment and electronic component manufacturing categories. These water-dependent industries are the backbone of the Bay Area economy. In some industries, water is an essential element of the production process, not ancillary to plant production and employee use. For example, 75 percent of the water use in the food products industry is employed directly in the process. Water essentially is the product for many beverage processors. Microchips are manufactured in a wet environment. … Biotechnology, an emerging industry in the Bay Area requires water. Genentech, for example, is the largest industrial user of water in South San Francisco. Over 75 percent of the water used in its South San Francisco plant is employed directly in the manufacturing process, while research and development uses account for most of the remainder.

The report estimates the value of production losses (lost value of shipments in 2001 dollars) in water-critical industries located in the BAWCA service area caused by water shortage of up to 20 percent at $2.5 billion to $7.7 billion per year, and notes that this estimate is conservative because of demand hardening. The report also cited the following information from an SFPUC report to the Federal Energy Regulatory Commission (FERC) (Hetch Hetchy Water and Power Department, 1993)

- "The economic impact resulting from a water supply cutback will be concentrated in two industries: electronic components and accessories, and computer office equipment. Other industries could experience larger production cutbacks, but their economic impact will be small by comparison, except for the beverage industry.
- A 15 percent cutback in water supply could reduce direct shipments from the electronic component industry in 1990 dollars by $68 million and $163 million from the computer industry. The secondary impact could increase loss from these two industries by $294 million.
- A 15 percent cutback in water supply could result in more than 2,000 jobs lost in the two industries and their ancillary service areas.
- At a 15 percent cutback in water supply, the beverage industry would experience the largest production cutback of 10.4 percent and lost sales of approximately $72.4 million (1990 dollars)."

Although the information on the effects of water shortages during drought is limited, studies completed to date indicate that rationing cutbacks of 15 to 20 percent can have substantial economic impact on commercial, industrial and residential sectors and well as lifestyle effects on residents. To date, these studies have not identified significant environmental impacts resulting from such rationing in urban areas and the economic consequences do not appear to have resulted in major physical changes such businesses and/or residents leaving the area to an extent that land use patterns change. However, requiring rationing of up to 20 percent during a drought of customers who have already implemented aggressive conservation and water recycling would result in more severe economic and lifestyle effects.

Ability to Meet Program Objectives

Tables 9-5 and 9-6, above, show how the No Program Alternative would perform in terms of meeting the level of service goals and system performance objectives established for the WSIP (no assumptions are made regarding the ability of the wholesale customers to develop alternative supplies to offset water supply shortages or reduced system reliability). While this alternative could occasionally satisfy the 2030 customer purchase requests of 300 mgd, the alternative would fail to meet the WSIP level of service goals with respect to seismic, delivery, and water supply reliability. The water quality level of service goal would be achieved, since the SFPUC would implement required facility improvements to meet federal and state water quality regulations for the regional system (assuming no new supply would be wheeled through the SFPUC's system from wholesale customer actions; the SFPUC would not be responsible for regulatory compliance for any new sources obtained by wholesale customers).

Under the No Program Alternative, the regional system could not reliably meet the average 2030 demand of 300 mgd during nondrought years. With the restoration of Calaveras and Lower Crystal Springs Reservoirs under this alternative, water supply reliability would be somewhat improved over existing conditions, but this alternative would still not meet the WSIP level of service goals for seismic and delivery reliability due to other system deficiencies related to water availability during maintenance or outages, storage, conveyance, and treatment. In addition, this alternative would fail the WSIP objective of limiting drought-year rationing to a maximum of 20 percent systemwide. Systemwide shortages of greater magnitude and frequency would occur compared to both existing conditions and the proposed program. Using the Hetch Hetchy/Local Simulation Model (HH/LSM) and assuming a maximum rationing of 30 percent, the regional system would experience shortages during 42 years of the 82-year period of hydrologic record—as much as one in every two years. There would be no supplemental dry-year sources (e.g., the Westside Groundwater Program) to potentially forestall customer shortages.

With the exception of the Calaveras Dam project (SV-2), key WSIP facility improvement projects that were identified as needed to meet the seismic reliability performance objectives would not be implemented.[6] As a result, the system would continue to be subject to seismic hazards. In the event of a major earthquake, critical facilities could fail, leading to prolonged outages; customers could be without water service (including drinking water supplies and water for firefighting) for more than 14 days and possibly more than 30 days. Furthermore, without the WSIP facility improvement projects, the system would not have sufficient redundancy to reliably maintain or quickly restore basic service following a major earthquake.

Under the No Program Alternative, comprehensive maintenance and repair of the regional system would continue to be deferred, resulting in an increasing risk of failure and service disruption; in addition, some facilities (such as the Irvington Tunnel) could not be inspected, serviced, or repaired without loss of service to customers. The system would also have a limited ability to respond to unplanned outages resulting from power failures, earthquakes, or water quality events at Hetch Hetchy Reservoir. Aging infrastructure and substandard maintenance under the No Program Alternative would severely compromise overall delivery reliability[7] compared to existing conditions, due to increased demand on the system coupled with a greater likelihood of facility failure. Facilities would not be in place to replenish local reservoirs as needed to prepare for drought, and, as previously stated, customers would be subject to more severe and more frequent shortages and rationing.

6 Key WSIP projects needed to meet seismic reliability levels of service include Calaveras Dam (SV-2), New Irvington Tunnel (SV-4), BDPL Reliability Upgrade (BD-1), BDPL 3 and 4 Seismic Upgrade at Hayward Fault (BD-3), Baden and San Pedro Valve Lots (PN-1), CS/SA Transmission (PN-2), HTWTP Long-Term (PN-3), and SAPL 3 Installation (SF-1). In addition, two WSIP projects identified as having independent utility—New Crystal Springs Bypass Tunnel and Bay Division Pipelines Nos. 3 and 4 Crossover/Isolation Valve at Hayward Fault—would be required (SFPUC, 2006).

7 Key WSIP projects needed to meet delivery reliability levels of service during maintenance conditions include SJPL System (SJ-3), 40-mgd Treated Water (SV-3), New Irvington Tunnel (SV-4), BDPL Reliability Upgrade (BD-1), CS/SA Transmission (PN-2), and HTWTP Long-Term (PN-3). Key WSIP projects needed to meet delivery reliability levels of service during a Hetch Hetchy water quality event or unplanned outage include Calaveras Dam (SV-2), 40-mgd Treated Water (SV-3), and HTWTP Long-Term (PN-3) (SFPUC, 2006).

If the wholesale customers and/or BAWSCA were to pursue supplemental water sources to compensate for the reduced reliability of the SFPUC's regional system under the No Program Alternative, additional studies would be required to determine both the technical and institutional feasibility of such supplemental sources. The resultant ability of the alternative to meet the program objectives would then depend in part on the wholesale customer actions and would be outside the control of the SFPUC.

While the SFPUC would continue to provide watershed protection and meet legal requirements for protection of fish and other wildlife, under the No Program Alternative, the system would not be managed in a comprehensive and coordinated manner to best manage natural resources and physical systems; therefore, the system would not meet all the sustainability objectives. Similarly, while the system would maintain its gravity-driven attributes, the system would not meet all of the WSIP cost-effectiveness objectives because the increased risk of facility failures and outages and likely increased need for emergency repairs and replacement would not be considered efficient or cost-effective use of resources or funds and the SFPUC would not be able to implement a regular inspection and maintenance program for all facilities.

Environmental Impacts Compared to those of the WSIP

Facility Construction and Operations Impacts

WSIP Facilities

Under the No Program Alternative, only five WSIP facility improvement projects would be constructed—Advanced Disinfection (SJ-1), Alameda Creek Fishery (SV-1), Calaveras Dam (SV-2), Treated Water Reservoirs (SV-5), and Lower Crystal Springs Dam (PN-4). None of the impacts attributable to the other WSIP facility projects would occur. The construction and operational impacts of these five facilities would be identical to those described in Chapter 4, Sections 4.3 to 4.15. As with the WSIP, the program-level analysis indicates that implementation of these five projects would result in potentially significant and unavoidable construction-related noise increases. In addition, implementation of the Advanced Disinfection project would result in potentially significant and unavoidable impacts related to temporary noise disturbance along construction haul routes; the Calaveras Dam project would result in potentially significant and unavoidable impacts related to visual resources as well as to historic districts and the historical significance of individual facilities; the Lower Crystal Springs Dam project would result in potentially significant impacts related to the historical significance of individual facilities. All other identified program-level impacts for these five projects would either be less than significant or could be mitigated to a less-than-significant level with implementation of identified mitigation measures.

Potentially significant unavoidable impacts associated with construction noise would be avoided at the 17 remaining WSIP facility improvement project sites. Impacts in the San Joaquin Region would be limited to the Tesla Portal area, and potentially significant unavoidable land use and/or vibration impacts associated with the SJPL System (SJ-3) and SJPL Rehabilitation (SJ-4) projects would be avoided. Impacts in the Sunol Valley Region would be limited to the Alameda Creek, Calaveras Dam, and Sunol Valley Water Treatment Plant (WTP) areas; and potentially significant unavoidable land use and/or cultural resource impacts associated with the 40-mgd Treated Water (SV-3), New Irvington Tunnel (SV-4), and SABUP (SV-6) projects would be avoided. There would be no construction or operations impacts in the Bay Division Region, and potentially significant unavoidable land use and/or vibration impacts associated with the three projects in this region would be avoided. Impacts in the Peninsula Region would be limited to the Crystal Springs Reservoir area, and potentially significant unavoidable land use and cultural resource impacts associated with the CS/SA Transmission project (PN-2) as well as potentially significant unavoidable vibration impacts associated with the Baden and San Pedro Valve Lots project (PN-1) would be avoided. There would be no construction or operations impacts in the San Francisco Region, and potentially significant unavoidable land use and/or vibration impacts associated with the three projects in this region would be avoided.

Under the No Program Alternative, all potentially significant collective impacts (with the exception of cultural resources) would be less than significant or avoided due to the greatly reduced number of projects. Only two of the three projects in the Sunol Valley—Alameda Creek Fishery (SV-1) and Calaveras Dam (SV-2)—would have overlapping construction schedules, and project-specific mitigation measures would be adequate to reduce any combined effects of construction activities on Calaveras Road to a less-than-significant level. Thus, multi-regional and overlapping collective impacts under the No Program Alternative would be less than significant.

Unlike the proposed program, the contribution of facilities impacts under the No Program Alternative to cumulative impacts on traffic and biological resources would be mitigated through project-specific mitigation; other WSIP-related activities such as the Habitat Reserve Program (if implemented, see Chapter 3, Section 3.12) would also reduce cumulative impacts on biological resources. However, similar to the proposed program, the contribution of the No Program Alternative's impacts to cumulative impacts on air quality and cultural resources would be cumulatively considerable, particularly due to the extent of construction activities associated with the Advanced Disinfection (SJ-1) and Calaveras Dam (SV-2) projects.

Other Facilities Potentially Implemented Under this Alternative

The ability of the wholesale customers to develop additional water supplies is uncertain and outside the control of the SFPUC. The types of projects that the wholesale customers might pursue and the potential facility and operations impacts associated with such projects are presented in **Table 9-10** for consideration by decision-makers and other interested parties. In general, certain types of impacts are common to water supply transfers/acquisition and include: the cessation of water application to lands irrigated by the water being transferred; changes related to flows, fisheries, and water quality; and impacts caused by the use of existing or the construction of new infrastructure. Typically, the water rights-holder previously applied the water to agricultural land. The transfer can result in the conversion of agricultural land to nonagricultural land. Beneficial environmental effects (related to retiring drainage-impaired lands, reducing the application of pesticides, etc.) can also occur. The need for new facilities and/or changes in the operations of existing facilities depend on the source of supply (e.g.,

TABLE 9-10
SUMMARY OF POTENTIAL IMPACTS AND MITIGATION STRATEGIES ASSOCIATED WITH REPRESENTATIVE WATER SUPPLY ACQUISITION PROJECTS

Actions Associated with Water Supply Acquisition Projects	Potential Impacts	Mitigation Strategy
Supplemental Water Supply Source		
Increased Water Use Efficiency/Conservation (e.g., conversion to drip irrigation); tiered water pricing	Reduced groundwater recharge. Exposure of soils to wind erosion leading to air quality impacts. Could lead to increased groundwater pumping.	None required. See below regarding increased groundwater pumping.
Conversion of More Water-Intensive to Less Water-Intensive Crops, Land Fallowing	Land fallowing could create pressure to convert land to urban uses and loss of agricultural land. Economic impacts to community.	Include consideration of farming interests in decision-making process for transfer.
Increased Groundwater Pumping/Conjunctive Use of Groundwater	Groundwater level reductions and overdraft if there is insufficient sustainable yield to accommodate increased pumping. Water quality issues include decreased aesthetic quality in drinking water (hardness, tastes, odors), health risk from potential contaminants in groundwater basin.	Determine sustainable yield of the basin, implement monitoring program, regulate groundwater pumping to preserve safe yield, provide treatment and/or blending if necessary to remove contaminants and control taste and odor. Local assistance programs for remediation of affected wells.
Delta Diversions	Potential impacts on sensitive Delta fisheries including: winter-run, spring-run Chinook salmon, Delta smelt, steelhead trout, and Delta splittail.	Compliance with existing and future pumping requirements related to threatened and endangered species protection.
	Changes in Delta inflow, outflow. Potential impacts on flows associated with wheeling Delta transfers through the Delta, resulting in secondary impacts on Delta fisheries and other biological resources.	Transfer would require review/approval by applicable regulatory agencies. Analysis of flow impacts and commitment to minimize adverse secondary impacts on biological resources (e.g., through transfer timing, pumping restrictions).
	Water quality for the Delta and downstream water users (including salinity, bromides, potential contaminants from agricultural and industrial run-off, taste and odor problems, disinfection byproducts, and temperature).	Compliance with existing and future applicable water quality control. Regulations. Treatment to bring up to water quality equitable to Tuolumne River.
	Water quality for the Delta and downstream water users (including salinity, bromides, and temperature).	Transfer would require review/approval by applicable regulatory agencies. Analysis of flow impacts and commitment to minimize adverse impacts on other water users (e.g., through transfer timing, pumping restrictions).

TABLE 9-10 (Continued)
SUMMARY OF POTENTIAL IMPACTS AND MITIGATION STRATEGIES ASSOCIATED WITH REPRESENTATIVE WATER SUPPLY ACQUISITION PROJECTS

Actions Associated with Water Supply Acquisition Projects	Potential Impacts	Mitigation Strategy
Facilities Required		
Conveyance	Mostly temporary impacts from construction of pipelines, valves, and pumps (disturbance of soils, surface water quality, biological resources, cultural resources, air quality, traffic, noise, land use, hazardous materials, aesthetics).	Most impacts associated with facility construction could be mitigated to a less-than-significant level with the types of measures identified in Chapter 6. As is the case with the proposed WSIP facilities, some impacts (e.g., short-term noise and traffic) could be unavoidable.
Pumping	Noise, energy consumption, air pollutant emissions from energy consumption.	Muffle noise. Use energy-efficient pumps and alternative energy sources.
Treatment	Temporary construction impacts, including land use, traffic, noise and air quality impacts. Potential long-term impacts could include increase in energy consumption, air pollutant and greenhouse gas emissions from energy consumption.	Use standard construction mitigations. Use energy-efficient pumps and alternative energy sources.
Groundwater Basin Storage of Surface Water	Potential degradation of groundwater quality, hydrofracturing (injection).	Pretreatment, groundwater quality monitoring, groundwater basin modeling, modifications to recharge and pumping practices.
Storage – Development of New Offstream Storage	Temporary and long-term impacts from construction of dam, pipelines, pumps, and appurtenant features (direct and indirect impacts on wetland and upland fish and wildlife and attendant habitat; impacts related to cultural resources, air quality, traffic, noise, land use, aesthetics, etc.).	Most impacts associated with facility construction could be mitigated to a less-than-significant level with the types of measures identified in Chapter 6. Some impacts would likely be unavoidable.

Tuolumne River through transfers with TID and MID, water-rights holders north of the Delta, in the Delta, or south of the Delta), the quantity of supply, and the means of conveyance. Construction or expansion of interties or connecting pipelines could be required, potentially resulting in impacts similar to those described for WSIP pipeline projects. The use of existing infrastructure to convey water to the wholesale customer would require extensive hydrologic, hydraulic and seismic reliability modeling to confirm that there would be no adverse consequences to the supply availability of other system users under all normal and emergency conditions. Without the WSIP improvements, capacity is already extremely limited, so ability to provide additional conveyance capacity is unlikely.

Water Supply and System Operations Impacts

Under the No Program Alternative, the estimated average annual diversions from the Tuolumne River would be 226 mgd, based on HH/LSM modeling of the no-program assumptions over the 82-year hydrologic record. This amount is 19 mgd less than the 245 mgd average annual diversions from the Tuolumne River under the WSIP, but 8 mgd more than the 218 mgd average annual diversions under existing conditions, as shown in Table 9-5, above. The potential impacts on water resources in the Tuolumne River, Alameda Creek, and Peninsula watersheds associated with this level of diversion are described below and compared to the impacts that would occur under the WSIP.

Tuolumne River Watershed

Currently, water storage in Hetch Hetchy Reservoir follows a seasonal pattern. The SFPUC typically draws the reservoir down in the summer, fall, and winter. During the summer, fall, and winter, only the minimum required release is made to the Tuolumne River below O'Shaughnessy Dam. The SFPUC refills Hetch Hetchy Reservoir with snowmelt in the spring and, once it is full, or in anticipation of it filling, releases excess to the river. The amount of the release in any particular year depends on the mass of snow that has accumulated in the previous winter.

Based on projected increases in customer water demand in 2030 the amount of water delivered to customers by the SFPUC regional system under the WSIP would be greater than under the existing condition. To meet the increased demand under the WSIP, the SFPUC would draw down Hetch Hetchy Reservoir to a greater extent in the summer, fall, and winter compared to the existing condition. A higher proportion of the snowmelt runoff would be required to refill the reservoir in the spring, and a smaller proportion would be released to the Tuolumne River below O'Shaughnessy Dam. Average annual releases to the Tuolumne River would be reduced by about 3.5 percent. The reduction in average annual releases to the river would manifest itself as a delay in the start of the spring release. The average delay would be 1 day, the maximum delay would be 8 days and a delay greater than 2 day would occur about once every 4 years.[8] The delay in spring releases would have a significant adverse effect on terrestrial biological resources in streamside meadows, particularly in the Poopenaut Valley, as described in Section 5.3.7.

8 The estimates of delay in spring releases are based on the assumption that operators would release water from Hetch Hetchy Reservoir at a rate of 3,000 cfs. Review of past practice indicates that this a typical springtime release rate. If the release rate was reduced, as might happen in a dry year, the delay would be extended.)

The No Program Alternative would also result in a delay in spring releases from Hetch Hetchy Reservoir. This delay would occur because, under the No Program Alternative, water demand would increase (as it would with the WSIP), and the SFPUC would attempt to satisfy the increase in demand by drawing more water from Hetch Hetchy Reservoir. The SFPUC would not draw as much water from Hetch Hetchy Reservoir with the No Program Alternative as it would with the WSIP because it would not provide the same level of delivery reliability during drought it would with the WSIP. This substantial reduction in delivery reliability during drought results in more frequent reductions to full deliveries during nondrought years. The average annual release of water to the Tuolumne River below O'Shaughnessy Dam would still be reduced (by about 1.3 percent). The delay in spring releases would be less with the No Program Alternative than with the WSIP. With the No Program Alternative the average delay would about half a day and the maximum delay would be 5.5 days. Delays of more than two days would occur about once every six years. The delays would still have a significant adverse effect on terrestrial biological resources.

Water storage in Don Pedro Reservoir also follows a seasonal pattern. The Turlock Irrigation District (TID) and Modesto Irrigation District (MID) typically draw the reservoir down in the summer and early fall by diversion to their service areas and releases from La Grange Dam to the Tuolumne River. During the summer and fall, typically only the minimum required release is made to the Tuolumne River below La Grange Dam. TID and MID replenish storage in Don Pedro Reservoir with rainfall runoff from the watershed in the winter and snowmelt in the spring. Because one of the purposes of Don Pedro Reservoir is flood control, space must be retained in the reservoir through the winter to capture runoff from large winter storms. In years when runoff exceeds the available capacity of the reservoir, TID and MID release the excess to the river below La Grange Dam. The amount of the release in any particular year depends on the size and frequency of winter storms and the mass of snow that has accumulated in the upper watershed in the previous winter. Releases may occur in a series of pulses rather than in a single defined spring release as typically occurs at Hetch Hetchy Reservoir.

As noted above, water demand in 2030 would be greater than under the existing condition. To meet the increased demand, with the WSIP the SFPUC would divert more water from the Tuolumne River at Hetch Hetchy Reservoir than under the existing condition. There would be a corresponding reduction in inflow to Don Pedro Reservoir. As a result, Don Pedro Reservoir would be drawn down farther by the late fall than it is under the current condition. A higher proportion of the rainfall and snowmelt runoff would be required to replenish storage in Don Pedro Reservoir in the winter and spring, and a smaller proportion would be released to the Tuolumne River below La Grange Dam. The reduction in average annual releases to the river with the WSIP would manifest itself as a delay in the start of pulse releases in the winter and spring. The combination of a reduction in the average annual volume of releases (of about 4 percent) and a delay in releases would have a significant adverse effect on fisheries in the Tuolumne River and on terrestrial biological resources in the riparian corridor, as described in Sections 5.3.6 and 5.3.7.

As noted above, water demand would increase with the No Program Alternative (as it would with the WSIP), and the SFPUC would attempt to satisfy the increase in demand by drawing more water from Hetch Hetchy Reservoir. Withdrawal of more water from Hetch Hetchy Reservoir would reduce inflow into Don Pedro Reservoir and result in a greater drawdown of storage in that reservoir compared to the existing condition. The No Program Alternative would reduce the average annual release of water to the Tuolumne River below La Grange Dam (by about 1.3 percent) and delay the initial release, but to a much lesser extent than with the WSIP. The reduction in total releases and the delay in the initial release would have an adverse effect on fisheries in the Tuolumne River and on terrestrial biological resources in the riparian corridor, but the impact would be less than significant.

Alameda Creek Watershed

The proposed improvements to Calaveras Dam included under the WSIP would also occur under the No Program Alternative. As a result of the improvements and associated modification in system operations, the maximum water level in Calaveras Reservoir would rise by about 50 feet. The rise in water level would have significant adverse impacts on terrestrial biological resources, as described in Section 5.4.6.

Under the No Program Alternative, as with the WSIP, restoration of historical water levels at Calaveras Reservoir would enable greater diversions of water from Alameda Creek into the reservoir. The consequent reductions in flow would have significant and unavoidable impacts on the hydrology of the creek below the diversion dam and significant adverse impacts on fisheries and terrestrial biological resources. The improvements to Calaveras Dam would also lead to changes in flow in Calaveras Creek and Alameda Creek below the Calaveras Creek confluence, which would have significant adverse impacts on terrestrial biological resources. The changes in water level in Calaveras Reservoir and changes in flow in the creeks would have a significant adverse effect on recreational and visual resources. Under the No Program Alternative, the SFPUC would operate its facilities in the Alameda Creek watershed in a similar manner as it would with the WSIP. Consequently, the environmental impacts of the No Program Alternative would be similar to those of the WSIP.

Peninsula Watershed

Currently, water storage in Pilarcitos Reservoir follows a seasonal pattern. The SFPUC typically draws the reservoir down in the summer. During the summer, water is released from the reservoir to Pilarcitos Creek to supply the Coastside County Water District (CWD). Coastside CWD diverts water from Pilarcitos Creek at Stone Dam. By late summer, Pilarcitos Reservoir is typically drawn down to its minimum, and the SFPUC supplies Coastside CWD from Crystal Springs Reservoir. The SFPUC refills Pilarcitos Reservoir in the winter and spring.

Water demand in 2030 would be greater than under the existing condition, including water demand in the Coastside CWD service area. To meet the increased demand in the Coastside CWD service area, the SFPUC would draw down Pilarcitos Reservoir more rapidly in the summer than under the existing condition and end stored water releases to Pilarcitos Creek at an earlier date. The more rapid drawdown and the earlier cessation of releases to Pilarcitos Creek would have a significant adverse effect on water quality, fisheries, and terrestrial biological resources in the reservoir and the creek, as described in Sections 5.5.3, 5.5.5, and 5.5.6.

Water demand would increase with the No Program Alternative, as it would with the WSIP. The SFPUC would try to serve increased demand in the Coastside CWD service area from Pilarcitos Reservoir, exactly as it would with the WSIP. The consequent, more rapid drawdown of Pilarcitos Reservoir and the earlier cessation of stored water releases to Pilarcitos Creek would have a significant adverse effect on water quality, fisheries, and terrestrial biological resources in the reservoir and the creek.

The improvements to Lower Crystal Springs Dam that would occur with the WSIP would also be part of the No Program Alternative. As a result of the improvements and associated modification in system operations, the maximum water level in Crystal Springs Reservoir would rise by about 20 feet. The rise in water level would have significant adverse impacts on terrestrial biological resources, as described in Section 5.5.6. Because the No Program Alternative would include the same improvements to Lower Crystal Springs Dam as the WSIP, the SFPUC would generally operate its facilities in the Peninsula watershed in a similar manner as it would with the WSIP. Consequently, the environmental impacts of the No Program Alternative would be similar to those of the WSIP.

Growth-Inducement Potential and Secondary Effects of Growth

The growth-inducement potential for this alternative is expected to be similar to that of the proposed program. Under this alternative, the SFPUC would not be able to provide a water supply with a reliability comparable to the WSIP in all nondrought years, or in dry years and drought periods; nonetheless, it is reasonable to expect that the SFPUC wholesale customers (either separately or together through BAWSCA) would seek to acquire supplemental dry-year water supplies to complement the supply increases the SFPUC is able to deliver under this alternative and to provide a comparable level of supply reliability. As a result, this alternative would have the same indirect, secondary effects of growth as the proposed program. As discussed in Chapter 7, growth has occurred in some communities, such as San Francisco, without a corresponding increase in water supply. In the future, the projected population and/or employment growth for some communities are clearly greater than the corresponding projected increase in water supply need, indicating that water use efficiency is increasing and that additional supply is not necessarily required for growth to occur. It is possible that approval of additional development within the SFPUC’s wholesale customer service areas might be slowed somewhat in some communities because the wholesale customers would have to pursue other projects and actions to achieve adequate dry-year supplies and reliability, but it is not expected that this would deter communities from taking actions to support planned growth.

9.2.3 No Purchase Request Increase Alternative

Under the No Purchase Request Increase Alternative, the SFPUC would implement all of the proposed WSIP facility improvement projects but would limit wholesale customers’ future purchases to terms of the existing Master Water Sales Agreement instead of providing for their 2030 purchase requests. The wholesale customers would have to pursue supplemental supply sources and/or conservation measures to make up the supply shortfall under this alternative. This alternative assumes there would be no increase in the existing level of supply assurance

(275 mgd, annual average which reflects the wholesale customer supply assurance under the Master Water Sales Agreement of 184 and a demand of 91 mgd in the SFPUC retail service area), but there would be a slight increase in demand compared to the existing purchase request level of 265 mgd. With the inclusion of 10 mgd of recycled water, groundwater and conservation projects in San Francisco, there would be limited need for additional Tuolumne River diversions except for drought supplies.

This alternative was included in the PEIR alternatives analysis to evaluate the consequences of the SFPUC not meeting the future increase requested by its customers in an effort to avoid or minimize the potential growth-inducing effects and secondary effects of growth associated with providing more water to the regional customers.

Description of SFPUC and Wholesale Customer Actions

SFPUC Actions

Table 9-4 summarizes the main characteristics of this alternative in comparison to those of the proposed program. Under the No Purchase Request Increase Alternative, the SFPUC would implement the same water supply option and facility improvement projects as those proposed under the WSIP; however, instead of serving the full 2030 purchase requests of 300 mgd (average annual), the SFPUC would limit customer deliveries to 275 mgd (as compared to current deliveries of 265 mgd), with 184 mgd for wholesale customers and 91 mgd for retail customers.
Master Water Sales Agreement Terms

Currently, the SFPUC's wholesale customers purchase an annual average of 170 mgd from the regional water system. The wholesale customers estimate that, by 2030, they will need to purchase an annual average of 209 mgd from the regional system. Under the WSIP, the regional system would meet the needs of wholesale customers for water. The No Purchase Request Increase Alternative assumes that the SFPUC would be able to limit the wholesale customers' future purchases to the terms of the existing Master Water Sales Agreement it holds with the wholesale customers, who are represented by BAWSCA (see Chapter 2, Section 2.5.5 for a description of the agreement). Under this agreement, the CCSF has agreed that the wholesale customers may collectively purchase up to 184 mgd on an average annual basis, subject to reductions in the event of a drought, water shortage, earthquake, other natural disaster, or rehabilitation and maintenance of the system ("the supply assurance"). Additional sales are made on an interruptible basis to San Jose and Santa Clara. The current master contract expires in 2009, but in the event the contract is not renewed or renegotiated, or the parties agree to a new contract without an increase in the supply assurance, the current supply assurance of the contract would remain in force. Thus, under the No Purchase Request Increase Alternative, it is assumed that the SFPUC and its customers would choose not to negotiate a new contract and instead would continue with the existing contract in which the customer water delivery for 2030 would be 184 mgd for the wholesale customers instead of 209 mgd and would be the same as under the WSIP for retail customers (91 mgd). Therefore, under the No Purchase Request Increase Alternative, the wholesale customers would receive 25 mgd (average annual) less than under the WSIP. It is assumed that the wholesale customers, either individually or collectively, would seek sources other than the SFPUC, through alternative supply sources, additional conservation, water recycling, or other demand management approaches, as described below. The SFPUC would need to work closely with BAWSCA to define where the additional 10 mgd would be served, and would need to redefine level of service objectives for seismic and delivery reliability based on the decreased supply and revised supply distribution.

Water Supply Characteristics

Under the No Purchase Request Increase Alternative, it is assumed that the total customer purchase requests to be served by the regional system by 2030 would be 275 mgd, consisting of 184 mgd for the wholesale customers and 91 mgd for the retail customers. As shown in Table 9-4, the increased water demand would be served through additional Tuolumne River diversions under existing CCSF water rights, increased use of local watershed supplies due to restoration of Calaveras and Crystal Springs Reservoirs, and 10 mgd from recycled water, groundwater, and conservation projects in San Francisco. During drought sequences, this supply would be supplemented by additional Tuolumne River diversions through a water transfer with TID and MID, similar to the proposed program, but for 1 mgd instead of 23 mgd. The supplemental dry-year supplies would also include implementation of the Westside Basin conjunctive-use program for 6 mgd (same as under the proposed program).

WSIP Facility Improvement Projects

The No Purchase Request Increase Alternative assumes that the SFPUC would implement all 22 WSIP facility improvement projects to meet the water quality, seismic reliability, and delivery reliability objectives of the WSIP. However, the design of some of the WSIP facilities would need to reevaluated and sized appropriately to meet the reduced delivery levels and corresponding adjusted performance objectives under this alternative. In addition, the No Purchase Request Increase Alternative assumes that the SFPUC would proceed with implementation of other capital improvement projects and related activities not considered part of the program analyzed in this PEIR (as described in Chapter 3, Sections 3.13 and 3.4.6).

Wholesale Customer Actions

Under this alternative, the SFPUC would serve 184 mgd out of the 209 mgd in wholesale customer purchase requests (demand) by 2030. BAWSCA and/or individual SFPUC wholesale customers could pursue supplemental water supplies on their own to compensate for the 25 mgd in additional demand, or possibly develop additional conservation programs or other demand management approaches. A potential approach for BAWSCA and the wholesale customers to secure supplemental water supplies and associated issues are described under the No Program Alternative. However, unlike the No Program Alternative (under which the SFPUC could at times meet the full purchase requests but with uncertain reliability), the No Purchase Request Increase Alternative would on average provide 184 mgd, or 88 percent, of wholesale customer demand with a high level of reliability. Nevertheless, the wholesale customers might elect to obtain supplemental supplies to meet the additional 25 mgd in demand using an approach similar to that described above under the No Program Alternative.

Feasibility Issues

Similar to the No Program Alternative, the No Purchase Request Increase would present no engineering or technical feasibility issues, but it would likely result in institutional and legal issues since it assumes that the SFPUC and it customers would collectively agree to maintain the current Master Water Sales Agreement contract provisions (and other individual contracts). However, without such an agreement BAWSCA and/or wholesale customers would likely pursue legal remedies to compel the SFPUC to meet the 2030 customer purchase request. Whether or not the SFPUC could agree with its customers on such an alternative, BAWSCA and/or wholesale customers would also likely seek other water supply sources to meet customer water needs; each alternate water source would have its own set of technical, cost, legal, and regulatory considerations that would require additional studies. With respect to public acceptance, it is unlikely that the SFPUC's regional system customers would support this alternative. In addition, depending on the outcome of customer actions, this alternative could add substantial capital and/or operation and maintenance costs as a result of having to accommodate alternate water sources in addition to the costs of the 22 facility improvement projects included in the WSIP. This unknown but possibly substantial additional cost raises questions about total program cost and financing feasibility and customer rate impacts.

Ability to Meet Program Objectives

Table 9-6, above, shows how the No Purchase Request Increase Alternative would perform in terms of meeting the WSIP level of service goals and system performance objectives compared to the proposed program. This alternative would fully meet the WSIP level of service goal with respect to water quality for the SFPUC system (although the SFPUC would not be responsible for regulatory compliance of new water sources obtained by wholesale customers; in addition, if new sources are to be "wheeled" through the SFPUC system, then the water quality objective may not be achieved). Seismic reliability would be improved over existing conditions, but due to the reduced target delivery level, the alternative would not meet the WSIP objective of providing 300 mgd average day demand but would meet a reduced objective of 275 mgd average day demand. In addition, there is no certainty about where the distribution of the additional 10 mgd would occur, so the seismic performance objectives of serving 70 percent of turnouts and meeting average day demand in the three customer regions (South Bay, Peninsula and San Francisco) could not be guaranteed and would need to be reevaluated to determine if the WSIP performance objective could be achieved. Delivery reliability of the regional system would be improved similar to the proposed program; however, this alternative would only partially meet those objectives, since it would not meet the average annual demand of 300 mgd under maintenance or outage conditions but instead meet the reduced target delivery level of 275 mgd. Comprehensive and regular repair and maintenance of the regional system would occur without service interruptions, and the risk of service interruptions due to unplanned facility upsets or outages would be minimal. Facilities would be in place to replenish local reservoirs as needed to prepare for drought, and the system would remain essentially gravity-driven.

The No Purchase Request Increase Alternative would fail to achieve the WSIP's water supply level of service goal during nondrought and drought periods and would not meet the 2030 customer purchase requests of 300 mgd. Under this alternative, the regional system would be capable of serving average annual purchase requests of 275 mgd during nondrought conditions (compared to 265 mgd delivered on average under existing conditions). Deliveries would be limited to an annual average of 275 mgd. Similarly, while this alternative would meet the WSIP objective of limiting drought-year rationing to a maximum of 20 percent systemwide, it would achieve this objective at the reduced demand level of 275 mgd. Unless wholesale customers were to obtain alternative supplies from other sources to supplement the SFPUC deliveries, the combined effect of reduced deliveries from the SFPUC and 20 percent rationing during droughts could effectively require rationing of over 20 percent of total demand during an extended drought sequence. However, the No Purchase Request Increase Alternative would succeed in diversifying the SFPUC water supply portfolio and improve use of new water sources during nondrought and drought periods.

In order to reevaluate levels of service objectives at a target delivery level of 275 mgd, system modeling using the hydrologic, hydraulic and seismic reliability models would need to be performed, and the level of service objectives would need to be revised to become compatible with the lower system delivery target. The distribution of future demands would need to be evaluated in order to determine if the seismic criteria of 70 percent of turnouts and average day demand to the three regional customer groups following a seismic event could be achieved.

If the wholesale customers and/or BAWSCA were to pursue supplemental water sources to compensate for the reduced supply provided by the SFPUC's regional system under this alternative, additional studies would be required to determine both the technical and institutional feasibility of such supplemental sources. The resultant ability of the alternative to meet the WSIP water supply and delivery reliability objectives would then depend in part on the wholesale customer actions and would be outside the control of the SFPUC.

Similarly, the No Purchase Request Increase Alternative would meet the WSIP sustainability objectives, within the bounds of the SFPUC actions, but it would be unknown with respect to the wholesale customer actions. If the wholesale customers were to take independent action from the SFPUC under this alternative, this would result in inefficient use of resources and funds and would not meet the WSIP objective for cost-effectiveness. The capital, operation and maintenance cost of the 22 facility improvement projects would be the same as the WSIP, but additional costs would be incurred from conservation or supply projects implemented by customers in place of the WSIP supply.

Environmental Impacts Compared to those of the WSIP

Facility Construction and Operations Impacts

WSIP Facilities

The No Purchase Increase Alternative assumes that all WSIP facility improvement projects would be implemented to meet the intent of the water quality, seismic reliability, and delivery reliability objectives of the WSIP. Therefore, the identical facility-related impacts described in Chapter 4 would occur under this alternative.

Other Facilities Potentially Implemented Under this Alternative

The ability of the wholesale customers to develop additional water supplies is uncertain and outside the control of the SFPUC. A potential approach for BAWSCA and the wholesale customers to secure supplemental water supplies is described under the No Program Alternative. The types of projects that the wholesale customers might pursue and the potential facility and operations impacts associated with such projects are presented in Table 9-10, above, for consideration by decision-makers and other interested parties.

This alternative could result in construction and operation of extensive additional recycled water, groundwater, and water conveyance facilities in the wholesale customer service areas; thus, collective impacts in the Bay Division and Peninsula Regions and associated cumulative effects (such as traffic, air quality, noise and vibration) would be more severe than those of the WSIP.

Water Supply and System Operations Impacts

Under the No Purchase Request Increase Alternative, the estimated average annual diversions from the Tuolumne River would be 221 mgd, based on HH/LSM modeling of this alternative over the 82-year hydrologic record. This amount is 24 mgd less than the 245 mgd average annual diversions from the Tuolumne River under the WSIP, but 3 mgd more than the 218 mgd average annual diversions under existing conditions, as shown in Table 9-5, above. The slight increase in diversions is due to the small increase in purchase request and the improvement in delivery reliability. The potential impacts on water resources in the Tuolumne River, Alameda Creek, and Peninsula watersheds associated with this level of diversion are described below and compared to the impacts that would occur under the WSIP.

Tuolumne River Watershed

Under the No Purchase Request Increase Alternative, the SFPUC would meet more purchase requests by 2030 than under the existing condition, but less than it would under the WSIP or any of the other alternatives analyzed in Section 9.2. The No Purchase Request Increase Alternative would result in a small reduction (less than 0.5 percent) in average annual releases to the Tuolumne River from Hetch Hetchy Reservoir and some reduction and delay in the spring releases on occasion compared to the existing condition. The reduction and delay in spring releases would occur because storage deficits in a series of dry years would accumulate in Hetch Hetchy Reservoir. The reduction and delay in spring releases would be less than with the WSIP, and a delay of more than two days would occur much less frequently, about once in every 10 years, with the No Purchase Request Increase Alternative than with the WSIP. The delay is still judged to be sufficient to have a significant adverse effect on terrestrial biological resources because of the ecological sensitivity of riverside meadows and their flora and fauna.

The No Purchase Request Increase Alternative would result in a small reduction in average annual releases to the Tuolumne River from La Grange Dam (less than 0.5 percent) and some reduction and delay in the winter/spring releases compared to the existing condition. The delay in winter/spring releases would have an adverse effect on fisheries in the Tuolumne River and on terrestrial biological resources in the riparian corridor, but the impact would be less than significant.

Alameda Creek Watershed

The improvements to Calaveras Dam that would occur with the WSIP would also be part of the No Purchase Request Increase Alternative. Furthermore, under this alternative, the SFPUC would operate its facilities in the Alameda Creek watershed in a similar manner as with the WSIP. Consequently, the environmental impacts of the No Purchase Request Increase Alternative would be similar to those of the WSIP.

Peninsula Watershed

Average annual system delivery to the wholesale customers would increase with the No Purchase Request Increase Alternative compared to the existing conditions, but to a much lesser degree than with the WSIP (10 mgd more rather than 25 mgd). The SFPUC would try to serve the smaller increase in demand in the Coastside CWD service area from Pilarcitos Reservoir, as it would with the WSIP. Drawdown of Pilarcitos Reservoir would occur more rapidly than under the existing condition but less rapidly than with the WSIP under the No Purchase Request Increase Alternative. Stored water releases to Pilarcitos Creek would cease earlier in the summer than under the existing condition but later than with the WSIP. The changes attributable to the No Purchase Request Increase Alternative would adversely affect water quality, fisheries, and terrestrial biological resources in the reservoir and the creek, but the impact would be less than significant.

The improvements to Lower Crystal Springs Dam that would occur with the WSIP would also be part of the No Purchase Request Increase Alternative. As a result of the improvements and associated modifications in system operations, the maximum water level in Crystal Springs Reservoir would rise by about 20 feet. The rise in water level would have significant adverse impacts on terrestrial biological resources, as described in Section 5.5.6. Since the No Purchase Request Increase Alternative would include improvements to Lower Crystal Springs Dam, the SFPUC would generally operate its facilities in the Peninsula watershed in a similar manner as it would with the WSIP. Consequently, the environmental impacts of this alternative would be similar to those of the WSIP.

Growth-Inducement Potential and Secondary Effects of Growth

This alternative, would have less growth-inducement potential than the WSIP, because the SFPUC would only provide additional water to its wholesale customers up to the existing contract amount of 184 mgd (average annual), compared with 209 mgd (average annual) under the WSIP. Under this alternative, the SFPUC would only improve system reliability for existing customers, providing for water delivery in accordance with the existing Master Sales Agreement between the SFPUC and the wholesale customers. As discussed above in the description of this alternative, it is reasonable to assume that the SFPUC wholesale customers would seek to acquire (either separately or together through BAWSCA) supplemental water supplies to meet their projected needs, as represented by the increased purchase requests they submitted to the SFPUC.

As discussed in Chapter 7, growth has occurred in some communities, such as San Francisco, without a corresponding increase in water supply. In the future, the projected population and/or employment growth in some communities are clearly greater than the corresponding projected increase in water supply needs, indicating that water use efficiency is increasing and that additional supply is not necessarily required for growth to occur. It is possible that approval of additional development within the SFPUC's wholesale customer service area might be slowed somewhat in some communities because the wholesale customers would have to pursue other projects and actions to achieve adequate dry-year supplies and reliability, but it is not expected that this would deter communities from taking actions to support planned growth. Thus, the growth-inducement potential under this alternative could be similar to that of the proposed program. The difference is that the WSIP would not support this additional growth, but the growth would occur anyway as a result of SFPUC wholesale customers and/or BAWSCA pursuing substitute supplemental water supplies.

Even assuming that growth potential under this alternative were appreciably reduced within Bay Area communities served by the regional system, it is nonetheless likely that growth pressure would increase elsewhere in the Bay Area, such as eastern Contra Costa County, Solano and Sonoma Counties, and southern Santa Clara County, or beyond to tributary areas in the Central Valley. It is also likely that growth in these outlying areas would have similar types of environmental impacts but of potentially greater magnitude and consequence due to the effects of new development or "sprawl" versus the infill that would occur in the existing Bay Area communities served by the SFPUC's regional system.

9.2.4 Aggressive Conservation/Water Recycling and Local Groundwater Alternative (with and without Tuolumne River Supplement)

The Aggressive Conservation/Water Recycling and Local Groundwater Alternative examines the potential for the SFPUC and the wholesale customers to meet the 2030 service goals for the regional system, including serving the 2030 customer purchase requests of 300 mgd average annual supply through a combination of additional conservation efforts and recycled water and local groundwater projects. Since the WSIP already includes some conservation, water recycling, and local groundwater projects, this alternative would require aggressive efforts in these three areas that go beyond those proposed as part of the WSIP. This alternative represents alternate sources of supply and different target delivery levels for the regional system compared to the WSIP. This alternative is evaluated to address the impacts to the Tuolumne River, Alameda Creek, and the Peninsula watershed, including Pilcarcitos Creek.

Conservation, water recycling, and local groundwater projects are already included in the proposed program in three ways. First, the effects of plumbing codes currently in place in the SFPUC service area (which provide passive conservation savings) are already incorporated into the projected total service area demand. Second, in the development of their 2030 purchase requests, the wholesale customers incorporated their current and anticipated future conservation programs and water recycling projects as well as local groundwater projects. The estimated 2030 purchase requests to the SFPUC reflect the wholesale customers' current assessment of the conservation, groundwater, and water recycling potential in their service areas. In addition, the proposed WSIP water supply option includes a combination of conservation, water recycling, and groundwater use in San Francisco to achieve an additional offset of 10 mgd of potable water demand from the regional system by the year 2030 (under the Groundwater and Recycled Water Projects, SF-2 and SF-3).

It is assumed that the wholesale customers would continue to actively participate in developing additional local and/or regional recycled water/groundwater/conservation projects to reduce the increased demand on surface water supplies during nondrought and drought periods in addition to the groundwater, recycled water, and conservation projects they are already committing to implement locally.

The SFPUC undertook a study, in coordination with its wholesale customers and BAWSCA, to assess the potential for more aggressive conservation coupled with local recycled water and naturally renewable groundwater projects[9] for potential regional development within the SFPUC service area. In preparing the *Investigation of Regional Water Supply Option No. 4 Technical Memorandum*, the SFPUC interviewed representatives of 27 wholesale customers to identify potential recycled water and groundwater projects that were not already considered implemented locally prior to estimating SFPUC regional water system purchases through the year 2030, and that could potentially be implemented regionally to offset SFPUC regional water system deliveries. In all, 53 recycled water and groundwater projects were identified for investigation of the potential to offset demand on the SFPUC regional water system. In addition, regional conservation programs consisting of between 8 and 23 conservation measures were evaluated. The regional conservation measures evaluated for the programs included a subset of the original 32 conservation measures evaluated in the 2004 conservation potential study (all but 8 of the original 32 measures that involved city of county ordinances or would be difficult to implement regionally), as well as four new measures and two revised original measures. The measures were evaluated individually and grouped into three regional programs. These conservation programs and the identified groundwater and recycled water projects were then screened to identify the feasibility and likelihood of implementation for each project/program.

The SFPUC assessed the likelihood of implementation on the basis of the degree to which various milestones in the project development and approval process had been completed by the local sponsoring agency, including: feasibility studies, cost estimate, conceptual engineering, CEQA environmental review, user commitments, community support, plans, and specifications. The projects identified as being eligible for the program (those that could potentially offset SFPUC regional water system deliveries) fell into three categories according to the likelihood of implementation with up to about 11 mgd in Category 1 (likely to be implemented), up to about 15.2 mgd in Category 2 (in early planning stages), and up to about 2.25 mgd in Category 3 (projects considered potentially eligible for future consideration). Due to their higher likelihood of implementation, the SFPUC incorporated the Category 1 San Francisco local projects into the WSIP's proposed water supply option for 10 mgd of additional supply (see Chapter 3, Section 3.6 for a description of these projects). The remaining projects in Categories 1, 2 and 3 have varying

9 Naturally renewable groundwater was defined as groundwater that, when pumped out of the ground, is naturally recharged in such a way that there is minimal or immeasurable effect on the beneficial uses of surface water. Further, this is groundwater that can be withdrawn from the ground at a sustainable rate without requiring imported surface water for recharge and without adversely affecting the local water resource.

degrees of feasibility; because most remain in the early stages of development and evaluation, information about their yield and ability to be implemented in a reasonable timeframe is limited, as well as their ability to ultimately offset SFPUC regional water system deliveries. This is likely the reason the SFPUC customers did not include them in their original SFPUC regional water system purchases estimates.

Table 9-11 lists the identified potential conservation, recycled water, and groundwater projects that could potentially provide for up to 19 mgd of water supply to meet the increasing delivery requests assuming it is determined that they can offset SFPUC regional water system supplies and are implementable. The 19 mgd is an optimistic, high estimate that combines the estimated high-range yield of remaining Category 1 projects as well as both projects in Categories 2 and 3, including some projects only at a conceptual stage. The implementation of the identified projects is uncertain due to numerous unknown factors, including water quality issues, end-users, long-term sustainable yield, production rates, feasibility, institutional arrangements, and permitting. Among many unknown factors, for example, is the degree to which other water agencies that serve some of the same customers as the SFPUC may choose to pursue the same actions and seek to reduce their use of other water supplies. Therefore, while the list of identified projects illustrates that there are opportunities within the service area to develop more conservation, recycled water, and local groundwater, the total yield of these potential projects is unknown. For purposes of analysis, this PEIR evaluates a maximum supply/supply offset of 19 mgd, identified as the high-range of potential yield that might offset SFPUC purchases, might be developed through this alternative over the planning horizon.

This discussion is intended to provide decision-makers and interested parties with information about the potential options that exist, the challenges associated with each, and (as discussed in a subsequent section) attendant environmental impacts. Even assuming that 19 mgd could be developed through these projects, this alternative could meet approximately 75 percent of the additional projected 2030 average annual water supply need. However, at least 6 mgd of the projected average annual 2030 demand would be unmet, and this alternative would also provide less drought supply reliability compared to the WSIP, requiring increased frequency of rationing at 20 percent.

Tuolumne River Supplement

For purposes of the analysis of alternatives, the PEIR considers a second scenario for this alternative in which the SFPUC would provide supplemental Tuolumne River water to fully meet the 2030 customer purchase requests.

In the first scenario, the SFPUC would not divert additional water from the Tuolumne River. SFPUC rationing of its deliveries would increase above the 20 percent objective during a drought. It is expected that the wholesale customers would pursue a supplemental supply, such as a water transfer, to augment this alternative to serve their 2030 purchase requests. Potential effects of pursuing a water transfer are described generally under Section 9.2.2 No Program Alternative, above. In the second scenario, the SFPUC would provide for the full 2030 customer purchase requests of 300 mgd by augmenting the 19 mgd of additional conservation, water recycling, and

TABLE 9-11
REGIONAL RECYCLED WATER, GROUNDWATER, AND CONSERVATION PROJECTS INCLUDED IN THE AGGRESSIVE CONSERVATION/WATER RECYCLING AND LOCAL GROUNDWATER ALTERNATIVE

Location/Jurisdiction	Type of Supply	Description	Low Range Yield (mgd)	High-Range Yield (mgd)
Category 1 – Projects Likely to be Implemented				
City of Daly City	Recycled Water	Expansion of recycled water uses from an existing facility to irrigate an additional park and landscape medians.	-	0.01
North Coast County Water District/San Francisco	Recycled Water	Various irrigation uses for school grounds and highway uses.	0.15	0.58
		Subtotal Category 1	**0.15**	**0.6**
Category 2 – Eligible Projects in Early Planning Stages				
Mountain View	Recycled Water	Irrigation and industrial usage – joint project with City of Palo Alto	-	1
Various	Conservation	Eight conservation measures to be implemented by a regional body	2.3	5.7
Various	Conservation	Seven additional conservation measures to be implemented by a regional body	0.6	1.5
Palo Alto	Recycled Water	Irrigation in Palo Alto and East Palo Alto	-	1
Cal Water–Mid-Peninsula	Groundwater	New well in Mid-Peninsula District for potable use	-	1
Cal Water–Bear Gulch	Groundwater	New well shared with Menlo Park for potable use	-	1
East Palo Alto	Groundwater	Reestablish use of existing well	-	0.5
Redwood City	Recycled Water	Expand recycled water system for use by additional customers outside of service area	2.2	4.5
South San Francisco and San Bruno	Recycled Water	Replace current groundwater irrigation uses with recycled water	-	0.3
		Project Overlap Adjustment[1]		(1.5)
		Subtotal Category 2	**5.1**	**15**
Category 3 – Potentially Eligible Projects for Future Consideration				
Menlo Park	Groundwater	Groundwater well for emergency use	Unknown	Unknown
Sunnyvale	Recycled Water	Extend existing recycled water project	-	0.7
Various	Conservation	Eight additional conservation measures to be implemented by a regional body	0.5	1.4

TABLE 9-11 (continued)
REGIONAL RECYCLED WATER, GROUNDWATER, AND CONSERVATION PROJECTS INCLUDED IN THE AGGRESSIVE CONSERVATION/WATER RECYCLING AND LOCAL GROUNDWATER ALTERNATIVE

Location/Jurisdiction	Type of Supply	Description	Low Range Yield (mgd)	High-Range Yield (mgd)
Category 3 – Potentially Eligible Projects for Future Consideration (cont.)				
Burlingame	Groundwater	Rehabilitate existing well	-	0.02
Burlingame	Recycled Water	Irrigation of commercial landscaping	-	0.25
		Project Overlap Adjustment		(0.14)
		Subtotal Category 3	**0.5**	**2.23**
Total			**5.75**	**~19**

[1] Project overlap adjustment represents the amount of potential conservation program savings overlap with respect to other projects to avoid double counting.

SOURCE: SFPUC, 2007b.

conservation with additional diversions from the Tuolumne River when available. In many years, alternative could fully meet the 2030 customer purchase requests by diverting the additional required amount from the Tuolumne River under the SFPUC's existing water rights. This would require diversion of some additional water from the Tuolumne River (at least approximately 5 mgd, average annual) compared to the existing condition, but substantially less than proposed under the WSIP (27 mgd, average annual). There would continue to be a shortfall in firm water supply during drought which would lead to more frequent need to ration water deliveries at 20 percent. Alternatively, the SFPUC could develop additional water through a desalination project to serve the remaining 6 mgd of average annual delivery demand (see Section 9.2.6 for a discussion of the year-round desalination supply alternative).

For purposes of the analysis of alternatives, the PEIR considers two possible scenarios for this alternative: one in which the SFPUC would not provide supplemental Tuolumne River water and one in which the SFPUC would provide supplemental Tuolumne River water to fully meet the 2030 customer purchase requests.

Description of SFPUC and Wholesale Customer Actions

SFPUC Actions

Under this alternative, the SFPUC would implement all of the same WSIP facility improvement projects as proposed for the WSIP, although the capacities of some of the facilities might be somewhat reduced since some of the supply would be provided by customers. The design of some of the WSIP facilities would need to reevaluated and sized appropriately to meet the delivery levels and performance objectives under this alternative. In addition, the SFPUC would proceed with implementation of other capital improvement projects and related activities not considered part of the program analyzed in this PEIR (as described in Chapter 3, Sections 3.13 and 3.4.6). The SFPUC would also implement the same system maintenance program and similar operational changes in the regional system as those proposed under the WSIP.

The SFPUC's role in helping its customers develop more aggressive conservation, recycled water, and local groundwater programs under this alternative could range from one of coordination and facilitation, to funding support, to full partnership with one or more customer in the design, construction, and/or operation of regional projects. The SFPUC's role in such projects would need to be defined on a case-by-case basis.

As discussed above, the maximum potential SFPUC regional water system delivery offset identified in the study is about 19 mgd (not including the 10 mgd of San Francisco local projects in the WSIP proposed program). The ability for the SFPUC and its customers to achieve this 19 mgd of yield by the year 2030 is highly uncertain, particularly the Category 3 project portion (2.25 mgd), for which the offset potential has not been determined even if the projects move forward. Assuming the 19 mgd is realized, this alternative still does not fully offset the regional water system increase of 25 mgd average annual supply needed to meet the 2030 purchase requests. In this case, the SFPUC could consider augmenting this alternative by providing an incremental increase in Tuolumne River supply to make up the potential delivery shortfall in years when water is available under their existing water rights. This would involve increasing the average annual Tuolumne River diversion by at least approximately 5 mgd over the existing average annual diversion. Alternatively, the SFPUC could provide a different supplemental source, such as potable water from a new desalination plant (described in Section 9.2.6).

This alternative includes the SFPUC implementing projects in San Francisco to achieve a 10-mgd offset on regional system demand through a combination of conservation, recycled water, and groundwater projects, as in the WSIP proposed program. However, without some additional Tuolumne River diversion there would be no supplemental dry-year water supply sources from water transfers or from the Westside Basin conjunctive-use program which would lead to delivery shortfalls during drought.

Wholesale Customer Actions

For this alternative, it is assumed that the wholesale customers would actively participate in developing additional recycled water/groundwater/conservation projects in their local service areas to reduce the increased regional demand on surface water supplies during nondrought and drought periods in addition to the groundwater, recycled water, and conservation projects they are already committing to implement locally. As indicated in Table 9-11, under this alternative, various wholesale customers, in partnership with the SFPUC and/or BAWSCA, would develop a variety of programs to increase local groundwater extraction and recycled water through more aggressive conservation efforts to offset 19 mgd of increased water demand on the SFPUC regional water system. It is also assumed that the wholesale customers, in coordination with the

SFPUC, would implements these actions in a timely manner so that the water supply/offset would be available as the estimated customer increase in purchase requests are realized.

If the SFPUC does not supplement this alternative with additional Tuolumne River water in order to fully meet the 2030 customer purchase requests, it is expected that the wholesale customers would pursue additional supplemental supply, such as a water transfer.

Feasibility Issues

The Aggressive Conservation/Water Recycling and Local Groundwater Alternatives, (with and without supplemental Tuolumne River supply), would have numerous technical, institutional, financial, and public acceptance issues to overcome prior to implementation. As described above, the estimated 19 mgd from regional conservation/water recycling and local groundwater projects represents an optimistic, high-end estimate based on very preliminary studies. There are numerous uncertainties with regard to water quality issues, end-users, long-term sustainable yield, and production rates; furthermore, in some communities, there remain public acceptance issues with regard to use of recycled water for non-potable uses. Institutional arrangements, funding sources, and permitting requirements for these programs are also unknown. Furthermore, even if these obstacles were overcome, this alternative would have questionable feasibility to require customers 20 percent rationing during drought periods due to demand hardening. It is unlikely that the SFPUC's regional system customers would support this alternative. In addition, this alternative would add substantial cost to overall program as a result of having to implement additional regional conservation/water recycling and local groundwater projects in addition to the costs of the 22 facility improvement projects included in the WSIP. This unknown but substantial additional cost raises questions about cost and financing feasibility and customer rate impacts.

Ability to Meet Program Objectives

The Aggressive Conservation/Water Recycling and Local Groundwater Alternative would meet the WSIP objectives for water quality only for the SFPUC actions; however, the objective could not be guaranteed for new sources provided by customers, nor if new sources are wheeled through the SFPUC's system, unless developed in cooperation with the SFPUC. As shown in Table 9-6, seismic reliability would be improved over existing conditions since all WSIP facility improvement projects would be implemented, but this alternative cannot meet the objective of providing basic service to all regions following a major earthquake with certainty, even with supplemental Tuolumne River water, since the reliability of new sources to be developed by customers is unknown. In addition, there is no certainty about where the distribution of the new sources would occur, so the seismic objectives of serving 70 percent of turnouts and meet basic service in the three customer regions (South Bay, Peninsula and City) could not be guaranteed. However, with implementation of all WSIP facility improvement projects, it is likely that facilities would be restored within 30 days of a major earthquake and the SFPUC could at least partially meet the average day demand.

Based on input from the wholesale customers throughout the SFPUC service area, aggressive conservation, recycled water, and local groundwater projects could partially but not fully meet the

WSIP delivery reliability and water supply performance objectives. Under this alternative, it might be possible to provide for much of (estimated up to approximately 19 mgd but with unknown certainty) but not all of the projected 25 mgd increase in customer purchase requests by 2030. To fully meet the 2030 purchase requests, a supplemental supply of at least 6 mgd would need to be provided to augment this alternative; otherwise, the SFPUC would not be able to fully serve the 2030 customer purchase requests. Even with the Tuolumne River water, the delivery reliability objectives could not be guaranteed due to the lack of SFPUC control over and the uncertainty of the wholesale customers' new sources of supply. Implementation of all the facility improvement projects would permit operational flexibility under planned maintenance conditions, when customer demands are low, but there is uncertainty over the reliability and availability of the full 19 mgd of regional recycled water /groundwater / conservation programs to provide sufficient operational flexibility when needed to replenish local reservoirs or during unplanned facility outages.

In addition, this alternative would provide less dry-year/drought supply reliability than the WSIP and would not meet the WSIP objective for system firm yield. As shown on Table 9-5, customers would experience rationing under this alternative of up to 20 percent (for the Tuolumne River supplemental supply scenario) or 25 percent (for the no supplemental supply scenario) with notably greater frequency than would customers under the WSIP. Furthermore, this degree of rationing would have different implications for customers under the Aggressive Conservation/Water Recycling and Local Groundwater Alternative compared to the WSIP. Demand hardening[10] refers to the increasing difficulty and expense of achieving short-term water conservation levels during shortages as more long-term conservation measures are implemented and water-use efficiency is maximized and is a concern among water conservation agencies regarding aggressive conservation programs. As a result of the water use efficiency or demand "hardening" that would be further institutionalized through this alternative, customers would have limited options for accommodating a period requiring 20 percent or more rationing in terms of what water uses they could cut back. Customers would have already increased their water use efficiency and eliminated less efficient uses such as many types of conventional outdoor use (e.g., landscape irrigation, car washing). In these cases, the water use cutbacks required to achieve 20 percent or more rationing would involve reductions in more essential water uses, such as indoor uses for cleaning and bathing, which could cause greater hardship on customers. This alternative would only partially meet the objective of diversifying water supply, since it does not provide for any dry year water sources.

This objective would meet the WSIP sustainability objectives, within the bounds of the SFPUC actions, but it would be unknown with respect to the wholesale customer actions. If the wholesale customers were to take independent action from the SFPUC under this alternative, this would

[10] As described by the California Department of Water Resources, demand hardening "occurs when agencies implement water conservation programs that result in permanent reductions in water use, such as retrofitting plumbing fixtures or installing low-water-use landscaping. These measures lessen agencies' ability to implement rationing to reduce water use during droughts, and can result in greater impacts to urban water users (e.g., loss of residential landscaping) when rationing is imposed. For example, the extensive Los Angeles retrofit program helped the city maintain reductions in urban per capita water use it achieved during the last drought. These permanent water use reductions will make it more difficult for the city to duplicate its previous 15 percent water use reduction goal during a future drought" (Department of Water Resources, 2005).

result in inefficient use of resources and funds and would not meet the WSIP objective for cost-effectiveness. While the system would remain largely gravity-driven, implementation of additional water recycling and groundwater projects would increase the pumping requirements of the overall system. The capital, operation and maintenance cost of the 22 facility improvement projects would be the same as the WSIP, but unknown and likely substantial additional costs would be incurred from conservation or supply projects implemented by customers in place of the WSIP supply.

Environmental Impacts Compared to those of the WSIP

Facility Construction and Operations Impacts

WSIP Facilities

The Aggressive Conservation/Water Recycling and Local Groundwater Alternative assumes that the same 22 facility improvement projects proposed under the WSIP would be implemented to meet the water quality, seismic reliability, and delivery reliability objectives of the WSIP; therefore, all of the impacts described in Chapter 4 would also occur under this alternative. Although the capacities of some of the proposed facilities, such as those under the SJPL System (SJ-3) and BDPL Reliability Upgrade (BD-1) projects, might be reduced compared to the WSIP, the impacts of constructing and operating these projects would be largely the same under this alternative as with the WSIP. This alternative relies on 19 mgd supply from the wholesale customers. However, as described below, this alternative could result in construction and operation of extensive additional recycled water and groundwater facilities in the wholesale customer service areas; thus, collective impacts in the Bay Division and Peninsula Regions and associated cumulative effects (such as traffic, air quality, noise, energy use, waste disposal, and vibration) would be more severe than those of the WSIP.

If the SFPUC were to supplement this alternative with additional Tuolumne River supply, no additional facilities beyond the proposed WSIP facilities and new customer facilities would be needed, except for recycling facilities or a possible desalination plant, as detailed in the next section. If the SFPUC were to supplement this alternative with a desalinated water supply, it would have to construct and operate a new desalination plant and conveyance facilities to connect to the regional system (see Section 9.2.6 for the discussion of a desalination alternative).

Other Facilities Potentially Implemented Under this Alternative

No significant environmental impacts would be expected from implementation of water conservation measures. However, implementation of the recycled water and groundwater projects listed in Table 9-11 would result in a full range of construction and operational impacts, similar to those described in Chapter 4 for the WSIP facilities, in the South Bay and Peninsula areas. The types of impacts associated with implementation of the local recycled water and groundwater projects are summarized in **Table 9-12** and generally relate to construction of new infrastructure, water quality, and groundwater resources and operational uses of energy and long-term air quality emissions.

TABLE 9-12
SUMMARY OF POTENTIAL IMPACTS AND MITIGATION STRATEGIES FOR RECYCLED WATER AND GROUNDWATER PROJECTS

Potential Impact	Mitigation Strategy
Groundwater Resources. Potential for increased groundwater pumping, groundwater level reductions, and overdraft if there is insufficient sustainable yield to accommodate increased pumping.	Determine sustainable yield of the basin, implement monitoring program, regulate groundwater pumping to preserve safe yield.
Surface Water, Groundwater Quality, and Public Health Issues. Recycled water applied to the irrigated lands would infiltrate through the subsurface levels, potentially affecting surface and groundwater quality. Groundwater may have contaminants with potential health effects. Groundwater lowers the aesthetic quality of the water through increased hardness, and potential for tastes and odors.	Comply with Title 22 Water Recycling Criteria. Groundwater may require disinfection, treatment and/or blending.
Energy use. Operation of both recycled water and groundwater projects would require increased energy use for treatment and distribution, and pumping. Increased energy production to support these activities along with plant operation would, in turn, generate additional air pollutant emissions, including greenhouse gases emissions.	Energy efficiency measures.
Treatment. Temporary construction impacts (disturbance of soils, surface water quality, biological resources, cultural resources, air quality, traffic, noise, land use, hazardous materials). Potential long-term impacts could include odor, depending on treatment processes and location relative to sensitive receptors. Plant operations could also generate long-term noise, traffic, and visual impacts depending on facility site location(s)and increased energy consumption and air pollutant emissions. **Pumping.** (groundwater pumping station)	Most impacts associated with facility construction could be mitigated to a less-than-significant level with the types of measures identified in Chapter 6. As is the case with the proposed WSIP facilities, odor control features (scrubbers) could reduce any odor impacts to a less-than-significant level.
Conveyance. Mostly temporary impacts from construction of pipelines, valves, and pumps (disturbance of soils, surface water quality, biological resources, cultural resources, air quality, traffic, noise, land use, hazardous materials, aesthetics).	Most impacts associated with facility construction could be mitigated to a less-than-significant level with the types of measures identified in Chapter 6. As is the case with the proposed WSIP facilities, some impacts (e.g., short-term noise and traffic) could be unavoidable.
Storage. Temporary construction impacts (disturbance of soils, surface water quality, biological resources, cultural resources, air quality, traffic, noise, land use, hazardous materials) and potential long-term impacts based on site-specific characteristics (e.g., slope stability, location within a scenic viewshed).	Most impacts associated with facility construction could be mitigated to a less-than-significant level with the types of measures identified in Chapter 6. As is the case with the proposed WSIP facilities, some impacts (e.g., short-term noise and traffic) could be unavoidable. Prepare and implement recommendations from a geotechnical study, implement measures to reduce visual contrast with surroundings (e.g., backfilling, earth-tone paint).

If the wholesale customers were to supplement this alternative with additional water through a water purchase, additional storage and/or limited conveyance facilities might be required. See the discussion of this topic under the No Program Alternative.

Water Supply and System Operations Impacts

This discussion addresses both alternative scenarios—the scenario in which the SFPUC would not supplement this alternative with additional supplies (could be anything), and the scenario in which the SFPUC would supplement this alternative with additional Tuolumne River diversions.

Aggressive Conservation/Water Recycling and Local Groundwater Alternative with No Supplemental Tuolumne River Water

Tuolumne River Watershed. Water demand would increase under the Aggressive Conservation/Water Recycling and Local Groundwater Alternative, but for this analysis, it is assumed that none of it would be met with water from the Tuolumne River. There would be no change in average annual releases to the Tuolumne River from Hetch Hetchy Reservoir with the Aggressive Conservation/Water Recycling and Local Groundwater Alternative compared to the existing condition. There may be changes in the pattern of releases from Hetch Hetchy Reservoir because of the improvements to conveyance facilities and improved maintenance practices. These changes could lead to year to year differences in the amount of water diverted from the Tuolumne River. There would be changes in the pattern of spring releases from Hetch Hetchy Reservoir, but these changes would be expected to have less severe impacts than the WSIP. However, the delay would still be enough to have a potentially significant adverse effect on terrestrial biological resources because of the ecological sensitivity of riverside meadows and their flora and fauna.

Similarly, the Aggressive Conservation/Water Recycling and Local Groundwater Alternative would result in no change in average annual releases to the Tuolumne River from La Grange Dam. The net effect of the small increases and decreases in the initial winter/spring releases would have a less-than- significant effect on fisheries in the Tuolumne River and the terrestrial biological resources in the riparian corridor.

Alameda Creek Watershed. The improvements to Calaveras Dam that would occur with the WSIP would also be part of the Aggressive Conservation/Water Recycling and Local Groundwater Alternative. Furthermore, under this alternative, the SFPUC would operate its facilities in the Alameda Creek watershed in a similar manner as the WSIP. Consequently, the environmental impacts of the Aggressive Conservation/Water Recycling and Local Groundwater Alternative would be similar to those of the WSIP.

Peninsula Watershed. Water demand would increase with the Aggressive Conservation/Water Recycling and Local Groundwater Alternative, as it would with the WSIP. The SFPUC would try to serve increased demand in the Coastside CWD service area from Pilarcitos Creek, exactly as it would with the WSIP. The consequent, more rapid drawdown of Pilarcitos Reservoir and the earlier cessation of stored water releases to Pilarcitos Creek would have a significant adverse effect on water quality, fisheries, and terrestrial biological resources in the reservoir and the creek.

The improvements to Lower Crystal Springs Dam that would occur with the WSIP would also be part of the Aggressive Conservation/Water Recycling and Local Groundwater Alternative. As a result of the improvements and associated modifications in system operations, the maximum water level in Crystal Springs Reservoir would rise by about 20 feet. The rise in water level would have significant adverse impacts on terrestrial biological resources, as described in Section 5.5.6. Since this alternative would include improvements to Lower Crystal Springs Dam, the SFPUC would generally operate its facilities in the Peninsula watershed in a similar manner as with the WSIP. Consequently, the environmental impacts of this alternative would be similar to those of the WSIP.

Aggressive Conservation/Water Recycling and Local Groundwater Alternative with Supplemental Tuolumne River Water

Tuolumne River Watershed. Water demand would increase under the Aggressive Conservation/Water Recycling and Local Groundwater Alternative, but a greater portion of the increase would be met by conservation, recycling, and groundwater than under the WSIP. This alternative would result in a small reduction in average annual releases to the Tuolumne River from Hetch Hetchy Reservoir (less than 1 percent) and some reduction and delay in the spring releases on occasion as compared to the existing condition. The reduction and delay in spring releases would occur because storage deficits in a series of dry years would accumulate in Hetch Hetchy Reservoir. The reduction and delay in spring releases would be less than with the WSIP, and a delay of more than two days would occur much less frequently, about once in every 10 years, with the Aggressive Conservation/Water Recycling and Local Groundwater Alternative than with the WSIP. The delay would still be enough to have a significant adverse effect on terrestrial biological resources because of the ecological sensitivity of riverside meadows and their flora and fauna.

The Aggressive Conservation/Water Recycling and Local Groundwater Alternative would result in a small reduction in average annual releases to the Tuolumne River from La Grange Dam (less than 1 percent) and some reduction and delay in the winter/spring releases as compared to the existing condition. The reduction and delay in winter/spring releases would have an adverse effect on fisheries in the lower Tuolumne River and on terrestrial biological resources in the riparian corridor, but the impact would be less than significant.

Alameda Creek Watershed. The improvements to Calaveras Dam that would occur with the WSIP would also be part of the Aggressive Conservation/Water Recycling and Local Groundwater Alternative. Furthermore, under this alternative, the SFPUC would operate its facilities in the Alameda Creek watershed in a similar manner as with the WSIP. Consequently, the environmental impacts of the Aggressive Conservation/Water Recycling and Local Groundwater Alternative would be similar to those of the WSIP.

Peninsula Watershed. Water demand would increase with the Aggressive Conservation/Water Recycling and Local Groundwater Alternative, as it would with the WSIP. The SFPUC would try to serve increased demand in the Coastside CWD service area from Pilarcitos Creek, exactly as it would with the WSIP. The consequent, more rapid drawdown of Pilarcitos Reservoir and the earlier cessation of stored water releases to Pilarcitos Creek would have a significant adverse effect on water quality, fisheries, and terrestrial biological resources in the reservoir and the creek.

The improvements to Lower Crystal Springs Dam that would occur with the WSIP would also be part of the Aggressive Conservation/Water Recycling and Local Groundwater Alternative. As a result of the improvements and associated modifications in system operations, the maximum water level in Crystal Springs Reservoir would rise by about 20 feet. The rise in water level would have significant adverse impacts on terrestrial biological resources. Since this alternative would include improvements to Lower Crystal Springs Dam, the SFPUC would generally operate its facilities in the Peninsula watershed in a similar manner as with the WSIP. Consequently, the environmental impacts of this alternative would be similar to those of the WSIP.

Growth-Inducement Potential and Secondary Effects of Growth

The growth-inducement potential for the Aggressive Conservation/Water Recycling and Local Groundwater Alternative would be similar to that described above for the No Program Alternative. As discussed above under Ability to Meet Program Objectives, this alternative would meet the 2030 purchase request increase but would not provide the same level of supply reliability as the proposed program. As a result, it is expected that SFPUC wholesale customers and/or BAWSCA would pursue other projects and actions to provide the desired level of reliability. While the need to develop additional projects beyond the WSIP might have some slowing effect on development approvals in some communities, it is not expected to impede growth from continuing in accordance with adopted plans. As a result, this alternative would have similar secondary effects of growth as those described for the proposed program.

9.2.5 Lower Tuolumne River Diversion Alternative

Under the Lower Tuolumne River Diversion Alternative, the SFPUC would implement all of the proposed facility improvement projects and would serve the projected increase in customer purchase requests through 2030 through diversions from the lower Tuolumne River, in accordance with an agreement with TID and MID, and construction of conveyance and treatment facilities to blend the new supply into the regional system. This alternative is based on an alternative developed by the SFPUC planning studies conducted for the WSIP water supply option (SFPUC, 2007b). Compared to the WSIP, this alternative represents an alternative source of supply and is evaluated to address impacts to the Tuolumne River.

Description of SFPUC and Wholesale Customer Actions

SFPUC Actions

Table 9-4 summarizes the main characteristics of the Lower Tuolumne River Diversion Alternative in comparison to those of the proposed program. Under this alternative, the SFPUC would rely on the same water supply sources as it would under the WSIP during both drought and nondrought periods. The increase in purchase requests would be served through the restored capacity of Calaveras and Crystal Springs Reservoirs, increased diversions from the Tuolumne River, and an equivalent of 10 mgd of supply from recycled water, groundwater, and conservation projects in San Francisco. Unlike the proposed program, however, the SFPUC would secure the increased diversions from the Tuolumne River at a downstream location near the confluence with the San Joaquin River. To meet the increase in purchase requests under this alternative, the SFPUC would release about 25 mgd (average annual) water from Hetch Hetchy Reservoir, allow it to flow to Don Pedro Reservoir, and release it from the New Don Pedro Dam to the lower Tuolumne River, in accordance with an agreement with TID/MID. A new SFPUC diversion facility located near the confluence of the San Joaquin and Tuolumne Rivers would recover the 25 mgd. From the diversion point, the recovered water would be pumped to a new treatment plant near Tesla Portal where it would be filtered and disinfected prior to blending with unfiltered Hetch Hetchy water. The lower Tuolumne River water would require treatment prior to blending into the Coast Range Tunnel because it would not meet the federal or state filtration exemption requirements. A conceptual schematic of this diversion is shown in **Figure 9.1**.

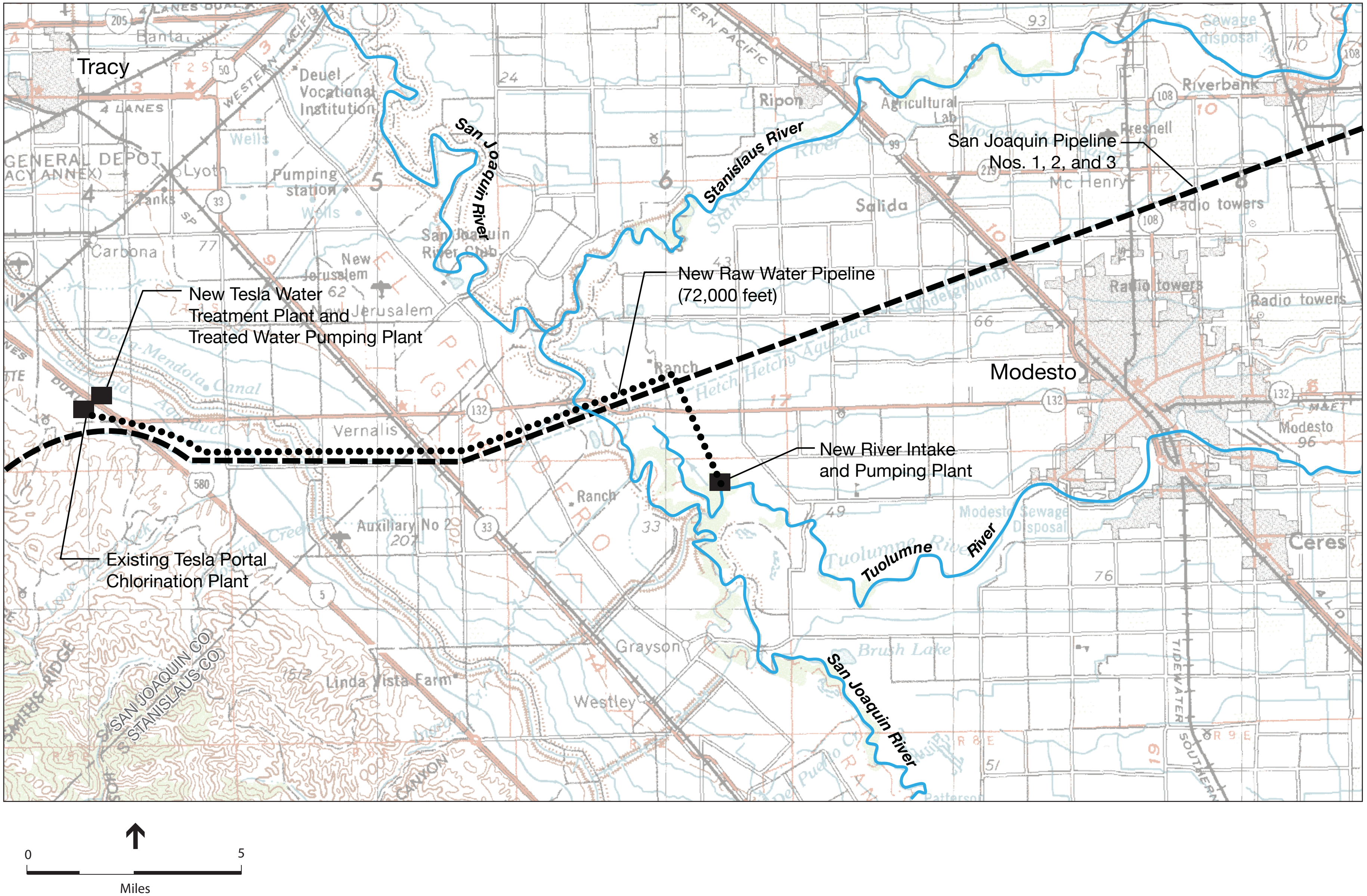
The Lower Tuolumne River Diversion Alternative assumes that all 22 WSIP facility improvement projects would be implemented. However, the design of some of the WSIP facilities would need to reevaluated and sized appropriately to meet the delivery levels and performance objectives under this alternative. In addition, the SFPUC would proceed with implementation of other capital improvement projects and related activities not considered part of the program analyzed in this PEIR (as described in Chapter 3, Sections 3.13 and 3.4.6). The SFPUC would also implement the same system maintenance program and similar operational changes in the regional system as those proposed under the WSIP with the addition of operation and maintenance of the additional facilities described below.

This alternative would require that the SFPUC construct and operate additional facilities not included under the WSIP, as summarized below:

- *Lower Tuolumne River Intake and Pumping Plant*. A new lower Tuolumne River intake and pumping plant would divert the 25 mgd (average annual) and lift the water to a new treatment plant near Tesla Portal. Depending on the suitability of the gravel bed, it is possible that the intake structure would be similar to that of the TID Infiltration Gallery Project, which consists of an array of perforated pipes installed in the lower Tuolumne River bed. If this design is not appropriate, the intake structure would be equipped with a fish screen designed to meet state and federal fish screen criteria. Two sites for the lower Tuolumne River intake and pumping plant have been considered at locations where the flood levels are not in place or already compromised. The facility would be sized appropriately (e.g., 55 mgd) to provide for seasonal diversions.

- *15-Mile Pipeline*. Diverted lower Tuolumne River flows would be pumped to the new treatment plant via a 15-mile, 48-inch-diameter welded steel pipe, the majority of which would run parallel to the existing San Joaquin Pipelines.

- *Lower Tuolumne Water Treatment Plant*. The Lower Tuolumne WTP would filter and disinfect the lower Tuolumne River water. The WTP would be located just north of Tesla Portal within the SFPUC property boundary and have a sustainable capacity of 55 mgd.



SOURCE: ESA+Orion, 2006

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Figure 9.1
Lower Tuolumne River Diversion Alternative Facilities and Pipeline Alignment

- *Tesla Treated Water Pumping Plant*. The pumping plant would pump treated lower Tuolumne River water to Tesla Portal, where it would be combined with Hetch Hetchy water via a new vertical shaft to the Coast Range Tunnel. However, if the Advanced Disinfection project (SJ-1) is sited at Tesla Portal, a blending structure could be added to the new facility, and a new vertical shaft to the Coast Range Tunnel would not be required.

Wholesale Customer Actions

Like the proposed program, the Lower Tuolumne River Diversion Alternative would fully meet the WSIP delivery reliability and water supply level of service goals. Therefore, the SFPUC would serve the projected 2030 purchase requests for all customers, and wholesale customers would not be required to implement any additional conservation and/or recycled water projects or develop supplemental water supplies from other sources beyond what is identified in their respective urban water management plans.

Feasibility Issues

The Lower Tuolumne Diversion Alternative would pose a number of technical and institutional challenges and there is uncertainty regarding the availability of water at this location. The availability of water on the lower Tuolumne River to the SFPUC would be dependent upon: (1) agreements with TID and MID for making the necessary releases from Don Pedro Reservoir, (2) approval by the State Water Resources Control Board for a change in the point of diversion and possibly additional appropriation license to recover this water, (3) and regulatory constraints under the state and federal Endangered Species Act. Construction of the intake in the lower Tuolumne River and crossing the San Joaquin River could affect critical habitat for steelhead and Chinook salmon. There could also be water quality issues with the new source, depending on the location of the intake and the design of the treatment facility, and the overall quality of the regional system water would be reduced with the addition of treated water from the lower Tuolumne River. This alternative would likely arouse public opposition result in the San Joaquin Valley due to substantial construction and operational impacts, outside of the SFPUC service area. In addition, this alternative would add substantial cost to overall program as a result of having to build and operate a new intake, treatment plant, and transmission pipelines in addition to the costs of the 22 facility improvement projects included in the WSIP. This substantial additional cost raises questions about cost and financing feasibility and customer rate impacts.

Ability to Meet Program Objectives

Table 9-6 shows how the Lower Tuolumne River Diversion Alternative would perform in terms of meeting the WSIP level of service goals and performance objectives compared to the proposed program. This alternative is dependent on agreements with TID/MID to make the requisite water releases from New Don Pedro Dam; State Water Resources Control Board appropriation licenses, if applicable; and regulatory constraints under the California and Federal Endangered Species Acts. Thus, water from the Tuolumne River is reliable but not necessarily available under this scenario.

The Lower Tuolumne River Diversion Alternative would only partially meet the level of service goal related to water quality, since it would require full treatment prior to blending with other Hetch Hetchy supplies. Although both the WSIP and this alternative would meet all applicable water quality requirements, there would be a deterioration in water quality, including potentially more contaminants in the water, and reduced aesthetic quality (tastes and odor, hardness) under the Lower Tuolumne River Diversion Alternative compared to the WSIP.

The Lower Tuolumne River Diversion Alternative would include implementation of the 22 facility improvement projects as proposed under the WSIP needed to meet the seismic and delivery reliability level of service goals. However, due to the unknown availability of the lower Tuolumne River as a year-round source, there is uncertainty of the capability of this alternative to provide adequate delivery to all regions following a major earthquake or to serve average day demand during an unplanned facility outage. Similarly, while the facilities could be restored within 30 days after a major earthquake, this alternative could partially restore service to the customer but the availability of the full average day demand of 300 mgd would depend on the lower Tuolumne River diversion. With implementation of all the facility improvement projects, the system would have increased operational flexibility for planned maintenance, but the extensive increase in facility requirements under this alternative would add additional constraints to systemwide operational flexibility. Comprehensive and regular repair and maintenance of the regional water system would generally occur without interruption, and the risk of service interruptions due to unplanned facility upsets or outages would be minimal, assuming availability of water from the lower Tuolumne River diversion location.

With respect to water supply reliability, the Lower Tuolumne River Diversion Alternative would increase system firm yield to 256 mgd, thus meeting the level of service goals for water supply during drought and nondrought periods. This assumes that diversions from the lower Tuolumne River are feasible during all water years and all seasons, as proposed under this scenario, and that the water transfer from TID/MID could be implemented.

It is uncertain if the Lower Tuolumne River Diversion Alternative would meet the WSIP sustainability objectives, since there are numerous regulatory and permitting issues to be resolved, including effects on steelhead and Chinook salmon, and would require significant increase in long-term energy use compared to the proposed program. While the system would remain largely gravity-driven, the new source of water under this alternative would increase the pumping requirements of the overall system. This alternative would result in inefficient use of resources and funds compared to the WSIP, and would not meet the WSIP objective for cost-effectiveness. The capital, operation and maintenance cost of the 22 facility improvement projects would be the same as the WSIP, but substantial additional capital, operation and maintenance costs would be incurred from the diversion, pumping, conveyance and treatment facilities needed for this alternative.

Environmental Impacts Compared to those of the WSIP

Facility Construction and Operations Impacts

WSIP Facilities

The Lower Tuolumne River Diversion Alternative would include implementation of all 22 WSIP facility improvement projects. Although implementation of the SJPL System project (SF-3) would be slightly different than under the WSIP, the impacts associated with this project would be about the same under both scenarios. Thus, the environmental impacts of constructing and operating each of the 22 WSIP facility projects would be about the same as those described in Chapter 4 for the proposed program. However, as discussed below, this alternative would require the construction and operation of extensive additional facilities in the San Joaquin Valley; thus, collective impacts in the San Joaquin Region and associated cumulative effects (such as traffic, air quality, noise, and vibration) would be more severe than those of the WSIP, depending on the construction schedule for these facilities.

Other Facilities and Actions Potentially Implemented Under this Alternative

In addition to the impacts related to construction and operation of the 22 WSIP facility improvement projects, implementation of the Lower Tuolumne River Diversion Alternative would also result in substantial additional impacts related to the construction and operation of additional facilities, including an intake structure and pumping plant, a new 55-mgd water treatment plant, a 15-mile pipeline to convey diverted flows from the point of diversion to the water treatment plant, and a new Tesla treated water pumping plant to transmit the treated water to Tesla Portal. These facilities would result in the full range of impacts at the proposed facility locations as those described in Chapter 4 for the WSIP facilities and would increase the construction and operational impacts in the San Joaquin Region. Impacts of these facilities would be similar to and in addition to those identified for the WSIP; construction and operational impacts would include effects on biological resources (described below), water quality, air quality, noise, traffic, visual, and recreation.

A primary concern with respect to these additional facilities is the potential for adverse effects on biological resources. Construction activities could affect wetlands and riparian habitat, alkali grasslands, valley oak woodland, agricultural areas, and grassland/ruderal habitat as well as special-status animal and plant species such as Swainson's hawk, vernal pool invertebrates, California tiger salamander, burrowing owl, Valley elderberry longhorn beetle, San Joaquin kit fox, California red-legged frog, and Delta button-celery. Construction of the intake structure at the Tuolumne River and across the San Joaquin River could adversely affect fishery resources, including Central Valley fall- and late-fall-run Chinook salmon and Central Valley steelhead.

The key operational issues associated with the Lower Tuolumne River Diversion Alternative would center around the effects of withdrawals on the Tuolumne River. Operation of the intake could result in the entrainment or impingement of species of concern (Central Valley steelhead and Chinook salmon). If an intake structure similar to that of the TID Infiltration Gallery Project were found to be inappropriate, the intake would be designed with state-of-the art fish screens. In addition, implementation of this alternative could potentially cause changes in hydrologic conditions along the lower Tuolumne River. Future evaluations would be required to assess hydrologic regime impacts. When compared to the proposed program, the Lower Tuolumne River Diversion Alternative would result in increased annual energy demand related to the operation of new pumping and treatment facilities, which in turn could result in secondary air quality and greenhouse gas emission, depending on the source of power.

Water Supply and System Operations

Under the Lower Tuolumne River Diversion Alternative, the total average annual diversions from the Tuolumne River would be essentially the same as with the WSIP, based on HH/LSM modeling over the 82-year hydrologic record, as shown in Table 9-5. However, due to the change in the point of diversion, system operations would be modified under this alternative compared to the WSIP. The potential impacts on water resources in the Tuolumne River, Alameda Creek, and Peninsula watersheds associated with this modified operation are described below and compared to the impacts that would occur under the WSIP.

Tuolumne River Watershed

Water demand would increase under the Lower Tuolumne River Diversion Alternative, as it would with the WSIP. The increased demand would be met, as it would be with the WSIP, by a combination of conservation, recycling, and groundwater storage and water from the Tuolumne River. However, with the Lower Tuolumne River Diversion Alternative, most of the increased diversion from the Tuolumne River would occur at a point just upstream of the Tuolumne River's confluence with the San Joaquin River, rather than at Hetch Hetchy Reservoir. This alternative would result in an increase in average annual releases to the Tuolumne River from Hetch Hetchy Reservoir of about 5 percent compared to the existing condition. Most of the time, releases to the river would be increased compared to the existing condition with the Lower Tuolumne River Diversion Alternative. Under the existing condition, the minimum required release would be made from Hetch Hetchy Reservoir 84.2 percent of the time (837 months in the 987-month hydrologic record). With the Lower Tuolumne River Diversion Alternative, the minimum required release would be made in many fewer months. The minimum releases would be supplemented by water released from Hetch Hetchy Reservoir for subsequent diversion near the Tuolumne River's confluence with the San Joaquin River in about half of the months in the 82-year hydrologic record. The increase in flow in the river between O'Shaughnessy Dam and Don Pedro Reservoir would benefit resident fish, riparian vegetation, fauna of the riparian corridor and whitewater recreation.

The Lower Tuolumne River Diversion Alternative would increase the average annual releases of water to the Tuolumne River below La Grange Dam, but would reduce and delay winter/spring releases by essentially the same amount as the WSIP. Under the existing condition, the minimum required release would be made from La Grange Dam 72.6 percent of the time (717 months in the 987-month hydrologic record). With the Lower Tuolumne River Diversion Alternative, the minimum required release would be made in fewer months. The minimum releases would be supplemented by water released from La Grange Dam for subsequent diversion near the

Tuolumne River's confluence with the San Joaquin River in many months. The increase in flow in the river between La Grange Dam and the San Joaquin River confluence would benefit resident and migratory fish, riparian vegetation, fauna of the riparian corridor and recreation. As with the WSIP, the reduction and delay in winter/spring releases would have a significant adverse effect on fisheries in the Tuolumne River and terrestrial resources in the riparian corridor.

Alameda Creek Watershed

The improvements to Calaveras Dam that would occur under the WSIP would also be part of the Lower Tuolumne River Diversion Alternative. Furthermore, under this alternative, the SFPUC would operate its facilities in the Alameda Creek watershed in a similar manner as with the WSIP. Consequently, the environmental impacts of the Lower Tuolumne River Diversion Alternative would be similar to those of the WSIP.

Peninsula Watershed

Water demand would increase with the Lower Tuolumne River Diversion Alternative, as it would with the WSIP. The SFPUC would try to serve increased demand in the Coastside CWD service area from Pilarcitos Creek, exactly as it would with the WSIP. The consequent, more rapid drawdown of Pilarcitos Reservoir and the earlier cessation of stored water releases to Pilarcitos Creek would have a significant adverse effect on water quality, fisheries, and terrestrial biological resources in the reservoir and the creek.

The improvements to Lower Crystal Springs Dam that would occur under the WSIP would also be part of the Lower Tuolumne River Diversion Alternative. As a result of the improvements and associated system operations, the maximum water level in Crystal Springs Reservoir would rise by about 20 feet. The rise in water level would have significant adverse impacts on terrestrial biological resources, as described in Section 5.5.6. Since this alternative would include improvements to Lower Crystal Springs Dam, the SFPUC would generally operate its facilities in the Peninsula watershed in a similar manner as with the WSIP. Consequently, the environmental impacts of the Lower Tuolumne River Diversion Alternative in the Peninsula watershed would be similar to those of the WSIP.

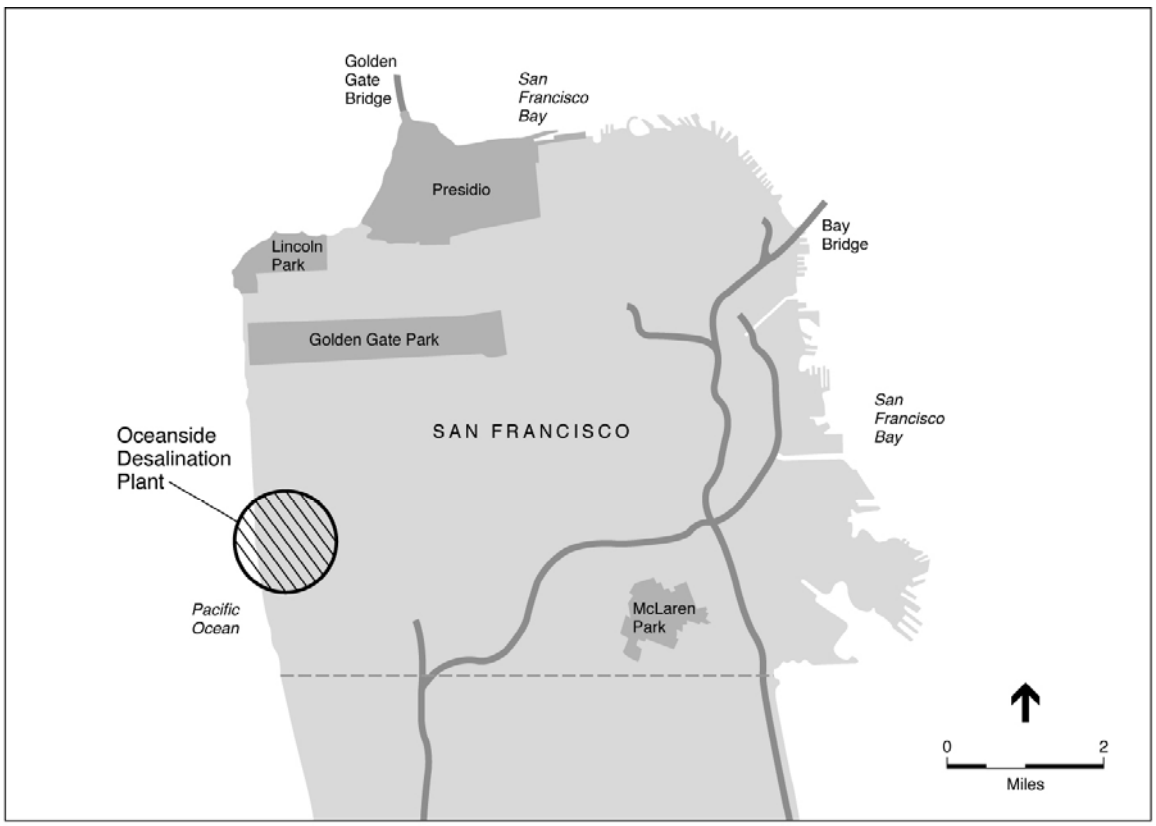
Growth-Inducement Potential and Secondary Effects of Growth

The growth-inducement potential for the Lower Tuolumne River Diversion Alternative would be similar to that of the proposed program, as described in Chapter 7. Since this alternative would meet the WSIP system performance objectives for delivery reliability and water supply, the water service and populations served would be identical. The minor difference in water quality would not affect the growth-inducement potential.

9.2.6 Year-round Desalination at Oceanside Alternative

Under the Year-round Desalination at Oceanside Alternative, the SFPUC would implement all of the proposed facility improvement projects and would construct a 25-mgd desalination plant in San Francisco to serve the projected increase in customer purchase requests. The plant would provide year-round supplies during all hydrologic year types to blend with the regional system water. This alternative is based on an alternative developed by the SFPUC planning studies conducted for the WSIP water supply option (SFPUC, 2007b). Compared to the WSIP this alternative represents and alternative source of supply and is evaluated to address the impacts to the Tuolumne River, Alameda Creek, and the Peninsula watershed, including Pilcarcitos Creek.

The Year-round Desalination at Oceanside Alternative would involve the construction of the Oceanside Seawater Desalination Plant (OSDP) on the west side of San Francisco near the existing Oceanside Water Pollution Control Plant (WPCP) (see **Figure 9.2**). Under this alternative, 25 mgd of potable water supplies produced by reverse-osmosis technologies would be provided year-round to retail customers in San Francisco during all hydrologic year types to the regional water system. The desalinated water would be introduced into the regional water system at Sunset Reservoir; this reservoir serves only customers in San Francisco and these customers would receive predominantly desalinated water.



SOURCE: ESA+Orion, 2006

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Figure 9.2
Year-Round Desalination at Oceanside Alternative

The Year-round Desalination at Oceanside Alternative assumes that seawater would be pumped through an offshore intake structure and pipeline to the OSDP, which would be designed with a sustainable capacity of 25 mgd. Based on a water recovery rate of approximately 50 percent in modern-day desalination plants, the capacity of the seawater intake structure and pipeline is estimated at 55 mgd. The conceptual process for the desalination plant includes pretreatment using advanced technologies to remove pathogens and suspended solids, a dual-stage reverse-osmosis system to remove salts, and post-treatment to stabilize and disinfect the product water and make it suitable for mixing in drinking water systems. The OSDP would make use of the existing wastewater outfall at the Oceanside WPCP for the discharge of the reverse-osmosis and pretreatment brine.

Description of SFPUC and Wholesale Customer Actions

SFPUC Actions

Table 9-4 summarizes the main characteristics of the Year-round Desalination at Oceanside Alternative in comparison to those of the proposed program. Under this alternative, the SFPUC would accommodate the projected increase of 35 mgd in customer purchase requests through 2030 through construction and operation of the OSDP (25 mgd), increased utilization of Bay Area watershed supplies associated with the restoration of storage in Calaveras Reservoir (SV-2) and Lower Crystal Springs Reservoir (PN-4), and an equivalent of 10 mgd of supply from recycled water, groundwater, and conservation projects in San Francisco. Supplemental drought-year supplies would consist of 25 mgd of desalination water and 6 mgd from implementation of the Westside Groundwater Basin conjunctive-use program.

The Year-round Desalination at Oceanside Alternative would implement all facility improvement projects proposed under the WSIP. However, the design of some of the WSIP facilities would need to reevaluated and sized appropriately to meet the delivery levels and performance objectives under this alternative. In addition, the SFPUC would proceed with implementation of other capital improvement projects and related activities not considered part of the program analyzed in this PEIR (as described in Chapter 3, Sections 3.13 and 3.4.6). The SFPUC would also implement the same system maintenance program and similar operational changes in the regional system as those proposed under the WSIP with the addition of operation and maintenance of the additional facilities described below.

Additional facilities that would be required under this alternative are summarized below:

- *55-mgd Concrete Seawater Intake Structure*. The new concrete intake structure would be located southwest of the desalination plant, approximately one to two miles offshore, at a depth of approximately 40 to 50 feet, depending on the extent of the existing sandbar. The intake structure would be sited and designed so as to minimize sediment intrusion, minimize the entrainment and/or impingement of marine organisms, and maximize water quality.

- *60-inch-Diameter Intake Pipeline*. The intake pipeline would convey 55 mgd of seawater from the intake structure to a new raw water pump station.

- *Seawater Intake Pump Station*. The seawater intake pump station, located onshore next to the OSDP, would be designed with a pumping capacity of 55 mgd and would pump raw water to pretreatment facilities.

- *Oceanside Seawater Desalination Plant*. The OSDP would be located near the existing Oceanside WPCP and would use the existing ocean outfall pipeline for brine disposal. The new plant would include pretreatment facilities, reverse-osmosis modules, and post-treatment facilities, as well as pipelines and pumps needed to convey the brine to the ocean outfall. There are feasibility issues associated with siting of the plant at this location due to space constraints for this plant as well as the proposed WSIP recycled water treatment facilities for the Recycled Water projects (SF-3).

- *25-mgd Treated Water Pump Station*. The treated water pump station would pump the treated water to the Sunset Reservoir for distribution via a new treated water pipeline.

- *48-Inch-Diameter Treated Water Pipeline*. A 2.4-mile 48-inch-diameter pipeline would convey the treated water through city streets to the Sunset Reservoir.

Implementation of the Year-round Desalination at Oceanside Alternative would require numerous additional permits and approvals, including preparation of a watershed sanitary survey in accordance with California Department of Health's safety regulations, approval by the U.S. Army Corps of Engineers for construction of structures in coastal areas, and approval by the Regional Water Quality Control Board for brine disposal. In addition, as required by Clean Water Act Section 316(b), the SFPUC would be required to submit a study to the California Coastal Commission describing the potential impingement and entrainment impacts on aquatic resources.

Wholesale Customer Actions

Like the proposed program, the Year-round Desalination at Oceanside Alternative would fully meet the WSIP delivery reliability and water supply level of service goals. Therefore, the SFPUC would serve the projected 2030 purchase requests for all customers, and wholesale customers would not be required to implement any additional conservation and/or recycled water projects or develop supplemental water supplies from other sources beyond what is identified in their respective urban water management plans.

Feasibility Issues

The major technical feasibility issue of implementing a year-round desalination plant at the Oceanside Water Pollution Control Plant site is due to the limited space available at this location. The site was selected to take advantage of the existing ocean outfall structure at this location, but there are other competing uses for this space, including the recycled water treatment facilities proposed as one of the WSIP facility improvement projects and recreational uses at and near the San Francisco Zoo. While there would be no restrictions on the availability of seawater, there remain site-specific uncertainties regarding the permit conditions for brine disposal and for minimizing impacts on aquatic resources. This alternative would also result in a direct impact on residents on the westside of San Francisco who are served from Sunset Reservoir and would essentially receive desalinated water instead of regional system water. Other public acceptance issues include potential conflicts with nearshore recreational uses in the Ocean Beach area. In addition, this alternative would add substantial cost to overall program as a result of having to build and operate a new intake structures, pump station, treatment plant, transmission pipelines, and any associated mitigation measures in addition to the costs of the 22 facility improvement projects included in the WSIP. This substantial additional cost raises questions about cost and financing feasibility and customer rate impacts.

Ability to Meet Program Objectives

Table 9-6 shows how the Year-round Desalination at Oceanside Alternative would perform in terms of meeting the WSIP level of service goals and performance objectives compared to the proposed program. Because there are no restrictions on the amount of seawater taken from the Pacific Ocean, this alternative does not have the same supply availability and reliability constraints as the surface water options.

The Year-round Desalination at Oceanside Alternative would increase system firm yield to approximately 256 mgd, thus meeting the level of service goals for water supply during drought and nondrought periods. This alternative would include implementation of all key projects needed to meet the seismic reliability and delivery reliability objectives of the WSIP, although the increase in facility maintenance and operational requirements associated with the desalination facilities would add additional constraints to systemwide operational flexibility. Although the Year-round Desalination at Oceanside Alternative would also meet the level of service objectives related to water quality, assuming the desalinated water would be treated to meet drinking water standards. As discussed above, this alternative would require that the SFPUC conduct a watershed sanitary survey and an impingement/entrainment study to comply with the requirements of the California Department of Health Services and the California Coastal Commission, respectively.

It is uncertain if the Year-round Desalination at Oceanside Alternative would meet the WSIP sustainability objectives, since there are numerous regulatory and permitting issues to be resolved associated with the desalination process, including protection of aquatic resources, water quality, and brine disposal issues, and it would require significant increase in long-term energy use compared to the proposed program. While the system would remain largely gravity-driven, the new source of water under this alternative would increase the pumping requirements of the overall system. This alternative would result in inefficient use of resources and funds compared to the WSIP, and would not meet the WSIP objective for cost-effectiveness. The capital, operation and maintenance cost of the 22 facility improvement projects would be the same as the WSIP, but substantial additional capital, operation and maintenance costs would be incurred from the intake, pumping, conveyance, treatment, and brine disposal facilities needed for this alternative.

Environmental Impacts Compared to those of the WSIP

Facility Construction and Operations Impacts

WSIP Facilities

The Year-round Desalination at Oceanside Alternative would include implementation of all 22 WSIP facility improvement projects. Although depending on a reevaluation of facilities sizing, some of the facilities could be slightly different than as proposed under the WSIP; however, the facilities impacts would be about the same under both scenarios. Thus, the environmental impacts of constructing and operating each of the 22 WSIP facility projects would be about the same as those of the proposed program. However, as discussed below, this alternative would require the construction and operation of extensive additional facilities on the west side of San Francisco; thus, collective impacts in the San Francisco Region and associated cumulative effects (such as traffic, air quality, noise, and vibration) would be more severe than those of the WSIP.

Other Facilities and Actions Potentially Implemented Under this Alternative

The Year-round Desalination at Oceanside Alternative would involve the construction of the OSDP, an intake structure and pipeline, intake pump station, a treated water pump station, and a treated water pipeline. A project-specific EIR would be required for the desalination plant and associated infrastructure. These facilities would result in a full range of construction and operations impacts at the proposed facility locations, similar to those described in Chapter 4 for the WSIP facilities, and would increase the construction and operational impacts in the San Francisco Region.

Construction Impacts. The primary environmental concerns during construction of the desalination plant and transmission pipelines are adverse impacts on sensitive receptors at the San Francisco Zoo and in nearby residential neighborhoods. Dust, noise and traffic generated during construction could affect nearby sensitive receptors, including animals and patrons at the zoo and residents who live along the pipeline routes. Depending on the location of the desalination plant, construction could also result in the displacement of parking at the San Francisco Zoo, result in temporary traffic impacts along pipeline alignments, and/or adversely affect recreational users at Fort Funston. In addition, the construction of the intake structure and pipeline would have a localized impact on marine organisms. Other potential construction-related effects would include cultural resources, hazardous materials, solid waste disposal impacts.

Operational Impacts. The primary concerns related to operation of the OSDP and related transmission facilities are potential impacts on aquatic resources, water quality, energy consumption, air quality, visual resources, geology and soils, land use and planning, traffic, and greenhouse gas emissions related to both traffic and energy use.

With respect to aquatic resources and water quality, operation of the OSDP could result in the entrainment and/or impingement of marine organisms in the intake pipeline and the discharge of potentially toxic substances into the Pacific Ocean from the existing outfall structure, including high-salinity discharges related to brine disposal as well as discharges of chemical and cleaning compounds. It is expected that significant entrainment and/or impingement impacts could be addressed by installing fine screens at the intake structure and by reducing the velocity of water intake. Discharge toxicity could be reduced by minimizing the use of chemicals during filter backwashing. Dilution modeling would be required to determine whether the new discharge, which would be a mixture of brine and wastewater from the Oceanside WPCP, would meet National Pollutant Discharge Elimination System discharge requirements and whether modifications to the outfall would be required. In addition, although blending of desalinated water with the regional system water would continue to meet all federal and state drinking water standards, there would be a noticeable change in water quality, particular residents in the westside of San Francisco who would receive predominantly desalinated water.

The energy consumption of desalination depends on the quality of the water produced and the feed water composition. The amount of electric power needed to produce potable water is proportional to the salinity of the source water. For this reason, when compared to the proposed program, operation of the Year-round Desalination at Oceanside Alternative would result in substantial increases in energy consumption and greenhouse gas emissions.

Potential impacts on cultural resources would result if the OSDP were sited at the Fleishhacker site or the National Guard Armory site. Construction of the OSDP at the Fleishhacker site would require the removal or modification of the Fleishhacker Bathhouse, which was constructed in the 1920s and thus potentially eligible for historic status. It is uncertain whether the National Guard Armory site has been evaluated for inclusion in the National Register of Historic Places. Cultural resource surveys would be completed during CEQA review and any identified cultural resources would be avoided to the extent feasible.

With respect to geology and soils, the proposed intake structure and pipeline would terminate in or near the surface rupture zone of the active San Andreas fault, which is located on the ocean floor about two miles west of the Oceanside WPCP. In addition, areas along the coast (such as ocean bluffs) can be unstable and are subject to erosion. Geotechnical studies would be conducted to characterize potential geologic and seismic hazards and to develop appropriate design measures.

Operation of the OSDP could also result in land use and planning issues related to the siting of the desalination plant near the coastal zone and potential land use conflicts with the San Francisco Zoo, the Oceanside WPCP, and/or the National Guard Armory.

Water Supply and System Operations

Under the Year-round Desalination at Oceanside Alternative, the total average annual diversions from the Tuolumne River would be essentially the same as the existing condition, based on HH/LSM modeling over the 82-year hydrologic record, as shown in Table 9-5. However, system operations would be modified under this alternative to accommodate the year-round addition of desalinated water to the regional water supply sources as well as to provide for regular system inspection and maintenance, similar to the WSIP. The potential impacts on water resources in the

Tuolumne River, Alameda Creek, and Peninsula watersheds associated with this modified operation are described below and compared to the impacts that would occur under the WSIP.

Tuolumne River Watershed

Water demand would increase under the Year-round Desalination at Oceanside Alternative by the same amount as with the WSIP. The increase in demand would be met with water from a new desalination plant. This alternative would not result in changes in average annual releases to the Tuolumne River from Hetch Hetchy Reservoir compared to the existing condition but changes could occur due to changes in operations attributed to conveyance system maintenance. The changes in spring releases would occur because of storage changes accumulating in Hetch Hetchy Reservoir leading to the delay or earlier initiation in spring releases. These changes would be less than with the WSIP and typically result in greater releases. Compared to current conditions, there could be a delay or an earlier initiation of the day of excess release. The delay would still be enough to have a potentially significant adverse effect on terrestrial biological resources because of the ecological sensitivity of riverside meadows and their flora and fauna.

Similarly, the Year-round Desalination at Oceanside Alternative would result in an occasional difference in the winter/spring releases from La Grange Dam compared to current conditions, sometimes greater and sometimes less year to year with no difference in the average annual releases to the Tuolumne River. In those years when the WSIP resulted in a delay in winter/spring releases it would have an adverse effect on fisheries in the Tuolumne River and on terrestrial biological resources in the riparian corridor, but the impact would be less than significant because this delay represents a minor variation in the flow release pattern.

Alameda Creek Watershed

The improvements to Calaveras Dam that would occur under the WSIP would also be part of the Year-round Desalination at Oceanside Alternative. Furthermore, under this alternative, the SFPUC would operate its facilities in the Alameda Creek watershed in a similar manner as with the WSIP. Consequently, the environmental impacts of the Year-round Desalination at Oceanside Alternative would be similar to those of the WSIP.

Peninsula Watershed

Water demand would increase with the Year-round Desalination at Oceanside Alternative, as it would with the WSIP. The SFPUC would try to serve increased demand in the Coastside CWD service area from Pilarcitos Creek, exactly as it would with the WSIP. The consequent, more rapid drawdown of Pilarcitos Reservoir and the earlier cessation of stored water releases to Pilarcitos Creek would have a significant adverse effect on water quality, fisheries, and terrestrial biological resources in the reservoir and the creek.

The improvements to Lower Crystal Springs Dam that would occur under the WSIP would also be part of the Year-round Desalination at Oceanside Alternative. As a result of the improvements and associated modifications in system operations, the maximum water level in Crystal Springs Reservoir would rise by about 20 feet. The rise in water level would have significant adverse impacts on terrestrial biological resources, as described in Section 5.5.6. Since the Year-round

Desalination at Oceanside Alternative would include improvements to Lower Crystal Springs Dam, the SFPUC would generally operate its facilities in the Peninsula watershed in a similar manner as with the WSIP. Consequently, the environmental impacts of the Year-round Desalination at Oceanside Alternative would be similar to those of the WSIP.

Growth-Inducement Potential and Secondary Effects of Growth

The growth-inducement potential for the Year-round Desalination at Oceanside Alternative would be similar to that of the proposed program, as described in Chapter 7. Since this alternative would meet the WSIP level of service goals for delivery reliability and water supply, the water service and populations served would be identical. The minor difference in water quality would not affect the growth-inducement potential.

9.2.7 Regional Desalination for Drought Alternative (Variant 2)

Under the Regional Desalination for Drought Alternative, the SFPUC would implement all of the proposed WSIP facility improvement projects and would partner with other Bay Area water agencies to construct and operate a proposed regional desalination plant. The SFPUC would receive supplemental supply from the regional desalination plant during drought years. This scenario is the same as WSIP Variant 2, as described in Chapter 8, Section 8.3, and is repeated here as a CEQA alternative because it would reduce impacts associated with increased diversions from the Tuolumne River.

The Regional Desalination for Drought Alternative (WSIP Variant 2) is similar to the WSIP, except that the SFPUC would receive supplemental drought-year supplies from a proposed regional desalination plant instead of from water transfers from TID and MID. The SFPUC, through its participation in the Bay Area Regional Desalination Project (BARDP), would receive additional water supply of up to 26 mgd during drought periods (an average annual yield of 23 mgd over the 8.5-year design drought). The SFPUC would not need to develop water transfer agreements with TID and MID for supplemental dry-year water, and, as a result, the overall increase in average annual water diversions from the Tuolumne River under this alternative would be less than that required for the proposed program. On an average annual basis, over the 82-year period of hydrologic record, this alternative would result in a 20-mgd increase in diversions from the Tuolumne River over existing conditions, compared to an increase of 27 mgd for the proposed program.

The BARDP involves a partnership among regional water agencies, including the SFPUC, Contra Costa Water District, East Bay Municipal Utility District, and Santa Clara Valley Water District, for the purpose of developing desalination as a regional water supply to improve supply reliability for over 5 million people served by the four agencies. The BARDP would develop and implement one or two desalination plants and associated facilities capable of producing about 65 to 71 mgd of potable water from ocean water, seawater, or brackish water. Participating agencies would either directly receive desalination product water into their water systems or would receive transfers from other agencies that directly receive desalination product water. A more detailed description of the BARDP is provided in Chapter 8, Section 8.3.

At the time of PEIR preparation, the institutional commitments and arrangements to implement a full-scale desalination plant as well as the necessary technical and feasibility studies had not been completed. However, in 2005, participating agencies received a grant from the California Department of Water Resources to complete a feasibility study to evaluate the institutional feasibility of the BARDP, and, in 2006, participating agencies received a second grant from the California Department of Water Resources to construct a desalination pilot plant. The pilot plant and related studies are scheduled to be implemented from 2007 to 2009.

Description of SFPUC and Wholesale Customer Actions

SFPUC Actions

Table 9-4 summarizes the main characteristics of the Regional Desalination for Drought Alternative in comparison to those of proposed program. As previously discussed, with the exception of supplemental drought-year supply sources, this alternative is similar to the proposed program in that the SFPUC would accommodate the projected increase of 35 mgd in customer purchase requests through an increase in average annual diversions from the Tuolumne River (20 mgd), increased utilization of Bay Area watershed supplies associated with the restoration of Calaveras Reservoir (SV-2) and Lower Crystal Springs Reservoir (PN-4), and an equivalent of 10 mgd of supply from recycled water, groundwater, and conservation projects in San Francisco. Unlike the proposed program, however, supplemental drought-year supplies would consist of up to 26 mgd (average annual yield of 23 mgd over the 8.5-year design drought) of desalination water from the BARDP and 6 mgd from implementation of the Westside Groundwater Basin conjunctive-use program.

The Regional Desalination for Drought Alternative would include implementation of all of the 22 facility improvement projects proposed in the WSIP. In addition, the SFPUC would proceed with implementation of other capital improvement projects and related activities not considered part of the program analyzed in this PEIR (as described in Chapter 3, Sections 3.13 and 3.4.6). The SFPUC would also implement the same system maintenance program and similar operational changes in the regional system as those proposed under the WSIP with the addition of participation in the operation and maintenance of the BARDP and related facilities.

The SFPUC is currently participating in the development of feasibility studies and pilot testing to determine the viability of the BARDP. If the project is found to be feasible, the SFPUC would contribute funds towards environmental review, project construction, and operation of the BARDP. Depending on the site(s) selected for development of the full-scale BARDP, the desalination project could require multiple components, including raw water supply/intake facilities, process and treatment facilities, and concentrate disposal facilities/outfall structures. To convey the product water from the desalination plant to the regional water agencies, transmission pipelines and pump station(s) would also be required. It is assumed that the BARDP would use or modify existing distribution and transmission facilities to the extent possible. Under the Regional Desalination for Drought Alternative, the SFPUC would receive transfer water from other participating water agencies, unless the facility were sited in San Francisco.

Wholesale Customer Actions

Like the proposed program, the Regional Desalination for Drought Alternative would fully meet the WSIP delivery reliability and water supply level of service goals. Therefore, the SFPUC would serve the projected 2030 purchase requests for all customers, and wholesale customers would not be required to implement any additional conservation and/or recycled water projects or develop supplemental water supplies from other sources beyond what is identified in their respective urban water management plans.

Feasibility Issues

A feasibility study is currently underway to refine the institutional, technical, environmental and scientific merits of a regional desalination facility. A pilot plant is proposed to test pretreatment options, membrane performance, and approaches for brine disposal. The technical feasibility of this alternative is dependent upon the outcome of these studies and pilot testing, and if determined to be fully feasible, implementation of a full-size regional desalination facility will require institutional arrangements to be formalized among the four partnering agencies as well as completion of environmental studies and permitting negotiations with numerous jurisdictions and resource agencies. In addition, this alternative would add costs to the overall program as a result of having to build and operate a new intake, treatment plant, transmission pipelines, and associated mitigation measures in addition to the costs of the 22 facility improvement projects included in the WSIP. Depending on the institutional and financial arrangements between the partnering agencies, this additional cost raises questions about cost and financing feasibility and customer rate impacts.

Ability to Meet Program Objectives

The Regional Desalination for Drought Alternative would include implementation of the same 22 regional system facility improvement projects as proposed under the WSIP needed to meet the water quality, seismic reliability, and delivery reliability performance objectives of the WSIP. Although this alternative would meet the level of service goals related to water quality, the desalinated water would require treatment to produce potable water supplies and would site-specific regulatory and permitting conditions for the desalination process. This alternative would increase system firm yield to 256 mgd, thus meeting the level of service goals for water supply during drought and nondrought periods.

However, it is uncertain if the Regional Desalination for Drought Alternative would meet the WSIP sustainability objectives, since there are numerous regulatory and permitting issues to be resolved associated with the desalination process, including protection of aquatic resources, water quality, and brine disposal issues, and it would require significant increase in long-term energy use compared to the proposed program. While the system would remain largely gravity-driven, the new source of water under this alternative would increase the pumping requirements of the overall system. This alternative would result in higher costs compared to the WSIP. The capital, operation and maintenance cost of the 22 facility improvement projects would be the same as the WSIP, but substantial additional capital, operation and maintenance costs—to be shared among the partnering agencies—would be incurred from the intake, pumping, conveyance, treatment, and brine disposal facilities needed for this alternative.

Environmental Impacts Compared to those of the WSIP

Facility Construction and Operations Impacts

WSIP Facilities

Potential impacts related to construction and operation of the WSIP facilities would be the same as those of the proposed program described in Chapter 4. However, as discussed below and in Chapter 8, this alternative would require the construction and operation of extensive additional facilities, and, depending on their location, could contribute to collective and cumulative effects (such as traffic, air quality, noise, and vibration), resulting in more severe collective and cumulative impacts than those of the WSIP.

Other Facilities and Actions Potentially Implemented Under this Alternative

As discussed in Chapter 8, Section 8.3.3, potential impacts resulting from the construction of desalination facilities and appurtenances include temporary conflicts with established uses during construction, temporary degradation of scenic resources, geologic and/or seismic hazards associated with facility siting, short-term impacts on water quality and the potential for short-term depletion of groundwater resources from construction dewatering, impacts on biological resources during construction and/or associated with facility siting, construction-related traffic impacts, increased air quality emissions and odors, construction-related noise, temporary impacts on agricultural resources, and potential impacts associated with encountering hazardous materials in soil and groundwater during construction.

The primary operational concerns would be the entrainment and/or impingement of special-status aquatic organisms in the intake pipeline, the discharge of potentially toxic substances from the outfall structure, and potential impacts on wetlands, marshlands, and other sensitive habitats. In addition, implementation of the BARDP would result in the substantial use of nonrenewable energy resources during construction and operation as well as the generation of greenhouse gases. Additional impacts associated with operation of the desalination plant and facilities include permanent conflicts with existing land uses or permanent degradation of visual resources/scenic views, operational air quality emissions and odors, and permanent increases in noise and vibration. A more detailed discussion of construction and operational impacts related to the BARDP is provided in Chapter 8, Section 8.3.3.

Water Supply and System Operations Impacts

As described in Chapter 8, the Regional Desalination for Drought Alternative would essentially have all the same water supply and system operations impacts as the WSIP. In the Tuolumne River, Alameda Creek, and Peninsula watersheds, all the same impacts would occur as with the proposed program and all the same mitigation measures would apply. During drought, SFPUC would supplement supplies with the desalination supply. However, in nondrought years the SFPUC would serve the customer requests with additional diversions from the Tuolumne River.

While impacts on Tuolumne River resources would be somewhat reduced compared to the proposed program, the significance determination of the impacts would remain the same as those for the proposed program. Refer to Chapter 8, Section 8.5 for further discussion of the water supply and system operations impacts of this alternative.

Growth-Inducement Potential and Secondary Effects of Growth

As described in Chapter 8, the growth-inducement potential under the Regional Desalination for Drought Alternative would be essentially the same as that for the WSIP insofar as the SFPUC's component of the BARDP would be used to serve the 2030 purchase requests of SFPUC customers. Any growth-inducement effects associated with the BARDP beyond this component would be determined as part of the CEQA review of the BARDP.

9.2.8 Modified WSIP Alternative

The Modified WSIP Alternative incorporates changes in the proposed WSIP primarily to modify the proposed water supply and system operations so as to minimize environmental effects.[11] Most of these changes are also proposed as mitigation measures for potentially significant or significant impacts identified in Chapter 5 – Water Supply and System Operations. In addition, the Modified WSIP Alternative includes other supply and operational modifications and actions that would further reduce impacts identified in Chapter 5. As discussed below under Ability to Meet Program Objectives, these supply and system operation modifications could, in some cases, compromise the level of service goals and system performance objectives established for the WSIP.

Description of SFPUC and Wholesale Customer Actions

SFPUC Actions

Under the Modified WSIP Alternative, the SFPUC would implement the identical facility improvement projects as those proposed under the WSIP. In addition, the SFPUC would proceed with implementation of other capital improvement projects and related activities not considered part of the program analyzed in this PEIR (as described in Chapter 3, Sections 3.13 and 3.4.6). The SFPUC would also implement the same system maintenance program and similar operational changes in the regional system as those proposed under the WSIP. The SFPUC would also implement largely the same water supply option package as proposed under the WSIP, but would endeavor to increase the amount of recycled water, conservation, and local groundwater contributing to meeting the regional system demand. Under this alternative, the SFPUC would also implement the following changes in the proposed system operations and supply options:

- <u>*Dry-year water transfer*</u>. The proposed WSIP includes acquisition of a water transfer from TID/MID to provide supplemental dry-year water for the regional system. The specific terms of this water transfer have not been established. Under this alternative, the terms of any water transfer from TID, MID or other agency(ies) would be conditioned such that it involves a transfer of conserved water only, rather than a transfer of stored water. This proposed condition is explained in Measure 5.3.6-4a. Under this alternative, a transfer of conserved water would be acquired for use every year, not only as a dry-year supplement,

[11] The description and analysis of the Modified WSIP Alternative has been updated in the Comment and Responses document. Please see Section **14.10, Master Response on the Modified WSIP Alternative** (Vol. 7, Chapter 14) for detailed information.

and doing so would avoid the WSIP impacts on the lower Tuolumne River below La Grange that result from the SFPUC increasing its diversions from the Tuolumne River.

- *Alameda Creek minimum flow requirement for trout between the Alameda Creek Diversion Dam and the confluence with Calaveras Creek*. To support trout spawning and egg incubation following the replacement of Calaveras Dam and the resumption of flow diversion from Alameda Creek, the SFPUC will meet a minimum flow requirement in the creek reach below the Alameda Creek Diversion Dam to the confluence with Calaveras Creek between December 1 and April 30 at times when precipitation would naturally generate unimpaired flow in this reach. The SFPUC will conduct the necessary site-specific studies to determine the specific minimum flow requirement. Allowing flow to bypass the diversion dam in order to meet this minimum flow requirement would result in some reduction in supply that would otherwise be available to the regional system, and this could compromise the system firm yield level of service objective under the WSIP's water supply goal. This proposed condition is explained in Measure 5.4.5-3a.

- *Water Delivery to Coastside County Water District – modified operations for Pilarcitos Reservoir*. Under the WSIP, the SFPUC would meet increased 2030 demand from Coastside CWD by drawing the additional water from Pilarcitos Reservoir. This would result in a variety of significant or potentially significant impacts on the water quality and fish, aquatic, and terrestrial resources associated with the reservoir and Pilarcitos Creek downstream of the reservoir (see Section 5.5 for a discussion of these impacts). Under this alternative, the SFPUC would serve Coastside CWD's increase in demand from Crystal Springs Reservoir rather than from Pilarcitos Reservoir, which would allow the SFPUC to continue to operate Pilarcitos Reservoir in a manner similar to existing conditions. Under this alternative approach, the SFPUC and Coastside CWD would need to work together to expand conveyance capacity to Coastside CWD to accommodate increased supply delivery from Crystal Springs Reservoir. Serving Coastside CWD from Crystal Springs Reservoir instead of Pilarcitos Reservoir, as proposed under the WSIP, would require additional water from the Hetch Hetchy system (combined Alameda watershed, Crystal Springs watershed, and Tuolumne River supplies) to substitute for the local Pilarcitos watershed supply that would have been used. This proposed condition is explained in Measure 5.5.3-2.

- *Crystal Springs Reservoir – modified operation to manage inundation levels*. As discussed in Section 5.5, the WSIP would result in significant effects on the biological resources associated with and surrounding Crystal Springs Reservoir as a result of increasing water storage levels within the reservoir and maintaining these higher water levels in the reservoir for a longer period each year than was the case under historic operations. The oak woodland habitat that occurs in the proposed reservoir inundation zone would not survive the extended period of inundation each year. The PEIR identifies mitigation measures to reduce these effects to a less-than-significant level, primarily through habitat compensation. One strategy that could substantially lessen these environmental effects would be to operate the regional system such that the water storage levels in Crystal Springs Reservoir would not be increased over existing levels for prolonged periods during the year. Although reservoir water levels still would be increased to the historical maximum under this Modified WSIP Alternative, modifying the proposed future reservoir operation to ensure that the water level fluctuates seasonally and is lowered for some period each year to create conditions that the oak woodland habitat could survive. The proposed modified operations would be similar to the operating conditions in effect prior to 1983, which the oak woodland was apparently able to survive. Because with this modification the water level in the reservoir would not be maintained as full for as long each year as proposed under the WSIP, this modified operation would reduce the amount of water in storage on the Peninsula and could compromise the system firm yield level of service objective under the WSIP's water supply goal. This is a new operation that SFPUC would implement under this alternative.

- *Increased Recycled Water, Conservation, and Local Groundwater*. Under this alternative, the SFPUC would institute a program to work with the wholesale customers to develop approximately 5 to 10 mgd of supply contribution, as feasible, from recycled water, conservation, and local groundwater projects within the regional wholesale service area. While the analysis of the Aggressive Conservation / Water Recycling and Local Groundwater Alternative in Section 9.2.4 indicates that it does not appear feasible to develop enough additional recycled water, water conservation and local groundwater to serve all or even a majority of the 25 mgd needed to meet the projected 2030 delivery demand for the regional system, it does appear feasible to develop at least some additional increment of supply / supply offset through these types of local projects. Based on the list of potential projects provided by the wholesale customers (see Table 9-11), a target goal of 5 to 10 mgd is proposed under this Modified WSIP Alternative. This is a new program that SFPUC would implement under this alternative.

  Developing additional water supply/ supply offset for the regional system through local water conservation, water recycling and groundwater projects would reduce the amount of additional Tuolumne River diversion required. At a minimum, it is expected that developing this level of additional local supply / supply offset could compensate for the reduction in available system supply resulting from the following operation modifications incorporated into this alternative to lessen or avoid environmental impacts: the Alameda minimum flow requirement, providing water delivery to Coastside CWD from Crystal Springs Reservoir, and the modified operation of Crystal Springs Reservoir. As a result, this alternative is not expected to require increases in Tuolumne River diversion that are greater than those proposed under the WSIP, and it is possible that the diversion increase would be less under this alternative than the WSIP.

  The SFPUC together with its wholesale customers have identified opportunities to expand supply contributions from water recycling, conservation and groundwater. While some of these projects are not cost-effective to pursue at the local level by a single agency or community, they may be more economically viable if developed and funded as regional projects contributing to the overall regional system. This alternative calls for the SFPUC to establish and fund, in conjunction with BAWSCA and the wholesale customers, a proactive regional program that will be supported by the SFPUC and its customers, promotes customer participation, and ultimately benefits the SFPUC regional water system. Based on a review of regional programs being implemented by other water agencies and consideration that the SFPUC provides water to both retail and wholesale customers, the SFPUC has identified several potential approaches for the program, shown in the bullet list below. One of these approaches, or a hybrid alternative featuring a combination of approaches, may best suit the SFPUC, its customers and the set of potential projects. The approaches include:

  – *Regional Entity Provides Financial Incentives.* This approach is structured such that the regional entity provides financial incentives for customers to apply for implementing their projects through the program. This financial assistance may include staff and material support.

  – *Regional Entity Implements Programs Directly.* This approach is structured such that the regional entity directly implements those projects or programs selected.

- *Regional Entity Implements Programs in Cooperation with Local Customers.* This approach is structured such that the regional entity implements those projects or programs selected in cooperation with the individual wholesale customer.

- *Regional Entity Implements a Grant Program.* This approach is structured such that the regional entity provides grants to individual wholesale customers, which are used by the individual wholesale customers to implement the projects.

Wholesale Customer Actions

Like the proposed program, the Modified WSIP Alternative would fully meet the WSIP delivery reliability and water supply level of service goals during nondrought years, and the SFPUC would serve the projected 2030 purchase requests for all customers. The wholesale customers would need to participate with the SFPUC in developing more recycled water, conservation, and local groundwater to contribute to meeting the needs of the regional system. The types of projects that would need to be pursued are discussed above under the Aggressive Conservation/Water Recycling and Local Groundwater Alternative.

Feasibility Issues

The Modified WSIP Alternative would have few feasibility issues, since in large part, this alternative represents the same actions and elements as the WSIP, for which the SFPUC has resolved major feasibility issues. Technical issues would be the same as the WSIP except for the design and implementation of facilities to permit bypass flows on Alameda Creek past the diversion dam. The institutional issues would be essentially the same as under the WSIP, including establishing agreements with local agencies for the regional groundwater conjunctive-use program in Northern San Mateo County and with TID, MID or other agency for water transfer agreements. The only difference would be that the water transfer agreement with TID, MID or other agency(ies) specify *conserved* water. Under this alternative the SFPUC would actively engage in developing regional recycled water, conservation, and local groundwater programs with the wholesale customers. While there remain feasibility issues associated with each specific water recycling, conservation and groundwater project (as discussed in Section 9.2.4, above), pursuing a goal of developing 5 to 10 mgd over time through a coordinated regional program appears achievable. Developing this additional increment of conservation, water recycling, and groundwater projects requires agreement between BAWSCA, the wholesale customers and the SFPUC as well as cooperation from several local agencies including wastewater agencies, stormwater management agencies, and planning departments, among others. Each project also will have its own feasibility questions, such as cost, facility siting, permitting and public acceptance, to resolve.

Ability to Meet Program Objectives

The Modified WSIP Alternative would include implementation of all of the proposed facility improvement projects needed to meet the water quality, seismic reliability, and delivery reliability goals of the WSIP, and would meet these objectives similar to the proposed program. Although the modified operation under this alternative would include actions that would affect the water supply and system firm yield (i.e., minimum flow requirements on Alameda Creek, reduced use of Pilarcitos Reservoir, and managed inundation levels in Crystal Springs Reservoir), the Modified WSIP Alternative also includes 5 to 10 mgd of regional recycled water / groundwater / conservation that is not part of the proposed program. Long-term implementation of these regional recycled water/local groundwater/conservation projects would offset impacts of the operational modifications proposed under the Modified WSIP Alternative on the Tuolumne River such that it is expected that this alternative would meet all of the water supply level of service goals and system performance objectives of the WSIP.

The Modified WSIP Alternative would meet the WSIP sustainability objective, and would be expected to have slightly greater costs than the WSIP, since there would be additional conservation, water recycling and local groundwater projects within the regional service area than under the WSIP. The water recycling and groundwater elements would add some pumping requirements to the overall regional system. However, it is assumed that planning and implementation of regional recycled water/groundwater/conservation projects in partnership with the wholesale customers would be conducted to incorporate the WSIP objectives for cost-effective use of funds.

Environmental Impacts Compared to those of the WSIP

Facility Construction and Operations Impacts

WSIP Facilities

Potential impacts related to construction and operation of the WSIP facilities would be the same as those of the proposed program, as described in Chapter 4.

Other Facilities Potentially Implemented Under this Alternative

No significant environmental impacts would be expected from implementation of water conservation measures. Implementation of recycled water and groundwater projects would result in a full range of construction and operational impacts in the South Bay and Peninsula areas, similar to those described in Chapter 4 for the WSIP facilities. The types of impacts associated with implementation of the local recycled water and groundwater projects are summarized in Table 9-12, above, and generally relate to construction of new infrastructure, water quality, and groundwater resources.

Water Supply and System Operations Impacts

This alternative incorporates mitigation measures to address some of the impacts identified for the WSIP, namely the effects on fish and riparian habitat in the lower Tuolumne River (Impacts 5.3.6-4 and 5.3.7-6), the effects on trout in Alameda Creek below the diversion dam (Impact 5.4.5-3), the effects on Pilarcitos Reservoir and Creek and associated resources (Impacts 5.5.3-2, 5.5.5-4, 5.5.5-5, 5.5.6-4, and 5.5.6-5), and the effects on fish and terrestrial biological resources around Crystal Springs Reservoir (Impacts 5.5.5-1 and 5.5.6-1). Otherwise, this alternative would have the same water supply and system operations impacts as the WSIP in the Tuolumne River, Alameda Creek, and Peninsula watersheds and would require the same mitigation measures.

The proposal to modify the proposed operations of Crystal Springs Reservoir would allow storage levels to be returned to their historical maximum; however, the reservoir would have to be operated to allow water levels to fluctuate annually and to provide for a seasonal lowering of the water level so that the oak woodland and other habitat on the periphery of the reservoir would not be inundated throughout the year. Historical vegetation mapping and accounts of habitat in the vicinity of Upper and Lower Crystal Springs Reservoirs (Oberlander, 1952) indicate that the prevailing reservoir levels in the 1950s resulted in more extensive freshwater marsh than at present. An increase in freshwater marsh habitat would benefit San Francisco garter snake and California red-legged frog. Although the overall increase in reservoir elevation under this alternative could still affect the populations of fountain thistle and other sensitive plants that now exist below the proposed maximum reservoir level, the habitat around the reservoir would return to conditions that existed before 1983, and these plant populations would therefore be expected to regain their former extent and distribution. Maintaining reservoir levels similar to historical patterns prior to 1983—and without the more lengthy periods when the reservoir is nearly full as proposed under the WSIP—would reduce or eliminate the adverse impacts on upland habitats such as oak woodland, which could experience extensive mortality if inundated for long periods of time.

With the WSIP, average monthly water levels would rise by 2 to 8 feet compared with existing conditions. Except for periodic drawdowns, all areas below the current maximum reservoir elevation of 283 feet would be permanently inundated, resulting in the loss of all existing freshwater marsh and riparian vegetation below this elevation. The maximum reservoir elevation of 291 feet would be maintained for several weeks longer than maximum elevations under existing and pre-1983 operations. Upland vegetation growing below 291 feet along the reservoir shoreline could not tolerate these longer periods of inundation and would be lost, including oak woodland, mixed evergreen forest, serpentine grassland, valley needlegrass grassland, and exotic forest.

The “bathtub ring” that is a trademark of reservoirs occurs because water remains high enough, for long enough, to exceed the flood tolerance of most woody and shrubby perennial vegetation and is not present long enough for emergent aquatic vegetation to persist. Inundation replaces the air-filled pores in the soil, which limits the amount of oxygen roots can obtain, resulting in increased stress, reduced growth, and eventually mortality. This PEIR predicts that implementation of the WSIP would result in a bathtub ring at some regional water system reservoirs, but this outcome is not inevitable. Most woody plants have some tolerance to flooding, which is a natural phenomenon. It would therefore be possible for the SFPUC to “manage” the inundation zone to allow selected species to survive, while still utilizing the restored historical reservoir capacity. Flood tolerance has been studied for several species. For example, 70 percent of valley oak (*Quercus lobata*) have been shown to survive inundation of over 40 days during the growing season (Walters, 1980). Under a managed inundation scenario, the maximum reservoir elevation would be periodically adjusted to limit inundation to the maximum tolerance of the least flood-tolerant species that are considered to provide valuable habitat components. Since these tolerances are not known for all of the species currently present, the Modified WSIP Alternative would require a period of adaptive management, during which growth and stress would be studied for a number of years to establish a balance between woody vegetation vigor and diversity and the needs of the proposed program for storage. Although this alternative would not likely avoid impacts on grasslands, much of the biological productivity of the area between 283 and 291 feet elevation would be retained.

Growth-Inducement Potential and Secondary Effects of Growth

The growth-inducement potential for this alternative would be identical to that of the proposed program, as described in Chapter 7.

9.3 Comparison of Alternatives

Based on the information presented in Section 9.2, the following discussion highlights the key similarities and differences between the WSIP and the eight alternatives evaluated in detail in this PEIR with respect to their ability to meet the program objectives and to lessen the severity of the WSIP's environmental impacts. The environmentally superior alternative is also identified from among the proposed WSIP and the alternatives.

9.3.1 Comparison of Alternatives

Ability to Meet Program Objectives

As summarized in Table 9-6, above, three alternatives to the WSIP appear to meet most of the basic project objectives: the Lower Tuolumne River Diversion Alternative, Year-round Desalination at Oceanside Alternative, and Regional Desalination for Drought Alternative. Each of these three alternatives develops additional water supplies to meet the 2030 average annual increase in delivery demand, drought-year needs, and support the 20 percent maximum systemwide rationing goal. There are questions associated with each of these alternatives, including questions of technical and institutional feasibility, cost, and public support as well as regulatory permit challenges; however, assuming these alternatives could be implemented, it appears that they could each largely meet the program objectives. All of them would cost more than the WSIP because each would require implementation of all 22 WSIP facility improvement projects as well as construction and operation of additional major facilities for water diversion, transmission, treatment and distribution. Costs for these alternatives would include all the WSIP facility improvement project costs plus the substantial additional costs for planning, environmental review, design, construction, operation, and mitigation of the additional facilities. All of these alternatives would also require an incremental increase in treatment and pumping facilities to the regional system; they would introduce a water source with different water quality into the system and would involve additions to the system that are not gravity-driven.

Four alternatives – the No Program Alternative, No Purchase Request Increase Alternative, and the Aggressive Conservation / Water Recycling and Local Groundwater Alternative (without and with supplemental Tuolumne River water), would each fail to meet one or more key program objectives. The No Program Alternative would meet the fewest of the program objectives. Under the No Program Alternative only those facility improvement projects required by current regulation or agreement with regulatory agencies would be implemented, thus, only a few of the many needed repairs and improvements would be made to the regional system. Many other facility improvement projects and supply development actions needed to improve seismic and delivery reliability, and provide adequate supplies to meet both average annual delivery demand and drought-year needs would not be implemented, leaving these objectives wholly or substantially unmet under the No Program Alternative.

The No Program Alternative leaves the SFPUC and its customers at significant risk of supply reduction or disruption during an earthquake or other emergency, or during a drought. This is not a feasible or acceptable alternative for the SFPUC. The SFPUC is responsible for maintaining and upgrading the regional system as needed to meet, at a minimum, the public health and safety needs of its customers. If the SFPUC cannot repair and improve its water system in a planned, comprehensive program like the WSIP, then it will be forced to do so in a piecemeal, reactive, emergency response manner, repairing parts of an aging system as facilities reach the end of their useful life or fail. This alternative is analyzed as required by CEQA to disclose the potential environmental impacts of not implementing the WSIP compared to implementation of the program but is not a practical alternative for the SFPUC.

The No Purchase Request Increase Alternative is designed to serve wholesale customers only the amount of water required under the existing Master Water Sales Agreement; therefore it would not fully meet the purchase request increase by the SFPUC wholesale customers for additional supply through the year 2030. Under this alternative, the SFPUC would choose not to meet the future water requests from its current customers – one of its key program objectives. This alternative was included in this alternatives analysis to evaluate the consequences of the SFPUC not meeting the future increase requested by its customers in an effort to avoid or minimize the potential growth-inducing effects and secondary effects of growth associated with providing more water to the regional customers. Neither BAWSCA nor its member agencies is expected to allow their customer needs to go unmet. Therefore, under this alternative, while the SFPUC would not achieve the program objective of meeting customer water delivery needs in 2030, it is expected that customer needs would nonetheless be met through other efforts by BAWSCA and/or the wholesale customers. Likely action by BAWSCA and wholesale customers would be to pursue a water transfer from another agency, similar to that proposed by the SFPUC as part of the WSIP. Consequently, the No Purchase Request Increase Alternative would not avoid the potential growth inducement effects of meeting the 2030 customer purchase requests.

The Aggressive Conservation / Water Recycling and Local Groundwater Alternatives (without and with supplemental Tuolumne River water) appear to meet, or almost meet the supply delivery and reliability objectives. This alternative, without supplemental Tuolumne River water, appears to almost meet the average annual 2030 delivery target of 300 mgd. With supplemental Tuolumne River water (5 mgd) it would meet the 300 mgd target. However, there are significant questions about the feasibility of producing up to 19 mgd of supply / supply offset with this alternative. As discussed in Section 9.2.4, while projects that might produce up to 19 mgd of potential supply/supply offset were identified within the wholesale customer service area, there are many steps still required to confirm the actual potential yield of each of the projects and assess the technical, cost, and permitting feasibility in addition to public acceptance associated with specific conservation, recycled water and groundwater projects within the wholesale customer service area.

As shown on Table 9-11, above, producing up to 19 mgd of supply/supply offset under this alternative could involve implementation of more than 14 separate conservation/water recycling/ groundwater projects in the wholesale customer service area. This requires coordinated action by the SFPUC and multiple partner agencies to plan, evaluate, design, permit, finance, construct and operate these projects. It also requires community approval and fairly extensive public participation. Of the 19 mgd of potential supply/supply offset shown on Table 9-11, 8.35 mgd or almost half could be recycled water, and conservation represents another 7 mgd; thus the majority would come from increased water recycling and conservation. These two water supply management approaches, perhaps more than any other, require significant community support and participation to implement. Water recycling is becoming more and more common throughout the Bay Area, yet it is not universally accepted by all communities and for all permitted uses. Community support for increasing the recycled water supply and using it primarily for non-potable uses throughout the SFPUC service areas is a critical component for implementing this alternative.

Similarly, implementing aggressive additional conservation actions, beyond existing conservation levels and the planned conservation efforts (already factored into the future water demand estimates by each wholesale customer), also requires widespread community support, participation and compliance. Further, if an aggressive level of conservation can be implemented to reduce the average day water demands, then the question arises, will the community also be able to further reduce its water use enough to achieve the WSIP goal of 20 percent rationing during a drought? As discussed in Section 9.2.2 under the discussion of feasibility for the No Program Alternative, effective, lasting water conservation leads to demand "hardening" such that there may be little flexibility remaining for customers to further reduce water use during a drought without experiencing substantial economic and personal hardship.

From the information gathered by the SFPUC and the wholesale customers to develop and assess this potential alternative it is apparent that there is the potential to implement additional conservation, recycled water projects, and local groundwater projects within the regional service area. However, given the uncertainties in implementing many of the projects assumed under this alternative, it is also apparent that there is not sufficient, reasonably foreseeable potential for these types of projects to fully meet the program objectives for 2030 supply and delivery reliability and drought reliability. As shown on Figure 5.1-2, based on the wholesale customers water demand projections and purchase request increase, planning estimates indicate about half of the total 35 mgd requested increase in water delivery would be needed by 2015. It is unlikely that this much additional supply/supply offset could be developed under this alternative in this short a time. Consequently, the Aggressive Conservation/Water Recycling and Local Groundwater Alternative, as a stand-alone program, would not meet the key program objectives. However, developing some more conservation, recycled water and local groundwater within the regional service area than is proposed under the WSIP does appear possible and this possibility has been incorporated into the proposed Modified WSIP Alternative. Developing more local conservation efforts, recycled water and local groundwater projects would also contribute to meeting the objective of diversifying the water supply and demand management portfolio for the regional system.

The Modified WSIP Alternative would meet all the program objectives, similar to the WSIP. This alternative was developed to avoid or substantially lessen some of the significant impacts of water system operations under the WSIP. Some of the operational changes included in this alternative would also be implemented if the WSIP and all mitigation measures presented in this PEIR are approved. This alternative also proposes that the SFPUC, in partnership with its wholesale customers, implement more conservation, water recycling and local groundwater projects than are proposed as part of the WSIP. The additional conservation, recycling, and local groundwater projects would offset the increase in diversion from the Tuolumne River made necessary by the operational modifications included in the Modified WSIP Alternative. While there remain feasibility issues associated with each specific water recycling, conservation and groundwater project (as discussed in Section 9.2.4, above), pursuing a goal of developing 5 to 10 mgd over time through a coordinated regional program appears achievable. Developing this additional increment of conservation, water recycling, and groundwater projects requires agreement between BAWSCA, the wholesale customers and the SFPUC as well as cooperation from several local agencies including wastewater agencies, stormwater management agencies, and planning departments, among others. Each project also will have its own feasibility questions, such as cost facility siting, permitting and public acceptance, to resolve.

Environmental Impacts Compared to Those of the WSIP

The following summarizes the chief differences between the WSIP and the alternatives with respect to potential environmental impacts. In some cases an alternative would result in more or less impacts on a particular environmental resource compared to the WSIP, and in other cases an alternative would affect an altogether different geography and environmental resource than the WSIP. This section frames the environmental impact trade-offs raised by each of the alternatives in comparison to the WSIP.

Water Resources Impacts

As summarized below some alternatives would lessen significant impacts of the program on the Tuolumne River, but all alternatives would continue to have significant impacts within the Alameda Creek and Peninsula watersheds because these impacts would result primarily from implementation of two facility improvement projects (Calaveras Dam Replacement Project (SV-2) and Lower Crystal Springs Dam Improvement Project (PN-4)) that are included in each alternative since they must be completed in order to meet regulatory requirements for public safety reasons. In addition, three alternatives would impact other water bodies not affected by the WSIP and three other alternatives might affect other water bodies depending on how they are implemented.

Tuolumne River Watershed

Under the WSIP, the SFPUC would increase average annual diversions from the Tuolumne River by 27 mgd to meet 2030 service area needs; this increase can be served from the CCSF's existing water rights on the Tuolumne River. Six of the eight alternatives considered also involve some level of increased average annual diversion from the Tuolumne River. Two alternatives, the Lower Tuolumne River Diversion Alternative and the Modified WSIP Alternative would require the same or greater increase in average annual Tuolumne River diversions compared to the WSIP. Under four alternatives the increase in average annual Tuolumne River diversion would be less then the WSIP, ranging from an increase of 20 mgd down to an increase of 3 mgd (in descending order): Regional Desalination for Drought Alternative, No Program Alternative, Aggressive Conservation / Water Recycling and Local Groundwater Alternative with supplemental Tuolumne River water, and the No Purchase Request Increase Alternative (see Table 9-5, above). Two alternatives, Aggressive Conservation / Water Recycling and Local Groundwater Alternative without supplemental Tuolumne River water and the Year-round Desalination at Oceanside Alternative, would not require an increase in average annual diversion from the Tuolumne River over the existing condition.

Table 9-7 summarizes the potentially significant impacts on the Tuolumne River and its associated environmental resources that would result from implementation of the WSIP and from each of the alternatives in comparison to the WSIP. Although some alternatives would result in less increase in Tuolumne River diversion than the WSIP (in some cases notably less), none of them would substantially lessen the potential impact on meadows between O'Shaughnessy Dam and Don Pedro Reservoir. All of the alternatives could still result in a potentially significant impact on meadows, in particular in the Poopenaut Valley, as a result of delaying the higher volume spring releases from Hetch Hetchy Reservoir (see Impact 5.3.7-2), similar to the WSIP. Three alternatives — Regional Desalination for Drought, Lower Tuolumne River Diversion, and the Modified WSIP – would involve increasing the average annual diversions by 20 mgd or more, similar to the WSIP and thus would have a similar impact to that described for the WSIP, requiring mitigation. Five other alternatives – No Program, No Purchase Request Increase, Year-round Desalination at Oceanside and the two Aggressive Conservation/Water Recycling and Local Groundwater Alternatives (without and with Supplemental Tuolumne River Water) – would involve either a diversion increase of less than 10 mgd or no increase in average annual diversion (see Table 9.5) and would result in shorter delays that occur less frequently than with the WSIP. Nonetheless, in order to meet the delivery reliability level of service goals, these alternatives would involve a change in system operations that would still result in a delay in spring releases due to the change in diversion patterns. For all but the No Program Alternative and the two Aggressive Conservation/Water Recycling and Local Groundwater Alternatives, the implementation of the Westside Basin Project would also affect the year to year diversions from the Tuolumne River thus potentially affecting spring flow releases. This delay in spring releases was deemed to still result in a significant adverse impact on mountain meadows and associated resources (i.e., sensitive habitats and species). As a result, the analysis determined that the impact would be potentially significant and that mitigation would still be required for these alternatives.

Although the Lower Tuolumne River Diversion Alternative would provide environmental benefits to water quality, habitat, fish, and recreation during most summers, winters and early spring as a result of flow being released to the river below O'Shaughnessy Dam for diversion further downstream, this alternative would still result in delays in the late spring (May and June) releases from O'Shaughnessy Dam, the same as and possibly greater than the WSIP. Therefore, despite the benefits at other times of the year, this delay was deemed to still result in a significant adverse impact on mountain meadows and associated resources (i.e., sensitive habitats and species). As a result, the analysis determined that the impact would be potentially significant and that mitigation would still be required for this alternative.

On the lower reach of the Tuolumne River below La Grange Dam, the WSIP would result in significant impacts on fisheries and riparian habitat, again as a result of reducing the volume and delaying the release of the higher spring flows from Don Pedro Reservoir (see Impacts 5.3.6-4 and 5.3.7-6). Most alternatives would have less impact on these resources in this river reach than the WSIP, except for the Lower Tuolumne River Diversion Alternative. The Lower Tuolumne Diversion Alternative would also result in additional fisheries impacts, including potential impacts on listed Chinook salmon and steelhead, as a consequence of constructing a new water intake facility in the lower river and diverting flow in the reach where listed Chinook salmon and steelhead occur, and would require supplemental mitigation for those effects in addition to the mitigation required under the WSIP. Four alternatives – the Aggressive Conservation / Water Recycling and Local Groundwater Alternative Without Supplemental Tuolumne River Water, the No Purchase Request Increase, the Year-round Desalination at Oceanside, and the Modified WSIP, would avoid this significant impact associated with the delay in spring releases.

Alameda Creek Watershed

In the Alameda Creek Watershed, all alternatives but the Modified WSIP Alternative would have the same significant impacts on fisheries in Alameda Creek below the diversion dam as the WSIP. This is because the impacts in this watershed are associated primarily with the replacement of Calaveras Dam (SV-2), as required by DSOD, and the subsequent revised system operations associated with restoration of storage capacity in the reservoir and are not related to which supply source(s) is selected to meet future customer delivery needs. The Calaveras Dam Replacement Project is required by DSOD to meet regulatory requirements, therefore it would occur under every alternative. Impacts would occur once the SFPUC resumes normal operation of that reservoir. The Modified WSIP Alternative would incorporate, as part of its description, the provision of a minimum flow in Alameda Creek below the Alameda Creek Diversion Dam to support resident trout spawning and egg incubation. (This minimum flow requirement is also proposed as mitigation for the WSIP.) Implementing the minimum flow requires the SFPUC to relinquish some of its supply that otherwise would have been available to customers. This supply reduction would have to be made up through more Tuolumne River diversion or more conservation, recycled water and local groundwater projects. The Modified WSIP Alternative proposes that the SFPUC develop more conservation, recycled water and local groundwater projects to both compensate for operational modifications that reduce supply for customers and reduce the amount of additional diversion required from the Tuolumne River to fully meet the WSIP program objectives, if possible.

Peninsula Watershed

In the Peninsula Watershed all alternatives but the No Purchase Request Increase Alternative and the Modified WSIP Alternative would have the same significant environmental impacts as the WSIP. This is because the impacts in this watershed are not a result of which water supply source is selected but are primarily associated with two actions proposed under the WSIP. The first is increased service to Coastside County Water District (Coastside CWD) to serve its 2030 purchase request and the second is implementation of the Lower Crystal Springs Dam Replacement Project (PN-4).

Coastside CWD assessed its future water supply needs and developed its 2030 customer purchase request from the SFPUC regional system. Coastside CWD requests a supply increase of 1.22 mgd by 2030. Coastside CWD serves Half Moon Bay and surrounding communities on the San Mateo County coast. The SFPUC currently serves Coastside CWD with about equal quantities of water from Pilarcitos Creek and Crystal Springs Reservoir. In order to meet Coastside's purchase request increase, under the WSIP the SFPUC would use more water from the Pilarcitos Creek watershed. However, as discussed in Section 5.5, this could result in significant environmental impacts on resources in and around Pilarcitos Reservoir and Creek. Two alternatives address these impacts; the other six alternatives would have the same impacts on Pilarcitos Reservoir and Creek resources. Under the No Purchase Request Increase Alternative, the SFPUC would not serve Coastside's 2030 purchase request increase and therefore this alternative would lessen the impacts on Pilarcitos Reservoir and Creek identified for the WSIP. Under the Modified WSIP Alternative, the SFPUC would serve Coastside's 2030 purchase request increase but it would modify its proposed system operation within the Peninsula Watershed to provide additional supply to Coastside CWD from Crystal Springs Reservoir instead of the Pilarcitos Creek watershed. As a result, under this alternative Pilarcitos Reservoir would be operated similarly to the way it is under existing conditions and none of the significant impacts associated with the WSIP would occur. However, this operational modification would require the SFPUC to provide Coastside CWD with some additional increment of supply from outside of the Pilarcitos Reservoir watershed from the rest of the regional water system. As discussed under the Alameda Creek Watershed above, this additional supply requirement would have to be made up through either more Tuolumne River diversion or more conservation, recycled water and local groundwater projects. The Modified WSIP Alternative proposes that the SFPUC develop more conservation, recycled water and local groundwater projects to both compensate for operational modifications that increase use of Crystal Springs Reservoir to serve Coastside CWD customers and to reduce the amount of additional diversion required from the Tuolumne River to fully meet the WSIP program objectives, if possible.

With respect to the significant environmental impacts associated with the Lower Crystal Dam Replacement Project and subsequent operation of Crystal Springs Reservoir to utilize the restored historical storage capacity, these impacts would occur under all alternatives because this project must be implemented under all alternatives in order to meet DSOD regulatory requirements. However, the Modified WSIP Alternative includes a modification to the proposed operation of this reservoir that would lessen the significant effects of increasing the reservoir water level on the oak woodland habitat and associated species. With this modification, the reservoir water levels would be allowed to fluctuate to a greater degree over the year than proposed under the WSIP such that the woodland trees would be able to survive the annual increase in inundation. This operational modification may require that the SFPUC sacrifice some of the increases in system delivery and drought reliability it would gain under the WSIP because it would not be able to store as much water in Crystal Springs Reservoir for as long each year. Additional modeling of this alternative would be needed to determine how it would specifically perform against the WSIP goals and objectives and if other system modifications could compensate for this change.

Westside Groundwater Basin

Three alternatives—No Program Alternative and the two Aggressive Conservation/Water Recycling and Local Groundwater Alternatives—would not include the Westside Basin conjunctive use program as a dry-year supplemental supply. Therefore, these alternatives would not result in potential overdraft or seawater intrusion in the North Westside Groundwater Basin or in the potential to affect Lake Merced levels due to implementation of the WSIP as proposed; however, as stated above, these three alternatives could all result in increased local groundwater pumping within the wholesale customer service area, with similar impacts as the WSIP. The remaining five alternatives would include the conjunctive use program, so groundwater impacts would be the same as for the WSIP.

Other Water Bodies

Three alternatives would affect other water bodies and their associated environmental resources in addition to those affected by the WSIP. The Lower Tuolumne River Diversion Alternative would result in direct impacts on the lower Tuolumne River from construction and operation of a new diversion facility. At the same time, compared to the WSIP this alternative would provide some benefit to both the upstream reach of the Tuolumne River below Hetch Hetchy Reservoir to Don Pedro Reservoir and the downstream reach below La Grange as a result of more water being released from Hetch Hetchy Reservoir for subsequent diversion downstream. However, while the upstream reach of the Tuolumne River supports a resident trout fishery, the downstream reach in the lower Tuolumne supports listed Chinook salmon and steelhead. This alternative would trade-off environmental benefits to both reaches of the river with adverse environmental impacts on the lower Tuolumne River.

The Regional Desalination for Drought Alternative would result in impacts on upper San Francisco Bay (along the eastern Contra Costa County shoreline based on the proposed plant location in the Pittsburg-Antioch area) in addition to the same water bodies affected by the WSIP. Under this alternative, water would be diverted from the bay, treated for use and the brine concentrate would then be discharged back to the Bay. The SFPUC has partnered with other Bay Area water agencies to evaluate the feasibility of this project which will include the ability to mitigate potential impacts to the Bay to a level that is less than significant. Alameda County Water District has successfully implemented a brackish groundwater desalination project to supplement its supply. Marin Municipal Water District is currently evaluating a potential desalination facility and has proceeded with a pilot project. Thus, several agencies are pursuing this type of water supply project. It may be possible to design and operate the proposed regional desalination facility in a manner that does not have significant, unavoidable effects on the Bay, but additional detailed pilot testing and environmental study are required to assess the site-specific feasibility and environmental effects of the proposed regional desalination facility. This alternative represents a trade-off in terms of environmental effects; it would slightly reduce the amount of additional Tuolumne River to be diverted compared to the WSIP and thus lessen the impact on the river, but it would introduce impacts on San Francisco Bay that would not occur under the WSIP.

Under the Year-round Desalination at Oceanside Alternative, seawater from the Pacific Ocean offshore of the City and County of San Francisco would be diverted for treatment and use in a portion of San Francisco on a year-round basis and the concentrated brine byproduct would be discharged back into the ocean. As described above for the Regional Desalination for Drought Alternative, many water agencies are currently studying potential seawater desalination facilities along the coast of California. It may be possible to design and operate the proposed seawater desalination facility required under this alternative in a manner that does not have significant, unavoidable effects on the ocean, but additional detailed feasibility and environmental study is required to assess whether this is possible. This alternative represents a trade-off in terms of environmental effects; it would substantially reduce the amount of additional Tuolumne River to be diverted compared to the WSIP and thus lessen the impact to the river, but it would introduce impacts on the offshore waters of the Pacific Ocean that would not occur under the WSIP.

The four alternatives that do not fully meet the supply reliability and/or drought reliability objectives - the No Program Alternative, the No Purchase Request Increase Alternative and the Aggressive Conservation / Water Recycling and Local Groundwater Alternative, with and without supplemental Tuolumne River water, would each likely prompt BAWSCA and/or the wholesale customers to pursue alternative supplies to meet their communities' needs through 2030. Actions taken by BAWSCA and/or individual wholesale customers could result in impacts to other water bodies including more pumping of local groundwater supplies, or water transfers from other surface water sources. BAWSCA and/or the wholesale customers would likely pursue water transfers from other water agencies. If BAWSCA and/or wholesale customers were to pursue a water transfer from Modesto Irrigation District or Turlock Irrigation District, it would affect the Tuolumne River and associated resources much as the WSIP (though there would be institutional complexities associated with wheeling water through third party facilities). If BAWSCA and/or wholesale customers were to pursue a water transfer from other entities, this could result in environmental effect on other rivers north or south of the Delta as well as the Delta, itself. Alternatives that result in water transfers from water sources other than as proposed under the WSIP also present environmental impact trade-offs; they could potentially lessen the effects of the WSIP on the Tuolumne River and, in one case to Pilarcitos Reservoir and Creek, but they introduce potential impacts on other water bodies and their associated resources and require additional mitigation.

Under the Aggressive Conservation / Water Recycling and Local Groundwater Alternatives (both without supplement supply and with supplemental Tuolumne River water) and possibly under the No Program and No Purchase Request Increase Alternatives, the wholesale customers would implement groundwater projects, which could result in overdraft and associated impacts to local groundwater basins, including seawater intrusion, similar to the effects described in Section 5.6 for the Westside Groundwater Basin. These alternatives also present environmental impact trade-offs; they could potentially lessen the effects of the WSIP on the Tuolumne River but they could introduce potential impacts to other water bodies and their associated resources and require additional mitigation.

Facility Impacts

Seven alternatives, except for the No Program Alternative, would involve the construction of all the same 22 facility projects on the SFPUC regional system as proposed under the WSIP. These projects are needed to repair and improve the system to meet the supply delivery and seismic reliability objectives regardless of target delivery demand level or source of supply. The sizing of some facilities would need to be evaluated under the various alternatives and might be revised / reduced from that proposed under the WSIP, but no facility project would be eliminated from the program. As a result all alternatives but the No Program Alternative would have, at a minimum, the same facility construction and operation impacts as the WSIP.

Under the No Program Alternative only five projects required to meet regulatory requirements are assumed to be implemented. Because far fewer facility improvement projects would be built under this alternative there would be much less facility construction and operation impact compared to the WSIP. However, it is expected that there would be much more emergency facility repair under this alternative as the system continued to age without proactive improvement and thus, ultimately, through required repair and rehabilitation efforts, a similar level of facility improvement projects might have to be carried out, resulting in much of the same facility impacts as the WSIP but possibly occurring over a longer period of time and in a less planned and comprehensive manner.

All eight alternatives would require construction and operation of other new facilities in additional to all the WSIP facility improvement projects. The two Aggressive Conservation / Water Recycling and Local Groundwater Alternatives (without and with Tuolumne River supplement), and to a lesser extent the Modified WSIP Alternative, would require the SFPUC and/or the wholesale customers to construct and operate additional water recycling treatment plants and distribution pipelines along with groundwater wells and distribution lines throughout the wholesale customer service area. The number and location of these facilities is not known but several new and/or expanded facilities would be required. Similarly, under the No Program and No Purchase Request Increase alternatives, the wholesale customers might decide to develop additional water recycling and/or groundwater facilities and, in addition, might pursue other surface water supplies that could require new treatment, storage or transmission facilities.

Both desalination alternatives require construction and operation of a new treatment plant, a water intake structure, transmission and distribution pipelines and possible storage. The Lower Tuolumne River Diversion Alternative requires construction and operation of a new water diversion structure on the river, a new water treatment plant and new pipelines. These alternatives would involve substantial additional facility construction and operation impacts, including impacts on land use, traffic, air quality, noise, energy and others. In addition, these alternatives would use greater amounts of energy than the WSIP and, as a consequence, could contribute additional greenhouse gas emissions along with other air pollutant emissions. The desalination process is particularly energy intensive; thus, the two alternatives that include desalination plants would make a more substantial contribution to increasing energy use and associated greenhouse gas emissions than the other alternatives.

Growth Inducement and Secondary Effects of Growth

As discussed in Chapter 7, the WSIP would provide water supply to some customers to use in supporting additional growth within their communities and, as such, water supply would be less of a potential constraint to growth. The communities within the regional system service area have evaluated their growth plans (i.e., through General Plans and Urban Water Management Plans) and found that there are some significant and, in some cases, significant and unavoidable impacts that could or would occur as a result of planned growth. One alternative, the No Purchase Request Increase Alternative, specifically attempts to reduce or avoid the growth inducing effects of the WSIP and two other alternatives (the No Program Alternative and the Aggressive Conservation, Recycled Water and Local Groundwater Alternative) also appear to have less growth inducement potential than the WSIP

The No Purchase Request Increase Alternative was included in the range of alternatives evaluated in the PEIR specifically to consider the consequences of the SFPUC not fully providing for future water supply needs of its customers in an attempt to avoid or minimize the significant secondary effects associated with planned growth in the service area. As discussed above, while the SFPUC would plan not to fully meet the future 2030 water purchase request from its wholesale customers under this alternative, it is expected that the customers would pursue and secure the additional supplies they require. Thus, with respect to the SFPUC’s actions, this alternative would have less growth inducement potential than the WSIP but combined with the wholesale customers actions, the same planned growth is ultimately expected to occur resulting in largely the same secondary effects of growth as would occur with the WSIP. While it is possible that approval of additional development and growth within the wholesale customer service area might be slowed somewhat in some communities as wholesale customers require more time to pursue other water supply and reliability projects, it is not expected that this would deter communities from ultimately taking the actions needed to support planned growth. As a result, this alternative is not an effective approach to avoiding or reducing the significant secondary effects of growth.

The No Program Alternative and the Aggressive Conservation, Recycled Water and Local Groundwater Alternative would both provide additional supplies to partially meet the 2030 average annual delivery demand and drought year needs but the supply would not be as reliable as that provided by the WSIP. As a result, as with the No Purchase Request Alternative, it is expected that the SFPUC wholesale customers and/or BAWSCA would pursue other projects and actions to provide the desired level of supply and supply reliability. While the need to develop additional projects beyond the WSIP might have some slowing effect on development approvals in some communities, it is not expected to impeded growth from continuing in accordance with adopted plans. As a result, this alternative would have similar secondary effects of growth as those described for the proposed program.

The other four alternatives would each have the same growth inducement potential and associated secondary effects of growth as the WSIP.

9.3.2 Environmentally Superior Alternative

CEQA requires the identification of an environmentally superior alternative from among the proposed project and the set of alternatives evaluated. The CEQA Guidelines further state that if the No Program Alternative is the environmentally superior alternative, then the EIR must also identify which of the action alternatives is the environmentally superior alternative. In this case, the No Program Alternative is not the environmentally superior alternative.

Although it appears that fewer facility improvement projects would be implemented under the No Program Alternative and that, as a result, there would be fewer facility and construction impacts, it is expected that there would be much more emergency facility repair and replacement projects under this alternative as the system continues to age without proactive improvement. Ultimately, through required repair and replacement efforts, a similar level of facility improvement projects as that proposed under the WSIP might have to be conducted under the No Program Alternative, resulting in much of the same facility impacts as the WSIP; however, these repair and replacement projects would likely occur over a longer period of time and in a less coordinated and comprehensive manner. In addition, implementing system improvements through a piecemeal and largely emergency response approach could result in greater environmental impacts and less mitigation for such impacts; when projects are implemented under emergency conditions, they often require little or no environmental review and thus could be implemented without the same level of mitigation and mitigation compliance monitoring that would be required for the WSIP. Furthermore, piecemeal implementation could also increase the cumulative effects of multiple, sequential facility repair and replacement projects throughout the system.

With respect to impacts on water resources, the No Program Alternative's effects on the Tuolumne River would be similar to but less than those of the WSIP because river diversions would not increase quite as much as with the WSIP; however, the No Program Alternative would result in the same significant impacts on the Tuolumne River as the WSIP and would require the same mitigation. As summarized above, the No Program Alternative would also have the same impacts as the WSIP on the Alameda Creek / Alameda watershed resources and on the Peninsula watersheds (including Pilarcitos Creek) resources. The No Program Alternative would have the same growth-inducement potential and associated secondary effects of growth as the WSIP because BAWSCA and the wholesale customers would be expected to secure supplemental supplies to meet any supply delivery and reliability shortfall from the regional system that would result under the No Program Alternative.

Finally, under this alternative, the SFPUC, BAWSCA and/or the wholesale customers might have to construct and operate additional facilities in order to develop supplemental surface water supplies, recycled water, or groundwater. Required facilities could include new treatment plants, storage and transmission facilities, and groundwater wells. The impacts of constructing and operating these facilities would be in addition to those resulting from improvement and repair of the regional system. Thus, the No Program Alternative could result in greater facility impacts than the WSIP. Because the No Program Alternative would not appreciably lessen the environmental impacts of the WSIP, might result in additional impacts due to the need for supplemental supply development and associated facility construction, and would not meet most of the basic program objectives, it is not considered the environmentally superior alternative.

In addition to having many of the same environmental impacts as the WSIP, under the No Program Alternative, the SFPUC would be unable to meet most of the program objectives. The No Program Alternative would leave the SFPUC and its customers at significant risk of supply reduction or disruption during an earthquake or other emergency, or during a drought. This is not a feasible or acceptable alternative for the SFPUC.

The Modified WSIP Alternative is considered to be the environmentally superior alternative. It would reduce key impacts of the proposed WSIP on natural resources along the lower Tuolumne River, along Alameda Creek below the diversion dam, at Pilarcitos Reservoir and along Pilarcitos Creek, and in Crystal Springs Reservoir, but it would continue to meet the WSIP's primary goals and objectives. Like the WSIP, this alternative would maximize the use of existing facilities and the largely gravity-driven system without also requiring the construction of additional major facilities called for under many other alternatives, or substantially increasing the energy demand of the system or need for pumping. While some of the other alternatives would avoid or lessen certain WSIP impacts, they would also result in substantial additional impacts that the WSIP would not generate, because these alternatives would require substantial additional major facilities and affect other environmental resources in different geographic locations in addition to those affected by the WSIP. For example, while the Year-round Desalination at Oceanside Alternative would meet the program objectives and lessen some of the impacts associated with the WSIP, it would also cause impacts to the marine environment associated with brine disposal, potential land use compatibility impacts due to space limitations in the vicinity of the proposed shoreline site, and require substantial energy use for the desalination process which would likely make a greater contribution to greenhouse gas and other pollutant emissions than the WSIP or other alternatives.

The Modified WSIP Alternative includes implementation of more conservation, water recycling and local groundwater projects within the regional service area than under the WSIP, which would require construction of some additional facilities in some areas not affected by the WSIP. However, while construction of these facilities would cause temporary construction disruption and related environmental impacts, long-term implementation of these regional conservation, water recycling, and local groundwater projects would offset impacts of the operational modifications proposed under the Modified WSIP Alternative on the Tuolumne River. Depending on the extent of these projects implemented by wholesale customers in collaboration with the SFPUC, they could also help reduce the amount of additional diversion required from the Tuolumne River to serve the 2030 customer purchase requests.

9.4 Alternatives Identification and Screening

This section presents the process and results of identifying and screening alternative concepts and strategies in order to develop the range of alternatives analyzed in Section 9.2.

9.4.1 Process for Identifying Alternative Concepts

Alternatives to be considered under CEQA are those that can avoid or substantially lessen one or more of the significant environmental effects identified for the proposed program. Many of the adverse environmental impacts of the WSIP described in Chapters 4 and 5 were judged to be less than significant. Other adverse impacts were judged to be significant or potentially significant but could be reduced to a less-than-significant level through the application of mitigation measures. Still others were judged to be significant and unavoidable, even with the application of mitigation measures described in Chapter 6. This section summarizes the chief significant environmental impacts identified for the WSIP and discusses potential strategies to avoid or lessen these significant effects. It also describes the process used to develop and identify the alternatives analyzed above in Section 9.2 and includes descriptions of preliminary alternatives as well as the concepts, strategies, and other elements used to develop the alternatives. The basic process is described below:

1. Review potentially significant/significant mitigable (PSM/SM) and potentially significant/significant unavoidable (PSU/SU) impacts identified in Chapters 4 and 5 of this PEIR and identify strategies to lessen or avoid impacts.

2. Review ideas and alternative concepts suggested during PEIR scoping.

3. Conduct preliminary screening of identified strategies and alternative concepts by determining if the strategy/concept meets <u>both</u> of the following criteria:

   - Does it meet any of the basic WSIP goals and objectives?
   - Would it lessen or reduce identified significant impacts?

   If the answer to either question was “no,” the concept was eliminated from further consideration. If the answer to both questions was “yes,” the concept was retained for further consideration.

4. Develop preliminary alternatives based on strategies and concepts retained for further consideration. Review feasibility issues with respect to technical, institutional, and regulatory concerns. If the preliminary alternative was determined to be infeasible, the conceptual alternative was eliminated from further consideration.

5. Develop and refine final alternatives for CEQA analysis in Section 9.2 and identify preliminary feasibility issues to be considered as part of the alternatives analysis.

Each step in this process is further described below. Section 9.5 provides a more detailed description of the concepts and strategies that were eliminated from further consideration and the reasons for their elimination.

9.4.2 Identified Impacts and Potential Strategies to Avoid or Lessen Significant Effects

Significant Facilities-Related Impacts and Strategies to Avoid or Lessen Effects

As described throughout Chapter 4, implementation of the WSIP would have potentially significant construction and/or operations impacts associated with the 22 facility improvement projects in the five regions analyzed in this PEIR. Chapter 4 identifies potentially significant construction impacts for individual facility improvement projects at and near individual project sites; potentially significant collective effects due to concurrent construction of WSIP facilities in the same and multiple regions (overlapping and multi-regional); and potentially significant impacts related to the WSIP facilities' contribution to cumulative impacts. Potentially significant mitigable (PSM) and potentially significant unavoidable (PSU) impacts were identified for one or more facility improvement project(s), as described below.

Significant Facilities Construction Impacts

- Land Use – temporary disruption of existing land uses, including PSU impact for New Irvington Tunnel (SV-4); and PSU impact for collective, overlapping effects in the Bay Division Region
- Geology – slope instability, squeezing ground/subsidence during tunneling, expansive or corrosive soils
- Hydrology – short-term depletion of groundwater resources
- Biological Resources – impacts on wetlands, aquatic resources, sensitive habitats, common habitats, heritage trees, special-status species, including PSU collective impacts in the Sunol Valley and Peninsula Regions
- Traffic – impacts related to roadway capacity, traffic delays, impaired access, parking, and safety hazards, including PSU collective and cumulative impacts
- Air Quality – emission of air pollutants, and exposure to diesel particulate matter, including PSU collective and cumulative impacts
- Noise and Vibration – disturbance adjacent to sites and haul routes, including PSU construction noise impacts for all projects, PSU vibration impacts for multiple projects, as well as PSU and PSM collective impacts in all regions and PSU cumulative impact
- Public Services and Utilities – impacts related to utility disruption, landfill capacity, compliance with solid waste regulations
- Recreational and Agricultural Resources – temporary conflicts with established uses
- Hazards – temporary exposure to hazardous materials
- Energy – construction energy use

Significant Facilities Siting/Design Impacts

- Land Use – permanent displacement or long-term disruption of existing land uses, including PSU impacts for SJPL System (SJ-3), 40-mgd Treated Water (SV-3), SABUP (SV-6), BDPL Reliability Upgrade (BD-1), CS/SA Transmission (PN-2), Groundwater Projects (SF-2), and Recycled Water Projects (SF-3)

- Visual Quality – effects on scenic vistas or visual character, including PSU impact for Calaveras Dam (SV-2); new sources of light and glare

- Hydrology and Water Quality – flooding impacts, increases in impervious surfaces

- Biological Resources – conflicts with adopted conservation plans

- Cultural Resources – impacts on paleontological resources, archaeological resources, and historic resources, including PSU impacts for Calaveras Dam (SV-2), New Irvington Tunnel (SV-4), CS/SA Transmission (PN-2), and Lower Crystal Springs Dam (PN-4), and PSU collective impacts in the Sunol Valley and Peninsula Regions, and PSU cumulative impacts

- Public Services and Utilities – relocation of utilities

- Recreational and Agricultural Resources – long-term conflicts with established uses

Significant Facilities Operational Impacts

- Biological Resources – water discharge effects on riparian/aquatic resources

- Energy – operational energy use

Strategies to Avoid or Lessen Significant Facilities-Related Impacts

Mitigation measures identified in Chapter 4 and described in Chapter 6 would reduce most of the facilities-related impacts listed above to a less-than-significant level, and include measures that would be implemented at the project level, such as construction controls or footprint or project design features. However, this PEIR identifies many impacts as PSU. Although SFPUC construction measures and additional mitigation measures would be applied to these impacts, the remaining environmental impacts would remain significant or potentially significant and therefore unavoidable. However, in many cases, the PSM and PSU impacts were identified as such because there was not enough site-specific information at this program level of analysis to determine definitively whether the impact would be less than significant or whether the identified mitigation measures could reduce the severity of the impact to a less-than-significant level. Separate, project-level CEQA evaluation of the WSIP projects could either confirm that the impact is less than significant or that mitigation is available to reduce the impact to a less-than-significant level. For the purpose of the PEIR analysis, a conservative determination regarding the level of impact has been made, and the designation of PSU is applied to disclose the potential for such effects.

Regardless of mitigation measures, programmatic strategies that would meet one or more of the basic WSIP objectives and might avoid or lessen the significant facilities impacts include:

- Reduce the number and/or extent of facility improvement projects to avoid construction, siting, or operational impacts associated with one or more project (possibly reducing the ability of the WSIP to fully meet the level of service goals for water quality, seismic reliability, delivery reliability, or water supply). This strategy could also lessen the collective and overlapping effects of multiple WSIP projects.

- Phase/extend the WSIP construction schedule such that fewer projects, especially those with geographic overlap, occur concurrently to lessen the collective regional and multi-regional impacts associated with the effects of multiple WSIP projects.

- Refine project site selections and/or facility layout designs to avoid or minimize impacts on sensitive resources (e.g., biological resources, cultural resources, land use, or agricultural lands).

Significant Water Supply/System Operations Impacts and Strategies to Lessen or Avoid Effects

As described in Chapter 5, implementation of the WSIP would have potentially significant impacts on water bodies and associated resources due to the changes in water supply and system operations. Chapter 5 identifies potentially significant impacts that would occur in the Tuolumne River, Alameda Creek, Peninsula watersheds (San Mateo and Pilarcitos Creeks) and in the Westside Groundwater Basin. Potentially significant water supply and system operations impacts, both mitigable and unavoidable, were identified, as described below.

Significant Tuolumne River Watershed and Downstream Impacts

- Effects on fishery resources below La Grange Dam

- Effects on alluvial features that support montane meadow and riparian habitat between Hetch Hetchy and Don Pedro Reservoirs and on riparian resources below La Grange Dam

Significant Alameda Creek Watershed Impacts

- Changes in flow in Alameda Creek below the diversion dam (significant and unavoidable)

- Effects on fishery resources in Alameda Creek below the diversion dam

- Effects on biological resources in Calaveras Reservoir, Calaveras Creek, and Alameda Creek

- Effects on recreational and visual resources in the Sunol Regional Wilderness near Alameda Creek below the diversion dam

Significant Peninsula Watershed Impacts

- Effects related to water quality, fisheries, and biological resources in Pilarcitos Reservoir and along Pilarcitos Creek

- Effects on fishery resources in tributaries to Crystal Springs Reservoir (PSU)

- Effects on biological resources around Upper and Lower Crystal Springs Reservoirs

Significant Westside Groundwater Basin Impacts

- Potential overdraft in the North Westside Groundwater Basin and related effects, including changes in Lake Merced water levels and seawater intrusion
- Water quality effects on drinking water due to groundwater pumping in the North and South Westside Groundwater Basin

Strategies to Avoid or Lessen Significant Water Supply and System Operations Impacts

Mitigation measures identified in Chapter 5 and described in Chapter 6 would reduce most of the effects listed above to a less-than-significant level, although a few of the impacts were identified as PSU. As an alternative to mitigation measures, programmatic strategies that would meet one or more of the basic WSIP objectives that might avoid or lessen the significant water supply and system operations impacts are presented below.

Reducing the amount of additional water diverted from the Tuolumne River could avoid or substantially lessen the significant impacts of the WSIP on the Tuolumne River watershed. Strategies include:

- Use an alternative supplemental supply source instead of the Tuolumne River to meet future purchase requests and/or dry-year water supply reliability needs.
- Use Tuolumne River water to meet additional water supply needs, but alter the point of diversion to a location downstream from the potentially affected fisheries and biological resources.
- Reduce service, thereby reducing the ability to fully meet the level of service goals for water supply. Specifically, do not meet some or all of the future purchase requests and/or dry-year water supply reliability needs.
- Implement demand management to meet increased purchase requests and dry-year water supply reliability needs through aggressive conservation and water recycling only.

Strategies to avoid or lessen impacts in the Alameda Creek watershed include:

- Do not resume diversions from Alameda Creek above the diversion dam to Calaveras Reservoir after Calaveras Dam is restored (possibly reducing the ability of the WSIP to fully meet the level of service goals for water supply and delivery reliability).
- Do not resume diversions from Alameda Creek above the diversion dam to Calaveras Reservoir to historical (pre-2002) levels after Calaveras Dam is restored, but recapture the flows at a location downstream from the potentially affected resources and pump the recaptured water to the regional system.

Strategies to avoid or lessen impacts in the Peninsula watershed include:

- Do not increase water storage in Crystal Springs Reservoir over existing levels for prolonged periods.
- Do not fully meet the 2030 increased purchase requests from wholesale customers served from Pilarcitos Reservoir.

Strategies to avoid or lessen impacts in the Westside Groundwater Basin include:

- Use an alternative supplemental supply instead of groundwater.
- Implement demand management, including conservation and/or water recycling, to reduce demand for additional potable water and thereby avoid or reduce the need to use groundwater.

Growth-Inducement Impacts and Strategies to Avoid or Lessen Effects

As discussed in Chapter 7, the WSIP would support some additional growth within the SFPUC service area—primarily the planned growth reflected in the adopted general plans of the local communities. This growth would result in potentially significant secondary environmental effects such as increased traffic, air pollution, greenhouse gas emissions, noise, and demand for public services and utilities; loss of open space; and effects on water quality, cultural resources, and habitat and associated biological resources. Local land use jurisdictions have prepared CEQA documents on their general plans to assess the secondary effects of growth; as part of that process, these jurisdictions have adopted mitigation measures for the secondary effects of planned growth and have also adopted statements of overriding considerations in cases where they approved growth that could result in significant and unavoidable impacts.

Strategies to Avoid or Lessen Growth-Inducement Impacts

The secondary effects of growth supported by the WSIP would meet one or more of the basic WSIP objectives that could be avoided or substantially reduced by the following strategy:

- Reduce service, thereby reducing the ability to meet the 2030 customer purchase request increase; meet only purchase request levels reflected in the existing Master Water Sales Agreement with the wholesale customers.

9.4.3 Preliminary Screening of Alternative Strategies and Concepts

This section summarizes the overall alternative strategies and concepts considered in the CEQA alternatives analysis, and it provides a preliminary screening based on the ability of each alternative to meet the WSIP level of service goals. The preliminary screening includes both the strategies identified in Section 9.4.2 as well as the concepts raised during the public scoping period. All of the strategies and concepts are grouped into one of the following four main categories: strategies/concepts that affect facilities; strategies/concepts that affect system operations; strategies/concepts that affect water supply sources; and other strategies/concepts.

Summary of Strategies to Avoid or Lessen Significant Impacts

Table 9-13 summarizes and categorizes the strategies identified in Section 9.4.2 to avoid or lessen significant impacts of the proposed program. The table also indicates the ability of each strategy to meet the basic WSIP performance objectives and level of service goals as a preliminary screening of alternative strategies.

Alternative Concepts Raised During PEIR Scoping

The WSIP PEIR Scoping Report (see Appendix A) summarizes the comments made during the public scoping process for this PEIR for consideration during the environmental review process. Participants in the scoping process presented numerous suggestions for reducing potential impacts as well as possible alternatives to one or more aspect of the proposed WSIP. **Table 9-14** summarizes the alternative concepts raised during the public scoping process and indicates the ability of each idea to meet the basic WSIP performance objectives and level of service goals as a preliminary screening of these ideas.

9.4.4 Alternative Screening

Tables 9-13 and 9-14 list alternative strategies and concepts that were either developed to reduce significant impacts or suggested during the public scoping period, and indicate the ability of each strategy or concept to meet the basic WSIP objectives. All of the strategies listed in Table 9-13 would meet one or more of the basic objectives and would avoid or lessen at least one significant impact. Many of the concepts in Table 9-14 would meet one or more of the basic objectives; however, some of the concepts would meet none of the basic WSIP objectives, and those concepts were eliminated from further consideration, as indicated in the table. In a few cases where extensive scoping comments were made on a concept, further discussion of the concepts and reasons for elimination is provided in Section 9.5.

This section further develops the strategies and remaining concepts, addresses feasibility issues of each strategy and concept, and provides screening for the alternatives and concepts that were either retained for detailed study in this PEIR, or eliminated from, further consideration as CEQA alternatives. Strategies and concepts were considered in the formulation of the range of alternatives evaluated in Section 9.2 if they were determined to be both feasible to implement and potentially effective in avoiding or reducing the environmental impacts associated with the WSIP. The range of alternatives identified for further evaluation and comparison to the WSIP is presented in Section 9.2.

In this section, alternative concepts or strategies were eliminated from further consideration for one or more of the following reasons: (a) they are a variation on an alternative that is evaluated in this PEIR in detail and thus are already represented in the range of alternatives selected for evaluation, (b) they do not meet the CEQA criteria for an alternative (i.e., meet most of the basic

TABLE 9-13
STRATEGIES TO AVOID OR LESSEN SIGNIFICANT IMPACTS AND PRELIMINARY SCREENING

Strategies to Avoid or Lessen Significant Impacts	Does the Strategy Meet the WSIP Performance Objectives and Level of Service Goals? Water Quality	Seismic Reliability	Delivery Reliability	Water Supply	Preliminary Screening
Strategies that Affect Facilities and Could Reduce Facilities Impacts					
Reduce the number and/or extent of facility improvement projects.	No to partially (depends on which projects)	No to partially (depends on which projects)	No to partially (depends on which projects)	No to partially (depends on which projects)	Concept is addressed under No Program Alternative and analyzed in Section 9.2.
Phase/extend the WSIP construction schedule such that fewer projects, especially those with geographic overlap, occur concurrently to lessen the collective regional and multi-regional impacts associated with the effects of multiple WSIP projects.	Partially (could delay ability to meet water quality requirements)	Yes (but would prolong period of time system is subject to seismic risks)	Yes (but may delay regular maintenance program and ability to keep local reservoirs full)	Yes	Concept is discussed in Section 9.4.4 and screened from further consideration, as described in more detail in Section 9.5.
Refine project site selections and/or facility layout designs that avoid or minimize impacts on sensitive resources (e.g., biological, cultural, land use, or agricultural lands).	Yes	Yes	Yes	Yes	Concept is discussed in Section 9.4.4 and screened from further consideration, as described in more detail in Section 9.5.
Strategies that Affect System Operations and Could Reduce Growth or System Operations Impacts					
Reduced service – do not fully meet the WSIP project objectives for water supply. Specifically, do not meet some or all of the future purchase requests and/or dry-year water supply reliability needs. ▪ Meet purchase request levels reflected in the existing Master Water Sales Agreement with the wholesale customers only ▪ Do not fully meet 2030 purchase requests from customers served from Pilarcitos Reservoir	Yes	Yes	Yes	No	Concept is further developed under No Purchase Request Increase Alternative and analyzed in Section 9.2.
Alter the point of diversion for additional Tuolumne River water needed to meet future water supply needs to a location downstream from the potentially affected fisheries and biological resources.	No, would require treatment prior to mixing with Hetch Hetchy supplies	Yes	Yes	Yes	Concept is further developed under Lower Tuolumne River Diversion Alternative and analyzed in Section 9.2.
Do not resume diversions from Alameda Creek above the diversion dam to Calaveras Reservoir after Calaveras Dam is restored.	Yes	Yes	No	No	Concept is discussed in Section 9.4.4 and screened from further consideration, as described in more detail in Section 9.5.

TABLE 9-13 (Continued)
STRATEGIES TO AVOID OR LESSEN SIGNIFICANT IMPACTS AND PRELIMINARY SCREENING

Strategies to Avoid or Lessen Significant Impacts	Does the Strategy Meet the WSIP Performance Objectives and Level of Service Goals?				Preliminary Screening
	Water Quality	Seismic Reliability	Delivery Reliability	Water Supply	
Strategies that Affect System Operations (cont.)					
Do not resume diversions from Alameda Creek above the diversion dam to Calaveras Reservoir to historical (pre-2002) levels after Calaveras Dam is restored, but recapture the flows at a location downstream from the potentially affected resources and pump the recaptured water to the regional system.	Yes	Yes	No	No	Concept is discussed in Section 9.4.4 and screened from further consideration, as described in more detail in Section 9.5.
Do not increase water storage in Crystal Springs Reservoir over existing levels for prolonged periods.	Yes	Yes	No	No	Concept is further developed under Modified WSIP Alternative and analyzed in Section 9.2.
Strategies that Affect Water Supply Sources and Could Reduce Water Supply Impacts					
Use an alternative supplemental supply source to meet future purchase requests and/or dry-year water supply reliability needs. ▪ Use an alternative supply source instead of additional Tuolumne River water ▪ Use an alternative supply source instead of additional pumping from the North Westside Groundwater Basin	Yes	Yes	Yes	Yes	Concept of alternative supply sources is addressed under Aggressive Conservation/Water Recycling and Local Groundwater Alternative and Year-round Desalination at Oceanside Alternative and analyzed in Section 9.2.
Implement demand management to meet increased purchase requests and dry-year water supply reliability needs through aggressive conservation and water recycling only.	Yes	Yes	Yes	Yes	Concept is addressed under Aggressive Conservation/Water Recycling and Local Groundwater Alternative and analyzed in Section 9.2.

TABLE 9-14
ALTERNATIVE CONCEPTS RAISED DURING PEIR SCOPING PROCESS AND PRELIMINARY SCREENING

Alternative Concept	Does the Concept Meet the WSIP Objective and Level of Service in the following areas?				Preliminary Screening
	Water Quality	Seismic Reliability	Delivery Reliability	Water Supply	
Concepts that Affect Facilities					
Do not expand the capacity of the system to withdraw water.	Yes	No	No	No	Concept does not meet three of the basic program objectives but is discussed under the No Program Alternative – analyzed in Section 9.2.
Enlarge Calaveras Reservoir to increase storage.	Yes	No	No	Possibly	Concept is discussed in Section 9.4.4 and screened from further consideration, as described in more detail in Section 9.5.
Remove O'Shaughnessy Dam and restore Hetch Hetchy Valley and use alternative water and power supplies / Use available storage capacity at New Melones Reservoir.	No	No	No	No	Concept does not meet any of the basic program objectives – eliminated from further consideration but discussed further in Section 9.5.
Build a pump station downstream of Holm Powerhouse to pump water from Cherry Creek to Mountain Tunnel / Larger intertie to Cherry Creek / Cherry Reservoir to Mountain Tunnel.	No	No	No	Possibly	Concept is discussed in Section 9.4.4 and screened from further consideration, as described in more detail in Section 9.5.
Expand downstream and off-stream storage.	No	No	No	Possibly	Concept is discussed in Section 9.4.4 and screened from further consideration, as described in more detail in Section 9.5.
Convey water from Don Pedro Reservoir to San Joaquin Pipelines.	No	No	No	Possibly	Concept is further developed under Lower Tuolumne River Diversion Alternative and analyzed in Section 9.2.
Do not build San Joaquin Pipeline (SJPL) No. 4 / Alternative without SJPL No. 4 / Advantages, disadvantages, and impacts of cross connections among SJPLs Nos. 1, 2, and 3 / Status of crossover on the San Joaquin Pipeline system at Albers Road.	No	No	No	No	Concept does not meet any of the basic program objectives – eliminated from further consideration and not discussed further in this PEIR. The SFPUC removed the SJPL No. 4 project from the WSIP and replaced it with the SJPL System project (SJ-3), which would include improvements to the San Joaquin Pipeline system without installation of a completely new SJPL No. 4. Programmatic impacts of the SJPL System project are evaluated as part of the proposed program and as part of all alternatives analyzed in Section 9.2.
Build pump station near Tesla Portal to reduce need for fourth San Joaquin Pipeline.	No	No	No	No	Concept does not meet any of the basic program objectives – eliminated from further consideration and not discussed further in this PEIR. When compared to the proposed program, the addition of a pump station at Tesla Portal would result in increased construction and operational impacts without reducing any of the impacts identified for the WSIP. This concept was considered during development of the SJPL System project (SJ-3) and may be considered in the project-level alternatives analysis if warranted.
Repair leaky pipelines.	No	No	No	No	Concept does not meet any of the basic program objectives – eliminated from further consideration and not discussed further in this PEIR. This concept is part of the SFPUC's ongoing repair and rehabilitation activities, and while it would improve the efficiency of the existing water supply, it would not be sufficient to meet the delivery reliability or water supply objectives.

TABLE 9-14 (Continued)
ALTERNATIVE CONCEPTS RAISED DURING PEIR SCOPING PROCESS AND PRELIMINARY SCREENING

Alternative Concept	Does the Concept Meet the WSIP Objective and Level of Service in the following areas?				Preliminary Screening
	Water Quality	Seismic Reliability	Delivery Reliability	Water Supply	
Concepts that Affect System Operations					
Filtration of Sierra source water / Expansion of filtration capacity in the SFPUC system / Alternative locations for filtration equipment.	No	No	No	No	Concept does not meet any of the basic program objectives – eliminated from further consideration but discussed further in Section 9.5.
Use of water stored in other reservoirs – Lake Lloyd, Lake Eleanor, Don Pedro Reservoir.	No	No	Possibly	Possibly	Concept is incorporated into the existing conditions as well as the proposed program; under both scenarios, the SFPUC maximizes use of water stored in Lake Lloyd and Lake Eleanor as part of Hetch Hetchy Reservoir operations. Use of water stored in Don Pedro Reservoir is part of the existing condition through the water bank described in Chapter 2; it is also assumed under the WSIP for the proposed water transfers with TID and MID for a supplemental drought supply. See Chapter 3, Program Description, Section 3.6, Proposed Water Supply Sources, and analysis in Chapter 5, Section 5.3. This concept is also incorporated and evaluated as part of all alternatives selected for detailed analysis in Section 9.2.
Assume the maximum releases identified in the 1987 Agreement as the required minimum flows for the Tuolumne River.	No	No	No	No	There is presently no basis for assigning the maximum releases to particular time periods, and the concept does not meet any of the basic program objectives – eliminated from further consideration as an alternative. However, concept is considered in the cumulative impact analysis of water supply and system operations and analyzed in Chapter 5, Section 5.7.
Extend the duration of releases into Pilarcitos Creek from Pilarcitos Reservoir to create a more natural flow regime in the creek.	No	No	No	No	Concept does not meet any of the basic program objectives – eliminated from further consideration and not discussed further in this PEIR. This concept is being considered under the SFPUC's Watershed and Environmental Improvement Program, described in Chapter 3, Section 3.12.
Alternative that will provide increased amount and duration of releases from Holm Powerhouse that can be used for whitewater recreation.	No	No	No	No	Concept does not meet any of the basic program objectives – eliminated from further consideration and not discussed further in this PEIR. Releases from SFPUC facilities for whitewater recreation under the proposed program are described in Chapter 3, Section 3.7.1.
Improve freshwater flows for streams.	No	No	No	No	Concept does not meet any of the basic program objectives – eliminated from further consideration and not discussed further in this PEIR. This concept is being considered under the SFPUC's Watershed and Environmental Improvement Program, described in Chapter 3, Section 3.12.
Alternative that analyzes the maximum conveyance capacity.	No	No	Possibly	No	Operation of the regional system under existing conditions, the proposed program, and all alternatives and variants considers the maximum conveyance capacity of the transmission system in terms of optimizing system reliability at the same time as meeting customer water demands. Under the WSIP, CEQA alternatives, and WSIP variants, the maximum conveyance capacity is

TABLE 9-14 (Continued)
ALTERNATIVE CONCEPTS RAISED DURING PEIR SCOPING PROCESS AND PRELIMINARY SCREENING

Alternative Concept	Does the Concept Meet the WSIP Objective and Level of Service in the following areas?				Preliminary Screening
	Water Quality	Seismic Reliability	Delivery Reliability	Water Supply	
Concepts that Affect System Operations (cont.)					
					evaluated in terms of delivery reliability, which includes provisions for maintenance, replenishment of local reservoirs, and minimizing risk of service interruption. Therefore, this concept is incorporated and analyzed as part of the delivery reliability level of service for the proposed program and all alternatives.
Concepts that Affect Water Supply Sources					
Increased conservation, demand-side management.	No	No	Possibly	Possibly	All three concepts are incorporated into the proposed program as described in Chapter 3 and are analyzed as part of the WSIP. In addition, these concepts are further developed under the Aggressive Conservation/Water Recycling and Local Groundwater Alternative and analyzed in Section 9.2.
Increased recycling to meet demand.	No	No	Possibly	Possibly	
Local and regional groundwater.	No	No	Possibly	Possibly	
Infiltration of groundwater into Mountain Tunnel.	No	No	No	No	Concept does not meet any of the basic program objectives – eliminated from further consideration and not discussed further in this PEIR. Current operations of the regional water system account for groundwater accretions to tunnels, and there would be no change in future operations under the WSIP in this regard.
Conjunctive use / Groundwater banking options.	No	No	No	Possibly	This concept is already incorporated in the proposed program and analyzed in Chapter 5. As described in Chapter 3, the proposed program includes a conjunctive-use program in the Westside Groundwater Basin in northern San Mateo County as a supplemental dry-year water source.
Groundwater banking in Kern County	No	No	No	Possibly	The concept of groundwater banking in Kern County in the Semitropic groundwater bank is discussed in Section 9.4.4 and screened from further consideration, as described in more detail in Section 9.5.
Purchase groundwater storage rights in foothills east of and outside of MID/Central Valley.	No	No	No	Possibly	Concept is discussed in Section 9.4.4 and screened from further consideration, as described in more detail in Section 9.5.
Zero increase in imports from the Tuolumne River / No further depletions from the Tuolumne River.	No	No	No	No	Concept alone does not meet any of the basic program objectives. However, this concept is further developed in combination with other alternative water sources under the Aggressive Conservation/Water Recycling and Local Groundwater Alternative and analyzed in Section 9.2.
Supply from Delta / More interties to other water sources, such as the Delta / Connect to the State Water Project at the California Aqueduct or Central Valley Project at the Delta-Mendota Canal.	No	No	Possibly	Possibly	Concept is discussed in Section 9.4.4 and screened from further consideration, as described in more detail in Section 9.5.

TABLE 9-14 (Continued)
ALTERNATIVE CONCEPTS RAISED DURING PEIR SCOPING PROCESS AND PRELIMINARY SCREENING

Alternative Concept	Does the Concept Meet the WSIP Objective and Level of Service in the following areas?				Preliminary Screening
	Water Quality	Seismic Reliability	Delivery Reliability	Water Supply	
Concepts that Affect Water Supply Sources (cont.)					
Additional intertie with Santa Clara Valley Water District.	No	No	Possibly	Possibly	Concept is discussed in Section 9.4.4 and screened from further consideration, as described in more detail in Section 9.5.
Desalination as water supply source.	No	No	Yes	Yes	Concept is developed and analyzed as Variant 2, Regional Desalination for Drought, in Chapter 8, as well as under the Year-round Desalination at Oceanside Alternative in Section 9.2. The Aggressive Conservation/Water Recycling and Local Groundwater Alternative also includes a component of desalination and is analyzed in Section 9.2.
Purchase water from TID and MID.	No	No	Yes	Yes	Concepts are incorporated into the proposed program, which would include water transfers with TID and MID for a supplemental drought supply. See Chapter 3, Program Description, Section 3.6, Proposed Water Supply Sources, and the Modified Alternative, analyzed in Section 9.2, considers water transfers from other agencies.
Water transfers.	No	No	Yes	Yes	
Different combinations of water sources.	No	No	Yes	Yes	Concept is incorporated into the proposed program, which would augment existing supply sources with conservation, recycled water, and groundwater projects in San Francisco; water transfers with TID and MID; and conjunctive-use program in northern San Mateo County. See Chapter 3, Section 3.6, Proposed Water Supply Sources, and analysis in Chapter 5. The concept is also incorporated into the No Purchase Request Increase and Aggressive Conservation/Water Recycling and Local Groundwater Alternatives analyzed in Section 9.2 as well as WSIP Variant 2 – Regional Desalination for Drought, analyzed in Chapter 8.
Urban stormwater.	No	No	No	No	Concept does not meet any of the basic program objectives – eliminated from further consideration and not discussed further in this PEIR. This concept is considered under one component of the Groundwater Projects (SF-2) to use treated urban stormwater to maintain water levels in Lake Merced as well as under the Recycled Water Projects (SF-3), since San Francisco's combined sewer system captures urban stormwater which would be treated as part of the recycled water. This concept alone would not be sufficient to meet the delivery reliability or water supply objectives.
Other Concepts					
No Program.	No	No	No	No	Concept does not meet any of the basic program objectives but is further analyzed in Section 9.2 as required by CEQA.
Meet only seismic and water quality objectives.	Yes	Yes	No	No	Concept is further developed under the No Purchase Request Increase Alternative and analyzed in Section 9.2.

TABLE 9-14 (Continued)
ALTERNATIVE CONCEPTS RAISED DURING PEIR SCOPING PROCESS AND PRELIMINARY SCREENING

Alternative Concept	Does the Concept Meet the WSIP Objective and Level of Service in the following areas?				Preliminary Screening
	Water Quality	Seismic Reliability	Delivery Reliability	Water Supply	
Other Concepts (cont.)					
Meet only sustainability objective / Provide projects that meet the sustainability objective.	No	No	No	No	Concept does not meet any of the basic program objectives – eliminated from further consideration and not discussed further in this PEIR. However, the SFPUC would meet the sustainability objective through implementation of mitigation measures incorporated into the WSIP. This concept is being implemented through the SFPUC's Watershed and Environmental Improvement Program, described in Chapter 3, Section 3.12, as well as through the Alameda and Peninsula Watershed Management Plans.
Meet goals and objectives without a gravity-driven system.	Not defined	Not defined	Not defined	Not defined	Concept is not sufficiently defined to determine if it could meet program objectives or for it to be analyzed. At a minimum, if any alternative to the WSIP were developed that relied on pumping rather than gravity to convey water supplies from the Sierra to San Francisco, it would result in greater long-term air quality and energy impacts than the WSIP, without reducing any impacts of the WSIP. It would also require construction of additional pumping and transmission facilities, resulting in additional construction impacts. Therefore, this concept is eliminated from further consideration and is not discussed further in this PEIR.
Reduce regional per capita daily consumption / Do not fully meet all of the 2030 customer purchase requests.	Not defined	Not defined	Not defined	Not defined	Concept is further developed under No Purchase Request Increase Alternative and analyzed in Section 9.2.
Alternative rationing objectives / scenarios.	No	No	No	No	Concept alone does not meet any of the basic program objectives. However, an alternative rationing objective is developed under Variant 3, 10% Rationing, and analyzed in Chapter 8. In addition, the No Program Alternative does not define a maximum drought rationing policy, but the analysis in Section 9.2 assumes incidental rationing up to 30 percent.
Provide watershed and fish-passage projects aimed at improving habitat and restoring steelhead in the Pilarcitos Creek watershed, such as through the removal or bypass of Old Stone Dam.	No	No	No	No	Concept does not meet any of the basic program objectives – eliminated from further consideration and not discussed further in this PEIR. This concept is being considered under the SFPUC's Watershed and Environmental Improvement Program, described in Chapter 3, Section 3.12.

project objectives *and* avoid or lessen the impacts of the proposed project), or (c) they are not considered feasible to implement. However, it should be noted that SFPUC decision-makers will ultimately determine whether an alternative is feasible or infeasible at the time of program approval. At that time, decision-makers may consider, among other things, whether the alternatives are desirable from a public policy standpoint in light of the program's objectives and whether they provide a reasonable balance of relevant economic, environmental, social, and technological factors.

Strategies/Concepts that Affect Facilities and Could Reduce Facilities Impacts

Reduce the Number and/or Extent of Facility Improvement Projects

The concept of reducing the number or extent of facility improvement projects implemented as part of the WSIP is addressed under the No Program Alternative. This strategy might avoid or lessen the significant construction effects of individual and/or multiple WSIP projects (such as short-term construction traffic, noise, air quality) and still meet most of the WSIP objectives to some degree, depending on which projects would be removed from the WSIP. However, the SFPUC has a limited ability to reduce the number of facility projects and/or the extent of work proposed as part of the WSIP. Each of the proposed facility improvement projects is an important part of repairing and upgrading the regional system, and all of the projects are needed to assure the program objectives can be met. The No Program Alternative describes the effects of a greatly reduced facilities improvement program. Under this alternative, the SFPUC would still proceed with certain projects in order to comply with future water quality regulations. The No Program Alternative, which is discussed in more detail in Section 9.2, assumes that at least five projects required for current regulatory compliance would be implemented in the near term by the SFPUC, even if the SFPUC did not approve the entire program considered in this PEIR. While the No Program Alternative would reduce overall construction impacts, including avoiding some PSU impacts, this alternative would fail to meet the WSIP level of service goals for seismic, delivery, and water supply reliability.

Among the remaining WSIP PEIR projects (beyond those required for immediate regulatory compliance), the SFPUC has determined that all are critical to achieving the WSIP level of service goals. As shown in Chapter 3, Table 3.10, each of the WSIP projects would be required in order to meet some combination of the water quality, seismic reliability, delivery reliability, water supply, and sustainability objectives. The SFPUC has identified most of the WSIP projects as *key* projects for seismic and/or delivery reliability (SFPUC, 2006), but a few projects not listed as key still represent needed facilities that are critical for long-term maintenance and asset management, such as the Pulgas Balancing Reservoir project (PN-5). It might be possible to delay the few maintenance projects not identified as key, but they would ultimately be needed to ensure responsible and adequate maintenance of the system, or, if deferred too long, would possibly have to be conducted as emergency repair projects.

In some cases, a WSIP project would definitively have a significant unavoidable impact, such as the New Irvington Tunnel project (SV-4), even at this programmatic level of environmental review. Potentially significant, unavoidable impacts related to land use, visual quality, historic resources, and construction noise were identified for individual WSIP projects, but the only clear strategy to avoiding or substantially reducing the significant and unavoidable construction and siting effects would be to not implement those projects. However, this strategy would not be reasonable. As described above, each of the WSIP projects is needed to meet the proposed level of service goals, and those that are not urgent in terms of regulatory or public safety concerns would still be needed for long-term maintenance and asset management of the regional system.

Since all of the projects would eventually be required, delaying implementation of any one project would only defer rather than avoid the identified construction effects. Eliminating the few maintenance-type projects would not substantially reduce the overall construction impacts of the multiple-project WSIP and could potentially prolong the construction impacts. As a result, this PEIR does not evaluate a “reduced project” alternative beyond that represented by the No Program Alternative.

Phase/Extend the WSIP Construction Schedule

Phasing or extending the WSIP construction schedule so that fewer projects, especially those with geographic overlap, would occur concurrently is one approach that could lessen the collective regional and multi-regional impacts associated with multiple WSIP projects. However, this concept would prolong the duration of construction impacts as a trade-off for reducing impact intensity, which is not considered effective as an alternative to avoid or substantially lessen impacts associated multiple and overlapping construction projects. Therefore, this concept was eliminated from further consideration, as discussed in Section 9.5, below. To some degree, like the refinement of site and facility layouts (see immediately below), the feasibility of minimizing impacts due to concurrent construction of projects in the same geographic area would be examined as part of project-level environmental review. Detailed siting studies and construction requirements for each facility would be needed to identify further opportunities to avoid or minimize these environmental effects, and site-specific evaluations will be conducted as part of project-level CEQA review of each WSIP project. When more project-specific information becomes available, it is expected that the SFPUC would coordinate the phasing of construction schedules to minimize impacts where feasible. These project-specific issues are not evaluated in this PEIR, since these actions affect individual groups of projects only and not the WSIP as a whole and would be best addressed during project-level CEQA review. No further analysis in this PEIR is warranted.

Refine Project Site Selection or Facility Layouts

Refining the individual project site selection and/or the facility layout designs could avoid or minimize impacts on sensitive resources (e.g., biological resources, cultural resources, land use, or agricultural lands) associated with construction of individual facility improvement projects. This concept is deferred to the project-level environmental review of individual WSIP projects and was eliminated from further consideration in the PEIR.

A strategy to avoid or lessen footprint impacts associated with siting a project at a specific location would be to revise and refine individual site selection and/or facility layout designs. As this is a program EIR that provides a program-level review of the overall WSIP, detailed project siting and layout information, while in development, is not yet available for many WSIP projects. In most cases, the proposed facility improvement projects would be constructed on existing SFPUC property, at or adjacent to existing water system facilities. This basic siting approach has helped reduce the potential footprint effects of the proposed projects, but detailed siting and design studies for each facility would be needed to identify further opportunities to avoid or minimize these environmental effects. Site-specific evaluations will be conducted as part of project-level CEQA review of each WSIP project. During detailed project design and subsequent CEQA review, facility siting and layout designs will be considered. Where appropriate, project-level CEQA review will consider site and design alternatives to avoid or lessen the effects of individual projects. These specific site alternatives are not evaluated in this PEIR, since these actions affect individual projects only and not the WSIP as a whole. In addition, the SFPUC's construction measures along with the mitigation measures identified in this PEIR establish procedures and performance measures to be implemented during siting and design of WSIP projects to minimize environmental impacts where feasible. Therefore, alternatives and refinements to individual site selection would be best addressed during project-level CEQA review. No further analysis in this PEIR is warranted.

Strategies/Concepts that Affect Facilities and Could Reduce Water Supply Impacts

Enlarge Calaveras Reservoir

Enlarging Calaveras Reservoir to increase storage beyond the historical capacity could result in the capture of more water within the upper Alameda Creek watershed and could increase local water supplies. This concept also included the potential to provide pumping facilities and to store Tuolumne River water in an enlarged Calaveras Reservoir, thereby increasing local storage for use during droughts, planned or unplanned outages, or other emergencies. However, this concept would not avoid or reduce identified environmental effects associated with increased diversions from the Tuolumne River and would result in more severe environmental impacts on Alameda Creek than the proposed program; therefore, this concept was eliminated from further consideration, as discussed in Section 9.5, below.

Connect Cherry Creek Directly to Regional Water System

The Cherry Creek water supply could be connected directly to the regional water system by building a pump station downstream of Holm Powerhouse to pump water from Cherry Creek to Mountain Tunnel; this would augment supplies to the regional system to serve increased customer demand instead of increasing diversions from Hetch Hetchy Reservoir. However, this concept was eliminated from further consideration because it would result in far greater environmental effects than the proposed program, as discussed in Section 9.5, below.

Expand Downstream and Off-stream Storage

Expanding downstream and off-stream storage within the regional system could possibly augment regional system supplies to help meet increased customer demand. The SFPUC has a limited ability to develop or expand storage within the existing system beyond the facility improvement projects already incorporated into the WSIP, which are designed to restore historical storage capacity rather than expand storage (i.e., Calaveras Dam, SV-2, and Lower Crystal Springs Dam, PN-4). The concept to expand storage is incorporated into other strategies discussed below, including Enlarge Calaveras Reservoir and Recapture Upper Alameda Creek Flows Downstream, using the infiltration galleries, quarries, or Alameda County Water District (ACWD) facilities. Both concepts were eliminated from further consideration due to institutional constraints or technical infeasibility, as discussed below in Section 9.5.

Strategies/Concepts that Affect System Operations and Could Reduce System Operations Impacts

Revise Alameda Creek Diversion Dam Operations

This concept involves not resuming historical levels of diversions from Alameda Creek above the diversion dam to Calaveras Reservoir after Calaveras Dam is restored. However, this concept was eliminated from further consideration since it would not meet two fundamental WSIP objectives—water supply and delivery reliability—and would make the system more vulnerable to water supply shortages in the event of drought or Hetch Hetchy system emergency outages because Alameda Creek is a local water supply source. This concept could affect the CCSF's water rights to Alameda Creek drainage, as discussed in Section 9.5, below.

Recapture Upper Alameda Creek Flows Downstream

This concept involves not resuming the historical pattern of diversions from Alameda Creek above the diversion dam to Calaveras Reservoir, recapturing the flows downstream from the potentially affected resources, and pumping the recaptured water to the regional system. The SFPUC explored the possibility of recapturing flows downstream at the Sunol infiltration galleries, the quarries, and ACWD facilities. This concept was eliminated from further consideration because of technical infeasibility, as discussed in Section 9.5, below.

Strategies/Concepts that Affect Water Supply Sources and Could Reduce Water Supply Impacts

Both Tables 9-13 and 9-14 indicate that alternative water supply sources would be a possible strategy to meet future purchase requests and to reduce identified impacts of the WSIP. Possible water supply sources shown in these tables include increased conservation (i.e., demand management), increased water recycling, local and regional groundwater, desalination, Delta groundwater banking/conjunctive use, and interties with other agencies. Conservation, increased water recycling, local groundwater, and desalination are incorporated into alternatives discussed and analyzed in Section 9.2. The overall approach of other water supply sources reviewed are discussed below.

As described in Chapter 3, Section 3.4, the SFPUC has conducted numerous water supply studies over the last 20 years to explore strategies and options for meeting future water purchase requests and dry-year water supply reliability needs. These studies have considered a broad range of water supply alternatives. Appendix C of the *Water Supply Options* report (SFPUC, 2007b), referred to as the WSIP Option 3 study, reviewed three previous water supply reports that considered among them a total of 28 potential water supply alternative projects to meet the growing water supply needs for the SFPUC system:

- *Alternative Means of Providing Additional Water to the San Francisco Water Department* (Kennedy/Jenks Engineers, 1986) – 12 alternatives evaluated.
- *Water Supply Master Plan* (SFPUC, 2000) – 19 alternatives evaluated.
- *Bay Area Water Quality and Supply Reliability Program – Final Report* (CDM, 2005) – Seven Bay Area water agencies evaluated potential regional projects for improvement of water quality and water supply reliability. A set of 69 concepts was screened, 35 of which were selected for further evaluation.

For the WSIP Option 3 study, the SFPUC screened numerous alternatives identified in previous studies for compatibility with the current WSIP goals and levels of service performance objectives. Alternative water supply sources considered include the following: Sacramento–San Joaquin Delta, direct purchase from neighboring water agencies, desalination of seawater or brackish water, recycled water, and water conservation. In addition, the SFPUC evaluated alternative locations for future Tuolumne River diversions (one location is discussed in Section 9.2). Conservation and water recycling options were addressed separately as part of the WSIP planning process (discussed in Section 9.2.4). The 28 alternative concepts were evaluated for the following major issues:

- Environmental issues – major impacts that have a high risk of not being resolved
- Institutional issues – contractual, jurisdiction authority issues or other permitting requirements that have a high risk of not being resolved
- Operational issues – perceived operation problems, either with the SFPUC system or state/federal water systems, that have a high risk of not being resolved
- Water quality issues – water treatment issues that have a high risk of requiring costly treatment or incurring unnecessary health risks

In addition, the SFPUC's initial screening process considered the following criteria specifically related to its system needs and WSIP level of service goals:

1. Secure a reliable and sustainable 25-mgd supplemental water supply.
2. No additional flows to be diverted from the Tuolumne River above historical levels; however, for this study, additional Tuolumne River diversions could be considered at the downstream end of the lower Tuolumne River near the confluence with the San Joaquin River.
3. Corollary to Criterion 2, no additional infrastructure requirements beyond the those of the proposed program (such as a complete fourth San Joaquin Pipeline extending from Oakdale Portal to Tesla Portal or second Coast Range Tunnel).
4. Maintain "filtration avoidance" for water diverted from Hetch Hetchy Reservoir.

The SFPUC's initial screening process identified 10 alternative concepts for further evaluation. Some of these concepts represented variations rather than distinct alternatives. After further review of the remaining 10 alternative concepts, the SFPUC selected three alternatives for more in-depth evaluation: Lower Tuolumne River Diversion, Oceanside Seawater Desalination Plant, and Delta Diversion. The first two are discussed and analyzed in Sections 9.2.5 and 9.2.6, respectively, as potential CEQA alternatives. The last one, Delta Diversion, was considered and rejected as a CEQA alternative, as discussed below. The list below also includes other water sources that were reviewed or suggested during scoping as possible supplemental supplies during nondrought or drought years, but were rejected from further consideration.

Additional Intertie with Santa Clara Valley Water District

The SFPUC investigated several alternatives for an exchange or transfer with the Santa Clara Valley Water District (SCVWD) as part of the WSIP background studies exploring regional water supply opportunities. The SFPUC and SCVWD explored options using the existing intertie, a new intertie, or exchanges through delivery to the eight customers in common to both the SCVWD and SFPUC. This concept was eliminated from further consideration, as described in more detail in Section 9.5, because it would not provide a dependable future water source for the SFPUC regional system. However, the SFPUC considered this concept in combination with supplemental water supply sources, including Groundwater Banking in Kern County and Delta Exchange, as discussed below.

Groundwater Banking in Kern County

As described in Chapter 3, Section 3.4, the SFPUC explored storage in the Semitropic Water Storage District's groundwater bank near Bakersfield as a possible dry-year water supply. Under this option, during wet years, the SFPUC would deliver Tuolumne River water to the Semitropic groundwater bank using the California Aqueduct and, in dry years, would receive water through the Semitropic Water Storage District's allocations of water from the State Water Project via the Delta and South Bay Aqueduct. Direct participation by the SFPUC in this type of water banking program was determined to pose a significant risk of violation of the Raker Act, and this option was therefore eliminated from further consideration, as described further in Section 9.5. The SFPUC also considered indirect participation in this program through current Bay Area partners, including the SCVWD, Alameda County Flood Control and Water Conservation District Zone 7, and ACWD via Delta exchange, but this was determined to be infeasible, as described in Section 9.5.

Delta Exchange

The SFPUC evaluated various alternatives for exchanging water from the SFPUC regional water system for Delta water. It considered the three Bay Area water agencies that are (1) State Water Project contractors receiving Delta water, and (2) agencies to which a means for transferring SFPUC regional water system supplies was identified. The SFPUC, in collaboration with the three potentially participating agencies (ACWD, Zone 7, and SCVWD), determined that this concept is not technically feasible due to timing and capacity issues, as described below in Section 9.5.

Delta Diversion

The SFPUC explored using diversions from the Delta as a supplemental water source. This scenario would involve the following: purchasing water from a water-right holder in the Delta and/or on one of the rivers tributary to the Delta; transporting the water via the State Water Project or Central Valley Project conveyance facilities to the regional system; treating the water at a new treatment plant at Tesla Portal; and blending the treated Delta supply with the Hetch Hetchy supply in the Coast Range Tunnel. This concept was eliminated from further consideration due to uncertainties regarding the availability of water supplies and pumping capacities (which would make consistent year-round diversions highly unlikely), potential water quality issues, and the significant increase in adverse environmental impacts from facility construction and on Delta resources, as discussed in Section 9.5.

Purchase Groundwater Storage Rights in Foothills East of and Outside of MID/Central Valley

This concept was raised during the public scoping period. The SFPUC has not explored this concept because of the limited information on the infiltration rates and potential groundwater quality issues in this basin as well as potential institutional issues. Therefore, due to technical infeasibility, this concept was eliminated from further consideration as a strategy to incorporate into a CEQA alternative, as discussed further in Section 9.5.

9.5 Alternative Concepts Considered But Rejected

9.5.1 Rejected Strategies/Concepts that Affect SFPUC Facilities

Phase/Extend the WSIP Construction Schedule

Phasing or extending the WSIP construction schedule so that fewer projects, especially those with geographic overlap, would occur concurrently is one approach that could lessen the collective regional and multi-regional impacts associated with construction of multiple WSIP projects. However, this concept was eliminated from further consideration, as discussed below.

The SFPUC has a limited ability to revise the phasing or to extend the proposed WSIP multi-project construction schedule. Critical to the phasing of the construction activities is the ability to maintain full service to customers throughout the entire WSIP construction schedule. Certain projects must be completed in the appropriate sequence to provide ongoing service. In addition, the construction of many of the projects requires certain linkages, which necessarily involve overlapping construction activities and schedules between some projects; this overlap would in fact reduce the duration of construction disturbance at some locations.

As described previously, many of the proposed facility improvement projects are urgent in order to meet public health requirements and water quality objectives as well as key to achieving the seismic and delivery reliability level of service goals. As a result, these projects cannot be delayed without compromising the fundamental WSIP goals and objectives and possibly jeopardizing public health and safety. In addition, lengthening the overall WSIP construction schedule might reduce the intensity of construction impacts from multiple projects in some areas but would, conversely, increase the duration of these impacts as projects are constructed sequentially rather than concurrently. Because phasing project schedules and extending overall construction would trade potential impact intensity for impact duration, this strategy is not considered effective as an alternative to avoid or substantially lessen impacts associated with multiple and overlapping construction projects. Therefore, the concepts of either revising the phasing of the WSIP construction or extending the construction schedule were eliminated from further consideration.

Enlarge Calaveras Reservoir

Enlarging Calaveras Reservoir to increase storage beyond the historical capacity would capture more water within the upper Alameda Creek watershed and could increase local water supplies. This concept also included the potential to provide pumping facilities and to store Tuolumne River water in an enlarged Calaveras Reservoir, thereby increasing local storage for use during droughts, planned or unplanned outages, or other emergencies. However, this concept would not avoid or reduce identified environmental effects associated with increased diversions from the Tuolumne River and would result in more severe environmental impacts on Alameda Creek than the proposed program; therefore, this concept was eliminated from further consideration, as discussed below.

As part of the development of the WSIP, the SFPUC considered an alternative under which Calaveras Reservoir would be enlarged from its historical capacity of 98,800 acre-feet to 256,000 or 409,000 acre-feet. An enlarged Calaveras Reservoir would enable the SFPUC to capture more water from the Alameda Creek watershed and to store more Tuolumne River water in the Bay Area. This alternative would increase the firm yield of the regional water system.

The SFPUC rejected this concept because of uncertainties about the ability to obtain the necessary water rights and environmental permits within the timeframe needed to replace Calaveras Dam to satisfy DSOD requirements. In 2002, the DSOD imposed interim restrictions on Calaveras Dam operations, with the caveat that the SFPUC continue to pursue an aggressive schedule for the remediation of Calaveras Dam. The Calaveras Dam project (SV-2), proposed as a part of the WSIP, includes design features that would technically allow the dam to be raised in the future and the reservoir capacity to be increased if needed, and water-rights and environmental issues can be resolved at that time.

As a potential CEQA alternative, enlarging Calaveras Reservoir to store more than its original 98,800 acre-feet would not help avoid or lessen the effects to the WSIP. It would not reduce the levels of Tuolumne River diversions, if the proposal includes pumping facilities to store Tuolumne River supplies in Calaveras Reservoir. Alternatively, it could replace that supply in whole or in part with increased diversions from upper Alameda Creek, Arroyo Hondo, and Calaveras Creek. This concept would allow increased diversions from upper Alameda Creek through the Alameda Creek Diversion Tunnel compared to the proposed program, which would exacerbate the identified significant, unavoidable impact on stream flow in Alameda Creek below the diversion dam as well as worsen the potentially significant impact on fishery resources in this reach of Alameda Creek. Therefore, the alternative of enlarging Calaveras Reservoir beyond its historical capacity was eliminated from further consideration in this PEIR.

Connect Cherry Creek Directly to Regional Water System

The Cherry Creek water supply could be connected directly to the regional water system by building a pump station downstream of Holm Powerhouse to pump water from Cherry Creek to Mountain Tunnel; this would augment supplies to the regional system to serve increased customer demand instead of increasing diversions from Hetch Hetchy Reservoir. However, this concept was eliminated from further consideration because it would result in far greater environmental effects than the proposed program, as discussed below.

This concept would use Cherry Creek to augment the regional water supply sources. It could consist of a pump station downstream of Holm Powerhouse to pump water from Cherry Creek to Mountain Tunnel or, alternatively, could consist of a larger intertie to Cherry Creek and Lake Lloyd (Cherry Reservoir) to Mountain Tunnel. This concept would avoid impacts on sensitive terrestrial biological resources downstream of O'Shaughnessy Dam, such as those in the Poopenaut Valley.

To meet federal and state water quality requirements, this concept would necessitate the construction of a filtration plant, since—unlike the Hetch Hetchy watershed—the Cherry Creek watershed does not meet filtration avoidance criteria (see Chapter 2, Section 2.4). This concept would require either filtration of the Cherry Creek source water prior to blending with Hetch Hetchy water in Mountain Tunnel, or filtration of the entire Hetch Hetchy supply after blending with the Cherry Creek water. In either case, construction of a filtration plant would result in numerous additional construction and operational environmental impacts that would not occur under the proposed program. Increased use of Cherry Creek water supplies to serve customer demand would reduce flows available for whitewater rafting. Furthermore, the concept would be contrary to the fundamental operating principle of maintaining filtration avoidance for the Hetch Hetchy system. Therefore, since this concept would not effectively avoid or substantially lessen WSIP impacts without also resulting in a number of other potentially significant environmental impacts, it was eliminated from further consideration.

9.5.2 Rejected Strategies/Concepts that Affect System Operations

Filtration of Sierra Source Water

During scoping, the suggestion was raised to expand the filtration capacity in the SFPUC system and/or to explore alternative locations for necessary filtration equipment, including locating facilities at Brown Adit or Moccasin, or expanding capacity at the Sunol Valley WTP. As a stand-alone alternative, this concept would not meet any of the basic program objectives, would not avoid or lessen any of the impacts of the WSIP, and would result in adverse construction and operational impacts. As described in Chapter 2, the existing quality of Hetch Hetchy water meets the full requirements of the state and federal Safe Drinking Water Acts, and the water can be consumed without the need for filtration. Therefore, this concept as a stand-alone alternative was eliminated from further consideration.

This suggestion was likely posed in combination with the concept of removing O'Shaughnessy Dam and restoring the Hetch Hetchy Valley. That concept was rejected since it would neither meet any of the program objectives nor avoid or lessen the significance of any of the WSIP impacts, as discussed below in Section 9.5.4.

Revise Alameda Creek Diversion Dam Operations

This concept would involve not resuming historical levels of diversions from Alameda Creek above the diversion dam to Calaveras Reservoir after Calaveras Dam is restored under the WSIP. However, this concept was eliminated from further consideration since it would not meet two fundamental WSIP objectives, would result in the loss of an irreplaceable local source of water needed during droughts and Hetch Hetchy water quality events, and could affect the CCSF's water rights to Alameda Creek drainage.

As discussed in Section 5.4, the WSIP would result in some significant impacts on the Alameda Creek system and its related environmental resources. Most notably, these impacts include a significant and unavoidable reduction of stream flow in Alameda Creek in the reach below the diversion dam to the confluence with Calaveras Creek, and a significant but mitigable effect on the resident trout fishery in this reach. Since the DSOD restricted the storage capacity of Calaveras Reservoir, the SFPUC has substantially reduced the amount of water it routinely diverts each year from Alameda Creek at the diversion dam. This concept would involve proceeding with implementation of the Calaveras Dam project (SV-2), as required by the DSOD, and allowing the reservoir to resume its historical capacity; however, the Alameda Creek Diversion Tunnel would remain as currently managed and would not resume the operations in existence prior to the DSOD restriction. This concept would avoid the significant, unavoidable impact on the hydrology of Alameda Creek below the diversion dam and maintain stream flow in Alameda Creek equivalent to 2005 conditions.

However, this concept would effectively eliminate Alameda Creek drainage as a local water supply source, and only Arroyo Hondo and Calaveras Creek would drain to Calaveras Reservoir. Alameda Creek drainage to Calaveras Reservoir, under historical operating conditions, represents about one-third of the reservoir's capacity and loss of this supply would constitute a substantial reduction in the regional system's total water supply. Without the contribution of Alameda Creek to the total supply, the SFPUC would be unable to meet the delivery reliability and water supply objectives without securing a replacement water supply. Most importantly, under this concept, the regional system would be more vulnerable to water supply shortages in the event of drought or other emergency, since Alameda Creek is a local water supply source. The need for this supply is especially acute during droughts and Hetch Hetchy system emergency outages. This local supply plays a critical role in providing delivery and water supply reliability and cannot be fulfilled through nonlocal supplies (such as the Tuolumne River or the Delta), since it provides local Bay Area storage within the regional water system in proximity to customers. In addition, this concept could possibly jeopardize the CCSF's pre-1914 appropriative water rights for this supply. Therefore, this concept was eliminated from further consideration.

Recapture Upper Alameda Creek Flows Downstream

This concept involves not resuming the historical pattern of diversions from Alameda Creek above the diversion dam to Calaveras Reservoir, recapturing the flows downstream from the potentially affected resources, and pumping the recaptured water to the regional system. This concept was eliminated from further consideration because of technical infeasibility, as discussed below.

This concept is similar to the previous concept in that it would avoid the significant, unavoidable impact associated with the reduction in stream flow in Alameda Creek below the diversion dam (by not resuming historical operation of the Alameda Creek Diversion Tunnel) and would maintain current stream flow patterns below the diversion dam. However, under this concept, stream flow equivalent to the volume normally diverted to Calaveras Reservoir would be recaptured farther downstream in the creek and then returned to the regional water system. This approach would allow the SFPUC to retain its local water supply source available for use during droughts, Hetch Hetchy water quality events, and other emergency situations.

The SFPUC explored the possibility of recapturing flows downstream at the Sunol infiltration galleries, the quarries, and ACWD facilities, with a focus on recapturing high winter flows rather than low-volume summer releases (SFPUC, 2007a). (The infiltration galleries are described in Section 5.4.4, and the quarries and ACWD facilities are described in Section 5.7.3.) All of these options were determined to be technically infeasible due to physical limitations, as described below. In addition, implementation of any of these concepts would require extensive new construction in sensitive habitats and would result in a host of additional potentially adverse environmental effects. Furthermore, this concept would only avoid the significant, unavoidable impact for the reach of the creek from the Alameda Creek Diversion Dam to the infiltration galleries/quarries/ACWD facilities, but a significant, unavoidable impact on stream flow in the creek below these facilities would remain.

The Sunol infiltration galleries, built in 1901, were designed to intercept surface water from Alameda Creek into the shallow alluvium of the Sunol Valley and provide a location for temporary aquifer recharge and recovery. Historically, the SFPUC (and its predecessors) operated the Sunol infiltration galleries to divert peak flood flows, to divert releases from Calaveras Reservoir, to divert releases of Hetch Hetchy water to Alameda Creek, and to divert flows from Pleasanton/Arroyo de la Laguna; up to 50 to 60 mgd of water was historically diverted at the infiltration galleries. Use of the galleries historically required installation of seasonal gravel dams to improve percolation rates into the galleries. However, following construction of the Calaveras Pipeline in 1934, and again following construction of San Antonio Dam in 1965, the yield of the infiltration galleries declined. The current capacity of the galleries has been further reduced due to the demolition of Sunol Dam and by aggregate mining upstream. Therefore, it is unknown whether it would be feasible to use the infiltration galleries to capture the flows from upper Alameda Creek that were diverted to Calaveras Reservoir prior to the DSOD restriction. The physical hydrogeology of the Alameda Creek and groundwater system has altered since the infiltration galleries were used, and it is likely that extensive upstream facilities would be required. This concept would then result in a number of potentially adverse environmental effects downstream of the diversion dam associated with placing new facilities in a sensitive habitat. Due to the extent of additional impacts and unknown feasibility, as well as the limited reduction in adverse effects, use of the infiltration galleries was eliminated from further consideration.

Diversion of Alameda Creek flows to the quarries currently located in the Sunol Valley might be possible when a limited amount of water storage space (approximately 14,000 acre-feet) becomes available at one of the lease sites along the bank of Alameda Creek between Interstate 680 and San Antonio Creek. This diversion would require a surface impounding structure (i.e., a rubber dam) and would also have to be screened to prevent fish entrainment. Use of the quarries for water storage would also require extensive modification of the site. Due to the extent of additional impacts and unknown feasibility, as well as the limited reduction in adverse effects, use of the quarries was eliminated from further consideration.

Similarly, use of ACWD's existing downstream facilities to recapture flows from upper Alameda Creek would be questionably feasible. Flows are currently diverted into streamside intakes behind two rubber dams, and, during the winter, the ACWD must lower its rubber dams if flows exceed 200 cubic feet per second. It may not be feasible to capture additional high winter flows from upper Alameda Creek. Due to the extent of additional impacts and unknown feasibility, as well as the limited reduction in adverse effects, use of ACWD facilities was eliminated from further consideration.

9.5.3 Rejected Strategies/Concepts that Affect Water Supply Sources

Additional Intertie with Santa Clara Valley Water District

As described in Chapter 2, the existing SFPUC intertie with the SCVWD has a capacity of 40 mgd and serves as a means to transfer water between the SFPUC and SCVWD during an emergency or during periods of planned maintenance work on critical facilities. The SFPUC investigated several alternatives for an exchange or transfer with the SCVWD as part of the WSIP background studies exploring regional water supply opportunities. The SFPUC and SCVWD explored options using the existing intertie, a new intertie, or exchanges through delivery to the eight customers in common to both the SCVWD and SFPUC. In general, an exchange would involve the SFPUC advancing water in wet years to the SCVWD in exchange for supplies from the SCVWD in dry years. However, it was determined that the SCVWD does not have capacity or need for additional water supplies during wet years. At times when the SFPUC has additional supplies available for delivery to the SCVWD, the SCVWD cannot use the water directly or store it. Additionally, the SCVWD does not have excess water to transfer to the SFPUC in normal or dry years.

Thus, this intertie or any additional intertie with the SCVWD alone would not provide a dependable future water source for the SFPUC regional system, since the SCVWD is faced with similar water supply issues as the SFPUC due to its projected increase in demand and limited water supply sources. However, the SFPUC considered this concept in combination with supplemental water supply sources, including Groundwater Banking in Kern County and Delta Exchange, as discussed below.

Groundwater Banking in Kern County

Hundreds of feet of permeable geologic strata underlie the southern end of the San Joaquin Valley, creating favorable conditions for groundwater storage and recovery. Water applied to the floor of the San Joaquin Valley in Kern County rapidly percolates into the ground and can be readily recovered by pumping from existing groundwater wells.

For many years, water agencies in Kern County have practiced conjunctive use of their surface and groundwater sources; that is, they actively manage their surface and groundwater sources to take advantage of the different characteristics of the two types of water sources. The availability of surface water supplies varies greatly from year to year, but the availability of groundwater supplies typically does not. When surface water is abundant, water agencies supply their customers with surface water and percolate the excess into the ground. When surface water is scarce, water agencies in Kern County supply their customers with groundwater.

Until about 10 years ago, water agencies in Kern County managed the groundwater basin underlying the San Joaquin Valley portion of Kern County exclusively for their own benefit. In 1994, the first of several water banking projects designed to benefit water agencies outside of Kern County came into operation. The Semitropic Water Storage District (Semitropic) provides groundwater storage capacity to multiple partners, including the Metropolitan Water District of Southern California, ACWD, Zone 7, and SCVWD. The total storage capacity of the Phase I basin is nearly 1 million acre-feet. Semitropic has been pursuing development of a Phase II basin (referred to as the “New Unit”) with 650,000 acre-feet of new storage capacity. The project is operated as a storage bank; during wet periods, when the project partners do not need all of their water from the State Water Project or other Delta sources to meet current needs, it places the excess in storage in Semitropic’s groundwater bank in Kern County. In dry periods, the project partners expect to recover water from the groundwater bank, either through groundwater extraction or Semitropic’s Delta entitlements, to supplement their other supplies.

The SFPUC evaluated storing water in the Semitropic groundwater bank in order to increase the firm yield of the regional water system. Specifically, the storage proposal involved an in-lieu groundwater banking concept in which the SFPUC would supply water in non-dry years under its existing Tuolumne River water rights or use another source of non-dry-year supply to irrigators in Semitropic’s service area for surface irrigation. In exchange, the farmers would not pump groundwater, which would be credited to the SFPUC’s Semitropic groundwater bank account (less the actual losses in delivery, estimated to be 10 percent). When called on by the SFPUC, Semitropic would provide the SFPUC credited amount of water to the California Aqueduct via a proposed New Unit of the Semitropic groundwater bank, which would, in turn, allow the SFPUC to draw the equal amount of water from the State Water Project South Bay Aqueduct turnout at San Antonio Reservoir or other locations. Finally, other State Water Project contractors located south of Semitropic would use the actual SFPUC banked water delivered by Semitropic.

However, there is uncertainty regarding the ability of the SFPUC to provide water for storage in the Semitropic groundwater bank. The SFPUC determined that there would be a significant risk that conveyance of Hetch Hetchy water to irrigators in the southern San Joaquin Valley would be in violation of the Raker Act, which stipulates that the CCSF not divert any more Hetch Hetchy water beyond the limits of the San Joaquin Valley than is required for its own domestic or municipal purposes. Therefore, due the institutional and legal uncertainties, this option was screened from further consideration.

The SFPUC then evaluated the possibility of purchasing a Delta water supply through a willing seller and delivering it to Semitropic for storage. The SFPUC concluded that delivering a source of Delta water to Semitropic would be subject to extreme competition for pumping capacity, which is already constrained during the winter and spring, the time that excess water is available. Pumping capacity is least constrained during the summer, when there is less water available. In addition to pumping capacity constraints, there may be constraints on the aqueduct capacity required to transport the water south. There may also be capacity issues with the South Bay Aqueduct. Although it appears that summertime capacity is available (when State Water Project deliveries are reduced, which is most likely when the SFPUC would be transporting its return water back), there is no assurance that the SFPUC would have access to that capacity. In addition, the SFPUC would have a lower priority for use of available capacity in the Bank Pumping Facility and in the South Bay Aqueduct than existing State Water Project customers.

In both of the scenarios described above, the SFPUC would receive State Project Water from the Sacramento–San Joaquin Delta in return for the water conveyed to Semitropic. Delta water is of lower quality than Hetch Hetchy water and requires filtration prior to potable use. Use of Delta water during dry periods would create operational difficulties for the SFPUC and would incur substantial additional cost. The SFPUC rejected the alternative of storing water in Semitropic’s groundwater bank for a combination of legal, institutional, operational, and cost factors. In an effort to address these issues, the SFPUC also investigated the possibility of participating in Semitropic’s groundwater bank through the ACWD, Zone 7, or SCVWD. These options are discussed below under Delta Exchange.

Delta Exchange

The SFPUC evaluated various alternatives for exchanging water from the SFPUC regional water system for Delta water. It considered the three Bay Area water agencies that are (1) State Water Project contractors receiving Delta water, and (2) agencies to which a means for transferring SFPUC regional water system supplies was identified. These three agencies are the ACWD, Zone 7, and SCVWD.

The general concept would be to advance SFPUC regional system water during wet years to the ACWD, Zone 7, or SCVWD via direct connections or interties, or through increased deliveries to the SFPUC's and SCVWD's common customers to replace demand otherwise met by the SCVWD. This would allow these water agencies to reduce their deliveries from the State Water Project, which could then be stored in Semitropic's groundwater bank (see Groundwater Banking in Kern County, below), used to allow recharge of their local groundwater basins, or use other storage, if available. In dry years, supplies would be returned to the SFPUC either through a reduction in SFPUC demand from SFPUC/SCVWD common customers or through State Water Project deliveries via the State Water Project South Bay Aqueduct turnout at San Antonio Reservoir or other locations.

The SFPUC obtains all of its water from high-quality sources—the Tuolumne River watershed and protected Bay Area watersheds—and therefore is not required to provide the same level of water treatment as water agencies that obtain water from less high-quality sources. It is difficult for the SFPUC to accept lower quality Delta water as a supplementary source of supply during droughts because it is not well equipped to receive, treat, and deliver it to customers. Because the ACWD, Zone 7, and SCVWD already use Delta water, they are better equipped to receive, treat, and deliver it to customers.

The SFPUC, in collaboration with the potentially participating agencies, determined that a Delta Exchange alternative is not technically feasible. The feasibility of this concept is related to the analysis in the discussion above for the Groundwater Banking in Kern County concept. The constraints to feasibility include: (1) inconsistent timing regarding when SFPUC excess water supplies are available and when storage capacity is available; (2) the limited capacity at the State Water Project pumps to move wet-year water to available storage; or (3) the lack of assurance that dry-year supplies could be provided from the State Water Project. These issues are in addition to potential treatment incompatibilities with SFPUC facilities and related water quality issues. Therefore, this concept was eliminated from further consideration.

Delta Diversion

The SFPUC explored using diversions from the Delta as a supplemental water source. This would involve the following: purchasing water from a water-right holder in the Delta and/or on one of the rivers tributary to the Delta; transporting the water via the State Water Project or Central Valley Project conveyance facilities (i.e., the California Aqueduct or the Delta-Mendota Canal) to the regional system; treating the water at a new treatment plant at Tesla Portal; and blending the treated Delta supply with the Hetch Hetchy supply in the Coast Range Tunnel. This concept was eliminated from further consideration due to uncertainties regarding the availability of water supplies and pumping capacities, which would make consistent year-round diversions unlikely, as discussed below.

The SFPUC developed a Delta Diversion alternative and determined that, in addition to construction of all of the WSIP facility improvement projects, a Delta intake and pumping plant, Delta water treatment plant, and associated pipelines would be required. This alternative would be similar in concept to two ideas raised during the scoping period. One included use of the South Bay Aqueduct to convey Delta water directly to San Antonio Reservoir, and the other involved use of the California Aqueduct/Delta-Mendota Canal to convey water to the Hetch Hetchy system.

The SFPUC evaluated the Delta Diversion alternative with respect to water supply availability and reliability from the source; conveyance capacity availability for the Delta supply option; regional water system performance; operations and maintenance requirements; water quality effects; facility siting considerations, including geotechnical, right-of-way, and environmental resources; permitting requirements; and capital, operating, and life-cycle costs. Overall, the SFPUC determined that the feasibility of this alternative would be limited by the availability of Delta water supplies and the pumping capacity of existing State Water Project/Central Valley Project conveyance facilities. In addition, because of numerous institutional and regulatory uncertainties associated with this alternative (largely dependent on how and where the SFPUC would purchase the water), it is unknown if this alternative could achieve the WSIP level of service goals for delivery and water supply reliability. The quality of Delta water supplies would be lower than that of water from the Hetch Hetchy system.

While this alternative could avoid or lessen the impacts on Tuolumne River resources that would occur under the WSIP (as described in Chapter 5), it would result in other, distinct significant environmental impacts on the Delta and associated environmental resources (e.g., fisheries, aquatic habitat and species, riparian habitat, and water quality affecting other beneficial uses). The alternative would substitute one set of significant environmental impacts with another, thus representing trade-offs among environmental resources and impacts without avoiding or necessarily reducing overall environmental impacts.

Regarding impacts associated with facility construction and operation, the Delta Diversion alternative would neither avoid nor lessen the environmental effects that would result from construction and operation of the WSIP facility improvement projects, as all of the key WSIP projects for water quality, seismic reliability, and delivery reliability would still need to be implemented. At the same time, additional facilities beyond those required for the WSIP would need to be constructed and operated. These facilities would be located in a combination of open space, rural settings, and dense urban settings, resulting in a range of additional environmental impacts.

Therefore, since this alternative would have uncertain water supply reliability and an unknown ability to reduce impacts on Tuolumne River resources, as well as significant additional environmental impacts, it was eliminated from further consideration.

Purchase Groundwater Storage Rights in Foothills East of and Outside of MID/Central Valley

As described above in Section 9.4.4, this concept was raised during the public scoping period, but the SFPUC has rejected this concept due to technical infeasibility. The SFPUC did not explore this concept because of the limited information on the infiltration rates in this groundwater basin and potential sources of groundwater quality impairment associated with dibromochloropropane, chlorine, boron, nitrate, iron, and manganese. In addition, there would be institutional issues concerning the SFPUC’s ability to use this basin as a drought supply, since the SFPUC would have lowest priority in times of overdraft. Therefore, this concept is not considered as a feasible strategy and was removed from further consideration in this PEIR.

9.5.4 Other Rejected Concepts

Removal of O'Shaughnessy Dam

In 1913, Congress passed and President Woodrow Wilson signed the Raker Act, granting the CCSF the right to dam the Tuolumne River at the mouth of the Hetch Hetchy Valley in Yosemite National Park. O'Shaughnessy Dam was completed in 1923, and water first flowed to the San Francisco Peninsula in 1934.

The decision to permit flooding of the Hetch Hetchy Valley was controversial; when the Raker Act was approved in the Senate, 43 senators voted in favor, 25 were opposed, and 29 abstained (Simpson, 2005). The controversy continues today, and many parties have expressed an interest in removing O'Shaughnessy Dam and restoring the Hetch Hetchy Valley to its condition before the O'Shaughnessy Dam was completed. A number of studies have been performed to determine the feasibility and cost of removing the dam and restoring the valley. Recently, the State of California examined all prior studies and concluded that restoration was feasible, but that the costs would be between $3 and $10 billion (California Department of Water Resources/California Department of Parks and Recreation, 2006).

In 2004, Environmental Defense prepared a planning-level analysis of replacing the water supply and hydropower benefits provided by Hetch Hetchy Reservoir and O'Shaughnessy Dam (Rosekrans et al., 2004). The study was prepared with the objective of restoring the Hetch Hetchy Valley to conditions that existed prior to the construction of O'Shaughnessy Dam; the restored valley would serve as a natural resource available to the public as part of Yosemite National Park. The study proposes alternatives for water storage (such as available storage in New Melones Reservoir), conveyance and treatment, and replacement of lost hydropower, and acknowledges that these alternatives must be in place before restoration of Hetch Hetchy Valley could begin. This study is considered highly speculative in that there are unresolved legal issues inherent in the proposal regarding the Raker Act and the CCSF, TID, and MID water rights, as well as in these water agencies' obligations to their customers.

Regardless of the merits of removing O'Shaughnessy Dam, dam removal is not considered an alternative to the WSIP that must be evaluated to satisfy the requirements of CEQA in this PEIR. The CEQA Guidelines state that an EIR must describe and evaluate a reasonable range of alternatives to the proposed project that would feasibly attain most of the project's basic objectives and would avoid or substantially lessen any significant adverse environmental effects. This proposal is not reasonably related to a reduction or elimination of the significant impacts that would result with implementation of the proposed program, but suggests far greater changes than would be necessary to address any impacts that this proposed program would cause on the Tuolumne River and related resources. To the extent Tuolumne River water continues to be diverted, it is likely to continue to cause or maintain impacts similar to those that resulted from construction of O'Shaughnessy Dam and created the existing condition. The proposal itself is likely to result in numerous, significant environmental impacts associated with construction and operation of unknown new storage, conveyance and treatment facilities at unknown locations, and would likely require increased long-term energy requirements compared to the Hetch Hetchy system that is gravity-driven and not subject to water filtration requirements. In addition, there would likely be other significant impacts on diversion of Tuolumne River water elsewhere or any other surface water bodies developed to replace any Tuolumne River supply and associated resources.

In addition, removal of O'Shaughnessy Dam would fail to meet any of the WSIP's basic objectives of improving water quality, seismic reliability, delivery reliability, and water supply. The proposal does not attempt to address any of the goals and objectives of the WSIP, but instead suggests a different way to operate the water system without Hetch Hetchy Reservoir. The purpose of the WSIP is to address the inadequacies of the existing system and to provide for reasonably foreseeable future needs. Removal of O'Shaughnessy Dam would require significantly more funding than is available, significant changes in water supply strategy, construction of additional storage and transmission facilities, and operation of a different water system.

This proposal could reduce the existing level of delivery and water supply reliability to regional system customers, since the status and availability of water supplies and transmission methods to replace the existing water system are unknown. Similarly, the proposal would reduce the reliability and jeopardize the power generation facilities associated with O'Shaughnessy Dam, causing impacts on power customers.

Therefore, since this concept does not meet any of the program objectives, nor does it effectively avoid or substantially lessen WSIP impacts without also resulting in a number of other potentially significant environmental impacts, this concept was eliminated from further consideration in this PEIR.

9.6 References – CEQA Alternatives

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10 Impact Overview

CHAPTER 10
Impact Overview

10.1 Significant Environmental Effects that Cannot Be Avoided if the Proposed Program Is Implemented

In accordance with Section 21067 of the California Environmental Quality Act (CEQA), and with Sections 15126(b) and 15126.2(b) of the CEQA Guidelines, the purpose of this section is to identify environmental impacts that could not be eliminated or reduced to a less-than-significant level by SFPUC construction measures included as part of the program or by other mitigation measures that could be implemented, as described in Chapter 6, Mitigation Measures. Findings in this chapter are subject to final determination by the Planning Commission as part of its certification of the PEIR.

Facility Construction Effects

The impacts associated with the facility improvement projects would occur primarily during the construction phase as opposed to the operations phase. Although most construction impacts would be short-term, they could pose significant effects. Construction of facility improvement projects could result in potential erosion and associated water quality and water resources effects, disruption of sensitive habitats and impacts on special-status species, impacts on cultural resources, short-term traffic delays and impaired access along project roadways, local and regional degradation of air quality, and short-term noise impacts. These impacts would be mitigated to less-than-significant levels by implementation of mitigation measures described in Chapter 6, Mitigation Measures, with the exception of the effects listed below. This PEIR makes a conservative determination that these effects would be potentially significant and unavoidable. When better facility siting information is available and the Major Environmental Analysis Section (MEA) of the San Francisco Planning Department completes detailed project-level CEQA review on the WSIP projects, it may be determined that these effects can be avoided or mitigated to a less-than-significant level.

- A ranch property in the Sunol Valley would be subject to 24-hour construction effects for the full duration of construction of the New Irvington Tunnel project, and such land use disruption is considered to be potentially significant and unavoidable even with implementation of traffic, noise, and air quality mitigation measures (Chapter 4, Section 4.3).

- Existing land uses could be displaced to accommodate proposed facilities at some locations under the following projects: San Joaquin Pipeline System, Additional 40-mgd Treated Water Supply, San Antonio Backup Pipeline, Bay Division Pipeline Reliability Upgrade, Crystal Springs/San Andreas Transmission Upgrade, Groundwater Projects, and Recycled Water Projects. Since final facility locations are undetermined at this time, any possible permanent displacement of existing land uses is conservatively considered to be potentially significant and unavoidable in this PEIR (Chapter 4, Section 4.3).

- Removal of a large area of existing oak woodland cover as part of the Calaveras Dam Replacement project would permanently alter a scenic vista, a potentially significant and unavoidable impact (Chapter 4, Section 4.3).

- Alteration or demolition of existing facilities under the following projects could result in potentially significant and unavoidable impacts on the historic significance of individual facilities: Calaveras Dam Replacement, New Irvington Tunnel, Crystal Springs/San Andreas Transmission Upgrade, and Lower Crystal Springs Dam Improvements (Chapter 4, Section 4.7).

- The Calaveras Dam Replacement and Crystal Springs/San Andreas Transmission Upgrade projects would result in potentially significant and unavoidable impacts on historic districts, if historic districts are determined to be present (Chapter 4, Section 4.7).

- Temporary construction-related noise impacts could occur under all facility improvement projects analyzed in the PEIR and would be potentially significant and unavoidable if excessive construction noise occurred in close proximity to sensitive receptors or audible construction noise occurred during the more noise-sensitive nighttime hours (Chapter 4, Section 4.10).

- Temporary noise disturbance could occur along construction haul routes under the following projects: Advanced Disinfection, San Joaquin Pipeline System, Rehabilitation of Existing San Joaquin Pipelines, Tesla Portal Disinfection Station, Bay Division Pipeline Reliability Upgrade, BDPL Nos. 3 and 4 Crossovers, Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault, Baden and San Pedro Valve Lots Improvements, HTWTP Long-Term Improvements, San Andreas Pipeline No. 3 Installation, Groundwater Projects, and Recycled Water Projects. This impact is conservatively considered potentially significant and unavoidable because haul routes, truck volumes, and hours of truck operations have not yet been determined for these projects (Chapter 4, Section 4.10).

- If any construction activities were to generate vibration in proximity to sensitive receptors during the nighttime hours, potentially significant and unavoidable vibration impacts could occur under the following projects: San Joaquin Pipeline System, Rehabilitation of Existing San Joaquin Pipelines, Additional 40-mgd Treated Water Supply, Bay Division Pipeline Reliability Upgrade, BDPL Nos. 3 and 4 Crossovers, Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault, Baden and San Pedro Valve Lots Improvements, San Andreas Pipeline No. 3 Installation, Groundwater Projects, and Recycled Water Projects (Chapter 4, Section 4.10).

- Combined or collective temporary impacts on residences near the Irvington Tunnel portal in Fremont (Bay Division Region) could result during construction because staging and access for both the New Irvington Tunnel and Bay Division Pipeline Reliability Upgrade projects would overlap in this vicinity. Since the feasibility of coordinating construction activities for these projects cannot be determined at this stage of project planning, such an effect is conservatively considered to be potentially significant and unavoidable (Chapter 4, Section 4.16).

- Multiple facility improvement projects in the Sunol Valley Region would have a potentially significant and unavoidable collective impact on biological resources because of the number of WSIP projects in this region and the extent of overlap in terms of construction activity timing and location (Chapter 4, Section 4.16).

- Potentially significant and unavoidable collective impacts on special-status plant species could occur during construction of the Crystal Springs/San Andreas Transmission Upgrade and Lower Crystal Springs Dam projects in the Peninsula Region; incidental disturbance of plants along the road shoulder would be difficult to completely avoid, even with proposed mitigation measures (Chapter 4, Section 4.16).

- Multiple facility improvement projects within the Sunol Valley and Peninsula Regions could collectively cause substantial adverse changes to historic districts, but until more detailed assessments are completed to determine if any historic districts exist, this potential collective impact is conservatively considered to be potentially significant and unavoidable (Chapter 4, Section 4.16).

- Even with proposed control measures, construction-related criteria air pollutant emissions associated with all of the WSIP projects would have a potentially significant and unavoidable collective impact on air quality, since the projects would contribute to the nonattainment status for ozone and particulate matter in both the San Francisco Bay Area and San Joaquin Valley Air Basins (Chapter 4, Section 4.16).

- Since the hours of construction as well as haul routes, truck volumes, and hours of truck operations have not yet been determined for all facility improvement projects within the San Joaquin, Bay Division, Peninsula, and San Francisco Regions, there is the potential that collective noise impacts could result from construction of multiple WSIP projects near Tesla Portal, Irvington Tunnel portal in Fremont, and Lower Crystal Springs Dam. Also, there could be collective truck traffic increases along any overlapping haul routes in these regions. Given these unknowns, such collective effects are conservatively considered to be potentially significant and unavoidable (Chapter 4, Section 4.16).

- Several WSIP projects and several other SFPUC projects could cumulatively affect individual historical resources or potential historic districts (if historic districts are determined to be present), and until project-level analysis is completed, this cumulative effect is conservatively considered to be potentially significant and unavoidable (Chapter 4, Section 4.17).

- Construction-related traffic generated by the WSIP projects would contribute to potentially significant and unavoidable cumulative traffic impacts (e.g., increased travel times), particularly if the travel routes of individual drivers coincided with the construction routes for the WSIP projects, other SFPUC projects, and/or other public and private projects within one or more regions, and/or when construction vehicles associated with the cumulative projects utilize regional transportation facilities (Chapter 4, Section 4.17).

- Construction emissions associated with the WSIP projects, other SFPUC projects, and other public and private projects would cumulatively contribute to the nonattainment status for ozone and particulate matter, a potentially significant and unavoidable cumulative impact (Chapter 4, Section 4.17).

- Potential overlap of the WSIP's construction truck traffic with construction truck traffic of other public and private projects could result in cumulative increases in diesel particulate matter (DPM) and noise on local roadways. Since the SFPUC would have no control over the construction schedules or traffic routes for other projects outside its jurisdiction, potential DPM and noise impacts are considered to be potentially significant and unavoidable (Chapter 4, Section 4.17).

Facility Operations Effects

As described above, implementation of WSIP facility improvement projects would primarily result in short-term effects associated with facility construction. However, operational effects would occur, associated with long-term maintenance and operations activities, such as increased vehicle trips for routine maintenance of new facilities, the long term effect of new facilities on scenic vistas or scenic resources, and the effects of treated water discharge on water quality and aquatic resources. These impacts would be mitigated to less-than-significant levels by implementation of mitigation measures described in Chapter 6.

Water Supply and System Operations Effects

Chapter 5 of this PEIR addresses the effects of the proposed water supply and system operations on the Tuolumne River system, Alameda Creek system, Peninsula system, and Westside Basin Groundwater Resources. In addition, Chapter 5 identifies the cumulative effects of implementing the WSIP water supply option and system operations in combination with other past, present, and reasonably foreseeable future projects within each of these watersheds as well as effects related to climate change.

Due to the proposed increase in diversions from the Tuolumne River and associated changes in system operations, implementation of the WSIP would result in changes in reservoir levels and associated changes in downstream flows in rivers or creeks in the three affected watersheds. In all three watersheds, these hydrologic changes could in turn result in impacts on geomorphology of the water body, groundwater, water quality, fisheries, terrestrial biological resources, and recreational and visual resources. In the Tuolumne River watershed, changes in stream flow could also affect downstream water supplies and hydropower generation. In the Alameda Creek and Peninsula watersheds, implementation of the WSIP would include restoration of the historical storage capacities in Calaveras and Lower Crystal Springs Reservoirs, respectively, resulting in impacts on reservoir levels, downstream flows, fisheries, terrestrial biological resources, and visual resources. In addition, implementation of the WSIP would include development of groundwater supplies in the North Westside Groundwater Basin as well as a conjunctive-use program in the South Westside Groundwater Basin. Identified impacts on these resources were determined to be less than significant with implementation of the mitigation measures described in Chapter 6, with the exception of the following:

- The WSIP would result in a significant and unavoidable impact in the Alameda Creek watershed on the flow along Alameda Creek below the Alameda Creek Diversion Dam (Chapter 4, Section 5.4.1)

- The WSIP would result in a potentially significant and unavoidable impact in the Peninsula watershed on fishery resources in Crystal Springs Reservoir (Chapter 4, Section 5.5.5)

10.2 Significant Irreversible Environmental Changes

In accordance with Section 21100(b)(2)(B) of the CEQA, and with Sections 15126(c) and 15126.2(c) of the CEQA Guidelines, the purpose of this section is to identify significant irreversible environmental changes that would be caused by implementation of the proposed project. Construction and operational impacts associated with implementation of the WSIP projects would result in an irretrievable and irreversible commitment of natural resources through the use of fossil fuels and construction materials. Operation of project facilities would incrementally increase power consumption associated with water facilities, even though operation of SFPUC facilities would predominantly use hydropower. The program's incremental increased use of these resources, however, would not significantly increase the overall commitment of resources associated with water treatment and distribution. The program would involve only minor incremental use of nonrenewable resources and would locate facilities primarily on lands already committed to water treatment and supply purposes. Furthermore, since the SFPUC would implement the mitigation measures identified in this PEIR in concert with other ongoing stewardship and watershed protection activities, implementation of the WSIP would not result in significant irreversible environmental changes. When completed, the program would provide a high level of public health protection against potential seismic hazards as well as increase the long-term reliability of the drinking water to customers throughout the SFPUC service area.

October 30, 2008

Final
Program Environmental Impact Report
Volume 5 of 8

For the
San Francisco Public Utilities Commission's

WATER SYSTEM IMPROVEMENT PROGRAM

Appendices A - I

San Francisco Planning Department File No. 2005.0159E
State Clearinghouse No. 2005092026

Draft PEIR Publication Date: June 29, 2007
Draft PEIR Public Hearing Dates:
September 5, 2007 in Sonora
September 6, 2007 in Modesto
September 18, 2007 in Fremont
September 19, 2007 in Palo Alto
September 20, 2007 in San Francisco
October 11, 2007 in San Francisco
Draft PEIR Public Comment Period: June 29, 2007 through October 15, 2007
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City and County of San Francisco
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City and County of San Francisco
San Francisco Planning Department

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Notice of Preparation/ Scoping Report

APPENDIX A

NOP and Scoping Report

NOTICE OF PREPARATION OF AN ENVIRONMENTAL IMPACT REPORT AND NOTICE OF PUBLIC SCOPING MEETINGS

Date of this Notice:	September 6, 2005	
Lead Agency:	San Francisco Planning Department 30 Van Ness Avenue, Suite 4150 San Francisco, CA 94103	**Email:** diana.sokolove@sfgov.org
Agency Contact Person:	Diana Sokolove	**Telephone:** (415) 558-5971
Project Title:	Water System Improvement Program (WSIP)	
Project Sponsor:	San Francisco Public Utilities Commission	**Email:** kcapone@sfwater.org
Contact Person:	Kelley Capone	**Telephone:** (415) 934-5715
Project Address:	Various	**Assessor's Block and Lot:** Various
County:	Alameda, Santa Clara, San Francisco, San Joaquin, San Mateo, Stanislaus, and Tuolumne Counties	

Project Description: The WSIP is a program to implement the service goals and system performance objectives established by the SFPUC for the regional water system in the areas of water quality, seismic reliability, delivery reliability, and water supply through the year 2030. The key program elements include:

- Meeting or exceeding existing and anticipated federal, state, and local water quality requirements
- Providing seismic reliability in order to restore basic service (215 million gallons per day [mgd]) to the regional system within 24 hours after a major earthquake and full service within 30 days
- Providing delivery reliability (300 mgd) that allows local reservoir replenishment and adequate maintenance and repair of the system without disruption below level of service goals
- Meeting customer purchase requests through the year 2030, which increase by 35 mgd to 300 mgd over the current 265 mgd, requiring an increase in average annual water delivery of 25 mgd from the regional water system plus 10 mgd from a combination of conservation, water recycling and groundwater supply programs
- Meeting water delivery demands in normal and drought years through 2030 with a combination of Tuolumne River water, groundwater conjunctive-use programs in the Westside Basin, San Mateo County, and conservation, water recycling and groundwater supply programs
- Providing drought reliability such that rationing in any year of the design drought does not result in more than a 20 percent systemwide reduction in delivery of the 2030 purchase requests, which requires an increase in system firm yield[1] from 223 mgd to 256 mgd
- Repairing, upgrading and, in some cases, expanding the regional system facilities to meet these system goals and performance objectives.

Please see the attached for more information about the proposed WSIP, the scope of the PEIR, and the anticipated environmental issues.

THIS PROJECT MAY HAVE A SIGNIFICANT EFFECT ON THE ENVIRONMENT. AN ENVIRONMENTAL IMPACT REPORT IS REQUIRED. This determination is based upon the criteria of the Guidelines of the State Secretary for Resources, Sections 15063 (Initial Study), 15064 (Determining Significant Effect), and 15065 (Mandatory Findings of Significance).

[1] System firm yield is defined as: the maximum annual water delivery that can be sustained by the regional water system during an extended drought. The SFPUC uses an 8.5-year design drought for planning purposes. Currently, due to recent operating restrictions imposed by the California Division of Safety of Dams on the Calaveras Dam, the system firm yield is reduced from its normal system firm yield of 223 mgd to about 219 mgd.

PUBLIC SCOPING MEETINGS will be held pursuant to the State of California Public Resources Code Section 21083.9 and California Environmental Quality Act Guidelines Section 15206 to receive oral comments concerning the scope of the PEIR. Five meetings will be held at different locations along the regional system between October 5 and October 19, 2005. Please see the attached for more information.

Written comments on the scope of the PEIR will be accepted until the close of business on **October 24, 2005**. Written comments should be sent to the San Francisco Planning Department, Attn: Paul Maltzer, 30 Van Ness, Suite 4150, San Francisco, CA 94103, or sent by email to diana.sokolove@sfgov.org.

Documents relating to the proposed project are available for review, by appointment, at the San Francisco Planning Department's Major Environmental Analysis office, 30 Van Ness Avenue, Suite 4150. Please call Diana Sokolove at (415) 558-5971. Documents are also available online at www.sfwater.org (click on "PEIR").

September 6, 2005
Date

Paul E. Maltzer, Environmental Review Officer

中文資料請電：558-6282
Para sa impormasyon sa Tagalog tumawag sa: 558-6251
Para información en Español llamar al: 558-6307

SFPUC Water System Improvement Program

CASE NO. 2005.0159E

1.0 Overview

1.1 Water System Improvement Program

The City and County of San Francisco, through the San Francisco Public Utilities Commission (SFPUC), owns and operates a regional water system that extends from the Sierra Nevada to San Francisco, as shown in **Figure 1**. The regional water system serves 2.4 million people in San Francisco, San Mateo, Santa Clara, Alameda and Tuolumne Counties. The SFPUC has developed a Water System Improvement Program (WSIP or program) in support of its mission to serve its customers with reliable, high-quality drinking water.[2] The basic goals of the WSIP are to increase the reliability of the system with respect to water quality, seismic response, water delivery, and water supply to meet water delivery needs in the service area through the year 2030. The WSIP is a program to implement the service goals and system performance objectives established by the SFPUC for the regional water system. These goals and objectives provide the basis for a series of facility improvement projects that the SFPUC would implement throughout the regional water system and for the implementation of water supply options to meet future annual water delivery needs during normal (nondrought) years as well as current and future needs during droughts.

1.2 Environmental Review Process

The San Francisco Planning Department will prepare an environmental impact report (EIR) to evaluate the environmental effects of the proposed WSIP. The EIR on the WSIP will be a Program EIR (PEIR), as defined in the California Environmental Quality Act (CEQA) Guidelines, Section 15168, and will thus address the broad environmental effects of the program as a whole. The PEIR will analyze the effects of improving the reliability of the system, implementing additional water recycling and conservation, augmenting existing water supplies with supplemental supplies during drought periods, and accommodating increases in customer water purchase requests through the year 2030. The PEIR will also analyze the general effects of constructing and operating the facility rehabilitation and improvement projects that are necessary to meet the goals and objectives of the program. The PEIR will address the "big picture" issues (including the program's growth inducement potential and the associated secondary effects of growth, cumulative effects, system tradeoffs, and program alternatives) and will identify programmatic mitigation measures. To the extent that projects within the WSIP require further, project-level CEQA evaluation in the future, the PEIR also will provide the foundation for such environmental review. For some of the WSIP projects, project-level CEQA analysis will be prepared, as required by CEQA, on a parallel track with the PEIR.

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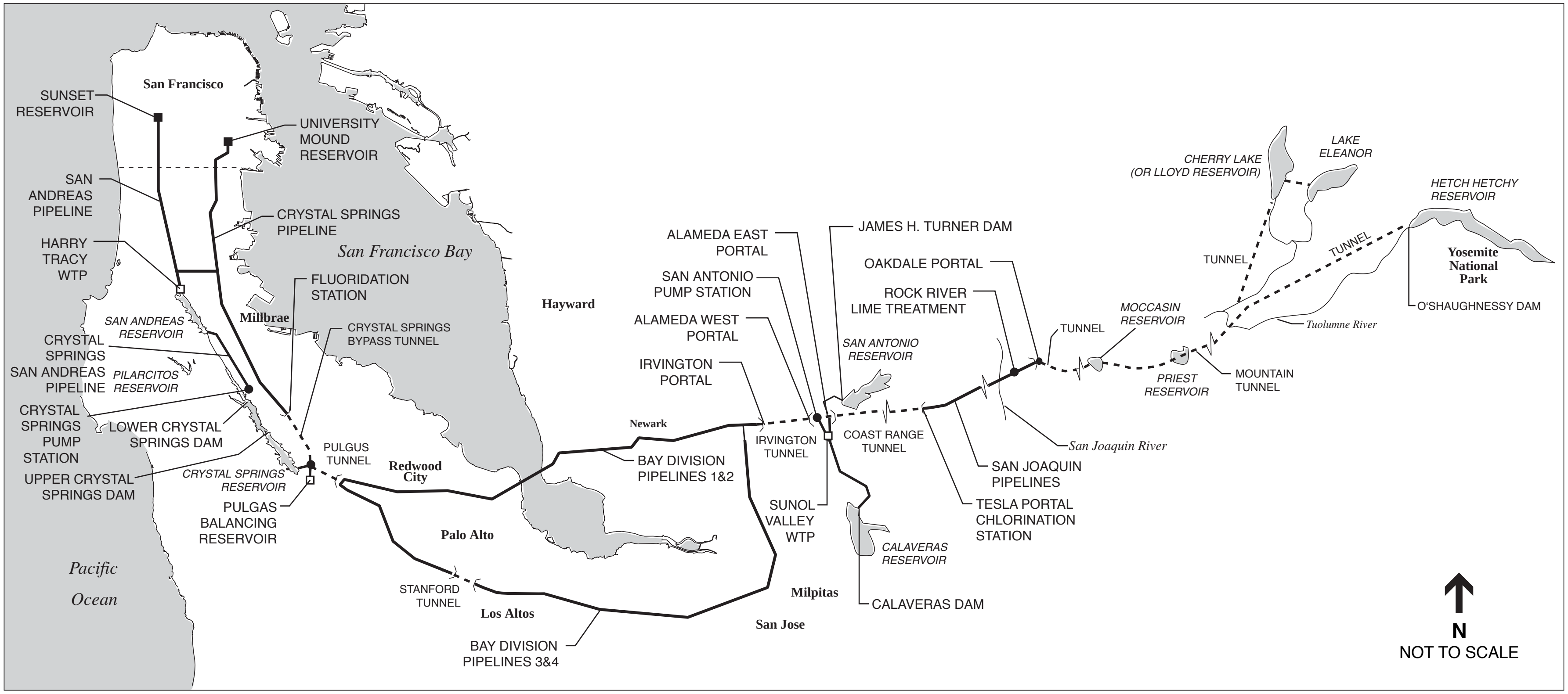
[2] San Francisco Public Utilities Commission, 2005. *Water System Improvement Program Description.* Prepared for the Programmatic Environmental Impact Report. February 28, 2005. This report plus additional information developed subsequently by the SFPUC has been used to prepare this Notice of Preparation (NOP).



SOURCE: San Francisco Public Utilities Commission (2005)

SFPUC Water System Improvement Program . 203287

Figure 1

SFPUC Regional Water System

The WSIP encompasses a comprehensive list of regional water system and local San Francisco system projects and actions designed to implement the program. Regional projects are designed to improve the regional system to meet needs throughout the entire service area, whereas the local San Francisco system projects would serve only customers within the City and County of San Francisco. The PEIR will primarily address the regional system projects in the WSIP and will address local San Francisco system projects to the extent that they affect the operations or capacity of the regional system or contribute to cumulative environmental effects. CEQA analysis of local projects in San Francisco will be addressed separately as appropriate.

Among the regional projects, the San Francisco Planning Department has determined that CEQA review for some of the projects in the WSIP can be conducted separately and independently from the regional projects evaluated in the PEIR, either because (1) the Planning Department completed CEQA review for those projects prior to development of the WSIP or (2) the SFPUC can proceed with implementation of these projects in advance of completing the PEIR on the remaining regional system projects with no substantial changes in the environmental issues to be evaluated in the PEIR. In general, those regional projects that will undergo separate CEQA review from the PEIR have independent utility from the overall WSIP and have no effects on regional system operations or capacity. The PEIR will consider these projects to the extent that they contribute to cumulative effects associated with the WSIP actions and projects. (These projects are identified below in Section 2.6, Table 4.)

1.3 Public Scoping Meetings

The San Francisco Planning Department is holding five **PUBLIC SCOPING MEETINGS**, at the following locations, dates, and times:

- SONORA – Wednesday, October 5, 2005, 7:00 to 9:00 PM
  Sonora Opera House, 250 S. Washington Street, Sonora, CA
- MODESTO – Thursday, October 6, 2005, 7:00 to 9:00 PM
  Thomas Downey High School Cafeteria, 1000 Coffee Road, Modesto, CA
- FREMONT – Tuesday, October 11, 2005, 6:00 to 8:00 PM
  Fremont Main Library, Fukaya Room, 2400 Stevenson Boulevard, Fremont, CA
- PALO ALTO – Tuesday, October 18, 2005, 7:00 to 9:00 PM
  Palo Alto Arts Center, 1313 Newell Road, Palo Alto, CA
- SAN FRANCISCO – Wednesday, October 19, 2005, 7:00 to 9:00 PM
  Tenderloin Community School, 627 Turk Street (at Van Ness), San Francisco, CA

The purpose of these meetings is to assist the San Francisco Planning Department in reviewing the proposed scope and content of the programmatic environmental impact analysis, summarized in this NOP, and the information to be contained in the PEIR for the WSIP. The public will have the opportunity to comment and offer testimony for consideration. Written comment will also be accepted at the meetings and by the San Francisco Planning Department until the close of business on **October 24, 2005.**

2.0 Program Description

2.1 Location and Service Area

The SFPUC regional water system consists of a complex network of facilities covering a geographic range of about 160 miles, from the Sierra Nevada on the east to San Francisco on the west. The regional water system crosses seven counties—Tuolumne, Stanislaus, San Joaquin, Alameda, Santa Clara, San Mateo, and San Francisco—as shown in Figure 1, above.

The SFPUC provides water delivery services to retail and wholesale customers primarily in San Francisco, San Mateo, Santa Clara, and Alameda Counties, as shown in **Figure 2**. The SFPUC serves about one-third of its water supplies directly to retail customers in San Francisco, and about two-thirds of its water supplies to 28 wholesale customers by contractual agreement. The 28 wholesale customers consist of 26 cities and water districts and 2 private utilities in San Mateo, Santa Clara, and Alameda Counties (as listed in Figure 2), which are represented by the Bay Area Water Supply and Conservation Agency (BAWSCA); some of these customers have other sources of water in addition to what they receive from the SFPUC regional system. The SFPUC also provides service to some isolated regional retail customers along the water system, including customers in Tuolumne County.

2.2 Existing Water Supply System

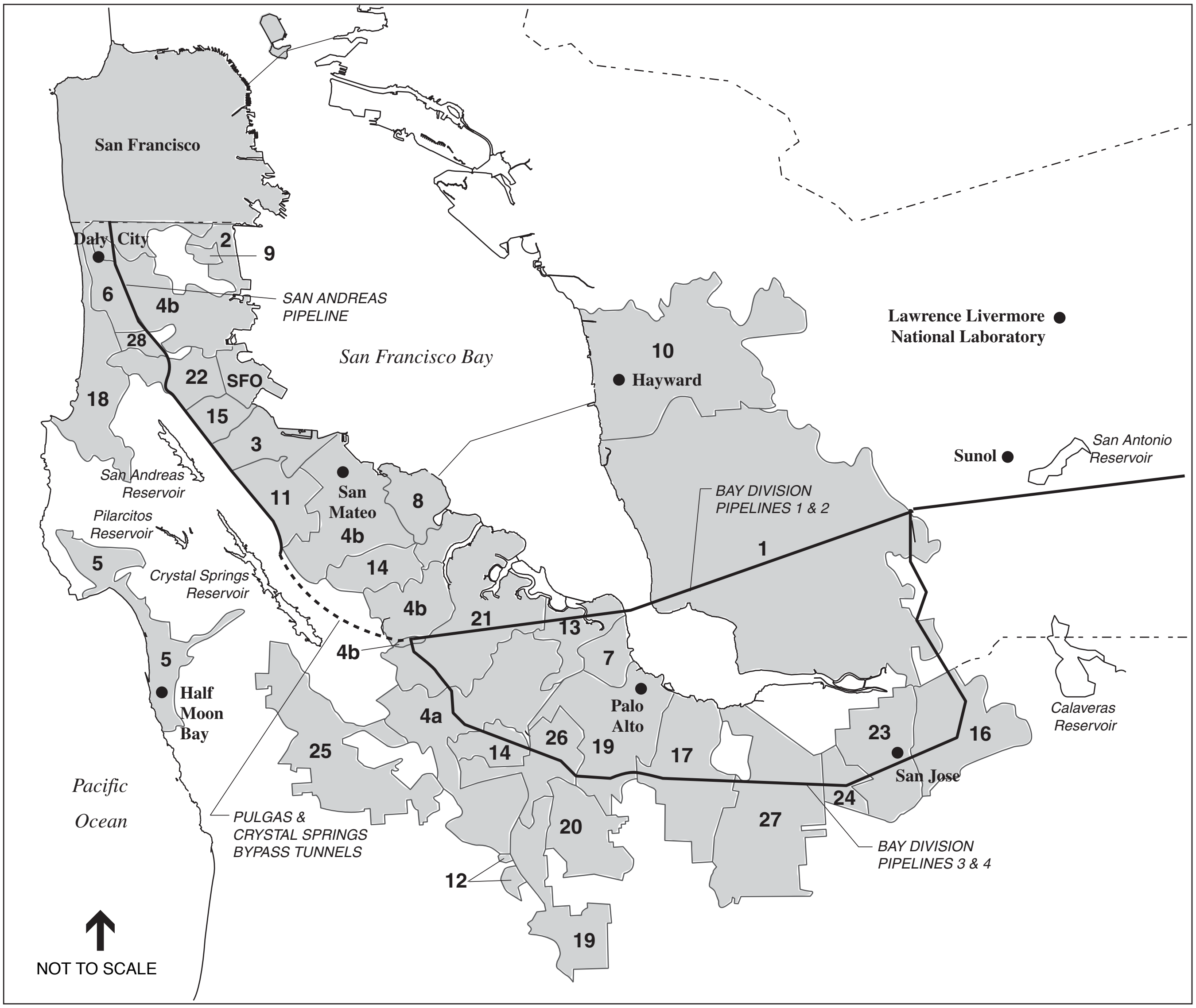
Water Supply

The regional water system currently delivers an average of about 265 million gallons per day (mgd) to about 2.4 million people. The major source of water for the regional system is the upper Tuolumne River Watershed in the Sierra Nevada, which provides about 85 percent of the total water supply. The remaining 15 percent of the water supply is provided by local creeks and runoff in the Alameda Watershed, which is generally located in Sunol Valley, and the Peninsula Watershed on the San Francisco Peninsula (referred to collectively as the "local" watersheds). In the Alameda Watershed, the creeks feeding the local reservoirs include Alameda, Arroyo Hondo, Calaveras, and San Antonio Creeks; on the Peninsula, San Mateo, Pilarcitos, and San Andreas Creeks are the major local water sources.

Water Quality

The SFPUC regional water system delivers extremely high-quality water. The majority of the water originates in the upper Tuolumne River Watershed high in the Sierra Nevada, remote from human development and pollution. This pristine water, referred to as Hetch Hetchy water, is protected in pipes and tunnels as it is conveyed to the Bay Area, requiring only primary disinfection and pH adjustment to control corrosion in the pipelines.

The U.S. Environmental Protection Agency and the California Department of Health Services have approved the use of this drinking water source without requiring filtration at a treatment plant. However, local water from the Alameda and Peninsula Watersheds does require filtration to meet drinking water quality requirements. The filtered and treated water from the local watersheds is blended with Hetch Hetchy water, and most customers receive water from a blended source. System water quality, including



1	Alameda County Water District	**14**	Mid Peninsula Water District
2	City of Brisbane	**15**	City of Milbrae
3	City of Burlingame	**16**	City of Milpitas
4a	Cal Water Service Co. - Bear Gulch	**17**	City of Mountain View
4b	Cal Water Service Co. - Bayshore	**18**	North Coast County Water District
5	Coastside County Water District	**19**	City of Palo Alto
6	City of Daly City	**20**	Purissima Hills Water District
7	East Palo Alto	**21**	City of Redwood City
8	Estero Municipal Improvement District	**22**	City of San Bruno
9	Guadalupe Valley Municipal Improvement District	**23**	City of San Jose
10	City of Hayward	**24**	City of Santa Clara
11	Town of Hillsborough	**25**	Skyline County Water District
12	Los Trancos County Water District	**26**	Stanford University
13	City of Menlo Park	**27**	City of Sunnyvale
		28	Westborough Water District

Areas served by the SFPUC Water System

SOURCE: Bay Area Water Supply and Conservation Agency

SFPUC Water System Improvement Program . 203287

Figure 2
SFPUC Water Service Area

both raw water and treated water, is continuously monitored and tested to assure that water delivered to customers meets or exceeds federal and state drinking water/public health requirements.

Major Regional Facilities

The SFPUC regional water system includes over 280 miles of pipelines, over 60 miles of tunnels, 11 reservoirs, 5 pump stations, and 2 water treatment plants. Major facilities in the water system generally fall into three categories based on their function: storage, transmission, and treatment facilities. **Table 1** lists the major facilities in the regional water system by their function as well as by their geographic sub-region. From east to west, the sub-regions are: Hetch Hetchy sub-region, San Joaquin sub-region, Sunol Valley sub-region, Bay Division sub-region, Peninsula sub-region, and San Francisco sub-region.

System Operations

The regional water system is basically a linear system transporting water from the Sierra Nevada to the Bay Area. The water system starts with the Hetch Hetchy Reservoir and O'Shaughnessy Dam, located on the main stem of the Tuolumne River in Yosemite National Park. From the Hetch Hetchy Reservoir, water flows west through a series of tunnels and hydropower facilities in the Sierra foothills and then to the San Joaquin Valley. Water is conveyed 47 miles in three San Joaquin Pipelines across the San Joaquin Valley and is disinfected at the Tesla Disinfection Facility near Tracy. The water is then transported 25 miles through the Coast Range Tunnel to the three Alameda Siphons in the Sunol Valley, where it is blended with treated sources of local water in the Alameda Watershed.

In the Alameda Watershed, local water from creeks and runoff is captured and stored in the Calaveras and San Antonio Reservoirs. San Antonio Reservoir is also used to store water from the Hetch Hetchy system. Water from the Calaveras and San Antonio Reservoirs is filtered and chloraminated at the Sunol Valley Water Treatment Plant (WTP) before it is blended with Hetch Hetchy water at the Alameda Siphons. The Alameda Siphons carry Hetch Hetchy water, blended with treated Alameda Watershed water, about one-half mile across the Sunol Valley to the Irvington Tunnel. Water flows about 3.5 miles through the Irvington Tunnel to the city of Fremont in the East Bay.

From the west end of the Irvington Tunnel in Fremont, the regional water supply is distributed through four Bay Division Pipelines, two of which cross San Francisco Bay and two of which go around the South Bay; the four pipelines then meet in Redwood City on the Peninsula at the Pulgas Tunnel. Up to this point, the water from Hetch Hetchy Reservoir flows entirely by gravity for over 120 miles. Part of the regional water supply from the Pulgas Tunnel continues to flow by gravity north up the Peninsula, ending at University Mound Reservoir in San Francisco. The remaining water from the Pulgas Tunnel flows into Crystal Springs Reservoir and blends with local water sources on the Peninsula Watershed. Water from Crystal Springs Reservoir is pumped to the adjacent San Andreas Reservoir, which is then pumped to the Harry Tracy WTP where it is filtered and disinfected. Treated water from Harry Tracy WTP is then piped to the Sunset Reservoir in San Francisco. The regional water is distributed to wholesale and a few retail customers through turnouts all along the system.

System operations and the amount of water delivered to customers vary throughout the year based on seasonal demand and the availability of water. The water available to deliver to customers is affected by

TABLE 1

MAJOR FACILITIES IN THE REGIONAL WATER SYSTEM BY SUB-REGION

Type of Facility	**Hetch Hetchy Facilities** *(from Sierra Nevada to the east side of the San Joaquin Valley)*	**San Joaquin Facilities** *(from the San Joaquin Valley to the west side of the Coast Range)*	**Sunol Valley Facilities** *(from the Sunol Valley to the west side of the East Bay Hills)*	**Bay Division Facilities** *(from Fremont to Redwood City)*	**Peninsula Facilities** *(from Redwood City to San Francisco)*	**San Francisco Regional Facilities** *(San Francisco and northern Peninsula)*
Storage	Hetch Hetchy Reservoir and O'Shaughnessy Dam Lake Eleanor and Eleanor Dam Lake Lloyd (also called Cherry Reservoir) and Cherry Valley Dam	None	Calaveras Reservoir and Calaveras Dam San Antonio Reservoir and James H. Turner Dam	None	Crystal Springs Reservoir and Upper and Lower Crystal Springs Dams San Andreas Reservoir and San Andreas Dam Pilarcitos Reservoir and Pilarcitos Dam and Stone Dam	University Mound Reservoir Sunset Reservoir Merced Manor Reservoir
Transmission	Canyon Power Tunnel Mountain Tunnel Foothill Tunnel	San Joaquin Pipelines1, 2, 3 Coast Range Tunnel	Alameda Siphons Alameda Creek Diversion Dam and Tunnel Calaveras Pipeline San Antonio Pipeline San Antonio Pump Station Irvington Tunnel	Bay Division Pipelines 1, 2, 3, 4	Pulgas Tunnel Crystal Springs Bypass Crystal Springs / San Andreas Pump Station	San Andreas Pipelines Crystal Springs Pipeline Sunset Supply Pipeline
Treatment	Rock River Lime Plant	Tesla Disinfection Facility Thomas Shaft Disinfection Station	Alameda Disinfection Facility Sunol Valley Water Treatment Plant	None	Pulgas Dechloramination Facility Harry Tracy Water Treatment Plant	None

numerous factors, including meteorological and hydrologic conditions; the capacity and operating condition of physical facilities and infrastructure; and institutional parameters that regulate and allocate the distribution of water from the various sources. The system is highly dependent on storage, both in the Sierra and locally in the Bay Area, to be able to serve water under a wide variety of meteorological/ hydrologic and operating conditions.

2.3 Need for Program

Planning for the existing water system began over a century ago, and the basic network of major facilities in the regional system was built from the late 1800s through the 1930s. Expansion and improvements of the major facilities continued through the 1970s. Although the population within the SFPUC service area has steadily grown, ongoing repairs, maintenance, and upgrades have not kept pace with the overall system needs to meet increasing water demand from customers. Aging facilities within the system, some of which made use of now outdated construction methods and materials, are currently in need of major repair, rehabilitation, upgrade, or replacement, and it has become difficult to balance the need for long-term maintenance and upgrades with the day-to-day operational demands of the system. Exacerbating the need for long-term maintenance and upgrade is the fact that the regional system crosses five active earthquake faults. Thus, portions of the existing system are vulnerable to extensive damage from a major earthquake and are at risk of interruption or failure during normal operations. In addition, the California Division of Safety of Dams has imposed operating restrictions on Calaveras and Crystal Springs Dams due to seismic concerns, reducing the local storage capacity and impairing normal system operations; this storage capacity needs to be restored. Existing and future water quality regulations also require further facility modifications as well as ongoing watershed management actions. The SFPUC has also determined that the current regional system cannot provide adequate reliable water delivery to its existing customers during a prolonged drought or meet expected increases in customer water purchases through the planning year of 2030.

The SFPUC began planning for major system improvements over 10 years ago, and public awareness of the need for major capital improvements became evident in 2002 with the passage of three related legislative actions. Propositions A and E, passed in November 2002 by San Francisco voters, approved financing for San Francisco’s portion of the multi-billion-dollar water system improvements. Also approved in 2002, Assembly Bill No. 1823 (AB 1823), the Wholesale Regional Water System Security and Reliability Act, requires the City and County of San Francisco to adopt a capital improvement program designed to restore and improve the regional water system and to review and update the program as necessary. The WSIP addresses these needs.

2.4 Program Goals And Objectives

The WSIP is designed to further the SFPUC’s overall mission as a water service agency, which is to serve San Francisco and its Bay Area customers with reliable, high-quality, and affordable water while maximizing the benefits from power operations and responsibly managing the resources entrusted to its care. The SFPUC based the goals and system performance objectives on two fundamental principles: maintaining a clean, unfiltered water source from the Hetch Hetchy system, and maintaining a gravity-driven system.

The overall goals of the WSIP for the regional water system are to:

- Maintain high-quality water
- Reduce vulnerability to earthquakes
- Increase delivery reliability
- Meet customer water supply needs
- Enhance sustainability
- Achieve a cost-effective, fully operational system

To further these program goals, the WSIP includes objectives that address system performance. **Table 2** presents these objectives as they relate to the WSIP goals. The system performance objectives describe and, in many cases, more specifically quantify what the regional water system is to achieve, and thereby guide the water supply actions, facility improvements, and maintenance requirements included in the WSIP. Although Table 2 lists certain sustainability objectives for the WSIP, enhancing sustainability is part of the SFPUC's ongoing watershed management and operational efforts and is not specifically or exclusively an element of the WSIP.

To meet the SFPUC's system goals and service performance objectives, the SFPUC would undertake a series of actions and projects under the WSIP. The following sections describe the proposed changes in system operations and level of service, including proposed water supply options, as well as the proposed facility projects to be implemented under this program.

2.5 Proposed System Operations and Levels of Service

As described above, the regional water system operations are affected by numerous factors, including meteorological and hydrologic conditions; physical facilities and infrastructure; and institutional parameters. The WSIP addresses the condition of the physical facilities and infrastructure while planning for and taking into account both the meteorological/hydrologic conditions and institutional parameters. Under the WSIP, the regional water system would continue to comply with the conditions of all applicable institutional and planning requirements, including:

- Complying with all water quality and public safety regulations
- Maximizing use of water from local watersheds
- Assigning a higher priority to water delivery over hydropower generation
- Meeting all downstream flow requirements

Table 3 summarizes the proposed changes in levels of service with implementation of the WSIP compared to existing conditions.

Water Quality

With implementation of the WSIP, the regional system would continue to meet all local, state, and federal drinking water quality requirements, but would also comply with anticipated future regulations. Changes to system operations are being proposed in order to comply with the proposed Long Term-2 Enhanced Surface Water Treatment Rule and provide secondary disinfection for the Hetch Hetchy water. Projects are proposed to upgrade both regional treatment plants. In addition, to support the objective of maintaining the filtration exemption status for Hetch Hetchy water, ongoing system operations would

TABLE 2

WSIP GOALS AND OBJECTIVES

Program Goal	System Performance Objective
Water Quality – *maintain high water quality*	• Design improvements to meet current and foreseeable future federal and state water quality requirements. • Provide clean, unfiltered water originating from Hetch Hetchy Reservoir and filtered water from local watersheds. • Continue to implement watershed protection measures.
Seismic Reliability – *reduce vulnerability to earthquakes*	• Design improvements to meet current seismic standards. • Deliver basic service to the three regions in the service area (East/ South Bay, Peninsula, and San Francisco) within 24 hours after a major earthquake. Basic service is defined as average winter-month usage, and the performance objective for the regional system is 215 mgd. The performance objective is to provide delivery to at least 70 percent of the turnouts in each region, with 96, 37, and 82 mgd delivered to the East/South Bay, Peninsula, and San Francisco, respectively. • Restore facilities to meet average-day demand within 30 days after a major earthquake.
Delivery Reliability – *increase delivery reliability and improve ability to maintain the system*	• Provide operational flexibility to allow planned maintenance shutdown of individual facilities without interrupting customer service. • Provide operational flexibility to minimize the risk of service interruption due to unplanned facility upsets or outages. • Provide operational flexibility and system capacity to replenish local reservoirs as needed. • Meet the estimated average annual demand of 300 mgd for 2030 under the conditions of one planned shutdown of a major facility for maintenance concurrent with one unplanned facility outage due to a natural disaster, emergency, or facility failure/upset.
Water Supply – *meet customer water needs in nondrought and drought periods*	• Meet average annual water purchase requirements of 300 mgd from retail and wholesale customers during nondrought years for system demands through 2030. • Meet dry-year delivery needs through 2030 while limiting rationing to a maximum 20 percent systemwide reduction in water service during extended droughts. • Diversify water supply options during nondrought and drought periods. • Improve use of new water sources and drought management, including groundwater, recycled water, conservation, and transfers.
Sustainability – *enhance sustainability in all system activities*	• Manage natural resources and physical systems to protect watershed ecosystems. • Meet, at a minimum, all current and anticipated legal requirements for protection of fish and wildlife habitat. • Manage natural resources and physical systems to protect public health and safety.
Cost-effectiveness – *achieve a cost-effective, fully operational system*	• Ensure cost-effective use of funds. • Maintain gravity-driven system. • Implement regular inspection and maintenance program for all facilities.

TABLE 3

EXISTING AND PROPOSED REGIONAL SYSTEM LEVELS OF SERVICE [a]

Operating Parameter	Existing Level of Service	Proposed Level of Service with WSIP (2030)
Water Quality	Meet all local, state, and federal water quality requirements in 2005	Meet all local, state, and federal water quality requirements in 2030
Seismic Response After Major Earthquake	Not defined	Provide basic service [b] of 215 mgd within 24 hours; average-day service of 300 mgd within 30 days
Average Annual Delivery	265 mgd	300 mgd [c]
Regional System Firm Yield [d]	223 mgd	256 mgd
Drought-Year Rationing	No maximum limit to rationing	Up to 20 percent systemwide rationing

[a] Level of service flow rates are defined on a systemwide basis and are not specific to any customer turnout (i.e., water diversion point).

[b] Basic service is defined as winter month demand (215 mgd).

[c] Includes 10 mgd from conservation, recycled water and groundwater supply programs.

[d] System firm yield is defined as: the maximum annual water delivery that can be sustained by the regional water system during an extended drought. The SFPUC uses an 8.5-year design drought for planning purposes. Currently, due to recent operating restrictions imposed by the California Division of Safety of Dams on the Calaveras Dam, the system firm yield is reduced from its normal system firm yield of 223 mgd to about 219 mgd.

include continued implementation of source water protection and systemwide watershed management and protection.

Delivery Reliability

The WSIP goal for water delivery reliability is to increase the reliability of the regional system to meet customer demand under a range of operating conditions. While current system operating strategies would generally remain unchanged, implementation of the WSIP would rehabilitate and upgrade existing facilities as well as provide a wider range of operational flexibility, thereby increasing the reliability of the system to deliver water to all customers.

The WSIP includes an improved maintenance program to increase day-to-day reliability that establishes a schedule and allows for the planned shutdown of facilities for inspection and maintenance while continuing to meet customer demands. Currently, some critical facilities cannot be taken out of service for inspection and maintenance, but the WSIP would provide adequate redundancy of critical facilities to enable inspection and maintenance on a regular schedule. Redundant facilities would also increase the operational flexibility and thus the reliability of water service to customers in the event of an unplanned facility failure or system upset, natural disaster, or other emergency situation. As summarized in Table 2, the SFPUC has set performance objectives to maintain water delivery services during planned facility maintenance activities and unplanned outages of key facilities.

The proposed system upgrades would optimize water storage to provide Bay Area customers with a local supply in the event of an emergency. At present, depending on hydrologic conditions and the transmission capacity of pipelines, replenishment of local reservoirs can take more than one year to complete. The WSIP includes an increase in the transmission capacity of pipelines such that the Alameda and Peninsula Reservoirs can be replenished while continuing to meet customer demands. Implementation of the WSIP would increase the SFPUC's ability to replenish local reservoirs more quickly, which is required both during normal and wet years after an unplanned outage that requires significant drawdown of the local reservoirs to keep water flowing to customers (see Seismic Reliability, below).

Seismic Reliability

To improve seismic reliability for the regional system, critical facilities would be upgraded to meet current seismic standards, thereby improving their ability to withstand seismic damage. In addition, the increased level of operational flexibility would improve the ability to respond and restore service following an earthquake.

In addition, to increase seismic reliability for the system (as described above for water delivery reliability), water storage in the Bay Area and the ability to replenish depleted water storage would be improved under the WSIP so that water service could be restored more rapidly and reliably following a seismic event.

Water Supply

The SFPUC's chief service objectives for water supply are (1) to fully meet customer purchase requests in nondrought years through the planning year 2030, and (2) to provide drought-year delivery with a maximum systemwide cutback of 20 percent in any one year of a drought. The SFPUC, in conjunction with its wholesale customers, has conducted extensive studies to determine water demand projections, conservation and recycled water potential, and water purchase estimates from the regional system. The current estimated total water demand within the entire SFPUC service area is 374 mgd. Of this current total demand, about 265 mgd is purchased annually from the SFPUC. SFPUC customers meet the balance of their supply needs with supplies from other sources. To develop their 2030 purchase requests to the SFPUC, customers have considered conservation and recycled water potential as well as other supply source options available to them. The total projected 2030 water demand within the service area is 417 mgd while the 2030 customer purchase requests to the SFPUC total 300 mgd.[3] The remaining 117 mgd of the 417 mgd total 2030 demand would be met through the other customer sources, primarily water purchases from other agencies, water recycling and conservation.

The 2030 customer purchase request of 300 mgd from the SFPUC is 35 mgd more than the current 265 mgd average annual delivery from the regional system. The SFPUC's proposed water supply option meets this 2030 request by increasing, on average, the SFPUC's annual diversion from the Tuolumne River by 25 mgd and implementing additional conservation, water recycling, and groundwater supply programs to achieve the other 10 mgd needed. SFPUC studies indicate that the SFPUC's existing water sources (i.e., local watersheds and the Tuolumne River) are sufficient to meet current and future water purchases in most years (assuming restored storage capacity in Bay Area reservoirs). Although the SFPUC can meet projected 2030 water purchases of 300 mgd from local supplies and Tuolumne River diversions in most years, those supplies alone have not allowed for full water deliveries during past droughts and cannot be relied upon alone in the future for water deliveries during potential future droughts.

3 San Francisco Public Utilities Commission, *2030 Purchase Estimates,* Technical Memorandum, December 2004.

With respect to drought-year supply, the system firm yield is defined as the maximum annual water delivery that can be sustained during an extended drought; the SFPUC uses an 8.5-year design drought for planning purposes. The current firm yield of the system is 223 mgd.[4] By 2030, with customer purchase requests of 300 mgd and assuming 10 mgd of this request is met by a combination of water recycling, conservation and groundwater supply programs as proposed, the system firm yield is estimated to be 256 mgd. The equivalent of an additional 33 mgd of firm yield is required to provide adequate water delivery in drought years by 2030. The SFPUC proposes to meet this 2030 system firm yield need with a combination of water transfers, groundwater conjunctive-use programs and rationing.

To address existing and future water delivery needs for customers under both average annual and drought conditions, the SFPUC has identified the following proposed water supply option as well as alternatives to be evaluated in the PEIR in comparison to the proposed option.

Proposed Water Supply Option

The SFPUC proposed water supply option to meet the projected 35 mgd increase in average annual delivery through 2030 includes increased use of Tuolumne River water coupled with increased conservation, water recycling and groundwater supply programs. Under this proposed option, the SFPUC would implement additional conservation, water recycling and groundwater supply programs to achieve the equivalent of 10 mgd of supply every year (in all year types: nondrought and drought). In nondrought years, the SFPUC would meet the remaining increase in average annual demand through 2030 (25 mgd) with increased use of Tuolumne River water under its existing water rights.

In drought years, the SFPUC would implement a multistep drought response program to:

- Acquire up to 25 mgd[5] of supplemental dry-year Tuolumne River water through water transfer agreements with Modesto Irrigation District and/or Turlock Irrigation District
- Implement a groundwater conjunctive-use program in the Westside Basin, in San Mateo County, to store water through in-lieu recharge in nondrought years and provide approximately 6 mgd[5] of water in a drought year
- Implement up to 20 percent systemwide rationing in any year of a drought

The facilities and facility improvements required to implement this water supply option are described in greater detail in the following section. Key regional system facility improvements needed include: increasing SFPUC regional system transmission capacity and redundancy in San Joaquin Pipelines and Bay Division Pipelines; restoring full storage capacity in the existing Crystal Springs Reservoir and Calaveras Reservoir; and developing additional wells to implement the regional groundwater conjunctive-use program. Additional facility improvements, described in the following section, are also needed to

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4 Currently, due to recent operating restrictions imposed by the California Division of Safety of Dams on the Calaveras Dam, the system firm yield is reduced from its normal system firm yield of 223 mgd to about 219 mgd.

5 The contribution to system firm yield from individual projects represents the system firm yield of the projects when evaluated independently by the simulation model. Restoration of Crystal Springs Reservoir storage capacity accounts for 1 mgd. When the projects (District transfers, Westside Basin and Crystal Springs Reservoir restoration) are combined and evaluated as one scenario in modeling, the system firm yield is slightly higher at 33 mgd. The small difference in combined system yield is due to changes in net evaporation over the design drought sequence.

meet the water quality, seismic reliability and delivery reliability performance objectives the SFPUC has established for the regional system in nondrought and drought years.

Other Supply Options

At the SFPUC's request the PEIR will provide a programmatic analysis and comparative evaluation of three other water supply options: (1) increased Tuolumne River diversions without additional recycling, conservation, and groundwater supply programs; (2) additional non-Tuolumne River surface water supplies that may include Delta water transfers and desalination, as well as recycling, conservation, and groundwater supply programs, but no additional Tuolumne River diversions; and (3) a combination of aggressive conservation / water recycling and naturally renewable groundwater supply, with no additional Tuolumne River diversions and no acquisition or use of other additional surface water supplies. Option 1 is a variation of the proposed water supply option described above and has similar facility requirements. Options 2 and 3 would involve repair and improvement of the SFPUC regional system as well as additional facility projects, such as additional transmission pipelines, additional storage facilities, new and/or modified treatment facilities (for example, desalination plant(s), additional recycled water treatment capacity and/or new plants, modifications at SFPUC water treatment plants in order to treat other supply sources), new wells, and additional distribution system pipelines. The feasibility of Options 2 and 3 is currently under study. The PEIR will investigate and compare the nature and magnitude of environmental impacts associated with these water supply options to the SFPUC's proposed water supply option.

At the request of the SFPUC, the PEIR will also provide a programmatic analysis and comparative evaluation of two other drought rationing scenarios: a maximum reduction of 10 percent and a maximum reduction of 30 percent of the 2030 customer purchase requests. These two rationing scenarios will be reviewed to see what effect they might have on the proposed WSIP facility projects. It is expected that all of the proposed WSIP facility projects would still be needed under these two rationing scenarios, but that the size requirements of certain facilities could be affected. In general, it is expected that the 10 percent maximum systemwide rationing scenario would require more supplemental dry-year water, more storage capacity, and possibly more transmission capacity than the SFPUC's proposed option (which includes a maximum of 20 percent systemwide rationing). By contrast, the maximum 30 percent systemwide rationing scenario is expected to require less supplemental dry-year supply than the proposed option. For this scenario, storage and transmission capacity sizing is expected to remain the same as described for the proposed water supply option in order to meet other regional system goals for day-to-day delivery reliability and seismic reliability as well as drought reliability. The SFPUC will confirm the appropriate facilities and sizing for each of these scenarios and this information will be presented in the PEIR.

2.6 WSIP Facility Improvement Projects

To achieve the system performance objectives of the WSIP, the SFPUC has proposed projects to repair, improve and, in some cases, expand the physical facilities in the regional system. **Table 4** lists and briefly describes the individual projects that have been identified in the WSIP, and **Figure 3** shows the locations of these projects. Project descriptions in Table 4 present information pertinent only to that individual facility as an isolated project and do not include how each project relates to the overall system in terms of operations and capacity; that information will be provided in the PEIR.

TABLE 4

SUMMARY OF WSIP FACILITY IMPROVEMENT PROJECTS

No.	Project Title	Type of Facility [a]	CEQA Review Approach [b]	Project Description
San Joaquin Sub-region				
SJ-1	Hetch Hetchy Advanced Disinfection	Treat	PEIR, possible separate CEQA	This project would construct a facility for secondary disinfection for the Hetch Hetchy water supply to comply with the proposed federal drinking water regulations contained in the Long Term-2 Enhanced Surface Water Treatment Rule to remove target organisms such as cryptosporidium.
SJ-2	Lawrence Livermore Filtration	Treat	PEIR	This project would construct treatment upgrades for potable water that the SFPUC provides to the Lawrence Livermore Laboratory. The project would install package membrane technology to ensure that this customer receives consistently high-quality water and would also meet the proposed federal drinking water regulations contained in the Long Term-2 Enhanced Surface Water Treatment Rule.
SJ-3	San Joaquin Pipeline System	Trans	PEIR	This project includes an alternative to construct a fourth 47-mile-long pipeline across the San Joaquin Valley adjacent to the existing three San Joaquin Pipelines and construct two new crossover facilities between all the pipelines. This project is designed to provide redundant system hydraulic capacity sufficient to allow long-term repairs on the existing pipelines while maintaining water supply service to the Bay Area; however, it will also increase the transmission capacity of the San Joaquin Pipelines.
SJ-4	Tesla Portal Disinfection Facility	Treat	Separate CEQA	This project would rehabilitate and upgrade the system's existing primary disinfection for the Hetch Hetchy supply to meet current seismic, safety/fire, and building code standards. The project would replace the existing facilities at the Tesla Portal.
Sunol Valley Sub-region				
SV-1	(project moved)			The project initially labeled as SV-1, Alameda Creek Fishery Enhancement, has been incorporated into SV-2, Calaveras Dam Replacement Project.
SV-2	Calaveras Dam Replacement and Alameda Creek Fishery Enhancement	Storage	PEIR	This project would replace the existing dam at the Calaveras Reservoir to meet seismic safety requirements and would be located just downstream from the existing site. Currently, the capacity of Calaveras Reservoir is restricted to 37,800 acre-feet by the California Department of Water Resources, Division of Safety of Dams due to potential seismic failure of the dam. The proposed dam would be designed to provide a reservoir with the same storage capacity as Calaveras Reservoir was originally designed to accommodate (96,850 acre-feet) to withstand the Maximum Credible Earthquake originating on the Calaveras fault, as well as to withstand the Probable Maximum Flood. The replacement dam would include a new intake tower. Upgrades to the Calaveras Pipeline, San Antonio Pipeline, San Antonio Pump Station, and San Antonio Cone Valve are being considered to provide reliability of water delivery in the event of interruption or outage of Hetch Hetchy water. As part of this project, Calaveras Reservoir would be operated to release up to 6,300 afy (5.5 mgd) of water to Alameda Creek for fish flow enhancement. New facilities would be installed downstream of the dam to recapture the released water and return it back to the regional system for use.
SV-3	Additional 40 mgd Treated Water Supply	Treat	PEIR	This project would construct new or additional water treatment facilities to provide an additional 40 mgd of treatment capacity at either the Sunol Valley (preferred location) or the Harry Tracy WTP.

TABLE 4

SUMMARY OF WSIP FACILITY IMPROVEMENT PROJECTS

No.	Project Title	Type of Facility [a]	CEQA Review Approach [b]	Project Description
SV-4	Irvington Tunnel / Alameda Siphons	Trans	PEIR	Irvington Tunnel – A second tunnel would be constructed to convey water from the Sunol Valley to Fremont in the East Bay. The second tunnel would be a redundant water transmission facility to the existing Irvington Tunnel. Alameda Siphons – A fourth Alameda Siphon would be constructed across the Sunol Valley. The fourth Alameda Siphon would be the seismic backbone and a redundant pipeline to the existing three Alameda Siphons.
SV-5	San Antonio Pump Station Upgrade	Trans	PEIR	This project would upgrade and rehabilitate facilities at the San Antonio Pump Station, which pumps water from San Antonio Reservoir to the Sunol Valley WTP and pumps Hetch Hetchy water to the Sunol Valley WTP, San Antonio Reservoir, or San Antonio Creek. This project provides seismic retrofit of structural deficiencies in the facility, replacement of three electric pumps, backup power for those three pumps, and an electrical substation. This project would allow the facility to sustain existing pumping capacity of 160mgd.
SV-6	Sunol Valley WTP – New Treated Water Reservoir	Treat	PEIR, possible separate CEQA	This project would construct a new 22.5-million-gallon storage reservoir for treated water at the Sunol Valley WTP plus miscellaneous pumping appurtenances to increase treatment efficiency of the WTP during periods of peak demand. The proposed project site is just north of the Sunol Valley WTP.
SV-7	Pipeline Repair Plan and Readiness Improvements	Trans	Separate CEQA	This project consists of developing a plan and purchasing materials for emergency repair and operation of the regional pipelines following an earthquake.
SV-8	Standby Power Facilities (various locations)	Other	Separate CEQA	This project would provide for standby backup power at various facilities to ensure continued operation during power outages. Project locations include the San Pedro and Capuchino Valve Lots, Millbrae Facility, San Antonio and Calaveras Reservoirs, Alameda West Portal, and Harry Tracy WTP.
Bay Division Sub-region				
BD-1	Bay Division Pipeline Hydraulic Capacity Upgrade	Trans	PEIR	This project would construct a new Bay Division Pipeline from Fremont to Redwood City, consisting of 16 miles of pipeline and 5 miles of tunnel running under San Francisco Bay between Newark and East Palo Alto. The new facility would replace the deteriorated existing submarine sections of Bay Division Pipelines 1 & 2. With the pipeline hydraulic upgrade and decommissioning of Bay Division Pipelines 1 & 2 sections, the transmission capacity of the pipeline system would increase.
BD-2	Bay Division Pipelines 3 & 4 Crossovers	Trans	PEIR	This project would construct three additional crossover facilities along Bay Division Pipelines 3 & 4 to provide operational flexibility for maintenance or during emergencies.
BD-3	Slipline Bay Division Pipeline 4 PCCP Sections	Trans	PEIR	This project would rehabilitate sections of the Bay Division Pipeline 4 where vulnerable prestressed concrete cylinder pipe (PCCP) currently exists.
BD-4	Seismic Upgrade of Bay Division Pipelines at Hayward Fault	Trans	Separate CEQA	This project would construct shutoff valves in underground vaults at two locations along Bay Division Pipelines 3 & 4 on either side where they cross the trace of the Hayward fault and upgrade the pipelines between the new shutoff valves. The project would not affect the transmission capacity of the pipelines.
BD-5	SFPUC/EBMUD Intertie	Trans	Separate CEQA	This project will provide a connection between the SFPUC and East Bay Municipal Utility District (EBMUD) water systems such that 30 mgd can be transferred in either direction in the event of an emergency. CEQA review on this project is complete and the project is currently under construction.

TABLE 4

SUMMARY OF WSIP FACILITY IMPROVEMENT PROJECTS

No.	Project Title	Type of Facility [a]	CEQA Review Approach [b]	Project Description
BD-6	Installation of SCADA System – Phase II	Other	Separate CEQA	The Supervisory Control and Data Acquisition (SCADA) project would install monitoring and control equipment at approximately 50 sites to allow collection of water quality and flow data throughout the regional system.
Peninsula Sub-region				
PN-1	Adit Leak Repair, Lower Crystal Springs & Calaveras Reservoirs	Trans	Separate CEQA	This project would repair leaking adits (outlet structures) used to control withdrawal of water from Lower Crystal Springs and Calaveras Reservoirs. The project includes Lower Crystal Springs Outlet Tower No. 1 and Calaveras Outlet Tower.
PN-2	Baden and San Pedro Valve Lots Improvements	Trans	PEIR	This project would upgrade valves, vaults, and piping at the Baden Valve Lot and the San Pedro Valve Lot to meet current seismic standards. The project would include a new pressure-reducing valve to allow transfer of water between high- and low-pressure zones, facilitating backfeed of water from Harry Tracy WTP to Peninsula customers to the south in an emergency.
PN-3	Capuchino Valve Lot Capacity Improvements	Trans	PEIR	This project would seismically upgrade the existing vault and relocate isolation valves to improve reliability of the Capuchino Valve Lot, which allows transfer of water from the high-pressure regional system to low-pressure zones in San Francisco.
PN-4	Cross Connection Controls (various locations)	Trans	Separate CEQA	This project would upgrade the existing valves and piping at 291 locations to eliminate and prevent cross connections and backflow from unapproved sources into the water system in compliance with California water quality regulations.
PN-5	New Crystal Springs Bypass Tunnel	Trans	PEIR, possible separate CEQA	This project would construct a 4,200-foot-long tunnel to replace an existing pipeline that is vulnerable to seismic and landslide hazards. Although the new tunnel would be a replacement facility, the existing pipeline would remain in place and be kept in service as a redundant facility to allow tunnel maintenance.
PN-6	Crystal Springs / San Andreas Transmission Upgrade	Trans	PEIR	This project would consist of hydraulic and seismic upgrades of facilities that convey water from Crystal Springs Reservoir to the Harry Tracy WTP, including the Crystal Springs Outlet facilities, Crystal Springs Pump Station, Crystal Springs–San Andreas Pipeline, and the San Andreas Outlet facilities. The project includes pipeline repair and replacement, a chemical system upgrade, and general structural repairs. This project would increase the transmission capacity of raw water from Crystal Springs Reservoir to San Andreas Reservoir for treatment at the Harry Tracy WTP to sustain delivery to Peninsula customers.
PN-7	Harry Tracy WTP Short-Term Improvements	Treat	PEIR, possible separate CEQA	This project would replace and upgrade the filtration system at the Harry Tracy WTP to increase the reliability and efficiency of the treatment process to deal with challenging raw water conditions. The project would improve the WTP's filtration and coagulation/flocculation process. With these improvements, the plant would reliably maintain its current sustainable capacity of 120 mgd for 60 days.
PN-8	Harry Tracy WTP Long-Term Improvements	Treat	PEIR	This project would be a seismic retrofit and rehabilitation of the existing building and facility, including raw water pumping and transmission improvements, and hydraulic and piping upgrades. The project would increase the sustained treatment capacity of the plant from 120 mgd to 140 mgd, sustainable for 60 days.
PN-9	Lower Crystal Springs Dam Improvements	Storage	PEIR	This project would consist of major repairs and improvements to Lower Crystal Springs Dam to provide adequate protection from the Probable Maximum Flood as well as the Maximum Credible Earthquake. Currently, California Division of Safety of Dams has placed operational restrictions on the dam, and the capacity of the reservoir is limited to 58,400 acre-feet. The project would restore the historic reservoir capacity of 69,300 acre-feet.

TABLE 4

SUMMARY OF WSIP FACILITY IMPROVEMENT PROJECTS

No.	Project Title	Type of Facility [a]	CEQA Review Approach [b]	Project Description
PN-10	Pulgas Balancing Reservoir Rehabilitation	Trans	PEIR	This project would install new inlet/outlet piping to improve mixing in the reservoir, replace the eroding Pulgas Channel to accommodate current maximum flows of 250 mgd, and replace the reservoir roof to meet current seismic standards.
San Francisco Regional Projects				
SF-1	Crystal Springs Pipeline 2 Replacement	Trans	Separate CEQA	This project would repair and replace aging and seismically vulnerable sections of the existing 19-mile-long Crystal Springs Pipeline 2. Transmission capacity of the pipeline would not change.
SF-2	San Andreas Pipeline 3 Installation	Trans	PEIR	This project would construct a new 3.9-mile pipeline extension between Daly City and San Francisco to replace the Baden-Merced Pipeline, which is beyond repair. The project would provide seismic reliability and system redundancy for Peninsula and San Francisco customers.
SF-3	Sunset Reservoir – North Basin	Storage	Separate CEQA	This project would involve seismic upgrades and rehabilitation of the existing reservoir, including seismically strengthening the reservoir roof, columns, and beams and stabilizing the earth embankment around the reservoir. There would be no change in reservoir capacity.
SF-4	University Mound Reservoir – North Basin	Storage	Separate CEQA	This project would involve seismic upgrades and rehabilitation of the existing reservoir, including seismically strengthening the reservoir roof, columns, and beams; upgrades to valves, gates, and drainage control; and miscellaneous roadway and site improvements. There would be no change in reservoir capacity.
SF-5	Groundwater Projects	Other	PEIR	This project includes two phases: Local Groundwater Projects and a Regional Groundwater Banking Program. Local Groundwater Projects would include development of about 2 mgd of new local groundwater for injecting and blending with water in the potable water system in San Francisco. The regional banking program would develop about 6 mgd of potable groundwater in San Mateo County as part of a regional conjunctive-use project. In nondrought years under this project, the SFPUC would provide regional system water to these customers to substitute groundwater currently used for municipal purposes, thereby allowing the groundwater basin to recharge naturally; in drought years, the groundwater would be available for local use to supplement the regional system water.
SF-6	Recycled Water Projects	Other	PEIR	This project includes local and regional recycled water projects. The local project would provide about 4.5 mgd of recycled water primarily for irrigation purposes on the west side and the Marina sections of San Francisco; it would include construction of a new recycled water treatment facility and distribution system within parts of San Francisco. The regional projects include SFPUC's partnering with other jurisdictions to develop and implement recycled water, primarily for irrigation uses.

See Figure 3 for the approximate locations of projects.

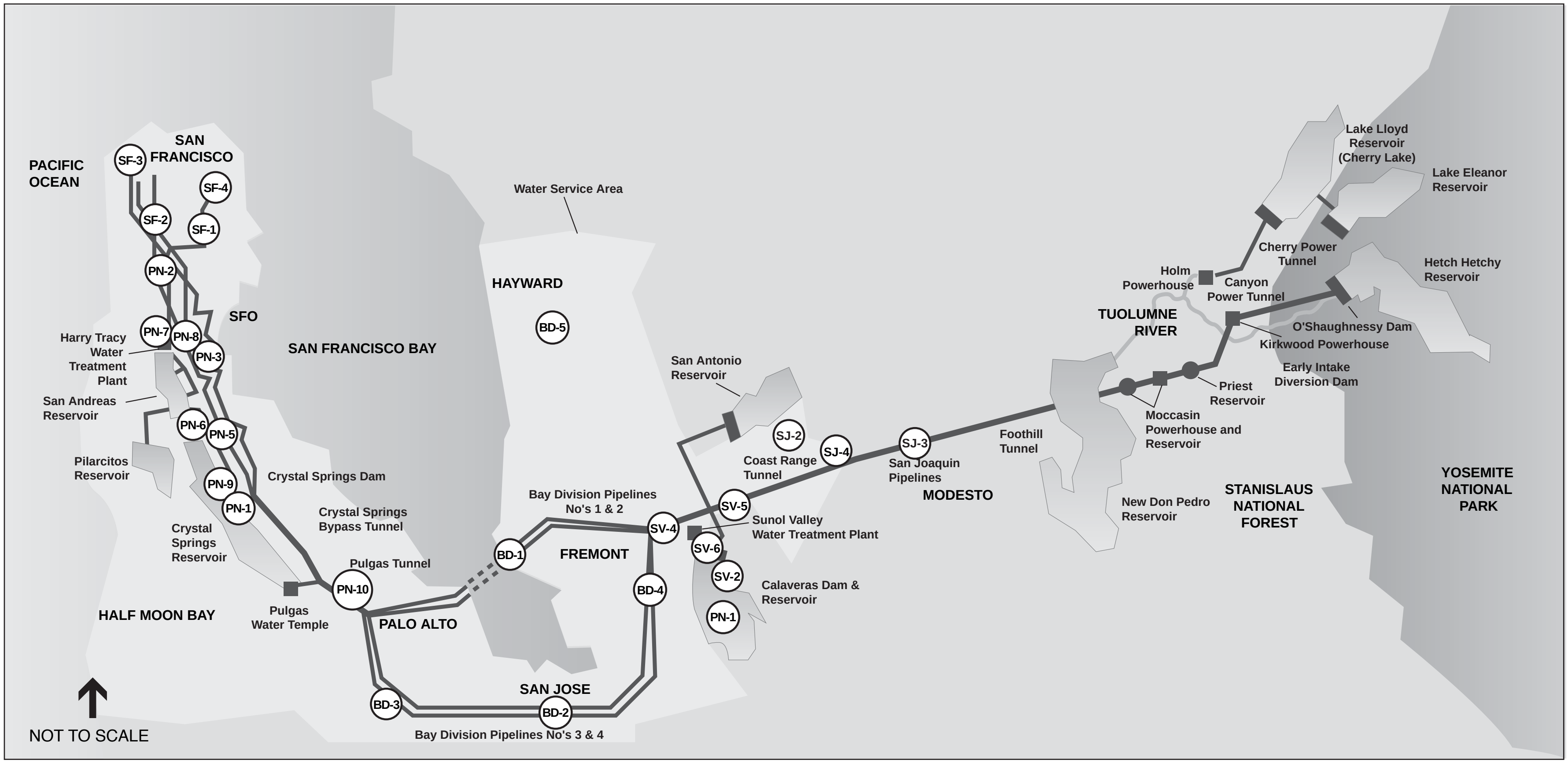
a. Stor = Storage Facility; Trans = Transmission Facility; Treat = Treatment Facility; Other = other types of facilities.

b. This column indicates the status of CEQA analysis for each project.

PEIR = Project to be included in the PEIR impact analysis and alternatives consideration and may undergo or is undergoing additional project-level CEQA analysis as required.

Separate CEQA = Project has undergone or is undergoing separate environmental review independent of the PEIR; however, the project will be considered in the PEIR cumulative effects analyses as relevant.

PEIR, possible separate CEQA = Project to be included in the PEIR impact analysis and alternatives consideration, but may be considered for separate CEQA review and documentation outside of and in advance of the PEIR.



NOTE: Projects SJ-1, SV-3, SV-7, SV-8, BD-6, PN-4, SF-5 and SF-6 not shown because either location not known or project would involve multiple locations. See Table 4 for names and descriptions of projects.

SOURCE: San Francisco Public Utilities Commission (2005)

SFPUC Water System Improvement Program . 203287

Figure 3
Location of WSIP Facility Improvement Projects

The projects identified in Table 4 are required to achieve the system performance objectives established by the SFPUC for the regional system and also to support implementation of the proposed water supply option described above. While most of these projects would be needed regardless of which water supply option is ultimately selected, the PEIR will identify particular projects that are not needed for one or more of the water supply alternatives and will identify other projects that may be required to implement a water supply alternative, such as a desalination facility and related transmission/treatment systems.

Table 4 also indicates which WSIP projects will be addressed in the PEIR at a programmatic level of detail and which have undergone or are undergoing separate CEQA review (these latter projects will be considered in the PEIR cumulative analysis as appropriate). The San Francisco Planning Department may also determine that other projects will undergo CEQA review separately and concurrently with the PEIR.

2.7 Implementation Actions

The actions associated with implementation of the WSIP include:

- Ongoing source water protection and systemwide watershed management
- Improved, on-going maintenance
- Drought management planning
- Various actions to secure supplemental water supply to meet 2030 purchase requests and 2030 system firm yield. Actions could include transfer agreements, groundwater conjunctive-use agreements, implementation of water recycling and conservation programs; and possibly additional wells, distribution system connections, and transmission/treatment capacity enhancements
- Construction and operation of WSIP facilities listed in Table 4
- Agreements with SFPUC customers as needed

As the SFPUC continues to develop the projects within the WSIP, it will identify in greater detail the specific implementation actions required for each project and action within the program.

2.8 Schedule

The WSIP includes a preliminary schedule indicating the planning, environmental review, design, and construction phases for all of the regional projects identified in the program. The schedule was developed to assure water delivery service is maintained consistently throughout construction of the numerous projects. The schedule indicates that construction of most projects would be underway by 2008 to 2009 and completed by 2012 to 2013. All projects in the WSIP would be completed by 2017. Acquisition of supplemental water supplies during droughts would be implemented as needed to match water delivery needs of the systemwide customers.

3.0 Environmental Analysis

3.1 Program EIR Level Of Analysis

According to the CEQA Guidelines, Section 15168, a program EIR is one type of environmental review document that may be used to evaluate a plan or program that has multiple components (projects and actions) or to address a series of actions that are related:

- Geographically,
- As logical parts in the chain of contemplated actions,
- In connection with the issuance of rules, regulations, plans, or other general criteria to govern the conduct of a continuing program, or
- As individual activities carried out under the same authorizing statutory or regulatory authority and having generally similar environmental effects that can be mitigated in similar ways.

The PEIR on the proposed WSIP can provide a foundation for any necessary future environmental review of the specific regional system facility projects within the program and, as provided by CEQA, can help simplify the task of preparing any necessary focused environmental documents on projects included in the program. A program EIR can provide the following additional advantages.

- Provide for a more exhaustive consideration of effects and alternatives than would be practical in an EIR on an individual action
- Ensure consideration of cumulative impacts that might not be evident in a case-by-case or project-by-project analysis
- Avoid duplicative consideration of basic policy issues
- Allow the lead agency to consider broad policy alternatives and programwide mitigation measures early in the process when the agency has greater flexibility to deal with basic problems or cumulative impacts
- Allow a reduction in paperwork

A program EIR may be prepared on a plan or program before the details of each and every project within the long-term plan have been developed, as is true for the PEIR on the WSIP. While the SFPUC is aggressively developing the design, construction and operation details of the regional system projects, these project details will not be the focus of the PEIR. The PEIR on the proposed WSIP regional system improvements will be used as a first-tier environmental document; the analysis will focus on the environmental effects of implementing the overall WSIP as a plan to improve and expand the ability of the regional water system to deliver water to the service area. The chief first-tier environmental issues to be evaluated in the PEIR include:

- The overall effects of upgrading and expanding the regional system to meet the water quality and reliability goals proposed for the system
- The effects of providing additional water supply to meet increasing purchase requests within the service area, specifically the effect of increasing average annual water supply to the service area over the next 25 years
- The effects of using the various proposed sources of water to meet the increasing water delivery needs in nondrought and drought periods

The PEIR will evaluate the overall cumulative effects of implementing the various WSIP actions and facility projects in broad terms to identify the major environmental effects and to determine if there are program mitigations and/or program alternatives that should be evaluated at this time. As described in Section 1.2 – Environmental Review Process, the PEIR will not evaluate in detail all the site-specific environmental impacts of constructing and operating each of the many projects proposed as part of the WSIP to rehabilitate, upgrade, and expand the regional system. As required by CEQA, project-level

CEQA review will be conducted for individual projects to address these detailed, site-specific environmental impact issues.

3.2 Environmental Issues to Be Addressed In The PEIR

Following is an overview of the environmental issues that the PEIR will address for the various WSIP actions and projects in association with the proposed water supply option. The PEIR will examine the potentially significant environmental effects in each of the environmental issue areas outlined below, identify mitigation measures, and evaluate whether such measures can reduce impacts to a less-than-significant level.

Surface Water Resources – Hydrology and Water Quality

The WSIP could affect surface water resources in a variety of ways. Changes in the timing and/or amount of supply, diversion and storage could affect Tuolumne River and/or Alameda Creek. Construction activities could cause short-term, temporary effects on local streams and drainages. Potential effects to be evaluated include:

- Changes in surface water flows and resulting adverse effects on beneficial uses (including instream uses such as aquatic habitat and fisheries, and recreation and consumptive uses)
- Changes in surface water quality from program operation or construction activities
- Alteration of existing drainage patterns
- Exposure of people to and/or increasing risk of flooding, seiche, or tsunami hazards

Groundwater Resources – Geohydrology and Water Quality

As part of the WSIP, the SFPUC is proposing greater use of groundwater resources in San Mateo and San Francisco Counties as part of the dry-year supply program. In addition, construction and/or operation of the WSIP facility projects could affect local groundwater resources. Potential effects to be evaluated include:

- Changes in groundwater levels, recharge rates, and/or storage
- Changes in groundwater flow or quality
- Indirect effects (e.g., effects on other beneficial uses of the groundwater, risk of land subsidence)

Fisheries and Aquatic Resources

Fisheries and aquatic resources could be affected indirectly due to changes in river flows or water quality, or directly due to construction activities in or near rivers, streams, and drainages. The PEIR will review the potential for fishery and aquatic resource effects on the Tuolumne River system, Alameda Creek, and within the system reservoirs due to changes in water supply operations as well as, in general, changes in local streams and drainages as a result of facility construction activities. Potential effects to be evaluated include:

- Changes in the extent of habitat or habitat quality
- Changes in a fish population that cause it to drop below self-sustaining levels

- Effects on special-status species
- Interference with the movement of any native or migratory fish species

Terrestrial Vegetation and Wildlife

Construction of the proposed regional system projects could have "footprint" impacts resulting in the loss of habitat at new facilities sites as well as cause construction disturbance to terrestrial habitats and wildlife as a result of short-term effects such noise, vibration, dust, and erosion. Potential effects to be evaluated include:

- Changes in the extent of habitat or habitat quality for terrestrial plants and wildlife
- Effects on special-status species
- Effects of species populations and the ability to maintain self-sustaining levels
- Interference with wildlife species movement corridors or migration

Geology, Soils, and Seismicity

One of the chief goals of the WSIP is to reduce the vulnerability of the system to severe damage during an earthquake and to improve the repair and response time to restore water delivery after an earthquake. The PEIR will describe the WSIP's effect on the water system's vulnerability and response to earthquake damage. In addition, construction of the regional facility projects could result in site-specific impacts to or from local geology and soils conditions. The PEIR will provide a general review of these types of project-specific impacts. Potential effects to be evaluated include:

- Seismic hazards to the water system and/or increased exposure of people and structures to seismic hazards
- Increased exposure of people or structures to geologic hazards (such as liquefaction, poor soil conditions, or unstable slopes)
- Erosion potential

Cultural Resources

The regional facility projects would repair, modify, demolish, and add facilities to the regional system. Construction of these projects could affect the historical significance of components of the water system and/or affect other historic or cultural resources in the vicinity of the system. Potential effects to be evaluated include:

- Effects on archaeological resources
- Effects on historic/architectural resources, including the regional water system
- Effects on Indian Trust assets and Native American resources

Land Use, Plans, and Policies

Construction of the proposed regional system projects could have "footprint" impacts that would affect existing or planned land uses along the regional system. While most of the proposed facility improvements or additions would occur within existing facility sites and rights-of-way for regional system facilities, some projects would involve construction activities at previously undisturbed areas and/or areas outside of the SFPUC's existing rights-of-way. In addition, construction or operation impacts could affect adjacent land uses. Also, WSIP projects could require removal of land uses including, in some cases, structures that have encroached onto SFPUC lands and rights-of-way such as gardens, fences, and sheds, and in one potential case, a house. While these are not permitted land uses, the PEIR will review potential environmental effects of removing or relocating such encroachments. For some projects, site-specific facility construction and operation impacts will be evaluated in detail in subsequent environmental documents; however, the PEIR will provide an overview of the potential land use impacts associated with implementation of these proposed facility projects. In addition, the PEIR will review appropriate local, regional, state, and federal plans and policies within the overall study area and evaluate their relationship to the WSIP and the SFPUC's jurisdiction as a public utility. Potential effects to be evaluated include:

- Substantial conflict with established local, regional, state, or federal plans, policies, and/or guidelines
- Disruption of an established community
- Inconsistency or incompatibility with existing or planned land uses at or adjacent to proposed regional facility sites
- Short-term construction disruption effects on neighboring land uses
- Operations effects on adjacent land uses

Recreation

Proposed program changes in water delivery operations (i.e., the level and timing of diversion from the Tuolumne River) or changes in reservoir storage could affect water-based recreation. In addition, construction of the proposed regional system projects could have "footprint" impacts that might conflict with or affect existing or planned recreation land uses. Also, construction could cause temporary disruption of these uses due to noise, dust, or access restrictions. The PEIR will evaluate the effects of the proposed water supply options and operations on water-based recreation, such as boating, rafting, or fishing, associated with the regional water system or downstream water resources. For some projects, site-specific facility construction and operation impacts will be evaluated in detail in subsequent environmental documents; however, the PEIR will provide an overview of the potential effects of the facility projects on land-based recreation. Potential effects to be evaluated include:

- Effects on water-based recreation facilities in the regional water system as well as any downstream water resources affected by SFPUC operations
- Effects on land-based recreation facilities and activities due to the siting or operations of proposed facilities or construction activities (e.g., short-term effects due to noise, dust, access restrictions)

Agricultural Resources

Siting of new or modified regional system facilities, primarily in the San Joaquin, Livermore and Sunol Valleys, could affect agricultural lands by removing agricultural soils from production. In addition, construction activities could cause short-term impacts to agricultural activities. Operation of proposed regional system facilities is not expected to result in ongoing impacts to neighboring agricultural activities. For some projects, site-specific facility construction and operation impacts will be evaluated in detail in subsequent environmental documents; however, the PEIR will provide a program-level review of the potential effects of the facility projects on agricultural soils and farming activities. Potential effects to be evaluated include:

- Loss of prime farmland
- Impacts or conflicts with existing or planned agricultural activities

Traffic, Transportation, and Circulation

Effects on traffic, transportation, and circulation resulting from the WSIP would largely be associated with facility construction activities and, as such, would be temporary and short term. However, some of the proposed regional system projects could have "footprint" impacts that would affect existing or planned traffic corridors or transportation facilities. For some projects, site-specific facility construction and operation impacts will be evaluated in detail in subsequent environmental documents; however, the PEIR will provide an overview of the potential effects of the facility projects on traffic, transportation, and circulation, including cumulative effects. Potential effects to be evaluated include:

- Effects on the regional transportation network or facilities
- Effects of adding new vehicle trips and contributing to increased traffic congestion during construction and/or operation of proposed facilities
- Effects on traffic safety

Air Quality

Effects on air quality from implementation of the WSIP regional system improvements would largely be associated with facility construction activities and, as such, would be temporary and short term. However, the PEIR will also evaluate potential changes in system operation that could result in long-term air quality effects. For some projects, site-specific facility construction and operation impacts will be evaluated in detail in subsequent environmental documents; however, the PEIR will provide an overview of the potential effects of the facility projects on air quality. Potential effects to be evaluated include:

- Effects of construction emissions, particularly dust
- Effects of system operations
- Consistency with regional air quality plans

Noise and Vibration

Noise and vibration effects from implementation of the WSIP regional system improvements would largely be associated with facility construction activities and, as such, would be temporary and short term. However, the PEIR will also evaluate potential changes in system operation that could result in long-term noise effects affecting adjacent land uses. For some projects, site-specific facility construction and operation impacts will be evaluated in detail in subsequent environmental documents; however, the PEIR will provide an overview of the potential noise effects of the facility projects. Potential effects to be evaluated include:

- Effects of construction noise and vibration
- Effects of operations on noise levels

Public Services, Utilities, and Energy

The PEIR will review the potential effects of the WSIP on utilities, public services, and energy resulting from both construction and operation of the improved and expanded regional system. While the regional water system is operated with water delivery as a higher priority than hydropower generation, the SFPUC system provides energy through its hydropower generation facilities to parts of San Francisco, the Modesto and Turlock Irrigation Districts, and other customers. The WSIP has been developed to focus on the water system infrastructure without affecting hydropower facilities   The PEIR will describe the relationship of the WSIP with the hydropower facilities during construction and operation of the WSIP. In addition, some of the WSIP projects, such as the Advanced Disinfection Project, could require substantial increases in the current energy demands of the regional system. For some projects, site-specific facility construction and operation impacts will be evaluated in detail in subsequent environmental documents; however, the PEIR will provide an overview of the potential effects of the facility projects on public utilities and services. Potential effects to be evaluated include:

- Effects on SFPUC hydropower generation and associated effects on power service provided to customers
- Systemwide increases in energy demands and potential need for expansion of power facilities
- Disruption of services (such as water or power) during construction
- Effects on other utilities (such as the need for relocation)

Hazards and Public Safety

The PEIR will review the hazardous materials proposed for use in operation of the system and evaluate potential changes over current operations. Some of the potential hazards are associated only with construction activities for the facility projects. For some projects, site-specific facility construction and operation impacts will be evaluated in detail in subsequent environmental documents; however, the PEIR will provide an overview of the facility projects with respect to hazards and public safety. Potential effects to be evaluated include:

- Potential to encounter hazardous materials or waste during construction or potential to release hazardous materials during construction
- Potential for accidental release of chemicals during facility operations or changes with respect to the risk of upset

Visual Quality

Effects on visual quality associated with implementation of the WSIP regional system projects would primarily result due to the siting of new or modified facilities. The PEIR will provide a program-level review of the potential visual resource impacts that could result from the proposed facilities projects. For some projects, site-specific facility construction and operation impacts will be evaluated in detail in subsequent environmental documents; however, the PEIR will provide an overview of the potential visual effects of the facility projects. Potential effects to be evaluated include:

- Degradation or obstruction of scenic views and designated scenic resources

Socioeconomics

The PEIR will review existing information about the potential socioeconomic effects of drought rationing, general conservation, and water supply costs and outline the potential socioeconomic effects of the WSIP on the customers within the regional system service area that could, in turn, result in physical environmental effects, such as changes in land use patterns and/or densities. The PEIR will summarize existing, available literature about the potential socioeconomic effects associated with drought rationing at different levels, and associated with varying costs of water supply options. If available, the PEIR will discuss the socioeconomic effects in the Bay Area and within the SFPUC service area of the most recent 1987 – 1992 drought.

Growth-Inducement Potential and Secondary Effects of Growth

The PEIR will evaluate the WSIP service goal to meet the future purchase requests of the SFPUC's customers within the existing service area through 2030. There is no proposal to expand the service area, but the SFPUC does propose to increase water supply to meet the needs of planned growth within its current service area. CEQA requires a discussion of a project's potential to remove an obstacle to growth, and an evaluation of the potential indirect environmental impacts, or secondary effects, of that growth. The PEIR evaluation will address the following:

- Relationship of the 2030 customer purchase requests for water supply to the planned growth and land uses reflected in currently adopted local land use plans (i.e., General Plans)
- Regional growth projections for the service area from the Association of Bay Area Governments and the California Department of Finance
- Secondary effects of growth projected within the service area, including effects on land uses, biological resources, traffic and transportation, air quality, noise, water quality, public services, and water resources

Cumulative Effects

The PEIR will evaluate the overall cumulative effects of implementing the WSIP, including implementation of all of the regional system projects. The analysis will also consider the cumulative effects of implementing the WSIP in conjunction with past, present, and reasonably foreseeable projects sponsored by the SFPUC and others in the vicinity of the regional system facilities.

3.3 Alternatives

CEQA requires that an EIR evaluate a reasonable range of feasible alternatives to the project, or to the location of the project, that would attain most of the basic project objectives, but that could avoid or substantially lessen any of the significant effects of the project, so that the merits of each alternative are compared to those of the proposed program. The PEIR alternatives analysis will identify the potentially significant impacts of the proposed WSIP regional system actions and facility projects. The findings of the PEIR impact analysis will guide the refinement of an appropriate range of alternatives to be evaluated in the PEIR to avoid or substantially lessen identified impacts.

As requested by the SFPUC, the PEIR will present a comparative evaluation of alternative water supply options for normal and dry-year conditions, including increased Tuolumne River diversion and non-Tuolumne River supply sources, such as Delta water transfers and desalination, as well as aggressive conservation and water recycling with no additional, supplemental surface water supplies. The SFPUC is continuing to assess these alternatives to determine their feasibility. The PEIR will identify other water supply options if appropriate. At a program level of detail, the PEIR will focus the alternatives analysis on different water supply source options and quantities as well as system operations and modifications that could reduce or avoid significant impacts associated with the proposed program.

With respect to facility alternatives, the PEIR will identify whether there are significant impacts associated generally with the proposed sites for the regional facilities and, if so, will identify site location alternatives to be considered to avoid or reduce such impacts. The SFPUC has or is completing an evaluation of a range of alternative sites and designs for major regional facility projects in the WSIP. The PEIR will review those project alternatives studies. For projects requiring site-specific EIRs, detailed evaluation of proposed and alternative sites and designs will occur in those subsequent environmental review documents, but the PEIR will provide a program-level review of facility site alternatives.

The PEIR will also include a discussion of impacts associated with the No Program Alternative. The No Program alternative will compare the potential impacts of the WSIP with the impacts that would be expected to occur in the event that the WSIP is not implemented.

SCOPING REPORT

SAN FRANCISCO PUBLIC UTILITIES COMMISSION

Water System Improvement Program
Program Environmental Impact Report

Prepared for:
San Francisco Planning Department

February 2006

Prepared by:
ESA+Orion Joint Venture

In conjunction with
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1.0 Introduction and Background

1.1 Introduction

The San Francisco Planning Department is the lead agency for implementation of California Environmental Quality Act (CEQA) requirements for all projects sponsored by the City and County of San Francisco or conducted within San Francisco. The San Francisco Planning Department is preparing a Draft Program Environmental Impact Report (PEIR) on the San Francisco Public Utilities Commission's (SFPUC's) proposed Water System Improvement Program (WSIP, or program). The Draft PEIR, which will assess the potential impacts of the WSIP on the physical environment of the program area, is being prepared in accordance with CEQA. CEQA requires the preparation of an EIR when a proposed project (in this case, a proposed program) could significantly affect the physical environment.

As part of the Draft PEIR process, the San Francisco Planning Department conducted a public scoping effort in September and October 2005, soliciting comments from agencies and the public to help determine the scope of the Draft PEIR. This report describes the scoping process and summarizes the public and regulatory agencies' comments received during scoping.

1.2 Notice of Preparation

As the first step in the CEQA process, the San Francisco Planning Department published a Notice of Preparation (NOP) on September 6, 2005 announcing the anticipated preparation of the Draft PEIR on the WSIP. The NOP summarized the goals, objectives, and elements of the proposed WSIP, and presented the San Francisco Planning Department's determination that the proposed WSIP may have a significant effect on the environment. The NOP also described the requirement for preparation of an environmental impact report (EIR) on the WSIP under CEQA. The San Francisco Planning Department determined that a Program EIR is the appropriate environmental document for the proposed WSIP. The NOP also described the scoping process and included information on the public scoping meetings. The scoping process, notification procedures, and outcome of the scoping meetings are described below, following a brief description of the WSIP.

1.3 Water System Improvement Program

The proposed WSIP is designed to increase the reliability of the regional water system, which currently provides drinking water to 2.4 million people in San Francisco, San Mateo, Santa Clara, Alameda, and Tuolumne Counties. The program would implement the service goals and system performance objectives established by the SFPUC for the regional water system in the specific areas of water quality, seismic reliability, delivery reliability, and water supply, through the year 2030. The $4.3 billion WSIP includes numerous improvement projects located throughout the regional system to meet the system performance goals and objectives; these project include repairs, upgrades, and, in some cases, expansion of system facilities.

The WSIP as presented in the NOP is based on a draft description issued by the SFPUC in February 2005. The SFPUC has continued to develop and refine the WSIP, issuing revised descriptions of various WSIP elements in October and November 2005 and January 2006. The revised WSIP maintains the same overall program, service goals, and system performance objectives as described in the NOP, and changes are limited to modifications and clarification to individual improvement projects, schedules, and costs. Therefore, although the program refinements were developed subsequent to the publication of the NOP and the scoping process, they likely will not affect the environmental analysis and scope of the Draft PEIR.

2.0 Purpose of the Scoping Process

The purpose of scoping is to solicit input from the public and agencies on the appropriate scope, focus, and content of the Draft PEIR. The San Francisco Planning Department will consider all of the input received during the scoping process in the preparation of the Draft PEIR.

The Draft PEIR will describe the existing environmental conditions of the area that could be affected by the proposed program and evaluate the potential effects of the WSIP in accordance with CEQA. The comments provided by the public and agencies during scoping will help the San Francisco Planning Department identify pertinent issues, methods of analyses, and level of detail that should be addressed in the Draft PEIR. The scoping comments will also provide the basis for developing a reasonable range of feasible alternatives that will be evaluated in the Draft PEIR.

The scoping comments will augment the information developed by the EIR team, which includes specialists in each of the environmental subject areas covered in the EIR. This combined input will result in an EIR scope of work that is both comprehensive and responsive to issues raised by the public and regulatory agencies, and that meets CEQA requirements. The Draft PEIR is scheduled to be available for public comment in 2006.

In addition to facilitating public and regulatory agency input on the scope and focus of the Draft PEIR, scoping allows the San Francisco Planning Department to explain the EIR process to the public and to identify additional opportunities for public comment and public involvement during the EIR process. CEQA requires that the public be informed about the significant environmental effects of a proposed project or program, and the ways in which those environmental effects can be avoided or reduced, before the project or program is approved.

3.0 Notification of Scoping

The scoping period began on September 6, 2005 with the issuance of the NOP. Scoping meetings were conducted on October 5, 6, 11, 18, and 19, 2005, and written comments were accepted through October 24, 2005. Agencies and the public were notified in advance about the availability of the NOP and the scoping meeting dates and locations, and were provided with details on the comment process. The following methods of notification were used:

- **Mailing List**. A mailing list was compiled, including approximately 1,400 contacts for affected federal, state, regional, and local agencies; federal, state, regional, and local elected officials; regional and local interest groups; member agencies of the Bay Area Water Supply and Conservation Agency (BAWSCA); other potentially affected water and irrigation districts; SFPUC Community Advisory Committee members; information repositories; media contacts; and individuals who attended the SFPUC informational meetings in May 2005. The May 2005 PEIR Informational Meeting Summary can be found on the PEIR section of the www.sfwater.org website under "Meetings."
- **NOP and NOP Notice of Availability**. On September 6, 2005, copies of the NOP were distributed via certified mail to 21 affected agencies, and 25 copies were delivered to the State Clearinghouse. Copies of the NOP were also sent via first-class mail to 272 additional organizations and individuals. In addition, a notice of availability of the NOP was distributed via first-class mail to the entire mailing list. (See Appendix A for copies of the NOP and NOP Notice of Availability.)
- **Meeting Notification**. Notice of the scoping meetings was provided to individuals and the general public through the following means (see Appendix B for copies of these materials):
  - **Six-week notice to stakeholders**. The SFPUC emailed advance notice of the meetings to individuals who had requested early notification.
  - **Two-week notice to entire mailing list**. Notifications of the scoping meetings—including information on the WSIP PEIR and the scoping process, and instructions on how to obtain a copy of the NOP and provide public comment—were mailed to the entire 1,400-contact mailing list two weeks prior to the first scoping meeting. The notice included contact information for Spanish and Chinese speakers.
  - **Legal notices**. Notices of the scoping meetings and information on how to obtain a copy of the NOP and provide public comment were placed in the legal classified section of the *Sonora Union Democrat* (9/28/05), *Modesto Bee* (9/29/05), *Fremont Argus* (9/30/05), *San Mateo Times* (10/7/05), and *San Francisco Chronicle* (10/10/05).
  - **Display ads**. Display ads with information about the scoping meetings and information on how to obtain a copy of the NOP and provide public comment were placed in the *Sonora Union Democrat* (9/30/05), *Modesto Bee* (10/1/05), *Fremont Argus* (10/1/05), *San Francisco Examiner* (10/8/05), and *San Mateo Times* (10/8/05).
  - **Community newspapers**. The SFPUC provided text about the scoping meetings to the Clerk of the Board of Supervisors in San Francisco for placement in selected San Francisco community newspapers in September and October 2005.
  - **Website**. A WSIP PEIR webpage was developed and uploaded to the SFPUC's website. Information about the WSIP, the environmental review process, the availability of the NOP, the scoping process, and how to provide public comment was provided in English, Chinese, and Spanish. The website also included the dates and locations of the scoping meetings.

– **Locations to obtain a copy of the NOP**. The NOP notice of availability and full NOP were posted to the project website (www.sfwater.org), as well as the San Francisco Planning Department's website (www.sfgov.org/site/planning). A printed copy of the NOP was also provided to anyone who requested it from the SFPUC or the San Francisco Planning Department.

Table 1 presents an itemized list of mailings.

TABLE 1
NUMBER OF RECIPIENTS ON MAILING LIST FOR NOP AND NOTICE OF SCOPING MEETINGS

Category	Number of NOP Recipients	Number of NOP Notice of Availability Recipients
Federal Agencies/Elected Officials	16	25
State and Regional Agencies/Elected Officials	72	30
Local Agencies/Elected Officials	16	630
Water Agencies/Irrigation Districts	84	25
Special Interest and Environmental Groups	44	120
Businesses or other Organizations	4	95
Media, Libraries, and Individuals	57	182
TOTAL	**293**	**1,107**

4.0 Scoping Meetings

The San Francisco Planning Department held public scoping meetings at five locations along or near the SFPUC's regional water system during October 2005, approximately one month after publication of the NOP, to solicit input from the public on potential impacts of the WSIP, the significance of impacts, the appropriate scope of the EIR, mitigation measures, and potential alternatives to the WSIP. The locations and dates of the meetings, and approximate number of attendees, are listed below.

- Sonora (93 attendees) – Wednesday, October 5, 2005
  Sonora Opera House, 250 S. Washington Street, Sonora, CA
- Modesto (33 attendees) – Thursday, October 6, 2005
  Thomas Downey High School Cafeteria, 1000 Coffee Road, Modesto, CA
- Fremont (62 attendees) – Tuesday, October 11, 2005
  Fremont Main Library, Fukaya Room, 2400 Stevenson Boulevard, Fremont, CA
- Palo Alto (36 attendees) – Tuesday, October 18, 2005
  Palo Alto Arts Center, 1313 Newell Road, Palo Alto, CA
- San Francisco (37 attendees) – Wednesday, October 19, 2005
  Tenderloin Community School, 627 Turk Street, San Francisco, CA

The total attendance for the five scoping meetings was 260 (based on the meeting sign-in sheets), representing a range of interested parties from the Tuolumne River Trust, Sierra Club, whitewater rafting groups, the Bay Area Water Supply and Conservation Agency, local governments, and the

League of Women Voters. A total of 80 participants provided oral comments at the five meetings, and local media attended each meeting. All five scoping meetings were recorded by certified court reporters who provided verbatim written transcripts of the proceedings. The transcripts can be found under Appendix D of this report.

Each meeting included presentations on the environmental review process and the proposed WSIP, followed by a formal public comment period. Attendees interested in presenting verbal comments submitted speaker cards and were allotted three minutes to speak. At all the meetings, there was sufficient time for all interested parties to speak. The meetings concluded with closing remarks. Following the formal meetings, attendees were invited to review project display boards and ask questions of the project team. (See Appendix C for copies of the scoping meeting presentation, handouts, display boards, comment/speaker cards, and sign-in sheets.)

The San Francisco Planning Department also held a scoping meeting for resource agencies on Thursday, November 3 in San Francisco. Representatives from the following agencies attended: U.S. Army Corps of Engineers, San Francisco Bay Regional Water Quality Control Board, California Department of Fish and Game, and the United States Fish and Wildlife Service. Representatives from the U.S. Environmental Protection Agency and National Marine Fisheries Service were invited but were unable to attend. A summary of this meeting can be found in Appendix D.

5.0 Overview of Comments Received

Agencies and members of the public utilized several different methods of providing input: verbal comments during the meetings, written comments submitted during the meetings or sent via U.S. mail, email or fax, and voice mail messages left at the San Francisco Planning Department. Tables 2 and 3 summarize the number of comments submitted via each method, and describe the commenters.

TABLE 2
TOTAL NUMBER OF COMMENTS RECEIVED

Category of Commenter	Number	Description
Written Comments		
Comment Letters	104	This includes 5 distinct form letters counted once each, but submitted multiple times, representing approximately 3,275 individuals or organizations.
Verbal Comments		
Speakers at scoping meetings	75	Two people spoke at multiple meetings
Speakers at resource agency meeting	4	
Voicemail messages left at SF Planning Department[a]	187	

[a] Received as of November 2, 2005.

Verbal comments were made by representatives from government agencies, water agencies, environmental interests, commercial interests, and private citizens. Seventy-five people spoke at the five scoping meetings, including two individuals representing Tuolumne River Trust and Friends of Lake Merced who spoke at multiple meetings. Four representatives from federal and state agencies spoke at the resource agency meeting. Written comments were submitted by federal agencies, state agencies, local agencies, special interests and environmental groups, business groups, and individuals.

Multiple copies of form letters were submitted by the following special interest and environmental groups:

- Working Assets (approximately 2,950 copies)
- Tuolumne River Trust (204 copies)
- Various environmental organizations (more than 100 copies)

TABLE 3
DESCRIPTION OF COMMENTERS

Category of Commenter	Number	Description
Written Comments		
Federal Agencies	1	U.S. Department of the Interior
State Agencies	6	State Water Resources Control Board, Central Valley Regional Water Quality Control Board, California Department of Parks and Recreation, California State Lands Commission, California Department of Health Services, California Department of Transportation (Caltrans)
Local Agencies	23	Representing cities, counties, park districts, water districts, sanitation districts, air districts, fire commission
Special Interest Groups	14	Representing Alameda Creek Alliance, Restore Hetch Hetchy, Tuolumne River Trust, Friends of Lake Merced, Environmental Defense, Audubon Society, Sierra Club, Clean Water Action, and others
Businesses	6	Representing rafting companies, manufacturing business, chamber of commerce
Individuals	45	Representing individuals in San Francisco, San Mateo, Santa Clara, Alameda, San Joaquin, Stanislaus, and Tuolumne Counties, and other areas
Verbal Comments from Public and Resource Agency Scoping Meetings		
Federal Agencies	2	U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service
State Agencies	2	San Francisco Bay Regional Water Quality Control Board, California Department of Fish and Game
Local Agencies	7	Representing cities, water districts, county fire commissioners, county boards of supervisors
Special Interest Groups	37	(same as written comments, above)
Businesses	4	Representing rafting companies
Individuals	18	Representing individuals in San Francisco, San Mateo, Santa Clara, Alameda, San Joaquin, Stanislaus, and Tuolumne Counties

In this summary report, verbal and written comments are divided into two broad categories: 1) CEQA, which includes comments on environmental issues or on potential alternatives to be considered in the PEIR; and 2) WSIP, which includes comments on the program and objectives, specific projects within the program, and SFPUC system operations. Tables 4 through 6 show the approximate number of comments in each subject area, with most letters and speakers providing comments in multiple subject areas.

TABLE 4
APPROXIMATE NUMBER OF COMMENTS BY CEQA SUBJECT AREA

Type of Comment	Written	Verbal at Scoping Meetings
Agricultural Resources	4	2
Air Quality	5	0
Biological Resources – Aquatic	20	10
Biological Resources – Terrestrial	15	10
Cultural Resources	1	1
Geology, Soils, and Seismicity	2	0
Groundwater Resources	10	2
Hazards and Public Safety	2	0
Land Use, Plans, and Policies	15	0
Noise and Vibration	5	0
Public Services and Utilities	10	1
Recreation	15	10
Socioeconomics	20	10
Surface Water Resources / Water Quality	45	15
Traffic, Transportation, and Circulation	10	0
Visual Quality	5	0
Growth-Inducement	10	10
Cumulative Effects	10	5
CEQA Alternatives	145	80
CEQA Process	10	5

TABLE 5
APPROXIMATE NUMBER OF COMMENTS RELATED TO ALTERNATIVES

Recommended Alternative	Number of Written Comments	Number of Verbal Comments at Scoping Meetings	Number of Phone Comments
Conservation and Recycling	75	40	1
Desalination	10	5	
Delta and Other Water Transfers	5	1	
Restore Hetch Hetchy	15	10	1
Other	50	20	

TABLE 6
APPROXIMATE NUMBER OF COMMENTS BY WSIP SUBJECT AREA

Type	General	Goals	System Operation	San Joaquin Pipeline System	Other Specific Projects	Filtration	Water Rights	Permits
Written	15	70	10	40	30	15	20	15
Verbal at Scoping		20	5	20	5	5	2	0
Phone				180				

6.0 Summary of Comments by Subject Area

This section summarizes the issues raised in both verbal and written comments during the scoping period. The comment summaries are presented in two categories: CEQA and WSIP. The issues and topics listed below are not inclusive of all comments received, but rather present a summary of the sentiments expressed by the commenters. The numbers in parenthesis following each comment summary refers to the specific comment letter or verbal commenter, which are listed in Tables 7 and 8 at the end of this section and may be used to cross-reference the source of the comments. (Appendix D also contains the index of commenters as well as all of the commenter correspondence and copies of the scoping meeting transcripts.)

6.1 CEQA Comments

6.1.1 Environmental Review Process

Comments on the CEQA/environmental review process included:

- Role of the National Environmental Policy Act (NEPA) in the PEIR review (Letters 93, 94; Verbal 55)
- Request for additional scoping meetings and extension of comment period (Letters 90, 136; Verbal 11)
- Coordination and interaction of the PEIR process with the SFPUC's ongoing changes in the WSIP (Letter 62; Verbal 3, 63, 67)
- Standards of significance used in EIR analysis (Letter 94)

6.1.2 EIR Issue Areas

Agricultural Resources

Comments on agricultural resources primarily related to reduced Tuolumne River water available for irrigation in the Central Valley (Letters 13, 35, 62; Verbal 27) and use of water conservation in agriculture (Letter 82).

Air Quality

Comments on air quality included:

- Effects of construction emissions, particularly dust (Letters 89, 136)
- Effects of system operations, including air pollution from increased energy use (Letters 60, 89)
- Consistency with air quality regulations and regional air quality plans (Letter 89)

Biological Resources

Comments related to biological resources are divided into two main categories: fishery/aquatic resources and terrestrial vegetation/wildlife.

Comments on fishery and aquatic resources related primarily to potential changes in the extent or quality of fish habitat, changes in fish populations, and effects on special-status fish species due to proposed increases in water diversions and changes in stream flow. Comments included suggestions for habitat protection and enhancement, species recovery, survey methods, and ecological benchmarks (Letters 2, 6, 12, 13, 14, 43, 48, 49, 51, 62, 65, 72, 76, 84, 87, 94, 95, 136; Verbal 7, 28, 44, 47, 49, 72, 73).

Some of the fishery-related comments specifically involve the following water bodies:

- Alameda Creek (Letters 2, 6, 14, 62)
- Tuolumne River to its confluence with San Joaquin River (Letters 43, 62, 72, 87, 94, 95)
- San Joaquin River and Delta, and San Francisco Bay (Letters 49, 51, 94)
- Calaveras Reservoir (Letters 6, 48, 62)
- Pilarcitos Creek (Letter 95)

Comments on terrestrial vegetation and wildlife issues were associated both with impacts from construction and operation of facility improvement projects and with diversion of water from natural water bodies. Specific habitats of concern included riparian, wetland, and vernal pool. Comments included suggestions for habitat protection, restoration and enhancement, watershed management, wildlife and habitat surveys, and potential for altering SFPUC water supply operations. The comments included:

- Changes in the extent of habitat or habitat quality for terrestrial plants and wildlife within the Alameda Watershed, Peninsula Watershed (includes Pilarcitos Creek and reservoir), Tuolumne River watershed, San Francisco Bay, and the Delta (Letters 2, 6, 12, 44, 49, 65, 72, 84, 87, 94, 95, 136; Verbal 7, 16, 28, 44, 47, 65, 72, 73; Resource Agency Meeting Summary)
- Effects on special-status species (Letter 17; Verbal 43; Resource Agency Meeting Summary)
- Loss of mature trees (Letter 71)

Cultural Resources

Comments on cultural resources pertained to Native American and cultural resources buried under water at Hetch Hetchy Reservoir, and the potential to encounter cultural resources during system construction and expansion (Letter 62; Verbal 11).

Geology, Soils, and Seismicity

Comments on geologic issues included the potential for seismic hazards to the water system and/or increased exposure of people and structures to seismic hazards (Letters 47, 62).

Groundwater Resources

Comments on groundwater resource issues and conjunctive use programs included:

- Potential changes in groundwater levels, flows, quality recharge rates, and storage in Tuolumne, Stanislaus, Alameda, Santa Clara, and San Mateo Counties, and in particular the Westside Basin (Letters 52, 58, 62, 93, 94, 95, 141; Verbal 53)
- Indirect effects associated with increased use of groundwater resources, including saltwater intrusion, dewatering impacts, and groundwater infiltration into the water system (Letters 10, 20, 71, 137, 141)

Hazards & Public Safety

Comments were raised about the potential to encounter hazardous materials or waste during construction, the potential to release hazardous materials during construction, or the potential to release hazardous materials in the event of a system failure (Letters 38, 71).

Land Use, Plans, and Policies

Comments on land use issues included:

- Potential for conflict with established local, regional, state, or federal plans, policies, and/or guidelines, including plans related to Yosemite National Park, Stanislaus National Forest, Tuolumne River, San Joaquin River, Golden Gate National Recreation Area, and San Bruno Mountain (Letters 12, 17, 19, 53, 84, 87, 93)
- Compatibility of WSIP with existing or planned land uses at or adjacent to proposed regional facility sites (Letters 14, 84, 136)

Noise and Vibration

Comments on noise or vibration issues included potential effects of construction noise and vibration on adjacent facilities and land uses (Letters 14, 28, 58, 71, 136).

Public Services, Utilities, and Energy

Comments on public services, utilities, or energy included:

- Potential for increases in energy demands, need for expansion of power facilities, effects on SFPUC hydropower generation, and associated effects on power service provided to customers (Letters 60, 68)
- Potential for disruption of services such as water, power, or fire protection during construction, and potential need for relocation of utilities (Letters 14, 39, 64, 93, 97, 137; Verbal 40)

Recreation

Comments on recreational issues included:

- Potential effects on water-based recreational activities on water bodies within and downstream of the regional system, including whitewater rafting on the Upper Tuolumne River and Cherry Creek, boating on the Lower Tuolumne River, and boating/rafting and fishing at various locations (Letters 12, 13, 32, 49, 55, 62, 65, 68, 69, 72, 77, 78, 87, 92, 94, 136; Verbal 6, 7, 28, 44, 72, 73)
- Potential effects on land-based recreation facilities and activities (such as hiking, birding, or camping) in Yosemite and East Bay parks, due to the siting, construction, or operation of proposed facilities, or due to overall program implementation (Letters 14, 17, 54, 60, 62, 77, 136; Verbal 73)

Socioeconomics

Comments on socioeconomic issues included:

- Direct and indirect impacts of WSIP rationing scenarios (Letters 69 and 91)
- Economic impacts of WSIP and increased water diversions from the Tuolumne River to Tuolumne and Stanislaus Counties (Letters 5, 13, 15, 18, 40, 41, 42, 44, 51, 54, 73, 93, 94, 96, 136; Verbal 11, 12, 33)
- Economics of conservation (Letters 49, 95)
- Economics of increased fees (Letter 38; Verbal 37)
- Economic benefits of WSIP (Letter 46)
- Potential for environmental justice issues (Letters 38, 55; Verbal 68)

Surface Water Resources and Water Quality

Comments on surface water resources and water quality included:

- Potential changes in surface water flows and resulting effects on beneficial uses due to proposed increases in diversions (Letters 5, 6, 8, 33, 41, 44, 49, 51, 55, 62, 65, 67, 68, 72, 79, 84, 87, 93, 94, 95, 133, 163; Verbal 10, 13, 16, 32, 33, 55, 66, 67, 72; Resource Agency Meeting Summary). Comments included suggestions for methods of analysis, requests to restore stream flows to affected watersheds, and recommendations for program-level mitigations to enhance stream flows and restore wildlife habitat on the lands and rivers affected by San Francisco's water system. Specific concerns were raised about the following water bodies:

(1) Alameda Creek and watershed (Letters 6, 62; Resource Agency Meeting Summary)

(2) Tuolumne River to its confluence with San Joaquin River, including water transfers affecting the Tuolumne River (Letters 49, 62, 65, 67, 72, 84, 94, 95; Resource Agency Meeting Summary)

(3) Cherry Creek (Letter 62)

(4) Pilarcitos Creek and watershed (Letters 6, 8, 95)

(5) Lake Merced (Letter 72)

(6) Stanislaus River watershed (Letter 93)

(7) San Joaquin River and Delta, and San Francisco Bay (Letters 62, 94)

- Changes in storage in Hetch Hetchy, Calaveras, and Don Pedro Reservoirs (Letter 62)
- Changes in surface water quality, specifically the parameters of temperature, dissolved oxygen, and turbidity, due to WSIP operation or construction activities and associated impacts on habitat, fish, and wildlife. Specific concerns were raised about the following water bodies:

(1) Alameda Watershed (Letters 14, 62)

(2) San Francisquito Creek (Verbal 45)

(3) San Francisco Bay (Letters 13, 60, 72; Verbal 60)

(4) Impact on Delta water quality from Tuolumne diversion (Letters 13, 67, 72, 136; Verbal 7, 28, 44, 73)

(5) Calaveras Reservoir (Letter 62)

(6) San Joaquin River (Letter 62; Verbal 34)

- Alteration of existing drainage patterns and related stormwater management and water quality concerns due to WSIP construction and operation, including changes in point and nonpoint discharges to San Francisco Bay (Letters 10, 14, 60, 71, 138)
- Exposure of people to, and/or increased risk of, flooding, seiche, or tsunami hazards, including tidal flooding (Letters 38, 71; Verbal 45)
- Exposure to flooding below Calaveras, Hetch Hetchy, and Don Pedro Reservoirs (Letter 62)
- Changes in stream/fluvial geomorphology (Letter 72; Resource Agency Meeting Summary)
- Impacts of global warming (Letters 9, 60, 93; Verbal 5, 15, 35)

Traffic, Transportation, and Circulation

Comments on transportation issues included:

- Effects on the regional transportation network or facilities (Letters 14, 71, 135, 136)
- Effects of adding new vehicle trips and contributing to increased traffic congestion during construction and/or operation of proposed facilities, potentially affecting emergency access and causing roadway wear and tear (Letters 28, 58, 71)

Visual Quality

Comments on visual quality included the potential degradation or obstruction of scenic views and designated scenic resources, including impacts on parks, open space, river corridors, and local communities along the regional system (Letters 12, 13, 14, 53, 71).

6.1.3 Other EIR Topics

Growth Inducement

Comments on growth inducement primarily consisted of the relationship between the 2030 customer purchase requests for water supply associated with the WSIP and the planned growth and land uses reflected in currently adopted local land use plans. The comments indicated concern over the dispersal of planned growth beyond San Francisco and the wholesale customers' service area. Concern was also expressed about secondary effects of growth projected within the service area, including effects on land uses, biological resources, traffic and transportation, air quality, noise, water quality, public services, and water resources. In addition, commenters recommended strategies for analyzing growth and for reducing growth-related impacts (Letters 1, 55, 60, 62, 91, 94, 136; Verbal 2, 11, 21, 23, 31, 37, 45, 68, 70).

Cumulative Effects

Comments on the overall cumulative effect of implementing the proposed WSIP were associated with the potential for combined effects of the WSIP and other projects in the vicinity of the regional water system. They also included comments on the combined effects of implementing all the improvement projects in the WSIP. Comments involved the extent of geographic coverage for the cumulative impact analysis, jurisdictions with other projects that could contribute to cumulative effects, and types of analyses to be conducted. Comments also referred to the cumulative impacts of recycling and groundwater and of water conservation, both of which should be addressed in the PEIR (Letters 4, 28, 53, 60, 62, 63, 93, 94; Verbal 12, 31, 37, 64, 71).

Alternatives

Comments on alternatives to be analyzed in the PEIR received during the scoping period included:

- No Program alternative (Letters 91, 94)
- Water Supply alternatives —
  - Desalination (Letters 1, 11, 20, 21, 32, 55, 60, 80, 81, 84, 93, 135; Verbal 20, 52, 54)
  - Increased recycled water and/or conservation on regional and local levels (Letters 1, 2, 3, 4, 5, 6, 8, 11, 12, 13, 20, 21, 23, 25, 27, 30, 31, 33, 35, 37, 38, 40, 41, 42, 43, 44, 45, 48, 50, 51, 52, 55, 57, 59, 60, 62, 65, 68, 70, 72, 75, 76, 78, 81, 82, 84, 85, 90, 91, 93, 94, 95, 96, 135, 136, 142, 143; Verbal 1, 7, 9, 14, 16, 18, 19, 20, 21, 27, 28, 29, 30, 32, 36, 41, 44, 47, 49, 52, 53, 58, 64, 65, 66, 69, 70, 71, 72, 73, 74)

- Water transfers from surface waters other than the Tuolumne River, including Delta water (Letters 1, 67, 68, 84, 136; Verbal 33)
- Stormwater (Letter 26; Verbal 22)
- Groundwater (Letters 38, 62, 68)
- Alternative with different combinations of water sources (Letter 94)

- Operational alternatives —
  - Restore Hetch Hetchy Valley and remove O'Shaughnessy Dam (Letters 5, 54, 55, 62, 68, 72; Verbal 3, 12, 26, 61, 62, 65, 68, 76, 77)
  - Keep Hetch Hetchy dam (Letter 23)
  - Filtration alternative for Hetch Hetchy water (Letters 55, 60, 62, 68, 72, 83, 93, 95,133, 137)
  - Repair leaky pipes alternative (Letters 31, 84)
  - Alternatives that allow increased releases to surface streams (i.e., alternatives that reduce diversions), including releases to the Tuolumne River (Letters 55, 73, 94, 96, 142), increases in rafting flows above existing levels (Letter 55), and releases to Pilarcitos Creek (Letter 95; Verbal 58)
- Alternative program objectives —
  - Alternative that meets only seismic and water quality objectives (Letter 94)
  - Alternative that meets sustainability objective (Letter 94)
  - Alternative that does not fully meet 2030 purchase request (Letters 62, 94, 95)
  - Alternative rationing objective/scenarios (Letters 58, 69, 91)
  - Alternative that meets program goals and objectives, but without maintaining a gravity-driven system (Letter 95)
- Alternative storage —
  - Expansion of downstream and off-stream storage (Letters 68, 95)
  - New Melones Reservoir (Letter 68)
  - Groundwater banking in Central Valley/conjunctive use (Letters 62, 68)
  - Increased storage at Calaveras Reservoir (Letters 54, 62, 91, 94)
  - Use of water stored in other Sierra reservoirs, such as Cherry, Eleanor, or Don Pedro Reservoirs (Letter 54)
- Conveyance alternatives (Letters 68, 95)
  - Intertie between the SFPUC system and the Santa Clara Valley Water District (Letter 61)
  - Pump station at Tesla Portal (Letter 62)
  - Pump station downstream from Holm Powerhouse to pump from Cherry Creek, and large intertie to Cherry Creek (Letter 62)
  - Don Pedro Reservoir to San Joaquin Pipelines (Letter 68)

  - Cherry Reservoir to Mountain Tunnel (Letter 68)
  - South Bay Aqueduct to San Antonio Reservoir (Letter 68)
  - California Aqueduct/Delta Mendota Canal to Hetch Hetchy system (Letter 68)
  - Alternative without San Joaquin Pipeline No. 4 (Letter 73, 94, 96, 142)
  - Alternative that analyzes the maximum conveyance capacity (Letter 95)
- Alternatives with additional facilities projects to meet various objectives (Letter 62)

6.2 WSIP Comments

6.2.1 SFPUC Regional System

Comments on the facilities and operations of the existing SFPUC regional water system included:

- Existing water and hydropower system operations (Letters 6, 8, 55, 62, 93, 133)
- Rafting flows, including releases, timing and volume, and seasons (Letters 55, 62, 92)
- Raker Act and Tuolumne River water rights (Letters 9, 11, 34, 35, 37, 52, 55, 62, 90, 93, 94, 133, 137); other water rights (Letter 58)
- Filtration avoidance, status and stipulations of waiver for Hetch Hetchy water system, and public health/water quality considerations of filtration avoidance (Letters 55, 60, 62, 68, 72, 83, 93, 95,133, 137; Resource Agency Meeting Summary)
- Existing drinking water and water quality regulations, including use of chloramines for disinfection and effect of chloramines on pipe materials. Specific regulations include California Safe Drinking Water Act and Disinfectants and Disinfection By-Product Rule (Letters 52, 56, 60; Verbal 46, 60)
- Operations and status of existing facilities, including San Joaquin pipeline system, Alameda Diversion Dam, releases from Calaveras Reservoir, Sunol Valley Water Treatment Plant, Sunol area water system, Mountain Tunnel, and Groveland facilities (Letters 2, 62, 93, 95, 97, 137)

6.2.2 Program Description

Assumptions

Comments requesting clarification or corrections to assumptions used in WSIP development included:

- Water demand/purchase request assumptions, including comparison with assumptions used for long-term water supply, use of Master Water Sales Contract, consideration of elasticity of demand, and clarification on conservation assumptions (Letters 55, 60, 62, 66, 139)
- Corrections to water demand assumptions (Letters 16, 57)
- Design drought compared to historical hydrology (Letters 62, 133)

Goals and Objectives

- WSIP goals and performance objectives, including clarification on the basis for the goals and objectives, and consistency with SFPUC goals in other documents (Letters 60, 62, 91, 141)
- Add program goal, level of service, and specific components to address sustainability, stewardship, and environmental enhancement (Letters 2, 6, 8, 13, 40, 41, 50, 51, 60, 62, 76, 78, 81, 94; Verbal 63, 69)
- Add program goal for redundancy (Letter 91)
- Basis for 20 percent rationing objective (Letters 57, 91, 139)

Program Elements

- Relationship of program elements, improvement projects, and operational assumptions to goals and clarification on how goals will be met (Letter 91, 94, 141)
- Requests for modeling results (Letters 91, 133)
- Ability of the WSIP to meet the goals and levels of service (Letter 91)
- More information on 10 million gallons per day (mgd) of additional conservation, water recycling, and groundwater supply programs (Letter 91)
- More information on proposed conservation as part of WSIP (Letters 55, 62, 91)
- More information on proposed drought response program, and how proposed drought rationing would be shared among SFPUC customers; more information on how rationing scenario relates to transmission capacity (Letter 91)
- Relationship between water delivery and hydropower generation with proposed program operations (Letter 91)
- Confirm with Modesto and Turlock Irrigation Districts regarding water transfers from those systems as a project element (Letter 133)

Facilities Improvement Projects

Comments on specific facility improvement projects in the WSIP included:

- San Joaquin Pipeline No. 4 (Letters 11, 12, 13, 15, 21, 41, 43, 44, 60, 67, 72, 78, 76, 84,90, 96; Verbal 33)
- Calaveras Dam Replacement (Letters 6, 8,14, 62, 95)
- Alameda Creek Fisheries Enhancement (Letters 2, 6, 95)
- Additional 40 mgd Treated Water Supply (Letter 6)
- Irvington Tunnel/Alameda Siphon (Letter 62)
- Hetch Hetchy Advanced Disinfection (Letters 56, 62)
- Bay Division Pipeline (Letters 62, 71; Verbal 42)
- Slipline Bay Division Pipeline No. 4 (Letters 71, 141)
- East Bay Municipal Utility District-SFPUC Hayward Intertie (Letter 62)
- Bay Division Pipeline Nos. 3 and 4 crossovers (Letter 62)
- Recycled water projects (Letters 58, 62)
- Tesla Portal Disinfection (Letter 56)

- Sunol Valley and Harry Tracy Water Treatment Plant projects (Letter 56, 58)
- Cross connection controls (Letter 56)
- Groundwater project (Letter 58)
- Capuchino Valve Lot (Letter 58)

Agency Coordination/Permits and Approvals

Comments included requests for continued coordination and consultation with agencies and other jurisdictions involved (Letters 14, 17, 39, 53, 58, 61, 63, 64, 66, 67, 69, 71, 89, 91, 93, 133, 137, 138, 139, 141; Resource Agency Meeting Summary). In addition, the Turlock Irrigation District indicated that the Modesto and Turlock Irrigation Districts should be consulted to confirm proposed water transfers as a project element (Letter 133).

Comments on regulatory compliance and permitting issues were received from governmental agencies as well as members of the public. Comments cited rules and regulations to which the WSIP (or some aspect of it) may be subject (Letters 6, 9, 10, 19, 37, 53, 56, 60, 62, 89, 91, 93, 95, 133, 135; Resource Agency Meeting Summary). Regulations, rules, and agreements cited (other than those related to CEQA and NEPA) included:

- Agreement between SFPUC and Golden Gate National Recreation Area
- Pre-1914 appropriative water right/Raker Act
- National Pollutant Discharge Elimination System permit process
- Clean Water Act, Sections 303 (d), 401,404
- Public Resources Code, Section 6327
- Wholesale Regional Water System Security and Reliability Act (AB 1823)
- California Safe Drinking Water Act
- Porter-Cologne Water Quality Control Act, including the Basin Plan
- Encroachment permit from Caltrans
- San Joaquin Valley Air District Air Quality Rules and Regulations
- Agreement between San Francisco and Modesto and Turlock Irrigation Districts regarding the Don Pedro Project and Federal Energy Regulatory Commission (FERC)-order fish flows
- State Water Code Section 73503(b)
- Stage 2 Disinfectant and Disinfection By-Product Rule
- Tuolumne County Ordinance Code 13.20 pertaining to groundwater
- Special Drainage Area 7-1 Drainage Fees
- California Fish and Game Code 5937
- AB 2717 pertaining to statewide Landscape Task Force
- San Joaquin River Agreement, including the Vernalis Adaptive Management Plan
- Wild and Scenic Rivers Act

Schedule

Comments on the WSIP schedule related primarily to scheduling priorities (Letters 1, 15, 38, 56, 64, 68).

TABLE 7
INDEX OF WRITTEN COMMENTS

Letter No.	Commenter	Federal Agency	State Agency	Local Agency	Business	Special Interest	Individual
1, 47	Steve Lawrence						X
2	Jeanine Ishi						X
3	Mike Kellogg						X
4	Michale Fornalski						X
5	Voters Choice Tuolumne County					X	
6	Alameda Creek Alliance					X	
7	R. Inez Baker						X
8	John G. Cordes						X
9	State Water Resource Control Board		X				
10	Central Valley Regional Water Quality Control Board		X				
11	Bob Hackamack						X
12, 87	Echo Wilderness Company				X		
13	Holly Welles						X
14	East Bay Regional Park District			X			
15	Tom Kuhn						X
16	City of Palo Alto			X			
17	California Parks and Recreation, Diablo Valley District		X				
19	California State Lands Commission		X				
20	Darryl Bramlette						X
21	Matthew J. Richardson						X
22	Alexander Gaguine						X
23	Patricia Kopf						X
24	Elaine Gorwan						X
25	Tuolumne County Planning			X			
26	Kay Bargmann						X
27	Scott Lewis						X
28	K. G. Snetsinger, J. C. Etheridge						X
29	George F. Peterson						X
30	Dusten Dennis						X
31	Zephyr Whitewater				X		
32	Marlee G. Powell						X
33	Mary Allen						X
34	Allen Bueb						X
35	Ellie Owen						X

Letter No.	Commenter	Federal Agency	State Agency	Local Agency	Business	Special Interest	Individual
36	Tuolumne Chamber of Commerce				X		
37	Friends of Lake Merced					X	
38	City of East Palo Alto			X			
39	Union Sanitary District			X			
40	Denise D'Anne						X
41	Patrick O'Hefferman						X
42	Stanislaus County Board of Supervisors			X			
43	Working Assets Form Letter					X	
44	Tuolumne River Form Letter					X	
45	Debbie Redmond						X
46	NUMMI Inc.				X		
47	Steve Lawrence Addendum						X
48	John G. H. Cant						X
49	Cathy McGowan						X
50	Christina Murphy						X
51	Nestor Ramirez						X
52	Libby Lucas						X
53	Golden Gate National Recreation Area	X					
54	Mark Palley						X
55	Gerald Meral						X
56	California Department of Health Services		X				
57	Stanford University					X	
58	City of San Bruno			X			
59	Vicki Trabold						X
60	Clean Water Action					X	
61	City of Palo Alto			X			
62	Restore Hetch Hetchy					X	
63	City of Fremont			X			
64	Alameda County Water District			X			
65	Friends of the Tuolumne					X	
66	City of Burlingame			X			
67	Contra Costa Water District			X			
68	Environmental Defense					X	
69	City of Daly City			X			
70	Stephanie Dolrenry						X
71	City of Menlo Park			X			

Letter No.	Commenter	Federal Agency	State Agency	Local Agency	Business	Special Interest	Individual
72	37 Environmental Organizations (same as 99-131)					X	
73	Tuolumne River Trust Form Letter					X	
75	Roger J. Janow						X
76	Olivia Fisher						X
77	Ralph E. Gaarde						X
78	Susan S. Reichle						X
79	Matthew Cutshall						X
80	Fred & Virginia Rush						X
81	Don Wood						X
82	Tom Dickerman						X
83	Glynn Reynolds						X
84	Doris Grinn						X
85	Scott Bryon Cariss						X
87	Echo Wilderness Addendum				X		
89	San Joaquin Valley Air District			X			
90	Linda A. Earhart						X
91	Bay Area Water Supply & Conservation Agency			X			
92	Whitewater Voyages				X		
93	Tuolumne County Board of Supervisors			X			
94	Stanford Legal Clinics					X	
95	Sierra Club					X	
96	Personalized Form Letter					X	
97	Alameda County Fire Commission			X			
98	Watershed Form Letter					X	
132	Stanford Legal Clinics Errata					X	
133	Turlock Irrigation District			X			
135	California Department of Transportation		X				
136	Gordon Hollingsworth						X
137	Groveland Community Services District			X			
138	Alameda County, Zone 7			X			
139	North Coast County Water District			X			
141	Santa Clara Valley Water District			X			
142	Phyllis Stevens						X
143	Dan Hernandez					X	

Note: Some comment numbers are missing due to removal of duplicates or multiples of form letters.

TABLE 8
INDEX OF VERBAL COMMENTS

Verbal Comment No.	First Name	Last Name	Organization Name (if applicable)	Written Comment No.
Speakers at multiple meetings				
v16, v44, v59, v73	Heather	Dempsey	Tuolumne River Trust	44
v1, v63	John	Plummer	Friends of Lake Merced	37
Sonora Meeting				
v1	John	Plummer	Friends of Lake Merced	37
v2	Noah	Hughes		
v3	Sunny	Hendricks	Tuolumne Band of Mc-Wuk Indians	
v4	Jerry	Cadagan	Restore Hetch Hetchy	
v5	Bob	Neuer		
v6	Jerry	Malone	SFPUC	
v7	Monica	Weakley	Tuolumne River Trust	
v8	Ron	Good	Restore Hetch Hetchy	62
v9	Bob	Hackamack	Restore Hetchy Hetchy	11
v10	Doris	Grinn		84
v11	Mark	Thornton	Tuolumne County Board of Supervisors	
v12	Gary W.	Danielson	Sierra Land Use Group. Inc	
v13	Allen	Bueb		34
v14	Ron	Pickup	Citizen	
v15	Rick	Breeze-Martin	Citizen	
v16	Heather	Dempsey	Tuolumne River Trust	44
v17	Steve	Welch	Tuolumne River Outfitters Association	
v18	John	Buckley	CSERC	
v19	Jimmy	Gado	Citizen	
v20	Clint	Weakley		
v21	Peter	Shumway		
v22	Doris	Grinn		
v23	Dolores	Boutin	Resident	
v24	Jerry	Cadagan	Restore Hetch Hetchy	
v25	Ron	Good	Restore Hetch Hetchy	62
Modesto Meeting				
v26	Spreck	Rosekrans	Environmental Defense	68, 72
v27	Danny	Gottlieb	Stanislaus Taxpayers Assoc.	
v28	Patrick	Koepele	Tuolumne River Trust	
v29	Jeani	Ferrari	Tuolumne River Trust	

Verbal Comment No.	First Name	Last Name	Organization Name (if applicable)	Written Comment No.
v30	Elaine	Gorman		24
v31	Carl	Collins		
v32	Sally	Chenault		
v33	Gordon	Hollingsworth		136
v34	Mike	Passalaqua		
Fremont Meeting				
v35	Susan	Gearhart		
v36	Justine	Burt		
v37	Jana	Sokale		
v38	John	Cant	Alameda Creek Alliance	48
v39	James	Gearhart		
v40	Nick	Chapman	Fire Commissioner, Alameda County	97
v41	Jeff	Miller	Alameda Creek Alliance	6
v42	Douglas	Chun	Alameda County Water District	
v43	Alison	Chaiken	Alameda Creek Alliance	
v44	Heather	Dempsey	Tuolumne River Trust	44
v45	Maria	Banico	City of East Palo Alto	134
v46	Wynn	Grich	Alternative Technology of Water Nationally	
v47	Juliet	Lamont	Sierra Club Bay Chapter	
v48	Greg	Scott		
v49	Jeff	Lorelli	Alameda Creek Alliance	
v50	Rich	Cimino	Alameda Creek Alliance	
v51	Maryalice	Bonilla	Sierra Club	
Palo Alto Meeting				
v52	Alice	Ringer	Sierra Club Loma Prieta Chapter	
v53	Libby	Lucas	California Native Plant Society & Sierra Club	52
v54	Chris	Condon	Sierra Club Mac River Trips	
v55	Justin	Pidot	Stanford Environmental Law Clinic	94
v56	Richard	Zimmerman	Sierra Club Loma Prieta Chapter	95
v57	Amy	Fowler	Santa Clara Valley Water District	
v58	Bill	Young	Sierra Club Loma Prieta Chapter	
v59	Heather	Dempsey	Tuolumne River Trust	44
v60	Lillian	Lieberman	CCAC	
San Francisco Meeting				
v61	Joe	Daly	Tuolumne River Outfitters, ECHO Wilderness Co.	12, 87
v62	Craig	Carrozzi		
v63	John	Plummer	Friends of Lake Merced	37

Verbal Comment No.	First Name	Last Name	Organization Name (if applicable)	Written Comment No.
v64	Jennifer	Clary	Clean Water Action	60
v65	Vake	Sigg		
v66	Jeff	Hoffman	Sierra Club	
v67	Dan	Sullivan	Sierra Club, California Water Committee	
v68	Jerry/Gerald	Meral	Tuolumne River Trust	55
v69	Holly	Welles	Tuolumne River Trust	13
v70	Victoria	Hoover	Sierra Club	
v71	Steve	Kreftig	San Francisco League of Conservation Voters	
v72	Cathleen	Sullivan	Sierra Club, San Francisco Bay Chapter	
v73	Heather	Dempsey	Tuolumne River Trust	44
v74	Tom	Radulovich	Transportation for a Livable City	
v75	Keith	Miller	California Canoe & Kayak, Inc.	
v76	Richard	Rypinski	Restore Hetch Hetchy	
v77	Scott	Blume	Tuolumne River Trust	
v78	Kelly	Fergusson	Menlo Park City Council Member, BAWSCA	
v79	Amandeep	Jawa	League of Conservation Voters	
Resource Agency Meeting				
			Multiple federal and state agencies	See meeting summary

Appendix B
WSIP Initial Study Checklist

APPENDIX B

SFPUC Water System Improvement Program Initial Study Checklist – File No. 2005.0159E

A. Project Description

See Chapter 3 of this PEIR for Background and Description of the proposed Water System Improvement Program (WSIP or proposed program).

B. Project Setting

See Chapters 2 and 3 for description of the existing regional water system and regional location of proposed program.

C. Compatibility with Existing Zoning and Plans

	Applicable	*Not Applicable*
Discuss any variances, special authorizations, or changes proposed to the Planning Code or Zoning Map, if applicable.	☐	☒
Discuss any conflicts with any adopted plans and goals of the City or Region, if applicable.	☒	☐
Discuss any approvals and/or permits from City departments other than the Planning Department or the Department of Building Inspection, or from Regional, State, or Federal Agencies.	☒	☐

The program does not propose any variances, special authorizations or changes to the Planning Code or Zoning Map. See Chapter 4, Section 4.2, Plans and Policies, for discussion of plans and policies applicable to WSIP facility improvement projects. See Chapter 5, Section 5.2, Plans and Policies, for discussion of plans and policies applicable to WSIP water supply and system operations. See Chapter 3, Section 3.12, Required Actions and Approvals, for discussion of approvals applicable to the proposed program.

D. Summary of Environmental Effects

The proposed project could potentially affect the environmental factor(s) checked below. The following pages present a more detailed checklist and discussion of each environmental factor.

- ☒ Land Use
- ☒ Aesthetics
- ☒ Population and Housing
- ☒ Cultural Resources
- ☒ Transportation and Circulation
- ☒ Noise
- ☒ Air Quality
- ☐ Wind and Shadow
- ☒ Recreation
- ☒ Utilities and Service Systems
- ☒ Public Services
- ☒ Biological Resources
- ☒ Geology and Soils
- ☒ Hydrology and Water Quality
- ☒ Hazards/Hazardous Materials
- ☒ Mineral/Energy Resources
- ☒ Agricultural Resources
- ☒ Mandatory Findings of Signif.

E. Evaluation of Environmental Effects

Topics:		*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*	*Not Applicable*
1.	**LAND USE AND LAND USE PLANNING—Would the project:**					
a)	Physically divide an established community?	☐	☐	☐	☐	☒
b)	Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☒	☐	☐	☐	☐
c)	Have any substantial impact on the existing character of the vicinity?	☒	☐	☐	☐	☐

Additional Land Use Significance Criterion Evaluated in the PEIR

- Substantially disrupt or displace existing land uses or land use activities

See Chapter 4, Section 4.2, and Chapter 5, Section 5.2, for discussion of plans and policies, for WSIP facilities and water supply/system operations, respectively. See Chapter 4, Section 4.3, Land Use and Visual, for discussion of impact upon the existing character of the vicinity associated with WSIP facility improvement projects. This issue (criterion c) is not discussed in Chapter 5 because the proposed water supply option and system operations would not affect the existing character of the vicinity. The program would not physically divide established communities; therefore, criterion (a) is not discussed.

Topics:	*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*	*Not Applicable*
2. AESTHETICS—Would the project:					
a) Have a substantial adverse effect on a scenic vista?	☒	☐	☐	☐	☐
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and other features of the built or natural environment that contribute to a scenic public setting?	☒	☐	☐	☐	☐
c) Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☐	☒	☐	☐
d) Create a new source of substantial light or glare that would adversely affect day or nighttime views in the area or substantially impact other people or properties?	☐	☒	☐	☐	☐

See Chapter 4, Sections 4.3 and 4.16, Land Use and Visual, for discussion of visual quality effects of the WSIP facility improvement projects. See Chapter 5, Sections 5.3.8, 5.4.7 and 5.5.7, for discussion of visual quality effects of the proposed water supply option and system operations. However, criterion (d) is not discussed in Chapter 5 because the proposed water supply option and system operations would not create a new source of substantial light or glare that would adversely affect views in the area or substantially impact other people or properties.

Topics:	*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*	*Not Applicable*
3. POPULATION AND HOUSING—Would the project:					
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☒	☐	☐	☐	☐
b) Displace substantial numbers of existing housing units or create demand for additional housing, necessitating the construction of replacement housing?	☐	☐	☐	☐	☒
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☐	☒

See Chapter 7, Growth Inducement Potential, for discussion of program effects on population growth, including direct and indirect effects. The program would not displace existing housing units, create demand for additional housing or displace people; therefore, criteria (b) and (c) are not discussed.

Topics:		*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*	*Not Applicable*
4.	**CULTURAL RESOURCES— Would the project:**					
a)	Cause a substantial adverse change in the significance of a historical resource as defined in CEQA Guidelines Section 15064.5, including those resources listed in Article 10 or Article 11 of the San Francisco Planning Code?	☒	☐	☐	☐	☐
b)	Cause a substantial adverse change in the significance of a unique archaeological resource pursuant to Section 15064.5?	☐	☒	☐	☐	☐
c)	Directly or indirectly destroy a unique paleontological resource or site or unique geological feature?	☐	☒	☐	☐	☐
d)	Disturb any human remains, including those interred outside of formal cemeteries?	☐	☒	☐	☐	☐

See Chapter 4, Sections 4.7 and 4.16, Cultural Resources, for discussion of cultural resources effects of the WSIP, including effects of the proposed water supply option and system operations. Therefore, this resource area is not discussed in Chapter 5.

Topics:		*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*	*Not Applicable*
5.	**TRANSPORTATION AND CIRCULATION— Would the project:**					
a)	Cause an increase in traffic that is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume-to-capacity ratio on roads, or congestion at intersections)?	☐	☒	☐	☐	☐
b)	Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways (unless it is practical to achieve the standard through increased use of alternative transportation modes)?	☐	☐	☐	☐	☒

Topics:		*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*	*Not Applicable*
c)	Result in a change in air traffic patterns, including either an increase in traffic levels, an obstruction to flight, or a change in location, that results in substantial safety risks?	☐	☐	☐	☐	☒
d)	Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses, or interfere with existing transportation systems (including vehicular, pedestrian, and bicycle networks), causing substantial alterations to circulation patterns or major traffic hazards.	☐	☒	☐	☐	☐
e)	Result in inadequate emergency access?	☐	☒	☐	☐	☐
f)	Result in inadequate parking capacity that could not be accommodated by alternative solutions?	☐	☒	☐	☐	☐
g)	Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., conflict with policies promoting bus turnouts, bicycle racks, etc.), or cause a substantial increase in transit demand that cannot be accommodated by existing or proposed transit capacity or alternative travel modes?	☒	☐	☐	☐	☐

See Chapter 4, Sections 4.8 and 4.16, Traffic, Transportation, and Circulation, for discussion of traffic effects of WSIP facility improvement projects. The level of service standards established by county congestion management agencies and documented in congestion management plans are intended to regulate long-term traffic impacts due to future development, and do not apply to temporary construction projects; no further consideration of this criterion (b) is required. The program would not have the potential to change air traffic patterns at any airport in the area; therefore, criterion (c) is not discussed.

This resource area is not discussed in Chapter 5 because the proposed water supply option and system operations would not affect traffic, transportation or circulation.

Topics:		*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*	*Not Applicable*
6.	**NOISE—Would the project:**					
a)	Expose people to or generate noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☒	☐	☐	☐	☐
b)	Expose people to or generate excessive groundborne vibration or groundborne noise levels?	☒	☐	☐	☐	☐

Topics:	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact	Not Applicable
c) Create a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☒	☐	☐
d) Create a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☒	☐	☐	☐	☐
e) For a project located within an area covered by an airport land use plan (or, where such a plan has not been adopted, within two miles of a public airport or public use airport), expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☐	☒
g) Be substantially affected by existing noise levels?	☐	☐	☐	☐	☒

See Chapter 4, Sections 4.10 and 4.16, Noise and Vibration, for discussion of noise and vibration effects of WSIP facility improvement projects. The WSIP facilities are not located within an airport land use plan area, nor in the vicinity of a private airstrip, therefore criterion (e) and (f) are not discussed. The WSIP facilities are not a noise-sensitive use; therefore, criterion (g) is not discussed.

This resource area is not discussed in Chapter 5 because the proposed water supply option and system operations would not affect noise and vibration.

Topics:	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact	Not Applicable
7. AIR QUALITY Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. **Would the project:**					
a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☒	☐	☐
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☒	☐	☐	☐
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in nonattainment under an applicable federal or state ambient air quality standard (including releasing emissions that exceed quantitative thresholds for ozone precursors)?	☒	☐	☐	☐	☐

Topics:		*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*	*Not Applicable*
d)	Expose sensitive receptors to substantial pollutant concentrations?	☐	☒	☐	☐	☐
e)	Create objectionable odors affecting a substantial number of people?	☐	☐	☒	☐	☐

Additional Air Quality Significance Criteria Evaluated in the PEIR

- Conflict with the state goal of reducing Greenhouse Gas emissions in California to 1990 levels by 2020, as set forth by the timetable established in AB 32, California Global Warming Solutions Act of 2006

See Chapter 4, Sections 4.9 and 4.16, Air Quality, for discussion of air quality effects of WSIP facility improvement projects. This resource area is not discussed in Chapter 5 because the proposed water supply option and system operations would not affect air quality.

Topics:		*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*	*Not Applicable*
8.	**WIND AND SHADOW—Would the project:**					
a)	Alter wind in a manner that substantially affects public areas?	☐	☐	☐	☐	☒
b)	Create new shadow in a manner that substantially affects outdoor recreation facilities or other public areas?	☐	☐	☐	☐	☒

The program would have no effect on wind patterns since proposed facilities would either be located below ground; be located in, adjacent to or replace existing structures; or have a maximum height of 40 feet but not in a location that affects public areas. In addition, the program would not create new shadows in a manner that would affect recreational facilities (discussed separately under Recreation) or other public areas due to the maximum height and location of proposed structures. This resource area is not discussed in either Chapter 4 or 5.

Topics:	*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*	*Not Applicable*
9. RECREATION—Would the project:					
a) Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facilities would occur or be accelerated?	☐	☐	☐	☐	☒
b) Include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment?	☐	☐	☐	☐	☒
c) Physically degrade existing recreational resources?	☐	☒	☐	☐	☐

Additional Recreation Significance Criteria Evaluated in the PEIR

- Remove or damage existing recreational resources directly
- Cause environmental impacts (such as air quality or noise effects) that would indirectly result in deterioration in the quality of the recreational experience
- Disrupt access to existing recreation facilities (which would divide a community from some of the established amenities used by its members)

See Chapter 4, Sections 4.12 and 4.16, Recreational Resources, for discussion of effects of WSIP facility improvement projects on recreational resources, and see Chapter 5, Sections 5.3.8, 5.4.7, and 5.5.7 for discussion of effects of the proposed water supply option and system operations on recreational resources. The program would not increase the use of existing neighborhood and regional parks or require the construction/expansion of recreational facilities; therefore, criteria (a) and (b) are not discussed.

Topics:	*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*	*Not Applicable*
10. UTILITIES AND SERVICE SYSTEMS—Would the project:					
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☐	☐	☒
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☒	☐	☐	☐

Topics:	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact	Not Applicable
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☐	☒
d) Not have sufficient water supply available to serve the project from existing entitlements and resources, or require new or expanded water supply resources or entitlements?	☐	☒	☐	☐	☐
e) Result in a determination by the wastewater treatment provider that would serve the project that it has inadequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☐	☐	☒
f) Be served by a landfill with insufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☒	☐	☐	☐
g) Be out of compliance with federal, state, and local statutes and regulations related to solid waste?	☐	☒	☐	☐	☐

Additional Utilities and Service Systems Significance Criterion Evaluated in the PEIR

- Disrupt operation of or require relocation of regional or local utilities

See Chapter 4, Sections 4.11 and 4.16, Public Services and Utilities, for discussion of effects of WSIP facility improvement projects on services and utilities. This resource area is not discussed in Chapter 5 because the proposed water supply option and system operations would not affect public services and utilities.

The program would result in improvements and possibly expansion of existing water facilities (part of criterion b) as part of the increased system reliability objectives of the WSIP; these impacts are discussed in Chapters 4, 5 and 7 of the PEIR. The existing entitlements are discussed in Chapter 2, Section 2.5.1, Existing Water Rights and Entitlements, and new or expanded water supply resources are described in Chapter 3 as part of the proposed water supply option (criterion d). The effects of the proposed water supply option are discussed in Chapters 5 and 7.

The program would have no effect on wastewater treatment requirements (criterion a) The program would not require construction or expansion of wastewater facilities (other part of criterion b), and any increase in wastewater demand associated with implementation of WSIP is addressed under secondary impacts of growth in Chapter 7 (criterion e). The program would not require construction or expansion of existing storm drainage facilities (criterion c). Therefore, these criteria are not further discussed.

Topics:	*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*	*Not Applicable*
11. PUBLIC SERVICES— Would the project:					
a) Result in substantial adverse physical impacts associated with the provision of, or the need for, new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any public services such as fire protection, police protection, schools, parks, or other services?	☐	☐	☐	☐	☒

The program would not directly affect the need for public services or governmental facilities, including fire protection, police protection, schools, parks or other services. Chapter 7, Section 7.4, addresses potential changing needs for these services and facilities as a result of the indirect or secondary effects of growth. The direct effects of WSIP facility project construction and/or operation on neighboring schools are discussed in Chapter 4, Section 4.3, under Land Use; and effects on parks are discussed in Chapter 4, Section 4.12, Recreational Resources. Otherwise, this resource area is not discussed further in Chapters 4 or 5.

Topics:	*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*	*Not Applicable*
12. BIOLOGICAL RESOURCES— Would the project:					
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☒	☐	☐	☐
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☒	☐	☐	☐
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☒	☐	☐	☐

Topics:	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact	Not Applicable
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☒	☐	☐	☐
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☒	☐	☐	☐
f) Conflict with the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or state habitat conservation plan?	☐	☒	☐	☐	☐

Additional Biological Resources Significance Criterion Evaluated in the PEIR

- Have a substantial adverse effect, either directly or through habitat modification, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the CDFG, NMFS, or USFWS.
- Conflict with the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or state habitat conservation plan, including the *Tuolumne Wild and Scenic River Management Plan.*

See Chapter 4, Sections 4.6 and 4.16, Biological Resources, for discussion of effects of WSIP facility improvement projects on biological resources, and see Chapter 5, Sections 5.3.6, 5.3.7, 5.4.5, 5.4.6, 5.5.5, and 5.5.6 for discussion of effects of the proposed water supply option and system operations on fisheries and other biological resources.

Topics:	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact	Not Applicable
13. GEOLOGY AND SOILS— Would the project:					
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:					
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? (Refer to Division of Mines and Geology Special Publication 42.)	☐	☐	☒	☐	☐
ii) Strong seismic ground shaking?	☐	☐	☒	☐	☐

Topics:	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact	Not Applicable
iii) Seismic-related ground failure, including liquefaction?	☐	☐	☒	☐	☐
iv) Landslides?	☐	☐	☒	☐	☐
b) Result in substantial soil erosion or the loss of topsoil?	☐	☐	☒	☐	☐
c) Be located on a geologic or soil unit that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?	☐	☒	☐	☐	☐
d) Be located on expansive or corrosive soil, creating substantial risks to life or property?	☐	☒	☐	☐	☐
e) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?	☐	☐	☐	☐	☒
f) Substantially change the topography or any unique geologic or physical features of the site?	☐	☐	☒	☐	☐

Additional Geology and Soils Significance Criteria Evaluated in the PEIR

- Substantially change the topography such that ecological, hydrologic, or aesthetic functions are adversely affected, or substantially change any unique geologic or physical features of the site or area
- Potentially result in onsite or offsite land subsidence that would cause substantial structural damage, increased flooding, or altered drainage patterns

See Chapter 4, Sections 4.4 and 4.16, Geology, Soils and Seismicity, for discussion of geologic/seismic effects of WSIP facility improvement projects. This resource area is generally not discussed in Chapter 5 because the proposed water supply option and system operations would not affect soils and seismicity; however, geomorphology effects on stream channels are discussed in Chapter 5, Sections 5.3.2, 5.4.2, and 5.5.2. None of the WSIP projects are expected to construct septic tanks or alternative wastewater disposal facilities; therefore, criterion (e) is not discussed.

Topics:	*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*	*Not Applicable*
14. HYDROLOGY AND WATER QUALITY—Would the project:					
a) Violate any water quality standards or waste discharge requirements?	☐	☒	☐	☐	☐
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level that would not support existing land uses or planned uses for which permits have been granted)?	☐	☒	☐	☐	☐
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation on or off the site?	☐	☐	☒	☐	☐
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on or off the site?	☐	☐	☒	☐	☐
e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☒	☐	☐	☐
f) Otherwise substantially degrade water quality?	☐	☒	☐	☐	☐
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other authoritative flood hazard delineation map?	☐	☐	☐	☐	☒
h) Place within a 100-year flood hazard area structures that would impede or redirect flood flows?	☐	☒	☐	☐	☐
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☐	☐	☒
j) Expose people or structures to a significant risk of loss, injury or death involving inundation by seiche, tsunami, or mudflow?	☐	☐	☐	☐	☒

Additional Hydrology and Water Quality Significance Criteria Evaluated in the PEIR

- Result in substantial adverse changes in operations or substantial decreases in water deliveries for water users, as measured by significant changes in reservoir storage, timing or rate of river flows, or water quality

- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of the stream or river, in a manner that would result in substantial erosion or siltation or adversely affect the ecological, hydrologic or aesthetic functions of the site or area
- Substantially alter stream flows such that they are outside the range of pre-project (pre-WSIP) conditions and result in adverse hydrologic effects
- Substantially alter stream flows such that they are outside the range of pre-project (pre-WSIP) conditions and result in substantial hydrologic changes
- Substantially impair a water body's ability to support its designated beneficial uses, as specified by the State Water Resources Control Board
- Substantially impair a water body's ability to support beneficial uses designated by the State Water Resources Control Board or Regional Water Quality Control Board
- Violate any water quality standards or otherwise substantially degrade water quality

See Chapter 4, Section 4.5, Hydrology and Water Quality, for discussion of hydrology and water quality effects of WSIP facility improvement projects. See Chapter 5, Sections 5.3 (Tuolumne River System and Downstream Water Bodies), Section 5.4 (Alameda Creek System and Related Resources), Section 5.5 (Peninsula Watershed Resources), and Section 5.6 (Westside Basin Groundwater Resources) for discussion of effects of the proposed water supply option and system operations on hydrology and water quality. The program would not involve the construction of housing; therefore, criterion (g) is not discussed. The program would not expose people to a significant flood risk or inundation by seiche, tsunami, or mudflow; therefore, criterion (i) and (j) are not discussed.

Topics:		*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*	*Not Applicable*
15.	**HAZARDS AND HAZARDOUS MATERIALS Would the project:**					
a)	Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☒	☐	☐
b)	Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☒	☐	☐	☐
c)	Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within 1/4 mile of an existing or proposed school?	☐	☐	☒	☐	☐

Topics:		*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*	*Not Applicable*
d)	Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would create a significant hazard to the public or the environment?	☐	☒	☐	☐	☐
e)	For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☐	☒
f)	For a project within the vicinity of a private airstrip, result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☐	☒
g)	Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☒	☐	☐	☐
h)	Expose people or structures to a significant risk of loss, injury or death involving fires?	☐	☐	☒	☐	☐

See Chapter 4, Sections 4.14 and 4.16, Hazards, for discussion of hazards effects of WSIP facility improvement projects. This resource area is not discussed in Chapter 5 because the proposed water supply option and system operations would not involve use or exposure to hazards. The program would not be located within an airport land use plan or within the vicinity of a private airstrip; therefore, criteria (e) and (f) are not discussed. Section 4.8, Traffic, Transportation, and Circulation discusses access for emergency response vehicles with respect to emergency response plans or emergency evacuation plans (criterion g).

Topics:		*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*	*Not Applicable*
16.	**MINERAL AND ENERGY RESOURCES—Would the project:**					
a)	Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	☐	☒
b)	Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	☐	☐	☐	☐	☒
c)	Encourage activities that result in the use of large amounts of fuel, water, or energy, or use these in a wasteful manner?	☐	☒	☐	☐	☐

Additional Mineral and Energy Significance Criteria Evaluated in the PEIR

- Reduce the production of renewable energy

See Chapter 4, Sections 4.15 and 4.16, Energy Resources, and Chapter 5, Section 5.3.9, for discussion of energy effects of the WSIP. Mineral resources in the WSIP area consist primarily of fuel resources and industrial minerals (e.g., aggregate, sand and gravel, and clay). Although access to these resources could be lost due to the conversion of lands underlain by these resources to other uses, conversion of land within close proximity to the resources, or due to changes in land ownership (e.g., non-renewal of a lease where active mining is occurring), none of the WSIP projects would result in a loss of mineral resources or make them inaccessible. Furthermore, construction of pipelines and other public engineering projects is excluded from Surface Mining and Reclamation Act regulation. Therefore, impacts related to the loss of mineral resources would be not applicable to WSIP projects and are not discussed further in Chapters 4 or 5.

Topics:	*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*	*Not Applicable*
17. AGRICULTURE RESOURCES In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Department of Conservation as an optional model to use in assessing impacts on agriculture and farmland. **Would the project:**					
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance, as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Department of Conservation, to non-agricultural use?	☐	☒	☐	☐	☐
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☒	☐	☐	☐
c) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland of Statewide Importance, to non-agricultural use?	☐	☒	☐	☐	☐

See Chapter 4, Sections 4.13 and 4.16, Agricultural Resources, for discussion of the effects of the WSIP facility improvement projects on agricultural resources. This resource area is not discussed in Chapter 5 because the proposed water supply option and system operations would not directly affect agricultural resources, although the program effects on water supplies for agricultural use are discussed in Chapter 5.

Topics:	*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*	*Not Applicable*
18. MANDATORY FINDINGS OF SIGNIFICANCE—Would the project:					
a) Have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, or substantially reduce the number or restrict the range of an endangered, rare or threatened species.	☒	☐	☐	☐	☐
b) Have impacts that would be individually limited, but cumulatively considerable? (“Cumulatively considerable” means that the incremental effects of a project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.)	☒	☐	☐	☐	☐
c) Have environmental effects that would cause substantial adverse effects on human beings, either directly or indirectly?	☒	☐	☐	☐	☐

See Chapters 4, 5, 6, and 7 for complete discussion of effects of WSIP on the physical environment.

F. Mitigation Measures and Improvement Measures

See Chapter 6 for description of mitigation measures. No improvement measures are recommended for the WSIP.

Appendix C
WSIP Facility Improvement Project Information

APPENDIX C
WSIP Facility Improvement Project Information

TABLE C.1
SFPUC WSIP PROJECT INFORMATION – DESCRIPTION OF PROJECT FACILITIES[1]

Project Number	Project Name	Description	PHYSICAL STRUCTURES											PHYSICAL REQUIREMENTS			
			Pipeline (miles)	Tunnel (miles)	Storage/ Basin (square feet)	Treatment (square feet)	Vaults/ Valve Houses	Pump Station	Other Facilities	Number of Structures	Maximum Height (feet)	Maximum Depth (feet)	Additional Sites for Borrow or Disposal?	Existing Land Use	Land Acquisition Required?	Temporary Staging Areas	Power Available?
SJ-1	Advanced Disinfection	This project would provide for the planning, design and construction of a new advanced disinfection facility for the Hetch Hetchy water supply to comply with the new federal drinking water regulatory requirements contained in the Long Term-2 Enhanced Surface Water Treatment Rule. This regulation is designed to provide treatment for the parasite *Cryptosporidium*. The project is in the planning phase and the SFPUC is evaluating applicable technologies and possible locations to identify the most technologically sound and cost-effective alternative. In addition, the project includes planning and conceptual engineering for providing advanced disinfection facilities at the Sunol Valley and Harry Tracy WTPs. This project may be combined with the Tesla Portal Disinfection project (SJ-5) along with portal modifications and the need for project SJ-2 may be affected by the location and technology selected for this project.	0.2	0	0	20,000	4	0	None	1	35'	20'	No	At Tesla Portal, a caretaker's residence, two valve houses, & chlorination facility	No, except land possibly needed for associated power requirements	On-site	Yes, but potentially need additional power from Hetch Hetchy
SJ-2	Lawrence Livermore Supply Improvements	This project includes design and construction of treatment upgrades for the water supplied to the Lawrence Livermore Laboratory. The project would construct water treatment facilities from the Thomas Shaft of the Coast Range Tunnel. An advanced disinfection facility planned at an upstream location (SJ-1) could affect project design.	0	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	Undeveloped	No	TBD	Yes
SJ-3	San Joaquin Pipeline System	The preferred project would generally be located within the existing San Joaquin Pipeline (SJPL) right-of-way and would include: • Construction of a new 6.4 mile long, 86" diameter fourth SJPL parallel to the existing three pipelines at the east end of the pipelines, starting at Oakdale Portal, and associated portal modifications; • Construction of two additional crossover facilities between the San Joaquin Pipelines within the existing right-of-way, both located in Stanislaus County with one about 20 miles east of Modesto and the other about 15 miles west of Modesto and improvements at the existing Roselle Crossover; • Construction of a new 10-mile long, 86-inch diameter fourth SJPL parallel to the existing three pipelines at the west end of the pipelines ending at Tesla Portal. This project would provide additional facilities to upgrade the hydraulic capacity of the SJPL system to 314 mgd (and a 271 mgd average during system maintenance when a pipeline segment must be taken out of service) and provide redundancy for pre-stressed concrete cylinder pipe for reliability. Note: While the current preferred alternative would construct 16 miles of pipeline facilities, depending on the results of the conditions assessment of the existing pipelines, as much as 22 miles of pipeline facilities could be constructed.	16.4	TBD where required for pipeline under-pass of roads, other utilities or environ-mentally sensitive areas	0	0	2	0	New valve houses and improvements at Oakdale Portal and Tesla Portal; two new crossover facilities.	NA	12' deep for 90" pipe assumes max 4' cover (may need to be revised)	Trench: 11' wide, 12' deep (assumes maximum 4' cover over 86" pipe	Clean spoils may be stockpiled on ROW (so as not to block irrigation) and adjacent property owners may be allowed to move spoils to adjacent agricultural land if they so desire and it is agreeable to City.	Agriculture and golf course uses within SFPUC ROW; residential uses adjacent to SFPUC ROW.	No, except land possibly needed for associated power requirements and temporary construction easements.	Additional ROW might be needed temporarily for staging.	TBD (depends on location of 2 proposed crossover facilities)

TABLE C.1 (Continued)
SFPUC WSIP PROJECT INFORMATION – DESCRIPTION OF PROJECT FACILITIES[1]

Project Number	Project Name	Description	PHYSICAL STRUCTURES											PHYSICAL REQUIREMENTS			
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SJ-4	Rehabilitation of Existing San Joaquin Pipelines	Reconditioning/rehabilitation of the existing SJPL pipelines. There are three existing pipelines, each 47.7 miles long, extending from Oakdale Portal to Tesla Portal: • SJPL-1, riveted steel pipe 56- to 72-inch internal diameter; • SJPL-2, reinforced concrete pipe and welded steel pipe, 61- to 62-inch internal diameter; • SJPL-3, pre-stressed concrete cylinder pipe and welded steel pipe, 78-inch internal diameter.	47.7 miles long each	0	0	0	SJPL – 2 Throttling Stations 1 and 2 Roselle Crossover San Joaquin River Valve House	0	None	0	NA	NA	No	Pipelines (within existing SJPL right-of-way) and routed through: open grasslands (sometimes used for grazing), City of Modesto, orchards, Tracy Golf Course. Conditions assessment and reconditioning activities could also affect public recreation areas in Modesto (linear parks with walking and bike paths).	No	No	No
SJ-5	Tesla Portal Disinfection Station	This project includes the planning, design, and construction of new disinfection facilities for the Hetch Hetchy water supply. The project would replace and upgrade the existing disinfection facilities at the Tesla Portal Disinfection Facility to meet current seismic, safety/fire, and building code standards. The preferred project would include construction of: • New control building and storage room; • Pump houses; • Chemical storage tanks and feed equipment and sampling systems; • Emergency generator, including primary and standby power supplies; • Access road. It should be noted that the design and location of the Advanced Disinfection project (SJ-1), would affect the design and location of this project.	0	0	0	6,000	0	0	Administration building (control room and offices) and pump houses (low horsepower pumps for domestic water and fire safety).	1	30'	15'	TBD	A caretaker's residence, two valve houses, and chlorination facility.	No except land possibly needed for associated power requirements	Yes	Yes
		Sub-totals	**64+**	**0**	**0**	**26,000**	**6+**	**0**		**2**	**30 to 35'**	**11 to 20'**					
SV-1	Alameda Creek Fishery Enhancement	This project would recapture the water released as part of the Calaveras Dam project (SV-2) and return it back to the regional system for use. A number of structural and non-structural recovery alternatives are under consideration including: a water recapture facility downstream of the Sunol Valley WTP, conjunctive groundwater use, horizontal collector wells, or other groundwater recovery systems yet to be defined. Other alternative designs for this project could be developed. If a structural alternative involving construction of a recapture facility is selected, the recapture facility would be located at the downstream end of the reach of Alameda Creek between the lower Sunol Valley and the confluence with Arroyo de la Laguna. As an alternative to the recapture facility, the SFPUC may coordinate with other water agencies to develop and implement other means of recapturing fishery enhancement flows consistent with the 1997 CDFG MOU.	TBD	0	0	0	0	TBD	Number of pumps depends on the alternative, ranging from 1 pump station to multiple pumps required.	TBD	TBD	TBD	TBD	Alternatives would be located in or near Alameda Creek downstream of Sunol Valley WTP.	No	TBD	TBD
SV-2	Calaveras Dam Replacement	This project would provide for the planning, design, and construction of a replacement dam at the Calaveras Reservoir to meet seismic safety requirements. The new dam would provide for a reservoir with the same storage capacity as the original reservoir (96,800 acre-feet), but the replacement dam would be designed to accommodate enlargement of the dam in the future. The preferred project would include construction of: • New earth-fill dam;	0	0	62,508,600	0	2	0	1. Zoned Earth-Fill Dam with Open Chute Spillway; 2. Various instrumentation; 3. Calaveras Road Upgrades (TBD).	3 (Dam, Spillway, Inlet Tower)	220' (foundation to dam crest)	NA	7 borrow areas (totaling over 222 acres)	Existing Calaveras Dam	No	Four staging areas: (1) north of the replacement dam; (2) south of the existing dam at Watershed Keeper's residence;	Yes

TABLE C.1 (Continued)
SFPUC WSIP PROJECT INFORMATION – DESCRIPTION OF PROJECT FACILITIES[1]

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SV-2 (cont.)	Calaveras Dam Replacement	• New intake tower and new outlet valve for water releases for instream flow requirements; • New or rehabilitated outlet works for seismic safety and improved operations and maintenance. • New bypass structure at the Alameda Creek Diversion Dam As part of this project, Calaveras Reservoir would be operated to release up to 6,300 afy (5.5 mgd) of water to Alameda Creek in support of fisheries in compliance with the 1997 CDFG MOU. When flow is available in Alameda Creek, releases would be made through the proposed bypass structure at the Alameda Creek Diversion Dam and would be supplemented as necessary with releases from Calaveras Dam.														(3) dam access road at Calaveras Road; (4) top of the existing dam.	

TABLE C.1 (Continued)
SFPUC WSIP PROJECT INFORMATION – DESCRIPTION OF PROJECT FACILITIES[1]

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			Pipeline (miles)	Tunnel (miles)	Storage/ Basin (square feet)	Treatment (square feet)	Vaults/ Valve Houses	Pump Station	Other Facilities	Number of Structures	Maximum Height (feet)	Maximum Depth (feet)	Additional Sites for Borrow or Disposal)	Existing Land Use	Land Acquisition Required?	Temporary Staging Areas	Power Available?
SV-3	Additional 40-mgd Treated Water Supply	This project would provide for the planning, design, and construction of an additional 40 mgd of treatment capacity at the Sunol Valley WTP. The project would increase the sustainable capacity of the Sunol Valley WTP to 160 mgd. The planning level study will include studies to evaluate treatment operations protocol and an alternative treatment process. The preferred project would include construction of: • New flocculation and sedimentation system; • Upgrade of existing filters or addition of three new filters and a new flow distribution chamber; • New filtered water and backwash piping; • New chemical feed and piping system; • Upgrade of the electrical supply system; • Miscellaneous piping, valves, and mechanical and electrical work; • Approximately 2 miles of 78-inch diameter pipe to connect to the Alameda Siphons or Irvington Tunnel.	1.5 to 2	0	42,000	0	0	0	Misc. piping, valves, chemical feed, electrical supply upgrades, and drainage piping system. Upgrade of electrical supply system (e.g. the Calaveras Substation)	1	10'	TBD	TBD	Undeveloped SFPUC lands immediately adjacent to Sunol WTP facilities	No, but may need easement across private property.	TBD	Yes
SV-4	New Irvington Tunnel	This project would construct a new tunnel parallel to and just south of the existing Irvington Tunnel to convey water from the Hetch Hetchy system and the Sunol Valley WTP to the Bay Area. The new tunnel would be a redundant water transmission facility to the existing Irvington Tunnel. The preferred project would include construction of: • New 18,200-foot long, 10-foot diameter tunnel; • New portal at the east end adjacent to the existing Alameda West Portal in the Sunol Valley with connections to the existing and proposed new siphon; • New portal at the west end adjacent to the existing Irvington Portal in Fremont with connections and to the existing and proposed new pipeline (BD-1); • Valves and equipment to control and monitor flows; • Modifications to the existing Alameda West and Irvington Portals.	0.0	3.4	0	0	9-12 (reinforced concrete vault across fault, Irvington Portal crossover valve vault, etc.)	0	1. New Alameda West Portal 2 and Overflow Shaft. 3. New access road to Irvington Portal and Alameda West Portal. 4. New Irvington Portal 2 and air release pipe. 5. Complete demolition and rebuild of existing Irvington Portal manifold. 6. Valves and equipment to control and monitor flows. 7. Two new permanent bridges across Alameda Creek. (Note: A total of two bridges are necessary to construct and operate both the New Irvington Tunnel and Alameda Siphons Upgrade projects; the determination of when to build the bridges would depend on which project would be constructed first. Since this determination has not been made to date, the bridges are evaluated under both projects.)	0	NA	NA	Up to four spoils disposal areas proposed; spoils transported to one of these areas by conveyor belt.	New east tunnel portal would be about 75 feet north or south of Alameda West Portal. New west tunnel portal would be about 175 feet south of existing Irvington Portal. Lands immediately adjacent to existing portals are undeveloped except for caretaker's home and water facilities at Irvington Portal and water facilities at Alameda West Portal. There is one residence located south of Alameda West Portal and residential uses located west of Irvington Portal.	Some sections of ROW do not have easements or fee ownership. Access to new west portal (south of Irvington Portal) would likely be outside of easement.	Three staging areas: 1. east of Alameda West Portal; 2.northwest of Alameda East Portal (west of Calaveras Rd); 3. west of existing cottage at Irvington Portal (at base of hill, east of homes).	NA
SV-5	SVWTP – Treated Water Reservoirs	This project would provide for the planning, design, and construction of new treated water storage reservoirs at the Sunol Valley WTP (SVWTP) to comply with requirements of the California Department of Health Services. The preferred project would include construction of: • One five-million-gallon chlorine contact basin; • Two 8.75-million gallon storage basins; • New inlet and outlet piping and reservoir drainage system; • Pipe bridge over Alameda Creek; • Chemical (ammonia and chlorine) storage and feed system; • Backup filter wash water supply and filter washwater supply system;	0.3	0	138,200	0	1	0	1. Chemical storage and feed system. 2. Pumping system for filter backwashing and other miscellaneous pumping appurtenances. 3. Backup filter backwash system. 4. Washwater supply system. 5. Reservoir drainage system, controls & instrumentation. 6. Expansion of the existing SVWTP electrical substation. 7. Modification of existing valves. 8. Upgrade of existing dechlorination station and miscellaneous piping.	1	15'	TBD	TBD	Site is within boundary of existing SVWTP. Site is currently used for temporary equipment or supply storage on an as-needed basis. The existing Calaveras Nursery is located to the north and open space is located to the west.	No	Not Specified	The power supply would be through an expansion of the existing SVWTP electrical substation.

TABLE C.1 (Continued)
SFPUC WSIP PROJECT INFORMATION – DESCRIPTION OF PROJECT FACILITIES[1]

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SV-5 (cont.)	SVWTP – Treated Water Reservoirs (cont.)	• Instrumentation and controls and miscellaneous pumping appurtenances to integrate the reservoirs into the existing treatment plant; • Expansion of the existing SVWTP electrical substation; • Two 750 kW diesel powered emergency generators.															
SV-6	San Antonio Backup Pipeline	This project would consist of three proposed facilities: 1. San Antonio Backup Pipeline, a new pipeline (size undetermined) from San Antonio Reservoir to San Antonio Pump Station, about 2 miles long; (2) San Antonio Creek Discharge Facilities (improvements allowing for the discharge of Hetch Hetchy water and associated road improvements); and (3) Alameda East Portal Vent Overflow Pipeline and portal modifications.	2.3	0	0	0	2	0	1. New discharge facilities at San Antonio Creek (at end of the new pipeline). 2. New pipeline from the existing overflow outlet near Alameda East Portal, passing adjacent to the San Antonio Pump Station (SAPS), and continuing to the discharge point on Alameda Creek.	NA	NA	No	Undeveloped SFPUC lands	Undeveloped SFPUC lands; pipeline alignment would generally extend between San Antonio Creek and reservoir access road (sometimes extending in the road, across this road, or close to the creek), then cross Calaveras Road, and extend along the west side of this road to SAPS.	TBD	No	NA
		Sub-totals	**4 to 5**	**3+**	**63 million**	**0**	**14 to 17**	**TBD**		**5+**	**10 to 220'**						
BD-1	Bay Division Pipeline Reliability Upgrade	This project would construct a new Bay Division Pipeline No. 5 (BDPL 5) from the Irvington Tunnel Portal in Fremont to the Pulgas Tunnel Portal near Redwood City, consisting of 16 miles of new pipeline and 5 miles of tunnel under San Francisco Bay. Portions of the section of BDPL No. 1 between Edgewood Valve Lot and Pulgas Valve Lot would be removed (approximately 1.4 miles) and existing above ground and submarine sections of BDPL Nos. 1 and 2 over the 5-mile long section from Newark Valve House to Ravenswood Valve House would be decommissioned (decommissioning is not part of this project). The redundancy provided by the project would increase the overall transmission capacity of the Bay Division pipeline system. The preferred project would include construction of: • New welded-steel pipeline, approximately 72 inches in diameter, extending along the 7-mile reach from Irvington Portal to Newark Valve Lot, located within the existing SFPUC ROW of BDPL Nos. 1 and 2; • New "Bay Tunnel" segment of BDPL No. 5, approximately 120 inches in diameter, extending 5 miles from Newark Valve Lot to Ravenswood Valve Lot, crossing under San Francisco Bay and adjacent marshlands. BDPL Nos. 1 and 2 would tie into the tunnel at both ends and would be decommissioned between Newark and Ravenswood Valve Lots; • New welded-steel pipeline, approximately 60 inches in diameter extending along the 9-mile reach from Ravenswood Valve Lot to Pulgas Portal, located within the existing SFPUC ROW of BDPL Nos. 1 and 2; • New facilities at eight valve vault lots along the alignment, containing new concrete vaults and control structures that house electrical control panels, isolation valves, mechanical equipment, and cross-connections between BDPL No. 5 and the existing BDPLs;	16	5	0	0	8 valve facilities, with up to 15 vaults total	0	Isolation valves and piping for connection to new Irvington extension and Pulgas Tunnels. One flow meter at each end of the alignment (2 total). Control buildings for electrical and mechanical equipment at each of the valve lots (8 total). New tunnel shafts at Ravenswood and Newark. Final decision as to which shaft would be the drive shaft and which would be the receiving shaft is still to be determined. For the drive shaft, excavated diameter would be approximately 50 feet with parking for up to 40 construction work vehicles. Staging area would accommodate mucking out materials handling area, on-site power generation (as needed) or a transformer station, ventilation fans and mufflers, water supply, compressed air supply and miscellaneous temporary construction facilities totaling approximately 30,000 s.f. The receiving shaft would require a demobilization area for disassembly & removal of Tunnel Boring Machine, materials handling area, on-site power generation (as needed) or a transformer station, ventilation fans & mufflers, water supply, compressed air supply and miscellaneous temporary construction facilities totaling approximately 11,000 s.f.	8 above ground electrical control buildings at the valve lots	Electrical control buildings would be above ground single story structures (up to 30' high).	The pipeline would be buried. The valve vaults are mostly below ground.	Potential disposal areas include salt ponds near Dumbarton Strait and South Bay Salt Pond Restoration Project.	Pipeline ROW traverses urbanized areas of Fremont, Newark, East Palo Alto, Menlo Park, Redwood City, traversing commercial, residential, school, park uses. The pipeline could affect approximately 16 schools (Cesar Chavez Academy [1,000 ft.], Costano [crossed by ROW] in East Palo Alto; Chadbourne, Durham [1,000 ft.], Fremont [1,500 ft.], Irvington [adjacent], Mission San Jose Junior/Senior High School [1,000 ft.], school near Azeveda Park [500 ft.], Walters Junior High School [750 ft.] in Fremont; Bell Haven [500 ft.] and Flood [500 ft.] in Menlo Park; Bunker [crossed by ROW] in Newark; Fair Oaks [1,500 ft.], Hawes [crossed by ROW], John Gill [crossed by ROW], West Bay Christian Academy [crossed by ROW] in Redwood City) and 11 parks (Azeveda, Fremont, Knoll, and Mission San Jose parks in Fremont; Flood County in Menlo Park; Ash Street and Birch Grove parks in Newark; Edgewood, Fleishman, Hawes, and Red Morton parks in Redwood City). The Newark shaft site has an existing valve house and is surrounded by industrial uses. The Ravenswood shaft site is bordered by BDPL right-of-way to the south, marshland to the east, Cargill Salt Ponds to the north, and University Avenue to the west. Approximately 15 acres of this site is in use for soil remediation, and might eventually be used as a maintenance yard. The Irvington portal vicinity is mostly undeveloped (except for caretaker's home and water facilities) and residential uses are located west of the portal and adjacent to BDPL right-of-way in this vicinity.	Some sections of the ROW do not have easements or fee ownership. The tunnel shaft on the west end of the tunnel can be located on a 40-acre site owned by SFPUC at the Ravenswood valve house. The tunnel shaft on the east end of the tunnel can be located on a 12-acre site owned by SFPUC at the Newark Valve House. The tunnel would require subsurface easement. Some additional easements may be needed for access along the right-of-way. [Note: BD-1 may require an easement at the Hayward Fault Crossing to the north of the SFPUC ROW, depending on the design selected. If the design routes the pipeline to the north of existing fault crossing facilities for BDPLs 1&2, then there would not be room for BDPL 5 within the SFPUC	For the tunnel section, the staging area near the Newark Valve House would require leasing additional land from owners adjacent to the existing pipeline ROW for use as temporary construction staging and stockpiling area. Owners include Leslie Salt Co., FMC Co., Cargill, and SamTrans. Additional staging areas for the pipeline contractors are being investigated.	Yes

TABLE C.1 (Continued)
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BD-1 (cont.)	Bay Division Pipeline Reliability Upgrade (cont.)	• Two flow metering vaults at or near Mission Boulevard (in Fremont) and Pulgas Portal areas; and • New Isolation valves and piping for connecting BDPL No. 5 to Irvington and Pulgas portals.													right-of-way. If required, the easement would be just to the north of the SFPUC right-of-way, and could be up to 2,300 feet long and 5 to 15 feet wide.		
BD-2	BDPL Nos. 3 and 4 Crossovers	This project would construct three additional crossover facilities along Bay Division Pipelines Nos. 3 and 4 (BDPL 3 and 4) to provide operational flexibility for maintenance or during emergencies. The new crossover facilities would reduce the length of pipe to be removed from service, either for maintenance or for emergencies, and would reduce the duration of outages. Each crossover facility would include construction of: • Four mainline valves and one cross-connect valve; • Automatic controlled actuators; • Discharge facilities to enable release of water that meets water quality discharge requirements within discrete pipeline segments to surface waters either for maintenance or emergencies.	0	0	0	0	3 valve vaults	0	Valve vaults would be 3,750 square feet each. Discharge location of drainage outfalls vary depending on site conditions. Piping to connect facility to outfalls. Control buildings for electrical and mechanical equipment at each valve vault (3 total).	3 above ground control buildings	3 to 8'	TBD (mostly under-ground)	TBD	Sites would be located in undeveloped areas on Veterans Administration Medical Center and Gunn High School lands (Barron Creek), Ulistac Natural Area (Guadalupe Creek), and reservoir lands (Bear Gulch).	If permanent drainage outfalls are constructed, an easement or use permit would likely be required. If temporary connections are made, easements/ permits may not be required.	Not specified, but adjacent areas at Bear Gulch and Guadalupe River are undeveloped.	No
BD-3	Seismic Upgrade of BDPLs Nos. 3 and 4 at Hayward Fault	This project would provide for the planning, design and construction of upgraded, seismically-resistant sections of the Bay Division Pipelines Nos. 3 and 4 where they cross the Hayward Fault. The replacement pipelines would be located between the two new crossover/isolation valves that would be built as part of the BDPL Nos. 3 and 4 Crossover/ Isolation Valve at Hayward Fault project (an WSIP project determined to be independent of the PEIR). In addition to the replacement pipelines, a new bypass pipeline between the two new crossover/isolation valve vaults could also be built as part of one of the several alternatives being considered for this project.	3	0	0	0	0-2 (TBD)	0	None	0	NA	Buried pipeline	No	Site spans the I-680/Mission Boulevard freeway interchange. All work would be performed within existing ROW.	No	Within BDPL ROW	TBD
		Sub-totals	**19**	**5**	**0**	**0**	**11 to 20**	**0**		**11**	**Up to 30'**						
PN-1	Baden and San Pedro Valve Lots Improvements	This project would upgrade valve vaults, valves, and piping at the existing Baden and the San Pedro Valve Lots to meet current seismic standards. Work could also be performed at the Pulgas Pump Station and Pulgas Valve Lot as part of transmission reliability. The project would include a new pressure-reducing valve at one of the locations to allow transfer of water between high- and low-pressure zones from the Harry Tracy WTP to the Peninsula under an emergency scenario.	<1	0	0	0	2 at San Pedro; 6 at Baden	2	Install new valves, pressure and flow meters, motor operators, SCADA valve controls, modify valves/pumps/ sump/vent shaft, and either enlarge existing vault or add new vault at Baden and/or San Pedro Valve Lots.	1 new; 11 retrofitted / rebuilt / replaced	Vaults: 1 to 3' above ground	30'	Disposal sites for excavated materials	Majority of work would occur within existing water supply facility sites owned by SFPUC.	No	On-site	Yes, from PG&E service area
PN-2	Crystal Springs/ San Andreas Transmission Upgrade	This project would consist of seismic improvements of facilities that convey water from Crystal Springs Reservoir to the Harry Tracy WTP. This project would increase the transmission capacity of the existing raw water pipeline from Crystal Springs Reservoir to San Andreas Reservoir in order to reliably supply 140 mgd of raw water for treatment at the Harry Tracy WTP. The project would include:	4.5	0.5**	0	Emergency chemical injection systems at CS and SA	32 existing vaults (number of vaults would most likely be reduced) & new vaults	Complete renovation or new pump station based on alternatives analysis	Repair lower culvert linking Upper and Lower Crystal Springs Reservoir; upgrade/repair Crystal Springs Outlet Structure Nos. 1 & 2; upgrade or replace Crystal Springs Pump Station (PS), including increasing capacity to transfer water between	8 existing, 1 or 2 may be completely replaced	Existing PS is 25' and new PS would be no higher; other structures would be below ground.	100' for tunnels; 30' for pipelines; 15' for building foundations; 100' for piles.	TBD	Project involves repair or replacement of existing SFPUC water facilities. If a new parallel pipeline is needed and an alternative alignment is chosen, an easement may be necessary. The most likely alignments would be within the watershed on SFPUC lands.	TBD	Significant staging areas would be required at all work sites. UCSD, CSOS1, CSOS2, CSPS,	Power upgrades at CSPS required. Low voltage and/or solar cells at various locations

TABLE C.1 (Continued)
SFPUC WSIP PROJECT INFORMATION – DESCRIPTION OF PROJECT FACILITIES[1]

Project Number	Project Name	Description	PHYSICAL STRUCTURES											PHYSICAL REQUIREMENTS			
			Pipeline (miles)	Tunnel (miles)	Storage/ Basin (square feet)	Treatment (square feet)	Vaults/ Valve Houses	Pump Station	Other Facilities	Number of Structures	Maximum Height (feet)	Maximum Depth (feet)	Additional Sites for Borrow or Disposal)	Existing Land Use	Land Acquisition Required?	Temporary Staging Areas	Power Available?
PN-2 (cont.)	Crystal Springs/ San Andreas Transmission Upgrade (cont.)	• Repair of the Upper Crystal Springs Dam discharge culverts; • Upgrade and repair of Lower Crystal Springs Dam outlet structures and tunnels conveying water to the Crystal Springs Pump Station; • Replacement or refurbishment of the Crystal Springs Pump Station; • Upgrade and repair of the chemical system and Crystal Springs chlorine emergency feed; • Improvements to the Crystal Springs–San Andreas Pipeline, including replacement of approximately 1,350 feet of 66-inch diameter pipeline, general renewal of the remaining pipeline, and addition of new manholes, blow-off valves, and isolation valves; or construction of a new redundant pipeline along a new alignment; • Seismic and hydraulic upgrade and repair of the San Andreas outlet facilities; • Addition of fish screens on the outlet structures for both Crystal Springs and San Andreas Reservoirs; • Repair of two pipelines that convey raw water from San Andreas Reservoir to the Harry Tracy WTP raw water pump station.					are limited to CSPS and outlets of four tunnels.		reservoirs from 80 to approximately 120 mgd depending on future modeling (maximum rate would be 140 mgd to match HTWTP output); build new power substation (chemical injection equipment is new only minor strengthening of pipe required); renew pipeline sections that are not replaced at San Andreas Reservoir; depending on alternative analysis, a new redundant pipeline may be required; upgrade/repair of San Andreas Outlet Structure Nos. 2 & 3 (significant retrofit of SA 2 Tunnel may be required); repair San Andreas pipelines Nos. 2 & 3; pump station capacity upgrades as required to meet HTWTP raw water supply requirements. **There are four existing tunnels that would require strengthening and/or retrofit.							CSSAPL, SAOS2, SAOS3, HTWTP.	throughout the project.
PN-3	HTWTP Long-Term Improvements	This project would be a seismic retrofit and rehabilitation of the existing building and facility to provide long-term reliability and process improvements. The project would increase the sustained treatment capacity of the plant from 120 to 140 mgd for 60 days. The proposed improvements would include: • Replacement and upgrade of the ozone generation system for primary disinfection; • Replacement or upgrade of the existing sedimentation basins at the same location; • Improvements to sludge handling facilities; • New, redundant pipeline from the treatment works to the finished water storage reservoir; • Raw water pump station improvements; • Upgrade and replacement of electrical and instrumentation components, including improvements to process and plant security facilities.	Possible transmission improvements within the facility property (1-2 miles)	0	2 treated water reservoirs	Project is a treatment facility	TBD (valves and vaults may be required)	1 raw water pump station	Some of the 16 identified structures would require upgrades but would not be determined until completion of PN-7. Mechanical, structural, electrical, and process upgrades are anticipated with known upgrades occurring within existing development footprints. However, structures could be added within the HTWTP property. Improvements include disinfection treatment upgrades, raw water pumping upgrades, replacement/ upgrade of sedimentation basins at same location, sludge facilities, and power and instrumentation upgrades.	TBD	TBD	TBD	TBD	HTWTP site is currently developed with water treatment facilities.	No	Available area within HTWTP property.	Yes
PN-4	Lower Crystal Springs Dam Improvements	This project would consist of major repairs and improvements to Lower Crystal Springs Dam to provide adequate protection of the dam and downstream areas from the probable maximum flood, as defined by the California Division of Safety of Dams (DSOD). DSOD has placed operational restrictions on the dam, and the capacity of the reservoir is limited to 56,800 acre-feet. The project would restore the historical reservoir capacity of 68,000 acre-feet. The project would be coordinated with San Mateo County, which is concurrently planning the replacement of the existing county bridge built above the crest of the dam. Project elements would include:	0	0	0	0	0	0	Raise dam parapet to provide required freeboard during probable maximum flood (PMF), which also could require strengthening abutments; lengthen spillway crest to increase discharge capacity; install new mechanical gates to replace the antiquated stop log system; enlarge the stilling basin to accommodate the PMF discharge. Project cannot be completed until Skyline Blvd (Hwy 35) bridge project is completed by San Mateo County.	TBD	TBD	TBD	TBD	The Lower Crystal Springs Dam is an existing dam and the Lower Crystal Springs Reservoir level is currently restricted by the CA Division of Safety of Dams (DSOD). The inundation zone is currently undeveloped; with implementation of the proposed project, including improvements to the dam and spillway, the reservoir levels would be restored to inundation zone levels that were permissible by DSOD prior to 1983.	No	Adjacent to the Dam's south abutment	Yes

TABLE C.1 (Continued)
SFPUC WSIP PROJECT INFORMATION – DESCRIPTION OF PROJECT FACILITIES[1]

			PHYSICAL STRUCTURES											PHYSICAL REQUIREMENTS			
Project Number	Project Name	Description	Pipeline (miles)	Tunnel (miles)	Storage/ Basin (square feet)	Treatment (square feet)	Vaults/ Valve Houses	Pump Station	Other Facilities	Number of Structures	Maximum Height (feet)	Maximum Depth (feet)	Additional Sites for Borrow or Disposal)	Existing Land Use	Land Acquisition Required?	Temporary Staging Areas	Power Available?
PN-4 (cont.)	Lower Crystal Springs Dam Improvements (cont.)	• Lowering the existing parapet wall on either side of the existing spillway to lengthen the overflow weir (central spillway) from the reservoir; • Raising the remaining parapet walls and adding two new spillway bays, one on each side of the existing central spillway; • Enlarging the spillway stilling basin to accommodated the probable maximum flood; • Installing four gates (with control building) or installing a fixed weir within the spillway to restore the historical storage capacity.															
PN-5	Pulgas Balancing Reservoir Rehabilitation	This project would provide for the planning, design, and construction of improvements to the existing Pulgas Balancing Reservoir and associated facilities. The project would include: • Modifications to the inlet/outlet piping (Phase 1, currently under construction); • Design and construction to rehabilitate and/or expand of the discharge channel to Crystal Springs Reservoir (or to install a parallel channel) (Phase 2); • Geotechnical investigations, design and construction of recommended seismic improvements, including repair/replacement of the reservoir walls, floor and roof (Phase 3); • Restoration of a 6- to 8-acre sediment catchment basin in Laguna Creek to also serve as sustainable habitat for San Francisco garter snake and California red-legged frog, including culvert replacement, sediment removal, revegetation, and protective measures to avoid impact to sensitive species (Phase 4); • Modification of the existing dechlorination process, including modifications to the chemical feed system to enable pH adjustment and dechlorination system to operate reliably (Phase 5).	0	0	0	Project is a treatment facility west of Canada Road	0	0	Five phases: 1. new inlet/outlet piping to ensure optimal mixing in reservoir; 2. rehabilitate/ replace existing Pulgas Channel with an enlarged channel to accommodate estimated maximum flow of 250 mgd; 3. structural rehabilitation and roof replacement; 4. restore the existing sedimentation basin for the enhancement of the habitat as a mitigation project for the existing dechloramination facility; 5. modification of the existing dechlorination process (increase capacity of carbon dioxide, chemical feed systems).	NA	NA	NA	NA	Project would be located within existing Pulgas Balancing Reservoir and existing Pulgas Channel, Laguna Creek Sedimentation Basin area and existing dechloramination facility.	No	Pulgas Reservoir parking area at the entrance (east of Canada Road) would be used for Phase 1 Inlet/Outlet Modifications project	Yes
		Sub-totals	**±7 to 9**	**0.5+**	**2**	**0**	**8+**	**3+**		3+	1 to 25						
SF-1	San Andreas Pipeline No. 3 Installation	This project would replace the out-of-service Baden-Merced Pipeline, which is beyond repair, and would construct a new pipeline extension of the existing San Andreas Pipeline No. 3 from the San Pedro Valve Lot in Daly City to the Merced Manor Reservoir in San Francisco. It would also connect the existing San Andreas Pipeline No. 2 at Sloat Boulevard in San Francisco and install an additional pipeline to serve the water turnouts along San Andreas Pipeline No. 2. The project would provide seismic reliability and system redundancy for Peninsula and San Francisco customers. The project would include: • New 3.8 mile long, 36-inch diameter pipeline; • Approximately 0.27 miles of 36-inch diameter pipeline for three connections between San Andreas Pipelines 2 and 3;	4.17	0	0	0	2	0	1. 4.07 miles of 36-inch and 0.1 mile of 12- to 16-inch diameter steel pipeline; 2. removal and/or slurry fill of the existing Baden Merced pipeline; 3. installation of line valves, vaults, and manholes; 4. installation of cathodic protection systems and monitoring stations, sample taps, air valves, blow offs, and other pipeline appurtenances.	2	8'	2'	NA	This pipeline would extend from San Pedro Valve Lot in Daly City to Merced Manor Reservoir in San Francisco. The entire length of the proposed pipelines would be located in developed, urban areas of San Francisco and Daly City. Most of the pipeline alignment, approximately 3 miles, would be located within existing roadways, parking lots, and other paved areas, with the remainder crossing through open space corridors in Lake Merced Golf & Country Club, San Francisco Golf Club. Adjacent uses include residential, commercial, school, church, and park uses.	The entire length of the proposed pipelines would be located within right-of-ways or easements owned by the City and County of San Francisco or in public roadways.	Additional ROW might be needed temporarily for staging	Yes

TABLE C.1 (Continued)
SFPUC WSIP PROJECT INFORMATION – DESCRIPTION OF PROJECT FACILITIES[1]

Project Number	Project Name	Description	PHYSICAL STRUCTURES											PHYSICAL REQUIREMENTS			
			Pipeline (miles)	Tunnel (miles)	Storage/ Basin (square feet)	Treatment (square feet)	Vaults/ Valve Houses	Pump Station	Other Facilities	Number of Structures	Maximum Height (feet)	Maximum Depth (feet)	Additional Sites for Borrow or Disposal)	Existing Land Use	Land Acquisition Required?	Temporary Staging Areas	Power Available?
SF-1 (cont.)	San Andreas Pipeline No. 3 Installation (cont.)	• Removal of the Baden-Merced Pipeline where the new San Andreas Pipeline No. 3 alignment matches the Baden-Merced alignment. • Less than 0.1 mile of 12- to 16-inch diameter new pipeline for five branch connections to user turnouts (three turnouts to Daly City, two turnouts to SF distribution lines); • Installation of line valves and vaults, manholes, cathodic protection and monitoring stations, sample taps, air valves, blow-offs, and other pipeline appurtenances.															
SF-2	Groundwater Projects – Local	This project includes three groundwater projects: Lake Merced, Local Groundwater, and Regional Groundwater. • The Lake Merced project would address raising the level of Lake Merced in San Francisco using a supplemental source of water, such as treated stormwater, recycled water, groundwater, or SFPUC system water. • The Local Groundwater Projects would include development of 2 mgd of new local groundwater for blending with water in the potable water system in San Francisco. An estimated 4 wells and well stations would be constructed to develop this new local groundwater. This project would also include the use of an additional 2 mgd of groundwater through replacement of existing irrigation wells at the San Francisco Zoo, Golden Gate Park and/or other locations, once recycled water were available for irrigation (to be developed under SF-3). Two existing wells also would be modified to enable emergency supply to local residents in the event of a major earthquake or other disaster. This project also would include the pipelines, water treatment equipment and controls needed to add the groundwater to the municipal supply. The additional water supply developed under this project would be used during both nondrought and drought years.	3.5	0	0	500	0	0	Install new wells, well stations and associated pipelines, water treatment and controls at Lake Merced Pump Station, South Sunset Playground, West Sunset Playground, and Golden Gate Park (or alternate location at Central Pump Station or Francis Scott Key Annex). Modify wells at SF Zoo and North Lake (Golden Gate Park) for emergency supply. Replace wells at the Zoo, Pine Lake (Stern Grove), Golden Gate Park and/or other locations (TBD); about 2,500 sq. ft. per site. Projects completed in 2005 and 2006: Initial phases of the Lake Merced project were completed in 2005 (upgrades to allow dechlorinated water to be discharged to Lake Merced and installation of a flow meter and water level meter). Local Groundwater Projects currently underway or completed in 2006 include the following: (1) construction of emergency well upgrades at SF Zoo Well No. 5; (2) construction and testing of test well at South Sunset Playground; and (3) emergency well upgrades in Golden Gate Park (North Lake); (4) earth embankment stabilization for seismic safety at Sunset Reservoir per State Division of Safety of Dams requirements. Sunset Reservoir seismic and general upgrades would resume in early 2007 to provide general facility rehabilitation and upgrade consisting of crack repairs, sealing of the reservoir roof, replacement of expansion joints and cover plates, improved reservoir access, drainage repairs, and miscellaneous roadway and site improvements. Valve and gate upgrades are also included.	6	16'	3'	NA	Varies: SFPUC Lake Merced Pump Station; South Sunset Playground: playground; West Sunset Playground: playground; Francis Scott Key Annex: school's parking lot. Golden Gate Park locations; SF Zoo: zoo; Pine Lake: Stern Grove; Central Pump Station.	Not for well sites located on City property. May be required for sites located on SFUSD property at Francis Scott Key Annex.	It is possible that additional staging, laydown or stockpile areas may be needed that are outside existing identified well locations.	Yes

TABLE C.1 (Continued)
SFPUC WSIP PROJECT INFORMATION – DESCRIPTION OF PROJECT FACILITIES[1]

Project Number	Project Name	Description	PHYSICAL STRUCTURES										PHYSICAL REQUIREMENTS			
			Pipeline (miles)	Tunnel (miles)	Storage/ Basin (square feet)	Treatment (square feet)	Vaults/ Valve Houses	Pump Station	Other Facilities	Number of Structures	Maximum Height (feet)	Maximum Depth (feet)	Additional Sites for Borrow or Disposal)	Existing Land Use	Land Acquisition Required?	Temporary Staging Areas	Power Available?
SF-2 (cont.)	Groundwater Projects – Regional	As part of the regional conjunctive-use project, the SFPUC would construct about 10 new groundwater production wells in San Mateo County to develop about 6 mgd of potable groundwater as part of a regional conjunctive-use project for uses as a supplemental drought-year supply. In non-drought years under this project, the SFPUC would provide potable water from the regional system to customers in Daly City, San Bruno and South San Francisco to substitute for groundwater currently used for municipal purposes, thereby reducing	0.5	0	0	0	0	0	Up to 10 new wells and well stations in San Mateo County, Daly City, San Bruno, South San Francisco and Colma. Wells are estimated to be 600 feet deep.	10	16'	3'	NA	Specific well station sites not yet identified	Locations not determined in San Mateo County	It is possible that additional staging, laydown or stockpile areas may be needed that are outside existing identified well locations.	TBD
SF-3	Recycled Water Projects	This project includes recycled water projects in San Francisco and other locations. Projects include Westside Baseline and Harding Park/Lake Merced. This project would provide treatment, storage, and distribution facilities for about 4 mgd of recycled water to users on the west side of San Francisco. Primary users would include Golden Gate Park, Lincoln Park, Lincoln Park Golf Course, Harding Park Golf Course, San Francisco Zoo, Sunset Boulevard medians, and San Francisco State University. As described under Groundwater Projects (SF-2), the SFPUC is also investigating appropriate sources of supply for increasing and maintaining Lake Merced lake levels, including recycled water that has undergone advanced treatment. • The Westside Baseline project would include a recycled water treatment facility at or near the Oceanside Water Pollution Control Plant (SF Zoo overflow parking lot) or locations in or near Golden Gate Park, about 8 miles of distribution pipelines, new storage at the recycled water treatment plant site, use of existing storage facilities in Golden Gate Park, and additional storage/pumping – possibly in the Lincoln Park area and other locations (TBD). The project would provide about 2.8 mgd of recycled water (average annual demand) primarily to Golden Gate Park, Lincoln Park, Lincoln Park Golf Course, San Francisco Zoo, Sunset Boulevard medians, and San Francisco State University.	20	0	TBD	Approximately 50,000	0	1 or 2	Utilize existing Golden Gate Park (2 mg) Reservoir. Additional storage in the Lincoln Park area. Other potential small booster pumping station(s) have not been identified.	1 to 4	40'	Not Specified	Not Specified	OWPCP has limited space in an existing room that houses odor control scrubbers; the Zoo overflow parking lot is unpaved and in use by the zoo; the Richmond-Sunset site is currently used for construction spoils storage; the McQueen site is currently being used by Rec & Park as their Urban Forestry Center. Golden Gate Park storage tank (existing facility), Lincoln Park (golf course).	Treatment: City-owned property, Dept. of Rec & Parks, Zoological Society has a 30 year lease. Storage: Golden Gate Park (existing 2 mg reservoir); another may be required in the Lincoln Park area, which is owned/operated by the City's Dept. of Rec & Parks.	Not Specified	No
		• The Harding Park/Lake Merced project would probably include advanced recycled water treatment potentially co-located with the tertiary facility, but could also consist of a satellite treatment facility; about 1.3 miles of distribution pipelines, and storage at the recycled water treatment plant. The project would provide about 1.3 mgd of highly treated recycled water for restoration of the Lake Merced levels, and possibly for irrigation of the Harding Park/Fleming Golf Course. The advanced treatment process may be required for use in Lake Merced, and could include nutrient removal to prevent eutrophication of Lake Merced.															
		Sub-totals	**28+**	**0**	**0**	**±50,500**	**2**	**1 or 2**		**19 to 22**	**8 to 40**	**3+**					

NOTES: afy = acre-feet per year; mgd = million gallons per day; NA = Not applicable; SCADA = Supervisory Control and Data Acquisition; sq. ft. = square feet; TBD = To be determined as project designs are developed and as part of separate, project-level CEQA review

[1] Project information presented in this table is preliminary and subject to change as project designs are developed.

SOURCE: SFPUC, 2006

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TABLE C.2
SFPUC WSIP PROJECT INFORMATION – PROJECT FACILITIES OPERATIONS[1]

Project Number	Project Name	Operational Changes	Change in chemical use?	New Lighting?	Change in Number of Employees	Any New Pumps?	Change in Truck Deliveries?	Permanent Change in Drainage/ Discharges?	Change in Power Demand	Emergency Generator/ Standby Power Required?
SJ-1	Advanced Disinfection	TBD (may require increased manpower).	Possible addition of new treatment chemicals (hydrofluorosilicic acid, and sulfuric acid or carbon dioxide). Potential use of new chemical for cleaning of UV lamps. Propane or diesel for standby power generator.	Likely, lighting at existing facilities	Operations Rep reports to site once/day for 2-4 hours.	TBD	Yes, approximately 1-2 additional deliveries per week per new chemical. Would use existing route: I-580, Chrisman Road, Vernalis Road, Existing Access Road	No new discharges	Yes, power to be provided to new facility.	Yes, standby generator of 750-2500 KVA would be needed.
SJ-2	Lawrence Livermore Supply Improvements	This is unmanned facility monitored by SCADA 24/7.	TBD	TBD	Operations Rep reports to site once/day for 2-4 hours.	TBD	I-580, Corral Hollow Road, Dirt Access Road	TBD	Yes	TBD
SJ-3	San Joaquin Pipeline System	Increased manpower during flow rate changes.	Propane or diesel for standby power generator.	Lighting at new facilities	Operations Rep reports during flow rate changes (8 days per year times two employees).	No	No	TBD	Yes, power to be provided for automation and operation of crossovers and valves at Oakdale and Tesla.	TBD
SJ-4	Rehabilitation of Existing San Joaquin Pipelines	None, reconditioning work would be conducted during the planned maintenance period (November through March).	No	No	TBD	No	No	No	No	No
SJ-5	Tesla Portal Disinfection Station	This is unmanned facility monitored by SCADA 24/7.	Possible addition of new treatment chemicals (hydrofluorosilicic acid, and sulfuric acid or carbon dioxide). Propane or diesel for standby power generator.	Likely, lighting at existing facilities	Operations Rep reports to site once/day for 2-4 hours.	TBD	Yes, approximately 1-2 additional deliveries per week per new chemical. Would use existing route: I-580, Chrisman Road, Vernalis Road, Existing Access Road	No new discharges	Yes, power to be provided to new facility.	Yes

TABLE C.2 (Continued)
SFPUC WSIP PROJECT INFORMATION – PROJECT FACILITIES OPERATIONS[1]

Project Number	Project Name	Operational Changes	Change in chemical use?	New Lighting?	Change in Number of Employees	Any New Pumps?	Change in Truck Deliveries?	Permanent Change in Drainage/ Discharges?	Change in Power Demand	Emergency Generator/ Standby Power Required?
SV-1	Alameda Creek Fishery Enhancement	TBD, depending on alternative selected.	No	No	No	TBD	No	TBD	TBD	No
SV-2	Calaveras Dam Replacement	Increased maintenance; Calaveras Reservoir would be operated to release up to 6,300 afy (5.5 mgd) of water to Alameda Creek for fish flow enhancement. Instrumentation calibrated at least annually or at manufacturer-recommended intervals; all valves cleaned every 6 months; packing or seals should be checked for undue leakage every 6 months.	No	No	No, O&M activities are required for existing dam and would be the same for new dam.	No	No	Dam will not reduce historic discharges since storage would be restored to DSOD-approved levels. The 1997 MOU with California Dept. of Fish & Game requires releases of up to 6,300 AF/year. It is expected a new MOU will be negotiated during the permitting phase.	Negligible.	No
SV-3	Additional 40-mgd Treated Water Supply	25% increase in maintenance activities.	Increased use of treatment chemicals.	400W metal halide cobra lighting fixtures mounted on 30' poles to provide general illumination.	No, same as existing (3 staff per shift, 3 shifts per day).	No, except possibly small pumps for chemical feed.	25% increase in chemical deliveries.	Drainage piping system is proposed to direct surface flows.	Likely increased need for power, but limited since it would be a largely gravity-driven operation.	No, but standby power for SVWTP would likely provide power for project as well.
SV-4	New Irvington Tunnel	NA	NA	NA	NA	NA	NA	NA	NA	NA
SV-5	SVWTP - Treated Water Reservoirs	No	Increased use of sodium hypochlorite and ammonia. Diesel for standby power facilities.	400W metal halide cobra lighting fixtures mounted on 30' poles to provide general illumination; about 11 light standards.	No, same as existing (3 shifts/day).	Yes for filter backwashing, chemical feed, etc.	Additional chemical deliveries of sodium hypochlorite and ammonia.	Possible maintenance discharges.	Yes, power would be provided through an expansion of the existing SVWTP electrical substation.	Yes
SV-6	San Antonio Backup Pipeline	Second pipeline would allow discharge of dechlorinated water to San Antonio	No	No	No	No	No	Improved discharge of Hetch Hetchy water, minimizing environmental impacts.	No	No

TABLE C.2 (Continued)
SFPUC WSIP PROJECT INFORMATION – PROJECT FACILITIES OPERATIONS[1]

Project Number	Project Name	Operational Changes	Change in chemical use?	New Lighting?	Change in Number of Employees	Any New Pumps?	Change in Truck Deliveries?	Permanent Change in Drainage/ Discharges?	Change in Power Demand	Emergency Generator/ Standby Power Required?
SV-6 (cont.)	San Antonio Backup Pipeline (cont.)	Creek during emergency outages. Pipeline would serve as a water supply alternative if existing SAPL is out of service due to maintenance or emergency reasons.								
BD-1	Bay Division Pipeline Reliability Upgrade	Would increase system capacity to meet 2030 demands, improve drought delivery through increased replenishment of Peninsula reservoirs, and allow more frequent maintenance of aged existing BDPLs than is now possible. Following construction of the project, the above ground and submarine sections of BDPL Nos. 1 and 2 from Newark Valve House to Ravenswood Valve House would be decommissioned (decommissioning not part of this project). BDPL No. 1 last reach between Edgewood Valve Lot and Pulgas Valve Lot would be removed.	Propane or batteries for standby power generators.	Yes	NA	Yes	NA	Yes, new treated water discharge to San Francisco Bay would be located at Ravenswood Valve Lot for draining the Bay Tunnel. Draining the Bay Tunnel for maintenance is expected to occur once every 20 years. Additional discharge points would be added to the pipeline reach between Edgewood Road and Pulgas Tunnel.	Yes	Yes

TABLE C.2 (Continued)
SFPUC WSIP PROJECT INFORMATION – PROJECT FACILITIES OPERATIONS[1]

Project Number	Project Name	Operational Changes	Change in chemical use?	New Lighting?	Change in Number of Employees	Any New Pumps?	Change in Truck Deliveries?	Permanent Change in Drainage/ Discharges?	Change in Power Demand	Emergency Generator/ Standby Power Required?
BD-2	BDPL Nos 3 & 4 Crossovers	Reduces the length of pipe out of service at any one time, reduces impact of maintenance or unplanned outages of BDPLs 3 or 4 on system flows. Could allow more frequent maintenance than is now possible.	Propane or diesel for standby power generator.	Yes	No	Yes	No	Yes, treated water would be discharged to creeks for maintenance (every 5 to 10 years, or in an emergency).	Yes	Yes
BD-3	Seismic Upgrade Of BDPLs Nos. 3 and 4 at Hayward Fault	Improves seismic resistance of BDPLs 3&4 across the Hayward Fault.	No	No	No	No	No	No	No	No
PN-1	Baden and San Pedro Valve Lots Improvements	Operation of new PRV at Baden Valve Lot would occur during emergencies only but would be run for maintenance purposes approximately 2 times per year.	Propane for standby power generator.	No	No	No	No	No	No	Baden has two existing standby backup generators and a 10,000-gallon diesel tank on site. New standby generator is required.
PN-2	Crystal Springs/ San Andreas Transmission Upgrade	Increased operations and maintenance due to increased pumping/ transmission capacity.	No	TBD	No	Yes, pump station capacity upgrades.	No	TBD	Yes	No new sources
PN-3	HTWTP Long-Term Improvements	Potential increase in operations and maintenance due to increased sustainable treatment capacity.	Yes, potential increased use of treatment chemicals.	TBD	Increased staffing	Yes, raw water pump station upgrades.	Increased chemical deliveries.	TBD	Yes	TBD
PN-4	Lower Crystal Springs Dam Improvements	Yes, historic storage capacity restored.	No	No	No	No	No	Improvement would allow restoration of historic storage capacity and would continue to allow safe passage of PMF to San Mateo Creek.	No	TBD

TABLE C.2 (Continued)
SFPUC WSIP PROJECT INFORMATION – PROJECT FACILITIES OPERATIONS[1]

Project Number	Project Name	Operational Changes	Change in chemical use?	New Lighting?	Change in Number of Employees	Any New Pumps?	Change in Truck Deliveries?	Permanent Change in Drainage/ Discharges?	Change in Power Demand	Emergency Generator/ Standby Power Required?
PN-5	Pulgas Balancing Reservoir Rehabilitation	No	No	No	No	No	No	TBD	No	No
SF-1	San Andreas Pipeline No. 3 Installation	No	No	No	No	No	No	No	Yes	No
SF-2	Groundwater Projects - Local	Increased chlorination or chloramination supplies, operation inspections, lubrication, calibration of monitoring equipment.	Increased chlorination or chloramination supplies. Diesel for standby power facilities.	Possible security lighting	1 person, 1 hour every day or two on average	Yes	Increased chemical deliveries.	SFPUC system water, treated stormwater, or recycled water would be added to Lake Merced to augment lake levels.	Yes	Yes, emergency generator or capability to be operated with portable emergency generator.
SF-2	Groundwater Projects – Regional	Increased chlorination or chloramination supplies during drought years only, operation inspections, lubrication, calibration of monitoring equipment.	Increased chlorination or chloramination supplies during drought years only. Diesel for standby power facilities.	Possible security lighting	1 person, 1 hour every day or two on average	Yes	Increased chemical deliveries during drought years.	No	Yes, during drought years and periodic testing.	Yes, emergency generator or capability to be operated with portable emergency generator.
SF-3	Recycled Water Projects	Increased deliveries & maintenance	Increased use of treatment chemicals. Diesel for standby power facilities.	Yes	Up to 6	Yes	Increased chemical deliveries.	Yes (reduced wastewater discharges)	Yes	Yes

[1] Project information presented in this table is preliminary and subject to change as project designs are developed.

TABLE C.3
SFPUC WSIP PROJECT INFORMATION – PROJECT FACILITY LOCATIONS[1]

Project Number	Project Name	Preferred Location	Affected Counties	Affected Cities	Major Access Roads	Nearby Waterways	Alternative Locations
SJ-1	Advanced Disinfection	Tesla Portal	San Joaquin	None	I-580, Chrisman Rd, Vernalis Road, Existing Access Road	A small vegetated swale on-site	None
SJ-2	Lawrence Livermore Supply Improvements	Thomas Shaft, which is off Corral Hollow Road.	San Joaquin	None	I-580, Corral Hollow Rd, dirt access road	Adjacent to drainage swale (determined to be wetlands by Corps) at Thomas Shaft site.	None
SJ-3	San Joaquin Pipeline System	6.4-mile new pipeline starting at Oakdale Portal; two crossovers, one about 20 miles east of Modesto and the other about 15 miles west of Modesto; 10-mile fourth pipeline at west end of pipelines, ending at Tesla Portal.	San Joaquin, Stanislaus, and Tuolumne	None	Access is available, however, in some areas, access would need to be negotiated with the local landowners.	Crosses Delta Mendota Aqueduct and California Aqueduct Alt 5 (16.3 miles on western end crosses San Joaquin River)	Alt 1 & 2: Full length pipelines from Oakdale Portal to Tesla Portal within existing ROW. Alt. 3: New 60-inch pipeline from Oakdale Portal to Tesla Portal with 8,000-horsepower pump station. Alt 4: described as preferred location; Alt. 5: New 16.3 mile pipeline ending at Tesla Portal, two crossovers, replacement of 6.4 miles of PCCP. All alternatives would include upgrade of existing Roselle crossover station.
SJ-4	Rehabilitation of Existing San Joaquin Pipelines	Across Central Valley from Oakdale Portal to Tesla Portal	San Joaquin, Stanislaus, and Tuolumne	Riverbank, Modesto	SFPUC has access rights to the SJPL right-of-way	Existing pipelines cross under the San Joaquin River, Delta Mendota Aqueduct, and California Aqueduct	None
SJ-5	Tesla Portal Disinfection Station	Tesla Portal	San Joaquin	None	I-580, Chrisman Rd, Vernalis Rd, Existing Access Rd	A small vegetated swale on-site	None
SV-1	Alameda Creek Fishery Enhancement	Alameda Creek in Alameda County.	Alameda	None	Calaveras Road	Alameda Creek	Structural and non-structural recovery alternatives under consideration and other alternative designs for this project could be developed.
SV-2	Calaveras Dam Replacement	Immediately downstream of Calaveras Dam.	Alameda and Santa Clara	None	I-680, Highway 84, Calaveras Rd	Calaveras, Arroyo Hondo, Alameda, San Antonio Creeks	None
SV-3	Additional 40-mgd Treated Water Supply	Sunol Valley Water Treatment Plant (SVWTP)	Alameda	None	I-680, Calaveras Rd	Alameda Creek	Sunol Valley

TABLE C.3 (Continued)
SFPUC WSIP PROJECT INFORMATION – PROJECT FACILITY LOCATIONS[1]

Project Number	Project Name	Preferred Location	Affected Counties	Affected Cities	Major Access Roads	Nearby Waterways	Alternative Locations
SV-4	New Irvington Tunnel	New east tunnel portal would be about 75 feet south of Alameda West Portal. New west tunnel portal would be about 175 feet south of existing Irvington Portal.	Alameda	Fremont	I-680, Calaveras Rd	Alameda Creek, Mission Creek (tunnel-no impact), Pirate Creek (tunnel-no impact), unnamed (0.25 mi. west of Mission Blvd, Fremont), and unnamed seasonal drainage (ROW crossing at Calaveras Road).	New 120-inch diameter pipe from Alameda East Portal to a new tunnel portal near SVWTP. From the portal, a new 132-inch diameter tunnel would extend west and terminate in Fremont. Also considering alternate locations for the new Alameda West and Irvington Portals, within a few hundred feet of the existing and proposed portals (similar tunnel location).
SV-5	SVWTP –Treated Water Reservoirs	Site is within boundary of existing SVWTP.	Alameda	None	I-680, Calaveras Rd	Alameda Creek	None
SV-6	San Antonio Backup Pipeline	Pipeline would extend between San Antonio Reservoir and San Antonio Pump Station.	Alameda	None	I-680, Highway 84, Calaveras Rd	Calaveras, Arroyo Hondo, Alameda, San Antonio Creeks	None
BD-1	Bay Division Pipeline Reliability Upgrade	The new pipeline would be located within the existing easement for the BDPL Nos. 1 and 2, which extends approximately 21 miles from Irvington Tunnel Portal in Fremont to Pulgas Tunnel Portal near Redwood City. The 5-mile long tunnel portion extends from Newark to East Palo Alto, running beneath San Francisco Bay and surrounding marshlands. A sub-surface easement would be required for this portion.	Alameda and San Mateo	Newark, Fremont, East Palo Alto, Menlo Park, Redwood City	There are many regional and local roads that traverse the pipeline alignment including the I-680, I-880, and Highway 101 freeways; Highway 84, Edgewood Road on the Peninsula; Mission Boulevard (2 crossings; Highway 238), Washington Boulevard, Paseo Padre Parkway, Durham Road, Grimmer Boulevard, Warren Avenue, Dixon Road, and Scott Creek Road in Fremont.	Crosses San Francisco Bay, Newark/Unnamed Sloughs, and could affect the following creeks: Agua Caliente (Fremont), Cordilleras Creek (Redwood City), Mission Creek (Fremont), Ojo de Agua Creek (Redwood City), six unnamed creeks (at Alameda de las Pulgas in Redwood City, Boone Drive in Fremont, Highway 84 in Redwood City, Marsh Drive in Menlo Park, Moores Avenue in Newark, N. of Farwell Drive in Fremont), and an unnamed drainage at Marsh Road in Newark.	Alternative locations may include a southern or northern alignment adjacent to BDPL Nos. 3 and 4.

TABLE C.3 (Continued)
SFPUC WSIP PROJECT INFORMATION – PROJECT FACILITY LOCATIONS[1]

Project Number	Project Name	Preferred Location	Affected Counties	Affected Cities	Major Access Roads	Nearby Waterways	Alternative Locations
BD-2	BDPL Nos. 3 and 4 Crossovers	Preferred locations and sites include: (1) Guadalupe River – Site B; (2) Barron Creek – Site C; and (3) Bear Gulch Reservoir – Site C.	Santa Clara and San Mateo	San Jose, Santa Clara, Palo Alto, and Atherton	Not Specified	Barron Creek (Santa Clara County, City of Palo Alto), Bear Gulch Reservoir (San Mateo County, Town of Atherton), Guadalupe Creek (Santa Clara County, cities of San Jose and Santa Clara).	Could be located in the vicinity of the following creeks: Adobe Creek (Santa Clara County, cities of Los Altos and Palo Alto), Calabazas Creek (Santa Clara County, cities of Santa Clara and Sunnyvale), Coyote Creek (Santa Clara County, cities of Milpitas and San Jose), Hamlin Court (Santa Clara County, City of Sunnyvale), Matadero Creek (Santa Clara County, City of Palo Alto), Ojo de Agua Creek (San Mateo County, City of Redwood City), Permanente Creek (Santa Clara County, City of Woodside), Redwood Creek (San Mateo Creek, City of Woodside), Saratoga Creek (Santa Clara County, City of Santa Clara), and Stevens Creek (Santa Clara County, City of Mountain View).
BD-3	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault	Spans the I-680/Mission Boulevard interchange between Tissiack Place, Cayuga Place, and Indian Hills Road on the north side and Crawford Street on the south side	Alameda	Fremont	I-680 and Mission Blvd	Aqua Fria Creek	None
PN-1	Baden and San Pedro Valve Lots Improvements	Baden: W. Orange Ave at El Camino Real in South San Francisco; San Pedro: San Pedro Road and Junipero Serra Boulevard in Daly City; Pulgas Pump Station: Cañada Road between Highway 92 and Edgewood Road. Pulgas Valve Lot: Edgewood Road near I-280.	San Mateo	Baden: South San Francisco; San Pedro: Daly City	Baden: El Camino Real (Highway 82), West Orange Ave in South San Francisco; San Pedro: I-280, Junipero Serra Blvd, San Pedro Rd in Daly City. Pulgas Pump Station off of Canada Road. Pulgas Valve Lot off of Edgewood Road.	Baden Valve Lot: Colma Creek (South San Francisco); Pulgas Pump Station: San Andreas Creek, Crystal Springs Reservoir, and unnamed blue-lined tributary to Crystal Springs Reservoir (Unincorporated San Mateo County); Pulgas Valve Lot: Cordilleras Creek (Unincorporated San Mateo County, City of San Carlos).	None

TABLE C.3 (Continued)
SFPUC WSIP PROJECT INFORMATION – PROJECT FACILITY LOCATIONS[1]

Project Number	Project Name	Preferred Location	Affected Counties	Affected Cities	Major Access Roads	Nearby Waterways	Alternative Locations
PN-2	Crystal Springs/San Andreas Transmission Upgrade	Proposed improvements would be located at: the Upper Crystal Springs (C.S.) Dam culverts (under Hwy 92); C.S. Outlet Tower Nos. 1 & 2 and C.S. Pump Station (west of I-280 near Skyline Blvd/Crystal Springs Rd intersection); Crystal Springs-San Andreas (S.A.) Pipeline, S.A. Inlet Structure, S.A. Outlet Towers Nos. 2 & 3 (west of I-280, generally between Millbrae Ave. and Crystal Springs Rd.), HTWTP (east of I-280 and south of Crystal Springs Rd.).	San Mateo	Pump Station Facility near Hillsborough. San Andreas PL traverses San Mateo County adjacent to Hillsborough, Burlingame, and Millbrae. Adits in San Andreas Reservoir adjacent to Millbrae	I-280 freeway, Skyline Blvd (Hwy 35), Crystal Springs Rd, Polhemus Rd, Hwy 92, SFPUC watershed, pump station, and HTWTP access roads.	San Mateo Creek, Upper and Lower Crystal Springs Reservoir, San Andreas Reservoir	NA
PN-3	HTWTP Long-Term Improvements	HTWTP is located south of Crystal Springs Road.	San Mateo	Adjacent to San Bruno and Millbrae	I-280 freeway, Crystal Springs Rd	San Andreas Reservoir	No long-term alternatives developed yet.
PN-4	Lower Crystal Springs Dam Improvements	Dam is located west of I-280 freeway and Skyline Blvd., and south of Crystal Springs Rd.	San Mateo	None	I-280 freeway, Skyline Blvd, Crystal Springs Rd	San Mateo Creek, Lower Crystal Springs Reservoir	NA
PN-5	Pulgas Balancing Reservoir Rehabilitation	Located on the east side of Cañada Road, southeast of the Pulgas Water Temple.	San Mateo	None	I-280 freeway, Cañada Rd	Pulgas Channel, Upper Crystal Springs Reservoir	NA
SF-1	San Andreas Pipeline No. 3 Installation	This pipeline would extend from San Pedro Valve Lot in Daly City (San Pedro Road at Junipero Serra Blvd) to Merced Manor Reservoir in San Francisco (at Ocean Avenue and 22nd Avenue).	San Francisco and San Mateo	San Francisco, Daly City	Highway 280, Junipero Serra Blvd, 19th Avenue, Brotherhood Way, and Ocean Avenue.	None	NA
SF-2	Groundwater Projects – Local	Lake Merced Pump Station, South Sunset Playground (40th/Wawona), West Sunset Playground (41st/Quintara), Golden Gate Park (Lincoln/42nd), or alternative locations, North Lake (north side of North Lake in Golden Gate Park,	San Francisco	San Francisco	Great Highway, 19th Avenue, Sunset Blvd	Lake Merced and Pine Lake are within 1,000 feet of two of the projects	The 1997 SFPUC Groundwater Master Plan EIR evaluated various groundwater production alternatives & recommended a group of projects very similar to those proposed in the WSIP Local Groundwater Project.

TABLE C.3 (Continued)
SFPUC WSIP PROJECT INFORMATION – PROJECT FACILITY LOCATIONS[1]

Project Number	Project Name	Preferred Location	Affected Counties	Affected Cities	Major Access Roads	Nearby Waterways	Alternative Locations
SF-2 (cont.)	Groundwater Projects – Local (cont.)	near 43rd/Fulton intersection), SF Zoo, Central Pump Station, Pine Lake (Stern Grove), other Golden Gate Park locations.					
	Groundwater Projects – Regional	Up to 10 sites within the Westside Groundwater Basin, cities of Daly City and San Bruno and the service area for the California Water Service Company's South San Francisco Service Area (including South San Francisco, Colma and unincorporated areas of northern San Mateo County). Wells could possibly be located in the cities of San Francisco, Burlingame, or Millbrae	San Mateo	Daly City, San Bruno, San Francisco, Burlingame, Millbrae, South San Francisco, Colma and unincorporated areas of northern San Mateo County.	TBD	Colma Creek	Alternative Analysis Report will be conducted in FY 06/07.
SF-3	Recycled Water Projects	Treatment site location is currently TBD; options include the OWPCP, SF Zoo overflow parking lot, the site of the old Richmond-Sunset Treatment Plant, and the site of the old McQueen Plan. Treated water storage will be provided at the treatment site, and also off-site; off-site locations include new storage in Lincoln Park (golf course), and the conversion of existing storage in Golden Gate Park Pipeline alignments within City streets.	San Francisco	San Francisco	Sloat Blvd, Highway 1, Great Highway	Pacific Ocean, lakes in Golden Gate Park, Lake Merced	Treatment: Previous location of the Richmond-Sunset Treatment Plant (now used as a staging area for Rec & Park) and within Oceanside facility. Storage: not yet identified.

[1] Project information presented in this table is preliminary and subject to change as project designs are developed.

TABLE C.4
SFPUC WSIP PROJECT INFORMATION – PROJECT FACILITY CONSTRUCTION[1]

Project Number	Project Name	Preliminary Construction Schedule	Construction Duration (years)	Construction Area (acres)	Excavation/ Spoils Volume (cubic yards)	Concrete Material (cubic yards)	Demolition Required	Dewatering Required	Temporary Construction Access Routes	Number of Crews	Construction Hours	Construction Rate
SJ-1	Advanced Disinfection	2009-2010	1 to 2	2	TBD	TBD	No	TBD	I-580, Chrisman Rd, Vernalis Rd, Existing Access Rd	TBD	TBD	NA
SJ-2	Lawrence Livermore Supply Improvements	2010-2011	1	TBD	TBD	TBD	No	No	I-580, Corral Hollow Rd, Dirt Access Rd	TBD	TBD	NA
SJ-3	San Joaquin Pipeline System	2011-2014	3	Most construction would occur within existing ROW (100-200 feet wide) with additional 200 feet temporary/ additional ROW possibly needed to the north of the SJPL ROW. Minimum Total Disturbance = 16.4 mi. x 50 feet = 100 acres. Maximum Total Disturbance = 16.4 mi. x 200 feet = 400 ac. (Note that this requirement would range from 140 to 575 acres for alternative 5.) Up to 11 temporary construction staging areas as big as 400 by 700 feet would be required (70 acres).	424,000	TBD	TBD	From San Joaquin River to Highway 33	Construction access available, but would need to be improved and negotiated with local landowners in some locations.	2 to 5 Crews, with maximum of 100 personnel total	TBD	NA
SJ-4	Rehabilitation of Existing San Joaquin Pipelines	2008-2014 The long-range rehabilitation program would not be developed until 2008. Most rehabilitation work would be conducted during the months of November through March. The 1st rehabilitation contract might start as early as 2008.	7 to 8	All work would be within the existing ROW	Rehabilitation spoils quantities cannot be estimated without the conditions assessment and subsequent determination of rehabilitation methods. Conservative estimate would be about 100,000 cubic yards.	None	TBD	Excavations within 4 miles west of the San Joaquin River and 10 miles east of the River most likely would require dewatering	Access to existing ROW exists through ROW agreements. No additional access agreements anticipated	TBD	TBD	NA
SJ-5	Tesla Portal Disinfection Station	2009-2011	1 to 2	2	TBD	TBD	TBD	TBD	I-580, Chrisman Rd, Vernalis Rd, Existing Access Rd	TBD	TBD	NA
	Sub-totals (Rounded)			**±104 to 650**	**±524,000**	**TBD**						
SV-1	Alameda Creek Fishery Enhancement	2011	1	TBD	TBD	TBD	NA	Not Specified	TBD	Not Specified	TBD	NA
SV-2	Calaveras Dam Replacement	2009-2011; flow release after 2011	2 to 3	666 (includes borrow areas)	6,300,000 cy total excavation and 4,000,000 cy spoil	60,000	Yes, existing cofferdam, chemical treatment building and valve vaults, existing spillway, and portions of the outlet tower.	Yes	Calaveras Road	2 to 3 Crews, 25 people/ crew	TBD	NA
SV-3	Additional 40-mgd Treated Water Supply	2010-2013	2 to 3	1.5	100,000	2,000	No	Not Anticipated	Calaveras Rd	Avg. Crew Size: 40 Max. Crew Size: 80	TBD	NA
SV-4	New Irvington Tunnel	2009-2013	3 to 4	120 (additional area for staging could be required)	190,000	TBD	Yes, potential demolition of existing Irvington Portal structure.	Yes	If the spoils are trucked outside of Sunol Valley, project would construct/ improve new access roads between Alameda West Portal and Calaveras Rd, Spoil Area 1 and Calaveras Rd, permanent gravel	Avg. Crew Size: 60 Max. Crew size: 144	TBD	60 to 100 feet per day of tunnel advancement by boring machine drive

TABLE C.4 (Continued)
SFPUC WSIP PROJECT INFORMATION – PROJECT FACILITY CONSTRUCTION[1]

Project Number	Project Name	Preliminary Construction Schedule	Construction Duration (years)	Construction Area (acres)	Excavation/ Spoils Volume (cubic yards)	Concrete Material (cubic yards)	Demolition Required	Dewatering Required	Temporary Construction Access Routes	Number of Crews	Construction Hours	Construction Rate
SV-4 (cont.)	New Irvington Tunnel (cont.)								between existing and new overflow shafts in Sunol Valley, between existing Irvington Portal and Mission Blvd.			
SV-5	SVWTP –Treated Water Reservoirs	2008-2010	2	10.5	300,000	30,900	No	No	Calaveras Rd, Interstate 680	Avg. Crew Size: 40 Max. Crew Size: 80	TBD	NA
SV-6	San Antonio Backup Pipeline	2009-2011	2	TBD	51,000 cy total excavation and 37,000 cy spoil	TBD	No	TBD	Along access road to San Antonio Reservoir	TBD	TBD	TBD
	Sub-totals (Rounded)			**±800**	**±7 million**	**±92,900**						
BD-1	Bay Division Pipeline Reliability Upgrade	2009-2013	4	Construction and staging would occur within the ROW corridor, which varies in width between 40 and 80 feet. Estimated Total Disturbance = 165 to 175 ac. Note that the amount disturbed by the pipeline at any one time would be around 3 acres.	434,000	TBD	Portions of the section of BDPL No. 1 between Edgewood Valve Lot and Pulgas Valve Lot would be removed (approximately 1.4 miles). The above ground and submarine sections of BDPLs 1 and 2 would be decommissioned.	Yes at both tunnel shafts and some reaches of the pipeline.	Both the Newark and Ravenswood Shaft sites would be accessed by existing city streets and there are several alternatives for highway access. The pipeline would be accessed from the numerous local roads and state highways.	Pipeline: A minimum of 5 separate crews; 3 on the pipeline, 2 to 3 for the tunnel, and additional crews at the valve vaults and the street and rail crossings.	TBD	Tunnel: 50 to 80 feet/day for initial liner and 120 feet/day for final liner. Pipeline: 120 to 160 feet per day average, up to 300 feet per day maximum if installing in open fields without obstruction.
	Bay Tunnel Segment	2009-2013	4	3.5 to 9 acres	260,000 to 355,000							
BD-2	BDPL Nos. 3 & 4 Crossovers	2010-2012	2	TBD but minimum 0.4 ac. at each site	43,500	TBD	May have to go through levee at Guadalupe site for outfall.	Discharge of treated water to creeks or exist. storm drains during construction.	Not Specified. Likely routes: Lick Mill Rd (Guadalupe River site), Foothill Expressway-Veterans Administration Medical Center-Gunn High School (Barron Creek), and Reservoir Rd-Alameda de Las Pulgas (Bear Gulch site).	TBD	TBD	TBD
BD-3	Seismic Upgrade of BDPLs Nos. 3 and 4 at Hayward Fault	2010-2012	1 to 2	TBD	Phase B – 55,300	TBD	No	Possible	Construction access to pipeline route would almost always be through the closest roads that intersect the ROW.	TBD	TBD	NA
	Sub-totals (Rounded)			**±170 to 180**	**±800,000 to 900,000**	**TBD**						
PN-1	Baden and San Pedro Valve Lots Improvements	2009-2011	2	Approx. 2 ac.	Baden Valve Lot: 4,000; San Pedro Valve Lot: 700; Pulgas Pump Station: TBD; Pulgas Tunnel Gate Shaft: 270; Pulgas Tunnel Air Shaft: TBD.	TBD	Yes, removal of existing vaults, shed, existing pipeline segment, roof above pump station.	Yes	Baden Valve Lot: El Camino Real (Highway 82), West Orange Ave in South San Francisco; San Pedro Valve Lot: Junipero Serra Blvd and San Pedro Rd in Daly City; Pulgas Pump Station off of Canada Road in San Mateo County; Pulgas Valve Lot off of Edgewood Road in San Mateo County.	TBD	TBD	NA
PN-2	Crystal Springs/ San Andreas Transmission Upgrade	2011-2013	2 to 3	TBD	Not Specified (estimated to be up to 9,000 cy)	TBD	Crystal Springs Pump Station (if not upgraded)	Project has discharge valve that empties into San Mateo Creek; discharge valve would be replaced and/or re-anchored. Outlet structures and the adits within them at both Lower Crystal Springs and San Andreas Reservoirs,	I-280 freeway, Skyline Blvd. (HWY 35), Crystal Springs Road, Polhemus Road, Hwy 92, SFPUC watershed, pump station, and HTWTP access roads	TBD	TBD	NA

TABLE C.4 (Continued)
SFPUC WSIP PROJECT INFORMATION – PROJECT FACILITY CONSTRUCTION[1]

Project Number	Project Name	Preliminary Construction Schedule	Construction Duration (years)	Construction Area (acres)	Excavation/ Spoils Volume (cubic yards)	Concrete Material (cubic yards)	Demolition Required	Dewatering Required	Temporary Construction Access Routes	Number of Crews	Construction Hours	Construction Rate
PN-2 (cont.)	Crystal Springs/ San Andreas Transmission Upgrade (cont.)							are the upstream inlets to the aforementioned valves. There would be structural and mechanical work on these structures to harden them. This may require coffer dams and other dewatering measures.				
PN-3	HTWTP Long-Term Improvements	2011 to 2013	2 to 3	TBD	Not Specified	Not Specified	Not Specified	Not Specified	I-280 freeway, Crystal Springs Road	Not Specified	TBD	NA
PN-4	Lower Crystal Springs Dam Improvements	2010-2011	1	6	21,000	TBD	Yes, modification of spillway, parapet wall, and stilling basin	TBD	I-280 freeway, Skyline Blvd, Crystal Springs Road	TBD	TBD	NA
PN-5	Pulgas Balancing Reservoir Rehabilitation	2010-2013	3	TBD	TBD	TBD	TBD	TBD	I-280 freeway, Cañada Road	TBD	TBD	NA
	Sub-totals (Rounded)			**±8**	**±35,000**	**TBD**						
SF-1	San Andreas Pipeline No. 3 Installation	2009-2010	2	23	44,170	3,200	Yes, removal of certain portions of existing BMPL	Yes	City streets along pipeline alignment.	2 crews, 8 to 10 people/crew	TBD	60 to 200 feet/day
SF-2	Groundwater Projects – Local	2009 to 2012	San Francisco: 3 (intermittent)	0.04/site (0.7 ac. for 18 sites) + pipeline alignments	TBD	TBD	TBD	No	TBD	TBD	TBD	Not Specified
	Groundwater Projects – Regional	2010 to 2014	Regional: 4		TBD	TBD	TBD	No	TBD	TBD	TBD	Not Specified
SF-3	Recycled Water Projects	2010 to 2012	2 yrs for treatment facility; longer for pipelines	5 to 7	47,200	10,800	TBD	Yes	Sloat Blvd, potential Highway 1 entrance. Possible haul routes: Highway 1, Skyline Blvd, Lake Merced Blvd, John Muir Dr, Brotherhood Way, I-280.	2 to 4 crews, 10 to 35 people/crew	TBD	Not Specified
	Sub-totals (Rounded)			**±29 to 31**	**±91,400**	**±14,000**						

[1] Project information presented in this table is preliminary and subject to change as project designs are developed.

TABLE C.5
SFPUC WSIP PROJECT INFORMATION – AFFECTED ROADS/RAILROADS AND CONSTRUCTION TRAFFIC

Project Number	Project Name	Temporary Construction Access Roads	In-Road (parallel to or within ROW)	Freeway Crossing	Major Road Crossings	Minor Road Crossings	Railroad Crossings	Daily Truck Trips	Ave./Max. Worker Daily Trips
SJ-1	Advanced Disinfection	I-580, Chrisman Road, Vernalis Road, Existing Access Road	No	None	No	No	No	TBD	TBD
SJ-2	Lawrence Livermore Supply Improvements	I-580, Corral Hollow Road, Dirt Access Road	No	None	No	No	No	TBD	TBD
SJ-3	San Joaquin Pipeline System	Construction access available, but would need to be negotiated with local landowners in some locations.	Yes	4 Crossings: Hwy 99, I-5, I-580 freeways, Highways 33	21 Crossings: Wilms, Rd., Wamble Rd (twice), River Rd, McCracken Rd, Welty Rd, Koster Rd, Bird Rd, Chrisman Rd, Bernard Rd, W. Vernalis Rd, Fogarty Rd, Emery Rd, Roselle Ave, Blewitt Rd, Koster Rd, The following road crossings would be used as well in addition to the above list if Alt 5 is selected: Blue Gum Ave, Dunn Rd, Gates Rd, Maze Blvd, Pelican Rd, Orchard Rd.	33	2 Crossings	Pipe Delivery: 4 trips/day (ave); haul truck volumes not specified.	
SJ-4	Rehabilitation of Existing San Joaquin Pipelines	None expected	The existing ROW would be used for accessing pipeline sites from nearby local public and private roads.	Existing pipelines cross under I-580 and I-5 freeways. Improvements for these under crossings are not anticipated.	Existing pipelines cross under Rte 33, Rte 132, Rte 99; Rte 108 (McHenry Ave); Standiford Ave near MP 74.8; Prescott Rd near MP 75.1; Sisk Rd near MP 76.2. It is not known at this time if any improvements would be required at these under crossings	The existing pipelines cross under 14 minor roads. It is not known at this time if any of these under crossings would require improvements.	Existing pipelines cross under: Sierra Railroad near MP 57.7; Union Pacific near MP 64; Burlinton Northern Santa Fe near MP 69.3; Union Pacific near MP 73.5; Union Pacific near MP 76.4; Union Pacific near MP 89.5. It is not known at this time if any improvements would be required under crossings.	TBD	TBD
SJ-5	Tesla Portal Disinfection Station	I-580, Chrisman Road, Vernalis Road, Existing Access Road	No	None	No	No	No	15 (average) - 40 (maximum) truck trips/day & up to 4 trips/day	25
SV-1	Alameda Creek Fishery Enhancement	Calaveras Road and possibly Highway 84	No	No	No	No	No	Not Specified	Not Specified
SV-2	Calaveras Dam Replacement	Calaveras Road	TBD	No	No	No	No	88 daily 9 peak hour	240 daily (Up to 400)
SV-3	Additional 40-mgd Treated Water Supply	Calaveras Road	No	No	No	No	No	64 daily 8 peak hour	80 daily
SV-4	New Irvington Tunnel	Construct/improve new access roads between Alameda West Portal and Calaveras Rd, Spoil Area 1 and Calaveras Rd, permanent gravel between existing and new overflow shafts in Sunol Valley, between existing Irvington Portal and Mission Blvd.	No	No	No	No	No	290 daily 36 peak hour	288 daily
SV-5	SVWTP - Treated Water Reservoirs	Calaveras Road	TBD	No	No	No	No	80 daily 10 peak hour	80 daily
SV-6	San Antonio Backup Pipeline	Access road to San Antonio Reservoir and Calaveras Road	San Antonio Reservoir Access Road/Calaveras Road	No	No	Calaveras Road	No	80 daily10 peak hour	80 daily
BD-1	Bay Division Pipeline Reliability Upgrade	Both the Newark and Ravenswood Shaft sites would be accessed by existing city streets and there are several alternatives for highway access. The pipeline would be accessed from the numerous local roads and state highways.	Ivy Drive, Bay Road, Avenue Del Ora, Bennett Road.	Pipeline, 3 crossings: the I-680, I-880, and Highway 101 freeways	20 to 25 major road crossings including: Edgewood Road Woodside Road El Camino Real Middlefield Road Marsh Road Willow Road University Avenue Central Avenue Mowry Avenue	Numerous	7, including 4 active	Pipe Delivery: 8 trips/day (ave); disposal volumes approximately 8 loads per day, 16 one-way trips. Tunnel: If onsite disposal is not available, then 120-160 trips/day to haul muck offsite If concrete rings would be manufactured offsite, then 15 trips/day to transport concrete rings to jobsite.	Pipeline Average: 20 workers per pipe crew, 20 per vault crew, 10 per crossing crew. Tunnel: 25 to 38 workers

TABLE C.5 (Continued)
SFPUC WSIP PROJECT INFORMATION – AFFECTED ROADS/RAILROADS AND CONSTRUCTION TRAFFIC

Project Number	Project Name	Temporary Construction Access Roads	In-Road (parallel to or within ROW)	Freeway Crossing	Major Road Crossings	Minor Road Crossings	Railroad Crossings	Daily Truck Trips	Ave./Max. Worker Daily Trips
BD-1 (cont.)	Bay Division Pipeline Reliability Upgrade (cont.)				Stevenson Blvd. Grimmer Blvd. Fremont Blvd. Paseo Padre Parkway Driscoll Road Mission Blvd.			Should Contractor elect to install an on site concrete batch plant then bulk transport of sand, aggregate, cement would occur periodically throughout the tunnel construction period. For drive and receiving shafts, 9 to 13 truck trips per day, intermittently over several months	
BD-2	BDPL Nos 3 & 4 Crossovers	Not Specified. Likely routes: Lick Mill Rd. (Guadalupe River site), Foothill Expressway-Veterans Administration Medical Center-Gunn High School (Barron Creek), and Reservoir Road-Alameda de Las Pulgas (Bear Gulch site).	No	No	No	No	No	TBD	TBD
BD-3	Seismic Upgrade of BDPLs Nos. 3 and 4 at Hayward Fault	Not specified, but I-680 and Mission Blvd. are adjacent to site.	Yes	I-680 (jack and bore)	I-680 and Mission Blvd.	Not Specified	No	Not Specified	Not Specified
PN-1	Baden and San Pedro Valve Lots Improvements	Baden: El Camino Real (Highway 82), West Orange Avenue in South San Francisco; San Pedro: Junipero Serra Blvd., San Pedro Rd. in Daly City; Pulgas Pump Station off of Canada Road; Pulgas Valve Lot off of Edgewood Road.	No	No	No	No	No	Baden: 2 to 4 peak hour truck trips; San Pedro: 25 peak hour trips; Pulgas Valve Lot and Pulgas Pump Station: 25 peak hour trips	Not Specified
PN-2	Crystal Springs/San Andreas Transmission Upgrade	I-280 freeway, SFPUC watershed and pump station roads	No	I-280 (S.A. Outlet Tower Nos. 2 & 3)	Hwy 92 (Upper C.S. Dam culverts)	No	No	Not Specified	Not Specified
PN-3	HTWTP Long-Term Improvements	I-280 freeway, Crystal Springs Road	No	No	No	No	No	TBD	TBD
PN-4	Lower Crystal Springs Dam Improvements	I-280 freeway, Skyline Boulevard, Crystal Springs Road	No	No	No	No	No	TBD	TBD
PN-5	Pulgas Balancing Reservoir Rehabilitation	I-280 freeway, Cañada Road	No	No	Cañada Road (channel located west of Canada Road)	No	No	TBD	TBD
SF-1	San Andreas #3 Pipeline Installation	Highway 280, Junipero Serra Blvd, 19th Ave, Brotherhood Way, and Ocean Ave, and city streets along alignment.	Possibly numerous other local streets to be determined.	No	19th Avenue	Numerous	Yes (MUNI track)	20	4
SF-2	Groundwater Projects - Local	Lake Merced Pump Station: Brotherhood Way, Lake Merced Boulevard; South Sunset Playground: Wawona St.; West Sunset Playground: Rivera, Quintara St., 40th Ave.; Golden Gate Park: 41st Ave, 42nd Ave, Lincoln Way; SF Zoo: Sloat Blvd; North Lake: 43rd Ave, Fulton St. Haul routes at these sites: 19th Ave, Sunset Blvd, Highway 1, I-280.	TBD (Pipeline locations not yet specified – potential alignments 40th Ave, 41st Ave., Ortega St., and others)	No	Sunset Blvd., Lincoln Way	Numerous local roads possible	No	TBD	TBD
	Groundwater Projects - Regional	Highway 1, I-280, Highway 101, El Camino Real	TBD (Locations not specified)	No	TBD	TBD (Locations not specified)	TBD	20/site (1 peak hour trip/site for pipeline)	45/site
SF-3	Recycled Water Projects	Sloat Blvd, potential Highway 1 entrance. Possible haul routes: Highway 1, Skyline Blvd, Lake Merced Blvd, John Muir Dr, Brotherhood Way, I-280.	TBD (Pipeline locations not yet specified - potential alignments Sloat Blvd., 42nd Ave. and others)	No	TBD (Pipeline locations not specified- Sloat Blvd., Great Highway, Lincoln Way, others)	TBD (Pipeline locations not specified)	No	20 trips/day (10 truckloads); max. 10 truck trips during peak hour	88

[1] Project information presented in this table is preliminary and subject to change as project designs are developed.

TABLE C.6
PERMITS, APPROVALS, AND EARLY COORDINATION WITH OTHER AGENCIES THAT MAY BE REQUIRED[a]

Project Number	Project Name	ACOE Section 10	Individual or ACOE NWP Section 404	National Wildlife Refuge	SHPO Section 106	NMFS Section 7 / USFWS Section 7	USFWS FWCA	National Park Service, GGNRA[b]	State Lands Commission Lease/ Permit[c]	Caltrans[d]	DWR, Central Valley Flood Protection Board	DWR, Division of Safety of Dams	CDFG 1602, 2080.1, 2081, or MOA	DHS (Public Water System)	SWRCB (SWPPP)	RWQCB 401	RWQCB Discharge/ Dewatering	BAAQMD	BCDC	Local CUPA/ HazMat Business Plan
SJ-1	Advanced Disinfection		Possible		Possible	Possible							X	X	X	Possible		TBD		
SJ-2	Lawrence Livermore Supply Improvements		X (TS site only)		Possible	X (TS site only)							X (TS site only)	X	X	X (TS site only)				X
SJ-3	San Joaquin Pipeline System		X	Possible	X	X			X	Possible	Possible		X		X	X				X
SJ-4	Rehabilitation of Existing San Joaquin Pipelines	Possible	Possible	Possible	Possible	Possible				Possible			Possible							
SJ-5	Tesla Portal Disinfection Station												X	X	X					X
SV-1	Alameda Creek Fishery Enhancement		TBD		TBD	TBD				Possible			X			TBD				
SV-2	Calaveras Dam Replacement		X		X	X	X					X	X		X	X	X			X
SV-3	Additional 40-mgd Treated Water Supply													X	X					X
SV-4	New Irvington Tunnel		X		X	X				Possible			X		X	X	X			X
SV-5	SVWTP – Treated Water Reservoirs													X	X					X
SV-6	San Antonio Backup Pipeline																			
BD-1	Bay Division Pipeline Reliability Upgrade	Possible	X	Possible	X	X	X[e]		X	Possible			X		X	X	X		Possible	X
BD-2	BDPL Nos. 3 and 4 Crossovers		X			X	X			Possible			X		X	X	X			
BD-3	Seismic Upgrade of BDPLs Nos. 3 and 4 at Hayward Fault	TBD	TBD		TBD	TBD	TBD		TBD	Possible			TBD	TBD	TBD	TBD	TBD	TBD		
PN-1	Baden and San Pedro Valve Lot Improvements									Possible				X			X			
PN-2	Crystal Springs/San Andreas Transmission Upgrade	X	X		X	X		EC[b]		Possible			X	X	X	X	X			X
PN-3	HTWTP Long-Term Improvements							EC[b]		Possible				X	X					
PN-4	Lower Crystal Springs Dam Improvements	X	X		X	X	X	EC[b]		Possible		X	X		X	X	X			X
PN-5	Pulgas Balancing Reservoir Rehabilitation							EC[b]					X							
SF-1	San Andreas Pipeline No. 3 Installation									Possible					X	X	X			
SF-2	Groundwater Projects (Local and Regional)									Possible				X				X		
SF-3	Recycled Water Projects									Possible				X		X				

NOTES: ACOE = U.S. Army Corps of Engineers; BAAQMD = Bay Area Air Quality Management District; BCDC = San Francisco Bay Conservation and Development Commission; Caltrans = California Department of Fish and GameTransportation; CDFG = California Department of Fish and Game; CUPA = Certified Unified Program Agency; DHS = California Department of Health Services; DWR = California Department of Water Resources; EC = Early Coordination Requested; (FWCA = Fish and Wildlife Coordination Act); GGNRA = Golden Gate National Recreation Area; MOA = Memorandum of Agreement; NMFS = U.S. National Marine Fisheries Service; (NWP = National Permit for Stream and Wetland Restoration Activities); RWQCB = Regional Water Quality Control Board; SHPO = State Historic Preservation Office; SWPPP = stormwater pollution prevention plan; SWRCB = State Water Resources Control Board; TBD = To Be Determined; TS = Thomas Shaft; USFWS = U.S. Fish and Wildlife Service.

h

a Additional approvals may be identified for WSIP facility projects when separate, project-level CEQA analysis is completed.

b The GGNRA requests consultation during project development and advance notification of meetings and would like to assist in creating mitigations for potential impacts from these projects.

c Section 6327 of the Public Resources Code provides that if a facility is for the "procurement of fresh-water from and construction of drainage facilities into navigable rivers, streams, lakes and bays," and if the applicant obtains a permit from the local reclamation district, State Reclamation Board, the U.S. Army Corps of Engineers, or the Department of Water Resources, then an application shall not be required by the State Lands Commission. Since the proposed program appears to fall within this section, a lease from the Commission would not be required, provided one of the above-listed permits is obtained.

d As part of project-level CEQA review, Caltrans requests that each facility improvement project be reviewed to determine if it encroaches on any state facilities. Any encroachment on Caltrans right-of-way would require an encroachment permit, and CEQA-related environmental studies may be necessary (including studies related to biological resources, cultural resources, and hazardous materials). A qualified professional must conduct these studies to satisfy Caltrans's environmental review policies. Ground-disturbing activities on the site prior to completing and/or approving the required environmental documents could affect Caltrans' ability to issue a permit for the project.

e The USFWS and the Coastal Conservancy are interested in acquiring clean dredge material generated by this project for use in wetland restoration associated with the South Bay Salt Pond Restoration Project, particularly within the Don Edwards San Francisco Bay National Wildlife Refuge (contact Clyde Morris, Manager, 510-792-0222, ext. 25). The USFWS recommends that the SFPUC coordinate with the USFWS's Division of Endangered Species at the Sacramento Fish and Wildlife Office (916-414-6600).

TABLE C.6 (Continued)
PERMITS, APPROVALS, AND EARLY COORDINATION WITH OTHER AGENCIES THAT MAY BE REQUIRED

Project Number	Project Name	San Mateo County Transit District	Coastal Conservancy	Association of Bay Area Governments	Local Flood Control Districts[f]	Alameda County Flood Control and Water Conservation District	Alameda County Water District[g]	East Bay Regional Park District[h]	City of Fremont[i]	City of Menlo Park	City of Palo Alto	Coastside County Water District
SJ-1	Advanced Disinfection											
SJ-2	Lawrence Livermore Supply Improvements											
SJ-3	San Joaquin Pipeline System				Possible							
SJ-4	Rehabilitation of Existing San Joaquin Pipelines				Possible							
SJ-5	Tesla Portal Disinfection Station											
SV-1	Alameda Creek Fishery Enhancement				Possible		EC	EC				
SV-2	Calaveras Dam Replacement					EC[j]	EC	EC	EC			
SV-3	Additional 40-mgd Treated Water Supply						EC	EC				
SV-4	New Irvington Tunnel				Possible		EC	EC				
SV-5	SVWTP – Treated Water Reservoirs						EC	EC				
SV-6	San Antonio Backup Pipeline				Possible		EC	EC				
BD-1	Bay Division Pipeline Reliability Upgrade	EC[k]	EC[l]	EC[l]	Possible		EC	EC	EC	EC[m]		
BD-2	BDPL Nos. 3 and 4 Crossovers				Possible						EC[n]	
BD-3	Seismic Upgrade of BDPLs Nos. 3 and 4 at Hayward Fault				Possible				EC			
PN-1	Baden and San Pedro Valve Lot Improvements											
PN-2	Crystal Springs/San Andreas Transmission Upgrade				Possible							
PN-3	HTWTP Long-Term Improvements											
PN-4	Lower Crystal Springs Dam Improvements											EC[o]
PN-5	Pulgas Balancing Reservoir Rehabilitation											
SF-1	San Andreas Pipeline No. 3 Installation				Possible							
SF-2	Groundwater Projects (Local and Regional)				Possible							
SF-3	Recycled Water Projects				Possible							

NOTE: EC = Early Coordination Requested

f As part of project-level CEQA review, the Alameda County Flood Control and Water Conservation District requests that each facility improvement project that includes pipelines be reviewed to determine if an encroachment permit is required where the pipelines cross the District's channels and creek inverts.

g The ACWD requests that the BD-1 project be coordinated with the ACWD earlier (during project planning and design phases, rather than during the construction phase) to minimize impacts associated with conflicting water facilities and potential impacts on the ACWD's ability to meet customer demands and fire flow requirements. In addition, all Sunol Valley projects (SV-1 through SV-6) will need to take into account potential effects of facility construction on downstream water intakes at ACWD's facilities in the flood control channel. The project-level CEQA review for the SV-2 project will need to consider coordination and notification related to Calaveras Reservoir release protocols that could affect downstream groundwater recharge and the potential for flooding.

h As part of project-level CEQA review, each facility improvement project in the Sunol Valley region should be reviewed to determine if it encroaches on EBRPD property. The EBRPD requests coordination of construction mitigation measures for certain WSIP projects in the Sunol Valley to minimize construction impacts on recreational uses and allow coordination of fire suppression planning and response (including review of traffic control plans). As part of the project-level EIR for SV-2, the EBRPD states that the SFPUC needs to coordinate the timing of water releases from Calaveras Dam to maximize benefits to amphibians and anadromous fish species.

i The City of Fremont requests consultation (regarding the applicability of encroachment permits, and development and review of traffic control plans) during the planning and design phases of the SV-2, BD-1, and BD-3 projects as well as any other WSIP project that could affect the Fremont transportation network.

j As part of the project-level CEQA review, mitigation measures should be developed to establish coordination and notification protocols between the SFPUC and the ACFCWCD regarding Calaveras Reservoir releases that could affect the potential for downstream flooding.

k The USFWS requests that the BD-1 project be coordinated with the Transit District's Dumbarton Rail Project to minimize habitat impacts for both projects.

l The Coastal Conservancy requests that the SFPUC coordinate with the Coastal Conservancy and Association of Bay Area Government's Bay Trail project (regarding completion of the Bay Trail gap through SFPUC lands).

m The City of Menlo Park requests coordination of construction mitigation measures for the BD-1 project to minimize construction impacts (e.g., access and parking) on local residents and businesses, including the Menlo Business Park.

n The City of Palo Alto requests early consultation on the BD-2 project.

o The Coastside CWD requests consultation during development of the adaptive management program for Crystal Springs Reservoir as part of the operations phase of the PN-4 project.

Appendix D
Biological Resources:
Special Status Species
in Alameda and
Peninsula Watersheds

APPENDIX D

Biological Resources: Special Status Species in Alameda and Peninsula Watersheds

TABLE III.E-3
SPECIAL-STATUS ANIMAL SPECIES
POTENTIALLY OCCURRING IN THE ALAMEDA WATERSHED

Common name *Scientific name*	**Listing Status USFWS/ CDFG**	**Habitat Requirements**	**Potential to Occur Within the Watershed**	**Period of Identification**
Invertebrates				
Opler's longhorn moth *Adella oplerella*	FSC/--	Serpentine grasslands	High Potential	Spring
Serpentine phalangid *Calcina serpentinea*	FSC/--	Serpentine rocks and barrens	High Potential	Fall-Winter
Bay checkerspot butterfly *Euphydryas editha bayensis*	FT/--	Serpentine grasslands	Moderate Potential	March-May
Ricksecker's water scavenger beetle *Hydrochara rickseckeri*	FSC/--	Found in freshwater ponds, shallow water of streams marshes and lakes	Moderate Potential	January-July
Curved-foot hygrotus diving beetle *Hygrotus curvipes*	FSC/--	Found in vernal pools and alkali flats	Moderate Potential	January-July
Unsilvered fritillary butterfly *Speyeria adiaste adiaste*	FSC/--	Found in native grasslands with *Viola penduculata* as larval food plant	Moderate Potential	Spring
Callipe silverspot butterfly *Speyeria callippe callippe*	FE/--	Found in native grasslands with *Viola peduculata* as larval food plant	Moderate Potential	Spring
Myrtle silverspot butterfly *Speyeria zerene myrtleae*	FE/--	Found in native grasslands with *Viola peduculata* as larval food plant	Moderate Potential	Spring
Amphibians				
California tiger salamander *Ambystoma californiense*	FC/CSC	Seasonal freshwater ponds with little or no emergent vegetation	High Potential	November-May
California red-legged frog *Rana aurora draytonii*	FT/CSC	Freshwater ponds and slow streams with emergent vegetation for egg attachment	High Potential	April-June
Foothill yellow-legged frog *Rana boylii*	FSC/CSC	Streams with quiet pools absent of predatory fish	High Potential	April-June
Western spadefoot toad *Scaphipus hammondii*	FSC/CSC	Floodplains and grassland pools	High Potential	February-August

TABLE III.E-3 (Continued)
SPECIAL-STATUS ANIMAL SPECIES
POTENTIALLY OCCURRING IN THE ALAMEDA WATERSHED

Common name *Scientific name*	**Listing Status USFWS/ CDFG**	**Habitat Requirements**	**Potential to Occur Within the Watershed**	**Period of Identification**
Reptiles				
Western pond turtle *Clemmys marmaorata*	FSC/CSC	Freshwater ponds and slow streams edged with sandy soils for laying eggs	High Potential	warm days
Southwestern pond turtle *Clemmys marmaorata pallida*	FSC/CSC	Freshwater ponds and slow streams edged with sandy soils for laying eggs	High Potential	warm days
Coastal western whiptail *Cnemidophorus tigris multiscutatus*	FSC/--	Dry open habitats	High Potential	all year
Alameda whipsnake *Masticophis lateralis euryxanthus*	FT/CT	South, southeast and southwest facing slopes of coastal scrub and chaparral	High Potential	warm days
Birds				
Cooper's hawk *Accipiter cooperi*	--/CSC	Nests in riparian growths of deciduous trees and live oaks	High Potential	March-July
Sharp-shinned hawk *Accipiter striatus*	--/CSC	Nests in riparian growths of deciduous trees and live oaks	High Potential	March-July
Western grebe *Aechmophorus occidentalis*	--/*	Quiet lakes with tules or rushes	Moderate Potential	March-May
Tricolored blackbird *Agelaius tricolor*	FSC/CSC	Riparian thickets and emergent vegetation	High Potential	Spring
Golden eagle *Aquila chrysaetos*	BPA/CSC	Nests in large trees, snags, and cliffs, winters on lakes and reservoirs	High Potential	Spring
Great blue heron *Ardea herodias*	--/*	Nests in trees along lakes and estuaries	High Potential	December-July
Short-eared owl *Asio flammeus (nesting)*	--/CSC	Nests in open grasslands	High Potential	March-June
Aleutian Canada goose *Branta canadensis leucopareia*	FT/--	Winters on lakes and inland prairie	High Potential	Winter
Ferruginous hawk *Buteo regalis (wintering)*	FSC/CSC	Winters in flat open grasslands	High Potential	Winter
Northern harrier *Circus cyaneus*	--/CSC	Nests and forages in wet meadows and pastures	High Potential	Year-round

TABLE III.E-3 (Continued)
SPECIAL-STATUS ANIMAL SPECIES
POTENTIALLY OCCURRING IN THE ALAMEDA WATERSHED

Common name *Scientific name*	**Listing Status USFWS/ CDFG**	**Habitat Requirements**	**Potential to Occur Within the Watershed**	**Period of Identification**
Birds (cont.)				
California horned lark *Eremophila alpestris actia*	--/CSC	Open grasslands and irrigated pastures	High Potential	Year-round
Prairie falcon *Falco mexicanus*	--/CSC	Nests in snags and cliffs of arid climates	High Potential	Spring
Bald eagle[a] *Haliaeetus leucocephalus*	FT/CE	Nests and forages on inland lakes, reservoirs, and rivers	High Potential	Winter
Osprey *Pandion haliaetus*	--/CSC	Nests near fresh water lakes and large streams on large snags	Moderate Potential	March-June
American white pelican *Pelecanus erythrorhynchos*	--/CSC	Nests on protected islets near freshwater lakes for protection from predators	Moderate Potential	May-July
Burrowing owl *Speotyto (=Athene) cunicularia (burrow sites)*	FSC/CSC	Nests in mammal burrows in open, sloping grasslands	High Potential	February-June
Mammals				
Pallid bat *Antrozous pallidus*	FSC/CSC	Roosts in caves, old buildings and under bark. Forages in open lowland areas and forms large maternity colonies in spring	Moderate Potential	February-August
Western mastiff bat *Eumops perotis*	FSC/CSC	Open semi-arid to arid habitats roosting on high cliffs and buildings	Moderate Potential	February-August
Small-footed myotis *Myotis ciliolabrum*	FSC/--	Roosts in caves, old buildings and under bark	Moderate Potential	February-August
Fringed myotis *Myotis evotis*	FSC/--	Roosts in caves, old buildings and under bark, forms maternity colony in the spring	Moderate Potential	February-August
Fringed myotis *Myotis thysanodes*	FSC/--	Roosts in caves, old buildings and under bark, forms maternity colony in the spring	Moderate Potential	February-August
Long-legged myotis *Myotis volans*	FSC/--	Roosts in caves, old buildings and under bark; Forms maternity colony in the spring	Moderate Potential	February-August

TABLE III.E-3 (Continued)
SPECIAL-STATUS ANIMAL SPECIES
POTENTIALLY OCCURRING IN THE ALAMEDA WATERSHED

Common name *Scientific name*	**Listing Status USFWS/ CDFG**	**Habitat Requirements**	**Potential to Occur Within the Watershed**	**Period of Identification**
Mammals (cont.)				
Townsend's big-eared bat *Plecotus townsendii*	FSC/CSC	Roosts in caves, old buildings and under bark; Forages in open lowland areas and forms large maternity colonies in spring	Moderate Potential	February-August
American badger *Taxidea taxus*	--/*	Open grasslands with loose, friable soils	Moderate Potential	Year-round
San Joaquin kit fox *Vulpes macrotis mutica*	FE/CT	Annual grasslands or grassy open stages with scattered shrubby vegetation; Need loose-textured sandy soils for burrowing	Moderate Potential	February-October
Mountain Lion *Felis* spp.	--/4800	Rural grasslands and woodlands	High	Year-round

LISTING STATUS CODES:

U.S. Fish and Wildlife Service (USFWS)

FE = Listed as Endangered (in danger of extinction) by the federal government.
FT = Listed as Threatened (likely to become endangered within the foreseeable future) by the federal government.
FPE = Proposed for Listing as Endangered
FPT = Proposed for Listing as Threatened
FC = Candidate to become a *proposed* species.
FSC = Federal Species of Concern. May be endangered or threatened, but not enough biological information has been gathered to support listing at this time.
FC3c = Species removed from listing
BPA = Federal Bald Eagle Protection Act

California Department of Fish and Game (CDFG)

CE = Listed as Endangered by the State of California
CT = Listed as Threatened by the State of California
CR = Listed as Rare by the State of California (plants only)
CSC = California Species of Special Concern
* = Special Animals
3503.5 =Protection for nesting species of Falconiformes (hawks) and Strigiformes (owls)
3511 = A fully protected species as defined by the CDFG
4800 = Mountain lion protection

High Potential = Species expected to occur and meets all habitats as defined in list
Moderate Potential = Habitat only marginally suitable or suitable but not within species geographic range
[a] Federal delisting is currently proposed, pending publication in the *Federal Register*.

SOURCE: Environmental Science Associates, 1994; EDAW, Inc., 1998; CDFG, 1998

TABLE III.E-1
SPECIAL-STATUS PLANT SPECIES
POTENTIALLY OCCURRING IN THE ALAMEDA WATERSHED

Common name ***Scientific name***	**Listing Status USFWS/CDFG/ CNPS**	**Habitat Requirements**	**General Site Occurrence Within the Watershed**	**Flowering Period**
Santa Clara thorn mint *Acanthomintha lanceolata*	--/--/4	Chaparral, shale scree	High Potential Type Habitat-Calaveras[a]	March-June
Balsamroot *Balsamorhiza macrolepis* var. *macrolepis*	--/--/1B	Cismontane woodland, grassland	High Potential Interior slopes near SF Bay	March-June
Oakland star-tulip *Calochortus umbellatus*	--/--/4	Broadleafed upland forests, chaparral, lower montane coniferous forests, grasslands, often on serpentinite	Moderate Potential Mt. Hamilton Range[a]	March-May
Sharsmith's harebell *Campanula sharsmithiae*	FSC/--/1B	Chaparral, ultramafic talus	Moderate Potential Mt. Hamilton Range	May-June
Mt. Hamilton thistle *Cirsium fontinale* var. *campylon*	FSC/--/1B	Ultramafic seeps, sandy streams	High Potential Mt. Hamilton Range[a]	Feb-Oct
Brewer's clarkia *Clarkia breweri*	--/--/ 4	Chaparral, shale talus	High Potential Mt. Hamilton Range[a]	April-May
Santa Clara red ribbons *Clarkia concinna* ssp. *automixa*	FSC/--/1B	Coastal scrub, grassland (ultramafic)	High Potential Alameda County[c]	May-July
Presidio clarkia *Clarkia franciscana*	FE/CE/1B	Coastal scrub, grassland (ultramafic)	Moderate Potential Alameda County[c]	May-July
Serpentine collomia *Collomia diversifolia*	--/--/4	Serpentine seeps, streams	Moderate Potential Red Mountains[a]	May-June
Mt. Hamilton coreopsis *Coreopsis hamiltonii*	FSC/--/1B	Steep, shale talus, woodland	Moderate Potential Mt. Hamilton Range[a]	March-May
Inner Coast Range Larkspur *Delphinium californicum* ssp. *interius*	FSC/--/1B	Dry ravines	High Potential Mt. Hamilton Range[a]	April-June
Western leatherwood *Dirca occidentalis*	--/--/1B	Broadleafed upland forests, closed-cone coniferous forests, chaparral, cismontane woodland, North Coast coniferous forests, riparian forests, riparian woodland; mesic sites	Moderate Potential Alameda, Santa Clara County[c]	Jan-March
Santa Clara Valley dudleya *Dudleya setchellii*	FE/--/1B	Ultramafic grasslands	Moderate Potential Outside of range	May-June

TABLE III.E-1 (Continued)
SPECIAL-STATUS PLANT SPECIES
POTENTIALLY OCCURRING IN THE ALAMEDA WATERSHED

Common name ***Scientific name***	**Listing Status USFWS/CDFG/ CNPS**	**Habitat Requirements**	**General Site Occurrence Within the Watershed**	**Flowering Period**
Tiburon buckwheat *Eriogonum luteolum* var. *caninum*	--/--/3	Chaparral, coastal prairie, grasslands, usually on serpentinite	Moderate Potential Alameda, Santa Clara County[c]	June-Sept
Ben Lomond buckwheat *Eriogonum nudum* var. *decurrens*	--/--/1B	Chaparral, coastal prairie, grasslands, usually on serpentinite	Moderate Potential Alameda, Santa Clara, Santa Cruz County[c]	June-Sept
Jepson's woolly sunflower *Eriophyllum jepsonii*	--/--/4	Coastal scrub	High Potential Alameda, Santa Clara County[c]	April-June
Stinkbells *Fritillaria agrestis*	--/--/4	Valley and foothill grasslands, oak woodlands; on clay flats; sometimes on serpentine	High Potential Alameda, Santa Clara County[c]	March-April
Talus fritillary *Fritillaria falcata*	FSC/--/1B	Chaparral, woodland, on talus	Moderate Potential Alameda, Santa Clara County[c]	March-May
Fragrant fritillary *Fritillaria liliacea*	FSC/--/1B	Coastal scrub, valley and foothill grassland, coastal prairie; on heavy clay soils, often on ultramafic soils	High Potential Alameda, Santa Clara County[c]	Feb-April
Contra Costa goldfields *Lasthenia conjugens*	FE/--/1B	Moist grasslands, vernal pools	Moderate Potential Alameda, Santa Clara County[c]	March-June
Woolly-headed lessingia *Lessingia hololeuca*	--/--/3	Grasslands	Moderate Potential	June-Oct
Arcuate bush mallow *Malacothamnus arcuatus*	--/--/4	Chaparral	Moderate Potential Santa Clara County[c]	April-July
Hall's bush mallow *Malacothamnus hallii*	--/--/4	Chaparral	Moderate Potential Alameda, Santa Clara County[c]	May-Sept
Gairdner's yampah *Perideridia gairdneri*	FSC/--/1B	Broad-leaved Upland forest, chapparral	Moderate Potential Santa Isabella Valley[a]	June-July
Mt. Diablo phacelia *Phacelia phacelioides*	FSC/--/1B	Cismontane woodland, chaparral	High Potential Alameda, Santa Clara County[c]	April-May
Forget-me-not popcorn flower *Plagiobothrys myosotoides*	--/--/4	Chaparral	Moderate Potential Ridge-top in Mt. Hamilton Range[a, c, e]	April-May

TABLE III.E-1 (Continued)
SPECIAL-STATUS PLANT SPECIES
POTENTIALLY OCCURRING IN THE ALAMEDA WATERSHED

Common name *Scientific name*	**Listing Status USFWS/CDFG/ CNPS**	**Habitat Requirements**	**General Site Occurrence Within the Watershed**	**Flowering Period**
Lobb's aquatic buttercup *Ranunculus lobbii*	--/--/4	Ponds, pools, watering holes	High Potential Alameda, Santa Clara County[b]	Feb-April
Rock sanicle *Sanicula saxitilis*	FSC/CR/1B	Broad-leaved upland forest, chaparral, valley and foothill grassland	Moderate Potential Santa Clara County[c]	April-May
Maple-leaved checkerbloom *Sidalcea malachroides*	--/--/1B	Grasslands	Moderate Potential Santa Clara County[c]	April-June
Metcalf Canyon jewelflower *Streptanthus albidus* ssp. *albidus*	FE/--/1B	Serpentine grassland, barrens	High Potential Santa Clara County[c]	April-June
Most beautiful jewelflower *Streptanthus albidus* ssp. *peramoenus*	FSC/--/1B	Serpentine grassland, chaparral	Moderate Potential San Francisco Bay Area[d]	April-June
Mt. Hamilton jewelflower *Streptanthus callistus*	FSC/--/1B	Shale talus	High Potential Endemic, Arroyo Bayo[a]	April-May
Mt. Diablo jewelflower *Streptanthus hispidus*	FSC/--/1B	Grassland	High Potential Endemic, Mt. Diablo[c]	March-June
Mt. Diablo cottonweed *Stylocline amphibola*	--/--/4	Broad-leaved Upland forest, Chaparral	High Potential Alameda County[c]	April-May

Federal Categories (USFWS)

FE = Listed as Endangered by the Federal Government
FT = Listed as Threatened by the Federal Government
FPE = Proposed for Listing as Endangered
FPT = Proposed for Listing as Threatened
FC = Candidate for Federal Listing
FSC = Federal Species of Concern (former Category 2 Candidate
FC3c = Species removed from listing

California Native Plant Society (CNPS)

List 1A = Plants presumed extinct in California
List 1B = Plants rare, threatened, or endangered in California and elsewhere
List 2 = Plants rare, threatened, or endangered in California but more common
List 3 = Plants about which more information is needed
List 4 = Plants of limited distribution

State Categories (CDFG)

CE = Listed as Endangered by the State of California
CT = Listed as Threatened by the State of California
CR = Listed as Rare by the State of California

High Potential = Species expected to occur and meets all habitats as defined in list
Moderate Potential = Habitat only marginally suitable or suitable but not within species geographic range

[a] Sharsmith, 1982.
[b] Hickman, 1993.
[c] Smith, Berg, 1992.
[d] CDFG, 1991.
[e] Environmental Science Associates, 1994.

SOURCE: Environmental Science Associates, 1994; EDAW, Inc., 1998; CNPS, 1998; CDFG, 1998

TABLE III.E-3
SPECIAL-STATUS ANIMAL SPECIES REPORTED OR POTENTIALLY OCCURRING IN THE PENINSULA WATERSHED

Common name *Scientific name*	**Listing Status USFWS/ CDFG**	**Habitat Requirements**	**Potential for Occurrence Within the Watershed**	**Period of Identification**
Invertebrates				
Opler's longhorn moth *Adella oplerella*	FSC/--	Serpentine bunchgrass grassland	High Potential	Spring
Edgewood blind harvestman *Calcinia minor*	FSC/--	Serpentine rock outcrops and barrens	High Potential	Fall-Winter
Serpentine phalangid *Calcina serpentinea*	FSC/--	Serpentine rocks and barrens	High Potential	Fall-Winter
Monarch butterfly *Danaus plexippus*	--/*	Eucalyptus groves (winter sites)	Moderate Potential	Winter
Bay checkerspot butterfly *Euphydryas editha bayensis*	FT/--	serpentine bunchgrass grassland	High Potential	March-May
Mission blue butterfly *Icaricia icarioides missionensis*	FE/--	Grassland with *Lupinus albifrons*, *L. formosa*, and *L. varicolor*	High Potential	March-June
San Bruno elfin butterfly *Incisalia mossii bayensis*	FE/--	Found in coastal scrub	High Potential	March-April
San Francisco fork-tailed damselfly *Ischnura gemina*	FSC/--	Wetlands with emergent vegetation	High Potential	April-October
San Francisco lacewing *Nothochrysa californica*	FSC/--	Grasslands	Moderate Potential	Spring
Unsilvered fritillary butterfly *Speyeria adiaste adiaste*	FSC/--	Found in native grasslands with *Viola penduculata* as larval food plant	High Potential	Spring
Callipe silverspot butterfly *Speyeria callippe callippe*	FE/--	Found in native grasslands with *Viola peduculata* as larval food plant	High Potential	Spring
Myrtle silverspot butterfly *Speyeria zerene myrtleae*	FE/--	Found in native grasslands with *Viola peduculata* as larval food plant	High Potential	Spring
Amphibians				
California tiger salamander *Ambystoma californiense*	FC/CSC	Seasonal freshwater ponds with little or no emergent vegetation	Moderate Potential	November-May
California red-legged frog *Rana aurora draytonii*	FT/CSC	Freshwater ponds and slow streams with emergent vegetation for egg attachment	High Potential	April-June
Foothill yellow-legged frog *Rana boylii*	FSC/CSC	Streams with quiet pools absent of predatory fish	High Potential	April-June
Western spadefoot toad *Scaphipus hammondii*	FSC/CSC	Floodplains and grassland pools	Moderate Potential	February-August

TABLE III.E-3 (Continued)
SPECIAL-STATUS ANIMAL SPECIES REPORTED OR POTENTIALLY OCCURRING IN THE PENINSULA WATERSHED

Common name *Scientific name*	**Listing Status USFWS/ CDFG**	**Habitat Requirements**	**Potential for Occurrence Within the Watershed**	**Period of Identification**
Reptiles				
Western pond turtle *Clemmys marmaorata*	FSC/CSC	Freshwater ponds and slow streams edged with sandy soils for laying eggs	High Potential	warm days
San Francisco garter snake *Thamnophis sirtalis tetrataenia*	FE/CE	Freshwater ponds and slow streams with emergent vegetation	High Potential	warm days
Birds				
Cooper's hawk *Accipiter cooperi*	--/CSC	Nests in riparian growths of deciduous trees and live in oaks	High Potential	March-July
Sharp-shinned hawk *Accipiter striatus*	--/CSC	Nests in riparian growths of deciduous trees and live oaks	High Potential	March-July
Great blue heron *Ardea herodias*	--/*	Nests in trees along lakes and estuaries	High Potential	Dec.-July
Marbled murrelet *Brachyramphus marmoratus*	FT/CE	Nests in dense, old growth forests along coast	High Potential	Year-round
Northern harrier *Circus cyaneus*	--/CSC	Nests and forages in wet meadows and pastures	High Potential	Year-round
Merlin *Falco columbarius*	--/CSC	A winter visitor of woodlands, foothills and valleys	High Potential	Winter
● American perigrine falcon *Falco peregrinus anatum*	--/CE	Nests in cliffs and outcrops	Moderate Potential	Year-round
Bald eagle[a] *Haliaeetus leucocephalus*	FT/CE	Nests and forages on inland lakes, reservoirs, and rivers	High Potential	Winter
Osprey *Pandion haliaetus*	--/CSC	Nests near fresh water lakes and large streams on large snags	Moderate Potential	March-June
American white pelican *Pelecanus erythrorhynchos*	--/CSC	Nests on protected islets near freshwater lakes for protection from predators	Moderate Potential	May-July
Mammals				
Pallid bat *Antrozous pallidus*	--/CSC	Roosts in caves, old buildings and under bark. Forages in open lowland areas and forms large maternity colonies in spring.	High Potential	February-August
Western mastiff bat *Eumops perotis*	FSC/CSC	Open semi-arid to arid habitats roosting on high cliffs and buildings	High Potential	February-August
Small-footed myotis *Myotis ciliolabrum*	FSC/--	Roosts in caves, old buildings and under bark	High Potential	February-August

TABLE III.E-3 (Continued)
SPECIAL-STATUS ANIMAL SPECIES REPORTED OR POTENTIALLY OCCURRING IN THE PENINSULA WATERSHED

Common name *Scientific name*	**Listing Status USFWS/ CDFG**	**Habitat Requirements**	**Potential for Occurrence Within the Watershed**	**Period of Identification**
Mammals (cont.)				
Long-eared myotis *Myotis evotis*	FSC/--	Roosts in caves, old buildings and under bark. Forms maternity colony in the spring	High Potential	February-August
Fringed myotis *Myotis thysanodes*	FSC/--	Roosts in caves, old buildings and under bark. Forms maternity colony in the spring	High Potential	February-August
Long-legged myotis *Myotis volans*	FSC/--	Roosts in caves, old buildings and under bark. Forms maternity colony in the spring.	High Potential	February-August
Townsend's big-eared bat *Plecotus townsendii*	FSC/CSC	Roosts in caves, old buildings and under bark. Forages in open lowland areas and forms large maternity colonies in spring.	Moderate Potential	February-August
Badger *Taxidea taxus*	-- /*	Open grasslands with loose, friable soils	Moderate Potential	Year-round
Mountain lion *Felis spp.*	--/4800	Rural grasslands and woodlands	High	Year-round
Fish				
Steelhead trout *Oncoryhnchus mykiss*	FT/--	Freshwater streams	High Potential	Year-round

Federal Categories (USFWS)

FE = Listed as Endangered (in danger of extinction) by the Federal Government.
FT = Listed as Threatened (likely to become endangered within the foreseeable future) by the Federal Government.
FPE = Proposed for Listing as Endangered
FPT = Proposed for Listing as Threatened
FC = Candidate to become a *proposed* species.
FSC = Federal Species of Concern. May be endangered or threatened, but not enough biological information has been gathered to support listing at this time.
FC3c = Species removed from listing

State Categories (CDFG)

CE = Listed as Endangered by the State of California
CT = Listed as Threatened by the State of California
CR = Listed as Rare by the State of California (plants only)
CSC = California Species of Special Concern
* = Special Animals
3511 = Fully protected bird species (Fish and Game Code)
3503.5 = Protection for nesting species of Falconiformes (hawks) and Strigiformes (owls)
4800 = Mountain lion protection

High Potential = Species expected to occur and meets all habitats as defined in list.
Moderate Potential = Habitat only marginally suitable or suitable but not within species geographic range.
Low Potential = Habitat does not meet species requirements as currently understood in the scientific community.
-- = No listing status.

[a] Federal delisting is currently proposed, pending publication in the *Federal Register*.

SOURCE: Environmental Science Associates, 1994, 1998; CDFG, 1998

TABLE III.E-1
SPECIAL-STATUS PLANT SPECIES REPORTED OR POTENTIALLY OCCURRING IN THE PENINSULA WATERSHED

Common name *Scientific name*	**Listing Status USFWS/ CDFG/CNPS**	**Habitat Requirements**	**Potential for Occurrence Within the Watershed**	**Flowering Period**
San Mateo thorn-mint *Acanthomintha duttonii*	FE/CE/1B	Grassland and chaparral, on serpentinite	Found in "Triangle" [a,b]	April-June
Coast rock cress *Arabis blepharophylla*	FC3c/--/4	Broadleafed upland forests, coastal prairie, coastal scrub; often in rocky places	Found[b,d]	February-April
San Bruno Mtn. Manzanita *Arctostaphylos imbricata*	FSC/CE/1B	Chaparral, coastal scrub	Found[b,d]	February-May
Montara manzanita *Arctostaphylos montaraensis*	FC/--/1B	Maritime chaparral, coastal scrub	Found[a,b]	January-March
Brewer's calandrinia *Calandrinia breweri*	--/--/4	Burns and disturbed areas in coastal scrub and chaparral	Moderate Potential[c]	March-June
Robust spineflower *Chorizanthe robusta* var. *robusta*	FPE/--/1B	Coastal scrub, coastal dunes, openings in oak woodlands	Moderate Potential[c]	May-September
Fountain thistle *Cirsium fontinale var. fontinale*	FE/CE/1B	Grassland and openings in chaparral, in serpentinite seeps	Found on Pulgas Ridge[b]	June-October
Mountain lady's-slipper *Cypripedium montanum*	FC3c/--/4	Broadleafed upland forests, lower montane coniferous forests	Moderate Potential[c]	March-July
Western leatherwood *Dirca occidentalis*	--/--/1B	Broadleafed upland forests, closed-cone coniferous forests, chaparral, cismontane woodland, North coast coniferous forests, riparian forests, riparian woodland; mesic sites	Found in many communities[e]	January-April
California bottle-brush grass *Elymus californicus*	FC3c/--/4	North coast coniferous forests	Occurs on Cahill Ridge[b,c]	June-August
Marsh horsetail *Equisetum palustre*	--/--/3	Marshes	Moderate Potential[c]	NK
Tiburon buckwheat *Eriogonum luteolum* var. *caninum*	FC3c/--/3	Chaparral, coastal prairie, grasslands, usually on serpentinite	High Potential[c] observed in coastal scrub	June-September
San Mateo woolly sunflower *Eriophyllum latilobum*	FE/CE/1B	Cismontane woodland, on serpentinite, often on roadcuts	Found along Crystal Sps. Rd.[a,b,f]	May-June

**TABLE III.E-1 (Continued)
SPECIAL-STATUS PLANT SPECIES REPORTED OR
POTENTIALLY OCCURRING IN THE PENINSULA WATERSHED**

Common name ***Scientific name***	**Listing Status USFWS/ CDFG/CNPS**	**Habitat Requirements**	**Potential for Occurrence Within the Watershed**	**Flowering Period**
San Francisco wallflower *Erysimum franciscanum*	FSC/--/4	Coastal dunes, coastal scrub, grasslands, often on serpentinite or granitic soils	Found throughout grassland[b]	March-June
Stink bells *Fritillaria agrestis*	--/--/4	Valley and foothill grasslands, oak woodlands; on clay flats; sometimes on serpentine	Low-Moderate Potential[c]	March-April
Fragrant fritillary *Fritillaria liliacea*	FSC/--/1B	Coastal scrub, valley and foothill grassland, coastal prairie; on heavy clay soils, often on ultramafic soils	Found on Pulgas Ridge[b]	February-April
Diablo rock-rose *Helianthella castanea*	FSC/--/1B	Openings in chaparral and broadleaved upland forest	Low-moderate[c] Potential	April-June
Marin dwarf flax *Hesperolinon congestum*	FT/CT/1B	Grassland and openings in chaparral, often on serpentinite	Found on Pulgas and Buri Buri Ridges[b]	May-July
Kellogg's horkelia *Horkelia cuneata* ssp. *sericea*	FSC/--/1B	Closed-cone coniferous forests, coastal scrub	Low-Moderate Potential[c]	April-September
Bristly linanthus *Linanthus acicularis*	--/--/4	Chaparral, cismontane woodland, coastal prairie	Low-Moderate Potential[c]	April-July
Large-flower linanthus *Linanthus grandiflorus*	--/--/4	Coastal bluff scrub, closed-cone coniferous forests, cismontane woodland, coastal dunes, coastal prairie, coastal scrub, grasslands	Low-Moderate Potential[c]	April-July
San Mateo tree lupine *Lupinus eximius*	FSC/--/3	Chaparral and coastal	Found[b]	April-July
Arcuate bush mallow *Malacothamnus arcuatus*	--/--/4	Chaparral	Found[c]	April-July
Dudley's lousewort *Pedicularia dudleyi*	FSC/CR/1B	North Coast coniferous forests, maritime chaparral, grasslands, sometimes in disturbed sites	High Potential[c]	April-June
● White-rayed pentachaeta *Pentachaeta bellidiflora*	FE/CE/1B	Grasslands, serpentinite soils, dry rocky slopes	Found in triangle area[c]	March-May
Gaairdner's yampah *Perideridia gairdneri* ssp. *gairdneri*	FSC/--/4	Broadleafed upland forests, chaparral, grasslands, vernal pools, usually in mesic sites	Moderate Potential[c]	June-October

TABLE III.E-1 (Continued)
SPECIAL-STATUS PLANT SPECIES REPORTED OR POTENTIALLY OCCURRING IN THE PENINSULA WATERSHED

	Common name *Scientific name*	Listing Status USFWS/ CDFG/CNPS	Habitat Requirements	Potential for Occurrence Within the Watershed	Flowering Period
	Choris's popcorn-flower *Plagiobothrys chorisianus* var. *chorisianus*	--/--/3	Chaparral, coastal prairie, coastal scrub, on mesic sites	Moderate Potential[c]	April-June
	Hickman's cinquefoil *Potentilla hickmanii*	FPE/CE/1B	Coastal bluff scrub, closed-cone coniferous forests, meadows and marshes, mesic sites	Moderate Potential[c]	April-August
●	San Francisco collinsia *Collinsia multicolor*	--/--/4	Closed-cone coniferous forests, coastal scrub, and moist, shady coast live oak woodland	High[g] Potential	March-May
●	Hillsborough chocolate lily *Fritillaria biflora var. ineziana*	--/--/1B	Cismontane woodland, grassland, on serpentinite	Found on Buri Buri Ridge in serpentine grassland[g]	March-April
●	San Francisco gumplant *Grindelia hirsutula var. maritima*	FSC/--/1B	Coastal bluff scrub, coastal scrub, grasslands, on sandy or serpentinite soils	High Potential[g]	August-September
●	Crystal Springs lessingia *Lessingia arachnoidea*	FSC/--/1B	Cismontane woodland, coastal scrub, grasslands, on serpentinite, often on roadcuts	Found on Pulgas Ridge[g]	July-October
●	Serpentine linanthus *Linanthus ambiguus*	--/--/4	Cismontane woodland, coastal scrub, grassland, usually on serpentinite	High Potential[g]	March-June
●	Hickman's cinquefoil *Potentilla hickmanii*	FPE/CE/1B	Coastal bluff scrub, closed-cone coniferous forests, meadows and marshes, mesic sites	High Potential[g]	April-August

● Federal Categories (U.S. Fish and Wildlife Service)

FE = Listed as Endangered by the Federal Government
FT = Listed as Threatened by the Federal Government
FPE = Proposed for Listing as Endangered
FPT = Proposed for Listing as Threatened
FC = Candidate for Federal Listing
FSC = Federal Species of Concern (former Category 2 Candidate)
FC3c = Species removed from listing

State Categories (California Department of Fish and Game)

CE = Listed as Endangered by the State of California
CT = Listed as Threatened by the State of California
CR = Listed as Rare by the State of California

California Native Plant Society (CNPS)

List 1A = Plants presumed extinct in California
List 1B = Plants rare, threatened, or endangered in California and elsewhere
List 2 = Plants rare, threatened, or endangered in California but more common
List 3 = Plants about which more information is needed
List 4 = Plants of limited distribution

● [a] CDFG, 1998.
[b] Corelli, T., 1991.
[c] Environmental Science Associates, 1998.
[d] Environmental Science Associates, 1994.
[e] Oberlander, G. T., 1953.
[f] The Nature Conservancy, 1990.
[g] California Native Plant Society, 2000.
[h] National Park Service, 2000.

High Potential = Species expected to occur and meets all habitats as defined in list.
Moderate Potential = Habitat only marginally suitable or suitable but not within species geographic range.
Low Potential = Habitat does not meet species requirements as currently understood in the scientific community.
-- = No listing status; NK = Not known, information unavailable.

SOURCE: Environmental Science Associates, 1994, 1998; CDFG, 1998; CNPS, 1998

Hickman, 1993; The Nature Conservancy, 1990; Corelli, 1991; and Oberlander, 1953). Seven of these species have formal listings as endangered or threatened under the California Endangered Species Act or Federal Endangered Species Act. These species include San Mateo thornmint, fountain thistle, San Mateo woolly sunflower, Marin dwarf flax, white-rayed pentachaeta, San Bruno Mountain manzanita, and Hickman's cinquefoil. All the species have been observed within the Watershed, except Hinkman's cinquefoil, which has a moderate potential to occur.

Appendix E
Growth Inducement Potential and Supporting Information

APPENDIX E

Growth Inducement and Supporting Information

This appendix supplements the information provided in Chapter 7, Growth Inducement Potential and Indirect Effects of Growth, of the WSIP PEIR. In separate subsections it provides information on the following topics:

- E.1 Water Supply Assurances
- E.2 Methodology the SFPUC used to develop 2030 water demand projections and the studies conducted to evaluate potential conservation measures and recycled water projects to help meet future demand, which together provided the basis for the 2030 purchase estimates submitted to the SFPUC.
- E.3 Supplementary information on population, employment, and water demand projections in the SFPUC water service area.
- E.4 Growth trends and policies of a selection of jurisdictions in the service area.
- E.5 Indirect effects of growth and measures identified to mitigate those effects.
- E.6 Project level impacts of growth.

APPENDIX E.1

Water Supply Assurances

Under the terms of the 1984 Settlement Agreement and Master Sales Water Contract (Master Sales Agreement) between the City and County of San Francisco and its suburban water purchasers (the SFPUC wholesale customers) (City and County of San Francisco, et al.,1984), the SFPUC is required to supply up to 184 million gallons per day (mgd) on an annual average basis to the wholesale customers, subject to reductions in the event of a drought, water shortage, earthquake, or other natural disaster, and for rehabilitation and maintenance of the system. In addition, the SFPUC and each of the wholesale customers, except for San Jose and Santa Clara, have negotiated individual supply assurance contracts (individual supply assurances) that cumulatively total 184 mgd. San Jose and Santa Clara do not have supply assurance contracts with the SFPUC.

In most cases, the individual supply assurances specify the amount of water the wholesale customer is entitled to purchase from the SFPUC. The individual supply assurances held by City Hayward and the Estero Municipal Improvement District (MID) are exceptions to this type of contract, as they do not specify a quantified limit on purchases from the SFPUC. A portion of the total 184 mgd (essentially the difference between the subtotal of all the specified individual assurances and 184 mgd, or 28 mgd) is set aside for current usage and growth in consumption by Hayward and Estero MID.[1] If the combined usage by Hayward and Estero exceeds this amount, the Master Sales Agreement provides a method for proportional reduction in the other water customers' supply guarantee (Bay Area Water Users Association [BAWUA], 1993; Bay Area Water Supply and Conservation Association [BAWSCA], 2006). The current individual supply assurance for each wholesale customer is shown in **Table E.1.1**. Table E.1.1 also shows the base year (2001) demand estimate, 2001 purchases, and 2030 purchase estimates for each customer, for comparison purposes. As the table shows, 12 wholesale customers have submitted 2030 purchase estimates that are greater than their existing individual supply assurances, and 11 have submitted purchase estimates that are less than or equal to their existing assurances. Such a comparison does not apply to Estero MID or the City of Hayward, since their individual supply assurances do not specify a limit on SFPUC purchases.

1 A 1993 memorandum from BAWSCA (then BAWUA) to its member agencies regarding allocation of the 184 mgd supply assurance indicated that the combined usage for Hayward and Estero MID at the time was 21.782 mgd and that an additional 6.2 mgd was set aside to allow for growth in Hayward and Estero MID consumption (BAWUA, 1993). The current BAWSCA annual survey (BAWSCA, 2006) shows a combined usage for Hayward and Estero MID in FY2004-2005 of 24.10 mgd and a reserve amount of 3.9 mgd (together equaling the same combined amount allocated for Hayward and Estero MID [28 mgd] in the 1993 memorandum).

TABLE E.1.1
ALLOCATION OF THE 184 MGD SUPPLY ASSURANCE

Customer	Supply Assurances (mgd[a])	Base-Year (2001) Demand Estimate (mgd[a])	Fiscal Year 2001/2002 Purchases from the SFPUC (mgd[a])	2030 Purchase Estimate (mgd[a])
Alameda County Water District	13.76	51.1	11.99	13.76
City of Brisbane	0.46	0.44	0.39	0.89
City of Burlingame	5.23	4.8	4.64	4.70
California Water Service District	35.5			
CWS - Bear Gulch[b,c]		13.51	11.23	11.76
CWS – Mid-Peninsula District[b]		17.2	16.75	17.24
CWS – South San Francisco District[b]		8.9	7.56	7.97
Coastside County Water District	2.18	2.6	1.8	2.24 – 3.02
City of Daly City	4.29	8.7	5.08	4.90 – 7.32
City of East Palo Alto	1.96	2.5	2.04	4.64
Guadalupe Valley MID[d]	0.52	0.32	0.3	0.71
Town of Hillsborough	4.09	3.7	3.56	3.70
City of Menlo Park	4.46	4.1	3.57	4.54
Mid-Peninsula Water District	3.89	3.7	3.46	3.70
City of Millbrae	3.15	3.1	2.47	3.19
City of Milpitas	9.23	12.0	6.83	8.20
City of Mountain View	13.46	13.3	10.97	13.20
North Coast County Water District	3.84	3.6	3.45	3.61 – 3.80
City of Palo Alto	17.07	14.2	13.19	13.00
Purissima Hills Water District	1.62	2.2	2.2	3.22
City of Redwood City	10.93	11.9	11.64	11.60 – 12.60
City of San Bruno	3.25	4.4	2.7	4.30
City of San Jose (North)[e]	-	5.2	4.42	6.34
City of Santa Clara	-	25.8	3.84	4.90
Skyline County Water District	0.18	0.17	0.17	0.30
Stanford University	3.03	3.9	2.36	4.20
City of Sunnyvale	12.58	24.8	9.69	12.10
Westborough Water District[f]	1.32	0.99	1.02	1.03
Subtotal, customers with specified assurances[g]	156	247	147	170 – 174
Estero MID[d,h]	5.59	5.8	5.62	6.20 – 6.80
City of Hayward[h]	18.51	19.3	17.61	27.95
Estero MID[d] and City of Hayward Reserve[h]	3.90			
Subtotal, Estero MID[d] and City of Hayward	28	25	23	34.15 – 34.75
TOTAL	**184**	**366**	**261**	**204 – 209**

NOTE: Numbers may not sum due to rounding.

a mgd = million gallons per day.
b CWS = California Water Service Company.
c CWS-Bear Gulch District includes the base year demand, 2001/2002 purchases, and 2030 purchase estimate for the former Los Trancos County Water District (now part of CWS-Bear Gulch District) as provided in background documents. The Supply Assurance for CWS-Bear Gulch is based on the BAWSCA 2004-2005 annual survey, which no longer lists Los Trancos as a separate entity.
d MID = Municipal Improvement District.
e Portion of north San Jose only.
f Purchase estimate is based on Westborough Water District's 2005 UWMP.
g Base year demand, base year purchases, and 2030 purchase estimate subtotals also include San Jose and Santa Clara, which do not have supply assurance contracts with the SFPUC.
h Because the supply assurance contracts between SFPUC and Estero MID and SFPUC and Hayward do not specify a limit, the current usage of these wholesale customers (as reported in the BAWSCA FY 2004-05 annual survey) is shown as the "supply assurance;" the amount shown as "Estero MID and City of Hayward Reserve" is the difference between the current supply assurance total (184 mgd) and the specified supply assurances (156 mgd) plus current Estero and Hayward usage (24.1).

SOURCE: BAWSCA, 2006, URS, 2004, Westborough Water District, 2005.

References – Appendix E.1 Water Supply Assurances

Bay Area Water Users Association (BAWUA, now BAWSCA), Memorandum from Douglas M. Short and Brian D. Burns to Member Agencies, RE: Allocation of Supply Assurance Under Section 7.02(b)(1) of the Settlement Agreement, December 6, 1993.

Bay Area Water Supply and Conservation Agency (BAWSCA), *Bay Area Water Supply and Conservation Agency Annual Survey FY2004-05*, April 2006.

City and County of San Francisco, et al., Settlement Agreement and Master Water Sales Contract between the City and County of San Francisco and Certain Suburban Purchasers in San Mateo County, Santa Clara County, and Alameda County; effective May 25, 1984.

URS, *SFPUC 2030 Purchase Estimates Technical Memorandum*, December 2004.

Westborough Water District, *Westborough Water District Urban Water Management Plan 2006-2010*, December 2005.

APPENDIX E.2

Demand Methodology and Purchase Estimates

Water Demand Projections and Purchase Requests

This appendix summarizes the methodology used to develop the water demand projections and the studies undertaken to identify the potential for conservation savings and the use of recycled water within the SFPUC service area, which together provided the basis for the purchase estimates submitted by the water customers to the SFPUC. This summary is based on the following SFPUC technical reports, supplemented by information provided by the SFPUC and BAWSCA staff:

- *SFPUC Wholesale Customer Demand Projections Technical Report* (URS, 2004a) (referred to in this chapter as the wholesale customer demand study)
- *SFPUC 2030 Purchase Estimates Technical Memorandum* (URS, 2004b)
- *SFPUC Wholesale Customer Water Conservation Potential* (URS, 2004c)
- *SFPUC Investigation of Regional Water Supply Option No. 4 Technical Memorandum*, Final (URS, 2006)[1]
- *City and County of San Francisco Retail Water Demands and Conservation Potential* (Hannaford and Hydroconsult, 2004) (referred to in this chapter as the retail customer demand study)
- *SFPUC Wholesale Customer Recycled Water Potential Technical Memorandum* (RMC, 2004)
- *Recycled Water Master Plan for the City and County of San Francisco* (RMC, 2006)[2]

Base-year demand for San Francisco retail customers and the SFPUC's wholesale customers (2000 and 2001, respectively) and projected 2030 demand are shown in **Table E.2.1**. The base-year demand estimate is based on actual consumption data (adjusted for unaccounted-for water) and therefore reflects the implementation of existing conservation programs. The 2030

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1 This report was not used as a basis for the demand estimates, which were developed in 2004. However, it includes customer specific estimates for 2030 recycled water use not included in the 2004 studies.

2 This is a technical feasibility report that assesses the feasibility of recycled water projects in San Francisco.

TABLE E.2.1
SUMMARY OF BASE-YEAR AND PROJECTED 2030 DEMAND AND PURCHASE ESTIMATES

Customer	Base-Year (2001) Demand Estimate (mgd[a])[b]	Fiscal Year 2001/2002 Purchases from the SFPUC (mgd[a])	Percent of 2001 Demand Met by Purchases from the SFPUC[c]	2030 Projected Demand (with Plumbing Code) (mgd[a])	Projected Change in Demand from 2001 (mgd[a])	Projected Percent Change in Demand from 2001	2030 Purchase Estimates (mgd[a])	Change in Water Purchases from the SFPUC 2001–2030 (mgd[a])	Percent Change in Purchases 2001–2030 (mgd[a])
Alameda County Water District	51.1	11.99	24.3%	59.3	8.20	16%	13.76	1.77	15%
City of Brisbane	0.44	0.39	100%	0.93	0.49	111%	0.89	0.50	128%
City of Burlingame	4.8	4.64	100%	4.9	0.12	3%	4.70	0.06	1%
CWS–Bear Gulch District[d]	13.4	11.12	90.6%	13.9	0.48	4%	11.60	0.48	4%
CWS–Mid-Peninsula District[d]	17.2	16.75	100%	18.1	0.94	5%	17.24	0.49	3%
CWS–South San Francisco District[d]	8.9	7.56	88.9%	9.9	1.00	11%	7.97	0.41	5%
Coastside County Water District	2.6	1.8	70.3%	3.2	0.63	25%	2.24 – 3.02	0.44 – 1.22	24 – 68%
City of Daly City	8.7	5.08	63.6%	9.1	0.44	5%	4.90 – 7.32	-0.18 – 2.24	-4 – 44%
City of East Palo Alto	2.5	2.04	100%	4.8	2.30	92%	4.64	2.60	127%
Estero MID[e]	5.8	5.62	100%	6.8	0.98	17%	6.20 – 6.80	0.58 – 1.18	10 – 21%
Guadalupe Valley MID[e]	0.32	0.3	100%	0.81	0.49	153%	0.71	0.41	138%
City of Hayward	19.3	17.61	100%	28.7	9.40	49%	27.95	10.34	59%
Town of Hillsborough	3.7	3.56	100%	3.9	0.20	5%	3.70	0.14	4%
Los Trancos County Water District[f]	0.11	0.11	100%	0.14	0.03	32%	0.16	0.05	45%
City of Menlo Park	4.1	3.57	96%	4.7	0.61	15%	4.54	0.97	27%
Mid-Peninsula Water District	3.7	3.46	100%	3.8	0.15	4%	3.70	0.24	7%
City of Millbrae	3.1	2.47	100%	3.3	0.17	5%	3.19	0.72	29%
City of Milpitas	12.0	6.83	59.3%	17.7	5.74	48%	8.20	1.37	20%
City of Mountain View	13.3	10.97	89.4%	14.8	1.53	12%	13.20	2.23	20%
North Coast County Water District	3.6	3.45	100%	3.8	0.17	5%	3.61 – 3.80	0.16 – 0.35	5 – 10%
City of Palo Alto[g]	14.2	13.19	99.4%	14.4	0.20	1%	13.00	-0.19	-1%
Purissima Hills Water District	2.2	2.2	100%	3.3	1.12	51%	3.22	1.02	46%
City of Redwood City[h]	11.9	11.64	100%	13.4	1.54	13%	11.60 – 12.60	-0.04 - 0.06	0 – 8%
City of San Bruno	4.4	2.7	64.4%	4.5	0.07	2%	4.30	1.60	59%
City of San Jose (North)[i]	5.2	4.42	96%	6.5	1.31	25%	6.34	1.92	43%
City of Santa Clara	25.8	3.84	16.2%	33.9	8.10	31%	4.90	1.06	28%
Skyline County Water District	0.17	0.17	100%	0.31	0.14	82%	0.30	0.13	76%
Stanford University	3.9	2.36	68%	6.8	2.94	76%	4.20	1.84	78%
City of Sunnyvale	24.8	9.69	43.6%	26.8	1.99	8%	12.10	2.41	25%
Westborough Water District[j]	1.02	1.02	100%	1.03	0.01	1%	1.03	0.01	1%
Total, Wholesale Service Area	**272**	**171**	**63%**	**324**	**52**	**19%**	**204 – 209**	**34 – 39**	**20 – 23%**
SFPUC Retail Service Area	**93.6**	**90**	**96%**	**93.4**	**-0.2**	**-0.2%**	**80 – 91**	**-10 – 1**	**-11 – 1%**
TOTAL	**366**	**261**	**71%**	**417**	**51**	**14%**	**284 – 300**	**24 –40**	**9 – 15%**

NOTE: Numbers may not sum due to rounding.

a mgd = million gallons per day.
b Demand estimates shown here include unaccounted-for water, which is the difference between total water produced and total water billed to customers (water consumed). Unaccounted-for water includes fire fighting use, maintenance requirements, system flushing, leaks, and any unauthorized use.
c Based on URS 2004b.
d CWS = California Water Service Company.
e MID = Municipal Improvement District.
f The former Los Trancos County Water District is now part of CWS–Bear Gulch District; information presented here reflects information in background reports (URS, 2004a, 2004b).
g 2030 demand is based on information provided by the City of Palo Alto to the SFPUC (City of Palo Alto, 2005).
h In November 2005, Redwood City informed the SFPUC that it would be purchasing its low range estimate of 11.6 mgd due to anticipated implementation of 1 mgd of recycled water in 2030 (City of Redwood City, 2005). The high-range purchase estimate total published in URS 2004b of 300 mgd remains the SFPUC 2030 purchase estimate for planning purposes to be consistent with the previous and ongoing WSIP studies.
i Portion of north San Jose only.
j Demand and purchase estimates are based on Westborough Water District's 2005 UWMP, as requested by the district in a letter to the SFPUC (Westborough Water District, 2007). Base year demand shown here is based on 2001 total water production presented in the UWMP (which is equal to 2001-02 purchases from the SFPUC).

SOURCES: URS, 2004a; URS, 2004b; URS, 2006, City of Palo Alto, 2005; City of Redwood City, 2005;SFPUC, 2004; Westborough Water District, 2005; Westborough Water District 2007.

projections take into account expected growth in population and employment, the influence of plumbing codes (which include efficiency requirements), and assumptions about rates of water fixture replacement. Thus, the 2030 demand projections already factor in some “passive” water savings due to plumbing code changes as well as the effects of conservation savings accrued prior to the base year. The purchase estimates in Table E.2.1 include the effects of continuing current conservation programs and new future conservation programs that the SFPUC and/or its wholesale customers plan to implement in the future (discussed below), as well as the use of other water sources.

Projections for both retail and wholesale customers were developed using end-use demand models that break down total water use, by water service account, to specific end uses such as toilets, faucets, and irrigation. Projections for the wholesale service area were developed in close consultation with the wholesale customers, which provided critical inputs to the demand model and subsequently submitted statements concurring with the demand projections. Given the central link between the demand forecasts developed for the SFPUC service area and the amount of growth the WSIP could support, this appendix describes in some detail the methodology used to develop the water demand projections and 2030 purchase requests. Additional information on the demand forecast methodology can be found in the above-referenced reports.

Demand Projections

Wholesale Customer Demand

To develop water demand projections for the wholesale customers, the SFPUC undertook a study using an end-use model called the Demand Side Management Least-Cost Planning Decision Support System (DSS) model. The DSS model uses growth in the number of accounts and a complete breakdown of water end uses, by customer billing category, to forecast water demands. This end-use model was selected over other forecasting approaches because it allows a more accurate representation of changing conditions, such as the future effects of plumbing and appliance codes and implementation of additional conservation measures on demand (URS, 2004a).

For the DSS model, water usage is broken down from total water production[3] in the service area to specific water end uses such as toilets, faucets, and irrigation. Natural fixture replacement (i.e., the replacement of fixtures assumed to occur over time due to failure, aging, or remodeling), the effects of plumbing codes, and effects of past conservation programs are factored in. (The effects of continuing existing conservation programs and of additional conservation and water recycling programs on demand were calculated in separate studies and are factored into the final customer purchase estimates shown in Table E.2.1, as discussed in more detail below.)

3 Water produced is the total water consumed (including imported water purchased from others, groundwater, or other sources) plus unaccounted-for water.

Establishing Base-Year Conditions

A key to water demand forecasting is accurately determining existing use. Establishing base-year conditions for the DSS model entailed the following steps: selecting the appropriate base year, developing water use data, and calibrating end uses for that year. The SFPUC selected 2001 as a representative base year because water use data in 2001 showed less influence from the recession than did 2002 data, and because 2001 was a normal year in terms of rainfall. (Complete data were not available for 2003 since the wholesale customer demand study was undertaken that year.)

Development of accurate base-year water use data involved the following steps:

- Determination of the percentage of "unaccounted-for" (unmetered) water in the system. A percentage of every water retailer's water is unaccounted for, resulting from, for example, leakage, pipe flushing, and firefighting. Unaccounted-for water is the difference between total water production and total water consumption (i.e., the difference between total water produced and the amount of water billed to customers), and must be considered in demand projections. The five-year average unaccounted-for water was calculated for each wholesale customer based on data published in customers' UWMPs and the 2002 Bay Area Water Users Association's (BAWUA, now BAWSCA) annual surveys. Estimates of unaccounted-for water in the UWMPs varied between 1 percent and 11 percent, and estimates in the annual surveys varied between 5.5 and 5.7 percent. These estimates of unaccounted-for water are low by national standards (which indicate approximately 15 percent unaccounted-for water within a system), according to an American Water Works Association report cited in the demand study, and are lower than the state average (estimated to be 9.3 percent in a 1982 study of state water agencies prepared for the California Department of Water Resources). Unaccounted-for water in a system is expected to increase as pipes and other infrastructure components age. Therefore, the demand projections assumed a minimum value of 7 percent unaccounted-for water, as a conservative estimate for future demands, unless the wholesale customer's five-year average unaccounted-for water was higher, in which case the higher rate was used. The assumed percentage of unaccounted-for water was added to the total water consumed, obtained from billing data, to arrive at the total water produced (the base year [2001] demand estimate in Table E.2.1).

- Determination of the basic split between indoor and outdoor water use, since outdoor use fluctuates seasonally and future water use will be affected by plumbing codes requiring more water-efficient fixtures.

- The further division of indoor and outdoor water usage into specific end uses, by customer billing category, based on published data of industry standards and data from previous water audits.

- Calibration and verification of residential and employment populations and per-capita water use. Once total water production was broken down into end uses ("disaggregated"), these water usage data were calibrated by performing the reverse: end uses and the average number of persons using them were combined to arrive at total water production. The calibration process requires verification of residential and employment population estimates in the service area and the per-capita and per-employee water use estimates. Census data and customer billing data were used to determine the average number of users per account.

- Reconciliation of service area and census area boundaries. The boundaries of many wholesale customer service areas do not exactly coincide with city or town limits. Therefore, the extent to which service area and census area boundaries conformed needed to be determined and adjustments made where they do not. For example, one water agency may serve all of a city except for a few blocks, which are served (along with other areas) by another agency, or a water agency may serve only a small part of a city. Modelers worked closely with wholesale customers to accurately understand the boundaries. Estimated population and employment projections were verified with wholesale customers and checked through the calibration process.

- Determination of the number of water users per residential account. This involved determining the number of single-family and multifamily buildings in a service area, the number of housing units per multifamily building, and household size. The service area population developed through this process was then checked for reasonableness by comparing it with service area population estimates from the annual survey conducted by BAWSCA.

- Calculation of per-capita water use for residents. This step required determination of total indoor water use for single- and multifamily accounts; usage was divided by average household size to determine per-capita usage.

- Determination of water users per nonresidential account. ABAG employee population figures supplemented by data from the California Department of Finance were used; adjustments were made to account for differences between service area boundaries and those of ABAG jurisdictions.

- Application of fixture models to end uses. Because the efficiency of water fixtures has increased over time, assumptions were required about the model (age) of the fixtures in use. Initial proportions of old, intermediate, and new fixtures were determined based on census age-of-housing data and assumptions about the amount of natural replacement that had occurred prior to the base year.

- Calibration of end uses. The results of the disaggregating and aggregating approaches were then compared and adjusted through a calibration process to match one another.

BAWSCA's annual surveys of wholesale customers since 2001 shows that actual demand for fiscal year (FY) 2001/2002 through FY 2004/2005 has been, for most wholesale customers each year, less than the base-year demand estimate used for the wholesale customer demand projections. As noted above, the SFPUC selected 2001 because it showed less influence from the recession than did 2002 data and was a normal year in terms of rainfall. In addition, as discussed above, the 2001 base year includes adjustments for unaccounted-for water, and therefore is somewhat higher than actual 2001 demand. In FY 2002/2003, total demand was somewhat down from that of the previous year, and only Guadalupe Valley Municipal Improvement District had demand higher than the 2001 base year. Total demand in FY 2003/2004 was greater than that of the two previous years, but slightly less than the 2001 base year. Demand in FY 2004/2005 was lower than that of the previous three years and 8 percent lower than the previous year. According to BAWSCA, the lower-than-normal consumption in FY 2004/2005 reflected expected year-to-year variations and could be explained in part by the combination of higher annual rainfall that year and mild spring temperatures, which extended into late spring and lowered irrigation demand (BAWSCA, 2006).

Forecasting Water Demand

Once the model was calibrated, water demands were forecasted from the base year. The forecasting process entailed the following steps:

- Determination of growth in the number of water accounts and increases in water use in those accounts. Published population and employment projections[4] were used to forecast growth in the number of water accounts. Each customer was asked to select the projections source to be used based on city planning estimates and the most recent general plan, to ensure that the projections were based on land use plans that were relevant to the particular wholesale customer service area. Nineteen of the 30 wholesale customer entities[5] selected ABAG *Projections 2002* as the source of growth rates; others selected BAWSCA's annual surveys,[6] urban water management plans, city planning sources, a service area planning study, a draft general plan,[7] and a water master plan (URS, 2004a). Projections for San Francisco were developed based on information provided by the San Francisco Planning Department.

  Projections 2002 provides forecasts in five year increments only to 2025. Population and employment projections for 2025-2030 were estimated using the 2020-2025 population/employment growth rate, which was applied to the 2025 estimate and carried forward linearly at that rate to 2030.

  To develop yearly projections to 2030 for each source (since none of the selected sources provided yearly projections), the population and employment increase for each five- or ten-year increment was divided evenly and applied yearly throughout the five- or ten-year period (depending on the increment used in the particular projection) to form a linear yearly projection between increments. For each SFPUC customer, the annual demographic projections that were developed through 2030 were used to derive an annual rate of change (annual growth rate) for each of the demographic sources(population and employment).

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4 Employment projections were not developed for Los Trancos County Water District or Stanford University because Los Trancos only has residential accounts and Stanford University uses other parameters (such as increases in building square footage) to forecast growth in nonresidential accounts. (Since the projection studies were conducted, Los Trancos County Water District was purchased by CWS and is now part of the CWS–Bear Gulch District.)

5 There are 27 wholesale customers, but California Water Service Company (CWS) serves three distinct subgroups—Bear Gulch District, Mid-Peninsula District, and South San Francisco District—which are tracked separately in the SFPUC reports. The former Los Trancos County Water District, which was recently purchased by CWS and is now part of the CWS–Bear Gulch District, is also tracked separately in the SFPUC reports. The 30 wholesale customer entities referenced here include the CWS districts and Los Trancos as distinct entities.

6 This organization was called the Bay Area Water Users Association (BAWUA) at the time the cited annual surveys were conducted.

7 The source of the population and employment projections used as the basis for San Bruno's demand forecasts (the City's draft general plan) has not been adopted and is thus potentially subject to change. Therefore, this analysis compared the projections used with the 2030 population and employment projections for San Bruno in ABAG's *Projections 2003* and *Projections 2005*, and the population projection included in the City's 2003 housing element. (*Projections 2002* was not reviewed for this purpose because it does not provide projections to 2030.) The population projections for 2030 in *Projections 2003* and *Projections 2005* are approximately the same as the projections used for the water demand forecasts (1 percent and 5 percent higher, respectively). Employment projections for 2030 in *Projections 2003* and *Projections 2005* were approximately 8 and 10 percent higher, respectively, than those used for the water demand forecasts. San Bruno's 2003 housing element includes a population projection for 2020 of 46,400, which is about 4 percent lower than the population used in the demand forecast for 2030. Based on these comparisons, the projections used for San Bruno in the demand study are reasonably consistent with the growth estimated by the regional planning agency and the City's 2003 housing element. San Bruno's current general plan, adopted in 1984, does not include applicable projections.

These annual growth rates were then input into the demand model, which applied them to the base-year number of water accounts to forecast the future number of water accounts and ultimately future water demand. In general, population projections were used as the source of growth rates for residential, institutional, and other miscellaneous water accounts and employment projections were applied to commercial and industrial accounts.

To reconcile the ABAG projections with those for wholesale customer service areas, a "blend" of ABAG cities was created (refer to Table 7.1 of PEIR Chapter 7). Projections 2002 was used as the source of employment projections for most of the SFPUC wholesale customers.

Based on *Projections 2002,* which showed relatively constant household sizes in the program area over the forecast period, the wholesale customer demand study assumed the average number of users per account would remain constant for all account categories. Based on this assumption, the rate of growth in demand forecast for each demographic category would be expected to correspond directly to the rate of growth in accounts for the customer-billing category to which the forecast is applied. However, data gathered on new accounts in some billing categories revealed higher water use rates by new accounts than by existing (older) accounts. Research into this disparity confirmed that new accounts in certain categories had higher use rates.[8] Therefore, in cases where some categories showed higher water use by new accounts, a category for new accounts, with water use rates consistent with recent customer billing, was incorporated into the DSS model. In other cases, model mechanics required the creation of new categories to estimate actual projected demand using the account growth method. (For example, a commercial building that was only partially occupied would show lower consumption than it would at full occupancy if not adjusted for the full growth potential.) Customers with new account categories incorporated into their DSS model are shown in **Table E.2.2**. In general, the modelers applied population projections to residential, institutional, and other miscellaneous accounts and applied employment projections to commercial and industrial accounts.

In addition to those described in Table E.2.2, a new commercial account for new/renovated commercial use was created for Daly City. This account was not established because of observed trends in new accounts but in order for the DSS model to accommodate additional planned growth (beyond ABAG employment projections for Daly City) of approximately 0.57 mgd estimated by the City to result from established public policy calling for intensification of mixed uses. The City's estimate of changes in demand expected to result from this is intensification of mixed uses is described in a letter from the Daly City director of water and wastewater resources to BAWSCA (Daly City, 2004). This growth reflecting intensified mixed use is expected to occur by the year 2010 and is documented by a number of project reviews that have gone through public processes in Daly City (Daly City, 2004).

- Determination of the average annual rate of fixture replacement and future plumbing code impacts and incorporation of the effects into the fixture models. Water fixtures are replaced over time due to failure, aging, or remodeling and must be replaced by more efficient models, as required by plumbing codes. Modelers considered the age of housing, income levels, fixture saturation study results, and replacement rate estimates by the California

8 For example, higher use rates were found in areas where redevelopment had replaced paved areas with landscaping. In other cases, higher use was linked to larger lot sizes with larger outdoor areas using irrigation.

TABLE E.2.2
SFPUC WHOLESALE CUSTOMERS WITH DEMAND MODEL CATEGORIES FOR NEW ACCOUNTS[a]

Wholesale Customer	Existing Account Category	Average Water Consumption (gpd/a[b])	New Account Category	Average Water Consumption (gpd/a[b])	Reason for New Category
City of East Palo Alto	Single-Family Residential	314	New Single-Family Residential	340	To represent additional water demand of 0.3 mgd from a new single-family residences in the Ravenswood Business District
	Commercial	1675	New Commercial	5,493	To represent additional water demand of 1.2 mgd from new commercial uses (having an assumed use rate of 5,000 gal /acct/day) in the Ravenswood Business District
Estero MID[c]	Single-Family Residential	320	New Single-Family Residential	450	New homes are assumed to be larger and have a higher outdoor water usage than existing; the per account usage was based on discussion with the wholesale customer. A trend of increasing home prices, based on 1990 and 2000 census information, supports the assumed increase in water usage.
	Commercial/Institutional	2,250	New Commercial/ Institutional	4,000	New commercial users are assumed to be larger and have a higher water usage than existing commercial users. The per account usage was based on discussion with the wholesale customer. Projected new development is expected to consist of large office building complexes.
City of Hayward	Single-Family Residential	275	New Renovated Single-Family Residential	400	Renovation of single family homes is occurring in Hayward where more affordable homes are attracting buyers. Homes are being purchased and remodeled; the remodeled homes have improved landscapes and use a net increase in water (compared to the current average if 275 gpd/a which is lower than most areas of the SFPUC service area). The city expects a 2 percent renovation rate to continue to 2030.
			New High-Use Single-Family Residential	440	To represent 2,200 new higher-use single family homes the City requested be added to the model. These homes have larger lots than existing small-lot homes and are assumed to use 438 gpd/account. At the time the demand modeling was undertaken the City had found that the larger lots being built actually use up to 600 gpd, and estimated the ultimate range for the new homes was 400-600 gpd. Assuming 438 gpd resulted in an overall increase of 0.9 mgd by 2030, which was assumed to be realistic for 2,200 larger homes. This value is slightly higher than the 400 gpd assumed in the City's Water Master Plan and results from the City's field observations showing 600 gpd per new account.
	Commercial/Institutional	1,775	New Commercial / Institutional	8,500	Based on the City's General Plan, which anticipates, and is actively marketing to attract, high technology manufacturing facilities to locate in Hayward. The assumed change for this new industrialization was 400,000 gpd. The new category also includes water for already-approved development of a golf course (170,000 gpd and up to 700,000 in summer, for irrigation), country club (100,000 gpd) and new sports park (45,000 gpd).

TABLE E.2.2 (Continued)
SFPUC WHOLESALE CUSTOMERS WITH DEMAND MODEL CATEGORIES FOR NEW ACCOUNTS[a]

Wholesale Customer	Existing Account Category	Average Water Consumption (gpd/a[b])	New Account Category	Average Water Consumption (gpd/a[b])	Reason for New Category
City of Milpitas	Single-Family Residential	325	New Single-Family Residential	500	All new single family accounts above those existing in 2001 were placed in this category. New homes were assumed to be larger and have higher outdoor water usage. The new single family accounts were assumed to use approximately 50 percent more water than existing accounts (all of which is allocated to outdoor use). Adjustments were based on information provided in the Water Master Plan and conversations with the wholesale customer.
	Commercial	2,164	New Commercial	4,500	All new commercial accounts above those existing in 2001 were placed in this category. These new accounts are assumed to have higher water usage than existing. Assumed to use 4,500 gpd/ acct, based on information in the Water Master Plan and conversations with the wholesale customer.
Purissima Hills Water District	Old Single-Family Residential	716	New/Renovated Single-Family Residential	1,605	The number of old versus new/renovated residential accounts was determined by assuming a 3 percent renovation rate since 1994. This assumption corresponds to a new/renovated water usage of 1,605 gpd/acct in order to reconcile the average water use for all residential accounts with billing data for 2001.
City of Santa Clara	Single-Family Residential	361	New Single-Family Residential	500	A special billing category was added for new single family homes in order to allow higher water usage per account for those future homes at rate provided by the City.

[a] In many of the cases shown here, the new categories were created because the model mechanics required doing so in order to estimate actual projected water demand using the account growth and end-use method. For example, a commercial building that is only 30 percent full has much lower consumption than it would with full occupancy; creation of a new account category provided an adjustment for full growth potential to ensure that consumption for that particular type of account was more accurately forecasted. The average water consumption for the new accounts shown here is not necessarily a reflection of actual use but rather of the adjustments made to more accurately estimate the projected demand using the tools available in the model.
[b] gpd/a = gallons per day per account.
[c] MID = Municipal Improvement District.

SOURCE: URS, 2004a (Appendices B and C).

Urban Water Conservation Council to establish a best estimate of the replacement rates for wholesale customers. The model also incorporated assumptions on the effect of federal legislation regarding high-efficiency clothes washers.

- Incorporation of recycled water use, where appropriate, because the recycled water use represents a demand that would otherwise be served by a potable supply. The cities of Milpitas, Palo Alto, Redwood City, Santa Clara, and Sunnyvale provided information on approved and funded recycled water programs, which was included in base-year and/or future demand projections. Where recycled water information was provided, a new account category for recycled water was added to the wholesale customer's DSS model. Recycled water was assumed to be entirely for outdoor (irrigation) use.

Retail Customer Demand

A separate SFPUC study evaluated retail customer demand (Hannaford and Hydroconsult, 2004). SFPUC retail water customers consist of residents and nonresidential businesses and institutions within the corporate boundaries of San Francisco that receive water from the SFPUC, and several other industrial, governmental, and individual retail customers in the Bay Area and Sierra Nevada foothills (shown in Table 3.1 in Chapter 3, Program Description, of the PEIR). The study evaluated the historical record of San Francisco's retail water demands and projected the future water demands through 2030 based on an estimation of how water uses will change in the future.

The retail customer demand study considered the following factors:

- Historical changes in water use practices that occurred in response to drought-induced water shortages
- Institutional changes, such as the implementation of plumbing fixture retrofit ordinances
- The manner and degree to which the uses of water would change in the future as a result of plumbing code, demographic, and industry changes

In-city customers that receive water hydraulically from the Hetch Hetchy Water and Power system and the SFPUC's Bay Area reservoir system represent more than 90 percent of the SFPUC's retail deliveries. Using an end-use model similar to that employed for the wholesale demand study described above, the retail demand study developed and refined disaggregated water use forecast models for three principal in-city customer categories:

- Nonresidential (representing the commercial, industrial, and service water uses); nonresidential water use was estimated using relationships between employment within San Francisco and employee use of water, segregated by type of business or service enterprise.
- Multifamily residential (representing water use within multiple-family dwellings such as apartments).
- Single-family residential (representing water use within single-family dwellings).

A fourth category (Builders, Contractors, Docks & Shipping) was estimated based on historical water use and maintained constant at the existing level of delivery (based on fiscal years 1997/1998 through 2000/2001) of 0.24 mgd. Unaccounted-for water use, which was based on the historical performance of the SFPUC regional water system, was estimated to be approximately 9 percent of metered water but not less than 7.3 mgd. The year 2000 was used as the base year for the SFPUC retail modeling because this year provided the best available data.

Historical and projected demographic data from the San Francisco Planning Department and ABAG's *Projections 2002* were used in the modeling process to project residential water demand. Data on historical and projected employment figures from the San Francisco Planning Department, the Bureau of the Census, and ABAG were considered in developing the nonresidential demand projections. ABAG's projections (which differed from San Francisco's figures by only 1 percent for 2025) were used because they provided a more comprehensive breakdown by industry type.

Water deliveries to other retail customers, including the U.S. Navy, San Francisco International Airport, and Lawrence Livermore National Laboratory, and nonpotable deliveries to the town of Sunol were assumed to remain constant into the future.[9] Based on a California Department of Water Resources projection for the town of Groveland, the study assumed SFPUC water deliveries to Groveland would also remain constant. The retail demand study also took into account nonpotable water demand within San Francisco that is currently met by groundwater supplies.

As shown in Table E.2.1, retail customer demand is expected to decrease slightly by 2030 to a total demand of 93.4. The net decrease is attributed to an increase in the market penetration of plumbing code changes in the single-family, multifamily, and nonresidential sectors. The total savings due to the plumbing code changes factored into projected retail demand is estimated to be 10.3 mgd by 2030.

Conservation Potential

As discussed above, the end-use demand models factored in water savings that would occur over time (from the base year to 2030) as a result of natural fixture replacement and compliance with plumbing code requirements and effects of past conservation programs. In addition, the SFPUC undertook conservation potential studies in its wholesale and retail service areas to identify conservation potential from feasible conservation measures that could be implemented to partially offset overall growth in water demands. The 2030 purchase estimates (discussed below) factor in projected conservation savings estimated by the individual customers based on these studies.

9 The study does note, however, that the water demand associated with U.S. Navy sites, such as Treasure Island and Hunters Point Naval Shipyard, should be reevaluated as additional information becomes available regarding the future use of these areas.

Wholesale Customer Conservation Potential

The SFPUC, in conjunction with its 30 wholesale customer entities,[10] conducted a comprehensive study to assess potential conservation savings in the wholesale customers' service areas. An initial list of 75 measures was screened qualitatively, considering the following factors:

- Commercial availability of technology/market maturity
- Service area match (i.e., appropriateness of the measure or technology considering such factors as climate, building stock, and lifestyle)
- Customer acceptance/equity
- Relative effectiveness of the measures available

Thirty-two potential conservation measures emerged from this initial screening. The list of 32 measures included (1) rebate and other incentive programs for installing water-saving devices, (2) city/county ordinances requiring the installation of water-saving devices, and (3) educational outreach and award programs that promote water use reductions in businesses and landscaping. (The list of 32 measures is included at the end of this appendix.) The DSS end-use model was used to estimate water savings and evaluate the cost-effectiveness of implementing the 32 measures. Taking into account the cost-benefit analysis and estimated water savings for each measure, as well as service area water characteristics, retail customer behavior patterns, budgetary considerations, and relative ease of implementation, each wholesale customer compiled three packages of conservation measures, referred to as Programs A, B, and C. Water savings resulting from the natural replacement of fixtures under current plumbing codes was assumed to occur with or without any of the three programs. In general, Program A consists of measures that are currently being implemented; Program B consists of the measures in Program A plus additional measures that were considered to be the most readily implemented; and Program C includes the measures in Programs A and B plus all other measures that appeared to be both feasible and cost-effective to implement. Since there was the potential for water savings from some measures to overlap, once the measures for each program were selected, they were modeled together as a program in order to provide the estimated savings for the program as a whole, accounting for the potential overlap between measures. Projected savings under the three programs for the wholesale customer service area are summarized in **Table E.2.3**, and savings projected for each program by customer are shown in **Table E.2.4**. To gauge the effect of plumbing codes and natural fixture replacement, the DSS model also was run without code-required fixture models in place; plumbing code effects on water savings are also shown in Tables E.2.3 and E.2.4.

[10] As previously noted, there are 27 wholesale customers, and the reference to 30 wholesale customer entities considers the three CWS districts and the former Los Trancos County Water District as distinct entities as they are represented in the conservation potential study.

TABLE E.2.3
CONSERVATION EVALUATION RESULTS
FOR SFPUC WHOLESALE AND RETAIL CUSTOMER SERVICE AREAS
(mgd[a])

Conservation Program[b]	2030 Water Savings due to Conservation Programs, Wholesale Service Area	Total Potential Water Savings, Wholesale Service Area	2030 Water Savings due to Conservation Programs, Retail Service Area	Total Potential Savings, Retail Service Area	Total Potential Savings, Wholesale and Retail Service Areas
(Plumbing Code[c])	–	25.4	–	10.3	35.7
Program/Package A	7.7	33.1[d]	0.64	10.9[g]	44.0
Program/Package B	14.5	40.0[e]	3.93	14.2[h]	54.2
Program/Package C	19.6	45.0[f]	4.45	14.8[i]	59.7

a mgd = million gallons per day
b The sets of conservation measures (A, B, and C) in the wholesale and retail conservation studies are referred to as programs and packages, respectively.
c Plumbing code savings represent savings associated with the natural replacement of plumbing fixtures with more efficient fixture models, and are assumed to occur with or without implementation of the conservation programs.
d Includes plumbing code savings plus Program A savings.
e Includes plumbing code savings plus Programs A and B savings.
f Includes plumbing code savings plus Programs A, B, and C savings.
g Includes plumbing code savings plus Package A savings.
h Includes plumbing code savings plus Packages A and B savings.
i Includes plumbing code savings plus Packages A, B, and C savings.

SOURCES: URS, 2004c; Hannaford and Hydroconsult, 2004.

As shown, a total savings of 25.4 mgd in 2030 is expected to be achieved as a result of natural replacement and plumbing code requirements in the wholesale service area; an additional 7.7 mgd would be saved with implementation of Program A; an additional 6.8 mgd would be saved with Program B over the savings achieved by Program A and the plumbing code; and an additional 5.1 mgd would be saved with implementation of Program C over the savings achieved by Programs A and B and the plumbing code. Multiple rounds of feedback from the wholesale customers were conducted, as needed, until the SFPUC and the wholesale customers were satisfied with the model inputs and results. Once agreement was reached, the wholesale customers submitted forms to the SFPUC indicating their concurrence with the demand projections and the range of conservation potential resulting from their Programs A, B, and C (URS, 2004c).

Following completion of the conservation potential study (and related studies described in this appendix), the wholesale customers submitted estimates of projected purchases for the year 2030, which included the customers' specific estimates of conservation savings as well as their other available sources of supply.

The customers' estimates are, for the most part, similar to the projections for Program B, and indicate savings of approximately 13 - 15 mgd (SFPUC, 2004). It should be noted, however, that because many of the wholesale customers meet their water demand through multiple supply sources, the water savings achieved through implementation of the conservation programs would not necessarily represent commensurate water savings for the SFPUC water system (URS, 2004c).

TABLE E.2.4
PROGRAM-SPECIFIC CONSERVATION POTENTIAL
AND CUSTOMER-PROJECTED CONSERVATION SAVINGS
(mgd[a])

SFPUC Customer	Plumbing Code	Program A	Program B	Program C	2030 Projected Conservation Savings[b]
Wholesale Customers					
Alameda County Water District	4.73	2.020	3.159	3.483	3.16
City of Brisbane	0.16	0.002	0.041	0.050	0.04
City of Burlingame	0.63	0.113	0.245	0.375	0.20
CWS–Bear Gulch District[c]	1.08	0.217	0.930	0.962	0.93
CWS–Mid-Peninsula District[c]	2.08	0.415	0.863	1.166	0.86
CWS–South San Francisco District[c]	0.92	0.208	0.560	0.650	0.56
Coastside County Water District	0.26	0.125	0.183	0.239	0.18
City of Daly City	1.06	0.093	0.448	0.531	0.44
City of East Palo Alto	0.33	0.009	0.092	0.163	0.16
Estero MID[d]	0.42	0.469	0.624	0.720	0.00 - 0.60
Guadalupe Valley MID[d]	0.03	0.001	0.097	0.098	0.10
City of Hayward	1.45	0.195	0.755	1.202	0.76
Town of Hillsborough	0.17	0.056	0.308	0.427	0.20
Los Trancos County Water District[e]	0.01	0.002	0.002	0.003	0.002
City of Menlo Park	0.22	0.014	0.160	0.349	0.16
Mid-Peninsula Water District	0.40	0.048	0.102	0.129	0.10
City of Millbrae	0.34	0.078	0.113	0.236	0.078 - 0.113
City of Milpitas	0.72	0.361	0.601	0.968	0.61
City of Mountain View	1.20	0.241	0.945	1.207	0.24 - 1.21
North Coast County Water District	0.55	0.126	0.185	0.300	0.00 - 0.185
City of Palo Alto	1.24	0.229	0.466	0.592	0.60
Purissima Hills Water District	0.02	0.055	0.077	0.288	0.08
City of Redwood City	1.51	0.593	0.828	1.026	0.59 - 1.02
City of San Bruno	0.68	0.028	0.185	0.266	0.185
City of San Jose (North)[f]	0.17	0.155	0.157	0.595	0.157
City of Santa Clara	1.77	0.647	1.011	1.233	1.00
Skyline County Water District	0.04	0.003	0.009	0.015	0.009
Stanford University	0.42	0.488	0.646	0.663	0.70
City of Sunnyvale	2.72	0.640	0.711	1.596	0.70
Westborough County Water District	0.13	0.015	0.020	0.055	See note g
Subtotal, Wholesale Customers, by Program	25.4	7.65	14.53	19.59	13 - 15
Plus Plumbing Code (Wholesale Customers)		25.4	25.4	25.4	
Total – Wholesale Customers		**33.1**	**40.0**	**45.0**	**13 - 15**
Retail Customers					
Retail Customers, by Program[h]	10.3	0.64	3.93	4.45	0 - 4
Plus Plumbing Code (Retail Customers)		10.3	10.3	10.3	
Total – Retail Customers		**10.9**	**14.2**	**14.8**	**0 - 4**
Total, SFPUC Regional Water System Customers	**35.7**	**44.0**	**54.2**	**59.7**	**13 - 19**

a mgd = million gallons per day.
b Projected conservation savings represent estimates specified by the wholesale customers and the SFPUC (for retail customers) and were considered when making their 2030 purchase estimates (SFPUC,2004, Popp, 2007).
c CWS = California Water Service Company.
d MID = Municipal Improvement District.
e The former Los Trancos County Water District is now part of the CWS–Bear Gulch District. Information presented here reflects information in the wholesale service area conservation study (URS, 2004c).
f Portion of north San Jose only.
g The 2030 demand projection and purchase estimate for Westborough Water District is based on the district's 2005 UWMP, based on a request from the district to the SFPUC (Westborough Water District 2007). The UWMP discusses ongoing and planned future demand management programs but does not quantify conservation savings in relation to its 2030 purchase estimate. The purchase estimate originally submitted by Westborough in 2004 assumed conservation savings of 0.02 mgd.
h The preferred alternative under the WSIP would result in 4 mgd of conservation savings (SFPUC, 2007).

SOURCES: URS, 2004c, URS, 2006; Hannaford and Hydroconsult, 2004; SFPUC, 2004; SFPUC, 2007, Popp, 2007.

Retail Customer Conservation Potential

A similar approach was taken to determine water conservation potential in the SFPUC's retail service area. The SFPUC initially evaluated the water conservation potential of 48 conservation measures, screening these down to 38 measures using the end-use, disaggregated forecast models employed for the demand projections. (The complete list of measures is included at the end of this appendix.) Market potential, costs, and benefits were identified for the 38 conservation measures.

Using the results of a benefit-cost analysis and professional judgment for each conservation measure, three conservation packages—Packages A, B, and C—were developed. Package A consists of the measures San Francisco is currently implementing. Package B includes all elements of Package A plus additional measures that would expand the current conservation program to an achievable, socially acceptable program that the SFPUC believes it can fund. Package C represents an upper bound of conservation that the SFPUC considers achievable and fundable; Package C includes all elements of Package B plus several additional measures. The additional measures in Package C are based on future improvements in technology (and the information about it) that are assumed to be achievable. For example, dishwasher rebates are included only in Package C because the current models of efficient dishwashers do not show significant water savings; they are included in Package C assuming the market availability of more efficient models will improve.

Projected savings under the three packages for San Francisco are shown in Tables E.2.3 and E.2.4. As shown, a total savings of 0.64 mgd in 2030 is expected to be achieved by implementation of Package A, over the 10.3-mgd savings projected from natural fixture replacement and plumbing codes; an additional 3.29 mgd would be saved with Package B over the savings achieved by Package A and the plumbing code; and an additional 0.52 mgd would be saved with Package C over the savings achieved by Packages A and B and the plumbing code. The 2030 purchase estimate range for the retail service area assumes conservation savings of 0 to 4 mgd (for the high end purchase estimate and for the proposed water supply option, respectively).

Combined Conservation Potential

As shown in Table E.2.3, the potential savings from implementation of plumbing codes and the three identified sets of conservation measures in the combined wholesale and retail service areas range from approximately 36 to 60 mgd. As shown in Table E.2.4, estimates provided by the wholesale customers indicate projected savings from conservation programs (apart from plumbing code savings) in 2030 for the wholesale service area of approximately 13 to 15 mgd. The WSIP proposed water supply option includes 4 mgd of projected savings in 2030 for the retail service area from conservation programs, apart from plumbing code savings.

Recycled Water Potential

Recycled water has the potential to replace potable supplies for such uses as landscape irrigation, toilet flushing, and cooling towers. The SFPUC also evaluated the recycled water potential in the wholesale and retail service areas. In the wholesale service area, the SFPUC identified 14 areas with current and/or planned recycled water projects; 9 areas that currently produce recycled water totaling approximately 12.6 mgd, and additional projects considered relatively certain to be implemented in the near future, as well as those under study.[11] The study estimated that by 2020, the total average annual yield of recycled water projects in the wholesale service area (i.e., current plus new projects, including projects under study) could produce 40 to 46 mgd. Total average annual yield includes water that would be used to meet nonpotable demand not represented in the SFPUC demand estimates. **Table E.2.5** summarizes the results of the study. Information provided by the wholesale customers indicates that by 2030 an estimated 9 mgd would be used in the wholesale service area to offset projected 2030 demand (see Table E.2.5) (URS, 2006).

SFPUC has published a technical feasibility report called the *Recycled Water Master Plan* (RMC, 2006), which assesses the feasibility of recycled water projects in the Westside area of San Francisco. The feasibility analysis identifies projects with the potential to provide approximately 6.2 mgd of recycled water to irrigate Golden Gate Park, Lincoln Park, Harding Park, the San Francisco Zoo, San Francisco State University, and other locations, as well as provide a supplemental water supply for Lake Merced (RMC, 2006). The first phase of projects identified in the report would provide 4.1 mgd recycled water to this area (RMC, 2006).

2030 Purchase Estimates

Following completion of 2030 demand modeling and the conservation potential and recycled water potential studies, the wholesale customers considered conservation potential and other water supply sources and submitted purchase estimates for SFPUC water for 2030 (see **Table E.2.6**). The changes in purchase estimates from 2001 are shown in Table E.2.1. As that table shows, the 2030 estimated purchases represent a total increase of 35 to 39 mgd, or 13 to 15 percent above 2001 purchases. Table E.2.6 also shows the percentage of water supply sources (including recycled water) that is represented by purchases from the SFPUC (i.e., the percentage of demand after conservation savings are taken into account). Purchases from the SFPUC in 2030 represent approximately 72 percent of the total SFPUC service area demand (with plumbing code savings) and about 75 percent of demand adjusted for conservation. (Figure 7.3 of PEIR Chapter 7 depicts historical water deliveries for the wholesale and retail services areas as well as the projected demand on the SFPUC system [i.e., estimated purchases] to 2030.)

[11] These projects, categorized in the technical memorandum as “planned and being implemented,” are defined as projects for which agencies have conducted planning studies and may have secured financing, and on which construction had begun or was planned to begin in the coming year. However, the projects in this category are not considered completely certain.

TABLE E.2.5
SUMMARY OF RECYCLED WATER POTENTIAL FOR THE SFPUC SERVICE AREA (mgd[a])

SFPUC Service Area Recycled Water Project Areas	Recycled Water Potential (Total Average Annual Yield)				2030 Projections (Offsets Potable Demand)
	Current (2004) Recycled Water Projects	Planned Recycled Water Projects[b]	Recycled Water Projects Under Study or Previously Studied	Subtotal – Additional Potential Projects	2030 Projected Recycled Water Supply[c]
Alameda County Water District	3.5	0	1.5	1.5	1.40
City of Burlingame	0	0	3.9	3.9	
Coastside County Water District	0	0	0.5	0.5	
City of Hayward	0.2	0	8.3 – 10.3	8.3 – 10.3	
City of Millbrae	0.003	0	1	1	
City of Milpitas					1.77
North San Mateo County Sanitary District (Daly City)[d]	0.001	2.77	0	2.77	
North Coast County Water District	3.4	0.2	0	0.2	
Palo Alto RWQCP – Mountain View Project[e]	0	1.3 – 1.7	0	1.3 – 1.7	
Palo Alto RWQCP – Other[f]	1.5	0	2.26 – 4.18	2.26 – 4.18	
City of Palo Alto					0.76
Redwood City Recycled Water Project/ City of Redwood City[g]	0.1	1.65 – 2.8	0	1.65 – 2.8	0 – 1.00
South Bay Water Recycling Project[h]	3.1	0.19	1.91	2.1	
City of Santa Clara					4.00
Cities of South San Francisco – San Bruno	0	0	TBD	TBD	
Stanford University	0	0	0.06 – 0.98	0.06 – 0.98	
City of Sunnyvale	0.81	0.18	1.3	1.48	1.50
Subtotal – SFPUC Wholesale Customer Service Area[i]	**12.6**	**6.3 – 7.8**	**20.7 – 25.6**	**27.0 – 33.4**	**9 – 10**
SFPUC Retail Service Area	**0**	**0**	**6**	**6**	**0 – 4**
Total, SFPUC Service Area[i]	**12.6**	**6.3 – 7.8**	**26.7 – 31.6**	**33 – 39.4**	**9 – 14**

a mgd = million gallons per day.
b These projects are identified in the *Wholesale Customer Recycled Water Potential Technical Memorandum* as “Planned and Being Implemented.” However, they are not considered completely certain, according to the SFPUC. Therefore, they are identified in this table as “Planned.”
c The source for this column is URS, 2006, except for SFPUC Retail Service Area, which is based on SFPUC, 2007.
d Wholesale customers served are California Water Service Company (CWS), Daly City, and Westborough Water District.
e Wholesale customers served are Palo Alto and Mountain View; RWQCP = Regional Water Quality Control Plant.
f Wholesale customers served are Palo Alto, Mountain View, and Stanford University; RWQCP = Regional Water Quality Control Plant.
g In November 2005, Redwood City informed the SFPUC of a revised purchase estimate to include 1 mgd of recycled water in lieu of 1 mgd of SFPUC purchases in 2030 (City of Redwood City, 2005). Despite this change, the overall 2030 purchase estimate remains at 300 mgd to be consistent with all the previous and ongoing WSIP studies.
h Wholesale customers served are the Cities of Milpitas, San Jose, and Santa Clara.
i Of the 12.6 mgd produced by current recycled water projects, 4.3 mgd replaces a potable water supply.

SOURCES: SFPUC, 2007; RMC, 2004; RMC, 2006; URS, 2006; City of Redwood City, 2005.

TABLE E.2.6
SUMMARY OF 2030 DEMAND PROJECTIONS, WATER SUPPLY ASSUMPTIONS, AND SFPUC PURCHASE ESTIMATES

Customer	A	B	C	D	E	F	G	H	I	J
	2030 Projected Demand (with Plumbing Code Savings) (mgd[a])	2030 Projected Conservation Savings (mgd[a])	2030 Demand Adjusted for Conservation (mgd[a])	2030 Projected Use of Recycled Water (mgd[a])	2030 Projected Use of Ground-water Sources (mgd[a])	2030 Projected Use of Other Surface Water Sources (mgd[a])	2030 Projected Demand Adjusted for Use of Other Sources and Conservation (mgd[a])	2030 Purchase Estimates (mgd[a])	Percent of Total 2030 Demand (with Plumbing Code Savings) met by SFPUC Purchases	Percent of 2030 Demand Adjusted for Conservation met by SFPUC Purchases
			(A - B)				(C - D - E - F)		(H/A)	(H/C)
Alameda County Water District	59.3	3.16	56.14	1.40	13.98	27.00	13.76	13.76	23%	25%
City of Brisbane	0.93	0.04	0.89				0.89	0.89	96%	100%
City of Burlingame	4.9	0.20	4.7				4.70	4.70	96%	100%
CWS–Bear Gulch District[b,c]	14.06	0.93	13.13			1.37	11.76	11.76	84%	90%
CWS–Mid-Peninsula District[b]	18.1	0.86	17.24				17.24	17.24	95%	100%
CWS–South San Francisco District[b]	9.9	0.56	9.34		1.37		7.97	7.97	81%	85%
Coastside County Water District[d]	3.2	0.18	3.02		0 – 0.30	0 – 0.48	2.24 – 3.02	2.24 – 3.02	70 – 94%	74 – 100%
City of Daly City[e]	9.1	0.44	8.66		1.34 – 3.76		4.90 – 7.32	4.90 – 7.32	54 – 80%	57 – 85%
City of East Palo Alto	4.8	0.16	4.64				4.64	4.64	97%	100%
Estero MID[f]	6.8	0.00 – 0.60	6.2 – 6.8				6.20 – 6.80	6.20 – 6.80	91 – 100%	100%
Guadalupe Valley MID[f]	0.81	0.10	0.71				0.71	0.71	88%	100%
City of Hayward	28.7	0.76	27.95				27.95	27.95	97%	100%
Town of Hillsborough	3.9	0.20	3.7				3.70	3.70	95%	100%
City of Menlo Park	4.7	0.16	4.54				4.54	4.54	97%	100%
Mid-Peninsula Water District	3.8	0.10	3.70				3.70	3.70	97%	100%
City of Millbrae[g]	3.3	0.08 – 0.11	3.19 – 3.27				3.19 – 3.22	3.19	97%	99 – 100%
City of Milpitas	17.7	0.61	17.09	1.77		7.13	8.19	8.20	46%	48%
City of Mountain View	14.8	0.24 – 1.21	13.59 – 14.56		0.05	1.30	12.24 – 13.21	13.20	89%	91 – 97%
North Coast County Water District	3.8	0.00 – 0.19	3.62 – 3.80				3.62 – 3.80	3.61 – 3.80	95 – 100%	100%
City of Palo Alto[h]	14.4	0.60	13.76	0.76			13.00	13.00	91%	94%
Purissima Hills Water District	3.3	0.08	3.22				3.22	3.22	98%	100%
City of Redwood City[i]	13.4	0.59 – 1.02	12.38 – 12.81	0 – 1.00			11.38 – 12.81	11.60 – 12.60	87 – 94%	94 – 98%
City of San Bruno	4.5	0.19	4.32				4.32	4.30	96%	100%
City of San Jose (North)[j]	6.5	0.16	6.34				6.34	6.34	98%	100%
City of Santa Clara	33.9	1.00	32.90	4.00	19.99	4.00	4.91	4.90	14%	15%
Skyline County Water District	0.31	0.01	0.30				0.30	0.30	97%	100%
Stanford University	6.8	0.70	6.10			1.90	4.20	4.20	62%	69%
City of Sunnyvale	26.8	0.70	26.10	1.50	2.60	9.90	12.10	12.10	45%	46%
Westborough Water District[k]	1.03	see note k	1.03				1.03	1.03	100%	100%
Total, Wholesale Service Area	**324**	**13 – 15**	**308 – 311**	**9.4 – 10.4**	**39.3 – 42.1**	**52.6 – 53.1**	**203 – 209**	**204 – 209**	**63 – 65%**	**66 – 67%**
SFPUC Retail Service Area[l]	**93.4**	**0 – 4**	**89.4 – 93.4**	**0 – 4**	**2.5 – 4.5**	**0**	**81 – 91**	**80 – 91**	**86 – 97%**	**89 – 97%**
TOTAL	**417**	**13 – 19**	**398 – 404**	**9.4 – 14.4**	**41.8 – 46.6**	**52.6 – 53.1**	**284 – 300**	**284 – 300**	**68 – 72%**	**71 – 74%**

NOTE: Numbers may not sum due to rounding.

a mgd = million gallons per day.
b CWS = California Water Service Company.
c CWS–Bear Gulch District includes the former Los Trancos County Water District.
d The upper range purchase estimate assumes loss of all local water sources (surface water and groundwater) and the lower range estimate assumes continuation of local sources; both estimates assume Level B water conservation.
e The purchase estimate range reflects a range of potential groundwater usage established under a pilot project, from the sustainable yield (3.76 mgd) to the lowest annual production yield (1.34 mgd), according to Daly City's best estimate of 2030 water purchases (SFPUC, 2004).
f MID = Municipal Improvement District.
g 2030 conservation savings is based on URS 2004c and the City's UWMP as confirmed by the City (Popp, 2007).
h 2030 demand and conservation savings are based on information provided by the City of Palo Alto to the SFPUC (City of Palo Alto, 2005a).
i In November 2005, Redwood City informed the SFPUC that it would be purchasing its low-range estimate of 11.6 mgd due to anticipated implementation of 1 mgd of recycled water in 2030 (City of Redwood City, 2005a). The high-range purchase estimate total of 300 mgd published in URS 2004b remains the SFPUC 2030 purchase estimate total for planning purposes, to be consistent with the previous and ongoing WSIP studies. The purchase estimate range originally submitted apparently reflects the average of the City's estimated conservation savings range plus the originally estimated range of recycled water use.
j Portion of north San Jose only.
k Demand and purchase estimates are based on Westborough Water District's 2005 UWMP, as requested by the District in a letter to the SFPUC (Westborough Water District, 2007). The UWMP discusses ongoing and planned future demand management programs but does not quantify conservation savings in relation to the demand and purchase estimate. The District's original estimate of water purchases indicated conservation savings of 0.020 mgd (SFPUC 2004).
l The low range of the SFPUC retail customer purchase estimate reflects the identified groundwater, recycled water, and conservation programs totaling 10 mgd in San Francisco that are included as part of the WSIP proposed water supply option.

SOURCES: URS, 2004a; URS, 2004b; URS, 2004c; URS, 2006; SFPUC, 2004; SFPUC, 2007; City of Palo Alto, 2005a; Popp, 2007; City of Redwood City, 2005a; Westborough Water District, 2005 ; Westborough Water District 2007.

Conservation Measures

The following two tables are included with this appendix to show the conservation identified in the wholesale and retail conservation studies:

- **Table 2-2** of the *SFPUC Wholesale Customer Water Conservation Potential Technical Report* (URS 2004c), which lists the 32 conservation measures that emerged from 75 initial measures screened by the SFPUC, as described above; and
- **Table 19** of the *City and County of San Francisco Retail Water Demands and Conservation Potential* report (Hannaford and Hydroconsult, 2004), which lists the 48 measures initially identified in the conservation study.

References – Appendix E.2: Demand Methodology and Purchase Estimates

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Table 2-2
Description of Conservation Measures Selected for Further Evaluation

Conservation Measure	Measure Description
1. Residential Water Surveys	Offer indoor and outdoor water surveys to existing Single-Family and Multi-Family residential retail customers with high water use; provide customized report to homeowner.
2. Residential Retrofit	Provide owners of pre-1992 homes with retrofit kits that contain easy-to-install low flow showerheads, faucet aerators, and toilet tank retrofit devices.
3. Large Landscape Conservation Audits	Provide free landscape water audits to all public and private irrigators of landscapes larger than one acre with separate Irrigation accounts upon request.
4. Water Budgets	Provide a monthly irrigation water use budget as information on the water bill for all irrigators of landscapes larger than one acre with separate Irrigation accounts.
5. Clothes Washer Rebate	Provide a rebate on a new water efficient clothes washer for homeowners.
6. Public Information Program	Provide public education to raise awareness of conservation measures available to retail customers. Programs could include poster contests, speakers to community groups, radio and television time, and printed educational material such as bill inserts, etc.
7. Commercial Water Audits	Provide a free water audit to high water use Commercial accounts that evaluates ways for the business to save water and money.
8. ULF Toilet and Urinal Rebates	Provide rebates to pre-1994 businesses with high use fixtures for commercial ULF toilets (1.6 gal/flush) and commercial ULF urinals (1.0 gal/flush).
9. Residential ULF Toilet Rebate	Provide a rebate to homeowners to replace an existing high volume toilet with a new water efficient toilet.
10. Require 1.6 gal per flush toilets to be installed at the time of sale of existing buildings	Work with the real estate industry to require a certificate of compliance be submitted to the water utility verifying that a plumber has inspected the RSF or RMF property and efficient fixtures were either present or installed at the time of sale, before close of escrow.
11. Home Leak Detection and Repair	Use leak detection equipment to determine whether and where leaks are occurring on the premises and provide a plumber to the retail customer to repair leaks for free.
12. Rebates for 6/3 dual flush or 4 liter toilets	Provide a rebate or voucher for the retrofit of a 6/3 dual flush, 4-liter or equivalent very low water use toilet. Rebate amounts would reflect the incremental purchase cost and would be in the range of $50 to $100 per toilet replaced.

Table 2-2
Description of Conservation Measures Selected for Further Evaluation

Conservation Measure	Measure Description
13. ET Controller Rebates	Provide a rebate for the latest state of the art irrigation controllers with on-site temperature sensors or a signal from a central weather station that modifies irrigation times at least weekly (preferably daily) as the weather changes.
14. Xeriscape education and staff training at retail garden/irrigation supply houses	Sponsor training for staff of stores where plants and irrigation equipment is sold to educate sales people about the benefits of native (low water use) plants, efficiently irrigated.
15. Homeowner irrigation classes	Sponsor classes at stores where irrigation equipment is sold or other suitable venues on selection and installation of efficient equipment (drip irrigation, smart controllers, low volume sprinklers, etc.)and proper plant.
16. Promote water efficient plantings at new homes	Provide information for planting water-efficient landscaping, including avoiding strip turf sections that are difficult to water efficiently and using native plants that do not require supplemental watering. Information would be provided in brochures with the water bill, or mailed. Informational displays at Water Utility offices and nurseries could also be provided.
17. Offer incentives for replacement of clothes washers in coin-operated laundries	Offer incentives to apartment and coin-op laundry managers to retrofit or use efficient clothes washers. The rebate would either go to the manager or the washing machine leasing company.
18. Incentives for retrofitting sub-metering	Rescind any regulations that prohibit sub-metering of multi-family buildings and encourage sub-metering through water audits and direct mail promotions, and/or incentives to building owners.
19. Require sub-metering multifamily units	Require all new multi-family units to provide sub-meters on individual units. To help reduce financial impacts on tenants, regulations would be adopted that specify acceptable methods of metering and billing.
20. Rebate efficient clothes washers	Provide a rebate to new apartment complexes over a certain size with a common laundry room equipped with efficient washing machines.
21. Enforce landscape requirements for new landscaping systems (turf limitations / regulations)	Enforce existing requirements on use of native or low-water-using plants for landscaping purposes. Proof of compliance would be necessary to obtain a water connection on all new Multi-Family Residential and commercial projects. Non-compliers would face a surcharge on their water bill until they complied.
22. Restaurant low flow spray rinse nozzles	Provide free installation of 1.6 gpm spray nozzles for the rinse and clean operation in restaurants and other commercial kitchens.

Table 2-2
Description of Conservation Measures Selected for Further Evaluation

Conservation Measure	Measure Description
23. Focused water audits for hotels/motels	Provide free water audits to hotels and motels covering bathrooms, kitchens, ice machines, cooling towers, and irrigation system schedules.
24. WAVE Program (US EPA) for hotels	Provide hotels with information about the US EPA's WAVE program. This program encourages hotels to do their own water audit and then analyze their water use with the software provided. The software identifies water saving projects and computes paybacks. Hotels that agree to participate in the program also agree to install cost-effective water conserving equipment.
25. Hotel retrofit (w/financial assistance)	Following a free water audit offer participating hotels a rebate for identified water saving. Provide a rebate schedule for certain efficient equipment such as air-cooled ice machines for hotels that don't participate in an audit.
26. Award program for water savings by businesses	Sponsor an annual awards program for businesses that significantly reduce water use. Provide a plaque, presented at a lunch with the mayor.
27. Replace inefficient water using equipment	Provide a rebate for a standard list of water efficient equipment including icemakers, efficient dishwashers, cooling towers to replace once through cooling, irrigation controllers, and certain process equipment.
28. Require 0.5 gal/flush urinals in new buildings	Require new buildings be fitted with 0.5 gal/flush urinals.
29. Financial incentives for complying with water use budget	Link a landscape water budget to a rate schedule that penalizes the account holder for exceeding its water budget and rewards them for using less than the budget.
30. Financial incentives for irrigation upgrades	Provide rebates for selected types of irrigation equipment upgrade.
31. Require dedicated irrigation meters for new accounts	Require new accounts with a substantial amount of irrigated landscape have dedicated landscape meters and are charged on a separate rate schedule that recognizes the high peak demand placed on the system by irrigators.
32. Water Utility / City Department water reduction goals	Provide water use reduction goals for metered City and County accounts and offer audits and employee education.

Table 19
Selection of Conservation Measures by Package

Number	Model No.	Meas. No.	Measure	Program A	Program B	Program C
	RESIDENTIAL SINGLE FAMILY					
1	RSF-1	1a	Clothes Washer Rebate -25 g/l rebate	Yes	Yes	Yes
2		1b	Clothes Washer Rebate -17 g/l rebate	Yes	Yes	Yes
3		1c	Clothes Washer Rebate -17 g/l rebate	Yes	Yes	Yes
4	RSF-2	2	Toilets-6/3 or 4 liter Rebates	No	Yes	Yes
5		3	Toilets-ULF Rebate	Yes	Yes	Yes
6		7	Toilets-Retrofit	No	No	No
7		8	Toilets-1.6 gpf Replace on Sale	No	Yes	Yes
8	RSF-3	4	Public Information	Yes	Yes	Yes
9	RSF-4	5	Leak Detection/Repair	No	No	No
10	RSF-5	6	Water Surveys	Yes	Yes	Yes
11	RSF-6	7	Retrofit: 1.75 gpm showerheads	No	No	No
12	RSF-7	45	Dishwasher Rebate	No	No	Yes
	RESIDENTIAL MULTI FAMILY					
13	RMF-1	9a	Clothes Washer Rebate -25 g/l rebate	Yes	Yes	Yes
14		9b	Clothes Washer Rebate -17 g/l rebate	Yes	Yes	Yes
15		9c	Clothes Washer Rebate -17 g/l rebate	Yes	Yes	Yes
16	RMF-2	2	Toilets-6/3 or 4 liter Rebates	No	Yes	Yes
17		3	Toilets-ULF Rebate	Yes	Yes	Yes
18		7	Toilets-Retrofit	No	No	No
19		8	Toilets-1.6 gpf Replace on Sale	No	Yes	Yes
20	RMF-3	10	Submetering Retrofit Incentives	No	No	No
21	RMF-4	11	Submetering Reqt. for New Units	No	No	Yes
22	RMF-5	6	Water Surveys	Yes	Yes	Yes
23	RSF-6	7	Retrofit: 1.75 gpm showerheads	No	No	No
	NON-RESIDENTIAL MEASURES					
24	NR-1	14	Lscape-Audits	No	Yes	Yes
25	NR-3	16	Water Savings Awards	No	No	Yes
26	NR-4	17	Water Audits	No	Yes	Yes
27	NR-5	19	Urinals-ULF Rebate	No	Yes	Yes
28		37	Urinals-Require 0.5 gpf	No	No	Yes
29	NR-6	19	Toilets-ULF Rebate	No	Yes	Yes
30	NR-7	20	Large Innovative Retrofit Incentives	No	Yes	Yes
31	NR-8	21	Large New Project Incentives	No	Yes	Yes
32	NR-11	24	Audits-Hospitals	No	Yes	Yes
33	NR-12	25	Audits-Laundry SS Rebates	Yes	Yes	Yes
34	NR-13	26	Audits-Schools/Universities	No	Yes	Yes
35	NR-14	27	Audits-School/University Toilets	No	No	No
36	NR-15	28	Audits-School/University Landscaping	No	Yes	Yes
37	NR-16	29	School/University Artificial Turf	No	No	No
38	NR-18	31	Low Flow Sprayers-Grocery/Flower	No	Yes	Yes
39	NR-19	32	Low Flow Sprayers-Restaurants	No	Yes	Yes
40	NR-19a	46	Steamers-Restaurants	No	Yes	Yes
41	NR-20	42	Cooling Towers	No	No	No
42	NR-21	44	City/PUC - Water Broom	No	Yes	Yes
43	NR-21a	14	City/PUC - Landscaping	No	Yes	Yes
44	NR-22	44	Water Broom	No	Yes	Yes
45	NR-23	33	Audits-Hotels/Motels	No	Yes	Yes
46	NR-24	34	WAVE Program	No	No	No
47	NR-25	35	Require Fixture Replacement on Resale	No	No	Yes
48		36	Retrofit with Financial Assistance	No	No	Yes

APPENDIX E.3

Population, Employment, and Water Demand Projections

This appendix provides a more detailed analysis of the population and employment projections and the associated water demand projections discussed in the PEIR Chapter 7, Growth Inducement Potential and Indirect Effects of Growth. This appendix reviews in greater detail the population and employment projections used by the San Francisco Public Utilities Commission (SFPUC) and its wholesale customers to develop their 2030 water demand projections and subsequent water purchase requests to the SFPUC. It also provides more detail on the evolution of the Association of Bay Area Governments (ABAG) regional growth projections for the Bay Area, and compares those growth projections to the projections of population and employment growth that correspond to the water customers' projections of demand growth. Finally, it provides additional discussion of the relationship between the customer growth and demand projections and the growth projections contained in the local general plans as well as ABAG projections.

Organization of Appendix E.3

The analysis presented in this appendix begins by reviewing the water customers' projections of water demand and identifying the population and employment expectations that are the basis for those projections. These expectations establish a basis of comparison with projections prepared by regional and local planning agencies. (The assessment presented in Chapter 7 evaluates the consistency of the demand projections developed by SFPUC in consultation with the water customers with those of the regional planning agency [ABAG] and the respective local jurisdictions.)

This analysis then reviews ABAG's *Projections 2002*, which was the published set of regional projections available at the time the water demand projections were prepared, and which provided a basis for many of those projections. It goes on to trace the evolution of ABAG's projections sets through *Projections 2003* and *Projections 2005*, to establish the trend in thinking, on the part of the regional planning agency, about how the Bay Area will grow. These projections do not incorporate explicit assumptions about the Water System Improvement Program (WSIP), and consequently provide a reasonable regional framework for evaluation of the projections on which the water demand forecasts are based.

Next, this analysis describes other sets of projections– those in cities' general plans and water districts' urban water management plans (UWMPs) (to the extent they are available) – for the areas served by the SFPUC and its wholesale customers, and compares these other sets of projections and ABAG's *Projections 2005* to the employment and population projections used by the respective water customers as the basis for projecting water demand.

Finally, this appendix compares the percentage increases in employment and population projected for the water customer service areas in both *Projections 2005* and the water customer demand studies (URS, 2004; Hannaford and Hydroconsult, 2004) to the percentage increase in water demand projected for each water customer service area.

Water Demand Projections

The majority of the wholesale customers selected ABAG's *Projections 2002* as the population and employment forecasts to be used in their demand forecasting models. There were some exceptions to this approach, such as where projections developed by the jurisdictions served or the BAWSCA annual survey were used. Table 4-1 of the *SFPUC Wholesale Customer Water Demand Projections Technical Report* (URS, 2004) (referenced in this appendix as the wholesale customer demand study) identifies the source of the projection for each wholesale customer. The *City and County of San Francisco Retail Water Demands and Conservation Potential* study (Hannaford and Hydroconsult, 2004) (referenced in this chapter as the retail customer demand study) identifies the sources of demographic data used for that study.

The wholesale customer demand study shows population and employment estimates for 2001 and projections through 2030. Because the horizon year for *Projections 2002* was 2025, it was necessary for the purposes of this PEIR to extend the projections to 2030. In most cases, the projections were extended by assuming the same (numeric) amount of growth between 2025 and 2030 as was projected to occur between 2020 and 2025.

Tables E.3.1 and **E.3.2** summarize the projections of employment and population growth used for the water demand projections, by county. In Table E.3.1, two interim years – 2005 and 2025 – have been added to the boundary years shown in the wholesale customer demand study. The estimates for 2005 and 2025 were created to provide a consistent interval for comparison of the growth assumed for the water demand projections to other sets of projections (primarily ABAG's *Projections 2003* and *Projections 2005*). For wholesale customers, the interim year estimates assume a constant numeric rate of growth over the entire projection period; in other words, both employment and population would increase in a straight line with constant slope over the 29-year period (2001-2030). This assumption is consistent with the procedure used in the wholesale demand report both to create year-by-year estimates and to extend the projections to 2030. The retail customer demand study uses a base year of 2000, but includes projections for 2005 and 2025 as well as 2030.

Table E.3.2 calculates the numeric and percentage changes in employment and population that would occur in the portion of each county served by the SFPUC and its wholesale customers.

TABLE E.3.1
EMPLOYMENT AND POPULATION PROJECTIONS FOR WATER DEMAND ESTIMATES: SUMMARY BY COUNTY[a]

	Employment				Population			
	2001	2005	2025	2030	2001	2005	2025	2030
Alameda County	238,565	251,963	318,953	335,701	456,962	468,786	527,908	542,688
Santa Clara County	501,186	519,755	612,598	635,809	466,452	482,168	560,746	580,391
San Mateo County	394,346	411,273	495,898	517,056	703,185	718,517	795,642	814,904
Total Wholesale Customers	1,134,097	1,182,991	1,427,449	1,488,566	1,626,599	1,669,471	1,884,296	1,937,983
San Francisco	638,840	656,480	770,500	795,400	760,075	772,470	834,448	849,942
Total Area Served	1,772,937	1,839,471	2,197,949	2,283,966	2,386,674	2,441,941	2,718,744	2,787,925

[a] Includes only those portions of each county served by SFPUC wholesale water customers or served directly by the SFPUC (San Francisco County). Population estimates for San Mateo County include updated figures for the Westborough Water District from the district's Urban Water Management Plan .

SOURCES: URS, 2004; Hannaford and Hydroconsult, 2004; Mundie & Associates, 2006; Westborough Water District, 2005.

TABLE E.3.2
POPULATION AND EMPLOYMENT PROJECTIONS FOR WATER DEMAND ESTIMATES: EXPECTED CHANGE BY COUNTY[a]

	2001-2030		2005-2025		2005-2030	
Area	#	%	#	%	#	%
Change in Employment						
Alameda County[a]	97,136	40.7%	66,990	26.6%	83,738	33.2%
Santa Clara County	134,623	26.9%	92,843	17.9%	116,054	22.3%
San Mateo County	122,710	31.1%	84,627	20.6%	105,783	25.7%
Total Wholesale Customers	354,469	31.3%	244,462	20.7%	305,575	25.8%
San Francisco	156,560	24.5%	114,020	17.4%	138,920	21.2%
Total Area Served	511,029	28.8%	358,482	19.5%	444,495	24.2%
Change in Population						
Alameda County[a]	85,726	18.8%	59,122	12.6%	73,902	15.8%
Santa Clara County	113,939	24.4%	78,578	16.3%	98,223	20.4%
San Mateo County	111,719	15.9%	77,125	10.7%	96,387	13.4%
Total Wholesale Customers	311,384	19.1%	214,825	12.9%	268,512	16.1%
San Francisco	89,867	11.8%	61,978	8.0%	77,472	10.0%
Total Area Served	401,251	16.8%	276,803	11.3%	345,984	14.2%

[a] Includes only those portions of each county served by SFPUC wholesale water customers or served directly by the SFPUC (San Francisco County). Population estimates for San Mateo County include updated figures for the Westborough Water District from the district's Urban Water Management Plan .

SOURCES: URS, 2004; Hannaford and Hydroconsult, 2004; Mundie & Associates, 2006; Westborough Water District, 2005.

These employment and population projections used in the water demand models indicate the type and amount of growth that is expected by wholesale customers and the SFPUC in the service area for which water will be required, and provide a basis for comparison with ABAG's current forecasts and other forecasts for the region.

Table E.3.3 compares the amount of growth expected between 2005 and 2025 to the amount that occurred between 1985 and 2005. This table provides an indication of whether future growth is expected to exceed past growth. It indicates that the percentage change in employment between 2005 and 2025 is expected to be smaller than the percentage change observed between 1985 and 2005, except in Santa Clara County and San Francisco County. Santa Clara County, which absorbed major employment losses during the "dot com bust" at the beginning of this decade, is estimated to have lost employment during the past 20 years. As a result, the percentage gain projected for the served portions of Santa Clara County during the next 20 years, although smaller than the percentage changes expected in the served portions of Alameda and San Mateo Counties, would represent a marked positive change from the experience of the past two decades. San Francisco, which was also affected by the dot com bust (but not as severely as Santa Clara County), showed modest employment growth during the past 20 years, but is expected to gain more jobs in the future.

TABLE E.3.3
POPULATION AND EMPLOYMENT PROJECTIONS FOR WATER DEMAND ESTIMATES: EXPECTED CHANGE COMPARED TO PAST CHANGE[a]

Area	1985-2005		2005-2025	
	#	%	#	%
Employment Change				
Alameda County	74,090	53.5%	66,990	26.6%
Santa Clara County	-18,770	-4.6%	92,843	17.9%
San Mateo County	54,770	21.5%	84,627	20.6%
Total Wholesale Customers	110,090	13.7%	244,462	20.7%
San Francisco	22,360	4.0%	114,020	17.4%
Total Area Served	132,450	9.7%	358,482	19.5%
Population Change				
Alameda County	116,100	32.4%	59,122	12.6%
Santa Clara County	74,600	19.2%	78,578	16.3%
San Mateo County	113,050	18.7%	77,125	10.7%
Total Wholesale Customers	303,750	22.5%	214,825	12.9%
San Francisco	79,500	11.1%	61,978	8.0%
Total Area Served	383,250	18.5%	276,803	11.3%

[a] Includes only those portions of each county served by SFPUC wholesale water customers or served directly by the SFPUC (San Francisco County). Population estimates for San Mateo County include updated figures for the Westborough Water District from the district's Urban Water Management Plan .

SOURCES: URS, 2004; Hannaford and Hydroconsult, 2004; ABAG, 2004; Mundie & Associates, 2006; Westborough Water District, 2005.

In the areas of San Mateo County served by SFPUC wholesale customers, the percentage increase in employment is expected to be slightly smaller during the forecast period than it was during the past two decades, but the numeric change is expected to be greater (by nearly 30,000 jobs, which would be about 55 percent more than were added during 1985-2005).

Table E.3.3 further indicates that, without exception, the percentage change in population during the next two decades is expected to be smaller than the percentage change during the past two, and that, except areas of Santa Clara County served by SFPUC water customers, the numeric change is expected to be smaller as well. (The number of residents added in this portion of Santa Clara County between 2005 and 2025 is projected to exceed the number added between 1985 and 2005 by about 4,000, or five percent.)

Projections of employment and population for each wholesale customer's service area are presented in **Table E.3.4**. This table parallels county Table E.3.1 in that it provides estimates of employment and population in 2001, 2005, 2025, and 2030.

Tables E.3.5 and **E.3.6** provide information parallel to that provided in county Table E.3.2, by calculating the numeric and percentage change in employment (Table E.3.5) and population (Table E.3.6) for each wholesale customer service area during 2001-30, 2005-2025, and 2005-30.

Comparisons of ABAG and Other Forecasts

Overview of ABAG Projections

As was noted on page E.3-2, many of the wholesale customers selected the employment and population growth projections prepared by the Association of Bay Area Governments (ABAG) for use in the water demand model to forecast 2030 water demand for their service areas.[1] ABAG generally updates its projections every other year. At the time the demand projections for this project were prepared, *Projections 2002* was the current set.

Comparing Water Customers' Projections to ABAG Projections

The SFPUC wholesale customers' projections are specific to the area served by the respective water districts, while ABAG provides projections for cities – both for the area within each city's corporate limits and, where cities abut unincorporated areas, for cities and their spheres of influence or planning areas. Because most water customers' service areas are not congruent with the boundaries of ABAG projection areas, the wholesale customers' projections of employment and population growth are not directly comparable to ABAG's projections of employment and population growth.

1 The end-use demand model utilized published population and employment projections to forecast the growth in the number of applicable water accounts. Each wholesale customer selected the projections source to be used for its service area. The selected population and employment projections were input into the demand model and the growth rate from the selected projection was applied to the applicable accounts. The water demand model and the development of water demand projections is described in more detail in PEIR Appendix E.2 and in the wholesale and retail customer demand studies (URS, 2004; Hannaford and Hydroconsult, 2004).

TABLE E.3.4
EMPLOYMENT AND POPULATION PROJECTIONS FOR WATER DEMAND ESTIMATES: DETAIL FOR WATER CUSTOMERS

	Employment				Population			
Customer	**2001**	**2005**	**2025**	**2030**	**2001**	**2005**	**2025**	**2030**
Alameda County								
Alameda County Water District	151,092	160,853	209,657	221,858	316,523	325,269	368,999	379,931
Hayward	87,473	91,110	109,296	113,843	140,439	143,517	158,909	162,757
Santa Clara County								
Milpitas	53,566	56,678	72,239	76,129	62,756	66,354	84,344	88,841
Mountain View	75,629	78,393	92,214	95,669	71,160	72,610	79,858	81,670
Palo Alto	105,432	106,645	112,708	114,224	59,954	61,229	67,605	69,199
Purissima Hills Water District	420	425	451	457	6,032	6,133	6,637	6,763
San Jose (North)	2,500	2,618	3,206	3,353	11,098	11,455	13,240	13,686
Santa Clara	138,163	143,524	170,326	177,027	104,349	109,363	134,431	140,698
Stanford University	na	na	na	na	19,738	20,867	26,513	27,924
Sunnyvale	125,476	131,472	161,454	168,950	131,365	134,157	148,119	151,610
San Mateo County								
Brisbane	3,789	5,966	16,853	19,575	3,174	3,372	4,359	4,606
Burlingame	31,205	31,888	35,306	36,160	30,154	30,818	34,137	34,967
CWS – Bear Gulch District	42,899	43,571	46,933	47,774	66,197	67,235	72,422	73,719
CWS – Mid-Peninsula District	79,493	82,400	96,934	100,568	120,856	123,474	136,562	139,834
CWS – South San Francisco District	49,288	51,089	60,093	62,344	49,207	50,638	57,795	59,584
Coastside County Water District	5,402	5,594	6,555	6,795	18,319	19,237	23,826	24,973
Daly City	26,941	27,912	32,767	33,981	106,117	107,432	114,007	115,651
East Palo Alto	3,289	4,032	7,745	8,673	24,395	25,542	31,278	32,712
Estero MID	24,318	25,356	30,543	31,840	34,568	35,330	39,143	40,096
Guadalupe Valley MID	4,442	4,611	5,457	5,668	446	599	1,366	1,558
Hillsborough	1,216	1,239	1,352	1,380	11,618	11,768	12,520	12,708
Los Trancos County Water District[a]	na	na	na	na	740	789	1,033	1,094
Menlo Park	10,053	10,499	12,729	13,287	12,153	12,360	13,396	13,655
Mid-Peninsula Water District	14,705	15,742	20,925	22,221	26,443	26,657	27,729	27,997
Millbrae	6,664	6,850	7,777	8,009	21,460	21,972	24,534	25,174
North Coast County Water District	5,797	6,029	7,188	7,478	40,457	41,474	46,558	47,829
Redwood City	66,389	68,774	80,697	83,678	81,888	83,494	91,527	93,535
San Bruno	16,622	17,884	24,193	25,770	40,727	41,762	46,936	48,229
Skyline County Water District	224	224	224	224	1,210	1,413	2,429	2,683
Westborough Water District[b]	1,610	1,613	1,627	1,631	13,056	13,150	14,225	14,300
Total Wholesale Customers	**1,134,097**	**1,182,991**	**1,427,449**	**1,488,566**	**1,626,599**	**1,669,470**	**1,884,437**	**1,937,983**
San Francisco	**638,840**	**656,480**	**770,500**	**795,400**	**760,075**	**772,470**	**834,448**	**849,942**
Total Area Served	**1,772,937**	**1,839,471**	**2,197,949**	**2,283,966**	**2,386,674**	**2,441,940**	**2,718,885**	**2,787,925**

[a] Los Trancos County Water District was acquired by CWS in 2006, and is now part of the CWS – Bear Gulch District. Because it was a separate entity when these projections were prepared, it is presented separately in this analysis.

[b] Population estimates from Westborough Water District's 2005 Urban Water Management Plan.

SOURCES: URS, 2004; Hannaford and Hydroconsult, 2004; Mundie & Associates, 2006; Westborough Water District, 2005.

TABLE E.3.5
EMPLOYMENT PROJECTIONS FOR WATER DEMAND ESTIMATES: EXPECTED CHANGE FOR WATER CUSTOMERS

Area	Employment Change					
	2001-2030		2005-2025		2005-2030	
	#	%	#	%	#	%
Alameda County						
Alameda County Water District	70,766	46.8%	48,804	30.3%	61,005	37.9%
Hayward	26,370	30.1%	18,186	20.0%	22,733	25.0%
Santa Clara County						
Milpitas	22,563	42.1%	15,561	27.5%	19,451	34.3%
Mountain View	20,040	26.5%	13,821	17.6%	17,276	22.0%
Palo Alto	8,792	8.3%	6,063	5.7%	7,579	7.1%
Purissima Hills Water District	37	8.8%	26	6.0%	32	7.5%
San Jose (North)	853	34.1%	588	22.5%	735	28.1%
Santa Clara	38,864	28.1%	26,802	18.7%	33,503	23.3%
Stanford University	na	na	na	na	na	na
Sunnyvale	43,474	34.6%	29,982	22.8%	37,478	28.5%
San Mateo County						
Brisbane	15,786	416.6%	10,887	182.5%	13,609	228.1%
Burlingame	4,955	15.9%	3,418	10.7%	4,272	13.4%
CWS – Bear Gulch District	4,875	11.4%	3,362	7.7%	4,203	9.6%
CWS – Mid-Peninsula District	21,075	26.5%	14,534	17.6%	18,168	22.0%
CWS – South San Francisco District	13,056	26.5%	9,004	17.6%	11,255	22.0%
Coastside County Water District	1,393	25.8%	961	17.2%	1,201	21.5%
Daly City	7,040	26.1%	4,855	17.4%	6,069	21.7%
East Palo Alto	5,384	163.7%	3,713	92.1%	4,641	115.1%
Estero MID	7,522	30.9%	5,187	20.5%	6,484	25.6%
Guadalupe Valley MID	1,226	27.6%	846	18.3%	1,057	22.9%
Hillsborough	164	13.5%	113	9.1%	141	11.4%
Los Trancos County Water District[b]	na	na	na	na	na	na
Menlo Park	3,234	32.2%	2,230	21.2%	2,788	26.6%
Mid-Peninsula Water District	7,516	51.1%	5,183	32.9%	6,479	41.2%
Millbrae	1,345	20.2%	927	13.5%	1,159	16.9%
North Coast County Water District	1,681	29.0%	1,159	19.2%	1,449	24.0%
Redwood City	17,289	26.0%	11,923	17.3%	14,904	21.7%
San Bruno	9,148	55.0%	6,309	35.3%	7,886	44.1%
Skyline County Water District	0	0.0%	0	0.0%	0	0.0%
Westborough Water District[b]	21	1.3%	14	0.9%	18	1.1%
Total Wholesale Customers	**354,469**	**31.3%**	**244,462**	**20.7%**	**305,577**	**25.8%**
San Francisco	**156,560**	**24.5%**	**114,020**	**17.4%**	**138,920**	**21.2%**
Total Area Served	**511,029**	**28.8%**	**358,482**	**19.5%**	**444,497**	**24.2%**

[a] Los Trancos County Water District was acquired by CWS in 2006, and is now part of the CWS – Bear Gulch District. Because it was a separate entity when these projections were prepared, it is presented separately in this analysis.

[b] Population estimates from Westborough Water District's 2005 Urban Water Management Plan.

SOURCES: URS, 2004; Hannaford and Hydroconsult, 2004; Mundie & Associates, 2006.

TABLE E.3.6
POPULATION PROJECTIONS FOR WATER DEMAND ESTIMATES:
EXPECTED CHANGE FOR WATER CUSTOMERS

	Population Change					
	2001-2030		2005-2025		2005-2030	
Area	**#**	**%**	**#**	**%**	**#**	**%**
Alameda County						
Alameda County Water District	63,408	20.0%	43,730	13.4%	54,662	16.8%
Hayward	22,318	15.9%	15,392	10.7%	19,240	13.4%
Santa Clara County						
Milpitas	26,085	41.6%	17,990	27.1%	22,487	33.9%
Mountain View	10,510	14.8%	7,248	10.0%	9,060	12.5%
Palo Alto	9,245	15.4%	6,376	10.4%	7,970	13.0%
Purissima Hills Water District	731	12.1%	504	8.2%	630	10.3%
San Jose	2,588	23.3%	1,785	15.6%	2,231	19.5%
Santa Clara	36,349	34.8%	25,068	22.9%	31,335	28.7%
Stanford University	8,186	41.5%	5,646	27.1%	7,057	33.8%
Sunnyvale	20,245	15.4%	13,962	10.4%	17,453	13.0%
San Mateo County						
Brisbane	1,432	45.1%	987	29.3%	1,234	36.6%
Burlingame	4,813	16.0%	3,319	10.8%	4,149	13.5%
CWS - Bear Gulch District	7,522	11.4%	5,187	7.7%	6,484	9.6%
CWS - Mid-Peninsula District	18,978	15.7%	13,088	10.6%	16,360	13.3%
CWS - South San Francisco District	10,377	21.1%	7,157	14.1%	8,946	17.7%
Coastside County Water District	6,654	36.3%	4,589	23.9%	5,736	29.8%
Daly City	9,534	9.0%	6,575	6.1%	8,219	7.7%
East Palo Alto	8,317	34.1%	5,736	22.5%	7,170	28.1%
Estero MID/Foster City	5,528	16.0%	3,813	10.8%	4,766	13.5%
Guadalupe Valley MID	1,112	249.3%	767	127.9%	959	159.9%
Hillsborough	1,090	9.4%	752	6.4%	940	8.0%
Los Trancos County Water District[a]	354	47.8%	244	30.9%	305	38.7%
Menlo Park	1,502	12.4%	1,036	8.4%	1,295	10.5%
Mid-Peninsula Water District	1,554	5.9%	1,072	4.0%	1,340	5.0%
Millbrae	3,714	17.3%	2,562	11.7%	3,202	14.6%
North Coast County Water District	7,372	18.2%	5,084	12.3%	6,355	15.3%
Redwood City	11,647	14.2%	8,033	9.6%	10,041	12.0%
San Bruno	7,502	18.4%	5,174	12.4%	6,467	15.5%
Skyline County Water District	1,473	121.7%	1,016	71.9%	1,270	89.9%
Westborough Water District	1,244	9.5%	1,075	8.2%	1,150	8.7%
Total	**311,384**	**19.1%**	**214,966**	**12.9%**	**268,513**	**16.1%**
San Francisco	**89,867**	**11.8%**	**61,978**	**8.0%**	**77,472**	**10.0%**
Total Area Served	**401,251**	**16.8%**	**276,944**	**11.3%**	**345,985**	**14.2%**

[a] Los Trancos County Water District was acquired by CWS in 2006, and is now part of the CWS – Bear Gulch District. Because it was a separate entity when these projections were prepared, it is presented separately in this analysis.

SOURCES: URS, 2004; Hannaford and Hydroconsult, 2004; Mundie & Associates, 2006; Westborough Water District, 2005.

To compare the changing expectation of growth in the SFPUC wholesale customer service area as depicted in the evolving sets of projections produced by ABAG, therefore, this analysis assigns wholesale customers to ABAG's projection units (typically cities or, where a city is bordered by unincorporated area, subregional study areas). As suggested above, this assignment is inexact: in some cases, only part of a city is served by a wholesale customer, or the wholesale customer serves an unincorporated area that could not be segregated from other unincorporated areas in the ABAG materials. **Tables E.3.A.1** and **E.3.A.2**, in Attachment E.3.A (at the end of this appendix)**,** detail the assumptions that were made to establish a correspondence between areas served by wholesale water customers and areas for which ABAG has prepared projections of employment and population, and the resulting correspondences between water customers and ABAG areas.

Most of the discussion that follows – describing ABAG's projections for employment and population growth in the nine-county Bay Area, the four counties that include the SFUC service area, and the portions of the four counties within the SFPUC service area – is based solely on the ABAG estimates of current and future conditions. It is only when the ABAG projections are compared to the water customers' projections (e.g., beginning with **Table E.3.33** and the related text), that the correspondence between water customer service areas and ABAG jurisdictions may introduce some distortion into the analysis, because of the inexact matches between the ABAG areas and the water service areas.

ABAG Projections: Evolution from *Projections 2002* to *Projections 2005*

ABAG, the regional planning agency in the Bay Area, provides long-term demographic and economic forecasts for the nine Bay Area counties. ABAG produces a biennial *Projections* series developed from a series of computer models. The projections are utilized by regional transportation and air quality agencies, local government, and private industry. As noted above, ABAG projections were selected by many of the wholesale customers as the basis for their growth and employment projections. In addition, because ABAG is the regional planning agency in the Bay Area, the ABAG projections in general provide a useful tool for assessing assumptions and forecasts made by other agencies regarding future trends in the area.

In 2003, ABAG revised the assumptions that provide the basis for its biennial (every two year) projections, to incorporate additional assumptions about future development in the Bay Area. To lay out how this change in underlying assumptions compares to the underlying assumptions at the time water demand projections were being prepared (and to compare the projections based on those assumptions), this appendix first presents a comprehensive comparison of the ABAG *Projections 2002* with *Projections 2003*, the first year incorporating the smart growth principles, and then presents a comprehensive comparison of *Projections 2003* and *Projections 2005*, ABAG's current projections set. This process provides a look at the evolution of ABAG's expectations for growth in the Bay Area and its constituent communities.

Changes in the Underlying Assumptions

Basis for Projections 2002

ABAG's projections have historically been based on a model that forecasts growth in the region in relation to national economic and demographic trends. In this model, projections of total employment growth in the nine-county Bay Area are based on expected growth of the national economy and the relative attractiveness of the Bay Area compared to other regions. This regional forecast provides a "control total," which is then distributed among subareas within the region The subareas are based primarily on municipal jurisdictions. [2]

The allocation of growth to subareas within the region has historically been based on existing patterns of economic activity and the availability of land for commercial, industrial, and residential development, and housing opportunities for employees. The distribution process begins with jobs: new economic activities are assumed to locate near existing similar or linked activities, and trends showing growth or decline are generally assumed to continue (although not necessarily at the same rate).

Residential (household and population) growth is projected for each county, based primarily on the "cohort-survival method" (births minus deaths), with additional assumptions about net migration. The migration assumptions are based on the relationship between predicted labor force-aged population and forecast employment: if a tight labor market is expected, then in-migration is assumed to occur. Assumptions about housing costs are also used, in recognition of the fact that housing prices outside the nine-county region may be more affordable than prices within the region.

The total population for each county is distributed to specific locations within the Bay Area (and beyond) based a series of variables including employment locations, housing opportunities and costs, education, and the cost of travel. The final forecasts are refined to recognize potential constraints on land availability. Land availability estimates are based on local land use policies and regulations, such as general plans and zoning codes.

Basis for Projections Beginning with Projections 2003

Beginning in 2003, ABAG added a new policy dimension to its regional forecasts, an overlay of "smart growth" principles. ABAG defines smart growth as:

> Development that reflects higher densities, mixed use, and a higher proportion of housing and employment growth in urban areas, particularly near transit stations and along transit corridors, as well as in town centers (ABAG, 2002).

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2 Subareas reported in the *Projections* series are "subregional study areas," which may be cities (when city limits coincide with a city's sphere of influence), city spheres of influence (considered to be each city's expected ultimate urban boundaries until modified), or "other subregional areas." ABAG also develops some projections (including population) for cities within jurisdictional boundaries (city limits). ABAG details its projections for areas as small as census tracts.

The smart growth policies have the following key impacts of the on the projections:

- Substitution of ABAG's smart growth policy-based assumptions about development potential for local land use policy assumptions. This substitution results in a geographic redistribution of development expectations. ABAG assumes that, over time – as general plans and zoning ordinances are updated – local policies will be modified to reflect smart growth principles.

- Rearrangement of the total expected growth in the region among jurisdictions, beginning in about 2010. The pattern of growth reflected in *Projections 2003* and *Projections 2005* is "mainly transit-oriented, and focuses development in urban core areas throughout the region." ABAG, the Metropolitan Transportation Commission (MTC), and the State of California are assumed to make funding recommendations and decisions linking transportation projects to the adoption and implementation of smart growth land use principles. ABAG recognizes, however, that "because of the time required to obtain incentives and make investments a reality, changes to land use patterns won't begin to occur until 2010" (ABAG, 2004).

- Increased housing production. *Projections 2003* (like its successor, *Projections 2005*) assumes that a combination of regulatory and policy changes, along with "partial government funding," will be needed "to spur an increase in overall housing production, and to channel housing toward infill sites". Specifically, the projections anticipate that the removal of barriers to infill development and an increase in (unspecified) government funds of $350 million per year will help to increase regional housing production by 5,000 units per year between 2010 and 2020, and by 7,500 units per year between 2020 and 2030.

Growth Expected by *Projections 2002* and *Projections 2003*

Projected Growth in the San Francisco Bay Area

Table E.3.7 establishes a framework for evaluating the evolution of the ABAG projections by comparing the employment projections for ABAG's entire nine-county area presented in ABAG's *Projections 2002* – the set on which most of the wholesale customer water demand projections are based – to employment projections for the nine counties in *Projections 2003*, the first set that uses the smart growth principles. This comparison illustrates the change in expectations for employment growth resulting from ABAG's shift to a smart growth policy-based projection. The table focuses on the change expected to occur between 2005 and 2025, which is the horizon year for *Projections 2002*.

TABLE E.3.7
ABAG *PROJECTIONS 2002* AND *PROJECTIONS 2003*:
EMPLOYMENT PROJECTIONS FOR THE NINE-COUNTY BAY AREA

Source of Projection	Jobs in 2005	Jobs in 2025	New Jobs, 2005-2025
Projections 2002	3,933,870	4,932,590	998,720
Projections 2003	3,848,870	4,982,800	1,133,930
% change	-2%	1%	14%

SOURCES: ABAG, 2001; ABAG, 2002.

This table shows that *Projections 2003* anticipates more employment growth within the Bay Area than did *Projections 2002*: the number of jobs is estimated to be lower in 2005, and to increase to a higher total in 2025. *Projections 2003* forecasts that the Bay Area will gain 135,210 more jobs between 2005 and 2025 than *Projections 2002* forecasts for this period; by 2025, the Bay Area is projected to have about 50,200 more jobs, according to *Projections 2003*. This adjustment in the employment projection reflects ABAG's increasing understanding of how many jobs were lost in the "dot com bust" recession in the early part of this decade, coupled with the ongoing assumption that the *Projections 2002* forecast of total employment in 2025 continued to represent a reasonable expectation for the future.

Table E.3.8 provides a similar comparison for population in the nine-county Bay Area. This table indicates that *Projections 2003* anticipates about 23 percent more population growth in the nine-county Bay Area between 2005 and 2025 than was anticipated in *Projections 2002*. This additional growth (234,100 more residents by 2025 in *Projections 2003*) is consistent with the increase in housing production forecasted in *Projections 2003* compared with *Projections 2002*, which would add 87,500 housing units between 2010 and 2025.

TABLE E.3.8
ABAG *PROJECTIONS 2002* AND *PROJECTIONS 2003*:
POPULATION PROJECTIONS FOR THE NINE-COUNTY BAY AREA

Source of Projection	Population in 2005	Population in 2025	Added Population, 2005-2025
Projections 2002	7,193,900	8,223,740	1,029,840
Projections 2003	7,193,900	8,457,800	1,263,900
% change	0%	3%	23%

SOURCES: ABAG, 2001; ABAG, 2002.

Projected Growth in the Four Water System Counties

The SFPUC water system delivers water to customers in four Bay Area counties: Alameda, Santa Clara, San Mateo, and San Francisco. The SFPUC system delivers water to 30 wholesale customers in the first three of these counties[3] and to retail customers in San Francisco.[4] (The four counties are considered here in their entirety; the following subsection considers the portion of the four-county area served within the service area of the SFPUC and its wholesale customers.)

3 There are 27 wholesale customers, but California Water Service Company (CWS) serves three distinct subgroups—Bear Gulch District, Mid-Peninsula District, and South San Francisco District —which are tracked separately in the SFPUC reports. One former wholesale customer, the Los Trancos County Water District, which was purchased by CWS and is now part of the Bear Gulch District, is also tracked separately in most of the SFPUC reports. The 30 wholesale customer entities referenced here include the CWS districts and Los Trancos as distinct entities.

4 The SFPUC also serves a few large retail customers in Alameda, San Mateo, and Tuolumne Counties, which project no change in water demand for 2030. This analysis focuses on projections of the wholesale customers and San Francisco.

To illuminate the differences between ABAG's *Projections 2002* and *Projections 2003* for the counties served by SFPUC water, **Tables E.3.9** and **E.3.10** compare employment and population projections in this four-county area. *Projections 2003* estimates that the four-county area had 81,000 fewer jobs in 2005 than did *Projections 2002,* but expects 20 percent (138,400) more jobs to be added between 2005 and 2025. By 2025, the number of jobs in the four-county area would be about two percent higher under *Projections 2003* than under *Projections 2002*.

TABLE E.3.9
ABAG *PROJECTIONS 2002* AND *PROJECTIONS 2003*:
EMPLOYMENT PROJECTIONS FOR THE FOCUSED FOUR-COUNTY AREA

Source of Projection	Jobs in 2005	Jobs in 2025	Added Jobs, 2005-2025
Projections 2002	2,989,370	3,682,510	693,140
Projections 2003	2,908,370	3,739,920	831,550
% change	-3%	2%	20%

SOURCES: ABAG, 2001; ABAG, 2002.

TABLE E.3.10
ABAG *PROJECTIONS 2002* AND *PROJECTIONS 2003*:
POPULATION PROJECTIONS FOR THE FOCUSED FOUR-COUNTY AREA

Source of Projection	Population in 2005	Population in 2025	Added Population, 2005-2025
Projections 2002	4,855,400	5,406,900	551,500
Projections 2003	4,855,400	5,695,800	840,400
% change	0%	5%	52%

SOURCES: ABAG, 2001; ABAG, 2002.

In combination with Table E.3.7, Table E.3.9 shows that:

- On a percentage basis, the four-county area accounts for greater employment losses as a result of the "dot com bust" than does the nine-county area as a whole. In the Bay Area as a whole (Table E.3.7), *Projections 2003* estimates *total* employment in 2005 that is about two percent lower than 2005 employment projected in *Projections 2002*; in the four-county area, the difference between these projections is three percent. Numerically, *Projections 2003* estimates that the nine Bay Area counties had 85,000 fewer jobs in 2005 than were forecasted in *Projections 2002,* and it estimates that the four-county area had 81,000 fewer jobs. In other words, the four-county area accounts for 95 percent of the nine-county employment adjustment for 2005 incorporated into *Projections 2003*.

- The increase in job *growth* in the four-county area anticipated by *Projections 2003* compared to *Projections 2002* – that is, about 138,400 more new jobs between 2005 and 2025 – is greater than the increase projected for the nine-county Bay Area as a whole (a difference of about 135,200 new jobs between *Projections 2003* and *Projections 2002*). This difference means that, just as the four-county area experienced most of the job loss during the dot com bust, it would account for all of the added job growth during the ensuing recovery.

Together, the comparisons of projections for the nine-county Bay Area and the four-county area indicate that employment in the Bay Area is expected to be increasingly concentrated in the four counties in which SFPUC water customers are located.

Table E.3.10 provides similar comparisons for population in the four-county area. It shows that the estimates of population in 2005 are the same in the two sets of projections, but that *Projections 2003* anticipates 52 percent more growth (840,400 new residents compared to 551,500 million) than *Projections 2002*. By 2025, *Projections 2003* projects the four counties to have about 5 percent more residents than were forecasted in *Projections 2002*.

In combination with Table E.3.8, Table E.3.10 shows that:

- The difference between *Projections 2002* and *Projections 2003* in the expected *total* population in 2025 is greater for the four-county area (about 289,000 more residents in *Projections 2003* in 2025) than for the entire nine-county Bay Area (about 234,100 more residents forecasted in 2025).

- The difference between the two sets of projections in the expected population *growth* forecasted for the 20-year period is also greater in the four-county area (with nearly 289,000 more new residents forecasted in the four counties in *Projections 2003* than were forecasted in *Projections 2002*, compared to about 234,100 more new residents in the nine counties in *Projections 2003*). (The difference in the *change* is the same as the difference in the *total* (previous bullet) are the same because the starting point – that is, population in 2005 – is the same in *Projections 2003* and *Projections 2002*.)

Together, the comparisons of projections for the nine-county and four-county areas indicate an expectation that population growth in the Bay Area will increasingly be concentrated in the four counties in which SFPUC water customers are located.

Projected Growth in the Area Served by SFPUC Water Customers

Employment Growth

ABAG projections of employment growth in the portion of the four-county area served by SFPUC water are compared in **Table E.3.11**. This table indicates that, in general, more new jobs are forecasted for this area by *Projections 2003* than were forecasted by *Projections 2002*. Overall, according to *Projections 2003*, the area would add nearly 438,300 jobs during the 20-year period, representing a 25 percent gain compared to the 2005 employment base and about 20 percent more growth than was forecast in *Projections 2002*.

Table E.3.12 provides detail about the employment projections for the ABAG cities that are served by one or more SFPUC water customers.

TABLE E.3.11
ABAG *PROJECTIONS 2002* AND *PROJECTIONS 2003*:
EMPLOYMENT PROJECTIONS FOR THE AREA SERVED BY SFPUC WATER CUSTOMERS (WHOLESALE AND RETAIL)[a]

Area	Source of Projection	Jobs in 2005	Jobs in 2025	Change, 2005-2025	
				Number	Percent
Alameda County	Proj. 2002	248,720	316,270	67,550	27.2%
	Proj. 2003	248,720	325,440	76,720	30.8%
Santa Clara County	Proj. 2002	517,310	617,590	100,280	19.4%
	Proj. 2003	499,410	608,030	108,620	21.7%
San Mateo County	Proj. 2002	382,280	465,240	82,960	21.7%
	Proj. 2003	362,460	464,870	102,410	28.3%
Total Wholesale Customers	Proj. 2002	1,148,310	1,399,100	250,790	21.8%
	Proj. 2003	1,110,590	1,398,340	287,750	25.9%
San Francisco	Proj. 2002	656,480	770,500	114,020	17.4%
	Proj. 2003	635,480	786,020	150,540	23.7%
Total Customers	Proj. 2002	1,804,790	2,169,600	364,810	20.2%
	Proj. 2003	1,746,070	2,184,360	438,290	25.1%

[a] Includes only those portions of each county served by SFPUC wholesale water customers or served directly by the SFPUC (San Francisco County).

SOURCES: ABAG, 2001; ABAG, 2002.

Table E.3.13 sorts the individual jurisdictions within the service area (a single wholesale customer may serve several jurisdictions) according to whether greater (total) employment in 2025 is expected by *Projections 2003* or *Projections 2002*. The projections are generally similar: *Projections 2003* expects that about one-half (16) of the jurisdictions will have about the same number of jobs in 2025 as were anticipated in *Projections 2002* (i.e., the projection is within 5 percent of the figure in *Projections 2002*); eight jurisdictions will have more jobs in 2025; and seven will have fewer jobs.

Table E.3.14 sorts the individual jurisdictions according to which set of projections anticipates a greater *increase* in the number of jobs between 2005 and 2025. This table differs from Table E.3.13 in that it shows the *change* in jobs during the 20-year period rather than the *total* number of jobs at the end of the period. As shown in the table, *Projections 2003* anticipates greater employment growth in 19 of the jurisdictions, about the same amount in 3,[5] and less growth in 10.

Combining the information from Tables E.3.13 and E.3.14 indicates that most of the jurisdictions in which more growth is anticipated during the next 20 years (from Table E.3.14) would be, in large part, regaining jobs lost at the beginning of this decade (reflected in a reduced ABAG estimate of employment in 2005).

5 In all of the comparison tables, “about the same” means “within five percent.”

TABLE E.3.12
ABAG *PROJECTIONS 2002* AND *PROJECTIONS 2003*:
EMPLOYMENT PROJECTIONS FOR CITIES WITHIN THE SFPUC SERVICE AREA
(WHOLESALE AND RETAIL)[a]

	Projections 2002				Projections 2003			
			Change, 2005-2025				Change, 2005-2025	
ABAG Jurisdiction	**2005**	**2025**	**#**	**%**	**2005**	**2025**	**#**	**%**
Alameda County								
Fremont[b]	115,700	146,520	30,820	26.6%	115,700	154,740	39,040	33.7%
Hayward	92,060	109,850	17,790	19.3%	92,060	109,760	17,700	19.2%
Newark[b]	19,480	26,630	7,150	36.7%	19,480	22,720	3,240	16.6%
Union City[b]	21,480	33,270	11,790	54.9%	21,480	38,220	16,740	77.9%
Santa Clara County								
Milpitas	53,310	69,540	16,230	30.4%	49,770	68,440	18,670	37.5%
Mountain View	78,710	94,370	15,660	19.9%	82,410	102,840	20,430	24.8%
Los Altos Hills[c]	2,730	2,890	160	5.9%	2,720	2,790	70	2.6%
Palo Alto[d]	112,520	119,040	6,520	5.8%	110,620	119,600	8,980	8.1%
Santa Clara	140,820	170,260	29,440	20.9%	135140	166,710	31,570	23.4%
Sunnyvale	129,220	161,490	32,270	25.0%	118,750	147,650	28,900	24.3%
San Mateo County								
Atherton[f]	3,600	4,040	440	12.2%	3,470	4,450	980	28.2%
Belmont[g]	15,380	19,500	4,120	26.8%	14,410	18,710	4,300	29.8%
Brisbane	8,800	15,820	7,020	79.8%	8130	16,580	8,450	103.9%
Burlingame	29,780	32,590	2,810	9.4%	28640	32,980	4,340	15.2%
Colma[h]	2,640	3,270	630	23.9%	2,530	3,610	1,080	42.7%
Daly City	26,250	30,840	4,590	17.5%	25,230	34,110	8,880	35.2%
East Palo Alto	3,730	8,540	4,810	129.0%	3450	5,920	2,470	71.6%
Foster City[i]	21,130	25,580	4,450	21.1%	20,330	24,120	3,790	18.6%
Half Moon Bay[j]	5,220	6,140	920	17.6%	5,010	5,720	710	14.2%
Hillsborough	1,240	1,360	120	9.7%	1,210	1,280	70	5.8%
Menlo Park[k]	31,140	38,580	7,440	23.9%	30,310	37,050	6,740	22.2%
Millbrae	6,210	7,200	990	15.9%	6,060	8,520	2,460	40.6%
Pacifica[l]	4,960	6,000	1,040	21.0%	4,770	5,970	1,200	25.2%
Portola Valley[f]	1,140	1,160	20	1.8%	1,130	1,140	10	0.9%
Woodside[f]	2,050	2,100	50	2.4%	2,050	2,060	10	0.5%
Redwood City[m]	65,020	77,650	12,630	19.4%	56,740	70,660	13,920	24.5%
San Bruno	16,680	22,880	6,200	37.2%	16,390	26,890	10,500	64.1%
San Carlos[n]	17,880	21,070	3,190	17.8%	17,430	22,080	4,650	26.7%
San Mateo[n]	64,060	75,490	11,430	17.8%	61,600	79,400	17,800	28.9%
South San Francisco[o]	55,370	65,430	10,060	18.2%	53,570	63,620	10,050	18.8%
Total Wholesale Customers	1,148,310	1,399,100	250,790	21.8%	1,118,590	1,395,340	287,750	25.9%
San Francisco	656,480	770,500	114,020	17.4%	635,480	786,020	150,540	23.7%
Total Area Served	1,804,790	2,169,600	364,810	20.2%	1,746,070	2,184,360	438,290	25.1%

[a] No separate projections for Guadalupe MID (part of Brisbane), Skyline County Water District (serves part of Woodside), Westborough Water District (serves part of South San Francisco), Stanford University (included by ABAG in the projections for Palo Alto), or San Jose (serves only a small portion of the city). Totals differ slightly from those shown in Table E.3.11 because the ABAG jurisdictions for which employment projections are reported in this table differ in geography from the water customer areas (see Tables E.3.A.1 and E.3.A.2).
[b] Fremont, Newark, and Union City are served by the Alameda County Water District.
[c] Los Altos Hills is served by the Purissima Hills Water District.
[d] Palo Alto projections include Stanford University
[e] This footnote deleted.
[f] Atherton, Portola Valley, and part of Woodside are served by CWS - Bear Gulch District. All of Portola Valley (including the portion previously served by Los Trancos County Water District, which is now a part of CWS) and Woodside are included in these projections.
[g] Belmont is served by the Mid-Peninsula Water District, which also serves parts of San Carlos.
[h] Colma is served by CWS - South San Francisco District
[i] Foster City is served by Estero MID, which also serves a portion of San Mateo. The projections for San Mateo are included in the projections for CWS - Mid-Peninsula District.
[j] Half Moon Bay and the adjacent unincorporated area (included in these figures) are served by the Coastside County Water District.
[k] The City of Menlo Park Water Agency serves only a portion of the City of Menlo Park (less than half of the city's population). These figures are for the entire city.
[l] Pacifica is served by the North Coast County Water District.
[m] Redwood City Water Agency also serves portions of San Carlos and Woodside.
[n] Parts of San Carlos and San Mateo are served by CWS - Mid Peninsula District. Both cities are included here in their entirety.
[o] South San Francisco is served by CWS - South San Francisco District + Westborough Water District.

SOURCE: ABAG, 2001; ABAG, 2002.

TABLE E.3.13
ABAG *PROJECTIONS 2002* AND *PROJECTIONS 2003*: TOTAL JOBS IN 2025

***Projections 2003* Forecast is Greater than *Projections 2002* Forecast**			***Projections 2003* Forecast is About the Same as *Projections 2002* Forecast[a]**			***Projections 2003* Forecast is Less than *Projections 2002* Forecast**		
Jurisdiction	**Jobs in 2025[b]**	**Proj. 2002 Jobs as % of Proj. 2003 Jobs**	**Jurisdiction**	**Jobs in 2025[b]**	**Proj. 2002 Jobs as % of Proj. 2003 Jobs**	**Jurisdiction**	**Jobs in 2025[b]**	**Proj. 2002 Jobs as % of Proj. 2003 Jobs**
Alameda County								
Union City	38,220	87.0%	Hayward	109,760	100.1%	Newark	22,720	117.2%
Fremont	154,740	94.7%						
Santa Clara County[d]								
Mountain View	102,840	91.8%	Palo Alto	119,600	99.5%	Sunnyvale	147,650	109.4%
			Milpitas	68,440	101.6%			
			Santa Clara	166,710	102.1%			
			Los Altos Hills	2,790	103.6%			
San Mateo County								
Millbrae	8,520	84.5%	San Mateo	79,400	95.1%	Foster City	24,120	106.1%
San Bruno	26,890	85.1%	Brisbane	16,580	95.4%	Hillsborough	1,280	106.3%
						Half Moon Bay[d]	5,720	107.3%
Daly City	34,110	90.4%	San Carlos	22,080	95.4%			
						Redwood City	70,660	109.9%
Colma	3,610	90.6%						
Atherton	4,450	90.8%	Burlingame	32,980	98.8%	East Palo Alto	5,920	144.3%
			Pacifica	5,970	100.5%			
			Portola Valley	1,140	101.8%			
			Woodside	2,060	101.9%			
			South San Francisco	63,620	102.8%			
			Menlo Park	37,050	104.1%			
			Belmont	18,710	104.2%			
San Francisco County								
			San Francisco	786,020	98.0%			

a Number of jobs in 2025 in *Projections 2003* is within five percent of the number of jobs in 2025 in *Projections 2002*.
b Number of jobs in 2025 forecast in *Projections 2003*.
c Stanford University is included within the City of Palo Alto in the ABAG projections. Only a small portion of the City of San Jose is within the district that obtains water from the SFPUC. It is considered misleading to include figures for all of San Jose in this analysis.
d Half Moon Bay plus Half Moon Bay (unincorporated).

SOURCES: ABAG, 2001; ABAG, 2002.

TABLE E.3.14
ABAG *PROJECTIONS 2002* AND *PROJECTIONS 2003*: CHANGE IN NUMBER OF JOBS, 2005-2025

Projections 2003 Forecast is Greater than *Projections 2002* Forecast			*Projections 2003* Forecast is About the Same as *Projections 2002* Forecast[a]			*Projections 2003* Forecast is Less than *Projections 2002* Forecast		
Jurisdiction	Change in Jobs, 2005-2025[b]	Proj. 2002 Change in Jobs as % of Proj. 2003 Change in Jobs	Jurisdiction	Change in Jobs, 2005-2025[b]	Proj. 2002 Change in Jobs as % of Proj. 2003 Change in Jobs	Jurisdiction	Change in Jobs, 2005-2025[b]	Proj. 2002 Change in Jobs as % of Proj. 2003 Change in Jobs
Alameda County								
Union City	16,740	70.4%	Hayward	17,700	100.5%	Newark	3,240	220.7%
Fremont	39,040	78.9%						
Santa Clara County[c]								
Palo Alto	8,980	72.6%				Sunnyvale	28,900	111.7%
Mountain View	20,430	76.7%				Los Altos Hills	70	228.6%
Milpitas	18,670	86.9%						
Santa Clara	31,570	93.3%						
San Mateo County								
Millbrae	2,460	40.2%	Belmont	4,300	95.8%	Menlo Park	6,740	110.4%
Atherton	980	44.9%	South San Francisco	10,050	100.1%	Foster City	3,790	117.4%
Daly City	8,880	51.7%				Half Moon Bay[d]	710	129.6%
Colma	1,080	58.3%				Hillsborough	70	171.4%
San Bruno	10,500	59.0%				East Palo Alto	2,470	194.7%
San Mateo	17,800	64.2%				Portola Valley	10	200.0%
Burlingame	4,340	64.7%				Woodside	10	500.0%
San Carlos	4,650	68.6%						
Brisbane	8,450	83.1%						
Pacifica	1,200	86.7%						
Redwood City	13,920	90.7%						
San Francisco County								
San Francisco	150,540	75.7%						

[a] Number of jobs added between 2005 and 2025 in *Projections 2003* is within five percent of the number of jobs added between 2005 and 2025 in *Projections 2002*.
[b] Number of jobs added between 2005 and 2025 in *Projections 2003*.
[c] Stanford University is included within the City of Palo Alto in the ABAG projections. Only a small portion of the City of San Jose is within the district that obtains water from the SFPUC. It is considered misleading to include figures for all of San Jose in this analysis.
[d] Half Moon Bay plus Half Moon Bay (unincorporated).

SOURCES: ABAG, 2001; ABAG, 2002.

Population Growth

Table E.3.15 compares expectations of population growth between 2005 and 2025 in the portion of the four-county area served by SFPUC water. This table indicates that *Projections 2003* expects nearly 137,000 more residents in the part of the four-county area served by SFPUC and its wholesale customers than did *Projections 2002*. This expectation represents overall growth of 350,420 residents, or about 66 percent more new residents than the 211,600 forecast by earlier set of projections.

TABLE E.3.15
ABAG *PROJECTIONS 2002* AND *PROJECTIONS 2003*:
POPULATION PROJECTIONS FOR THE AREA SERVED BY SFPUC WATER CUSTOMERS (WHOLESALE AND RETAIL)[a]

Area	Source of Projection	Population in 2005	Population in 2025	Change, 2005-2025	
				Number	Percent
Alameda County	Proj 2002	482,700	532,500	49,800	10.32%
	Proj 2003	481,100	552,500	71,400	14.84%
Santa Clara County	Proj 2002	473,100	545,300	72,200	15.26%
	Proj 2003	472,700	560,800	88,100	18.64%
San Mateo County	Proj 2002	727,000	800,000	73,000	10.04%
	Proj 2003	726,990	826,710	99,720	13.72%
Total Wholesale Customers	Proj 2002	1,682,800	1,877,800	195,000	11.59%
	Proj 2003	1,680,790	1,940,010	259,220	15.42%
San Francisco	Proj 2002	798,600	815,200	16,600	2.08%
	Proj 2003	798,600	889,800	91,200	11.42%
Total Customers	Proj 2002	2,481,400	2,693,000	211,600	8.53%
	Proj 2003	2,479,390	2,829,810	350,420	14.13%

[a] Includes only those portions of each county served by SFPUC wholesale water customers or served directly by the SFPUC (San Francisco County).

SOURCES: ABAG, 2001; ABAG, 2002.

Table E.3.16 provides detail about the population projections for the ABAG cities that are served by one or more SFPUC water customers.

Table E.3.17 sorts the jurisdictions served by SFPUC water according to whether greater *total* population in 2025 is expected by *Projections 2003* or *Projections 2002*. Slightly more than one-half of the jurisdictions (18 of 31) are expected to have about the same number of residents in 2025 (within 5 percent) in both sets of projections. In this case, however, most of the remaining jurisdictions (11 of 13) are expected by *Projections 2003* to have more residents in 2025, and only 2 are expected to have fewer residents.

Table E.3.18 sorts the jurisdictions according to whether greater *change* in population is expected by *Projections 2003* or *Projections 2002* in the jurisdictions served by SFPUC water. This table indicates that the same 18 jurisdictions that are expected to have greater population *growth* during the coming two decades under *Projections 2003* also are expected to have greater *total* population at the end of the 20-year period (as shown in Table E.3.17 [i.e., jurisdictions where the *Projections 2002* population as a percent of *Projections 2003* population is less than 1.00 percent]). Of the remaining 14 jurisdictions, however, 11 are expected to have less population growth with *Projections 2003* than with *Projections 2002*. Most of these 11 jurisdictions are relatively small: the population growth anticipated for these communities by *Projections 2003* ranges from 400 to 3,500 new residents over the 20-year period (except in Newark, where 6,400 new residents are expected).

TABLE E.3.16
ABAG *PROJECTIONS 2002* AND *PROJECTIONS 2003*:
POPULATION PROJECTIONS FOR THE AREA SERVED BY SFPUC WATER CUSTOMERS (WHOLESALE AND RETAIL)[a]

	Projections 2002				Projections 2003			
			Change, 2005-2025				Change, 2005-2025	
ABAG Jurisdiction	**2005**	**2025**	**#**	**%**	**2005**	**2025**	**#**	**%**
Alameda County								
Fremont[b]	214,600	233,200	18,600	8.7%	214,600	245,500	30,900	14.4%
Hayward	148,800	161,200	12,400	8.3%	147,600	164,200	16,600	11.2%
Newark[b]	45,400	53,400	8,000	17.6%	45,300	51,700	6,400	14.1%
Union City[b]	73,900	84,700	10,800	14.6%	73,600	91,100	17,500	23.8%
Santa Clara County								
Milpitas	68,400	86,300	17,900	26.2%	68,700	89,300	20,600	30.0%
Mountain View	73,300	80,900	7,600	10.4%	73,200	85,700	12,500	17.1%
Los Altos Hills[c]	10,000	10,500	500	5.0%	9,800	10,200	400	4.1%
Palo Alto[d]	75,800	82,800	7,000	9.2%	74,500	85,100	10,600	14.2%
Santa Clara	108,600	134,000	25,400	23.4%	108,600	133,100	24,500	22.6%
Sunnyvale	137,000	150,800	13,800	10.1%	137,900	157,400	19,500	14.1%
San Mateo County								
Atherton[f]	7,300	8,000	700	9.6%	7,400	8,000	600	8.1%
Belmont[g]	25,900	28,200	2,300	8.9%	25,800	28,300	2,500	9.7%
Brisbane	3,870	5,480	1,610	41.6%	3,770	4,940	1,170	31.0%
Burlingame	30,300	33,600	3,300	10.9%	30,000	32,300	2,300	7.7%
Colma[h]	1,330	1,620	290	21.8%	1,320	1,870	550	41.7%
Daly City	111,300	118,400	7,100	6.4%	112,000	125,300	13,300	11.9%
East Palo Alto	31,500	38,200	6,700	21.3%	32,200	43,100	10,900	33.9%
Foster City[i]	29,900	33,000	3,100	10.4%	30,100	31,900	1,800	6.0%
Half Moon Bay[j]	24,500	29,800	5,300	21.6%	24,200	27,700	3,500	14.5%
Hillsborough	11,100	11,800	700	6.3%	11,100	11,700	600	5.4%
Menlo Park[k]	36,100	39,100	3,000	8.3%	36,300	41,200	4,900	13.5%
Millbrae	21,400	23,100	1,700	7.9%	21,500	22,600	1,100	5.1%
Pacifica[l]	40,000	44,300	4,300	10.8%	40,200	42,600	2,400	6.0%
Portola Valley[f]	7,300	7,900	600	8.2%	7,100	7,700	600	8.5%
Redwood City[m]	103,100	112,600	9,500	9.2%	102,100	119,500	17,400	17.0%
San Bruno	41,200	44,700	3,500	8.5%	40,800	47,900	7,100	17.4%
San Carlos[n]	29,600	31,200	1,600	5.4%	29,800	33,300	3,500	11.7%
San Mateo[n]	101,900	113,100	11,200	11.0%	102,100	117,100	15,000	14.7%
South San Francisco[o]	62,800	68,700	5,900	9.4%	62,500	72,600	10,100	16.2%
Woodside[f]	6,600	7,200	600	9.1%	6,700	7,100	400	6.0%
Total Wholesale Customers	1,682,800	1,877,800	195,000	11.6%	1,680,790	1,940,010	259,220	15.4%
San Francisco	798,600	815,200	16,600	2.1%	798,600	889,800	91,200	11.4%
Total Area Served	2,481,400	2,693,000	211,600	8.5%	2,479,390	2,829,810	350,420	14.1%

a No separate projections for Guadalupe MID (part of Brisbane), Skyline County Water District (serves part of Woodside), Westborough Water District (serves part of South San Francisco), Stanford University (included by ABAG in the projections for Palo Alto), or San Jose (serves only a small portion of the city). Totals differ slightly from those shown in Table E.3.15 because the ABAG jurisdictions for which employment projections are reported in this table differ in geography from the water customer areas (see Tables E.3.A.1 and E.3.A.2).
b Fremont, Newark, and Union City are served by the Alameda County Water District.
c Los Altos Hills is served by the Purissima Hills Water District.
d Palo Alto projections include Stanford University
e This footnote deleted.
f Atherton, Portola Valley, and part of Woodside are served by CWS - Bear Gulch District. All of Portola Valley (including the portion previously served by Los Trancos County Water District, which is now a part of CWS) and Woodside are included in these projections.
g Belmont is served by the Mid-Peninsula Water District, which also serves parts of San Carlos.
h Colma is served by CWS - South San Francisco District
i Foster City is served by Estero MID, which also serves a portion of San Mateo. The projections for San Mateo are included in the projections for CWS - Mid-Peninsula District.
j Half Moon Bay and the adjacent unincorporated area (included in these figures) are served by the Coastside County Water District.
k The City of Menlo Park Water Agency serves only a portion of the City of Menlo Park (less than half of the city's population). These figures are for the entire city.
l Pacifica is served by the North Coast County Water District.
m Redwood City Water Agency also serves portions of San Carlos and Woodside.
n Parts of San Carlos and San Mateo are served by CWS - Mid Peninsula District. Both cities are included here in their entirety.
o South San Francisco is served by CWS - South San Francisco District + Westborough Water District.

SOURCE: ABAG, 2001; ABAG, 2002.

TABLE E.3.17
ABAG *PROJECTIONS 2002* AND *PROJECTIONS 2003*: TOTAL POPULATION IN 2025

***Projections 2003* Forecast is Greater than *Projections 2002* Forecast**			***Projections 2003* Forecast is About the Same as *Projections 2002* Forecast**[a]			***Projections 2003* Forecast is Less than *Projections 2002* Forecast**		
Jurisdiction	**Population in 2025**[b]	**Proj. 2002 Pop. as % of Proj. 2003 Pop.**	**Jurisdiction**	**Population in 2025**[b]	**Proj. 2002 Pop. as % of Proj. 2003 Pop.**	**Jurisdiction**	**Population in 2025**[b]	**Proj. 2002 Pop. as % of Proj. 2003 Pop.**
Alameda County								
Union City	91,100	93.0%	Fremont	245,500	95.0%			
			Hayward	164,200	98.2%			
			Newark	51,700	103.3%			
Santa Clara County[c]								
Mountain View	85,700	94.4%	Sunnyvale	157,400	95.8%			
			Milpitas	89,300	96.6%			
			Palo Alto	85,100	97.3%			
			Santa Clara	133,100	100.7%			
			Los Altos Hills	10,200	102.9%			
San Mateo County								
Colma	1,870	86.6%	San Mateo	117,100	96.6%	Half Moon Bay	27,700	107.6%
East Palo Alto	43,100	88.6%	Belmont	28,300	99.6%			
San Bruno	47,900	93.3%	Atherton	8,000	100.0%	Brisbane	4,940	110.9%
San Carlos	33,300	93.7%	Hillsborough	11,700	100.9%			
Redwood City	119,500	94.2%	Woodside	7,100	101.4%			
Daly City	125,300	94.5%	Millbrae	22,600	102.2%			
South San Francisco	72,600	94.6%	Portola Valley	7,700	102.6%			
Menlo Park	41,200	94.9%	Foster City	31,900	103.4%			
			Pacifica	42,600	104.0%			
			Burlingame	32,300	104.0%			
San Francisco County								
San Francisco	889,800	91.6%						

[a] Population in 2025 in *Projections 2003* is within five percent of the population in 2025 in *Projections 2002*.
[b] Population in 2025 forecast in *Projections 2003*.
[c] Stanford University is included within the City of Palo Alto in the ABAG projections. Only a small portion of the City of San Jose is within the district that obtains water from the SFPUC. It is considered misleading to include figures for all of San Jose in this analysis.
[d] Half Moon Bay plus Half Moon Bay (unincorporated).

SOURCES: ABAG, 2001; ABAG, 2002.

Growth Expected by *Projections 2003* and *Projections 2005*

Projected Growth in the San Francisco Bay Area

ABAG's current set of projections, *Projections 2005*, continues to assume that Bay Area growth will begin to reflect "smart growth" principles beginning in about 2010. Accordingly, *Projections 2005* relies on the same assumptions about increased housing production introduced in *Projections 2003*. *Projections 2005* differs from *Projections 2003*, however, in that it readjusts employment and population estimates for 2005 to reflect improved information about the number of jobs lost in the dot com bust of the early part of this decade and improved estimates of the 2005 population.

TABLE E.3.18
ABAG *PROJECTIONS 2002* AND *PROJECTIONS 2003*: CHANGE IN POPULATION, 2005-2025

***Projections 2003* Forecast is Greater than *Projections 2002* Forecast**			***Projections 2003* Forecast is About the Same as *Projections 2002* Forecast[a]**			***Projections 2003* Forecast is Less than *Projections 2002* Forecast**		
Jurisdiction	**Change in Population, 2005-2025[b]**	**Proj. 2002 Change in Pop. as % of Proj. 2003 Change in Pop.**	**Jurisdiction**	**Change in Population, 2005-2025[b]**	**Proj. 2002 Change in Pop. as % of Proj. 2003 Change in Pop.**	**Jurisdiction**	**Change in Population, 2005-2025[b]**	**Proj. 2002 Change in Pop. as % of Proj. 2003 Change in Pop.**
Alameda County								
Fremont	30,900	60.2%				Newark	6,400	125.0%
Union City	17,500	61.7%						
Hayward	16,600	74.7%						
Santa Clara County[c]								
Mountain View	12,500	60.8%	Santa Clara	24,500	103.7%	Los Altos Hills	400	125.0%
Palo Alto	10,600	66.0%						
Sunnyvale	19,500	70.8%						
Milpitas	20,600	86.9%						
San Mateo County								
San Carlos	3,500	45.7%	Portola Valley	600	100.0%	Atherton	600	116.7%
San Bruno	7,100	49.3%				Hillsborough	600	116.7%
Colma	550	52.7%				Brisbane	1,170	137.6%
Daly City	13,300	53.4%				Burlingame	2,300	143.5%
Redwood City	17,400	54.6%				Woodside	400	150.0%
South San Francisco	10,100	58.4%				Half Moon Bay[d]	3,500	151.4%
Menlo Park	4,900	61.2%				Millbrae	1,100	154.5%
East Palo Alto	10,900	61.5%				Foster City	1,800	172.2%
San Mateo	15,000	74.7%				Pacifica	2,400	179.2%
Belmont	2,500	92.0%						
San Francisco County								
San Francisco	91,200	18.2%						

[a] Population added between 2005 and 2025 in *Projections 2003* is within five percent of the population added between 2005 and 2025 in *Projections 2002*.
[b] Population added between 2005 and 2025 in *Projections 2003*.
[c] Stanford University is included within the City of Palo Alto in the ABAG projections. Only a small portion of the City of San Jose is within the district that obtains water from the SFPUC. It is considered misleading to include figures for all of San Jose in this analysis.
[d] Half Moon Bay plus Half Moon Bay (unincorporated).

SOURCES: ABAG, 2001; ABAG, 2002.

Table E.3.19 compares estimates of employment in 2005, and projections of employment in 2025, from *Projections 2003* and *Projections 2005* for the nine-county Bay Area. This comparison shows a reduction in the estimate of total jobs in 2005 from about 3.8 million to about 3.5 million, an adjustment of nine percent. *Projections 2005* forecasts nearly 4.8 million jobs in 2025, down from the 5.0 million anticipated by *Projections 2003*. This future total reflects an expectation of stronger employment growth (more new jobs), but even the addition of 12 percent more jobs than were anticipated in *Projections 2003* is not sufficient to achieve the same number of jobs anticipated by that set of forecasts, given the smaller employment base estimated for 2005 in *Projections 2005*.

TABLE E.3.19
ABAG *PROJECTIONS 2003* AND *PROJECTIONS 2005*:
EMPLOYMENT PROJECTIONS FOR THE NINE-COUNTY BAY AREA

Source of Projection	Jobs in 2005	Jobs in 2025	Jobs in 2030	New Jobs, 2005-2025	New Jobs, 2005-2030
Projections 2003	3,848,870	4,982,800	5,226,400	1,133,930	1,377,530
Projections 2005	3,516,960	4,788,330	5,120,600	1,271,370	1,603,640
% change	-9%	-4%	-2%	12%	16%

SOURCES: ABAG, 2001; ABAG, 2002

Because both *Projections 2003* and *Projections 2005* extend the forecasts through 2030, that year is also included in this table. By 2030, *Projections 2005* anticipates that total employment in the nine-county Bay Area will reach 5.1 million jobs, which is within 2 percent of the *Projections 2003* forecast of 5.2 million. This total reflects the expected addition of 1.6 million new jobs during the 25-year interval from 2005, or about 16 percent more than the 1.4 million anticipated in *Projections 2003*.

Table E.3.20 provides the same comparison for population. It shows that the two sets of ABAG forecasts – *Projections 2003* and *Projections 2005* – maintain similar estimates of population in the nine Bay Area counties in 2005, and similar projections of population in the nine-county area in 2025. The projections for 2025 (8.42 million in *Projections 2005*; 8.46 million in *Projections 2003*) are within 0.5 percent of each other.

TABLE E.3.20
ABAG *PROJECTIONS 2003* AND *PROJECTIONS 2005*:
POPULATION PROJECTIONS FOR THE NINE-COUNTY BAY AREA

Source of Projection	Population in 2005	Population in 2025	Population in 2030	Added Population, 2005-2025	Added Population, 2005-2030
Projections 2003	7,193,900	8,457,800	8,780,300	1,263,900	1,586,400
Projections 2005	7,091,700	8,419,100	8,747,100	1,327,400	1,655,400
% Change	-1%	0%	0%	5%	4%

SOURCES: ABAG, 2002; ABAG, 2004.

By 2030, both sets of projections anticipate that the population of the Bay Area will exceed 8.7 million, or about 1.6 million more than in 2005. The projections for that year are also within 0.5 percent of each other.

Projected Growth in the Four Water System Counties

Table E.3.21 focuses the comparison of employment anticipated in *Projections 2003* and *Projection 2005* on the four counties in which the SFPUC system provides water. (The four counties are considered here in their entirety; the following subsection considers the portion of the four-county area within the service area of the SFPUC and its wholesale customers.) This comparison indicates a downward adjustment of the job base in 2005 by about 345,000 jobs, or 12 percent (compared to a downward adjustment of 332,000, or 9 percent, for the nine-county area). This adjustment provides further indication that most of the Bay Area job losses early in this decade were in these four counties.

TABLE E.3.21
ABAG *PROJECTIONS 2003* AND *PROJECTIONS 2005*:
EMPLOYMENT PROJECTIONS FOR THE FOCUSED FOUR-COUNTY AREA

Source of Projection	Jobs in 2005	Jobs in 2025	Jobs in 2030	New Jobs, 2005-2025	New Jobs, 2005-2030
Projections 2003	2,908,370	3,739,920	3,911,320	831,550	1,002,950
Projections 2005	2,563,600	3,516,890	3,765,020	953,290	1,201,420
% Change	-12%	-6%	-4%	15%	20%

SOURCES: ABAG, 2002; ABAG, 2004.

Table E.3.21 shows that *Projections 2005* anticipates that the four-county area will gain more employment between 2005 and 2025, and between 2005 and 2030, than did *Projections 2003*. The total numbers of jobs projected in 2025 and 2030 are, however, smaller in *Projections 2005*, as the expected growth in employment is insufficient to compensate for the reduction in 2005 employment (based on more recent, and, presumably, more accurate, information about current employment) incorporated into the forecasts.

Table E.3.22 provides the comparison *of Projections 2003* and *Projections 2005* in the four counties for population projections. This table also shows a small downward adjustment in the estimate for 2005 compared to *Projections 2003*; however, this adjustment is minor (about one percent of total population in the four-county area). *Projections 2005* anticipates more population growth in the four-county area than does *Projections 2003*, and a similar total population projected in the horizon years of 2025 and 2030 (within 0.5 percent of the total forecast in *Projections 2003*).

Projected Growth in the Area Served by SFPUC Water Customers

Employment Growth

Employment growth anticipated in the area served by SFPUC water customers by *Projections 2003* and *Projections 2005* is compared in **Table E.3.23**. This table shows that employment growth in three of the four counties is expected to follow the pattern observed in the nine-county area: *Projections 2005* anticipates greater employment growth between 2005 and 2025, and between 2005 and 2030, than does *Projections 2003*, but, because of the lower estimate of

TABLE E.3.22
ABAG *PROJECTIONS 2003* AND *PROJECTIONS 2005*:
POPULATION PROJECTIONS FOR THE FOCUSED FOUR-COUNTY AREA

Source of Projection	Population in 2005	Population in 2025	Population in 2030	Added Population, 2005-2025	Added Population, 2005-2030
Projections 2003	4,855,400	5,695,800	5,943,500	840,400	1,088,100
Projections 2005	4,788,400	5,681,700	5,924,700	893,300	1,136,300
% Change	-1%	0%	0%	6%	4%

SOURCES: ABAG, 2002; ABAG, 2004.

TABLE E.3.23
ABAG *PROJECTIONS 2003* AND *PROJECTIONS 2005*:
EMPLOYMENT PROJECTIONS FOR THE AREA SERVED BY SFPUC WATER CUSTOMERS (WHOLESALE AND RETAIL)[a]

Area	Source of Projection	Jobs in 2005	Jobs in 2025	Jobs in 2030	Change, 2005-2025		Change, 2005-2030	
					Number	Percent	Number	Percent
Alameda County[a]	Proj 2003	248,720	325,440	341,510	76,720	30.8%	92,790	37.3%
	Proj 2005	212,560	308,120	329,800	95,560	45.0%	117,240	58.2%
Santa Clara County	Proj 2003	499,410	608,030	624,370	108,620	21.7%	124,960	25.0%
	Proj 2005	393,700	512,830	544,610	119,130	30.3%	150,910	38.3%
San Mateo County	Proj 2003	362,460	464,870	483,850	102,410	28.3%	121,390	33.5%
	Proj 2005	309,470	435,600	469,900	126,130	40.8%	160,430	51.8%
Total Wholesale Customers	Proj 2003	1,110,590	1,398,340	1,449,730	287,750	25.9%	339,140	30.5%
	Proj 2005	915,730	1,256,550	1,344,310	340,820	37.2%	428,580	46.8%
San Francisco	Proj 2003	635,480	786,020	815,680	150,540	23.7%	180,200	28.4%
	Proj 2005	575,800	776,100	829,090	200,300	34.8%	253,290	44.0%
Total Customers	Proj 2003	1,746,070	2,184,360	2,265,410	438,290	25.1%	519,340	29.7%
	Proj 2005	1,491,530	2,032,650	2,173,400	541,120	36.3%	681,870	45.7%

[a] Includes only those portions of each county served by SFPUC wholesale water customers or served directly by the SFPUC (San Francisco County).

SOURCES: ABAG, 2002; ABAG, 2004.

employment in 2005, *Projections 2005* forecasts less *total* employment in both horizon years than does *Projections 2003*. In San Francisco, however, *Projections 2005* forecasts stronger employment *growth* through 2030, and this change lifts the *total* employment in that year higher than that projected for San Francisco in *Projections 2003*.

Table E.3.24 provides detail about the employment projections for the ABAG cities that are served by one or more SFPUC water customers. Because of format constraints, the projections for 2025 are omitted; only estimates for 2005 and projections for 2030 are shown.

TABLE E.3.24
ABAG *PROJECTIONS 2003* AND *PROJECTIONS 2005*: EMPLOYMENT PROJECTIONS FOR CITIES WITHIN THE AREA SERVED BY SFPUC WATER CUSTOMERS (WHOLESALE AND RETAIL)[a]

	Projections 2003				Projections 2005			
			Change, 2005-2030				Change, 2005-2030	
ABAG Jurisdiction	**2005**	**2030**	**#**	**%**	**2005**	**2030**	**#**	**%**
Alameda County								
Fremont[b]	115,700	163,690	47,990	41.5%	96,530	160,410	63,880	66.2%
Hayward	92,060	112,560	20,500	22.3%	74,930	100,430	25,500	34.0%
Newark[b]	19,480	23,220	3,740	19.2%	21,180	24,960	3,780	17.8%
Union City[b]	21,480	42,040	20,560	95.7%	19,920	44,000	24,080	120.9%
Santa Clara County								
Milpitas	49,770	70,490	20,720	41.6%	50,980	68,940	17,960	35.2%
Mountain View	82,410	104,750	22,340	27.1%	57,130	81,110	23,980	42.0%
Los Altos Hills[c]	2,720	2,790	70	2.6%	1,650	1,780	130	7.9%
Palo Alto[d]	110,620	121,130	10,510	9.5%	99,350	117,090	17,740	17.9%
Santa Clara	135,140	171,520	36,380	26.9%	110,030	152,670	42,640	38.8%
Sunnyvale	118,750	153,690	34,940	29.4%	74,560	123,020	48,460	65.0%
San Mateo County								
Atherton[f]	3,470	4,570	1,100	31.7%	2,530	3,710	1,180	46.6%
Belmont[g]	14,410	19,860	5,450	37.8%	8,190	14,070	5,880	71.8%
Brisbane	8,130	19,910	11,780	144.9%	8,200	20,420	12,220	149.0%
Burlingame	28,640	33,870	5,230	18.3%	22,850	33,370	10,520	46.0%
Colma[h]	2,530	3,930	1,400	55.3%	3,180	4,570	1,390	43.7%
Daly City	25,230	37,230	12,000	47.6%	17,980	29,830	11,850	65.9%
East Palo Alto	3,450	7,000	3,550	102.9%	2,130	6,110	3,980	186.9%
Foster City[i]	20,330	24,520	4,190	20.6%	14,190	21,110	6,920	48.8%
Half Moon Bay[j]	5,010	5,820	810	16.2%	7,540	8,490	950	12.6%
Hillsborough	1,210	1,280	70	5.8%	1,660	2,030	370	22.3%
Menlo Park[k]	30,310	37,670	7,360	24.3%	28,750	43,700	14,950	52.0%
Millbrae	6,060	8,930	2,870	47.4%	6,860	9,960	3,100	45.2%
Pacifica[l]	4,770	6,280	1,510	31.7%	6,170	7,670	1,500	24.3%
Portola Valley[f]	1,130	1,140	10	0.9%	2,560	2,720	160	6.3%
Redwood City[m]	56,740	71,890	15,150	26.7%	55,040	76,550	21,510	39.1%
San Bruno	16,390	28,400	12,010	73.3%	13,910	28,400	14,490	104.2%
San Carlos[n]	17,430	23,270	5,840	33.5%	16,590	26,930	10,340	62.3%
San Mateo[n]	61,600	81,490	19,890	32.3%	45,700	70,780	25,080	54.9%
South San Francisco[o]	53,570	64,730	11,160	20.8%	42,170	56,080	13,910	33.0%
Woodside[f]	2,050	2,060	10	0.5%	3,270	3,400	130	4.0%
Total Wholesale Customers	**1,110,590**	**1,449,730**	**339,140**	**30.5%**	**915,730**	**1,344,310**	**428,580**	**46.8%**
San Francisco	635,480	815,680	180,200	28.4%	575,800	829,090	253,290	44.0%
Total Area Served	**1,746,070**	**2,265,410**	**519,340**	**29.7%**	**1,491,530**	**2,173,400**	**681,870**	**45.7%**

a No separate projections for Guadalupe MID (part of Brisbane), Skyline County Water District (serves part of Woodside), Westborough Water District (serves part of South San Francisco), Stanford University (included by ABAG in the projections for Palo Alto), or San Jose (serves only a small portion of the city). Totals differ slightly from those shown in Table E.3.23 because the ABAG jurisdictions for which employment projections are reported in this table differ in geography from the water customer areas (see Tables E.3.A.1 and E.3.A.2).
b Fremont, Newark, and Union City are served by the Alameda County Water District.
c Los Altos Hills is served by the Purissima Hills Water District.
d Palo Alto projections include Stanford University
e This footnote deleted.
f Atherton, Portola Valley, and part of Woodside are served by CWS - Bear Gulch District. All of Portola Valley (including the portion previously served by Los Trancos County Water District, which is now a part of CWS) and Woodside are included in these projections.
g Belmont is served by the Mid-Peninsula Water District, which also serves parts of San Carlos.
h Colma is served by CWS - South San Francisco District
i Foster City is served by Estero MID, which also serves a portion of San Mateo. The projections for San Mateo are included in the projections for CWS - Mid-Peninsula District.
j Half Moon Bay and the adjacent unincorporated area (included in these figures) are served by the Coastside County Water District.
k The City of Menlo Park Water Agency serves only a portion of the City of Menlo Park (less than half of the city's population). These figures are for the entire city.
l Pacifica is served by the North Coast County Water District.
m Redwood City Water Agency also serves portions of San Carlos and Woodside.
n Parts of San Carlos and San Mateo are served by CWS - Mid Peninsula District. Both cities are included here in their entirety.
o South San Francisco is served by CWS - South San Francisco District + Westborough Water District.

SOURCES: ABAG, 2002; ABAG, 2004.

Table E.3.25 sorts the individual jurisdictions within the service area (a single water customer may comprise several jurisdictions) according to whether greater employment in 2030 is expected by *Projections 2005* or *Projections 2003*. In this case, 8 of the 31 jurisdictions are expected to have about the same total employment in 2030 (within 5 percent) in both sets of projections, 11 of the jurisdictions are expected by *Projections 2005* to have more employment in 2030, and 12 are expected to have less.

TABLE E.3.25
ABAG *PROJECTIONS 2003* AND *PROJECTIONS 2005*: TOTAL JOBS IN 2030

***Projections 2005* Forecast is Greater than *Projections 2003* Forecast**			***Projections 2005* Forecast is About the Same as *Projections 2003* Forecast[a]**			***Projections 2005* Forecast is Less than *Projections 2003* Forecast**		
Jurisdiction	**Jobs in 2030[b]**	**Proj. 2003 Jobs as % of Proj. 2005 Jobs**	**Jurisdiction**	**Jobs in 2030[b]**	**Proj. 2003 Jobs as % of Proj. 2005 Jobs**	**Jurisdiction**	**Jobs in 2030[b]**	**Proj. 2003 Jobs as % of Proj. 2005 Jobs**
Alameda County								
Newark	24,960	93.0%	Union City	44,000	95.5%	Hayward	100,430	112.1%
			Fremont	160,410	102.0%			
Santa Clara County[c]								
			Milpitas	68,940	102.2%	Santa Clara	152,670	112.3%
			Palo Alto	117,090	103.5%	Sunnyvale	123,020	124.9%
						Mountain View	81,110	129.1%
						Los Altos Hills	1,780	156.7%
San Mateo County								
Portola Valley	2,720	41.9%	Brisbane	20,420	97.5%	East Palo Alto	6,110	114.6%
Half Moon Bay[d]	8,490	45.9%	San Bruno	28,400	100.0%	San Mateo	70,780	115.1%
Woodside	3,400	60.6%						
Hillsborough	2,030	63.1%	Burlingame	33,370	101.5%	South San Francisco	56,080	115.4%
Pacifica	7,670	81.9%				Foster City	21,110	116.2%
						Atherton	3,710	123.2%
Colma	4,570	86.0%				Daly City	29,830	124.8%
Menlo Park	43,700	86.2%				Belmont	14,070	141.2%
San Carlos	26,930	86.4%						
Millbrae	9,960	89.7%						
Redwood City	76,550	93.9%						
San Francisco County								
			San Francisco	829,090	98.4%			

a Number of jobs in 2030 in *Projections 2005* is within five percent of the number of jobs in 2030 in *Projections 2003*.
b Number of jobs in 2030 forecast in *Projections 2005*.
c Stanford University is included within the City of Palo Alto in the ABAG projections. Only a small portion of the City of San Jose is within the district that obtains water from the SFPUC. It is considered misleading to include figures for all of San Jose in this analysis.
d Half Moon Bay plus Half Moon Bay (unincorporated).

SOURCES: ABAG, 2002; ABAG, 2004.

For comparison, as shown in Table E.3.13, *Projections 2003* expected 16 jurisdictions to have about the same employment in 2025 as did *Projections 2002*; 8 were expected to have more, and 7 were expected to have less. This comparison with the previous projections suggests that, although employment estimates for 2005 have again been readjusted downward in *Projections 2005*, expectations of future employment growth are now stronger than they were previously.

Table E.3.26 sorts the individual jurisdictions within the service area according to whether greater *increases* in employment between 2005 and 2030 are expected by *Projections 2005* or *Projections 2003*. Supporting the conclusions of the preceding paragraph, this table shows that *Projections 2005* forecasts greater employment growth than does *Projections 2003* for 25 of the 31 areas, about the same amount of growth for 5 areas, and less growth for only 1 area.

TABLE E.3.26
ABAG *PROJECTIONS 2003* AND *PROJECTIONS 2005*: CHANGE IN NUMBER OF JOBS, 2005-2030

***Projections 2005* Forecast is Greater than *Projections 2003* Forecast**			***Projections 2005* Forecast is About the Same as *Projections 2003* Forecast**[a]			***Projections 2005* Forecast is Less than *Projections 2003* Forecast**		
Jurisdiction	**Change in Jobs, 2005-2030**[b]	**Proj. 2003 Change in Jobs as % of Proj. 2005 Change in Jobs**	**Jurisdiction**	**Change in Jobs, 2005-2030**[b]	**Proj. 2003 Change in Jobs as % of Proj. 2005 Change in Jobs**	**Jurisdiction**	**Change in Jobs, 2005-2030**[b]	**Proj. 2003 Change in Jobs as % of Proj. 2005 Change in Jobs**
Alameda County								
Fremont	63,880	75.1%	Newark	3,780	98.9%			
Hayward	25,500	80.4%						
Union City	24,080	85.4%						
Santa Clara County[c]								
Los Altos Hills	130	53.8%				Milpitas	17,960	115.4%
Palo Alto	17,740	59.2%						
Sunnyvale	48,460	72.1%						
Santa Clara	42,640	85.3%						
Mountain View	23,980	93.2%						
San Mateo County								
Portola Valley	160	6.3%	Brisbane	12,220	96.4%			
Woodside	130	7.7%	Pacifica	1,500	100.7%			
Hillsborough	370	18.9%	Colma	1,390	100.7%			
Menlo Park	14,950	49.2%	Daly City	11,850	101.3%			
Burlingame	10,520	49.7%						
San Carlos	10,340	56.5%						
Foster City	6,920	60.5%						
Redwood City	21,510	70.4%						
San Mateo	25,080	79.3%						
South San Francisco	13,910	80.2%						
Half Moon Bay[d]	950	85.3%						
San Bruno	14,490	82.9%						
East Palo Alto	3,980	89.2%						
Millbrae	3,100	92.6%						
Belmont	5,880	92.7%						
Atherton	1,180	93.2%						
San Francisco County								
San Francisco	253,290	71.1%						

[a] Number of jobs added between 2005 and 2030 in *Projections 2005* is within five percent of the number of jobs added between 2005 and 2030 in *Projections 2003*.
[b] Number of jobs added between 2005 and 2030 forecast in *Projections 2005*.
[c] Stanford University is included within the City of Palo Alto in the ABAG projections. Only a small portion of the City of San Jose is within the district that obtains water from the SFPUC. It is considered misleading to include figures for all of San Jose in this analysis.
[d] Half Moon Bay plus Half Moon Bay (unincorporated).

SOURCES: ABAG, 2002; ABAG, 2004.

Population Growth

Population growth forecasted in *Projections 2003* and *Projections 2005* for the portion of the four-county area served by SFPUC water is summarized in **Table E.3.27**. This table shows that *Projections 2005* anticipates greater *total* population in three of the counties (Alameda, Santa Clara, and San Francisco) in 2025, and greater population in all four in 2030, than does *Projections 2003*.

TABLE E.3.27
ABAG *PROJECTIONS 2003* AND *PROJECTIONS 2005*:
POPULATION PROJECTIONS FOR THE AREA SERVED BY SFPUC WATER CUSTOMERS (WHOLESALE AND RETAIL)[a]

Area	Source of Projection	Population in 2005	Population in 2025	Population in 2030	Change, 2005-2025		Change, 2005-2030	
					Number	Percent	Number	Percent
Alameda County	Proj 2003	481,100	552,500	575,700	71,400	14.8%	94,600	19.7%
	Proj 2005	473,900	552,700	576,200	78,800	16.6%	102,300	21.6%
Santa Clara County	Proj 2003	472,700	560,800	579,200	88,100	18.6%	106,500	22.5%
	Proj 2005	463,100	561,700	585,100	98,600	21.3%	122,000	26.3%
San Mateo County	Proj 2003	726,990	826,710	838,230	99,720	13.7%	111,240	15.3%
	Proj 2005	716,100	818,800	840,900	102,700	14.3%	124,800	17.4%
Total Wholesale Customers	Proj 2003	1,680,790	1,940,010	1,993,130	259,220	15.4%	312,340	18.6%
	Proj 2005	1,653,100	1,933,200	2,002,200	280,100	16.9%	349,100	21.1%
San Francisco	Proj 2003	798,600	889,800	935,100	91,200	11.4%	136,500	17.1%
	Proj 2005	798,000	890,400	924,600	92,400	11.6%	126,600	15.9%
Total Customers	Proj 2003	2,479,390	2,829,810	2,928,230	350,420	14.1%	448,840	18.1%
	Proj 2005	2,451,100	2,823,600	2,926,800	372,500	15.2%	475,700	19.4%

[a] Includes only those portions of each county served by SFPUC wholesale water customers or served directly by the SFPUC (San Francisco County).

SOURCES: ABAG, 2002, ABAG, 2004.

The table also shows that *Projections 2005* forecasts greater population *growth* in every county than does *Projection 2003*, during the 20-year period from 2005 through 2025, and greater *growth* in three of the four counties (excluding San Francisco) during the 25-year period from 2005 through 2030.

Table E.3.28 provides detail about the population projections for the ABAG cities that are served by one or more SFPUC water customers. Because of format constraints, the projections for 2025 are omitted; only estimates for 2005 and projections for 2030 are shown.

Table E.3.29 sorts the jurisdictions according to whether *Projections 2005* anticipates greater total population in 2030 than does *Projections 2003*. This table shows that, in most jurisdictions (28 of the 31), the projections are about the same. *Projections 2005* expects one jurisdiction (Millbrae) to have more residents in 2030, and two (Half Moon Bay and Colma) to have fewer.

TABLE E.3.28
ABAG *PROJECTIONS 2003* AND *PROJECTIONS 2005*:
POPULATION PROJECTIONS FOR CITIES WITHIN THE AREA SERVED BY SFPUC WATER CUSTOMERS (WHOLESALE AND RETAIL)[a]

	Projections 2003				Projections 2005			
			Change, 2005-2030				Change, 2005-2030	
ABAG Jurisdiction	**2005**	**2030**	**#**	**%**	**2005**	**2030**	**#**	**%**
Alameda County								
Fremont[b]	214,600	257,100	42,500	19.8%	211,100	257,200	46,100	21.8%
Hayward[d]	147,600	169,800	22,200	15.0%	147,000	171,500	24,500	16.7%
Newark[b]	45,300	53,500	8,200	18.1%	44,400	53,400	9,000	20.3%
Union City[b]	73,600	95,300	21,700	29.5%	71,400	94,100	22,700	31.8%
Santa Clara County								
Milpitas	68,700	91,500	22,800	33.2%	65,500	91,400	25,900	39.5%
Mountain View	73,200	87,700	14,500	19.8%	72,000	89,600	17,600	24.4%
Los Altos Hills[c]	9,800	10,300	500	5.1%	9,900	10,700	800	8.1%
Palo Alto[d]	74,500	89,000	14,500	19.5%	74,000	92,200	18,200	24.6%
Santa Clara	108,600	138,700	30,100	27.7%	108,700	142,100	33,400	30.7%
Sunnyvale	137,900	162,000	24,100	17.5%	133,000	159,100	26,100	19.6%
San Mateo County								
Atherton[f]	7,400	8,100	700	9.5%	7,300	8,200	900	12.3%
Belmont[g]	25,800	28,900	3,100	12.0%	25,500	28,800	3,300	12.9%
Brisbane	3,770	5,390	1,620	43.0%	3,750	5,240	1,490	39.7%
Burlingame	30,000	32,500	2,500	8.3%	29,400	31,900	2,500	8.5%
Colma[h]	1,320	2,040	720	54.5%	1,350	1,860	510	37.8%
Daly City	112,000	126,900	14,900	13.3%	109,400	127,200	17,800	16.3%
East Palo Alto	32,200	44,600	12,400	38.5%	32,700	43,600	10,900	33.3%
Foster City[i]	30,100	32,100	2,000	6.6%	29,800	32,500	2,700	9.1%
Half Moon Bay[j]	24,200	28,000	3,800	15.7%	23,900	27,100	3,200	13.4%
Hillsborough	11,100	11,900	800	7.2%	11,000	11,800	800	7.3%
Menlo Park[k]	36,300	41,800	5,500	15.2%	35,300	41,100	5,800	16.4%
Millbrae	21,500	22,700	1,200	5.6%	21,200	24,500	3,300	15.6%
Pacifica[l]	40,200	42,900	2,700	6.7%	38,600	42,200	3,600	9.3%
Portola Valley[f]	7,100	7,800	700	9.9%	7,100	7,800	700	9.9%
Redwood City[m]	102,100	121,400	19,300	18.9%	101,700	122,300	20,600	20.3%
San Bruno	40,800	48,500	7,700	18.9%	41,700	50,700	9,000	21.6%
San Carlos[n]	29,800	34,100	4,300	14.4%	29,300	35,200	5,900	20.1%
San Mateo[n]	102,100	118,000	15,900	15.6%	99,300	119,800	20,500	20.6%
South San Francisco[o]	62,500	73,400	10,900	17.4%	61,200	71,800	10,600	17.3%
Woodside[f]	6,700	7,200	500	7.5%	6,600	7,300	700	10.6%
Total Wholesale Customers	**1,680,790**	**1,993,130**	**312,340**	**18.6%**	**1,653,100**	**2,002,200**	**349,100**	**21.1%**
San Francisco	798,600	935,100	136,500	17.1%	798,000	924,600	126,600	15.9%
Total Area Served	**2,479,390**	**2,928,230**	**448,840**	**18.1%**	**2,451,100**	**2,926,800**	**475,700**	**19.4%**

a No separate projections for Guadalupe MID (part of Brisbane), Skyline County Water District (serves part of Woodside), Westborough Water District (serves part of South San Francisco), Stanford University (included by ABAG in the projections for Palo Alto), or San Jose (serves only a small portion of the city). Totals differ slightly from those shown in Table E.3.27 because the ABAG jurisdictions for which employment projections are reported in this table differ in geography from the water customer areas (see Tables E.3.A.1 and E.3.A.2).
b Fremont, Newark, and Union City are served by the Alameda County Water District.
c Los Altos Hills is served by the Purissima Hills Water District.
d Palo Alto projections include Stanford University
e This footnote deleted.
f Atherton, Portola Valley, and part of Woodside are served by CWS - Bear Gulch District. All of Portola Valley (including the portion previously served by Los Trancos County Water District, which is now a part of CWS) and Woodside are included in these projections.
g Belmont is served by the Mid-Peninsula Water District, which also serves parts of San Carlos.
h Colma is served by CWS - South San Francisco District
i Foster City is served by Estero MID, which also serves a portion of San Mateo. The projections for San Mateo are included in the projections for CWS - Mid-Peninsula District.
j Half Moon Bay and the adjacent unincorporated area (included in these figures) are served by the Coastside County Water District.
k The City of Menlo Park Water Agency serves only a portion of the City of Menlo Park (less than half of the city's population). These figures are for the entire city.
l Pacifica is served by the North Coast County Water District.
m Redwood City Water Agency also serves portions of San Carlos and Woodside.
n Parts of San Carlos and San Mateo are served by CWS - Mid Peninsula District. Both cities are included here in their entirety.
o South San Francisco is served by CWS - South San Francisco District + Westborough Water District.

SOURCES: ABAG, 2002; ABAG, 2004.

TABLE E.3.29
ABAG *PROJECTIONS 2003* AND *PROJECTIONS 2005*: TOTAL POPULATION IN 2030

***Projections 2005* Forecast is Greater than *Projections 2003* Forecast**			***Projections 2005* Forecast is About the Same as *Projections 2003* Forecast[a]**			***Projections 2005* Forecast is Less than *Projections 2003* Forecast**		
Jurisdiction	**Population in 2030[b]**	**Proj. 2003 Pop. as % of Proj. 2005 Pop.**	**Jurisdiction**	**Population in 2030[b]**	**Proj. 2003 Pop. as % of Proj. 2005 Pop.**	**Jurisdiction**	**Population in 2030[b]**	**Proj. 2003 Pop. as % of Proj. 2005 Pop.**
Alameda County								
			Hayward	171,500	99.0%			
			Fremont	257,200	100.0%			
			Newark	53,400	100.2%			
			Union City	94,100	101.3%			
Santa Clara County[c]								
			Los Altos Hills	10,700	96.3%			
			Palo Alto	92,200	96.5%			
			Santa Clara	142,100	97.6%			
			Mountain View	89,600	97.9%			
			Milpitas	91,400	100.1%			
			Sunnyvale	159,100	101.8%			
San Mateo County								
Millbrae	24,500	92.7%	San Bruno	50,700	95.7%	Half Moon Bay[d]	27,100	103.3%
			San Carlos	35,200	96.9%	Colma	1,860	109.7%
			San Mateo	119,800	98.5%			
			Woodside	7,300	98.6%			
			Foster City	32,500	98.8%			
			Atherton	8,200	98.8%			
			Redwood City	122,300	99.3%			
			Daly City	127,200	99.8%			
			Portola Valley	7,800	100.0%			
			Belmont	28,800	100.3%			
			Hillsborough	11,800	100.8%			
			Pacifica	42,200	101.7%			
			Menlo Park	41,100	101.7%			
			Burlingame	31,900	101.9%			
			South San Francisco	71,800	102.2%			
			East Palo Alto	43,600	102.3%			
			Brisbane	5,240	102.9%			
San Francisco County								
			San Francisco	924,600	101.1%			

a Population in 2030 in *Projections 2005* is within five percent of the population in 2030 in *Projections 2003*.
b Population in 2030 forecast in *Projections 2005*.
c Stanford University is included within the City of Palo Alto in the ABAG projections. Only a small portion of the City of San Jose is within the district that obtains water from the SFPUC. It is considered misleading to include figures for all of San Jose in this analysis.
d Half Moon Bay plus Half Moon Bay (unincorporated).

SOURCES: ABAG, 2002; ABAG, 2004.

Table E.3.30 sorts the jurisdictions according to whether *Projections 2005* anticipates more population growth between 2005 and 2030 than does *Projections 2003*. As shown, 5 jurisdictions are expected to gain about the same number of new residents (within 5 percent), 21 are expected to gain more, and 5 are expected to gain fewer new residents, according to *Projections 2005*.

TABLE E.3.30
ABAG *PROJECTIONS 2003* AND *PROJECTIONS 2005*:
CHANGE IN POPULATION, 2005-2030

***Projections 2005* Forecast is Greater than *Projections 2003* Forecast**			***Projections 2005* Forecast is About the Same as *Projections 2003* Forecast[a]**			***Projections 2005* Forecast is Less than *Projections 2003* Forecast**		
Jurisdiction	**Change in Population, 2005-2030[b]**	**Proj. 2003 Change in Pop. as % of Proj. 2005 Change in Pop.**	**Jurisdiction**	**Change in Population, 2005-2030[b]**	**Proj. 2003 Change in Pop. as % of Proj. 2005 Change in Pop.**	**Jurisdiction**	**Change in Population, 2005-2030[b]**	**Proj. 2003 Change in Pop. as % of Proj. 2005 Change in Pop.**
Alameda County								
Hayward	24,500	90.6%	Union City	22,700	95.6%			
Newark	9,000	91.1%						
Fremont	46,100	92.2%						
Santa Clara County[c]								
Los Altos Hills	800	62.5%						
Palo Alto	18,200	79.7%						
Mountain View	17,600	82.4%						
Milpitas	25,900	88.0%						
Santa Clara	33,400	90.1%						
Sunnyvale	26,100	92.3%						
San Mateo County								
Millbrae	3,300	36.4%	Burlingame	2,500	100.0%	Brisbane	1,490	108.7%
Woodside	700	71.4%	Portola Valley	700	100.0%	East Palo Alto	10,900	113.8%
San Carlos	5,900	72.9%	Hillsborough	800	100.0%	Half Moon Bay[d]	3,200	118.8%
Foster City	2,700	74.1%	South San Francisco	10,600	102.8%			
Pacifica	3,600	75.0%				Colma	510	141.2%
San Mateo	20,500	77.6%						
Atherton	900	77.8%						
Daly City	17,800	83.7%						
San Bruno	9,000	85.6%						
Redwood City	20,600	93.7%						
Belmont	3,300	93.9%						
Menlo Park	5,800	94.8%						
San Francisco County								
						San Francisco	126,600	107.8%

[a] Population added between 2005 and 2030 in *Projections 2005* is within five percent of the population added between 2005 and 2030 in *Projections 2003*.
[b] Population added between 2005 and 2030 in *Projections 2005*.
[c] Stanford University is included within the City of Palo Alto in the ABAG projections. Only a small portion of the City of San Jose is within the district that obtains water from the SFPUC. It is considered misleading to include figures for all of San Jose in this analysis.
[d] Half Moon Bay plus Half Moon Bay (unincorporated).

SOURCES: ABAG, 2002; ABAG, 2004.

Conclusions about ABAG Growth Projections

The evolution of ABAG forecasts of employment and population growth in the Bay Area paints a picture of changed expectations of growth in the nine-county Bay Area, the four-county area in which SFPUC water customers are located, and the area served by SFPUC water customers, in generally consistent ways.

- Expectations of future *total* employment increased between *Projections 2002* and *Projections 2003*, and then decreased between *Projections 2003* and *Projections 2005*.

  The reduction shown in *Projections 2005* results primarily from ongoing adjustments to the estimate of employment in 2005. Projections of *growth* between 2005 and 2025, and between 2005 and 2030, have been increased in successive sets of forecasts, but these increases do not completely offset the cumulative reductions in beginning year (2005) employment that have been made as the impacts of the dot com bust in the early part of this decade have become clearer; as a result, *total* employment expected at the end of the forecast period is lower in the later projections.

  The successive sets of projections show that *Projections 2003* anticipated greater employment in 2025 than *Projections 2002*, but *Projections 2005* anticipate less employment in 2025 than either *Projections 2002* or *Projections 2003*, and less employment in 2030 than *Projections 2003* in all of the geographic areas considered. This summary comparison is shown in **Table E.3.31**.

TABLE E.3.31
ABAG PROJECTIONS OF EMPLOYMENT IN 2025: SUMMARY COMPARISON

Area	Year	*Projections 2002*	*Projections 2003*	*Projections 2005*
Nine-County Bay Area	2025	4,932,590	4,982,800	4,788,330
	2030		5,226,400	5,120,600
Four-County Area	2025	3,682,510	3,739,920	3,516,890
	2030		3,911,320	3,765,020
SFPUC Water Customers	2025	2,169,600	2,184,360	2,032,650
	2030		2,265,410	2,173,400

SOURCES: Tables E.3.7, E.3.9, E.3.11, E.3.19, E.3.21, E.3.23.

- Expectations of future population increased between *Projections 2002* and *Projections 2003*, and then decreased slightly between *Projections 2003* and *Projections 2005*. The future population anticipated by *Projections 2005* is, however, greater than the population anticipated by *Projections 2002*.

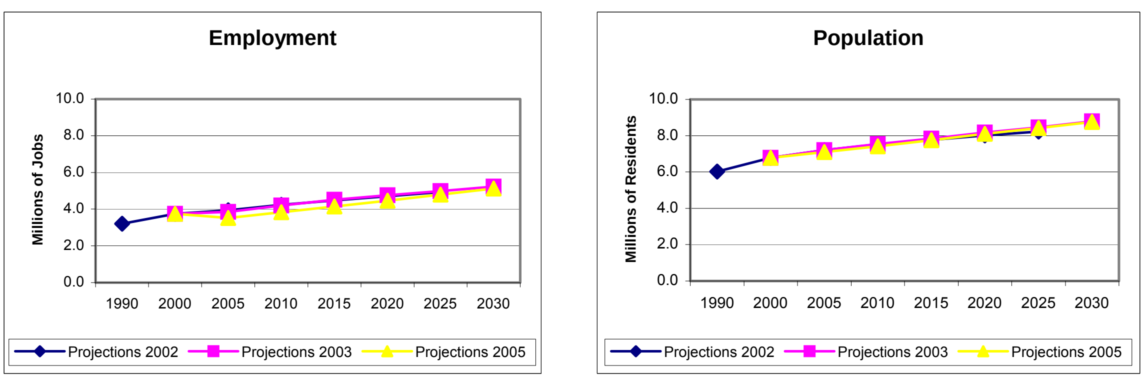
  The increases result primarily from the smart growth assumptions that were initiated with *Projections 2003*. These assumptions *rearrange* population growth (but not employment growth) within the Bay Area, compared to assumed population growth trends in previous projections sets, locating it generally in urban areas that have transit stations and/or transit corridors, and *add* growth based on the assumption that barriers to infill development will be removed and increasing government assistance for housing production will be provided (ABAG 2002). The summary of population comparisons is shown in **Table E.3.32**.

TABLE E.3.32
ABAG PROJECTIONS OF POPULATION IN 2025: SUMMARY COMPARISON

Area	Year	*Projections 2002*	*Projections 2003*	*Projections 2005*
Nine-County Bay Area	2025	8,223,740	8,457,800	8,419,100
	2030		8,780,300	8,747,100
Four-County Area	2025	5,406,900	5,695,800	5,681,700
	2030		5,943,500	5,924,700
SFPUC Water Customers	2025	2,693,000	2,829,810	2,823,600
	2030		2,928,230	2,926,800

SOURCES: Tables E.3.8, E.3.10, E.3.17, E.3.20, E.3.22, E.3.28.

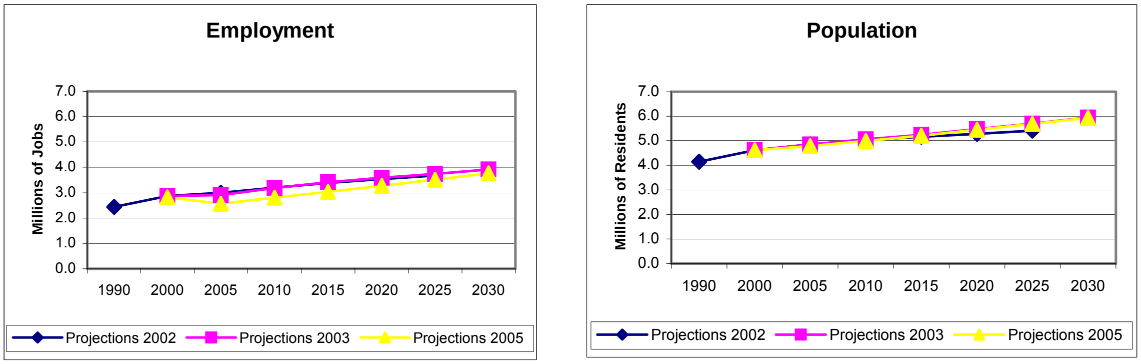
Figures E.3.1 and **E.3.2** provide a summary comparison of the thee projections sets for the nine-county bay area and the four counties that are partially served by the SFPUC and its wholesale customers. The figures illustrate that, notwithstanding the changes incorporated into *Projections 2003* and *Projections 2005*, the three sets of projections are similar both for the nine-county Bay Area (Figure E.3.1) and for the four-county area that is partially served by SFPUC water[6] (Figure E.3.2). The employment graphs reflect the lower estimates of 2005 employment presented in *Projections 2003* and *Projections 2005*, and the more rapid growth expected between 2005 and 2030 that would make up for most of the job losses in the early part of this decade.



SFPUC Water System Improvement Program ▪ 203287

Figure E.3.1
ABAG Projections of Employment and Population in the Nine-County Bay Area

6 SFPUC water serves all of San Francisco County and portions of Alameda, Santa Clara, and San Mateo Counties.



SFPUC Water System Improvement Program ▪ 203287

Figure E.3.2
ABAG Projections of Employment and Population in the Four County Area (Partially) Served by SFPUC Water

Other Growth Projections

The ABAG projections reviewed above are the only comprehensive set of employment and population projections that cover the area served by SFPUC water. There are, however, other planning documents that include projections of population and/or jobs, and these documents provide additional context for considering the San Francisco and wholesale customer demand projections. Most of the SFPUC wholesale customers, or the cities they represent, have adopted urban water management plans, which include projections to 2030. Cities and counties served by SFPUC water have general plans that typically include projections of employment and population, and these projections provide indications of whether the demand forecasts are consistent with or more ambitious than the adopted planning policies. **Table E.3.33** compares projections of employment from these local sources to employment anticipated by ABAG's *Projections 2005*.

For each source, the table shows the expected employment in the most distant year for which the general plan has a forecast. In some cases, the projections from different sources are similar; in others, they diverge. Reasons for differences between sources may include:

- Age of the projection source. *Projections 2005* was prepared during 2004. Some of the general plans were prepared 10 or more years ago. The water customers updated their urban water management plans in 2005. Some of the UWMPs utilize more recent ABAG projections than were available when the water demand studies were undertaken.

- Methodology. Some local projections may be based more on the development capacity of the land available for development (e.g., as designated in the general plan) than on demand factors such as economic growth and comparative advantage of a location in the community.

- Area covered. General plans typically cover a city's "planning area," which may be larger than its corporate limits or sphere of influence in cases where there is unincorporated land adjacent to the city limits. Because UWMPs are produced by the water customers for their service areas,

TABLE E.3.33
COMPARISON OF GENERAL PLAN EMPLOYMENT PROJECTIONS TO ABAG *PROJECTIONS 2005*, UWMPS, AND WATER CUSTOMER DEMAND PROJECTIONS FOR GENERAL PLAN PROJECTION YEAR

	Employment in General Plan Employment Year[a] Shown in:			
	General Plan[b]	UWMP	SFPUC Water Customer Projection[c]	*Projections 2005*
Cities with GP Employment Projections for 2010				
East Palo Alto	5,940	see note d	8,673	6,110
Foster City	18,760	see note d	see note e	15,560
Menlo Park	17,900	see note d	11,057[f]	31,730
Milpitas	65,200	see note d	60,567	54,340
Mountain View	84,810	see note d	81,848	63,330
Palo Alto	98,500	108,450	108,161	102,190
San Mateo	67,628	see note d	see notes e, g	50,110
Santa Clara	151,280		177,027	152,670
Cities with GP Employment Projections for 2015				
Millbrae	12,006	see note d	7,313	8,190
Cities with GP Employment Projections for 2020				
Atherton	3,840	see note d	see note h	3,380
Colma	2,080	see note d	see note i	4,080
Daly City	34,260	34,000	33,981	29,830
Fremont	130,530	see note d	see note j	96,530
Newark	26,560	see note d	see note j	23,310
San Bruno	19,180		25,770	28,400
San Francisco	745,600	770,500	770,500	776,100
South San Francisco	71,400	see note d	59,466[k]	51,210
Sunnyvale	152,730	see note d	153,959	101,590
Union City	20,710	see note d	see note j	34,900
Cities with GP Employment Projections for 2025				
Hayward	108,830	see note d	109,296	95,430
Hillsborough	1,360		1,323[l]	1,970
Cities with GP Employment Projections for Years Prior to 2005 or No Applicable GP: Projections for 2030				
Belmont			22,221	14,070
Brisbane + Guadalupe Valley MID			25,243	20,420
Burlingame			36,160[m]	33,370
Half Moon Bay			6,795	8,490[n]
Los Altos Hills			see note o	1,780
Pacifica			7,478	7,670
Portola Valley				2,720
Redwood City		69,980	83,678	76,550
San Carlos			see note g	26,930
San Jose			3,353[p]	
Stanford University				n.a.
Woodside				3,400

n.a. = Not available.

[a] Employment shown is for the year of the most distant employment projection available in the general plan or other relevant local document (see note b). For example, employment figures in all columns for cities in the group titled "Cities with GP Employment Projections for 2010" are employment projected for or estimated in 2010.
[b] Employment estimates are from each city's general plan (GP) or the general plan's EIR.
[c] Estimates for years between 2001 and 2030 are derived by Mundie & Associates, based on linear interpolations of the water customers' projections presented in URS 2004.
[d] UWMP does not forecast employment (some, but not all, UWMPs do forecast commercial, industrial, and other types of nonresidential accounts).
[e] Estero MID (Foster City and part of San Mateo) projection for 2010 is 26,652.
[f] Figure shown is for the portion of Menlo Park (less than half of the city's population) served by the SFPUC wholesale customer, the City of Menlo Park water agency.
[g] CWS – Mid-Peninsula District (parts of the cities of San Mateo and San Carlos plus unincorporated areas) projection for 2010 is 86,034.
[h] CWS – Bear Gulch District (Atherton, parts of Menlo Park, Portola Valley, and Woodside, plus unincorporated areas) projection for 2020 is 46,093.

TABLE E.3.33 (Continued)
COMPARISON OF GENERAL PLAN EMPLOYMENT PROJECTIONS TO
ABAG *PROJECTIONS 2005*, UWMPS, AND WATER CUSTOMER DEMAND PROJECTIONS
FOR GENERAL PLAN PROJECTION YEAR

[i] CWS – South San Francisco District (Colma, parts of Daly City and South San Francisco, plus unincorporated areas) plus Westborough Water District projection for 2020 is 59,466.
[j] Alameda County Water District (cities of Fremont, Newark, and Union City) projection is 151,092 in 2005; 160,853 in 2010, and 197,456 in 2020.
[k] Figure shown is for CWS – South San Francisco District (Colma, parts of Daly City and South San Francisco, plus unincorporated areas) plus Westborough Water District.
[l] Figure shown is for Town of Hillsborough water agency, which also serves some unincorporated area.
[m] Figure shown is for the City of Burlingame water agency, which also serves some unincorporated areas.
[n] Figure shown for *Projections 2005* includes ABAG's unincorporated Half Moon Bay.
[o] Projection for Purissima Hills Water District (part of Los Altos Hills and some unincorporated areas) is 457.
[p] Figure shown is for the City of San Jose water agency, which serves only a small part of the City of San Jose.

SOURCES: ABAG, 2004; ACWD, 2005; City and County of San Francisco, 2004; City of Burlingame, 2005; City of Daly City, 2004; City of Daly City,2005; City of East Palo 2001; City of East Palo Alto, 2006; City of Foster City, 2001; City of Fremont, 2003; City of Hayward, 2002; City of Hayward, 2005; City of Menlo Park, 1994; City of Menlo Park. 2006, City of Millbrae,1998; City of Millbrae, 2005; City of Milpitas, 2002a; City of Milpitas, 2005; City of Mountain View, 2002; City of Mountain View, 2005; City of Newark, 2002;City of Palo Alto, 2002; City of Palo Alto, 2005; City of Redwood City, 2005; City of San Mateo, 2001; City of Santa Clara, 2002; City of Santa Clara, 2005; City of South San Francisco, 2002; City of Sunnyvale, 2002; City of Sunnyvale, 2005; City of Union City, 2002; Coastside County Water District,2005; CWS-Mid-Peninsula, 2005; CWS-South San Francisco, 2006; Hannaford and Hydroconsult, 2004; Mid-Peninsula Water District, 2005; SFPUC, 2005; Town of Atherton, 2002; Town of Colma, 1999; Town of Hillsborough, 2002; Westborough Water District, 2005; URS, 2004.

the area covered in these plans would be the same as the area considered for the water demand projections. However, in many cases the service area boundaries do not coincide with boundaries covered in cities' general plans or the areas covered in ABAG projections; some service areas include unincorporated areas or portions of multiple cities. As noted elsewhere in this analysis, the ABAG areas that were assigned to water customer service areas are not congruent with those areas (see **Attachment E.3.A, Tables E.3.A.1** and **E.3.A.2** for correspondence between water customer service areas and ABAG areas).

In 13 of the 20 cases for which direct comparisons are available, Table E.3.33 shows that water customer projections of employment in the given general plan projection year exceed *Projections 2005* employment. This result is expected, because most of the water customer projections are based on extensions of *Projections 2002*, which anticipated higher overall employment in the near term and future years for most jurisdictions than does *Projections 2005*.

Table E.3.34 compares population projections contained in local general plans, urban water management plans, SFPUC demand documents, and *Projections 2005*. In almost all cases, Table E.3.34 indicates that future population levels anticipated by *Projections 2005* or the city's general plan exceed the population levels anticipated in the relevant water customer projection.[7] In most cases, *Projections 2005* contains the highest forecast. This pattern is consistent with ABAG's assumptions that smart growth principles and increased housing production will be incorporated into planning policy and practice in the future, especially after 2010.

[7] In Foster City, the water customer projection is higher than any of the others, but the water customer, which is Estero MID, serves a portion of San Mateo in addition to the City of Foster City.

TABLE E.3.34
COMPARISON OF GENERAL PLAN POPULATION PROJECTIONS TO ABAG PROJECTIONS 2005, UWMPS, AND WATER CUSTOMER DEMAND PROJECTIONS FOR GENERAL PLAN PROJECTION YEAR

	Population in General Plan Population Year[a] Shown in:			
	General Plan[b]	UWMP	SFPUC Water Customer Projection[c]	*Projections 2005*
Cities with GP Population Projections for 2005				
Colma	1,285	see note d	see note d	1,350
Cities with GP Population Projections for 2010				
Belmont	27,800	see note f	see note f	26,000
Burlingame	31,500	30,200	31,648	30,200
Foster City	30,803	37,424[e]	36,284[e]	29,800
Menlo Park	35,285	10,344[g]	12,619[g]	35,600
Mountain View	75,200	75,200	74,422	76,000
Palo Alto	62,880	64,168	62,823	78,300
San Mateo	100,700	see note h	see note h	102,500
Santa Clara	129,900	116,527	115,630	117,400
Cities with GP Population Projections for 2015				
Millbrae	24,860	23,055	23,253	22,800
Cities with GP Population Projections for 2020				
Atherton	8,400	see note i	see note i	7,900
Daly City	113,000	114,291[j]	112,363[j]	120,200
East Palo Alto	34,600	29,612	29,844	39,600
Fremont	229,213	236,700	see note k	236,900
Half Moon Bay (incl. unincorporated area)	21,065	23,262	22,679	26,400
Milpitas	77,100[l]	82,400	79,846	82,400
Newark	49,800	50,000	see note k	49,000
San Bruno	46,400	see note m	45,642	47,700
San Francisco	811,100	840,000	818,954[n]	859,200
South San Francisco+Westborough Water District[d]	67,400	78,200	70,156	68,700
Sunnyvale	154,600	146,900	144,629	146,900
Union City	80,100	86,000	see note k	82,600
Cities with GP Population Projections for 2025				
Hayward	160,300	160,300	158,909	165,900
Hillsborough	11,800	n.a	12,520	11,600
Cities with GP Population Projections for Years Prior to 2005 or No Applicable GP: Projections for 2030				
Brisbane + Guadalupe Valley MID		n.a.	6,164	5,240
Los Altos Hills		n.a.	see note o	10,700
Los Trancos County Water District[p]		see note q	1,094	n.a.
Pacifica		42,100	47,829	42,200
Portola Valley		see note q	see note q	7,800
San Carlos		see note h	see note h	35,200
Stanford University		n.a.	27,924	n.a.
Woodside		see note q	see note q	7,300

n.a. = Not available.

a Population shown is for the year of the most distant population projection available in the general plan, housing element, or other relevant local document (see note b). For example, populations in all columns for cities in the group titled “Cities with GP Population Projections for 2005” are populations projected for or estimated in 2005.

b Population estimates are from each city’s general plan (GP) or the general plan’s EIR.

c Estimates for years between 2001 and 2030 are derived by Mundie & Associates, based on linear interpolations of water customer projections, except for the 2020 San Francisco projection, which is included in the Retail Demand Study (Hannaford and Hydroconsult, 2004).

d CWS – South San Francisco District (Colma, parts of Daly City and South San Francisco, plus unincorporated areas) UWMP projection for 2020 is 64,050, and Westborough Water District (which serves part of South San Francisco) UWMP projection for 2020 is 14,150; the CWS-South San Francisco water customer projection for 2020 is 56,006 and the Westborough Water District water customer projection is the same as its UWMP projection (14,150).

TABLE E.3.34 (Continued)
COMPARISON OF GENERAL PLAN POPULATION PROJECTIONS TO ABAG PROJECTIONS 2005, UWMPS, AND WATER CUSTOMER DEMAND PROJECTIONS FOR GENERAL PLAN PROJECTION YEAR

[e] Figures shown are for Estero MID (Foster City and part of San Mateo).
[f] Mid-Peninsula Water District (Belmont, part of San Carlos, and portions of unincorporated San Mateo County) UWMP projection for 2010 is 26,130; water customer projection is 26,925.
[g] Figures shown are for the City of Menlo Park water agency, which serves part of Menlo Park (less than half of the city's population).
[h] CWS – Mid-Peninsula District (parts of the cities of San Mateo and San Carlos plus unincorporated areas) UWMP projection for 2010 is 129,070; water customer projection is 126,746. Part of San Mateo is served by Estero MID.
[i] CWS – Bear Gulch District (Atherton, parts of Menlo Park, Portola Valley, and Woodside, plus unincorporated areas) UWMP projection for 2020 is 57,730; water customer projection for 2020 is 71,125.
[j] Figures shown are for City of Daly City water agency, which serves part of Daly City.
[k] Alameda County Water District (cities of Fremont, Newark, and Union City) projection is 358,066 in 2020.
[l] Based on Milpitas General Plan.
[m] The UWMP (Table 2) reports three population projections: the draft general plan (2006), ABAG subregional (2005), and adjusted draft general plan (2001), although the draft general plan (2006) does not include a projection for 2020. The projections for 2020 are, respectively, 43,400 (based on a straight-line interpolation from projections shown for 2005 and 2025), 47,700, and 43,400.
[n] Figure is for Household Population in 2020 as shown in the Retail Demand Study (Hannaford and Hydroconsult, 2004)
[o] Purissima Water District (part of Los Altos Hills and some unincorporated areas) water customer projection is 6,763.
[p] Los Trancos County Water District was acquired by CWS in 2006, and is now part of the CWS – Bear Gulch District. Because it was a separate entity when these projections were prepared, it is presented separately in this analysis.
[q] CWS – Bear Gulch District (Atherton, parts of Menlo Park, Portola Valley, and Woodside, plus unincorporated areas) UWMP projection for 2030 is 59,220; water customer projection is 73,719 (excluding Los Trancos).

SOURCES: ABAG, 2004; ACWD, 2005; CWS-Mid-Peninsula, 2005 ;CWS-South San Francisco, 2006; City and County of San Francisco, 2004; City of Belmont, 2002; City of Burlingame, 2002a; City of Burlingame, 2005; City of Daly City, 2004; City of Daly City, 2005; City of East Palo Alto, 1999; City of East Palo Alto, 2006; City of Foster City, 2001; City of Fremont, 2003; City of Half Moon Bay, 1993; City of Hayward, 2002; City of Hayward, 2005; City of Menlo Park, 1994; City of Menlo Park, 2006; City of Millbrae, 1998; City of Millbrae, 2005; City of Milpitas, 2002b; City of Milpitas, 2005; City of Mountain View, 2002; City of Mountain View, 2005; City of Newark, 2002; City of Palo Alto, 1998; City of Palo Alto, 2005; City of San Bruno, 2003; City of San Bruno, 2007; City of San Mateo, 2001; City of Santa Clara, 2002; City of Santa Clara, 2005; City of South San Francisco, 2002; City of Sunnyvale, 2002; City of Sunnyvale, 2005; City of Union City, 2002; Coastside County Water District, 2005; Estero MID, 2005; Hannaford and Hydroconsult, 2004; Mid-Peninsula Water District, 2006; SFPUC, 2005; Town of Atherton, 2002; Town of Colma, 1999; Town of Hillsborough, 2002; URS, 2004, Westborough Water District, 2005.

Tables E.3.35 and **E.3.36** provide a different comparison of the projections published by the various water customers, local general purpose governments, and ABAG: instead of focusing on the most distant future year of general plan projections, they focus on employment and population forecasts for 2030.

In just over half of the cases for which direct comparisons are available (11 of 20), Table E.3.35 shows that water customer projections of employment in 2030 exceed *Projections 2005* employment in that year. As previously noted (regarding Table 3.33) this result is expected because most of the water customer projections are based on extensions of *Projections 2002*, which anticipated higher overall employment in 2025 (that projection's horizon year) than does *Projections 2005* (for a comparison, see Table E.3.31). In some cases, too, the water customer encompasses a greater area than the city.

In most cases, Table E.3.36 shows that water customer projections of population in 2030 are smaller than the *Projections 2005* estimates for that year. This result is also expected: because most of the customer projections are based on *Projections 2002*, they do not incorporate ABAG's smart growth assumptions, which include increased housing production (and, consequently, population) after about 2010.

TABLE E.3.35
COMPARISON OF GENERAL PLAN EMPLOYMENT PROJECTIONS TO ABAG *PROJECTIONS 2005*, UWMPS, AND WATER CUSTOMER DEMAND PROJECTIONS FOR 2030

	General Plan Employment Projection	UWMP Employment in 2030	SFUC Water Customer Employment Projection for 2030	*Projections 2005* Employment in 2030
Cities with GP Employment Projections for 2010				
East Palo Alto	5,940		8,673	6,110
Foster City	18,760		see note b	21,110
Menlo Park	17,900		13,287[c,d]	43,700
Milpitas	65,200		76,129	68,940
Mountain View	84,810		95,669[e]	81,110
Palo Alto	98,500	114,224	114,224	117,090
San Mateo	67,628		see notes b,f	70,780
Santa Clara	151,280		177,027	152,670
Cities with GP Employment Projections for 2015				
Millbrae	12,006		8,009	9,960
Cities with GP Employment Projections for 2020				
Atherton	3,840		see note d	3,710
Colma	2,080		see note g	4,570
Daly City	34,260	34,000	33,981[k,g]	29,830
Fremont	130,530		see note a	160,410
Newark	26,560		see note a	24,960
San Bruno	19,180		25,770[o]	28,400
San Francisco	745,600	795,400	795,400	829,090
South San Francisco+Westborough Water District	71,400		63,975[g]	56,080
Sunnyvale	152,730		168,950	123,020
Union City	20,710		see note a	44,000
Cities with GP Employment Projections for 2025				
Hayward	108,830		113,843	100,430
Hillsborough	1,360		1,380[h]	2,030
Cities with GP Employment Projections for Years Prior to 2005 or No Applicable GP Employment Projection				
Belmont			22,221[i]	14,070
Brisbane+Guadalupe Valley MID			25,243	20,420
Burlingame			36,160[j]	33,370
Half Moon Bay			6,795[l]	8,490[p]
Los Altos Hills			see note m	1,780
Pacifica			7,478	7,670
Portola Valley			see notes d,n	2,720
Redwood City		69,980	83,678	76,550
San Carlos			see note f	26,930
San Jose (North)			3,353	
Stanford University			see note q	see note q
Woodside			see note d	3,400

a Alameda County Water District (cities of Fremont, Newark, and Union City) projection for 2030 is 221,858.
b Estero MID (Foster City and part of San Mateo) projection for 2030 is 31,840.
c Figure shown is for the portion of Menlo Park (less than half of the city's population) served by the SFPUC wholesale customer, the City of Menlo Park Water Agency).
d CWS – Bear Gulch District (Atherton, parts of Menlo Park, Portola Valley, and Woodside, plus unincorporated areas) projection for 2030 is 47,774.
e Figure shown is for the City of Mountain View Water Agency, which serves most of Mountain View.
f CWS – Mid-Peninsula District (parts of the cities of San Mateo and San Carlos plus unincorporated areas) projection for 2030 is 100,568.
g Figure shown is for CWS – South San Francisco District (Colma, parts of Daly City and South San Francisco, plus unincorporated areas) and Westborough Water District combined.
h Figure shown is for the Town of Hillsborough Water Agency, which also serves some unincorporated area.
i Figure shown is for the Mid-Peninsula Water District, which also serves a portion of San Carlos and some unincorporated areas.
j Figure shown is for the City of Burlingame Water Agency, which also serves some unincorporated area.
k Figure shown is for the portion of Daly City served by the City of Daly City Water Agency.
l Figure shown is for the Coastside County Water District, which also serves unincorporated Half Moon Bay.
m Purissima Hills Water District (part of Los Altos Hills and some unincorporated area) projection for 2030 is 457.
n A portion of Portola Valley is in the Los Trancos County Water District, has no nonresidential accounts. (Los Trancos was acquired by CWS in 2006, and is now part of the CWS – Bear Gulch District.)
o Figure shown is for the City of San Bruno Water Agency, which also serves some unincorporated areas.
p Includes ABAG's "unincorporated Half Moon Bay."
q Employment projections were not provided for Stanford because it uses other parameters to forecast growth in non-residential accounts.

SOURCES: Same as sources for Table E.3.33.

TABLE E.3.36
COMPARISON OF GENERAL PLAN POPULATION PROJECTIONS TO ABAG *PROJECTIONS 2005*, UWMPS, AND WATER CUSTOMER DEMAND PROJECTIONS FOR 2030

	General Plan Population Projection	UWMP Population in 2030	SFPUC Water Customer Population Projection for 2030	*Projections 2005* Population in 2030
Cities with GP Population Projections for 2005				
Colma	1,285	see note a	see note a	1,860
Cities with GP Population Projections for 2010				
Belmont	27,800	see note c	see note c	28,800
Burlingame	31,500	31,900	34,967[d]	31,900
Foster City	30,803	40,866	40,096[b]	32,500
Menlo Park	35,285	11,218[e,f]	13,655[e,f]	41,100
Mountain View	75,200	81,700[g]	81,670[g]	89,600
Palo Alto	62,880	69,199	69,199	92,200
San Mateo	100,700	see note h	see note b,h	119,800
Santa Clara	129,900	140,698	140,698	142,100
Cities with GP Population Projections for 2015				
Millbrae	24,860	24,200	25,174	24,500
Cities with GP Population Projections for 2020				
Atherton	8,400	see note f	see note f	8,200
Daly City	113,000[i]	115,651 [j,k]	115,651[j,k]	127,200
East Palo Alto	34,600	32,712	32,712	43,600
Fremont	229,213	257,100	see note l	257,200
Half Moon Bay (incl. uninc. area)	21,065	24,973[m]	24,973[m]	27,100
Milpitas	77,100[n]	91,400	88,841	91,400
Newark	49,800	53,500	see note l	53,400
San Bruno	46,400	see note o	48,229[p]	50,700
San Francisco	811,100	871,000	849,942	924,600
South San Francisco+Westborough Water District	67,400	83,450[q]	73,884[q]	71,800
Sunnyvale	154,600	159,100	151,610	159,100
Union City	80,100	95,300	see note l	94,100
Cities with GP Population Projections for 2025				
Hayward	160,300	162,800	162,757	171,500
Hillsborough	11,800		12,708[r]	11,800
Cities with GP Population Projections for Years Prior to 2005 or No Applicable GP Population Projection				
Brisbane + Guadalupe Valley MID		n.a.	6,164	5,240
Los Altos Hills		n.a.	see note s	10,700
Los Trancos Valley Water Dist.[t]		n.a.	1,094[v]	
Pacifica		42,100	47,829	42,200
Portola Valley		n.a.	see notes f,v	7,800
San Carlos		see note h	see note h	35,200
Stanford University			27,924	n.a.
Woodside			see note f	7,300

a CWS – South San Francisco District (Colma, parts of Daly City and South San Francisco, plus unincorporated areas) UWMP projection for 2030 is 60,150; water customer projection for 2030 is 59,584.
b Estero MID (Foster City and part of San Mateo) projection for 2030 is 40,096.
c Mid-Peninsula Water District (Belmont, part of San Carlos, and portions of unincorporated San Mateo County) UWMP projection for 2030 is 28,930; water customer projection is 27,997.
d Figure shown is for the City of Burlingame Water Agency, which also serves some unincorporated area.
e Figure shown is for the portion of Menlo Park (less than half of the city's population) served by the City of Menlo Park Water Agency.
f CWS – Bear Gulch District (Atherton, parts of Menlo Park, Portola Valley, and Woodside, plus unincorporated areas) projection for 2030 is 73,719; UWMP population projection is 59,220 in 2030.
g Figure shown is for the City of Mountain View Water Agency, which serves most of Mountain View.
h CWS – Mid-Peninsula District (parts of the cities of San Mateo and San Carlos plus unincorporated areas) water customer population projection for 2030 is 139,834; UWMP population projection for 2030 is 134,010.
i The Housing Element of the Daly City General Plan projects this population within the city limits and a population of 120,000 within the (planning) area that corresponds to the ABAG subregional study area.
j Figure shown is for the portion of Daly City served by the City of Daly City Water Agency.
k Parts of Daly City and South San Francisco are served by CWS – South San Francisco District.
l Alameda County Water District (cities of Fremont, Newark, and Union City) projection for 2030 is 379,931.
m Figure shown is for the Coastside County Water District, which also serves unincorporated Half Moon Bay.
n Based on Milpitas General Plan.
o San Bruno UWMP (City of San Bruno,2007) shows two population projections for 2030: 50,700, based on ABAG's *Projections 2005*, and 48,229, based on the City's Adjusted Draft General Plan.
p Figure shown is for the City of San Bruno Water Agency, which also serves some unincorporated areas.
q Figures shown are for the CWS – South San Francisco District plus Westborough Water District. For the Westborough Water District, the water customer projection is the same as the UWMP projection.
r Figure shown is for the Town of Hillsborough Water Agency, which also serves some unincorporated area.
s Purissima Hills Water District, (part of Los Altos Hills and some unincorporated area) projection is 6,763.
t Los Trancos County Water District was acquired by CWS in 2006, and is now part of the CWS – Bear Gulch District. Because it was a separate entity when these projections were prepared, it is presented separately in this analysis.
u Includes a portion of Portola Valley.
v Portola Valley is served by CWS – Bear Gulch District; a portion of the city was previously served by the Los Trancos County Water District, which is now part of CWS – Bear Gulch.

SOURCE: See sources for Table E.3.34.

Summary: Comparison of Employment and Population Projections to Water Demand Projections

The review of employment and population projections presented above traces the evolution of ABAG's projections for Bay Area counties and communities from *Projections 2002*, which provided the basis for most water customer forecasts of future demand for water, through *Projections 2003*, which applied smart growth principles to the forecasts, and *Projections 2005*, which updated the smart growth-based forecasts. As shown in Tables E.3.31 and E.3.32, ABAG's projections of both employment and population were greater with *Projections 2003* than with *Projections 2002*. *Projections 2005* anticipated less total employment and population in 2030 than *Projections 2003*, but more in 2025 than *Projections 2002*. The downward adjustments of employment between *Projections 2003* and *Projections 2005* reflect improved understanding of the magnitude of job losses in the early 2000s: although *Projections 2005* anticipates more employment growth between 2005 and 2030 than did *Projections 2003*, the increased growth does not make up for the adjusted starting point.

Tables E.3.37 and **E.3.38** provide final comparisons: they compare the percentage increases in employment and population to the expected percentage increase in water demand in each water customer service area. Table E.3.37 compares increased water demand to the employment and population forecasts in ABAG's *Projections 2005*, while Table E.3.38 compares increased water demand to employment and population forecasts used by the customers themselves.

There are two critical differences between Table E.3.37 and E.3.38: (1) in Table E.3.37, the geographic areas covered by the ABAG projections on the one hand and the customers' projections of water demand on the other are not congruent, and distortions in area may distort the comparisons of percentage change (see **Tables E.3.A.1** and **E.3.A.2** for the correspondence between ABAG areas used in the table and water customer service areas), and (2) the water customers' projections are based primarily on *Projections 2002*. If the greatest proportion of water demand is associated with population (rather than employment), then the water demand projections are likely to be lower than forecasts based on *Projections 2005* (see text above).

Table E.3.37 indicates that, with only two exceptions, the percentage increases in water demand forecast by the water customers are smaller than the percentage changes in population and employment anticipated by *Projections 2005*. The exceptions are:

- *Hayward*: the water customer forecast shows a 38 percent increase in water demand; *Projections 2005* shows a 34 percent increase in employment and a 17 percent increase in population.

- *Purissima Hills Water District*: the water customer forecast shows an increase of 38 percent in water demand; *Projections 2005* anticipates increases of about 8 percent in both employment and population. Note, however, that (1) the water district includes some unincorporated areas that are not captured in the ABAG figures reported here, and (2) the district is quite small, with district-estimated employment of about 400 and population of about 6,000 in 2001.

TABLE E.3.37
COMPARISON OF INCREASES IN EMPLOYMENT AND POPULATION TO EXPECTED INCREASES IN DEMAND
(*PROJECTIONS 2005* ESTIMATES OF EMPLOYMENT AND POPULATION)

Customer/Jurisdiction	% Change in: Employ-ment	% Change in: Population	Change in Demand: 2005 (MGD)	Change in Demand: 2030 (MGD)	Change in Demand: % Change	Projected % of Total Demand in 2030
Alameda County						
Alameda County Water District	66.7%	23.8%	53.20	59.30	11.5%	14.2%
Hayward/Hayward	34.0%	16.7%	20.80	28.70	38.0%	6.9%
Santa Clara County						
Milpitas/Milpitas	35.2%	39.5%	13.00	17.70	36.2%	4.2%
Mountain View/Mountain View (most)	42.0%	24.4%	13.40	14.80	10.4%	3.6%
Palo Alto/Palo Alto	17.9%	24.6%	14.50	14.36	-1.0%	3.4%
Purissima Hills Water District	7.9%	8.1%	2.40	3.30	37.5%	0.8%
San Jose (North)	na	na	5.40	6.50	20.4%	1.6%
Santa Clara/Santa Clara	38.8%	30.7%	28.00	33.90	21.1%	8.1%
Stanford University/(part of Palo Alto)	na	na	4.30	6.80	58.1%	1.6%
Sunnyvale/Sunnyvale	65.0%	19.6%	25.00	26.80	7.2%	6.4%
San Mateo County						
Brisbane/Brisbane (part)	149.0%	39.7%	0.50	0.93	86.0%	0.2%
Guadalupe Valley MID/Brisbane (part)			0.39	0.81	107.7%	0.2%
Burlingame	46.0%	8.5%	4.80	4.90	2.1%	1.2%
CWS – Bear Gulch District	na	na	13.50	13.90	3.0%	3.3%
CWS – Mid Peninsula District	54.9%	20.5%	17.50	18.10	3.4%	4.3%
CWS – South San Francisco District	35.5%	17.8%	9.00	9.90	10.0%	2.4%
Coastside County Water District	12.6%	13.4%	2.70	3.20	18.5%	0.8%
Daly City/Daly City	65.9%	16.3%	8.70	9.10	4.6%	2.2%
East Palo Alto/East Palo Alto	186.9%	33.3%	2.60	4.80	84.6%	1.2%
Estero MID	48.8%	9.1%	6.00	6.80	13.3%	1.6%
Hillsborough	22.3%	7.3%	3.70	3.90	5.4%	0.9%
Los Trancos County Water District/ Portola Valley (part)[a]	na	na	0.11	0.14	27.3%	0.0%
Menlo Park/Menlo Park (part)	52.0%	16.4%	4.10	4.70	14.6%	1.1%
Mid-Peninsula Water District	71.8%	12.9%	3.70	3.80	2.7%	0.9%
Millbrae/Millbrae	45.2%	15.6%	3.30	3.30	0.0%	0.8%
North Coast County Water District/Pacifica	24.3%	9.3%	3.70	3.80	2.7%	0.9%
Redwood City	39.1%	20.3%	12.10	13.40	10.7%	3.2%
San Bruno	104.2%	21.6%	4.20	4.50	7.1%	1.1%
Skyline County Water District	na	na	0.19	0.31	63.2%	0.1%
Westborough Water District/ South San Francisco (part)	na	na	1.01	1.03	2.0%	0.2%
Total, Wholesale Service Area	**46.8%**	**21.1%**	**281.80**	**323.82**	**14.9%**	**77.6%**
SFPUC Retail Service Area/San Francisco	**44.0%**	**15.9%**	**92.40**	**93.40**	**1.1%**	**22.4%**
TOTAL	**45.7%**	**19.4%**	**374.20**	**417.22**	**11.5%**	**100.0%**

[a] Los Trancos County Water District was acquired by CWS in 2006, and is now part of the CWS – Bear Gulch District. Because it was a separate entity when these projections were prepared, it is presented separately in this analysis.

SOURCES: ABAG, 2004, URS, 2004, Hannaford and Hydroconsult, 2004; Westborough Water District, 2005

TABLE E.3.38
COMPARISON OF INCREASES IN EMPLOYMENT AND POPULATION TO EXPECTED INCREASES IN DEMAND (WATER CUSTOMER ESTIMATES OF EMPLOYMENT AND POPULATION)[a]

	% Change in:		Change in Demand			Projected % of Total Demand in 2030
Customer/Jurisdiction	Employment (2005-2030)	Population (2005-2030)	2005 (MGD)	2030 (MGD)	% Change	
Alameda County						
Alameda County Water District	37.9%	16.8%	53.2	59.3	11.5%	14.2%
Hayward/Hayward	25.0%	13.4%	20.8	28.7	38.0%	6.9%
Santa Clara County						
Milpitas/Milpitas	34.3%	33.9%	13	17.7	36.2%	4.2%
Mountain View/Mountain View (most)	22.0%	12.5%	13.4	14.8	10.4%	3.6%
Palo Alto/Palo Alto	7.1%	13.0%	14.5	14.36	1.0%	3.4%
Purissima Hills Water District	7.5%	10.3%	2.4	3.3	37.5%	0.8%
San Jose (North)	28.1%	19.5%	5.4	6.5	20.4%	1.6%
Santa Clara/Santa Clara	23.3%	28.7%	28	33.9	21.1%	8.1%
Stanford University/(part of Palo Alto)	na	33.8%	4.3	6.8	58.1%	1.6%
Sunnyvale/Sunnyvale	28.5%	13.0%	25	26.8	7.2%	6.4%
San Mateo County						
Brisbane/Brisbane (part)	228.1%	36.6%	0.5	0.93	86.0%	0.2%
Burlingame	13.4%	13.5%	4.8	4.9	2.1%	1.2%
CWS – Bear Gulch District	9.6%	9.6%	13.5	13.9	3.0%	3.3%
CWS – Mid Peninsula District	22.0%	13.3%	17.5	18.1	3.4%	4.3%
CWS – South San Francisco District	22.0%	17.7%	9	9.9	10.0%	2.4%
Coastside County Water District	21.5%	29.8%	2.7	3.2	18.5%	0.8%
Daly City/Daly City	21.7%	7.7%	8.7	9.1	4.6%	2.2%
East Palo Alto/East Palo Alto	115.1%	28.1%	2.6	4.8	84.6%	1.2%
Estero MID	25.6%	13.5%	6	6.8	13.3%	1.6%
Guadalupe Valley MID/Brisbane (part)	22.9%	159.9%	0.39	0.81	107.7%	0.2%
Hillsborough	11.4%	8.0%	3.7	3.9	5.4%	0.9%
Los Trancos County Water District/ Portola Valley (part)[b]	na	38.7%	0.11	0.14	27.3%	0.0%
Menlo Park/Menlo Park (part)	26.6%	10.5%	4.1	4.7	14.6%	1.1%
Mid-Peninsula Water District	41.2%	5.0%	3.7	3.8	2.7%	0.9%
Millbrae/Millbrae	16.9%	14.6%	3.3	3.3	0.0%	0.8%
North Coast County Water District/Pacifica	24.0%	15.3%	3.7	3.8	2.7%	0.9%
Redwood City	21.7%	12.0%	12.1	13.4	10.7%	3.2%
San Bruno	44.1%	15.5%	4.2	4.5	7.1%	1.1%
Skyline County Water District	na	89.9%	0.19	0.31	63.2%	0.1%
Westborough Water District/ South San Francisco (part)[c]	1.3%	8.7%	1.01	1.03	2.0%	0.2%
Total, Wholesale Service Area	**25.8%**	**16.1%**	**281.8**	**323.8**	**14.9%**	**77.6%**
SFPUC Retail Service Area/ San Francisco	**21.2%**	**10.0%**	**92.4**	**93.4**	**1.1%**	**22.4%**
TOTAL	**24.2%**	**14.2%**	**374.2**	**417.2**	**11.5%**	**100.0%**

[a] Includes only those portions of each county served by SFPUC wholesale water customers or served directly by the SFPUC (San Francisco County).
[b] Los Trancos County Water District was acquired by CWS in 2006, and is now part of the CWS – Bear Gulch District. Because it was a separate entity when these projections were prepared, it is presented separately in this analysis.
[c] Population estimates from the Westborough Water District's 2005 Urban Water Management Plan.

SOURCES: URS, 2004; Hannaford and Hydroconsult, 2004; Westborough Water District, 2005

The figures in Table E.3.38 indicate that, with only a few exceptions, the water customers themselves anticipate smaller increases in water demand than they do in employment and population. This relationship between water demand and employment/population growth reflect that other factors also influence the rate of water consumption. These factors could include changes in land use patterns such as higher-density development that results in less open landscaped area, shifts toward landscaping with drought-tolerate plants, and the effects of plumbing codes that require low-flow appliances in all new development and fixture replacement over time in existing homes and businesses. As a result of these types of changes, the rate of increase in water demand is lower than the rate of increase in population and employment.

In three cases, the water customer's forecast of the percentage increase in water demand exceeds its forecasts of the percentage increases in *both* employment *and* population:

- *Hayward*: the forecast shows an increase of 38 percent in water demand, compared to 25 percent in employment and 13 percent in population.
- *Milpitas*: the forecast shows an increase of 36 percent in water demand, compared to 34 percent in employment and 34 percent in population.
- *Purissima Hills*: the forecast shows an increase of 38 percent in water demand, compared to 8 percent in employment and 10 percent in population.

All three customers anticipate growth in a new category of high-water-use residential accounts associated with development of larger residences with larger landscaped areas and substantially higher water usage than older residences. Hayward also expects growth in renovated single family residences, commercial, and industrial accounts that will have higher water usage than existing accounts in those categories. Milpitas anticipates growth of high water uses commercial accounts. Milpitas also expects to increase the use of recycled water which offset some of the increase in its future demand.

In three other cases, the water customer's forecast of the percentage increase in water demand exceeds its forecasts of the percentage increases in *either* employment *or* population:

- *Brisbane*: the forecast shows an increase of 86 percent in water demand, compared to 228 percent in employment but only 37 percent in population.
- *Guadalupe Valley MID*: the forecast shows an increase of 108 percent in water demand, compared to 23 percent in employment but 160 percent in population.
- *Menlo Park*: the forecast shows an increase of 15 percent in water demand, compared to 27 percent in employment but only 11 percent in population.
- *San Jose*: the forecast shows an increase of 20 percent in water demand, compared to 28 percent in employment but only 20 percent in population.

ATTACHMENT E.3.A

Table E.3.A.1 establishes a correspondence between the boundaries of wholesale customers in Alameda, Santa Clara, and San Mateo Counties and the jurisdictions/areas for which ABAG publishes population and employment projections. Table E.3.A.2 assigns jurisdictions to the respective water districts.

TABLE E.3.A.1
COMPARISON OF WHOLESALE CUSTOMER BOUNDARIES AND BOUNDARIES OF ABAG PROJECTION AREAS

Customer	County	ABAG Jurisdiction(s)	
Alameda County Water District	Alameda	Fremont Newark	Union City
Brisbane	San Mateo	Brisbane (part)	
Burlingame	San Mateo	Burlingame (Non-segregable) Unincorporated areas	
Coastside County Water District	San Mateo	Half Moon Bay Unincorporated Half Moon Bay	
CWS - Bear Gulch District	San Mateo	Atherton Menlo Park (part) (Non-segregable) Unincorporated areas	Portola Valley (part) Woodside (part)
CWS - Mid Peninsula District	San Mateo	San Carlos (part) (Non-segregable) Unincorporated areas	San Mateo (part)
CWS - South San Francisco District	San Mateo	Colma Daly City (part) (Non-segregable) Unincorporated areas	South San Francisco (part)
Daly City	San Mateo	Daly City	
East Palo Alto	San Mateo	East Palo Alto	
Estero MID	San Mateo	Foster City	San Mateo (part)
Guadalupe Valley MID	San Mateo	Brisbane (part)	
Hayward	Alameda	Hayward	
Hillsborough	San Mateo	Hillsborough (Non-segregable) Unincorporated areas	
Los Trancos County Water District[a]	San Mateo	Portola Valley (part)	
Menlo Park	San Mateo	Menlo Park (part)	
Mid-Peninsula Water District	San Mateo	Belmont (Non-segregable) Unincorporated areas	San Carlos (part)
Millbrae	San Mateo	Millbrae	
Milpitas	Santa Clara	Milpitas	
Mountain View	Santa Clara	Mountain View (most)	
North Coast County Water District	San Mateo	Pacifica	
Palo Alto	Santa Clara	Palo Alto	
Purissima Hills Water District	Santa Clara	Los Altos Hills (Non-segregable) Unincorporated areas	
Redwood City	San Mateo	Redwood City San Carlos (part) (Non-segregable) Unincorporated areas	Woodside (part)
San Bruno	San Mateo	San Bruno (Non-segregable) Unincorporated areas	
San Jose	Santa Clara	North San Jose/Alviso	
Santa Clara	Santa Clara	Santa Clara	
Skyline County Water District	San Mateo	Woodside (part) (Non-segregable) Unincorporated areas	
Stanford University	Santa Clara	(part of Palo Alto)	
Sunnyvale	Santa Clara	Sunnyvale	
Westborough Water District	San Mateo	South San Francisco (part)	

[a] Los Trancos County Water District was acquired by CWS in 2006, and is now part of the CWS – Bear Gulch District. Because it was a separate entity when these projections were prepared, it is presented separately in this analysis.

TABLE E.3.A.2
CORRESPONDENCE OF ABAG JURISDICTIONS WITH WHOLESALE CUSTOMER WATER CUSTOMERS

Wholesale Water Customers	Corresponding Jurisdiction(s)
Alameda County Water District	Fremont, Newark, Union City
Brisbane Guadalupe Valley MID	Brisbane
Burlingame[a]	Burlingame
Coastside County Water District	Half Moon Bay, unincorporated HMB
CWS - Bear Gulch District[a,b] Los Trancos County Water District[n] Skyline County Water District	Atherton, Portola Valley, Woodside[l]
CWS - Mid Peninsula District[a]	San Carlos, San Mateo[j]
CWS - South San Francisco District[a,c] Westborough Water District[h]	Colma, South San Francisco[m]
Daly City[i]	Daly City
East Palo Alto	East Palo Alto
Estero MID[d]	Foster City
Hayward	Hayward
Hillsborough[a]	Hillsborough
Menlo Park	Menlo Park[k]
Mid-Peninsula Water District[a,e]	Belmont
Millbrae	Millbrae
Milpitas	Milpitas
Mountain View	Mountain View
North Coast County Water District	Pacifica
Palo Alto Stanford University	Palo Alto
Purissima Hills Water District[a]	Los Altos Hills
Redwood City[a,f]	Redwood City
San Bruno[a]	San Bruno
San Jose[g]	(None)
Santa Clara	Santa Clara
Sunnyvale	Sunnyvale

a Correspondence excludes non-segregable unincorporated areas that are not included in the ABAG definition of the jurisdiction.
b Portion of Menlo Park served by CWS – Bear Gulch District assigned to Menlo Park.
c Portion of Daly City served by CWS – South San Francisco District assigned to Daly City.
d Portion of San Mateo served by Estero MID assigned to San Mateo.
e Portion of San Carlos served by Mid-Peninsula Water District assigned to CWS – Mid-Peninsula District.
f Portion of San Carlos served by Redwood City assigned to CWS – Mid-Peninsula District; portion of Woodside served by Redwood City assigned to CWS – Bear Gulch District.
g Portion of North San Jose/Alviso served by San Jose Water District is not assigned.
h Portion of South San Francisco served by Westborough Water District assigned to CWS – South San Francisco District.
i Includes portion of Daly City served by CWS – South San Francisco District.
j Includes portions of San Carlos served by Mid-Peninsula Water District and Redwood City.
k Includes portions of Menlo Park served by CWS – Bear Gulch District
l Includes portion of Portola Valley served by Los Trancos Water District (now a part of CWS – Bear Gulch District) and portions of Woodside served by Redwood City and Skyline County Water District.
m Includes portion of South San Francisco served by Westborough Water District.
n Los Trancos County Water District was acquired by CWS in 2006, and is now part of the CWS – Bear Gulch District. Because it was a separate entity when these projections were prepared, it is presented separately in this analysis.

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APPENDIX E.4

Growth Trends and Policies of a Selection of Jurisdictions

To supplement information on forecasted population and employment growth presented in PEIR Chapter 7 and provide a more in-depth understanding of service area growth trends, this appendix takes a more detailed look at the growth trends and policies of San Francisco and a selection of jurisdictions (and a university) served by wholesale customers. A selection of jurisdictions served by wholesale customers in each county of the wholesale service area are included. These jurisdictions represent a range of sizes and include, but are not limited to, the largest city (San Francisco), some of the other larger cities in the wholesale service area, and some of the cities projecting relatively substantial increases in water demand in 2030. in each county of the wholesale service area.

Summaries of growth trends and policies are presented for the jurisdictions and university listed below. The profiles are based primarily on information in BAWSCA agency profiles (BAWSCA, 2005), the general plans of the respective jurisdictions, and contacts with city planning departments. The population of each jurisdiction from Census 2000 (U.S. Census Bureau, 2000), and population estimates for 2005 and 2006 from the U.S. Census Bureau, ABAG, and the California Department of Finance (DOF) (U.S. Census Bureau, 2006; ABAG, 2004; California Department of Finance 2006) are included to provide a sense of recent growth.

- Alameda County: Fremont, Newark, Union City, and Hayward
- Santa Clara County: Milpitas, Santa Clara, Stanford University, and Sunnyvale
- San Mateo County: East Palo Alto, Redwood City, San Mateo, and South San Francisco
- San Francisco (City and County)

E.4.1 Alameda County

Fremont

Overview

Fremont is bordered by San Francisco Bay to the west, the foothills and mountains of the Diablo Range to the east, Union City and Hayward to the north, and Milpitas and San Jose to the south (refer to Figure 7.2 in PEIR Chapter 7). Fremont also borders—and encircles—the city of Newark. According to the Fremont General Plan (adopted in 1991[1]), the city's land use mix

[1] Updated land use and housing elements, also cited herein, were a adopted in 2003.

consists of approximately 29 percent single-family and multifamily residences, 3 percent retail/commercial space, 13 percent industrial space, and 55 percent open space[2] (City of Fremont, 1991).

Water Service

Fremont is served by the Alameda County Water District (ACWD), which also includes the cities of Newark and Union City. The ACWD service area encompasses approximately 103 square miles in southwestern Alameda County, on the east side of San Francisco Bay (refer to Figure 7.1 in PEIR Chapter 7). The ACWD serves a population of about 323,000 people, providing water to the cities of Fremont, Newark, and Union City. The ACWD consists primarily of single-family, owner-occupied homes. Residential accounts represent approximately 64 percent of ACWD's current total water demand; commercial and industrial accounts represent approximately 22 percent; and other uses and unaccounted-for water represent 7 and 8 percent of demand, respectively. According to the BAWSCA agency profile, the SFPUC supplies approximately 24 percent of the ACWD's water, while water from the State Water Project, local groundwater, and local surface water meet the remaining need (URS, 2004; BAWSCA, 2005).

Growth Trends and Policies

Fremont grew rapidly following its incorporation in 1956, with population increasing fourfold (to 100,000) by 1970. The population doubled again over the next three decades, to 203,413 in 2000 (City of Fremont, 2003a; U.S. Census Bureau, 2000). Population estimates since 2000 vary somewhat. The U.S. Census Bureau estimates Fremont's 2005 population to be 200,468, a 1.4 percent decrease, whereas the California DOF estimates Fremont's 2006 population to be 210,158, a 3.3 percent increase from 2000. These figures, ABAG estimates for 2005, and the buildout projections of the general plan are shown in **Table E.4.1**.

The Fremont Municipal Code does not include a growth ordinance per se, but the stated purposes of sections of the code governing subdivisions (Section 8-1101) and development agreements (Section 8-7101) include the promotion of orderly growth and development (City of Fremont, 2007).

The Fremont General Plan is a statement of the community's vision of its long-term or ultimate physical form and contains goals, policies, and programs intended to guide decision-making for future development in the city (City of Fremont, 1991). Goals related to growth management articulated in the 2003 Fremont General Plan Land Use Element include conservation of the city's open space resources (Goal LU 4) and protection of "sensitive hill face and uses in the remainder of the hill area" consistent with the area's character and environmental constraints (Goal LU 6). Buildout under the 1991 Fremont General Plan is expected to occur by 2010 and result in a total population of approximately 201,100 (less than the actual population in 2000) (City of Fremont, 1991). The more recent housing element (City of Fremont, 2003a) projects that the population will increase by 25,800 between 2000 and 2020 (i.e., from 203,413 to 229,213). The average household size is projected to be 3.17 in 2010 (City of Fremont, 2003b).

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[2] Percentages derived from area information (acreage and square footage) provided in the Fremont General Plan.

TABLE E.4.1
CURRENT POPULATION ESTIMATES AND FORECASTS OF SELECT JURISDICTIONS

	Actual Population	Current Population Estimates			Forecasts				
City	U.S. Census 2000 Population	U.S. Census Estimated 2005 Population	ABAG *Projections 2005* Estimated 2005 Population	Department of Finance Estimated 2006 Population	General Plan Buildout (Year) and Population	ABAG *Projections 2005 Population* Projection for General Plan Buildout Year	Customer-Selected Population Projection for 2030	ABAG *Projections 2005 Population* Projection for 2030	Percent of Supply (after Conservation) from SFPUC
Alameda County									
ACWD[a]	312,753	311,600	326,900	325,396	(2020) 359,113	368,500	379,931	404,700	25%
Fremont	*203,413*	*200,468*	*211,100*	*210,158*	*(2020) 229,213*	*236,900*		*257,200*	
Newark[b]	*42,471*	*41,956*	*44,400*	*43,486*	*(2020) 49,800*	*49,000*		*53,400*	
Union City	*66,869*	*69,176*	*71,400*	*71,752*	*(2020) 80,100*	*82,600*		*94,100*	
Hayward	140,030	140,293	146,300	146,398	(2025) 160,300	165,900	162,757	171,500	100%
Santa Clara County									
Milpitas[c]	62,698	63,383	65,400	65,276	(2020) 77,100	82,400	88,841	91,400	48%
Santa Clara[d]	102,361	105,402	108,700	110,771	(2010) 129,900	117,400	140,698	142,100	15%
Sunnyvale	131,760	128,902	131,700	133,544	(2025) 154,600	146,900	151,610	159,100	46%
San Mateo County									
East Palo Alto	29,506	32,242	32,700	32,083	(2020) 34,600	39,600	32,712	43,600	100%
Redwood City[e]	75,402	73,114	77,300	76,087	(2000) 70,000	87,100	93,535	122,300	92%
San Mateo[f]	92,482	91,081	94,900	94,315	(2010) 100,700	98,000	See note f	119,800	100%
South San Francisco[g]	60,552	60,735	61,000	61,824	(2020) 67,400	68,500	73,884	71,800	See note g
City and County of San Francisco	776,733	739,426	798,000	798,680	(2020) 811,100	859,200	849,942	924,600	97%

a ACWD = Alameda County Water District; U.S. Census, ABAG, Department of Finance (DOF), and general plan figures are the combined estimates for Fremont, Newark and Union City.
b The Newark general plan projection shown is from the 2002 housing element. The general plan (adopted in 1992) projected a buildout population of 51,942 by the year 2007.
c The general plan population is based on the population shown in the general plan.
d The general plan figure for Santa Clara is the average of the range projected in the general plan at buildout of 124,800 to 135,000.
e The SFPUC provides 100 percent of Redwood City's potable water. The remaining 8 percent of demand indicated here is met by recycled water.
f The city of San Mateo is served by the CWS–Mid-Peninsula District and Estero MID, both of which serve other jurisdictions as well; therefore, the 2030 population assumed by the wholesale customers is not comparable to projections for the city. The SFPUC supplies all of the CWS–Mid Peninsula District's and Estero MID's water.
g The customer-selected projection is the combined 2030 estimates for the CWS–South San Francisco District (which also serves Colma and a small portion of unincorporated San Mateo County), based on the 2004 demand study, and the Westborough Water District, based on the district's 2005 UWMP. The SFPUC would supply approximately 85 percent of the CWS–South San Francisco District's water supply in 2030 and 100 percent of Westborough Water District's. The other figures are for South San Francisco only.

SOURCES: ABAG, 2004; California Department of Finance, 2006; City of East Palo Alto, 1999a; City of Fremont, 2003a; City of Hayward, 2002a; City of Milpitas, 2002a; City of Newark, 2002; City of Redwood City, 1990; City of San Mateo, 2001; City of Santa Clara, 2002; City of Sunnyvale, 2002; City of Union City, 2002a; U.S. Census Bureau, 2000; U.S. Census Bureau, 2006; URS, 2004, Westborough Water District, 2005.

Newark

Overview

Newark is bordered on all sides by the city of Fremont—to the north, east, and south by developed areas of Fremont, and to the west by salt ponds, wetlands, and other areas of the Fremont baylands (refer to Figure 7.2 in PEIR Chapter 7). According to the Newark General Plan, the city's land use mix consists primarily of residential neighborhoods, with several key commercial shopping areas and smaller neighborhood commercial areas, industrial uses located primarily along the western edge of the developed part of the city, and salt evaporation ponds and processing facilities on the extreme western side of the city(City of Newark, 1992a).

Water Service

Newark, along with Fremont and Union City, is served by the ACWD. Refer to the description of ACWD under Fremont water service, above.

Growth Trends and Policies

Newark grew most rapidly in the 1960s, with the population nearly tripling (from 9,911 in 1960 to 27,157 in 1970). The population growth continued at a somewhat lower rate in the ensuing decades, increasing by approximately 18 percent in the 1970s and 1980s and 12 percent in the 1990s (City of Newark, 2002). According to the U.S. Census, the city's population was 42,471 in 2000. Population estimates since 2000 vary somewhat. The U.S. Census Bureau estimates Newark's 2005 population to be 41,956, a 1.2 percent decrease, whereas the DOF estimates Newark's total population to be 43,486 as of January 1, 2006, a 2.4 percent increase from 2000 (see Table E.4.1).

Newark does not have an adopted growth management ordinance; policies contained within the general plan are intended in part to manage growth in the city (Slafter, 2005). The Newark General Plan (adopted in 1992) contains goals, policies, and programs intended to direct public and private decision-making and guide future growth and change within the city (City of Newark 1992a). The general plan identifies six study areas with the most potential for change, including areas along the city's western and southern boundaries as well as an "infill[3] area," where development would result from development of the few remaining vacant sites or change in the existing uses within urbanized Newark.

Buildout under the general plan is expected to occur in 2007 and result in a total population of approximately 51,942 (City of Newark, 1992b). The more recent (2002) housing element projects a population of 49,800 in 2020, as shown in Table E.4.1. The housing element cites ABAG projections that the city will grow by about 13.5 percent by 2010 and at a lower rate (approximately 3 percent) between 2010 and 2020, as sites for new development are depleted (City of Newark, 2002).

[3] "Infill" development generally refers to development of individual or small groups of vacant parcels that are surrounded by development.

Union City

Overview

Union City is bordered on the west by a salt marsh that is within the Hayward city limits, on the east by the foothills of the Diablo Range, on the north by Hayward, and on the south by Fremont (refer to Figure 7.2 in PEIR Chapter 7). The city's land use mix consists of approximately 18 percent residential uses, 3 percent commercial, 3 percent public/institutional, 58 percent agricultural and open space, and 9 percent vacant land or miscellaneous uses such as rights-of-way and canals (City of Union City, 2002b).

Water Service

Union City, along with Fremont and Newark, is served by the ACWD. Refer to the description of ACWD under Fremont water service, above.

Growth Trends and Policies

The city grew rapidly from the 1960s through the 1980s, from a population of approximately 7,000 in 1962 to 45,000 in 1983 (City of Union City, 2002c); growth continued through the 1990s, and in 2000 the city had a population of 66,869 according to the U.S. Census. Population estimates since 2000 vary somewhat. The U.S. Census Bureau estimates Union City's 2005 population to be 69,176, a 3.5 percent increase, whereas the DOF estimates Union City's total population to be 71,752 as of January 1, 2006, a 7.3 percent increase from 2000 (see Table E.4.1).

Union City does not have an adopted growth management ordinance. A prior growth management ordinance was revoked about 10 years ago, and since then the general plan has guided growth in the city (Leonard, 2005). The Union City General Plan (2002c) contains goals and policies to guide future development in the city. The general plan identifies several physical constraints that present challenges in planning for future growth, including sensitive wetland habitat near the city's western border, steep topography on the east side of the city, and limited available land. Infill development and redevelopment strategies are therefore identified as the primary means for accommodating future growth. The general plan identifies five business districts, which are generally underutilized or have obsolete uses, that can be redeveloped to help the city achieve housing and job growth goals (City of Union City, 2002c). Buildout under the general plan is expected to occur in 2020 and result in a total population of approximately 80,100 (City of Union City, 2002a).

Hayward

Overview

Hayward is located in western Alameda County, on the east side of San Francisco Bay (refer to Figure 7.2 in PEIR Chapter 7). The city encompasses approximately 61 square miles and is bordered on the west by the Bay, on the east by unincorporated Alameda County and the city of Pleasanton, on the south by Fremont and Union City, and on the north by the unincorporated communities of San Lorenzo, Ashland, and Castro Valley, and by other unincorporated Alameda County lands.

Water Service

Hayward owns and operates its own water system (which is maintained and operated by the City's Public Works Department Utilities Division) and receives all of its water from the SFPUC. The Hayward water system serves the entire city, except for a small area in the northern part of the city that is served by the East Bay Municipal Utility District (EBMUD). The service area population was 144,500 as of 2005. Residential accounts represent approximately 57 percent of Hayward's current total water demand; commercial and industrial accounts represent about 34 percent; other uses represent 4 percent; and unaccounted-for water represents 5 percent (BAWSCA, 2005).

Growth Trends and Policies

Hayward grew rapidly in the 1950s with the opening of Interstate 580, from a population of 14,000 in 1950 to 72,000 in 1960. Industrial development surged in the 1960s and 1970s, and multifamily residential housing grew through the 1980s; by 1990, the city's population was 111,000. Residential development in the 1990s predominantly consisted of infill development in the form of single-family detached homes on smaller lots and, toward the end of the decade, townhouses or single-family attached units. Today, Hayward is highly urbanized. Although only about 50 percent of the total area within the city limits is in urban use, the remaining land is either baylands (marshes and salt ponds, 9 square miles), rangelands (5 square miles), or under water (within San Francisco Bay, 17 square miles) (City of Hayward, 2002a). Current land uses include 29 percent residential uses, 5 percent commercial, 14 percent industrial, 31 percent institutional, and 21 percent categorized as agricultural/rural, vacant, or other/unknown (City of Hayward, 2002b). According to the Census 2000, Hayward had a total population of 140,030 in 2000. Population estimates since 2000 vary somewhat. The U.S. Census Bureau estimates Hayward's 2005 population to be 140,293, a 0.2 percent increase, whereas the DOF estimated Hayward's total population to be 146,398 as of January 1, 2006, a 4.5 percent increase from 2000 (see Table E.4.1).

Hayward does not have an adopted growth management ordinance; policies contained within the general plan are intended in part to manage growth in the city (Rizk, 2005). The Hayward General Plan (adopted in 2002) serves as a policy guide for determining physical development in the city through 2025. The general plan includes policies that encourage the use of "smart growth" principals in long-range planning and development.[4] The City of Hayward expects continued growth through 2025, with the general plan guiding a gradual transition of certain areas from lower to higher density. Buildout under the general plan is expected to occur in 2025 and

4 The general plan states that, while there is no universally accepted definition of smart growth, smart growth principles generally include those that would foster development that revitalizes central cities and suburbs, supports public transit, and preserves open space and agricultural lands by encouraging more infill development, more concentrated development, and more redevelopment, especially in areas served by transit or close to major employment centers (City of Hayward, 2002b).

result in a total population of approximately 160,300 for the city itself and 190,700 for the Hayward Planning Area, which includes the communities of Cherryland and Fairview (City of Hayward, 2002a). The general plan also includes a policy to evaluate annexing unincorporated islands[5] and adjoining urbanized county areas within Hayward's sphere of influence (City of Hayward, 2002a; City of Hayward, 2002b).

E.4.2 Santa Clara County

Milpitas

Overview

Milpitas occupies an area of about 13.6 square miles and is located southeast of the south end of San Francisco Bay in northern Santa Clara County (refer to Figure 7.2 in PEIR Chapter 7). It is bordered by Fremont on the north, the foothills of the Diablo Range on the east, and San Jose on the south and west.

Water Service

The City of Milpitas owns and operates its own water system; it receives approximately 65 percent of its water from the SFPUC and the rest from the Santa Clara Valley Water District (SCVWD). In general, residents receive SFPUC water, while the SCVWD primarily serves industrial and commercial areas. Residential accounts represent approximately 43 percent of the city's total water demand; commercial/industrial uses represent 29 percent; other uses account for 23 percent; and unaccounted-for water represents approximately 4 percent of total demand (BAWSCA, 2005). According to the Milpitas general plan, the city's land uses consist of approximately 25 percent residential, 4 percent commercial, 14 percent industrial, 17 percent public facilities and parks, 5 percent transportation facilities (e.g., major streets, freeways, and rail), and 35 percent undeveloped lands (City of Milpitas, 2002a).

Growth Trends and Policies

While the origins of the city of Milpitas go back to the latter part of the 18th century, most of the city has developed in the last 30 years. Between 1980 and 1990 the city grew at an average annual rate of 3 percent, from a 1980 population of 37,820 to 50,690, and between 1990 and 2000 at an average annual rate of 2.2 percent. The city's growth rate between 1980 and 2000 was roughly twice that of Santa Clara County as a whole (City of Milpitas, 2002a). The city's population in 2000 was 62,698 (Census 2000). Population estimates since 2000 vary somewhat. The U.S. Census Bureau estimates Milpitas's 2005 population to be 63,383, a 1.1 percent increase, whereas the DOF estimates Milpitas's total population to be 65,276 as of January 1, 2006, a 4.1 percent increase from 2000 (see Table E.4.1). (The 2002 general plan update projected a population of 67,300 for 2005.)

[5] By "islands" the general plan refers to pockets of unincorporated area within and adjacent to the City's industrial corridor (Hayward, 2004b).

Milpitas does not have an adopted growth management ordinance. Policies contained within the general plan are intended in part to manage growth in the city (Duncan, 2005). The City has adopted an Urban Growth Boundary (UGB), which delineates the ultimate extent of the urbanized area. The UGB was approved by local voters in 1998 and is intended to remain in place through 2018. According to the housing element (City of Milpitas, 2002b), the UGB does not include provisions related to residential development capacity or growth control and was primarily created as a hillside protection measure. The land use element includes polices related to the UGB (City of Milpitas, 2002a).

The Milpitas general plan, *2002 Update of the 1994 General Plan* (City of Milpitas, 2002a), serves as a policy guide for determining physical development in the city. The 2002 general plan update incorporates the 2002 Midtown Milpitas Specific Plan, which includes mixed-use development and new, very-high-density multifamily development. The revised general plan also includes transit-oriented development and gateway office overlay designations. According to the general plan, the rapid growth in the region has left little room in the flatlands for expansion of the city boundaries. With the Midtown Milpitas Specific Plan, the city's general plan population at buildout is projected to be 77,100 (City of Milpitas, 2002a; City of Milpitas, 2002c).

According to the 2002 housing element, approximately 87 percent of the development capacity to meet Milpitas' identified share of regional housing need is located within developed areas, and approximately 95 percent of the residential development capacity consists of higher density housing sites. The analysis of infrastructure and public services constraints concluded that adequate water supply is not a constraint to developing the city's fair share housing allocation (City of Milpitas 2002b).

City of Santa Clara

Overview

Santa Clara is located at the south end of San Francisco Bay; it is bordered by San Jose to the north, east, and south, and Sunnyvale and Cupertino to the west (refer to Figure 7.2 in PEIR Chapter 7).

Water Service

The City of Santa Clara owns and operates its own water system; the city's service area encompasses nearly 19.4 square miles. Local groundwater is the primary source of potable water. The SFPUC supplies approximately 15 percent of the city's water (URS, 2004; BAWSCA, 2005). According to the Santa Clara General Plan, the city normally receives about 30 percent of its water from the SFPUC and the SCVWD, and the remaining 70 percent from the city's 28 wells (City of Santa Clara, 2002). SFPUC water is delivered to the northern portion of the city, and SCVWD water is delivered to the southwestern portion of the city. Santa Clara also operates a recycled water system; tertiary-treated effluent from a plant jointly operated with San Jose is available for landscape irrigation and certain industrial uses (BAWSCA, 2005).

The northern portion of Santa Clara is predominantly commercial/industrial, and the southern portion is primarily residential (URS, 2004). Residential accounts represent approximately 45 percent of total water demand; commercial/industrial uses represent approximately 46 percent; other uses represent 7 percent; and unaccounted-for water represents 2 percent of total demand (BAWSCA, 2005). As of 2000, land uses consisted of approximately 37 percent residential, 6 percent commercial, 22 percent industrial, 30 percent public facilities (including institutional, educational, parks, and rights-of-way), 4 percent vacant, and 0.2 percent mixed use (City of Santa Clara, 2002).

Growth Trends and Policies

Santa Clara has grown by more than 800 percent since 1950, from a population of 11,702 in 1950 to 102,361 in 2000. The city's fastest growth occurred between 1950 and 1960, when the city experienced a fivefold population increase (to 58,850). Between 1960 and 1980, the population increased by nearly 50 percent (to 87,700). Since then, constraints on available land for residential development have limited new housing development and thus population growth. According to the housing element, the city grew by 7 percent between 1980 and 1990 and by 9 percent between 1990 and 2000 (City of Santa Clara, 2002). The city's population in 2000 was 102,361 (Census 2000), with 135,370 jobs and 39,630 dwelling units in the city (City of Santa Clara, 2002). Population estimates since 2000 vary somewhat. The U.S. Census Bureau estimates Santa Clara's 2005 population to be 105,402, a 3.0 percent increase, whereas the DOF estimates Santa Clara's total population to be 110,771 as of January 1, 2006, an 8.2 percent increase from 2000 (see Table E.4.1).

The 1992 Santa Clara General Plan (with land use and housing element updates in 2002) serves as a policy guide for determining physical development in the city through 2010. The general plan projects continued growth in the city through the development and redevelopment of underutilized properties and recognizes the need for preservation and enhancement of single-family areas. According to the general plan, the city is essentially built out; however, there is potential for development, redevelopment, and expansion at various locations in the city. The general plan identifies a number of sites for new development, including some sites distributed throughout the city and some in specific areas, such as along the El Camino Real corridor and the area northeast of Agnew Road (City of Santa Clara, 2002). Buildout under the general plan is expected to occur in 2010 and result in a total population ranging from 124,800 to 135,000, about 151,280 jobs, and up to 12,556 additional dwelling units (City of Santa Clara, 2002).

Stanford University

Overview

Stanford University comprises approximately 8,200 acres in Santa Clara and San Mateo Counties. Approximately 4,000 acres containing the university's academic, open space, and agricultural land are located in unincorporated Santa Clara County, on the border of San Mateo County. The university is generally bordered on the northwest by Menlo Park, on the southeast, east, and south by Palo Alto, and on the west by Portola Valley and unincorporated Santa Clara County.

Water Service

The university's water system, operated by the Stanford Utilities Division, primarily serves the central campus, which comprises approximately 2,000 acres (3.1 square miles). Approximately 70 percent of the university's water supply—and all of its potable water—is supplied by the SFPUC; approximately 8 percent of total supply is groundwater, and approximately 22 percent is nonpotable surface (lake) water used for irrigation (BAWSCA, 2005).

According to the Stanford University Community Plan, land uses in the central campus area consist of the academic campus, open space, and low- and moderate-density residential uses (Santa Clara County, 2000). Residential uses account for approximately 35 percent of water demand; commercial/industrial uses represent about 24 percent; other uses represent 40 percent; and unaccounted-for water represents approximately 1 percent of demand (BAWSCA, 2005). The current cumulative building area on campus is approximately 12.3 million gross square feet (gsf).

Growth Trends and Policies

Stanford was founded in 1891; most new development at the campus, in the form of academic buildings, support services, and student housing, has occurred since World War II. Since 1960, the building area has almost tripled, from 4,363,375 gsf to 12,294,230 in 2000. Growth since 1960 represents an average annual addition of approximately 198,300 square feet of building area. The campus building area includes approximately 9,760 units of undergraduate and graduate housing. (Stanford University is not shown in Table E.4.1 because most of the data presented in the table do not apply to the university. The Stanford Water Utility serves only the university, whereas ABAG, DOF, and the Census Bureau data are developed for cities and counties.)

The 1995 Santa Clara County General Plan sets goals and overall policy direction for physical development and land use in unincorporated areas of the county. The Stanford Community Plan (adopted as an amendment of the General Plan in 2000) refines the policies of the general plan as they apply to Stanford lands within the county. The community plan identifies policies and establishes various land use designations. The plan emphasizes two basic principles of the Santa Clara County General Plan: compact and efficient urban development, and conservation of natural resources. However, the community plan is not intended to define the long-term development potential of Stanford's unincorporated lands in terms of the amount or location of development beyond the planning horizon (Santa Clara County, 2000).

In the community plan, the concept of urban growth boundaries promoted in the county general plan is applied to the university in the form of an Academic Growth Boundary (AGB). According to the community plan, development at Stanford must occur within the AGB; furthermore, the AGB will remain in the established location for a period of at least 25 years and may only be modified within this period by a fourth-fifths vote of all members of the board of supervisors. In addition to the 25-year time limitation, the AGB cannot be modified until the total building area on the central campus reaches 17,300,000 square feet. At the rate of 200,000 square feet of additional development per year (the historical growth rate at the campus), a total of 5 million square feet would be added in 25 years, for a total building area in the central campus, excluding housing, of 17,300,000 square feet. The community plan indicates that an additional 2,035,000 gsf of academic and academic support space and 3,018 additional housing units may be constructed through 2010.

Development on the campus is also regulated by a general use permit issued by Santa Clara County. Concurrent with development of the community plan, Stanford University applied to the County to revise its general use permit, requesting an additional 2,035,000 square feet of academic and support space, 2,000 housing units for students, and 350 units for postdoctoral fellows. These facilities would result in the development of 3,485,000 square feet of new building area on the campus between 2000 and 2010. A revised general use permit was issued in 2000.

City of Sunnyvale

Overview

Sunnyvale is located at the southwest end of San Francisco Bay (refer to Figure 7.2 in PEIR Chapter 7). The city is bordered on the north by San Francisco Bay, on the west by Mountain View and Los Altos, on the south by Cupertino, and on the east by Santa Clara and San Jose.

Water Service

The City of Sunnyvale owns and operates its own water system. The service area for the water utility is contiguous with the city limits; however, CWS serves several small areas within the city. The city's water service area encompasses nearly 24 square miles (URS, 2004; BAWSCA, 2005). The 1996 water resources sub-element of the Sunnyvale General Plan indicates that the SFPUC provides approximately 40 percent of the city's water and the SCVWD provides approximately 50 percent; the remaining 10 percent is from local groundwater sources (City of Sunnyvale, 1996). BAWSCA's more recent agency profiles indicate that the SFPUC provides approximately 42 percent, with SCVWD, CWS, and local groundwater providing the balance (BAWSCA, 2005). Residential accounts represent approximately 58 percent of total water demand; commercial/industrial uses represent 23 percent; other uses represent 17 percent; and unaccounted-for water represents 2 percent of demand (BAWSCA, 2005). According to the general plan, the city's land use mix consists of approximately 41 percent residential; 6 percent commercial; 18 percent industrial; 10 percent public facilities; 14 percent baylands, creeks, and sloughs; and 11 percent categorized as "other," which includes public and private schools and religious, military, park, agricultural, and vacant land uses (City of Sunnyvale, 1997).

Growth Trends and Policies

Between 1950 and 2000, Sunnyvale changed from an agricultural area and location for heavy industry to a center for high technology. The city's first surge of growth in the 1950s established its basic development pattern. The city continued to grow rapidly until the mid-1970s. Today Sunnyvale is nearly built out, and infill development, redevelopment, and revitalization activities predominate (City of Sunnyvale, 2002). The city's population in 2000 was 131,760 (Census 2000). Population estimates since 2000 vary somewhat. The U.S. Census Bureau estimates

Sunnyvale's 2005 population to be 128,902, a 2.2 percent decrease, whereas the DOF estimates the city's population to be 133,544 as of January 1, 2006, a 1.4 percent increase over 2000 (see Table E.4.1).

Sunnyvale does not have an adopted growth management ordinance. Growth in the city is managed through the general plan and zoning ordinance (Zarrin, 2006). The Sunnyvale General Plan is the principal policy document guiding future conservation and development of the city. It includes both long-term goals and policies and shorter term "action statements" to guide local government decisions (City of Sunnyvale, 2002). Growth-related policies of the land use and transportation element include promotion of integrated and coordinated local land use and transportation planning, protection of regional environmental resources through local land use practices, and protection of the integrity of the city's residential, industrial, and commercial neighborhoods (City of Sunnyvale, 1997). Buildout under the general plan is expected to occur in 2025 and result in a total population of 154,600 (City of Sunnyvale, 2002).

E.4.3 San Mateo County

City of East Palo Alto

Overview

East Palo Alto is located at the southern end of the San Francisco Peninsula on the populous west side of San Francisco Bay (refer to Figure 7.2 in PEIR Chapter 7). The city is bordered by the Bay to the east, Menlo Park to the north and west, and Palo Alto to the south.

Water Service

East Palo Alto's public water system is operated under contract through the city's Department of Public Works by American Water Company[6] (City of East Palo Alto, 2006). The city's service area encompasses approximately 2.5 square miles and covers most of the city. The SFPUC is the city's only source of supply. (Two other water companies, the Palo Alto Mutual Water Company and the O'Conner Tract Mutual Cooperative Water Company, which are not SFPUC customers, also provide water to small sections of the city.) Residential accounts represent approximately 68 percent of the municipal water system's total water demand; commercial/industrial accounts represent about 13 percent; other uses represent about 9 percent; and unaccounted-for water represents 10 percent (BAWSCA, 2005). According to the city's general plan, land uses consist of approximately 52 percent residential, 2 percent commercial, 6 percent industrial, 7 percent institutional, and 33 percent open space, conservation resource management, agricultural, or vacant lands (City of East Palo Alto, 1999b).

[6] Previously, the city's water system had been operated by San Mateo County under the name East Palo Alto Waterworks District; the city took over the water distribution system from the county in 2001.

Growth Trends and Policies

Prior to the city's incorporation in 1983, East Palo Alto was part of unincorporated San Mateo County. The area historically regarded as East Palo Alto was much larger than the city's current area of 2.5 square miles. Between the late 1940s and 1960s, areas previously part of East Palo Alto were annexed to Menlo Park and Palo Alto. Economic activities in East Palo Alto have included farming, ranching, and brick manufacturing. Today, the city has a mix of small industrial, agricultural, and commercial businesses. Since its incorporation, the city has grown dramatically—by 29 percent between 1980 and 1990 (from a population of 18,292 to 23,451) and by 26 percent between 1990 and 2000. However, development of additional housing has not kept pace with the population growth, resulting in an increase in household size from 2.7 people per housing unit in 1980 to 4.2 people per housing unit in 2000 (City of East Palo Alto, 2001). The city's population in 2000 was 29,506 (Census 2000). Population estimates since 2000 are similar. The U.S. Census Bureau estimates East Palo Alto's 2005 population to be 32,242, a 9.3 percent increase, and the DOF estimates the city's population to be 32,083 as of January 1, 2006, an increase of 8.7 percent over 2000 (see Table E.4.1).

East Palo Alto does not have any growth management ordinances in effect (Banico, 2005). The East Palo Alto General Plan (City of East Palo Alto, 1999b) serves as a policy guide for determining the appropriate physical development and character for the city. The general plan identifies infill properties as the site of much of the new development that will occur in the city, and emphasizes redevelopment or renovation of major portions of the community as critical to achieving fiscal stability (City of East Palo Alto, 1999b). East Palo Alto expects continued growth through general plan buildout. Buildout is projected to occur in 2020, with a population of 34,600 (City of East Palo Alto, 1999a).

City of Redwood City

Overview

Redwood City is located in the geographic center of the San Francisco Peninsula, near the southern end of San Mateo County (refer to Figure 7.2 in PEIR Chapter 7). The city is bordered by the Bay to the east, San Carlos, Belmont, and Foster City and unincorporated county land to the north and west, Woodside to the west, and Atherton. Menlo Park , and unincorporated land to the south.

Water Service

Redwood City owns and operates its own water utility and supplies water to portions of Woodside, San Carlos, and unincorporated areas of the county. The city's service area includes about 83,000 residents and covers roughly 35 square miles. Redwood City purchases all of its potable water from the SFPUC (BAWSCA, 2005). The area within the city's boundaries is roughly divided between land and water areas, with 54 percent land area and 46 percent water area. According to the Redwood City General Plan (City of Redwood City, 1990), 46 percent of the city's land area is in residential development, the city's predominant land use; other uses include public and quasi-public land uses (14 percent), commercial land use (10 percent), industrial land use (6 percent), and streets and rights-of-way (25 percent).

Growth Trends and Policies

At the time San Mateo County was formed, in 1856, Redwood City was the only bayside settlement that resembled a real town, and in 1867 it became the county's first incorporated city. By 1870, the city had a population of more than 700, which nearly doubled by 1880. While the city continued to grow steadily in the ensuing decades, the postwar population influx that occurred throughout California from 1940 to 1960 created the most dramatic growth in Redwood City's history—from 12,453 to 46,290 (City of Redwood City, 1990). During the 1970s and 1980s, changes in industry and housing occurred, with the craft industries of the city's early years giving way to high-technology and information-age industries (City of Redwood City, 1990). The 1990 Redwood City General Plan indicated that the city was expected to reach a population of 70,000 by the year 2000 (Redwood City, 1990, Chapter 4, p. 4-1). The EIR for the Downtown Precise Plan cites ABAG's *Projections 2005* forecasts for the city (not including its sphere of influence) of 87,100 in 2020. The city's population in 2000 was 75,402 (Census 2000). Population estimates since 2000 vary somewhat. The U.S. Census Bureau estimates Redwood City's 2005 population to be 73,114, a 3.0 percent decrease, whereas the DOF estimates the city's population to be 76,087 as of January 1, 2006, a 0.9 percent increase over 2000 (see Table E.4.1).

Redwood City is essentially built out, and future development will be accommodated through infill development, including the redevelopment of industrial sites and development along the El Camino Real corridor. In May 2006, the Planning Commission adopted principals to guide its general plan update (currently underway) and provide the foundation for general plan elements. These guiding principals include (among others) planning for sustainability, which recognizes the city's long-term obligations to future residents and encourages development that conserves natural resources; working to develop attractive, convenient transportation alternatives to the automobile; and designing for active pedestrian and bicycle-friendly streets and public spaces (City of Redwood City, 2006). The City's recently adopted Downtown Precise Plan (City of Redwood City, 2007a) provides for housing in the downtown area that is affordable to a range of incomes, mixed residential and commercial development, and the concentration of retail development in certain areas proximate to civic buildings and activities, so that access to transit and parking, customers, and destination identity for a variety of land uses are shared. The plan is intended to revitalize the downtown area and serve as a tool to help the city meet its goals and achieve sustainable development (City of Redwood City, 2007a). The City Council approved the "moderate intensity" alternative of the plan, which would allow development of 2,500 additional residential units as well as specified amounts of office, retail and lodging in the downtown planning area (City of Redwood City, 2007b). According to the plan's EIR, neither of the development alternatives considered (a maximum intensity alternative and a moderate intensity alternative) would permit buildout totals that were substantially different from buildout allowed under existing zoning, the City expected that achieving permitted buildout totals was more likely to be realized with adoption of the precise plan; (City of Redwood City, 2007c).

Redwood City's Franklin Project Phase I, a development that includes residential units and retail within walking distance of the Caltrain station and downtown area, was the first project to receive a grant from the City/County Association of Governments of San Mateo County (C/CAG) Transit Oriented Development (TOD) Incentive Program. The C/CAG's TOD Incentive Program won the Environmental Protection Agency's National Award for Smart Growth in 2002 (U.S. EPA, 2002).

City of San Mateo

Overview

The city of San Mateo is located in the middle of the San Francisco Peninsula (refer to Figure 7.2 in PEIR Chapter 7). The city is bordered by the Bay to the east, Burlingame to the north, Hillsborough to the west, and Belmont to the south.

Water Service

San Mateo is served by the CWS–Mid-Peninsula District, which is located in central San Mateo County; this water district also serves San Carlos and adjacent unincorporated portions of San Mateo County, including the Highlands and Palomar Park (refer to Figure 7.1 in PEIR Chapter 7). In 2001, the CWS–Mid-Peninsula District served 120,856 residents and covered approximately 17 square miles. All of the district's water is supplied by the SFPUC, as local water storage is not feasible and groundwater of adequate quantity and quality is not available (BAWSCA, 2005).

Growth Trends and Policies

San Mateo's development began in earnest with the establishment of a stagecoach stop along the Old County Road (El Camino Real [Highway 82]) in the 1850s. With the advent of the railroad in the 1860s, the center of city activity shifted to the area along Third Avenue and B Street. The city was incorporated in 1894 and remained a relatively small, rural community until the 1940s. The city grew substantially during World War II and the following years, from a population of 19,405 in 1940 to 69,870 by 1960, and its economic base shifted toward office and retail sectors (City of San Mateo, 1990).

During the 1970s and 1980s, population growth slowed, increasing by only 16,000, while both retail space and office space increased significantly. Retail uses are now largely concentrated at Hillsdale Shopping Center, along El Camino Real, and office uses are concentrated in office parks along the Highway 92 corridor and, to a lesser extent, the downtown area. According to the general plan, these changes have altered the image of San Mateo as a "bedroom community" to a place where people can both live and work as well as an important subregional office retail center (City of San Mateo, 1990).

The general plan characterizes San Mateo as becoming a larger, more diverse, and more complex community, but also as one with a slowing growth rate due to the continued decrease in average household size, limited vacant land, and high local land values. The population of the city and its sphere of influence was expected to increase from an estimated 92,482 in 2000 to 100,700 in

2010 (City of San Mateo, 2001). According to the Census 2000, the city's population in 2000 was 92,482. Population estimates since 2000 vary somewhat. The U.S. Census Bureau estimates San Mateo's 2005 population to be 91,081, a 1.5 percent decrease, whereas the DOF estimates the city's population to be 94,315 as of January 1, 2006, a 2 percent increase over 2000 (see Table E.4.1).

The City of San Mateo does not have growth management policies, as the city is largely built out. Future growth is expected to be accommodated through redevelopment on infill sites (Ring, 2006). An example of such development is the San Mateo Rail Corridor Transit-Oriented Development Plan, which was adopted in 2005. Implementation of the plan is expected to improve access to Caltrain stations and provide higher density housing that will help alleviate some of the measures throughout the Bay Area for both affordable and market-rate housing (City of San Mateo, 2005).

City of South San Francisco

Overview

South San Francisco is located at the northern end of the San Francisco Peninsula (refer to Figure 7.2 in PEIR Chapter 7). The city is bordered by the Bay to the east, Colma to the north, Daly City and Pacifica to the west, and San Bruno to the south.

Water Service

South San Francisco is served by CWS–South San Francisco District, which also serves Colma, part of unincorporated San Mateo County, and a small part of Daly City, and Westborough Water District. CWS-South San Francisco encompasses approximately 11.2 square miles; in 2001, it served a population of 49,207. Land use in the water district service area includes both residential and commercial areas (City of South San Francisco, 1999). In FY 2001/2002 approximately 89 percent of the CWS-South San Francisco's water supply was provided by the SFPUC (BAWSCA, 2005). The remaining water demand in the CWS–South San Francisco service area is met by groundwater supply (City of South San Francisco, 1999). Westborough Water District encompasses approximately 1 square mile; in 2000 it served a population of 13,033 (Westborough Water District, 2005). Land use in the service area is primarily residential with some commercial land uses. In FY 2001/2002, 100 percent of Westborough's supply was provided by the SFPUC (BAWSCA, 2005).

Growth Trends and Policies

Steel mills and other industries began to locate in South San Francisco following construction of the Southern Pacific Railroad line between San Francisco and San Jose (1904 to 1907). When the city incorporated in 1908 it had 1,989 residents and 14 major industries. The city's steel and shipbuilding industries continued to grow through the 1920s and World War II, and helped to spur residential growth. South San Francisco's fastest period of growth was during the war and postwar period; between 1940 and 1960, the population increased sixfold, from approximately

6,000 to over 39,000. This growth, achieved through extensive annexation and residential subdivision, was fueled by continued industrial growth. Almost half of the city's existing housing units were built between 1940 and 1959. In the 1960s, drainage and fill of marshlands made shoreline areas available for development. Over the past 30 years, the city's industrial base has slowly transformed, with warehousing, research, and biotechnology replacing steel production and other heavy industries. Since the 1960s, infill development has been the primary means of accommodating growth and change along major arteries west of Highway 101, although major expansion has occurred in the Westborough area and the area east of Highway 101. South San Francisco contains 8.3 percent of San Mateo County's population (City of South San Francisco, 1999). The city's population in 2000 was 60,552 (Census 2000). Population estimates since 2000 vary slightly. The U.S. Census Bureau estimates South San Francisco's 2005 population to be 60,735, a 0.3 percent increase, whereas the DOF estimates the city's population to be 61,824 as of January 1, 2006, a 2.1 percent increase over 2000 (see Table E.4.1).

The city identifies the Terrabay multi-use development project, on the south slopes of San Bruno Mountain, as its last phase of expansion. Future growth is expected to be limited to redevelopment and a few remaining unincorporated islands within the city. The general plan projects that the city's growth rate will be much slower over the 20-year horizon of the plan than the growth experienced in the 10 years before its publication (in 1999). The general plan forecasts a buildout population of 67,400, although buildout is not necessarily expected to occur within the 20-year horizon of the plan (City of South San Francisco, 1999).

E.4.4 City and County of San Francisco

Overview

San Francisco is located at the northern tip of the San Francisco Peninsula. The city is surrounded by water on three sides: to the west by the Pacific Ocean, and to the north and east by San Francisco Bay. The city is bordered to the south by San Mateo County and the cities of Daly City and Brisbane.

Water Service

The City and County of San Francisco (CCSF) owns its own water system, which is maintained and operated by the SFPUC. The SFPUC is the retail water supplier for all of the city's water users. The SFPUC regional water system meets 100 percent of the city's potable water demand and about 97 percent of total demand. Nonpotable groundwater, which is not linked hydraulically to the SFPUC water system, supplements the city's potable supply and is used for landscape irrigation at Golden Gate Park, the San Francisco Zoo, and along the Great Highway. According to the *City and County of San Francisco Retail Water Demands and Conservation Potential* (Hannaford and Hydroconsult, 2004), in 2000 (the study's base year) residential water use accounted for approximately 57 percent of the city's water use; commercial, industrial, and municipal uses accounted for approximately 33 percent; other uses (which include builders and contractors and docks and shipping) accounted for less than 1 percent (0.3 percent); and unaccounted-for water represented about 10 percent. For 2005, this distribution of water use was expected to shift slightly, with 56 percent residential use, 35 percent nonresidential, 0.3 percent builders/ contractors and docks/shipping, and 9 percent unaccounted-for water (Hannaford and Hydroconsult, 2004).

Growth Trends and Policies

San Francisco was incorporated as a city on April 15th, 1850. The County of San Francisco and the City of San Francisco were established as separate entities by the state legislature in 1850 and were combined by the legislature in 1856.[7] At that time, San Francisco's population was approximately 30,000 (CCSF, 2006a; CCSF, 2006b). By 1900, the city had grown approximately tenfold, to 342,782 residents (U.S. Census Bureau, 1995).

The city grew steadily for most of the first half of the 20th century, with the population increasing more than 20 percent each decade from 1900 to 1930. There was little change between 1930 and 1940, and between 1940 and 1950 the city grew by 22 percent, to a population of 775,357. In each of the next three decades the city's population declined somewhat, decreasing by 12 percent overall between 1950 and 1980. By 1980 this downward trend reversed, and the city grew by 7 percent each decade between 1980 and 2000, to a population of 776,733 (an increase of only 0.2 percent above the 1950 population) (U.S. Census Bureau, 1995; U.S, Census Bureau, 2000). Population estimates since 2000 vary somewhat. The U.S. Census Bureau estimates San Francisco's 2005 population to be 739,426, a 4.8 percent decrease, whereas the DOF estimates the city's population to be 798,680 as of January1, 2006, a 2.8 percent increase from 2000 (see Table E.4.1).

According to the general plan housing element, San Francisco is a "mature built-up city with very few large open tracts of land to develop" (CCSF, 2004). The *Citywide Action Plan* (CCSF, 2006c) "explores comprehensively the issue of how to meet the need for housing and jobs in ways that capitalize upon and enhance the best qualities of San Francisco as a place." Under this plan, the planning department is developing policy initiatives "for supporting and encouraging higher density, mixed-use—primarily residential—infill in selected transit-rich corridors."

In a November 2005 letter to ABAG, San Francisco's interim planning director indicated the CCSF's disagreement with the 2030 population projections contained in ABAG's *Draft Projections 2005* (provided to the CCSF prior to publication). The letter indicated that the CCSF expected less growth than was projected in *Draft Projections 2005*, despite its efforts to implement smart growth principles and increase development densities along major transit corridors (Macris, 2004). According to the CCSF, the forecast of job and household growth presented in its *2002 Land Use Allocation*—which estimates more growth in both jobs and households than forecasted in *Projections 2002*, but less than forecasted in the *Draft Projections 2005*—is a more realistic projection. The *2002 Land Use Allocation* estimates that San Francisco will add 23,144 housing units between 2000 and 2030 (for a total of 373,513, a 13 percent

7 When the City and County were combined, the part of San Francisco County south of the city's corporate boundary became part of San Mateo County.

increase) and 151,807 jobs in the same period (for a total of 786,000, a 24 percent increase) (Macris, 2004). The published estimates in *Projections 2005* (of 829,090 jobs and 398,280 households by 2030) (ABAG, 2004) are somewhat lower than those presented in the draft document, but are still greater than estimates presented in San Francisco's *2002 Land Use Allocation*.

E.4.5 Summary of Growth Trends and Policies of Select Jurisdictions

The jurisdictions profiled in the preceding section are a sample of cities in the service area. These jurisdictions represent a range of sizes and include some of the larger cities and some of the cities projecting relatively substantial increases in water demand by 2030. As the profiles indicate, these cities are largely urbanized, typically experienced their most rapid period of growth in the postwar decades through the 1970s, and are largely built out. Milpitas and East Palo Alto have experienced high rates of growth more recently (over the past 30 years) and are also highly urbanized. On average, San Francisco's population has been stable over the past 50 years. While none of these jurisdictions has adopted growth management ordinances per se, their general plans include policies to manage growth, in some cases including the establishment of urban growth or hillside protection boundaries (or, in the case of Stanford University's community plan, an analogous academic growth boundary). Most of the general plans identify infill development and redevelopment and/or revitalization of previously developed areas (strategies consistent with smart growth policies) as the principal means of accommodating future growth.

In addition to the general plan projections discussed above, Table E.4.1 presents a comparison between the 2030 population projections used for the wholesale customer water demand forecasts and ABAG *Projections 2005* forecasts, for both 2030 and the buildout years for the respective general plans. (Table E.4.1 includes subtotals for Fremont, Newark, and Union City for comparison with the ACWD projection.)

As the table shows, the population projections used for the WSIP water demand projections are reasonably consistent with the population projections in the jurisdictions' general plans, although the stated general plan projection years do not extend to 2030. The general plans of three cities—Milpitas, Sunnyvale, and East Palo Alto—expect more population at buildout than is assumed for the 2030 water demand projections. The general plan projections for the jurisdictions served by the other water customers (that can be compared) are within 11 percent of the population projections used for the water demand forecasts, although the general plan projection years are 2010 or 2020. This comparison suggests that the population growth estimated in the water demand projections for these jurisdictions has largely been addressed in the jurisdictions' general plans, and has been fully addressed in the case of three of the cities.

The projected 2030 population projection used for Hayward in the demand study is about 2 percent higher than that presented in the city's general plan. The 2030 population assumed for San Francisco in the demand study is about 5 percent higher than projected in the city's general plan. The 2030 population assumed for the ACWD demand forecast is about 6 percent higher than projections in the respective general plans (considering the projections in the Fremont, Newark, and Union City General Plans combined). The demand study projection for Redwood City is about 7 percent higher than that presented in the city's general plan. The population assumed for South San Francisco in the demand study (for CWS-South San Francisco and Westborough Water District, as updated by Westborough Water District's UWMP) is about 8 percent higher than the combined general plan projections of South San Francisco and Colma, which is also served by the CWS-South San Francisco, and the projection used for the Santa Clara demand forecast is about 8 percent higher than the population projected (for 2010) in the general plan.. (The 2030 population for the CWS–Mid-Peninsula District and Stanford University estimated in the demand study are not directly comparable to the growth projected in the San Mateo General Plan and the Stanford University Community Plan.)

The ABAG projections for 2030, which incorporate smart growth assumptions (as discussed in PEIR Section 7.3 and Appendix E.3), are somewhat higher than either the general plan or WSIP demand study projections (see Table E.4.1).

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APPENDIX E.5

Summary of Planned Growth – Impacts and Mitigation Measures

This appendix supplements information presented in PEIR Chapter 7, Growth Inducement Potential and Secondary Effects of Growth. As discussed in Chapter 7, the environmental impact reports (EIRs) prepared for the general plans, area plans and specific plans of the jurisdictions within the SFPUC service area identify impacts associated with planned growth in the respective jurisdictions and identify measures to mitigate those impacts. **Table E.5.1** summarizes the impacts and mitigation measures identified in the EIRs and CEQA Findings prepared for those planning documents. These environmental impacts are the secondary environmental effects of growth supported in part by the proposed project (see Chapter 7). Table E.5.1 is intended to provide a summary overview of the impacts and mitigation measures identified in the relevant planning document EIRs for jurisdictions served by SFPUC water, and does not purport to reflect the full scope and intent of those EIRs. For a complete discussion of the impacts, please refer to the specific EIRs.

The following EIRs and City Council and Board of Supervisors resolutions were reviewed and are summarized in Table E.5.1. These documents are incorporated by reference into this Draft PEIR, pursuant to CEQA Guidelines 15150. Please see Section 1.3.5 in PEIR Chapter 1, Introduction, for a list of locations where documents incorporated by reference are available for public review.

- City of Belmont San Juan Hills Area Plan EIR, State Clearinghouse #86122320 (1988), Western Hills Area Plan EIR, State Clearinghouse #89051615 (1990)
- City of Brisbane 1993 General Plan EIR, State Clearinghouse #93071072 (1994)
- City of East Palo Alto General Plan EIR, State Clearinghouse #98051028 (1999)
- City of Foster City General Plan EIR, State Clearinghouse #92073017 (1993)
- City of Fremont General Plan EIR, State Clearinghouse #90030675 (1991)
- City of Hayward General Plan EIR, State Clearinghouse #2001072069 (2002)
- City of Menlo Park General Plan EIR, State Clearinghouse #890 124 20 (1994)
- City of Millbrae General Plan EIR, State Clearinghouse #98041090 (1998), Millbrae Station Area Specific Plan EIR, State Clearinghouse #98041091 (1998)
- City of Milpitas Midtown Milpitas Specific Plan EIR, State Clearinghouse #2000092027 (2002)
- City of Mountain View General Plan EIR, State Clearinghouse #91083044 (1992)

- City of Newark General Plan Update Project 2007 EIR, State Clearinghouse #91093071 (1992)
- City of Palo Alto Comprehensive Plan 1998–2010 EIR, State Clearinghouse #96052043 (1997)
- City of Redwood City Downtown Precise Plan EIR, State Clearinghouse #2006052027 (2007)
- City of San Bruno General Plan and EIR (1984)
- City of San Jose General Plan EIR, State Clearinghouse #94023031 (1994)
- City of San Mateo General Plan EIR, State Clearinghouse #89100308 (1990)
- San Mateo County Board of Supervisors Resolution 48639 Adopting Findings Pursuant to Certification of the Final Environmental Impact Report for the San Mateo County General Plan, State Clearinghouse #84042404 (1986)
- City of Santa Clara Resolution No. 5728: A Resolution and Related Findings Certifying a Final Environmental Impact Report and Directing the Filing of a Notice of Determination, General Plan Amendment #32, State Clearinghouse #8908017 (1992)
- Santa Clara County General Plan EIR, State Clearinghouse #94023004 (1994)
- Stanford University Community Plan EIR, State Clearinghouse #1999112107 (2000)
- City of Union City General Plan EIR, State Clearinghouse #2000112009 (2002)

Negative declarations were prepared for the following general plans, specific plans, and general plan elements and therefore are not represented in Table E.5-1:

- Town of Atherton General Plan Revisions (2002)
- City of Burlingame General Plan (1969), Bayfront Specific Plan (2004), North Rollins Road Specific Plan (2004), and Housing Element (2002)
- Town of Colma General Plan (1999)
- City of Daly City General Plan Land Use and Circulation Elements (1987) and Housing Element (2004)
- Town of Hillsborough General Plan (2005)
- Town of Los Altos Hills General Plan (1975)
- Town of Portola Valley General Plan (1998 except for Housing Element, which appears to be 1990)
- City of San Carlos General Plan (1992) and Housing Element (2001)
- City and County of San Francisco General Plan (1998) and Housing Element (2004)
- City of Sunnyvale General Plan Elements: Land Use and Transportation Element (1997), Water Resources Sub-element, and (1996), Housing and Community Revitalization Sub-element (2002)
- Town of Woodside General Plan Housing Element (2003)

TABLE E.5.1
SIGNIFICANT MITIGABLE (S) AND SIGNIFICANT UNAVOIDABLE (U) IMPACTS OF GROWTH IDENTIFIED BY GENERAL AND SPECIFIC PLAN ENVIRONMENTAL IMPACT REPORTS IN PROJECT AREA

Impact	JURISDICTION																				
	Belmont[a]	Brisbane[b]	East Palo Alto[c]	Foster City[d]	Fremont[e]	Hayward[f]	Menlo Park[g]	Millbrae[h]	Milpitas[i]	Mountain View[j]	Newark[k]	Palo Alto[l]	Redwood City[m]	San Bruno[n]	San Jose[o]	City of San Mateo[p]	San Mateo County[q]	City of Santa Clara[r]	Santa Clara County[s]	Stanford University[t]	Union City[u]
2000 Population	25,123	3,597	29,506	28,803	203,413	140,030	30,785	20718	62,698	70,708	42,471	58,598	75,402	40,165	894,943	92,482		102,361	100,300		66,869
AESTHETICS																					
Impacts																					
• Alteration of visual setting or degradation of existing views	S	S			S	S		S			S				S, U	S	S			S	
• Impacts on scenic resources, including resources within a scenic highway corridor						S											S				
• Impacts on visual quality due to loss of open space														U							
• Creation of new source(s) of light and/or glare, or incremental increases in light or glare			S			S					S		S							S	S
• Cumulative impacts on visual quality																	U				
Mitigation Measures																					
• Develop, strengthen, and/or implement design and landscaping standards and conduct project-specific design review.	X		X																		
• Implement general plan programs and policies and general plan EIR measures that address visual quality in the planning area. (Such policies and measures may include site planning and design procedures and standards, architectural review, and standards pertaining to landscaping and natural areas.)		X				X		X			X						X				
• Provide incentives, including zoning ordinance density or intensity bonuses, streamlined permitting, and rehabilitation funding, to encourage and support projects offering exceptional design quality or otherwise contributing to the desired level of physical quality in the city.			X																		
• Conduct project-specific environmental review and require mitigation to protect visual character and reduce aesthetic impacts, including impacts on natural resources.			X			X										X				X	
• Implement/require measures to reduce light and glare.			X								X		X							X	X
• Implement general plan policies that address visual impacts from nearby incompatible uses.					X										X		X				
AGRICULTURAL RESOURCES																					
Impacts																					
• Conversion of agricultural land to nonagricultural uses					U						S								S		U
• Cumulative loss of agricultural land																			U		
• Conflicts between agricultural uses and adjacent land uses																			S		
• Impacts of continued grazing and farming on soil or other environmental resources																	S		S		
Mitigation Measures																					
• Implement general plan policies that designate agricultural uses as permitted uses in all open space areas.					X																
• Implement general plan programs and policies that reduce impacts on agricultural soils.											X						X				
• Prepare a cumulative impact analysis of projected losses due to the permanent conversion of south county agricultural lands																			X		
• Evaluate and adopt mechanisms (e.g., impact fees, conservation easements, and purchase of development rights) to offset impacts on prime agricultural lands.																			X		
• Implement recommendations of a study on the development of golf courses in areas zoned for agriculture to reduce impacts.																			X		

S = Significant mitigable impact   U = Significant and unavoidable impact   X = Mitigation measure identified in Environmental Impact Report

TABLE GROWTH E.5.1 (Continued)
SIGNIFICANT MITIGABLE (S) AND SIGNIFICANT UNAVOIDABLE (U) IMPACTS OF GROWTH IDENTIFIED BY GENERAL AND SPECIFIC PLAN ENVIRONMENTAL IMPACT REPORTS IN PROJECT AREA

	JURISDICTION																				
Impact	Belmont[a]	Brisbane[b]	East Palo Alto[c]	Foster City[d]	Fremont[e]	Hayward[f]	Menlo Park[g]	Millbrae[h]	Milpitas[i]	Mountain View[j]	Newark[k]	Palo Alto[l]	Redwood City[m]	San Bruno[n]	San Jose[o]	City of San Mateo[p]	San Mateo County[q]	City of Santa Clara[r]	Santa Clara County[s]	Stanford University[t]	Union City[u]
• Implement general plan programs and policies, and measures identified in the general plan EIR, to protect agricultural and prevent its conversion to non-agricultural uses.																			X		
AIR QUALITY																					
Impacts																					
• Conflicts with, or obstruction of, the implementation of an applicable air quality attainment plan or congestion management plan																					S
• Violation of a stationary source air quality standard or contribution to an existing or projected air quality violation			U																		
• Increases in air emissions and/or ozone precursors		U	U				U	U	U		S			U		U	S	U			
• Exposure of new sensitive land uses to toxic air contaminant or local odor emission sources										S		S			S						
• Periodic construction-related air quality impacts	S		S		S	S		S			S		S		S					S	
• Increases in exhaust emissions from traffic	U				U			U					U		U		S				
• Cumulative impacts on regional air quality in the Bay Area								U	U	U					U		U				
Mitigation Measures																					
• Implement BAAQMD- and EIR-specified control measures to mitigate construction dust and emissions.	X				X	X		X					X								
• Participate in and promote local and regional planning efforts to improve air quality.			X							X	X										
• Provide site features and implement measures to encourage use of alternative modes of travel (to single-passenger vehicles) and reduce vehicle trips. (Such measures include implementing improvements to bicycle and pedestrian circulation systems and working with local and regional planning and transportation agencies to improve public transit services.)	X	X	X					X	X	X	X		X			X	X	X			X
• Implement selected roadway and/or intersection improvements to maximize the efficiency of the circulation system.		X	X				X									X					
• Implement general plan measures to reduce soil erosion and associated air quality impacts.																	X				
• Implement general plan measures that reduce dependence on automobile use and improve the efficiency of the existing transportation system.																	X				
• Reduce negative effects caused by roadways and rail lines on visual quality, air quality and noise.										X											
• Require adequate buffers, ventilation systems, and other measures to reduce impacts of odors or toxic emissions.												X									
• Implement general plan natural resource chapter policies regarding air quality impacts.															X						
• Facilitate mixed-use development and maintain jobs/housing balance.																X					
• Reduce diesel emissions.																				X	
BIOLOGICAL RESOURCES																					
Impacts																					
• Impact(s) on/loss of special-status animal or plant species		S				S			S		S		S		S		S			S	
• Impacts on biological resources due to individual or cumulative impacts on wetlands, riparian habitat, or other sensitive habitat	S	S	S	S, U	S	S		S		S	S	S	S	U	S		S		U	S	
• Conflicts with local policies or ordinances protecting biological resources													S		S					S	
• Cumulative impacts on biological resources			S																	S	

S = Significant mitigable impact U = Significant and unavoidable impact X = Mitigation measure identified in Environmental Impact Report

TABLE GROWTH E.5.1 (Continued)
SIGNIFICANT MITIGABLE (S) AND SIGNIFICANT UNAVOIDABLE (U) IMPACTS OF GROWTH IDENTIFIED BY GENERAL AND SPECIFIC PLAN ENVIRONMENTAL IMPACT REPORTS IN PROJECT AREA

	JURISDICTION																				
Impact	Belmont[a]	Brisbane[b]	East Palo Alto[c]	Foster City[d]	Fremont[e]	Hayward[f]	Menlo Park[g]	Millbrae[h]	Milpitas[i]	Mountain View[j]	Newark[k]	Palo Alto[l]	Redwood City[m]	San Bruno[n]	San Jose[o]	City of San Mateo[p]	San Mateo County[q]	City of Santa Clara[r]	Santa Clara County[s]	Stanford University[t]	Union City[u]
• Disruption of wildlife migration or travel corridors																				S	
Mitigation Measures																					
• Negotiate any necessary streambed alteration agreements with the California Department of Fish and Game.	X					X															
• Plant native species for revegetation and landscaping purposes.	X																				
• Implement the San Bruno Mountain Habitat Conservation Plan.		X																			
• Implement general plan policies and programs to protect biological resources.		X			X						X						X				
• Conduct project-specific environmental review and implement mitigation.		X	X									X	X								
• Obtain all applicable resource agency permits prior to development within areas under the jurisdiction of federal, state, or local resource agencies.			X																		
• Coordinate with all applicable resource agencies to ensure that required mitigation protocols and design modifications are incorporated during the early stages of project review.													X								
• Where impacts on special-status species may occur, coordinate with relevant resource agencies as early as possible and substantially complete the consultation prior to or in conjunction with project environmental review.			X																		
• Require project-specific surveys conducted by qualified professionals according to established protocols to determine on-site resources and appropriate site-specific mitigation measures.			X	X		X			X				X							X	
• Protect and preserve open space areas and design any improvements in open space areas to minimize adverse impacts on habitats and other open space values.				X				X		X											
• Exclude development in environmentally sensitive areas that would result in a net loss of significant wetlands.				X																	
• Avoid wetlands and replace them where avoidance is infeasible.																				X	
• Include a program in the general plan to conduct a detailed wetland delineation study of vacant sites to accurately determine the extent of jurisdictional wetlands.								X													
• Maximize open space preservation opportunities in the development review process.								X													
• Protect and restore plant and wildlife habitats.				X						X							X			X	
• Protect wildlife from the hazards of urbanization.										X											
• Implement the identified program to mitigate impacts on California Tiger Salamander.																				X	
• Develop a program to educate the public and landowners about sensitive biotic resources in the area and best management practices for preserving those resources.																			X		
CULTURAL RESOURCES																					
Impacts																					
• Disturbance of historical resource(s)		S	S		S			S	S		S		S, U		S		S			S	
• Disturbance of archaeological resource(s)			S			S		S		S	S		S		S		S	S		S	
• Disturbance of paleontological resource(s)								S		S						S	S			S	
• Disturbance of human remains								S		S						S				S	
• Disturbance of unknown subsurface cultural resources	S	S			S	S						S									
• Cumulative impacts on historical resources																			U	U	
• Cumulative impacts on historical, archaeological, or paleontological resources																	U			S	

S = Significant mitigable impact U = Significant and unavoidable impact X = Mitigation measure identified in Environmental Impact Report

TABLE GROWTH E.5.1 (Continued)
SIGNIFICANT MITIGABLE (S) AND SIGNIFICANT UNAVOIDABLE (U) IMPACTS OF GROWTH IDENTIFIED BY GENERAL AND SPECIFIC PLAN ENVIRONMENTAL IMPACT REPORTS IN PROJECT AREA

	JURISDICTION																				
Impact	**Belmont[a]**	**Brisbane[b]**	**East Palo Alto[c]**	**Foster City[d]**	**Fremont[e]**	**Hayward[f]**	**Menlo Park[g]**	**Millbrae[h]**	**Milpitas[i]**	**Mountain View[j]**	**Newark[k]**	**Palo Alto[l]**	**Redwood City[m]**	**San Bruno[n]**	**San Jose[o]**	**City of San Mateo[p]**	**San Mateo County[q]**	**City of Santa Clara[r]**	**Santa Clara County[s]**	**Stanford University[t]**	**Union City[u]**
Mitigation Measures																					
• Implement general plan policies and programs and measures identified in the general plan EIR to protect cultural resources.		X			X	X		X			X	X	X		X		X	X			
• Conduct project-specific review and implement identified mitigation consistent with general plan cultural resource policies.		X	X			X			X				X								
• If any cultural resources are found, halt work and protect the site from disturbance until a qualified archaeologist / cultural resources specialist has evaluated the resources and identified appropriate site-specific mitigation.	X					X															
• If human remains are found, halt work and notify the county coroner; implement subsequent specified actions and investigations as applicable, consistent with California Public Resources Code Section 5097.98.						X															
• Identify sensitive paleontological resources prior to commencement of development activities and recover sensitive fossils.			X																		
• Conduct the proposed work consistent with the state and federal standards for historic resources.									X												
• Implement CEQA Guidelines Section 15064.5 provisions for the accidentally discovery of historic or archeological resources.									X												
• Maintain documentation of significant archeological and historical sites.										X											
• Develop standard practices or contingency plans for archeological materials that are unearthed during construction.										X											
• Support the preservation of historic buildings and structures.									X	X						X					
• Implement measures to protect historic, archaeological, and paleontological resources.																				X	
GEOLOGY AND SOILS																					
Impacts																					
• Exposure to earthquake fault rupture hazards						S												S			
• Exposure to hazards from strong seismic ground shaking	S	S	S		S	U		S		S	S							S	U		
• Exposure to seismic-related ground failure, including liquefaction		S	S			S		S			S		S					S			
• Exposure to landslides	S	S				S															
• Exposure to flooding, including flooding as a result of levee or dam failure																S					
• Soil erosion or the loss of topsoil	S	S									S		S				S				
• Cumulative impacts on soil resources																	U				
• Damage to structures or utilities caused by soils with high shrink-swell potential						S															
• Hazards, including architectural and/or structural damage, due to differential settlement								S													
• Exposure of new development on or downslope of unstable slopes to rockfall or landslide hazards	S																				
• Exposure to seismic-, geologic-, and/or flood-related hazards														U	S		S				
• Cumulative impacts associated with exposure to natural hazards																	U				
Mitigation Measures																					
• Prohibit off-road vehicle use and implement an erosion control plan.	X																				
• Prohibit grading during the rainy season (Oct. 15 - April 15).	X																				

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TABLE GROWTH E.5.1 (Continued)
SIGNIFICANT MITIGABLE (S) AND SIGNIFICANT UNAVOIDABLE (U) IMPACTS OF GROWTH IDENTIFIED BY GENERAL AND SPECIFIC PLAN ENVIRONMENTAL IMPACT REPORTS IN PROJECT AREA

	JURISDICTION																				
Impact	**Belmont**[a]	**Brisbane**[b]	**East Palo Alto**[c]	**Foster City**[d]	**Fremont**[e]	**Hayward**[f]	**Menlo Park**[g]	**Millbrae**[h]	**Milpitas**[i]	**Mountain View**[j]	**Newark**[k]	**Palo Alto**[l]	**Redwood City**[m]	**San Bruno**[n]	**San Jose**[o]	**City of San Mateo**[p]	**San Mateo County**[q]	**City of Santa Clara**[r]	**Santa Clara County**[s]	**Stanford University**[t]	**Union City**[u]
• Implement the geologic hazard policy map and engineering geology map, table of geological criteria for development, and related policies and mitigation measures.	X																				
• Implement general plan policies and programs to mitigate potential geologic and seismic hazards.		X			X			X							X		X				
• Implement general plan policies and programs to mitigate impacts on soils.											X										
• Conduct/require site-specific environmental review that characterizes site-specific soils, geology, and seismic conditions, conduct site-specific geotechnical review as applicable, and implement identified measures to mitigate project-specific impacts from expansive or corrosive soils and geologic and seismic hazards.		X	X			X		X					X								
• Use open space easements and other regulatory techniques to prohibit development and avoid public safety hazards in areas where geologic instability or faulting is identified.			X																		
• Adopt and enforce the most recent state seismic requirements and applicable standards for structural design of new development and redevelopment (e.g., the Uniform Building Code and California Building Code).			X			X				X								X			
• Promote disaster preparedness in the community with the disaster simulation program. Adopt a disaster preparedness plan and continue to conduct simulation exercises.			X																		
• Require new development within the Alquist Priolo Special Study Zone to comply with applicable regulations pertaining to fault rupture hazard.						X															
• Determine the expansion potential of clay soils on a project-specific basis. Remove or amend and compact highly expansive soils under new buildings. Drain surface water away from buildings to minimize shrink-swell potential.						X															
• Minimize disruption of vegetation during construction and implement measures to reduce soil movement, in accordance with best management practices.						X															
• Continue programs to educate residents about seismic hazards.										X											
• Develop an ordinance to upgrade unreinforced masonry buildings.										X											
• Continue to update the city's emergency preparedness plan.										X											
• Prohibit reduction in creek capacity, implement flood control measures and the San Mateo Creek capital improvement program, and conduct public information programs.																X					
• Implement County plans and policies to reduce impacts; however substantial property damage and loss of life could occur in a major earthquake.																			X		
HAZARDS AND HAZARDOUS MATERIALS																					
Impacts																					
• Release of or exposure to hazardous materials		S	S			S		S							S	S	S			S	
• Exposure to the risk of loss, injury or death involving wildland fires		S														S					
• Hazards associated with unreinforced masonry buildings		S																			
• Increased risk of structural fires and the degree of damage sustained from industrial chemical fires			S																		
• Exposure to soil and/or groundwater contamination		S						S	S	U											
• Safety hazard(s) related to aircraft overflights											S										

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TABLE GROWTH E.5.1 (Continued)
SIGNIFICANT MITIGABLE (S) AND SIGNIFICANT UNAVOIDABLE (U) IMPACTS OF GROWTH IDENTIFIED BY GENERAL AND SPECIFIC PLAN ENVIRONMENTAL IMPACT REPORTS IN PROJECT AREA

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• Potential impacts related to emergency response											S		S				S				
• Increased exposure to man-made and natural hazards																	S				
• Increased exposure to fire hazard in rural areas																	S				
• Impacts on vegetation, water and wildlife resources from elimination of vegetation to reduce fire hazards																	S				
• Cumulative effects from increased exposure to man-made hazards																	U				
Mitigation Measures																					
• Implement general plan programs and policies that address public safety hazards in the planning area.		X						X			X				X		X	X			
• Conduct project-specific environmental review and implement identified measures to mitigate identified potential hazards.		X	X						X							X		X			
• Implement measures identified in the Precise Plan EIR to reduce traffic impacts and ensure the adequacy of project-level emergency-response provisions.													X								
• Adopt and maintain a disaster preparedness plan including emergency response for accidents involving hazardous materials and promote disaster preparedness in the community.			X																		
• Continue to participate in the National Flood Insurance Administration program and investigate the availability of levee reconstruction funding.			X																		
• For proposed projects within the planning area of the airport, ensure consistency with the Airport Land Use Plan and participate in future amendments to the plan.			X																		
• Cooperate with federal, state, and local agencies to effectively regulate and manage hazardous waste.			X																		
• Prior to development of or in proximity to a reported hazardous material site, implement specified measures, including appropriate site assessment, remediation, and follow-up investigation.						X			X												
• Include programs in the general plan to map and remediate potential hazardous soils sites in the city.								X													
• Implement measures to minimize the risks from the use of or accidental exposure to hazardous materials.										X							X				
• Support NASA/Ames as the future federal operator of Moffett Field.										X											
• Implement a risk management plan.																				X	
HYDROLOGY AND WATER QUALITY																					
Impacts																					
• Degradation of surface water and/or groundwater quality		S	S					S			S							S		S	
• Increases in impervious surfaces and/or alternations to drainage resulting in exposure to flood hazards and/or the need for new drainage facilities		S	U			S	S								S			U			
• Degradation of surface water quality from construction activities and/or post-construction uses						S							S								
• Water pollution from stormwater runoff							U								S						
• Exposure of people and property to flooding						S		S		S							S				
• Increased bank erosion and bed sedimentation, risks of landslides, and impacts on new structures as a result of increased runoff from inadequately designed uphill drainage systems	S																				
• Direct and/or cumulative impacts on the hydrologic regime					S															S	
• Increased demands on groundwater resources											S										

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TABLE GROWTH E.5.1 (Continued)
SIGNIFICANT MITIGABLE (S) AND SIGNIFICANT UNAVOIDABLE (U) IMPACTS OF GROWTH IDENTIFIED BY GENERAL AND SPECIFIC PLAN ENVIRONMENTAL IMPACT REPORTS IN PROJECT AREA

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• Flood hazards, including hazards related to potential dam failure											S	S				S					
• Increases in impervious surfaces from cumulative development resulting in increasing frequency and severity of downstream flooding												U								S	
Mitigation Measures																					
• Implement general plan programs and policies that address impacts on drainage facilities and flood control channels and that control erosion and sedimentation.	X	X			X			X			X				X						
• Conduct project-specific environmental review and implement identified mitigation of construction and operational impacts. Include specified requirements such as adherence to best management erosion and sedimentation control practices and calculations to determine the adequacy of site drainage facilities and public facilities.		X				X	X						X							X	
• Require new development projects and substantial redevelopment projects to incorporate as applicable best management practices of the National Pollutant Discharge Elimination System permit and requirements of other applicable plans to control runoff pollutants and sedimentation.			X															X			
• Establish an advisory network of representatives having jurisdiction over the San Francisquito Creek to ensure the community needs for flood control and infrastructure maintenance are met.			X																		
• Identify deficiencies in local storm drainage systems and determine and implement needed improvements and maintenance.			X																		
• Implement general plan policies and programs that protect against dam failure inundation.					X																
• Cooperate with other agencies in preparing plans and developing projects to alleviate flooding potential in newly mapped floodplain areas. Require new developments in mapped 100-year flood zones to provide evidence of flood control protection and compliance with applicable regulations of flood management agencies.						X															
• Reopen the Marsh Road water storage and treatment facility, implement drainage capital improvements, and conduct hydrologic studies.							X														
• Include a policy in the general plan requiring finished floor elevations for new structures to be completed above the 8.2 feet NGVD and requiring other improvements constructed below 8.2 NGVD to be built to withstand temporary inundation.								X													
• Establish pollution control measures that keep pollutants from entering storm drain systems.										X											
• Ensure proper use, storage and disposal of toxic chemicals to prevent soil contamination.										X											
• Implement improvements and policies recommended by the Storm Drainage Task Force.	X																				
• Require ongoing technical evaluations of dam safety and cooperation with relevant entities to implement project-specific mitigation measures included in the technical studies.												X									
• Provide adequate storm drainage systems in new development in coordination with the Santa Clara Valley Water District and the San Mateo County Flood Control District.												X									
• Prohibit reduction of creek capacity.																X					
• Implement flood control measures.																X					

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TABLE GROWTH E.5.1 (Continued)
SIGNIFICANT MITIGABLE (S) AND SIGNIFICANT UNAVOIDABLE (U) IMPACTS OF GROWTH IDENTIFIED BY GENERAL AND SPECIFIC PLAN ENVIRONMENTAL IMPACT REPORTS IN PROJECT AREA

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• Implement the San Mateo Creek Capital Improvement Project.																X					
• Conduct a comprehensive drainage study that includes a survey of maintenance needs for the city's creeks and channels; develop funding, maintenance, and public education programs addressing water quality and flood control issues and develop an enforcement program for illegal dumping in creeks and channels.																X					
• Raise levees to 108 feet.																X					
• Require public notification of flood hazards.																X					
• Implement general plan that reduce exposure to flood hazard.																	X				
• Manage stormwater runoff.															X					X	
• Maintain groundwater recharge.																				X	
• Protect water quality.																				X	
• Support flood control improvements that reduce flood hazards. Regulate the type, location and intensity of land uses within flood-prone areas. Require expansion of storm drainage facilities where needed to serve new development.																		X			
LAND USE & PLANNING																					
Impacts																					
• Conflict(s) with an applicable land use plan, policy, and/or regulation					S			U													
• Land use incompatibilities	S			S	S	S		U		S		S			S	S	S		S		
• Intensification of land uses or substantial changes in land use density, scale, and/or character			S	S	S			U			S				S		S		S		
• Loss of open space or agricultural lands or the premature urbanization of rural areas					S										U		S		S		
• Potential failure or underutilization of neighborhood commercial centers				S																	
• Division of an established community						S															
• Increases in the existing oversupply of jobs							U														
• Visual, traffic and other environmental impacts of constructing a bicycle connection across El Camino Real												S									
• Inefficient land use patterns																	S		S		
• Cumulative land use impacts																	U				
Mitigation Measures																					
• Implement applicable general plan land use programs and policies that address the clustering of development, resource protection, zoning code modification(s), potential impacts of intensified land uses, conflicts between incompatible land uses, impacts on open space, and/or golf course development.	X		X		X			X									X		X		
• Encourage open space dedications and assessment fees.	X																				
• Work with San Mateo and the Mid-Peninsula Open Space District to maintain a buffer between the planning area and Sugarloaf Mountain.	X																				
• Review implementation of the general plan and land use policy map to identify the effect of land development and use in the community on City revenues and costs of providing public facilities and services.			X																		
• Develop a design and improvement plan as part of the City's capital improvement plan.			X																		
• Prepare area or specific plans for neighborhoods identified in the general plan.			X																		

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TABLE GROWTH E.5.1 (Continued)
SIGNIFICANT MITIGABLE (S) AND SIGNIFICANT UNAVOIDABLE (U) IMPACTS OF GROWTH IDENTIFIED BY GENERAL AND SPECIFIC PLAN ENVIRONMENTAL IMPACT REPORTS IN PROJECT AREA

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• Provide adequate resources to enforce the zoning ordinance and other ordinances to achieve the desire level of physical quality in the city.			X																		
• Conduct project-specific environmental review, including design and architectural review as applicable, and implement identified mitigation consistent with general plan land use policies.				X		X					X	X					X		X		
• Monitor commercial and industrial development annually (and prepare a written report every two years) to determine whether land use element policies should be changed.							X														
• Preserve, protect, and enhance the character of residential, retail, and commercial districts and ensure compatibility between the residential, retail, commercial, and industrial districts.										X											
• Preserve mobile home parks, and assure safe construction of mobile and modular housing.										X											
• Ensure that zoning, building regulations and public works requirements are equitable and City processes are efficient.										X											
• Adopt and apply performance standards for review of mixed use developments.												X									
• Construct an at-grade pedestrian/bicycle crossing as specified in the general plan EIR.												X									
• Implement City Concept, Community Development, Aesthetic, Cultural, and Recreational chapter policies of the general plan.															X						
• Prevent incompatible land uses; avoid concentrations of potentially incompatible uses; adopt design policies.																X					
• Establish 20-year growth limits as recommended in the plan's urban growth boundary policy.																			X		
• Deny expansion of commercial development into viable agricultural land and emphasize in-fill to meet these needs (to be implemented by the LAFCO).																			X		
• Implement the appropriate recommendations of the agricultural preserve study																			X		
• Conduct studies and implement recommendations on recreational vehicle park needs and golf course development.																			X		
MINERAL RESOURCES																					
Impacts																					
• Impacts of mineral extraction operations on land, water, air, biological resources																	S				
• Depletion of non-renewable mineral resources																	S				
• Cumulative impacts from the depletion of non-renewable resources and permanent alteration of landforms																	U				
Mitigation Measures																					
• Promote growth management and sphere of influence planning.																	X				
• Maintain the County land use database to monitor land conversion rates, the health of the rural economy, and impacts on resources from land use changes.																	X				
• Implement general plans and policies that require identification of significant mineral resource areas and the buffering of extraction activities from incompatible land uses.																	X				

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TABLE GROWTH E.5.1 (Continued)
SIGNIFICANT MITIGABLE (S) AND SIGNIFICANT UNAVOIDABLE (U) IMPACTS OF GROWTH IDENTIFIED BY GENERAL AND SPECIFIC PLAN ENVIRONMENTAL IMPACT REPORTS IN PROJECT AREA

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NOISE																					
Impacts																					
• Exposure to or generation of excessive noise levels or groundborne vibration		S	S	S	S	S		S				S	S		S		S	S		S	
• Substantial permanent increase in ambient noise levels				S		S											S				
• Substantial temporary or periodic increase(s) in ambient noise levels						S															
• Exposure of additional residents or businesses to excessive noise levels from aircraft overflights		U																U			
• Exposure of adjacent land uses to noise from future light rail line.															S						
• Short-term noise impacts during construction	S		S			U		S		S			S		S					U	S
• Increased noise levels particularly from vehicular traffic	U	S	S		U	S	U			U	S	S		U	S, U	S					
Mitigation Measures																					
• Implement general plan programs and policies that reduce noise impacts.		X		X				X				X			X		X				
• Implement/require measures to reduce construction noise (e.g., requiring limits on construction hours, use of hospital-grade mufflers on equipment, use of sound barriers or baffles, and/or limits on the number of active building permits issued).	X					X		X					X		X					X	
• Conduct project-level environmental review and implement identified mitigation.		X	X		X	X				X			X			X		X		X	
• Use noise and land use compatibility standards to guide review of development proposals.			X	X	X							X									
• Require all new development to meet general plan and airport land commission noise attenuation standards through building code requirements.																		X			
• Enforce applicable noise insulation standards of the state building code (Title 24) and adopt and enforce local noise ordinances.			X										X								
• Implement specified measures to address traffic noise (e.g., periodic review of truck routes for noise impacts on sensitive land uses, enforcement of vehicle noise standards, limitations on truck operations, and/or installation of noise barriers)	X		X	X			X														
• Encourage other agencies to reduce noise levels generated by roadways, railways, airports, and other facilities.					X																
• Work with Caltrans to quantify and mitigate noise impacts associated with extension of state highways.					X																
• Locate noise-sensitive uses away from noise sources and less sensitive uses closer to noise sources.					X	X															
• Include incremental traffic generated by new development in the analysis of a proposed a project's contribution to traffic noise.						X															
• Evaluate proposed new developments near railroad rights of way for potential vibration impacts and incorporate engineering recommendations in development design.						X															
• Develop a noise abatement mitigation plan.																					X
POPULATION AND HOUSING																					
Impacts																					
• Substantial population and/or job growth in the area					S			U			S							U		U	
• New or increased demand for special housing needs											S										

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TABLE GROWTH E.5.1 (Continued)
SIGNIFICANT MITIGABLE (S) AND SIGNIFICANT UNAVOIDABLE (U) IMPACTS OF GROWTH IDENTIFIED BY GENERAL AND SPECIFIC PLAN ENVIRONMENTAL IMPACT REPORTS IN PROJECT AREA

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• Increased demand for housing and related impacts on housing affordability			S	S	S															S	
• Jobs/housing imbalances, oversupply of jobs							S														
• Failure to meet population growth projections, resulting in additional population growth in other jurisdictions.																					U
Mitigation Measures																					
• Implement general plan programs and policies that address impacts related to population growth and housing demand.			X	X	X			X			X										
• Implement regional and local land use, transportation and infrastructure plans designed to accommodate the projected growth and reduce associated environmental impacts.			X																		
• Regularly update the employment database to assess actual job development with respect to projections and apprise infrastructure planning agencies of results.					X																
• Require affordable housing of all development within the community development agency project area and provide other incentives to encourage development of affordable units.				X																	
• Regularly monitor and report to the Planning Commission the amount of commercial and industrial development being permitted, as a basis for considering changes to land use element policies. When development approaches currently projected levels, conduct a traffic analysis as specified to provide a basis for City Council consideration of changes to the land use and transportation and circulation elements.							X														
• Implement general plan land use programs and policies that address jobs/housing imbalances.									X												
• Identify additional housing sites and condition new academic space on the construction of housing.																				X	
• Implement traffic and service mitigation measures.																				X	
• Implement general plan air quality policies and programs.																		X			
PUBLIC SERVICES																					
Impacts																					
• Increased demand for fire protection services			S		S			S		S	S	S								S	
• Increased demand for police protection services			S		S					S	S	S				S				S	
• Increased demand for schools, including cumulative demand			S		S	S	U	S		S	S	U							S, U	S	
• Increased demand for parks and/or deterioration of parks and recreational facilities from increased use			S		S	S				S	S						S			S	
• Increased demand for public services other than fire and police protection, schools, and parks					S					S	S							U			
• Overcrowding of city governmental offices and/or inefficient dispersion of city services resulting from the need for additional city personnel					S																
• Economic impacts if demands on infrastructure exceed collected development impact fees		S																			
• Impacts on existing and demand for new infrastructure															S		S				
• Increased demand for public services														S	S						

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Mitigation Measures																					
• Implement specified general plan programs and policies and mitigation identified in the general plan EIR that address funding for and the provision and maintenance of community services and/or facilities.			X		X			X		X	X	X			X	X			X		
• Impose development impact fees to cover the costs of needed infrastructure.		X			X																
• Conduct project-specific review to assess required levels of public services and implement identified mitigation			X		X										X						
• Cooperate with school districts regarding enrollment projections, the collection of school impact fees, and/or implement other specified measures to provide for and maintain adequate educational services.			X	X	X	X		X										X	X		
• Maintain an emergency preparedness plan to maximize the efforts of emergency service providers and minimize human suffering and property damage during disasters.			X																		
• Encourage regional recreation and parks districts to plan, acquire, and/or construct new recreation and park facilities.						X															
• Encourage the incorporation of park and recreation facilities into major development projects.						X															
• Reopen closed schools, increase the use of temporary facilities, and limit development.							X														
• Implement general plan policies that address increased demands on public services.															X						
• Maintain police and fire services and school capacity.																				X	
RECREATION																					
Impacts																					
• Increased demand for new or expanded parks and/or recreational facilities			S			S						S			S		S				
• Loss and/or degradation of open space				U	S												S			U	
• Cumulative impacts on overused park facilities																	U		U		
• Inefficient or ineffective park and recreation facility operations due to duplicative or ambiguous jurisdictional roles																	S				
• Infringement of other land uses on park lands and natural habitats																	S				
• Impacts of park creation on alternative land uses																	S				
Mitigation Measures																					
• Implement general plan policies and programs to improve, expand, acquire, and/or develop park and recreational facilities			X	X	X										X		X				
• Implement various methods to acquire parkland and improve access to open space and recreational facilities			X																		
• Implement general plan land use and open space policies that address impacts on open space and the protection of sensitive lands.				X	X												X				
• Conduct planning and environmental studies for the expansion or acquisition and construction of parks and recreational facilities to meet increased demand.						X															
• Review development projects to ensure the adequate provision of park facilities.						X						X									
• Cluster development in Lathrop Development District.																				X	
• Encourage the use of less-utilized parks in the County.																			X		
• Implement park improvements and dedicate new trails.																				X	

S = Significant mitigable impact U = Significant and unavoidable impact X = Mitigation measure identified in Environmental Impact Report

TABLE GROWTH E.5.1 (Continued)
SIGNIFICANT MITIGABLE (S) AND SIGNIFICANT UNAVOIDABLE (U) IMPACTS OF GROWTH IDENTIFIED BY GENERAL AND SPECIFIC PLAN ENVIRONMENTAL IMPACT REPORTS IN PROJECT AREA

Impact	JURISDICTION																				
	Belmont[a]	Brisbane[b]	East Palo Alto[c]	Foster City[d]	Fremont[e]	Hayward[f]	Menlo Park[g]	Millbrae[h]	Milpitas[i]	Mountain View[j]	Newark[k]	Palo Alto[l]	Redwood City[m]	San Bruno[n]	San Jose[o]	City of San Mateo[p]	San Mateo County[q]	City of Santa Clara[r]	Santa Clara County[s]	Stanford University[t]	Union City[u]
TRAFFIC AND TRANSPORTATION																					
Impacts																					
• Increased traffic relative to existing traffic and the capacity of the street system	S	U	U		S					S	U	U		U		U	S	U		S	
• Degradation of levels of service on area roads or highways	U			S, U		U	U		U			S, U	U				S				U
• Increased vehicle delays at area intersections		S							U				S, U							U	
• Increased vehicle delays at intersections in adjacent cities		U																		U	
• Declines of average speeds on individual roadway segments							S														
• Cumulative traffic impacts on roadway segments and/or intersections	U								U				S, U				U		U		
• Traffic safety impacts	S											S					S				
• Impacts on parking capacity												S					S				
• Traffic congestion interference with transit service and/or bicycle levels of service												S									
• Constraints on providing for bicycle and pedestrian travel as a result of increased competition for use of roads and highways by motor vehicles																	S				
• The loss of 40 homes for Hillsdale Boulevard widening																U					
• Construction traffic impacts																				S	
Mitigation Measures																					
• Implement general plan and/or local transportation plan programs and policies and measures identified in the general plan EIR to mitigate traffic and circulation impacts.		X	X		X	X				X	X						X				X
• Encourage adjacent jurisdictions to consent to improvements required of project developers.		X																			
• Coordinate planned development in the city with needed improvements to the regional circulation system.			X																		
• Work with transit agencies to improve local transit service, develop new transportation facilities, and encourage public transit ridership.			X	X																	
• Implement measures to encourage the use of alternative modes of travel and reduce vehicle trips.	X		X	X							X						X	X	X	X	
• Coordinate traffic signals, improve intersection capacity, and implement other operational measures to maximize the efficiency of the circulation system.			X						X											X	
• Support and participate in regional transportation planning.			X								X	X					X	X			
• Require project-specific transportation studies and implement identified mitigation measures.			X	X																X	
• Implement Transportation Systems Management Programs.				X												X		X			
• Add various combinations of turn lanes, through lanes, off- and on-ramps, and/or widen lanes at intersections where unacceptable levels of service occur.	X						X		X			X				X					
• Continue to implement the city's traffic safety program and continue to monitor, identify, and implement safety programs at high-accident intersections.												X									
• Implement measures to reduce traffic impacts on local streets.												X								X	
• Participate in regional efforts to achieve jobs/housing balance and traffic improvements.																X					
• Purchase homes at fair market value and assist resident relocation.																X					
• Expand highway capacity to relieve some bottlenecks.																			X		
• Encourage higher densities and supportive uses around transit stations.																		X			

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TABLE GROWTH E.5.1 (Continued)
SIGNIFICANT MITIGABLE (S) AND SIGNIFICANT UNAVOIDABLE (U) IMPACTS OF GROWTH IDENTIFIED BY GENERAL AND SPECIFIC PLAN ENVIRONMENTAL IMPACT REPORTS IN PROJECT AREA

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• Evaluate Zoning Ordinance parking standards to require only the minimum necessary parking.																		X			
• Implement policies that require road improvements to increase safety on rural roads.																	X				
• Implement parking provisions described in the general plan EIR.												X									
UTILITIES																					
Impacts																					
• Need for new or expanded water service or wastewater treatment facilities	S		S	S	S			S	S		S										
• Need for new or expanded stormwater drainage facilities											S					S	S				
• Increased water demand				U	S										S	U	S				
• Impacts on groundwater quality and quantity and the ability of water districts to provide adequate supply																	S				
• Potentially inequitable allocation system for excess water and inadequate emergency techniques for water service interruption																	S				
• Impacts on biological resources from surface water diversion or impoundment																	S				
• Impacts on small water systems																	S				
• Cumulative impacts on groundwater or surface waters																	U				
• Increased demand for wastewater treatment capacity				S				S					S		S	S	S			S	
• Impacts associated with inadequate sewage systems															S		S				
• Cumulative impacts related to wastewater generation and management													S				U				
• Impacts on landfill capacity					S											U	S	S			
• Impacts on water quality, hydrology, biology, public health and safety, visual quality, noise levels, air quality, soil erosion, and traffic associated with landfill operations																	S				
• Increased demand for solid waste services				S								S									
• Cumulative impacts associated with solid waste management																	U				
• Increased demand for public utilities	S									S											
• Cumulative demand on drainage facilities outside the city's control												U									
Mitigation Measures																					
• Provide additional infrastructure.	X																				
• Comply with service provider development requirements.	X																				
• Establish a technical network as specified to ensure that the community's utility-related needs are met.			X																		
• Review development projects for consistency with water and sewer infrastructure requirements established in approved development plans and agreements.			X																		
• Encourage coordination between land use and water supply planning and protection of water supply sources.															X		X				
• Implement general plan water supply policies pertaining to the use of wells in urban areas, water supply planning for rural areas, and the encouragement of conservation and reclamation.																					
• Encourage the implementation of water conservation measures.			X	X	X			X	X		X				X	X	X			X	
• Upgrade the current water distribution system to accommodate required service.			X																		

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TABLE GROWTH E.5.1 (Continued)
SIGNIFICANT MITIGABLE (S) AND SIGNIFICANT UNAVOIDABLE (U) IMPACTS OF GROWTH IDENTIFIED BY GENERAL AND SPECIFIC PLAN ENVIRONMENTAL IMPACT REPORTS IN PROJECT AREA

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• Implement Natural Resource chapter policies to mitigate potential water supply impacts.															X						
• Implement general plan policies that encourage water conservation and recharge in park and recreation facilities.																	X				
• Implement general plan policies to find an alternative disposal site to meet the city's future disposal needs.					X																
• Work with San Mateo to ensure the adequacy of the wastewater treatment plant.				X																	
• Implement general/community plan programs and policies to reduce waste and promote recycling.				X	X							X					X	X		X	
• Implement specified general plan policies and programs that address the adequacy of and improvements to the existing utility infrastructure and the potential for using recycled water.								X	X		X										
• Implement environmental management chapter policies and action programs pertaining to the provision of utilities and urban services.										X											
• Implement measures identified in the Precise Plan EIR to ensure adequate wastewater treatment and transmission capacity.													X								
• Implement general plan policies that require provision of adequate wastewater systems and coordination of wastewater management, land use, and water supply planning.															X		X				
• Improve the wastewater collection system.																				X	
• Work with water districts to secure additional supplies.																X					
• Work with the County to secure permits to use the Apanolio canyon to provide adequate landfill capacity.																X					
• Implement general plan policies that encourage buffering of landfills from more sensitive land uses.																	X				
• Implement general plan policies that address impacts associated with solid waste management.																	X				
• Implement a comprehensive sewer system study and storm drainage system study.																X					
ENERGY																					
Impacts																					
• Large and wasteful increases in energy consumption					U																
• Increased demand for energy, including electricity and natural gas	S		S					S			S						S				
• Increased demand for automobile fuel	S							S													
• Incremental increase in the use of non-renewable energy resources																	S				
• Cumulative energy-related impacts																	U				
Mitigation Measures																					
• Require compliance with California Administrative Code Title 24 (Building Code) energy conservation standards.	X		X					X													
• Encourage project proponents to incorporate energy conservation techniques in proposed projects. Provide brochures with information on energy efficient building and site design at the public counter.			X																		
• Operate construction equipment to avoid unnecessary use of fuel.	X																				
• Promote energy efficient building and site design for all new public buildings, and install energy saving devices in new public buildings and retrofit existing public buildings.	X		X														X				
• Promote retrofit programs to reduce energy usage and reduce emissions associated with energy consumption.			X																		

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TABLE GROWTH E.5.1 (Continued)
SIGNIFICANT MITIGABLE (S) AND SIGNIFICANT UNAVOIDABLE (U) IMPACTS OF GROWTH IDENTIFIED BY GENERAL AND SPECIFIC PLAN ENVIRONMENTAL IMPACT REPORTS IN PROJECT AREA

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• Implement transportation measures to improve roadway system efficiency and provide for alternative means of transportation.					X												X				
• Implement specified circulation policies concerning public transportation, bicycle, and pedestrian system improvements.								X									X				
• Implement specified general plan policies and programs concerning energy conservation in new and existing housing.								X													
• Expand general plan policies to require all new construction to conform with Title 22 and 24 standards, as well as to incorporate additional prescribed packages of energy saving building strategies as recommended by the California Energy Commission.								X													
• Require extensive landscaping of parking lots with trees to maximize shade and reduce localized warming.								X													
• Implement general plan policies related to the distribution of land use designations to minimize energy demand and maximize energy efficiency.																					
• Implement policies and programs of the general plan open space and conservation element that reduce energy-related impacts.											X										

[a] City of Belmont, San Juan Hills Area Plan Environmental Impact Report, State Clearinghouse #86122320, March 22, 1988; Western Hills Area Plan Environmental Impact Report, State Clearinghouse #89051615, June 12, 1990.
[b] City of Brisbane, 1993 General Plan Environmental Impact Report, State Clearinghouse #93071072, January 1994a; Resolution No. 94-23 of the City Council Making Certain Findings Regarding the Environmental Impact Report for the 1994 General Plan and Adopting a Mitigation Monitoring Program, June 1994b.
[c] City of East Palo Alto, General Plan Final Program Environmental Impact Report, State Clearinghouse #98051028, November 23, 1999a; Final Environmental Impact Report CEQA Findings: City of East Palo Alto General Plan Final Program EIR, November 23, 1999b.
[d] City of Foster City, Final Environmental Impact Report on the General Plan Revision for the City of Foster City, State Clearinghouse #92073017, April 1993.
[e] City of Fremont, Fremont 1990 General Plan Final Program Environmental Impact Report, State Clearinghouse #90030675, March, 1991a; Resolution No. 8080 of the City of Fremont Adopting an Updated General Plan, Certifying a Project EIR, and Adopting Findings of Fact and a Statement of Overriding Considerations, May 7, 1991b.
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[g] City of Menlo Park, Final Environmental Impact Report: Amendments to the City of Menlo Park General Plan and to the City of Menlo Park Zoning Ordinance including Policy Document, Background Report, and Land Use and Circulation Elements, State Clearinghouse #890 124 20, October 19, 1994 (includes November 15, 1994 Findings for Project and Final EIR).
[h] City of Millbrae, Final Environmental Impact Report for the City of Millbrae General Plan Revision, State Clearinghouse #98041090, October 1998a; Draft Finalized with Addition of Comments and Responses as Adopted by City Council November 24, 1998: Millbrae Station Area Specific Plan Draft Environmental Impact Report, State Clearinghouse #98041091, 1998b.
[i] City of Milpitas, Environmental Impact Report for the Midtown Milpitas Specific Plan, State Clearinghouse #2000092027, January 2002a; City of Milpitas, Resolution No. 7150 of the City Council of the City of Milpitas Certifying an Environmental Impact Report for the Milpitas Midtown General Plan Amendment and Specific Plan Project and Adopting Related Mitigation Findings, Findings Regarding Alternatives, A Statement of Overriding Considerations and a Mitigation Monitoring and Reporting Plan Pursuant to the California Environmental Quality Act, March 19, 2002b.
[j] City of Mountain View, Final Environmental Impact Report: City of Mountain View 1992-2005 General Plan, State Clearinghouse #91083044, November 1992a; Resolution 15481 series 1992 Certifying the Final EIR for the 1992 General Plan, Adopting the 1992 General Plan Land Use Map and Adopting the City of Mountain View 1992-2005 General Plan, October 29, 1992b.
[k] City of Newark, General Plan Update Project 2007 Environmental Impact Report, State Clearinghouse #91093071, June 1992a; Resolution No. 1241 Recommending to the City Council Approval and Certification of the Final Environmental Impact Report for the Newark General Plan Update, Including a Statement of Overriding Considerations and Mitigation Monitoring Program, passed May 26, 1992b.
[l] City of Palo Alto, Comprehensive Plan Update Draft Environmental Impact Report, State Clearinghouse #96052043, certified July 1998a; Resolution 7780 Certifying the Adequacy of the 1998-2010 Comprehensive Plan Final EIR and Making Findings Thereon Pursuant to the CEQA and Adopting the 1998-2010 City of Palo Alto Comprehensive Plan and Land Use and Circulation Map, July 20, 1998b.
[m] City of Redwood City, Downtown Precise Plan Environmental Impact Report, State Clearinghouse #2006052027, certified March 2007a; Resolution No. 14769 of the City Council of City of Redwood City Making Certain Findings Concerning Mitigation Measures, Adopting a Mitigation Monitoring and Reporting Program, Making Findings Concerning Alternatives, and Adopting a Statement of Overriding Considerations in Accordance with the California Environmental Quality Act for the Redwood City Downtown Precise Plan, adopted March 26, 2007b; Ordinance No. 2308 of the City Council of the City of Redwood City Adopting the Redwood City Downtown Precise Plan and the Moderate Intensity Alternative as the Most Appropriate Maximum Alternative Development Limitation for the Downtown Precise Plan, approved April 24, 2007c.
[n] City of San Bruno, 1984 General Plan and Environmental Impact Report, adopted June 25, 1984a; Resolution No. 1984-37 of the City Council of the City of San Bruno Adopting a Modification to the General Plan of the City Including the Following Elements: Noise, Seismic Safety/Safety, Housing, Open Space, Conservation, Scenic Corridors, Circulation, and Land Use, and the Certification of an Environmental Impact Report Pertinent Thereto, June 25, 1984b.
[o] City of San Jose, 2020 General Plan Final Environmental Impact Report, State Clearinghouse #94023031, 1994.
[p] City of San Mateo, Final Environmental Impact Report: Proposed General Plan Revisions, State Clearinghouse #89100308, June 1990a; Resolution #77 (1990) Certifying the Final Environmental Impact Report Pertaining to the General Plan Revision, and Adopting the Revised City of San Mateo General Plan, July 16, 1990b.
[q] County of San Mateo, Board of Supervisors Resolution 48639 Adopting Findings Pursuant to Certification of the Final Environmental Impact Report for the San Mateo County General Plan, State Clearinghouse #84042404, November 18, 1986.
[r] City of Santa Clara, Resolution No. 5728: A Resolution and Related Findings Certifying a Final Environmental Impact Report and Directing the Filing of a Notice of Determination, General Plan Amendment #32, State Clearinghouse #8908017, July 1992.
[s] County of Santa Clara, General Plan Environmental Report, State Clearinghouse #94023004, November 1994a; Resolution of the Board of Supervisors of the County of Santa Clara Recommending Certification of Final Impact Report, Adopting Related Overriding Considerations and Monitoring Program, and Adoption of the County General Plan, December 20, 1994b.
[t] County of Santa Clara, 2000 Stanford University Draft Community Plan and General Use Permit Application Final Environmental Impact Report, State Clearinghouse #1999112107, December 2000a; Resolution of the Board of Supervisors or the County of Santa Clara Certifying the Environmental Impact Report, Making Related Findings, and Adopting a Mitigation Monitoring and Reporting Program for the Stanford University Community Plan and 2000 General Use Permit, December 12, 2000b.
[u] City of Union City, Environmental Impact Report for the City of Union City General Plan Update, State Clearinghouse #2000112009, January 2002a; Resolution 2109-08 of the City Council of the City of Union City Adopting the 2002 General Plan Update Making Mitigations and Alternatives Finding and Adopting a Statement of Overriding Considerations and Adopting a Mitigation Monitoring Plan, February 12, 2002b.

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References – Appendix E.5

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City of Redwood City, Ordinance No. 2308: An Ordinance of the City Council of the City of Redwood City Adopting the Redwood City Downtown Precise Plan and the Moderate Intensity Alternative as the Most Appropriate Maximum Alternative Development Limitation for the Downtown Precise Plan, approved April 24, 2007c.

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City of San Bruno, Resolution No. 1984-37 A Resolution of the City Council of the City of San Bruno Adopting a Modification to the General Plan of the City Including the Following Elements: Noise, Seismic Safety/Safety, Housing, Open Space, Conservation, Scenic Corridors, Circulation, and Land Use, and the Certification of an Environmental Impact Report Pertinent Thereto, June 25, 1984b.

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APPENDIX E.6
Project Level Impacts of Growth

General plans aim to provide for orderly development within the planning area and incorporate policies to reduce the adverse impacts of such development, as discussed in the WSIP PEIR Chapter 7. Mitigation measures have been identified in the EIRs of adopted general plans to reduce the adverse impacts related to growth (refer to Appendix E, Section E.5, Table E.5.1). As part of WSIP PEIR analysis, a selection of EIRs of major projects currently being undertaken in the SFPUC service area were reviewed. The purpose of the review was to assess whether, at least for the small selection of EIRs reviewed, the mitigation measures identified in general plan EIRs were being implemented at the project level.

The thresholds for large projects contained in SB 610 were used to guide identification of the projects for this assessment.(i.e., residential developments with more than 500 units; retail uses with more than 500,000 square feet of floor space; office buildings with more than 250,000 square feet of floor space; hotels or motels with more than 500 rooms; industrial uses occupying more than 40 acres or having more than 650,000 square feet of floor area; and mixed-use projects that include any use or combination as large as the above uses).

The specific impacts of a project necessarily depend on its particular circumstances, such as the location and nature of the project. Nevertheless, the review of current development projects in the service area and review of impacts and mitigation measures presented in **Table E.6.1** indicates that the impacts of growth are being mitigated consistent with the measures identified to reduce those impacts in the respective general plan EIRs.

The Projects

This appendix summarizes the impacts and mitigation measures identified for the following projects:

- One Quarry Road Residential Project, Brisbane
- Electronics for Imaging, Inc., Vintage Park Development, Foster City
- Elmwood Residential Commercial Development, Milpitas
- Abbott Labs, Redwood City
- Palo Alto Medical Foundation, San Carlos

One Quarry Road Residential Project, Brisbane

The proposed project consists of the redevelopment of an existing quarry for residential and open space uses. The project site is 144.4 acres, including the Guadalupe Valley Quarry and surrounding undeveloped land; it is located northeast of the main ridge of San Bruno Mountain in unincorporated San Mateo County, approximately three-quarters of a mile west of central Brisbane. The project includes subdivision of the site and construction of 148 single-family detached residences, three condominiums totaling 61 townhouses, a main access road, and internal roadways. A 600,000-gallon water tank would be constructed on a bench in the quarry wall, and associated utilities, landscaping, and lighting would be developed to serve the project. The residential development includes a 2.7-acre city park, a 0.29-acre neighborhood tot-lot, and 13.5 acres of common landscaped space. The residential areas would occupy roughly 19 acres plus 16.5 acres of common landscaped area and parks. The remaining land would be divided between relatively undisturbed open space surrounding the residential development (58 acres) and reclaimed quarry slopes (43 acres). Impacts and mitigation measures identified in the One Quarry Road Residential Project EIR are presented in Table E.6.1. Brisbane voters rejected the project in November 2006, when project approval was placed on the city ballot as Measure B. The EIR prepared for the project nevertheless provides a means to compare project-level impact assessment and mitigation with the city's general plan EIR.

Electronics for Imaging, Inc., Foster City

The EIR prepared for this project serves as a master EIR for one project component (a proposed master plan amendment) and a project-level EIR for the other project component (the proposed construction of several phases of the proposed development). The amendment to the Vintage Park Master Plan proposes development of 750,000 to 1,000,000 square feet of space for offices, research and development, and light industry instead of the nearly 1,500 multifamily residential units and 60,000 square feet of support retail space allowed under the current master plan. The project-level development includes construction of three buildings. Impacts and mitigation measures identified in the Electronics for Imaging EIR are presented in Table E.6.1.

Elmwood Residential and Commercial Development, Milpitas

The proposed project consists of a 59-acre residential, commercial, and recreational development surrounding the Santa Clara County Elmwood Correctional Facility east of Interstate 880 and north of Great Mall Parkway in the city of Milpitas. The project includes the development of approximately 680 residential units (315 condominium units, 110 of which would be available for sale to qualified moderate-income households; 165 single-family detached homes; and 203 townhomes), 180,000 square feet of auto mall building space (to accommodate approximately three auto dealerships), six acres of public park (including Hetch Hetchy park/trail improvements, Elmwood Park, and West Able Street Public Park), and approximately 8.4 acres for two private park/recreation areas (one within the single-family home area and one within the proposed condominium area). To accommodate the proposed development, the project also proposes to amend the Milpitas General Plan, the Midtown Specific Plan, and the city's zoning map; it also proposes approval of a planned unit development map, site and architectural plans, and a use permit for exceptions to development standards. Impacts and mitigation measures identified in the Elmwood EIR are presented in Table E.6.1.

Abbott Laboratories, Redwood City

Abbott Laboratories consists of a master-planned research center at the foot of Chesapeake Drive on Redwood City's bayfront, adjacent to the Port of Redwood City small-boat launch facility and the Stanford Rowing Club. The project proposes to remove salt processing structures and equipment and to construct approximately 541,000 square feet of manufacturing, research and development, and offices in four buildings around a central green space. The project includes an onsite multilevel parking garage, a greenbelt around a portion of the site, and a publicly accessible linear waterfront park; it would also set aside land to construct a replacement facility for the Marine Sciences Institute. The institute would be responsible for the planning and execution of its new facility within the design guidelines established in the project's master plan. The project proposes subdividing the site into eight lots: six for the proposed buildings of the Abbott Laboratories campus, a separate lot for the Marine Sciences Institute, and a common area lot for private roadways, utilities, and landscaping. The project would be constructed in three phases over a 10-year period. Impacts and mitigation measures identified in the Abbott Laboratories EIR are presented in Table E.6.1.

The Palo Alto Medical Foundation–San Carlos Center, San Carlos

The proposed Palo Alto Medical Foundation–San Carlos Center (PAMF–SCC) project involves the closure and demolition of industrial manufacturing facilities, implementation of an approved remedial action plan at the site, and construction of medical facilities. The 18.1-acre project site is located at 301 Industrial Road, northwest of the Holly Street/Highway 101 interchange in east San Carlos. Existing structures at the site include four main buildings, a wastewater treatment plant, a hazardous waste storage area, other smaller structures, and surface parking. Structures occupy approximately 42 percent of the site; areas not covered by structures are paved (except for minor landscaping along the street frontage). Following closure and decommissioning by the current owner, the site would be remediated according to the approved remedial action plan. The RWQCB would be the lead agency overseeing site remediation, with review and concurrence by the Department of Toxic Substances Control and San Mateo County. The proposed medical facility includes a 478,500-square-foot medical building (including a detached 12,500-square-foot central plant), two aboveground parking garages with approximately 1,245 spaces, and a clock tower. The medical building would house a hospital, medical offices, an ambulatory care clinic, and ancillary/supporting uses. The project would occupy approximately 7.2 acres (40 percent) of the site and would increase the area of permeable surface from zero to about 4.5 acres. Impacts and mitigation measures identified in the PAMF–SCC EIR are presented in Table E.6.1.

References – Appendix E.6

City of Brisbane, *One Quarry Road Residential Project Environmental Impact Report*, State Clearinghouse #2000052109, April 2001.

City of Foster City, *Electronics for Imaging, Inc. Vintage Park Development Environmental Impact Report*, State Clearinghouse #96102060, January 1997.

City of Milpitas, *Final Environmental Impact Report for the Elmwood Residential and Commercial Development Project*, State Clearinghouse #2003112102, December 2004.

City of Redwood City, *Abbott Laboratories West Coast Research Center Final Environmental Impact Report*, State Clearinghouse #2003032014, January 2004.

City of San Carlos, *Palo Alto Medical Foundation – San Carlos Center Draft Environmental Impact Report*, State Clearinghouse #2003062086, February 2006.

TABLE E.6.1
SIGNIFICANT IMPACTS AND MITIGATION MEASURES IDENTIFIED
IN ENVIRONMENTAL IMPACT REPORTS OF RECENT MAJOR PROJECTS IN THE SFPUC SERVICE AREA

Impact	One Quarry Road Project (Brisbane)	Electronics for Imaging (Foster City)	Elmwood Residential and Commercial Development Project (Milpitas)	Abbott Laboratories (Redwood City)	Palo Alto Medical Foundation (San Carlos)
Aesthetics					
Impacts					
• Negative aesthetic effect or degradation of existing views	S				
• Conflicts with design guidelines previously adopted for the site		S			
• Creation of new source(s) of light and/or glare	S			S	
Mitigation Measures					
• Amend design guidelines as recommended prior to project approval		X			
• Confine illumination to the project site; shield and orient light sources to minimize their visibility from outside the site; complete and submit a photometrics site plan analysis with each of the project's building phases for review and approval by the city's community development services director				X	
• Relocate and reconfigure specified site plan features (water tank, townhouses, and single-family houses) to reduce or eliminate their visual prominence	X				
• Use nonreflective paint and nonglare fixtures	X				
• Provide appropriate structural and/or vegetative screening for sensitive adjacent uses	X			X	
Agricultural Resources					
Impacts – No significant impacts identified					
Air Quality					
Impacts					
• Construction-related air quality impacts (construction vehicle emissions and particulate matter)		S		S	S
• Fugitive dust emissions during construction	S		U		
• Operational air quality emissions from new area and mobile sources					U
• Increased regional air pollutant emissions from traffic generated by the project		U			
• Cumulative impacts on regional air quality in the Bay Area			U		U
Mitigation Measures					
• Implement BAAQMD- and EIR-specified construction dust control measures	X	X	X	X	X
• Provide site features and implement measures to encourage the use of alternative modes of travel (alternatives to private vehicles) and reduce vehicle trips		X	X		X
• Allow only natural gas fireplaces, pellet stoves, or EPA-certified wood-burning stoves; prohibit conventional open-hearth fire places			X		

Impact	One Quarry Road Project (Brisbane)	Electronics for Imaging (Foster City)	Elmwood Residential and Commercial Development Project (Milpitas)	Abbott Laboratories (Redwood City)	Palo Alto Medical Foundation (San Carlos)
• Use reflective/high albedo roofs and light-colored construction materials to increase the reflectivity of paved surfaces and include shade trees near buildings to shield buildings from the sun and reduce local air temperature and energy demand			X		
Biological Resources					
Impacts					
• Impact(s) on sensitive or special-status animal or plant species	S		S		S
• Degradation of riparian habitat or other sensitive habitat	S		S		
• Impact(s) on protected wetlands, either individually or in combination with known or probable impacts of other activities	S		S		
• Conflicts with an adopted habitat conservation plan	S				
• Displacement of native plants, including important wildlife food plants, by invasive exotic plants	S				
• Disturbance of burrowing owls and/or permanent loss of owl habitat			S		
• Disturbance of active raptor nests, the nests of sensitive bird species, or other nesting bird species	S		S		S
• Cumulative impacts on nesting birds					S
Mitigation Measures					
• Fulfill the city's obligations under the habitat conservation plan in light of the change of site status from an unplanned to a planned parcel	X				
• Develop, implement, and monitor a varicolored lupine establishment plan in consultation with U.S. Forest Service	X				
• Oversee maintenance of slopes to maximize safety and minimize adverse impacts on butterfly food plants	X				
• Construct chain-link fences acceptable to the property owner and the California Department of Fish and Game (CDFG) along the perimeter of developed areas and along access roads to prevent people from entering sensitive habitat areas	X				
• Post interpretive signage at specified areas to educate homeowners about San Bruno Mountain habitat and the detrimental effects of exotic plants	X				
• Provide new homeowners with the current Open Space and Ecology Committee brochure and make reasonable, ongoing efforts to educate homeowners about exotic plants and the habitat of San Bruno Mountain	X				
• Indicate in conditions, covenants, and restrictions attached to individual properties that no pets will be allowed outside the owner's lot unless under the control of a responsible person by leash or other means	X				
• Revise grading plan so that stonecrop on the site is outside project's grading limits	X				

Impact	One Quarry Road Project (Brisbane)	Electronics for Imaging (Foster City)	Elmwood Residential and Commercial Development Project (Milpitas)	Abbott Laboratories (Redwood City)	Palo Alto Medical Foundation (San Carlos)
• Conduct appropriately timed survey for nesting raptors before removing any eucalyptus trees and for nesting loggerhead shrikes before removing any shrubs; establish a 250-foot buffer around any nests that are found, within which no vegetation will be removed until the young birds have fledged	X				
• Indicate in conditions, covenants, and restrictions attached to individual properties that the use on private property of any invasive non-native plant species that could displace butterfly food plants will be prohibited; provide information to the homeowners association and individual homeowners about invasive species; invite homeowners to an informational meeting conducted by a local environmental organization to educate residents about the sensitive environment adjoining the project site, and the potential impact of invasive plant species on butterfly habitat; hold annual meetings between the homeowners association and each homeowner to verify that invasive plants are not being planted; require the homeowners association to remove any invasive plants from areas for which it is responsible	X				
• Remove invasive exotic plant species found in both the revegetated and undisturbed areas of the project site; preclude the use of invasive exotic species from landscaping in common areas; and maintain common areas to ensure exotic invasive species are removed	X				
• Verify the prepared wetland delineation with the U.S. Army Corps of Engineers; apply for relevant permits, waivers, and certifications for jurisdictional wetlands determined to occur on the site	X				
• Develop and implement a mitigation plan to replace the lost watercourse consistent with requirements of the RWQCB and CDFG	X				
• Identify the species of gumplant at the site and, if it is a special-status species, include the species in the planting mix used for slope benches	X				
• Conduct appropriately timed surveys (to be conducted by a qualified botanist) to determine the presence or absence of special-status plant species; if special-status plants are detected, contact the CDFG and develop appropriate protocols for relocating the plants and conducting future monitoring at the site			X		
• Prepare a stormwater pollution prevention plan that specifies measures to minimize impacts on biological resources (in particular special-status fish species) resulting from stormwater runoff			X		
• Avoid disturbance of trees and shrubs during nesting season; if construction during nesting season cannot be avoided, conduct preconstruction surveys for nesting birds and implement protective measures if active nests are identified			X		X
• Prior to discing for fire or weed control, conduct a burrowing owl nesting/occupancy survey as prescribed by the CDFG; implement appropriate relocation protocols if burrows are identified within project impact area; provide for replacement of habitat with offsite mitigation habitat that has been approved by the CDFG; conduct preconstruction surveys no more than 30 days prior to any ground-disturbing activity			X		

Impact	One Quarry Road Project (Brisbane)	Electronics for Imaging (Foster City)	Elmwood Residential and Commercial Development Project (Milpitas)	Abbott Laboratories (Redwood City)	Palo Alto Medical Foundation (San Carlos)
• Obtain a nationwide permit from the U.S. Army Corps of Engineers, a streambed alteration agreement permit from the CDFG, and an RWQCB Section 401 water quality certification and/or waiver of discharge requirements prior to filling waters or constructing any facilities in or affecting waters at or near the site			X		
• Prior to demolition or construction near drainage channels, install appropriate exclusion fencing to prevent red-legged frogs from entering the site					X
Cultural Resources					
Impacts					
• Disturbance of archaeological resources			S	S	S
• Disturbance of paleontological resources					S
• Disturbance of architectural or historic resources				S	
• Disturbance of human remains			S		S
Mitigation Measures					
• Monitor future ground-disturbing activities (to be monitored by qualified archaeologist)			X	X	
• If any cultural resources are found, halt work in the vicinity until the find has been evaluated by a qualified archaeologist/cultural resources consultant and a mitigation plan has been developed			X		X
• If avoidance of the resource is not feasible, prepare and execute a plan for the methodical excavation and documentation of those portions of the site that would be adversely affected; conduct construction activities in the vicinity of the find in accordance with current professional standards and do not recommence until the archaeological work is completed					X
• If cultural resources are found, inform project personnel that collecting significant historical or unique archaeological resources discovered during project development is prohibited by law					X
• If any human remains are uncovered during future construction activity, halt work and notify the county coroner immediately; if the coroner determines the remains are Native American, contact the Native American Heritage Commission pursuant to state regulations			X	X	X
• Provide a photographic record of existing structures and equipment on the project site prior to demolition; submit the photographs to the Redwood City Historic Resources Advisory Committee to be used at the committee's discretion				X	
Geology and Soils					
Impacts					
• Exposure to seismic or geologic hazards	S	S	S	S	
• Substantial soil erosion or the loss of topsoil				S	
• Damage to structures or utilities caused by soils with high shrink-swell potential			S	S	
• Location of structures on strata or soil that is unstable or that would become unstable as a result of the project	S				
• Exposure of facilities, including buildings, parking structures, and underground utilities, to corrosive soils				S	

Impact	One Quarry Road Project (Brisbane)	Electronics for Imaging (Foster City)	Elmwood Residential and Commercial Development Project (Milpitas)	Abbott Laboratories (Redwood City)	Palo Alto Medical Foundation (San Carlos)
• Hazards, including architectural and/or structural damage, due to differential settlement	S	S			
• Exposure to rockfall hazards	S				
Mitigation Measures					
• Conduct earthworks and foundation design in accordance with all recommendations contained in project geotechnical reports	X				
• Base grading and foundation design on the anticipated strong seismic shaking associated with a future major earthquake on the San Andreas fault	X				
• Prepare and submit to the city for approval an earthquake preparedness and emergency response plan for all public facilities	X				
• Prepare an earthquake hazards information document prior to marketing residential units for sale	X				
• Reconfigure the proposed townhouse pad to improve fill slope stability; construct fill slopes by excavating a slot key	X				
• Limit the differential fill thickness below individual buildings as specified	X				
• Conduct a geotechnical investigation to determine the feasibility of placing the water tank at the proposed location; redesign the water storage component of the project to ensure stability of the site and post-earthquake water supply; replace the proposed single tank with three smaller tanks; and reinforce the rock cut slope surrounding the water tanks	X				
• Construct an adequate rockfall catchment along the base of the planned final quarry slopes	X				
• Incorporate all recommendations of the slope stability analysis into the project	X				
• Cut and rebench quarry slopes by mechanical means where rock conditions are suitable for ripping with heavy-duty equipment; where blasting is required, use control methods to minimize over-breaking and loosening of final rock surfaces and to protect worker safety	X				
• Install subdrains beneath the deep fills to be put in place in the southeastern portion of the site	X				
• Design and construct a retaining wall, catchment basin, or other engineered feature to retain slope debris in areas of mapped landslides; establish a geologic hazard abatement district or other mechanism approved by the city to be responsible for all bench maintenance and slope repair	X				
• Comply with all aspects of the California Surface Mining and Reclamation Act regarding approval of land uses that are incompatible with mineral production at the project site	X				
• Conduct site-specific geotechnical and soils investigation(s) as specified and incorporate all measures identified to mitigate impacts		X	X	X	
• Install cathodic protection system on the project site to protect underground metallic fittings, appurtenances, and piping from corrosion				X	
• During construction, comply with erosion and sediment control measures in accordance with local stormwater requirements, construction best management practices, and State Water Resources Control Board National Pollution Discharge Elimination System requirements				X	

Impact	One Quarry Road Project (Brisbane)	Electronics for Imaging (Foster City)	Elmwood Residential and Commercial Development Project (Milpitas)	Abbott Laboratories (Redwood City)	Palo Alto Medical Foundation (San Carlos)
Hazards and Hazardous Materials					
Impacts					
• Hazards resulting from the routine transport, use, or disposal of hazardous materials	S			S	
• Hazards associated with petroleum-contaminated soils and the potential presence of petroleum hydrocarbons and polycyclic aromatic hydrocarbons in the soil and groundwater	S				
• Exposure of construction workers or the public to hazardous materials, including lead-based paint and/or materials containing asbestos	S		S		
Mitigation Measures					
• Assess existing structures for the presence of hazardous materials (assessment to be conducted by a qualified professional); if found, remove and dispose of hazardous materials in accordance with applicable state and federal regulations	X		X		
• Test the ground-mounted electrical transformers for PCBs; if found, remove and dispose of the materials in accordance with state and federal regulations			X		
• Remediate previously identified contaminated soils to below RWQCB risk-based thresholds or thresholds developed by a site-specific human health risk assessment prepared by a qualified professional	X				
• Investigate presence and extent of contaminants in soils and groundwater; coordinate this investigation and remediation with the removal of the underground oil storage tank	X				
• Adhere to existing federal, state, and local regulations regarding management and handling of hazardous materials	X				
• Include an area evacuation and business evacuation plan as part of the business plan submitted to the county health services agency and the city fire department; in conjunction with the fire department, conduct onsite hazardous materials training as needed or at least every 18 months				X	
Hydrology and Water Quality					
Impacts					
• Increases in impervious surface area and/or the alteration of area drainage resulting in flood hazards or the need for new drainage facilities	S	S	S	S	
• Water pollution from stormwater runoff	S			S	
• Placement of structures within a 100-year floodplain			S	S	
• Degradation of surface water quality due to construction activities and/or post-construction uses	S	S	S	S	
Mitigation Measures					
• Design and implement site drainage plan, in accordance with applicable standards and requirements, to address lot grading, paved areas, site facilities, and landscaping; demonstrate adequacy of conveyance structures; and incorporate appropriate filtration and control structures to direct, control, and filter runoff	X	X	X	X	
• Reduce the amount of impervious surface to the extent feasible	X		X		

Impact	One Quarry Road Project (Brisbane)	Electronics for Imaging (Foster City)	Elmwood Residential and Commercial Development Project (Milpitas)	Abbott Laboratories (Redwood City)	Palo Alto Medical Foundation (San Carlos)
• Design detention basins to contain runoff during the design storm event and enhance water quality	X				
• Stipulate in conditions, covenants, and restrictions attached to site properties the manner in which drainage facilities are to be monitored and maintained to sustain conveyance capacity	X				
• Construct new storm drain pipe as specified to alleviate existing flood hazard and accept increased project flows	X				
• Prepare and submit to the city for approval a construction stormwater pollution prevention plan (SWPPP) that includes best management practices to reduce construction impacts on surface water quality	X				
• Prepare and implement a SWPPP that includes best management practices to reduce potential impacts on surface water quality over the life of the project	X			X	
• Prepare and distribute to all potential occupants a water quality information document prior to purchase of the housing units	X				
• Conduct a final floodplain study demonstrating that existing sheet flows through the project will be accommodated without affecting adjacent floodplains more than is allowed by the Federal Emergency Management Agency (FEMA)			X		
• Design and construct residential and commercial structures to conform with applicable city requirements for structures in a floodplain			X		
• Design the new bridge to meet creek flow standards and all other applicable standards of the U.S. Army Corps of Engineers and the city			X		
• Provide storm drain system signs and/or stenciling to discourage illegal dumping into storm drains, catch basins, and/or filled inlets	X		X		
• Implement best management practices to protect water quality, including, at a minimum, erosion control, sediment transfer reduction, and dust control measures			X		
• Require in conditions, covenants, and restrictions for all future residential development: good housekeeping practices for handling potentially harmful material and controls to prevent and reduce pollutant discharge to stormwater for common landscaped areas and open space; material disposal and recycling controls to discourage illegal dumping of unwanted material into storm drains; a prohibition against dumping waste products into storm drains; and maintenance requirements for private streets, parking lots, and storm drain facilities to control and remove pollutants			X		
• Require as a condition of approval for future commercial development that educational flyers and other materials be provided to all owners/tenants to increase understanding of water quality best management practices and ensure that measures are implemented within private and open space areas to control and limit exposure to potential pollutants			X		
• Require that commercial operators be responsible for inspection, maintenance, and repair of sediment and oil filtering devices for the pretreatment of runoff from paved areas			X		

Impact	One Quarry Road Project (Brisbane)	Electronics for Imaging (Foster City)	Elmwood Residential and Commercial Development Project (Milpitas)	Abbott Laboratories (Redwood City)	Palo Alto Medical Foundation (San Carlos)
• Construct a levee to the specified minimum elevation to satisfy FEMA requirements to prevent 100-year flood water inundation of the project site; conduct a geotechnical investigation as specified to determine whether soil material and compaction would satisfy city levee requirements				X	
• Utilize integrated pest management techniques to minimize the use of pesticide sprays as specified by the county pollution prevention program				X	
• In addition to compliance with applicable regulations, establish a construction buffer of at least 1 meter along drainage channels within which no construction activities would occur (improvement measure for less-than-significant impact)					X
Land Use and Planning					
Impacts					
• Conflict with existing zoning designation		S			
• Conflict of parking areas and landscaping with existing utility easement		S			
• Conflicts with elements of the general plan					S/SU
• Cumulative land use impacts					SU
Mitigation Measures					
• Approve requested rezoning prior to project approval		X			
• Submit final improvement plans for review and comment to the utility with an easement through the site		X			
• Implement the measure identified in the analysis of noise impacts					X
• Implement the measure identified in the analysis of transportation impacts to reduce impacts at four specified intersections (cumulative effects at the intersections would not be reduced to a less-than-significant level)					X
• Implement the measure identified in the analysis of transportation impacts to reduce mobile-source air pollutants					X
Mineral Resources					
Impacts					
• Incompatibility of the project with mineral production at the project site	X				
Mitigation Measures					
• Comply with all aspects of the California Surface Mining and Reclamation Act regarding approval of the proposed land use and make appropriate findings regarding the benefits and disadvantages of quarry operations and the benefits to the community of new housing	X				
Noise					
Impacts					
• Short-term noise impacts during construction		S	S	S	
• Construction vibration from pile driving					U
• Cumulative construction noise and vibration					U
• Exposure to excessive noise levels (roadway noise and/or stationary noise sources)			S		S

Impact	One Quarry Road Project (Brisbane)	Electronics for Imaging (Foster City)	Elmwood Residential and Commercial Development Project (Milpitas)	Abbott Laboratories (Redwood City)	Palo Alto Medical Foundation (San Carlos)
Mitigation Measures					
• Implement management practices as specified to limit construction noise (may include limiting construction hours to minimize impacts on nearby uses, use of mufflers on equipment and maintaining equipment in good working order, locating noise sources as far as possible from nearby sensitive receptors, and limiting idling times for equipment and vehicles with internal combustion engines)		X	X	X	X
• Use hydraulically or electrically powered impact tools (e.g., jack hammers and pavement breakers) wherever feasible; where use of pneumatically powered tools is unavoidable, use an exhaust muffler on compressed air exhaust and external jackets on the tools themselves where feasible				X	
• Establish a process for responding to and tracking complaints pertaining to construction noise				X	
• If pile driving would be conducted outside specified hours (consistent with provisions for exceptions), erect plywood barriers as specified on site boundary and hire acoustical consultants to recommend additional site-specific measures to reduce pile-driving noise				X	
• Implement vibration abatement strategies to reduce vibration impacts on the adjacent residents					X
• Develop a noise attenuation plan to be implemented at the commercial portion of the site; noise control measures in the plan may include construction of noise barriers and site planning to avoid locating noise-generating operations adjacent to residential property boundaries			X		
• To reduce parking noise, construct a noise barrier fence along the northern site boundary where it adjoins single-family residences			X		
• Conduct acoustic study and implement recommendations, including noise insulation features to ensure interior noise levels do not exceed the specified threshold			X		X
Population and Housing					
Impacts					
• Potential conflicts with housing design requirements for persons with disabilities	S				
• Conflicts with affordable housing requirements or housing element designation of site for affordable housing	S	S			
• Jobs/housing imbalances (and consequent impacts on housing prices, commute times, and other effects)				S	
Mitigation Measures					
• Include in site plans units suitable for persons with disabilities	X				
• Comply with the city's affordable housing requirements either by providing the appropriate percentage of units affordable to low- and moderate-income households or by paying to the city fees in lieu of affordable housing units	X				
• Revise the housing element to provide adequate alternative housing sites, consistent with land use element designations, and remove all text related to providing housing at the project site		X			

Impact	One Quarry Road Project (Brisbane)	Electronics for Imaging (Foster City)	Elmwood Residential and Commercial Development Project (Milpitas)	Abbott Laboratories (Redwood City)	Palo Alto Medical Foundation (San Carlos)
• Pay the required fee per square foot for Phases 2 and 3 of the project if the city adopts a jobs/housing linkage program requiring such a fee before those phases are developed				X	
• Increase the residential development potential in the city through land use and zoning changes				X	
Public Services					
Impacts					
• Increased demand for fire protection services	S	S	S	S	
• Increased demand for police protection services	S	S	S	S	
• Increased use of parks, resulting in physical deterioration and increased maintenance demands			S		
• Increased demand for public services other than fire and police protection, schools, and parks	S				
• Cumulative increases in demand for police, fire, emergency, and childcare services				S	
• Cumulative increases in demand for schools				S	
Mitigation Measures					
• Incorporate fire protection design features and equipment as specified for all buildings within 50 feet of wildland; implement a 30-foot firebreak or other fire buffer program approved by the fire chief	X				
• Locate and design site structures and infrastructure to ensure adequate access by fire department vehicles and equipment		X			
• Fund additional water mains, to be installed by the city, as required by the city fire department to ensure adequate water supply for fire suppression activities				X	
• Comply with all applicable requirements of the Uniform Fire Code				X	
• Design and light parking structures to reduce auto thefts and burglary		X			
• Provide security lighting for the landscaped waterfront perimeter				X	
• Provide private security measures, including security personnel, to protect people and property at the site; submit plans for each development phase to the police department for review to identify additional design measures to enhance site security				X	
• Increase police staffing levels as indicated and provide for associated vehicles and equipment		X			
• Contribute a fair share portion of the costs associated with fire, police, park/landscape maintenance needed to serve the new residential development, as determined by a study to be conducted by the city	X		X		
• Use a qualified vector control professional to eliminate ground squirrels and feral cats from the site; submit site landscape plans to the city's vector control unit for review, for the purpose of identifying potential rat harborage areas and/or food sources, and for approval of pest proofing measures contained in the plan	X				
• Provide adequate childcare services for the children of project employees; if feasible, provide an onsite childcare facility				X	

Impact	One Quarry Road Project (Brisbane)	Electronics for Imaging (Foster City)	Elmwood Residential and Commercial Development Project (Milpitas)	Abbott Laboratories (Redwood City)	Palo Alto Medical Foundation (San Carlos)
Recreation					
Impacts – See Public Services regarding impacts on parks; no other significant recreation impacts identified					
Traffic and Transportation					
Impacts					
• Impacts related to site access roadways	S				
• Increased traffic relative to existing traffic and the capacity of the street system				U	
• Freeway traffic impacts			U	U	U
• Increased vehicle delays at area intersection(s)		S	S	S	
• Temporary construction impacts on traffic circulation and safety				S	
• Increase traffic safety concerns				S	
• Impacts on parking					S
• Cumulative traffic impacts on roadway segments and/or intersections			U	S, U	U
• Cumulative freeway traffic impacts					S
Mitigation Measures					
• Submit plans for the main and secondary access roads to the city engineer for review and concurrence with city and American Association of State Highway and Transportation Official Standards (recommended measure: design the secondary access road for two-way traffic)	X				
• Pay for signal warrant analyses at specified intersections and contribute fair share of costs of signal(s) determined by the city engineer to be needed			X		
• Working with the city and Caltrans, as applicable, make roadway and/or signal modifications, potentially including installation of turn lanes, combinations of turn lanes and through lanes, or warning signals; widening of lanes at specified intersections; and modification of traffic signal phasing		X		X	
• Contribute fair share of traffic mitigation fees to fund improvements to areas and/or roadways affected by the project			X	X	
• Submit a construction traffic management plan for review and approval by the city's engineering and construction division				X	
• Implement increasingly aggressive measures as part of the proposed transportation demand management (TDM) program				X	
• Implement a TDM program, including specified measures throughout the life of the project, with the objective of achieving the trip reductions specified in general plan Transportation Policy 9					X
• Design the main access driveway to ensure proper operation of the signalized intersection (recommended for a less-than-significant impact)					X
Utilities					
Impacts					
• Need for new or expanded water and/or wastewater treatment facilities	S		S		U

Impact	One Quarry Road Project (Brisbane)	Electronics for Imaging (Foster City)	Elmwood Residential and Commercial Development Project (Milpitas)	Abbott Laboratories (Redwood City)	Palo Alto Medical Foundation (San Carlos)
• Need for new or expanded stormwater drainage facilities	S				
Mitigation Measures					
• Provide additional infrastructure	X		X	X	
• Pay pro rata share for the installation of all needed water supply and sewer lines and for pump station improvements	X				
• Integrate water conservation measures and design features into the project's design to reduce overall water demand associated with the project (recommended for a less-than-significant impact)		X			
• Retain public ownership and responsibility for maintenance of onsite water lines, obtain approval from Estero MID for relocation of the water transmission line, and relocate it within water line easements; avoid locating structures or undertaking pile-driving activities in close proximity to water lines unless adequate shoring is provided; and avoid use of special or costly surfacing materials over the public water line easements to reduce the costs for reconstruction if future maintenance work is necessary (recommended for a less-than-significant impact)		X			
• Fund onsite improvements to the existing sewer system or lift station (recommended for a less-than-significant impact)		X			
• Purchase adequate public water system and sewer system capacities for the development; fees for this purpose cover treatment plant operations, sewage collection, and a proportional share of replacement costs for a new sewage pump station			X		
• Obtain nonpotable water supply from the city's planned recycled water program and contribute fair share of the cost of implementing the program; implement the city's landscape guidelines to reduce demand for irrigation water; implement best management practices identified by the California Urban Water Conservation Council; and retain an independent civil engineer or water specialist to monitor actual water use to ensure estimated water demand is consistent with actual demand				X	
• Include water-saving fixtures, appliances, and irrigation systems in site buildings and landscaping, and design landscaping with drought-resistant and other low-water-use plants (recommended for a less-than-significant cumulative impact on water supply)					X
• Purchase from the sewer authority sufficient dry-weather treatment capacity to accommodate the projected increase in sewage generated by the proposed project (to be performed by the city) and reimburse the city for all costs associated with this purchase (to be performed by the project applicant)				X	
• Fund one of three identified sanitary sewer improvement alternatives				X	
• Implement measures to reduce solid waste generation and encourage recycling		X		X	
• Implement measures to encourage the recycling of construction and demolition debris during the construction phase				X	X
Energy					
Impacts					
• Increased demand for energy, including electricity and natural gas				X	

Impact	One Quarry Road Project (Brisbane)	Electronics for Imaging (Foster City)	Elmwood Residential and Commercial Development Project (Milpitas)	Abbott Laboratories (Redwood City)	Palo Alto Medical Foundation (San Carlos)
Mitigation Measures					
• Require improvements to conform with all requirements of Title 24 and the Uniform Building Code to reduce energy demands (recommended for a less-than-significant impact)		X			
• Implement the specified energy conservation measures, including use of energy-efficient heating, cooling, and lighting fixtures				X	

SOURCES: City of Brisbane, 2001; City of Foster City, 1997; City of Milpitas, 2004; City of Redwood City, 2004; City of San Carlos, 2006.

Appendix F
Noise and Traffic Background Data

APPENDIX F

Noise

TABLE F-1
TYPICAL MAXIMUM CONSTRUCTION NOISE LEVELS AT VARIOUS DISTANCES

Project and Receptor Location	Maximum Noise Source	Reference Hourly Leq in dBA at 50 feet[1]	Distance Between Closest Project & Receptor	Distance Adjustment	Adjusted Leq	Exterior Speech Interference Criterion	Unmitigated Leq Exceeds Criterion?	Exterior Sleep Interference Criterion	Unmitigated Leq Exceeds Criterion?	Reduction Due to Controls[2]	Mitigated Leq With Controls	Exterior Speech Interference Criterion	Mitigated Leq Exceeds Criterion?	Exterior Sleep Interference Criterion	Unmitigated Leq Exceeds Criterion?
Typical Construction Noise Levels at Various Distances															
Minimum Setback Distance of 75 feet	Earthmoving Equipment	85	75	-4	81	70	**Yes**	60 or 50	**Yes/Yes**	-10	71	70	**Yes**	60 or 50	**Yes/Yes**
	Trucks (Lmax)	91	75	-4	87	70	**Yes**	60 or 50	**Yes/Yes**	-16	71	70	**Yes**	60 or 50	**Yes/Yes**
	Materials Handling	85	75	-4	81	70	**Yes**	60 or 50	**Yes/Yes**	-10	71	70	**Yes**	60 or 50	**Yes/Yes**
	Drilling/Stationary Equipment	80	75	-4	76	70	**Yes**	60 or 50	**Yes/Yes**	-6	70	70	**Yes**	60 or 50	**Yes/Yes**
	Impact Equipment	87	75	-4	83	70	**Yes**	60 or 50	**Yes/Yes**	-6	77	70	**Yes**	60 or 50	**Yes/Yes**
Minimum Setback Distance of 100 feet	Earthmoving Equipment	85	100	-6	79	70	**Yes**	60 or 50	**Yes/Yes**	-10	69	70	No	60 or 50	**Yes/Yes**
	Trucks (Lmax)	91	100	-6	85	70	**Yes**	60 or 50	**Yes/Yes**	-16	69	70	No	60 or 50	**Yes/Yes**
	Materials Handling	85	100	-6	79	70	**Yes**	60 or 50	**Yes/Yes**	-10	69	70	No	60 or 50	**Yes/Yes**
	Drilling/Stationary Equipment	80	100	-6	74	70	**Yes**	60 or 50	**Yes/Yes**	-6	68	70	No	60 or 50	**Yes/Yes**
	Impact Equipment	87	100	-6	81	70	**Yes**	60 or 50	**Yes/Yes**	-6	75	70	**Yes**	60 or 50	**Yes/Yes**
Minimum Setback Distance of 275 feet	Earthmoving Equipment	85	275	-15	70	70	No	60 or 50	**Yes/Yes**	-10	60	70	No	60 or 50	No/**Yes**
	Trucks (Lmax)	91	275	-15	76	70	**Yes**	60 or 50	**Yes/Yes**	-16	60	70	No	60 or 50	No/**Yes**
	Materials Handling	85	275	-15	70	70	No	60 or 50	**Yes/Yes**	-10	60	70	No	60 or 50	No/**Yes**
	Drilling/Stationary Equipment	80	275	-15	65	70	No	60 or 50	**Yes/Yes**	-6	59	70	No	60 or 50	No/**Yes**
	Impact Equipment	87	275	-15	72	70	No	60 or 50	**Yes/Yes**	-6	66	70	No	60 or 50	**Yes/Yes**
Minimum Setback Distance of 300 feet	Earthmoving Equipment	85	300	-16	69	70	No	60 or 50	**Yes/Yes**	-10	59	70	No	60 or 50	No/**Yes**
	Trucks (Lmax)	91	300	-16	75	70	**Yes**	60 or 50	**Yes/Yes**	-16	59	70	No	60 or 50	No/**Yes**
	Materials Handling	85	300	-16	69	70	No	60 or 50	**Yes/Yes**	-10	59	70	No	60 or 50	No/**Yes**
	Drilling/Stationary Equipment	80	300	-16	64	70	No	60 or 50	**Yes/Yes**	-6	58	70	No	60 or 50	No/**Yes**
	Impact Equipment	87	300	-16	71	70	**Yes**	60 or 50	**Yes/Yes**	-6	65	70	No	60 or 50	**Yes/Yes**

TABLE F-1 (Continued)
TYPICAL MAXIMUM CONSTRUCTION NOISE LEVELS AT VARIOUS DISTANCES

Project and Receptor Location	Maximum Noise Source	Reference Hourly Leq in dBA at 50 feet[1]	Distance Between Closest Project & Receptor	Distance Adjustment	Adjusted Leq	Exterior Speech Interference Criterion	Unmitigated Leq Exceeds Criterion?	Exterior Sleep Interference Criterion	Unmitigated Leq Exceeds Criterion?	Reduction Due to Controls[2]	Mitigated Leq With Controls	Exterior Speech Interference Criterion	Mitigated Leq Exceeds Criterion?	Exterior Sleep Interference Criterion	Unmitigated Leq Exceeds Criterion?
Minimum Setback Distance of 500 feet	Earthmoving Equipment	85	500	-20	65	70	No	60 or 50	**Yes/Yes**	-10	55	70	No	60 or 50	No/**Yes**
	Trucks (Lmax)	91	500	-20	71	70	**Yes**	60 or 50	**Yes/Yes**	-16	55	70	No	60 or 50	No/**Yes**
	Materials Handling	85	500	-20	65	70	No	60 or 50	**Yes/Yes**	-10	55	70	No	60 or 50	No/**Yes**
	Drilling/Stationary Equipment	80	500	-20	60	70	No	60 or 50	No/**Yes**	-6	54	70	No	60 or 50	No/**Yes**
	Impact Equipment	87	500	-20	67	70	No	60 or 50	**Yes/Yes**	-6	61	70	No	60 or 50	**Yes/Yes**
Minimum Setback Distance of 850 to 1,700 feet	Earthmoving Equipment	85	850	-25	60	70	No	60 or 50	No/**Yes**	-10	50	70	No	60 or 50	No/No
	Trucks (Lmax)	91	850	-25	66	70	No	60 or 50	**Yes/Yes**	-16	50	70	No	60 or 50	No/No
	Materials Handling	85	850	-25	60	70	No	60 or 50	No/**Yes**	-10	50	70	No	60 or 50	No/No
	Drilling/Stationary Equipment	80	850	-25	55	70	No	60 or 50	No/**Yes**	-6	49	70	No	60 or 50	No/No
	Impact Equipment	87	1,700	-31	56	70	No	60 or 50	No/**Yes**	-6	50	70	No	60 or 50	No/No
Minimum Setback Distance of 3,000 feet	Earthmoving Equipment	85	3,000	-36	49	70	No	60 or 50	No/No	-10	39	70	No	60 or 50	No/No
	Trucks (Lmax)	91	3,000	-36	55	70	No	60 or 50	No/**Yes**	-16	39	70	No	60 or 50	No/No
	Materials Handling	85	3,000	-36	49	70	No	60 or 50	No/No	-10	39	70	No	60 or 50	No/No
	Drilling/Stationary Equipment	80	3,000	-36	44	70	No	60 or 50	No/No	-6	38	70	No	60 or 50	No/No
	Impact Equipment	87	3,000	-36	51	70	No	60 or 50	No/**Yes**	-6	45	70	No	60 or 50	No/No
Minimum Setback Distance of 3,400 feet	Earthmoving Equipment	85	3,400	-37	48	70	No	60 or 50	No/No	-10	38	70	No	60 or 50	No/No
	Trucks (Lmax)	91	3,400	-37	54	70	No	60 or 50	No/**Yes**	-16	38	70	No	60 or 50	No/No
	Materials Handling	85	3,400	-37	48	70	No	60 or 50	No/No	-10	38	70	No	60 or 50	No/No
	Drilling/Stationary Equipment	80	3,400	-37	43	70	No	60 or 50	No/No	-6	37	70	No	60 or 50	No/No
	Impact Equipment	87	3,400	-37	50	70	No	60 or 50	No/No	-6	44	70	No	60 or 50	No/No

1 Reference noise levels represent the highest noise level by equipment type (without controls) listed in Table 4.10-4 at 50 feet. Reference noise level for tunneling activities includes a crane, and is based on noise measurements taken at the Hollywood Hills Tunnel project (entrance shaft), which involved similar tunneling construction techniques.

2 Noise control reductions represent the difference between the highest noise levels listed in Table 4.10-4 with controls versus without controls.

TABLE F-2
ESTIMATED MAXIMUM TRUCK NOISE LEVELS AT NEARBY RECEPTORS IN SUNOL VALLEY REGION

Project and Receptor Location	Hourly Truck Volume	Hourly Leq in dBA at 50 feet[1]	Distance Between Closest Project & Receptor	Distance Adjustment	Adjusted Leq	Ambient and Sleep Interference Criterion	Unmitigated Leq Exceeds Criterion?
New Irvington Tunnel Project (SV-4)							
Average and Peak Hour Hourly Truck Volume	36	66					
Closest residential receptor is located 200 feet east of Calaveras Road		66	200	-9 Note: Hill could reduce noise by additional 5 dBA	57	46 ambient 50 sleep	**Yes** **Yes**
Closest residential receptor is located 1,000 feet south of Access Road		66	1,000	-20	46	46 ambient 50 sleep	No No
Closest residential receptor is located 2,000 feet west of Calaveras Road		66	2,000	-25	41	46 ambient 50 sleep	No No
Calaveras Dam Replacement Project (SV-2)							
Average Hourly Truck Volume (Peak Volumes Lower)	12	61					
Closest residential receptor is located 200 feet east of Calaveras Road		61	200	-9 Note: Hill could reduce noise by additional 5 dBA	52	46 ambient 50 sleep	**Yes** **Yes**
Closest residential receptor is located 2,000 feet west of Calaveras Road		61	2,000	-25	36	46 ambient 50 sleep	No No
40-mgd Treated Water Project (SV-3)							
Average and Peak Hour Hourly Truck Volume	8	59					
Closest residential receptor is located 200 feet east of Calaveras Road		59	200	-9 Note: Hill could reduce noise by additional 5 dBA	50	46 ambient 50 sleep	**Yes** No
Closest residential receptor is located 2,000 feet west of Calaveras Road		59	2,000	-25	34	46 ambient 50 sleep	No No
Treated Water Reservoirs Project (SV-5)							
Average and Peak Hour Hourly Truck Volume	10	60					
Closest residential receptor is located 200 feet east of Calaveras Road		60	200	-9 Note: Hill could reduce noise by additional 5 dBA	51	46 ambient 50 sleep	**Yes** No
Closest residential receptor is located 2,000 feet west of Calaveras Road		60	2,000	-25	35	46 ambient 50 sleep	No No

TABLE F-2 (Continued)
ESTIMATED MAXIMUM TRUCK NOISE LEVELS AT NEARBY RECEPTORS IN SUNOL VALLEY REGION

Project and Receptor Location	Hourly Truck Volume	Hourly Leq in dBA at 50 feet[1]	Distance Between Closest Project & Receptor	Distance Adjustment	Adjusted Leq	Ambient and Sleep Interference Criterion	Unmitigated Leq Exceeds Criterion?
San Antonio Backup Pipeline Project (SV-6)							
Average and Peak Hour Hourly Truck Volume	10	60					
Closest residential receptor is located 200 feet east of Calaveras Road		60	200	-9 Note: Hill could reduce noise by additional 5 dBA	51	46 ambient 50 sleep	**Yes** **Yes**
Closest residential receptor is located 2,000 feet west of Calaveras Road		60	2,000	-25	35	46 ambient 50 sleep	No No
Collective Maximum Truck Noise Level from All Four Projects (SV-2, SV-3, SV-4, SV-5)							
Maximum Hourly Truck Volume	76	69					
Closest residential receptor is located 200 feet east of Calaveras Road		69	200	-9 Note: Hill could reduce noise by additional 5 dBA	59	46 ambient 50 sleep	**Yes** **Yes**
Closest residential receptor is located 2,000 feet west of Calaveras Road		69	2,000	-25	43	46 ambient 50 sleep	No No

NOTES: Assumed travel speed is 45 mph and reference Leq is 50 dBA for 1 truck at 50 feet. Truck volume estimates are presented in Table 3.

TABLE F-3
SFPUC WATER SYSTEM IMPROVEMENT PROGRAM
BACKGROUND DAILY TRAFFIC VOLUMES ON CALAVERAS ROAD – COLLECTIVE CONDITIONS

			Worker		Trucks		Total		
Source:			**In**	**Out**	**In**	**Out**	**In**	**Out**	**Total**
1	SV2	Calaveras Dam	120	120	44	44	164	164	328
2	SV3	Additional 40 mgd	40	40	32	32	72	72	144
3	SV4	Irvington Tunnel	144	144	145	145	289	289	578
4	SV5	Treated Water	40	40	40	40	80	80	160
5	SV6	San Antonio	40	40	40	40	80	80	160
		Total	***384***	***384***	***301***	***301***	***685***	***685***	***1,370***
AM Peak Hour	SV2	Calaveras Dam	65	18	4	5	69	23	92
	SV3	Additional 40 mgd	40	0	4	4	44	4	48
	SV4	Irvington Tunnel	144	0	18	18	162	18	180
	SV5	Treated Water	40	0	5	5	45	5	50
	SV6	San Antonio	40	0	5	5	45	5	50
		Total	***329***	***18***	***36***	***37***	***365***	***55***	***420***
PM Peak Hour	SV2	Calaveras Dam	18	65	4	5	22	70	92
	SV3	Additional 40 mgd	0	40	4	4	4	44	48
	SV4	Irvington Tunnel	0	144	18	18	18	162	180
	SV5	Treated Water	0	40	5	5	5	45	50
	SV6	San Antonio	0	40	5	5	5	45	50
		Total	***18***	***329***	***36***	***37***	***54***	***366***	***420***
Average Hour	SV2	Calaveras Dam	6	6	6	6	12	12	24
	SV3	Additional 40 mgd	0	0	4	4	4	4	8
	SV4	Irvington Tunnel	0	0	18	18	18	18	36
	SV5	Treated Water	0	0	5	5	5	5	10
	SV6	San Antonio	0	0	5	5	5	5	10
		Total	***6***	***6***	***38***	***38***	***44***	***44***	***88***

NOTE: Traffic estimates are based on preliminary project information (available as of February 22, 2007) and subject to change through the project design process.

Sources

1 Calaveras Dam Transportation Section
2 Table C-4 for Workers (40 to 80 - used 40), and Table C-5 for trucks (assumed 32 trucks/day is one-way truck trips)
3 Irvington Tunnel Alternative Project EIR - 12/18/06
4 Information not available. Estimated based on SV3
5 Distribution between worker and truck trips estimated, based on SV3, and information from project team

Appendix G
Hazardous Materials

APPENDIX G
Hazardous Materials

This appendix supplements the information provided in Section 4.14 of the WSIP PEIR. It provides an overview of the federal and state hazardous materials regulatory framework.

Regulatory Framework

Hazardous materials and hazardous wastes are extensively regulated by various federal, state, regional, and local regulations, with the major objective of protecting public health and the environment. This appendix summarizes the overall regulatory framework governing hazardous materials management.

Federal Regulations – General Hazardous Materials

The U.S. Environmental Protection Agency (U.S. EPA) is the lead agency responsible for enforcing federal regulations that affect public health or the environment. The primary federal laws and regulations include: the Resource Conservation and Recovery Act of 1974 (RCRA); the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA); and the Superfund Amendments and Reauthorization Act of 1986 (SARA). Federal statutes pertaining to hazardous materials and wastes are contained in Title 40 of the Code of Federal Regulations.

RCRA was enacted to provide a general framework for the national hazardous waste management system, including the determination of whether hazardous wastes are being generated, techniques for tracking wastes to eventual disposal, and the design and permitting of hazardous waste management facilities. In 1984, the Hazardous and Solid Waste Amendment was enacted to better address hazardous waste; this amendment began the process of eliminating land disposal as the principal hazardous waste disposal method. Other specific areas covered by the amendment include the regulation of carcinogens, listing and delisting of hazardous wastes, permitting for hazardous waste facilities, and leaking underground storage tanks.

CERCLA, also known as Superfund, was enacted to ensure that a source of funds was available to clean up abandoned hazardous waste sites, compensate victims, address releases of hazardous materials, and establish liability standards for responsible parties. SARA amended CERCLA in 1986 to increase the Superfund budget, modify contaminated site clean up criteria and schedules, and revise settlement procedures. SARA also provides a regulatory program and fund for underground storage tank cleanups and the Emergency Planning and Community Right-to-Know Program (EPCRA).

In 1976, Congress passed the Toxic Substances Control Act (TSCA) which was implemented in 1979. This act governs the manufacture, processing, distribution in commerce, use, cleanup, storage, and disposal of polychlorinated biphenyls (PCBs). Since 1978, the U.S. EPA has promulgated numerous rules further addressing all aspects of the life cycle of PCBs. The most recent rule was the “Final Rule: Amendments to the TSCA PCB Disposal Regulations Including Amendments to the PCB Notification and Manifesting Rule” promulgated on June 24, 1999. This rule is deregulatory in nature and provides individuals with more flexibility in their PCB disposal practices while continuing to provide protection from unreasonable risk.

State and Regional Regulations – General Hazardous Materials

The California Department of Toxic Substances Control (DTSC) and the Regional Water Quality Control Board (RWQCB) are the primary state agencies regulating hazardous materials in California. These agencies are part of the Cal-EPA. The RWQCB is authorized by the State Water Resources Control Board to enforce provisions of the Porter-Cologne Water Quality Control Act of 1969. This act gives the RWQCB authority to require groundwater investigations when the quality of groundwater or surface waters of the state is threatened, and to require remediation of the site if necessary. The DTSC is authorized by the U.S. EPA to regulate the management of hazardous substances, including the remediation of sites contaminated by hazardous substances.

California hazardous materials laws incorporate federal standards but are often stricter than federal laws. The primary state laws include: the California Hazardous Waste Control Law (HWCL), the state equivalent of RCRA; and the Carpenter-Presley-Tanner Hazardous Substances Account Act (HSAA), the state equivalent of CERCLA. State hazardous materials and waste laws are contained in the California Code of Regulations, Titles 22 and 26.

The HWCL, enacted in 1972 and administered by the DTSC, is the basic hazardous waste statute in California and has been amended several times to address current needs, including bringing the state law and regulations into conformance with federal laws. This act implements the RCRA “cradle-to-grave” waste management system in California but is more stringent in its regulation of non-RCRA wastes, spent lubricating oil, small-quantity generators, transportation and permitting requirements, as well as in its penalties for violations. The HWCL also exceeds federal requirements by mandating the recycling of certain wastes, requiring certain generators to document a hazardous waste source reduction plan, requiring permitting for federally exempt treatment of hazardous wastes by generators, and implementing stricter regulation of hazardous waste facilities.

The HSAA, enacted in 1981, addresses similar concerns as CERCLA. The primary difference is in how liability is assigned for a site with more than one responsible party. This is important for petroleum cleanup sites because federal law is usually used to force responsible-party cleanups; state law is used for petroleum cleanup sites that are exempt from CERCLA.

Other relevant State of California statutes include:

- The Toxic Pit Cleanup Act of 1984 and the Toxic Injection Well Act of 1985, which were established to provide a regulatory framework for open pits or injection wells as a means of hazardous waste or disposal.
- The Hazardous Waste Management Act of 1986, which coordinates the state's implementation of federal landfill bans and authorizes landfill bans for non-RCRA hazardous wastes.
- The Aboveground Petroleum Storage Act of 1989, which requires the owner or operator of aboveground petroleum storage tanks to file a storage statement with the State Water Resources Control Board if tank storage exceeds 10,000 gallons and holds petroleum or petroleum product that is liquid at ambient temperatures. In addition, the tank or tanks must be registered if they are subject to federal requirements; this potentially expands the requirement for a storage statement to any tank over 660 gallons or aggregate storage of 1,320 gallons.
- The Hazardous Waste Source Reduction and Management Act, which, beginning in 1991, required large-quantity generators to document the hazardous wastes being generated and to prepare a documented waste reduction plan.
- The Hazardous Waste Treatment Permitting Reform Act of 1992, which required a permit for any hazardous waste treatment by a generator beginning on April 1, 1993. This statute established a new, tiered permitting program whereby onsite treatment facilities are permitted or authorized to operate subject to different levels of regulatory requirements, depending on the nature and size of the treatment activity. Amendments to this statute adopted in 1993–1996 have enacted certain exemptions and modified compliance requirements.
- The Hazardous Waste Management Reform Act of 1995, which required the DTSC to revise its regulations to more closely conform to federal hazardous waste identification criteria and essentially eliminate land disposal restrictions for California-only hazardous wastes, among other major changes. However, many of these changes have been deferred to a DTSC advisory committee for further study and are not expected to be implemented for several years, and in certain cases, not at all.

The Bay Area Air Quality Management District, a regional regulatory agency, may impose specific requirements on remediation activities to protect ambient air quality from dust or other airborne contaminants.

Appendix H
Modeling Analysis – Water Supply and System Operations

APPENDIX H

Modeling Analysis – Water Supply and System Operations

H1 – Hydrologic Modeling Report

H2 – Hydrologic Modeling – Supporting Information

H3 – Temperature Modeling Report

APPENDIX H1

Hydrologic Modeling Conducted for the WSIP Water Supply and System Operations Impact Assessment

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1. Introduction

This technical appendix summarizes the methodology and results of the hydrologic analyses conducted for the water supply and system operations impact assessment for the Program Environmental Impact Report (PEIR) on the Water System Improvement Program (WSIP). It includes descriptions of the analysis conducted by the PEIR consultant team using output data derived from the San Francisco Public Utilities Commission’s (SFPUC) water supply planning model, the Hetch Hetchy/Local Simulation Model (HH/LSM) and provided by the SFPUC. This type of analysis is also referred to as “post-processing” of data, since it involves manipulating information following the completion of the model runs. The HH/LSM analyzes system operations based on historical hydrology, including actual hydrological sequences and events, and the model allows the SFPUC to predict the consequences of changes to the system's facilities and/or operations. The SFPUC’s model was used to predict potential impacts on water resources in the affected watersheds resulting from the proposed program, variants, and alternatives developed in the PEIR. The HH/LSM is similar to the tools used by other water purveyors in the United States to plan system improvements.

A detailed description of the HH/LSM is provided in the *Water Supply System Modeling Report, Hetch Hetchy/Local Simulation Model* (SFPUC, 2007) and is incorporated herein by this reference. This appendix, Appendix H1, provides descriptions of the model runs and the methods used to post-process and analyze the HH/LSM data. Appendix H2 –Modeling Analysis – Water Supply and System Operations, prepared by the SFPUC, presents further data and explanation of the HH/LSM raw data output as it relates to system operations; modeling data were used to support the PEIR impact assessment of water supply and system operations. Appendix H3, Temperature Modeling Report, describes the model and analytical methodology used to predict temperature changes in the Tuolumne River below La Grange Dam, and presents the modeling results. A full compilation of post-processed model data for the proposed program, variants and CEQA alternatives proposed according to the methodology presented in this document and used in the PEIR impact assessment is available for review at the SF Planning Department and the SFPUC offices.

The post-processing effort included summarizing the myriad of data derived from the HH/LSM modeling in a uniform, succinct format to allow for the analysis of potential hydrologic impacts of the proposed program, variants, and alternatives compared to existing conditions. In certain instances the variants and alternatives are also compared to the proposed program. The PEIR team utilized the post-process results to identify potential direct impacts on hydrology (stream flow and reservoir water levels) in the affected watersheds as well as potential indirect impacts on related resources, including geomorphology, surface water quality, groundwater, fisheries, terrestrial biological resources, recreation, and visual resources. In addition to the results of this analysis, the authors of the PEIR relied on additional post-processing and analysis provided by the SFPUC and presented in Appendix H2.

This appendix is organized as follows:

1. **Modeling Scenarios** – An explanation of the model runs analyzed for the PEIR. Further explanation of the model runs is provided in Appendix H2.

2. **Hydrologic Modeling Methodology and Model Output Data** – A brief explanation of the HH/LSM, with reference to the SFPUC's modeling documentation, *Water Supply System Modeling Report, Hetch Hetchy/Local Simulation Model* (SFPUC, 2007), which provides greater detail on the operation of HH/LSM. Review of the data provided by the HH/LSM, with a focus on data used in the post-processing analysis.

3. **Post-processing Hydrological Analysis Methodology** – Discussion of the analyses performed on the HH/LSM data. Analyses included statistical summaries, calculation of reservoir levels, and hydrologic analyses to predict creek and river flows. Description of the quality control methodology implemented for the analysis of the model results.

4. **Index of Post-processed Model Results** – An index of the hydrological analyses prepared for the PEIR impact assessment.

2. Modeling Scenarios

The scenarios analyzed in the PEIR were developed through collaboration with the SFPUC, San Francisco Planning Department, Major Environmental Analysis (MEA) Division, and the PEIR consultants. The SFPUC provided input regarding the existing conditions, proposed program, and variants as well as the technical feasibility of alternatives. The MEA and PEIR consultants provided input into the baseline conditions, variants and CEQA alternatives. The SFPUC then conducted model runs for the selected scenarios using the HH/LSM and provided the output data to the PEIR team for post-processing analysis.

The scenarios are organized and discussed in the order presented below. The code presented in brackets after each scenario name is the reference used by the SFPUC to denote the model run. Tables 1 through 3 summarize the major assumptions of each scenario.

1. Baseline(s)
   - Existing Conditions with "Calaveras Down" [MEA3CHR]
   - Conditions Prior to 2002 with "Calaveras Up" [MEA2A]

2. Proposed Program
   - WSIP or Proposed Program [MEA5HIN]

3. Variants
   - WSIP Variant 1 – All Tuolumne [MEA4HIN]
   - WSIP Variant 2 – Regional Desalination for Drought [MEA30H]
   - WSIP Variant 3 – 10% Rationing [MEA31H]

4. CEQA Alternatives
   - CEQA Alternative 1 – No Program Alternative [MEA37H]
   - CEQA Alternative 2 – No Purchase Request Increase [MEA40H]
   - CEQA Alternative 3 – Aggressive Conservation/Recycling and Local Groundwater [MEA42H]

2.1 Baseline(s)

The existing conditions or environmental setting, as defined under California Environmental Quality Act (CEQA) Section 15125, represents the physical environmental conditions as they exist at the time of the Notice of Preparation (NOP) and "will normally constitute the baseline physical conditions by which a lead agency determines whether an impact is significant." Therefore, it follows that once the physical baseline conditions are established, impacts can be assessed by comparing changes that would result from implementation of the proposed program to the baseline condition. The NOP for the WSIP PEIR was issued in September 2005, and thus the year 2005 conditions generally represent existing (baseline) conditions for the PEIR analysis.

In most cases, the PEIR description of the baseline reflects the regional system facilities and water supply operations in 2005. However, to be meaningful, the baseline must represent the expected variability of environmental conditions that could reasonably be expected in the future, based on the present and historical state of such conditions. In this PEIR, because hydrology varies widely over time and cannot be properly represented at a specific point in time, the baseline for hydrology reflects a sufficiently long record to allow assessment of long-term variability. Therefore, the "existing conditions" in this PEIR are presented in terms of an 82-year depiction of hydrology (1920 to 2002) to provide a depiction of the range of environment conditions that occur within the varying hydrology of California. Current (2005) operating conditions are analyzed using these 82-years of hydrology to determine how the current system would perform over a range of hydrologic conditions.

In addition to the baseline model runs, actual flow data, diversions, reservoir levels and releases were reviewed to aid in the determination of significance impacts.

Existing Conditions with "Calaveras Down" [MEA3CHR]

As described above, the baseline condition used for the PEIR analysis to determine the significance of impacts is generally represented by the SFPUC facilities and system operating conditions in 2005 in all cases but hydrology. Thus, as described in Chapter 2 of the PEIR, the 2005 average annual customer purchase request is estimated at 265 million gallons per day (mgd), and system operations are restricted due to Division of Safety of Dams (DSOD) requirements that limit the storage capacity of Calaveras Reservoir. This baseline, also referred to as "Calaveras Down," does not represent the SFPUC's historical operating conditions, since operation of Calaveras Reservoir at its full capacity has been a fundamental part of the regional water system prior to DSOD restrictions.

Conditions Prior to 2002 with "Calaveras Up" [MEA2A]

This baseline scenario was developed to simulate 2005 conditions, except with Calaveras Reservoir at its historical operating capacity. It essentially represents conditions prior to 2002 before the DSOD restriction was in place, and applies the 2005 average annual customer purchase request of 265 mgd. This scenario was not used to determine the significance of impacts, but in some cases was helpful in understanding the variable conditions prior to 2002.

2.2 Proposed Program

The SFPUC's proposed program, also referred to as the WSIP in this PEIR, is described in detail in Chapter 3 of the PEIR. The WSIP is the main focus of the PEIR.

Proposed Program [MEA5HIN]

The proposed program represents conditions in 2030 with 300 mgd average annual customer purchase requests, the WSIP water supply sources in place, and all WSIP facility improvement projects constructed and in operation. It includes supplemental dry-year water sources and a maximum drought rationing policy of 20 percent.

Table 1 provides a summary of the model scenarios analyzed.

2.3 Variants

The WSIP variants are variations of the proposed program that are designed to meet or exceed all WSIP goals and objectives but differ with respect to water supply source or drought-year level of service. The variants are not intended to be alternatives to the proposed program that would lessen or avoid environmental impacts as required by CEQA. The SFPUC requested that the potential environmental impacts of the variants be included in the PEIR. Further detail on the variants is provided in Chapter 8 of the PEIR.

WSIP Variant 1 – All Tuolumne [MEA4HIN]

The water supply for WSIP Variant 1 would be identical to that proposed for the WSIP, except that to accommodate the estimated 35-mgd average annual increase in purchase requests (from 265 to 300 mgd) by the year 2030, customers would predominately be served with additional water from the Tuolumne River watershed. As with the proposed program and existing conditions (2005), local watershed runoff would supplement supply from Tuolumne River watershed. And, similar to the proposed program, water from the Westside Basin Groundwater Program would also serve the purchase requests. The water supply would not include the 10 mgd from implementation of the local groundwater projects, recycled water projects, and additional conservation programs in San Francisco, however does include the conjunctive use and regional groundwater projects. In all other respects, WSIP Variant 1 would include the same water supply sources and construction of nearly all the same facilities as the proposed program.

WSIP Variant 2 – Regional Desalination for Drought [MEA30H]

The water supply for WSIP Variant 2 would be identical to that proposed for the WSIP, except that during drought years the SFPUC would receive water from a proposed regional desalination plant instead of water transfers from the Turlock and Modesto Irrigation Districts (TID and MID). Under this variant, the SFPUC, through its participation in the Bay Area Regional Desalination Project, would receive additional potable water supply during drought periods, either directly or indirectly from the regional desalination plant, to meet the WSIP water supply and delivery

TABLE 1
SUMMARY OF EXISTING CONDITIONS AND PROPOSED PROGRAM

Program Element	Existing Condition, 2005, with Calaveras Down (CEQA Baseline) [MEA3CHR]	Existing Condition, Pre-2002 Condition with Calaveras Up [MEA2A]	Proposed Program, 2030 Conditions [MEA5HIN]
Planning Year	2005	2005	2030
Customer Purchase Request (annual average)	265 mgd	265 mgd	300 mgd
Water Supply Sources (during nondrought and drought periods)	▪ Peninsula watershed (with Lower Crystal Springs Reservoir operating at reduced levels based on DSOD restrictions) ▪ Alameda watershed (with Calaveras Reservoir operating at reduced levels based on DSOD restrictions) ▪ Tuolumne River	▪ Peninsula watershed (with Lower Crystal Springs Reservoir operating at reduced levels based on DSOD restrictions) ▪ Alameda watershed (with Calaveras Reservoir at historical capacity, pre-2002) ▪ Tuolumne River	▪ Peninsula watershed (with Lower Crystal Springs Reservoir restored) ▪ Alameda watershed (with Calaveras Reservoir restored) ▪ Tuolumne River, with increased annual diversion over 2005 conditions ▪ Recycled water/ groundwater/conservation in San Francisco, 10 mgd
Supplemental Dry-Year Water Supply Sources (for implementation during drought periods)	None	None	▪ Additional Tuolumne River diversions from TID and MID transfers of 23 mgd (average over design drought) ▪ Westside Basin conjunctive use, 6 mgd (average over design drought)
Maximum Drought Rationing Policy	No defined limit but assumed incidental rationing of up to 25%	No defined limit but assumed incidental rationing of up to 25%	20%
System Firm Yield	219 mgd	223 mgd	256 mgd
WSIP Facility Improvement Projects	None	None	All 22 WSIP PEIR projects

DSOD = Division of Safety of Dams; TID = Turlock Irrigation District; MID = Modesto Irrigation District.

reliability objectives. WSIP Variant 2 would include all the same facilities as the proposed program, with the addition of a regional desalination plant.

WSIP Variant 3 – 10% Rationing [MEA31H]

The water supply sources and facilities for WSIP Variant 3 would be identical to those for the proposed program. This variant would reduce the maximum rationing during drought years from 20 to 10 percent, surpassing the WSIP system performance objective for dry-year delivery. The additional water supplies needed to meet this enhanced performance would come from the Tuolumne River through augmentation of TID and MID transfers during drought years.

Table 2 provides a summary of the WSIP variants.

TABLE 2
SUMMARY OF WSIP VARIANTS

Program Element	Variant 1 [MEA4HIN] All Tuolumne	Variant 2 [MEA30H] Regional Desalination for Drought	Variant 3 [MEA31H] 10% Rationing
Planning Year	2030	2030	2030
Customer Purchase Request (annual average)	300 mgd	300 mgd	300 mgd
Water Supply Sources (during nondrought and drought periods)	▪ Local watersheds (with Calaveras and Lower Crystal Springs Reservoirs restored) ▪ Tuolumne River, with 5 mgd increased average annual diversion over the Proposed Program	▪ Local watersheds (with Calaveras and Lower Crystals Springs Reservoirs restored) ▪ Tuolumne River, with 7 mgd less average annual diversion over the Proposed Program ▪ Recycled water/ groundwater/conservation in San Francisco, 10 mgd	Approximately the same as proposed program (less than 1 mgd average annual increase in diversion from Tuolumne)
Supplemental Dry-Year Water Supply Sources (for implementation during drought periods)	▪ Westside Basin conjunctive use, 6 mgd (average over design drought) [Same as proposed program]	▪ Potable water from regional desalination plant, 23 mgd (average over design drought) ▪ Westside Basin conjunctive use, 6 mgd (average over design drought)	▪ Additional Tuolumne River diversions from TID and MID transfers of 35 mgd (average over design drought) ▪ Westside Basin conjunctive use, 6 mgd (average over design drought)
Maximum Drought Rationing Policy	20%	20%	10%
System Firm Yield	256 mgd	256 mgd	268 mgd
Facility Improvement Projects	20 of the 22 WSIP PEIR projects; two projects would not be implemented: local groundwater and recycled water projects in San Francisco	All projects 22 WSIP PEIR projects plus Bay Area Regional Desalination Plant and associated pumping plant(s) and pipelines needed for intertie facilities	All 22 WSIP PEIR projects

TID = Turlock Irrigation District; MID = Modesto Irrigation District.

2.4 CEQA Alternatives

As required under CEQA, alternatives were developed that would feasibly attain most of the WSIP's basic objectives, but that would avoid or substantially lessen any significant adverse environmental effects of the WSIP. The No Program Alternative, also required by CEQA, was also analyzed. Further detail on the CEQA alternatives is provided in Chapter 9 of the PEIR.

CEQA Alternative 1 – No Program Alternative [MEA37H]

Under the No Program Alternative, customer purchase requests from the SFPUC (water demand) would increase from an annual average of 265 mgd in 2005 to 300 mgd in 2030, and the SFPUC would continue to rely on water supply sources from local watersheds and the Tuolumne River. The SFPUC would construct only those WSIP facility improvement projects that are mandated by or previously agreed upon with regulatory agencies to represent the likely scenario that would occur in the event the WSIP is not implemented. There would be no supplemental dry-year water supply sources. The additional water demand would be served, to the extent possible, from increased diversions from the Tuolumne River as well as the increased use of local watershed supplies, primarily associated with the restoration of storage at Calaveras Reservoir.

CEQA Alternative 2 – No Purchase Request Increase [MEA40H]

Under the No Purchase Request Increase Alternative, the total customer purchase requests to be served by the regional system by 2030 would be limited to 275 mgd, consisting of 184 mgd for the wholesale customers and 91 mgd for the retail customers. The increased water demand would be served through additional Tuolumne River diversions, increased use of local watershed supplies from restoration of Calaveras Reservoir, and 10 mgd from recycled water, groundwater, and conservation projects in San Francisco. During drought sequences, this supply would be supplemented by additional Tuolumne River diversions through a water transfer with TID and MID as well as through implementation of the Westside Basin Groundwater Program. This alternative assumes that 21 of the 22 WSIP facility improvement projects would be built, with the exception being the Lower Crystal Springs Dam Improvements project.

CEQA Alternative 3 – Aggressive Conservation/Recycling and Local Groundwater [MEA42H]

Under the Aggressive Conservation/Recycling and Local Groundwater Alternative, the customer purchase requests in 2030 would be 300 mgd, which would be met in large part through additional water conservation, water recycling, and groundwater programs beyond those already assumed in the 2030 demand projections. Up to 19 mgd of the demand would be met through regional recycled water/groundwater/conservation projects within the regional service area but outside of San Francisco, and 10 mgd of recycled water/groundwater/conservation in San Francisco. There would be no supplemental dry-year supply sources. This alternative assumes that 20 of the 22 WSIP facility improvement projects would be built, with the exceptions being the Lower Crystal Springs Dam Improvements project and the Westside Basin Groundwater Program.

Table 3 provides a summary of the WSIP CEQA alternatives analyzed.

Further detail on the modeling scenarios analyzed for the PEIR is provided in Appendix H2.

TABLE 3
SUMMARY OF WSIP CEQA ALTERNATIVES

Program Element	No Program Alternative [MEA37H]	No Increased Purchase Request Alternative [MEA40H]	Aggressive Conservation and Water Recycling Alternative [MEA42H]
Planning Year	2030	2030	2030
Customer Purchase Request (annual average)	300 mgd	275 mgd	300 mgd
Water Supply Sources (during nondrought and drought periods)	▪ Local watersheds (with Calaveras Reservoir restored and Crystal Springs Reservoir at its existing capacity) ▪ Tuolumne River, with 8 mgd increased average annual diversion over 2005 conditions	▪ Local watersheds (with Calaveras Reservoir restored and Crystal Springs Reservoir at its existing capacity) ▪ Tuolumne River, with 3 mgd increased average annual diversion over 2005 conditions ▪ Recycled water/ groundwater/conservation in San Francisco, 10 mgd	▪ Local watersheds (with Calaveras Reservoir restored and Crystal Springs Reservoir at its existing capacity) ▪ Tuolumne River, with 5 mgd increased average annual diversion over 2005 conditions ▪ Recycled water/ groundwater/conservation in San Francisco, 10 mgd ▪ Regional recycled water/ groundwater/conservation, in service area outside of San Francisco, 19 mgd
Supplemental Dry-Year Water Supply Sources (for implementation during drought periods)	None	▪ Additional Tuolumne River diversions from TID and MID transfers of 1 mgd (average over design drought) ▪ Westside Basin conjunctive use, 6 mgd (average over design drought)	None
Maximum Drought Rationing Policy	No defined limit, but assumed incidental rationing up to 30%	20%	20%
System Firm Yield	226 mgd	233 mgd	226 mgd
Facility Improvement Projects	4 of 22 WSIP PEIR projects	21 of 22 WSIP PEIR projects	20 of 22 WSIP PEIR projects plus regional recycled water and groundwater projects outside of San Francisco

TID = Turlock Irrigation District; MID = Modesto Irrigation District.

3. Water Supply Planning Model

3.1 Model Description

The data analysis for the PEIR was performed on output data from the SFPUC's HH/LSM. The following is a brief review of the HH/LSM. For a comprehensive discussion of HH/LSM design and operation, refer to *Water Supply System Modeling Report, Hetch Hetchy/Local Simulation Model* (SFPUC, 2007).

The HH/LSM is a computerized mathematical model used by the SFPUC to assist in the evaluation of its water system operations. The HH/LSM incorporates information about key aspects of the SFPUC regional water system, including facilities (i.e., reservoir and conveyance capacities) and operating procedures and "rules" that determine how and when water is moved through the system to the SFPUC's customers. The operating procedures and rules include responses to seasonal variation in demand, allocation of demand to customer groups, and procedures to maximize the use of local watershed supplies, while "rules" include responses to regulatory requirements for instream flows and compliance with Raker Act obligations. Operation of the regional water system can be generally delineated between rules and strategies affecting the operation of the Bay Area water system, and rules and strategies affecting the operation of the Hetch Hetchy system.

The HH/LSM is personal-computer-based and is written in Fortran code, with spreadsheet input and output interfaces. The model can be modified to incorporate changes in operation assumptions or to allow the testing of possible modifications to the infrastructure and/or operation of San Francisco facilities, or other facilities affecting regional system operations (i.e., TID's and MID's operation of Don Pedro Reservoir). Certain hydrologic and hydraulic parameters are "input driven," allowing the user to modify hydrology and the representation of physical characteristics such as reservoir capacity, preferred operational storage levels, water demands and certain operational decisions.

The model simulates system operations over the course of an 82-year sequential hydrologic period from July 1920 through September 2002. The model incorporates actual historical information about the hydrology (the amount of runoff as snowmelt and/or rainfall) that occurred in each year over the 82-year record for each of the three watershed areas under consideration: the Tuolumne River, the Alameda Creek, and the Peninsula watersheds. This 82-year period includes many different types and sequences of actual hydrological events that occurred, ranging from flood events to droughts of different magnitude and duration. The long-term 82-year historical record is used in the model to represent the range of hydrologic conditions that could occur in the future and to assess how the system would perform in terms of an assumed system configuration and assumed operational objectives.

The model uses a watershed runoff forecasting routine (for snowmelt and rainfall) that projects the amount of runoff in the Tuolumne River Basin. The amount of expected runoff is then compared against the availability of reservoir storage to capture the runoff and the expected releases required from the reservoir to meet downstream requirements and diversions to San

Francisco. If a reservoir is projected to spill, the model can simulate operational releases that would likely be made in those situations in order to enhance power generation from the system. This forecasting and decision process occurs continuously each month of the period being modeled.

The model simulates sequential hydrologic events on a monthly time step. That is, the model simulates the operation of facilities on a continuum, from one month to the next, one year to the next for 82 years. This method of modeling allows the investigation of sequential hydrologic events varying in duration as well as varying in distribution of runoff. However, because the input and results are depicted as monthly volumes of water, a drawback of this monthly time-step approach is that the results may not adequately depict the day-to-day variations of operations, hydrology, or operational decisions that can occur in less than monthly intervals. In these instances, additional supplemental analysis is developed.

The HH/LSM is used iteratively; that is, the model input is adjusted following a review of the results from a model study. The model simulates system performance and operations for a recurrence of historical hydrologic events. Parameters reviewed are typically the simulated delivery of water to San Francisco customers and reservoir levels and releases. Model inputs that affect model decisions are adjusted until a simulation achieves an accepted, or desired, performance of the scenario being modeled. Results from the scenarios described above were compared to illustrate the effects of alternative system objectives and requirements, operational assumptions, and system configurations.

System operations during drought periods require more complex planning and system management than during nondrought years, and the SFPUC's drought planning uses as a backdrop the concept of a "design drought" and "system firm yield." System firm yield is a measure of the amount of water that can be delivered to customers without shortages during all anticipated hydrologic sequences. This yield is also comparable to the amount of delivery that would occur on average across the design drought period. The design drought is a planning tool developed by the SFPUC to anticipate and plan for drought. For planning purposes, the SFPUC uses a design drought that contemplates a more severe drought than historical events, and evaluates the system firm yield assuming the system is experiencing the design drought. This premise is founded on experience that illustrates that drought sequences can get more extreme as our hydrologic record lengthens. Studies suggest that there is a 30 percent chance that the SFPUC system will experience a drought in the next 75 years equal to or more severe than the 1987–1992 drought (Beck, 1994). The SFPUC uses a design drought based on the hydrology of the six years of the worst historical drought (1977–1992) plus the 2.5 years of the 1976–1977 drought, for a combined total of an 8.5-year design drought sequence.

For the purposes of the PEIR, the HH/LSM is the best available tool to predict potential impacts on water resources in the affected watersheds resulting from the proposed program, variants, and alternatives. HH/LSM output was used to provide quantitative estimates of changes that would occur with implementation of the WSIP compared to the existing condition.

The HH/LSM is typical of water supply planning models utilized in California. With its diversity in weather—ranging from flood events to multi-year sequences of drought—California hydrology warrants the evaluation of water supply projects over a long sequence of years to measure system performance and reliability. The SFPUC, like other major California water purveyors, employs models to evaluate the effect of California hydrology on its ability to provide water supply (and to evaluate its system's effect on the environment). The East Bay Municipal Utility District and other municipal water purveyors use comparable models for the purpose of water supply planning. The California Department of Water Resources and U.S. Bureau of Reclamation use the CalSim II model, which employs the same approach as the HH/LSM to evaluate the statewide water supply. Appropriately, the HH/LSM focuses narrowly on the SFPUC water system, but provides information that integrates into the overall California river system. In fact, the Department of Water Resources and Bureau of Reclamation use results from the HH/LSM in the evaluation of statewide water resources.

3.2 Model Limitations

The HH/LSM model is the best available tool for depicting the overall regional water system operations, and a number of limitations inherent in the model have been supplemented by additional data.

For example, HH/LSM was used to estimate baseline and with-WSIP water levels in all of the SFPUC's reservoirs except Pilarcitos Reservoir. Model results for the Pilarcitos watershed were not directly used to analyze existing and projected water levels in Pilarcitos Reservoir or flows in Pilarcitos Creek. The model does not currently reflect a complete contemporary depiction of the physical operation of the watershed's facilities. Although adequate for SFPUC systemwide water supply planning purposes, HH/LSM results for the Pilarcitos watershed at times requires supplemental refinement and analysis.

HH/LSM was also used to estimate baseline and with-WSIP flows in the Tuolumne River and Alameda Creek. However, the model results were not solely relied upon when evaluating flows in creeks immediately downstream of SFPUC reservoirs that are normally minimal or affected by SFPUC operations for time periods less than a month in duration. This is because the model uses a monthly time interval. The model does not simulate day-to-day variations in water levels or releases to a stream, but instead provides an average water level and an average release in a given month. The inability of the model to illustrate short-term variations is generally not problematic when simulating continuous phenomena like storage or water level in a reservoir or flow in a perennial stream. The modeling limitation requires additional considerations such as operator experience when simulating intermittent phenomena such as infrequent spills or releases from reservoirs that may last only a few days.

Flow in San Mateo Creek downstream of Lower Crystal Springs Dam provides an example. The SFPUC system operators rarely release water from Crystal Springs Reservoir to San Mateo Creek, and flow in the creek below the dam typically occurs only from seepage from the dam and groundwater infiltration. Because releases to the creek are not required, the SFPUC operators attempt to capture and retain as much runoff as possible from the upper San Mateo Creek watershed in Crystal Springs Reservoir. In all but wet years, the SFPUC captures all of the runoff from the upper watershed. In wet months of wet years, the operators of the reservoir obtain frequent weather forecasts and manage the reservoir to capture as much runoff as possible from the sequence of winter storms that cross the watershed. The operator's decisions with respect to reservoir management are made on a day-to-day, sometimes hour-to-hour, basis. In certain circumstances during wet hydrologic conditions the operators will release to the creek due to a lack of predictability of the weather and an ability to manage the reservoir and other system-wide facilities through the event without releases.

Because the HH/LSM does not simulate, on a monthly time step, the day-to-day changes in operations which give rise to releases from Crystal Springs Reservoir to San Mateo Creek cannot be modeled. Consequently, the model does not always provide a refined absolute prediction of the magnitude and timing of infrequent and short-term releases from the reservoir. Similarly, the model does not provide a precise prediction of the magnitude and timing of release from San Antonio Reservoir and flow in San Antonio Creek downstream of the reservoir. However, HH/LSM results were sufficient to provide general trends of the effects of the WSIP upon these parameters.

For the reasons noted above, HH/LSM results were not used to predict water levels in Pilarcitos Reservoir, flows in Pilarcitos Creek, or the magnitude and timing of spills or releases from Crystal Springs and San Antonio Reservoirs. In these cases, the likely effects of the WSIP were determined by a review of historical data and consultation with individuals cognizant of past and predicted future reservoir operating practices.

In additional instances such as the analyses of flow effects below Hetch Hetchy Reservoir and Alameda Creek Diversion Dam, HH/LSM results have been refined or tiered from to provide additional insight to the effects of the WSIP upon stream flow for time periods less than a month in duration.

3.3 Model Output Data

The HH/LSM outputs data in a monthly time-step for each model simulation. Once the operation of the system is modeled under a particular set of assumptions, the model provides output information about how the system performs under that scenario in terms of water in reservoir storage, releases, water deliveries, and other parameters associated with the system's reservoirs, conveyance facilities, and treatment plants. The model provides information representing monthly volumes of water, although certain parameters have been converted to flow rates.

The SFPUC conducted the model runs analyzed in the PEIR. Model runs were provided to the PEIR team in spreadsheet format. Multiple revisions of the model runs occurred through an iterative process with the PEIR consultant team in order to ensure that the appropriate assumptions were used under each scenario, consistent with the PEIR impact analysis.

Table 4 lists key output information calculated by the model. Highlighted rows denote data that were used in the post-processing analysis.

TABLE 4
HH/LSM OUTPUT PARAMETERS
(Data provided as monthly time step for 82 years of historical hydrology)

Feature	Output Parameter
TUOLUMNE RIVER SYSTEM	
Unimpaired Inflow	Inflow to Hetch Hetchy Reservoir Inflow to Lake Lloyd Inflow to Lake Eleanor Unregulated Flow below Hetch Hetchy Reservoir
End-of-Month Storage	Hetch Hetchy Reservoir Storage Lake Lloyd Storage Lake Eleanor Storage Don Pedro Water Bank Account Storage Don Pedro Reservoir Storage Total Up-Country Reservoir Storage Total Hetch Hetchy System Storage
Releases	Hetch Hetchy Reservoir Release to Stream Hetch Hetchy Reservoir Release to Canyon Tunnel Lake Lloyd Release to Stream Lake Lloyd Release to Holm Powerhouse Lake Eleanor Release to Stream Lake Eleanor Tunnel to Lake Lloyd
Evaporation	Hetch Hetchy Reservoir Lake Lloyd Lake Eleanor
San Joaquin Pipeline	SJPL Flow from Lower Cherry Aqueduct Total SJPL
Power Production	Moccasin Powerhouse Kirkwood Powerhouse Holm Powerhouse Total
Unimpaired Runoff	Unimpaired Runoff at La Grange Dam TID, MID, and SFPUC Rights and Entitlements Unimpaired Runoff Available to San Francisco
Don Pedro Operations	Inflow Storage Don Pedro Reservoir Flood Control Limit Don Pedro Reservoir Evaporation (San Francisco) Total Don Pedro Reservoir Evaporation Don Pedro Reservoir Power – MWh Total MID Diversion at La Grange Dam Total TID Diversion at La Grange Dam La Grange Minimum Release Requirement Total La Grange Dam Release to River Total Release from Don Pedro Reservoir
Water Bank Account	Water Bank Account Maximum Water Bank Account Balance Transfer to Water Bank Account
Miscellaneous	SFPUC Shortage Level Hetch Hetchy Precipitation – Accumulated Hetch Hetchy Minimum Stream Release (acre-feet)
LOCAL SYSTEM (ALAMEDA CREEK AND PENINSULA WATERSHEDS)	
Calaveras	Calaveras Reservoir Storage Calaveras Reservoir Inflow from Arroyo Hondo Calaveras Reservoir Inflow from Upper Alameda Creek Calaveras Reservoir Release to San Antonio Reservoir Calaveras Reservoir Release to Sunol Valley WTP Calaveras Reservoir Release to Calaveras Creek Calaveras Reservoir Spill to Calaveras Creek Calaveras Reservoir Evaporation
San Antonio	San Antonio Reservoir Storage San Antonio Reservoir Inflow from San Antonio Creek

TABLE 4 (Continued)
HH/LSM OUTPUT PARAMETERS
(Data provided as monthly time step for 82 years of historical hydrology)

Feature	Output Parameter
San Antonio (cont.)	San Antonio Reservoir Inflow from Calaveras Reservoir/SJPL
	San Antonio Reservoir Release to Sunol Valley WTP
	San Antonio Reservoir Release to San Antonio Creek
	Calaveras Reservoir Spill to Calaveras Creek
	San Antonio Reservoir Evaporation
Crystal Springs	Crystal Springs Reservoir Storage
	Crystal Springs Reservoir Inflow from San Mateo Creek
	Crystal Springs Reservoir Inflow from San Andreas Reservoir
	Crystal Springs Reservoir Inflow from Bay Division Pipelines
	Crystal Springs Reservoir Pumping to San Andreas Reservoir
	Crystal Springs Reservoir Pumping to Coastside CWD
	Crystal Springs Reservoir Release to San Mateo Creek
	Crystal Springs Reservoir Spill to San Mateo Creek
	Crystal Springs Reservoir Evaporation
San Andreas	San Andreas Reservoir Storage
	San Andreas Reservoir Inflow from Watershed
	San Andreas Reservoir Inflow from Crystal Springs, San Mateo Creek & Pilarcitos
	San Andreas Reservoir Release to Harry Tracy WTP
	San Andreas Reservoir Release to San Mateo Creek
	San Andreas Reservoir Spill to San Mateo Creek
	San Andreas Reservoir Evaporation
Pilarcitos	Pilarcitos Reservoir Storage
	Pilarcitos Reservoir Inflow
	Pilarcitos Reservoir Release to San Andreas Reservoir
	Pilarcitos Reservoir Release for Stone Dam Diversion to Coastside CWD
	Pilarcitos Reservoir Pre-Release to Pilarcitos Creek
	Pilarcitos Reservoir Spill to Pilarcitos Creek
	Pilarcitos Reservoir Evaporation
Stone Dam (MG)	Stone Dam Inflow (Accretion)
	Stone Dam Release to Coastside CWD
	Stone Dam Release to Crystal Springs Reservoir
Reservoir Storage (MG)	Total Reservoir Storage – East Bay
	Total Reservoir Storage – Peninsula
	Total Local Storage
	Maximum Targeted Total Local Storage
Demand (MGD)	Delivery to South Bay Demand Center
	Delivery to Crystal Springs Demand Center
	Delivery to San Andreas Demand Center
	Delivery to In-City Demand Center
	Total Delivery to Demand Centers (not including Coastside CWD)
Demand (MG)	Delivery to South Bay Demand Center
	Delivery to Crystal Springs Demand Center
	Delivery to San Andreas Demand Center
	Delivery to In-City Demand Center
	Total Delivery to Demand Centers (not including Coastside CWD)
San Joaquin Pipelines	SJPL Flow – MG
	SJPL Flow – MGD
SJPL (MG)	SJPL Flow to Crystal Springs Reservoir – MG
	SJPL Flow to San Antonio Reservoir – MG
West Basin Reservoir (MG)	Beginning of Month Storage
	West Basin Reservoir – Input Resulting from San Andreas Gradient Deliveries
	West Basin Reservoir – Input Resulting from Crystal Springs Gradient Deliveries
	End of Month Storage
Desalination Project (MG)	Input from Desalination Project
Treatment Plant Delivery (MGD)	Calaveras Reservoir Flow to Sunol Valley WTP
	San Antonio Reservoir Flow to Sunol Valley WTP
	Sunol Valley WTP Production
	Harry Tracy WTP Production

(Highlighted) Indicates data used in the PEIR analysis

Coastside CWD = Coastside County Water District; MG = million gallons; MGD = million gallons per day; MWh = megawatt-hours; MID = Modesto Irrigation District; SJPL = San Joaquin Pipelines; TID = Turlock Irrigation District; WTP = water treatment plant.

4. Hydrologic Computations and Data Presentation

4.1 Hydrologic Year Types

The HH/LSM produces a set of results for a hydrologic sequence of 82 years, 12 months each year. While at times it is necessary to evaluate the results from month to month and year to year, in many instances the illustration and understanding of results can be achieved by a grouping within water year types. Each year in the 82-year period of historical hydrology was ranked and grouped into hydrologic year types according to an appropriate wetness indicator. Three different groupings (referred to as indices) were used in the PEIR analysis according to the specific hydrologic system in which the affected facilities are located. The hydrologic year types are defined differently for different areas affected by the WSIP in order to accurately reflect each area's unique hydrology.

Each index contains five hydrologic year-type categories. The three indices and corresponding year-type categories are as follows:

Tuolumne Index	Wet (W) Above Normal (AN) Normal (N) Below Normal (BN) Dry (D)
San Joaquin Index (Reflects the existing San Joaquin Valley Water Year Hydrologic Classification)	Wet (W) Above Normal (AN) Below Normal (BN) Dry (D) Critically Dry (CD)
Five Reservoir Index	Wet (W) Above Normal (AN) Normal (N) Below Normal (BN) Dry (D)

Tuolumne Index

Hydrologic year types for the Tuolumne River above Don Pedro Reservoir were developed for this analysis. The year types were classified based on the SFPUC's calculation of unimpaired flow for the Tuolumne River at La Grange Dam. The years were ranked as simple percentiles. The 20 percent of years when unimpaired inflow to Don Pedro Reservoir was lowest were designated dry years; the next driest 20 percent of years were designated below-normal years, and so on.

San Joaquin Index

Hydrologic year types for the Tuolumne River below La Grange Dam and Don Pedro Reservoir are classified according to the Department of Water Resources' San Joaquin Valley Water Year Classification (San Joaquin Index). The San Joaquin Index was used to analyze Don Pedro and La Grange operations because release requirements from Don Pedro Reservoir at La Grange are tied to this index. The San Joaquin Index was not readily applicable to the entire Tuolumne River system because this index is based on all inflow into the San Joaquin River, not just contributions from the Tuolumne River. As such, the San Joaquin Index ranking of year types is at times inconsistent with runoff from the Tuolumne system alone.

Five Reservoir Index

Hydrologic year types for the Alameda Creek and Peninsula watersheds are also classified by the 20 percent grouping technique and are based on local stream gauge data and the SFPUC's estimation of flow into its five San Francisco Bay Area reservoirs (Calaveras, San Antonio, Crystal Springs, Pilarcitos, and San Andreas Reservoirs). Annual flow into each of the reservoirs was aggregated for each water year. The 20 percent of years when total runoff into the five reservoirs was lowest were designated dry years; the next driest 20 percent of years were designated below-normal years, and so on.

Table 5 illustrates how these hydrologic year types apply over the historical record. Note that the table is organized according to rank, and that the water year corresponding to a given rank may vary from index to index. For instance, for all three indices, 1983 is ranked as the wettest year; however, the second-ranked year in the Tuolumne Index is 1995, in the San Joaquin Index is 1969, and in the Five Reservoir Index is 1998. The differences in rank reflect the differences in hydrology between the upper Tuolumne River watershed, the San Joaquin Valley, and the Bay Area.

4.2 Computations and Data Presentation

General Approach

The analysis of HH/LSM data focused on reservoir storage, releases, diversions, and deliveries. Data were analyzed according to the three portions of the regional system, the Tuolumne River, Alameda, and Peninsula systems, which correspond to the three respective watersheds that would be affected by the proposed water supply and system operations changes. The following sections outline the general approach to the analysis of each system. Specific data sets were extracted from the model output and then ranked, statistically analyzed, summarized, and charted. The ultimate use of these data was to allow for comparison between the existing condition and the WSIP, WSIP variant, or CEQA alternative. As such, seven separate discrete comparisons were performed:

1. Existing Condition [MEA3CHR] vs WSIP [MEA5HIN]
2. Existing Condition [MEA3CHR] vs Variant 1, All Tuolumne [MEA4HIN]
3. Existing Condition [MEA3CHR] vs Variant 2, Regional Desalination for Drought [MEA30H]

TABLE 5
COMPARISON OF HYDROLOGIC YEAR TYPES

TUOLUMNE INDEX			SAN JOAQUIN INDEX			5 RESERVOIR INDEX		
Rank	Water Year	TUOL Yr Type	Rank	Water year	SJ Yr Type	Rank	Water Year	5RES Yr Type
1	1983	W	1	1983	W	1	1983	W
2	1995	W	2	1969	W	2	1998	W
3	1969	W	3	1995	W	3	1958	W
4	1982	W	4	1938	W	4	1941	W
5	1938	W	5	1998	W	5	1982	W
6	1998	W	6	1982	W	6	1995	W
7	1997	W	7	1967	W	7	1956	W
8	1956	W	8	1952	W	8	1952	W
9	1967	W	9	1958	W	9	1938	W
10	1980	W	10	1980	W	10	1997	W
11	1986	W	11	1978	W	11	1969	W
12	1952	W	12	1922	W	12	1973	W
13	1978	W	13	1956	W	13	1986	W
14	1965	W	14	1942	W	14	1980	W
15	1958	W	15	1941	W	15	1942	W
16	1993	W	16	1986	W	16	1967	W
17	1941	AN	17	1993	W	17	1963	AN
18	1951	AN	18	1997	W	18	1940	AN
19	1922	AN	19	1996	W	19	1965	AN
20	1984	AN	20	1943	W	20	1996	AN
21	1943	AN	21	1937	W	21	1922	AN
22	1942	AN	22	1974	W	22	1975	AN
23	1996	AN	23	1975	W	23	1974	AN
24	1974	AN	24	1965	W	24	1978	AN
25	1940	AN	25	1936	AN	25	1993	AN
26	1936	AN	26	1984	AN	26	1951	AN
27	1932	AN	27	1979	AN	27	1943	AN
28	1935	AN	28	1945	AN	28	1927	AN
29	1999	AN	29	1999	AN	29	1937	AN
30	1945	AN	30	1963	AN	30	2000	AN
31	1927	AN	31	1927	AN	31	1921	AN
32	1963	AN	32	1935	AN	32	1999	AN
33	1975	AN	33	1923	AN	33	1923	AN
34	1973	N	34	1973	AN	34	1953	N
35	1921	N	35	1932	AN	35	1928	N
36	1937	N	36	2000	AN	36	1970	N
37	1970	N	37	1940	AN	37	1984	N
38	2000	N	38	1946	AN	38	1946	N
39	1925	N	39	1921	AN	39	1926	N
40	1979	N	40	1970	AN	40	1936	N
41	1946	N	41	1951	AN	41	1945	N
42	1923	N	42	1962	BN	42	1971	N
43	1962	N	43	1953	BN	43	1935	N
44	1971	N	44	1957	BN	44	1932	N
45	1950	N	45	1925	BN	45	1979	N
46	1953	N	46	1971	BN	46	1962	N
47	1928	N	47	1950	BN	47	1949	N
48	1954	N	48	1944	BN	48	1992	N
49	2002	N	49	1954	BN	49	1981	N
50	1957	BN	50	1948	BN	50	2001	BN
51	1948	BN	51	1928	BN	51	1930	BN
52	1989	BN	52	1949	BN	52	1954	BN
53	1966	BN	53	1966	BN	53	1968	BN
54	1944	BN	54	1933	D	54	1959	BN
55	1949	BN	55	1981	D	55	1925	BN
56	1985	BN	56	1985	D	56	1944	BN
57	1972	BN	57	2002	D	57	2002	BN
58	1930	BN	58	1926	D	58	1950	BN
59	1964	BN	59	1955	D	59	1966	BN
60	1955	BN	60	1959	D	60	1955	BN
61	1926	BN	61	1968	D	61	1957	BN
62	1933	BN	62	1939	D	62	1934	BN
63	1991	BN	63	2001	D	63	1985	BN
64	2001	BN	64	1964	D	64	1991	BN
65	1947	BN	65	1947	D	65	1929	BN
66	1960	BN	66	1972	D	66	1964	BN
67	1981	D	67	1994	C	67	1947	D
68	1968	D	68	1930	C	68	1994	D
69	1959	D	69	1929	C	69	1939	D
70	1939	D	70	1989	C	70	1948	D
71	1929	D	71	1991	C	71	1960	D
72	1990	D	72	1987	C	72	1972	D
73	1992	D	73	1960	C	73	1933	D
74	1994	D	74	1976	C	74	1961	D
75	1988	D	75	1992	C	75	1990	D
76	1934	D	76	1990	C	76	1987	D
77	1961	D	77	1988	C	77	1988	D
78	1976	D	78	1934	C	78	1989	D
79	1987	D	79	1924	C	79	1931	D
80	1931	D	80	1961	C	80	1976	D
81	1924	D	81	1931	C	81	1977	D
82	1977	D	82	1977	C	82	1924	D

4. Existing Condition [MEA3CHR] vs Variant 3, 10% Rationing [MEA31H]
5. Existing Condition [MEA3CHR] vs CEQA Alternative 1, No Program Alternative [MEA37H]
6. Existing Condition [MEA3CHR] vs CEQA Alternative 2, No Purchase Request Increase [MEA40H]
7. Existing Condition [MEA3CHR] vs CEQA Alternative 3, Aggressive Conservation and Water Recycling [MEA42H]

Comparisons were made by generating annual and monthly statistics for all years in the sequence as well as for each of the indexed year types (e.g., wet, above normal, etc.). The analysis performed can generally be divided into two primary hydrologic regimes: reservoir releases to rivers/creeks and reservoir storage.

Reservoir Releases/Spills to Rivers and Creeks

The HH/LSM predicts both reservoir releases and spills. Reservoir releases involve a release of impounded water through a reservoir's adit to the watercourse downstream of the dam. Releases are generally made to control water levels in the reservoir or to meet minimum flow requirements in the watercourse below the reservoir. Reservoir spills happen when impounded water discharges from a dam's spillway. Spills generally occur during periods of high flow when the reservoir is full. Reservoirs are usually operated to avoid spills by releasing water through the adits. For the purpose of this analysis, releases and spills were aggregated for each month of model output and reported as a release from each respective reservoir. Spills and releases were not considered separately, since both contribute to flow in the watercourse downstream of the reservoir.

Each comparison of reservoir releases to watercourses included a comparison of baseline data and WSIP/variant/alternative data related to annual average releases, monthly average releases, and changes in monthly releases for all months and each year type over the 82 years of historical hydrology analyzed. The monthly value for a given year type was calculated as the average of all values for a given month within that year type. An example of a monthly comparison is provided in **Table 6**. Statistics were also generated for each monthly release including average, minimum, maximum, median and standard deviation. Comprehensive tables were also generated detailing the monthly release for all 82-years of hydrology for both the existing condition and the WSIP/variant/alternative being analyzed as well as the changes to releases in any given month. This full data set essentially gave the reviewer access to the full model output in a compact format to aid in identifying trends or single-year anomalies and extremes in the data.

Monthly averages were charted, as were the 82,years of chronological releases, to visually detect trends and regularly occurring changes between the existing condition and the WSIP/variant/alternative being reviewed. Where relevant, additional charting was developed to highlight the percentage of monthly change for the 82-year hydrologic sequence, highlighting trends or single anomalies and extremes.

TABLE 6
EXAMPLE OF RESERVOIR RELEASE COMPARISON
(Estimated average monthly flows from O'Shaugnesssy Dam to the Tuolumne River under various conditions [cubic feet per second])

	Wet	Above Normal	Normal	Below Normal	Dry	All
Existing Condition, MEA3CHR (2005)						
Oct	55	55	54	55	53	54
Nov	51	96	54	55	53	62
Dec	51	88	50	46	44	56
Jan	180	66	51	43	40	75
Feb	88	88	74	51	44	69
Mar	93	86	74	63	50	73
Apr	148	131	98	91	64	107
May	2,518	1,273	1,479	758	224	1,245
June	4,534	3,092	1,913	768	168	2,091
July	2,034	379	167	113	86	548
Aug	184	125	122	111	86	125
Sept	90	89	86	73	65	81
Future with WSIP, MEA5HIN (2030)						
Oct	55	55	54	55	53	54
Nov	51	89	54	55	53	61
Dec	51	88	50	46	44	56
Jan	167	66	55	43	40	74
Feb	88	88	74	51	44	69
Mar	84	94	74	63	50	73
Apr	144	131	98	88	56	103
May	2,416	1,187	1,260	564	157	1,111
June	4,548	3,095	1,907	709	139	2,075
July	2,034	379	167	113	86	548
Aug	184	125	122	111	86	125
Sept	89	89	86	73	65	81

Difference and Percent Change, Existing Condition (2005) vs WSIP (2030)

	Wet		Above Normal		Normal		Below Normal		Dry		All	
Oct	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]
Nov	0	[0%]	-8	-[8%]	0	[0%]	0	[0%]	0	[0%]	-2	-[3%]
Dec	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]
Jan	-12	-[7%]	0	[0%]	4	[8%]	0	[0%]	0	[0%]	-2	-[2%]
Feb	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]
Mar	-9	-[9%]	8	[9%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]
Apr	-4	-[3%]	0	[0%]	0	[0%]	-4	-[4%]	-8	-[12%]	-3	-[3%]
May	-103	-[4%]	-86	-[7%]	-220	-[15%]	-195	-[26%]	-67	-[30%]	-134	-[11%]
June	14	[0%]	3	[0%]	-6	[0%]	-59	-[8%]	-29	-[17%]	-16	-[1%]
July	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]
Aug	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]
Sept	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]

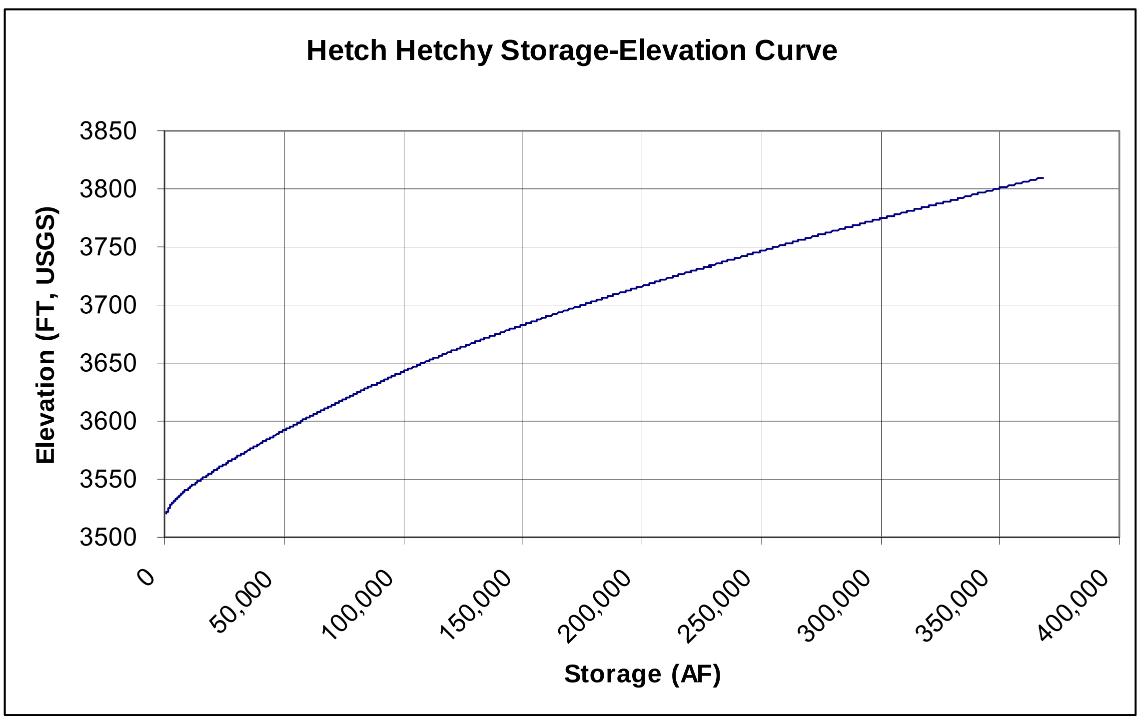
Key
- > 0%
- < 0 to -5%
- < -5%

Reservoir Storage and Water Surface Elevation

Reservoir storage was presented on a monthly basis for each hydrologic year type and as an average for all years. This exercise was performed for all reservoirs in the SFPUC system as well as for Don Pedro Reservoir. Impoundments at the Alameda Creek Diversion Dam and Stone Dam do not have sufficient storage to warrant the exercise. Percent change between the existing condition and WSIP were also calculated and tabulated, including highlighting of months within year types with a change from the existing condition. An example of a monthly comparison for reservoir water surface elevation is provided in **Table 7**.

Reservoir water surface elevations were generated based on storage-elevation data provided by the SFPUC for each reservoir. Storage-elevation data did not generally include datum information, and several curves were incomplete. Datums were assumed to be U.S. Geological Survey (USGS) National Geodetic Vertical Datum 29; however; it is likely that some elevation data were provided on Crystal Springs Datum, which is 3.75 feet lower than the USGS datum. In the case of incomplete curve data, data extrapolations were performed to extend the curve over the full operating range of the reservoir, which was considered sufficient for the analysis being performed. **Figure 1** presents an example of a storage-elevation curve used to generate reservoir elevation data.

Similar to the release data, monthly data were provided in tabular format for all months in the 82-year sequence to give the reviewer access to the full data set.

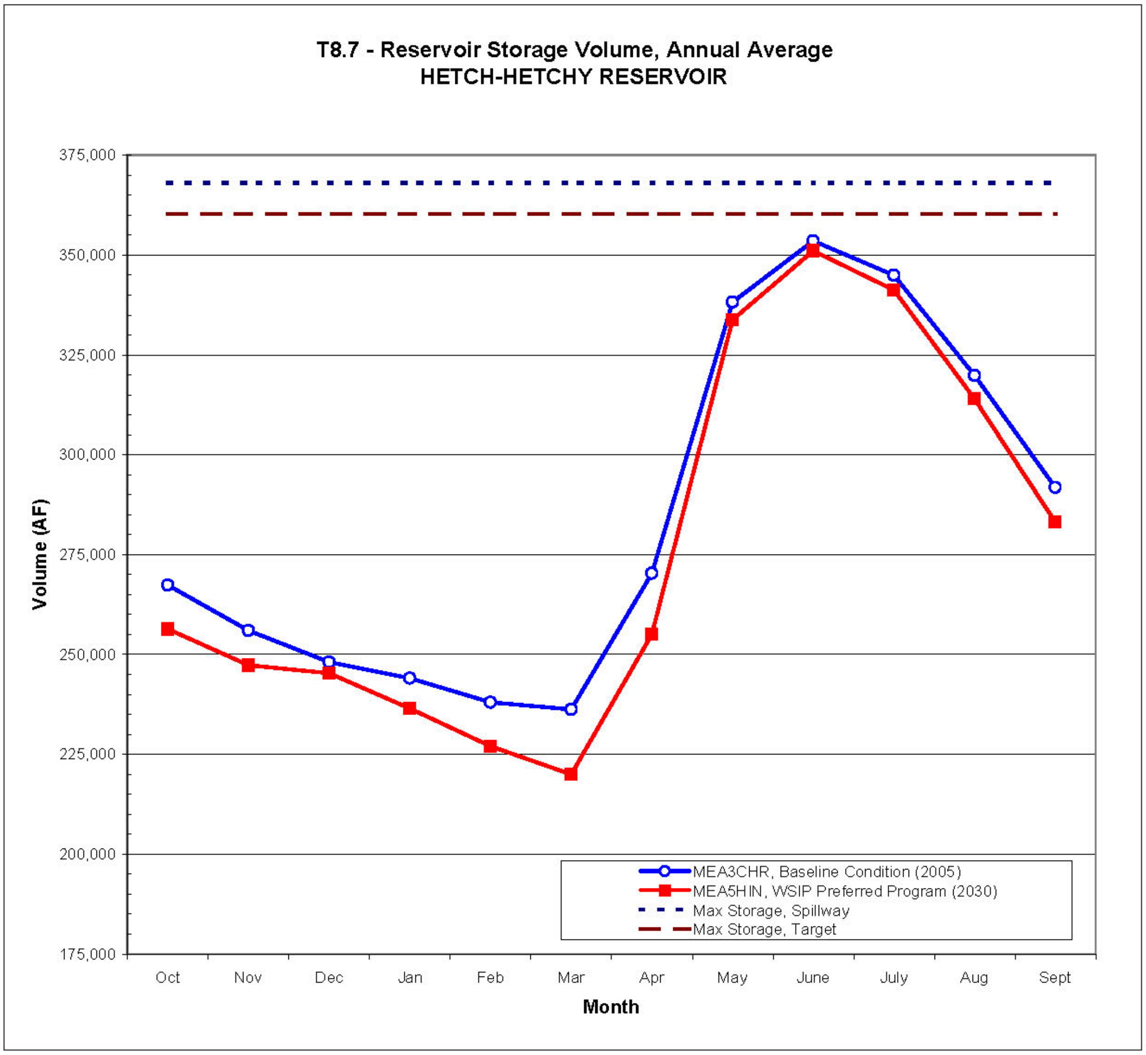


SFPUC Water System Improvement Program ■ 203287

Figure 1
Example of a Storage Elevation Curve

TABLE 7
EXAMPLE OF RESERVOIR SURFACE ELEVATION COMPARISON

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
MEA3CHR, Baseline Condition (2005)												
All	267,350	255,970	248,055	244,033	238,026	236,250	270,308	338,205	353,575	344,926	319,840	291,861
Wet	254,797	247,599	261,665	276,607	274,771	276,682	315,327	355,450	360,400	360,400	353,795	332,896
Above Normal	271,112	265,309	254,326	239,804	227,800	216,027	236,381	340,710	360,400	359,021	334,026	303,926
Normal	268,076	255,293	245,741	247,678	242,092	243,199	284,841	352,393	360,400	355,019	325,020	293,980
Below Normal	269,065	255,550	241,448	231,143	225,328	223,980	257,796	321,660	355,655	342,155	310,136	280,095
Dry	273,356	255,542	237,118	226,005	221,571	223,393	260,099	321,689	330,462	307,326	275,944	248,388
MEA5HIN, WSIP Preferred Program (2030)												
All	256,342	247,285	245,298	236,492	227,024	219,969	255,079	333,845	351,079	341,276	313,972	283,204
Wet	243,060	237,479	256,288	268,743	267,145	269,817	307,705	356,276	360,400	360,400	352,226	328,585
Above Normal	259,753	258,029	255,119	237,665	224,720	210,962	231,343	340,911	360,400	358,887	331,608	298,488
Normal	256,760	248,368	244,486	239,566	230,227	224,956	267,857	352,038	360,400	353,965	321,684	287,746
Below Normal	259,020	247,487	240,041	223,889	211,467	201,013	237,323	314,402	355,477	339,673	305,027	272,715
Dry	262,736	244,375	230,270	213,311	202,678	194,847	233,761	306,370	317,860	292,453	258,773	228,185
Percent Change, MEA3CHR vs MEA5HIN												
All	-4%	-3%	-1%	-3%	-5%	-7%	-6%	-1%	-1%	-1%	-2%	-3%
Wet	-5%	-4%	-2%	-3%	-3%	-2%	-2%	0%	0%	0%	0%	-1%
Above Normal	-4%	-3%	0%	-1%	-1%	-2%	-2%	0%	0%	0%	-1%	-2%
Normal	-4%	-3%	-1%	-3%	-5%	-8%	-6%	0%	0%	0%	-1%	-2%
Below Normal	-4%	-3%	-1%	-3%	-6%	-10%	-8%	-2%	0%	-1%	-2%	-3%
Dry	-4%	-4%	-3%	-6%	-9%	-13%	-10%	-5%	-4%	-5%	-6%	-8%



Tuolumne River System

The Tuolumne River system encompasses SFPUC facilities within the Tuolumne River watershed. These included Hetch Hetchy Reservoir, Lake Lloyd, Lake Eleanor, Kirkwood and Holm Powerhouses, and the diversion/power tunnels. Don Pedro Reservoir is also included in the system. Although this reservoir is not an SFPUC-operated facility, the SFPUC maintains a water bank in Don Pedro Reservoir, and Tuolumne system operations are directly linked to the water rights and entitlements of TID and MID, which own and operate Don Pedro Reservoir. Also, SFPUC operations affect water availability at Don Pedro Reservoir and thus have an indirect influence upon Don Pedro Reservoir releases to the Tuolumne River below La Grange Dam.

The following is a list of locations within the Tuolumne River system analyzed using HH/LSM data.

Releases to Rivers/Creeks

1. Hetch Hetchy Reservoir releases to the Tuolumne River
2. Don Pedro Reservoir releases at La Grange Dam to the Tuolumne River
3. Lake Lloyd releases to Cherry Creek
4. Lake Eleanor releases to Eleanor Creek
5. Kirkwood Powerhouse releases to the Tuolumne River at Early Intake
6. Holm Powerhouse releases to Cherry Creek
7. Sum of Releases calculated at the Cherry Creek confluence

Reservoir Storage

8. Hetch Hetchy Reservoir storage and water levels
9. Lake Lloyd storage and water levels
10. Lake Eleanor storage and water levels
11. Don Pedro Reservoir storage and water levels

These analysis locations are shown in **Figure 2**.

Data for releases from each of the reservoirs were obtained directly from the HH/LSM output data. Reservoir releases presented in this analysis include both spills and releases from the respective dam.

Kirkwood Powerhouse releases, which represent flow returned to the Tuolumne River at Early Intake, were calculated based on the capacity of Mountain Tunnel. The instantaneous capacity of Mountain Tunnel was assumed to be 650 cubic feet per second (cfs) and scaled to a monthly capacity. Releases from Kirkwood Powerhouse were calculated as the difference between flow in Canyon Power Tunnel (upstream of Kirkwood) and the monthly capacity of Mountain Tunnel (downstream of Kirkwood). Holm Powerhouse releases were assumed to be the same as diversions from Lake Lloyd to Cherry Power Tunnel, which is an HH/LSM output.

Releases at the Cherry Creek confluence are a summation of all reservoir and powerhouse releases to the Tuolumne River. Each of the releases on the Tuolumne River above the Cherry Creek confluence or on Cherry Creek or Eleanor Creek is implemented such that all SFPUC-controlled flow of the Tuolumne River occurs upstream from the confluence where Cherry Creek

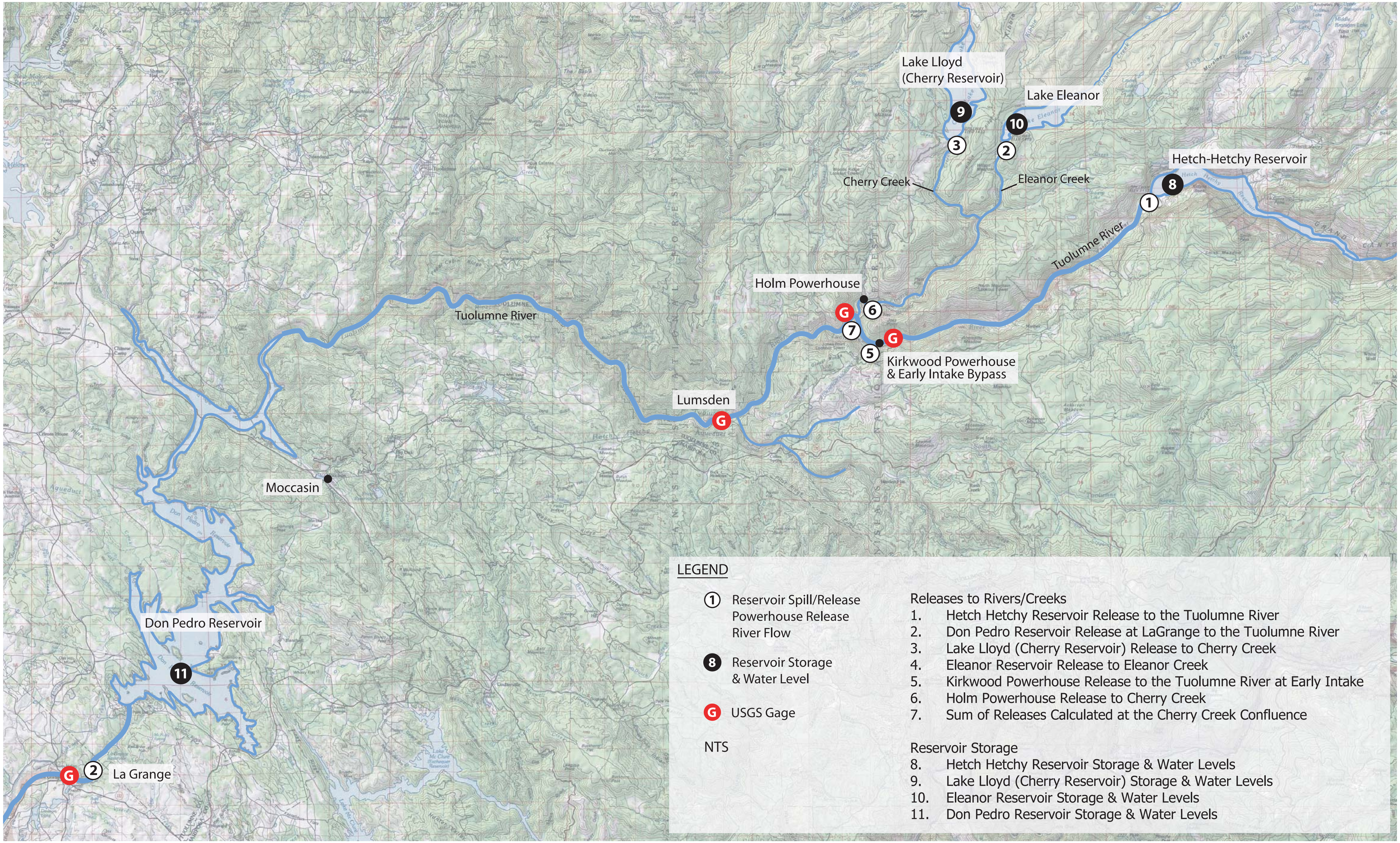


Figure 2 (Model Appendix 1)
Tuolumne System Flow and Storage Analysis Locations

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joins the Tuolumne River. The summation of controlled releases was made to provide a point of comparison for the reach of the Tuolumne River between the Cherry Creek confluence and Don Pedro Reservoir. Absent from the calculation are monthly accretions over the 82-year record from the watersheds between the dams and the confluence, as these data were not readily available. These accretions would not be affected by system operations and thus would not change from model run to model run. Therefore, the calculation of absolute flows at the Cherry Creek confluence is lower than actual flow, but any change in flow rates between scenarios identified by the calculation is accurate.

Reservoir storage was readily available from HH/LSM output, and water surface elevations were calculated using SFPUC-supplied storage-elevation curves.

In addition to the analyses listed above for the Tuolumne River system, statistics were developed for the summary tables. The summary tables provide a single-page review of pertinent statistics, allowing comparison across the WSIP, variants, and CEQA alternative model runs. Most statistics presented in the Tuolumne River system summary table are self-explanatory.

Additional calculations were performed using HH/LSM output to develop minimum release statistics. Releases from each of the reservoirs were compared against monthly minimum release requirements. The number of months in the record where releases were at minimum flow requirements was calculated as a point of comparison between model runs. For instance, in the existing condition, releases from Hetch Hetchy Reservoir are at minimum levels in 837 months out of 987 in the record. For the proposed program, 846 months out of the record would have releases occurring at the minimum requirements, representing an increase in the frequency of minimum flow conditions of 0.9 percent.

Calculations were also made as part of the cumulative analysis for additional releases to the Tuolumne River at La Grange Dam for the proposed TID Regional Surface Water Supply Project. For the TID project, it was assumed that 66 cfs would be released from La Grange Dam year-round to supply water to the downstream infiltration gallery and treatment plant, and an additional 34 cfs could be released from La Grange Dam during the irrigation season, diverted at the infiltration gallery, and conveyed to the Ceres Main Canal for agricultural use. The release for agricultural purposes was assumed to occur from mid-March to mid-October. Releases at La Grange under the proposed program, as predicted by the HH/LSM, and estimated releases for the proposed TID project were aggregated and compared against the existing condition for the cumulative analysis presented in Chapter 5, Section 5.7, of the PEIR.

Alameda Creek System

The Alameda Creek system encompasses SFPUC facilities in the Sunol Valley region. These include Calaveras Reservoir, Alameda Creek Diversion Dam, and San Antonio Reservoir. Local watercourses include Alameda Creek, Arroyo Hondo, Calaveras Creek, and San Antonio Creek. The following is a list of locations within the Alameda system analyzed using HH/LSM data.

Releases to Rivers/Creeks

1. Diversions from upper Alameda Creek to Calaveras Reservoir
2. Calaveras Reservoir releases to Calaveras Creek
3. San Antonio Reservoir releases to San Antonio Creek
4. Flow in Alameda Creek below the diversion dam (1)
5. Flow in Alameda Creek below the Calaveras Creek confluence (2)
6. Flow in Alameda Creek below the San Antonio Creek confluence (3)

Reservoir Storage

7. Calaveras Reservoir storage and water levels
8. San Antonio Reservoir storage and water levels

These analysis locations are shown in **Figure 3**, and the three flow locations in Alameda Creek (numbers shown in parenthesis after analysis locations 4, 5, and 6) are described in more detail below and in **Figure 4**.

Data for releases from Calaveras and San Antonio Reservoirs were obtained directly from the HH/LSM output data. Reservoir releases presented in this analysis include both spills and releases from the respective dam. The HH/LSM also provided output data on diversions from the Alameda Creek Diversion Dam to Calaveras Reservoir.

In addition to the releases and diversions, average monthly flow in Alameda Creek was estimated at three locations to aid in the impact analysis. Calculations were made for the following three locations:

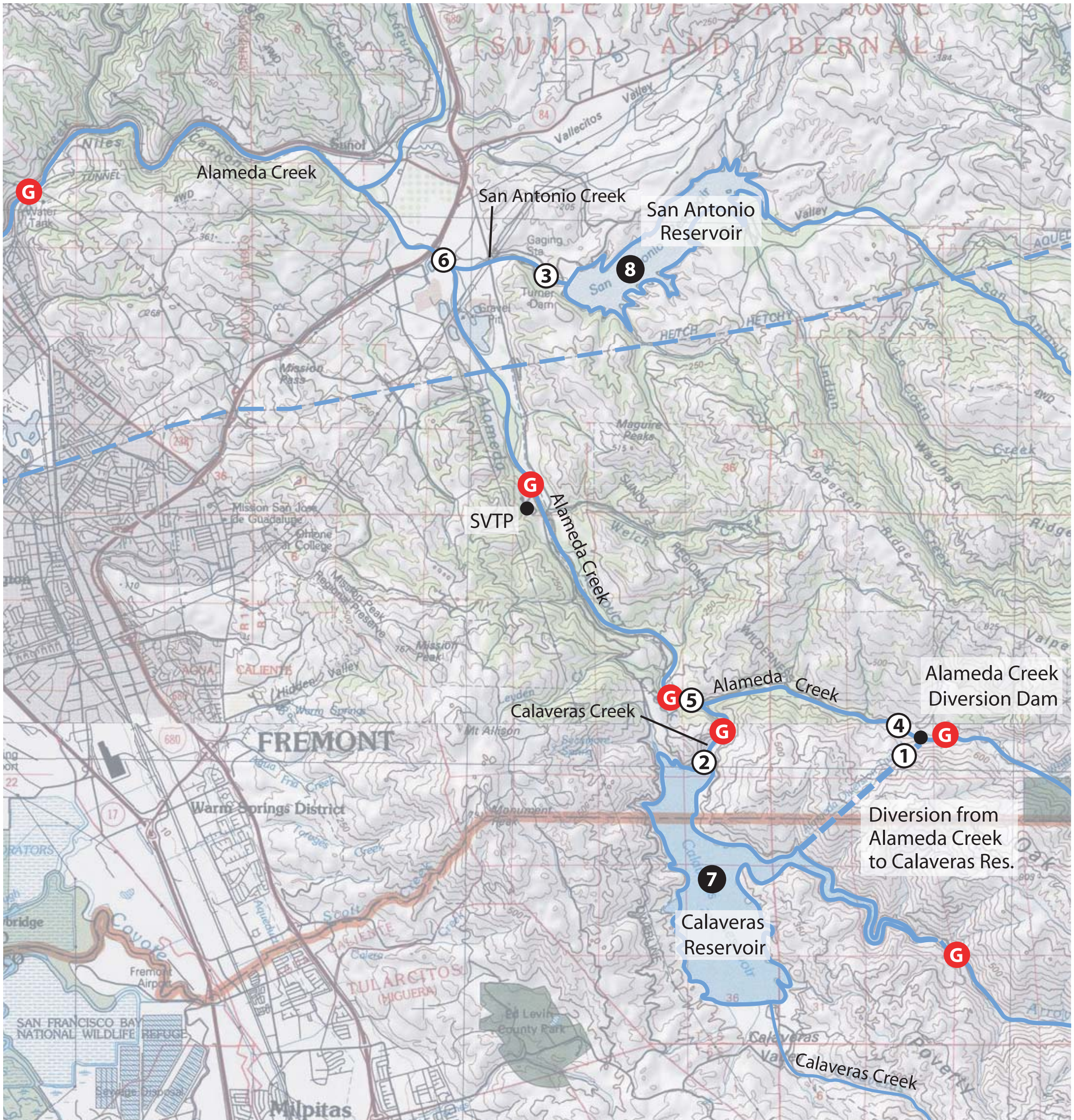
1. Below the diversion dam
2. Below the Calaveras Creek confluence (below Calaveras Reservoir)
3. Below the San Antonio Creek confluence (below San Antonio Reservoir)

Figure 4 presents a flow schematic of the major components of the water balance on Alameda Creek. Evaporative and groundwater losses were not included in the balance, since these losses are not expected to vary substantially among the scenarios.

Flow at each of these locations was derived from HH/LSM output data combined with calculated flow for runoff volumes, using the methodology provided by the SFPUC (Hannaford, 2004). The basis of calculations for the flow at each location is shown in **Table 8**.

Reservoir storage was readily available from HH/LSM output data, and water surface elevations were calculated using SFPUC-supplied storage-elevation curves.

In addition to the analyses listed above for the Alameda Creek system, statistics were developed for the summary tables. Statistics presented in the Alameda Creek system summary table are self-explanatory.



LEGEND

① Reservoir Spill/Release Creek Flow

❼ Reservoir Storage & Water Level

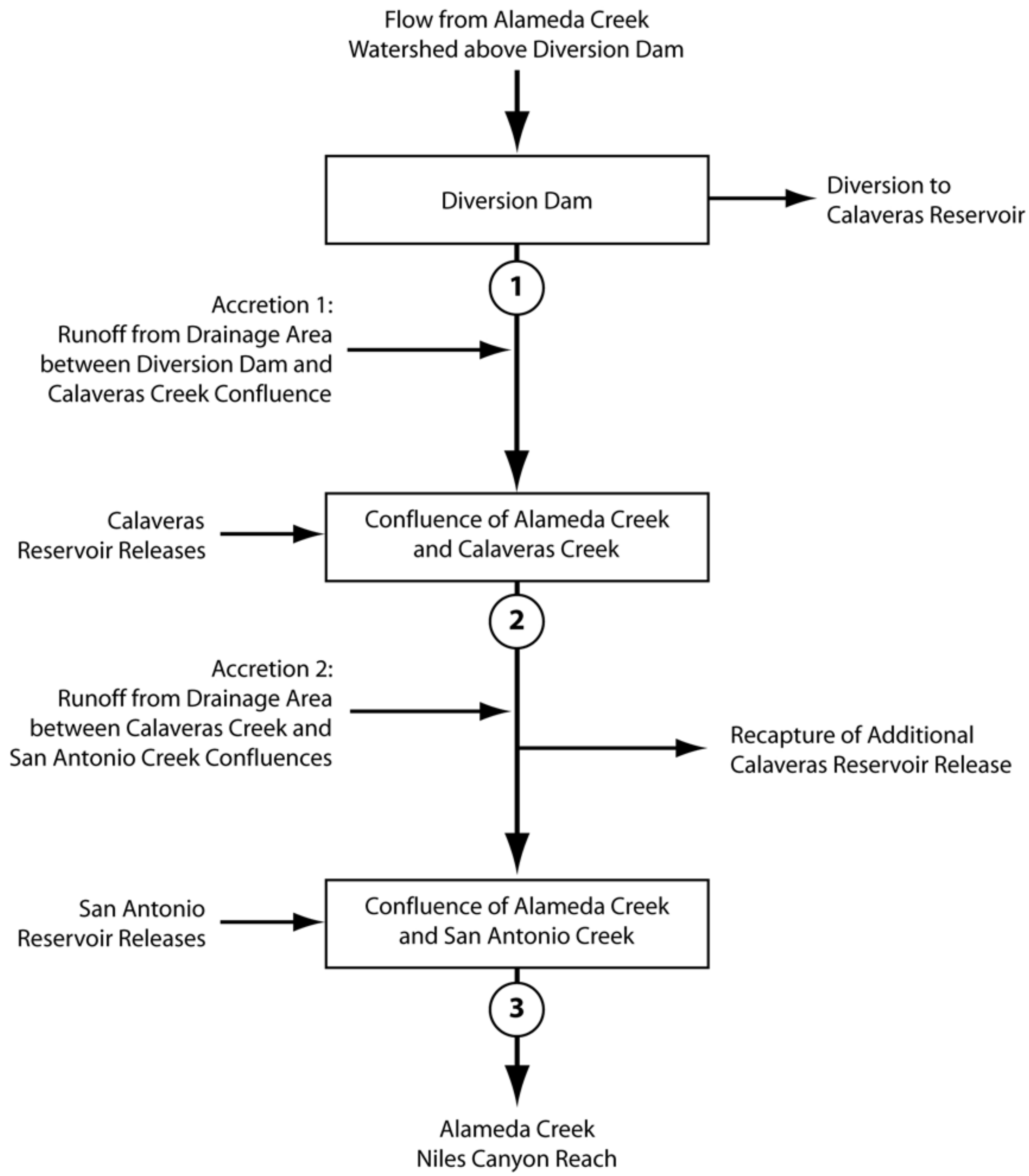
G USGS Gage

NTS

Releases to Rivers/Creeks
1. Diversion from Upper Alameda Creek to Calaveras Reservoir
2. Calaveras Reservoir Release to Calaveras Creek
3. San Antonio Reservoir Release to San Antonio Creek
4. Flow in Alameda Creek below the Diversion Dam (1)
5. Flow in Alameda Creek below the Calaveras Creek Confluence (2)
6. Flow in Alameda Creek below the San Antonio Creek Confluence (3)

Reservoir Storage
7. Calaveras Reservoir Storage & Water Levels
8. San Antonio Reservoir Storage & Water Levels

Figure 3 (Model Appendix 1)
Alameda System Flow and Storage Analysis Locations



SOURCE: WRE, 2006, modified to include recapture and flow locations.

SFPUC Water System Improvement Program ▪ 203287

Figure 4
Alameda Creek Water Balance Flowchart

TABLE 8
CALCULATION OF FLOWS IN ALAMEDA CREEK

Alameda Creek Flow Location	Unimpaired Flow	Current Impaired and Proposed Flows
1. Below the Diversion Dam	SFPUC Calculation Data Source:[a]	= (Unimpaired Flow) – (Diversion to Calaveras Reservoir) Data Source:[a,b]
2. Below the Calaveras Creek Confluence	= (Unimpaired Flow at 1) + (Accretion 1) + (Calaveras Reservoir inflow) Data Source:[a,b,c]	= (Flow at 1) + (Accretion 1) + (Calaveras Reservoir Release) + (Calaveras Reservoir Spill) Data Source:[b,c]
3. Below the San Antonio Creek Confluence	= (Unimpaired Flow at 2) + (Accretion 2) + (San Antonio Reservoir inflow) Data Source:[b,c]	= (Flow at 2) + (Accretion 2) + (San Antonio Reservoir Release) + (San Antonio Reservoir Spill) – (Calaveras Reservoir Release/Recapture) Data Source:[b,c]

Data Source Notes:

[a] Unimpaired flow at Alameda Creek Diversion Dam is from the SFPUC, file "AlamedaCkOnlyAtDiversion.xls."
[b] HH/LSM output source of data for existing and proposed program conditions for: diversion to Calaveras Reservoir; Calaveras Reservoir inflow; Calaveras Reservoir release/recapture; Calaveras Reservoir spill; San Antonio Reservoir inflow; San Antonio Reservoir release; San Antonio Reservoir spill.
[c] Accretion 1 = average monthly runoff volume from drainage area between diversion dam and confluence of Alameda and Calaveras Creeks = (unimpaired inflow to San Antonio Reservoir) x (0.253).
Accretion 2 = average monthly runoff volume from drainage area between Calaveras/Alameda Creek and San Antonio/Alameda Creek confluences = (unimpaired inflow to San Antonio Reservoir) x (0.221).

Peninsula Watershed System

The Peninsula watershed system encompasses SFPUC facilities in the Peninsula watershed. These include Upper and Lower Crystal Springs Reservoirs, San Andreas Reservoir, Pilarcitos Reservoir, and Stone Dam. Local watercourses include San Mateo Creek and Pilarcitos Creek. The following is a list of locations within the Peninsula system analyzed using HH/LSM data.

Releases to Rivers/Creeks

1. Lower Crystal Springs Reservoir releases to San Mateo Creek

Reservoir Storage

2. Upper/Lower Crystal Springs Reservoir storage and water levels
3. San Andreas Reservoir storage and water levels

These analysis locations are shown in **Figure 5**.

Data for releases from Upper/Lower Crystal Springs to San Mateo Creek were readily available from the HH/LSM output data. Releases from Upper/Lower Crystal Springs Reservoir presented in this analysis include both spills and releases from the dam. San Antonio Reservoir releases/spills to San Mateo Creek (which flows to Lower Crystal Springs Reservoir) did not occur in the 82 years of hydrology, so tables were not generated for this location. Additionally, as discussed above in Section 3.2, Model Limitations, Pilarcitos Reservoir storage and release as

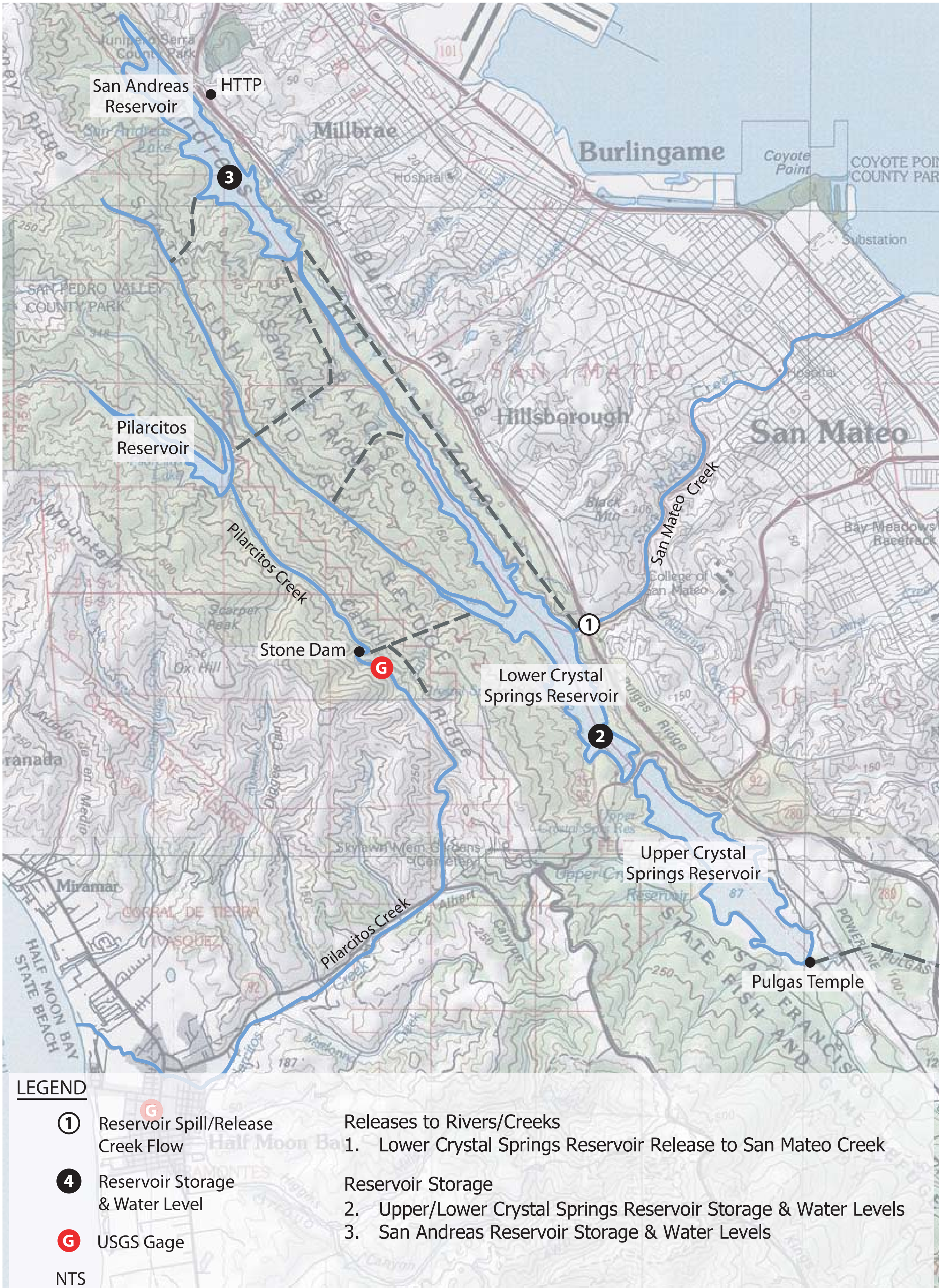


Figure 5 (Appendix H1)
Peninsula System Flow and Storage Analysis Locations

well as Stone Dam release predicted by the HH/LSM model were not analyzed due to inaccuracies in the model for these two facilities. Supplemental analysis of these two facilities, as well as all facilities in the Peninsula System, is provided in Appendix H2, Hydrologic Modeling Assumptions and Results.

Reservoir storage data for Upper/Lower Crystal Springs and San Andreas were readily available from HH/LSM output, and water surface elevations were calculated using SFPUC-supplied storage-elevation curves.

In addition to the analyses listed above for the Peninsula watershed system, statistics were developed for the summary tables. Statistics presented in the Peninsula watershed system summary table are self-explanatory.

5. Post-processed Model Outputs

Summaries of the analyses performed according the methodology outlined in this document are provided in **Tables 9**, **10**, and **11**. The tables correspond to each of the three systems, Tuolumne, Alameda and Peninsula, respectively.

Complete results from the HH/LSM model output analysis are available for review at the SF Planning Department and the SFPUC offices. An index of these tables and a table of contents for each system analysis is provided below.

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Table 9 Summary of Tuolumne System Analysis

Summary of HH/LSM Output	Base:		MEA3CHR, Baseline Condition (2005)				MEA3CHR, Baseline Condition (2005)				MEA3CHR, Baseline Condition (2005)				MEA3CHR, Baseline Condition (2005)				MEA3CHR, Baseline Condition (2005)				MEA3CHR, Baseline Condition (2005)				MEA3CHR, Baseline Condition (2005)			
	Future Condition:		MEA5HIN, WSIP Preferred Program (2030)				MEA4HIN, WSIP Variant, All Tuolumne Alternative (2030)				MEA30H, WSIP Variant, Desal for Drought (2030)				MEA31, WSIP Variant, 10% Rationing (2030)				MEA37H, WSIP CEQA Alt, No Program (2030)				MEA40H, WSIP CEQA Alt, No Purchase Request Inc. (2030)				MEA42H, WSIP CEQA Alt, Aggressive Conservation (2030)			
RESERVOIR LEVELS			Base (Cal Down)	Future Condition	Compared Delta	Compared % Change	Base (Cal Down)	Future Condition	Compared Delta	Compared % Change	Base (Cal Down)	Future Condition	Compared Delta	Compared % Change	Base (Cal Down)	Future Condition	Compared Delta	Compared % Change	Base (Cal Down)	Future Condition	Compared Delta	Compared % Change	Base (Cal Down)	Future Condition	Compared Delta	Compared % Change	Base (Cal Down)	Future Condition	Compared Delta	Compared % Change
Lake Lloyd (Cherry)																														
Average Monthly Storage, All Years	Max	AF	271,747	270,458	-1,289	-0.5%	271,747	271,205	-542	-0.2%	271,747	269,481	-2,266	-0.8%	271,747	271,489	-258	-0.1%	271,747	271,904	157	0.1%	271,747	270,611	-1,136	-0.4%	271,747	271,399	-348	-0.1%
	Min	AF	203,512	201,773	-1,739	-0.9%	203,512	202,519	-993	-0.5%	203,512	200,162	-3,350	-1.6%	203,512	203,376	-136	-0.1%	204,203	203,861	-343	-0.2%	203,512	201,736	-1,776	-0.9%	203,512	202,657	-855	-0.4%
	Avg	AF	240,319	238,996	-1,323	-0.6%	240,319	239,640	-679	-0.3%	240,319	237,911	-2,408	-1.0%	240,319	240,083	-236	-0.1%	240,426	240,457	31	0.0%	240,319	239,074	-1,245	-0.5%	240,319	239,794	-525	-0.2%
Avg Monthly Water Surface Elev, All Years	Max	FT	4,702	4,701	-1	0.0%	4,702	4,701	0	0.0%	4,702	4,700	-1	0.0%	4,702	4,701	0	0.0%	4,702	4,702	0	0.0%	4,702	4,701	-1	0.0%	4,702	4,701	0	0.0%
	Min	FT	4,661	4,660	-1	0.0%	4,661	4,661	-1	0.0%	4,661	4,659	-2	0.0%	4,661	4,661	0	0.0%	4,662	4,662	0	0.0%	4,661	4,660	-1	0.0%	4,661	4,661	-1	0.0%
	Avg	FT	4,683	4,683	-1	0.0%	4,683	4,683	0	0.0%	4,683	4,682	-1	0.0%	4,683	4,683	0	0.0%	4,683	4,683	0	0.0%	4,683	4,683	-1	0.0%	4,683	4,683	0	0.0%
Lake Eleanor																														
Average Monthly Storage, All Years	Max	AF	27,100	27,100	0	0.0%	27,100	27,100	0	0.0%	27,100	27,100	0	0.0%	27,100	27,100	0	0.0%	27,100	27,100	0	0.0%	27,100	27,100	0	0.0%	27,100	27,100	0	0.0%
	Min	AF	13,860	13,860	0	0.0%	13,860	13,860	0	0.0%	13,860	13,860	0	0.0%	13,860	13,860	0	0.0%	13,860	13,860	0	0.0%	13,860	13,860	0	0.0%	13,860	13,860	0	0.0%
	Avg	AF	22,201	22,191	-10	0.0%	22,201	22,191	-10	0.0%	22,201	22,191	-10	0.0%	22,201	22,191	-10	0.0%	22,201	22,201	0	0.0%	22,201	22,191	-10	0.0%	22,201	22,191	-10	0.0%
Avg Monthly Water Surface Elev, All Years	Max	FT	4,661	4,661	0	0.0%	4,661	4,661	0	0.0%	4,661	4,661	0	0.0%	4,661	4,661	0	0.0%	4,661	4,661	0	0.0%	4,661	4,661	0	0.0%	4,661	4,661	0	0.0%
	Min	FT	4,646	4,646	0	0.0%	4,646	4,646	0	0.0%	4,646	4,646	0	0.0%	4,646	4,646	0	0.0%	4,646	4,646	0	0.0%	4,646	4,646	0	0.0%	4,646	4,646	0	0.0%
	Avg	FT	4,656	4,656	0	0.0%	4,656	4,656	0	0.0%	4,656	4,656	0	0.0%	4,656	4,656	0	0.0%	4,656	4,656	0	0.0%	4,656	4,656	0	0.0%	4,656	4,656	0	0.0%
Hetch Hetchy Reservoir																														
Avg Monthly Water Surface Elev, Dry Years	Level in Month of Max Reduction	FT	3,731	3,713	-18		3,731	3,710	-21		3,731	3,718	-13		3,731	3,714	-17		3,760	3,758	-2		3,731	3,725	-6		3,731	3,722	-9	Mar
Avg Monthly Water Surface Elev, All Years	Level in Month of Max Reduction	FT	3,738	3,729	-10		3,738	3,726	-12		3,738	3,731	-7		3,738	3,729	-10		3,738	3,736	-2		3,770	3,768	-2		3,738	3,736	-3	Mar
	Level in Month of Min Reduction	FT	3,802	3,801	-1		3,802	3,801	-1		3,802	3,802	1		3,802	3,801	-1		3,745	3,752	7		3,745	3,750	5		3,745	3,749	4	Dec
Storage April 1999	Volume in Storage	AF	190,000	175,000	-		190,000	167,000	-		190,000	173,000	-		190,000	173,000	-		190,000	183,000	-		190,000	180,000	-		190,000	180,000	-	
	Refill Volume Required	AF	160,000	175,000	15,000		160,000	183,000	23,000		160,000	177,000	17,000		160,000	177,000	17,000		160,000	167,000	7,000		160,000	170,000	10,000		160,000	170,000	10,000	
Maximum Reduction	Level in Month of Max Reduction	FT	3717	3654	-63		3717	3669	-48		3701	3662	-39		3717	3655	-62		3788	3771	-17		3701	3677	-24		3701	3677	-24	Mar-34
Don Pedro Reservoir																														
Avg Monthly Water Surface Elev,	Level in Month of Max Reduction	FT	721	711	-10		721	710	-10		754	748	-6		721	709	-11		754	753	-2		754	752	-2		754	751	-3	Sep, Dry
Any Monthly Avg in Yr type summaries	Level in Month of Min Reduction	FT	804	804	0		804	804	0		804	804	0		804	804	0		774	774	0		774	773	0		774	773	0	Sep, Wet
Maximum Reduction	Level in Month of Max Reduction	FT	720	690	-30		718	681	-37		720	704	-16		708	670	-38		756	752	-4		762	754	-9		762	753	-9	Feb-35
FLOWS AND RELEASES			Base (Cal Down)	Future Condition	Compared Delta	Compared % Change	Base (Cal Down)	Future Condition	Compared Delta	Compared % Change	Base (Cal Down)	Future Condition	Compared Delta	Compared % Change	Base (Cal Down)	Future Condition	Compared Delta	Compared % Change	Base (Cal Down)	Future Condition	Compared Delta	Compared % Change	Base (Cal Down)	Future Condition	Compared Delta	Compared % Change	Base (Cal Down)	Future Condition	Compared Delta	Compared % Change
Cherry Ck Below Lake Lloyd (Cherry)																														
Frequency, Flowrate	is Minimum Release	MON	889	888	-1		889	887	-2		889	884	-5		889	886	-3		889	885	-4		889	886	-3		889		-889	
	Total Months in Record	MON	987	988			987	987			987	987			987	987			987	987			987	987			987	987		
	%	%	90.1%	89.9%		-0.2%	90.1%	89.9%		-0.2%	90.1%	89.6%		-0.5%	90.1%	89.8%		-0.3%	90.1%	89.7%		-0.4%	90.1%	89.8%		-0.3%	90.1%	0.0%		-90.1%
Eleanor Ck Below Lake Eleanor																														
Frequency, Flowrate	is Minimum Release	MON	702	702	0		702	702	0		702	702	0		702	702	0		702	702	0		702	702	0		702		-702	
	Total Months in Record	MON	987	988			987	987			987	987			987	987			987	987			987	987			987	987		
	%	%	71.1%	71.1%		-0.1%	71.1%	71.1%		0.0%	71.1%	71.1%		0.0%	71.1%	71.1%		0.0%	71.1%	71.1%		0.0%	71.1%	71.1%		0.0%	71.1%	0.0%		-71.1%
Tuolumne below Hetch Hetchy																														
Change in Monthly Flowrate by Year Type	Max Change	CFS	224	157	-67	-30.0%	224	150	-74	-33.1%	224	157	-67	-29.9%	224	157	-67	-29.9%	224	186	-38	-17.1%	224	167	-57	-25.6%	224	160	-64	-28.7%
	Mo/Yr Type		May, Dry				May, Dry				May, Dry				May, Dry				May, Dry				May, Dry				May, Dry			
Change in Monthly Flowrate, Max Delta	Max Change in 82 Year Record	CFS	520	50	-470	-90.4%	520	50	-470	-90.4%	520	50	-470	-90.4%	520	50	-470	-90.4%	313	144	-169	-54.0%	520	50	-470	-90.4%	520	53	-468	-90.0%
Frequency, Flowrate	Springs with Reductions >30%	YRS	-	-	19		-	-	27		-	-	19		-	-	20		-	-	7		-	-	8		-	-	9	
	Total Springs in Record	YRS	-	-	82		-	-	82		-	-	82		-	-	82		-	-	82		-	-	82		-	-	82	
	% of Springs with Reduction >30%	%	-	-		23.2%	-	-		32.9%	-	-		23.2%	-	-		24.4%	-	-		8.5%	-	-		9.8%	-	-		11.0%
	is Minimum Release	MON	837	846	9		837	849	12		837	845	8		837	846	9		837	838	1		837	837	0		837		-837	
	Total Months in Record	MON	987	987			987	987			987	987			987	987			987	987			987	987			987	987		
	%	%	84.8%	85.7%		0.9%	84.8%	86.0%		1.2%	84.8%	85.6%		0.8%	84.8%	85.7%		0.9%	84.8%	84.9%		0.1%	84.8%	84.8%		0.0%	84.8%	0.0%		-84.8%
Tuolumne below LaGrange																														
Change in Monthly Flowrate by Year Type	Max Change	CFS	408	306	-102	-25%	408	277	-131	-32%	408	322	-86	-21%	408	306	-101	-25%	408	342	-66	-16%	1,969	1,876	-93	-5%	324	298	-26	-8%
	Mo/Yr Type		June, Above Normal				June, Above Normal				June, Above Normal				June, Above Normal				June, Above Normal				Mar, Above Normal				November, Dry			
Change in Monthly Flowrate, Max Delta	Max Change in 82 Year Record	CFS	987	250	-737	-74.7%	3,409	250	-3,159	-92.7%	663	150	-513	-77.4%	3,409	250	-3,159	-92.7%	987	514	-473	-47.9%	523	330	-193	-36.9%	987	600	-387	-39.2%
	Springs with Reductions >30%	YRS			5				5				4				5				3				2				1	
	Total Springs in Record	YRS			82				82				82				82				82				82				82	
	% of Springs with Reduction >30%	%				6.1%				6.1%				4.9%				6.1%				3.7%				2.4%				1.2%
	is Minimum Release	MON	717	734	17		717	739	22		717	732	15		717	737	20		717	719	2		717	717	0		717		-717	
	Total Months in Record	MON	987	987			987	987			987	987			987	987			987	987			987	987			987	987		
	%	%	72.6%	74.4%		1.7%	72.6%	74.9%		2.2%	72.6%	74.2%		1.5%	72.6%	74.7%		2.0%	72.6%	72.8%		0.2%	72.6%	72.6%		0.0%	72.6%	0.0%		-72.6%

Table 10 Summary of Alameda System Analysis

Summary of HH/LSM Output		Base: / Future Condition:	MEA3CHR, Baseline Condition (2005) / MEA5HIN, WSIP Prop. Program (2030), Calaveras Up				MEA3CHR, Baseline Condition (2005) / MEA4HIN, WSIP Variant, All Tuolumne Alternative (2030)				MEA3CHR, Baseline Condition (2005) / MEA30H, WSIP Variant, Desal for Drought (2030)				MEA3CHR, Baseline Condition (2005) / MEA31, WSIP Variant, 10% Rationing (2030)				MEA3CHR, Baseline Condition (2005) / MEA37H, WSIP CEQA Alt, No Program (2030)				MEA3CHR, Baseline Condition (2005) / MEA40H, WSIP CEQA Alt, No Purchase Request Inc. (2030)				MEA3CHR, Baseline Condition (2005) / MEA42H, WSIP CEQA Alt, Aggressive Conservation (2030)			
RESERVOIR LEVELS			Base (Cal Down)	Future Condition	Compared Delta	Compared % Change	Base (Cal Down)	Future Condition	Compared Delta	Compared % Change	Base (Cal Down)	Future Condition	Compared Delta	Compared % Change	Base (Cal Down)	Future Condition	Compared Delta	Compared % Change	Base (Cal Down)	Future Condition	Compared Delta	Compared % Change	Base (Cal Down)	Future Condition	Compared Delta	Compared % Change	Base (Cal Down)	Future Condition	Compared Delta	Compared % Change
Calaveras Reservoir																														
Storage, Average Monthly of All Years	Max	AF	35,681	91,498	55,817	156%	35,681	91,517	55,836	156%	35,681	91,394	55,714	156%	35,681	91,187	55,506	156%	35,681	82,153	46,472	130%	35,681	91,534	55,853	157%	35,681	91,456	55,775	156%
	Min	AF	31,090	79,512	48,421	156%	31,090	79,411	48,321	155%	31,090	79,334	48,243	155%	31,090	79,156	48,065	155%	31,090	68,628	37,538	121%	31,090	79,822	48,732	157%	31,090	79,767	48,677	157%
	Avg	AF	33,680	86,913	53,232	158%	33,680	86,717	53,037	157%	33,680	86,794	53,114	158%	33,680	86,588	52,908	157%	33,680	76,154	42,474	126%	33,680	87,176	53,496	159%	33,680	87,089	53,409	159%
	Range	AF	4,590	11,986	7,396	161%	4,590	12,105	7,515	164%	4,590	12,061	7,470	163%	4,590	12,031	7,441	162%	4,590	13,524	8,934	195%	4,590	11,712	7,122	155%	4,590	11,689	7,099	155%
Water Surf Elev, Avg Monthly of All Years	Max	FT	702	752	50		702	752	50		702	752	50		702	752	50		702	745	43		702	752	50		702	752	50	
	Min	FT	697	743	46		697	743	46		697	743	46		697	743	46		697	734	37		697	743	46		697	743	46	
	Avg	FT	700	749	49		700	748	49		700	749	49		700	748	49		700	740	40		700	749	49		700	749	49	
	Range	FT	5	9	4		5	9	4		5	9	4		5	9	4		5	11	6		5	9	4		5	9	4	
Water Suf Elev, Max Difference in Range in Any One Year	Max	FT	705	756			705	756			705	756			705	756			705	754			705	756			705	756		
	Min	FT	693	721			693	723			693	720			693	720			693	701			693	731			693	731		
	Range	FT	12	35			12	33			12	36			12	36			12	53			12	25			12	25		
	Year (Same)	YR	1978	1978			1978	1978			1978	1978			1978	1978			1978	1978			1978	1978			1978	1978		
San Antonio Reservoir																														
Storage, Average Monthly of All Years	Max	AF	45,426	47,245	1,819	4%	45,426	46,855	1,429	3%	45,426	48,057	2,631	6%	45,426	46,696	1,270	3%	45,426	37,177	-8,248	-18%	45,426	49,109	3,683	8%	45,426	48,589	3,163	7%
	Min	AF	40,426	42,613	2,186	5%	40,426	41,527	1,101	3%	40,426	42,816	2,390	6%	40,426	41,145	719	2%	40,426	25,535	-14,891	-37%	40,426	46,208	5,782	14%	40,426	45,899	5,473	14%
	Avg	AF	43,222	44,901	1,679	4%	43,222	43,982	760	2%	43,222	45,706	2,484	6%	43,222	44,104	882	2%	43,222	31,853	-11,369	-26%	43,222	47,826	4,604	11%	43,222	47,397	4,175	10%
	Range	AF	4,999	4,632	-367	-7%	4,999	5,328	328	7%	4,999	5,241	242	5%	4,999	5,551	552	11%	4,999	11,642	6,643	133%	4,999	2,901	-2,098	-42%	4,999	2,690	-2,310	-46%
Water Surf Elev, Avg Monthly of All Years	Max	FT	461	463	2		461	463	2		461	464	3		461	463	2		461	450	-11		461	466	5		461	465	4	
	Min	FT	455	458	3		455	456	1		455	458	3		455	456	1		455	431	-24		455	462	7		455	462	7	
	Avg	FT	459	461	2		459	460	1		459	462	3		459	460	1		459	442	-17		459	464	6		459	464	5	
	Range	FT	6	5	-1		6	7	1		6	6	0		6	7	1		6	19	13		6	4	-2		6	3	-3	
Water Suf Elev, Max Difference in Range in Any One Year	Max	FT	457	462			454	457			464	467			468	468			468	463			468	468			454	463		
	Min	FT	446	441			441	433			444	426			455	399			446	368			441	463			441	447		
	Range	FT	11	21			13	24			20	41			13	69			22	95			27	5			13	16		
	Year (Same)	YR	1977	1977			1930	1930			1935	1935			1978	1978			1973	1973			1956	1956			1930	1930		
FLOWS AND RELEASES			Base (Cal Down)	Future Condition	Compared Delta	Compared % Change	Base (Cal Down)	Future Condition	Compared Delta	Compared % Change	Base (Cal Down)	Future Condition	Compared Delta	Compared % Change	Base (Cal Down)	Future Condition	Compared Delta	Compared % Change	Base (Cal Down)	Future Condition	Compared Delta	Compared % Change	Base (Cal Down)	Future Condition	Compared Delta	Compared % Change	Base (Cal Down)	Future Condition	Compared Delta	Compared % Change
AC below Diversion Dam																														
Annual Flow Past ACDD	Avg (All Years)	AF/Y	8,849	7,636	-1,213	-14%	8,849	7,615	-1,234	-14%	8,849	7,642	-1,208	-14%	8,849	7,634	-1,215	-14%	8,849	6,739	-2,110	-24%	8,849	7,746	-1,103	-12%	8,849	7,734	-1,115	-13%
(Majority-All flow occurs Nov-May)		CFS	12.1	10.5	-2	-14%	12.1	10.4	-2	-14%	12.1	10.5	-2	-14%	12.1	10.5	-2	-14%	12.1	9.2	-3	-24%	12.1	10.6	-2	-12%	12.1	10.6	-2	-13%
	Avg (Wet Years)	AF/Y	25,331	24,389	-942	-4%	25,331	24,389	-942	-4%	25,331	24,389	-942	-4%	25,331	24,389	-942	-4%	25,331	23,291	-2,040	-8%	25,331	24,570	-762	-3%	25,331	24,544	-788	-3%
		CFS	34.7	33.4	-1	-4%	34.7	33.4	-1	-4%	34.7	33.4	-1	-4%	34.7	33.4	-1	-4%	34.7	31.9	-3	-8%	34.7	33.6	-1	-3%	34.7	33.6	-1	-3%
Freq of Flow Past ACDD	Months with Flow >5 CFS	No Mon	129	124	-5	-4%	129	124	-5	-4%	129	124	-5	-4%	129	124	-5	-4%	129	117	-12	-9%	129	124	-5	-4%	129	123	-6	-5%
	Total Months	No Mon	984	984			984	984			984	984			984	984			984	984			984	984			984	984		
	%	%	13.1%	12.6%		-1%	13.1%	12.6%		-1%	13.1%	12.6%		-1%	13.1%	12.6%		-1%	13.1%	11.9%		-1%	13.1%	12.6%		-1%	13.1%	12.5%		-1%
Calaveras Ck below Calaveras Dam																														
Total Annual Spills/Releases from Calaveras	Max	AF/Y	91,236	86,268	-4,968	-5%	91,236	86,268	-4,968	-5%	91,236	86,268	-4,968	-5%	91,236	86,268	-4,968	-5%	91,236	86,268	-4,968	-5%	91,236	86,268	-4,968	-5%	91,236	86,268	-4,968	-5%
	Min	AF/Y	0	4,227	4,227	+999%	0	4,227	4,227	+999%	0	4,227	4,227	+999%	0	4,227	4,227	+999%	0	0	0	+999%	0	4,227	4,227	+999%	0	4,227	4,227	+999%
	Avg	AF/Y	11,232	13,149	1,918	17%	11,232	13,038	1,806	16%	11,232	13,186	1,955	17%	11,232	13,136	1,904	17%	11,232	11,426	194	2%	11,232	13,084	1,853	16%	11,232	13,049	1,817	16%
Frequency of Spill (Non-MOU Releases)	No Months of Spill	No Mon	83	61	-22	-27%	83	60	-23	-28%	83	60	-23	-28%	83	60	-23	-28%	83	47	-36	-43%	83	59	-24	-29%	83	59	-24	-29%
	Total Months	No Mon	984	984			984	984			984	984			984	984			984	984			984	984			987	987		
	%	%	8%	6%		-2%	8%	6%		-2%	8%	6%		-2%	8%	6%		-2%	8%	5%		-4%	8%	6%		-2%	8%	6%		-2%
AC below Calaveras Creek Confl.																														
Annual Flow at Confluence, All Years	Avg Annual	AF/Y	21,998	22,703	704	3%	21,998	22,570	572	3%	21,998	22,746	747	3%	21,998	22,687	689	3%	21,998	20,082	-1,916	-9%	21,998	22,748	749	3%	21,998	22,701	702	3%
	Max Annual	AF/Y	146,366	141,163	-5,203	-4%	146,366	141,163	-5,203	-4%	146,366	141,163	-5,203	-4%	146,366	141,163	-5,203	-4%	146,366	142,085	-4,281	-3%	146,366	142,085	-4,281	-3%	146,366	142,085	-4,281	-3%
	Min Annual	AF/Y	0	6,310	6,310	+999%	0	6,310	6,310	+999%	0	6,310	6,310	+999%	0	6,310	6,310	+999%	0	184	184	+999%	0	6,310	6,310	+999%	0	6,310	6,310	+999%
Winter Flow at Confl, Wet Years	Avg Winter, Jan-Mar	CFS	338	302	-36	-11%	338	301	-37	-11%	338	303	-36	-11%	338	302	-36	-11%	338	273	-65	-19%	338	300	-38	-11%	338	300	-38	-11%
Winter Flow at Confl, Above Normal Years	Avg Winter, Jan-Mar	CFS	146	72	-74	-51%	146	72	-74	-51%	146	72	-74	-51%	146	72	-74	-51%	146	72	-74	-51%	146	72	-74	-51%	146	72	-74	-51%
San Antonio Ck below Turner (SA) Dam																														
Frequency of Spill/Release	No Years of Spill	No Yrs	17	17	0	0%	17	16	-1	-6%	17	18	1	6%	17	16	-1	-6%	17	2	-15	-88%	17	25	8	47%	17	20	3	18%
(Greater than 35cfs)	Total Years	No Yrs	82	82			82	82			82	82			82	82			82	82			82	82			82	82		
	%	%	21%	21%		0%	21%	20%		-1%	21%	22%		1%	21%	20%		-1%	21%	2%		-18%	21%	30%		10%	21%	24%		4%
	No Months of Spill	No Mon	22	24	2	9%	22	22	0	0%	22	27	5	23%	22	24	2	9%	22	2	-20	-91%	22	41	19	86%	22	35	13	59%
	Total Months	No Mon	984	984			984	984			984	984			984	984			984	984			984	984			984	984		
	%	%	2%	2%		0%	2%	2%		0%	2%	3%		1%	2%	2%		0%	2%	0%		-2%	2%	4%		2%	2%	4%		1%
Avg Monthly Spill/Release	Avg, Months >35 CFS	CFS	89	77	-12	-13%	89	74	-15	-17%	89	78	-11	-12%	89	78	-11	-13%	89	113	24	27%	89	74	-15	-17%	89	78	-10	-12%
AC below San Antonio Confl.																														
Winter Flow at Confl, Wet Years	Avg Winter, Jan-Mar	CFS	384	347	-37	-10%	384	344	-40	-10%	384	352	-32	-8%	384	348	-36	-9%	384	291	-93	-24%	384	360	-24	-6%	384	357	-27	-7%
Winter Flow at Confl, Above Normal Years	Avg Winter, Jan-Mar	CFS	165	121	-45	-27%	165	116	-49	-30%	165	123	-42	-26%	165	121	-45	-27%	165	77	-88	-53%	165	130	-35	-21%	165	125	-40	-24%
Winter Flow at Confl, Normal Years	Avg Winter, Jan-Mar	CFS	40	21	-19	-48%	40	20	-19	-49%	40	21	-19	-48%	40	21	-19	-48%	40	17	-22	-56%	40	22	-17	-44%	40	21	-19	-47%

Table 11 Summary of Peninsula System Analysis

Summary of HH/LSM Output	Base: Future Condition:		MEA3CHR, Baseline Condition (2005) MEA5HIN, WSIP Proposed Program (2030)				MEA3CHR, Baseline Condition (2005) MEA4HIN, WSIP Variant, All Tuolumne Alternative (2030)				MEA3CHR, Baseline Condition (2005) MEA30H, WSIP Variant, Desal for Drought (2030)				MEA3CHR, Baseline Condition (2005) MEA31, WSIP Variant, 10% Rationing (2030)			
RESERVOIR LEVELS			Base (Cal Down)	Future Condition	Compared Delta	Compared % Change	Base (Cal Down)	Future Condition	Compared Delta	Compared % Change	Base (Cal Down)	Future Condition	Compared Delta	Compared % Change	Base (Cal Down)	Future Condition	Compared Delta	Compared % Change
San Andreas Reservoir																		
Storage, Avg Monthly of All Years	Max	AF	19,027	19,027	0	0%	19,027	19,027	0	0%	19,027	19,027	0	0%	19,027	19,027	0	0%
	Min	AF	17,116	16,272	-844	-5%	17,116	16,201	-915	-5%	17,116	16,416	-701	-4%	17,116	16,274	-842	-5%
	Avg	AF	18,085	17,987	-97	-1%	18,085	17,964	-121	-1%	18,085	18,010	-75	0%	18,085	17,988	-97	-1%
	Range	AF	1,911	2,755	844	44%	1,911	2,826	915	48%	1,911	2,611	701	37%	1,911	2,753	842	44%
Water Surf Elev, Avg Monthly of All Years	Max	FT	449	449	0		449	449	0		449	449	0		449	449	0	
	Min	FT	445	443	-2		445	443	-2		445	443	-2		445	443	-2	
	Avg	FT	447	447	0		447	447	0		447	447	0		447	447	0	
	Range	AF	4	6	2		4	6	2		4	6	2		4	6	2	
Maintenance Water Levels, December	Avg Non-Maint Water Level	FT	-	445			-	445			-	445			-	445		
	Min Maint Water Level	FT	-	431			-	429			-	431			-	431		
				-14				-16				-14				-14		
Upper/Lower Crystal Springs Reservoir																		
Storage, Avg Monthly of All Years	Max	AF	52,936	64,238	11,303	21%	52,936	63,071	10,135	19%	52,936	65,067	12,131	23%	52,936	64,510	11,575	22%
	Min	AF	44,896	52,546	7,651	17%	44,896	51,558	6,662	15%	44,896	54,201	9,305	21%	44,896	53,539	8,644	19%
	Avg	AF	49,416	58,194	8,777	18%	49,416	56,737	7,320	15%	49,416	59,208	9,791	20%	49,416	58,538	9,122	18%
	Range	AF	8,040	11,692	3,652	45%	8,040	11,513	3,473	43%	8,040	10,866	2,826	35%	8,040	10,971	2,931	36%
Water Surf Elev, Avg Monthly of All Years	Max	FT	280	288	8		280	287	7		280	289	9		280	288	8	
	Min	FT	273	279	6		273	278	5		273	281	8		273	280	7	
	Avg	FT	276	283	7		276	282	6		276	284	8		276	283	7	
	Range	FT	7	9	2		7	9	2		7	8	1		7	8	1	
Maintenance Water Levels, December	Avg Non-Maint Water Level	FT	-	281			-	280			-	281			-	281		
	Min Maint Water Level	FT	-	265			-	255			-	270			-	266		
				-16				-25				-11				-15		
FLOWS AND RELEASES			Base (Cal Down)	Future Condition	Compared Delta	Compared % Change	Base (Cal Down)	Future Condition	Compared Delta	Compared % Change	Base (Cal Down)	Future Condition	Compared Delta	Compared % Change	Base (Cal Down)	Future Condition	Compared Delta	Compared % Change
San Mateo Ck below Lower Crystal Springs Reservoir																		
Release Year Types	Year Types Rel. Occurs		W, AN	W, AN, N, BN			W, AN	W, AN			W, AN	W, AN, N, BN			W, AN	W, AN, N, BN		
Frequency of Release	No of Release Months	No Mon	27	33	6	22%	27	16	-11	-41%	27	33	6	22%	27	30	3	11%
	Total Months	No Mon	984	984			984	984			984	984			984	984		
	%		2.7%	3.4%		1%	2.7%	1.6%		-1%	2.7%	3.4%		1%	2.7%	3.0%		0%
Releases, Wet Years	Avg Annual Total	AF	6,336	4,397	-1,939	-31%	6,336	3,049	-3,287	-52%	6,336	6,017	-320	-5%	6,336	4,623	-1,713	-27%
	Avg Monthly Flowrate (Jan-Apr)	CFS	27	19	-8	-30%	27	13	-14	-52%	27	24	-2	-8%	27	19	-7	-27%
	Jan-April Local Wshed Below CS Dam	AF	2500	2500			2500	2500			2500	2500			2500	2500		
		CFS	10.5	10.5			10.5	10.5			10.5	10.5			10.5	10.5		
	% of Flow in SM Ck from CS Reservoir	%	71.7%	63.8%			71.7%	54.9%			71.7%	70.6%			71.7%	64.9%		

Summary of HH/LSM Output	Base: Future Condition:		MEA3CHR, Baseline Condition (2005) MEA37H, WSIP CEQA Alt, No Program (2030)				MEA3CHR, Baseline Condition (2005) MEA40H, WSIP CEQA Alt, No Purchase Request Inc. (2030)				MEA3CHR, Baseline Condition (2005) MEA42H, WSIP CEQA Alt, Aggressive Conservation (2030)			
RESERVOIR LEVELS			Base (Cal Down)	Future Condition	Compared Delta	Compared % Change	Base (Cal Down)	Future Condition	Compared Delta	Compared % Change	Base (Cal Down)	Future Condition	Compared Delta	Compared % Change
San Andreas Reservoir														
Storage, Avg Monthly of All Years	Max	AF	19,027	19,027	0	0%	19,027	19,027	0	0%	19,027	19,027	0	0%
	Min	AF	17,116	14,782	-2,334	-14%	17,116	16,090	-1,026	-6%	17,116	15,832	-1,284	-8%
	Avg	AF	18,085	17,862	-223	-1%	18,085	17,934	-151	-1%	18,085	17,883	-202	-1%
	Range	AF	1,911	4,245	2,334	122%	1,911	2,937	1,026	54%	1,911	3,195	1,284	67%
Water Surf Elev, Avg Monthly of All Years	Max	FT	449	449	0		449	449	0		449	449	0	
	Min	FT	445	439	-6		445	442	-3		445	442	-3	
	Avg	FT	447	447	-1		447	447	0		447	447	-1	
	Range	AF	4	10	6		4	7	3		4	7	3	
Maintenance Water Levels, December	Avg Non-Maint Water Level	FT	-	440			-	445			-	445		
	Min Maint Water Level	FT	-	438			-	428			-	425		
				-1				-17				-20		
Upper/Lower Crystal Springs Reservoir														
Storage, Avg Monthly of All Years	Max	AF	52,936	50,269	-2,667	-5%	52,936	56,386	3,450	7%	52,936	56,303	3,368	6%
	Min	AF	44,896	41,807	-3,089	-7%	44,896	49,189	4,293	10%	44,896	48,829	3,934	9%
	Avg	AF	49,416	46,392	-3,025	-6%	49,416	52,251	2,835	6%	49,416	52,071	2,655	5%
	Range	AF	8,040	8,462	422	5%	8,040	7,197	-843	-10%	8,040	7,474	-566	-7%
Water Surf Elev, Avg Monthly of All Years	Max	FT	280	277	-3		280	282	2		280	282	2	
	Min	FT	273	270	-3		273	276	3		273	276	3	
	Avg	FT	276	273	-3		276	279	2		276	278	2	
	Range	FT	7	7	0		7	6	-1		7	6	-1	
Maintenance Water Levels, December	Avg Non-Maint Water Level	FT	-	269			-	278			-	277		
	Min Maint Water Level	FT	-	260			-	266			-	266		
				-9				-12				-12		
FLOWS AND RELEASES			Base (Cal Down)	Future Condition	Compared Delta	Compared % Change	Base (Cal Down)	Future Condition	Compared Delta	Compared % Change	Base (Cal Down)	Future Condition	Compared Delta	Compared % Change
San Mateo Ck below Lower Crystal Springs Reservoir														
Release Year Types	Year Types Rel. Occurs		W, AN	W			W, AN	W, AN			W, AN	W, AN		
Frequency of Release	No of Release Months	No Mon	27	8	-19	-70%	27	32	5	19%	27	29	2	7%
	Total Months	No Mon	984	984			984	984			984	984		
	%		2.7%	0.8%		-2%	2.7%	3.3%		1%	2.7%	2.9%		0%
Releases, Wet Years	Avg Annual Total	AF	6,336	1,832	-4,504	-71%	6,336	9,551	3,215	51%	6,336	7,812	1,476	23%
	Avg Monthly Flowrate (Jan-Apr)	CFS	27	7	-19	-73%	27	40	13	49%	27	32	6	22%
	Jan-April Local Wshed Below CS Dam	AF	2500	2500			2500	2500			2500	2500		
		CFS	10.5	10.5			10.5	10.5			10.5	10.5		
	% of Flow in SM Ck from CS Reservoir	%	71.7%	42.3%			71.7%	79.3%			71.7%	75.8%		

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Index of Post-processed Model Results

Contents of Each System Analysis Results Report

(refer to index presented with each report for further detail)

Tuolumne River System Results Report

Alameda Creek System Results Report

Peninsula Watershed System Results Report

References

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APPENDIX H2

Hydrologic Modeling – Supporting Information

[Additional discussion on water resources modeling was prepared as part of the Comments and Responses document. Please refer to Section 13.3, Updated Water System Assumptions and Modeling (Vol. 7, Chapter 13), and to Appendix O, Hydrologic Modeling – Additional Supporting Information (Vol. 8).]

APPENDIX H2-1

Memorandum

Subject: **HH/LSM Assumptions and Results – Proposed WSIP**
From: **Daniel B. Steiner**
Date: **March 18, 2007**

1. Introduction

This memorandum summarizes assumptions for, and discusses the interpretation of, Hetch Hetchy Local Simulation Model (HH/LSM) results for the simulation of the Water System Improvement Program ("WSIP" or the "proposed program"). Table 1-1 and Table 1-2 summarize the program/setting characteristics and modeling assumptions, and the performance and hydrologic results, respectively, for the WSIP as they compare to the modeled existing setting (2005, with Calaveras Reservoir constrained by the California Division of Safety of Dams (DSOD) restrictions) and the pre-2002 setting (with Calaveras Reservoir operation prior to DSOD restrictions).

The hydrology of the proposed program is primarily discussed in terms of a comparison to the baseline condition of the Program Environmental Impact Report (PEIR), i.e., the simulated current (2005) operation of the regional system, assuming that the operation of Calaveras and Crystal Springs Reservoirs is constrained by DSOD restrictions. Primary hydrologic parameters such as projected water deliveries, reservoir storage, and stream flows are compared, and additional parameters that assist in identifying causes of hydrologic changes are also described as needed. Key hydrologic factors that lead to environmental impact assessment are illustrated.

Table 1-1
Setting Characteristics and Modeling Assumptions (Part 1/3)

Assumptions and Characteristics of Setting and/or Program	Units	Baselines: Baseline Conditions[1] - Calaveras Constrained	Baselines: Baseline Conditions[2] - Calaveras Unconstrained	Proposed WSIP[3]
Time Horizon for Setting of Analysis / Date[4]		2005	2005	2030
HH/LSM Simulation Study Name[5]		MEA3CHR	MEA2A	MEA5HIN
System Wide Parameters				
Customer Purchase Request (Demand Level)[6]	MGD	265	265	300
Demand Level Supplied from Other Sources[7]				
Regional Recycled Water/Conservation/Groundwater in SF	MGD	0	0	10
Other Regional Recycled Water/Conservation/Groundwater	MGD	0	0	0
Demand Level Supplied from Tuolumne + Local Watersheds[8]	MGD	265	265	290
Average Annual Deliveries and Supplies[9]				
Deliveries from Tuolume + Local Watersheds (Average Annual)	MGD	258	259	287
Supply or Deliveries from Other Sources - Regional Recl/Cons/GW	MGD	0	0	10
Total Deliveries and Supply for Demand Level (Average Annual)	MGD	258	259	297
Features and Facilities[10]				
Regional Reclaimed Water/Conservation/Groundwater - SF				●
Regional Reclaimed Water/Conservation/Groundwater - Other				
Calaveras Reservoir - 12.4 BG (Constrained)		●		
Calaveras Reservoir - 31.6 BG (Restored/Unconstrained)			●	●
Calaveras Reseroivr Release for Fish				●
Calaveras Reservoir Release for Fish & Flow Recapture				●
Crystal Springs Reservoir - 19.0 BG (Constrained)		●	●	
Crystal Springs Reservoir - 22.6 BG (Restored/Unconstrained)				●
Sunol Valley Water Treatment Plant Expansion				●
Sunol Valley Water Treatment Plant Feed from SJPL				●
Harry Tracy Water Treatment Plant Expansion				●
Bay Division Pipeline Increased Conveyance				●
San Joaquin Pipeline Increased Conveyance				●
Desalination Project				
Westside Groundwater Project				●
Tuolumne River Transfer				●
Water Supply Reliability[11]				
Action	Level	Rationing %	Rationing %	Rationing %
Implement Drought Water Supply Action (Westside GW or Desal)	1	NA	NA	GW
Rationing (Level 1)	2	10	10	10
Rationing (Level 2)	3	20	20	20
Rationing (Level 3)	4	25	25	25
	Years	Action Level	Action Level	Action Level
	1921			
	1924	2	2	1
	1925			1
	1926			1
	1929			1
	1930			1
	1931	3	2	2
	1932			
	1933			
	1934	2	2	1
	1935			
	1939			
	1944			
	1946			
	1947			
	1948			1
	1949			
	1950			1
	1953			
	1954			
	1955			1
	1957			
	1959			
	1960	2	2	1
	1961	3	3	2
	1962			
	1964			1
	1966			
	1968			
	1971			
	1972			1
	1976	2	2	1
	1977	3	3	2
	1979			
	1981			
	1984			
	1985			1
	1987	2	2	1
	1988	3	3	2
	1989	3	2	2
	1990	3	3	3
	1991	3	3	2
	1992	3	3	3
	1994	2	2	1
	DD1993	4	3	3
	DD1994	4	3	3
Max Drought Rationing - Policy Cap[12]	DD	Incidental 25%	Incidental 20%	20%
	Historical	Incidental 20%	Incidental 20%	20%

Table 1-1
Setting Characteristics and Modeling Assumptions (Part 2/3)

Assumptions and Characteristics of Setting and/or Program	Units	Baselines: Baseline Conditions[1] - Calaveras Constrained	Baselines: Baseline Conditions[2] - Calaveras Unconstrained	Proposed WSIP
System Wide Parameters				
Incremental Supply - Average[13]				
System Customer Purchase Request Level	MGD	265	265	300
Demand Level Supplied from Other Sources	MGD	0	0	10
Demand Level Supplied from Tuolumne + Local Watersheds	MGD	265	265	290
System Deliveries	MGD	258	259	287
Regional Desalination	MGD	0	0	0
San Joaquin Pipelines (Tuolumne Diversion)	MGD	218	215	245
Inferred Local Watershed Production	MGD	40	44	42
Addt'l Tuolumne Diversion (Compared to Calaveras Constrained)	MGD	*218*	*215*	27
Addt'l Tuolumne Diversion (Compared to Calaveras pre-2002)	MGD	*218*	*215*	30
Incremental Design Drought Supply[14]				
From Other Sources - Regional Recl/Cons/GW (Every Year)	MGD	0	0	10
Restoration of Calaveras Reservoir Capacity (w/ flow recapture)	MGD	0	0	7
Restoration of Crystal Springs Capacity		0	0	1
MID/TID Transfer to SFPUC (Results in additional diversion from TR)	MGD	0	0	23
Westside Basin Conjunctive Use (8,100 acre-feet Storage)	MGD	0	0	6
Regional Desalination (26 mgd)	MGD	0	0	0
Sum of Incremental Supplies	MGD	0	0	47
Yield - Without Other Sources Added (Compared to Calaveras Constrained)	MGD	219	226	256
Yield - With Other Sources Added (Compared to Calaveras Constrained)	MGD	219	226	266
Design Drought Delivery Calculator[15]		2	3	4
	MGD			
Average Annual Delivery During	Year 1	265	265	290
Average Annual Delivery During	Year 2	239	239	290
Average Annual Delivery During	Year 3	212	212	261
Average Annual Delivery During	Year 4	212	239	261
Average Annual Delivery During	Year 5	212	212	232
Average Annual Delivery During	Year 6	212	212	261
Average Annual Delivery During	Year 7	212	212	232
Average Annual Delivery During	Year 8	199	212	232
Average Annual Delivery During	Last 6 Mo	99	106	116
	DD Ave	219	224	256
Firm Yield (Nominal) Not Including Other Sources	MGD	219	226	256
Local System Operational Parmeters				
Crystal Springs Reservoir Operation				
Storage - Minimum/Maximum	BG	5.4 - 19.0		5.4 - 22.6
	TAF	16.6 - 58.4		16.6 - 69.3
Fall/Winter Operation Storage		17.0 BG (52.2 TAF)		19.0 BG (58.3 TAF)
Stream Release		Up to 250 cfs to not exceed 19 BG		Up to 250 cfs to not exceed 21 BG
Calaveras Reservoir Operation				
Storage - Minimum/Maximum	BG	8.4 - 12.4	8.4 - 31.5	8.4 - 31.5
	TAF	25.7 - 38.0	25.7 - 96.8	25.7 - 96.8
Fall/Winter Operation Storage		10.3 BG (31.6 TAF)	27.0 BG (82.9 TAF)	27.0 BG (82.9 TAF)
Alameda Creek Release/Recapture[16]	AFY	0		Up to 6,300
San Andreas Reservoir Operation				
Storage - Minimum/Maximum	BG	3.0 - 6.2		3.0 - 6.2
	TAF	9.2 - 19.0		9.2 - 19.0
Fall/Winter Operation Storage		5.6 BG (17.2 TAF)		5.6 BG (17.2 TAF)
San Antonio Reservoir Operation				
Storage - Minimum/Maximum	BG	1.0 - 16.5		1.0 - 16.5
	TAF	3.1 - 50.5		3.1 - 50.5
Fall/Winter Operation Storage		15.9 BG (48.8 TAF)		15.9 BG (48.8 TAF)
Pilarcitos Reservoir Operation				
Storage - Minimum/Maximum	BG	0.65 - 0.97		0.65 - 0.97
	TAF	2.0 - 3.0		2.0 - 3.0
Fall/Winter Operation Storage		0.75 BG (2.2 TAF)		0.75 BG (2.2 TAF)
Water Treatment Plants				
Sunol Valley Water Treatment Plant Maximum	MGD	120		160
		90 MGD from Calaveras		90 frm Calvrs + Flw Rec
Sunol Valley Water Treatment Plant Minimum	MGD	20		20
		Calvrs & SA Res & SJPL	Cal & SA Res	Frm Calvrs & SA & SJPL
Harry Tracy Water Treatment Plant Maximum	MGD	120		140
Harry Tracy Water Treatment Plant Minimum	MGD	20		20
Conveyance				
Bay Division Pipeline Maximum		340 MGD Jun - Sep 320 MGD Apr, May & Oct 290 MGD Nov - Mar		380 MGD Apr - Oct 320 MGD Nov - Mar
Bay Division Pipeline Maintenance		Cycle one pipeline out Nov - Mar each year (average remaining capacity rotation) maximum 230 MGD		Same as Baselines, except maximum 320 MGD

Table 1-1
Setting Characteristics and Modeling Assumptions (Part 3/3)

Assumptions and Characteristics of Setting and/or Program	Units	Baselines: Baseline Conditions[1] - Calaveras Constrained	Baselines: Baseline Conditions[2] - Calaveras Unconstrained	Proposed WSIP
Tuolumne River System Operational Parameters				
Hetch Hetchy Reservoir Operation				
Storage - Minimum/Maximum	TAF	26.1 - 360.4		26.1 - 360.4
Fall/Winter Operation Storage		30 TAF winter buffer		30 TAF winter buffer
1987 Stipulation Minimum Release Flows		Yes		Yes
1987 Stipulation Supplemental Release Flows		No		No
Cherry Reservoir Operation				
Storage - Minimum/Maximum	TAF	1.0 - 273.3		1.0 - 273.3
Fall/Winter Operation Storage		25.3 TAF winter buffer		25.3 TAF winter buffer
Eleanor Reservoir Operation				
Storage - Minimum/Maximum	TAF	0.0 - 27.1		0.0 - 27.1
Fall/Winter Operation Storage		Required Minimum Storage		Reqrd Minimum Stor
New Don Pedro Water Bank Account				
Storage - Minimum/Maximum	TAF	0.0 - 570.0 Temporary storage up to 740 TAF during Apr - Sep		0.0 - 570.0 Temp stor up to 740 TAF during Apr - Sep
Conveyance				
San Joaquin Pipelines Maximum	MGD	290		314
San Joaquin Pipelines Minimum	MGD	70		70
San Joaquin Pipelines Flow Rate Changes		11 Stepwise Surrogate minimum changes by allowing only 7 changes in a year		17 Stepwise Allow up to 7 changes in a year (surrogate)
San Joaquin Pipelines Maintenance		Cycle one pipeline out Nov - Mar each year (average remaining capacity rotation) maximum 210 MGD		Cyclic 5-year maintenance, maximum capacity available Apr - Oct all years 271 MGD available all other months except 0 MGD available Year 5 Nov - Dec and 135.5 MGD available Year 1 and Year 3 Dec
TID/MID Operational Parameters				
Districts' Tuolumne Diversion[17]		Varies annually based on land use and water availability Annual average 867 TAF		Set equal to baseline conditions SFPUC diversion effects measured by the result of reducing inflow to New Don Pedro Resevoir and its effect upon La Grange releases to the Tuolumne River
Tuolumne River La Grange Flow Releases				
Don Pedro, 1996 FERC		X	X	X
VAMP - considered but not modeled[18]		X	X	X

Table 1-2
Summary of Modeling Results (Part 1/2)

HH/LSM Simulation Results	Units	Baselines: Baseline Conditions[1] - Calaveras Constrained	Baselines: Baseline Conditions[2] - Calaveras Unconstrained	Proposed WSIP
Design Drought Production & Disposition[19]				
San Joaquin Pipeline Diversion	MGD	206.9	206.4	232.5
Bay-Area Deliveries	MGD	218.3	223.9	248.9
Added Groveland & Coastside Delivery	MGD	2.6	2.6	3.6
Local Reservoir Evaporation	MGD	10.2	10.6	12.3
Inflow from ACDD	MGD	2.3	2.5	2.5
Flow Recapture	MGD	0	0	5.3
Local Reservoir Stream Release	MGD	0.1	0.2	5.5
Desalination	MGD	0	0	0
Westside Basin	MGD	0	0	5.6
District Transfer to NDP Water Bank	MGD	0	0	22.7
Local Storage - Begin	MG	53,725	72,505	77,708
Local Storage - End	MG	20,044	19,133	18,846
Study Average Production & Disposition (1921-02)[20]				
Tuolumne River System				
Reservoirs				
Hetch Hetchy				
Inflow	AF	749,605	749,605	749,605
River	AF	277,018	277,714	267,446
Stream Minimum Release	AF	65,731	65,912	65,547
Tunnel	AF	468,975	468,279	478,524
Evaporation	AF	3,896	3,886	3,868
Reservoir	AF	284,033	287,056	275,905
Cherry				
Inflow		279,293	279,293	279,293
Eleanor Gravity	AF	199	199	289
Eleanor Pump	AF	118,270	118,188	118,299
River	AF	44,659	44,001	45,978
Stream Minimum Release	AF			
Tunnel	AF	349,596	350,171	348,403
Evaporation	AF	3,507	3,508	3,499
Reservoir	AF	240,426	240,602	239,298
Eleanor				
Inflow	AF	169,617	169,617	169,617
Eleanor Gravity	AF	199	199	289
Eleanor Pump	AF	118,270	118,188	118,299
River	AF	49,243	49,325	49,124
Stream Minimum Release	AF			
Evaporation	AF	1,905	1,905	1,906
Reservoir	AF	22,201	22,201	22,191
Don Pedro Reservoir				
Inflow	AF	1,591,144	1,594,967	1,561,409
MID Diversion	AF	303,546	303,546	303,546
TID Diversion	AF	563,497	563,497	563,497
LaGrange Total Stream	AF	680,091	684,124	652,299
LaGrange Minimum Stream Release	AF	221,361	221,361	221,361
Total Evaporation	AF	44,024	44,092	43,106
Reservoir	AF	1,492,181	1,495,055	1,453,662
Water Bank Account				
Balance	AF	518,149	520,327	517,209
Transfer	AF	0	0	27,000
San Joaquin Pipelines				
Volume (AF)	AF	244,165	240,340	273,887
Volume (MG)	MG	79,562	78,315	89,246
Rate (MGD)	MGD	218	215	245
Max Rate (MGD)	MGD	290	290	314
Min Rate (MGD)	MGD	70	0	0
East Bay System				
Reservoirs				
Calaveras				
Inflow	MG	12,368	12,368	12,368
From ACDD	MG	1,352	2,023	1,748
Stream	MG	3,660	2,242	4,285
Stream Flow Recapture	MG	0	0	1,555
To SVWTP	MG	9,049	10,616	9,694
To San Antonio	MG	0	0	0
Evaporation	MG	1,023	1,591	1,709
Resevoir	MG	10,975	25,116	28,320
San Antonio				
Inflow	MG	2,468	2,468	2,468
From Calaveras/SJPL	MG	1,053	1,525	1,278
Stream	MG	555	521	548
To SVWTP	MG	2,061	2,511	2,239
Evaporation	MG	956	971	976
Resevoir	MG	14,084	14,447	14,631
Alameda Creek Diversion Dam				
Inflow	MG	4,197	4,197	4,197
To Calaveras Reservoir	MG	1,352	2,023	1,748
Spill	MG	2,845	2,174	2,449
Alameda Creek Confluence				
Accretion	MG	1,918	1,918	1,918
From ACDD	MG	2,845	2,174	2,449
From Calaveras Dam	MG	3,660	2,242	4,285
At Confluence	MG	8,422	6,333	8,652
Treatment Plants				
SVWTP Total	MG	13,752	13,267	14,313
From Calaveras	MG	9,049	10,616	9,694
From San Antonio	MG	2,061	2,511	2,239
From SJPL	MG	2,642	141	2,380
SVWTP Total MGD	MGD	38	36	39
SVWTP Max MGD	MGD	117	120	160
SVWTP Min MGD	MGD	20	20	20

Table 1-2
Summary of Modeling Results (Part 2/2)

HH/LSM Simulation Results	Units	Baselines		
		Baseline Conditions[1] - Calaveras Constrained	Baseline Conditions[2] - Calaveras Unconstrained	Proposed WSIP
Peninsula System				
Reservoirs				
Crystal Springs				
Inflow	MG	3,722	3,722	3,722
From San Andreas	MG	0	0	0
From Pilarcitos and SJPL	MG	6,751	8,545	8,508
Stream	MG	448	409	316
Pump to San Andreas	MG	8,832	10,540	10,311
Pump to Coastside	MG	54	55	239
Evaporation	MG	1,189	1,261	1,407
Reservoir	MG	16,102	16,907	18,962
San Andreas				
Inflow	MG	1,428	1,428	1,428
From other Streams	MG	9,271	10,992	10,656
Stream	MG	0	0	0
To HTWTP	MG	10,168	11,890	11,553
Evaporation	MG	530	530	530
Reservoir	MG	5,893	5,846	5,861
Pilarcitos				
Inflow		1,297	1,297	1,297
To San Andreas	MG	439	452	345
For Stone Diversion	MG	444	444	607
Stream other than Diversion	MG	327	314	278
Evaporation	MG	89	89	72
Reservoir	MG	623	623	469
Stone Dam				
Accretion blw Pilarcitos	MG	603	603	603
Pilarcitos non-diversion Release	MG	327	314	278
Pilarcitos Release for Diversions	MG	930	917	880
Diversion to Coastside	MG	178	178	236
Diversion to Crystal Springs	MG	180	200	181
Spill past Stone	MG	1,502	1,455	1,343
Treatment Plants				
HTWTP Total	MG	10,168	11,890	11,553
HTWTP Total MGD	MGD	28	33	32
HTWTP Max MGD	MGD	149	149	106
HTWTP Min MGD	MGD	20	20	20
Other Facilites				
Westside Basin Net	MG	0	0	11
Desalination Input	MG	0	0	0
Additional Information				
Total Local Reservoir Stream Release	MG	4,990	3,486	5,427
Total Local Reservoir Stream Evaporation	MG	3,788	4,442	4,694
Deliveries				
In-City	MG	29,589	29,667	26,686
South Bay	MG	43,106	43,221	52,906
Crystal Springs	MG	15,120	15,160	16,931
San Andreas	MG	5,400	5,414	6,604
Coastside	MG	675	678	1,082
Groveland	MG	365	365	365
Total Deliveries	MG	94,255	94,502	104,574
Total Deliveries	MGD	258	259	287
Storage				
Total Local Storage Begin	MG	23,240	23,488	26,150
Total Local Storage End	MG	18,915	23,358	22,188
Residual Difference during 82-year Simulation	MGD	0.14	0.00	0.13
Westside Storage Begin	MG	0	0	23,474
Westside Storage End	MG	0	0	24,363
Residual Difference during 82-year Simulation	MGD	0.00	0.00	0.03

Notes for Table 1-1 and Table 1-2

1. Baseline condition represents the existing conditions at the time of NOP publication in September 2005. This is the baseline used to assess WSIP program impact and impact significance. This setting indicates DSOD restrictions on Calaveras and Crystal Springs Reservoirs.

2. This baseline condition represents a system configuration and operation prior to the DSOD storage restriction (pre-2002).

3. More features and elements of the WSIP exist. Only features affecting the hydrologic analysis are illustrated.

4. The time horizon for the setting of the scenario. The baseline condition scenarios are depicted for recent conditions, while the proposed WSIP, variants, and alternatives are depicted for the future at full buildout and implementation, i.e., conditions in the year 2030.

5. HH/LSM model simulation study name.

6. The customer purchase request (demand) information is based on the demand and request studies prepared by the SFPUC in coordination with the wholesale customers (SFPUC/URS 2004). This demand on the regional water system includes both the SFPUC retail customers and wholesale customers. The current (2005) average annual demand is 265 mgd and the projected 2030 average annual demand is 300 mgd, assuming the SFPUC adopts the updated wholesale customer purchase requests as part of the Master Sales Agreement renewal with these customers (due in 2009).

7. Certain scenarios include the development of additional water supply from a combination of recycled water projects, groundwater projects, and conservation, utilized every year and not subject to reduction during drought.

8. The average annual demand for supplies from the combination of the SFPUC local watershed and Tuolumne River, as well as programs not included in the regional water conservation, reclamation, and groundwater programs shown.

9. Modeled results for SFPUC deliveries, with supplies added for regional water conservation, reclamation, and groundwater programs. Total deliveries and supply will be less than full customer purchase requests due to rationing in some years.

10. Shows only the features that affect hydrologic results of the system operation simulations. Additional projects are included in the WSIP, variants, and alternatives.

11. Illustrates the frequency and severity of water supply action or severity of system-wide rationing. Only years in which variable water supply component is implemented or rationing occurs are shown. "DD" illustrates the shortage results for years included in the prospective drought period of the SFPUC Design Drought. These years contribute to establishing system operation protocols, but are not included in the hydrologic assessment analyses.

12. Rationing policy cap: The SFPUC WSIP level of service goal is to maintain rationing on the regional system at no more than 20% during any one year of drought. Some alternatives do not achieve this level of service goal. Performance is indicated for both the Design Drought ("DD") sequence and "Historical" hydrologic sequence.

13. Water supply elements develop water in different amounts from year to year, and, in some instances, they only develop water during dry years. This information is provided to compare local watershed supplies, Tuolumne River supplies, and other identifiable water supplies used to meet system purchase requests. Values are stated in units of average annual quantities during the simulated historical sequence.

14. Results from HH/LSM analysis of each scenario. Values represent the average annual production of each element of supply during the design drought period.

15. Simplified calculation of system deliveries during the SFPUC design drought. The value represents the application of system-wide shortages to the demand level being met with SFPUC local watershed, Tuolumne, and other developed supplies, and does not include supplies from regional water conservation or from recycled water or groundwater projects. Average value may be slightly misstated (up to 3 mgd) due to metric of analysis that does not account for differences in residual storage between studies. "Nominal" firm yield represents the yield of each scenario after adjustment for minor residual storage differences.

16. Supplemental releases from Calaveras Reservoir for fisheries (1997 MOU) of up to 6,300 AFY and the Alameda Creek Recapture project are tied to implementation of the Calaveras Dam replacement project. When the dam is replaced and capacity restored, both the flow release and recapture will occur. The release requirement is based on the supplementation of other occurring flows below Calaveras Reservoir, sometimes not requiring the full 6,300 acre-feet.

17. SFPUC actions are assumed to leave MID/TID diversions unchanged so that the SFPUC effects on the Tuolumne River below La Grange Dam are isolated and possibly overstated. The Districts' diversions are assumed to be constant among the scenarios to provide comparable results of SFPUC-alone effects.

18. Participation in the San Joaquin River Agreement is assumed. Although the agreement expires after 2010, it is assumed that a subsequent similar agreement or requirement of the Districts will occur. HH/LSM does not explicitly model the Districts' participation in the agreement; however, its participation if modeled would result in only minor differences in results and would not change impact conclusions.

19. From HH/LSM results for modeling the SFPUC Design Drought Period.

20. From HH/LSM results for modeling the system operations for the historical hydrologic period 1921-2002. Values indicate average annual quantities during the simulated historical period.

2. Proposed WSIP

The San Francisco Public Utilities Commission (SFPUC) proposes to adopt and implement the WSIP to increase the reliability of the Regional Water System. The WSIP is a program to implement the service goals and system performance objectives established by the SFPUC for the Regional Water System in the areas of water quality, seismic reliability, delivery reliability, and water supply through the year 2030.

The WSIP level of service objectives for water supply are to: (1) fully meet customer purchase requests in non-drought years through planning year 2030, estimated at 300 ,million gallons per day (mgd) average annual delivery; and (2) provide drought-year delivery with a maximum system-wide delivery reduction (rationing) of 20 percent in any one year of a drought. These objectives correspond to a required system firm yield of 256 mgd in 2030. System firm yield is defined as the average annual water delivery that can be sustained throughout an extended drought. The current firm yield of the system is 219 mgd under the current restricted operating conditions that limit storage levels in Calaveras and Crystal Springs Reservoirs. In the setting prior to restrictions to the operation of the reservoirs, the system firm yield is estimated to be 226 mgd.

During non-drought years, the SFPUC would serve the increased 35 mgd in purchase requests through a combination of conservation, water recycling, groundwater supply programs, increased diversions from the Tuolumne River, and greater utilization of Bay Area watershed supplies associated with the restoration of operational storage capacity (primarily at Calaveras Reservoir). The SFPUC would implement conservation, water recycling, and groundwater supply programs in the SFPUC retail service area to achieve the equivalent of 10 mgd of supply per year, in all years. These programs would be in addition to demand management and conservation measures already accounted for in the 2030 purchase request for the retail service area.

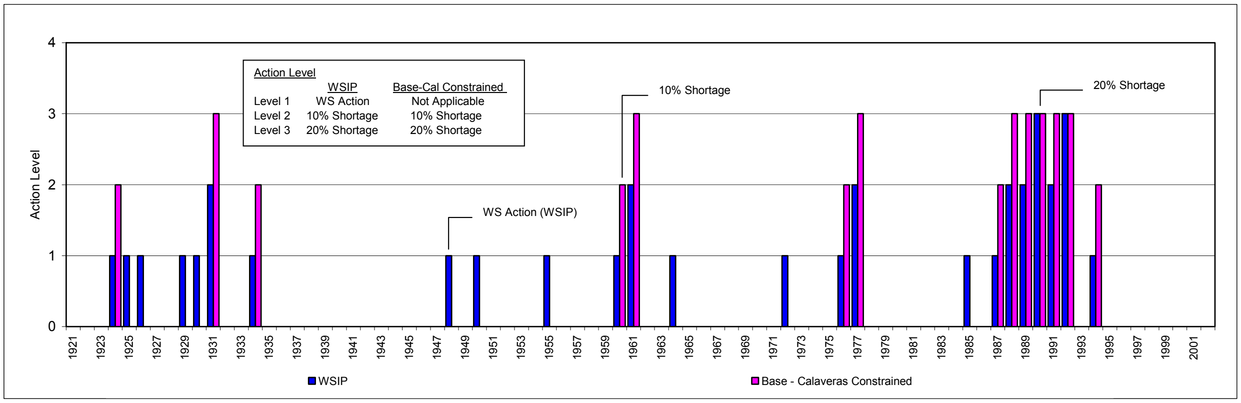
In most years, the SFPUC could serve the projected 2030 water purchases of 300 mgd with its existing sources of water supply; however, these sources alone have not allowed for full water deliveries during past droughts, and they would be insufficient during future droughts as purchase requests increase. The SFPUC proposes to serve this 2030 need for increased system firm yield (i.e., water supply during a drought scenario) with a combination of conservation, water recycling, and groundwater programs in the SFPUC retail service area; water transfers from the Turlock Irrigation District (TID) and Modesto Irrigation District (MID); a groundwater conjunctive-use program, incorporating the Westside Basin Groundwater Program; and restoration of reservoir operating capacity at Crystal Springs and Calaveras Reservoirs. System-wide rationing is limited to no more than 20 percent in any year, with a firm yield of 256 mgd throughout an extended drought.

2.1 Water Deliveries and Drought Response Actions

With a current system-wide purchase request of approximately 265 mgd, the Regional Water System cannot provide full deliveries during all anticipated drought sequences. Drought response actions (delivery shortages) are necessary at the onset of a drought to provide a viable, albeit reduced, supply throughout the duration of drought. Because the Regional Water System has limited current resources, rationing of the SFPUC supply by more than 20 percent may be required during an extended drought. With the proposed program, the purchase requests would increase from 265 mgd to 300 mgd, with 10 mgd of this request satisfied by conservation, recycling, and groundwater programs in the city of San Francisco. In the future, the Regional Water System would experience a net demand of 290 mgd. The additional net demand and increase in the water supply reliability of the Regional Water System would be served by the water supply programs described above. Table 1-1 compares the drought response actions for the proposed program and base-Calaveras constrained settings. Figure 2.1-1 illustrates the drought response actions for the simulated 82-year historical period (1921-2002).

In Figure 2.1-1, years with bars showing a “1” or greater level of action indicate periods when a supplemental water supply action is initiated. In the WSIP setting, the action is the use of the Westside Basin Groundwater Program to supplement SFPUC water deliveries. The water transfer from MID/TID is also occurring during these periods. Action levels greater than “1” indicate the imposition of delivery shortages (rationing) to SFPUC customers.

Figure 2.1-1
Drought Response Actions – WSIP and Base-Calaveras Constrained



In modeling parlance, there is no level 1 action level in the base setting. Without supplemental resources, the existing system only has the delivery shortage measure available to cope with drought. This shortage measure is imposed during level 2 (10 percent) and level 3 (20 percent). These percentages of shortage are applied to both the WSIP and the base settings for these action levels. As evidenced in Figure 2.1-1, rationing would be required more frequently and with greater severity in the base-Calaveras constrained setting (level 2 and level 3 actions).

Figure 2.1-2 illustrates the same information in comparing the WSIP setting to the base-Calaveras unconstrained setting. The same general differences occur between the WSIP and the base-Calaveras unconstrained settings. The WSIP would decrease the frequency of imposed water delivery shortages, and at times reduce the severity of shortages.

Figure 2.1-2
Drought Response Actions – WSIP and Base-Calaveras Unconstrained

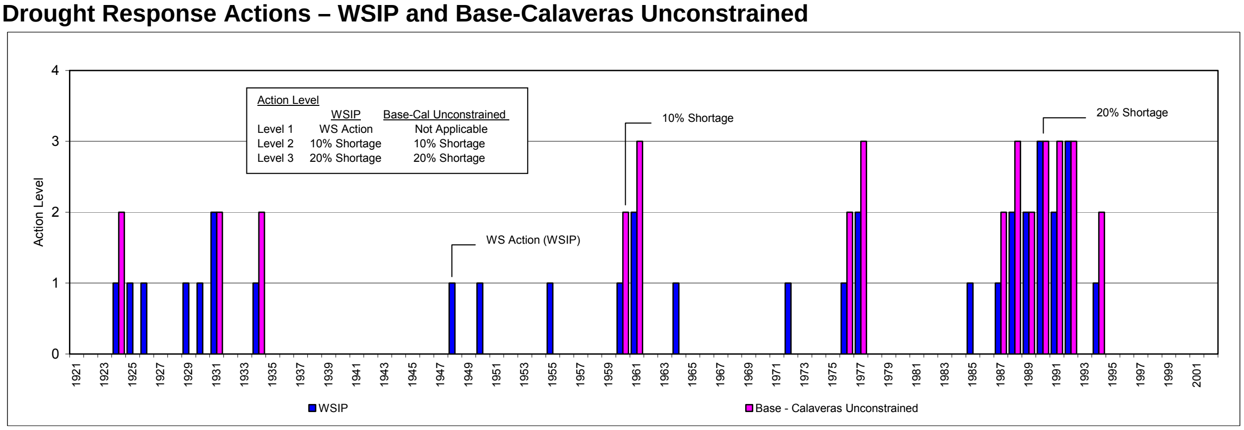


Figure 2.1-1 and Figure 2.1-2 illustrate that, when compared to the base settings, the WSIP setting triggers the supplemental resource (Westside Basin Groundwater Program) at an early indication of drought and during periods, when in the base settings there were no supplemental resources available to the system. The utilization of the supplemental resource during these times results in the elimination or reduction, or at least a non-increase in the severity, of delivery shortage.

Although not illustrated in Figure 2.1-1 or Figure 2.1-2, Table 1-1 shows the delivery shortages anticipated during the entire SFPUC Design Drought. Shortages during the Design Drought with the WSIP are maintained within the objective to limit the severity of shortage to no more than 20 percent. With the existing system (Calaveras and Crystal Springs Reservoirs constrained), the 20-percent-limitation (cap) objective cannot be achieved during the last 18 months of the Design Drought, and a 25-percent shortage is applied. The system's yield in this setting is 219 mgd. In the base-Calaveras unconstrained setting, the 20-percent limitation could be achieved; however, the frequency of imposing that level of rationing exceeds the SFPUC objective for the Design Drought.

The difference in water deliveries between the proposed program and the base-Calaveras constrained settings is shown chronologically for the 82-year simulation in Table 2.1-1. The differences all indicate an increase in deliveries due to an increase in the level of purchase requests, and an increase in the reliability of delivery. The annual (fiscal year-based) increase of approximately 9,100 million gallons represents the basic increase in delivery associated with an increase in purchase request from 265 mgd to 290 mgd. The annual increase of approximately 6,500 mgd indicates years during which the Westside Basin Groundwater Program provides a supplemental supply to the system and offsets the demand needed from other SFPUC resources. The positive difference following this period, approximately 11,800 million gallons per year, represents years when replenishment of the Westside Basin Groundwater Program is necessary after the draw from the program. The years that show other levels of additional deliveries represent years when shortages are reduced in the WSIP setting compared to the base-Calaveras constrained setting.

Table 2.1-2 presents the same information in comparing the WSIP setting with the base-Calaveras unconstrained settings. The results for system-wide deliveries are predominantly the same, except for periods when the base-Calaveras unconstrained setting has slightly improved water supply reliability (less rationing) than the base-Calaveras constrained setting. During these periods, the increase in deliveries due to the WSIP would be slightly less than that of the base-Calaveras constrained setting.

2.2 Diversions from Tuolumne River

The metric for illustrating the SFPUC diversion from the Tuolumne River Basin is the flow through the San Joaquin Pipeline (SJPL). Table 2.2-1 illustrates the difference in diversions to the SJPL between the proposed program and the base-Calaveras constrained settings. Evident in the operation is the increase in summer diversions associated with the increase in the conveyance capacity of the SJPL. Regardless of an increase in purchase requests, the availability of increased conveyance capacity would increase diversions during the summer to retain storage in the Bay Area reservoirs, typically exercising the SJPL at its maximum capacity. The increase in purchase requests would require the utilization of the maximum capacity for a longer period into the fall. Generally, fewer diversions would occur during the late fall and early winter because of the lesser drawdown of the Bay Area reservoirs (requiring less replenishment), and because systematic maintenance within Hetch Hetchy facilities (lessening available conveyance capacity) would impair diversions in the WSIP setting. The increase in diversions during the winter and spring would result from the need to replenish Bay Area reservoir storage after the maintenance period, serve increased purchase requests and top off Bay Area reservoir storage prior to summer. The difference in SJPL diversions between the WSIP setting and the base-Calaveras constrained setting is illustrated in Figure 2.2-1. The difference in average monthly diversion through the SJPL is shown by year type for the 82-year simulation period.

Table 2.2-2 illustrates the average monthly diversion through the SJPL, by year type, for the 82-year simulation period for the proposed program and the base-Calaveras constrained settings. The table illustrates a trend of less diversion of water from the Tuolumne River Basin in wetter years (as Bay Area reservoir watersheds provide more supply during those years) than in drier years. Table 2.2-3 illustrates the same form of information in comparing diversions through the SJPL between the WSIP and the base-Calaveras unconstrained settings.

Table 2.1-1

Difference in Total System-wide Delivery (MG)

WSIP minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
1921	1,034	828	685	599	437	609	727	907	1,008	1,145	1,095	940	10,014	10,679
1922	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1923	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1924	810	611	461	374	437	609	727	907	1,008	2,041	1,988	1,671	11,644	9,124
1925	1,403	996	710	537	693	1,078	1,365	1,714	772	839	821	702	11,629	14,967
1926	586	409	278	216	260	410	508	685	772	839	821	702	6,485	6,485
1927	586	409	278	216	260	410	508	685	772	1,369	1,319	1,157	7,968	6,485
1928	1,034	828	685	599	640	833	944	1,131	1,225	1,369	1,319	1,157	11,764	11,764
1929	1,034	828	685	599	640	833	944	1,131	1,225	839	821	702	10,280	11,764
1930	586	409	278	216	260	410	508	685	772	839	821	702	6,485	6,485
1931	586	409	278	216	260	410	508	685	772	1,702	1,672	1,473	8,970	6,485
1932	1,323	1,057	891	789	829	1,110	1,260	1,499	1,611	1,369	1,319	1,157	14,215	15,216
1933	1,034	828	685	599	640	833	944	1,131	1,225	1,369	1,319	1,157	11,764	11,764
1934	1,034	828	685	599	640	833	944	1,131	1,225	2,041	1,988	1,671	13,618	11,764
1935	1,403	996	710	537	693	1,078	1,365	1,714	772	1,369	1,319	1,157	13,113	14,967
1936	1,034	828	685	599	640	833	944	1,131	1,225	1,369	1,319	1,157	11,764	11,764
1937	1,034	828	685	599	640	833	944	1,131	1,225	1,369	1,319	1,157	11,764	11,764
1938	1,034	828	685	599	640	833	944	1,131	1,225	1,145	1,095	940	11,099	11,764
1939	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1940	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1941	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1942	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1943	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1944	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1945	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1946	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1947	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1948	810	611	461	374	437	609	727	907	1,008	839	821	702	8,306	9,124
1949	586	409	278	216	260	410	508	685	772	1,369	1,319	1,157	7,968	6,485
1950	1,034	828	685	599	640	833	944	1,131	1,225	839	821	702	10,280	11,764
1951	586	409	278	216	260	410	508	685	772	1,369	1,319	1,157	7,968	6,485
1952	1,034	828	685	599	640	833	944	1,131	1,225	1,145	1,095	940	11,099	11,764
1953	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1954	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1955	810	611	461	374	437	609	727	907	1,008	839	821	702	8,306	9,124
1956	586	409	278	216	260	410	508	685	772	1,369	1,319	1,157	7,968	6,485
1957	1,034	828	685	599	640	833	944	1,131	1,225	1,145	1,095	940	11,099	11,764
1958	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1959	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1960	810	611	461	374	437	609	727	907	1,008	2,041	1,988	1,671	11,644	9,124
1961	1,403	996	710	537	693	1,078	1,365	1,714	1,914	1,702	1,672	1,473	15,256	16,109
1962	1,323	1,057	891	789	829	1,110	1,260	1,499	1,611	1,369	1,319	1,157	14,215	15,216
1963	1,034	828	685	599	640	833	944	1,131	1,225	1,369	1,319	1,157	11,764	11,764
1964	1,034	828	685	599	640	833	944	1,131	1,225	839	821	702	10,280	11,764
1965	586	409	278	216	260	410	508	685	772	1,369	1,319	1,157	7,968	6,485
1966	1,034	828	685	599	640	833	944	1,131	1,225	1,145	1,095	940	11,099	11,764
1967	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1968	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1969	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1970	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1971	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1972	810	611	461	374	437	609	727	907	1,008	839	821	702	8,306	9,124
1973	586	409	278	216	260	410	508	685	772	1,369	1,319	1,157	7,968	6,485
1974	1,034	828	685	599	640	833	944	1,131	1,225	1,145	1,095	940	11,099	11,764
1975	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1976	810	611	461	374	437	609	727	907	1,008	2,041	1,988	1,671	11,644	9,124
1977	1,403	996	710	537	693	1,078	1,365	1,714	1,914	1,702	1,672	1,473	15,256	16,109
1978	1,323	1,057	891	789	829	1,110	1,260	1,499	-499	1,369	1,319	1,157	12,104	13,106
1979	1,034	828	685	599	640	833	944	1,131	1,225	1,369	1,319	1,157	11,764	11,764
1980	1,034	828	685	599	640	833	944	1,131	1,225	1,145	1,095	940	11,099	11,764
1981	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1982	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1983	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1984	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1985	810	611	461	374	437	609	727	907	1,008	839	821	702	8,306	9,124
1986	586	409	278	216	260	410	508	685	772	1,369	1,319	1,157	7,968	6,485
1987	1,034	828	685	599	640	833	944	1,131	1,225	2,041	1,988	1,671	13,618	11,764
1988	1,403	996	710	537	693	1,078	1,365	1,714	1,914	1,702	1,672	1,473	15,256	16,109
1989	1,323	1,057	891	789	829	1,110	1,260	1,499	1,611	1,702	1,672	1,473	15,216	15,216
1990	1,323	1,057	891	789	829	1,110	1,260	1,499	1,611	579	571	495	12,014	15,216
1991	421	307	219	179	204	304	367	487	539	1,702	1,672	1,473	7,874	4,671
1992	1,323	1,057	891	789	829	1,110	1,260	1,499	1,611	579	571	495	12,014	15,216
1993	421	307	219	179	204	304	367	487	-1,571	1,369	1,319	1,157	4,762	2,561
1994	1,034	828	685	599	640	833	944	1,131	1,225	2,041	1,988	1,671	13,618	11,764
1995	1,403	996	710	537	693	1,078	508	685	772	1,369	1,319	1,157	11,227	13,082
1996	1,034	828	685	599	640	833	944	1,131	1,225	1,369	1,319	1,157	11,764	11,764
1997	1,034	828	685	599	640	833	944	1,131	1,225	1,369	1,319	1,157	11,764	11,764
1998	1,034	828	685	599	640	833	944	1,131	1,225	1,369	1,319	1,157	11,764	11,764
1999	1,034	828	685	599	640	833	944	1,131	1,225	1,369	1,319	1,157	11,764	11,764
2000	1,034	828	685	599	640	833	944	1,131	1,225	1,369	1,319	1,157	11,764	11,764
2001	1,034	828	685	599	640	833	944	1,131	1,225	1,145	1,095	940	11,099	11,764
2002	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
Avg (21-02)	922	706	551	461	516	714	830	1,025	1,049	1,266	1,222	1,056	10,318	10,326

Table 2.1-2

Difference in Total System-wide Delivery (MG)

WSIP minus Base - Calaveras Unconstrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
1921	1,034	828	685	599	437	609	727	907	1,008	1,145	1,095	940	10,014	10,679
1922	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1923	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1924	810	611	461	374	437	609	727	907	1,008	2,041	1,988	1,671	11,644	9,124
1925	1,403	996	710	537	693	1,078	1,365	1,714	772	839	821	702	11,629	14,967
1926	586	409	278	216	260	410	508	685	772	839	821	702	6,485	6,485
1927	586	409	278	216	260	410	508	685	772	1,369	1,319	1,157	7,968	6,485
1928	1,034	828	685	599	640	833	944	1,131	1,225	1,369	1,319	1,157	11,764	11,764
1929	1,034	828	685	599	640	833	944	1,131	1,225	839	821	702	10,280	11,764
1930	586	409	278	216	260	410	508	685	772	839	821	702	6,485	6,485
1931	586	409	278	216	260	410	508	685	772	689	678	589	6,080	6,485
1932	499	366	264	212	243	365	436	581	643	1,369	1,319	1,157	7,454	5,565
1933	1,034	828	685	599	640	833	944	1,131	1,225	1,369	1,319	1,157	11,764	11,764
1934	1,034	828	685	599	640	833	944	1,131	1,225	2,041	1,988	1,671	13,618	11,764
1935	1,403	996	710	537	693	1,078	1,365	1,714	772	1,369	1,319	1,157	13,113	14,967
1936	1,034	828	685	599	640	833	944	1,131	1,225	1,369	1,319	1,157	11,764	11,764
1937	1,034	828	685	599	640	833	944	1,131	1,225	1,369	1,319	1,157	11,764	11,764
1938	1,034	828	685	599	640	833	944	1,131	1,225	1,145	1,095	940	11,099	11,764
1939	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1940	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1941	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1942	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1943	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1944	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1945	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1946	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1947	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1948	810	611	461	374	437	609	727	907	1,008	839	821	702	8,306	9,124
1949	586	409	278	216	260	410	508	685	772	1,369	1,319	1,157	7,968	6,485
1950	1,034	828	685	599	640	833	944	1,131	1,225	839	821	702	10,280	11,764
1951	586	409	278	216	260	410	508	685	772	1,369	1,319	1,157	7,968	6,485
1952	1,034	828	685	599	640	833	944	1,131	1,225	1,145	1,095	940	11,099	11,764
1953	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1954	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1955	810	611	461	374	437	609	727	907	1,008	839	821	702	8,306	9,124
1956	586	409	278	216	260	410	508	685	772	1,369	1,319	1,157	7,968	6,485
1957	1,034	828	685	599	640	833	944	1,131	1,225	1,145	1,095	940	11,099	11,764
1958	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1959	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1960	810	611	461	374	437	609	727	907	1,008	2,041	1,988	1,671	11,644	9,124
1961	1,403	996	710	537	693	1,078	1,365	1,714	1,914	1,702	1,672	1,473	15,256	16,109
1962	1,323	1,057	891	789	829	1,110	1,260	1,499	1,611	1,369	1,319	1,157	14,215	15,216
1963	1,034	828	685	599	640	833	944	1,131	1,225	1,369	1,319	1,157	11,764	11,764
1964	1,034	828	685	599	640	833	944	1,131	1,225	839	821	702	10,280	11,764
1965	586	409	278	216	260	410	508	685	772	1,369	1,319	1,157	7,968	6,485
1966	1,034	828	685	599	640	833	944	1,131	1,225	1,145	1,095	940	11,099	11,764
1967	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1968	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1969	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1970	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1971	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1972	810	611	461	374	437	609	727	907	1,008	839	821	702	8,306	9,124
1973	586	409	278	216	260	410	508	685	772	1,369	1,319	1,157	7,968	6,485
1974	1,034	828	685	599	640	833	944	1,131	1,225	1,145	1,095	940	11,099	11,764
1975	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1976	810	611	461	374	437	609	727	907	1,008	2,041	1,988	1,671	11,644	9,124
1977	1,403	996	710	537	693	1,078	1,365	1,714	1,914	1,702	1,672	1,473	15,256	16,109
1978	1,323	1,057	891	789	829	1,110	1,260	1,499	-499	1,369	1,319	1,157	12,104	13,106
1979	1,034	828	685	599	640	833	944	1,131	1,225	1,369	1,319	1,157	11,764	11,764
1980	1,034	828	685	599	640	833	944	1,131	1,225	1,145	1,095	940	11,099	11,764
1981	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1982	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1983	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1984	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1985	810	611	461	374	437	609	727	907	1,008	839	821	702	8,306	9,124
1986	586	409	278	216	260	410	508	685	772	1,369	1,319	1,157	7,968	6,485
1987	1,034	828	685	599	640	833	944	1,131	1,225	2,041	1,988	1,671	13,618	11,764
1988	1,403	996	710	537	693	1,078	1,365	1,714	1,914	1,702	1,672	1,473	15,256	16,109
1989	1,323	1,057	891	789	829	1,110	1,260	1,499	1,611	689	678	589	12,326	15,216
1990	499	366	264	212	243	365	436	581	643	579	571	495	5,253	5,565
1991	421	307	219	179	204	304	367	487	539	1,702	1,672	1,473	7,874	4,671
1992	1,323	1,057	891	789	829	1,110	1,260	1,499	1,611	579	571	495	12,014	15,216
1993	421	307	219	179	204	304	367	487	-1,571	1,369	1,319	1,157	4,762	2,561
1994	1,034	828	685	599	640	833	944	1,131	1,225	2,041	1,988	1,671	13,618	11,764
1995	1,403	996	710	537	260	410	508	685	772	1,369	1,319	1,157	10,126	11,981
1996	1,034	828	685	599	640	833	944	1,131	1,225	1,369	1,319	1,157	11,764	11,764
1997	1,034	828	685	599	640	833	944	1,131	1,225	1,369	1,319	1,157	11,764	11,764
1998	1,034	828	685	599	640	833	944	1,131	1,225	1,369	1,319	1,157	11,764	11,764
1999	1,034	828	685	599	640	833	944	1,131	1,225	1,369	1,319	1,157	11,764	11,764
2000	1,034	828	685	599	640	833	944	1,131	1,225	1,369	1,319	1,157	11,764	11,764
2001	1,034	828	685	599	640	833	944	1,131	1,225	1,145	1,095	940	11,099	11,764
2002	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
Avg (21-02)	902	689	536	447	497	688	810	1,003	1,025	1,241	1,198	1,035	10,069	10,077

Table 2.2-1

Difference in Total SJPL (Acre-feet) WSIP minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
1921	952	-921	0	0	0	14,270	2,210	2,284	2,210	2,284	2,284	2,210	27,783	32,018
1922	-951	0	0	6,659	0	0	7,365	5,138	4,972	2,284	2,284	2,210	29,961	29,961
1923	0	-2,762	0	0	0	15,317	2,210	2,284	2,210	2,284	2,284	2,210	26,037	26,037
1924	1,047	0	-952	-952	-859	5,803	2,210	2,284	2,210	2,284	2,284	2,210	17,569	17,569
1925	2,284	-19,334	-15,222	5,803	17,272	15,317	2,210	2,284	2,210	2,284	2,284	2,210	19,602	19,602
1926	5,138	5,616	-7,088	5,803	7,734	15,317	2,210	2,284	2,210	2,284	2,284	2,210	46,002	46,002
1927	2,949	921	-952	7,801	0	3,805	0	2,284	2,210	2,284	2,284	4,972	28,558	25,796
1928	2,854	0	-1,379	4,757	4,297	7,610	1,841	2,284	2,210	2,284	2,284	4,972	34,014	34,014
1929	4,757	0	0	4,757	4,297	10,560	2,210	2,284	2,210	2,284	2,284	2,210	37,853	40,615
1930	2,284	-19,334	-19,979	5,803	5,242	15,317	2,210	2,284	2,210	2,284	2,284	2,210	2,815	2,815
1931	2,284	5,616	-7,088	5,803	9,538	5,803	2,210	2,284	2,210	2,284	2,284	2,210	35,438	35,438
1932	6,659	7,365	-7,326	4,281	6,874	16,459	2,210	7,992	7,734	2,284	2,284	2,210	59,026	59,026
1933	1,047	0	-7,088	7,611	6,875	10,560	2,210	2,284	2,210	2,284	2,284	2,210	32,487	32,487
1934	2,284	5,616	4,756	7,611	10,312	10,560	2,210	2,284	2,210	2,284	2,284	2,210	54,621	54,621
1935	2,284	-19,334	-19,979	16,459	14,866	10,560	2,210	7,992	7,734	2,284	2,284	2,210	29,570	29,570
1936	7,040	4,603	-7,088	12,368	859	15,317	2,210	2,284	2,210	2,284	2,284	2,210	46,581	46,581
1937	2,854	1,841	-952	5,709	0	2,663	1,842	5,138	4,972	2,284	2,284	2,210	30,845	30,845
1938	3,901	0	-1,142	5,708	0	0	7,365	5,138	4,972	2,284	2,284	4,972	35,482	32,720
1939	-952	-921	0	3,805	3,437	10,560	2,210	2,284	2,210	2,284	2,284	2,210	29,411	32,173
1940	2,284	-19,334	-19,979	11,512	9,452	12,367	6,444	5,138	4,972	2,284	2,284	2,210	19,634	19,634
1941	-952	-921	-1,142	0	0	0	0	2,854	2,762	2,284	2,284	2,210	9,379	9,379
1942	1,903	-921	-1,712	0	0	3,805	5,524	2,854	2,762	2,284	2,284	2,210	20,993	20,993
1943	2,949	1,841	-7,088	0	0	7,610	4,972	5,138	4,972	2,284	2,284	2,210	27,172	27,172
1944	0	-921	-2,855	4,757	8,765	14,270	2,210	2,284	2,210	2,284	2,284	2,210	37,498	37,498
1945	-1,807	-19,334	-19,979	5,803	13,749	15,317	2,210	2,284	2,210	2,284	2,284	2,210	7,231	7,231
1946	5,708	1,841	0	0	0	11,512	2,210	2,284	2,210	2,284	2,284	2,210	32,543	32,543
1947	952	0	1,902	4,757	4,296	10,560	2,210	2,284	2,210	2,284	2,284	2,210	35,949	35,949
1948	2,284	5,616	-7,088	4,756	4,297	5,803	2,210	2,284	2,210	2,284	2,284	2,210	29,150	29,150
1949	2,284	5,616	0	0	0	-4,757	2,210	2,284	2,210	2,284	2,284	4,972	19,387	16,625
1950	2,949	-19,334	-19,979	18,171	16,413	10,560	2,210	2,284	2,210	2,284	2,284	2,210	22,262	25,024
1951	2,284	2,762	0	0	0	6,659	2,210	2,284	2,210	2,284	2,284	4,972	27,949	25,187
1952	2,949	0	0	0	0	0	11,048	5,138	4,972	2,284	2,284	2,210	30,885	33,647
1953	0	-921	-951	0	0	15,317	2,210	2,284	2,210	2,284	2,284	2,210	26,927	26,927
1954	-2,854	-921	-2,855	8,562	7,046	15,317	2,210	2,284	2,210	2,284	2,284	2,210	37,777	37,777
1955	-1,807	-19,334	-15,222	18,171	16,413	5,803	2,210	2,284	2,210	2,284	2,284	2,210	17,506	17,506
1956	2,284	5,616	-3,805	0	0	3,805	2,210	5,138	4,972	2,284	2,284	2,210	26,998	26,998
1957	1,902	0	-952	4,757	8,765	10,560	2,210	2,284	2,210	2,284	2,284	2,210	38,514	38,514
1958	3,806	2,762	-2,331	3,805	0	0	0	2,949	2,854	2,284	2,284	2,210	20,623	20,623
1959	1,902	-921	-2,855	8,562	0	15,317	2,210	2,284	2,210	2,284	2,284	2,210	35,487	35,487
1960	2,284	-19,334	-19,979	5,803	9,538	5,803	2,210	2,284	2,210	2,284	2,284	2,210	-2,403	-2,403
1961	2,284	5,616	-8,515	5,328	10,398	5,803	2,210	2,284	2,210	2,284	2,284	14,178	46,364	34,396
1962	14,651	-368	-4,282	2,379	11,171	18,171	2,210	7,992	7,734	2,284	2,284	4,972	69,198	78,404
1963	5,233	4,603	-2,331	2,663	0	4,757	5,524	1,902	1,841	2,284	2,284	2,210	30,970	33,732
1964	7,040	3,682	-2,855	9,513	8,593	5,803	2,210	2,284	2,210	2,284	2,284	2,210	45,258	45,258
1965	2,284	-19,334	-15,222	5,708	5,156	15,317	4,603	952	921	2,284	2,284	4,972	9,925	7,163
1966	1,902	1,841	-1,902	8,562	7,734	10,560	2,210	2,284	2,210	2,284	2,284	2,210	42,179	44,941
1967	2,284	5,616	-7,611	0	0	2,854	2,762	0	0	2,284	2,284	2,210	12,683	12,683
1968	5,708	0	-7,088	8,562	7,734	10,560	2,210	2,284	2,210	2,284	2,284	2,210	38,958	38,958
1969	2,284	2,762	1,902	0	0	0	7,734	5,138	4,972	2,284	2,284	2,210	31,570	31,570
1970	0	-19,334	-15,222	12,367	11,171	14,270	2,210	2,284	2,210	2,284	2,284	2,210	16,734	16,734
1971	2,949	3,682	-951	0	0	10,560	2,210	2,284	2,210	2,284	2,284	2,210	29,722	29,722
1972	2,284	5,616	0	4,757	4,296	5,803	2,210	2,284	2,210	2,284	2,284	2,210	36,238	36,238
1973	2,284	5,616	-7,088	0	0	0	6,813	2,284	2,210	2,284	2,284	4,972	21,659	18,897
1974	1,902	0	0	0	0	8,562	5,524	5,138	4,972	2,284	2,284	4,972	35,638	35,638
1975	-952	-19,334	-19,979	11,512	7,734	3,805	8,286	5,138	4,972	2,284	2,284	2,210	7,960	10,722
1976	0	-921	-7,611	6,659	6,015	5,803	2,210	2,284	2,210	2,284	2,284	2,210	23,427	23,427
1977	2,284	5,616	0	1,427	6,875	5,803	2,210	2,284	2,210	-3,900	-3,900	-1,012	19,897	35,487
1978	3,710	4,235	-8,515	9,037	6,874	8,562	10,311	6,659	6,445	2,284	2,284	2,210	54,096	38,506
1979	0	0	-952	8,562	0	12,368	2,210	2,284	2,210	2,284	2,284	2,210	33,460	33,460
1980	5,708	-19,334	-15,222	15,221	0	8,562	4,972	5,138	4,972	2,284	2,284	2,210	16,795	16,795
1981	1,902	0	-7,088	5,708	5,156	15,317	2,210	2,284	2,210	2,284	2,284	2,210	34,477	34,477
1982	2,284	3,682	-2,854	0	0	951	0	2,854	2,762	2,284	2,284	2,210	16,457	16,457
1983	2,949	1,841	-2,663	0	0	0	2,946	2,854	2,762	2,284	2,284	2,210	17,467	17,467
1984	3,806	0	0	0	0	5,803	2,210	2,284	2,210	2,284	2,284	2,210	23,091	23,091
1985	2,284	-14,731	-15,222	5,803	9,538	10,560	2,210	2,284	2,210	2,284	2,284	2,210	11,714	11,714
1986	2,284	5,616	-7,088	5,803	2,406	5,708	7,365	5,138	4,972	2,284	2,284	2,210	38,982	38,982
1987	1,902	-921	-952	3,805	3,437	10,560	2,210	2,284	2,210	2,284	2,284	2,210	31,313	31,313
1988	2,284	5,616	-7,088	5,803	8,593	5,803	2,210	2,284	2,210	5,138	7,040	4,972	44,865	34,493
1989	4,756	6,444	0	4,757	4,297	10,560	2,210	2,284	2,210	7,992	5,708	-1,841	49,377	54,668
1990	1,902	-14,731	-15,222	11,512	10,398	10,560	2,210	2,284	2,210	7,992	5,708	1,841	26,664	22,982
1991	-952	3,682	-2,854	-4,757	860	17,124	2,210	-2,854	-2,762	7,992	4,757	4,603	27,049	25,238
1992	4,757	0	952	9,704	3,437	18,171	2,210	7,992	7,734	0	952	1,841	57,750	72,309
1993	1,902	-921	1,903	0	0	0	9,206	952	921	2,284	2,284	2,210	20,741	16,756
1994	1,902	-921	-2,855	4,757	7,734	10,560	2,210	2,284	2,210	2,284	2,284	4,972	37,421	34,659
1995	7,040	-19,334	-19,979	10,464	7,734	0	9,206	3,805	3,683	2,284	2,284	4,972	12,159	12,159
1996	1,902	-921	-2,331	0	0	0	6,813	2,284	2,210	2,284	2,284	4,972	19,497	19,497
1997	3,901	921	0	0	0	11,512	2,210	2,284	2,210	2,284	2,284	2,210	29,816	32,578
1998	952	1,841	-1,379	0	0	951	7,365	3,901	3,775	2,284	2,284	4,972	26,946	24,184
1999	952	-921	1,902	8,562	0	11,416	921	5,138	4,972	2,284	2,284	4,972	42,482	42,482
2000	1,902	-19,334	-19,979	15,317	9,452	13,510	2,210	2,284	2,210	2,284	2,284	4,972	17,112	17,112
2001	4,756	1,841	-7,088	8,563	8,593	14,270	2,210	2,284	2,210	2,284	2,284	2,210	44,417	47,179
2002	2,854	0	0	6,659	6,015	10,560	2,210	2,284	2,210	2,284	2,284	2,210	39,570	39,570
Avg (21-02)	2,464	-2,173	-5,508	5,170	4,523	8,454	3,245	3,015	2,917	2,424	2,364	2,826	29,722	29,774

Figure 2.2-1
SJPL Diversions – WSIP and Base-Calaveras Constrained

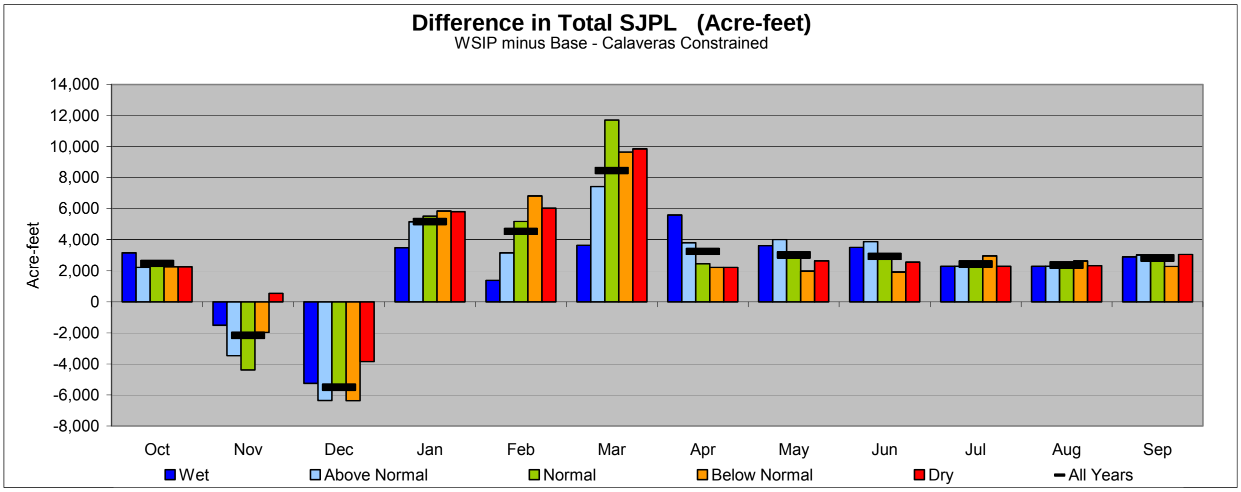


Table 2.2-2

Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	27,417	16,624	8,533	11,512	7,401	11,072	21,613	26,698	25,836	29,873	29,873	28,909	245,359	242,680
Above Normal	26,381	14,460	7,852	14,254	9,306	16,705	24,111	28,687	27,761	29,873	29,873	28,909	258,169	258,169
Normal	25,830	14,656	8,776	15,448	12,041	22,339	28,403	29,873	28,909	29,873	29,873	28,909	274,929	274,849
Below Normal	27,220	15,998	11,595	21,574	18,621	24,976	28,909	29,571	28,617	29,873	29,548	27,945	294,447	295,146
Dry	25,931	19,593	14,583	19,883	17,417	25,782	28,909	29,873	28,909	29,165	28,904	27,281	296,229	298,165
All Years	26,562	16,241	10,254	16,568	12,982	20,191	26,392	28,945	28,011	29,735	29,617	28,391	273,887	273,872

Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	24,260	18,126	13,783	8,028	6,015	7,433	16,031	23,070	22,326	27,589	27,589	26,009	220,258	218,975
Above Normal	24,176	17,926	14,204	9,100	6,157	9,279	20,309	24,679	23,883	27,589	27,589	25,887	230,776	230,776
Normal	23,368	19,046	14,390	9,930	6,864	10,632	25,951	27,054	26,181	27,589	27,589	26,009	244,601	243,681
Below Normal	24,959	17,980	17,964	15,726	11,808	15,334	26,699	27,589	26,699	26,917	26,917	25,670	264,263	264,595
Dry	23,665	19,046	18,433	14,080	11,386	15,936	26,699	27,232	26,354	26,876	26,578	24,225	260,509	262,015
All Years	24,097	18,413	15,763	11,398	8,459	11,737	23,147	25,930	25,093	27,311	27,253	25,565	244,165	244,098

Difference in Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — WSIP minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	3,158	-1,502	-5,250	3,484	1,386	3,639	5,581	3,627	3,510	2,284	2,284	2,901	25,102	23,706
Above Normal	2,205	-3,466	-6,352	5,154	3,149	7,426	3,802	4,007	3,878	2,284	2,284	3,022	27,394	27,394
Normal	2,462	-4,391	-5,613	5,518	5,177	11,708	2,452	2,819	2,728	2,284	2,284	2,901	30,328	31,168
Below Normal	2,261	-1,982	-6,369	5,848	6,814	9,642	2,210	1,982	1,918	2,956	2,631	2,275	30,185	30,552
Dry	2,265	547	-3,850	5,803	6,031	9,846	2,210	2,641	2,555	2,290	2,326	3,056	35,720	36,150
All Years	2,464	-2,173	-5,508	5,170	4,523	8,454	3,245	3,015	2,917	2,424	2,364	2,826	29,722	29,774

Table 2.2-3

Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	27,417	16,624	8,533	11,512	7,401	11,072	21,613	26,698	25,836	29,873	29,873	28,909	245,359	242,680
Above Normal	26,381	14,460	7,852	14,254	9,306	16,705	24,111	28,687	27,761	29,873	29,873	28,909	258,169	258,169
Normal	25,830	14,656	8,776	15,448	12,041	22,339	28,403	29,873	28,909	29,873	29,873	28,909	274,929	274,849
Below Normal	27,220	15,998	11,595	21,574	18,621	24,976	28,909	29,571	28,617	29,873	29,548	27,945	294,447	295,146
Dry	25,931	19,593	14,583	19,883	17,417	25,782	28,909	29,873	28,909	29,165	28,904	27,281	296,229	298,165
All Years	26,562	16,241	10,254	16,568	12,982	20,191	26,392	28,945	28,011	29,735	29,617	28,391	273,887	273,872

Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Base - Calaveras Unconstrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	24,438	18,701	0	9,502	6,337	8,325	16,561	22,595	21,866	27,589	27,589	26,526	210,028	207,997
Above Normal	25,798	17,980	0	14,595	8,431	13,263	19,984	23,728	22,962	27,589	27,589	26,699	228,619	228,457
Normal	24,378	18,471	0	15,103	11,117	16,292	25,318	26,459	25,606	27,589	27,589	26,699	244,622	243,230
Below Normal	25,071	18,792	0	19,979	17,742	19,979	26,537	26,694	25,833	27,421	27,421	25,670	261,138	261,030
Dry	24,022	19,046	0	19,979	17,239	19,384	26,699	27,113	26,239	27,054	26,876	23,074	256,725	260,149
All Years	24,758	18,593	0	15,867	12,196	15,477	23,025	25,315	24,498	27,450	27,415	25,745	240,340	240,284

Difference in Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — WSIP minus Base - Calaveras Unconstrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	2,979	-2,077	8,533	2,010	1,063	2,747	5,052	4,103	3,971	2,284	2,284	2,383	35,331	34,683
Above Normal	582	-3,520	7,852	-341	874	3,441	4,127	4,959	4,799	2,284	2,284	2,210	29,550	29,712
Normal	1,451	-3,815	8,776	345	924	6,047	3,085	3,414	3,303	2,284	2,284	2,210	30,307	31,619
Below Normal	2,149	-2,795	11,595	1,595	880	4,997	2,372	2,877	2,784	2,452	2,127	2,275	33,309	34,117
Dry	1,909	547	14,583	-96	178	6,398	2,210	2,760	2,670	2,112	2,028	4,207	39,504	38,016
All Years	1,803	-2,352	10,254	700	786	4,714	3,366	3,630	3,512	2,285	2,202	2,647	33,547	33,588

2.3 Hetch Hetchy Reservoir and Releases

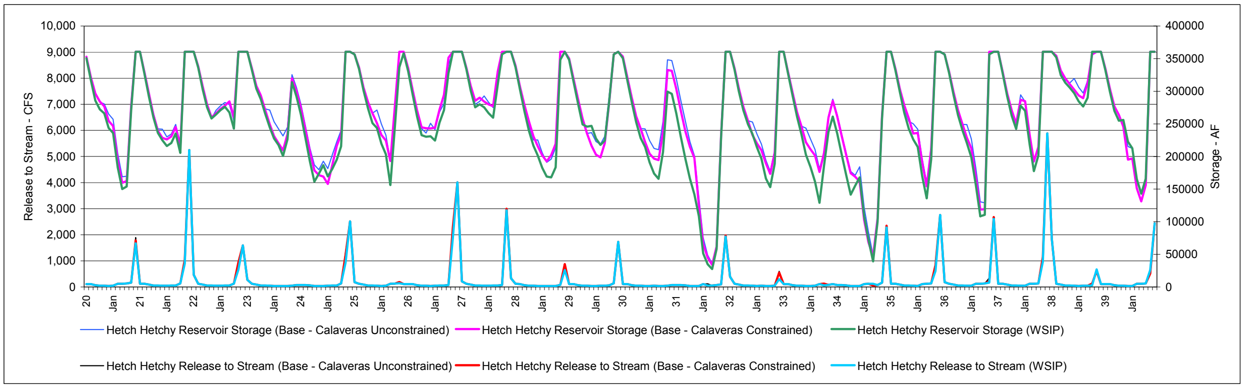
The additional draw of water for the additional deliveries of the WSIP will generally result in an increase in draw from Hetch Hetchy Reservoir. Figure 2.3-1 illustrates a chronological trace of the simulation of Hetch Hetchy Reservoir storage and stream releases. Shown in Figure 2.3-1 are the results for the WSIP, base-Calaveras constrained ("Base – Calaveras Constrained") and base-Calaveras unconstrained ("Base – Calaveras Unconstrained") settings. Supplementing the Figure 2.3-1 representation of Hetch Hetchy Reservoir storage are Table 2.3-1 Hetch Hetchy Reservoir Storage (WSIP), Table 2.3-2 Hetch Hetchy Reservoir Storage (Base - Calaveras Constrained), and Table 2.3-3 Difference in Hetch Hetchy Reservoir Storage (WSIP minus Base – Calaveras Constrained).

Table 2.3-3 illustrates the difference in Hetch Hetchy Reservoir storage between the WSIP and base-Calaveras constrained settings. Immediately after Hetch Hetchy Reservoir is filled (May or June, and then continuing through July), occasional differences in storage would occur, typically during a multi-year drought sequence or during an occasional single year when the reservoir does not fill. No reduction in yearly storage during that period would indicate that the same amount of water is being passed through the reservoir, regardless of the size of the conveyance capacity of the SJPL or the purchase request. Water not diverted to the SJPL would return to the Tuolumne River at Kirkwood Powerhouse or Moccasin Reservoir and flow to Don Pedro Reservoir. In the late summer and early fall, storage levels would consistently be slightly different (lower) between the two settings, as additional diversions to the SJPL would retain Bay Area reservoir storage. The additional storage depletion would be somewhat ameliorated later in the fall and into winter as SJPL diversions are reduced because of lower Bay Area reservoir replenishment needs and conveyance system maintenance. The storage difference would become almost neutral in December with the WSIP setting because of the additional conveyance maintenance that would occur in the WSIP (and which does not occur in the base-Calaveras constrained setting). The maintenance impairs diversions to the SJPL. After December, storage in the reservoir associated with the WSIP setting again would be affected as replenishment of Bay Area reservoir storage resumes following the maintenance period and because of increased purchase requests. During drier years, there is a difference in storage between the WSIP and base-Calaveras constrained settings; the alternative setting results in a lower amount of storage in the reservoir by the end of April. Figure 2.3-2 illustrates the reservoir storage, averaged by year type, for the WSIP setting. Figure 2.3-3 illustrates the average difference in storage, averaged by year type, for the two settings during the 82-year simulation. Figure 2.3-4 illustrates the average monthly storage in Hetch Hetchy Reservoir for the 82-year simulation, and the range in storage for each month for the WSIP and base-Calaveras constrained settings.

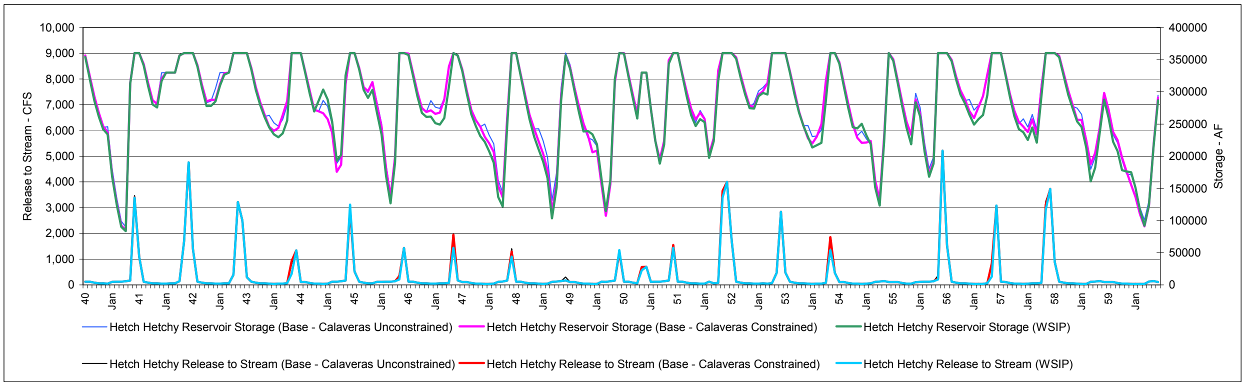
The difference in storage in Hetch Hetchy Reservoir attributed to the diversion effects of the WSIP would manifest into differences in releases from O'Shaughnessy Dam to the stream. A different amount of available reservoir space in the winter and spring due to the WSIP would lead to a different ability to regulate inflow, thus potentially changing the amount of water released to the stream (which is above minimum release requirements). Figure 2.3-1 illustrates the stream release from O'Shaughnessy Dam for the WSIP and base settings. Supplementing Figure 2.3-1 are Table 2.3-4 and Table 2.3-5, which illustrate the stream release from O'Shaughnessy Dam for the WSIP and base-Calaveras constrained settings. Table 2.3-6 illustrates the difference in stream releases between the WSIP and base-Calaveras constrained settings. Compared to the base-Calaveras constrained setting, the WSIP setting typically results in a lesser stream release, predominantly during May or June, which reflects the months when releases to the stream above minimum release requirements are made in anticipation of the reservoir being filled. In a few exceptions to this circumstance, an increase in release to the stream occurs. Several of these exceptions are considered anomalous within modeling, the results of only shifting releases from one month to another. The other exceptions occur due to the balancing of reservoir storage among the Hetch Hetchy system and the Bay Area reservoirs. The decrease in releases is the result of a more depleted reservoir, which is the result of greater demands between the settings.

Figure 2.3-1
Hetch Hetchy Reservoir Storage and Stream Release

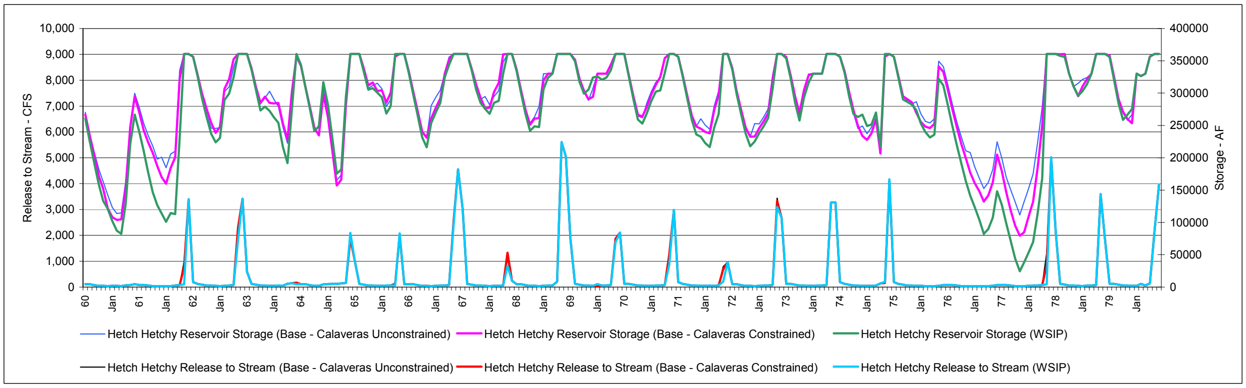
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

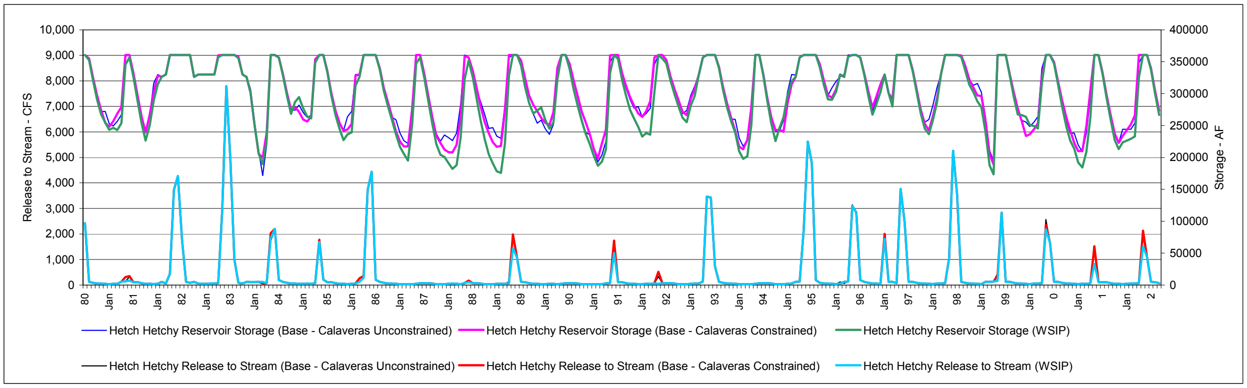


Table 2.3-1

Hetch Hetchy Reservoir Storage (Acre-feet) WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	272,212	265,854	243,679	235,730	183,131	150,102	154,083	270,998	360,400	360,400	326,716	291,641
1922	260,017	235,936	225,012	216,071	220,532	235,108	205,422	360,400	360,400	360,400	335,987	302,666
1923	275,632	258,180	264,257	270,969	276,110	267,395	242,750	360,400	360,400	360,400	333,091	304,054
1924	287,909	265,274	244,743	227,762	217,516	200,947	226,335	313,797	291,963	263,927	228,573	192,617
1925	161,496	173,531	186,568	169,497	181,122	195,112	215,423	360,400	360,400	356,465	334,115	301,240
1926	273,802	251,145	243,620	219,652	203,282	156,192	244,974	336,634	358,000	330,739	295,220	261,181
1927	232,632	230,302	230,939	224,241	251,810	270,898	327,581	360,400	360,400	360,400	333,623	301,044
1928	275,347	280,001	275,359	266,381	259,381	309,939	356,775	360,400	360,400	337,001	302,499	269,162
1929	239,425	216,620	201,515	182,739	169,077	168,044	183,509	347,948	360,400	348,007	314,236	280,955
1930	249,116	245,546	246,876	227,370	217,938	224,416	285,686	356,465	360,400	350,673	316,536	283,142
1931	252,621	228,300	214,607	191,032	173,741	165,859	207,051	299,235	295,885	265,896	230,558	196,275
1932	166,254	141,968	108,624	51,576	34,804	27,502	58,360	229,750	360,400	360,400	332,994	299,731
1933	270,827	249,318	234,552	213,938	196,774	166,223	153,096	188,750	360,400	360,400	326,498	293,195
1934	260,679	234,062	202,956	183,568	161,386	128,818	185,180	237,597	261,314	234,993	202,895	171,557
1935	141,478	155,200	167,988	108,234	72,493	39,306	100,061	259,139	360,400	360,400	331,693	299,135
1936	266,804	242,416	226,072	214,618	169,794	136,016	195,669	360,400	360,400	356,465	327,758	293,923
1937	263,258	239,922	220,528	198,592	156,392	108,310	110,656	356,408	360,400	360,400	327,117	292,284
1938	262,588	242,187	277,814	270,001	219,089	177,586	201,634	360,400	360,400	360,400	351,934	324,527
1939	313,230	305,433	296,949	284,402	276,549	290,033	360,400	360,400	360,400	332,062	299,302	270,045
1940	254,832	255,868	222,545	212,796	165,425	143,040	166,068	360,400	360,400	354,356	320,123	286,028
1941	261,347	241,787	234,144	168,334	124,378	90,323	83,423	312,783	360,400	360,400	341,196	308,861
1942	280,534	275,676	316,612	330,000	330,000	330,000	356,592	360,400	360,400	360,400	339,434	306,775
1943	277,834	278,290	285,202	309,631	326,722	330,000	360,400	360,400	360,400	360,400	334,725	302,903
1944	278,957	260,161	244,775	234,057	229,556	235,278	255,261	360,400	360,400	360,400	329,195	297,258
1945	269,594	286,486	303,391	288,236	253,700	192,916	201,894	325,435	360,400	360,400	334,833	302,981
1946	290,629	303,058	267,626	233,689	169,219	126,757	189,566	360,400	360,400	357,172	325,391	292,953
1947	267,302	261,048	261,651	251,424	249,312	259,119	307,974	360,400	356,592	332,752	297,801	265,047
1948	246,881	231,142	222,253	207,832	189,798	136,522	121,769	246,854	360,400	360,400	325,679	290,875
1949	257,155	230,043	210,351	191,360	165,907	103,444	151,449	286,217	356,592	335,945	301,138	267,891
1950	238,302	239,272	233,940	218,468	163,874	114,732	162,958	320,001	360,400	359,505	323,659	289,647
1951	258,661	330,000	330,000	273,739	223,537	188,600	217,740	343,707	360,400	360,400	326,685	293,016
1952	263,532	246,844	257,770	252,854	197,413	223,120	317,085	360,400	360,400	360,400	351,556	322,024
1953	296,142	274,941	274,019	293,074	298,536	295,862	360,095	360,400	360,400	360,400	330,041	296,984
1954	267,877	246,868	229,980	213,382	217,141	220,828	286,535	360,400	360,400	343,861	308,637	274,661
1955	245,158	243,209	250,427	232,593	218,869	151,555	123,312	222,529	360,400	348,403	313,548	278,581
1956	244,439	218,424	283,804	261,732	206,903	168,220	188,432	360,400	360,400	360,400	347,696	319,103
1957	295,940	282,110	264,718	249,070	257,623	263,923	295,093	360,400	360,400	360,400	326,728	292,510
1958	262,110	242,027	237,007	225,108	244,617	221,109	292,913	360,400	360,400	360,400	353,805	323,723
1959	295,240	273,752	254,105	245,284	213,696	161,127	182,231	235,467	287,846	259,305	222,628	207,712
1960	178,409	176,252	175,096	150,690	115,751	91,900	123,736	215,354	287,027	260,692	225,395	191,086
1961	158,157	133,346	121,240	102,042	87,316	82,200	129,149	221,278	266,879	240,690	210,599	177,543
1962	146,426	126,777	114,005	100,855	114,374	112,611	231,046	360,400	360,400	356,465	326,284	291,944
1963	263,525	237,000	223,881	230,563	289,186	299,242	324,537	360,400	360,400	360,400	336,301	304,839
1964	273,386	279,133	272,347	262,295	254,165	216,943	191,753	276,738	360,400	343,655	309,219	275,614
1965	241,436	248,743	317,082	281,745	230,783	175,442	181,773	294,420	360,400	360,400	360,400	333,096
1966	305,307	307,670	300,943	293,396	268,438	279,703	360,400	360,400	360,400	331,355	297,781	265,039
1967	231,529	216,381	253,632	269,858	284,791	324,593	344,126	360,400	360,400	360,400	360,400	335,676
1968	305,198	284,641	275,671	268,002	284,962	288,019	330,134	360,400	360,400	334,230	299,647	267,169
1969	241,770	248,709	247,430	305,815	323,485	330,000	360,400	360,400	360,400	360,400	349,331	317,590
1970	299,109	305,471	324,248	326,065	320,846	323,844	335,624	360,400	360,400	360,400	325,921	290,573
1971	259,109	252,707	268,931	287,804	302,524	304,076	331,376	360,400	360,400	356,465	325,669	292,259
1972	258,557	236,088	232,636	222,878	216,488	246,700	268,071	360,400	360,400	336,331	298,810	267,683
1973	237,812	217,831	225,249	238,096	248,774	261,422	306,780	360,400	360,400	353,895	322,638	285,845
1974	257,512	293,218	316,222	330,000	330,000	330,000	360,400	360,400	360,400	356,465	331,455	295,000
1975	267,677	262,890	266,892	249,208	251,420	270,142	216,550	360,400	360,400	356,465	324,067	290,292
1976	286,149	282,281	273,766	252,600	239,720	231,421	235,679	322,419	311,776	281,614	249,822	219,836
1977	190,805	164,307	141,524	123,723	104,154	82,557	89,725	107,373	148,407	127,479	98,702	71,356
1978	44,138	24,460	38,242	53,329	69,672	114,812	168,593	360,400	360,400	360,400	357,774	356,219
1979	330,000	310,323	296,034	303,033	313,915	330,000	360,400	360,400	360,400	356,002	320,543	284,032
1980	258,680	266,832	275,490	330,000	326,446	330,000	356,592	360,400	360,400	360,400	352,634	320,226
1981	290,609	267,554	254,678	243,125	246,527	243,029	253,653	345,334	356,592	326,286	288,639	253,673
1982	226,369	250,404	289,261	314,387	326,446	330,000	360,400	360,400	360,400	360,400	360,400	360,400
1983	326,065	330,000	330,000	330,000	330,000	330,000	356,951	360,400	360,400	360,400	360,400	355,878
1984	330,000	326,192	301,515	251,330	205,725	189,676	226,912	360,400	360,400	356,465	328,867	296,270
1985	268,090	286,622	294,695	277,075	264,192	261,404	348,453	360,400	360,400	333,440	296,675	266,441
1986	245,025	227,275	236,097	238,964	312,444	326,065	360,400	360,400	360,400	360,400	337,395	304,410
1987	281,007	259,483	236,297	216,538	205,386	195,078	251,137	347,208	356,556	324,828	288,222	252,930
1988	221,048	204,111	200,855	191,081	181,990	188,083	230,852	322,256	351,607	325,661	290,794	257,070
1989	228,073	204,737	190,690	178,343	175,662	221,683	328,113	360,400	360,400	343,879	310,198	285,098
1990	268,790	273,511	278,290	258,918	244,935	254,745	322,352	360,400	360,400	339,067	307,034	280,546
1991	257,352	236,658	221,201	202,049	187,037	193,387	212,656	332,085	360,400	354,334	321,620	296,626
1992	274,381	260,899	247,962	232,665	238,267	235,667	302,099	360,400	354,930	347,198	320,400	298,656
1993	279,702	262,114	255,135	281,069	296,384	330,000	356,592	360,400	360,400	360,400	339,589	305,807
1994	278,527	256,433	239,168	209,495	197,633	201,926	250,691	360,400	360,400	328,011	288,314	253,017
1995	225,731	246,319	262,918	296,356	319,234	326,065	356,592	360,400	360,400	360,400	360,400	341,143
1996	313,010	291,009	290,227	303,212	330,000	326,065	357,776	360,400	360,400	356,465	329,174	295,620
1997	267,055	283,869	302,446	330,000	300,695	280,067	360,400	360,400	360,400	360,400	334,414	301,362
1998	268,797	245,081	236,479	258,671	285,912	330,000	360,400	360,400	360,400	360,400	357,480	336,176
1999	314,095	302,261	287,758	278,518	240,711	187,527	173,440	360,278	360,400	360,400	328,428	295,218
2000	267,327	266,240	263,716	251,013	249,182	245,478	316,692	360,400	360,400	347,162	314,239	280,150
2001	249,036	226,405	213,862	192,086	184,141	208,822	262,701	360,400	360,094	330,641	293,416	258,894
2002	227,484	212,909	223,635	226,411	229,117	232,820	324,946	360,400	360,400	337,441	300,376	266,502
Avg (21-02)	256,342	247,285	245,298	236,492	227,024	219,969	255,079	333,845	351,079	341,276	313,972	283,204

Table 2.3-2

Hetch Hetchy Reservoir Storage (Acre-feet) Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	284,123	276,845	254,669	246,727	194,135	159,730	162,202	277,799	360,400	360,400	328,999	296,132
1922	263,554	239,474	228,550	226,270	230,738	245,314	215,627	360,400	360,400	360,400	338,270	307,157
1923	280,121	259,907	265,984	272,697	277,839	284,441	259,796	360,400	360,400	360,400	335,374	308,545
1924	293,444	270,810	249,327	231,398	220,294	209,529	233,996	319,907	300,277	274,514	241,424	207,664
1925	178,818	171,519	169,334	158,055	186,943	216,250	233,961	360,400	360,400	356,465	336,398	305,731
1926	283,429	266,388	251,261	233,101	224,226	193,028	276,699	360,400	360,400	335,420	302,178	270,343
1927	244,738	243,329	243,015	244,124	271,705	294,599	351,281	360,400	360,400	360,400	335,906	308,297
1928	285,451	290,105	284,084	279,866	277,170	330,000	360,400	360,400	360,400	339,284	307,062	278,693
1929	253,709	230,904	215,798	201,787	192,432	201,960	219,634	360,400	360,400	350,290	318,800	287,725
1930	258,166	235,262	216,614	202,893	198,689	220,483	283,964	356,465	360,400	352,956	321,099	289,912
1931	261,671	242,966	222,186	204,418	196,672	194,593	237,996	332,445	331,278	303,529	270,420	238,300
1932	214,915	197,994	125,942	66,003	45,176	33,919	62,013	232,389	360,400	360,400	335,277	304,222
1933	276,362	254,854	233,000	219,997	209,710	189,719	173,443	205,787	360,400	360,400	328,781	297,686
1934	267,451	246,451	221,992	210,837	201,526	176,415	204,744	259,433	285,334	261,258	231,397	202,237
1935	174,422	168,811	161,620	102,887	68,320	47,214	105,172	263,017	360,400	360,400	333,976	303,626
1936	278,333	258,549	235,112	236,086	190,913	154,325	211,131	360,400	360,400	356,465	330,041	298,414
1937	270,601	249,107	228,767	212,531	168,750	118,672	119,294	360,400	360,400	360,400	329,400	296,775
1938	270,978	250,577	286,885	284,785	233,880	192,377	214,647	360,400	360,400	360,400	354,217	331,780
1939	319,529	310,811	302,327	293,587	289,176	313,220	356,592	360,400	360,400	334,345	303,865	276,815
1940	263,881	245,583	195,221	196,968	151,390	131,258	156,118	360,400	360,400	356,639	324,687	292,798
1941	267,162	246,682	237,081	171,273	126,888	92,426	85,026	313,980	360,400	360,400	343,479	313,352
1942	286,926	281,147	320,371	330,000	330,000	330,000	356,592	360,400	360,400	360,400	341,717	311,266
1943	285,272	287,570	287,394	311,824	328,916	330,000	360,400	360,400	360,400	360,400	337,008	307,394
1944	283,446	263,729	245,490	239,529	243,796	263,788	285,981	360,400	360,400	360,400	331,478	301,749
1945	272,276	269,834	266,760	257,391	236,587	175,803	186,832	312,263	360,400	360,400	337,116	307,472
1946	300,826	315,097	279,665	245,734	181,271	137,100	198,297	360,400	360,400	359,455	329,955	299,722
1947	275,020	268,766	271,273	265,807	268,000	288,368	339,432	360,400	356,592	335,035	302,365	271,816
1948	255,930	245,807	229,831	220,170	206,440	153,592	136,183	258,923	360,400	360,400	327,962	295,366
1949	263,928	242,431	222,739	203,721	178,274	113,920	159,848	293,245	356,592	338,228	305,702	277,423
1950	250,778	232,413	206,179	208,609	155,076	107,349	156,859	314,887	360,400	360,400	326,837	295,032
1951	266,327	330,000	330,000	273,739	223,537	195,259	223,591	349,555	360,400	360,400	328,968	300,269
1952	273,732	257,043	267,969	257,959	202,522	228,229	333,242	360,400	360,400	360,400	353,839	326,515
1953	300,631	278,509	276,637	295,692	301,156	313,798	360,400	360,400	360,400	360,400	332,324	301,476
1954	269,513	247,582	227,840	219,803	230,612	249,616	317,533	360,400	360,400	346,144	313,200	281,430
1955	250,117	228,834	220,830	221,150	223,832	162,322	132,398	230,121	360,400	350,686	318,112	285,351
1956	253,489	233,090	288,149	266,080	211,253	172,022	191,635	360,400	360,400	360,400	349,979	323,594
1957	302,332	288,502	270,158	259,271	276,594	293,455	326,834	360,400	360,400	360,400	329,011	297,001
1958	270,405	253,084	245,733	237,644	257,160	233,653	305,456	360,400	360,400	360,400	356,088	328,214
1959	301,632	279,224	256,723	256,465	224,883	187,632	205,060	243,798	298,377	272,105	237,689	224,965
1960	197,935	176,445	155,310	136,693	109,750	90,960	123,020	217,281	291,161	267,103	234,078	201,968
1961	171,317	152,122	122,114	108,244	103,924	104,611	153,770	246,891	294,672	270,725	242,865	223,950
1962	207,457	187,440	170,386	159,676	184,438	200,846	321,490	360,400	360,400	356,465	328,567	299,197
1963	276,008	254,086	238,636	247,990	306,623	321,436	352,256	360,400	360,400	360,400	338,584	309,330
1964	284,915	294,345	284,705	284,172	284,647	253,229	227,945	302,737	356,592	342,134	309,983	278,588
1965	246,691	234,664	297,938	262,593	211,621	157,081	166,277	281,195	360,400	360,400	360,400	338,068
1966	312,180	316,384	303,397	304,413	285,402	300,776	356,592	360,400	360,400	333,638	302,345	271,809
1967	240,578	231,046	260,686	276,916	291,853	330,000	352,295	360,400	360,400	360,400	360,400	337,886
1968	313,115	292,558	276,501	277,394	302,093	315,710	360,034	360,400	360,400	336,513	304,211	273,939
1969	250,819	260,520	261,144	319,537	330,000	330,000	360,400	360,400	360,400	360,400	351,614	322,081
1970	303,598	290,627	294,181	330,000	330,000	330,000	343,990	360,400	360,400	360,400	328,204	295,064
1971	266,547	263,828	279,101	297,979	312,703	324,816	354,325	360,400	360,400	356,465	327,952	296,750
1972	265,329	248,476	245,025	240,031	237,947	273,962	297,543	360,400	360,400	338,614	303,374	274,452
1973	246,861	232,496	232,826	245,678	256,360	269,008	321,179	360,400	360,400	356,178	327,202	295,376
1974	268,943	304,648	327,652	330,000	330,000	330,000	360,400	360,400	360,400	356,465	333,738	302,253
1975	273,975	249,855	233,878	227,686	237,619	260,147	206,555	356,465	360,400	356,465	326,350	294,783
1976	290,639	285,849	269,723	255,215	248,352	245,855	252,323	341,337	332,889	304,985	275,445	247,639
1977	220,874	199,993	177,210	160,866	148,212	132,419	141,796	161,660	204,774	179,831	147,007	118,521
1978	94,963	79,520	84,788	108,941	132,205	185,907	249,999	360,400	360,400	360,400	360,057	360,400
1979	330,000	310,323	295,083	310,643	321,529	330,000	360,400	360,400	360,400	358,285	325,107	290,802
1980	271,155	259,973	253,409	330,000	326,446	330,000	356,592	360,400	360,400	360,400	354,917	324,717
1981	297,001	273,946	253,982	248,138	256,698	268,517	279,140	360,400	360,400	332,373	297,002	264,239
1982	239,211	266,929	302,932	328,064	326,446	330,000	360,400	360,400	360,400	360,400	360,400	360,400
1983	326,065	330,000	330,000	330,000	330,000	330,000	359,897	360,400	360,400	360,400	360,400	358,088
1984	330,000	326,192	301,515	251,330	205,725	199,414	238,663	360,400	360,400	356,465	331,150	300,761
1985	274,862	278,663	271,515	259,687	256,332	264,105	353,363	360,400	360,400	335,723	301,239	273,210
1986	254,074	241,940	243,674	252,349	328,243	330,000	360,400	360,400	360,400	360,400	339,678	308,901
1987	287,399	264,954	240,817	224,866	217,156	217,408	275,676	360,400	360,400	330,951	296,621	263,532
1988	233,926	222,605	212,262	208,298	207,809	219,705	264,684	358,352	356,592	335,777	307,938	279,172
1989	254,919	238,028	223,981	216,409	218,047	274,627	360,400	360,400	360,400	351,870	323,888	296,935
1990	282,525	272,515	262,073	254,204	250,615	270,985	340,802	360,400	360,400	347,058	320,725	296,066
1991	271,914	254,902	236,592	212,691	198,545	222,019	243,498	360,055	360,400	360,400	332,436	312,037
1992	294,543	281,061	269,075	263,494	272,551	288,122	356,763	360,400	360,400	352,662	326,809	306,901
1993	289,846	271,337	266,261	292,201	307,522	330,000	356,592	360,400	360,400	360,400	341,872	310,298
1994	284,919	261,904	241,785	216,870	212,746	227,600	278,574	360,400	360,400	330,294	292,878	262,548
1995	242,297	243,550	240,171	284,061	314,667	326,065	356,592	360,400	360,400	360,400	360,400	346,115
1996	319,883	296,960	293,848	306,835	330,000	326,065	357,776	360,400	360,400	356,465	331,457	302,874
1997	278,205	295,940	314,517	330,000	300,695	291,579	360,400	360,400	360,400	360,400	336,697	305,853
1998	274,237	252,363	242,381	264,577	291,821	330,000	360,400	360,400	360,400	360,400	359,763	343,429
1999	322,296	309,542	296,942	296,268	258,469	205,285	189,045	360,400	360,400	360,400	330,711	302,471
2000	276,480	256,059	233,556	236,152	243,765	253,571	326,994	360,400	360,400	349,445	318,802	289,682
2001	263,320	242,531	222,899	209,691	210,349	249,300	305,389	360,400	360,400	333,230	298,285	265,969
2002	237,409	222,834	233,559	243,001	251,732	265,994	360,330	360,400	360,400	339,724	304,940	273,272
Avg (21-02)	267,350	255,970	248,055	244,033	238,026	236,250	270,308	338,205	353,575	344,926	319,840	291,861

Table 2.3-3

Difference in Hetch Hetchy Reservoir Storage (Acre-feet) WSIP minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	-11,911	-10,991	-10,990	-10,997	-11,004	-9,628	-8,119	-6,801	0	0	-2,283	-4,491
1922	-3,537	-3,538	-3,538	-10,199	-10,206	-10,206	-10,205	0	0	0	-2,283	-4,491
1923	-4,489	-1,727	-1,727	-1,728	-1,729	-17,046	-17,046	0	0	0	-2,283	-4,491
1924	-5,535	-5,536	-4,584	-3,636	-2,778	-8,582	-7,661	-6,110	-8,314	-10,587	-12,851	-15,047
1925	-17,322	2,012	17,234	11,442	-5,821	-21,138	-18,538	0	0	0	-2,283	-4,491
1926	-9,627	-15,243	-7,641	-13,449	-20,944	-36,836	-31,725	-23,766	-2,400	-4,681	-6,958	-9,162
1927	-12,106	-13,027	-12,076	-19,883	-19,895	-23,701	-23,700	0	0	0	-2,283	-7,253
1928	-10,104	-10,104	-8,725	-13,485	-17,789	-20,061	-3,625	0	0	-2,283	-4,563	-9,531
1929	-14,284	-14,284	-14,283	-19,048	-23,355	-33,916	-36,125	-12,452	0	-2,283	-4,564	-6,770
1930	-9,050	10,284	30,262	24,477	19,249	3,933	1,722	0	0	-2,283	-4,563	-6,770
1931	-9,050	-14,666	-7,579	-13,386	-22,931	-28,734	-30,945	-33,210	-35,393	-37,633	-39,862	-42,025
1932	-48,661	-56,026	-17,318	-14,427	-10,372	-6,417	-3,653	-2,639	0	0	-2,283	-4,491
1933	-5,535	-5,536	1,552	-6,059	-12,936	-23,496	-20,347	-17,037	0	0	-2,283	-4,491
1934	-6,772	-12,389	-19,036	-27,269	-40,140	-47,597	-19,564	-21,836	-24,020	-26,265	-28,502	-30,680
1935	-32,944	-13,611	6,368	5,347	4,173	-7,908	-5,111	-3,878	0	0	-2,283	-4,491
1936	-11,529	-16,133	-9,040	-21,468	-21,119	-18,309	-15,462	0	0	0	-2,283	-4,491
1937	-7,343	-9,185	-8,239	-13,939	-12,358	-10,362	-8,638	-3,992	0	0	-2,283	-4,491
1938	-8,390	-8,390	-9,071	-14,784	-14,791	-14,791	-13,013	0	0	0	-2,283	-7,253
1939	-6,299	-5,378	-5,378	-9,185	-12,627	-23,187	3,808	0	0	-2,283	-4,563	-6,770
1940	-9,049	10,285	27,324	15,828	14,035	11,782	9,950	0	0	-2,283	-4,564	-6,770
1941	-5,815	-4,895	-2,937	-2,939	-2,510	-2,103	-1,603	-1,197	0	0	-2,283	-4,491
1942	-6,392	-5,471	-3,759	0	0	0	0	0	0	0	-2,283	-4,491
1943	-7,438	-9,280	-2,192	-2,193	-2,194	0	0	0	0	0	-2,283	-4,491
1944	-4,489	-3,568	-715	-5,472	-14,240	-28,510	-30,720	0	0	0	-2,283	-4,491
1945	-2,682	16,652	36,631	30,845	17,113	17,113	15,062	13,172	0	0	-2,283	-4,491
1946	-10,197	-12,039	-12,039	-12,045	-12,052	-10,343	-8,731	0	0	-2,283	-4,564	-6,769
1947	-7,718	-7,718	-9,622	-14,383	-18,688	-29,249	-31,458	0	0	-2,283	-4,564	-6,769
1948	-9,049	-14,665	-7,578	-12,338	-16,642	-17,070	-14,414	-12,069	0	0	-2,283	-4,491
1949	-6,773	-12,388	-12,388	-12,361	-12,367	-10,476	-8,399	-7,028	0	-2,283	-4,564	-9,532
1950	-12,476	6,859	27,761	9,859	8,798	7,383	6,099	5,114	0	-895	-3,178	-5,385
1951	-7,666	0	0	0	0	-6,659	-5,851	-5,848	0	0	-2,283	-7,253
1952	-10,200	-10,199	-10,199	-5,105	-5,109	-5,109	-16,157	0	0	0	-2,283	-4,491
1953	-4,489	-3,568	-2,618	-2,618	-2,620	-17,936	-305	0	0	0	-2,283	-4,492
1954	-1,636	-714	2,140	-6,421	-13,471	-28,788	-30,998	0	0	-2,283	-4,563	-6,769
1955	-4,959	14,375	29,597	11,443	-4,963	-10,767	-9,086	-7,592	0	-2,283	-4,564	-6,770
1956	-9,050	-14,666	-4,345	-4,348	-4,350	-3,802	-3,203	0	0	0	-2,283	-4,491
1957	-6,392	-6,392	-5,440	-10,201	-18,971	-29,532	-31,741	0	0	0	-2,283	-4,491
1958	-8,295	-11,057	-8,726	-12,536	-12,543	-12,544	-12,543	0	0	0	-2,283	-4,491
1959	-6,392	-5,472	-2,618	-11,181	-11,187	-26,505	-22,829	-8,331	-10,531	-12,800	-15,061	-17,253
1960	-19,526	-193	19,786	13,997	6,001	940	716	-1,927	-4,134	-6,411	-8,683	-10,882
1961	-13,160	-18,776	-874	-6,202	-16,608	-22,411	-24,621	-25,613	-27,793	-30,035	-32,266	-46,407
1962	-61,031	-60,663	-56,381	-58,821	-70,064	-88,235	-90,444	0	0	0	-2,283	-7,253
1963	-12,483	-17,086	-14,755	-17,427	-17,437	-22,194	-27,719	0	0	0	-2,283	-4,491
1964	-11,529	-15,212	-12,358	-21,877	-30,482	-36,286	-36,192	-25,999	3,808	1,521	-764	-2,974
1965	-5,255	14,079	19,144	19,152	19,162	18,361	15,496	13,225	0	0	0	-4,972
1966	-6,873	-8,714	-2,454	-11,017	-16,964	-21,073	3,808	0	0	-2,283	-4,564	-6,770
1967	-9,049	-14,665	-7,054	-7,058	-7,062	-5,407	-8,169	0	0	0	0	-2,210
1968	-7,917	-7,917	-830	-9,392	-17,131	-27,691	-29,900	0	0	-2,283	-4,564	-6,770
1969	-9,049	-11,811	-13,714	-13,722	-6,515	0	0	0	0	0	-2,283	-4,491
1970	-4,489	14,844	30,067	-3,935	-9,154	-6,156	-8,366	0	0	0	-2,283	-4,491
1971	-7,438	-11,121	-10,170	-10,175	-10,179	-20,740	-22,949	0	0	0	-2,283	-4,491
1972	-6,772	-12,388	-12,389	-17,153	-21,459	-27,262	-29,472	0	0	-2,283	-4,564	-6,769
1973	-9,049	-14,665	-7,577	-7,582	-7,586	-7,586	-14,399	0	0	-2,283	-4,564	-9,531
1974	-11,431	-11,430	-11,430	0	0	0	0	0	0	0	-2,283	-7,253
1975	-6,298	13,035	33,014	21,522	13,801	9,995	9,995	3,935	0	0	-2,283	-4,491
1976	-4,490	-3,568	4,043	-2,615	-8,632	-14,434	-16,644	-18,918	-21,113	-23,371	-25,623	-27,803
1977	-30,069	-35,686	-35,686	-37,143	-44,058	-49,862	-52,071	-54,287	-56,367	-52,352	-48,305	-47,165
1978	-50,825	-55,060	-46,546	-55,612	-62,533	-71,095	-81,406	0	0	0	-2,283	-4,181
1979	0	0	951	-7,610	-7,614	0	0	0	0	-2,283	-4,564	-6,770
1980	-12,475	6,859	22,081	0	0	0	0	0	0	0	-2,283	-4,491
1981	-6,392	-6,392	696	-5,013	-10,171	-25,488	-25,487	-15,066	-3,808	-6,087	-8,363	-10,566
1982	-12,842	-16,525	-13,671	-13,677	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	-2,946	0	0	0	0	-2,210
1984	0	0	0	0	0	-9,738	-11,751	0	0	0	-2,283	-4,491
1985	-6,772	7,959	23,180	17,388	7,860	-2,701	-4,910	0	0	-2,283	-4,564	-6,769
1986	-9,049	-14,665	-7,577	-13,385	-15,799	-3,935	0	0	0	0	-2,283	-4,491
1987	-6,392	-5,471	-4,520	-8,328	-11,770	-22,330	-24,539	-13,192	-3,844	-6,123	-8,399	-10,602
1988	-12,878	-18,494	-11,407	-17,217	-25,819	-31,622	-33,832	-36,096	-4,985	-10,116	-17,144	-22,102
1989	-26,846	-33,291	-33,291	-38,066	-42,385	-52,944	-32,287	0	0	-7,991	-13,690	-11,837
1990	-13,735	996	16,217	4,714	-5,680	-16,240	-18,450	0	0	-7,991	-13,691	-15,520
1991	-14,562	-18,244	-15,391	-10,642	-11,508	-28,632	-30,842	-27,970	0	-6,066	-10,816	-15,411
1992	-20,162	-20,162	-21,113	-30,829	-34,284	-52,455	-54,664	0	-5,470	-5,464	-6,409	-8,245
1993	-10,144	-9,223	-11,126	-11,132	-11,138	0	0	0	0	0	-2,283	-4,491
1994	-6,392	-5,471	-2,617	-7,375	-15,113	-25,674	-27,883	0	0	-2,283	-4,564	-9,531
1995	-16,566	2,769	22,747	12,295	4,567	0	0	0	0	0	0	-4,972
1996	-6,873	-5,951	-3,621	-3,623	0	0	0	0	0	0	-2,283	-7,254
1997	-11,150	-12,071	-12,071	0	0	-11,512	0	0	0	0	-2,283	-4,491
1998	-5,440	-7,282	-5,902	-5,906	-5,909	0	0	0	0	0	-2,283	-7,253
1999	-8,201	-7,281	-9,184	-17,750	-17,758	-17,758	-15,605	-122	0	0	-2,283	-7,253
2000	-9,153	10,181	30,160	14,861	5,417	-8,093	-10,302	0	0	-2,283	-4,563	-9,532
2001	-14,284	-16,126	-9,037	-17,605	-26,208	-40,478	-42,688	0	-306	-2,589	-4,869	-7,075
2002	-9,925	-9,925	-9,924	-16,590	-22,615	-33,174	-35,384	0	0	-2,283	-4,564	-6,770
Avg (21-02)	-11,007	-8,685	-2,758	-7,541	-11,002	-16,281	-15,229	-4,360	-2,496	-3,650	-5,868	-8,657

Figure 2.3-2

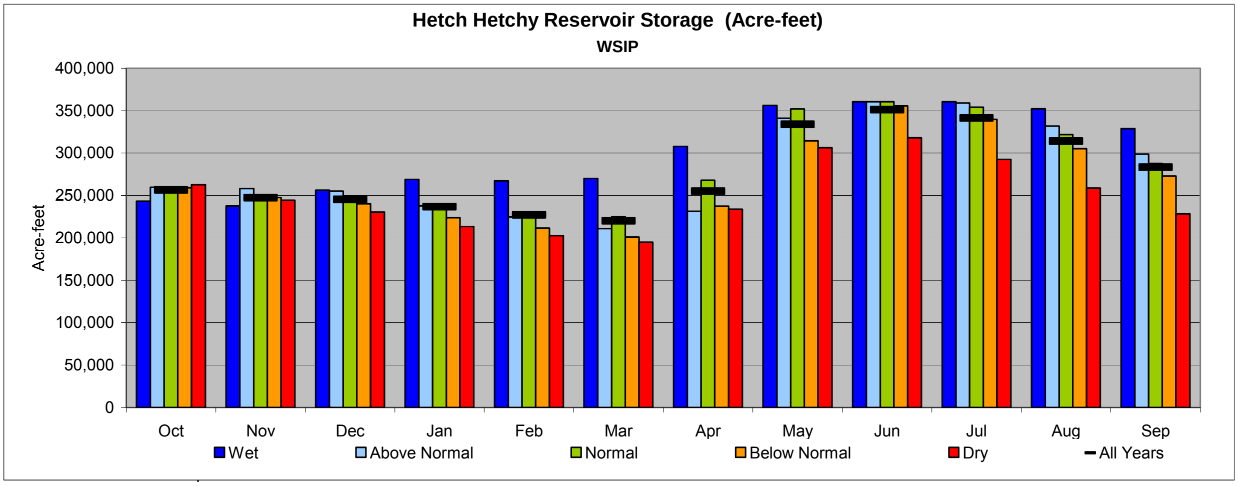


Figure 2.3-3

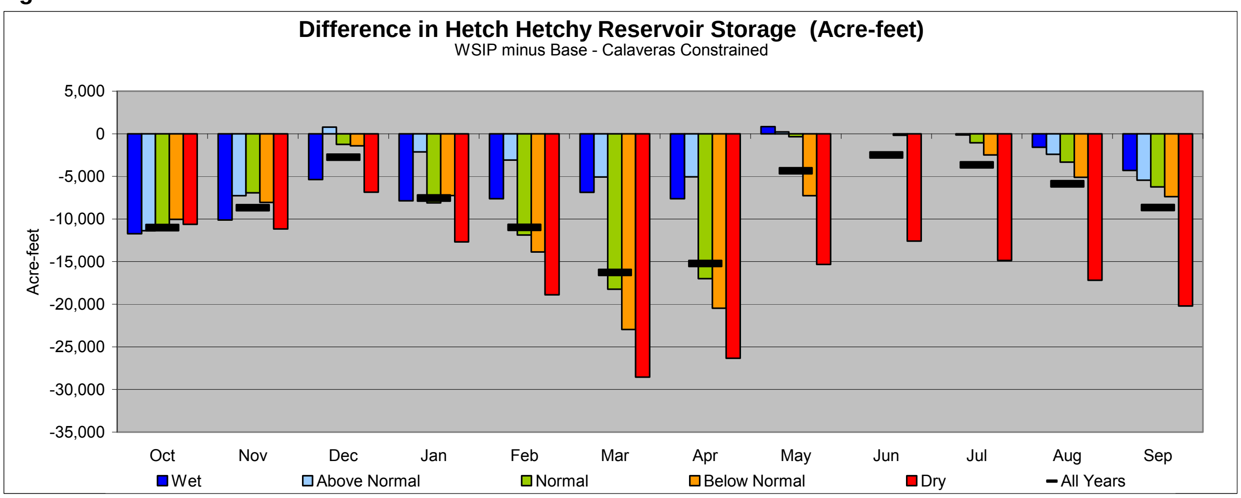


Figure 2.3-4

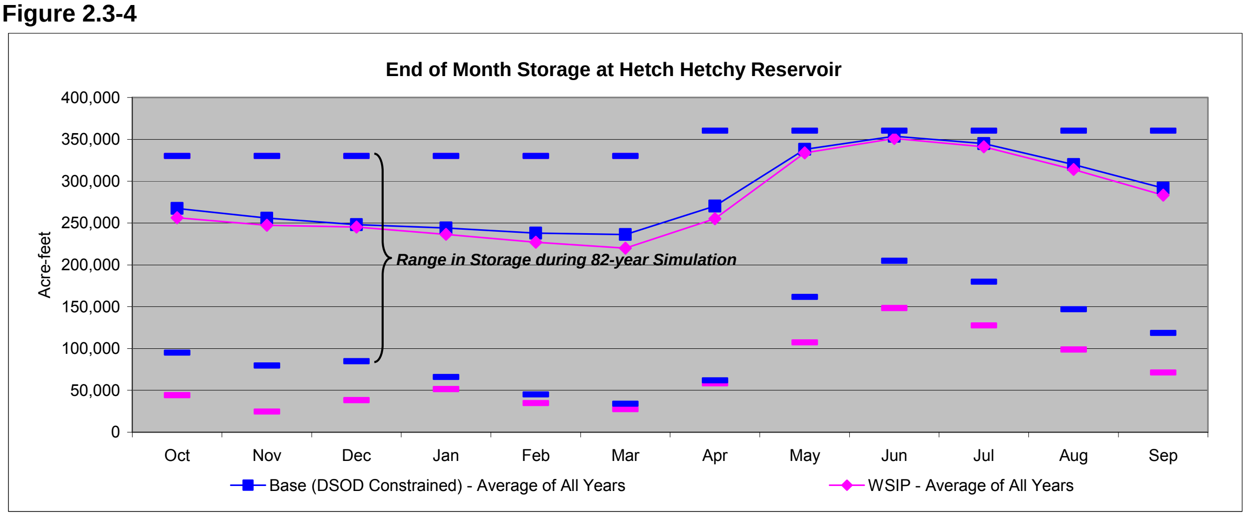


Table 2.3-4

Hetch Hetchy Release to Stream (Acre-feet)

WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	3,074	2,975	2,460	3,074	6,916	7,624	8,271	10,084	99,564	7,686	7,686	5,316	164,730
1922	3,689	3,570	3,074	3,074	3,362	3,689	8,271	55,204	312,197	28,813	7,686	5,316	437,945
1923	3,689	3,570	3,074	3,074	3,362	3,689	7,676	40,770	95,231	16,928	7,686	5,316	194,065
1924	3,689	3,570	3,074	2,152	1,961	2,152	2,083	3,074	4,463	4,612	4,612	3,669	39,111
1925	2,152	2,083	2,152	3,074	3,362	3,689	8,271	57,635	149,864	11,621	7,686	5,316	256,905
1926	3,689	3,570	3,074	2,460	2,802	7,624	7,676	8,854	6,545	6,764	6,764	4,284	64,106
1927	3,074	2,975	2,460	3,074	3,362	3,689	4,463	118,075	238,640	13,543	7,686	5,316	406,357
1928	3,689	3,570	3,074	3,074	3,362	3,689	4,463	180,585	19,601	7,686	6,764	4,284	243,841
1929	3,074	2,975	2,460	2,460	1,961	2,152	2,083	4,919	38,907	6,764	6,764	4,284	78,803
1930	3,074	2,975	2,460	2,152	2,802	3,074	3,868	8,854	102,907	6,764	6,764	4,284	149,978
1931	3,074	2,975	2,460	2,152	2,802	2,152	2,083	3,074	4,463	4,612	4,612	3,669	38,128
1932	2,152	2,083	2,152	7,009	3,362	3,689	4,463	6,149	115,006	24,366	7,686	5,316	183,433
1933	3,689	3,570	3,074	2,152	2,802	2,152	2,083	3,074	18,146	6,764	6,764	4,284	58,554
1934	3,074	2,975	2,460	2,460	2,802	7,009	3,868	4,919	6,545	4,612	4,612	3,669	49,005
1935	2,152	2,083	2,152	7,009	6,916	7,624	4,463	10,084	135,857	7,686	7,686	5,316	199,028
1936	3,689	3,570	3,074	2,460	6,356	7,624	8,271	37,899	164,181	11,621	7,686	5,316	261,747
1937	3,689	3,570	3,074	3,074	6,916	7,624	8,271	10,084	155,401	7,686	7,686	5,316	222,391
1938	3,689	3,570	3,074	3,074	6,916	7,624	8,271	59,689	350,036	112,643	7,686	5,316	571,588
1939	3,689	3,570	3,074	2,460	2,802	3,074	3,868	41,832	6,545	6,764	6,764	4,284	88,726
1940	3,074	2,975	2,460	2,460	6,916	7,624	8,271	40,085	145,292	7,686	7,686	5,316	239,845
1941	3,689	3,570	3,074	7,009	6,916	7,624	8,271	10,084	201,267	67,763	7,686	5,316	332,269
1942	3,689	3,570	3,074	3,074	3,362	3,689	8,271	105,473	283,373	86,094	7,686	5,316	516,671
1943	3,689	3,570	3,074	3,074	3,362	3,689	23,247	197,709	148,920	18,174	7,686	5,316	421,510
1944	3,689	3,570	3,074	2,460	2,802	3,074	3,868	26,182	79,627	6,764	6,764	4,284	146,158
1945	3,074	2,975	2,460	3,074	6,916	7,624	8,271	10,084	185,512	31,926	7,686	5,316	274,918
1946	3,689	3,570	7,009	7,009	6,916	7,624	8,271	12,838	85,083	7,686	7,686	5,316	162,697
1947	3,689	3,570	3,074	3,074	3,362	3,689	4,463	88,557	10,353	6,764	6,764	4,284	141,643
1948	3,074	2,975	2,460	2,460	2,802	7,009	7,676	10,084	65,186	7,686	7,686	5,316	124,414
1949	3,689	3,570	3,074	2,460	2,802	7,009	7,676	8,854	10,353	6,764	6,764	4,284	67,299
1950	3,074	2,975	2,460	2,460	6,916	7,009	8,271	10,084	80,554	7,686	7,686	5,316	144,491
1951	3,689	33,633	42,960	7,009	6,916	7,624	8,271	10,084	85,948	7,686	7,686	5,316	226,822
1952	3,689	3,570	3,074	3,074	6,916	3,689	4,463	208,310	238,065	106,256	7,686	5,316	594,108
1953	3,689	3,570	3,074	3,074	3,362	3,074	3,868	27,989	168,768	29,365	7,686	5,316	262,835
1954	3,689	3,570	3,074	2,460	2,802	3,074	4,463	83,197	27,809	6,764	6,764	4,284	151,950
1955	3,074	2,975	2,460	3,074	3,362	7,009	7,676	8,854	6,545	6,764	6,764	4,284	62,841
1956	3,074	2,975	6,395	7,009	6,916	7,624	8,271	12,620	310,301	94,682	7,686	5,316	472,869
1957	3,689	3,570	3,074	2,152	1,961	2,152	3,868	19,557	183,319	7,686	6,764	4,284	242,076
1958	3,074	2,975	2,460	3,074	3,362	3,689	4,463	179,135	221,860	55,443	7,686	5,316	492,537
1959	3,689	3,570	3,074	2,152	1,961	7,009	7,676	8,854	6,545	6,764	6,764	4,284	62,342
1960	3,074	2,975	2,460	2,152	1,961	2,152	7,676	8,854	6,545	6,764	6,764	4,284	55,661
1961	3,074	2,975	2,460	3,074	2,802	2,152	3,868	4,919	6,545	4,612	4,612	3,669	44,762
1962	2,152	2,083	2,152	2,460	1,961	3,689	4,463	6,149	202,079	11,621	7,686	5,316	251,811
1963	3,689	3,570	3,074	2,152	2,802	3,689	4,463	113,021	203,340	36,602	7,686	5,316	389,404
1964	3,689	3,570	3,074	3,074	3,362	3,074	7,676	8,854	6,545	6,764	6,764	4,284	60,730
1965	3,074	2,975	6,395	7,009	6,916	7,624	8,271	10,084	124,701	61,519	7,686	5,316	251,570
1966	3,689	3,570	3,074	3,074	3,362	3,689	3,868	127,600	6,545	6,764	6,764	4,284	176,283
1967	3,074	2,975	2,460	3,074	3,362	3,689	4,463	147,278	270,669	185,208	7,686	5,316	639,254
1968	3,689	3,570	3,074	2,460	2,802	3,074	3,868	50,600	14,833	6,764	6,764	4,284	105,782
1969	3,074	2,975	2,460	3,074	3,362	3,689	12,681	344,502	300,076	115,876	7,686	5,316	804,771
1970	3,689	3,570	3,074	7,009	3,362	3,689	4,463	106,382	124,926	7,686	7,686	5,316	280,852
1971	3,689	3,570	3,074	3,074	3,362	3,689	4,463	53,512	177,149	11,621	7,686	5,316	280,205
1972	3,689	3,570	3,074	3,074	3,362	3,074	3,868	12,829	57,109	6,764	6,764	4,284	111,461
1973	3,074	2,975	2,460	3,074	3,362	3,689	4,463	190,360	159,403	7,686	7,686	5,316	393,548
1974	3,689	3,570	3,074	3,074	3,362	3,689	4,463	201,034	194,704	11,621	7,686	5,316	445,282
1975	3,689	3,570	3,074	3,074	2,802	3,689	8,271	12,443	247,984	11,621	7,686	5,316	313,219
1976	3,689	3,570	3,074	3,074	1,961	2,152	2,083	3,074	4,463	4,612	4,612	3,669	40,033
1977	2,152	2,083	2,152	2,152	1,961	2,152	2,083	3,074	4,463	4,612	4,612	3,669	35,165
1978	2,152	2,083	2,152	3,074	3,362	3,689	4,463	6,149	298,570	132,949	7,686	5,316	471,645
1979	3,689	3,570	3,074	2,460	3,362	3,689	4,463	220,976	107,368	7,686	7,686	5,316	373,339
1980	3,689	3,570	3,074	3,074	6,916	3,689	8,271	133,323	235,879	148,920	7,686	5,316	563,407
1981	3,689	3,570	3,074	2,152	2,802	3,074	7,676	8,854	10,353	6,764	6,764	4,284	63,056
1982	3,074	2,975	2,460	3,074	6,916	3,689	26,103	228,913	254,131	108,434	7,686	5,316	652,771
1983	7,624	3,570	3,074	3,074	3,362	3,689	4,463	177,176	463,488	302,677	61,509	5,316	1,039,022
1984	3,689	7,378	7,009	7,009	6,916	7,624	4,463	112,921	130,916	11,621	7,686	5,316	312,548
1985	3,689	3,570	3,074	3,074	3,362	3,074	4,463	103,803	12,733	6,764	6,764	4,284	158,654
1986	3,074	2,975	2,460	3,074	3,362	7,624	17,050	228,842	263,786	12,678	7,686	5,316	557,927
1987	3,689	3,570	3,074	2,152	1,961	2,152	2,083	3,074	4,463	4,612	4,612	3,669	39,111
1988	2,152	2,083	2,152	3,074	3,362	3,074	2,083	4,919	6,545	4,612	4,612	3,669	42,337
1989	2,152	2,083	2,152	3,074	2,802	3,074	4,463	88,702	62,889	7,686	6,764	4,284	190,125
1990	3,074	2,975	2,460	2,460	2,802	3,074	2,083	3,074	4,463	4,612	4,612	3,669	39,358
1991	2,152	2,083	2,152	2,152	1,961	2,152	3,868	4,919	74,892	6,764	6,764	4,284	114,143
1992	3,074	2,975	2,460	2,460	2,802	3,074	3,868	3,074	4,463	4,612	4,612	3,669	41,143
1993	2,152	2,083	2,152	3,074	3,362	3,689	8,271	213,205	204,082	44,068	7,686	5,316	499,140
1994	3,689	3,570	3,074	2,460	1,961	2,152	2,083	3,074	4,463	4,612	4,612	3,669	39,419
1995	2,152	2,083	2,152	3,074	3,362	7,624	8,271	131,296	334,396	294,086	11,843	5,316	805,655
1996	3,689	3,570	3,074	2,460	3,362	7,624	8,271	190,622	169,121	11,621	7,686	5,316	416,416
1997	3,689	3,570	3,074	111,273	6,916	7,624	4,463	231,648	146,890	7,686	7,686	5,316	539,835
1998	3,689	3,570	3,074	2,460	3,362	3,689	4,463	64,194	312,909	217,820	7,686	5,316	632,232
1999	3,689	3,570	3,074	2,460	6,916	7,624	8,271	10,084	168,859	7,686	7,686	5,316	235,235
2000	3,689	3,570	3,074	2,152	3,362	3,689	4,463	134,499	97,677	7,686	7,686	5,316	276,863
2001	3,689	3,570	3,074	2,460	2,802	3,074	3,868	50,785	6,545	6,764	6,764	4,284	97,679
2002	3,074	2,975	2,460	3,074	3,362	3,689	4,463	94,194	64,932	7,686	6,764	4,284	200,957
Avg (21-02)	3,351	3,609	3,449	4,522	3,861	4,506	6,153	68,297	123,484	33,709	7,711	4,793	267,446

Table 2.3-5

Hetch Hetchy Release to Stream (Acre-feet)

Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	3,074	2,975	2,460	3,074	6,916	7,624	8,271	10,084	106,358	7,686	7,686	5,316	171,524
1922	3,689	3,570	3,074	3,074	3,362	3,689	8,271	64,089	312,197	28,813	7,686	5,316	446,830
1923	3,689	3,570	3,074	3,074	3,362	3,689	7,676	57,807	95,231	16,928	7,686	5,316	211,102
1924	3,689	3,570	3,074	2,152	1,961	2,152	2,083	3,074	4,463	4,612	4,612	3,669	39,111
1925	2,152	2,083	2,152	3,074	3,362	3,689	8,271	75,868	149,864	11,621	7,686	5,316	275,138
1926	3,689	3,570	3,074	2,460	2,802	7,624	7,676	11,767	6,545	6,764	6,764	4,284	67,019
1927	3,074	2,975	2,460	3,074	3,362	3,689	4,463	142,263	238,640	13,543	7,686	5,316	430,545
1928	3,689	3,570	3,074	3,074	3,362	3,689	4,463	184,434	19,601	7,686	6,764	4,284	247,690
1929	3,074	2,975	2,460	2,460	1,961	2,152	2,083	4,919	52,130	6,764	6,764	4,284	92,026
1930	3,074	2,975	2,460	2,152	2,802	3,074	3,868	8,854	102,907	6,764	6,764	4,284	149,978
1931	3,074	2,975	2,460	2,152	2,802	2,152	2,083	3,074	4,463	4,612	4,612	3,669	38,128
1932	2,152	2,083	2,152	7,009	3,362	3,689	4,463	6,149	117,642	24,366	7,686	5,316	186,069
1933	3,689	3,570	3,074	2,152	2,802	2,152	2,083	3,074	33,096	6,764	6,764	4,284	73,504
1934	3,074	2,975	2,460	2,460	2,802	7,009	7,676	4,919	6,545	4,612	4,612	3,669	52,813
1935	2,152	2,083	2,152	7,009	6,916	3,689	4,463	10,084	139,731	7,686	7,686	5,316	198,967
1936	3,689	3,570	3,074	2,460	6,356	7,624	8,271	51,409	164,181	11,621	7,686	5,316	275,257
1937	3,689	3,570	3,074	3,074	6,916	7,624	8,271	13,227	159,632	7,686	7,686	5,316	229,765
1938	3,689	3,570	3,074	3,074	6,916	7,624	8,271	71,028	350,036	112,643	7,686	5,316	582,927
1939	3,689	3,570	3,074	2,460	2,802	3,074	7,676	37,787	6,545	6,764	6,764	4,284	88,489
1940	3,074	2,975	2,460	2,460	6,916	7,624	8,271	31,737	145,292	7,686	7,686	5,316	231,497
1941	3,689	3,570	3,074	7,009	6,916	7,624	8,271	10,084	202,464	67,763	7,686	5,316	333,466
1942	3,689	3,570	3,074	3,074	3,362	3,689	8,271	105,473	283,373	86,094	7,686	5,316	516,671
1943	3,689	3,570	3,074	3,074	3,362	3,689	23,247	197,709	148,920	18,174	7,686	5,316	421,510
1944	3,689	3,570	3,074	2,460	2,802	3,074	3,868	56,885	79,627	6,764	6,764	4,284	176,861
1945	3,074	2,975	2,460	3,074	6,916	7,624	8,271	10,084	172,351	31,926	7,686	5,316	261,757
1946	3,689	3,570	7,009	7,009	6,916	7,624	8,271	20,474	85,083	7,686	7,686	5,316	170,333
1947	3,689	3,570	3,074	3,074	3,362	3,689	4,463	120,003	10,353	6,764	6,764	4,284	173,089
1948	3,074	2,975	2,460	2,460	2,802	7,009	7,676	10,084	77,241	7,686	7,686	5,316	136,469
1949	3,689	3,570	3,074	2,460	2,802	7,009	7,676	8,854	10,353	6,764	6,764	4,284	67,299
1950	3,074	2,975	2,460	2,460	6,916	7,009	8,271	10,084	75,444	7,686	7,686	5,316	139,381
1951	3,689	41,299	42,960	7,009	6,916	7,624	8,271	10,084	92,161	7,686	7,686	5,316	240,701
1952	3,689	3,570	3,074	3,074	6,916	3,689	4,463	224,460	238,065	106,256	7,686	5,316	610,258
1953	3,689	3,570	3,074	3,074	3,362	3,074	3,868	28,311	168,768	29,365	7,686	5,316	263,157
1954	3,689	3,570	3,074	2,460	2,802	3,074	4,463	114,181	27,809	6,764	6,764	4,284	182,934
1955	3,074	2,975	2,460	3,074	3,362	7,009	7,676	8,854	6,545	6,764	6,764	4,284	62,841
1956	3,074	2,975	6,395	7,009	6,916	7,624	8,271	15,426	310,301	94,682	7,686	5,316	475,675
1957	3,689	3,570	3,074	2,152	1,961	2,152	3,868	51,285	183,319	7,686	6,764	4,284	273,804
1958	3,074	2,975	2,460	3,074	3,362	3,689	4,463	191,673	221,860	55,443	7,686	5,316	505,075
1959	3,689	3,570	3,074	2,152	1,961	7,009	7,676	8,854	6,545	6,764	6,764	4,284	62,342
1960	3,074	2,975	2,460	2,152	1,961	2,152	7,676	8,854	6,545	6,764	6,764	4,284	55,661
1961	3,074	2,975	2,460	3,074	2,802	2,152	3,868	4,919	6,545	4,612	4,612	3,669	44,762
1962	2,152	2,083	2,152	2,460	1,961	3,689	4,463	47,803	202,079	11,621	7,686	5,316	293,465
1963	3,689	3,570	3,074	2,152	2,802	3,689	4,463	141,289	203,340	36,602	7,686	5,316	417,672
1964	3,689	3,570	3,074	3,074	3,362	3,074	7,676	8,854	10,353	6,764	6,764	4,284	64,538
1965	3,074	2,975	6,395	7,009	6,916	7,624	8,271	10,084	111,487	61,519	7,686	5,316	238,356
1966	3,689	3,570	3,074	3,074	3,362	3,689	7,676	123,555	6,545	6,764	6,764	4,284	176,046
1967	3,074	2,975	2,460	3,074	3,362	3,689	4,463	156,001	270,669	185,208	7,686	5,316	647,977
1968	3,689	3,570	3,074	2,460	2,802	3,074	3,868	81,548	14,833	6,764	6,764	4,284	136,730
1969	3,074	2,975	2,460	3,074	3,362	3,689	12,681	344,502	300,076	115,876	7,686	5,316	804,771
1970	3,689	3,570	3,074	3,074	3,362	3,689	4,463	114,745	124,926	7,686	7,686	5,316	285,280
1971	3,689	3,570	3,074	3,074	3,362	3,689	4,463	77,148	177,149	11,621	7,686	5,316	303,841
1972	3,689	3,570	3,074	3,074	3,362	3,074	3,868	42,286	57,109	6,764	6,764	4,284	140,918
1973	3,074	2,975	2,460	3,074	3,362	3,689	4,463	204,754	159,403	7,686	7,686	5,316	407,942
1974	3,689	3,570	3,074	3,074	3,362	3,689	4,463	201,034	194,704	11,621	7,686	5,316	445,282
1975	3,689	3,570	3,074	3,074	2,802	3,689	8,271	10,084	243,813	11,621	7,686	5,316	306,689
1976	3,689	3,570	3,074	3,074	1,961	2,152	2,083	3,074	4,463	4,612	4,612	3,669	40,033
1977	2,152	2,083	2,152	2,152	1,961	2,152	2,083	3,074	4,463	4,612	4,612	3,669	35,165
1978	2,152	2,083	2,152	3,074	3,362	3,689	4,463	52,739	298,570	132,949	7,686	5,626	518,545
1979	3,689	3,570	3,074	2,460	3,362	3,689	4,463	220,976	107,368	7,686	7,686	5,316	373,339
1980	3,689	3,570	3,074	3,074	6,916	3,689	8,271	133,323	235,879	148,920	7,686	5,316	563,407
1981	3,689	3,570	3,074	2,152	2,802	3,074	7,676	19,261	20,663	6,764	6,764	4,284	83,773
1982	3,074	2,975	2,460	3,074	6,916	3,689	26,103	228,913	254,131	108,434	7,686	5,316	652,771
1983	7,624	3,570	3,074	3,074	3,362	3,689	4,463	180,307	463,488	302,677	61,509	5,316	1,042,153
1984	3,689	7,378	7,009	7,009	6,916	3,689	4,463	124,666	130,916	11,621	7,686	5,316	320,358
1985	3,689	3,570	3,074	3,074	3,362	3,074	4,463	109,038	12,733	6,764	6,764	4,284	163,889
1986	3,074	2,975	2,460	3,074	3,362	16,102	20,985	228,842	263,786	12,678	7,686	5,316	570,340
1987	3,689	3,570	3,074	2,152	1,961	2,152	2,083	3,074	4,463	4,612	4,612	3,669	39,111
1988	2,152	2,083	2,152	3,074	3,362	3,074	2,083	4,919	10,353	4,612	4,612	3,669	46,145
1989	2,152	2,083	2,152	3,074	2,802	3,074	4,463	122,056	62,889	7,686	6,764	4,284	223,479
1990	3,074	2,975	2,460	2,460	2,802	3,074	2,083	3,074	4,463	4,612	4,612	3,669	39,358
1991	2,152	2,083	2,152	2,152	1,961	2,152	3,868	4,919	103,866	6,764	6,764	4,284	143,117
1992	3,074	2,975	2,460	2,460	2,802	3,074	3,868	31,992	4,463	4,612	4,612	3,669	70,061
1993	2,152	2,083	2,152	3,074	3,362	3,689	8,271	213,205	204,082	44,068	7,686	5,316	499,140
1994	3,689	3,570	3,074	2,460	1,961	2,152	2,083	3,074	4,463	4,612	4,612	3,669	39,419
1995	2,152	2,083	2,152	3,074	3,362	7,624	8,271	131,296	334,396	294,086	11,843	5,316	805,655
1996	3,689	3,570	3,074	2,460	3,362	7,624	8,271	190,622	169,121	11,621	7,686	5,316	416,416
1997	3,689	3,570	3,074	123,349	6,916	7,624	4,463	231,648	146,890	7,686	7,686	5,316	551,911
1998	3,689	3,570	3,074	2,460	3,362	3,689	4,463	64,194	312,909	217,820	7,686	5,316	632,232
1999	3,689	3,570	3,074	2,460	6,916	7,624	8,271	23,575	168,986	7,686	7,686	5,316	248,853
2000	3,689	3,570	3,074	2,152	3,362	3,689	4,463	144,797	97,677	7,686	7,686	5,316	287,161
2001	3,689	3,570	3,074	2,460	2,802	3,074	3,868	93,452	6,545	6,764	6,764	4,284	140,346
2002	3,074	2,975	2,460	3,074	3,362	3,689	4,463	130,642	64,932	7,686	6,764	4,284	237,405
Avg (21-02)	3,351	3,703	3,449	4,621	3,861	4,514	6,340	76,545	124,417	33,709	7,711	4,797	277,018

Table 2.3-6

Difference in Hetch Hetchy Release to Stream (Acre-feet)

WSIP minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	0	0	0	-6,794	0	0	0	-6,794
1922	0	0	0	0	0	0	0	-8,885	0	0	0	0	-8,885
1923	0	0	0	0	0	0	0	-17,037	0	0	0	0	-17,037
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	-18,233	0	0	0	0	-18,233
1926	0	0	0	0	0	0	0	-2,913	0	0	0	0	-2,913
1927	0	0	0	0	0	0	0	-24,188	0	0	0	0	-24,188
1928	0	0	0	0	0	0	0	-3,849	0	0	0	0	-3,849
1929	0	0	0	0	0	0	0	0	-13,223	0	0	0	-13,223
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	-2,636	0	0	0	-2,636
1933	0	0	0	0	0	0	0	0	-14,950	0	0	0	-14,950
1934	0	0	0	0	0	0	-3,808	0	0	0	0	0	-3,808
1935	0	0	0	0	0	3,935	0	0	-3,874	0	0	0	61
1936	0	0	0	0	0	0	0	-13,510	0	0	0	0	-13,510
1937	0	0	0	0	0	0	0	-3,143	-4,231	0	0	0	-7,374
1938	0	0	0	0	0	0	0	-11,339	0	0	0	0	-11,339
1939	0	0	0	0	0	0	-3,808	4,045	0	0	0	0	237
1940	0	0	0	0	0	0	0	8,348	0	0	0	0	8,348
1941	0	0	0	0	0	0	0	0	-1,197	0	0	0	-1,197
1942	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	-30,703	0	0	0	0	-30,703
1945	0	0	0	0	0	0	0	0	13,161	0	0	0	13,161
1946	0	0	0	0	0	0	0	-7,636	0	0	0	0	-7,636
1947	0	0	0	0	0	0	0	-31,446	0	0	0	0	-31,446
1948	0	0	0	0	0	0	0	0	-12,055	0	0	0	-12,055
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	5,110	0	0	0	5,110
1951	0	-7,666	0	0	0	0	0	0	-6,213	0	0	0	-13,879
1952	0	0	0	0	0	0	0	-16,150	0	0	0	0	-16,150
1953	0	0	0	0	0	0	0	-322	0	0	0	0	-322
1954	0	0	0	0	0	0	0	-30,984	0	0	0	0	-30,984
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	-2,806	0	0	0	0	-2,806
1957	0	0	0	0	0	0	0	-31,728	0	0	0	0	-31,728
1958	0	0	0	0	0	0	0	-12,538	0	0	0	0	-12,538
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	-41,654	0	0	0	0	-41,654
1963	0	0	0	0	0	0	0	-28,268	0	0	0	0	-28,268
1964	0	0	0	0	0	0	0	0	-3,808	0	0	0	-3,808
1965	0	0	0	0	0	0	0	0	13,214	0	0	0	13,214
1966	0	0	0	0	0	0	-3,808	4,045	0	0	0	0	237
1967	0	0	0	0	0	0	0	-8,723	0	0	0	0	-8,723
1968	0	0	0	0	0	0	0	-30,948	0	0	0	0	-30,948
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	3,935	0	0	0	-8,363	0	0	0	0	-4,428
1971	0	0	0	0	0	0	0	-23,636	0	0	0	0	-23,636
1972	0	0	0	0	0	0	0	-29,457	0	0	0	0	-29,457
1973	0	0	0	0	0	0	0	-14,394	0	0	0	0	-14,394
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	2,359	4,171	0	0	0	6,530
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	-46,590	0	0	0	-310	-46,900
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	-10,407	-10,310	0	0	0	-20,717
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	-3,131	0	0	0	0	-3,131
1984	0	0	0	0	0	3,935	0	-11,745	0	0	0	0	-7,810
1985	0	0	0	0	0	0	0	-5,235	0	0	0	0	-5,235
1986	0	0	0	0	0	-8,478	-3,935	0	0	0	0	0	-12,413
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	-3,808	0	0	0	-3,808
1989	0	0	0	0	0	0	0	-33,354	0	0	0	0	-33,354
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	-28,974	0	0	0	-28,974
1992	0	0	0	0	0	0	0	-28,918	0	0	0	0	-28,918
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	-12,076	0	0	0	0	0	0	0	0	-12,076
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	-13,491	-127	0	0	0	-13,618
2000	0	0	0	0	0	0	0	-10,298	0	0	0	0	-10,298
2001	0	0	0	0	0	0	0	-42,667	0	0	0	0	-42,667
2002	0	0	0	0	0	0	0	-36,448	0	0	0	0	-36,448
Avg (21-02)	0	-93	0	-99	0	-7	-187	-8,248	-933	0	0	-4	-9,573

Table 2.3-6 illustrates the difference in stream release between the WSIP and base-Calaveras constrained settings, expressed in terms of a monthly volume (acre-feet) of flow. The difference in monthly flow below O'Shaughnessy Dam indicates a potential change in releases between the WSIP and base-Calaveras constrained settings, ranging from a decrease of approximately 46,000 acre-feet to an increase of approximately 13,000 acre-feet. Considering the manner in which releases are determined and made to the stream, quantifying the effect of these changes in terms of average monthly flow (in cubic feet per second [cfs]) is not always meaningful.[1] Assuming that a change in release volume equates to a delay or earlier initiation of releasing 6,000 acre-feet per day, the difference in stream release from O'Shaughnessy Dam between the WSIP and base-Calaveras constrained settings would range from delayed releases up to 8 days to an addition of up to 2 days of release. Normally, the effect of a delay in release would not affect the year's peak stream release rate during a year.

2.4 Lake Lloyd and Lake Eleanor

Compared to the operation in the base-Calaveras constrained setting, the operation of Lake Lloyd and Lake Eleanor are simulated to be only slightly different in the WSIP setting. Figure 2.4-1 illustrates a chronological trace of the simulation of Lake Lloyd storage and stream releases. Figure 2.4-1 shows the results for the WSIP and base settings. The operation resulting for the WSIP setting is essentially the same as for the base-Calaveras constrained setting, except during the prolonged drought of 1987-1992. During this drought period, there is a greater draw from Hetch Hetchy Reservoir in the WSIP setting compared to the base-Calaveras constrained setting. The additional draw of water reduces the amount of water released from Hetch Hetchy Reservoir to Don Pedro Reservoir in the WSIP setting, which, to satisfy MID/TID entitlements to inflow, is met with additional releases from Lake Lloyd.

Figure 2.4-2 illustrates an almost identical operation of Lake Eleanor between the WSIP and base-Calaveras constrained settings. Also shown in Figure 2.4-2 is the operation for the base-Calaveras unconstrained setting. Any difference that occurs in the Lake Eleanor operation would be caused by a small change in operation at Lake Lloyd that would affect the operation of the Cherry-Eleanor Tunnel between the two watersheds. Any difference that occurs in the simulations is associated more with modeling discretion than with any substantive likely difference in operation.

Supplementing the Figure 2.4-1 representation of Lake Lloyd stream releases is Table 2.4-1, which illustrates the differences in stream release between the WSIP and base-Calaveras constrained settings. The one notable difference in operation of the 82-year simulation occurs during the year following the rare 1987-1992 drought sequence, when the additional draw from Lake Lloyd storage described above would require replenishment. In this one occurrence, the release to the stream above the minimum release requirement that would occur in the base-Calaveras constrained setting would not occur in the WSIP setting. Table 2.4-2 illustrates releases for the WSIP and base-Calaveras constrained settings, and shows almost no difference in releases between the two settings.

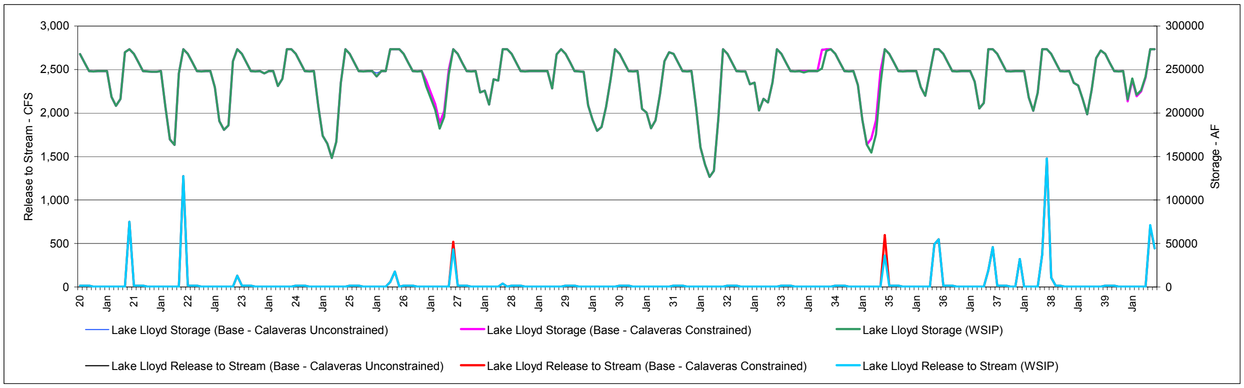
2.5 Flow below Tuolumne River and Cherry River Confluence

The flow that occurs below the confluence of the Tuolumne River and Cherry River is considered important to recreational activity (white water rafting) during the May-through-September period. To estimate the affect of WSIP on the occurrence of flow at this location, HH/LSM monthly volumetric flow results were post-processed to reflect the daily and hourly shaping potential currently exercised by Hetch Hetchy operators to satisfy water and power objectives while accommodating the desires of recreational interests. Figure 2.5-1 and Figure 2.5-2 illustrate the controlled flow below Hetch Hetchy facilities below the confluence of the Tuolumne River and Cherry River, averaged by year type, for the WSIP and base-Calaveras constrained settings. Illustrated are the combined flow elements of: 1) stream releases from O'Shaughnessy Dam, Lake Lloyd, and Lake Eleanor; 2) the return of Canyon Tunnel diversions through Kirkwood Powerhouse that exceed the Mountain Tunnel diversion; and 3) diversions through Holm Powerhouse. For this analysis, the monthly volumes of diversion through Holm Powerhouse have been shaped into a release of 4 hours per day for 6 days a week. The other flow elements represent the

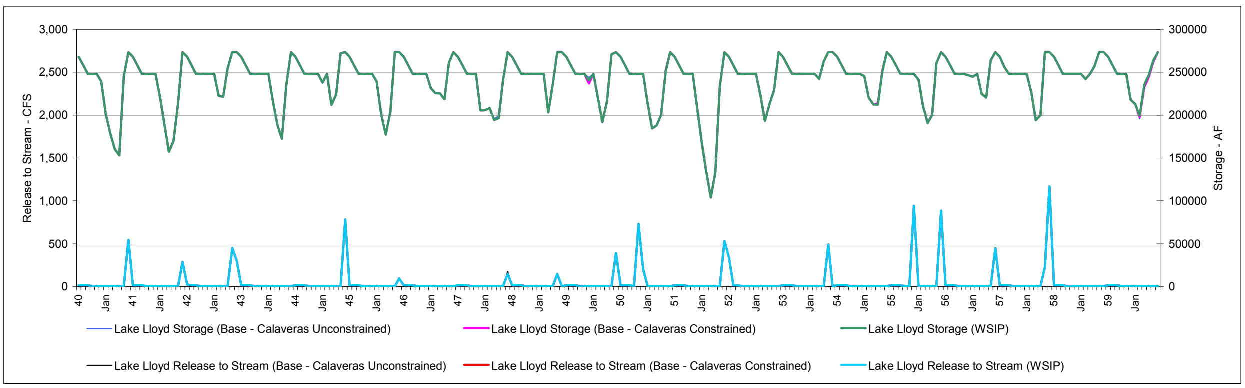
[1] See "Estimated Effect of WSIP on Daily Releases below Hetch Hetchy Reservoir", Memorandum by Daniel B. Steiner, December 31, 2006.

Figure 2.4-1
Lake Lloyd Storage and Stream Release

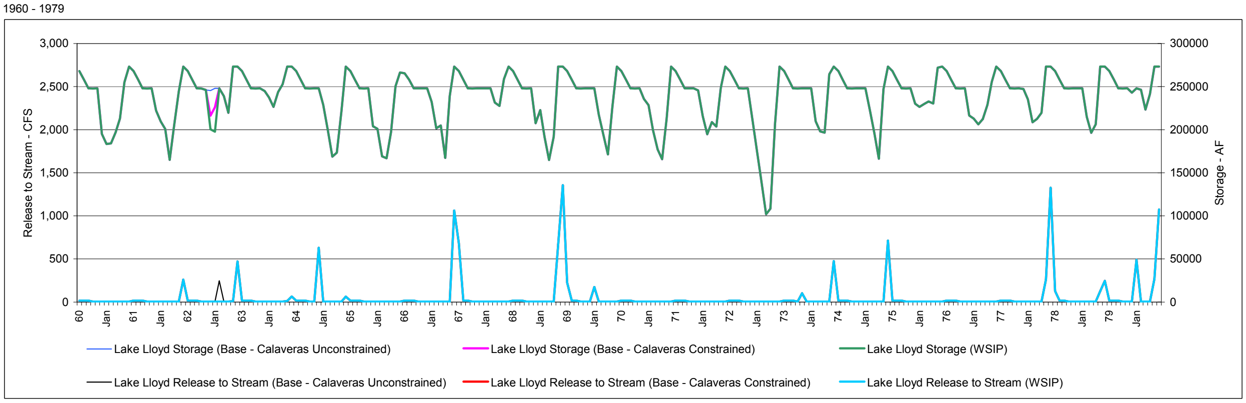
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

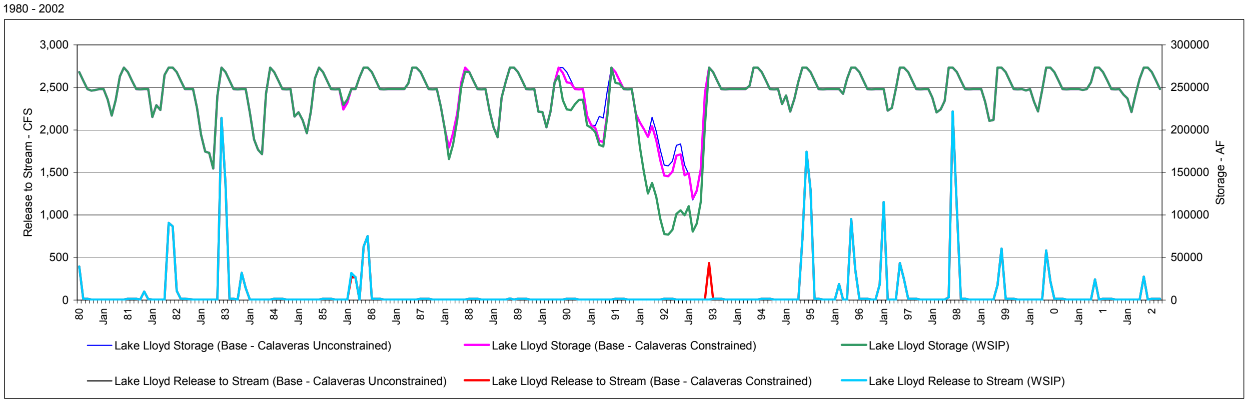
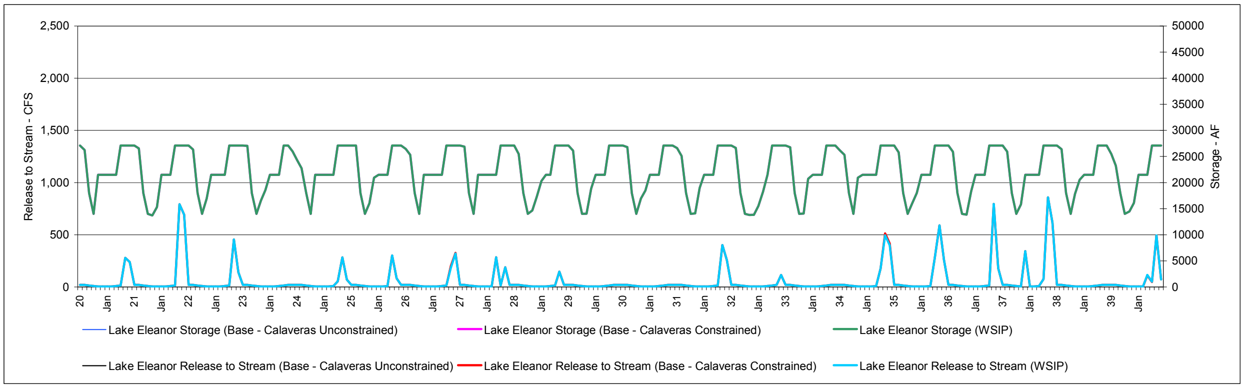
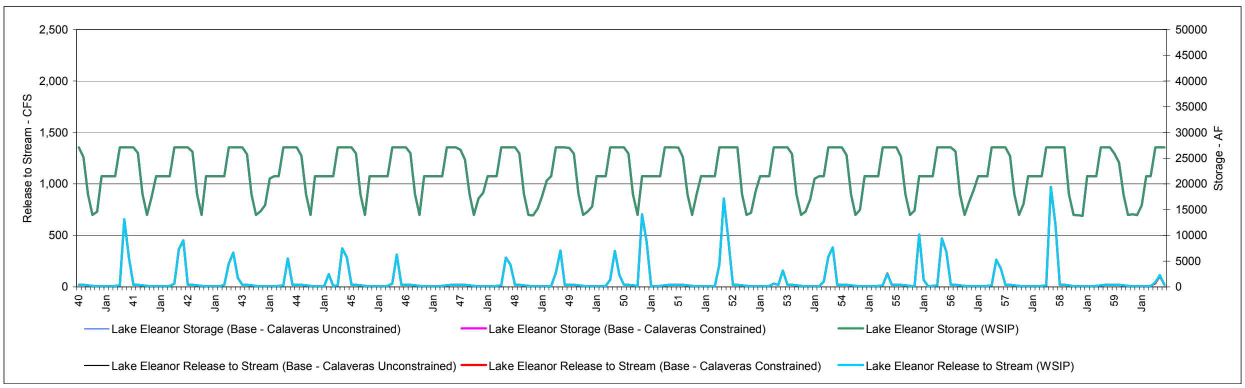


Figure 2.4-2
Lake Eleanor Storage and Stream Release

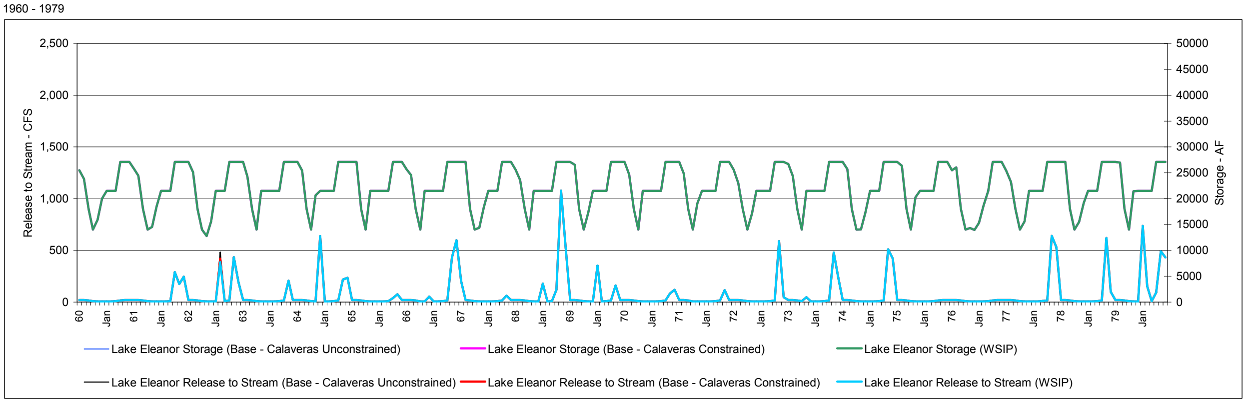
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

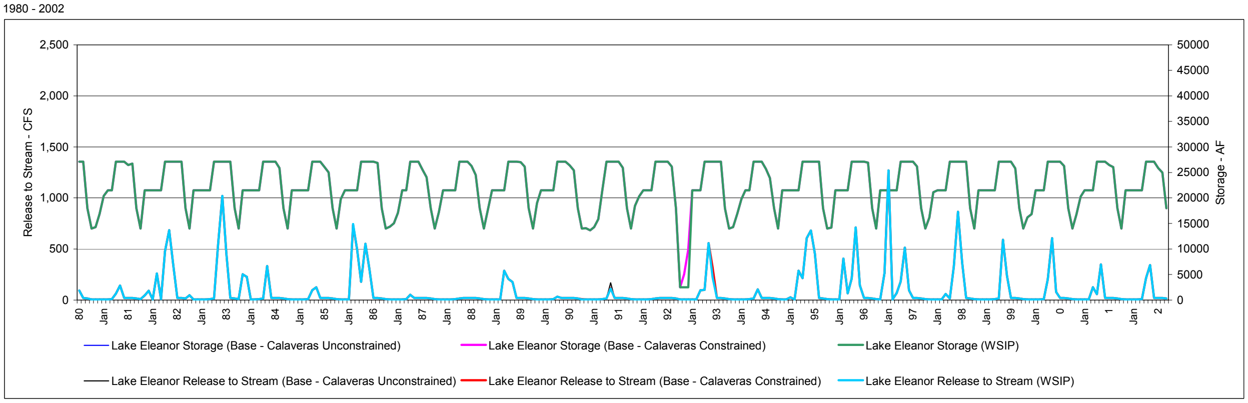


Table 2.4-1

Difference in Lake Lloyd Release to Stream (Acre-feet)

WSIP minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	0	0	0	0	0	0	0	0
1922	0	0	0	0	0	0	0	0	0	0	0	0	0
1923	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	-5,164	0	0	0	-5,164
1928	0	0	0	0	0	0	0	0	0	0	0	0	0
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	-14,010	0	0	0	-14,010
1936	0	0	0	0	0	0	0	0	0	0	0	0	0
1937	0	0	0	0	0	0	0	0	0	0	0	0	0
1938	0	0	0	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	0	0	0	1,070	0	0	0	0	1,070
1941	0	0	0	0	0	0	0	0	0	0	0	0	0
1942	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	0	0	0	0	0	0	0	0	0
1946	0	0	0	0	0	0	0	0	0	0	0	0	0
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	2,941	0	0	0	0	0	0	0	2,941
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	1	0	0	0	0	1
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	9	0	0	0	0	0	0	-25,595	0	0	0	-25,586
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	0	0	0	0	36	0	0	13	-546	0	0	0	-497

Table 2.4-2

Lake Lloyd Release to Stream (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	334	653	8,224	6,566	1,362	1,319	298	17,483	62,931	22,325	953	922	123,370
Above Normal	307	4,282	1,525	307	870	307	298	10,285	26,639	993	953	922	47,689
Normal	307	298	307	953	278	307	298	6,734	9,633	953	953	922	21,943
Below Normal	307	298	307	307	278	307	485	2,383	2,551	953	953	922	10,051
Dry	307	298	307	307	278	307	298	307	298	953	953	922	5,535
All Years	312	1,193	2,104	1,654	612	505	337	7,412	20,268	5,131	953	922	41,404

Lake Lloyd Release to Stream (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	334	653	8,224	6,566	1,179	1,319	298	17,483	64,530	22,325	953	922	124,786
Above Normal	307	4,282	1,525	307	870	307	298	10,222	27,767	993	953	922	48,754
Normal	307	298	307	953	278	307	298	6,734	9,633	953	953	922	21,943
Below Normal	307	298	307	307	278	307	485	2,383	2,551	953	953	922	10,051
Dry	307	298	307	307	278	307	298	307	298	953	953	922	5,535
All Years	312	1,193	2,104	1,654	577	505	337	7,399	20,814	5,131	953	922	41,901

Difference in Lake Lloyd Release to Stream (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — WSIP minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	1	0	0	184	0	0	0	-1,600	0	0	0	-1,415
Above Normal	0	0	0	0	0	0	0	63	-1,128	0	0	0	-1,065
Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	0	0	36	0	0	13	-546	0	0	0	-497

Figure 2.5-1

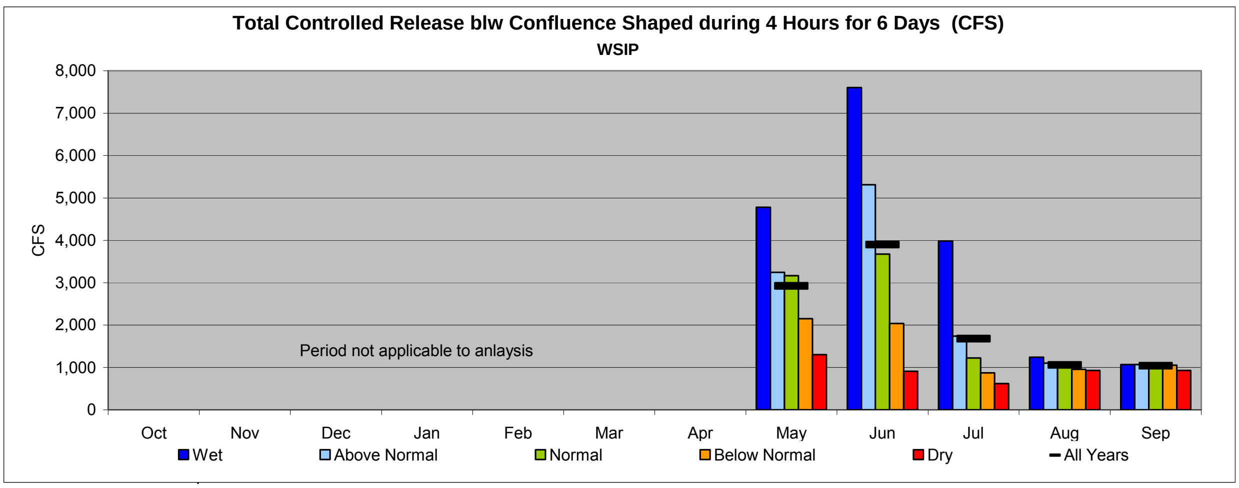
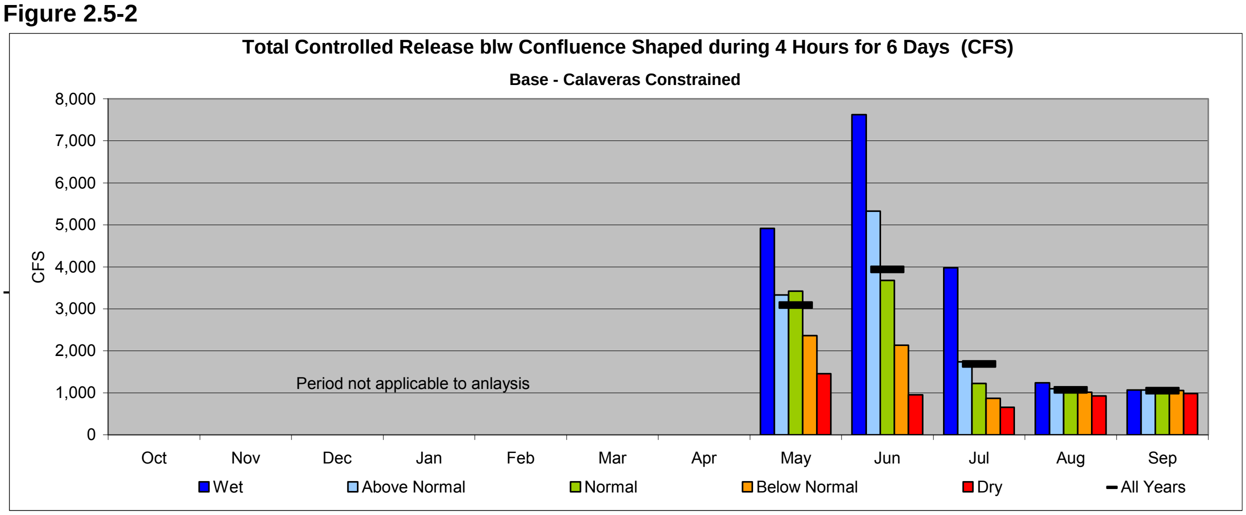
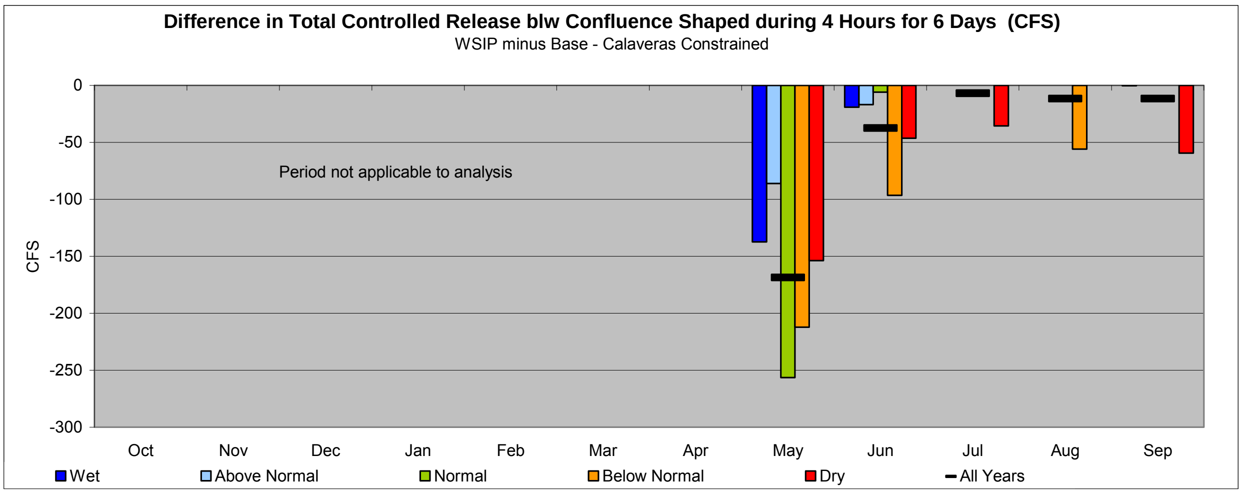


Figure 2.5-2



average daily flow rate associated with the monthly volume of flow. Figure 2.5-1 and Figure 2.5-2 illustrate that the HH/LSM operation protocols for reservoir operation incidentally result in approximately 1,000 cfs of flow below the confluence if Holm Powerhouse releases are shaped. This opportunity occurs in both the WSIP and base-Calaveras constrained settings. The flow rates illustrated in this analysis do not reflect either the occasional shaping opportunities that occur with Kirkwood Powerhouse releases or the unregulated flow that enters the streams below O'Shaughnessy Dam, Lake Lloyd, and Lake Eleanor; both of these factors would increase the illustrated flow rate. The difference in flow between the two settings that could occur during the concentrated period of flow is illustrated in Figure 2.5-3.

Figure 2.5-3



More detailed review of the 82-year simulation of operations indicates that, in only 2 months of the simulation do circumstances in the WSIP setting result in the shaped flow crossing the threshold to below 1,000 cfs, compared to levels greater than 1,000 cfs in the base-Calaveras constrained setting. In both the WSIP and base-Calaveras constrained settings, in some dry and critical years, circumstances could result in a shaped flow of less than 1,000 cfs; however, results indicate that the WSIP setting would rarely increase the frequency of such an occurrence.

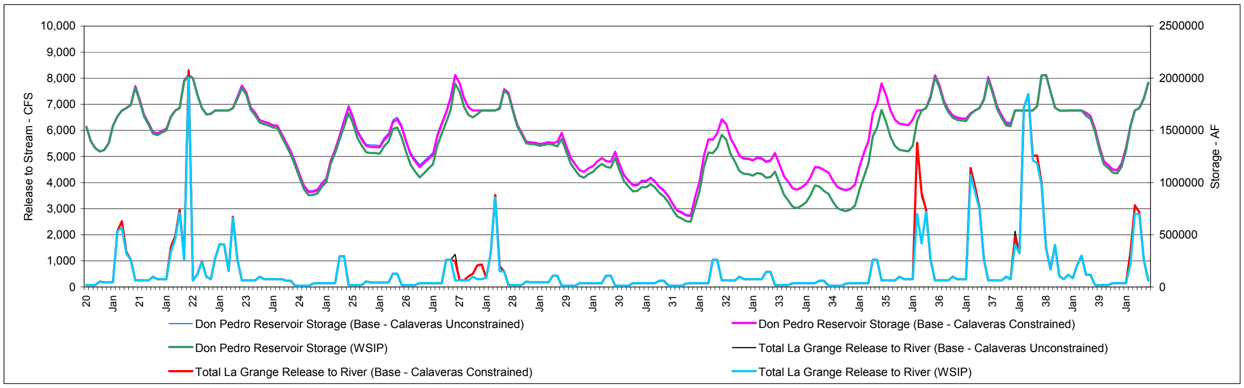
2.6 Don Pedro Reservoir and La Grange Releases

A change in Don Pedro Reservoir operation is caused by changes in inflow to the reservoir. The changes in inflow to the reservoir are the result of net changes within the operation of the upstream SFPUC facilities, described previously, and other changes in SFPUC operations associated with diversions to the Holm, Kirkwood, and Moccasin Powerhouses. Figure 2.6-1 illustrates a chronological trace of the simulation of Don Pedro Reservoir storage and Tuolumne River stream releases from La Grange Dam. Figure 2.6-1 presents the results for the WSIP and base settings.

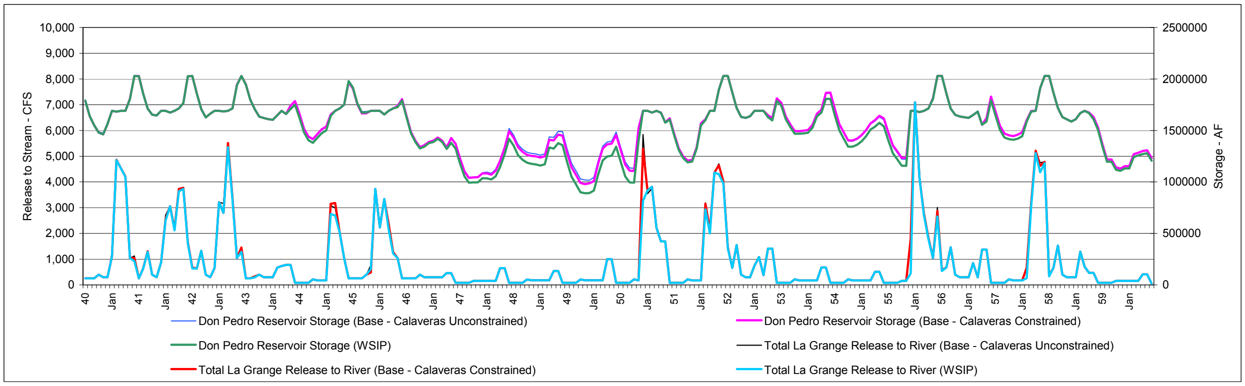
Supplementing the Figure 2.6-1 representation of Don Pedro Reservoir storage are Table 2.6-1 Don Pedro Reservoir Storage (WSIP), Table 2.6-2 Don Pedro Reservoir (Base – Calaveras Constrained), and Table 2.6-3 Difference in Don Pedro Reservoir Storage (WSIP minus Calaveras Constrained). The results illustrate that, throughout many years, the storage in Don Pedro Reservoir associated with the WSIP setting would differ from the storage in the WSIP setting, and that this difference would almost always be less storage. Compared to the base-Calaveras constrained setting, the differences in storage indicate the decreases to the inflow of Don Pedro Reservoir due to greater SFPUC demands and SJPL diversions in the WSIP setting. The decreases in inflow typically occur from winter through early summer. Table 2.6-4 illustrates the difference in inflow to Don Pedro Reservoir between the WSIP and base-Calaveras constrained settings. Generally, the difference is an annual amount of about 30,000 acre-feet, approximating the additional delivery of the SFPUC. The season of inflow reduction is associated with the direct increase in diversion to the SJPL and the replenishment operation of Hetch Hetchy Reservoir. Figure 2.6-2 illustrates the seasonal change in Don Pedro Reservoir inflow, averaged by year type.

Figure 2.6-1
Don Pedro Reservoir Storage and Release below La Grange Dam

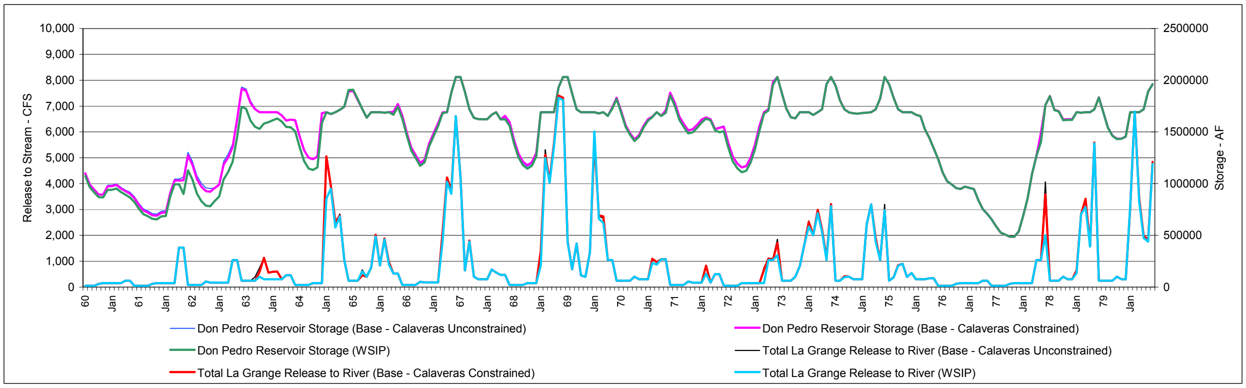
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

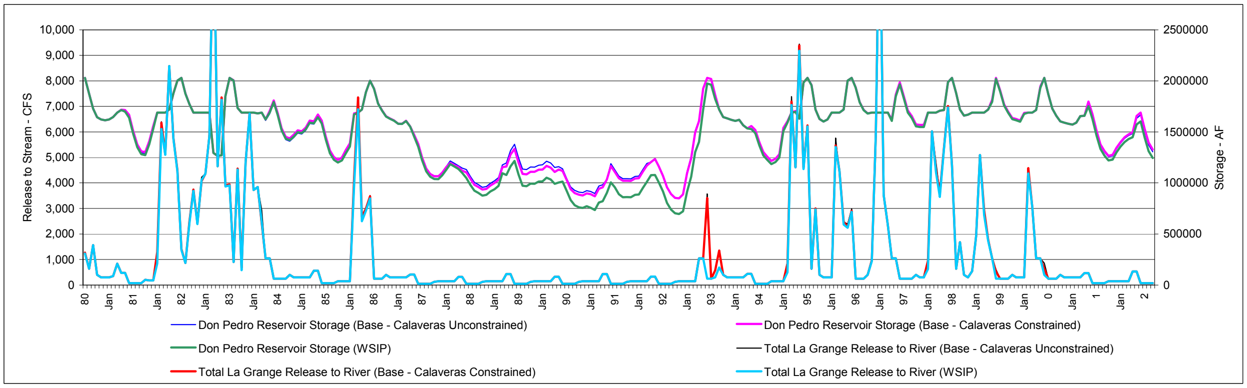


Table 2.6-1

Don Pedro Reservoir Storage (Acre-feet) WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	1,297,919	1,311,969	1,374,649	1,543,191	1,633,956	1,690,000	1,713,000	1,742,154	1,909,912	1,779,947	1,631,674	1,555,087
1922	1,469,116	1,454,308	1,478,601	1,498,765	1,627,062	1,690,000	1,713,000	1,967,567	2,030,000	1,998,041	1,838,188	1,715,718
1923	1,653,081	1,658,408	1,689,999	1,689,989	1,689,997	1,690,000	1,713,000	1,800,909	1,907,182	1,839,107	1,696,444	1,644,854
1924	1,575,009	1,559,343	1,545,325	1,526,919	1,521,632	1,436,947	1,351,927	1,269,310	1,161,839	1,043,035	934,362	880,179
1925	882,358	896,470	960,259	1,002,527	1,178,845	1,285,699	1,415,416	1,536,955	1,665,322	1,567,081	1,426,669	1,354,700
1926	1,290,841	1,282,495	1,282,912	1,276,824	1,347,431	1,393,215	1,513,431	1,529,132	1,430,876	1,291,382	1,169,168	1,105,402
1927	1,050,185	1,089,842	1,136,351	1,175,906	1,353,820	1,468,562	1,577,769	1,698,023	1,948,492	1,868,718	1,722,803	1,645,689
1928	1,624,412	1,655,738	1,690,000	1,690,000	1,689,998	1,690,000	1,705,499	1,881,986	1,844,539	1,680,890	1,538,432	1,460,504
1929	1,376,925	1,368,595	1,365,702	1,352,493	1,361,347	1,369,756	1,363,320	1,347,224	1,419,566	1,296,940	1,183,629	1,119,702
1930	1,063,576	1,047,412	1,082,926	1,102,916	1,146,887	1,178,330	1,151,470	1,143,227	1,235,412	1,119,051	1,014,293	961,444
1931	916,788	919,127	956,563	954,741	986,269	952,973	899,411	865,472	809,514	735,646	675,830	656,304
1932	630,168	625,030	769,521	913,534	1,153,444	1,289,825	1,280,793	1,334,069	1,458,021	1,410,599	1,274,962	1,198,076
1933	1,109,046	1,083,648	1,081,347	1,066,810	1,091,460	1,083,362	1,048,132	1,053,363	1,104,947	995,152	884,663	825,690
1934	768,284	756,532	778,426	811,719	879,231	973,527	961,019	918,806	892,463	818,740	757,348	738,059
1935	727,382	741,020	780,535	934,617	1,058,518	1,183,873	1,442,298	1,526,908	1,697,122	1,581,812	1,437,108	1,350,153
1936	1,313,964	1,305,527	1,299,545	1,353,079	1,589,109	1,690,000	1,713,000	1,808,162	2,006,603	1,908,135	1,758,193	1,675,358
1937	1,622,051	1,600,732	1,594,212	1,588,128	1,654,812	1,690,000	1,713,000	1,792,193	1,987,140	1,852,386	1,706,269	1,621,556
1938	1,547,436	1,538,874	1,689,998	1,689,992	1,689,987	1,690,000	1,690,000	1,730,000	2,025,000	2,030,000	1,870,754	1,718,957
1939	1,690,000	1,689,224	1,690,000	1,690,000	1,689,999	1,690,000	1,640,136	1,609,346	1,485,747	1,318,522	1,176,804	1,138,053
1940	1,095,829	1,088,559	1,152,400	1,306,261	1,540,227	1,690,000	1,713,000	1,807,723	1,954,652	1,788,947	1,638,725	1,550,117
1941	1,479,514	1,463,206	1,562,630	1,689,993	1,683,096	1,690,000	1,690,000	1,803,646	2,030,000	2,027,475	1,857,774	1,712,174
1942	1,653,602	1,645,974	1,689,999	1,689,982	1,673,445	1,690,000	1,713,000	1,765,000	2,027,000	2,030,000	1,860,016	1,707,840
1943	1,626,500	1,664,178	1,690,000	1,689,976	1,683,949	1,690,000	1,713,000	1,939,650	2,030,000	1,944,494	1,798,476	1,708,539
1944	1,635,548	1,622,064	1,610,321	1,603,274	1,647,456	1,690,000	1,658,867	1,707,586	1,750,208	1,623,490	1,481,831	1,404,426
1945	1,379,794	1,427,821	1,474,257	1,500,550	1,640,388	1,690,000	1,713,000	1,750,490	1,979,080	1,915,904	1,761,716	1,673,833
1946	1,676,003	1,690,000	1,689,996	1,689,984	1,655,146	1,690,000	1,713,000	1,726,923	1,791,308	1,626,984	1,471,391	1,384,998
1947	1,325,797	1,342,234	1,375,560	1,387,779	1,418,570	1,388,085	1,320,233	1,380,276	1,321,244	1,180,640	1,055,294	992,073
1948	995,836	997,103	1,035,726	1,034,852	1,022,922	1,055,342	1,146,487	1,267,945	1,418,003	1,353,141	1,259,749	1,215,428
1949	1,186,203	1,175,712	1,170,472	1,158,924	1,171,007	1,335,110	1,324,533	1,376,033	1,357,651	1,195,392	1,052,328	977,511
1950	899,485	889,413	892,224	916,879	1,074,192	1,209,417	1,247,067	1,254,186	1,342,400	1,193,086	1,052,952	994,465
1951	991,837	1,395,953	1,689,996	1,689,971	1,673,951	1,690,000	1,671,280	1,576,052	1,604,719	1,451,209	1,311,422	1,232,085
1952	1,190,739	1,198,448	1,320,040	1,549,021	1,599,117	1,690,000	1,690,000	1,895,000	2,030,000	2,030,000	1,869,932	1,719,140
1953	1,632,895	1,622,960	1,637,300	1,689,996	1,689,998	1,690,000	1,627,805	1,597,670	1,787,254	1,742,396	1,609,381	1,534,414
1954	1,468,628	1,467,830	1,471,472	1,478,272	1,527,241	1,636,809	1,674,641	1,806,537	1,806,600	1,646,548	1,500,604	1,422,171
1955	1,342,774	1,342,526	1,360,811	1,393,387	1,443,658	1,509,285	1,536,773	1,574,515	1,539,789	1,404,270	1,279,178	1,220,548
1956	1,157,629	1,156,262	1,690,000	1,689,942	1,678,244	1,690,000	1,713,000	1,804,719	2,030,000	2,030,000	1,859,576	1,712,725
1957	1,651,881	1,635,922	1,627,970	1,622,414	1,650,203	1,683,085	1,554,764	1,585,676	1,792,847	1,645,523	1,505,651	1,431,990
1958	1,415,635	1,408,082	1,420,790	1,443,748	1,585,696	1,683,150	1,690,000	1,910,000	2,030,000	2,030,000	1,868,297	1,719,418
1959	1,629,791	1,607,494	1,585,600	1,610,046	1,668,508	1,690,000	1,667,209	1,607,868	1,505,353	1,340,209	1,196,857	1,196,565
1960	1,118,661	1,107,237	1,130,464	1,130,153	1,243,532	1,256,171	1,271,114	1,278,736	1,204,810	1,074,160	965,400	916,155
1961	868,272	867,480	938,355	940,051	952,205	918,282	893,177	866,136	823,008	758,324	704,730	685,442
1962	659,505	654,417	682,152	686,096	873,196	994,305	994,447	900,271	1,129,751	1,038,952	902,181	829,505
1963	786,793	780,752	831,071	876,126	1,043,308	1,111,390	1,211,258	1,448,431	1,743,224	1,723,618	1,607,530	1,548,750
1964	1,530,117	1,579,681	1,595,347	1,613,453	1,629,939	1,600,004	1,547,600	1,544,300	1,506,555	1,351,609	1,216,652	1,145,766
1965	1,132,274	1,155,586	1,587,084	1,689,972	1,672,299	1,690,000	1,713,000	1,744,617	1,904,454	1,906,417	1,816,850	1,723,010
1966	1,638,053	1,690,000	1,689,998	1,689,996	1,685,995	1,690,000	1,666,092	1,743,542	1,626,186	1,462,164	1,318,555	1,247,974
1967	1,172,070	1,205,602	1,359,294	1,458,308	1,556,141	1,679,371	1,690,000	1,880,000	2,030,000	2,030,000	1,885,243	1,717,656
1968	1,636,802	1,624,597	1,622,733	1,622,938	1,666,603	1,690,000	1,620,006	1,623,104	1,560,312	1,393,242	1,257,826	1,180,125
1969	1,143,709	1,173,021	1,262,503	1,689,994	1,689,990	1,690,000	1,690,000	1,930,000	2,030,000	2,030,000	1,871,603	1,717,046
1970	1,690,000	1,690,000	1,689,999	1,689,952	1,679,633	1,690,000	1,655,509	1,725,894	1,817,297	1,687,171	1,550,130	1,472,003
1971	1,411,974	1,454,887	1,541,936	1,607,844	1,641,860	1,690,000	1,654,817	1,684,314	1,852,122	1,751,886	1,618,308	1,548,737
1972	1,486,524	1,495,072	1,538,668	1,589,139	1,627,917	1,610,864	1,516,947	1,496,024	1,505,254	1,347,538	1,216,200	1,149,557
1973	1,110,879	1,123,889	1,205,959	1,334,754	1,514,370	1,676,817	1,708,199	1,954,560	2,030,000	1,868,018	1,723,820	1,640,583
1974	1,631,540	1,690,000	1,689,998	1,689,983	1,662,882	1,690,000	1,717,600	1,963,440	2,030,000	1,947,206	1,804,319	1,717,373
1975	1,688,940	1,679,043	1,677,497	1,682,835	1,684,941	1,690,000	1,717,600	1,822,763	2,030,000	1,959,911	1,829,920	1,720,415
1976	1,690,000	1,690,000	1,690,000	1,664,706	1,652,292	1,526,598	1,445,307	1,341,473	1,236,083	1,107,685	1,022,829	992,425
1977	956,011	948,887	970,778	958,850	947,176	838,580	752,503	707,496	653,830	583,546	526,720	507,835
1978	487,414	485,146	537,432	682,534	851,424	1,090,274	1,269,016	1,400,571	1,761,000	1,845,209	1,711,253	1,699,232
1979	1,613,622	1,616,696	1,615,753	1,689,998	1,684,439	1,690,000	1,690,000	1,717,600	1,832,211	1,682,213	1,538,195	1,461,600
1980	1,430,197	1,432,910	1,452,944	1,689,976	1,689,987	1,690,000	1,717,600	1,890,400	1,960,200	2,030,000	1,874,603	1,727,346
1981	1,644,248	1,621,877	1,614,080	1,621,636	1,645,736	1,690,000	1,713,995	1,699,243	1,639,415	1,478,412	1,349,907	1,281,733
1982	1,272,860	1,379,771	1,530,515	1,689,994	1,689,988	1,690,000	1,717,600	1,876,400	2,002,900	2,030,000	1,873,946	1,772,100
1983	1,690,000	1,690,000	1,689,995	1,689,966	1,689,989	1,294,700	1,264,000	1,270,800	1,851,400	2,030,000	2,002,394	1,735,008
1984	1,690,000	1,690,000	1,689,992	1,689,971	1,681,440	1,690,000	1,622,221	1,691,426	1,791,689	1,663,465	1,516,873	1,433,460
1985	1,418,439	1,453,549	1,497,928	1,488,516	1,523,571	1,591,651	1,584,754	1,644,256	1,582,430	1,421,974	1,290,376	1,226,486
1986	1,199,500	1,220,692	1,292,278	1,357,285	1,669,715	1,690,000	1,717,600	1,888,300	2,001,400	1,921,826	1,777,583	1,709,211
1987	1,650,077	1,628,032	1,609,483	1,578,362	1,577,562	1,606,421	1,550,898	1,452,868	1,354,008	1,222,826	1,114,464	1,061,192
1988	1,038,470	1,037,567	1,073,751	1,127,570	1,183,427	1,160,444	1,137,556	1,097,677	1,048,582	981,891	923,960	902,169
1989	875,584	883,086	915,766	939,421	971,389	1,095,309	1,078,946	1,161,500	1,214,779	1,082,548	972,611	967,469
1990	994,107	992,645	1,012,533	1,015,239	1,050,737	1,033,997	990,403	1,005,220	1,012,241	923,156	831,603	781,902
1991	760,675	754,101	772,318	756,988	734,639	808,384	821,556	901,729	1,005,632	957,374	889,470	860,058
1992	861,478	860,106	882,529	887,270	951,046	1,010,560	1,076,245	1,078,931	1,005,240	915,151	803,103	738,800
1993	702,039	695,670	721,477	911,042	1,060,777	1,301,608	1,402,622	1,721,015	1,975,772	1,961,162	1,822,521	1,719,662
1994	1,646,166	1,631,950	1,617,800	1,607,849	1,617,912	1,565,143	1,533,295	1,527,858	1,486,808	1,367,864	1,270,429	1,224,486
1995	1,185,105	1,204,907	1,249,690	1,507,208	1,592,626	1,690,000	1,695,046	1,629,700	1,982,800	2,030,000	1,957,746	1,718,604
1996	1,625,966	1,600,351	1,621,669	1,689,837	1,689,990	1,690,000	1,717,600	2,002,400	2,030,000	1,934,433	1,789,218	1,712,746
1997	1,679,576	1,690,000	1,689,993	1,689,875	1,689,994	1,690,000	1,607,102	1,849,805	1,965,905	1,829,245	1,689,885	1,635,625
1998	1,553,690	1,547,294	1,548,700	1,689,997	1,689,989	1,690,000	1,707,834	1,714,000	1,987,500	2,030,000	1,881,075	1,719,248
1999	1,658,952	1,669,423	1,690,000	1,689,986	1,689,990	1,690,000	1,717,600	1,793,754	2,020,634	1,895,297	1,757,301	1,687,752
2000	1,624,814	1,614,823	1,599,179	1,675,115	1,689,992	1,690,000	1,713,910	1,930,118	2,030,000	1,869,201	1,728,017	1,657,692
2001	1,603,232	1,590,888	1,579,361	1,571,337	1,589,625	1,655,516	1,658,030	1,752,325	1,626,260	1,466,757	1,332,053	1,267,353
2002	1,220,381	1,229,204	1,298,576	1,353,992	1,401,083	1,429,659	1,447,448	1,573,566	1,603,699	1,445,465	1,311,155	1,243,321
Avg (21-02)	1,311,258	1,320,206	1,364,659	1,409,799	1,461,002	1,494,785	1,500,016	1,568,523	1,654,063	1,565,510	1,437,040	1,357,080

Table 2.6-2

Don Pedro Reservoir Storage (Acre-feet)

Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	1,298,116	1,312,166	1,374,846	1,543,388	1,634,035	1,690,000	1,713,000	1,745,744	1,922,480	1,794,738	1,646,401	1,569,766
1922	1,483,764	1,468,948	1,493,242	1,513,410	1,632,921	1,690,000	1,713,000	1,977,208	2,030,000	2,000,320	1,839,774	1,715,715
1923	1,653,078	1,658,406	1,689,999	1,689,989	1,689,997	1,690,000	1,713,000	1,820,205	1,928,620	1,862,730	1,719,964	1,668,299
1924	1,598,406	1,582,728	1,568,711	1,550,312	1,545,026	1,460,333	1,378,419	1,299,558	1,191,983	1,073,043	964,229	909,938
1925	912,051	926,145	989,936	1,032,212	1,208,533	1,315,376	1,449,872	1,592,106	1,722,494	1,626,279	1,485,599	1,413,429
1926	1,349,447	1,341,068	1,342,001	1,335,930	1,406,789	1,451,975	1,579,452	1,605,196	1,530,198	1,390,251	1,267,579	1,203,484
1927	1,148,064	1,187,666	1,227,580	1,267,160	1,445,082	1,559,790	1,668,910	1,815,946	2,030,000	1,952,155	1,805,231	1,718,301
1928	1,690,000	1,690,000	1,689,999	1,690,000	1,689,998	1,690,000	1,713,000	1,895,368	1,860,082	1,696,367	1,553,839	1,475,861
1929	1,392,250	1,383,911	1,381,019	1,367,814	1,376,669	1,385,072	1,378,621	1,388,388	1,475,214	1,352,334	1,238,768	1,174,656
1930	1,118,416	1,102,222	1,137,738	1,157,744	1,201,718	1,233,141	1,206,229	1,198,406	1,292,609	1,175,991	1,070,973	1,017,929
1931	973,151	975,457	1,012,896	1,011,091	1,042,623	1,009,306	955,687	921,592	865,431	791,298	731,212	711,489
1932	685,236	680,066	855,944	1,007,181	1,258,036	1,414,788	1,410,604	1,472,532	1,606,361	1,560,550	1,424,224	1,346,829
1933	1,257,492	1,232,011	1,229,716	1,215,222	1,239,883	1,231,730	1,201,713	1,212,118	1,282,354	1,174,034	1,062,712	1,003,113
1934	945,319	933,463	952,031	986,209	1,051,192	1,148,525	1,144,916	1,121,547	1,096,288	1,021,604	959,237	939,233
1935	928,117	941,636	981,161	1,150,737	1,288,340	1,396,009	1,659,231	1,753,551	1,949,593	1,835,467	1,689,641	1,601,844
1936	1,565,134	1,556,556	1,550,590	1,604,141	1,689,990	1,690,000	1,713,000	1,825,876	2,026,466	1,930,192	1,780,152	1,697,248
1937	1,643,897	1,622,565	1,616,040	1,609,976	1,663,235	1,690,000	1,713,000	1,801,952	2,005,813	1,873,257	1,727,048	1,642,270
1938	1,568,107	1,559,534	1,689,998	1,689,992	1,689,987	1,690,000	1,690,000	1,730,000	2,025,000	2,030,000	1,870,754	1,718,957
1939	1,690,000	1,689,224	1,690,000	1,690,000	1,689,999	1,690,000	1,669,327	1,636,942	1,515,456	1,348,095	1,206,241	1,167,392
1940	1,125,107	1,117,821	1,181,093	1,334,247	1,549,893	1,690,000	1,713,000	1,801,778	1,953,690	1,787,989	1,637,771	1,549,166
1941	1,478,565	1,462,258	1,562,498	1,689,993	1,683,010	1,690,000	1,690,000	1,806,900	2,030,000	2,029,753	1,859,361	1,712,171
1942	1,653,599	1,645,971	1,689,999	1,689,981	1,673,445	1,690,000	1,713,000	1,765,000	2,027,000	2,030,000	1,860,016	1,707,840
1943	1,626,500	1,664,178	1,690,000	1,689,976	1,683,949	1,690,000	1,713,000	1,944,781	2,030,000	1,946,772	1,800,744	1,708,535
1944	1,635,544	1,622,060	1,610,317	1,603,271	1,647,454	1,690,000	1,658,867	1,740,532	1,785,253	1,660,664	1,518,838	1,441,309
1945	1,416,600	1,464,606	1,511,043	1,537,346	1,655,108	1,690,000	1,713,000	1,750,891	1,968,546	1,907,693	1,753,542	1,665,684
1946	1,667,870	1,690,000	1,689,996	1,689,984	1,655,146	1,690,000	1,713,000	1,737,919	1,804,474	1,640,094	1,484,441	1,398,004
1947	1,338,776	1,355,205	1,388,532	1,400,755	1,431,546	1,401,057	1,333,192	1,426,886	1,369,899	1,229,070	1,103,503	1,040,119
1948	1,043,781	1,045,021	1,083,645	1,082,785	1,070,859	1,108,634	1,204,592	1,330,504	1,494,586	1,431,653	1,337,895	1,293,308
1949	1,263,923	1,253,389	1,248,152	1,236,661	1,248,749	1,409,959	1,403,593	1,458,528	1,449,077	1,286,396	1,142,917	1,067,793
1950	989,574	979,449	986,869	1,008,124	1,180,789	1,325,119	1,363,581	1,371,695	1,456,605	1,308,149	1,167,490	1,108,617
1951	1,105,750	1,520,227	1,689,993	1,689,971	1,673,951	1,690,000	1,674,296	1,580,080	1,618,032	1,466,740	1,326,882	1,247,492
1952	1,206,114	1,213,815	1,335,408	1,569,493	1,607,306	1,690,000	1,690,000	1,895,000	2,030,000	2,030,000	1,869,932	1,719,140
1953	1,632,895	1,622,960	1,637,300	1,689,996	1,689,998	1,690,000	1,647,636	1,620,036	1,811,754	1,769,068	1,635,938	1,560,884
1954	1,495,044	1,494,231	1,497,874	1,504,682	1,553,652	1,663,210	1,701,018	1,866,077	1,868,149	1,707,833	1,561,614	1,482,979
1955	1,403,454	1,403,172	1,421,459	1,454,053	1,504,329	1,569,934	1,599,724	1,641,321	1,617,417	1,481,549	1,356,100	1,297,208
1956	1,234,131	1,232,721	1,689,998	1,689,942	1,678,244	1,690,000	1,713,000	1,813,047	2,030,000	2,030,000	1,859,576	1,712,725
1957	1,651,881	1,635,922	1,627,970	1,622,414	1,650,203	1,683,085	1,554,764	1,619,645	1,828,911	1,683,711	1,543,668	1,469,881
1958	1,453,447	1,445,872	1,458,581	1,481,551	1,600,819	1,689,196	1,690,000	1,910,000	2,030,000	2,030,000	1,868,297	1,719,418
1959	1,629,791	1,607,494	1,585,600	1,610,046	1,668,508	1,690,000	1,673,092	1,630,483	1,527,892	1,362,645	1,219,188	1,218,822
1960	1,140,872	1,129,435	1,152,664	1,152,359	1,269,185	1,283,225	1,299,668	1,306,406	1,230,714	1,099,946	991,067	941,733
1961	893,793	892,985	973,250	974,956	987,113	953,177	928,036	902,160	858,902	794,048	740,282	720,867
1962	694,851	689,743	717,480	721,434	908,537	1,029,633	1,029,740	1,033,729	1,270,469	1,181,313	1,043,881	970,704
1963	927,682	921,558	956,090	988,740	1,184,189	1,252,220	1,351,952	1,618,330	1,914,402	1,896,333	1,779,493	1,720,157
1964	1,690,000	1,690,000	1,690,000	1,689,998	1,689,999	1,660,043	1,609,884	1,618,868	1,612,810	1,457,385	1,321,936	1,250,696
1965	1,236,988	1,260,242	1,681,588	1,689,959	1,671,262	1,690,000	1,713,000	1,743,310	1,890,878	1,895,178	1,807,939	1,723,024
1966	1,638,067	1,690,000	1,689,998	1,689,996	1,685,637	1,690,000	1,693,170	1,769,033	1,653,800	1,489,654	1,345,919	1,275,244
1967	1,199,284	1,232,801	1,386,494	1,485,516	1,583,351	1,689,346	1,690,000	1,880,000	2,030,000	2,030,000	1,887,521	1,717,653
1968	1,636,798	1,624,593	1,622,729	1,622,934	1,666,601	1,690,000	1,620,006	1,655,235	1,594,542	1,427,317	1,291,743	1,213,928
1969	1,177,443	1,206,736	1,296,220	1,689,989	1,689,990	1,690,000	1,690,000	1,930,000	2,030,000	2,030,000	1,871,603	1,717,046
1970	1,690,000	1,690,000	1,689,999	1,689,955	1,678,444	1,690,000	1,655,509	1,736,527	1,830,101	1,702,198	1,565,091	1,486,913
1971	1,426,854	1,469,758	1,556,808	1,622,720	1,647,812	1,690,000	1,654,817	1,709,507	1,879,438	1,781,361	1,647,656	1,577,988
1972	1,515,715	1,524,247	1,567,844	1,618,323	1,639,592	1,622,536	1,528,607	1,539,355	1,550,642	1,392,720	1,261,172	1,194,378
1973	1,155,608	1,168,592	1,250,664	1,379,472	1,559,092	1,690,000	1,717,600	1,980,594	2,030,000	1,868,018	1,723,820	1,640,583
1974	1,631,540	1,690,000	1,689,998	1,689,982	1,662,881	1,690,000	1,717,600	1,962,884	2,030,000	1,949,484	1,806,587	1,717,369
1975	1,688,936	1,679,039	1,677,494	1,682,832	1,684,940	1,690,000	1,717,600	1,821,847	2,030,000	1,962,190	1,831,507	1,720,413
1976	1,690,000	1,690,000	1,690,000	1,664,706	1,652,292	1,526,598	1,445,307	1,341,473	1,236,083	1,107,685	1,022,829	992,425
1977	956,011	948,887	970,778	958,850	947,176	838,580	752,503	707,496	653,830	583,546	526,720	507,835
1978	487,414	485,146	537,432	682,534	851,424	1,090,274	1,269,016	1,488,474	1,761,000	1,847,487	1,713,521	1,701,803
1979	1,620,362	1,623,433	1,622,490	1,689,997	1,684,438	1,690,000	1,690,000	1,717,600	1,834,417	1,684,409	1,540,382	1,463,780
1980	1,432,372	1,435,084	1,455,118	1,689,976	1,689,987	1,690,000	1,717,600	1,890,400	1,960,200	2,030,000	1,874,603	1,727,346
1981	1,644,248	1,621,877	1,614,080	1,621,636	1,645,736	1,690,000	1,716,204	1,714,121	1,667,678	1,506,550	1,377,916	1,309,646
1982	1,300,713	1,407,609	1,558,354	1,689,990	1,689,988	1,690,000	1,717,600	1,876,400	2,002,900	2,030,000	1,876,224	1,772,100
1983	1,690,000	1,690,000	1,689,995	1,689,966	1,689,989	1,294,700	1,264,000	1,270,800	1,851,400	2,030,000	2,004,672	1,735,004
1984	1,690,000	1,690,000	1,689,992	1,689,971	1,681,440	1,690,000	1,622,418	1,705,632	1,808,055	1,682,040	1,535,365	1,451,890
1985	1,436,830	1,471,930	1,516,310	1,506,903	1,541,959	1,610,032	1,603,118	1,669,756	1,610,051	1,449,470	1,317,745	1,253,762
1986	1,226,720	1,247,897	1,325,042	1,388,140	1,680,601	1,690,000	1,717,600	1,888,300	2,001,400	1,924,104	1,779,851	1,711,472
1987	1,652,333	1,630,287	1,611,738	1,580,618	1,579,818	1,608,676	1,553,151	1,468,714	1,381,326	1,250,018	1,141,533	1,088,170
1988	1,065,391	1,064,473	1,100,658	1,154,485	1,196,684	1,173,696	1,156,372	1,118,792	1,103,568	1,041,615	983,401	961,401
1989	934,685	942,151	974,835	998,508	1,030,480	1,154,378	1,160,815	1,277,670	1,332,756	1,199,993	1,089,517	1,083,975
1990	1,110,369	1,108,840	1,128,734	1,131,473	1,166,980	1,150,197	1,106,490	1,131,895	1,118,630	1,029,055	936,990	900,804
1991	884,701	878,055	897,800	890,380	869,583	943,276	956,310	1,033,067	1,166,236	1,106,542	1,046,761	1,020,572
1992	1,021,642	1,020,177	1,042,607	1,047,396	1,111,184	1,170,639	1,205,199	1,234,517	1,160,292	1,069,490	956,699	891,852
1993	854,759	848,295	888,089	1,093,297	1,243,083	1,495,226	1,605,426	1,924,275	2,030,000	2,017,436	1,861,705	1,719,599
1994	1,646,103	1,631,887	1,617,737	1,607,786	1,617,849	1,565,080	1,533,232	1,557,907	1,518,961	1,399,871	1,302,285	1,256,235
1995	1,216,788	1,236,573	1,281,357	1,538,884	1,605,298	1,690,000	1,704,249	1,629,700	1,982,800	2,030,000	1,960,024	1,718,601
1996	1,625,962	1,600,348	1,621,665	1,689,833	1,689,990	1,690,000	1,717,600	2,002,400	2,030,000	1,936,711	1,791,487	1,715,008
1997	1,681,833	1,690,000	1,689,993	1,689,873	1,689,994	1,690,000	1,620,816	1,865,766	1,984,020	1,849,561	1,710,113	1,655,788
1998	1,573,813	1,567,406	1,568,813	1,689,994	1,689,989	1,690,000	1,706,362	1,714,000	1,987,500	2,030,000	1,881,075	1,719,248
1999	1,658,952	1,669,423	1,690,000	1,689,986	1,689,990	1,690,000	1,717,600	1,814,340	2,030,000	1,906,901	1,768,854	1,699,268
2000	1,636,307	1,626,310	1,610,667	1,686,605	1,689,992	1,690,000	1,713,910	1,942,683	2,030,000	1,869,201	1,728,017	1,657,692
2001	1,603,232	1,590,888	1,579,361	1,571,337	1,589,625	1,655,516	1,658,030	1,797,220	1,672,911	1,513,200	1,378,282	1,313,424
2002	1,266,355	1,275,152	1,344,526	1,399,956	1,447,050	1,475,610	1,493,354	1,656,960	1,689,021	1,530,407	1,395,706	1,327,581
Avg (21-02)	1,352,497	1,360,634	1,402,162	1,445,244	1,492,954	1,524,255	1,531,400	1,611,872	1,696,701	1,608,792	1,480,132	1,399,534

Table 2.6-3

Difference in Don Pedro Reservoir Storage (Acre-feet)

WSIP minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	-197	-197	-197	-197	-79	0	0	-3,590	-12,568	-14,791	-14,727	-14,679
1922	-14,648	-14,640	-14,641	-14,645	-5,859	0	0	-9,641	0	-2,279	-1,586	3
1923	3	2	0	0	0	0	0	-19,296	-21,438	-23,623	-23,520	-23,445
1924	-23,397	-23,385	-23,386	-23,393	-23,394	-23,386	-26,492	-30,248	-30,144	-30,008	-29,867	-29,759
1925	-29,693	-29,675	-29,677	-29,685	-29,688	-29,677	-34,456	-55,151	-57,172	-59,198	-58,930	-58,729
1926	-58,606	-58,573	-59,089	-59,106	-59,358	-58,760	-66,021	-76,064	-99,322	-98,869	-98,411	-98,082
1927	-97,879	-97,824	-91,229	-91,254	-91,262	-91,228	-91,141	-117,923	-81,508	-83,437	-82,428	-72,612
1928	-65,588	-34,262	1	0	0	0	-7,501	-13,382	-15,543	-15,477	-15,407	-15,357
1929	-15,325	-15,316	-15,317	-15,321	-15,322	-15,316	-15,301	-41,164	-55,648	-55,394	-55,139	-54,954
1930	-54,840	-54,810	-54,812	-54,828	-54,831	-54,811	-54,759	-55,179	-57,197	-56,940	-56,680	-56,485
1931	-56,363	-56,330	-56,333	-56,350	-56,354	-56,333	-56,276	-56,120	-55,917	-55,652	-55,382	-55,185
1932	-55,068	-55,036	-86,423	-93,647	-104,592	-124,963	-129,811	-138,463	-148,340	-149,951	-149,262	-148,753
1933	-148,446	-148,363	-148,369	-148,412	-148,423	-148,368	-153,581	-158,755	-177,407	-178,882	-178,049	-177,423
1934	-177,035	-176,931	-173,605	-174,490	-171,961	-174,998	-183,897	-202,741	-203,825	-202,864	-201,889	-201,174
1935	-200,735	-200,616	-200,626	-216,120	-229,822	-212,136	-216,933	-226,643	-252,471	-253,655	-252,533	-251,691
1936	-251,170	-251,029	-251,045	-251,062	-100,881	0	0	-17,714	-19,863	-22,057	-21,959	-21,890
1937	-21,846	-21,833	-21,828	-21,848	-8,423	0	0	-9,759	-18,673	-20,871	-20,779	-20,714
1938	-20,671	-20,660	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	-29,191	-27,596	-29,709	-29,573	-29,437	-29,339
1940	-29,278	-29,262	-28,693	-27,986	-9,666	0	0	5,945	962	958	954	951
1941	949	948	132	0	86	0	0	-3,254	0	-2,278	-1,587	3
1942	3	3	0	1	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	-5,131	0	-2,278	-2,268	4
1944	4	4	4	3	2	0	0	-32,946	-35,045	-37,174	-37,007	-36,883
1945	-36,806	-36,785	-36,786	-36,796	-14,720	0	0	-401	10,534	8,211	8,174	8,149
1946	8,133	0	0	0	0	0	0	-10,996	-13,166	-13,110	-13,050	-13,006
1947	-12,979	-12,971	-12,972	-12,976	-12,976	-12,972	-12,959	-46,610	-48,655	-48,430	-48,209	-48,046
1948	-47,945	-47,918	-47,919	-47,933	-47,937	-53,292	-58,105	-62,559	-76,583	-78,512	-78,146	-77,880
1949	-77,720	-77,677	-77,680	-77,737	-77,742	-74,849	-79,060	-82,495	-91,426	-91,004	-90,589	-90,282
1950	-90,089	-90,036	-94,645	-91,245	-106,597	-115,702	-116,514	-117,509	-114,205	-115,063	-114,538	-114,152
1951	-113,913	-124,274	3	0	0	0	-3,016	-4,028	-13,313	-15,531	-15,460	-15,407
1952	-15,375	-15,367	-15,368	-20,472	-8,189	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	-19,831	-22,366	-24,500	-26,672	-26,557	-26,470
1954	-26,416	-26,401	-26,402	-26,410	-26,411	-26,401	-26,377	-59,540	-61,549	-61,285	-61,010	-60,808
1955	-60,680	-60,646	-60,648	-60,666	-60,671	-60,649	-62,951	-66,806	-77,628	-77,279	-76,922	-76,660
1956	-76,502	-76,459	2	0	0	0	0	-8,328	0	0	0	0
1957	0	0	0	0	0	0	0	-33,969	-36,064	-38,188	-38,017	-37,891
1958	-37,812	-37,790	-37,791	-37,803	-15,123	-6,046	0	0	0	0	0	0
1959	0	0	0	0	0	0	-5,883	-22,615	-22,539	-22,436	-22,331	-22,257
1960	-22,211	-22,198	-22,200	-22,206	-25,653	-27,054	-28,554	-27,670	-25,904	-25,786	-25,667	-25,578
1961	-25,521	-25,505	-34,895	-34,905	-34,908	-34,895	-34,859	-36,024	-35,894	-35,724	-35,552	-35,425
1962	-35,346	-35,326	-35,328	-35,338	-35,341	-35,328	-35,293	-133,458	-140,718	-142,361	-141,700	-141,199
1963	-140,889	-140,806	-125,019	-112,614	-140,881	-140,830	-140,694	-169,899	-171,178	-172,715	-171,963	-171,407
1964	-159,883	-110,319	-94,653	-76,545	-60,060	-60,039	-62,284	-74,568	-106,255	-105,776	-105,284	-104,930
1965	-104,714	-104,656	-94,504	13	1,037	0	0	1,307	13,576	11,239	8,911	-14
1966	-14	0	0	0	358	0	-27,078	-25,491	-27,614	-27,490	-27,364	-27,270
1967	-27,214	-27,199	-27,200	-27,208	-27,210	-9,975	0	0	0	0	-2,278	3
1968	4	4	4	4	2	0	0	-32,131	-34,230	-34,075	-33,917	-33,803
1969	-33,734	-33,715	-33,717	5	0	0	0	0	0	0	0	0
1970	0	0	0	-3	1,189	0	0	-10,633	-12,804	-15,027	-14,961	-14,910
1971	-14,880	-14,871	-14,872	-14,876	-5,952	0	0	-25,193	-27,316	-29,475	-29,348	-29,251
1972	-29,191	-29,175	-29,176	-29,184	-11,675	-11,672	-11,660	-43,331	-45,388	-45,182	-44,972	-44,821
1973	-44,729	-44,703	-44,705	-44,718	-44,722	-13,183	-9,401	-26,034	0	0	0	0
1974	0	0	0	1	1	0	0	556	0	-2,278	-2,268	4
1975	4	4	3	3	1	0	0	916	0	-2,279	-1,587	2
1976	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	-87,903	0	-2,278	-2,268	-2,571
1979	-6,740	-6,737	-6,737	1	1	0	0	0	-2,206	-2,196	-2,187	-2,180
1980	-2,175	-2,174	-2,174	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	-2,209	-14,878	-28,263	-28,138	-28,009	-27,913
1982	-27,853	-27,838	-27,839	4	0	0	0	0	0	0	-2,278	0
1983	0	0	0	0	0	0	0	0	0	0	-2,278	4
1984	0	0	0	0	0	0	-197	-14,206	-16,366	-18,575	-18,492	-18,430
1985	-18,391	-18,381	-18,382	-18,387	-18,388	-18,381	-18,364	-25,500	-27,621	-27,496	-27,369	-27,276
1986	-27,220	-27,205	-32,764	-30,855	-10,886	0	0	0	0	-2,278	-2,268	-2,261
1987	-2,256	-2,255	-2,255	-2,256	-2,256	-2,255	-2,253	-15,846	-27,318	-27,192	-27,069	-26,978
1988	-26,921	-26,906	-26,907	-26,915	-13,257	-13,252	-18,816	-21,115	-54,986	-59,724	-59,441	-59,232
1989	-59,101	-59,065	-59,069	-59,087	-59,091	-59,069	-81,869	-116,170	-117,977	-117,445	-116,906	-116,506
1990	-116,262	-116,195	-116,201	-116,234	-116,243	-116,200	-116,087	-126,675	-106,389	-105,899	-105,387	-118,902
1991	-124,026	-123,954	-125,482	-133,392	-134,944	-134,892	-134,754	-131,338	-160,604	-149,168	-157,291	-160,514
1992	-160,164	-160,071	-160,078	-160,126	-160,138	-160,079	-128,954	-155,586	-155,052	-154,339	-153,596	-153,052
1993	-152,720	-152,625	-166,612	-182,255	-182,306	-193,618	-202,804	-203,260	-54,228	-56,274	-39,184	63
1994	63	63	63	63	63	63	63	-30,049	-32,153	-32,007	-31,856	-31,749
1995	-31,683	-31,666	-31,667	-31,676	-12,672	0	-9,203	0	0	0	-2,278	3
1996	4	3	4	4	0	0	0	0	0	-2,278	-2,269	-2,262
1997	-2,257	0	0	2	0	0	-13,714	-15,961	-18,115	-20,316	-20,228	-20,163
1998	-20,123	-20,112	-20,113	3	0	0	1,472	0	0	0	0	0
1999	0	0	0	0	0	0	0	-20,586	-9,366	-11,604	-11,553	-11,516
2000	-11,493	-11,487	-11,488	-11,490	0	0	0	-12,565	0	0	0	0
2001	0	0	0	0	0	0	0	-44,895	-46,651	-46,443	-46,229	-46,071
2002	-45,974	-45,948	-45,950	-45,964	-45,967	-45,951	-45,906	-83,394	-85,322	-84,942	-84,551	-84,260
Avg (21-02)	-41,238	-40,428	-37,503	-35,445	-31,952	-29,469	-31,384	-43,349	-42,637	-43,282	-43,091	-42,454

Table 2.6-4

Difference in Don Pedro Reservoir Inflow (Acre-feet)

WSIP minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	-15,646	-3,719	-3,595	-9,004	-2,284	0	0	-34,248
1922	0	0	0	0	0	0	-7,366	-15,337	-4,972	-2,284	0	0	-29,959
1923	0	0	0	0	0	0	-2,209	-19,320	-2,209	-2,284	0	0	-26,022
1924	0	0	0	0	0	0	-3,130	-3,830	0	0	0	0	-6,960
1925	0	0	0	0	0	0	-4,810	-20,810	-2,210	-2,283	0	0	-30,113
1926	0	0	-515	0	-246	576	-7,321	-10,224	-23,557	0	0	0	-41,287
1927	0	0	6,599	0	0	0	0	-27,040	-7,742	-2,284	0	0	-30,467
1928	0	0	0	0	0	-5,339	-18,278	-5,907	-2,210	0	0	0	-31,734
1929	0	0	0	0	0	0	0	-25,937	-14,652	0	0	0	-40,589
1930	0	0	0	0	0	0	0	-562	-2,210	0	0	0	-2,772
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	-31,384	-7,196	-10,937	-20,414	-4,973	-9,004	-10,370	-2,284	0	0	-96,562
1933	0	0	0	0	0	0	-5,359	-5,578	-19,227	-2,284	0	0	-32,448
1934	0	0	3,334	-832	2,543	-3,103	-9,075	-19,352	-1,802	0	0	0	-28,287
1935	0	0	0	-15,432	-13,685	17,605	-5,006	-10,269	-26,617	-2,284	0	0	-55,688
1936	0	0	-6	55	-1,220	-18,127	-5,058	-17,736	-2,210	-2,283	0	0	-46,585
1937	0	0	6	-14	-1,588	-4,659	-3,565	-9,771	-8,961	-2,284	0	0	-30,836
1938	0	0	1,823	0	0	0	-9,143	-18,144	-4,972	-2,284	0	0	-32,720
1939	0	0	0	0	0	0	-29,205	1,523	-2,210	0	0	0	-29,892
1940	0	0	570	715	-7,651	-9,830	-4,388	5,952	-4,972	0	0	0	-19,604
1941	0	0	-815	0	-431	-407	-500	-3,259	-3,959	-2,284	0	0	-11,655
1942	0	0	0	-3,760	0	-3,806	-5,524	-2,854	-2,762	-2,284	0	0	-20,990
1943	0	0	0	0	0	-9,805	-4,972	-5,137	-4,972	-2,284	0	0	-27,170
1944	0	0	0	0	0	0	0	-32,986	-2,210	-2,284	0	0	-37,480
1945	0	0	0	0	0	-15,317	-159	-402	10,952	-2,284	0	0	-7,210
1946	0	0	0	0	0	-13,221	-3,822	-11,009	-2,210	0	0	0	-30,262
1947	0	0	0	0	0	0	0	-33,729	-2,210	0	0	0	-35,939
1948	0	0	0	0	0	-5,375	-4,865	-4,609	-14,265	-2,284	0	0	-31,398
1949	0	0	0	-35	0	2,865	-4,286	-3,647	-9,232	0	0	0	-14,335
1950	0	0	-4,604	3,429	-15,345	-9,146	-925	-1,303	2,900	-1,388	0	0	-26,382
1951	0	-10,428	0	0	0	0	-3,018	-1,020	-9,315	-2,284	0	0	-26,065
1952	0	0	0	-5,099	0	0	0	-21,287	-4,972	-2,284	0	0	-33,642
1953	0	0	0	0	0	0	-19,840	-2,589	-2,210	-2,284	0	0	-26,923
1954	0	0	0	0	0	0	0	-33,268	-2,210	0	0	0	-35,478
1955	0	0	0	0	0	0	-2,361	-4,019	-11,066	0	0	0	-17,446
1956	0	0	-6,515	0	0	-4,354	-2,808	-8,339	-4,971	-2,284	0	0	-29,271
1957	0	0	0	0	0	0	0	-34,012	-2,209	-2,284	0	0	-38,505
1958	0	0	0	0	0	0	0	-15,488	-2,854	-2,284	0	0	-20,626
1959	0	0	0	0	0	0	-5,886	-16,768	0	0	0	0	-22,654
1960	0	0	0	0	-3,446	-1,411	-1,528	811	1,675	0	0	0	-3,899
1961	0	0	-9,388	0	0	0	0	-1,263	0	0	0	0	-10,651
1962	0	0	0	0	0	0	0	-98,391	-7,734	-2,283	0	0	-108,408
1963	0	0	15,794	12,440	-28,258	0	0	-29,610	-1,841	-2,284	0	0	-33,759
1964	0	0	0	0	0	0	-2,303	-12,456	-31,993	0	0	0	-46,752
1965	0	0	10,157	-5,708	-5,156	-14,516	-1,738	1,308	12,293	-2,284	-2,283	0	-7,927
1966	0	0	-4,357	0	-1,791	-6,452	-27,091	1,523	-2,210	0	0	0	-40,378
1967	0	0	0	0	0	-4,509	0	-8,166	0	-2,284	-2,283	0	-17,242
1968	0	0	0	0	0	0	0	-32,172	-2,209	0	0	0	-34,381
1969	0	0	0	0	-7,212	-6,516	-7,734	-5,137	-4,972	-2,284	0	0	-33,855
1970	0	0	0	21,646	-5,953	-17,268	0	-10,645	-2,210	-2,284	0	0	-16,714
1971	0	0	0	0	0	0	0	-25,223	-2,209	-2,283	0	0	-29,715
1972	0	0	0	0	0	0	0	-31,740	-2,210	0	0	0	-33,950
1973	0	0	0	0	0	0	0	-16,677	-2,209	0	0	0	-18,886
1974	0	0	0	-11,435	0	-8,562	-5,524	-5,138	-4,971	-2,283	0	0	-37,913
1975	0	0	0	0	0	0	-8,286	917	-1,039	-2,283	0	0	-10,691
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	-88,018	-6,444	-2,284	0	-310	-97,056
1979	-4,179	0	0	0	0	-19,981	-2,209	-2,283	-2,210	0	0	0	-30,862
1980	0	0	0	6,872	0	-8,562	-4,972	-5,137	-4,972	-2,284	0	0	-19,055
1981	0	0	0	0	0	0	-2,209	-12,690	-13,456	0	0	0	-28,355
1982	0	0	0	0	-13,682	-951	0	-2,854	-2,762	-2,284	-2,283	-2,210	-27,026
1983	-2,949	-1,841	2,664	0	0	0	0	-5,799	-2,762	-2,284	-2,283	0	-15,254
1984	-6,014	0	0	0	0	3,935	-197	-14,028	-2,210	-2,283	0	0	-20,797
1985	0	0	0	0	0	0	0	-7,192	-2,209	0	0	0	-9,401
1986	0	0	-5,558	1,919	3,643	-17,572	-11,300	-5,137	-4,972	-2,284	0	0	-41,261
1987	0	0	0	0	0	0	0	-13,616	-11,547	0	0	0	-25,163
1988	0	0	0	0	13,660	0	-5,580	-2,350	-34,003	-5,001	0	0	-33,274
1989	0	0	0	0	0	0	-22,867	-34,558	-2,210	0	0	0	-59,635
1990	0	0	0	0	0	0	0	-10,905	19,882	0	0	-13,914	-4,937
1991	-5,388	0	-1,522	-7,871	-1,541	0	0	3,054	-29,777	10,725	-8,844	-3,783	-44,947
1992	0	0	0	0	0	0	30,985	-27,000	0	0	0	0	3,985
1993	0	5	-13,980	-15,590	-37	-11,382	-9,377	-962	-39,351	-2,284	0	0	-92,958
1994	0	0	0	0	0	0	0	-30,151	-2,210	0	0	0	-32,361
1995	0	0	0	0	0	4,567	-9,206	-3,806	-3,682	-2,284	-2,283	0	-16,694
1996	0	0	0	0	-3,624	0	-6,813	-2,284	-2,210	-2,283	0	0	-17,214
1997	0	0	0	-12,077	0	0	-13,721	-2,283	-2,210	-2,284	0	0	-32,575
1998	0	0	0	0	0	-6,861	-7,366	-3,900	-3,775	-2,284	0	0	-24,186
1999	0	0	0	0	0	-11,416	-3,074	-20,611	-5,093	-2,284	0	0	-42,478
2000	0	0	0	0	0	0	0	-12,581	-2,210	0	0	0	-14,791
2001	0	0	0	0	0	0	0	-44,951	-1,904	0	0	0	-46,855
2002	0	0	0	0	0	0	0	-37,653	-2,210	0	0	0	-39,863
Avg (21-02)	-226	-150	-460	-463	-1,243	-2,987	-3,703	-13,542	-5,295	-1,173	-247	-247	-29,736

Figure 2.6-2

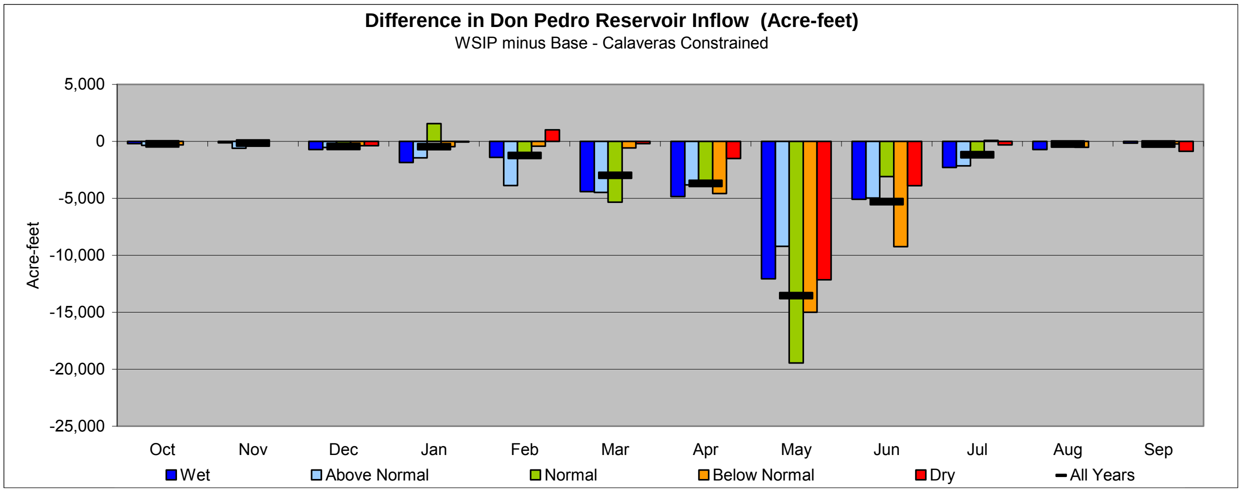


Figure 2.6-1 and Table 2.6-3 illustrate that, during drought sequences, the reduction in inflow to Don Pedro Reservoir can accumulate from year to year. Compared to the base setting, the WSIP would result in lower Don Pedro Reservoir storage during some part of most years, and more predominantly during multi-year drought periods. Figure 2.6-3 illustrates the Don Pedro Reservoir storage for the WSIP setting, averaged by year type. Figure 2.6-4 illustrates the difference in reservoir storage, averaged by year type, in comparing the WSIP and base-Calaveras constrained settings. Also shown is the average difference in storage for the two settings during the 82-year simulation.

Table 2.6-3 illustrates that, in some years (approximately one-third of the years, i.e., the wettest of years), the storage in Don Pedro Reservoir would not be substantially different, because large inflows to the reservoir during these years would require the management of storage (release of flow above minimum stream requirements) to satisfy flood control requirements. During the other years, the reduction in storage could range from a single year's additional diversions by the SFPUC to over 200,000 acre-feet (1993) from the accumulation of several years of additional diversions by the SFPUC. For example, the greatest draw from reservoir storage occurs during the drought of 1976-1977 (during which the WSIP would not cause an incremental additional draw from storage), and the greatest difference in reservoir draw between the base-Calaveras constrained setting and the WSIP occurs during the year of the 1987-1992 drought.

Figure 2.6-5 illustrates the average monthly storage in Don Pedro Reservoir for the 82-year simulation, and the range in storage for each month for the WSIP and base-Calaveras constrained settings. The difference in storage in Don Pedro Reservoir attributed to the upstream effects of the WSIP would affect releases from La Grange Dam to the stream. A difference in the amount of available reservoir space in the winter and spring due to the WSIP would lead to a difference in the ability to regulate inflow, thus potentially changing the amount of water released to the stream that is above minimum release requirements. During periods when inflow differs and Don Pedro Reservoir is at maximum storage capacity within the flood control storage limitation, a change in inflow would directly manifest as a change in release from La Grange Dam (a change in either more or less flow). Figure 2.6-1 illustrates the stream release from La Grange Dam for the WSIP and base settings.

Figure 2.6-3

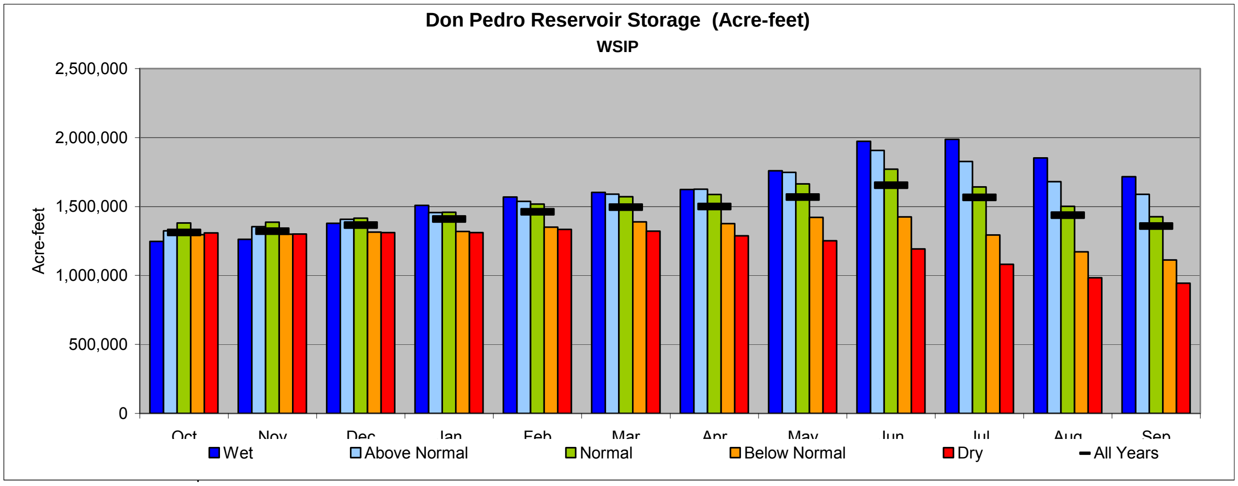


Figure 2.6-4

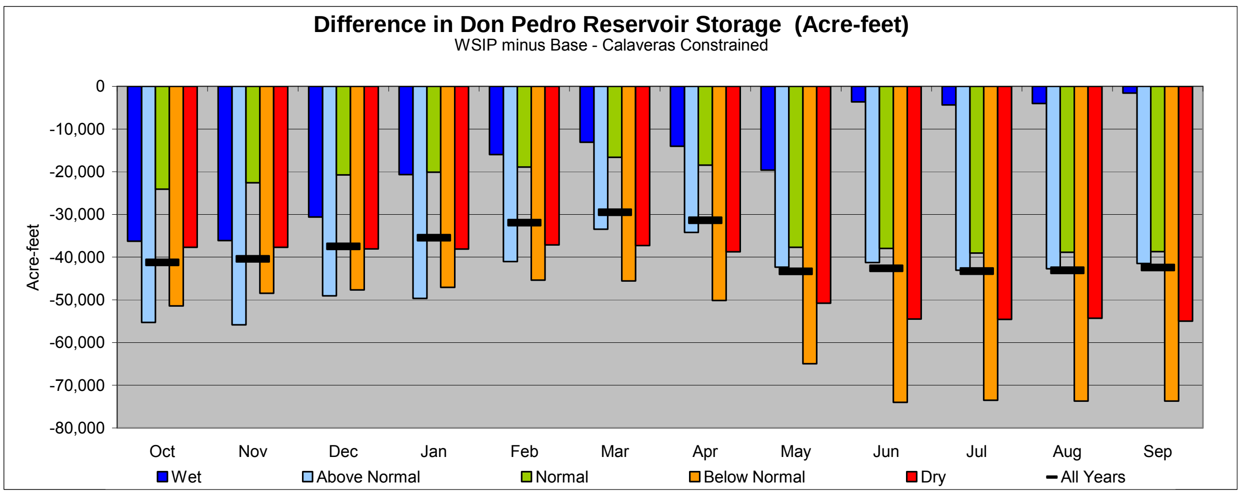
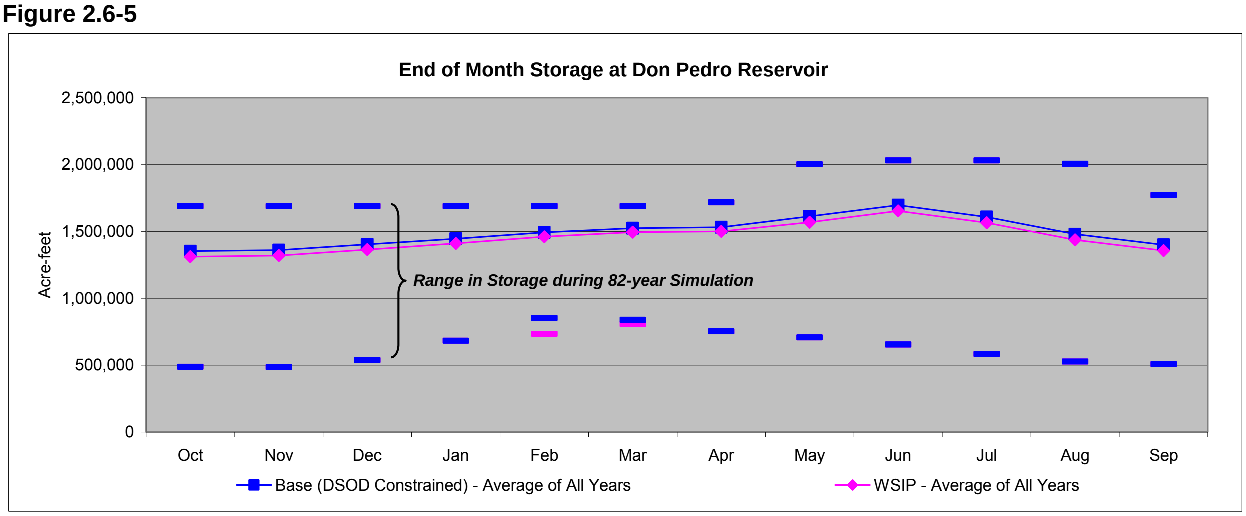


Figure 2.6-5



Supplementing Figure 2.6-1 are Table 2.6-5 and Table 2.6-6, which illustrate the releases to the Tuolumne River from La Grange Dam for the WSIP and base-Calaveras constrained settings. Table 2.6-7 shows the difference in stream releases between the WSIP and base-Calaveras constrained settings. Consistent with the periods showing changes in Don Pedro Reservoir storage, stream releases following the draw down periods would indicate a reduction. The additional depletion of reservoir storage would manifest as a reduction in subsequent releases below La Grange Dam to replenish reservoir storage. The same information shown in Table 2.6-7 is illustrated in Table 2.6-8, arranged in descending order of San Joaquin River index. The differences in releases to the Tuolumne River from La Grange Dam would occur only when there would otherwise be releases in excess of minimum Federal Energy Regulatory Commission (FERC) flow requirements, typically during wetter years. Occasional minor reductions in releases would also occur during winter, when the direct diversion of additional water by the SFPUC would lead to a commensurate reduction in inflow to Don Pedro Reservoir. If Don Pedro Reservoir is passing inflow for flood control, a similar commensurate reduction in release would occur. Table 2.6-7 illustrates the decrease in monthly flow below La Grange Dam that would occur, up to approximately 188,000 acre-feet in one month (June 1993). This reduction is associated with the additional replenishment of Don Pedro Reservoir caused by the additional diversions of the SFPUC during the drought of 1987-1992. The effects of the SFPUC diversions accumulate in Don Pedro Reservoir throughout the drought period. Using an assumption that a change in release volume equates to a delay or acceleration of releasing 6,000 acre-feet per day means that the difference in stream release from La Grange Dam between the WSIP and the base-Calaveras-constrained settings would be a delay in releases above minimum FERC flow requirements up to an entire month. Normally, the effect of the delay in release would not affect the year’s peak stream release rate during a year. However, infrequently, and, in this instance (the WSIP’s affect upon stream releases), an elimination of all flows could occur during this year (rather than an exceedance of minimum FERC flow requirements). Such a large and lengthy reduction in flow would not be common, and would occur only because of the multi-year droughts.

Comparing the WSIP and base-Calaveras constrained settings, Table 2.6-9 illustrates the releases to the Tuolumne River below La Grange Dam; their differences are provided in terms of monthly volumetric flow averaged within year types.

Table 2.6-5

Total La Grange Release to River (Acre-feet)

WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	12,744	10,711	11,068	11,068	119,250	139,412	75,681	64,123	14,876	15,372	15,372	14,876	504,553
1922	24,397	17,852	18,447	18,447	74,949	114,271	168,922	64,123	477,629	15,372	29,587	56,752	1,080,748
1923	24,397	17,852	67,861	101,025	90,321	37,878	158,031	64,123	14,876	15,372	15,372	14,876	621,984
1924	24,397	17,852	18,447	18,447	16,661	18,447	14,380	14,859	2,975	3,074	3,074	2,975	155,588
1925	7,736	8,926	9,223	9,223	8,331	9,223	70,201	72,541	4,463	4,612	4,612	4,463	213,554
1926	13,240	10,413	10,760	10,760	9,719	10,760	30,499	31,516	4,463	4,612	4,612	4,463	145,817
1927	9,223	8,926	9,223	9,223	8,331	9,223	62,054	64,123	14,876	15,372	15,372	14,876	240,822
1928	24,397	17,852	18,652	21,575	71,119	211,449	35,952	37,150	4,463	4,612	4,612	4,463	456,296
1929	12,744	10,711	11,068	11,068	9,997	11,068	25,929	26,793	2,975	3,074	3,074	2,975	131,476
1930	9,223	8,926	9,223	9,223	8,331	9,223	26,195	27,068	2,975	3,074	3,074	2,975	119,510
1931	9,223	8,926	9,223	9,223	8,331	9,223	14,380	14,859	2,975	3,074	3,074	2,975	95,486
1932	7,736	8,926	9,223	9,223	8,331	9,223	62,054	64,123	14,876	15,372	15,372	14,876	239,335
1933	24,397	17,852	18,447	18,447	16,661	18,447	34,489	35,639	4,463	4,612	4,612	4,463	202,529
1934	9,223	8,926	9,223	9,223	8,331	9,223	14,380	14,859	2,975	3,074	3,074	2,975	95,486
1935	7,736	8,926	9,223	9,223	8,331	9,223	62,054	64,123	14,876	15,372	15,372	14,876	239,335
1936	24,397	17,852	18,447	18,447	155,223	102,499	170,989	64,123	14,876	15,372	15,372	14,876	632,473
1937	24,397	17,852	18,447	18,447	238,549	223,620	177,377	64,123	14,876	15,372	15,372	14,876	843,308
1938	24,397	17,852	99,508	79,596	381,104	454,618	289,194	291,774	231,959	89,978	41,064	95,616	2,096,660
1939	25,528	17,852	28,534	20,573	46,130	73,525	27,601	28,521	4,463	4,612	4,612	4,463	286,414
1940	9,223	8,926	9,223	9,223	49,847	172,147	165,734	64,123	14,876	15,372	15,372	14,876	548,942
1941	24,397	17,852	18,447	68,093	269,269	278,100	249,758	64,123	54,687	15,372	38,718	76,339	1,175,155
1942	24,397	17,852	53,648	153,449	169,872	130,509	216,086	229,147	96,134	39,236	39,175	78,580	1,248,085
1943	24,397	17,852	40,024	197,464	155,298	329,240	197,076	64,123	76,506	15,372	15,372	17,040	1,149,764
1944	24,397	17,852	18,447	18,447	37,057	45,140	46,127	47,665	4,463	4,612	4,612	4,463	273,282
1945	13,240	10,413	10,760	10,760	153,054	165,782	121,381	64,123	14,876	15,372	15,372	14,876	610,009
1946	24,397	36,825	229,316	136,983	185,079	133,267	72,379	64,123	14,876	15,372	15,372	14,876	942,865
1947	24,397	17,852	18,447	18,447	16,661	18,447	27,152	28,057	4,463	4,612	4,612	4,463	187,610
1948	9,223	8,926	9,223	9,223	8,331	9,223	38,569	39,855	4,463	4,612	4,612	4,463	150,723
1949	12,744	10,711	11,068	11,068	9,997	11,068	31,985	33,051	4,463	4,612	4,612	4,463	149,842
1950	12,744	10,711	11,068	11,068	9,997	11,068	59,264	61,239	4,463	4,612	4,612	4,463	205,309
1951	13,240	10,413	201,087	225,258	211,857	136,669	100,446	103,794	4,463	4,612	4,612	4,463	1,020,914
1952	13,240	10,413	10,760	10,760	162,881	122,880	259,828	264,497	234,858	87,333	40,200	91,911	1,309,561
1953	24,397	17,852	18,447	45,961	60,044	22,985	83,992	86,792	4,463	4,612	4,612	4,463	378,620
1954	13,240	10,413	10,760	10,760	9,719	10,760	39,961	41,293	4,463	4,612	4,612	4,463	165,056
1955	13,240	10,413	10,760	10,760	9,719	10,760	30,489	31,505	4,463	4,612	4,612	4,463	145,796
1956	9,223	8,926	27,316	436,179	230,645	165,845	105,870	64,123	158,051	33,028	41,789	86,855	1,367,850
1957	24,397	17,852	18,447	18,447	46,972	18,447	81,508	84,225	4,463	4,612	4,612	4,463	328,445
1958	13,240	10,413	10,760	10,760	14,341	187,337	304,463	269,071	281,406	20,686	40,371	90,848	1,253,696
1959	24,397	17,852	18,447	18,447	71,548	43,235	27,886	28,815	4,463	4,612	4,612	4,463	268,777
1960	9,223	8,926	9,223	9,223	8,331	9,223	24,142	24,947	2,975	3,074	3,074	2,975	115,336
1961	7,736	8,926	9,223	9,223	8,331	9,223	14,380	14,859	2,975	3,074	3,074	2,975	93,999
1962	7,736	8,926	9,223	9,223	8,331	9,223	90,974	94,006	4,463	4,612	4,612	4,463	255,792
1963	13,240	10,413	10,760	10,760	9,719	10,760	62,054	64,123	14,876	15,372	15,372	14,876	252,325
1964	24,397	17,852	18,447	18,447	16,661	18,447	27,261	28,170	4,463	4,612	4,612	4,463	187,832
1965	9,223	8,926	9,223	210,251	211,389	141,209	162,554	64,123	14,876	15,372	15,372	36,063	898,581
1966	24,397	44,828	120,084	51,266	102,057	53,115	31,225	32,266	4,463	4,612	4,612	4,463	477,388
1967	12,744	10,711	11,068	11,068	9,997	106,843	241,982	221,647	393,186	261,291	39,448	104,716	1,424,701
1968	24,397	17,852	18,447	18,447	37,788	34,555	28,042	28,977	4,463	4,612	4,612	4,463	226,655
1969	9,223	8,926	9,223	51,827	276,918	247,910	324,217	450,113	430,359	105,856	42,046	99,739	2,056,357
1970	27,493	23,285	82,113	369,830	146,490	152,248	62,054	64,123	14,876	15,372	15,372	14,876	988,132
1971	24,397	17,852	18,447	18,447	51,836	53,278	63,878	66,007	4,463	4,612	4,612	4,463	332,292
1972	13,240	10,413	10,760	10,760	28,466	10,760	29,559	30,544	2,975	3,074	3,074	2,975	156,600
1973	9,223	8,926	9,223	9,223	8,331	9,223	62,054	64,123	73,119	15,372	15,372	14,876	299,065
1974	24,397	48,640	100,199	143,757	111,341	175,409	126,659	64,123	186,262	15,372	15,372	22,883	1,034,414
1975	24,397	17,852	18,447	18,447	134,788	196,370	104,412	64,123	176,978	15,372	22,420	48,485	842,091
1976	55,557	22,988	33,098	18,447	16,661	18,447	20,107	20,777	2,975	3,074	3,074	2,975	218,180
1977	7,736	8,926	9,223	9,223	8,331	9,223	14,380	14,859	2,975	3,074	3,074	2,975	93,999
1978	7,736	8,926	9,223	9,223	8,331	9,223	62,054	64,123	119,357	15,372	15,372	14,876	343,816
1979	24,397	17,852	18,447	33,234	156,508	190,095	93,045	341,647	14,876	15,372	15,372	14,876	935,721
1980	24,397	17,852	18,447	192,487	376,595	202,895	113,083	107,786	283,094	76,055	39,175	93,167	1,545,033
1981	24,397	17,852	18,447	18,447	19,348	51,333	28,382	29,328	4,463	4,612	4,612	4,463	225,684
1982	12,744	10,711	11,068	51,750	339,671	313,814	510,575	351,576	264,599	84,326	53,224	143,705	2,147,763
1983	226,858	142,160	253,127	268,146	324,750	929,999	277,119	446,281	229,787	240,194	55,448	269,439	3,663,308
1984	35,724	285,481	413,016	228,905	213,251	152,003	62,054	64,123	14,876	15,372	15,372	14,876	1,515,053
1985	24,397	17,852	18,447	18,447	16,661	18,447	33,423	34,537	4,463	4,612	4,612	4,463	200,361
1986	9,223	8,926	9,223	9,223	213,998	423,685	148,537	178,759	202,001	15,372	15,372	14,876	1,249,195
1987	24,397	17,852	18,447	18,447	16,661	18,447	24,245	25,054	2,975	3,074	3,074	2,975	175,648
1988	7,736	8,926	9,223	9,223	8,331	9,223	18,809	19,436	2,975	3,074	3,074	2,975	103,005
1989	7,736	8,926	9,223	9,223	8,331	9,223	25,689	26,546	2,975	3,074	3,074	2,975	116,995
1990	7,736	8,926	9,223	9,223	8,331	9,223	19,351	19,996	2,975	3,074	3,074	2,975	104,107
1991	7,736	8,926	9,223	9,223	8,331	9,223	25,574	26,426	2,975	3,074	3,074	2,975	116,760
1992	7,736	8,926	9,223	9,223	8,331	9,223	19,956	20,621	2,975	3,074	3,074	2,975	105,337
1993	7,736	8,926	9,223	9,223	8,331	9,223	62,054	64,123	14,876	15,372	18,523	41,085	268,695
1994	24,397	17,852	18,447	18,447	16,661	18,447	25,933	26,798	2,975	3,074	3,074	2,975	179,080
1995	9,223	8,926	9,223	9,223	27,784	434,063	274,679	564,368	270,506	382,280	39,175	176,310	2,205,760
1996	24,397	17,852	18,447	18,447	300,445	273,865	140,899	137,734	170,892	15,372	15,372	14,876	1,148,598
1997	24,397	55,332	363,466	950,499	195,855	144,914	62,054	64,123	14,876	15,372	15,372	14,876	1,921,136
1998	24,397	17,852	18,447	38,386	334,716	271,647	205,361	328,114	413,737	286,861	39,218	99,782	2,078,518
1999	24,397	17,852	33,782	118,488	283,039	168,411	103,162	64,123	14,876	15,372	15,372	14,876	873,750
2000	24,397	17,852	18,447	18,447	242,853	187,111	62,054	64,123	23,389	15,372	15,372	14,876	704,293
2001	24,397	17,852	18,447	18,447	16,661	18,447	27,828	28,756	4,463	4,612	4,612	4,463	188,985
2002	9,223	8,926	9,223	9,223	8,331	9,223	31,561	32,613	4,463	4,612	4,612	4,463	136,473
Avg (21-02)	20,126	19,875	36,808	60,307	91,806	105,614	94,241	90,065	64,371	28,111	14,098	26,876	652,299

Table 2.6-6

Total La Grange Release to River (Acre-feet)

Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	12,744	10,711	11,068	11,068	119,368	155,136	79,399	64,123	14,876	15,372	15,372	14,876	524,113
1922	24,397	17,852	18,447	18,447	83,736	120,129	176,287	69,807	492,225	15,372	30,271	58,339	1,125,309
1923	24,397	17,852	67,858	101,025	90,321	37,878	160,240	64,123	14,876	15,372	15,372	14,876	624,190
1924	24,397	17,852	18,447	18,447	16,661	18,447	14,380	14,859	2,975	3,074	3,074	2,975	155,588
1925	7,736	8,926	9,223	9,223	8,331	9,223	70,201	72,541	4,463	4,612	4,612	4,463	213,554
1926	13,240	10,413	10,760	10,760	9,719	10,760	30,499	31,516	4,463	4,612	4,612	4,463	145,817
1927	9,223	8,926	9,223	9,223	8,331	9,223	62,054	64,123	58,704	15,372	16,016	24,445	294,863
1928	31,283	49,151	52,916	21,575	71,119	216,788	46,725	37,150	4,463	4,612	4,612	4,463	544,857
1929	12,744	10,711	11,068	11,068	9,997	11,068	25,929	26,793	2,975	3,074	3,074	2,975	131,476
1930	9,223	8,926	9,223	9,223	8,331	9,223	26,195	27,068	2,975	3,074	3,074	2,975	119,510
1931	9,223	8,926	9,223	9,223	8,331	9,223	14,380	14,859	2,975	3,074	3,074	2,975	95,486
1932	7,736	8,926	9,223	9,223	8,331	9,223	62,054	64,123	14,876	15,372	15,372	14,876	239,335
1933	24,397	17,852	18,447	18,447	16,661	18,447	34,489	35,639	4,463	4,612	4,612	4,463	202,529
1934	9,223	8,926	9,223	9,223	8,331	9,223	14,380	14,859	2,975	3,074	3,074	2,975	95,486
1935	7,736	8,926	9,223	9,223	8,331	9,223	62,054	64,123	14,876	15,372	15,372	14,876	239,335
1936	24,397	17,852	18,447	18,447	306,637	221,489	176,046	64,123	14,876	15,372	15,372	14,876	907,934
1937	24,397	17,852	18,447	18,447	253,564	236,700	180,943	64,123	14,876	15,372	15,372	14,876	874,969
1938	24,397	17,852	118,346	79,596	381,104	454,618	298,338	309,917	236,931	92,262	41,064	95,616	2,150,041
1939	25,528	17,852	28,534	20,573	46,130	73,525	27,601	28,521	4,463	4,612	4,612	4,463	286,414
1940	9,223	8,926	9,223	9,223	75,820	191,640	170,122	64,123	14,876	15,372	15,372	14,876	598,796
1941	24,397	17,852	18,447	67,960	269,787	278,421	250,259	64,123	61,895	15,372	39,401	77,925	1,185,839
1942	24,397	17,852	53,646	157,210	169,872	134,314	221,610	232,002	98,896	41,519	39,175	78,580	1,269,073
1943	24,397	17,852	40,024	197,464	155,298	339,045	202,047	64,123	86,600	15,372	15,372	19,308	1,176,902
1944	24,397	17,852	18,447	18,447	37,055	45,139	46,127	47,665	4,463	4,612	4,612	4,463	273,279
1945	13,240	10,413	10,760	10,760	175,132	195,817	121,540	64,123	14,876	15,372	15,372	14,876	662,281
1946	24,397	28,694	229,316	136,983	185,079	146,489	76,200	64,123	14,876	15,372	15,372	14,876	951,777
1947	24,397	17,852	18,447	18,447	16,661	18,447	27,152	28,057	4,463	4,612	4,612	4,463	187,610
1948	9,223	8,926	9,223	9,223	8,331	9,223	38,569	39,855	4,463	4,612	4,612	4,463	150,723
1949	12,744	10,711	11,068	11,068	9,997	11,068	31,985	33,051	4,463	4,612	4,612	4,463	149,842
1950	12,744	10,711	11,068	11,068	9,997	11,068	59,264	61,239	4,463	4,612	4,612	4,463	205,309
1951	13,240	10,413	325,365	225,256	211,857	136,669	100,446	103,794	4,463	4,612	4,612	4,463	1,145,190
1952	13,240	10,413	10,760	10,760	175,164	131,068	259,828	285,785	239,830	89,617	40,200	91,911	1,358,576
1953	24,397	17,852	18,447	45,961	60,044	22,985	83,992	86,792	4,463	4,612	4,612	4,463	378,620
1954	13,240	10,413	10,760	10,760	9,719	10,760	39,961	41,293	4,463	4,612	4,612	4,463	165,056
1955	13,240	10,413	10,760	10,760	9,719	10,760	30,489	31,505	4,463	4,612	4,612	4,463	145,796
1956	9,223	8,926	110,294	436,177	230,645	170,199	108,677	64,123	171,338	35,311	41,789	86,855	1,473,557
1957	24,397	17,852	18,447	18,447	46,972	18,447	81,508	84,225	4,463	4,612	4,612	4,463	328,445
1958	13,240	10,413	10,760	10,760	37,022	196,411	310,506	284,559	284,260	22,969	40,371	90,848	1,312,119
1959	24,397	17,852	18,447	18,447	71,548	43,235	27,886	28,815	4,463	4,612	4,612	4,463	268,777
1960	9,223	8,926	9,223	9,223	8,331	9,223	24,142	24,947	2,975	3,074	3,074	2,975	115,336
1961	7,736	8,926	9,223	9,223	8,331	9,223	14,380	14,859	2,975	3,074	3,074	2,975	93,999
1962	7,736	8,926	9,223	9,223	8,331	9,223	90,974	94,006	4,463	4,612	4,612	4,463	255,792
1963	13,240	10,413	10,760	10,760	9,719	10,760	62,054	64,123	14,876	15,372	15,372	14,876	252,325
1964	35,586	67,343	34,117	36,579	33,150	18,447	27,261	28,170	4,463	4,612	4,612	4,463	298,803
1965	9,223	8,926	9,223	310,490	217,567	154,689	164,292	64,123	14,876	15,372	15,372	27,153	1,011,306
1966	24,397	44,842	124,441	51,266	104,206	59,209	31,225	32,266	4,463	4,612	4,612	4,463	490,002
1967	12,744	10,711	11,068	11,068	9,997	128,580	251,953	229,813	393,186	263,574	39,448	106,995	1,469,137
1968	24,397	17,852	18,447	18,447	37,786	34,554	28,042	28,977	4,463	4,612	4,612	4,463	226,652
1969	9,223	8,926	9,223	85,553	284,125	254,425	331,950	455,251	435,331	108,139	42,046	99,739	2,123,931
1970	27,493	23,285	82,113	348,180	153,636	168,327	62,054	64,123	14,876	15,372	15,372	14,876	989,707
1971	24,397	17,852	18,447	18,447	60,762	59,228	63,878	66,007	4,463	4,612	4,612	4,463	347,168
1972	13,240	10,413	10,760	10,760	45,977	10,760	29,559	30,544	2,975	3,074	3,074	2,975	174,111
1973	9,223	8,926	9,223	9,223	8,331	40,751	65,826	64,123	101,320	15,372	15,372	14,876	362,566
1974	24,397	48,640	100,199	155,194	111,340	183,971	132,183	69,817	190,678	15,372	15,372	25,151	1,072,314
1975	24,397	17,852	18,447	18,447	134,786	196,369	112,698	64,123	177,103	15,372	23,104	50,071	852,769
1976	55,555	22,988	33,098	18,447	16,661	18,447	20,107	20,777	2,975	3,074	3,074	2,975	218,178
1977	7,736	8,926	9,223	9,223	8,331	9,223	14,380	14,859	2,975	3,074	3,074	2,975	93,999
1978	7,736	8,926	9,223	9,223	8,331	9,223	62,054	64,123	213,557	15,372	15,372	14,876	438,016
1979	24,397	17,852	18,447	39,973	156,508	210,076	95,255	343,931	14,876	15,372	15,372	14,876	966,935
1980	24,397	17,852	18,447	187,788	376,596	211,457	118,055	112,924	288,066	78,339	39,175	93,167	1,566,263
1981	24,397	17,852	18,447	18,447	19,348	51,333	28,382	29,328	4,463	4,612	4,612	4,463	225,684
1982	12,744	10,711	11,068	79,596	353,350	314,764	510,575	354,430	267,361	86,609	53,224	148,189	2,202,621
1983	229,807	144,001	250,463	268,146	324,750	929,999	277,119	452,080	232,549	242,477	55,448	271,717	3,678,556
1984	41,734	285,481	413,016	228,905	213,251	148,068	62,054	64,123	14,876	15,372	15,372	14,876	1,517,128
1985	24,397	17,852	18,447	18,447	16,661	18,447	33,423	34,537	4,463	4,612	4,612	4,463	200,361
1986	9,223	8,926	9,223	9,223	230,324	452,141	159,837	183,896	206,972	15,372	15,372	14,876	1,315,385
1987	24,397	17,852	18,447	18,447	16,661	18,447	24,245	25,054	2,975	3,074	3,074	2,975	175,648
1988	7,736	8,926	9,223	9,223	8,331	9,223	18,809	19,436	2,975	3,074	3,074	2,975	103,005
1989	7,736	8,926	9,223	9,223	8,331	9,223	25,689	26,546	2,975	3,074	3,074	2,975	116,995
1990	7,736	8,926	9,223	9,223	8,331	9,223	19,351	19,996	2,975	3,074	3,074	2,975	104,107
1991	7,736	8,926	9,223	9,223	8,331	9,223	25,574	26,426	2,975	3,074	3,074	2,975	116,760
1992	7,736	8,926	9,223	9,223	8,331	9,223	19,956	20,621	2,975	3,074	3,074	2,975	105,337
1993	7,736	8,926	9,223	9,223	8,331	9,223	62,054	64,123	202,838	15,372	35,406	80,270	512,725
1994	24,397	17,852	18,447	18,447	16,661	18,447	25,933	26,798	2,975	3,074	3,074	2,975	179,080
1995	9,223	8,926	9,223	9,223	46,790	442,165	274,679	577,365	274,189	384,563	39,175	178,588	2,254,109
1996	24,397	17,852	18,447	18,447	304,065	273,865	147,712	140,017	173,102	15,372	15,372	14,876	1,163,524
1997	24,397	57,588	363,466	962,577	195,853	144,914	62,054	64,123	14,876	15,372	15,372	14,876	1,935,468
1998	24,397	17,852	18,447	58,505	334,713	278,508	214,200	330,544	417,511	289,144	39,218	99,782	2,122,821
1999	24,397	17,852	33,782	118,488	283,039	179,828	106,236	64,123	31,140	15,372	15,372	14,876	904,505
2000	24,397	17,852	18,447	18,447	254,344	187,111	62,054	64,123	38,144	15,372	15,372	14,876	730,539
2001	24,397	17,852	18,447	18,447	16,661	18,447	27,828	28,756	4,463	4,612	4,612	4,463	188,985
2002	9,223	8,926	9,223	9,223	8,331	9,223	31,561	32,613	4,463	4,612	4,612	4,463	136,473
Avg (21-02)	20,456	20,812	40,195	62,838	96,544	111,073	96,000	91,545	70,232	28,445	14,337	27,614	680,091

Table 2.6-7

Difference in Total La Grange Release to River (Acre-feet)

WSIP minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	-118	-15,724	-3,718	0	0	0	0	0	-19,560
1922	0	0	0	0	-8,787	-5,858	-7,365	-5,684	-14,596	0	-684	-1,587	-44,561
1923	0	0	3	0	0	0	-2,209	0	0	0	0	0	-2,206
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	-43,828	0	-644	-9,569	-54,041
1928	-6,886	-31,299	-34,264	0	0	-5,339	-10,773	0	0	0	0	0	-88,561
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	-151,414	-118,990	-5,057	0	0	0	0	0	-275,461
1937	0	0	0	0	-15,015	-13,080	-3,566	0	0	0	0	0	-31,661
1938	0	0	-18,838	0	0	0	-9,144	-18,143	-4,972	-2,284	0	0	-53,381
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	-25,973	-19,493	-4,388	0	0	0	0	0	-49,854
1941	0	0	0	133	-518	-321	-501	0	-7,208	0	-683	-1,586	-10,684
1942	0	0	2	-3,761	0	-3,805	-5,524	-2,855	-2,762	-2,283	0	0	-20,988
1943	0	0	0	0	0	-9,805	-4,971	0	-10,094	0	0	-2,268	-27,138
1944	0	0	0	0	2	1	0	0	0	0	0	0	3
1945	0	0	0	0	-22,078	-30,035	-159	0	0	0	0	0	-52,272
1946	0	8,131	0	0	0	-13,222	-3,821	0	0	0	0	0	-8,912
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	-124,278	2	0	0	0	0	0	0	0	0	-124,276
1952	0	0	0	0	-12,283	-8,188	0	-21,288	-4,972	-2,284	0	0	-49,015
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	-82,978	2	0	-4,354	-2,807	0	-13,287	-2,283	0	0	-105,707
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	-22,681	-9,074	-6,043	-15,488	-2,854	-2,283	0	0	-58,423
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	-11,189	-49,491	-15,670	-18,132	-16,489	0	0	0	0	0	0	0	-110,971
1965	0	0	0	-100,239	-6,178	-13,480	-1,738	0	0	0	0	8,910	-112,725
1966	0	-14	-4,357	0	-2,149	-6,094	0	0	0	0	0	0	-12,614
1967	0	0	0	0	0	-21,737	-9,971	-8,166	0	-2,283	0	-2,279	-44,436
1968	0	0	0	0	2	1	0	0	0	0	0	0	3
1969	0	0	0	-33,726	-7,207	-6,515	-7,733	-5,138	-4,972	-2,283	0	0	-67,574
1970	0	0	0	21,650	-7,146	-16,079	0	0	0	0	0	0	-1,575
1971	0	0	0	0	-8,926	-5,950	0	0	0	0	0	0	-14,876
1972	0	0	0	0	-17,511	0	0	0	0	0	0	0	-17,511
1973	0	0	0	0	0	-31,528	-3,772	0	-28,201	0	0	0	-63,501
1974	0	0	0	-11,437	1	-8,562	-5,524	-5,694	-4,416	0	0	-2,268	-37,900
1975	0	0	0	0	2	1	-8,286	0	-125	0	-684	-1,586	-10,678
1976	2	0	0	0	0	0	0	0	0	0	0	0	2
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	-94,200	0	0	0	-94,200
1979	0	0	0	-6,739	0	-19,981	-2,210	-2,284	0	0	0	0	-31,214
1980	0	0	0	4,699	-1	-8,562	-4,972	-5,138	-4,972	-2,284	0	0	-21,230
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	-27,846	-13,679	-950	0	-2,854	-2,762	-2,283	0	-4,484	-54,858
1983	-2,949	-1,841	2,664	0	0	0	0	-5,799	-2,762	-2,283	0	-2,278	-15,248
1984	-6,010	0	0	0	0	3,935	0	0	0	0	0	0	-2,075
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	-16,326	-28,456	-11,300	-5,137	-4,971	0	0	0	-66,190
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	-187,962	0	-16,883	-39,185	-244,030
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	-19,006	-8,102	0	-12,997	-3,683	-2,283	0	-2,278	-48,349
1996	0	0	0	0	-3,620	0	-6,813	-2,283	-2,210	0	0	0	-14,926
1997	0	-2,256	0	-12,078	2	0	0	0	0	0	0	0	-14,332
1998	0	0	0	-20,119	3	-6,861	-8,839	-2,430	-3,774	-2,283	0	0	-44,303
1999	0	0	0	0	0	-11,417	-3,074	0	-16,264	0	0	0	-30,755
2000	0	0	0	0	-11,491	0	0	0	-14,755	0	0	0	-26,246
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	-330	-936	-3,387	-2,532	-4,739	-5,459	-1,759	-1,480	-5,861	-334	-239	-737	-27,793

Table 2.6-8

Difference in Total La Grange Release to River (Acre-feet)

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending SJR Index

WSIP minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1983	-2,949	-1,841	2,664	0	0	0	0	-5,799	-2,762	-2,283	0	-2,278	-15,248
1969	0	0	0	-33,726	-7,207	-6,515	-7,733	-5,138	-4,972	-2,283	0	0	-67,574
1995	0	0	0	0	-19,006	-8,102	0	-12,997	-3,683	-2,283	0	-2,278	-48,349
1938	0	0	-18,838	0	0	0	-9,144	-18,143	-4,972	-2,284	0	0	-53,381
1998	0	0	0	-20,119	3	-6,861	-8,839	-2,430	-3,774	-2,283	0	0	-44,303
1982	0	0	0	-27,846	-13,679	-950	0	-2,854	-2,762	-2,283	0	-4,484	-54,858
1967	0	0	0	0	0	-21,737	-9,971	-8,166	0	-2,283	0	-2,279	-44,436
1952	0	0	0	0	-12,283	-8,188	0	-21,288	-4,972	-2,284	0	0	-49,015
1958	0	0	0	0	-22,681	-9,074	-6,043	-15,488	-2,854	-2,283	0	0	-58,423
1980	0	0	0	4,699	-1	-8,562	-4,972	-5,138	-4,972	-2,284	0	0	-21,230
1978	0	0	0	0	0	0	0	0	-94,200	0	0	0	-94,200
1922	0	0	0	0	-8,787	-5,858	-7,365	-5,684	-14,596	0	-684	-1,587	-44,561
1956	0	0	-82,978	2	0	-4,354	-2,807	0	-13,287	-2,283	0	0	-105,707
1942	0	0	2	-3,761	0	-3,805	-5,524	-2,855	-2,762	-2,283	0	0	-20,988
1941	0	0	0	133	-518	-321	-501	0	-7,208	0	-683	-1,586	-10,684
1986	0	0	0	0	-16,326	-28,456	-11,300	-5,137	-4,971	0	0	0	-66,190
1993	0	0	0	0	0	0	0	0	-187,962	0	-16,883	-39,185	-244,030
1997	0	-2,256	0	-12,078	2	0	0	0	0	0	0	0	-14,332
1996	0	0	0	0	-3,620	0	-6,813	-2,283	-2,210	0	0	0	-14,926
1943	0	0	0	0	0	-9,805	-4,971	0	-10,094	0	0	-2,268	-27,138
1937	0	0	0	0	-15,015	-13,080	-3,566	0	0	0	0	0	-31,661
1974	0	0	0	-11,437	1	-8,562	-5,524	-5,694	-4,416	0	0	-2,268	-37,900
1975	0	0	0	0	2	1	-8,286	0	-125	0	-684	-1,586	-10,678
1965	0	0	0	-100,239	-6,178	-13,480	-1,738	0	0	0	0	8,910	-112,725
1936	0	0	0	0	-151,414	-118,990	-5,057	0	0	0	0	0	-275,461
1984	-6,010	0	0	0	0	3,935	0	0	0	0	0	0	-2,075
1979	0	0	0	-6,739	0	-19,981	-2,210	-2,284	0	0	0	0	-31,214
1945	0	0	0	0	-22,078	-30,035	-159	0	0	0	0	0	-52,272
1999	0	0	0	0	0	-11,417	-3,074	0	-16,264	0	0	0	-30,755
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	-43,828	0	-644	-9,569	-54,041
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1946	0	8,131	0	0	0	-13,222	-3,821	0	0	0	0	0	-8,912
1973	0	0	0	0	0	-31,528	-3,772	0	-28,201	0	0	0	-63,501
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	-11,491	0	0	0	-14,755	0	0	0	-26,246
1940	0	0	0	0	-25,973	-19,493	-4,388	0	0	0	0	0	-49,854
1923	0	0	3	0	0	0	-2,209	0	0	0	0	0	-2,206
1921	0	0	0	0	-118	-15,724	-3,718	0	0	0	0	0	-19,560
1970	0	0	0	21,650	-7,146	-16,079	0	0	0	0	0	0	-1,575
1951	0	0	-124,278	2	0	0	0	0	0	0	0	0	-124,276
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	-8,926	-5,950	0	0	0	0	0	0	-14,876
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	2	1	0	0	0	0	0	0	3
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1928	-6,886	-31,299	-34,264	0	0	-5,339	-10,773	0	0	0	0	0	-88,561
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	-14	-4,357	0	-2,149	-6,094	0	0	0	0	0	0	-12,614
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	2	1	0	0	0	0	0	0	3
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	-11,189	-49,491	-15,670	-18,132	-16,489	0	0	0	0	0	0	0	-110,971
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	-17,511	0	0	0	0	0	0	0	-17,511
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	2	0	0	0	0	0	0	0	0	0	0	0	2
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 2.6-9

Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by SJR Index Year Type) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	26,382	22,058	48,559	124,381	190,492	245,312	199,367	189,426	200,479	78,816	30,940	75,154	1,431,366
Above Normal	17,953	30,672	68,307	78,195	120,577	105,010	91,605	82,782	18,190	14,739	14,739	14,263	657,034
Below Normal	17,484	16,058	22,757	19,559	35,316	38,748	56,136	58,008	4,463	4,612	4,612	4,463	282,217
Dry	20,742	15,449	16,739	16,127	24,181	25,876	29,552	30,537	4,349	4,494	4,494	4,349	196,887
Critical	14,534	11,590	12,560	11,644	10,518	11,644	20,489	21,172	2,975	3,074	3,074	2,975	126,250
All Years	20,126	19,875	36,808	60,307	91,806	105,614	94,241	90,065	64,371	28,111	14,098	26,876	652,299

Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by SJR Index Year Type) Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	26,505	22,228	52,690	132,897	195,713	251,883	203,746	194,388	216,210	79,958	31,729	77,274	1,485,222
Above Normal	18,307	30,194	75,617	77,318	133,414	121,042	93,276	82,916	24,252	14,739	14,777	14,826	700,678
Below Normal	18,058	18,668	25,976	19,559	36,239	40,197	57,034	58,008	4,463	4,612	4,612	4,463	291,887
Dry	21,603	19,256	17,945	17,522	26,796	25,876	29,552	30,537	4,349	4,494	4,494	4,349	206,770
Critical	14,533	11,590	12,560	11,644	10,518	11,644	20,489	21,172	2,975	3,074	3,074	2,975	126,249
All Years	20,456	20,812	40,195	62,838	96,544	111,073	96,000	91,545	70,232	28,445	14,337	27,614	680,091

Difference in Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by SJR Index Year Type) WSIP minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	-123	-171	-4,131	-8,516	-5,221	-6,571	-4,379	-4,962	-15,731	-1,142	-789	-2,120	-53,856
Above Normal	-354	478	-7,310	877	-12,836	-16,031	-1,671	-134	-6,062	0	-38	-563	-43,644
Below Normal	-574	-2,609	-3,218	0	-923	-1,449	-898	0	0	0	0	0	-9,671
Dry	-861	-3,807	-1,205	-1,395	-2,615	0	0	0	0	0	0	0	-9,883
Critical	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	-330	-936	-3,387	-2,532	-4,739	-5,459	-1,759	-1,480	-5,861	-334	-239	-737	-27,793

2.7 Calaveras and San Antonio Reservoirs, Alameda Creek and Downstream

Compared to the base-Calaveras constrained setting, Calaveras Reservoir operations would substantively change in the WSIP setting. With the restoration of Calaveras Reservoir operating capacity, the reservoir would operate with a larger storage capacity. Compared to the base-Calaveras unconstrained setting, the WSIP operation of Calaveras Reservoir would generally be the same, but its range of reservoir fluctuation would typically be less. Figure 2.7-1 illustrates a chronological trace of the simulation of Calaveras Reservoir storage and stream releases from Calaveras Dam. Shown in Figure 2.7-1 are the results for the WSIP and base settings.

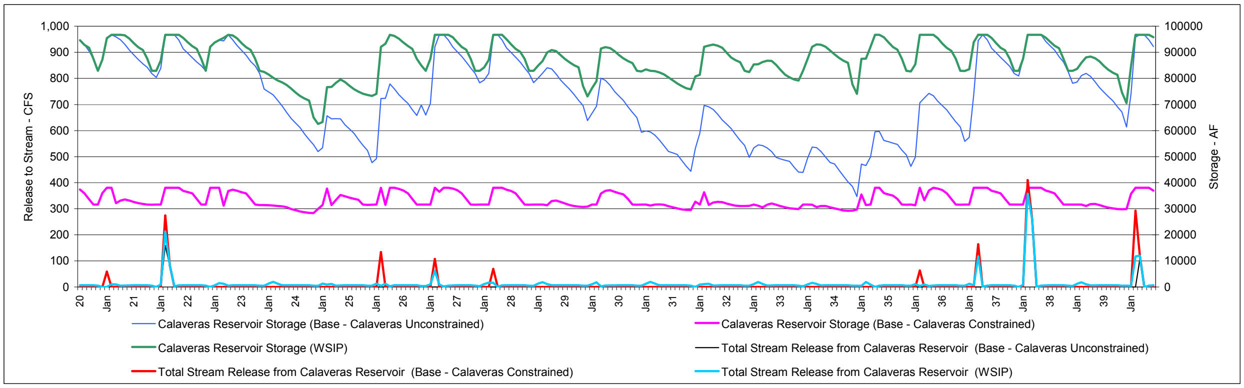
The current operation of Calaveras Reservoir (base-Calaveras constrained setting) is modeled to be greatly constrained, to vary only within a limited storage range. Although a within-year cyclic operation occurs for the conservation of local watershed runoff, there is relatively little reservoir storage available for year-to-year carryover and multi-year drought use. In the WSIP setting, a greater within-year cyclic operation occurs, providing for a greater use of local watershed runoff. Also, during prolonged periods of drought (i.e., multiple years in duration), reservoir storage would be drawn to supplement runoff available to the regional system and other water supply resources.

When compared to the base-Calaveras unconstrained setting, the WSIP operation retains greater storage within a year and for longer periods during a drought. Although greater purchase requests and a greater level of water supply delivery occur in the WSIP setting, Calaveras Reservoir storage would incidentally be operated “fuller” than before. Within a year, more storage would be retained in Calaveras Reservoir during the summer because of additional conveyance capacity in the SJPL, lessening the burden of storage releases from the Bay Area reservoirs. Although the target storage (operational buffer) for the fall draw down of the reservoir would sometimes result in the same amount of storage in either setting, storage during the summer in the WSIP setting would be greater, for a longer period of time. Retained storage also occurs in the WSIP setting because of the reduced use of Calaveras Reservoir and San Antonio Reservoir supplies for the maintenance of desired minimum water production at Sunol Valley Water Treatment Plant (Sunol Valley WTP). In the WSIP setting, water required for Sunol Valley WTP production can be acquired from the SJPL.

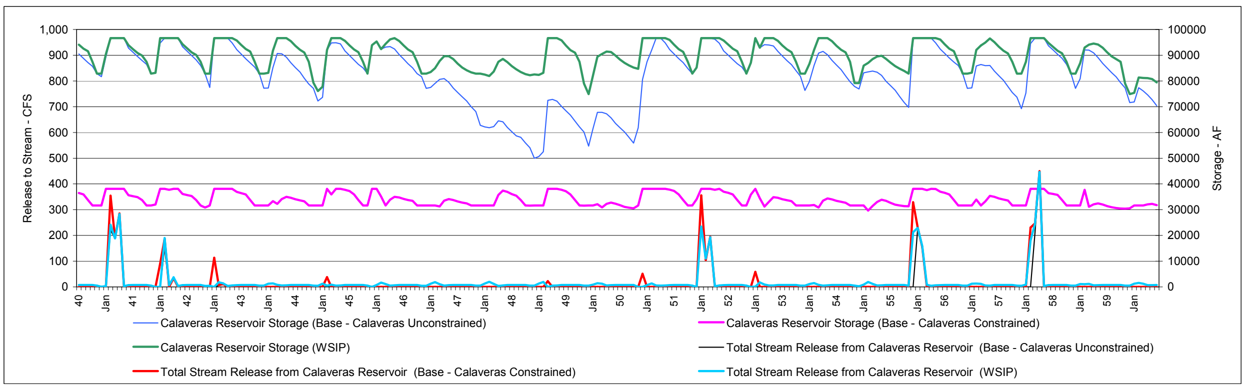
Figure 2.7-2 illustrates the average monthly storage in Calaveras Reservoir for the 82-year simulation, and the range in storage for each month for the WSIP and base-Calaveras constrained settings. Figure 2.7-3 illustrates the same form of information for the WSIP and base-Calaveras unconstrained settings.

Figure 2.7-1
Calaveras Reservoir Storage and Stream Release

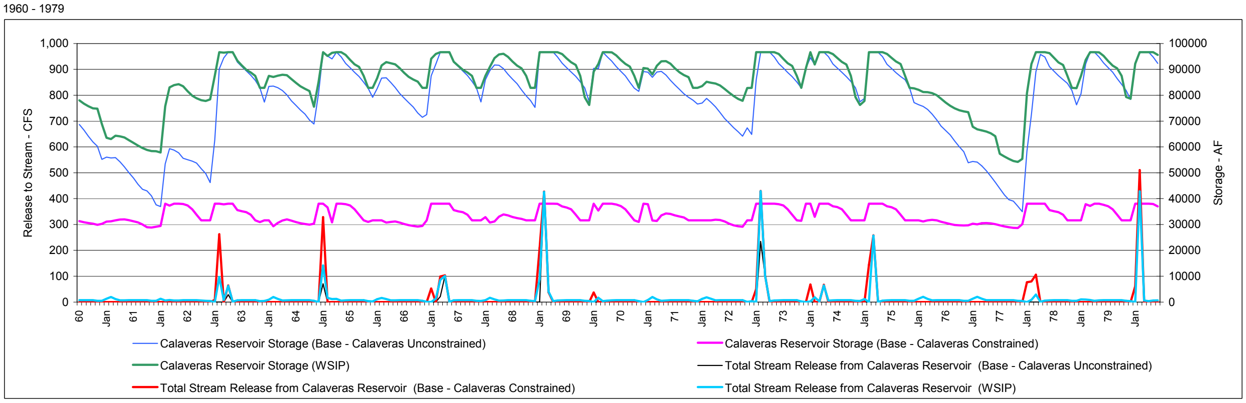
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

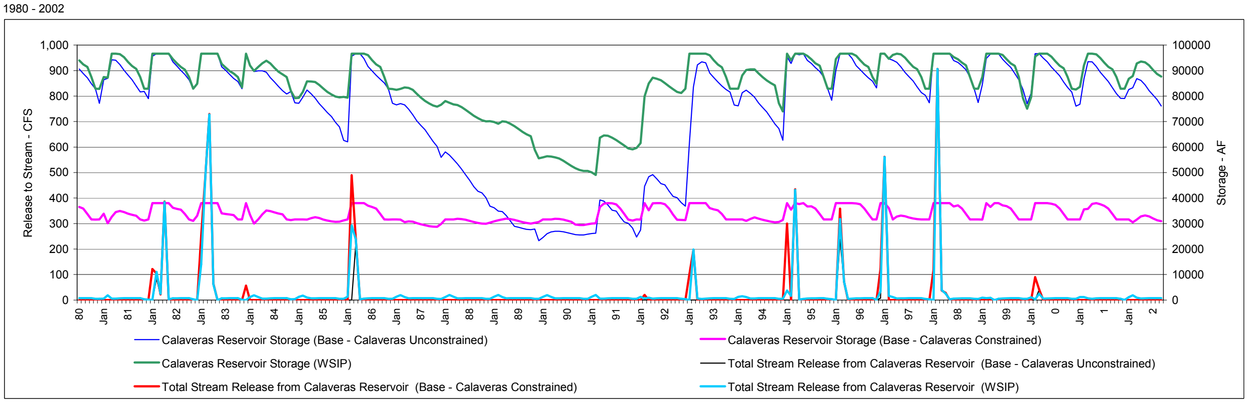


Figure 2.7-2

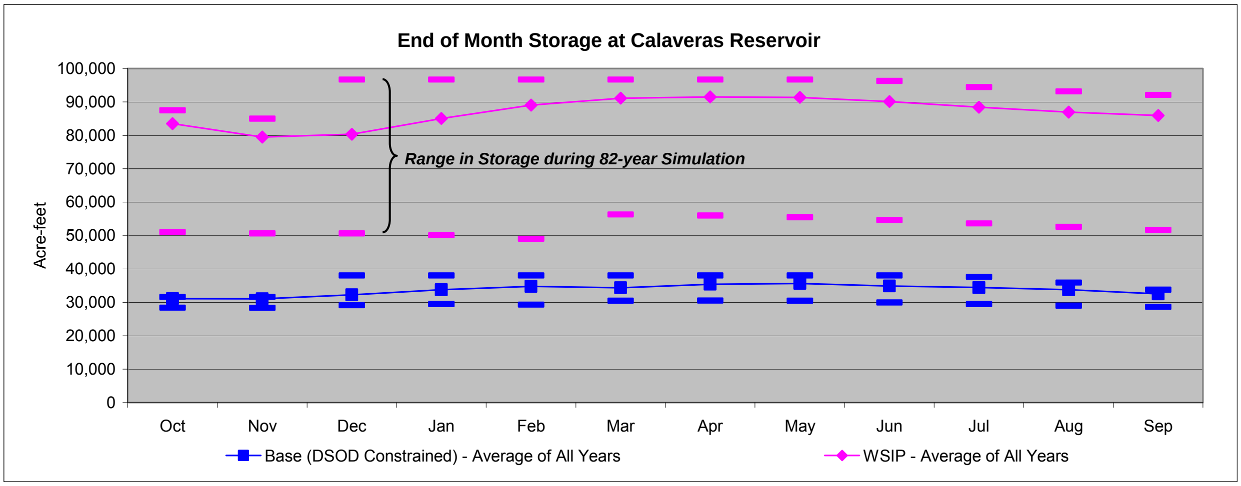
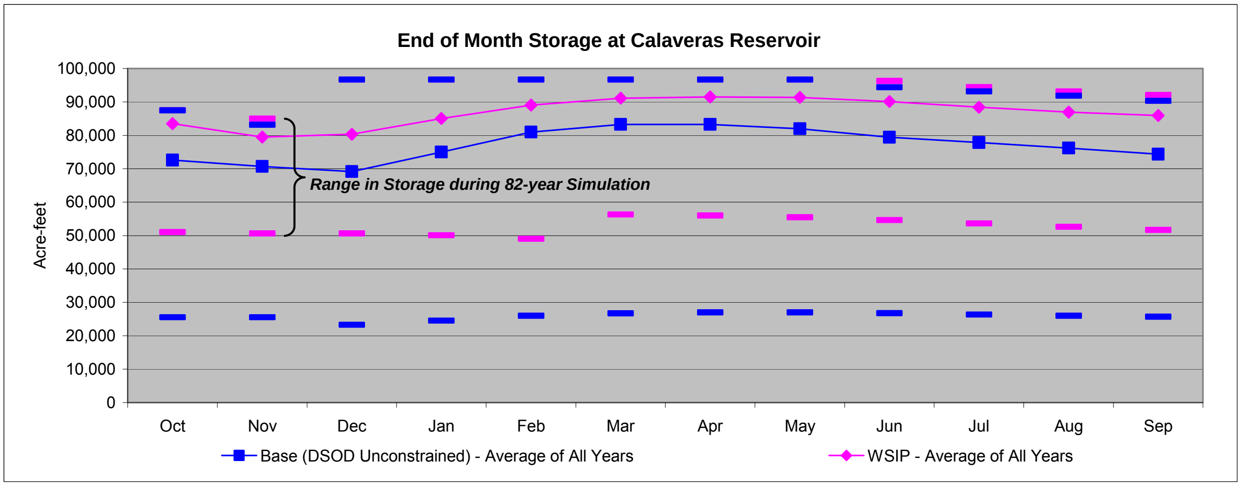


Figure 2.7-3



In the WSIP setting (as compared to the base-Calaveras constrained setting), there would be two categorical changes in releases to Calaveras Creek below Calaveras Dam: the addition of flows representing the flow objectives associated with the1997 Memorandum of Understanding (MOU); and the reduction of stream releases during wetter-year/wetter-season flows due to the restored operational capacity of Calaveras Reservoir. Supplementing the Figure 2.7-1 representation of Calaveras Dam stream releases is Table 2.7-1, illustrating releases for the WSIP and base-Calaveras constrained settings and the difference in releases between the two.

Table 2.7-2 illustrates the same form of information for Calaveras Dam releases to the stream in comparing the WSIP setting to the base-Calaveras unconstrained setting. The difference in releases between the settings is, again, the result of two factors: the additional flows representing the flow objectives associated with the1997 MOU; and the reduction of stream releases during wetter-year/wetter-season flows due to restored Calaveras Reservoir operational capacity.

Compared to the base-Calaveras constrained setting, diversions from Alameda Creek to Calaveras Reservoir would increase in the WSIP setting. With the current constraints on Calaveras Reservoir storage, diversions to Calaveras Creek are rejected. With the restoration of operational storage in the reservoir, the opportunity to divert water into the reservoir would increase.

Table 2.7-1

Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	1,065	5,085	15,137	10,007	5,085	255	387	417	425	415	38,955
Above Normal	425	258	172	811	3,666	2,849	637	327	396	423	428	417	10,808
Normal	429	275	195	548	725	556	264	370	408	428	430	417	5,046
Below Normal	429	276	246	672	876	596	345	389	411	429	430	417	5,515
Dry	429	292	281	778	1,044	747	374	407	416	430	430	417	6,045
All Years	428	269	387	1,558	4,240	2,921	1,321	350	403	426	428	417	13,149

Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	1,736	9,221	16,641	9,968	5,024	0	0	0	0	0	42,590
Above Normal	0	0	184	2,731	5,911	3,096	459	0	0	0	0	0	12,382
Normal	0	0	216	364	882	353	0	0	0	0	0	0	1,815
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	419	2,437	4,645	2,656	1,076	0	0	0	0	0	11,232

Difference in Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	-671	-4,136	-1,504	39	61	255	387	417	425	415	-3,636
Above Normal	425	258	-12	-1,920	-2,246	-247	178	327	396	423	428	417	-1,574
Normal	429	275	-22	184	-157	204	264	370	408	428	430	417	3,231
Below Normal	429	276	246	672	876	596	345	389	411	429	430	417	5,515
Dry	429	292	281	778	1,044	747	374	407	416	430	430	417	6,045
All Years	428	269	-32	-878	-404	265	245	350	403	426	428	417	1,918

Table 2.7-2

Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	1,065	5,085	15,137	10,007	5,085	255	387	417	425	415	38,955
Above Normal	425	258	172	811	3,666	2,849	637	327	396	423	428	417	10,808
Normal	429	275	195	548	725	556	264	370	408	428	430	417	5,046
Below Normal	429	276	246	672	876	596	345	389	411	429	430	417	5,515
Dry	429	292	281	778	1,044	747	374	407	416	430	430	417	6,045
All Years	428	269	387	1,558	4,240	2,921	1,321	350	403	426	428	417	13,149

Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Base - Calaveras Unconstrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	29	4,472	12,303	9,322	4,975	0	0	0	0	0	31,102
Above Normal	0	0	0	253	1,312	2,035	309	0	0	0	0	0	3,910
Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	6	925	2,673	2,241	1,035	0	0	0	0	0	6,879

Difference in Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP minus Base - Calaveras Unconstrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	1,036	613	2,834	685	110	255	387	417	425	415	7,853
Above Normal	425	258	172	558	2,353	814	328	327	396	423	428	417	6,898
Normal	429	275	195	548	725	556	264	370	408	428	430	417	5,046
Below Normal	429	276	246	672	876	596	345	389	411	429	430	417	5,515
Dry	429	292	281	778	1,044	747	374	407	416	430	430	417	6,045
All Years	428	269	382	634	1,568	680	286	350	403	426	428	417	6,270

To provide a context to the amount of water diverted at Alameda Creek Diversion Dam, Table 2.7-3 illustrates the estimated runoff (inflow) to the dam, averaged by year type. Table 2.7-4 compares diversions to Calaveras Reservoir in the WSIP and base-Calaveras constrained settings. An increase in diversions during the winter season due to WSIP operation would generally occur during normal or wetter year types, as reservoir storage space would accommodate diversions. During summer in all years and during all periods in below normal and normal years, diversions would continue as they do currently. A few exceptions would occur when diversions would be reduced from that of the base-Calaveras constrained setting.

Table 2.7-3

Total Inflow to ACDD (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	7	156	2,472	7,382	8,284	6,064	3,608	1,035	227	42	18	12	29,308
Above Normal	18	183	1,817	4,394	5,619	3,692	1,976	542	139	23	11	7	18,420
Normal	7	41	1,589	1,840	2,684	2,029	939	332	87	8	5	3	9,564
Below Normal	7	42	554	1,069	1,689	1,271	395	246	64	6	4	3	5,350
Dry	7	16	222	314	531	382	238	124	38	3	3	2	1,880
All Years	9	88	1,327	2,993	3,759	2,683	1,425	454	111	17	8	5	12,880

Table 2.7-4

Calaveras Reservoir Inflow from Upper Alameda Creek (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	7	128	1,093	1,210	302	314	647	919	227	42	18	12	4,919
Above Normal	11	159	1,117	1,861	1,601	597	1,007	542	139	23	11	7	7,076
Normal	9	37	1,229	1,691	1,791	1,618	881	326	96	8	5	3	7,695
Below Normal	8	44	541	1,029	1,584	1,279	393	259	68	9	5	4	5,224
Dry	7	16	205	318	367	487	232	126	38	3	3	2	1,805
All Years	8	78	837	1,227	1,141	861	634	434	113	17	8	6	5,363

Calaveras Reservoir Inflow from Upper Alameda Creek (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	7	128	1,093	415	185	307	637	904	227	42	18	12	3,977
Above Normal	11	159	633	722	326	596	1,284	542	139	23	11	7	4,453
Normal	9	37	691	1,087	899	1,172	872	326	96	8	5	3	5,205
Below Normal	8	44	541	1,029	1,584	1,279	393	259	68	9	5	4	5,224
Dry	7	16	205	318	367	487	232	126	38	3	3	2	1,805
All Years	8	78	632	718	679	772	687	431	113	17	8	6	4,150

Difference in Calaveras Reservoir Inflow from Upper Alameda Creek (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	794	117	6	10	15	0	0	0	0	942
Above Normal	0	0	484	1,140	1,275	1	-277	0	0	0	0	0	2,623
Normal	0	0	537	604	892	447	10	0	0	0	0	0	2,490
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	205	509	461	89	-54	3	0	0	0	0	1,213

Table 2.7-5 illustrates the same form of information in comparing diversions to Calaveras Reservoir between the WSIP and base-Calaveras unconstrained settings. In this comparison, less water would be diverted to Calaveras Reservoir in the WSIP setting, because of the greater amount of storage retained by the reservoir than in the base-Calaveras unconstrained setting. As described above with regard to Calaveras Reservoir storage, even with an increase in deliveries and releases for the downstream fishery the reduction in Sunol Valley WTP diversions would result in a greater retention of storage in the reservoir. A fuller reservoir would result in a greater frequency of periods when diversions from Alameda Creek would be rejected.

Table 2.7-5

Calaveras Reservoir Inflow from Upper Alameda Creek (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	7	128	1,093	1,210	302	314	647	919	227	42	18	12	4,919
Above Normal	11	159	1,117	1,861	1,601	597	1,007	542	139	23	11	7	7,076
Normal	9	37	1,229	1,691	1,791	1,618	881	326	96	8	5	3	7,695
Below Normal	8	44	541	1,029	1,584	1,279	393	259	68	9	5	4	5,224
Dry	7	16	205	318	367	487	232	126	38	3	3	2	1,805
All Years	8	78	837	1,227	1,141	861	634	434	113	17	8	6	5,363

Calaveras Reservoir Inflow from Upper Alameda Creek (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base - Calaveras Unconstrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	7	128	1,093	2,252	302	314	647	861	227	42	18	12	5,904
Above Normal	11	159	1,338	2,464	2,772	1,284	1,114	542	139	23	11	7	9,864
Normal	9	37	1,268	1,691	2,014	1,731	894	326	96	8	5	3	8,082
Below Normal	8	44	541	1,029	1,584	1,279	393	259	68	9	5	4	5,224
Dry	7	16	205	318	367	487	232	126	38	3	3	2	1,805
All Years	8	78	890	1,556	1,427	1,025	658	422	113	17	8	6	6,209

Difference in Calaveras Reservoir Inflow from Upper Alameda Creek (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP minus Base - Calaveras Unconstrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	-1,042	0	0	0	58	0	0	0	0	-985
Above Normal	0	0	-221	-603	-1,170	-687	-107	0	0	0	0	0	-2,788
Normal	0	0	-39	0	-223	-113	-13	0	0	0	0	0	-388
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-53	-328	-286	-164	-25	11	0	0	0	0	-846

Commensurate with changes in diversions from Alameda Creek to Calaveras Reservoir would be changes to the flow below the Alameda Creek Diversion Dam. Table 2.7-6 illustrates the flow below the Alameda Creek Diversion Dam for the WSIP and base-Calaveras constrained settings. Table 2.7-6 illustrates that, opposed to diversions to Calaveras Reservoir, flow passing Alameda Creek Diversion Dam would decrease in the WSIP setting. With operational capacity restored at Calaveras Reservoir, there would be more opportunity (and need) to divert Alameda Creek flows; thus, flow passing the dam would be reduced.

Comparing the WSIP and base-Calaveras unconstrained setting, there would more flow passing Alameda Creek Diversion Dam in the WSIP setting. As described above concerning diversions of these settings, a more frequent rejection of the diversions in the WSIP setting would occur than in the base-Calaveras unconstrained setting. Table 2.7-7 illustrates these modeling results.

The increase or decrease in flow passing the Alameda Creek Diversion Dam would occur non-systematically, not necessarily at the beginning or end of a winter season. The month (or shorter period) during which the change would occur would be governed by the coincidence of many factors, including reservoir storage, system-wide conveyance maintenance, and current hydrology.

Table 2.7-6

Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	28	1,379	6,172	7,982	5,751	2,962	116	0	0	0	0	24,389
Above Normal	7	23	700	2,532	4,017	3,095	969	0	0	0	0	0	11,345
Normal	0	6	377	264	893	459	117	6	0	0	0	0	2,122
Below Normal	0	0	18	45	106	191	2	0	0	0	0	0	361
Dry	0	0	17	0	163	0	6	0	0	0	0	0	186
All Years	1	12	495	1,790	2,618	1,893	803	24	0	0	0	0	7,636

Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	28	1,379	6,967	8,099	5,757	2,972	130	0	0	0	0	25,331
Above Normal	7	23	1,184	3,672	5,292	3,096	692	0	0	0	0	0	13,968
Normal	0	6	914	868	1,785	906	126	6	0	0	0	0	4,611
Below Normal	0	0	18	45	106	191	2	0	0	0	0	0	361
Dry	0	0	17	0	163	0	6	0	0	0	0	0	186
All Years	1	12	700	2,299	3,079	1,982	750	27	0	0	0	0	8,849

Difference in Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	-794	-117	-6	-10	-15	0	0	0	0	-942
Above Normal	0	0	-484	-1,140	-1,275	-1	277	0	0	0	0	0	-2,623
Normal	0	0	-537	-604	-892	-447	-10	0	0	0	0	0	-2,490
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-205	-509	-461	-89	54	-3	0	0	0	0	-1,213

Table 2.7-7

Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	28	1,379	6,172	7,982	5,751	2,962	116	0	0	0	0	24,389
Above Normal	7	23	700	2,532	4,017	3,095	969	0	0	0	0	0	11,345
Normal	0	6	377	264	893	459	117	6	0	0	0	0	2,122
Below Normal	0	0	18	45	106	191	2	0	0	0	0	0	361
Dry	0	0	17	0	163	0	6	0	0	0	0	0	186
All Years	1	12	495	1,790	2,618	1,893	803	24	0	0	0	0	7,636

Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base - Calaveras Unconstrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	28	1,379	5,130	7,982	5,751	2,962	173	0	0	0	0	23,405
Above Normal	7	23	479	1,929	2,847	2,408	863	0	0	0	0	0	8,556
Normal	0	6	338	264	670	346	104	6	0	0	0	0	1,734
Below Normal	0	0	18	45	106	191	2	0	0	0	0	0	361
Dry	0	0	17	0	163	0	6	0	0	0	0	0	186
All Years	1	12	441	1,462	2,332	1,728	778	35	0	0	0	0	6,790

Difference in Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP minus Base - Calaveras Unconstrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	1,042	0	0	0	-58	0	0	0	0	985
Above Normal	0	0	221	603	1,170	687	107	0	0	0	0	0	2,788
Normal	0	0	39	0	223	113	13	0	0	0	0	0	388
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	53	328	286	164	25	-11	0	0	0	0	846

Flow below the confluence of Alameda Creek and Calaveras Creek is affected by releases from Calaveras Dam to the stream, flow passing Alameda Creek Diversion Dam, and unregulated flow below Alameda Creek Diversion Dam and Calaveras Dam. Table 2.7-8 illustrates the flow below the confluence for the WSIP and base-Calaveras constrained settings, and the difference in inflow between the two. The notable differences between the WSIP and the base-Calaveras constrained settings are the addition of stream flows representing the 1997 MOU and the reduction of wetter-year/wet-season flows due to the restoration of Calaveras Reservoir storage.

Table 2.7-8

Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	430	326	2,789	12,266	24,307	16,744	8,649	548	417	430	430	417	67,751
Above Normal	437	327	1,116	3,941	8,459	6,506	1,917	430	417	430	430	417	24,826
Normal	430	304	798	1,081	2,004	1,343	539	435	417	430	430	417	8,628
Below Normal	430	298	324	858	1,217	1,007	419	430	417	430	430	417	6,677
Dry	430	298	324	813	1,274	816	423	430	417	430	430	417	6,502
All Years	431	310	1,062	3,758	7,388	5,246	2,360	454	417	430	430	417	22,703

Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	1	80	3,460	17,197	25,928	16,711	8,598	307	30	12	4	2	72,329
Above Normal	12	68	1,612	7,001	11,980	6,754	1,462	103	22	6	2	1	29,023
Normal	1	29	1,356	1,501	3,053	1,586	284	65	9	2	0	0	7,886
Below Normal	1	22	78	186	341	412	74	41	7	0	0	0	1,161
Dry	1	6	43	35	230	69	49	23	1	0	0	0	457
All Years	3	41	1,298	5,145	8,254	5,069	2,061	107	14	4	1	1	21,999

Difference in Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	-671	-4,930	-1,621	33	51	241	387	417	425	415	-4,578
Above Normal	425	258	-496	-3,060	-3,520	-248	454	327	396	423	428	417	-4,197
Normal	429	275	-559	-420	-1,049	-243	255	370	408	428	430	417	741
Below Normal	429	276	246	672	876	596	345	389	411	429	430	417	5,515
Dry	429	292	281	778	1,044	747	374	407	416	430	430	417	6,045
All Years	428	269	-237	-1,387	-865	177	298	347	403	426	428	417	704

Table 2.7-9 illustrates the same form of information in comparing flows below the confluence for the WSIP and base-Calaveras unconstrained settings. As described above, in the WSIP setting, Calaveras Reservoir would retain more storage than in the base-Calaveras unconstrained setting, which would lead to additional rejection of water from Alameda Creek and an increase in spills of Calaveras Creek water from Calaveras Reservoir. In combination with fishery releases from Calaveras Dam to Calaveras Creek, more flow in all years would occur below the confluence.

Table 2.7-9

Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	430	326	2,789	12,266	24,307	16,744	8,649	548	417	430	430	417	67,751
Above Normal	437	327	1,116	3,941	8,459	6,506	1,917	430	417	430	430	417	24,826
Normal	430	304	798	1,081	2,004	1,343	539	435	417	430	430	417	8,628
Below Normal	430	298	324	858	1,217	1,007	419	430	417	430	430	417	6,677
Dry	430	298	324	813	1,274	816	423	430	417	430	430	417	6,502
All Years	431	310	1,062	3,758	7,388	5,246	2,360	454	417	430	430	417	22,703

Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Base - Calaveras Unconstrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	1	80	1,752	10,611	21,473	16,059	8,539	350	30	12	4	2	58,913
Above Normal	12	68	723	2,780	4,936	5,005	1,482	103	22	6	2	1	15,139
Normal	1	29	564	533	1,056	674	262	65	9	2	0	0	3,194
Below Normal	1	22	78	186	341	412	74	41	7	0	0	0	1,161
Dry	1	6	43	35	230	69	49	23	1	0	0	0	457
All Years	3	41	626	2,796	5,535	4,401	2,049	115	14	4	1	1	15,587

Difference in Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP minus Base - Calaveras Unconstrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	1,036	1,655	2,834	685	110	198	387	417	425	415	8,838
Above Normal	425	258	393	1,161	3,524	1,501	434	327	396	423	428	417	9,687
Normal	429	275	234	548	948	669	277	370	408	428	430	417	5,434
Below Normal	429	276	246	672	876	596	345	389	411	429	430	417	5,515
Dry	429	292	281	778	1,044	747	374	407	416	430	430	417	6,045
All Years	428	269	435	962	1,854	845	310	338	403	426	428	417	7,116

A flow recapture facility in Alameda Creek below Calaveras Reservoir is incorporated in the WSIP setting. This facility is assumed to recapture flows explicitly released from Calaveras Dam in the representation of the 1997 MOU. The effect of the recapture is a reduction in the flow that occurs below the confluence of Alameda and Calaveras Creeks, but only to the extent that releases were explicitly made from Calaveras Reservoir. Flows below this diversion have been estimated and noted as the flow above the Alameda and San Antonio Creek confluence. Table 2.7-10 illustrates the flow at this location for the WSIP and base-Calaveras constrained settings. The flows identified at this location indicate flow occurring below the confluence of Alameda and Calaveras Creeks (described above), with the addition of estimated unregulated stream accretions between the Alameda-Calaveras Creek confluence and the Alameda-San Antonio Creek confluence minus the water assumed to be recaptured (diverted) by the SFPUC from the creek. The same form of information is illustrated in Table 2.7-11 in comparing the WSIP and base-Calaveras unconstrained settings.

Table 2.7-10

Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,180	13,613	25,832	17,847	9,299	498	76	33	15	9	70,563
Above Normal	19	150	1,312	4,459	9,146	6,916	2,168	217	54	20	9	6	24,477
Normal	7	64	922	913	1,837	1,269	469	134	28	9	4	3	5,658
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	1,128	3,862	7,502	5,333	2,407	197	38	14	7	4	20,588

Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,968	18,668	27,692	17,977	9,358	513	76	33	15	9	78,470
Above Normal	19	150	1,981	7,819	13,060	7,467	1,861	217	54	20	9	6	32,664
Normal	7	64	1,676	1,881	3,611	2,007	479	134	28	9	4	3	9,902
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	1,567	5,733	9,022	5,616	2,356	199	38	14	7	4	24,656

Difference in Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-788	-5,055	-1,860	-131	-59	-15	0	0	0	0	-7,907
Above Normal	0	0	-668	-3,360	-3,914	-550	306	0	0	0	0	0	-8,186
Normal	0	0	-753	-968	-1,774	-738	-10	0	0	0	0	0	-4,244
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-439	-1,872	-1,521	-284	50	-3	0	0	0	0	-4,068

Table 2.7-11

Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,180	13,613	25,832	17,847	9,299	498	76	33	15	9	70,563
Above Normal	19	150	1,312	4,459	9,146	6,916	2,168	217	54	20	9	6	24,477
Normal	7	64	922	913	1,837	1,269	469	134	28	9	4	3	5,658
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	1,128	3,862	7,502	5,333	2,407	197	38	14	7	4	20,588

Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Base - Calaveras Unconstrained

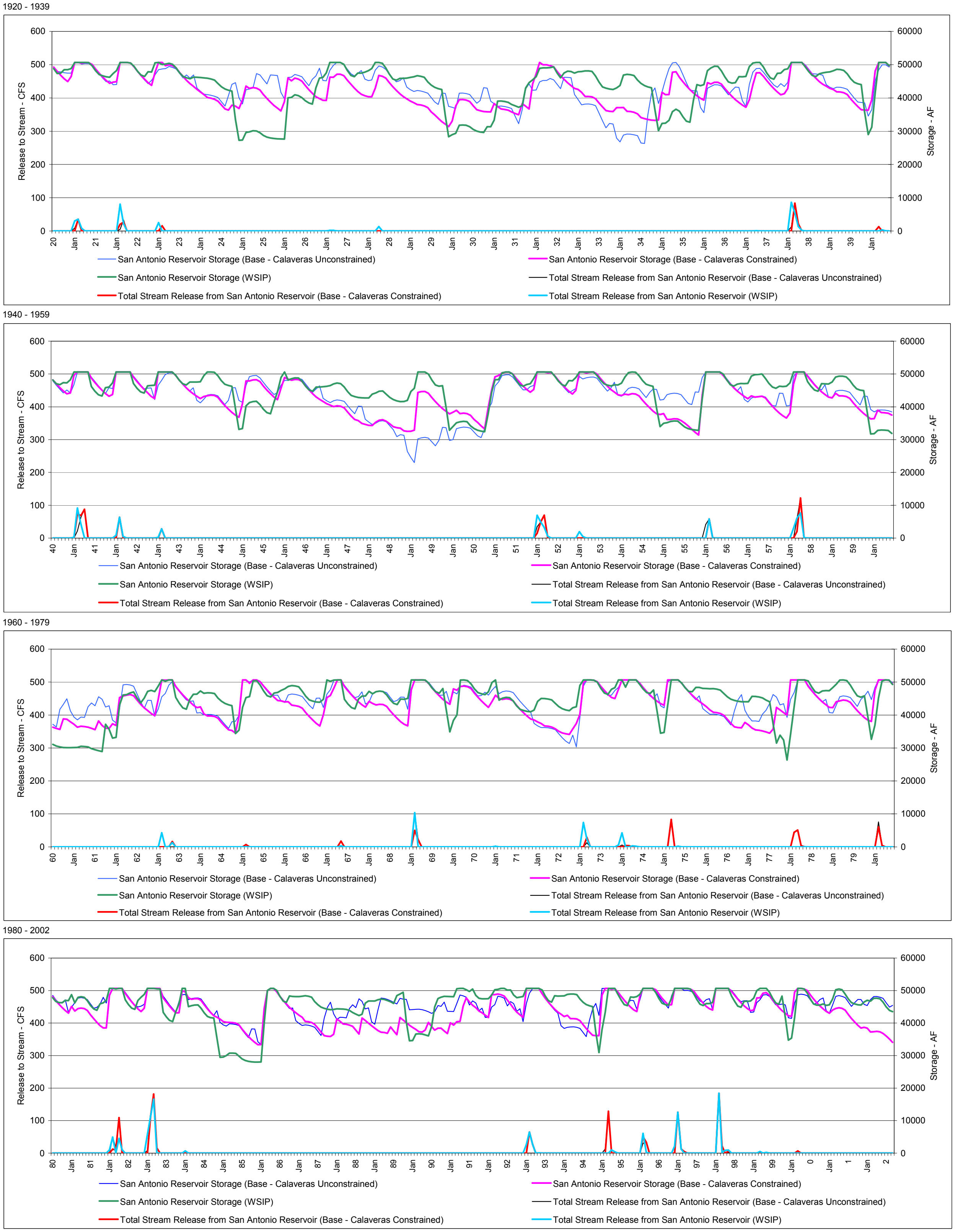
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	2,261	12,082	23,237	17,326	9,299	556	76	33	15	9	65,054
Above Normal	19	150	1,091	3,597	6,016	5,718	1,881	217	54	20	9	6	18,780
Normal	7	64	883	913	1,614	1,095	456	134	28	9	4	3	5,209
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	895	3,384	6,303	4,949	2,345	208	38	14	7	4	18,244

Difference in Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP minus Base - Calaveras Unconstrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	920	1,531	2,594	521	0	-58	0	0	0	0	5,508
Above Normal	0	0	221	862	3,130	1,199	286	0	0	0	0	0	5,698
Normal	0	0	39	0	223	174	13	0	0	0	0	0	449
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	233	477	1,199	384	62	-11	0	0	0	0	2,344

The difference in San Antonio Reservoir storage between the WSIP and base-Calaveras constrained settings is the result of several factors, and is predominantly due to the restoration of the operational capacity of Calaveras Reservoir, the use of SJPL flow for maintenance of Sunol Valley WTP production, and the maintenance of Hetch Hetchy conveyance. Figure 2.7-4 illustrates a chronological trace of the simulation of San Antonio Reservoir storage and stream releases from the dam. Shown in Figure 2.7-4 are the results for the WSIP and base settings. In the base-Calaveras constrained setting, the limited operating storage capacity at Calaveras Reservoir leads to a different operation at San Antonio Reservoir, one that draws relatively more stored water for system demands when the draw from Calaveras Reservoir is constrained due to limited storage. The resultant effect is that the WSIP setting would retain more storage in San Antonio Reservoir than in the base-Calaveras constrained setting. The exception to this outcome is during cyclic maintenance of Hetch Hetchy conveyance that will constrain Hetch Hetchy diversions every year, but most dramatically every fifth year. During these periods, additional water will be drawn from San Antonio Reservoir and the other Bay Area reservoirs to serve system-wide deliveries when limited or no water will be available from Hetch Hetchy. The coincidence of wet local Bay Area watershed hydrology, reservoir storage balancing among the Bay Area reservoirs, and maintenance affects the severity of draw down and rate of replenishment of San Antonio Reservoir.

Figure 2.7-4
San Antonio Reservoir Storage and Stream Release



Also affecting the magnitude of draw from San Antonio Reservoir are modeling assumptions for the balancing of total Bay Area reservoir storage among the five major SFPUC reservoirs. The model balances storage between reservoirs by way of an input file by the modeler concerning the relative draw (percentage) from each reservoir under various storage conditions. These are discretionary input in the model, and the logic and relative percentages are meant to mimic the current practice and discretion of the system operators based on recognition of the physical conveyance constraints within the system and the ability of each reservoir to provide yield and water delivery security. The logic currently favors the retention of storage in the peninsula reservoirs for security reasons, and thus the provision of additional water between the settings is balanced between San Antonio and Calaveras Reservoir.

Compared to the base-Calaveras unconstrained setting, relative changes in San Antonio Reservoir operations in the WSIP generally lead to conclusions that mirror the differences experienced for the comparison to the base-Calaveras constrained operation. The WSIP setting would typically result in a reservoir less drawn upon, except during periods when system-wide conveyance maintenance would additionally burden Bay Area reservoir storage. Figure 2.7-5 illustrates the average monthly storage in San Antonio Reservoir for the 82-year simulation, and the range in storage for each month for the WSIP and base-Calaveras constrained settings. Figure 2.7-6 illustrates the same form of information in comparing the WSIP and base-Calaveras unconstrained settings.

Figure 2.7-5

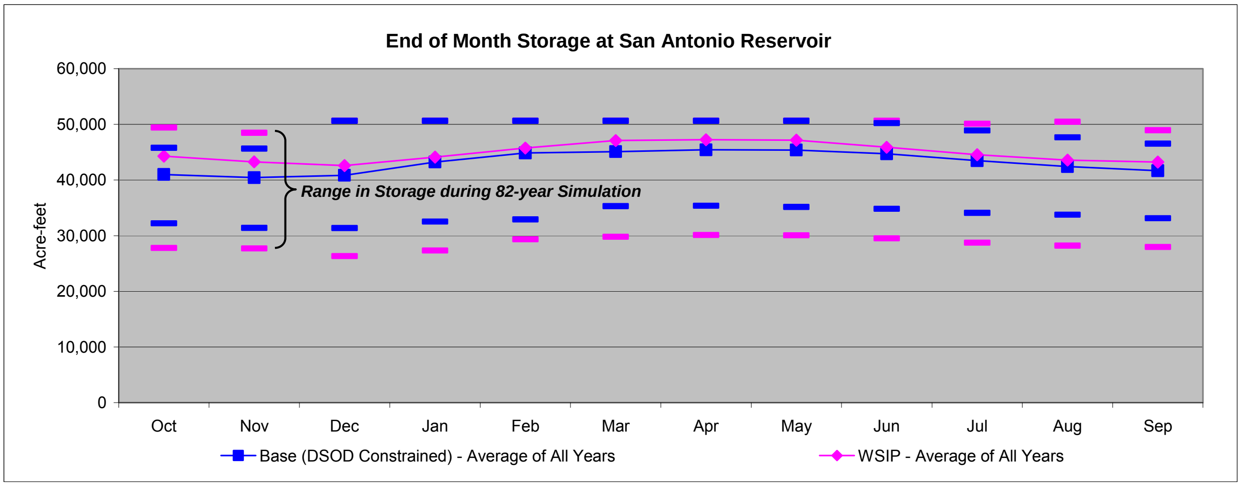
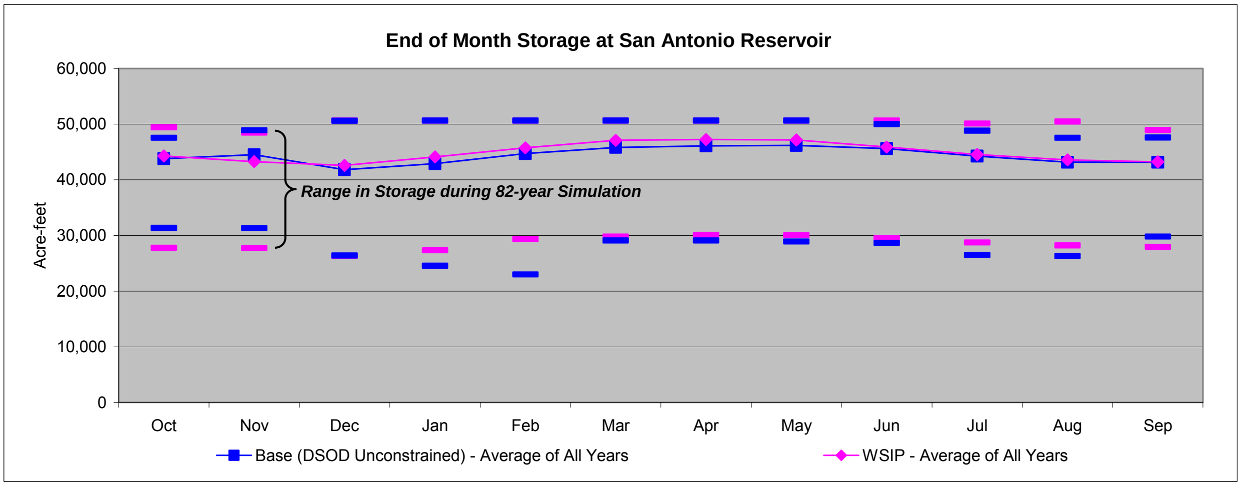


Figure 2.7-6



There would very little change in stream releases below San Antonio Reservoir between the WSIP and base settings. With storage conditions lower at some times and higher at other times, a difference in the ability to regulate reservoir inflow and avoid stream releases is expected. Given the sometimes rigid constraints within the modeling assumptions, the model will overestimate the frequency and magnitude of stream releases from San Antonio Reservoir under any of the investigated settings. The flexibility that occurs in actual operations would likely avoid most of the releases represented by the model. The modeled stream releases from San Antonio Reservoir and difference between releases for the WSIP setting and base-Calaveras constrained setting are shown in Table 2.7-12. The differences among the two settings range from increases to decreases in flow. This modeled circumstance reflects the different resulting storage operation between the two settings as seen in Figure 2.7-4. As described above, the model will overestimate the frequency and magnitude of releases from San Antonio Reservoir, and the actual releases from San Antonio Reservoir in any setting and the difference between settings are expected to be minor. Table 2.7-13 illustrates the same form of information in comparing the WSIP and base-Calaveras unconstrained settings.

Table 2.7-12

Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	82	1,046	3,176	1,482	592	115	0	0	0	0	6,493
Above Normal	0	0	19	456	1,025	237	29	73	0	0	0	0	1,841
Normal	0	0	0	105	16	0	50	0	0	0	0	0	172
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	20	319	835	338	131	38	0	0	0	0	1,682

Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	538	2,350	2,480	1,324	88	0	0	0	0	6,780
Above Normal	0	0	0	0	881	883	12	58	0	0	0	0	1,835
Normal	0	0	0	0	1	0	0	0	0	0	0	0	1
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	0	105	641	667	261	29	0	0	0	0	1,703

Difference in Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	82	508	826	-999	-732	28	0	0	0	0	-287
Above Normal	0	0	19	456	145	-647	17	15	0	0	0	0	6
Normal	0	0	0	105	16	0	50	0	0	0	0	0	172
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	20	214	194	-329	-129	8	0	0	0	0	-21

Table 2.7-13

Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	82	1,046	3,176	1,482	592	115	0	0	0	0	6,493
Above Normal	0	0	19	456	1,025	237	29	73	0	0	0	0	1,841
Normal	0	0	0	105	16	0	50	0	0	0	0	0	172
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	20	319	835	338	131	38	0	0	0	0	1,682

Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base - Calaveras Unconstrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	805	2,624	2,557	1,327	18	0	0	0	0	7,330
Above Normal	0	0	0	51	251	509	0	0	0	0	0	0	811
Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	0	168	564	604	259	3	0	0	0	0	1,598

Difference in Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP minus Base - Calaveras Unconstrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	82	242	551	-1,075	-735	98	0	0	0	0	-837
Above Normal	0	0	19	405	775	-272	29	73	0	0	0	0	1,030
Normal	0	0	0	105	16	0	50	0	0	0	0	0	172
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	20	152	271	-266	-127	34	0	0	0	0	84

Flow below the confluence of Alameda and San Antonio Creeks is influenced by releases from San Antonio Reservoir and flow arriving at the location from Alameda Creek, which includes upstream impairment by SFPUC operations and facilities. Table 2.7-14 illustrates the flow below the confluence for the WSIP and base-Calaveras constrained settings, and the differences in flow between the two. The differences are particularly due to the effects of the restoration of Calaveras Reservoir operating capacity in the WSIP setting. The same form of information for the flow below the San Antonio Creek and Alameda

Creek confluence is illustrated in Table 2.7-15 in comparing the WSIP and base-Calaveras unconstrained settings.

Table 2.7-14

Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,262	14,659	29,007	19,329	9,890	614	76	33	15	9	77,055
Above Normal	19	150	1,332	4,916	10,171	7,153	2,197	290	54	20	9	6	26,318
Normal	7	64	922	1,019	1,853	1,269	519	134	28	9	4	3	5,830
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	1,148	4,181	8,337	5,671	2,538	234	38	14	7	4	22,270

Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,968	19,206	30,042	20,458	10,681	601	76	33	15	9	85,250
Above Normal	19	150	1,981	7,819	13,941	8,350	1,873	276	54	20	9	6	34,498
Normal	7	64	1,676	1,881	3,612	2,007	479	134	28	9	4	3	9,902
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	1,567	5,838	9,664	6,284	2,617	229	38	14	7	4	26,359

Difference in Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-706	-4,547	-1,034	-1,129	-791	13	0	0	0	0	-8,194
Above Normal	0	0	-649	-2,903	-3,770	-1,197	324	15	0	0	0	0	-8,180
Normal	0	0	-753	-863	-1,759	-738	41	0	0	0	0	0	-4,072
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-419	-1,657	-1,327	-612	-79	6	0	0	0	0	-4,089

Table 2.7-15

Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,262	14,659	29,007	19,329	9,890	614	76	33	15	9	77,055
Above Normal	19	150	1,332	4,916	10,171	7,153	2,197	290	54	20	9	6	26,318
Normal	7	64	922	1,019	1,853	1,269	519	134	28	9	4	3	5,830
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	1,148	4,181	8,337	5,671	2,538	234	38	14	7	4	22,270

Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Base - Calaveras Unconstrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	2,261	12,887	25,861	19,882	10,625	574	76	33	15	9	72,384
Above Normal	19	150	1,091	3,648	6,266	6,227	1,881	217	54	20	9	6	19,590
Normal	7	64	883	913	1,614	1,095	456	134	28	9	4	3	5,209
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	895	3,552	6,867	5,553	2,603	211	38	14	7	4	19,842

Difference in Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP minus Base - Calaveras Unconstrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	1,001	1,772	3,146	-554	-735	40	0	0	0	0	4,671
Above Normal	0	0	240	1,267	3,904	927	316	73	0	0	0	0	6,728
Normal	0	0	39	105	239	174	63	0	0	0	0	0	621
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	253	629	1,470	118	-66	23	0	0	0	0	2,427

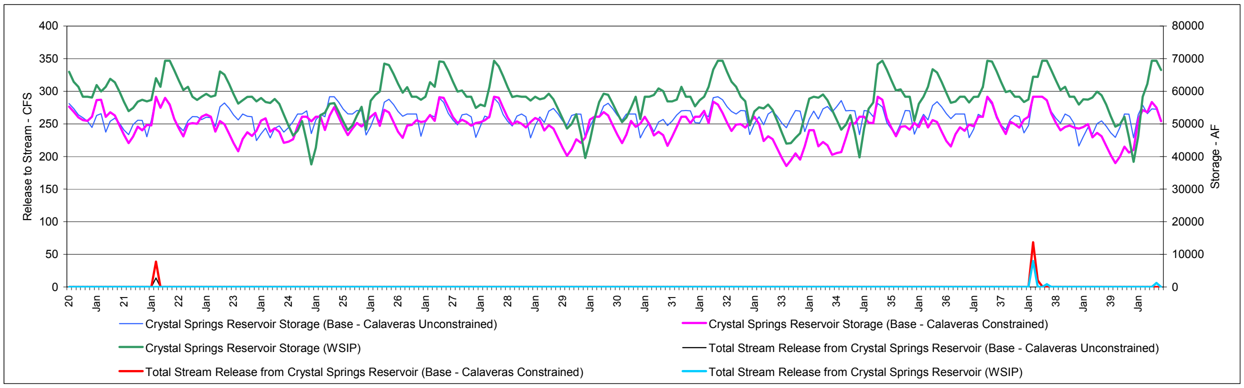
2.8 Crystal Springs and San Andreas Reservoirs

Fundamental to the difference in storage operations between the WSIP setting and the base settings is the restoration of reservoir operation capacity in the WSIP setting, which does not occur in the base settings. The result is the operation of Crystal Springs Reservoir at a higher maximum storage in the WSIP setting. Figure 2.8-1 illustrates a chronological trace of the simulation of Crystal Springs Reservoir storage and stream releases from Springs Dam. Shown in Figure 2.8-1 are the results for the WSIP and base settings.

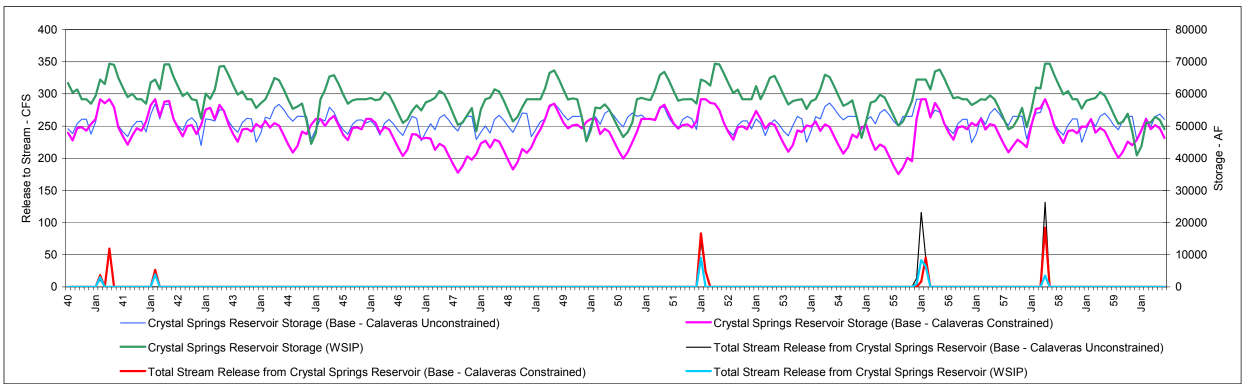
Compared to the base-Calaveras constrained setting, the WSIP setting would generally result in a shifting of the maximum storage level and the range of reservoir operation to a greater volume (elevation); the lower end of the monthly operating range would normally be greater in storage than in the base-Calaveras constrained setting. In some years, the variation from maximum storage to minimum storage may increase in the WSIP setting.

Figure 2.8-1
Crystal Springs Reservoir Storage and Release

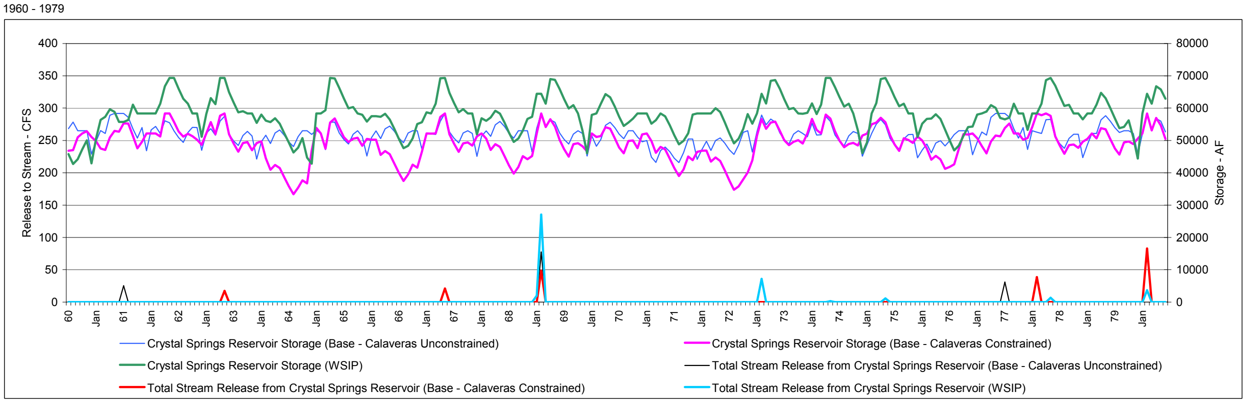
1920 - 1939



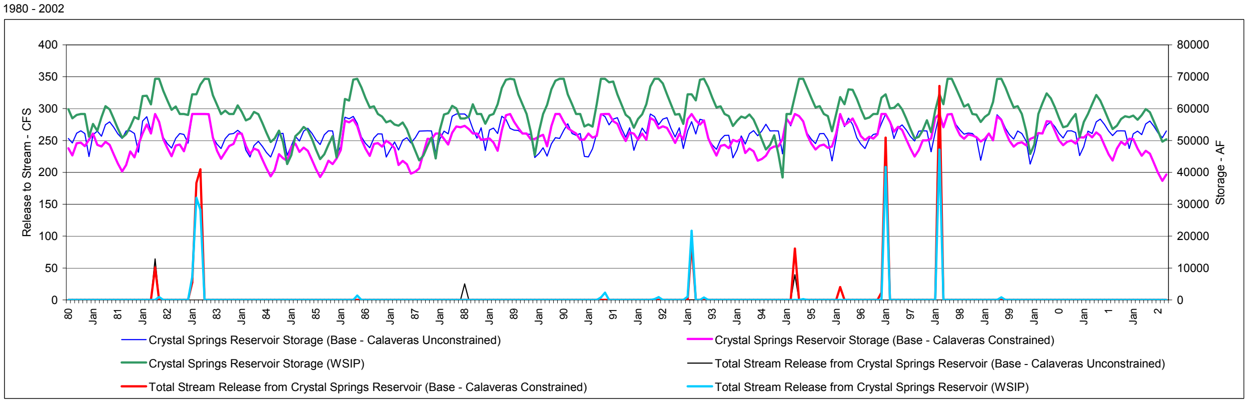
1940 - 1959



1960 - 1979



1980 - 2002



The comparison of the WSIP setting to the base-Calaveras unconstrained setting is about the same as for the comparison to the base-Calaveras constrained setting. The differences are slightly less pronounced because the base-Calaveras unconstrained setting results in a less exercised reservoir than the base-Calaveras constrained setting. The base-Calaveras unconstrained setting typically draws less water cyclically from Crystal Springs Reservoir due to the ability of Calaveras Reservoir to serve system-wide deliveries.

Figure 2.8-2 illustrates the average monthly storage in Crystal Springs Reservoir for the 82-year simulation, and the range in storage for each month for the WSIP and base-Calaveras constrained settings. Consistent with the discussion above, the WSIP setting would result in reservoir storage operating at a higher average and higher upper-range than the base-Calaveras constrained setting. This circumstance predominantly occurs due to the restoration of the operating capacity of Crystal Springs Reservoir. The same form of information is illustrated in Figure 2.8-3 in comparing the WSIP and base-Calaveras unconstrained settings.

There is minimal difference in stream releases between the WSIP and base settings (which could be either an increase or decrease in the release). The potential difference is attributed to whether the different resulting storage in the reservoir is higher or lower between the two settings. Part of the difference in modeled Crystal Springs Reservoir storage is due to modeling assumptions for the proportionate management of storage among the Bay Area reservoirs, and the coincidence of constrained conveyance flow rates. In actual operations, it is anticipated that system operators would manage the reservoir system such that stream releases would be minimal under any setting and essentially no difference would occur between the WSIP and base settings.

Table 2.8-1 illustrates the stream releases for the WSIP and base-Calaveras constrained settings, and the difference in modeled flows between the two settings. A greater operating range in Crystal Springs Reservoir operation would lead to an increased potential to regulate reservoir inflow, which would lead to less risk in needing to make stream releases. However, as described above, actual system operations will attempt to minimize releases under any setting; thus, the difference in releases between the variant and base setting will be minimal, if any. Table 2.8-2 illustrates the same form of information in comparing modeled stream releases between the WSIP and base-Calaveras unconstrained settings.

San Andreas Reservoir operations would generally be the same between the WSIP and base settings. Reservoir storage would follow a systematic filling and lowering each year in managing runoff. Figure 2.8-4 illustrates the average monthly storage in San Andreas Reservoir for the 82-year simulation, and the range in storage for each month for the WSIP and base-Calaveras constrained settings. Figure 2.8-5 illustrates a chronological trace of the simulation of San Andreas Reservoir storage and stream releases from Springs Dam. Shown in Figure 2.8-5 are the results for the WSIP and base settings. There are no projected stream releases from San Andreas Reservoir in any setting. Notable in Figure 2.8-5 is the difference in storage operation every fifth year. The WSIP setting storage operation differs from the base settings. The differences in operation arise from the assumed difference in Hetch Hetchy conveyance maintenance in each setting. In the WSIP setting, the maintenance occurs systematically every year, and to a greater degree every fifth year, which constrains the amount of Hetch Hetchy water supplied to serve water demands in the Bay Area. As discussed previously, during these winter periods, the Bay Area reservoir system accommodates the reduction in imported supply by serving the Bay Area water deliveries with the local watersheds' runoff and storage. At San Andreas Reservoir, the serving of water demand affects the reservoir when additional required water production at Harry Tracy Water Treatment Plant (Harry Tracy WTP) associated with WSIP or the base-Calaveras unconstrained setting exceeds the ability to maintain San Andreas Reservoir storage with pumping from Crystal Springs Reservoir. The model assumes that the conveyance capacity from Crystal Springs Reservoir is the same among all of the settings. The additional water demand of the WSIP setting and the current demand of the base-Calaveras unconstrained setting require additional production from Harry Tracy WTP to be drawn from San Andreas Reservoir.

Figure 2.8-2

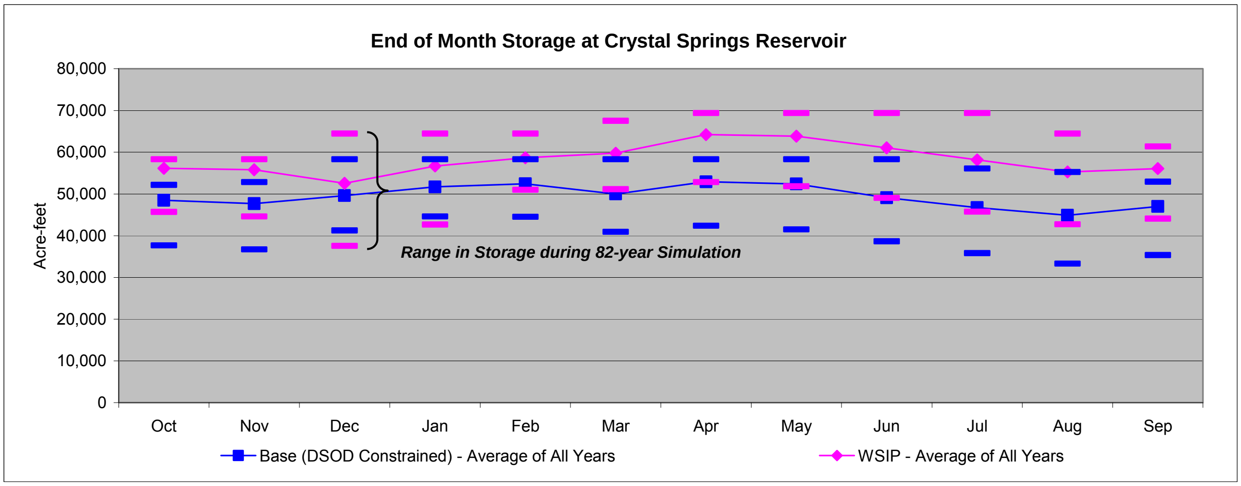


Figure 2.8-3

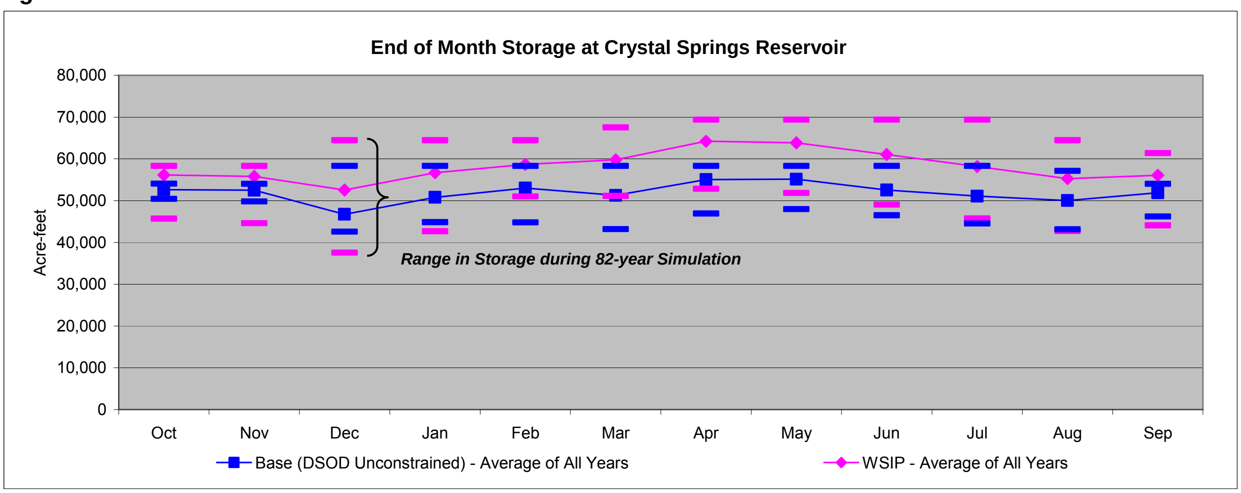


Table 2.8-1

Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	17	1,309	2,398	542	65	65	0	0	0	0	4,397
Above Normal	0	0	0	18	354	0	0	99	0	0	0	0	472
Normal	0	0	0	0	0	0	0	5	15	0	0	0	20
Below Normal	0	0	0	0	0	0	13	40	0	0	0	0	53
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	3	259	541	106	15	43	3	0	0	0	971

Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	44	1,433	2,889	1,134	756	81	0	0	0	0	6,336
Above Normal	0	0	0	0	608	0	0	63	0	0	0	0	671
Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	9	280	690	221	147	29	0	0	0	0	1,375

Difference in Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
WSIP minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-27	-124	-491	-592	-691	-15	0	0	0	0	-1,939
Above Normal	0	0	0	18	-254	0	0	37	0	0	0	0	-199
Normal	0	0	0	0	0	0	0	5	15	0	0	0	20
Below Normal	0	0	0	0	0	0	13	40	0	0	0	0	53
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-5	-20	-148	-115	-132	14	3	0	0	0	-405

Table 2.8-2

Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	17	1,309	2,398	542	65	65	0	0	0	0	4,397
Above Normal	0	0	0	18	354	0	0	99	0	0	0	0	472
Normal	0	0	0	0	0	0	0	5	15	0	0	0	20
Below Normal	0	0	0	0	0	0	13	40	0	0	0	0	53
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	3	259	541	106	15	43	3	0	0	0	971

Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Base - Calaveras Unconstrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	52	1,612	2,497	975	942	0	0	0	0	0	6,079
Above Normal	0	0	0	0	46	0	0	0	0	0	0	0	46
Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	313	0	0	313
All Years	0	0	10	315	497	190	184	0	0	61	0	0	1,257

Difference in Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP minus Base - Calaveras Unconstrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-35	-303	-99	-433	-877	65	0	0	0	0	-1,682
Above Normal	0	0	0	18	308	0	0	99	0	0	0	0	426
Normal	0	0	0	0	0	0	0	5	15	0	0	0	20
Below Normal	0	0	0	0	0	0	13	40	0	0	0	0	53
Dry	0	0	0	0	0	0	0	0	0	-313	0	0	-313
All Years	0	0	-7	-55	45	-85	-168	43	3	-61	0	0	-286

Figure 2.8-4

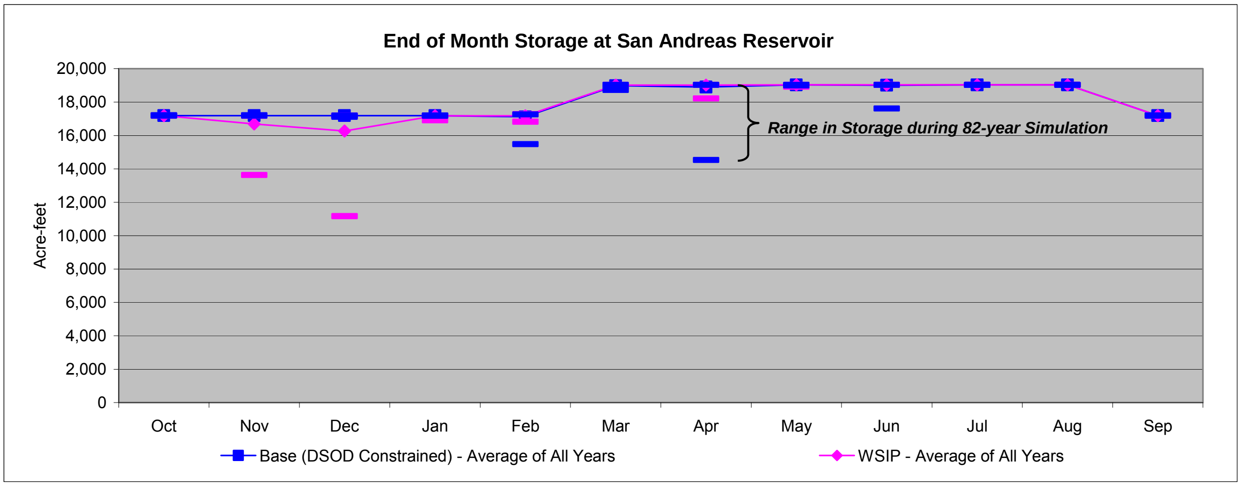
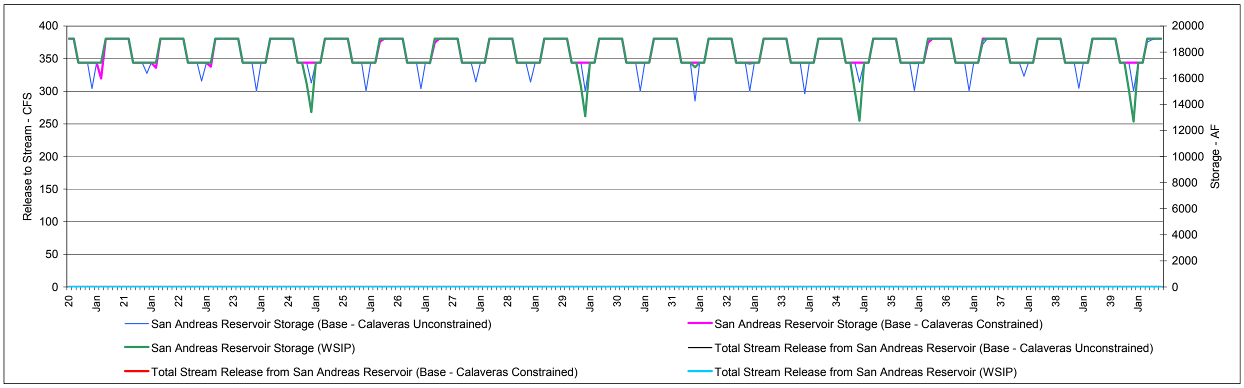
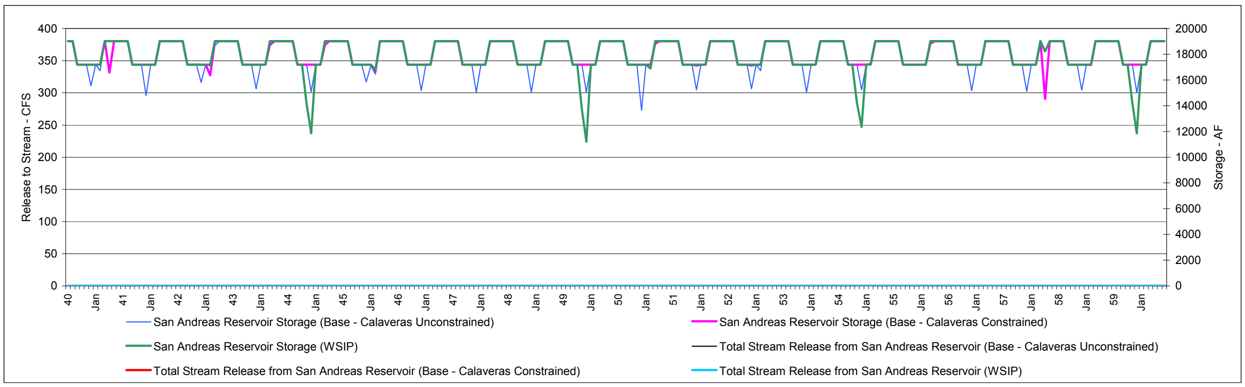


Figure 2.8-5
San Andreas Reservoir Storage and Stream Release

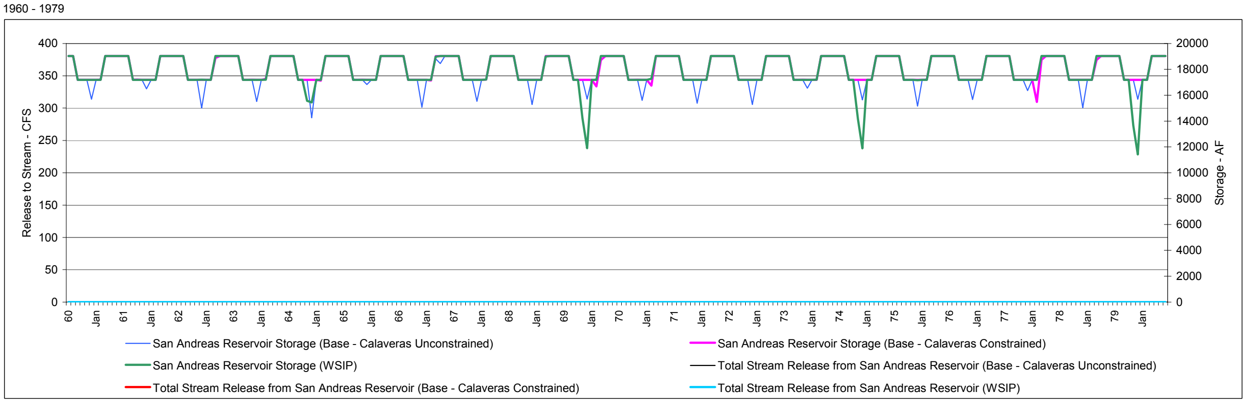
1920 - 1939



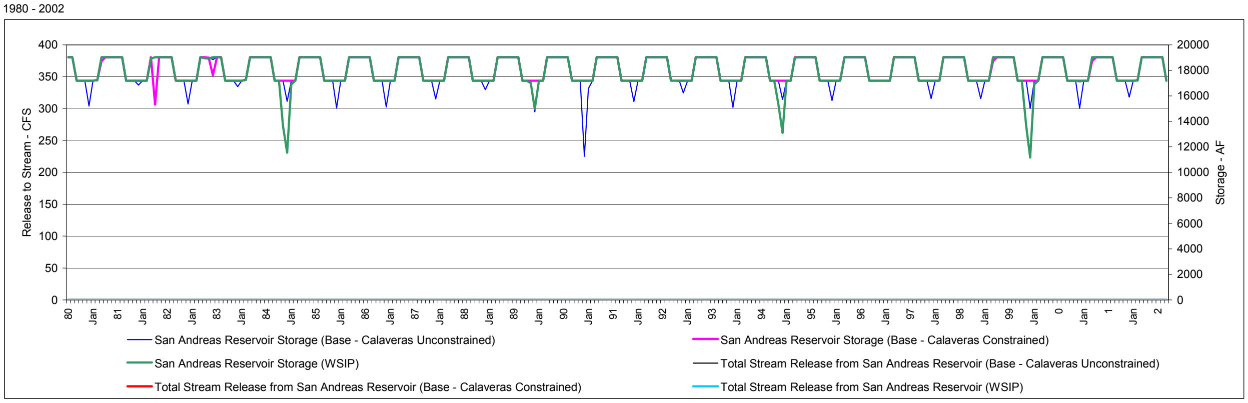
1940 - 1959



1960 - 1979



1980 - 2002



2.9 Pilarcitos Reservoir

Coastside County Water District's (Coastside CWD's) water demand and its SFPUC purchase request are projected to increase within the WSIP planning horizon of year 2030. Within the context of the 2030 purchase request of 300 mgd, Coastside CWD's portion has been estimated to amount to about 3 mgd. This projected purchase request is approximately 1 mgd greater that its current purchase request. Considering the current physical constraints to deliveries from the SFPUC to Coastside CWD and the ongoing planning activities in the watershed, the precise means of serving Coastside CWD's additional purchase request (and the resultant potential changes to the operation of SFPUC facilities and their affected environs) are uncertain.[2]

Assuming a range of potential means to serve the additional purchase request from Coastside CWD, the following are potential hydrologic effects to SFPUC facilities and their affected environs:

- Due to limited yield from Pilarcitos Reservoir, additional diversions would be required from Crystal Springs Reservoir.
- If deliveries to Coastside CWD from Pilarcitos Reservoir increase during the winter season, these deliveries could potentially reduce storage in Pilarcitos Reservoir, thereby potentially reducing diversions to the San Mateo Creek watershed. Although the increased delivery would increase releases to Pilarcitos Creek from Pilarcitos Dam for a period of time, the increase would subsequently lead to a reduction in spills past Stone Dam.
- Additional wintertime deliveries could also potentially impair the ability to provide carry-over storage into the summer season from Pilarcitos Reservoir, and subsequently lead to an acceleration of the beginning of the season when releases to Pilarcitos Creek from Pilarcitos Reservoir consist only of the passage of reservoir inflow.
- An increase in summertime deliveries from Pilarcitos Creek could also accelerate the beginning of the season when releases to Pilarcitos Creek from Pilarcitos Reservoir consist only of the passage of reservoir inflow.

[2] See "Analysis of SFPUC PIlarcitos/Coastside County Water District Operations", Memorandum by Daniel B. Steiner, March 8, 2007.

APPENDIX H2-2

Memorandum

Subject: **Estimated Effect of WSIP on Daily Releases below Hetch Hetchy Reservoir**
From: **Daniel B. Steiner**
Date: **December 31, 2006**

1. Introduction

The simulation of San Francisco Public Utilities Commission (SFPUC) Regional Water System daily operations over a long-term record of hydrology is currently not available with existing modeling tools. The Hetch Hetchy Local Simulation Model (HH/LSM) performs analyses using a monthly time-step, with input and results depicted by monthly volumes of water. As such, the day-to-day variation of operations, or an operational decision that can occur in less than monthly intervals cannot always be adequately represented or depicted by "monthly" HH/LSM results. One such hydrologic parameter that suggests an alternative interpretation is the stream release that is simulated to occur below O'Shaughnessy Dam. This occurs as either a fairly constant release through the low-level outlet for fishery maintenance or varying controlled releases through the dam's outlet valves and through the spillway. The release from the dam during the year is typically limited to the amount of flow required to meet fishery stream flow commitments. However, during many years, an amount of water above minimum flow commitments requires release to the stream. These flows are managed on a day-to-day basis to balance inflow, reservoir storage, and diversions to water supply and power operations. During the runoff season, operations can change daily as prevailing conditions warrant.

HH/LSM simulations cannot fully depict the within-month changes that can occur. For instance, although the model will accurately depict that several thousand acre-feet of reservoir spill would occur in a month (e.g., 24,000 acre-feet in a month), the model results do not provide sufficient information regarding the daily magnitude or duration of the release during that month. A 24,000-acre-foot release during a month could occur as a constant release of 400 cubic feet per second (cfs) per day, or it could occur as an 800 cfs release during half of the days during a month. By looking solely at the average monthly results provided by HH/LSM, the effects of the operational and system changes may not be fully understood. This memorandum illustrates the adaptation of HH/LSM monthly results into an estimate of the projected change in daily releases to the stream below the dam as a result of the Water System Improvement Program (WSIP).

2. Approach

The record of recent historical operations at O'Shaughnessy Dam serves as the backdrop for this analysis. Also incorporated are the HH/LSM simulated operation of the existing system and the simulation of system operations after implementation of the WSIP. Upon tracing historical operations, the modeled incremental changes between the existing system operation and the operation of the system with the WSIP are layered. The modeled operation captured in the analysis is the change in Hetch Hetchy Reservoir storage that occurs from one year to the next due to the WSIP. That change in storage would be subsequently replenished by a change in diversions to Canyon Tunnel or spills to the river below the dam.

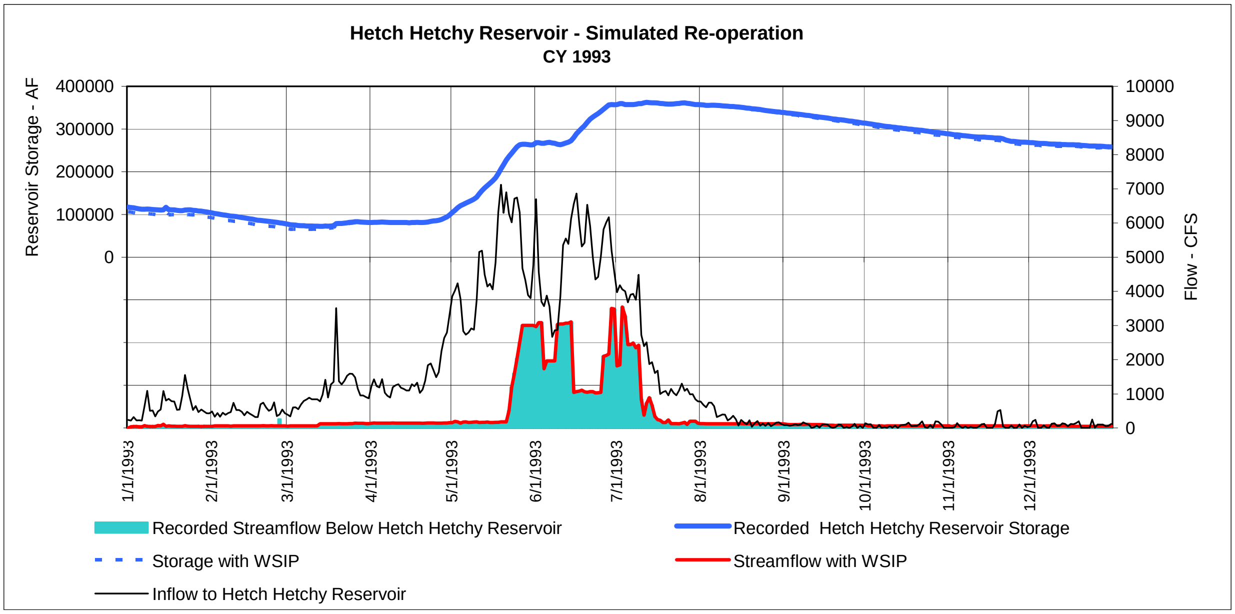
This analysis has been limited to evaluating only the most recent record of operations, those that have occurred since the 1987-1992 drought. Operations subsequent to that period incorporate additional emphasis on carryover storage to safeguard water supply yield, consistent with modeled operations. This period also represents a generally stable level of current system water demand, again consistent with modeled operations. Both of these factors make the modeled results of the existing system a more comparable representation to recent historical operations.

3. Analysis

Analyses of the WSIP have illustrated that additional diversion from Hetch Hetchy Reservoir to provide for additional SFPUC Regional Water System water deliveries would additionally deplete the reservoir in most years. To replenish this storage, spills to the river either from Kirkwood Powerhouse or from the dam would be subsequently reduced.

Figure 1 illustrates a trace of the recorded storage in Hetch Hetchy Reservoir (solid blue line), inflow to the reservoir (daily varying black solid line), and releases to the stream below the dam (area graph shown in aqua blue) for calendar year 1993. Also shown in Figure 1 is the adjusted Hetch Hetchy Reservoir storage (dashed blue line) subsequent to the WSIP. The solid red line depicts the estimated daily release below the dam subsequent to the WSIP.

Figure 1



The adjusted Hetch Hetchy Reservoir storage is depicted by layering onto the historical record of reservoir storage the change in modeled storage between existing conditions and the WSIP condition. The premise is that, although the absolute depiction of reservoir storage through modeling may differ from recorded operations (due to several anomalies that occur in the actual operation that cannot be fully captured by modeling), the relative difference between the two modeled conditions will be adequately representative of the change that would have occurred to historical operations. Because HH/LSM only develops monthly results, the model change in storage in the reservoir was evenly distributed during a month to provide the daily adjustment to the recorded daily historical storage.

The change in storage from month to month is derived from HH/LSM results and is applied to the historical record of storage. In this “re-operation” of 1993, there is approximately 11,000 acre-feet less storage in the reservoir at the end of February, with the deficit eliminated by the end of March (dashed blue line). The deficit is due to additional water supply diversions in the previous year under the WSIP. Both the modeled operation and recorded operation release no more than minimum flows below the dam for this period, indicating that the replenishment of storage in this particular year would have occurred through a reduction in Canyon Tunnel diversions (spills to the river from Kirkwood Powerhouse). With this replenishment occurring prior to the spill period, the remainder of the stream release operation through the spill period (solid red line) would remain the same as the historical operation. In this example, the WSIP would not affect the magnitude or duration of the spill hydrograph for 1993.

The effect of the WSIP varies by year. Calendar year 1994 is another example illustrating that, at times, the WSIP is anticipated to have no effect on the stream releases below the dam. Figure 2 provides a trace of 1994 actual operations. Although reservoir storage is depicted to be diminished prior to and through May, only minimum releases to the stream occurred during the year; therefore, the WSIP would have no effect on stream releases below the dam in this year. During this year of operation, the deficit of storage would be replenished prior to the end of the runoff season by a reduction in Canyon Tunnel diversions. Subsequent to the reservoir being filled, the additional diminishment of storage would begin again and the effect would be carried into the next year.

Figure 2

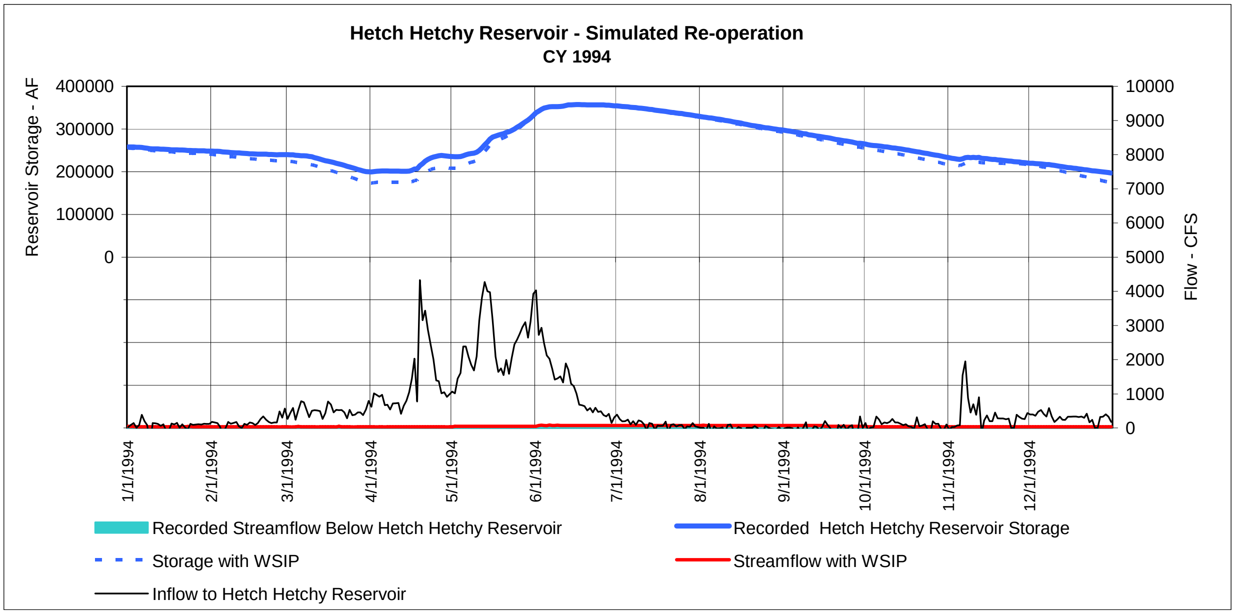


Figure 3 (1995), Figure 4 (1996), Figure 5 (1997), and Figure 6 (1998) each illustrate additional years of actual and projected operations. In each of these example years, there would be no WSIP affect on stream releases below the dam. In each instance, the storage deficit developed by the WSIP would have been replenished by reductions to Canyon Tunnel diversions well prior to spills into the river.

Figure 3

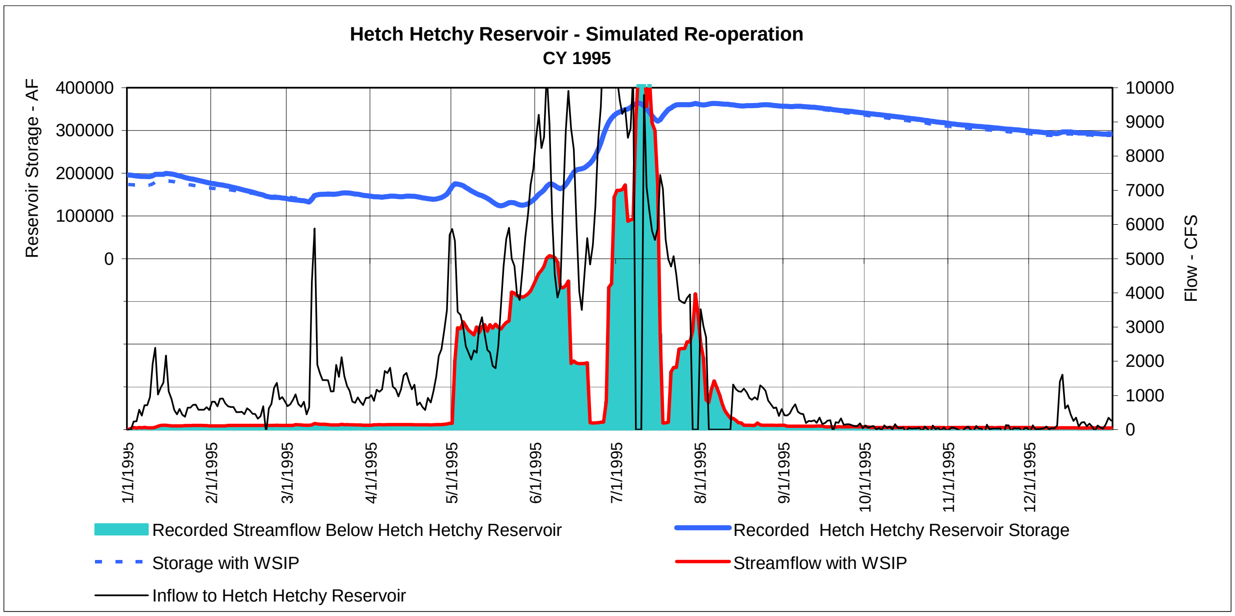


Figure 4

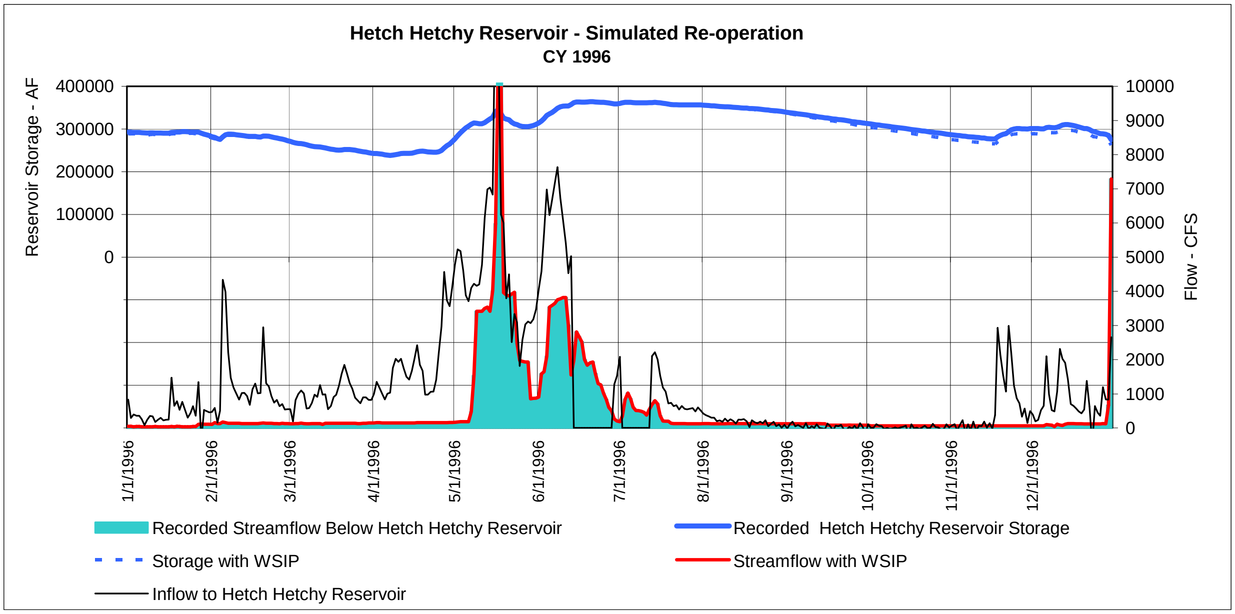


Figure 5

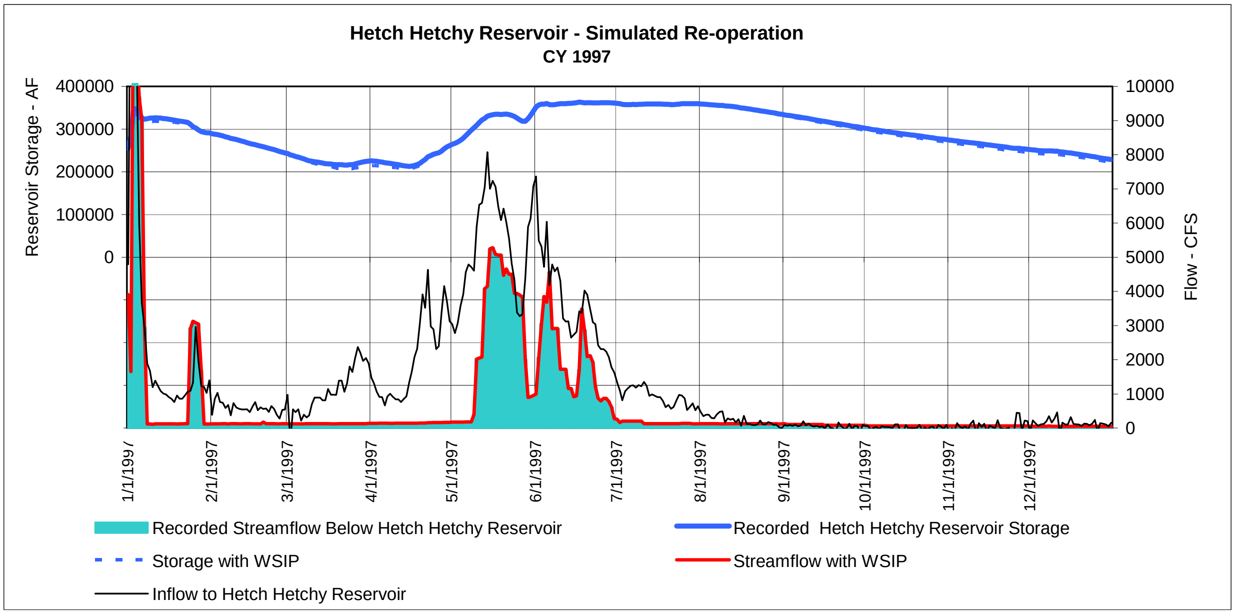
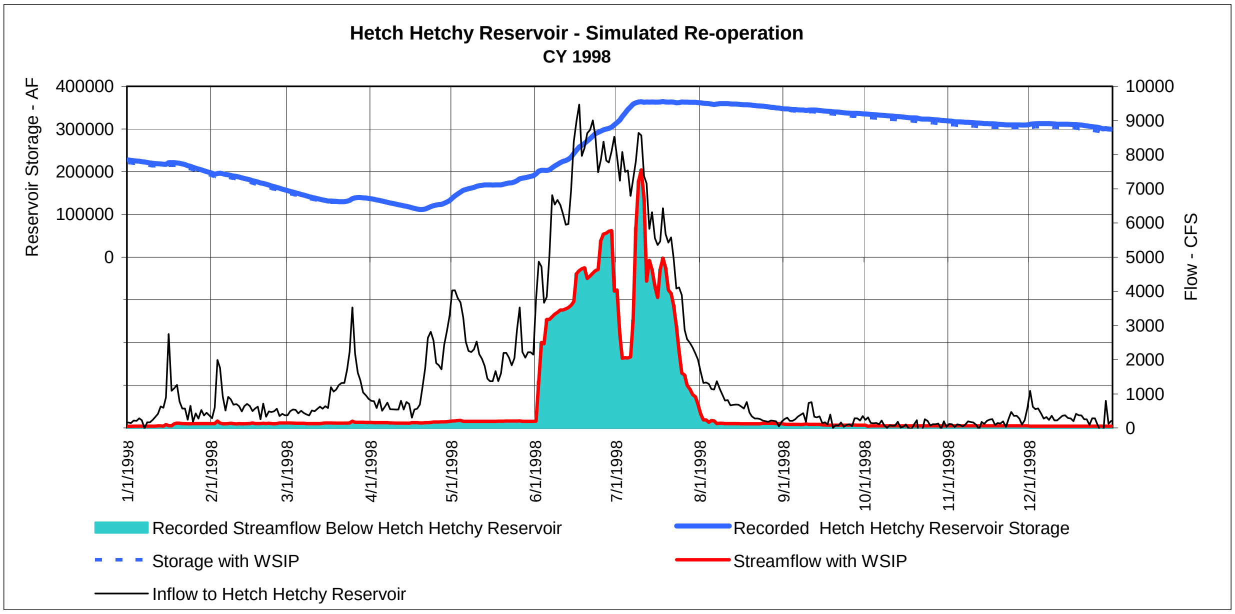


Figure 6



Calendar years 1999 and 2000 illustrate instances when the WSIP may affect stream releases below the dam. Figure 7 illustrates the trace of historical and projected operations for 1999. An incremental storage deficit from the WSIP could occur during the time that the reservoir would otherwise be releasing in excess of minimum flows, leading to a delay in the day that such excess releases would occur (illustrated by the solid red line). In this instance, the analysis indicates a 3-day delay in spills due to the effect of the WSIP. Figure 8 illustrates the same form of effects during calendar year 2000, with a 1 day delay in excess releases due to the WSIP.

Figure 7

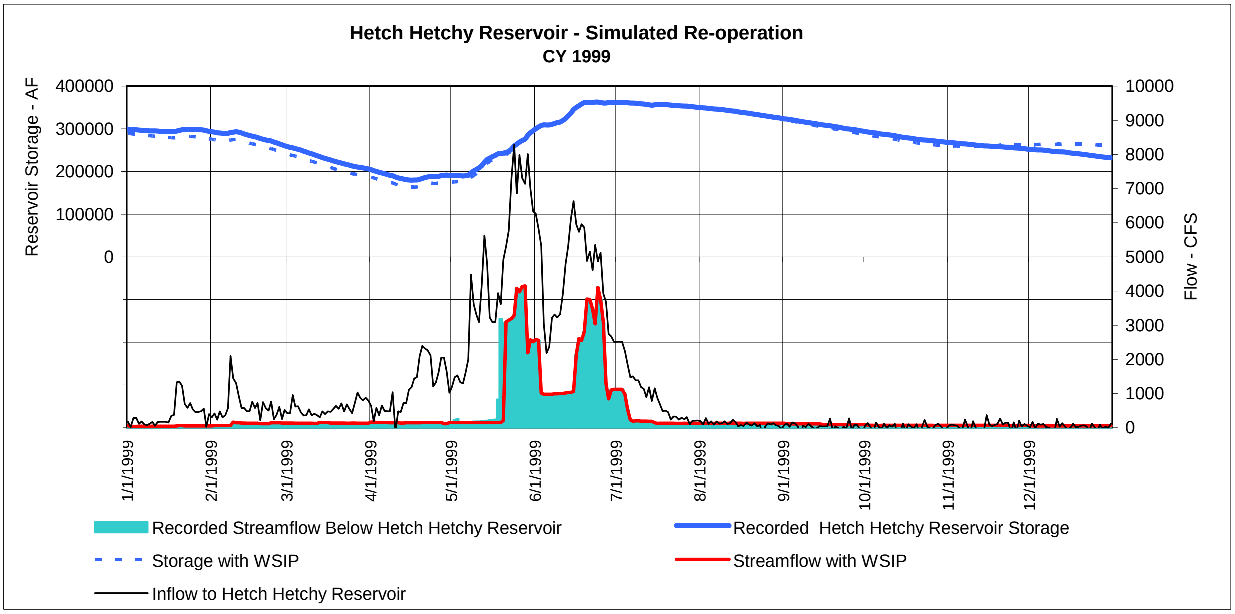
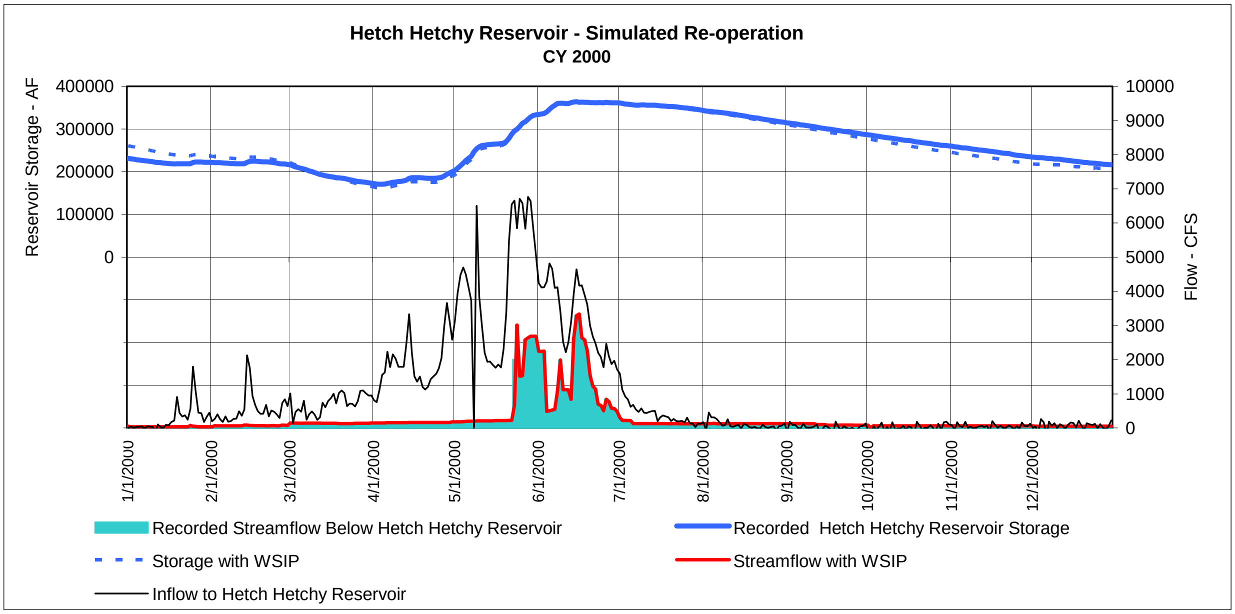


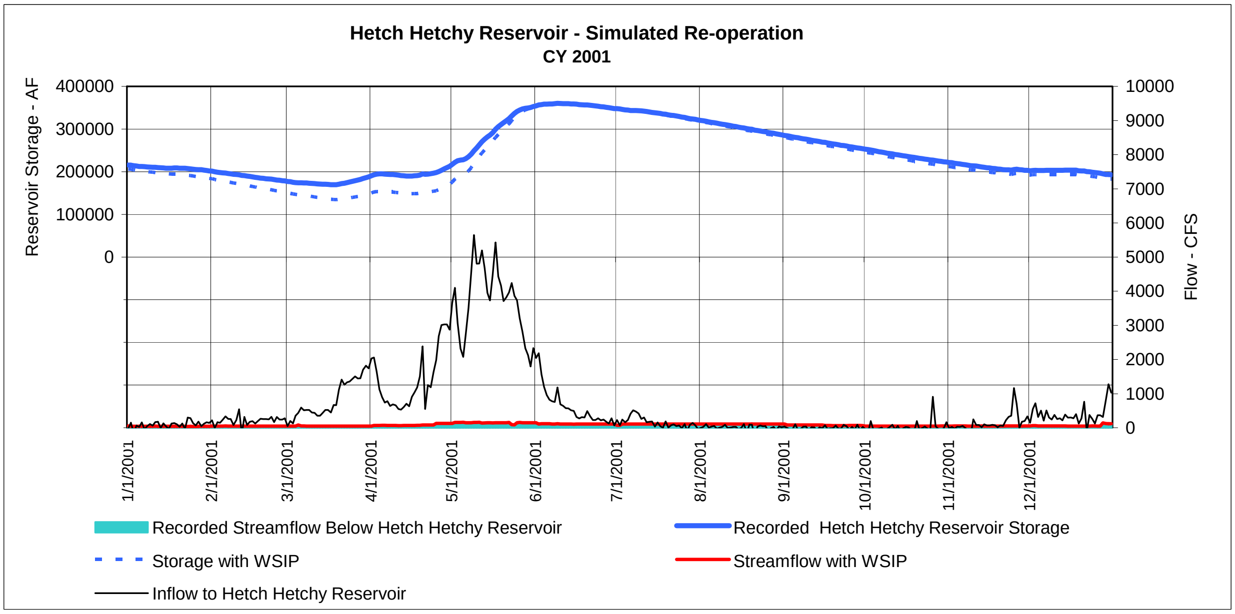
Figure 8



In each of these examples, the spill that would have occurred otherwise was diminished in volume. However, subsequent to storage being replenished, the spill hydrograph returns to what would have occurred regardless of the WSIP, typically for a substantial portion of the time that would have occurred and at a peak magnitude that would be greater than what flows levels were reduced.

Figure 9 illustrates that calendar year 2001 is similar to conditions during 1994. No spills above minimum stream commitments occurred during 2001. Although there is an incremental deficit in storage due to the WSIP, replenishment of the storage by the end of the runoff season would occur through a reduction in Canyon Tunnel diversions. Stream flow below the dam would be unaffected.

Figure 9



Calendar year 2002 (Figure 10) illustrates a low-frequency event in Hetch Hetchy Reservoir operations. During 2002, the reservoir was filled during the early days of June. The spills that occurred were due to the reservoir being full and diversions to Canyon Tunnel maximized. With no ability to store or divert additional water, minor spills occurred at the reservoir until inflow receded. The WSIP would not affect this spill event because reservoir storage would already have been replenished by adjustment of Canyon Tunnel diversions.

Figure 10

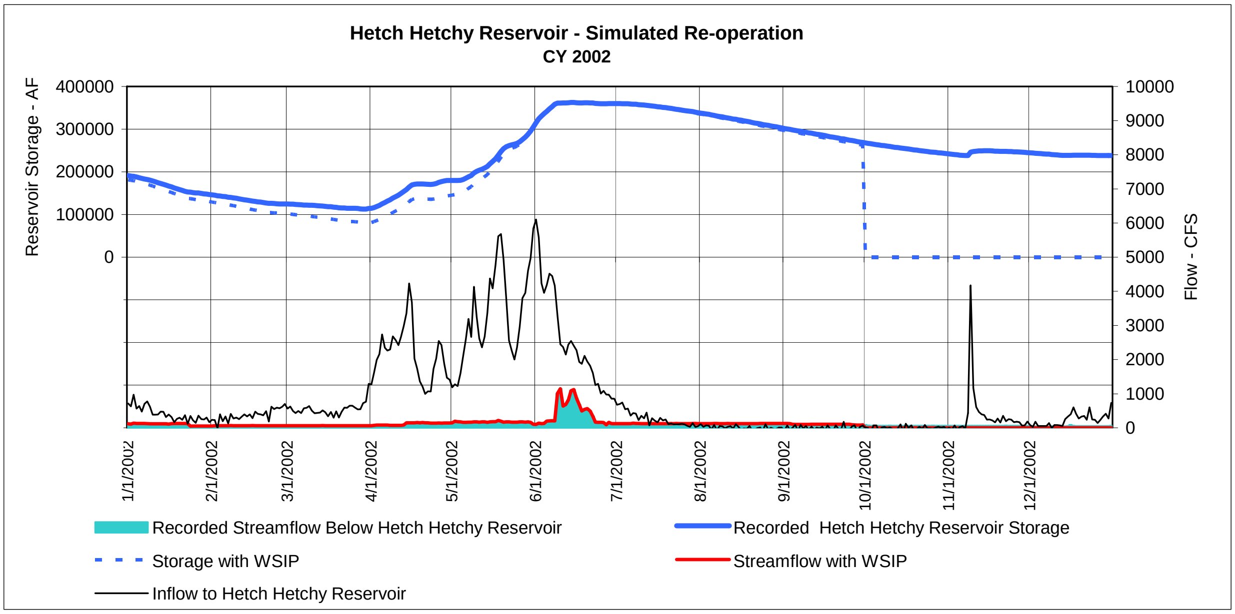
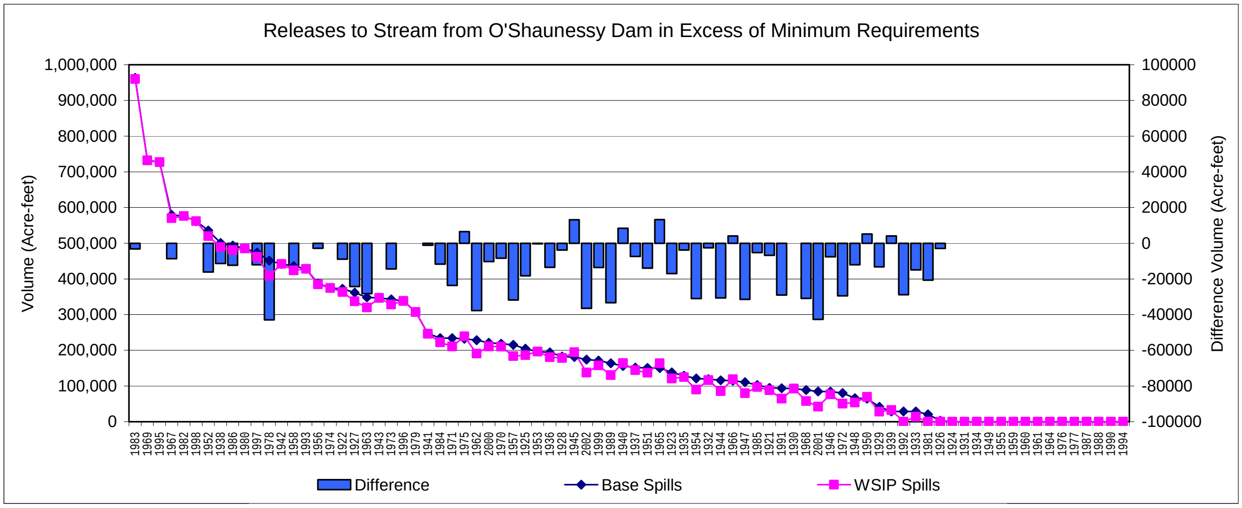


Figure 11 illustrates the annual volume of spill from the dam (releases to the stream in excess of minimum commitments), simulated for existing conditions and with the WSIP. Under existing conditions, the reservoir would not spill in 15 years (out of 82 years); when spilling, the volume normally would exceed 100,000 acre-feet. The spills typically occur during May through July, normally during May and June. With the WSIP, three additional years of spill could be eliminated. During these types of years, there would have been minimal spills otherwise occurring under existing conditions. When a reduction in the volume of spills occurs due to the WSIP in the other years of simulation, it is anticipated that the reduction would occur in the form of a delayed spill period, as demonstrated by this analysis of the historical operation. As an example of the potential delay in releases, recent historical operations have shown that it is typical to initially establish dam releases at 3,000 cfs or more. A 3,000-cfs release would equate to approximately 6,000 acre-feet in a day. With such a release otherwise occurring, a diminished storage effect in the reservoir of 24,000 acre-feet would be ameliorated in about 4 days due to a delay in the release.

Figure 11



Releases to Stream from O'Shaunessy Dam in Excess of Minimum Requirements
Volume (Acre-feet)
Difference Volume (Acre-feet)
Difference
Base Spills
WSIP Spills

APPENDIX H2-3

Memorandum

Subject: **Analysis of SFPUC Pilarcitos and Coastside County Water District Operations**
From: **Daniel B. Steiner**
Date: **March 8, 2007**

1. Introduction

Pilarcitos Creek has provided water supply to San Francisco since the 19th century. Pilarcitos Reservoir, Stone Dam, and associated facilities are an integral part of San Francisco Public Utilities Commission (SFPUC) Regional Water System operations. Watershed runoff regulated at these SFPUC facilities serves the Coastside County Water District (Coastside CWD) purchase request, and is also diverted to the San Mateo Creek watershed for integration into the rest of the SFPUC system.

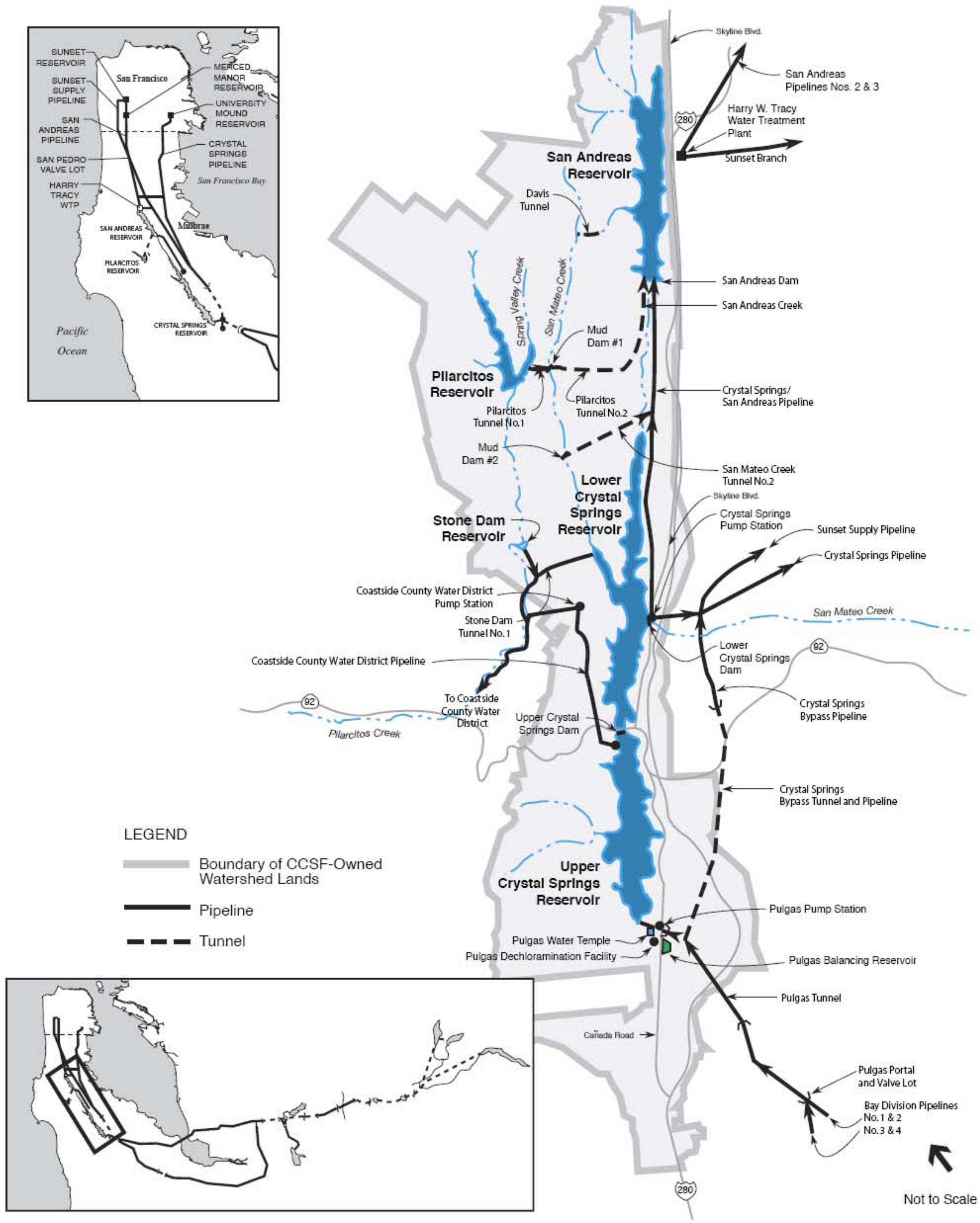
The purpose of this memorandum is to provide a brief description of the operation of SFPUC facilities in the Pilarcitos Creek watershed, both in the context of deliveries to Coastside CWD and integration into the SFPUC Regional Water System. Also described are illustrations of the potential changes in operations and hydrologic outcome that may be associated with implementation of the Water System Improvement Program (WSIP) as it is affected by an increase in Coastside CWD's purchase request.

2. System Description

Major SFPUC facilities located on the peninsula are shown in Figure 1. Pilarcitos Reservoir (maximum storage capacity of approximately 3,000 acre-feet) regulates watershed runoff into the reservoir for release to Pilarcitos Creek for rediversion at Stone Dam. Excess water in the watershed is diverted to the San Mateo watershed from Pilarcitos Reservoir through the Pilarcitos Tunnel No. 1, and at Stone Dam through Stone Dam Tunnel No. 1. The annual average runoff to Pilarcitos Reservoir is estimated to be approximately 3,980 acre-feet per year, and has ranged from little or no runoff to over 15,000 acre-feet in a year. Inflow to the reservoir occurs predominantly from rainfall during December through April. Additional runoff enters the stream reach below Pilarcitos Dam and above Stone Dam from several tributaries. This runoff is estimated to be an average annual 1,849 acre-feet. Flow at Stone Dam that exceeds the diversion needs to Coastside CWD and the ability to divert water to Crystal Springs Reservoir spills over Stone Dam and continues downstream in Pilarcitos Creek.

Current operations of the SFPUC Pilarcitos watershed facilities focus on the management of runoff. The tools available to manage the runoff are Pilarcitos Reservoir and the diversion works at Pilarcitos Reservoir and Stone Dam. An underlying objective for the operation is the conservation of runoff for the delivery of water to Coastside CWD and diversion into the SFPUC Regional Water System, minimizing releases past Stone Dam. This objective is achieved beginning with the drawing of storage in Pilarcitos Reservoir before the rainy season. By early fall, Pilarcitos Reservoir storage will typically be incidentally drawn down to the minimum level that passes water through the stream outlet works. This draw occurs because of releases made for deliveries to Coastside CWD from Pilarcitos Reservoir. During the ensuing rainy season, storm runoff is regulated in the reservoir with diversions made to Coastside CWD deliveries and transfers to the San Mateo Creek watershed via Pilarcitos Tunnel No. 1. Adequate available reservoir storage space in the reservoir is retained to regulate storm runoff, minimizing spills past Stone Dam. At the end of the rainy season, mid-April or sometimes earlier, transfers to the San Mateo Creek watershed will be curtailed in an effort to fill Pilarcitos Reservoir for maximum carry over into the summer season. Releases from Pilarcitos Reservoir will typically be reduced to only those requested by Coastside CWD for diversion at Stone Dam. During the summer, releases continue to be maintained at the request of Coastside CWD for diversion at Stone Dam. Current delivery requests by Coastside CWD can often deplete Pilarcitos Reservoir by late summer to a reservoir level when the outlet gates are opened to pass reservoir inflow. During these times, the reservoir release is typically less than that needed by Coastside CWD and the district exercises its Crystal Springs Reservoir diversion for delivery of the SFPUC supply.

Figure 1
Major SFPUC Peninsula Watershed Facilities



SOURCE: San Francisco Planning Department, 2001

During the wettest of years, storm runoff can exceed the regulation efforts of the SFPUC, and spills past Pilarcitos Dam will occur. These events could be as short as a matter of days to as long as 1 or 2 months. At times, transfers to the San Mateo Creek facilities may cease in circumstances when the SFPUC San Mateo Creek watershed facilities are already operating at maximum capacity managing their own watershed's runoff. Although it is more desirable to transfer water from Pilarcitos Reservoir to the San Mateo Creek watershed directly to San Andreas Reservoir, reservoir or conveyance constraints may warrant that the transfer occur to Crystal Springs Reservoir, either through diversions to Pilarcitos Tunnel No. 1 or from the diversion at Stone Dam.

Accretions and depletions of the stream reach between Pilarcitos Dam and Stone Dam enter the calculus of releases from Pilarcitos Dam and diversions at Stone Dam. Coastside CWD's delivery from Pilarcitos Creek is through the Pilarcitos Canyon Pipeline, which is connected to a SFPUC pipeline connecting to the diversion from Stone Dam. The SFPUC diversion works provide the headwater for Coastside CWD's delivery, with diversions in excess of Coastside CWD's need or capacity flowing to Crystal Springs Reservoir. Releases from Pilarcitos Reservoir are typically established based on the delivery request of Coastside CWD, accounting for the intervening flow or depletion of flow below Pilarcitos Dam. Any estimation errors in the hydrology of the intervening reach result in the delivery request of Coastside CWD slightly shorted at Stone Dam, or in excess flow being diverted to Crystal Springs Reservoir. Flow past Stone Dam to Pilarcitos Creek in either circumstance remains no more than seeps or leaks past the dam, with tributary flows adding to Pilarcitos Creek below the dam. There may be circumstances in which Stone Dam spills to Pilarcitos Creek when Pilarcitos Reservoir is not releasing to the creek. This can occur when the runoff from the intervening reach exceeds the delivery of water to Coastside CWD at Stone Dam and the transfer of water to Crystal Springs Reservoir.

3. Recent Historical Operations

The Figure 2 series of charts illustrate historical hydrologic information (1986-2005) for Pilarcitos Reservoir and deliveries to Coastside CWD from the SFPUC. Also included are observed flow values for Pilarcitos Creek at two locations, below Stone Dam and near Half Moon Bay. Figure 2 illustrates the daily storage in Pilarcitos Reservoir. Evident is the annually cyclic operation of storage, operated to achieve maximum storage in April or May, being drawn during the summer and fall, and then varying in storage throughout the winter in reaction to winter storm runoff and subsequent evacuation of storage until the spring-time filling cycle. Also shown are the deliveries to Coastside CWD from SFPUC facilities. The shaded "bars" illustrate the average daily deliveries to Coastside CWD from Stone Dam for a month. Typically, the pattern of deliveries indicates that Coastside CWD shapes the SFPUC delivery throughout the year in a distribution that reflects their total system demand, greatest during the summer and less during the winter. Periods when no delivery from Stone Dam occur reflect insufficient water deliveries from Pilarcitos Reservoir (typically reflective of minimal reservoir storage to sustain sufficient releases to the creek for subsequent diversion), whereby Coastside CWD opts to switch its SFPUC delivery to pumping from Crystal Springs Reservoir.

The creek flow information shown in Figure 2 is for Pilarcitos Creek just below Stone Dam, and for a downstream location near Half Moon Bay. The flow record below Stone Dam typically indicates a circumstance whereby flow occurring above the dam is diverted to Coastside CWD and Crystal Springs Reservoir. The flow at Half Moon Bay occurs predominantly from tributaries below Stone Dam. Significant flow at either location indicates periods of runoff from storm events. The occurrence of storm events is also reflected in changes in Pilarcitos Reservoir storage.

Deliveries from Crystal Springs Reservoir and total production from Coastside CWD sources are also illustrated in Figure 2. Coastside CWD's portfolio of resources includes deliveries from the SFPUC from Pilarcitos Creek (Stone Dam), from the SFPUC through pumping from Crystal Springs Reservoir, the district's Pilarcitos wells, and surface and groundwater supplies associated with the district's Denniston Project. Recent annual water production from Coastside CWD's non-SFPUC supplies is illustrated in Figure 3. Production from Coastside CWD's Denniston Project sources appears fairly constant for the past several years, with the annual variation generally reactive to the wetness of a year. Annual production from the district's Pilarcitos wells appears to have declined in recent years, with the production occurring during their permitted period of pumping November through March.

Figure 2a
Historical Record of SFPUC Deliveries to Coastside CWD, Pilarcitos Reservoir and Pilarcitos Creek Flow 1998

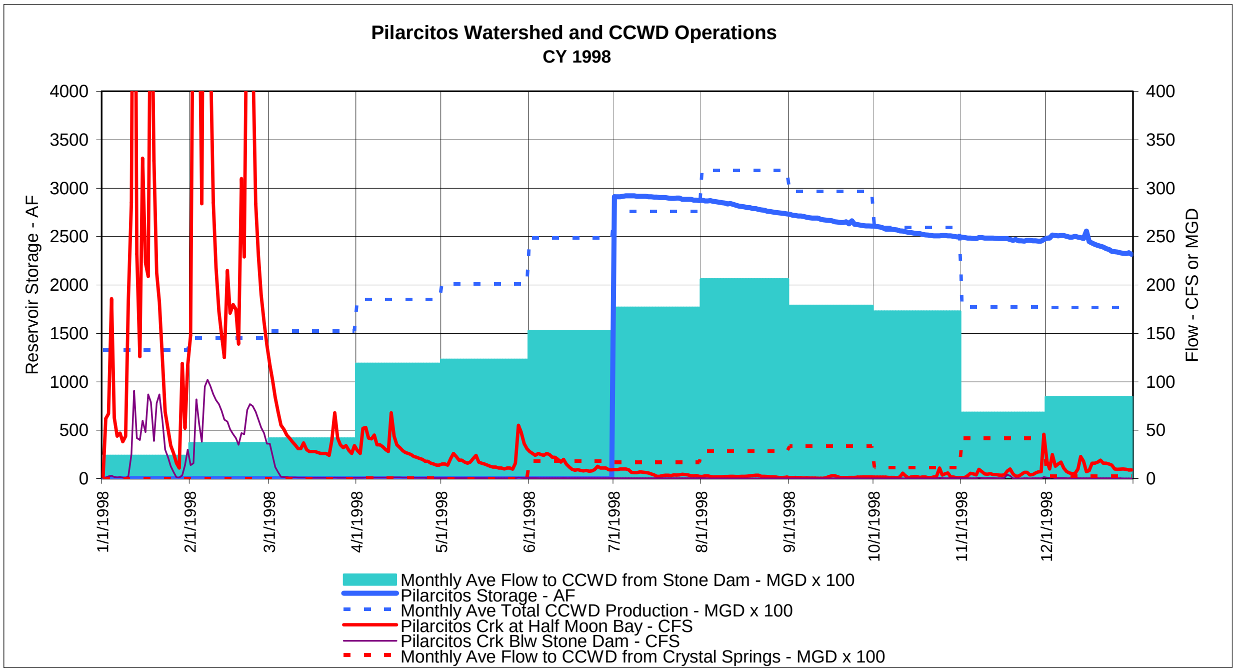


Figure 2b
Historical Record of SFPUC Deliveries to Coastside CWD, Pilarcitos Reservoir and Pilarcitos Creek Flow 1999

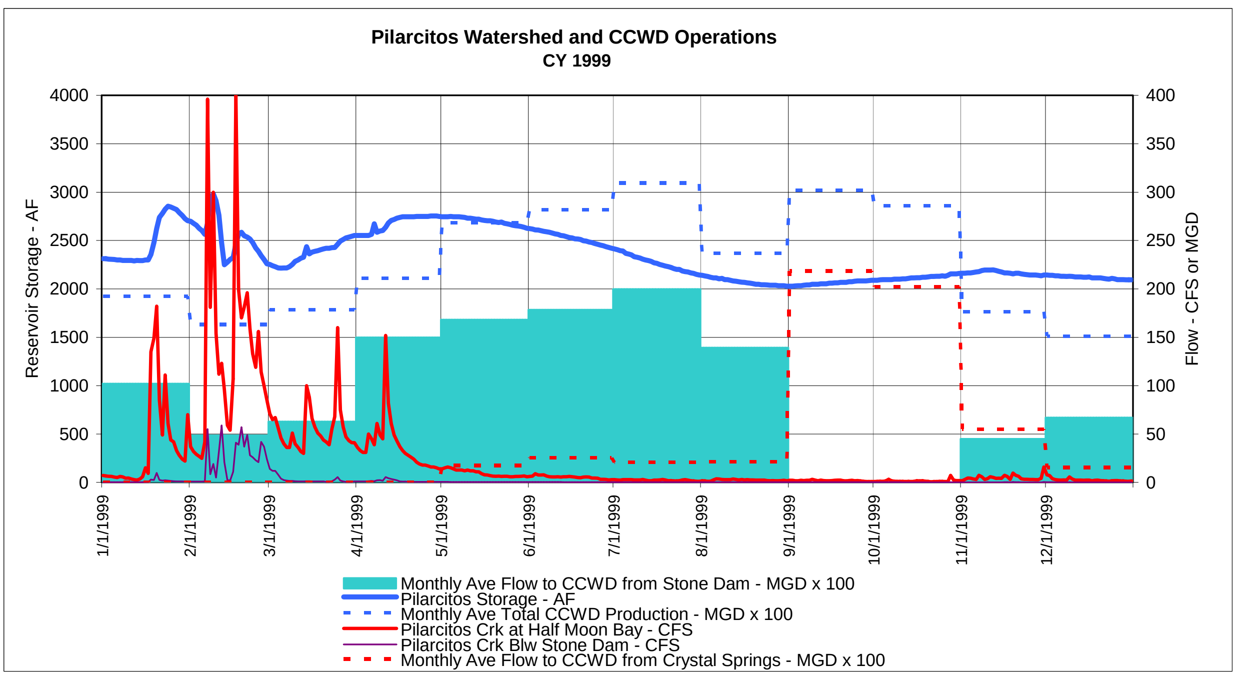


Figure 2c
Historical Record of SFPUC Deliveries to Coastside CWD, Pilarcitos Reservoir and Pilarcitos Creek Flow 2000

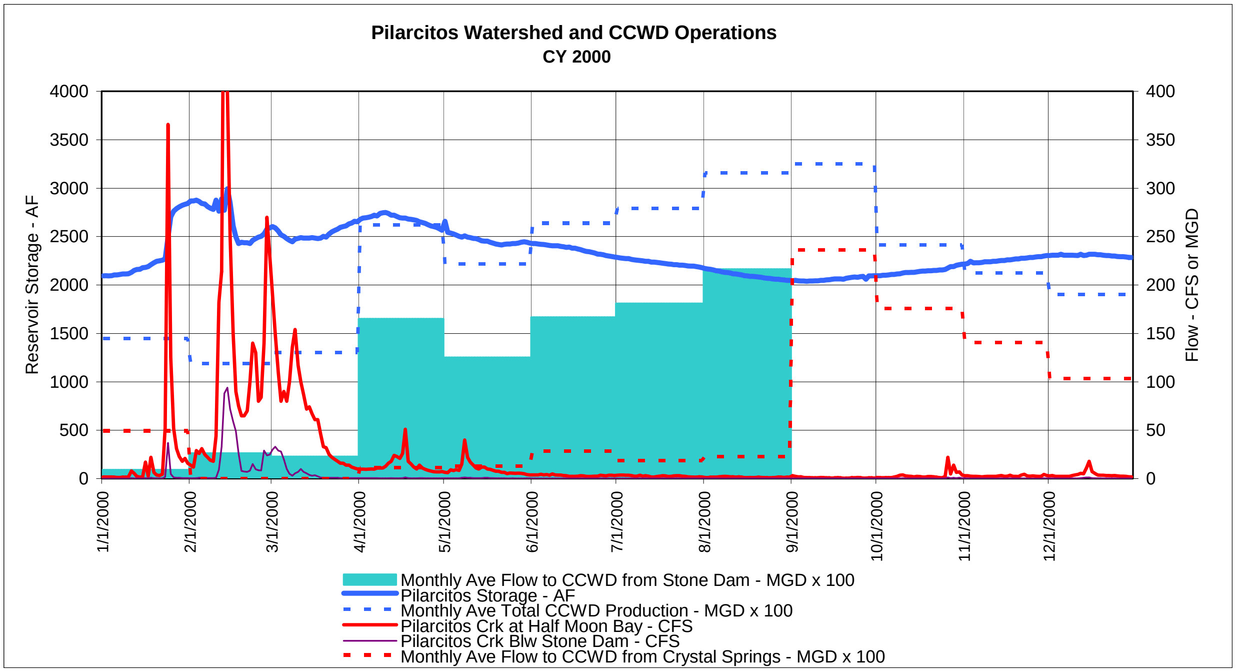


Figure 2d
Historical Record of SFPUC Deliveries to Coastside CWD, Pilarcitos Reservoir and Pilarcitos Creek Flow 2001

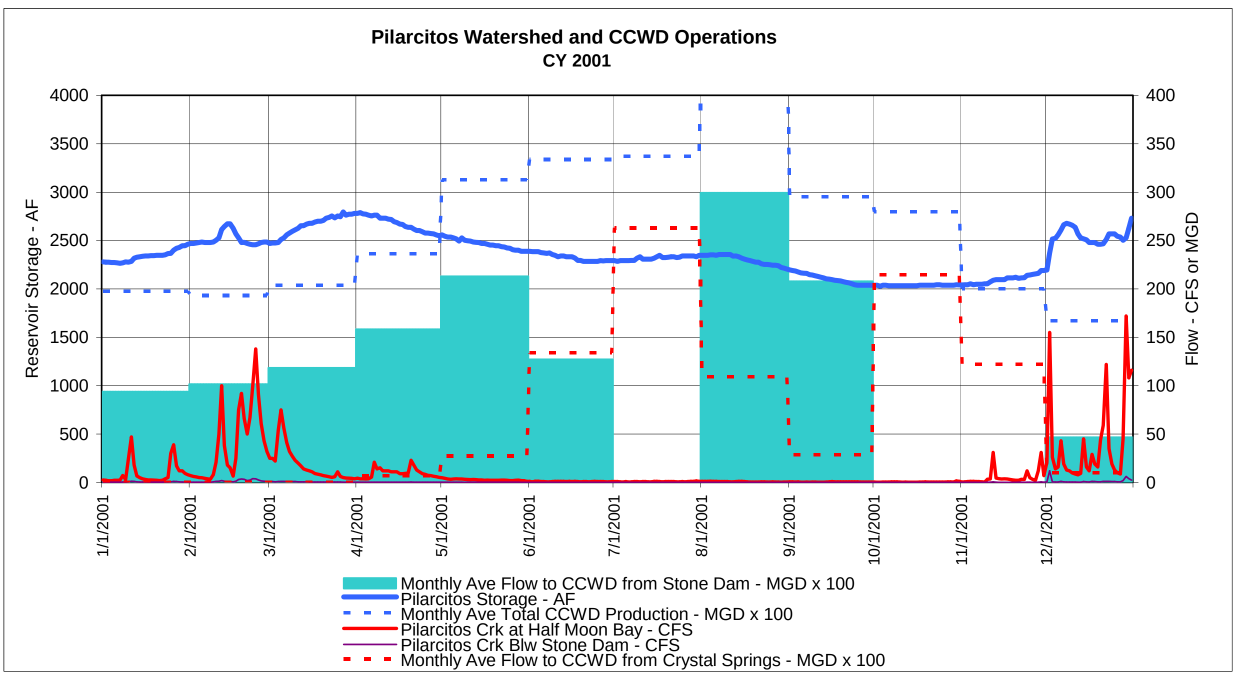


Figure 2e
Historical Record of SFPUC Deliveries to Coastside CWD, Pilarcitos Reservoir and Pilarcitos Creek Flow 2002

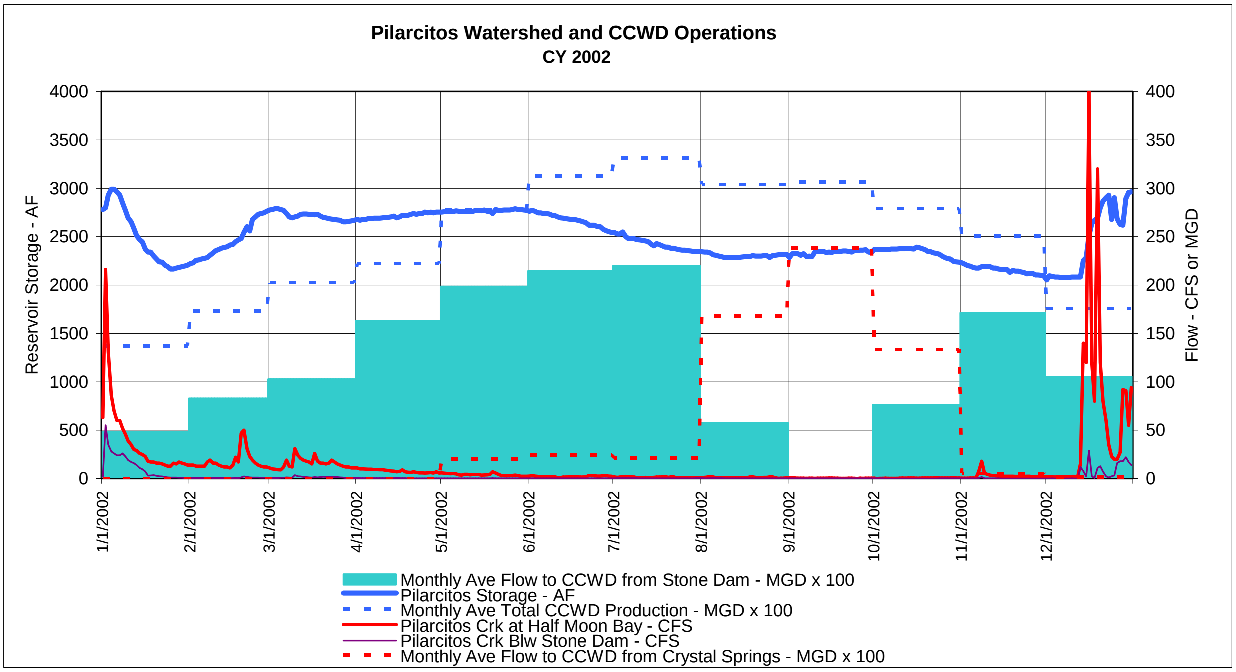


Figure 2f
Historical Record of SFPUC Deliveries to Coastside CWD, Pilarcitos Reservoir and Pilarcitos Creek Flow 2003

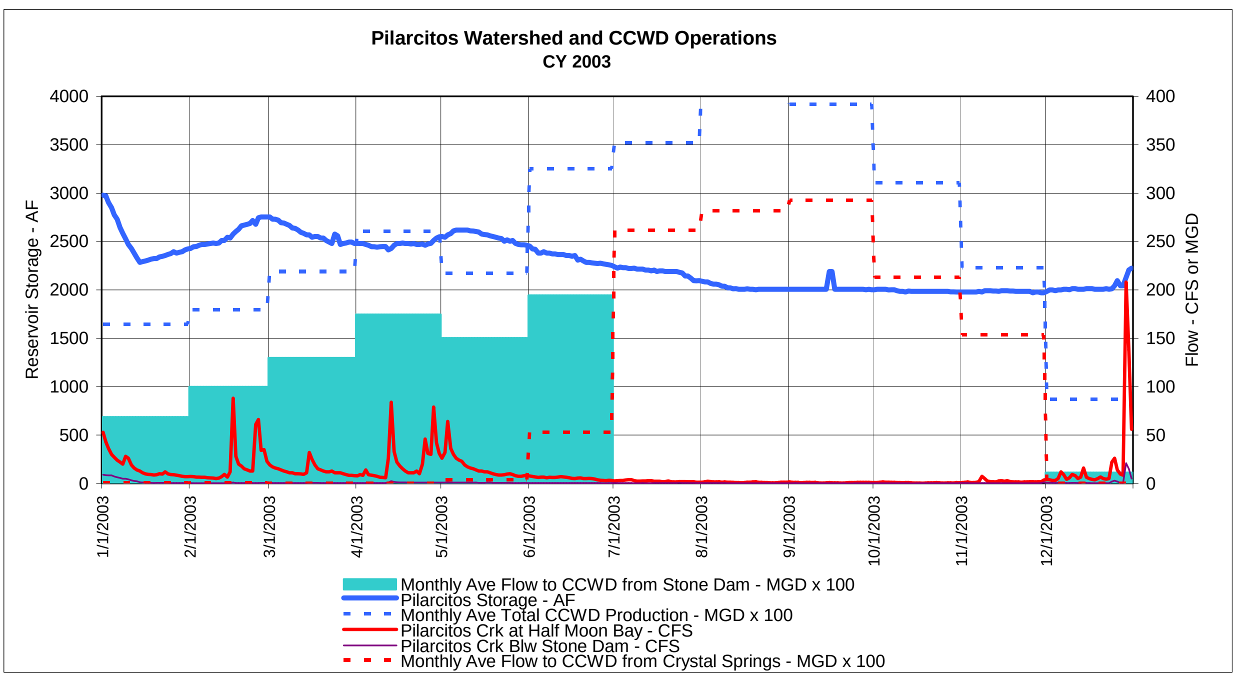


Figure 2g
Historical Record of SFPUC Deliveries to Coastside CWD, Pilarcitos Reservoir and Pilarcitos Creek Flow 2004

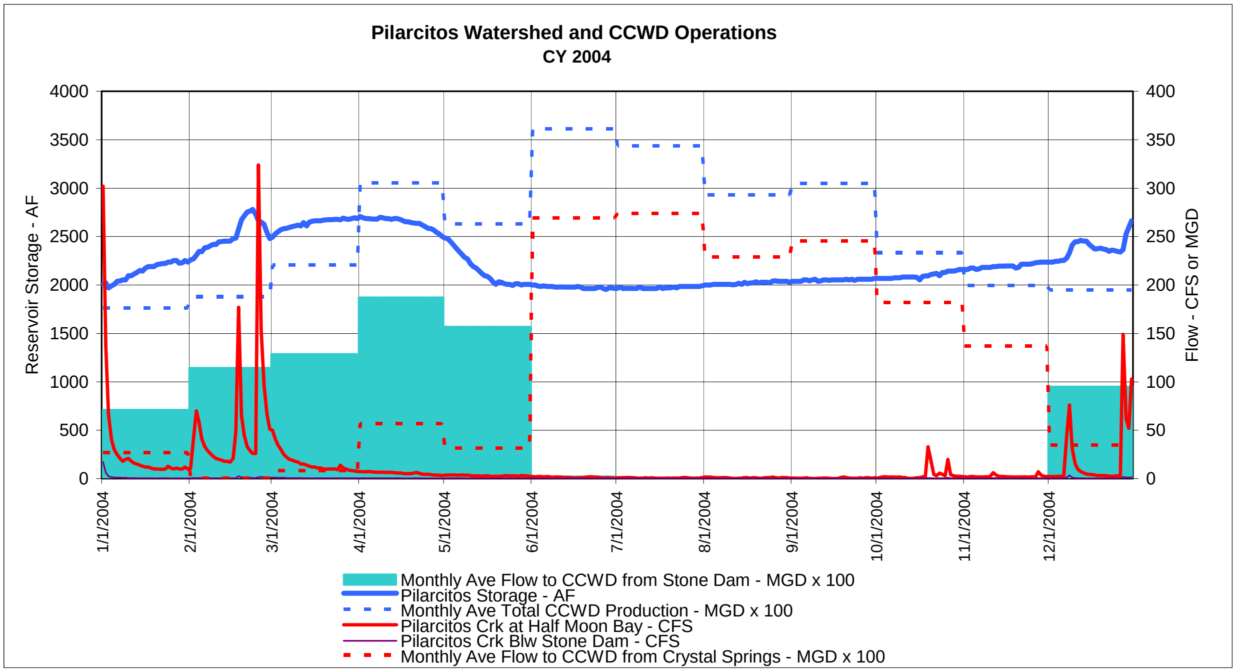


Figure 2h
Historical Record of SFPUC Deliveries to Coastside CWD, Pilarcitos Reservoir and Pilarcitos Creek Flow 2005

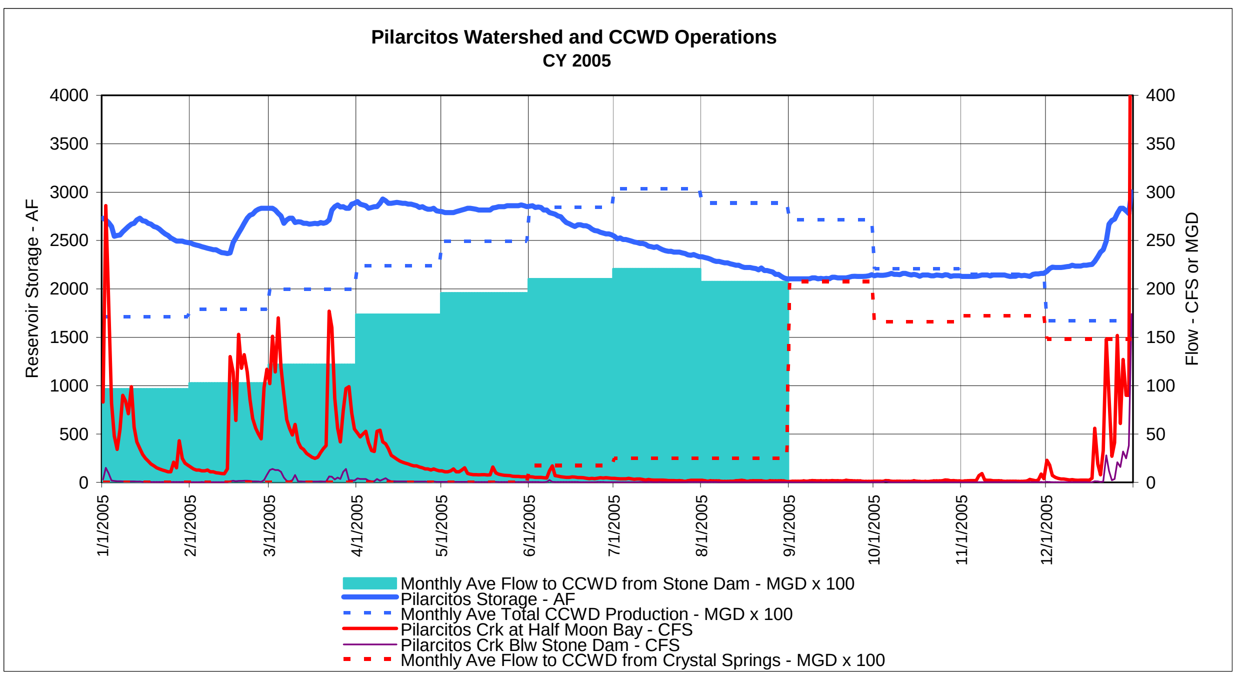
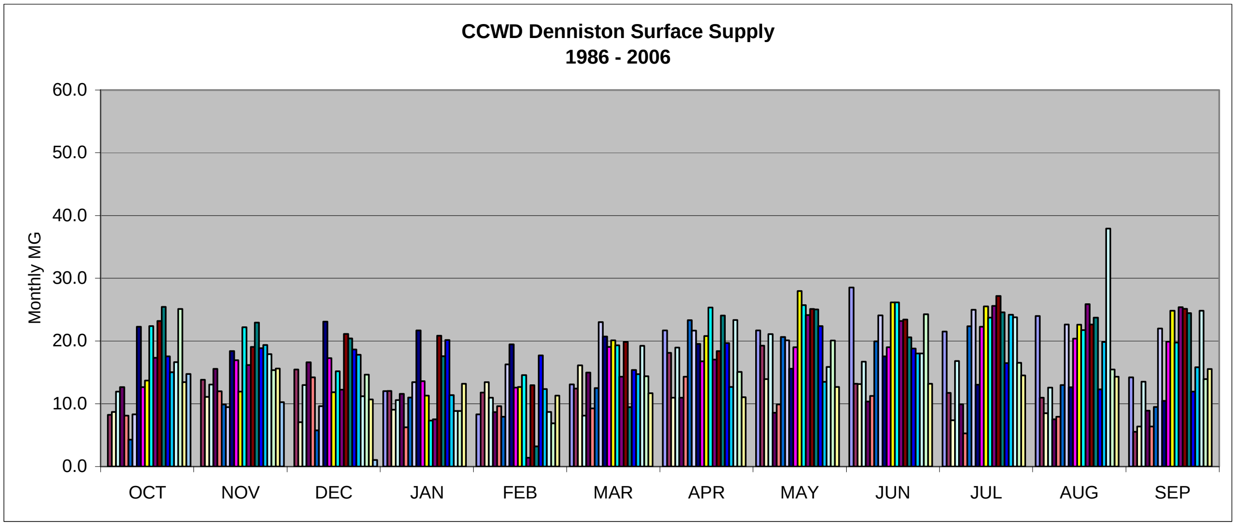
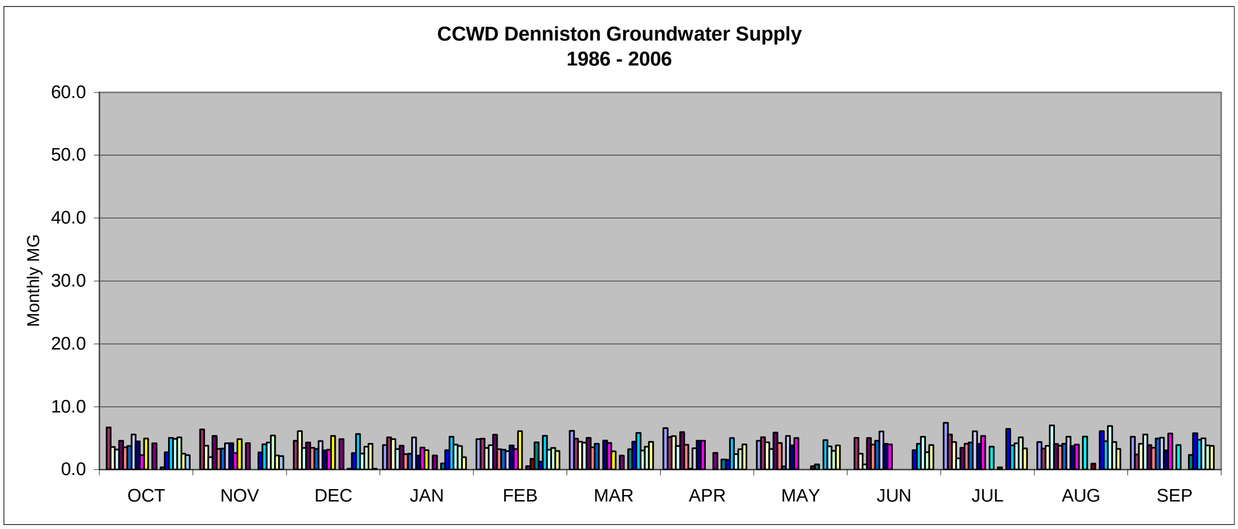


Figure 3
Coastside CWD Non-SFPUC Supplies (MG)
1986-2005





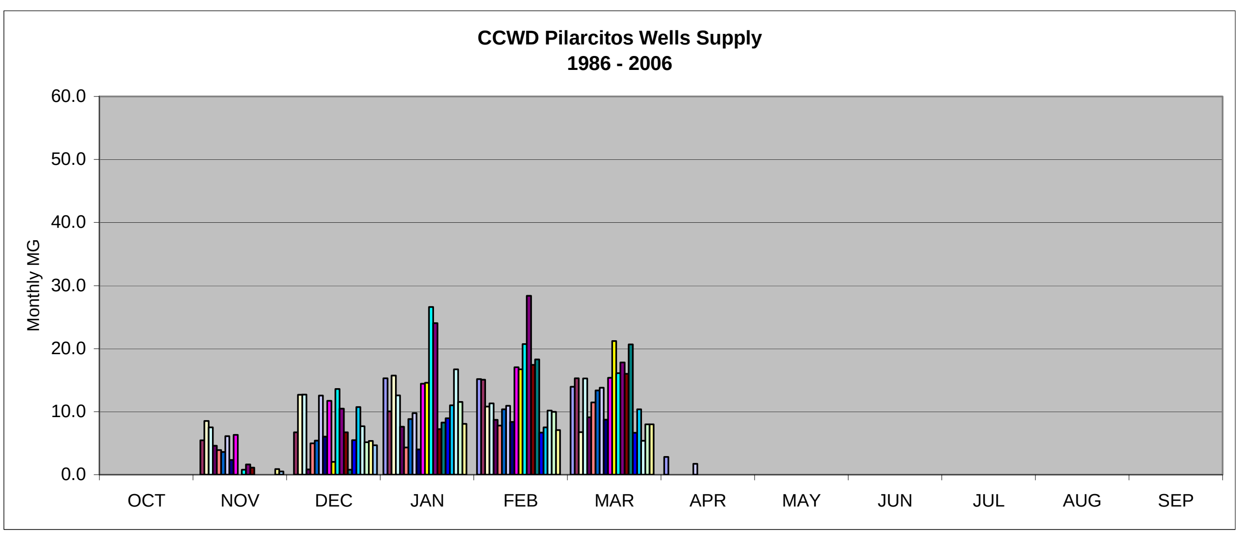
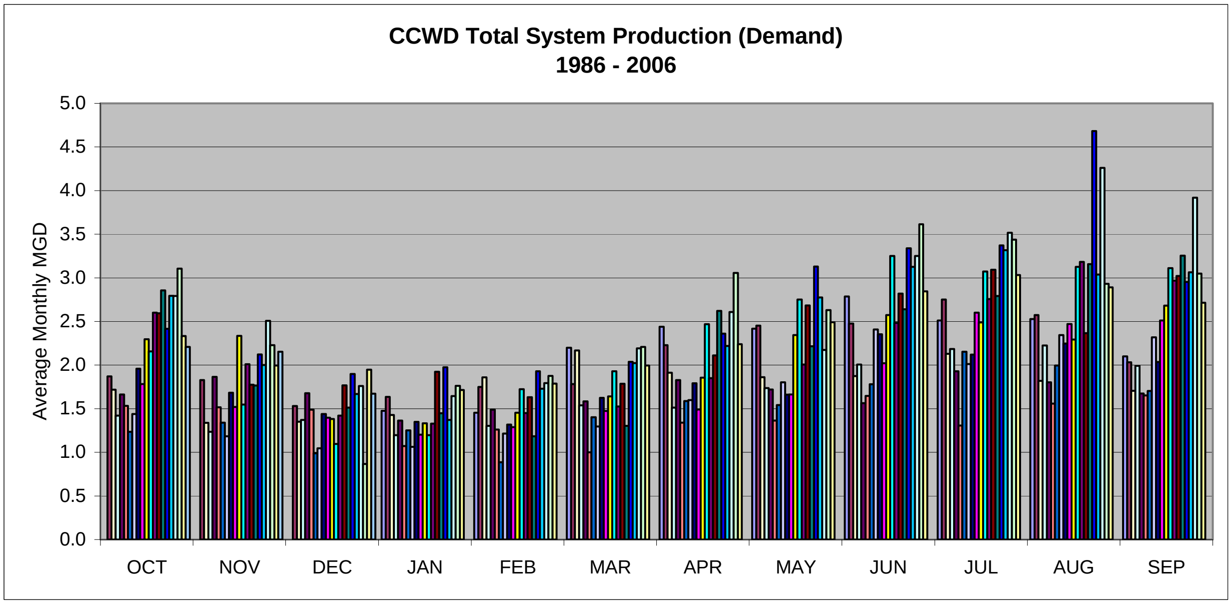


Figure 4 provides an insight to Coastside CWD's total water production (representative of total system demand) and the proportion provided by SFPUC deliveries. Supplementing Figure 4 is Table 1, which reports the district's total production. The district's annual water production has averaged 2.5 million gallons per day (mgd) over the past 5 years. Table 2 illustrates the district's delivery of water from the SFPUC, indicating a fairly constant receipt of about 1.8 mgd over the past 5 years. The delivery of water

Figure 4
Coastside CWD Total Production and SFPUC Delivery – MGD
1986-2005



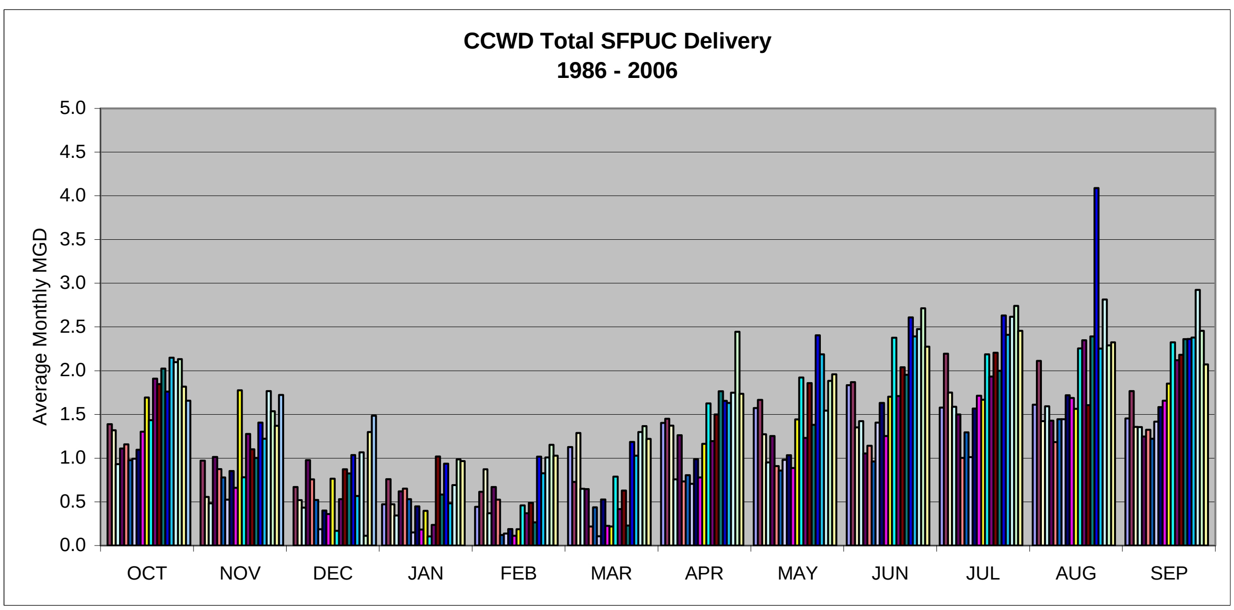


Table 1
Coastside CWD Total Production - MGD
1986-2006

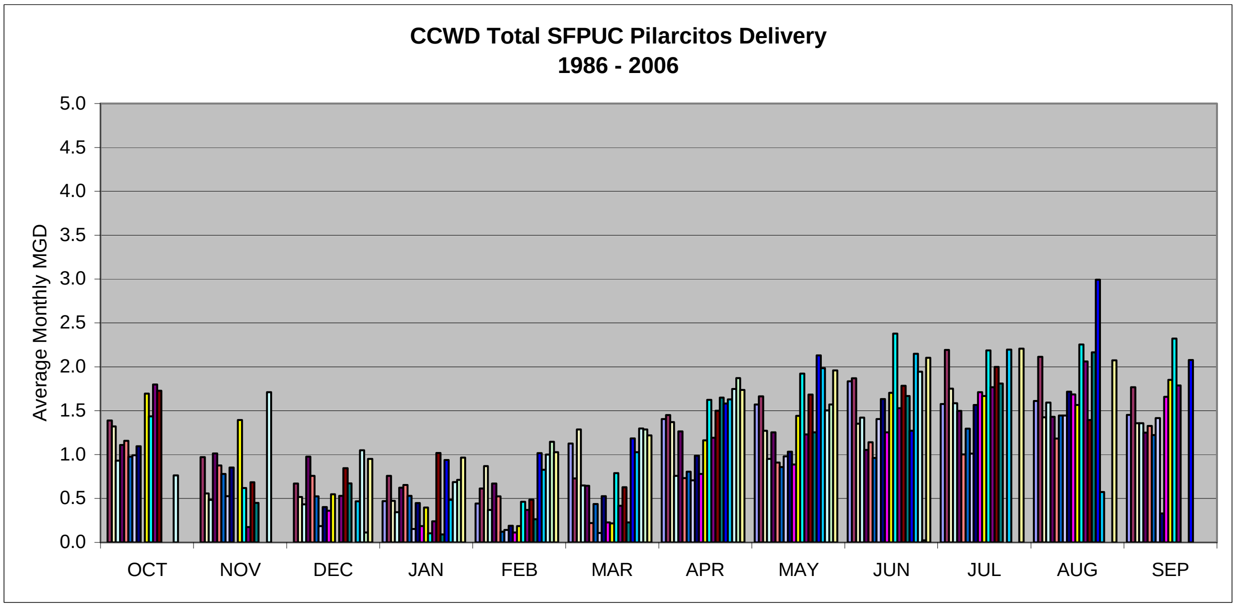
WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	WY Total	Jul-Jun Total	CY Total
1986				1.5	1.5	2.2	2.4	2.4	2.8	2.5	2.5	2.1		2.1	2.1
1987	1.9	1.8	1.5	1.6	1.7	1.8	2.2	2.5	2.5	2.8	2.6	2.0	2.1	1.9	2.0
1988	1.7	1.3	1.4	1.4	1.9	2.2	1.9	1.9	1.9	2.1	1.8	1.7	1.8	1.6	1.7
1989	1.4	1.2	1.4	1.2	1.3	1.5	1.5	1.7	2.0	2.2	2.2	2.0	1.6	1.8	1.7
1990	1.7	1.9	1.7	1.4	1.5	1.6	1.8	1.7	1.6	1.9	1.8	1.7	1.7	1.5	1.6
1991	1.5	1.5	1.5	1.1	1.3	1.0	1.3	1.4	1.6	1.3	1.6	1.7	1.4	1.4	1.3
1992	1.2	1.3	1.0	1.3	0.9	1.4	1.6	1.5	1.8	2.2	2.0	1.7	1.5	1.6	1.5
1993	1.4	1.2	1.0	1.1	1.2	1.3	1.6	1.8	2.4	2.0	2.3	2.3	1.6	1.8	1.8
1994	2.0	1.7	1.4	1.3	1.3	1.6	1.8	1.7	2.4	2.1	2.2	2.0	1.8	1.7	1.8
1995	1.8	1.5	1.4	1.2	1.3	1.5	1.5	1.7	2.0	2.6	2.5	2.5	1.8	2.1	1.9
1996	2.3	2.3	1.4	1.3	1.5	1.6	1.9	2.3	2.6	2.5	2.3	2.7	2.1	2.1	2.0
1997	2.2	1.5	1.1	1.2	1.7	1.9	2.5	2.8	3.3	3.1	3.1	3.1	2.3	2.2	2.4
1998	2.6	2.0	1.4	1.3	1.5	1.5	1.8	2.0	2.5	2.8	3.2	3.0	2.1	2.3	2.1
1999	2.6	1.8	1.8	1.9	1.6	1.8	2.1	2.7	2.8	3.1	2.4	3.0	2.3	2.2	2.3
2000	2.9	1.8	1.5	1.4	1.2	1.3	2.6	2.2	2.6	2.8	3.2	3.3	2.2	2.5	2.3
2001	2.4	2.1	1.9	2.0	1.9	2.0	2.4	3.1	3.3	3.4	4.7	3.0	2.7	2.6	2.7
2002	2.8	2.0	1.7	1.4	1.7	2.0	2.2	2.8	3.1	3.3	3.0	3.1	2.4	2.5	2.5
2003	2.8	2.5	1.8	1.6	1.8	2.2	2.6	2.2	3.3	3.5	4.3	3.9	2.7	2.8	2.6
2004	3.1	2.2	0.9	1.8	1.9	2.2	3.1	2.6	3.6	3.4	2.9	3.0	2.6	2.4	2.6
2005	2.3	2.0	1.9	1.7	1.8	2.0	2.2	2.5	2.8	3.0	2.9	2.7	2.3		2.3
2006	2.2	2.2	1.7												

Table 2
Coastside CWD Deliveries from SFPUC - MGD
1986-2006

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	WY Total	Jul-Jun Total	CY Total
1986				0.5	0.4	1.1	1.4	1.6	1.8	1.6	1.6	1.5		1.2	1.2
1987	1.4	1.0	0.7	0.8	0.6	0.7	1.5	1.7	1.9	2.2	2.1	1.8	1.4	1.3	1.3
1988	1.3	0.6	0.5	0.5	0.9	1.3	1.4	1.3	1.4	1.8	1.4	1.4	1.1	0.9	1.1
1989	0.9	0.5	0.4	0.3	0.4	0.6	0.8	1.0	1.4	1.6	1.6	1.4	0.9	1.1	1.0
1990	1.1	1.0	1.0	0.6	0.7	0.6	1.3	1.3	1.1	1.5	1.4	1.2	1.1	0.9	1.0
1991	1.2	0.9	0.8	0.7	0.5	0.2	0.7	0.9	1.1	1.0	1.2	1.3	0.9	0.8	0.8
1992	1.0	0.8	0.5	0.5	0.1	0.4	0.8	0.9	1.0	1.3	1.4	1.2	0.8	0.8	0.8
1993	1.0	0.5	0.2	0.2	0.1	0.1	0.7	1.0	1.4	1.0	1.4	1.4	0.8	0.9	0.8
1994	1.1	0.9	0.4	0.4	0.2	0.5	1.0	1.0	1.6	1.6	1.7	1.6	1.0	0.9	1.0
1995	1.3	0.7	0.4	0.2	0.1	0.2	0.8	0.9	1.3	1.7	1.7	1.7	0.9	1.2	1.1
1996	1.7	1.8	0.8	0.4	0.2	0.2	1.2	1.4	1.7	1.7	1.6	1.9	1.2	1.2	1.1
1997	1.4	0.8	0.2	0.1	0.5	0.8	1.6	1.9	2.4	2.2	2.3	2.3	1.4	1.3	1.5
1998	1.9	1.3	0.5	0.2	0.4	0.4	1.2	1.2	1.7	1.9	2.3	2.1	1.3	1.5	1.3
1999	1.8	1.1	0.9	1.0	0.5	0.6	1.5	1.9	2.0	2.2	1.6	2.2	1.5	1.3	1.5
2000	2.0	1.0	0.8	0.6	0.3	0.2	1.8	1.4	2.0	2.0	2.4	2.4	1.4	1.7	1.4
2001	1.8	1.4	1.0	0.9	1.0	1.2	1.7	2.4	2.6	2.6	4.1	2.4	1.9	1.8	1.9
2002	2.1	1.2	0.6	0.5	0.8	1.0	1.6	2.2	2.4	2.4	2.3	2.4	1.6	1.7	1.7
2003	2.1	1.8	1.1	0.7	1.0	1.3	1.7	1.5	2.5	2.6	2.8	2.9	1.8	1.9	1.7
2004	2.1	1.5	0.1	1.0	1.2	1.4	2.4	1.9	2.7	2.7	2.3	2.5	1.8	1.8	1.9
2005	1.8	1.4	1.3	1.0	1.0	1.2	1.7	2.0	2.3	2.5	2.3	2.1	1.7		1.7
2006	1.7	1.7	1.5												

from SFPUC sources to Coastside CWD is illustrated in Figure 5, showing the seasonal trend and magnitude of deliveries from Stone Dam and Crystal Springs Reservoir. The data illustrate that deliveries from the Stone Dam diversion have generally peaked in recent years during May through September, typically representing an average monthly delivery rate of 2 mgd. The estimated capacity of the turnout is slightly greater than historical records indicate; however, the record indicates the typical maximum average monthly performance of the diversion facilities. Deliveries during this period may actually be less than the maximum diversion rate due to either limited water availability from Pilarcitos Reservoir or a need to serve a greater rate of delivery that can be accommodated by diversions from Crystal Springs Reservoir. Deliveries from Pilarcitos Reservoir are reduced during the winter as the district's demand is less and the district utilizes other resources. The district's average delivery of SFPUC water from the Stone Dam diversion has averaged about 1 mgd over the past 5 years, with another 0.8 mgd originating from Crystal Springs Reservoir. Table 3 and Table 4 report the SFPUC deliveries to the district from each source.

Figure 5
SFPUC Deliveries to Coastside CWD from Stone Dam and Crystal Springs Reservoir – MGD
1986-2006



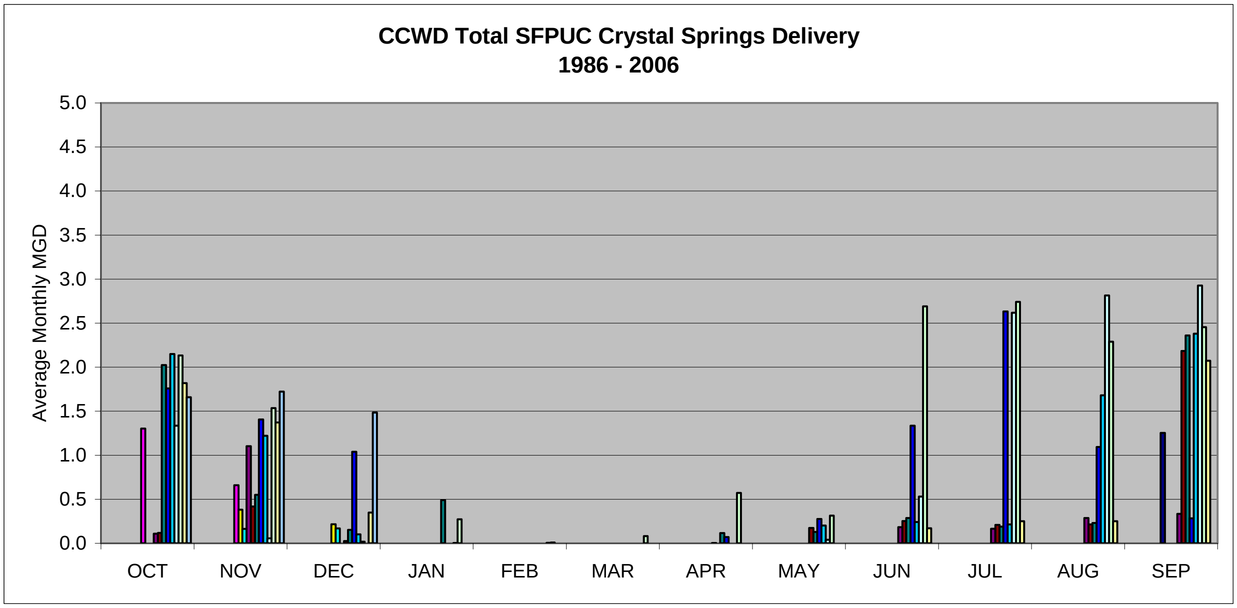


Table 3
Deliveries from SFPUC Stone Dam Diversion to Coastside CWD - MGD
1986-2006

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	WY Total	Jul-Jun Total	CY Total
1986	0.0	0.0	0.0	0.5	0.4	1.1	1.4	1.6	1.8	1.6	1.6	1.5		1.2	1.2
1987	1.4	1.0	0.7	0.8	0.6	0.7	1.5	1.7	1.9	2.2	2.1	1.8	1.4	1.3	1.3
1988	1.3	0.6	0.5	0.5	0.9	1.3	1.4	1.3	1.4	1.8	1.4	1.4	1.1	0.9	1.1
1989	0.9	0.5	0.4	0.3	0.4	0.6	0.8	1.0	1.4	1.6	1.6	1.4	0.9	1.1	1.0
1990	1.1	1.0	1.0	0.6	0.7	0.6	1.3	1.3	1.1	1.5	1.4	1.2	1.1	0.9	1.0
1991	1.2	0.9	0.8	0.7	0.5	0.2	0.7	0.9	1.1	1.0	1.2	1.3	0.9	0.8	0.8
1992	1.0	0.8	0.5	0.5	0.1	0.4	0.8	0.9	1.0	1.3	1.4	1.2	0.8	0.8	0.8
1993	1.0	0.5	0.2	0.2	0.1	0.1	0.7	1.0	1.4	1.0	1.4	1.4	0.8	0.9	0.8
1994	1.1	0.9	0.4	0.4	0.2	0.5	1.0	1.0	1.6	1.6	1.7	0.3	0.9	0.6	0.7
1995	0.0	0.0	0.4	0.2	0.1	0.2	0.8	0.9	1.3	1.7	1.7	1.7	0.7	1.2	1.0
1996	1.7	1.4	0.5	0.4	0.2	0.2	1.2	1.4	1.7	1.7	1.6	1.9	1.2	1.2	1.0
1997	1.4	0.6	0.0	0.1	0.5	0.8	1.6	1.9	2.4	2.2	2.3	2.3	1.3	1.2	1.4
1998	1.8	0.2	0.5	0.2	0.4	0.4	1.2	1.2	1.5	1.8	2.1	1.8	1.1	1.3	1.2
1999	1.7	0.7	0.8	1.0	0.5	0.6	1.5	1.7	1.8	2.0	1.4	0.0	1.2	0.8	1.0
2000	0.0	0.5	0.7	0.1	0.3	0.2	1.6	1.3	1.7	1.8	2.2	0.0	0.9	1.0	0.8
2001	0.0	0.0	0.0	0.9	1.0	1.2	1.6	2.1	1.3	0.0	3.0	2.1	1.1	1.1	1.1
2002	0.0	0.0	0.5	0.5	0.8	1.0	1.6	2.0	2.1	2.2	0.6	0.0	0.9	1.2	1.2
2003	0.8	1.7	1.1	0.7	1.0	1.3	1.7	1.5	1.9	0.0	0.0	0.0	1.0	0.6	0.7
2004	0.0	0.0	0.1	0.7	1.1	1.3	1.9	1.6	0.0	0.0	0.0	0.0	0.6	0.8	0.6
2005	0.0	0.0	1.0	1.0	1.0	1.2	1.7	2.0	2.1	2.2	2.1	0.0	1.2		1.1
2006	0.0	0.0	0.0												

Table 4
Deliveries from SFPUC Crystal Springs Reservoir to Coastside CWD - MGD
1986-2006

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	WY Total	Jul-Jun Total	CY Total
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.1	0.3	0.3
1995	1.3	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0
1996	0.0	0.4	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
1998	0.1	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.3	0.3	0.2	0.1	0.1
1999	0.1	0.4	0.0	0.0	0.0	0.0	0.0	0.2	0.3	0.2	0.2	2.2	0.3	0.5	0.5
2000	2.0	0.6	0.2	0.5	0.0	0.0	0.1	0.1	0.3	0.2	0.2	2.4	0.5	0.7	0.7
2001	1.8	1.4	1.0	0.0	0.0	0.0	0.1	0.3	1.3	2.6	1.1	0.3	0.8	0.7	0.8
2002	2.1	1.2	0.1	0.0	0.0	0.0	0.0	0.2	0.2	0.2	1.7	2.4	0.7	0.5	0.5
2003	1.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.5	2.6	2.8	2.9	0.9	1.3	1.1
2004	2.1	1.5	0.0	0.3	0.0	0.1	0.6	0.3	2.7	2.7	2.3	2.5	1.3	0.9	1.3
2005	1.8	1.4	0.3	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.2	2.1	0.5		0.6
2006	1.7	1.7	1.5												

Long-term planning model (Hetch Hetchy Local Simulation Model) results indicate that, under existing operations and demands, Pilarcitos Reservoir would fill to maximum capacity in the spring during about 50 percent of the years, and, in about 60 percent of the years, Coastside CWD deliveries from Pilarcitos would draw the reservoir down to minimum pool at the stream outlet works by the end of September. The recent record of operations (1998-2005) indicates that the minimum pool was reached during 7 of the past 8 years of operation.

4. Estimation of Potential Effects of Increased Deliveries to Coastside CWD

Coastside CWD's water demand and its SFPUC purchase request are projected to increase within the WSIP planning horizon of year 2030. Within the context of the 2030 purchase request of 300 mgd, Coastside CWD's portion has been estimated to be about 3 mgd.[1] This projected purchase request is approximately 1 mgd greater than its current purchase request.

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[1] SFPUC Water System Improvement Program EIR, Chapter 3, 2007.

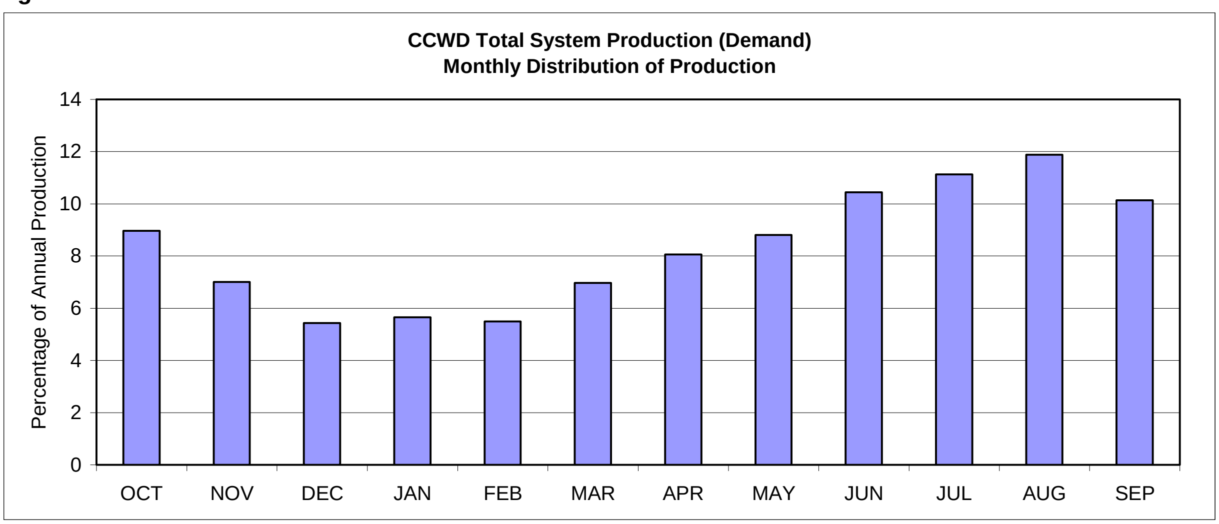
A definitive description for the temporal distribution of Coastside CWD's future SFPUC purchase request is not currently known. The district is currently evaluating how to best manage its future demand with its available resources, and the SFPUC and the district are involved in forums concerning the management of the Pilarcitos Creek watershed. The recent historical record of SFPUC deliveries to the district sheds light on how the current level of delivery affects Pilarcitos Reservoir operation and watershed hydrology. That record also illustrates the hydrologic constraints of the water supply (e.g., the finite amount of water available at Pilarcitos Reservoir) and physical constraints of conveying water to the district (e.g., delivery rate constraint from the Stone Dam diversion). How the additional supply from the SFPUC will manifest as a change in deliveries from the regional system (both source and seasonal pattern) will unfold sometime in the future, and at a minimum be a subject of inquiry during the negotiation of a new water supply contact.

Although it is uncertain how serving Coastside CWD's additional purchase request will specifically change the operation of SFPUC facilities and affect their environs, a range of potential hydrologic effects can be described through development of reasonable assumptions for the manner in which the additional purchase occurs. The following describes several potential postulated delivery scenarios and resultant hydrologic outcomes.

Proportional Load-shape Increase

In this delivery scenario, Coastside CWD's seasonal SFPUC delivery would increase in proportion to the shape of the district's total system production. Figure 6 illustrates the monthly distribution of Coastside CWD's total system production (a surrogate of demand). The temporal shape of the production indicates a demand that is affected by urban use, including domestic irrigation, and irrigation deliveries by the district.

Figure 6



Coastside CWD's current deliveries from the SFPUC are slightly less than those under contract. Recent deliveries (2001-2005) have been approximately 1.9 mgd annually, compared to Coastside CWD's contractual amount of about 2.2 mgd. Figure 7 and Figure 8 illustrate the change in temporal deliveries from current deliveries to the scenario that assumes the district's future purchase request of 2.99 mgd.

Figure 7

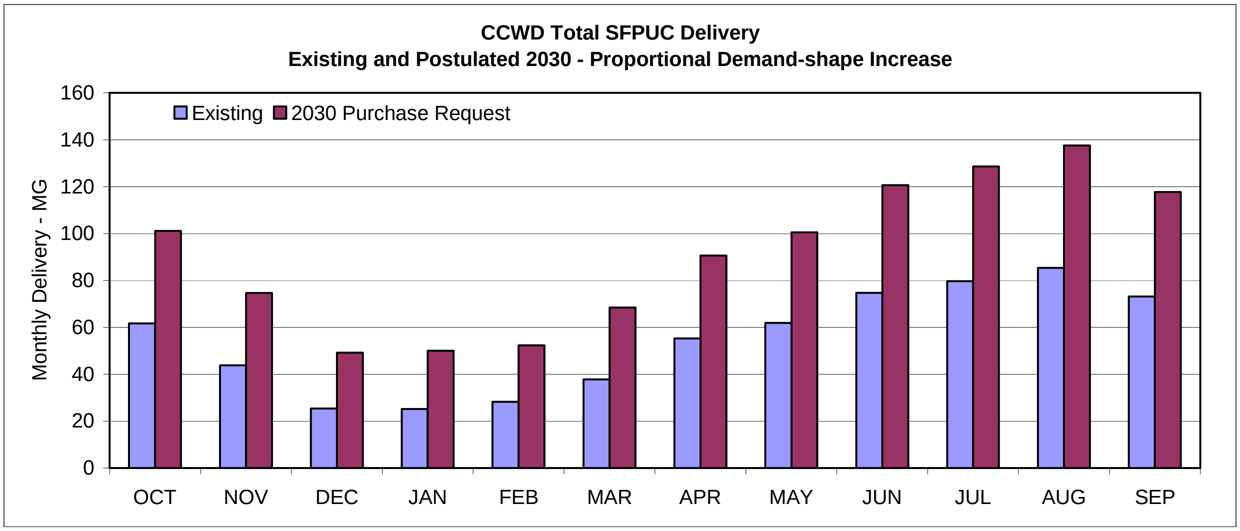
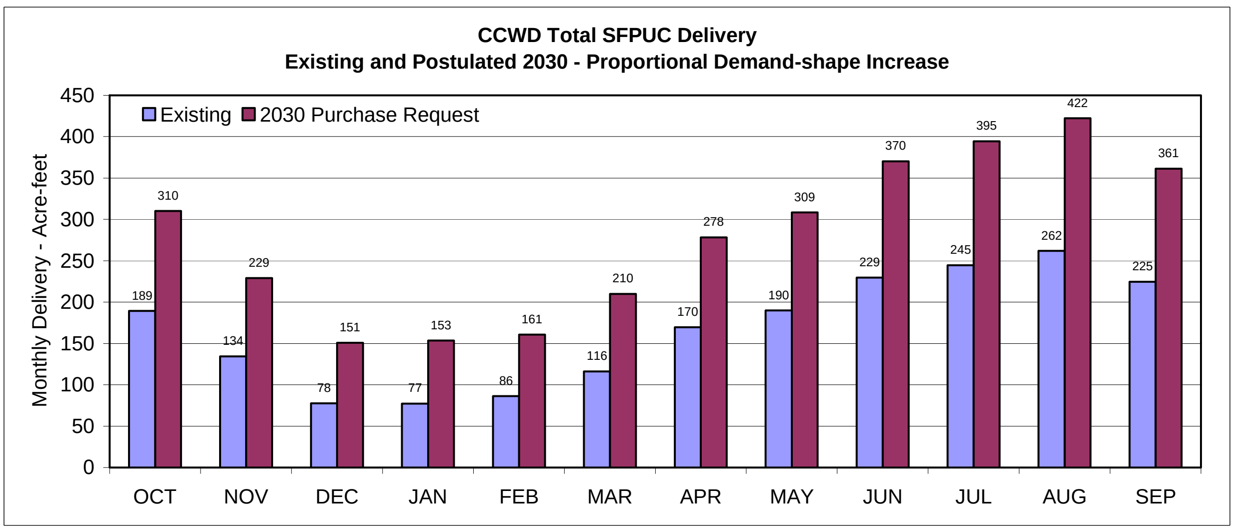
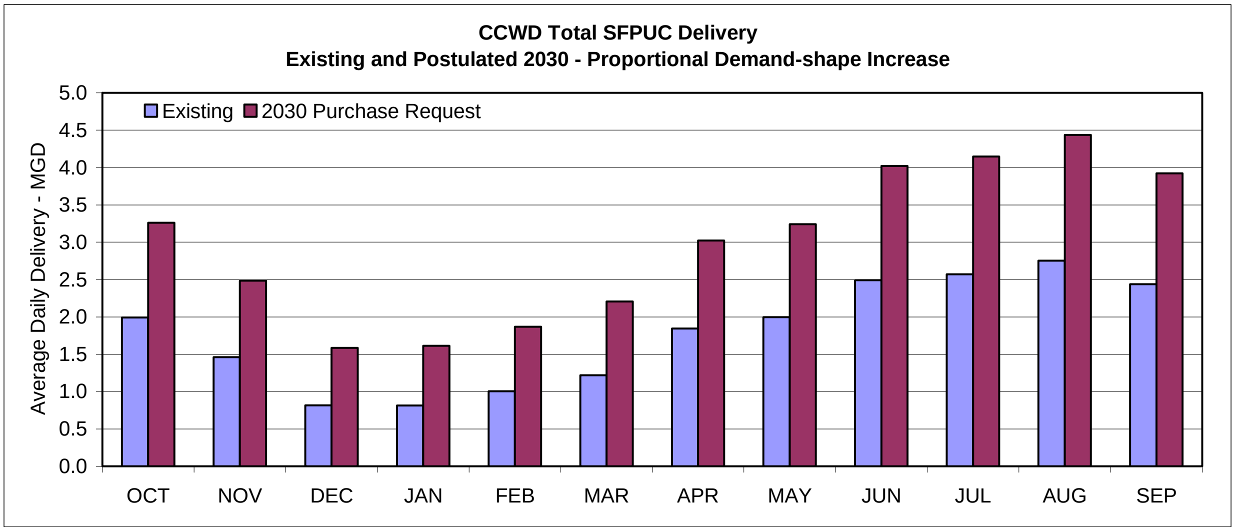


Figure 8



To illustrate potential delivery conveyance constraints, Figure 9 illustrates the average daily flow rate of monthly deliveries associated with current and projected Coastside CWD deliveries from the SFPUC. For recent years, Coastside CWD has been receiving deliveries at a rate of 2 mgd or greater for the period of May through September. This rate of delivery has shown to be a general limitation for deliveries from the Stone Dam diversion, if there is water supply to divert from this source (refer to Figure 5). If Coastside CWD ultimately increases its delivery from the SFPUC in the distribution postulated, the current conveyance constraint of the Stone Dam diversion would require the district to divert the additional water from Crystal Springs Reservoir, possibly requiring facility improvements to effectuate simultaneous deliveries from both sources. Additional deliveries during this season from Crystal Springs Reservoir would not affect the Pilarcitos Reservoir operation if the district is currently already exercising a maximum delivery rate from the Reservoir as constrained by the diversion at Stone Dam. During November through April, Coastside CWD could increase its delivery of Pilarcitos water within the existing capacity of the

Figure 9



Stone Dam diversion. If water was available from Pilarcitos Reservoir (inflow plus storage above the minimum pool of the outlet works), such an increase in delivery would deplete storage in the reservoir or delay the replenishment of the reservoir. While releases from the dam would increase to serve the additional delivery, transfers to the San Mateo Creek watershed would be reduced, and in wetter years the occasional spill to the stream would be delayed if it were to occur at all.

Within any specific year, an additional delivery from Pilarcitos Reservoir could lead to the accelerated draw of storage as compared to current conditions. If, in the current condition, the reservoir is depleted to the minimum pool of the outlet works, the additional delivery would increase the release to the stream until storage is depleted, which would occur at an earlier date. Or, the additional delivery could draw storage to the minimum pool of the outlet works in a year that it would not have occurred in the current condition. Flow in the stream subsequent to this point would be the passage of reservoir inflow, which would occur earlier than in the current condition.

If Coastside CWD were to increase the rate at which it could take delivery of water from Pilarcitos Creek by increasing the size of the Pilarcitos Canyon Pipeline, there would be a potential of an accelerated draw of storage from Pilarcitos Reservoir. The accelerated draw of storage would lead to an increase in the number of days that the stream below Pilarcitos Dam would incur only the passage of inflow to the reservoir. During the period in which the additional level of delivery occurs, the stream flow would increase compared to current conditions. The additional draw of storage could lead to a reduction of water transferred to the San Mateo Creek watershed, and reduce the occasional spill from the reservoir to the stream.

Any purchase request by Coastside CWD not met with Pilarcitos Creek diversions would continue to be met from deliveries from Crystal Springs Reservoir.

Increasing Winter-season Deliveries

An alternative outcome for the postulated temporal distribution of increased water deliveries would be a request that the increase in delivery predominantly occur during the winter season. Assuming the postulated seasonally proportional growth in delivery request, analysis indicates that the distribution of the future level of deliveries would not accommodate the full increase in annual delivery during the winter (November through April) period. Also, if the delivery to Coastside CWD from the Stone Dam diversion continues to be constrained at about 2 mgd, the full future purchase request for the district cannot be fully met from Pilarcitos Creek, even if unlimited water were available from the watershed.

The concentration of additional deliveries to the winter period would increase the draw of water from Pilarcitos Reservoir when it is available. As described previously, an increase in draw during this period would deplete storage in the reservoir or delay the replenishment of the reservoir. While releases from the dam would increase to serve the additional delivery, transfers to the San Mateo Creek watershed would be reduced, and, in wetter years, spill to the stream would be delayed if it occurred at all. During years in which water is not transferred to the San Mateo Creek watershed and water is not spilled from the reservoir (a year when Pilarcitos Reservoir may not fill to maximum carry over storage), the additional draw of water in the winter season would affect the amount of water available for delivery from Pilarcitos Creek during the subsequent summer. Shifting deliveries to earlier in the year would increase flows to meet the increased deliveries, but would accelerate the time when storage is depleted from the reservoir, and the stream would incur only the passage of inflow to the reservoir. Deliveries from Crystal Springs Reservoir would be initiated earlier in the year under these circumstances.

5. Potential Measures to Avoid or Reduce Hydrologic Effects in Pilarcitos Operations

Compared to the current hydrologic condition resulting from the SFPUC's Pilarcitos Creek operations, increased deliveries to Coastside CWD would likely have some level of hydrologic effect to the reservoir and stream. If the basis of comparison is the current condition of the reservoir and stream, and the maintenance of this condition is an objective, several operational measures could avoid or reduce potential hydrologic effects of an increased delivery to Coastside CWD.

- A reservoir operation protocol could be developed that identifies specific storage levels to be retained during seasons of the year. The purpose of the storage levels would be to generally replicate the recent historical operation of the reservoir, leading to a general replication of the frequency and magnitude of stream releases and reservoir storage. Operation to these storage levels could at times limit the seasonal amount of release from Pilarcitos Reservoir and subsequent re-diversion of water to Coastside CWD from Pilarcitos Creek. The purchase request of Coastside CWD not served from Pilarcitos Creek would be served from Crystal Springs Reservoir.

- Rate of delivery constraints within the Coastside CWD contract could be established that would serve as a limitation upon the seasonal or annual amount of water delivered from Pilarcitos Creek. These limitations could be fashioned to reflect recent historical deliveries from the SFPUC from Pilarcitos Creek. For instance, summertime deliveries could be limited to no more than currently delivered, up to about 2 mgd. During the winter, deliveries could be limited to no more than 1 mgd. The effect of limiting deliveries would result in releases for deliveries from Pilarcitos Reservoir no greater than those in recent history. In effect, the increased delivery level would be served from Crystal Springs Reservoir.

6. References

Balance Hydrologics, Inc. Pilarcitos Creek Alternative Point of CCWD Diversion Study. Prepared for Coastside County Water District. July 1997.

Coastside County Water District. Water Supply Evaluation Report Calendar Year 2005. March 2006.

APPENDIX H2-4

Memorandum

Subject: **HH/LSM Assumptions and Results – WSIP Variants**
From: **Daniel B. Steiner**
Date: **February 20, 2007**

1. Introduction

This memorandum summarizes assumptions for, and describes the interpretation of, Hetch Hetchy Local Simulation Model (HH/LSM) results for the simulation of the Water System Improvement Program (WSIP) variants that are incorporated into the Program Environmental Impact Report (PEIR). Three WSIP variants have been evaluated: WSIP Variant 1 - All Tuolumne; WSIP Variant 2 - Regional Desalination for Drought; and WSIP Variant 3 - 10% Rationing. Major difference between the variants and the proposed program (WSIP) occur either in the proposed source(s) of water supply or in the drought-year rationing level of service. Table 1-1 and Table 1-2 summarize the components, various modeling assumptions, and performance and hydrologic results for the variants as compared with the modeled existing setting (2005) with Calaveras Reservoir constrained by California Division of Safety of Dams (DSOD) restrictions, the pre-2002 setting (with a Calaveras Reservoir operation prior to DSOD restrictions), and the WSIP setting.

The hydrology of each variant is primarily discussed in terms of a comparison to the proposed program (WSIP) and contrasted to the baseline condition of the PEIR, i.e., the simulated current (2005) operation of the Regional Water System assuming DSOD constraints on operations of both the Calaveras and Crystal Springs Reservoirs. Only primary hydrologic parameters such as projected water deliveries, reservoir storage, and stream flows are compared, and only those parameters identified as key hydrologic factors that lead to environmental impact assessment are illustrated.

Table 1-1
Setting Characteristics and Modeling Assumptions (Part 1/3)

Assumptions and Characteristics of Setting and/or Program	Units	Baselines: Baseline Conditions[1] - Calaveras Constrained	Baselines: Baseline Conditions[2] - Calaveras Unconstrained	Proposed WSIP	WSIP Variants[3]: All Tuolumne	WSIP Variants[3]: Regional Desalination for Drought	WSIP Variants[3]: 10% Rationing
Time Horizon for Setting of Analysis / Date[4]		2005	2005	2030	2030	2030	2030
HH/LSM Simulation Study Name[5]		MEA3CHR	MEA2A	MEA5HIN	MEA4HIN	MEA30H	MEA31H
System Wide Parameters							
Customer Purchase Request (Demand Level)[6]	MGD	265	265	300	300	300	300
Demand Level Supplied from Other Sources[7]							
Regional Recycled Water/Conservation/Groundwater in SF	MGD	0	0	10	0	10	10
Other Regional Recycled Water/Conservation/Groundwater	MGD	0	0	0	0	0	0
Demand Level Supplied from Tuolumne + Local Watersheds[8]	MGD	265	265	290	300	290	290
Average Annual Deliveries and Supplies[9]							
Deliveries from Tuolume + Local Watersheds (Average Annual)	MGD	258	259	287	293	287	287
Supply or Deliveries from Other Sources - Regional Recl/Cons/GW	MGD	0	0	10	0	10	10
Total Deliveries and Supply for Demand Level (Average Annual)	MGD	258	259	297	293	297	297
Features and Facilities[10]							
Regional Reclaimed Water/Conservation/Groundwater - SF				●		●	●
Regional Reclaimed Water/Conservation/Groundwater - Other							
Calaveras Reservoir - 12.4 BG (Constrained)		●					
Calaveras Reservoir - 31.6 BG (Restored/Unconstrained)			●	●	●	●	●
Calaveras Reseroivr Release for Fish				●	●	●	●
Calaveras Reservoir Release for Fish & Flow Recapture				●	●	●	●
Crystal Springs Reservoir - 19.0 BG (Constrained)		●	●				
Crystal Springs Reservoir - 22.6 BG (Restored/Unconstrained)				●	●	●	●
Sunol Valley Water Treatment Plant Expansion				●	●	●	●
Sunol Valley Water Treatment Plant Feed from SJPL				●	●	●	●
Harry Tracy Water Treatment Plant Expansion				●	●	●	●
Bay Division Pipeline Increased Conveyance				●	●	●	●
San Joaquin Pipeline Increased Conveyance				●	●	●	●
Desalination Project						●	
Westside Groundwater Project				●	●	●	●
Tuolumne River Transfer				●	●		●
Water Supply Reliability[11]							
Action	Level	Rationing %	Rationing %	Rationing %	Rationing %	Rationing %	Rationing %
Implement Drought Water Supply Action (Westside GW or Desal)	1	NA	NA	GW	GW	Desalination	GW
Rationing (Level 1)	2	10	10	10	10	10	10
Rationing (Level 2)	3	20	20	20	20	20	20
Rationing (Level 3)	4	25	25	25	25	25	25
	Years	Action Level	Action Level	Action Level	Action Level	Action Level	Action Level
	1921				1		
	1924	2	2	1	2	1	1
	1925			1			1
	1926			1	1	1	1
	1929			1	1	1	1
	1930			1	1	1	1
	1931	3	2	2	2	2	2
	1932						
	1933				1		1
	1934	2	2	1	2	1	1
	1935				1		
	1939						
	1944						
	1946						
	1947						
	1948			1	1	1	1
	1949						
	1950			1	1	1	1
	1953						
	1954						
	1955			1	1	1	1
	1957						
	1959						
	1960	2	2	1	2	1	1
	1961	3	3	2	3	2	2
	1962						
	1964			1	1	1	1
	1966						
	1968						
	1971						
	1972			1	1	1	1
	1976	2	2	1	2	1	1
	1977	3	3	2	3	2	2
	1979						
	1981						
	1984						
	1985			1	1	1	1
	1987	2	2	1	2	1	1
	1988	3	3	2	3	2	2
	1989	3	2	2	2	2	2
	1990	3	3	3	3	3	2
	1991	3	3	2	3	2	2
	1992	3	3	3	3	3	2
	1994	2	2	1	2	1	1
	DD1993	4	3	3	3	3	2
	DD1994	4	3	3	3	3	2
Max Drought Rationing - Policy Cap[12]	DD	Incidental 25%	Incidental 20%	20%	20%	20%	10%
	Historical	Incidental 20%	Incidental 20%	20%	20%	20%	10%

Table 1-1
Setting Characteristics and Modeling Assumptions (Part 2/3)

Assumptions and Characteristics of Setting and/or Program	Units	Baselines: Baseline Conditions[1] - Calaveras Constrained	Baselines: Baseline Conditions[2] - Calaveras Unconstrained	Proposed WSIP	WSIP Variants[3]: All Tuolumne	WSIP Variants[3]: Regional Desalination for Drought	WSIP Variants[3]: 10% Rationing
System Wide Parameters							
Incremental Supply - Average[13]							
System Customer Purchase Request Level	MGD	265	265	300	300	300	300
Demand Level Supplied from Other Sources	MGD	0	0	10	0	10	10
Demand Level Supplied from Tuolumne + Local Watersheds	MGD	265	265	290	300	290	290
System Deliveries	MGD	258	259	287	293	287	287
Regional Desalination	MGD	0	0	0	0	7	0
San Joaquin Pipelines (Tuolumne Diversion)	MGD	218	215	245	250	238	245
Inferred Local Watershed Production	MGD	40	44	42	43	41	42
Addt'l Tuolumne Diversion (Compared to Calaveras Constrained)	MGD	*218*	*215*	27	32	20	27
Addt'l Tuolumne Diversion (Compared to Calaveras pre-2002)	MGD	*218*	*215*	30	35	23	31
Incremental Design Drought Supply[14]							
From Other Sources - Regional Recl/Cons/GW (Every Year)	MGD	0	0	10	0	10	10
Restoration of Calaveras Reservoir Capacity (w/ flow recapture)	MGD	0	0	7	7	7	7
Restoration of Crystal Springs Capacity		0	0	1	1	1	1
MID/TID Transfer to SFPUC (Results in additional diversion from TR)	MGD	0	0	23	23	0	35
Westside Basin Conjunctive Use (8,100 acre-feet Storage)	MGD	0	0	6	6	6	6
Regional Desalination (26 mgd)	MGD	0	0	0	0	23	0
Sum of Incremental Supplies	MGD	0	0	47	37	47	59
Yield - Without Other Sources Added (Compared to Calaveras Constrained)	MGD	219	226	256	256	256	268
Yield - With Other Sources Added (Compared to Calaveras Constrained)	MGD	219	226	266	256	266	278
Design Drought Delivery Calculator[15]		2	3	4	5	6	7
	MGD						
Average Annual Delivery During	Year 1	265	265	290	300	290	290
Average Annual Delivery During	Year 2	239	239	290	270	290	290
Average Annual Delivery During	Year 3	212	212	261	240	261	261
Average Annual Delivery During	Year 4	212	239	261	270	261	261
Average Annual Delivery During	Year 5	212	212	232	240	232	261
Average Annual Delivery During	Year 6	212	212	261	240	261	261
Average Annual Delivery During	Year 7	212	212	232	240	232	261
Average Annual Delivery During	Year 8	199	212	232	240	232	261
Average Annual Delivery During	Last 6 Mo	99	106	116	120	116	131
	DD Ave	219	224	256	254	256	268
Firm Yield (Nominal) Not Including Other Sources	MGD	219	226	256	256	256	268
Local System Operational Parmeters							
Crystal Springs Reservoir Operation							
Storage - Minimum/Maximum	BG	5.4 - 19.0		5.4 - 22.6			
	TAF	16.6 - 58.4		16.6 - 69.3			
Fall/Winter Operation Storage		17.0 BG (52.2 TAF)		19.0 BG (58.3 TAF)			
Stream Release		Up to 250 cfs to not exceed 19 BG		Up to 250 cfs to not exceed 21 BG			
Calaveras Reservoir Operation							
Storage - Minimum/Maximum	BG	8.4 - 12.4	8.4 - 31.5	8.4 - 31.5			
	TAF	25.7 - 38.0	25.7 - 96.8	25.7 - 96.8			
Fall/Winter Operation Storage		10.3 BG (31.6 TAF)	27.0 BG (82.9 TAF)	27.0 BG (82.9 TAF)			
Alameda Creek Release/Recapture[16]	AFY	0		Up to 6,300			
San Andreas Reservoir Operation							
Storage - Minimum/Maximum	BG	3.0 - 6.2		3.0 - 6.2			
	TAF	9.2 - 19.0		9.2 - 19.0			
Fall/Winter Operation Storage		5.6 BG (17.2 TAF)		5.6 BG (17.2 TAF)			
San Antonio Reservoir Operation							
Storage - Minimum/Maximum	BG	1.0 - 16.5		1.0 - 16.5			
	TAF	3.1 - 50.5		3.1 - 50.5			
Fall/Winter Operation Storage		15.9 BG (48.8 TAF)		15.9 BG (48.8 TAF)			
Pilarcitos Reservoir Operation							
Storage - Minimum/Maximum	BG	0.65 - 0.97		0.65 - 0.97			
	TAF	2.0 - 3.0		2.0 - 3.0			
Fall/Winter Operation Storage		0.75 BG (2.2 TAF)		0.75 BG (2.2 TAF)			
Water Treatment Plants							
Sunol Valley Water Treatment Plant Maximum	MGD	120		160			
		90 MGD from Calaveras		90 MGD from Calaveras + Flow Recapture			
Sunol Valley Water Treatment Plant Minimum	MGD	20		20			
		Cal & SA Res & SJPL	Cal & SA Res	From Calavers & San Antonio Reservoirs & SJPL			
Harry Tracy Water Treatment Plant Maximum	MGD	120		140			
Harry Tracy Water Treatment Plant Minimum	MGD	20		20			
Conveyance							
Bay Division Pipeline Maximum		340 MGD Jun - Sep 320 MGD Apr, May & Oct 290 MGD Nov - Mar		380 MGD Apr - Oct 320 MGD Nov - Mar			
Bay Division Pipeline Maintenance		Cycle one pipeline out Nov - Mar each year (average remaining capacity rotation) maximum 230 MGD		Cycle one pipeline out Nov - Mar each year (average remaining capacity rotation) maximum 320 MGD			

Table 1-1
Setting Characteristics and Modeling Assumptions (Part 3/3)

Assumptions and Characteristics of Setting and/or Program	Units	Baselines: Baseline Conditions[1] - Calaveras Constrained	Baselines: Baseline Conditions[2] - Calaveras Unconstrained	Proposed WSIP	WSIP Variants[3]: All Tuolumne	WSIP Variants[3]: Regional Desalination for Drought	WSIP Variants[3]: 10% Rationing
Tuolumne River System Operational Parameters							
Hetch Hetchy Reservoir Operation							
Storage - Minimum/Maximum	TAF	26.1 - 360.4		26.1 - 360.4			
Fall/Winter Operation Storage		30 TAF winter buffer		30 TAF winter buffer			
1987 Stipulation Minimum Release Flows		Yes		Yes			
1987 Stipulation Supplemental Release Flows		No		No			
Cherry Reservoir Operation							
Storage - Minimum/Maximum	TAF	1.0 - 273.3		1.0 - 273.3			
Fall/Winter Operation Storage		25.3 TAF winter buffer		25.3 TAF winter buffer			
Eleanor Reservoir Operation							
Storage - Minimum/Maximum	TAF	0.0 - 27.1		0.0 - 27.1			
Fall/Winter Operation Storage		Required Minimum Stoarge		Required Minimum Stoarge			
New Don Pedro Water Bank Account							
Storage - Minimum/Maximum	TAF	0.0 - 570.0 Temporary storage up to 740 TAF during Apr - Sep		0.0 - 570.0 Temporary storage up to 740 TAF during Apr - Sep			
Conveyance							
San Joaquin Pipelines Maximum	MGD	290		314	314	313	
San Joaquin Pipelines Minimum	MGD	70		70			
San Joaquin Pipelines Flow Rate Changes		11 Stepwise		17 Stepwise			
		Surrogate minimum changes by allowing only 7 changes in a year		Surrogate minimum changes by allowing only 7 changes in a year			
San Joaquin Pipelines Maintenance		Cycle one pipeline out Nov - Mar each year (average remaining capacity rotation) maximum 210 MGD		Cyclic 5-year maintenance, maximum capacity available Apr - Oct all years 271 MGD available all other months except 0 MGD available Year 5 Nov - Dec and 135.5 MGD available Year 1 and Year 3 Dec			
TID/MID Operational Parameters							
Districts' Tuolumne Diversion[17]		Varies annually based on land use and water availability Annual average 867 TAF		Set equal to baseline conditions SFPUC diversion effects measured by the result of reducing inflow to New Don Pedro Resevoir and its effect upon La Grange releases to the Tuolumne River			
Tuolumne River La Grange Flow Releases							
Don Pedro, 1996 FERC		X	X	X	X	X	X
VAMP - considered but not modeled[18]		X	X	X	X	X	X

Table 1-2
Summary of Modeling Results (Part 1/2)

HH/LSM Simulation Results	Units	Baselines: Baseline Conditions[1] - Calaveras Constrained	Baselines: Baseline Conditions[2] - Calaveras Unconstrained	Proposed WSIP	WSIP Variants[3]: All Tuolumne	WSIP Variants[3]: Regional Desalination for Drought	WSIP Variants[3]: 10% Rationing
Design Drought Production & Disposition[19]							
San Joaquin Pipeline Diversion	MGD	206.9	206.4	232.5	232.1	210.4	245
Bay-Area Deliveries	MGD	218.3	223.9	248.9	247.3	248.9	260.6
Added Groveland & Coastside Delivery	MGD	2.6	2.6	3.6	3.5	3.6	3.7
Local Reservoir Evaporation	MGD	10.2	10.6	12.3	12.3	12.5	12.3
Inflow from ACDD	MGD	2.3	2.5	2.5	2.5	2.5	2.5
Flow Recapture	MGD	0	0	5.3	5.3	5.3	5.3
Local Reservoir Stream Release	MGD	0.1	0.2	5.5	5.4	5.3	5.3
Desalination	MGD	0	0	0	0	22.9	0
Westside Basin	MGD	0	0	5.6	5.6	0	5.6
District Transfer to NDP Water Bank	MGD	0	0	22.7	22.7	0	35.3
Local Storage - Begin	MG	53,725	72,505	77,708	77,496	77,673	77,708
Local Storage - End	MG	20,044	19,133	18,846	22,808	21,303	21,672
Study Average Production & Disposition (1921-02)[20]							
Tuolumne River System							
Reservoirs							
Hetch Hetchy							
Inflow	AF	749,605	749,605	749,605	749,605	749,605	749,605
River	AF	277,018	277,714	267,446	264,222	269,172	267,073
Stream Minimum Release	AF	65,731	65,912	65,547	65,551	65,686	65,547
Tunnel	AF	468,975	468,279	478,524	481,733	476,791	478,892
Evaporation	AF	3,896	3,886	3,868	3,867	3,873	3,871
Reservoir	AF	284,033	287,056	275,905	273,571	278,946	276,175
Cherry							
Inflow		279,293	279,293	279,293	279,293	279,293	279,293
Eleanor Gravity	AF	199	199	289	289	289	289
Eleanor Pump	AF	118,270	118,188	118,299	118,269	118,582	118,074
River	AF	44,659	44,001	45,978	44,437	46,435	43,928
Stream Minimum Release	AF						
Tunnel	AF	349,596	350,171	348,403	349,910	348,236	350,221
Evaporation	AF	3,507	3,508	3,499	3,504	3,493	3,507
Reservoir	AF	240,426	240,602	239,298	239,814	238,382	240,139
Eleanor							
Inflow	AF	169,617	169,617	169,617	169,617	169,617	169,617
Eleanor Gravity	AF	199	199	289	289	289	289
Eleanor Pump	AF	118,270	118,188	118,299	118,269	118,582	118,074
River	AF	49,243	49,325	49,124	49,154	48,840	49,348
Stream Minimum Release	AF						
Evaporation	AF	1,905	1,905	1,906	1,906	1,906	1,906
Reservoir	AF	22,201	22,201	22,191	22,191	22,191	22,191
Don Pedro Reservoir							
Inflow	AF	1,591,144	1,594,967	1,561,409	1,555,539	1,568,786	1,560,686
MID Diversion	AF	303,546	303,546	303,546	303,546	303,546	303,546
TID Diversion	AF	563,497	563,497	563,497	563,497	563,497	563,497
LaGrange Total Stream	AF	680,091	684,124	652,299	646,860	659,360	651,632
LaGrange Minimum Stream Release	AF	221,361	221,361	221,361	221,361	221,361	221,361
Total Evaporation	AF	44,024	44,092	43,106	42,960	43,429	43,056
Reservoir	AF	1,492,181	1,495,055	1,453,662	1,447,722	1,467,488	1,451,840
Water Bank Account							
Balance	AF	518,149	520,327	517,209	516,614	507,638	524,298
Transfer	AF	0	0	27,000	27,000	0	42,000
San Joaquin Pipelines							
Volume (AF)	AF	244,165	240,340	273,887	279,737	266,510	274,599
Volume (MG)	MG	79,562	78,315	89,246	91,152	86,842	89,477
Rate (MGD)	MGD	218	215	245	250	238	245
Max Rate (MGD)	MGD	290	290	314	313	313	313
Min Rate (MGD)	MGD	70	0	0	0	0	0
East Bay System		MG	MG	MG	MG	MG	MG
Reservoirs							
Calaveras							
Inflow	MG	12,368	12,368	12,368	12,368	12,368	12,368
From ACDD	MG	1,352	2,023	1,748	1,755	1,746	1,748
Stream	MG	3,660	2,242	4,285	4,248	4,297	4,280
Stream Flow Recapture	MG	0	0	1,555	1,555	1,555	1,555
To SVWTP	MG	9,049	10,616	9,694	9,740	9,682	9,703
To San Antonio	MG	0	0	0	0	0	0
Evaporation	MG	1,023	1,591	1,709	1,706	1,707	1,705
Resevoir	MG	10,975	25,116	28,320	28,257	28,282	28,215
San Antonio							
Inflow	MG	2,468	2,468	2,468	2,468	2,468	2,468
From Calaveras/SJPL	MG	1,053	1,525	1,278	1,543	1,674	1,655
Stream	MG	555	521	548	494	632	567
To SVWTP	MG	2,061	2,511	2,239	2,572	2,529	2,604
Evaporation	MG	956	971	976	963	994	967
Resevoir	MG	14,084	14,447	14,631	14,331	14,893	14,371
Alameda Creek Diversion Dam							
Inflow	MG	4,197	4,197	4,197	4,197	4,197	4,197
To Calaveras Reservoir	MG	1,352	2,023	1,748	1,755	1,746	1,748
Spill	MG	2,845	2,174	2,449	2,442	2,451	2,449
Alameda Creek Confluence							
Accretion	MG	1,918	1,918	1,918	1,918	1,918	1,918
From ACDD	MG	2,845	2,174	2,449	2,442	2,451	2,449
From Calaveras Dam	MG	3,660	2,242	4,285	4,248	4,297	4,280
At Confluence	MG	8,422	6,333	8,652	8,609	8,666	8,647
Treatment Plants							
SVWTP Total	MG	13,752	13,267	14,313	14,522	14,604	14,648
From Calaveras	MG	9,049	10,616	9,694	9,740	9,682	9,703
From San Antonio	MG	2,061	2,511	2,239	2,572	2,529	2,604
From SJPL	MG	2,642	141	2,380	2,210	2,393	2,341
SVWTP Total MGD	MGD	38	36	39	40	40	40
SVWTP Max MGD	MGD	117	120	160	160	160	160
SVWTP Min MGD	MGD	20	20	20	20	20	20

Table 1-2
Summary of Modeling Results (Part 2/2)

HH/LSM Simulation Results	Units	Baselines			WSIP Variants[3]		
		Baseline Conditions[1] - Calaveras Constrained	Baseline Conditions[2] - Calaveras Unconstrained	Proposed WSIP	All Tuolumne	Regional Desalination for Drought	10% Rationing
Peninsula System							
Reservoirs							
Crystal Springs							
Inflow	MG	3,722	3,722	3,722	3,722	3,722	3,722
From San Andreas	MG	0	0	0	0	0	0
From Pilarcitos and SJPL	MG	6,751	8,545	8,508	8,402	8,701	8,486
Stream	MG	448	409	316	220	438	303
Pump to San Andreas	MG	8,832	10,540	10,311	10,358	10,364	10,298
Pump to Coastside	MG	54	55	239	228	239	240
Evaporation	MG	1,189	1,261	1,407	1,373	1,429	1,413
Reservoir	MG	16,102	16,907	18,962	18,488	19,293	19,075
San Andreas							
Inflow	MG	1,428	1,428	1,428	1,428	1,428	1,428
From other Streams	MG	9,271	10,992	10,656	10,781	10,724	10,657
Stream	MG	0	0	0	0	0	0
To HTWTP	MG	10,168	11,890	11,553	11,678	11,621	11,555
Evaporation	MG	530	530	530	530	530	530
Reservoir	MG	5,893	5,846	5,861	5,853	5,868	5,861
Pilarcitos							
Inflow		1,297	1,297	1,297	1,297	1,297	1,297
To San Andreas	MG	439	452	345	423	360	359
For Stone Diversion	MG	444	444	607	605	607	608
Stream other than Diversion	MG	327	314	278	201	263	263
Evaporation	MG	89	89	72	72	72	71
Reservoir	MG	623	623	469	471	469	467
Stone Dam							
Accretion blw Pilarcitos	MG	603	603	603	603	603	603
Pilarcitos non-diversion Release	MG	327	314	278	201	263	263
Pilarcitos Release for Diversions	MG	930	917	880	804	866	866
Diversion to Coastside	MG	178	178	236	235	236	236
Diversion to Crystal Springs	MG	180	200	181	214	166	184
Spill past Stone	MG	1,502	1,455	1,343	1,159	1,329	1,311
Treatment Plants							
HTWTP Total	MG	10,168	11,890	11,553	11,678	11,621	11,555
HTWTP Total MGD	MGD	28	33	32	32	32	32
HTWTP Max MGD	MGD	149	149	106	145	106	106
HTWTP Min MGD	MGD	20	20	20	20	20	20
Other Facilites							
Westside Basin Net	MG	0	0	11	11	11	11
Desalination Input	MG	0	0	0	0	2,662	0
Additional Information							
Total Local Reservoir Stream Release	MG	4,990	3,486	5,427	5,164	5,630	5,413
Total Local Reservoir Stream Evaporation	MG	3,788	4,442	4,694	4,644	4,733	4,686
Deliveries							
In-City	MG	29,589	29,667	26,686	29,982	26,686	26,751
South Bay	MG	43,106	43,221	52,906	52,206	52,906	53,037
Crystal Springs	MG	15,120	15,160	16,931	16,687	16,931	16,973
San Andreas	MG	5,400	5,414	6,604	6,535	6,604	6,621
Coastside	MG	675	678	1,082	1,082	1,082	1,084
Groveland	MG	365	365	365	365	365	365
Total Deliveries	MG	94,255	94,502	104,574	106,857	104,574	104,829
Total Deliveries	MGD	258	259	287	293	287	287
Storage							
Total Local Storage Begin	MG	23,240	23,488	26,150	26,150	26,150	26,150
Total Local Storage End	MG	18,915	23,358	22,188	21,241	21,957	21,957
Residual Difference during 82-year Simulation	MGD	0.14	0.00	0.13	0.16	0.14	0.14
Westside Storage Begin	MG	0	0	23,474	23,474	23,474	23,474
Westside Storage End	MG	0	0	24,363	24,363	24,363	24,363
Residual Difference during 82-year Simulation	MGD	0.00	0.00	0.03	0.03	0.03	0.03

Notes for Table 1-1 and Table 1-2

1. Baseline condition represents the existing conditions at the time of NOP publication in September 2005. This is the baseline used to assess WSIP program impact and impact significance. This setting indicates DSOD restrictions on Calaveras and Crystal Springs Reservoirs.

2. This baseline condition represents a system configuration and operation prior to the DSOD storage restriction (pre-2002).

3. These three scenarios are variations on the proposed WSIP. The attributes of these scenarios are largely the same as the proposed WSIP, except for variations in water supply source(s) or objectives for water delivery rationing.

4. The time horizon for the setting of the scenario. The baseline condition scenarios are depicted for recent conditions, while the proposed WSIP, variants, and alternatives are depicted for the future at full buildout and implementation, i.e., conditions in the year 2030.

5. HH/LSM model simulation study name.

6. The customer purchase request (demand) information is based on the demand and request studies prepared by the SFPUC in coordination with the wholesale customers (SFPUC/URS 2004). This demand on the regional water system includes both the SFPUC retail customers and wholesale customers. The current (2005) average annual demand is 265 mgd and the projected 2030 average annual demand is 300 mgd, assuming the SFPUC adopts the updated wholesale customer purchase requests as part of the Master Sales Agreement renewal with these customers (due in 2009).

7. Certain scenarios include the development of additional water supply from a combination of recycled water projects, groundwater projects, and conservation, utilized every year and not subject to reduction during drought.

8. The average annual demand for supplies from the combination of the SFPUC local watershed and Tuolumne River, as well as programs not included in the regional water conservation, reclamation, and groundwater programs shown.

9. Modeled results for SFPUC deliveries, with supplies added for regional water conservation, reclamation, and groundwater programs. Total deliveries and supply will be less than full customer purchase requests due to rationing in some years.

10. Shows only the features that affect hydrologic results of the system operation simulations. Additional projects are included in the WSIP, variants, and alternatives.

11. Illustrates the frequency and severity of water supply action or severity of system-wide rationing. Only years in which variable water supply component is implemented or rationing occurs are shown. "DD" illustrates the shortage results for years included in the prospective drought period of the SFPUC Design Drought. These years contribute to establishing system operation protocols but are not included in the hydrologic assessment analyses.

12. Rationing policy cap: The SFPUC WSIP level of service goal is to maintain rationing on the regional system at no more than 20% during any one year of the drought. Some alternatives do not achieve this level of service goal. Performance is indicated for both the Design Drought ("DD") sequence and "Historical" hydrologic sequence.

13. Water supply elements develop water in different amounts from year to year, and, in some instances, they only develop water during dry years. This information is provided to compare local watershed supplies, Tuolumne River supplies, and other identifiable water supplies used to meet system purchase requests. Values are stated in units of average annual quantities during the simulated historical sequence.

14. Results from HH/LSM analysis of each scenario. Values represent the average annual production of each element of supply during the design drought period.

15. Simplified calculation of system deliveries during the SFPUC design drought. The value represents the application of system-wide shortages to the demand level being met with SFPUC local watershed, Tuolumne, and other developed supplies, and does not include supplies from regional water conservation or from recycled water or groundwater projects. Average value may be slightly misstated (up to 3 mgd) due to metric of analysis that does not account for differences in residual storage between studies. "Nominal" firm yield represents the yield of each scenario after adjustment for minor residual storage differences.

16. Supplemental releases from Calaveras Reservoir for fisheries (1997 MOU) of up to 6,300 AFY and the Alameda Creek Recapture project are tied to implementation of the Calaveras Dam replacement project. When the dam is replaced and capacity restored, both the flow release and recapture will occur. The release requirement is based on the supplementation of other occurring flows below Calaveras Reservoir, sometimes not requiring the full 6,300 acre-feet.

17. SFPUC actions are assumed to leave MID/TID diversions unchanged so that the SFPUC effects on the Tuolumne River below La Grange Dam are isolated and possibly overstated. The Districts' diversions are assumed to be constant among the scenarios to provide comparable results of SFPUC-alone effects.

18. Participation in the San Joaquin River Agreement is assumed. Although the agreement expires after 2010, it is assumed that a subsequent similar agreement or requirement of the Districts will occur. HH/LSM does not explicitly model the Districts' participation in the agreement; however, its participation if modeled would result in only minor differences in results and would not change impact conclusions.

19. From HH/LSM results for modeling the SFPUC Design Drought Period.

20. From HH/LSM results for modeling the system operations for the historical hydrologic period 1921-2002. Values indicate average annual quantities during the simulated historical period.

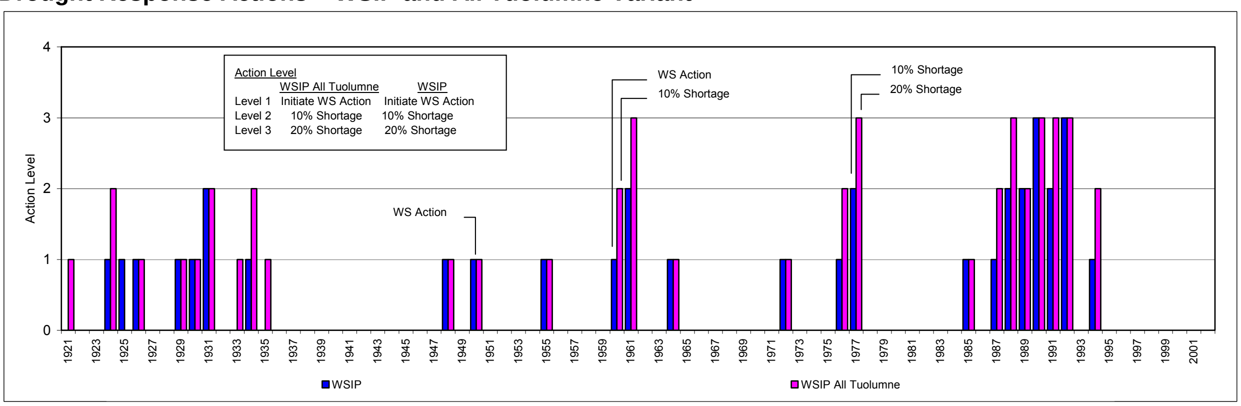
2. WSIP Variant 1 - All Tuolumne

WSIP Variant 1 - All Tuolumne variant would be identical to the proposed program (WSIP), except that the programs used to serve the increase in purchase request (from 265 to 300 million gallons per day [mgd]) and improvement in supply reliability would not include a supply of 10 mgd from implementation of the Recycled Water Projects (SF-3), Local Groundwater Projects (a component of SF-2, Groundwater Projects), and additional conservation programs (collectively referred to in this memorandum as RRGWC). In effect, the absence of the 10 mgd of RRGWC requires the Regional Water System's resources to serve a 300-mgd demand instead of a net 290-mgd demand. In all other aspects, this variant would include the same water supply sources as the WSIP, and would incorporate the same restored storage features of Calaveras and Crystal Springs Reservoir and the integration of the Westside Basin Groundwater Program. Identical to the WSIP, also included is a supplemental water supply for delivery during drought obtained from Tuolumne River diversions through transfers from the Turlock Irrigation District (TID) and Modesto Irrigation District (MID).

2.1 Water Deliveries and Drought Response Actions

The same amount of MID/TID Tuolumne River water transfer (27,000 acre-feet) is modeled for both the proposed program and the variant. With the absence of 10 mgd of RRGWC, the Regional Water System's resources are required to serve a 300-mgd demand instead of a net 290-mgd demand. This greater demand being served with the same amount of supply leads to a more frequent implementation of rationing and a greater severity of rationing during drought periods. This rationing is applied to the 300-mgd level of demand as opposed to the 290-mgd level of demand. Table 1-1 compares the drought response actions of the proposed program and the variant. Figure 2.1-1 illustrates the drought response actions for the simulated 82-year historical period (1921-2002) for the variant and WSIP settings.

Figure 2.1-1
Drought Response Actions – WSIP and All Tuolumne Variant



In Figure 2.1-1, years with bars showing a "1" or greater level of action indicate periods when a supplemental water supply action is initiated. In these scenarios, the water supply action is the use of the Westside Basin Groundwater Program to supplement San Francisco Public Utilities Commission (SFPUC) water deliveries. Action levels greater than "1" indicate the imposition of delivery shortages (rationing) to SFPUC customers. The initiation of supplemental supplies from the Westside Basin Groundwater Program, frequency of imposed delivery shortages, and severity of shortages all increase in the variant setting.

The same form of information is shown in Figure 2.1-2 in comparing the variant and the "Base - Calaveras Constrained" (existing) settings. In modeling parlance, there is no level 1 action level in the base setting. Without supplemental resources, the existing system has only delivery shortage measures available to cope with drought. This shortage measure is imposed during level 2 (10 percent) and level 3 (20 percent). These percentages of shortage are applied to both the variant and base setting for these action levels, although they are applied to different levels of water demand. In the variant, the system's water demand is an average annual net 300 mgd; in the base setting, the water demand is 265 mgd.

Figure 2.1-2
Drought Response Actions – Base and All Tuolumne Variant

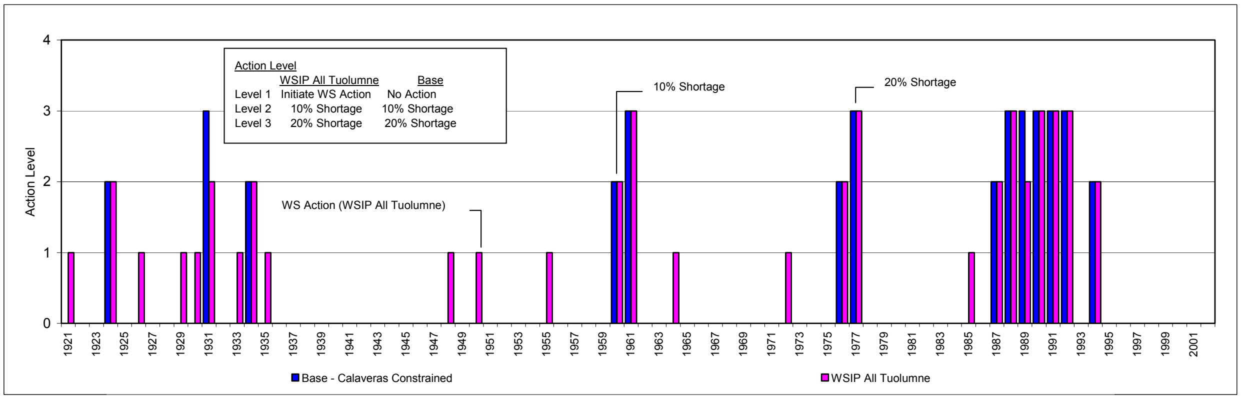


Figure 2.1-2 illustrates that, when compared to the base setting, the variant triggers supplemental resources at an early indication of drought, during periods when in the current setting there is no supplemental resource available to the system. The use of the supplemental resource during these times results in the lessening of (or at least a non-increase in) the severity of delivery shortage, even with an increase in deliveries.

Not illustrated in Figure 2.1-2, but shown in Table 1-1, are the delivery shortages anticipated during the entire SFPUC Design Drought. Shortages during the Design Drought with the variant are maintained within the objective to limit the severity of shortage to no more than 20 percent. This objective is also achieved with the WSIP. However, with the variant, an additional 10 percent of shortage occurs during 3 more years than with the WSIP, but the shortages occur to a larger demand (300 mgd). Over the Design Drought, approximately the same amount of water is delivered to SFPUC customers for the proposed program and the variant. With the existing system, the 20-percent-limitation (cap) objective cannot be achieved during the last 18 months of the Design Drought, and a 25 percent shortage is applied.

The difference in water deliveries between the proposed program and the variant is shown chronologically for the 82-year simulation in Table 2.1-1. The years indicating positive differences amounting to approximately 3,600 million gallons indicate periods when 10 mgd of demand is being met from the regional system (which, in the proposed program, is being met from RRGWC). The years showing positive differences of approximately 6,300 million gallons represent years when additional replenishment of the Westside Basin Groundwater Program was necessary after an additional draw from the program was needed to partially offset the absence of the 10 mgd of RRGWC. The years showing a reduction of deliveries of approximately 7,000 million gallons represent years of additional shortages with the variant.

2.2 Diversions from Tuolumne River

The metric for illustrating the SFPUC diversion from the Tuolumne River Basin is the flow through the San Joaquin Pipeline (SJPL). Inherent to this variant is the draw of additional water from the Tuolumne River Basin to replace the 10 mgd of RRGWC that was included in the proposed program. Table 2.2-1 illustrates the difference in diversions to the SJPL between the proposed program and the variant. The differences appear much less systematic than the system deliveries shown in Table 2.1-1 because system storage buffers the change in deliveries; however, the reductions in SJPL diversions are generally associated with periods of reduced system-wide deliveries, and the increases are due to additional water diversions to offset the absence of the 10 mgd of RRGWC included in the proposed program. The additional diversion typically occurs from October through March when unused capacity is available in the SJPL. During the spring and summer, the SJPL is modeled in both settings to be diverting at maximum capacity to minimize the amount of storage drawn from local Bay Area reservoirs. Table 2.2-2 illustrates the average monthly diversion through the SJPL, by year type, for the 82-year simulation period for the proposed program and the variant.

Table 2.1-1

Difference in Total System-wide Delivery (MG)

WSIP All Tuolumne minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
1921	307	276	282	276	260	304	327	341	336	7	42	69	2,826	3,644
1922	83	74	99	118	84	105	108	119	100	537	540	523	2,489	1,005
1923	531	493	506	500	463	528	544	565	553	313	316	306	5,619	6,284
1924	307	276	282	276	260	304	327	341	336	-1,073	-1,027	-809	-200	3,644
1925	-628	-385	-191	-71	-209	-438	-635	-826	-974	844	815	760	-1,937	-7,265
1926	756	695	690	659	640	727	763	787	789	313	316	306	7,440	8,923
1927	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1928	307	276	282	276	260	304	327	341	336	89	92	89	2,979	3,644
1929	83	59	58	52	58	80	110	117	119	313	316	306	1,670	1,005
1930	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1931	307	276	282	276	260	304	327	341	336	279	282	273	3,543	3,644
1932	276	246	254	254	241	276	294	307	297	313	316	306	3,380	3,279
1933	307	276	282	276	260	304	327	341	336	-217	-183	-148	2,161	3,644
1934	-142	-143	-126	-107	-119	-120	-109	-105	-117	-1,073	-1,027	-809	-3,995	-1,635
1935	-628	-385	-191	-71	-209	-438	-635	-826	-974	-217	-183	-148	-4,904	-7,265
1936	-142	-143	-126	-107	-119	-120	-109	-105	-117	313	316	306	-151	-1,635
1937	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1938	307	276	282	276	260	304	327	341	336	537	540	523	4,310	3,644
1939	531	493	506	500	463	528	544	565	553	537	540	523	6,284	6,284
1940	531	493	506	500	463	528	544	565	553	537	540	523	6,284	6,284
1941	531	493	506	500	463	528	544	565	553	313	316	306	5,619	6,284
1942	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1943	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1944	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1945	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1946	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1947	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1948	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1949	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1950	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1951	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1952	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1953	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1954	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1955	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1956	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1957	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1958	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1959	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1960	307	276	282	276	260	304	327	341	336	-1,073	-1,027	-809	-200	3,644
1961	-628	-385	-191	-71	-209	-438	-635	-826	-974	-876	-850	-735	-6,816	-7,265
1962	-657	-531	-443	-384	-417	-561	-632	-740	-802	313	316	306	-4,232	-7,627
1963	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1964	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1965	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1966	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1967	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1968	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1969	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1970	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1971	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1972	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1973	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1974	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1975	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1976	307	276	282	276	260	304	327	341	336	-1,073	-1,027	-809	-200	3,644
1977	-628	-385	-191	-71	-209	-438	-635	-826	-974	-876	-850	-735	-6,816	-7,265
1978	-657	-531	-443	-384	-417	-561	-632	-740	-802	313	316	306	-4,232	-7,627
1979	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1980	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1981	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1982	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1983	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1984	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1985	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1986	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1987	307	276	282	276	260	304	327	341	336	-1,073	-1,027	-809	-200	3,644
1988	-628	-385	-191	-71	-209	-438	-635	-826	-974	-876	-850	-735	-6,816	-7,265
1989	-657	-531	-443	-384	-417	-561	-632	-740	-802	279	282	273	-4,333	-7,627
1990	276	246	254	254	241	276	294	307	297	248	251	243	3,187	3,279
1991	245	219	229	226	207	245	261	273	270	-876	-850	-735	-285	2,918
1992	-657	-531	-443	-384	-417	-561	-632	-740	-802	248	251	243	-4,425	-7,627
1993	245	219	229	226	207	245	261	273	270	313	316	306	3,111	2,918
1994	307	276	282	276	260	304	327	341	336	-1,073	-1,027	-809	-200	3,644
1995	-628	-385	-191	-71	-209	-438	-635	-826	-974	313	316	306	-3,421	-7,265
1996	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1997	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1998	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1999	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
2000	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
2001	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
2002	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
Avg (21-02)	189	187	211	218	192	206	207	200	182	149	157	171	2,270	2,270

Table 2.2-1

Difference in Total SJPL (Acre-feet) WSIP All Tuolumne minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
1921	1,902	0	951	0	0	1,047	0	0	0	0	0	0	3,900	5,189
1922	1,903	1,841	0	1,903	0	0	0	0	0	0	0	0	5,647	5,647
1923	5,708	2,762	0	0	0	0	0	0	0	0	0	0	8,470	8,470
1924	4,091	5,616	2,854	2,854	2,578	0	0	0	0	0	0	0	17,993	17,993
1925	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	4,091	4,603	2,854	1,903	0	2,854	1,841	0	0	0	0	0	18,146	18,146
1928	3,806	1,841	0	2,854	2,578	0	0	0	0	0	0	0	11,079	11,079
1929	1,903	1,841	0	0	0	0	0	0	0	0	0	0	3,744	3,744
1930	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	3,235	2,854	13,034	7,135	-1,718	0	0	0	0	0	0	0	24,540	24,540
1933	4,091	5,616	0	2,854	2,578	0	0	0	0	0	0	0	15,139	15,139
1934	0	0	0	0	-1,719	0	0	0	0	0	0	0	-1,719	-1,719
1935	-3,235	0	0	0	0	0	0	-2,284	-2,210	0	0	0	-7,729	-7,729
1936	-7,040	-5,524	0	-2,854	-859	0	0	0	0	0	0	0	-16,277	-16,277
1937	952	0	952	1,902	0	3,045	460	0	0	0	0	0	7,311	7,311
1938	4,091	1,841	1,142	1,902	0	0	0	0	0	0	0	0	8,976	8,976
1939	6,660	2,762	1,902	952	859	0	0	0	0	0	0	0	13,135	13,135
1940	0	0	0	0	7,820	6,755	2,762	0	0	0	0	0	17,337	17,337
1941	6,660	2,762	1,142	951	0	0	3,682	1,902	1,841	0	0	0	18,940	18,940
1942	1,903	2,762	0	0	0	1,903	1,841	1,047	1,013	0	0	0	10,469	10,469
1943	2,759	1,841	0	0	0	952	0	0	0	0	0	0	5,552	5,552
1944	4,756	2,762	1,903	0	0	1,047	0	0	0	0	0	0	10,468	10,468
1945	4,091	0	0	0	3,523	0	0	0	0	0	0	0	7,614	7,614
1946	1,332	3,775	3,805	951	859	0	0	0	0	0	0	0	10,722	10,722
1947	1,332	5,616	4,757	1,902	1,719	0	0	0	0	0	0	0	15,326	15,326
1948	0	0	0	1,047	945	0	0	0	0	0	0	0	1,992	1,992
1949	0	0	5,803	5,803	4,297	3,805	0	0	0	0	0	0	19,708	19,708
1950	4,091	0	0	0	0	0	0	0	0	0	0	0	4,091	4,091
1951	0	2,854	5,708	2,663	2,406	1,903	0	0	0	0	0	0	15,534	15,534
1952	4,091	1,841	1,712	0	0	0	1,841	0	0	0	0	0	9,485	9,485
1953	3,805	921	951	0	0	0	0	0	0	0	0	0	5,677	5,677
1954	5,138	2,762	2,855	952	0	0	0	0	0	0	0	0	11,707	11,707
1955	4,091	0	0	0	0	0	0	0	0	0	0	0	4,091	4,091
1956	0	0	5,708	0	0	1,903	0	0	0	0	0	0	7,611	7,611
1957	3,806	2,762	952	952	859	0	0	0	0	0	0	0	9,331	9,331
1958	1,332	2,854	0	3,806	0	0	0	856	829	0	0	0	9,677	9,677
1959	2,379	921	1,903	952	1,547	0	0	0	0	0	0	0	7,702	7,702
1960	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	2,378	2,378	0	0	0	0	0	0	0	-2,670	2,086	4,756
1962	-7,040	368	-4,281	-3,330	-6,015	-1,047	0	-4,091	-3,959	0	0	0	-29,395	-32,065
1963	475	0	0	1,142	0	4,756	0	952	921	0	0	0	8,246	8,246
1964	0	2,762	2,855	0	0	0	0	0	0	0	0	0	5,617	5,617
1965	0	0	0	6,659	2,578	0	2,210	1,332	1,289	0	0	0	14,068	14,068
1966	3,806	1,841	523	952	859	0	0	0	0	0	0	0	7,981	7,981
1967	0	0	6,659	0	0	4,757	1,841	1,902	1,841	0	0	0	17,000	17,000
1968	1,332	1,841	0	1,902	1,718	0	0	0	0	0	0	0	6,793	6,793
1969	0	2,854	2,855	0	0	951	0	0	0	0	0	0	6,660	6,660
1970	4,281	0	0	2,854	2,578	1,047	0	0	0	0	0	0	10,760	10,760
1971	4,091	921	951	951	859	0	0	0	0	0	0	0	7,773	7,773
1972	0	0	6,659	2,854	2,578	0	0	0	0	0	0	0	12,091	12,091
1973	0	0	0	5,708	0	0	0	0	0	0	0	0	5,708	5,708
1974	3,806	1,841	0	0	0	3,805	0	0	0	0	0	0	9,452	9,452
1975	3,901	0	0	0	3,437	1,903	1,841	0	0	0	0	0	11,082	11,082
1976	2,854	921	523	952	859	0	0	0	0	0	0	0	6,109	6,109
1977	0	-1,013	-2,855	-475	-2,578	0	0	0	0	1,046	1,046	-5,432	-10,261	-6,921
1978	-5,613	-1,473	2,378	-5,232	-6,015	-5,899	-921	-3,805	-3,683	0	0	0	-30,263	-33,603
1979	4,281	1,841	0	952	859	1,902	0	0	0	0	0	0	9,835	9,835
1980	1,332	0	0	3,901	0	1,902	0	0	0	0	0	0	7,135	7,135
1981	3,806	1,841	0	2,854	2,578	0	0	0	0	0	0	0	11,079	11,079
1982	0	3,683	1,902	0	0	4,757	0	0	0	0	0	0	10,342	10,342
1983	2,759	1,841	951	0	0	0	6,444	1,903	1,841	0	0	0	15,739	15,739
1984	1,332	1,841	0	0	0	0	0	0	0	0	0	0	3,173	3,173
1985	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	8,765	6,659	921	0	0	0	0	0	16,345	16,345
1987	2,854	2,762	0	2,854	2,578	0	0	0	0	0	0	0	11,048	11,048
1988	-1,332	-1,013	0	-3,901	-4,297	0	0	0	0	-2,284	-2,284	-7,734	-22,845	-10,543
1989	-4,756	-2,762	-952	-1,903	-1,719	0	0	-1,332	-2,210	-2,284	0	0	-17,918	-27,936
1990	952	0	0	0	0	0	0	0	0	0	2,284	2,762	5,998	-1,332
1991	2,854	0	523	1,902	1,718	1,047	0	0	0	-5,138	-1,903	1,841	2,844	13,090
1992	-952	-2,762	-952	-1,903	-1,031	-1,047	0	-5,138	-4,972	0	1,902	2,762	-14,093	-23,957
1993	1,903	0	0	0	0	0	1,842	0	0	0	0	0	3,745	8,409
1994	2,379	2,762	1,903	0	859	0	0	0	0	0	0	0	7,903	7,903
1995	-1,332	0	0	-2,854	-2,578	0	-2,762	-1,903	-1,842	0	0	0	-13,271	-13,271
1996	1,047	2,762	0	951	0	2,663	0	0	0	0	0	0	7,423	7,423
1997	4,091	1,841	0	0	0	0	0	0	0	0	0	0	5,932	5,932
1998	1,332	3,775	0	951	0	1,712	921	856	829	0	0	0	10,376	10,376
1999	2,949	2,762	0	1,902	0	0	1,841	0	0	0	0	0	9,454	9,454
2000	2,379	0	0	0	4,297	2,949	0	0	0	0	0	0	9,625	9,625
2001	2,284	2,762	0	1,902	2,578	1,047	0	0	0	0	0	0	10,573	10,573
2002	2,284	4,603	0	2,855	2,578	0	0	0	0	0	0	0	12,320	12,320
Avg (21-02)	1,562	1,218	1,011	843	565	720	324	-95	-103	-106	13	-103	5,849	5,865

Table 2.2-2

Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) WSIP All Tuolumne

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	28,291	17,815	9,989	12,083	7,573	12,118	22,384	26,769	25,905	29,873	29,873	28,909	251,582	248,985
Above Normal	28,021	15,824	9,189	15,177	10,165	18,322	24,923	28,782	27,853	29,873	29,873	28,909	266,911	266,911
Normal	28,143	15,893	9,163	16,488	12,578	22,898	28,431	29,617	28,662	29,873	29,873	28,909	280,528	280,361
Below Normal	28,530	17,254	12,950	22,648	19,587	25,385	28,909	29,492	28,487	29,436	29,436	28,053	300,167	300,880
Dry	27,613	20,623	15,061	20,472	17,664	25,717	28,909	29,552	28,598	29,088	29,088	26,636	299,021	301,027
All Years	28,123	17,459	11,266	17,411	13,546	20,911	26,716	28,850	27,907	29,629	29,629	28,288	279,737	279,737

Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	27,417	16,624	8,533	11,512	7,401	11,072	21,613	26,698	25,836	29,873	29,873	28,909	245,359	242,680
Above Normal	26,381	14,460	7,852	14,254	9,306	16,705	24,111	28,687	27,761	29,873	29,873	28,909	258,169	258,169
Normal	25,830	14,656	8,776	15,448	12,041	22,339	28,403	29,873	28,909	29,873	29,873	28,909	274,929	274,849
Below Normal	27,220	15,998	11,595	21,574	18,621	24,976	28,909	29,571	28,617	29,873	29,548	27,945	294,447	295,146
Dry	25,931	19,593	14,583	19,883	17,417	25,782	28,909	29,873	28,909	29,165	28,904	27,281	296,229	298,165
All Years	26,562	16,241	10,254	16,568	12,982	20,191	26,392	28,945	28,011	29,735	29,617	28,391	273,887	273,872

Difference in Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) WSIP All Tuolumne minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	874	1,191	1,457	571	172	1,046	771	71	69	0	0	0	6,222	6,305
Above Normal	1,640	1,365	1,338	923	859	1,617	812	95	92	0	0	0	8,741	8,741
Normal	2,313	1,237	387	1,041	537	559	29	-256	-247	0	0	0	5,599	5,513
Below Normal	1,310	1,256	1,354	1,074	965	409	0	-78	-130	-437	-112	108	5,720	5,734
Dry	1,683	1,030	479	589	247	-65	0	-321	-311	-77	184	-645	2,792	2,862
All Years	1,562	1,218	1,011	843	565	720	324	-95	-103	-106	13	-103	5,849	5,865

2.3 Hetch Hetchy Reservoir and Releases

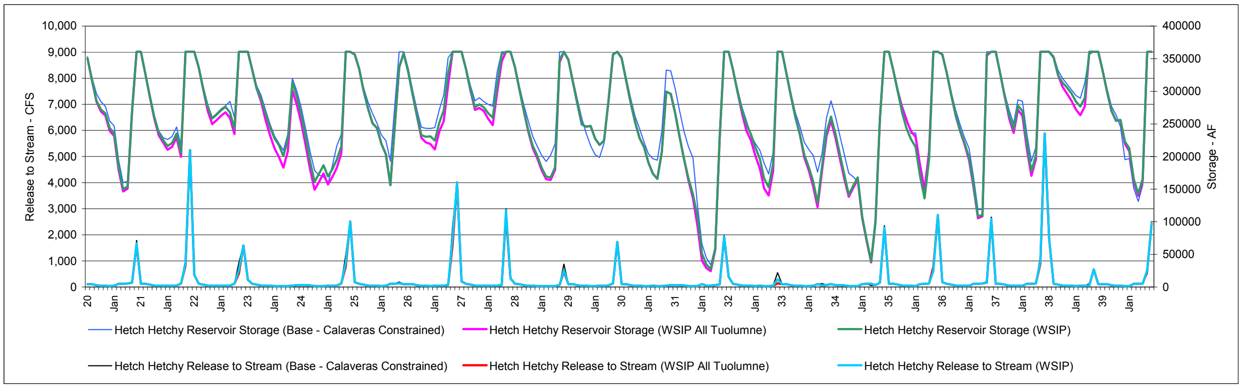
The additional draw of water for the SJPL will cause an increase in draw from Hetch Hetchy Reservoir; however, the additional draw of storage does not occur every year, and the largest differences are due to the accumulation of additional draw over a series of years. Figure 2.3-1 illustrates a chronological trace of the simulation of Hetch Hetchy Reservoir storage and stream releases. Shown in Figure 2.3-1 are the results for the WSIP, variant (“WSIP All Tuolumne”), and base (“Base – Calaveras Constrained”) settings. Supplementing the Figure 2.3-1 representation of Hetch Hetchy Reservoir storage are Table 2.3-1 Hetch Hetchy Reservoir Storage (All Tuolumne), Table 2.3-2 Hetch Hetchy Reservoir Storage (WSIP), and Table 2.3-3 Difference in Hetch Hetchy Reservoir Storage (All Tuolumne minus WSIP). Table 2.3-4 illustrates the difference in Hetch Hetchy Reservoir storage between the base and variant settings.

Table 2.3-3 illustrates that, throughout the summer and into the fall, storage in Hetch Hetchy Reservoir in the variant setting would differ from the storage in the WSIP setting only in some years, and this difference could be more or less storage. Although Hetch Hetchy Reservoir would typically be lower in storage during the fall and winter, generally coincident with the additional diversion to the SJPL, Hetch Hetchy Reservoir normally fills by the end of May, which would negate the additional draw from storage carrying into the next summer. The greatest draw from reservoir storage occurs during the droughts of the 1930s and 1976-1977, which is not coincident with the year of greatest difference in reservoir draw between the base setting and either the WSIP or variant setting. There are exceptions to the additional draw when the variant causes a greater level of rationing (e.g., 1987-1988), which then reduces diversion from Hetch Hetchy. This results in greater storage in the variant setting than in the WSIP setting. Figure 2.3-2 illustrates the difference in reservoir storage, averaged by year type, to compare the variant to the WSIP setting. Also shown is the average difference in storage for the two settings. Figure 2.3-3 illustrates the same information in comparing the variant and base settings. Figure 2.3-4 illustrates the average monthly storage in Hetch Hetchy Reservoir for the 82-year simulation, and the range in storage for each month for the variant and base settings.

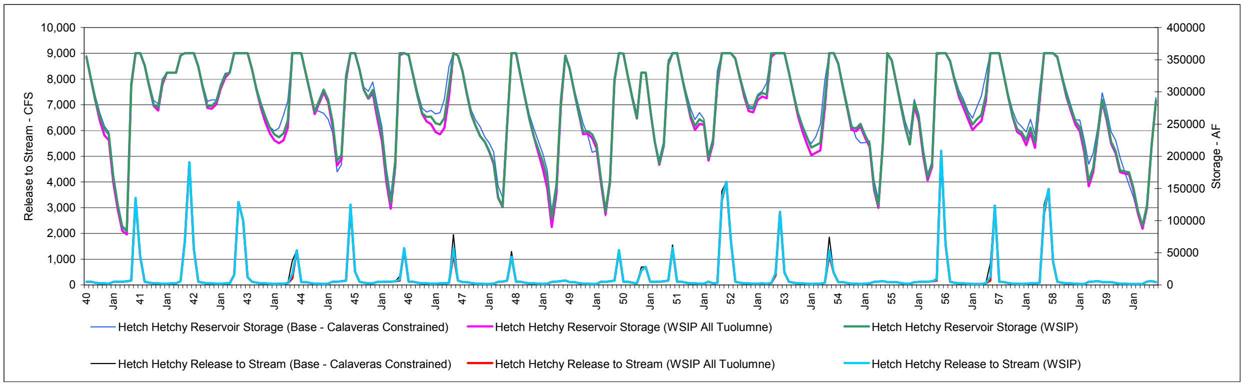
The difference in storage in Hetch Hetchy Reservoir attributed to the diversion effects of the variant would manifest into differences in releases from the reservoir to the stream. A different amount of available reservoir space in the winter and spring due to the variant would lead to a different ability to regulate inflow, thus potentially changing the amount of water released to the stream (which is above minimum release requirements). Figure 2.3-1 illustrates the stream release from the dam for the WSIP, variant, and base settings. Table 2.3-5 illustrates the difference in stream releases between the variant and WSIP settings. Compared to the WSIP setting, the variant typically exhibits an incrementally larger reduction in stream releases, predominantly during May or June, which reflects the months when releases to the stream above minimum release requirements are made in anticipation of filling the reservoir. There are exceptions to the reductions (increases) during periods when the variant causes incrementally greater delivery shortages, thereby leaving greater storage in the reservoir.

Figure 2.3-1
Hetch Hetchy Reservoir Storage and Stream Release

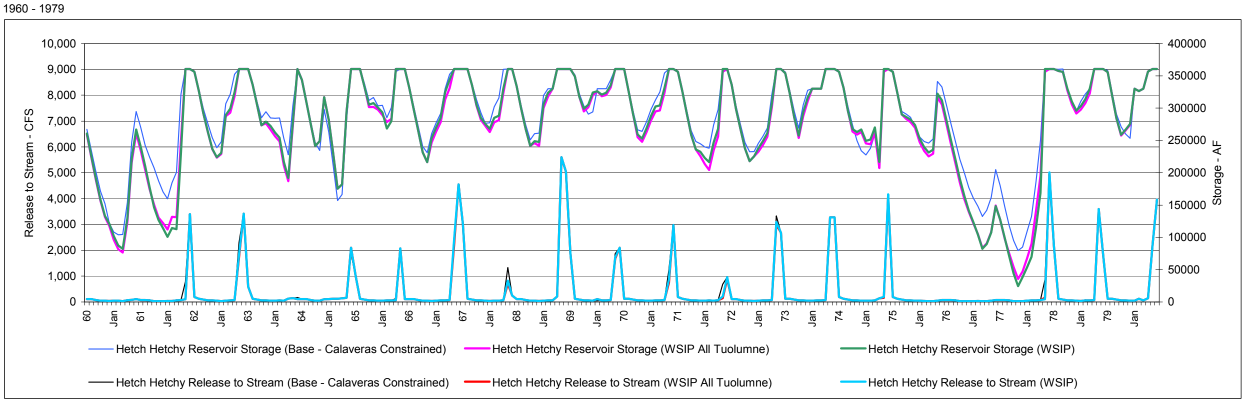
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

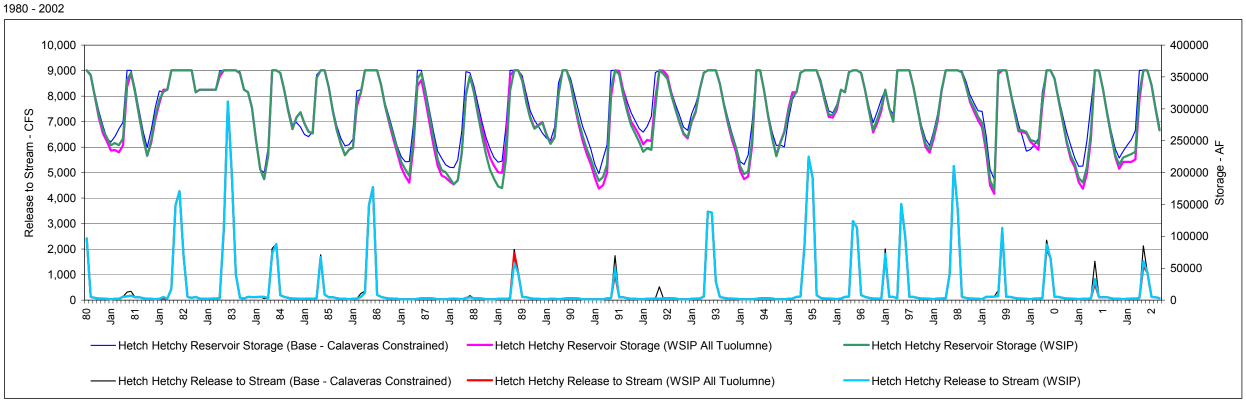


Table 2.3-1

Hetch Hetchy Reservoir Storage (Acre-feet) WSIP All Tuolumne

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	269,021	262,663	239,536	231,585	178,984	146,462	151,001	268,414	360,400	360,400	326,716	291,641
1922	258,114	232,192	221,268	210,422	214,880	229,456	199,769	360,400	360,400	360,400	335,987	302,666
1923	269,924	249,710	255,787	262,493	267,630	258,915	234,270	360,400	360,400	360,400	333,091	304,054
1924	283,818	255,568	232,182	212,340	199,507	182,938	208,326	301,473	279,649	251,630	216,298	180,357
1925	149,243	161,278	174,315	157,236	168,851	182,842	204,635	360,400	360,400	356,465	334,115	301,240
1926	273,802	251,145	243,620	219,652	203,282	156,192	244,974	336,634	358,000	330,739	295,220	261,181
1927	228,541	221,608	219,391	210,783	238,345	254,579	309,420	360,400	360,400	360,400	333,623	301,044
1928	271,542	274,354	269,712	257,877	248,294	298,852	345,688	360,400	360,400	337,001	302,499	269,162
1929	237,523	212,876	197,771	178,993	165,328	164,296	179,761	344,202	360,400	348,007	314,236	280,955
1930	249,116	245,546	246,876	227,370	217,938	224,416	285,686	356,465	360,400	350,673	316,536	283,142
1931	252,621	228,300	214,607	191,032	173,741	165,859	207,051	299,235	295,885	265,896	230,558	196,275
1932	163,019	135,879	94,041	40,484	29,319	24,348	56,658	228,585	360,400	360,400	332,994	299,731
1933	266,736	239,611	224,845	201,372	181,623	151,072	140,298	178,017	360,400	360,400	326,498	293,195
1934	260,679	234,062	198,472	178,886	153,783	122,447	178,808	231,230	254,953	228,644	196,557	165,226
1935	138,385	152,108	164,896	105,649	70,473	37,798	99,143	258,440	360,400	360,400	331,693	299,135
1936	273,844	254,980	238,631	230,020	184,844	149,010	206,639	360,400	360,400	356,465	327,758	293,923
1937	262,306	238,971	218,644	194,748	152,975	105,445	108,472	354,599	360,400	360,400	327,117	292,284
1938	258,497	236,255	271,729	262,010	211,093	170,458	195,532	360,400	360,400	360,400	351,934	324,527
1939	306,571	296,011	285,625	272,121	263,403	276,887	360,400	360,400	360,400	332,062	299,302	270,045
1940	254,832	255,868	219,052	208,272	161,417	139,664	163,230	360,400	360,400	354,356	320,123	286,028
1941	254,687	232,366	225,151	159,336	116,680	83,905	78,541	309,124	360,400	360,400	341,196	308,861
1942	278,631	271,011	311,947	330,000	330,000	330,000	356,592	360,400	360,400	360,400	339,434	306,775
1943	275,075	273,690	280,602	305,028	322,117	330,000	360,400	360,400	360,400	360,400	334,725	302,903
1944	274,200	252,642	235,354	224,630	220,124	224,799	244,782	360,400	360,400	360,400	329,195	297,258
1945	265,504	282,396	299,300	284,144	246,398	185,615	195,482	319,826	360,400	360,400	334,833	302,981
1946	289,297	297,952	258,863	223,969	159,494	118,596	182,694	357,139	360,400	357,172	325,391	292,953
1947	265,970	254,100	249,947	237,809	233,971	243,778	292,633	360,400	356,592	332,752	297,801	265,047
1948	246,881	231,142	222,253	206,785	187,806	135,526	120,925	246,146	360,400	360,400	325,679	290,875
1949	257,155	230,043	204,547	179,767	150,009	90,098	141,240	277,654	356,592	335,945	301,138	267,891
1950	234,211	235,181	227,964	212,235	158,290	110,039	159,044	316,713	360,400	359,505	323,659	289,647
1951	258,661	330,000	330,000	273,739	223,537	186,697	216,066	342,246	360,400	360,400	326,685	293,016
1952	259,441	240,912	250,125	249,027	193,584	219,291	311,415	360,400	360,400	360,400	351,556	322,024
1953	292,337	270,214	268,342	287,393	292,853	290,178	354,411	360,400	360,400	360,400	330,041	296,984
1954	262,740	238,969	219,226	201,671	205,423	209,110	274,818	360,400	360,400	343,861	308,637	274,661
1955	241,068	239,118	246,336	228,500	214,774	147,460	119,847	219,624	360,400	348,403	313,548	278,581
1956	244,439	218,424	277,281	255,207	200,374	162,516	183,620	358,724	360,400	360,400	347,696	319,103
1957	292,134	275,543	257,199	240,595	248,284	254,584	285,754	360,400	360,400	360,400	326,728	292,510
1958	260,779	237,841	232,821	217,114	236,618	213,111	284,914	360,400	360,400	360,400	353,805	323,723
1959	292,862	270,453	248,904	239,128	205,989	153,421	175,734	232,223	284,605	256,069	219,398	204,485
1960	175,184	173,028	171,871	147,463	110,995	87,148	120,108	213,545	285,220	258,887	223,594	189,286
1961	156,359	131,548	117,963	96,382	81,648	76,532	123,481	215,618	261,225	235,046	204,965	174,585
1962	150,510	130,493	122,002	112,193	131,743	131,026	249,461	360,400	360,400	356,465	326,284	291,944
1963	263,050	236,524	223,406	228,945	287,567	292,866	318,162	360,400	360,400	360,400	336,301	304,839
1964	273,386	276,371	266,731	256,676	248,542	211,321	186,849	272,184	360,400	343,655	309,219	275,614
1965	241,436	248,743	317,082	281,745	230,783	175,442	181,773	294,420	360,400	360,400	360,400	333,096
1966	301,502	302,024	297,596	289,096	278,655	283,468	360,400	360,400	360,400	331,355	297,781	265,039
1967	231,529	216,381	246,973	263,194	278,123	313,169	330,860	360,400	360,400	360,400	360,400	335,676
1968	303,866	281,468	272,498	262,925	278,163	281,220	323,335	360,400	360,400	334,230	299,647	267,169
1969	241,770	245,855	241,722	300,104	317,771	330,000	360,400	360,400	360,400	360,400	349,331	317,590
1970	294,827	301,190	319,967	326,065	318,268	320,219	332,000	360,400	360,400	360,400	325,921	290,573
1971	255,018	247,696	262,968	280,886	294,743	296,296	323,596	360,400	360,400	356,465	325,669	292,259
1972	258,557	236,088	225,977	213,361	204,387	234,599	255,971	356,465	360,400	336,331	298,810	267,683
1973	237,812	217,831	225,249	232,388	243,063	255,710	301,068	360,400	360,400	353,895	322,638	285,845
1974	253,707	287,571	310,575	330,000	330,000	330,000	360,400	360,400	360,400	356,465	331,455	295,000
1975	263,776	258,990	262,991	245,305	244,078	260,897	207,305	356,465	360,400	356,465	324,067	290,292
1976	283,295	278,506	269,468	247,348	233,606	225,307	229,564	316,309	305,670	275,516	243,732	213,753
1977	184,725	159,241	139,312	121,983	104,990	83,394	90,561	108,209	149,240	127,263	97,441	75,530
1978	53,923	35,718	47,122	67,447	89,813	140,851	195,553	356,465	360,400	360,400	357,774	356,219
1979	327,392	305,873	291,584	297,630	307,651	322,742	360,400	360,400	360,400	356,002	320,543	284,032
1980	257,348	265,500	274,159	330,000	326,446	330,000	356,592	360,400	360,400	360,400	352,634	320,226
1981	286,804	261,907	249,031	234,621	235,440	231,943	242,566	334,253	356,592	326,286	288,639	253,673
1982	226,369	246,721	283,675	308,799	330,000	330,000	360,400	360,400	360,400	360,400	360,400	360,400
1983	326,065	330,000	330,000	330,000	330,000	330,000	350,506	360,400	360,400	360,400	360,400	355,878
1984	330,000	326,192	301,515	251,330	205,725	189,676	226,912	360,400	360,400	356,465	328,867	296,270
1985	268,090	286,622	294,695	277,075	264,192	261,404	348,453	360,400	360,400	333,440	296,675	266,441
1986	245,025	227,275	236,097	238,964	303,680	326,065	360,400	360,400	360,400	360,400	337,395	304,410
1987	278,153	253,867	230,681	208,065	194,330	184,022	240,081	336,159	345,515	313,800	277,207	241,926
1988	211,382	195,457	192,202	186,324	181,527	187,619	230,388	321,793	351,144	327,482	294,895	268,902
1989	244,654	224,081	210,985	200,552	199,603	245,623	352,054	360,400	360,400	346,162	312,478	287,376
1990	270,116	274,837	279,616	260,245	246,263	256,072	323,680	360,400	360,400	339,067	304,751	275,502
1991	249,457	228,762	212,783	191,723	174,987	180,290	199,559	318,996	360,400	359,471	328,654	301,814
1992	280,518	269,798	257,812	244,423	251,063	249,510	315,941	360,400	359,902	352,164	323,458	298,949
1993	278,092	260,504	253,525	279,458	294,773	330,000	356,592	360,400	360,400	360,400	339,589	305,807
1994	276,149	251,292	232,125	202,448	189,722	194,016	242,781	360,400	360,400	328,011	288,314	253,017
1995	227,063	247,651	264,250	300,543	326,001	326,065	356,592	360,400	360,400	360,400	360,400	341,143
1996	311,964	287,200	286,419	298,451	330,000	326,065	357,776	360,400	360,400	356,465	329,174	295,620
1997	262,964	277,936	296,513	330,000	300,695	280,067	360,400	360,400	360,400	360,400	334,414	301,362
1998	267,465	239,975	231,372	252,610	279,847	327,860	360,400	360,400	360,400	360,400	357,480	336,176
1999	311,146	296,550	282,047	270,901	233,091	179,906	166,729	354,663	360,400	360,400	328,428	295,218
2000	264,949	263,862	261,337	248,633	242,504	235,852	307,065	360,400	360,400	347,162	314,239	280,150
2001	246,752	221,360	208,816	185,135	174,608	198,243	252,122	360,400	360,094	330,641	293,416	258,894
2002	225,201	206,023	216,748	216,666	216,789	220,492	312,618	360,400	360,400	337,441	300,376	266,502
Avg (21-02)	254,531	244,335	241,422	232,409	222,901	215,898	251,348	332,086	350,577	340,880	313,564	282,900

Table 2.3-2

Hetch Hetchy Reservoir Storage (Acre-feet) WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	272,212	265,854	243,679	235,730	183,131	150,102	154,083	270,998	360,400	360,400	326,716	291,641
1922	260,017	235,936	225,012	216,071	220,532	235,108	205,422	360,400	360,400	360,400	335,987	302,666
1923	275,632	258,180	264,257	270,969	276,110	267,395	242,750	360,400	360,400	360,400	333,091	304,054
1924	287,909	265,274	244,743	227,762	217,516	200,947	226,335	313,797	291,963	263,927	228,573	192,617
1925	161,496	173,531	186,568	169,497	181,122	195,112	215,423	360,400	360,400	356,465	334,115	301,240
1926	273,802	251,145	243,620	219,652	203,282	156,192	244,974	336,634	358,000	330,739	295,220	261,181
1927	232,632	230,302	230,939	224,241	251,810	270,898	327,581	360,400	360,400	360,400	333,623	301,044
1928	275,347	280,001	275,359	266,381	259,381	309,939	356,775	360,400	360,400	337,001	302,499	269,162
1929	239,425	216,620	201,515	182,739	169,077	168,044	183,509	347,948	360,400	348,007	314,236	280,955
1930	249,116	245,546	246,876	227,370	217,938	224,416	285,686	356,465	360,400	350,673	316,536	283,142
1931	252,621	228,300	214,607	191,032	173,741	165,859	207,051	299,235	295,885	265,896	230,558	196,275
1932	166,254	141,968	108,624	51,576	34,804	27,502	58,360	229,750	360,400	360,400	332,994	299,731
1933	270,827	249,318	234,552	213,938	196,774	166,223	153,096	188,750	360,400	360,400	326,498	293,195
1934	260,679	234,062	202,956	183,568	161,386	128,818	185,180	237,597	261,314	234,993	202,895	171,557
1935	141,478	155,200	167,988	108,234	72,493	39,306	100,061	259,139	360,400	360,400	331,693	299,135
1936	266,804	242,416	226,072	214,618	169,794	136,016	195,669	360,400	360,400	356,465	327,758	293,923
1937	263,258	239,922	220,528	198,592	156,392	108,310	110,656	356,408	360,400	360,400	327,117	292,284
1938	262,588	242,187	277,814	270,001	219,089	177,586	201,634	360,400	360,400	360,400	351,934	324,527
1939	313,230	305,433	296,949	284,402	276,549	290,033	360,400	360,400	360,400	332,062	299,302	270,045
1940	254,832	255,868	222,545	212,796	165,425	143,040	166,068	360,400	360,400	354,356	320,123	286,028
1941	261,347	241,787	234,144	168,334	124,378	90,323	83,423	312,783	360,400	360,400	341,196	308,861
1942	280,534	275,676	316,612	330,000	330,000	330,000	356,592	360,400	360,400	360,400	339,434	306,775
1943	277,834	278,290	285,202	309,631	326,722	330,000	360,400	360,400	360,400	360,400	334,725	302,903
1944	278,957	260,161	244,775	234,057	229,556	235,278	255,261	360,400	360,400	360,400	329,195	297,258
1945	269,594	286,486	303,391	288,236	253,700	192,916	201,894	325,435	360,400	360,400	334,833	302,981
1946	290,629	303,058	267,626	233,689	169,219	126,757	189,566	360,400	360,400	357,172	325,391	292,953
1947	267,302	261,048	261,651	251,424	249,312	259,119	307,974	360,400	356,592	332,752	297,801	265,047
1948	246,881	231,142	222,253	207,832	189,798	136,522	121,769	246,854	360,400	360,400	325,679	290,875
1949	257,155	230,043	210,351	191,360	165,907	103,444	151,449	286,217	356,592	335,945	301,138	267,891
1950	238,302	239,272	233,940	218,468	163,874	114,732	162,958	320,001	360,400	359,505	323,659	289,647
1951	258,661	330,000	330,000	273,739	223,537	188,600	217,740	343,707	360,400	360,400	326,685	293,016
1952	263,532	246,844	257,770	252,854	197,413	223,120	317,085	360,400	360,400	360,400	351,556	322,024
1953	296,142	274,941	274,019	293,074	298,536	295,862	360,095	360,400	360,400	360,400	330,041	296,984
1954	267,877	246,868	229,980	213,382	217,141	220,828	286,535	360,400	360,400	343,861	308,637	274,661
1955	245,158	243,209	250,427	232,593	218,869	151,555	123,312	222,529	360,400	348,403	313,548	278,581
1956	244,439	218,424	283,804	261,732	206,903	168,220	188,432	360,400	360,400	360,400	347,696	319,103
1957	295,940	282,110	264,718	249,070	257,623	263,923	295,093	360,400	360,400	360,400	326,728	292,510
1958	262,110	242,027	237,007	225,108	244,617	221,109	292,913	360,400	360,400	360,400	353,805	323,723
1959	295,240	273,752	254,105	245,284	213,696	161,127	182,231	235,467	287,846	259,305	222,628	207,712
1960	178,409	176,252	175,096	150,690	115,751	91,900	123,736	215,354	287,027	260,692	225,395	191,086
1961	158,157	133,346	121,240	102,042	87,316	82,200	129,149	221,278	266,879	240,690	210,599	177,543
1962	146,426	126,777	114,005	100,855	114,374	112,611	231,046	360,400	360,400	356,465	326,284	291,944
1963	263,525	237,000	223,881	230,563	289,186	299,242	324,537	360,400	360,400	360,400	336,301	304,839
1964	273,386	279,133	272,347	262,295	254,165	216,943	191,753	276,738	360,400	343,655	309,219	275,614
1965	241,436	248,743	317,082	281,745	230,783	175,442	181,773	294,420	360,400	360,400	360,400	333,096
1966	305,307	307,670	300,943	293,396	268,438	279,703	360,400	360,400	360,400	331,355	297,781	265,039
1967	231,529	216,381	253,632	269,858	284,791	324,593	344,126	360,400	360,400	360,400	360,400	335,676
1968	305,198	284,641	275,671	268,002	284,962	288,019	330,134	360,400	360,400	334,230	299,647	267,169
1969	241,770	248,709	247,430	305,815	323,485	330,000	360,400	360,400	360,400	360,400	349,331	317,590
1970	299,109	305,471	324,248	326,065	320,846	323,844	335,624	360,400	360,400	360,400	325,921	290,573
1971	259,109	252,707	268,931	287,804	302,524	304,076	331,376	360,400	360,400	356,465	325,669	292,259
1972	258,557	236,088	232,636	222,878	216,488	246,700	268,071	360,400	360,400	336,331	298,810	267,683
1973	237,812	217,831	225,249	238,096	248,774	261,422	306,780	360,400	360,400	353,895	322,638	285,845
1974	257,512	293,218	316,222	330,000	330,000	330,000	360,400	360,400	360,400	356,465	331,455	295,000
1975	267,677	262,890	266,892	249,208	251,420	270,142	216,550	360,400	360,400	356,465	324,067	290,292
1976	286,149	282,281	273,766	252,600	239,720	231,421	235,679	322,419	311,776	281,614	249,822	219,836
1977	190,805	164,307	141,524	123,723	104,154	82,557	89,725	107,373	148,407	127,479	98,702	71,356
1978	44,138	24,460	38,242	53,329	69,672	114,812	168,593	360,400	360,400	360,400	357,774	356,219
1979	330,000	310,323	296,034	303,033	313,915	330,000	360,400	360,400	360,400	356,002	320,543	284,032
1980	258,680	266,832	275,490	330,000	326,446	330,000	356,592	360,400	360,400	360,400	352,634	320,226
1981	290,609	267,554	254,678	243,125	246,527	243,029	253,653	345,334	356,592	326,286	288,639	253,673
1982	226,369	250,404	289,261	314,387	326,446	330,000	360,400	360,400	360,400	360,400	360,400	360,400
1983	326,065	330,000	330,000	330,000	330,000	330,000	356,951	360,400	360,400	360,400	360,400	355,878
1984	330,000	326,192	301,515	251,330	205,725	189,676	226,912	360,400	360,400	356,465	328,867	296,270
1985	268,090	286,622	294,695	277,075	264,192	261,404	348,453	360,400	360,400	333,440	296,675	266,441
1986	245,025	227,275	236,097	238,964	312,444	326,065	360,400	360,400	360,400	360,400	337,395	304,410
1987	281,007	259,483	236,297	216,538	205,386	195,078	251,137	347,208	356,556	324,828	288,222	252,930
1988	221,048	204,111	200,855	191,081	181,990	188,083	230,852	322,256	351,607	325,661	290,794	257,070
1989	228,073	204,737	190,690	178,343	175,662	221,683	328,113	360,400	360,400	343,879	310,198	285,098
1990	268,790	273,511	278,290	258,918	244,935	254,745	322,352	360,400	360,400	339,067	307,034	280,546
1991	257,352	236,658	221,201	202,049	187,037	193,387	212,656	332,085	360,400	354,334	321,620	296,626
1992	274,381	260,899	247,962	232,665	238,267	235,667	302,099	360,400	354,930	347,198	320,400	298,656
1993	279,702	262,114	255,135	281,069	296,384	330,000	356,592	360,400	360,400	360,400	339,589	305,807
1994	278,527	256,433	239,168	209,495	197,633	201,926	250,691	360,400	360,400	328,011	288,314	253,017
1995	225,731	246,319	262,918	296,356	319,234	326,065	356,592	360,400	360,400	360,400	360,400	341,143
1996	313,010	291,009	290,227	303,212	330,000	326,065	357,776	360,400	360,400	356,465	329,174	295,620
1997	267,055	283,869	302,446	330,000	300,695	280,067	360,400	360,400	360,400	360,400	334,414	301,362
1998	268,797	245,081	236,479	258,671	285,912	330,000	360,400	360,400	360,400	360,400	357,480	336,176
1999	314,095	302,261	287,758	278,518	240,711	187,527	173,440	360,278	360,400	360,400	328,428	295,218
2000	267,327	266,240	263,716	251,013	249,182	245,478	316,692	360,400	360,400	347,162	314,239	280,150
2001	249,036	226,405	213,862	192,086	184,141	208,822	262,701	360,400	360,094	330,641	293,416	258,894
2002	227,484	212,909	223,635	226,411	229,117	232,820	324,946	360,400	360,400	337,441	300,376	266,502
Avg (21-02)	256,342	247,285	245,298	236,492	227,024	219,969	255,079	333,845	351,079	341,276	313,972	283,204

Table 2.3-3

Difference in Hetch Hetchy Reservoir Storage (Acre-feet)

WSIP All Tuolumne minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	-3,191	-3,191	-4,143	-4,145	-4,147	-3,640	-3,082	-2,584	0	0	0	0
1922	-1,903	-3,744	-3,744	-5,649	-5,652	-5,652	-5,653	0	0	0	0	0
1923	-5,708	-8,470	-8,470	-8,476	-8,480	-8,480	-8,480	0	0	0	0	0
1924	-4,091	-9,706	-12,561	-15,422	-18,009	-18,009	-18,009	-12,324	-12,314	-12,297	-12,275	-12,260
1925	-12,253	-12,253	-12,253	-12,261	-12,271	-12,270	-10,788	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0
1927	-4,091	-8,694	-11,548	-13,458	-13,465	-16,319	-18,161	0	0	0	0	0
1928	-3,805	-5,647	-5,647	-8,504	-11,087	-11,087	-11,087	0	0	0	0	0
1929	-1,902	-3,744	-3,744	-3,746	-3,749	-3,748	-3,748	-3,746	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0
1932	-3,235	-6,089	-14,583	-11,092	-5,485	-3,154	-1,702	-1,165	0	0	0	0
1933	-4,091	-9,707	-9,707	-12,566	-15,151	-15,151	-12,798	-10,733	0	0	0	0
1934	0	0	-4,484	-4,682	-7,603	-6,371	-6,372	-6,367	-6,361	-6,349	-6,338	-6,331
1935	-3,093	-3,092	-3,092	-2,585	-2,020	-1,508	-918	-699	0	0	0	0
1936	7,040	12,564	12,559	15,402	15,050	12,994	10,970	0	0	0	0	0
1937	-952	-951	-1,884	-3,844	-3,417	-2,865	-2,184	-1,809	0	0	0	0
1938	-4,091	-5,932	-6,085	-7,991	-7,996	-7,128	-6,102	0	0	0	0	0
1939	-6,659	-9,422	-11,324	-12,281	-13,146	-13,146	0	0	0	0	0	0
1940	0	0	-3,493	-4,524	-4,008	-3,376	-2,838	0	0	0	0	0
1941	-6,660	-9,421	-8,993	-8,998	-7,698	-6,418	-4,882	-3,659	0	0	0	0
1942	-1,903	-4,665	-4,665	0	0	0	0	0	0	0	0	0
1943	-2,759	-4,600	-4,600	-4,603	-4,605	0	0	0	0	0	0	0
1944	-4,757	-7,519	-9,421	-9,427	-9,432	-10,479	-10,479	0	0	0	0	0
1945	-4,090	-4,090	-4,091	-4,092	-7,302	-7,301	-6,412	-5,609	0	0	0	0
1946	-1,332	-5,106	-8,763	-9,720	-9,725	-8,161	-6,872	-3,261	0	0	0	0
1947	-1,332	-6,948	-11,704	-13,615	-15,341	-15,341	-15,341	0	0	0	0	0
1948	0	0	0	-1,047	-1,992	-996	-844	-708	0	0	0	0
1949	0	0	-5,804	-11,593	-15,898	-13,346	-10,209	-8,563	0	0	0	0
1950	-4,091	-4,091	-5,976	-6,233	-5,584	-4,693	-3,914	-3,288	0	0	0	0
1951	0	0	0	0	0	-1,903	-1,674	-1,461	0	0	0	0
1952	-4,091	-5,932	-7,645	-3,827	-3,829	-3,829	-5,670	0	0	0	0	0
1953	-3,805	-4,727	-5,677	-5,681	-5,683	-5,684	-5,684	0	0	0	0	0
1954	-5,137	-7,899	-10,754	-11,711	-11,718	-11,718	-11,717	0	0	0	0	0
1955	-4,090	-4,091	-4,091	-4,093	-4,095	-4,095	-3,465	-2,905	0	0	0	0
1956	0	0	-6,523	-6,525	-6,529	-5,704	-4,812	-1,676	0	0	0	0
1957	-3,806	-6,567	-7,519	-8,475	-9,339	-9,339	-9,339	0	0	0	0	0
1958	-1,331	-4,186	-4,186	-7,994	-7,999	-7,998	-7,999	0	0	0	0	0
1959	-2,378	-3,299	-5,201	-6,156	-7,707	-7,706	-6,497	-3,244	-3,241	-3,236	-3,230	-3,227
1960	-3,225	-3,224	-3,225	-3,227	-4,756	-4,752	-3,628	-1,809	-1,807	-1,805	-1,801	-1,800
1961	-1,798	-1,798	-3,277	-5,660	-5,668	-5,668	-5,668	-5,660	-5,654	-5,644	-5,634	-2,958
1962	4,084	3,716	7,997	11,338	17,369	18,415	18,415	0	0	0	0	0
1963	-475	-476	-475	-1,618	-1,619	-6,376	-6,375	0	0	0	0	0
1964	0	-2,762	-5,616	-5,619	-5,623	-5,622	-4,904	-4,554	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0
1966	-3,805	-5,646	-3,347	-4,300	10,217	3,765	0	0	0	0	0	0
1967	0	0	-6,659	-6,664	-6,668	-11,424	-13,266	0	0	0	0	0
1968	-1,332	-3,173	-3,173	-5,077	-6,799	-6,799	-6,799	0	0	0	0	0
1969	0	-2,854	-5,708	-5,711	-5,714	0	0	0	0	0	0	0
1970	-4,282	-4,281	-4,281	0	-2,578	-3,625	-3,624	0	0	0	0	0
1971	-4,091	-5,011	-5,963	-6,918	-7,781	-7,780	-7,780	0	0	0	0	0
1972	0	0	-6,659	-9,517	-12,101	-12,101	-12,100	-3,935	0	0	0	0
1973	0	0	0	-5,708	-5,711	-5,712	-5,712	0	0	0	0	0
1974	-3,805	-5,647	-5,647	0	0	0	0	0	0	0	0	0
1975	-3,901	-3,900	-3,901	-3,903	-7,342	-9,245	-9,245	-3,935	0	0	0	0
1976	-2,854	-3,775	-4,298	-5,252	-6,114	-6,114	-6,115	-6,110	-6,106	-6,098	-6,090	-6,083
1977	-6,080	-5,066	-2,212	-1,740	836	837	836	836	833	-216	-1,261	4,174
1978	9,785	11,258	8,880	14,118	20,141	26,039	26,960	-3,935	0	0	0	0
1979	-2,608	-4,450	-4,450	-5,403	-6,264	-7,258	0	0	0	0	0	0
1980	-1,332	-1,332	-1,331	0	0	0	0	0	0	0	0	0
1981	-3,805	-5,647	-5,647	-8,504	-11,087	-11,086	-11,087	-11,081	0	0	0	0
1982	0	-3,683	-5,586	-5,588	3,554	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	-6,445	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	-8,764	0	0	0	0	0	0	0
1987	-2,854	-5,616	-5,616	-8,473	-11,056	-11,056	-11,056	-11,049	-11,041	-11,028	-11,015	-11,004
1988	-9,666	-8,654	-8,653	-4,757	-463	-464	-464	-463	-463	1,821	4,101	11,832
1989	16,581	19,344	20,295	22,209	23,941	23,940	23,941	0	0	2,283	2,280	2,278
1990	1,326	1,326	1,326	1,327	1,328	1,327	1,328	0	0	0	-2,283	-5,044
1991	-7,895	-7,896	-8,418	-10,326	-12,050	-13,097	-13,097	-13,089	0	5,137	7,034	5,188
1992	6,137	8,899	9,850	11,758	12,796	13,843	13,842	0	4,972	4,966	3,058	293
1993	-1,610	-1,610	-1,610	-1,611	-1,611	0	0	0	0	0	0	0
1994	-2,378	-5,141	-7,043	-7,047	-7,911	-7,910	-7,910	0	0	0	0	0
1995	1,332	1,332	1,332	4,187	6,767	0	0	0	0	0	0	0
1996	-1,046	-3,809	-3,808	-4,761	0	0	0	0	0	0	0	0
1997	-4,091	-5,933	-5,933	0	0	0	0	0	0	0	0	0
1998	-1,332	-5,106	-5,107	-6,061	-6,065	-2,140	0	0	0	0	0	0
1999	-2,949	-5,711	-5,711	-7,617	-7,620	-7,621	-6,711	-5,615	0	0	0	0
2000	-2,378	-2,378	-2,379	-2,380	-6,678	-9,626	-9,627	0	0	0	0	0
2001	-2,284	-5,045	-5,046	-6,951	-9,533	-10,579	-10,579	0	0	0	0	0
2002	-2,283	-6,886	-6,887	-9,745	-12,328	-12,328	-12,328	0	0	0	0	0
Avg (21-02)	-1,811	-2,949	-3,876	-4,083	-4,123	-4,071	-3,731	-1,759	-502	-396	-408	-304

Table 2.3-4

Difference in Hetch Hetchy Reservoir Storage (Acre-feet)

WSIP All Tuolumne minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	-15,102	-14,182	-15,133	-15,142	-15,151	-13,268	-11,201	-9,385	0	0	-2,283	-4,491
1922	-5,440	-7,282	-7,282	-15,848	-15,858	-15,858	-15,858	0	0	0	-2,283	-4,491
1923	-10,197	-10,197	-10,197	-10,204	-10,209	-25,526	-25,526	0	0	0	-2,283	-4,491
1924	-9,626	-15,242	-17,145	-19,058	-20,787	-26,591	-25,670	-18,434	-20,628	-22,884	-25,126	-27,307
1925	-29,575	-10,241	4,981	-819	-18,092	-33,408	-29,326	0	0	0	-2,283	-4,491
1926	-9,627	-15,243	-7,641	-13,449	-20,944	-36,836	-31,725	-23,766	-2,400	-4,681	-6,958	-9,162
1927	-16,197	-21,721	-23,624	-33,341	-33,360	-40,020	-41,861	0	0	0	-2,283	-7,253
1928	-13,909	-15,751	-14,372	-21,989	-28,876	-31,148	-14,712	0	0	-2,283	-4,563	-9,531
1929	-16,186	-18,028	-18,027	-22,794	-27,104	-37,664	-39,873	-16,198	0	-2,283	-4,564	-6,770
1930	-9,050	10,284	30,262	24,477	19,249	3,933	1,722	0	0	-2,283	-4,563	-6,770
1931	-9,050	-14,666	-7,579	-13,386	-22,931	-28,734	-30,945	-33,210	-35,393	-37,633	-39,862	-42,025
1932	-51,896	-62,115	-31,901	-25,519	-15,857	-9,571	-5,355	-3,804	0	0	-2,283	-4,491
1933	-9,626	-15,243	-8,155	-18,625	-28,087	-38,647	-33,145	-27,770	0	0	-2,283	-4,491
1934	-6,772	-12,389	-23,520	-31,951	-47,743	-53,968	-25,936	-28,203	-30,381	-32,614	-34,840	-37,011
1935	-36,037	-16,703	3,276	2,762	2,153	-9,416	-6,029	-4,577	0	0	-2,283	-4,491
1936	-4,489	-3,569	3,519	-6,066	-6,069	-5,315	-4,492	0	0	0	-2,283	-4,491
1937	-8,295	-10,136	-10,123	-17,783	-15,775	-13,227	-10,822	-5,801	0	0	-2,283	-4,491
1938	-12,481	-14,322	-15,156	-22,775	-22,787	-21,919	-19,115	0	0	0	-2,283	-7,253
1939	-12,958	-14,800	-16,702	-21,466	-25,773	-36,333	3,808	0	0	-2,283	-4,563	-6,770
1940	-9,049	10,285	23,831	11,304	10,027	8,406	7,112	0	0	-2,283	-4,564	-6,770
1941	-12,475	-14,316	-11,930	-11,937	-10,208	-8,521	-6,485	-4,856	0	0	-2,283	-4,491
1942	-8,295	-10,136	-8,424	0	0	0	0	0	0	0	-2,283	-4,491
1943	-10,197	-13,880	-6,792	-6,796	-6,799	0	0	0	0	0	-2,283	-4,491
1944	-9,246	-11,087	-10,136	-14,899	-23,672	-38,989	-41,199	0	0	0	-2,283	-4,491
1945	-6,772	12,562	32,540	26,753	9,811	9,812	8,650	7,563	0	0	-2,283	-4,491
1946	-11,529	-17,145	-20,802	-21,765	-21,777	-18,504	-15,603	-3,261	0	-2,283	-4,564	-6,769
1947	-9,050	-14,666	-21,326	-27,998	-34,029	-44,590	-46,799	0	0	-2,283	-4,564	-6,769
1948	-9,049	-14,665	-7,578	-13,385	-18,634	-18,066	-15,258	-12,777	0	0	-2,283	-4,491
1949	-6,773	-12,388	-18,192	-23,954	-28,265	-23,822	-18,608	-15,591	0	-2,283	-4,564	-9,532
1950	-16,567	2,768	21,785	3,626	3,214	2,690	2,185	1,826	0	-895	-3,178	-5,385
1951	-7,666	0	0	0	0	-8,562	-7,525	-7,309	0	0	-2,283	-7,253
1952	-14,291	-16,131	-17,844	-8,932	-8,938	-8,938	-21,827	0	0	0	-2,283	-4,491
1953	-8,294	-8,295	-8,295	-8,299	-8,303	-23,620	-5,989	0	0	0	-2,283	-4,492
1954	-6,773	-8,613	-8,614	-18,132	-25,189	-40,506	-42,715	0	0	-2,283	-4,563	-6,769
1955	-9,049	10,284	25,506	7,350	-9,058	-14,862	-12,551	-10,497	0	-2,283	-4,564	-6,770
1956	-9,050	-14,666	-10,868	-10,873	-10,879	-9,506	-8,015	-1,676	0	0	-2,283	-4,491
1957	-10,198	-12,959	-12,959	-18,676	-28,310	-38,871	-41,080	0	0	0	-2,283	-4,491
1958	-9,626	-15,243	-12,912	-20,530	-20,542	-20,542	-20,542	0	0	0	-2,283	-4,491
1959	-8,770	-8,771	-7,819	-17,337	-18,894	-34,211	-29,326	-11,575	-13,772	-16,036	-18,291	-20,480
1960	-22,751	-3,417	16,561	10,770	1,245	-3,812	-2,912	-3,736	-5,941	-8,216	-10,484	-12,682
1961	-14,958	-20,574	-4,151	-11,862	-22,276	-28,079	-30,289	-31,273	-33,447	-35,679	-37,900	-49,365
1962	-56,947	-56,947	-48,384	-47,483	-52,695	-69,820	-72,029	0	0	0	-2,283	-7,253
1963	-12,958	-17,562	-15,230	-19,045	-19,056	-28,570	-34,094	0	0	0	-2,283	-4,491
1964	-11,529	-17,974	-17,974	-27,496	-36,105	-41,908	-41,096	-30,553	3,808	1,521	-764	-2,974
1965	-5,255	14,079	19,144	19,152	19,162	18,361	15,496	13,225	0	0	0	-4,972
1966	-10,678	-14,360	-5,801	-15,317	-6,747	-17,308	3,808	0	0	-2,283	-4,564	-6,770
1967	-9,049	-14,665	-13,713	-13,722	-13,730	-16,831	-21,435	0	0	0	0	-2,210
1968	-9,249	-11,090	-4,003	-14,469	-23,930	-34,490	-36,699	0	0	-2,283	-4,564	-6,770
1969	-9,049	-14,665	-19,422	-19,433	-12,229	0	0	0	0	0	-2,283	-4,491
1970	-8,771	10,563	25,786	-3,935	-11,732	-9,781	-11,990	0	0	0	-2,283	-4,491
1971	-11,529	-16,132	-16,133	-17,093	-17,960	-28,520	-30,729	0	0	0	-2,283	-4,491
1972	-6,772	-12,388	-19,048	-26,670	-33,560	-39,363	-41,572	-3,935	0	-2,283	-4,564	-6,769
1973	-9,049	-14,665	-7,577	-13,290	-13,297	-13,298	-20,111	0	0	-2,283	-4,564	-9,531
1974	-15,236	-17,077	-17,077	0	0	0	0	0	0	0	-2,283	-7,253
1975	-10,199	9,135	29,113	17,619	6,459	750	750	0	0	0	-2,283	-4,491
1976	-7,344	-7,343	-255	-7,867	-14,746	-20,548	-22,759	-25,028	-27,219	-29,469	-31,713	-33,886
1977	-36,149	-40,752	-37,898	-38,883	-43,222	-49,025	-51,235	-53,451	-55,534	-52,568	-49,566	-42,991
1978	-41,040	-43,802	-37,666	-41,494	-42,392	-45,056	-54,446	-3,935	0	0	-2,283	-4,181
1979	-2,608	-4,450	-3,499	-13,013	-13,878	-7,258	0	0	0	-2,283	-4,564	-6,770
1980	-13,807	5,527	20,750	0	0	0	0	0	0	0	-2,283	-4,491
1981	-10,197	-12,039	-4,951	-13,517	-21,258	-36,574	-36,574	-26,147	-3,808	-6,087	-8,363	-10,566
1982	-12,842	-20,208	-19,257	-19,265	3,554	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	-9,391	0	0	0	0	-2,210
1984	0	0	0	0	0	-9,738	-11,751	0	0	0	-2,283	-4,491
1985	-6,772	7,959	23,180	17,388	7,860	-2,701	-4,910	0	0	-2,283	-4,564	-6,769
1986	-9,049	-14,665	-7,577	-13,385	-24,563	-3,935	0	0	0	0	-2,283	-4,491
1987	-9,246	-11,087	-10,136	-16,801	-22,826	-33,386	-35,595	-24,241	-14,885	-17,151	-19,414	-21,606
1988	-22,544	-27,148	-20,060	-21,974	-26,282	-32,086	-34,296	-36,559	-5,448	-8,295	-13,043	-10,270
1989	-10,265	-13,947	-12,996	-15,857	-18,444	-29,004	-8,346	0	0	-5,708	-11,410	-9,559
1990	-12,409	2,322	17,543	6,041	-4,352	-14,913	-17,122	0	0	-7,991	-15,974	-20,564
1991	-22,457	-26,140	-23,809	-20,968	-23,558	-41,729	-43,939	-41,059	0	-929	-3,782	-10,223
1992	-14,025	-11,263	-11,263	-19,071	-21,488	-38,612	-40,822	0	-498	-498	-3,351	-7,952
1993	-11,754	-10,833	-12,736	-12,743	-12,749	0	0	0	0	0	-2,283	-4,491
1994	-8,770	-10,612	-9,660	-14,422	-23,024	-33,584	-35,793	0	0	-2,283	-4,564	-9,531
1995	-15,234	4,101	24,079	16,482	11,334	0	0	0	0	0	0	-4,972
1996	-7,919	-9,760	-7,429	-8,384	0	0	0	0	0	0	-2,283	-7,254
1997	-15,241	-18,004	-18,004	0	0	-11,512	0	0	0	0	-2,283	-4,491
1998	-6,772	-12,388	-11,009	-11,967	-11,974	-2,140	0	0	0	0	-2,283	-7,253
1999	-11,150	-12,992	-14,895	-25,367	-25,378	-25,379	-22,316	-5,737	0	0	-2,283	-7,253
2000	-11,531	7,803	27,781	12,481	-1,261	-17,719	-19,929	0	0	-2,283	-4,563	-9,532
2001	-16,568	-21,171	-14,083	-24,556	-35,741	-51,057	-53,267	0	-306	-2,589	-4,869	-7,075
2002	-12,208	-16,811	-16,811	-26,335	-34,943	-45,502	-47,712	0	0	-2,283	-4,564	-6,770
Avg (21-02)	-12,818	-11,635	-6,633	-11,624	-15,125	-20,352	-18,960	-6,119	-2,998	-4,046	-6,276	-8,961

Figure 2.3-2

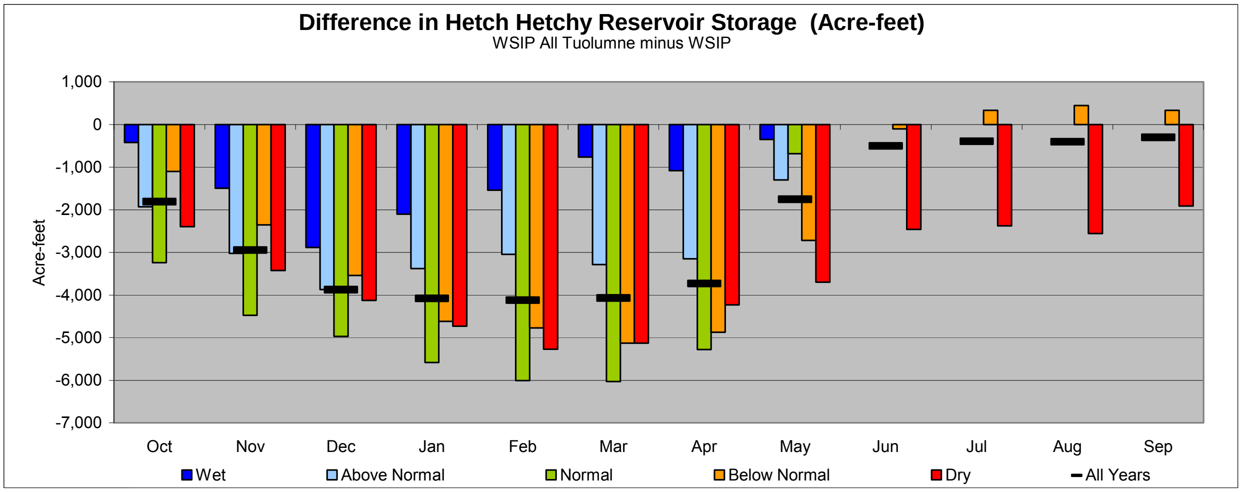


Figure 2.3-3

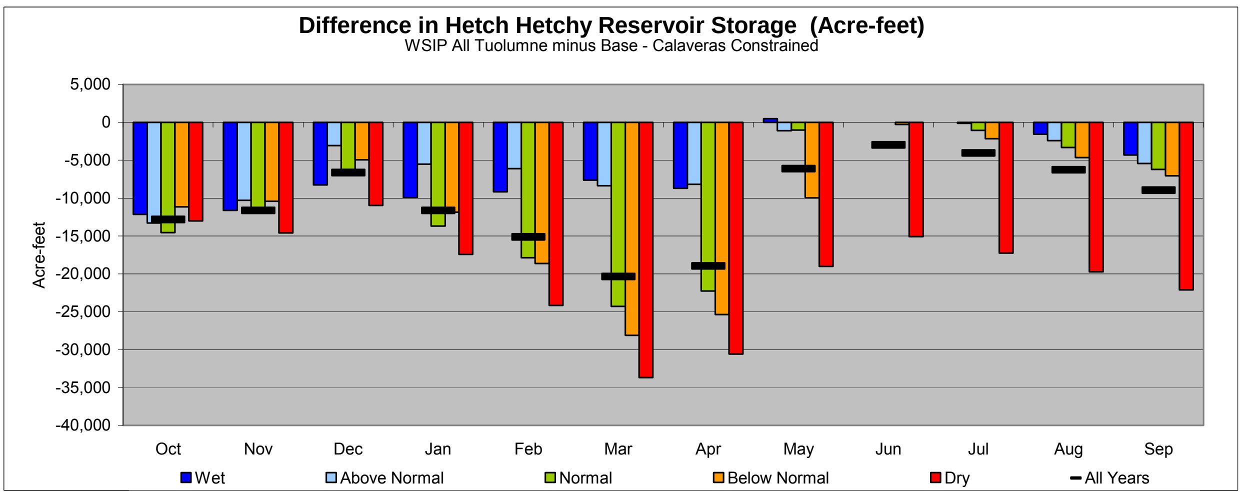


Figure 2.3-4

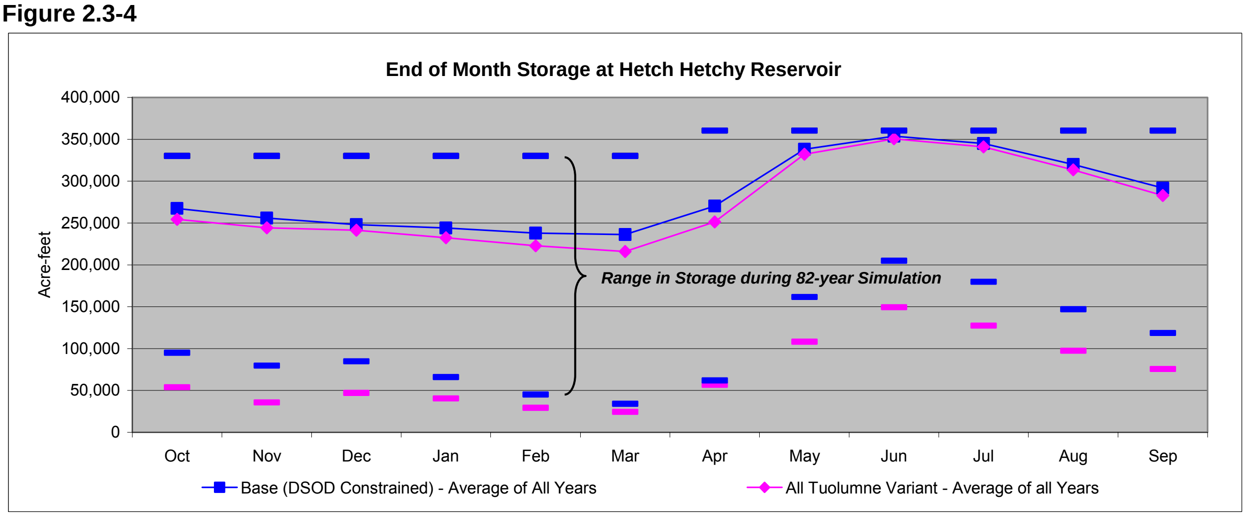


Table 2.3-5

Difference in Hetch Hetchy Release to Stream (Acre-feet)

WSIP All Tuolumne minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	0	0	0	-2,581	0	0	0	-2,581
1922	0	0	0	0	0	0	0	-4,936	0	0	0	0	-4,936
1923	0	0	0	0	0	0	0	-8,475	0	0	0	0	-8,475
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	-9,394	0	0	0	0	-9,394
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	-18,153	0	0	0	0	-18,153
1928	0	0	0	0	0	0	0	-11,821	0	0	0	0	-11,821
1929	0	0	0	0	0	0	0	0	-3,996	0	0	0	-3,996
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	-1,164	0	0	0	-1,164
1933	0	0	0	0	0	0	0	0	-9,440	0	0	0	-9,440
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	-698	0	0	0	-698
1936	0	0	0	0	0	0	0	9,587	0	0	0	0	9,587
1937	0	0	0	0	0	0	0	0	-1,920	0	0	0	-1,920
1938	0	0	0	0	0	0	0	-5,339	0	0	0	0	-5,339
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	0	0	0	-2,386	0	0	0	0	-2,386
1941	0	0	0	0	0	0	0	0	-3,656	0	0	0	-3,656
1942	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	-10,472	0	0	0	0	-10,472
1945	0	0	0	0	0	0	0	0	-5,605	0	0	0	-5,605
1946	0	0	0	0	0	0	0	-2,754	-3,455	0	0	0	-6,209
1947	0	0	0	0	0	0	0	-15,334	0	0	0	0	-15,334
1948	0	0	0	0	0	0	0	0	-707	0	0	0	-707
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	-3,286	0	0	0	-3,286
1951	0	0	0	0	0	0	0	0	-1,460	0	0	0	-1,460
1952	0	0	0	0	0	0	0	-5,668	0	0	0	0	-5,668
1953	0	0	0	0	0	0	0	-6,043	0	0	0	0	-6,043
1954	0	0	0	0	0	0	0	-11,712	0	0	0	0	-11,712
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	-2,536	-1,774	0	0	0	-4,310
1957	0	0	0	0	0	0	0	-9,335	0	0	0	0	-9,335
1958	0	0	0	0	0	0	0	-7,995	0	0	0	0	-7,995
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	-6,373	0	0	0	0	-6,373
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	-13,267	0	0	0	0	-13,267
1968	0	0	0	0	0	0	0	-6,796	0	0	0	0	-6,796
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	-3,623	0	0	0	0	-3,623
1971	0	0	0	0	0	0	0	-7,777	0	0	0	0	-7,777
1972	0	0	0	0	0	0	0	-3,975	-4,171	0	0	0	-8,146
1973	0	0	0	0	0	0	0	-5,709	0	0	0	0	-5,709
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	-2,359	-4,171	0	0	0	-6,530
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	3,935	-4,171	0	0	0	-236
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	-3,554	0	0	0	0	0	0	0	-3,554
1983	0	0	0	0	0	0	0	-6,862	0	0	0	0	-6,862
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	24,479	0	0	0	0	24,479
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	-13,079	0	0	0	-13,079
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	46	0	0	0	0	46
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	-5,935	0	0	0	0	0	0	0	0	-5,935
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	-5,956	0	0	0	-5,956
2000	0	0	0	0	0	0	0	-9,623	0	0	0	0	-9,623
2001	0	0	0	0	0	0	0	-10,573	0	0	0	0	-10,573
2002	0	0	0	0	0	0	0	-12,323	0	0	0	0	-12,323
Avg (21-02)	0	0	0	-72	-43	0	0	-2,239	-869	0	0	0	-3,224

Table 2.3-5 illustrates the difference in stream release between the variant and WSIP settings, expressed in terms of a monthly volume (acre-feet) of flow. Table 2.3-6 illustrates the same information and the average monthly stream release for the variant and WSIP setting, expressed in average monthly flow (in cubic feet per second [cfs]). Table 2.3-7 illustrates the same form of information in comparing the variant and base settings.

Table 2.3-5 illustrates that the difference in monthly flow below O'Shaughnessy Dam could range from an increase of approximately 24,000 acre-feet to a decrease of approximately 18,000 acre-feet. Considering the manner in which releases are determined and made to the stream, quantifying the effect of these changes in terms of average monthly flow (cfs) is not always meaningful.[1] When comparing the variant to the WSIP setting, a change in the volume of release from O'Shaughnessy Dam to the stream would likely result in the delay or earlier initiation of the release by a matter of days. Typical springtime releases, when initiated, amount to a release up to 3,000 cfs (approximately 6,000 acre-feet over the span of a day). Assuming that a change in release volume equates to a delay or earlier initiation of a 6,000 acre-feet-per-day release, the difference in stream release from O'Shaughnessy Dam between the variant and WSIP would be a delay up to 3 days or up to an added 4 days of release. Normally, the effect of the delay in release would not affect the year's peak stream release rate during a year. Comparing the variant and WSIP setting, a change (increase or decrease) in stream release would occur in approximately 60 percent of the years simulated.

Compared to the base setting, the variant's effect to stream flow is very similar to the effect caused by the WSIP, but at times slightly greater. Table 2.3-8 illustrates the difference in stream release between the variant and base settings, expressed in terms of a month-to-month volume (acre-feet) of flow. Assuming the type of effect to releases described above, the releases above minimum requirements below the dam could be delayed by up to 9 days or initiated earlier by up to 2 days.

2.4 Lake Lloyd and Lake Eleanor

Compared to the operation of the WSIP, the operation of Lake Lloyd and Lake Eleanor are simulated to be only slightly different in the variant. Figure 2.4-1 illustrates a chronological trace of the simulation of Lake Lloyd storage and stream releases. Shown in Figure 2.4-1 are the results for the WSIP, variant, and base setting. The operation resulting from the variant is essentially the same as the WSIP, except during the prolonged drought of 1987-1992. The difference is explained by modeling assumptions for the discretionary judgment used by system operations to balance reservoir operations within the system, and the modeled differences are not likely to occur. HH/LSM model logic estimates the amount of water to be released from Lake Lloyd based on the condition of Hetch Hetchy Reservoir, the Don Pedro Water Bank Account, and Lake Eleanor and Lake Lloyd storage in comparison to demands. In this instance, Hetch Hetchy Reservoir storage is slightly lower in the variant at the later stage of the drought, and larger demands are anticipated within the variant. The model logic retains more storage in Lake Lloyd (in anticipation of a larger need) than in the WSIP setting. The model logic is not very refined, and a small change in computation can result in a large difference in Lake Lloyd release (in this instance, through Holm Powerhouse). Overall, the Lake Lloyd operation would be discretionary, and the outcome would likely be very similar if not the same between the variant and the WSIP settings.

Figure 2.4-2 illustrates the almost identical operation of Lake Eleanor for the variant and WSIP settings. Also shown in Figure 2.4-2 is the operation for the base setting. Any difference that occurs in the Lake Eleanor operation would be caused by a small change in operation at Lake Lloyd that would affect the operation of the Cherry-Eleanor Tunnel between the two watersheds. Any difference that occurs in the simulations is associated more with modeling discretion than with any substantive difference in operation.

Supplementing the Figure 2.4-1 representation of Lake Lloyd stream releases is Table 2.4-1, which illustrates releases for the variant and WSIP settings and the difference in releases between the two. Table 2.4-2 provides the same form of information for the variant and base settings.

[1] See "Estimated Effect of WSIP on Daily Releases below Hetch Hetchy Reservoir", Memorandum by Daniel B. Steiner, December 31, 2006.

Table 2.3-6

Hetch Hetchy Release to Stream (CFS)

(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) WSIP All Tuolumne

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	55	51	51	161	85	84	144	2,377	4,542	2,034	184	89
Above Normal	55	89	88	66	89	94	131	1,164	3,073	379	125	89
Normal	54	54	50	55	74	74	98	1,169	1,895	167	122	86
Below Normal	55	55	46	43	51	63	88	540	682	113	111	73
Dry	53	53	44	40	44	50	56	150	135	86	86	65
All Years	54	61	56	72	69	73	103	1,074	2,061	548	125	81

Hetch Hetchy Release to Stream (CFS)

(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	55	51	51	167	89	84	144	2,415	4,548	2,034	184	89
Above Normal	55	89	88	66	89	94	131	1,187	3,095	379	125	89
Normal	54	54	50	55	74	74	98	1,260	1,907	167	122	86
Below Normal	55	55	46	43	51	63	88	564	709	113	111	73
Dry	53	53	44	40	44	50	56	157	139	86	86	65
All Years	54	61	56	74	70	73	103	1,111	2,075	548	125	81

Difference in Hetch Hetchy Release to Stream (CFS)

(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) WSIP All Tuolumne minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	0	0	0	-6	-4	0	0	-38	-6	0	0	0
Above Normal	0	0	0	0	0	0	0	-24	-22	0	0	0
Normal	0	0	0	0	0	0	0	-91	-12	0	0	0
Below Normal	0	0	0	0	0	0	0	-24	-27	0	0	0
Dry	0	0	0	0	0	0	0	-7	-4	0	0	0
All Years	0	0	0	-1	-1	0	0	-36	-15	0	0	0

Table 2.3-7

Hetch Hetchy Release to Stream (Acre-feet)

(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) WSIP All Tuolumne

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	3,378	3,031	3,124	9,919	4,695	5,165	8,544	146,165	270,243	125,059	11,310	5,316	595,948
Above Normal	3,400	5,282	5,435	4,033	4,936	5,772	7,808	71,555	182,847	23,302	7,686	5,316	327,372
Normal	3,343	3,235	3,051	3,355	4,128	4,557	5,817	71,880	112,760	10,299	7,513	5,123	235,062
Below Normal	3,363	3,255	2,821	2,622	2,851	3,891	5,212	33,177	40,552	6,927	6,818	4,345	115,835
Dry	3,266	3,161	2,729	2,460	2,469	3,105	3,340	9,229	8,033	5,285	5,285	3,861	52,221
All Years	3,351	3,609	3,449	4,450	3,818	4,506	6,153	66,059	122,614	33,709	7,711	4,793	264,222

Hetch Hetchy Release to Stream (Acre-feet)

(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	3,378	3,031	3,124	11,045	4,917	5,695	8,790	154,853	269,789	125,059	11,310	5,335	606,325
Above Normal	3,400	5,733	5,435	4,033	4,936	5,309	7,808	78,261	183,990	23,302	7,686	5,316	335,208
Normal	3,343	3,235	3,051	3,109	4,128	4,557	5,817	90,958	113,833	10,299	7,513	5,123	254,966
Below Normal	3,363	3,255	2,821	2,622	2,851	3,891	5,436	46,628	45,681	6,927	6,818	4,345	134,639
Dry	3,266	3,161	2,729	2,460	2,469	3,105	3,816	13,790	9,991	5,285	5,285	3,861	59,217
All Years	3,351	3,703	3,449	4,621	3,861	4,514	6,340	76,545	124,417	33,709	7,711	4,797	277,018

Difference in Hetch Hetchy Release to Stream (Acre-feet)

(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) WSIP All Tuolumne minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	-1,126	-222	-530	-246	-8,688	454	0	0	-19	-10,377
Above Normal	0	-451	0	0	0	463	0	-6,706	-1,143	0	0	0	-7,837
Normal	0	0	0	246	0	0	0	-19,078	-1,072	0	0	0	-19,905
Below Normal	0	0	0	0	0	0	-224	-13,451	-5,128	0	0	0	-18,804
Dry	0	0	0	0	0	0	-476	-4,561	-1,959	0	0	0	-6,996
All Years	0	-93	0	-172	-43	-7	-187	-10,487	-1,803	0	0	-4	-12,797

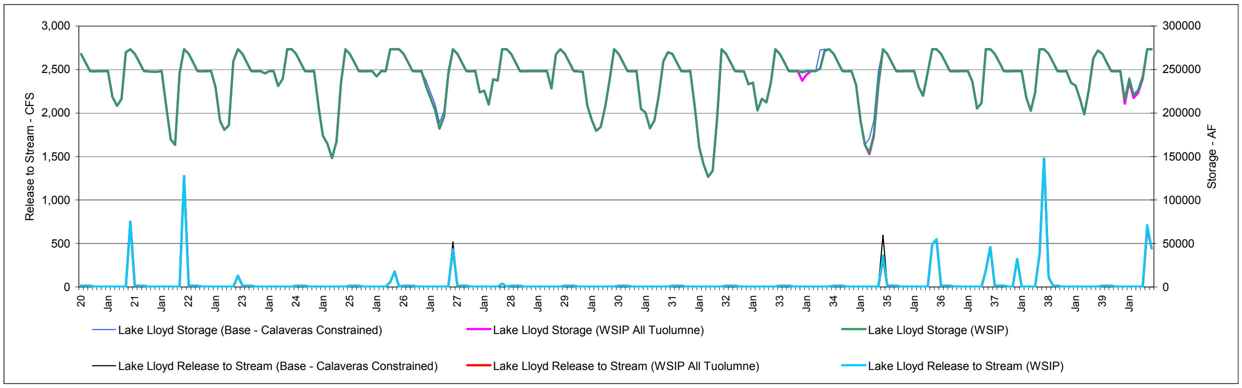
Table 2.3-8

Difference in Hetch Hetchy Release to Stream (Acre-feet) WSIP All Tuolumne minus Base - Calaveras Constrained

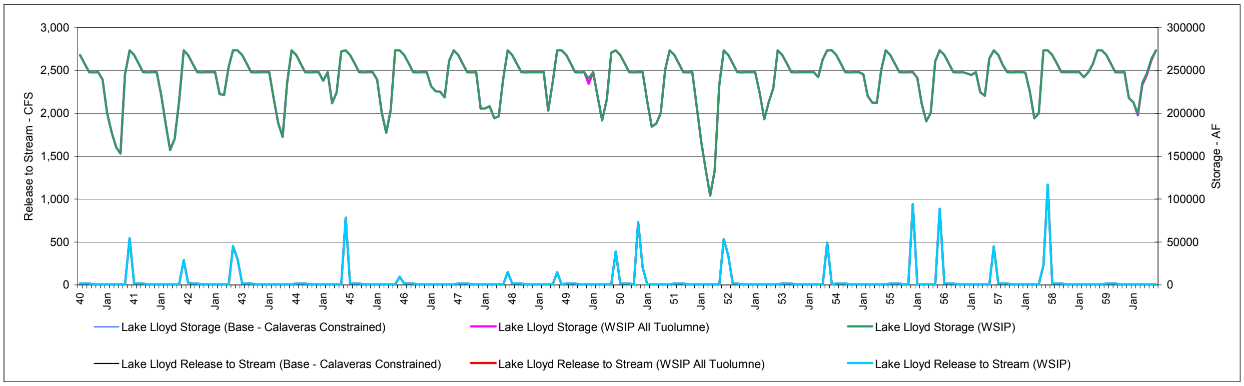
Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	0	0	0	-9,375	0	0	0	-9,375
1922	0	0	0	0	0	0	0	-13,821	0	0	0	0	-13,821
1923	0	0	0	0	0	0	0	-25,512	0	0	0	0	-25,512
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	-27,627	0	0	0	0	-27,627
1926	0	0	0	0	0	0	0	-2,913	0	0	0	0	-2,913
1927	0	0	0	0	0	0	0	-42,341	0	0	0	0	-42,341
1928	0	0	0	0	0	0	0	-15,670	0	0	0	0	-15,670
1929	0	0	0	0	0	0	0	0	-17,219	0	0	0	-17,219
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	-3,800	0	0	0	-3,800
1933	0	0	0	0	0	0	0	0	-24,390	0	0	0	-24,390
1934	0	0	0	0	0	0	-3,808	0	0	0	0	0	-3,808
1935	0	0	0	0	0	3,935	0	0	-4,572	0	0	0	-637
1936	0	0	0	0	0	0	0	-3,923	0	0	0	0	-3,923
1937	0	0	0	0	0	0	0	-3,143	-6,151	0	0	0	-9,294
1938	0	0	0	0	0	0	0	-16,678	0	0	0	0	-16,678
1939	0	0	0	0	0	0	-3,808	4,045	0	0	0	0	237
1940	0	0	0	0	0	0	0	5,962	0	0	0	0	5,962
1941	0	0	0	0	0	0	0	0	-4,853	0	0	0	-4,853
1942	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	-41,175	0	0	0	0	-41,175
1945	0	0	0	0	0	0	0	0	7,556	0	0	0	7,556
1946	0	0	0	0	0	0	0	-10,390	-3,455	0	0	0	-13,845
1947	0	0	0	0	0	0	0	-46,780	0	0	0	0	-46,780
1948	0	0	0	0	0	0	0	0	-12,762	0	0	0	-12,762
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	1,824	0	0	0	1,824
1951	0	-7,666	0	0	0	0	0	0	-7,673	0	0	0	-15,339
1952	0	0	0	0	0	0	0	-21,818	0	0	0	0	-21,818
1953	0	0	0	0	0	0	0	-6,365	0	0	0	0	-6,365
1954	0	0	0	0	0	0	0	-42,696	0	0	0	0	-42,696
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	-5,342	-1,774	0	0	0	-7,116
1957	0	0	0	0	0	0	0	-41,063	0	0	0	0	-41,063
1958	0	0	0	0	0	0	0	-20,533	0	0	0	0	-20,533
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	-41,654	0	0	0	0	-41,654
1963	0	0	0	0	0	0	0	-34,641	0	0	0	0	-34,641
1964	0	0	0	0	0	0	0	0	-3,808	0	0	0	-3,808
1965	0	0	0	0	0	0	0	0	13,214	0	0	0	13,214
1966	0	0	0	0	0	0	-3,808	4,045	0	0	0	0	237
1967	0	0	0	0	0	0	0	-21,990	0	0	0	0	-21,990
1968	0	0	0	0	0	0	0	-37,744	0	0	0	0	-37,744
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	3,935	0	0	0	-11,986	0	0	0	0	-8,051
1971	0	0	0	0	0	0	0	-31,413	0	0	0	0	-31,413
1972	0	0	0	0	0	0	0	-33,432	-4,171	0	0	0	-37,603
1973	0	0	0	0	0	0	0	-20,103	0	0	0	0	-20,103
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	-42,655	-4,171	0	0	-310	-47,136
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	-10,407	-10,310	0	0	0	-20,717
1982	0	0	0	0	-3,554	0	0	0	0	0	0	0	-3,554
1983	0	0	0	0	0	0	0	-9,993	0	0	0	0	-9,993
1984	0	0	0	0	0	3,935	0	-11,745	0	0	0	0	-7,810
1985	0	0	0	0	0	0	0	-5,235	0	0	0	0	-5,235
1986	0	0	0	0	0	-8,478	-3,935	0	0	0	0	0	-12,413
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	-3,808	0	0	0	-3,808
1989	0	0	0	0	0	0	0	-8,875	0	0	0	0	-8,875
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	-42,053	0	0	0	-42,053
1992	0	0	0	0	0	0	0	-28,918	0	0	0	0	-28,918
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	46	0	0	0	0	46
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	-18,011	0	0	0	0	0	0	0	0	-18,011
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	-13,491	-6,083	0	0	0	-19,574
2000	0	0	0	0	0	0	0	-19,921	0	0	0	0	-19,921
2001	0	0	0	0	0	0	0	-53,240	0	0	0	0	-53,240
2002	0	0	0	0	0	0	0	-48,771	0	0	0	0	-48,771
Avg (21-02)	0	-93	0	-172	-43	-7	-187	-10,487	-1,803	0	0	-4	-12,797

Figure 2.4-1
Lake Lloyd Storage and Stream Release

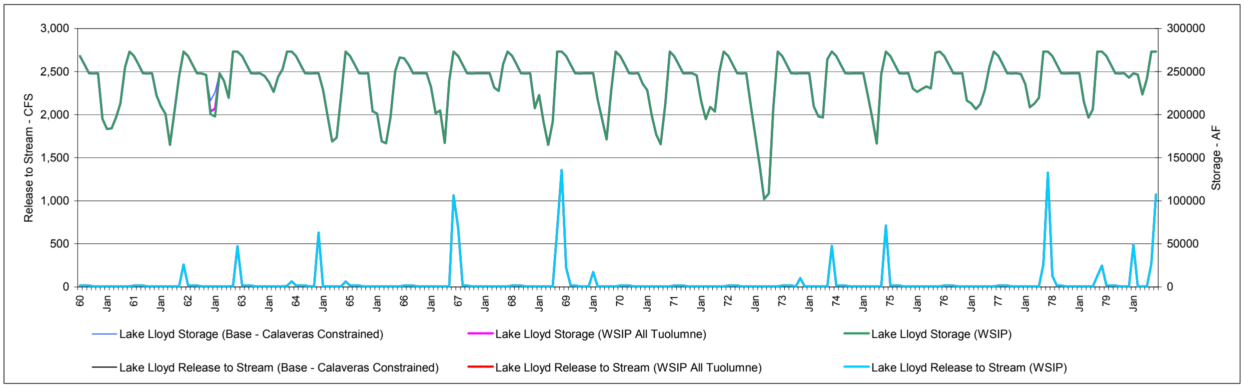
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

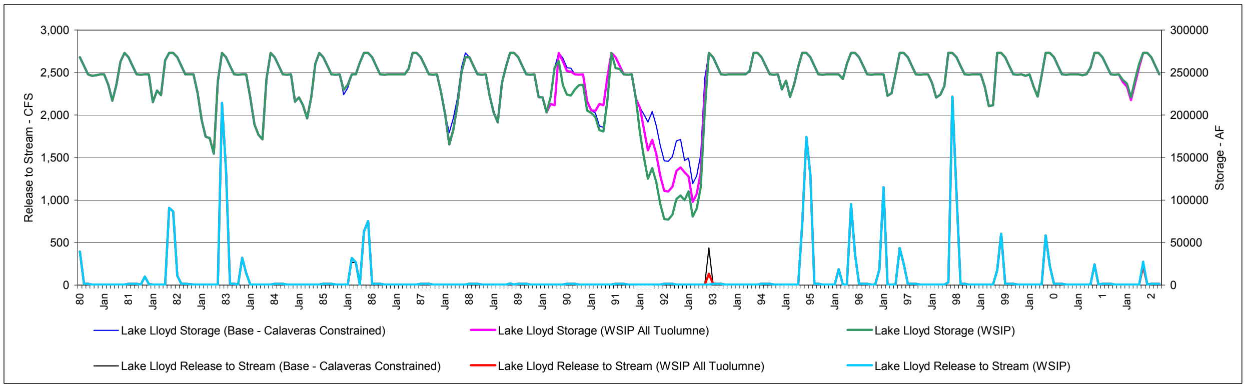
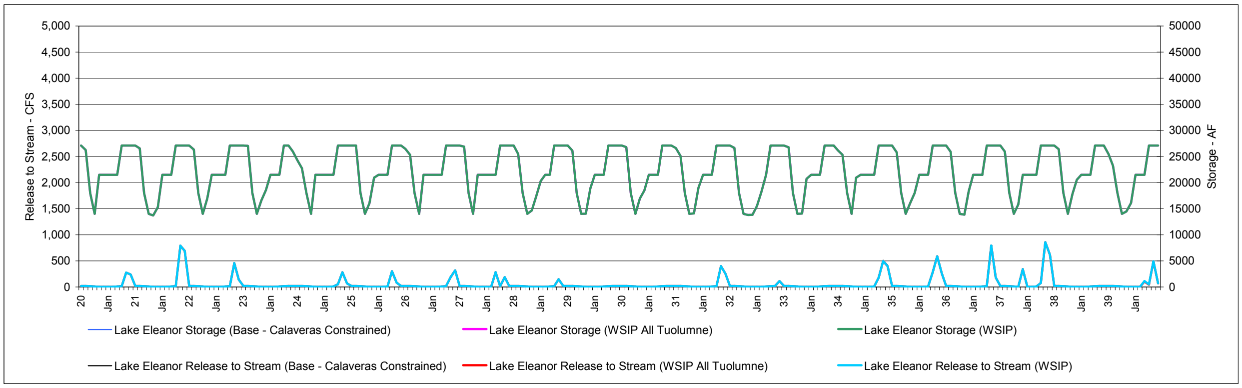
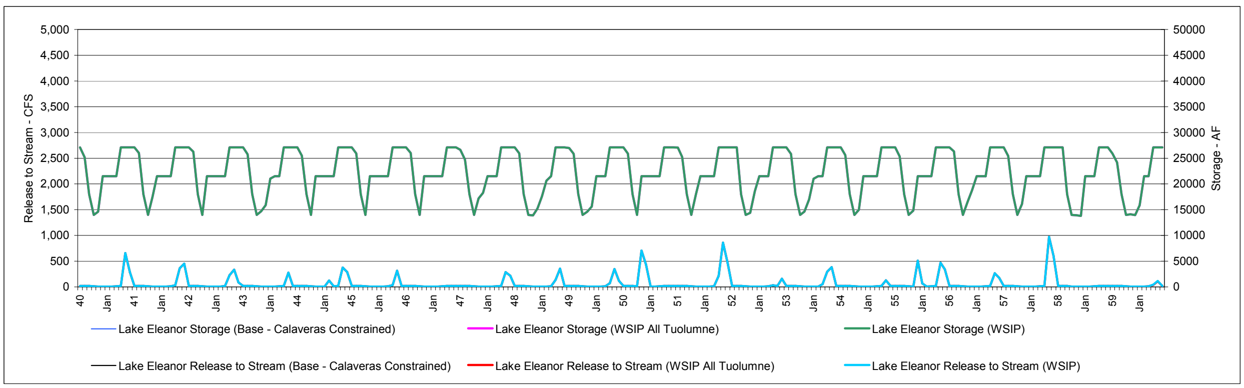


Figure 2.4-2
Lake Eleanor Storage and Stream Release

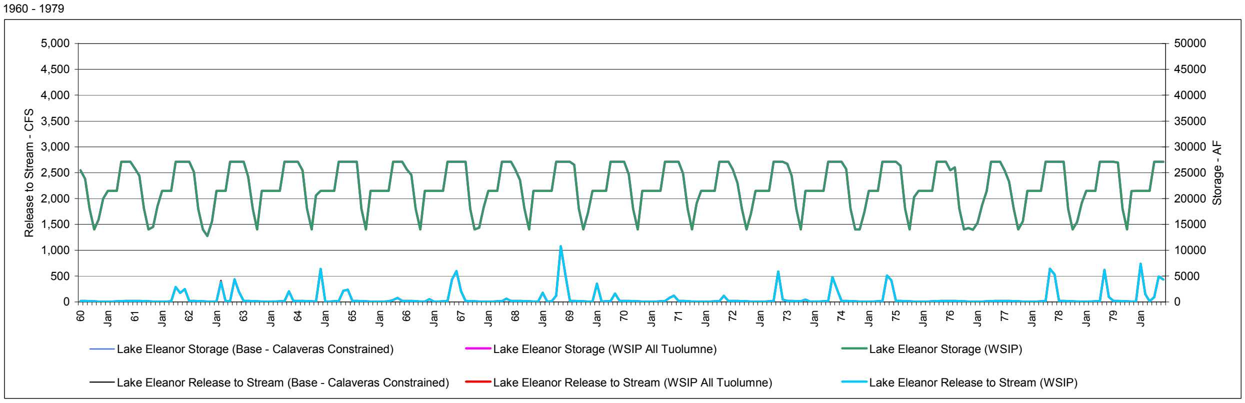
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

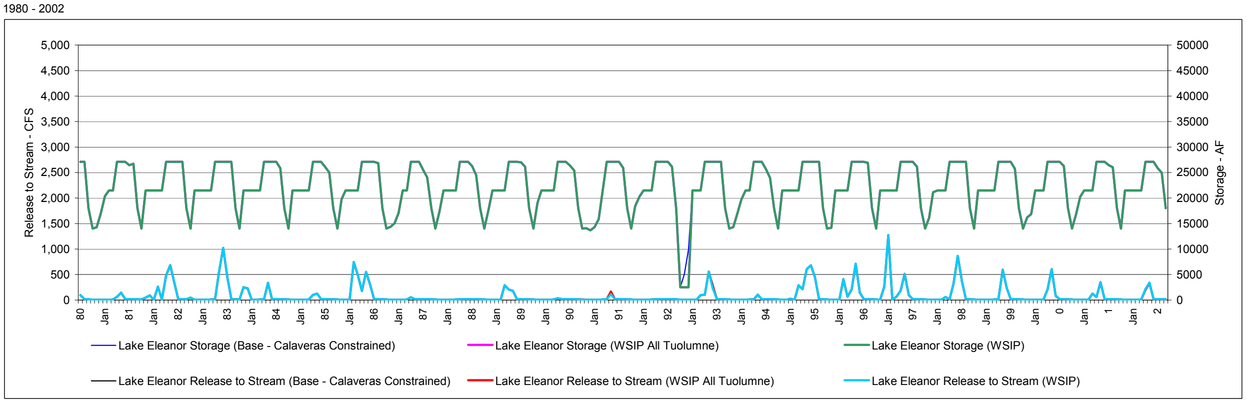


Table 2.4-1

Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) WSIP All Tuolumne

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	5	11	134	107	25	21	5	284	1,066	363	15	15
Above Normal	5	72	25	5	16	5	5	165	446	16	15	15
Normal	5	5	5	16	5	5	5	107	162	15	15	15
Below Normal	5	5	5	5	5	5	8	39	43	15	15	15
Dry	5	5	5	5	5	5	5	5	5	15	15	15
All Years	5	20	34	27	11	8	6	120	342	83	15	15

Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	5	11	134	107	25	21	5	284	1,058	363	15	15
Above Normal	5	72	25	5	16	5	5	167	448	16	15	15
Normal	5	5	5	16	5	5	5	110	162	15	15	15
Below Normal	5	5	5	5	5	5	8	39	43	15	15	15
Dry	5	5	5	5	5	5	5	5	5	15	15	15
All Years	5	20	34	27	11	8	6	121	341	83	15	15

Difference in Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) WSIP All Tuolumne minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	0	0	0	0	0	0	0	0	8	0	0	0
Above Normal	0	0	0	0	0	0	0	-2	-2	0	0	0
Normal	0	0	0	0	0	0	0	-3	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	0	0	0	0	0	-1	1	0	0	0

Table 2.4-2

Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) WSIP All Tuolumne

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	5	11	134	107	25	21	5	284	1,066	363	15	15
Above Normal	5	72	25	5	16	5	5	165	446	16	15	15
Normal	5	5	5	16	5	5	5	107	162	15	15	15
Below Normal	5	5	5	5	5	5	8	39	43	15	15	15
Dry	5	5	5	5	5	5	5	5	5	15	15	15
All Years	5	20	34	27	11	8	6	120	342	83	15	15

Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	5	11	134	107	21	21	5	284	1,084	363	15	15
Above Normal	5	72	25	5	16	5	5	166	467	16	15	15
Normal	5	5	5	16	5	5	5	110	162	15	15	15
Below Normal	5	5	5	5	5	5	8	39	43	15	15	15
Dry	5	5	5	5	5	5	5	5	5	15	15	15
All Years	5	20	34	27	10	8	6	120	350	83	15	15

Difference in Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) WSIP All Tuolumne minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	0	0	0	0	3	0	0	0	-19	0	0	0
Above Normal	0	0	0	0	0	0	0	-1	-21	0	0	0
Normal	0	0	0	0	0	0	0	-3	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	0	0	1	0	0	-1	-8	0	0	0

2.5 Don Pedro Reservoir and La Grange Releases

A change in Don Pedro Reservoir operation is caused by changes in inflow to the reservoir. The changes in inflow to the reservoir are the result of net changes within the operation of the upstream SFPUC facilities, described previously, and other changes in SFPUC operations associated with diversions to the Holm, Kirkwood, and Moccasin Powerhouses. Figure 2.5-1 illustrates a chronological trace of the simulation of Don Pedro Reservoir storage and Tuolumne River stream releases from La Grange Dam. Shown in Figure 2.5-1 are the results for the WSIP, variant, and base settings.

Supplementing the Figure 2.5-1 representation of Don Pedro Reservoir storage are Table 2.5-1 Don Pedro Reservoir Storage (All Tuolumne), Table 2.5-2 Don Pedro Reservoir Storage (WSIP), and Table 2.5-3 Difference in Don Pedro Reservoir Storage (All Tuolumne minus WSIP). Table 2.5-4 illustrates the difference in Hetch Hetchy Reservoir storage between the base and variant settings.

Table 2.5-3 illustrates that, throughout many years, the storage in Don Pedro Reservoir associated with the variant setting would differ from the storage in the WSIP setting, and that this difference could be more or less storage. When there is a change, the change occurs because inflow to the reservoir differs between the two settings in a month or series of months when Don Pedro Reservoir is below the flood control storage limitation and can regulate inflow with storage. When no storage difference occurs for months or other periods of time, either inflow to the reservoir did not change between the settings or (if inflow was different while storage was at the flood control storage limitation) the change in inflow manifests as a change in release to the Tuolumne River below La Grange Dam (discussed later).

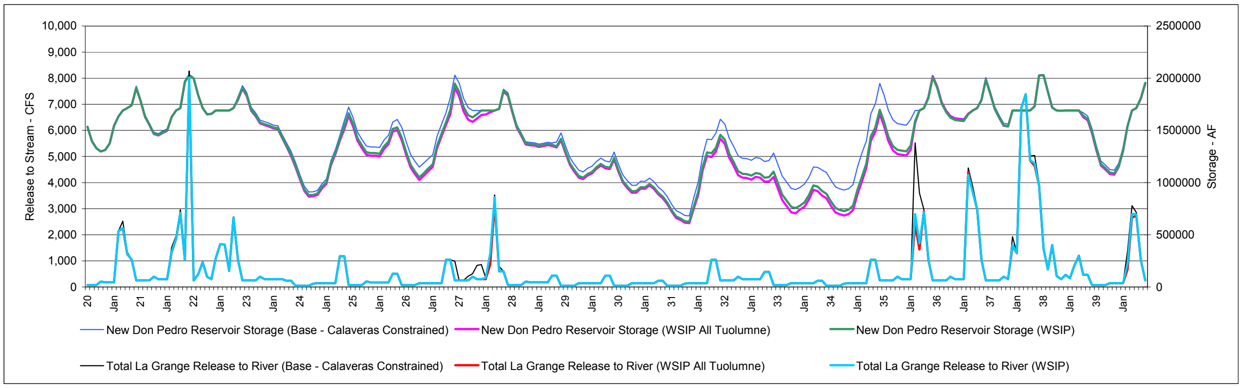
The greatest draw from reservoir storage occurs during the drought of 1976-1977, which does not coincide with the year of greatest difference in reservoir draw between the base setting and either the WSIP or variant settings, the drought of the 1930s. There are exceptions to reductions in storage (due to a reduction in inflow) when the variant causes a greater level of SFPUC rationing (e.g., 1987-1988), which then reduces the SFPUC's upstream diversion from the Tuolumne and leads to greater inflow to Don Pedro Reservoir in a subsequent period. Figure 2.5-2 illustrates the difference in reservoir storage, averaged by year type, in comparing the variant to the WSIP settings. Also shown is the average difference in storage for the two settings during the 82-year simulation. Figure 2.5-3 illustrates the same information in comparing the variant and base settings.

Figure 2.5-4 illustrates the average monthly storage in Don Pedro Reservoir for the 82-year simulation, and the range in storage for each month for the variant and base settings.

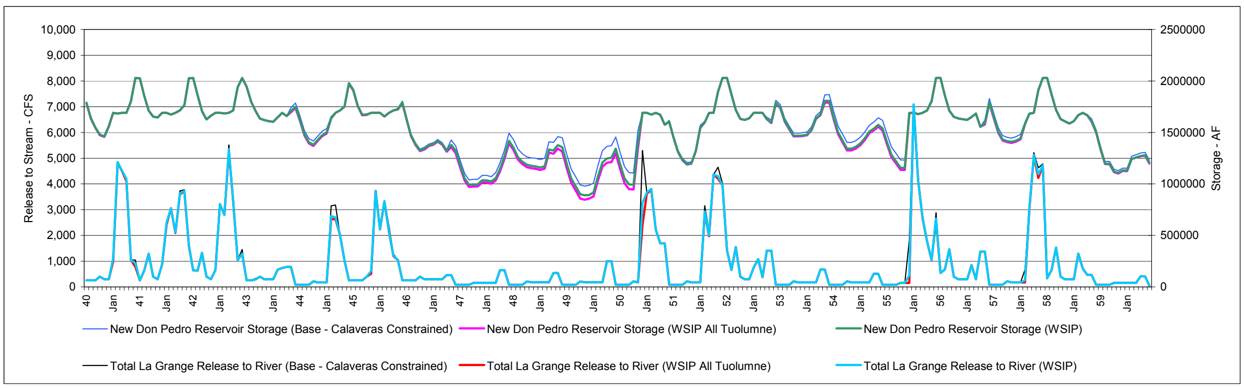
The difference in storage in Don Pedro Reservoir attributed to the upstream effects of the variant would manifest into differences in releases from La Grange Dam to the stream. A different amount of available reservoir space in the winter and spring due to the variant would lead to a different ability to additionally regulate inflow, thus potentially changing the amount of water released to the stream, which is above minimum release requirements. During periods when inflow differs and Don Pedro Reservoir is at maximum storage capacity within the flood control storage limitation, a change in inflow directly manifests as a change in release from La Grange Dam (a change in either more or less flow). Figure 2.5-1 illustrates the stream release from La Grange Dam for the WSIP, variant, and base settings.

Figure 2.5-1
Don Pedro Reservoir Storage and Release below La Grange Dam

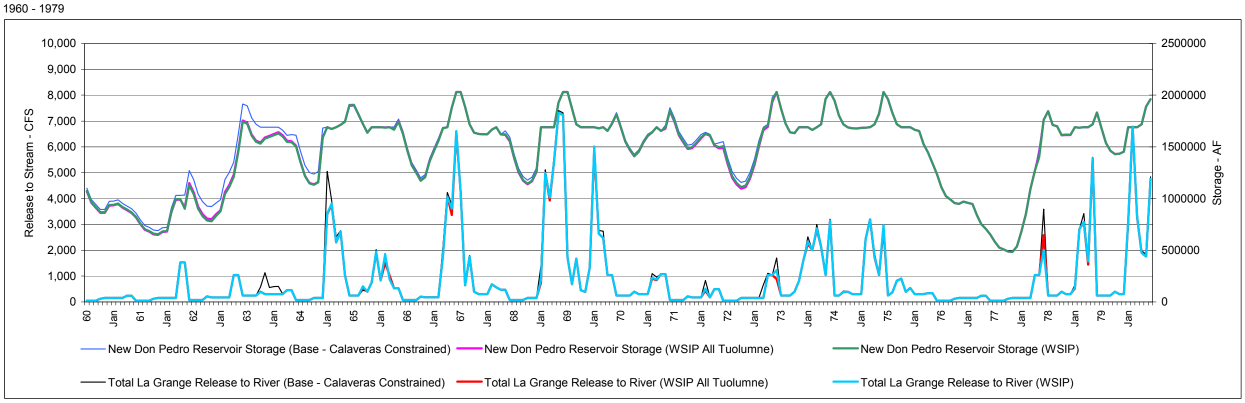
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

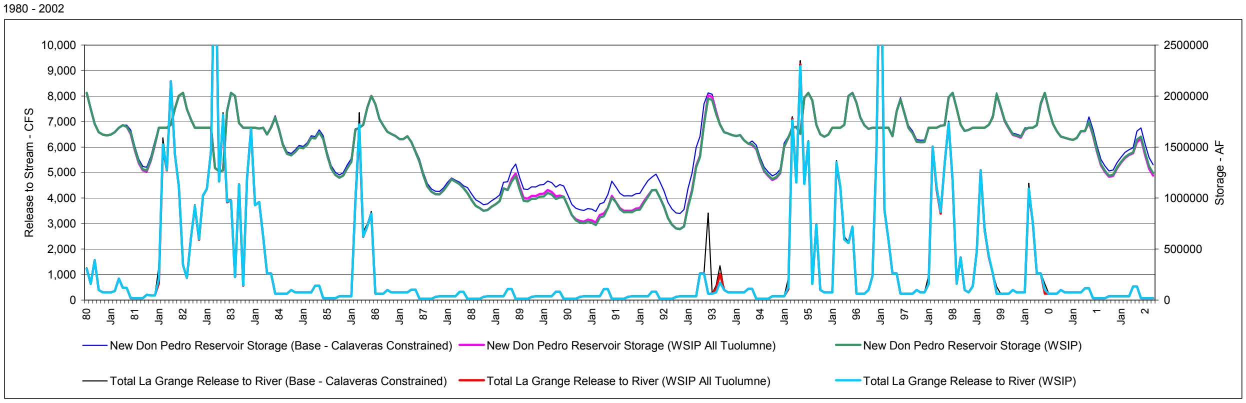


Table 2.5-1

Don Pedro Reservoir Storage (Acre-feet) WSIP All Tuolumne

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	1,297,919	1,311,969	1,374,649	1,543,191	1,633,956	1,690,000	1,713,000	1,741,659	1,906,842	1,776,891	1,628,631	1,552,054
1922	1,466,089	1,451,283	1,475,576	1,495,739	1,625,852	1,690,000	1,713,000	1,961,925	2,030,000	1,998,041	1,838,188	1,715,718
1923	1,653,081	1,658,408	1,689,999	1,689,989	1,689,997	1,690,000	1,713,000	1,792,444	1,898,745	1,830,707	1,688,080	1,636,517
1924	1,566,689	1,551,028	1,537,009	1,518,601	1,513,314	1,428,632	1,343,620	1,255,358	1,147,933	1,029,192	920,586	866,452
1925	868,661	882,781	946,570	988,833	1,165,150	1,272,010	1,400,260	1,511,068	1,639,522	1,541,395	1,401,100	1,329,217
1926	1,265,412	1,257,081	1,257,496	1,251,401	1,322,007	1,367,800	1,488,041	1,503,806	1,405,637	1,266,259	1,144,159	1,080,478
1927	1,025,313	1,064,983	1,111,492	1,151,039	1,328,952	1,443,703	1,552,933	1,655,120	1,905,730	1,826,141	1,680,413	1,603,435
1928	1,582,244	1,613,593	1,648,059	1,651,176	1,674,569	1,690,000	1,705,499	1,870,918	1,833,506	1,669,905	1,527,496	1,449,605
1929	1,366,048	1,357,725	1,354,831	1,341,619	1,350,472	1,358,885	1,352,459	1,336,392	1,405,035	1,282,476	1,169,231	1,105,352
1930	1,049,256	1,033,100	1,068,613	1,088,600	1,132,569	1,164,017	1,137,172	1,128,965	1,221,199	1,104,902	1,000,210	947,410
1931	902,784	905,132	942,567	940,741	972,268	938,978	885,430	851,529	795,621	721,819	662,071	642,591
1932	616,484	611,354	751,305	884,666	1,120,678	1,254,740	1,244,289	1,297,126	1,420,045	1,372,796	1,237,336	1,160,575
1933	1,071,623	1,046,247	1,043,944	1,029,396	1,054,043	1,045,958	1,008,412	1,011,698	1,052,725	943,170	832,935	774,144
1934	716,849	705,128	741,064	768,854	837,120	930,201	917,736	875,643	849,458	775,939	714,751	695,614
1935	685,032	698,696	738,209	891,769	1,015,097	1,141,876	1,399,752	1,486,535	1,656,480	1,541,350	1,396,830	1,310,012
1936	1,273,907	1,265,494	1,259,515	1,313,055	1,572,854	1,690,000	1,713,000	1,819,113	2,017,518	1,919,004	1,769,014	1,686,144
1937	1,632,816	1,611,490	1,604,952	1,598,928	1,659,219	1,690,000	1,713,000	1,791,821	1,984,965	1,850,220	1,704,112	1,619,407
1938	1,545,291	1,536,731	1,689,998	1,689,992	1,689,987	1,690,000	1,690,000	1,730,000	2,025,000	2,030,000	1,870,754	1,718,957
1939	1,690,000	1,689,224	1,690,000	1,690,000	1,689,999	1,690,000	1,626,996	1,596,239	1,472,685	1,305,520	1,163,860	1,125,153
1940	1,082,956	1,075,694	1,148,029	1,301,630	1,540,042	1,690,000	1,713,000	1,802,316	1,949,263	1,783,582	1,633,383	1,544,792
1941	1,474,200	1,457,895	1,555,749	1,689,994	1,683,358	1,690,000	1,690,000	1,800,527	2,030,000	2,027,475	1,857,774	1,712,174
1942	1,653,602	1,645,974	1,689,999	1,689,982	1,673,446	1,690,000	1,713,000	1,765,000	2,027,000	2,030,000	1,860,016	1,707,840
1943	1,626,500	1,664,178	1,690,000	1,689,976	1,683,949	1,690,000	1,713,000	1,939,650	2,030,000	1,944,494	1,798,476	1,708,539
1944	1,635,548	1,622,064	1,610,321	1,603,274	1,647,456	1,690,000	1,658,867	1,697,126	1,739,782	1,613,109	1,471,496	1,394,127
1945	1,369,516	1,417,549	1,463,984	1,490,274	1,636,340	1,690,000	1,713,000	1,749,692	1,972,689	1,909,540	1,755,381	1,667,517
1946	1,669,700	1,690,000	1,689,996	1,689,984	1,655,318	1,690,000	1,713,000	1,723,320	1,784,464	1,620,170	1,464,606	1,378,237
1947	1,319,050	1,335,491	1,368,817	1,381,034	1,411,824	1,381,342	1,313,496	1,358,242	1,299,289	1,158,782	1,033,537	970,391
1948	974,201	975,480	1,014,102	1,013,221	1,001,290	1,032,721	1,123,736	1,245,117	1,394,551	1,329,796	1,236,512	1,192,269
1949	1,163,092	1,152,614	1,147,373	1,135,802	1,147,883	1,305,639	1,291,956	1,341,908	1,315,106	1,153,040	1,010,170	935,499
1950	857,566	847,519	858,385	877,311	1,033,968	1,168,317	1,205,228	1,211,788	1,296,712	1,147,604	1,007,678	949,348
1951	946,817	1,348,105	1,689,997	1,689,971	1,674,432	1,690,000	1,671,050	1,575,613	1,602,823	1,449,321	1,309,544	1,230,213
1952	1,188,870	1,196,581	1,318,173	1,543,330	1,596,840	1,689,552	1,690,000	1,895,000	2,030,000	2,030,000	1,869,932	1,719,140
1953	1,632,895	1,622,960	1,637,300	1,689,996	1,689,998	1,690,000	1,627,805	1,591,996	1,781,598	1,736,764	1,603,774	1,528,825
1954	1,463,051	1,462,256	1,465,898	1,472,697	1,521,664	1,631,234	1,669,072	1,789,284	1,789,404	1,629,426	1,483,558	1,405,183
1955	1,325,821	1,325,583	1,343,867	1,376,438	1,426,708	1,492,341	1,519,216	1,556,447	1,518,886	1,383,461	1,258,466	1,199,906
1956	1,137,029	1,135,673	1,688,318	1,689,942	1,678,244	1,690,000	1,713,000	1,801,590	2,030,000	2,030,000	1,859,576	1,712,725
1957	1,651,881	1,635,922	1,627,970	1,622,414	1,650,203	1,683,085	1,554,764	1,576,353	1,783,554	1,636,270	1,496,439	1,422,810
1958	1,406,474	1,398,925	1,411,633	1,434,589	1,581,158	1,681,336	1,690,000	1,910,000	2,030,000	2,030,000	1,868,297	1,719,418
1959	1,629,791	1,607,494	1,585,600	1,610,046	1,668,508	1,690,000	1,666,000	1,603,418	1,500,918	1,335,794	1,192,463	1,192,185
1960	1,114,290	1,102,869	1,126,096	1,125,784	1,242,608	1,255,912	1,269,274	1,274,637	1,199,054	1,068,430	959,696	910,471
1961	862,601	861,812	931,788	933,481	945,635	911,714	886,616	859,594	816,489	751,836	698,273	679,009
1962	653,086	648,001	675,736	679,678	866,777	987,889	988,038	916,344	1,149,720	1,058,831	921,965	849,218
1963	806,463	800,410	847,806	886,533	1,062,979	1,131,054	1,230,903	1,460,709	1,754,542	1,734,888	1,618,751	1,559,934
1964	1,541,278	1,590,836	1,606,502	1,624,612	1,641,098	1,611,160	1,558,027	1,554,355	1,512,032	1,357,062	1,222,080	1,151,175
1965	1,137,672	1,160,980	1,592,480	1,689,973	1,672,815	1,690,000	1,713,000	1,743,287	1,901,841	1,903,816	1,814,260	1,723,014
1966	1,638,057	1,690,000	1,689,998	1,689,996	1,689,070	1,690,000	1,669,855	1,747,296	1,629,928	1,465,889	1,322,263	1,251,669
1967	1,175,758	1,209,287	1,362,980	1,461,995	1,559,828	1,680,844	1,690,000	1,880,000	2,030,000	2,030,000	1,885,243	1,717,656
1968	1,636,802	1,624,597	1,622,733	1,622,938	1,666,603	1,690,000	1,620,006	1,616,316	1,553,547	1,386,507	1,251,123	1,173,444
1969	1,137,042	1,166,357	1,255,840	1,689,995	1,689,990	1,690,000	1,690,000	1,930,000	2,030,000	2,030,000	1,871,603	1,717,046
1970	1,690,000	1,690,000	1,689,999	1,689,953	1,679,634	1,690,000	1,655,509	1,722,276	1,813,690	1,683,580	1,546,555	1,468,439
1971	1,408,419	1,451,334	1,538,382	1,604,289	1,640,438	1,690,000	1,654,817	1,676,546	1,844,379	1,744,178	1,610,633	1,541,087
1972	1,478,889	1,487,442	1,531,038	1,581,506	1,624,864	1,607,812	1,513,898	1,484,835	1,490,177	1,332,530	1,201,263	1,134,669
1973	1,096,022	1,109,040	1,191,110	1,319,901	1,499,515	1,661,968	1,693,363	1,934,059	2,030,000	1,868,018	1,723,820	1,640,583
1974	1,631,540	1,690,000	1,689,998	1,689,984	1,662,882	1,690,000	1,717,600	1,963,440	2,030,000	1,947,206	1,804,319	1,717,373
1975	1,688,940	1,679,043	1,677,497	1,682,835	1,684,941	1,690,000	1,717,600	1,817,465	2,030,000	1,959,911	1,829,920	1,720,415
1976	1,690,000	1,690,000	1,690,000	1,664,706	1,652,292	1,526,598	1,445,307	1,341,473	1,236,083	1,107,685	1,022,829	992,425
1977	956,011	948,887	970,778	958,850	947,176	838,580	752,503	707,496	653,830	583,546	526,720	507,835
1978	487,414	485,146	537,432	682,534	851,424	1,090,274	1,269,016	1,435,209	1,761,000	1,845,208	1,711,253	1,699,232
1979	1,611,950	1,615,026	1,614,082	1,689,998	1,684,439	1,690,000	1,690,000	1,717,600	1,832,211	1,682,213	1,538,195	1,461,600
1980	1,430,197	1,432,910	1,452,944	1,689,976	1,689,987	1,690,000	1,717,600	1,890,400	1,960,200	2,030,000	1,874,603	1,727,346
1981	1,644,248	1,621,877	1,614,080	1,621,636	1,645,736	1,690,000	1,713,995	1,699,243	1,628,361	1,467,408	1,338,954	1,270,817
1982	1,261,967	1,368,885	1,519,628	1,689,996	1,689,988	1,690,000	1,717,600	1,876,400	2,002,900	2,030,000	1,873,946	1,772,100
1983	1,690,000	1,690,000	1,689,995	1,689,966	1,689,989	1,294,700	1,264,000	1,270,800	1,851,400	2,030,000	2,002,394	1,735,008
1984	1,690,000	1,690,000	1,689,992	1,689,972	1,681,440	1,690,000	1,622,221	1,691,426	1,791,689	1,663,465	1,516,873	1,433,460
1985	1,418,439	1,453,549	1,497,928	1,488,516	1,523,571	1,591,651	1,584,754	1,644,256	1,582,430	1,421,974	1,290,376	1,226,486
1986	1,199,500	1,220,692	1,292,278	1,357,285	1,669,715	1,690,000	1,717,600	1,888,300	2,001,400	1,921,826	1,777,583	1,709,211
1987	1,650,077	1,628,032	1,609,483	1,578,362	1,577,562	1,606,421	1,550,898	1,452,868	1,354,008	1,222,826	1,114,464	1,061,192
1988	1,038,470	1,037,567	1,073,751	1,127,570	1,183,427	1,160,444	1,137,556	1,097,677	1,048,582	981,891	923,960	902,169
1989	875,584	883,086	915,766	939,421	971,389	1,095,309	1,078,946	1,186,730	1,242,130	1,109,774	999,712	994,476
1990	1,021,056	1,019,578	1,039,468	1,042,181	1,077,681	1,060,931	1,017,311	1,023,574	1,012,389	923,304	831,750	792,041
1991	776,175	769,592	789,332	781,880	761,073	834,809	847,954	901,910	1,020,403	959,456	900,365	874,690
1992	876,077	874,696	897,120	901,865	965,642	1,025,152	1,076,518	1,079,203	1,005,512	915,422	803,372	739,069
1993	702,307	695,938	721,744	926,902	1,076,676	1,316,011	1,415,283	1,733,654	2,005,500	1,990,762	1,843,132	1,719,629
1994	1,646,133	1,631,917	1,617,767	1,607,816	1,617,879	1,565,110	1,533,262	1,519,929	1,478,907	1,359,999	1,262,600	1,216,683
1995	1,177,318	1,197,125	1,241,907	1,499,423	1,589,512	1,690,000	1,697,807	1,629,700	1,982,800	2,030,000	1,957,746	1,718,604
1996	1,625,966	1,600,351	1,621,669	1,689,837	1,689,990	1,690,000	1,717,600	2,002,400	2,030,000	1,934,433	1,789,218	1,712,746
1997	1,679,576	1,690,000	1,689,993	1,689,876	1,689,994	1,690,000	1,607,102	1,849,805	1,965,905	1,829,245	1,689,885	1,635,625
1998	1,553,690	1,547,294	1,548,700	1,689,997	1,689,989	1,690,000	1,708,446	1,714,000	1,987,500	2,030,000	1,881,075	1,719,248
1999	1,658,952	1,669,423	1,690,000	1,689,986	1,689,990	1,690,000	1,717,600	1,792,664	2,013,946	1,888,638	1,750,671	1,681,143
2000	1,618,218	1,608,230	1,592,587	1,668,520	1,689,992	1,690,000	1,713,910	1,920,507	2,028,919	1,868,125	1,726,946	1,656,624
2001	1,602,166	1,589,823	1,578,296	1,570,271	1,588,560	1,654,451	1,656,966	1,740,703	1,614,676	1,455,224	1,320,574	1,255,914
2002	1,208,965	1,217,794	1,289,558	1,346,002	1,393,091	1,422,690	1,439,572	1,549,879	1,580,092	1,421,964	1,287,762	1,220,007
Avg (21-02)	1,304,529	1,313,522	1,359,117	1,404,467	1,456,812	1,490,901	1,495,691	1,562,082	1,647,108	1,558,432	1,429,995	1,350,007

Table 2.5-2

Don Pedro Reservoir Storage (Acre-feet) WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	1,297,919	1,311,969	1,374,649	1,543,191	1,633,956	1,690,000	1,713,000	1,742,154	1,909,912	1,779,947	1,631,674	1,555,087
1922	1,469,116	1,454,308	1,478,601	1,498,765	1,627,062	1,690,000	1,713,000	1,967,567	2,030,000	1,998,041	1,838,188	1,715,718
1923	1,653,081	1,658,408	1,689,999	1,689,989	1,689,997	1,690,000	1,713,000	1,800,909	1,907,182	1,839,107	1,696,444	1,644,854
1924	1,575,009	1,559,343	1,545,325	1,526,919	1,521,632	1,436,947	1,351,927	1,269,310	1,161,839	1,043,035	934,362	880,179
1925	882,358	896,470	960,259	1,002,527	1,178,845	1,285,699	1,415,416	1,536,955	1,665,322	1,567,081	1,426,669	1,354,700
1926	1,290,841	1,282,495	1,282,912	1,276,824	1,347,431	1,393,215	1,513,431	1,529,132	1,430,876	1,291,382	1,169,168	1,105,402
1927	1,050,185	1,089,842	1,136,351	1,175,906	1,353,820	1,468,562	1,577,769	1,698,023	1,948,492	1,868,718	1,722,803	1,645,689
1928	1,624,412	1,655,738	1,690,000	1,690,000	1,689,998	1,690,000	1,705,499	1,881,986	1,844,539	1,680,890	1,538,432	1,460,504
1929	1,376,925	1,368,595	1,365,702	1,352,493	1,361,347	1,369,756	1,363,320	1,347,224	1,419,566	1,296,940	1,183,629	1,119,702
1930	1,063,576	1,047,412	1,082,926	1,102,916	1,146,887	1,178,330	1,151,470	1,143,227	1,235,412	1,119,051	1,014,293	961,444
1931	916,788	919,127	956,563	954,741	986,269	952,973	899,411	865,472	809,514	735,646	675,830	656,304
1932	630,168	625,030	769,521	913,534	1,153,444	1,289,825	1,280,793	1,334,069	1,458,021	1,410,599	1,274,962	1,198,076
1933	1,109,046	1,083,648	1,081,347	1,066,810	1,091,460	1,083,362	1,048,132	1,053,363	1,104,947	995,152	884,663	825,690
1934	768,284	756,532	778,426	811,719	879,231	973,527	961,019	918,806	892,463	818,740	757,348	738,059
1935	727,382	741,020	780,535	934,617	1,058,518	1,183,873	1,442,298	1,526,908	1,697,122	1,581,812	1,437,108	1,350,153
1936	1,313,964	1,305,527	1,299,545	1,353,079	1,589,109	1,690,000	1,713,000	1,808,162	2,006,603	1,908,135	1,758,193	1,675,358
1937	1,622,051	1,600,732	1,594,212	1,588,128	1,654,812	1,690,000	1,713,000	1,792,193	1,987,140	1,852,386	1,706,269	1,621,556
1938	1,547,436	1,538,874	1,689,998	1,689,992	1,689,987	1,690,000	1,690,000	1,730,000	2,025,000	2,030,000	1,870,754	1,718,957
1939	1,690,000	1,689,224	1,690,000	1,690,000	1,689,999	1,690,000	1,640,136	1,609,346	1,485,747	1,318,522	1,176,804	1,138,053
1940	1,095,829	1,088,559	1,152,400	1,306,261	1,540,227	1,690,000	1,713,000	1,807,723	1,954,652	1,788,947	1,638,725	1,550,117
1941	1,479,514	1,463,206	1,562,630	1,689,993	1,683,096	1,690,000	1,690,000	1,803,646	2,030,000	2,027,475	1,857,774	1,712,174
1942	1,653,602	1,645,974	1,689,999	1,689,982	1,673,445	1,690,000	1,713,000	1,765,000	2,027,000	2,030,000	1,860,016	1,707,840
1943	1,626,500	1,664,178	1,690,000	1,689,976	1,683,949	1,690,000	1,713,000	1,939,650	2,030,000	1,944,494	1,798,476	1,708,539
1944	1,635,548	1,622,064	1,610,321	1,603,274	1,647,456	1,690,000	1,658,867	1,707,586	1,750,208	1,623,490	1,481,831	1,404,426
1945	1,379,794	1,427,821	1,474,257	1,500,550	1,640,388	1,690,000	1,713,000	1,750,490	1,979,080	1,915,904	1,761,716	1,673,833
1946	1,676,003	1,690,000	1,689,996	1,689,984	1,655,146	1,690,000	1,713,000	1,726,923	1,791,308	1,626,984	1,471,391	1,384,998
1947	1,325,797	1,342,234	1,375,560	1,387,779	1,418,570	1,388,085	1,320,233	1,380,276	1,321,244	1,180,640	1,055,294	992,073
1948	995,836	997,103	1,035,726	1,034,852	1,022,922	1,055,342	1,146,487	1,267,945	1,418,003	1,353,141	1,259,749	1,215,428
1949	1,186,203	1,175,712	1,170,472	1,158,924	1,171,007	1,335,110	1,324,533	1,376,033	1,357,651	1,195,392	1,052,328	977,511
1950	899,485	889,413	892,224	916,879	1,074,192	1,209,417	1,247,067	1,254,186	1,342,400	1,193,086	1,052,952	994,465
1951	991,837	1,395,953	1,689,996	1,689,971	1,673,951	1,690,000	1,671,280	1,576,052	1,604,719	1,451,209	1,311,422	1,232,085
1952	1,190,739	1,198,448	1,320,040	1,549,021	1,599,117	1,690,000	1,690,000	1,895,000	2,030,000	2,030,000	1,869,932	1,719,140
1953	1,632,895	1,622,960	1,637,300	1,689,996	1,689,998	1,690,000	1,627,805	1,597,670	1,787,254	1,742,396	1,609,381	1,534,414
1954	1,468,628	1,467,830	1,471,472	1,478,272	1,527,241	1,636,809	1,674,641	1,806,537	1,806,600	1,646,548	1,500,604	1,422,171
1955	1,342,774	1,342,526	1,360,811	1,393,387	1,443,658	1,509,285	1,536,773	1,574,515	1,539,789	1,404,270	1,279,178	1,220,548
1956	1,157,629	1,156,262	1,690,000	1,689,942	1,678,244	1,690,000	1,713,000	1,804,719	2,030,000	2,030,000	1,859,576	1,712,725
1957	1,651,881	1,635,922	1,627,970	1,622,414	1,650,203	1,683,085	1,554,764	1,585,676	1,792,847	1,645,523	1,505,651	1,431,990
1958	1,415,635	1,408,082	1,420,790	1,443,748	1,585,696	1,683,150	1,690,000	1,910,000	2,030,000	2,030,000	1,868,297	1,719,418
1959	1,629,791	1,607,494	1,585,600	1,610,046	1,668,508	1,690,000	1,667,209	1,607,868	1,505,353	1,340,209	1,196,857	1,196,565
1960	1,118,661	1,107,237	1,130,464	1,130,153	1,243,532	1,256,171	1,271,114	1,278,736	1,204,810	1,074,160	965,400	916,155
1961	868,272	867,480	938,355	940,051	952,205	918,282	893,177	866,136	823,008	758,324	704,730	685,442
1962	659,505	654,417	682,152	686,096	873,196	994,305	994,447	900,271	1,129,751	1,038,952	902,181	829,505
1963	786,793	780,752	831,071	876,126	1,043,308	1,111,390	1,211,258	1,448,431	1,743,224	1,723,618	1,607,530	1,548,750
1964	1,530,117	1,579,681	1,595,347	1,613,453	1,629,939	1,600,004	1,547,600	1,544,300	1,506,555	1,351,609	1,216,652	1,145,766
1965	1,132,274	1,155,586	1,587,084	1,689,972	1,672,299	1,690,000	1,713,000	1,744,617	1,904,454	1,906,417	1,816,850	1,723,010
1966	1,638,053	1,690,000	1,689,998	1,689,996	1,685,995	1,690,000	1,666,092	1,743,542	1,626,186	1,462,164	1,318,555	1,247,974
1967	1,172,070	1,205,602	1,359,294	1,458,308	1,556,141	1,679,371	1,690,000	1,880,000	2,030,000	2,030,000	1,885,243	1,717,656
1968	1,636,802	1,624,597	1,622,733	1,622,938	1,666,603	1,690,000	1,620,006	1,623,104	1,560,312	1,393,242	1,257,826	1,180,125
1969	1,143,709	1,173,021	1,262,503	1,689,994	1,689,990	1,690,000	1,690,000	1,930,000	2,030,000	2,030,000	1,871,603	1,717,046
1970	1,690,000	1,690,000	1,689,999	1,689,952	1,679,633	1,690,000	1,655,509	1,725,894	1,817,297	1,687,171	1,550,130	1,472,003
1971	1,411,974	1,454,887	1,541,936	1,607,844	1,641,860	1,690,000	1,654,817	1,684,314	1,852,122	1,751,886	1,618,308	1,548,737
1972	1,486,524	1,495,072	1,538,668	1,589,139	1,627,917	1,610,864	1,516,947	1,496,024	1,505,254	1,347,538	1,216,200	1,149,557
1973	1,110,879	1,123,889	1,205,959	1,334,754	1,514,370	1,676,817	1,708,199	1,954,560	2,030,000	1,868,018	1,723,820	1,640,583
1974	1,631,540	1,690,000	1,689,998	1,689,983	1,662,882	1,690,000	1,717,600	1,963,440	2,030,000	1,947,206	1,804,319	1,717,373
1975	1,688,940	1,679,043	1,677,497	1,682,835	1,684,941	1,690,000	1,717,600	1,822,763	2,030,000	1,959,911	1,829,920	1,720,415
1976	1,690,000	1,690,000	1,690,000	1,664,706	1,652,292	1,526,598	1,445,307	1,341,473	1,236,083	1,107,685	1,022,829	992,425
1977	956,011	948,887	970,778	958,850	947,176	838,580	752,503	707,496	653,830	583,546	526,720	507,835
1978	487,414	485,146	537,432	682,534	851,424	1,090,274	1,269,016	1,400,571	1,761,000	1,845,209	1,711,253	1,699,232
1979	1,613,622	1,616,696	1,615,753	1,689,998	1,684,439	1,690,000	1,690,000	1,717,600	1,832,211	1,682,213	1,538,195	1,461,600
1980	1,430,197	1,432,910	1,452,944	1,689,976	1,689,987	1,690,000	1,717,600	1,890,400	1,960,200	2,030,000	1,874,603	1,727,346
1981	1,644,248	1,621,877	1,614,080	1,621,636	1,645,736	1,690,000	1,713,995	1,699,243	1,639,415	1,478,412	1,349,907	1,281,733
1982	1,272,860	1,379,771	1,530,515	1,689,994	1,689,988	1,690,000	1,717,600	1,876,400	2,002,900	2,030,000	1,873,946	1,772,100
1983	1,690,000	1,690,000	1,689,995	1,689,966	1,689,989	1,294,700	1,264,000	1,270,800	1,851,400	2,030,000	2,002,394	1,735,008
1984	1,690,000	1,690,000	1,689,992	1,689,971	1,681,440	1,690,000	1,622,221	1,691,426	1,791,689	1,663,465	1,516,873	1,433,460
1985	1,418,439	1,453,549	1,497,928	1,488,516	1,523,571	1,591,651	1,584,754	1,644,256	1,582,430	1,421,974	1,290,376	1,226,486
1986	1,199,500	1,220,692	1,292,278	1,357,285	1,669,715	1,690,000	1,717,600	1,888,300	2,001,400	1,921,826	1,777,583	1,709,211
1987	1,650,077	1,628,032	1,609,483	1,578,362	1,577,562	1,606,421	1,550,898	1,452,868	1,354,008	1,222,826	1,114,464	1,061,192
1988	1,038,470	1,037,567	1,073,751	1,127,570	1,183,427	1,160,444	1,137,556	1,097,677	1,048,582	981,891	923,960	902,169
1989	875,584	883,086	915,766	939,421	971,389	1,095,309	1,078,946	1,161,500	1,214,779	1,082,548	972,611	967,469
1990	994,107	992,645	1,012,533	1,015,239	1,050,737	1,033,997	990,403	1,005,220	1,012,241	923,156	831,603	781,902
1991	760,675	754,101	772,318	756,988	734,639	808,384	821,556	901,729	1,005,632	957,374	889,470	860,058
1992	861,478	860,106	882,529	887,270	951,046	1,010,560	1,076,245	1,078,931	1,005,240	915,151	803,103	738,800
1993	702,039	695,670	721,477	911,042	1,060,777	1,301,608	1,402,622	1,721,015	1,975,772	1,961,162	1,822,521	1,719,662
1994	1,646,166	1,631,950	1,617,800	1,607,849	1,617,912	1,565,143	1,533,295	1,527,858	1,486,808	1,367,864	1,270,429	1,224,486
1995	1,185,105	1,204,907	1,249,690	1,507,208	1,592,626	1,690,000	1,695,046	1,629,700	1,982,800	2,030,000	1,957,746	1,718,604
1996	1,625,966	1,600,351	1,621,669	1,689,837	1,689,990	1,690,000	1,717,600	2,002,400	2,030,000	1,934,433	1,789,218	1,712,746
1997	1,679,576	1,690,000	1,689,993	1,689,875	1,689,994	1,690,000	1,607,102	1,849,805	1,965,905	1,829,245	1,689,885	1,635,625
1998	1,553,690	1,547,294	1,548,700	1,689,997	1,689,989	1,690,000	1,707,834	1,714,000	1,987,500	2,030,000	1,881,075	1,719,248
1999	1,658,952	1,669,423	1,690,000	1,689,986	1,689,990	1,690,000	1,717,600	1,793,754	2,020,634	1,895,297	1,757,301	1,687,752
2000	1,624,814	1,614,823	1,599,179	1,675,115	1,689,992	1,690,000	1,713,910	1,930,118	2,030,000	1,869,201	1,728,017	1,657,692
2001	1,603,232	1,590,888	1,579,361	1,571,337	1,589,625	1,655,516	1,658,030	1,752,325	1,626,260	1,466,757	1,332,053	1,267,353
2002	1,220,381	1,229,204	1,298,576	1,353,992	1,401,083	1,429,659	1,447,448	1,573,566	1,603,699	1,445,465	1,311,155	1,243,321
Avg (21-02)	1,311,258	1,320,206	1,364,659	1,409,799	1,461,002	1,494,785	1,500,016	1,568,523	1,654,063	1,565,510	1,437,040	1,357,080

Table 2.5-3

Difference in Don Pedro Reservoir Storage (Acre-feet)

WSIP All Tuolumne minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	0	0	0	0	0	0	0	-495	-3,070	-3,056	-3,043	-3,033
1922	-3,027	-3,025	-3,025	-3,026	-1,210	0	0	-5,642	0	0	0	0
1923	0	0	0	0	0	0	0	-8,465	-8,437	-8,400	-8,364	-8,337
1924	-8,320	-8,315	-8,316	-8,318	-8,318	-8,315	-8,307	-13,952	-13,906	-13,843	-13,776	-13,727
1925	-13,697	-13,689	-13,689	-13,694	-13,695	-13,689	-15,156	-25,887	-25,800	-25,686	-25,569	-25,483
1926	-25,429	-25,414	-25,416	-25,423	-25,424	-25,415	-25,390	-25,326	-25,239	-25,123	-25,009	-24,924
1927	-24,872	-24,859	-24,859	-24,867	-24,868	-24,859	-24,836	-42,903	-42,762	-42,577	-42,390	-42,254
1928	-42,168	-42,145	-41,941	-38,824	-15,429	0	0	-11,068	-11,033	-10,985	-10,936	-10,899
1929	-10,877	-10,870	-10,871	-10,874	-10,875	-10,871	-10,861	-10,832	-14,531	-14,464	-14,398	-14,350
1930	-14,320	-14,312	-14,313	-14,316	-14,318	-14,313	-14,298	-14,262	-14,213	-14,149	-14,083	-14,034
1931	-14,004	-13,995	-13,996	-14,000	-14,001	-13,995	-13,981	-13,943	-13,893	-13,827	-13,759	-13,713
1932	-13,684	-13,676	-18,216	-28,868	-32,766	-35,085	-36,504	-36,943	-37,976	-37,803	-37,626	-37,501
1933	-37,423	-37,401	-37,403	-37,414	-37,417	-37,404	-39,720	-41,665	-52,222	-51,982	-51,728	-51,546
1934	-51,435	-51,404	-37,362	-42,865	-42,111	-43,326	-43,283	-43,163	-43,005	-42,801	-42,597	-42,445
1935	-42,350	-42,324	-42,326	-42,848	-43,421	-41,997	-42,546	-40,373	-40,642	-40,462	-40,278	-40,141
1936	-40,057	-40,033	-40,030	-40,024	-16,255	0	0	10,951	10,915	10,869	10,821	10,786
1937	10,765	10,758	10,740	10,800	4,407	0	0	-372	-2,175	-2,166	-2,157	-2,149
1938	-2,145	-2,143	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	-13,140	-13,107	-13,062	-13,002	-12,944	-12,900
1940	-12,873	-12,865	-4,371	-4,631	-185	0	0	-5,407	-5,389	-5,365	-5,342	-5,325
1941	-5,314	-5,311	-6,881	1	262	0	0	-3,119	0	0	0	0
1942	0	0	0	0	1	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	-10,460	-10,426	-10,381	-10,335	-10,299
1945	-10,278	-10,272	-10,273	-10,276	-4,048	0	0	-798	-6,391	-6,364	-6,335	-6,316
1946	-6,303	0	0	0	172	0	0	-3,603	-6,844	-6,814	-6,785	-6,761
1947	-6,747	-6,743	-6,743	-6,745	-6,746	-6,743	-6,737	-22,034	-21,955	-21,858	-21,757	-21,682
1948	-21,635	-21,623	-21,624	-21,631	-21,632	-22,621	-22,751	-22,828	-23,452	-23,345	-23,237	-23,159
1949	-23,111	-23,098	-23,099	-23,122	-23,124	-29,471	-32,577	-34,125	-42,545	-42,352	-42,158	-42,012
1950	-41,919	-41,894	-33,839	-39,568	-40,224	-41,100	-41,839	-42,398	-45,688	-45,482	-45,274	-45,117
1951	-45,020	-47,848	1	0	481	0	-230	-439	-1,896	-1,888	-1,878	-1,872
1952	-1,869	-1,867	-1,867	-5,691	-2,277	-448	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	-5,674	-5,656	-5,632	-5,607	-5,589
1954	-5,577	-5,574	-5,574	-5,575	-5,577	-5,575	-5,569	-17,253	-17,196	-17,122	-17,046	-16,988
1955	-16,953	-16,943	-16,944	-16,949	-16,950	-16,944	-17,557	-18,068	-20,903	-20,809	-20,712	-20,642
1956	-20,600	-20,589	-1,682	0	0	0	0	-3,129	0	0	0	0
1957	0	0	0	0	0	0	0	-9,323	-9,293	-9,253	-9,212	-9,180
1958	-9,161	-9,157	-9,157	-9,159	-4,538	-1,814	0	0	0	0	0	0
1959	0	0	0	0	0	0	-1,209	-4,450	-4,435	-4,415	-4,394	-4,380
1960	-4,371	-4,368	-4,368	-4,369	-924	-259	-1,840	-4,099	-5,756	-5,730	-5,704	-5,684
1961	-5,671	-5,668	-6,567	-6,570	-6,570	-6,568	-6,561	-6,542	-6,519	-6,488	-6,457	-6,433
1962	-6,419	-6,416	-6,416	-6,418	-6,419	-6,416	-6,409	16,073	19,969	19,879	19,784	19,713
1963	19,670	19,658	16,735	10,407	19,671	19,664	19,645	12,278	11,318	11,270	11,221	11,184
1964	11,161	11,155	11,155	11,159	11,159	11,156	10,427	10,055	5,477	5,453	5,428	5,409
1965	5,398	5,394	5,396	1	516	0	0	-1,330	-2,613	-2,601	-2,590	4
1966	4	0	0	0	3,075	0	3,763	3,754	3,742	3,725	3,708	3,695
1967	3,688	3,685	3,686	3,687	3,687	1,473	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	-6,788	-6,765	-6,735	-6,703	-6,681
1969	-6,667	-6,664	-6,663	1	0	0	0	0	0	0	0	0
1970	0	0	0	1	1	0	0	-3,618	-3,607	-3,591	-3,575	-3,564
1971	-3,555	-3,553	-3,554	-3,555	-1,422	0	0	-7,768	-7,743	-7,708	-7,675	-7,650
1972	-7,635	-7,630	-7,630	-7,633	-3,053	-3,052	-3,049	-11,189	-15,077	-15,008	-14,937	-14,888
1973	-14,857	-14,849	-14,849	-14,853	-14,855	-14,849	-14,836	-20,501	0	0	0	0
1974	0	0	0	1	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	-5,298	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	34,638	0	-1	0	0
1979	-1,672	-1,670	-1,671	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	-11,054	-11,004	-10,953	-10,916
1982	-10,893	-10,886	-10,887	2	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	1	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	25,230	27,351	27,226	27,101	27,007
1990	26,949	26,933	26,935	26,942	26,944	26,934	26,908	18,354	148	148	147	10,139
1991	15,500	15,491	17,014	24,892	26,434	26,425	26,398	181	14,771	2,082	10,895	14,632
1992	14,599	14,590	14,591	14,595	14,596	14,592	273	272	272	271	269	269
1993	268	268	267	15,860	15,899	14,403	12,661	12,639	29,728	29,600	20,611	-33
1994	-33	-33	-33	-33	-33	-33	-33	-7,929	-7,901	-7,865	-7,829	-7,803
1995	-7,787	-7,782	-7,783	-7,785	-3,114	0	2,761	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	1	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	612	0	0	0	0	0
1999	0	0	0	0	0	0	0	-1,090	-6,688	-6,659	-6,630	-6,609
2000	-6,596	-6,593	-6,592	-6,595	0	0	0	-9,611	-1,081	-1,076	-1,071	-1,068
2001	-1,066	-1,065	-1,065	-1,066	-1,065	-1,065	-1,064	-11,622	-11,584	-11,533	-11,479	-11,439
2002	-11,416	-11,410	-9,018	-7,990	-7,992	-6,969	-7,876	-23,687	-23,607	-23,501	-23,393	-23,314
Avg (21-02)	-6,729	-6,683	-5,541	-5,332	-4,190	-3,885	-4,326	-6,441	-6,955	-7,078	-7,046	-7,073

Table 2.5-4

Difference in Don Pedro Reservoir Storage (Acre-feet)

WSIP All Tuolumne minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	-197	-197	-197	-197	-79	0	0	-4,085	-15,638	-17,847	-17,770	-17,712
1922	-17,675	-17,665	-17,666	-17,671	-7,069	0	0	-15,283	0	-2,279	-1,586	3
1923	3	2	0	0	0	0	0	-27,761	-29,875	-32,023	-31,884	-31,782
1924	-31,717	-31,700	-31,702	-31,711	-31,712	-31,701	-34,799	-44,200	-44,050	-43,851	-43,643	-43,486
1925	-43,390	-43,364	-43,366	-43,379	-43,383	-43,366	-49,612	-81,038	-82,972	-84,884	-84,499	-84,212
1926	-84,035	-83,987	-84,505	-84,529	-84,782	-84,175	-91,411	-101,390	-124,561	-123,992	-123,420	-123,006
1927	-122,751	-122,683	-116,088	-116,121	-116,130	-116,087	-115,977	-160,826	-124,270	-126,014	-124,818	-114,866
1928	-107,756	-76,407	-41,940	-38,824	-15,429	0	-7,501	-24,450	-26,576	-26,462	-26,343	-26,256
1929	-26,202	-26,186	-26,188	-26,195	-26,197	-26,187	-26,162	-51,996	-70,179	-69,858	-69,537	-69,304
1930	-69,160	-69,122	-69,125	-69,144	-69,149	-69,124	-69,057	-69,441	-71,410	-71,089	-70,763	-70,519
1931	-70,367	-70,325	-70,329	-70,350	-70,355	-70,328	-70,257	-70,063	-69,810	-69,479	-69,141	-68,898
1932	-68,752	-68,712	-104,639	-122,515	-137,358	-160,048	-166,315	-175,406	-186,316	-187,754	-186,888	-186,254
1933	-185,869	-185,764	-185,772	-185,826	-185,840	-185,772	-193,301	-200,420	-229,629	-230,864	-229,777	-228,969
1934	-228,470	-228,335	-210,967	-217,355	-214,072	-218,324	-227,180	-245,904	-246,830	-245,665	-244,486	-243,619
1935	-243,085	-242,940	-242,952	-258,968	-273,243	-254,133	-259,479	-267,016	-293,113	-294,117	-292,811	-291,832
1936	-291,227	-291,062	-291,075	-291,086	-117,136	0	0	-6,763	-8,948	-11,188	-11,138	-11,104
1937	-11,081	-11,075	-11,088	-11,048	-4,016	0	0	-10,131	-20,848	-23,037	-22,936	-22,863
1938	-22,816	-22,803	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	-42,331	-40,703	-42,771	-42,575	-42,381	-42,239
1940	-42,151	-42,127	-33,064	-32,617	-9,851	0	0	538	-4,427	-4,407	-4,388	-4,374
1941	-4,365	-4,363	-6,749	1	348	0	0	-6,373	0	-2,278	-1,587	3
1942	3	3	0	1	1	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	-5,131	0	-2,278	-2,268	4
1944	4	4	4	3	2	0	0	-43,406	-45,471	-47,555	-47,342	-47,182
1945	-47,084	-47,057	-47,059	-47,072	-18,768	0	0	-1,199	4,143	1,847	1,839	1,833
1946	1,830	0	0	0	172	0	0	-14,599	-20,010	-19,924	-19,835	-19,767
1947	-19,726	-19,714	-19,715	-19,721	-19,722	-19,715	-19,696	-68,644	-70,610	-70,288	-69,966	-69,728
1948	-69,580	-69,541	-69,543	-69,564	-69,569	-75,913	-80,856	-85,387	-100,035	-101,857	-101,383	-101,039
1949	-100,831	-100,775	-100,779	-100,859	-100,866	-104,320	-111,637	-116,620	-133,971	-133,356	-132,747	-132,294
1950	-132,008	-131,930	-128,484	-130,813	-146,821	-156,802	-158,353	-159,907	-159,893	-160,545	-159,812	-159,269
1951	-158,933	-172,122	4	0	481	0	-3,246	-4,467	-15,209	-17,419	-17,338	-17,279
1952	-17,244	-17,234	-17,235	-26,163	-10,466	-448	0	0	0	0	0	0
1953	0	0	0	0	0	0	-19,831	-28,040	-30,156	-32,304	-32,164	-32,059
1954	-31,993	-31,975	-31,976	-31,985	-31,988	-31,976	-31,946	-76,793	-78,745	-78,407	-78,056	-77,796
1955	-77,633	-77,589	-77,592	-77,615	-77,621	-77,593	-80,508	-84,874	-98,531	-98,088	-97,634	-97,302
1956	-97,102	-97,048	-1,680	0	0	0	0	-11,457	0	0	0	0
1957	0	0	0	0	0	0	0	-43,292	-45,357	-47,441	-47,229	-47,071
1958	-46,973	-46,947	-46,948	-46,962	-19,661	-7,860	0	0	0	0	0	0
1959	0	0	0	0	0	0	-7,092	-27,065	-26,974	-26,851	-26,725	-26,637
1960	-26,582	-26,566	-26,568	-26,575	-26,577	-27,313	-30,394	-31,769	-31,660	-31,516	-31,371	-31,262
1961	-31,192	-31,173	-41,462	-41,475	-41,478	-41,463	-41,420	-42,566	-42,413	-42,212	-42,009	-41,858
1962	-41,765	-41,742	-41,744	-41,756	-41,760	-41,744	-41,702	-117,385	-120,749	-122,482	-121,916	-121,486
1963	-121,219	-121,148	-108,284	-102,207	-121,210	-121,166	-121,049	-157,621	-159,860	-161,445	-160,742	-160,223
1964	-148,722	-99,164	-83,498	-65,386	-48,901	-48,883	-51,857	-64,513	-100,778	-100,323	-99,856	-99,521
1965	-99,316	-99,262	-89,108	14	1,553	0	0	-23	10,963	8,638	6,321	-10
1966	-10	0	0	0	3,433	0	-23,315	-21,737	-23,872	-23,765	-23,656	-23,575
1967	-23,526	-23,514	-23,514	-23,521	-23,523	-8,502	0	0	0	0	-2,278	3
1968	4	4	4	4	2	0	0	-38,919	-40,995	-40,810	-40,620	-40,484
1969	-40,401	-40,379	-40,380	6	0	0	0	0	0	0	0	0
1970	0	0	0	-2	1,190	0	0	-14,251	-16,411	-18,618	-18,536	-18,474
1971	-18,435	-18,424	-18,426	-18,431	-7,374	0	0	-32,961	-35,059	-37,183	-37,023	-36,901
1972	-36,826	-36,805	-36,806	-36,817	-14,728	-14,724	-14,709	-54,520	-60,465	-60,190	-59,909	-59,709
1973	-59,586	-59,552	-59,554	-59,571	-59,577	-28,032	-24,237	-46,535	0	0	0	0
1974	0	0	0	2	1	0	0	556	0	-2,278	-2,268	4
1975	4	4	3	3	1	0	0	-4,382	0	-2,279	-1,587	2
1976	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	-53,265	0	-2,279	-2,268	-2,571
1979	-8,412	-8,407	-8,408	1	1	0	0	0	-2,206	-2,196	-2,187	-2,180
1980	-2,175	-2,174	-2,174	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	-2,209	-14,878	-39,317	-39,142	-38,962	-38,829
1982	-38,746	-38,724	-38,726	6	0	0	0	0	0	0	-2,278	0
1983	0	0	0	0	0	0	0	0	0	0	-2,278	4
1984	0	0	0	1	0	0	-197	-14,206	-16,366	-18,575	-18,492	-18,430
1985	-18,391	-18,381	-18,382	-18,387	-18,388	-18,381	-18,364	-25,500	-27,621	-27,496	-27,369	-27,276
1986	-27,220	-27,205	-32,764	-30,855	-10,886	0	0	0	0	-2,278	-2,268	-2,261
1987	-2,256	-2,255	-2,255	-2,256	-2,256	-2,255	-2,253	-15,846	-27,318	-27,192	-27,069	-26,978
1988	-26,921	-26,906	-26,907	-26,915	-13,257	-13,252	-18,816	-21,115	-54,986	-59,724	-59,441	-59,232
1989	-59,101	-59,065	-59,069	-59,087	-59,091	-59,069	-81,869	-90,940	-90,626	-90,219	-89,805	-89,499
1990	-89,313	-89,262	-89,266	-89,292	-89,299	-89,266	-89,179	-108,321	-106,241	-105,751	-105,240	-108,763
1991	-108,526	-108,463	-108,468	-108,500	-108,510	-108,467	-108,356	-131,157	-145,833	-147,086	-146,396	-145,882
1992	-145,565	-145,481	-145,487	-145,531	-145,542	-145,487	-128,681	-155,314	-154,780	-154,068	-153,327	-152,783
1993	-152,452	-152,357	-166,345	-166,395	-166,407	-179,215	-190,143	-190,621	-24,500	-26,674	-18,573	30
1994	30	30	30	30	30	30	30	-37,978	-40,054	-39,872	-39,685	-39,552
1995	-39,470	-39,448	-39,450	-39,461	-15,786	0	-6,442	0	0	0	-2,278	3
1996	4	3	4	4	0	0	0	0	0	-2,278	-2,269	-2,262
1997	-2,257	0	0	3	0	0	-13,714	-15,961	-18,115	-20,316	-20,228	-20,163
1998	-20,123	-20,112	-20,113	3	0	0	2,084	0	0	0	0	0
1999	0	0	0	0	0	0	0	-21,676	-16,054	-18,263	-18,183	-18,125
2000	-18,089	-18,080	-18,080	-18,085	0	0	0	-22,176	-1,081	-1,076	-1,071	-1,068
2001	-1,066	-1,065	-1,065	-1,066	-1,065	-1,065	-1,064	-56,517	-58,235	-57,976	-57,708	-57,510
2002	-57,390	-57,358	-54,968	-53,954	-53,959	-52,920	-53,782	-107,081	-108,929	-108,443	-107,944	-107,574
Avg (21-02)	-47,968	-47,112	-43,044	-40,777	-36,142	-33,354	-35,710	-49,790	-49,593	-50,360	-50,137	-49,528

Figure 2.5-2

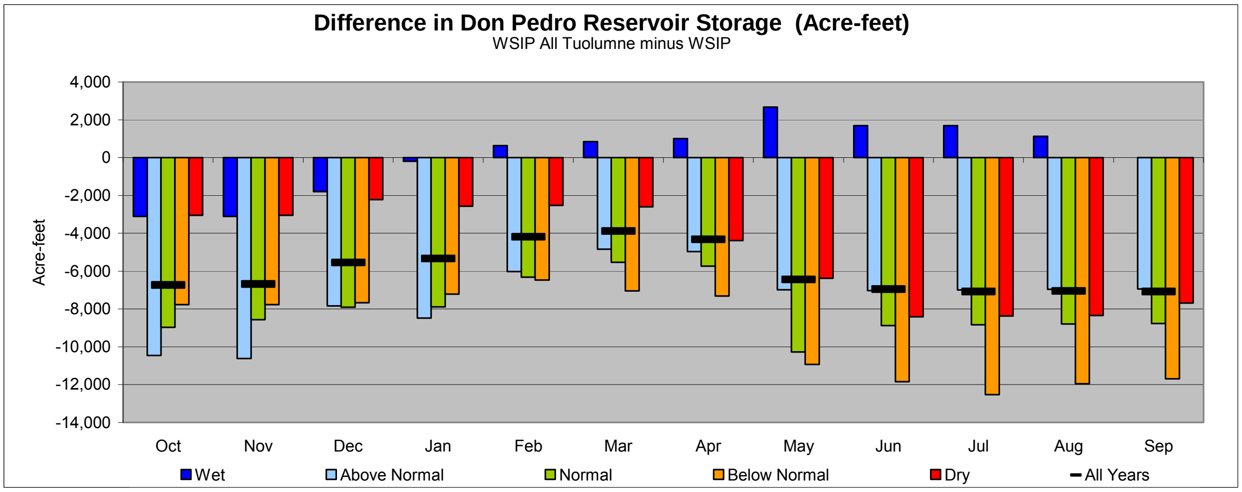


Figure 2.5-3

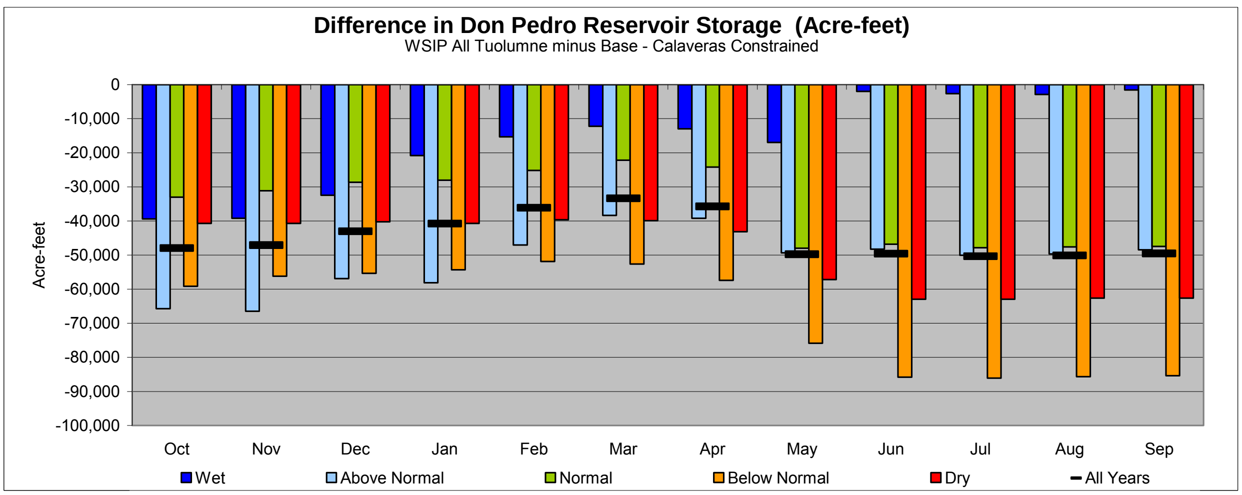


Figure 2.5-4

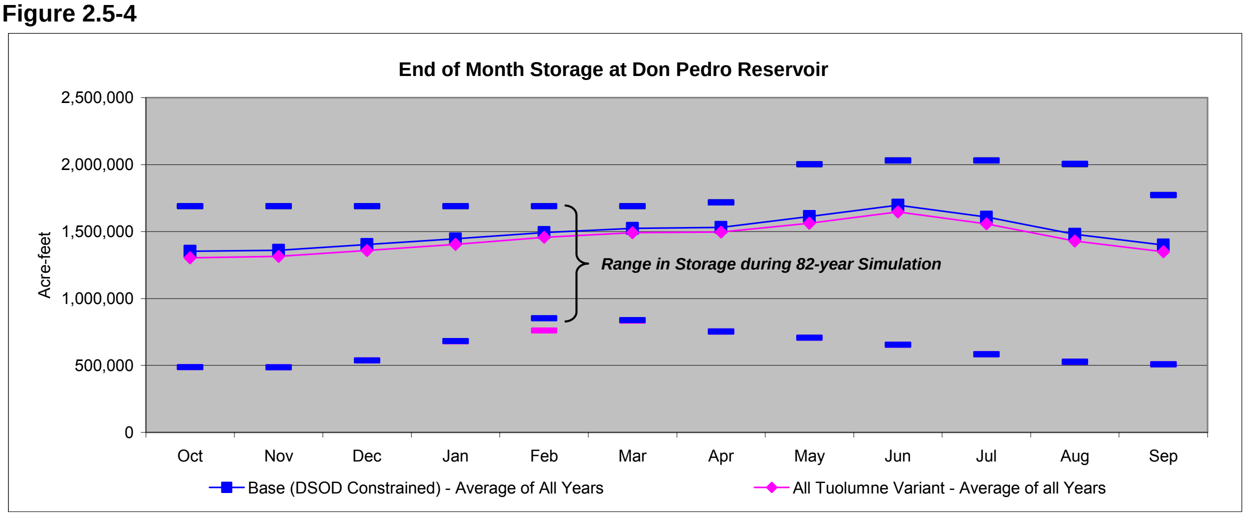


Table 2.5-5 illustrates the difference in stream releases between the variant and WSIP settings. Compared to the WSIP setting, the variant typically exhibits an incrementally larger reduction in stream releases, predominantly during early winter through June, which reflects the months when releases to the stream above minimum release requirements are made, due to flood control or in anticipation of filling the reservoir. Increase in releases to the stream sometimes occur, during periods when the variant causes incrementally greater delivery shortages, which thereby provides greater inflow to the reservoir (and subsequent additional release) as compared to the WSIP setting. Table 2.5-6 illustrates the same information in comparing the variant and WSIP settings, with years ranked by descending order of the San Joaquin River Index. The table shows the finding that differences in releases to the Tuolumne River from La Grange Dam would occur only with releases above minimum Federal Energy Regulatory Commission (FERC) flow requirements. This circumstance typically occurs only in above normal and wet years, and predominantly during early winter through June. During other year types and during the summer and fall, releases would be maintained at minimum FERC flow requirements regardless of the setting.

Table 2.5-5 illustrates the difference in stream release between the variant and WSIP settings, expressed in terms of a monthly volume (acre-feet) of flow. Table 2.5-7 illustrates the same information and the average monthly stream release for the variant and WSIP settings, expressed in average monthly flow (cfs). Table 2.5-5 illustrates that the difference in monthly flow below La Grange Dam could range from an increase of approximately 21,000 acre-feet to a decrease of approximately 54,000 acre-feet. Considering the manner in which releases are determined and made to the stream, quantifying the effect of these changes in terms of average monthly flow (cfs) is not always meaningful. Similar to the operation of releases below O'Shaughnessy Dam, a change in the volume of release from La Grange Dam to the stream would likely result in the delay or earlier initiation of the release by a matter of days. Assuming that a change in release volume equates to a delay or earlier initiation of releasing 6,000 acre-feet per day, the difference in stream release from La Grange Dam between the variant and WSIP would be a delay in releases up to 9 days or up to an added 3 days of release. Normally, the effect of the delay in release would not affect the year's peak stream release rate during a year. However, infrequently, the variant's effect on stream releases could manifest as an elimination of all flows above minimum FERC flow requirements within a year. This would occur after the experience of an extended drought period. Comparing the variant and WSIP settings, a change (increase or decrease) in stream release would occur in approximately 50 percent of the years simulated.

Table 2.5-8 illustrates the releases to the Tuolumne River below La Grange Dam and their differences for the variant and base settings, provided in terms of average monthly flow (cfs) averaged within year types. Table 2.5-9 illustrates the results for the comparison of the variant and the base settings, in the same format as Table 2.5-5, showing the simulated month-to-month flow (volume) changes between the two settings. Compared to the base setting, the variant's effect to stream flow is very similar to the effect caused by the WSIP, but at times slightly greater. Assuming that a change in release volume equates to a delay or earlier initiation of releasing 6,000 acre-feet per day, the difference in stream release from La Grange Dam between the variant and base would typically be a delay in releases up to a few days. Normally, the effect of the delay in release would not affect the year's peak stream release rate during a year. However, infrequently, following a prolonged multi-year drought period, the variant's effect on stream releases could manifest as an elimination of all flows above minimum FERC flow requirements within a year.

Table 2.5-5

Difference in Total La Grange Release to River (Acre-feet)

WSIP All Tuolumne minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	-1,554	-558	0	0	0	0	0	-2,112
1922	0	0	0	0	-1,816	-1,210	0	0	-5,633	0	0	0	-8,659
1923	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	0	0	0	0	0
1928	0	0	-205	-3,128	-23,397	-15,426	0	0	0	0	0	0	-42,156
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	-22,552	-14,196	2,024	0	0	0	0	0	-34,724
1937	0	0	0	0	5,964	808	-1,140	0	0	0	0	0	5,632
1938	0	0	-3,133	0	0	-868	-1,025	-6,099	0	0	0	0	-11,125
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	-12,784	-8,211	-3,802	0	0	0	0	0	-24,797
1941	0	0	0	-7,835	-1,567	-1,017	-5,219	0	-8,611	0	0	0	-24,249
1942	0	0	0	-4,668	1	-1,903	-1,841	-1,046	-1,013	0	0	0	-10,470
1943	0	0	0	0	0	-5,556	0	0	0	0	0	0	-5,556
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	-6,545	-4,047	-889	0	0	0	0	0	-11,481
1946	0	-6,302	-149	0	-1,031	-1,392	-1,289	0	0	0	0	0	-10,163
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	-53,559	-2,663	-2,887	481	0	0	0	0	0	0	-58,628
1952	0	0	0	0	-3,415	-1,828	-448	-5,668	0	0	0	0	-11,359
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	-18,093	-1,682	0	-2,727	-894	0	-4,798	0	0	0	-28,194
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	-4,622	-2,723	-1,813	-8,851	-829	0	0	0	-18,838
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	-1,264	-3,094	516	-2,209	0	0	0	0	-2,590	-8,641
1966	0	4	-2,823	0	-18,453	9,527	0	0	0	0	0	0	-11,745
1967	0	0	0	0	0	2,212	1,474	-15,163	-1,842	0	0	0	-13,319
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	-6,666	1	-6,665	0	0	0	0	0	0	-13,330
1970	0	0	0	-7,138	1	0	0	0	0	0	0	0	-7,137
1971	0	0	0	0	-2,133	-1,422	0	0	0	0	0	0	-3,555
1972	0	0	0	0	-4,579	0	0	0	0	0	0	0	-4,579
1973	0	0	0	0	0	0	0	0	-20,468	0	0	0	-20,468
1974	0	0	0	-5,650	0	-3,805	0	0	0	0	0	0	-9,455
1975	0	0	0	0	0	0	-1,841	0	-9,222	0	0	0	-11,063
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	34,331	0	0	0	34,331
1979	0	0	0	-1,671	0	-909	-7,258	0	0	0	0	0	-9,838
1980	0	0	0	-5,234	1	-1,903	0	0	0	0	0	0	-7,136
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	-10,890	-9,144	-1,202	0	0	0	0	0	0	-21,236
1983	-2,759	-1,842	-952	-1	0	0	0	-8,345	-1,842	0	0	0	-15,741
1984	-1,332	-1,841	0	0	0	0	0	0	0	0	0	0	-3,173
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	0	-15,425	-921	0	0	0	0	0	-16,346
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	8,881	20,611	29,492
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	-4,671	3,652	0	4,660	1,842	0	0	0	5,483
1996	0	0	0	0	-4,764	-2,663	0	0	0	0	0	0	-7,427
1997	0	0	0	-5,935	1	0	0	0	0	0	0	0	-5,934
1998	0	0	0	0	0	-5,637	-3,672	-245	-829	0	0	0	-10,383
1999	0	0	0	0	0	0	-2,751	0	0	0	0	0	-2,751
2000	0	0	0	0	-6,595	1	0	0	-8,513	0	0	0	-15,107
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	-50	-122	-962	-786	-1,562	-1,038	-416	-497	-334	0	108	220	-5,438

Table 2.5-6

Difference in Total La Grange Release to River (Acre-feet)

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending SJR Index WSIP All Tuolumne minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1983	-2,759	-1,842	-952	-1	0	0	0	-8,345	-1,842	0	0	0	-15,741
1969	0	0	0	-6,666	1	-6,665	0	0	0	0	0	0	-13,330
1995	0	0	0	0	-4,671	3,652	0	4,660	1,842	0	0	0	5,483
1938	0	0	-3,133	0	0	-868	-1,025	-6,099	0	0	0	0	-11,125
1998	0	0	0	0	0	-5,637	-3,672	-245	-829	0	0	0	-10,383
1982	0	0	0	-10,890	-9,144	-1,202	0	0	0	0	0	0	-21,236
1967	0	0	0	0	0	2,212	1,474	-15,163	-1,842	0	0	0	-13,319
1952	0	0	0	0	-3,415	-1,828	-448	-5,668	0	0	0	0	-11,359
1958	0	0	0	0	-4,622	-2,723	-1,813	-8,851	-829	0	0	0	-18,838
1980	0	0	0	-5,234	1	-1,903	0	0	0	0	0	0	-7,136
1978	0	0	0	0	0	0	0	0	34,331	0	0	0	34,331
1922	0	0	0	0	-1,816	-1,210	0	0	-5,633	0	0	0	-8,659
1956	0	0	-18,093	-1,682	0	-2,727	-894	0	-4,798	0	0	0	-28,194
1942	0	0	0	-4,668	1	-1,903	-1,841	-1,046	-1,013	0	0	0	-10,470
1941	0	0	0	-7,835	-1,567	-1,017	-5,219	0	-8,611	0	0	0	-24,249
1986	0	0	0	0	0	-15,425	-921	0	0	0	0	0	-16,346
1993	0	0	0	0	0	0	0	0	0	0	8,881	20,611	29,492
1997	0	0	0	-5,935	1	0	0	0	0	0	0	0	-5,934
1996	0	0	0	0	-4,764	-2,663	0	0	0	0	0	0	-7,427
1943	0	0	0	0	0	-5,556	0	0	0	0	0	0	-5,556
1937	0	0	0	0	5,964	808	-1,140	0	0	0	0	0	5,632
1974	0	0	0	-5,650	0	-3,805	0	0	0	0	0	0	-9,455
1975	0	0	0	0	0	0	-1,841	0	-9,222	0	0	0	-11,063
1965	0	0	0	-1,264	-3,094	516	-2,209	0	0	0	0	-2,590	-8,641
1936	0	0	0	0	-22,552	-14,196	2,024	0	0	0	0	0	-34,724
1984	-1,332	-1,841	0	0	0	0	0	0	0	0	0	0	-3,173
1979	0	0	0	-1,671	0	-909	-7,258	0	0	0	0	0	-9,838
1945	0	0	0	0	-6,545	-4,047	-889	0	0	0	0	0	-11,481
1999	0	0	0	0	0	0	-2,751	0	0	0	0	0	-2,751
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1946	0	-6,302	-149	0	-1,031	-1,392	-1,289	0	0	0	0	0	-10,163
1973	0	0	0	0	0	0	0	0	-20,468	0	0	0	-20,468
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	-6,595	1	0	0	-8,513	0	0	0	-15,107
1940	0	0	0	0	-12,784	-8,211	-3,802	0	0	0	0	0	-24,797
1923	0	0	0	0	0	0	0	0	0	0	0	0	0
1921	0	0	0	0	0	-1,554	-558	0	0	0	0	0	-2,112
1970	0	0	0	-7,138	1	0	0	0	0	0	0	0	-7,137
1951	0	0	-53,559	-2,663	-2,887	481	0	0	0	0	0	0	-58,628
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	-2,133	-1,422	0	0	0	0	0	0	-3,555
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1928	0	0	-205	-3,128	-23,397	-15,426	0	0	0	0	0	0	-42,156
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	4	-2,823	0	-18,453	9,527	0	0	0	0	0	0	-11,745
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	-4,579	0	0	0	0	0	0	0	-4,579
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 2.5-7

Total La Grange Release to River (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — WSIP All Tuolumne

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	442	372	871	2,355	3,480	4,202	3,565	3,817	3,764	1,773	569	1,567
Above Normal	313	536	898	1,193	2,398	2,288	2,137	1,308	1,337	263	305	448
Normal	300	259	569	835	1,562	1,413	1,290	1,303	202	163	163	163
Below Normal	278	253	321	258	366	295	565	565	68	68	68	68
Dry	302	232	252	229	349	358	355	355	56	56	56	56
All Years	327	332	583	968	1,625	1,701	1,577	1,457	1,076	457	231	455

Total La Grange Release to River (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	445	374	894	2,387	3,508	4,235	3,575	3,857	3,737	1,773	560	1,548
Above Normal	315	538	949	1,213	2,454	2,328	2,151	1,309	1,362	263	305	448
Normal	300	265	569	847	1,593	1,433	1,301	1,303	233	163	163	163
Below Normal	278	253	324	258	391	285	565	565	68	68	68	68
Dry	302	232	252	229	349	358	355	355	56	56	56	56
All Years	327	334	599	981	1,653	1,718	1,584	1,465	1,082	457	229	452

Difference in Total La Grange Release to River (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — WSIP All Tuolumne minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	-3	-2	-23	-32	-28	-33	-10	-40	27	0	9	19
Above Normal	-1	-2	-51	-20	-56	-40	-14	-1	-24	0	0	0
Normal	0	-7	0	-12	-31	-20	-11	0	-30	0	0	0
Below Normal	0	0	-3	0	-24	9	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0
All Years	-1	-2	-16	-13	-28	-17	-7	-8	-6	0	2	4

Table 2.5-8

Total La Grange Release to River (CFS)
(Average within Year Type - Grouped by SJR Index Year Type) — WSIP All Tuolumne

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	427	369	775	1,989	3,410	3,957	3,337	3,053	3,370	1,282	509	1,276
Above Normal	291	507	1,060	1,261	2,116	1,679	1,525	1,346	277	240	240	240
Below Normal	284	270	366	314	570	620	943	943	75	75	75	75
Dry	337	260	272	262	429	421	497	497	73	73	73	73
Critical	236	195	204	189	189	189	344	344	50	50	50	50
All Years	327	332	583	968	1,625	1,701	1,577	1,457	1,076	457	231	455

Total La Grange Release to River (CFS)
(Average within Year Type - Grouped by SJR Index Year Type) — Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	431	374	857	2,161	3,524	4,096	3,424	3,161	3,634	1,300	516	1,299
Above Normal	298	507	1,230	1,257	2,402	1,969	1,568	1,348	408	240	240	249
Below Normal	294	314	422	318	653	654	958	943	75	75	75	75
Dry	351	324	292	285	482	421	497	497	73	73	73	73
Critical	236	195	204	189	189	189	344	344	50	50	50	50
All Years	333	350	654	1,022	1,738	1,806	1,613	1,489	1,180	463	233	464

Difference in Total La Grange Release to River (CFS)
(Average within Year Type - Grouped by SJR Index Year Type) — WSIP All Tuolumne minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	-4	-4	-82	-172	-114	-139	-87	-108	-263	-19	-7	-23
Above Normal	-7	0	-170	3	-287	-289	-42	-2	-131	0	-1	-9
Below Normal	-9	-44	-56	-4	-83	-33	-15	0	0	0	0	0
Dry	-14	-64	-20	-23	-53	0	0	0	0	0	0	0
Critical	0	0	0	0	0	0	0	0	0	0	0	0
All Years	-6	-18	-71	-54	-113	-106	-37	-32	-104	-5	-2	-9

Table 2.5-9

Difference in Total La Grange Release to River (Acre-feet)

WSIP All Tuolumne minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	-118	-17,278	-4,276	0	0	0	0	0	-21,672
1922	0	0	0	0	-10,603	-7,068	-7,365	-5,684	-20,229	0	-684	-1,587	-53,220
1923	0	0	3	0	0	0	-2,209	0	0	0	0	0	-2,206
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	-43,828	0	-644	-9,569	-54,041
1928	-6,886	-31,299	-34,469	-3,128	-23,397	-20,765	-10,773	0	0	0	0	0	-130,717
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	-173,966	-133,186	-3,033	0	0	0	0	0	-310,185
1937	0	0	0	0	-9,051	-12,272	-4,706	0	0	0	0	0	-26,029
1938	0	0	-21,971	0	0	-868	-10,169	-24,242	-4,972	-2,284	0	0	-64,506
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	-38,757	-27,704	-8,190	0	0	0	0	0	-74,651
1941	0	0	0	-7,702	-2,085	-1,338	-5,720	0	-15,819	0	-683	-1,586	-34,933
1942	0	0	2	-8,429	1	-5,708	-7,365	-3,901	-3,775	-2,283	0	0	-31,458
1943	0	0	0	0	0	-15,361	-4,971	0	-10,094	0	0	-2,268	-32,694
1944	0	0	0	0	2	1	0	0	0	0	0	0	3
1945	0	0	0	0	-28,623	-34,082	-1,048	0	0	0	0	0	-63,753
1946	0	1,829	-149	0	-1,031	-14,614	-5,110	0	0	0	0	0	-19,075
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	-177,837	-2,661	-2,887	481	0	0	0	0	0	0	-182,904
1952	0	0	0	0	-15,698	-10,016	-448	-26,956	-4,972	-2,284	0	0	-60,374
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	-101,071	-1,680	0	-7,081	-3,701	0	-18,085	-2,283	0	0	-133,901
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	-27,303	-11,797	-7,856	-24,339	-3,683	-2,283	0	0	-77,261
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	-11,189	-49,491	-15,670	-18,132	-16,489	0	0	0	0	0	0	0	-110,971
1965	0	0	0	-101,503	-9,272	-12,964	-3,947	0	0	0	0	6,320	-121,366
1966	0	-10	-7,180	0	-20,602	3,433	0	0	0	0	0	0	-24,359
1967	0	0	0	0	0	-19,525	-8,497	-23,329	-1,842	-2,283	0	-2,279	-57,755
1968	0	0	0	0	2	1	0	0	0	0	0	0	3
1969	0	0	0	-40,392	-7,206	-13,180	-7,733	-5,138	-4,972	-2,283	0	0	-80,904
1970	0	0	0	14,512	-7,145	-16,079	0	0	0	0	0	0	-8,712
1971	0	0	0	0	-11,059	-7,372	0	0	0	0	0	0	-18,431
1972	0	0	0	0	-22,090	0	0	0	0	0	0	0	-22,090
1973	0	0	0	0	0	-31,528	-3,772	0	-48,669	0	0	0	-83,969
1974	0	0	0	-17,087	1	-12,367	-5,524	-5,694	-4,416	0	0	-2,268	-47,355
1975	0	0	0	0	2	1	-10,127	0	-9,347	0	-684	-1,586	-21,741
1976	2	0	0	0	0	0	0	0	0	0	0	0	2
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	-59,869	0	0	0	-59,869
1979	0	0	0	-8,410	0	-20,890	-9,468	-2,284	0	0	0	0	-41,052
1980	0	0	0	-535	0	-10,465	-4,972	-5,138	-4,972	-2,284	0	0	-28,366
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	-38,736	-22,823	-2,152	0	-2,854	-2,762	-2,283	0	-4,484	-76,094
1983	-5,708	-3,683	1,712	-1	0	0	0	-14,144	-4,604	-2,283	0	-2,278	-30,989
1984	-7,342	-1,841	0	0	0	3,935	0	0	0	0	0	0	-5,248
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	-16,326	-43,881	-12,221	-5,137	-4,971	0	0	0	-82,536
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	-187,962	0	-8,002	-18,574	-214,538
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	-23,677	-4,450	0	-8,337	-1,841	-2,283	0	-2,278	-42,866
1996	0	0	0	0	-8,384	-2,663	-6,813	-2,283	-2,210	0	0	0	-22,353
1997	0	-2,256	0	-18,013	3	0	0	0	0	0	0	0	-20,266
1998	0	0	0	-20,119	3	-12,498	-12,511	-2,675	-4,603	-2,283	0	0	-54,686
1999	0	0	0	0	0	-11,417	-5,825	0	-16,264	0	0	0	-33,506
2000	0	0	0	0	-18,086	1	0	0	-23,268	0	0	0	-41,353
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	-380	-1,058	-4,349	-3,317	-6,301	-6,497	-2,175	-1,977	-6,195	-334	-130	-518	-33,231

2.6 Calaveras and San Antonio Reservoirs, Alameda Creek and Downstream

There is only a slight difference in Calaveras Reservoir operations between the variant and WSIP settings. Figure 2.6-1 illustrates a chronological trace of the simulation of Calaveras Reservoir storage and stream releases from Calaveras Dam. Shown in Figure 2.6-1 are the results for the WSIP, variant, and base settings. The difference in Calaveras Reservoir storage between the variant and WSIP settings is mostly caused by the interaction of the increased demand served by the system's resources (300 mgd for the variant and a net 290 demand for the WSIP) and the operation of the SJPL. Generally, the systematic minor decrease in reservoir storage in most years is due to the additional demand drawing slightly more water from Calaveras Reservoir during the summer when the SJPL is operating at maximum capacity. In a few instances, storage is greater in the variant setting. This occurs when greater water delivery reductions are required in the variant setting, thus reducing the draw from Calaveras Reservoir as compared to the WSIP setting. The difference in storage between the variant and WSIP settings and the base setting is due to the restoration of the operational capacity of Calaveras Reservoir. Figure 2.6-2 illustrates the average monthly storage in Calaveras Reservoir for the 82-year simulation, and the range in storage for each month for the variant and base settings.

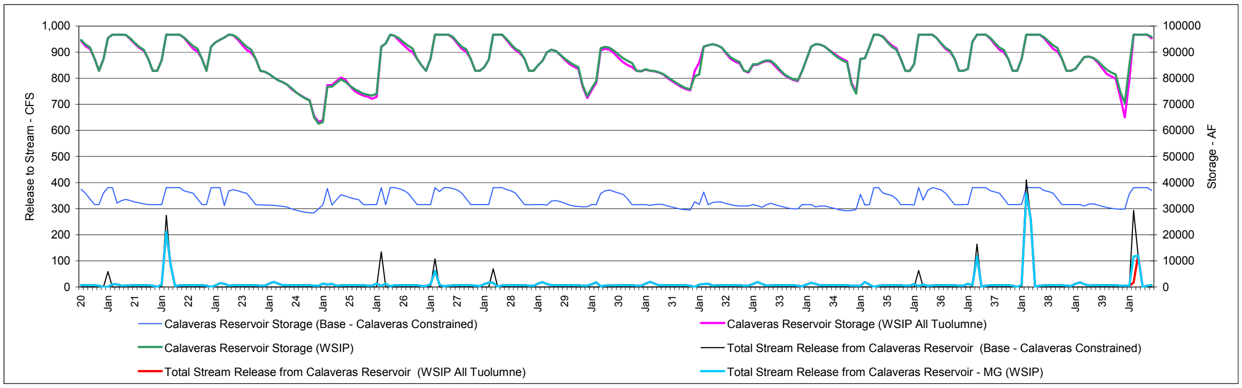
There is essentially no change (i.e., change occurs infrequently) in releases to Calaveras Creek below Calaveras Dam between the variant and WSIP settings. Both settings have fishery releases that are not included in the base setting. Table 2.6-1 illustrates the difference in releases to Calaveras Creek between the variant and WSIP settings. Supplementing the Figure 2.6-1 representation of Calaveras Dam stream releases and Table 2.6-1 is Table 2.6-2, illustrating releases for the variant and WSIP settings, and the difference in releases between the two. Table 2.6-3 provides the same form of information for the variant and base settings. The notable difference in releases between the variant and base settings is the addition of the flows associated with the 1997 Memorandum of Understanding (MOU) and the reduction of stream releases during wetter-year/wetter-season flows due to the restoration of Calaveras Reservoir operational capacity.

There is essentially no change (i.e., minor difference occur during 2 months of the 82-year simulation) in Alameda Creek diversions to Calaveras Reservoir between the variant and the WSIP settings. With almost no change in Calaveras Reservoir storage between the two settings, there would be no change in the diversion operation at the Alameda Creek Diversion Dam. Water would only be diverted to Calaveras Reservoir when the diversion would not contribute to releases below Calaveras Dam that are above minimum required flows . Coincidentally, with no change in the diversion at Alameda Creek Diversion Dam, flow spilling past the diversion dam would be the same in both the variant and WSIP settings. Table 2.6-4 illustrates the flow below the Alameda Creek Diversion Dam for the variant and base settings. The notable difference between the variant and the base settings is the reduction of wetter-year water flowing past the diversion dam. This occurs because, in the variant setting, the restoration of Calaveras Reservoir storage allows a greater frequency of diversion from Alameda Creek to Calaveras Reservoir.

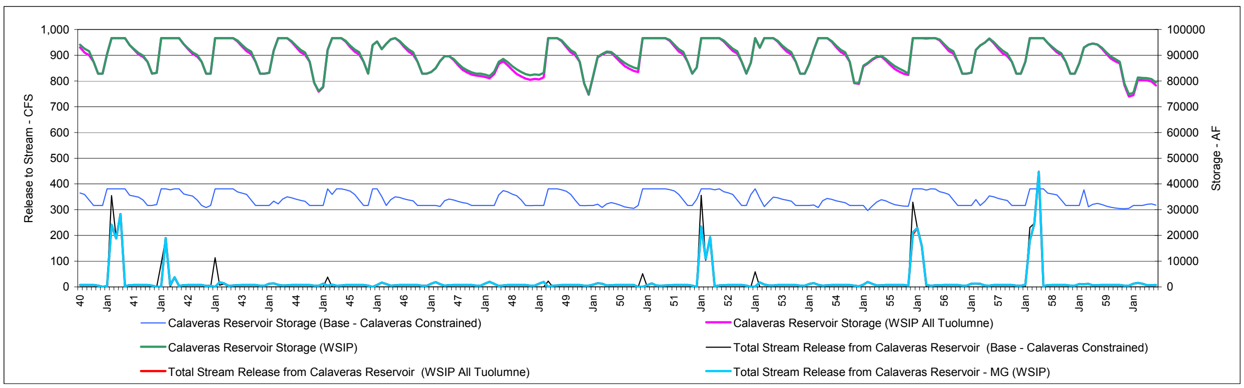
Comparing the variant and WSIP settings, with no differences in releases from Calaveras Dam to the stream, and no differences to spills at Alameda Creek Diversion Dam, flow below the Alameda Creek and Calaveras Creek confluence will be the same for each setting. Table 2.6-5 illustrates the flow below the confluence for the variant and WSIP settings, and the similarity in flow between the two. Table 2.6-6 provides the same form of information for the variant and base settings. The notable differences between the variant and the base settings (comparable to the difference between the WSIP and base settings) are the addition of required stream flows for the 1997 MOU and the reduction of wetter-year/wet-season flows due to the restoration of Calaveras Reservoir storage.

Figure 2.6-1
Calaveras Reservoir Storage and Stream Release

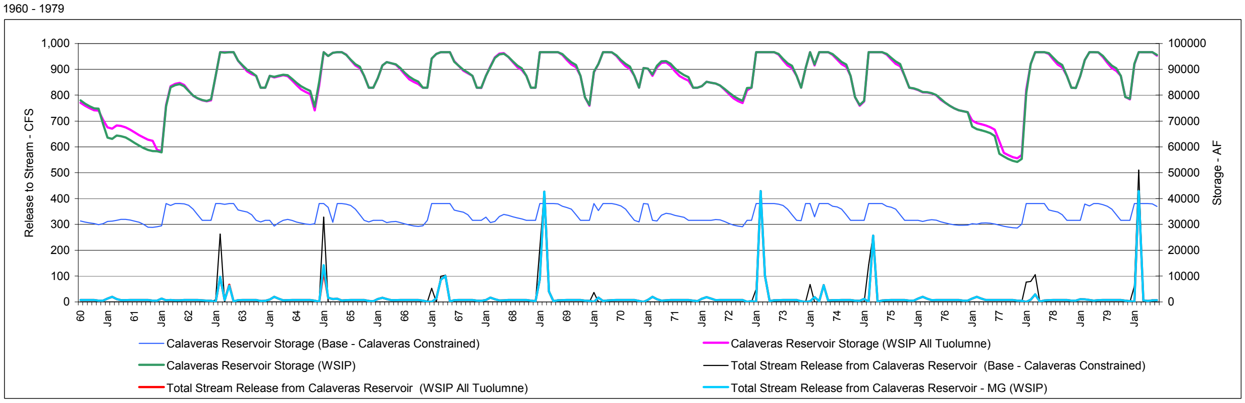
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

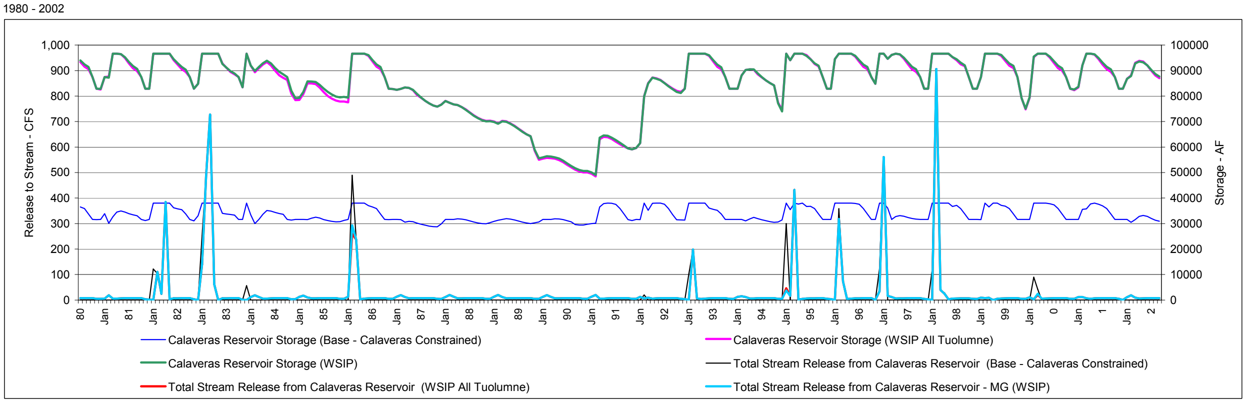
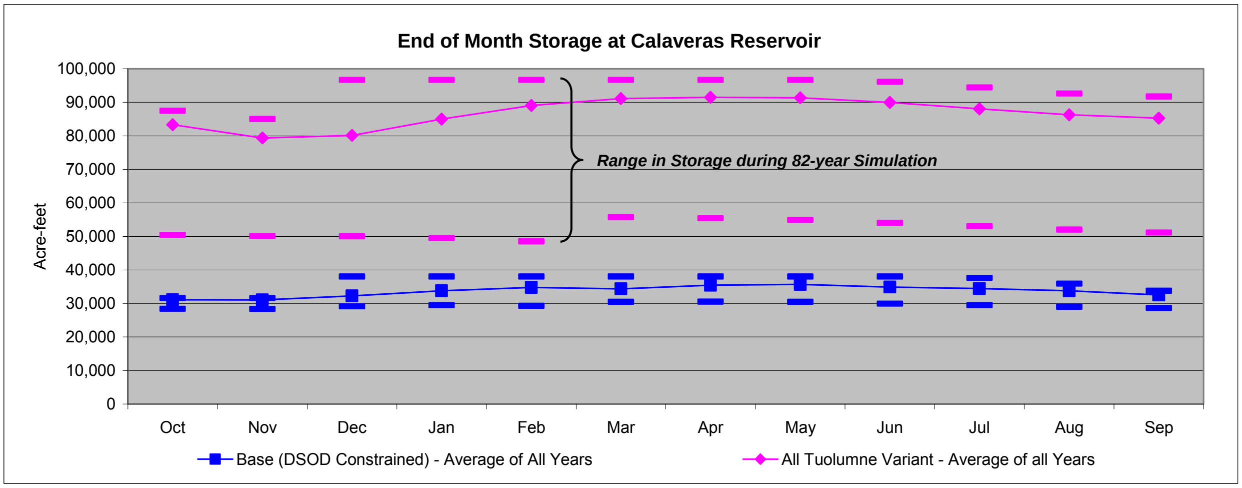


Figure 2.6-2



End of Month Storage at Calaveras Reservoir
100,000
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
Acre-feet
Range in Storage during 82-year Simulation
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Base (DSOD Constrained) - Average of All Years
All Tuolumne Variant - Average of all Years

Table 2.6-1

Difference in Total Stream Release from Calaveras Reservoir (Acre-feet)

WSIP All Tuolumne minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	0	0	0	0	0	0	0	0
1922	0	0	0	0	0	0	0	0	0	0	0	0	0
1923	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	0	0	0	0	0
1928	0	0	0	0	0	0	0	0	0	0	0	0	0
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	0	0	0	0	0	0	0	0	0
1937	0	0	0	0	0	0	0	0	0	0	0	0	0
1938	0	0	0	0	24	0	0	0	0	0	0	0	24
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	-5,532	0	0	0	0	0	0	0	-5,532
1941	0	0	0	0	0	0	0	0	0	0	0	0	0
1942	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	0	0	0	0	0	0	0	0	0
1946	0	0	0	0	0	0	0	0	0	0	0	0	0
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	-486	0	0	0	0	0	0	0	0	0	-486
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	-59	0	216	0	0	0	0	0	157
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	-1,458	0	0	0	0	0	0	0	0	-1,458
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	-259	0	0	0	0	0	0	0	-259
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	-1,832	0	0	0	0	0	0	0	-1,832
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	525	0	0	0	0	0	0	0	0	525
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	-259	0	0	0	0	0	0	-259
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	0	0	-6	-11	-93	-3	3	0	0	0	0	0	-111

Table 2.6-2

Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP All Tuolumne

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	1,035	5,118	15,008	10,007	5,085	255	387	417	425	415	38,828
Above Normal	425	258	172	725	3,337	2,834	650	327	396	423	428	417	10,391
Normal	429	275	195	548	725	556	264	370	408	428	430	417	5,046
Below Normal	429	276	246	672	876	596	345	389	411	429	430	417	5,515
Dry	429	292	281	778	1,044	747	374	407	416	430	430	417	6,045
All Years	428	269	382	1,547	4,147	2,918	1,323	350	403	426	428	417	13,038

Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	1,065	5,085	15,137	10,007	5,085	255	387	417	425	415	38,955
Above Normal	425	258	172	811	3,666	2,849	637	327	396	423	428	417	10,808
Normal	429	275	195	548	725	556	264	370	408	428	430	417	5,046
Below Normal	429	276	246	672	876	596	345	389	411	429	430	417	5,515
Dry	429	292	281	778	1,044	747	374	407	416	430	430	417	6,045
All Years	428	269	387	1,558	4,240	2,921	1,321	350	403	426	428	417	13,149

Difference in Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP All Tuolumne minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-30	33	-129	0	0	0	0	0	0	0	-127
Above Normal	0	0	0	-86	-329	-15	13	0	0	0	0	0	-417
Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-6	-11	-93	-3	3	0	0	0	0	0	-111

Table 2.6-3

Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP All Tuolumne

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	1,035	5,118	15,008	10,007	5,085	255	387	417	425	415	38,828
Above Normal	425	258	172	725	3,337	2,834	650	327	396	423	428	417	10,391
Normal	429	275	195	548	725	556	264	370	408	428	430	417	5,046
Below Normal	429	276	246	672	876	596	345	389	411	429	430	417	5,515
Dry	429	292	281	778	1,044	747	374	407	416	430	430	417	6,045
All Years	428	269	382	1,547	4,147	2,918	1,323	350	403	426	428	417	13,038

Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	1,736	9,221	16,641	9,968	5,024	0	0	0	0	0	42,590
Above Normal	0	0	184	2,731	5,911	3,096	459	0	0	0	0	0	12,382
Normal	0	0	216	364	882	353	0	0	0	0	0	0	1,815
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	419	2,437	4,645	2,656	1,076	0	0	0	0	0	11,232

Difference in Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP All Tuolumne minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	-701	-4,103	-1,633	39	61	255	387	417	425	415	-3,762
Above Normal	425	258	-12	-2,006	-2,574	-262	190	327	396	423	428	417	-1,992
Normal	429	275	-22	184	-157	204	264	370	408	428	430	417	3,231
Below Normal	429	276	246	672	876	596	345	389	411	429	430	417	5,515
Dry	429	292	281	778	1,044	747	374	407	416	430	430	417	6,045
All Years	428	269	-38	-889	-498	262	248	350	403	426	428	417	1,806

Table 2.6-4

Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP All Tuolumne

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	28	1,379	6,172	7,982	5,751	2,962	116	0	0	0	0	24,389
Above Normal	7	23	628	2,532	4,002	3,075	969	0	0	0	0	0	11,237
Normal	0	6	377	264	900	459	117	6	0	0	0	0	2,129
Below Normal	0	0	18	45	106	191	2	0	0	0	0	0	361
Dry	0	0	17	0	163	0	6	0	0	0	0	0	186
All Years	1	12	480	1,790	2,616	1,889	803	24	0	0	0	0	7,615

Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	28	1,379	6,967	8,099	5,757	2,972	130	0	0	0	0	25,331
Above Normal	7	23	1,184	3,672	5,292	3,096	692	0	0	0	0	0	13,968
Normal	0	6	914	868	1,785	906	126	6	0	0	0	0	4,611
Below Normal	0	0	18	45	106	191	2	0	0	0	0	0	361
Dry	0	0	17	0	163	0	6	0	0	0	0	0	186
All Years	1	12	700	2,299	3,079	1,982	750	27	0	0	0	0	8,849

Difference in Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP All Tuolumne minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	-794	-117	-6	-10	-15	0	0	0	0	-942
Above Normal	0	0	-556	-1,140	-1,290	-21	277	0	0	0	0	0	-2,731
Normal	0	0	-537	-604	-885	-447	-10	0	0	0	0	0	-2,482
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-220	-509	-463	-93	54	-3	0	0	0	0	-1,234

Table 2.6-5

Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP All Tuolumne

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	430	326	2,758	12,299	24,178	16,744	8,649	548	417	429	430	417	67,624
Above Normal	437	327	1,044	3,855	8,115	6,470	1,929	430	417	430	430	417	24,301
Normal	428	301	781	966	2,011	1,294	481	435	409	430	430	417	8,383
Below Normal	428	295	319	853	1,216	809	419	417	413	427	428	416	6,442
Dry	429	298	324	809	1,274	712	423	428	417	430	430	417	6,391
All Years	430	309	1,036	3,723	7,293	5,167	2,351	451	415	429	429	417	22,451

Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	430	326	2,789	12,266	24,307	16,744	8,649	548	417	429	430	417	67,751
Above Normal	437	327	1,116	3,941	8,459	6,506	1,917	430	417	430	430	417	24,826
Normal	428	301	781	966	2,004	1,294	481	435	409	430	430	417	8,375
Below Normal	428	295	319	853	1,216	809	419	417	413	427	428	416	6,442
Dry	429	298	324	809	1,274	712	423	428	417	430	430	417	6,391
All Years	430	309	1,057	3,734	7,388	5,175	2,348	451	415	429	429	417	22,583

Difference in Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP All Tuolumne minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-30	33	-129	0	0	0	0	0	0	0	-127
Above Normal	0	0	-72	-86	-344	-36	13	0	0	0	0	0	-525
Normal	0	0	0	0	7	0	0	0	0	0	0	0	7
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-21	-11	-95	-7	3	0	0	0	0	0	-132

Table 2.6-6

Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP All Tuolumne

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	430	326	2,758	12,299	24,178	16,744	8,649	548	417	429	430	417	67,624
Above Normal	437	327	1,044	3,855	8,115	6,470	1,929	430	417	430	430	417	24,301
Normal	428	301	781	966	2,011	1,294	481	435	409	430	430	417	8,383
Below Normal	428	295	319	853	1,216	809	419	417	413	427	428	416	6,442
Dry	429	298	324	809	1,274	712	423	428	417	430	430	417	6,391
All Years	430	309	1,036	3,723	7,293	5,167	2,351	451	415	429	429	417	22,451

Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	1	80	3,460	17,197	25,927	16,711	8,598	307	30	12	4	2	72,328
Above Normal	12	68	1,612	7,001	11,980	6,754	1,462	103	22	6	2	1	29,023
Normal	-1	26	1,340	1,386	3,053	1,537	226	65	1	2	0	0	7,634
Below Normal	-1	19	73	182	341	213	74	28	3	-2	-2	-1	927
Dry	0	6	43	31	230	-35	49	21	1	0	0	0	346
All Years	2	40	1,294	5,121	8,254	4,998	2,050	104	11	4	1	0	21,879

Difference in Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP All Tuolumne minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	-701	-4,898	-1,750	33	51	241	387	417	425	415	-4,704
Above Normal	425	258	-568	-3,146	-3,865	-284	467	327	396	423	428	417	-4,722
Normal	429	275	-559	-420	-1,042	-243	255	370	408	428	430	417	748
Below Normal	429	276	246	672	876	596	345	389	411	429	430	417	5,515
Dry	429	292	281	778	1,044	747	374	407	416	430	430	417	6,045
All Years	428	269	-258	-1,399	-961	169	301	347	403	426	428	417	572

A flow recapture facility in Alameda Creek below Calaveras Reservoir is incorporated in the variant and WSIP settings. This facility is assumed to recapture flows explicitly released from Calaveras Dam for the 1997 MOU. The effect of the recapture is a reduction in the flow that occurs below the confluence of Alameda and Calaveras Creeks, but only to the extent that releases were explicitly made from Calaveras Reservoir for the 1997 MOU. Table 2.6-7 illustrates the flow below the confluence and upstream of the Alameda and San Antonio Creek confluence for the variant and WSIP settings, and the similarity in flow between the two. Table 2.6-8 provides the same form of information for the variant and base settings. The flows at this location are indicative of flow occurring below the confluence of Alameda and Calaveras Creeks (described above), with the addition of estimated stream accretions between the Alameda and Calaveras Creek confluence and the Alameda and San Antonio Creek confluence, minus the water assumed to be recaptured (diverted) from the creek by the SFPUC.

Table 2.6-7

Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP All Tuolumne

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,150	13,646	25,702	17,847	9,299	498	76	33	15	9	70,436
Above Normal	19	150	1,240	4,373	8,802	6,881	2,180	217	54	20	9	6	23,952
Normal	7	64	922	913	1,844	1,269	469	134	28	9	4	3	5,665
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	1,107	3,850	7,407	5,325	2,409	197	38	14	7	4	20,456

Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,180	13,613	25,832	17,847	9,299	498	76	33	15	9	70,563
Above Normal	19	150	1,312	4,459	9,146	6,916	2,168	217	54	20	9	6	24,477
Normal	7	64	922	913	1,837	1,269	469	134	28	9	4	3	5,658
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	1,128	3,862	7,502	5,333	2,407	197	38	14	7	4	20,588

Difference in Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP All Tuolumne minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-30	33	-129	0	0	0	0	0	0	0	-127
Above Normal	0	0	-72	-86	-344	-36	13	0	0	0	0	0	-525
Normal	0	0	0	0	7	0	0	0	0	0	0	0	7
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-21	-11	-95	-7	3	0	0	0	0	0	-132

Table 2.6-8

Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP All Tuolumne

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,150	13,646	25,702	17,847	9,299	498	76	33	15	9	70,436
Above Normal	19	150	1,240	4,373	8,802	6,881	2,180	217	54	20	9	6	23,952
Normal	7	64	922	913	1,844	1,269	469	134	28	9	4	3	5,665
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	1,107	3,850	7,407	5,325	2,409	197	38	14	7	4	20,456

Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,968	18,668	27,692	17,977	9,358	513	76	33	15	9	78,470
Above Normal	19	150	1,981	7,819	13,060	7,467	1,861	217	54	20	9	6	32,664
Normal	7	64	1,676	1,881	3,611	2,007	479	134	28	9	4	3	9,902
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	1,567	5,733	9,022	5,616	2,356	199	38	14	7	4	24,656

Difference in Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP All Tuolumne minus Base - Calaveras Constrained

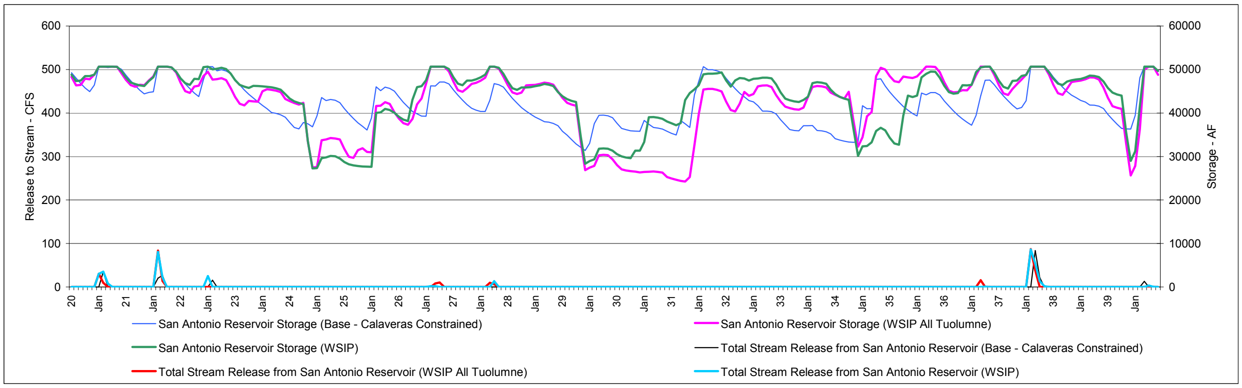
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-818	-5,022	-1,989	-131	-59	-15	0	0	0	0	-8,034
Above Normal	0	0	-740	-3,445	-4,259	-586	319	0	0	0	0	0	-8,711
Normal	0	0	-753	-968	-1,767	-738	-10	0	0	0	0	0	-4,236
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-460	-1,883	-1,616	-291	53	-3	0	0	0	0	-4,200

Compared to the WSIP setting, San Antonio Reservoir operations in the variant setting generally mirror the changes experienced for Calaveras Reservoir operations. Figure 2.6-3 illustrates a chronological trace of the simulation of San Antonio Reservoir storage and stream releases from the dam. Shown in Figure 2.6-3 are the results for the WSIP, variant, and base settings. The difference in San Antonio Reservoir storage between the variant and WSIP settings is mostly caused by the interaction of the increased demand served by the system's resources (300 mgd for the variant and a net 290 demand for the WSIP) and the operation of the SJPL. Mirroring the Calaveras Reservoir effect, the systematic minor decrease in reservoir storage in most years is due to the additional demand drawing slightly more water from the Bay Area reservoirs during the summer when the SJPL is operating at maximum capacity. In a few instances, storage is greater in the variant setting. This occurs when greater water delivery reductions are required in the variant setting, thus reducing the draw from Bay Area reservoirs as compared to the WSIP setting.

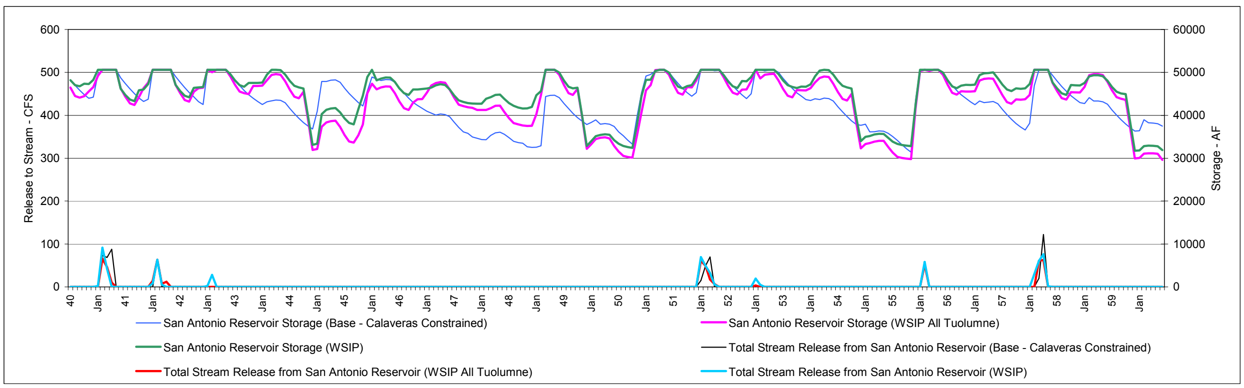
The effect of the difference in San Antonio Reservoir storage depends on modeling assumptions for the balancing of total Bay Area reservoir storage among the five major SFPUC reservoirs. The model balances storage between reservoirs by way of an input file by the modeler concerning the relative draw (percentage) from each reservoir under various storage conditions. These are discretionary input in the model, and the logic and relative percentages are meant to mimic the current practice and

Figure 2.6-3
San Antonio Reservoir Storage and Stream Release

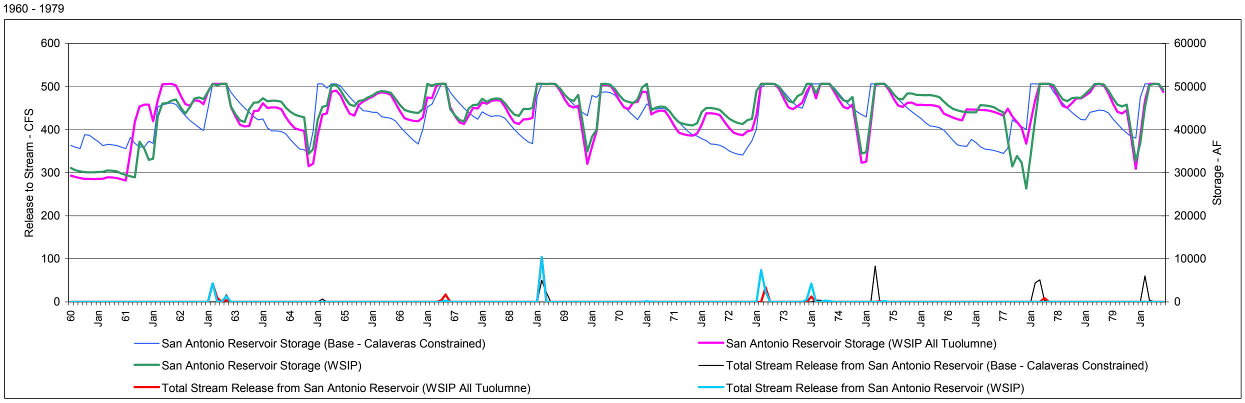
1920 - 1939



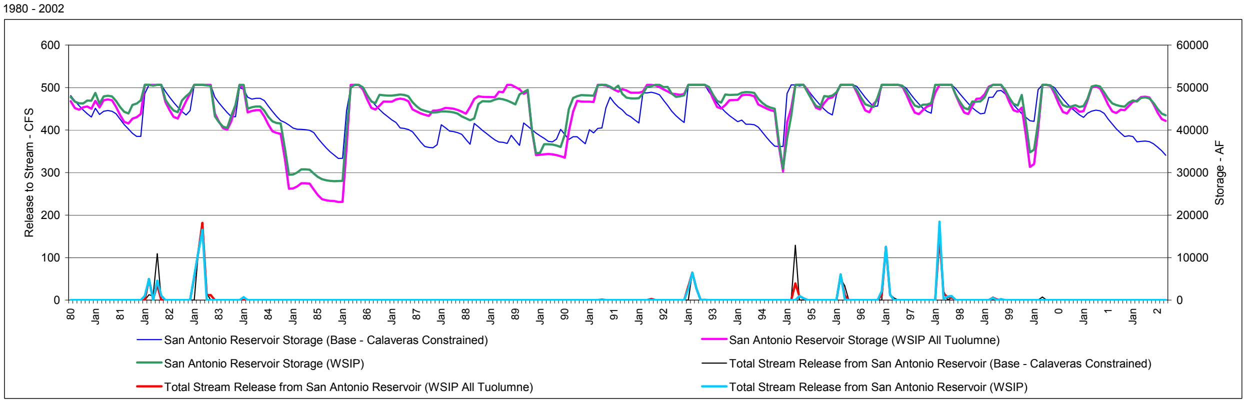
1940 - 1959



1960 - 1979



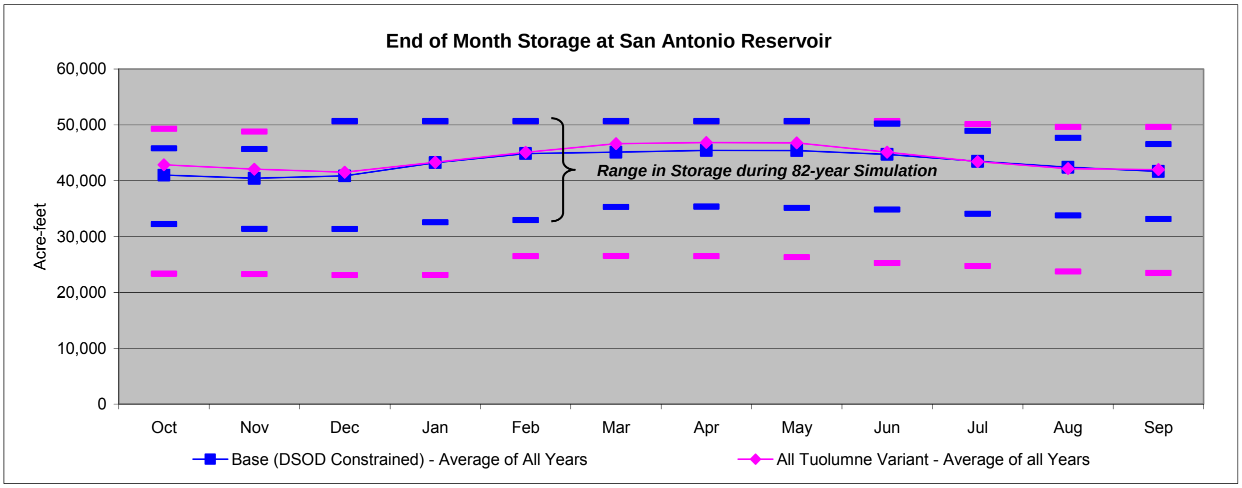
1980 - 2002



discretion of the system operators based on recognition of the physical conveyance constraints within the system and the ability of each reservoir to provide yield and water delivery security.

The difference in storage between the variant and WSIP settings and the base setting is due to the restoration of the operational capacity of Calaveras Reservoir. In the base setting, the limited operating storage capacity at Calaveras leads to a different operation at San Antonio Reservoir, one that provides relatively more stored water for system demands when the draw from Calaveras Reservoir is constrained because of limited storage. There is also a notable difference in storage operation between the variant and WSIP settings and the base setting every fifth year. Assumed systematic maintenance of Hetch Hetchy conveyance facilities occurs in the simulation that constrains diversions to the Bay Area from Hetch Hetchy every fifth year. The reduction in diversion from Hetch Hetchy during these periods is accommodated in the system by additional water draws from the Bay Area reservoirs. The proportionate share of this operation is evident in the tracing of San Antonio Reservoir storage for the variant and WSIP settings. Figure 2.6-4 illustrates the average monthly storage in Calaveras Reservoir for the 82-year simulation, and the range in storage for each month for the variant and base settings.

Figure 2.6-4



There would very little change in stream releases below San Antonio Reservoir between the variant and WSIP settings. Table 2.6-9 illustrates the modeled release to San Antonio Creek from San Antonio Reservoir for the two settings and the differences for the average release during a year type. With a slightly lower reservoir operation at times during the winter, as seen in Figure 2.6-4, an increase in the ability to regulate reservoir inflow and avoid stream releases would be expected. Given the sometimes rigid constraints of the modeling assumptions, the model will overestimate the frequency and magnitude of stream releases from San Antonio Reservoir under any of the investigated settings. The flexibility that occurs in actual operations would likely serve to avoid most of the releases represented by the model. The modeled stream releases from San Antonio Reservoir and difference between releases for the variant and base setting are shown in Table 2.6-10. The differences among the two settings range from increases to decreases in flow. This modeled circumstance reflects the different resulting storage operation between the two settings, as seen in Figure 2.6-3. In some circumstances, the base setting storage at San Antonio Reservoir could be higher than projected for the variant setting during the same period. This circumstance could lead to an occasionally greater modeled release for the base setting, which would be reflected in the results. As described above, the model will overestimate the frequency and magnitude of releases from San Antonio Reservoir, and the actual releases from San Antonio Reservoir in any setting and the difference between settings are expected to be minor.

Flow below the confluence of Alameda and San Antonio Creeks is influenced by releases from San Antonio Creek and flow arriving at the location from Alameda Creek, which includes upstream impairment by SFPUC operations and facilities. Table 2.6-11 illustrates the flow below the confluence for the variant and WSIP settings, and the differences in flow between the two.

Table 2.6-9

Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP All Tuolumne

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	0	0	44	976	2,593	1,695	584	149	0	0	0	0	6,041	6,041
Above Normal	0	0	0	268	848	329	82	16	0	0	0	0	1,544	1,544
Normal	0	0	0	13	0	37	34	0	0	0	0	0	84	84
Below Normal	0	0	0	0	0	0	3	0	0	0	0	0	3	3
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	9	249	682	406	138	32	0	0	0	0	1,516	1,516

Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	0	0	82	1,046	3,176	1,482	592	115	0	0	0	0	6,493	6,493
Above Normal	0	0	19	456	1,025	237	29	73	0	0	0	0	1,841	1,841
Normal	0	0	0	105	16	0	50	0	0	0	0	0	172	172
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	20	319	835	338	131	38	0	0	0	0	1,682	1,682

Difference in Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP All Tuolumne minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	0	0	-38	-71	-582	214	-7	34	0	0	0	0	-451	-451
Above Normal	0	0	-19	-188	-177	93	53	-57	0	0	0	0	-296	-296
Normal	0	0	0	-92	-16	37	-17	0	0	0	0	0	-89	-89
Below Normal	0	0	0	0	0	0	3	0	0	0	0	0	3	3
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-11	-71	-153	68	7	-5	0	0	0	0	-166	-166

Table 2.6-10

Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP All Tuolumne

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	44	976	2,593	1,695	584	149	0	0	0	0	6,041
Above Normal	0	0	0	268	848	329	82	16	0	0	0	0	1,544
Normal	0	0	0	13	0	37	34	0	0	0	0	0	84
Below Normal	0	0	0	0	0	0	3	0	0	0	0	0	3
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	9	249	682	406	138	32	0	0	0	0	1,516

Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	538	2,350	2,480	1,324	88	0	0	0	0	6,780
Above Normal	0	0	0	0	881	883	12	58	0	0	0	0	1,835
Normal	0	0	0	0	1	0	0	0	0	0	0	0	1
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	0	105	641	667	261	29	0	0	0	0	1,703

Difference in Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP All Tuolumne minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	44	437	243	-785	-739	61	0	0	0	0	-739
Above Normal	0	0	0	268	-33	-554	70	-42	0	0	0	0	-290
Normal	0	0	0	13	-1	37	34	0	0	0	0	0	83
Below Normal	0	0	0	0	0	0	3	0	0	0	0	0	3
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	9	143	41	-261	-122	3	0	0	0	0	-187

Table 2.6-11

Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP All Tuolumne

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,194	14,621	28,296	19,542	9,883	647	76	33	15	9	76,477
Above Normal	19	150	1,240	4,642	9,649	7,210	2,263	233	54	20	9	6	25,497
Normal	7	64	922	926	1,844	1,306	503	134	28	9	4	3	5,749
Below Normal	7	56	183	404	682	678	160	91	20	5	3	2	2,292
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	1,115	4,099	8,088	5,732	2,547	229	38	14	7	4	21,972

Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,262	14,659	29,007	19,329	9,890	614	76	33	15	9	77,055
Above Normal	19	150	1,332	4,916	10,171	7,153	2,197	290	54	20	9	6	26,318
Normal	7	64	922	1,019	1,853	1,269	519	134	28	9	4	3	5,830
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	1,148	4,181	8,337	5,671	2,538	234	38	14	7	4	22,270

Difference in Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP All Tuolumne minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-68	-38	-711	214	-7	34	0	0	0	0	-578
Above Normal	0	0	-92	-274	-521	57	66	-57	0	0	0	0	-821
Normal	0	0	0	-92	-9	37	-17	0	0	0	0	0	-81
Below Normal	0	0	0	0	0	0	3	0	0	0	0	0	3
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-32	-82	-249	61	10	-5	0	0	0	0	-298

Table 2.6-12 illustrates the same information in comparing the variant and base settings. Table 2.6-11 illustrates the minor modeled differences in flow that occur between the variant and WSIP settings, while Table 2.6-12 illustrates the relatively larger differences in flow that could occur between the variant and base settings. The difference is particularly due to the effects of the restoration of Calaveras Reservoir operating capacity in the variant setting.

Table 2.6-12

Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP All Tuolumne

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,194	14,621	28,296	19,542	9,883	647	76	33	15	9	76,477
Above Normal	19	150	1,240	4,642	9,649	7,210	2,263	233	54	20	9	6	25,497
Normal	7	64	922	926	1,844	1,306	503	134	28	9	4	3	5,749
Below Normal	7	56	183	404	682	678	160	91	20	5	3	2	2,292
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	1,115	4,099	8,088	5,732	2,547	229	38	14	7	4	21,972

Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,968	19,206	30,042	20,458	10,681	601	76	33	15	9	85,250
Above Normal	19	150	1,981	7,819	13,941	8,350	1,873	276	54	20	9	6	34,498
Normal	7	64	1,676	1,881	3,612	2,007	479	134	28	9	4	3	9,902
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	1,567	5,838	9,664	6,284	2,617	229	38	14	7	4	26,359

Difference in Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP All Tuolumne minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-774	-4,585	-1,746	-916	-798	47	0	0	0	0	-8,772
Above Normal	0	0	-740	-3,177	-4,291	-1,140	389	-42	0	0	0	0	-9,001
Normal	0	0	-753	-955	-1,768	-701	24	0	0	0	0	0	-4,154
Below Normal	0	0	0	0	0	0	3	0	0	0	0	0	3
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-452	-1,740	-1,575	-552	-70	0	0	0	0	0	-4,388

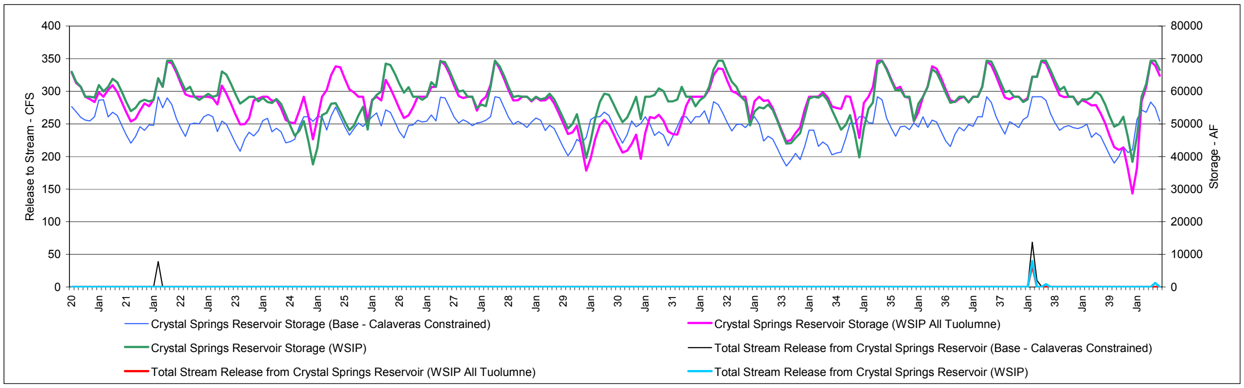
2.7 Crystal Springs and San Andreas Reservoirs

There are differences in Crystal Springs Reservoir operations between the variant and WSIP settings. Figure 2.7-1 illustrates a chronological trace of the simulation of Crystal Springs Reservoir storage and stream releases from Crystal Springs Dam. Shown in Figure 2.7-1 are the results for the WSIP, variant, and base settings. The difference in Crystal Springs Reservoir storage between the variant and WSIP setting is caused by the interaction of the increased demand served by the system's resources (300 mgd for the variant and a net 290 demand for the WSIP) and the operation of the SJPL and Bay Diversion Pipelines (BDPL). Generally, the systematic decrease in reservoir storage is due to the additional demand drawing more water from the Bay Area system reservoirs during the summer when the SJPL is operating at maximum capacity. A portion of this additional draw is focused on Crystal Springs Reservoir. Subsequent to the additional draw of storage, Hetch Hetchy would attempt to replenish the Bay Area system reservoirs. However, there are modeled circumstances in which the coincidence of SJPL or BDPL capacity constraints would inhibit the ability to replenish Crystal Springs Reservoir storage. During these periods, Crystal Springs Reservoir storage would be lower in the variant setting than in the WSIP setting. The exception to the lower storage condition would be during periods when the variant condition leads to greater delivery shortages (rationing, and therefore less delivery) or the initiation of drought water supplies (in this setting, the offset of demand with the Westside Groundwater Program). During these periods, Crystal Springs Reservoir storage becomes greater in the variant setting than in the WSIP setting because of the lesser need for water from the reservoirs. The magnitude of the additional draw of storage from Crystal Springs Reservoir and the lesser draw from storage during drought partially depends on the discretionary assumptions of the model that proportion the use of storage among the Bay Area system reservoirs. In actual operations, some of the differences in result may not occur as system operators and prevailing hydraulic and hydrologic conditions may direct the operational effect of the different demand to an alternative apportionment of effect among the reservoirs. Figure 2.7-2 illustrates the average monthly storage in Crystal Springs Reservoir for the 82-year simulation, and the range in storage for each month for the variant and WSIP settings.

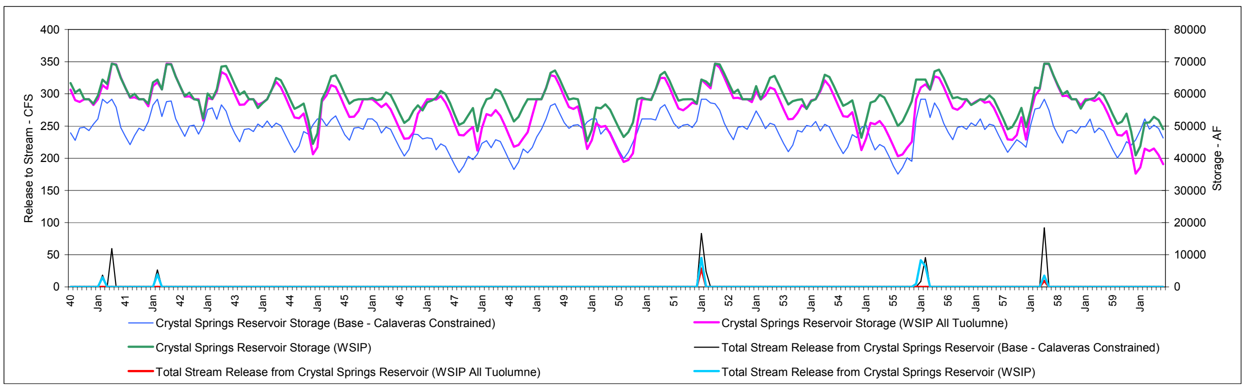
Figure 2.7-3 illustrates the average monthly storage in Crystal Springs Reservoir for the 82-year simulation, and the range in storage for each month for the variant and base settings. Consistent with the comparison of the WSIP and base settings, the variant setting would result in reservoir storage operating at a higher

Figure 2.7-1
Crystal Springs Reservoir Storage and Release

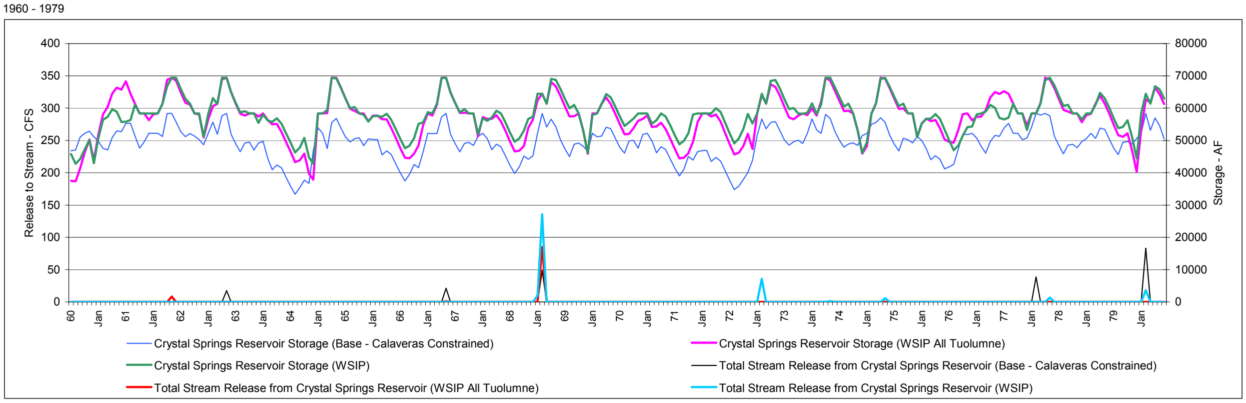
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

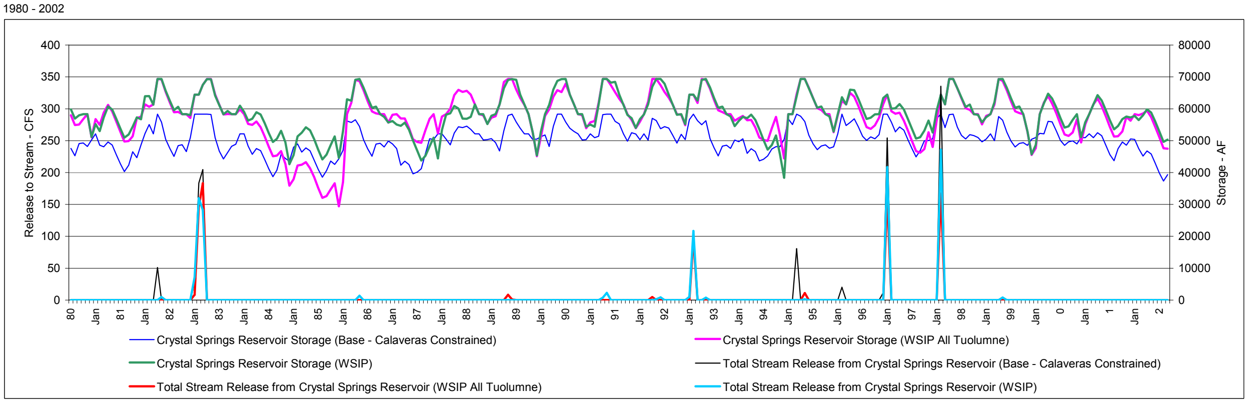


Figure 2.7-2

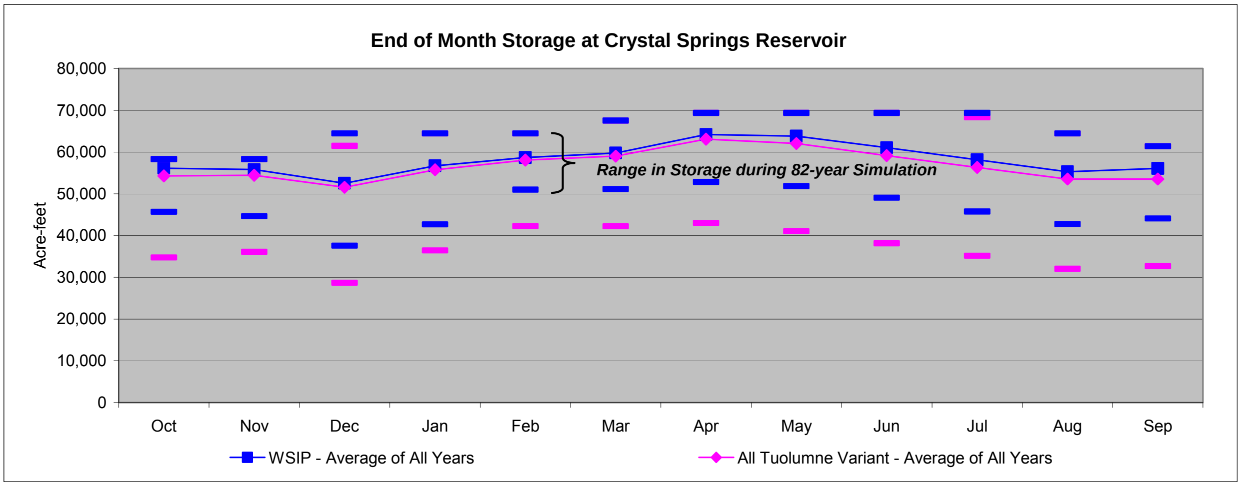
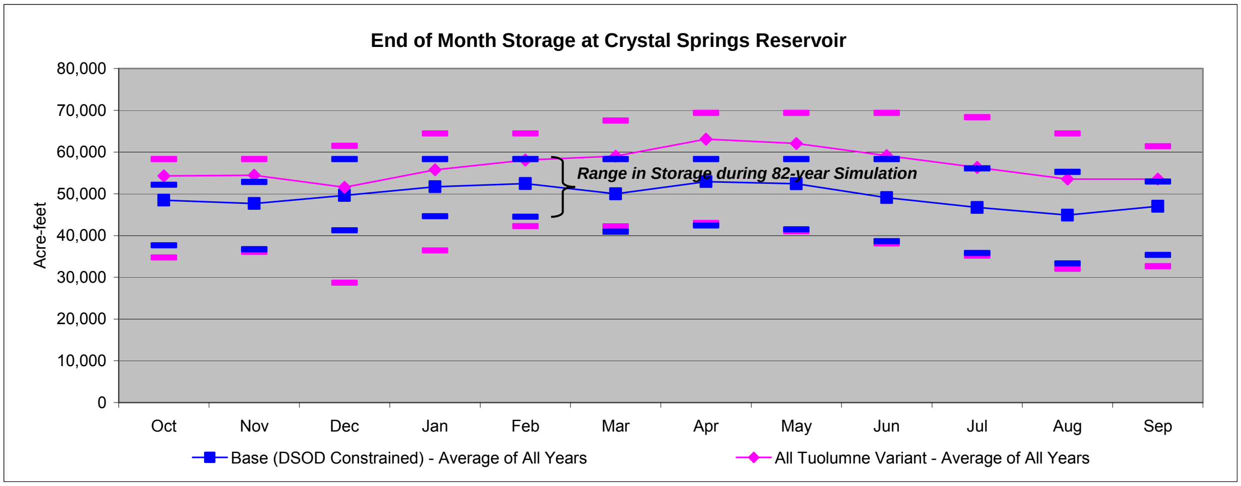


Figure 2.7-3



average and higher upper-range than the base setting. This occurs due to the restoration of the operating capacity of Crystal Springs Reservoir.

Table 2.7-1 illustrates the modeled variant and WSIP stream releases from Crystal Springs Reservoir and the differences between the two settings. Modeling results indicate that, within a month, either an increase or decrease in the occasional release could occur. The potential difference is attributed to whether the different resulting storage in the reservoir is higher or lower between the two settings. Part of the difference in modeled Crystal Springs Reservoir storage is due to modeling assumptions for the proportionate balancing of storage among the Bay Area reservoirs, and the coincidence of assumed system-wide maintenance with less than favorable hydrologic conditions. In actual operations, it is anticipated that system operators would manage the reservoir system such that stream releases would be minimal under any setting, with the effect of essentially no difference between the variant and WSIP settings. Modeling results indicate that there would be releases in only 16 months of the 6-month January-through-May period of the 82-years of simulation.

Table 2.7-2 illustrates the stream releases for the variant and base settings and the difference in modeled flows between the two settings. A greater operating range in Crystal Springs Reservoir operation would lead to an increased potential to regulate reservoir inflow, which would lead to less risk in needing to make stream releases. However, as described above, actual system operations would attempt to minimize releases under any setting; thus, the difference in releases between the variant and base setting would be minimal, if any.

Table 2.7-1

Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP All Tuolumne

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	768	1,496	704	35	46	0	0	0	0	3,049
Above Normal	0	0	0	0	314	0	0	0	0	0	0	0	314
Normal	0	0	0	0	0	0	18	32	0	0	0	0	50
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	32	3	0	0	0	35
All Years	0	0	0	150	357	137	10	21	1	0	0	0	677

Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	17	1,309	2,398	542	65	65	0	0	0	0	4,397
Above Normal	0	0	0	18	354	0	0	99	0	0	0	0	472
Normal	0	0	0	0	0	0	0	5	15	0	0	0	20
Below Normal	0	0	0	0	0	0	13	40	0	0	0	0	53
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	3	259	541	106	15	43	3	0	0	0	971

Difference in Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP All Tuolumne minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-17	-541	-902	162	-30	-20	0	0	0	0	-1,348
Above Normal	0	0	0	-18	-40	0	0	-99	0	0	0	0	-157
Normal	0	0	0	0	0	0	18	27	-15	0	0	0	29
Below Normal	0	0	0	0	0	0	-13	-40	0	0	0	0	-53
Dry	0	0	0	0	0	0	0	32	3	0	0	0	35
All Years	0	0	-3	-109	-184	32	-5	-21	-2	0	0	0	-294

Table 2.7-2

Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP All Tuolumne

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	768	1,496	704	35	46	0	0	0	0	3,049
Above Normal	0	0	0	0	314	0	0	0	0	0	0	0	314
Normal	0	0	0	0	0	0	18	32	0	0	0	0	50
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	32	3	0	0	0	35
All Years	0	0	0	150	357	137	10	21	1	0	0	0	677

Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	44	1,433	2,889	1,134	756	81	0	0	0	0	6,336
Above Normal	0	0	0	0	608	0	0	63	0	0	0	0	671
Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	9	280	690	221	147	29	0	0	0	0	1,375

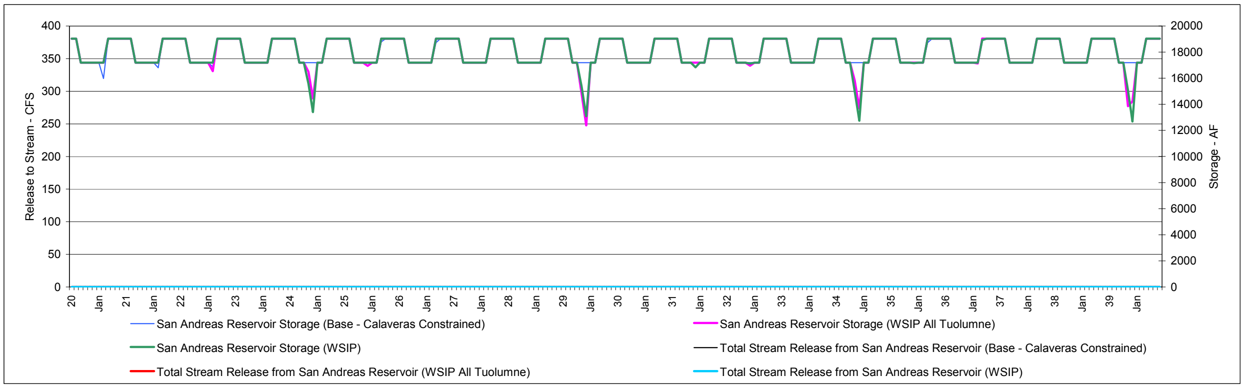
Difference in Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP All Tuolumne minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-44	-665	-1,393	-430	-721	-35	0	0	0	0	-3,287
Above Normal	0	0	0	0	-294	0	0	-63	0	0	0	0	-357
Normal	0	0	0	0	0	0	18	32	0	0	0	0	50
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	32	3	0	0	0	35
All Years	0	0	-9	-130	-333	-84	-137	-7	1	0	0	0	-699

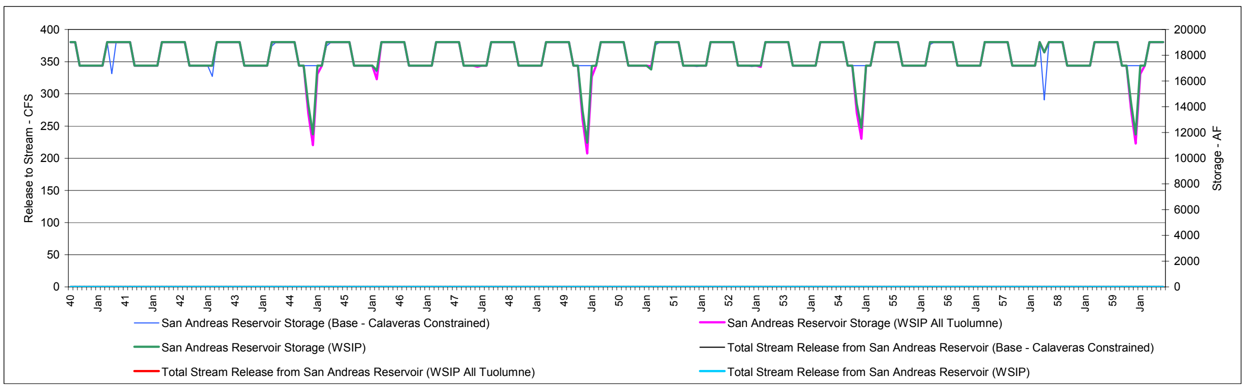
San Andreas Reservoir operations would generally be the same between the variant and WSIP settings. Reservoir storage would follow a systematic filling and lowering each year. Figure 2.7-4 illustrates a chronological trace of the simulation of San Andreas Reservoir storage and stream releases from San Andreas Dam. Shown in Figure 2.7-4 are the results for the WSIP, variant, and base settings. There are no projected stream releases from San Andreas Reservoir in any setting. Notable in Figure 2.7-4 is the difference in storage operation every fifth year. Both the variant and WSIP setting storage operation differ from the base setting. This is due to the assumption that Hetch Hetchy conveyance maintenance occurs systematically every fifth year, which constrains the amount of Hetch Hetchy water supplied to serve water demands in the Bay Area. As discussed previously, during these winter periods, the Bay Area reservoir system accommodates the reduction in imported supply by serving the Bay Area water deliveries with the local watersheds' runoff and storage. At San Andreas Reservoir, the serving of water demand affects the reservoir when additional required water production at Harry Tracy Water Treatment Plant (Harry Tracy WTP) associated with WSIP or the variant exceeds the ability to maintain San Andreas Reservoir storage with pumping from Crystal Springs Reservoir. In the modeling, the conveyance capacity from Crystal Springs Reservoir is assumed to be the same among all of the settings. The additional water demand of the WSIP and variant require additional production from Harry Tracy WTP to be drawn from San Andreas Reservoir. Figure 2.7-5 illustrates the average monthly storage in San Andreas Reservoir for the 82-year simulation, and the range in storage for each month for the variant and base settings.

Figure 2.7-4
San Andreas Reservoir Storage and Stream Release

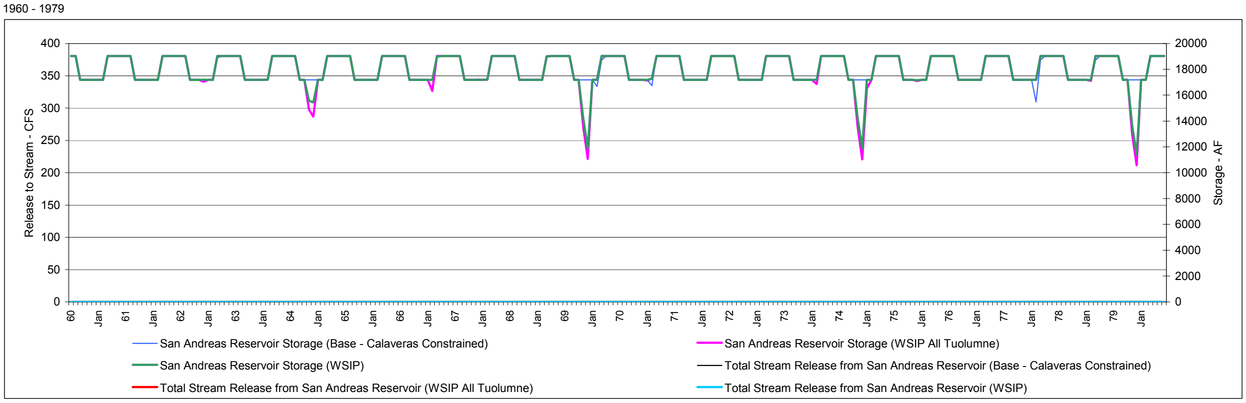
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

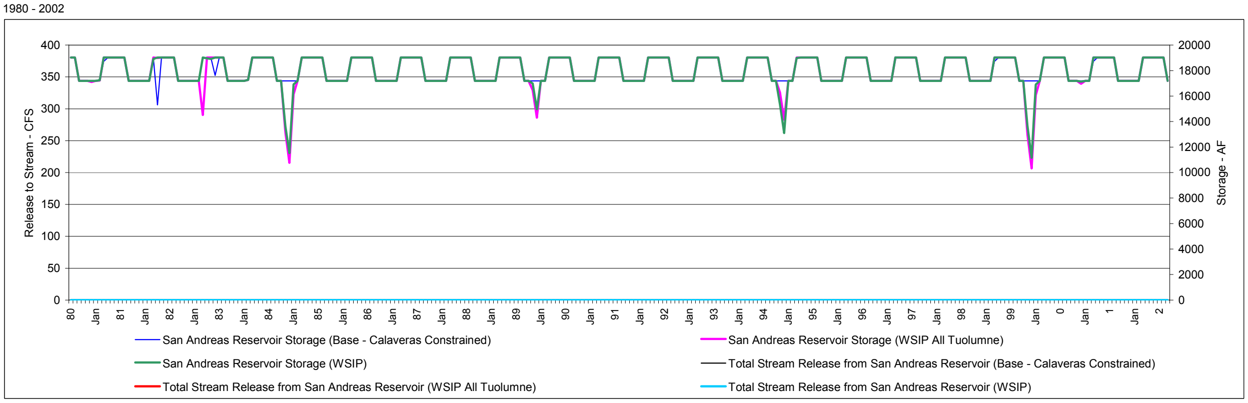
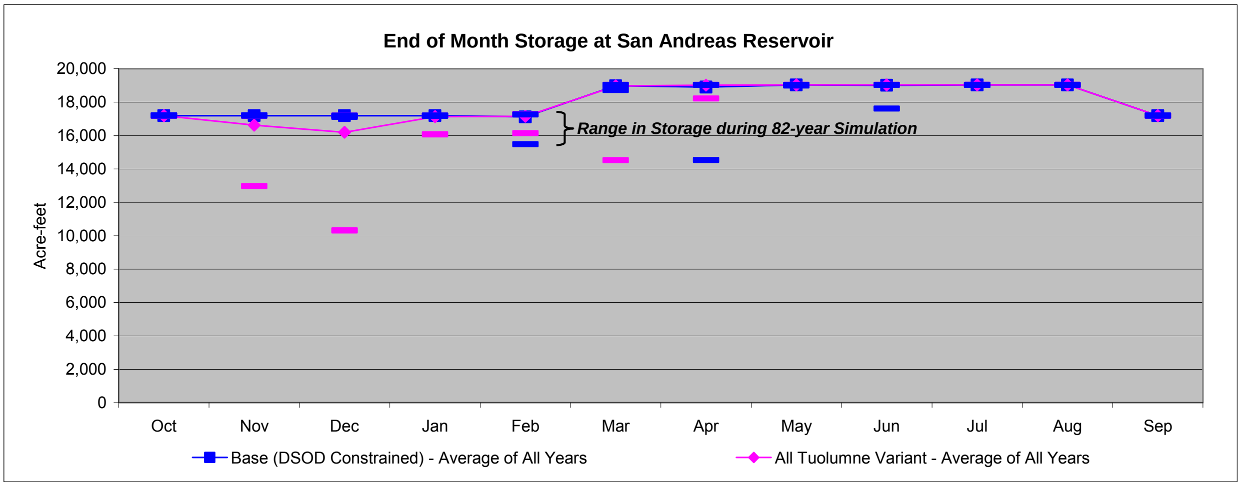


Figure 2.7-5



2.8 Pilarcitos Reservoir

Coastside County Water District's (Coastside CWD's) water demand and its SFPUC purchase request are projected to increase within the WSIP planning horizon of year 2030. Within the context of the 2030 purchase request of 300 mgd, Coastside CWD's portion has been estimated to amount to about 3 mgd. This projected purchase request is approximately 1 mgd greater than its current purchase request. Recognizing the current physical constraints to deliveries from the SFPUC to Coastside CWD and the ongoing planning activities in the watershed, there is uncertainty as to the precise manner in which Coastside CWD's additional purchase request would be served and the resultant potential changes to the operation of SFPUC facilities and their affected environs.[2]

Assuming a range of potential means to serve the additional purchase request from Coastside CWD, the following potential hydrologic effects to SFPUC facilities and their affected environs are identified:

- Due to limited yield from Pilarcitos Reservoir, additional diversions would be required from Crystal Springs Reservoir.
- If deliveries to Coastside CWD from Pilarcitos Reservoir increase during the winter season, these deliveries could potentially reduce storage in Pilarcitos Reservoir, thereby potentially reducing diversions to the San Mateo Creek watershed. Although the increased delivery would increase releases to Pilarcitos Creek from Pilarcitos Dam for a period of time, the increase would subsequently lead to a reduction in spills past Stone Dam.
- Additional wintertime deliveries could also potentially impair the ability to provide carry-over storage into the summer season from Pilarcitos Reservoir, and subsequently lead to an acceleration of the beginning of the season when releases to Pilarcitos Creek from Pilarcitos Reservoir consist only of the passage of reservoir inflow.
- An increase in summertime deliveries from Pilarcitos Creek could also accelerate the beginning of the season when releases to Pilarcitos Creek from Pilarcitos Reservoir consist only of the passage of reservoir inflow.

The variant setting could result in the same potential effects to the Pilarcitos Creek watershed as the WSIP setting.

[2] See "Analysis of SFPUC PIlarcitos/Coastside County Water District Operations", Memorandum by Daniel B. Steiner, March 8, 2007.

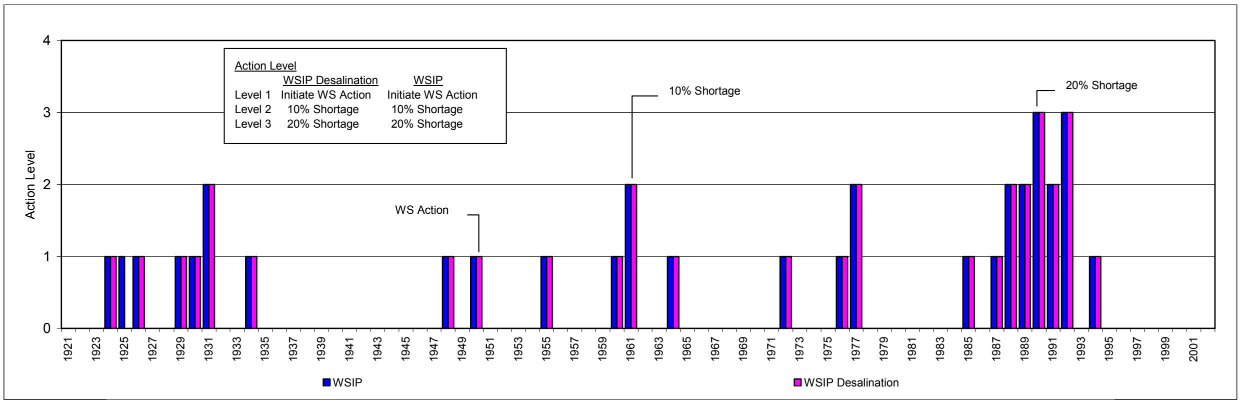
3. WSIP Variant 2 – Regional Desalination for Drought

WSIP Variant 2 – Regional Desalination for Drought (Desalination) variant programs would be the same as the WSIP programs, except that water production during drought from a desalination plant would substitute for the purchase from TID/MID. As with the WSIP, the purchase request increases from 265 mgd to 300 mgd and increase in delivery reliability would be served with a supply of 10 mgd from implementation of the Recycled Water Projects (SF-3), Local Groundwater Projects (a component of SF-2, Groundwater Projects), and additional conservation programs (RRGWC). In effect, the 10 mgd of RRGWC requires the Regional Water System's resources to serve a net 290 mgd demand. In all other aspects, this variant would include the same water supply sources as the proposed program, and integrate the same restored storage features of Calaveras and Crystal Springs Reservoirs and the incorporation of the Westside Basin Groundwater Program.

3.1 Water Deliveries and Drought Response Actions

In the WSIP, the MID/TID Tuolumne River water transfer (27,000 acre-feet) is modeled to occur each year. In the variant, this transfer does not occur, but instead 27,000 acre-feet of water offsets demand during the onset of anticipated drought. Table 1-1 compares the drought response actions for the proposed program and variant. Figure 3.1-1 illustrates the drought response actions for the simulated 82-year historical period (1921-2002).

Figure 3.1-1
Drought Response Actions – WSIP and All Tuolumne Variant



In Figure 3.1-1, years with bars showing a "1" or greater level of action indicate periods when a supplemental water supply action is initiated. In both scenarios, the action is the use of the Westside Basin Groundwater Program to supplement SFPUC water deliveries. In the variant setting, demand offset by desalination production also occurs. Action levels greater than "1" indicate the imposition of delivery shortages (rationing) to SFPUC customers. The initiation of supplemental supplies from the groundwater project and desalination occur one additional time during the 82-year simulation. The frequency of imposed delivery shortages and the severity of shortages remain the same between the variant and WSIP settings.

The same form of information is shown in Figure 3.-1-2 in comparing the variant and "Base - Calaveras Constrained" (existing) settings. In modeling parlance, there is no level 1 action level in the base setting. Without supplemental resources, the existing system only has the delivery shortage measure available to cope with drought. This shortage measure is imposed during level 2 (10 percent) and level 3 (20 percent). These percentages of shortage are applied to both the variant and the base setting for these action levels.

Figure 3.1-2
Drought Response Actions – Base and All Tuolumne Variant

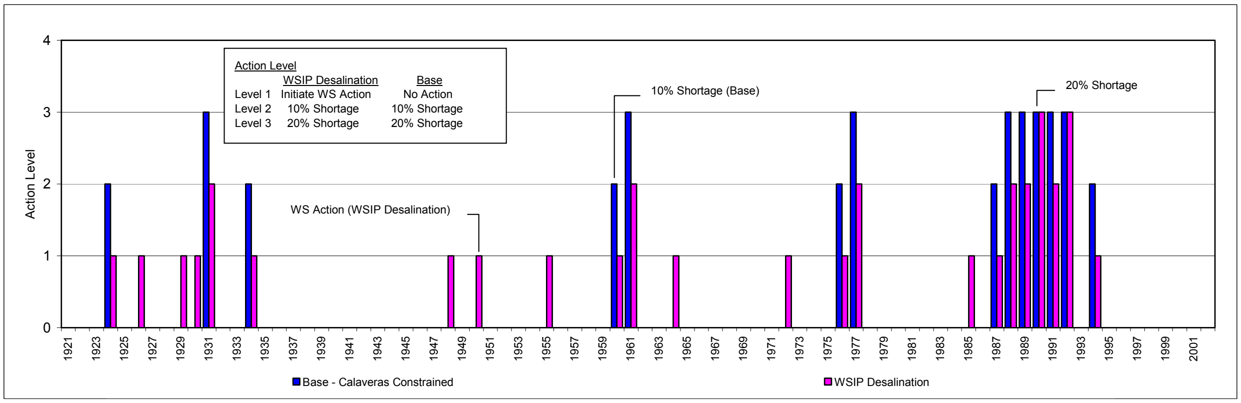


Figure 3.1-2 illustrates that, when compared to the base setting, the variant triggers the supplemental resources at an early indication of drought, during periods when in the current setting no supplemental resource is available to the system. The utilization of the supplemental resource during these times results in the lessening of (or at least a non-increase in) the severity of delivery shortage.

Not illustrated in Figure 3.1-2, but shown in Table 1-1, are the delivery shortages anticipated during the entire SFPUC Design Drought. Shortages during the Design Drought with the variant are maintained within the objective to limit the severity of shortage to no more than 20 percent, and the frequency and severity of shortages during the Design Drought are identical between the variant and WSIP settings. With the existing system, the 20 percent limitation (cap) objective cannot be achieved during the last 18 months of the Design Drought, and a 25 percent shortage is applied.

The difference in water deliveries between the proposed program and the variant is shown chronologically for the 82-year simulation in Table 3.1-1. Deliveries are almost identical between the variant and WSIP settings. The differences occur during 1925-1926 when an additional year of supplemental supply through the Westside Groundwater Program provides an offset to deliveries, and then an “increase” in demand during immediate subsequent years (1928-1929 and 1937-1938), indicating replenishment of the groundwater basin through additional deliveries to the program’s participants.

3.2 Diversions from Tuolumne River

The metric for illustrating the SFPUC diversion from the Tuolumne River Basin is the flow through the SJPL. Table 3.2-1 illustrates the difference in diversions to the SJPL between the proposed program and the variant settings. As demonstrated in Table 3.1-1, water deliveries do not substantially differ between the two scenarios. However, the water supplies for the deliveries differ. During non-drought periods, the increase in deliveries associated with the WSIP would still predominantly be met with increased diversion from the Tuolumne River in both the WSIP and variant setting. The absence of the MID/TID transfer during these years does not affect the amount of water the SFPUC can divert from the Tuolumne River, because the SFPUC has adequate rights and entitlements to do so without the TID/MID transfer water. Thus, the diversions to the SJPL during non-drought periods remain essentially the same between the two settings. The differences would occur during years when the water supply action is triggered during drought. When triggered, the offset in deliveries provided by the desalination supply reduces the need for diversions from the Tuolumne River, and thus reduces the diversion to the SJPL as compared to the WSIP setting. The effect of substituting the variant’s month-to-month desalination supply for the WSIP’s transfer supply does not directly modify the corresponding SJPL month-to-month diversion. Other system-wide storage and conveyance factors affecting the SJPL diversion rate result in the difference in diversion manifesting in less than every month in the year, but the effect would occur over the course of several years within the drought period. Table 3.2-2 illustrates the average monthly diversion through the SJPL, by year type, for the 82-year simulation period for the proposed program and the variant. Table 3.2-3 illustrates the average monthly diversion through the SJPL, by year type, for the variant and the base settings.

Table 3.1-1

Difference in Total System-wide Delivery (MG)

WSIP minus WSIP Desalination

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
1921	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1922	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1923	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	-530	-499	-454	-1,484	0
1926	-449	-419	-408	-383	-379	-423	-436	-446	-453	0	0	0	-3,795	-5,279
1927	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1928	0	0	0	0	0	0	0	0	0	224	224	217	665	0
1929	224	217	224	224	203	224	217	224	217	0	0	0	1,974	2,640
1930	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1937	0	0	0	0	0	0	0	0	0	224	224	217	665	0
1938	224	217	224	224	203	224	217	224	217	0	0	0	1,974	2,640
1939	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1941	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1942	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1946	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1947	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	0	0	0	1	0	0	0	0	0	-1	-1	0	0	0

Table 3.2-1

Difference in Total SJPL (Acre-feet)

WSIP Desalination minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
1921	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1922	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1923	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	-1,237	0	0	0	-945	0	0	0	0	0	0	0	-2,182	-2,182
1926	0	0	0	0	-6,875	0	0	0	0	0	0	-1,197	-8,072	-6,875
1927	-7,135	-4,604	-3,805	-2,854	0	-3,805	-2,762	-1,237	-1,197	0	0	0	-27,399	-28,596
1928	0	-921	-523	-952	-859	0	1,841	0	0	0	0	0	-1,414	-1,414
1929	-2,379	0	-952	0	0	0	0	0	0	0	0	0	-3,331	-3,331
1930	-5,043	0	0	0	0	0	0	0	0	0	0	-4,880	-9,923	-5,043
1931	-7,897	-10,219	0	-8,658	-7,820	0	0	0	0	0	-2,189	-9,483	-46,266	-39,474
1932	-8,562	-5,524	3,521	-8,753	-4,468	-1,047	0	-3,996	-3,867	0	0	0	-32,696	-44,368
1933	-856	0	0	0	0	0	0	0	0	0	0	0	-856	-856
1934	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	-10,275	0	0	0	0	0	0	-2,189	-2,118	0	0	0	-14,582	-14,582
1936	-5,043	-4,603	0	-952	-859	0	0	0	0	0	0	0	-11,457	-11,457
1937	-1,427	0	0	-952	0	1,142	0	0	0	0	0	0	-1,237	-1,237
1938	-2,949	-921	0	-1,902	0	0	-1,841	0	0	0	0	0	-7,613	-7,613
1939	-952	0	952	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	0	0	-921	0	0	0	0	0	-921	-921
1941	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1942	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1946	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1947	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	-3,140	-3,775	-4,757	-2,855	-2,578	-4,757	0	-2,189	-2,118	0	0	0	-26,169	-26,169
1950	-1,903	0	0	0	0	0	0	0	0	0	0	0	-1,903	-1,903
1951	0	-9,206	0	0	0	-10,464	0	-2,189	-2,118	0	0	0	-23,977	-23,977
1952	0	-921	-951	0	0	0	0	0	0	0	0	0	-1,872	-1,872
1953	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	-1,013	0	0	0	-2,854	0	-2,189	-2,118	0	0	0	-8,174	-8,174
1957	0	-921	-1,903	952	0	0	0	0	0	0	0	0	-1,872	-1,872
1958	-1,237	0	0	0	0	0	0	0	0	0	0	0	-1,237	-1,237
1959	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	-6,905	-951	-1,998	-2,664	0	0	0	0	0	-1,237	-7,642	-21,397	-12,518
1962	-10,751	-2,394	-9,514	-6,660	-4,297	0	0	-3,140	-3,038	0	0	0	-39,794	-48,673
1963	-1,332	-1,841	-523	5,899	0	952	921	0	0	0	0	0	4,076	4,076
1964	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	-2,189	0	0	-5,708	-5,156	0	-7,826	-1,903	-1,841	0	0	0	-24,623	-24,623
1966	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	-1,902	0	0	0	0	0	0	0	0	0	-1,902	-1,902
1968	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	-2,189	-5,616	-523	0	0	0	-2,118	-2,664	-2,578	0	0	0	-15,688	-15,688
1974	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	-2,664	-2,854	-6,659	-3,806	-2,578	0	0	0	0	-7,136	-3,140	-5,801	-34,638	-18,561
1978	-4,757	-1,934	-951	-3,806	0	-2,854	-2,762	-2,949	-2,854	0	0	0	-22,867	-38,944
1979	0	921	0	0	0	0	0	0	0	0	0	0	921	921
1980	-1,237	0	0	0	0	1,902	0	0	0	0	0	0	665	665
1981	0	-921	0	-1,902	-1,718	0	0	0	0	0	0	0	-4,541	-4,541
1982	1,237	0	1,903	0	0	0	0	0	0	0	0	0	3,140	3,140
1983	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	-1,047	-3,437	-7,610	-5,524	-3,140	-3,038	0	0	0	-23,796	-23,796
1987	0	921	0	0	0	0	0	0	0	0	0	0	921	921
1988	-1,237	-2,854	0	-6,755	-5,156	0	0	0	0	0	-3,140	-9,483	-28,625	-16,002
1989	-5,708	-4,603	-2,854	-1,902	-1,718	0	0	-2,189	-2,118	-3,140	-5,043	-5,524	-34,799	-33,715
1990	-4,757	0	0	0	-2,664	0	0	0	0	-5,043	-7,610	-6,444	-26,518	-21,128
1991	-4,757	-3,682	0	-2,854	-2,578	-2,854	-2,118	-2,854	-2,762	-2,664	-1,903	-921	-29,947	-43,556
1992	-952	-2,762	-4,756	-1,902	-2,578	-1,047	-1,197	-5,043	-4,880	0	-2,854	-1,841	-29,812	-30,605
1993	-1,902	-3,682	-3,045	0	0	0	-4,603	-2,854	-2,762	0	0	0	-18,848	-23,543
1994	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	-3,140	0	0	-7,801	-5,328	0	-4,603	-1,903	-1,842	0	0	0	-24,617	-24,617
1996	-1,902	921	0	951	0	0	0	0	0	0	0	0	-30	-30
1997	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	-1,320	-975	-466	-808	-784	-406	-409	-520	-503	-219	-331	-649	-7,389	-7,389

Table 3.2-2

Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — WSIP Desalination

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	26,347	16,094	8,223	10,245	6,595	10,584	19,863	25,669	24,841	29,778	29,778	28,817	236,835	233,262
Above Normal	24,691	13,323	7,703	13,918	8,992	15,860	24,013	28,043	27,138	29,778	29,778	28,817	252,054	251,297
Normal	25,080	14,213	8,105	15,091	11,713	22,476	28,190	29,415	28,466	29,778	29,778	28,817	271,122	270,492
Below Normal	26,191	15,343	11,371	21,131	17,712	24,590	28,692	29,056	28,118	29,437	29,185	27,127	287,953	288,133
Dry	24,688	17,993	14,021	18,201	15,897	25,717	28,742	29,463	28,512	28,702	27,560	24,657	284,151	288,892
All Years	25,400	15,367	9,876	15,761	12,210	19,855	25,911	28,335	27,420	29,497	29,222	27,655	266,510	266,496

Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	27,358	16,624	8,533	11,512	7,465	11,298	21,561	26,603	25,744	29,778	29,778	28,817	245,069	242,794
Above Normal	26,705	14,785	7,751	14,254	9,306	16,705	24,176	28,608	27,685	29,778	29,778	28,817	258,347	258,347
Normal	26,174	14,713	8,765	15,626	12,095	22,405	28,207	29,778	28,817	29,778	29,778	28,817	274,953	274,878
Below Normal	27,338	16,106	11,931	21,523	18,520	25,038	28,817	29,481	28,530	29,778	29,593	27,864	294,520	295,079
Dry	25,990	19,593	14,794	19,764	17,471	25,782	28,817	29,778	28,817	29,463	28,821	27,200	296,289	297,969
All Years	26,721	16,342	10,342	16,569	12,994	20,261	26,320	28,854	27,923	29,717	29,553	28,304	273,899	273,884

Difference in Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — WSIP Desalination minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	-1,011	-529	-309	-1,267	-870	-714	-1,697	-934	-903	0	0	0	-8,234	-9,532
Above Normal	-2,015	-1,462	-47	-336	-313	-845	-162	-565	-547	0	0	0	-6,293	-7,050
Normal	-1,094	-501	-660	-535	-381	71	-17	-363	-351	0	0	0	-3,831	-4,386
Below Normal	-1,147	-764	-560	-392	-809	-448	-125	-425	-412	-341	-409	-737	-6,567	-6,946
Dry	-1,302	-1,600	-773	-1,564	-1,574	-65	-75	-315	-305	-761	-1,261	-2,543	-12,138	-9,077
All Years	-1,320	-975	-466	-808	-784	-406	-409	-520	-503	-219	-331	-649	-7,389	-7,389

Table 3.2-3

Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — WSIP Desalination

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	26,347	16,094	8,223	10,245	6,595	10,584	19,863	25,669	24,841	29,778	29,778	28,817	236,835	233,262
Above Normal	24,691	13,323	7,703	13,918	8,992	15,860	24,013	28,043	27,138	29,778	29,778	28,817	252,054	251,297
Normal	25,080	14,213	8,105	15,091	11,713	22,476	28,190	29,415	28,466	29,778	29,778	28,817	271,122	270,492
Below Normal	26,191	15,343	11,371	21,131	17,712	24,590	28,692	29,056	28,118	29,437	29,185	27,127	287,953	288,133
Dry	24,688	17,993	14,021	18,201	15,897	25,717	28,742	29,463	28,512	28,702	27,560	24,657	284,151	288,892
All Years	25,400	15,367	9,876	15,761	12,210	19,855	25,911	28,335	27,420	29,497	29,222	27,655	266,510	266,496

Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	24,260	18,126	13,783	8,028	6,015	7,433	16,031	23,070	22,326	27,589	27,589	26,009	220,258	218,975
Above Normal	24,176	17,926	14,204	9,100	6,157	9,279	20,309	24,679	23,883	27,589	27,589	25,887	230,776	230,776
Normal	23,368	19,046	14,390	9,930	6,864	10,632	25,951	27,054	26,181	27,589	27,589	26,009	244,601	243,681
Below Normal	24,959	17,980	17,964	15,726	11,808	15,334	26,699	27,589	26,699	26,917	26,917	25,670	264,263	264,595
Dry	23,665	19,046	18,433	14,080	11,386	15,936	26,699	27,232	26,354	26,876	26,578	24,225	260,509	262,015
All Years	24,097	18,413	15,763	11,398	8,459	11,737	23,147	25,930	25,093	27,311	27,253	25,565	244,165	244,098

Difference in Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — WSIP Desalination minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	2,087	-2,031	-5,560	2,218	580	3,151	3,832	2,599	2,515	2,189	2,189	2,809	16,578	14,287
Above Normal	515	-4,603	-6,500	4,818	2,836	6,581	3,704	3,364	3,255	2,189	2,189	2,930	21,278	20,521
Normal	1,712	-4,834	-6,285	5,161	4,850	11,844	2,239	2,361	2,285	2,189	2,189	2,809	26,520	26,811
Below Normal	1,231	-2,638	-6,593	5,406	5,904	9,256	1,993	1,467	1,419	2,519	2,267	1,457	23,690	23,538
Dry	1,023	-1,053	-4,412	4,120	4,511	9,781	2,043	2,231	2,158	1,826	982	432	23,642	26,877
All Years	1,303	-3,046	-5,886	4,363	3,752	8,118	2,765	2,405	2,327	2,187	1,970	2,090	22,345	22,398

The results shown in Table 3.2-3 illustrate that, when comparing the variant setting to the base setting, similar to the WSIP setting, additional diversions from the Tuolumne River would occur to serve the increase in purchase request and improvement in delivery reliability. The difference between the variant and WSIP results would occur during drier years, when less increase in deliveries and reliability would manifest as increases in diversions from the Tuolumne River.

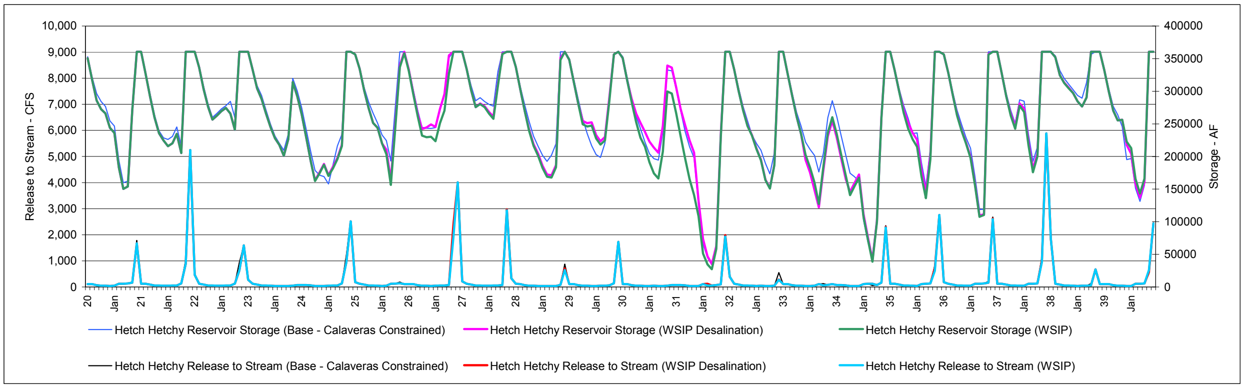
3.3 Hetch Hetchy Reservoir and Releases

The difference between the variant and WSIP operation of Hetch Hetchy during non-drought years is inconsequential, consistent with the similarity occurring in SJPL operation. However, during drought periods, there is less draw of storage because of the reduction in SJPL diversion due to the substitution of the desalination supply in the variant setting. Figure 3.3-1 illustrates a chronological trace of the simulation of Hetch Hetchy Reservoir storage and stream releases. Shown in Figure 3.3-1 are the results for the WSIP, variant (“WSIP All Tuolumne”), and base (“Base – Calaveras Constrained”) settings. Supplementing the Figure 3.3-1 representation of Hetch Hetchy Reservoir storage are Table 3.3-1 Hetch Hetchy Reservoir Storage (Desalination) and Table 3.3-2 Difference in Hetch Hetchy Reservoir Storage (Desalination minus WSIP). Table 3.3-3 is provided to illustrate the difference in Hetch Hetchy Reservoir storage between the base and variant settings.

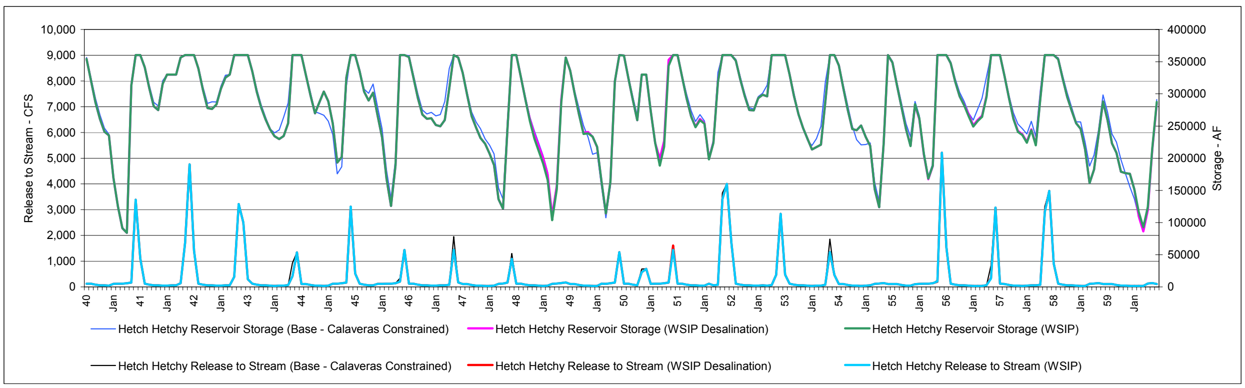
Table 3.3-2 illustrates that, throughout the summer and into the fall in some years, storage in Hetch Hetchy Reservoir associated with the variant would differ from that of the WSIP,

Figure 3.3-1
Hetch Hetchy Reservoir Storage and Stream Release

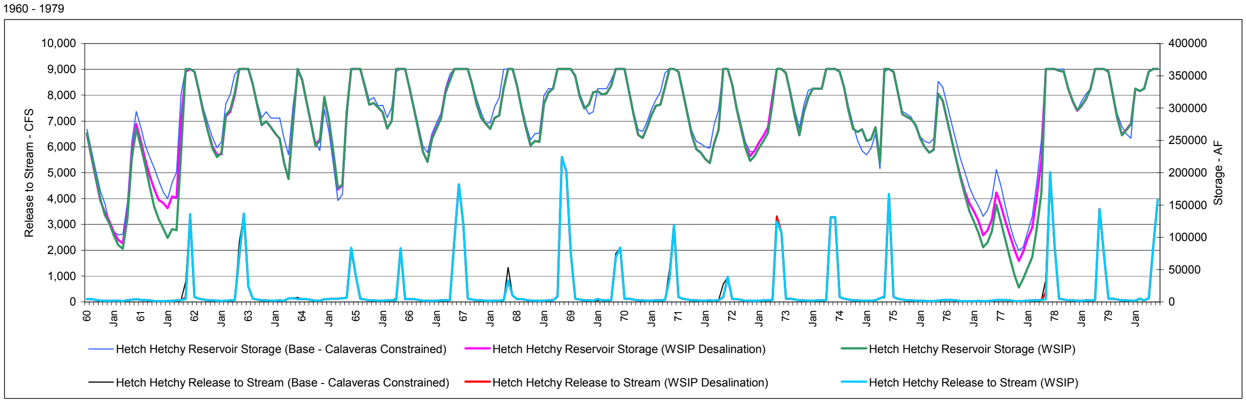
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

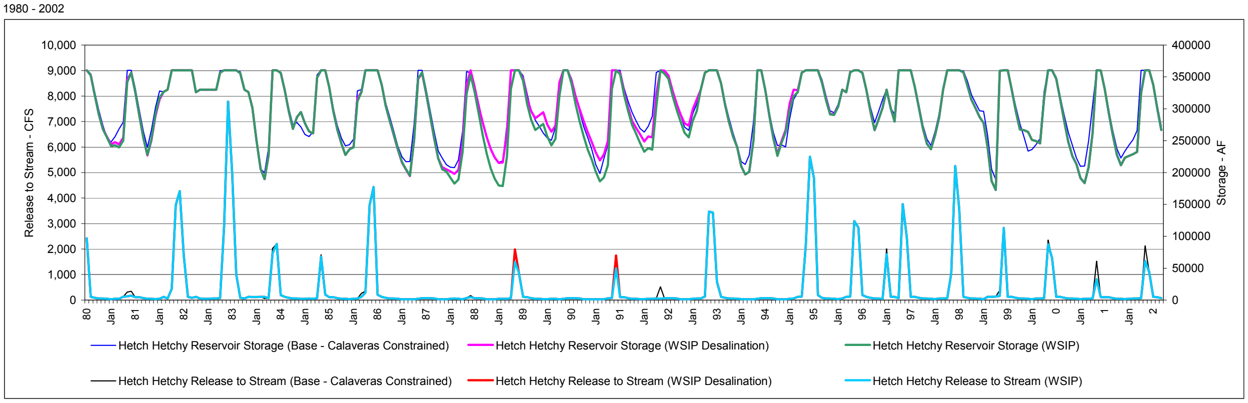


Table 3.3-1

Hetch Hetchy Reservoir Storage (Acre-feet) WSIP Desalination

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	272,402	266,044	243,868	235,920	183,321	150,269	154,224	271,116	360,400	360,400	326,811	291,828
1922	259,728	235,648	224,723	215,782	220,244	234,819	205,133	360,400	360,400	360,400	336,082	302,853
1923	275,819	256,526	262,603	269,313	274,454	265,738	241,094	360,400	360,400	360,400	333,186	304,241
1924	288,096	265,462	244,930	227,949	217,703	201,135	226,615	314,032	292,290	264,348	229,088	193,225
1925	163,435	175,470	188,507	171,437	184,008	197,999	217,964	360,400	360,400	356,465	334,210	301,427
1926	274,085	251,427	243,883	219,916	210,370	163,280	250,959	339,718	360,400	333,232	297,804	265,052
1927	242,305	244,578	249,021	245,187	272,768	295,662	355,106	360,400	360,400	360,400	333,718	301,231
1928	275,534	281,108	276,990	268,012	261,013	311,571	358,408	360,400	360,400	337,096	302,689	269,444
1929	241,610	218,805	204,651	185,877	172,216	171,184	186,741	351,273	360,400	348,102	314,426	281,237
1930	254,535	250,965	252,296	232,792	223,363	229,841	291,204	356,465	360,400	350,768	316,726	288,304
1931	265,772	251,670	237,977	223,073	213,619	205,737	247,022	339,278	335,987	306,045	272,933	248,175
1932	224,785	206,022	132,424	73,586	47,145	35,173	62,787	232,945	360,400	360,400	333,089	299,918
1933	271,014	247,664	232,897	212,283	195,118	164,567	151,695	187,575	360,400	360,400	326,593	293,382
1934	260,961	234,344	194,788	175,294	148,471	122,088	178,542	231,058	254,874	228,660	196,668	165,430
1935	145,724	159,447	172,234	111,792	75,509	41,545	101,479	260,217	360,400	360,400	331,788	299,322
1936	272,128	252,344	235,929	225,470	180,292	145,017	203,263	360,400	360,400	356,465	327,853	294,110
1937	263,920	240,585	221,178	200,180	157,802	109,489	111,641	357,223	360,400	360,400	327,212	292,471
1938	265,724	246,244	281,195	273,384	222,473	180,971	204,620	360,400	360,400	360,400	352,029	324,714
1939	313,417	305,620	297,136	284,589	276,736	290,220	360,400	360,400	360,400	332,157	299,492	270,327
1940	255,209	256,245	217,355	204,352	157,941	136,749	160,763	360,400	360,400	354,451	320,313	286,310
1941	260,678	241,118	235,298	169,490	125,366	91,151	84,054	313,255	360,400	360,400	341,291	309,048
1942	280,721	274,942	315,878	330,000	330,000	330,000	356,592	360,400	360,400	360,400	339,529	306,962
1943	278,021	276,636	283,548	307,975	325,066	330,000	360,400	360,400	360,400	360,400	334,820	303,090
1944	279,144	260,348	244,962	234,244	229,744	234,419	254,494	360,400	360,400	360,400	329,290	297,445
1945	269,782	286,673	303,578	288,423	253,887	193,103	202,059	325,579	360,400	360,400	334,928	303,168
1946	289,579	302,009	266,576	232,638	168,168	125,876	188,823	360,400	360,400	357,267	325,581	293,235
1947	267,584	261,329	261,933	251,706	249,594	259,401	308,348	360,400	356,592	332,847	297,991	265,329
1948	247,258	231,519	222,630	207,163	189,129	136,187	121,486	246,616	360,400	360,400	325,774	291,062
1949	260,577	237,239	218,264	200,289	174,433	110,569	157,053	290,911	356,592	336,040	301,328	268,173
1950	239,630	240,600	233,163	217,437	162,871	113,888	162,254	319,409	360,400	359,600	323,849	289,929
1951	259,038	330,000	330,000	273,739	223,537	199,065	226,940	352,902	360,400	360,400	326,780	293,203
1952	264,766	248,998	260,875	254,408	198,969	224,676	318,641	360,400	360,400	360,400	351,651	322,211
1953	296,329	275,128	274,206	293,261	298,723	296,049	360,374	360,400	360,400	360,400	330,136	297,172
1954	268,064	247,055	230,167	213,569	217,328	221,015	286,815	360,400	360,400	343,956	308,827	274,943
1955	245,440	243,491	250,709	232,875	219,152	151,838	123,551	222,728	360,400	348,498	313,738	278,863
1956	244,816	219,814	282,653	260,582	205,752	167,213	187,582	360,400	360,400	360,400	347,791	319,290
1957	296,127	283,218	267,728	251,131	259,685	265,985	297,247	360,400	360,400	360,400	326,823	292,697
1958	262,298	242,214	237,194	225,295	244,804	221,297	293,100	360,400	360,400	360,400	353,900	323,910
1959	295,427	273,939	254,292	245,472	213,883	161,315	182,390	235,642	288,112	259,667	223,084	208,259
1960	179,051	176,894	175,738	151,333	109,788	86,147	119,346	213,260	285,028	258,790	223,592	189,377
1961	156,544	138,638	124,838	107,642	95,588	90,471	137,512	229,726	275,410	249,301	220,527	195,193
1962	174,911	157,656	153,446	145,101	162,975	161,212	279,739	356,465	360,400	356,465	326,379	292,131
1963	265,044	240,360	227,765	228,550	287,172	294,374	319,669	360,400	360,400	360,400	336,396	305,026
1964	273,668	279,416	270,727	260,673	252,543	215,321	190,335	275,763	360,400	343,750	309,409	275,896
1965	244,001	251,308	315,754	280,416	229,453	174,113	180,638	293,425	360,400	360,400	360,400	333,188
1966	305,400	307,762	300,989	293,442	268,461	279,726	360,400	360,400	360,400	331,450	297,972	265,321
1967	231,906	216,758	254,009	270,235	285,168	324,970	344,503	360,400	360,400	360,400	360,400	335,768
1968	305,290	284,733	275,763	268,094	285,055	288,111	330,318	360,400	360,400	334,325	299,837	267,451
1969	242,147	249,086	247,807	306,192	323,862	330,000	360,400	360,400	360,400	360,400	349,426	317,777
1970	299,296	305,659	324,435	326,065	320,846	322,797	334,670	360,400	360,400	360,400	326,016	290,760
1971	258,440	253,880	270,103	288,977	303,697	305,250	332,642	360,400	360,400	356,465	325,764	292,446
1972	258,839	236,370	231,016	221,257	214,866	245,077	266,541	360,400	360,400	336,426	299,001	267,965
1973	240,378	226,012	233,953	246,805	257,489	270,136	317,704	360,400	360,400	353,990	322,828	286,127
1974	257,794	293,500	316,503	330,000	330,000	330,000	360,400	360,400	360,400	356,465	331,550	295,187
1975	267,864	263,077	267,079	249,395	251,607	270,330	216,738	360,400	360,400	356,465	324,162	290,479
1976	286,336	282,468	273,429	252,264	239,384	231,084	235,434	322,270	311,719	281,653	249,955	220,061
1977	193,788	170,145	152,119	140,036	124,785	103,188	110,448	128,166	169,234	149,302	123,682	102,160
1978	81,003	63,258	77,992	98,811	115,187	163,180	219,723	360,400	360,400	360,400	357,869	356,406
1979	329,957	310,280	295,991	302,990	313,872	330,000	360,400	360,400	360,400	356,097	320,734	284,314
1980	258,962	267,114	275,772	330,000	326,446	330,000	356,592	360,400	360,400	360,400	352,729	320,413
1981	290,796	268,662	255,785	244,234	247,636	244,138	254,762	346,442	356,592	326,381	288,829	253,955
1982	226,746	250,781	289,638	314,765	326,446	330,000	360,400	360,400	360,400	360,400	360,400	360,400
1983	326,065	330,000	330,000	330,000	330,000	330,000	356,951	360,400	360,400	360,400	360,400	355,970
1984	330,000	326,192	301,515	251,330	205,725	189,676	227,004	360,400	360,400	356,465	328,962	296,457
1985	268,372	286,904	294,977	277,357	264,474	261,687	348,828	360,400	360,400	333,535	296,865	266,723
1986	245,402	227,652	236,474	240,387	316,275	326,509	360,400	360,400	360,400	360,400	337,490	304,597
1987	281,194	258,749	235,564	215,804	204,652	194,343	250,494	346,661	356,101	324,469	287,959	252,759
1988	222,209	208,126	204,870	201,853	197,924	204,017	246,877	338,368	360,400	334,539	302,895	278,737
1989	255,435	236,703	223,607	215,084	215,862	261,882	360,400	360,400	360,400	347,113	316,283	296,702
1990	285,145	289,866	294,646	275,281	263,971	273,781	341,481	360,400	360,400	344,204	319,777	299,722
1991	280,325	263,314	247,857	231,574	219,157	228,361	249,840	360,400	360,400	357,093	326,278	302,202
1992	280,906	270,186	260,102	248,618	256,808	255,254	322,974	360,400	359,902	352,164	328,215	308,305
1993	291,250	277,344	273,410	299,354	314,678	330,000	356,592	360,400	360,400	360,400	339,684	305,994
1994	278,714	256,620	239,355	209,682	196,961	201,254	250,111	360,400	360,400	328,106	288,504	253,299
1995	229,248	249,835	266,435	307,676	330,000	329,098	356,592	360,400	360,400	360,400	360,400	341,235
1996	315,005	292,083	291,301	303,336	330,000	326,065	357,776	360,400	360,400	356,465	329,269	295,808
1997	266,385	283,200	301,776	330,000	300,695	280,067	360,400	360,400	360,400	360,400	334,509	301,549
1998	268,984	245,268	236,666	258,858	286,099	330,000	360,400	360,400	360,400	360,400	357,575	336,363
1999	314,282	301,528	287,025	277,784	239,977	186,792	172,794	359,739	360,400	360,400	328,523	295,405
2000	267,514	266,427	263,903	251,200	249,369	245,666	316,972	360,400	360,400	347,257	314,429	280,432
2001	248,366	225,736	213,192	191,416	183,471	208,152	262,123	360,400	360,186	330,828	293,698	259,268
2002	227,858	211,442	223,309	226,085	228,791	232,493	324,711	360,400	360,400	337,536	300,566	266,784
Avg (21-02)	259,784	251,506	249,084	240,803	231,608	224,400	259,450	335,354	352,022	342,404	315,487	285,452

Table 3.3-2

Difference in Hetch Hetchy Reservoir Storage (Acre-feet)

WSIP Desalination minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	0	0	0	0	0	0	0	0	0	0	0	0
1922	0	0	0	0	0	0	0	0	0	0	0	0
1923	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0
1925	1,237	1,237	1,237	1,237	2,184	2,184	1,922	0	0	0	0	0
1926	0	0	0	0	6,874	6,874	5,805	2,899	2,123	2,121	2,118	3,313
1927	10,447	15,050	18,856	21,721	21,733	25,539	28,300	0	0	0	0	0
1928	0	920	1,444	2,396	3,256	3,256	1,415	0	0	0	0	0
1929	2,378	2,379	3,330	3,332	3,333	3,334	3,334	3,331	0	0	0	0
1930	5,042	5,042	5,043	5,045	5,048	5,048	5,048	0	0	0	0	4,880
1931	12,774	22,993	22,993	31,664	39,501	39,501	39,501	39,478	39,446	39,399	41,531	50,965
1932	59,499	65,022	24,042	22,211	12,491	7,761	4,476	3,230	0	0	0	0
1933	857	856	856	857	857	857	726	609	0	0	0	0
1934	0	0	-7,454	-7,636	-11,339	-5,404	-5,404	-5,401	-5,394	-5,385	-5,375	-5,369
1935	4,909	4,909	4,909	4,115	3,452	2,564	1,616	1,229	0	0	0	0
1936	5,042	9,645	9,584	10,586	10,263	8,805	7,427	0	0	0	0	0
1937	1,427	1,427	1,399	2,319	2,059	1,723	1,408	1,165	0	0	0	0
1938	2,949	3,870	3,225	5,130	5,132	5,088	4,490	0	0	0	0	0
1939	951	952	0	0	0	0	0	0	0	0	0	0
1940	0	0	-5,405	-8,660	-7,675	-6,451	-5,440	0	0	0	0	0
1941	0	0	0	0	0	0	0	0	0	0	0	0
1942	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	0	0	0	0	0	0	0	0
1946	0	0	0	0	0	0	0	0	0	0	0	0
1947	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0
1949	3,140	6,914	7,631	8,656	8,253	6,895	5,428	4,547	0	0	0	0
1950	1,902	1,903	-287	-287	-258	-217	-182	-153	0	0	0	0
1951	0	0	0	0	0	10,465	9,200	9,195	0	0	0	0
1952	0	920	1,872	937	938	938	938	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	1,013	-1,311	-1,310	-1,311	-1,147	-968	0	0	0	0	0
1957	0	921	2,823	1,874	1,875	1,874	1,874	0	0	0	0	0
1958	1,237	1,236	1,237	1,237	1,238	1,238	1,238	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	-6,606	-6,396	-4,880	-2,434	-2,430	-2,427	-2,423	-2,420
1961	-2,419	4,486	3,195	5,196	7,868	7,867	7,867	7,857	7,849	7,835	9,058	16,690
1962	27,430	29,824	39,337	46,045	50,402	50,402	50,402	-3,935	0	0	0	0
1963	1,332	3,173	3,697	-2,200	-2,201	-3,152	-4,073	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0
1965	2,188	2,188	-1,705	-1,706	-1,707	-1,707	-1,468	-1,288	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	1,903	1,904	1,905	1,904	1,905	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0
1973	2,188	7,804	8,327	8,332	8,338	8,337	10,455	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0
1977	2,663	5,518	12,178	15,995	18,594	18,593	18,593	18,570	18,519	25,610	28,656	34,379
1978	39,106	41,039	41,991	45,823	45,856	48,709	51,471	0	0	0	0	0
1979	0	-921	-921	-921	-922	0	0	0	0	0	0	0
1980	1,237	1,237	1,236	0	0	0	0	0	0	0	0	0
1981	0	921	920	2,824	4,544	4,544	4,544	4,542	0	0	0	0
1982	-1,236	-1,237	-3,139	-3,141	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	1,046	4,484	444	0	0	0	0	0	0
1987	0	-921	-920	-921	-921	-922	-922	-921	-921	-919	-918	-918
1988	320	3,174	3,174	9,930	15,091	15,092	15,091	15,083	7,673	7,664	10,794	20,268
1989	25,965	30,568	33,422	35,344	37,083	37,083	29,078	0	0	3,139	8,178	13,696
1990	18,445	18,446	18,446	18,454	21,129	21,129	21,129	0	0	5,042	12,647	19,082
1991	23,829	27,513	27,512	30,382	32,977	35,831	37,950	29,080	0	2,664	4,563	5,481
1992	6,430	9,192	13,948	15,859	18,447	19,493	20,689	0	4,880	4,874	7,723	9,557
1993	11,456	15,139	18,183	18,194	18,202	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0
1995	3,140	3,139	3,140	10,943	10,388	3,033	0	0	0	0	0	0
1996	1,903	982	982	32	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	3,387	4,250	3,914	4,425	4,767	4,646	4,512	1,545	875	1,093	1,421	2,068

Table 3.3-3

Difference in Hetch Hetchy Reservoir Storage (Acre-feet)

WSIP Desalination minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	-11,721	-10,801	-10,801	-10,807	-10,814	-9,461	-7,978	-6,683	0	0	-2,188	-4,304
1922	-3,826	-3,826	-3,827	-10,488	-10,494	-10,495	-10,494	0	0	0	-2,188	-4,304
1923	-4,302	-3,381	-3,381	-3,384	-3,385	-18,703	-18,702	0	0	0	-2,188	-4,304
1924	-5,348	-5,348	-4,397	-3,449	-2,591	-8,394	-7,381	-5,875	-7,987	-10,166	-12,336	-14,439
1925	-15,383	3,951	19,173	13,382	-2,935	-18,251	-15,997	0	0	0	-2,188	-4,304
1926	-9,344	-14,961	-7,378	-13,185	-13,856	-29,748	-25,740	-20,682	0	-2,188	-4,374	-5,291
1927	-2,433	1,249	6,006	1,063	1,063	1,063	3,825	0	0	0	-2,188	-7,066
1928	-9,917	-8,997	-7,094	-11,854	-16,157	-18,429	-1,992	0	0	-2,188	-4,373	-9,249
1929	-12,099	-12,099	-11,147	-15,910	-20,216	-30,776	-32,893	-9,127	0	-2,188	-4,374	-6,488
1930	-3,631	15,703	35,682	29,899	24,674	9,358	7,240	0	0	-2,188	-4,373	-1,608
1931	4,101	8,704	15,791	18,655	16,947	11,144	9,026	6,833	4,709	2,516	2,513	9,875
1932	9,870	8,028	6,482	7,583	1,969	1,254	774	556	0	0	-2,188	-4,304
1933	-5,348	-7,190	-103	-7,714	-14,592	-25,152	-21,748	-18,212	0	0	-2,188	-4,304
1934	-6,490	-12,107	-27,204	-35,543	-53,055	-54,327	-26,202	-28,375	-30,460	-32,598	-34,729	-36,807
1935	-28,698	-9,364	10,614	8,905	7,189	-5,669	-3,693	-2,800	0	0	-2,188	-4,304
1936	-6,205	-6,205	817	-10,616	-10,621	-9,308	-7,868	0	0	0	-2,188	-4,304
1937	-6,681	-8,522	-7,589	-12,351	-10,948	-9,183	-7,653	-3,177	0	0	-2,188	-4,304
1938	-5,254	-4,333	-5,690	-11,401	-11,407	-11,406	-10,027	0	0	0	-2,188	-7,066
1939	-6,112	-5,191	-5,191	-8,998	-12,440	-23,000	3,808	0	0	-2,188	-4,373	-6,488
1940	-8,672	10,662	22,134	7,384	6,551	5,491	4,645	0	0	-2,188	-4,374	-6,488
1941	-6,484	-5,564	-1,783	-1,783	-1,522	-1,275	-972	-725	0	0	-2,188	-4,304
1942	-6,205	-6,205	-4,493	0	0	0	0	0	0	0	-2,188	-4,304
1943	-7,251	-10,934	-3,846	-3,849	-3,850	0	0	0	0	0	-2,188	-4,304
1944	-4,302	-3,381	-528	-5,285	-14,052	-29,369	-31,487	0	0	0	-2,188	-4,304
1945	-2,494	16,839	36,818	31,032	17,300	17,300	15,227	13,316	0	0	-2,188	-4,304
1946	-11,247	-13,088	-13,089	-13,096	-13,103	-11,224	-9,474	0	0	-2,188	-4,374	-6,487
1947	-7,436	-7,437	-9,340	-14,101	-18,406	-28,967	-31,084	0	0	-2,188	-4,374	-6,487
1948	-8,672	-14,288	-7,201	-13,007	-17,311	-17,405	-14,697	-12,307	0	0	-2,188	-4,304
1949	-3,351	-5,192	-4,475	-3,432	-3,841	-3,351	-2,795	-2,334	0	-2,188	-4,374	-9,250
1950	-11,148	8,187	26,984	8,828	7,795	6,539	5,395	4,522	0	-800	-2,988	-5,103
1951	-7,289	0	0	0	0	3,806	3,349	3,347	0	0	-2,188	-7,066
1952	-8,966	-8,045	-7,094	-3,551	-3,553	-3,553	-14,601	0	0	0	-2,188	-4,304
1953	-4,302	-3,381	-2,431	-2,431	-2,433	-17,749	-26	0	0	0	-2,188	-4,304
1954	-1,449	-527	2,327	-6,234	-13,284	-28,601	-30,718	0	0	-2,188	-4,373	-6,487
1955	-4,677	14,657	29,879	11,725	-4,680	-10,484	-8,847	-7,393	0	-2,188	-4,374	-6,488
1956	-8,673	-13,276	-5,496	-5,498	-5,501	-4,809	-4,053	0	0	0	-2,188	-4,304
1957	-6,205	-5,284	-2,430	-8,140	-16,909	-27,470	-29,587	0	0	0	-2,188	-4,304
1958	-8,107	-10,870	-8,539	-12,349	-12,356	-12,356	-12,356	0	0	0	-2,188	-4,304
1959	-6,205	-5,285	-2,431	-10,993	-11,000	-26,317	-22,670	-8,156	-10,265	-12,438	-14,605	-16,706
1960	-18,884	449	20,428	14,640	38	-4,813	-3,674	-4,021	-6,133	-8,313	-10,486	-12,591
1961	-14,773	-13,484	2,724	-602	-8,336	-14,140	-16,258	-17,165	-19,262	-21,424	-22,338	-28,757
1962	-32,546	-29,784	-16,940	-14,575	-21,463	-39,634	-41,751	-3,935	0	0	-2,188	-7,066
1963	-10,964	-13,726	-10,871	-19,440	-19,451	-27,062	-32,587	0	0	0	-2,188	-4,304
1964	-11,247	-14,929	-13,978	-23,499	-32,104	-37,908	-37,610	-26,974	3,808	1,616	-574	-2,692
1965	-2,690	16,644	17,816	17,823	17,832	17,032	14,361	12,230	0	0	0	-4,880
1966	-6,780	-8,622	-2,408	-10,971	-16,941	-21,050	3,808	0	0	-2,188	-4,373	-6,488
1967	-8,672	-14,288	-6,677	-6,681	-6,685	-5,030	-7,792	0	0	0	0	-2,118
1968	-7,825	-7,825	-738	-9,300	-17,038	-27,599	-29,716	0	0	-2,188	-4,374	-6,488
1969	-8,672	-11,434	-13,337	-13,345	-6,138	0	0	0	0	0	-2,188	-4,304
1970	-4,302	15,032	30,254	-3,935	-9,154	-7,203	-9,320	0	0	0	-2,188	-4,304
1971	-8,107	-9,948	-8,998	-9,002	-9,006	-19,566	-21,683	0	0	0	-2,188	-4,304
1972	-6,490	-12,106	-14,009	-18,774	-23,081	-28,885	-31,002	0	0	-2,188	-4,373	-6,487
1973	-6,483	-6,484	1,127	1,127	1,129	1,128	-3,475	0	0	-2,188	-4,374	-9,249
1974	-11,149	-11,148	-11,149	0	0	0	0	0	0	0	-2,188	-7,066
1975	-6,111	13,222	33,201	21,709	13,988	10,183	10,183	3,935	0	0	-2,188	-4,304
1976	-4,303	-3,381	3,706	-2,951	-8,968	-14,771	-16,889	-19,067	-21,170	-23,332	-25,490	-27,578
1977	-27,086	-29,848	-25,091	-20,830	-23,427	-29,231	-31,348	-33,494	-35,540	-30,529	-23,325	-16,361
1978	-13,960	-16,262	-6,796	-10,130	-17,018	-22,727	-30,276	0	0	0	-2,188	-3,994
1979	-43	-43	908	-7,653	-7,657	0	0	0	0	-2,188	-4,373	-6,488
1980	-12,193	7,141	22,363	0	0	0	0	0	0	0	-2,188	-4,304
1981	-6,205	-5,284	1,803	-3,904	-9,062	-24,379	-24,378	-13,958	-3,808	-5,992	-8,173	-10,284
1982	-12,465	-16,148	-13,294	-13,299	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	-2,946	0	0	0	0	-2,118
1984	0	0	0	0	0	-9,738	-11,659	0	0	0	-2,188	-4,304
1985	-6,490	8,241	23,462	17,670	8,142	-2,418	-4,535	0	0	-2,188	-4,374	-6,487
1986	-8,672	-14,288	-7,200	-11,962	-11,968	-3,491	0	0	0	0	-2,188	-4,304
1987	-6,205	-6,205	-5,253	-9,062	-12,504	-23,065	-25,182	-13,739	-4,299	-6,482	-8,662	-10,773
1988	-11,717	-14,479	-7,392	-6,445	-9,885	-15,688	-17,807	-19,984	3,808	-1,238	-5,043	-435
1989	516	-1,325	-374	-1,325	-2,185	-12,745	0	0	0	-4,757	-7,605	-233
1990	2,620	17,351	32,573	21,077	13,356	2,796	679	0	0	-2,854	-948	3,656
1991	8,411	8,412	11,265	18,883	20,612	6,342	6,342	345	0	-3,307	-6,158	-9,835
1992	-13,637	-10,875	-8,973	-14,876	-15,743	-32,868	-33,789	0	-498	-498	1,406	1,404
1993	1,404	6,007	7,149	7,153	7,156	0	0	0	0	0	-2,188	-4,304
1994	-6,205	-5,284	-2,430	-7,188	-15,785	-26,346	-28,463	0	0	-2,188	-4,374	-9,249
1995	-13,049	6,285	26,264	23,615	15,333	3,033	0	0	0	0	0	-4,880
1996	-4,878	-4,877	-2,547	-3,499	0	0	0	0	0	0	-2,188	-7,066
1997	-11,820	-12,740	-12,741	0	0	-11,512	0	0	0	0	-2,188	-4,304
1998	-5,253	-7,095	-5,715	-5,719	-5,722	0	0	0	0	0	-2,188	-7,066
1999	-8,014	-8,014	-9,917	-18,484	-18,492	-18,493	-16,251	-661	0	0	-2,188	-7,066
2000	-8,966	10,368	30,347	15,048	5,604	-7,905	-10,022	0	0	-2,188	-4,373	-9,250
2001	-14,954	-16,795	-9,707	-18,275	-26,878	-41,148	-43,266	0	-214	-2,402	-4,587	-6,701
2002	-9,551	-11,392	-10,250	-16,916	-22,941	-33,501	-35,619	0	0	-2,188	-4,374	-6,488
Avg (21-02)	-7,565	-4,464	1,028	-3,230	-6,418	-11,850	-10,858	-2,851	-1,553	-2,521	-4,353	-6,408

and that this difference could be more or less storage, but typically would be more storage. These years would be associated with drought periods. During drought periods, Hetch Hetchy Reservoir would typically have greater storage during the fall and winter, generally coincident with less diversion to the SJPL. Even during drought, Hetch Hetchy Reservoir could fill by the end of May, which would negate the relative gain in storage from carrying into the following summer. Figure 3.3-2 illustrates the difference in reservoir storage, averaged by year type, in comparing the variant to the WSIP setting. Also shown is the average difference in storage for the two settings during the 82-year simulation. Figure 3.3-3 illustrates the same information in comparing the variant and base settings.

Figure 3.3-2

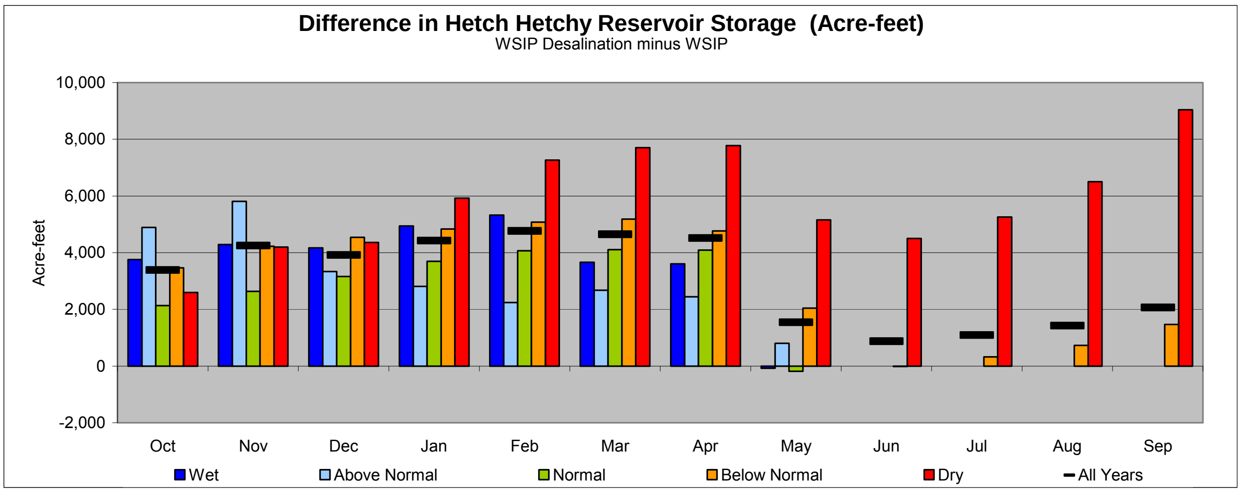
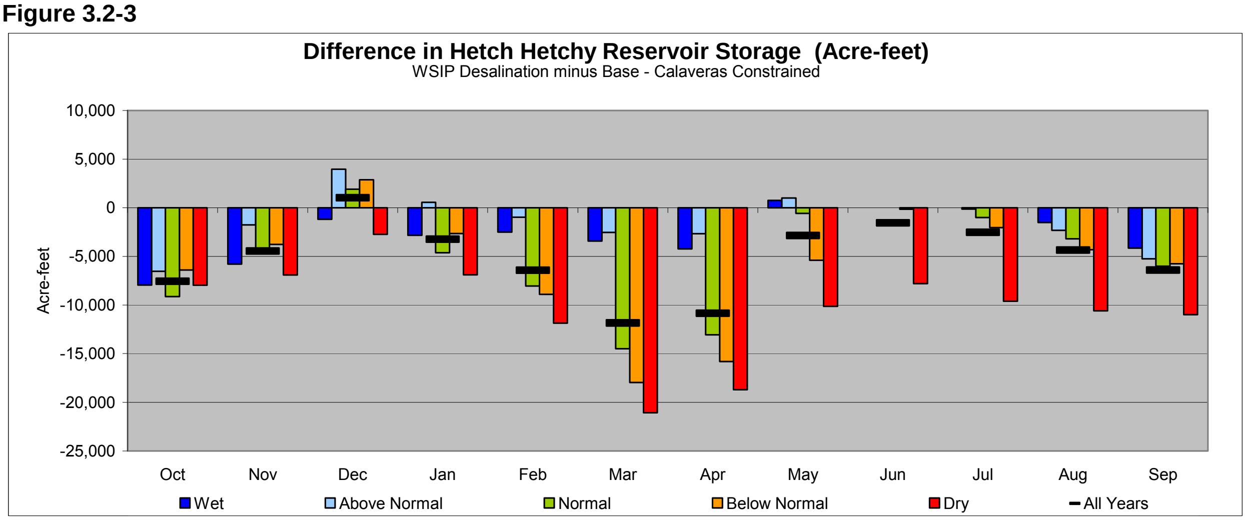
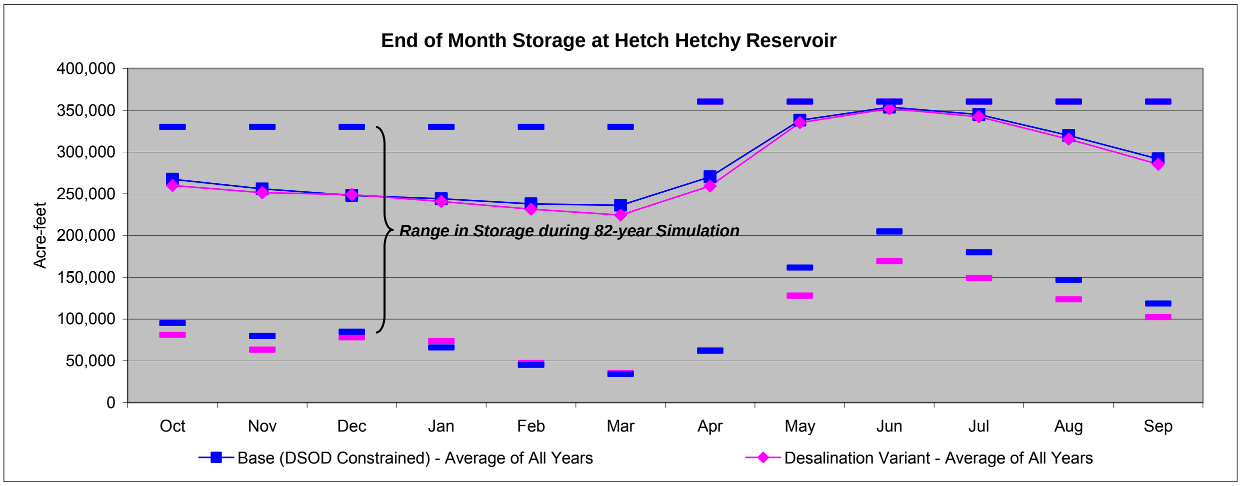


Figure 3.2-3



Compared to the base setting, Hetch Hetchy Reservoir storage would normally be the same during the summer, as diversions for the SJPL are at maximum in both settings. Similar to the WSIP setting, storage begins to be systematically lower in early fall into early winter as the effects of increased system purchases draw additional water from the reservoir. Average storage during the early winter would be approximately the same in both settings as system-wide maintenance in the variant setting decreases diversions to the SJPL compared to the base setting. During late winter and during spring, the variant would typically draw additional water from Hetch Hetchy to serve a larger purchase request and replenish Bay Area reservoirs. Figure 3.3-4 illustrates the average monthly storage in Hetch Hetchy Reservoir for the 82-year simulation, and the range in storage for each month for the variant and base settings.

Figure 3.3-4



The difference in storage in Hetch Hetchy Reservoir attributed to the diversion effects of the variant would then manifest into differences in releases from O'Shaughnessy Dam to the stream. Compared to the WSIP, a lesser amount of available reservoir space in the winter and spring of some years due to the variant would lead to a lesser ability to regulate inflow, thus potentially increasing the amount of water released to the stream above minimum release requirements. Figure 3.3-1 illustrates the stream release from O'Shaughnessy Dam for the WSIP, variant, and base settings. Table 3.3-4 illustrates the difference in stream releases between the variant and WSIP settings. Compared to the WSIP setting, the variant typically exhibits an incrementally larger stream release, predominantly during May or June, which reflects the months when releases to the stream above minimum release requirements are made in anticipation of filling the reservoir.

Table 3.3-4 illustrates the difference in stream release between the variant and WSIP settings, expressed in terms of a monthly volume (acre-feet) of flow. Table 3.3-5 illustrates the same form of information for the difference in stream release between the variant and base settings. Table 3.3-6 illustrates the same information and the average monthly stream release for the variant and WSIP settings, expressed in average monthly flow (cfs), and Table 3.3-7 illustrates the same form of information for the variant and base settings.

Table 3.3-4 illustrates that the difference in monthly flow below O'Shaughnessy Dam could range from an increase of approximately 30,000 acre-feet to a decrease of approximately 4,000 acre-feet. Considering the manner in which releases are determined and made to the stream, quantifying the effect of these changes in terms of average monthly flow (cfs) is not always meaningful.[3] When comparing the variant to the WSIP setting, a change in the volume of release from O'Shaughnessy Dam to the stream would likely result in the release being delayed or initiated earlier by a matter of days. Assuming that a change in release volume equates to a delay or acceleration of releasing 6,000 acre-feet per day, the difference in stream release from O'Shaughnessy Dam between the variant and WSIP would be an earlier release up to 5 days or a delay of up to an added day. Normally, the effect of the delay in release would not affect the year's peak stream release rate during a year. Comparing the variant and WSIP settings, a change (increase or decrease) in stream release would occur in approximately 32 percent of the years simulated.

Compared to the base setting, the variant's effect to stream flow is very similar to the effect caused by the WSIP, but for years following drought the effect would be less. Assuming the type of effect to releases described above, releases above minimum requirements below the dam could be delayed by up to 7 days or initiated earlier by up to 2 days.

[3] See "Estimated Effect of WSIP on Daily Releases below Hetch Hetchy Reservoir", Memorandum by Daniel B. Steiner, December 31, 2006.

Table 3.3-4

Difference in Hetch Hetchy Release to Stream (Acre-feet)

WSIP Desalination minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	0	0	0	0	0	0	0	0
1922	0	0	0	0	0	0	0	0	0	0	0	0	0
1923	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	1,707	0	0	0	0	1,707
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	29,036	0	0	0	0	29,036
1928	0	0	0	0	0	0	0	1,504	0	0	0	0	1,504
1929	0	0	0	0	0	0	0	0	3,546	0	0	0	3,546
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	3,554	0	0	0	3,226	0	0	0	6,780
1933	0	0	0	0	0	0	0	0	535	0	0	0	535
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	1,228	0	0	0	1,228
1936	0	0	0	0	0	0	0	6,494	0	0	0	0	6,494
1937	0	0	0	0	0	0	0	0	1,237	0	0	0	1,237
1938	0	0	0	0	0	0	0	3,920	0	0	0	0	3,920
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	0	0	0	-4,577	0	0	0	0	-4,577
1941	0	0	0	0	0	0	0	0	0	0	0	0	0
1942	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	0	0	0	0	0	0	0	0	0
1946	0	0	0	0	0	0	0	0	0	0	0	0	0
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	-152	0	0	0	-152
1951	0	0	0	0	0	0	0	0	9,772	0	0	0	9,772
1952	0	0	0	0	0	0	0	938	0	0	0	0	938
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	-847	0	0	0	0	-847
1957	0	0	0	0	0	0	0	1,874	0	0	0	0	1,874
1958	0	0	0	0	0	0	0	1,238	0	0	0	0	1,238
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	3,935	-4,171	0	0	0	-236
1963	0	0	0	0	0	0	0	-4,071	0	0	0	0	-4,071
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	-1,287	0	0	0	-1,287
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	1,937	0	0	0	0	1,937
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	10,450	0	0	0	0	10,450
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	16,331	0	0	0	0	16,331
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	445	0	0	0	0	0	445
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	30,146	0	0	0	0	30,146
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	30,103	0	0	0	30,103
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	0	0	0	0	43	0	5	1,220	537	0	0	0	1,806

Table 3.3-5

Difference in Hetch Hetchy Release to Stream (Acre-feet)

WSIP Desalination minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	0	0	0	-6,676	0	0	0	-6,676
1922	0	0	0	0	0	0	0	-9,137	0	0	0	0	-9,137
1923	0	0	0	0	0	0	0	-18,692	0	0	0	0	-18,692
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	-15,988	0	0	0	0	-15,988
1926	0	0	0	0	0	0	0	-2,913	0	0	0	0	-2,913
1927	0	0	0	0	0	0	0	4,073	0	0	0	0	4,073
1928	0	0	0	0	0	0	0	-2,114	0	0	0	0	-2,114
1929	0	0	0	0	0	0	0	0	-9,685	0	0	0	-9,685
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	3,554	0	0	0	555	0	0	0	4,109
1933	0	0	0	0	0	0	0	0	-15,982	0	0	0	-15,982
1934	0	0	0	0	0	0	-3,808	0	0	0	0	0	-3,808
1935	0	0	0	0	0	3,935	0	0	-2,796	0	0	0	1,139
1936	0	0	0	0	0	0	0	-6,870	0	0	0	0	-6,870
1937	0	0	0	0	0	0	0	-3,143	-3,366	0	0	0	-6,509
1938	0	0	0	0	0	0	0	-8,733	0	0	0	0	-8,733
1939	0	0	0	0	0	0	-3,808	4,045	0	0	0	0	237
1940	0	0	0	0	0	0	0	3,885	0	0	0	0	3,885
1941	0	0	0	0	0	0	0	0	-725	0	0	0	-725
1942	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	-31,469	0	0	0	0	-31,469
1945	0	0	0	0	0	0	0	0	13,305	0	0	0	13,305
1946	0	0	0	0	0	0	0	-8,285	0	0	0	0	-8,285
1947	0	0	0	0	0	0	0	-31,072	0	0	0	0	-31,072
1948	0	0	0	0	0	0	0	0	-12,293	0	0	0	-12,293
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	4,518	0	0	0	4,518
1951	0	-7,289	0	0	0	0	0	0	3,559	0	0	0	-3,730
1952	0	0	0	0	0	0	0	-14,595	0	0	0	0	-14,595
1953	0	0	0	0	0	0	0	-26	0	0	0	0	-26
1954	0	0	0	0	0	0	0	-30,705	0	0	0	0	-30,705
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	-3,550	0	0	0	0	-3,550
1957	0	0	0	0	0	0	0	-29,575	0	0	0	0	-29,575
1958	0	0	0	0	0	0	0	-12,351	0	0	0	0	-12,351
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	-37,719	-4,171	0	0	0	-41,890
1963	0	0	0	0	0	0	0	-33,134	0	0	0	0	-33,134
1964	0	0	0	0	0	0	0	0	-3,808	0	0	0	-3,808
1965	0	0	0	0	0	0	0	0	12,219	0	0	0	12,219
1966	0	0	0	0	0	0	-3,808	4,045	0	0	0	0	237
1967	0	0	0	0	0	0	0	-8,319	0	0	0	0	-8,319
1968	0	0	0	0	0	0	0	-30,764	0	0	0	0	-30,764
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	3,935	0	0	0	-9,317	0	0	0	0	-5,382
1971	0	0	0	0	0	0	0	-22,371	0	0	0	0	-22,371
1972	0	0	0	0	0	0	0	-30,986	0	0	0	0	-30,986
1973	0	0	0	0	0	0	0	-3,474	0	0	0	0	-3,474
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	2,521	4,171	0	0	0	6,692
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	-30,259	0	0	0	-310	-30,569
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	-10,407	-10,310	0	0	0	-20,717
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	-3,131	0	0	0	0	-3,131
1984	0	0	0	0	0	3,935	0	-11,653	0	0	0	0	-7,718
1985	0	0	0	0	0	0	0	-4,835	0	0	0	0	-4,835
1986	0	0	0	0	0	-8,478	-3,490	0	0	0	0	0	-11,968
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	-3,808	0	0	0	-3,808
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	364	0	0	0	364
1992	0	0	0	0	0	0	0	-28,918	0	0	0	0	-28,918
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	-12,746	0	0	0	0	0	0	0	0	-12,746
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	-13,491	-698	0	0	0	-14,189
2000	0	0	0	0	0	0	0	-10,019	0	0	0	0	-10,019
2001	0	0	0	0	0	0	0	-43,245	0	0	0	0	-43,245
2002	0	0	0	0	0	0	0	-36,682	0	0	0	0	-36,682
Avg (21-02)	0	-89	0	-107	43	-7	-182	-7,066	-434	0	0	-4	-7,846

Table 3.3-6

Hetch Hetchy Release to Stream (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) WSIP Desalination

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	3,378	3,031	3,124	10,248	4,917	5,165	8,572	149,794	270,553	125,059	11,310	5,316	600,466
Above Normal	3,400	5,305	5,435	4,033	5,145	5,772	7,808	74,508	185,012	23,302	7,686	5,316	332,720
Normal	3,343	3,235	3,051	3,355	4,128	4,557	5,817	78,550	113,227	10,299	7,513	5,123	242,198
Below Normal	3,363	3,255	2,821	2,622	2,851	3,891	5,212	36,625	43,815	6,927	6,818	4,345	122,546
Dry	3,266	3,161	2,729	2,460	2,469	3,105	3,340	9,662	8,504	5,285	5,285	3,861	53,125
All Years	3,351	3,614	3,449	4,514	3,904	4,506	6,158	69,480	123,983	33,709	7,711	4,793	269,172

Hetch Hetchy Release to Stream (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	3,378	3,031	3,124	10,248	4,917	5,165	8,544	148,324	270,633	125,059	11,310	5,316	599,048
Above Normal	3,400	5,305	5,435	4,033	4,936	5,772	7,808	72,926	184,175	23,302	7,686	5,316	330,093
Normal	3,343	3,235	3,051	3,355	4,128	4,557	5,817	77,450	113,420	10,299	7,513	5,123	241,291
Below Normal	3,363	3,255	2,821	2,622	2,851	3,891	5,212	34,741	42,013	6,927	6,818	4,345	118,860
Dry	3,266	3,161	2,729	2,460	2,469	3,105	3,340	9,662	8,282	5,285	5,285	3,861	52,904
All Years	3,351	3,614	3,449	4,514	3,861	4,506	6,153	68,260	123,446	33,709	7,711	4,793	267,367

Difference in Hetch Hetchy Release to Stream (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) WSIP Desalination minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	0	0	0	28	1,470	-80	0	0	0	1,417
Above Normal	0	0	0	0	209	0	0	1,581	837	0	0	0	2,627
Normal	0	0	0	0	0	0	0	1,100	-193	0	0	0	907
Below Normal	0	0	0	0	0	0	0	1,884	1,802	0	0	0	3,686
Dry	0	0	0	0	0	0	0	0	222	0	0	0	222
All Years	0	0	0	0	43	0	5	1,220	537	0	0	0	1,806

Table 3.3-7

Hetch Hetchy Release to Stream (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) WSIP Desalination

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	3,378	3,031	3,124	10,248	4,917	5,165	8,572	149,794	270,553	125,059	11,310	5,316	600,466
Above Normal	3,400	5,305	5,435	4,033	5,145	5,772	7,808	74,508	185,012	23,302	7,686	5,316	332,720
Normal	3,343	3,235	3,051	3,355	4,128	4,557	5,817	78,550	113,227	10,299	7,513	5,123	242,198
Below Normal	3,363	3,255	2,821	2,622	2,851	3,891	5,212	36,625	43,815	6,927	6,818	4,345	122,546
Dry	3,266	3,161	2,729	2,460	2,469	3,105	3,340	9,662	8,504	5,285	5,285	3,861	53,125
All Years	3,351	3,614	3,449	4,514	3,904	4,506	6,158	69,480	123,983	33,709	7,711	4,793	269,172

Hetch Hetchy Release to Stream (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	3,378	3,031	3,124	11,045	4,917	5,695	8,790	154,853	269,789	125,059	11,310	5,335	606,325
Above Normal	3,400	5,733	5,435	4,033	4,936	5,309	7,808	78,261	183,990	23,302	7,686	5,316	335,208
Normal	3,343	3,235	3,051	3,109	4,128	4,557	5,817	90,958	113,833	10,299	7,513	5,123	254,966
Below Normal	3,363	3,255	2,821	2,622	2,851	3,891	5,436	46,628	45,681	6,927	6,818	4,345	134,639
Dry	3,266	3,161	2,729	2,460	2,469	3,105	3,816	13,790	9,991	5,285	5,285	3,861	59,217
All Years	3,351	3,703	3,449	4,621	3,861	4,514	6,340	76,545	124,417	33,709	7,711	4,797	277,018

Difference in Hetch Hetchy Release to Stream (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) WSIP Desalination minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	-797	0	-530	-218	-5,059	764	0	0	-19	-5,859
Above Normal	0	-429	0	0	209	463	0	-3,753	1,022	0	0	0	-2,488
Normal	0	0	0	246	0	0	0	-12,408	-606	0	0	0	-12,768
Below Normal	0	0	0	0	0	0	-224	-10,003	-1,866	0	0	0	-12,093
Dry	0	0	0	0	0	0	-476	-4,128	-1,488	0	0	0	-6,091
All Years	0	-89	0	-107	43	-7	-182	-7,066	-434	0	0	-4	-7,846

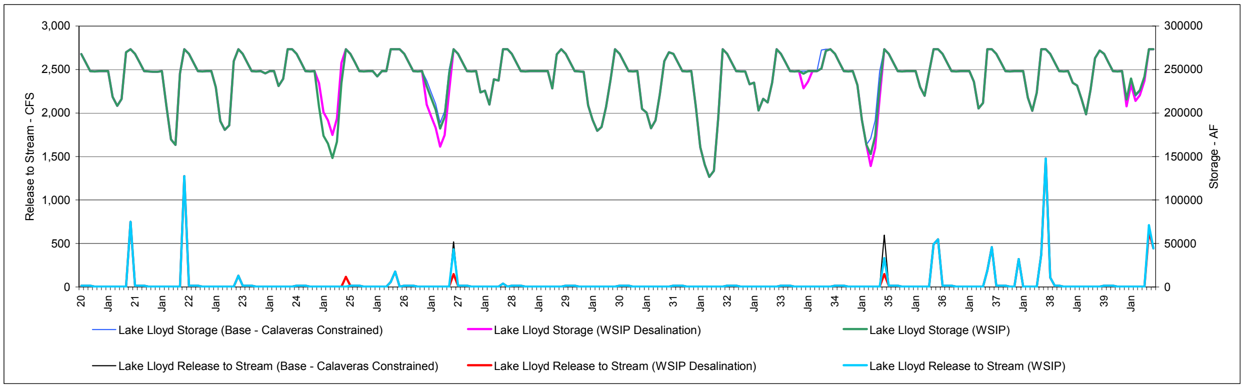
3.4 Lake Lloyd and Lake Eleanor

Compared to the operation of the WSIP, the operation of Lake Lloyd and Lake Eleanor are simulated to be only slightly different in the variant setting. Figure 3.4-1 illustrates a chronological trace of the simulation of Lake Lloyd storage and stream releases. Shown in Figure 3.4-1 are the results for the WSIP, variant, and base settings. The operation resulting from the variant is essentially the same as the WSIP, except during the prolonged drought of 1987-1992, and to a small extent during the other drought periods. The difference is explained as modeling discretion, and is not likely a difference that would occur in actual operations. HH/LSM model logic estimates the amount of water to be released from Lake Lloyd based on the condition of Hetch Hetchy Reservoir, Don Pedro Water Bank Account, and Lake Eleanor and Lake Lloyd storage in comparison to demands. In these instances, Hetch Hetchy Reservoir storage is different between the variant and the WSIP settings, typically slightly higher in the variant during drought. The model logic is not very refined, and a small change in computation result can result in a large difference in Lake Lloyd release (in this instance, through Holm Powerhouse). Overall, the Lake Lloyd operation would be discretionary and the outcome would likely be the same among the variant and the WSIP settings.

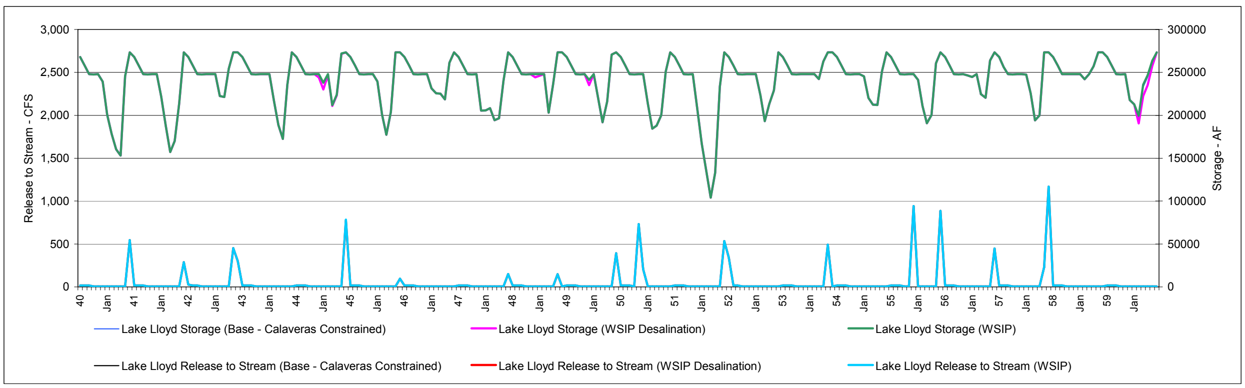
Figure 3.4-2 illustrates the almost identical operation of Lake Eleanor for the variant and WSIP settings. Also shown in Figure 3.4-2 is the operation for the base setting. Any difference that occurs in the Lake

Figure 3.4-1
Lake Lloyd Storage and Stream Release

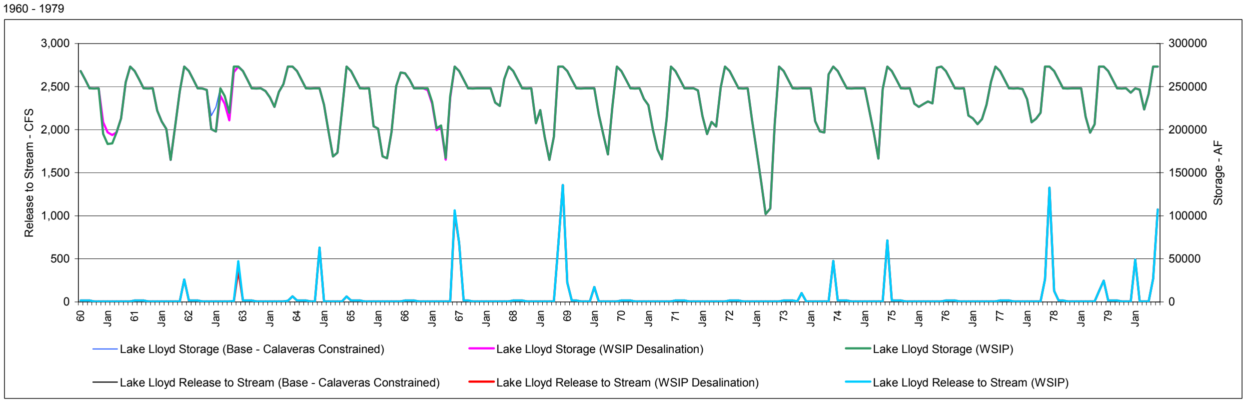
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

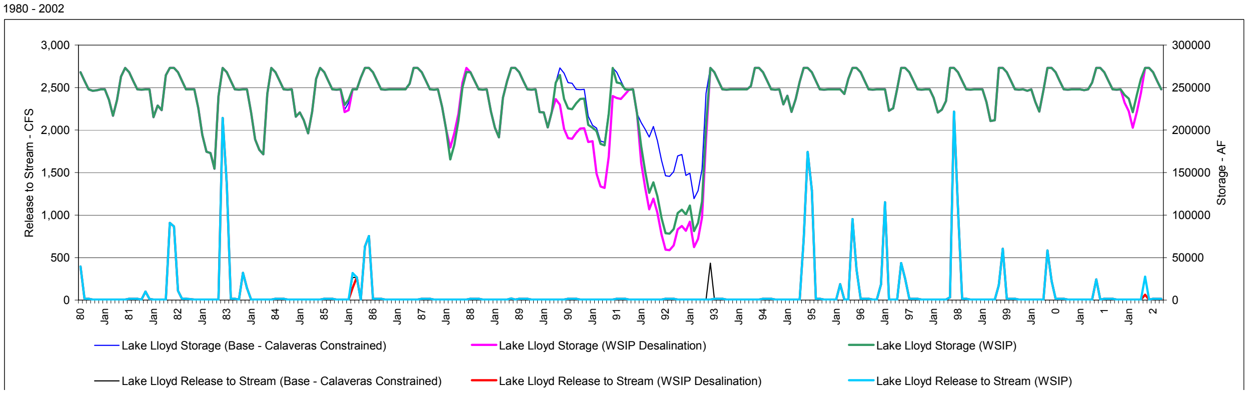
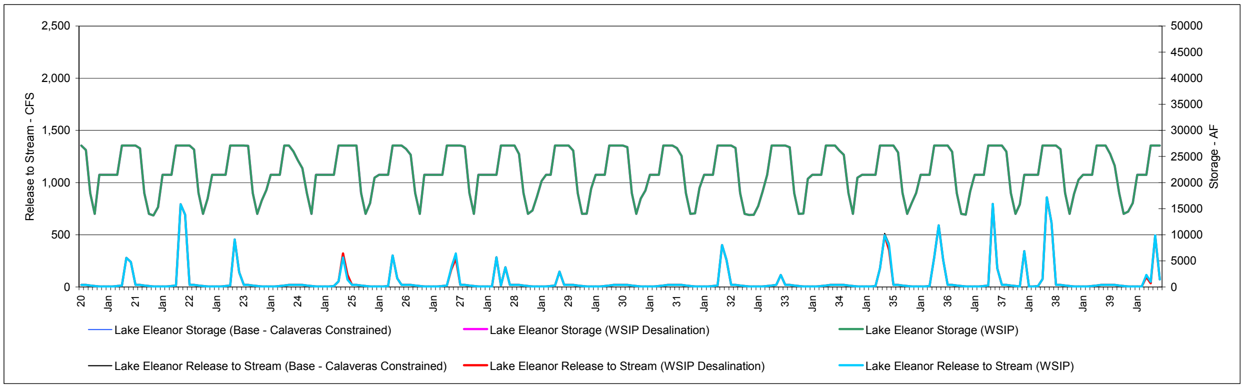
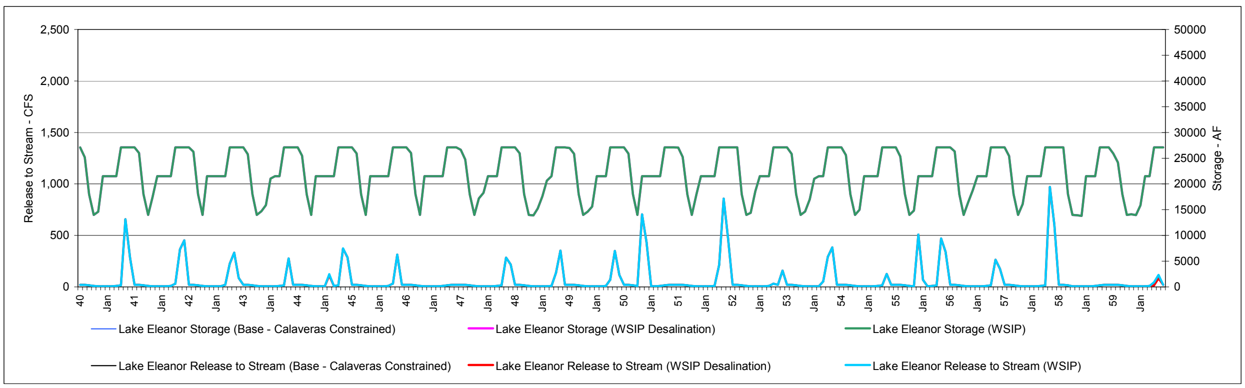


Figure 3.4-2
Lake Eleanor Storage and Stream Release

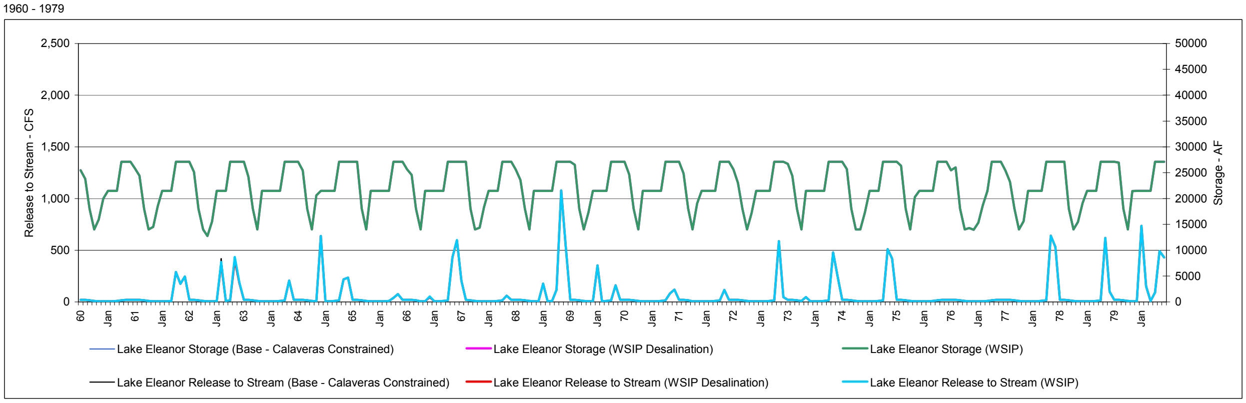
1920 - 1939



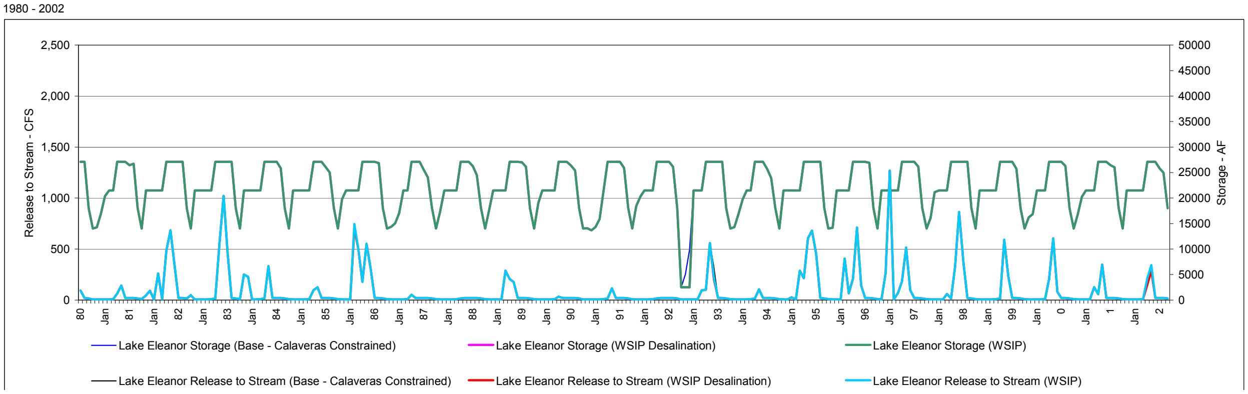
1940 - 1959



1960 - 1979



1980 - 2002



Eleanor operation would be caused by a small change in operation at Lake Lloyd that would affect the operation of the Cherry-Eleanor Tunnel between the two watersheds. Any difference that occurs in the simulations is more associated with modeling discretion as opposed to any substantive difference in operation.

Supplementing the Figure 3.4-1 representation of Lake Lloyd stream releases is Table 3.4-1, illustrating releases for the variant and WSIP settings, and the difference in releases between the two. Table 3.4-2 provides the same form of information for the variant and base settings.

Table 3.4-1

Lake Lloyd Release to Stream (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) WSIP Desalination

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	334	653	8,227	6,566	754	1,319	298	17,483	62,808	22,325	953	922	122,642
Above Normal	307	4,282	1,525	307	870	307	298	9,999	24,492	993	953	922	45,256
Normal	307	298	307	953	278	307	298	5,917	10,046	953	953	922	21,540
Below Normal	307	298	307	307	278	307	485	2,383	2,551	951	951	920	10,045
Dry	307	298	307	307	278	307	298	307	298	949	949	918	5,524
All Years	312	1,193	2,105	1,654	494	505	337	7,193	19,880	5,130	952	921	40,676

Lake Lloyd Release to Stream (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	334	653	8,227	6,566	1,362	1,319	298	17,483	62,931	22,325	953	922	123,373
Above Normal	307	4,282	1,525	307	870	307	298	10,285	26,534	993	953	922	47,584
Normal	307	298	307	953	278	307	298	6,734	9,633	953	953	922	21,943
Below Normal	307	298	307	307	278	307	485	2,383	2,551	951	951	920	10,046
Dry	307	298	307	307	278	307	298	307	298	949	949	918	5,524
All Years	312	1,193	2,105	1,654	612	505	337	7,412	20,247	5,130	952	921	41,380

Difference in Lake Lloyd Release to Stream (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) WSIP Desalination minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	0	-608	0	0	0	-123	0	0	0	-731
Above Normal	0	0	0	0	0	0	0	-286	-2,043	0	0	0	-2,329
Normal	0	0	0	0	0	0	0	-817	414	0	0	0	-404
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	0	0	-119	0	0	-219	-367	0	0	0	-704

Table 3.4-2

Lake Lloyd Release to Stream (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) WSIP Desalination

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	334	653	8,227	6,566	754	1,319	298	17,483	62,808	22,325	953	922	122,642
Above Normal	307	4,282	1,525	307	870	307	298	9,999	24,492	993	953	922	45,256
Normal	307	298	307	953	278	307	298	5,917	10,046	953	953	922	21,540
Below Normal	307	298	307	307	278	307	485	2,383	2,551	951	951	920	10,045
Dry	307	298	307	307	278	307	298	307	298	949	949	918	5,524
All Years	312	1,193	2,105	1,654	494	505	337	7,193	19,880	5,130	952	921	40,676

Lake Lloyd Release to Stream (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	334	653	8,224	6,566	1,179	1,319	298	17,483	64,530	22,325	953	922	124,786
Above Normal	307	4,282	1,525	307	870	307	298	10,222	27,767	993	953	922	48,754
Normal	307	298	307	953	278	307	298	6,734	9,633	953	953	922	21,943
Below Normal	307	298	307	307	278	307	485	2,383	2,551	953	953	922	10,051
Dry	307	298	307	307	278	307	298	307	298	953	953	922	5,535
All Years	312	1,193	2,104	1,654	577	505	337	7,399	20,814	5,131	953	922	41,901

Difference in Lake Lloyd Release to Stream (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) WSIP Desalination minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	3	0	-425	0	0	0	-1,722	0	0	0	-2,144
Above Normal	0	0	0	0	0	0	0	-223	-3,276	0	0	0	-3,499
Normal	0	0	0	0	0	0	0	-817	414	0	0	0	-404
Below Normal	0	0	0	0	0	0	0	0	0	-2	-2	-2	-5
Dry	0	0	0	0	0	0	0	0	0	-4	-4	-4	-11
All Years	0	0	1	0	-83	0	0	-206	-934	-1	-1	-1	-1,226

3.5 Don Pedro Reservoir and La Grange Releases

A change in Don Pedro Reservoir operation is caused by changes in inflow to the reservoir. The changes in inflow to the reservoir are the result of net changes within the operation of the upstream SFPUC facilities described previously, and other changes in SFPUC operations associated with diversions to the Holm, Kirkwood, and Moccasin Powerhouses. Figure 3.5-1 illustrates a chronological trace of the simulation of Don Pedro Reservoir storage and Tuolumne River stream releases from La Grange Dam. Shown in Figure 3.5-1 are the results for the WSIP, variant, and base settings.

Supplementing the Figure 3.5-1 representation of Don Pedro Reservoir storage are Table 3.5-1 Don Pedro Reservoir Storage (Desalination) and Table 3.5-2 Difference in Don Pedro Reservoir Storage (Desalination minus WSIP). Table 3.5-3 illustrates the difference in Hetch Hetchy Reservoir storage between the base and variant settings.

Figure 3.5-1 and Table 3.5-2 illustrate that, throughout many years, the storage in Don Pedro Reservoir in the variant setting would not differ greatly from storage in the WSIP setting. These periods generally occur during non-drought periods when the upstream operation of SFPUC facilities does not differ due to the absence of the TID/MID transfer. The differences primarily occur during periods of drought when a substitution of the desalination supply for the TID/MID transfer occurs. Any changes that do occur are due to the different inflow to the reservoir between the two settings in a month or series of months when Don Pedro Reservoir is below the flood control storage limitation and has an ability to regulate inflow with storage. When no storage difference occurs for months or other periods of time, either inflow to the reservoir did not change between the settings or the flood control storage limitation was reached and the change in inflow resulted in a change in release to the Tuolumne River below La Grange Dam (discussed later). As described above, the variant would divert less water from the Tuolumne River during drought than would occur in the WSIP setting, thus leading to less accumulated depletion of storage from Don Pedro Reservoir. However, the additional depletion effect in Don Pedro Reservoir is not completely eliminated when compared to the base setting.

The greatest draw down of reservoir storage occurs during the drought of the 1976-1977, which is not coincident with the year of greatest difference in reservoir draw between the base setting and either the WSIP or variant settings, the drought of the 1930s. Figure 3.5-2 illustrates the difference in reservoir storage, averaged by year type, in comparing the variant to the WSIP setting. Also shown is the average difference in storage for the two settings during the 82-year simulation. Figure 3.5-3 illustrates the same information in comparing the variant and base settings.

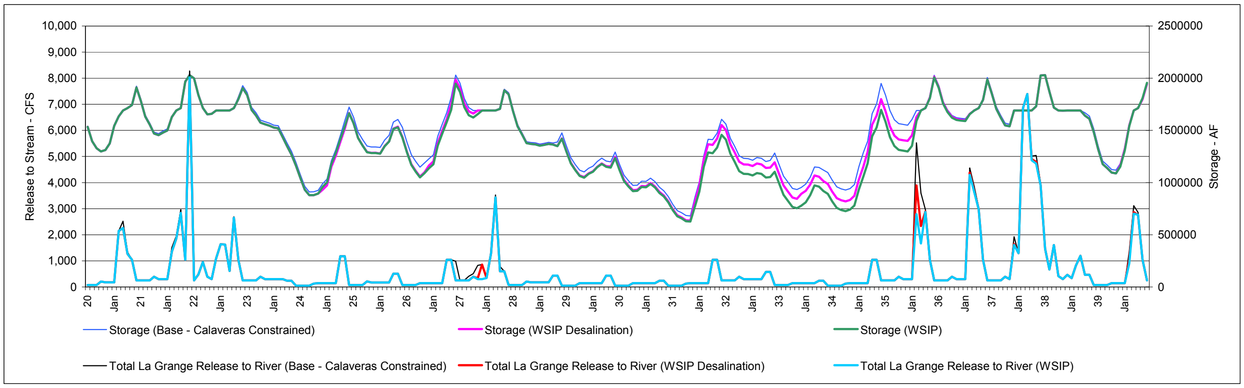
Figure 3.5-4 illustrates the average monthly storage in Don Pedro Reservoir for the 82-year simulation, and the range in storage for each month for the variant and base settings.

The difference in storage in Don Pedro Reservoir attributed to the upstream effects of the variant would manifest in differences in releases from La Grange Dam to the stream. As opposed to the WSIP setting, less available reservoir space in the winter and spring due to the variant would lead to greater frequency of water released to the stream at levels above minimum release requirements. During periods when inflow differs and Don Pedro Reservoir is at maximum storage capacity within the flood control storage limitation, a change in inflow would directly manifest as a change in release from La Grange Dam. Figure 3.5-1 illustrates the stream release from La Grange Dam for the WSIP, variant, and base settings.

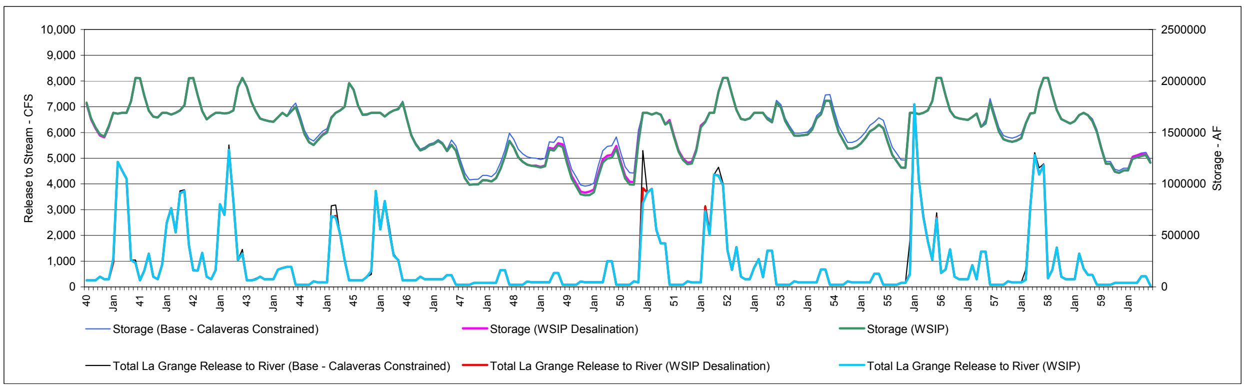
Table 3.5-4 illustrates the difference in stream releases between the variant and WSIP settings. Compared to the WSIP setting, the variant typically exhibits an incrementally larger stream release, predominantly during early winter through June, which reflects the months when releases to the stream above minimum release requirements are made due to flood control or in anticipation of filling the reservoir. Table 3.5-5 illustrates the same information in comparing the variant and WSIP settings, with years ranked in descending order of the San Joaquin River Index. The table shows that differences in releases to the Tuolumne River from La Grange Dam occur only when there are releases above minimum FERC flow requirements. This typically occurs only in above normal and wet years, and predominantly during early winter through June. During other year types and during the summer and fall, releases would be maintained at minimum FERC flow requirements regardless of the setting. Table 3.5-6 illustrates the difference in stream releases between the variant and base settings.

Figure 3.5-1
Don Pedro Reservoir Storage and Release below La Grange Dam

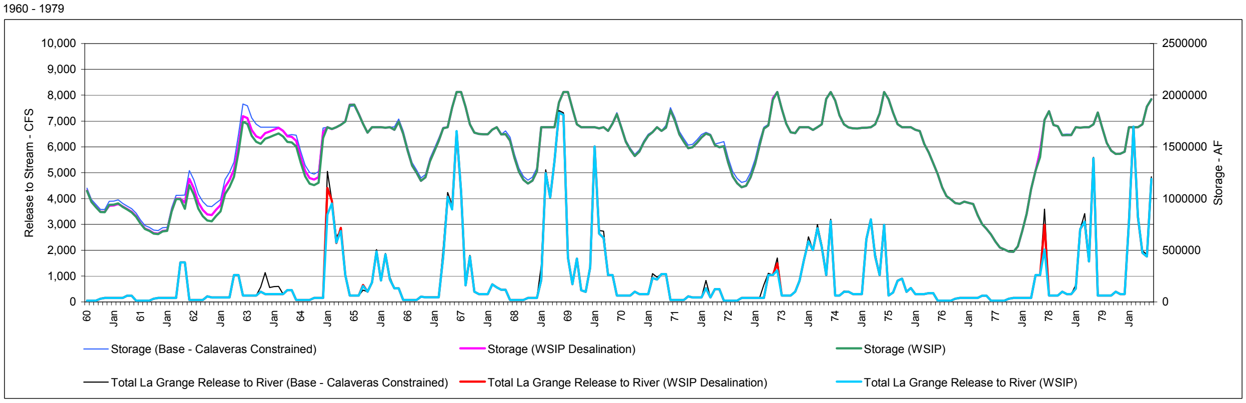
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

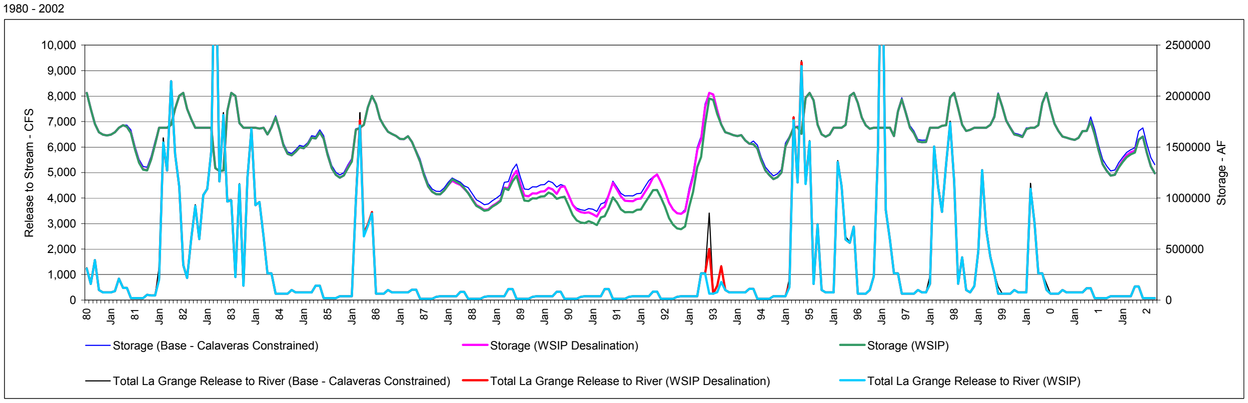


Table 3.5-1

Don Pedro Reservoir Storage (Acre-feet) WSIP Desalination

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	1,297,919	1,311,969	1,374,649	1,543,191	1,633,956	1,690,000	1,713,000	1,742,271	1,910,239	1,780,368	1,632,093	1,555,504
1922	1,469,532	1,454,724	1,479,018	1,499,182	1,627,229	1,690,000	1,713,000	1,967,374	2,030,000	1,998,136	1,838,254	1,715,718
1923	1,653,081	1,658,408	1,689,999	1,689,989	1,689,997	1,690,000	1,713,000	1,799,350	1,905,720	1,837,747	1,695,090	1,643,504
1924	1,573,662	1,557,997	1,543,979	1,525,572	1,520,285	1,435,601	1,350,582	1,268,108	1,160,641	1,041,842	933,176	878,997
1925	881,178	895,290	931,846	974,106	1,151,060	1,257,925	1,388,107	1,515,656	1,667,420	1,569,265	1,428,844	1,356,866
1926	1,293,003	1,284,656	1,285,092	1,279,004	1,349,662	1,395,445	1,516,853	1,535,534	1,438,028	1,298,502	1,176,256	1,112,466
1927	1,057,235	1,096,887	1,164,236	1,203,799	1,381,716	1,496,447	1,605,627	1,753,729	1,985,397	1,905,559	1,759,483	1,682,252
1928	1,660,901	1,690,000	1,689,999	1,690,000	1,689,998	1,690,000	1,705,499	1,883,712	1,846,350	1,682,693	1,540,227	1,462,294
1929	1,378,711	1,370,380	1,367,487	1,354,278	1,363,132	1,371,541	1,365,102	1,349,002	1,424,746	1,302,097	1,188,763	1,124,819
1930	1,068,682	1,052,515	1,088,029	1,108,021	1,151,992	1,183,433	1,156,568	1,153,914	1,246,156	1,129,746	1,024,939	972,053
1931	927,374	929,706	967,143	965,324	996,853	963,554	909,980	876,012	820,016	746,098	686,231	666,670
1932	640,513	635,369	816,597	971,200	1,225,265	1,367,335	1,361,561	1,419,938	1,550,732	1,502,987	1,366,923	1,289,724
1933	1,200,506	1,175,057	1,172,760	1,158,249	1,182,906	1,174,774	1,139,293	1,144,158	1,194,350	1,084,244	973,334	914,045
1934	856,446	844,643	893,199	920,392	980,563	1,068,636	1,056,034	1,013,568	986,884	912,707	850,865	831,247
1935	820,368	833,951	873,471	1,028,272	1,152,727	1,294,297	1,553,524	1,640,469	1,798,164	1,682,512	1,537,356	1,450,063
1936	1,413,664	1,405,171	1,399,264	1,452,789	1,628,755	1,690,000	1,713,000	1,815,837	2,014,345	1,915,939	1,765,962	1,683,103
1937	1,629,780	1,608,457	1,601,950	1,595,882	1,657,878	1,690,000	1,713,000	1,792,456	1,988,308	1,853,643	1,707,521	1,622,804
1938	1,548,681	1,540,119	1,689,998	1,689,992	1,689,987	1,690,000	1,690,000	1,730,000	2,025,000	2,030,000	1,870,754	1,718,957
1939	1,690,000	1,689,224	1,690,000	1,690,000	1,689,999	1,690,000	1,640,415	1,609,719	1,486,211	1,318,984	1,177,264	1,138,511
1940	1,096,286	1,089,016	1,166,352	1,322,462	1,546,901	1,690,000	1,713,000	1,797,680	1,944,734	1,779,072	1,628,893	1,540,317
1941	1,469,734	1,453,431	1,552,744	1,689,994	1,683,062	1,690,000	1,690,000	1,803,805	2,030,000	2,027,570	1,857,840	1,712,174
1942	1,653,602	1,645,974	1,689,999	1,689,982	1,673,445	1,690,000	1,713,000	1,765,000	2,027,000	2,030,000	1,860,016	1,707,840
1943	1,626,500	1,664,178	1,690,000	1,689,976	1,683,949	1,690,000	1,713,000	1,939,745	2,030,000	1,944,589	1,798,570	1,708,539
1944	1,635,547	1,622,064	1,610,321	1,603,274	1,647,456	1,690,000	1,658,867	1,706,915	1,749,631	1,623,011	1,481,354	1,403,951
1945	1,379,320	1,427,347	1,477,717	1,508,008	1,644,340	1,690,000	1,713,000	1,750,416	1,978,550	1,915,470	1,761,285	1,673,403
1946	1,675,574	1,690,000	1,689,996	1,689,984	1,655,146	1,690,000	1,713,000	1,726,277	1,790,756	1,626,434	1,470,843	1,384,452
1947	1,325,252	1,341,690	1,375,016	1,387,235	1,418,025	1,387,541	1,319,689	1,380,202	1,321,263	1,180,658	1,055,313	992,092
1948	995,855	997,122	1,035,745	1,034,871	1,022,941	1,055,025	1,146,212	1,267,720	1,417,634	1,352,869	1,259,478	1,215,157
1949	1,185,933	1,175,442	1,177,951	1,166,449	1,179,606	1,349,863	1,340,884	1,395,525	1,383,963	1,221,582	1,078,398	1,003,493
1950	925,411	915,323	925,485	945,157	1,102,443	1,237,499	1,275,073	1,282,104	1,369,722	1,220,281	1,080,022	1,021,444
1951	1,018,758	1,430,600	1,689,995	1,689,971	1,673,951	1,690,000	1,672,636	1,579,686	1,619,718	1,466,235	1,326,380	1,246,991
1952	1,205,614	1,213,315	1,334,908	1,565,446	1,605,688	1,690,000	1,690,000	1,895,000	2,030,000	2,030,000	1,869,932	1,719,140
1953	1,632,895	1,622,960	1,637,300	1,689,996	1,689,998	1,690,000	1,627,805	1,598,044	1,787,718	1,742,953	1,609,936	1,534,967
1954	1,469,181	1,468,382	1,472,024	1,478,824	1,527,793	1,637,361	1,675,192	1,807,461	1,807,613	1,647,557	1,501,608	1,423,172
1955	1,343,773	1,343,524	1,361,809	1,394,386	1,444,656	1,510,283	1,537,906	1,575,778	1,541,339	1,405,813	1,280,713	1,222,079
1956	1,159,157	1,157,788	1,690,000	1,689,941	1,678,244	1,690,000	1,713,000	1,806,151	2,030,000	2,030,000	1,859,576	1,712,725
1957	1,651,881	1,635,922	1,627,970	1,622,414	1,650,203	1,683,085	1,554,764	1,587,922	1,795,177	1,647,938	1,508,055	1,434,387
1958	1,418,027	1,410,472	1,423,180	1,446,139	1,586,653	1,683,533	1,690,000	1,910,000	2,030,000	2,030,000	1,868,297	1,719,418
1959	1,629,791	1,607,494	1,585,600	1,610,046	1,668,508	1,690,000	1,667,329	1,608,068	1,505,552	1,340,406	1,197,054	1,196,761
1960	1,118,856	1,107,432	1,130,660	1,130,349	1,259,387	1,275,928	1,287,863	1,287,845	1,207,869	1,077,205	968,431	919,175
1961	871,285	870,491	930,440	932,133	948,188	923,951	898,840	871,784	828,635	763,925	710,303	690,995
1962	665,046	659,956	687,691	691,636	878,736	999,844	999,980	961,550	1,190,017	1,099,040	961,986	889,096
1963	846,254	840,178	890,501	935,573	1,111,580	1,179,637	1,279,440	1,509,426	1,797,369	1,777,626	1,661,304	1,602,347
1964	1,583,605	1,633,140	1,648,808	1,666,929	1,683,419	1,653,465	1,600,898	1,597,117	1,558,312	1,403,132	1,267,934	1,196,877
1965	1,183,279	1,206,562	1,641,957	1,689,964	1,671,265	1,690,000	1,713,000	1,746,379	1,907,054	1,909,101	1,819,617	1,723,006
1966	1,638,048	1,690,000	1,689,998	1,689,996	1,685,990	1,690,000	1,666,206	1,743,752	1,626,487	1,462,463	1,318,853	1,248,271
1967	1,172,366	1,205,898	1,361,691	1,460,706	1,558,538	1,680,329	1,690,000	1,880,000	2,030,000	2,030,000	1,885,338	1,717,656
1968	1,636,802	1,624,597	1,622,733	1,622,937	1,666,603	1,690,000	1,620,006	1,623,382	1,560,682	1,393,610	1,258,193	1,180,490
1969	1,144,074	1,173,385	1,262,868	1,689,994	1,689,990	1,690,000	1,690,000	1,930,000	2,030,000	2,030,000	1,871,603	1,717,046
1970	1,690,000	1,690,000	1,689,999	1,689,952	1,679,633	1,690,000	1,655,509	1,725,036	1,816,534	1,686,506	1,549,469	1,471,343
1971	1,411,316	1,454,230	1,541,278	1,607,186	1,641,597	1,690,000	1,654,817	1,685,672	1,853,567	1,753,420	1,619,836	1,550,260
1972	1,488,043	1,496,591	1,540,187	1,590,658	1,628,525	1,611,472	1,517,554	1,495,198	1,504,521	1,346,809	1,215,475	1,148,834
1973	1,110,158	1,123,168	1,205,238	1,334,033	1,513,648	1,676,096	1,707,479	1,967,503	2,030,000	1,868,018	1,723,820	1,640,583
1974	1,631,540	1,690,000	1,689,998	1,689,983	1,662,882	1,690,000	1,717,600	1,963,536	2,030,000	1,947,300	1,804,413	1,717,372
1975	1,688,940	1,679,043	1,677,497	1,682,835	1,684,941	1,690,000	1,717,600	1,823,045	2,030,000	1,960,006	1,829,986	1,720,415
1976	1,690,000	1,690,000	1,690,000	1,664,706	1,652,292	1,526,598	1,445,307	1,341,473	1,236,083	1,107,685	1,022,829	992,425
1977	956,011	948,887	970,778	958,850	947,176	838,580	752,503	707,496	653,830	583,546	526,720	507,835
1978	487,414	485,146	537,432	682,534	851,424	1,090,274	1,269,016	1,455,404	1,761,000	1,845,304	1,711,347	1,699,327
1979	1,612,045	1,615,120	1,614,177	1,689,998	1,684,439	1,690,000	1,690,000	1,717,600	1,832,303	1,682,304	1,538,286	1,461,691
1980	1,430,288	1,433,000	1,453,035	1,689,976	1,689,987	1,690,000	1,717,600	1,890,400	1,960,200	2,030,000	1,874,603	1,727,346
1981	1,644,248	1,621,877	1,614,080	1,621,636	1,645,736	1,690,000	1,714,087	1,699,430	1,640,799	1,479,790	1,351,278	1,283,100
1982	1,274,224	1,381,134	1,531,878	1,689,994	1,689,988	1,690,000	1,717,600	1,876,400	2,002,900	2,030,000	1,874,041	1,772,100
1983	1,690,000	1,690,000	1,689,995	1,689,966	1,689,989	1,294,700	1,264,000	1,270,800	1,851,400	2,030,000	2,002,489	1,735,007
1984	1,690,000	1,690,000	1,689,992	1,689,971	1,681,440	1,690,000	1,622,221	1,691,612	1,791,967	1,663,838	1,517,244	1,433,830
1985	1,418,807	1,453,917	1,498,296	1,488,884	1,523,939	1,592,019	1,585,122	1,645,091	1,583,355	1,422,894	1,291,292	1,227,399
1986	1,200,412	1,221,603	1,301,584	1,370,256	1,670,077	1,690,000	1,717,600	1,888,300	2,001,400	1,921,921	1,777,677	1,709,305
1987	1,650,170	1,628,126	1,609,576	1,578,456	1,577,656	1,606,514	1,550,992	1,452,961	1,354,101	1,222,918	1,114,556	1,061,284
1988	1,038,561	1,037,658	1,073,842	1,127,662	1,169,858	1,146,881	1,129,582	1,092,071	1,051,090	989,376	931,410	909,593
1989	882,991	890,488	923,169	946,827	978,795	1,102,712	1,094,344	1,211,370	1,266,686	1,134,220	1,024,045	1,018,725
1990	1,045,254	1,043,763	1,063,653	1,066,374	1,101,875	1,085,117	1,041,473	1,108,935	1,115,597	1,026,035	933,985	883,922
1991	862,473	855,840	859,994	840,914	817,710	891,424	916,058	1,030,065	1,149,236	1,084,682	1,016,177	974,784
1992	970,189	968,636	991,064	995,800	1,059,585	1,119,059	1,201,976	1,231,303	1,157,089	1,066,300	953,525	888,690
1993	851,603	845,141	870,954	1,060,565	1,210,204	1,469,130	1,574,457	1,892,602	2,030,000	2,015,252	1,860,185	1,719,602
1994	1,646,106	1,631,889	1,617,739	1,607,788	1,617,852	1,565,083	1,533,235	1,527,313	1,486,358	1,367,416	1,269,982	1,224,041
1995	1,184,661	1,204,464	1,249,246	1,506,764	1,591,271	1,690,000	1,702,679	1,629,700	1,982,800	2,030,000	1,957,840	1,718,604
1996	1,625,966	1,600,351	1,621,669	1,689,837	1,689,990	1,690,000	1,717,600	2,002,400	2,030,000	1,934,528	1,789,313	1,712,841
1997	1,679,670	1,690,000	1,689,993	1,689,875	1,689,994	1,690,000	1,607,194	1,849,992	1,966,183	1,829,617	1,690,255	1,635,994
1998	1,554,059	1,547,662	1,549,068	1,689,997	1,689,989	1,690,000	1,707,834	1,714,000	1,987,500	2,030,000	1,881,075	1,719,248
1999	1,658,952	1,669,423	1,690,000	1,689,986	1,689,990	1,690,000	1,717,600	1,793,743	2,020,177	1,894,937	1,756,942	1,687,394
2000	1,624,457	1,614,466	1,598,823	1,674,758	1,689,992	1,690,000	1,713,910	1,930,492	2,030,000	1,869,201	1,728,017	1,657,692
2001	1,603,232	1,590,888	1,579,361	1,571,337	1,589,625	1,655,516	1,658,030	1,751,843	1,625,780	1,466,278	1,331,576	1,266,879
2002	1,219,908	1,228,730	1,307,095	1,368,323	1,418,827	1,449,436	1,463,422	1,572,911	1,603,138	1,444,907	1,310,599	1,242,767
Avg (21-02)	1,324,764	1,333,774	1,378,425	1,423,179	1,473,434	1,507,158	1,513,058	1,585,137	1,668,794	1,580,081	1,451,351	1,370,699

Table 3.5-2

Difference in Don Pedro Reservoir Storage (Acre-feet)

WSIP Desalination minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	0	0	0	0	0	0	0	0	0	0	0	0
1922	0	0	0	0	0	0	0	0	0	0	0	0
1923	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	-27,234	-27,241	-26,605	-26,595	-26,307	-21,012	2,292	2,282	2,273	2,264
1926	2,260	2,258	2,259	2,259	2,259	2,259	3,325	6,216	6,966	6,935	6,904	6,880
1927	6,866	6,862	27,702	27,710	27,713	27,702	27,675	56,202	37,308	37,147	36,984	36,867
1928	36,792	34,565	97	0	0	0	0	1,414	1,408	1,402	1,396	1,392
1929	1,389	1,388	1,388	1,388	1,388	1,388	1,386	1,382	4,701	4,680	4,658	4,643
1930	4,633	4,630	4,631	4,632	4,632	4,631	4,626	9,652	9,621	9,577	9,533	9,500
1931	9,479	9,473	9,474	9,476	9,478	9,474	9,464	9,438	9,404	9,359	9,314	9,282
1932	9,263	9,258	46,721	57,352	71,558	77,307	80,515	85,535	92,321	91,905	91,481	91,170
1933	90,982	90,931	90,935	90,961	90,968	90,934	90,978	90,858	91,152	90,738	90,310	89,988
1934	89,792	89,739	114,073	109,382	101,103	95,130	95,036	94,783	94,442	93,987	93,537	93,209
1935	93,007	92,952	92,956	93,782	94,458	108,864	109,704	111,994	101,452	101,013	100,559	100,220
1936	100,010	99,953	100,019	100,004	39,769	0	0	7,414	7,390	7,358	7,325	7,302
1937	7,287	7,284	7,312	7,346	2,886	0	0	240	1,403	1,396	1,390	1,385
1938	1,383	1,381	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	1	0	0	0	0	0
1940	0	0	13,333	15,582	6,431	0	0	-10,273	-10,239	-10,195	-10,151	-10,117
1941	-10,096	-10,092	-10,091	1	0	0	0	0	0	0	0	0
1942	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	3,935	7,933	4,142	0	0	-190	-881	-878	-874	-871
1946	-870	0	0	0	0	0	0	0	0	0	0	0
1947	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	7,748	7,785	8,859	14,970	16,422	19,440	26,020	25,900	25,781	25,694
1950	25,639	25,623	33,750	27,821	27,794	27,743	27,680	27,580	27,331	27,204	27,080	26,989
1951	26,930	36,120	-1	0	0	0	1,264	3,447	14,722	14,655	14,588	14,538
1952	14,508	14,499	14,500	15,440	6,178	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	1,219	0	0	0	0
1957	0	0	0	0	0	0	0	1,872	1,866	1,857	1,849	1,844
1958	1,840	1,839	1,839	1,839	736	294	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	15,660	19,561	16,308	8,425	2,377	2,366	2,355	2,347
1961	2,341	2,340	-8,989	-8,992	-5,092	4,595	4,590	4,578	4,561	4,540	4,517	4,501
1962	4,491	4,489	4,489	4,490	4,491	4,489	4,484	61,844	60,737	60,462	60,178	59,962
1963	59,832	59,797	59,800	59,818	68,643	68,618	68,552	62,158	55,304	55,066	54,828	54,647
1964	54,537	54,506	54,509	54,524	54,528	54,509	54,457	54,319	54,136	53,890	53,638	53,459
1965	53,349	53,319	57,215	-9	-1,034	0	0	1,721	2,268	2,258	2,249	-3
1966	-4	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	2,101	2,102	2,101	840	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	13,098	0	0	1	0
1974	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	54,318	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	4,531	4,511	4,489	4,474
1982	4,465	4,462	4,462	-1	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	8,396	12,060	-2	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	-13,661	-13,655	-8,065	-5,697	2,418	7,395	7,360	7,334
1989	7,318	7,313	7,314	7,316	7,317	7,314	15,309	46,483	48,439	48,220	47,998	47,832
1990	47,730	47,703	47,705	47,719	47,722	47,705	47,659	103,602	103,244	102,768	102,271	101,910
1991	101,688	101,628	86,828	82,710	81,671	81,640	93,104	128,227	142,790	127,200	126,599	113,918
1992	107,905	107,725	107,729	107,725	107,734	107,693	125,622	152,263	151,740	151,041	150,314	149,782
1993	149,457	149,364	149,370	149,197	149,096	167,095	171,402	171,151	53,066	52,838	36,792	-59
1994	-59	-59	-59	-59	-59	-59	-59	-59	-59	-58	-59	-58
1995	-58	-58	-58	-58	-1,201	0	7,633	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	8,993	14,804	18,218	20,250	16,447	-44	-45	-44	-44	-43
Avg (21-02)	13,464	13,551	13,721	13,254	12,316	12,252	12,917	16,507	14,685	14,497	14,237	13,563

Table 3.5-3

Difference in Don Pedro Reservoir Storage (Acre-feet)

WSIP Desalination minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	-197	-197	-197	-197	-79	0	0	-3,473	-12,241	-14,370	-14,308	-14,262
1922	-14,232	-14,224	-14,224	-14,228	-5,692	0	0	-9,834	0	-2,184	-1,520	3
1923	3	2	0	0	0	0	0	-20,855	-22,900	-24,983	-24,874	-24,795
1924	-24,744	-24,731	-24,732	-24,740	-24,741	-24,732	-27,837	-31,450	-31,342	-31,201	-31,053	-30,941
1925	-30,873	-30,855	-58,090	-58,106	-57,473	-57,451	-61,765	-76,450	-55,074	-57,014	-56,755	-56,563
1926	-56,444	-56,412	-56,909	-56,926	-57,127	-56,530	-62,599	-69,662	-92,170	-91,749	-91,323	-91,018
1927	-90,829	-90,779	-63,344	-63,361	-63,366	-63,343	-63,283	-62,217	-44,603	-46,596	-45,748	-36,049
1928	-29,099	0	0	0	0	0	-7,501	-11,656	-13,732	-13,674	-13,612	-13,567
1929	-13,539	-13,531	-13,532	-13,536	-13,537	-13,531	-13,519	-39,386	-50,468	-50,237	-50,005	-49,837
1930	-49,734	-49,707	-49,709	-49,723	-49,726	-49,708	-49,661	-44,492	-46,453	-46,245	-46,034	-45,876
1931	-45,777	-45,751	-45,753	-45,767	-45,770	-45,752	-45,707	-45,580	-45,415	-45,200	-44,981	-44,819
1932	-44,723	-44,697	-39,347	-35,981	-32,771	-47,453	-49,043	-52,594	-55,629	-57,563	-57,301	-57,105
1933	-56,986	-56,954	-56,956	-56,973	-56,977	-56,956	-62,420	-67,960	-88,004	-89,790	-89,378	-89,068
1934	-88,873	-88,820	-58,832	-65,817	-70,629	-79,889	-88,882	-107,979	-109,404	-108,897	-108,372	-107,986
1935	-107,749	-107,685	-107,690	-122,465	-135,613	-101,712	-105,707	-113,082	-151,429	-152,955	-152,285	-151,781
1936	-151,470	-151,385	-151,326	-151,352	-61,235	0	0	-10,039	-12,121	-14,253	-14,190	-14,145
1937	-14,117	-14,108	-14,090	-14,094	-5,357	0	0	-9,496	-17,505	-19,614	-19,527	-19,466
1938	-19,426	-19,415	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	-28,912	-27,223	-29,245	-29,111	-28,977	-28,881
1940	-28,821	-28,805	-14,741	-11,785	-2,992	0	0	-4,098	-8,956	-8,917	-8,878	-8,849
1941	-8,831	-8,827	-9,754	1	52	0	0	-3,095	0	-2,183	-1,521	3
1942	3	3	0	1	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	-5,036	0	-2,183	-2,174	4
1944	3	4	4	3	2	0	0	-33,617	-35,622	-37,653	-37,484	-37,358
1945	-37,280	-37,259	-33,326	-29,338	-10,768	0	0	-475	10,004	7,777	7,743	7,719
1946	7,704	0	0	0	0	0	0	-11,642	-13,718	-13,660	-13,598	-13,552
1947	-13,524	-13,515	-13,516	-13,520	-13,521	-13,516	-13,503	-46,684	-48,636	-48,412	-48,190	-48,027
1948	-47,926	-47,899	-47,900	-47,914	-47,918	-53,609	-58,380	-62,784	-76,952	-78,784	-78,417	-78,151
1949	-77,990	-77,947	-70,201	-70,212	-69,143	-60,096	-62,709	-63,003	-65,114	-64,814	-64,519	-64,300
1950	-64,163	-64,126	-61,384	-62,967	-78,346	-87,620	-88,508	-89,591	-86,883	-87,868	-87,468	-87,173
1951	-86,992	-89,627	2	0	0	0	-1,660	-394	1,686	-505	-502	-501
1952	-500	-500	-500	-4,047	-1,618	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	-19,831	-21,992	-24,036	-26,115	-26,002	-25,917
1954	-25,863	-25,849	-25,850	-25,858	-25,859	-25,849	-25,826	-58,616	-60,536	-60,276	-60,006	-59,807
1955	-59,681	-59,648	-59,650	-59,667	-59,673	-59,651	-61,818	-65,543	-76,078	-75,736	-75,387	-75,129
1956	-74,974	-74,933	2	-1	0	0	0	-6,896	0	0	0	0
1957	0	0	0	0	0	0	0	-31,723	-33,734	-35,773	-35,613	-35,494
1958	-35,420	-35,400	-35,401	-35,412	-14,166	-5,663	0	0	0	0	0	0
1959	0	0	0	0	0	0	-5,763	-22,415	-22,340	-22,239	-22,134	-22,061
1960	-22,016	-22,003	-22,004	-22,010	-9,798	-7,297	-11,805	-18,561	-22,845	-22,741	-22,636	-22,558
1961	-22,508	-22,494	-42,810	-42,823	-38,925	-29,226	-29,196	-30,376	-30,267	-30,123	-29,979	-29,872
1962	-29,805	-29,787	-29,789	-29,798	-29,801	-29,789	-29,760	-72,179	-80,452	-82,273	-81,895	-81,608
1963	-81,428	-81,380	-65,589	-53,167	-72,609	-72,583	-72,512	-108,904	-117,033	-118,707	-118,189	-117,810
1964	-106,395	-56,860	-41,192	-23,069	-6,580	-6,578	-8,986	-21,751	-54,498	-54,253	-54,002	-53,819
1965	-53,709	-53,680	-39,631	5	3	0	0	3,069	16,176	13,923	11,678	-18
1966	-19	0	0	0	353	0	-26,964	-25,281	-27,313	-27,191	-27,066	-26,973
1967	-26,918	-26,903	-24,803	-24,810	-24,813	-9,017	0	0	0	0	-2,183	3
1968	4	4	4	3	2	0	0	-31,853	-33,860	-33,707	-33,550	-33,438
1969	-33,369	-33,351	-33,352	5	0	0	0	0	0	0	0	0
1970	0	0	0	-3	1,189	0	0	-11,491	-13,567	-15,692	-15,622	-15,570
1971	-15,538	-15,528	-15,530	-15,534	-6,215	0	0	-23,835	-25,871	-27,941	-27,820	-27,728
1972	-27,672	-27,656	-27,657	-27,665	-11,067	-11,064	-11,053	-44,157	-46,121	-45,911	-45,697	-45,544
1973	-45,450	-45,424	-45,426	-45,439	-45,444	-13,904	-10,121	-13,091	0	0	0	0
1974	0	0	0	1	1	0	0	652	0	-2,184	-2,174	3
1975	4	4	3	3	1	0	0	1,198	0	-2,184	-1,521	2
1976	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	-33,070	0	-2,183	-2,174	-2,476
1979	-8,317	-8,313	-8,313	1	1	0	0	0	-2,114	-2,105	-2,096	-2,089
1980	-2,084	-2,084	-2,083	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	-2,117	-14,691	-26,879	-26,760	-26,638	-26,546
1982	-26,489	-26,475	-26,476	4	0	0	0	0	0	0	-2,183	0
1983	0	0	0	0	0	0	0	0	0	0	-2,183	3
1984	0	0	0	0	0	0	-197	-14,020	-16,088	-18,202	-18,121	-18,060
1985	-18,023	-18,013	-18,014	-18,019	-18,020	-18,013	-17,996	-24,665	-26,696	-26,576	-26,453	-26,363
1986	-26,308	-26,294	-23,458	-17,884	-10,524	0	0	0	0	-2,183	-2,174	-2,167
1987	-2,163	-2,161	-2,162	-2,162	-2,162	-2,162	-2,159	-15,753	-27,225	-27,100	-26,977	-26,886
1988	-26,830	-26,815	-26,816	-26,823	-26,826	-26,815	-26,790	-26,721	-52,478	-52,239	-51,991	-51,808
1989	-51,694	-51,663	-51,666	-51,681	-51,685	-51,666	-66,471	-66,300	-66,070	-65,773	-65,472	-65,250
1990	-65,115	-65,077	-65,081	-65,099	-65,105	-65,080	-65,017	-22,960	-3,033	-3,020	-3,005	-16,882
1991	-22,228	-22,215	-37,806	-49,466	-51,873	-51,852	-40,252	-3,002	-17,000	-21,860	-30,584	-45,788
1992	-51,453	-51,541	-51,543	-51,596	-51,599	-51,580	-3,223	-3,214	-3,203	-3,190	-3,174	-3,162
1993	-3,156	-3,154	-17,135	-32,732	-32,879	-26,096	-30,969	-31,673	0	-2,184	-1,520	3
1994	3	2	2	3	3	3	3	-30,594	-32,603	-32,455	-32,303	-32,194
1995	-32,127	-32,109	-32,111	-32,120	-14,027	0	-1,570	0	0	0	-2,184	3
1996	4	3	4	4	0	0	0	0	0	-2,183	-2,174	-2,167
1997	-2,163	0	0	2	0	0	-13,622	-15,774	-17,837	-19,944	-19,858	-19,794
1998	-19,754	-19,744	-19,745	3	0	0	1,472	0	0	0	0	0
1999	0	0	0	0	0	0	0	-20,597	-9,823	-11,964	-11,912	-11,874
2000	-11,850	-11,844	-11,844	-11,847	0	0	0	-12,191	0	0	0	0
2001	0	0	0	0	0	0	0	-45,377	-47,131	-46,922	-46,706	-46,545
2002	-46,447	-46,422	-37,431	-31,633	-28,223	-26,174	-29,932	-84,049	-85,883	-85,500	-85,107	-84,814
Avg (21-02)	-27,733	-26,860	-23,737	-22,065	-19,520	-17,097	-18,342	-26,735	-27,907	-28,711	-28,781	-28,836

Figure 3.5-2

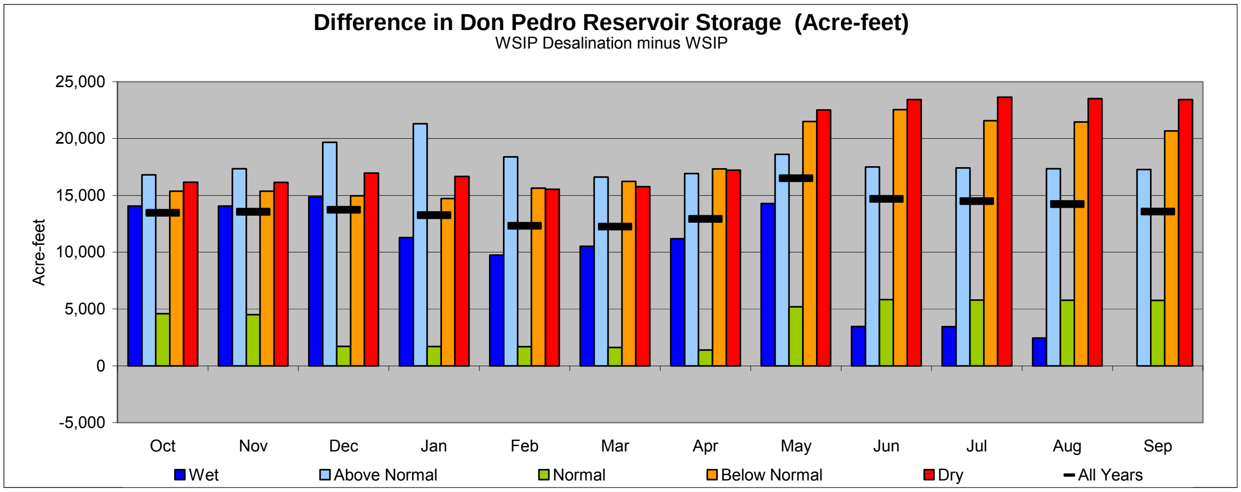


Figure 3.5-3

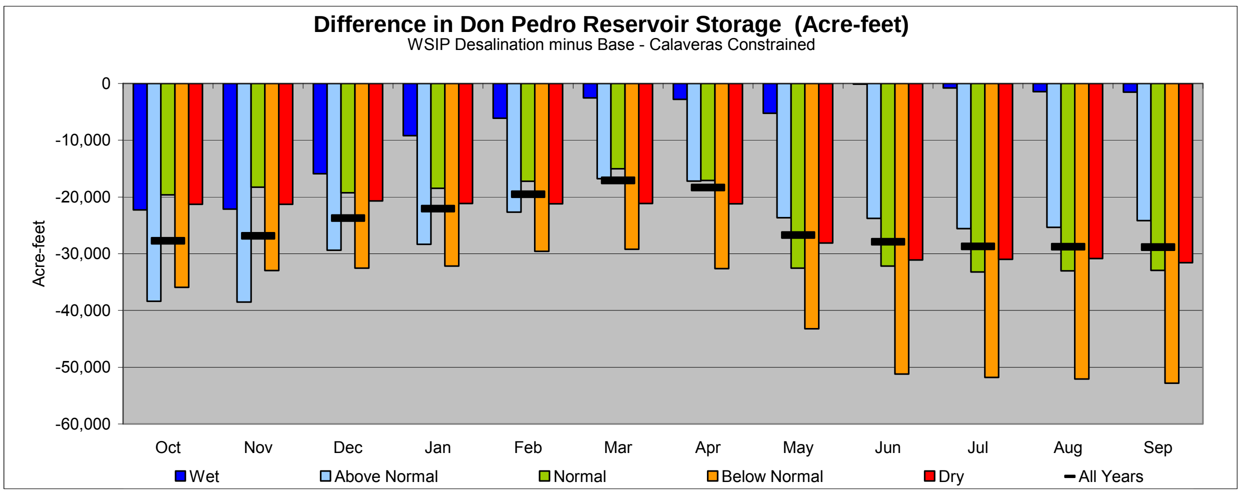


Figure 3.5-4

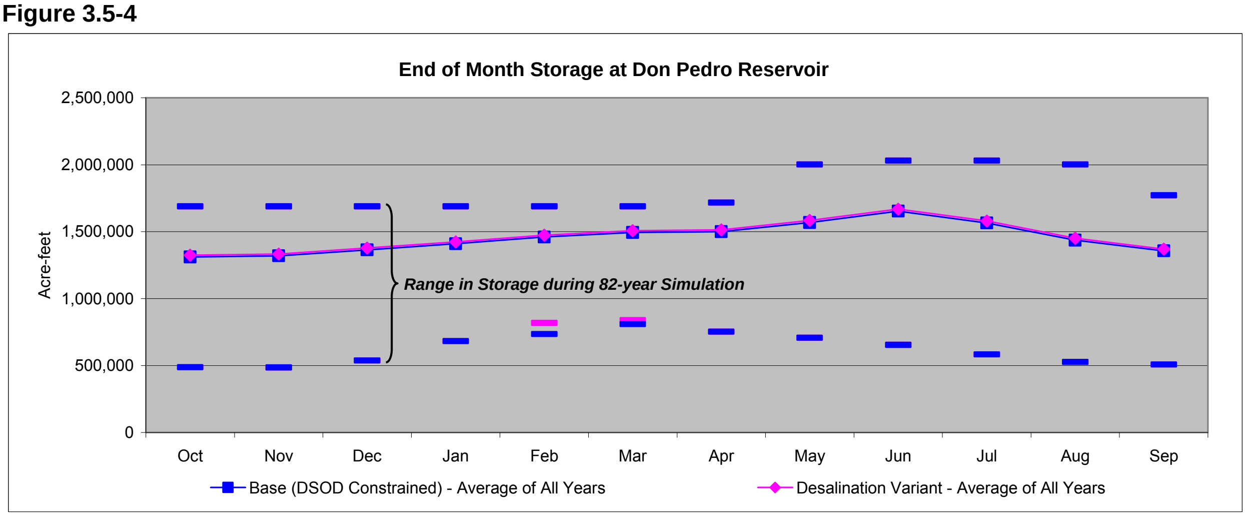


Table 3.5-4

Difference in Total La Grange Release to River (Acre-feet)

WSIP Desalination minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	0	0	0	0	0	0	0	0
1922	0	0	0	0	0	0	0	0	0	0	0	0	0
1923	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	0	0	0	0	0
1928	0	2,208	34,469	97	0	0	0	0	0	0	0	0	36,774
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	61,428	41,220	1,378	0	0	0	0	0	104,026
1937	0	0	0	0	4,721	2,080	316	0	0	0	0	0	7,117
1938	0	0	2,027	0	0	45	2,439	4,487	0	0	0	0	8,998
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	8,162	4,075	-1,036	0	0	0	0	0	11,201
1941	0	0	0	-10,095	1	1	0	0	0	0	0	0	-10,093
1942	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	-3,260	4,141	0	0	0	0	0	0	881
1946	0	-869	0	0	0	0	0	0	0	0	0	0	-869
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	36,122	0	0	0	0	0	0	0	0	0	36,122
1952	0	0	0	0	9,265	6,176	0	937	0	0	0	0	16,378
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	2,323	0	0	2,690	-178	0	3,335	0	0	0	8,170
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	1,103	441	294	1,237	0	0	0	0	3,075
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	62,939	6,182	-1,034	7,587	0	0	0	0	2,249	77,923
1966	0	-4	0	0	0	0	0	0	0	0	0	0	-4
1967	0	0	0	0	0	1,261	839	1,904	-2,100	0	0	0	1,904
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	15,654	0	0	0	15,654
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	57,081	0	0	0	57,081
1979	0	0	0	0	0	-921	0	0	0	0	0	0	-921
1980	0	0	0	1,237	0	-1,903	0	0	0	0	0	0	-666
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	4,464	-3,143	0	0	0	0	0	0	0	1,321
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	-4	11,648	5,968	3,140	3,038	0	0	0	23,790
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	104,600	0	15,852	36,792	157,244
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	7,029	6,155	0	9,526	1,842	0	0	0	24,552
1996	0	0	0	0	31	0	0	0	0	0	0	0	31
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	0	16	914	715	1,116	928	215	259	2,237	0	193	476	7,069

Table 3.5-5

Difference in Total La Grange Release to River (Acre-feet)

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending SJR Index — WSIP Desalination minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	7,029	6,155	0	9,526	1,842	0	0	0	24,552
1938	0	0	2,027	0	0	45	2,439	4,487	0	0	0	0	8,998
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	4,464	-3,143	0	0	0	0	0	0	0	1,321
1967	0	0	0	0	0	1,261	839	1,904	-2,100	0	0	0	1,904
1952	0	0	0	0	9,265	6,176	0	937	0	0	0	0	16,378
1958	0	0	0	0	1,103	441	294	1,237	0	0	0	0	3,075
1980	0	0	0	1,237	0	-1,903	0	0	0	0	0	0	-666
1978	0	0	0	0	0	0	0	0	57,081	0	0	0	57,081
1922	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	2,323	0	0	2,690	-178	0	3,335	0	0	0	8,170
1942	0	0	0	0	0	0	0	0	0	0	0	0	0
1941	0	0	0	-10,095	1	1	0	0	0	0	0	0	-10,093
1986	0	0	0	0	-4	11,648	5,968	3,140	3,038	0	0	0	23,790
1993	0	0	0	0	0	0	0	0	104,600	0	15,852	36,792	157,244
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	31	0	0	0	0	0	0	0	31
1943	0	0	0	0	0	0	0	0	0	0	0	0	0
1937	0	0	0	0	4,721	2,080	316	0	0	0	0	0	7,117
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	62,939	6,182	-1,034	7,587	0	0	0	0	2,249	77,923
1936	0	0	0	0	61,428	41,220	1,378	0	0	0	0	0	104,026
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	-921	0	0	0	0	0	0	-921
1945	0	0	0	0	-3,260	4,141	0	0	0	0	0	0	881
1999	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1946	0	-869	0	0	0	0	0	0	0	0	0	0	-869
1973	0	0	0	0	0	0	0	0	15,654	0	0	0	15,654
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	8,162	4,075	-1,036	0	0	0	0	0	11,201
1923	0	0	0	0	0	0	0	0	0	0	0	0	0
1921	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	36,122	0	0	0	0	0	0	0	0	0	36,122
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1928	0	2,208	34,469	97	0	0	0	0	0	0	0	0	36,774
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	-4	0	0	0	0	0	0	0	0	0	0	-4
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 3.5-6

Difference in Total La Grange Release to River (Acre-feet)

WSIP Desalination minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	-118	-15,701	-3,600	0	0	0	0	0	-19,419
1922	0	0	0	0	-8,537	-5,691	-7,365	-5,684	-14,697	0	-655	-1,521	-44,150
1923	0	0	3	0	0	0	-2,117	0	0	0	0	0	-2,114
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	-43,828	0	-644	-9,569	-54,041
1928	-6,886	-29,091	0	0	0	-5,339	-10,773	0	0	0	0	0	-52,089
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	-90,125	-77,855	-3,557	0	0	0	0	0	-171,537
1937	0	0	0	0	-10,148	-10,926	-3,371	0	0	0	0	0	-24,445
1938	0	0	-16,917	0	0	0	-6,904	-15,064	-4,880	-2,189	0	0	-45,954
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	-17,410	-15,145	-6,320	0	0	0	0	0	-38,875
1941	0	0	0	-9,757	-314	-194	-304	0	-6,578	0	-655	-1,520	-19,322
1942	0	0	2	-4,495	0	-3,805	-5,524	-2,855	-2,762	-2,188	0	0	-21,627
1943	0	0	0	0	0	-11,461	-4,879	0	-9,907	0	0	-2,173	-28,420
1944	0	0	0	0	2	1	0	0	0	0	0	0	3
1945	0	0	0	0	-25,623	-26,084	-45	0	0	0	0	0	-51,752
1946	0	7,702	0	0	0	-13,392	-3,867	0	0	0	0	0	-9,557
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	-89,630	2	0	0	0	0	0	0	0	0	-89,628
1952	0	0	0	0	-2,428	-1,618	0	-19,638	-4,879	-2,188	0	0	-30,751
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	-78,911	2	0	-1,644	-2,872	0	-9,647	-2,188	0	0	-95,260
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	-21,247	-8,500	-5,661	-15,301	-2,854	-2,188	0	0	-55,751
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	-11,189	-49,491	-15,670	-18,132	-16,489	0	0	0	0	0	0	0	-110,971
1965	0	0	0	-39,643	4	-14,514	6,354	0	0	0	0	11,678	-36,121
1966	0	-19	-4,311	0	-2,121	-6,099	0	0	0	0	0	0	-12,550
1967	0	0	0	0	0	-20,299	-9,013	-7,789	-2,100	-2,188	0	-2,184	-43,573
1968	0	0	0	0	2	1	0	0	0	0	0	0	3
1969	0	0	0	-33,361	-7,207	-6,138	-7,641	-5,043	-4,879	-2,188	0	0	-66,457
1970	0	0	0	21,837	-7,145	-16,079	0	0	0	0	0	0	-1,387
1971	0	0	0	0	-9,321	-6,213	0	0	0	0	0	0	-15,534
1972	0	0	0	0	-16,599	0	0	0	0	0	0	0	-16,599
1973	0	0	0	0	0	-31,528	-3,772	0	-12,609	0	0	0	-47,909
1974	0	0	0	-11,155	1	-8,562	-5,524	-5,694	-4,229	0	0	-2,174	-37,337
1975	0	0	0	0	2	1	-8,286	0	248	0	-655	-1,520	-10,210
1976	2	0	0	0	0	0	0	0	0	0	0	0	2
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	-35,776	0	0	0	-35,776
1979	0	0	0	-8,316	0	-20,024	-2,118	-2,189	0	0	0	0	-32,647
1980	0	0	0	5,071	-1	-10,465	-4,880	-5,042	-4,880	-2,188	0	0	-22,385
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	-26,483	-13,302	-2,663	0	-2,854	-2,762	-2,188	0	-4,297	-54,549
1983	-2,949	-1,841	2,664	0	0	0	0	-5,799	-2,762	-2,188	0	-2,183	-15,058
1984	-7,155	0	0	0	0	3,935	0	0	0	0	0	0	-3,220
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	-15,784	-19,000	-5,332	-1,902	-1,841	0	0	0	-43,859
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	-83,362	0	-655	-1,521	-85,538
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	-12,209	-1,724	0	-3,471	-1,841	-2,188	0	-2,183	-23,616
1996	0	0	0	0	-3,497	0	-6,721	-2,188	-2,118	0	0	0	-14,524
1997	0	-2,162	0	-12,747	2	0	0	0	0	0	0	0	-14,907
1998	0	0	0	-19,751	3	-6,674	-8,839	-2,430	-3,774	-2,188	0	0	-43,653
1999	0	0	0	0	0	-9,514	-5,004	0	-16,264	0	0	0	-30,782
2000	0	0	0	0	-11,848	0	0	0	-14,290	0	0	0	-26,138
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	-344	-913	-2,473	-1,914	-3,554	-4,548	-1,560	-1,255	-3,576	-320	-40	-234	-20,732

Table 3.5-4 illustrates the difference in stream release between the variant and WSIP settings, expressed in terms of a monthly volume (acre-feet) of flow. Table 3.5-7 illustrates the same information and the average monthly stream release for the variant and WSIP setting, expressed in average monthly flow (cfs). Table 3.5-4 illustrates that the difference in monthly flow below La Grange Dam could range from an increase of approximately 105,000 acre-feet to a minor decrease of approximately 3,000 acre-feet. Considering the manner in which releases are determined and made to the stream, quantifying the effect of these changes in terms of average monthly flow (cfs) is not always meaningful. Assuming that a change in release volume equates to a delay or earlier initiation of a 6,000 acre-feet release per day, the difference in stream release from La Grange Dam between the variant and WSIP settings would be an almost unnoticeable delay in release or up to an added 18 days of release when compared to the WSIP (and possibly more, depending on the management of spills at Don Pedro Reservoir over a period of time).

Normally, the effect of reduced releases would not affect the year's peak stream release rate during a year. However, infrequently, the variant's effect on stream releases could manifest as an elimination of all flow above minimum FERC flow requirements within a month. This would occur after the experience of an extended drought period. Comparing the variant and WSIP settings, a change (increase or decrease) in stream release would occur in approximately 28 percent of the years simulated. Compared to the base setting, the variant's effect to stream flow is similar to the effect caused by the WSIP, but following drought would be less.

Compared to the base setting, there would be some reduction of release, but a lesser effect than occurs in the WSIP setting. Table 3.5-6 illustrates that the difference in monthly flow below La Grange Dam could range from an increase of approximately 13,000 acre-feet to a decrease of approximately 43,000 acre-feet. Using the same assumption described above for the effect of a changed release, compared to the base setting, the variant setting would result in release changes ranging from an additional 2 days of release to a decrease of 7 days of release in excess of minimum release requirements. Table 3.5-8 illustrates the releases to the Tuolumne River below La Grange Dam and their differences for the variant and base settings, provided in terms of average monthly flow (cfs) averaged within year types.

Table 3.5-7

Total La Grange Release to River (CFS)
(Average within Year Type - Grouped by SJR Index Year Type) — WSIP Desalination

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	429	371	794	2,058	3,453	4,006	3,363	3,093	3,489	1,283	514	1,292
Above Normal	291	515	1,144	1,270	2,241	1,757	1,537	1,346	322	240	240	240
Below Normal	284	273	417	318	635	630	943	943	75	75	75	75
Dry	337	260	272	262	437	421	497	497	73	73	73	73
Critical	236	195	204	189	189	189	344	344	50	50	50	50
All Years	327	334	613	991	1,674	1,732	1,587	1,468	1,120	457	233	460

Total La Grange Release to River (CFS)
(Average within Year Type - Grouped by SJR Index Year Type) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	429	371	791	2,018	3,434	3,987	3,351	3,079	3,372	1,283	504	1,265
Above Normal	291	516	1,109	1,270	2,171	1,710	1,537	1,346	306	240	240	240
Below Normal	284	270	370	318	635	630	943	943	75	75	75	75
Dry	337	260	272	262	437	421	497	497	73	73	73	73
Critical	236	195	204	189	189	189	344	344	50	50	50	50
All Years	327	334	599	979	1,654	1,717	1,584	1,464	1,083	457	229	452

Difference in Total La Grange Release to River (CFS)
(Average within Year Type - Grouped by SJR Index Year Type) — WSIP Desalination minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	0	0	3	40	19	19	12	14	117	0	11	27
Above Normal	0	-1	35	0	70	46	0	0	15	0	0	0
Below Normal	0	3	47	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0
Critical	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	15	12	20	15	4	4	38	0	3	8

Table 3.5-8

Total La Grange Release to River (CFS) (Average within Year Type - Grouped by SJR Index Year Type)											WSIP Desalination	
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	429	371	794	2,058	3,453	4,006	3,363	3,093	3,489	1,283	514	1,292
Above Normal	291	515	1,144	1,270	2,241	1,757	1,537	1,346	322	240	240	240
Below Normal	284	273	417	318	635	630	943	943	75	75	75	75
Dry	337	260	272	262	437	421	497	497	73	73	73	73
Critical	236	195	204	189	189	189	344	344	50	50	50	50
All Years	327	334	613	991	1,674	1,732	1,587	1,468	1,120	457	233	460

Total La Grange Release to River (CFS) (Average within Year Type - Grouped by SJR Index Year Type)											Base - Calaveras Constrained	
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	431	374	857	2,161	3,524	4,096	3,424	3,161	3,634	1,300	516	1,299
Above Normal	298	507	1,230	1,257	2,402	1,969	1,568	1,348	408	240	240	249
Below Normal	294	314	422	318	653	654	958	943	75	75	75	75
Dry	351	324	292	285	482	421	497	497	73	73	73	73
Critical	236	195	204	189	189	189	344	344	50	50	50	50
All Years	333	350	654	1,022	1,738	1,806	1,613	1,489	1,180	463	233	464

Difference in Total La Grange Release to River (CFS) (Average within Year Type - Grouped by SJR Index Year Type)											WSIP Desalination minus Base - Calaveras Constrained	
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	-2	-3	-63	-103	-71	-91	-61	-68	-144	-18	-2	-7
Above Normal	-7	8	-86	13	-161	-212	-30	-2	-86	0	-1	-9
Below Normal	-9	-41	-6	0	-17	-24	-15	0	0	0	0	0
Dry	-14	-64	-20	-23	-46	0	0	0	0	0	0	0
Critical	0	0	0	0	0	0	0	0	0	0	0	0
All Years	-6	-15	-40	-31	-64	-74	-26	-20	-60	-5	-1	-4

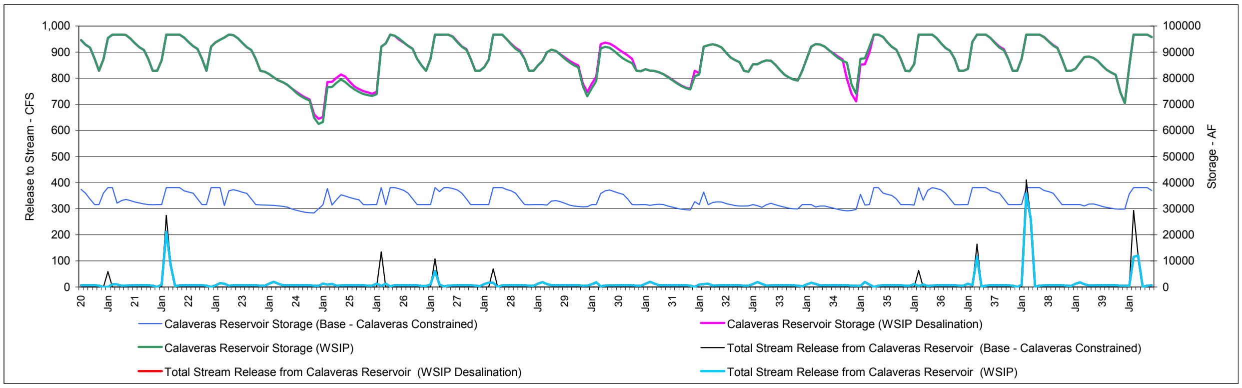
3.6 Calaveras and San Antonio Reservoirs, Alameda Creek and Downstream

There are only a few modeled differences in Calaveras Reservoir operations between the variant and WSIP settings. Figure 3.6-1 illustrates a chronological trace of the simulation of Calaveras Reservoir storage and stream releases from Calaveras Dam. Shown in Figure 3.6-1 are the results for the WSIP, variant, and base settings. Generally, the differences in reservoir storage are partially due to the dependence on modeling assumptions to balance total Bay Area reservoir storage among the five major SFPUC reservoirs and to balance storage between the Bay Areas reservoirs and Hetch Hetchy. The model balances storage between reservoirs by way of an input file by the modeler concerning the relative draw (percentage) from each reservoir under various storage conditions. These are discretionary input in the model, and the logic and relative percentages are meant to mimic the current practice and discretion of the system operators based on recognition of the physical conveyance constraints within the system and the ability of each reservoir to provide yield and water delivery security. Generally, during drought, the draw of water for deliveries from Hetch Hetchy is lessened with the variant (compared to the WSIP setting), leaving Bay Area reservoir storage less drawn upon due to conveyance limitations. During these circumstances, some of the storage gain is proportionately left in Calaveras Reservoir.

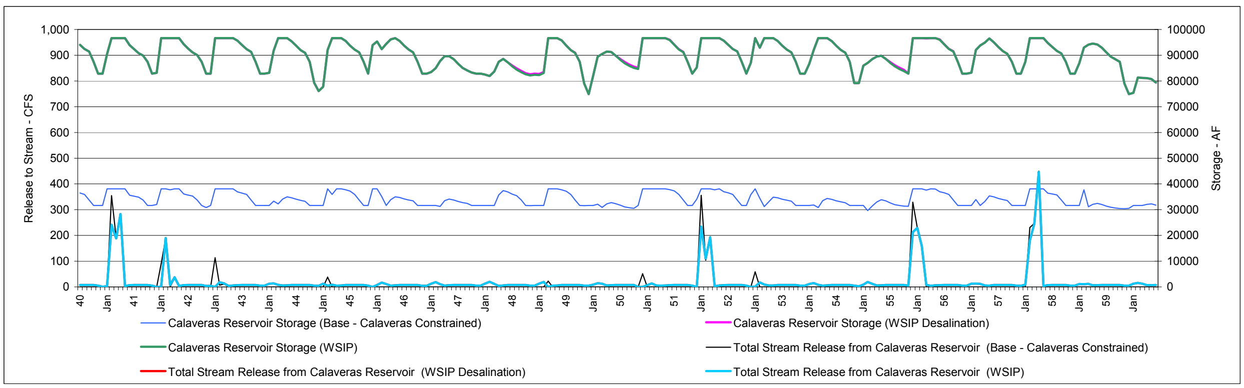
The notable difference in storage between the variant and WSIP settings is during the drought of the 1960s; Calaveras Reservoir storage is modeled to be lower in the variant than in the WSIP setting. This circumstance is primarily the result of modeling assumptions for the balancing of storage among Calaveras Reservoir and San Antonio Reservoir. For the results that indicate Calaveras Reservoir storage is lower than the WSIP setting, the results will coincidentally indicate that San Antonio Reservoir storage is higher than in the WSIP setting. There is little net difference in combined storage for the two reservoirs in comparison to the WSIP setting. It is concluded that little, if any, difference in Calaveras Reservoir storage occurs between the variant and WSIP settings, except for slight increases during drought. The difference in storage between the variant and WSIP settings and the base setting is due to the restoration of the operational capacity of Calaveras Reservoir. Figure 3.6-2 illustrates the average monthly storage in Calaveras Reservoir for the 82-year simulation, and the range in storage for each month for the variant and base settings.

Figure 3.6-1
Calaveras Reservoir Storage and Stream Release

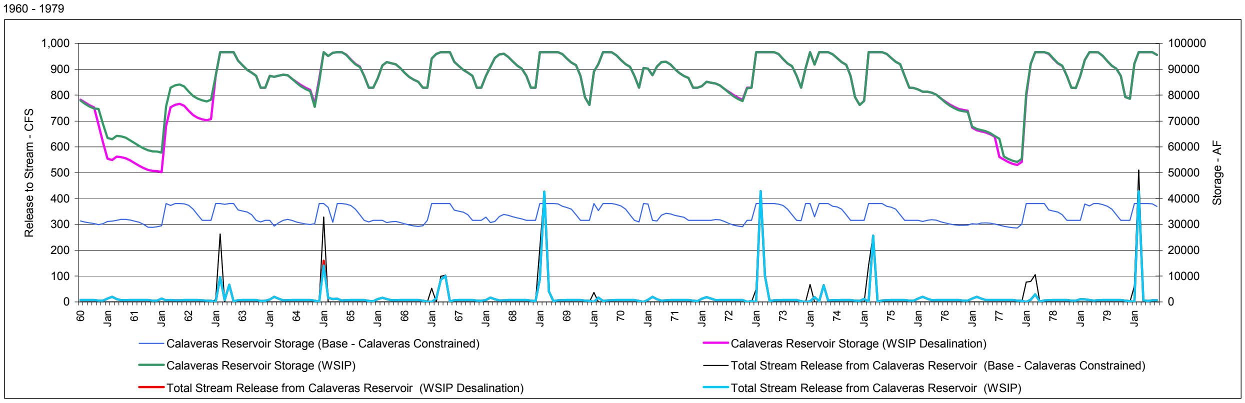
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

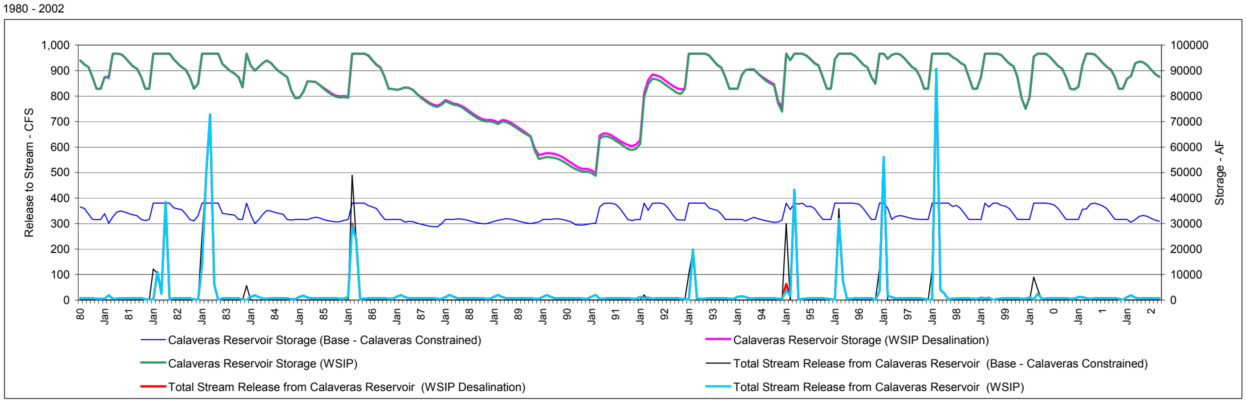
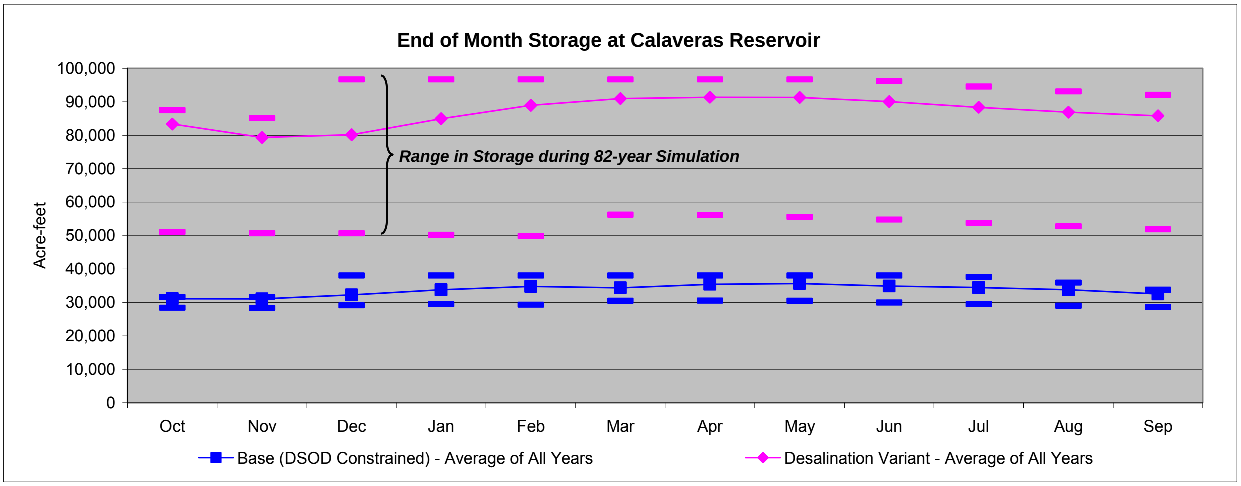


Figure 3.6-2



There is essentially no change in releases (i.e., infrequent slight increases) to Calaveras Creek below Calaveras Dam between the variant and WSIP settings. Both settings have fishery releases that are not included in the base setting. Table 3.6-1 illustrates the difference in releases to Calaveras Creek between the variant and WSIP settings. Supplementing the Figure 3.6-1 representation of Calaveras Dam stream releases and Table 3.6-1 is Table 3.6-2, illustrating releases for the variant and WSIP settings, and the difference in releases between the two. Table 3.6-3 provides the same form of information for the variant and base settings. The notable difference in releases between the variant and base settings is the addition of the flows representing the 1997 MOU and the reduction of stream releases during wetter-year/wetter-season flows due to the restoration of Calaveras Reservoir operational capacity.

There is essentially no change (minor differences during 5 months of the 82-year simulation) in Alameda Creek diversions to Calaveras Reservoir between the variant and the WSIP settings. With almost no change in Calaveras Reservoir storage between the two settings, there would be no change in the diversion operation at the Alameda Creek Diversion Dam. Water would only be diverted to Calaveras Reservoir when the diversion would not contribute to releases in excess of minimum required flows below Calaveras Dam. Coincidentally, with no change in the diversion at Alameda Creek Diversion Dam, flow spilling past the diversion dam would experience no differences between the variant and WSIP settings. Table 3.6-4 illustrates the flow below the Alameda Creek Diversion Dam for the variant and base settings. The notable difference between the variant and base settings is the reduction of wetter-year water flowing past the diversion dam. This occurs because, in the variant setting, the restoration of Calaveras Reservoir storage allows a greater frequency of diversion from Alameda Creek to Calaveras Reservoir.

Table 3.6-1

Difference in Total Stream Release from Calaveras Reservoir (Acre-feet)

WSIP Desalination minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	0	0	0	0	0	0	0	0
1922	0	0	0	0	0	0	0	0	0	0	0	0	0
1923	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	0	0	0	0	0
1928	0	0	0	0	0	0	0	0	0	0	0	0	0
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	0	0	0	0	0	0	0	0	0
1937	0	0	0	0	0	0	0	0	0	0	0	0	0
1938	0	0	0	0	-85	0	0	0	0	0	0	0	-85
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	0	0	0	0	0	0	0	0	0
1941	0	0	0	0	0	0	0	0	0	0	0	0	0
1942	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	0	0	0	0	0	0	0	0	0
1946	0	0	0	0	0	0	0	0	0	0	0	0	0
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	1,180	0	0	0	0	0	0	0	0	1,180
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	463	0	0	0	0	0	0	0	463
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	1,598	0	0	0	0	0	0	0	0	1,598
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	0	0	0	34	5	0	0	0	0	0	0	0	38

Table 3.6-2

Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
WSIP Desalination

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	1,065	5,183	15,157	10,007	5,085	255	387	417	425	415	39,073
Above Normal	425	258	172	875	3,657	2,849	650	327	396	423	428	417	10,877
Normal	429	275	195	548	725	556	264	370	408	428	430	417	5,046
Below Normal	429	276	246	672	876	596	345	389	411	429	430	417	5,515
Dry	429	292	281	778	1,044	747	374	407	416	430	430	417	6,045
All Years	428	269	387	1,591	4,242	2,921	1,323	350	403	426	428	417	13,186

Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	1,065	5,083	15,133	10,007	5,085	255	387	417	425	415	38,949
Above Normal	425	258	172	806	3,657	2,849	650	327	396	423	428	417	10,807
Normal	429	275	195	548	725	556	264	370	408	428	430	417	5,046
Below Normal	429	276	246	672	876	596	345	389	411	429	430	417	5,515
Dry	429	292	281	778	1,044	747	374	407	416	430	430	417	6,045
All Years	428	269	387	1,557	4,238	2,921	1,323	350	403	426	428	417	13,148

Difference in Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
WSIP Desalination minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	100	24	0	0	0	0	0	0	0	123
Above Normal	0	0	0	69	0	0	0	0	0	0	0	0	69
Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	0	34	5	0	0	0	0	0	0	0	38

Table 3.6-3

Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
WSIP Desalination

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	1,065	5,183	15,157	10,007	5,085	255	387	417	425	415	39,073
Above Normal	425	258	172	875	3,657	2,849	650	327	396	423	428	417	10,877
Normal	429	275	195	548	725	556	264	370	408	428	430	417	5,046
Below Normal	429	276	246	672	876	596	345	389	411	429	430	417	5,515
Dry	429	292	281	778	1,044	747	374	407	416	430	430	417	6,045
All Years	428	269	387	1,591	4,242	2,921	1,323	350	403	426	428	417	13,186

Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	1,736	9,221	16,641	9,968	5,024	0	0	0	0	0	42,590
Above Normal	0	0	184	2,731	5,911	3,096	459	0	0	0	0	0	12,382
Normal	0	0	216	364	882	353	0	0	0	0	0	0	1,815
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	419	2,437	4,645	2,656	1,076	0	0	0	0	0	11,232

Difference in Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
WSIP Desalination minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	-671	-4,038	-1,484	39	61	255	387	417	425	415	-3,517
Above Normal	425	258	-12	-1,856	-2,254	-247	190	327	396	423	428	417	-1,506
Normal	429	275	-22	184	-157	204	264	370	408	428	430	417	3,231
Below Normal	429	276	246	672	876	596	345	389	411	429	430	417	5,515
Dry	429	292	281	778	1,044	747	374	407	416	430	430	417	6,045
All Years	428	269	-32	-846	-402	265	248	350	403	426	428	417	1,955

Table 3.6-4

Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
WSIP Desalination

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	28	1,379	6,172	7,982	5,751	2,962	116	0	0	0	0	24,389
Above Normal	7	23	722	2,532	4,017	3,095	968	0	0	0	0	0	11,366
Normal	0	6	377	264	893	466	117	6	0	0	0	0	2,128
Below Normal	0	0	18	45	106	191	2	0	0	0	0	0	361
Dry	0	0	17	0	163	0	6	0	0	0	0	0	186
All Years	1	12	499	1,790	2,618	1,894	803	24	0	0	0	0	7,642

Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	28	1,379	6,967	8,099	5,757	2,972	130	0	0	0	0	25,331
Above Normal	7	23	1,184	3,672	5,292	3,096	692	0	0	0	0	0	13,968
Normal	0	6	914	868	1,785	906	126	6	0	0	0	0	4,611
Below Normal	0	0	18	45	106	191	2	0	0	0	0	0	361
Dry	0	0	17	0	163	0	6	0	0	0	0	0	186
All Years	1	12	700	2,299	3,079	1,982	750	27	0	0	0	0	8,849

Difference in Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
WSIP Desalination minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	-794	-117	-6	-10	-15	0	0	0	0	-942
Above Normal	0	0	-461	-1,140	-1,275	-1	276	0	0	0	0	0	-2,601
Normal	0	0	-537	-604	-892	-440	-10	0	0	0	0	0	-2,483
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-200	-509	-461	-87	53	-3	0	0	0	0	-1,208

Comparing the variant and WSIP settings, with essentially no differences (albeit slight increases) in releases from Calaveras Dam to the stream and no differences to spills at Alameda Creek Diversion Dam (albeit slight increases), flow below the Alameda Creek and Calaveras Creek confluence will be the same for each setting, or slightly larger for the variant setting. Table 3.6-5 illustrates the flow below the confluence for the variant and WSIP settings, and the near similarity in flow between the two. Table 3.6-6 provides the same form of information for the variant and base settings. The notable differences between the variant and base settings (comparable to the difference between the WSIP and base settings) are the addition of required stream flows for the 1997 MOU and the reduction of wetter-year/wet-season flows due to the restoration of Calaveras Reservoir storage.

Table 3.6-5

Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP Desalination

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	430	326	2,789	12,365	24,327	16,744	8,649	548	417	430	430	417	67,869
Above Normal	437	327	1,138	4,005	8,451	6,506	1,929	430	417	430	430	417	24,917
Normal	430	304	798	1,081	2,004	1,349	539	435	417	430	430	417	8,634
Below Normal	430	298	324	858	1,217	1,007	419	430	417	430	430	417	6,677
Dry	430	298	324	813	1,274	816	423	430	417	430	430	417	6,502
All Years	431	310	1,066	3,791	7,391	5,247	2,362	454	417	430	430	417	22,746

Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	430	326	2,789	12,265	24,303	16,744	8,649	548	417	430	430	417	67,746
Above Normal	437	327	1,111	3,929	8,451	6,502	1,929	430	417	430	430	417	24,810
Normal	430	304	798	1,081	2,004	1,343	539	435	417	430	430	417	8,628
Below Normal	430	298	324	858	1,217	1,007	419	430	417	430	430	417	6,677
Dry	430	298	324	813	1,274	816	423	430	417	430	430	417	6,502
All Years	431	310	1,061	3,755	7,386	5,245	2,362	454	417	430	430	417	22,699

Difference in Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP Desalination minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	100	24	0	0	0	0	0	0	0	123
Above Normal	0	0	27	76	0	4	-1	0	0	0	0	0	106
Normal	0	0	0	0	0	7	0	0	0	0	0	0	7
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	6	35	5	2	0	0	0	0	0	0	47

Table 3.6-6

Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP Desalination

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	430	326	2,789	12,365	24,327	16,744	8,649	548	417	430	430	417	67,869
Above Normal	437	327	1,138	4,005	8,451	6,506	1,929	430	417	430	430	417	24,917
Normal	430	304	798	1,081	2,004	1,349	539	435	417	430	430	417	8,634
Below Normal	430	298	324	858	1,217	1,007	419	430	417	430	430	417	6,677
Dry	430	298	324	813	1,274	816	423	430	417	430	430	417	6,502
All Years	431	310	1,066	3,791	7,391	5,247	2,362	454	417	430	430	417	22,746

Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	1	80	3,460	17,197	25,928	16,711	8,598	307	30	12	4	2	72,329
Above Normal	12	68	1,612	7,001	11,980	6,754	1,462	103	22	6	2	1	29,023
Normal	1	29	1,356	1,501	3,053	1,586	284	65	9	2	0	0	7,886
Below Normal	1	22	78	186	341	412	74	41	7	0	0	0	1,161
Dry	1	6	43	35	230	69	49	23	1	0	0	0	457
All Years	3	41	1,298	5,145	8,254	5,069	2,061	107	14	4	1	1	21,999

Difference in Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP Desalination minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	-671	-4,832	-1,601	33	51	241	387	417	425	415	-4,460
Above Normal	425	258	-474	-2,996	-3,529	-248	466	327	396	423	428	417	-4,107
Normal	429	275	-559	-420	-1,049	-236	255	370	408	428	430	417	748
Below Normal	429	276	246	672	876	596	345	389	411	429	430	417	5,515
Dry	429	292	281	778	1,044	747	374	407	416	430	430	417	6,045
All Years	428	269	-232	-1,355	-863	178	301	347	403	426	428	417	747

A flow recapture facility in Alameda Creek below Calaveras Reservoir is incorporated in the variant and WSIP settings. This facility is assumed to recapture flows explicitly released from Calaveras Dam for the 1997 MOU. The effect of the recapture is a reduction in the flow that occurs below the confluence of Alameda and Calaveras Creeks, but only to the extent that releases were explicitly made from Calaveras Reservoir for the 1997 MOU. Table 3.6-7 illustrates the flow below the confluence and above the Alameda and San Antonio Creek confluence for the variant and WSIP settings, and the near similarity in flow between the two. Table 3.6-8 provides the same form of information for the variant and base settings. The flows identified at this location are indicative of flow occurring below the confluence of Alameda and Calaveras Creeks (described above), with the addition of estimated stream accretions between the Alameda and Calaveras Creek confluence and the Alameda and San Antonio Creek confluence, minus the water assumed to be recaptured (diverted) by the SFPUC from the creek.

Table 3.6-7

Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP Desalination

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,180	13,711	25,851	17,847	9,299	498	76	33	15	9	70,681
Above Normal	19	150	1,335	4,524	9,137	6,916	2,180	217	54	20	9	6	24,568
Normal	7	64	922	913	1,837	1,275	469	134	28	9	4	3	5,665
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	1,132	3,894	7,504	5,334	2,409	197	38	14	7	4	20,631

Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,180	13,611	25,828	17,847	9,299	498	76	33	15	9	70,558
Above Normal	19	150	1,308	4,448	9,137	6,913	2,180	217	54	20	9	6	24,462
Normal	7	64	922	913	1,837	1,269	469	134	28	9	4	3	5,658
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	1,127	3,859	7,499	5,332	2,409	197	38	14	7	4	20,583

Difference in Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP Desalination minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	100	24	0	0	0	0	0	0	0	123
Above Normal	0	0	27	76	0	4	-1	0	0	0	0	0	106
Normal	0	0	0	0	0	7	0	0	0	0	0	0	7
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	6	35	5	2	0	0	0	0	0	0	47

Table 3.6-8

Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP Desalination

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,180	13,711	25,851	17,847	9,299	498	76	33	15	9	70,681
Above Normal	19	150	1,335	4,524	9,137	6,916	2,180	217	54	20	9	6	24,568
Normal	7	64	922	913	1,837	1,275	469	134	28	9	4	3	5,665
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	1,132	3,894	7,504	5,334	2,409	197	38	14	7	4	20,631

Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,968	18,668	27,692	17,977	9,358	513	76	33	15	9	78,470
Above Normal	19	150	1,981	7,819	13,060	7,467	1,861	217	54	20	9	6	32,664
Normal	7	64	1,676	1,881	3,611	2,007	479	134	28	9	4	3	9,902
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	1,567	5,733	9,022	5,616	2,356	199	38	14	7	4	24,656

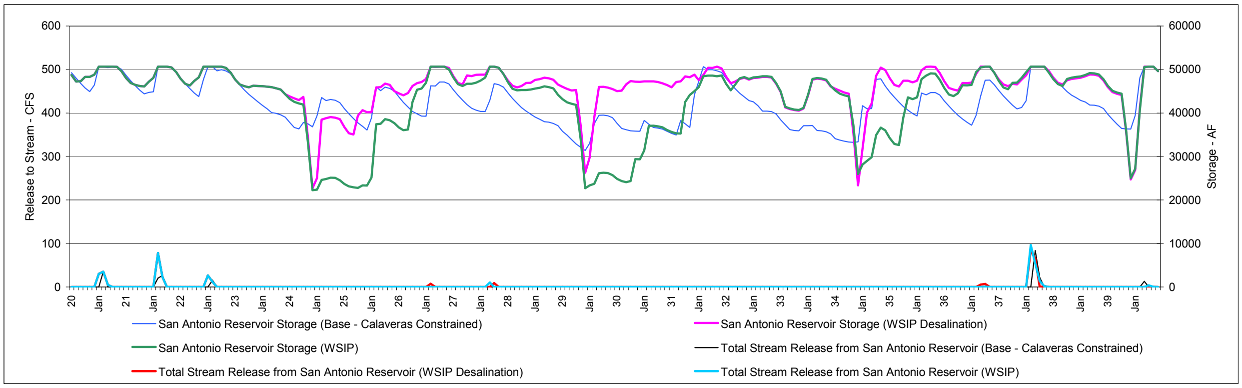
Difference in Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP Desalination minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-788	-4,957	-1,840	-131	-59	-15	0	0	0	0	-7,789
Above Normal	0	0	-646	-3,295	-3,923	-550	318	0	0	0	0	0	-8,096
Normal	0	0	-753	-968	-1,774	-732	-10	0	0	0	0	0	-4,237
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-435	-1,839	-1,518	-282	53	-3	0	0	0	0	-4,025

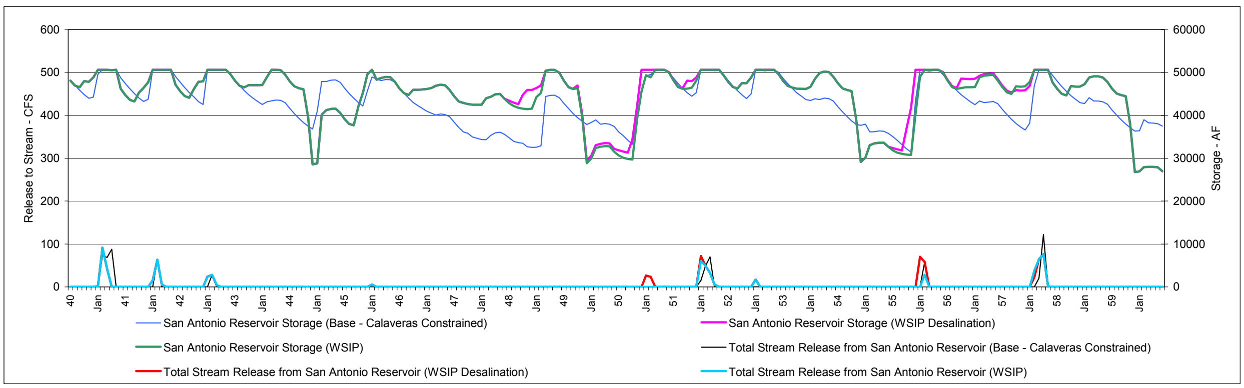
Compared to the WSIP setting, San Antonio Reservoir operations in the variant setting generally mirror the changes experienced for Calaveras Reservoir operations. Figure 3.6-3 illustrates a chronological trace of the simulation of San Antonio Reservoir storage and stream releases from the dam. Shown in Figure 3.6-3 are the results for the WSIP, variant, and base settings. The difference in San Antonio Reservoir storage between the variant and WSIP setting is mostly caused by the increase in Bay Area reservoir storage due to the desalination supply offsetting some of the draw of reservoir storage during drought periods when Hetch Hetchy imports are at maximum capacity. The magnitude of effect in the difference in San Antonio Reservoir storage depends on modeling assumptions to balance total Bay Area reservoir storage among the five major SFPUC reservoirs. The model balances storage between reservoirs by way of an input file by the modeler concerning the relative draw (percentage) from each reservoir under various storage conditions. These are discretionary input in the model, and the logic and relative percentages are meant to mimic the current practice and discretion of the system operators based on recognition of the physical conveyance constraints within the system and the ability of each reservoir to provide yield and water delivery security.

Figure 3.6-3
San Antonio Reservoir Storage and Stream Release

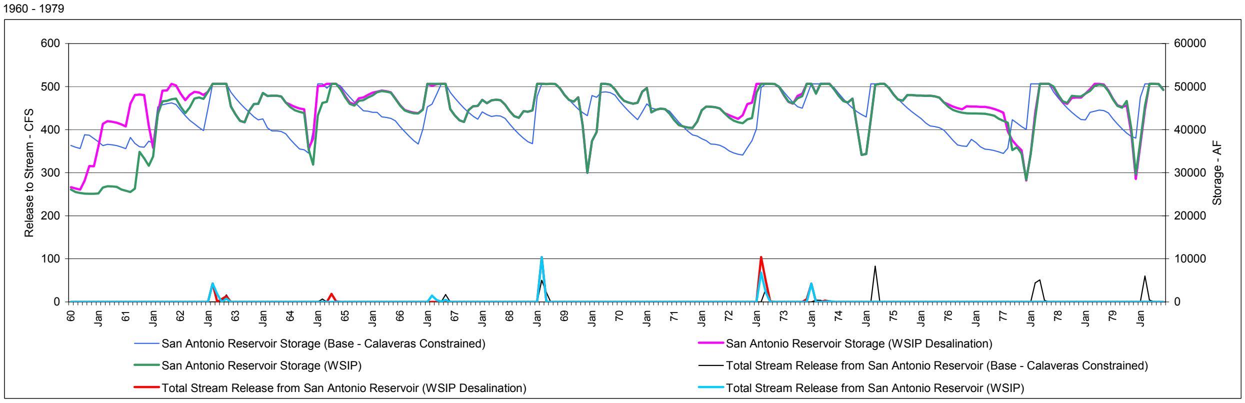
1920 - 1939



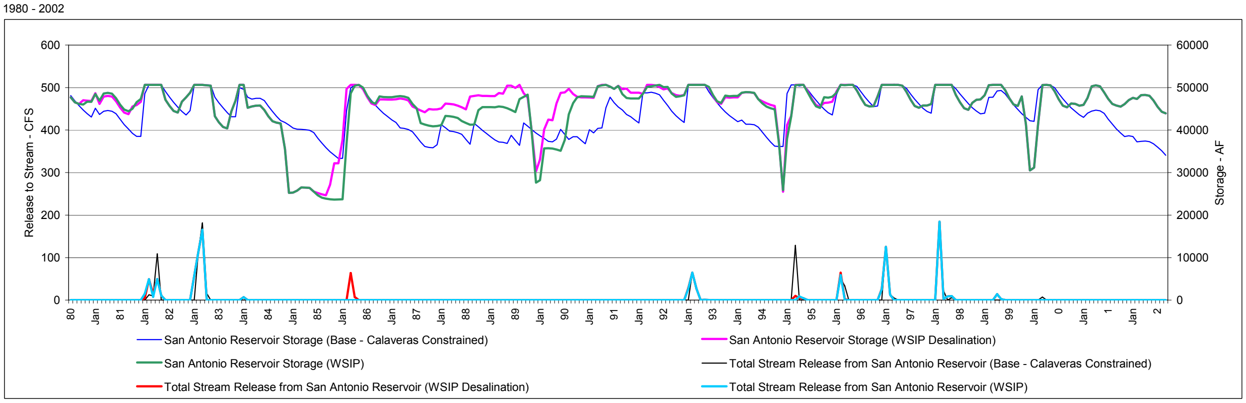
1940 - 1959



1960 - 1979

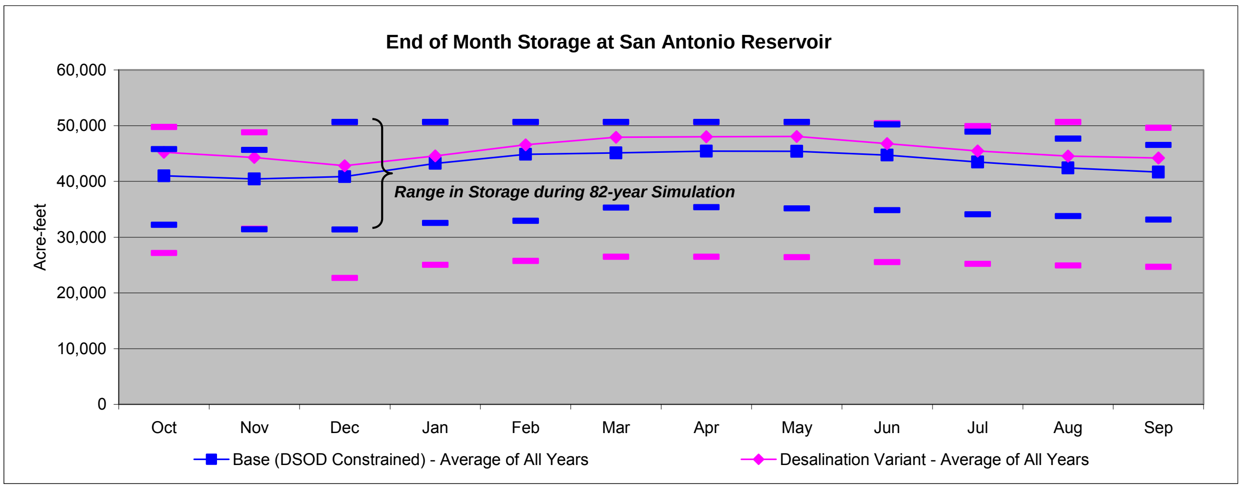


1980 - 2002



The difference in storage between the variant and WSIP settings and the base settings is due to the restoration of the operational capacity of Calaveras Reservoir. In the base setting, the limited operating storage capacity at Calaveras leads to a different operation at San Antonio Reservoir, one that provides relatively more stored water for system demands when the draw from Calaveras Reservoir is constrained due to limited storage. There is also a notable difference in storage operation between the variant and WSIP settings and the base setting every fifth year. Assumed systematic maintenance of Hetch Hetchy conveyance facilities occurs in the simulation that constrains diversions to the Bay Area from Hetch Hetchy every fifth year. The reduction in diversion from Hetch Hetchy during these periods is accommodated in the system by drawing additional water from the Bay Area reservoirs. The proportionate share of this operation is evident in the tracing of San Antonio Reservoir storage for the variant and WSIP settings. Figure 3.6-4 illustrates the average monthly storage in Calaveras Reservoir for the 82-year simulation, and the range in storage for each month for the variant and base settings.

Figure 3.6-4



There would be very little change in stream releases below San Antonio Reservoir between the variant and WSIP settings. Table 3.6-9 illustrates the modeled release to San Antonio Creek from San Antonio Reservoir for the two settings and the differences for the average release during a year type. With a slightly higher reservoir operation at times during the winter, as seen in Figure 3.6-4, a greater frequency in stream releases is expected. Given the sometimes rigid constraints within the modeling assumptions, the model will overestimate the frequency and magnitude of stream releases from San Antonio Reservoir under any of the investigated settings. The flexibility that occurs in actual operations would likely avoid most of the releases represented by the model. The modeled stream releases from San Antonio Reservoir and difference between releases for the variant and base settings are shown in Table 3.6-10. The differences between the two settings range from increases to decreases in flow. This modeled circumstance reflects the different resulting storage operation between the two settings, as seen in Figure 3.6-3. In some circumstances, the base setting storage at San Antonio Reservoir could be higher than projected for the variant setting during the same period. This circumstance could lead to an occasionally greater modeled release for the base setting, which would be reflected in the results. As described above, the model will overestimate the frequency and magnitude of releases from San Antonio Reservoir, and the actual releases from San Antonio Reservoir in any setting, and the difference between settings are expected to be minor.

Flow below the confluence of Alameda and San Antonio Creeks is influenced by releases from San Antonio Creek and flow arriving at the location from Alameda Creek, which includes upstream impairment by SFPUC operations and facilities. Table 3.6-11 illustrates the flow below the confluence for the variant and WSIP settings, and the differences in flow between the two.

Table 3.6-9

Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
WSIP Desalination

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	101	1,327	3,248	1,983	568	112	0	0	0	0	7,339
Above Normal	0	0	23	642	1,164	238	171	70	0	0	0	0	2,308
Normal	0	0	0	113	0	0	33	0	0	0	0	0	146
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	24	414	875	436	153	37	0	0	0	0	1,939

Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	95	1,054	3,168	1,543	605	121	0	0	0	0	6,586
Above Normal	0	0	0	540	1,045	277	67	44	0	0	0	0	1,974
Normal	0	0	0	113	0	40	0	0	0	0	0	0	152
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	19	340	835	366	132	33	0	0	0	0	1,724

Difference in Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
WSIP Desalination minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	6	272	80	440	-37	-8	0	0	0	0	752
Above Normal	0	0	23	102	120	-39	103	26	0	0	0	0	335
Normal	0	0	0	0	0	-40	33	0	0	0	0	0	-6
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	6	74	40	70	21	4	0	0	0	0	215

Table 3.6-10

Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
WSIP Desalination

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	101	1,327	3,248	1,983	568	112	0	0	0	0	7,339
Above Normal	0	0	23	642	1,164	238	171	70	0	0	0	0	2,308
Normal	0	0	0	113	0	0	33	0	0	0	0	0	146
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	24	414	875	436	153	37	0	0	0	0	1,939

Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	538	2,350	2,480	1,324	88	0	0	0	0	6,780
Above Normal	0	0	0	0	881	883	12	58	0	0	0	0	1,835
Normal	0	0	0	0	1	0	0	0	0	0	0	0	1
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	0	105	641	667	261	29	0	0	0	0	1,703

Difference in Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
WSIP Desalination minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	101	788	898	-497	-756	25	0	0	0	0	559
Above Normal	0	0	23	642	284	-645	158	12	0	0	0	0	474
Normal	0	0	0	113	-1	0	33	0	0	0	0	0	145
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	24	309	234	-231	-108	7	0	0	0	0	236

Table 3.6-11

Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
WSIP Desalination

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,281	15,038	29,100	19,830	9,866	611	76	33	15	9	78,020
Above Normal	19	150	1,357	5,165	10,302	7,155	2,350	288	54	20	9	6	26,876
Normal	7	64	922	1,026	1,837	1,275	502	134	28	9	4	3	5,811
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	1,157	4,308	8,379	5,770	2,562	233	38	14	7	4	22,570

Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,276	14,666	28,996	19,390	9,903	619	76	33	15	9	77,144
Above Normal	19	150	1,308	4,987	10,182	7,190	2,248	262	54	20	9	6	26,435
Normal	7	64	922	1,026	1,837	1,308	469	134	28	9	4	3	5,810
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	1,145	4,199	8,334	5,698	2,541	229	38	14	7	4	22,307

Difference in Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
WSIP Desalination minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	6	372	103	440	-37	-8	0	0	0	0	876
Above Normal	0	0	50	178	120	-35	102	26	0	0	0	0	441
Normal	0	0	0	0	0	-33	33	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	11	110	45	72	20	4	0	0	0	0	262

Table 3.6-12 illustrates the same information in comparing the variant and base settings. Table 3.6-11 illustrates the minor modeled differences in flow that occur between the variant and WSIP settings, while Table 3.6-12 illustrates the relatively larger differences in flow that could occur between the variant and base settings. The difference is particularly due to the effects of the restoration of Calaveras Reservoir operating capacity in the variant setting.

Table 3.6-12

Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP Desalination

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,281	15,038	29,100	19,830	9,866	611	76	33	15	9	78,020
Above Normal	19	150	1,357	5,165	10,302	7,155	2,350	288	54	20	9	6	26,876
Normal	7	64	922	1,026	1,837	1,275	502	134	28	9	4	3	5,811
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	1,157	4,308	8,379	5,770	2,562	233	38	14	7	4	22,570

Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,968	19,206	30,042	20,458	10,681	601	76	33	15	9	85,250
Above Normal	19	150	1,981	7,819	13,941	8,350	1,873	276	54	20	9	6	34,498
Normal	7	64	1,676	1,881	3,612	2,007	479	134	28	9	4	3	9,902
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	1,567	5,838	9,664	6,284	2,617	229	38	14	7	4	26,359

Difference in Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP Desalination minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-687	-4,169	-942	-628	-815	10	0	0	0	0	-7,230
Above Normal	0	0	-623	-2,653	-3,639	-1,195	477	12	0	0	0	0	-7,622
Normal	0	0	-753	-855	-1,775	-732	23	0	0	0	0	0	-4,092
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-410	-1,530	-1,285	-513	-56	4	0	0	0	0	-3,789

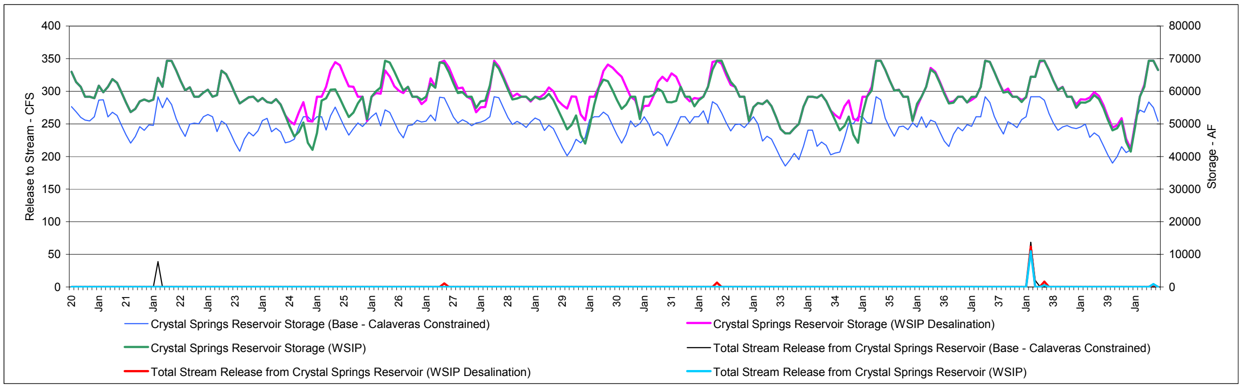
3.7 Crystal Springs and San Andreas Reservoirs

There are differences in Crystal Springs Reservoir operations between the variant and WSIP setting. Figure 3.7-1 illustrates a chronological trace of the simulation of Crystal Springs Reservoir storage and stream releases from Springs Dam. Shown in Figure 3.7-1 are the results for the WSIP, variant, and base settings.

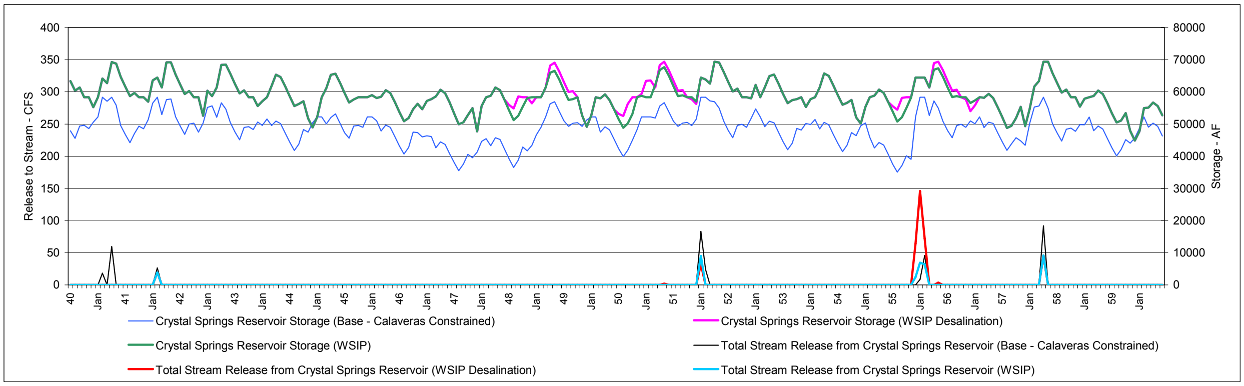
The difference in Crystal Springs Reservoir storage between the variant and WSIP settings is largely due to the increase in Bay Area reservoir storage that results from the desalination supply offsetting some of the draw during drought periods (when Hetch Hetchy imports are at maximum capacity). The effect of the difference in storage at Crystal Springs Reservoir depends on modeling assumptions for balancing total Bay Area reservoir storage among the five major SFPUC reservoirs. The model balances storage between reservoirs by way of an input file by the modeler concerning the relative draw (percentage) from each reservoir under various storage conditions. These are discretionary input in the model, and the logic and relative percentages are meant to mimic the current practice and discretion of the system operators based on recognition of the physical conveyance constraints within the system and the ability of each reservoir to provide yield and water delivery security. In actual operations, some of the differences in result may not occur, as system operators and prevailing hydraulic and hydrologic conditions may direct the operational effect of the different demand to an alternative apportionment of effect among the reservoirs. Figure 3.7-2 illustrates the average monthly storage in Crystal Springs Reservoir for the 82-year simulation, and the range in storage for each month for the variant and WSIP settings. Figure 3.7-3 illustrates the average monthly storage in Crystal Springs Reservoir for the 82-year simulation, and the range in storage for each month for the variant and base settings. Consistent with the comparison of the WSIP and base settings, the variant setting would result in reservoir storage operating at a higher average and higher upper-range than the base setting. This is due to the restoration of the operating capacity of Crystal Springs Reservoir.

Figure 3.7-1
Crystal Springs Reservoir Storage and Stream Release

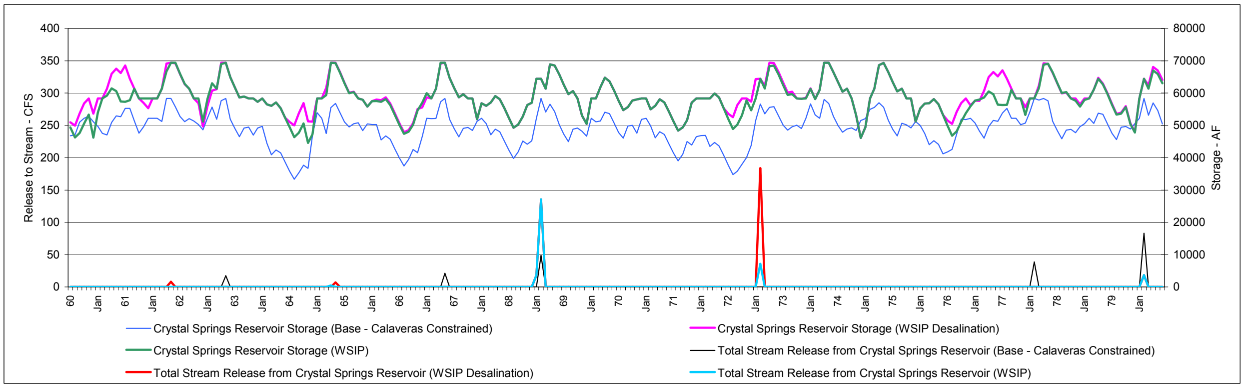
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

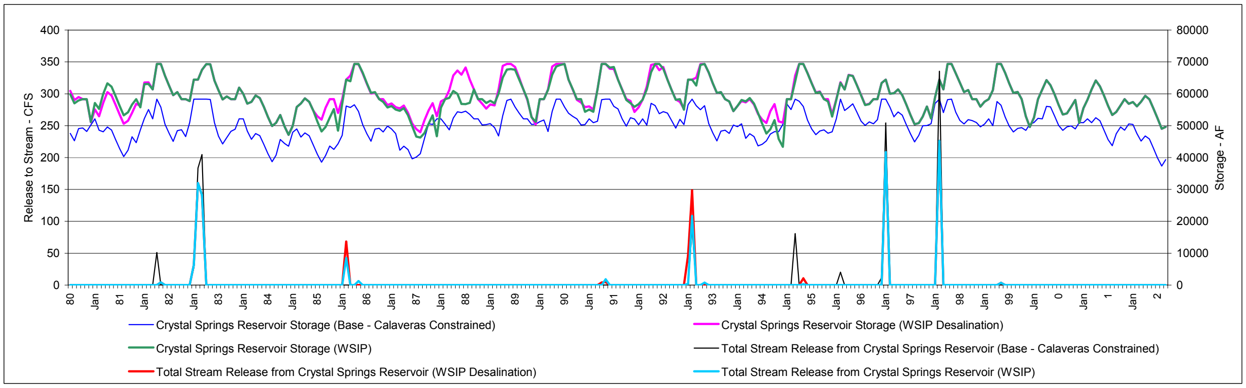


Figure 3.7-2

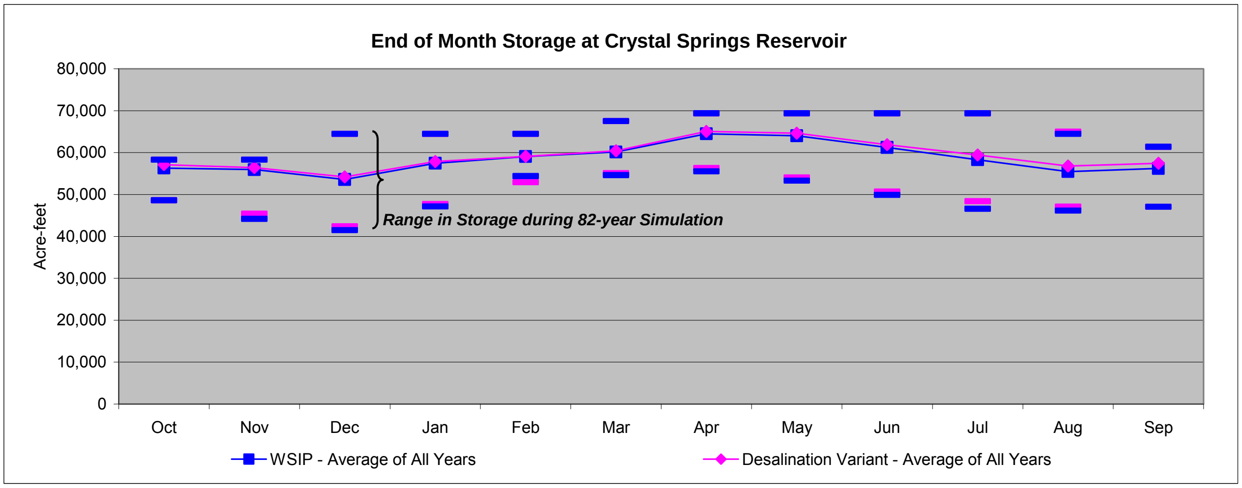


Figure 3.7-3

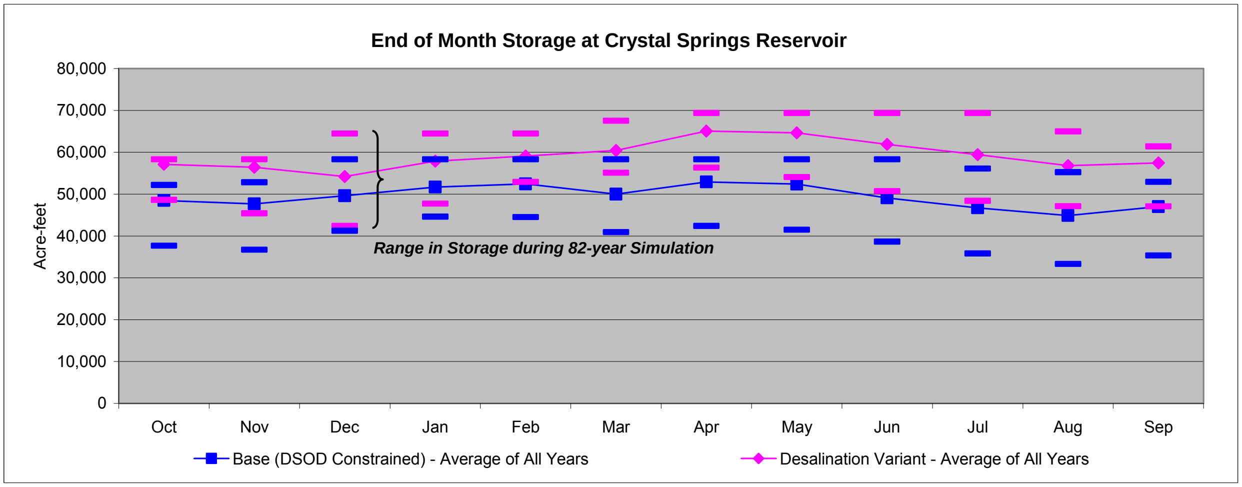


Table 3.7-1 illustrates the modeled variant and WSIP stream releases from Crystal Springs Reservoir and the differences between the two settings. Modeling results indicate that an occasional increase in releases could occur. The potential difference is attributed to slightly higher reservoir storage in the variant setting. Part of the difference in modeled Crystal Springs Reservoir storage is due to modeling assumptions for the proportionate management of storage among the Bay Area reservoirs, and the coincidence of assumed system-wide maintenance with less than favorable hydrologic conditions. In actual operations, it is anticipated that system operators would manage the reservoir system such that stream releases would be minimal under any setting, with the effect of essentially no difference between the variant and WSIP settings. Modeling results indicate that there would be releases in only 23 months (in the 6-month January-through-May period) during the 82-year simulation.

Table 3.7-2 illustrates the stream releases for the variant and base settings, and the difference in modeled flows between the two settings. A greater operating range in Crystal Springs Reservoir operation would lead to an increased potential to regulate reservoir inflow, which would lead to less risk in making needed stream releases. However, as described above, actual system operations would attempt to minimize releases under any setting; thus, the difference in releases between the variant and base setting would be minimal, if any.

Table 3.7-1

Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP Desalination

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	247	1,677	3,279	542	170	101	0	0	0	0	6,017
Above Normal	0	0	0	169	485	0	0	82	0	0	0	0	737
Normal	0	0	0	0	0	0	0	56	0	0	0	0	56
Below Normal	0	0	0	0	0	0	14	18	0	0	0	0	31
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	48	362	740	106	36	51	0	0	0	0	1,344

Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	47	1,296	2,512	542	170	54	0	0	0	0	4,623
Above Normal	0	0	0	8	354	0	8	42	0	0	0	0	412
Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	33	0	0	0	0	33
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	9	254	564	106	35	26	0	0	0	0	994

Difference in Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP Desalination minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	200	381	767	0	0	46	0	0	0	0	1,394
Above Normal	0	0	0	162	131	0	-8	39	0	0	0	0	325
Normal	0	0	0	0	0	0	0	56	0	0	0	0	56
Below Normal	0	0	0	0	0	0	14	-15	0	0	0	0	-1
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	39	108	177	0	1	25	0	0	0	0	350

Table 3.7-2

Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP Desalination

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	247	1,677	3,279	542	170	101	0	0	0	0	6,017
Above Normal	0	0	0	169	485	0	0	82	0	0	0	0	737
Normal	0	0	0	0	0	0	0	56	0	0	0	0	56
Below Normal	0	0	0	0	0	0	14	18	0	0	0	0	31
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	48	362	740	106	36	51	0	0	0	0	1,344

Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	44	1,433	2,889	1,134	756	81	0	0	0	0	6,336
Above Normal	0	0	0	0	608	0	0	63	0	0	0	0	671
Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	9	280	690	221	147	29	0	0	0	0	1,375

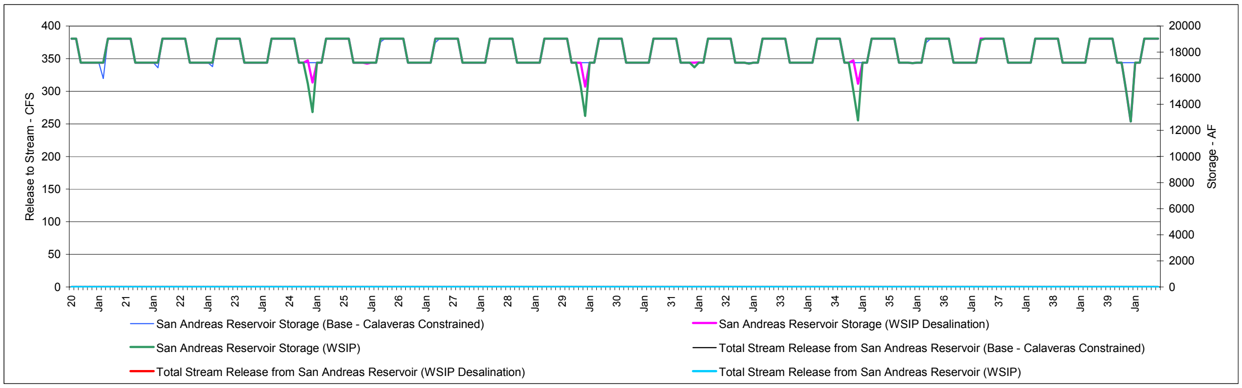
Difference in Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP Desalination minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	203	244	391	-592	-586	20	0	0	0	0	-320
Above Normal	0	0	0	169	-123	0	0	19	0	0	0	0	65
Normal	0	0	0	0	0	0	0	56	0	0	0	0	56
Below Normal	0	0	0	0	0	0	14	18	0	0	0	0	31
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	40	83	51	-115	-111	23	0	0	0	0	-31

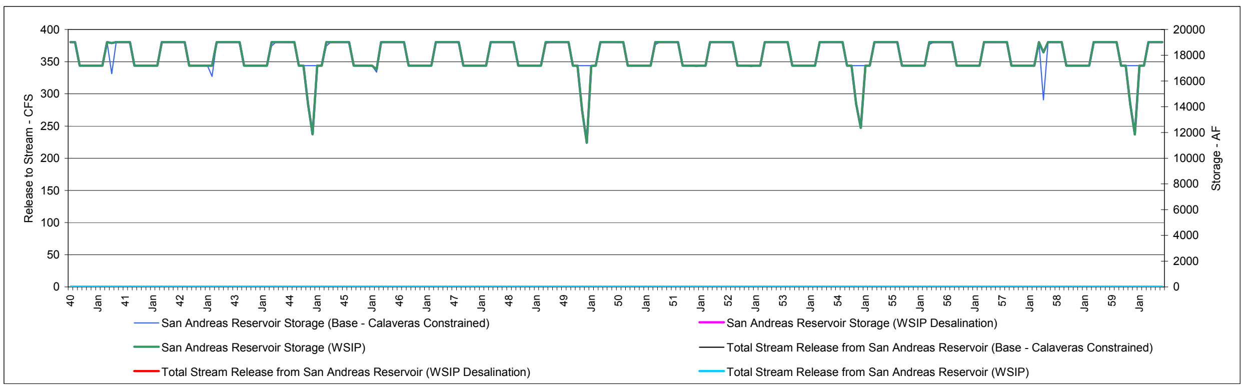
San Andreas Reservoir operations would generally be the same between the variant and WSIP settings. Reservoir storage would follow a systematic filling and lowering each year. Figure 3.7-4 illustrates a chronological trace of the simulation of San Andreas Reservoir storage and stream releases from Springs Dam. Shown in Figure 3.7-4 are the results for the WSIP, variant, and base settings. There are no projected stream releases from San Andreas Reservoir in any setting. Notable in Figure 3.7-4 is the difference in storage operation every fifth year. Both the variant and WSIP setting storage operation differ from the base setting. This operation is based on the assumption that Hetch Hetchy conveyance maintenance occurs systematically every fifth year, which constrains the amount of Hetch Hetchy water supplied to serve water demands in the Bay Area. As discussed previously, during these winter periods, the Bay Area reservoir system accommodates the reduction in imported supply by serving the Bay Area water deliveries with the local watersheds' runoff and storage. At San Andreas Reservoir, the serving of water demand affects the reservoir when additional required water production at Harry Tracy WTP associated with WSIP or the variant exceeds the ability to maintain San Andreas Reservoir storage with pumping from Crystal Springs Reservoir. In the modeling, the conveyance capacity from Crystal Springs Reservoir is assumed to be the same among all of the settings. The additional water demand of the WSIP and variant requires additional production from Harry Tracy WTP to be drawn from San Andreas Reservoir. The draw down of storage due to the variant would be slightly less than for the WSIP setting. Figure 3.7-5 illustrates the average monthly storage in San Andreas Reservoir for the 82-year simulation, and the range in storage for each month for the variant and base settings.

Figure 3.7-4
San Andreas Reservoir Storage and Stream Release

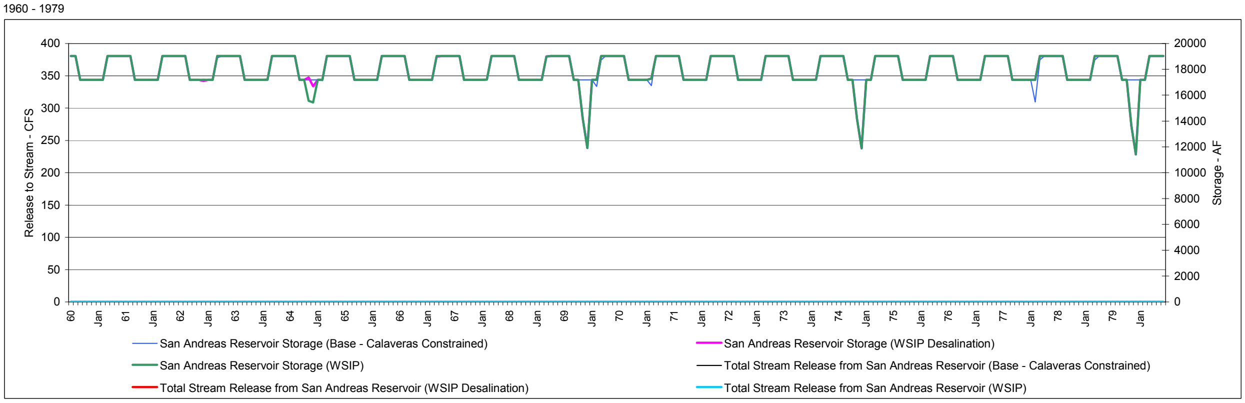
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

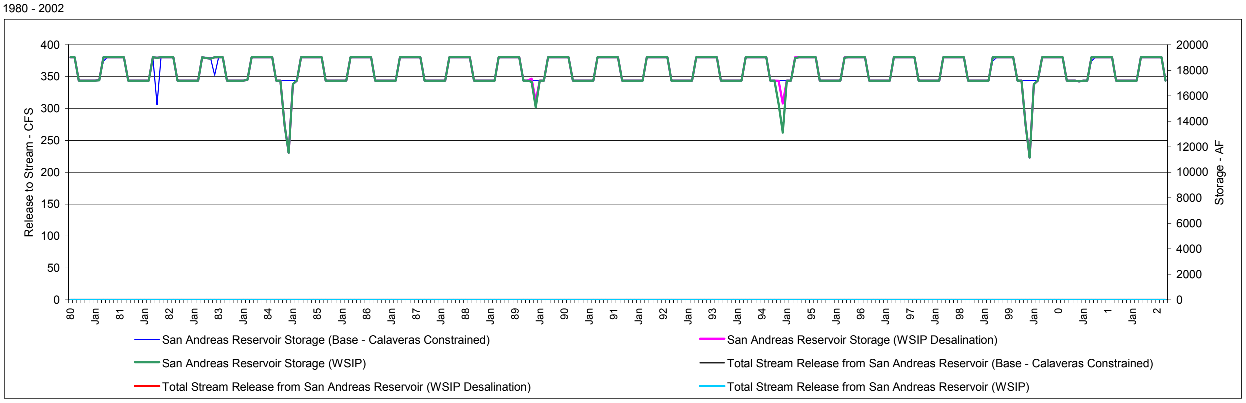
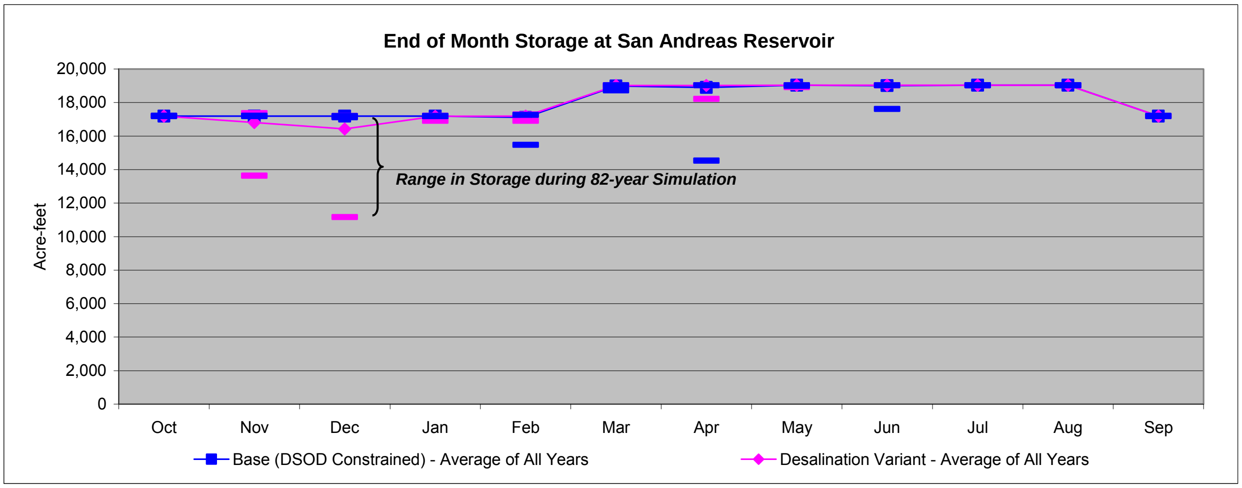


Figure 3.7-4



3.8 Pilarcitos Reservoir

Coastside County Water District's (Coastside CWD) water demand and its SFPUC purchase request are projected to increase within the WSIP planning horizon of year 2030. Within the context of the 2030 purchase request of 300 mgd, Coastside CWD's portion has been estimated at about 3 mgd. This projected purchase request is approximately 1 mgd greater that its current purchase request. Recognizing the current physical constraints to deliveries from the SFPUC to Coastside CWD and the ongoing planning activities in the watershed, there is uncertainty as to the precise manner in which Coastside CWD's additional purchase request would be served and the resultant potential changes to the operation of SFPUC facilities and their affected environs.[4]

Assuming a range of potential means to serve the additional purchase request from Coastside CWD, the following potential hydrologic effects to SFPUC facilities and their affected environs are identified:

- Due to limited yield from Pilarcitos Reservoir, additional diversions would be required from Crystal Springs Reservoir.
- If deliveries to Coastside CWD from Pilarcitos Reservoir increase during the winter season, these deliveries could potentially reduce storage in Pilarcitos Reservoir, thereby potentially reducing diversions to the San Mateo Creek watershed. Although the increased delivery would increase releases to Pilarcitos Creek from Pilarcitos Dam for a period of time, the increase would subsequently lead to a reduction in spills past Stone Dam.
- Additional wintertime deliveries could also potentially impair the ability to provide carry-over storage into the summer season from Pilarcitos Reservoir, and subsequently lead to an acceleration of the beginning of the season when releases to Pilarcitos Creek from Pilarcitos Reservoir consist only of the passage of reservoir inflow.
- An increase in summertime deliveries from Pilarcitos Creek could also accelerate the beginning of the season when releases to Pilarcitos Creek from Pilarcitos Reservoir consist only of the passage of reservoir inflow.

The variant setting could result in the same potential effects to the Pilarcitos Creek watershed as the WSIP setting.

[4] See "Analysis of SFPUC PIlarcitos/Coastside County Water District Operations", Memorandum by Daniel B. Steiner, March 8, 2007.

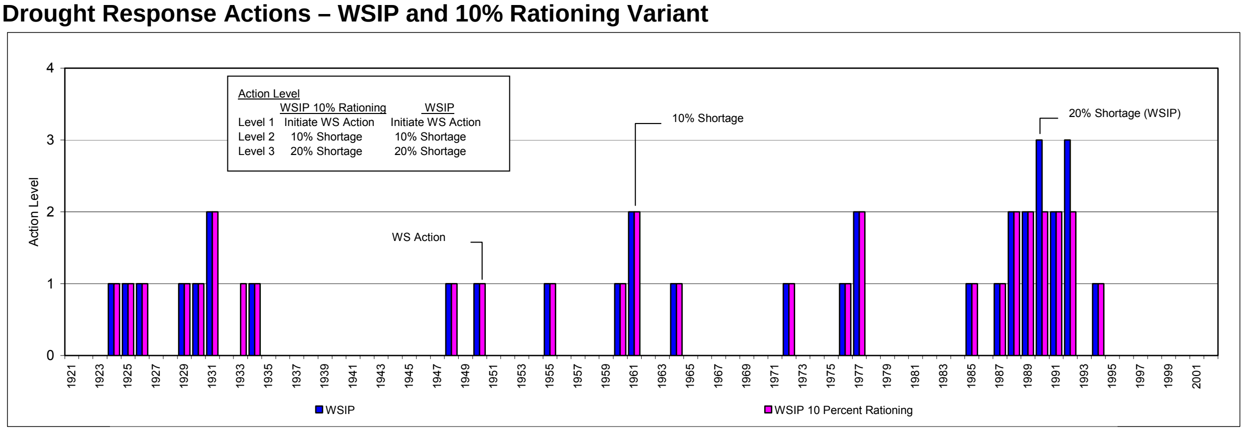
4. WSIP Variant 3 – 10% Rationing

WSIP Variant 3 – 10% Rationing variant programs would be identical to the programs proposed for the WSIP, except that the drought response program would limit delivery shortages (rationing) to no more than 10 percent. The resources that would be needed to serve the increase in purchase request (from 265 to 300 mgd) and the improvement in supply reliability include: 1) a supply of 10 mgd from implementation of the Recycled Water Projects (SF-3), Local Groundwater Projects (a component of SF-2, Groundwater Projects), and additional conservation programs (RRGWC); 2) the same restored storage features of Calaveras and Crystal Springs Reservoirs; and 3) the incorporation of the Westside Basin Groundwater Program. Also included is a supplemental water supply for delivery during drought obtained from Tuolumne River diversions through transfers from the TID and MID.

4.1 Water Deliveries and Drought Response Actions

The same form of MID/TID Tuolumne River water transfer is modeled for both the proposed program and the variant. However, the volume of water transferred is increased from 27,000 acre-feet per year (afy) to 42,000 afy for use during drought. The additional transfer volume is needed in the variant setting to provide the supplemental water necessary to accommodate the goal of limiting delivery shortages to no more than 10 percent in any year including during the Design Drought. Table 1-1 compares the drought response actions for the WSIP and variant. Figure 4.1-1 illustrates the drought response actions for the simulated 82-year historical period (1921-2002).

Figure 4.1-1
Drought Response Actions – WSIP and 10% Rationing Variant



In Figure 4.1-1, years with bars showing a “1” or greater level of action indicate periods when a supplemental water supply action is initiated. In these scenarios, the action is the use of the Westside Basin Groundwater Program to supplement SFPUC water deliveries. Action levels greater than “1” indicate the imposition of delivery shortages (rationing) to SFPUC customers. Rationing is not greater than 10 percent in the variant setting. Compared to the WSIP setting, the 10-percent rationing limit of the variant requires the triggering of an additional year of utilization of supplemental water from the Westside Basin Groundwater Program; this rationing limit could not be achieved without the increase in transfer from MID/TID.

The same form of information is shown in Figure 4.1-2 in comparing the variant and “Base - Calaveras Constrained” (existing) settings. In modeling parlance, there is no level 1 action level in the base setting. Without supplemental resources, the existing system has only the delivery shortage measure available to cope with drought. This shortage measure is imposed during level 2 (10 percent) and level 3 (20 percent). These percentages of shortage are applied to both the variant and base setting for these action levels.

Figure 4.1-2
Drought Response Actions – Base and 10% Rationing Variant

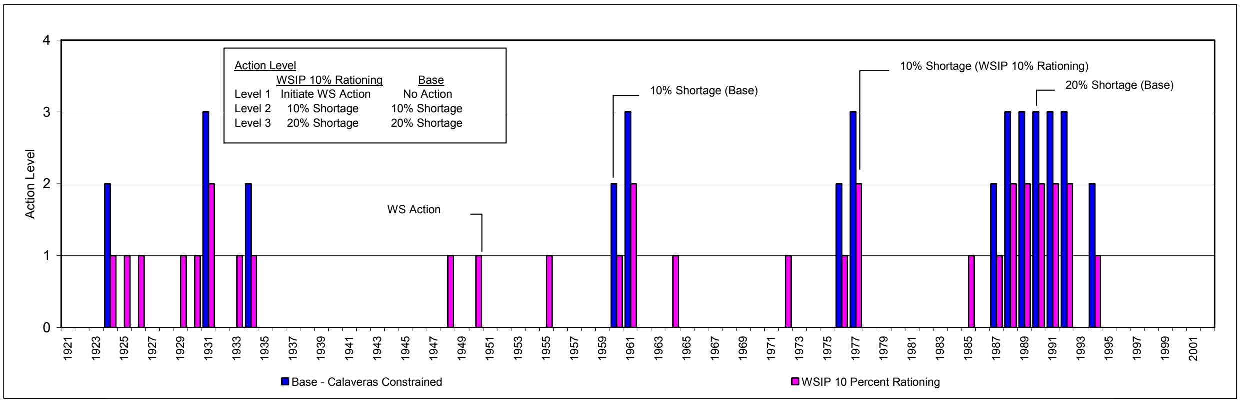


Figure 4.1-2 illustrates that, when compared to the base setting, the variant triggers the supplemental resource (Westside Basin Groundwater Program) at an early indication of drought, during periods when in the current setting there is no supplemental resource available to the system. The utilization of the supplemental resource during these times results in the lessening of (or at least a non-increase in) the severity of delivery shortage.

Not illustrated in Figure 4.1-2, but shown in Table 1-1, are the delivery shortages anticipated during the entire SFPUC Design Drought. Shortages during the Design Drought with the variant are maintained within the objective of limiting the severity of shortage to no more than 10 percent. With the existing system, the WSIP's 20 percent limitation (cap) objective cannot be achieved during the last 18 months of the Design Drought, and a 25 percent shortage is applied.

The difference in water deliveries between the proposed program and the variant is shown chronologically for the 82-year simulation in Table 4.1-1. The negative differences indicated for 1934-1935 reflect the triggering of an additional year of supplement supply from the Westside Groundwater Program. In effect, the use of the resource offsets the demand needed from other SFPUC resources. The positive differences following this period of approximately 2,600 million gallons per year represent years when additional replenishment of the Westside Basin Groundwater Program was necessary after the additional draw from the program. The years showing additional deliveries of approximately 10,000 million gallons during the 1990s represent years when shortages were reduced to 10 percent in the variant setting.

4.2 Diversions from Tuolumne River

The metric for illustrating the SFPUC diversion from the Tuolumne River Basin is the flow through the SJPL. Table 4.2-1 illustrates the difference in diversions to the SJPL between the proposed program and the variant settings. The year-to-year shift in diversions to the SJPL during the 1930s reflects the minor change in system deliveries shown in Table 4.1-1 that are due to the additional operation of the Westside Groundwater Program. The net difference during the period is negligible. A similar shifting of diversions between years is modeled to occur during the 1960s and 1970s, both attributable to modeling assumptions that balance storage among SFPUC reservoirs and the setting of the flow rate of the SJPL. These changes are not considered to be meaningful. The additional diversions indicated during the 1990s represent the additional water supply provided from the Tuolumne River to serve the additional deliveries associated with the 10 percent rationing limit. In the WSIP setting, the diversion would be less because its 20-percent rationing goal requires fewer water deliveries. Table 4.2-2 illustrates the average monthly diversion through the SJPL, by year type, for the 82-year simulation period for the proposed program and the variant settings.

Table 4.1-1

Difference in Total System-wide Delivery (MG)

WSIP 10 Percent Rationing minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
1921	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1922	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1923	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1928	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1929	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	-530	-499	-454	-1,484	0
1934	-449	-419	-408	-383	-379	-423	-436	-446	-453	0	0	0	-3,795	-5,279
1935	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1937	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1938	0	0	0	0	0	0	0	0	0	224	224	217	665	0
1939	224	217	224	224	203	224	217	224	217	224	224	217	2,640	2,640
1940	224	217	224	224	203	224	217	224	217	0	0	0	1,974	2,640
1941	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1942	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1946	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1947	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	1,124	1,101	978	3,202	0
1991	901	750	672	610	624	806	893	1,013	1,072	0	0	0	7,343	10,545
1992	0	0	0	0	0	0	0	0	0	1,124	1,101	978	3,202	0
1993	901	750	672	610	624	806	893	1,013	1,072	0	0	0	7,343	10,545
1994	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	22	18	17	16	16	20	22	25	26	26	26	24	257	257

Table 4.2-1

Difference in Total SJPL (Acre-feet) WSIP 10 Percent Rationing minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	0	0	0	0	0	0	0	0
1922	0	0	0	0	0	0	0	0	0	0	0	0	0
1923	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	0	0	0	0	0
1928	0	0	0	0	0	0	0	0	0	0	0	0	0
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	-6,905	3,996	-2,854	0	0	0	0	0	0	0	0	-5,763
1933	-856	2,762	0	0	0	0	0	0	0	0	0	0	1,906
1934	0	0	-4,756	-2,854	-2,578	0	0	0	0	0	0	0	-10,188
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	-1,841	0	0	0	0	0	0	0	0	0	0	-1,841
1937	0	0	0	-952	0	1,142	0	0	0	0	0	0	190
1938	0	0	0	0	0	0	0	0	0	0	0	0	0
1939	1,902	0	2,854	0	0	0	0	0	0	0	0	0	4,756
1940	0	0	0	0	4,297	3,806	0	0	0	0	0	0	8,103
1941	1,902	0	0	0	0	0	0	0	0	0	0	0	1,902
1942	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	0	0	0	0	0	0	0	0	0
1946	0	0	0	0	0	0	0	0	0	0	0	0	0
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	-6,905	-951	-951	0	0	0	0	0	0	0	0	-8,807
1962	0	-921	1,998	95	2,578	0	0	0	0	0	0	0	3,750
1963	1,427	0	0	3,045	0	0	0	0	0	0	0	0	4,472
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	-7,135	-952	0	0	0	0	0	-7,136	-952	-921	-17,096
1978	285	-921	-951	4,852	7,734	4,757	1,841	0	0	0	0	0	17,597
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	-1,237	0	0	0	0	1,902	0	0	0	0	0	0	665
1981	0	-921	0	0	0	0	0	0	0	0	0	0	-921
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	2,189	5,064	7,253
1991	4,756	2,762	523	3,805	3,437	1,047	0	5,043	4,880	-1,237	0	0	25,016
1992	0	0	-1,902	1,903	0	0	0	0	0	3,806	2,949	2,762	9,518
1993	2,855	921	523	0	0	0	4,880	2,949	2,854	0	0	0	14,982
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	1,903	0	0	0	0	0	0	0	0	1,903
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	135	-146	-71	86	189	154	82	97	94	-56	51	84	700

Table 4.2-2

Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — WSIP 10 Percent Rationing

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	27,477	16,624	8,506	11,934	7,948	11,714	21,981	26,787	25,923	29,778	29,778	28,817	247,266	245,023
Above Normal	26,901	14,270	7,986	14,265	9,558	16,929	24,176	28,608	27,685	29,778	29,778	28,817	258,752	258,752
Normal	26,174	14,656	8,889	15,573	12,256	22,476	28,207	29,778	28,817	29,778	29,778	28,817	275,199	275,124
Below Normal	27,567	16,431	11,962	21,747	18,723	25,099	28,817	29,778	28,817	29,705	29,593	27,864	296,103	297,162
Dry	26,109	19,104	14,050	19,586	17,309	25,782	28,817	29,778	28,817	29,255	29,082	27,632	295,321	296,439
All Years	26,855	16,196	10,271	16,655	13,183	20,415	26,402	28,952	28,018	29,661	29,604	28,388	274,599	274,584

Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	27,358	16,624	8,533	11,512	7,465	11,298	21,561	26,603	25,744	29,778	29,778	28,817	245,069	242,794
Above Normal	26,705	14,785	7,751	14,254	9,306	16,705	24,176	28,608	27,685	29,778	29,778	28,817	258,347	258,347
Normal	26,174	14,713	8,765	15,626	12,095	22,405	28,207	29,778	28,817	29,778	29,778	28,817	274,953	274,878
Below Normal	27,338	16,106	11,931	21,523	18,520	25,038	28,817	29,481	28,530	29,778	29,593	27,864	294,520	295,079
Dry	25,990	19,593	14,794	19,764	17,471	25,782	28,817	29,778	28,817	29,463	28,821	27,200	296,289	297,969
All Years	26,721	16,342	10,342	16,569	12,994	20,261	26,320	28,854	27,923	29,717	29,553	28,304	273,899	273,884

Difference in Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — WSIP 10 Percent Rationing minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	119	0	-27	422	483	416	420	184	178	0	0	0	2,197	2,228
Above Normal	196	-514	235	11	253	224	0	0	0	0	0	0	404	404
Normal	0	-58	125	-54	161	71	0	0	0	0	0	0	246	246
Below Normal	229	325	31	224	202	62	0	297	287	-73	0	0	1,584	2,083
Dry	119	-489	-743	-178	-161	0	0	0	0	-208	262	432	-968	-1,530
All Years	135	-146	-71	86	189	154	82	97	94	-56	51	84	700	700

4.3 Hetch Hetchy Reservoir and Releases

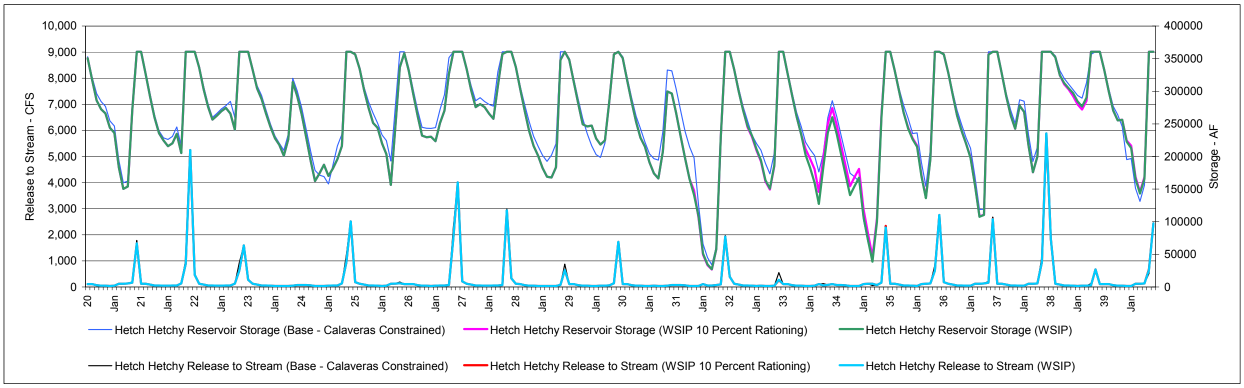
The additional draw of water for the additional deliveries of the variant would increase the draw from Hetch Hetchy Reservoir; however, this draw essentially only occurs during one period of the simulation. Figure 4.3-1 illustrates a chronological trace of the simulation of Hetch Hetchy Reservoir storage and stream releases. Shown in Figure 4.3-1 are the results for the WSIP, variant ("WSIP All Tuolumne"), and base ("Base – Calaveras Constrained") settings. Supplementing the Figure 4.3-1 representation of Hetch Hetchy Reservoir storage are Table 4.3-1 Hetch Hetchy Reservoir Storage (10% Rationing) and Table 4.3-2 Difference in Hetch Hetchy Reservoir Storage (10% Rationing minus WSIP). Table 4.3-3 illustrates the difference in Hetch Hetchy Reservoir storage between the base and variant settings.

Table 4.3-2 illustrates that, throughout the summer and into the fall, storage in Hetch Hetchy Reservoir associated with the variant would differ from the storage in the WSIP setting only in some years, and this difference could be more or less storage. The occasional difference in storage at Hetch Hetchy Reservoir is coincident with the changes that are modeled for the SJPL diversion. Only the changes associated with the difference in Westside Groundwater Program operations (1930s) and the diversion of additional water for the 10 percent rationing objective (1990s) are meaningful. The other modeled differences are attributable to assumptions for reservoir balancing and flow rates of the SJPL, which are discretionary in the model, and the differences may not occur in actual operations. The minor changes that would occur to Hetch Hetchy Reservoir storage during the winter and spring would typically be negated by the end of May with the filling of the reservoir. Figure 4.3-1 illustrates that the greatest draw from reservoir storage occurs during the droughts of the 1930s and 1976-1977 for both the variant and the base settings, and that there is not much difference between the two. Figure 4.3-2 illustrates the difference in reservoir storage, averaged by year type, in comparing the variant and WSIP settings. Also shown is the average difference in storage for the two settings during the 82-year simulation. Figure 4.3-3 illustrates the same information in comparing the variant and base setting. Figure 4.3-4 illustrates the average monthly storage in Hetch Hetchy Reservoir for the 82-year simulation, and the range in storage for each month for the variant and base settings.

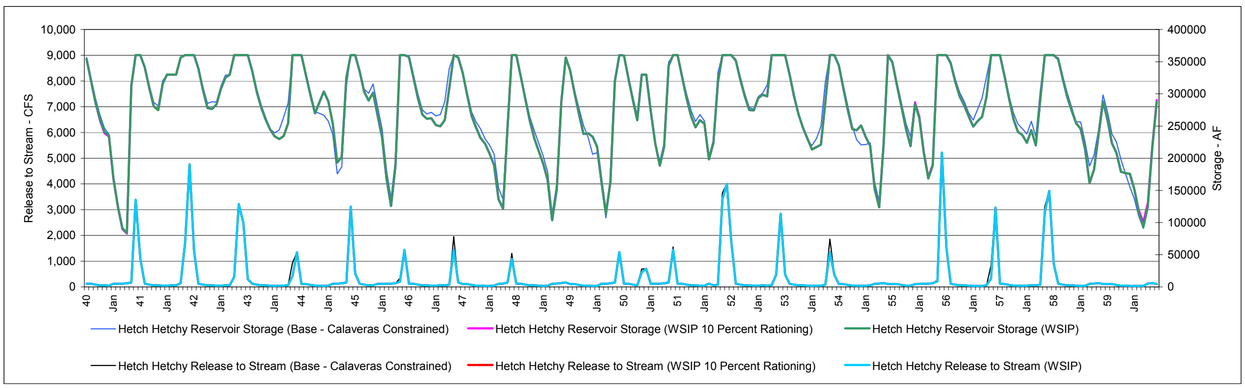
The infrequent minor differences in storage in Hetch Hetchy Reservoir attributed to the diversion effects of the variant manifest into differences in releases from O'Shaughnessy Dam to the stream. A difference in the amount of available reservoir space in the winter and spring would lead to a difference in how inflow is regulated at O'Shaughnessy Dam. Figure 4.3-1 illustrates the stream release from O'Shaughnessy Dam for the WSIP, variant, and base settings. Table 4.3-4 illustrates the difference in stream releases between the variant and WSIP settings. Compared to the WSIP setting, the variant exhibits almost no change in stream releases. The one meaningful exception occurs during the drought of the 1990s, when additional water is diverted for additional deliveries and the effect manifests as a reduction to releases to the stream in one subsequent month (June). Table 4.3-5 illustrates the same information in comparing the variant and base settings.

Figure 4.3-1
Hetch Hetchy Reservoir Storage and Stream Release

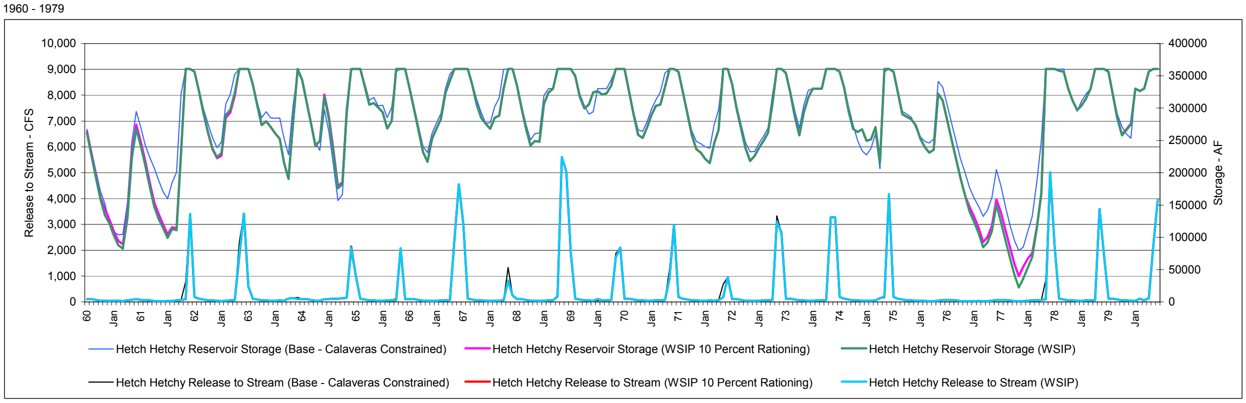
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

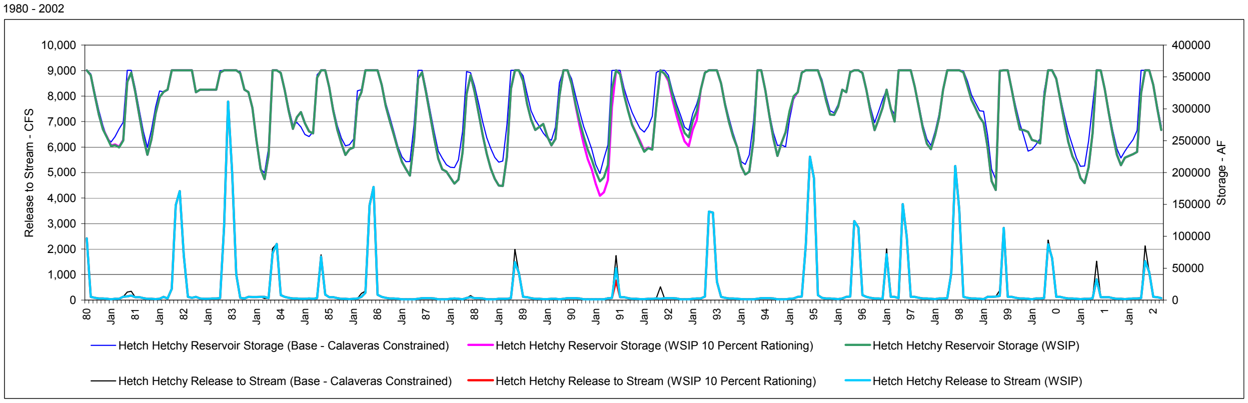


Table 4.3-1

Hetch Hetchy Reservoir Storage (Acre-feet) WSIP 10 Percent Rationing

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	272,402	266,044	243,868	235,920	183,321	150,269	154,224	271,116	360,400	360,400	326,811	291,828
1922	259,728	235,648	224,723	215,782	220,244	234,819	205,133	360,400	360,400	360,400	336,082	302,853
1923	275,819	256,526	262,603	269,313	274,454	265,738	241,094	360,400	360,400	360,400	333,186	304,241
1924	288,096	265,462	244,930	227,949	217,703	201,135	226,615	314,032	292,290	264,348	229,088	193,225
1925	162,198	174,233	187,270	170,200	181,824	195,815	216,042	360,400	360,400	356,465	334,210	301,427
1926	274,085	251,427	243,883	219,916	203,496	156,406	245,154	336,819	358,277	331,111	295,686	261,739
1927	231,858	229,528	230,165	223,466	251,035	270,123	326,806	360,400	360,400	360,400	333,718	301,231
1928	275,534	280,188	275,546	265,616	257,757	308,315	356,993	360,400	360,400	337,096	302,689	269,444
1929	239,232	216,426	201,321	182,545	168,883	167,850	183,407	347,942	360,400	348,102	314,426	281,237
1930	249,493	245,923	247,253	227,747	218,315	224,793	286,156	356,465	360,400	350,768	316,726	283,424
1931	252,998	228,677	214,984	191,409	174,118	166,236	207,521	299,800	296,541	266,646	231,402	197,210
1932	165,286	147,905	106,113	49,644	33,394	26,649	57,902	229,418	360,400	360,400	333,089	299,918
1933	271,014	244,902	230,135	209,520	192,353	161,802	149,351	185,608	360,400	360,400	326,593	293,382
1934	260,961	234,344	211,518	196,653	180,728	145,826	197,881	250,386	274,180	247,932	215,906	184,646
1935	154,653	168,376	181,163	119,522	82,042	46,446	104,675	262,641	360,400	360,400	331,788	299,322
1936	267,086	244,540	228,122	216,707	171,639	137,560	196,977	360,400	360,400	356,465	327,853	294,110
1937	262,493	239,158	219,779	198,812	156,588	108,473	110,793	356,521	360,400	360,400	327,212	292,471
1938	262,775	242,374	277,970	268,254	217,341	175,883	200,130	360,400	360,400	360,400	352,029	324,714
1939	310,563	302,766	292,380	279,830	271,975	285,459	360,400	360,400	360,400	332,157	299,492	270,327
1940	255,209	256,245	224,385	216,543	168,721	145,791	168,387	360,400	360,400	354,451	320,313	286,310
1941	258,775	239,215	233,713	167,903	124,010	90,014	83,187	312,606	360,400	360,400	341,291	309,048
1942	280,721	274,942	315,878	330,000	330,000	330,000	356,592	360,400	360,400	360,400	339,529	306,962
1943	278,021	276,636	283,548	307,975	325,066	330,000	360,400	360,400	360,400	360,400	334,820	303,090
1944	279,144	260,348	244,962	234,244	229,744	234,419	254,494	360,400	360,400	360,400	329,290	297,445
1945	269,782	286,673	303,578	288,423	253,887	193,103	202,059	325,579	360,400	360,400	334,928	303,168
1946	289,579	302,009	266,576	232,638	168,168	125,876	188,823	360,400	360,400	357,267	325,581	293,235
1947	267,584	261,329	261,933	251,706	249,594	259,401	308,348	360,400	356,592	332,847	297,991	265,329
1948	247,258	231,519	222,630	207,163	189,129	136,187	121,486	246,616	360,400	360,400	325,774	291,062
1949	257,437	230,325	210,633	191,633	166,180	103,674	151,625	286,364	356,592	336,040	301,328	268,173
1950	237,728	238,697	233,450	217,724	163,129	114,105	162,436	319,562	360,400	359,600	323,849	289,929
1951	259,038	330,000	330,000	273,739	223,537	188,600	217,740	343,707	360,400	360,400	326,780	293,203
1952	264,766	248,078	259,003	253,471	198,031	223,738	317,703	360,400	360,400	360,400	351,651	322,211
1953	296,329	275,128	274,206	293,261	298,723	296,049	360,374	360,400	360,400	360,400	330,136	297,172
1954	268,064	247,055	230,167	213,569	217,328	221,015	286,815	360,400	360,400	343,956	308,827	274,943
1955	245,440	243,491	250,709	232,875	219,152	151,838	123,551	222,728	360,400	348,498	313,738	278,863
1956	244,816	218,801	286,194	264,124	209,296	170,313	190,196	360,400	360,400	360,400	347,791	319,290
1957	296,127	282,297	264,905	249,257	257,810	264,111	295,373	360,400	360,400	360,400	326,823	292,697
1958	261,061	240,978	235,957	224,058	243,566	220,059	291,862	360,400	360,400	360,400	353,900	323,910
1959	295,427	273,939	254,292	245,472	213,883	161,315	182,390	235,642	288,112	259,667	223,084	208,259
1960	179,051	176,894	175,738	151,333	119,223	100,133	130,026	218,505	290,266	264,021	228,814	194,592
1961	161,757	143,851	127,444	109,206	94,490	89,373	136,414	228,629	274,314	248,207	218,199	185,225
1962	154,199	135,470	119,749	104,609	115,556	113,793	232,320	360,400	360,400	356,465	326,379	292,131
1963	262,285	235,760	222,641	226,278	284,898	293,051	319,268	360,400	360,400	360,400	336,396	305,026
1964	273,668	279,416	270,727	260,673	252,543	215,321	190,335	275,763	360,400	343,750	309,409	275,896
1965	241,813	249,120	320,973	285,638	234,677	179,337	185,211	297,432	360,400	360,400	360,400	333,188
1966	305,400	307,762	300,989	293,442	268,461	279,726	360,400	360,400	360,400	331,450	297,972	265,321
1967	231,906	216,758	252,106	268,331	283,263	323,066	342,598	360,400	360,400	360,400	360,400	335,768
1968	305,290	284,733	275,763	268,094	285,055	288,111	330,318	360,400	360,400	334,325	299,837	267,451
1969	242,147	249,086	247,807	306,192	323,862	330,000	360,400	360,400	360,400	360,400	349,426	317,777
1970	299,296	305,659	324,435	326,065	320,846	322,797	334,670	360,400	360,400	360,400	326,016	290,760
1971	258,440	253,880	270,103	288,977	303,697	305,250	332,642	360,400	360,400	356,465	325,764	292,446
1972	258,839	236,370	231,016	221,257	214,866	245,077	266,541	360,400	360,400	336,426	299,001	267,965
1973	238,190	218,208	225,626	238,473	249,151	261,799	307,249	360,400	360,400	353,990	322,828	286,127
1974	257,794	293,500	316,503	330,000	330,000	330,000	360,400	360,400	360,400	356,465	331,550	295,187
1975	267,864	263,077	267,079	249,395	251,607	270,330	216,738	360,400	360,400	356,465	324,162	290,479
1976	286,336	282,468	273,429	252,264	239,384	231,084	235,434	322,270	311,719	281,653	249,955	220,061
1977	191,125	164,627	147,077	132,136	114,297	92,700	99,960	117,692	158,788	138,879	111,106	84,739
1978	58,559	39,802	54,535	66,684	75,301	115,684	167,623	360,400	360,400	360,400	357,869	356,406
1979	329,957	311,201	296,912	303,911	314,794	330,000	360,400	360,400	360,400	356,097	320,734	284,314
1980	258,962	267,114	275,772	330,000	326,446	330,000	356,592	360,400	360,400	360,400	352,729	320,413
1981	290,796	268,662	255,785	242,331	244,014	240,516	251,139	342,822	356,592	326,381	288,829	253,955
1982	227,982	252,018	292,777	317,906	326,446	330,000	360,400	360,400	360,400	360,400	360,400	360,400
1983	326,065	330,000	330,000	330,000	330,000	330,000	356,951	360,400	360,400	360,400	360,400	355,970
1984	330,000	326,192	301,515	251,330	205,725	189,676	227,004	360,400	360,400	356,465	328,962	296,457
1985	268,372	286,904	294,977	277,357	264,474	261,687	348,828	360,400	360,400	333,535	296,865	266,723
1986	245,402	227,652	236,474	239,341	311,791	326,065	360,400	360,400	360,400	360,400	337,490	304,597
1987	281,194	259,670	236,484	216,725	205,573	195,265	251,416	347,582	357,022	325,388	288,877	253,677
1988	221,889	204,952	201,696	191,923	182,833	188,925	231,786	323,285	352,727	326,875	292,101	258,469
1989	229,470	206,135	190,185	179,740	178,779	224,799	331,322	360,400	360,400	343,974	308,105	283,006
1990	266,700	271,420	276,200	256,827	242,842	252,652	320,352	360,400	360,400	339,162	304,941	273,390
1991	244,492	221,036	205,056	182,089	163,629	168,932	188,293	302,693	360,400	355,666	322,950	297,956
1992	275,710	262,228	249,291	233,995	239,598	236,997	303,521	360,400	355,022	343,485	313,742	289,241
1993	267,437	248,928	241,426	267,352	282,660	330,000	356,592	360,400	360,400	360,400	339,684	305,994
1994	278,714	256,620	239,355	209,682	196,961	201,254	250,111	360,400	360,400	328,106	288,504	253,299
1995	226,108	246,696	263,295	294,831	317,708	326,065	356,592	360,400	360,400	360,400	360,400	341,235
1996	313,102	291,101	290,319	303,304	330,000	326,065	357,776	360,400	360,400	356,465	329,269	295,808
1997	266,385	283,200	301,776	330,000	300,695	280,067	360,400	360,400	360,400	360,400	334,509	301,549
1998	268,984	245,268	236,666	258,858	286,099	330,000	360,400	360,400	360,400	360,400	357,575	336,363
1999	314,282	301,528	287,025	277,784	239,977	186,792	172,794	359,739	360,400	360,400	328,523	295,405
2000	267,514	266,427	263,903	251,200	249,369	245,666	316,972	360,400	360,400	347,257	314,429	280,432
2001	248,366	225,736	213,192	191,416	183,471	208,152	262,123	360,400	360,186	330,828	293,698	259,268
2002	227,858	211,442	223,309	226,085	228,791	232,493	324,711	360,400	360,400	337,536	300,566	266,784
Avg (21-02)	256,564	247,570	245,580	236,678	227,073	220,096	255,201	333,912	351,532	341,751	314,453	283,687

Table 4.3-2

Difference in Hetch Hetchy Reservoir Storage (Acre-feet)

WSIP 10 Percent Rationing minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	0	0	0	0	0	0	0	0	0	0	0	0
1922	0	0	0	0	0	0	0	0	0	0	0	0
1923	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	0	0	0	0
1928	0	0	0	0	0	0	0	0	0	0	0	0
1929	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	6,905	-2,269	-1,731	-1,260	-763	-409	-297	0	0	0	0
1933	857	-1,906	-1,906	-1,906	-1,908	-1,908	-1,618	-1,358	0	0	0	0
1934	0	0	9,276	13,723	20,918	18,334	13,935	13,927	13,912	13,887	13,863	13,847
1935	13,838	13,838	13,838	11,845	9,985	7,465	4,812	3,653	0	0	0	0
1936	0	1,841	1,777	1,823	1,610	1,348	1,141	0	0	0	0	0
1937	0	0	0	951	845	707	560	463	0	0	0	0
1938	0	0	0	0	0	0	0	0	0	0	0	0
1939	-1,903	-1,902	-4,756	-4,759	-4,761	-4,761	0	0	0	0	0	0
1940	0	0	1,625	3,531	3,105	2,591	2,184	0	0	0	0	0
1941	-1,903	-1,903	-1,585	-1,587	-1,356	-1,137	-867	-649	0	0	0	0
1942	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	0	0	0	0	0	0	0	0
1946	0	0	0	0	0	0	0	0	0	0	0	0
1947	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	2,230	2,232	2,233	1,953	1,646	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	2,829	7,590	5,800	2,811	2,808	2,804	2,799	2,795
1961	2,794	9,699	5,801	6,760	6,770	6,769	6,769	6,760	6,753	6,741	6,730	6,722
1962	6,718	7,638	5,640	5,553	2,983	2,983	2,983	0	0	0	0	0
1963	-1,427	-1,427	-1,427	-4,472	-4,475	-4,475	-4,474	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	3,514	3,516	3,517	3,517	3,105	2,719	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	7,136	8,095	8,106	8,105	8,105	8,096	8,073	15,187	16,080	16,958
1978	16,662	17,583	18,534	13,696	5,970	1,213	-629	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0
1980	1,237	1,237	1,236	0	0	0	0	0	0	0	0	0
1981	0	921	920	921	922	922	921	922	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	-2,189	-7,250
1991	-12,004	-14,765	-15,289	-19,103	-22,551	-23,598	-23,597	-28,627	0	1,237	1,235	1,235
1992	1,234	1,234	3,137	1,236	1,237	1,236	1,236	0	0	-3,805	-6,750	-9,507
1993	-12,357	-13,277	-13,801	-13,808	-13,816	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	-1,902	-1,904	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	168	314	410	300	232	343	263	103	385	440	387	302

Table 4.3-3

Difference in Hetch Hetchy Reservoir Storage (Acre-feet)

WSIP 10 Percent Rationing minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	-11,721	-10,801	-10,801	-10,807	-10,814	-9,461	-7,978	-6,683	0	0	-2,188	-4,304
1922	-3,826	-3,826	-3,827	-10,488	-10,494	-10,495	-10,494	0	0	0	-2,188	-4,304
1923	-4,302	-3,381	-3,381	-3,384	-3,385	-18,703	-18,702	0	0	0	-2,188	-4,304
1924	-5,348	-5,348	-4,397	-3,449	-2,591	-8,394	-7,381	-5,875	-7,987	-10,166	-12,336	-14,439
1925	-16,620	2,714	17,936	12,145	-5,119	-20,435	-17,919	0	0	0	-2,188	-4,304
1926	-9,344	-14,961	-7,378	-13,185	-20,730	-36,622	-31,545	-23,581	-2,123	-4,309	-6,492	-8,604
1927	-12,880	-13,801	-12,850	-20,658	-20,670	-24,476	-24,475	0	0	0	-2,188	-7,066
1928	-9,917	-9,917	-8,538	-14,250	-19,413	-21,685	-3,407	0	0	-2,188	-4,373	-9,249
1929	-14,477	-14,478	-14,477	-19,242	-23,549	-34,110	-36,227	-12,458	0	-2,188	-4,374	-6,488
1930	-8,673	10,661	30,639	24,854	19,626	4,310	2,192	0	0	-2,188	-4,373	-6,488
1931	-8,673	-14,289	-7,202	-13,009	-22,554	-28,357	-30,475	-32,645	-34,737	-36,883	-39,018	-41,090
1932	-49,629	-50,089	-19,829	-16,359	-11,782	-7,270	-4,111	-2,971	0	0	-2,188	-4,304
1933	-5,348	-9,952	-2,865	-10,477	-17,357	-27,917	-24,092	-20,179	0	0	-2,188	-4,304
1934	-6,490	-12,107	-10,474	-14,184	-20,798	-30,589	-6,863	-9,047	-11,154	-13,326	-15,491	-17,591
1935	-19,769	-435	19,543	16,635	13,722	-768	-497	-376	0	0	-2,188	-4,304
1936	-11,247	-14,009	-6,990	-19,379	-19,274	-16,765	-14,154	0	0	0	-2,188	-4,304
1937	-8,108	-9,949	-8,988	-13,719	-12,162	-10,199	-8,501	-3,879	0	0	-2,188	-4,304
1938	-8,203	-8,203	-8,915	-16,531	-16,539	-16,494	-14,517	0	0	0	-2,188	-7,066
1939	-8,966	-8,045	-9,947	-13,757	-17,201	-27,761	3,808	0	0	-2,188	-4,373	-6,488
1940	-8,672	10,662	29,164	19,575	17,331	14,533	12,269	0	0	-2,188	-4,374	-6,488
1941	-8,387	-7,467	-3,368	-3,370	-2,878	-2,412	-1,839	-1,374	0	0	-2,188	-4,304
1942	-6,205	-6,205	-4,493	0	0	0	0	0	0	0	-2,188	-4,304
1943	-7,251	-10,934	-3,846	-3,849	-3,850	0	0	0	0	0	-2,188	-4,304
1944	-4,302	-3,381	-528	-5,285	-14,052	-29,369	-31,487	0	0	0	-2,188	-4,304
1945	-2,494	16,839	36,818	31,032	17,300	17,300	15,227	13,316	0	0	-2,188	-4,304
1946	-11,247	-13,088	-13,089	-13,096	-13,103	-11,224	-9,474	0	0	-2,188	-4,374	-6,487
1947	-7,436	-7,437	-9,340	-14,101	-18,406	-28,967	-31,084	0	0	-2,188	-4,374	-6,487
1948	-8,672	-14,288	-7,201	-13,007	-17,311	-17,405	-14,697	-12,307	0	0	-2,188	-4,304
1949	-6,491	-12,106	-12,106	-12,088	-12,094	-10,246	-8,223	-6,881	0	-2,188	-4,374	-9,250
1950	-13,050	6,284	27,271	9,115	8,053	6,756	5,577	4,675	0	-800	-2,988	-5,103
1951	-7,289	0	0	0	0	-6,659	-5,851	-5,848	0	0	-2,188	-7,066
1952	-8,966	-8,965	-8,966	-4,488	-4,491	-4,491	-15,539	0	0	0	-2,188	-4,304
1953	-4,302	-3,381	-2,431	-2,431	-2,433	-17,749	-26	0	0	0	-2,188	-4,304
1954	-1,449	-527	2,327	-6,234	-13,284	-28,601	-30,718	0	0	-2,188	-4,373	-6,487
1955	-4,677	14,657	29,879	11,725	-4,680	-10,484	-8,847	-7,393	0	-2,188	-4,374	-6,488
1956	-8,673	-14,289	-1,955	-1,956	-1,957	-1,709	-1,439	0	0	0	-2,188	-4,304
1957	-6,205	-6,205	-5,253	-10,014	-18,784	-29,344	-31,461	0	0	0	-2,188	-4,304
1958	-9,344	-12,106	-9,776	-13,586	-13,594	-13,594	-13,594	0	0	0	-2,188	-4,304
1959	-6,205	-5,285	-2,431	-10,993	-11,000	-26,317	-22,670	-8,156	-10,265	-12,438	-14,605	-16,706
1960	-18,884	449	20,428	14,640	9,473	9,173	7,006	1,224	-895	-3,082	-5,264	-7,376
1961	-9,560	-8,271	5,330	962	-9,434	-15,238	-17,356	-18,262	-20,358	-22,518	-24,666	-38,725
1962	-53,258	-51,970	-50,637	-55,067	-68,882	-87,053	-89,170	0	0	0	-2,188	-7,066
1963	-13,723	-18,326	-15,995	-21,712	-21,725	-28,385	-32,988	0	0	0	-2,188	-4,304
1964	-11,247	-14,929	-13,978	-23,499	-32,104	-37,908	-37,610	-26,974	3,808	1,616	-574	-2,692
1965	-4,878	14,456	23,035	23,045	23,056	22,256	18,934	16,237	0	0	0	-4,880
1966	-6,780	-8,622	-2,408	-10,971	-16,941	-21,050	3,808	0	0	-2,188	-4,373	-6,488
1967	-8,672	-14,288	-8,580	-8,585	-8,590	-6,934	-9,697	0	0	0	0	-2,118
1968	-7,825	-7,825	-738	-9,300	-17,038	-27,599	-29,716	0	0	-2,188	-4,374	-6,488
1969	-8,672	-11,434	-13,337	-13,345	-6,138	0	0	0	0	0	-2,188	-4,304
1970	-4,302	15,032	30,254	-3,935	-9,154	-7,203	-9,320	0	0	0	-2,188	-4,304
1971	-8,107	-9,948	-8,998	-9,002	-9,006	-19,566	-21,683	0	0	0	-2,188	-4,304
1972	-6,490	-12,106	-14,009	-18,774	-23,081	-28,885	-31,002	0	0	-2,188	-4,373	-6,487
1973	-8,671	-14,288	-7,200	-7,205	-7,209	-7,209	-13,930	0	0	-2,188	-4,374	-9,249
1974	-11,149	-11,148	-11,149	0	0	0	0	0	0	0	-2,188	-7,066
1975	-6,111	13,222	33,201	21,709	13,988	10,183	10,183	3,935	0	0	-2,188	-4,304
1976	-4,303	-3,381	3,706	-2,951	-8,968	-14,771	-16,889	-19,067	-21,170	-23,332	-25,490	-27,578
1977	-29,749	-35,366	-30,133	-28,730	-33,915	-39,719	-41,836	-43,968	-45,986	-40,952	-35,901	-33,782
1978	-36,404	-39,718	-30,253	-42,257	-56,904	-70,223	-82,376	0	0	0	-2,188	-3,994
1979	-43	878	1,829	-6,732	-6,735	0	0	0	0	-2,188	-4,373	-6,488
1980	-12,193	7,141	22,363	0	0	0	0	0	0	0	-2,188	-4,304
1981	-6,205	-5,284	1,803	-5,807	-12,684	-28,001	-28,001	-17,578	-3,808	-5,992	-8,173	-10,284
1982	-11,229	-14,911	-10,155	-10,158	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	-2,946	0	0	0	0	-2,118
1984	0	0	0	0	0	-9,738	-11,659	0	0	0	-2,188	-4,304
1985	-6,490	8,241	23,462	17,670	8,142	-2,418	-4,535	0	0	-2,188	-4,374	-6,487
1986	-8,672	-14,288	-7,200	-13,008	-16,452	-3,935	0	0	0	0	-2,188	-4,304
1987	-6,205	-5,284	-4,333	-8,141	-11,583	-22,143	-24,260	-12,818	-3,378	-5,563	-7,744	-9,855
1988	-12,037	-17,653	-10,566	-16,375	-24,976	-30,780	-32,898	-35,067	-3,865	-8,902	-15,837	-20,703
1989	-25,449	-31,893	-33,796	-36,669	-39,268	-49,828	-29,078	0	0	-7,896	-15,783	-13,929
1990	-15,825	-1,095	14,127	2,623	-7,773	-18,333	-20,450	0	0	-7,896	-15,784	-22,676
1991	-27,422	-33,866	-31,536	-30,602	-34,916	-53,087	-55,205	-57,362	0	-4,734	-9,486	-14,081
1992	-18,833	-18,833	-19,784	-29,499	-32,953	-51,125	-53,242	0	-5,378	-9,177	-13,067	-17,660
1993	-22,409	-22,409	-24,835	-24,849	-24,862	0	0	0	0	0	-2,188	-4,304
1994	-6,205	-5,284	-2,430	-7,188	-15,785	-26,346	-28,463	0	0	-2,188	-4,374	-9,249
1995	-16,189	3,146	23,124	10,770	3,041	0	0	0	0	0	0	-4,880
1996	-6,781	-5,859	-3,529	-3,531	0	0	0	0	0	0	-2,188	-7,066
1997	-11,820	-12,740	-12,741	0	0	-11,512	0	0	0	0	-2,188	-4,304
1998	-5,253	-7,095	-5,715	-5,719	-5,722	0	0	0	0	0	-2,188	-7,066
1999	-8,014	-8,014	-9,917	-18,484	-18,492	-18,493	-16,251	-661	0	0	-2,188	-7,066
2000	-8,966	10,368	30,347	15,048	5,604	-7,905	-10,022	0	0	-2,188	-4,373	-9,250
2001	-14,954	-16,795	-9,707	-18,275	-26,878	-41,148	-43,266	0	-214	-2,402	-4,587	-6,701
2002	-9,551	-11,392	-10,250	-16,916	-22,941	-33,501	-35,619	0	0	-2,188	-4,374	-6,488
Avg (21-02)	-10,785	-8,400	-2,475	-7,355	-10,953	-16,154	-15,107	-4,293	-2,043	-3,175	-5,387	-8,174

Figure 4.3-2

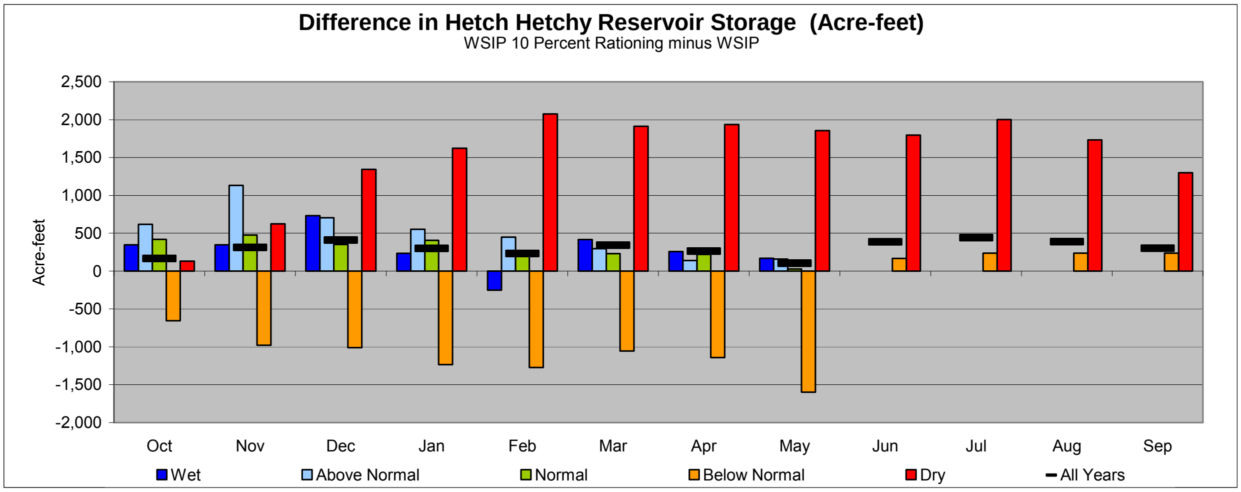


Figure 4.3-3

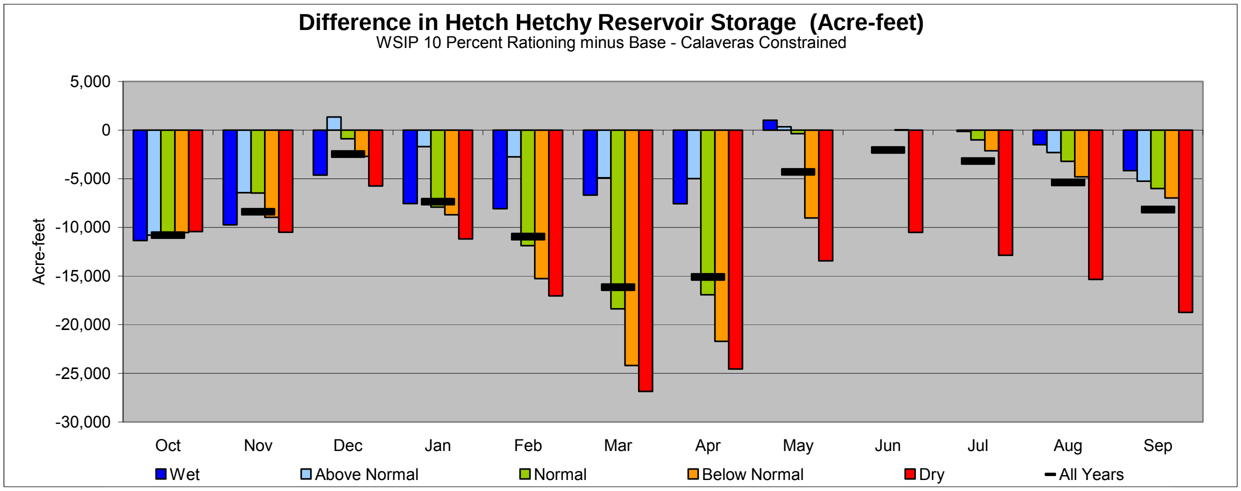


Figure 4.3-4

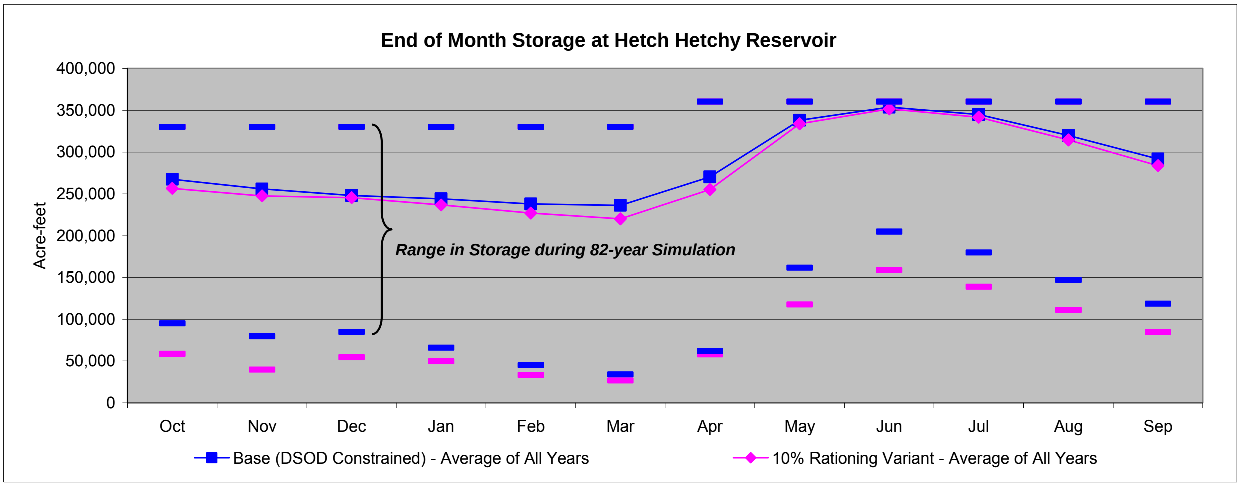


Table 4.3-4

Difference in Hetch Hetchy Release to Stream (Acre-feet)

WSIP 10 Percent Rationing minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	0	0	0	0	0	0	0	0
1922	0	0	0	0	0	0	0	0	0	0	0	0	0
1923	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	0	0	0	0	0
1928	0	0	0	0	0	0	0	0	0	0	0	0	0
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	-297	0	0	0	-297
1933	0	0	0	0	0	0	0	0	-1,193	0	0	0	-1,193
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	3,648	0	0	0	3,648
1936	0	0	0	0	0	0	0	999	0	0	0	0	999
1937	0	0	0	0	0	0	0	0	492	0	0	0	492
1938	0	0	0	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	0	0	0	1,816	0	0	0	0	1,816
1941	0	0	0	0	0	0	0	0	-648	0	0	0	-648
1942	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	0	0	0	0	0	0	0	0	0
1946	0	0	0	0	0	0	0	0	0	0	0	0	0
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	1,439	0	0	0	0	1,439
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	-4,473	0	0	0	0	-4,473
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	2,717	0	0	0	2,717
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	-28,603	0	0	0	-28,603
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	0	0	0	0	0	0	0	-3	-291	0	0	0	-294

Table 4.3-5

Difference in Hetch Hetchy Release to Stream (Acre-feet)

WSIP 10 Percent Rationing minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	0	0	0	-6,676	0	0	0	-6,676
1922	0	0	0	0	0	0	0	-9,137	0	0	0	0	-9,137
1923	0	0	0	0	0	0	0	-18,692	0	0	0	0	-18,692
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	-17,695	0	0	0	0	-17,695
1926	0	0	0	0	0	0	0	-2,913	0	0	0	0	-2,913
1927	0	0	0	0	0	0	0	-24,963	0	0	0	0	-24,963
1928	0	0	0	0	0	0	0	-3,618	0	0	0	0	-3,618
1929	0	0	0	0	0	0	0	0	-13,231	0	0	0	-13,231
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	-2,968	0	0	0	-2,968
1933	0	0	0	0	0	0	0	0	-17,710	0	0	0	-17,710
1934	0	0	0	0	0	0	-3,808	0	0	0	0	0	-3,808
1935	0	0	0	0	0	3,935	0	0	-376	0	0	0	3,559
1936	0	0	0	0	0	0	0	-12,365	0	0	0	0	-12,365
1937	0	0	0	0	0	0	0	-3,143	-4,111	0	0	0	-7,254
1938	0	0	0	0	0	0	0	-12,653	0	0	0	0	-12,653
1939	0	0	0	0	0	0	-3,808	4,045	0	0	0	0	237
1940	0	0	0	0	0	0	0	10,278	0	0	0	0	10,278
1941	0	0	0	0	0	0	0	0	-1,373	0	0	0	-1,373
1942	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	-31,469	0	0	0	0	-31,469
1945	0	0	0	0	0	0	0	0	13,305	0	0	0	13,305
1946	0	0	0	0	0	0	0	-8,285	0	0	0	0	-8,285
1947	0	0	0	0	0	0	0	-31,072	0	0	0	0	-31,072
1948	0	0	0	0	0	0	0	0	-12,293	0	0	0	-12,293
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	4,670	0	0	0	4,670
1951	0	-7,289	0	0	0	0	0	0	-6,213	0	0	0	-13,502
1952	0	0	0	0	0	0	0	-15,533	0	0	0	0	-15,533
1953	0	0	0	0	0	0	0	-26	0	0	0	0	-26
1954	0	0	0	0	0	0	0	-30,705	0	0	0	0	-30,705
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	-1,264	0	0	0	0	-1,264
1957	0	0	0	0	0	0	0	-31,449	0	0	0	0	-31,449
1958	0	0	0	0	0	0	0	-13,589	0	0	0	0	-13,589
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	-41,654	0	0	0	0	-41,654
1963	0	0	0	0	0	0	0	-33,536	0	0	0	0	-33,536
1964	0	0	0	0	0	0	0	0	-3,808	0	0	0	-3,808
1965	0	0	0	0	0	0	0	0	16,223	0	0	0	16,223
1966	0	0	0	0	0	0	-3,808	4,045	0	0	0	0	237
1967	0	0	0	0	0	0	0	-10,256	0	0	0	0	-10,256
1968	0	0	0	0	0	0	0	-30,764	0	0	0	0	-30,764
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	3,935	0	0	0	-9,317	0	0	0	0	-5,382
1971	0	0	0	0	0	0	0	-22,371	0	0	0	0	-22,371
1972	0	0	0	0	0	0	0	-30,986	0	0	0	0	-30,986
1973	0	0	0	0	0	0	0	-13,924	0	0	0	0	-13,924
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	2,521	4,171	0	0	0	6,692
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	-46,590	0	0	0	-310	-46,900
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	-10,407	-10,310	0	0	0	-20,717
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	-3,131	0	0	0	0	-3,131
1984	0	0	0	0	0	3,935	0	-11,653	0	0	0	0	-7,718
1985	0	0	0	0	0	0	0	-4,835	0	0	0	0	-4,835
1986	0	0	0	0	0	-8,478	-3,935	0	0	0	0	0	-12,413
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	-3,808	0	0	0	-3,808
1989	0	0	0	0	0	0	0	-30,146	0	0	0	0	-30,146
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	-58,342	0	0	0	-58,342
1992	0	0	0	0	0	0	0	-28,918	0	0	0	0	-28,918
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	-12,746	0	0	0	0	0	0	0	0	-12,746
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	-13,491	-698	0	0	0	-14,189
2000	0	0	0	0	0	0	0	-10,019	0	0	0	0	-10,019
2001	0	0	0	0	0	0	0	-43,245	0	0	0	0	-43,245
2002	0	0	0	0	0	0	0	-36,682	0	0	0	0	-36,682
Avg (21-02)	0	-89	0	-107	0	-7	-187	-8,288	-1,263	0	0	-4	-9,946

Table 4.3-4 illustrates the difference in stream release between the variant and WSIP settings, expressed in terms of a month-to-month change in volume (acre-feet) of flow. The one notable difference in monthly flow below O'Shaughnessy Dam indicates a potential decrease of approximately 29,000 acre-feet between the variant and WSIP settings. Considering the manner in which releases are determined and made to the stream, quantifying the effect of these changes in terms of average monthly flow (cfs) is not always meaningful.[5] Assuming that a change in release volume equates to a delay or earlier initiation of releasing 6,000 acre-feet per day, the difference in stream release from O'Shaughnessy Dam between the variant and WSIP would be a delay in releases up to 5 days. Normally, the effect of a delay in release would not affect the year's peak stream release rate during a year. Compared to the base setting, the variant's effect to stream flow is almost identical to the effect caused by the WSIP.

Compared to the base setting, Table 4.3-5 illustrates that the variant could potentially decrease releases by up to 58,000 acre-feet in one monthly instance, or increase releases by up to 10,000 acre-feet during a month. These changes would equate to an effect ranging from a delay in release of up to 10 days to an earlier initiation of releases by 2 days.

4.4 Lake Lloyd and Lake Eleanor

Compared to the operation of the WSIP, the operation of Lake Lloyd and Lake Eleanor are simulated to be only slightly different in the variant. Figure 4.4-1 illustrates a chronological trace of the simulation of Lake Lloyd storage and stream releases. Shown in Figure 4.4-1 are the results for the WSIP, variant, and base settings. The operation resulting from the variant is essentially the same as in the WSIP setting, except during the prolonged drought of 1987-1992. The difference is explained as modeling discretion, and would not likely occur. HH/LSM model logic estimates the amount of water to be released from Lake Lloyd based on the condition of Hetch Hetchy Reservoir, the Don Pedro Water Bank Account, and Lake Eleanor and Lake Lloyd storage in comparison to demands. In this instance, the model logic retains more water in Lake Lloyd as compared to the WSIP setting. By the end of the drought, this water is utilized, and the storage between the two settings is comparable. The end result is the same storage at the end of the period, and only the rate at which it changes is different. The model logic is not very refined, and a small change in computation result can result in a large difference in Lake Lloyd release (in this instance, through Holm Powerhouse). Overall, the Lake Lloyd operation would be discretionary, and the outcome would likely be the same among the variant and the WSIP settings.

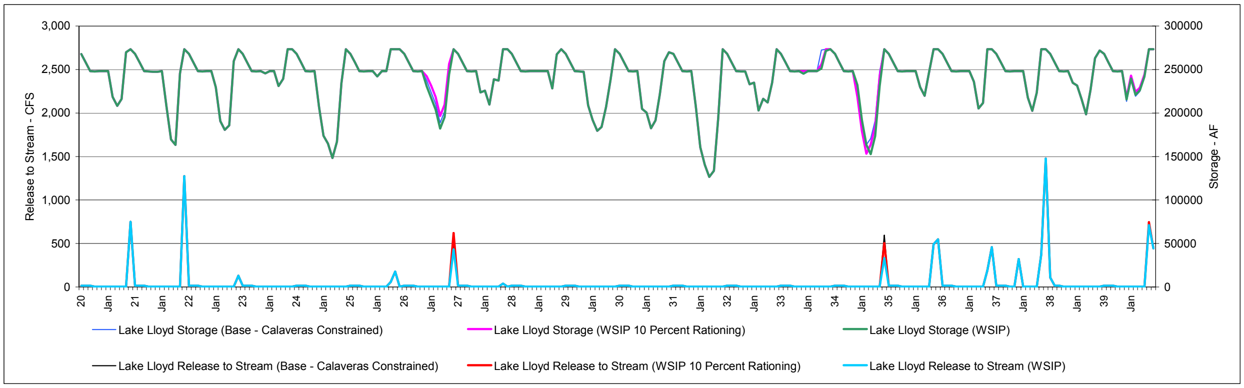
Figure 4.4-2 illustrates an almost identical operation of Lake Eleanor for the variant and WSIP settings. Also shown in Figure 4.4-2 is the operation for the base setting. Any difference that occurs in the Lake Eleanor operation would be caused by a small change in operation at Lake Lloyd that would affect the operation of the Cherry-Eleanor Tunnel between the two watersheds. Any difference that occurs in the simulations is more associated with modeling discretion than with any substantive likely difference in operation.

Supplementing the Figure 4.4-1 representation of Lake Lloyd stream releases is Table 4.4-1, which illustrates releases for the variant and WSIP settings and the almost no difference in releases between the two. Table 4.4-2 provides the same form of information for the variant and base settings, also showing almost no difference between the variant and the base settings.

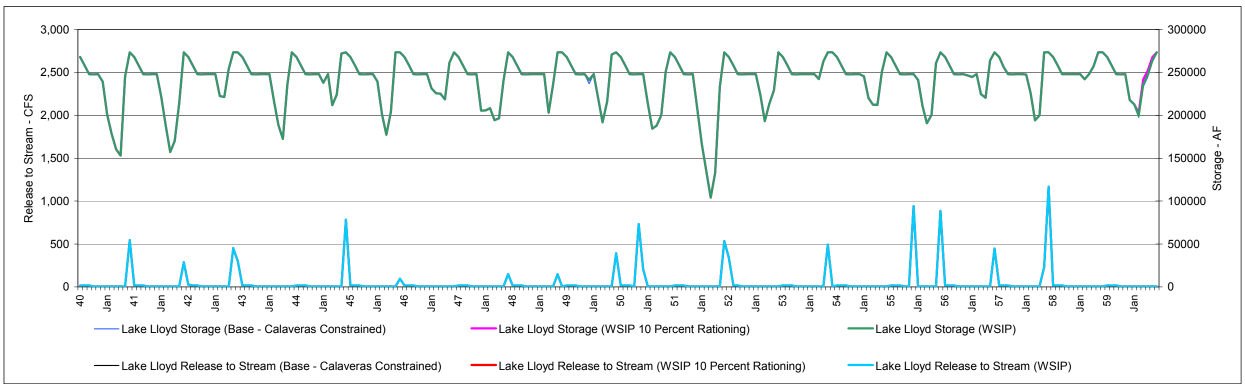
[5] See "Estimated Effect of WSIP on Daily Releases below Hetch Hetchy Reservoir", Memorandum by Daniel B. Steiner, December 31, 2006.

Figure 4.4-1
Lake Lloyd Storage and Stream Release

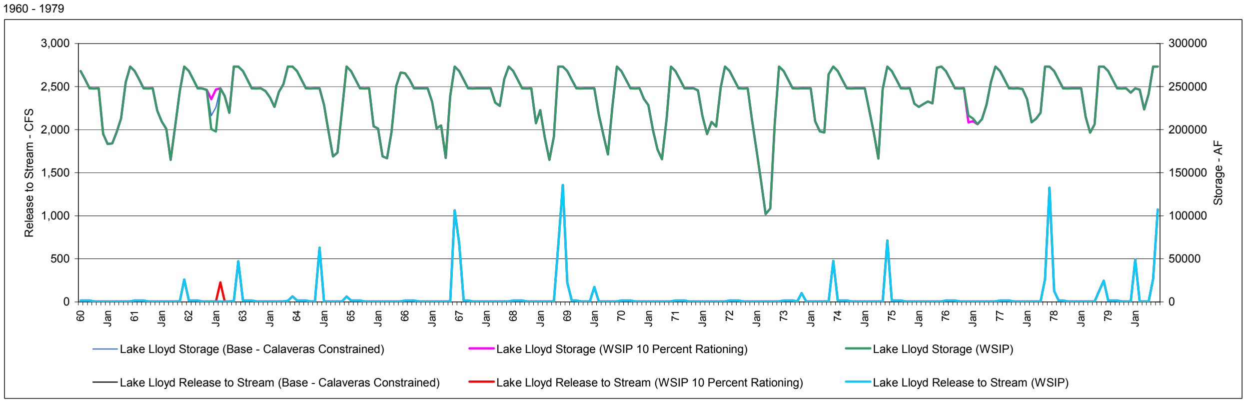
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

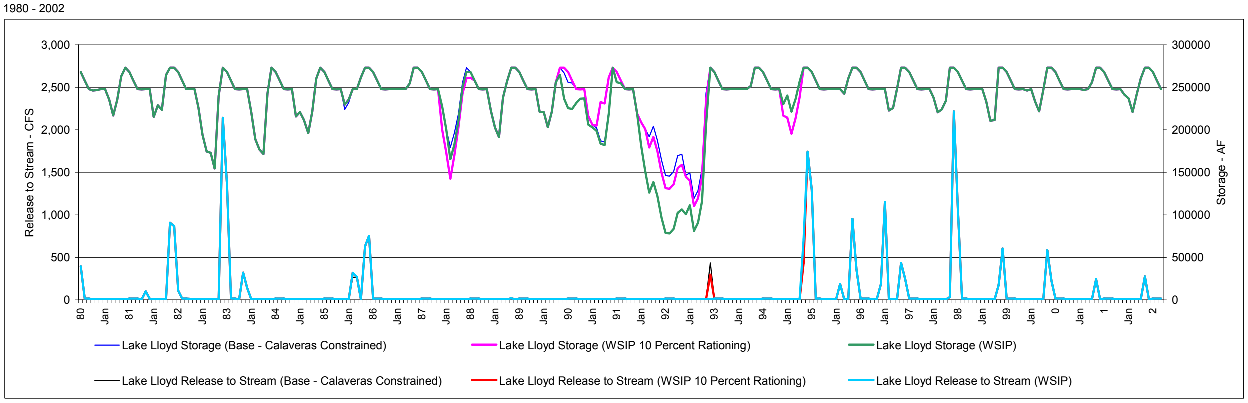


Figure 4.4-2
Lake Eleanor Storage and Stream Release

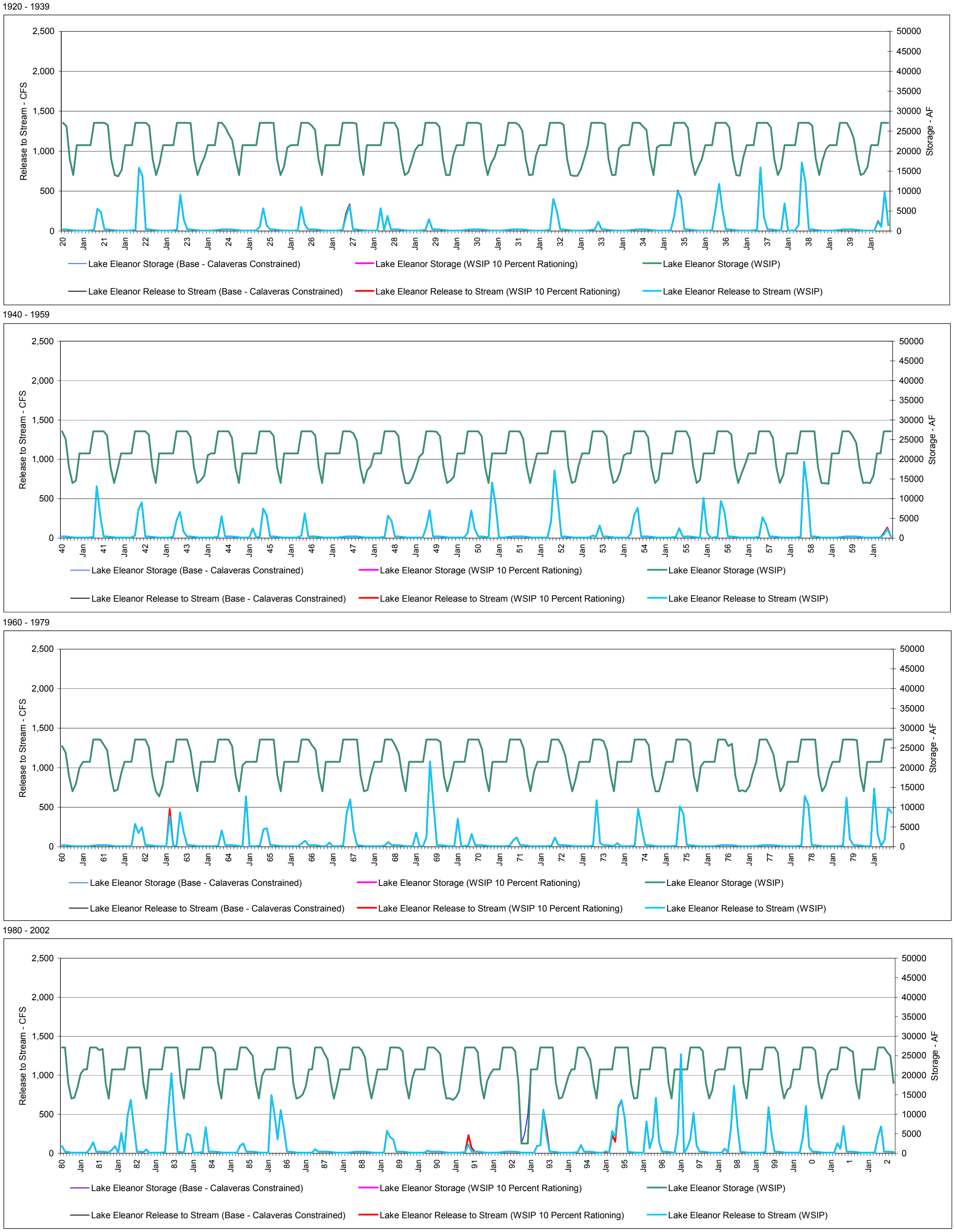


Table 4.4-1

Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) WSIP 10 Percent Rationing

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	5	11	134	107	25	21	5	267	1,076	363	15	15
Above Normal	5	72	25	5	29	5	5	169	467	16	15	15
Normal	5	5	5	16	5	5	5	110	162	15	15	15
Below Normal	5	5	5	5	5	5	8	39	43	15	15	15
Dry	5	5	5	5	5	5	5	5	5	15	15	15
All Years	5	20	34	27	14	8	6	118	348	83	15	15

Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	5	11	134	107	25	21	5	284	1,058	363	15	15
Above Normal	5	72	25	5	16	5	5	167	446	16	15	15
Normal	5	5	5	16	5	5	5	110	162	15	15	15
Below Normal	5	5	5	5	5	5	8	39	43	15	15	15
Dry	5	5	5	5	5	5	5	5	5	15	15	15
All Years	5	20	34	27	11	8	6	121	340	83	15	15

Difference in Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) WSIP 10 Percent Rationing minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	0	0	0	0	0	0	0	-18	18	0	0	0
Above Normal	0	0	0	0	13	0	0	2	21	0	0	0
Normal	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	0	0	3	0	0	-3	8	0	0	0

Table 4.4-2

Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) WSIP 10 Percent Rationing

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	5	11	134	107	25	21	5	267	1,076	363	15	15
Above Normal	5	72	25	5	29	5	5	169	467	16	15	15
Normal	5	5	5	16	5	5	5	110	162	15	15	15
Below Normal	5	5	5	5	5	5	8	39	43	15	15	15
Dry	5	5	5	5	5	5	5	5	5	15	15	15
All Years	5	20	34	27	14	8	6	118	348	83	15	15

Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	5	11	134	107	21	21	5	284	1,084	363	15	15
Above Normal	5	72	25	5	16	5	5	166	467	16	15	15
Normal	5	5	5	16	5	5	5	110	162	15	15	15
Below Normal	5	5	5	5	5	5	8	39	43	15	15	15
Dry	5	5	5	5	5	5	5	5	5	15	15	15
All Years	5	20	34	27	10	8	6	120	350	83	15	15

Difference in Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) WSIP 10 Percent Rationing minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	0	0	0	0	3	0	0	-18	-9	0	0	0
Above Normal	0	0	0	0	13	0	0	3	1	0	0	0
Normal	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	0	0	3	0	0	-3	-2	0	0	0

4.5 Don Pedro Reservoir and La Grange Releases

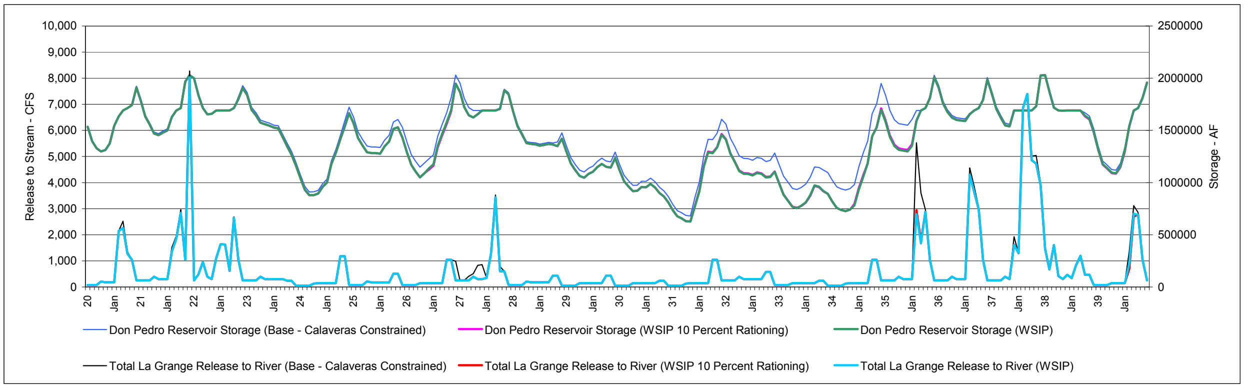
A change in Don Pedro Reservoir operation is caused by changes in inflow to the reservoir. The changes in inflow to the reservoir are the result of net changes within the operation of the upstream SFPUC facilities described previously, and other changes in SFPUC operations associated with diversions to the Holm, Kirkwood, and Moccasin Powerhouses. Figure 4.5-1 illustrates a chronological trace of the simulation of Don Pedro Reservoir storage and Tuolumne River stream releases from La Grange Dam. Shown in Figure 4.5-1 are the results for the WSIP, variant, and base settings.

Supplementing the Figure 4.5-1 representation of Don Pedro Reservoir storage are Table 4.5-1 Don Pedro Reservoir Storage (10% Rationing) and Table 4.5-2 Difference in Don Pedro Reservoir Storage (10% Rationing minus WSIP). Table 4.5-3 is provided to illustrate the difference in Hetch Hetchy Reservoir storage between the base and variant settings.

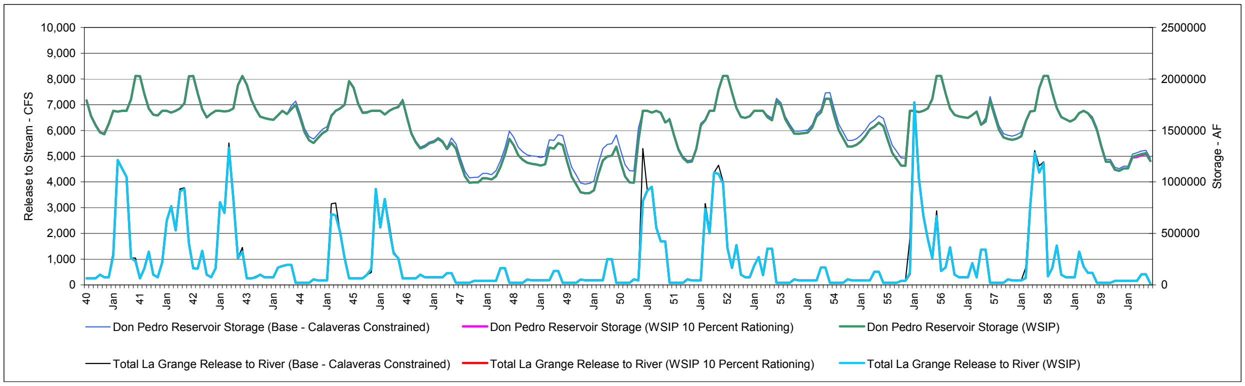
Table 4.5-2 illustrates that, throughout many years, the storage in Don Pedro Reservoir associated with the variant would not differ from the storage in the WSIP setting. Minor changes in storage occur during

Figure 4.5-1
Don Pedro Reservoir Storage and Release below La Grange Dam

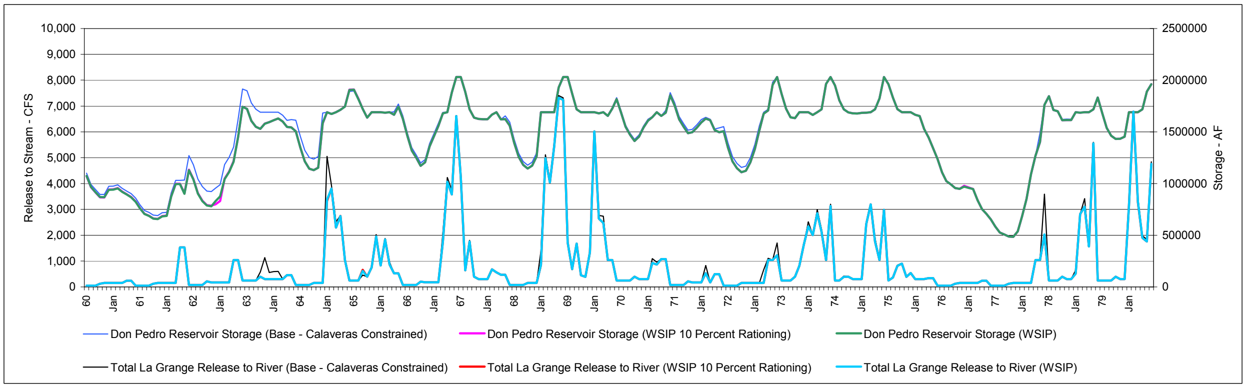
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

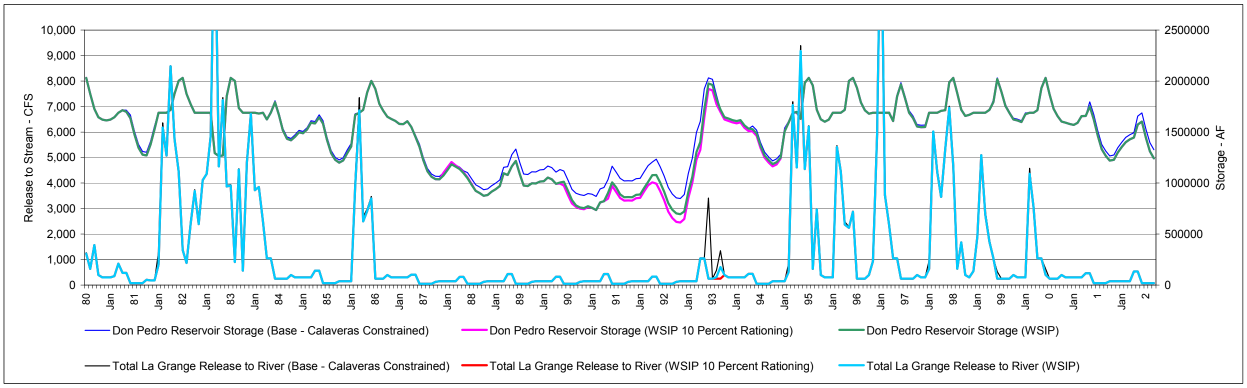


Table 4.5-1

Don Pedro Reservoir Storage (Acre-feet)

WSIP 10 Percent Rationing

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	1,297,919	1,311,969	1,374,649	1,543,191	1,633,956	1,690,000	1,713,000	1,742,271	1,910,239	1,780,368	1,632,093	1,555,504
1922	1,469,532	1,454,724	1,479,018	1,499,182	1,627,229	1,690,000	1,713,000	1,967,374	2,030,000	1,998,136	1,838,254	1,715,718
1923	1,653,081	1,658,408	1,689,999	1,689,989	1,689,997	1,690,000	1,713,000	1,799,350	1,905,720	1,837,747	1,695,090	1,643,504
1924	1,573,662	1,557,997	1,543,979	1,525,572	1,520,285	1,435,601	1,350,582	1,268,108	1,160,641	1,041,842	933,176	878,997
1925	881,178	895,290	959,080	1,001,347	1,177,665	1,284,520	1,414,414	1,536,668	1,665,128	1,566,983	1,426,571	1,354,602
1926	1,290,743	1,282,398	1,282,833	1,276,745	1,347,403	1,393,186	1,513,528	1,529,318	1,431,062	1,291,567	1,169,352	1,105,586
1927	1,050,369	1,090,025	1,124,968	1,161,721	1,339,634	1,454,381	1,563,601	1,685,574	1,948,150	1,868,472	1,722,559	1,645,445
1928	1,624,169	1,655,495	1,689,962	1,690,000	1,689,998	1,690,000	1,705,499	1,882,298	1,844,942	1,681,291	1,538,831	1,460,902
1929	1,377,322	1,368,992	1,366,099	1,352,890	1,361,744	1,370,153	1,363,716	1,347,620	1,420,045	1,297,417	1,184,105	1,120,176
1930	1,064,049	1,047,885	1,083,398	1,103,389	1,147,360	1,178,802	1,151,942	1,144,262	1,236,535	1,120,169	1,015,406	962,553
1931	917,895	920,233	957,669	955,848	987,375	954,080	900,516	866,574	810,612	736,739	676,917	657,388
1932	631,250	626,111	775,055	921,341	1,160,729	1,296,550	1,287,208	1,340,437	1,464,128	1,416,773	1,281,107	1,204,200
1933	1,115,158	1,089,757	1,087,456	1,072,920	1,097,571	1,089,471	1,053,650	1,058,364	1,106,890	997,181	886,682	827,702
1934	770,291	758,539	775,466	808,538	872,379	969,011	956,055	916,896	892,359	818,637	757,246	737,956
1935	727,280	740,918	794,093	948,977	1,072,447	1,180,619	1,441,663	1,527,535	1,710,444	1,595,170	1,450,406	1,363,406
1936	1,327,188	1,318,744	1,312,836	1,366,335	1,594,364	1,690,000	1,713,000	1,809,562	2,008,091	1,909,712	1,759,762	1,676,922
1937	1,623,613	1,602,292	1,595,757	1,589,655	1,655,418	1,690,000	1,713,000	1,792,311	1,987,462	1,852,802	1,706,683	1,621,969
1938	1,547,848	1,539,286	1,689,998	1,689,992	1,689,987	1,690,000	1,690,000	1,730,000	2,025,000	2,030,000	1,870,754	1,718,957
1939	1,690,000	1,689,224	1,690,000	1,690,000	1,689,999	1,690,000	1,635,656	1,604,973	1,481,480	1,314,275	1,172,576	1,133,839
1940	1,091,624	1,084,357	1,144,602	1,295,283	1,536,604	1,690,000	1,713,000	1,812,499	1,959,504	1,793,778	1,643,535	1,554,911
1941	1,484,298	1,467,987	1,566,983	1,689,992	1,683,108	1,690,000	1,690,000	1,803,587	2,030,000	2,027,570	1,857,840	1,712,174
1942	1,653,602	1,645,974	1,689,999	1,689,982	1,673,445	1,690,000	1,713,000	1,765,000	2,027,000	2,030,000	1,860,016	1,707,840
1943	1,626,500	1,664,178	1,690,000	1,689,976	1,683,949	1,690,000	1,713,000	1,939,745	2,030,000	1,944,589	1,798,570	1,708,539
1944	1,635,547	1,622,064	1,610,321	1,603,274	1,647,456	1,690,000	1,658,867	1,706,915	1,749,631	1,623,011	1,481,354	1,403,951
1945	1,379,320	1,427,347	1,473,782	1,500,075	1,640,198	1,690,000	1,713,000	1,750,606	1,979,431	1,916,348	1,762,159	1,674,274
1946	1,676,444	1,690,000	1,689,996	1,689,984	1,655,146	1,690,000	1,713,000	1,726,277	1,790,756	1,626,434	1,470,843	1,384,452
1947	1,325,252	1,341,690	1,375,016	1,387,235	1,418,025	1,387,541	1,319,689	1,380,202	1,321,263	1,180,658	1,055,313	992,092
1948	995,855	997,122	1,035,745	1,034,871	1,022,941	1,055,025	1,146,212	1,267,720	1,417,634	1,352,869	1,259,478	1,215,157
1949	1,185,933	1,175,442	1,170,203	1,158,664	1,170,747	1,334,893	1,324,462	1,376,085	1,357,943	1,195,682	1,052,617	977,799
1950	899,772	889,700	891,735	917,336	1,074,649	1,209,756	1,247,393	1,254,524	1,342,391	1,193,077	1,052,942	994,455
1951	991,828	1,394,480	1,689,996	1,689,971	1,673,951	1,690,000	1,671,372	1,576,239	1,604,996	1,451,580	1,311,792	1,232,453
1952	1,191,106	1,198,816	1,320,408	1,550,006	1,599,510	1,690,000	1,690,000	1,895,000	2,030,000	2,030,000	1,869,932	1,719,140
1953	1,632,895	1,622,960	1,637,300	1,689,996	1,689,998	1,690,000	1,627,805	1,598,044	1,787,718	1,742,953	1,609,936	1,534,967
1954	1,469,181	1,468,382	1,472,024	1,478,824	1,527,793	1,637,361	1,675,192	1,807,461	1,807,613	1,647,557	1,501,608	1,423,172
1955	1,343,773	1,343,524	1,361,809	1,394,386	1,444,656	1,510,283	1,537,906	1,575,778	1,541,339	1,405,813	1,280,713	1,222,079
1956	1,159,157	1,157,788	1,690,000	1,689,942	1,678,244	1,690,000	1,713,000	1,806,575	2,030,000	2,030,000	1,859,576	1,712,725
1957	1,651,881	1,635,922	1,627,970	1,622,414	1,650,203	1,683,085	1,554,764	1,586,050	1,793,311	1,646,081	1,506,206	1,432,543
1958	1,416,187	1,408,633	1,421,341	1,444,300	1,585,917	1,683,239	1,690,000	1,910,000	2,030,000	2,030,000	1,868,297	1,719,418
1959	1,629,791	1,607,494	1,585,600	1,610,046	1,668,508	1,690,000	1,667,329	1,608,068	1,505,552	1,340,406	1,197,054	1,196,761
1960	1,118,856	1,107,432	1,130,660	1,130,349	1,237,617	1,242,541	1,260,703	1,272,649	1,202,722	1,072,082	963,331	914,093
1961	866,214	865,423	941,551	943,248	955,402	921,478	896,370	869,320	826,181	761,482	707,872	688,573
1962	662,629	657,540	685,275	689,219	876,319	997,428	997,567	904,748	1,134,305	1,043,580	906,787	834,095
1963	791,372	785,329	800,877	831,757	1,047,914	1,115,994	1,215,858	1,447,758	1,742,553	1,723,046	1,606,960	1,548,182
1964	1,529,550	1,579,114	1,594,780	1,612,886	1,629,372	1,599,437	1,546,921	1,543,278	1,504,654	1,349,718	1,214,770	1,143,889
1965	1,130,401	1,153,714	1,581,698	1,689,973	1,672,299	1,690,000	1,713,000	1,745,040	1,907,880	1,909,923	1,820,436	1,723,004
1966	1,638,047	1,690,000	1,689,998	1,689,996	1,685,990	1,690,000	1,666,206	1,743,752	1,626,487	1,462,463	1,318,853	1,248,271
1967	1,172,366	1,205,898	1,359,590	1,458,604	1,556,437	1,679,489	1,690,000	1,880,000	2,030,000	2,030,000	1,885,338	1,717,656
1968	1,636,802	1,624,597	1,622,733	1,622,937	1,666,603	1,690,000	1,620,006	1,623,382	1,560,682	1,393,610	1,258,193	1,180,490
1969	1,144,074	1,173,385	1,262,868	1,689,994	1,689,990	1,690,000	1,690,000	1,930,000	2,030,000	2,030,000	1,871,603	1,717,046
1970	1,690,000	1,690,000	1,689,999	1,689,952	1,679,633	1,690,000	1,655,509	1,725,036	1,816,534	1,686,506	1,549,469	1,471,343
1971	1,411,316	1,454,230	1,541,278	1,607,186	1,641,597	1,690,000	1,654,817	1,685,672	1,853,567	1,753,420	1,619,836	1,550,260
1972	1,488,043	1,496,591	1,540,187	1,590,658	1,628,525	1,611,472	1,517,554	1,495,198	1,504,521	1,346,809	1,215,475	1,148,834
1973	1,110,158	1,123,168	1,205,238	1,334,033	1,513,648	1,676,096	1,707,479	1,954,405	2,030,000	1,868,018	1,723,819	1,640,583
1974	1,631,540	1,690,000	1,689,998	1,689,983	1,662,882	1,690,000	1,717,600	1,963,536	2,030,000	1,947,300	1,804,413	1,717,372
1975	1,688,940	1,679,043	1,677,497	1,682,835	1,684,941	1,690,000	1,717,600	1,823,045	2,030,000	1,960,006	1,829,986	1,720,415
1976	1,690,000	1,690,000	1,690,000	1,664,706	1,652,292	1,526,598	1,445,307	1,341,473	1,236,083	1,107,685	1,022,829	992,425
1977	956,011	948,887	978,997	961,854	947,174	838,577	752,499	707,492	653,826	583,542	526,716	507,831
1978	487,410	485,142	537,428	682,530	851,420	1,090,270	1,269,012	1,400,455	1,761,000	1,845,303	1,711,347	1,699,327
1979	1,612,044	1,615,120	1,614,176	1,689,998	1,684,439	1,690,000	1,690,000	1,717,600	1,832,303	1,682,304	1,538,286	1,461,691
1980	1,430,288	1,433,000	1,453,035	1,689,976	1,689,987	1,690,000	1,717,600	1,890,400	1,960,200	2,030,000	1,874,603	1,727,346
1981	1,644,248	1,621,877	1,614,080	1,621,636	1,645,736	1,690,000	1,714,087	1,699,430	1,637,187	1,476,194	1,347,699	1,279,533
1982	1,270,664	1,377,577	1,528,321	1,689,995	1,689,988	1,690,000	1,717,600	1,876,400	2,002,900	2,030,000	1,874,041	1,772,100
1983	1,690,000	1,690,000	1,689,995	1,689,966	1,689,989	1,294,700	1,264,000	1,270,800	1,851,400	2,030,000	2,002,489	1,735,007
1984	1,690,000	1,690,000	1,689,992	1,689,971	1,681,440	1,690,000	1,622,221	1,691,612	1,791,967	1,663,838	1,517,244	1,433,830
1985	1,418,807	1,453,917	1,498,296	1,488,884	1,523,939	1,592,019	1,585,122	1,645,091	1,583,355	1,422,894	1,291,292	1,227,399
1986	1,200,412	1,221,603	1,293,188	1,358,196	1,670,079	1,690,000	1,717,600	1,888,300	2,001,400	1,921,921	1,777,677	1,709,305
1987	1,650,170	1,628,126	1,609,576	1,578,456	1,577,656	1,606,514	1,550,992	1,452,961	1,354,101	1,222,918	1,114,556	1,061,284
1988	1,038,561	1,037,658	1,101,076	1,154,903	1,206,529	1,173,122	1,145,179	1,105,281	1,056,159	988,686	923,954	902,164
1989	875,578	883,080	915,761	939,416	971,383	1,095,303	1,078,941	1,164,792	1,218,153	1,085,906	975,954	970,800
1990	997,431	995,967	1,015,855	1,018,562	1,054,060	1,037,319	993,722	996,820	975,585	880,866	798,664	765,919
1991	750,108	743,541	763,280	755,820	735,012	808,757	821,928	847,606	973,473	912,746	853,883	828,373
1992	829,861	828,508	850,929	855,660	919,434	978,961	1,007,259	995,144	921,749	832,061	720,410	656,403
1993	619,819	613,501	647,418	852,554	1,002,322	1,229,654	1,326,033	1,641,687	1,923,239	1,908,948	1,773,682	1,697,146
1994	1,623,694	1,609,490	1,595,339	1,585,382	1,595,443	1,542,683	1,510,856	1,504,992	1,464,113	1,345,272	1,247,942	1,202,075
1995	1,162,740	1,182,554	1,240,996	1,510,820	1,594,071	1,690,000	1,691,072	1,629,700	1,982,800	2,030,000	1,957,840	1,718,604
1996	1,625,966	1,600,351	1,621,669	1,689,837	1,689,990	1,690,000	1,717,600	2,002,400	2,030,000	1,934,528	1,789,313	1,712,841
1997	1,679,670	1,690,000	1,689,993	1,689,875	1,689,994	1,690,000	1,607,194	1,849,992	1,966,183	1,829,617	1,690,255	1,635,994
1998	1,554,059	1,547,662	1,549,068	1,689,997	1,689,989	1,690,000	1,707,834	1,714,000	1,987,500	2,030,000	1,881,075	1,719,248
1999	1,658,952	1,669,423	1,690,000	1,689,986	1,689,990	1,690,000	1,717,600	1,793,743	2,020,177	1,894,937	1,756,942	1,687,394
2000	1,624,457	1,614,466	1,598,823	1,674,758	1,689,992	1,690,000	1,713,910	1,930,492	2,030,000	1,869,201	1,728,017	1,657,692
2001	1,603,232	1,590,888	1,579,361	1,571,337	1,589,625	1,655,516	1,658,030	1,751,843	1,625,780	1,466,278	1,331,576	1,266,879
2002	1,219,908	1,228,730	1,298,102	1,353,519	1,400,609	1,429,186	1,446,975	1,572,955	1,603,183	1,444,951	1,310,643	1,242,810
Avg (21-02)	1,309,596	1,318,520	1,363,245	1,408,615	1,460,150	1,493,301	1,497,919	1,565,685	1,651,816	1,563,076	1,434,798	1,355,363

Table 4.5-2

Difference in Don Pedro Reservoir Storage (Acre-feet)

WSIP 10 Percent Rationing minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	0	0	0	0	0	0	0	0	0	0	0	0
1922	0	0	0	0	0	0	0	0	0	0	0	0
1923	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	-11,566	-14,368	-14,369	-14,364	-14,351	-11,953	61	60	60	60
1928	60	60	60	0	0	0	0	0	0	0	0	0
1929	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	5,179	7,493	7,022	6,522	6,162	6,034	5,717	5,691	5,665	5,646
1933	5,634	5,631	5,631	5,632	5,633	5,631	5,335	5,064	3,692	3,675	3,658	3,645
1934	3,637	3,635	-3,660	-2,472	-7,081	-4,495	-4,943	-1,889	-83	-83	-82	-82
1935	-81	-81	13,578	14,487	14,178	-4,814	-2,157	-940	13,732	13,671	13,609	13,563
1936	13,534	13,526	13,591	13,550	5,378	0	0	1,139	1,136	1,131	1,125	1,121
1937	1,120	1,119	1,119	1,119	426	0	0	95	557	555	552	550
1938	550	548	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	-4,758	-4,746	-4,731	-4,709	-4,688	-4,672
1940	-4,662	-4,659	-8,417	-11,597	-3,866	0	0	4,546	4,531	4,511	4,491	4,477
1941	4,468	4,464	4,148	-1	46	0	0	-218	0	0	0	0
1942	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	0	0	0	0	0	0	0	0
1946	0	0	0	0	0	0	0	0	0	0	0	0
1947	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	1	0	0	0	1,643	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	-6,110	-13,826	-10,852	-6,771	-2,770	-2,757	-2,745	-2,735
1961	-2,730	-2,728	2,122	2,123	2,122	2,122	2,120	2,114	2,107	2,097	2,086	2,079
1962	2,074	2,073	2,073	2,073	2,074	2,073	2,071	5,042	5,025	5,002	4,979	4,961
1963	4,950	4,948	-29,824	-43,998	4,977	4,975	4,970	490	488	486	484	482
1964	482	480	481	481	481	481	480	480	478	476	474	471
1965	471	471	-3,044	0	0	0	0	382	3,094	3,080	3,068	-5
1966	-5	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	8,219	3,004	-2	-3	-4	-4	-4	-4	-4	-4
1978	-4	-4	-4	-4	-4	-4	-4	-631	0	-1	0	0
1979	-1	0	-1	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	919	915	910	907
1982	905	905	905	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	27,234	27,241	23,010	12,586	7,532	7,513	7,487	6,705	-96	-95
1989	-95	-95	-94	-95	-95	-95	-94	-95	-94	-94	-93	-93
1990	-93	-93	-93	-93	-93	-93	-92	-8,513	-36,768	-42,401	-33,050	-16,093
1991	-10,677	-10,671	-9,886	-2,384	-1,027	-1,027	-1,026	-54,232	-32,973	-44,736	-35,695	-32,493
1992	-32,423	-32,403	-32,406	-32,415	-32,417	-32,405	-69,095	-83,896	-83,600	-83,198	-82,801	-82,505
1993	-82,327	-82,276	-74,166	-58,814	-58,786	-72,381	-77,022	-79,764	-53,695	-53,466	-49,711	-22,515
1994	-22,471	-22,458	-22,459	-22,465	-22,468	-22,459	-22,438	-22,380	-22,304	-22,202	-22,099	-22,024
1995	-21,979	-21,968	-8,308	3,998	1,599	0	-3,974	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	-1,703	-1,702	-1,458	-1,311	-968	-1,605	-2,221	-2,945	-2,293	-2,507	-2,316	-1,773

Table 4.5-3

Difference in Don Pedro Reservoir Storage (Acre-feet)

WSIP 10 Percent Rationing minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	-197	-197	-197	-197	-79	0	0	-3,473	-12,241	-14,370	-14,308	-14,262
1922	-14,232	-14,224	-14,224	-14,228	-5,692	0	0	-9,834	0	-2,184	-1,520	3
1923	3	2	0	0	0	0	0	-20,855	-22,900	-24,983	-24,874	-24,795
1924	-24,744	-24,731	-24,732	-24,740	-24,741	-24,732	-27,837	-31,450	-31,342	-31,201	-31,053	-30,941
1925	-30,873	-30,855	-30,856	-30,865	-30,868	-30,856	-35,458	-55,438	-57,366	-59,296	-59,028	-58,827
1926	-58,704	-58,670	-59,168	-59,185	-59,386	-58,789	-65,924	-75,878	-99,136	-98,684	-98,227	-97,898
1927	-97,695	-97,641	-102,612	-105,439	-105,448	-105,409	-105,309	-130,372	-81,850	-83,683	-82,672	-72,856
1928	-65,831	-34,505	-37	0	0	0	-7,501	-13,070	-15,140	-15,076	-15,008	-14,959
1929	-14,928	-14,919	-14,920	-14,924	-14,925	-14,919	-14,905	-40,768	-55,169	-54,917	-54,663	-54,480
1930	-54,367	-54,337	-54,340	-54,355	-54,358	-54,339	-54,287	-54,144	-56,074	-55,822	-55,567	-55,376
1931	-55,256	-55,224	-55,227	-55,243	-55,248	-55,226	-55,171	-55,018	-54,819	-54,559	-54,295	-54,101
1932	-53,986	-53,955	-80,889	-85,840	-97,307	-118,238	-123,396	-132,095	-142,233	-143,777	-143,117	-142,629
1933	-142,334	-142,254	-142,260	-142,302	-142,312	-142,259	-148,063	-153,754	-175,464	-176,853	-176,030	-175,411
1934	-175,028	-174,924	-176,565	-177,671	-178,813	-179,514	-188,861	-204,651	-203,929	-202,967	-201,991	-201,277
1935	-200,837	-200,718	-187,068	-201,760	-215,893	-215,390	-217,568	-226,016	-239,149	-240,297	-239,235	-238,438
1936	-237,946	-237,812	-237,754	-237,806	-95,626	0	0	-16,314	-18,375	-20,480	-20,390	-20,326
1937	-20,284	-20,273	-20,283	-20,321	-7,817	0	0	-9,641	-18,351	-20,455	-20,365	-20,301
1938	-20,259	-20,248	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	-33,671	-31,969	-33,976	-33,820	-33,665	-33,553
1940	-33,483	-33,464	-36,491	-38,964	-13,289	0	0	10,721	5,814	5,789	5,764	5,745
1941	5,733	5,729	4,485	-1	98	0	0	-3,313	0	-2,183	-1,521	3
1942	3	3	0	1	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	-5,036	0	-2,183	-2,174	4
1944	3	4	4	3	2	0	0	-33,617	-35,622	-37,653	-37,484	-37,358
1945	-37,280	-37,259	-37,261	-37,271	-14,910	0	0	-285	10,885	8,655	8,617	8,590
1946	8,574	0	0	0	0	0	0	-11,642	-13,718	-13,660	-13,598	-13,552
1947	-13,524	-13,515	-13,516	-13,520	-13,521	-13,516	-13,503	-46,684	-48,636	-48,412	-48,190	-48,027
1948	-47,926	-47,899	-47,900	-47,914	-47,918	-53,609	-58,380	-62,784	-76,952	-78,784	-78,417	-78,151
1949	-77,990	-77,947	-77,949	-77,997	-78,002	-75,066	-79,131	-82,443	-91,134	-90,714	-90,300	-89,994
1950	-89,802	-89,749	-95,134	-90,788	-106,140	-115,363	-116,188	-117,171	-114,214	-115,072	-114,548	-114,162
1951	-113,922	-125,747	3	0	0	0	-2,924	-3,841	-13,036	-15,160	-15,090	-15,039
1952	-15,008	-14,999	-15,000	-19,487	-7,796	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	-19,831	-21,992	-24,036	-26,115	-26,002	-25,917
1954	-25,863	-25,849	-25,850	-25,858	-25,859	-25,849	-25,826	-58,616	-60,536	-60,276	-60,006	-59,807
1955	-59,681	-59,648	-59,650	-59,667	-59,673	-59,651	-61,818	-65,543	-76,078	-75,736	-75,387	-75,129
1956	-74,974	-74,933	2	0	0	0	0	-6,472	0	0	0	0
1957	0	0	0	0	0	0	0	-33,595	-35,600	-37,630	-37,462	-37,338
1958	-37,260	-37,239	-37,240	-37,251	-14,902	-5,957	0	0	0	0	0	0
1959	0	0	0	0	0	0	-5,763	-22,415	-22,340	-22,239	-22,134	-22,061
1960	-22,016	-22,003	-22,004	-22,010	-31,568	-40,684	-38,965	-33,757	-27,992	-27,864	-27,736	-27,640
1961	-27,579	-27,562	-31,699	-31,708	-31,711	-31,699	-31,666	-32,840	-32,721	-32,566	-32,410	-32,294
1962	-32,222	-32,203	-32,205	-32,215	-32,218	-32,205	-32,173	-128,981	-136,164	-137,733	-137,094	-136,609
1963	-136,310	-136,229	-155,213	-156,983	-136,275	-136,226	-136,094	-170,572	-171,849	-173,287	-172,533	-171,975
1964	-160,450	-110,886	-95,220	-77,112	-60,627	-60,606	-62,963	-75,590	-108,156	-107,667	-107,166	-106,807
1965	-106,587	-106,528	-99,890	14	1,037	0	0	1,730	17,002	14,745	12,497	-20
1966	-20	0	0	0	353	0	-26,964	-25,281	-27,313	-27,191	-27,066	-26,973
1967	-26,918	-26,903	-26,904	-26,912	-26,914	-9,857	0	0	0	0	-2,183	3
1968	4	4	4	3	2	0	0	-31,853	-33,860	-33,707	-33,550	-33,438
1969	-33,369	-33,351	-33,352	5	0	0	0	0	0	0	0	0
1970	0	0	0	-3	1,189	0	0	-11,491	-13,567	-15,692	-15,622	-15,570
1971	-15,538	-15,528	-15,530	-15,534	-6,215	0	0	-23,835	-25,871	-27,941	-27,820	-27,728
1972	-27,672	-27,656	-27,657	-27,665	-11,067	-11,064	-11,053	-44,157	-46,121	-45,911	-45,697	-45,544
1973	-45,450	-45,424	-45,426	-45,439	-45,444	-13,904	-10,121	-26,189	0	0	-1	0
1974	0	0	0	1	1	0	0	652	0	-2,184	-2,174	3
1975	4	4	3	3	1	0	0	1,198	0	-2,184	-1,521	2
1976	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	8,219	3,004	-2	-3	-4	-4	-4	-4	-4	-4
1978	-4	-4	-4	-4	-4	-4	-4	-88,019	0	-2,184	-2,174	-2,476
1979	-8,318	-8,313	-8,314	1	1	0	0	0	-2,114	-2,105	-2,096	-2,089
1980	-2,084	-2,084	-2,083	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	-2,117	-14,691	-30,491	-30,356	-30,217	-30,113
1982	-30,049	-30,032	-30,033	5	0	0	0	0	0	0	-2,183	0
1983	0	0	0	0	0	0	0	0	0	0	-2,183	3
1984	0	0	0	0	0	0	-197	-14,020	-16,088	-18,202	-18,121	-18,060
1985	-18,023	-18,013	-18,014	-18,019	-18,020	-18,013	-17,996	-24,665	-26,696	-26,576	-26,453	-26,363
1986	-26,308	-26,294	-31,854	-29,944	-10,522	0	0	0	0	-2,183	-2,174	-2,167
1987	-2,163	-2,161	-2,162	-2,162	-2,162	-2,162	-2,159	-15,753	-27,225	-27,100	-26,977	-26,886
1988	-26,830	-26,815	418	418	9,845	-574	-11,193	-13,511	-47,409	-52,929	-59,447	-59,237
1989	-59,107	-59,071	-59,074	-59,092	-59,097	-59,075	-81,874	-112,878	-114,603	-114,087	-113,563	-113,175
1990	-112,938	-112,873	-112,879	-112,911	-112,920	-112,878	-112,768	-135,075	-143,045	-148,189	-138,326	-134,885
1991	-134,593	-134,514	-134,520	-134,560	-134,571	-134,519	-134,382	-185,461	-192,763	-193,796	-192,878	-192,199
1992	-191,781	-191,669	-191,678	-191,736	-191,750	-191,678	-197,940	-239,373	-238,543	-237,429	-236,289	-235,449
1993	-234,940	-234,794	-240,671	-240,743	-240,761	-265,572	-279,393	-282,588	-106,761	-108,488	-88,023	-22,453
1994	-22,409	-22,397	-22,398	-22,404	-22,406	-22,397	-22,376	-52,915	-54,848	-54,599	-54,343	-54,160
1995	-54,048	-54,019	-40,361	-28,064	-11,227	0	-13,177	0	0	0	-2,184	3
1996	4	3	4	4	0	0	0	0	0	-2,183	-2,174	-2,167
1997	-2,163	0	0	2	0	0	-13,622	-15,774	-17,837	-19,944	-19,858	-19,794
1998	-19,754	-19,744	-19,745	3	0	0	1,472	0	0	0	0	0
1999	0	0	0	0	0	0	0	-20,597	-9,823	-11,964	-11,912	-11,874
2000	-11,850	-11,844	-11,844	-11,847	0	0	0	-12,191	0	0	0	0
2001	0	0	0	0	0	0	0	-45,377	-47,131	-46,922	-46,706	-46,545
2002	-46,447	-46,422	-46,424	-46,437	-46,441	-46,424	-46,379	-84,005	-85,838	-85,456	-85,063	-84,771
Avg (21-02)	-42,900	-42,114	-38,916	-36,630	-32,804	-30,954	-33,481	-46,187	-44,885	-45,716	-45,334	-44,172

the 1930s and 1960s, and then sporadically in other years. These changes are due to slight changes in the upstream operation of SFPUC facilities, which have previously been described as modeling discretion; this has led to the conclusion that little or no change in actual operations would occur during these periods. The one notable change in Don Pedro Reservoir storage occurs during the 1990s, while the variant's 10% shortage limitation requires additional diversion from the Tuolumne River. The storage difference manifesting in Don Pedro Reservoir is the result of the MID/TID transfer facilitating the addition diversion of water to the SJPL.

The greatest draw from reservoir storage occurs during the drought of the 1976-1977, which is the same for the variant, WSIP, and base settings. The year of greatest difference in reservoir draw between the base setting and variant occurs during the 1987-1992 drought. Figure 4.5-2 illustrates the difference in reservoir storage, averaged by year type, in comparing the variant to the WSIP setting; almost no difference between the two settings is illustrated, except during dry years (associated with the 1987-1992 drought period). Also shown is the average difference in storage for the two settings during the 82-year simulation. Figure 4.5-3 illustrates the same information in comparing the variant and base setting. These results are almost identical to the comparison of the WSIP and base settings.

Figure 4.5-2

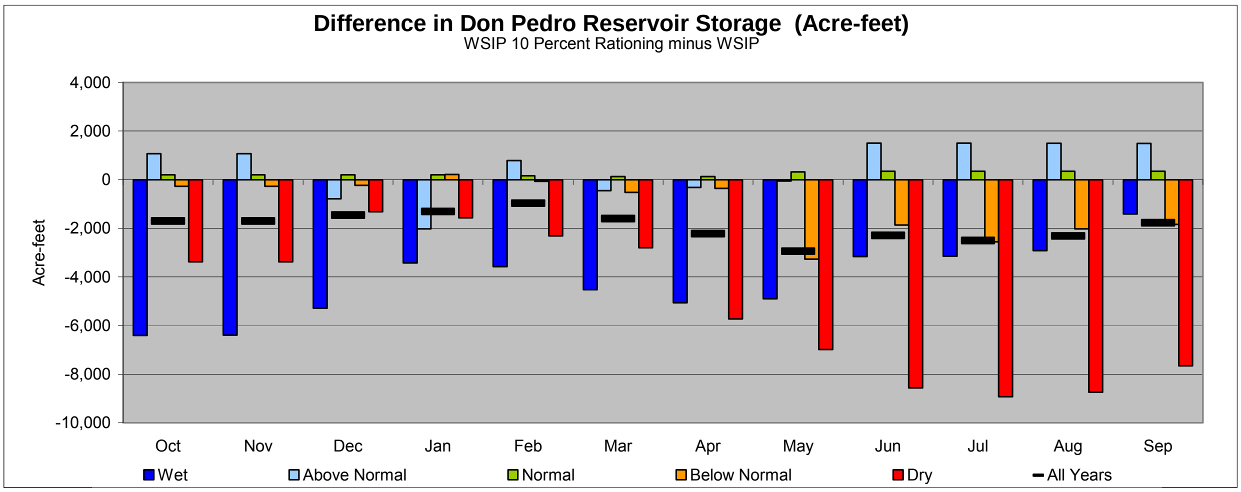


Figure 4.5-3

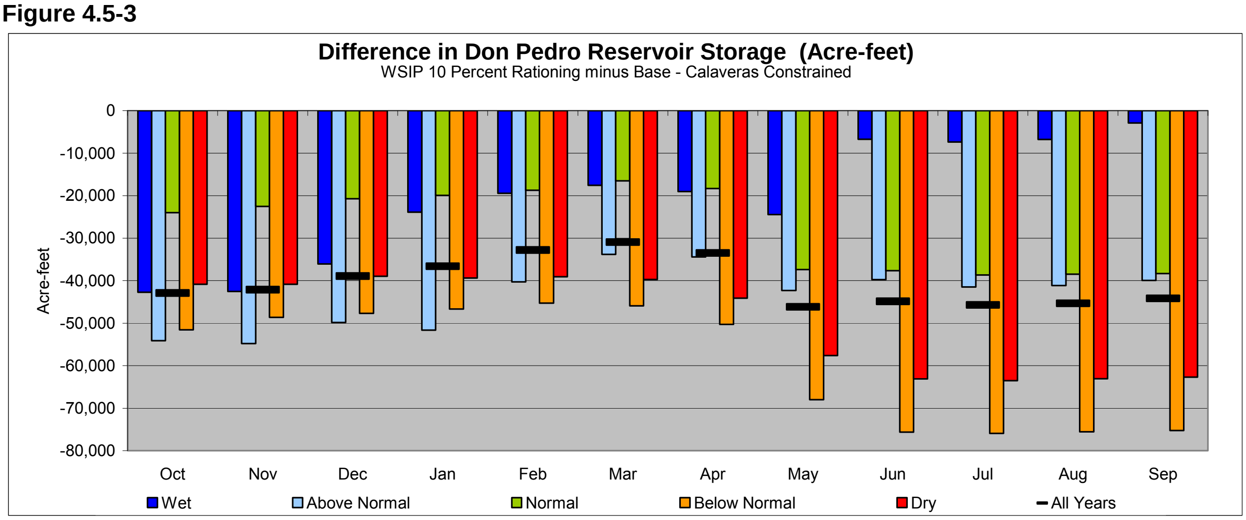


Figure 4.5-4 illustrates the average monthly storage in Don Pedro Reservoir for the 82-year simulation, and the range in storage for each month for the variant and base settings. The difference in storage in Don Pedro Reservoir attributed to the upstream effects of the variant would manifest into differences in releases from La Grange Dam to the stream. A difference in the amount of available reservoir space in

the winter and spring due to the variant would lead to a difference in the ability to regulate inflow, thus potentially changing the amount of water released to the stream, which is above minimum release requirements. During periods when inflow differs and Don Pedro Reservoir is at maximum storage capacity within the flood control storage limitation, a change in inflow would directly manifest as a change in release from La Grange Dam (a change in either more or less flow). Figure 4.5-1 illustrates the stream release from La Grange Dam for the WSIP, variant, and base settings.

Figure 4.5-4

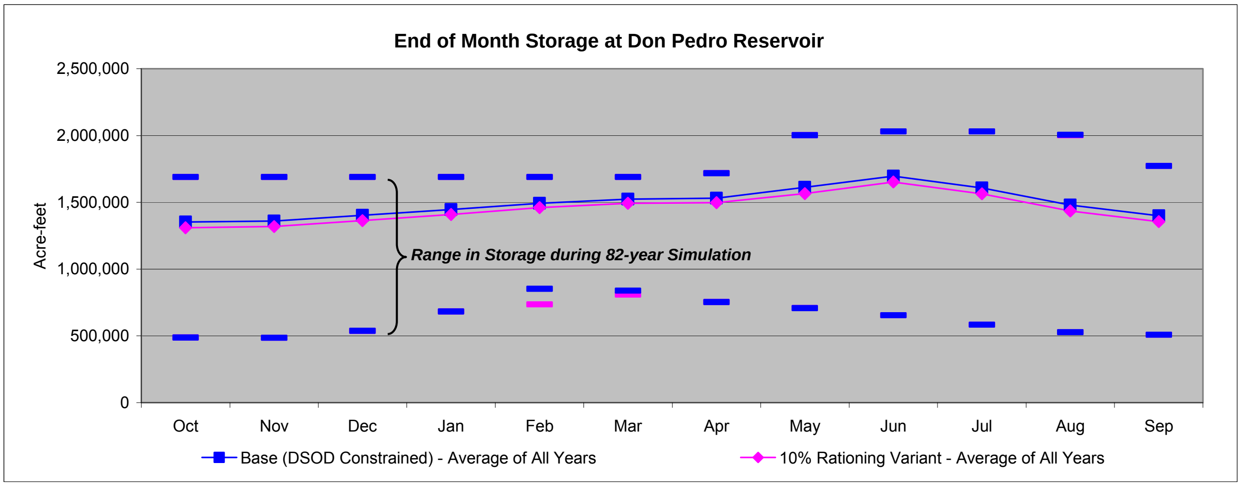


Table 4.5-4 illustrates the difference in stream releases between the variant and WSIP settings. Consistent with the near absence of changes in Don Pedro Reservoir storage, stream releases between the variant and WSIP settings are almost identical, except for a period following the droughts of the 1930s and 1987-1992. In both instances, additional diversions to the SJPL lead to additional depletion of Don Pedro Reservoir storage. The additional depletion of reservoir storage manifests as a reduction in subsequent releases below La Grange Dam to replenish the reservoir storage. The differences in releases to the Tuolumne River from La Grange Dam would occur only when there are releases above minimum FERC flow requirements. Table 4.5-4 illustrates that the difference in monthly flow below La Grange Dam ranged up to a decrease of approximately 23,000 acre-feet in one month. Assuming that a change in release volume equates to a delay or earlier initiation of releasing 6,000 acre-feet per day, the difference in stream release from La Grange Dam between the variant and WSIP would be a delay in releases up to 4 days in that month. Normally, the effect of the delay in release would not affect the year's peak stream release rate during a year. However, infrequently, the variant's effect on stream releases could manifest as an elimination of all flows above minimum FERC flow requirements within a month or year. This would occur after the experience of an extended drought period.

Table 4.5-5 illustrates differences in releases between the variant and base settings. Compared to the base setting, the variant's effect on stream flow is very similar to the effect caused by the WSIP, but at times slightly greater. Using the same assumption that a change in release volume equates to a delay or earlier initiation of releasing 6,000 acre-feet per day, the difference in stream release from La Grange Dam between the variant and base would typically be a delay in releases up to a few days. Normally, the effect of the delay in release would not affect the year's peak stream release rate during a year. However, infrequently, following a prolonged multi-year drought period, the variant's effect on stream releases could manifest as an elimination of all flows above minimum FERC flow requirements within a year.

Table 4.5-6 illustrates releases to the Tuolumne River below La Grange Dam and their differences, in terms of average monthly flow (cfs) averaged within year types, in comparing the variant and WSIP settings. The same form of information is provided for the variant and base settings in Table 4.5-7.

Table 4.5-4

Difference in Total La Grange Release to River (Acre-feet)

WSIP 10 Percent Rationing minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	0	0	0	0	0	0	0	0
1922	0	0	0	0	0	0	0	0	0	0	0	0	0
1923	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	0	0	0	0	0
1928	0	0	0	59	1	0	0	0	0	0	0	0	60
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	8,387	5,639	206	0	0	0	0	0	14,232
1937	0	0	0	0	800	-578	148	0	0	0	0	0	370
1938	0	0	549	0	0	0	0	0	0	0	0	0	549
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	-11,600	-6,577	863	0	0	0	0	0	-17,314
1941	0	0	0	4,149	-278	-173	-270	0	-865	0	0	0	2,563
1942	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	0	0	0	0	0	0	0	0	0
1946	0	0	0	0	0	0	0	0	0	0	0	0	0
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	-2,231	0	0	281	307	0	1,641	0	0	0	-2
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	-3,045	0	1	412	0	0	0	0	3,067	435
1966	0	-5	0	0	0	0	0	0	0	0	0	0	-5
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	-630	0	0	0	-630
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	1,237	0	-1,903	0	0	0	0	0	0	-666
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	906	0	0	0	0	0	0	0	0	906
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	-3,527	-27,081	-30,608
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	2,399	-3,646	0	-22,629	0	0	0	0	-23,876
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	0	0	-21	40	-4	-85	20	-276	2	0	-43	-293	-658

Table 4.5-5

Difference in Total La Grange Release to River (Acre-feet)

WSIP 10 Percent Rationing minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	-118	-15,701	-3,600	0	0	0	0	0	-19,419
1922	0	0	0	0	-8,537	-5,691	-7,365	-5,684	-14,697	0	-655	-1,521	-44,150
1923	0	0	3	0	0	0	-2,117	0	0	0	0	0	-2,114
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	-43,828	0	-644	-9,569	-54,041
1928	-6,886	-31,299	-34,469	-38	1	-5,339	-10,773	0	0	0	0	0	-88,803
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	-143,166	-113,436	-4,729	0	0	0	0	0	-261,331
1937	0	0	0	0	-14,069	-13,584	-3,539	0	0	0	0	0	-31,192
1938	0	0	-18,395	0	0	-45	-9,343	-19,551	-4,880	-2,189	0	0	-54,403
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	-37,172	-25,797	-4,421	0	0	0	0	0	-67,390
1941	0	0	0	4,487	-593	-368	-574	0	-7,443	0	-655	-1,520	-6,666
1942	0	0	2	-4,495	0	-3,805	-5,524	-2,855	-2,762	-2,188	0	0	-21,627
1943	0	0	0	0	0	-11,461	-4,879	0	-9,907	0	0	-2,173	-28,420
1944	0	0	0	0	2	1	0	0	0	0	0	0	3
1945	0	0	0	0	-22,363	-30,225	-45	0	0	0	0	0	-52,633
1946	0	8,571	0	0	0	-13,392	-3,867	0	0	0	0	0	-8,688
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	-125,752	2	0	0	0	0	0	0	0	0	-125,750
1952	0	0	0	0	-11,693	-7,794	0	-20,575	-4,879	-2,188	0	0	-47,129
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	-83,465	2	0	-4,053	-2,387	0	-11,341	-2,188	0	0	-103,432
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	-22,350	-8,941	-5,955	-16,538	-2,854	-2,188	0	0	-58,826
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	-11,189	-49,491	-15,670	-18,132	-16,489	0	0	0	0	0	0	0	-110,971
1965	0	0	0	-105,627	-6,178	-13,479	-821	0	0	0	0	12,496	-113,609
1966	0	-20	-4,311	0	-2,121	-6,099	0	0	0	0	0	0	-12,551
1967	0	0	0	0	0	-21,560	-9,852	-9,693	0	-2,188	0	-2,184	-45,477
1968	0	0	0	0	2	1	0	0	0	0	0	0	3
1969	0	0	0	-33,361	-7,207	-6,138	-7,641	-5,043	-4,879	-2,188	0	0	-66,457
1970	0	0	0	21,837	-7,145	-16,079	0	0	0	0	0	0	-1,387
1971	0	0	0	0	-9,321	-6,213	0	0	0	0	0	0	-15,534
1972	0	0	0	0	-16,599	0	0	0	0	0	0	0	-16,599
1973	0	0	0	0	0	-31,528	-3,772	0	-28,263	0	0	0	-63,563
1974	0	0	0	-11,155	1	-8,562	-5,524	-5,694	-4,229	0	0	-2,174	-37,337
1975	0	0	0	0	2	1	-8,286	0	248	0	-655	-1,520	-10,210
1976	2	0	0	0	0	0	0	0	0	0	0	0	2
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	-93,487	0	0	0	-93,487
1979	0	0	0	-8,316	0	-19,103	-2,118	-2,189	0	0	0	0	-31,726
1980	0	0	0	5,071	-1	-10,465	-4,880	-5,042	-4,880	-2,188	0	0	-22,385
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	-30,041	-10,159	-2,663	0	-2,854	-2,762	-2,188	0	-4,297	-54,964
1983	-2,949	-1,841	2,664	0	0	0	0	-5,799	-2,762	-2,188	0	-2,183	-15,058
1984	-7,155	0	0	0	0	3,935	0	0	0	0	0	0	-3,220
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	-15,780	-30,648	-11,300	-5,042	-4,879	0	0	0	-67,649
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	-187,962	0	-20,034	-65,394	-273,390
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	-16,839	-11,525	0	-35,626	-3,683	-2,188	0	-2,183	-72,044
1996	0	0	0	0	-3,528	0	-6,721	-2,188	-2,118	0	0	0	-14,555
1997	0	-2,162	0	-12,747	2	0	0	0	0	0	0	0	-14,907
1998	0	0	0	-19,751	3	-6,674	-8,839	-2,430	-3,774	-2,188	0	0	-43,653
1999	0	0	0	0	0	-9,514	-5,004	0	-16,264	0	0	0	-30,782
2000	0	0	0	0	-11,848	0	0	0	-14,290	0	0	0	-26,138
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	-344	-930	-3,407	-2,589	-4,674	-5,560	-1,755	-1,790	-5,812	-320	-276	-1,003	-28,459

Table 4.5-6

Total La Grange Release to River (CFS)
(Average within Year Type - Grouped by SJR Index Year Type) — WSIP 10 Percent Rationing

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	429	371	790	2,021	3,436	3,983	3,352	3,063	3,372	1,283	501	1,248
Above Normal	291	516	1,109	1,270	2,167	1,709	1,538	1,346	306	240	240	240
Below Normal	284	270	370	318	635	630	943	943	75	75	75	75
Dry	337	260	272	262	437	421	497	497	73	73	73	73
Critical	236	195	204	189	189	189	344	344	50	50	50	50
All Years	327	334	598	980	1,654	1,716	1,584	1,460	1,083	457	229	447

Total La Grange Release to River (CFS)
(Average within Year Type - Grouped by SJR Index Year Type) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	429	371	790	2,023	3,430	3,990	3,350	3,081	3,369	1,282	503	1,263
Above Normal	292	515	1,111	1,272	2,171	1,708	1,539	1,346	306	240	240	240
Below Normal	284	270	370	318	636	630	943	943	75	75	75	75
Dry	337	260	272	262	435	421	497	497	73	73	73	73
Critical	236	195	204	189	189	189	344	344	50	50	50	50
All Years	327	334	599	981	1,653	1,718	1,584	1,465	1,082	457	229	452

Difference in Total La Grange Release to River (CFS)
(Average within Year Type - Grouped by SJR Index Year Type) — WSIP 10 Percent Rationing minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	0	0	0	-2	6	-7	1	-17	3	1	-2	-15
Above Normal	-1	0	-1	-1	-4	2	-1	0	0	0	0	0
Below Normal	0	0	0	0	-1	0	0	0	0	0	0	0
Dry	0	0	0	0	1	0	0	0	0	0	0	0
Critical	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	0	-1	1	-2	0	-5	1	0	-1	-4

Table 4.5-7

Total La Grange Release to River (CFS)
(Average within Year Type - Grouped by SJR Index Year Type) — WSIP 10 Percent Rationing

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	26,382	22,062	48,557	124,246	190,841	244,906	199,437	188,363	200,630	78,864	30,812	74,247
Above Normal	17,886	30,698	68,220	78,114	120,366	105,110	91,530	82,787	18,214	14,739	14,739	14,263
Below Normal	17,484	16,058	22,744	19,556	35,285	38,726	56,136	58,008	4,463	4,612	4,612	4,463
Dry	20,742	15,449	16,739	16,127	24,251	25,876	29,552	30,537	4,349	4,494	4,494	4,349
Critical	14,534	11,590	12,560	11,644	10,518	11,644	20,489	21,172	2,975	3,074	3,074	2,975
All Years	20,112	19,882	36,788	60,250	91,870	105,512	94,246	89,755	64,420	28,125	14,061	26,611

Total La Grange Release to River (CFS)
(Average within Year Type - Grouped by SJR Index Year Type) — Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	26,505	22,228	52,690	132,897	195,713	251,883	203,746	194,388	216,210	79,958	31,729	77,274
Above Normal	18,307	30,194	75,617	77,318	133,414	121,042	93,276	82,916	24,252	14,739	14,777	14,826
Below Normal	18,058	18,668	25,976	19,559	36,239	40,197	57,034	58,008	4,463	4,612	4,612	4,463
Dry	21,603	19,256	17,945	17,522	26,796	25,876	29,552	30,537	4,349	4,494	4,494	4,349
Critical	14,533	11,590	12,560	11,644	10,518	11,644	20,489	21,172	2,975	3,074	3,074	2,975
All Years	20,456	20,812	40,195	62,838	96,544	111,073	96,000	91,545	70,232	28,445	14,337	27,614

Difference in Total La Grange Release to River (CFS)
(Average within Year Type - Grouped by SJR Index Year Type) — WSIP 10 Percent Rationing minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	-123	-167	-4,133	-8,651	-4,872	-6,977	-4,310	-6,026	-15,580	-1,094	-917	-3,027
Above Normal	-421	504	-7,397	795	-13,048	-15,932	-1,745	-129	-6,038	0	-38	-563
Below Normal	-574	-2,610	-3,232	-3	-953	-1,471	-898	0	0	0	0	0
Dry	-861	-3,807	-1,205	-1,395	-2,545	0	0	0	0	0	0	0
Critical	0	0	0	0	0	0	0	0	0	0	0	0
All Years	-344	-930	-3,407	-2,589	-4,674	-5,560	-1,755	-1,790	-5,812	-320	-276	-1,003

4.6 Calaveras and San Antonio Reservoirs, Alameda Creek and Downstream

There are only slight differences in Calaveras Reservoir operations between the variant and WSIP settings. Figure 4.6-1 illustrates a chronological trace of the simulation of Calaveras Reservoir storage and stream releases from Calaveras Dam. Shown in Figure 4.6-1 are the results for the WSIP, variant, and base settings. The differences in Calaveras Reservoir storage between the variant and WSIP settings during the 1930s, 1960s, and 1976-1977 are due to the modeled difference in SJPL diversions during those periods. These differences are mostly due to model logic that selects the rate at which diversions occur to the pipelines, and to reservoir balancing logic. During each of these periods, results indicate that the differences are negated prior to reservoir spill, which indicates that the differences are due to discretionary logic and may not occur in actual operations. The operation of Calaveras Reservoir between the variant and WSIP settings would be the essentially the same.

The difference in storage between the variant and WSIP settings and the base setting is due to the restoration of the operational capacity of Calaveras Reservoir. Figure 4.6-2 illustrates the average monthly storage in Calaveras Reservoir for the 82-year simulation, and the range in storage for each month for the variant and base settings.

There is essentially no change in releases to Calaveras Creek below Calaveras Dam between the variant and WSIP settings. A change was indicated in only one month of the 82-year simulation, and that was attributed to discretionary modeling assumptions. The difference is almost unnoticeable during February 1940, as shown in Figure 4.6-1. Both settings have fishery releases that are not included in the base setting. Supplementing the Figure 4.6-1 representation of Calaveras Dam stream releases is Table 4.6-1, illustrating releases for the variant and base settings, and the difference in releases between the two. The notable difference in releases between the variant and base settings is the addition of the flows representing the 1997 MOU and the reduction of stream releases during wetter-year/wetter-season flows due to the restoration of Calaveras Reservoir operational capacity.

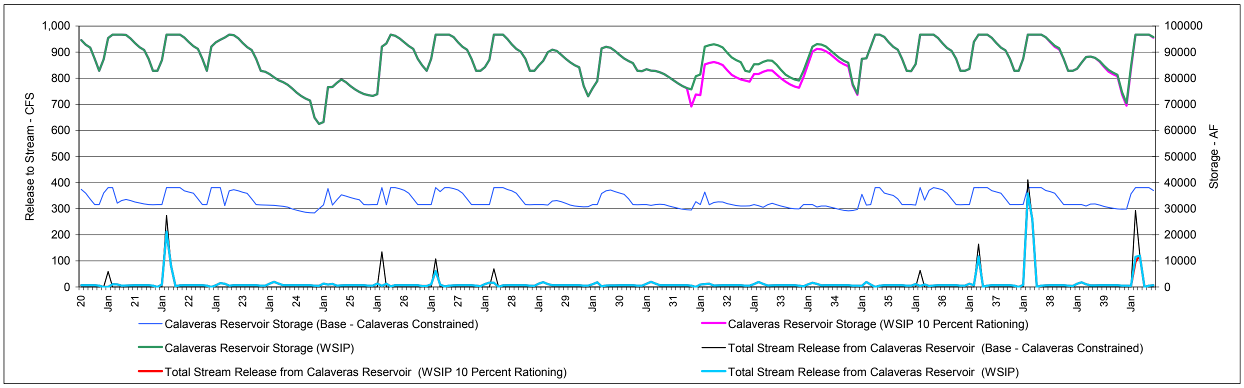
There is essentially no change (one month of minor change during the 82-year simulation) in Alameda Creek diversions to Calaveras Reservoir between the variant and the WSIP settings. With almost no change in Calaveras Reservoir storage between the two settings, there would be no change in the diversion operation at the Alameda Creek Diversion Dam. Water would only be diverted to Calaveras Reservoir when the diversion would not contribute to releases in excess of minimum required flows below Calaveras Dam. Coincidentally, with no change in the diversion at Alameda Creek Diversion Dam, flow spilling past the diversion dam would experience no differences between the variant and WSIP settings. Table 4.6-2 illustrates the flow below the Alameda Creek Diversion Dam for the variant and base settings. The notable difference between the variant and the base settings is the reduction of wetter-year water flowing past the diversion dam. This occurs because, in the variant setting, the restoration of Calaveras Reservoir storage allows a greater frequency of diversion from Alameda Creek to Calaveras Reservoir.

Comparing the variant and WSIP setting, with no differences in releases from Calaveras Dam to the stream, and no differences to spills at Alameda Creek Diversion Dam, flow below the Alameda Creek and Calaveras Creek confluence will be the same for each setting. Table 4.6-3 illustrates the flow below the confluence for the variant and base settings, and the difference in flow between the two. The notable differences between the variant and the base settings (comparable to the difference between the WSIP and base settings) are the addition of stream flows for the 1997 MOU and the reduction of wetter-year/wet season flows due to the restoration of Calaveras Reservoir storage.

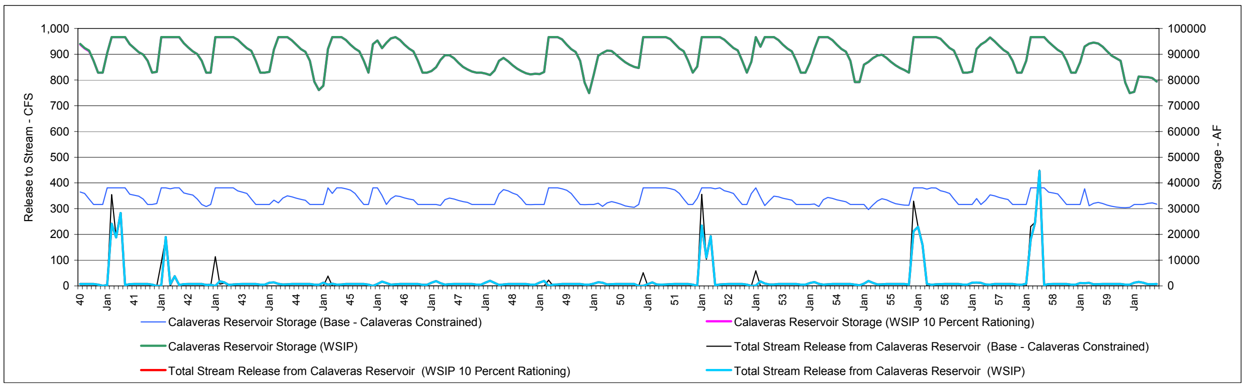
A flow recapture facility in Alameda Creek below Calaveras Reservoir is incorporated in the variant and WSIP settings. This facility is assumed to recapture flows explicitly released from Calaveras Dam for the 1997 MOU. The effect of the recapture is a reduction in the flow that occurs below the confluence of Alameda and Calaveras Creeks, but only to the extent that releases were explicitly made from Calaveras Reservoir for the 1997 MOU. Flows below this diversion have been estimated and noted as the flow above the Alameda and San Antonio Creek confluence. With no changes noted for stream releases from Calaveras Reservoir or flow past Alameda Creek Diversion Dam between the variant and WSIP settings, the flow at this location will be the same among the variant and WSIP settings. Table 4.6-4 illustrates the flow at this location for the variant and base settings. The flows identified at this location indicate flow below the confluence of Alameda and Calaveras Creeks (described above), with the addition of estimated stream accretions between the Alameda-Calaveras Creek confluence and the Alameda-San Antonio Creek confluence, minus the water assumed to be recaptured (diverted) by the SFPUC from the creek.

Figure 4.6-1
Calaveras Reservoir Storage and Stream Release

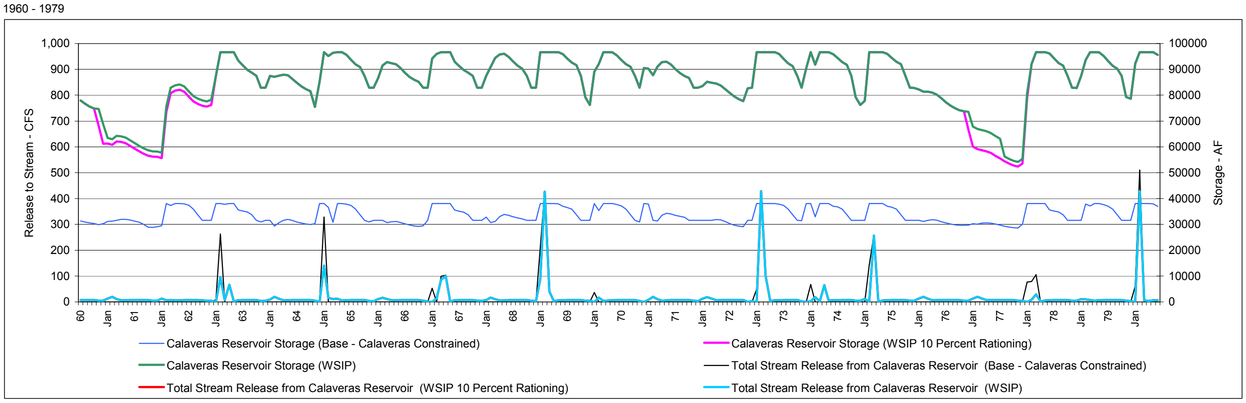
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

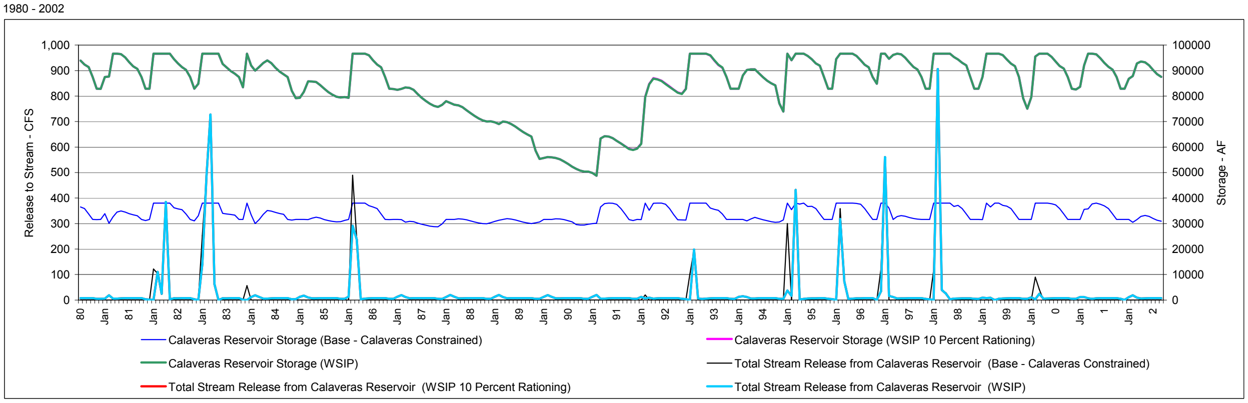


Figure 4.6-2

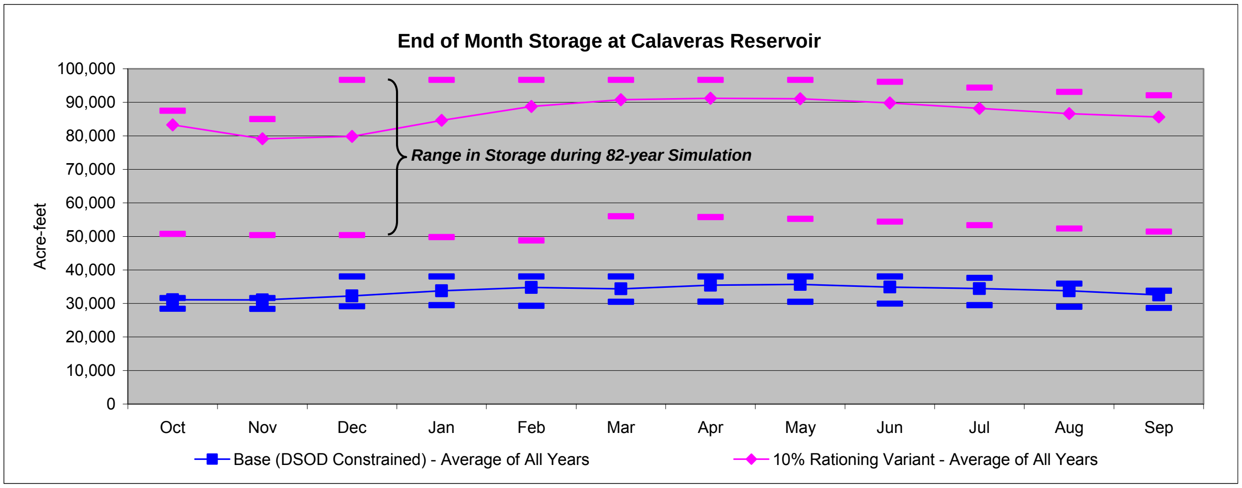


Table 4.6-1

Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP 10 Percent Rationing

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	1,065	5,083	15,133	10,007	5,085	255	387	417	425	415	38,949
Above Normal	425	258	172	806	3,598	2,849	650	327	396	423	428	417	10,748
Normal	429	275	195	548	725	556	264	370	408	428	430	417	5,046
Below Normal	429	276	246	672	876	596	345	389	411	429	430	417	5,515
Dry	429	292	281	778	1,044	747	374	407	416	430	430	417	6,045
All Years	428	269	387	1,557	4,226	2,921	1,323	350	403	426	428	417	13,136

Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	1,736	9,221	16,641	9,968	5,024	0	0	0	0	0	42,590
Above Normal	0	0	184	2,731	5,911	3,096	459	0	0	0	0	0	12,382
Normal	0	0	216	364	882	353	0	0	0	0	0	0	1,815
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	419	2,437	4,645	2,656	1,076	0	0	0	0	0	11,232

Difference in Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP 10 Percent Rationing minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	-671	-4,138	-1,507	39	61	255	387	417	425	415	-3,641
Above Normal	425	258	-12	-1,925	-2,313	-247	190	327	396	423	428	417	-1,634
Normal	429	275	-22	184	-157	204	264	370	408	428	430	417	3,231
Below Normal	429	276	246	672	876	596	345	389	411	429	430	417	5,515
Dry	429	292	281	778	1,044	747	374	407	416	430	430	417	6,045
All Years	428	269	-32	-879	-419	265	248	350	403	426	428	417	1,904

Table 4.6-2

Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP 10 Percent Rationing

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	28	1,379	6,172	7,982	5,751	2,962	116	0	0	0	0	24,389
Above Normal	7	23	695	2,532	4,017	3,092	969	0	0	0	0	0	11,336
Normal	0	6	377	264	893	459	117	6	0	0	0	0	2,122
Below Normal	0	0	18	45	106	191	2	0	0	0	0	0	361
Dry	0	0	17	0	163	0	6	0	0	0	0	0	186
All Years	1	12	494	1,790	2,618	1,892	803	24	0	0	0	0	7,634

Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	28	1,379	6,967	8,099	5,757	2,972	130	0	0	0	0	25,331
Above Normal	7	23	1,184	3,672	5,292	3,096	692	0	0	0	0	0	13,968
Normal	0	6	914	868	1,785	906	126	6	0	0	0	0	4,611
Below Normal	0	0	18	45	106	191	2	0	0	0	0	0	361
Dry	0	0	17	0	163	0	6	0	0	0	0	0	186
All Years	1	12	700	2,299	3,079	1,982	750	27	0	0	0	0	8,849

Difference in Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP 10 Percent Rationing minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	-794	-117	-6	-10	-15	0	0	0	0	-942
Above Normal	0	0	-489	-1,140	-1,275	-5	277	0	0	0	0	0	-2,632
Normal	0	0	-537	-604	-892	-447	-10	0	0	0	0	0	-2,490
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-206	-509	-461	-89	54	-3	0	0	0	0	-1,215

Table 4.6-3

Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP 10 Percent Rationing

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	430	326	2,789	12,265	24,303	16,744	8,649	548	417	430	430	417	67,746
Above Normal	437	327	1,111	3,936	8,392	6,502	1,929	430	417	430	430	417	24,757
Normal	430	304	798	1,081	2,004	1,343	539	435	417	430	430	417	8,628
Below Normal	430	298	324	858	1,217	1,007	419	430	417	430	430	417	6,677
Dry	430	298	324	813	1,274	816	423	430	417	430	430	417	6,502
All Years	431	310	1,061	3,757	7,374	5,245	2,362	454	417	430	430	417	22,688

Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	1	80	3,460	17,197	25,928	16,711	8,598	307	30	12	4	2	72,329
Above Normal	12	68	1,612	7,001	11,980	6,754	1,462	103	22	6	2	1	29,023
Normal	1	29	1,356	1,501	3,053	1,586	284	65	9	2	0	0	7,886
Below Normal	1	22	78	186	341	412	74	41	7	0	0	0	1,161
Dry	1	6	43	35	230	69	49	23	1	0	0	0	457
All Years	3	41	1,298	5,145	8,254	5,069	2,061	107	14	4	1	1	21,999

Difference in Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP 10 Percent Rationing minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	-671	-4,932	-1,624	33	51	241	387	417	425	415	-4,583
Above Normal	425	258	-501	-3,065	-3,588	-252	467	327	396	423	428	417	-4,266
Normal	429	275	-559	-420	-1,049	-243	255	370	408	428	430	417	741
Below Normal	429	276	246	672	876	596	345	389	411	429	430	417	5,515
Dry	429	292	281	778	1,044	747	374	407	416	430	430	417	6,045
All Years	428	269	-238	-1,389	-880	176	301	347	403	426	428	417	689

Table 4.6-4

Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP 10 Percent Rationing

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,180	13,611	25,828	17,847	9,299	498	76	33	15	9	70,558
Above Normal	19	150	1,308	4,454	9,078	6,913	2,180	217	54	20	9	6	24,409
Normal	7	64	922	913	1,837	1,269	469	134	28	9	4	3	5,658
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	1,127	3,860	7,487	5,332	2,409	197	38	14	7	4	20,572

Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,968	18,668	27,692	17,977	9,358	513	76	33	15	9	78,470
Above Normal	19	150	1,981	7,819	13,060	7,467	1,861	217	54	20	9	6	32,664
Normal	7	64	1,676	1,881	3,611	2,007	479	134	28	9	4	3	9,902
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	1,567	5,733	9,022	5,616	2,356	199	38	14	7	4	24,656

Difference in Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP 10 Percent Rationing minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-788	-5,057	-1,864	-131	-59	-15	0	0	0	0	-7,912
Above Normal	0	0	-673	-3,365	-3,982	-554	319	0	0	0	0	0	-8,255
Normal	0	0	-753	-968	-1,774	-738	-10	0	0	0	0	0	-4,244
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-440	-1,873	-1,535	-284	53	-3	0	0	0	0	-4,083

Compared to the WSIP setting, San Antonio Reservoir operations in the variant setting generally mirror the changes experienced for Calaveras Reservoir operations. Figure 4.6-3 illustrates a chronological trace of the simulation of San Antonio Reservoir storage and stream releases from the dam. Shown in Figure 4.6-3 are the results for the WSIP, variant, and base settings. The difference in San Antonio Reservoir storage between the variant and WSIP settings during the 1930s, 1960s, and 1976-1977 are due to the same modeling nuances described for Calaveras Reservoir differences. These differences are mostly due to model-selected flow rates for the SJPL and to reservoir balancing logic. During each of these periods, results indicate that the differences are negated prior to reservoir spill, indicating that the differences are due to discretionary logic and may not occur in actual operations. The operation of San Antonio Reservoir between the variant and WSIP settings would be essentially the same.

The magnitude of effect in the difference in San Antonio Reservoir storage depends on modeling assumptions for the balancing of total Bay Area reservoir storage among the five major SFPUC reservoirs. The model balances storage between reservoirs by way of an input file by the modeler concerning the relative draw (percentage) from each reservoir under various storage conditions. These are discretionary input in the model, and the logic and relative percentages are meant to mimic the current practice and discretion of the system operators based on recognition of the physical conveyance constraints within the system and the ability of each reservoir to provide yield and water delivery security.

The logic currently favors the retention of storage in the peninsula reservoirs for security reasons; thus, the provision of additional water between the settings is balanced between San Antonio and Calaveras Reservoir.

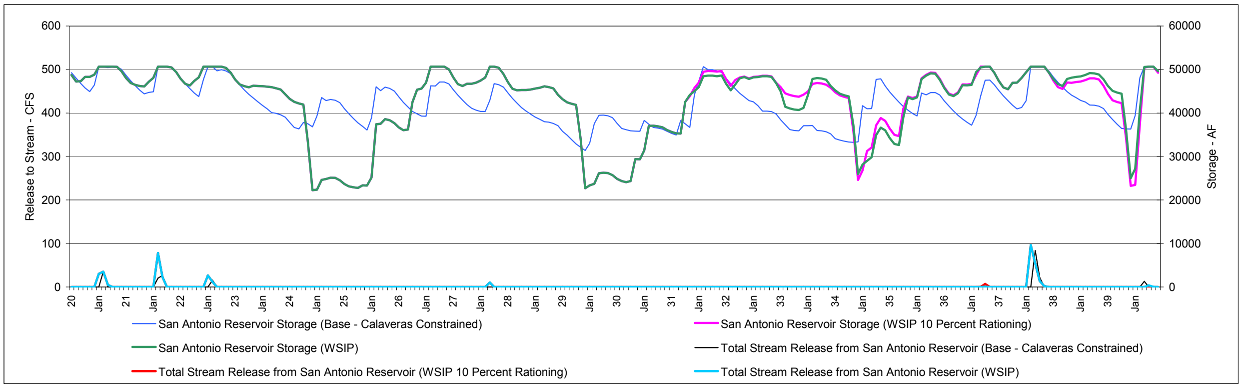
The difference in storage between the variant and WSIP settings and the base setting is due to the restoration of the operational capacity of Calaveras Reservoir. In the base setting, the limited operating storage capacity at Calaveras leads to a different operation at San Antonio Reservoir, one that provides relatively more stored water for system demands when the draw from Calaveras Reservoir is constrained due to limited storage. There is also a notable difference in storage operation between the variant and WSIP settings and the base setting every fifth year. Assumed systematic maintenance of Hetch Hetchy conveyance facilities occurs in the simulation, and constrains diversions to the Bay Area from Hetch Hetchy every fifth year. The reduction in diversion from Hetch Hetchy during these periods is accommodated in the system by the drawing of additional water from the Bay Area reservoirs. The proportionate share of this operation is evident in the tracing of San Antonio Reservoir storage for the variant and WSIP settings. Figure 4.6-4 illustrates the average monthly storage in Calaveras Reservoir for the 82-year simulation, and the range in storage for each month for the variant and base settings.

There would very little change in stream releases below San Antonio Reservoir between the variant and WSIP settings. Table 4.6-5 illustrates the modeled release to San Antonio Creek from San Antonio Reservoir for the two settings and the differences for the average release during a year type. With a slightly lower reservoir operation at times, an increase in the ability to regulate reservoir inflow and avoid stream releases would be expected. Given the sometimes rigid constraints within the modeling assumptions, the model overestimates the frequency and magnitude of stream releases from San Antonio Reservoir under any of the investigated settings. The flexibility that occurs in actual operations would likely avoid most of the releases represented by the model. The modeled stream releases from San Antonio Reservoir and difference between releases for the variant and base settings are shown in Table 4.6-6. The differences among the two settings range from increases to decreases in flow. This modeled circumstance reflects the different resulting storage operation between the two settings, as seen in Figure 4.6-3. In some circumstances, the base setting storage at San Antonio Reservoir during a period could be higher than projected for the variant setting during the same period. This could lead to an occasionally greater modeled release for the base setting, which would be reflected in the results. As described above, the model overestimates the frequency and magnitude of releases from San Antonio Reservoir; the actual releases from San Antonio Reservoir in any setting and the difference between settings are expected to be minor.

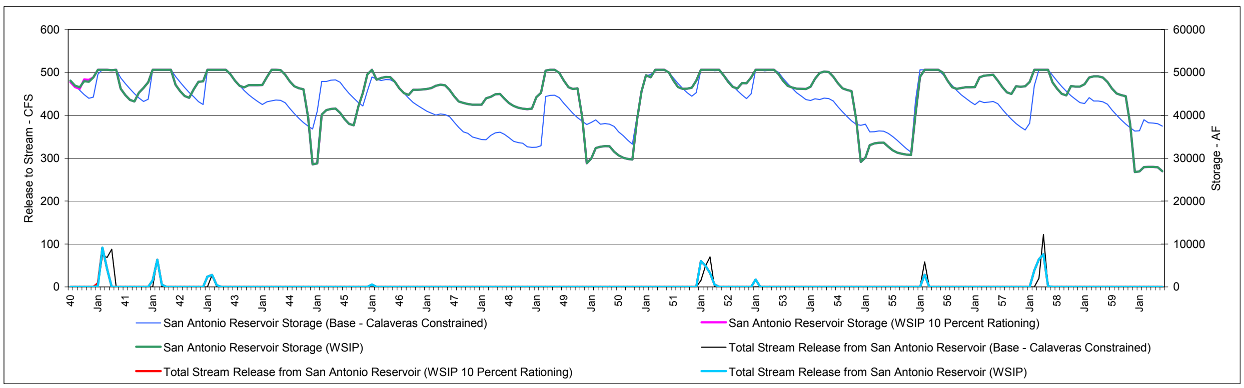
Flow below the confluence of Alameda and San Antonio Creeks is influenced by releases from San Antonio Creek and flow arriving at the location from Alameda Creek, which includes upstream impairment by SFPUC operations and facilities. Table 4.6-7 illustrates the flow below the confluence for the variant and base settings, and the differences in flow between the two. The differences are particularly due to the effects of the restoration of Calaveras Reservoir operating capacity in the variant setting.

Figure 4.6-3
San Antonio Reservoir Storage and Stream Release

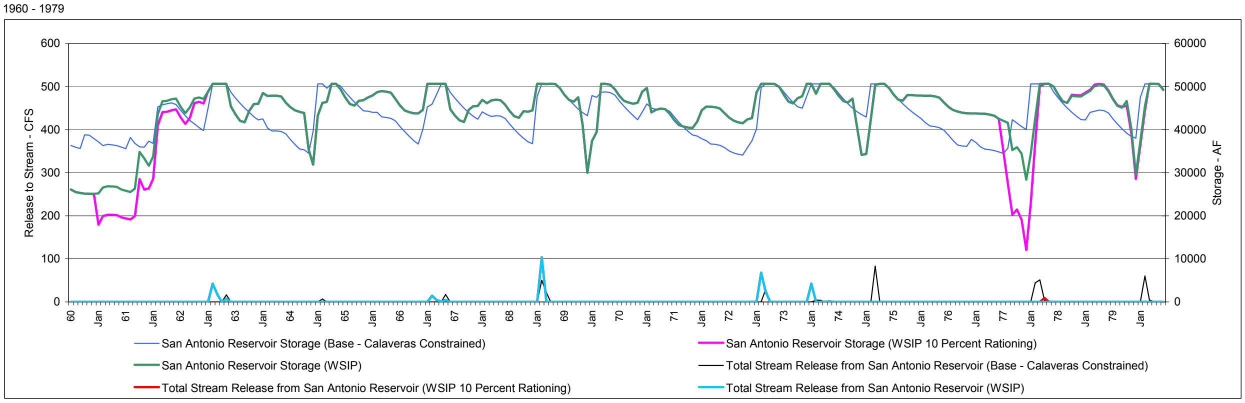
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

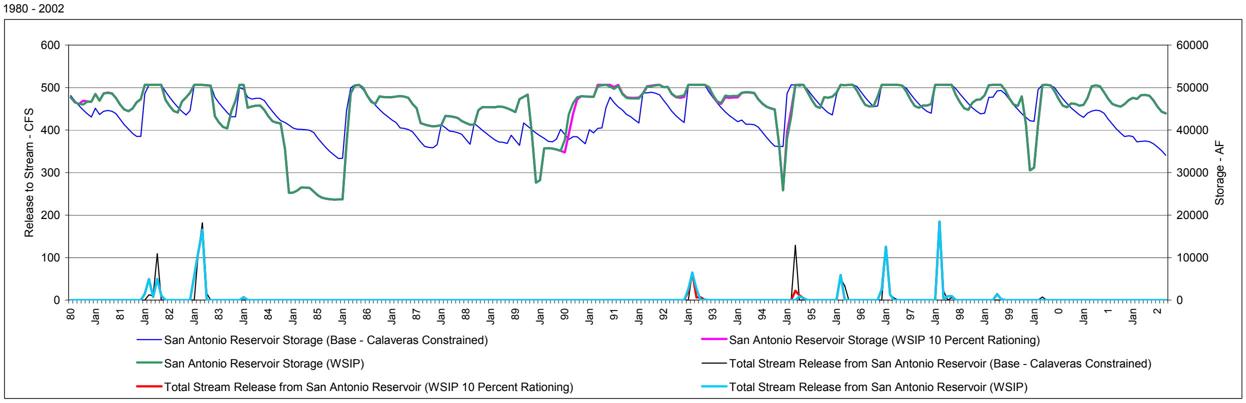


Figure 4.6-4

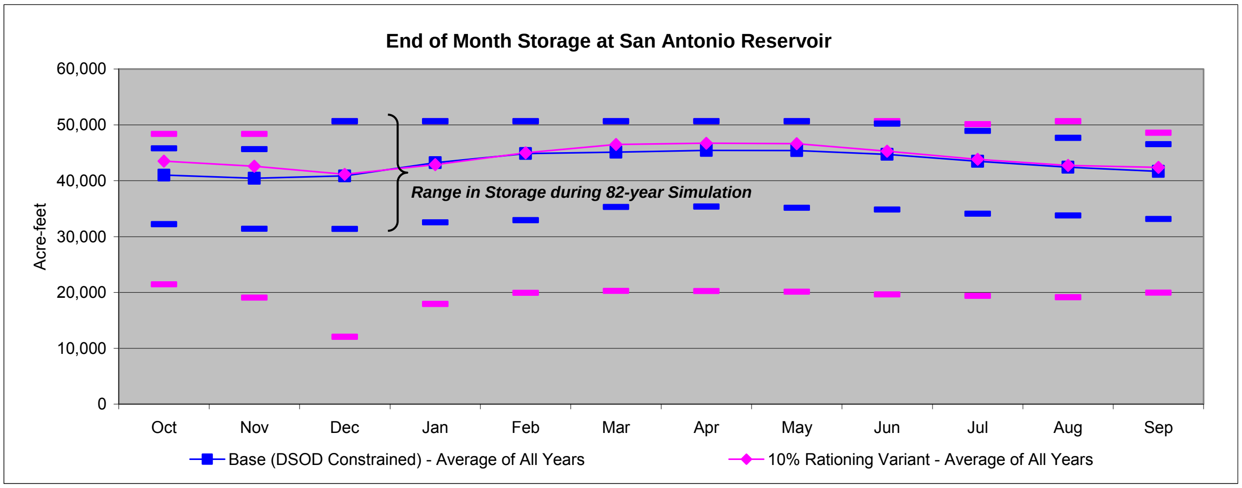


Table 4.6-5

Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
WSIP 10 Percent Rationing

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	95	1,078	3,168	1,626	614	121	0	0	0	0	6,702
Above Normal	0	0	0	517	1,045	204	128	43	0	0	0	0	1,937
Normal	0	0	0	113	0	40	0	0	0	0	0	0	152
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	19	340	835	367	146	32	0	0	0	0	1,739

Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	95	1,054	3,168	1,543	605	121	0	0	0	0	6,586
Above Normal	0	0	0	540	1,045	277	67	44	0	0	0	0	1,974
Normal	0	0	0	113	0	40	0	0	0	0	0	0	152
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	19	340	835	366	132	33	0	0	0	0	1,724

Difference in Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
WSIP 10 Percent Rationing minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	23	0	83	9	0	0	0	0	0	116
Above Normal	0	0	0	-23	0	-73	61	-1	0	0	0	0	-36
Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	0	0	0	1	14	0	0	0	0	0	15

Table 4.6-6

Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
WSIP 10 Percent Rationing

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	95	1,078	3,168	1,626	614	121	0	0	0	0	6,702
Above Normal	0	0	0	517	1,045	204	128	43	0	0	0	0	1,937
Normal	0	0	0	113	0	40	0	0	0	0	0	0	152
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	19	340	835	367	146	32	0	0	0	0	1,739

Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	538	2,350	2,480	1,324	88	0	0	0	0	6,780
Above Normal	0	0	0	0	881	883	12	58	0	0	0	0	1,835
Normal	0	0	0	0	1	0	0	0	0	0	0	0	1
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	0	105	641	667	261	29	0	0	0	0	1,703

Difference in Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
WSIP 10 Percent Rationing minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	95	539	819	-854	-710	33	0	0	0	0	-78
Above Normal	0	0	0	517	164	-680	116	-15	0	0	0	0	103
Normal	0	0	0	113	-1	40	0	0	0	0	0	0	152
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	19	234	194	-300	-114	3	0	0	0	0	36

Table 4.6-7

Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP 10 Percent Rationing

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,276	14,689	28,996	19,473	9,912	619	76	33	15	9	77,259
Above Normal	19	150	1,308	4,971	10,123	7,117	2,308	260	54	20	9	6	26,346
Normal	7	64	922	1,026	1,837	1,308	469	134	28	9	4	3	5,810
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	1,145	4,200	8,322	5,699	2,555	229	38	14	7	4	22,311

Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,968	19,206	30,042	20,458	10,681	601	76	33	15	9	85,250
Above Normal	19	150	1,981	7,819	13,941	8,350	1,873	276	54	20	9	6	34,498
Normal	7	64	1,676	1,881	3,612	2,007	479	134	28	9	4	3	9,902
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	1,567	5,838	9,664	6,284	2,617	229	38	14	7	4	26,359

Difference in Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP 10 Percent Rationing minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-692	-4,517	-1,045	-985	-769	18	0	0	0	0	-7,990
Above Normal	0	0	-673	-2,848	-3,818	-1,234	435	-15	0	0	0	0	-8,152
Normal	0	0	-753	-855	-1,775	-699	-10	0	0	0	0	0	-4,092
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-422	-1,639	-1,342	-584	-62	0	0	0	0	0	-4,048

4.7 Crystal Springs and San Andreas Reservoirs

There are essentially no differences in Crystal Springs Reservoir operations between the variant and WSIP settings. Figure 4.7-1 illustrates a chronological trace of the simulation of Crystal Springs Reservoir storage and stream releases from Crystal Springs Dam. Shown in Figure 4.7-1 are the results for the WSIP, variant, and base settings. The slight differences in Crystal Springs Reservoir storage between the variant and WSIP setting are caused by the coincidence of reservoir balancing logic in the model, conveyance constraints, and selected flow rates for the SJPL. In actual operations, results may not differ as system operators and prevailing hydraulic and hydrologic conditions may direct the operational effect of the different demand to an alternative apportionment of effect among the reservoirs.

Figure 4.7-2 illustrates the average monthly storage in Crystal Springs Reservoir for the 82-year simulation, and the range in storage for each month for the variant and base settings. Consistent with the comparison of the WSIP and base settings, the variant setting would result in reservoir storage operating at a higher average and higher upper-range than the base setting. This is due to the restoration of the operating capacity of Crystal Springs Reservoir.

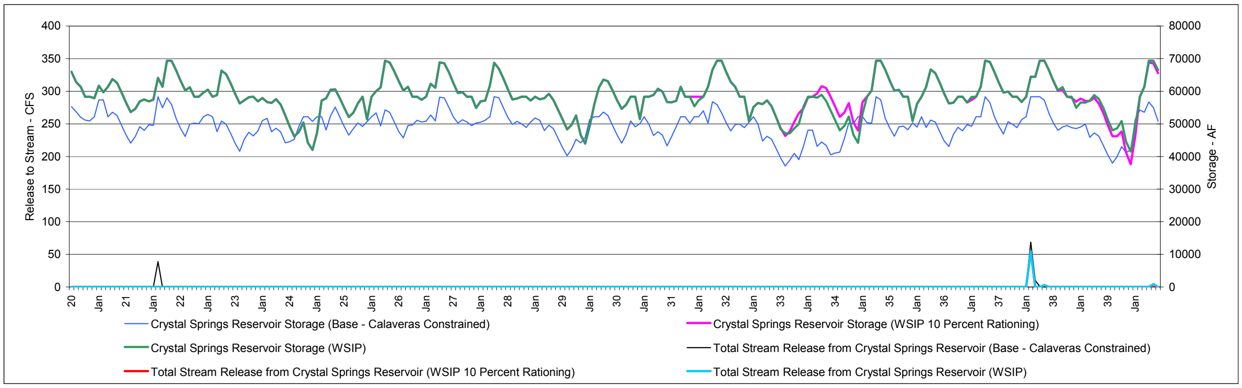
Comparing the variant to WSIP settings, differences in stream releases are infrequent (9 months during the 82-year simulation), and could be either an increase or decrease in the release. The potential difference is attributed to whether the different resulting storage in the reservoir was higher or lower between the two settings. Part of the difference in modeled Crystal Springs Reservoir storage is due to modeling assumptions for the proportionate management of storage among the Bay Area reservoirs, and the coincidence of constrained conveyance flow rates. In actual operations, it is anticipated that system operators would manage the reservoir system, whereby stream releases would be minimal under any setting, with the result of essentially no difference between the variant and WSIP settings.

Table 4.7-1 illustrates the stream releases for the variant and base settings, and the difference in modeled flows between the two settings. A greater operating range in Crystal Springs Reservoir operation would lead to an increased potential to regulate reservoir inflow, which would lead to less risk in needing to make stream releases. However, as described above, actual system operations would attempt to minimize releases under any setting; thus, the difference in releases between the variant and base setting would be minimal, if any.

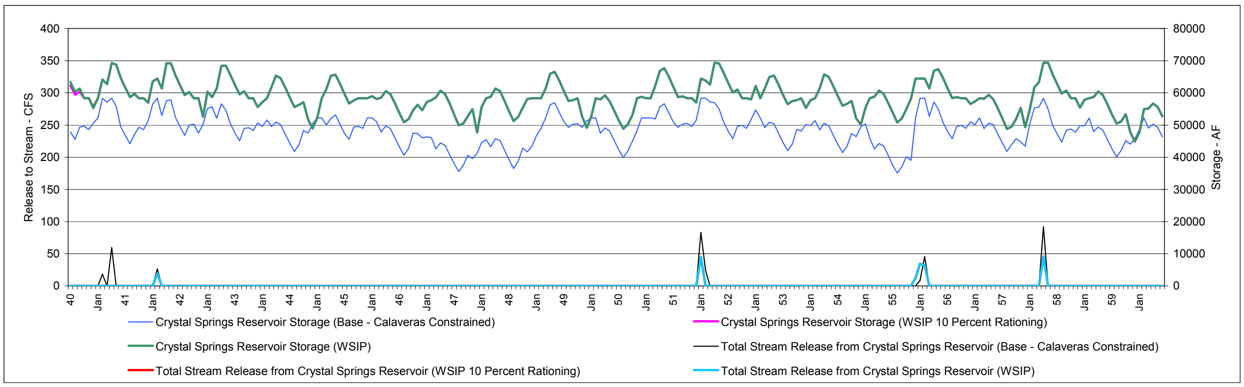
San Andreas Reservoir operations would generally be the same between the variant and WSIP settings. Reservoir storage would follow a systematic filling and lowering each year. Figure 4.7-3 illustrates a chronological trace of the simulation of San Andreas Reservoir storage and stream releases. Shown in Figure 4.7-3 are the results for the WSIP, variant, and base settings. There are no projected stream

Figure 4.7-1
Crystal Springs Reservoir Storage and Release

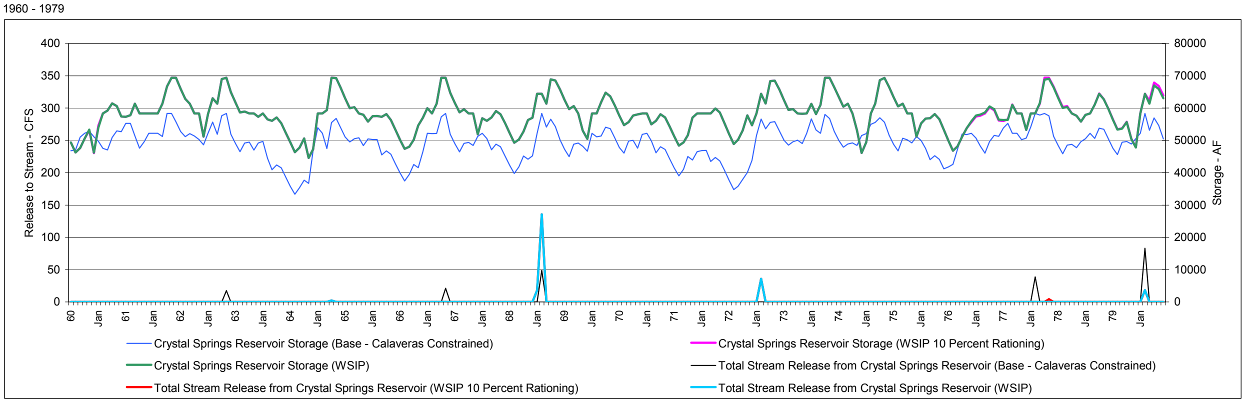
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

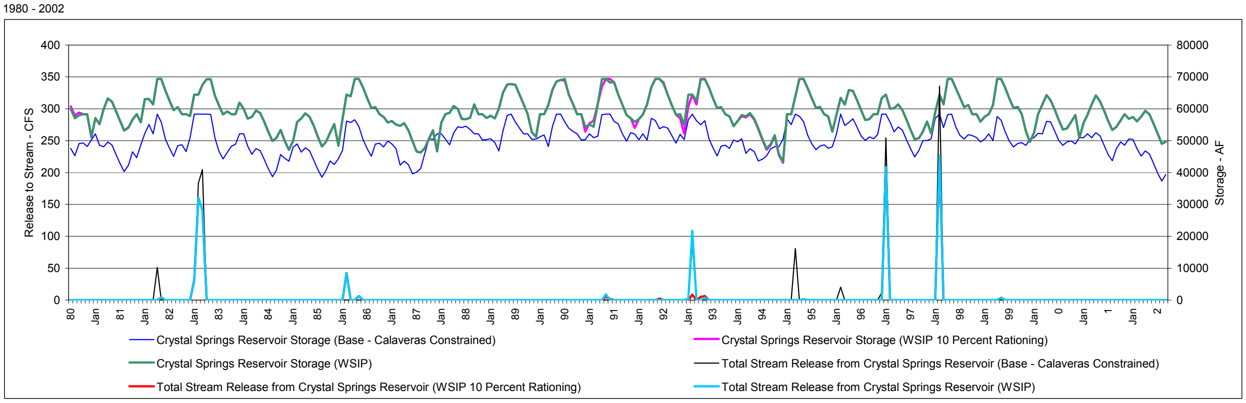


Figure 4.7-2

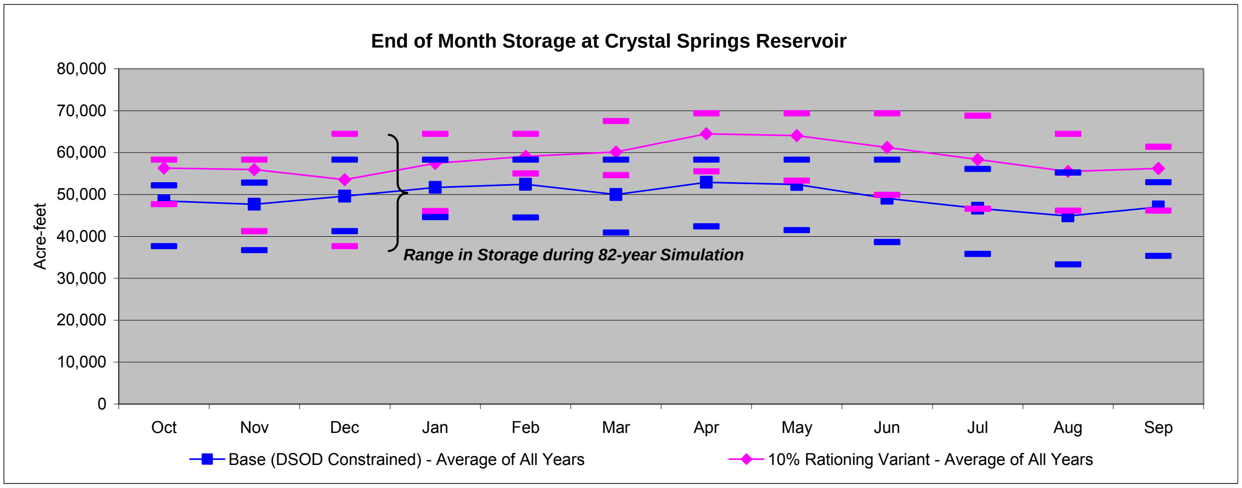


Table 4.7-1

Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP 10 Percent Rationing

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	47	1,296	2,512	542	170	54	0	0	0	0	4,623
Above Normal	0	0	0	0	28	0	26	50	0	0	0	0	103
Normal	0	0	0	0	0	0	0	0	8	0	0	0	8
Below Normal	0	0	0	0	0	0	0	19	5	0	0	0	24
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	9	253	496	106	39	25	3	0	0	0	930

Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base - Calaveras Constrained

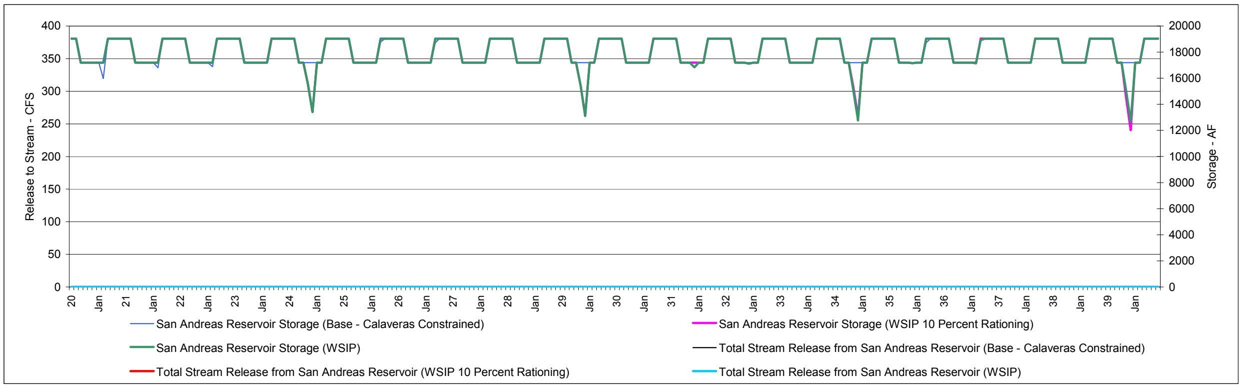
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	44	1,433	2,889	1,134	756	81	0	0	0	0	6,336
Above Normal	0	0	0	0	608	0	0	63	0	0	0	0	671
Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	9	280	690	221	147	29	0	0	0	0	1,375

Difference in Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP 10 Percent Rationing minus Base - Calaveras Constrained

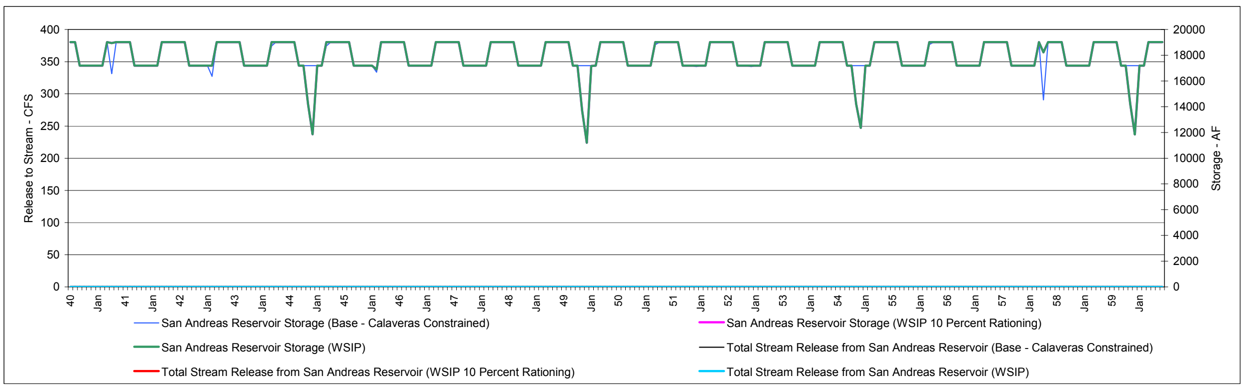
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	3	-137	-376	-592	-586	-26	0	0	0	0	-1,713
Above Normal	0	0	0	0	-581	0	26	-13	0	0	0	0	-568
Normal	0	0	0	0	0	0	0	0	8	0	0	0	8
Below Normal	0	0	0	0	0	0	0	19	5	0	0	0	24
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	1	-27	-194	-115	-109	-4	3	0	0	0	-446

Figure 4.7-3
San Andreas Reservoir Storage and Stream Release

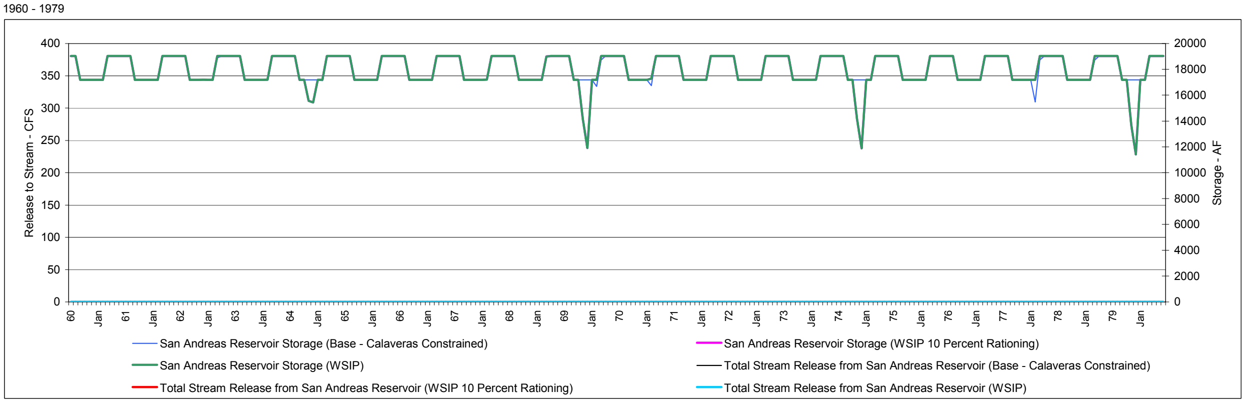
1920 - 1939



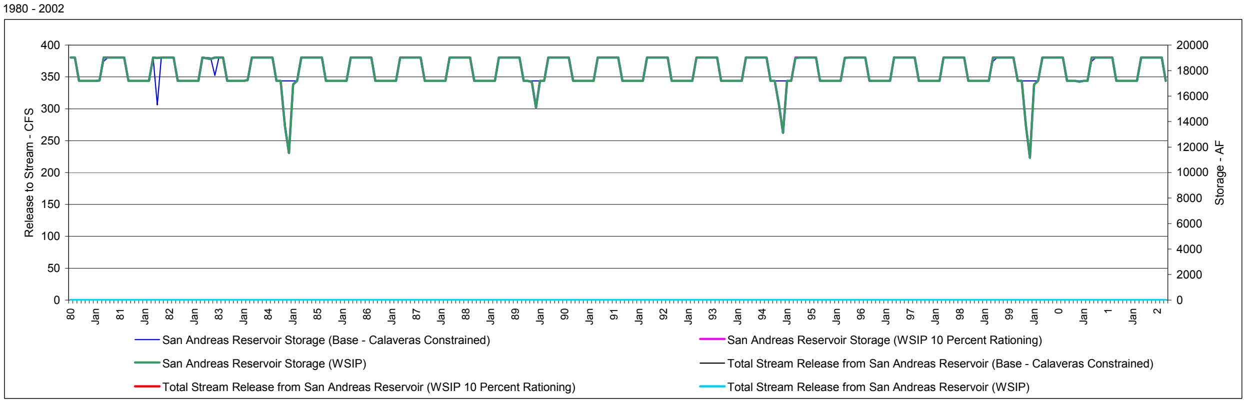
1940 - 1959



1960 - 1979

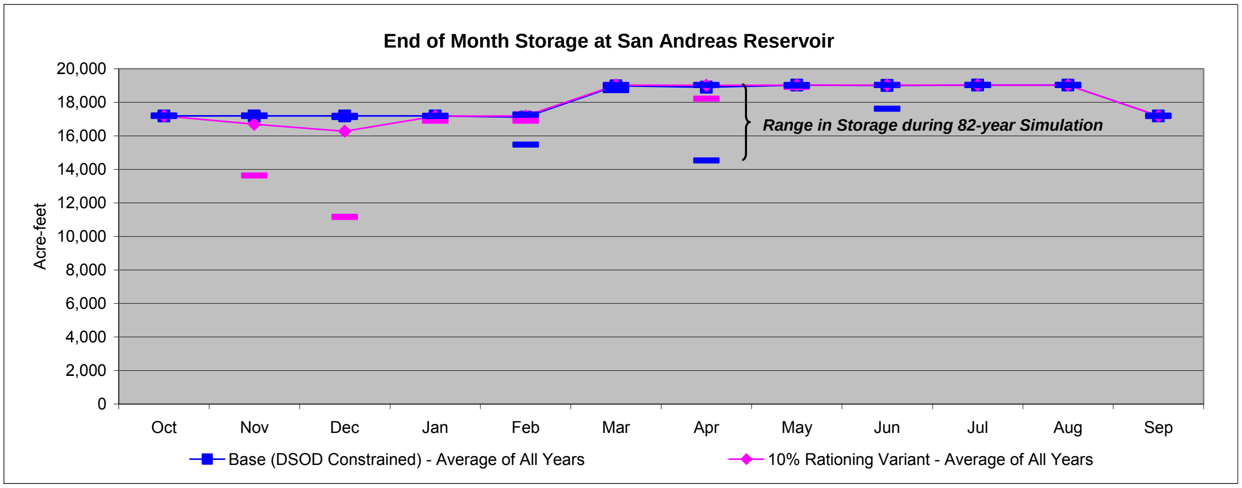


1980 - 2002



releases from San Andreas Reservoir in any setting. Notable in Figure 4.7-3 is the difference in storage operation every fifth year. Both the variant and WSIP setting storage operation differ from the base setting. This operation is the result of the assumption that Hetch Hetchy conveyance maintenance occurs systematically every fifth year, which constrains the amount of Hetch Hetchy water supplied to serve water demands in the Bay Area. As discussed previously, during these winter periods, the Bay Area reservoir system accommodates the reduction in imported supply by serving the Bay Area water deliveries with the local watersheds' runoff and storage. At San Andreas Reservoir, the serving of water demand affects the reservoir when additional required water production at Harry Tracy WTP associated with WSIP or the variant exceeds the ability to maintain San Andreas Reservoir storage with pumping from Crystal Springs Reservoir. In the modeling, the conveyance capacity from Crystal Springs Reservoir is assumed to be the same among all of the settings. The additional water demand of the WSIP and variant require additional draw from Harry Tracy WTP to the San Andreas Reservoir. Figure 4.7-4 illustrates the average monthly storage in San Andreas Reservoir for the 82-year simulation, and the range in storage for each month for the variant and base settings.

Figure 4.7-4



4.8 Pilarcitos Reservoir

Coastside County Water District's (Coastside CWD) water demand and its SFPUC purchase request are projected to increase within the WSIP planning horizon of year 2030. Within the context of the 2030 purchase request of 300 mgd, Coastside CWD's portion has been estimated at about 3 mgd. This projected purchase request is approximately 1 mgd greater that its current purchase request. Recognizing the current physical constraints to deliveries from the SFPUC to Coastside CWD and the ongoing planning activities in the watershed, there is uncertainty as to the precise manner in which Coastside CWD's additional purchase request would be served and the resultant potential changes to the operation of SFPUC facilities and their affected environs.[6]

Assuming a range of potential means to serve the additional purchase request from Coastside CWD, the following potential hydrologic effects to SFPUC facilities and their affected environs have been identified:

- Due to limited yield from Pilarcitos Reservoir, additional diversions would be required from Crystal Springs Reservoir.
- If deliveries to Coastside CWD from Pilarcitos Reservoir increase during the winter season, these deliveries could potentially reduce storage in Pilarcitos Reservoir, thereby potentially reducing diversions to the San Mateo Creek watershed. Although the increased delivery would increase releases to Pilarcitos Creek from Pilarcitos Dam for a period of time, the increase would subsequently lead to a reduction in spills past Stone Dam.

[6] See "Analysis of SFPUC PIlarcitos/Coastside County Water District Operations", Memorandum by Daniel B. Steiner, March 8, 2007.

- Additional wintertime deliveries could also potentially impair the ability to provide carry-over storage into the summer season from Pilarcitos Reservoir, and subsequently lead to an acceleration of the beginning of the season when releases to Pilarcitos Creek from Pilarcitos Reservoir consist only of the passage of reservoir inflow.
- An increase in summertime deliveries from Pilarcitos Creek could also accelerate the beginning of the season when releases to Pilarcitos Creek from Pilarcitos Reservoir consist only of the passage of reservoir inflow.

The variant setting could result in essentially the same potential effects to the Pilarcitos Creek watershed as under the WSIP setting. In the variant setting, there would be a slightly higher delivery to Coastside CWD during prolonged drought due to the greater reliability of 10 percent maximum rationing. In contrast to the WSIP setting, during these periods, the effect on the Pilarcitos Creek watershed could be slightly greater.

APPENDIX H2-5

Memorandum

Subject: **HH/LSM Assumptions and Results – CEQA Alternatives**
From: **Daniel B. Steiner**
Date: **April 2, 2007**

1. Introduction

This memorandum summarizes assumptions for and describes the interpretation of Hetch Hetchy Local Simulation Model (HH/LSM) results for the simulation of the California Environmental Quality Act (CEQA) Alternatives that are incorporated into the Program Environmental Impact Report (PEIR). Five CEQA alternatives are analyzed: 1) No Program; 2) No Purchase Request Increase; 3) Aggressive Conservation and Water Recycling; 4) Lower Tuolumne River Diversion; and 5) Desalination within San Francisco. A sixth alternative, Regional Desalination for Drought, was identified as a CEQA alternative; its hydrologic analysis is described in a separate memorandum.[1] These scenarios represent CEQA program alternatives that vary from the proposed program (Water System Improvement Program [WSIP]) on key program components in a manner expected to avoid or reduce potentially significant effects of the proposed program. Table 1-1 and Table 1-2 summarize the components, various modeling assumptions, and performance and hydrologic results for Alternatives 1, 2, and 3 in comparison to the modeled existing setting (2005) with Calaveras Reservoir constrained by California Division of Safety of Dams (DSOD) restrictions, the pre-2002 setting (with a Calaveras Reservoir operation prior to DSOD restrictions), and the WSIP setting. Alternative 3, Aggressive Conservation, has additionally been analyzed in terms of alternative objectives of performance (level of service [LOS]) and effect to Tuolumne River hydrology, with those results mostly described qualitatively. Alternative 4, Lower Tuolumne River Diversion, and Alternative 5, Desalination within San Francisco, are discussed partly quantitatively and partly qualitatively.

The hydrology of each alternative is primarily compared to the proposed program and contrasted to the baseline condition of the PEIR, namely the simulated current (2005) operation of the regional system, assuming the Calaveras and Crystal Springs Reservoirs operation being constrained by DSOD restrictions. Only primary hydrologic parameters such as projected water deliveries, reservoir storage, and stream flows are compared, and only those parameters that have been identified as key hydrologic factors that lead to environmental impact assessment are illustrated.

<u>Note Regarding Crystal Springs Reservoir Modeling Assumptions</u>

This memorandum describes results for several studies performed with HH/LSM during the past several years. A number of the HH/LSM studies concerning the CEQA Alternatives considered for the WSIP PEIR reflect an assumption that the WSIP Lower Crystal Springs Dam Improvements (LCSDI) project would not be implemented. These modeling studies were conducted in such a manner because early drafts of those alternatives proposed this assumption. Upon further investigation, the SFPUC concluded that the LCSDI project is required in all future scenarios due to a number of factors such as DSOD regulations and public health and safety, in addition to its role in meeting WSIP reliability objectives.

When illustrated for the CEQA Alternatives described in this memorandum, the results for the Crystal Springs Reservoir operation may reflect the assumed constraint to operations that limits the reservoir's maximum storage to approximately 58,300 acre-feet. Some results of those operations would be different when assuming that under each CEQA Alternative the reservoir would be operated to its restored operational capacity of 69,300 acre-feet. Little or no change would occur in hydrologic effects for almost all of the hydrologic parameters compared. The substantive change to the alternative's operation would be the range of Crystal Springs Reservoir storage, which would be comparable to the range which occurs in the WSIP. The text and illustrations contained in this memorandum, for some of the alternatives, have not been modified to reflect this revised assumption for the LCSDI project.

[1] See "HH/LSM Assumptions and Results – WSIP Variants", Memorandum by Daniel B. Steiner, February 20, 2007.

Table 1-1
Setting Characteristics and Modeling Assumptions (Part 1/3)

Assumptions and Characteristics of Setting and/or Program	Units	Baselines			CEQA Alternatives[3]		
		Baseline Conditions[1] - Calaveras Constrained	Baseline Conditions[2] - Calaveras Unconstrained	Proposed WSIP	No Program	No Indreased Purchase	Aggressive Conservation
Time Horizon for Setting of Analysis / Date[4]		2005	2005	2030	2030	2030	2030
HH/LSM Simulation Study Name[5]		MEA3CHR	MEA2A	MEA5HIN	MEA37H	MEA40H	MEA42H
System Wide Parameters							
Customer Purchase Request (Demand Level)[6]	MGD	265	265	300	300	275	300
Demand Level Supplied from Other Sources[7]							
Regional Recycled Water/Conservation/Groundwater in SF	MGD	0	0	10	0	10	10
Other Regional Recycled Water/Conservation/Groundwater	MGD	0	0	0	0	0	19
Demand Level Supplied from Tuolumne + Local Watersheds[8]	MGD	265	265	290	300	265	271
Average Annual Deliveries and Supplies[9]							
Deliveries from Tuolume + Local Watersheds (Average Annual)	MGD	258	259	287	275	262	264
Supply or Deliveries from Other Sources - Regional Recl/Cons/GW	MGD	0	0	10	0	10	29
Total Deliveries and Supply for Demand Level (Average Annual)	MGD	258	259	297	275	272	293
Features and Facilities[10]							
Regional Reclaimed Water/Conservation/Groundwater - SF				●		●	●
Regional Reclaimed Water/Conservation/Groundwater - Other							●
Calaveras Reservoir - 12.4 BG (Constrained)		●					
Calaveras Reservoir - 31.6 BG (Restored/Unconstrained)			●	●	●	●	●
Calaveras Reseroivr Release for Fish				●	●	●	●
Calaveras Reservoir Release for Fish & Flow Recapture				●	●	●	●
Crystal Springs Reservoir - 19.0 BG (Constrained)		●	●		●	●	●
Crystal Springs Reservoir - 22.6 BG (Restored/Unconstrained)				●	Note 21	Note 21	Note 21
Sunol Valley Water Treatment Plant Expansion				●		●	●
Sunol Valley Water Treatment Plant Feed from SJPL				●	●	●	●
Harry Tracy Water Treatment Plant Expansion				●		●	●
Bay Division Pipeline Increased Conveyance				●		●	●
San Joaquin Pipeline Increased Conveyance				●		●	●
Desalination Project							
Westside Groundwater Project				●		●	
Tuolumne River Transfer				●		●	
Water Supply Reliability[11]							
Action	Level	Rationing %	Rationing %	Rationing %	Rationing %	Rationing %	Rationing %
Implement Drought Water Supply Action (Westside GW or Desal)	1	NA	NA	GW	NA	GW	NA
Rationing (Level 1)	2	10	10	10	10	10	10
Rationing (Level 2)	3	20	20	20	20	20	20
Rationing (Level 3)	4	25	25	25	30	25	25
	Years	Action Level	Action Level	Action Level	Action Level	Action Level	Action Level
	1921						
	1924	2	2	1	3	2	2
	1925			1	3		
	1926			1	2		
	1929			1	3		
	1930			1	2	1	
	1931	3	2	2	4	2	3
	1932				2		
	1933				2		
	1934	2	2	1	3	1	2
	1935						
	1939				2		
	1944				2		
	1946				2		
	1947				3		
	1948			1	2		
	1949				2		
	1950			1	3		
	1953				2		
	1954				2		
	1955			1	2	1	
	1957				2		
	1959				2		
	1960	2	2	1	3	2	2
	1961	3	3	2	4	2	3
	1962				2		
	1964			1	2		
	1966				2		
	1968				2		
	1971				2		
	1972			1	2	1	
	1976	2	2	1	3	2	2
	1977	3	3	2	4	2	3
	1979				2		
	1981				2		
	1984				2		
	1985			1	2		2
	1987	2	2	1	3	1	2
	1988	3	3	2	4	2	3
	1989	3	2	2	4	2	3
	1990	3	3	3	4	3	3
	1991	3	3	2	4	2	3
	1992	3	3	3	4	3	3
	1994	2	2	1	3	1	2
	DD1993	4	3	3	4	3	3
	DD1994	4	3	3	4	3	3
Max Drought Rationing - Policy Cap[12]	DD	Incidental 25%	Incidental 20%	20%	Incidental 30%	20%	20%
	Historical	Incidental 20%	Incidental 20%	20%	Incidental 30%	20%	20%

Table 1-1
Setting Characteristics and Modeling Assumptions (Part 2/3)

Assumptions and Characteristics of Setting and/or Program	Units	Baselines			CEQA Alternatives[3]		
		Baseline Conditions[1] - Calaveras Constrained	Baseline Conditions[2] - Calaveras Unconstrained	Proposed WSIP	No Program	No Indreased Purchase	Aggressive Conservation
System Wide Parameters							
Incremental Supply - Average[13]							
System Customer Purchase Request Level	MGD	265	265	300	300	275	300
Demand Level Supplied from Other Sources	MGD	0	0	10	0	10	29
Demand Level Supplied from Tuolumne + Local Watersheds	MGD	265	265	290	300	265	271
System Deliveries	MGD	258	259	287	275	262	264
Regional Desalination	MGD	0	0	0	0	0	0
San Joaquin Pipelines (Tuolumne Diversion)	MGD	218	215	245	226	221	223
Inferred Local Watershed Production	MGD	40	44	42	49	41	41
Addt'l Tuolumne Diversion (Compared to Calaveras Constrained)	MGD	*218*	*215*	27	8	3	5
Addt'l Tuolumne Diversion (Compared to Calaveras pre-2002)	MGD	*218*	*215*	30	12	7	8
Incremental Design Drought Supply[14]							
From Other Sources - Regional Recl/Cons/GW (Every Year)	MGD	0	0	10	0	10	29
Restoration of Calaveras Reservoir Capacity (w/ flow recapture)	MGD	0	0	7	7	7	7
Restoration of Crystal Springs Capacity[21]		0	0	1	0	0	0
MID/TID Transfer to SFPUC (Results in additional diversion from TR)	MGD	0	0	23	0	1	0
Westside Basin Conjunctive Use (8,100 acre-feet Storage)	MGD	0	0	6	0	6	0
Regional Desalination (26 mgd)	MGD	0	0	0	0	0	0
Sum of Incremental Supplies	MGD	0	0	47	7	24	36
Yield - Without Other Sources Added (Compared to Calaveras Constrained)	MGD	219	226	256	226	233	226
Yield - With Other Sources Added (Compared to Calaveras Constrained)	MGD	219	226	266	226	243	255
Design Drought Delivery Calculator[15]		2	3	4	8	9	10
	MGD						
Average Annual Delivery During	Year 1	265	265	290	300	265	271
Average Annual Delivery During	Year 2	239	239	290	240	265	244
Average Annual Delivery During	Year 3	212	212	261	210	239	217
Average Annual Delivery During	Year 4	212	239	261	210	239	217
Average Annual Delivery During	Year 5	212	212	232	210	212	217
Average Annual Delivery During	Year 6	212	212	261	210	239	217
Average Annual Delivery During	Year 7	212	212	232	210	212	217
Average Annual Delivery During	Year 8	199	212	232	210	212	217
Average Annual Delivery During	Last 6 Mo	99	106	116	105	106	108
	DD Ave	219	224	256	224	234	226
Firm Yield (Nominal) Not Including Other Sources	MGD	219	226	256	226	234	226
Local System Operational Parmeters							
Crystal Springs Reservoir Operation							
Storage - Minimum/Maximum	BG	5.4 - 19.0		5.4 - 22.6	Modeling was conducted assuming the same constrained		
	TAF	16.6 - 58.4		16.6 - 69.3	capacity as occurs in Baselines		
Fall/Winter Operation Storage		17.0 BG (52.2 TAF)		19.0 BG (58.3 TAF)			
Stream Release		Up to 250 cfs to not exceed 19 BG		Up to 250 cfs to not exceed 21 BG	Alternatives would include LCSDI project with restored reservoir capacity		
Calaveras Reservoir Operation							
Storage - Minimum/Maximum	BG	8.4 - 12.4	8.4 - 31.5	8.4 - 31.5	Same		
	TAF	25.7 - 38.0	25.7 - 96.8	25.7 - 96.8	as		
Fall/Winter Operation Storage		10.3 BG (31.6 TAF)	27.0 BG (82.9 TAF)	27.0 BG (82.9 TAF)	WSIP		
Alameda Creek Release/Recapture[16]	AFY	0		Up to 6,300	Same as WSIP		
San Andreas Reservoir Operation							
Storage - Minimum/Maximum	BG	3.0 - 6.2		3.0 - 6.2	Same		
	TAF	9.2 - 19.0		9.2 - 19.0	as		
Fall/Winter Operation Storage		5.6 BG (17.2 TAF)		5.6 BG (17.2 TAF)	Baselines and WSIP		
San Antonio Reservoir Operation							
Storage - Minimum/Maximum	BG	1.0 - 16.5		1.0 - 16.5	Same		
	TAF	3.1 - 50.5		3.1 - 50.5	as		
Fall/Winter Operation Storage		15.9 BG (48.8 TAF)		15.9 BG (48.8 TAF)	Baselines and WSIP		
Pilarcitos Reservoir Operation							
Storage - Minimum/Maximum	BG	0.65 - 0.97		0.65 - 0.97	Same		
	TAF	2.0 - 3.0		2.0 - 3.0	as		
Fall/Winter Operation Storage		0.75 BG (2.2 TAF)		0.75 BG (2.2 TAF)	Baselines and WSIP		
Water Treatment Plants							
Sunol Valley Water Treatment Plant Maximum	MGD	120		160	Same as Baselines	Same as WSIP	Same as WSIP
		90 MGD from Calaveras		90 frm Calvrs + Flw Rec	90 MGD from Calaveras + Recapture		
Sunol Valley Water Treatment Plant Minimum	MGD	20		20	Same as Baselines and WSIP		
		Calvrs & SA Res & SJPL	Cal & SA Res	Frm Calvrs & SA & SJPL	From Calavers & San Antonio & SJPL		
Harry Tracy Water Treatment Plant Maximum	MGD	120		140	Same as Baselines	Same as WSIP	Same as WSIP
Harry Tracy Water Treatment Plant Minimum	MGD	20		20	Same as WSIP		
Conveyance							
Bay Division Pipeline Maximum		340 MGD Jun - Sep 320 MGD Apr, May & Oct 290 MGD Nov - Mar		380 MGD Apr - Oct 320 MGD Nov - Mar	Same as Baselines	Same as WSIP	
Bay Division Pipeline Maintenance		Cycle one pipeline out Nov - Mar each year (average remaining capacity rotation) maximum 230 MGD		Same as Baselines, except maximum 320 MGD	Same as Baselines	Same as WSIP	

Table 1-1
Setting Characteristics and Modeling Assumptions (Part 3/3)

Assumptions and Characteristics of Setting and/or Program	Units	Baselines: Baseline Conditions[1] - Calaveras Constrained	Baselines: Baseline Conditions[2] - Calaveras Unconstrained	Proposed WSIP	CEQA Alternatives[3]: No Program	CEQA Alternatives[3]: No Indreased Purchase	CEQA Alternatives[3]: Aggressive Conservation
Tuolumne River System Operational Parameters							
Hetch Hetchy Reservoir Operation							
Storage - Minimum/Maximum	TAF	26.1 - 360.4		26.1 - 360.4	Same		
Fall/Winter Operation Storage		30 TAF winter buffer		30 TAF winter buffer	as		
1987 Stipulation Minimum Release Flows		Yes		Yes	Baselines and		
1987 Stipulation Supplemental Release Flows		No		No	WSIP		
Cherry Reservoir Operation							
Storage - Minimum/Maximum	TAF	1.0 - 273.3		1.0 - 273.3	Same as		
Fall/Winter Operation Storage		25.3 TAF winter buffer		25.3 TAF winter buffer	Baselines and WSIP		
Eleanor Reservoir Operation							
Storage - Minimum/Maximum	TAF	0.0 - 27.1		0.0 - 27.1	Same as		
Fall/Winter Operation Storage		Required Minimum Storage		Reqrd Minimum Stor	Baselines and WSIP		
New Don Pedro Water Bank Account							
Storage - Minimum/Maximum	TAF	0.0 - 570.0 Temporary storage up to 740 TAF during Apr - Sep		0.0 - 570.0 Temp stor up to 740 TAF during Apr - Sep	Same as Baselines and WSIP		
Conveyance							
San Joaquin Pipelines Maximum	MGD	290		314	Same as Baselines	313	
San Joaquin Pipelines Minimum	MGD	70		70	Same as Baselines	Same as WSIP	
San Joaquin Pipelines Flow Rate Changes		11 Stepwise Surrogate minimum changes by allowing only 7 changes in a year		17 Stepwise Allow up to 7 changes in a year (surrogate)	Same as Baselines Same as Baselines	Same as WSIP Same as WSIP	
San Joaquin Pipelines Maintenance		Cycle one pipeline out Nov - Mar each year (average remaining capacity rotation) maximum 210 MGD		Cyclic 5-year mantenance (see note)	Same as Baselines with No December	Same as WSIP	
				Note:	Cyclic 5-year maintenance, maximum capacity available Apr - Oct all years 271 MGD available all other months except 0 MGD available Year 5 Nov - Dec and 135.5 MGD available Year 1 and Year 3 Dec		
TID/MID Operational Parameters							
Districts' Tuolumne Diversion[17]		Varies annually based on land use and water availability Annual average 867 TAF		SFPUC diversion effects measured by the result of reducing inflow to New Don Pedro Resevoir and its effect upon La Grange releases to the Tuolumne River	Set equal to baseline conditions		
Tuolumne River La Grange Flow Releases							
Don Pedro, 1996 FERC		X	X	X	X	X	X
VAMP - considered but not modeled[18]		X	X	X	X	X	X

Table 1-2
Summary of Modeling Results (Part 1/2)

HH/LSM Simulation Results	Units	Baselines		Proposed WSIP	CEQA Alternatives[3]		
		Baseline Conditions[1] - Calaveras Constrained	Baseline Conditions[2] - Calaveras Unconstrained		No Program	No Indreased Purchase	Aggressive Conservation
Design Drought Production & Disposition[19]							
San Joaquin Pipeline Diversion	MGD	206.9	206.4	232.5	206.8	211.3	208.9
Bay-Area Deliveries	MGD	218.3	223.9	248.9	223	226.8	224.9
Added Groveland & Coastside Delivery	MGD	2.6	2.6	3.6	3.3	2.6	3.5
Local Reservoir Evaporation	MGD	10.2	10.6	12.3	10.7	11.8	11.7
Inflow from ACDD	MGD	2.3	2.5	2.5	2.5	2.5	2.5
Flow Recapture	MGD	0	0	5.3	5.2	5.3	5.3
Local Reservoir Stream Release	MGD	0.1	0.2	5.5	5.2	5.3	5.3
Desalination	MGD	0	0	0	0	0	0
Westside Basin	MGD	0	0	5.6	0	6.4	0
District Transfer to NDP Water Bank	MGD	0	0	22.7	0	1.3	0
Local Storage - Begin	MG	53,725	72,505	77,708	71,883	73,362	73,331
Local Storage - End	MG	20,044	19,133	18,846	20,682	22,596	19,272
Study Average Production & Disposition (1921-02)[20]							
Tuolumne River System							
Reservoirs							
Hetch Hetchy							
Inflow	AF	749,605	749,605	749,605	749,605	749,605	749,605
River	AF	277,018	277,714	267,446	273,433	276,158	274,836
Stream Minimum Release	AF	65,731	65,912	65,547	65,824	65,740	65,735
Tunnel	AF	468,975	468,279	478,524	472,503	469,826	471,186
Evaporation	AF	3,896	3,886	3,868	3,887	3,882	3,879
Reservoir	AF	284,033	287,056	275,905	284,419	284,544	283,443
Cherry							
Inflow		279,293	279,293	279,293	279,293	279,293	279,293
Eleanor Gravity	AF	199	199	289	199	289	289
Eleanor Pump	AF	118,270	118,188	118,299	118,295	118,337	118,306
River	AF	44,659	44,001	45,978	43,925	45,810	41,514
Stream Minimum Release	AF						
Tunnel	AF	349,596	350,171	348,403	350,353	348,608	352,756
Evaporation	AF	3,507	3,508	3,499	3,508	3,500	3,505
Reservoir	AF	240,426	240,602	239,298	240,457	239,407	239,794
Eleanor							
Inflow	AF	169,617	169,617	169,617	169,617	169,617	169,617
Eleanor Gravity	AF	199	199	289	199	289	289
Eleanor Pump	AF	118,270	118,188	118,299	118,295	118,337	118,306
River	AF	49,243	49,325	49,124	49,219	49,086	49,116
Stream Minimum Release	AF						
Evaporation	AF	1,905	1,905	1,906	1,905	1,906	1,906
Reservoir	AF	22,201	22,201	22,191	22,201	22,191	22,191
Don Pedro Reservoir							
Inflow	AF	1,591,144	1,594,967	1,561,409	1,581,846	1,587,455	1,585,545
MID Diversion	AF	303,546	303,546	303,546	303,546	303,546	303,546
TID Diversion	AF	563,497	563,497	563,497	563,497	563,497	563,497
LaGrange Total Stream	AF	680,091	684,124	652,299	671,218	677,049	675,258
LaGrange Minimum Stream Release	AF	221,361	221,361	221,361	221,361	221,361	221,361
Total Evaporation	AF	44,024	44,092	43,106	43,945	43,846	43,783
Reservoir	AF	1,492,181	1,495,055	1,453,662	1,489,120	1,484,587	1,482,183
Water Bank Account							
Balance	AF	518,149	520,327	517,209	518,066	514,804	513,675
Transfer	AF	0	0	27,000	0	1,500	0
San Joaquin Pipelines							
Volume (AF)	AF	244,165	240,340	273,887	253,403	247,854	249,796
Volume (MG)	MG	79,562	78,315	89,246	82,572	80,763	81,396
Rate (MGD)	MGD	218	215	245	226	221	223
Max Rate (MGD)	MGD	290	290	314	290	313	313
Min Rate (MGD)	MGD	70	0	0	0	0	0
East Bay System							
Reservoirs							
Calaveras							
Inflow	MG	12,368	12,368	12,368	12,368	12,368	12,368
From ACDD	MG	1,352	2,023	1,748	2,040	1,712	1,716
Stream	MG	3,660	2,242	4,285	3,723	4,263	4,252
Stream Flow Recapture	MG	0	0	1,555	1,511	1,555	1,555
To SVWTP	MG	9,049	10,616	9,694	10,666	9,673	9,690
To San Antonio	MG	0	0	0	0	0	0
Evaporation	MG	1,023	1,591	1,709	1,579	1,712	1,711
Resevoir	MG	10,975	25,116	28,320	24,815	28,406	28,378
San Antonio							
Inflow	MG	2,468	2,468	2,468	2,468	2,468	2,468
From Calaveras/SJPL	MG	1,053	1,525	1,278	3,035	626	618
Stream	MG	555	521	548	74	897	797
To SVWTP	MG	2,061	2,511	2,239	4,848	1,173	1,277
Evaporation	MG	956	971	976	757	1,028	1,020
Resevoir	MG	14,084	14,447	14,631	10,379	15,584	15,444
Alameda Creek Diversion Dam							
Inflow	MG	4,197	4,197	4,197	4,197	4,197	4,197
To Calaveras Reservoir	MG	1,352	2,023	1,748	2,040	1,712	1,716
Spill	MG	2,845	2,174	2,449	2,157	2,485	2,481
Alameda Creek Confluence							
Accretion	MG	1,918	1,918	1,918	1,918	1,918	1,918
From ACDD	MG	2,845	2,174	2,449	2,157	2,485	2,481
From Calaveras Dam	MG	3,660	2,242	4,285	3,723	4,263	4,252
At Confluence	MG	8,422	6,333	8,652	7,798	8,666	8,651
Treatment Plants							
SVWTP Total	MG	13,752	13,267	14,313	16,123	13,885	14,002
From Calaveras	MG	9,049	10,616	9,694	10,666	9,673	9,690
From San Antonio	MG	2,061	2,511	2,239	4,848	1,173	1,277
From SJPL	MG	2,642	141	2,380	609	3,039	3,035
SVWTP Total MGD	MGD	38	36	39	44	38	38
SVWTP Max MGD	MGD	117	120	160	120	120	120
SVWTP Min MGD	MGD	20	20	20	20	20	20

Table 1-2
Summary of Modeling Results (Part 2/2)

HH/LSM Simulation Results	Units	Baselines			CEQA Alternatives[3]		
		Baseline Conditions[1] - Calaveras Constrained	Baseline Conditions[2] - Calaveras Unconstrained	Proposed WSIP	No Program	No Indreased Purchase	Aggressive Conservation
Peninsula System							
Reservoirs							
Crystal Springs							
Inflow	MG	3,722	3,722	3,722	3,722	3,722	3,722
From San Andreas	MG	0	0	0	0	0	0
From Pilarcitos and SJPL	MG	6,751	8,545	8,508	9,193	8,306	8,277
Stream	MG	448	409	316	117	661	685
Pump to San Andreas	MG	8,832	10,540	10,311	11,497	10,034	9,983
Pump to Coastside	MG	54	55	239	183	58	54
Evaporation	MG	1,189	1,261	1,407	1,140	1,274	1,275
Reservoir	MG	16,102	16,907	18,962	15,117	17,026	17,035
San Andreas							
Inflow	MG	1,428	1,428	1,428	1,428	1,428	1,428
From other Streams	MG	9,271	10,992	10,656	11,963	10,430	10,377
Stream	MG	0	0	0	0	0	0
To HTWTP	MG	10,168	11,890	11,553	12,861	11,328	11,275
Evaporation	MG	530	530	530	529	530	530
Reservoir	MG	5,893	5,846	5,861	5,820	5,844	5,847
Pilarcitos							
Inflow		1,297	1,297	1,297	1,297	1,297	1,297
To San Andreas	MG	439	452	345	465	396	394
For Stone Diversion	MG	444	444	607	591	446	443
Stream other than Diversion	MG	327	314	278	171	369	373
Evaporation	MG	89	89	72	74	89	89
Reservoir	MG	623	623	469	485	623	625
Stone Dam							
Accretion blw Pilarcitos	MG	603	603	603	603	603	603
Pilarcitos non-diversion Release	MG	327	314	278	171	369	373
Pilarcitos Release for Diversions	MG	930	917	880	774	971	975
Diversion to Coastside	MG	178	178	236	230	179	178
Diversion to Crystal Springs	MG	180	200	181	232	169	167
Spill past Stone	MG	1,502	1,455	1,343	1,085	1,595	1,606
Treatment Plants							
HTWTP Total	MG	10,168	11,890	11,553	12,861	11,328	11,275
HTWTP Total MGD	MGD	28	33	32	35	31	31
HTWTP Max MGD	MGD	149	149	106	185	147	147
HTWTP Min MGD	MGD	20	20	20	20	20	20
Other Facilites							
Westside Basin Net	MG	0	0	11	0	11	0
Desalination Input	MG	0	0	0	0	0	0
Additional Information							
Total Local Reservoir Stream Release	MG	4,990	3,486	5,427	4,084	6,191	5,908
Total Local Reservoir Stream Evaporation	MG	3,788	4,442	4,694	4,078	4,632	4,604
Deliveries							
In-City	MG	29,589	29,667	26,686	28,520	27,418	26,273
South Bay	MG	43,106	43,221	52,906	48,603	45,073	46,408
Crystal Springs	MG	15,120	15,160	16,931	15,721	15,844	16,146
San Andreas	MG	5,400	5,414	6,604	6,108	5,839	5,961
Coastside	MG	675	678	1,082	991	683	1,082
Groveland	MG	365	365	365	365	365	365
Total Deliveries	MG	94,255	94,502	104,574	100,398	95,621	96,235
Total Deliveries	MGD	258	259	287	275	262	264
Storage							
Total Local Storage Begin	MG	23,240	23,488	26,150	21,433	23,263	23,150
Total Local Storage End	MG	18,915	23,358	22,188	19,257	23,088	22,577
Residual Difference during 82-year Simulation	MGD	0.14	0.00	0.13	0.07	0.01	0.02
Westside Storage Begin	MG	0	0	23,474	0	23,474	0
Westside Storage End	MG	0	0	24,363	0	24,399	0
Residual Difference during 82-year Simulation	MGD	0.00	0.00	0.03	0.00	0.03	0.00

Notes for Table 1-1 and Table 1-2

1. Baseline condition represents the existing conditions at the time of NOP publication in September 2005. This is the baseline used to assess WSIP program impact and impact significance. This setting indicates DSOD restrictions on Calaveras and Crystal Springs Reservoirs.

2. This baseline condition represents a system configuration and operation prior to the DSOD storage restriction (pre-2002).

3. These scenarios represent CEQA program alternatives that vary from the proposed WSIP program on key components in a manner expected to avoid or reduce potentially significant effects of the proposed program.

4. The time horizon for the setting of the scenario. The baseline condition scenarios are depicted for recent conditions, while the proposed WSIP, variants, and alternatives are depicted for the future at full buildout and implementation, i.e., conditions in the year 2030.

5. HH/LSM model simulation study name.

6. The customer purchase request (demand) information is based on the demand and request studies prepared by the SFPUC in coordination with the wholesale customers (SFPUC/URS 2004). This demand on the regional water system includes both the SFPUC retail customers and wholesale customers. The current (2005) average annual demand is 265 mgd, and the projected 2030 average annual demand is 300 mgd, assuming the SFPUC adopts the updated wholesale customer purchase requests as part of the Master Sales Agreement renewal with these customers (due in 2009).

7. Certain scenarios include the development of additional water supply from a combination of recycled water projects, groundwater projects, and conservation, utilized every year and not subject to reduction during drought.

8. The average annual demand for supplies from the combination of the SFPUC local watershed and Tuolumne River, as well as programs not included in the regional water conservation, reclamation, and groundwater programs shown.

9. Modeled results for SFPUC deliveries, with supplies added for regional water conservation, reclamation, and groundwater programs. Total deliveries and supply will be less than full customer purchase requests due to rationing in some years.

10. Shows only the features that affect hydrologic results of the system operation simulations. Additional projects are included in the WSIP, variants, and alternatives.

11. Illustrates the frequency and severity of water supply action or severity of system wide rationing. Only years in which variable water supply component is implemented or rationing occurs are shown. "DD" illustrates the shortage results for years included in the prospective drought period of the SFPUC Design Drought. These years contribute to establishing system operation protocols, but are not included in the hydrologic assessment analyses.

12. Rationing policy cap: The SFPUC WSIP level of service goal is to maintain rationing on the regional system at no more than 20% during any one year of drought. Some alternatives do not achieve this level of service goal. Performance is indicated for both the Design Drought ("DD") sequence and for the "Historical" hydrologic sequence.

13. Water supply elements develop water in different amounts from year-to-year, and in some instances, they only develop water during dry years. This information is provided to compare local watershed supplies, Tuolumne River supplies, and other identifiable water supplies used to meet system purchase requests. Values are stated in units of average annual quantities during the simulated historical sequence.

14. Results from HH/LSM analysis of each scenario. Values represent the average annual production of each element of supply during the design drought period.

15. Simplified calculation of system deliveries during the SFPUC design drought. The value represents the application of system-wide shortages to the demand level being met with SFPUC local watershed, Tuolumne, and other developed supplies, and does not include supplies from regional water conservation, or from recycled water or groundwater projects. Average value may be slightly misstated (up to 3 mgd) due to metric of analysis that does not account for differences in residual storage between studies. "Nominal" firm yield represents the yield of each scenario after adjustment for minor residual storage differences.

16. Supplemental releases from Calaveras Reservoir for fisheries (1997 MOU) of up to 6,300 AFY and the Alameda Creek Recapture project are tied to implementation of the Calaveras Dam replacement project. When the dam is replaced and capacity restored, both the flow release and recapture will occur. The release requirement is based on the supplementation of other occurring flows below Calaveras Reservoir, sometimes not requiring the full 6,300 acre-feet.

17. SFPUC actions are assumed to leave MID/TID diversions unchanged so that the SFPUC effects on the Tuolumne River below La Grange Dam are isolated and possibly overstated. The Districts' diversions are assumed to be constant among the scenarios to provide comparable results of SFPUC-alone effects.

18. Participation in the San Joaquin River Agreement is assumed. Although the agreement expires after 2010, it is assumed that a subsequent similar agreement or requirement of the Districts will occur. HH/LSM does not explicitly model the Districts' participation in the agreement; however, its participation if modeled would result in only minor differences in results and would not change impact conclusions.

19. From HH/LSM results for modeling the SFPUC Design Drought Period.

20. From HH/LSM results for modeling the system operations for the historical hydrologic period 1921-2002. Values indicate average annual quantities during the simulated historical period.

21. Modeling did not include inclusion of LSCDI project. Inclusion of the project in alternatives would develop 1 mgd of system firm yield.

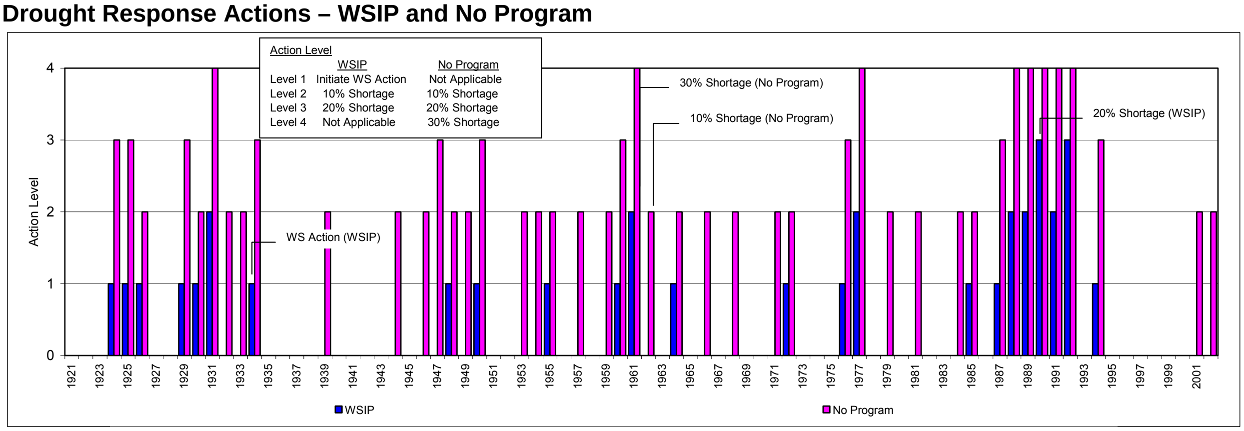
2. CEQA Alternative 1 – No Program

CEQA Alternative 1 – No Program Alternative would implement only those WSIP facility improvement projects that are mandated by, or previously agreed upon with, regulatory agencies. Those projects affecting hydrology include Alameda Creek Fishery Enhancement (SV-1) and Calaveras Dam Replacement (SV-2).[2] Under the No Program Alternative, customer purchase requests for water from the San Francisco Public Utilities Commission (SFPUC) (water demand) would increase from an average annual demand of 265 million gallons per day (mgd) in 2005 to 300 mgd in 2030. There would be no supplemental water supply sources from regional groundwater development, recycled water projects or conservation (collectively referred herein for the WSIP as Regional Recycled/Ground Water and Conservation [RRGWC]), restoration of Crystal Springs Reservoir capacity, water transfers, or the Westside Basin Groundwater Program. The additional water demand would be served, to the extent possible, from increased diversions from the Tuolumne River, as well as from the increased use of local watershed supplies, primarily associated with the restoration of Calaveras Reservoir.

2.1 Water Deliveries and Drought Response Actions

Compared to the WSIP setting, with the absence of 10 mgd of RRGWC, the regional system's resources are required to serve a 300-mgd demand instead of a net 290-mgd demand. Combined with a lesser supply as compared to the WSIP setting, this circumstance leads to a more frequent implementation of rationing and a greater severity of rationing during drought periods. The rationing is applied to the 300-mgd level of demand as opposed to a 290-mgd level of demand. Table 1-1 compares the drought response actions for the proposed program and the alternative. Figure 2.1-1 illustrates the occurrence of drought response actions for the simulated 82-year historical period (1921-2002).

Figure 2.1-1
Drought Response Actions – WSIP and No Program



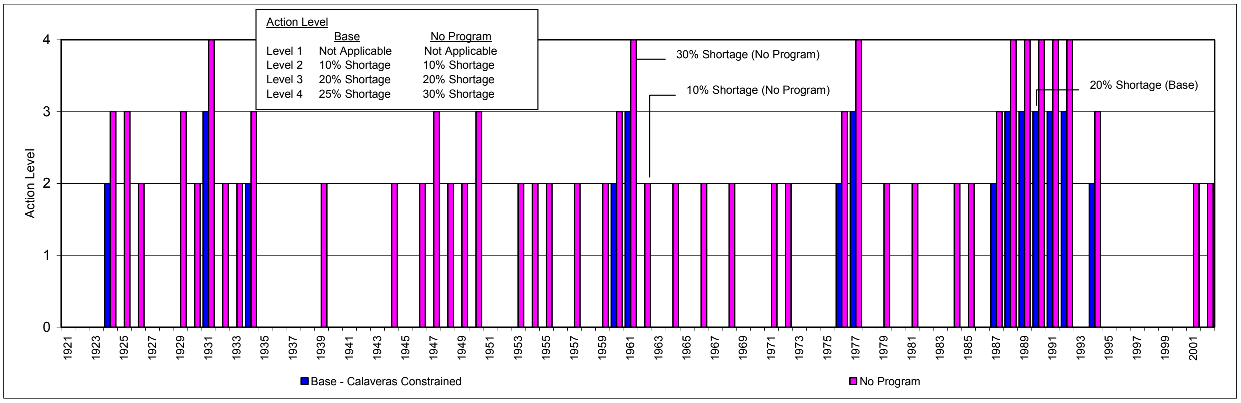
In Figure 2.1-1, years with bars showing a "1" or greater level of action indicate periods when a supplemental water supply action is initiated. In the WSIP setting, the water supply action is the use of the Westside Basin Groundwater Program to supplement SFPUC water deliveries. Also occurring in the WSIP setting is the water transfer supplemental supply from MID/TID. Action levels greater than "1" indicate the imposition of delivery shortages (rationing) to SFPUC customers. Without supplemental resources, the alternative only has delivery shortage measures available to cope with drought. This shortage measure is imposed during level 2 (10 percent), level 3 (20 percent), and level 4 (an assumed 30 percent shortage). The frequency of imposed delivery shortages and severity of shortages all increase in the alternative setting.

The same form of information is shown in Figure 2.1-2 in comparing the alternative and "Base - Calaveras Constrained" (existing) settings. As illustrated above, there is no level 1 action level in the alternative setting or base setting. Without supplemental resources, the existing system only has delivery shortage

[2] The Lower Crystal Springs Dam Improvements project is also included in the No Program Alternative but was not included in the HH/LSM modeling.

measures available to cope with drought. In the base setting, the shortage measure is imposed during level 2 (10 percent) and level 3 (20 percent). These percentages of shortage are applied to both the alternative and the base setting for these action levels, although they are applied to different levels of water demand. In the alternative, the system's water demand is an average annual 300 mgd; in the base setting, the water demand is 265 mgd. Rationing above 20 percent is not required in the base setting; however, for the same simulation period, a 30-percent level of rationing is needed for the alternative to be viable.

Figure 2.1-2
Drought Response Actions – Base and No Program



Not illustrated in Figure 2.1-2 but shown in Table 1-1 are the delivery shortages anticipated during the entire SFPUC Design Drought. During the Design Drought, neither the base setting nor the alternative setting has a viable operation without exceeding a 20-percent shortage level. The base setting exceeds the 20-percent shortage level (requires 25 percent rationing) during the last 18 months of the Design Drought. The alternative exceeds the 20-percent shortage level (requires 35 percent rationing) 6½ years out of the 8½ year Design Drought, and 3 other years within the simulation.

The difference in water deliveries between the proposed program and the alternative is shown chronologically for the 82-year simulation in Table 2.1-1. The years indicating positive differences amounting to approximately 3,600 million gallons illustrate 10 mgd of demand being met from the regional system, which, in the proposed program, was being met from RRGWC. This indicates that the regional system serves an average annual demand of 300 mgd in the alternative setting compared to the regional system serving an average annual net demand of 290 mgd in the WSIP setting. During about 23 percent of the years, the alternative can fully serve the 300 mgd of demand. During another 23 percent of the years, the alternative would provide some amount of additional water greater than base setting deliveries, but not the full amount associated with a 300-mgd level of demand. During the remaining 50 percent of years, water deliveries in the alternative setting would be less than the deliveries provided in the base setting. This reduction in reliability is due to the need to initiate shortages on the higher level of demand in many more years in anticipation of potential prolonged drought. Comparing the alternative setting to the base setting, Table 2.1-2 illustrates the difference in water deliveries between the two settings. The alternative setting would provide greater deliveries in most years. This indicates that an increase in system deliveries can be accommodated with the existing system.

2.2 Diversions from Tuolumne River

The metric for illustrating the SFPUC diversion from the Tuolumne River Basin (Tuolumne) is the flow through the San Joaquin Pipeline (SJPL). Inherent to this alternative is the draw of additional water from the Tuolumne. Table 2.2-1 illustrates the difference in diversions to the SJPL between the proposed program and the alternative settings. Compared to the base setting, the constrained conveyance capacity of the SJPL in the alternative (only equal to the existing capacity) is evident. During the summer, the SJPL would convey less water in the alternative setting. In some years, this reduction in flow is offset during the winter with an increase in diversion when capacity is available in the SJPL. With only the

Table 2.1-1

Difference in Total System-wide Delivery (MG)

No Program minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
1921	83	59	58	52	260	304	327	341	336	313	316	306	2,755	2,090
1922	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1923	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1924	307	276	282	276	260	304	327	341	336	-1,936	-1,900	-1,595	-2,722	3,644
1925	-1,352	-975	-717	-566	-704	-1,091	-1,357	-1,670	-1,855	-1,936	-1,900	-1,595	-15,718	-15,718
1926	-1,352	-975	-717	-566	-704	-1,091	-1,357	-1,670	-1,855	-782	-765	-587	-12,420	-15,718
1927	-416	-195	-20	72	-46	-257	-431	-623	-753	89	92	89	-2,398	-4,802
1928	83	59	58	52	58	80	110	117	119	89	92	89	1,005	1,005
1929	83	59	58	52	58	80	110	117	119	-1,936	-1,900	-1,595	-4,696	1,005
1930	-1,352	-975	-717	-566	-704	-1,091	-1,357	-1,670	-1,855	-782	-765	-587	-12,420	-15,718
1931	-416	-195	-20	72	-46	-257	-431	-623	-753	-1,994	-1,813	-1,553	-8,028	-4,802
1932	-1,368	-1,047	-842	-718	-808	-1,153	-1,361	-1,627	-1,770	-1,312	-1,264	-1,041	-14,310	-16,052
1933	-865	-613	-428	-310	-425	-680	-867	-1,069	-1,206	-1,312	-1,264	-1,041	-10,081	-10,081
1934	-865	-613	-428	-310	-425	-680	-867	-1,069	-1,206	-1,936	-1,900	-1,595	-11,895	-10,081
1935	-1,352	-975	-717	-566	-704	-1,091	-1,357	-1,670	-1,855	89	92	89	-10,017	-15,718
1936	83	59	58	52	58	80	110	117	119	89	92	89	1,005	1,005
1937	83	59	58	52	58	80	110	117	119	89	92	89	1,005	1,005
1938	83	59	58	52	58	80	110	117	119	313	316	306	1,670	1,005
1939	307	276	282	276	260	304	327	341	336	-1,088	-1,040	-824	-243	3,644
1940	-641	-397	-204	-86	-223	-456	-650	-845	336	313	316	306	-2,229	-6,116
1941	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1942	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1943	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1944	307	276	282	276	260	304	327	341	336	-1,088	-1,040	-824	-243	3,644
1945	-641	-397	-204	-86	-223	-456	-650	-845	-989	313	316	306	-3,554	-7,442
1946	307	276	282	276	260	304	327	341	336	-1,088	-1,040	-824	-243	3,644
1947	-641	-397	-204	-86	-223	-456	-650	-845	-989	-2,243	-2,175	-1,832	-10,739	-7,442
1948	-1,576	-1,177	-901	-724	-881	-1,290	-1,576	-1,891	-2,092	-782	-765	-587	-14,242	-18,357
1949	-416	-195	-20	72	-46	-257	-431	-623	-753	-1,312	-1,264	-1,041	-6,286	-4,802
1950	-865	-613	-428	-310	-425	-680	-867	-1,069	-1,206	-1,936	-1,900	-1,595	-11,895	-10,081
1951	-1,352	-975	-717	-566	-704	-1,091	-1,357	-1,670	-1,855	89	92	89	-10,017	-15,718
1952	83	59	58	52	58	80	110	117	119	313	316	306	1,670	1,005
1953	307	276	282	276	260	304	327	341	336	-1,088	-1,040	-824	-243	3,644
1954	-641	-397	-204	-86	-223	-456	-650	-845	-989	-1,088	-1,040	-824	-7,442	-7,442
1955	-641	-397	-204	-86	-223	-456	-650	-845	-989	-782	-765	-587	-6,623	-7,442
1956	-416	-195	-20	72	-46	-257	-431	-623	572	89	92	89	-1,073	-3,477
1957	83	59	58	52	58	80	110	117	119	-1,088	-1,040	-824	-2,217	1,005
1958	-641	-397	-204	-86	-223	-456	-650	-845	336	313	316	306	-2,229	-6,116
1959	307	276	282	276	260	304	327	341	336	-1,088	-1,040	-824	-243	3,644
1960	-641	-397	-204	-86	-223	-456	-650	-845	-989	-1,936	-1,900	-1,595	-9,921	-7,442
1961	-1,352	-975	-717	-566	-704	-1,091	-1,357	-1,670	-1,855	-1,994	-1,813	-1,553	-15,646	-15,718
1962	-1,368	-1,047	-842	-718	-808	-1,153	-1,361	-1,627	-1,770	-1,312	-1,264	-1,041	-14,310	-16,052
1963	-865	-613	-428	-310	-425	-680	-867	-1,069	-1,206	89	92	89	-6,194	-10,081
1964	83	59	58	52	58	80	110	117	119	-782	-765	-587	-1,399	1,005
1965	-416	-195	-20	72	-46	-257	-431	-623	-753	89	92	89	-2,398	-4,802
1966	83	59	58	52	58	80	110	117	119	-1,088	-1,040	-824	-2,217	1,005
1967	-641	-397	-204	-86	-223	-456	-650	-845	336	313	316	306	-2,229	-6,116
1968	307	276	282	276	260	304	327	341	336	-1,088	-1,040	-824	-243	3,644
1969	-641	-397	-204	-86	-223	-456	-650	-845	336	313	316	306	-2,229	-6,116
1970	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1971	307	276	282	276	260	304	327	341	336	-1,088	-1,040	-824	-243	3,644
1972	-641	-397	-204	-86	-223	-456	-650	-845	-989	-782	-765	-587	-6,623	-7,442
1973	-416	-195	-20	72	-46	-257	-431	-623	572	89	92	89	-1,073	-3,477
1974	83	59	58	52	58	80	110	117	119	313	316	306	1,670	1,005
1975	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1976	307	276	282	276	260	304	327	341	336	-1,936	-1,900	-1,595	-2,722	3,644
1977	-1,352	-975	-717	-566	-704	-1,091	-1,357	-1,670	-1,855	-1,994	-1,813	-1,553	-15,646	-15,718
1978	-1,368	-1,047	-842	-718	-808	-1,153	-1,361	-1,627	-1,770	89	92	89	-10,423	-16,052
1979	83	59	58	52	58	80	110	117	119	-1,312	-1,264	-1,041	-2,882	1,005
1980	-865	-613	-428	-310	-425	-680	-867	-1,069	119	313	316	306	-4,203	-8,756
1981	307	276	282	276	260	304	327	341	336	-1,088	-1,040	-824	-243	3,644
1982	-641	-397	-204	-86	-223	-456	-650	-845	336	313	316	306	-2,229	-6,116
1983	307	276	282	276	260	304	327	341	336	313	316	306	3,644	3,644
1984	307	276	282	276	260	304	327	341	336	-1,088	-1,040	-824	-243	3,644
1985	-641	-397	-204	-86	-223	-456	-650	-845	-989	-782	-765	-587	-6,623	-7,442
1986	-416	-195	-20	72	-46	-257	-431	-623	572	89	92	89	-1,073	-3,477
1987	83	59	58	52	58	80	110	117	119	-1,936	-1,900	-1,595	-4,696	1,005
1988	-1,352	-975	-717	-566	-704	-1,091	-1,357	-1,670	-1,855	-1,994	-1,813	-1,553	-15,646	-15,718
1989	-1,368	-1,047	-842	-718	-808	-1,153	-1,361	-1,627	-1,770	-1,994	-1,813	-1,553	-16,052	-16,052
1990	-1,368	-1,047	-842	-718	-808	-1,153	-1,361	-1,627	-1,770	-870	-712	-575	-12,850	-16,052
1991	-466	-296	-170	-108	-184	-346	-467	-614	-698	-1,994	-1,813	-1,553	-8,710	-5,507
1992	-1,368	-1,047	-842	-718	-808	-1,153	-1,361	-1,627	-1,770	-870	-712	-575	-12,850	-16,052
1993	-466	-296	-170	-108	-184	-346	-467	-614	-698	89	92	89	-3,080	-5,507
1994	83	59	58	52	58	80	110	117	119	-1,936	-1,900	-1,595	-4,696	1,005
1995	-1,352	-975	-717	-566	-704	-1,091	-1,357	-1,670	-1,855	89	92	89	-10,017	-15,718
1996	83	59	58	52	58	80	110	117	119	89	92	89	1,005	1,005
1997	83	59	58	52	58	80	110	117	119	89	92	89	1,005	1,005
1998	83	59	58	52	58	80	110	117	119	89	92	89	1,005	1,005
1999	83	59	58	52	58	80	110	117	119	89	92	89	1,005	1,005
2000	83	59	58	52	58	80	110	117	119	89	92	89	1,005	1,005
2001	83	59	58	52	58	80	110	117	119	-1,088	-1,040	-824	-2,217	1,005
2002	-641	-397	-204	-86	-223	-456	-650	-845	-989	-1,088	-1,040	-824	-7,442	-7,442
Avg (21-02)	-378	-244	-136	-76	-140	-271	-366	-482	-415	-646	-610	-488	-4,253	-4,214

Table 2.1-2

Difference in Total System-wide Delivery (MG) — No Program minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
1921	1,117	887	743	650	697	913	1,054	1,248	1,344	1,458	1,411	1,246	12,769	12,769
1922	1,117	887	743	650	697	913	1,054	1,248	1,344	1,458	1,411	1,246	12,769	12,769
1923	1,117	887	743	650	697	913	1,054	1,248	1,344	1,458	1,411	1,246	12,769	12,769
1924	1,117	887	743	650	697	913	1,054	1,248	1,344	104	87	77	8,922	12,769
1925	51	22	-7	-29	-11	-12	8	44	-1,083	-1,098	-1,080	-892	-4,089	-751
1926	-766	-566	-440	-350	-444	-681	-849	-985	-1,083	57	55	116	-5,935	-9,233
1927	169	215	257	288	214	153	77	62	19	1,458	1,411	1,246	5,570	1,683
1928	1,117	887	743	650	697	913	1,054	1,248	1,344	1,458	1,411	1,246	12,769	12,769
1929	1,117	887	743	650	697	913	1,054	1,248	1,344	-1,098	-1,080	-892	5,584	12,769
1930	-766	-566	-440	-350	-444	-681	-849	-985	-1,083	57	55	116	-5,935	-9,233
1931	169	215	257	288	214	153	77	62	19	-291	-141	-80	942	1,683
1932	-45	10	50	71	20	-43	-101	-128	-159	57	55	116	-96	-836
1933	169	215	257	288	214	153	77	62	19	57	55	116	1,683	1,683
1934	169	215	257	288	214	153	77	62	19	104	87	77	1,723	1,683
1935	51	22	-7	-29	-11	-12	8	44	-1,083	1,458	1,411	1,246	3,096	-751
1936	1,117	887	743	650	697	913	1,054	1,248	1,344	1,458	1,411	1,246	12,769	12,769
1937	1,117	887	743	650	697	913	1,054	1,248	1,344	1,458	1,411	1,246	12,769	12,769
1938	1,117	887	743	650	697	913	1,054	1,248	1,344	1,458	1,411	1,246	12,769	12,769
1939	1,117	887	743	650	697	913	1,054	1,248	1,344	57	55	116	8,881	12,769
1940	169	215	257	288	214	153	77	62	1,344	1,458	1,411	1,246	6,895	3,008
1941	1,117	887	743	650	697	913	1,054	1,248	1,344	1,458	1,411	1,246	12,769	12,769
1942	1,117	887	743	650	697	913	1,054	1,248	1,344	1,458	1,411	1,246	12,769	12,769
1943	1,117	887	743	650	697	913	1,054	1,248	1,344	1,458	1,411	1,246	12,769	12,769
1944	1,117	887	743	650	697	913	1,054	1,248	1,344	57	55	116	8,881	12,769
1945	169	215	257	288	214	153	77	62	19	1,458	1,411	1,246	5,570	1,683
1946	1,117	887	743	650	697	913	1,054	1,248	1,344	57	55	116	8,881	12,769
1947	169	215	257	288	214	153	77	62	19	-1,098	-1,080	-892	-1,615	1,683
1948	-766	-566	-440	-350	-444	-681	-849	-985	-1,083	57	55	116	-5,935	-9,233
1949	169	215	257	288	214	153	77	62	19	57	55	116	1,683	1,683
1950	169	215	257	288	214	153	77	62	19	-1,098	-1,080	-892	-1,615	1,683
1951	-766	-566	-440	-350	-444	-681	-849	-985	-1,083	1,458	1,411	1,246	-2,048	-9,233
1952	1,117	887	743	650	697	913	1,054	1,248	1,344	1,458	1,411	1,246	12,769	12,769
1953	1,117	887	743	650	697	913	1,054	1,248	1,344	57	55	116	8,881	12,769
1954	169	215	257	288	214	153	77	62	19	57	55	116	1,683	1,683
1955	169	215	257	288	214	153	77	62	19	57	55	116	1,683	1,683
1956	169	215	257	288	214	153	77	62	1,344	1,458	1,411	1,246	6,895	3,008
1957	1,117	887	743	650	697	913	1,054	1,248	1,344	57	55	116	8,881	12,769
1958	169	215	257	288	214	153	77	62	1,344	1,458	1,411	1,246	6,895	3,008
1959	1,117	887	743	650	697	913	1,054	1,248	1,344	57	55	116	8,881	12,769
1960	169	215	257	288	214	153	77	62	19	104	87	77	1,723	1,683
1961	51	22	-7	-29	-11	-12	8	44	59	-291	-141	-80	-390	391
1962	-45	10	50	71	20	-43	-101	-128	-159	57	55	116	-96	-836
1963	169	215	257	288	214	153	77	62	19	1,458	1,411	1,246	5,570	1,683
1964	1,117	887	743	650	697	913	1,054	1,248	1,344	57	55	116	8,881	12,769
1965	169	215	257	288	214	153	77	62	19	1,458	1,411	1,246	5,570	1,683
1966	1,117	887	743	650	697	913	1,054	1,248	1,344	57	55	116	8,881	12,769
1967	169	215	257	288	214	153	77	62	1,344	1,458	1,411	1,246	6,895	3,008
1968	1,117	887	743	650	697	913	1,054	1,248	1,344	57	55	116	8,881	12,769
1969	169	215	257	288	214	153	77	62	1,344	1,458	1,411	1,246	6,895	3,008
1970	1,117	887	743	650	697	913	1,054	1,248	1,344	1,458	1,411	1,246	12,769	12,769
1971	1,117	887	743	650	697	913	1,054	1,248	1,344	57	55	116	8,881	12,769
1972	169	215	257	288	214	153	77	62	19	57	55	116	1,683	1,683
1973	169	215	257	288	214	153	77	62	1,344	1,458	1,411	1,246	6,895	3,008
1974	1,117	887	743	650	697	913	1,054	1,248	1,344	1,458	1,411	1,246	12,769	12,769
1975	1,117	887	743	650	697	913	1,054	1,248	1,344	1,458	1,411	1,246	12,769	12,769
1976	1,117	887	743	650	697	913	1,054	1,248	1,344	104	87	77	8,922	12,769
1977	51	22	-7	-29	-11	-12	8	44	59	-291	-141	-80	-390	391
1978	-45	10	50	71	20	-43	-101	-128	-2,269	1,458	1,411	1,246	1,681	-2,946
1979	1,117	887	743	650	697	913	1,054	1,248	1,344	57	55	116	8,881	12,769
1980	169	215	257	288	214	153	77	62	1,344	1,458	1,411	1,246	6,895	3,008
1981	1,117	887	743	650	697	913	1,054	1,248	1,344	57	55	116	8,881	12,769
1982	169	215	257	288	214	153	77	62	1,344	1,458	1,411	1,246	6,895	3,008
1983	1,117	887	743	650	697	913	1,054	1,248	1,344	1,458	1,411	1,246	12,769	12,769
1984	1,117	887	743	650	697	913	1,054	1,248	1,344	57	55	116	8,881	12,769
1985	169	215	257	288	214	153	77	62	19	57	55	116	1,683	1,683
1986	169	215	257	288	214	153	77	62	1,344	1,458	1,411	1,246	6,895	3,008
1987	1,117	887	743	650	697	913	1,054	1,248	1,344	104	87	77	8,922	12,769
1988	51	22	-7	-29	-11	-12	8	44	59	-291	-141	-80	-390	391
1989	-45	10	50	71	20	-43	-101	-128	-159	-291	-141	-80	-836	-836
1990	-45	10	50	71	20	-43	-101	-128	-159	-291	-141	-80	-836	-836
1991	-45	10	50	71	20	-43	-101	-128	-159	-291	-141	-80	-836	-836
1992	-45	10	50	71	20	-43	-101	-128	-159	-291	-141	-80	-836	-836
1993	-45	10	50	71	20	-43	-101	-128	-2,269	1,458	1,411	1,246	1,681	-2,946
1994	1,117	887	743	650	697	913	1,054	1,248	1,344	104	87	77	8,922	12,769
1995	51	22	-7	-29	-11	-12	-849	-985	-1,083	1,458	1,411	1,246	1,211	-2,636
1996	1,117	887	743	650	697	913	1,054	1,248	1,344	1,458	1,411	1,246	12,769	12,769
1997	1,117	887	743	650	697	913	1,054	1,248	1,344	1,458	1,411	1,246	12,769	12,769
1998	1,117	887	743	650	697	913	1,054	1,248	1,344	1,458	1,411	1,246	12,769	12,769
1999	1,117	887	743	650	697	913	1,054	1,248	1,344	1,458	1,411	1,246	12,769	12,769
2000	1,117	887	743	650	697	913	1,054	1,248	1,344	1,458	1,411	1,246	12,769	12,769
2001	1,117	887	743	650	697	913	1,054	1,248	1,344	57	55	116	8,881	12,769
2002	169	215	257	288	214	153	77	62	19	57	55	116	1,683	1,683
Avg (21-02)	545	462	415	385	376	442	464	543	633	619	612	568	6,064	6,112

Table 2.2-1

Difference in Total SJPL (Acre-feet)

No Program minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
1921	4,756	-3,682	-6,660	3,805	3,437	-9,513	-2,118	-2,189	-2,118	-2,189	-2,189	-2,118	-20,778	-19,581
1922	475	0	-10,465	2,855	12,030	8,562	0	-2,189	-2,118	-2,189	-2,189	-2,118	2,654	2,654
1923	4,756	921	-6,660	8,562	7,734	-5,803	-2,118	-2,189	-2,118	-2,189	-2,189	-2,118	-3,411	-3,411
1924	1,807	0	-19,027	952	859	-5,803	-2,118	-2,189	-2,118	-2,189	-2,189	-2,118	-34,133	-34,133
1925	-2,189	19,334	0	-5,803	-5,242	-5,803	-2,118	-2,189	-2,118	-2,189	-2,189	-2,118	-12,624	-12,624
1926	-2,189	-5,616	-12,891	-5,803	4,296	-5,803	-2,118	-2,189	-2,118	-2,189	-2,189	-2,118	-40,927	-40,927
1927	-2,379	4,603	-14,270	2,855	3,437	5,709	1,841	-5,043	-4,880	-2,189	-2,189	-2,118	-14,623	-14,623
1928	2,854	0	-12,891	0	0	5,709	4,603	-2,189	-2,118	-2,189	-2,189	-2,118	-10,528	-10,528
1929	475	0	-15,222	952	859	-5,803	-2,118	-2,189	-2,118	-2,189	-2,189	-2,118	-31,660	-31,660
1930	-2,189	19,334	0	-5,803	-5,242	-5,803	-2,118	-2,189	-2,118	-2,189	-2,189	-2,118	-12,624	-12,624
1931	-2,189	-5,616	-12,891	-5,803	-5,242	-5,803	-2,118	-2,189	-2,118	-2,567	-2,567	-2,483	-51,586	-50,465
1932	-1,330	-2,762	-3,139	9,038	-3,437	-5,803	-4,880	-9,799	-9,483	-2,189	-2,189	-2,118	-38,091	-39,212
1933	951	-1,841	-12,891	-1,902	-1,719	-5,803	-2,118	-2,189	-2,118	-2,189	-2,189	-2,118	-36,126	-36,126
1934	-2,189	-5,616	-24,735	-1,902	-1,719	-5,803	-2,118	-2,189	-2,118	-2,189	-2,189	-2,118	-54,885	-54,885
1935	-2,189	19,334	0	-5,803	-5,242	-5,803	-2,118	-5,043	-4,880	-2,189	-2,189	-2,118	-18,240	-18,240
1936	-2,189	-4,603	-12,891	-2,854	11,171	-5,803	-2,118	-2,189	-2,118	-2,189	-2,189	-2,118	-30,090	-30,090
1937	-952	-1,841	-19,027	0	12,030	10,656	920	-2,189	-2,118	-2,189	-2,189	-2,118	-9,017	-9,017
1938	1,807	0	-9,323	5,709	12,030	13,319	5,524	-2,189	-2,118	-2,189	-2,189	-2,118	18,263	18,263
1939	4,756	921	-14,270	952	859	-5,803	-2,118	-2,189	-2,118	-2,189	-2,189	-2,118	-25,506	-25,506
1940	-2,189	19,334	0	-5,803	2,578	952	4,603	-6,945	-6,721	-2,189	-2,189	-2,118	-687	-687
1941	4,756	921	-7,611	13,319	0	951	920	0	0	-2,189	-2,189	-2,118	6,760	6,760
1942	951	0	-7,611	8,562	0	4,757	0	0	0	-2,189	-2,189	-2,118	163	163
1943	1,807	921	-12,891	8,562	7,734	952	-2,118	-2,189	-2,118	-2,189	-2,189	-2,118	-5,836	-5,836
1944	4,756	921	-17,124	952	859	-5,803	-2,118	-2,189	-2,118	-2,189	-2,189	-2,118	-28,360	-28,360
1945	1,807	19,334	0	-5,803	-1,719	-5,803	-2,118	-2,189	-2,118	-2,189	-2,189	-2,118	-5,105	-5,105
1946	-2,189	-1,841	-6,660	13,319	12,030	-5,803	-2,118	-2,189	-2,118	-2,189	-2,189	-2,118	-4,065	-4,065
1947	-952	0	-17,124	0	0	-5,803	-2,118	-2,189	-2,118	-2,189	-2,189	-2,118	-36,800	-36,800
1948	-2,189	-5,616	-12,891	-5,803	-4,297	-5,803	-2,118	-2,189	-2,118	-2,189	-2,189	-2,118	-49,520	-49,520
1949	-2,189	-5,616	-19,979	0	0	4,757	-2,118	-2,189	-2,118	-2,189	-2,189	-2,118	-35,948	-35,948
1950	951	19,334	0	-5,803	-5,242	-5,803	-2,118	-2,189	-2,118	-2,189	-2,189	-2,118	-9,484	-9,484
1951	-2,189	-4,603	-6,660	7,610	6,874	-6,659	-2,118	-7,897	-7,642	-2,189	-2,189	-2,118	-29,780	-29,780
1952	2,854	0	-7,611	0	0	0	-3,683	-5,043	-4,880	-2,189	-2,189	-2,118	-24,859	-24,859
1953	4,756	921	-6,660	8,562	7,734	-5,803	-2,118	-2,189	-2,118	-2,189	-2,189	-2,118	-3,411	-3,411
1954	2,854	921	-17,124	952	2,578	-5,803	-2,118	-2,189	-2,118	-2,189	-2,189	-2,118	-28,543	-28,543
1955	1,807	19,334	0	-5,803	-5,242	-5,803	-2,118	-2,189	-2,118	-2,189	-2,189	-2,118	-8,628	-8,628
1956	-2,189	-5,616	-6,660	3,805	0	3,805	-2,118	-5,043	-4,880	-2,189	-2,189	-2,118	-25,392	-25,392
1957	2,854	0	-19,027	952	859	-5,803	-2,118	-2,189	-2,118	-2,189	-2,189	-2,118	-33,086	-33,086
1958	-2,189	-2,762	-12,891	952	12,030	13,319	0	-3,901	-3,775	-2,189	-2,189	-2,118	-5,713	-5,713
1959	2,854	921	-17,124	952	11,171	-5,803	-2,118	-2,189	-2,118	-2,189	-2,189	-2,118	-19,950	-19,950
1960	-2,189	19,334	0	-5,803	-5,242	-5,803	-2,118	-2,189	-2,118	-2,189	-2,189	-2,118	-12,624	-12,624
1961	-2,189	-5,616	-6,707	381	-5,242	-5,803	-2,118	-2,189	-2,118	-2,567	-2,567	-2,483	-39,218	-38,097
1962	-5,421	368	-16,649	1,427	-7,734	-10,560	-2,118	-9,799	-9,483	-2,189	-2,189	-2,118	-66,465	-67,586
1963	-2,379	-4,603	-12,891	10,656	3,437	5,709	-4,603	-1,902	-1,841	-2,189	-2,189	-2,118	-14,913	-14,913
1964	-2,189	921	-19,027	2,855	2,578	-5,803	-2,118	-2,189	-2,118	-2,189	-2,189	-2,118	-33,586	-33,586
1965	-2,189	19,334	0	2,854	2,578	-5,803	460	-5,708	-5,524	-2,189	-2,189	-2,118	-494	-494
1966	2,854	2,762	-12,368	952	859	-5,803	-2,118	-2,189	-2,118	-2,189	-2,189	-2,118	-23,665	-23,665
1967	-2,189	-5,616	-14,270	13,319	12,030	9,514	2,762	0	0	-2,189	-2,189	-2,118	9,054	9,054
1968	-952	0	-12,891	4,757	4,296	-5,803	-2,118	-2,189	-2,118	-2,189	-2,189	-2,118	-23,514	-23,514
1969	-2,189	-2,762	-17,124	13,319	2,406	7,610	-4,880	-5,043	-4,880	-2,189	-2,189	-2,118	-20,039	-20,039
1970	4,756	19,334	0	952	859	-5,803	-2,118	-2,189	-2,118	-2,189	-2,189	-2,118	7,177	7,177
1971	951	2,762	-6,660	13,319	12,030	-5,803	-2,118	-2,189	-2,118	-2,189	-2,189	-2,118	3,678	3,678
1972	-2,189	-5,616	-17,124	0	0	-5,803	-2,118	-2,189	-2,118	-2,189	-2,189	-2,118	-43,653	-43,653
1973	-2,189	-5,616	-12,891	13,319	12,030	8,562	-2,118	-5,043	-4,880	-2,189	-2,189	-2,118	-5,322	-5,322
1974	2,854	4,603	-6,660	8,562	7,734	4,757	-4,603	-5,043	-4,880	-2,189	-2,189	-2,118	828	828
1975	5,708	19,334	0	-5,803	4,296	3,805	-921	-5,043	-4,880	-2,189	-2,189	-2,118	10,000	10,000
1976	5,708	921	-12,891	-1,902	-1,719	-5,803	-2,118	-2,189	-2,118	-2,189	-2,189	-2,118	-28,607	-28,607
1977	-2,189	-5,616	-21,881	6,184	0	-5,803	-2,118	-2,189	-2,118	-2,567	3,617	3,501	-31,179	-42,226
1978	4,854	368	-6,707	475	-6,015	-4,757	0	-5,803	-5,616	-2,189	-2,189	-2,118	-29,697	-18,650
1979	2,854	921	-19,027	952	12,030	-2,854	-2,118	-2,189	-2,118	-2,189	-2,189	-2,118	-18,045	-18,045
1980	-2,189	19,334	0	-1,902	0	-5,899	-2,118	-6,945	-6,721	-2,189	-2,189	-2,118	-12,936	-12,936
1981	2,854	0	-12,891	5,709	5,156	-5,803	-2,118	-2,189	-2,118	-2,189	-2,189	-2,118	-17,896	-17,896
1982	-952	921	-10,465	13,319	6,874	5,899	0	-4,756	-4,603	-2,189	-2,189	-2,118	-259	-259
1983	1,807	2,762	-6,660	3,805	0	0	2,762	2,855	2,762	-2,189	-2,189	-2,118	3,597	3,597
1984	-2,189	4,603	-6,660	8,562	7,734	-5,803	-2,118	-2,189	-2,118	-2,189	-2,189	-2,118	-6,674	-6,674
1985	-2,189	19,334	0	-5,803	-5,242	-5,803	-2,118	-2,189	-2,118	-2,189	-2,189	-2,118	-12,624	-12,624
1986	-2,189	-5,616	-12,891	-5,803	4,297	952	-2,762	-6,945	-6,721	-2,189	-2,189	-2,118	-44,174	-44,174
1987	2,854	921	-19,027	952	859	-5,803	-2,118	-2,189	-2,118	-2,189	-2,189	-2,118	-32,165	-32,165
1988	-2,189	-5,616	-12,891	-5,803	-4,297	-5,803	-2,118	-2,189	-2,118	-2,567	-2,567	-2,483	-50,641	-49,520
1989	2,476	-1,841	-17,124	2,855	2,578	-5,803	-2,118	-9,799	-9,483	-5,421	-5,421	-1,286	-50,387	-45,876
1990	-2,281	19,334	0	-5,803	-5,242	-5,803	-2,118	-6,945	-6,721	-5,421	-3,232	-2,207	-26,439	-27,707
1991	-379	921	-12,368	4,757	4,296	-4,756	-6,721	-4,756	-4,603	-5,421	-2,281	-366	-31,677	-34,469
1992	-379	-4,603	-17,124	2,855	-1,031	-10,560	-4,880	-9,799	-9,483	-378	1,524	2,396	-51,462	-63,072
1993	2,476	-3,682	-12,368	2,663	0	3,805	-4,603	-2,854	-2,762	-2,189	-2,189	-2,118	-23,821	-13,783
1994	2,854	921	-17,124	0	0	-5,803	-2,118	-2,189	-2,118	-2,189	-2,189	-2,118	-32,073	-32,073
1995	-2,189	19,334	0	-6,659	-4,297	0	-10,127	-6,659	-6,445	-2,189	-2,189	-2,118	-23,538	-23,538
1996	2,854	921	-12,891	8,562	0	951	-4,880	-5,043	-4,880	-2,189	-2,189	-2,118	-20,902	-20,902
1997	951	4,603	-6,660	0	0	-10,560	-2,118	-2,189	-2,118	-2,189	-2,189	-2,118	-24,587	-24,587
1998	-952	-1,841	-12,891	13,319	0	0	-6,444	-1,047	-1,013	-2,189	-2,189	-2,118	-17,365	-17,365
1999	4,756	0	-17,124	4,757	7,734	0	-1,841	-2,189	-2,118	-2,189	-2,189	-2,118	-12,521	-12,521
2000	2,854	19,334	0	-5,803	2,578	-7,611	-2,118	-2,189	-2,118	-2,189	-2,189	-2,118	-1,569	-1,569
2001	-952	-1,841	-12,891	-2,854	2,578	-4,756	-2,118	-2,189	-2,118	-2,189	-2,189	-2,118	-33,637	-33,637
2002	0	-1,841	-9,323	2,855	2,578	-5,803	-2,118	-2,189	-2,118	-2,189	-2,189	-2,118	-24,455	-24,455
Avg (21-02)	356	2,824	-10,342	1,888	2,039	-2,546	-1,900	-3,249	-3,144	-2,304	-2,140	-1,977	-20,496	-20,481

existing capacity of the SJPL available in the alternative, and with scheduled maintenance for the facility, the additional demand on the system would require the SJPL to operate on an average annual basis of approximately 95 percent of it capacity, and in many years full capacity. Overall, compared to the WSIP setting, the alternative setting would divert less water from the Tuolumne.

Table 2.2-2 illustrates the difference in diversions to the SJPL between the alternative and base settings. During many springs and summers, there is little or no difference in diversions to the SJPL alternative and base settings. This indicates that the SJPL is conveying water at maximum capacity in both settings, attempting to retain storage in the Bay Area reservoirs. During the fall and winter, the increase in diversions to the SJPL indicates the system's need to serve additional demand and replenish Bay Area reservoirs. The reduction in diversion during December indicates the implementation of annual system-wide maintenance within the Hetch Hetchy conveyance facilities that currently does not occur. Overall, there would be an increase in average annual diversions to the SJPL in the alternative setting.

The average monthly diversion through the SJPL by year type for the 82-year simulation period for the proposed program and the alternative settings, and the difference between the two settings, are illustrated in Table 2.2-3. Table 2.2-4 presents the same information for the alternative and base settings.

2.3 Hetch Hetchy Reservoir and Releases

Compared to the WSIP setting, the alternative setting would draw less water from the Tuolumne in most years. This circumstance would lead to less draw from Hetch Hetchy Reservoir in most years. Figure 2.3-1 illustrates a chronological trace of the simulation of Hetch Hetchy Reservoir storage and stream releases. Shown in Figure 2.3-1 are the results for the WSIP, alternative ("No Program"), and base ("Base – Calaveras Constrained") settings. Supplementing the Figure 2.3-1 representation of Hetch Hetchy Reservoir storage are Table 2.3-1 Hetch Hetchy Reservoir Storage (No Program), Table 2.3-2 Hetch Hetchy Reservoir Storage (WSIP), and Table 2.3-3 Difference in Hetch Hetchy Reservoir Storage (No Program minus WSIP). Table 2.3-4 illustrates the difference in Hetch Hetchy Reservoir storage between the base and alternative settings.

Table 2.3-3 shows that, by the end of summer, storage in Hetch Hetchy Reservoir associated with the alternative setting would be greater than the storage in the WSIP setting, albeit typically an increase of less than 10,000 acre-feet. In about 16 percent of the years, storage would be greater by 10,000 acre-feet or more. The relatively minor increases in storage are attributable to less water being diverted during the summer to the SJPL due to a lesser conveyance capacity. The lesser capacity does not always lead to an increase in storage because, in many years, the same release from Hetch Hetchy Reservoir (via Canyon Tunnel) occurs regardless of the diversion to the SJPL, with any flow not being diverted to the SJPL flowing to Don Pedro Reservoir. The larger increases in storage are associated with years or periods during which the increase in severity of water delivery shortages between the WSIP and alternative settings require less water to be diverted to the SJPL. Through the fall and winter, storage in Hetch Hetchy Reservoir would typically be higher, but could be lower depending on the system's need to replenish Bay Area reservoir storage, which is lower due to the lesser conveyance capacity of the SJPL. Hetch Hetchy Reservoir would fill by the end of May during approximately 61 percent of the years, which would negate any difference in storage from carrying into the next summer. Figure 2.3-2 illustrates the difference in reservoir storage averaged by year type for the comparison of the alternative to the WSIP setting. Also shown is the average difference in storage for the two settings during the 82-year simulation.

Table 2.3-4 illustrates the difference in Hetch Hetchy Reservoir storage between the alternative and base settings. Throughout the summer and early fall, there would be very little difference in storage levels between the two settings. Beginning in fall, storage would slightly decrease in the alternative setting, as additional diversions to the SJPL would be needed to replenish Bay Area reservoir storage, which would be affected by the additional demand of the alternative setting during the summer. Storage becomes greater in December of the alternative setting due to the assumed system-wide maintenance that occurs in the alternative (no water being conveyed through the SJPL), which does not occur in the base setting. After December, storage in the alternative setting again becomes affected as Bay Area reservoir storage begins to replenish. In most years, there is a difference in storage between the alternative and base settings; the alternative setting results in a lower storage in the reservoir by the end of April.

Table 2.2-2

Difference in Total SJPL (Acre-feet)

No Program minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
1921	5,708	-4,603	-6,660	3,805	3,437	4,757	0	0	0	0	0	0	6,444	11,968
1922	0	0	-10,465	9,514	12,030	8,562	7,365	2,854	2,762	0	0	0	32,622	32,622
1923	4,756	0	-6,660	8,562	7,734	9,514	0	0	0	0	0	0	23,906	23,906
1924	2,854	0	-19,979	0	0	0	0	0	0	0	0	0	-17,125	-17,125
1925	0	0	-15,222	0	12,030	9,514	0	0	0	0	0	0	6,322	6,322
1926	2,854	0	-19,979	0	12,030	9,514	0	0	0	0	0	0	4,419	4,419
1927	1,902	5,524	-15,222	10,656	3,437	9,514	1,841	-2,854	-2,762	0	0	2,762	14,798	12,036
1928	5,708	0	-14,270	5,709	5,156	13,319	4,603	0	0	0	0	2,762	22,987	22,987
1929	5,708	0	-15,222	5,709	5,156	4,757	0	0	0	0	0	0	6,108	8,870
1930	0	0	-19,979	0	0	9,514	0	0	0	0	0	0	-10,465	-10,465
1931	0	0	-19,979	0	4,296	0	0	0	0	-378	-378	-365	-16,804	-15,683
1932	7,232	4,603	-10,465	13,319	3,437	10,656	-2,762	-1,902	-1,841	0	0	0	22,277	21,156
1933	2,854	0	-19,979	5,709	5,156	4,757	0	0	0	0	0	0	-1,503	-1,503
1934	0	0	-19,979	5,709	8,593	4,757	0	0	0	0	0	0	-920	-920
1935	0	0	-19,979	10,656	9,624	4,757	0	2,854	2,762	0	0	0	10,674	10,674
1936	4,756	0	-19,979	9,514	12,030	9,514	0	0	0	0	0	0	15,835	15,835
1937	2,854	0	-19,979	5,709	12,030	13,319	2,762	2,854	2,762	0	0	0	22,311	22,311
1938	5,708	0	-10,465	13,319	12,030	13,319	12,889	2,854	2,762	0	0	2,762	55,178	52,416
1939	4,756	0	-15,222	4,757	4,296	4,757	0	0	0	0	0	0	3,344	6,106
1940	0	0	-19,979	5,709	12,030	13,319	11,968	-1,902	-1,841	0	0	0	19,304	19,304
1941	4,756	0	-10,465	13,319	0	951	920	2,854	2,762	0	0	0	15,097	15,097
1942	2,854	0	-9,323	8,562	0	8,562	5,524	2,854	2,762	0	0	0	21,795	21,795
1943	4,756	4,603	-19,979	8,562	7,734	8,562	2,762	2,854	2,762	0	0	0	22,616	22,616
1944	4,756	0	-19,979	5,709	9,624	9,514	0	0	0	0	0	0	9,624	9,624
1945	0	0	-19,979	0	12,030	9,514	0	0	0	0	0	0	1,565	1,565
1946	4,756	0	-6,660	13,319	12,030	5,709	0	0	0	0	0	0	29,154	29,154
1947	0	0	-15,222	4,757	4,296	4,757	0	0	0	0	0	0	-1,412	-1,412
1948	0	0	-19,979	0	0	0	0	0	0	0	0	0	-19,979	-19,979
1949	0	0	-19,979	0	0	0	0	0	0	0	0	2,762	-17,217	-19,979
1950	4,756	0	-19,979	12,368	11,171	4,757	0	0	0	0	0	0	13,073	15,835
1951	0	0	-6,660	7,610	6,874	0	0	-5,708	-5,524	0	0	2,762	-646	-3,408
1952	4,756	0	-7,611	0	0	0	7,365	0	0	0	0	0	4,510	7,272
1953	4,756	0	-7,611	8,562	7,734	9,514	0	0	0	0	0	0	22,955	22,955
1954	0	0	-19,979	9,514	9,624	9,514	0	0	0	0	0	0	8,673	8,673
1955	0	0	-15,222	12,368	11,171	0	0	0	0	0	0	0	8,317	8,317
1956	0	0	-10,465	3,805	0	7,610	0	0	0	0	0	0	950	950
1957	4,756	0	-19,979	5,709	9,624	4,757	0	0	0	0	0	0	4,867	4,867
1958	2,854	0	-15,222	4,757	12,030	13,319	0	-952	-921	0	0	0	15,865	15,865
1959	4,756	0	-19,979	9,514	11,171	9,514	0	0	0	0	0	0	14,976	14,976
1960	0	0	-19,979	0	4,296	0	0	0	0	0	0	0	-15,683	-15,683
1961	0	0	-15,222	5,709	5,156	0	0	0	0	-378	-378	11,603	6,490	-4,357
1962	9,135	0	-19,979	5,709	3,437	7,611	0	-1,902	-1,841	0	0	2,762	4,932	13,017
1963	2,854	0	-15,222	13,319	3,437	12,368	0	0	0	0	0	0	16,756	19,518
1964	4,756	4,603	-19,979	12,368	11,171	0	0	0	0	0	0	0	12,919	12,919
1965	0	0	-15,222	8,562	7,734	9,514	4,603	-4,756	-4,603	0	0	2,762	8,594	5,832
1966	4,756	4,603	-14,270	9,514	8,593	4,757	0	0	0	0	0	0	17,953	20,715
1967	0	0	-19,979	13,319	12,030	12,368	5,524	0	0	0	0	0	23,262	23,262
1968	4,756	0	-19,979	13,319	12,030	4,757	0	0	0	0	0	0	14,883	14,883
1969	0	0	-15,222	13,319	2,406	7,610	2,762	0	0	0	0	0	10,875	10,875
1970	4,756	0	-15,222	13,319	12,030	9,514	0	0	0	0	0	0	24,397	24,397
1971	4,756	4,603	-7,611	13,319	12,030	4,757	0	0	0	0	0	0	31,854	31,854
1972	0	0	-15,222	4,757	4,296	0	0	0	0	0	0	0	-6,169	-6,169
1973	0	0	-19,979	13,319	12,030	8,562	4,603	-2,854	-2,762	0	0	2,762	15,681	12,919
1974	4,756	4,603	-6,660	8,562	7,734	13,319	921	0	0	0	0	2,762	35,997	35,997
1975	4,756	0	-19,979	5,709	12,030	7,610	7,365	0	0	0	0	0	17,491	20,253
1976	5,708	0	-19,979	4,757	4,296	0	0	0	0	0	0	0	-5,218	-5,218
1977	0	0	-19,979	5,709	5,156	0	0	0	0	-378	-378	2,397	-7,473	-9,114
1978	7,232	4,603	-15,222	7,610	859	3,805	10,311	0	0	0	0	0	19,198	20,839
1979	4,756	0	-19,979	9,514	12,030	9,514	0	0	0	0	0	0	15,835	15,835
1980	4,756	0	-15,222	13,319	0	2,663	2,762	-1,902	-1,841	0	0	0	4,535	4,535
1981	4,756	0	-19,979	13,319	12,030	9,514	0	0	0	0	0	0	19,640	19,640
1982	0	4,603	-15,222	13,319	6,874	8,562	0	-1,902	-1,841	0	0	0	14,393	14,393
1983	4,756	4,603	-9,323	3,805	0	0	5,708	5,709	5,524	0	0	0	20,782	20,782
1984	2,854	4,603	-6,660	8,562	7,734	0	0	0	0	0	0	0	17,093	17,093
1985	0	4,603	-15,222	0	4,296	4,757	0	0	0	0	0	0	-1,566	-1,566
1986	0	0	-19,979	0	7,734	8,562	4,603	-1,902	-1,841	0	0	0	-2,823	-2,823
1987	4,756	0	-19,979	4,757	4,296	4,757	0	0	0	0	0	0	-1,413	-1,413
1988	0	0	-19,979	0	4,296	0	0	0	0	2,476	4,378	2,397	-6,432	-15,683
1989	7,232	4,603	-15,222	5,709	5,156	4,757	0	-7,610	-7,365	2,476	2,476	-3,127	-915	6,511
1990	-379	4,603	-15,222	5,709	5,156	4,757	0	-4,756	-4,603	2,476	2,476	-366	-149	-2,910
1991	-379	4,603	-15,222	0	5,156	12,368	-4,603	-7,610	-7,365	2,476	2,476	4,237	-3,863	-8,466
1992	4,378	-4,603	-14,270	10,656	2,406	7,611	-2,762	-1,902	-1,841	-378	2,476	4,237	6,008	8,862
1993	4,378	-4,603	-10,465	2,663	0	3,805	4,603	-1,902	-1,841	0	0	0	-3,362	2,973
1994	4,756	0	-19,979	4,757	8,593	4,757	0	0	0	0	0	2,762	5,646	2,884
1995	4,756	0	-19,979	3,805	3,437	0	-921	-2,854	-2,762	0	0	2,762	-11,756	-11,756
1996	4,756	0	-15,222	8,562	0	951	1,841	-2,854	-2,762	0	0	2,762	-1,966	-1,966
1997	5,708	5,524	-6,660	0	0	952	0	0	0	0	0	0	5,524	8,286
1998	0	0	-14,270	13,319	0	951	921	2,854	2,762	0	0	2,762	9,299	6,537
1999	5,708	0	-15,222	13,319	7,734	9,514	921	2,854	2,762	0	0	2,762	30,352	30,352
2000	4,756	0	-19,979	9,514	12,030	5,899	0	0	0	0	0	2,762	14,982	14,982
2001	4,756	0	-19,979	5,709	11,171	9,514	0	0	0	0	0	0	11,171	13,933
2002	2,854	0	-10,465	9,514	8,593	4,757	0	0	0	0	0	0	15,253	15,253
Avg (21-02)	2,979	752	-15,763	7,059	6,575	5,977	1,273	-325	-314	102	160	762	9,238	9,305

Table 2.2-3

Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — No Program

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	27,066	19,046	0	15,210	10,086	13,248	19,852	22,773	22,038	27,589	27,589	26,699	231,197	230,239
Above Normal	27,231	19,334	0	18,244	13,092	16,789	22,583	24,791	23,991	27,589	27,589	26,699	247,932	247,866
Normal	27,387	19,046	0	18,790	16,434	18,790	26,699	26,935	26,066	27,589	27,589	26,699	262,024	261,954
Below Normal	27,097	19,334	0	19,979	18,045	19,979	26,428	26,694	25,833	27,209	27,209	25,898	263,704	264,364
Dry	26,590	19,046	0	19,979	17,444	19,682	26,526	26,816	25,951	27,091	27,091	25,641	261,857	262,252
All Years	27,076	19,166	0	18,457	15,033	17,714	24,420	25,605	24,779	27,413	27,413	26,327	253,403	253,403

Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	27,358	16,624	8,533	11,512	7,465	11,298	21,561	26,603	25,744	29,778	29,778	28,817	245,069	242,794
Above Normal	26,705	14,785	7,751	14,254	9,306	16,705	24,176	28,608	27,685	29,778	29,778	28,817	258,347	258,347
Normal	26,174	14,713	8,765	15,626	12,095	22,405	28,207	29,778	28,817	29,778	29,778	28,817	274,953	274,878
Below Normal	27,338	16,106	11,931	21,523	18,520	25,038	28,817	29,481	28,530	29,778	29,593	27,864	294,520	295,079
Dry	25,990	19,593	14,794	19,764	17,471	25,782	28,817	29,778	28,817	29,463	28,821	27,200	296,289	297,969
All Years	26,721	16,342	10,342	16,569	12,994	20,261	26,320	28,854	27,923	29,717	29,553	28,304	273,899	273,884

Difference in Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — No Program minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	-292	2,423	-8,533	3,698	2,621	1,950	-1,709	-3,829	-3,706	-2,189	-2,189	-2,118	-13,873	-12,555
Above Normal	526	4,549	-7,751	3,990	3,786	84	-1,592	-3,817	-3,694	-2,189	-2,189	-2,118	-10,415	-10,481
Normal	1,213	4,333	-8,765	3,163	4,339	-3,615	-1,508	-2,843	-2,751	-2,189	-2,189	-2,118	-12,929	-12,924
Below Normal	-241	3,228	-11,931	-1,544	-475	-5,059	-2,389	-2,788	-2,697	-2,569	-2,385	-1,966	-30,816	-30,715
Dry	600	-547	-14,794	215	-27	-6,100	-2,291	-2,962	-2,866	-2,372	-1,730	-1,559	-34,432	-35,717
All Years	356	2,824	-10,342	1,888	2,039	-2,546	-1,900	-3,249	-3,144	-2,304	-2,140	-1,977	-20,496	-20,481

Table 2.2-4

Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — No Program

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	27,066	19,046	0	15,210	10,086	13,248	19,852	22,773	22,038	27,589	27,589	26,699	231,197	230,239
Above Normal	27,231	19,334	0	18,244	13,092	16,789	22,583	24,791	23,991	27,589	27,589	26,699	247,932	247,866
Normal	27,387	19,046	0	18,790	16,434	18,790	26,699	26,935	26,066	27,589	27,589	26,699	262,024	261,954
Below Normal	27,097	19,334	0	19,979	18,045	19,979	26,428	26,694	25,833	27,209	27,209	25,898	263,704	264,364
Dry	26,590	19,046	0	19,979	17,444	19,682	26,526	26,816	25,951	27,091	27,091	25,641	261,857	262,252
All Years	27,076	19,166	0	18,457	15,033	17,714	24,420	25,605	24,779	27,413	27,413	26,327	253,403	253,403

Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Base - Calaveras Constrained

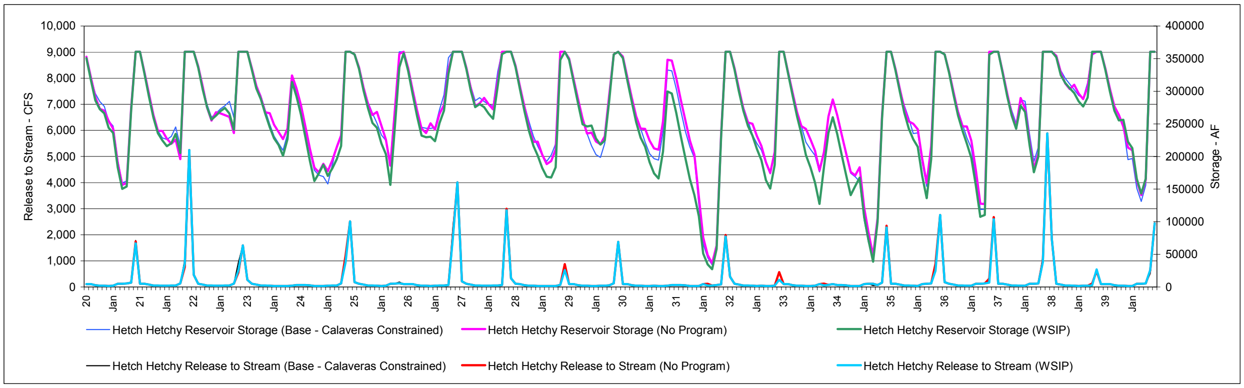
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	24,260	18,126	13,783	8,028	6,015	7,433	16,031	23,070	22,326	27,589	27,589	26,009	220,258	218,975
Above Normal	24,176	17,926	14,204	9,100	6,157	9,279	20,309	24,679	23,883	27,589	27,589	25,887	230,776	230,776
Normal	23,368	19,046	14,390	9,930	6,864	10,632	25,951	27,054	26,181	27,589	27,589	26,009	244,601	243,681
Below Normal	24,959	17,980	17,964	15,726	11,808	15,334	26,699	27,589	26,699	26,917	26,917	25,670	264,263	264,595
Dry	23,665	19,046	18,433	14,080	11,386	15,936	26,699	27,232	26,354	26,876	26,578	24,225	260,509	262,015
All Years	24,097	18,413	15,763	11,398	8,459	11,737	23,147	25,930	25,093	27,311	27,253	25,565	244,165	244,098

Difference in Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — No Program minus Base - Calaveras Constrained

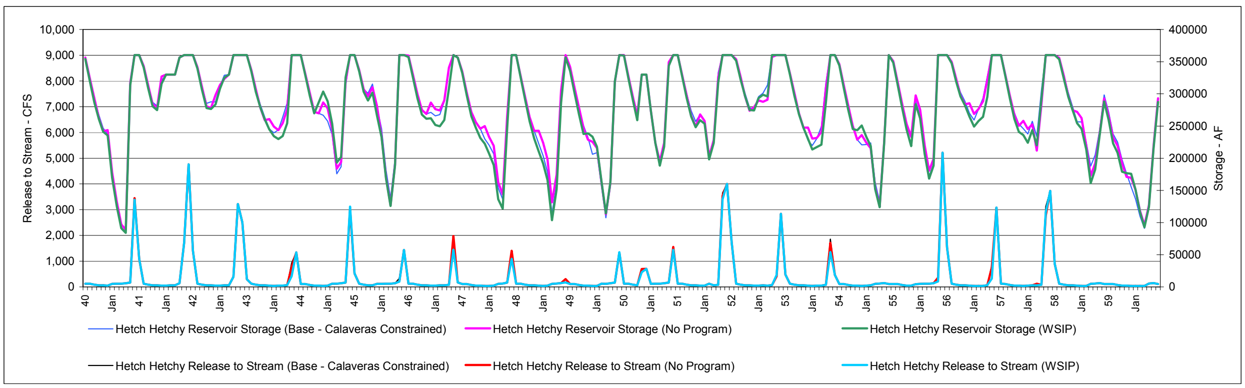
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	2,807	921	-13,783	7,183	4,071	5,815	3,821	-297	-288	0	0	691	10,939	11,265
Above Normal	3,055	1,408	-14,204	9,144	6,935	7,510	2,274	112	108	0	0	812	17,156	17,091
Normal	4,019	0	-14,390	8,860	9,570	8,158	748	-119	-115	0	0	691	17,422	18,273
Below Normal	2,138	1,354	-17,964	4,253	6,237	4,645	-271	-895	-866	291	291	228	-559	-230
Dry	2,925	0	-18,433	5,899	6,058	3,746	-173	-416	-403	215	512	1,417	1,348	237
All Years	2,979	752	-15,763	7,059	6,575	5,977	1,273	-325	-314	102	160	762	9,238	9,305

Figure 2.3-1
Hetch Hetchy Reservoir Storage and Stream Release

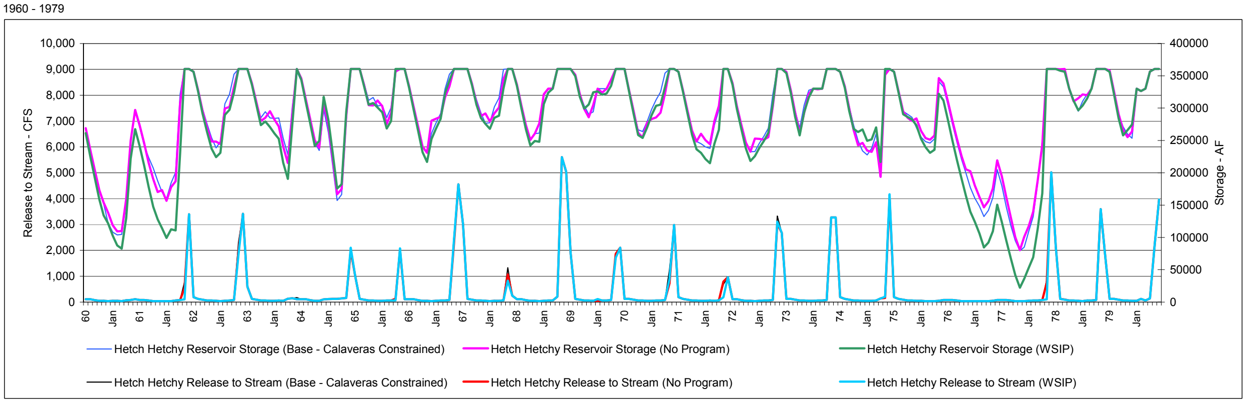
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

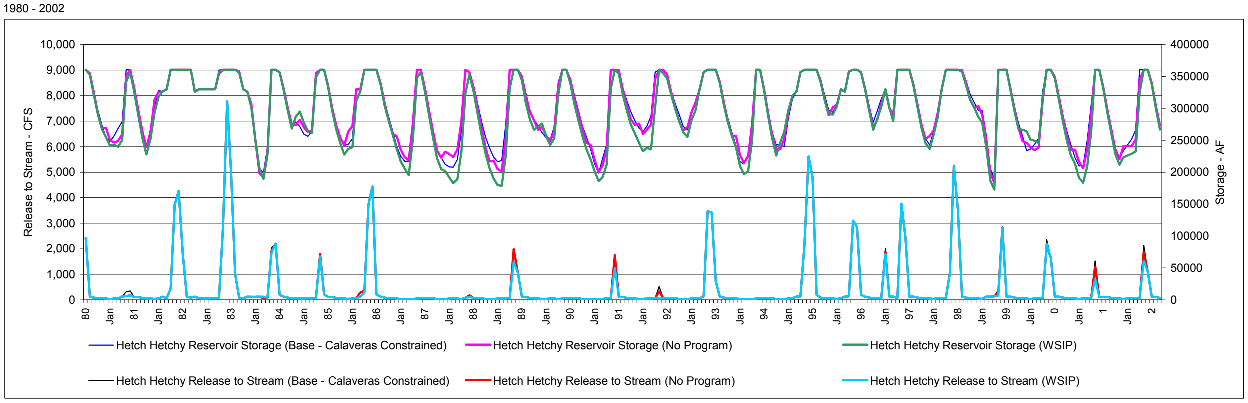


Table 2.3-1

Hetch Hetchy Reservoir Storage (Acre-feet) No Program

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	272,893	270,218	254,702	242,954	190,360	156,433	159,427	275,467	360,400	360,400	328,999	296,132
1922	263,554	239,474	239,015	227,228	219,665	225,679	195,992	360,400	360,400	360,400	338,270	307,157
1923	275,365	255,150	267,887	266,038	263,443	260,531	235,886	360,400	360,400	360,400	335,374	308,545
1924	290,590	267,956	266,452	248,532	237,439	226,674	242,568	324,188	304,555	278,786	245,691	211,925
1925	183,077	175,778	188,815	177,549	194,420	214,214	232,180	360,400	360,400	356,465	336,398	305,731
1926	280,575	263,534	268,396	247,076	225,673	186,028	270,552	357,169	360,400	335,420	302,178	270,343
1927	242,836	235,902	250,810	241,269	265,411	278,790	333,632	360,400	360,400	360,400	335,906	305,535
1928	276,982	281,636	289,885	279,962	272,110	316,960	360,400	360,400	360,400	339,284	307,062	275,931
1929	245,240	222,435	222,551	202,836	188,326	193,097	210,771	360,400	360,400	350,290	318,800	287,725
1930	258,166	235,262	236,592	222,883	218,690	230,971	294,451	356,465	360,400	352,956	321,099	289,912
1931	261,671	242,966	242,164	224,408	212,377	210,298	253,701	348,141	346,961	319,572	286,822	255,051
1932	224,424	202,899	138,042	76,171	49,127	36,436	63,563	233,502	360,400	360,400	335,277	304,222
1933	273,508	252,000	250,124	231,423	215,987	191,239	174,783	206,904	360,400	360,400	328,781	297,686
1934	267,451	246,451	242,318	225,701	208,569	178,613	206,684	261,373	287,271	263,192	233,328	204,166
1935	176,349	170,738	183,525	121,596	83,814	47,773	105,533	263,279	360,400	360,400	333,976	303,626
1936	273,576	253,792	250,223	241,701	196,532	159,238	215,269	360,400	360,400	356,465	330,041	298,414
1937	267,747	246,253	245,892	223,957	179,565	127,909	127,074	360,400	360,400	360,400	329,400	296,775
1938	265,270	244,869	289,372	273,954	223,044	181,541	205,123	360,400	360,400	360,400	354,217	329,018
1939	312,011	303,293	310,032	296,538	287,831	307,118	356,592	360,400	360,400	334,345	303,865	276,815
1940	263,881	245,583	213,652	209,702	162,684	140,732	164,120	360,400	360,400	356,639	324,687	292,798
1941	262,405	241,925	243,582	177,778	132,539	97,152	88,617	316,680	360,400	360,400	343,479	313,352
1942	284,072	278,293	326,840	330,000	330,000	330,000	356,592	360,400	360,400	360,400	341,717	311,266
1943	280,515	278,210	298,012	313,885	323,244	330,000	360,400	360,400	360,400	360,400	337,008	307,394
1944	278,689	258,972	260,712	249,051	243,700	254,179	276,371	360,400	360,400	360,400	331,478	301,749
1945	272,276	269,834	286,738	277,380	244,557	183,773	193,861	318,405	360,400	360,400	337,116	307,472
1946	296,069	310,340	281,567	234,319	169,849	127,285	190,011	360,400	360,400	359,455	329,955	299,722
1947	275,020	268,766	286,494	276,280	274,182	289,793	340,857	360,400	356,592	335,035	302,365	271,816
1948	255,930	245,807	249,809	232,949	219,226	162,391	143,608	265,138	360,400	360,400	327,962	295,366
1949	263,928	242,431	242,718	223,741	198,306	131,467	174,578	305,581	360,400	342,032	309,501	278,457
1950	247,055	228,690	225,372	215,939	161,548	112,773	161,325	318,626	360,400	360,400	326,837	295,032
1951	266,327	330,000	330,000	273,739	223,537	195,259	223,591	349,555	360,400	360,400	328,968	297,507
1952	266,214	249,526	268,062	258,006	202,569	228,275	325,923	360,400	360,400	360,400	353,839	326,515
1953	295,875	273,752	279,491	289,986	287,713	290,842	357,284	360,400	360,400	360,400	332,324	301,476
1954	269,513	247,582	247,819	230,280	231,471	240,961	308,878	360,400	360,400	346,144	313,200	281,430
1955	250,117	228,834	236,051	224,013	215,526	154,015	125,390	224,268	360,400	350,686	318,112	285,351
1956	253,489	233,090	297,509	275,444	220,623	180,544	199,031	360,400	360,400	360,400	349,979	323,594
1957	297,575	283,746	285,380	268,792	276,497	288,601	321,980	360,400	360,400	360,400	329,011	297,001
1958	267,551	250,230	258,100	245,262	252,753	211,991	283,794	360,400	360,400	360,400	356,088	328,214
1959	296,875	274,467	271,944	262,183	219,433	172,668	191,966	238,160	292,746	266,482	232,075	219,357
1960	192,331	170,840	169,684	151,078	118,247	95,935	126,803	219,167	293,045	268,985	235,957	203,844
1961	173,192	153,997	138,273	118,717	109,255	109,942	159,101	249,552	297,330	273,757	246,270	215,748
1962	190,124	170,107	173,032	156,616	177,938	186,735	307,379	360,400	360,400	356,465	328,567	296,435
1963	270,393	248,471	248,243	244,284	299,477	301,922	332,742	360,400	360,400	360,400	338,584	309,330
1964	280,158	284,985	295,324	282,428	271,731	240,313	215,029	290,647	360,400	345,938	313,783	282,384
1965	250,486	238,458	308,616	273,276	222,309	166,969	174,620	288,158	360,400	360,400	360,400	335,306
1966	304,662	304,263	311,607	303,113	275,509	292,577	356,592	360,400	360,400	333,638	302,345	271,809
1967	240,578	231,046	280,665	283,586	286,496	316,785	333,556	360,400	360,400	360,400	360,400	337,886
1968	308,358	287,801	291,722	279,304	291,974	300,834	345,158	360,400	360,400	336,513	304,211	273,939
1969	250,819	260,520	276,366	321,448	330,000	330,000	360,400	360,400	360,400	360,400	351,614	322,081
1970	298,841	285,870	304,646	330,000	323,923	330,000	343,990	360,400	360,400	360,400	328,204	295,064
1971	261,790	254,468	277,352	282,910	285,597	292,953	322,462	360,400	360,400	356,465	327,952	296,750
1972	265,329	248,476	260,246	250,505	244,130	280,145	303,727	360,400	360,400	338,614	303,374	274,452
1973	246,861	232,496	252,805	252,349	251,005	255,091	302,658	360,400	360,400	356,178	327,202	292,614
1974	261,425	292,527	322,190	330,000	329,186	330,000	360,400	360,400	360,400	356,465	333,738	299,491
1975	266,458	242,337	246,339	234,446	232,353	247,270	193,678	351,382	360,400	356,465	326,350	294,783
1976	284,930	280,141	283,994	264,736	253,582	251,085	257,553	346,564	338,111	310,201	280,655	252,844
1977	226,077	205,195	202,391	180,353	162,557	146,764	156,141	175,991	219,085	194,496	162,023	131,115
1978	100,307	80,261	100,751	117,310	139,726	189,623	243,404	360,400	360,400	360,400	360,057	360,400
1979	330,000	310,323	315,061	321,117	319,976	330,000	360,400	360,400	360,400	358,285	325,107	290,802
1980	266,398	255,216	263,874	330,000	326,446	330,000	356,592	360,400	360,400	360,400	354,917	324,717
1981	292,244	269,189	269,204	250,049	246,580	248,886	259,509	351,187	360,400	332,373	297,002	264,239
1982	239,211	262,326	313,550	325,368	326,446	330,000	360,400	360,400	360,400	360,400	360,400	360,400
1983	326,065	330,000	330,000	330,000	330,000	330,000	354,189	360,400	360,400	360,400	360,400	358,088
1984	330,000	326,192	307,348	251,605	198,266	191,955	231,204	360,400	360,400	356,465	331,150	300,761
1985	274,862	274,060	282,133	270,311	262,666	265,682	354,940	360,400	360,400	335,723	301,239	273,210
1986	254,074	241,940	263,652	272,339	330,000	330,000	360,400	360,400	360,400	360,400	339,678	308,901
1987	282,642	260,198	256,039	235,340	223,339	218,834	277,103	360,400	360,400	330,951	296,621	263,532
1988	233,926	222,605	232,241	228,288	223,514	235,410	280,389	360,400	356,592	333,301	301,086	269,930
1989	238,448	216,954	218,129	204,846	201,321	253,145	360,400	360,400	360,400	349,394	318,939	295,118
1990	281,087	266,473	271,253	257,681	248,938	264,551	334,369	360,400	360,400	344,582	315,776	291,487
1991	267,715	246,099	243,011	219,114	199,815	210,922	237,004	360,400	360,400	359,849	329,410	304,776
1992	282,905	274,027	276,311	260,079	266,729	274,688	346,092	360,400	360,400	353,040	324,711	300,566
1993	279,136	265,230	270,619	293,898	309,220	330,000	356,592	360,400	360,400	360,400	341,872	310,298
1994	280,162	257,147	257,007	227,344	214,633	224,730	275,704	360,400	360,400	330,294	292,878	259,786
1995	234,780	236,033	252,633	292,724	319,897	326,065	356,592	360,400	360,400	360,400	360,400	343,353
1996	312,365	289,443	301,552	305,980	330,000	326,065	357,776	360,400	360,400	356,465	331,457	300,112
1997	269,736	281,947	307,183	330,000	300,695	290,627	360,400	360,400	360,400	360,400	336,697	305,853
1998	274,237	252,363	256,652	265,537	292,781	330,000	360,400	360,400	360,400	360,400	359,763	340,667
1999	313,827	301,073	303,695	289,704	251,903	198,718	183,279	360,400	360,400	360,400	330,711	299,709
2000	268,963	248,541	246,017	239,107	234,691	238,598	312,022	360,400	360,400	349,445	318,802	286,920
2001	255,802	235,013	235,360	216,451	205,942	235,380	291,468	360,400	360,400	333,230	298,285	265,969
2002	234,555	219,980	241,170	241,102	241,239	250,745	345,081	360,400	360,400	339,724	304,940	273,272
Avg (21-02)	264,036	252,016	259,568	249,451	238,200	232,710	267,074	338,760	354,160	345,431	320,184	291,443

Table 2.3-2

Hetch Hetchy Reservoir Storage (Acre-feet) WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	272,402	266,044	243,868	235,920	183,321	150,269	154,224	271,116	360,400	360,400	326,811	291,828
1922	259,728	235,648	224,723	215,782	220,244	234,819	205,133	360,400	360,400	360,400	336,082	302,853
1923	275,819	256,526	262,603	269,313	274,454	265,738	241,094	360,400	360,400	360,400	333,186	304,241
1924	288,096	265,462	244,930	227,949	217,703	201,135	226,615	314,032	292,290	264,348	229,088	193,225
1925	162,198	174,233	187,270	170,200	181,824	195,815	216,042	360,400	360,400	356,465	334,210	301,427
1926	274,085	251,427	243,883	219,916	203,496	156,406	245,154	336,819	358,277	331,111	295,686	261,739
1927	231,858	229,528	230,165	223,466	251,035	270,123	326,806	360,400	360,400	360,400	333,718	301,231
1928	275,534	280,188	275,546	265,616	257,757	308,315	356,993	360,400	360,400	337,096	302,689	269,444
1929	239,232	216,426	201,321	182,545	168,883	167,850	183,407	347,942	360,400	348,102	314,426	281,237
1930	249,493	245,923	247,253	227,747	218,315	224,793	286,156	356,465	360,400	350,768	316,726	283,424
1931	252,998	228,677	214,984	191,409	174,118	166,236	207,521	299,800	296,541	266,646	231,402	197,210
1932	165,286	141,000	108,382	51,375	34,654	27,412	58,311	229,715	360,400	360,400	333,089	299,918
1933	270,157	246,808	232,041	211,426	194,261	163,710	150,969	186,966	360,400	360,400	326,593	293,382
1934	260,961	234,344	202,242	182,930	159,810	127,492	183,946	236,459	260,268	234,045	202,043	170,799
1935	140,815	154,538	167,325	107,677	72,057	38,981	99,863	258,988	360,400	360,400	331,788	299,322
1936	267,086	242,699	226,345	214,884	170,029	136,212	195,836	360,400	360,400	356,465	327,853	294,110
1937	262,493	239,158	219,779	197,861	155,743	107,766	110,233	356,058	360,400	360,400	327,212	292,471
1938	262,775	242,374	277,970	268,254	217,341	175,883	200,130	360,400	360,400	360,400	352,029	324,714
1939	312,466	304,668	297,136	284,589	276,736	290,220	360,400	360,400	360,400	332,157	299,492	270,327
1940	255,209	256,245	222,760	213,012	165,616	143,200	166,203	360,400	360,400	354,451	320,313	286,310
1941	260,678	241,118	235,298	169,490	125,366	91,151	84,054	313,255	360,400	360,400	341,291	309,048
1942	280,721	274,942	315,878	330,000	330,000	330,000	356,592	360,400	360,400	360,400	339,529	306,962
1943	278,021	276,636	283,548	307,975	325,066	330,000	360,400	360,400	360,400	360,400	334,820	303,090
1944	279,144	260,348	244,962	234,244	229,744	234,419	254,494	360,400	360,400	360,400	329,290	297,445
1945	269,782	286,673	303,578	288,423	253,887	193,103	202,059	325,579	360,400	360,400	334,928	303,168
1946	289,579	302,009	266,576	232,638	168,168	125,876	188,823	360,400	360,400	357,267	325,581	293,235
1947	267,584	261,329	261,933	251,706	249,594	259,401	308,348	360,400	356,592	332,847	297,991	265,329
1948	247,258	231,519	222,630	207,163	189,129	136,187	121,486	246,616	360,400	360,400	325,774	291,062
1949	257,437	230,325	210,633	191,633	166,180	103,674	151,625	286,364	356,592	336,040	301,328	268,173
1950	237,728	238,697	233,450	217,724	163,129	114,105	162,436	319,562	360,400	359,600	323,849	289,929
1951	259,038	330,000	330,000	273,739	223,537	188,600	217,740	343,707	360,400	360,400	326,780	293,203
1952	264,766	248,078	259,003	253,471	198,031	223,738	317,703	360,400	360,400	360,400	351,651	322,211
1953	296,329	275,128	274,206	293,261	298,723	296,049	360,374	360,400	360,400	360,400	330,136	297,172
1954	268,064	247,055	230,167	213,569	217,328	221,015	286,815	360,400	360,400	343,956	308,827	274,943
1955	245,440	243,491	250,709	232,875	219,152	151,838	123,551	222,728	360,400	348,498	313,738	278,863
1956	244,816	218,801	283,964	261,892	207,063	168,360	188,550	360,400	360,400	360,400	347,791	319,290
1957	296,127	282,297	264,905	249,257	257,810	264,111	295,373	360,400	360,400	360,400	326,823	292,697
1958	261,061	240,978	235,957	224,058	243,566	220,059	291,862	360,400	360,400	360,400	353,900	323,910
1959	295,427	273,939	254,292	245,472	213,883	161,315	182,390	235,642	288,112	259,667	223,084	208,259
1960	179,051	176,894	175,738	151,333	116,394	92,543	124,226	215,694	287,458	261,217	226,015	191,797
1961	158,963	134,152	121,643	102,446	87,720	82,604	129,645	221,869	267,561	241,466	211,469	178,503
1962	147,481	127,832	114,109	99,056	112,573	110,810	229,337	360,400	360,400	356,465	326,379	292,131
1963	263,712	237,187	224,068	230,750	289,373	297,526	323,742	360,400	360,400	360,400	336,396	305,026
1964	273,668	279,416	270,727	260,673	252,543	215,321	190,335	275,763	360,400	343,750	309,409	275,896
1965	241,813	249,120	317,459	282,122	231,160	175,820	182,106	294,713	360,400	360,400	360,400	333,188
1966	305,400	307,762	300,989	293,442	268,461	279,726	360,400	360,400	360,400	331,450	297,972	265,321
1967	231,906	216,758	252,106	268,331	283,263	323,066	342,598	360,400	360,400	360,400	360,400	335,768
1968	305,290	284,733	275,763	268,094	285,055	288,111	330,318	360,400	360,400	334,325	299,837	267,451
1969	242,147	249,086	247,807	306,192	323,862	330,000	360,400	360,400	360,400	360,400	349,426	317,777
1970	299,296	305,659	324,435	326,065	320,846	322,797	334,670	360,400	360,400	360,400	326,016	290,760
1971	258,440	253,880	270,103	288,977	303,697	305,250	332,642	360,400	360,400	356,465	325,764	292,446
1972	258,839	236,370	231,016	221,257	214,866	245,077	266,541	360,400	360,400	336,426	299,001	267,965
1973	238,190	218,208	225,626	238,473	249,151	261,799	307,249	360,400	360,400	353,990	322,828	286,127
1974	257,794	293,500	316,503	330,000	330,000	330,000	360,400	360,400	360,400	356,465	331,550	295,187
1975	267,864	263,077	267,079	249,395	251,607	270,330	216,738	360,400	360,400	356,465	324,162	290,479
1976	286,336	282,468	273,429	252,264	239,384	231,084	235,434	322,270	311,719	281,653	249,955	220,061
1977	191,125	164,627	139,941	124,041	106,191	84,595	91,855	109,596	150,715	123,692	95,026	67,781
1978	41,897	22,219	36,001	52,988	69,331	114,471	168,252	360,400	360,400	360,400	357,869	356,406
1979	329,957	311,201	296,912	303,911	314,794	330,000	360,400	360,400	360,400	356,097	320,734	284,314
1980	257,725	265,877	274,536	330,000	326,446	330,000	356,592	360,400	360,400	360,400	352,729	320,413
1981	290,796	267,741	254,865	241,410	243,092	239,594	250,218	341,900	356,592	326,381	288,829	253,955
1982	227,982	252,018	292,777	317,906	326,446	330,000	360,400	360,400	360,400	360,400	360,400	360,400
1983	326,065	330,000	330,000	330,000	330,000	330,000	356,951	360,400	360,400	360,400	360,400	355,970
1984	330,000	326,192	301,515	251,330	205,725	189,676	227,004	360,400	360,400	356,465	328,962	296,457
1985	268,372	286,904	294,977	277,357	264,474	261,687	348,828	360,400	360,400	333,535	296,865	266,723
1986	245,402	227,652	236,474	239,341	311,791	326,065	360,400	360,400	360,400	360,400	337,490	304,597
1987	281,194	259,670	236,484	216,725	205,573	195,265	251,416	347,582	357,022	325,388	288,877	253,677
1988	221,889	204,952	201,696	191,923	182,833	188,925	231,786	323,285	352,727	326,875	292,101	258,469
1989	229,470	206,135	190,185	179,740	178,779	224,799	331,322	360,400	360,400	343,974	308,105	283,006
1990	266,700	271,420	276,200	256,827	242,842	252,652	320,352	360,400	360,400	339,162	307,130	280,640
1991	256,496	235,801	220,345	201,192	186,180	192,530	211,890	331,320	360,400	354,429	321,715	296,721
1992	274,476	260,994	246,154	232,759	238,361	235,761	302,285	360,400	355,022	347,290	320,492	298,748
1993	279,794	262,205	255,227	281,160	296,476	330,000	356,592	360,400	360,400	360,400	339,684	305,994
1994	278,714	256,620	239,355	209,682	196,961	201,254	250,111	360,400	360,400	328,106	288,504	253,299
1995	226,108	246,696	263,295	296,733	319,612	326,065	356,592	360,400	360,400	360,400	360,400	341,235
1996	313,102	291,101	290,319	303,304	330,000	326,065	357,776	360,400	360,400	356,465	329,269	295,808
1997	266,385	283,200	301,776	330,000	300,695	280,067	360,400	360,400	360,400	360,400	334,509	301,549
1998	268,984	245,268	236,666	258,858	286,099	330,000	360,400	360,400	360,400	360,400	357,575	336,363
1999	314,282	301,528	287,025	277,784	239,977	186,792	172,794	359,739	360,400	360,400	328,523	295,405
2000	267,514	266,427	263,903	251,200	249,369	245,666	316,972	360,400	360,400	347,257	314,429	280,432
2001	248,366	225,736	213,192	191,416	183,471	208,152	262,123	360,400	360,186	330,828	293,698	259,268
2002	227,858	211,442	223,309	226,085	228,791	232,493	324,711	360,400	360,400	337,536	300,566	266,784
Avg (21-02)	256,397	247,256	245,170	236,378	226,842	219,754	254,938	333,809	351,147	341,312	314,066	283,384

Table 2.3-3

Difference in Hetch Hetchy Reservoir Storage (Acre-feet) No Program minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	491	4,174	10,834	7,034	7,039	6,164	5,203	4,351	0	0	2,188	4,304
1922	3,826	3,826	14,292	11,446	-579	-9,140	-9,141	0	0	0	2,188	4,304
1923	-454	-1,376	5,284	-3,275	-11,011	-5,207	-5,208	0	0	0	2,188	4,304
1924	2,494	2,494	21,522	20,583	19,736	25,539	15,953	10,156	12,265	14,438	16,603	18,700
1925	20,879	1,545	1,545	7,349	12,596	18,399	16,138	0	0	0	2,188	4,304
1926	6,490	12,107	24,513	27,160	22,177	29,622	25,398	20,350	2,123	4,309	6,492	8,604
1927	10,978	6,374	20,645	17,803	14,376	8,667	6,826	0	0	0	2,188	4,304
1928	1,448	1,448	14,339	14,346	14,353	8,645	3,407	0	0	2,188	4,373	6,487
1929	6,008	6,009	21,230	20,291	19,443	25,247	27,364	12,458	0	2,188	4,374	6,488
1930	8,673	-10,661	-10,661	-4,864	375	6,178	8,295	0	0	2,188	4,373	6,488
1931	8,673	14,289	27,180	32,999	38,259	44,062	46,180	48,341	50,420	52,926	55,420	57,841
1932	59,138	61,899	29,660	24,796	14,473	9,024	5,252	3,787	0	0	2,188	4,304
1933	3,351	5,192	18,083	19,997	21,726	27,529	23,814	19,938	0	0	2,188	4,304
1934	6,490	12,107	40,076	42,771	48,759	51,121	22,738	24,914	27,003	29,147	31,285	33,367
1935	35,534	16,200	16,200	13,919	11,757	8,792	5,670	4,291	0	0	2,188	4,304
1936	6,490	11,093	23,878	26,817	26,503	23,026	19,433	0	0	0	2,188	4,304
1937	5,254	7,095	26,113	26,096	23,822	20,143	16,841	4,342	0	0	2,188	4,304
1938	2,495	2,495	11,402	5,700	5,703	5,658	4,993	0	0	0	2,188	4,304
1939	-455	-1,375	12,896	11,949	11,095	16,898	-3,808	0	0	2,188	4,373	6,488
1940	8,672	-10,662	-9,108	-3,310	-2,932	-2,468	-2,083	0	0	2,188	4,374	6,488
1941	1,727	807	8,284	8,288	7,173	6,001	4,563	3,425	0	0	2,188	4,304
1942	3,351	3,351	10,962	0	0	0	0	0	0	0	2,188	4,304
1943	2,494	1,574	14,464	5,910	-1,822	0	0	0	0	0	2,188	4,304
1944	-455	-1,376	15,750	14,807	13,956	19,760	21,877	0	0	0	2,188	4,304
1945	2,494	-16,839	-16,840	-11,043	-9,330	-9,330	-8,198	-7,174	0	0	2,188	4,304
1946	6,490	8,331	14,991	1,681	1,681	1,409	1,188	0	0	2,188	4,374	6,487
1947	7,436	7,437	24,561	24,574	24,588	30,392	32,509	0	0	2,188	4,374	6,487
1948	8,672	14,288	27,179	25,786	30,097	26,204	22,122	18,522	0	0	2,188	4,304
1949	6,491	12,106	32,085	32,108	32,126	27,793	22,953	19,217	3,808	5,992	8,173	10,284
1950	9,327	-10,007	-8,078	-1,785	-1,581	-1,332	-1,111	-936	0	800	2,988	5,103
1951	7,289	0	0	0	0	6,659	5,851	5,848	0	0	2,188	4,304
1952	1,448	1,448	9,059	4,535	4,538	4,537	8,220	0	0	0	2,188	4,304
1953	-454	-1,376	5,285	-3,275	-11,010	-5,207	-3,090	0	0	0	2,188	4,304
1954	1,449	527	17,652	16,711	14,143	19,946	22,063	0	0	2,188	4,373	6,487
1955	4,677	-14,657	-14,658	-8,862	-3,626	2,177	1,839	1,540	0	2,188	4,374	6,488
1956	8,673	14,289	13,545	13,552	13,560	12,184	10,481	0	0	0	2,188	4,304
1957	1,448	1,449	20,475	19,535	18,687	24,490	26,607	0	0	0	2,188	4,304
1958	6,490	9,252	22,143	21,204	9,187	-8,068	-8,068	0	0	0	2,188	4,304
1959	1,448	528	17,652	16,711	5,550	11,353	9,576	2,518	4,634	6,815	8,991	11,098
1960	13,280	-6,054	-6,054	-255	1,853	3,392	2,577	3,473	5,587	7,768	9,942	12,047
1961	14,229	19,845	16,630	16,271	21,535	27,338	29,456	27,683	29,769	32,291	34,801	37,245
1962	42,643	42,275	58,923	57,560	65,365	75,925	78,042	0	0	0	2,188	4,304
1963	6,681	11,284	24,175	13,534	10,104	4,396	9,000	0	0	0	2,188	4,304
1964	6,490	5,569	24,597	21,755	19,188	24,992	24,694	14,884	0	2,188	4,374	6,488
1965	8,673	-10,662	-8,843	-8,846	-8,851	-8,851	-7,486	-6,555	0	0	0	2,118
1966	-738	-3,499	10,618	9,671	7,048	12,851	-3,808	0	0	2,188	4,373	6,488
1967	8,672	14,288	28,559	15,255	3,233	-6,281	-9,042	0	0	0	0	2,118
1968	3,068	3,068	15,959	11,210	6,919	12,723	14,840	0	0	2,188	4,374	6,488
1969	8,672	11,434	28,559	15,256	6,138	0	0	0	0	0	2,188	4,304
1970	-455	-19,789	-19,789	3,935	3,077	7,203	9,320	0	0	0	2,188	4,304
1971	3,350	588	7,249	-6,067	-18,100	-12,297	-10,180	0	0	0	2,188	4,304
1972	6,490	12,106	29,230	29,248	29,264	35,068	37,186	0	0	2,188	4,373	6,487
1973	8,671	14,288	27,179	13,876	1,854	-6,708	-4,591	0	0	2,188	4,374	6,487
1974	3,631	-973	5,687	0	-814	0	0	0	0	0	2,188	4,304
1975	-1,406	-20,740	-20,740	-14,949	-19,254	-23,060	-23,060	-9,018	0	0	2,188	4,304
1976	-1,406	-2,327	10,565	12,472	14,198	20,001	22,119	24,294	26,392	28,548	30,700	32,783
1977	34,952	40,568	62,450	56,312	56,366	62,169	64,286	66,395	68,370	70,804	66,997	63,334
1978	58,410	58,042	64,750	64,322	70,395	75,152	75,152	0	0	0	2,188	3,994
1979	43	-878	18,149	17,206	5,182	0	0	0	0	2,188	4,373	6,488
1980	8,673	-10,661	-10,662	0	0	0	0	0	0	0	2,188	4,304
1981	1,448	1,448	14,339	8,639	3,488	9,292	9,291	9,287	3,808	5,992	8,173	10,284
1982	11,229	10,308	20,773	7,462	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	-2,762	0	0	0	0	2,118
1984	0	0	5,833	275	-7,459	2,279	4,200	0	0	0	2,188	4,304
1985	6,490	-12,844	-12,844	-7,046	-1,808	3,995	6,112	0	0	2,188	4,374	6,487
1986	8,672	14,288	27,178	32,998	18,209	3,935	0	0	0	0	2,188	4,304
1987	1,448	528	19,555	18,615	17,766	23,569	25,687	12,818	3,378	5,563	7,744	9,855
1988	12,037	17,653	30,545	36,365	40,681	46,485	48,603	37,115	3,865	6,426	8,985	11,461
1989	8,978	10,819	27,944	25,106	22,542	28,346	29,078	0	0	5,420	10,834	12,112
1990	14,387	-4,947	-4,947	854	6,096	11,899	14,017	0	0	5,420	8,646	10,847
1991	11,219	10,298	22,666	17,922	13,635	18,392	25,114	29,080	0	5,420	7,695	8,055
1992	8,429	13,033	30,157	27,320	28,368	38,927	43,807	0	5,378	5,750	4,219	1,818
1993	-658	3,025	15,392	12,738	12,744	0	0	0	0	0	2,188	4,304
1994	1,448	527	17,652	17,662	17,672	23,476	25,593	0	0	2,188	4,374	6,487
1995	8,672	-10,663	-10,662	-4,009	285	0	0	0	0	0	0	2,118
1996	-737	-1,658	11,233	2,676	0	0	0	0	0	0	2,188	4,304
1997	3,351	-1,253	5,407	0	0	10,560	0	0	0	0	2,188	4,304
1998	5,253	7,095	19,986	6,679	6,682	0	0	0	0	0	2,188	4,304
1999	-455	-455	16,670	11,920	11,926	11,926	10,485	661	0	0	2,188	4,304
2000	1,449	-17,886	-17,886	-12,093	-14,678	-7,068	-4,950	0	0	2,188	4,373	6,488
2001	7,436	9,277	22,168	25,035	22,471	27,228	29,345	0	214	2,402	4,587	6,701
2002	6,697	8,538	17,861	15,017	12,448	18,252	20,370	0	0	2,188	4,374	6,488
Avg (21-02)	7,639	4,760	14,398	13,073	11,358	12,956	12,136	4,951	3,012	4,120	6,118	8,059

Table 2.3-4

Difference in Hetch Hetchy Reservoir Storage (Acre-feet)

No Program minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	-11,230	-6,627	33	-3,773	-3,775	-3,297	-2,775	-2,332	0	0	0	0
1922	0	0	10,465	958	-11,073	-19,635	-19,635	0	0	0	0	0
1923	-4,756	-4,757	1,903	-6,659	-14,396	-23,910	-23,910	0	0	0	0	0
1924	-2,854	-2,854	17,125	17,134	17,145	17,145	8,572	4,281	4,278	4,272	4,267	4,261
1925	4,259	4,259	19,481	19,494	7,477	-2,036	-1,781	0	0	0	0	0
1926	-2,854	-2,854	17,135	13,975	1,447	-7,000	-6,147	-3,231	0	0	0	0
1927	-1,902	-7,427	7,795	-2,855	-6,294	-15,809	-17,649	0	0	0	0	-2,762
1928	-8,469	-8,469	5,801	96	-5,060	-13,040	0	0	0	0	0	-2,762
1929	-8,469	-8,469	6,753	1,049	-4,106	-8,863	-8,863	0	0	0	0	0
1930	0	0	19,978	19,990	20,001	10,488	10,487	0	0	0	0	0
1931	0	0	19,978	19,990	15,705	15,705	15,705	15,696	15,683	16,043	16,402	16,751
1932	9,509	4,905	12,100	10,168	3,951	2,517	1,550	1,113	0	0	0	0
1933	-2,854	-2,854	17,124	11,426	6,277	1,520	1,340	1,117	0	0	0	0
1934	0	0	20,326	14,864	7,043	2,198	1,940	1,940	1,937	1,934	1,931	1,929
1935	1,927	1,927	21,905	18,709	15,494	559	361	262	0	0	0	0
1936	-4,757	-4,757	15,111	5,615	5,619	4,913	4,138	0	0	0	0	0
1937	-2,854	-2,854	17,125	11,426	10,815	9,237	7,780	0	0	0	0	0
1938	-5,708	-5,708	2,487	-10,831	-10,836	-10,836	-9,524	0	0	0	0	-2,762
1939	-7,518	-7,518	7,705	2,951	-1,345	-6,102	0	0	0	0	0	0
1940	0	0	18,431	12,734	11,294	9,474	8,002	0	0	0	0	0
1941	-4,757	-4,757	6,501	6,505	5,651	4,726	3,591	2,700	0	0	0	0
1942	-2,854	-2,854	6,469	0	0	0	0	0	0	0	0	0
1943	-4,757	-9,360	10,618	2,061	-5,672	0	0	0	0	0	0	0
1944	-4,757	-4,757	15,222	9,522	-96	-9,609	-9,610	0	0	0	0	0
1945	0	0	19,978	19,989	7,970	7,970	7,029	6,142	0	0	0	0
1946	-4,757	-4,757	1,902	-11,415	-11,422	-9,815	-8,286	0	0	0	0	0
1947	0	0	15,221	10,473	6,182	1,425	1,425	0	0	0	0	0
1948	0	0	19,978	12,779	12,786	8,799	7,425	6,215	0	0	0	0
1949	0	0	19,979	20,020	20,032	17,547	14,730	12,336	3,808	3,804	3,799	1,034
1950	-3,723	-3,723	19,193	7,330	6,472	5,424	4,466	3,739	0	0	0	0
1951	0	0	0	0	0	0	0	0	0	0	0	-2,762
1952	-7,518	-7,517	93	47	47	46	-7,319	0	0	0	0	0
1953	-4,756	-4,757	2,854	-5,706	-13,443	-22,956	-3,116	0	0	0	0	0
1954	0	0	19,979	10,477	859	-8,655	-8,655	0	0	0	0	0
1955	0	0	15,221	2,863	-8,306	-8,307	-7,008	-5,853	0	0	0	0
1956	0	0	9,360	9,364	9,370	8,522	7,396	0	0	0	0	0
1957	-4,757	-4,756	15,222	9,521	-97	-4,854	-4,854	0	0	0	0	0
1958	-2,854	-2,854	12,367	7,618	-4,407	-21,662	-21,662	0	0	0	0	0
1959	-4,757	-4,757	15,221	5,718	-5,450	-14,964	-13,094	-5,638	-5,631	-5,623	-5,614	-5,608
1960	-5,604	-5,605	14,374	14,385	8,497	4,975	3,783	1,886	1,884	1,882	1,879	1,876
1961	1,875	1,875	16,159	10,473	5,331	5,331	5,331	2,661	2,658	3,032	3,405	-8,202
1962	-17,333	-17,333	2,646	-3,060	-6,500	-14,111	-14,111	0	0	0	0	-2,762
1963	-5,615	-5,615	9,607	-3,706	-7,146	-19,514	-19,514	0	0	0	0	0
1964	-4,757	-9,360	10,619	-1,744	-12,916	-12,916	-12,916	-12,090	3,808	3,804	3,800	3,796
1965	3,795	3,794	10,678	10,683	10,688	9,888	8,343	6,963	0	0	0	-2,762
1966	-7,518	-12,121	8,210	-1,300	-9,893	-8,199	0	0	0	0	0	0
1967	0	0	19,979	6,670	-5,357	-13,215	-18,739	0	0	0	0	0
1968	-4,757	-4,757	15,221	1,910	-10,119	-14,876	-14,876	0	0	0	0	0
1969	0	0	15,222	1,911	0	0	0	0	0	0	0	0
1970	-4,757	-4,757	10,465	0	-6,077	0	0	0	0	0	0	0
1971	-4,757	-9,360	-1,749	-15,069	-27,106	-31,863	-31,863	0	0	0	0	0
1972	0	0	15,221	10,474	6,183	6,183	6,184	0	0	0	0	0
1973	0	0	19,979	6,671	-5,355	-13,917	-18,521	0	0	0	0	-2,762
1974	-7,518	-12,121	-5,462	0	-814	0	0	0	0	0	0	-2,762
1975	-7,517	-7,518	12,461	6,760	-5,266	-12,877	-12,877	-5,083	0	0	0	0
1976	-5,709	-5,708	14,271	9,521	5,230	5,230	5,230	5,227	5,222	5,216	5,210	5,205
1977	5,203	5,202	25,181	19,487	14,345	14,345	14,345	14,331	14,311	14,665	15,016	12,594
1978	5,344	741	15,963	8,369	7,521	3,716	-6,595	0	0	0	0	0
1979	0	0	19,978	10,474	-1,553	0	0	0	0	0	0	0
1980	-4,757	-4,757	10,465	0	0	0	0	0	0	0	0	0
1981	-4,757	-4,757	15,222	1,911	-10,118	-19,631	-19,631	-9,213	0	0	0	0
1982	0	-4,603	10,618	-2,696	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	-5,708	0	0	0	0	0
1984	0	0	5,833	275	-7,459	-7,459	-7,459	0	0	0	0	0
1985	0	-4,603	10,618	10,624	6,334	1,577	1,577	0	0	0	0	0
1986	0	0	19,978	19,990	1,757	0	0	0	0	0	0	0
1987	-4,757	-4,756	15,222	10,474	6,183	1,426	1,427	0	0	0	0	0
1988	0	0	19,979	19,990	15,705	15,705	15,705	2,048	0	-2,476	-6,852	-9,242
1989	-16,471	-21,074	-5,852	-11,563	-16,726	-21,482	0	0	0	-2,476	-4,949	-1,817
1990	-1,438	-6,042	9,180	3,477	-1,677	-6,434	-6,433	0	0	-2,476	-4,949	-4,579
1991	-4,199	-8,803	6,419	6,423	1,270	-11,097	-6,494	345	0	-551	-3,026	-7,261
1992	-11,638	-7,034	7,236	-3,415	-5,822	-13,434	-10,671	0	0	378	-2,098	-6,335
1993	-10,710	-6,107	4,358	1,697	1,698	0	0	0	0	0	0	0
1994	-4,757	-4,757	15,222	10,474	1,887	-2,870	-2,870	0	0	0	0	-2,762
1995	-7,517	-7,517	12,462	8,663	5,230	0	0	0	0	0	0	-2,762
1996	-7,518	-7,517	7,704	-855	0	0	0	0	0	0	0	-2,762
1997	-8,469	-13,993	-7,334	0	0	-952	0	0	0	0	0	0
1998	0	0	14,271	960	960	0	0	0	0	0	0	-2,762
1999	-8,469	-8,469	6,753	-6,564	-6,566	-6,567	-5,766	0	0	0	0	-2,762
2000	-7,517	-7,518	12,461	2,955	-9,074	-14,973	-14,972	0	0	0	0	-2,762
2001	-7,518	-7,518	12,461	6,760	-4,407	-13,920	-13,921	0	0	0	0	0
2002	-2,854	-2,854	7,611	-1,899	-10,493	-15,249	-15,249	0	0	0	0	0
Avg (21-02)	-3,314	-3,954	11,513	5,417	174	-3,540	-3,234	556	585	505	344	-418

Figure 2.3-2

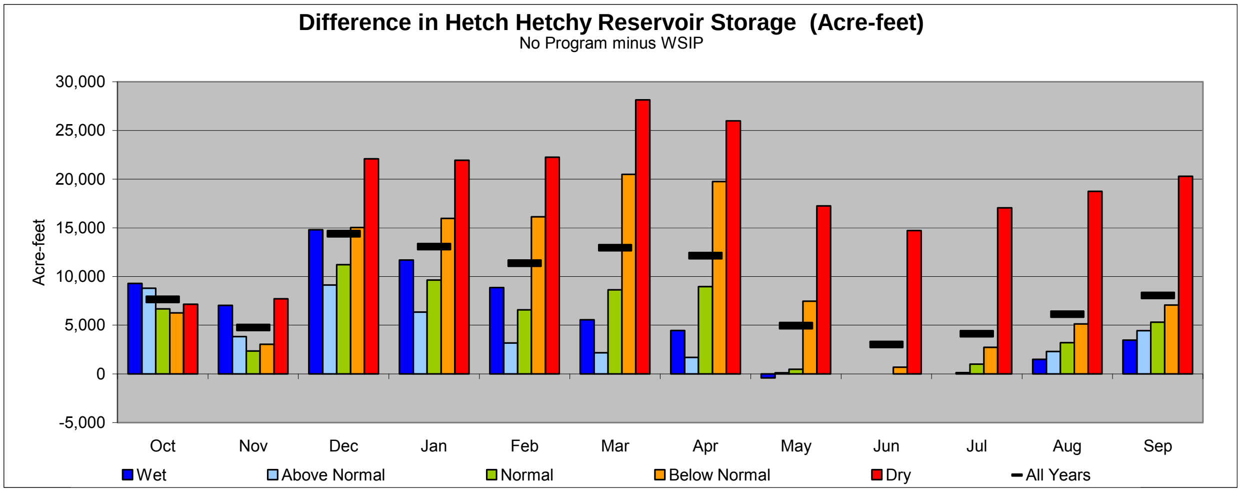


Figure 2.3-3 illustrates the difference in reservoir storage averaged by year type for the comparison of the alternative to the base setting. Also shown is the average difference in storage for the two settings during the 82-year simulation. Figure 2.3-4 illustrates the average monthly storage in Hetch Hetchy Reservoir for the 82-year simulation, and the range in storage for each month for the variant and base settings.

Figure 2.3-3

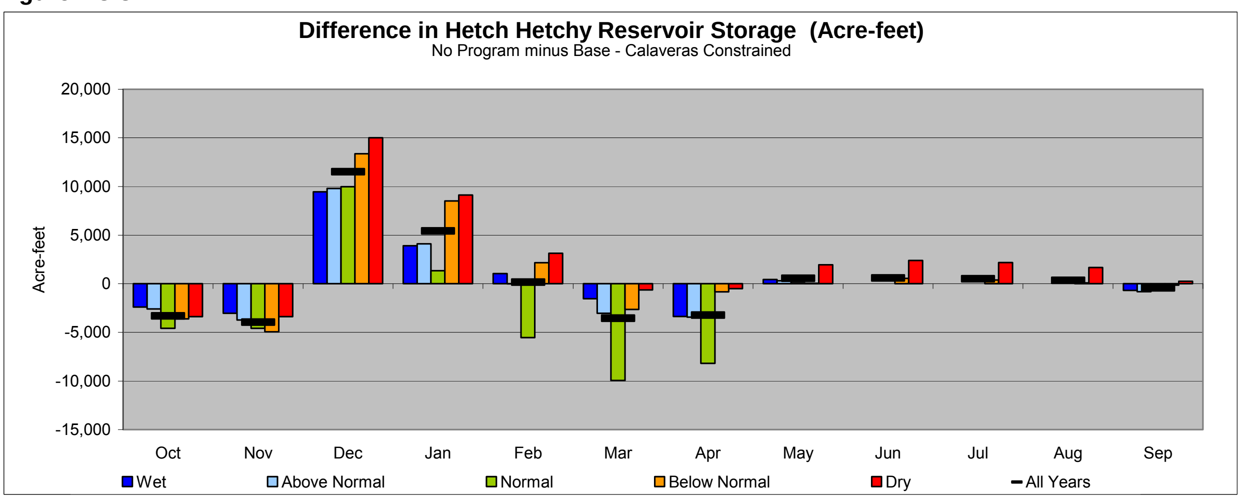
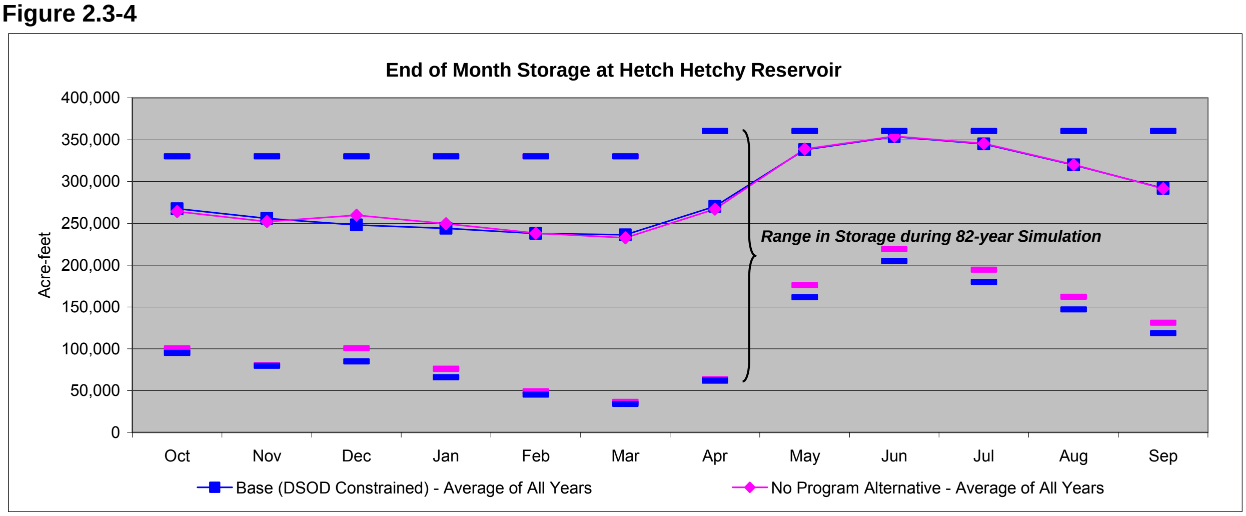


Figure 2.3-4



The difference in storage in Hetch Hetchy Reservoir attributed to the diversion effects of the alternative would manifest in differences in releases from O'Shaughnessy Dam to the stream. A different amount of available reservoir space in the winter and spring due to the alternative would lead to a different ability to regulate inflow, thus potentially changing the amount of water released to the stream that is above minimum release requirements. Figure 2.3-1 illustrates the stream release from O'Shaughnessy Dam for the WSIP, alternative, and base settings. Table 2.3-5 illustrates the difference in stream releases between the alternative and WSIP settings. Compared to the WSIP setting, the alternative typically exhibits an incrementally greater stream release, predominantly during May or June, which reflects the months when releases to the stream are made above minimum release requirements in anticipation of the reservoir being filled. However, there are exceptions to this circumstance during which incrementally larger reductions in releases to the stream occurs. Whether the change is an increase in releases or a decrease in releases is a matter of whether the reservoir is higher or lower in storage compared to the WSIP setting, which is a matter of coincidence of greater or lesser demands between the settings and the hydrologic sequence of years that leads to the need for Bay Area reservoir storage replenishment from the Tuolumne.

Table 2.3-6 illustrates the difference in stream release between the alternative and base settings. Consistent with the lower storage in Hetch Hetchy Reservoir by the end of April for the alternative setting, releases to the stream below Hetch Hetchy Reservoir would be less compared to the base setting. This circumstance occurs in 32 percent of the years of the 82-year simulation. There are a few exceptions when an increase in release would occur.

Table 2.3-5 illustrates the difference in stream release between the alternative and WSIP settings, expressed in terms of a monthly volume (acre-feet) of flow. Table 2.3-7 illustrates the same information and the average monthly stream release for the alternative and WSIP setting, expressed in average monthly flow (in cubic feet per second [cfs]) for each year type. Table 2.3-5 illustrates that the difference in monthly flow below O'Shaughnessy Dam could range from an increase of approximately 30,000 acre-feet to a decrease of approximately 10,000 acre-feet. Considering the manner in which releases are determined and made to the stream, quantifying the effect of these changes in terms of monthly flow (acre-feet or average cfs) is not always meaningful.[3] When comparing the alternative to the WSIP setting, a change in the volume of release from O'Shaughnessy Dam to the stream would likely result in the initiation of the release being delayed or initiated earlier by a matter of days. Typical spring-time releases, when initiated, amount to a release up to 3,000 cfs (approximately 6,000 acre-feet over the span of a day). Assuming that a change in release volume equates to a delay or acceleration of releasing 6,000 acre-feet per day, the difference in stream release between the alternative and WSIP settings would be a delay in releases up to 2 days or up to an added 5 days of release. Normally, the effect of the delay in release would not affect the year's peak stream release rate during a year. Comparing the alternative and WSIP settings, a change (increase or decrease) in stream release would occur in approximately 70 percent of the years simulated. Compared to the base setting, the alternative's effect to stream flow is typically less than the effect caused by the WSIP, but at times could be greater.

Table 2.3-8 illustrates the average monthly stream release for the alternative and base setting, expressed in average monthly flow (cfs), and the differences between the two. Table 2.3-6 illustrates that the difference in monthly flow below O'Shaughnessy Dam between the alternative and base settings could range from an increase of approximately 8,000 acre-feet to a decrease of approximately 33,000 acre-feet. Using the same metric as described above to estimate the delay or addition in the number days of release to the stream, the alternative could lead to an effect ranging from an increase of 1 day of release to a decrease of up to 6 days, compared to the base setting.

[3] See "Estimated Effect of WSIP on Daily Releases below Hetch Hetchy Reservoir", Memorandum by Daniel B. Steiner, December 31, 2006.

Table 2.3-5

Difference in Hetch Hetchy Release to Stream (Acre-feet)

No Program minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	0	0	0	4,346	0	0	0	4,346
1922	0	0	0	0	0	0	0	-7,989	0	0	0	0	-7,989
1923	0	0	0	0	0	0	0	-5,204	0	0	0	0	-5,204
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	15,915	0	0	0	0	15,915
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	6,824	0	0	0	0	6,824
1928	0	0	0	0	0	0	0	3,618	0	0	0	0	3,618
1929	0	0	0	0	0	0	0	0	13,231	0	0	0	13,231
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	3,554	0	0	0	3,782	0	0	0	7,336
1933	0	0	0	0	0	0	0	0	17,497	0	0	0	17,497
1934	0	0	0	0	0	0	3,808	0	0	0	0	0	3,808
1935	0	0	0	0	0	0	0	0	4,286	0	0	0	4,286
1936	0	0	0	0	0	0	0	16,952	0	0	0	0	16,952
1937	0	0	0	0	0	0	0	9,651	4,603	0	0	0	14,254
1938	0	0	0	0	0	0	0	4,359	0	0	0	0	4,359
1939	0	0	0	0	0	0	3,808	-4,045	0	0	0	0	-237
1940	0	0	0	0	0	0	0	-1,751	0	0	0	0	-1,751
1941	0	0	0	0	0	0	0	0	3,423	0	0	0	3,423
1942	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	21,864	0	0	0	0	21,864
1945	0	0	0	0	0	0	0	0	-7,168	0	0	0	-7,168
1946	0	0	0	0	0	0	0	1,038	0	0	0	0	1,038
1947	0	0	0	0	0	0	0	32,496	0	0	0	0	32,496
1948	0	0	0	0	0	0	0	0	18,501	0	0	0	18,501
1949	0	0	0	0	0	0	0	0	7,688	0	0	0	7,688
1950	0	0	0	0	0	0	0	0	-935	0	0	0	-935
1951	0	7,289	0	0	0	0	0	0	6,213	0	0	0	13,502
1952	0	0	0	0	0	0	0	8,217	0	0	0	0	8,217
1953	0	0	0	0	0	0	0	-3,282	0	0	0	0	-3,282
1954	0	0	0	0	0	0	0	22,054	0	0	0	0	22,054
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	9,166	0	0	0	0	9,166
1957	0	0	0	0	0	0	0	26,597	0	0	0	0	26,597
1958	0	0	0	0	0	3,935	0	-8,063	0	0	0	0	-4,128
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	27,548	0	0	0	0	27,548
1963	0	0	0	0	0	0	0	8,996	0	0	0	0	8,996
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	-6,549	0	0	0	-6,549
1966	0	0	0	0	0	0	3,808	-4,045	0	0	0	0	-237
1967	0	0	0	0	0	0	0	-9,039	0	0	0	0	-9,039
1968	0	0	0	0	0	0	0	14,913	0	0	0	0	14,913
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	-3,935	0	0	0	9,317	0	0	0	0	5,382
1971	0	0	0	0	0	0	0	-10,175	0	0	0	0	-10,175
1972	0	0	0	0	0	0	0	37,167	0	0	0	0	37,167
1973	0	0	0	0	0	0	0	-4,589	0	0	0	0	-4,589
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	-2,521	-9,569	0	0	0	-12,090
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	39,998	0	0	0	310	40,308
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	533	0	0	0	533
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	-2,939	0	0	0	0	-2,939
1984	0	0	0	0	0	-3,935	0	4,198	0	0	0	0	263
1985	0	0	0	0	0	0	0	6,513	0	0	0	0	6,513
1986	0	0	0	0	0	10,235	3,935	0	0	0	0	0	14,170
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	3,808	0	0	0	3,808
1989	0	0	0	0	0	0	0	30,146	0	0	0	0	30,146
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	30,103	0	0	0	30,103
1992	0	0	0	0	0	0	0	17,542	0	0	0	0	17,542
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	5,409	0	0	0	0	0	0	0	0	5,409
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	8,445	698	0	0	0	9,143
2000	0	0	0	0	0	0	0	-4,948	0	0	0	0	-4,948
2001	0	0	0	0	0	0	0	29,330	0	0	0	0	29,330
2002	0	0	0	0	0	0	0	20,434	0	0	0	0	20,434
Avg (21-02)	0	89	0	18	43	125	187	4,448	1,152	0	0	4	6,066

Table 2.3-6

Difference in Hetch Hetchy Release to Stream (Acre-feet) No Program minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	0	0	0	-2,330	0	0	0	-2,330
1922	0	0	0	0	0	0	0	-17,126	0	0	0	0	-17,126
1923	0	0	0	0	0	0	0	-23,896	0	0	0	0	-23,896
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	-1,780	0	0	0	0	-1,780
1926	0	0	0	0	0	0	0	-2,913	0	0	0	0	-2,913
1927	0	0	0	0	0	0	0	-18,139	0	0	0	0	-18,139
1928	0	0	0	0	0	0	0	0	0	0	0	0	0
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	3,554	0	0	0	1,111	0	0	0	4,665
1933	0	0	0	0	0	0	0	0	980	0	0	0	980
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	3,935	0	0	262	0	0	0	4,197
1936	0	0	0	0	0	0	0	3,588	0	0	0	0	3,588
1937	0	0	0	0	0	0	0	6,508	0	0	0	0	6,508
1938	0	0	0	0	0	0	0	-8,294	0	0	0	0	-8,294
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	0	0	0	6,711	0	0	0	0	6,711
1941	0	0	0	0	0	0	0	0	2,698	0	0	0	2,698
1942	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	-9,605	0	0	0	0	-9,605
1945	0	0	0	0	0	0	0	0	6,137	0	0	0	6,137
1946	0	0	0	0	0	0	0	-7,247	0	0	0	0	-7,247
1947	0	0	0	0	0	0	0	1,424	0	0	0	0	1,424
1948	0	0	0	0	0	0	0	0	6,208	0	0	0	6,208
1949	0	0	0	0	0	0	0	0	7,688	0	0	0	7,688
1950	0	0	0	0	0	0	0	0	3,735	0	0	0	3,735
1951	0	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0	-7,316	0	0	0	0	-7,316
1953	0	0	0	0	0	0	0	-3,308	0	0	0	0	-3,308
1954	0	0	0	0	0	0	0	-8,651	0	0	0	0	-8,651
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	6,463	0	0	0	0	6,463
1957	0	0	0	0	0	0	0	-4,852	0	0	0	0	-4,852
1958	0	0	0	0	0	3,935	0	-21,652	0	0	0	0	-17,717
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	-14,106	0	0	0	0	-14,106
1963	0	0	0	0	0	0	0	-20,067	0	0	0	0	-20,067
1964	0	0	0	0	0	0	0	0	-3,808	0	0	0	-3,808
1965	0	0	0	0	0	0	0	0	6,957	0	0	0	6,957
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	-19,295	0	0	0	0	-19,295
1968	0	0	0	0	0	0	0	-15,851	0	0	0	0	-15,851
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	-32,546	0	0	0	0	-32,546
1972	0	0	0	0	0	0	0	6,181	0	0	0	0	6,181
1973	0	0	0	0	0	0	0	-18,513	0	0	0	0	-18,513
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	-5,398	0	0	0	-5,398
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	-6,592	0	0	0	0	-6,592
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	-10,407	-9,777	0	0	0	-20,184
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	-6,070	0	0	0	0	-6,070
1984	0	0	0	0	0	0	0	-7,455	0	0	0	0	-7,455
1985	0	0	0	0	0	0	0	1,678	0	0	0	0	1,678
1986	0	0	0	0	0	1,757	0	0	0	0	0	0	1,757
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	364	0	0	0	364
1992	0	0	0	0	0	0	0	-11,376	0	0	0	0	-11,376
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	-7,337	0	0	0	0	0	0	0	0	-7,337
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	-5,046	0	0	0	0	-5,046
2000	0	0	0	0	0	0	0	-14,967	0	0	0	0	-14,967
2001	0	0	0	0	0	0	0	-13,915	0	0	0	0	-13,915
2002	0	0	0	0	0	0	0	-16,248	0	0	0	0	-16,248
Avg (21-02)	0	0	0	-89	43	117	0	-3,838	181	0	0	0	-3,585

Table 2.3-7

Hetch Hetchy Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — No Program

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	55	51	51	172	89	98	148	2,455	4,541	2,034	184	90
Above Normal	55	96	88	66	93	90	131	1,218	3,097	379	125	89
Normal	54	54	50	51	74	74	98	1,342	1,914	167	122	86
Below Normal	55	55	46	43	51	63	91	737	779	113	111	73
Dry	53	53	44	40	44	50	64	186	158	86	86	65
All Years	54	62	56	74	70	75	107	1,182	2,094	548	125	81

Hetch Hetchy Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	55	51	51	167	89	84	144	2,412	4,548	2,034	184	89
Above Normal	55	89	88	66	89	94	131	1,186	3,095	379	125	89
Normal	54	54	50	55	74	74	98	1,260	1,906	167	122	86
Below Normal	55	55	46	43	51	63	88	565	706	113	111	73
Dry	53	53	44	40	44	50	56	157	139	86	86	65
All Years	54	61	56	73	70	73	103	1,110	2,075	548	125	81

Difference in Hetch Hetchy Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — No Program minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	0	0	0	5	0	14	4	42	-7	0	0	0
Above Normal	0	7	0	0	4	-4	0	32	2	0	0	0
Normal	0	0	0	-4	0	0	0	83	8	0	0	0
Below Normal	0	0	0	0	0	0	4	172	73	0	0	0
Dry	0	0	0	0	0	0	8	29	18	0	0	0
All Years	0	1	0	0	1	2	3	72	19	0	0	0

Table 2.3-8

Hetch Hetchy Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — No Program

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	55	51	51	172	89	98	148	2,455	4,541	2,034	184	90
Above Normal	55	96	88	66	93	90	131	1,218	3,097	379	125	89
Normal	54	54	50	51	74	74	98	1,342	1,914	167	122	86
Below Normal	55	55	46	43	51	63	91	737	779	113	111	73
Dry	53	53	44	40	44	50	64	186	158	86	86	65
All Years	54	62	56	74	70	75	107	1,182	2,094	548	125	81

Hetch Hetchy Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	55	51	51	180	89	93	148	2,518	4,534	2,034	184	90
Above Normal	55	96	88	66	89	86	131	1,273	3,092	379	125	89
Normal	54	54	50	51	74	74	98	1,479	1,913	167	122	86
Below Normal	55	55	46	43	51	63	91	758	768	113	111	73
Dry	53	53	44	40	44	50	64	224	168	86	86	65
All Years	54	62	56	75	70	73	107	1,245	2,091	548	125	81

Difference in Hetch Hetchy Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — No Program minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	0	0	0	-7	0	6	0	-64	7	0	0	0
Above Normal	0	0	0	0	4	4	0	-55	5	0	0	0
Normal	0	0	0	0	0	0	0	-137	1	0	0	0
Below Normal	0	0	0	0	0	0	0	-21	11	0	0	0
Dry	0	0	0	0	0	0	0	-38	-10	0	0	0
All Years	0	0	0	-1	1	2	0	-62	3	0	0	0

2.4 Lake Lloyd and Lake Eleanor

Compared to the operation of the WSIP, the operation of Lake Lloyd and Lake Eleanor are simulated to be only slightly different for the alternative. Figure 2.4-1 illustrates a chronological trace of the simulation of Lake Lloyd storage and stream releases. Shown in Figure 2.4-1 are the results for the WSIP, alternative, and base settings. The operation resulting from the alternative is essentially the same as the WSIP, except during the prolonged drought of 1987-1992. The difference in operation during that drought stems from the delivery of additional water from Hetch Hetchy Reservoir in the WSIP setting. The additional draw of water reduced the amount of water released from Hetch Hetchy Reservoir to Don Pedro Reservoir in the WSIP setting, which, for satisfaction of MID/TID entitlements to inflow, was met with additional releases from Lake Lloyd. In the alternative setting, SFPUC deliveries during the 1987-1992 drought are nearly identical to the base setting; thus, an additional release from Lake Lloyd is not needed and the reservoir's operation would essentially be identical to the operation in the base setting.

Figure 2.4-2 illustrates the almost identical operation of Lake Eleanor for the alternative and WSIP settings. Also shown in Figure 2.4-2 is the operation for the base setting. Any difference that occurs in the Lake Eleanor operation would be caused by a small change in operation at Lake Lloyd that would affect the operation of the Cherry-Eleanor Tunnel between the two watersheds. Any difference that occurs in the simulations is more associated with modeling discretion than with any substantive difference in operation.

Supplementing the Figure 2.4-1 representation of Lake Lloyd stream releases is Table 2.4-1, illustrating releases for the alternative and WSIP settings and the difference in releases between the two settings. Table 2.4-2 provides the same form of information for the alternative and base settings.

2.5 Don Pedro Reservoir and La Grange Releases

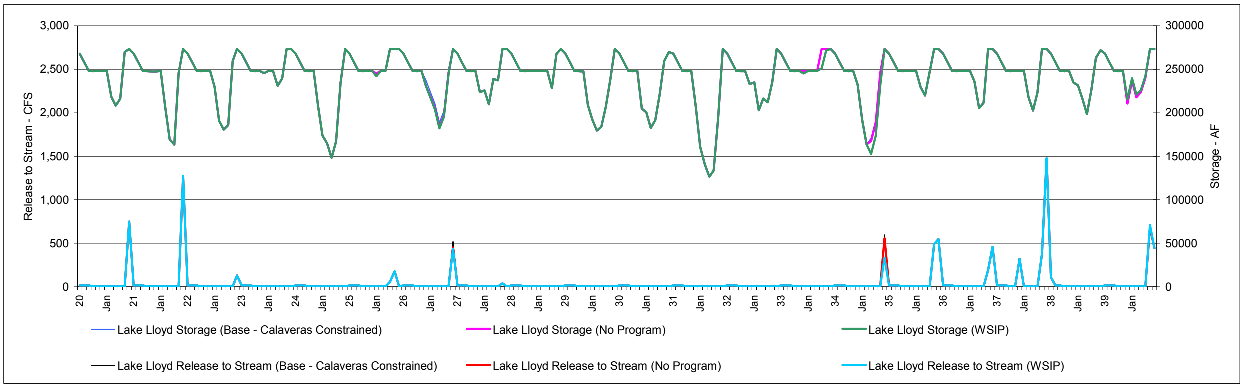
A change in Don Pedro Reservoir operation is caused by changes in inflow to the reservoir. The changes in inflow to the reservoir are the result of net changes within the operation of the upstream SFPUC facilities described previously, and other changes in SFPUC operations associated with diversions to the Holm, Kirkwood, and Moccasin Powerhouses. Figure 2.5-1 illustrates a chronological trace of the simulation of Don Pedro Reservoir storage and Tuolumne River stream releases from La Grange Dam. Shown in Figure 9 are the results for the WSIP, alternative, and base settings.

Supplementing the Figure 2.5-1 representation of Don Pedro Reservoir storage are Table 2.5-1 Don Pedro Reservoir Storage (No Program), Table 2.5-2 Don Pedro Reservoir Storage (WSIP), and Table 2.5-3 Difference in Don Pedro Reservoir Storage (No Program minus WSIP). Table 2.5-4 illustrates the difference in Don Pedro Reservoir storage between the base and alternative settings.

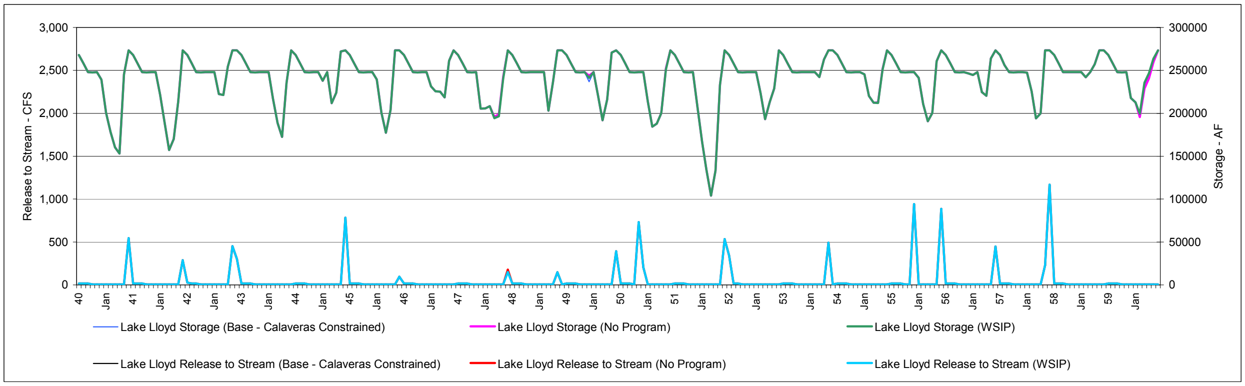
Table 2.5-3 illustrates that, throughout many years, the storage in Don Pedro Reservoir associated with the alternative setting would differ from the storage in the WSIP setting, and that this difference would almost always be more storage. Table 2.5-4 illustrates that the alternative setting results for Don Pedro Reservoir storage are close to the storage results depicted for the base setting. Compared to the WSIP setting, the differences in storage are indicative of the increases to the inflow of Don Pedro Reservoir that are due to lesser SJPL diversions in the alternative setting. The increases in inflow typically occur during winter through early summer. Comparing to the base setting, the alternative would result in typically less inflow to Don Pedro Reservoir, and thus less reservoir storage. As described above concerning SFPUC deliveries and SJPL diversions, when compared to the base setting, the alternative would divert additional water from the Tuolumne in many years. The greatest draw from reservoir storage for both the base and alternative settings occurs during the droughts of the 1930s, 1960s, and 1976-1977.

Figure 2.4-1
Lake Lloyd Storage and Stream Release

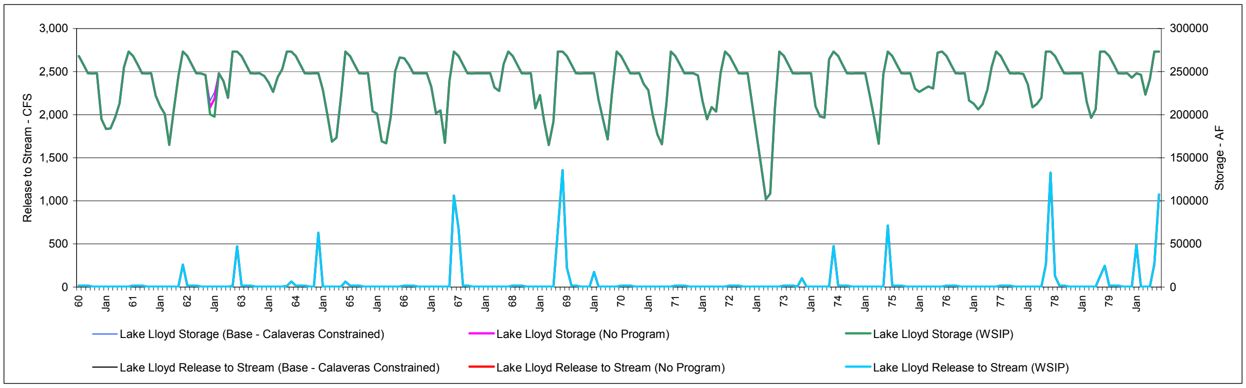
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

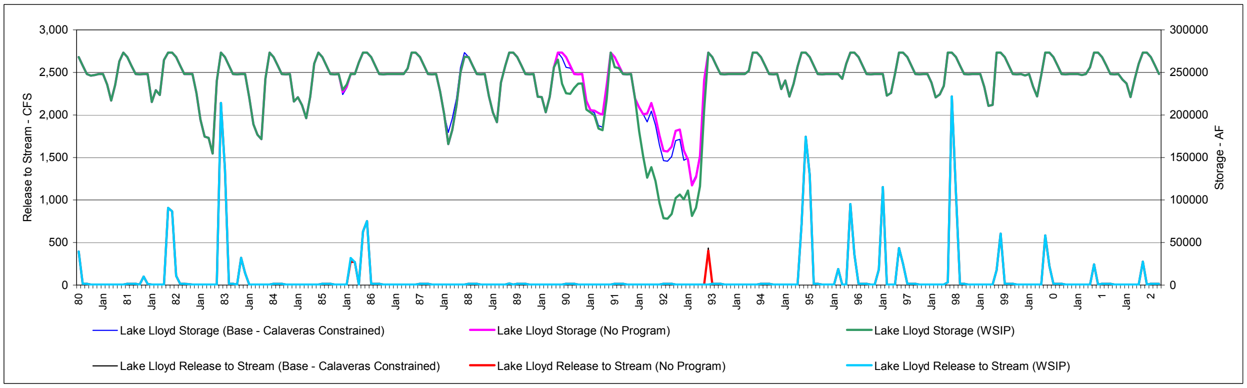
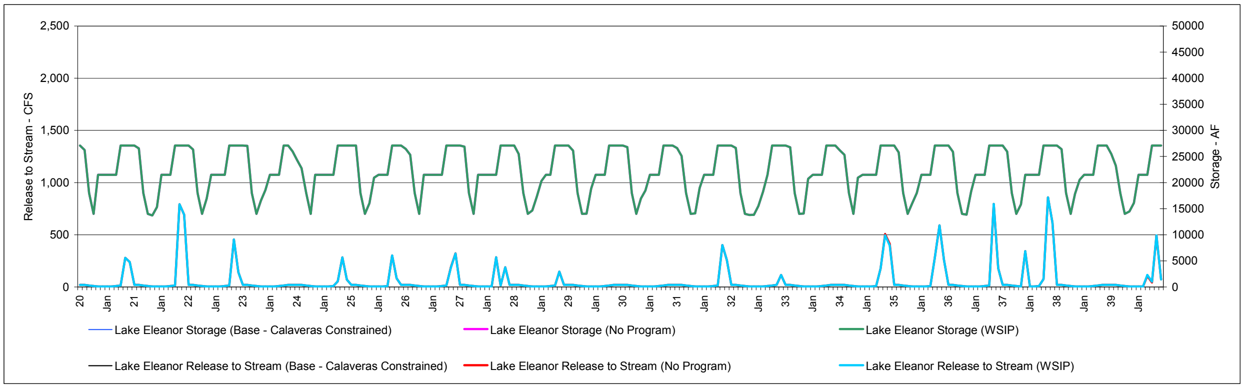
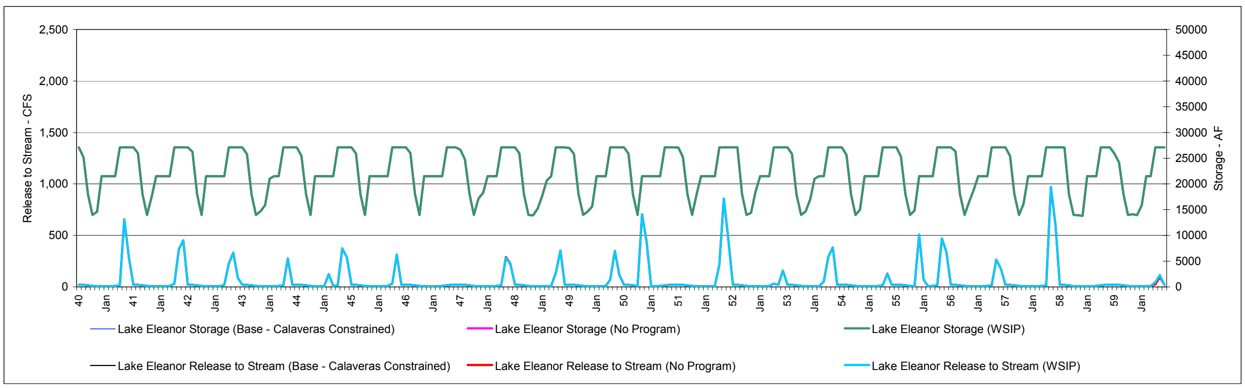


Figure 2.4-2
Lake Eleanor Storage and Stream Release

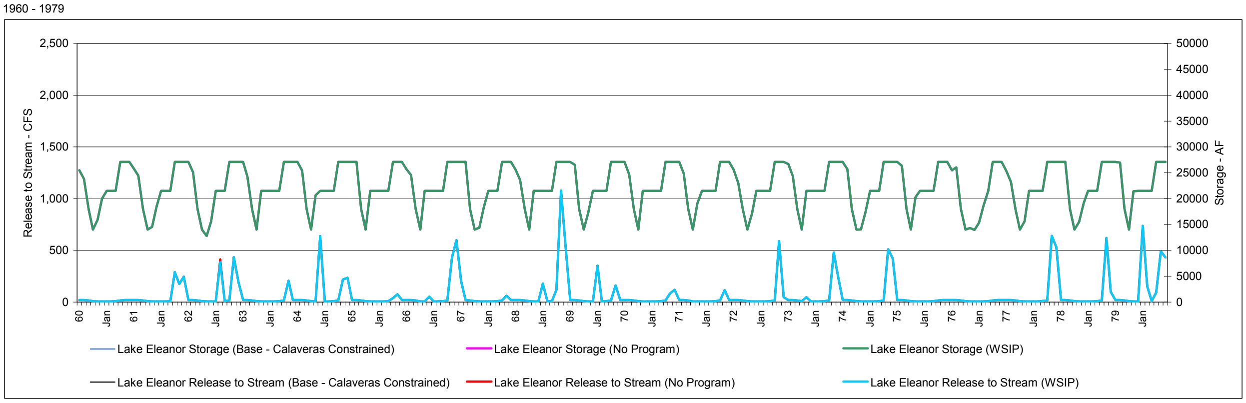
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

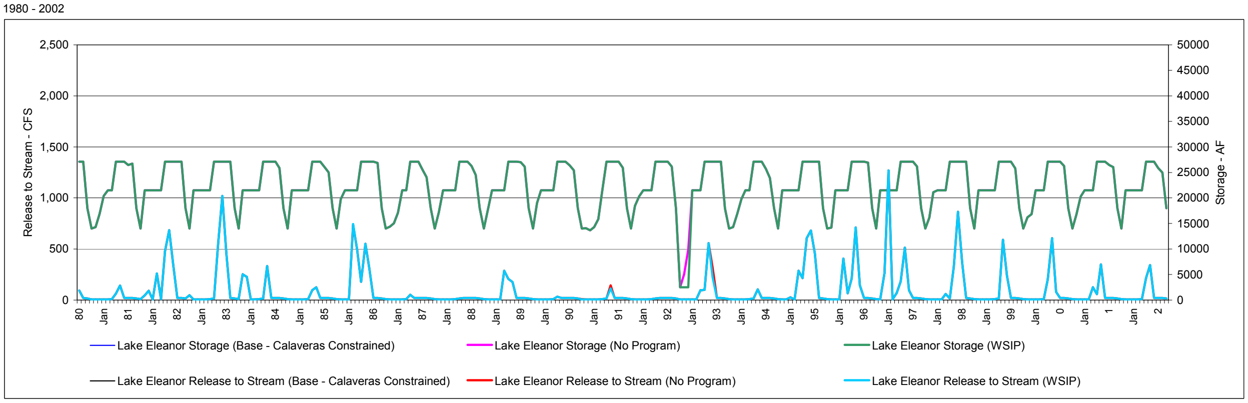


Table 2.4-1

Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — No Program

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	5	11	134	107	22	21	5	284	1,082	363	15	15
Above Normal	5	72	25	5	16	5	5	165	460	16	15	15
Normal	5	5	5	16	5	5	5	110	162	15	15	15
Below Normal	5	5	5	5	5	5	8	39	45	15	15	15
Dry	5	5	5	5	5	5	5	5	5	15	15	15
All Years	5	20	34	27	11	8	6	120	348	83	15	15

Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	5	11	134	107	25	21	5	284	1,058	363	15	15
Above Normal	5	72	25	5	16	5	5	167	446	16	15	15
Normal	5	5	5	16	5	5	5	110	162	15	15	15
Below Normal	5	5	5	5	5	5	8	39	43	15	15	15
Dry	5	5	5	5	5	5	5	5	5	15	15	15
All Years	5	20	34	27	11	8	6	121	340	83	15	15

Difference in Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — No Program minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	0	0	0	0	-2	0	0	0	25	0	0	0
Above Normal	0	0	0	0	0	0	0	-2	14	0	0	0
Normal	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	2	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	0	0	0	0	0	0	8	0	0	0

Table 2.4-2

Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — No Program

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	5	11	134	107	22	21	5	284	1,082	363	15	15
Above Normal	5	72	25	5	16	5	5	165	460	16	15	15
Normal	5	5	5	16	5	5	5	110	162	15	15	15
Below Normal	5	5	5	5	5	5	8	39	45	15	15	15
Dry	5	5	5	5	5	5	5	5	5	15	15	15
All Years	5	20	34	27	11	8	6	120	348	83	15	15

Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Base - Calaveras Constrained

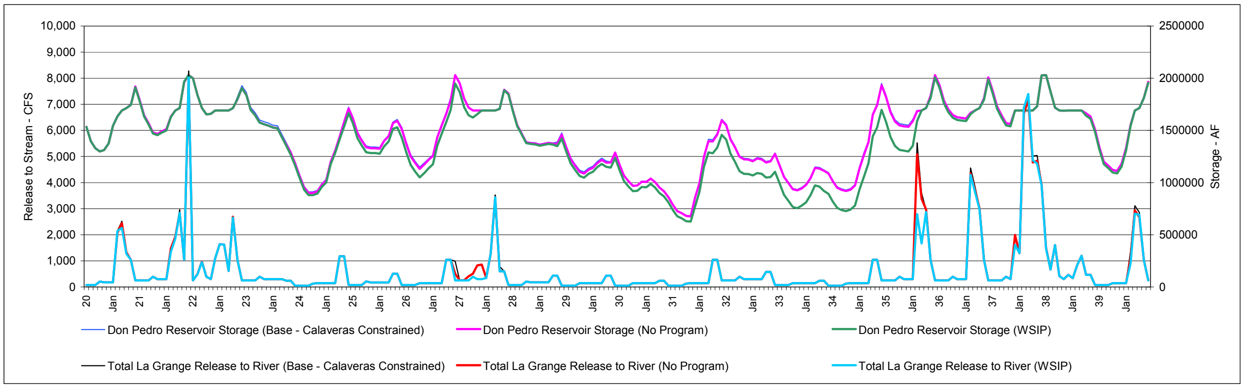
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	5	11	134	107	21	21	5	284	1,084	363	15	15
Above Normal	5	72	25	5	16	5	5	166	467	16	15	15
Normal	5	5	5	16	5	5	5	110	162	15	15	15
Below Normal	5	5	5	5	5	5	8	39	43	15	15	15
Dry	5	5	5	5	5	5	5	5	5	15	15	15
All Years	5	20	34	27	10	8	6	120	350	83	15	15

Difference in Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — No Program minus Base - Calaveras Constrained

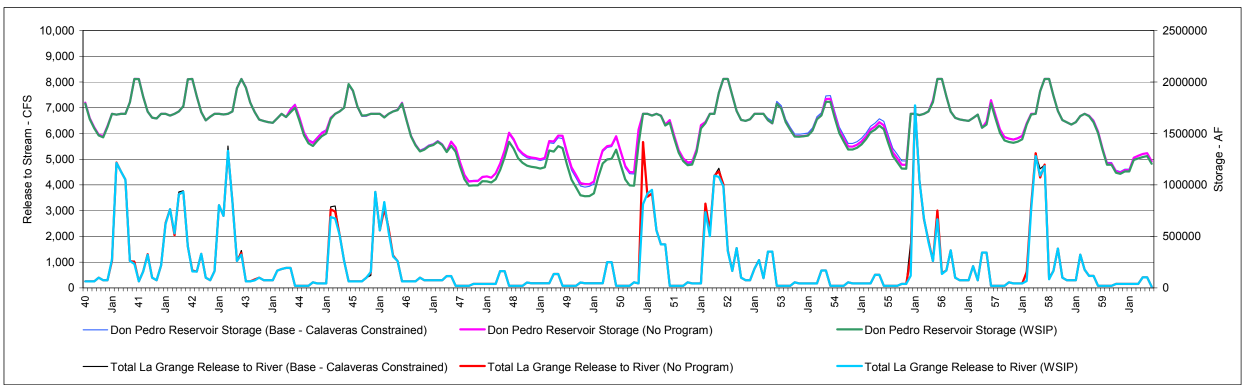
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	0	0	0	0	1	0	0	0	-2	0	0	0
Above Normal	0	0	0	0	0	0	0	-1	-6	0	0	0
Normal	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	2	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	0	0	0	0	0	0	-1	0	0	0

Figure 2.5-1
Don Pedro Reservoir Storage and Release below La Grange Dam

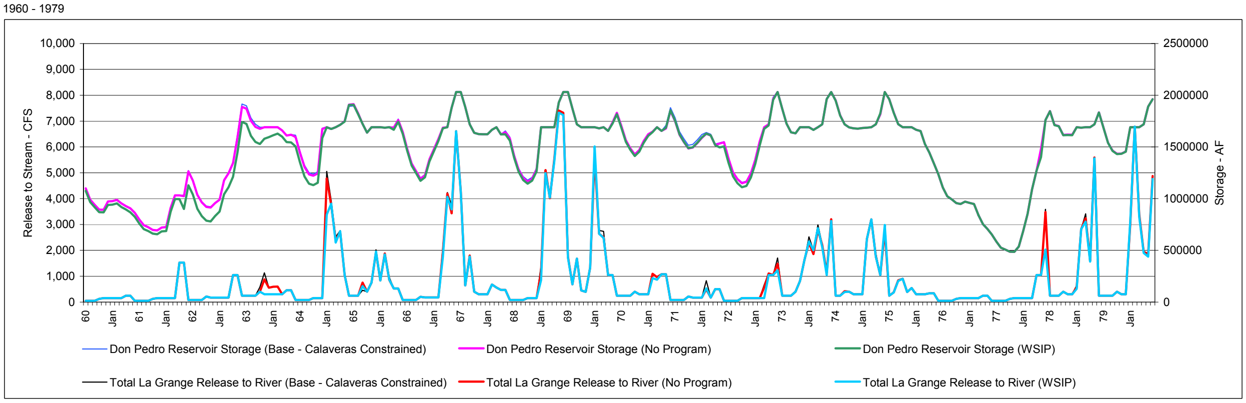
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

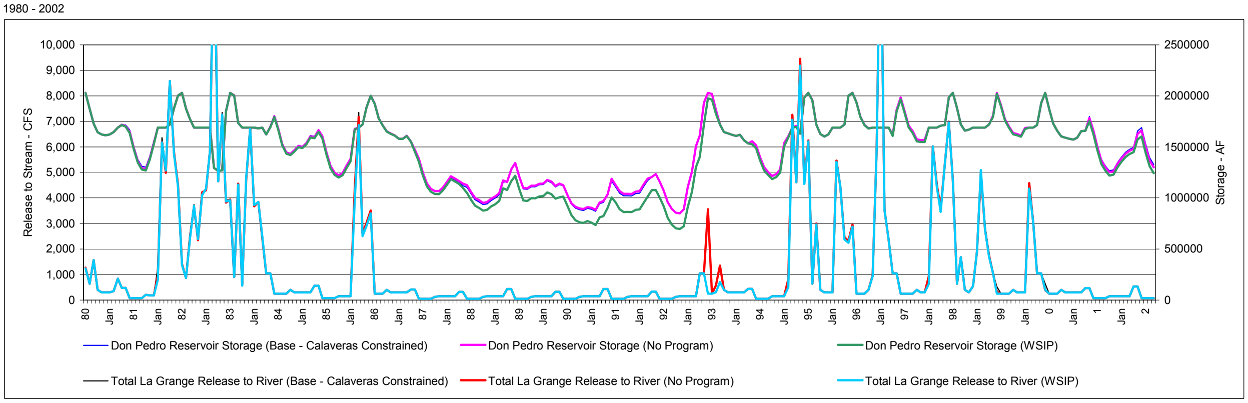


Table 2.5-1

Don Pedro Reservoir Storage (Acre-feet) No Program

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	1,298,116	1,312,166	1,374,846	1,543,388	1,634,722	1,690,000	1,713,000	1,745,304	1,919,714	1,791,985	1,643,660	1,567,033
1922	1,481,037	1,466,223	1,490,517	1,510,684	1,631,831	1,690,000	1,713,000	1,960,435	2,030,000	2,000,320	1,839,774	1,715,715
1923	1,653,078	1,658,406	1,689,999	1,689,989	1,689,997	1,690,000	1,713,000	1,796,338	1,904,832	1,839,046	1,696,383	1,644,794
1924	1,574,948	1,559,282	1,545,265	1,526,859	1,521,572	1,436,887	1,363,564	1,289,023	1,181,484	1,062,591	953,826	899,573
1925	901,708	915,808	979,599	1,021,872	1,198,192	1,305,039	1,439,290	1,579,773	1,710,202	1,614,041	1,473,416	1,401,288
1926	1,337,330	1,328,958	1,329,880	1,323,832	1,398,341	1,442,464	1,569,098	1,591,959	1,513,782	1,373,910	1,251,315	1,187,274
1927	1,131,888	1,171,498	1,218,011	1,256,190	1,434,111	1,548,823	1,657,953	1,789,384	2,030,000	1,952,155	1,805,231	1,718,301
1928	1,690,000	1,690,000	1,689,999	1,690,000	1,689,998	1,690,000	1,706,133	1,888,518	1,853,255	1,689,569	1,547,072	1,469,116
1929	1,385,519	1,377,184	1,374,291	1,361,084	1,369,939	1,378,345	1,371,900	1,372,838	1,459,717	1,336,908	1,223,414	1,159,354
1930	1,103,146	1,086,960	1,122,475	1,142,477	1,186,450	1,217,878	1,190,981	1,193,666	1,287,886	1,171,289	1,066,292	1,013,264
1931	968,496	970,805	1,008,243	1,006,437	1,037,969	1,004,654	951,039	916,957	860,813	786,702	726,638	706,931
1932	680,688	675,522	854,670	994,532	1,248,172	1,395,708	1,395,270	1,459,574	1,596,395	1,550,629	1,414,347	1,336,986
1933	1,247,669	1,222,194	1,219,899	1,205,402	1,230,062	1,221,913	1,192,086	1,202,737	1,274,118	1,165,836	1,054,551	994,979
1934	937,203	925,353	943,572	977,514	1,041,731	1,139,157	1,134,818	1,112,471	1,087,242	1,012,600	950,275	930,302
1935	919,206	932,731	972,255	1,134,385	1,265,602	1,386,527	1,649,956	1,741,108	1,932,070	1,818,021	1,672,270	1,584,531
1936	1,547,855	1,539,287	1,533,431	1,586,968	1,684,922	1,690,000	1,713,000	1,830,008	2,030,000	1,933,710	1,783,656	1,700,740
1937	1,647,382	1,626,049	1,619,524	1,613,461	1,666,911	1,690,000	1,713,000	1,806,861	2,007,948	1,875,383	1,729,165	1,644,380
1938	1,570,213	1,561,639	1,689,998	1,689,992	1,689,987	1,690,000	1,690,000	1,730,000	2,025,000	2,030,000	1,870,754	1,718,957
1939	1,690,000	1,689,224	1,690,000	1,690,000	1,689,999	1,690,000	1,663,228	1,630,859	1,509,393	1,342,060	1,200,234	1,161,404
1940	1,119,132	1,111,850	1,179,301	1,331,138	1,550,766	1,690,000	1,713,000	1,810,751	1,964,472	1,798,724	1,648,460	1,559,820
1941	1,489,196	1,472,883	1,572,331	1,689,994	1,682,838	1,690,000	1,690,000	1,804,936	2,030,000	2,029,753	1,859,361	1,712,171
1942	1,653,599	1,645,971	1,689,999	1,689,982	1,673,445	1,690,000	1,713,000	1,765,000	2,027,000	2,030,000	1,860,016	1,707,840
1943	1,626,500	1,664,178	1,690,000	1,689,976	1,683,949	1,690,000	1,713,000	1,941,931	2,030,000	1,946,772	1,800,744	1,708,535
1944	1,635,544	1,622,060	1,610,317	1,603,271	1,647,454	1,690,000	1,658,867	1,730,938	1,775,690	1,651,142	1,509,359	1,431,862
1945	1,407,172	1,455,184	1,501,621	1,527,921	1,651,338	1,690,000	1,713,000	1,751,773	1,975,552	1,914,669	1,760,487	1,672,607
1946	1,674,780	1,690,000	1,689,996	1,689,984	1,657,552	1,690,000	1,713,000	1,729,648	1,796,230	1,631,885	1,476,269	1,389,860
1947	1,330,648	1,347,083	1,380,410	1,392,630	1,423,421	1,392,934	1,325,077	1,420,215	1,363,251	1,222,453	1,096,916	1,033,555
1948	1,037,230	1,038,473	1,077,098	1,083,448	1,071,522	1,111,725	1,208,171	1,335,625	1,507,968	1,444,975	1,351,156	1,306,523
1949	1,277,110	1,266,568	1,261,333	1,249,816	1,261,905	1,425,593	1,422,028	1,479,296	1,478,277	1,315,462	1,171,851	1,096,630
1950	1,018,351	1,008,209	1,005,737	1,033,464	1,195,822	1,336,439	1,375,846	1,384,651	1,473,246	1,324,713	1,183,980	1,125,051
1951	1,122,150	1,536,617	1,689,993	1,689,972	1,675,326	1,690,000	1,674,296	1,585,781	1,629,228	1,477,886	1,337,977	1,258,548
1952	1,217,148	1,224,843	1,346,436	1,580,571	1,611,738	1,690,000	1,690,000	1,895,000	2,030,000	2,030,000	1,869,932	1,719,140
1953	1,632,895	1,622,960	1,637,300	1,689,996	1,689,998	1,690,000	1,627,805	1,597,144	1,788,936	1,746,349	1,613,317	1,538,337
1954	1,472,544	1,471,743	1,475,386	1,482,187	1,531,156	1,640,722	1,678,551	1,835,023	1,837,198	1,677,016	1,530,935	1,452,401
1955	1,372,941	1,372,676	1,390,962	1,423,547	1,473,820	1,539,436	1,568,682	1,609,093	1,578,859	1,443,164	1,317,892	1,259,130
1956	1,196,132	1,194,743	1,689,999	1,689,942	1,678,244	1,690,000	1,713,000	1,820,430	2,030,000	2,030,000	1,859,576	1,712,725
1957	1,651,881	1,635,922	1,627,970	1,622,414	1,650,203	1,683,085	1,554,764	1,614,799	1,824,080	1,678,902	1,538,880	1,465,109
1958	1,448,685	1,441,112	1,453,822	1,476,790	1,598,914	1,690,000	1,690,000	1,910,000	2,030,000	2,030,000	1,868,297	1,719,418
1959	1,629,791	1,607,494	1,585,600	1,610,046	1,668,508	1,690,000	1,671,222	1,621,179	1,518,619	1,353,414	1,210,000	1,209,664
1960	1,131,733	1,120,302	1,143,530	1,143,223	1,263,788	1,283,664	1,300,579	1,307,832	1,229,790	1,099,027	990,152	940,821
1961	892,883	892,076	973,279	974,984	987,142	953,205	928,064	904,850	861,582	796,716	742,937	723,512
1962	697,491	692,381	720,118	724,073	911,176	1,032,271	1,032,375	1,024,171	1,262,782	1,173,660	1,036,264	963,113
1963	920,107	913,988	956,386	988,479	1,176,610	1,244,644	1,344,383	1,591,300	1,887,460	1,869,508	1,752,786	1,693,534
1964	1,674,608	1,690,000	1,690,000	1,689,998	1,689,999	1,660,043	1,609,884	1,618,050	1,596,133	1,440,783	1,305,411	1,234,228
1965	1,220,553	1,243,816	1,673,500	1,689,961	1,672,810	1,690,000	1,713,000	1,749,433	1,908,523	1,912,747	1,825,430	1,722,996
1966	1,638,039	1,690,000	1,689,998	1,689,996	1,685,637	1,690,000	1,684,975	1,760,858	1,645,651	1,481,542	1,337,844	1,267,197
1967	1,191,253	1,224,774	1,378,467	1,477,487	1,575,321	1,687,038	1,690,000	1,880,000	2,030,000	2,030,000	1,887,521	1,717,653
1968	1,636,798	1,624,593	1,622,729	1,622,934	1,666,601	1,690,000	1,620,006	1,640,383	1,579,740	1,412,582	1,277,076	1,199,310
1969	1,162,855	1,192,156	1,281,640	1,689,991	1,689,990	1,690,000	1,690,000	1,930,000	2,030,000	2,030,000	1,871,603	1,717,046
1970	1,690,000	1,690,000	1,689,999	1,689,955	1,679,635	1,690,000	1,655,509	1,736,527	1,830,101	1,702,198	1,565,091	1,486,913
1971	1,426,854	1,469,758	1,556,808	1,622,720	1,647,812	1,690,000	1,654,817	1,677,695	1,847,730	1,749,792	1,616,223	1,546,659
1972	1,484,450	1,492,999	1,536,596	1,587,066	1,627,088	1,610,035	1,516,119	1,533,071	1,544,380	1,386,486	1,254,967	1,188,194
1973	1,149,437	1,162,425	1,244,497	1,373,303	1,552,922	1,690,000	1,717,600	1,964,954	2,030,000	1,868,018	1,723,820	1,640,583
1974	1,631,540	1,690,000	1,689,998	1,689,983	1,664,266	1,690,000	1,717,600	1,962,884	2,030,000	1,949,484	1,806,587	1,717,369
1975	1,688,936	1,679,039	1,677,494	1,682,832	1,684,940	1,690,000	1,717,600	1,814,069	2,030,000	1,962,189	1,831,507	1,720,413
1976	1,690,000	1,690,000	1,690,000	1,664,706	1,652,292	1,526,598	1,445,307	1,341,473	1,236,083	1,107,685	1,022,829	992,425
1977	956,011	948,887	970,778	958,850	947,176	838,580	752,503	707,496	653,830	583,546	526,720	507,835
1978	487,414	485,146	537,432	682,534	851,424	1,090,274	1,269,016	1,481,891	1,761,000	1,847,487	1,713,521	1,701,803
1979	1,615,610	1,618,684	1,617,740	1,689,998	1,684,439	1,690,000	1,690,000	1,717,600	1,834,417	1,684,409	1,540,382	1,463,780
1980	1,432,372	1,435,084	1,455,118	1,689,977	1,689,987	1,690,000	1,717,600	1,890,400	1,960,200	2,030,000	1,874,603	1,727,346
1981	1,644,248	1,621,877	1,614,080	1,621,636	1,645,736	1,690,000	1,716,204	1,703,727	1,648,127	1,487,086	1,358,541	1,290,338
1982	1,281,446	1,388,353	1,539,097	1,689,993	1,689,988	1,690,000	1,717,600	1,876,400	2,002,900	2,030,000	1,876,224	1,772,100
1983	1,690,000	1,690,000	1,689,995	1,689,966	1,689,989	1,294,700	1,264,000	1,270,800	1,851,400	2,030,000	2,004,672	1,735,004
1984	1,690,000	1,690,000	1,689,992	1,689,972	1,681,440	1,690,000	1,622,418	1,698,186	1,800,634	1,674,650	1,528,008	1,444,558
1985	1,429,514	1,464,617	1,508,997	1,499,588	1,534,644	1,602,720	1,595,813	1,664,043	1,604,356	1,443,802	1,312,103	1,248,139
1986	1,221,109	1,242,289	1,316,508	1,381,523	1,676,254	1,690,000	1,717,600	1,888,300	2,001,400	1,924,104	1,779,851	1,711,472
1987	1,652,333	1,630,287	1,611,738	1,580,618	1,579,818	1,608,676	1,553,151	1,470,139	1,382,746	1,251,431	1,142,939	1,089,571
1988	1,066,790	1,065,871	1,102,056	1,155,884	1,211,743	1,188,750	1,165,834	1,139,512	1,125,551	1,058,509	1,000,217	978,158
1989	951,406	958,863	991,547	1,015,225	1,047,198	1,171,090	1,156,038	1,280,507	1,342,936	1,210,126	1,099,604	1,094,028
1990	1,120,400	1,118,866	1,138,760	1,141,502	1,177,010	1,160,223	1,116,507	1,140,214	1,125,190	1,029,776	946,857	913,586
1991	897,454	890,801	910,546	903,130	882,334	956,022	969,043	1,033,359	1,187,388	1,125,678	1,065,809	1,039,556
1992	1,040,586	1,039,109	1,061,541	1,066,335	1,130,124	1,189,573	1,205,643	1,234,960	1,160,733	1,069,929	957,136	892,288
1993	855,193	848,729	888,523	1,107,393	1,257,180	1,507,210	1,612,798	1,933,530	2,030,000	2,017,436	1,861,705	1,719,599
1994	1,646,103	1,631,887	1,617,737	1,607,786	1,617,849	1,565,080	1,533,232	1,555,042	1,516,106	1,397,028	1,299,456	1,253,416
1995	1,213,975	1,233,762	1,278,545	1,536,071	1,604,173	1,690,000	1,705,169	1,629,700	1,982,800	2,030,000	1,960,024	1,718,601
1996	1,625,962	1,600,348	1,621,665	1,689,833	1,689,990	1,690,000	1,717,600	2,002,400	2,030,000	1,936,711	1,791,487	1,715,008
1997	1,681,833	1,690,000	1,689,993	1,689,874	1,689,994	1,690,000	1,619,865	1,864,818	1,983,075	1,848,620	1,709,176	1,654,854
1998	1,572,881	1,566,474	1,567,881	1,689,994	1,689,989	1,690,000	1,706,546	1,714,000	1,987,500	2,030,000	1,881,075	1,719,248
1999	1,658,952	1,669,423	1,690,000	1,689,986	1,689,991	1,690,000	1,717,600	1,805,734	2,030,000	1,906,901	1,768,854	1,699,268
2000	1,636,307	1,626,310	1,610,667	1,686,605	1,689,992	1,690,000	1,713,910	1,927,735	2,030,000	1,869,201	1,728,017	1,657,692
2001	1,603,232	1,590,888	1,579,361	1,571,337	1,589,625	1,655,516	1,658,030	1,783,322	1,659,058	1,499,408	1,364,554	1,299,743
2002	1,252,704	1,261,508	1,330,882	1,386,308	1,433,400	1,461,965	1,479,722	1,628,139	1,660,295	1,501,809	1,367,238	1,299,212
Avg (21-02)	1,349,150	1,357,393	1,399,370	1,442,997	1,491,316	1,522,868	1,529,084	1,606,836	1,693,098	1,605,050	1,476,518	1,395,756

Table 2.5-2

Don Pedro Reservoir Storage (Acre-feet) WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	1,297,919	1,311,969	1,374,649	1,543,191	1,633,956	1,690,000	1,713,000	1,742,271	1,910,239	1,780,368	1,632,093	1,555,504
1922	1,469,532	1,454,724	1,479,018	1,499,182	1,627,229	1,690,000	1,713,000	1,967,374	2,030,000	1,998,136	1,838,254	1,715,718
1923	1,653,081	1,658,408	1,689,999	1,689,989	1,689,997	1,690,000	1,713,000	1,799,350	1,905,720	1,837,747	1,695,090	1,643,504
1924	1,573,662	1,557,997	1,543,979	1,525,572	1,520,285	1,435,601	1,350,582	1,268,108	1,160,641	1,041,842	933,176	878,997
1925	881,178	895,290	959,080	1,001,347	1,177,665	1,284,520	1,414,414	1,536,668	1,665,128	1,566,983	1,426,571	1,354,602
1926	1,290,743	1,282,398	1,282,833	1,276,745	1,347,403	1,393,186	1,513,528	1,529,318	1,431,062	1,291,567	1,169,352	1,105,586
1927	1,050,369	1,090,025	1,136,534	1,176,089	1,354,003	1,468,745	1,577,952	1,697,527	1,948,089	1,868,412	1,722,499	1,645,385
1928	1,624,109	1,655,435	1,689,902	1,690,000	1,689,998	1,690,000	1,705,499	1,882,298	1,844,942	1,681,291	1,538,831	1,460,902
1929	1,377,322	1,368,992	1,366,099	1,352,890	1,361,744	1,370,153	1,363,716	1,347,620	1,420,045	1,297,417	1,184,105	1,120,176
1930	1,064,049	1,047,885	1,083,398	1,103,389	1,147,360	1,178,802	1,151,942	1,144,262	1,236,535	1,120,169	1,015,406	962,553
1931	917,895	920,233	957,669	955,848	987,375	954,080	900,516	866,574	810,612	736,739	676,917	657,388
1932	631,250	626,111	769,876	913,848	1,153,707	1,290,028	1,281,046	1,334,403	1,458,411	1,411,082	1,275,442	1,198,554
1933	1,109,524	1,084,126	1,081,825	1,067,288	1,091,938	1,083,840	1,048,315	1,053,300	1,103,198	993,506	883,024	824,057
1934	766,654	754,904	779,126	811,010	879,460	973,506	960,998	918,785	892,442	818,720	757,328	738,038
1935	727,361	740,999	780,515	934,490	1,058,269	1,185,433	1,443,820	1,528,475	1,696,712	1,581,499	1,436,797	1,349,843
1936	1,313,654	1,305,218	1,299,245	1,352,785	1,588,986	1,690,000	1,713,000	1,808,423	2,006,955	1,908,581	1,758,637	1,675,801
1937	1,622,493	1,601,173	1,594,638	1,588,536	1,654,992	1,690,000	1,713,000	1,792,216	1,986,905	1,852,247	1,706,131	1,621,419
1938	1,547,298	1,538,738	1,689,998	1,689,992	1,689,987	1,690,000	1,690,000	1,730,000	2,025,000	2,030,000	1,870,754	1,718,957
1939	1,690,000	1,689,224	1,690,000	1,690,000	1,689,999	1,690,000	1,640,414	1,609,719	1,486,211	1,318,984	1,177,264	1,138,511
1940	1,096,286	1,089,016	1,153,019	1,306,880	1,540,470	1,690,000	1,713,000	1,807,953	1,954,973	1,789,267	1,639,044	1,550,434
1941	1,479,830	1,463,523	1,562,835	1,689,993	1,683,062	1,690,000	1,690,000	1,803,805	2,030,000	2,027,570	1,857,840	1,712,174
1942	1,653,602	1,645,974	1,689,999	1,689,982	1,673,445	1,690,000	1,713,000	1,765,000	2,027,000	2,030,000	1,860,016	1,707,840
1943	1,626,500	1,664,178	1,690,000	1,689,976	1,683,949	1,690,000	1,713,000	1,939,745	2,030,000	1,944,589	1,798,570	1,708,539
1944	1,635,547	1,622,064	1,610,321	1,603,274	1,647,456	1,690,000	1,658,867	1,706,915	1,749,631	1,623,011	1,481,354	1,403,951
1945	1,379,320	1,427,347	1,473,782	1,500,075	1,640,198	1,690,000	1,713,000	1,750,606	1,979,431	1,916,348	1,762,159	1,674,274
1946	1,676,444	1,690,000	1,689,996	1,689,984	1,655,146	1,690,000	1,713,000	1,726,277	1,790,756	1,626,434	1,470,843	1,384,452
1947	1,325,252	1,341,690	1,375,016	1,387,235	1,418,025	1,387,541	1,319,689	1,380,202	1,321,263	1,180,658	1,055,313	992,092
1948	995,855	997,122	1,035,745	1,034,871	1,022,941	1,055,025	1,146,212	1,267,720	1,417,634	1,352,869	1,259,478	1,215,157
1949	1,185,933	1,175,442	1,170,203	1,158,664	1,170,747	1,334,893	1,324,462	1,376,085	1,357,943	1,195,682	1,052,617	977,799
1950	899,772	889,700	891,735	917,336	1,074,649	1,209,756	1,247,393	1,254,524	1,342,391	1,193,077	1,052,942	994,455
1951	991,828	1,394,480	1,689,996	1,689,971	1,673,951	1,690,000	1,671,372	1,576,239	1,604,996	1,451,580	1,311,792	1,232,453
1952	1,191,106	1,198,816	1,320,408	1,550,006	1,599,510	1,690,000	1,690,000	1,895,000	2,030,000	2,030,000	1,869,932	1,719,140
1953	1,632,895	1,622,960	1,637,300	1,689,996	1,689,998	1,690,000	1,627,805	1,598,044	1,787,718	1,742,953	1,609,936	1,534,967
1954	1,469,181	1,468,382	1,472,024	1,478,824	1,527,793	1,637,361	1,675,192	1,807,461	1,807,613	1,647,557	1,501,608	1,423,172
1955	1,343,773	1,343,524	1,361,809	1,394,386	1,444,656	1,510,283	1,537,906	1,575,778	1,541,339	1,405,813	1,280,713	1,222,079
1956	1,159,157	1,157,788	1,690,000	1,689,941	1,678,244	1,690,000	1,713,000	1,804,932	2,030,000	2,030,000	1,859,576	1,712,725
1957	1,651,881	1,635,922	1,627,970	1,622,414	1,650,203	1,683,085	1,554,764	1,586,050	1,793,311	1,646,081	1,506,206	1,432,543
1958	1,416,187	1,408,633	1,421,341	1,444,300	1,585,917	1,683,239	1,690,000	1,910,000	2,030,000	2,030,000	1,868,297	1,719,418
1959	1,629,791	1,607,494	1,585,600	1,610,046	1,668,508	1,690,000	1,667,329	1,608,068	1,505,552	1,340,406	1,197,054	1,196,761
1960	1,118,856	1,107,432	1,130,660	1,130,349	1,243,727	1,256,367	1,271,555	1,279,420	1,205,492	1,074,839	966,076	916,828
1961	868,944	868,151	939,429	941,125	953,280	919,356	894,250	867,206	824,074	759,385	705,786	686,494
1962	660,555	655,467	683,202	687,146	874,245	995,355	995,496	899,706	1,129,280	1,038,578	901,808	829,134
1963	786,422	780,381	830,701	875,755	1,042,937	1,111,019	1,210,888	1,447,268	1,742,065	1,722,560	1,606,476	1,547,700
1964	1,529,068	1,578,634	1,594,299	1,612,405	1,628,891	1,598,956	1,546,441	1,542,798	1,504,176	1,349,242	1,214,296	1,143,418
1965	1,129,930	1,153,243	1,584,742	1,689,973	1,672,299	1,690,000	1,713,000	1,744,658	1,904,786	1,906,843	1,817,368	1,723,009
1966	1,638,052	1,690,000	1,689,998	1,689,996	1,685,990	1,690,000	1,666,206	1,743,752	1,626,487	1,462,463	1,318,853	1,248,271
1967	1,172,366	1,205,898	1,359,590	1,458,604	1,556,437	1,679,489	1,690,000	1,880,000	2,030,000	2,030,000	1,885,338	1,717,656
1968	1,636,802	1,624,597	1,622,733	1,622,937	1,666,603	1,690,000	1,620,006	1,623,382	1,560,682	1,393,610	1,258,193	1,180,490
1969	1,144,074	1,173,385	1,262,868	1,689,994	1,689,990	1,690,000	1,690,000	1,930,000	2,030,000	2,030,000	1,871,603	1,717,046
1970	1,690,000	1,690,000	1,689,999	1,689,952	1,679,633	1,690,000	1,655,509	1,725,036	1,816,534	1,686,506	1,549,469	1,471,343
1971	1,411,316	1,454,230	1,541,278	1,607,186	1,641,597	1,690,000	1,654,817	1,685,672	1,853,567	1,753,420	1,619,836	1,550,260
1972	1,488,043	1,496,591	1,540,187	1,590,658	1,628,525	1,611,472	1,517,554	1,495,198	1,504,521	1,346,809	1,215,475	1,148,834
1973	1,110,158	1,123,168	1,205,238	1,334,033	1,513,648	1,676,096	1,707,479	1,954,405	2,030,000	1,868,018	1,723,819	1,640,583
1974	1,631,540	1,690,000	1,689,998	1,689,983	1,662,882	1,690,000	1,717,600	1,963,536	2,030,000	1,947,300	1,804,413	1,717,372
1975	1,688,940	1,679,043	1,677,497	1,682,835	1,684,941	1,690,000	1,717,600	1,823,045	2,030,000	1,960,006	1,829,986	1,720,415
1976	1,690,000	1,690,000	1,690,000	1,664,706	1,652,292	1,526,598	1,445,307	1,341,473	1,236,083	1,107,685	1,022,829	992,425
1977	956,011	948,887	970,778	958,850	947,176	838,580	752,503	707,496	653,830	583,546	526,720	507,835
1978	487,414	485,146	537,432	682,534	851,424	1,090,274	1,269,016	1,401,086	1,761,000	1,845,304	1,711,347	1,699,327
1979	1,612,045	1,615,120	1,614,177	1,689,998	1,684,439	1,690,000	1,690,000	1,717,600	1,832,303	1,682,304	1,538,286	1,461,691
1980	1,430,288	1,433,000	1,453,035	1,689,976	1,689,987	1,690,000	1,717,600	1,890,400	1,960,200	2,030,000	1,874,603	1,727,346
1981	1,644,248	1,621,877	1,614,080	1,621,636	1,645,736	1,690,000	1,714,087	1,699,430	1,636,268	1,475,279	1,346,789	1,278,626
1982	1,269,759	1,376,672	1,527,416	1,689,995	1,689,988	1,690,000	1,717,600	1,876,400	2,002,900	2,030,000	1,874,041	1,772,100
1983	1,690,000	1,690,000	1,689,995	1,689,966	1,689,989	1,294,700	1,264,000	1,270,800	1,851,400	2,030,000	2,002,489	1,735,007
1984	1,690,000	1,690,000	1,689,992	1,689,971	1,681,440	1,690,000	1,622,221	1,691,612	1,791,967	1,663,838	1,517,244	1,433,830
1985	1,418,807	1,453,917	1,498,296	1,488,884	1,523,939	1,592,019	1,585,122	1,645,091	1,583,355	1,422,894	1,291,292	1,227,399
1986	1,200,412	1,221,603	1,293,188	1,358,196	1,670,079	1,690,000	1,717,600	1,888,300	2,001,400	1,921,921	1,777,677	1,709,305
1987	1,650,170	1,628,126	1,609,576	1,578,456	1,577,656	1,606,514	1,550,992	1,452,961	1,354,101	1,222,918	1,114,556	1,061,284
1988	1,038,561	1,037,658	1,073,842	1,127,662	1,183,519	1,160,536	1,137,647	1,097,768	1,048,672	981,981	924,050	902,259
1989	875,673	883,175	915,855	939,511	971,478	1,095,398	1,079,035	1,164,887	1,218,247	1,086,000	976,047	970,893
1990	997,524	996,060	1,015,948	1,018,655	1,054,153	1,037,412	993,814	1,005,333	1,012,353	923,267	831,714	782,012
1991	760,785	754,212	773,166	758,204	736,039	809,784	822,954	901,838	1,006,446	957,482	889,578	860,866
1992	862,284	860,911	883,335	888,075	951,851	1,011,366	1,076,354	1,079,040	1,005,349	915,259	803,211	738,908
1993	702,146	695,777	721,584	911,368	1,061,108	1,302,035	1,403,055	1,721,451	1,976,934	1,962,414	1,823,393	1,719,661
1994	1,646,165	1,631,948	1,617,798	1,607,847	1,617,911	1,565,142	1,533,294	1,527,372	1,486,417	1,367,474	1,270,041	1,224,099
1995	1,184,719	1,204,522	1,249,304	1,506,822	1,592,472	1,690,000	1,695,046	1,629,700	1,982,800	2,030,000	1,957,840	1,718,604
1996	1,625,966	1,600,351	1,621,669	1,689,837	1,689,990	1,690,000	1,717,600	2,002,400	2,030,000	1,934,528	1,789,313	1,712,841
1997	1,679,670	1,690,000	1,689,993	1,689,875	1,689,994	1,690,000	1,607,194	1,849,992	1,966,183	1,829,617	1,690,255	1,635,994
1998	1,554,059	1,547,662	1,549,068	1,689,997	1,689,989	1,690,000	1,707,834	1,714,000	1,987,500	2,030,000	1,881,075	1,719,248
1999	1,658,952	1,669,423	1,690,000	1,689,986	1,689,990	1,690,000	1,717,600	1,793,743	2,020,177	1,894,937	1,756,942	1,687,394
2000	1,624,457	1,614,466	1,598,823	1,674,758	1,689,992	1,690,000	1,713,910	1,930,492	2,030,000	1,869,201	1,728,017	1,657,692
2001	1,603,232	1,590,888	1,579,361	1,571,337	1,589,625	1,655,516	1,658,030	1,751,843	1,625,780	1,466,278	1,331,576	1,266,879
2002	1,219,908	1,228,730	1,298,102	1,353,519	1,400,609	1,429,186	1,446,975	1,572,955	1,603,183	1,444,951	1,310,643	1,242,810
Avg (21-02)	1,311,299	1,320,223	1,364,704	1,409,926	1,461,118	1,494,905	1,500,141	1,568,630	1,654,109	1,565,583	1,437,114	1,357,135

Table 2.5-3

Difference in Don Pedro Reservoir Storage (Acre-feet)

No Program minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	197	197	197	197	766	0	0	3,033	9,475	11,617	11,567	11,529
1922	11,505	11,499	11,499	11,502	4,602	0	0	-6,939	0	2,184	1,520	-3
1923	-3	-2	0	0	0	0	0	-3,012	-888	1,299	1,293	1,290
1924	1,286	1,285	1,286	1,287	1,287	1,286	12,982	20,915	20,843	20,749	20,650	20,576
1925	20,530	20,518	20,519	20,525	20,527	20,519	24,876	43,105	45,074	47,058	46,845	46,686
1926	46,587	46,560	47,047	47,087	50,938	49,278	55,570	62,641	82,720	82,343	81,963	81,688
1927	81,519	81,473	81,477	80,101	80,108	80,078	80,001	91,857	81,911	83,743	82,732	72,916
1928	65,891	34,565	97	0	0	0	634	6,220	8,313	8,278	8,241	8,214
1929	8,197	8,192	8,192	8,194	8,195	8,192	8,184	25,218	39,672	39,491	39,309	39,178
1930	39,097	39,075	39,077	39,088	39,090	39,076	39,039	49,404	51,351	51,120	50,886	50,711
1931	50,601	50,572	50,574	50,589	50,594	50,574	50,523	50,383	50,201	49,963	49,721	49,543
1932	49,438	49,411	84,794	80,684	94,465	105,680	114,224	125,171	137,984	139,547	138,905	138,432
1933	138,145	138,068	138,074	138,114	138,124	138,073	143,771	149,437	170,920	172,330	171,527	170,922
1934	170,549	170,449	164,446	166,504	162,271	165,651	173,820	193,686	194,800	193,880	192,947	192,264
1935	191,845	191,732	191,740	199,895	207,333	201,094	206,136	212,633	235,358	236,522	235,473	234,688
1936	234,201	234,069	234,186	234,183	95,936	0	0	21,585	23,045	25,129	25,019	24,939
1937	24,889	24,876	24,886	24,925	11,919	0	0	14,645	21,043	23,136	23,034	22,961
1938	22,915	22,901	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	22,814	21,140	23,182	23,076	22,970	22,893
1940	22,846	22,834	26,282	24,258	10,296	0	0	2,798	9,499	9,457	9,416	9,386
1941	9,366	9,360	9,496	1	-224	0	0	1,131	0	2,183	1,521	-3
1942	-3	-3	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	2,186	0	2,183	2,174	-4
1944	-3	-4	-4	-3	-2	0	0	24,023	26,059	28,131	28,005	27,911
1945	27,852	27,837	27,839	27,846	11,140	0	0	1,167	-3,879	-1,679	-1,672	-1,667
1946	-1,664	0	0	0	2,406	0	0	3,371	5,474	5,451	5,426	5,408
1947	5,396	5,393	5,394	5,395	5,396	5,393	5,388	40,013	41,988	41,795	41,603	41,463
1948	41,375	41,351	41,353	48,577	48,581	56,700	61,959	67,905	90,334	92,106	91,678	91,366
1949	91,177	91,126	91,130	91,152	91,158	90,700	97,566	103,211	120,334	119,780	119,234	118,831
1950	118,579	118,509	114,002	116,128	121,173	126,683	128,453	130,127	130,855	131,636	131,038	130,596
1951	130,322	142,137	-3	1	1,375	0	2,924	9,542	24,232	26,306	26,185	26,095
1952	26,042	26,027	26,028	30,565	12,228	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	-900	1,218	3,396	3,381	3,370
1954	3,363	3,361	3,362	3,363	3,363	3,361	3,359	27,562	29,585	29,459	29,327	29,229
1955	29,168	29,152	29,153	29,161	29,164	29,153	30,776	33,315	37,520	37,351	37,179	37,051
1956	36,975	36,955	-1	1	0	0	0	15,498	0	0	0	0
1957	0	0	0	0	0	0	0	28,749	30,769	32,821	32,674	32,566
1958	32,498	32,479	32,481	32,490	12,997	6,761	0	0	0	0	0	0
1959	0	0	0	0	0	0	3,893	13,111	13,067	13,008	12,946	12,903
1960	12,877	12,870	12,870	12,874	20,061	27,297	29,024	28,412	24,298	24,188	24,076	23,993
1961	23,939	23,925	33,850	33,859	33,862	33,849	33,814	37,644	37,508	37,331	37,151	37,018
1962	36,936	36,914	36,916	36,927	36,931	36,916	36,879	124,465	133,502	135,082	134,456	133,979
1963	133,685	133,607	125,685	112,724	133,673	133,625	133,495	144,032	145,395	146,948	146,310	145,834
1964	145,540	111,366	95,701	77,593	61,108	61,087	63,443	75,252	91,957	91,541	91,115	90,810
1965	90,623	90,573	88,758	-12	511	0	0	4,775	3,737	5,904	8,062	-13
1966	-13	0	0	0	-353	0	18,769	17,106	19,164	19,079	18,991	18,926
1967	18,887	18,876	18,877	18,883	18,884	7,549	0	0	0	0	2,183	-3
1968	-4	-4	-4	-3	-2	0	0	17,001	19,058	18,972	18,883	18,820
1969	18,781	18,771	18,772	-3	0	0	0	0	0	0	0	0
1970	0	0	0	3	2	0	0	11,491	13,567	15,692	15,622	15,570
1971	15,538	15,528	15,530	15,534	6,215	0	0	-7,977	-5,837	-3,628	-3,613	-3,601
1972	-3,593	-3,592	-3,591	-3,592	-1,437	-1,437	-1,435	37,873	39,859	39,677	39,492	39,360
1973	39,279	39,257	39,259	39,270	39,274	13,904	10,121	10,549	0	0	1	0
1974	0	0	0	0	1,384	0	0	-652	0	2,184	2,174	-3
1975	-4	-4	-3	-3	-1	0	0	-8,976	0	2,183	1,521	-2
1976	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	80,805	0	2,183	2,174	2,476
1979	3,565	3,564	3,563	0	0	0	0	0	2,114	2,105	2,096	2,089
1980	2,084	2,084	2,083	1	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	2,117	4,297	11,859	11,807	11,752	11,712
1982	11,687	11,681	11,681	-2	0	0	0	0	0	0	2,183	0
1983	0	0	0	0	0	0	0	0	0	0	2,183	-3
1984	0	0	0	1	0	0	197	6,574	8,667	10,812	10,764	10,728
1985	10,707	10,700	10,701	10,704	10,705	10,701	10,691	18,952	21,001	20,908	20,811	20,740
1986	20,697	20,686	23,320	23,327	6,175	0	0	0	0	2,183	2,174	2,167
1987	2,163	2,161	2,162	2,162	2,162	2,162	2,159	17,178	28,645	28,513	28,383	28,287
1988	28,229	28,213	28,214	28,222	28,224	28,214	28,187	41,744	76,879	76,528	76,167	75,899
1989	75,733	75,688	75,692	75,714	75,720	75,692	77,003	115,620	124,689	124,126	123,557	123,135
1990	122,876	122,806	122,812	122,847	122,857	122,811	122,693	134,881	112,837	106,509	115,143	131,574
1991	136,669	136,589	137,380	144,926	146,295	146,238	146,089	131,521	180,942	168,196	176,231	178,690
1992	178,302	178,198	178,206	178,260	178,273	178,207	129,289	155,920	155,384	154,670	153,925	153,380
1993	153,047	152,952	166,939	196,025	196,072	205,175	209,743	212,079	53,066	55,022	38,312	-62
1994	-62	-61	-61	-61	-62	-62	-62	27,670	29,689	29,554	29,415	29,317
1995	29,256	29,240	29,241	29,249	11,701	0	10,123	0	0	0	2,184	-3
1996	-4	-3	-4	-4	0	0	0	0	0	2,183	2,174	2,167
1997	2,163	0	0	-1	0	0	12,671	14,826	16,892	19,003	18,921	18,860
1998	18,822	18,812	18,813	-3	0	0	-1,288	0	0	0	0	0
1999	0	0	0	0	1	0	0	11,991	9,823	11,964	11,912	11,874
2000	11,850	11,844	11,844	11,847	0	0	0	-2,757	0	0	0	0
2001	0	0	0	0	0	0	0	31,479	33,278	33,130	32,978	32,864
2002	32,796	32,778	32,780	32,789	32,791	32,779	32,747	55,184	57,112	56,858	56,595	56,402
Avg (21-02)	37,850	37,170	34,666	33,072	30,198	27,963	28,943	38,206	38,990	39,467	39,405	38,621

Table 2.5-4

Difference in Don Pedro Reservoir Storage (Acre-feet)

No Program minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	0	0	0	0	687	0	0	-440	-2,766	-2,753	-2,741	-2,733
1922	-2,727	-2,725	-2,725	-2,726	-1,090	0	0	-16,773	0	0	0	0
1923	0	0	0	0	0	0	0	-23,867	-23,788	-23,684	-23,581	-23,505
1924	-23,458	-23,446	-23,446	-23,453	-23,454	-23,446	-14,855	-10,535	-10,499	-10,452	-10,403	-10,365
1925	-10,343	-10,337	-10,337	-10,340	-10,341	-10,337	-10,582	-12,333	-12,292	-12,238	-12,183	-12,141
1926	-12,117	-12,110	-12,121	-12,098	-8,448	-9,511	-10,354	-13,237	-16,416	-16,341	-16,264	-16,210
1927	-16,176	-16,168	-9,569	-10,970	-10,971	-10,967	-10,957	-26,562	0	0	0	0
1928	0	0	0	0	0	0	-6,867	-6,850	-6,827	-6,798	-6,767	-6,745
1929	-6,731	-6,727	-6,728	-6,730	-6,730	-6,727	-6,721	-15,550	-15,497	-15,426	-15,354	-15,302
1930	-15,270	-15,262	-15,263	-15,267	-15,268	-15,263	-15,248	-4,740	-4,723	-4,702	-4,681	-4,665
1931	-4,655	-4,652	-4,653	-4,654	-4,654	-4,652	-4,648	-4,635	-4,618	-4,596	-4,574	-4,558
1932	-4,548	-4,544	-1,274	-12,649	-9,864	-19,080	-15,334	-12,958	-9,966	-9,921	-9,877	-9,843
1933	-9,823	-9,817	-9,817	-9,820	-9,821	-9,817	-9,627	-9,381	-8,236	-8,198	-8,161	-8,134
1934	-8,116	-8,110	-8,459	-8,695	-9,461	-9,368	-10,098	-9,076	-9,046	-9,004	-8,962	-8,931
1935	-8,911	-8,905	-8,906	-16,352	-22,738	-9,482	-9,275	-12,443	-17,523	-17,446	-17,371	-17,313
1936	-17,279	-17,269	-17,159	-17,173	-5,068	0	0	4,132	3,534	3,518	3,504	3,492
1937	3,485	3,484	3,484	3,485	3,676	0	0	4,909	2,135	2,126	2,117	2,110
1938	2,106	2,105	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	-6,099	-6,083	-6,063	-6,035	-6,007	-5,988
1940	-5,975	-5,971	-1,792	-3,109	873	0	0	8,973	10,782	10,735	10,689	10,654
1941	10,631	10,625	9,833	1	-172	0	0	-1,964	0	0	0	0
1942	0	0	0	1	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	-2,850	0	0	0	0
1944	0	0	0	0	0	0	0	-9,594	-9,563	-9,522	-9,479	-9,447
1945	-9,428	-9,422	-9,422	-9,425	-3,770	0	0	882	7,006	6,976	6,945	6,923
1946	6,910	0	0	0	2,406	0	0	-8,271	-8,244	-8,209	-8,172	-8,144
1947	-8,128	-8,122	-8,122	-8,125	-8,125	-8,123	-8,115	-6,671	-6,648	-6,617	-6,587	-6,564
1948	-6,551	-6,548	-6,547	663	663	3,091	3,579	5,121	13,382	13,322	13,261	13,215
1949	13,187	13,179	13,181	13,155	13,156	15,634	18,435	20,768	29,200	29,066	28,934	28,837
1950	28,777	28,760	18,868	25,340	15,033	11,320	12,265	12,956	16,641	16,564	16,490	16,434
1951	16,400	16,390	0	1	1,375	0	0	5,701	11,196	11,146	11,095	11,056
1952	11,034	11,028	11,028	11,078	4,432	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	-19,831	-22,892	-22,818	-22,719	-22,621	-22,547
1954	-22,500	-22,488	-22,488	-22,495	-22,496	-22,488	-22,467	-31,054	-30,951	-30,817	-30,679	-30,578
1955	-30,513	-30,496	-30,497	-30,506	-30,509	-30,498	-31,042	-32,228	-38,558	-38,385	-38,208	-38,078
1956	-37,999	-37,978	1	0	0	0	0	7,383	0	0	0	0
1957	0	0	0	0	0	0	0	-4,846	-4,831	-4,809	-4,788	-4,772
1958	-4,762	-4,760	-4,759	-4,761	-1,905	804	0	0	0	0	0	0
1959	0	0	0	0	0	0	-1,870	-9,304	-9,273	-9,231	-9,188	-9,158
1960	-9,139	-9,133	-9,134	-9,136	-5,397	439	911	1,426	-924	-919	-915	-912
1961	-910	-909	29	28	29	28	28	2,690	2,680	2,668	2,655	2,645
1962	2,640	2,638	2,638	2,639	2,639	2,638	2,635	-9,558	-7,687	-7,653	-7,617	-7,591
1963	-7,575	-7,570	296	-261	-7,579	-7,576	-7,569	-27,030	-26,942	-26,825	-26,707	-26,623
1964	-15,392	0	0	0	0	0	0	-818	-16,677	-16,602	-16,525	-16,468
1965	-16,435	-16,426	-8,088	2	1,548	0	0	6,123	17,645	17,569	17,491	-28
1966	-28	0	0	0	0	0	-8,195	-8,175	-8,149	-8,112	-8,075	-8,047
1967	-8,031	-8,027	-8,027	-8,029	-8,030	-2,308	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	-14,852	-14,802	-14,735	-14,667	-14,618
1969	-14,588	-14,580	-14,580	2	0	0	0	0	0	0	0	0
1970	0	0	0	0	1,191	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	-31,812	-31,708	-31,569	-31,433	-31,329
1972	-31,265	-31,248	-31,248	-31,257	-12,504	-12,501	-12,488	-6,284	-6,262	-6,234	-6,205	-6,184
1973	-6,171	-6,167	-6,167	-6,169	-6,170	0	0	-15,640	0	0	0	0
1974	0	0	0	1	1,385	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	-7,778	0	-1	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	-6,583	0	0	0	0
1979	-4,752	-4,749	-4,750	1	1	0	0	0	0	0	0	0
1980	0	0	0	1	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	-10,394	-19,551	-19,464	-19,375	-19,308
1982	-19,267	-19,256	-19,257	3	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	1	0	0	0	-7,446	-7,421	-7,390	-7,357	-7,332
1985	-7,316	-7,313	-7,313	-7,315	-7,315	-7,312	-7,305	-5,713	-5,695	-5,668	-5,642	-5,623
1986	-5,611	-5,608	-8,534	-6,617	-4,347	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	1,425	1,420	1,413	1,406	1,401
1988	1,399	1,398	1,398	1,399	15,059	15,054	9,462	20,720	21,983	16,894	16,816	16,757
1989	16,721	16,712	16,712	16,717	16,718	16,712	-4,777	2,837	10,180	10,133	10,087	10,053
1990	10,031	10,026	10,026	10,029	10,030	10,026	10,017	8,319	6,560	721	9,867	12,782
1991	12,753	12,746	12,746	12,750	12,751	12,746	12,733	292	21,152	19,136	19,048	18,984
1992	18,944	18,932	18,934	18,939	18,940	18,934	444	443	441	439	437	436
1993	434	434	434	14,096	14,097	11,984	7,372	9,255	0	0	0	0
1994	0	0	0	0	0	0	0	-2,865	-2,855	-2,843	-2,829	-2,819
1995	-2,813	-2,811	-2,812	-2,813	-1,125	0	920	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	1	0	0	-951	-948	-945	-941	-937	-934
1998	-932	-932	-932	0	0	0	184	0	0	0	0	0
1999	0	0	0	0	1	0	0	-8,606	0	0	0	0
2000	0	0	0	0	0	0	0	-14,948	0	0	0	0
2001	0	0	0	0	0	0	0	-13,898	-13,853	-13,792	-13,728	-13,681
2002	-13,651	-13,644	-13,644	-13,648	-13,650	-13,645	-13,632	-28,821	-28,726	-28,598	-28,468	-28,369
Avg (21-02)	-3,347	-3,241	-2,792	-2,247	-1,638	-1,386	-2,316	-5,036	-3,603	-3,742	-3,613	-3,778

Figure 2.5-2 illustrates the difference in reservoir storage averaged by year type in comparing the alternative to the WSIP settings. Also shown is the average difference in storage for the two settings during the 82-year simulation. Figure 2.5-3 illustrates the same information in comparing the alternative and the base settings.

Figure 2.5-2

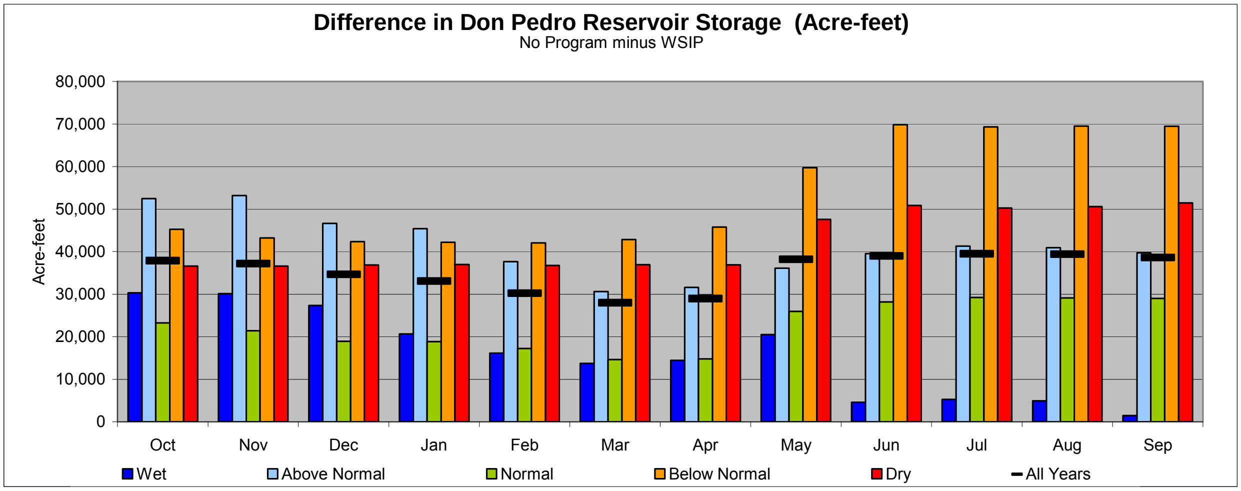


Figure 2.5-3

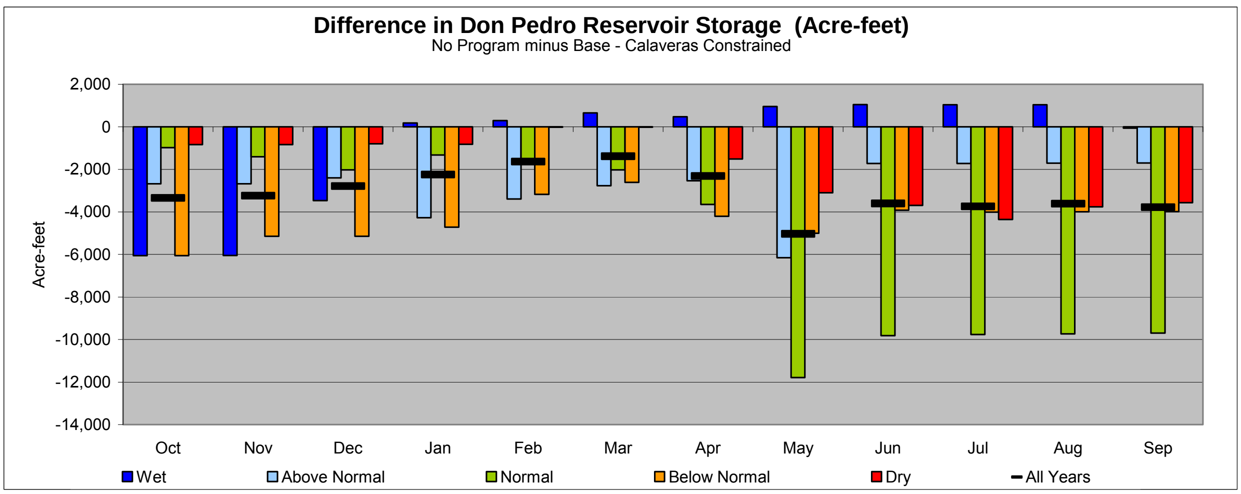


Figure 2.5-4 illustrates the average monthly storage in Don Pedro Reservoir for the 82-year simulation, and the range in storage for each month for the alternative and base settings.

The difference in storage in Don Pedro Reservoir attributed to the upstream effects of the alternative would manifest in differences in releases from La Grange Dam to the stream. A different amount of available reservoir space in the winter and spring due to the alternative would lead to a different ability to regulate inflow, thus potentially changing the amount of water released to the stream that is above minimum release requirements. During periods when inflow differs and Don Pedro Reservoir is at maximum storage capacity within the flood control storage limitation, a change in inflow directly manifests as a change in release from La Grange Dam (a change of either more or less flow). Figure 2.5-1 illustrates the stream release from La Grange Dam for the WSIP, alternative, and base settings.

Figure 2.5-4

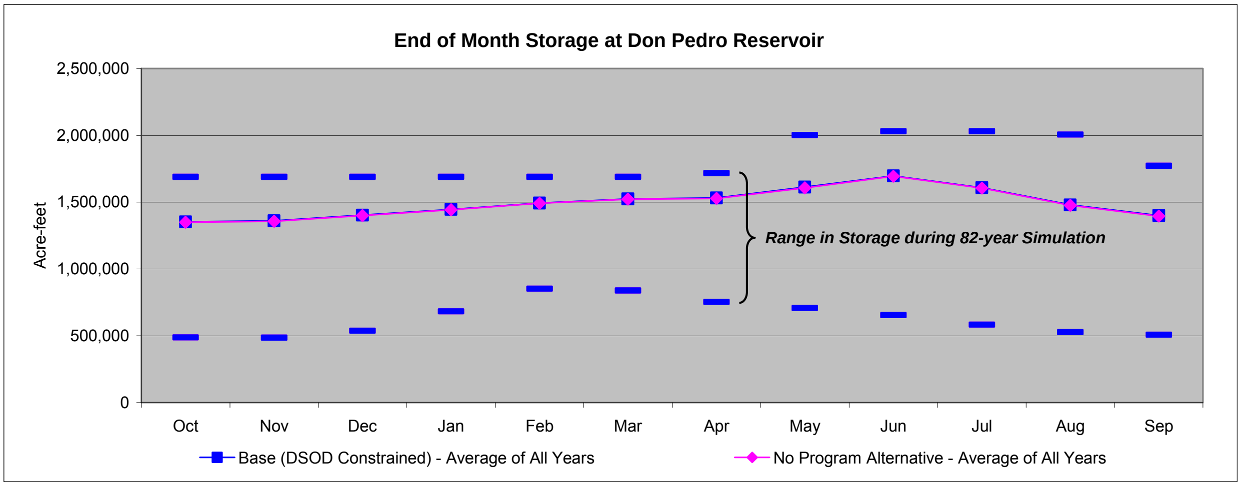


Table 2.5-5 illustrates the difference in stream releases between the alternative and WSIP settings. Compared to the WSIP setting, the alternative typically exhibits an incrementally larger stream release, predominantly during some months in early winter through June, which reflects the months when releases to the stream are made above minimum release requirements due to flood control or in anticipation of the reservoir being filled. There are exceptions, a decrease in releases to the stream, during certain years when the alternative diverts more water the SJPL to serve more demand as compared to the WSIP setting. Table 2.5-6 illustrates the same information in comparing the alternative and WSIP settings, with years ranked in descending order of the San Joaquin River Index. Illustrated is the finding that differences in releases to the Tuolumne River from La Grange Dam would occur only when there are releases in excess of minimum Federal Energy Regulatory Commission (FERC) flow requirements. This circumstance typically occurs only in above normal and wet years, and predominantly during early winter through June. During July of the wettest of years, additional releases could be associated with the alternative setting. During other year types and during the summer and fall, releases would be maintained at minimum FERC flow requirements regardless of the setting. Compared to the WSIP setting, the large potential reduction in flow following an extended drought period is ameliorated with the alternative because the amount of water delivered by the SFPUC during these periods is typically about the same as delivered in the base setting, thereby not exacerbating the draw down of Don Pedro Reservoir.

As described above concerning Don Pedro inflow and storage, compared to the base setting, the alternative setting would lead to an additional draw of storage due to SFPUC diversions that are greater than in the base setting in many years. Although the reduction in storage would not greatly accumulate over several years, greater replenishment of Don Pedro Reservoir storage is needed in over 40 percent of the years of the 82-year simulation. Table 2.5-7 illustrates the difference in stream releases between the alternative and base settings, depicting the predominance of reductions to flow. Table 2.5-8 illustrates the same information ranked in descending order of the San Joaquin River Index.

Table 2.5-6 and Table 2.5-7 illustrate the difference in stream release between the alternative, WSIP, and base settings, expressed in terms of a monthly volume (acre-feet) of flow. Table 2.5-9 illustrates the same information and the average monthly stream release for the alternative and WSIP settings, expressed in average monthly flow (cfs). Table 2.5-10 illustrates the same information in comparing the alternative and base settings. For the comparison of the alternative to the WSIP setting, the difference in monthly flow below La Grange Dam could range from an increase of approximately 197,000 acre-feet to a decrease of approximately 25,000 acre-feet. Considering the manner in which releases are determined and made to the stream, quantifying the effect of these changes in terms of average monthly flow (cfs) is not always meaningful. Similar to the operation of releases below O'Shaughnessy Dam, a change in the volume of release from La Grange Dam to the stream would likely result in the initiation of the release being delayed or accelerated by a matter of days. Assuming that a change in release volume equates to a delay or acceleration of releasing 6,000 acre-feet per day, the difference in stream release from La Grange Dam between the alternative and WSIP would be a delay in releases up to 4 days or up to an added month of release.

Table 2.5-5

Difference in Total La Grange Release to River (Acre-feet) No Program minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	-4,006	11,155	3,078	0	0	0	0	0	10,227
1922	0	0	0	0	6,901	4,600	0	0	-4,810	0	655	1,521	8,867
1923	0	0	-3	0	0	0	2,117	0	0	0	0	0	2,114
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	15,734	0	644	9,569	25,947
1928	6,886	31,299	34,469	97	0	0	0	0	0	0	0	0	72,751
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	127,417	105,199	5,710	0	585	0	0	0	238,911
1937	0	0	0	0	3,265	4,940	2,383	0	0	0	0	0	10,588
1938	0	0	23,319	-1	-12,030	-13,274	-4,858	7,178	2,118	2,188	0	0	4,640
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	11,005	8,369	-5,390	0	0	0	0	0	13,984
1941	0	0	0	-3,823	1,344	-3	519	0	4,553	0	655	1,520	4,765
1942	0	0	-2	2,404	0	-4,757	0	0	0	2,188	0	0	-167
1943	0	0	0	0	0	-2,773	2,117	0	4,299	0	0	2,174	5,817
1944	0	0	0	0	-2	-1	0	0	0	0	0	0	-3
1945	0	0	0	0	16,708	16,941	986	0	0	0	0	0	34,635
1946	0	-1,663	0	0	-14,436	8,481	2,339	0	0	0	0	0	-5,279
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	148,803	-7,614	-8,248	1,375	0	0	0	0	0	0	134,316
1952	0	0	0	0	18,340	12,225	0	13,259	4,879	2,188	0	0	50,891
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	44,359	-3,807	0	-2,429	3,821	0	20,353	2,188	0	0	64,485
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	19,494	10,167	6,759	-4,163	3,774	2,188	0	0	38,219
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	34,103	15,670	18,132	16,489	0	0	0	0	0	0	0	84,394
1965	0	0	0	85,928	-3,100	6,315	-1,825	0	0	0	0	8,062	95,380
1966	0	-13	-1,749	0	2,121	-353	0	0	0	0	0	0	6
1967	0	0	0	0	0	11,331	7,545	-9,039	0	2,188	0	2,184	14,209
1968	0	0	0	0	-2	-1	0	0	0	0	0	0	-3
1969	0	0	0	18,777	6,716	-1,473	4,880	5,043	4,879	2,188	0	0	41,010
1970	0	0	0	-24,687	2	1,679	0	0	0	0	0	0	-23,006
1971	0	0	0	0	9,321	6,213	0	0	0	0	0	0	15,534
1972	0	0	0	0	-2,156	0	0	0	0	0	0	0	-2,156
1973	0	0	0	0	0	25,359	3,772	0	15,411	0	0	0	44,542
1974	0	0	0	-2,873	-8,303	-4,187	4,604	5,695	4,229	0	0	2,174	1,339
1975	0	0	0	0	-2	-1	921	0	-13,092	0	655	1,520	-9,999
1976	-2	0	0	0	0	0	0	0	0	0	0	0	-2
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	86,285	0	0	0	86,285
1979	0	0	0	3,565	0	8,037	2,118	2,189	0	0	0	0	15,909
1980	0	0	0	-6,682	1	5,898	2,118	6,944	6,721	2,188	0	0	17,188
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	11,685	589	-5,898	0	4,757	4,603	2,188	0	4,297	22,221
1983	-1,808	-2,762	6,659	-3,806	0	0	0	-5,615	-2,762	2,188	0	2,183	-5,723
1984	4,301	-4,603	827	-3,002	0	-3,935	0	0	0	0	0	0	-6,412
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	25,029	19,497	6,697	6,945	6,721	0	0	0	64,889
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	196,874	0	16,507	38,313	251,694
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	17,550	11,984	0	16,770	6,445	2,188	0	2,183	57,120
1996	0	0	0	0	2,673	-951	4,880	5,043	4,880	0	0	0	16,525
1997	0	2,162	0	5,410	-1	0	0	0	0	0	0	0	7,571
1998	0	0	0	18,818	-3	6,683	7,734	-240	1,012	2,188	0	0	36,192
1999	0	0	0	0	-7,734	0	3,282	0	4,910	0	0	0	458
2000	0	0	0	0	11,848	0	0	0	-634	0	0	0	11,214
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	114	714	3,321	1,323	2,888	3,005	809	668	4,609	320	233	923	18,928

Table 2.5-6

Difference in Total La Grange Release to River (Acre-feet)

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending SJR Index No Program minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1983	-1,808	-2,762	6,659	-3,806	0	0	0	-5,615	-2,762	2,188	0	2,183	-5,723
1969	0	0	0	18,777	6,716	-1,473	4,880	5,043	4,879	2,188	0	0	41,010
1995	0	0	0	0	17,550	11,984	0	16,770	6,445	2,188	0	2,183	57,120
1938	0	0	23,319	-1	-12,030	-13,274	-4,858	7,178	2,118	2,188	0	0	4,640
1998	0	0	0	18,818	-3	6,683	7,734	-240	1,012	2,188	0	0	36,192
1982	0	0	0	11,685	589	-5,898	0	4,757	4,603	2,188	0	4,297	22,221
1967	0	0	0	0	0	11,331	7,545	-9,039	0	2,188	0	2,184	14,209
1952	0	0	0	0	18,340	12,225	0	13,259	4,879	2,188	0	0	50,891
1958	0	0	0	0	19,494	10,167	6,759	-4,163	3,774	2,188	0	0	38,219
1980	0	0	0	-6,682	1	5,898	2,118	6,944	6,721	2,188	0	0	17,188
1978	0	0	0	0	0	0	0	0	86,285	0	0	0	86,285
1922	0	0	0	0	6,901	4,600	0	0	-4,810	0	655	1,521	8,867
1956	0	0	44,359	-3,807	0	-2,429	3,821	0	20,353	2,188	0	0	64,485
1942	0	0	-2	2,404	0	-4,757	0	0	0	2,188	0	0	-167
1941	0	0	0	-3,823	1,344	-3	519	0	4,553	0	655	1,520	4,765
1986	0	0	0	0	25,029	19,497	6,697	6,945	6,721	0	0	0	64,889
1993	0	0	0	0	0	0	0	0	196,874	0	16,507	38,313	251,694
1997	0	2,162	0	5,410	-1	0	0	0	0	0	0	0	7,571
1996	0	0	0	0	2,673	-951	4,880	5,043	4,880	0	0	0	16,525
1943	0	0	0	0	0	-2,773	2,117	0	4,299	0	0	2,174	5,817
1937	0	0	0	0	3,265	4,940	2,383	0	0	0	0	0	10,588
1974	0	0	0	-2,873	-8,303	-4,187	4,604	5,695	4,229	0	0	2,174	1,339
1975	0	0	0	0	-2	-1	921	0	-13,092	0	655	1,520	-9,999
1965	0	0	0	85,928	-3,100	6,315	-1,825	0	0	0	0	8,062	95,380
1936	0	0	0	0	127,417	105,199	5,710	0	585	0	0	0	238,911
1984	4,301	-4,603	827	-3,002	0	-3,935	0	0	0	0	0	0	-6,412
1979	0	0	0	3,565	0	8,037	2,118	2,189	0	0	0	0	15,909
1945	0	0	0	0	16,708	16,941	986	0	0	0	0	0	34,635
1999	0	0	0	0	-7,734	0	3,282	0	4,910	0	0	0	458
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	15,734	0	644	9,569	25,947
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1946	0	-1,663	0	0	-14,436	8,481	2,339	0	0	0	0	0	-5,279
1973	0	0	0	0	0	25,359	3,772	0	15,411	0	0	0	44,542
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	11,848	0	0	0	-634	0	0	0	11,214
1940	0	0	0	0	11,005	8,369	-5,390	0	0	0	0	0	13,984
1923	0	0	-3	0	0	0	2,117	0	0	0	0	0	2,114
1921	0	0	0	0	-4,006	11,155	3,078	0	0	0	0	0	10,227
1970	0	0	0	-24,687	2	1,679	0	0	0	0	0	0	-23,006
1951	0	0	148,803	-7,614	-8,248	1,375	0	0	0	0	0	0	134,316
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	9,321	6,213	0	0	0	0	0	0	15,534
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	-2	-1	0	0	0	0	0	0	-3
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1928	6,886	31,299	34,469	97	0	0	0	0	0	0	0	0	72,751
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	-13	-1,749	0	2,121	-353	0	0	0	0	0	0	6
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	-2	-1	0	0	0	0	0	0	-3
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	34,103	15,670	18,132	16,489	0	0	0	0	0	0	0	84,394
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	-2,156	0	0	0	0	0	0	0	-2,156
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	-2	0	0	0	0	0	0	0	0	0	0	0	-2
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 2.5-7

Difference in Total La Grange Release to River (Acre-feet)

No Program minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	-4,124	-4,546	-522	0	0	0	0	0	-9,192
1922	0	0	0	0	-1,636	-1,091	-7,365	-5,684	-19,507	0	0	0	-35,283
1923	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	-28,094	0	0	0	-28,094
1928	0	0	0	0	0	-5,339	-10,773	0	0	0	0	0	-16,112
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	-24,136	-13,876	775	0	585	0	0	0	-36,652
1937	0	0	0	0	-11,604	-8,066	-1,304	0	0	0	0	0	-20,974
1938	0	0	4,375	-1	-12,030	-13,319	-14,201	-12,373	-2,762	-1	0	0	-50,312
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	-14,567	-10,851	-10,674	0	0	0	0	0	-36,092
1941	0	0	0	-3,485	1,029	-198	215	0	-2,025	0	0	0	-4,464
1942	0	0	0	-2,091	0	-8,562	-5,524	-2,855	-2,762	0	0	0	-21,794
1943	0	0	0	0	0	-14,234	-2,762	0	-5,608	0	0	1	-22,603
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	-5,655	-13,284	941	0	0	0	0	0	-17,998
1946	0	6,908	0	0	-14,436	-4,911	-1,528	0	0	0	0	0	-13,967
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	23,051	-7,612	-8,248	1,375	0	0	0	0	0	0	8,566
1952	0	0	0	0	6,647	4,431	0	-7,316	0	0	0	0	3,762
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	-36,875	-3,805	0	-6,763	1,127	0	7,371	0	0	0	-38,945
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	-2,856	1,226	804	-20,701	920	0	0	0	-20,607
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	-11,189	-15,388	0	0	0	0	0	0	0	0	0	0	-26,577
1965	0	0	0	-16,654	-9,278	-7,165	-3,058	0	0	0	0	17,491	-18,664
1966	0	-28	-6,060	0	0	-6,452	0	0	0	0	0	0	-12,540
1967	0	0	0	0	0	-10,229	-2,307	-18,732	0	0	0	0	-31,268
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	-14,584	-491	-7,611	-2,761	0	0	0	0	0	-25,447
1970	0	0	0	-2,850	-7,143	-14,400	0	0	0	0	0	0	-24,393
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	-18,755	0	0	0	0	0	0	0	-18,755
1973	0	0	0	0	0	-6,169	0	0	-12,852	0	0	0	-19,021
1974	0	0	0	-14,028	-8,302	-12,749	-920	1	0	0	0	0	-35,998
1975	0	0	0	0	0	0	-7,365	0	-12,844	0	0	0	-20,209
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	-6,572	0	0	0	-6,572
1979	0	0	0	-4,751	0	-11,066	0	0	0	0	0	0	-15,817
1980	0	0	0	-2,848	0	-2,664	-2,762	1,902	1,841	0	0	0	-4,531
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	-19,262	-9,570	-8,561	0	1,903	1,841	0	0	0	-33,649
1983	-4,757	-4,603	9,323	-3,806	0	0	0	-11,414	-5,524	0	0	0	-20,781
1984	-2,854	-4,603	827	-3,002	0	0	0	0	0	0	0	0	-9,632
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	9,249	-11,151	-4,603	1,903	1,842	0	0	0	-2,760
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	8,912	0	0	0	8,912
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	-1,688	4,105	0	3,773	2,762	0	0	0	8,952
1996	0	0	0	0	-855	-951	-1,841	2,855	2,762	0	0	0	1,970
1997	0	0	0	-7,337	1	0	0	0	0	0	0	0	-7,336
1998	0	0	0	-933	0	9	-1,105	-2,670	-2,762	0	0	0	-7,461
1999	0	0	0	0	-7,734	-9,514	-1,722	0	-11,354	0	0	0	-30,324
2000	0	0	0	0	0	0	0	0	-14,924	0	0	0	-14,924
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	-229	-216	-65	-1,305	-1,783	-2,470	-966	-846	-1,204	0	0	213	-8,873

Table 2.5-8

Difference in Total La Grange Release to River (Acre-feet)

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending SJR Index

No Program minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1983	-4,757	-4,603	9,323	-3,806	0	0	0	-11,414	-5,524	0	0	0	-20,781
1969	0	0	0	-14,584	-491	-7,611	-2,761	0	0	0	0	0	-25,447
1995	0	0	0	0	-1,688	4,105	0	3,773	2,762	0	0	0	8,952
1938	0	0	4,375	-1	-12,030	-13,319	-14,201	-12,373	-2,762	-1	0	0	-50,312
1998	0	0	0	-933	0	9	-1,105	-2,670	-2,762	0	0	0	-7,461
1982	0	0	0	-19,262	-9,570	-8,561	0	1,903	1,841	0	0	0	-33,649
1967	0	0	0	0	0	-10,229	-2,307	-18,732	0	0	0	0	-31,268
1952	0	0	0	0	6,647	4,431	0	-7,316	0	0	0	0	3,762
1958	0	0	0	0	-2,856	1,226	804	-20,701	920	0	0	0	-20,607
1980	0	0	0	-2,848	0	-2,664	-2,762	1,902	1,841	0	0	0	-4,531
1978	0	0	0	0	0	0	0	0	-6,572	0	0	0	-6,572
1922	0	0	0	0	-1,636	-1,091	-7,365	-5,684	-19,507	0	0	0	-35,283
1956	0	0	-36,875	-3,805	0	-6,763	1,127	0	7,371	0	0	0	-38,945
1942	0	0	0	-2,091	0	-8,562	-5,524	-2,855	-2,762	0	0	0	-21,794
1941	0	0	0	-3,485	1,029	-198	215	0	-2,025	0	0	0	-4,464
1986	0	0	0	0	9,249	-11,151	-4,603	1,903	1,842	0	0	0	-2,760
1993	0	0	0	0	0	0	0	0	8,912	0	0	0	8,912
1997	0	0	0	-7,337	1	0	0	0	0	0	0	0	-7,336
1996	0	0	0	0	-855	-951	-1,841	2,855	2,762	0	0	0	1,970
1943	0	0	0	0	0	-14,234	-2,762	0	-5,608	0	0	1	-22,603
1937	0	0	0	0	-11,604	-8,066	-1,304	0	0	0	0	0	-20,974
1974	0	0	0	-14,028	-8,302	-12,749	-920	1	0	0	0	0	-35,998
1975	0	0	0	0	0	0	-7,365	0	-12,844	0	0	0	-20,209
1965	0	0	0	-16,654	-9,278	-7,165	-3,058	0	0	0	0	17,491	-18,664
1936	0	0	0	0	-24,136	-13,876	775	0	585	0	0	0	-36,652
1984	-2,854	-4,603	827	-3,002	0	0	0	0	0	0	0	0	-9,632
1979	0	0	0	-4,751	0	-11,066	0	0	0	0	0	0	-15,817
1945	0	0	0	0	-5,655	-13,284	941	0	0	0	0	0	-17,998
1999	0	0	0	0	-7,734	-9,514	-1,722	0	-11,354	0	0	0	-30,324
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	-28,094	0	0	0	-28,094
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1946	0	6,908	0	0	-14,436	-4,911	-1,528	0	0	0	0	0	-13,967
1973	0	0	0	0	0	-6,169	0	0	-12,852	0	0	0	-19,021
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	-14,924	0	0	0	-14,924
1940	0	0	0	0	-14,567	-10,851	-10,674	0	0	0	0	0	-36,092
1923	0	0	0	0	0	0	0	0	0	0	0	0	0
1921	0	0	0	0	-4,124	-4,546	-522	0	0	0	0	0	-9,192
1970	0	0	0	-2,850	-7,143	-14,400	0	0	0	0	0	0	-24,393
1951	0	0	23,051	-7,612	-8,248	1,375	0	0	0	0	0	0	8,566
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1928	0	0	0	0	0	-5,339	-10,773	0	0	0	0	0	-16,112
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	-28	-6,060	0	0	-6,452	0	0	0	0	0	0	-12,540
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	-11,189	-15,388	0	0	0	0	0	0	0	0	0	0	-26,577
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	-18,755	0	0	0	0	0	0	0	-18,755
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 2.5-9

Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by SJR Index Year Type) No Program

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	26,307	22,037	51,724	129,195	193,989	247,569	201,424	191,496	214,872	79,958	31,729	78,003	1,468,303
Above Normal	18,139	30,330	77,022	76,247	128,352	115,910	92,527	82,916	20,332	14,739	14,777	14,826	686,116
Below Normal	18,058	18,666	25,471	19,559	36,239	39,214	56,136	58,008	4,463	4,612	4,612	4,463	289,500
Dry	20,742	18,072	17,945	17,522	25,354	25,876	29,552	30,537	4,349	4,494	4,494	4,349	203,283
Critical	14,533	11,590	12,560	11,644	10,518	11,644	20,489	21,172	2,975	3,074	3,074	2,975	126,249
All Years	20,227	20,596	40,130	61,533	94,762	108,602	95,034	90,699	69,028	28,445	14,337	27,827	671,218

Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by SJR Index Year Type) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	26,382	22,062	48,627	124,111	190,719	245,157	199,412	189,305	200,624	78,864	30,959	75,248	1,431,469
Above Normal	17,886	30,698	68,220	78,114	120,555	105,165	91,467	82,787	18,214	14,739	14,739	14,263	656,848
Below Normal	17,484	16,058	22,744	19,551	35,285	38,726	56,136	58,008	4,463	4,612	4,612	4,463	282,142
Dry	20,742	15,449	16,739	16,127	24,251	25,876	29,552	30,537	4,349	4,494	4,494	4,349	196,957
Critical	14,534	11,590	12,560	11,644	10,518	11,644	20,489	21,172	2,975	3,074	3,074	2,975	126,250
All Years	20,112	19,882	36,809	60,209	91,874	105,597	94,225	90,031	64,418	28,125	14,104	26,904	652,291

Difference in Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by SJR Index Year Type) No Program minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	-75	-25	3,097	5,085	3,269	2,412	2,012	2,191	14,248	1,094	770	2,755	36,834
Above Normal	253	-369	8,802	-1,867	7,797	10,745	1,060	129	2,118	0	38	563	29,268
Below Normal	574	2,607	2,727	8	953	488	0	0	0	0	0	0	7,357
Dry	0	2,623	1,205	1,395	1,102	0	0	0	0	0	0	0	6,326
Critical	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	114	714	3,321	1,323	2,888	3,005	809	668	4,609	320	233	923	18,928

Table 2.5-10

Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by SJR Index Year Type) No Program

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	26,307	22,037	51,724	129,195	193,989	247,569	201,424	191,496	214,872	79,958	31,729	78,003	1,468,303
Above Normal	18,139	30,330	77,022	76,247	128,352	115,910	92,527	82,916	20,332	14,739	14,777	14,826	686,116
Below Normal	18,058	18,666	25,471	19,559	36,239	39,214	56,136	58,008	4,463	4,612	4,612	4,463	289,500
Dry	20,742	18,072	17,945	17,522	25,354	25,876	29,552	30,537	4,349	4,494	4,494	4,349	203,283
Critical	14,533	11,590	12,560	11,644	10,518	11,644	20,489	21,172	2,975	3,074	3,074	2,975	126,249
All Years	20,227	20,596	40,130	61,533	94,762	108,602	95,034	90,699	69,028	28,445	14,337	27,827	671,218

Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by SJR Index Year Type) Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	26,505	22,228	52,690	132,897	195,713	251,883	203,746	194,388	216,210	79,958	31,729	77,274	1,485,222
Above Normal	18,307	30,194	75,617	77,318	133,414	121,042	93,276	82,916	24,252	14,739	14,777	14,826	700,678
Below Normal	18,058	18,668	25,976	19,559	36,239	40,197	57,034	58,008	4,463	4,612	4,612	4,463	291,887
Dry	21,603	19,256	17,945	17,522	26,796	25,876	29,552	30,537	4,349	4,494	4,494	4,349	206,770
Critical	14,533	11,590	12,560	11,644	10,518	11,644	20,489	21,172	2,975	3,074	3,074	2,975	126,249
All Years	20,456	20,812	40,195	62,838	96,544	111,073	96,000	91,545	70,232	28,445	14,337	27,614	680,091

Difference in Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by SJR Index Year Type) No Program minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	-198	-192	-966	-3,701	-1,724	-4,314	-2,322	-2,892	-1,338	0	0	729	-16,919
Above Normal	-168	136	1,405	-1,071	-5,061	-5,132	-749	0	-3,920	0	0	0	-14,561
Below Normal	0	-2	-505	0	0	-983	-898	0	0	0	0	0	-2,388
Dry	-861	-1,184	0	0	-1,443	0	0	0	0	0	0	0	-3,487
Critical	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	-229	-216	-65	-1,305	-1,783	-2,470	-966	-846	-1,204	0	0	213	-8,873

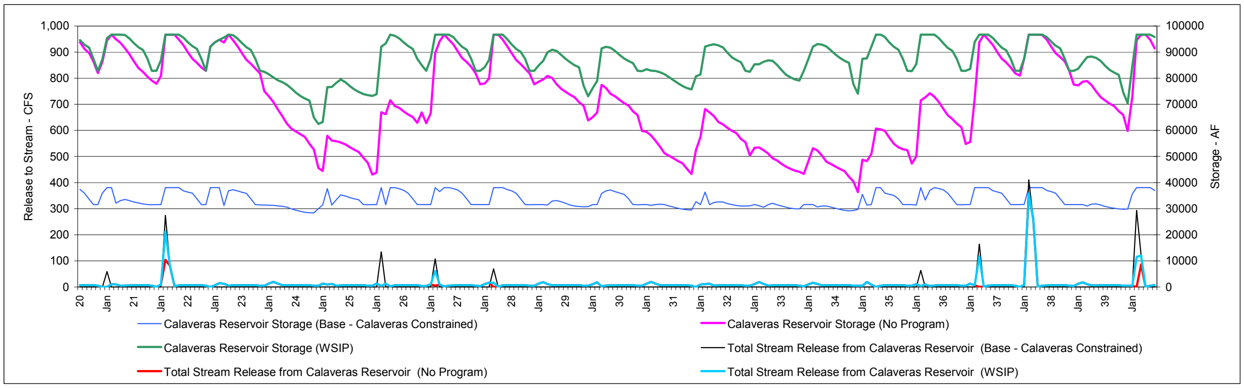
Normally, the effect of the delay in release would not affect the year's peak stream release rate during a year. However, infrequently, the alternative's effect on stream releases could manifest as an elimination of all flows during a year above minimum FERC flow requirements. Compared to the base setting, the alternative's effect to stream flow ranges from a slight reduction to releases (a potential delay in release of 6 days) to a slight increase in releases (a potential additional day of release).

2.6 Calaveras and San Antonio Reservoirs, Alameda Creek, and Downstream

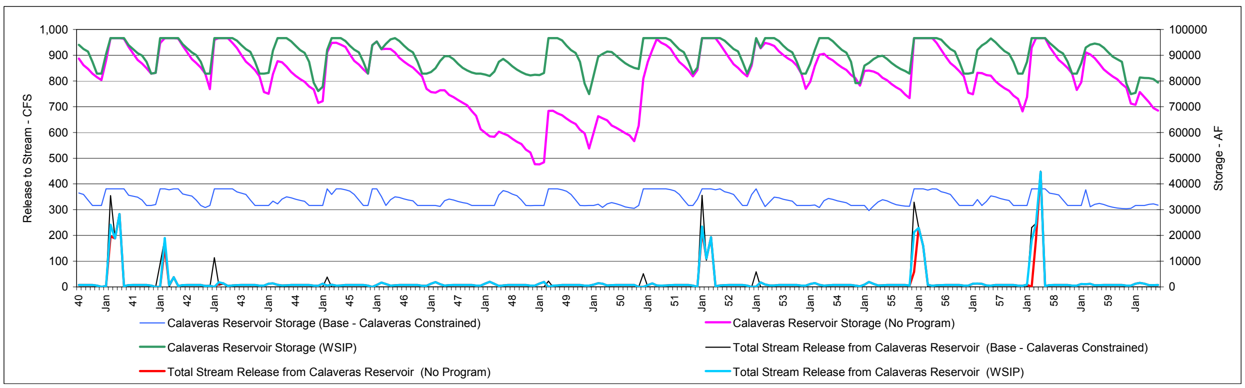
Compared to the WSIP setting, Calaveras Reservoir storage is utilized to a greater extent in the alternative setting. Figure 2.6-1 illustrates a chronological trace of the simulation of Calaveras Reservoir storage and stream releases from Calaveras Dam. Shown in Figure 2.6-1 are the results for the WSIP, alternative, and base settings. The difference in Calaveras Reservoir storage between the alternative and WSIP settings is mostly caused by the interaction of the increased demand served by the system's resources (300 mgd for the alternative and a net 290-mgd demand for the WSIP for many years), and by the difference in conveyance capacity of the SJPL. Generally, the systematic decrease in reservoir storage beginning in spring and lasting through fall is due to the additional demand and less SJPL conveyance capacity drawing more water from Calaveras Reservoir during the period. This additional draw down occurs each year between annual filling events, and accumulates during drought sequences

Figure 2.6-1
Calaveras Reservoir Storage and Stream Release

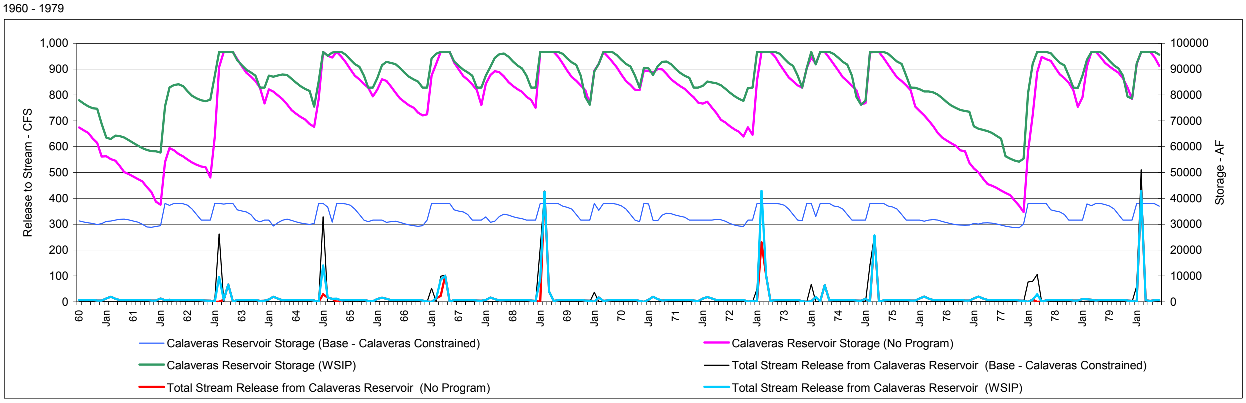
1920 - 1939



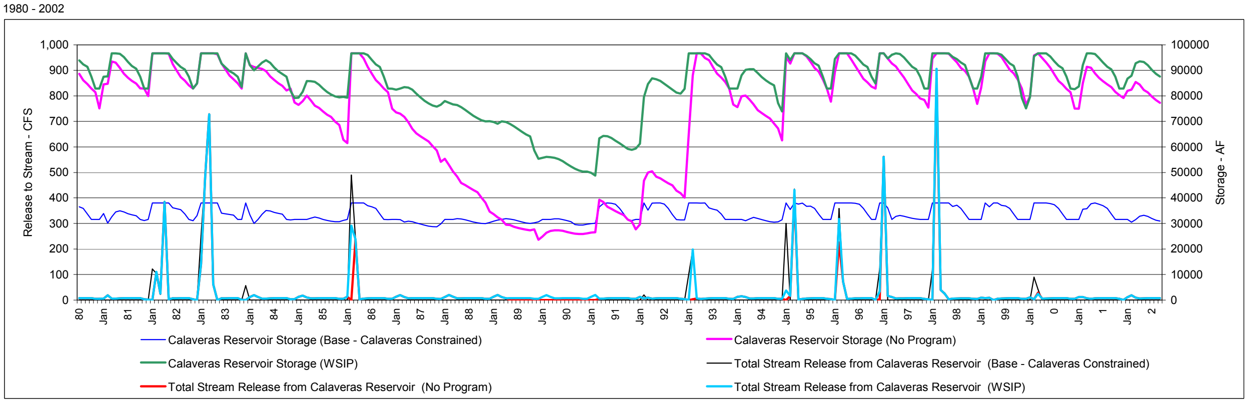
1940 - 1959



1960 - 1979

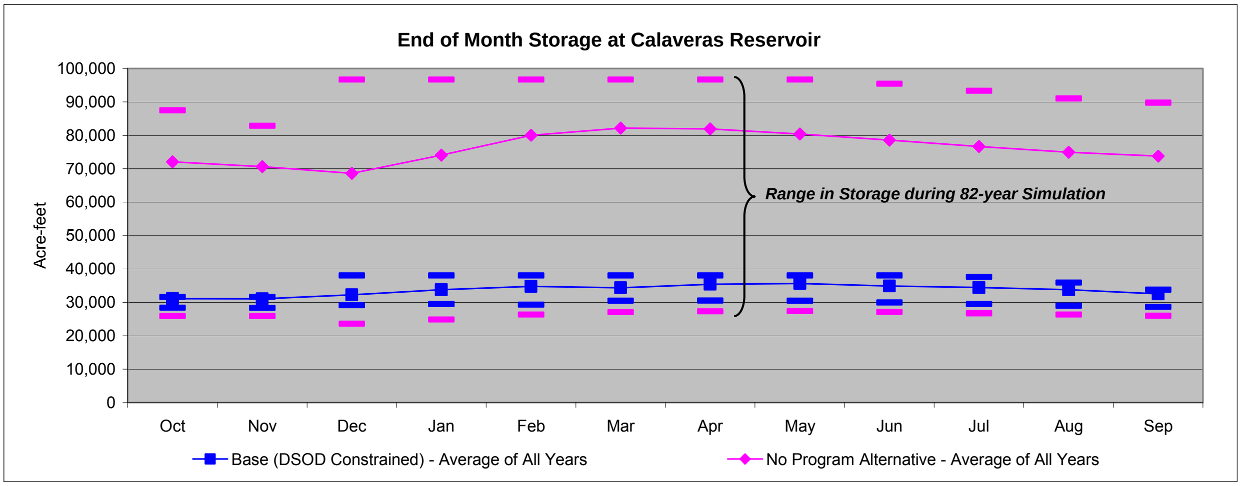


1980 - 2002



when the local watershed runoff is minimal. The lesser capacity of the SJPL in the alternative setting would also constrain the ability to offset the need for diversions from Calaveras Reservoir during the replenishment period. The difference in storage between the alternative and WSIP settings and the base setting is due to the restoration of the operational capacity of Calaveras Reservoir. Under both the alternative and WSIP settings, the full capacity of Calaveras Reservoir would be available, and a greater range in storage operation would occur. Figure 2.6-2 illustrates the average monthly storage in Calaveras Reservoir for the 82-year simulation, and the range in storage for each month for the alternative and base settings.

Figure 2.6-2



Compared to the WSIP setting, there would potentially be less release to Calaveras Creek below Calaveras Dam in the alternative setting. Both settings have fishery releases that are not included in the base setting. However, due to a greater draw down of Calaveras Reservoir storage in the alternative setting as compared to the base setting, more regulation of local watershed runoff is possible and fewer and smaller releases in excess of the fishery release would occur. Table 2.6-1 illustrates the difference in releases to Calaveras Creek between the alternative and WSIP settings. Supplementing the Figure 2.6-1 representation of Calaveras Dam stream releases and Table 2.6-1 is Table 2.6-2, illustrating releases for the alternative and WSIP settings, and the difference in releases between the two. Table 2.6-3 provides the same form of information for the alternative and base settings. The notable difference in releases between the alternative and base settings is the addition of the required flows to satisfy the 1997 Memorandum of Understanding (MOU) and the reduction of stream releases during wetter-year/wetter-season flows due to the restoration of Calaveras Reservoir operational capacity.

There would be greater Alameda Creek diversions to Calaveras Reservoir in the alternative setting compared to the WSIP setting. This circumstance is related to the occurrence of less Calaveras Reservoir storage in the alternative setting. With lower storage, there are more opportunities and need to divert from the Alameda Creek watershed. Coincidentally, with the increase in the diversion at Alameda Creek Diversion Dam, flow spilling past the diversion dam would decrease in the alternative setting. Table 2.6-4 illustrates the difference in flow below the Alameda Creek Diversion Dam between the alternative and WSIP settings. Table 2.6-5 illustrates the difference in flow below Alameda Creek Diversion Dam between the alternative and base settings. In this comparison, the reduction in flow below the diversion dam is due to the additional diversions to Calaveras Reservoir resulting from the restoration of reservoir operating capacity. Table 2.6-6 and Table 2.6-7 illustrate the flow past the Alameda Creek Diversion Dam comparing the alternative, WSIP, and base settings by year type and the average of all years.

Table 2.6-1

Difference in Total Stream Release from Calaveras Reservoir (Acre-feet)

No Program minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	0	0	0	0	0	0	0	0
1922	0	0	0	0	-6,018	0	0	0	0	0	0	0	-6,018
1923	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	-3,153	0	0	0	0	0	0	0	-3,153
1928	0	0	0	0	0	-977	0	0	0	0	0	0	-977
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	0	0	0	0	0	0	0	0	0
1937	0	0	0	0	0	-7,195	0	0	0	0	0	0	-7,195
1938	0	0	0	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	-6,424	-2,094	0	0	0	0	0	0	-8,518
1941	0	0	0	0	-2,494	0	0	0	0	0	0	0	-2,494
1942	0	0	0	0	-1,920	0	0	0	0	0	0	0	-1,920
1943	0	0	0	0	-294	0	0	0	0	0	0	0	-294
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	0	0	0	0	0	0	0	0	0
1946	0	0	0	0	0	0	0	0	0	0	0	0	0
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	-1,011	0	0	0	0	0	0	0	0	-1,011
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	-9,534	0	0	0	0	0	0	0	0	0	-9,534
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	-9,994	-3,726	0	0	0	0	0	0	-13,720
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	-5,310	0	0	0	0	0	0	0	-5,310
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	-6,857	0	0	-740	0	0	0	0	0	-7,597
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	-3,884	0	0	0	0	0	0	-3,884
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	-5,438	0	0	0	0	0	0	0	0	-5,438
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	-11,013	0	0	0	0	0	0	0	-11,013
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	-274	0	0	0	0	0	0	-274
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	-1,790	0	0	0	0	0	0	-1,790
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	-188	0	0	0	0	0	0	0	-188
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	-46	-78	0	0	0	0	0	0	0	-124
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	-16,192	0	0	0	0	0	0	0	-16,192
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	-423	-417	-430	-430	-417	-2,117
1990	-430	-283	-295	-777	-1,068	-775	-397	-414	-417	-430	-430	-417	-6,133
1991	-430	-298	-298	-806	-1,104	0	0	0	0	0	0	0	-2,935
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	-10,830	0	0	0	0	0	0	0	-10,830
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	-2,276	0	-1,406	0	0	0	0	0	0	-3,681
1996	0	0	0	0	-5,149	0	0	0	0	0	0	0	-5,149
1997	0	0	-1,958	0	0	0	0	0	0	0	0	0	-1,958
1998	0	0	0	0	-2,092	0	0	0	0	0	0	0	-2,092
1999	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	310	0	0	0	0	0	0	310
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	-10	-7	-147	-210	-1,016	-266	-14	-10	-10	-10	-10	-10	-1,722

Table 2.6-2

Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — No Program

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	347	4,535	12,385	9,444	5,085	255	387	417	425	415	34,371
Above Normal	425	258	172	403	1,471	2,199	606	327	396	423	428	417	7,524
Normal	429	275	195	548	725	495	264	370	408	428	430	417	4,985
Below Normal	403	258	229	625	811	596	345	389	411	429	430	417	5,343
Dry	402	274	263	730	978	698	349	354	364	376	376	365	5,529
All Years	418	262	240	1,347	3,222	2,655	1,309	339	393	415	418	407	11,426

Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	1,065	5,083	15,133	10,007	5,085	255	387	417	425	415	38,949
Above Normal	425	258	172	806	3,657	2,849	650	327	396	423	428	417	10,807
Normal	429	275	195	548	725	556	264	370	408	428	430	417	5,046
Below Normal	429	276	246	672	876	596	345	389	411	429	430	417	5,515
Dry	429	292	281	778	1,044	747	374	407	416	430	430	417	6,045
All Years	428	269	387	1,557	4,238	2,921	1,323	350	403	426	428	417	13,148

Difference in Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — No Program minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-718	-548	-2,748	-563	0	0	0	0	0	0	-4,578
Above Normal	0	0	0	-403	-2,187	-650	-44	0	0	0	0	0	-3,283
Normal	0	0	0	0	0	-61	0	0	0	0	0	0	-61
Below Normal	-25	-18	-18	-47	-65	0	0	0	0	0	0	0	-173
Dry	-27	-18	-18	-49	-67	-48	-25	-52	-52	-54	-54	-52	-516
All Years	-10	-7	-147	-210	-1,016	-266	-14	-10	-10	-10	-10	-10	-1,722

Table 2.6-3

Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — No Program

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	347	4,535	12,385	9,444	5,085	255	387	417	425	415	34,371
Above Normal	425	258	172	403	1,471	2,199	606	327	396	423	428	417	7,524
Normal	429	275	195	548	725	495	264	370	408	428	430	417	4,985
Below Normal	403	258	229	625	811	596	345	389	411	429	430	417	5,343
Dry	402	274	263	730	978	698	349	354	364	376	376	365	5,529
All Years	418	262	240	1,347	3,222	2,655	1,309	339	393	415	418	407	11,426

Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	1,736	9,221	16,641	9,968	5,024	0	0	0	0	0	42,590
Above Normal	0	0	184	2,731	5,911	3,096	459	0	0	0	0	0	12,382
Normal	0	0	216	364	882	353	0	0	0	0	0	0	1,815
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	419	2,437	4,645	2,656	1,076	0	0	0	0	0	11,232

Difference in Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — No Program minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	-1,389	-4,686	-4,256	-524	61	255	387	417	425	415	-8,219
Above Normal	425	258	-12	-2,329	-4,441	-897	147	327	396	423	428	417	-4,859
Normal	429	275	-22	184	-157	143	264	370	408	428	430	417	3,170
Below Normal	403	258	229	625	811	596	345	389	411	429	430	417	5,343
Dry	402	274	263	730	978	698	349	354	364	376	376	365	5,529
All Years	418	262	-179	-1,089	-1,423	-1	234	339	393	415	418	407	194

Table 2.6-4

Difference in Flow Passing Alameda Creek Diversion Dam (Acre-feet) No Program minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	-921	0	0	0	0	0	0	0	-921
1922	0	0	0	0	0	0	0	0	0	0	0	0	0
1923	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	-4,520	0	-373	0	0	0	0	0	-4,893
1928	0	0	0	0	0	-1,801	0	0	0	0	0	0	-1,801
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	-3,566	0	0	0	0	0	0	0	-3,566
1937	0	0	0	0	0	-4,818	0	0	0	0	0	0	-4,818
1938	0	0	0	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	-3,186	0	0	0	0	0	0	0	-3,186
1941	0	0	0	0	0	0	0	0	0	0	0	0	0
1942	0	0	0	1,922	0	0	0	0	0	0	0	0	1,922
1943	0	0	0	-5,368	-352	0	0	0	0	0	0	0	-5,719
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	0	0	0	0	0	0	0	0	0
1946	0	0	0	0	0	0	0	0	0	0	0	0	0
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	-3,673	-2,746	-1,764	-2,747	0	0	0	0	0	0	-10,930
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	-709	0	0	0	0	0	0	0	0	-709
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	-6,116	0	0	0	0	0	0	0	-6,116
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	-2,357	0	0	0	0	0	0	0	0	-2,357
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	-586	0	0	0	0	0	0	0	0	-586
1974	0	0	0	2,096	0	1,320	0	0	0	0	0	0	3,416
1975	0	0	0	0	-671	0	0	0	0	0	0	0	-671
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	-3,434	0	0	0	0	0	0	-3,434
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	-2,808	0	0	0	0	0	0	0	0	-2,808
1983	0	0	0	0	0	0	0	922	0	0	0	0	922
1984	0	0	-627	0	0	0	0	0	0	0	0	0	-627
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	-1,596	0	0	0	0	0	0	0	-1,596
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	-4,146	-4,588	-1,943	0	0	0	0	0	0	-10,677
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	-7,694	0	0	0	0	0	0	0	0	-7,694
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	-5,374	0	0	0	0	0	0	0	0	-5,374
1999	0	0	0	0	-1,069	0	0	0	0	0	0	0	-1,069
2000	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	0	0	-52	-339	-346	-164	-5	11	0	0	0	0	-894

Table 2.6-5

Difference in Flow Passing Alameda Creek Diversion Dam (Acre-feet)

No Program minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	-2,559	-2,274	0	0	0	0	0	0	0	-4,834
1922	0	0	0	0	0	0	0	0	0	0	0	0	0
1923	0	0	-2,856	-1,688	-1,004	0	0	0	0	0	0	0	-5,547
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	-3,210	0	0	0	0	0	0	0	-3,210
1927	0	0	0	0	-4,520	0	0	0	0	0	0	0	-4,520
1928	0	0	0	0	0	-1,801	-156	0	0	0	0	0	-1,957
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	-4,662	0	0	0	0	0	0	0	-4,662
1937	0	0	0	0	-3,964	-4,818	0	0	0	0	0	0	-8,782
1938	0	0	0	0	0	0	-156	0	0	0	0	0	-156
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	-3,186	0	-156	0	0	0	0	0	-3,341
1941	0	0	0	-1,197	0	0	0	0	0	0	0	0	-1,197
1942	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	-5,825	-352	0	0	0	0	0	0	0	-6,176
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	-4,471	0	0	0	0	0	0	0	-4,471
1946	0	0	-4,651	-1,522	0	0	0	0	0	0	0	0	-6,173
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	-5,524	0	0	0	0	0	0	-5,524
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	-6,184	-2,793	-1,823	-2,848	0	0	0	0	0	0	-13,647
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	-4,600	0	0	0	0	0	0	0	0	-4,600
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	-1,919	0	0	0	0	0	0	0	-1,919
1963	0	0	0	-2,219	-6,116	0	0	0	0	0	0	0	-8,335
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	-1,921	0	0	0	3,250	0	0	0	0	0	1,329
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	-1,676	-1,872	0	0	0	0	0	0	0	-3,548
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	-2,357	0	0	0	0	0	0	0	0	-2,357
1970	0	0	0	-4,247	0	-1,623	0	0	0	0	0	0	-5,870
1971	0	0	-613	0	0	0	0	0	0	0	0	0	-613
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	-4,926	0	0	0	0	0	0	0	0	-4,926
1974	0	0	-1,019	0	0	1,444	0	0	0	0	0	0	425
1975	0	0	0	0	-5,196	0	-156	0	0	0	0	0	-5,352
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	-4,152	-3,403	-3,434	0	0	0	0	0	0	-10,990
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	-3,360	0	-101	0	0	0	0	0	0	-3,462
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	-2,808	0	0	0	0	0	0	0	0	-2,808
1983	0	0	0	0	0	0	0	687	0	0	0	0	687
1984	0	0	-3,959	0	0	0	0	0	0	0	0	0	-3,959
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	-1,596	0	0	0	0	0	0	0	-1,596
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	-3,578	0	0	0	0	0	0	0	-3,578
1993	0	0	0	-5,180	-4,588	-2,044	0	0	0	0	0	0	-11,812
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	-7,694	0	0	0	0	0	0	0	0	-7,694
1996	0	0	0	-5,239	0	0	0	0	0	0	0	0	-5,239
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	-5,588	0	0	0	0	0	0	0	0	-5,588
1999	0	0	0	0	-3,867	0	1,392	0	0	0	0	0	-2,475
2000	0	0	0	0	-4,567	0	0	0	0	0	0	0	-4,567
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	0	0	-259	-849	-807	-253	49	8	0	0	0	0	-2,110

Table 2.6-6

Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — No Program

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	28	1,379	5,116	7,882	5,751	2,962	173	0	0	0	0	23,291
Above Normal	7	23	479	1,928	2,653	2,408	947	0	0	0	0	0	8,446
Normal	0	6	338	220	670	346	117	6	0	0	0	0	1,703
Below Normal	0	0	18	45	106	191	2	0	0	0	0	0	361
Dry	0	0	17	0	163	0	6	0	0	0	0	0	186
All Years	1	12	441	1,450	2,272	1,728	799	35	0	0	0	0	6,739

Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	28	1,379	6,172	7,982	5,751	2,962	116	0	0	0	0	24,389
Above Normal	7	23	695	2,526	4,017	3,092	969	0	0	0	0	0	11,330
Normal	0	6	377	264	893	459	117	6	0	0	0	0	2,122
Below Normal	0	0	18	45	106	191	2	0	0	0	0	0	361
Dry	0	0	17	0	163	0	6	0	0	0	0	0	186
All Years	1	12	494	1,789	2,618	1,892	803	24	0	0	0	0	7,633

Difference in Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — No Program minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	-1,056	-100	0	0	58	0	0	0	0	-1,098
Above Normal	0	0	-216	-598	-1,364	-684	-22	0	0	0	0	0	-2,883
Normal	0	0	-39	-44	-223	-113	0	0	0	0	0	0	-419
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-52	-339	-346	-164	-5	11	0	0	0	0	-894

Table 2.6-7

Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — No Program

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	28	1,379	5,116	7,882	5,751	2,962	173	0	0	0	0	23,291
Above Normal	7	23	479	1,928	2,653	2,408	947	0	0	0	0	0	8,446
Normal	0	6	338	220	670	346	117	6	0	0	0	0	1,703
Below Normal	0	0	18	45	106	191	2	0	0	0	0	0	361
Dry	0	0	17	0	163	0	6	0	0	0	0	0	186
All Years	1	12	441	1,450	2,272	1,728	799	35	0	0	0	0	6,739

Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	28	1,379	6,967	8,099	5,757	2,972	130	0	0	0	0	25,331
Above Normal	7	23	1,184	3,672	5,292	3,096	692	0	0	0	0	0	13,968
Normal	0	6	914	868	1,785	906	126	6	0	0	0	0	4,611
Below Normal	0	0	18	45	106	191	2	0	0	0	0	0	361
Dry	0	0	17	0	163	0	6	0	0	0	0	0	186
All Years	1	12	700	2,299	3,079	1,982	750	27	0	0	0	0	8,849

Difference in Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — No Program minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	-1,850	-217	-6	-10	43	0	0	0	0	-2,040
Above Normal	0	0	-705	-1,744	-2,639	-688	255	0	0	0	0	0	-5,521
Normal	0	0	-576	-648	-1,115	-559	-10	0	0	0	0	0	-2,909
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-259	-849	-807	-253	49	8	0	0	0	0	-2,110

Comparing the alternative and WSIP settings, differences in releases from Calaveras Dam to the stream and differences to spills at Alameda Creek Diversion Dam would result in differences in flow below the Alameda Creek and Calaveras Creek confluence. Table 2.6-8 illustrates the flow below the confluence for the alternative and WSIP settings. Fishery releases for the 1997 MOU are assumed in both of the settings; the differences in flow are attributable to the effect of greater draw down of Calaveras Reservoir in the alternative setting. Table 2.6-9 provides the same form of information for the alternative and base settings. The notable differences between the alternative and the base settings (comparable to the difference between the WSIP and base settings) are the addition of required stream flows for the 1997 MOU and the reduction of wetter-year/wet season flows due to the restoration of Calaveras Reservoir storage.

Table 2.6-8

Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — No Program

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	430	326	2,070	10,660	21,455	16,180	8,649	605	417	430	430	417	62,070
Above Normal	437	327	895	2,928	4,900	5,169	1,864	430	417	430	430	417	18,643
Normal	430	304	758	1,037	1,781	1,169	539	435	417	430	430	417	8,148
Below Normal	404	280	307	811	1,152	1,007	419	430	417	430	430	417	6,504
Dry	403	280	306	765	1,207	768	398	377	365	376	376	365	5,986
All Years	421	303	861	3,207	6,024	4,815	2,344	455	407	419	419	407	20,082

Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	430	326	2,789	12,265	24,303	16,744	8,649	548	417	430	430	417	67,746
Above Normal	437	327	1,111	3,929	8,451	6,502	1,929	430	417	430	430	417	24,810
Normal	430	304	798	1,081	2,004	1,343	539	435	417	430	430	417	8,628
Below Normal	430	298	324	858	1,217	1,007	419	430	417	430	430	417	6,677
Dry	430	298	324	813	1,274	816	423	430	417	430	430	417	6,502
All Years	431	310	1,061	3,755	7,386	5,245	2,362	454	417	430	430	417	22,699

Difference in Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — No Program minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-718	-1,604	-2,848	-563	0	58	0	0	0	0	-5,676
Above Normal	0	0	-216	-1,001	-3,551	-1,333	-65	0	0	0	0	0	-6,167
Normal	0	0	-39	-44	-223	-174	0	0	0	0	0	0	-480
Below Normal	-25	-18	-18	-47	-65	0	0	0	0	0	0	0	-173
Dry	-27	-18	-18	-49	-67	-48	-25	-52	-52	-54	-54	-52	-516
All Years	-10	-7	-200	-549	-1,362	-430	-18	1	-10	-10	-10	-10	-2,616

Table 2.6-9

Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — No Program

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	430	326	2,070	10,660	21,455	16,180	8,649	605	417	430	430	417	62,070
Above Normal	437	327	895	2,928	4,900	5,169	1,864	430	417	430	430	417	18,643
Normal	430	304	758	1,037	1,781	1,169	539	435	417	430	430	417	8,148
Below Normal	404	280	307	811	1,152	1,007	419	430	417	430	430	417	6,504
Dry	403	280	306	765	1,207	768	398	377	365	376	376	365	5,986
All Years	421	303	861	3,207	6,024	4,815	2,344	455	407	419	419	407	20,082

Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	1	80	3,460	17,197	25,928	16,711	8,598	307	30	12	4	2	72,329
Above Normal	12	68	1,612	7,001	11,980	6,754	1,462	103	22	6	2	1	29,023
Normal	1	29	1,356	1,501	3,053	1,586	284	65	9	2	0	0	7,886
Below Normal	1	22	78	186	341	412	74	41	7	0	0	0	1,161
Dry	1	6	43	35	230	69	49	23	1	0	0	0	457
All Years	3	41	1,298	5,145	8,254	5,069	2,061	107	14	4	1	1	21,999

Difference in Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — No Program minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	-1,389	-6,536	-4,472	-530	51	298	387	417	425	415	-10,259
Above Normal	425	258	-717	-4,073	-7,080	-1,585	402	327	396	423	428	417	-10,380
Normal	429	275	-598	-464	-1,272	-417	255	370	408	428	430	417	261
Below Normal	403	258	229	625	811	596	345	389	411	429	430	417	5,343
Dry	402	274	263	730	978	698	349	354	364	376	376	365	5,529
All Years	418	262	-438	-1,938	-2,230	-254	283	348	393	415	418	407	-1,916

A flow recapture facility in Alameda Creek below Calaveras Reservoir is incorporated in the alternative and WSIP settings. This facility is assumed to recapture flows explicitly released from Calaveras Dam for the 1997 MOU. The effect of the recapture is a reduction in the flow that occurs below the confluence of Alameda and Calaveras Creeks, but only to the extent that releases were explicitly made from Calaveras Reservoir for the 1997 MOU. Flows below this diversion have been estimated and noted as the flow above the Alameda and San Antonio confluence. Table 2.6-10 illustrates the flow at this location for the alternative and WSIP settings. Table 2.6-11 provides the same form of information for the alternative and base settings. The flows identified at this location indicate flow occurring below the confluence of Alameda and Calaveras Creeks (described above), with the addition of estimated stream accretions between the Alameda and Calaveras Creek confluence and the Alameda and San Antonio Creek confluence, less the water assumed to be recaptured (diverted) by the SFPUC from the creek.

Table 2.6-10

Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — No Program

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	2,462	12,007	22,980	17,283	9,299	556	76	33	15	9	64,881
Above Normal	19	150	1,091	3,446	5,586	5,579	2,115	217	54	20	9	6	18,295
Normal	7	64	883	869	1,614	1,095	469	134	28	9	4	3	5,178
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	934	3,330	6,164	4,912	2,396	208	38	14	7	4	18,104

Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,180	13,611	25,828	17,847	9,299	498	76	33	15	9	70,558
Above Normal	19	150	1,308	4,448	9,137	6,913	2,180	217	54	20	9	6	24,462
Normal	7	64	922	913	1,837	1,269	469	134	28	9	4	3	5,658
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	1,127	3,859	7,499	5,332	2,409	197	38	14	7	4	20,583

Difference in Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — No Program minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-718	-1,604	-2,848	-563	0	58	0	0	0	0	-5,676
Above Normal	0	0	-216	-1,001	-3,551	-1,333	-65	0	0	0	0	0	-6,167
Normal	0	0	-39	-44	-223	-174	0	0	0	0	0	0	-480
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-193	-529	-1,335	-420	-14	11	0	0	0	0	-2,480

Table 2.6-11

Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — No Program

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	2,462	12,007	22,980	17,283	9,299	556	76	33	15	9	64,881
Above Normal	19	150	1,091	3,446	5,586	5,579	2,115	217	54	20	9	6	18,295
Normal	7	64	883	869	1,614	1,095	469	134	28	9	4	3	5,178
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	934	3,330	6,164	4,912	2,396	208	38	14	7	4	18,104

Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,968	18,668	27,692	17,977	9,358	513	76	33	15	9	78,470
Above Normal	19	150	1,981	7,819	13,060	7,467	1,861	217	54	20	9	6	32,664
Normal	7	64	1,676	1,881	3,611	2,007	479	134	28	9	4	3	9,902
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	1,567	5,733	9,022	5,616	2,356	199	38	14	7	4	24,656

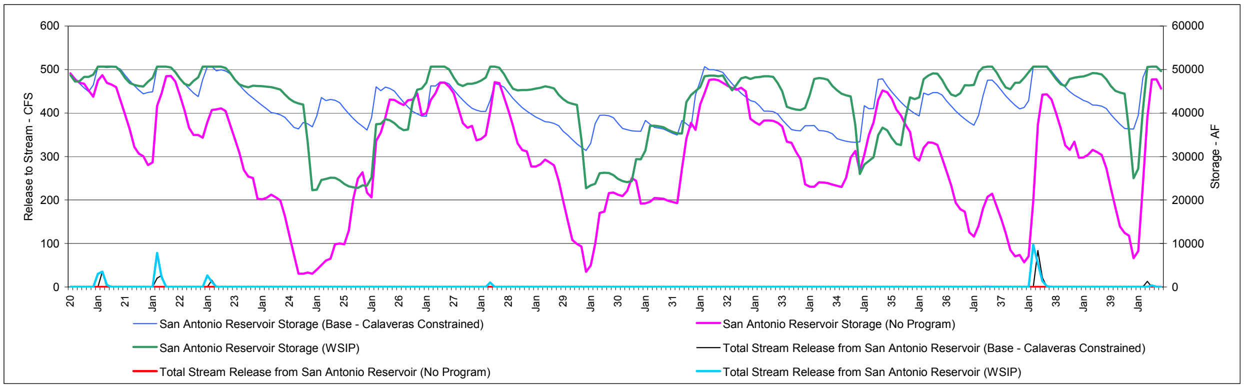
Difference in Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — No Program minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-1,506	-6,661	-4,712	-694	-59	43	0	0	0	0	-13,589
Above Normal	0	0	-889	-4,372	-7,474	-1,887	253	0	0	0	0	0	-14,369
Normal	0	0	-793	-1,012	-1,997	-912	-10	0	0	0	0	0	-4,724
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-633	-2,404	-2,858	-705	39	8	0	0	0	0	-6,552

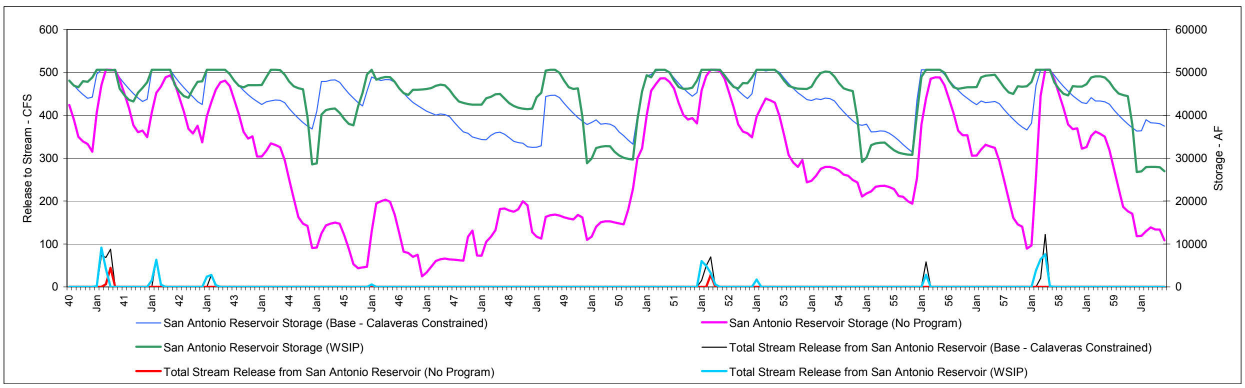
Compared to the WSIP setting, San Antonio Reservoir operations in the alternative setting generally mirror the trend of differences experienced for Calaveras Reservoir operations. Figure 2.6-3 illustrates a chronological trace of the simulation of San Antonio Reservoir storage and stream releases from San Antonio Dam. Shown in Figure 2.6-3 are the results for the WSIP, alternative, and base settings. Similar to the difference in Calaveras Reservoir storage between the alternative and WSIP settings, the difference in San Antonio Reservoir storage between the settings is mostly caused by the interaction of the increased demand served by the system’s resources (300 mgd for the variant and a net 290-mgd demand for the WSIP form many years) and the difference in conveyance capacity of the SJPL. Mirroring the Calaveras Reservoir effect, the systematic decrease in reservoir storage in most years is due to the additional demand drawing more water from the Bay Area reservoirs during the summer when the SJPL is operating at maximum capacity. The relative draw down of San Antonio Reservoir storage and Calaveras Reservoir storage is a matter of discretion to a degree. However, operational strategy would draw storage more quickly from San Antonio Reservoir, recognizing that San Antonio Reservoir can be replenished not only from its own watershed but also from diversions from the SJPL and Calaveras Reservoir. Modeling reflects this strategy.

Figure 2.6-3
San Antonio Reservoir Storage and Stream Release

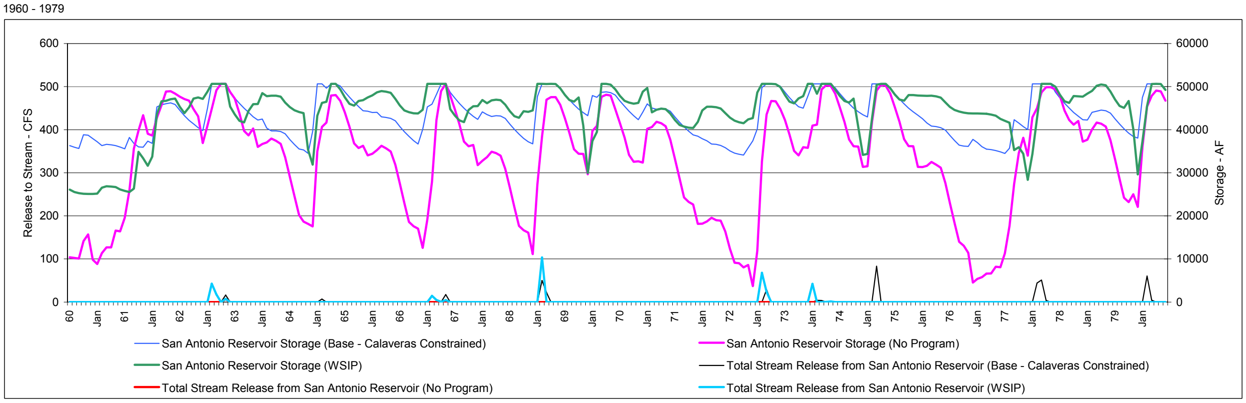
1920 - 1939



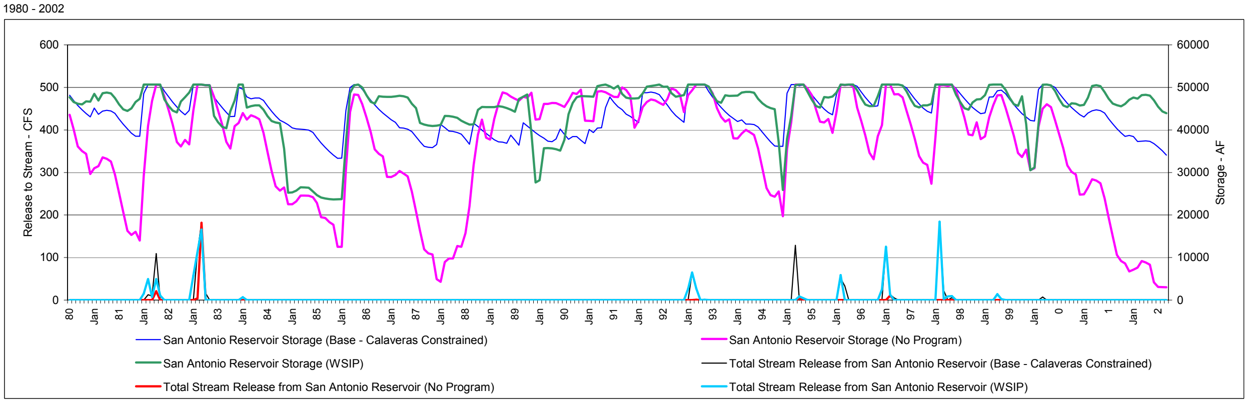
1940 - 1959



1960 - 1979

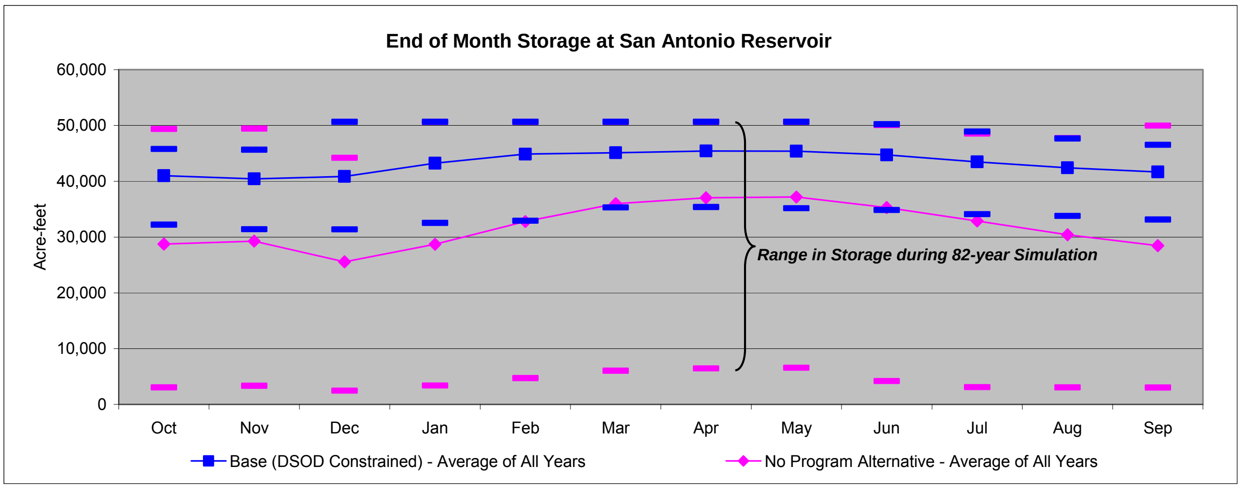


1980 - 2002



The difference in storage between the alternative and WSIP settings and the base setting is due to the restoration of the operational capacity of Calaveras Reservoir. In the base setting, the limited operating storage capacity at Calaveras leads to a different operation at San Antonio Reservoir, one that retains relatively more stored water for system demands when the draw from Calaveras Reservoir is constrained due to limited storage. There is also a notable difference in storage operation between the alternative and WSIP settings and the base setting due to assumed maintenance. Assumed systematic maintenance of Hetch Hetchy conveyance facilities constrains diversions to the Bay Area from Hetch Hetchy every fifth year in the WSIP setting. In the alternative setting, maintenance occurs, in a different fashion, every year. The reduction in diversion from Hetch Hetchy during these periods is accommodated in the system by drawing additional water from the Bay Area reservoirs. The proportionate share of this operation is evident in the tracing of San Antonio Reservoir storage for the alternative and WSIP settings. Figure 2.6-4 illustrates the average monthly storage in San Antonio Reservoir for the 82-year simulation, and the range in storage for each month for the alternative and base settings.

Figure 2.6-4



Very little change in stream releases below San Antonio Reservoir is anticipated between the alternative and WSIP settings. Table 2.6-12 illustrates the modeled release to San Antonio Creek from San Antonio Reservoir for the two settings and the differences for the average release during a year type. With a lower reservoir operation at times during the winter, as seen in Figure 2.6-4, an increase in the ability to regulate reservoir inflow and avoid stream releases is expected. Given the sometimes rigid constraints within the modeling assumptions, the model will overestimate the frequency and magnitude of stream releases from San Antonio Reservoir under any of the investigated settings. The flexibility that would occur in actual operations would likely avoid most of the releases represented by the model. The modeled stream releases from San Antonio Reservoir and difference between releases for the alternative and base setting are shown in Table 2.6-13. The differences between the two settings reflect a general decrease in modeled releases. This modeled circumstance reflects the different resulting storage operation between the two settings, as seen in Figure 2.6-3. In some circumstances, the base setting storage at San Antonio Reservoir during a period could be higher than projected for the alternative setting during the same period. This circumstance could lead to an occasionally greater modeled release for the base setting, which would be reflected in the results. As described above, the model will overestimate the frequency and magnitude of releases from San Antonio Reservoir, and the actual releases from San Antonio Reservoir in any setting and the difference between settings are expected to be minor.

Flow below the confluence of Alameda and San Antonio Creeks is influenced by releases from San Antonio Creek and flow arriving at the location from Alameda Creek, which includes upstream impairment by SFPUC operations and facilities. Table 2.6-14 illustrates the flow below the confluence for the alternative and WSIP settings, and the differences in flow between the two.

Table 2.6-12

Total Stream Release from San Antonio Reservoir (Acre-feet)													
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)											No Program		
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	0	50	829	253	0	0	0	0	0	1,132
Above Normal	0	0	0	0	0	2	0	25	0	0	0	0	27
Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	0	0	10	162	49	5	0	0	0	0	226

Total Stream Release from San Antonio Reservoir (Acre-feet)													
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)											WSIP		
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	95	1,054	3,168	1,543	605	121	0	0	0	0	6,586
Above Normal	0	0	0	540	1,045	277	67	44	0	0	0	0	1,974
Normal	0	0	0	113	0	40	0	0	0	0	0	0	152
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	19	340	835	366	132	33	0	0	0	0	1,724

Difference in Total Stream Release from San Antonio Reservoir (Acre-feet)													
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)											No Program minus WSIP		
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-95	-1,054	-3,119	-714	-352	-121	0	0	0	0	-5,455
Above Normal	0	0	0	-540	-1,045	-275	-67	-20	0	0	0	0	-1,947
Normal	0	0	0	-113	0	-40	0	0	0	0	0	0	-152
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-19	-340	-825	-204	-83	-28	0	0	0	0	-1,498

Table 2.6-13

Total Stream Release from San Antonio Reservoir (Acre-feet)													
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)											No Program		
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	0	50	829	253	0	0	0	0	0	1,132
Above Normal	0	0	0	0	0	2	0	25	0	0	0	0	27
Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	0	0	10	162	49	5	0	0	0	0	226

Total Stream Release from San Antonio Reservoir (Acre-feet)													
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)										Base - Calaveras Constrained			
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	538	2,350	2,480	1,324	88	0	0	0	0	6,780
Above Normal	0	0	0	0	881	883	12	58	0	0	0	0	1,835
Normal	0	0	0	0	1	0	0	0	0	0	0	0	1
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	0	105	641	667	261	29	0	0	0	0	1,703

Difference in Total Stream Release from San Antonio Reservoir (Acre-feet)													
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)								No Program minus Base - Calaveras Constrained					
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	-538	-2,300	-1,652	-1,070	-88	0	0	0	0	-5,648
Above Normal	0	0	0	0	-881	-882	-12	-34	0	0	0	0	-1,808
Normal	0	0	0	0	-1	0	0	0	0	0	0	0	-1
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	0	-105	-632	-505	-211	-24	0	0	0	0	-1,477

Table 2.6-14

Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)													
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)											No Program		
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	2,462	12,007	23,030	18,112	9,552	556	76	33	15	9	66,013
Above Normal	19	150	1,091	3,446	5,586	5,581	2,115	242	54	20	9	6	18,321
Normal	7	64	883	869	1,614	1,095	469	134	28	9	4	3	5,178
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	934	3,330	6,174	5,074	2,445	213	38	14	7	4	18,330

Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)													
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)											WSIP		
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,276	14,666	28,996	19,390	9,903	619	76	33	15	9	77,144
Above Normal	19	150	1,308	4,987	10,182	7,190	2,248	262	54	20	9	6	26,435
Normal	7	64	922	1,026	1,837	1,308	469	134	28	9	4	3	5,810
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	1,145	4,199	8,334	5,698	2,541	229	38	14	7	4	22,307

Difference in Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)													
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)											No Program minus WSIP		
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-814	-2,659	-5,967	-1,278	-352	-63	0	0	0	0	-11,131
Above Normal	0	0	-216	-1,541	-4,596	-1,609	-133	-20	0	0	0	0	-8,114
Normal	0	0	-39	-157	-223	-213	0	0	0	0	0	0	-632
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-211	-869	-2,160	-624	-96	-16	0	0	0	0	-3,977

Table 2.6-15 illustrates the same information in comparing the alternative and base settings. Table 2.6-14 illustrates the modeled differences in flow that occur between the alternative and WSIP settings that are predominantly affected by the greater draw down of East Bay reservoirs in the alternative setting, while Table 2.6-15 illustrates the relatively larger differences in flow that could occur between the alternative and base settings. Those differences are particularly due to the combined effects of the restoration of Calaveras Reservoir operating capacity and the additional East Bay reservoir storage space available in the alternative setting.

Table 2.6-15

Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — No Program

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	2,462	12,007	23,030	18,112	9,552	556	76	33	15	9	66,013
Above Normal	19	150	1,091	3,446	5,586	5,581	2,115	242	54	20	9	6	18,321
Normal	7	64	883	869	1,614	1,095	469	134	28	9	4	3	5,178
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	934	3,330	6,174	5,074	2,445	213	38	14	7	4	18,330

Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,968	19,206	30,042	20,458	10,681	601	76	33	15	9	85,250
Above Normal	19	150	1,981	7,819	13,941	8,350	1,873	276	54	20	9	6	34,498
Normal	7	64	1,676	1,881	3,612	2,007	479	134	28	9	4	3	9,902
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	1,567	5,838	9,664	6,284	2,617	229	38	14	7	4	26,359

Difference in Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — No Program minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-1,506	-7,199	-7,012	-2,346	-1,129	-45	0	0	0	0	-19,237
Above Normal	0	0	-889	-4,372	-8,354	-2,769	241	-34	0	0	0	0	-16,177
Normal	0	0	-793	-1,012	-1,998	-912	-10	0	0	0	0	0	-4,724
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-633	-2,509	-3,490	-1,210	-172	-16	0	0	0	0	-8,029

2.7 Crystal Springs and San Andreas Reservoirs

There are differences in Crystal Springs Reservoir operations between the alternative and WSIP settings. Figure 2.7-1 illustrates a chronological trace of the simulation of Crystal Springs Reservoir storage and stream releases from Crystal Springs Dam. Shown are the results for the WSIP, alternative, and base settings. Fundamental to the difference in storage operations between the WSIP setting and the alternative and base settings is the restoration of reservoir operation capacity in the WSIP setting, which does not occur in the alternative and base settings.[4] The result is the operation of Crystal Springs Reservoir at a lower maximum storage in the alternative and base settings. A second difference in Crystal Springs Reservoir storage between the alternative and WSIP setting is caused by the interaction of the increased demand served by the system's resources (300 mgd for the alternative and a net 290-mgd demand for the WSIP in many years) and the lesser conveyance capacity of the SJPL and Bay Division Pipelines (BDPLs). Generally, the systematic decrease in reservoir storage is due to the additional demand drawing more water from the Bay Area system reservoirs during the spring and summer when the SJPL is operating at maximum capacity. A portion of this additional draw is focused on Crystal Springs Reservoir. Subsequent to this additional draw of storage, Hetch Hetchy would attempt to replenish the Bay Area system reservoirs. However, there are modeled circumstances when the coincidence of SJPL or BDPL capacity constraints would inhibit the ability to replenish Crystal Springs Reservoir storage. During these periods, Crystal Springs Reservoir storage would be lower in the alternative setting than in the WSIP setting. The magnitude of the additional draw of storage from Crystal Springs Reservoir is partially dependent on modeling assumptions that proportion the use of storage among the Bay Area system reservoirs. In actual operations, some of the differences in result may not occur as system operators and prevailing hydraulic and hydrologic conditions may direct the operational effect of the different demand to an alternative apportionment of effect among the reservoirs. However, operation strategy prefers the retention of storage in the Peninsula Reservoirs, similar to the strategy used by the model. Figure 2.7-2 illustrates the average monthly storage in Crystal Springs Reservoir for the 82-year simulation, and the range in storage for each month for the alternative and WSIP settings.

[4] The Lower Crystal Springs Dam Improvements project is included in the alternative, but was not modeled. With the project included in the alternative the hydrologic effects at Crystal Springs Reservoir would be comparable to the WSIP setting.

Figure 2.7-1
Crystal Springs Reservoir Storage and Release

Figure 2.7-2

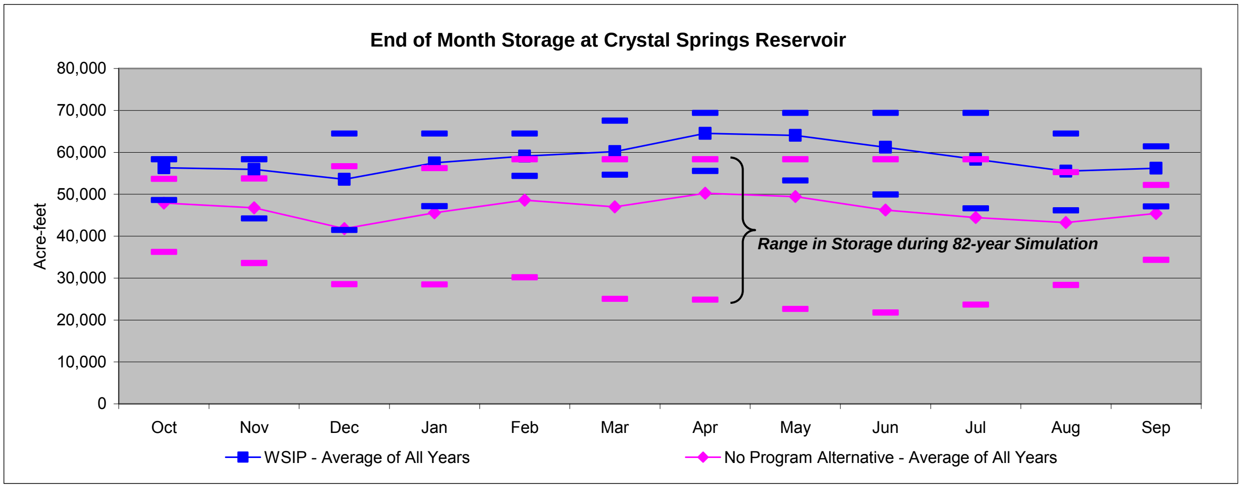


Figure 2.7-3 illustrates the average monthly storage in Crystal Springs Reservoir for the 82-year simulation, and the range in storage for each month for the alternative and base settings. The alternative setting would result in reservoir storage operating at a lower average storage than the base setting, and the range of operating storage would have a lower expected minimum in the alternative setting.

Figure 2.7-3

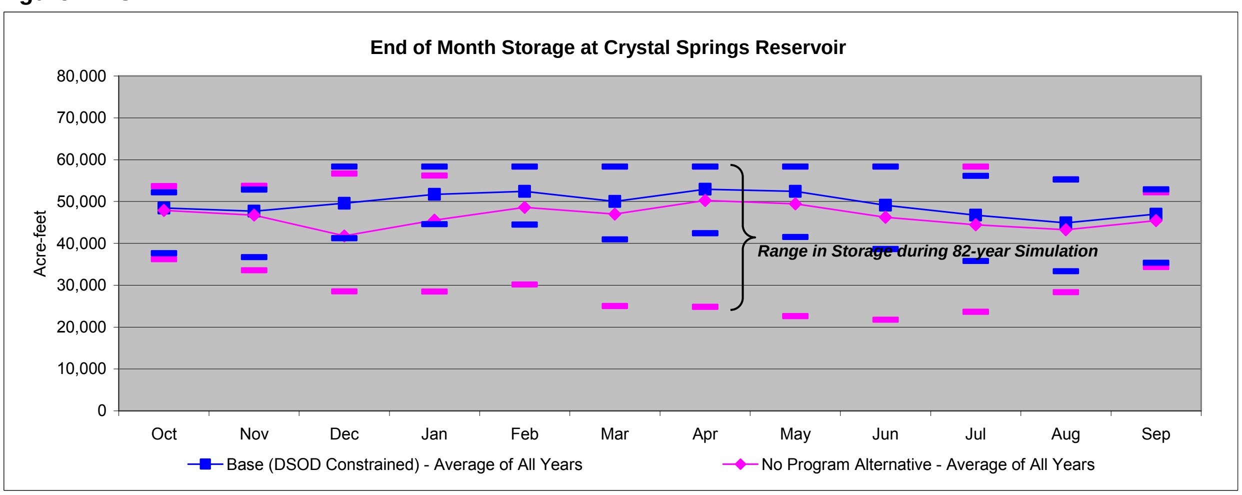


Table 2.7-1 illustrates the modeled alternative and WSIP stream releases from Crystal Springs Reservoir and the differences between the two settings. Modeling results indicate that, during a month in a year, either an increase or decrease in the occasional release could occur. The potential difference is attributed to whether the different resulting storage in the reservoir was higher or lower within the operating range of the two settings. Part of the difference in modeled Crystal Springs Reservoir storage is due to modeling assumptions for the proportionate balancing of storage among the Bay Area reservoirs, and the coincidence of assumed system-wide maintenance with less than favorable hydrologic conditions. In actual operations, it is anticipated that system operators would manage the reservoir system such that stream releases would be minimal under any setting, with the effect that essentially no difference would occur between the alternative and WSIP settings. Similarly, Table 2.7-2 illustrates the stream releases for the alternative and base settings, and the difference in modeled flows between the two settings. A greater draw down in Crystal Springs Reservoir storage would lead to an increased potential to regulate reservoir inflow, which would lead to less risk in needing to make stream releases. However, as described above, actual system operations would attempt to minimize releases under any setting; thus, the difference in releases between the alternative and base setting would be minimal, if any.

Table 2.7-1

Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — No Program

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	0	256	1,212	283	81	0	0	0	0	1,832
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	0	0	50	236	55	16	0	0	0	0	358

Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	47	1,296	2,512	542	170	54	0	0	0	0	4,623
Above Normal	0	0	0	8	354	0	8	42	0	0	0	0	412
Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	33	0	0	0	0	33
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	9	254	564	106	35	26	0	0	0	0	994

Difference in Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — No Program minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-47	-1,296	-2,256	670	113	27	0	0	0	0	-2,790
Above Normal	0	0	0	-8	-354	0	-8	-42	0	0	0	0	-412
Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	-33	0	0	0	0	-33
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-9	-254	-514	131	20	-10	0	0	0	0	-637

Table 2.7-2

Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — No Program

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	0	256	1,212	283	81	0	0	0	0	1,832
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	0	0	50	236	55	16	0	0	0	0	358

Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	44	1,433	2,889	1,134	756	81	0	0	0	0	6,336
Above Normal	0	0	0	0	608	0	0	63	0	0	0	0	671
Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	9	280	690	221	147	29	0	0	0	0	1,375

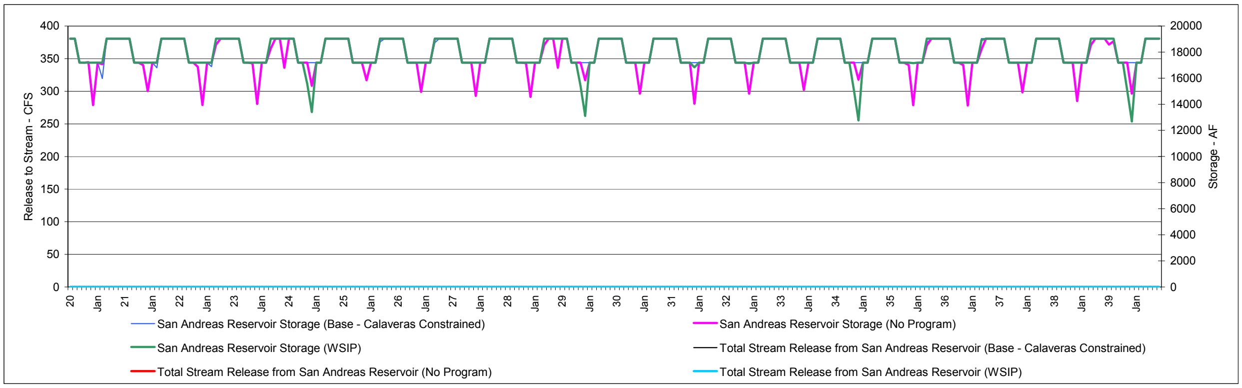
Difference in Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — No Program minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-44	-1,433	-2,632	78	-473	1	0	0	0	0	-4,504
Above Normal	0	0	0	0	-608	0	0	-63	0	0	0	0	-671
Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-9	-280	-640	15	-92	-13	0	0	0	0	-1,018

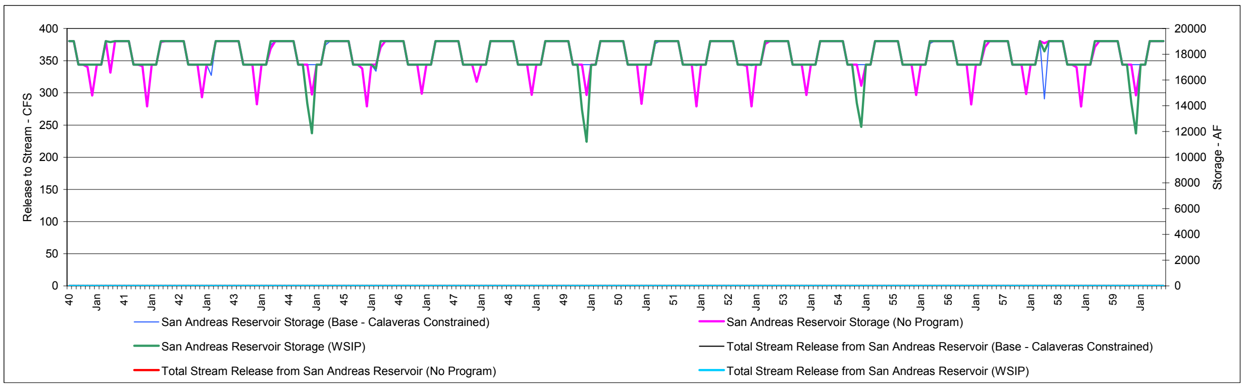
Reservoir storage at San Andreas Reservoir would follow a systematic filling and lowering each year; however, there would be a difference in draw down between the alternative and WSIP settings, primarily due to the effects of different system-wide maintenance within each setting. Figure 2.7-4 illustrates a chronological trace of the simulation of San Andreas Reservoir storage and stream releases from San Andreas Dam. Shown in Figure 2.7-4 are the results for the WSIP, alternative, and base settings. There are no projected stream releases from San Andreas Reservoir in any setting. Compared to the base setting, Figure 2.7-4 illustrates the difference in storage operation every fifth year for the WSIP setting and every year for the alternative setting. These operations are the result of Hetch Hetchy conveyance maintenance, which is assumed to occur systematically in the alternative and WSIP settings. The maintenance constrains the amount of Hetch Hetchy water supplied to serve water demands in the Bay Area. As discussed previously, during these winter periods, the Bay Area reservoir system accommodates the reduction in imported supply by serving the Bay Area water deliveries with the local watersheds' runoff and storage. At San Andreas Reservoir, the serving of water demand affects the reservoir when additional required water production at Harry Tracy Water Treatment Plant (Harry Tracy WTP) associated with the WSIP or the alternative exceeds the ability to maintain San Andreas Reservoir storage with pumping from Crystal Springs Reservoir. In the modeling, the conveyance capacity from Crystal Springs Reservoir is assumed to be same among all of the settings. The additional water demand of the WSIP and alternative require additional production from Harry Tracy WTP to be drawn from San Andreas Reservoir.

Figure 2.7-4
San Andreas Reservoir Storage and Stream Release

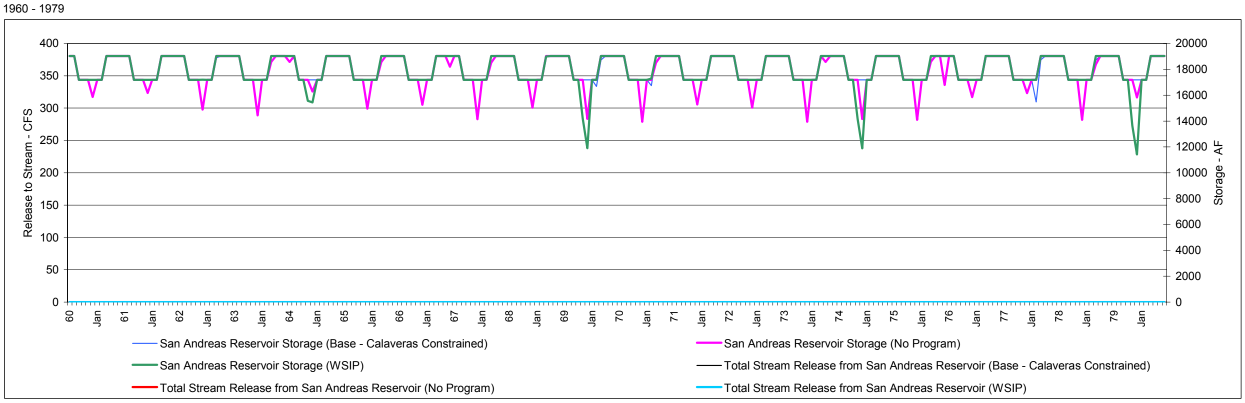
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

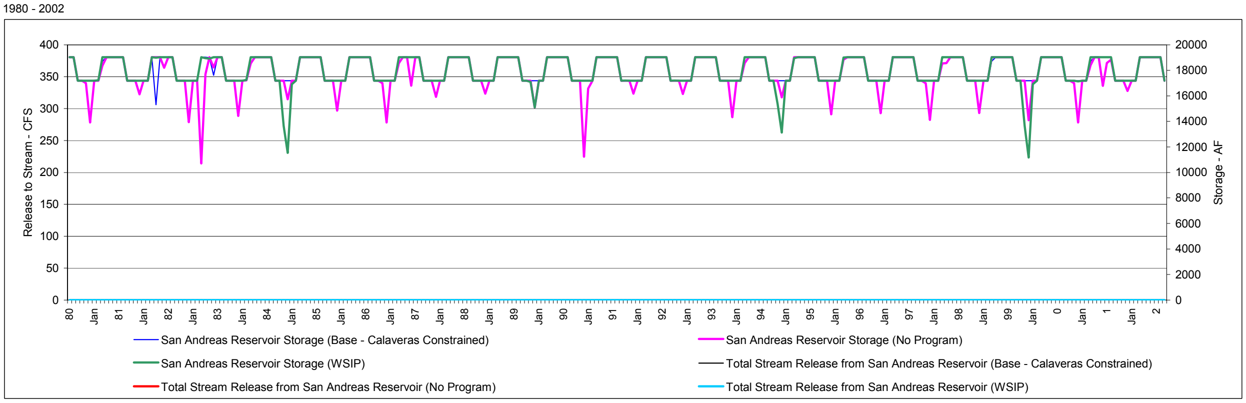
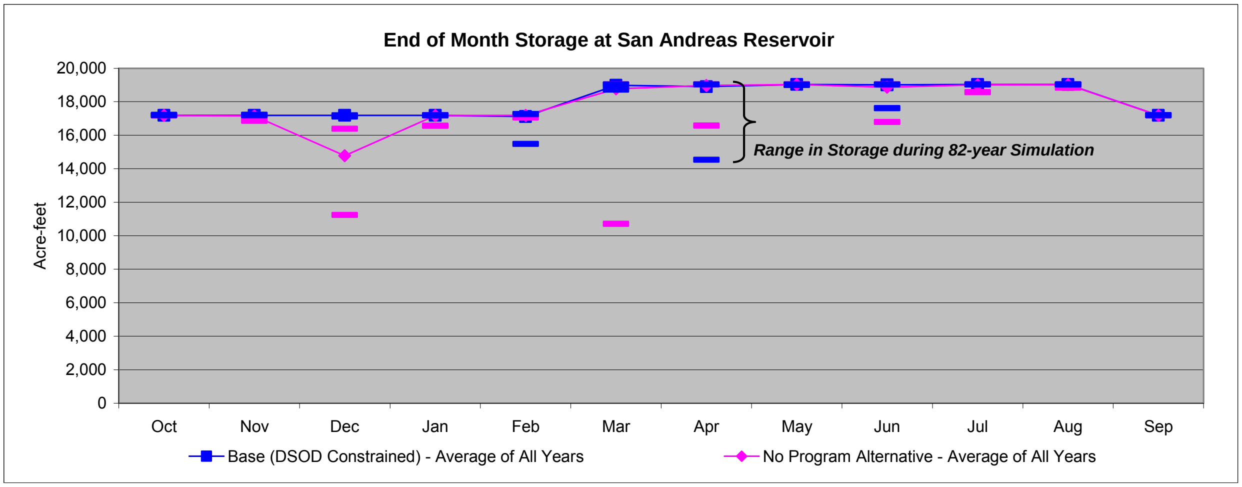


Figure 2.7-5 illustrates the average monthly storage in San Andreas Reservoir for the 82-year simulation, and the range in storage for each month for the alternative and base settings.

Figure 2.7-5



2.8 Pilarcitos Reservoir

Coastside County Water District's (Coastside CWD's) water demand and its SFPUC purchase request are projected to increase within the WSIP planning horizon of year 2030. With the context of the 2030 purchase request of 300 mgd, Coastside CWD's portion has been estimated at about 3 mgd. This projected purchase request is approximately 1 mgd greater than its current purchase request. Recognizing the current physical constraints to deliveries from the SFPUC to Coastside CWD and the ongoing planning activities in the watershed, the precise means of serving Coastside CWD's additional purchase request and the resultant potential changes to the operation of SFPUC facilities and their affected environs are unknown.[5]

Assuming a range of potential means to serve the additional purchase request from Coastside CWD, the following potential hydrologic effects to SFPUC facilities and their affected environs have been identified:

- Due to limited yield from Pilarcitos Reservoir, additional diversions would be required from Crystal Springs Reservoir.
- If deliveries to Coastside CWD from Pilarcitos Reservoir increase during the winter season, these deliveries could potentially reduce storage in Pilarcitos Reservoir, thereby potentially reducing diversions to the San Mateo Creek watershed. Although the increased delivery would increase releases to Pilarcitos Creek from Pilarcitos Dam for a period of time, the increase would subsequently lead to a reduction in spills past Stone Dam.
- Additional wintertime deliveries could also potentially impair the ability to provide carry-over storage into the summer season from Pilarcitos Reservoir, and subsequently lead to an acceleration of the beginning of the season when releases to Pilarcitos Creek from Pilarcitos Reservoir consist only of the passage of reservoir inflow.
- An increase in summertime deliveries from Pilarcitos Creek could also accelerate the beginning of the season when releases to Pilarcitos Creek from Pilarcitos Reservoir consist only of the passage of reservoir inflow.

In the No-program setting, Coastside CWD would increase its purchase request to the same level as that of the WSIP setting. Due to an increase in the frequency of system-wide delivery shortages in the alternative setting, less water would be delivered to Coastside CWD; thus, a slight lessening of hydrologic effects would occur with the alternative as compared to the WSIP.

[5] See "Analysis of SFPUC Pilarcitos/Coastside County Water District Operations", Memorandum by Daniel B. Steiner, March 8, 2007.

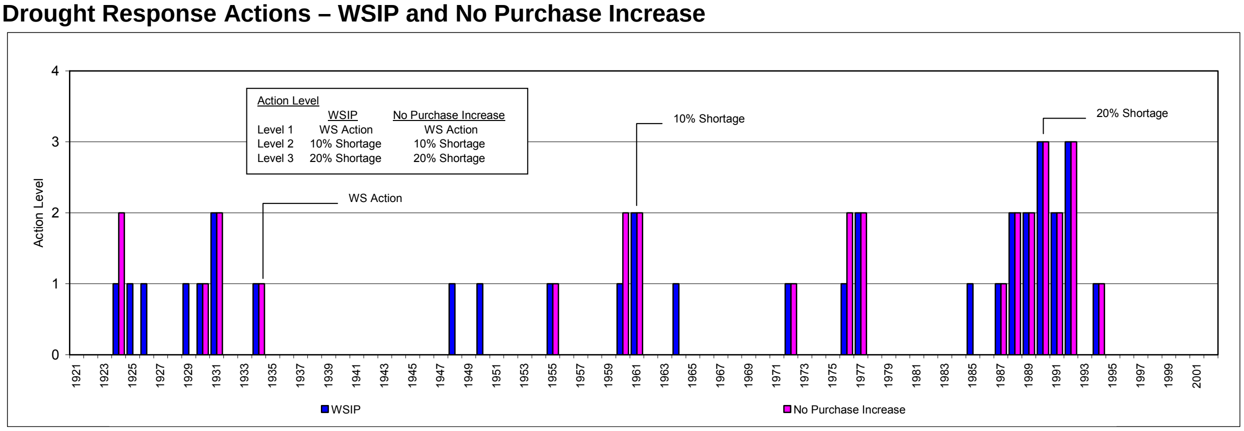
3. CEQA Alternative 2 – No Purchase Request Increase

CEQA Alternative 2 – No Purchase Request Increase Alternative (No Purchase Increase) would limit the SFPUC's wholesale customers' future purchases to the terms of the existing Master Water Sales Agreement. Under that agreement, the wholesale customers may purchase up to 184 mgd on an average annual basis, subject to reductions in the event of a drought, water shortage, earthquake, other natural disaster, or rehabilitation and maintenance of the system. Under the alternative, the customer purchase requests for 2030 would be 184 mgd for the wholesale customers instead of 209 mgd. It is assumed that the total customer purchase requests to be served by the regional system by 2030 would be 275 mgd, consisting of 184 mgd for the wholesale customers and 91 mgd for the retail customers. The increased water demand would be served through additional Tuolumne River diversions, increased use of local watershed supplies from restoration of Calaveras Reservoir, and 10 mgd from recycled water, groundwater, and conservation projects in San Francisco (RRGWC). Supplemental supplies would include implementation of the Westside Basin Groundwater Program and a water transfer with the TID/MID similar to the proposed program. Compared to the WSIP setting, the only project not included is the Lower Crystal Springs Dam improvement project (PN-4).[6]

3.1 Water Deliveries and Drought Response Actions

Compared to the WSIP setting, the regional system's resources are required to serve a net 265-mgd demand (275 mgd purchase request minus 10 mgd of RRGWC) instead of a net 290-mgd demand. As part of the formulation of this alternative, the water transfer from MID/TID was sized to provide the same frequency and severity of water shortages (percentage-wise) for the alternative as that of the WSIP setting during the Design Drought (although system-wide water deliveries are a net 265 mgd in the alternative setting as compared to the WSIP setting delivery of a net 290 mgd). This objective required the water transfer to be sized at 1,500 acre-feet per year. With a water supply formulated about comparable to that provided for the WSIP setting, only proportionately smaller for a lesser demand, the implementation of rationing and the severity of rationing from the SFPUC system during drought periods would be about the same. However, this result does not speak to the regional shortage of water that would occur by the SFPUC system not supplying the full purchase request of 300 mgd. Although the results indicate that SFPUC customers would experience essentially the same shortages in supply from the SFPUC system in the future as they currently experience, the ability of SFPUC customers to cope with these projected shortages in the future may be less depending on the resources and measures implemented by the customers to fill in the gap between their 300-mgd purchase request and the purchase request served in this alternative (275 mgd). Table 1-1 illustrates the comparison of the drought response actions for the proposed program and the alternative. Figure 3.1-1 illustrates the occurrence of drought response actions for the simulated 82-year historical period (1921-2002).

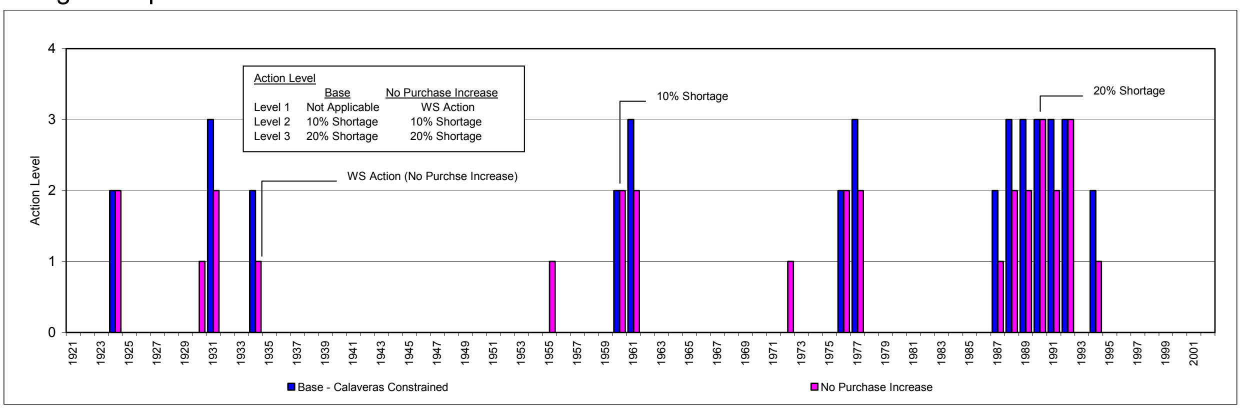
Figure 3.1-1
Drought Response Actions – WSIP and No Purchase Increase



[6] The Lower Crystal Springs Dam Improvements project is also included in the alternative but was not included in the HH/LSM modeling.

In Figure 3.1-1, years with bars showing a “1” or greater level of action indicate periods when a supplemental water supply action is initiated. In both settings, the water supply action is the use of the Westside Groundwater Basin Program to supplement SFPUC water deliveries. Also occurring in both settings is the water transfer supplemental supply from MID/TID. Action levels greater than “1” indicate the imposition of delivery shortages (rationing) to SFPUC customers. Although SFPUC customers would experience the same frequency and severity of shortages (percentage-wise) during the Design Drought in both settings, the frequency of shortage in other drought periods would slightly increase in the alternative setting. The triggering of the Westside Basin Groundwater Program supplemental supply would occur more frequently in the WSIP setting. Both of these differences are an outcome of a slightly different interaction between differing available supplies and demands. The same form of information is shown in Figure 3.1-2 in comparing the alternative and the “Base - Calaveras Constrained” (existing) settings. There is no level 1 action level in the base setting. Without supplemental resources, the existing system only has delivery shortage measures available to cope with drought. In the base setting, the shortage measure is imposed during level 2 (10 percent) and level 3 (20 percent). These percentages of shortage are applied to both the alternative and the base settings for these action levels, and they are applied to the same level of net water demand (265 mgd). During this simulation period, rationing above 20 percent is not required in either setting; however, in the alternative setting, the occurrence of additional water supplies lessens the frequency and severity of water delivery shortages.

Figure 3.1-2
Drought Response Actions – Base and No Purchase Increase



Not illustrated in Figure 3.1-2 but shown in Table 1-1 are the delivery shortages anticipated during the entire SFPUC Design Drought. During the Design Drought, the base setting does not have a viable operation without exceeding a 20-percent shortage level. The base setting exceeds the 20-percent shortage level (requires 25 percent rationing) during the last 18 months of the Design Drought. The alternative would viably provide deliveries without exceeding a 20-percent shortage level.

The difference in water deliveries between the proposed program and the alternative is shown chronologically for the 82-year simulation in Table 3.1-1. Less water would be delivered to the region by the SFPUC in all years, a result of serving a lesser purchase request (275 mgd instead of 300 mgd, and a lesser net demand 265 mgd instead of 290 mgd). The difference would have to be met from non-SFPUC system water supplies and measures. Comparing the alternative setting to the base setting, Table 3.1-2 illustrates the difference in water deliveries between the two settings. The increases in deliveries in the alternative setting occur due to an improvement in water delivery reliability, which reduces the severity of water shortages. The results also indicate periods in which additional deliveries occur to replenish the Westside Basin Groundwater Program. The occasional reductions in deliveries indicate periods when the Westside Basin Groundwater Program is offsetting SFPUC demands during a level 1 action circumstance. The 265-mgd net demand is being served during these periods; however, the regional system experiences a reduction in delivery associated with the Westside Basin Groundwater Program offsetting demands. The shifting in the pattern of deliveries (evident during years when there is no increase in total annual delivery) indicates the anticipated seasonal effect of RRGWC within the pattern of the projected future, albeit limited, purchase request.

Table 3.1-1

Difference in Total System-wide Delivery (MG)

No Purchase Increase minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
1921	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1922	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1923	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1924	-801	-620	-508	-433	-479	-637	-745	-900	-984	-2,291	-2,216	-1,888	-12,502	-9,124
1925	-1,624	-1,207	-931	-751	-897	-1,303	-1,596	-1,929	-2,132	-543	-538	-453	-13,903	-18,764
1926	-352	-201	-100	-51	-100	-213	-309	-455	-531	-767	-762	-669	-4,510	-3,845
1927	-576	-418	-324	-275	-302	-438	-526	-679	-748	-1,298	-1,260	-1,124	-7,968	-6,485
1928	-1,025	-837	-732	-657	-682	-861	-962	-1,125	-1,201	-1,298	-1,260	-1,124	-11,763	-11,763
1929	-1,025	-837	-732	-657	-682	-861	-962	-1,125	-1,201	-767	-762	-669	-10,280	-11,763
1930	-576	-418	-324	-275	-302	-438	-526	-679	-748	-1,074	-1,036	-907	-7,303	-6,485
1931	-801	-620	-508	-433	-479	-637	-745	-901	-984	-940	-906	-806	-8,759	-9,124
1932	-720	-577	-485	-426	-448	-589	-667	-796	-861	-1,074	-1,036	-907	-8,586	-8,220
1933	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1934	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1935	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1936	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,298	-1,260	-1,124	-9,789	-9,124
1937	-1,025	-837	-732	-657	-682	-861	-962	-1,125	-1,201	-1,298	-1,260	-1,124	-11,763	-11,763
1938	-1,025	-837	-732	-657	-682	-861	-962	-1,125	-1,201	-1,074	-1,036	-907	-11,098	-11,763
1939	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1940	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1941	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1942	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1943	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1944	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1945	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1946	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1947	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1948	-801	-620	-508	-433	-479	-637	-745	-900	-984	-767	-762	-669	-8,306	-9,124
1949	-576	-418	-324	-275	-302	-438	-526	-679	-748	-1,298	-1,260	-1,124	-7,968	-6,485
1950	-1,025	-837	-732	-657	-682	-861	-962	-1,125	-1,201	-767	-762	-669	-10,280	-11,763
1951	-576	-418	-324	-275	-302	-438	-526	-679	-748	-1,298	-1,260	-1,124	-7,968	-6,485
1952	-1,025	-837	-732	-657	-682	-861	-962	-1,125	-1,201	-1,074	-1,036	-907	-11,098	-11,763
1953	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1954	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1955	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1956	-801	-620	-508	-433	-479	-637	-745	-901	-531	-1,074	-1,036	-907	-8,671	-8,671
1957	-801	-620	-508	-433	-479	-637	-745	-1,125	-1,201	-1,074	-1,036	-907	-9,565	-9,565
1958	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1959	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1960	-801	-620	-508	-433	-479	-637	-745	-900	-984	-2,291	-2,216	-1,888	-12,502	-9,124
1961	-1,624	-1,207	-931	-751	-897	-1,303	-1,596	-1,929	-2,132	-940	-906	-806	-15,021	-18,764
1962	-720	-577	-485	-426	-448	-589	-667	-796	-861	-1,074	-1,036	-907	-8,586	-8,220
1963	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1964	-801	-620	-508	-433	-479	-637	-745	-901	-984	-767	-762	-669	-8,306	-9,124
1965	-576	-418	-324	-275	-302	-438	-526	-679	-748	-1,298	-1,260	-1,124	-7,968	-6,485
1966	-1,025	-837	-732	-657	-682	-861	-962	-1,125	-1,201	-1,074	-1,036	-907	-11,098	-11,763
1967	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1968	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1969	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1970	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1971	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1972	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1973	-801	-620	-508	-433	-479	-637	-745	-901	-531	-1,074	-1,036	-907	-8,671	-8,671
1974	-801	-620	-508	-433	-479	-637	-745	-1,125	-1,201	-1,074	-1,036	-907	-9,565	-9,565
1975	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1976	-801	-620	-508	-433	-479	-637	-745	-900	-984	-2,291	-2,216	-1,888	-12,502	-9,124
1977	-1,624	-1,207	-931	-751	-897	-1,303	-1,596	-1,929	-2,132	-940	-906	-806	-15,021	-18,764
1978	-720	-577	-485	-426	-448	-589	-667	-796	740	-1,074	-1,036	-907	-6,985	-6,619
1979	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1980	-801	-620	-508	-433	-479	-637	-745	-1,125	-1,201	-1,074	-1,036	-907	-9,565	-9,565
1981	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1982	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1983	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1984	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1985	-801	-620	-508	-433	-479	-637	-745	-900	-984	-767	-762	-669	-8,306	-9,124
1986	-576	-418	-324	-275	-302	-438	-526	-679	-748	-1,298	-1,260	-1,124	-7,968	-6,485
1987	-1,025	-837	-732	-657	-682	-861	-962	-1,125	-1,201	-1,074	-1,036	-907	-11,098	-11,763
1988	-801	-620	-508	-433	-479	-637	-745	-901	-984	-940	-906	-806	-8,759	-9,124
1989	-720	-577	-485	-426	-448	-589	-667	-796	-861	-940	-906	-806	-8,220	-8,220
1990	-720	-577	-485	-426	-448	-589	-667	-796	-861	-832	-808	-708	-7,918	-8,220
1991	-643	-512	-430	-381	-406	-522	-598	-705	-760	-940	-906	-806	-7,608	-7,306
1992	-720	-577	-485	-426	-448	-589	-667	-796	-861	-832	-808	-708	-7,918	-8,220
1993	-643	-512	-430	-381	-406	-522	-598	-705	-760	-1,074	-1,036	-907	-7,973	-7,306
1994	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1995	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1996	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1997	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1998	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1999	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
2000	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
2001	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
2002	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
Avg (21-02)	-821	-637	-523	-449	-492	-657	-766	-934	-988	-1,095	-1,060	-929	-9,352	-9,352

Table 3.1-2

Difference in Total System-wide Delivery (MG)

No Purchase Increase minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
1921	234	208	178	165	-42	-28	-18	6	24	71	59	33	890	1,555
1922	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1923	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1924	9	-9	-47	-59	-42	-28	-18	6	24	-250	-228	-217	-858	0
1925	-221	-211	-221	-214	-205	-224	-231	-216	-1,360	296	283	250	-2,274	-3,797
1926	234	208	178	165	161	196	199	230	241	71	59	33	1,975	2,640
1927	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1928	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1929	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1930	9	-9	-47	-59	-42	-28	-18	6	24	-235	-216	-205	-818	0
1931	-215	-211	-230	-217	-219	-227	-237	-216	-212	763	766	667	212	-2,639
1932	603	480	406	363	381	521	593	703	750	296	283	250	5,629	6,996
1933	234	208	178	165	161	196	199	230	241	296	283	250	2,640	2,640
1934	234	208	178	165	161	196	199	230	241	967	951	765	4,494	2,640
1935	602	376	202	103	213	442	620	813	-212	296	283	250	3,989	5,843
1936	234	208	178	165	161	196	199	230	241	71	59	33	1,975	2,640
1937	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1938	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1939	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1940	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1941	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1942	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1943	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1944	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1945	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1946	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1947	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1948	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1949	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1950	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1951	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1952	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1953	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1954	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1955	9	-9	-47	-59	-42	-28	-18	6	24	-235	-216	-205	-818	0
1956	-215	-211	-230	-217	-219	-227	-237	-216	241	296	283	250	-702	-2,186
1957	234	208	178	165	161	196	199	6	24	71	59	33	1,534	2,199
1958	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1959	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1960	9	-9	-47	-59	-42	-28	-18	6	24	-250	-228	-217	-858	0
1961	-221	-211	-221	-214	-205	-224	-231	-216	-218	763	766	667	235	-2,656
1962	603	480	406	363	381	521	593	703	750	296	283	250	5,629	6,996
1963	234	208	178	165	161	196	199	230	241	296	283	250	2,640	2,640
1964	234	208	178	165	161	196	199	230	241	71	59	33	1,975	2,640
1965	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1966	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1967	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1968	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1969	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1970	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1971	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1972	9	-9	-47	-59	-42	-28	-18	6	24	-235	-216	-205	-818	0
1973	-215	-211	-230	-217	-219	-227	-237	-216	241	296	283	250	-702	-2,186
1974	234	208	178	165	161	196	199	6	24	71	59	33	1,534	2,199
1975	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1976	9	-9	-47	-59	-42	-28	-18	6	24	-250	-228	-217	-858	0
1977	-221	-211	-221	-214	-205	-224	-231	-216	-218	763	766	667	235	-2,656
1978	603	480	406	363	381	521	593	703	241	296	283	250	5,120	6,487
1979	234	208	178	165	161	196	199	230	241	296	283	250	2,640	2,640
1980	234	208	178	165	161	196	199	6	24	71	59	33	1,534	2,199
1981	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1982	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1983	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1984	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1985	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1986	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1987	9	-9	-47	-59	-42	-28	-18	6	24	967	951	765	2,520	0
1988	602	376	202	103	213	442	620	813	930	763	766	667	6,498	6,985
1989	603	480	406	363	381	521	593	703	750	763	766	667	6,996	6,996
1990	603	480	406	363	381	521	593	703	750	-254	-237	-214	4,096	6,996
1991	-221	-205	-211	-202	-202	-218	-231	-219	-221	763	766	667	266	-2,634
1992	603	480	406	363	381	521	593	703	750	-254	-237	-214	4,096	6,996
1993	-221	-205	-211	-202	-202	-218	-231	-219	-2,332	296	283	250	-3,212	-4,745
1994	234	208	178	165	161	196	199	230	241	967	951	765	4,494	2,640
1995	602	376	202	103	213	442	-237	-216	-212	296	283	250	2,103	3,958
1996	234	208	178	165	161	196	199	230	241	296	283	250	2,640	2,640
1997	234	208	178	165	161	196	199	230	241	296	283	250	2,640	2,640
1998	234	208	178	165	161	196	199	230	241	296	283	250	2,640	2,640
1999	234	208	178	165	161	196	199	230	241	296	283	250	2,640	2,640
2000	234	208	178	165	161	196	199	230	241	296	283	250	2,640	2,640
2001	234	208	178	165	161	196	199	230	241	71	59	33	1,975	2,640
2002	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
Avg (21-02)	101	69	28	12	24	57	64	91	61	170	162	127	966	974

3.2 Diversions from Tuolumne River

The metric for illustrating the SFPUC diversion from the Tuolumne River Basin (Tuolumne) is the flow through the San Joaquin Pipeline (SJPL). Inherent to this alternative is a net water demand essentially equal to the base setting, which is less than the demand served by the proposed program. Table 3.2-1 illustrates the difference in diversions to the SJPL between the proposed program and the alternative settings. In both settings, the conveyance capacity of the SJPL is increased compared to the base setting. During the summer, the SJPL would essentially operate at the same maximum rate in both the alternative and WSIP settings to minimize draw down of Bay Area reservoir storage. A few exceptions occur during the summer of drought periods when the alternative is serving a lesser demand than occurs in the WSIP setting. Overall, compared to the WSIP setting, the alternative setting would divert less water from the Tuolumne.

Table 3.2-2 illustrates the difference in diversions to the SJPL between the alternative and base settings. Evident in the operation is the increase in summer diversions associated with an increase in the conveyance capacity of the SJPL. As described above, with the increase in SJPL conveyance capacity, summer diversions would increase to retain storage in the Bay Area reservoirs. With the demand of the alternative approximately the same as the base setting, the increase in summer diversions to the SJPL result in reduced diversions during the late summer and fall. The differences in December diversions are largely the result of maintenance occurring in the alternative setting (lessening available conveyance capacity), which does not occur in the base setting. The increase in diversion during the winter and spring results from the need to replenish Bay Area reservoir storage after the maintenance, and then from the need to top off Bay Area reservoir storage prior to summer. Overall, there would be an increase in average annual diversions to the SJPL in the alternative setting, which is associated with the improvement in water delivery reliability.

The average monthly diversion through the SJPL by year type for the 82-year simulation for the proposed program and the alternative settings, and the difference between the two settings, is illustrated in Table 3.2-3. Table 3.2-4 illustrates the same information for the alternative and base settings.

Table 3.2-1

Difference in Total SJPL (Acre-feet)

No Purchase Increase minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
1921	-952	-1,841	0	0	0	-7,611	0	-3,140	-3,038	0	0	-2,118	-18,700	-22,106
1922	-5,233	-2,762	-1,142	-2,854	0	0	-8,286	-3,996	-3,867	0	0	-2,118	-30,258	-30,258
1923	-952	-1,841	0	0	0	-6,755	-4,880	-3,140	-3,038	0	0	-2,578	-23,184	-22,724
1924	-3,901	-2,762	0	-3,805	-3,437	0	0	0	0	-1,237	-1,237	-9,483	-25,862	-16,483
1925	-9,799	0	0	0	-3,523	0	-1,197	-6,945	-6,721	0	0	0	-28,185	-40,142
1926	-3,996	-2,854	0	-6,755	-7,734	-3,901	-3,867	-1,237	-1,197	0	0	-3,038	-34,579	-31,541
1927	-5,233	-2,762	0	-2,854	0	-4,947	-5,524	-2,664	-2,578	0	0	-2,578	-29,140	-29,600
1928	-2,854	-2,762	-523	-4,757	-4,296	-4,947	-5,524	-3,140	-3,038	0	0	-2,118	-33,959	-34,419
1929	-5,233	-2,762	0	-4,757	-4,297	0	0	-1,237	-1,197	0	0	-2,118	-21,601	-21,601
1930	-5,043	0	0	0	0	0	0	0	0	0	0	-4,880	-9,923	-7,161
1931	-5,043	-6,537	0	-8,658	-7,820	0	0	-1,237	-1,197	-2,189	-2,189	-9,483	-44,353	-35,372
1932	-8,562	-2,762	7,326	-476	-6,874	-8,658	-1,197	-6,945	-6,721	0	0	-1,197	-36,066	-48,730
1933	-856	-2,762	0	-2,854	-2,578	0	0	0	0	0	0	0	-9,050	-10,247
1934	-3,996	-2,854	-7,611	-6,659	-6,015	-1,047	0	0	0	0	0	-3,867	-32,049	-28,182
1935	-5,043	0	0	-1,047	-3,523	0	-7,642	-5,043	-4,880	0	0	-1,197	-28,375	-31,045
1936	-6,945	-5,524	0	-5,709	-859	-8,658	-2,118	-2,189	-2,118	0	0	-2,578	-36,698	-35,317
1937	-6,660	-4,603	0	-4,757	0	-2,663	-9,207	-3,140	-3,038	0	0	-2,578	-36,646	-36,646
1938	-3,901	-2,762	0	-6,659	0	0	-9,206	-5,043	-4,880	0	0	-2,578	-35,029	-35,029
1939	-952	-1,841	952	-3,805	-3,437	-1,047	0	0	0	0	0	-3,038	-13,168	-12,708
1940	-5,043	0	0	0	-9,452	-12,367	-5,524	-5,043	-4,880	0	0	-2,118	-44,427	-45,347
1941	-952	-1,841	2,854	0	0	0	0	-2,854	-2,762	0	0	0	-5,555	-7,673
1942	-3,805	-2,762	0	0	0	-3,805	-7,365	-2,854	-2,762	0	0	-1,197	-24,550	-23,353
1943	-2,949	-3,682	0	0	0	-7,610	-6,721	-3,140	-3,038	0	0	-2,578	-29,718	-28,337
1944	-952	-1,841	1,903	-4,757	-4,297	-6,755	0	-2,189	-2,118	0	0	-2,118	-23,124	-23,584
1945	-3,901	0	0	0	-6,015	-2,949	0	-5,043	-4,880	0	0	-1,197	-23,985	-24,906
1946	-6,945	-4,603	0	0	0	-5,803	0	-2,664	-2,578	0	0	-2,578	-25,171	-23,790
1947	-6,660	-4,603	0	-4,757	-4,296	0	0	-1,237	-1,197	0	0	-2,578	-25,328	-25,328
1948	-5,043	-5,616	0	-6,755	-5,156	0	0	-2,189	-2,118	0	0	-2,118	-28,995	-29,455
1949	-3,996	-3,775	-952	-4,757	-4,296	-2,854	-1,197	-3,996	-3,867	0	0	-2,118	-31,808	-31,808
1950	-4,757	0	0	0	-2,664	0	0	0	0	0	0	-2,118	-9,539	-9,539
1951	-3,996	-13,810	0	0	0	-9,513	-2,578	-3,996	-3,867	0	0	-2,118	-39,878	-39,878
1952	-2,854	-2,762	-951	0	0	0	-9,207	-5,043	-4,880	0	0	-2,578	-28,275	-27,815
1953	-952	-1,841	0	0	0	-6,755	-2,118	-3,996	-3,867	0	0	-2,118	-21,647	-22,107
1954	-2,854	-1,841	1,903	-3,805	-2,578	-6,755	-2,118	-2,664	-2,578	0	0	-2,578	-25,868	-25,408
1955	-3,901	0	0	0	-2,664	0	0	0	0	0	0	-3,867	-10,432	-9,143
1956	-5,043	-3,775	0	0	0	-3,805	-3,867	-3,996	-3,867	0	0	-1,197	-25,550	-28,220
1957	-2,854	-921	0	-3,805	-3,437	-1,047	0	-1,237	-1,197	0	0	-2,578	-17,076	-15,695
1958	-7,897	-5,524	0	-4,757	0	0	0	-2,949	-2,854	0	0	-1,197	-25,178	-26,559
1959	-2,854	-1,841	1,903	-3,805	-859	-3,901	0	-1,237	-1,197	0	0	-2,578	-16,369	-14,988
1960	-6,945	0	0	0	0	0	0	0	0	0	-1,237	-7,642	-15,824	-9,523
1961	-7,897	-6,537	6,184	-4,376	-9,538	-1,047	-1,197	-6,945	-6,721	-1,237	-2,189	-9,483	-50,983	-46,953
1962	-9,799	368	475	-3,330	-7,734	-8,658	-1,197	-6,945	-6,721	0	0	-1,197	-44,738	-56,450
1963	-2,379	-5,524	0	-2,663	0	-6,659	-6,444	-2,854	-2,762	0	0	0	-29,285	-30,482
1964	-3,996	-1,841	0	-4,756	-4,296	0	0	0	0	0	0	-1,197	-16,086	-14,889
1965	-3,996	0	0	-5,708	-5,156	-3,901	-9,667	-2,759	-2,670	0	0	-2,118	-35,975	-35,054
1966	-2,854	-1,841	0	-4,757	-4,297	-2,949	0	0	0	0	0	-3,038	-19,736	-18,816
1967	-5,043	-6,537	-3,805	0	0	-3,805	-6,445	-2,855	-2,762	0	0	-1,197	-32,449	-34,290
1968	-3,806	-2,762	0	-2,854	-2,578	0	0	-1,237	-1,197	0	0	-2,578	-17,012	-15,631
1969	-7,897	-5,524	-1,902	0	0	0	-7,642	-3,140	-3,038	0	0	-3,038	-32,181	-31,721
1970	-2,854	0	0	-4,757	-4,297	-5,803	0	-1,237	-1,197	0	0	-3,038	-23,183	-23,183
1971	-4,757	-1,841	0	0	0	-1,047	0	-2,189	-2,118	0	0	-2,118	-14,070	-14,990
1972	-6,945	-6,537	-2,854	-5,709	-5,156	0	0	0	0	0	0	-3,867	-31,068	-29,319
1973	-5,043	-6,537	-523	0	0	0	-7,642	-5,043	-4,880	0	0	0	-29,668	-33,535
1974	-1,902	-921	0	0	0	-5,899	-5,524	-5,043	-4,880	0	0	-2,578	-26,747	-24,169
1975	0	0	0	0	-6,875	-3,805	-7,365	-3,996	-3,867	0	0	-3,038	-28,946	-28,486
1976	-1,902	-1,841	0	-2,854	-2,578	0	0	0	0	-2,189	-2,664	-9,483	-23,511	-12,213
1977	-9,799	-5,616	-4,757	475	-5,156	0	-1,197	-5,043	-4,880	-2,664	3,520	-3,499	-38,616	-50,309
1978	-2,378	368	6,184	-7,135	-6,874	-8,562	-7,365	-3,901	-3,775	0	0	0	-33,438	-36,081
1979	-1,902	0	952	-3,805	0	-7,611	0	-2,189	-2,118	0	0	-1,197	-17,870	-16,673
1980	-6,945	0	0	-7,611	0	-8,562	-3,867	-3,140	-3,038	0	0	-3,038	-36,201	-34,360
1981	-2,854	-2,762	0	-3,805	-3,437	-2,949	0	-2,189	-2,118	0	0	-2,118	-22,232	-23,152
1982	-6,660	-4,603	1,903	0	0	-2,663	0	-2,854	-2,762	0	0	-1,197	-18,836	-19,757
1983	-2,949	-1,841	0	0	0	0	-2,946	-1,902	-1,841	0	0	0	-11,479	-12,676
1984	-6,945	-2,762	0	0	0	-1,047	0	-2,189	-2,118	0	0	-2,118	-17,179	-15,061
1985	-5,043	0	0	0	-945	0	0	0	0	0	0	-2,118	-8,106	-8,106
1986	-3,996	-3,775	0	-6,755	-3,437	-7,610	-8,286	-5,043	-4,880	0	0	-2,118	-45,900	-45,900
1987	-2,854	-1,841	0	-3,805	-3,437	0	0	0	0	0	0	-4,880	-16,817	-14,055
1988	-5,043	-3,775	0	-8,658	-6,875	0	0	-1,237	-1,197	-2,189	-2,189	-9,483	-40,646	-31,665
1989	-4,756	-1,841	0	-2,854	-2,578	-1,047	-1,197	-5,043	-4,880	-2,664	-2,664	-2,762	-32,286	-38,057
1990	-1,902	0	0	0	-945	0	0	-2,664	-2,578	-8,201	-6,012	-3,056	-25,358	-16,179
1991	-1,256	-1,215	-733	-2,207	-1,994	-6,012	-3,333	-4,110	-3,977	-1,237	951	0	-25,123	-42,106
1992	0	0	0	-2,854	-1,031	-6,755	-2,578	-5,043	-4,880	-3,158	-1,256	1,547	-26,008	-23,427
1993	1,599	-3,056	-733	-1,256	-1,134	-1,256	-6,739	-4,110	-3,977	0	0	0	-20,662	-23,529
1994	-2,854	0	1,903	-4,757	-4,296	0	0	0	0	0	0	-3,867	-13,871	-10,004
1995	-5,043	0	0	-9,513	-6,875	0	-7,365	-4,757	-4,604	0	0	-2,118	-40,275	-42,024
1996	-2,854	0	0	0	0	0	-4,880	-3,996	-3,867	0	0	-1,197	-16,794	-17,715
1997	-4,757	-2,762	0	0	0	-5,803	0	-1,237	-1,197	0	0	-1,197	-16,953	-16,953
1998	-6,660	-4,603	-523	0	0	-951	-7,365	-3,901	-3,775	0	0	-3,038	-30,816	-28,975
1999	-952	-2,762	1,903	-2,854	0	-7,611	-7,365	-3,996	-3,867	0	0	-1,197	-28,701	-30,542
2000	-2,854	0	0	0	-4,296	-10,465	0	-1,237	-1,197	0	0	-1,197	-21,246	-21,246
2001	-6,660	-2,762	0	-5,709	0	-7,611	0	-1,237	-1,197	0	0	-2,578	-27,754	-26,373
2002	-5,708	-4,603	0	-2,854	-2,578	-2,949	0	0	0	0	0	-3,038	-21,730	-21,270
Avg (21-02)	-4,188	-2,550	114	-2,699	-2,543	-3,136	-2,646	-2,691	-2,604	-329	-209	-2,563	-26,045	-26,075

Table 3.2-2

Difference in Total SJPL (Acre-feet) No Purchase Increase minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
1921	0	-2,762	0	0	0	6,659	2,118	-951	-920	2,189	2,189	0	8,522	9,443
1922	-5,708	-2,762	-1,142	3,805	0	0	-921	1,047	1,013	2,189	2,189	0	-290	-290
1923	-952	-2,762	0	0	0	8,562	-2,762	-951	-920	2,189	2,189	-460	4,133	4,593
1924	-2,854	-2,762	-952	-4,757	-4,296	5,803	2,118	2,189	2,118	952	952	-7,365	-8,854	525
1925	-7,610	-19,334	-15,222	5,803	13,749	15,317	921	-4,756	-4,603	2,189	2,189	2,118	-9,239	-21,196
1926	1,047	2,762	-7,088	-952	0	11,416	-1,749	952	921	2,189	2,189	-920	10,767	13,805
1927	-952	-1,841	-952	4,947	0	-1,142	-5,524	-475	-460	2,189	2,189	2,302	281	-2,941
1928	0	-2,762	-1,902	952	860	2,663	-5,524	-951	-920	2,189	2,189	2,762	-444	-904
1929	0	-2,762	0	0	0	10,560	2,118	952	921	2,189	2,189	0	16,167	18,929
1930	-2,854	-19,334	-19,979	5,803	5,242	15,317	2,118	2,189	2,118	2,189	2,189	-2,762	-7,764	-5,002
1931	-2,854	-921	-7,088	-2,855	1,718	5,803	2,118	952	921	0	0	-7,365	-9,571	-590
1932	0	4,603	0	3,805	0	7,801	921	952	921	2,189	2,189	921	24,302	11,638
1933	1,047	-921	-7,088	4,757	4,297	10,560	2,118	2,189	2,118	2,189	2,189	2,118	25,573	24,376
1934	-1,807	2,762	-2,855	952	4,297	9,513	2,118	2,189	2,118	2,189	2,189	-1,749	21,916	25,783
1935	-2,854	-19,334	-19,979	15,412	11,343	10,560	-5,524	2,854	2,762	2,189	2,189	921	539	-2,131
1936	0	-921	-7,088	6,659	0	6,659	0	0	0	2,189	2,189	-460	9,227	10,608
1937	-2,854	-2,762	-952	952	0	0	-7,365	1,903	1,842	2,189	2,189	-460	-5,318	-5,318
1938	0	-2,762	-1,142	951	0	0	-1,841	0	0	2,189	2,189	2,302	1,886	-876
1939	-952	-2,762	0	0	0	9,513	2,118	2,189	2,118	2,189	2,189	-920	15,682	18,904
1940	-2,854	-19,334	-19,979	11,512	0	0	1,841	0	0	2,189	2,189	0	-24,436	-25,356
1941	-952	-2,762	0	0	0	0	0	0	0	2,189	2,189	2,118	2,782	664
1942	-1,902	-2,762	-1,712	0	0	0	-1,841	0	0	2,189	2,189	921	-2,918	-1,721
1943	0	0	-7,088	0	0	0	-1,841	1,903	1,842	2,189	2,189	-460	-1,266	115
1944	-952	-2,762	-952	0	4,468	8,562	2,118	0	0	2,189	2,189	0	14,860	14,400
1945	-5,708	-19,334	-19,979	5,803	7,734	12,368	2,118	-2,854	-2,762	2,189	2,189	921	-17,315	-18,236
1946	0	-2,762	0	0	0	5,709	2,118	-475	-460	2,189	2,189	-460	8,048	9,429
1947	-5,708	-4,603	1,902	0	0	10,560	2,118	952	921	2,189	2,189	-460	10,060	10,060
1948	-2,854	0	-7,088	-952	-859	5,803	2,118	0	0	2,189	2,189	0	546	86
1949	-1,807	1,841	-952	-4,757	-4,296	-7,611	921	-1,807	-1,749	2,189	2,189	2,762	-13,077	-15,839
1950	-952	-19,334	-19,979	18,171	13,749	10,560	2,118	2,189	2,118	2,189	2,189	0	13,018	15,780
1951	-1,807	-9,207	0	0	0	-2,854	-460	-1,807	-1,749	2,189	2,189	2,762	-10,744	-13,506
1952	-952	-2,762	-951	0	0	0	1,841	0	0	2,189	2,189	-460	1,094	4,316
1953	-952	-2,762	-951	0	0	8,562	0	-1,807	-1,749	2,189	2,189	0	4,719	4,259
1954	-5,708	-2,762	-952	4,757	4,468	8,562	0	-475	-460	2,189	2,189	-460	11,348	11,808
1955	-5,708	-19,334	-15,222	18,171	13,749	5,803	2,118	2,189	2,118	2,189	2,189	-1,749	6,513	7,802
1956	-2,854	1,841	-3,805	0	0	0	-1,749	1,047	1,013	2,189	2,189	921	792	-1,878
1957	-952	-921	-952	952	5,328	9,513	2,118	952	921	2,189	2,189	-460	20,877	22,258
1958	-2,854	-2,762	-2,331	-952	0	0	0	0	0	2,189	2,189	921	-3,600	-4,981
1959	-952	-2,762	-952	4,757	-859	11,416	2,118	952	921	2,189	2,189	-460	18,557	19,938
1960	-4,756	-19,334	-19,979	5,803	9,538	5,803	2,118	2,189	2,118	2,189	952	-5,524	-18,883	-12,582
1961	-5,708	-921	-2,331	952	860	4,756	921	-4,756	-4,603	952	0	4,603	-5,275	-13,213
1962	4,757	0	-2,855	952	3,437	9,513	921	952	921	2,189	2,189	3,683	26,659	24,153
1963	2,854	-921	-2,331	0	0	0	-1,841	-952	-921	2,189	2,189	2,118	2,384	3,949
1964	2,949	1,841	-952	4,757	4,297	5,803	2,118	2,189	2,118	2,189	2,189	921	30,419	31,616
1965	-1,807	-19,334	-15,222	0	0	11,416	-5,524	-1,807	-1,749	2,189	2,189	2,762	-26,887	-28,728
1966	-952	0	-1,902	3,805	3,437	7,611	2,118	2,189	2,118	2,189	2,189	-920	21,882	25,564
1967	-2,854	-921	-9,514	0	0	-951	-3,683	-2,855	-2,762	2,189	2,189	921	-18,241	-20,082
1968	1,902	-2,762	-7,088	5,708	5,156	10,560	2,118	952	921	2,189	2,189	-460	21,385	22,766
1969	-5,708	-2,762	0	0	0	0	0	1,903	1,842	2,189	2,189	-920	-1,267	-807
1970	-2,854	-19,334	-15,222	7,610	6,874	9,514	2,118	952	921	2,189	2,189	-920	-5,963	-5,963
1971	-952	0	-951	0	0	9,513	2,118	0	0	2,189	2,189	0	14,106	13,186
1972	-4,756	-921	-952	-952	-860	5,803	2,118	2,189	2,118	2,189	2,189	-1,749	6,416	8,165
1973	-2,854	-921	-7,611	0	0	0	-921	-2,854	-2,762	2,189	2,189	4,880	-8,665	-15,294
1974	0	-921	0	0	0	2,663	0	0	0	2,189	2,189	2,302	8,422	11,000
1975	-952	-19,334	-19,979	11,512	859	0	921	1,047	1,013	2,189	2,189	-920	-21,455	-18,233
1976	-1,902	-2,762	-7,088	3,805	3,437	5,803	2,118	2,189	2,118	0	-475	-7,365	-122	11,176
1977	-7,610	0	-2,855	0	0	5,803	921	-2,854	-2,762	-475	-475	-4,603	-14,910	-17,197
1978	0	4,603	-2,331	0	0	0	2,946	1,902	1,841	2,189	2,189	2,118	15,457	3,408
1979	0	-921	0	4,757	0	4,757	2,118	0	0	2,189	2,189	921	16,010	17,207
1980	0	-19,334	-15,222	7,610	0	0	1,013	1,903	1,842	2,189	2,189	-920	-18,730	-16,889
1981	-952	-2,762	-7,088	3,805	3,437	12,368	2,118	0	0	2,189	2,189	0	15,304	14,384
1982	-5,708	-921	-2,854	0	0	0	0	0	0	2,189	2,189	921	-4,184	-5,105
1983	0	0	-2,663	0	0	0	0	952	921	2,189	2,189	2,118	5,706	4,509
1984	-1,902	-2,762	0	0	0	4,756	2,118	0	0	2,189	2,189	0	6,588	8,706
1985	-2,854	-14,731	-15,222	5,803	8,593	10,560	2,118	2,189	2,118	2,189	2,189	0	2,952	2,952
1986	-1,807	1,841	-7,088	-952	0	0	-921	0	0	2,189	2,189	0	-4,549	-4,549
1987	-952	-2,762	-952	0	0	10,560	2,118	2,189	2,118	2,189	2,189	-2,762	13,935	16,697
1988	-2,854	1,841	-7,088	-2,855	1,718	5,803	2,118	952	921	2,854	4,756	-4,603	3,563	2,172
1989	0	4,603	1,902	0	0	9,513	921	-2,854	-2,762	5,233	5,233	-4,603	17,186	14,330
1990	0	-14,731	-15,222	11,512	9,453	10,560	2,118	-475	-460	-304	-304	-1,215	932	8,618
1991	-1,256	2,467	-3,587	-6,964	-1,134	11,112	-1,215	-6,964	-6,739	6,660	5,708	4,603	2,691	-16,103
1992	4,757	0	2,854	4,947	2,406	11,416	-460	2,854	2,762	-3,158	-304	3,388	31,462	48,507
1993	3,501	-3,977	1,170	-1,256	-1,134	-1,256	2,467	-3,158	-3,056	2,189	2,189	2,118	-203	-6,773
1994	-952	-921	-952	0	4,297	10,560	2,118	2,189	2,118	2,189	2,189	1,013	23,848	24,953
1995	1,902	-19,334	-19,979	951	859	0	1,841	-952	-921	2,189	2,189	2,762	-28,493	-30,242
1996	-952	-921	-2,331	0	0	0	1,841	-1,807	-1,749	2,189	2,189	3,683	2,142	1,221
1997	0	-1,841	0	0	0	5,709	2,118	952	921	2,189	2,189	921	13,158	15,920
1998	-5,708	-2,762	-1,902	0	0	0	0	0	0	2,189	2,189	1,842	-4,152	-5,073
1999	0	-2,762	3,805	5,708	0	1,903	-4,603	1,047	1,013	2,189	2,189	3,683	14,172	12,331
2000	-952	-19,334	-19,979	15,317	5,156	3,045	2,118	952	921	2,189	2,189	3,683	-4,695	-4,695
2001	-952	-921	-7,088	2,854	8,593	6,659	2,118	952	921	2,189	2,189	-460	17,054	21,197
2002	-2,854	-2,762	-1,142	3,805	3,437	7,611	2,118	2,189	2,118	2,189	2,189	-920	17,978	18,438
Avg (21-02)	-1,564	-4,622	-5,307	2,472	1,993	5,387	528	233	225	2,077	2,091	176	3,689	3,712

Table 3.2-3

Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — No Purchase Increase

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	22,707	13,677	8,543	8,425	5,998	8,365	15,938	23,063	22,319	29,778	29,778	27,154	215,744	212,860
Above Normal	22,782	11,969	8,394	13,168	7,329	11,791	19,556	24,735	23,937	29,778	29,778	27,111	230,329	229,471
Normal	21,822	12,717	8,907	13,872	10,097	17,541	26,089	26,799	25,934	29,778	29,778	26,906	250,240	248,364
Below Normal	23,117	13,847	11,776	17,968	15,360	23,145	28,253	28,159	27,251	29,549	29,420	25,129	272,973	273,247
Dry	22,184	16,860	14,704	15,703	13,362	24,735	28,506	28,024	27,119	28,021	27,932	22,358	269,510	274,662
All Years	22,533	13,792	10,456	13,870	10,452	17,124	23,674	26,163	25,319	29,388	29,344	25,741	247,854	247,809

Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	27,358	16,624	8,533	11,512	7,465	11,298	21,561	26,603	25,744	29,778	29,778	28,817	245,069	242,794
Above Normal	26,705	14,785	7,751	14,254	9,306	16,705	24,176	28,608	27,685	29,778	29,778	28,817	258,347	258,347
Normal	26,174	14,713	8,765	15,626	12,095	22,405	28,207	29,778	28,817	29,778	29,778	28,817	274,953	274,878
Below Normal	27,338	16,106	11,931	21,523	18,520	25,038	28,817	29,481	28,530	29,778	29,593	27,864	294,520	295,079
Dry	25,990	19,593	14,794	19,764	17,471	25,782	28,817	29,778	28,817	29,463	28,821	27,200	296,289	297,969
All Years	26,721	16,342	10,342	16,569	12,994	20,261	26,320	28,854	27,923	29,717	29,553	28,304	273,899	273,884

Difference in Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — No Purchase Increase minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	-4,651	-2,947	11	-3,087	-1,467	-2,932	-5,623	-3,539	-3,425	0	0	-1,663	-29,325	-29,934
Above Normal	-3,923	-2,816	644	-1,086	-1,976	-4,913	-4,620	-3,873	-3,748	0	0	-1,706	-28,018	-28,876
Normal	-4,353	-1,997	143	-1,754	-1,998	-4,864	-2,118	-2,979	-2,883	0	0	-1,911	-24,713	-26,514
Below Normal	-4,221	-2,259	-155	-3,555	-3,160	-1,893	-564	-1,322	-1,279	-229	-174	-2,735	-21,547	-21,832
Dry	-3,806	-2,733	-89	-4,061	-4,109	-1,047	-311	-1,754	-1,698	-1,442	-889	-4,842	-26,779	-23,308
All Years	-4,188	-2,550	114	-2,699	-2,543	-3,136	-2,646	-2,691	-2,604	-329	-209	-2,563	-26,045	-26,075

Table 3.2-4

Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — No Purchase Increase

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	22,707	13,677	8,543	8,425	5,998	8,365	15,938	23,063	22,319	29,778	29,778	27,154	215,744	212,860
Above Normal	22,782	11,969	8,394	13,168	7,329	11,791	19,556	24,735	23,937	29,778	29,778	27,111	230,329	229,471
Normal	21,822	12,717	8,907	13,872	10,097	17,541	26,089	26,799	25,934	29,778	29,778	26,906	250,240	248,364
Below Normal	23,117	13,847	11,776	17,968	15,360	23,145	28,253	28,159	27,251	29,549	29,420	25,129	272,973	273,247
Dry	22,184	16,860	14,704	15,703	13,362	24,735	28,506	28,024	27,119	28,021	27,932	22,358	269,510	274,662
All Years	22,533	13,792	10,456	13,870	10,452	17,124	23,674	26,163	25,319	29,388	29,344	25,741	247,854	247,809

Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	24,260	18,126	13,783	8,028	6,015	7,433	16,031	23,070	22,326	27,589	27,589	26,009	220,258	218,975
Above Normal	24,176	17,926	14,204	9,100	6,157	9,279	20,309	24,679	23,883	27,589	27,589	25,887	230,776	230,776
Normal	23,368	19,046	14,390	9,930	6,864	10,632	25,951	27,054	26,181	27,589	27,589	26,009	244,601	243,681
Below Normal	24,959	17,980	17,964	15,726	11,808	15,334	26,699	27,589	26,699	26,917	26,917	25,670	264,263	264,595
Dry	23,665	19,046	18,433	14,080	11,386	15,936	26,699	27,232	26,354	26,876	26,578	24,225	260,509	262,015
All Years	24,097	18,413	15,763	11,398	8,459	11,737	23,147	25,930	25,093	27,311	27,253	25,565	244,165	244,098

Difference in Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — No Purchase Increase minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	-1,553	-4,449	-5,240	397	-17	932	-93	-7	-7	2,189	2,189	1,145	-4,513	-6,114
Above Normal	-1,393	-5,957	-5,809	4,068	1,173	2,513	-753	56	54	2,189	2,189	1,224	-446	-1,305
Normal	-1,546	-6,330	-5,482	3,942	3,233	6,909	138	-255	-247	2,189	2,189	898	5,639	4,683
Below Normal	-1,842	-4,133	-6,188	2,243	3,553	7,811	1,554	570	552	2,631	2,502	-541	8,710	8,652
Dry	-1,481	-2,187	-3,729	1,623	1,977	8,800	1,807	791	766	1,146	1,354	-1,866	9,001	12,647
All Years	-1,564	-4,622	-5,307	2,472	1,993	5,387	528	233	225	2,077	2,091	176	3,689	3,712

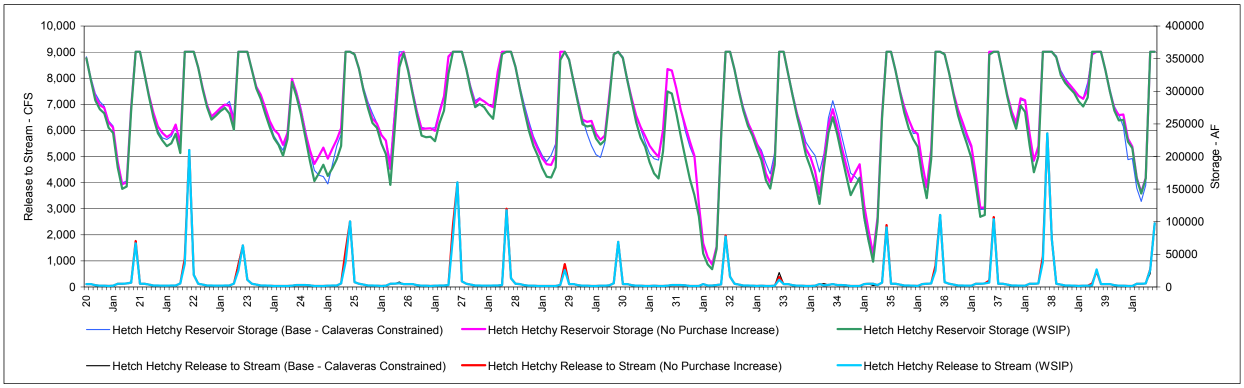
3.3 Hetch Hetchy Reservoir and Releases

Compared to the WSIP setting, the alternative setting would draw less water from the Tuolumne due to the lesser demand. This circumstance would lead to less draw from Hetch Hetchy Reservoir in the alternative setting in all years. Figure 3.3-1 illustrates a chronological trace of the simulation of Hetch Hetchy Reservoir storage and stream releases. Shown in Figure 3.3-1 are the results for the WSIP, alternative ("No Purchase Increase"), and base ("Base – Calaveras Constrained") setting. Supplementing the Figure 3.3-1 representation of Hetch Hetchy Reservoir storage are Table 3.3-1 Hetch Hetchy Reservoir Storage (No Purchase Increase), Table 3.3-2 Hetch Hetchy Reservoir Storage (WSIP), and Table 3.2-1 Difference in Hetch Hetchy Reservoir Storage (No Purchase Increase minus WSIP). Table 3.2-2 is provided to illustrate the difference in Hetch Hetchy Reservoir storage between the base and alternative settings.

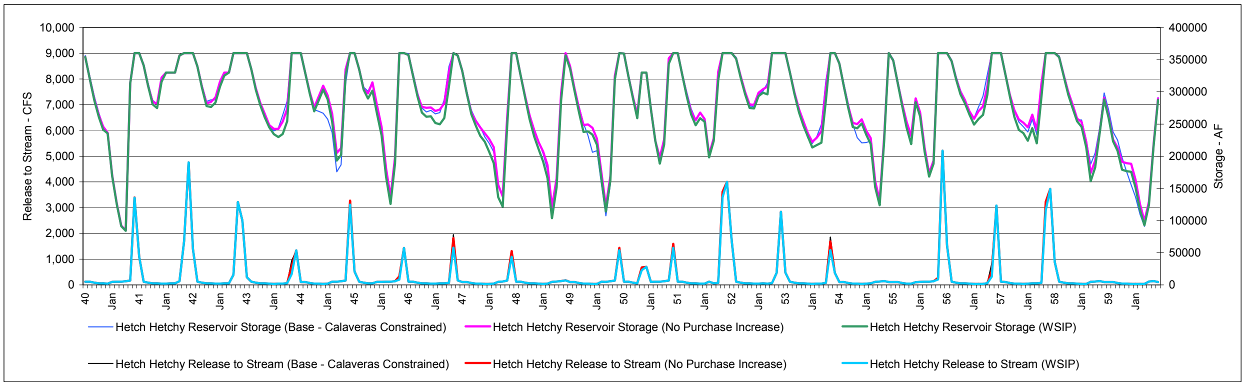
Table 3.3-3 illustrates that, by the end of summer, storage in Hetch Hetchy Reservoir associated with the alternative setting would be greater than the storage in the WSIP setting, although typically an increase of less than 3,000 acre-feet. In about 20 percent of the years, storage would be greater by 3,000 acre-feet or more. The relatively minor increases in storage are attributable to years when summer diversions are the same in both settings (SJPL operating at maximum capacity) but less water is being diverted in the fall due to the lesser water demand. The larger increases in storage are associated with drought periods during which the differences in underlying demand and water delivery shortages between the WSIP and alternative settings are greater.

Figure 3.3-1
Hetch Hetchy Reservoir Storage and Stream Release

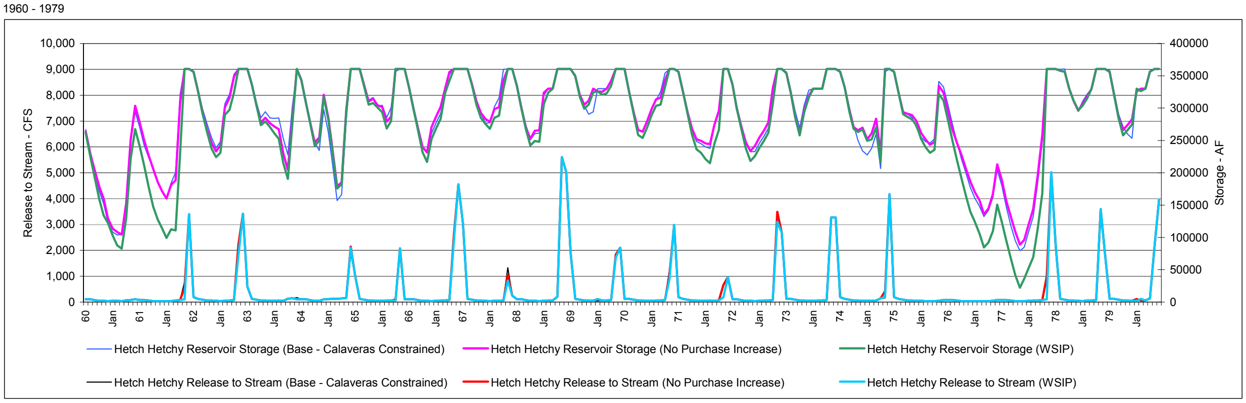
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

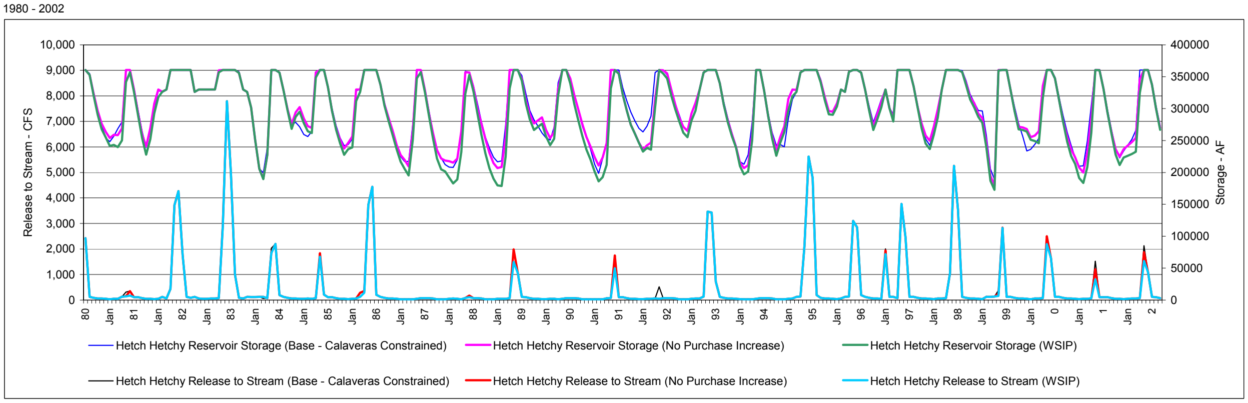


Table 3.3-1

Hetch Hetchy Reservoir Storage (Acre-feet)

No Purchase Increase

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	278,834	274,318	252,143	244,199	191,605	157,527	160,348	276,237	360,400	360,400	326,811	293,946
1922	267,077	245,759	235,976	229,895	234,365	248,941	219,254	360,400	360,400	360,400	336,082	304,970
1923	278,887	261,435	267,512	274,226	279,369	277,408	252,763	360,400	360,400	360,400	333,186	306,819
1924	294,573	274,701	254,169	241,000	234,198	217,630	235,929	318,684	296,938	270,227	236,194	209,805
1925	188,568	200,603	213,640	196,584	211,749	225,739	243,269	360,400	360,400	356,465	334,210	301,427
1926	278,080	258,277	250,270	233,060	224,191	181,001	266,125	352,744	360,400	333,232	297,804	266,894
1927	242,242	242,675	243,312	239,474	267,052	291,087	353,294	360,400	360,400	360,400	333,718	303,809
1928	280,965	288,381	284,262	279,094	275,538	330,000	360,400	360,400	360,400	337,096	302,689	271,561
1929	246,580	226,537	211,432	197,418	188,061	187,029	202,586	360,400	360,400	348,102	314,426	283,355
1930	256,652	253,082	254,412	234,910	225,482	231,960	293,323	356,465	360,400	350,768	316,726	288,304
1931	262,918	245,133	231,441	216,532	207,075	199,193	240,477	333,974	331,885	304,135	271,026	246,270
1932	222,881	201,357	127,063	66,943	45,872	34,363	62,287	232,586	360,400	360,400	333,089	301,115
1933	272,210	251,622	236,856	219,098	204,515	173,964	159,604	194,193	360,400	360,400	326,593	293,382
1934	264,956	241,194	211,799	198,512	177,717	142,610	195,961	248,467	272,263	246,018	213,996	186,605
1935	161,653	175,376	188,163	125,661	87,293	50,380	107,252	264,576	360,400	360,400	331,788	300,519
1936	275,227	256,364	240,014	234,340	189,167	152,795	209,839	360,400	360,400	356,465	327,853	296,688
1937	271,730	252,998	233,609	216,424	172,176	121,540	121,701	360,400	360,400	360,400	327,212	295,049
1938	269,253	251,613	289,063	286,013	235,108	193,606	215,731	360,400	360,400	360,400	352,029	327,292
1939	315,994	310,038	301,554	292,814	288,403	302,933	356,592	360,400	360,400	332,157	299,492	273,366
1940	263,287	264,323	227,206	215,348	167,666	144,907	167,642	360,400	360,400	354,451	320,313	288,428
1941	263,745	246,027	236,535	170,727	126,422	92,036	84,729	313,759	360,400	360,400	341,291	309,048
1942	284,527	281,509	322,446	330,000	330,000	330,000	356,592	360,400	360,400	360,400	339,529	308,159
1943	282,166	284,464	291,376	315,807	330,000	330,000	360,400	360,400	360,400	360,400	334,820	305,668
1944	282,672	265,717	248,429	242,470	242,270	253,701	273,775	360,400	360,400	360,400	329,290	299,563
1945	275,799	292,691	309,595	294,443	265,924	205,141	212,643	334,819	360,400	360,400	334,928	304,365
1946	297,720	314,753	279,321	245,390	180,927	136,798	198,041	360,400	360,400	357,267	325,581	295,813
1947	276,820	275,169	275,773	270,310	272,506	282,313	331,260	360,400	356,592	332,847	297,991	267,907
1948	254,877	244,754	235,865	226,920	214,053	155,402	137,710	260,206	360,400	360,400	325,774	293,180
1949	263,550	240,212	221,471	207,242	186,093	120,779	165,568	298,057	360,400	339,844	305,128	274,087
1950	248,395	249,365	244,010	227,028	172,439	121,902	168,949	325,017	360,400	359,600	323,849	292,047
1951	265,150	330,000	330,000	273,739	223,537	198,113	226,103	352,066	360,400	360,400	326,780	295,321
1952	269,737	255,810	267,687	257,818	202,381	228,088	331,260	360,400	360,400	360,400	351,651	324,789
1953	299,857	280,497	279,576	298,633	304,098	308,178	360,400	360,400	360,400	360,400	330,136	299,289
1954	273,035	253,867	235,076	222,287	228,629	239,070	306,987	360,400	360,400	343,956	308,827	277,521
1955	251,917	249,968	257,186	239,356	228,300	160,986	131,265	229,177	360,400	348,498	313,738	282,730
1956	253,724	231,483	289,968	267,900	213,074	173,611	192,971	360,400	360,400	360,400	347,791	320,487
1957	300,177	287,269	269,876	258,037	270,032	277,379	308,641	360,400	360,400	360,400	326,823	295,275
1958	271,534	256,975	251,954	244,821	264,341	240,834	312,637	360,400	360,400	360,400	353,900	325,107
1959	299,477	279,831	258,282	253,268	222,544	173,876	192,982	237,209	290,874	262,424	225,837	213,587
1960	191,320	189,164	188,007	163,610	125,548	99,254	129,350	218,249	290,010	263,766	229,796	203,215
1961	178,271	159,996	128,382	113,570	108,398	104,328	152,566	251,047	303,427	278,517	250,645	227,117
1962	205,866	185,849	171,650	159,989	181,314	188,208	307,932	360,400	360,400	356,465	326,379	293,328
1963	267,287	246,286	233,167	242,518	301,148	315,960	348,621	360,400	360,400	360,400	336,396	305,026
1964	277,664	285,253	276,564	271,270	267,442	230,221	204,937	283,418	360,400	343,750	309,409	277,093
1965	247,005	254,312	320,754	285,419	234,458	179,118	185,018	297,263	360,400	360,400	360,400	335,306
1966	310,370	314,574	304,395	301,606	279,157	286,920	360,400	360,400	360,400	331,450	297,972	268,360
1967	239,984	231,374	270,527	286,763	301,704	330,000	355,978	360,400	360,400	360,400	360,400	336,965
1968	310,292	292,497	283,527	278,716	298,260	301,316	343,523	360,400	360,400	334,325	299,837	270,029
1969	252,619	265,083	265,707	324,102	330,000	330,000	360,400	360,400	360,400	360,400	349,426	320,816
1970	305,187	311,550	330,000	326,065	325,142	330,000	341,873	360,400	360,400	360,400	326,016	293,798
1971	266,233	263,515	279,738	298,617	313,341	315,940	343,332	360,400	360,400	356,465	325,764	294,564
1972	267,901	251,968	249,468	245,428	244,206	274,418	295,882	360,400	360,400	336,426	299,001	271,831
1973	247,096	233,652	241,592	254,449	265,137	277,785	330,876	360,400	360,400	353,990	322,828	286,127
1974	259,697	296,323	319,327	330,000	330,000	330,000	360,400	360,400	360,400	356,465	331,550	297,765
1975	270,440	265,654	269,656	251,973	261,061	283,589	229,997	360,400	360,400	356,465	324,162	293,517
1976	291,276	289,249	280,210	261,902	251,605	243,306	247,656	334,485	323,924	296,031	266,978	246,546
1977	227,394	206,513	186,584	170,245	157,598	136,002	144,458	167,173	213,042	188,560	156,195	132,296
1978	108,720	88,673	96,272	120,436	143,716	197,418	258,565	360,400	360,400	360,400	357,869	356,406
1979	330,000	311,243	296,003	306,808	317,692	330,000	360,400	360,400	360,400	356,097	320,734	285,511
1980	265,867	274,018	282,677	326,065	330,000	330,000	356,592	360,400	360,400	360,400	352,729	323,451
1981	296,687	276,394	263,518	253,873	259,000	258,452	269,075	360,400	360,400	330,185	292,628	259,869
1982	240,552	269,191	308,047	330,000	326,446	330,000	360,400	360,400	360,400	360,400	360,400	360,400
1983	326,065	330,000	330,000	330,000	330,000	330,000	359,897	360,400	360,400	360,400	360,400	355,970
1984	330,000	326,192	301,515	251,330	205,725	190,722	227,853	360,400	360,400	356,465	328,962	298,574
1985	275,531	294,063	302,136	284,519	272,585	269,797	356,938	360,400	360,400	333,535	296,865	268,840
1986	251,514	237,539	246,360	255,988	330,000	330,000	360,400	360,400	360,400	360,400	337,490	306,714
1987	286,164	266,482	243,296	227,347	219,638	209,330	265,481	360,400	360,400	328,763	292,248	261,924
1988	235,173	222,011	218,755	217,649	215,447	221,540	264,401	357,117	356,592	332,923	300,330	276,174
1989	251,922	230,428	214,478	206,901	208,533	255,600	360,400	360,400	360,400	346,638	313,429	291,088
1990	276,681	281,401	286,181	266,813	253,779	263,589	331,289	360,400	360,400	347,362	321,333	297,889
1991	274,992	255,513	240,789	223,855	210,849	223,212	245,906	360,400	360,400	355,666	321,999	297,005
1992	274,760	261,278	246,438	235,897	242,532	246,686	315,788	360,400	359,902	355,323	329,771	306,472
1993	285,917	271,385	265,139	292,334	308,790	330,000	356,592	360,400	360,400	360,400	339,684	305,994
1994	281,568	259,474	240,306	215,391	206,969	211,263	260,120	360,400	360,400	328,106	288,504	257,165
1995	235,015	255,603	272,202	315,159	330,000	329,098	356,592	360,400	360,400	360,400	360,400	343,353
1996	318,073	296,072	295,290	308,277	330,000	326,065	357,776	360,400	360,400	356,465	329,269	297,004
1997	272,339	291,915	310,492	330,000	300,695	285,870	360,400	360,400	360,400	360,400	334,509	302,746
1998	276,840	257,728	249,648	271,848	299,096	330,000	360,400	360,400	360,400	360,400	357,575	339,401
1999	318,270	308,278	291,872	285,488	247,685	194,500	179,566	360,400	360,400	360,400	328,523	296,602
2000	271,565	270,478	267,953	255,253	257,721	264,482	335,788	360,400	360,400	347,257	314,429	281,629
2001	256,222	236,354	223,810	207,748	199,812	232,104	286,075	360,400	360,400	331,042	293,911	262,059
2002	236,356	224,542	236,410	242,047	247,340	253,992	346,210	360,400	360,400	337,536	300,566	269,822
Avg (21-02)	265,855	258,966	255,941	248,964	240,899	234,060	268,456	338,295	353,462	343,951	316,910	288,772

Table 3.3-2

Hetch Hetchy Reservoir Storage (Acre-feet) WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	272,402	266,044	243,868	235,920	183,321	150,269	154,224	271,116	360,400	360,400	326,811	291,828
1922	259,728	235,648	224,723	215,782	220,244	234,819	205,133	360,400	360,400	360,400	336,082	302,853
1923	275,819	256,526	262,603	269,313	274,454	265,738	241,094	360,400	360,400	360,400	333,186	304,241
1924	288,096	265,462	244,930	227,949	217,703	201,135	226,615	314,032	292,290	264,348	229,088	193,225
1925	162,198	174,233	187,270	170,200	181,824	195,815	216,042	360,400	360,400	356,465	334,210	301,427
1926	274,085	251,427	243,883	219,916	203,496	156,406	245,154	336,819	358,277	331,111	295,686	261,739
1927	231,858	229,528	230,165	223,466	251,035	270,123	326,806	360,400	360,400	360,400	333,718	301,231
1928	275,534	280,188	275,546	265,616	257,757	308,315	356,993	360,400	360,400	337,096	302,689	269,444
1929	239,232	216,426	201,321	182,545	168,883	167,850	183,407	347,942	360,400	348,102	314,426	281,237
1930	249,493	245,923	247,253	227,747	218,315	224,793	286,156	356,465	360,400	350,768	316,726	283,424
1931	252,998	228,677	214,984	191,409	174,118	166,236	207,521	299,800	296,541	266,646	231,402	197,210
1932	165,286	141,000	108,382	51,375	34,654	27,412	58,311	229,715	360,400	360,400	333,089	299,918
1933	270,157	246,808	232,041	211,426	194,261	163,710	150,969	186,966	360,400	360,400	326,593	293,382
1934	260,961	234,344	202,242	182,930	159,810	127,492	183,946	236,459	260,268	234,045	202,043	170,799
1935	140,815	154,538	167,325	107,677	72,057	38,981	99,863	258,988	360,400	360,400	331,788	299,322
1936	267,086	242,699	226,345	214,884	170,029	136,212	195,836	360,400	360,400	356,465	327,853	294,110
1937	262,493	239,158	219,779	197,861	155,743	107,766	110,233	356,058	360,400	360,400	327,212	292,471
1938	262,775	242,374	277,970	268,254	217,341	175,883	200,130	360,400	360,400	360,400	352,029	324,714
1939	312,466	304,668	297,136	284,589	276,736	290,220	360,400	360,400	360,400	332,157	299,492	270,327
1940	255,209	256,245	222,760	213,012	165,616	143,200	166,203	360,400	360,400	354,451	320,313	286,310
1941	260,678	241,118	235,298	169,490	125,366	91,151	84,054	313,255	360,400	360,400	341,291	309,048
1942	280,721	274,942	315,878	330,000	330,000	330,000	356,592	360,400	360,400	360,400	339,529	306,962
1943	278,021	276,636	283,548	307,975	325,066	330,000	360,400	360,400	360,400	360,400	334,820	303,090
1944	279,144	260,348	244,962	234,244	229,744	234,419	254,494	360,400	360,400	360,400	329,290	297,445
1945	269,782	286,673	303,578	288,423	253,887	193,103	202,059	325,579	360,400	360,400	334,928	303,168
1946	289,579	302,009	266,576	232,638	168,168	125,876	188,823	360,400	360,400	357,267	325,581	293,235
1947	267,584	261,329	261,933	251,706	249,594	259,401	308,348	360,400	356,592	332,847	297,991	265,329
1948	247,258	231,519	222,630	207,163	189,129	136,187	121,486	246,616	360,400	360,400	325,774	291,062
1949	257,437	230,325	210,633	191,633	166,180	103,674	151,625	286,364	356,592	336,040	301,328	268,173
1950	237,728	238,697	233,450	217,724	163,129	114,105	162,436	319,562	360,400	359,600	323,849	289,929
1951	259,038	330,000	330,000	273,739	223,537	188,600	217,740	343,707	360,400	360,400	326,780	293,203
1952	264,766	248,078	259,003	253,471	198,031	223,738	317,703	360,400	360,400	360,400	351,651	322,211
1953	296,329	275,128	274,206	293,261	298,723	296,049	360,374	360,400	360,400	360,400	330,136	297,172
1954	268,064	247,055	230,167	213,569	217,328	221,015	286,815	360,400	360,400	343,956	308,827	274,943
1955	245,440	243,491	250,709	232,875	219,152	151,838	123,551	222,728	360,400	348,498	313,738	278,863
1956	244,816	218,801	283,964	261,892	207,063	168,360	188,550	360,400	360,400	360,400	347,791	319,290
1957	296,127	282,297	264,905	249,257	257,810	264,111	295,373	360,400	360,400	360,400	326,823	292,697
1958	261,061	240,978	235,957	224,058	243,566	220,059	291,862	360,400	360,400	360,400	353,900	323,910
1959	295,427	273,939	254,292	245,472	213,883	161,315	182,390	235,642	288,112	259,667	223,084	208,259
1960	179,051	176,894	175,738	151,333	116,394	92,543	124,226	215,694	287,458	261,217	226,015	191,797
1961	158,963	134,152	121,643	102,446	87,720	82,604	129,645	221,869	267,561	241,466	211,469	178,503
1962	147,481	127,832	114,109	99,056	112,573	110,810	229,337	360,400	360,400	356,465	326,379	292,131
1963	263,712	237,187	224,068	230,750	289,373	297,526	323,742	360,400	360,400	360,400	336,396	305,026
1964	273,668	279,416	270,727	260,673	252,543	215,321	190,335	275,763	360,400	343,750	309,409	275,896
1965	241,813	249,120	317,459	282,122	231,160	175,820	182,106	294,713	360,400	360,400	360,400	333,188
1966	305,400	307,762	300,989	293,442	268,461	279,726	360,400	360,400	360,400	331,450	297,972	265,321
1967	231,906	216,758	252,106	268,331	283,263	323,066	342,598	360,400	360,400	360,400	360,400	335,768
1968	305,290	284,733	275,763	268,094	285,055	288,111	330,318	360,400	360,400	334,325	299,837	267,451
1969	242,147	249,086	247,807	306,192	323,862	330,000	360,400	360,400	360,400	360,400	349,426	317,777
1970	299,296	305,659	324,435	326,065	320,846	322,797	334,670	360,400	360,400	360,400	326,016	290,760
1971	258,440	253,880	270,103	288,977	303,697	305,250	332,642	360,400	360,400	356,465	325,764	292,446
1972	258,839	236,370	231,016	221,257	214,866	245,077	266,541	360,400	360,400	336,426	299,001	267,965
1973	238,190	218,208	225,626	238,473	249,151	261,799	307,249	360,400	360,400	353,990	322,828	286,127
1974	257,794	293,500	316,503	330,000	330,000	330,000	360,400	360,400	360,400	356,465	331,550	295,187
1975	267,864	263,077	267,079	249,395	251,607	270,330	216,738	360,400	360,400	356,465	324,162	290,479
1976	286,336	282,468	273,429	252,264	239,384	231,084	235,434	322,270	311,719	281,653	249,955	220,061
1977	191,125	164,627	139,941	124,041	106,191	84,595	91,855	109,596	150,715	123,692	95,026	67,781
1978	41,897	22,219	36,001	52,988	69,331	114,471	168,252	360,400	360,400	360,400	357,869	356,406
1979	329,957	311,201	296,912	303,911	314,794	330,000	360,400	360,400	360,400	356,097	320,734	284,314
1980	257,725	265,877	274,536	330,000	326,446	330,000	356,592	360,400	360,400	360,400	352,729	320,413
1981	290,796	267,741	254,865	241,410	243,092	239,594	250,218	341,900	356,592	326,381	288,829	253,955
1982	227,982	252,018	292,777	317,906	326,446	330,000	360,400	360,400	360,400	360,400	360,400	360,400
1983	326,065	330,000	330,000	330,000	330,000	330,000	356,951	360,400	360,400	360,400	360,400	355,970
1984	330,000	326,192	301,515	251,330	205,725	189,676	227,004	360,400	360,400	356,465	328,962	296,457
1985	268,372	286,904	294,977	277,357	264,474	261,687	348,828	360,400	360,400	333,535	296,865	266,723
1986	245,402	227,652	236,474	239,341	311,791	326,065	360,400	360,400	360,400	360,400	337,490	304,597
1987	281,194	259,670	236,484	216,725	205,573	195,265	251,416	347,582	357,022	325,388	288,877	253,677
1988	221,889	204,952	201,696	191,923	182,833	188,925	231,786	323,285	352,727	326,875	292,101	258,469
1989	229,470	206,135	190,185	179,740	178,779	224,799	331,322	360,400	360,400	343,974	308,105	283,006
1990	266,700	271,420	276,200	256,827	242,842	252,652	320,352	360,400	360,400	339,162	307,130	280,640
1991	256,496	235,801	220,345	201,192	186,180	192,530	211,890	331,320	360,400	354,429	321,715	296,721
1992	274,476	260,994	246,154	232,759	238,361	235,761	302,285	360,400	355,022	347,290	320,492	298,748
1993	279,794	262,205	255,227	281,160	296,476	330,000	356,592	360,400	360,400	360,400	339,684	305,994
1994	278,714	256,620	239,355	209,682	196,961	201,254	250,111	360,400	360,400	328,106	288,504	253,299
1995	226,108	246,696	263,295	296,733	319,612	326,065	356,592	360,400	360,400	360,400	360,400	341,235
1996	313,102	291,101	290,319	303,304	330,000	326,065	357,776	360,400	360,400	356,465	329,269	295,808
1997	266,385	283,200	301,776	330,000	300,695	280,067	360,400	360,400	360,400	360,400	334,509	301,549
1998	268,984	245,268	236,666	258,858	286,099	330,000	360,400	360,400	360,400	360,400	357,575	336,363
1999	314,282	301,528	287,025	277,784	239,977	186,792	172,794	359,739	360,400	360,400	328,523	295,405
2000	267,514	266,427	263,903	251,200	249,369	245,666	316,972	360,400	360,400	347,257	314,429	280,432
2001	248,366	225,736	213,192	191,416	183,471	208,152	262,123	360,400	360,186	330,828	293,698	259,268
2002	227,858	211,442	223,309	226,085	228,791	232,493	324,711	360,400	360,400	337,536	300,566	266,784
Avg (21-02)	256,397	247,256	245,170	236,378	226,842	219,754	254,938	333,809	351,147	341,312	314,066	283,384

Table 3.3-3

Difference in Hetch Hetchy Reservoir Storage (Acre-feet) No Purchase Increase minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	6,432	8,274	8,275	8,279	8,284	7,258	6,124	5,121	0	0	0	2,118
1922	7,349	10,111	11,253	14,113	14,121	14,122	14,121	0	0	0	0	2,117
1923	3,068	4,909	4,909	4,913	4,915	11,670	11,669	0	0	0	0	2,578
1924	6,477	9,239	9,239	13,051	16,495	16,495	9,314	4,652	4,648	5,879	7,106	16,580
1925	26,370	26,370	26,370	26,384	29,925	29,924	27,227	0	0	0	0	0
1926	3,995	6,850	6,387	13,144	20,695	24,595	20,971	15,925	2,123	2,121	2,118	5,155
1927	10,384	13,147	13,147	16,008	16,017	20,964	26,488	0	0	0	0	2,578
1928	5,431	8,193	8,716	13,478	17,781	21,685	3,407	0	0	0	0	2,117
1929	7,348	10,111	10,111	14,873	19,178	19,179	19,179	12,458	0	0	0	2,118
1930	7,159	7,159	7,159	7,163	7,167	7,167	7,167	0	0	0	0	4,880
1931	9,920	16,456	16,457	25,123	32,957	32,957	32,956	34,174	35,344	37,489	39,624	49,060
1932	57,595	60,357	18,681	15,568	11,218	6,951	3,976	2,871	0	0	0	1,197
1933	2,053	4,814	4,815	7,672	10,254	10,254	8,635	7,227	0	0	0	0
1934	3,995	6,850	9,557	15,582	17,907	15,118	12,015	12,008	11,995	11,973	11,953	15,806
1935	20,838	20,838	20,838	17,984	15,236	11,399	7,389	5,588	0	0	0	1,197
1936	8,141	13,665	13,669	19,456	19,138	16,583	14,003	0	0	0	0	2,578
1937	9,237	13,840	13,830	18,563	16,433	13,774	11,468	4,342	0	0	0	2,578
1938	6,478	9,239	11,093	17,759	17,767	17,723	15,601	0	0	0	0	2,578
1939	3,528	5,370	4,418	8,225	11,667	12,713	-3,808	0	0	0	0	3,039
1940	8,078	8,078	4,446	2,336	2,050	1,707	1,439	0	0	0	0	2,118
1941	3,067	4,909	1,237	1,237	1,056	885	675	504	0	0	0	0
1942	3,806	6,567	6,568	0	0	0	0	0	0	0	0	1,197
1943	4,145	7,828	7,828	7,832	4,934	0	0	0	0	0	0	2,578
1944	3,528	5,369	3,467	8,226	12,526	19,282	19,281	0	0	0	0	2,118
1945	6,017	6,018	6,017	6,020	12,037	12,038	10,584	9,240	0	0	0	1,197
1946	8,141	12,744	12,745	12,752	12,759	10,922	9,218	0	0	0	0	2,578
1947	9,236	13,840	13,840	18,604	22,912	22,912	22,912	0	0	0	0	2,578
1948	7,619	13,235	13,235	19,757	24,924	19,215	16,224	13,590	0	0	0	2,118
1949	6,113	9,887	10,838	15,609	19,913	17,105	13,943	11,693	3,808	3,804	3,800	5,914
1950	10,667	10,668	10,560	9,304	9,310	7,797	6,513	5,455	0	0	0	2,118
1951	6,112	0	0	0	0	9,513	8,363	8,359	0	0	0	2,118
1952	4,971	7,732	8,684	4,347	4,350	4,350	13,557	0	0	0	0	2,578
1953	3,528	5,369	5,370	5,372	5,375	12,129	26	0	0	0	0	2,117
1954	4,971	6,812	4,909	8,718	11,301	18,055	20,172	0	0	0	0	2,578
1955	6,477	6,477	6,477	6,481	9,148	9,148	7,714	6,449	0	0	0	3,867
1956	8,908	12,682	6,004	6,008	6,011	5,251	4,421	0	0	0	0	1,197
1957	4,050	4,972	4,971	8,780	12,222	13,268	13,268	0	0	0	0	2,578
1958	10,473	15,997	15,997	20,763	20,775	20,775	20,775	0	0	0	0	1,197
1959	4,050	5,892	3,990	7,796	8,661	12,561	10,592	1,567	2,762	2,757	2,753	5,328
1960	12,269	12,270	12,269	12,277	9,154	6,711	5,124	2,555	2,552	2,549	3,781	11,418
1961	19,308	25,844	6,739	11,124	20,678	21,724	22,921	29,178	35,866	37,051	39,176	48,614
1962	58,385	58,017	57,541	60,933	68,741	77,398	78,595	0	0	0	0	1,197
1963	3,575	9,099	9,099	11,768	11,775	18,434	24,879	0	0	0	0	0
1964	3,996	5,837	5,837	10,597	14,899	14,900	14,602	7,655	0	0	0	1,197
1965	5,192	5,192	3,295	3,297	3,298	3,298	2,912	2,550	0	0	0	2,118
1966	4,970	6,812	3,406	8,164	10,696	7,194	0	0	0	0	0	3,039
1967	8,078	14,616	18,421	18,432	18,441	6,934	13,380	0	0	0	0	1,197
1968	5,002	7,764	7,764	10,622	13,205	13,205	13,205	0	0	0	0	2,578
1969	10,472	15,997	17,900	17,910	6,138	0	0	0	0	0	0	3,039
1970	5,891	5,891	5,565	0	4,296	7,203	7,203	0	0	0	0	3,038
1971	7,793	9,635	9,635	9,640	9,644	10,690	10,690	0	0	0	0	2,118
1972	9,062	15,598	18,452	24,171	29,340	29,341	29,341	0	0	0	0	3,866
1973	8,906	15,444	15,966	15,976	15,986	15,986	23,627	0	0	0	0	0
1974	1,903	2,823	2,824	0	0	0	0	0	0	0	0	2,578
1975	2,576	2,577	2,577	2,578	9,454	13,259	13,259	0	0	0	0	3,038
1976	4,940	6,781	6,781	9,638	12,221	12,222	12,222	12,215	12,205	14,378	17,023	26,485
1977	36,269	41,886	46,643	46,204	51,407	51,407	52,603	57,577	62,327	64,868	61,169	64,515
1978	66,823	66,454	60,271	67,448	74,385	82,947	90,313	0	0	0	0	0
1979	43	42	-909	2,897	2,898	0	0	0	0	0	0	1,197
1980	8,142	8,141	8,141	-3,935	3,554	0	0	0	0	0	0	3,038
1981	5,891	8,653	8,653	12,463	15,908	18,858	18,857	18,500	3,808	3,804	3,799	5,914
1982	12,570	17,173	15,270	12,094	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	2,946	0	0	0	0	0
1984	0	0	0	0	0	1,046	849	0	0	0	0	2,117
1985	7,159	7,159	7,159	7,162	8,111	8,110	8,110	0	0	0	0	2,117
1986	6,112	9,887	9,886	16,647	18,209	3,935	0	0	0	0	0	2,117
1987	4,970	6,812	6,812	10,622	14,065	14,065	14,065	12,818	3,378	3,375	3,371	8,247
1988	13,284	17,059	17,059	25,726	32,614	32,615	32,615	33,832	3,865	6,048	8,229	17,705
1989	22,452	24,293	24,293	27,161	29,754	30,801	29,078	0	0	2,664	5,324	8,082
1990	9,981	9,981	9,981	9,986	10,937	10,937	10,937	0	0	8,200	14,203	17,249
1991	18,496	19,712	20,444	22,663	24,669	30,682	34,016	29,080	0	1,237	284	284
1992	284	284	284	3,138	4,171	10,925	13,503	0	4,880	8,033	9,279	7,724
1993	6,123	9,180	9,912	11,174	12,314	0	0	0	0	0	0	0
1994	2,854	2,854	951	5,709	10,008	10,009	10,009	0	0	0	0	3,866
1995	8,907	8,907	8,907	18,426	10,388	3,033	0	0	0	0	0	2,118
1996	4,971	4,971	4,971	4,973	0	0	0	0	0	0	0	1,196
1997	5,954	8,715	8,716	0	0	5,803	0	0	0	0	0	1,197
1998	7,856	12,460	12,982	12,990	12,997	0	0	0	0	0	0	3,038
1999	3,988	6,750	4,847	7,704	7,708	7,708	6,772	661	0	0	0	1,197
2000	4,051	4,051	4,050	4,053	8,352	18,816	18,816	0	0	0	0	1,197
2001	7,856	10,618	10,618	16,332	16,341	23,952	23,952	0	214	214	213	2,791
2002	8,498	13,100	13,101	15,962	18,549	21,499	21,499	0	0	0	0	3,038
Avg (21-02)	9,459	11,710	10,771	12,585	14,058	14,306	13,518	4,486	2,314	2,640	2,844	5,388

Through the fall and winter, storage in Hetch Hetchy Reservoir would be the same or be higher. Hetch Hetchy Reservoir would fill by the end of May during approximately 72 percent of the years, which would negate any difference in storage from carrying into the next summer. Figure 3.3-2 illustrates the difference in reservoir storage averaged by year type for the comparison of the alternative to the WSIP setting. Also shown is the average difference in storage for the two settings during the 82-year simulation.

Table 3.3-4 illustrates the difference in Hetch Hetchy Reservoir storage between the alternative and base settings. Immediately after Hetch Hetchy Reservoir is filled (May or June, and then continuing through July), there would only be occasional differences in storage at the reservoir, typically a decrease of less than 10,000 acre-feet. This indicates that the same amount of water is being passed through the reservoir, regardless of the size of the conveyance capacity of the SJPL. Water not diverted to the SJPL would return to the Tuolumne River and flow to Don Pedro Reservoir. In the late summer and early fall, there would consistently be a slight difference (lower) in storage levels between the two settings, as additional diversions to the SJPL would retain Bay Area reservoir storage. Some of this additional storage depletion would be ameliorated later in the fall and into winter as SJPL diversions are reduced due to lower Bay Area reservoir replenishment needs and less conveyance system maintenance. Storage becomes greater in November and December of the alternative setting due to the assumed system-wide maintenance that occurs in the alternative and does not occur in the base setting. Subsequent to December, the storage gain occurring in the alternative setting again becomes affected as replenishment of Bay Area reservoir storage resumes. In non-wetter years, there is a difference in storage between the alternative and base settings; the alternative setting results in a lower storage in the reservoir by the end of April. Figure 3.3-3 illustrates the difference in reservoir storage averaged by year type for the comparison of the alternative to the base setting. Also shown is the average difference in storage for the two settings during the 82-year simulation. Figure 3.3-4 illustrates the average monthly storage in Hetch Hetchy Reservoir for the 82-year simulation and the range in storage for each month for the variant and base settings.

The difference in storage in Hetch Hetchy Reservoir attributed to the diversion effects of the alternative would manifest in differences in releases from O’Shaughnessy Dam to the stream. A different amount of available reservoir space in the winter and spring due to the alternative would lead to a different ability to regulate inflow, thus potentially changing the amount of water released to the stream that is above minimum release requirements. Figure 3.3-1 illustrates the stream release from O’Shaughnessy Dam for the WSIP, alternative, and base settings. Table 3.3-5 illustrates the difference in stream releases between the alternative and WSIP settings. Compared to the WSIP setting, the alternative exhibits an incrementally greater stream release, predominantly during May or June, which reflects the months when releases to the stream above excess of minimum release requirements are made in anticipation of the reservoir being filled. Exceptions during which incrementally larger reductions in releases to the stream occurs are considered anomalous within modeling, the results of only shifting releases from one month to the next. The increase in releases is the result of a less depleted reservoir, which is the result of lesser demands between the settings.

Table 3.3-6 illustrates the difference in stream release between the alternative and base settings. In this comparison, releases could be either greater or lesser than depicted for the base setting, and these differences would occur predominantly during May or June. Generally, Hetch Hetchy Reservoir storage would be slightly lower during non-wetter years, leading to a reduction in stream releases during non-wetter years if a release occurs. During wetter years, the releases are projected to increase. The differences, either increases or decreases, are a result of the coincidence of the several parameters affecting the release of water from the reservoir, including system-wide water demands, conveyance capacity and maintenance assumptions, and the watershed’s hydrology.

Table 3.3-5 illustrates the difference in stream release between the alternative and WSIP settings, expressed in terms of a monthly volume (acre-feet) of flow. Table 3.3-7 illustrates the same information and the average monthly stream release for the alternative and WSIP setting, expressed in average monthly flow (cfs). Table 3.3-5 illustrates that the difference in monthly flow below O’Shaughnessy Dam could range up to an increase of approximately 30,000 acre-feet. Considering the manner in which releases are determined and made to the stream, quantifying the effect of these changes in terms of average monthly

Table 3.3-4

Difference in Hetch Hetchy Reservoir Storage (Acre-feet) — No Purchase Increase minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	-5,289	-2,527	-2,526	-2,528	-2,530	-2,203	-1,854	-1,562	0	0	-2,188	-2,186
1922	3,523	6,285	7,426	3,625	3,627	3,627	3,627	0	0	0	-2,188	-2,187
1923	-1,234	1,528	1,528	1,529	1,530	-7,033	-7,033	0	0	0	-2,188	-1,726
1924	1,129	3,891	4,842	9,602	13,904	8,101	1,933	-1,223	-3,339	-4,287	-5,230	2,141
1925	9,750	29,084	44,306	38,529	24,806	9,489	9,308	0	0	0	-2,188	-4,304
1926	-5,349	-8,111	-991	-41	-35	-12,027	-10,574	-7,656	0	-2,188	-4,374	-3,449
1927	-2,496	-654	297	-4,650	-4,653	-3,512	2,013	0	0	0	-2,188	-4,488
1928	-4,486	-1,724	178	-772	-1,632	0	0	0	0	-2,188	-4,373	-7,132
1929	-7,129	-4,367	-4,366	-4,369	-4,371	-14,931	-17,048	0	0	-2,188	-4,374	-4,370
1930	-1,514	17,820	37,798	32,017	26,793	11,477	9,359	0	0	-2,188	-4,373	-1,608
1931	1,247	2,167	9,255	12,114	10,403	4,600	2,481	1,529	607	606	606	7,970
1932	7,966	3,363	1,121	940	696	444	274	197	0	0	-2,188	-3,107
1933	-4,152	-3,232	3,856	-899	-5,195	-15,755	-13,839	-11,594	0	0	-2,188	-4,304
1934	-2,495	-5,257	-10,193	-12,325	-23,809	-33,805	-8,783	-10,966	-13,071	-15,240	-17,401	-15,632
1935	-12,769	6,565	26,543	22,774	18,973	3,166	2,080	1,559	0	0	-2,188	-3,107
1936	-3,106	-2,185	4,902	-1,746	-1,746	-1,530	-1,292	0	0	0	-2,188	-1,726
1937	1,129	3,891	4,842	3,893	3,426	2,868	2,407	0	0	0	-2,188	-1,726
1938	-1,725	1,036	2,178	1,228	1,228	1,229	1,084	0	0	0	-2,188	-4,488
1939	-3,535	-773	-773	-773	-773	-10,287	0	0	0	-2,188	-4,373	-3,449
1940	-594	18,740	31,985	18,380	16,276	13,649	11,524	0	0	-2,188	-4,374	-4,370
1941	-3,417	-655	-546	-546	-466	-390	-297	-221	0	0	-2,188	-4,304
1942	-2,399	362	2,075	0	0	0	0	0	0	0	-2,188	-3,107
1943	-3,106	-3,106	3,982	3,983	1,084	0	0	0	0	0	-2,188	-1,726
1944	-774	1,988	2,939	2,941	-1,526	-10,087	-12,206	0	0	0	-2,188	-2,186
1945	3,523	22,857	42,835	37,052	29,337	29,338	25,811	22,556	0	0	-2,188	-3,107
1946	-3,106	-344	-344	-344	-344	-302	-256	0	0	-2,188	-4,374	-3,909
1947	1,800	6,403	4,500	4,503	4,506	-6,055	-8,172	0	0	-2,188	-4,374	-3,909
1948	-1,053	-1,053	6,034	6,750	7,613	1,810	1,527	1,283	0	0	-2,188	-2,186
1949	-378	-2,219	-1,268	3,521	7,819	6,859	5,720	4,812	3,808	1,616	-574	-3,336
1950	-2,383	16,952	37,831	18,419	17,363	14,553	12,090	10,130	0	-800	-2,988	-2,985
1951	-1,177	0	0	0	0	2,854	2,512	2,511	0	0	-2,188	-4,948
1952	-3,995	-1,233	-282	-141	-141	-141	-1,982	0	0	0	-2,188	-1,726
1953	-774	1,988	2,939	2,941	2,942	-5,620	0	0	0	0	-2,188	-2,187
1954	3,522	6,285	7,236	2,484	-1,983	-10,546	-10,546	0	0	-2,188	-4,373	-3,909
1955	1,800	21,134	36,356	18,206	4,468	-1,336	-1,133	-944	0	-2,188	-4,374	-2,621
1956	235	-1,607	1,819	1,820	1,821	1,589	1,336	0	0	0	-2,188	-3,107
1957	-2,155	-1,233	-282	-1,234	-6,562	-16,076	-18,193	0	0	0	-2,188	-1,726
1958	1,129	3,891	6,221	7,177	7,181	7,181	7,181	0	0	0	-2,188	-3,107
1959	-2,155	607	1,559	-3,197	-2,339	-13,756	-12,078	-6,589	-7,503	-9,681	-11,852	-11,378
1960	-6,615	12,719	32,697	26,917	15,798	8,294	6,330	968	-1,151	-3,337	-4,282	1,247
1961	6,954	7,874	6,268	5,326	4,474	-283	-1,204	4,156	8,755	7,792	7,780	3,167
1962	-1,591	-1,591	1,264	313	-3,124	-12,638	-13,558	0	0	0	-2,188	-5,869
1963	-8,721	-7,800	-5,469	-5,472	-5,475	-5,476	-3,635	0	0	0	-2,188	-4,304
1964	-7,251	-9,092	-8,141	-12,902	-17,205	-23,008	-23,008	-19,319	3,808	1,616	-574	-1,495
1965	314	19,648	22,816	22,826	22,837	22,037	18,741	16,068	0	0	0	-2,762
1966	-1,810	-1,810	998	-2,807	-6,245	-13,856	3,808	0	0	-2,188	-4,373	-3,449
1967	-594	328	9,841	9,847	9,851	0	3,683	0	0	0	0	-921
1968	-2,823	-61	7,026	1,322	-3,833	-14,394	-16,511	0	0	-2,188	-4,374	-3,910
1969	1,800	4,563	4,563	4,565	0	0	0	0	0	0	-2,188	-1,265
1970	1,589	20,923	35,819	-3,935	-4,858	0	-2,117	0	0	0	-2,188	-1,266
1971	-314	-313	637	638	638	-8,876	-10,993	0	0	0	-2,188	-2,186
1972	2,572	3,492	4,443	5,397	6,259	456	-1,661	0	0	-2,188	-4,373	-2,621
1973	235	1,156	8,766	8,771	8,777	8,777	9,697	0	0	-2,188	-4,374	-9,249
1974	-9,246	-8,325	-8,325	0	0	0	0	0	0	0	-2,188	-4,488
1975	-3,535	15,799	35,778	24,287	23,442	23,442	23,442	3,935	0	0	-2,188	-1,266
1976	637	3,400	10,487	6,687	3,253	-2,549	-4,667	-6,852	-8,965	-8,954	-8,467	-1,093
1977	6,520	6,520	9,374	9,379	9,386	3,583	2,662	5,513	8,268	8,729	9,188	13,775
1978	13,757	9,153	11,484	11,495	11,511	11,511	8,566	0	0	0	-2,188	-3,994
1979	0	920	920	-3,835	-3,837	0	0	0	0	-2,188	-4,373	-5,291
1980	-5,288	14,045	29,268	-3,935	3,554	0	0	0	0	0	-2,188	-1,266
1981	-314	2,448	9,536	5,735	2,302	-10,065	-10,065	0	0	-2,188	-4,374	-4,370
1982	1,341	2,262	5,115	1,936	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	-2,118
1984	0	0	0	0	0	-8,692	-10,810	0	0	0	-2,188	-2,187
1985	669	15,400	30,621	24,832	16,253	5,692	3,575	0	0	-2,188	-4,374	-4,370
1986	-2,560	-4,401	2,686	3,639	1,757	0	0	0	0	0	-2,188	-2,187
1987	-1,235	1,528	2,479	2,481	2,482	-8,078	-10,195	0	0	-2,188	-4,373	-1,608
1988	1,247	-594	6,493	9,351	7,638	1,835	-283	-1,235	0	-2,854	-7,608	-2,998
1989	-2,997	-7,600	-9,503	-9,508	-9,514	-19,027	0	0	0	-5,232	-10,459	-5,847
1990	-5,844	8,886	24,108	12,609	3,164	-7,396	-9,513	0	0	304	608	1,823
1991	3,078	611	4,197	11,164	12,304	1,193	2,408	345	0	-4,734	-10,437	-15,032
1992	-19,783	-19,783	-22,637	-27,597	-30,019	-41,436	-40,975	0	-498	2,661	2,962	-429
1993	-3,929	48	-1,122	133	1,268	0	0	0	0	0	-2,188	-4,304
1994	-3,351	-2,430	-1,479	-1,479	-5,777	-16,337	-18,454	0	0	-2,188	-4,374	-5,383
1995	-7,282	12,053	32,031	31,098	15,333	3,033	0	0	0	0	0	-2,762
1996	-1,810	-888	1,442	1,442	0	0	0	0	0	0	-2,188	-5,870
1997	-5,866	-4,025	-4,025	0	0	-5,709	0	0	0	0	-2,188	-3,107
1998	2,603	5,365	7,267	7,271	7,275	0	0	0	0	0	-2,188	-4,028
1999	-4,026	-1,264	-5,070	-10,780	-10,784	-10,785	-9,479	0	0	0	-2,188	-5,869
2000	-4,915	14,419	34,397	19,101	13,956	10,911	8,794	0	0	-2,188	-4,373	-8,053
2001	-7,098	-6,177	911	-1,943	-10,537	-17,196	-19,314	0	0	-2,188	-4,374	-3,910
2002	-1,053	1,708	2,851	-954	-4,392	-12,002	-14,120	0	0	-2,188	-4,374	-3,450
Avg (21-02)	-1,494	2,996	7,886	4,930	2,873	-2,190	-1,852	90	-113	-975	-2,930	-3,089

Figure 3.3-2

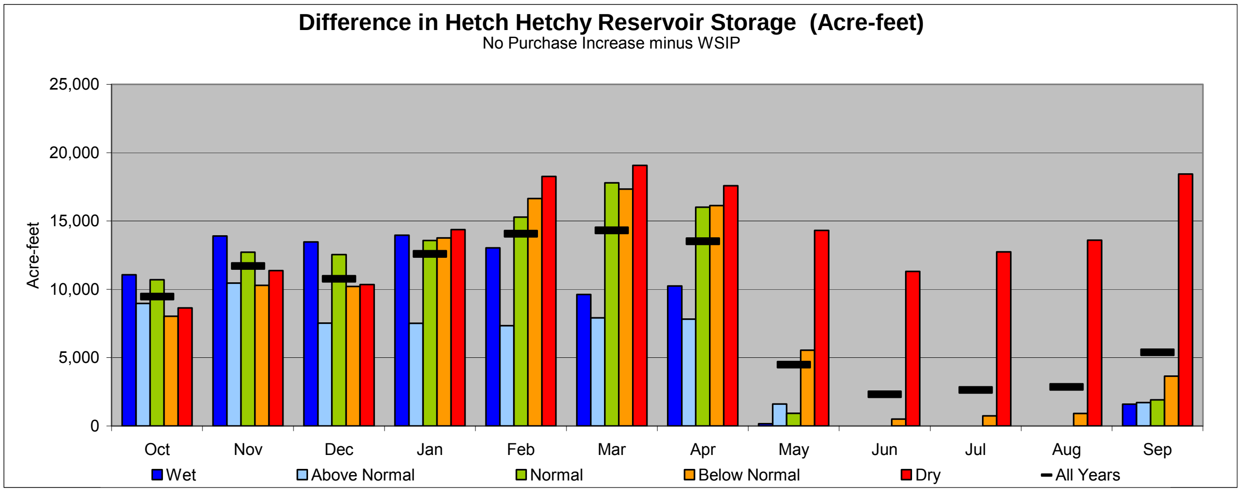


Figure 3.3-3

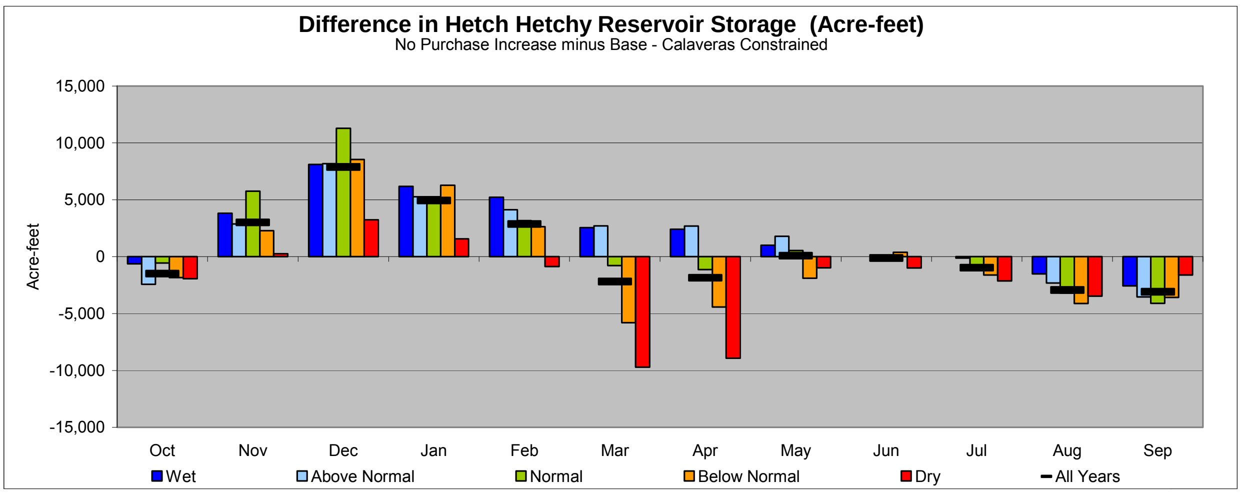


Figure 3.3-4

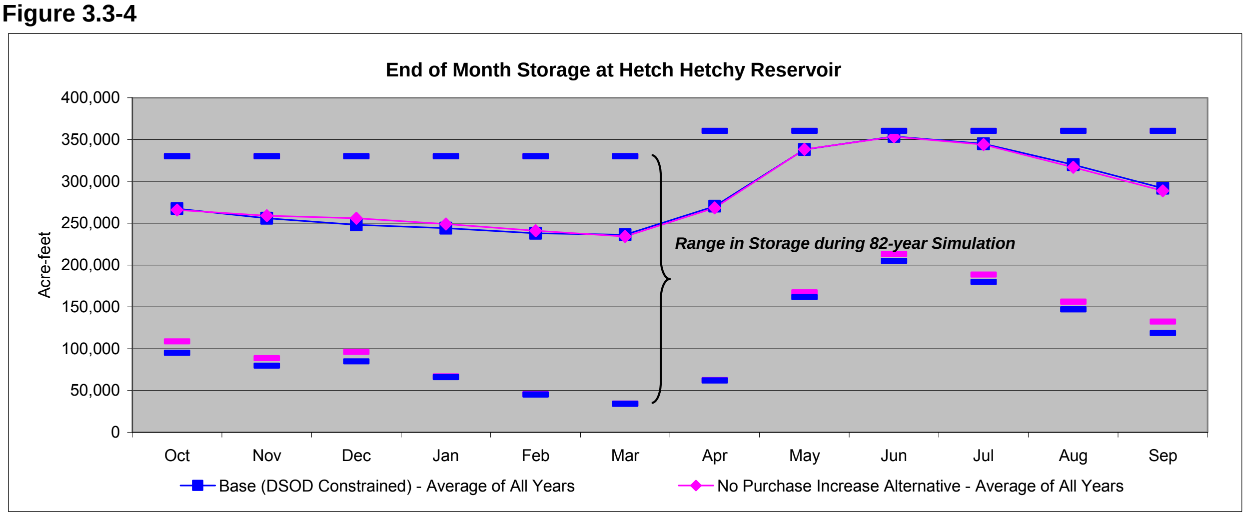


Table 3.3-5

Difference in Hetch Hetchy Release to Stream (Acre-feet)

No Purchase Increase minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	0	0	0	5,115	0	0	0	5,115
1922	0	0	0	0	0	0	0	12,494	0	0	0	0	12,494
1923	0	0	0	0	0	0	0	11,663	0	0	0	0	11,663
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	26,998	0	0	0	0	26,998
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	27,107	0	0	0	0	27,107
1928	0	0	0	0	0	0	0	3,618	0	0	0	0	3,618
1929	0	0	0	0	0	0	0	0	13,231	0	0	0	13,231
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	2,868	0	0	0	2,868
1933	0	0	0	0	0	0	0	0	6,341	0	0	0	6,341
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	5,581	0	0	0	5,581
1936	0	0	0	0	0	0	0	12,237	0	0	0	0	12,237
1937	0	0	0	0	0	0	0	5,152	4,603	0	0	0	9,755
1938	0	0	0	0	0	0	0	13,595	0	0	0	0	13,595
1939	0	0	0	0	0	0	3,808	-4,045	0	0	0	0	-237
1940	0	0	0	0	0	0	0	1,192	0	0	0	0	1,192
1941	0	0	0	0	0	0	0	0	503	0	0	0	503
1942	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	19,270	0	0	0	0	19,270
1945	0	0	0	0	0	0	0	0	9,232	0	0	0	9,232
1946	0	0	0	0	0	0	0	8,061	0	0	0	0	8,061
1947	0	0	0	0	0	0	0	22,903	0	0	0	0	22,903
1948	0	0	0	0	0	0	0	0	13,575	0	0	0	13,575
1949	0	0	0	0	0	0	0	0	170	0	0	0	170
1950	0	0	0	0	0	0	0	0	5,451	0	0	0	5,451
1951	0	6,113	0	0	0	0	0	0	8,883	0	0	0	14,996
1952	0	0	0	0	0	0	0	13,551	0	0	0	0	13,551
1953	0	0	0	0	0	0	0	26	0	0	0	0	26
1954	0	0	0	0	0	0	0	20,164	0	0	0	0	20,164
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	3,858	0	0	0	0	3,858
1957	0	0	0	0	0	0	0	13,263	0	0	0	0	13,263
1958	0	0	0	0	0	0	0	20,767	0	0	0	0	20,767
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	28,101	0	0	0	0	28,101
1963	0	0	0	0	0	0	0	25,188	0	0	0	0	25,188
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	2,548	0	0	0	2,548
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	14,176	0	0	0	0	14,176
1968	0	0	0	0	0	0	0	13,200	0	0	0	0	13,200
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	326	0	0	0	0	7,200	0	0	0	0	7,526
1971	0	0	0	0	0	0	0	10,686	0	0	0	0	10,686
1972	0	0	0	0	0	0	0	29,326	0	0	0	0	29,326
1973	0	0	0	0	0	0	0	23,617	0	0	0	0	23,617
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	13,129	0	0	0	0	13,129
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	55,150	0	0	0	0	55,150
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	3,935	-3,554	0	0	0	0	0	0	0	381
1981	0	0	0	0	0	0	0	347	10,310	0	0	0	10,657
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	3,131	0	0	0	0	3,131
1984	0	0	0	0	0	0	0	849	0	0	0	0	849
1985	0	0	0	0	0	0	0	8,639	0	0	0	0	8,639
1986	0	0	0	0	0	10,235	3,935	0	0	0	0	0	14,170
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	3,808	0	0	0	3,808
1989	0	0	0	0	0	0	0	30,146	0	0	0	0	30,146
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	30,103	0	0	0	30,103
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	8,719	0	0	0	0	0	0	0	0	8,719
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	5,189	698	0	0	0	5,887
2000	0	0	0	0	0	0	0	18,809	0	0	0	0	18,809
2001	0	0	0	0	0	0	0	23,939	0	0	0	0	23,939
2002	0	0	0	0	0	0	0	21,642	0	0	0	0	21,642
Avg (21-02)	0	75	4	154	-43	125	94	6,882	1,500	0	0	0	8,791

Table 3.3-6

Difference in Hetch Hetchy Release to Stream (Acre-feet)

No Purchase Increase minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	0	0	0	-1,561	0	0	0	-1,561
1922	0	0	0	0	0	0	0	3,357	0	0	0	0	3,357
1923	0	0	0	0	0	0	0	-7,029	0	0	0	0	-7,029
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	9,303	0	0	0	0	9,303
1926	0	0	0	0	0	0	0	-2,913	0	0	0	0	-2,913
1927	0	0	0	0	0	0	0	2,144	0	0	0	0	2,144
1928	0	0	0	0	0	0	0	0	0	0	0	0	0
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	197	0	0	0	197
1933	0	0	0	0	0	0	0	0	-10,176	0	0	0	-10,176
1934	0	0	0	0	0	0	-3,808	0	0	0	0	0	-3,808
1935	0	0	0	0	0	3,935	0	0	1,557	0	0	0	5,492
1936	0	0	0	0	0	0	0	-1,127	0	0	0	0	-1,127
1937	0	0	0	0	0	0	0	2,009	0	0	0	0	2,009
1938	0	0	0	0	0	0	0	942	0	0	0	0	942
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	0	0	0	9,654	0	0	0	0	9,654
1941	0	0	0	0	0	0	0	0	-222	0	0	0	-222
1942	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	-12,199	0	0	0	0	-12,199
1945	0	0	0	0	0	0	0	0	22,537	0	0	0	22,537
1946	0	0	0	0	0	0	0	-224	0	0	0	0	-224
1947	0	0	0	0	0	0	0	-8,169	0	0	0	0	-8,169
1948	0	0	0	0	0	0	0	0	1,282	0	0	0	1,282
1949	0	0	0	0	0	0	0	0	170	0	0	0	170
1950	0	0	0	0	0	0	0	0	10,121	0	0	0	10,121
1951	0	-1,176	0	0	0	0	0	0	2,670	0	0	0	1,494
1952	0	0	0	0	0	0	0	-1,982	0	0	0	0	-1,982
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	-10,541	0	0	0	0	-10,541
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	1,155	0	0	0	0	1,155
1957	0	0	0	0	0	0	0	-18,186	0	0	0	0	-18,186
1958	0	0	0	0	0	0	0	7,178	0	0	0	0	7,178
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	-13,553	0	0	0	0	-13,553
1963	0	0	0	0	0	0	0	-3,875	0	0	0	0	-3,875
1964	0	0	0	0	0	0	0	0	-3,808	0	0	0	-3,808
1965	0	0	0	0	0	0	0	0	16,054	0	0	0	16,054
1966	0	0	0	0	0	0	-3,808	4,045	0	0	0	0	237
1967	0	0	0	0	0	0	0	3,920	0	0	0	0	3,920
1968	0	0	0	0	0	0	0	-17,564	0	0	0	0	-17,564
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	326	3,935	0	0	0	-2,117	0	0	0	0	2,144
1971	0	0	0	0	0	0	0	-11,685	0	0	0	0	-11,685
1972	0	0	0	0	0	0	0	-1,660	0	0	0	0	-1,660
1973	0	0	0	0	0	0	0	9,693	0	0	0	0	9,693
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	15,650	4,171	0	0	0	19,821
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	8,560	0	0	0	-310	8,250
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	3,935	-3,554	0	0	0	0	0	0	0	381
1981	0	0	0	0	0	0	0	-10,060	0	0	0	0	-10,060
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	3,935	0	-10,804	0	0	0	0	-6,869
1985	0	0	0	0	0	0	0	3,804	0	0	0	0	3,804
1986	0	0	0	0	0	1,757	0	0	0	0	0	0	1,757
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	364	0	0	0	364
1992	0	0	0	0	0	0	0	-28,918	0	0	0	0	-28,918
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	-4,027	0	0	0	0	0	0	0	0	-4,027
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	-8,302	0	0	0	0	-8,302
2000	0	0	0	0	0	0	0	8,790	0	0	0	0	8,790
2001	0	0	0	0	0	0	0	-19,306	0	0	0	0	-19,306
2002	0	0	0	0	0	0	0	-15,040	0	0	0	0	-15,040
Avg (21-02)	0	-14	4	47	-43	117	-93	-1,403	529	0	0	-4	-860

Table 3.3-7

Hetch Hetchy Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — No Purchase Increase

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	55	51	51	180	85	94	148	2,539	4,551	2,034	184	89
Above Normal	55	95	88	66	89	94	131	1,279	3,123	379	125	89
Normal	54	54	50	55	74	74	98	1,448	1,922	167	122	86
Below Normal	55	55	46	43	51	63	88	706	756	113	111	73
Dry	53	53	44	40	44	50	60	167	168	86	86	65
All Years	54	62	56	76	69	75	105	1,222	2,100	548	125	81

Hetch Hetchy Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	55	51	51	167	89	84	144	2,412	4,548	2,034	184	89
Above Normal	55	89	88	66	89	94	131	1,186	3,095	379	125	89
Normal	54	54	50	55	74	74	98	1,260	1,906	167	122	86
Below Normal	55	55	46	43	51	63	88	565	706	113	111	73
Dry	53	53	44	40	44	50	56	157	139	86	86	65
All Years	54	61	56	73	70	73	103	1,110	2,075	548	125	81

Difference in Hetch Hetchy Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — No Purchase Increase minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	0	0	0	13	-4	10	4	126	3	0	0	0
Above Normal	0	6	0	0	0	0	0	93	27	0	0	0
Normal	0	0	0	0	0	0	0	189	16	0	0	0
Below Normal	0	0	0	0	0	0	0	141	50	0	0	0
Dry	0	0	0	0	0	0	4	10	29	0	0	0
All Years	0	1	0	3	-1	2	2	112	25	0	0	0

flow (cfs) is not always meaningful.[7] When comparing the alternative to the WSIP setting, a change in the volume of release from O'Shaughnessy Dam to the stream would likely result in the initiation of the release being delayed or initiated earlier by a matter of days. Typical springtime releases, when initiated, amount to a release up to 3,000 cfs (approximately 6,000 acre-feet over the span of a day). Assuming that a change in release volume equates to a delay or an earlier initiation of releasing 6,000 acre-feet per day, the difference in stream release between the alternative and WSIP would be up to an additional 5 days of release. Normally, the effect of this change in release would not affect the year's peak stream release rate during a year. Table 3.3-8 illustrates the average monthly stream release for the alternative and base setting, and differences, expressed in average monthly flow (cfs). Table 3.3-6 illustrates that the difference in monthly flow below O'Shaughnessy Dam between the alternative and base settings could range from an increase of approximately 16,000 acre-feet to a decrease of approximately 29,000 acre-feet. Using the same metric as described above to estimate the delay or addition in the number days of release to the stream, the alternative could lead to an effect ranging from an increase of 3 days of release to a decrease of up to 5 days, compared to the base setting.

Table 3.3-8

Hetch Hetchy Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — No Purchase Increase

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	55	51	51	180	85	94	148	2,539	4,551	2,034	184	89
Above Normal	55	95	88	66	89	94	131	1,279	3,123	379	125	89
Normal	54	54	50	55	74	74	98	1,448	1,922	167	122	86
Below Normal	55	55	46	43	51	63	88	706	756	113	111	73
Dry	53	53	44	40	44	50	60	167	168	86	86	65
All Years	54	62	56	76	69	75	105	1,222	2,100	548	125	81

Hetch Hetchy Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	55	51	51	180	89	93	148	2,518	4,534	2,034	184	90
Above Normal	55	96	88	66	89	86	131	1,273	3,092	379	125	89
Normal	54	54	50	51	74	74	98	1,479	1,913	167	122	86
Below Normal	55	55	46	43	51	63	91	758	768	113	111	73
Dry	53	53	44	40	44	50	64	224	168	86	86	65
All Years	54	62	56	75	70	73	107	1,245	2,091	548	125	81

Difference in Hetch Hetchy Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — No Purchase Increase minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	0	0	0	0	-4	2	0	20	17	0	0	0
Above Normal	0	-1	0	0	0	8	0	6	31	0	0	0
Normal	0	0	0	4	0	0	0	-31	9	0	0	0
Below Normal	0	0	0	0	0	0	-4	-52	-12	0	0	0
Dry	0	0	0	0	0	0	-4	-57	0	0	0	0
All Years	0	0	0	1	-1	2	-2	-23	9	0	0	0

[7] See "Estimated Effect of WSIP on Daily Releases below Hetch Hetchy Reservoir", Memorandum by Daniel B. Steiner, December 31, 2006.

3.4 Lake Lloyd and Lake Eleanor

Compared to the operation of the WSIP, the operation of Lake Lloyd and Lake Eleanor are simulated to be only slightly different for the alternative. Figure 3.4-1 illustrates a chronological trace of the simulation of Lake Lloyd storage and stream releases. Shown in Figure 3.4-1 are the results for the WSIP, alternative, and base settings. The operation resulting from the alternative is essentially the same as the WSIP setting, including during drought. Although the level of delivery between the alternative and base settings is essentially the same (net 265-mgd demand) during the 1987-1992 drought, water delivery reliability has been improved in the alternative setting, resulting in a similarity to the WSIP setting in the draw down of Lake Lloyd during this period. Although less water is delivered during this period in the alternative setting compared to the WSIP setting, more water is delivered in the alternative setting than in the base setting. The additional draw of water reduced the amount of water released from Hetch Hetchy Reservoir to Don Pedro Reservoir in the alternative setting, which, for satisfaction of MID/TID entitlements to inflow, was met with additional releases from Lake Lloyd, similar to the WSIP setting. The result that the amount of additional release from Lake Lloyd associated with the alternative appears approximately the same as in the WSIP setting in this instance is partially a factor of modeling discretion in that HH/LSM makes release decisions in the form of block amounts of releases. Additional refinement of modeling assumptions would likely produce a result that places Lake Lloyd storage during this drought period more equally between the base setting and WSIP setting results. Otherwise, the results for Lake Lloyd storage are essentially the same between the WSIP and alternative settings.

Figure 3.4-2 illustrates the almost identical operation of Lake Eleanor for the alternative and WSIP settings. Also shown in Figure 3.4-2 is the operation for the base setting. Any difference that occurs in the Lake Eleanor operation would be caused by a small change in operation at Lake Lloyd that would affect the operation of the Cherry-Eleanor Tunnel between the two watersheds. Any difference that occurs in the simulations is more associated with modeling discretion than with any substantive difference in operation.

Supplementing the Figure 3.4-1 representation of Lake Lloyd stream releases is Table 3.4-1, illustrating releases for the alternative and WSIP settings, and the difference in releases between the two settings. Table 3.4-2 provides the same form of information for the alternative and base settings. With essentially no change in reservoir operations, stream releases would not be different.

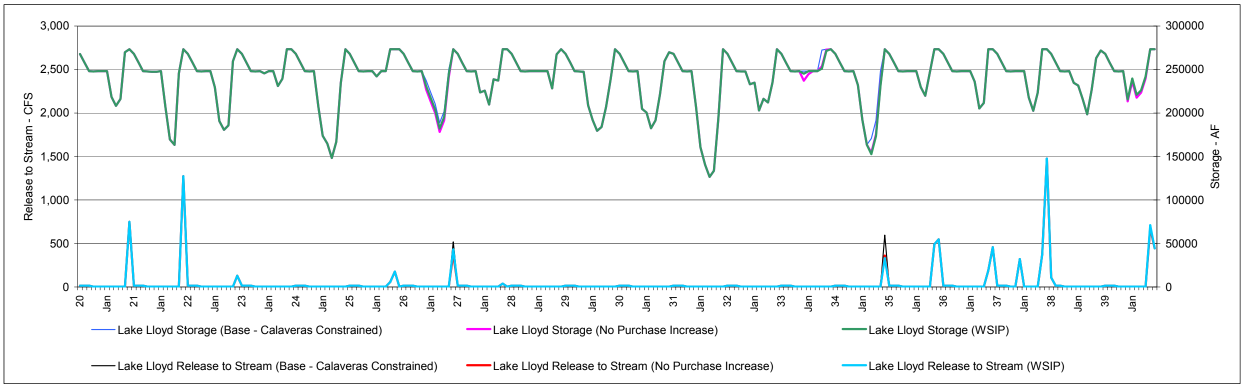
3.5 Don Pedro Reservoir and La Grange Releases

A change in Don Pedro Reservoir operation is caused by changes in inflow to the reservoir. The changes in inflow to the reservoir are the result of net changes within the operation of the upstream SFPUC facilities, described previously, and other changes in SFPUC operations associated with diversions to the Holm, Kirkwood, and Moccasin Powerhouses. Figure 3.5-1 illustrates a chronological trace of the simulation of Don Pedro Reservoir storage and Tuolumne River stream releases from La Grange Dam. Shown in Figure 3.5-1 are the results for the WSIP, alternative, and base settings. Supplementing the Figure 3.5-1 representation of Don Pedro Reservoir storage are Table 3.5-1 Don Pedro Reservoir Storage (No Purchase Increase), Table 59 Don Pedro Reservoir Storage (WSIP), and Table 3.5-2 Difference in Don Pedro Reservoir Storage (No Purchase Increase minus WSIP). Table 3.5-3 is provided to illustrate the difference in Don Pedro Reservoir storage between the base and alternative settings.

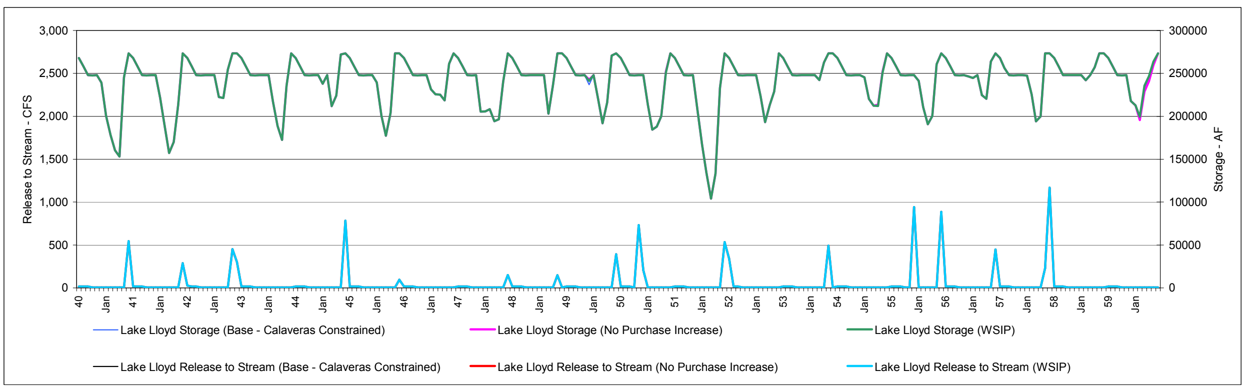
Table 3.5-2 illustrates that, throughout many years, the storage in Don Pedro Reservoir associated with the alternative setting would differ from the storage in the WSIP setting, and that this difference would almost always be more storage. Table 3.5-3 illustrates that the alternative setting results for Don Pedro Reservoir storage are close to the storage results depicted for the base setting, although typically lower than the base setting. Compared to the WSIP setting, the differences in storage indicate increases to the inflow of Don Pedro Reservoir, which are due to lesser demands and SJPL diversions in the alternative setting. The increases in inflow typically occur during the winter through early summer. Compared to the base setting, the alternative would result in typically less inflow to Don Pedro Reservoir during non-wetter years, and particularly during drought periods when more water is diverted to the SJPL in the alternative setting. Less inflow leads to less reservoir storage.

Figure 3.4-1
Lake Lloyd Storage and Stream Release

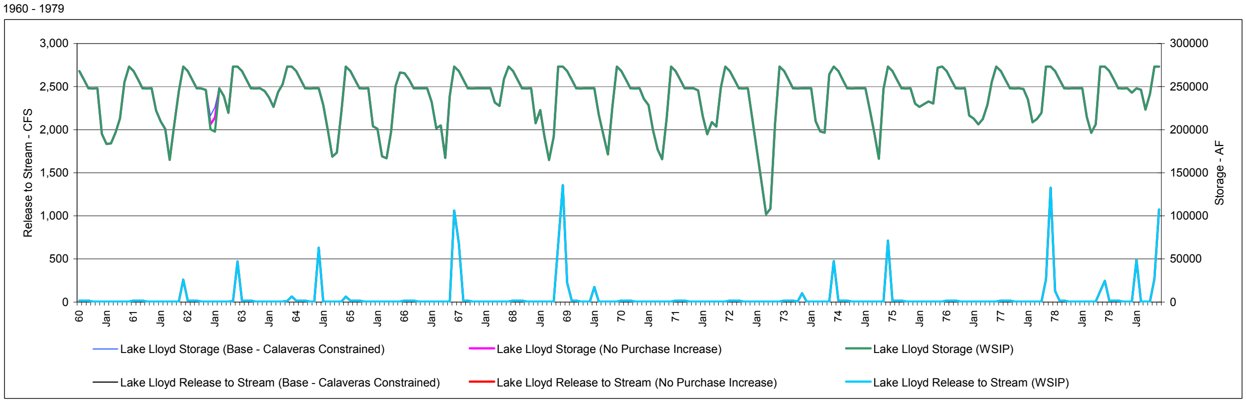
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

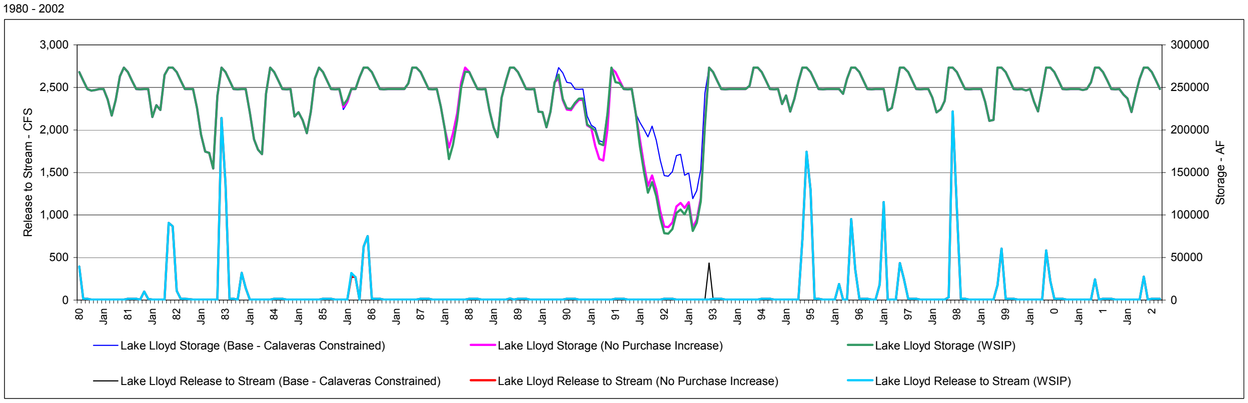
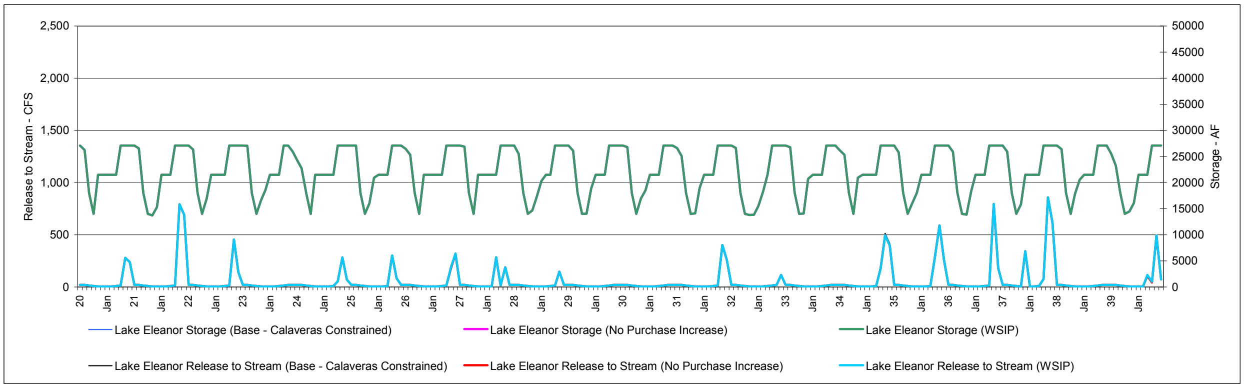
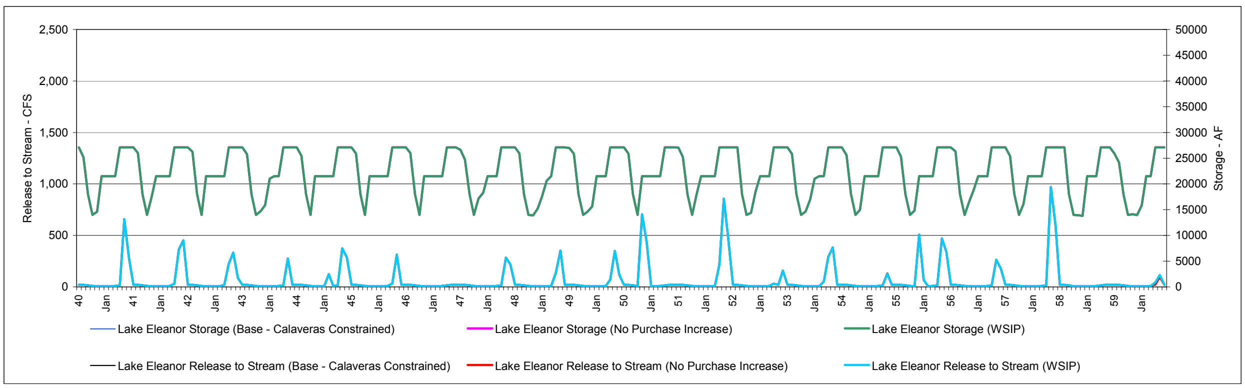


Figure 3.4-2
Lake Eleanor Storage and Stream Release

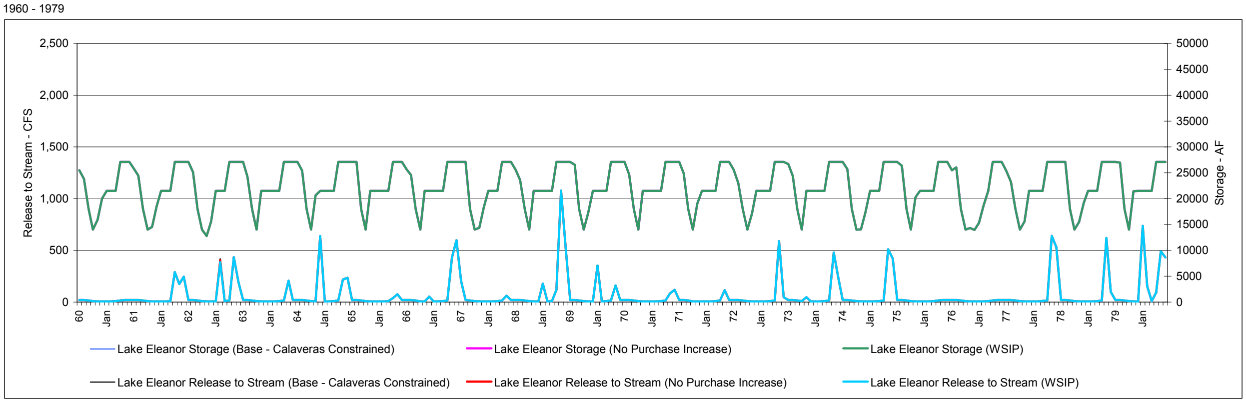
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

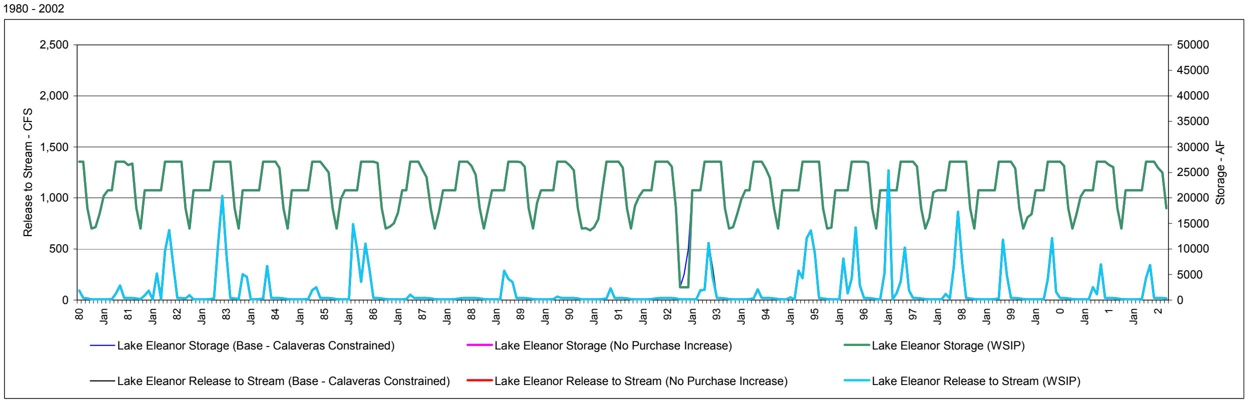


Table 3.4-1

Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) No Purchase Increase

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	5	11	134	107	22	21	5	284	1,058	363	15	15
Above Normal	5	72	25	5	16	5	5	165	445	16	15	15
Normal	5	5	5	16	5	5	5	110	162	15	15	15
Below Normal	5	5	5	5	5	5	8	39	43	15	15	15
Dry	5	5	5	5	5	5	5	5	5	15	15	15
All Years	5	20	34	27	11	8	6	120	340	83	15	15

Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	5	11	134	107	25	21	5	284	1,058	363	15	15
Above Normal	5	72	25	5	16	5	5	167	446	16	15	15
Normal	5	5	5	16	5	5	5	110	162	15	15	15
Below Normal	5	5	5	5	5	5	8	39	43	15	15	15
Dry	5	5	5	5	5	5	5	5	5	15	15	15
All Years	5	20	34	27	11	8	6	121	340	83	15	15

Difference in Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) No Purchase Increase minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	0	0	0	0	-2	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	-2	-1	0	0	0
Normal	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	0	0	0	0	0	0	0	0	0	0

Table 3.4-2

Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) No Purchase Increase

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	5	11	134	107	22	21	5	284	1,058	363	15	15
Above Normal	5	72	25	5	16	5	5	165	445	16	15	15
Normal	5	5	5	16	5	5	5	110	162	15	15	15
Below Normal	5	5	5	5	5	5	8	39	43	15	15	15
Dry	5	5	5	5	5	5	5	5	5	15	15	15
All Years	5	20	34	27	11	8	6	120	340	83	15	15

Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) Base - Calaveras Constrained

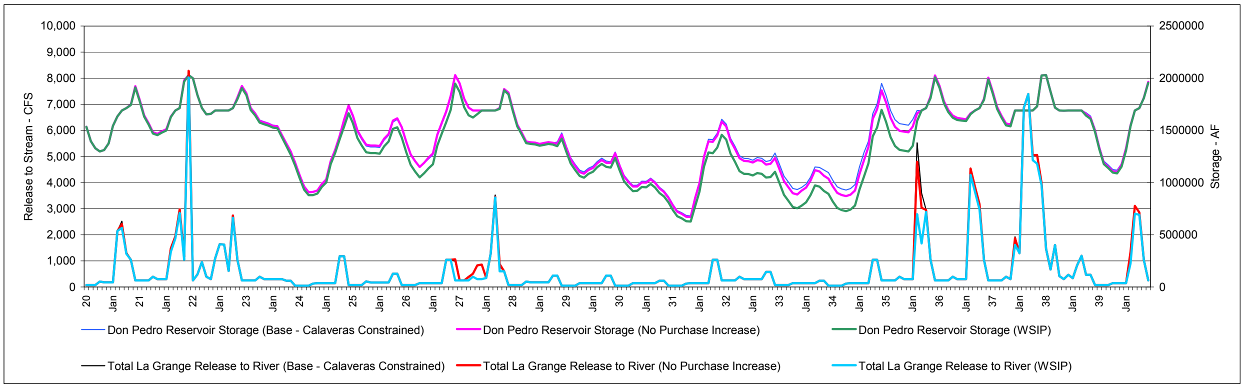
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	5	11	134	107	21	21	5	284	1,084	363	15	15
Above Normal	5	72	25	5	16	5	5	166	467	16	15	15
Normal	5	5	5	16	5	5	5	110	162	15	15	15
Below Normal	5	5	5	5	5	5	8	39	43	15	15	15
Dry	5	5	5	5	5	5	5	5	5	15	15	15
All Years	5	20	34	27	10	8	6	120	350	83	15	15

Difference in Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) No Purchase Increase minus Base - Calaveras Constrained

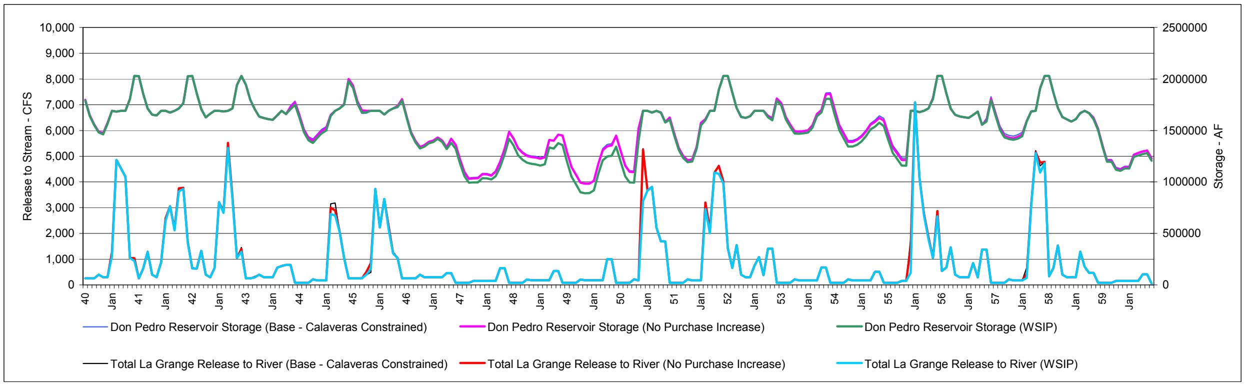
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	0	0	0	0	1	0	0	0	-27	0	0	0
Above Normal	0	0	0	0	0	0	0	-1	-22	0	0	0
Normal	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	0	0	0	0	0	0	-10	0	0	0

Figure 3.5-1
Don Pedro Reservoir Storage and Release below La Grange Dam

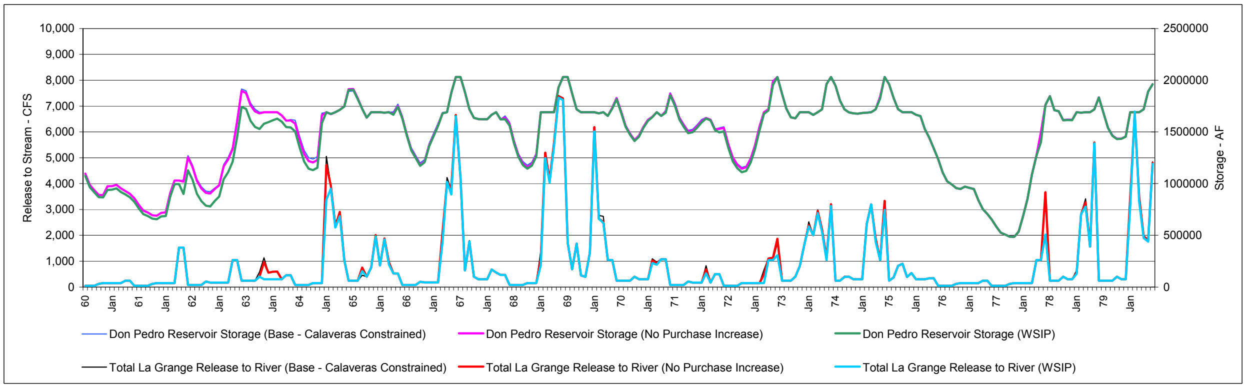
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

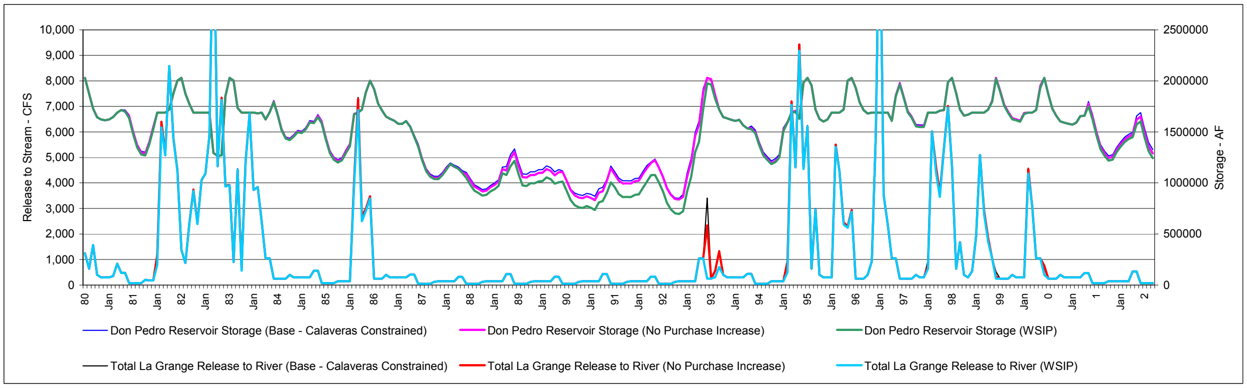


Table 3.5-1

Don Pedro Reservoir Storage (Acre-feet) No Purchase Increase

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	1,298,116	1,312,166	1,374,846	1,543,388	1,634,035	1,690,000	1,713,000	1,746,404	1,922,499	1,792,574	1,644,246	1,567,618
1922	1,481,620	1,466,806	1,491,100	1,511,268	1,632,064	1,690,000	1,713,000	1,978,705	2,030,000	1,998,136	1,838,254	1,715,718
1923	1,653,081	1,658,408	1,689,999	1,689,989	1,689,997	1,690,000	1,713,000	1,814,135	1,923,489	1,855,439	1,712,704	1,661,062
1924	1,591,184	1,575,510	1,561,492	1,543,091	1,537,806	1,453,114	1,375,256	1,297,368	1,189,801	1,070,870	962,066	907,784
1925	909,901	923,996	987,787	1,030,063	1,206,383	1,313,228	1,446,986	1,603,269	1,738,215	1,639,750	1,499,010	1,426,795
1926	1,362,785	1,354,398	1,355,300	1,349,233	1,420,087	1,465,844	1,593,604	1,615,453	1,531,864	1,391,910	1,269,231	1,205,130
1927	1,149,707	1,189,308	1,239,681	1,279,265	1,457,187	1,571,891	1,681,000	1,828,869	2,030,000	1,949,971	1,803,700	1,718,303
1928	1,690,000	1,690,000	1,689,999	1,690,000	1,689,998	1,690,000	1,713,000	1,896,318	1,861,948	1,698,225	1,555,689	1,477,704
1929	1,394,089	1,385,750	1,382,857	1,369,653	1,378,508	1,386,911	1,380,458	1,372,253	1,458,215	1,335,413	1,221,926	1,157,870
1930	1,101,665	1,085,480	1,120,995	1,140,996	1,184,970	1,216,398	1,189,503	1,188,879	1,281,001	1,164,436	1,059,470	1,006,465
1931	961,712	964,024	1,001,463	999,654	1,031,185	997,873	944,265	910,202	854,082	780,004	719,971	700,289
1932	674,060	668,898	847,017	994,626	1,245,725	1,394,934	1,390,018	1,451,126	1,584,306	1,536,411	1,400,194	1,322,880
1933	1,233,594	1,208,126	1,205,831	1,191,329	1,215,989	1,207,845	1,173,818	1,179,876	1,236,547	1,126,249	1,015,146	955,711
1934	898,020	886,193	923,553	951,351	1,020,046	1,117,873	1,105,773	1,064,453	1,038,863	964,443	902,347	882,546
1935	871,556	885,109	924,631	1,082,565	1,212,652	1,341,677	1,611,558	1,702,611	1,882,633	1,766,615	1,621,087	1,533,516
1936	1,496,945	1,488,405	1,482,436	1,535,959	1,662,027	1,690,000	1,713,000	1,824,587	2,025,181	1,926,728	1,776,704	1,693,811
1937	1,640,466	1,619,137	1,612,612	1,606,547	1,661,769	1,690,000	1,713,000	1,802,452	2,004,473	1,869,739	1,723,546	1,638,778
1938	1,564,623	1,556,052	1,689,998	1,689,992	1,689,987	1,690,000	1,690,000	1,730,000	2,025,000	2,030,000	1,870,754	1,718,957
1939	1,690,000	1,689,224	1,690,000	1,690,000	1,689,999	1,690,000	1,656,928	1,622,389	1,498,838	1,331,553	1,189,776	1,150,981
1940	1,108,730	1,101,454	1,171,459	1,328,292	1,547,088	1,690,000	1,713,000	1,812,192	1,964,069	1,798,323	1,648,060	1,559,422
1941	1,488,799	1,472,486	1,572,618	1,689,992	1,683,025	1,690,000	1,690,000	1,806,825	2,030,000	2,027,570	1,857,840	1,712,174
1942	1,653,602	1,645,974	1,689,999	1,689,981	1,673,445	1,690,000	1,713,000	1,765,000	2,027,000	2,030,000	1,860,016	1,707,840
1943	1,626,500	1,664,178	1,690,000	1,689,976	1,683,369	1,690,000	1,713,000	1,942,881	2,030,000	1,944,589	1,798,570	1,708,539
1944	1,635,547	1,622,064	1,610,321	1,603,274	1,647,456	1,690,000	1,658,867	1,728,347	1,773,108	1,646,387	1,504,625	1,427,144
1945	1,402,464	1,450,478	1,496,915	1,523,214	1,649,455	1,690,000	1,713,000	1,756,978	1,999,871	1,936,700	1,782,422	1,694,472
1946	1,690,000	1,690,000	1,689,996	1,689,984	1,655,146	1,690,000	1,713,000	1,738,139	1,805,152	1,640,770	1,485,114	1,398,674
1947	1,339,445	1,355,874	1,389,201	1,401,424	1,432,216	1,401,726	1,333,860	1,418,444	1,360,567	1,219,782	1,094,257	1,030,905
1948	1,034,586	1,035,830	1,074,455	1,073,831	1,061,904	1,099,683	1,193,815	1,319,997	1,485,394	1,420,320	1,326,614	1,282,066
1949	1,252,704	1,242,176	1,236,940	1,225,413	1,237,500	1,407,283	1,401,139	1,458,788	1,452,080	1,289,385	1,145,893	1,070,759
1950	992,534	982,407	983,129	1,011,446	1,171,429	1,308,014	1,346,837	1,354,759	1,447,718	1,297,917	1,157,305	1,098,466
1951	1,095,620	1,518,131	1,689,993	1,689,971	1,673,951	1,690,000	1,675,098	1,582,685	1,624,879	1,471,374	1,331,494	1,252,088
1952	1,210,700	1,218,399	1,339,992	1,573,938	1,609,085	1,690,000	1,690,000	1,895,000	2,030,000	2,030,000	1,869,932	1,719,140
1953	1,632,895	1,622,960	1,637,300	1,689,996	1,689,998	1,690,000	1,642,019	1,616,238	1,809,714	1,764,854	1,631,742	1,556,702
1954	1,490,870	1,490,060	1,493,703	1,500,509	1,549,479	1,659,039	1,696,851	1,851,866	1,854,445	1,694,189	1,548,031	1,469,440
1955	1,389,944	1,389,670	1,407,956	1,440,546	1,490,821	1,556,431	1,583,914	1,623,180	1,596,281	1,460,508	1,335,156	1,276,335
1956	1,213,302	1,211,903	1,689,998	1,689,942	1,678,244	1,690,000	1,713,000	1,813,336	2,030,000	2,030,000	1,859,576	1,712,725
1957	1,651,881	1,635,922	1,627,970	1,622,414	1,650,203	1,683,085	1,554,764	1,600,532	1,808,930	1,661,643	1,521,698	1,447,984
1958	1,431,596	1,424,033	1,436,742	1,459,706	1,592,080	1,685,702	1,690,000	1,910,000	2,030,000	2,030,000	1,868,297	1,719,418
1959	1,629,791	1,607,494	1,585,600	1,610,046	1,668,508	1,690,000	1,669,298	1,620,274	1,517,717	1,352,516	1,209,107	1,208,774
1960	1,130,844	1,119,414	1,142,642	1,142,334	1,262,899	1,280,955	1,296,528	1,305,063	1,227,031	1,096,280	987,418	938,096
1961	890,165	889,359	973,561	975,267	987,425	953,488	928,346	901,869	858,612	793,760	739,995	720,580
1962	694,566	689,458	717,194	721,149	908,251	1,029,348	1,029,455	1,018,959	1,254,831	1,163,562	1,026,211	953,095
1963	910,112	903,998	948,766	983,022	1,166,614	1,234,651	1,334,401	1,598,146	1,895,203	1,875,034	1,758,287	1,699,018
1964	1,680,082	1,690,000	1,690,000	1,689,998	1,689,999	1,660,043	1,607,767	1,610,899	1,579,683	1,424,407	1,289,110	1,217,982
1965	1,204,341	1,227,613	1,661,012	1,689,962	1,671,264	1,690,000	1,713,000	1,747,772	1,913,099	1,915,120	1,825,610	1,722,996
1966	1,638,039	1,690,000	1,689,998	1,689,996	1,685,637	1,690,000	1,673,397	1,750,925	1,633,636	1,469,580	1,325,938	1,255,331
1967	1,179,412	1,212,940	1,366,632	1,465,649	1,563,482	1,679,244	1,690,000	1,880,000	2,030,000	2,030,000	1,885,338	1,717,656
1968	1,636,802	1,624,597	1,622,733	1,622,937	1,666,603	1,690,000	1,620,006	1,637,801	1,576,247	1,409,104	1,273,615	1,195,861
1969	1,159,413	1,188,716	1,278,199	1,689,992	1,689,990	1,690,000	1,690,000	1,930,000	2,030,000	2,030,000	1,871,603	1,717,046
1970	1,690,000	1,690,000	1,689,999	1,689,950	1,679,633	1,690,000	1,655,509	1,733,462	1,826,128	1,696,059	1,558,978	1,480,821
1971	1,420,774	1,463,683	1,550,732	1,616,642	1,645,380	1,690,000	1,654,817	1,698,531	1,868,498	1,768,286	1,634,637	1,565,013
1972	1,502,766	1,511,305	1,554,902	1,605,377	1,634,413	1,617,358	1,523,435	1,530,352	1,539,556	1,381,684	1,250,187	1,183,430
1973	1,144,682	1,157,673	1,239,745	1,368,550	1,548,168	1,690,000	1,717,600	1,987,574	2,030,000	1,868,018	1,723,820	1,640,583
1974	1,631,540	1,690,000	1,689,998	1,689,983	1,662,882	1,690,000	1,717,600	1,962,884	2,030,000	1,947,300	1,804,413	1,717,372
1975	1,688,940	1,679,043	1,677,497	1,682,835	1,684,941	1,690,000	1,717,600	1,840,271	2,030,000	1,960,006	1,829,986	1,720,415
1976	1,690,000	1,690,000	1,690,000	1,664,706	1,652,292	1,526,598	1,445,307	1,341,473	1,236,083	1,107,685	1,022,829	992,425
1977	956,011	948,887	970,778	958,850	947,176	838,580	752,503	707,496	653,830	583,546	526,720	507,835
1978	487,414	485,146	537,432	682,534	851,424	1,090,274	1,269,016	1,495,123	1,761,000	1,845,303	1,711,347	1,699,327
1979	1,613,902	1,616,977	1,616,034	1,689,998	1,684,439	1,690,000	1,690,000	1,717,600	1,834,417	1,684,409	1,540,382	1,463,780
1980	1,432,372	1,435,084	1,455,118	1,689,973	1,689,987	1,690,000	1,717,600	1,890,400	1,960,200	2,030,000	1,874,603	1,727,346
1981	1,644,248	1,621,877	1,614,080	1,621,636	1,645,736	1,690,000	1,714,087	1,701,962	1,655,558	1,494,484	1,365,905	1,297,676
1982	1,288,769	1,395,672	1,546,416	1,689,992	1,689,988	1,690,000	1,717,600	1,876,400	2,002,900	2,030,000	1,874,041	1,772,100
1983	1,690,000	1,690,000	1,689,995	1,689,966	1,689,989	1,294,700	1,264,000	1,270,800	1,851,400	2,030,000	2,002,489	1,735,007
1984	1,690,000	1,690,000	1,689,992	1,689,971	1,681,440	1,690,000	1,622,418	1,694,842	1,797,300	1,669,148	1,522,530	1,439,098
1985	1,424,065	1,459,172	1,503,551	1,494,141	1,529,196	1,597,274	1,590,372	1,658,425	1,596,644	1,436,124	1,304,460	1,240,522
1986	1,213,508	1,234,692	1,308,911	1,373,924	1,674,940	1,690,000	1,717,600	1,888,300	2,001,400	1,921,921	1,777,678	1,709,305
1987	1,650,171	1,628,126	1,609,576	1,578,456	1,577,656	1,606,515	1,550,992	1,454,198	1,364,747	1,233,515	1,125,104	1,071,797
1988	1,049,052	1,048,144	1,084,328	1,138,150	1,180,348	1,157,366	1,140,058	1,102,520	1,085,202	1,023,333	965,205	943,268
1989	916,592	924,069	956,752	980,419	1,012,390	1,136,294	1,122,811	1,242,614	1,300,580	1,167,962	1,057,633	1,052,199
1990	1,078,658	1,077,148	1,097,040	1,099,770	1,135,274	1,118,504	1,074,827	1,103,804	1,110,484	1,020,945	928,919	878,874
1991	857,437	850,807	869,011	853,701	831,355	905,063	918,137	1,023,538	1,143,945	1,081,258	1,021,594	995,490
1992	996,614	995,162	1,017,592	1,022,373	1,086,160	1,145,624	1,195,723	1,223,568	1,149,380	1,058,627	945,887	881,080
1993	844,010	837,552	863,365	1,057,063	1,206,835	1,461,304	1,568,930	1,891,024	2,030,000	2,015,252	1,860,185	1,719,602
1994	1,646,106	1,631,889	1,617,739	1,607,788	1,617,852	1,565,083	1,533,235	1,537,303	1,496,314	1,377,326	1,279,846	1,233,872
1995	1,194,472	1,214,269	1,259,052	1,516,572	1,593,388	1,690,000	1,705,440	1,629,700	1,982,800	2,030,000	1,957,840	1,718,604
1996	1,625,966	1,600,351	1,621,669	1,689,837	1,689,990	1,690,000	1,717,600	2,002,400	2,030,000	1,934,528	1,789,313	1,712,841
1997	1,679,670	1,690,000	1,689,993	1,689,874	1,689,994	1,690,000	1,612,994	1,857,013	1,974,377	1,837,775	1,698,378	1,644,091
1998	1,562,140	1,555,739	1,557,145	1,689,996	1,689,989	1,690,000	1,706,362	1,714,000	1,987,500	2,030,000	1,881,075	1,719,248
1999	1,658,952	1,669,423	1,690,000	1,689,986	1,689,990	1,690,000	1,717,600	1,803,833	2,030,000	1,904,718	1,766,680	1,697,101
2000	1,634,145	1,624,148	1,608,505	1,684,443	1,689,992	1,690,000	1,713,910	1,950,512	2,030,000	1,869,201	1,728,017	1,657,692
2001	1,603,232	1,590,888	1,579,361	1,571,337	1,589,625	1,655,516	1,658,030	1,776,988	1,651,825	1,492,207	1,357,386	1,292,600
2002	1,245,576	1,254,384	1,323,757	1,379,181	1,426,273	1,454,840	1,472,604	1,619,982	1,650,052	1,491,610	1,357,087	1,289,095
Avg (21-02)	1,344,027	1,352,145	1,394,472	1,437,941	1,486,538	1,519,112	1,525,620	1,604,331	1,688,834	1,600,053	1,471,340	1,390,636

Table 3.5-2

Don Pedro Reservoir Storage (Acre-feet) WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	1,297,919	1,311,969	1,374,649	1,543,191	1,633,956	1,690,000	1,713,000	1,742,271	1,910,239	1,780,368	1,632,093	1,555,504
1922	1,469,532	1,454,724	1,479,018	1,499,182	1,627,229	1,690,000	1,713,000	1,967,374	2,030,000	1,998,136	1,838,254	1,715,718
1923	1,653,081	1,658,408	1,689,999	1,689,989	1,689,997	1,690,000	1,713,000	1,799,350	1,905,720	1,837,747	1,695,090	1,643,504
1924	1,573,662	1,557,997	1,543,979	1,525,572	1,520,285	1,435,601	1,350,582	1,268,108	1,160,641	1,041,842	933,176	878,997
1925	881,178	895,290	959,080	1,001,347	1,177,665	1,284,520	1,414,414	1,536,668	1,665,128	1,566,983	1,426,571	1,354,602
1926	1,290,743	1,282,398	1,282,833	1,276,745	1,347,403	1,393,186	1,513,528	1,529,318	1,431,062	1,291,567	1,169,352	1,105,586
1927	1,050,369	1,090,025	1,136,534	1,176,089	1,354,003	1,468,745	1,577,952	1,697,527	1,948,089	1,868,412	1,722,499	1,645,385
1928	1,624,109	1,655,435	1,689,902	1,690,000	1,689,998	1,690,000	1,705,499	1,882,298	1,844,942	1,681,291	1,538,831	1,460,902
1929	1,377,322	1,368,992	1,366,099	1,352,890	1,361,744	1,370,153	1,363,716	1,347,620	1,420,045	1,297,417	1,184,105	1,120,176
1930	1,064,049	1,047,885	1,083,398	1,103,389	1,147,360	1,178,802	1,151,942	1,144,262	1,236,535	1,120,169	1,015,406	962,553
1931	917,895	920,233	957,669	955,848	987,375	954,080	900,516	866,574	810,612	736,739	676,917	657,388
1932	631,250	626,111	769,876	913,848	1,153,707	1,290,028	1,281,046	1,334,403	1,458,411	1,411,082	1,275,442	1,198,554
1933	1,109,524	1,084,126	1,081,825	1,067,288	1,091,938	1,083,840	1,048,315	1,053,300	1,103,198	993,506	883,024	824,057
1934	766,654	754,904	779,126	811,010	879,460	973,506	960,998	918,785	892,442	818,720	757,328	738,038
1935	727,361	740,999	780,515	934,490	1,058,269	1,185,433	1,443,820	1,528,475	1,696,712	1,581,499	1,436,797	1,349,843
1936	1,313,654	1,305,218	1,299,245	1,352,785	1,588,986	1,690,000	1,713,000	1,808,423	2,006,955	1,908,581	1,758,637	1,675,801
1937	1,622,493	1,601,173	1,594,638	1,588,536	1,654,992	1,690,000	1,713,000	1,792,216	1,986,905	1,852,247	1,706,131	1,621,419
1938	1,547,298	1,538,738	1,689,998	1,689,992	1,689,987	1,690,000	1,690,000	1,730,000	2,025,000	2,030,000	1,870,754	1,718,957
1939	1,690,000	1,689,224	1,690,000	1,690,000	1,689,999	1,690,000	1,640,414	1,609,719	1,486,211	1,318,984	1,177,264	1,138,511
1940	1,096,286	1,089,016	1,153,019	1,306,880	1,540,470	1,690,000	1,713,000	1,807,953	1,954,973	1,789,267	1,639,044	1,550,434
1941	1,479,830	1,463,523	1,562,835	1,689,993	1,683,062	1,690,000	1,690,000	1,803,805	2,030,000	2,027,570	1,857,840	1,712,174
1942	1,653,602	1,645,974	1,689,999	1,689,982	1,673,445	1,690,000	1,713,000	1,765,000	2,027,000	2,030,000	1,860,016	1,707,840
1943	1,626,500	1,664,178	1,690,000	1,689,976	1,683,949	1,690,000	1,713,000	1,939,745	2,030,000	1,944,589	1,798,570	1,708,539
1944	1,635,547	1,622,064	1,610,321	1,603,274	1,647,456	1,690,000	1,658,867	1,706,915	1,749,631	1,623,011	1,481,354	1,403,951
1945	1,379,320	1,427,347	1,473,782	1,500,075	1,640,198	1,690,000	1,713,000	1,750,606	1,979,431	1,916,348	1,762,159	1,674,274
1946	1,676,444	1,690,000	1,689,996	1,689,984	1,655,146	1,690,000	1,713,000	1,726,277	1,790,756	1,626,434	1,470,843	1,384,452
1947	1,325,252	1,341,690	1,375,016	1,387,235	1,418,025	1,387,541	1,319,689	1,380,202	1,321,263	1,180,658	1,055,313	992,092
1948	995,855	997,122	1,035,745	1,034,871	1,022,941	1,055,025	1,146,212	1,267,720	1,417,634	1,352,869	1,259,478	1,215,157
1949	1,185,933	1,175,442	1,170,203	1,158,664	1,170,747	1,334,893	1,324,462	1,376,085	1,357,943	1,195,682	1,052,617	977,799
1950	899,772	889,700	891,735	917,336	1,074,649	1,209,756	1,247,393	1,254,524	1,342,391	1,193,077	1,052,942	994,455
1951	991,828	1,394,480	1,689,996	1,689,971	1,673,951	1,690,000	1,671,372	1,576,239	1,604,996	1,451,580	1,311,792	1,232,453
1952	1,191,106	1,198,816	1,320,408	1,550,006	1,599,510	1,690,000	1,690,000	1,895,000	2,030,000	2,030,000	1,869,932	1,719,140
1953	1,632,895	1,622,960	1,637,300	1,689,996	1,689,998	1,690,000	1,627,805	1,598,044	1,787,718	1,742,953	1,609,936	1,534,967
1954	1,469,181	1,468,382	1,472,024	1,478,824	1,527,793	1,637,361	1,675,192	1,807,461	1,807,613	1,647,557	1,501,608	1,423,172
1955	1,343,773	1,343,524	1,361,809	1,394,386	1,444,656	1,510,283	1,537,906	1,575,778	1,541,339	1,405,813	1,280,713	1,222,079
1956	1,159,157	1,157,788	1,690,000	1,689,941	1,678,244	1,690,000	1,713,000	1,804,932	2,030,000	2,030,000	1,859,576	1,712,725
1957	1,651,881	1,635,922	1,627,970	1,622,414	1,650,203	1,683,085	1,554,764	1,586,050	1,793,311	1,646,081	1,506,206	1,432,543
1958	1,416,187	1,408,633	1,421,341	1,444,300	1,585,917	1,683,239	1,690,000	1,910,000	2,030,000	2,030,000	1,868,297	1,719,418
1959	1,629,791	1,607,494	1,585,600	1,610,046	1,668,508	1,690,000	1,667,329	1,608,068	1,505,552	1,340,406	1,197,054	1,196,761
1960	1,118,856	1,107,432	1,130,660	1,130,349	1,243,727	1,256,367	1,271,555	1,279,420	1,205,492	1,074,839	966,076	916,828
1961	868,944	868,151	939,429	941,125	953,280	919,356	894,250	867,206	824,074	759,385	705,786	686,494
1962	660,555	655,467	683,202	687,146	874,245	995,355	995,496	899,706	1,129,280	1,038,578	901,808	829,134
1963	786,422	780,381	830,701	875,755	1,042,937	1,111,019	1,210,888	1,447,268	1,742,065	1,722,560	1,606,476	1,547,700
1964	1,529,068	1,578,634	1,594,299	1,612,405	1,628,891	1,598,956	1,546,441	1,542,798	1,504,176	1,349,242	1,214,296	1,143,418
1965	1,129,930	1,153,243	1,584,742	1,689,973	1,672,299	1,690,000	1,713,000	1,744,658	1,904,786	1,906,843	1,817,368	1,723,009
1966	1,638,052	1,690,000	1,689,998	1,689,996	1,685,990	1,690,000	1,666,206	1,743,752	1,626,487	1,462,463	1,318,853	1,248,271
1967	1,172,366	1,205,898	1,359,590	1,458,604	1,556,437	1,679,489	1,690,000	1,880,000	2,030,000	2,030,000	1,885,338	1,717,656
1968	1,636,802	1,624,597	1,622,733	1,622,937	1,666,603	1,690,000	1,620,006	1,623,382	1,560,682	1,393,610	1,258,193	1,180,490
1969	1,144,074	1,173,385	1,262,868	1,689,994	1,689,990	1,690,000	1,690,000	1,930,000	2,030,000	2,030,000	1,871,603	1,717,046
1970	1,690,000	1,690,000	1,689,999	1,689,952	1,679,633	1,690,000	1,655,509	1,725,036	1,816,534	1,686,506	1,549,469	1,471,343
1971	1,411,316	1,454,230	1,541,278	1,607,186	1,641,597	1,690,000	1,654,817	1,685,672	1,853,567	1,753,420	1,619,836	1,550,260
1972	1,488,043	1,496,591	1,540,187	1,590,658	1,628,525	1,611,472	1,517,554	1,495,198	1,504,521	1,346,809	1,215,475	1,148,834
1973	1,110,158	1,123,168	1,205,238	1,334,033	1,513,648	1,676,096	1,707,479	1,954,405	2,030,000	1,868,018	1,723,819	1,640,583
1974	1,631,540	1,690,000	1,689,998	1,689,983	1,662,882	1,690,000	1,717,600	1,963,536	2,030,000	1,947,300	1,804,413	1,717,372
1975	1,688,940	1,679,043	1,677,497	1,682,835	1,684,941	1,690,000	1,717,600	1,823,045	2,030,000	1,960,006	1,829,986	1,720,415
1976	1,690,000	1,690,000	1,690,000	1,664,706	1,652,292	1,526,598	1,445,307	1,341,473	1,236,083	1,107,685	1,022,829	992,425
1977	956,011	948,887	970,778	958,850	947,176	838,580	752,503	707,496	653,830	583,546	526,720	507,835
1978	487,414	485,146	537,432	682,534	851,424	1,090,274	1,269,016	1,401,086	1,761,000	1,845,304	1,711,347	1,699,327
1979	1,612,045	1,615,120	1,614,177	1,689,998	1,684,439	1,690,000	1,690,000	1,717,600	1,832,303	1,682,304	1,538,286	1,461,691
1980	1,430,288	1,433,000	1,453,035	1,689,976	1,689,987	1,690,000	1,717,600	1,890,400	1,960,200	2,030,000	1,874,603	1,727,346
1981	1,644,248	1,621,877	1,614,080	1,621,636	1,645,736	1,690,000	1,714,087	1,699,430	1,636,268	1,475,279	1,346,789	1,278,626
1982	1,269,759	1,376,672	1,527,416	1,689,995	1,689,988	1,690,000	1,717,600	1,876,400	2,002,900	2,030,000	1,874,041	1,772,100
1983	1,690,000	1,690,000	1,689,995	1,689,966	1,689,989	1,294,700	1,264,000	1,270,800	1,851,400	2,030,000	2,002,489	1,735,007
1984	1,690,000	1,690,000	1,689,992	1,689,971	1,681,440	1,690,000	1,622,221	1,691,612	1,791,967	1,663,838	1,517,244	1,433,830
1985	1,418,807	1,453,917	1,498,296	1,488,884	1,523,939	1,592,019	1,585,122	1,645,091	1,583,355	1,422,894	1,291,292	1,227,399
1986	1,200,412	1,221,603	1,293,188	1,358,196	1,670,079	1,690,000	1,717,600	1,888,300	2,001,400	1,921,921	1,777,677	1,709,305
1987	1,650,170	1,628,126	1,609,576	1,578,456	1,577,656	1,606,514	1,550,992	1,452,961	1,354,101	1,222,918	1,114,556	1,061,284
1988	1,038,561	1,037,658	1,073,842	1,127,662	1,183,519	1,160,536	1,137,647	1,097,768	1,048,672	981,981	924,050	902,259
1989	875,673	883,175	915,855	939,511	971,478	1,095,398	1,079,035	1,164,887	1,218,247	1,086,000	976,047	970,893
1990	997,524	996,060	1,015,948	1,018,655	1,054,153	1,037,412	993,814	1,005,333	1,012,353	923,267	831,714	782,012
1991	760,785	754,212	773,166	758,204	736,039	809,784	822,954	901,838	1,006,446	957,482	889,578	860,866
1992	862,284	860,911	883,335	888,075	951,851	1,011,366	1,076,354	1,079,040	1,005,349	915,259	803,211	738,908
1993	702,146	695,777	721,584	911,368	1,061,108	1,302,035	1,403,055	1,721,451	1,976,934	1,962,414	1,823,393	1,719,661
1994	1,646,165	1,631,948	1,617,798	1,607,847	1,617,911	1,565,142	1,533,294	1,527,372	1,486,417	1,367,474	1,270,041	1,224,099
1995	1,184,719	1,204,522	1,249,304	1,506,822	1,592,472	1,690,000	1,695,046	1,629,700	1,982,800	2,030,000	1,957,840	1,718,604
1996	1,625,966	1,600,351	1,621,669	1,689,837	1,689,990	1,690,000	1,717,600	2,002,400	2,030,000	1,934,528	1,789,313	1,712,841
1997	1,679,670	1,690,000	1,689,993	1,689,875	1,689,994	1,690,000	1,607,194	1,849,992	1,966,183	1,829,617	1,690,255	1,635,994
1998	1,554,059	1,547,662	1,549,068	1,689,997	1,689,989	1,690,000	1,707,834	1,714,000	1,987,500	2,030,000	1,881,075	1,719,248
1999	1,658,952	1,669,423	1,690,000	1,689,986	1,689,990	1,690,000	1,717,600	1,793,743	2,020,177	1,894,937	1,756,942	1,687,394
2000	1,624,457	1,614,466	1,598,823	1,674,758	1,689,992	1,690,000	1,713,910	1,930,492	2,030,000	1,869,201	1,728,017	1,657,692
2001	1,603,232	1,590,888	1,579,361	1,571,337	1,589,625	1,655,516	1,658,030	1,751,843	1,625,780	1,466,278	1,331,576	1,266,879
2002	1,219,908	1,228,730	1,298,102	1,353,519	1,400,609	1,429,186	1,446,975	1,572,955	1,603,183	1,444,951	1,310,643	1,242,810
Avg (21-02)	1,311,299	1,320,223	1,364,704	1,409,926	1,461,118	1,494,905	1,500,141	1,568,630	1,654,109	1,565,583	1,437,114	1,357,135

Table 3.5-3

Difference in Don Pedro Reservoir Storage (Acre-feet)

No Purchase Increase minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	197	197	197	197	79	0	0	4,133	12,260	12,206	12,153	12,114
1922	12,088	12,082	12,082	12,086	4,835	0	0	11,331	0	0	0	0
1923	0	0	0	0	0	0	0	14,785	17,769	17,692	17,614	17,558
1924	17,522	17,513	17,513	17,519	17,521	17,513	24,674	29,260	29,160	29,028	28,890	28,787
1925	28,723	28,706	28,707	28,716	28,718	28,708	32,572	66,601	73,087	72,767	72,439	72,193
1926	72,042	72,000	72,467	72,488	72,684	72,658	80,076	86,135	100,802	100,343	99,879	99,544
1927	99,338	99,283	103,147	103,176	103,184	103,146	103,048	131,342	81,911	81,559	81,201	72,918
1928	65,891	34,565	97	0	0	0	7,501	14,020	17,006	16,934	16,858	16,802
1929	16,767	16,758	16,758	16,763	16,764	16,758	16,742	24,633	38,170	37,996	37,821	37,694
1930	37,616	37,595	37,597	37,607	37,610	37,596	37,561	44,617	44,466	44,267	44,064	43,912
1931	43,817	43,791	43,794	43,806	43,810	43,793	43,749	43,628	43,470	43,265	43,054	42,901
1932	42,810	42,787	77,141	80,778	92,018	104,906	108,972	116,723	125,895	125,329	124,752	124,326
1933	124,070	124,000	124,006	124,041	124,051	124,005	125,503	126,576	133,349	132,743	132,122	131,654
1934	131,366	131,289	144,427	140,341	140,586	144,367	144,775	145,668	146,421	145,723	145,019	144,508
1935	144,195	144,110	144,116	148,075	154,383	156,244	167,738	174,136	185,921	185,116	184,290	183,673
1936	183,291	183,187	183,191	183,174	73,041	0	0	16,164	18,226	18,147	18,067	18,010
1937	17,973	17,964	17,974	18,011	6,777	0	0	10,236	17,568	17,492	17,415	17,359
1938	17,325	17,314	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	16,514	12,670	12,627	12,569	12,512	12,470
1940	12,444	12,438	18,440	21,412	6,618	0	0	4,239	9,096	9,056	9,016	8,988
1941	8,969	8,963	9,783	-1	-37	0	0	3,020	0	0	0	0
1942	0	0	0	-1	0	0	0	0	0	0	0	0
1943	0	0	0	0	-580	0	0	3,136	0	0	0	0
1944	0	0	0	0	0	0	0	21,432	23,477	23,376	23,271	23,193
1945	23,144	23,131	23,133	23,139	9,257	0	0	6,372	20,440	20,352	20,263	20,198
1946	13,556	0	0	0	0	0	0	11,862	14,396	14,336	14,271	14,222
1947	14,193	14,184	14,185	14,189	14,191	14,185	14,171	38,242	39,304	39,124	38,944	38,813
1948	38,731	38,708	38,710	38,960	38,963	44,658	47,603	52,277	67,760	67,451	67,136	66,909
1949	66,771	66,734	66,737	66,749	66,753	72,390	76,677	82,703	94,137	93,703	93,276	92,960
1950	92,762	92,707	91,394	94,110	96,780	98,258	99,444	100,235	105,327	104,840	104,363	104,011
1951	103,792	123,651	-3	0	0	0	3,726	6,446	19,883	19,794	19,702	19,635
1952	19,594	19,583	19,584	23,932	9,575	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	14,214	18,194	21,996	21,901	21,806	21,735
1954	21,689	21,678	21,679	21,685	21,686	21,678	21,659	44,405	46,832	46,632	46,423	46,268
1955	46,171	46,146	46,147	46,160	46,165	46,148	46,008	47,402	54,942	54,695	54,443	54,256
1956	54,145	54,115	-2	1	0	0	0	8,404	0	0	0	0
1957	0	0	0	0	0	0	0	14,482	15,629	15,562	15,492	15,441
1958	15,409	15,400	15,401	15,406	6,163	2,463	0	0	0	0	0	0
1959	0	0	0	0	0	0	1,969	12,206	12,165	12,110	12,053	12,013
1960	11,988	11,982	11,982	11,985	19,172	24,588	24,973	25,643	21,539	21,441	21,342	21,268
1961	21,221	21,208	34,132	34,142	34,145	34,132	34,096	34,663	34,538	34,375	34,209	34,086
1962	34,011	33,991	33,992	34,003	34,006	33,993	33,959	119,253	125,551	124,984	124,403	123,961
1963	123,690	123,617	118,065	107,267	123,677	123,632	123,513	150,878	153,138	152,474	151,811	151,318
1964	151,014	111,366	95,701	77,593	61,108	61,087	61,326	68,101	75,507	75,165	74,814	74,564
1965	74,411	74,370	76,270	-11	-1,035	0	0	3,114	8,313	8,277	8,242	-13
1966	-13	0	0	0	-353	0	7,191	7,173	7,149	7,117	7,085	7,060
1967	7,046	7,042	7,042	7,045	7,045	-245	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	14,419	15,565	15,494	15,422	15,371
1969	15,339	15,331	15,331	-2	0	0	0	0	0	0	0	0
1970	0	0	0	-2	0	0	0	8,426	9,594	9,553	9,509	9,478
1971	9,458	9,453	9,454	9,456	3,783	0	0	12,859	14,931	14,866	14,801	14,753
1972	14,723	14,714	14,715	14,719	5,888	5,886	5,881	35,154	35,035	34,875	34,712	34,596
1973	34,524	34,505	34,507	34,517	34,520	13,904	10,121	33,169	0	0	1	0
1974	0	0	0	0	0	0	0	-652	0	0	0	0
1975	0	0	0	0	0	0	0	17,226	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	94,037	0	-1	0	0
1979	1,857	1,857	1,857	0	0	0	0	0	2,114	2,105	2,096	2,089
1980	2,084	2,084	2,083	-3	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	2,532	19,290	19,205	19,116	19,050
1982	19,010	19,000	19,000	-3	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	197	3,230	5,333	5,310	5,286	5,268
1985	5,258	5,255	5,255	5,257	5,257	5,255	5,250	13,334	13,289	13,230	13,168	13,123
1986	13,096	13,089	15,723	15,728	4,861	0	0	0	0	0	1	0
1987	1	0	0	0	0	1	0	1,237	10,646	10,597	10,548	10,513
1988	10,491	10,486	10,486	10,488	-3,171	-3,170	2,411	4,752	36,530	41,352	41,155	41,009
1989	40,919	40,894	40,897	40,908	40,912	40,896	43,776	77,727	82,333	81,962	81,586	81,306
1990	81,134	81,088	81,092	81,115	81,121	81,092	81,013	98,471	98,131	97,678	97,205	96,862
1991	96,652	96,595	95,845	95,497	95,316	95,279	95,183	121,700	137,499	123,776	132,016	134,624
1992	134,330	134,251	134,257	134,298	134,309	134,258	119,369	144,528	144,031	143,368	142,676	142,172
1993	141,864	141,775	141,781	145,695	145,727	159,269	165,875	169,573	53,066	52,838	36,792	-59
1994	-59	-59	-59	-59	-59	-59	-59	9,931	9,897	9,852	9,805	9,773
1995	9,753	9,747	9,748	9,750	916	0	10,394	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	-1	0	0	5,800	7,021	8,194	8,158	8,123	8,097
1998	8,081	8,077	8,077	-1	0	0	-1,472	0	0	0	0	0
1999	0	0	0	0	0	0	0	10,090	9,823	9,781	9,738	9,707
2000	9,688	9,682	9,682	9,685	0	0	0	20,020	0	0	0	0
2001	0	0	0	0	0	0	0	25,145	26,045	25,929	25,810	25,721
2002	25,668	25,654	25,655	25,662	25,664	25,654	25,629	47,027	46,869	46,659	46,444	46,285
Avg (21-02)	32,727	31,922	29,768	28,015	25,420	24,206	25,480	35,701	34,725	34,470	34,226	33,501

Figure 3.5-1 and Table 3.5-4 illustrate that, during drought sequences, reduction to inflow to Don Pedro Reservoir can accumulate from year to year. Compared to the base setting, the alternative would result in lower Don Pedro Reservoir storage during drought periods. Figure 3.5-2 illustrates the difference in reservoir storage averaged by year type for the comparison of the alternative to the WSIP settings. Also shown is the average difference in storage for the two settings during the 82-year simulation. Figure 3.5-3 illustrates the same information for the comparison between the alternative and the base settings.

Figure 3.5-2

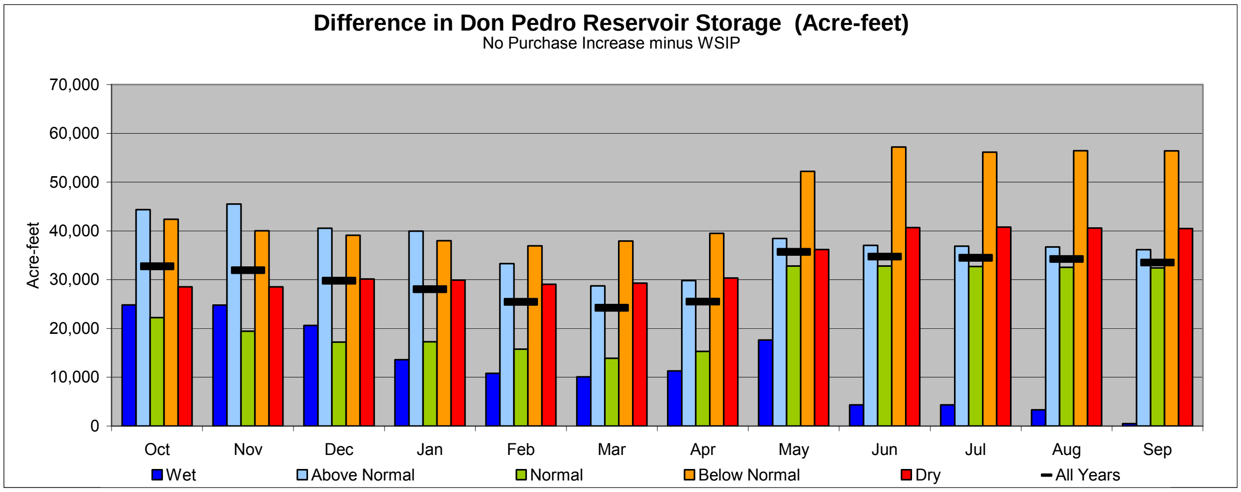


Figure 3.5-3

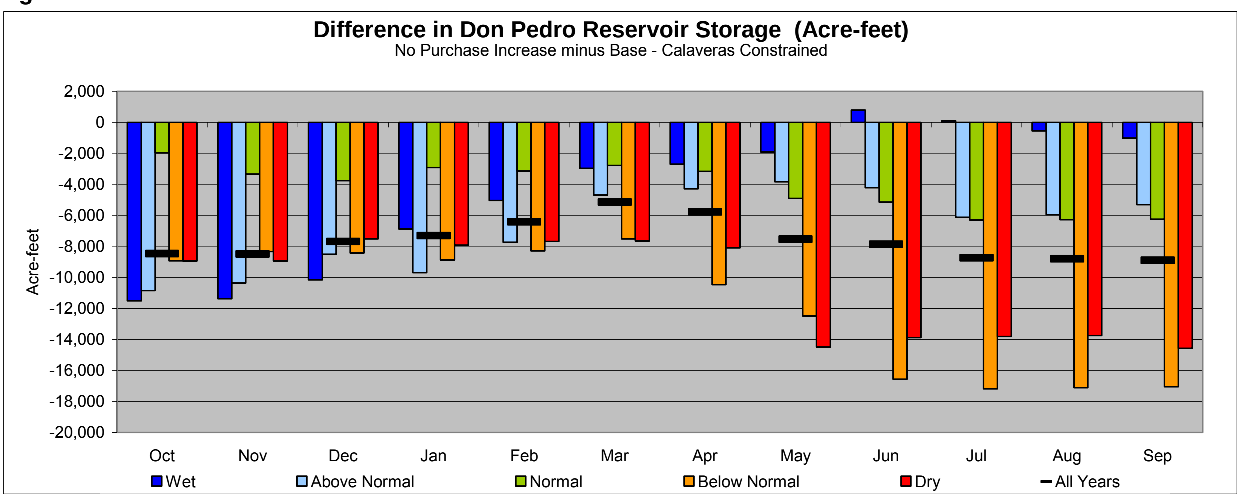


Figure 3.5-4 illustrates the average monthly storage in Don Pedro Reservoir for the 82-year simulation, and the range in storage for each month for the alternative and base settings.

The difference in storage in Don Pedro Reservoir attributed to the upstream effects of the alternative would manifest in differences in releases from La Grange Dam to the stream. A different amount of available reservoir space in the winter and spring due to the alternative would lead to a different ability to regulate inflow, thus potentially changing the amount of water released to the stream that is above minimum release requirements. During periods when inflow differs and Don Pedro Reservoir is at maximum storage capacity within the flood control storage limitation, a change in inflow directly manifests as a change in release from La Grange Dam (a change of either more or less flow). Figure 3.5-1 illustrates the stream release from La Grange Dam for the WSIP, alternative, and base settings.

Table 3.5-4

Difference in Don Pedro Reservoir Storage (Acre-feet)

No Purchase Increase minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	0	0	0	0	0	0	0	660	19	-2,164	-2,155	-2,148
1922	-2,144	-2,142	-2,142	-2,142	-857	0	0	1,497	0	-2,184	-1,520	3
1923	3	2	0	0	0	0	0	-6,070	-5,131	-7,291	-7,260	-7,237
1924	-7,222	-7,218	-7,219	-7,221	-7,220	-7,219	-3,163	-2,190	-2,182	-2,173	-2,163	-2,154
1925	-2,150	-2,149	-2,149	-2,149	-2,150	-2,148	-2,886	11,163	15,721	13,471	13,411	13,366
1926	13,338	13,330	13,299	13,303	13,298	13,869	14,152	10,257	1,666	1,659	1,652	1,646
1927	1,643	1,642	12,101	12,105	12,105	12,101	12,090	12,923	0	-2,184	-1,531	2
1928	0	0	0	0	0	0	0	950	1,866	1,858	1,850	1,843
1929	1,839	1,839	1,838	1,839	1,839	1,839	1,837	-16,135	-16,999	-16,921	-16,842	-16,786
1930	-16,751	-16,742	-16,743	-16,748	-16,748	-16,743	-16,726	-9,527	-11,608	-11,555	-11,503	-11,464
1931	-11,439	-11,433	-11,433	-11,437	-11,438	-11,433	-11,422	-11,390	-11,349	-11,294	-11,241	-11,200
1932	-11,176	-11,168	-8,927	-12,555	-12,311	-19,854	-20,586	-21,406	-22,055	-24,139	-24,030	-23,949
1933	-23,898	-23,885	-23,885	-23,893	-23,894	-23,885	-27,895	-32,242	-45,807	-47,785	-47,566	-47,402
1934	-47,299	-47,270	-28,478	-34,858	-31,146	-30,652	-39,143	-57,094	-57,425	-57,161	-56,890	-56,687
1935	-56,561	-56,527	-56,530	-68,172	-75,688	-54,332	-47,673	-50,940	-66,960	-68,852	-68,554	-68,328
1936	-68,189	-68,151	-68,154	-68,182	-27,963	0	0	-1,289	-1,285	-3,464	-3,448	-3,437
1937	-3,431	-3,428	-3,428	-3,429	-1,466	0	0	500	-1,340	-3,518	-3,502	-3,492
1938	-3,484	-3,482	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	-12,399	-14,553	-16,618	-16,542	-16,465	-16,411
1940	-16,377	-16,367	-9,634	-5,955	-2,805	0	0	10,414	10,379	10,334	10,289	10,256
1941	10,234	10,228	10,120	-1	15	0	0	-75	0	-2,183	-1,521	3
1942	3	3	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	-580	0	0	-1,900	0	-2,183	-2,174	4
1944	3	4	4	3	2	0	0	-12,185	-12,145	-14,277	-14,213	-14,165
1945	-14,136	-14,128	-14,128	-14,132	-5,653	0	0	6,087	31,325	29,007	28,880	28,788
1946	22,130	0	0	0	0	0	0	220	678	676	673	670
1947	669	669	669	669	670	669	668	-8,442	-9,332	-9,288	-9,246	-9,214
1948	-9,195	-9,191	-9,190	-8,954	-8,955	-8,951	-10,777	-10,507	-9,192	-11,333	-11,281	-11,242
1949	-11,219	-11,213	-11,212	-11,248	-11,249	-2,676	-2,454	260	3,003	2,989	2,976	2,966
1950	2,960	2,958	-3,740	3,322	-9,360	-17,105	-16,744	-16,936	-8,887	-10,232	-10,185	-10,151
1951	-10,130	-2,096	0	0	0	0	802	2,605	6,847	4,634	4,612	4,596
1952	4,586	4,584	4,584	4,445	1,779	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	-5,617	-3,798	-2,040	-4,214	-4,196	-4,182
1954	-4,174	-4,171	-4,171	-4,173	-4,173	-4,171	-4,167	-14,211	-13,704	-13,644	-13,583	-13,539
1955	-13,510	-13,502	-13,503	-13,507	-13,508	-13,503	-15,810	-18,141	-21,136	-21,041	-20,944	-20,873
1956	-20,829	-20,818	0	0	0	0	0	289	0	0	0	0
1957	0	0	0	0	0	0	0	-19,113	-19,971	-22,068	-21,970	-21,897
1958	-21,851	-21,839	-21,839	-21,845	-8,739	-3,494	0	0	0	0	0	0
1959	0	0	0	0	0	0	-3,794	-10,209	-10,175	-10,129	-10,081	-10,048
1960	-10,028	-10,021	-10,022	-10,025	-6,286	-2,270	-3,140	-1,343	-3,683	-3,666	-3,649	-3,637
1961	-3,628	-3,626	311	311	312	311	310	-291	-290	-288	-287	-287
1962	-285	-285	-286	-285	-286	-285	-285	-14,770	-15,638	-17,751	-17,670	-17,609
1963	-17,570	-17,560	-7,324	-5,718	-17,575	-17,569	-17,551	-20,184	-19,199	-21,299	-21,206	-21,139
1964	-9,918	0	0	0	0	0	-2,117	-7,969	-33,127	-32,978	-32,826	-32,714
1965	-32,647	-32,629	-20,576	3	2	0	0	4,462	22,221	19,942	17,671	-28
1966	-28	0	0	0	0	0	-19,773	-18,108	-20,164	-20,074	-19,981	-19,913
1967	-19,872	-19,861	-19,862	-19,867	-19,869	-10,102	0	0	0	0	-2,183	3
1968	4	4	4	3	2	0	0	-17,434	-18,295	-18,213	-18,128	-18,067
1969	-18,030	-18,020	-18,021	3	0	0	0	0	0	0	0	0
1970	0	0	0	-5	1,189	0	0	-3,065	-3,973	-6,139	-6,113	-6,092
1971	-6,080	-6,075	-6,076	-6,078	-2,432	0	0	-10,976	-10,940	-13,075	-13,019	-12,975
1972	-12,949	-12,942	-12,942	-12,946	-5,179	-5,178	-5,172	-9,003	-11,086	-11,036	-10,985	-10,948
1973	-10,926	-10,919	-10,919	-10,922	-10,924	0	0	6,980	0	0	0	0
1974	0	0	0	1	1	0	0	0	0	-2,184	-2,174	3
1975	4	4	3	3	1	0	0	18,424	0	-2,184	-1,521	2
1976	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	6,649	0	-2,184	-2,174	-2,476
1979	-6,460	-6,456	-6,456	1	1	0	0	0	0	0	0	0
1980	0	0	0	-3	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	-2,117	-12,159	-12,120	-12,066	-12,011	-11,970
1982	-11,944	-11,937	-11,938	2	0	0	0	0	0	0	-2,183	0
1983	0	0	0	0	0	0	0	0	0	0	-2,183	3
1984	0	0	0	0	0	0	0	-10,790	-10,755	-12,892	-12,835	-12,792
1985	-12,765	-12,758	-12,759	-12,762	-12,763	-12,758	-12,746	-11,331	-13,407	-13,346	-13,285	-13,240
1986	-13,212	-13,205	-16,131	-14,216	-5,661	0	0	0	0	-2,183	-2,173	-2,167
1987	-2,162	-2,161	-2,162	-2,162	-2,162	-2,161	-2,159	-14,516	-16,579	-16,503	-16,429	-16,373
1988	-16,339	-16,329	-16,330	-16,335	-16,336	-16,330	-16,314	-16,272	-18,366	-18,282	-18,196	-18,133
1989	-18,093	-18,082	-18,083	-18,089	-18,090	-18,084	-38,004	-35,056	-32,176	-32,031	-31,884	-31,776
1990	-31,711	-31,692	-31,694	-31,703	-31,706	-31,693	-31,663	-28,091	-8,146	-8,110	-8,071	-21,930
1991	-27,264	-27,248	-28,789	-36,679	-38,228	-38,213	-38,173	-9,529	-22,291	-25,284	-25,167	-25,082
1992	-25,028	-25,015	-25,015	-25,023	-25,024	-25,015	-9,476	-10,949	-10,912	-10,863	-10,812	-10,772
1993	-10,749	-10,743	-24,724	-36,234	-36,248	-33,922	-36,496	-33,251	0	-2,184	-1,520	3
1994	3	2	2	2	3	3	3	-20,604	-22,647	-22,545	-22,439	-22,363
1995	-22,316	-22,304	-22,305	-22,312	-11,910	0	1,191	0	0	0	-2,184	3
1996	4	3	4	4	0	0	0	0	0	-2,183	-2,174	-2,167
1997	-2,163	0	0	1	0	0	-7,822	-8,753	-9,643	-11,786	-11,735	-11,697
1998	-11,673	-11,667	-11,668	2	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	-10,507	0	-2,183	-2,174	-2,167
2000	-2,162	-2,162	-2,162	-2,162	0	0	0	7,829	0	0	0	0
2001	0	0	0	0	0	0	0	-20,232	-21,086	-20,993	-20,896	-20,824
2002	-20,779	-20,768	-20,769	-20,775	-20,777	-20,770	-20,750	-36,978	-38,969	-38,797	-38,619	-38,486
Avg (21-02)	-8,470	-8,489	-7,690	-7,303	-6,416	-5,143	-5,780	-7,541	-7,867	-8,738	-8,792	-8,898

Figure 3.5-4

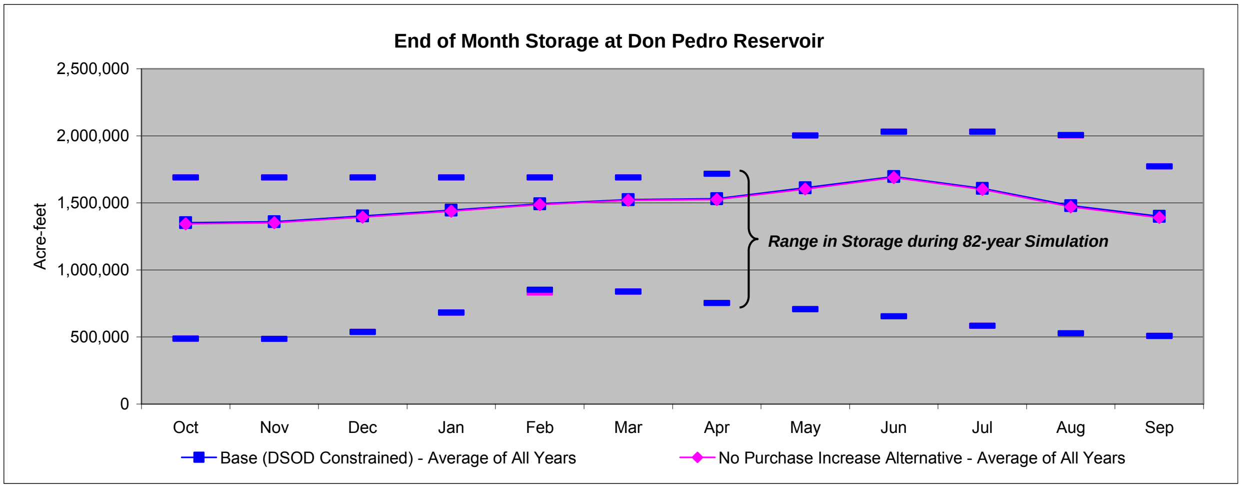


Table 3.5-5 illustrates the difference in stream releases between the alternative and WSIP settings. Compared to the WSIP setting, the alternative exhibits an incrementally larger stream release, predominantly during some months of the early-winter-through-June period, which reflects the months when releases to the stream above minimum release requirements are made due to flood control or in anticipation of the reservoir being filled. Table 3.5-6 illustrates the same information in comparing the alternative and WSIP settings, with years ranked in descending order of the San Joaquin River Index. Illustrated is the finding that differences in releases to the Tuolumne River from La Grange Dam would occur only when there are releases above minimum FERC flow requirements. This circumstance typically occurs only in above-normal and wet years, and predominantly during early winter through June. During other year types and during summer and fall, releases would be maintained at minimum FERC flow requirements regardless of the setting. Compared to the WSIP setting, the large potential reduction in flow following an extended drought period is reduced with the alternative because the amount of water delivered by the SFPUC during these periods is less than in the WSIP setting, but is still more than in the base setting.

As described above concerning Don Pedro inflow and storage, compared to the base setting, the alternative setting would lead to an additional draw of storage due to SFPUC diversions that are greater than in the base setting in drought periods. Although the reduction in storage would not greatly accumulate, greater replenishment of Don Pedro Reservoir storage is needed in about 30 percent of the years of the 82-year simulation. Occasionally, an increase in releases would occur. This circumstance would occur because of the shift in timing of SJPL diversions due to the increased conveyance capacity. The effect is an occasional additional release of water from Hetch Hetchy Reservoir in the winter, which then manifests as an additional release from Don Pedro Reservoir. Table 3.5-7 illustrates the difference in stream releases between the alternative and base settings, depicting the predominance of reductions to flow. Table 3.5-8 illustrates the same information, ranked in descending order of the San Joaquin River Index.

Table 3.5-5 and Table 3.5-7 illustrate the difference in stream release between the alternative, WSIP, and base settings, expressed in terms of a monthly volume (acre-feet) of flow. Table 3.5-9 illustrates the same information and the average monthly stream release for the alternative and WSIP settings, expressed in average monthly flow (cfs). Table 3.5-10 presents the same information in comparing the alternative and base settings. In comparing the alternative to the WSIP setting, the difference in monthly flow below La Grange Dam could range from an increase of approximately 123,000 acre-feet to a decrease of approximately 7,000 acre-feet. Considering the manner in which releases are determined and made to the stream, quantifying the effect of these changes in terms of average monthly flow (cfs) is not always meaningful. Similar to the operation of releases below O'Shaughnessy Dam, a change in the volume of release from La Grange Dam to the stream would likely result in the initiation of the release being delayed or accelerated by a matter of days. Assuming that a change in release volume equates to a delay or acceleration of releasing 6,000 acre-feet per day, the difference in stream release from La Grange Dam between the alternative and WSIP would be an additional day of delay in releases or up to almost an

Table 3.5-5

Difference in Total La Grange Release to River (Acre-feet)

No Purchase Increase minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	118	8,716	1,133	0	0	0	0	0	9,967
1922	0	0	0	0	7,251	4,834	8,286	6,764	15,179	0	0	0	42,314
1923	0	0	0	0	0	0	4,879	0	0	0	0	0	4,879
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	48,358	0	0	8,037	56,395
1928	6,889	31,299	34,469	97	0	1,043	16,297	0	0	0	0	0	90,094
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	111,330	84,242	4,697	0	0	0	0	0	200,269
1937	0	0	0	0	13,375	12,098	11,514	0	0	0	0	0	36,987
1938	0	0	15,461	0	0	45	11,329	20,634	4,880	0	0	0	52,349
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	24,536	18,774	5,356	0	0	0	0	0	48,666
1941	0	0	0	9,785	217	135	211	0	6,282	0	0	0	16,630
1942	0	0	0	6,571	0	3,805	7,365	2,855	2,762	0	0	0	23,358
1943	0	0	0	0	3,481	11,965	6,721	0	6,169	0	0	0	28,336
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	13,884	12,204	1,454	0	0	0	0	0	27,542
1946	6,608	13,553	0	0	0	7,641	1,704	0	0	0	0	0	29,506
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	123,656	-2	0	0	0	0	0	0	0	0	123,654
1952	0	0	0	0	14,360	9,572	0	18,593	4,879	0	0	0	47,404
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	60,795	-1	0	4,566	4,697	0	12,257	0	0	0	82,314
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	9,243	3,697	2,463	23,716	2,854	0	0	0	41,973
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	39,575	15,670	18,132	16,489	0	0	0	0	0	0	0	89,866
1965	0	0	0	81,999	6,180	2,866	10,053	0	0	0	0	8,241	109,339
1966	0	-13	3,406	0	2,121	6,099	0	0	0	0	0	0	11,613
1967	0	0	0	0	0	22,602	-246	16,228	2,762	0	0	0	41,346
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	15,335	11,777	6,138	7,641	3,140	3,038	0	0	0	47,069
1970	0	0	326	10,325	-1	2,896	0	0	0	0	0	0	13,546
1971	0	0	0	0	5,674	3,782	0	0	0	0	0	0	9,456
1972	0	0	0	0	8,831	0	0	0	0	0	0	0	8,831
1973	0	0	0	0	0	20,607	3,772	5,558	37,994	0	0	0	67,931
1974	0	0	0	2,825	0	5,899	5,524	5,694	4,229	0	0	0	24,171
1975	0	0	0	0	0	0	7,366	0	21,066	0	0	0	28,432
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	97,653	0	0	0	97,653
1979	0	0	0	1,858	0	10,509	0	2,189	0	0	0	0	14,556
1980	0	0	0	21,778	-7,494	12,117	3,867	3,139	3,039	0	0	0	36,446
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	22,189	12,097	2,663	0	2,854	2,762	0	0	1,196	43,761
1983	2,949	1,841	0	-1	0	0	0	4,848	1,841	0	0	0	11,478
1984	6,944	2,763	0	0	0	0	0	0	0	0	0	0	9,707
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	10,117	26,744	12,221	5,042	4,879	0	0	0	59,003
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	123,909	0	15,852	36,792	176,553
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	23,754	8,272	0	15,137	4,604	0	0	0	51,767
1996	0	0	0	0	4,975	0	4,880	3,996	3,867	0	0	0	17,718
1997	0	0	0	8,720	-1	0	0	0	0	0	0	0	8,719
1998	0	0	0	8,080	-1	13,949	8,839	2,430	3,774	0	0	0	37,071
1999	0	0	0	0	0	7,611	8,301	0	4,762	0	0	0	20,674
2000	0	0	0	0	9,685	0	0	0	21,186	0	0	0	30,871
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	285	1,086	3,095	2,533	3,683	4,099	1,955	1,742	5,427	0	193	662	24,759

Table 3.5-6

Difference in Total La Grange Release to River (Acre-feet)

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending SJR Index

No Purchase Increase minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1983	2,949	1,841	0	-1	0	0	0	4,848	1,841	0	0	0	11,478
1969	0	0	0	15,335	11,777	6,138	7,641	3,140	3,038	0	0	0	47,069
1995	0	0	0	0	23,754	8,272	0	15,137	4,604	0	0	0	51,767
1938	0	0	15,461	0	0	45	11,329	20,634	4,880	0	0	0	52,349
1998	0	0	0	8,080	-1	13,949	8,839	2,430	3,774	0	0	0	37,071
1982	0	0	0	22,189	12,097	2,663	0	2,854	2,762	0	0	1,196	43,761
1967	0	0	0	0	0	22,602	-246	16,228	2,762	0	0	0	41,346
1952	0	0	0	0	14,360	9,572	0	18,593	4,879	0	0	0	47,404
1958	0	0	0	0	9,243	3,697	2,463	23,716	2,854	0	0	0	41,973
1980	0	0	0	21,778	-7,494	12,117	3,867	3,139	3,039	0	0	0	36,446
1978	0	0	0	0	0	0	0	0	97,653	0	0	0	97,653
1922	0	0	0	0	7,251	4,834	8,286	6,764	15,179	0	0	0	42,314
1956	0	0	60,795	-1	0	4,566	4,697	0	12,257	0	0	0	82,314
1942	0	0	0	6,571	0	3,805	7,365	2,855	2,762	0	0	0	23,358
1941	0	0	0	9,785	217	135	211	0	6,282	0	0	0	16,630
1986	0	0	0	0	10,117	26,744	12,221	5,042	4,879	0	0	0	59,003
1993	0	0	0	0	0	0	0	0	123,909	0	15,852	36,792	176,553
1997	0	0	0	8,720	-1	0	0	0	0	0	0	0	8,719
1996	0	0	0	0	4,975	0	4,880	3,996	3,867	0	0	0	17,718
1943	0	0	0	0	3,481	11,965	6,721	0	6,169	0	0	0	28,336
1937	0	0	0	0	13,375	12,098	11,514	0	0	0	0	0	36,987
1974	0	0	0	2,825	0	5,899	5,524	5,694	4,229	0	0	0	24,171
1975	0	0	0	0	0	0	7,366	0	21,066	0	0	0	28,432
1965	0	0	0	81,999	6,180	2,866	10,053	0	0	0	0	8,241	109,339
1936	0	0	0	0	111,330	84,242	4,697	0	0	0	0	0	200,269
1984	6,944	2,763	0	0	0	0	0	0	0	0	0	0	9,707
1979	0	0	0	1,858	0	10,509	0	2,189	0	0	0	0	14,556
1945	0	0	0	0	13,884	12,204	1,454	0	0	0	0	0	27,542
1999	0	0	0	0	0	7,611	8,301	0	4,762	0	0	0	20,674
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	48,358	0	0	8,037	56,395
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1946	6,608	13,553	0	0	0	7,641	1,704	0	0	0	0	0	29,506
1973	0	0	0	0	0	20,607	3,772	5,558	37,994	0	0	0	67,931
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	9,685	0	0	0	21,186	0	0	0	30,871
1940	0	0	0	0	24,536	18,774	5,356	0	0	0	0	0	48,666
1923	0	0	0	0	0	0	4,879	0	0	0	0	0	4,879
1921	0	0	0	0	118	8,716	1,133	0	0	0	0	0	9,967
1970	0	0	326	10,325	-1	2,896	0	0	0	0	0	0	13,546
1951	0	0	123,656	-2	0	0	0	0	0	0	0	0	123,654
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	5,674	3,782	0	0	0	0	0	0	9,456
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1928	6,889	31,299	34,469	97	0	1,043	16,297	0	0	0	0	0	90,094
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	-13	3,406	0	2,121	6,099	0	0	0	0	0	0	11,613
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	39,575	15,670	18,132	16,489	0	0	0	0	0	0	0	89,866
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	8,831	0	0	0	0	0	0	0	8,831
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 3.5-7

Difference in Total La Grange Release to River (Acre-feet)

No Purchase Increase minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	-6,985	-2,467	0	0	0	0	0	-9,452
1922	0	0	0	0	-1,286	-857	921	1,080	482	0	-655	-1,521	-1,836
1923	0	0	3	0	0	0	2,762	0	0	0	0	0	2,765
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	4,530	0	-644	-1,532	2,354
1928	3	0	0	0	0	-4,296	5,524	0	0	0	0	0	1,231
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	-40,223	-34,833	-238	0	0	0	0	0	-75,294
1937	0	0	0	0	-1,494	-908	7,827	0	0	0	0	0	5,425
1938	0	0	-3,483	0	0	0	1,986	1,083	0	-2,189	0	0	-2,603
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	-1,036	-446	72	0	0	0	0	0	-1,410
1941	0	0	0	10,123	-98	-60	-93	0	-296	0	-655	-1,520	7,401
1942	0	0	2	2,076	0	0	1,841	0	0	-2,188	0	0	1,731
1943	0	0	0	0	3,481	504	1,842	0	-3,738	0	0	-2,173	-84
1944	0	0	0	0	2	1	0	0	0	0	0	0	3
1945	0	0	0	0	-8,479	-18,021	1,409	0	0	0	0	0	-25,091
1946	6,608	22,124	0	0	0	-5,751	-2,163	0	0	0	0	0	20,818
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	-2,096	0	0	0	0	0	0	0	0	0	-2,096
1952	0	0	0	0	2,667	1,778	0	-1,982	0	-2,188	0	0	275
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	-20,439	1	0	232	2,003	0	-725	-2,188	0	0	-21,116
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	-13,107	-5,244	-3,492	7,178	0	-2,188	0	0	-16,853
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	-11,189	-9,916	0	0	0	0	0	0	0	0	0	0	-21,105
1965	0	0	0	-20,583	2	-10,614	8,820	0	0	0	0	17,670	-4,705
1966	0	-28	-905	0	0	0	0	0	0	0	0	0	-933
1967	0	0	0	0	0	1,042	-10,098	6,535	2,762	-2,188	0	-2,184	-4,131
1968	0	0	0	0	2	1	0	0	0	0	0	0	3
1969	0	0	0	-18,026	4,570	0	0	-1,903	-1,841	-2,188	0	0	-19,388
1970	0	0	326	32,162	-7,146	-13,183	0	0	0	0	0	0	12,159
1971	0	0	0	0	-3,647	-2,431	0	0	0	0	0	0	-6,078
1972	0	0	0	0	-7,768	0	0	0	0	0	0	0	-7,768
1973	0	0	0	0	0	-10,921	0	5,558	9,731	0	0	0	4,368
1974	0	0	0	-8,330	1	-2,663	0	0	0	0	0	-2,174	-13,166
1975	0	0	0	0	2	1	-920	0	21,314	0	-655	-1,520	18,222
1976	2	0	0	0	0	0	0	0	0	0	0	0	2
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	4,796	0	0	0	4,796
1979	0	0	0	-6,458	0	-8,594	-2,118	0	0	0	0	0	-17,170
1980	0	0	0	25,612	-7,495	3,555	-1,013	-1,903	-1,841	-2,188	0	0	14,727
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	-8,758	1,938	0	0	0	0	-2,188	0	-3,101	-12,109
1983	0	0	2,664	-1	0	0	0	-951	-921	-2,188	0	-2,183	-3,580
1984	-211	2,763	0	0	0	3,935	0	0	0	0	0	0	6,487
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	-5,663	-3,904	921	0	0	0	0	0	-8,646
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	-64,053	0	-655	-1,521	-66,229
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	4,516	393	0	2,140	921	-2,188	0	-2,183	3,599
1996	0	0	0	0	1,447	0	-1,841	1,808	1,749	0	0	0	3,163
1997	0	-2,162	0	-4,027	1	0	0	0	0	0	0	0	-6,188
1998	0	0	0	-11,671	2	7,275	0	0	0	-2,188	0	0	-6,582
1999	0	0	0	0	0	-1,903	3,297	0	-11,502	0	0	0	-10,108
2000	0	0	0	0	-2,163	0	0	0	6,896	0	0	0	4,733
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	-58	156	-292	-96	-987	-1,377	180	227	-387	-320	-40	-48	-3,042

Table 3.5-8

Difference in Total La Grange Release to River (Acre-feet)

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending SJR Index No Purchase Increase minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1983	0	0	2,664	-1	0	0	0	-951	-921	-2,188	0	-2,183	-3,580
1969	0	0	0	-18,026	4,570	0	0	-1,903	-1,841	-2,188	0	0	-19,388
1995	0	0	0	0	4,516	393	0	2,140	921	-2,188	0	-2,183	3,599
1938	0	0	-3,483	0	0	0	1,986	1,083	0	-2,189	0	0	-2,603
1998	0	0	0	-11,671	2	7,275	0	0	0	-2,188	0	0	-6,582
1982	0	0	0	-8,758	1,938	0	0	0	0	-2,188	0	-3,101	-12,109
1967	0	0	0	0	0	1,042	-10,098	6,535	2,762	-2,188	0	-2,184	-4,131
1952	0	0	0	0	2,667	1,778	0	-1,982	0	-2,188	0	0	275
1958	0	0	0	0	-13,107	-5,244	-3,492	7,178	0	-2,188	0	0	-16,853
1980	0	0	0	25,612	-7,495	3,555	-1,013	-1,903	-1,841	-2,188	0	0	14,727
1978	0	0	0	0	0	0	0	0	4,796	0	0	0	4,796
1922	0	0	0	0	-1,286	-857	921	1,080	482	0	-655	-1,521	-1,836
1956	0	0	-20,439	1	0	232	2,003	0	-725	-2,188	0	0	-21,116
1942	0	0	2	2,076	0	0	1,841	0	0	-2,188	0	0	1,731
1941	0	0	0	10,123	-98	-60	-93	0	-296	0	-655	-1,520	7,401
1986	0	0	0	0	-5,663	-3,904	921	0	0	0	0	0	-8,646
1993	0	0	0	0	0	0	0	0	-64,053	0	-655	-1,521	-66,229
1997	0	-2,162	0	-4,027	1	0	0	0	0	0	0	0	-6,188
1996	0	0	0	0	1,447	0	-1,841	1,808	1,749	0	0	0	3,163
1943	0	0	0	0	3,481	504	1,842	0	-3,738	0	0	-2,173	-84
1937	0	0	0	0	-1,494	-908	7,827	0	0	0	0	0	5,425
1974	0	0	0	-8,330	1	-2,663	0	0	0	0	0	-2,174	-13,166
1975	0	0	0	0	2	1	-920	0	21,314	0	-655	-1,520	18,222
1965	0	0	0	-20,583	2	-10,614	8,820	0	0	0	0	17,670	-4,705
1936	0	0	0	0	-40,223	-34,833	-238	0	0	0	0	0	-75,294
1984	-211	2,763	0	0	0	3,935	0	0	0	0	0	0	6,487
1979	0	0	0	-6,458	0	-8,594	-2,118	0	0	0	0	0	-17,170
1945	0	0	0	0	-8,479	-18,021	1,409	0	0	0	0	0	-25,091
1999	0	0	0	0	0	-1,903	3,297	0	-11,502	0	0	0	-10,108
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	4,530	0	-644	-1,532	2,354
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1946	6,608	22,124	0	0	0	-5,751	-2,163	0	0	0	0	0	20,818
1973	0	0	0	0	0	-10,921	0	5,558	9,731	0	0	0	4,368
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	-2,163	0	0	0	6,896	0	0	0	4,733
1940	0	0	0	0	-1,036	-446	72	0	0	0	0	0	-1,410
1923	0	0	3	0	0	0	2,762	0	0	0	0	0	2,765
1921	0	0	0	0	0	-6,985	-2,467	0	0	0	0	0	-9,452
1970	0	0	326	32,162	-7,146	-13,183	0	0	0	0	0	0	12,159
1951	0	0	-2,096	0	0	0	0	0	0	0	0	0	-2,096
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	-3,647	-2,431	0	0	0	0	0	0	-6,078
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	2	1	0	0	0	0	0	0	3
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1928	3	0	0	0	0	-4,296	5,524	0	0	0	0	0	1,231
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	-28	-905	0	0	0	0	0	0	0	0	0	-933
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	2	1	0	0	0	0	0	0	3
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	-11,189	-9,916	0	0	0	0	0	0	0	0	0	0	-21,105
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	-7,768	0	0	0	0	0	0	0	-7,768
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	2	0	0	0	0	0	0	0	0	0	0	0	2
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 3.5-9

Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by SJR Index Year Type) No Purchase Increase

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	26,505	22,138	51,804	131,498	195,275	251,489	204,109	194,933	214,486	78,864	31,620	77,174	1,479,894
Above Normal	18,683	31,658	75,513	78,830	129,940	115,353	93,308	83,243	24,820	14,739	14,739	14,736	695,564
Below Normal	18,058	18,666	25,900	19,559	35,935	39,636	57,494	58,008	4,463	4,612	4,612	4,463	291,406
Dry	20,742	18,493	17,945	17,522	26,199	25,876	29,552	30,537	4,349	4,494	4,494	4,349	204,549
Critical	14,534	11,590	12,560	11,644	10,518	11,644	20,489	21,172	2,975	3,074	3,074	2,975	126,250
All Years	20,398	20,968	39,903	62,742	95,557	109,696	96,180	91,773	69,845	28,125	14,297	27,566	677,049

Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by SJR Index Year Type) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	26,382	22,062	48,627	124,111	190,719	245,157	199,412	189,305	200,624	78,864	30,959	75,248	1,431,469
Above Normal	17,886	30,698	68,220	78,114	120,555	105,165	91,467	82,787	18,214	14,739	14,739	14,263	656,848
Below Normal	17,484	16,058	22,744	19,551	35,285	38,726	56,136	58,008	4,463	4,612	4,612	4,463	282,142
Dry	20,742	15,449	16,739	16,127	24,251	25,876	29,552	30,537	4,349	4,494	4,494	4,349	196,957
Critical	14,534	11,590	12,560	11,644	10,518	11,644	20,489	21,172	2,975	3,074	3,074	2,975	126,250
All Years	20,112	19,882	36,809	60,209	91,874	105,597	94,225	90,031	64,418	28,125	14,104	26,904	652,291

Difference in Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by SJR Index Year Type) No Purchase Increase minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	123	77	3,177	7,387	4,555	6,332	4,697	5,628	13,862	0	661	1,926	48,425
Above Normal	797	960	7,293	717	9,385	10,188	1,841	456	6,606	0	0	473	38,715
Below Normal	574	2,607	3,156	8	650	910	1,358	0	0	0	0	0	9,264
Dry	0	3,044	1,205	1,395	1,948	0	0	0	0	0	0	0	7,592
Critical	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	285	1,086	3,095	2,533	3,683	4,099	1,955	1,742	5,427	0	193	662	24,759

Table 3.5-10

Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by SJR Index Year Type) No Purchase Increase

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	26,505	22,138	51,804	131,498	195,275	251,489	204,109	194,933	214,486	78,864	31,620	77,174	1,479,894
Above Normal	18,683	31,658	75,513	78,830	129,940	115,353	93,308	83,243	24,820	14,739	14,739	14,736	695,564
Below Normal	18,058	18,666	25,900	19,559	35,935	39,636	57,494	58,008	4,463	4,612	4,612	4,463	291,406
Dry	20,742	18,493	17,945	17,522	26,199	25,876	29,552	30,537	4,349	4,494	4,494	4,349	204,549
Critical	14,534	11,590	12,560	11,644	10,518	11,644	20,489	21,172	2,975	3,074	3,074	2,975	126,250
All Years	20,398	20,968	39,903	62,742	95,557	109,696	96,180	91,773	69,845	28,125	14,297	27,566	677,049

Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by SJR Index Year Type) Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	26,505	22,228	52,690	132,897	195,713	251,883	203,746	194,388	216,210	79,958	31,729	77,274	1,485,222
Above Normal	18,307	30,194	75,617	77,318	133,414	121,042	93,276	82,916	24,252	14,739	14,777	14,826	700,678
Below Normal	18,058	18,668	25,976	19,559	36,239	40,197	57,034	58,008	4,463	4,612	4,612	4,463	291,887
Dry	21,603	19,256	17,945	17,522	26,796	25,876	29,552	30,537	4,349	4,494	4,494	4,349	206,770
Critical	14,533	11,590	12,560	11,644	10,518	11,644	20,489	21,172	2,975	3,074	3,074	2,975	126,249
All Years	20,456	20,812	40,195	62,838	96,544	111,073	96,000	91,545	70,232	28,445	14,337	27,614	680,091

Difference in Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by SJR Index Year Type) No Purchase Increase minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	-90	-886	-1,399	-438	-395	363	545	-1,725	-1,094	-109	-100	-5,328
Above Normal	376	1,464	-104	1,512	-3,473	-5,688	33	327	568	0	-38	-90	-5,114
Below Normal	0	-2	-75	0	-304	-561	460	0	0	0	0	0	-481
Dry	-861	-763	0	0	-597	0	0	0	0	0	0	0	-2,221
Critical	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	-58	156	-292	-96	-987	-1,377	180	227	-387	-320	-40	-48	-3,042

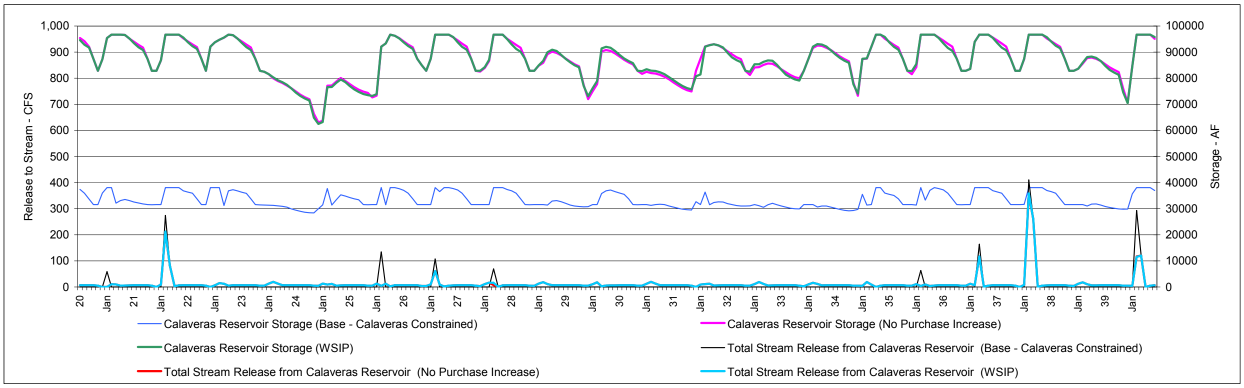
added month of release. Normally, the effect of a change in release would not affect the year's peak stream release rate during a year. However, infrequently, the alternative's effect on stream releases could manifest as an elimination of all flow during a year or as the only provision of flow that occurs in excess of minimum FERC flow requirements. Compared to the base setting, the alternative's effect to stream flow ranges from a reduction to releases (a potential delay in release of 10 days) to an increase in releases (a potential additional 5 days of release).

3.6 Calaveras and San Antonio Reservoirs, Alameda Creek and Downstream

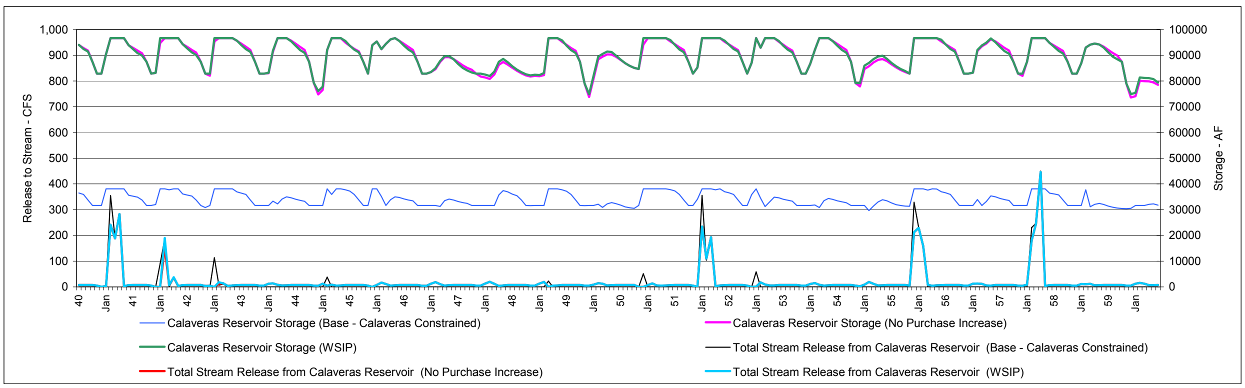
Compared to the WSIP setting, the operation of Calaveras Reservoir in the alternative setting is almost identical. Figure 3.6-1 illustrates a chronological trace of the simulation of Calaveras Reservoir storage and stream releases from Calaveras Dam. Shown in Figure 3.6-1 are the results for the WSIP, alternative, and base settings. Recognizing the different levels of system-wide deliveries served in each setting, the near identical operation of Calaveras Reservoir resulting from the two settings indicates that Calaveras Reservoir operations are mostly influenced by the principles that manage local watershed production. The differences in reservoir operation during the droughts of the 1960s and 1976-1977 are the result of modeling assumptions that balance reservoir storage among SFPUC reservoirs and the selection of the monthly SJPL conveyance rate. It is anticipated that the difference in Calaveras Reservoir operation in actual operations would be minimal, if at all.

Figure 3.6-1
Calaveras Reservoir Storage and Stream Release

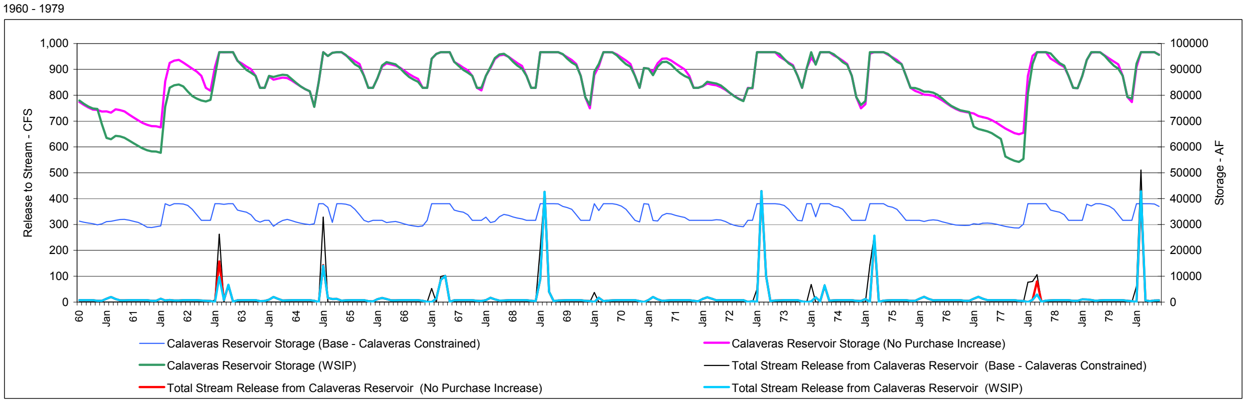
1920 - 1939



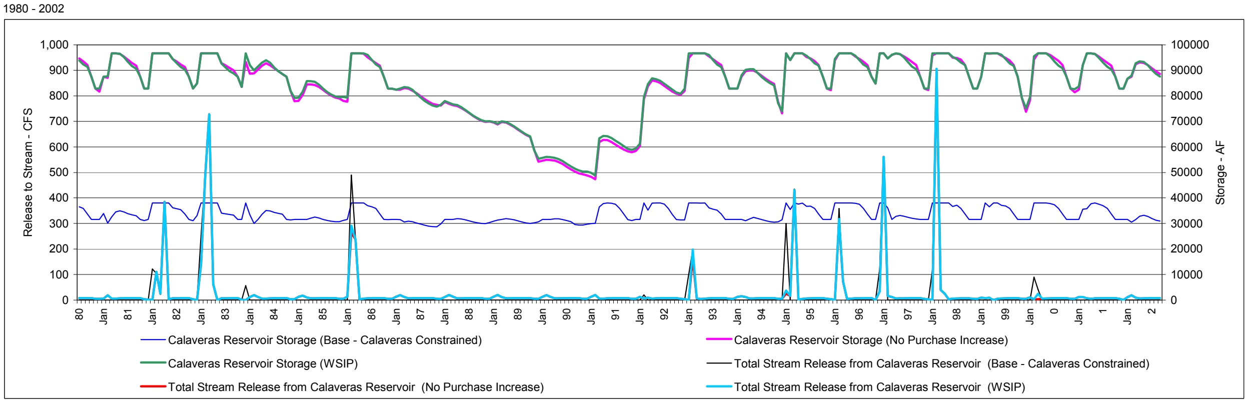
1940 - 1959



1960 - 1979

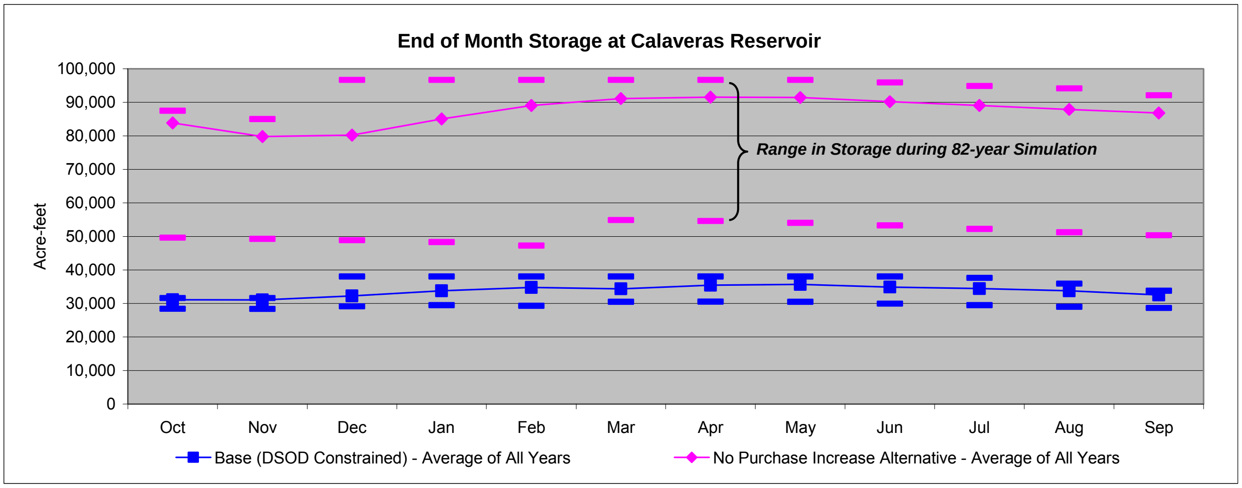


1980 - 2002



The difference in storage between the alternative and WSIP settings and the base setting is due to the restoration of the operational capacity of Calaveras Reservoir. Under both the alternative and WSIP settings, the full capacity of Calaveras Reservoir would be available, and a greater range in storage operation would occur. Figure 3.6-2 illustrates the average monthly storage in Calaveras Reservoir for the 82-year simulation, and the range in storage for each month for the alternative and base settings.

Figure 3.6-2



Compared to the WSIP setting, there would potentially be more or less release to Calaveras Creek below Calaveras Dam in the alternative setting. Both settings have fishery releases that are not included in the base setting. Calaveras Reservoir storage in the alternative setting is sometimes more and sometimes less than in the WSIP setting; however, in either direction the difference is minor. Table 3.6-1 illustrates the difference in releases to Calaveras Creek between the alternative and WSIP settings (considered non-substantial). Supplementing the Figure 3.6-1 representation of Calaveras Dam stream releases and Table 3.6-1 is Table 3.6-2, illustrating releases for the alternative and WSIP settings, and the difference in releases between the two. Table 3.6-3 provides the same form of information for the alternative and base settings. The notable difference in releases between the alternative and base settings is the addition of the required flows to satisfy the 1997 MOU and the reduction of stream releases during wetter-year/wetter-season flows due to the restoration of Calaveras Reservoir operational capacity.

There would be very little if any difference in Alameda Creek diversions to Calaveras Reservoir in the alternative setting compared to the WSIP setting. With essentially the same storage conditions between the two settings, there would be no difference in diversions from the Alameda Creek watershed. With no difference in the diversion at Alameda Creek Diversion Dam, flow spilling past the diversion dam would be the same in the alternative setting. Table 3.6-4 illustrates the difference in flow below the Alameda Creek Diversion Dam between the alternative and WSIP settings (considered non-substantial).

Table 3.6-5 illustrates the difference in flow below Alameda Creek Diversion Dam between the alternative and base settings. In this comparison, the reduction in flow below the diversion dam is due to the additional diversions to Calaveras Reservoir resulting from the restoration of reservoir operating capacity. Table 3.6-6 and Table 3.6-7 illustrate the flow past the Alameda Creek Diversion Dam, comparing the alternative, WSIP, and base settings by year type and the average of all years.

Table 3.6-1

Difference in Total Stream Release from Calaveras Reservoir (Acre-feet)

No Purchase Increase minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	0	0	0	0	0	0	0	0
1922	0	0	0	0	-56	0	0	0	0	0	0	0	-56
1923	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	0	0	0	0	0
1928	0	0	0	0	0	-519	0	0	0	0	0	0	-519
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	0	0	0	0	0	0	0	0	0
1937	0	0	0	0	0	0	0	0	0	0	0	0	0
1938	0	0	0	0	-157	0	0	0	0	0	0	0	-157
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	91	0	0	0	0	0	0	0	91
1941	0	0	0	0	0	0	0	0	0	0	0	0	0
1942	0	0	0	0	-1,920	0	-65	0	0	0	0	0	-1,986
1943	0	0	0	0	-294	0	0	0	0	0	0	0	-294
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	0	0	0	0	0	0	0	0	0
1946	0	0	0	0	0	0	0	0	0	0	0	0	0
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	3,398	0	-87	0	0	0	0	0	3,311
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	149	0	0	0	0	0	0	0	0	149
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	-114	0	0	0	0	0	-114
1975	0	0	0	0	0	-615	0	0	0	0	0	0	-615
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	3,136	0	0	0	0	0	0	3,136
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	-1,295	0	0	0	0	0	0	0	-1,295
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	-1,570	0	0	0	0	0	0	0	-1,570
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	-1,885	0	0	0	0	0	0	0	-1,885
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	-737	0	0	0	0	0	0	0	0	-737
1996	0	0	0	0	-642	0	0	0	0	0	0	0	-642
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	-763	0	0	0	0	0	0	0	-763
1999	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	-1,287	0	0	0	0	0	0	-1,287
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	0	0	0	-7	-62	9	-3	0	0	0	0	0	-64

Table 3.6-2

Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
No Purchase Increase

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	1,065	5,037	14,777	10,007	5,081	255	387	417	425	415	38,543
Above Normal	425	258	172	815	3,693	2,921	638	327	396	423	428	417	10,913
Normal	429	275	195	548	725	524	264	370	408	428	430	417	5,013
Below Normal	429	276	246	672	876	596	345	389	411	429	430	417	5,515
Dry	429	292	281	778	1,044	747	374	407	416	430	430	417	6,045
All Years	428	269	387	1,550	4,176	2,930	1,320	350	403	426	428	417	13,084

Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	1,065	5,083	15,133	10,007	5,085	255	387	417	425	415	38,949
Above Normal	425	258	172	806	3,657	2,849	650	327	396	423	428	417	10,807
Normal	429	275	195	548	725	556	264	370	408	428	430	417	5,046
Below Normal	429	276	246	672	876	596	345	389	411	429	430	417	5,515
Dry	429	292	281	778	1,044	747	374	407	416	430	430	417	6,045
All Years	428	269	387	1,557	4,238	2,921	1,323	350	403	426	428	417	13,148

Difference in Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
No Purchase Increase minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	-46	-357	0	-4	0	0	0	0	0	-407
Above Normal	0	0	0	9	36	73	-12	0	0	0	0	0	106
Normal	0	0	0	0	0	-32	0	0	0	0	0	0	-32
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	0	-7	-62	9	-3	0	0	0	0	0	-64

Table 3.6-3

Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
No Purchase Increase

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	1,065	5,037	14,777	10,007	5,081	255	387	417	425	415	38,543
Above Normal	425	258	172	815	3,693	2,921	638	327	396	423	428	417	10,913
Normal	429	275	195	548	725	524	264	370	408	428	430	417	5,013
Below Normal	429	276	246	672	876	596	345	389	411	429	430	417	5,515
Dry	429	292	281	778	1,044	747	374	407	416	430	430	417	6,045
All Years	428	269	387	1,550	4,176	2,930	1,320	350	403	426	428	417	13,084

Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	1,736	9,221	16,641	9,968	5,024	0	0	0	0	0	42,590
Above Normal	0	0	184	2,731	5,911	3,096	459	0	0	0	0	0	12,382
Normal	0	0	216	364	882	353	0	0	0	0	0	0	1,815
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	419	2,437	4,645	2,656	1,076	0	0	0	0	0	11,232

Difference in Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
No Purchase Increase minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	-671	-4,184	-1,864	39	57	255	387	417	425	415	-4,048
Above Normal	425	258	-12	-1,917	-2,218	-175	179	327	396	423	428	417	-1,470
Normal	429	275	-22	184	-157	171	264	370	408	428	430	417	3,198
Below Normal	429	276	246	672	876	596	345	389	411	429	430	417	5,515
Dry	429	292	281	778	1,044	747	374	407	416	430	430	417	6,045
All Years	428	269	-32	-887	-469	274	244	350	403	426	428	417	1,853

Table 3.6-4

Difference in Flow Passing Alameda Creek Diversion Dam (Acre-feet)

No Purchase Increase minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	0	0	0	0	0	0	0	0
1922	0	0	0	0	0	0	0	0	0	0	0	0	0
1923	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	0	0	0	0	0
1928	0	0	0	0	0	0	0	0	0	0	0	0	0
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	-1,164	0	0	0	0	0	0	0	-1,164
1937	0	0	0	0	0	0	0	0	0	0	0	0	0
1938	0	0	0	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	0	0	0	0	0	0	0	0	0
1941	0	0	0	0	0	0	0	0	0	0	0	0	0
1942	0	0	0	1,922	0	0	0	0	0	0	0	0	1,922
1943	0	0	0	457	-995	0	0	0	0	0	0	0	-538
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	0	0	0	0	0	0	0	0	0
1946	0	0	0	0	0	0	0	0	0	0	0	0	0
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	2,511	-2,507	0	402	0	0	0	0	0	0	406
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	-170	0	0	0	0	0	0	0	0	-170
1974	0	0	0	2,096	0	1,320	0	0	0	0	0	0	3,416
1975	0	0	0	0	-671	0	0	0	0	0	0	0	-671
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	922	0	0	0	0	922
1984	0	0	3,332	0	0	0	0	0	0	0	0	0	3,332
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	1,034	0	752	0	0	0	0	0	0	1,786
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	215	0	0	0	0	0	0	0	0	215
1999	0	0	0	0	0	0	-178	0	0	0	0	0	-178
2000	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	0	0	71	37	-35	30	-2	11	0	0	0	0	113

Table 3.6-5

Difference in Flow Passing Alameda Creek Diversion Dam (Acre-feet) No Purchase Increase minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	-2,559	-1,353	0	0	0	0	0	0	0	-3,913
1922	0	0	0	0	0	0	0	0	0	0	0	0	0
1923	0	0	-2,856	-1,688	-1,004	0	0	0	0	0	0	0	-5,547
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	-3,210	0	0	0	0	0	0	0	-3,210
1927	0	0	0	0	0	0	373	0	0	0	0	0	373
1928	0	0	0	0	0	0	-156	0	0	0	0	0	-156
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	-2,259	0	0	0	0	0	0	0	-2,259
1937	0	0	0	0	-3,964	0	0	0	0	0	0	0	-3,964
1938	0	0	0	0	0	0	-156	0	0	0	0	0	-156
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	0	0	-156	0	0	0	0	0	-156
1941	0	0	0	-1,197	0	0	0	0	0	0	0	0	-1,197
1942	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	-995	0	0	0	0	0	0	0	-995
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	-4,471	0	0	0	0	0	0	0	-4,471
1946	0	0	-4,651	-1,522	0	0	0	0	0	0	0	0	-6,173
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	-5,524	0	0	0	0	0	0	-5,524
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	-2,553	-59	301	0	0	0	0	0	0	-2,311
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	-3,892	0	0	0	0	0	0	0	0	-3,892
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	-1,919	0	0	0	0	0	0	0	-1,919
1963	0	0	0	-2,219	0	0	0	0	0	0	0	0	-2,219
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	-1,921	0	0	0	3,250	0	0	0	0	0	1,329
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	-1,676	-1,872	0	0	0	0	0	0	0	-3,548
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	-4,247	0	-1,623	0	0	0	0	0	0	-5,870
1971	0	0	-613	0	0	0	0	0	0	0	0	0	-613
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	-4,509	0	0	0	0	0	0	0	0	-4,509
1974	0	0	-1,019	0	0	1,444	0	0	0	0	0	0	425
1975	0	0	0	0	-5,196	0	-156	0	0	0	0	0	-5,352
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	-4,152	-3,403	0	0	0	0	0	0	0	-7,556
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	-3,360	0	-101	0	0	0	0	0	0	-3,462
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	687	0	0	0	0	687
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	-3,578	0	0	0	0	0	0	0	-3,578
1993	0	0	0	0	0	651	0	0	0	0	0	0	651
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	-5,239	0	0	0	0	0	0	0	0	-5,239
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	-2,798	0	1,214	0	0	0	0	0	-1,584
2000	0	0	0	0	-4,567	0	0	0	0	0	0	0	-4,567
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	0	0	-135	-473	-496	-59	51	8	0	0	0	0	-1,103

Table 3.6-6

Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) No Purchase Increase

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	28	1,379	6,295	7,982	5,751	2,962	173	0	0	0	0	24,570
Above Normal	7	23	843	2,589	3,919	3,237	959	0	0	0	0	0	11,578
Normal	0	6	585	264	820	459	117	6	0	0	0	0	2,257
Below Normal	0	0	18	45	106	191	2	0	0	0	0	0	361
Dry	0	0	17	0	163	0	6	0	0	0	0	0	186
All Years	1	12	565	1,826	2,584	1,922	801	35	0	0	0	0	7,746

Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	28	1,379	6,172	7,982	5,751	2,962	116	0	0	0	0	24,389
Above Normal	7	23	695	2,526	4,017	3,092	969	0	0	0	0	0	11,330
Normal	0	6	377	264	893	459	117	6	0	0	0	0	2,122
Below Normal	0	0	18	45	106	191	2	0	0	0	0	0	361
Dry	0	0	17	0	163	0	6	0	0	0	0	0	186
All Years	1	12	494	1,789	2,618	1,892	803	24	0	0	0	0	7,633

Difference in Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) No Purchase Increase minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	123	0	0	0	58	0	0	0	0	181
Above Normal	0	0	148	64	-98	146	-10	0	0	0	0	0	248
Normal	0	0	208	0	-73	0	0	0	0	0	0	0	136
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	71	37	-35	30	-2	11	0	0	0	0	113

Table 3.6-7

Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) No Purchase Increase

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	28	1,379	6,295	7,982	5,751	2,962	173	0	0	0	0	24,570
Above Normal	7	23	843	2,589	3,919	3,237	959	0	0	0	0	0	11,578
Normal	0	6	585	264	820	459	117	6	0	0	0	0	2,257
Below Normal	0	0	18	45	106	191	2	0	0	0	0	0	361
Dry	0	0	17	0	163	0	6	0	0	0	0	0	186
All Years	1	12	565	1,826	2,584	1,922	801	35	0	0	0	0	7,746

Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	28	1,379	6,967	8,099	5,757	2,972	130	0	0	0	0	25,331
Above Normal	7	23	1,184	3,672	5,292	3,096	692	0	0	0	0	0	13,968
Normal	0	6	914	868	1,785	906	126	6	0	0	0	0	4,611
Below Normal	0	0	18	45	106	191	2	0	0	0	0	0	361
Dry	0	0	17	0	163	0	6	0	0	0	0	0	186
All Years	1	12	700	2,299	3,079	1,982	750	27	0	0	0	0	8,849

Difference in Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) No Purchase Increase minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	-671	-117	-6	-10	43	0	0	0	0	-762
Above Normal	0	0	-341	-1,083	-1,373	141	266	0	0	0	0	0	-2,390
Normal	0	0	-329	-604	-965	-447	-10	0	0	0	0	0	-2,354
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-135	-473	-496	-59	51	8	0	0	0	0	-1,103

Comparing the alternative and WSIP settings, differences in releases from Calaveras Dam to the stream and differences to spills at Alameda Creek Diversion Dam would result in differences in flow below the Alameda Creek and Calaveras Creek confluence. Table 3.6-8 illustrates the flow below the confluence for the alternative and WSIP settings. The modeled difference of these parameters has been described above as being non-substantial; thus, the combined effect of the differences at the confluence is considered non-substantial. Fishery releases for the 1997 MOU are assumed in both of the settings. Table 3.6-9 provides the same form of information for the alternative and base settings. The notable differences between the alternative and base settings (comparable to the difference between the WSIP and base settings) are the addition of required stream flows for the 1997 MOU and the reduction of wetter-year/wet season flows due to the restoration of Calaveras Reservoir storage.

Table 3.6-8

Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) No Purchase Increase

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	430	326	2,789	12,342	23,947	16,744	8,644	605	417	430	430	417	67,520
Above Normal	437	327	1,259	4,002	8,389	6,720	1,907	430	417	430	430	417	25,164
Normal	430	304	1,006	1,081	1,931	1,310	539	435	417	430	430	417	8,731
Below Normal	430	298	324	858	1,217	1,007	419	430	417	430	430	417	6,677
Dry	430	298	324	813	1,274	816	423	430	417	430	430	417	6,502
All Years	431	310	1,132	3,785	7,289	5,284	2,357	465	417	430	430	417	22,748

Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	430	326	2,789	12,265	24,303	16,744	8,649	548	417	430	430	417	67,746
Above Normal	437	327	1,111	3,929	8,451	6,502	1,929	430	417	430	430	417	24,810
Normal	430	304	798	1,081	2,004	1,343	539	435	417	430	430	417	8,628
Below Normal	430	298	324	858	1,217	1,007	419	430	417	430	430	417	6,677
Dry	430	298	324	813	1,274	816	423	430	417	430	430	417	6,502
All Years	431	310	1,061	3,755	7,386	5,245	2,362	454	417	430	430	417	22,699

Difference in Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) No Purchase Increase minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	77	-357	0	-4	58	0	0	0	0	-226
Above Normal	0	0	148	72	-62	218	-22	0	0	0	0	0	354
Normal	0	0	208	0	-73	-32	0	0	0	0	0	0	103
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	71	30	-97	39	-5	11	0	0	0	0	49

Table 3.6-9

Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) No Purchase Increase

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	430	326	2,789	12,342	23,947	16,744	8,644	605	417	430	430	417	67,520
Above Normal	437	327	1,259	4,002	8,389	6,720	1,907	430	417	430	430	417	25,164
Normal	430	304	1,006	1,081	1,931	1,310	539	435	417	430	430	417	8,731
Below Normal	430	298	324	858	1,217	1,007	419	430	417	430	430	417	6,677
Dry	430	298	324	813	1,274	816	423	430	417	430	430	417	6,502
All Years	431	310	1,132	3,785	7,289	5,284	2,357	465	417	430	430	417	22,748

Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	1	80	3,460	17,197	25,928	16,711	8,598	307	30	12	4	2	72,329
Above Normal	12	68	1,612	7,001	11,980	6,754	1,462	103	22	6	2	1	29,023
Normal	1	29	1,356	1,501	3,053	1,586	284	65	9	2	0	0	7,886
Below Normal	1	22	78	186	341	412	74	41	7	0	0	0	1,161
Dry	1	6	43	35	230	69	49	23	1	0	0	0	457
All Years	3	41	1,298	5,145	8,254	5,069	2,061	107	14	4	1	1	21,999

Difference in Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) No Purchase Increase minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	-671	-4,855	-1,981	33	47	298	387	417	425	415	-4,809
Above Normal	425	258	-353	-3,000	-3,591	-34	445	327	396	423	428	417	-3,859
Normal	429	275	-351	-420	-1,122	-275	255	370	408	428	430	417	844
Below Normal	429	276	246	672	876	596	345	389	411	429	430	417	5,515
Dry	429	292	281	778	1,044	747	374	407	416	430	430	417	6,045
All Years	428	269	-167	-1,360	-965	215	296	358	403	426	428	417	749

A flow recapture facility in Alameda Creek below Calaveras Reservoir is incorporated in the alternative and WSIP settings. This facility is assumed to recapture flows explicitly released from Calaveras Dam for the 1997 MOU. The effect of the recapture is a reduction in the flow that occurs below the confluence of Alameda and Calaveras Creeks, but only to the extent that releases were explicitly made from Calaveras Reservoir for the 1997 MOU. Flows below this diversion have been estimated and noted as the flow above the Alameda and San Antonio confluence. Table 3.6-10 illustrates the flow at this location for the alternative and WSIP settings. The flow changes at this location are consistent with the changes noted for below the confluence of Alameda and Calaveras Creeks. These flow changes are considered non-substantial. Table 3.6-11 provides the same form of information for the alternative and base settings. The flows identified at this location indicate flow occurring below the confluence of Alameda and Calaveras Creeks (described above), with the addition of estimated stream accretions between the Alameda and Calaveras Creek confluence and the Alameda and San Antonio Creek confluence, less the water assumed to be recaptured (diverted) by the SFPUC from the creek.

Table 3.6-10

Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — No Purchase Increase

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,180	13,688	25,471	17,847	9,295	556	76	33	15	9	70,331
Above Normal	19	150	1,455	4,520	9,075	7,131	2,158	217	54	20	9	6	24,815
Normal	7	64	1,131	913	1,764	1,236	469	134	28	9	4	3	5,761
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	1,198	3,889	7,403	5,371	2,404	208	38	14	7	4	20,633

Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,180	13,611	25,828	17,847	9,299	498	76	33	15	9	70,558
Above Normal	19	150	1,308	4,448	9,137	6,913	2,180	217	54	20	9	6	24,462
Normal	7	64	922	913	1,837	1,269	469	134	28	9	4	3	5,658
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	1,127	3,859	7,499	5,332	2,409	197	38	14	7	4	20,583

Difference in Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — No Purchase Increase minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	77	-357	0	-4	58	0	0	0	0	-226
Above Normal	0	0	148	72	-62	218	-22	0	0	0	0	0	354
Normal	0	0	208	0	-73	-32	0	0	0	0	0	0	103
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	71	30	-97	39	-5	11	0	0	0	0	49

Table 3.6-11

Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — No Purchase Increase

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,180	13,688	25,471	17,847	9,295	556	76	33	15	9	70,331
Above Normal	19	150	1,455	4,520	9,075	7,131	2,158	217	54	20	9	6	24,815
Normal	7	64	1,131	913	1,764	1,236	469	134	28	9	4	3	5,761
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	1,198	3,889	7,403	5,371	2,404	208	38	14	7	4	20,633

Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,968	18,668	27,692	17,977	9,358	513	76	33	15	9	78,470
Above Normal	19	150	1,981	7,819	13,060	7,467	1,861	217	54	20	9	6	32,664
Normal	7	64	1,676	1,881	3,611	2,007	479	134	28	9	4	3	9,902
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	1,567	5,733	9,022	5,616	2,356	199	38	14	7	4	24,656

Difference in Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — No Purchase Increase minus Base - Calaveras Constrained

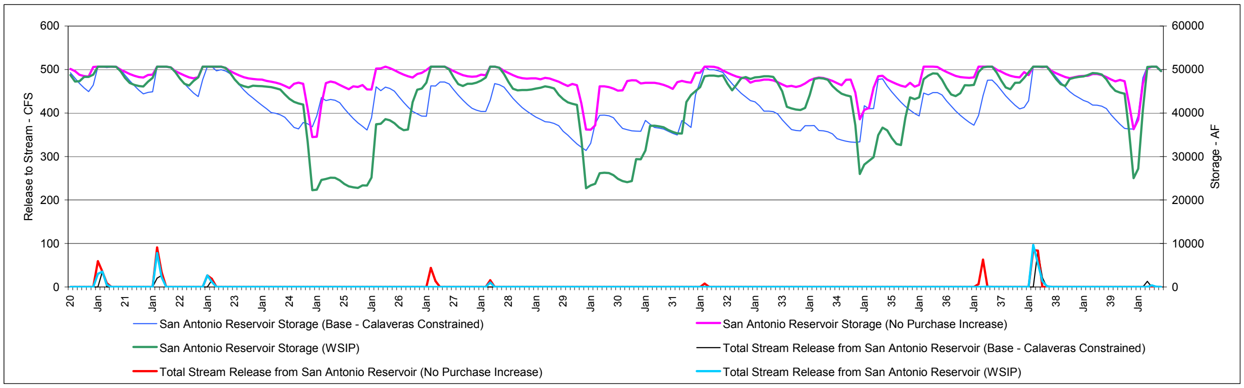
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-788	-4,980	-2,220	-131	-63	43	0	0	0	0	-8,138
Above Normal	0	0	-525	-3,299	-3,985	-336	297	0	0	0	0	0	-7,848
Normal	0	0	-545	-968	-1,847	-771	-10	0	0	0	0	0	-4,141
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-369	-1,844	-1,620	-246	47	8	0	0	0	0	-4,023

Compared to the WSIP setting, the alternative's San Antonio Reservoir operation would draw less from storage on an annual basis, and particularly during cyclic maintenance. Figure 3.6-3 illustrates a chronological trace of the simulation of San Antonio Reservoir storage and stream releases from San Antonio Dam. Shown in Figure 3.6-3 are the results for the WSIP, alternative, and base settings. The difference in San Antonio Reservoir storage between the alternative and WSIP settings is mostly caused by the lesser demand of the alternative. Considering that Calaveras Reservoir storage is essentially the same between the settings, the difference in San Antonio Reservoir storage indicates the operational strategy to affect storage in San Antonio Reservoir more than storage in the other SFPUC Bay Area reservoirs. San Antonio Reservoir would retain more storage in the alternative setting compared to the WSIP setting.

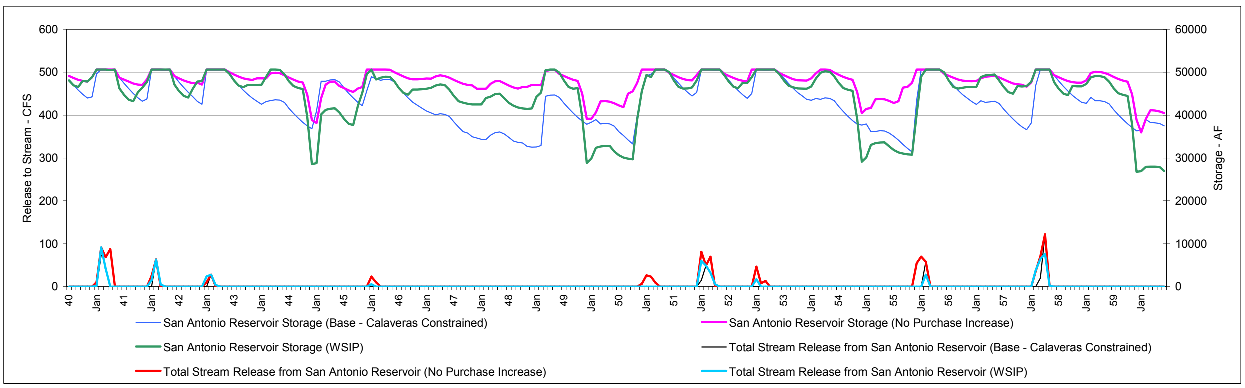
The difference in storage between the alternative and WSIP settings and the base setting is due to the restoration of the operational capacity of Calaveras Reservoir. In the base setting, the limited operating storage capacity at Calaveras Reservoir leads to a different operation at San Antonio Reservoir, one that retains relatively more stored water for system demands when the draw from Calaveras Reservoir is constrained due to limited storage. There is also a notable difference in storage operation between the alternative and WSIP settings and the base setting due to assumed maintenance. Assumed systematic maintenance of Hetch Hetchy conveyance facilities constrains diversions to the Bay Area from Hetch Hetchy every year, and particularly during every fifth year in the WSIP and alternative settings.

Figure 3.6-3
San Antonio Reservoir Storage and Stream Release

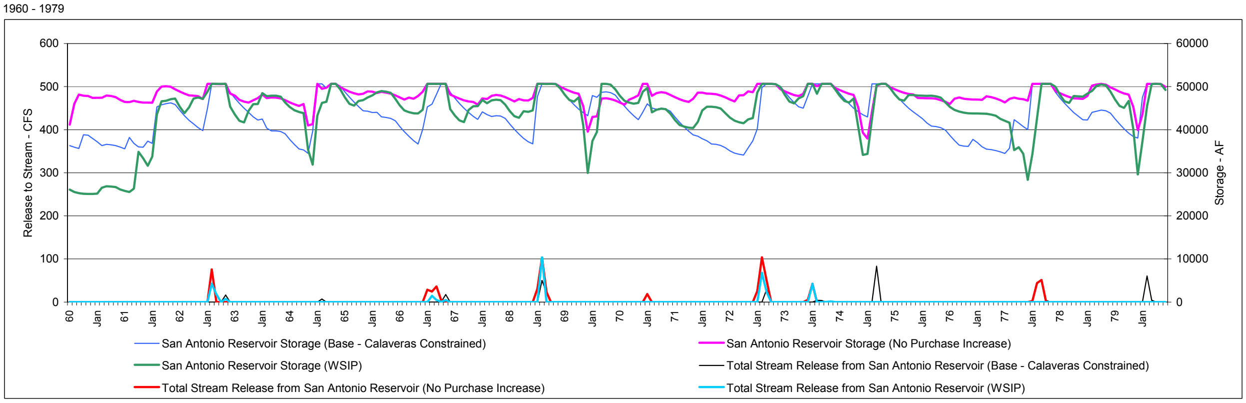
1920 - 1939



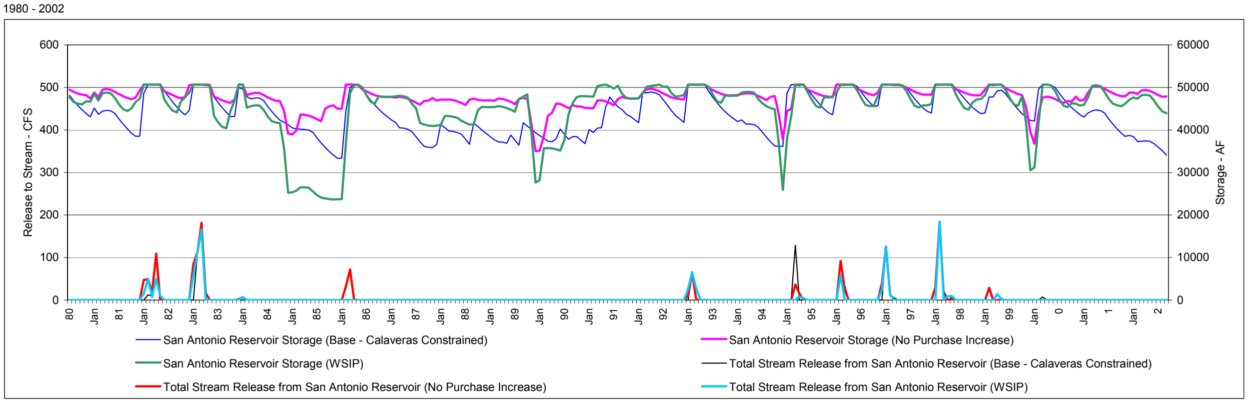
1940 - 1959



1960 - 1979

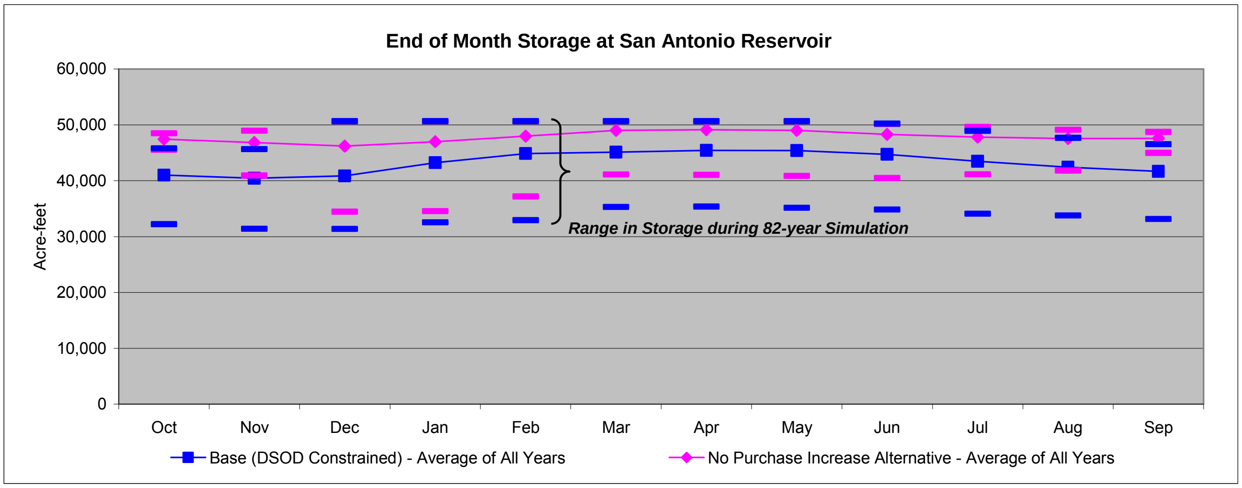


1980 - 2002



The reduction in diversion from Hetch Hetchy during these periods is accommodated in the system by the drawing of additional water from the Bay Area reservoirs. The proportionate share of this operation is evident in the tracing of San Antonio Reservoir storage for the alternative and WSIP settings. Figure 3.6-4 illustrates the average monthly storage in San Antonio Reservoir for the 82-year simulation, and the range in storage for each month for the alternative and base settings. Compared to the base setting, the alternative would draw less storage from San Antonio Reservoir, typically retaining a fuller reservoir.

Figure 3.6-4



Very little change in stream releases below San Antonio Reservoir is anticipated between the alternative and WSIP settings. Table 3.6-12 illustrates the modeled release to San Antonio Creek from San Antonio Reservoir for the two settings and the differences for the average release during a year type. With a fuller reservoir operation at times during the winter, as seen in Figure 3.6-4, a decrease in the ability to regulate reservoir inflow and avoid stream releases is expected. Given the sometimes rigid constraints within the modeling assumptions, the model will overestimate the frequency and magnitude of stream releases from San Antonio Reservoir under any of the investigated settings. The flexibility that occurs in actual operations would likely avoid most of the releases represented by the model. The modeled stream releases from San Antonio Reservoir and difference between releases for the alternative and base setting are shown in Table 3.6-13. The differences between the two settings reflect a general increase in modeled releases. This modeled circumstance reflects the different resulting storage operation between the two settings, as seen in Figure 3.6-3. In most circumstances, the alternative setting storage at San Antonio Reservoir would be higher than projected for the base setting during the same period. This circumstance could lead to an occasionally greater modeled release for the alternative setting, which is reflected in the results. As described above, the model will overestimate the frequency and magnitude of releases from San Antonio Reservoir, and the actual releases from San Antonio Reservoir in any setting and the difference between settings are expected to be minor.

Flow below the confluence of Alameda and San Antonio Creeks is influenced by releases from San Antonio Creek and flow arriving at the location from Alameda Creek, which includes upstream impairment by SFPUC operations and facilities. Table 3.6-14 illustrates the flow below the confluence for the alternative and WSIP settings, and the differences in flow between the two. The difference in flow between the alternative and WSIP settings at this location are the net sum of the differences identified for flow reaching the location from Alameda Creek and San Antonio Creek. The difference in flow from upstream in Alameda Creek has previously been identified as non-substantial. Along with the conclusion that flow differences in San Antonio Creek are non-substantial, modeled differences below the confluence are also considered non-substantial.

Table 3.6-12

Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
No Purchase Increase

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	362	2,142	3,494	2,777	1,327	6	0	0	0	0	10,108
Above Normal	0	0	42	642	1,805	741	0	0	0	0	0	0	3,229
Normal	0	0	7	367	90	110	0	0	0	0	0	0	574
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	81	623	1,074	717	259	1	0	0	0	0	2,754

Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	95	1,054	3,168	1,543	605	121	0	0	0	0	6,586
Above Normal	0	0	0	540	1,045	277	67	44	0	0	0	0	1,974
Normal	0	0	0	113	0	40	0	0	0	0	0	0	152
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	19	340	835	366	132	33	0	0	0	0	1,724

Difference in Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
No Purchase Increase minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	266	1,088	325	1,234	722	-115	0	0	0	0	3,521
Above Normal	0	0	42	102	760	464	-67	-44	0	0	0	0	1,256
Normal	0	0	7	254	90	70	0	0	0	0	0	0	422
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	62	283	239	351	127	-32	0	0	0	0	1,030

Table 3.6-13

Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
No Purchase Increase

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	362	2,142	3,494	2,777	1,327	6	0	0	0	0	10,108
Above Normal	0	0	42	642	1,805	741	0	0	0	0	0	0	3,229
Normal	0	0	7	367	90	110	0	0	0	0	0	0	574
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	81	623	1,074	717	259	1	0	0	0	0	2,754

Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	538	2,350	2,480	1,324	88	0	0	0	0	6,780
Above Normal	0	0	0	0	881	883	12	58	0	0	0	0	1,835
Normal	0	0	0	0	1	0	0	0	0	0	0	0	1
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	0	105	641	667	261	29	0	0	0	0	1,703

Difference in Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
No Purchase Increase minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	362	1,604	1,144	297	4	-82	0	0	0	0	3,328
Above Normal	0	0	42	642	924	-142	-12	-58	0	0	0	0	1,395
Normal	0	0	7	367	90	110	0	0	0	0	0	0	574
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	81	518	432	50	-2	-28	0	0	0	0	1,050

Table 3.6-14

Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
No Purchase Increase

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,542	15,830	28,965	20,624	10,622	562	76	33	15	9	80,439
Above Normal	19	150	1,497	5,162	10,880	7,872	2,158	217	54	20	9	6	28,045
Normal	7	64	1,138	1,280	1,854	1,346	469	134	28	9	4	3	6,335
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	1,279	4,512	8,476	6,088	2,663	209	38	14	7	4	23,387

Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,276	14,666	28,996	19,390	9,903	619	76	33	15	9	77,144
Above Normal	19	150	1,308	4,987	10,182	7,190	2,248	262	54	20	9	6	26,435
Normal	7	64	922	1,026	1,837	1,308	469	134	28	9	4	3	5,810
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	1,145	4,199	8,334	5,698	2,541	229	38	14	7	4	22,307

Difference in Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
No Purchase Increase minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	266	1,164	-31	1,234	718	-57	0	0	0	0	3,295
Above Normal	0	0	189	174	698	682	-90	-44	0	0	0	0	1,610
Normal	0	0	216	254	18	38	0	0	0	0	0	0	525
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	133	313	142	390	122	-20	0	0	0	0	1,079

Table 3.6-15 illustrates the same information in comparing the alternative and base settings. Table 3.6-15 illustrates the larger differences in flow that would occur between the alternative and base settings. Those differences are particularly due to the effects of the restoration of Calaveras Reservoir operating capacity and the fuller San Antonio Reservoir in the alternative setting (if the fuller reservoir has any effect on steam releases).

Table 3.6-15

Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — No Purchase Increase

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,542	15,830	28,965	20,624	10,622	562	76	33	15	9	80,439
Above Normal	19	150	1,497	5,162	10,880	7,872	2,158	217	54	20	9	6	28,045
Normal	7	64	1,138	1,280	1,854	1,346	469	134	28	9	4	3	6,335
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	1,279	4,512	8,476	6,088	2,663	209	38	14	7	4	23,387

Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,968	19,206	30,042	20,458	10,681	601	76	33	15	9	85,250
Above Normal	19	150	1,981	7,819	13,941	8,350	1,873	276	54	20	9	6	34,498
Normal	7	64	1,676	1,881	3,612	2,007	479	134	28	9	4	3	9,902
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	1,567	5,838	9,664	6,284	2,617	229	38	14	7	4	26,359

Difference in Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — No Purchase Increase minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-426	-3,376	-1,076	166	-59	-39	0	0	0	0	-4,811
Above Normal	0	0	-484	-2,657	-3,060	-478	285	-58	0	0	0	0	-6,453
Normal	0	0	-538	-601	-1,757	-661	-10	0	0	0	0	0	-3,567
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-288	-1,327	-1,187	-196	45	-20	0	0	0	0	-2,973

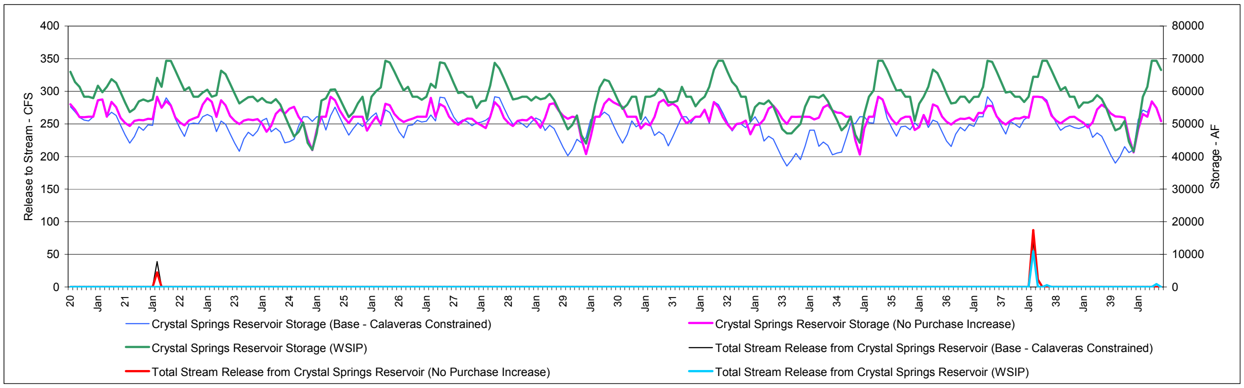
3.7 Crystal Springs and San Andreas Reservoirs

There are differences in Crystal Springs Reservoir operations between the WSIP setting and the alternative and base settings. Figure 3.7-1 illustrates a chronological trace of the simulation of Crystal Springs Reservoir storage and stream releases from Crystal Springs Dam. Shown in Figure 3.7-1 are the results for the WSIP, alternative, and base settings. Fundamental to the difference in storage operations between the WSIP setting and the alternative and base settings is the restoration of reservoir operation capacity in the WSIP setting, which does not occur in the alternative or base settings.[8] The result is the operation of Crystal Springs Reservoir at a lower maximum storage in the alternative and base settings. A second difference in Crystal Springs Reservoir storage between the alternative and WSIP setting is caused by the interaction of the increased demand served by the system's resources (a net 265 mgd for the alternative and a net 290-mgd demand for the WSIP in many years), which tends to lessen the operation range of the reservoir in the alternative setting. Replenishment of Crystal Springs Reservoir storage (as well as other Bay Area reservoirs) would be accelerated with less system-wide demand to serve. The alternative setting would provide less carry-over storage at Crystal Springs Reservoir into periods of drought, and thereby cause additional draw from other resources to serve the same delivery. The magnitude of the draw of storage from Crystal Springs Reservoir is partially dependent on the discretionary assumptions of the model that proportion the use of storage among the Bay Area system reservoirs. In actual operations, some of the differences in result may not occur as system operators and prevailing hydraulic and hydrologic conditions may direct the operational effect of the different demand to an alternative apportionment of effect among the reservoirs. However, operation strategy prefers the retention of storage in the Peninsula Reservoirs, similar to the strategy used by the model. Figure 3.7-2 illustrates the average monthly storage in Crystal Springs Reservoir for the 82-year simulation, and the range in storage for each month for the alternative and WSIP settings.

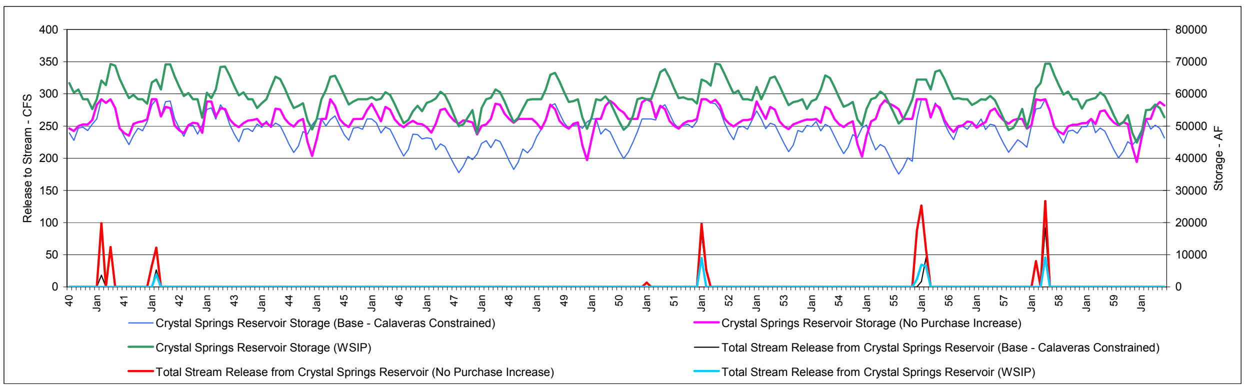
[8] The Lower Crystal Springs Dam Improvements (LCSDI) project is included in the alternative, but was not modeled. With the LCSDI project included in the alternative the hydrologic effects at Crystal Springs Reservoir would be comparable to the WSIP setting.

Figure 3.7-1
Crystal Springs Reservoir Storage and Release

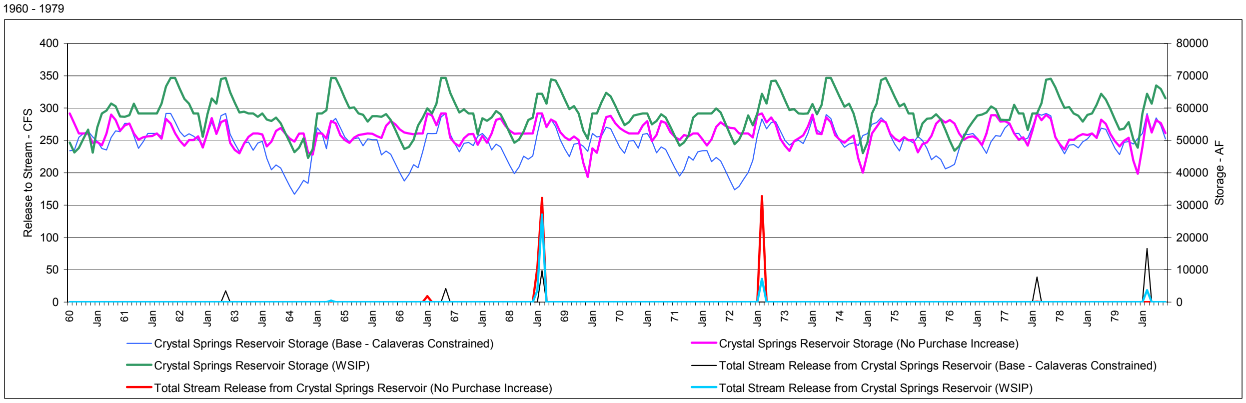
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

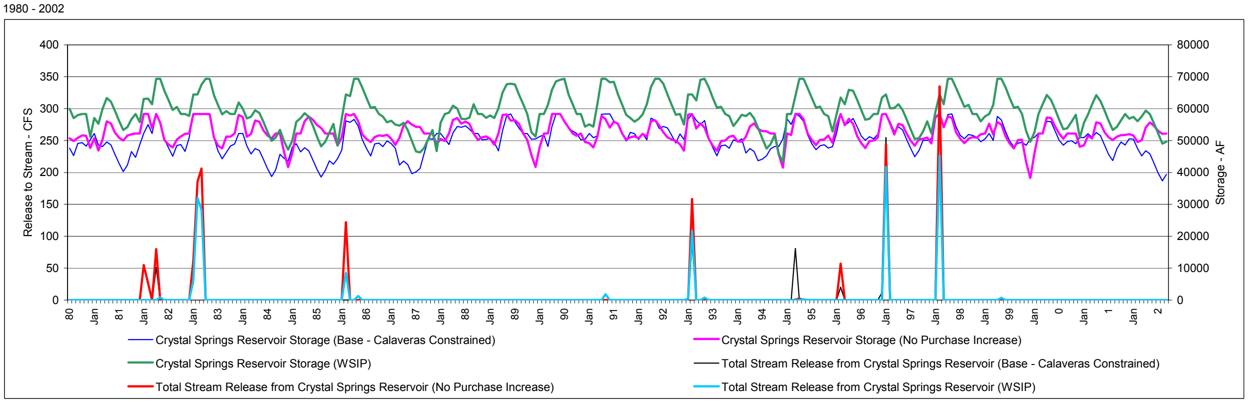


Figure 3.7-2

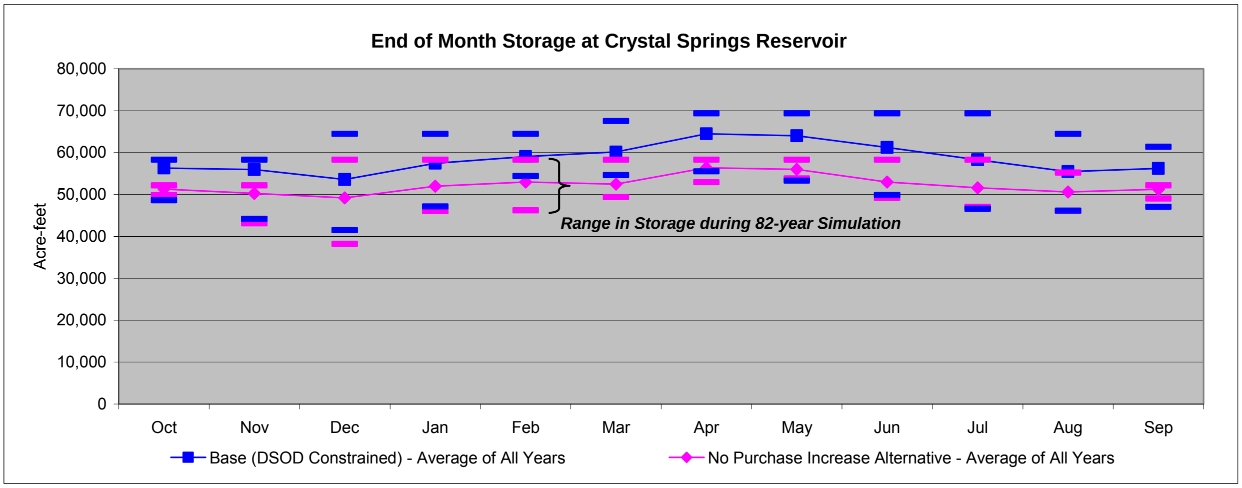


Figure 3.7-3 illustrates the average monthly storage in Crystal Springs Reservoir for the 82-year simulation, and the range in storage for each month for the alternative and base settings. The alternative setting would result in reservoir storage operating at a slightly higher average storage during some months, and the range of operating storage would typically be smaller in the alternative setting.

Figure 3.7-3

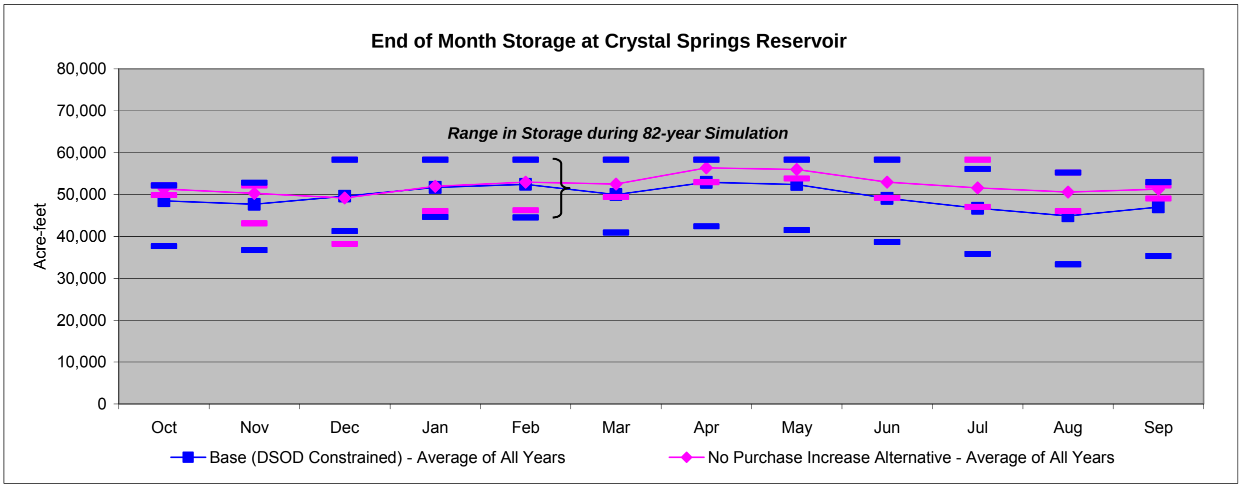


Table 3.7-1 illustrates the modeled alternative and WSIP stream releases from Crystal Springs Reservoir and the differences between the two settings. Modeling results indicate that an increase in the occasional release could occur. The potential difference is attributed to a narrower operating range of reservoir storage in the alternative setting. This narrower range in storage would lead to a greater potential for stream releases. In actual operations, it is anticipated that system operators would manage the reservoir system such that stream releases would be minimal under any setting, with the effect of essentially no difference would occur between the alternative and WSIP settings. Similarly, Table 3.7-2 illustrates the stream releases for the alternative and base settings, and the difference in modeled flows between the two settings. A lesser draw down in Crystal Springs Reservoir storage associated with the alternative setting would lead to a decreased potential to regulate reservoir inflow, which would lead to additional risk in needing to make stream releases. However, as described above, actual system operations would attempt to minimize releases under any setting; thus, the difference in releases between the alternative and base setting would be minimal, if any.

Table 3.7-1

Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — No Purchase Increase

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	337	2,611	4,735	837	1,030	0	0	0	0	0	9,551
Above Normal	0	0	0	24	777	0	0	0	0	0	0	0	802
Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	66	515	1,085	163	201	0	0	0	0	0	2,030

Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	47	1,296	2,512	542	170	54	0	0	0	0	4,623
Above Normal	0	0	0	8	354	0	8	42	0	0	0	0	412
Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	33	0	0	0	0	33
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	9	254	564	106	35	26	0	0	0	0	994

Difference in Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — No Purchase Increase minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	290	1,315	2,223	295	860	-54	0	0	0	0	4,928
Above Normal	0	0	0	17	423	0	-8	-42	0	0	0	0	390
Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	-33	0	0	0	0	-33
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	57	260	522	57	166	-26	0	0	0	0	1,036

Table 3.7-2

Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — No Purchase Increase

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	337	2,611	4,735	837	1,030	0	0	0	0	0	9,551
Above Normal	0	0	0	24	777	0	0	0	0	0	0	0	802
Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	66	515	1,085	163	201	0	0	0	0	0	2,030

Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	44	1,433	2,889	1,134	756	81	0	0	0	0	6,336
Above Normal	0	0	0	0	608	0	0	63	0	0	0	0	671
Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	9	280	690	221	147	29	0	0	0	0	1,375

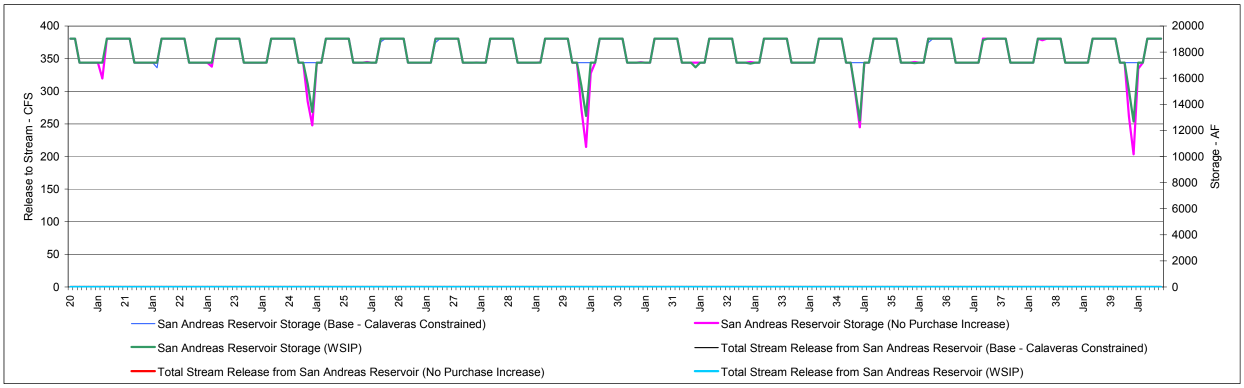
Difference in Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — No Purchase Increase minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	293	1,179	1,847	-297	274	-81	0	0	0	0	3,215
Above Normal	0	0	0	24	169	0	0	-63	0	0	0	0	130
Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	57	235	395	-58	54	-29	0	0	0	0	654

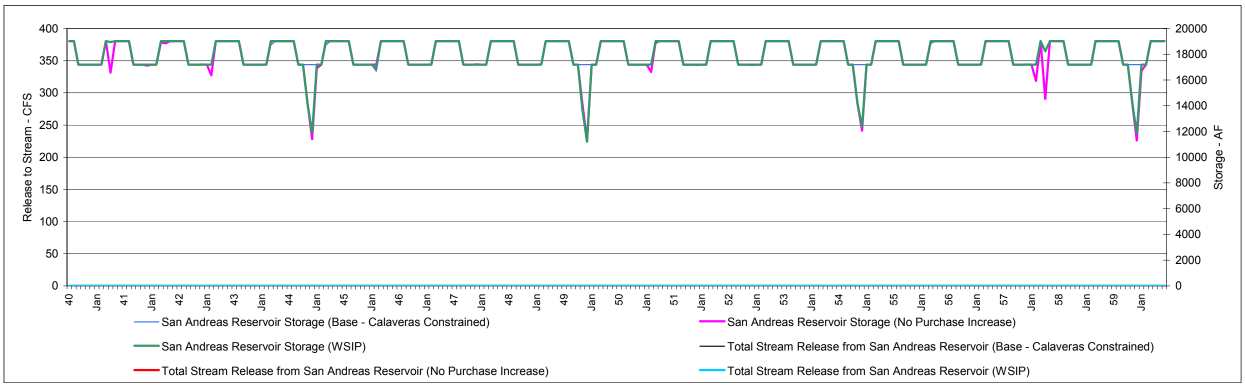
Reservoir storage at San Andreas Reservoir would follow a systematic filling and lowering each year; however, there would be slight differences in draw down between the alternative and WSIP settings, primarily due to the coincidence of the effects of different system-wide maintenance and differing water demands within each setting. Figure 3.7-4 illustrates a chronological trace of the simulation of San Andreas Reservoir storage and stream releases from San Andreas Dam. Shown in Figure 3.7-4 are the results for the WSIP, alternative, and base settings. There are no projected stream releases from San Andreas Reservoir in any setting. Compared to the base setting, Figure 3.7-4 illustrates the difference in storage operation every fifth year for the WSIP and alternative settings. These operations are the result of Hetch Hetchy conveyance maintenance, which is assumed to occur systematically in the alternative and WSIP settings. The maintenance constrains the amount of Hetch Hetchy water supplied to serve water demands in the Bay Area. As discussed previously, during these winter periods, the Bay Area reservoir system accommodates the reduction in imported supply by serving the Bay Area water deliveries with the local watersheds' runoff and storage. At San Andreas Reservoir, the serving of water demand affects the reservoir when additional required water production at Harry Tracy WTP associated with WSIP or the alternative exceeds the ability to maintain San Andreas Reservoir storage with pumping from Crystal Springs Reservoir. In the modeling, the conveyance capacity from Crystal Springs Reservoir is assumed to be same among all of the settings. The additional water demand of the WSIP and alternative require additional production from Harry Tracy WTP to be drawn from San Andreas Reservoir.

Figure 3.7-4
San Andreas Reservoir Storage and Stream Release

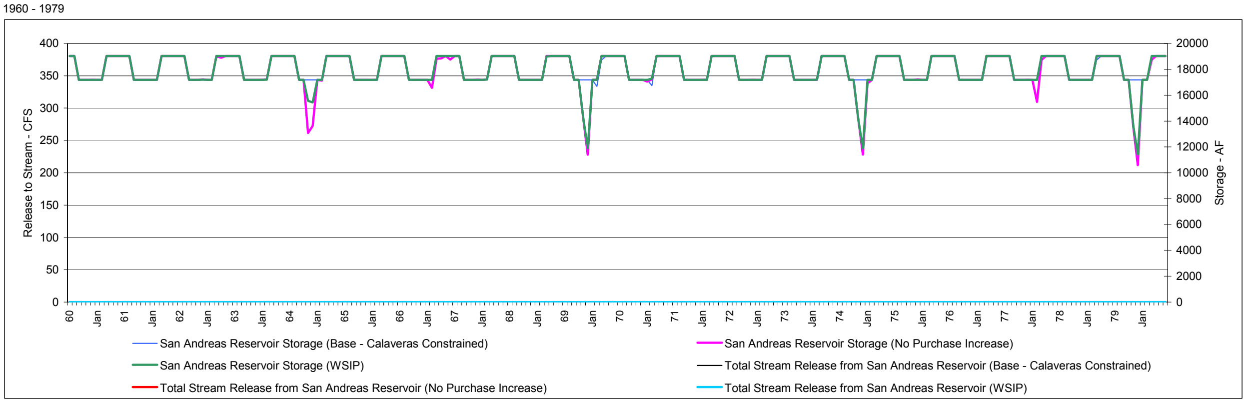
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

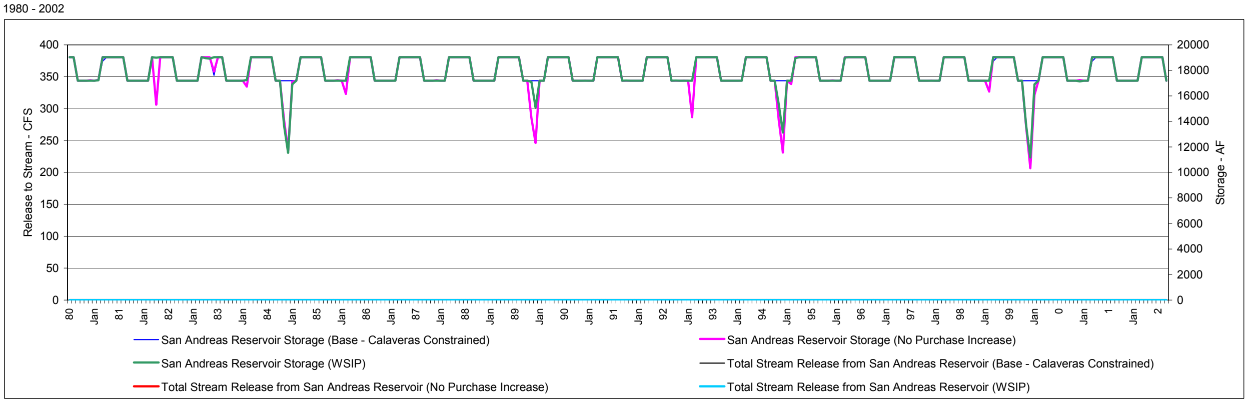
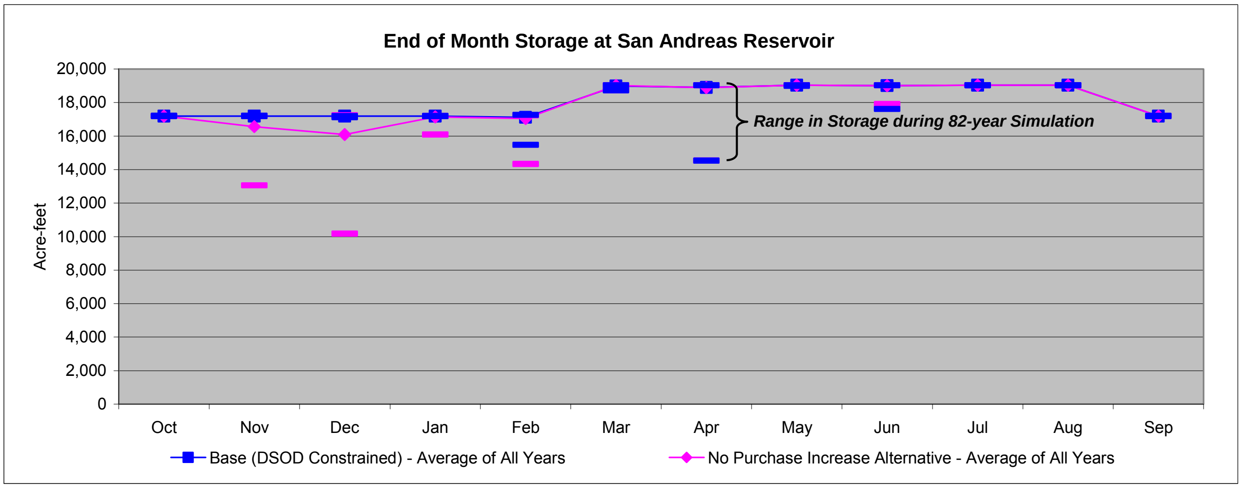


Figure 3.7-5 illustrates the average monthly storage in San Andreas Reservoir for the 82-year simulation, and the range in storage for each month for the alternative and base settings.

Figure 3.7-5



3.8 Pilarcitos Reservoir

Coastside CWD's water demand and its SFPUC delivery would slightly increase within the WSIP planning horizon of year 2030. Recognizing the current physical constraints to deliveries from the SFPUC to Coastside CWD and the ongoing planning activities in the watershed, the precise means of serving Coastside CWD's additional deliveries and the resultant potential changes to the operation of SFPUC facilities and their affected environs are uncertain.[9]

Assuming a range of potential means to serve the additional delivery from Coastside CWD, the following potential hydrologic effects to SFPUC facilities and their affected environs were identified:

- Due to limited yield from Pilarcitos Reservoir, additional diversions would be required from Crystal Springs Reservoir.
- If deliveries to Coastside CWD from Pilarcitos Reservoir increase during the winter season, these deliveries could potentially reduce storage in Pilarcitos Reservoir, thereby potentially reducing diversions to the San Mateo Creek watershed. Although the increased delivery would increase releases to Pilarcitos Creek from Pilarcitos Dam for a period of time, the increase would subsequently lead to a reduction in spills past Stone Dam.
- Additional wintertime deliveries could also potentially impair the ability to provide carry-over storage into the summer season from Pilarcitos Reservoir, and subsequently lead to an acceleration of the beginning of the season when releases to Pilarcitos Creek from Pilarcitos Reservoir consist only of the passage of reservoir inflow.
- An increase in summertime deliveries from Pilarcitos Creek could also accelerate the beginning of the season when releases to Pilarcitos Creek from Pilarcitos Reservoir consist only of the passage of reservoir inflow.

In the No Purchase Request Alternative, Coastside CWD's water delivery is anticipated to slightly increase to its maximum allotment, but would be less than in the WSIP setting. Hydrologic effects to the Pilarcitos Creek watershed would be less than in the WSIP setting.

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[9] See "Analysis of SFPUC Pilarcitos/Coastside County Water District Operations", Daniel B. Steiner, March 8, 2007.

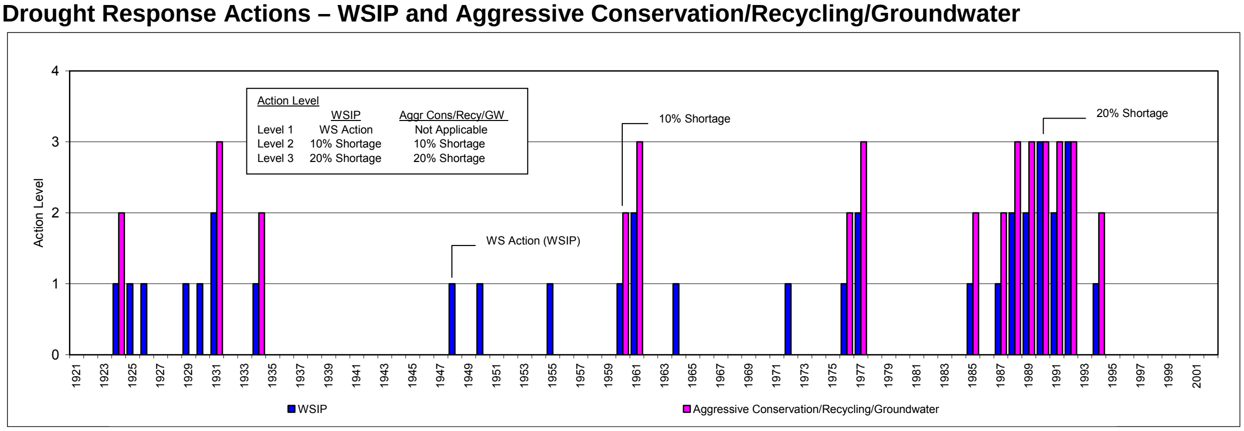
4. CEQA Alternative 3 – Aggressive Conservation/Recycling/Groundwater

CEQA Alternative 3 – Aggressive Conservation/Recycling/Groundwater Alternative would serve an increase in customer purchases from 265 mgd in 2005 to 300 mgd in 2030, met in large part through additional water conservation, water recycling, and groundwater programs beyond those already assumed in the 2030 demand projections. A total of 19 mgd of the demand is assumed to be met through regional recycled water, groundwater, and conservation projects within the regional service area, but outside of San Francisco. These projects are in addition to the 10 mgd of groundwater development, recycled water projects, and conservation in San Francisco (referred to herein as RRGWC) included in the WSIP and also incorporated into this alternative. The alternative would result in an average annual net demand on the regional system of 271 mgd compared to a net demand of 290 mgd in the WSIP setting, and compared to an average annual demand of 265 mgd for the base setting. The increased net water demand would be served through additional Tuolumne River diversions and increased use of local watershed supplies from restoration of Calaveras Reservoir. Compared to the WSIP setting, the alternative would not include supplemental supplies from implementation of the Westside Basin Groundwater Program, water transfers with the TID/MID, or water supply associated with restoration of Lower Crystal Springs Dam.[10] All other WSIP facility improvement projects would be implemented.

4.1 Water Deliveries and Drought Response Actions

Compared to the WSIP setting, the regional system's resources are required to serve a net 271-mgd demand (300 mgd purchase request less 10 mgd of RRGWC and 19 mgd from projects within the region but not in San Francisco) instead of a net 290-mgd demand. However, the alternative does not provide relatively comparable supplemental water supplies for the lesser demand, and requires a more frequent implementation of rationing and severity of rationing from the SFPUC system during drought periods. The shortages that SFPUC customers would experience in supply from the SFPUC system in the future would be in a setting where the region would have already developed some portion of the 19 mgd included in this alternative as a system resource. Development of these projects might affect the ability of SFPUC customers to cope with projected shortages in SFPUC supplies. Table 1-1 illustrates the comparison of the drought response actions for the proposed program and the alternative. Figure 4.1-1 illustrates the occurrence of drought response actions for the simulated 82-year historical period (1921-2002).

Figure 4.1-1
Drought Response Actions – WSIP and Aggressive Conservation/Recycling/Groundwater



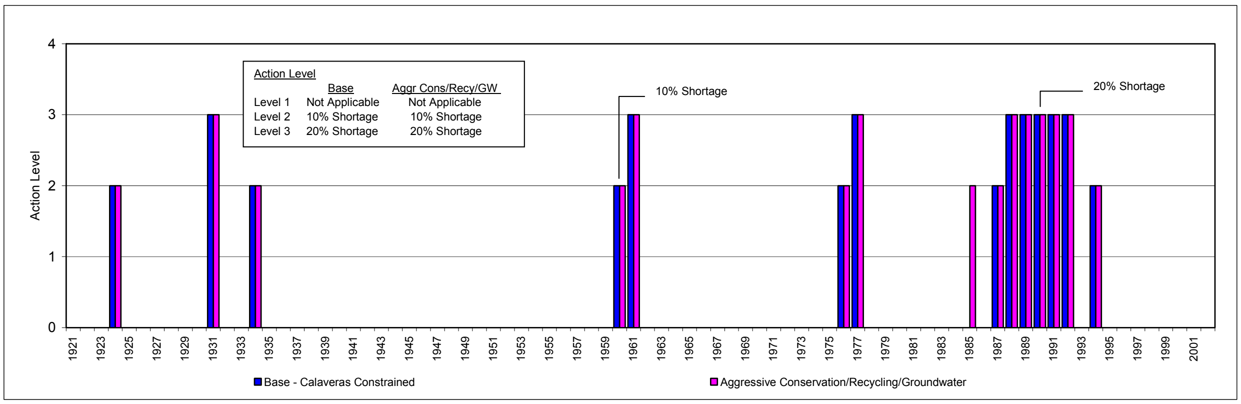
In Figure 4.1-1, years with bars showing a "1" or greater level of action indicate periods when a supplemental water supply action is initiated. In the WSIP setting, the water supply action is the use of the Westside Groundwater Basin Program to supplement SFPUC water deliveries. Also occurring in the WSIP setting is the water transfer supplemental supply from MID/TID. In the alternative setting, no supplemental water supply action is available, and only water delivery shortage (rationing) measures are available. Action levels greater than "1" indicate the imposition of delivery shortages to SFPUC

[10] The Lower Crystal Springs Dam Improvements (LCSDI) project is also included in this alternative; however, it was not included in the HH/LSM modeling.

customers. In both settings, the shortage measure is applied during level 2 (10 percent) and level 3 (20 percent), although they are applied to different levels of water demand. In the alternative, the system's net water demand is 271 mgd, and in the WSIP setting the net water demand is 290 mgd. SFPUC customers would experience more frequent periods of shortages, and the severity of shortages (percentage-wise) would increase.

The same form of information is shown in Figure 4.1-2 in comparing the alternative and "Base - Calaveras Constrained" (existing) settings. There is no level 1 action level in either the base or alternative setting. Without supplemental resources, both settings only have delivery shortage measures available to cope with drought. In the base setting, the shortage measure is imposed during level 2 (10 percent) and level 3 (20 percent). During this simulation period, rationing above 20 percent is not required in either setting; however, in the alternative setting, the frequency of water delivery shortages increases. The applied shortages (percentage-wise) occur to two different levels of net water demand.

Figure 4.1-2
Drought Response Actions – Base and Aggressive Conservation/Recycling/Groundwater



Not illustrated in Figure 4.1-2 but shown in Table 1-1 are the delivery shortages anticipated during the entire SFPUC Design Drought. During the Design Drought, the base setting does not have a viable operation without exceeding a 20-percent shortage level. The base setting exceeds the 20-percent shortage level (requires 25 percent rationing) during the last 18 months of the Design Drought. The alternative would viably provide deliveries without exceeding a 20-percent shortage level. However, the alternative would require 4 years of greater shortages (percentage-wise) than the WSIP setting during the Design Drought.

The difference in water deliveries between the proposed program and the alternative is shown chronologically for the 82-year simulation in Table 4.1-1. Less water would be delivered to the region by the SFPUC in all years, a result of serving a lesser net water demand (275 mgd instead of 290 mgd).

Comparing the alternative setting to the base setting, Table 4.1-2 illustrates the difference in water deliveries between the two settings. The increases in deliveries indicate the SFPUC system serving a larger net demand in the alternative setting (271 mgd) compared to the base setting (265 mgd). The one notable reduction in deliveries occurs during 1985 when the alternative setting requires rationing and the base setting does not.

Table 4.1-1

Difference in Total System-wide Delivery (MG)

Aggressive Conservation/Recycling/Groundwater minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
1921	-1,126	-346	-373	-370	-120	-155	-852	-868	-870	-905	-899	-873	-7,758	-8,423
1922	-902	-129	-149	-146	-120	-155	-852	-868	-870	-905	-899	-873	-6,868	-6,868
1923	-902	-129	-149	-146	-120	-155	-852	-868	-870	-905	-899	-873	-6,868	-6,868
1924	-902	-129	-149	-146	-120	-155	-852	-868	-870	-1,839	-1,816	-1,604	-9,450	-6,868
1925	-1,467	-597	-445	-346	-424	-706	-1,448	-1,668	-1,794	-599	-625	-636	-10,754	-14,153
1926	-678	73	35	13	56	44	-633	-646	-634	-599	-625	-636	-4,229	-4,229
1927	-678	73	35	13	56	44	-633	-646	-634	-1,129	-1,123	-1,090	-5,712	-4,229
1928	-1,126	-346	-373	-370	-323	-379	-1,069	-1,092	-1,087	-1,129	-1,123	-1,090	-9,508	-9,508
1929	-1,126	-346	-373	-370	-323	-379	-1,069	-1,092	-1,087	-599	-625	-636	-8,024	-9,508
1930	-678	73	35	13	56	44	-633	-646	-634	-599	-625	-636	-4,229	-4,229
1931	-678	73	35	13	56	44	-633	-646	-634	-1,518	-1,521	-1,409	-6,818	-4,229
1932	-1,375	-701	-656	-616	-593	-777	-1,331	-1,464	-1,502	-1,129	-1,123	-1,090	-12,358	-13,464
1933	-1,126	-346	-373	-370	-323	-379	-1,069	-1,092	-1,087	-1,129	-1,123	-1,090	-9,508	-9,508
1934	-1,126	-346	-373	-370	-323	-379	-1,069	-1,092	-1,087	-1,839	-1,816	-1,604	-11,424	-9,508
1935	-1,467	-597	-445	-346	-424	-706	-1,448	-1,668	-1,794	-1,129	-1,123	-1,090	-12,237	-14,153
1936	-1,126	-346	-373	-370	-323	-379	-1,069	-1,092	-1,087	-1,129	-1,123	-1,090	-9,508	-9,508
1937	-1,126	-346	-373	-370	-323	-379	-1,069	-1,092	-1,087	-1,129	-1,123	-1,090	-9,508	-9,508
1938	-1,126	-346	-373	-370	-323	-379	-1,069	-1,092	-1,087	-905	-899	-873	-8,842	-9,508
1939	-902	-129	-149	-146	-120	-155	-852	-868	-870	-905	-899	-873	-6,868	-6,868
1940	-902	-129	-149	-146	-120	-155	-852	-868	-870	-905	-899	-873	-6,868	-6,868
1941	-902	-129	-149	-146	-120	-155	-852	-868	-870	-905	-899	-873	-6,868	-6,868
1942	-902	-129	-149	-146	-120	-155	-852	-868	-870	-905	-899	-873	-6,868	-6,868
1943	-902	-129	-149	-146	-120	-155	-852	-868	-870	-905	-899	-873	-6,868	-6,868
1944	-902	-129	-149	-146	-120	-155	-852	-868	-870	-905	-899	-873	-6,868	-6,868
1945	-902	-129	-149	-146	-120	-155	-852	-868	-870	-905	-899	-873	-6,868	-6,868
1946	-902	-129	-149	-146	-120	-155	-852	-868	-870	-905	-899	-873	-6,868	-6,868
1947	-902	-129	-149	-146	-120	-155	-852	-868	-870	-905	-899	-873	-6,868	-6,868
1948	-902	-129	-149	-146	-120	-155	-852	-868	-870	-599	-625	-636	-6,050	-6,868
1949	-678	73	35	13	56	44	-633	-646	-634	-1,129	-1,123	-1,090	-5,712	-4,229
1950	-1,126	-346	-373	-370	-323	-379	-1,069	-1,092	-1,087	-599	-625	-636	-8,024	-9,508
1951	-678	73	35	13	56	44	-633	-646	-634	-1,129	-1,123	-1,090	-5,712	-4,229
1952	-1,126	-346	-373	-370	-323	-379	-1,069	-1,092	-1,087	-905	-899	-873	-8,842	-9,508
1953	-902	-129	-149	-146	-120	-155	-852	-868	-870	-905	-899	-873	-6,868	-6,868
1954	-902	-129	-149	-146	-120	-155	-852	-868	-870	-905	-899	-873	-6,868	-6,868
1955	-902	-129	-149	-146	-120	-155	-852	-868	-870	-599	-625	-636	-6,050	-6,868
1956	-678	73	35	13	56	44	-633	-646	-634	-1,129	-1,123	-1,090	-5,712	-4,229
1957	-1,126	-346	-373	-370	-323	-379	-1,069	-1,092	-1,087	-905	-899	-873	-8,842	-9,508
1958	-902	-129	-149	-146	-120	-155	-852	-868	-870	-905	-899	-873	-6,868	-6,868
1959	-902	-129	-149	-146	-120	-155	-852	-868	-870	-905	-899	-873	-6,868	-6,868
1960	-902	-129	-149	-146	-120	-155	-852	-868	-870	-1,839	-1,816	-1,604	-9,450	-6,868
1961	-1,467	-597	-445	-346	-424	-706	-1,448	-1,668	-1,794	-1,518	-1,521	-1,409	-13,343	-14,153
1962	-1,375	-701	-656	-616	-593	-777	-1,331	-1,464	-1,502	-1,129	-1,123	-1,090	-12,358	-13,464
1963	-1,126	-346	-373	-370	-323	-379	-1,069	-1,092	-1,087	-1,129	-1,123	-1,090	-9,508	-9,508
1964	-1,126	-346	-373	-370	-323	-379	-1,069	-1,092	-1,087	-599	-625	-636	-8,024	-9,508
1965	-678	73	35	13	56	44	-633	-646	-634	-1,129	-1,123	-1,090	-5,712	-4,229
1966	-1,126	-346	-373	-370	-323	-379	-1,069	-1,092	-1,087	-905	-899	-873	-8,842	-9,508
1967	-902	-129	-149	-146	-120	-155	-852	-868	-870	-905	-899	-873	-6,868	-6,868
1968	-902	-129	-149	-146	-120	-155	-852	-868	-870	-905	-899	-873	-6,868	-6,868
1969	-902	-129	-149	-146	-120	-155	-852	-868	-870	-905	-899	-873	-6,868	-6,868
1970	-902	-129	-149	-146	-120	-155	-852	-868	-870	-905	-899	-873	-6,868	-6,868
1971	-902	-129	-149	-146	-120	-155	-852	-868	-870	-905	-899	-873	-6,868	-6,868
1972	-902	-129	-149	-146	-120	-155	-852	-868	-870	-599	-625	-636	-6,050	-6,868
1973	-678	73	35	13	56	44	-633	-646	-634	-1,129	-1,123	-1,090	-5,712	-4,229
1974	-1,126	-346	-373	-370	-323	-379	-1,069	-1,092	-1,087	-905	-899	-873	-8,842	-9,508
1975	-902	-129	-149	-146	-120	-155	-852	-868	-870	-905	-899	-873	-6,868	-6,868
1976	-902	-129	-149	-146	-120	-155	-852	-868	-870	-1,839	-1,816	-1,604	-9,450	-6,868
1977	-1,467	-597	-445	-346	-424	-706	-1,448	-1,668	-1,794	-1,518	-1,521	-1,409	-13,343	-14,153
1978	-1,375	-701	-656	-616	-593	-777	-1,331	-1,464	-1,502	-1,129	-1,123	-1,090	-12,358	-13,464
1979	-1,126	-346	-373	-370	-323	-379	-1,069	-1,092	-1,087	-1,129	-1,123	-1,090	-9,508	-9,508
1980	-1,126	-346	-373	-370	-323	-379	-1,069	-1,092	-1,087	-905	-899	-873	-8,842	-9,508
1981	-902	-129	-149	-146	-120	-155	-852	-868	-870	-905	-899	-873	-6,868	-6,868
1982	-902	-129	-149	-146	-120	-155	-852	-868	-870	-905	-899	-873	-6,868	-6,868
1983	-902	-129	-149	-146	-120	-155	-852	-868	-870	-905	-899	-873	-6,868	-6,868
1984	-902	-129	-149	-146	-120	-155	-852	-868	-870	-905	-899	-873	-6,868	-6,868
1985	-902	-129	-149	-146	-120	-155	-852	-868	-870	-1,839	-1,816	-1,604	-9,450	-6,868
1986	-1,467	-597	-445	-346	-424	-706	-1,448	-1,668	-634	-1,129	-1,123	-1,090	-11,077	-12,993
1987	-1,126	-346	-373	-370	-323	-379	-1,069	-1,092	-1,087	-1,839	-1,816	-1,604	-11,424	-9,508
1988	-1,467	-597	-445	-346	-424	-706	-1,448	-1,668	-1,794	-1,518	-1,521	-1,409	-13,343	-14,153
1989	-1,375	-701	-656	-616	-593	-777	-1,331	-1,464	-1,502	-1,518	-1,521	-1,409	-13,464	-13,464
1990	-1,375	-701	-656	-616	-593	-777	-1,331	-1,464	-1,502	-394	-420	-432	-10,261	-13,464
1991	-473	49	16	-6	31	29	-438	-451	-430	-1,518	-1,521	-1,409	-6,121	-2,919
1992	-1,375	-701	-656	-616	-593	-777	-1,331	-1,464	-1,502	-394	-420	-432	-10,261	-13,464
1993	-473	49	16	-6	31	29	-438	-451	-430	-1,129	-1,123	-1,090	-5,015	-2,919
1994	-1,126	-346	-373	-370	-323	-379	-1,069	-1,092	-1,087	-1,839	-1,816	-1,604	-11,424	-9,508
1995	-1,467	-597	-445	-346	-424	-706	-1,448	-1,668	-1,794	-1,129	-1,123	-1,090	-12,237	-14,153
1996	-1,126	-346	-373	-370	-323	-379	-1,069	-1,092	-1,087	-1,129	-1,123	-1,090	-9,508	-9,508
1997	-1,126	-346	-373	-370	-323	-379	-1,069	-1,092	-1,087	-1,129	-1,123	-1,090	-9,508	-9,508
1998	-1,126	-346	-373	-370	-323	-379	-1,069	-1,092	-1,087	-1,129	-1,123	-1,090	-9,508	-9,508
1999	-1,126	-346	-373	-370	-323	-379	-1,069	-1,092	-1,087	-1,129	-1,123	-1,090	-9,508	-9,508
2000	-1,126	-346	-373	-370	-323	-379	-1,069	-1,092	-1,087	-1,129	-1,123	-1,090	-9,508	-9,508
2001	-1,126	-346	-373	-370	-323	-379	-1,069	-1,092	-1,087	-905	-899	-873	-8,842	-9,508
2002	-902	-129	-149	-146	-120	-155	-852	-868	-870	-905	-899	-873	-6,868	-6,868
Avg (21-02)	-1,018	-250	-255	-245	-217	-287	-967	-1,011	-1,008	-1,049	-1,047	-1,001	-8,356	-8,364

Table 4.1-2

Difference in Total System-wide Delivery (MG)

Aggressive Conservation/Recycling/Groundwater minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
1921	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1922	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1923	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1924	-92	482	312	229	317	454	-125	39	138	202	171	68	2,194	2,256
1925	-64	400	265	191	268	372	-83	46	-1,022	240	196	67	875	814
1926	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1927	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1928	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1929	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1930	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1931	-92	482	312	229	317	454	-125	39	138	184	151	63	2,152	2,256
1932	-52	356	235	173	236	333	-71	36	109	240	196	67	1,856	1,753
1933	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1934	-92	482	312	229	317	454	-125	39	138	202	171	68	2,194	2,256
1935	-64	400	265	191	268	372	-83	46	-1,022	240	196	67	875	814
1936	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1937	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1938	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1939	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1940	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1941	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1942	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1943	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1944	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1945	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1946	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1947	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1948	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1949	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1950	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1951	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1952	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1953	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1954	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1955	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1956	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1957	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1958	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1959	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1960	-92	482	312	229	317	454	-125	39	138	202	171	68	2,194	2,256
1961	-64	400	265	191	268	372	-83	46	120	184	151	63	1,914	1,956
1962	-52	356	235	173	236	333	-71	36	109	240	196	67	1,856	1,753
1963	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1964	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1965	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1966	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1967	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1968	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1969	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1970	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1971	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1972	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1973	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1974	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1975	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1976	-92	482	312	229	317	454	-125	39	138	202	171	68	2,194	2,256
1977	-64	400	265	191	268	372	-83	46	120	184	151	63	1,914	1,956
1978	-52	356	235	173	236	333	-71	36	-2,001	240	196	67	-254	-358
1979	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1980	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1981	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1982	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1983	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1984	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1985	-92	482	312	229	317	454	-125	39	138	-1,000	-996	-901	-1,144	2,256
1986	-882	-187	-167	-130	-164	-297	-940	-983	138	240	196	67	-3,108	-6,508
1987	-92	482	312	229	317	454	-125	39	138	202	171	68	2,194	2,256
1988	-64	400	265	191	268	372	-83	46	120	184	151	63	1,914	1,956
1989	-52	356	235	173	236	333	-71	36	109	184	151	63	1,753	1,753
1990	-52	356	235	173	236	333	-71	36	109	184	151	63	1,753	1,753
1991	-52	356	235	173	236	333	-71	36	109	184	151	63	1,753	1,753
1992	-52	356	235	173	236	333	-71	36	109	184	151	63	1,753	1,753
1993	-52	356	235	173	236	333	-71	36	-2,001	240	196	67	-254	-358
1994	-92	482	312	229	317	454	-125	39	138	202	171	68	2,194	2,256
1995	-64	400	265	191	268	372	-940	-983	-1,022	240	196	67	-1,010	-1,072
1996	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1997	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1998	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
1999	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
2000	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
2001	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
2002	-92	482	312	229	317	454	-125	39	138	240	196	67	2,256	2,256
Avg (21-02)	-96	456	295	216	299	427	-137	14	41	216	175	55	1,962	1,962

4.2 Diversions from Tuolumne River

The metric for illustrating the SFPUC diversion from the Tuolumne River Basin (Tuolumne) is the flow through the San Joaquin Pipeline (SJPL). Inherent to this alternative setting is a net water demand slightly greater than the base setting, which is less than the demand served by the proposed program. Table 4.2-1 illustrates the difference in diversions to the SJPL between the proposed program and the alternative settings. In both settings, the conveyance capacity of the SJPL is increased compared to the base setting. During the summer, the SJPL would essentially operate at the same maximum rate in both the alternative and WSIP settings to minimize draw down of Bay Area reservoir storage. A few exceptions occur during the summer of drought periods when the alternative is serving a lesser net demand than in the WSIP setting. Overall, compared to the WSIP setting, the alternative setting would divert less water from the Tuolumne, primarily due to the lesser net water demand place on the system.

Table 4.2-2 illustrates the difference in diversions to the SJPL between the alternative and base settings. Evident in the operation is the increase in summer diversions associated with an increase in the conveyance capacity of the SJPL. As described above, with the increase in SJPL conveyance capacity, summer diversions would increase to retain storage in the Bay Area reservoirs. Because the demand of the alternative is approximately the same as the base setting, the increase in summer diversions to the SJPL result in reduced diversions during the late summer and fall. The differences in December diversions are largely the result of maintenance occurring in the alternative setting (lessening available conveyance capacity), which does not occur in the base setting. The increased diversion during the winter and spring result from the need to replenish Bay Area reservoir storage after the maintenance, and then top off Bay Area reservoir storage prior to summer. Overall, there would be an increase in average annual diversions to the SJPL in the alternative setting, which is predominantly associated with the increase in net water demand.

The average monthly diversion through the SJPL by year type for the 82-year simulation for the proposed program and the alternative settings and the difference between the two settings is illustrated in Table 4.2-3. Table 4.2-4 illustrates the same information for the alternative and base settings.

Table 4.2-1

Difference in Total SJPL (Acre-feet) Aggressive Conservation/Recycling/Groundwater minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
1921	-2,854	-1,841	0	0	0	-5,708	0	-2,664	-2,578	0	0	-2,118	-17,763	-22,090
1922	-5,233	-921	0	-1,902	0	0	-10,127	-2,664	-2,578	0	0	-2,578	-26,003	-25,543
1923	-2,854	0	0	0	0	-2,949	-3,867	-2,664	-2,578	0	0	-2,118	-17,030	-17,490
1924	-3,901	-921	952	-1,903	-1,719	0	0	0	0	0	0	-7,642	-15,134	-9,610
1925	-7,897	0	0	0	-945	0	0	-3,996	-3,867	0	0	-2,578	-19,283	-24,347
1926	-5,043	-2,854	0	-6,755	-6,875	-2,949	-4,880	-2,189	-2,118	0	0	-2,118	-35,781	-36,241
1927	-5,233	-921	952	-1,902	0	-1,902	-5,524	-3,140	-3,038	0	0	-2,118	-22,826	-22,826
1928	-2,854	-921	-523	-2,855	-2,578	-3,805	-5,524	-3,140	-3,038	0	0	-2,118	-27,356	-27,356
1929	-5,233	-921	0	-3,805	-3,437	0	0	0	0	0	0	-1,197	-14,593	-15,514
1930	-5,043	0	0	0	0	0	0	0	0	0	0	0	-5,043	-6,240
1931	-3,140	-2,854	0	-6,755	-6,101	0	0	0	0	-2,522	-3,949	-10,726	-36,047	-18,850
1932	-9,847	-4,005	7,944	-1,760	-8,034	-8,039	-3,821	-8,230	-7,964	0	0	-2,118	-45,874	-60,953
1933	-1,903	-2,762	0	-2,854	-2,578	0	0	0	0	0	0	-1,197	-11,294	-12,215
1934	-3,996	-1,013	-7,611	-6,659	-6,015	0	0	-1,237	-1,197	-1,237	-1,237	-7,642	-37,844	-28,925
1935	-7,897	0	0	-1,047	-2,664	0	-10,404	-7,897	-7,642	0	0	-1,197	-38,748	-47,667
1936	-7,897	-5,524	0	-3,806	-859	-6,755	-3,038	-3,996	-3,867	0	0	-1,197	-36,939	-36,939
1937	-6,660	-2,762	952	-4,757	0	-2,663	-7,366	-3,996	-3,867	0	0	-2,118	-33,237	-32,316
1938	-3,901	-921	1,142	-4,947	0	0	-9,206	-5,043	-4,880	0	0	-2,578	-30,334	-29,874
1939	-2,854	0	2,854	-1,903	-1,719	0	0	-1,237	-1,197	0	0	-1,197	-7,253	-8,634
1940	-5,043	0	0	0	-8,593	-9,704	-5,524	-3,996	-3,867	0	0	-1,197	-37,924	-37,924
1941	-952	0	2,854	0	0	0	0	-2,854	-2,762	0	0	0	-3,714	-4,911
1942	-3,805	-921	1,712	0	0	-2,854	-7,365	-2,854	-2,762	0	0	-1,197	-20,046	-18,849
1943	-2,949	-1,841	0	0	0	-4,947	-4,880	-3,996	-3,867	0	0	-2,118	-24,598	-23,677
1944	-952	0	1,903	-3,805	-3,437	-3,901	0	-3,140	-3,038	0	0	-1,197	-17,567	-18,488
1945	-3,901	0	0	0	-2,578	0	0	-3,140	-3,038	0	0	-1,197	-13,854	-13,854
1946	-7,897	-2,762	0	0	0	-3,901	0	-1,237	-1,197	0	0	-3,038	-20,032	-18,191
1947	-8,562	-921	1,903	-4,757	-4,296	0	0	0	0	0	0	-2,118	-18,751	-19,671
1948	-5,043	-2,854	0	-6,755	-5,156	0	0	0	0	0	0	-1,197	-21,005	-21,926
1949	-5,043	-2,854	0	-2,855	-2,578	-952	-3,038	-3,140	-3,038	0	0	-2,118	-25,616	-24,695
1950	-4,757	0	0	0	0	0	0	0	0	0	0	0	-4,757	-6,875
1951	-3,140	-11,968	0	0	0	-7,801	-2,578	-3,996	-3,867	0	0	-2,118	-35,468	-33,350
1952	-2,854	-921	0	0	0	0	-9,207	-5,043	-4,880	0	0	-2,118	-25,023	-25,023
1953	-2,854	0	951	0	0	-5,803	0	-5,043	-4,880	0	0	-1,197	-18,826	-19,747
1954	-2,854	0	2,855	-3,805	-1,718	-5,803	-1,197	-2,189	-2,118	0	0	-2,118	-18,947	-18,026
1955	-3,901	0	0	0	0	0	0	0	0	0	0	0	-3,901	-6,019
1956	-3,140	-1,013	0	0	0	-1,142	-3,867	-3,140	-3,038	0	0	-3,038	-18,378	-15,340
1957	-4,756	-921	952	-1,903	-1,719	-2,949	0	-1,237	-1,197	0	0	-2,118	-15,848	-16,768
1958	-7,897	-3,683	0	-3,805	0	0	0	-2,949	-2,854	0	0	-1,197	-22,385	-23,306
1959	-2,854	0	2,855	-3,805	0	-1,047	0	-2,189	-2,118	0	0	-1,197	-10,355	-10,355
1960	-5,043	0	0	0	0	0	0	0	0	0	0	-3,867	-8,910	-6,240
1961	-6,945	-3,775	6,184	-571	-6,101	-1,047	0	-5,043	-4,880	-5,281	-5,281	-10,726	-43,466	-26,045
1962	-11,084	-875	1,094	-5,566	-8,894	-8,039	-4,281	-9,181	-8,884	0	0	-1,197	-56,907	-76,998
1963	-1,332	-5,524	0	-2,663	0	-4,947	-6,444	-2,854	-2,762	0	0	-1,197	-27,723	-27,723
1964	-6,945	-1,841	0	-2,854	-2,578	0	0	0	0	0	0	-2,118	-16,336	-15,415
1965	-5,043	0	0	-5,708	-5,156	0	-7,826	-3,806	-3,683	0	0	-1,197	-32,419	-33,340
1966	-2,854	0	523	-3,805	-3,437	0	0	0	0	0	0	-2,578	-12,151	-10,770
1967	-5,043	-5,616	-1,902	0	0	-3,805	-6,445	-2,855	-2,762	0	0	0	-28,428	-31,006
1968	-3,806	-921	0	-952	-860	0	0	0	0	0	0	-3,038	-9,577	-6,539
1969	-7,897	-3,683	0	0	0	0	-7,642	-3,996	-3,867	0	0	-2,118	-29,203	-30,123
1970	-952	0	0	-1,903	-1,719	-5,803	0	-1,237	-1,197	0	0	-2,578	-15,389	-14,929
1971	-4,757	0	0	0	0	0	0	0	0	0	0	-2,118	-6,875	-7,335
1972	-5,043	-6,537	-2,854	-4,757	-4,296	0	0	0	0	0	0	0	-23,487	-25,605
1973	-3,996	-3,775	0	0	0	0	-7,642	-3,140	-3,038	0	0	-2,578	-24,169	-21,591
1974	-4,756	0	0	0	0	-2,854	-7,365	-5,043	-4,880	0	0	-2,118	-27,016	-27,476
1975	0	0	0	0	-2,578	-2,854	-7,365	-3,996	-3,867	0	0	-2,118	-22,778	-22,778
1976	0	0	0	-2,854	-2,578	0	0	0	0	0	0	-7,642	-13,074	-7,550
1977	-7,897	-3,775	-2,854	1,427	-4,296	0	0	-5,043	-4,880	-4,424	1,760	-4,742	-34,724	-34,960
1978	-3,663	-875	4,900	-8,420	-8,034	-9,847	-10,450	-5,185	-5,017	0	0	-2,578	-49,169	-53,997
1979	-2,854	0	0	-3,805	0	-5,709	-1,197	-2,664	-2,578	0	0	-2,118	-20,925	-21,385
1980	-7,897	0	0	-6,659	0	-7,611	-4,880	-3,996	-3,867	0	0	-2,118	-37,028	-37,028
1981	-2,854	-921	0	-1,902	-1,718	-1,047	-1,197	-2,189	-2,118	0	0	-2,118	-16,064	-16,064
1982	-6,660	-1,841	1,903	0	0	-2,663	0	-2,854	-2,762	0	0	-1,197	-16,074	-16,995
1983	-2,949	0	0	0	0	0	-4,604	-1,902	-1,841	0	0	0	-11,296	-12,493
1984	-5,043	-921	0	0	0	0	0	0	0	0	0	-2,578	-8,542	-5,964
1985	-5,043	0	0	0	0	0	0	0	0	0	0	-4,880	-9,923	-7,621
1986	-6,945	-3,775	0	-8,658	-3,437	-7,610	-11,968	-7,897	-7,642	0	0	-1,197	-59,129	-62,812
1987	-1,902	0	952	-1,903	-1,719	0	0	0	0	0	-1,237	-7,642	-13,451	-5,769
1988	-7,897	-3,775	0	-8,658	-6,875	0	0	-5,043	-4,880	-4,424	-5,281	-10,726	-57,559	-46,007
1989	-6,041	-3,084	-1,284	-3,187	-2,878	-1,285	-2,440	-8,230	-7,964	-3,949	-4,424	-4,005	-48,771	-56,824
1990	-3,187	0	0	-1,285	-2,105	-1,285	-1,243	-3,949	-4,281	-6,327	-4,138	-3,084	-30,884	-29,713
1991	-1,285	-322	-761	618	558	-4,138	-3,360	-3,187	-3,084	-4,424	-2,141	-1,243	-22,769	-28,510
1992	-1,285	-1,243	-1,284	-3,187	559	-8,039	-4,281	-9,181	-8,884	1,094	2,521	1,519	-31,691	-44,633
1993	1,570	-322	-761	-1,285	-1,160	-1,285	-4,004	-4,139	-4,005	0	0	-1,197	-16,588	-10,257
1994	-2,854	0	1,903	-2,855	-2,578	-1,047	0	-1,237	-1,197	0	-1,237	-7,642	-18,744	-11,062
1995	-7,897	0	0	-7,801	-5,328	0	-10,127	-6,659	-6,445	0	0	-3,867	-48,124	-53,136
1996	-4,756	0	0	0	0	0	-6,721	-3,996	-3,867	0	0	-2,578	-21,918	-23,207
1997	-4,757	-2,762	0	0	0	-3,901	0	-3,140	-3,038	0	0	-2,118	-19,716	-20,176
1998	-6,660	-4,603	-523	0	0	-951	-9,206	-3,901	-3,775	0	0	-3,867	-33,486	-31,737
1999	-2,854	-921	1,903	-2,854	0	-5,709	-7,365	-5,043	-4,880	0	0	-2,578	-30,301	-31,590
2000	-4,756	0	0	0	-2,578	-8,563	0	-3,140	-3,038	0	0	-1,197	-23,272	-24,653
2001	-6,660	-2,762	0	-3,806	0	-5,708	-2,118	-2,664	-2,578	0	0	-2,118	-28,414	-27,493
2002	-5,708	-2,762	1,142	-1,902	-1,718	0	0	-1,237	-1,197	0	0	-1,197	-14,579	-15,500
Avg (21-02)	-4,532	-1,549	377	-2,230	-1,892	-2,333	-2,946	-2,925	-2,836	-384	-301	-2,552	-24,103	-24,167

Table 4.2-2

Difference in Total SJPL (Acre-feet) Aggressive Conservation/Recycling/Groundwater minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
1921	-1,902	-2,762	0	0	0	8,562	2,118	-475	-460	2,189	2,189	0	9,459	9,459
1922	-5,708	-921	0	4,757	0	0	-2,762	2,379	2,302	2,189	2,189	-460	3,965	4,425
1923	-2,854	-921	0	0	0	12,368	-1,749	-475	-460	2,189	2,189	0	10,287	9,827
1924	-2,854	-921	0	-2,855	-2,578	5,803	2,118	2,189	2,118	2,189	2,189	-5,524	1,874	7,398
1925	-5,708	-19,334	-15,222	5,803	16,327	15,317	2,118	-1,807	-1,749	2,189	2,189	-460	-337	-5,401
1926	0	2,762	-7,088	-952	859	12,368	-2,762	0	0	2,189	2,189	0	9,565	9,105
1927	-952	0	0	5,899	0	1,903	-5,524	-951	-920	2,189	2,189	2,762	6,595	3,833
1928	0	-921	-1,902	2,854	2,578	3,805	-5,524	-951	-920	2,189	2,189	2,762	6,159	6,159
1929	0	-921	0	952	860	10,560	2,118	2,189	2,118	2,189	2,189	921	23,175	25,016
1930	-2,854	-19,334	-19,979	5,803	5,242	15,317	2,118	2,189	2,118	2,189	2,189	2,118	-2,884	-4,081
1931	-951	2,762	-7,088	-952	3,437	5,803	2,118	2,189	2,118	-333	-1,760	-8,608	-1,265	15,932
1932	-1,285	3,360	618	2,521	-1,160	8,420	-1,703	-333	-322	2,189	2,189	0	14,494	-585
1933	0	-921	-7,088	4,757	4,297	10,560	2,118	2,189	2,118	2,189	2,189	921	23,329	22,408
1934	-1,807	4,603	-2,855	952	4,297	10,560	2,118	952	921	952	952	-5,524	16,121	25,040
1935	-5,708	-19,334	-19,979	15,412	12,202	10,560	-8,286	0	0	2,189	2,189	921	-9,834	-18,753
1936	-952	-921	-7,088	8,562	0	8,562	-920	-1,807	-1,749	2,189	2,189	921	8,986	8,986
1937	-2,854	-921	0	952	0	0	-5,524	1,047	1,013	2,189	2,189	0	-1,909	-988
1938	0	-921	0	2,663	0	0	-1,841	0	0	2,189	2,189	2,302	6,581	4,279
1939	-2,854	-921	1,902	1,902	1,718	10,560	2,118	952	921	2,189	2,189	921	21,597	22,978
1940	-2,854	-19,334	-19,979	11,512	859	2,663	1,841	1,047	1,013	2,189	2,189	921	-17,933	-17,933
1941	-952	-921	0	0	0	0	0	0	0	2,189	2,189	2,118	4,623	3,426
1942	-1,902	-921	0	0	0	951	-1,841	0	0	2,189	2,189	921	1,586	2,783
1943	0	1,841	-7,088	0	0	2,663	0	1,047	1,013	2,189	2,189	0	3,854	4,775
1944	-952	-921	-952	952	5,328	11,416	2,118	-951	-920	2,189	2,189	921	20,417	19,496
1945	-5,708	-19,334	-19,979	5,803	11,171	15,317	2,118	-951	-920	2,189	2,189	921	-7,184	-7,184
1946	-952	-921	0	0	0	7,611	2,118	952	921	2,189	2,189	-920	13,187	15,028
1947	-7,610	-921	3,805	0	0	10,560	2,118	2,189	2,118	2,189	2,189	0	16,637	15,717
1948	-2,854	2,762	-7,088	-952	-859	5,803	2,118	2,189	2,118	2,189	2,189	921	8,536	7,615
1949	-2,854	2,762	0	-2,855	-2,578	-5,709	-920	-951	-920	2,189	2,189	2,762	-6,885	-8,726
1950	-952	-19,334	-19,979	18,171	16,413	10,560	2,118	2,189	2,118	2,189	2,189	2,118	17,800	18,444
1951	-951	-7,365	0	0	0	-1,142	-460	-1,807	-1,749	2,189	2,189	2,762	-6,334	-6,978
1952	-952	-921	0	0	0	0	1,841	0	0	2,189	2,189	0	4,346	7,108
1953	-2,854	-921	0	0	0	9,514	2,118	-2,854	-2,762	2,189	2,189	921	7,540	6,619
1954	-5,708	-921	0	4,757	5,328	9,514	921	0	0	2,189	2,189	0	18,269	19,190
1955	-5,708	-19,334	-15,222	18,171	16,413	5,803	2,118	2,189	2,118	2,189	2,189	2,118	13,044	10,926
1956	-951	4,603	-3,805	0	0	2,663	-1,749	1,903	1,842	2,189	2,189	-920	7,964	11,002
1957	-2,854	-921	0	2,854	7,046	7,611	2,118	952	921	2,189	2,189	0	22,105	21,185
1958	-2,854	-921	-2,331	0	0	0	0	0	0	2,189	2,189	921	-807	-1,728
1959	-952	-921	0	4,757	0	14,270	2,118	0	0	2,189	2,189	921	24,571	24,571
1960	-2,854	-19,334	-19,979	5,803	9,538	5,803	2,118	2,189	2,118	2,189	2,189	-1,749	-11,969	-9,299
1961	-4,756	1,841	-2,331	4,757	4,297	4,756	2,118	-2,854	-2,762	-3,092	-3,092	3,360	2,242	7,695
1962	3,472	-1,243	-2,236	-1,284	2,277	10,132	-2,163	-1,284	-1,242	2,189	2,189	3,683	14,490	3,605
1963	3,901	-921	-2,331	0	0	1,712	-1,841	-952	-921	2,189	2,189	921	3,946	6,708
1964	0	1,841	-952	6,659	6,015	5,803	2,118	2,189	2,118	2,189	2,189	0	30,169	31,090
1965	-2,854	-19,334	-15,222	0	0	15,317	-3,683	-2,854	-2,762	2,189	2,189	3,683	-23,331	-27,014
1966	-952	1,841	-1,379	4,757	4,297	10,560	2,118	2,189	2,118	2,189	2,189	-460	29,467	33,610
1967	-2,854	0	-7,611	0	0	-951	-3,683	-2,855	-2,762	2,189	2,189	2,118	-14,220	-16,798
1968	1,902	-921	-7,088	7,610	6,874	10,560	2,118	2,189	2,118	2,189	2,189	-920	28,820	31,858
1969	-5,708	-921	1,902	0	0	0	0	1,047	1,013	2,189	2,189	0	1,711	791
1970	-952	-19,334	-15,222	10,464	9,452	9,514	2,118	952	921	2,189	2,189	-460	1,831	2,291
1971	-952	1,841	-951	0	0	10,560	2,118	2,189	2,118	2,189	2,189	0	21,301	20,841
1972	-2,854	-921	-952	0	0	5,803	2,118	2,189	2,118	2,189	2,189	2,118	13,997	11,879
1973	-1,807	1,841	-7,088	0	0	0	-921	-951	-920	2,189	2,189	2,302	-3,166	-3,350
1974	-2,854	0	0	0	0	5,708	-1,841	0	0	2,189	2,189	2,762	8,153	7,693
1975	-952	-19,334	-19,979	11,512	5,156	951	921	1,047	1,013	2,189	2,189	0	-15,287	-12,525
1976	0	-921	-7,088	3,805	3,437	5,803	2,118	2,189	2,118	2,189	2,189	-5,524	10,315	15,839
1977	-5,708	1,841	-952	952	860	5,803	2,118	-2,854	-2,762	-2,235	-2,235	-5,846	-11,018	-1,848
1978	-1,285	3,360	-3,615	-1,285	-1,160	-1,285	-139	618	599	2,189	2,189	-460	-274	-14,508
1979	-952	-921	-952	4,757	0	6,659	921	-475	-460	2,189	2,189	0	12,955	12,495
1980	-952	-19,334	-15,222	8,562	0	951	0	1,047	1,013	2,189	2,189	0	-19,557	-19,557
1981	-952	-921	-7,088	5,708	5,156	14,270	921	0	0	2,189	2,189	0	21,472	21,472
1982	-5,708	1,841	-2,854	0	0	0	0	0	0	2,189	2,189	921	-1,422	-2,343
1983	0	1,841	-2,663	0	0	0	-1,658	952	921	2,189	2,189	2,118	5,889	4,692
1984	0	-921	0	0	0	5,803	2,118	2,189	2,118	2,189	2,189	-460	15,225	17,803
1985	-2,854	-14,731	-15,222	5,803	9,538	10,560	2,118	2,189	2,118	2,189	2,189	-2,762	1,135	3,437
1986	-4,756	1,841	-7,088	-2,855	0	0	-4,603	-2,854	-2,762	2,189	2,189	921	-17,778	-21,461
1987	0	-921	0	1,902	1,718	10,560	2,118	2,189	2,118	2,189	952	-5,524	17,301	24,983
1988	-5,708	1,841	-7,088	-2,855	1,718	5,803	2,118	-2,854	-2,762	619	1,664	-5,846	-13,350	-12,170
1989	-1,285	3,360	618	-333	-300	9,275	-322	-6,041	-5,846	3,948	3,473	-5,846	701	-4,437
1990	-1,285	-14,731	-15,222	10,227	8,293	9,275	875	-1,760	-2,163	1,570	1,570	-1,243	-4,594	-4,916
1991	-1,285	3,360	-3,615	-4,139	1,418	12,986	-1,242	-6,041	-5,846	3,473	2,616	3,360	5,045	-2,507
1992	3,472	-1,243	1,570	4,614	3,996	10,132	-2,163	-1,284	-1,242	1,094	3,473	3,360	25,779	27,301
1993	3,472	-1,243	1,142	-1,285	-1,160	-1,285	5,202	-3,187	-3,084	2,189	2,189	921	3,871	6,499
1994	-952	-921	-952	1,902	6,015	9,513	2,118	952	921	2,189	952	-2,762	18,975	23,895
1995	-952	-19,334	-19,979	2,663	2,406	0	-921	-2,854	-2,762	2,189	2,189	1,013	-36,342	-41,354
1996	-2,854	-921	-2,331	0	0	0	0	-1,807	-1,749	2,189	2,189	2,302	-2,982	-4,271
1997	0	-1,841	0	0	0	7,611	2,118	-951	-920	2,189	2,189	0	10,395	12,697
1998	-5,708	-2,762	-1,902	0	0	0	-1,841	0	0	2,189	2,189	1,013	-6,822	-7,835
1999	-1,902	-921	3,805	5,708	0	3,805	-4,603	0	0	2,189	2,189	2,302	12,572	11,283
2000	-2,854	-19,334	-19,979	15,317	6,874	4,947	2,118	-951	-920	2,189	2,189	3,683	-6,721	-8,102
2001	-952	-921	-7,088	4,757	8,593	8,562	0	-475	-460	2,189	2,189	0	16,394	20,077
2002	-2,854	-921	0	4,757	4,297	10,560	2,118	952	921	2,189	2,189	921	25,129	24,208
Avg (21-02)	-1,909	-3,621	-5,044	2,941	2,644	6,191	227	-1	-6	2,022	2,000	187	5,631	5,620

Table 4.2-3

Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) Aggressive Conservation/Recycling/Groundwater

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	22,256	14,748	8,830	8,557	6,020	8,872	15,346	22,446	21,722	29,778	29,778	26,918	215,270	212,379
Above Normal	22,315	12,816	8,655	13,317	7,817	13,272	18,969	24,626	23,832	29,778	29,778	27,040	232,214	230,981
Normal	21,450	13,732	9,169	14,089	10,835	18,733	26,265	26,933	26,064	29,778	29,778	26,918	253,743	251,826
Below Normal	22,681	14,476	11,954	18,731	16,210	23,750	27,885	28,082	27,176	29,285	29,207	25,930	275,369	275,036
Dry	22,202	18,335	15,040	16,791	14,517	24,938	28,397	27,506	26,590	28,018	27,691	21,860	271,885	277,955
All Years	22,189	14,793	10,719	14,339	11,103	17,927	23,374	25,929	25,087	29,332	29,252	25,752	249,796	249,718

Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	27,358	16,624	8,533	11,512	7,465	11,298	21,561	26,603	25,744	29,778	29,778	28,817	245,069	242,794
Above Normal	26,705	14,785	7,751	14,254	9,306	16,705	24,176	28,608	27,685	29,778	29,778	28,817	258,347	258,347
Normal	26,174	14,713	8,765	15,626	12,095	22,405	28,207	29,778	28,817	29,778	29,778	28,817	274,953	274,878
Below Normal	27,338	16,106	11,931	21,523	18,520	25,038	28,817	29,481	28,530	29,778	29,593	27,864	294,520	295,079
Dry	25,990	19,593	14,794	19,764	17,471	25,782	28,817	29,778	28,817	29,463	28,821	27,200	296,289	297,969
All Years	26,721	16,342	10,342	16,569	12,994	20,261	26,320	28,854	27,923	29,717	29,553	28,304	273,899	273,884

Difference in Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) Aggressive Conservation/Recycling/Groundwater minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	-5,102	-1,876	297	-2,955	-1,445	-2,426	-6,215	-4,157	-4,022	0	0	-1,899	-29,799	-30,415
Above Normal	-4,390	-1,969	904	-937	-1,489	-3,433	-5,207	-3,982	-3,853	0	0	-1,777	-26,134	-27,367
Normal	-4,724	-981	404	-1,537	-1,259	-3,672	-1,942	-2,846	-2,753	0	0	-1,899	-21,209	-23,052
Below Normal	-4,656	-1,630	22	-2,793	-2,310	-1,287	-932	-1,399	-1,354	-493	-386	-1,934	-19,151	-20,044
Dry	-3,788	-1,257	247	-2,973	-2,954	-845	-420	-2,272	-2,227	-1,445	-1,130	-5,340	-24,404	-20,014
All Years	-4,532	-1,549	377	-2,230	-1,892	-2,333	-2,946	-2,925	-2,836	-384	-301	-2,552	-24,103	-24,167

Table 4.2-4

Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) Aggressive Conservation/Recycling/Groundwater

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	22,256	14,748	8,830	8,557	6,020	8,872	15,346	22,446	21,722	29,778	29,778	26,918	215,270	212,379
Above Normal	22,315	12,816	8,655	13,317	7,817	13,272	18,969	24,626	23,832	29,778	29,778	27,040	232,214	230,981
Normal	21,450	13,732	9,169	14,089	10,835	18,733	26,265	26,933	26,064	29,778	29,778	26,918	253,743	251,826
Below Normal	22,681	14,476	11,954	18,731	16,210	23,750	27,885	28,082	27,176	29,285	29,207	25,930	275,369	275,036
Dry	22,202	18,335	15,040	16,791	14,517	24,938	28,397	27,506	26,590	28,018	27,691	21,860	271,885	277,955
All Years	22,189	14,793	10,719	14,339	11,103	17,927	23,374	25,929	25,087	29,332	29,252	25,752	249,796	249,718

Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	24,260	18,126	13,783	8,028	6,015	7,433	16,031	23,070	22,326	27,589	27,589	26,009	220,258	218,975
Above Normal	24,176	17,926	14,204	9,100	6,157	9,279	20,309	24,679	23,883	27,589	27,589	25,887	230,776	230,776
Normal	23,368	19,046	14,390	9,930	6,864	10,632	25,951	27,054	26,181	27,589	27,589	26,009	244,601	243,681
Below Normal	24,959	17,980	17,964	15,726	11,808	15,334	26,699	27,589	26,699	26,917	26,917	25,670	264,263	264,595
Dry	23,665	19,046	18,433	14,080	11,386	15,936	26,699	27,232	26,354	26,876	26,578	24,225	260,509	262,015
All Years	24,097	18,413	15,763	11,398	8,459	11,737	23,147	25,930	25,093	27,311	27,253	25,565	244,165	244,098

Difference in Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) Aggressive Conservation/Recycling/Groundwater minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	-2,004	-3,378	-4,953	529	5	1,439	-685	-624	-604	2,189	2,189	909	-4,987	-6,596
Above Normal	-1,861	-5,110	-5,549	4,217	1,660	3,993	-1,340	-53	-51	2,189	2,189	1,154	1,438	205
Normal	-1,918	-5,314	-5,221	4,159	3,972	8,101	314	-121	-118	2,189	2,189	909	9,142	8,145
Below Normal	-2,278	-3,504	-6,011	3,005	4,403	8,417	1,186	493	477	2,368	2,290	260	11,106	10,441
Dry	-1,463	-711	-3,393	2,711	3,131	9,002	1,698	274	236	1,142	1,112	-2,365	11,376	15,940
All Years	-1,909	-3,621	-5,044	2,941	2,644	6,191	227	-1	-6	2,022	2,000	187	5,631	5,620

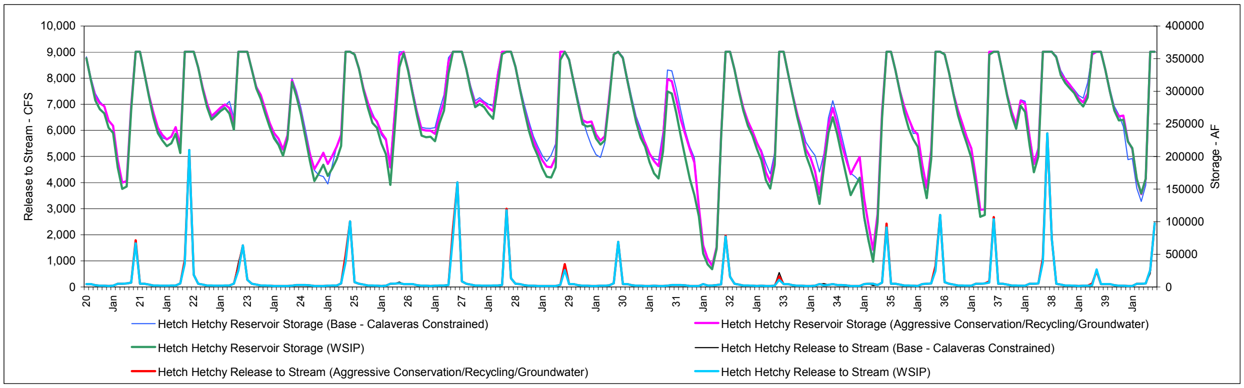
4.3 Hetch Hetchy Reservoir and Releases

Compared to the WSIP setting, the alternative setting would draw less water from the Tuolumne due to the lesser net demand. This circumstance would lead to less draw from Hetch Hetchy Reservoir in all years. Figure 4.3-1 illustrates a chronological trace of the simulation of Hetch Hetchy Reservoir storage and stream releases. Shown in Figure 4.3-1 are the results for the WSIP, alternative ("Aggressive Conservation/Recycling/Groundwater"), and base ("Base – Calaveras Constrained") setting. Supplementing the Figure 4.3-1 representation of Hetch Hetchy Reservoir storage are Table 4.3-1 Hetch Hetchy Reservoir Storage (Aggressive Conservation/Recycling/Groundwater), Table 4.3-2 Hetch Hetchy Reservoir Storage (WSIP), and Table 4.3-3 Difference in Hetch Hetchy Reservoir Storage (Aggressive Conservation/Recycling/Groundwater minus WSIP). Table 4.3-4 is provided to illustrate the difference in Hetch Hetchy Reservoir storage between the base and alternative settings.

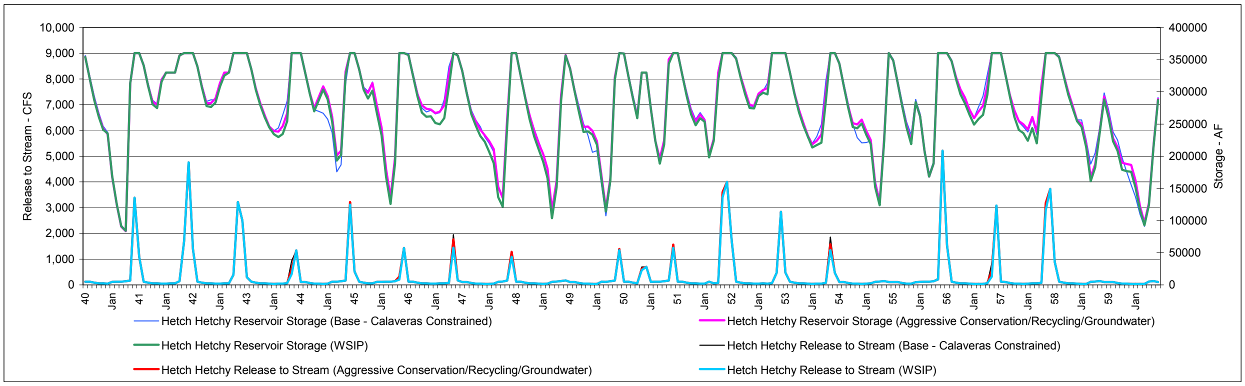
Table 4.3-3 illustrates that, by the end of summer, storage in Hetch Hetchy Reservoir associated with the alternative setting would be equal to or greater than the storage in the WSIP setting, albeit typically below 3,000 acre-feet. In about 20 percent of the years, storage would be greater by 3,000 acre-feet or more. The relatively minor increases in storage are attributable to years when summer diversions are the same in both settings (SJPL operating at maximum capacity) but less water is being diverted in the fall due to the lesser water demand. The larger increases in storage are associated with drought periods during which the differences in underlying demand and water delivery shortages between the WSIP and alternative settings are greater.

Figure 4.3-1
Hetch Hetchy Reservoir Storage and Stream Release

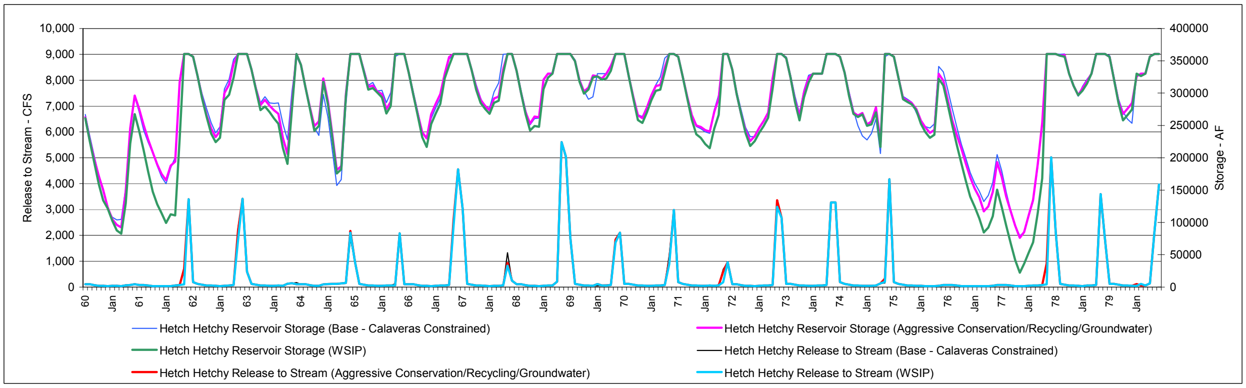
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

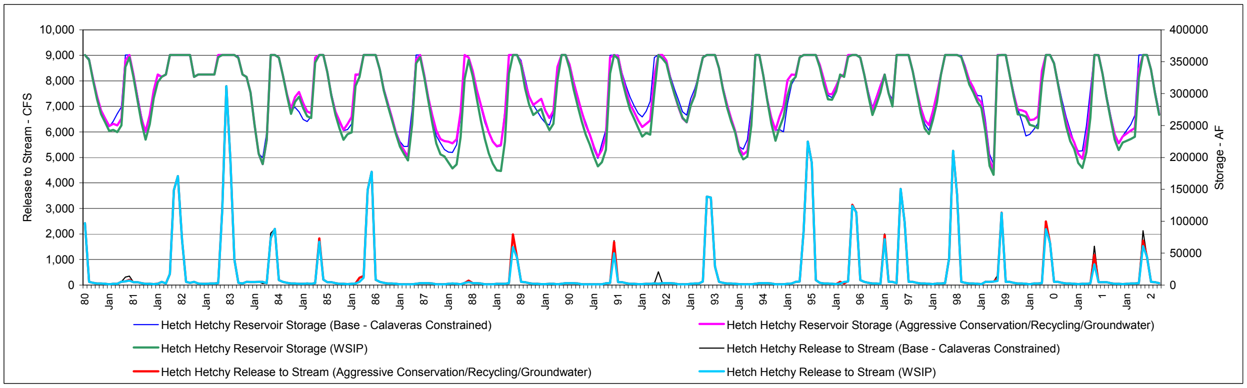


Table 4.3-1

Hetch Hetchy Reservoir Storage (Acre-feet)

Aggressive Conservation/Recycling/Groundwater

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	281,657	277,141	254,966	247,023	194,431	159,991	162,421	277,983	360,400	360,400	326,811	293,946
1922	267,077	243,918	232,993	225,959	230,427	245,002	215,316	360,400	360,400	360,400	336,082	305,431
1923	281,250	261,957	268,033	274,747	279,891	274,125	249,480	360,400	360,400	360,400	333,186	306,359
1924	294,113	272,399	250,916	235,842	227,319	210,751	232,489	316,966	295,221	267,276	232,011	203,785
1925	180,650	192,684	205,722	188,661	201,243	215,234	233,073	360,400	360,400	356,465	334,210	304,005
1926	281,704	261,900	253,814	236,607	226,700	183,134	268,004	354,623	360,400	333,232	297,804	265,973
1927	241,322	239,913	239,599	234,808	262,383	283,374	345,581	360,400	360,400	360,400	333,718	303,348
1928	280,505	286,079	281,961	274,888	269,612	323,975	360,400	360,400	360,400	337,096	302,689	271,561
1929	246,580	224,696	209,590	194,624	184,407	183,374	198,931	360,400	360,400	348,102	314,426	282,434
1930	255,732	252,162	253,492	233,989	224,561	231,039	292,402	356,465	360,400	350,768	316,726	283,424
1931	256,138	234,670	220,978	204,161	192,978	185,096	226,380	318,648	315,375	287,978	256,649	233,153
1932	211,056	190,774	122,917	63,462	43,287	32,708	61,263	231,849	360,400	360,400	333,089	302,036
1933	274,177	253,589	238,823	221,066	206,484	175,933	161,298	195,616	360,400	360,400	326,593	294,579
1934	266,153	240,549	211,282	198,047	177,252	142,202	195,747	249,490	274,481	249,470	218,678	195,056
1935	172,953	186,676	199,464	135,557	95,757	56,762	111,512	268,033	360,400	360,400	331,788	300,519
1936	276,179	257,315	240,966	233,390	188,216	151,962	209,136	360,400	360,400	356,465	327,853	295,307
1937	270,349	249,776	229,436	212,249	168,501	118,463	119,120	360,400	360,400	360,400	327,212	294,588
1938	268,792	249,312	285,620	280,856	229,949	188,446	211,201	360,400	360,400	360,400	352,029	327,292
1939	317,897	310,099	299,713	289,069	282,938	296,421	356,592	360,400	360,400	332,157	299,492	271,524
1940	261,447	262,483	223,464	211,605	164,370	142,152	165,319	360,400	360,400	354,451	320,313	287,507
1941	262,825	243,266	234,234	168,425	124,456	90,388	83,473	312,820	360,400	360,400	341,291	309,048
1942	284,527	279,668	318,892	330,000	330,000	330,000	356,592	360,400	360,400	360,400	339,529	308,159
1943	282,166	282,623	289,534	313,965	330,000	330,000	360,400	360,400	360,400	360,400	334,820	305,207
1944	282,212	263,416	246,128	239,216	238,155	246,731	266,806	360,400	360,400	360,400	329,290	298,642
1945	274,878	291,770	308,675	293,522	261,566	200,783	208,818	331,481	360,400	360,400	334,928	304,365
1946	298,672	313,863	278,431	244,500	180,036	136,015	197,378	360,400	360,400	357,267	325,581	296,273
1947	279,183	273,849	272,551	267,086	269,280	279,087	328,034	360,400	356,592	332,847	297,991	267,446
1948	254,417	241,532	232,643	223,936	211,067	152,415	135,190	258,087	360,400	360,400	325,774	292,259
1949	263,676	239,418	219,726	203,574	180,704	116,054	161,626	294,740	357,256	336,704	301,991	270,953
1950	245,263	246,232	239,497	223,137	168,546	118,643	166,212	322,737	360,400	359,600	323,849	289,929
1951	262,178	330,000	330,000	273,739	223,537	196,401	224,596	350,560	360,400	360,400	326,780	295,321
1952	269,737	253,969	264,895	256,420	200,982	226,689	329,861	360,400	360,400	360,400	351,651	324,328
1953	301,300	280,098	278,226	297,282	302,746	305,875	360,400	360,400	360,400	360,400	330,136	298,368
1954	272,115	251,105	231,363	218,572	224,052	233,542	300,539	360,400	360,400	343,956	308,827	277,060
1955	251,457	249,508	256,726	238,896	225,176	157,862	128,631	226,978	360,400	348,498	313,738	278,863
1956	247,956	222,953	283,831	261,759	206,930	168,244	188,452	360,400	360,400	360,400	347,791	322,328
1957	303,920	291,012	272,668	258,927	269,205	278,454	309,716	360,400	360,400	360,400	326,823	294,815
1958	271,074	254,673	249,653	241,567	261,085	237,578	309,381	360,400	360,400	360,400	353,900	325,107
1959	299,477	277,990	255,489	250,474	218,889	167,366	187,499	238,163	292,748	264,296	227,705	214,072
1960	189,902	187,746	186,590	162,192	122,437	96,645	127,341	217,247	289,010	262,767	227,562	197,208
1961	171,317	150,280	123,524	104,899	96,278	92,208	148,472	245,716	296,261	275,403	250,628	228,343
1962	208,375	189,601	174,783	165,360	187,849	194,125	316,933	360,400	360,400	356,465	326,379	293,328
1963	266,241	245,239	232,121	241,471	300,100	313,200	345,861	360,400	360,400	360,400	336,396	306,223
1964	281,809	289,398	280,709	273,515	267,970	230,748	205,464	283,682	360,400	343,750	309,409	278,014
1965	248,972	256,278	322,721	287,386	236,427	181,086	186,753	298,783	360,400	360,400	360,400	334,385
1966	309,450	311,813	302,491	298,750	275,440	286,706	360,400	360,400	360,400	331,450	297,972	267,899
1967	239,524	229,993	267,244	283,477	298,417	330,000	355,978	360,400	360,400	360,400	360,400	335,768
1968	309,096	289,459	280,489	273,774	291,597	294,654	336,860	360,400	360,400	334,325	299,837	270,490
1969	253,079	263,702	262,423	320,816	330,000	330,000	360,400	360,400	360,400	360,400	349,426	319,895
1970	302,364	308,727	327,503	326,065	322,564	330,000	341,873	360,400	360,400	360,400	326,016	293,338
1971	265,773	261,213	277,437	296,314	311,038	312,590	339,982	360,400	360,400	356,465	325,764	294,564
1972	265,998	250,065	247,565	242,573	240,490	270,702	292,166	360,400	360,400	336,426	299,001	267,965
1973	242,185	225,979	233,396	246,248	256,931	269,579	322,670	360,400	360,400	353,990	322,828	288,705
1974	265,128	300,833	323,837	330,000	330,000	330,000	360,400	360,400	360,400	356,465	331,550	297,304
1975	269,980	265,194	269,196	251,513	256,304	277,881	224,289	360,400	360,400	356,465	324,162	292,596
1976	288,453	284,585	275,546	257,236	246,936	238,637	242,987	329,818	319,261	289,186	257,477	235,216
1977	214,167	191,445	169,613	152,312	138,792	117,195	124,455	147,195	193,096	170,408	139,838	117,215
1978	94,943	76,140	85,023	110,460	134,887	189,873	254,103	360,400	360,400	360,400	357,869	358,984
1979	330,000	311,243	296,955	307,759	318,644	330,000	360,400	360,400	360,400	356,097	320,734	286,431
1980	267,738	275,890	284,548	326,065	330,000	330,000	356,592	360,400	360,400	360,400	352,729	322,530
1981	295,767	273,633	260,756	249,208	252,613	250,162	260,785	352,461	360,400	330,185	292,628	259,869
1982	240,552	266,428	305,285	330,000	326,446	330,000	360,400	360,400	360,400	360,400	360,400	360,400
1983	326,065	330,000	330,000	330,000	330,000	330,000	360,400	360,400	360,400	360,400	360,400	355,970
1984	330,000	326,192	301,515	251,330	205,725	189,676	227,004	360,400	360,400	356,465	328,962	299,035
1985	275,991	294,523	302,596	284,979	272,100	269,312	356,453	360,400	360,400	333,535	296,865	271,602
1986	257,224	243,248	252,070	263,604	330,000	330,000	360,400	360,400	360,400	360,400	337,490	305,794
1987	284,293	262,769	238,632	220,777	211,346	201,038	257,188	353,352	360,400	328,763	293,484	265,922
1988	242,023	228,860	225,605	224,502	222,304	228,397	271,258	360,400	356,592	335,159	305,655	282,737
1989	259,767	239,516	224,850	217,612	219,551	266,856	360,400	360,400	360,400	347,922	316,472	295,372
1990	282,246	286,967	291,747	273,665	261,796	272,890	341,833	360,400	360,400	345,488	317,587	294,174
1991	271,307	250,935	236,239	216,477	200,915	211,403	234,125	356,729	360,400	358,853	328,274	304,518
1992	283,554	271,315	257,759	247,558	252,610	258,049	328,854	360,400	360,400	351,568	322,244	298,979
1993	278,455	261,189	254,971	282,189	298,665	330,000	356,592	360,400	360,400	360,400	339,684	307,191
1994	282,765	260,670	241,502	214,685	204,545	209,885	258,742	360,400	360,400	328,106	289,741	262,176
1995	242,876	263,464	280,064	321,312	330,000	329,098	356,592	360,400	360,400	360,400	360,400	345,102
1996	321,724	299,723	298,941	311,930	326,446	330,000	360,400	360,400	360,400	356,465	329,269	298,386
1997	273,719	293,295	311,872	330,000	300,695	283,968	360,400	360,400	360,400	360,400	334,509	303,667
1998	277,760	258,648	250,569	272,769	300,018	330,000	360,400	360,400	360,400	360,400	357,575	340,230
1999	321,001	309,168	292,762	286,378	248,575	195,390	180,351	360,400	360,400	360,400	328,523	297,983
2000	274,848	273,761	271,236	258,538	259,289	264,148	335,454	360,400	360,400	347,257	314,429	281,629
2001	256,222	236,354	223,810	205,846	197,908	228,298	284,386	360,400	360,400	331,042	293,911	261,599
2002	235,896	222,241	232,967	237,651	242,082	245,785	338,003	360,400	360,400	337,536	300,566	267,981
Avg (21-02)	265,748	257,960	254,834	247,449	238,584	231,737	266,513	337,471	352,857	343,403	316,454	288,306

Table 4.3-2

Hetch Hetchy Reservoir Storage (Acre-feet) WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	272,402	266,044	243,868	235,920	183,321	150,269	154,224	271,116	360,400	360,400	326,811	291,828
1922	259,728	235,648	224,723	215,782	220,244	234,819	205,133	360,400	360,400	360,400	336,082	302,853
1923	275,819	256,526	262,603	269,313	274,454	265,738	241,094	360,400	360,400	360,400	333,186	304,241
1924	288,096	265,462	244,930	227,949	217,703	201,135	226,615	314,032	292,290	264,348	229,088	193,225
1925	162,198	174,233	187,270	170,200	181,824	195,815	216,042	360,400	360,400	356,465	334,210	301,427
1926	274,085	251,427	243,883	219,916	203,496	156,406	245,154	336,819	358,277	331,111	295,686	261,739
1927	231,858	229,528	230,165	223,466	251,035	270,123	326,806	360,400	360,400	360,400	333,718	301,231
1928	275,534	280,188	275,546	265,616	257,757	308,315	356,993	360,400	360,400	337,096	302,689	269,444
1929	239,232	216,426	201,321	182,545	168,883	167,850	183,407	347,942	360,400	348,102	314,426	281,237
1930	249,493	245,923	247,253	227,747	218,315	224,793	286,156	356,465	360,400	350,768	316,726	283,424
1931	252,998	228,677	214,984	191,409	174,118	166,236	207,521	299,800	296,541	266,646	231,402	197,210
1932	165,286	141,000	108,382	51,375	34,654	27,412	58,311	229,715	360,400	360,400	333,089	299,918
1933	270,157	246,808	232,041	211,426	194,261	163,710	150,969	186,966	360,400	360,400	326,593	293,382
1934	260,961	234,344	202,242	182,930	159,810	127,492	183,946	236,459	260,268	234,045	202,043	170,799
1935	140,815	154,538	167,325	107,677	72,057	38,981	99,863	258,988	360,400	360,400	331,788	299,322
1936	267,086	242,699	226,345	214,884	170,029	136,212	195,836	360,400	360,400	356,465	327,853	294,110
1937	262,493	239,158	219,779	197,861	155,743	107,766	110,233	356,058	360,400	360,400	327,212	292,471
1938	262,775	242,374	277,970	268,254	217,341	175,883	200,130	360,400	360,400	360,400	352,029	324,714
1939	312,466	304,668	297,136	284,589	276,736	290,220	360,400	360,400	360,400	332,157	299,492	270,327
1940	255,209	256,245	222,760	213,012	165,616	143,200	166,203	360,400	360,400	354,451	320,313	286,310
1941	260,678	241,118	235,298	169,490	125,366	91,151	84,054	313,255	360,400	360,400	341,291	309,048
1942	280,721	274,942	315,878	330,000	330,000	330,000	356,592	360,400	360,400	360,400	339,529	306,962
1943	278,021	276,636	283,548	307,975	325,066	330,000	360,400	360,400	360,400	360,400	334,820	303,090
1944	279,144	260,348	244,962	234,244	229,744	234,419	254,494	360,400	360,400	360,400	329,290	297,445
1945	269,782	286,673	303,578	288,423	253,887	193,103	202,059	325,579	360,400	360,400	334,928	303,168
1946	289,579	302,009	266,576	232,638	168,168	125,876	188,823	360,400	360,400	357,267	325,581	293,235
1947	267,584	261,329	261,933	251,706	249,594	259,401	308,348	360,400	356,592	332,847	297,991	265,329
1948	247,258	231,519	222,630	207,163	189,129	136,187	121,486	246,616	360,400	360,400	325,774	291,062
1949	257,437	230,325	210,633	191,633	166,180	103,674	151,625	286,364	356,592	336,040	301,328	268,173
1950	237,728	238,697	233,450	217,724	163,129	114,105	162,436	319,562	360,400	359,600	323,849	289,929
1951	259,038	330,000	330,000	273,739	223,537	188,600	217,740	343,707	360,400	360,400	326,780	293,203
1952	264,766	248,078	259,003	253,471	198,031	223,738	317,703	360,400	360,400	360,400	351,651	322,211
1953	296,329	275,128	274,206	293,261	298,723	296,049	360,374	360,400	360,400	360,400	330,136	297,172
1954	268,064	247,055	230,167	213,569	217,328	221,015	286,815	360,400	360,400	343,956	308,827	274,943
1955	245,440	243,491	250,709	232,875	219,152	151,838	123,551	222,728	360,400	348,498	313,738	278,863
1956	244,816	218,801	283,964	261,892	207,063	168,360	188,550	360,400	360,400	360,400	347,791	319,290
1957	296,127	282,297	264,905	249,257	257,810	264,111	295,373	360,400	360,400	360,400	326,823	292,697
1958	261,061	240,978	235,957	224,058	243,566	220,059	291,862	360,400	360,400	360,400	353,900	323,910
1959	295,427	273,939	254,292	245,472	213,883	161,315	182,390	235,642	288,112	259,667	223,084	208,259
1960	179,051	176,894	175,738	151,333	116,394	92,543	124,226	215,694	287,458	261,217	226,015	191,797
1961	158,963	134,152	121,643	102,446	87,720	82,604	129,645	221,869	267,561	241,466	211,469	178,503
1962	147,481	127,832	114,109	99,056	112,573	110,810	229,337	360,400	360,400	356,465	326,379	292,131
1963	263,712	237,187	224,068	230,750	289,373	297,526	323,742	360,400	360,400	360,400	336,396	305,026
1964	273,668	279,416	270,727	260,673	252,543	215,321	190,335	275,763	360,400	343,750	309,409	275,896
1965	241,813	249,120	317,459	282,122	231,160	175,820	182,106	294,713	360,400	360,400	360,400	333,188
1966	305,400	307,762	300,989	293,442	268,461	279,726	360,400	360,400	360,400	331,450	297,972	265,321
1967	231,906	216,758	252,106	268,331	283,263	323,066	342,598	360,400	360,400	360,400	360,400	335,768
1968	305,290	284,733	275,763	268,094	285,055	288,111	330,318	360,400	360,400	334,325	299,837	267,451
1969	242,147	249,086	247,807	306,192	323,862	330,000	360,400	360,400	360,400	360,400	349,426	317,777
1970	299,296	305,659	324,435	326,065	320,846	322,797	334,670	360,400	360,400	360,400	326,016	290,760
1971	258,440	253,880	270,103	288,977	303,697	305,250	332,642	360,400	360,400	356,465	325,764	292,446
1972	258,839	236,370	231,016	221,257	214,866	245,077	266,541	360,400	360,400	336,426	299,001	267,965
1973	238,190	218,208	225,626	238,473	249,151	261,799	307,249	360,400	360,400	353,990	322,828	286,127
1974	257,794	293,500	316,503	330,000	330,000	330,000	360,400	360,400	360,400	356,465	331,550	295,187
1975	267,864	263,077	267,079	249,395	251,607	270,330	216,738	360,400	360,400	356,465	324,162	290,479
1976	286,336	282,468	273,429	252,264	239,384	231,084	235,434	322,270	311,719	281,653	249,955	220,061
1977	191,125	164,627	139,941	124,041	106,191	84,595	91,855	109,596	150,715	123,692	95,026	67,781
1978	41,897	22,219	36,001	52,988	69,331	114,471	168,252	360,400	360,400	360,400	357,869	356,406
1979	329,957	311,201	296,912	303,911	314,794	330,000	360,400	360,400	360,400	356,097	320,734	284,314
1980	257,725	265,877	274,536	330,000	326,446	330,000	356,592	360,400	360,400	360,400	352,729	320,413
1981	290,796	267,741	254,865	241,410	243,092	239,594	250,218	341,900	356,592	326,381	288,829	253,955
1982	227,982	252,018	292,777	317,906	326,446	330,000	360,400	360,400	360,400	360,400	360,400	360,400
1983	326,065	330,000	330,000	330,000	330,000	330,000	356,951	360,400	360,400	360,400	360,400	355,970
1984	330,000	326,192	301,515	251,330	205,725	189,676	227,004	360,400	360,400	356,465	328,962	296,457
1985	268,372	286,904	294,977	277,357	264,474	261,687	348,828	360,400	360,400	333,535	296,865	266,723
1986	245,402	227,652	236,474	239,341	311,791	326,065	360,400	360,400	360,400	360,400	337,490	304,597
1987	281,194	259,670	236,484	216,725	205,573	195,265	251,416	347,582	357,022	325,388	288,877	253,677
1988	221,889	204,952	201,696	191,923	182,833	188,925	231,786	323,285	352,727	326,875	292,101	258,469
1989	229,470	206,135	190,185	179,740	178,779	224,799	331,322	360,400	360,400	343,974	308,105	283,006
1990	266,700	271,420	276,200	256,827	242,842	252,652	320,352	360,400	360,400	339,162	307,130	280,640
1991	256,496	235,801	220,345	201,192	186,180	192,530	211,890	331,320	360,400	354,429	321,715	296,721
1992	274,476	260,994	246,154	232,759	238,361	235,761	302,285	360,400	355,022	347,290	320,492	298,748
1993	279,794	262,205	255,227	281,160	296,476	330,000	356,592	360,400	360,400	360,400	339,684	305,994
1994	278,714	256,620	239,355	209,682	196,961	201,254	250,111	360,400	360,400	328,106	288,504	253,299
1995	226,108	246,696	263,295	296,733	319,612	326,065	356,592	360,400	360,400	360,400	360,400	341,235
1996	313,102	291,101	290,319	303,304	330,000	326,065	357,776	360,400	360,400	356,465	329,269	295,808
1997	266,385	283,200	301,776	330,000	300,695	280,067	360,400	360,400	360,400	360,400	334,509	301,549
1998	268,984	245,268	236,666	258,858	286,099	330,000	360,400	360,400	360,400	360,400	357,575	336,363
1999	314,282	301,528	287,025	277,784	239,977	186,792	172,794	359,739	360,400	360,400	328,523	295,405
2000	267,514	266,427	263,903	251,200	249,369	245,666	316,972	360,400	360,400	347,257	314,429	280,432
2001	248,366	225,736	213,192	191,416	183,471	208,152	262,123	360,400	360,186	330,828	293,698	259,268
2002	227,858	211,442	223,309	226,085	228,791	232,493	324,711	360,400	360,400	337,536	300,566	266,784
Avg (21-02)	256,397	247,256	245,170	236,378	226,842	219,754	254,938	333,809	351,147	341,312	314,066	283,384

Table 4.3-3

Difference in Hetch Hetchy Reservoir Storage (Acre-feet) Aggressive Conservation/Recycling/Groundwater minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	9,255	11,097	11,098	11,103	11,110	9,722	8,197	6,867	0	0	0	2,118
1922	7,349	8,270	8,270	10,177	10,183	10,183	10,183	0	0	0	0	2,578
1923	5,431	5,431	5,430	5,434	5,437	8,387	8,386	0	0	0	0	2,118
1924	6,017	6,937	5,986	7,893	9,616	9,616	5,874	2,934	2,931	2,928	2,923	10,560
1925	18,452	18,451	18,452	18,461	19,419	19,419	17,031	0	0	0	0	2,578
1926	7,619	10,473	9,931	16,691	23,204	26,728	22,850	17,804	2,123	2,121	2,118	4,234
1927	9,464	10,385	9,434	11,342	11,348	13,251	18,775	0	0	0	0	2,117
1928	4,971	5,891	6,415	9,272	11,855	15,660	3,407	0	0	0	0	2,117
1929	7,348	8,270	8,269	12,079	15,524	15,524	15,524	12,458	0	0	0	1,197
1930	6,239	6,239	6,239	6,242	6,246	6,246	6,246	0	0	0	0	0
1931	3,140	5,993	5,994	12,752	18,860	18,860	18,859	18,848	18,834	21,332	25,247	35,943
1932	45,770	49,774	14,535	12,087	8,633	5,296	2,952	2,134	0	0	0	2,118
1933	4,020	6,781	6,782	9,640	12,223	12,223	10,329	8,650	0	0	0	1,197
1934	5,192	6,205	9,040	15,117	17,442	14,710	11,801	13,031	14,213	15,425	16,635	24,257
1935	32,138	32,138	32,139	27,880	23,700	17,781	11,649	9,045	0	0	0	1,197
1936	9,093	14,616	14,621	18,506	18,187	15,750	13,300	0	0	0	0	1,197
1937	7,856	10,618	9,657	14,388	12,758	10,697	8,887	4,342	0	0	0	2,117
1938	6,017	6,938	7,650	12,602	12,608	12,563	11,071	0	0	0	0	2,578
1939	5,431	5,431	2,577	4,480	6,202	6,201	-3,808	0	0	0	0	1,197
1940	6,238	6,238	704	-1,407	-1,246	-1,048	-884	0	0	0	0	1,197
1941	2,147	2,148	-1,064	-1,065	-910	-763	-581	-435	0	0	0	0
1942	3,806	4,726	3,014	0	0	0	0	0	0	0	0	1,197
1943	4,145	5,987	5,986	5,990	4,934	0	0	0	0	0	0	2,117
1944	3,068	3,068	1,166	4,972	8,411	12,312	12,312	0	0	0	0	1,197
1945	5,096	5,097	5,097	5,099	7,679	7,680	6,759	5,902	0	0	0	1,197
1946	9,093	11,854	11,855	11,862	11,868	10,139	8,555	0	0	0	0	3,038
1947	11,599	12,520	10,618	15,380	19,686	19,686	19,686	0	0	0	0	2,117
1948	7,159	10,013	10,013	16,773	21,938	16,228	13,704	11,471	0	0	0	1,197
1949	6,239	9,093	9,093	11,941	14,524	12,380	10,001	8,376	664	664	663	2,780
1950	7,535	7,535	6,047	5,413	5,417	4,538	3,776	3,175	0	0	0	0
1951	3,140	0	0	0	0	7,801	6,856	6,853	0	0	0	2,118
1952	4,971	5,891	5,892	2,949	2,951	2,951	12,158	0	0	0	0	2,117
1953	4,971	4,970	4,020	4,021	4,023	9,826	26	0	0	0	0	1,196
1954	4,051	4,050	1,196	5,003	6,724	12,527	13,724	0	0	0	0	2,117
1955	6,017	6,017	6,017	6,021	6,024	6,024	5,080	4,250	0	0	0	0
1956	3,140	4,152	-133	-133	-133	-116	-98	0	0	0	0	3,038
1957	7,793	8,715	7,763	9,670	11,395	14,343	14,343	0	0	0	0	2,118
1958	10,013	13,695	13,696	17,509	17,519	17,519	17,519	0	0	0	0	1,197
1959	4,050	4,051	1,197	5,002	5,006	6,051	5,109	2,521	4,636	4,629	4,621	5,813
1960	10,851	10,852	10,852	10,859	6,043	4,102	3,115	1,553	1,552	1,550	1,547	5,411
1961	12,354	16,128	1,881	2,453	8,558	9,604	18,827	23,847	28,700	33,937	39,159	49,840
1962	60,894	61,769	60,674	66,304	75,276	83,315	87,596	0	0	0	0	1,197
1963	2,529	8,052	8,053	10,721	10,727	15,674	22,119	0	0	0	0	1,197
1964	8,141	9,982	9,982	12,842	15,427	15,427	15,129	7,919	0	0	0	2,118
1965	7,159	7,158	5,262	5,264	5,267	5,266	4,647	4,070	0	0	0	1,197
1966	4,050	4,051	1,502	5,308	6,979	6,980	0	0	0	0	0	2,578
1967	7,618	13,235	15,138	15,146	15,154	6,934	13,380	0	0	0	0	0
1968	3,806	4,726	4,726	5,680	6,542	6,543	6,542	0	0	0	0	3,039
1969	10,932	14,616	14,616	14,624	6,138	0	0	0	0	0	0	2,118
1970	3,068	3,068	3,068	0	1,718	7,203	7,203	0	0	0	0	2,578
1971	7,333	7,333	7,334	7,337	7,341	7,340	7,340	0	0	0	0	2,118
1972	7,159	13,695	16,549	21,316	25,624	25,625	25,625	0	0	0	0	0
1973	3,995	7,771	7,770	7,775	7,780	7,780	15,421	0	0	0	0	2,578
1974	7,334	7,333	7,334	0	0	0	0	0	0	0	0	2,117
1975	2,116	2,117	2,117	2,118	4,697	7,551	7,551	0	0	0	0	2,117
1976	2,117	2,117	2,117	4,972	7,552	7,553	7,553	7,548	7,542	7,533	7,522	15,155
1977	23,042	26,818	29,672	28,271	32,601	32,600	32,600	37,599	42,381	46,716	44,812	49,434
1978	53,046	53,921	49,022	57,472	65,556	75,402	85,851	0	0	0	0	2,578
1979	43	42	43	3,848	3,850	0	0	0	0	0	0	2,117
1980	10,013	10,013	10,012	-3,935	3,554	0	0	0	0	0	0	2,117
1981	4,971	5,892	5,891	7,798	9,521	10,568	10,567	10,561	3,808	3,804	3,799	5,914
1982	12,570	14,410	12,508	12,094	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	3,449	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	2,578
1985	7,619	7,619	7,619	7,622	7,626	7,625	7,625	0	0	0	0	4,879
1986	11,822	15,596	15,596	24,263	18,209	3,935	0	0	0	0	0	1,197
1987	3,099	3,099	2,148	4,052	5,773	5,773	5,772	5,770	3,378	3,375	4,607	12,245
1988	20,134	23,908	23,909	32,579	39,471	39,472	39,472	37,115	3,865	8,284	13,554	24,268
1989	30,297	33,381	34,665	37,872	40,772	42,057	29,078	0	0	3,948	8,367	12,366
1990	15,546	15,547	15,547	16,838	18,954	20,238	21,481	0	0	6,326	10,457	13,534
1991	14,811	15,134	15,894	15,285	14,735	18,873	22,235	25,409	0	4,424	6,559	7,797
1992	9,078	10,321	11,605	14,799	14,249	22,288	26,569	0	5,378	4,278	1,752	231
1993	-1,339	-1,016	-256	1,029	2,189	0	0	0	0	0	0	1,197
1994	4,051	4,050	2,147	5,003	7,584	8,631	8,631	0	0	0	1,237	8,877
1995	16,768	16,768	16,769	24,579	10,388	3,033	0	0	0	0	0	3,867
1996	8,622	8,622	8,622	8,626	-3,554	3,935	2,624	0	0	0	0	2,578
1997	7,334	10,095	10,096	0	0	3,901	0	0	0	0	0	2,118
1998	8,776	13,380	13,903	13,911	13,919	0	0	0	0	0	0	3,867
1999	6,719	7,640	5,737	8,594	8,598	8,598	7,557	661	0	0	0	2,578
2000	7,334	7,334	7,333	7,338	9,920	18,482	18,482	0	0	0	0	1,197
2001	7,856	10,618	10,618	14,430	14,437	20,146	22,263	0	214	214	213	2,331
2002	8,038	10,799	9,658	11,566	13,291	13,292	13,292	0	0	0	0	1,197
Avg (21-02)	9,351	10,704	9,664	11,071	11,742	11,983	11,575	3,662	1,710	2,091	2,388	4,922

Table 4.3-4

Difference in Hetch Hetchy Reservoir Storage (Acre-feet) Aggressive Conservation/Recycling/Groundwater minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	-2,466	296	297	296	296	261	219	184	0	0	-2,188	-2,186
1922	3,523	4,444	4,443	-311	-311	-312	-311	0	0	0	-2,188	-1,726
1923	1,129	2,050	2,049	2,050	2,052	-10,316	-10,316	0	0	0	-2,188	-2,186
1924	669	1,589	1,589	4,444	7,025	1,222	-1,507	-2,941	-5,056	-7,238	-9,413	-3,879
1925	1,832	21,165	36,388	30,606	14,300	-1,016	-888	0	0	0	-2,188	-1,726
1926	-1,725	-4,488	2,553	3,506	2,474	-9,894	-8,695	-5,777	0	-2,188	-4,374	-4,370
1927	-3,416	-3,416	-3,416	-9,316	-9,322	-11,225	-5,700	0	0	0	-2,188	-4,949
1928	-4,946	-4,026	-2,123	-4,978	-7,558	-6,025	0	0	0	-2,188	-4,373	-7,132
1929	-7,129	-6,208	-6,208	-7,163	-8,025	-18,586	-20,703	0	0	-2,188	-4,374	-5,291
1930	-2,434	16,900	36,878	31,096	25,872	10,556	8,438	0	0	-2,188	-4,373	-6,488
1931	-5,533	-8,296	-1,208	-257	-3,694	-9,497	-11,616	-13,797	-15,903	-15,551	-13,771	-5,147
1932	-3,859	-7,220	-3,025	-2,541	-1,889	-1,211	-750	-540	0	0	-2,188	-2,186
1933	-2,185	-1,265	5,823	1,069	-3,226	-13,786	-12,145	-10,171	0	0	-2,188	-3,107
1934	-1,298	-5,902	-10,710	-12,790	-24,274	-34,213	-8,997	-9,943	-10,853	-11,788	-12,719	-7,181
1935	-1,469	17,865	37,844	32,670	27,437	9,548	6,340	5,016	0	0	-2,188	-3,107
1936	-2,154	-1,234	5,854	-2,696	-2,697	-2,363	-1,995	0	0	0	-2,188	-3,107
1937	-252	669	669	-282	-249	-209	-174	0	0	0	-2,188	-2,187
1938	-2,186	-1,265	-1,265	-3,929	-3,931	-3,931	-3,446	0	0	0	-2,188	-4,488
1939	-1,632	-712	-2,614	-4,518	-6,238	-16,799	0	0	0	-2,188	-4,373	-5,291
1940	-2,434	16,900	28,243	14,637	12,980	10,894	9,201	0	0	-2,188	-4,374	-5,291
1941	-4,337	-3,416	-2,847	-2,848	-2,432	-2,038	-1,553	-1,160	0	0	-2,188	-4,304
1942	-2,399	-1,479	-1,479	0	0	0	0	0	0	0	-2,188	-3,107
1943	-3,106	-4,947	2,140	2,141	1,084	0	0	0	0	0	-2,188	-2,187
1944	-1,234	-313	638	-313	-5,641	-17,057	-19,175	0	0	0	-2,188	-3,107
1945	2,602	21,936	41,915	36,131	24,979	24,980	21,986	19,218	0	0	-2,188	-3,107
1946	-2,154	-1,234	-1,234	-1,234	-1,235	-1,085	-919	0	0	-2,188	-4,374	-3,449
1947	4,163	5,083	1,278	1,279	1,280	-9,281	-11,398	0	0	-2,188	-4,374	-4,370
1948	-1,513	-4,275	2,812	3,766	4,627	-1,177	-993	-836	0	0	-2,188	-3,107
1949	-252	-3,013	-3,013	-147	2,430	2,134	1,778	1,495	664	-1,524	-3,711	-6,470
1950	-5,515	13,819	33,318	14,528	13,470	11,294	9,353	7,850	0	-800	-2,988	-5,103
1951	-4,149	0	0	0	0	1,142	1,005	1,005	0	0	-2,188	-4,948
1952	-3,995	-3,074	-3,074	-1,539	-1,540	-1,540	-3,381	0	0	0	-2,188	-2,187
1953	669	1,589	1,589	1,590	1,590	-7,923	0	0	0	0	-2,188	-3,108
1954	2,602	3,523	3,523	-1,231	-6,560	-16,074	-16,994	0	0	-2,188	-4,373	-4,370
1955	1,340	20,674	35,896	17,746	1,344	-4,460	-3,767	-3,143	0	-2,188	-4,374	-6,488
1956	-5,533	-10,137	-4,318	-4,321	-4,323	-3,778	-3,183	0	0	0	-2,188	-1,266
1957	1,588	2,510	2,510	-344	-7,389	-15,001	-17,118	0	0	0	-2,188	-2,186
1958	669	1,589	3,920	3,923	3,925	3,925	3,925	0	0	0	-2,188	-3,107
1959	-2,155	-1,234	-1,234	-5,991	-5,994	-20,266	-17,561	-5,635	-5,629	-7,809	-9,984	-10,893
1960	-8,033	11,301	31,280	25,499	12,687	5,685	4,321	-34	-2,151	-4,336	-6,516	-4,760
1961	0	-1,842	1,410	-3,345	-7,646	-12,403	-5,298	-1,175	1,589	4,678	7,763	4,393
1962	918	2,161	4,397	5,684	3,411	-6,721	-4,557	0	0	0	-2,188	-5,869
1963	-9,767	-8,847	-6,515	-6,519	-6,523	-8,236	-6,395	0	0	0	-2,188	-3,107
1964	-3,106	-4,947	-3,996	-10,657	-16,677	-22,481	-22,481	-19,055	3,808	1,616	-574	-574
1965	2,281	21,614	24,783	24,793	24,806	24,005	20,476	17,588	0	0	0	-3,683
1966	-2,730	-4,571	-906	-5,663	-9,962	-14,070	3,808	0	0	-2,188	-4,373	-3,910
1967	-1,054	-1,053	6,558	6,561	6,564	0	3,683	0	0	0	0	-2,118
1968	-4,019	-3,099	3,988	-3,620	-10,496	-21,056	-23,174	0	0	-2,188	-4,374	-3,449
1969	2,260	3,182	1,279	1,279	0	0	0	0	0	0	-2,188	-2,186
1970	-1,234	18,100	33,322	-3,935	-7,436	0	-2,117	0	0	0	-2,188	-1,726
1971	-774	-2,615	-1,664	-1,665	-1,665	-12,226	-14,343	0	0	0	-2,188	-2,186
1972	669	1,589	2,540	2,542	2,543	-3,260	-5,377	0	0	-2,188	-4,373	-6,487
1973	-4,676	-6,517	570	570	571	571	1,491	0	0	-2,188	-4,374	-6,671
1974	-3,815	-3,815	-3,815	0	0	0	0	0	0	0	-2,188	-4,949
1975	-3,995	15,339	35,318	23,827	18,685	17,734	17,734	3,935	0	0	-2,188	-2,187
1976	-2,186	-1,264	5,823	2,021	-1,416	-7,218	-9,336	-11,519	-13,628	-15,799	-17,968	-12,423
1977	-6,707	-8,548	-7,597	-8,554	-9,420	-15,224	-17,341	-14,465	-11,678	-9,423	-7,169	-1,306
1978	-20	-3,380	235	1,519	2,682	3,966	4,104	0	0	0	-2,188	-1,416
1979	0	920	1,872	-2,884	-2,885	0	0	0	0	-2,188	-4,373	-4,371
1980	-3,417	15,917	31,139	-3,935	3,554	0	0	0	0	0	-2,188	-2,187
1981	-1,234	-313	6,774	1,070	-4,085	-18,355	-18,355	-7,939	0	-2,188	-4,374	-4,370
1982	1,341	-501	2,353	1,936	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	503	0	0	0	0	-2,118
1984	0	0	0	0	0	-9,738	-11,659	0	0	0	-2,188	-1,726
1985	1,129	15,860	31,081	25,292	15,768	5,207	3,090	0	0	-2,188	-4,374	-1,608
1986	3,150	1,308	8,396	11,255	1,757	0	0	0	0	0	-2,188	-3,107
1987	-3,106	-2,185	-2,185	-4,089	-5,810	-16,370	-18,488	-7,048	0	-2,188	-3,137	2,390
1988	8,097	6,255	13,343	16,204	14,495	8,692	6,574	2,048	0	-618	-2,283	3,565
1989	4,848	1,488	869	1,203	1,504	-7,771	0	0	0	-3,948	-7,416	-1,563
1990	-279	14,452	29,674	19,461	11,181	1,905	1,031	0	0	-1,570	-3,138	-1,892
1991	-607	-3,967	-353	3,786	2,370	-10,616	-9,373	-3,326	0	-1,547	-4,162	-7,519
1992	-10,989	-9,746	-11,316	-15,936	-19,941	-30,073	-27,909	0	0	-1,094	-4,565	-7,922
1993	-11,391	-10,148	-11,290	-10,012	-8,857	0	0	0	0	0	-2,188	-3,107
1994	-2,154	-1,234	-283	-2,185	-8,201	-17,715	-19,832	0	0	-2,188	-3,137	-372
1995	579	19,914	39,893	37,251	15,333	3,033	0	0	0	0	0	-1,013
1996	1,841	2,763	5,093	5,095	-3,554	3,935	2,624	0	0	0	-2,188	-4,488
1997	-4,486	-2,645	-2,645	0	0	-7,611	0	0	0	0	-2,188	-2,186
1998	3,523	6,285	8,188	8,192	8,197	0	0	0	0	0	-2,188	-3,199
1999	-1,295	-374	-4,180	-9,890	-9,894	-9,895	-8,694	0	0	0	-2,188	-4,488
2000	-1,632	17,702	37,680	22,386	15,524	10,577	8,460	0	0	-2,188	-4,373	-8,053
2001	-7,098	-6,177	911	-3,845	-12,441	-21,002	-21,003	0	0	-2,188	-4,374	-4,370
2002	-1,513	-593	-592	-5,350	-9,650	-20,209	-22,327	0	0	-2,188	-4,374	-5,291
Avg (21-02)	-1,602	1,990	6,778	3,416	557	-4,513	-3,795	-734	-718	-1,523	-3,386	-3,555

Through the fall and winter, storage in Hetch Hetchy Reservoir would be the same or higher. Hetch Hetchy Reservoir would fill by the end of May or June during approximately 89 percent of the years, which would negate any difference in storage from carrying into the next summer. Figure 4.3-2 illustrates the difference in reservoir storage averaged by year type for the comparison of the alternative to the WSIP setting. Also shown is the average difference in storage for the two settings during the 82-year simulation.

Table 4.3-4 illustrates the difference in Hetch Hetchy Reservoir storage between the alternative and base settings. Immediately after Hetch Hetchy Reservoir is filled (May or June, and then continuing through July), there would only be occasional differences in storage at the reservoir, typically a decrease of less than 10,000 acre-feet. This indicates that the same amount of water is being passed through the reservoir, regardless of the size of the conveyance capacity of the SJPL. Water not diverted to the SJPL would return to the Tuolumne River and flow to Don Pedro Reservoir. In the late summer and early fall, there would consistently be a slight difference (lower) in storage levels between the two settings as additional diversions to the SJPL would retain Bay Area reservoir storage. Some of this additional storage depletion would be ameliorated later in the fall and into winter as SJPL diversions are reduced due to lower Bay Area reservoir replenishment needs and less conveyance system maintenance. Storage becomes greater in November and December of the alternative setting due to the assumed system-wide maintenance that occurs in the alternative and does not occur in the base setting. Subsequent to December, the storage gain occurring in the alternative setting again becomes affected as replenishment of Bay Area reservoir storage resumes. In non-wetter years, there is a difference in storage between the alternative and base settings; the alternative setting results in a lower storage in the reservoir by the end of April. Figure 4.3-3 illustrates the difference in reservoir storage averaged by year type for the comparison of the alternative to the base setting. Also shown is the average difference in storage for the two settings during the 82-year simulation. Figure 4.3-4 illustrates the average monthly storage in Hetch Hetchy Reservoir for the 82-year simulation, and the range in storage for each month for the variant and base settings.

The difference in storage in Hetch Hetchy Reservoir attributed to the diversion effects of the alternative would manifest in differences in releases from O’Shaughnessy Dam to the stream. A different amount of available reservoir space in the winter and spring due to the alternative would lead to a different ability to regulate inflow, thus potentially changing the amount of water released to the stream in excess of minimum release requirements. Figure 4.3-1 illustrates the stream release from O’Shaughnessy Dam for the WSIP, alternative, and base settings. Table 4.3-5 illustrates the difference in stream releases between the alternative and WSIP settings. Compared to the WSIP setting, the alternative exhibits an incrementally greater stream release, predominantly during May or June, which reflects the months when releases to the stream above minimum release requirements are made in anticipation of the reservoir being filled. The exceptions to this circumstance during which incrementally larger reductions in releases to the stream occurs are considered anomalous within modeling, the results of only shifting releases from one month to the next. The increase in releases is the result of a less depleted reservoir, which is the result of lesser demands between the settings.

Table 4.3-6 illustrates the difference in stream release between the alternative and base settings. In this comparison, releases could be either greater or lesser than depicted for the base setting, and these differences would occur predominantly during May or June. Generally, Hetch Hetchy Reservoir storage would be slightly lower during non-wetter years, leading to a reduction in stream releases during non-wetter years if a release occurs. During wetter years, the releases are projected to increase. The differences, either increases or decreases are a result of the coincidence of the several parameters affecting the release of water from the reservoir, including system-wide water demands, conveyance capacity and maintenance assumptions, and the watershed’s hydrology.

Table 4.3-5 illustrates the difference in stream release between the alternative and WSIP settings, expressed in terms of a monthly volume (acre-feet) of flow. Table 4.3-7 illustrates the same information and the average monthly stream release for the alternative and WSIP setting, expressed in average monthly flow (cfs). Table 4.3-5 illustrates that the difference in monthly flow below O’Shaughnessy Dam could range up to an increase of approximately 51,000 acre-feet. Considering the manner in which releases are determined and made to the stream, quantifying the effect of these changes in terms of

Figure 4.3-2

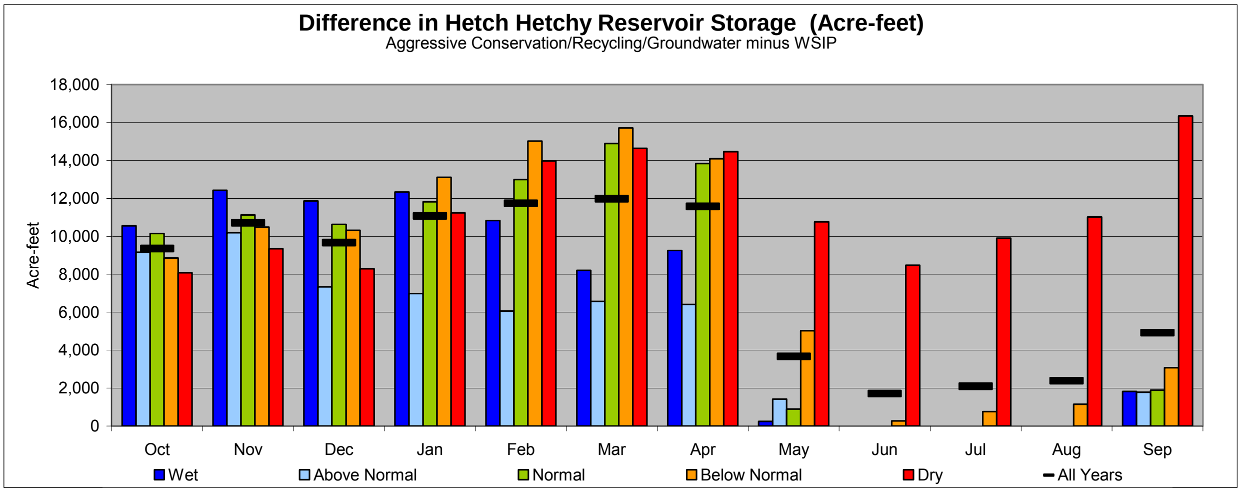


Figure 4.3-3

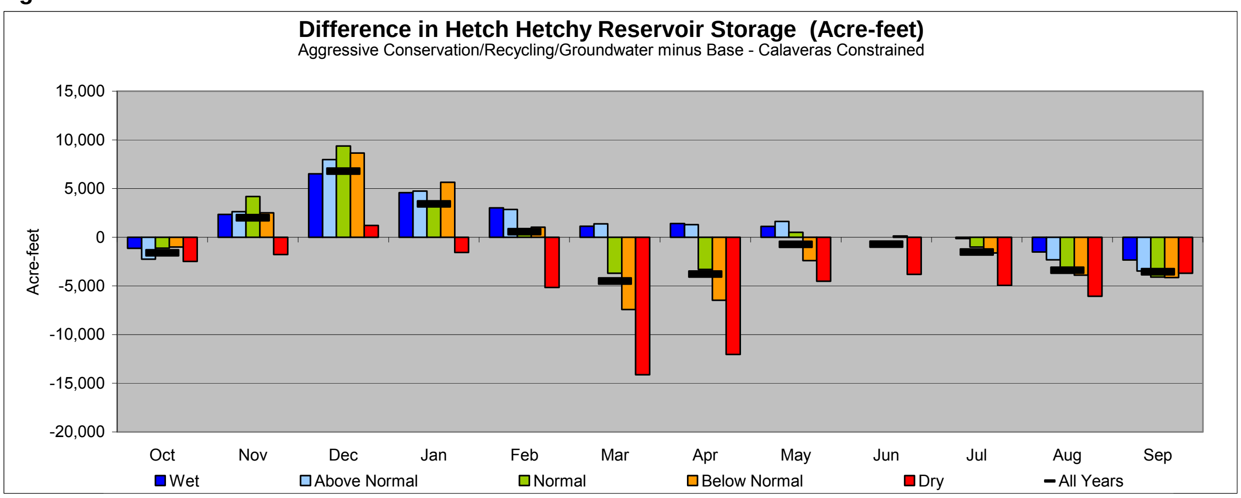


Figure 4.3-4

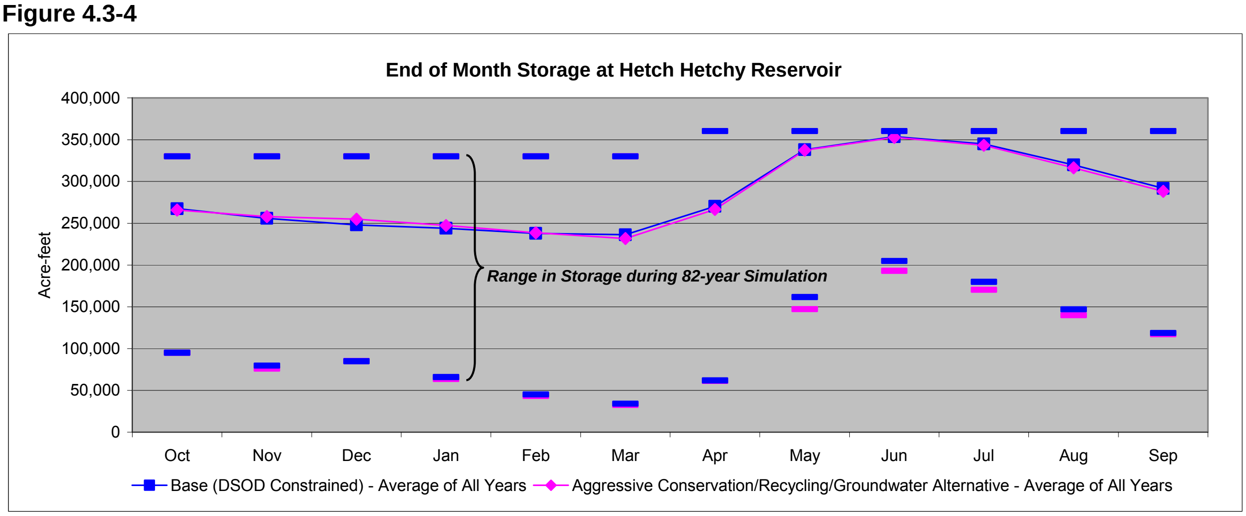


Table 4.3-5

Difference in Hetch Hetchy Release to Stream (Acre-feet)

Aggressive Conservation/Recycling/Groundwater minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	0	0	0	6,860	0	0	0	6,860
1922	0	0	0	0	0	0	0	8,866	0	0	0	0	8,866
1923	0	0	0	0	0	0	0	8,382	0	0	0	0	8,382
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	16,807	0	0	0	0	16,807
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	18,876	0	0	0	0	18,876
1928	0	0	0	0	0	0	0	3,618	0	0	0	0	3,618
1929	0	0	0	0	0	0	0	0	13,231	0	0	0	13,231
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	2,132	0	0	0	2,132
1933	0	0	0	0	0	0	0	0	7,593	0	0	0	7,593
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	9,034	0	0	0	9,034
1936	0	0	0	0	0	0	0	11,623	0	0	0	0	11,623
1937	0	0	0	0	0	0	0	3,000	4,603	0	0	0	7,603
1938	0	0	0	0	0	0	0	9,667	0	0	0	0	9,667
1939	0	0	0	0	0	0	3,808	-4,045	0	0	0	0	-237
1940	0	0	0	0	0	0	0	-743	0	0	0	0	-743
1941	0	0	0	0	0	0	0	0	-435	0	0	0	-435
1942	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	12,304	0	0	0	0	12,304
1945	0	0	0	0	0	0	0	0	5,897	0	0	0	5,897
1946	0	0	0	0	0	0	0	7,481	0	0	0	0	7,481
1947	0	0	0	0	0	0	0	19,678	0	0	0	0	19,678
1948	0	0	0	0	0	0	0	0	11,458	0	0	0	11,458
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	3,174	0	0	0	3,174
1951	0	3,140	0	0	0	0	0	0	7,281	0	0	0	10,421
1952	0	0	0	0	0	0	0	12,153	0	0	0	0	12,153
1953	0	0	0	0	0	0	0	26	0	0	0	0	26
1954	0	0	0	0	0	0	0	13,718	0	0	0	0	13,718
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	-86	0	0	0	0	-86
1957	0	0	0	0	0	0	0	14,338	0	0	0	0	14,338
1958	0	0	0	0	0	0	0	17,512	0	0	0	0	17,512
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	37,098	0	0	0	0	37,098
1963	0	0	0	0	0	0	0	22,238	0	0	0	0	22,238
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	4,066	0	0	0	4,066
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	14,176	0	0	0	0	14,176
1968	0	0	0	0	0	0	0	6,540	0	0	0	0	6,540
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	319	0	7,200	0	0	0	0	7,519
1971	0	0	0	0	0	0	0	7,337	0	0	0	0	7,337
1972	0	0	0	0	0	0	0	25,611	0	0	0	0	25,611
1973	0	0	0	0	0	0	0	15,414	0	0	0	0	15,414
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	7,424	0	0	0	0	7,424
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	50,691	0	0	0	0	50,691
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	3,935	-3,554	0	0	0	0	0	0	0	381
1981	0	0	0	0	0	0	0	0	1,888	0	0	0	1,888
1982	0	0	0	419	0	0	0	0	0	0	0	0	419
1983	0	0	0	0	0	0	0	3,662	0	0	0	0	3,662
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	8,123	0	0	0	0	8,123
1986	0	0	0	0	0	10,235	3,935	0	0	0	0	0	14,170
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	3,808	0	0	0	3,808
1989	0	0	0	0	0	0	0	30,146	0	0	0	0	30,146
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	26,212	0	0	0	26,212
1992	0	0	0	0	0	0	0	167	0	0	0	0	167
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	3,554	-3,935	1,311	2,785	0	0	0	0	3,715
1997	0	0	0	10,100	0	0	0	0	0	0	0	0	10,100
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	5,877	698	0	0	0	6,575
2000	0	0	0	0	0	0	0	18,475	0	0	0	0	18,475
2001	0	0	0	0	0	0	0	22,251	0	0	0	0	22,251
2002	0	0	0	0	0	0	0	13,286	0	0	0	0	13,286
Avg (21-02)	0	38	0	176	0	81	110	5,752	1,311	0	0	0	7,469

Table 4.3-6

Difference in Hetch Hetchy Release to Stream (Acre-feet) Aggressive Conservation/Recycling/Groundwater minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	0	0	0	184	0	0	0	184
1922	0	0	0	0	0	0	0	-271	0	0	0	0	-271
1923	0	0	0	0	0	0	0	-10,310	0	0	0	0	-10,310
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	-888	0	0	0	0	-888
1926	0	0	0	0	0	0	0	-2,913	0	0	0	0	-2,913
1927	0	0	0	0	0	0	0	-6,087	0	0	0	0	-6,087
1928	0	0	0	0	0	0	0	0	0	0	0	0	0
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	-539	0	0	0	-539
1933	0	0	0	0	0	0	0	0	-8,924	0	0	0	-8,924
1934	0	0	0	0	0	0	-3,808	0	0	0	0	0	-3,808
1935	0	0	0	0	0	3,935	0	0	5,010	0	0	0	8,945
1936	0	0	0	0	0	0	0	-1,741	0	0	0	0	-1,741
1937	0	0	0	0	0	0	0	-143	0	0	0	0	-143
1938	0	0	0	0	0	0	0	-2,986	0	0	0	0	-2,986
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	0	0	0	7,719	0	0	0	0	7,719
1941	0	0	0	0	0	0	0	0	-1,160	0	0	0	-1,160
1942	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	-19,165	0	0	0	0	-19,165
1945	0	0	0	0	0	0	0	0	19,202	0	0	0	19,202
1946	0	0	0	0	0	0	0	-804	0	0	0	0	-804
1947	0	0	0	0	0	0	0	-11,394	0	0	0	0	-11,394
1948	0	0	0	0	0	0	0	0	-835	0	0	0	-835
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	7,844	0	0	0	7,844
1951	0	-4,149	0	0	0	0	0	0	1,068	0	0	0	-3,081
1952	0	0	0	0	0	0	0	-3,380	0	0	0	0	-3,380
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	-16,987	0	0	0	0	-16,987
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	-2,789	0	0	0	0	-2,789
1957	0	0	0	0	0	0	0	-17,111	0	0	0	0	-17,111
1958	0	0	0	0	0	0	0	3,923	0	0	0	0	3,923
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	-4,556	0	0	0	0	-4,556
1963	0	0	0	0	0	0	0	-6,825	0	0	0	0	-6,825
1964	0	0	0	0	0	0	0	0	-3,808	0	0	0	-3,808
1965	0	0	0	0	0	0	0	0	17,572	0	0	0	17,572
1966	0	0	0	0	0	0	-3,808	4,045	0	0	0	0	237
1967	0	0	0	0	0	0	0	3,920	0	0	0	0	3,920
1968	0	0	0	0	0	0	0	-24,224	0	0	0	0	-24,224
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	3,935	0	319	0	-2,117	0	0	0	0	2,137
1971	0	0	0	0	0	0	0	-15,034	0	0	0	0	-15,034
1972	0	0	0	0	0	0	0	-5,375	0	0	0	0	-5,375
1973	0	0	0	0	0	0	0	1,490	0	0	0	0	1,490
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	9,945	4,171	0	0	0	14,116
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	4,101	0	0	0	-310	3,791
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	3,935	-3,554	0	0	0	0	0	0	0	381
1981	0	0	0	0	0	0	0	-10,407	-8,422	0	0	0	-18,829
1982	0	0	0	419	0	0	0	0	0	0	0	0	419
1983	0	0	0	0	0	0	0	531	0	0	0	0	531
1984	0	0	0	0	0	3,935	0	-11,653	0	0	0	0	-7,718
1985	0	0	0	0	0	0	0	3,288	0	0	0	0	3,288
1986	0	0	0	0	0	1,757	0	0	0	0	0	0	1,757
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	-3,527	0	0	0	-3,527
1992	0	0	0	0	0	0	0	-28,751	0	0	0	0	-28,751
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	3,554	-3,935	1,311	2,785	0	0	0	0	3,715
1997	0	0	0	-2,646	0	0	0	0	0	0	0	0	-2,646
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	-7,614	0	0	0	0	-7,614
2000	0	0	0	0	0	0	0	8,456	0	0	0	0	8,456
2001	0	0	0	0	0	0	0	-20,994	0	0	0	0	-20,994
2002	0	0	0	0	0	0	0	-23,396	0	0	0	0	-23,396
Avg (21-02)	0	-51	0	69	0	73	-77	-2,533	339	0	0	-4	-2,183

Table 4.3-7

Hetch Hetchy Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) Aggressive Conservation/Recycling/Groundwater

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	55	51	51	181	85	94	148	2,522	4,552	2,034	184	89
Above Normal	55	92	88	66	93	90	133	1,260	3,119	379	125	89
Normal	54	54	50	55	74	74	98	1,414	1,921	167	122	86
Below Normal	55	55	46	43	51	63	88	692	751	113	111	73
Dry	53	53	44	40	44	50	60	160	159	86	86	65
All Years	54	61	56	76	70	75	105	1,204	2,097	548	125	81

Hetch Hetchy Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	55	51	51	167	89	84	144	2,412	4,548	2,034	184	89
Above Normal	55	89	88	66	89	94	131	1,186	3,095	379	125	89
Normal	54	54	50	55	74	74	98	1,260	1,906	167	122	86
Below Normal	55	55	46	43	51	63	88	565	706	113	111	73
Dry	53	53	44	40	44	50	56	157	139	86	86	65
All Years	54	61	56	73	70	73	103	1,110	2,075	548	125	81

Difference in Hetch Hetchy Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) Aggressive Conservation/Recycling/Groundwater minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	0	0	0	15	-4	10	4	110	4	0	0	0
Above Normal	0	3	0	0	4	-4	1	74	24	0	0	0
Normal	0	0	0	0	0	0	0	154	15	0	0	0
Below Normal	0	0	0	0	0	0	0	127	45	0	0	0
Dry	0	0	0	0	0	0	4	3	20	0	0	0
All Years	0	1	0	3	0	1	2	94	22	0	0	0

average monthly flow (cfs) is not always meaningful.[11] When comparing the alternative to the WSIP setting, a change in the volume of release from O'Shaughnessy Dam to the stream would likely result in the initiation of the release being delayed or initiated earlier by a matter of days. Typical spring-time releases, when initiated, amount to a release up to 3,000 cfs (approximately 6,000 acre-feet over the span of a day). Assuming that a change in release volume equates to a delay or an earlier initiation of releasing 6,000 acre-feet per day, the difference in stream release between the alternative and WSIP would be up to an additional 8 days of release. Normally, the effect of this change in release would not affect the year's peak stream release rate during a year. Table 4.3-8 illustrates the average monthly stream release for the alternative and base setting, and differences, expressed in average monthly flow (cfs). Table 4.3-6 illustrates that the difference in monthly flow below the dam between the alternative and base settings could range from an increase of approximately 18,000 acre-feet to a decrease of approximately 29,000 acre-feet. Using the same metric as described above to estimate the delay or addition in the number days of release to the stream, the alternative could lead to an effect ranging from an increase of 3 days of release to a decrease of up to 5 days, compared to the base setting.

Table 4.3-8

Hetch Hetchy Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) Aggressive Conservation/Recycling/Groundwater

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	55	51	51	181	85	94	148	2,522	4,552	2,034	184	89
Above Normal	55	92	88	66	93	90	133	1,260	3,119	379	125	89
Normal	54	54	50	55	74	74	98	1,414	1,921	167	122	86
Below Normal	55	55	46	43	51	63	88	692	751	113	111	73
Dry	53	53	44	40	44	50	60	160	159	86	86	65
All Years	54	61	56	76	70	75	105	1,204	2,097	548	125	81

Hetch Hetchy Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	55	51	51	180	89	93	148	2,518	4,534	2,034	184	90
Above Normal	55	96	88	66	89	86	131	1,273	3,092	379	125	89
Normal	54	54	50	51	74	74	98	1,479	1,913	167	122	86
Below Normal	55	55	46	43	51	63	91	758	768	113	111	73
Dry	53	53	44	40	44	50	64	224	168	86	86	65
All Years	54	62	56	75	70	73	107	1,245	2,091	548	125	81

Difference in Hetch Hetchy Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) Aggressive Conservation/Recycling/Groundwater minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	0	0	0	2	-4	2	0	3	18	0	0	0
Above Normal	0	-4	0	0	4	4	1	-13	27	0	0	0
Normal	0	0	0	4	0	0	0	-65	8	0	0	0
Below Normal	0	0	0	0	0	0	-4	-67	-17	0	0	0
Dry	0	0	0	0	0	0	-4	-64	-9	0	0	0
All Years	0	-1	0	1	0	1	-1	-41	6	0	0	0

[11] See "Estimated Effect of WSIP on Daily Releases below Hetch Hetchy Reservoir", Memorandum by Daniel B. Steiner, December 31, 2006.

4.4 Lake Lloyd and Lake Eleanor

Compared to the operation of the WSIP, the operation of Lake Lloyd and Lake Eleanor are simulated to be only slightly different for the alternative. Figure 4.4-1 illustrates a chronological trace of the simulation of Lake Lloyd storage and stream releases. Shown in Figure 4.4-1 are the results for the WSIP, alternative, and base settings. The operation resulting from the alternative is essentially the same as for the WSIP setting, including during drought. The level of delivery between the alternative and base settings is close to the same (net demand of 271 mgd compared to 265-mgd demand) during the 1987-1992 drought, but there is a slightly greater draw from Hetch Hetchy Reservoir in the alternative setting compared to the base setting. The additional draw of water reduced the amount of water released from Hetch Hetchy Reservoir to Don Pedro Reservoir in the alternative setting, which, for satisfaction of MID/TID entitlements to inflow, was met with additional releases from Lake Lloyd, slightly more than in the base setting; thus, Lake Lloyd is slightly lower during this period in the alternative setting. Otherwise, the results for Lake Lloyd storage are essentially the same between the WSIP, base, and alternative settings.

Figure 4.4-2 illustrates the almost identical operation of Lake Eleanor for the alternative and WSIP settings. Also shown in Figure 4.4-2 is the operation for the base setting. Any difference that occurs in the Lake Eleanor operation would be caused by a small change in operation at Lake Lloyd that would affect the operation of the Cherry-Eleanor Tunnel between the two watersheds. Any difference that occurs in the simulations is more associated with modeling discretion that with any substantive difference in operation.

Supplementing the Figure 4.4-1 representation of Lake Lloyd stream releases is Table 4.4-1, illustrating releases for the alternative and WSIP settings, and the difference in releases between the two settings. Table 4.4-2 provides the same form of information for the alternative and base settings. With essentially no change in reservoir operations, stream releases would not be different.

4.5 Don Pedro Reservoir and La Grange Releases

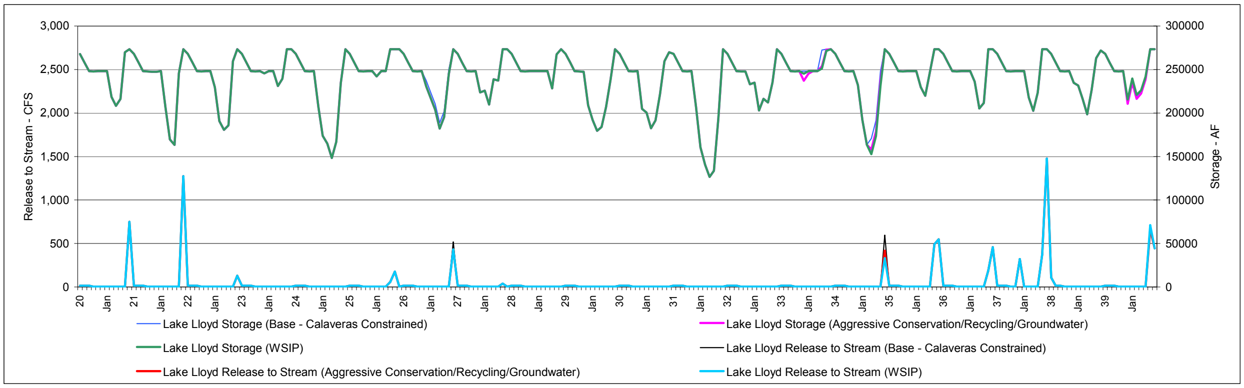
A change in Don Pedro Reservoir operation is caused by changes in inflow to the reservoir. The changes in inflow to the reservoir are the result of net changes within the operation of the upstream SFPUC facilities described previously, and other changes in SFPUC operations associated with diversions to the Holm, Kirkwood, and Moccasin Powerhouses. Figure 4.5-1 illustrates a chronological trace of the simulation of Don Pedro Reservoir storage and Tuolumne River stream releases from La Grange Dam. Shown in Figure 4.5-1 are the results for the WSIP, alternative, and base settings.

Supplementing the Figure 4.5-1 representation of Don Pedro Reservoir storage are Table 4.5-1 Don Pedro Reservoir Storage (Aggressive Conservation/Recycling/Groundwater), Table 4.5-2 Don Pedro Reservoir Storage (WSIP), and Table 4.5-3 Difference in Don Pedro Reservoir Storage (Aggressive Conservation/Recycling/Groundwater minus WSIP). Table 4.5-4 is provided to illustrate the difference in Don Pedro Reservoir storage between the base and alternative settings.

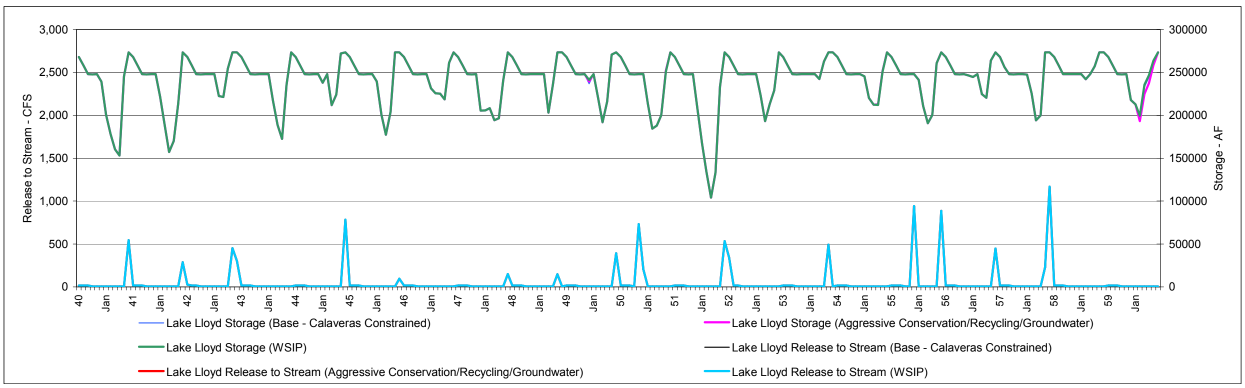
Table 4.5-3 illustrates that, throughout many years, the storage in Don Pedro Reservoir associated with the alternative setting would differ from the storage in the WSIP setting, and this difference would almost always be more storage. Table 4.5-4 illustrates that the alternative setting results for Don Pedro Reservoir storage are close to the storage results depicted for the base setting, although typically lower than the base setting. Compared to the WSIP setting, the differences in storage indicate increases to the inflow of Don Pedro Reservoir that are due to lesser demands and SJPL diversions in the alternative setting. The increases in inflow typically occur during the winter through early summer. Compared to the base setting, the alternative would result in typically less inflow to Don Pedro Reservoir and the accumulation of less storage over multiple years.

Figure 4.4-1
Lake Lloyd Storage and Stream Release

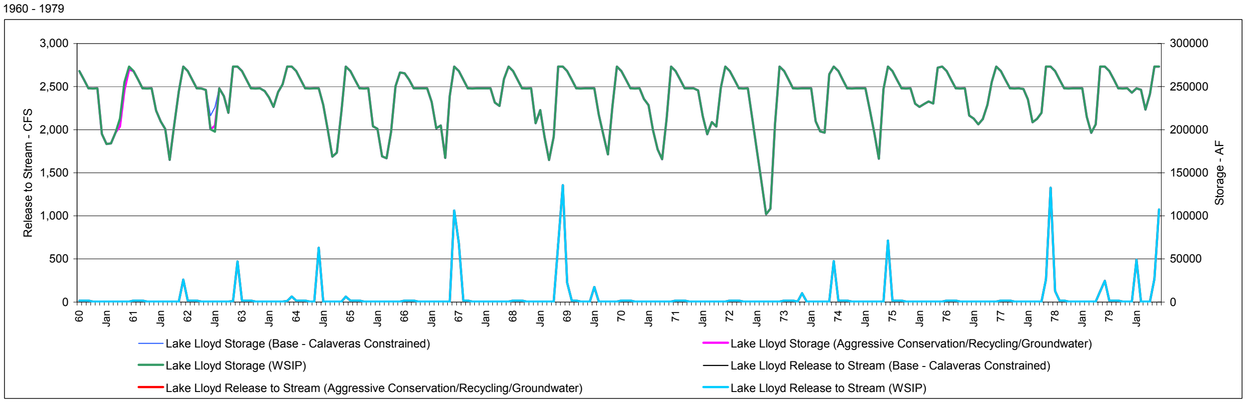
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

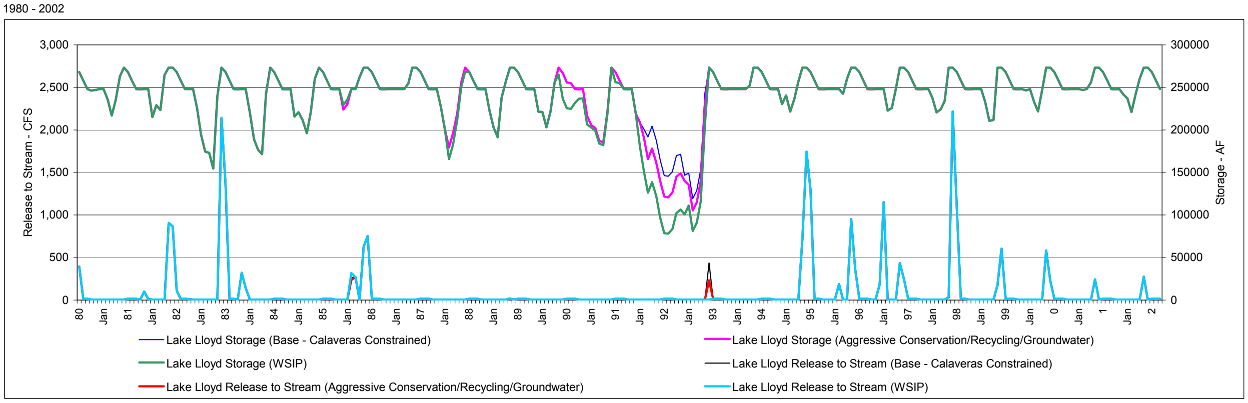
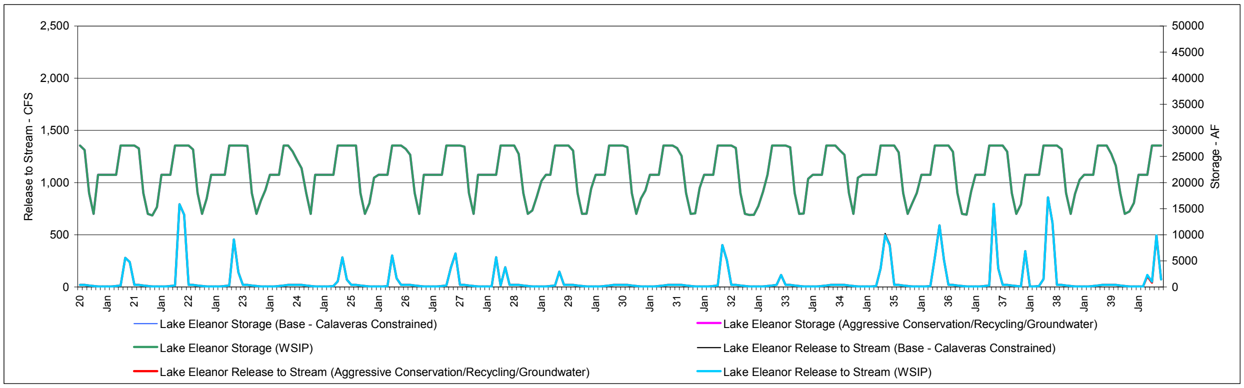
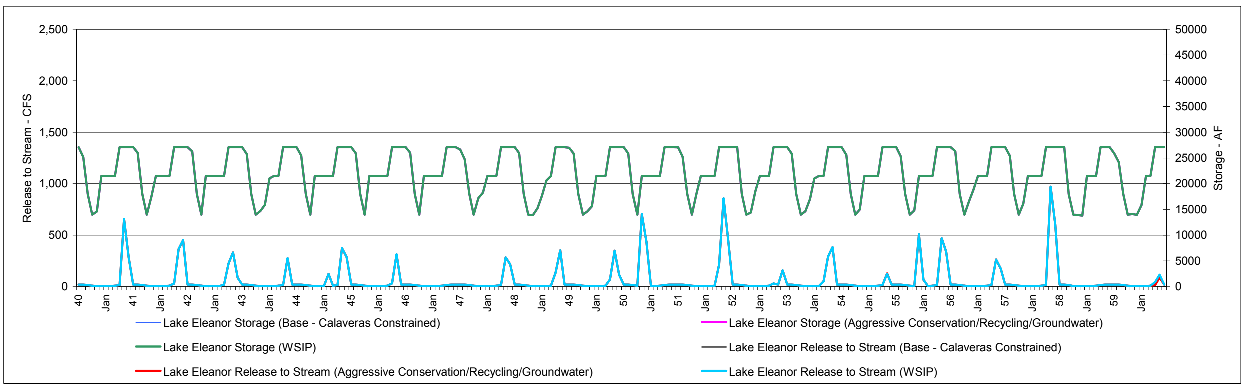


Figure 4.4-2
Lake Eleanor Storage and Stream Release

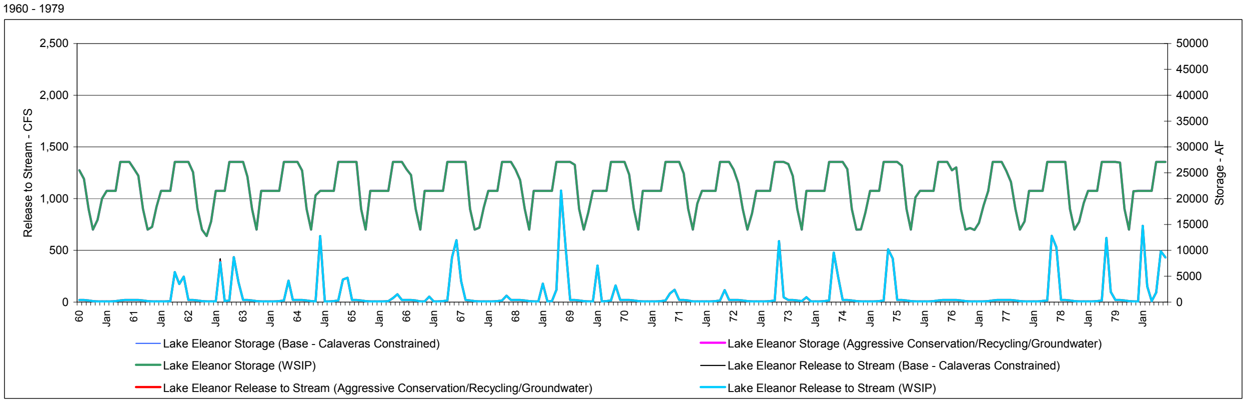
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

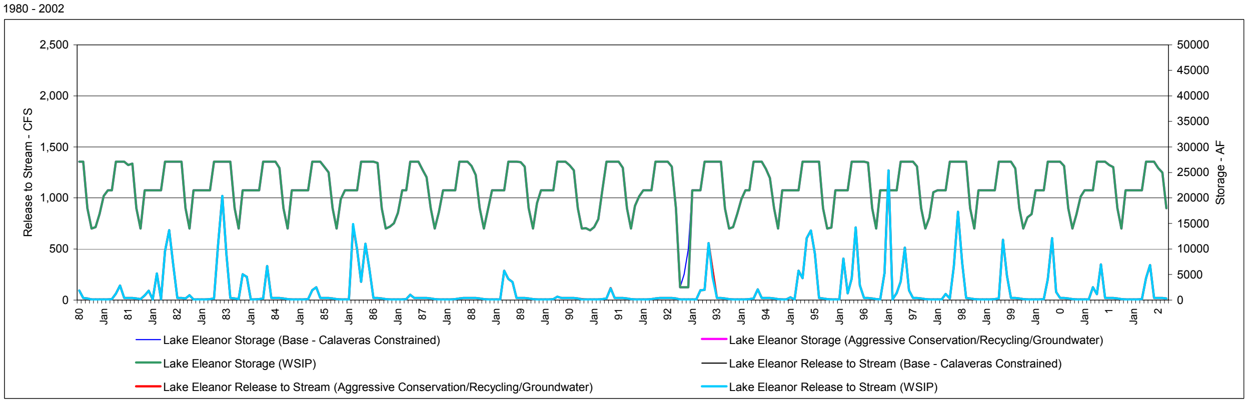


Table 4.4-1

Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Aggressive Conservation/Recycling/Groundwater

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	5	11	134	107	19	21	5	284	1,072	363	15	15
Above Normal	5	72	25	5	16	5	5	164	451	16	15	15
Normal	5	5	5	16	5	5	5	110	162	15	15	15
Below Normal	5	5	5	5	5	5	8	39	43	15	15	15
Dry	5	5	5	5	5	5	5	5	5	15	15	15
All Years	5	20	34	27	10	8	6	120	344	83	15	15

Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	5	11	134	107	25	21	5	284	1,058	363	15	15
Above Normal	5	72	25	5	16	5	5	167	446	16	15	15
Normal	5	5	5	16	5	5	5	110	162	15	15	15
Below Normal	5	5	5	5	5	5	8	39	43	15	15	15
Dry	5	5	5	5	5	5	5	5	5	15	15	15
All Years	5	20	34	27	11	8	6	121	340	83	15	15

Difference in Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Aggressive Conservation/Recycling/Groundwater minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	0	0	0	0	-5	0	0	0	14	0	0	0
Above Normal	0	0	0	0	0	0	0	-3	5	0	0	0
Normal	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	0	0	-1	0	0	-1	4	0	0	0

Table 4.4-2

Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Aggressive Conservation/Recycling/Groundwater

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	5	11	134	107	19	21	5	284	1,072	363	15	15
Above Normal	5	72	25	5	16	5	5	164	451	16	15	15
Normal	5	5	5	16	5	5	5	110	162	15	15	15
Below Normal	5	5	5	5	5	5	8	39	43	15	15	15
Dry	5	5	5	5	5	5	5	5	5	15	15	15
All Years	5	20	34	27	10	8	6	120	344	83	15	15

Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	5	11	134	107	21	21	5	284	1,084	363	15	15
Above Normal	5	72	25	5	16	5	5	166	467	16	15	15
Normal	5	5	5	16	5	5	5	110	162	15	15	15
Below Normal	5	5	5	5	5	5	8	39	43	15	15	15
Dry	5	5	5	5	5	5	5	5	5	15	15	15
All Years	5	20	34	27	10	8	6	120	350	83	15	15

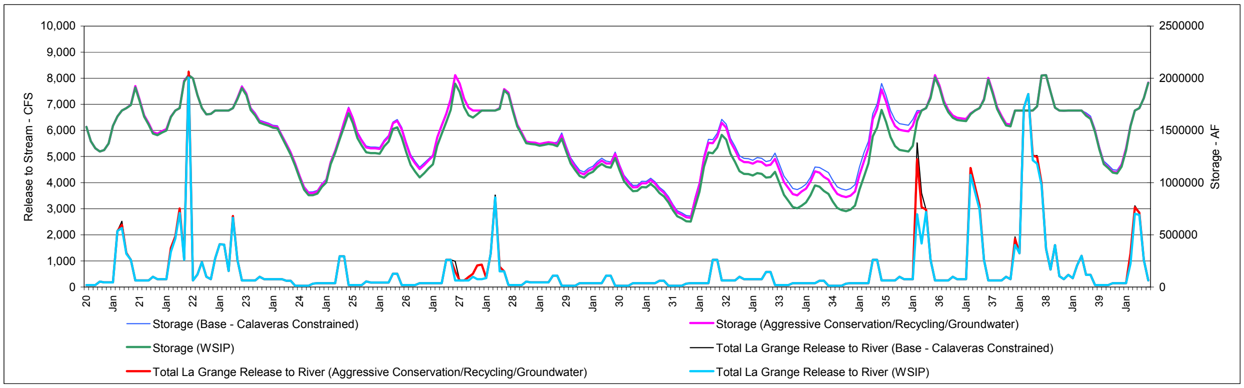
Difference in Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Aggressive Conservation/Recycling/Groundwater minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	0	0	0	0	-2	0	0	0	-13	0	0	0
Above Normal	0	0	0	0	0	0	0	-2	-16	0	0	0
Normal	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	0	0	0	0	0	0	-6	0	0	0

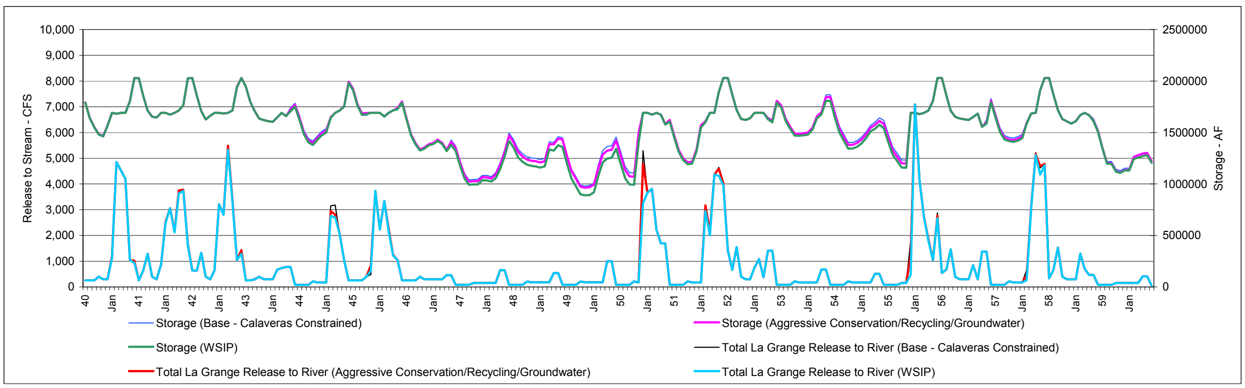
Figure 4.5-1

Don Pedro Reservoir Storage and Release below La Grange Dam

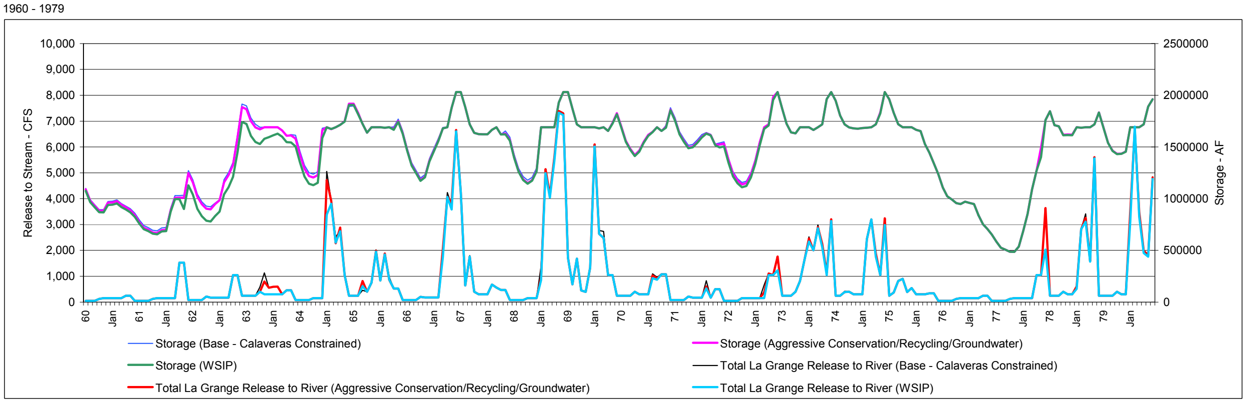
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

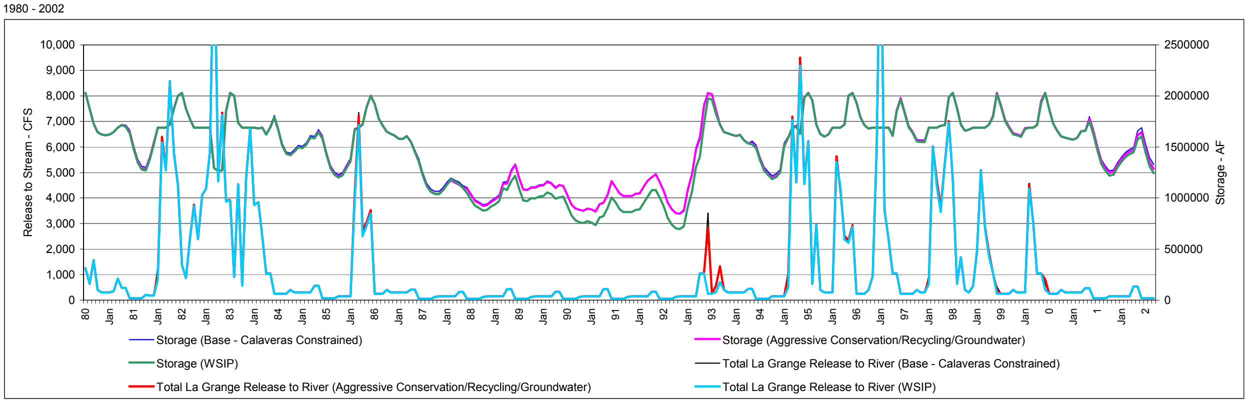


Table 4.5-1

Don Pedro Reservoir Storage (Acre-feet)

Aggressive Conservation/Recycling/Groundwater

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	1,298,116	1,312,166	1,374,846	1,543,388	1,634,035	1,690,000	1,713,000	1,746,254	1,923,631	1,793,701	1,645,368	1,568,736
1922	1,482,736	1,467,921	1,492,215	1,512,383	1,632,510	1,690,000	1,713,000	1,977,583	2,030,000	1,998,136	1,838,254	1,715,718
1923	1,653,081	1,658,408	1,689,999	1,689,989	1,689,997	1,690,000	1,713,000	1,810,382	1,919,290	1,851,257	1,708,541	1,656,913
1924	1,587,043	1,571,371	1,557,353	1,538,951	1,533,665	1,448,976	1,367,683	1,288,098	1,180,562	1,061,673	952,912	898,663
1925	900,800	914,901	978,692	1,020,965	1,197,284	1,304,132	1,436,394	1,579,581	1,711,757	1,613,406	1,472,784	1,400,658
1926	1,336,702	1,328,330	1,329,310	1,323,236	1,394,268	1,439,459	1,568,510	1,591,372	1,510,658	1,370,800	1,248,219	1,184,189
1927	1,128,809	1,168,421	1,214,934	1,254,511	1,432,431	1,547,144	1,656,276	1,797,538	2,030,000	1,949,971	1,803,700	1,718,303
1928	1,690,000	1,690,000	1,689,999	1,690,000	1,689,998	1,690,000	1,713,000	1,896,318	1,861,948	1,698,225	1,555,689	1,477,704
1929	1,394,089	1,385,750	1,382,857	1,369,653	1,378,508	1,386,911	1,380,458	1,367,370	1,452,154	1,329,380	1,215,921	1,151,885
1930	1,095,693	1,079,511	1,115,026	1,135,026	1,178,998	1,210,429	1,183,539	1,182,011	1,274,157	1,157,622	1,052,687	999,705
1931	954,967	957,283	994,721	992,911	1,024,441	991,131	937,530	903,486	847,390	773,344	713,343	693,684
1932	667,471	662,312	833,376	981,595	1,232,955	1,380,620	1,377,711	1,439,848	1,573,572	1,525,724	1,389,556	1,312,278
1933	1,223,014	1,197,553	1,195,256	1,180,752	1,205,411	1,197,270	1,163,529	1,169,883	1,228,006	1,117,747	1,006,684	947,278
1934	889,605	877,783	915,015	942,153	1,011,452	1,108,180	1,095,895	1,054,601	1,029,045	954,670	892,623	872,857
1935	861,888	875,447	914,968	1,074,311	1,204,982	1,332,638	1,607,409	1,702,119	1,891,791	1,775,734	1,630,166	1,542,565
1936	1,505,975	1,497,430	1,491,462	1,544,987	1,665,639	1,690,000	1,713,000	1,825,691	2,028,027	1,929,563	1,779,526	1,696,623
1937	1,643,274	1,621,943	1,615,418	1,609,353	1,662,992	1,690,000	1,713,000	1,800,733	2,003,587	1,868,857	1,722,668	1,637,903
1938	1,563,749	1,555,179	1,689,998	1,689,992	1,689,987	1,690,000	1,690,000	1,730,000	2,025,000	2,030,000	1,870,754	1,718,957
1939	1,690,000	1,689,224	1,690,000	1,690,000	1,689,999	1,690,000	1,650,420	1,617,132	1,494,794	1,327,527	1,185,768	1,146,987
1940	1,104,744	1,097,470	1,172,009	1,327,526	1,547,043	1,690,000	1,713,000	1,807,916	1,958,797	1,793,074	1,642,834	1,554,212
1941	1,483,600	1,467,290	1,566,961	1,689,992	1,683,093	1,690,000	1,690,000	1,806,509	2,030,000	2,027,570	1,857,840	1,712,174
1942	1,653,602	1,645,974	1,689,999	1,689,981	1,673,445	1,690,000	1,713,000	1,765,000	2,027,000	2,030,000	1,860,016	1,707,840
1943	1,626,500	1,664,178	1,690,000	1,689,976	1,683,737	1,690,000	1,713,000	1,943,736	2,030,000	1,944,589	1,798,570	1,708,539
1944	1,635,547	1,622,064	1,610,321	1,603,274	1,647,456	1,690,000	1,658,867	1,722,340	1,768,040	1,641,341	1,499,601	1,422,137
1945	1,397,468	1,445,485	1,491,921	1,518,219	1,647,456	1,690,000	1,713,000	1,754,594	1,992,326	1,929,188	1,774,942	1,687,016
1946	1,689,161	1,690,000	1,689,996	1,689,984	1,655,146	1,690,000	1,713,000	1,736,052	1,801,694	1,637,326	1,481,685	1,395,258
1947	1,336,035	1,352,466	1,385,793	1,398,015	1,428,806	1,398,318	1,330,455	1,410,592	1,351,548	1,210,805	1,085,321	1,021,999
1948	1,025,698	1,026,948	1,065,572	1,064,706	1,052,779	1,090,561	1,184,236	1,307,859	1,469,072	1,404,072	1,310,441	1,265,949
1949	1,236,620	1,226,101	1,220,864	1,209,352	1,221,438	1,388,660	1,383,592	1,439,810	1,432,171	1,269,567	1,126,164	1,051,097
1950	972,913	962,797	968,044	992,585	1,149,903	1,285,862	1,324,184	1,331,711	1,422,476	1,272,791	1,132,293	1,073,538
1951	1,070,744	1,488,456	1,689,994	1,689,971	1,673,951	1,690,000	1,674,893	1,582,480	1,623,173	1,469,675	1,329,803	1,250,402
1952	1,209,019	1,216,718	1,338,311	1,570,860	1,607,853	1,690,000	1,690,000	1,895,000	2,030,000	2,030,000	1,869,932	1,719,140
1953	1,632,895	1,622,960	1,637,300	1,689,996	1,689,998	1,690,000	1,637,601	1,612,876	1,807,374	1,762,524	1,629,423	1,554,390
1954	1,488,563	1,487,754	1,491,397	1,498,203	1,547,172	1,656,733	1,694,547	1,842,655	1,844,804	1,684,589	1,538,474	1,459,916
1955	1,380,440	1,380,171	1,398,457	1,431,044	1,481,318	1,546,931	1,574,658	1,613,394	1,583,735	1,448,018	1,322,723	1,263,946
1956	1,200,937	1,199,546	1,689,999	1,689,942	1,678,244	1,690,000	1,713,000	1,807,969	2,030,000	2,030,000	1,859,576	1,712,725
1957	1,651,881	1,635,922	1,627,970	1,622,414	1,650,203	1,683,085	1,554,764	1,601,605	1,810,011	1,662,709	1,522,759	1,449,042
1958	1,432,651	1,425,088	1,437,796	1,460,760	1,592,502	1,685,871	1,690,000	1,910,000	2,030,000	2,030,000	1,868,297	1,719,418
1959	1,629,791	1,607,494	1,585,600	1,610,046	1,668,508	1,690,000	1,668,272	1,613,774	1,511,239	1,346,068	1,202,689	1,202,377
1960	1,124,461	1,113,034	1,136,262	1,135,952	1,260,578	1,279,681	1,294,114	1,299,490	1,220,270	1,089,550	980,720	931,421
1961	883,504	882,703	962,046	963,749	975,905	941,972	916,843	889,737	840,908	772,571	718,908	699,569
1962	673,602	668,506	696,242	700,189	887,290	1,008,394	1,008,522	1,009,300	1,247,365	1,156,129	1,018,813	945,723
1963	902,756	896,646	946,971	985,264	1,159,254	1,227,294	1,327,050	1,588,059	1,885,149	1,865,023	1,748,321	1,689,084
1964	1,670,166	1,690,000	1,690,000	1,689,998	1,689,999	1,660,043	1,607,767	1,611,163	1,580,208	1,424,930	1,289,630	1,218,501
1965	1,204,859	1,228,130	1,661,529	1,689,962	1,671,264	1,690,000	1,713,000	1,749,032	1,916,882	1,918,887	1,829,360	1,722,990
1966	1,638,033	1,690,000	1,689,998	1,689,996	1,685,637	1,690,000	1,673,183	1,750,711	1,633,424	1,469,368	1,325,726	1,255,121
1967	1,179,202	1,212,730	1,366,423	1,465,439	1,563,272	1,679,817	1,690,000	1,880,000	2,030,000	2,030,000	1,885,338	1,717,656
1968	1,636,802	1,624,597	1,622,733	1,622,937	1,666,603	1,690,000	1,620,006	1,629,914	1,567,192	1,400,090	1,264,643	1,186,918
1969	1,150,489	1,179,797	1,269,280	1,689,993	1,689,990	1,690,000	1,690,000	1,930,000	2,030,000	2,030,000	1,871,603	1,717,046
1970	1,690,000	1,690,000	1,689,999	1,689,951	1,679,633	1,690,000	1,655,509	1,733,462	1,826,128	1,696,059	1,558,979	1,480,821
1971	1,420,775	1,463,683	1,550,732	1,616,642	1,645,380	1,690,000	1,654,817	1,693,001	1,860,872	1,760,694	1,627,078	1,557,478
1972	1,495,246	1,503,790	1,547,387	1,597,860	1,631,406	1,614,352	1,520,432	1,523,646	1,532,873	1,375,031	1,243,566	1,176,831
1973	1,138,097	1,151,091	1,233,162	1,361,966	1,541,583	1,690,000	1,717,600	1,983,033	2,030,000	1,868,018	1,723,820	1,640,583
1974	1,631,540	1,690,000	1,689,998	1,689,982	1,662,881	1,690,000	1,717,600	1,962,884	2,030,000	1,947,300	1,804,413	1,717,372
1975	1,688,940	1,679,043	1,677,497	1,682,835	1,684,941	1,690,000	1,717,600	1,834,573	2,030,000	1,960,006	1,829,986	1,720,415
1976	1,690,000	1,690,000	1,690,000	1,664,706	1,652,292	1,526,598	1,445,307	1,341,473	1,236,083	1,107,685	1,022,829	992,425
1977	956,011	948,887	970,778	958,850	947,176	838,580	752,503	707,496	653,830	583,546	526,720	507,835
1978	487,414	485,146	537,432	682,534	851,424	1,090,274	1,269,016	1,491,952	1,761,000	1,845,304	1,711,347	1,699,327
1979	1,617,427	1,620,500	1,619,556	1,689,997	1,684,439	1,690,000	1,690,000	1,717,600	1,834,877	1,684,867	1,540,837	1,464,234
1980	1,432,825	1,435,536	1,455,571	1,689,972	1,689,987	1,690,000	1,717,600	1,890,400	1,960,200	2,030,000	1,874,603	1,727,346
1981	1,644,248	1,621,877	1,614,080	1,621,636	1,645,736	1,690,000	1,715,284	1,702,809	1,648,484	1,487,441	1,358,894	1,290,690
1982	1,281,797	1,388,704	1,539,448	1,689,993	1,689,988	1,690,000	1,717,600	1,876,400	2,002,900	2,030,000	1,874,041	1,772,100
1983	1,690,000	1,690,000	1,689,995	1,689,966	1,689,989	1,294,700	1,264,000	1,270,800	1,851,400	2,030,000	2,002,489	1,735,007
1984	1,690,000	1,690,000	1,689,992	1,689,972	1,681,440	1,690,000	1,622,221	1,691,612	1,791,967	1,663,838	1,517,244	1,433,830
1985	1,418,807	1,453,917	1,498,296	1,488,884	1,523,939	1,592,019	1,585,122	1,652,704	1,590,942	1,430,448	1,298,810	1,234,892
1986	1,207,890	1,229,077	1,306,220	1,371,232	1,671,168	1,690,000	1,717,600	1,888,300	2,001,400	1,921,921	1,777,678	1,709,305
1987	1,650,171	1,628,126	1,609,576	1,578,456	1,577,656	1,606,515	1,550,992	1,452,961	1,356,483	1,225,290	1,116,916	1,063,636
1988	1,040,909	1,040,005	1,076,189	1,130,008	1,172,206	1,149,227	1,131,926	1,101,776	1,091,411	1,029,514	971,357	949,398
1989	922,708	930,182	962,865	986,534	1,018,505	1,142,408	1,141,410	1,264,349	1,325,317	1,192,588	1,082,147	1,076,630
1990	1,103,038	1,101,514	1,121,408	1,124,145	1,159,650	1,142,870	1,099,171	1,127,382	1,116,383	1,026,818	934,764	898,495
1991	882,397	875,752	895,497	888,076	867,279	940,973	954,009	1,030,862	1,166,467	1,104,852	1,045,079	1,018,895
1992	1,019,969	1,018,504	1,040,934	1,045,722	1,109,511	1,168,967	1,203,043	1,232,367	1,158,149	1,067,356	954,575	889,736
1993	852,647	846,185	875,171	1,080,375	1,230,160	1,474,664	1,579,670	1,901,766	2,030,000	2,015,252	1,860,185	1,719,602
1994	1,646,106	1,631,889	1,617,739	1,607,788	1,617,852	1,565,083	1,533,235	1,537,163	1,497,369	1,378,376	1,280,892	1,234,914
1995	1,195,512	1,215,308	1,260,091	1,517,612	1,592,882	1,690,000	1,708,201	1,629,700	1,982,800	2,030,000	1,957,840	1,718,604
1996	1,625,966	1,600,351	1,621,669	1,689,837	1,689,989	1,690,000	1,717,600	2,002,400	2,030,000	1,934,528	1,789,313	1,712,841
1997	1,679,670	1,690,000	1,689,993	1,689,873	1,689,994	1,690,000	1,611,092	1,857,016	1,976,218	1,839,609	1,700,204	1,645,911
1998	1,563,956	1,557,554	1,558,960	1,689,996	1,689,989	1,690,000	1,705,994	1,714,000	1,987,500	2,030,000	1,881,075	1,719,248
1999	1,658,952	1,669,423	1,690,000	1,689,986	1,689,990	1,690,000	1,717,600	1,805,662	2,030,000	1,904,718	1,766,680	1,697,101
2000	1,634,145	1,624,148	1,608,505	1,684,443	1,689,992	1,690,000	1,713,910	1,952,079	2,030,000	1,869,202	1,728,018	1,657,692
2001	1,603,232	1,590,888	1,579,361	1,571,337	1,589,625	1,655,516	1,658,030	1,776,727	1,652,944	1,493,321	1,358,495	1,293,704
2002	1,246,678	1,255,486	1,324,859	1,380,284	1,427,376	1,455,942	1,473,706	1,614,122	1,645,406	1,486,986	1,352,484	1,284,507
Avg (21-02)	1,341,424	1,349,616	1,392,539	1,436,414	1,484,945	1,517,424	1,523,748	1,601,046	1,685,849	1,597,053	1,468,353	1,387,782

Table 4.5-2

Don Pedro Reservoir Storage (Acre-feet) WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	1,297,919	1,311,969	1,374,649	1,543,191	1,633,956	1,690,000	1,713,000	1,742,271	1,910,239	1,780,368	1,632,093	1,555,504
1922	1,469,532	1,454,724	1,479,018	1,499,182	1,627,229	1,690,000	1,713,000	1,967,374	2,030,000	1,998,136	1,838,254	1,715,718
1923	1,653,081	1,658,408	1,689,999	1,689,989	1,689,997	1,690,000	1,713,000	1,799,350	1,905,720	1,837,747	1,695,090	1,643,504
1924	1,573,662	1,557,997	1,543,979	1,525,572	1,520,285	1,435,601	1,350,582	1,268,108	1,160,641	1,041,842	933,176	878,997
1925	881,178	895,290	959,080	1,001,347	1,177,665	1,284,520	1,414,414	1,536,668	1,665,128	1,566,983	1,426,571	1,354,602
1926	1,290,743	1,282,398	1,282,833	1,276,745	1,347,403	1,393,186	1,513,528	1,529,318	1,431,062	1,291,567	1,169,352	1,105,586
1927	1,050,369	1,090,025	1,136,534	1,176,089	1,354,003	1,468,745	1,577,952	1,697,527	1,948,089	1,868,412	1,722,499	1,645,385
1928	1,624,109	1,655,435	1,689,902	1,690,000	1,689,998	1,690,000	1,705,499	1,882,298	1,844,942	1,681,291	1,538,831	1,460,902
1929	1,377,322	1,368,992	1,366,099	1,352,890	1,361,744	1,370,153	1,363,716	1,347,620	1,420,045	1,297,417	1,184,105	1,120,176
1930	1,064,049	1,047,885	1,083,398	1,103,389	1,147,360	1,178,802	1,151,942	1,144,262	1,236,535	1,120,169	1,015,406	962,553
1931	917,895	920,233	957,669	955,848	987,375	954,080	900,516	866,574	810,612	736,739	676,917	657,388
1932	631,250	626,111	769,876	913,848	1,153,707	1,290,028	1,281,046	1,334,403	1,458,411	1,411,082	1,275,442	1,198,554
1933	1,109,524	1,084,126	1,081,825	1,067,288	1,091,938	1,083,840	1,048,315	1,053,300	1,103,198	993,506	883,024	824,057
1934	766,654	754,904	779,126	811,010	879,460	973,506	960,998	918,785	892,442	818,720	757,328	738,038
1935	727,361	740,999	780,515	934,490	1,058,269	1,185,433	1,443,820	1,528,475	1,696,712	1,581,499	1,436,797	1,349,843
1936	1,313,654	1,305,218	1,299,245	1,352,785	1,588,986	1,690,000	1,713,000	1,808,423	2,006,955	1,908,581	1,758,637	1,675,801
1937	1,622,493	1,601,173	1,594,638	1,588,536	1,654,992	1,690,000	1,713,000	1,792,216	1,986,905	1,852,247	1,706,131	1,621,419
1938	1,547,298	1,538,738	1,689,998	1,689,992	1,689,987	1,690,000	1,690,000	1,730,000	2,025,000	2,030,000	1,870,754	1,718,957
1939	1,690,000	1,689,224	1,690,000	1,690,000	1,689,999	1,690,000	1,640,414	1,609,719	1,486,211	1,318,984	1,177,264	1,138,511
1940	1,096,286	1,089,016	1,153,019	1,306,880	1,540,470	1,690,000	1,713,000	1,807,953	1,954,973	1,789,267	1,639,044	1,550,434
1941	1,479,830	1,463,523	1,562,835	1,689,993	1,683,062	1,690,000	1,690,000	1,803,805	2,030,000	2,027,570	1,857,840	1,712,174
1942	1,653,602	1,645,974	1,689,999	1,689,982	1,673,445	1,690,000	1,713,000	1,765,000	2,027,000	2,030,000	1,860,016	1,707,840
1943	1,626,500	1,664,178	1,690,000	1,689,976	1,683,949	1,690,000	1,713,000	1,939,745	2,030,000	1,944,589	1,798,570	1,708,539
1944	1,635,547	1,622,064	1,610,321	1,603,274	1,647,456	1,690,000	1,658,867	1,706,915	1,749,631	1,623,011	1,481,354	1,403,951
1945	1,379,320	1,427,347	1,473,782	1,500,075	1,640,198	1,690,000	1,713,000	1,750,606	1,979,431	1,916,348	1,762,159	1,674,274
1946	1,676,444	1,690,000	1,689,996	1,689,984	1,655,146	1,690,000	1,713,000	1,726,277	1,790,756	1,626,434	1,470,843	1,384,452
1947	1,325,252	1,341,690	1,375,016	1,387,235	1,418,025	1,387,541	1,319,689	1,380,202	1,321,263	1,180,658	1,055,313	992,092
1948	995,855	997,122	1,035,745	1,034,871	1,022,941	1,055,025	1,146,212	1,267,720	1,417,634	1,352,869	1,259,478	1,215,157
1949	1,185,933	1,175,442	1,170,203	1,158,664	1,170,747	1,334,893	1,324,462	1,376,085	1,357,943	1,195,682	1,052,617	977,799
1950	899,772	889,700	891,735	917,336	1,074,649	1,209,756	1,247,393	1,254,524	1,342,391	1,193,077	1,052,942	994,455
1951	991,828	1,394,480	1,689,996	1,689,971	1,673,951	1,690,000	1,671,372	1,576,239	1,604,996	1,451,580	1,311,792	1,232,453
1952	1,191,106	1,198,816	1,320,408	1,550,006	1,599,510	1,690,000	1,690,000	1,895,000	2,030,000	2,030,000	1,869,932	1,719,140
1953	1,632,895	1,622,960	1,637,300	1,689,996	1,689,998	1,690,000	1,627,805	1,598,044	1,787,718	1,742,953	1,609,936	1,534,967
1954	1,469,181	1,468,382	1,472,024	1,478,824	1,527,793	1,637,361	1,675,192	1,807,461	1,807,613	1,647,557	1,501,608	1,423,172
1955	1,343,773	1,343,524	1,361,809	1,394,386	1,444,656	1,510,283	1,537,906	1,575,778	1,541,339	1,405,813	1,280,713	1,222,079
1956	1,159,157	1,157,788	1,690,000	1,689,941	1,678,244	1,690,000	1,713,000	1,804,932	2,030,000	2,030,000	1,859,576	1,712,725
1957	1,651,881	1,635,922	1,627,970	1,622,414	1,650,203	1,683,085	1,554,764	1,586,050	1,793,311	1,646,081	1,506,206	1,432,543
1958	1,416,187	1,408,633	1,421,341	1,444,300	1,585,917	1,683,239	1,690,000	1,910,000	2,030,000	2,030,000	1,868,297	1,719,418
1959	1,629,791	1,607,494	1,585,600	1,610,046	1,668,508	1,690,000	1,667,329	1,608,068	1,505,552	1,340,406	1,197,054	1,196,761
1960	1,118,856	1,107,432	1,130,660	1,130,349	1,243,727	1,256,367	1,271,555	1,279,420	1,205,492	1,074,839	966,076	916,828
1961	868,944	868,151	939,429	941,125	953,280	919,356	894,250	867,206	824,074	759,385	705,786	686,494
1962	660,555	655,467	683,202	687,146	874,245	995,355	995,496	899,706	1,129,280	1,038,578	901,808	829,134
1963	786,422	780,381	830,701	875,755	1,042,937	1,111,019	1,210,888	1,447,268	1,742,065	1,722,560	1,606,476	1,547,700
1964	1,529,068	1,578,634	1,594,299	1,612,405	1,628,891	1,598,956	1,546,441	1,542,798	1,504,176	1,349,242	1,214,296	1,143,418
1965	1,129,930	1,153,243	1,584,742	1,689,973	1,672,299	1,690,000	1,713,000	1,744,658	1,904,786	1,906,843	1,817,368	1,723,009
1966	1,638,052	1,690,000	1,689,998	1,689,996	1,685,990	1,690,000	1,666,206	1,743,752	1,626,487	1,462,463	1,318,853	1,248,271
1967	1,172,366	1,205,898	1,359,590	1,458,604	1,556,437	1,679,489	1,690,000	1,880,000	2,030,000	2,030,000	1,885,338	1,717,656
1968	1,636,802	1,624,597	1,622,733	1,622,937	1,666,603	1,690,000	1,620,006	1,623,382	1,560,682	1,393,610	1,258,193	1,180,490
1969	1,144,074	1,173,385	1,262,868	1,689,994	1,689,990	1,690,000	1,690,000	1,930,000	2,030,000	2,030,000	1,871,603	1,717,046
1970	1,690,000	1,690,000	1,689,999	1,689,952	1,679,633	1,690,000	1,655,509	1,725,036	1,816,534	1,686,506	1,549,469	1,471,343
1971	1,411,316	1,454,230	1,541,278	1,607,186	1,641,597	1,690,000	1,654,817	1,685,672	1,853,567	1,753,420	1,619,836	1,550,260
1972	1,488,043	1,496,591	1,540,187	1,590,658	1,628,525	1,611,472	1,517,554	1,495,198	1,504,521	1,346,809	1,215,475	1,148,834
1973	1,110,158	1,123,168	1,205,238	1,334,033	1,513,648	1,676,096	1,707,479	1,954,405	2,030,000	1,868,018	1,723,819	1,640,583
1974	1,631,540	1,690,000	1,689,998	1,689,983	1,662,882	1,690,000	1,717,600	1,963,536	2,030,000	1,947,300	1,804,413	1,717,372
1975	1,688,940	1,679,043	1,677,497	1,682,835	1,684,941	1,690,000	1,717,600	1,823,045	2,030,000	1,960,006	1,829,986	1,720,415
1976	1,690,000	1,690,000	1,690,000	1,664,706	1,652,292	1,526,598	1,445,307	1,341,473	1,236,083	1,107,685	1,022,829	992,425
1977	956,011	948,887	970,778	958,850	947,176	838,580	752,503	707,496	653,830	583,546	526,720	507,835
1978	487,414	485,146	537,432	682,534	851,424	1,090,274	1,269,016	1,401,086	1,761,000	1,845,304	1,711,347	1,699,327
1979	1,612,045	1,615,120	1,614,177	1,689,998	1,684,439	1,690,000	1,690,000	1,717,600	1,832,303	1,682,304	1,538,286	1,461,691
1980	1,430,288	1,433,000	1,453,035	1,689,976	1,689,987	1,690,000	1,717,600	1,890,400	1,960,200	2,030,000	1,874,603	1,727,346
1981	1,644,248	1,621,877	1,614,080	1,621,636	1,645,736	1,690,000	1,714,087	1,699,430	1,636,268	1,475,279	1,346,789	1,278,626
1982	1,269,759	1,376,672	1,527,416	1,689,995	1,689,988	1,690,000	1,717,600	1,876,400	2,002,900	2,030,000	1,874,041	1,772,100
1983	1,690,000	1,690,000	1,689,995	1,689,966	1,689,989	1,294,700	1,264,000	1,270,800	1,851,400	2,030,000	2,002,489	1,735,007
1984	1,690,000	1,690,000	1,689,992	1,689,971	1,681,440	1,690,000	1,622,221	1,691,612	1,791,967	1,663,838	1,517,244	1,433,830
1985	1,418,807	1,453,917	1,498,296	1,488,884	1,523,939	1,592,019	1,585,122	1,645,091	1,583,355	1,422,894	1,291,292	1,227,399
1986	1,200,412	1,221,603	1,293,188	1,358,196	1,670,079	1,690,000	1,717,600	1,888,300	2,001,400	1,921,921	1,777,677	1,709,305
1987	1,650,170	1,628,126	1,609,576	1,578,456	1,577,656	1,606,514	1,550,992	1,452,961	1,354,101	1,222,918	1,114,556	1,061,284
1988	1,038,561	1,037,658	1,073,842	1,127,662	1,183,519	1,160,536	1,137,647	1,097,768	1,048,672	981,981	924,050	902,259
1989	875,673	883,175	915,855	939,511	971,478	1,095,398	1,079,035	1,164,887	1,218,247	1,086,000	976,047	970,893
1990	997,524	996,060	1,015,948	1,018,655	1,054,153	1,037,412	993,814	1,005,333	1,012,353	923,267	831,714	782,012
1991	760,785	754,212	773,166	758,204	736,039	809,784	822,954	901,838	1,006,446	957,482	889,578	860,866
1992	862,284	860,911	883,335	888,075	951,851	1,011,366	1,076,354	1,079,040	1,005,349	915,259	803,211	738,908
1993	702,146	695,777	721,584	911,368	1,061,108	1,302,035	1,403,055	1,721,451	1,976,934	1,962,414	1,823,393	1,719,661
1994	1,646,165	1,631,948	1,617,798	1,607,847	1,617,911	1,565,142	1,533,294	1,527,372	1,486,417	1,367,474	1,270,041	1,224,099
1995	1,184,719	1,204,522	1,249,304	1,506,822	1,592,472	1,690,000	1,695,046	1,629,700	1,982,800	2,030,000	1,957,840	1,718,604
1996	1,625,966	1,600,351	1,621,669	1,689,837	1,689,990	1,690,000	1,717,600	2,002,400	2,030,000	1,934,528	1,789,313	1,712,841
1997	1,679,670	1,690,000	1,689,993	1,689,875	1,689,994	1,690,000	1,607,194	1,849,992	1,966,183	1,829,617	1,690,255	1,635,994
1998	1,554,059	1,547,662	1,549,068	1,689,997	1,689,989	1,690,000	1,707,834	1,714,000	1,987,500	2,030,000	1,881,075	1,719,248
1999	1,658,952	1,669,423	1,690,000	1,689,986	1,689,990	1,690,000	1,717,600	1,793,743	2,020,177	1,894,937	1,756,942	1,687,394
2000	1,624,457	1,614,466	1,598,823	1,674,758	1,689,992	1,690,000	1,713,910	1,930,492	2,030,000	1,869,201	1,728,017	1,657,692
2001	1,603,232	1,590,888	1,579,361	1,571,337	1,589,625	1,655,516	1,658,030	1,751,843	1,625,780	1,466,278	1,331,576	1,266,879
2002	1,219,908	1,228,730	1,298,102	1,353,519	1,400,609	1,429,186	1,446,975	1,572,955	1,603,183	1,444,951	1,310,643	1,242,810
Avg (21-02)	1,311,299	1,320,223	1,364,704	1,409,926	1,461,118	1,494,905	1,500,141	1,568,630	1,654,109	1,565,583	1,437,114	1,357,135

Table 4.5-3

Difference in Don Pedro Reservoir Storage (Acre-feet) — Aggressive Conservation/Recycling/Groundwater minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	197	197	197	197	79	0	0	3,983	13,392	13,333	13,275	13,232
1922	13,204	13,197	13,197	13,201	5,281	0	0	10,209	0	0	0	0
1923	0	0	0	0	0	0	0	11,032	13,570	13,510	13,451	13,409
1924	13,381	13,374	13,374	13,379	13,380	13,375	17,101	19,990	19,921	19,831	19,736	19,666
1925	19,622	19,611	19,612	19,618	19,619	19,612	21,980	42,913	46,629	46,423	46,213	46,056
1926	45,959	45,932	46,477	46,491	46,865	46,273	54,982	62,054	79,596	79,233	78,867	78,603
1927	78,440	78,396	78,400	78,422	78,428	78,399	78,324	100,011	81,911	81,559	81,201	72,918
1928	65,891	34,565	97	0	0	0	7,501	14,020	17,006	16,934	16,858	16,802
1929	16,767	16,758	16,758	16,763	16,764	16,758	16,742	19,750	32,109	31,963	31,816	31,709
1930	31,644	31,626	31,628	31,637	31,638	31,627	31,597	37,749	37,622	37,453	37,281	37,152
1931	37,072	37,050	37,052	37,063	37,066	37,051	37,014	36,912	36,778	36,605	36,426	36,296
1932	36,221	36,201	63,500	67,747	79,248	90,592	96,665	105,445	115,161	114,642	114,114	113,724
1933	113,490	113,427	113,431	113,464	113,473	113,430	115,214	116,583	124,808	124,241	123,660	123,221
1934	122,951	122,879	135,889	131,143	131,992	134,674	134,897	135,816	136,603	135,950	135,295	134,819
1935	134,527	134,448	134,453	139,821	146,713	147,205	163,589	173,644	195,079	194,235	193,369	192,722
1936	192,321	192,212	192,217	192,202	76,653	0	0	17,268	21,072	20,982	20,889	20,822
1937	20,781	20,770	20,780	20,817	8,000	0	0	8,517	16,682	16,610	16,537	16,484
1938	16,451	16,441	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	10,006	7,413	8,583	8,543	8,504	8,476
1940	8,458	8,454	18,990	20,646	6,573	0	0	-37	3,824	3,807	3,790	3,778
1941	3,770	3,767	4,126	-1	31	0	0	2,704	0	0	0	0
1942	0	0	0	-1	0	0	0	0	0	0	0	0
1943	0	0	0	0	-212	0	0	3,991	0	0	0	0
1944	0	0	0	0	0	0	0	15,425	18,409	18,330	18,247	18,186
1945	18,148	18,138	18,139	18,144	7,258	0	0	3,988	12,895	12,840	12,783	12,742
1946	12,717	0	0	0	0	0	0	9,775	10,938	10,892	10,842	10,806
1947	10,783	10,776	10,777	10,780	10,781	10,777	10,766	30,390	30,285	30,147	30,008	29,907
1948	29,843	29,826	29,827	29,835	29,838	35,536	38,024	40,139	51,438	51,203	50,963	50,792
1949	50,687	50,659	50,661	50,688	50,691	53,767	59,130	63,725	74,228	73,885	73,547	73,298
1950	73,141	73,097	76,309	75,249	75,254	76,106	76,791	77,187	80,085	79,714	79,351	79,083
1951	78,916	93,976	-2	0	0	0	3,521	6,241	18,177	18,095	18,011	17,949
1952	17,913	17,902	17,903	20,854	8,343	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	9,796	14,832	19,656	19,571	19,487	19,423
1954	19,382	19,372	19,373	19,379	19,379	19,372	19,355	35,194	37,191	37,032	36,866	36,744
1955	36,667	36,647	36,648	36,658	36,662	36,648	36,752	37,616	42,396	42,205	42,010	41,867
1956	41,780	41,758	-1	1	0	0	0	3,037	0	0	0	0
1957	0	0	0	0	0	0	0	15,555	16,700	16,628	16,553	16,499
1958	16,464	16,455	16,455	16,460	6,585	2,632	0	0	0	0	0	0
1959	0	0	0	0	0	0	943	5,706	5,687	5,662	5,635	5,616
1960	5,605	5,602	5,602	5,603	16,851	23,314	22,559	20,070	14,778	14,711	14,644	14,593
1961	14,560	14,552	22,617	22,624	22,625	22,616	22,593	22,531	16,834	13,186	13,122	13,075
1962	13,047	13,039	13,040	13,043	13,045	13,039	13,026	109,594	118,085	117,551	117,005	116,589
1963	116,334	116,265	116,270	109,509	116,317	116,275	116,162	140,791	143,084	142,463	141,845	141,384
1964	141,098	111,366	95,701	77,593	61,108	61,087	61,326	68,365	76,032	75,688	75,334	75,083
1965	74,929	74,887	76,787	-11	-1,035	0	0	4,374	12,096	12,044	11,992	-19
1966	-19	0	0	0	-353	0	6,977	6,959	6,937	6,905	6,873	6,850
1967	6,836	6,832	6,833	6,835	6,835	328	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	6,532	6,510	6,480	6,450	6,428
1969	6,415	6,412	6,412	-1	0	0	0	0	0	0	0	0
1970	0	0	0	-1	0	0	0	8,426	9,594	9,553	9,510	9,478
1971	9,459	9,453	9,454	9,456	3,783	0	0	7,329	7,305	7,274	7,242	7,218
1972	7,203	7,199	7,200	7,202	2,881	2,880	2,878	28,448	28,352	28,222	28,091	27,997
1973	27,939	27,923	27,924	27,933	27,935	13,904	10,121	28,628	0	0	1	0
1974	0	0	0	-1	-1	0	0	-652	0	0	0	0
1975	0	0	0	0	0	0	0	11,528	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	90,866	0	0	0	0
1979	5,382	5,380	5,379	-1	0	0	0	0	2,574	2,563	2,551	2,543
1980	2,537	2,536	2,536	-4	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	1,197	3,379	12,216	12,162	12,105	12,064
1982	12,038	12,032	12,032	-2	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	1	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	7,613	7,587	7,554	7,518	7,493
1986	7,478	7,474	13,032	13,036	1,089	0	0	0	0	0	1	0
1987	1	0	0	0	0	1	0	0	2,382	2,372	2,360	2,352
1988	2,348	2,347	2,347	2,346	-11,313	-11,309	-5,721	4,008	42,739	47,533	47,307	47,139
1989	47,035	47,007	47,010	47,023	47,027	47,010	62,375	99,462	107,070	106,588	106,100	105,737
1990	105,514	105,454	105,460	105,490	105,497	105,458	105,357	122,049	104,030	103,551	103,050	116,483
1991	121,612	121,540	122,331	129,872	131,240	131,189	131,055	129,024	160,021	147,370	155,501	158,029
1992	157,685	157,593	157,599	157,647	157,660	157,601	126,689	153,327	152,800	152,097	151,364	150,828
1993	150,501	150,408	153,587	169,007	169,052	172,629	176,615	180,315	53,066	52,838	36,792	-59
1994	-59	-59	-59	-59	-59	-59	-59	9,791	10,952	10,902	10,851	10,815
1995	10,793	10,786	10,787	10,790	410	0	13,155	0	0	0	0	0
1996	0	0	0	0	-1	0	0	0	0	0	0	0
1997	0	0	0	-2	0	0	3,898	7,024	10,035	9,992	9,949	9,917
1998	9,897	9,892	9,892	-1	0	0	-1,840	0	0	0	0	0
1999	0	0	0	0	0	0	0	11,919	9,823	9,781	9,738	9,707
2000	9,688	9,682	9,682	9,685	0	0	0	21,587	0	1	1	0
2001	0	0	0	0	0	0	0	24,884	27,164	27,043	26,919	26,825
2002	26,770	26,756	26,757	26,765	26,767	26,756	26,731	41,167	42,223	42,035	41,841	41,697
Avg (21-02)	30,125	29,394	27,835	26,488	23,826	22,519	23,607	32,416	31,740	31,470	31,240	30,647

Table 4.5-4

Difference in Don Pedro Reservoir Storage (Acre-feet) Aggressive Conservation/Recycling/Groundwater minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	0	0	0	0	0	0	0	510	1,151	-1,037	-1,033	-1,030
1922	-1,028	-1,027	-1,027	-1,027	-411	0	0	375	0	-2,184	-1,520	3
1923	3	2	0	0	0	0	0	-9,823	-9,330	-11,473	-11,423	-11,386
1924	-11,363	-11,357	-11,358	-11,361	-11,361	-11,357	-10,736	-11,460	-11,421	-11,370	-11,317	-11,275
1925	-11,251	-11,244	-11,244	-11,247	-11,249	-11,244	-13,478	-12,525	-10,737	-12,873	-12,815	-12,771
1926	-12,745	-12,738	-12,691	-12,694	-12,521	-12,516	-10,942	-13,824	-19,540	-19,451	-19,360	-19,295
1927	-19,255	-19,245	-12,646	-12,649	-12,651	-12,646	-12,634	-18,408	0	-2,184	-1,531	2
1928	0	0	0	0	0	0	0	950	1,866	1,858	1,850	1,843
1929	1,839	1,839	1,838	1,839	1,839	1,839	1,837	-21,018	-23,060	-22,954	-22,847	-22,771
1930	-22,723	-22,711	-22,712	-22,718	-22,720	-22,712	-22,690	-16,395	-18,452	-18,369	-18,286	-18,224
1931	-18,184	-18,174	-18,175	-18,180	-18,182	-18,175	-18,157	-18,106	-18,041	-17,954	-17,869	-17,805
1932	-17,765	-17,754	-22,568	-25,586	-25,081	-34,168	-32,893	-32,684	-32,789	-34,826	-34,668	-34,551
1933	-34,478	-34,458	-34,460	-34,470	-34,472	-34,460	-38,184	-42,235	-54,348	-56,287	-56,028	-55,835
1934	-55,714	-55,680	-37,016	-44,056	-39,740	-40,345	-49,021	-66,946	-67,243	-66,934	-66,614	-66,376
1935	-66,229	-66,189	-66,193	-76,426	-83,358	-63,371	-51,822	-51,432	-57,802	-59,733	-59,475	-59,279
1936	-59,159	-59,126	-59,128	-59,154	-24,351	0	0	-185	1,561	-629	-626	-625
1937	-623	-622	-622	-623	-243	0	0	-1,219	-2,226	-4,400	-4,380	-4,367
1938	-4,358	-4,355	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	-18,907	-19,810	-20,662	-20,568	-20,473	-20,405
1940	-20,363	-20,351	-9,084	-6,721	-2,850	0	0	6,138	5,107	5,085	5,063	5,046
1941	5,035	5,032	4,463	-1	83	0	0	-391	0	-2,183	-1,521	3
1942	3	3	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	-212	0	0	-1,045	0	-2,183	-2,174	4
1944	3	4	4	3	2	0	0	-18,192	-17,213	-19,323	-19,237	-19,172
1945	-19,132	-19,121	-19,122	-19,127	-7,652	0	0	3,703	23,780	21,495	21,400	21,332
1946	21,291	0	0	0	0	0	0	-1,867	-2,780	-2,768	-2,756	-2,746
1947	-2,741	-2,739	-2,739	-2,740	-2,740	-2,739	-2,737	-16,294	-18,351	-18,265	-18,182	-18,120
1948	-18,083	-18,073	-18,073	-18,079	-18,080	-18,073	-20,356	-22,645	-25,514	-27,581	-27,454	-27,359
1949	-27,303	-27,288	-27,288	-27,309	-27,311	-21,299	-20,001	-18,718	-16,906	-16,829	-16,753	-16,696
1950	-16,661	-16,652	-18,825	-15,539	-30,886	-39,257	-39,397	-39,984	-34,129	-35,358	-35,197	-35,079
1951	-35,006	-31,771	1	0	0	0	597	2,400	5,141	2,935	2,921	2,910
1952	2,905	2,903	2,903	1,367	547	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	-10,035	-7,160	-4,380	-6,544	-6,515	-6,494
1954	-6,481	-6,477	-6,477	-6,479	-6,480	-6,477	-6,471	-23,422	-23,345	-23,244	-23,140	-23,063
1955	-23,014	-23,001	-23,002	-23,009	-23,011	-23,003	-25,066	-27,927	-33,682	-33,531	-33,377	-33,262
1956	-33,194	-33,175	1	0	0	0	0	-5,078	0	0	0	0
1957	0	0	0	0	0	0	0	-18,040	-18,900	-21,002	-20,909	-20,839
1958	-20,796	-20,784	-20,785	-20,791	-8,317	-3,325	0	0	0	0	0	0
1959	0	0	0	0	0	0	-4,820	-16,709	-16,653	-16,577	-16,499	-16,445
1960	-16,411	-16,401	-16,402	-16,407	-8,607	-3,544	-5,554	-6,916	-10,444	-10,396	-10,347	-10,312
1961	-10,289	-10,282	-11,204	-11,207	-11,208	-11,205	-11,193	-12,423	-17,994	-21,477	-21,374	-21,298
1962	-21,249	-21,237	-21,238	-21,245	-21,247	-21,239	-21,218	-24,429	-23,104	-25,184	-25,068	-24,981
1963	-24,926	-24,912	-9,119	-3,476	-24,935	-24,926	-24,902	-30,271	-29,253	-31,310	-31,172	-31,073
1964	-19,834	0	0	0	0	0	-2,117	-7,705	-32,602	-32,455	-32,306	-32,195
1965	-32,129	-32,112	-20,059	3	2	0	0	5,722	26,004	23,709	21,421	-34
1966	-34	0	0	0	0	0	-19,987	-18,322	-20,376	-20,286	-20,193	-20,123
1967	-20,082	-20,071	-20,071	-20,077	-20,079	-9,529	0	0	0	0	-2,183	3
1968	4	4	4	3	2	0	0	-25,321	-27,350	-27,227	-27,100	-27,010
1969	-26,954	-26,939	-26,940	4	0	0	0	0	0	0	0	0
1970	0	0	0	-4	1,189	0	0	-3,065	-3,973	-6,139	-6,112	-6,092
1971	-6,079	-6,075	-6,076	-6,078	-2,432	0	0	-16,506	-18,566	-20,667	-20,578	-20,510
1972	-20,469	-20,457	-20,457	-20,463	-8,186	-8,184	-8,175	-15,709	-17,769	-17,689	-17,606	-17,547
1973	-17,511	-17,501	-17,502	-17,506	-17,509	0	0	2,439	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	-2,184	-2,174	3
1975	4	4	3	3	1	0	0	12,726	0	-2,184	-1,521	2
1976	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	3,478	0	-2,183	-2,174	-2,476
1979	-2,935	-2,933	-2,934	0	1	0	0	0	460	458	455	454
1980	453	452	453	-4	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	-920	-11,312	-19,194	-19,109	-19,022	-18,956
1982	-18,916	-18,905	-18,906	3	0	0	0	0	0	0	-2,183	0
1983	0	0	0	0	0	0	0	0	0	0	-2,183	3
1984	0	0	0	1	0	0	-197	-14,020	-16,088	-18,202	-18,121	-18,060
1985	-18,023	-18,013	-18,014	-18,019	-18,020	-18,013	-17,996	-17,052	-19,109	-19,022	-18,935	-18,870
1986	-18,830	-18,820	-18,822	-16,908	-9,433	0	0	0	0	-2,183	-2,173	-2,167
1987	-2,162	-2,161	-2,162	-2,162	-2,162	-2,161	-2,159	-15,753	-24,843	-24,728	-24,617	-24,534
1988	-24,482	-24,468	-24,469	-24,477	-24,478	-24,469	-24,446	-17,016	-12,157	-12,101	-12,044	-12,003
1989	-11,977	-11,969	-11,970	-11,974	-11,975	-11,970	-19,405	-13,321	-7,439	-7,405	-7,370	-7,345
1990	-7,331	-7,326	-7,326	-7,328	-7,330	-7,327	-7,319	-4,513	-2,247	-2,237	-2,226	-2,309
1991	-2,304	-2,303	-2,303	-2,304	-2,304	-2,303	-2,301	-2,205	231	-1,690	-1,682	-1,677
1992	-1,673	-1,673	-1,673	-1,674	-1,673	-1,672	-2,156	-2,150	-2,143	-2,134	-2,124	-2,116
1993	-2,112	-2,110	-12,918	-12,922	-12,923	-20,562	-25,756	-22,509	0	-2,184	-1,520	3
1994	3	2	2	2	3	3	3	-20,744	-21,592	-21,495	-21,393	-21,321
1995	-21,276	-21,265	-21,266	-21,272	-12,416	0	3,952	0	0	0	-2,184	3
1996	4	3	4	4	-1	0	0	0	0	-2,183	-2,174	-2,167
1997	-2,163	0	0	0	0	0	-9,724	-8,750	-7,802	-9,952	-9,909	-9,877
1998	-9,857	-9,852	-9,853	2	0	0	-368	0	0	0	0	0
1999	0	0	0	0	0	0	0	-8,678	0	-2,183	-2,174	-2,167
2000	-2,162	-2,162	-2,162	-2,162	0	0	0	9,396	0	1	1	0
2001	0	0	0	0	0	0	0	-20,493	-19,967	-19,879	-19,787	-19,720
2002	-19,677	-19,666	-19,667	-19,672	-19,674	-19,668	-19,648	-42,838	-43,615	-43,421	-43,222	-43,074
Avg (21-02)	-11,073	-11,018	-9,623	-8,830	-8,010	-6,830	-7,652	-10,826	-10,852	-11,739	-11,778	-11,752

Figure 4.5-1 and Table 4.5-4 illustrate that, during drought sequences, reduction in inflow to Don Pedro Reservoir can accumulate from year to year. Compared to the base setting, the alternative would result in lower Don Pedro Reservoir storage during drought periods. Figure 4.5-2 illustrates the difference in reservoir storage averaged by year type in comparing the alternative to the WSIP settings. Also shown is the average difference in storage for the two settings during the 82-year simulation. Figure 4.5-3 illustrates the same information in comparing the alternative and base settings.

Figure 4.5-2

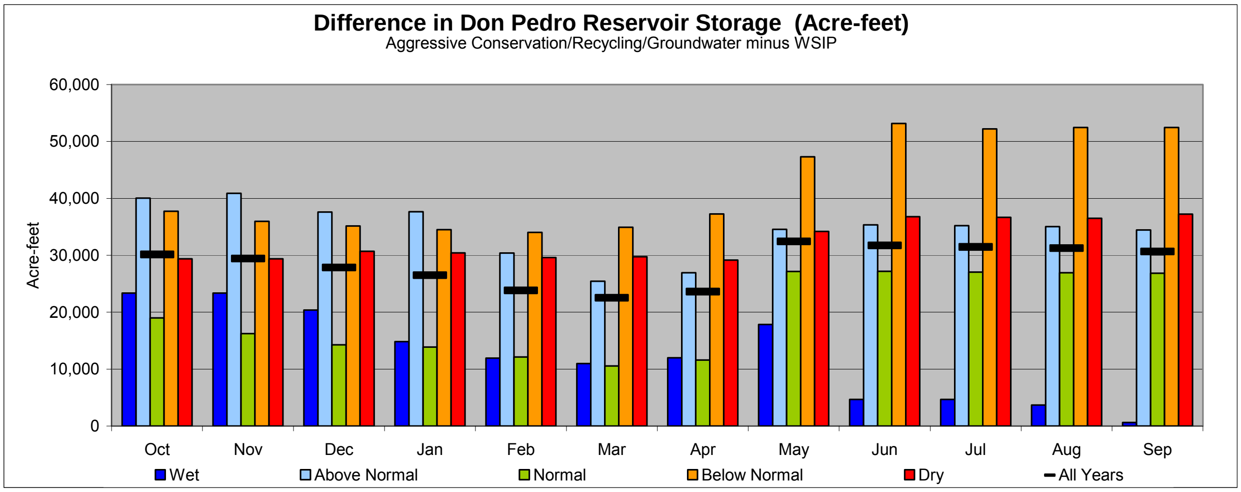


Figure 4.5-3

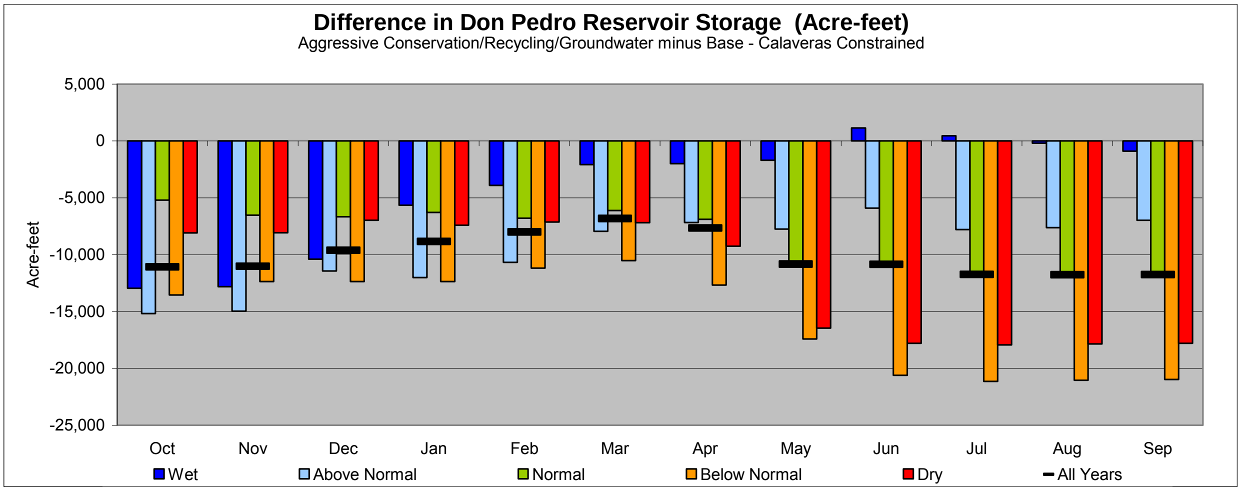


Figure 4.5-4 illustrates the average monthly storage in Don Pedro Reservoir for the 82-year simulation, and the range in storage for each month for the alternative and base settings.

The difference in storage in Don Pedro Reservoir attributed to the upstream effects of the alternative would manifest in differences in releases from La Grange Dam to the stream. A different amount of available reservoir space in the winter and spring due to the alternative would lead to a different ability to regulate inflow, thus potentially changing the amount of water released to the stream that is above minimum release requirements. During periods when inflow differs and Don Pedro Reservoir is at maximum storage capacity within the flood control storage limitation, a change in inflow directly manifests as a change in release from La Grange Dam (a change of either more or less flow). Figure 4.5-1 illustrates the stream release from La Grange Dam for the WSIP, alternative, and base settings.

Figure 4.5-4

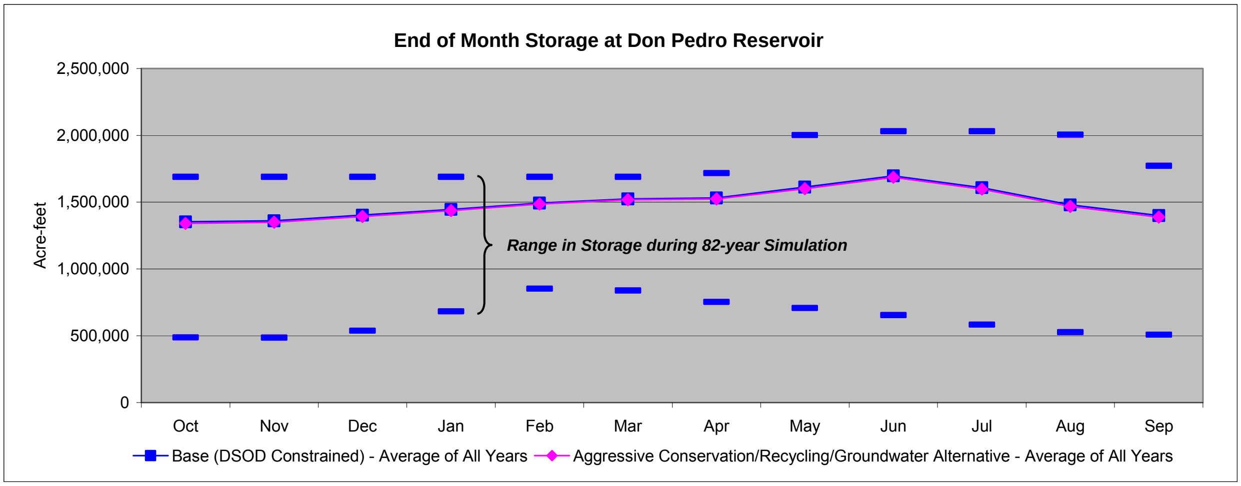


Table 4.5-5 illustrates the difference in stream releases between the alternative and WSIP settings. Compared to the WSIP setting, the alternative exhibits an incrementally larger stream release, predominantly during some months of the early-winter-through-June period, which reflects the months when releases to the stream above minimum release requirements are made due to flood control or in anticipation of the reservoir being filled. Table 4.5-6 illustrates the same information in comparing the alternative and WSIP settings, ranked in descending order of the San Joaquin River Index. Illustrated is the finding that differences in releases to the Tuolumne River from La Grange Dam would occur only when there are releases in excess of minimum FERC flow requirements. This circumstance typically occurs only in above normal and wet years, and predominantly during early winter through June. During other year types and during the summer and fall, releases would be maintained at minimum FERC flow requirements regardless of the setting. Compared to the WSIP setting, the large potential reduction in flow following an extended drought period is reduced with the alternative because the amount of water delivered by the SFPUC during these periods is less than that delivered in the WSIP setting, but is still more than that delivered in the base setting.

As described above concerning Don Pedro inflow and storage, compared to the base setting, the alternative setting would lead to an additional draw of storage due to SFPUC diversions that are greater than in the base setting. Although the reduction in storage would not greatly accumulate, greater replenishment of Don Pedro Reservoir storage is needed in about 38 percent of the years of the 82-year simulation. Occasionally, an increase in releases would occur, due to the shift in timing of SJPL diversions because of the increased conveyance capacity. The effect is an occasional additional release of water from Hetch Hetchy Reservoir in the winter, which then manifests as an additional release from Don Pedro Reservoir. Table 4.5-7 illustrates the difference in stream releases between the alternative and base settings, depicting the predominance of reductions to flow. Table 4.5-8 illustrates the same information ranked in descending order of the San Joaquin River Index.

Table 4.5-5 and Table 4.5-7 illustrate the difference in stream release between the alternative, WSIP, and base settings, expressed in terms of a monthly volume (acre-feet) of flow. Table 4.5-9 illustrates the same information and the average monthly stream release for the alternative and WSIP settings, expressed in average monthly flow (cfs). Table 4.5-10 illustrates the same information in comparing the alternative and base settings. In comparing the alternative to the WSIP setting, the difference in monthly flow below La Grange Dam could range from an increase of approximately 155,000 acre-feet to a decrease of approximately 7,000 acre-feet. Considering the manner in which releases are determined and made to the stream, quantifying the effect of these changes in terms of average monthly flow (cfs) is not always meaningful. Similar to the operation of releases below O'Shaughnessy Dam, a change in the volume of release from La Grange Dam to the stream would likely result in the initiation of the release being delayed or initiated earlier by a matter of days. Assuming that a change in release volume equates to a delay or acceleration of releasing 6,000 acre-feet per day, the difference in stream release from La Grange Dam between the alternative and WSIP would be an additional day of delay in releases

Table 4.5-5

Difference in Total La Grange Release to River (Acre-feet)

Aggressive Conservation/Recycling/Groundwater minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	118	7,176	1,524	0	0	0	0	0	8,818
1922	0	0	0	0	7,921	5,280	10,127	2,619	12,770	0	0	0	38,717
1923	0	0	0	0	0	0	3,867	0	0	0	0	0	3,867
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	20,838	0	0	8,037	28,875
1928	6,889	31,299	34,469	97	0	0	10,272	0	0	0	0	0	83,026
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	116,747	85,831	5,488	0	0	0	0	0	208,066
1937	0	0	0	0	14,456	12,723	9,176	0	0	0	0	0	36,355
1938	0	0	14,588	0	0	45	10,699	16,107	4,880	0	0	0	46,319
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	22,505	15,298	4,746	0	0	0	0	0	42,549
1941	0	0	0	4,127	-187	-116	-181	0	5,028	0	0	0	8,671
1942	0	0	0	3,015	0	2,854	7,365	2,855	2,762	0	0	0	18,851
1943	0	0	0	0	1,270	9,670	4,879	0	7,851	0	0	0	23,670
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	10,887	7,257	921	0	0	0	0	0	19,065
1946	0	12,714	0	0	0	5,630	1,584	0	0	0	0	0	19,928
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	93,981	-2	0	0	0	0	0	0	0	0	93,979
1952	0	0	0	0	12,513	8,341	0	17,195	4,879	0	0	0	42,928
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	46,045	-1	0	1,125	3,849	0	6,071	0	0	0	57,089
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	9,876	3,950	2,631	20,461	2,854	0	0	0	39,772
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	29,662	15,670	18,132	16,489	0	0	0	0	0	0	0	79,953
1965	0	0	0	82,517	6,180	-1,035	8,445	0	0	0	0	11,992	108,099
1966	0	-19	2,026	0	2,121	-353	0	0	0	0	0	0	3,775
1967	0	0	0	0	0	18,532	327	16,228	2,762	0	0	0	37,849
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	6,413	8,491	6,138	7,641	3,996	3,866	0	0	0	36,545
1970	0	0	0	4,973	-1	319	0	0	0	0	0	0	5,291
1971	0	0	0	0	5,674	3,783	0	0	0	0	0	0	9,457
1972	0	0	0	0	4,321	0	0	0	0	0	0	0	4,321
1973	0	0	0	0	0	14,023	3,772	0	31,619	0	0	0	49,414
1974	0	0	0	7,338	-1	2,854	7,366	5,695	4,229	0	0	0	27,481
1975	0	0	0	0	0	0	7,366	0	15,377	0	0	0	22,743
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	95,731	0	0	0	95,731
1979	0	0	0	5,382	0	9,558	1,197	2,664	0	0	0	0	18,801
1980	0	0	0	23,152	-7,494	11,165	4,880	3,995	3,867	0	0	0	39,565
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	12,455	12,098	2,663	0	2,854	2,762	0	0	1,196	34,028
1983	2,949	0	0	0	0	0	1,154	5,351	1,841	0	0	0	11,295
1984	5,042	921	0	0	0	0	0	0	0	0	0	0	5,963
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	15,890	22,973	15,903	7,897	7,641	0	0	0	70,304
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	154,679	0	15,852	36,792	207,323
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	29,908	7,766	0	19,798	6,445	0	0	0	63,917
1996	0	0	0	0	12,184	-7,490	8,032	6,619	3,867	0	0	0	23,212
1997	0	0	0	10,101	-1	0	0	0	0	0	0	0	10,100
1998	0	0	0	9,895	-1	14,871	11,048	2,062	3,774	0	0	0	41,649
1999	0	0	0	0	0	5,708	8,407	0	7,600	0	0	0	21,715
2000	0	0	0	0	9,685	0	0	0	24,591	0	0	0	34,276
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	181	909	2,522	2,288	3,801	3,372	1,982	1,663	5,349	0	193	708	22,968

Table 4.5-6

Difference in Total La Grange Release to River (Acre-feet)

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending SJR Index

Aggressive Conservation/Recycling/Groundwater minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1983	2,949	0	0	0	0	0	1,154	5,351	1,841	0	0	0	11,295
1969	0	0	0	6,413	8,491	6,138	7,641	3,996	3,866	0	0	0	36,545
1995	0	0	0	0	29,908	7,766	0	19,798	6,445	0	0	0	63,917
1938	0	0	14,588	0	0	45	10,699	16,107	4,880	0	0	0	46,319
1998	0	0	0	9,895	-1	14,871	11,048	2,062	3,774	0	0	0	41,649
1982	0	0	0	12,455	12,098	2,663	0	2,854	2,762	0	0	1,196	34,028
1967	0	0	0	0	0	18,532	327	16,228	2,762	0	0	0	37,849
1952	0	0	0	0	12,513	8,341	0	17,195	4,879	0	0	0	42,928
1958	0	0	0	0	9,876	3,950	2,631	20,461	2,854	0	0	0	39,772
1980	0	0	0	23,152	-7,494	11,165	4,880	3,995	3,867	0	0	0	39,565
1978	0	0	0	0	0	0	0	0	95,731	0	0	0	95,731
1922	0	0	0	0	7,921	5,280	10,127	2,619	12,770	0	0	0	38,717
1956	0	0	46,045	-1	0	1,125	3,849	0	6,071	0	0	0	57,089
1942	0	0	0	3,015	0	2,854	7,365	2,855	2,762	0	0	0	18,851
1941	0	0	0	4,127	-187	-116	-181	0	5,028	0	0	0	8,671
1986	0	0	0	0	15,890	22,973	15,903	7,897	7,641	0	0	0	70,304
1993	0	0	0	0	0	0	0	0	154,679	0	15,852	36,792	207,323
1997	0	0	0	10,101	-1	0	0	0	0	0	0	0	10,100
1996	0	0	0	0	12,184	-7,490	8,032	6,619	3,867	0	0	0	23,212
1943	0	0	0	0	1,270	9,670	4,879	0	7,851	0	0	0	23,670
1937	0	0	0	0	14,456	12,723	9,176	0	0	0	0	0	36,355
1974	0	0	0	7,338	-1	2,854	7,366	5,695	4,229	0	0	0	27,481
1975	0	0	0	0	0	0	7,366	0	15,377	0	0	0	22,743
1965	0	0	0	82,517	6,180	-1,035	8,445	0	0	0	0	11,992	108,099
1936	0	0	0	0	116,747	85,831	5,488	0	0	0	0	0	208,066
1984	5,042	921	0	0	0	0	0	0	0	0	0	0	5,963
1979	0	0	0	5,382	0	9,558	1,197	2,664	0	0	0	0	18,801
1945	0	0	0	0	10,887	7,257	921	0	0	0	0	0	19,065
1999	0	0	0	0	0	5,708	8,407	0	7,600	0	0	0	21,715
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	20,838	0	0	8,037	28,875
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1946	0	12,714	0	0	0	5,630	1,584	0	0	0	0	0	19,928
1973	0	0	0	0	0	14,023	3,772	0	31,619	0	0	0	49,414
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	9,685	0	0	0	24,591	0	0	0	34,276
1940	0	0	0	0	22,505	15,298	4,746	0	0	0	0	0	42,549
1923	0	0	0	0	0	0	3,867	0	0	0	0	0	3,867
1921	0	0	0	0	118	7,176	1,524	0	0	0	0	0	8,818
1970	0	0	0	4,973	-1	319	0	0	0	0	0	0	5,291
1951	0	0	93,981	-2	0	0	0	0	0	0	0	0	93,979
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	5,674	3,783	0	0	0	0	0	0	9,457
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1928	6,889	31,299	34,469	97	0	0	10,272	0	0	0	0	0	83,026
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	-19	2,026	0	2,121	-353	0	0	0	0	0	0	3,775
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	29,662	15,670	18,132	16,489	0	0	0	0	0	0	0	79,953
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	4,321	0	0	0	0	0	0	0	4,321
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 4.5-7

Difference in Total La Grange Release to River (Acre-feet) Aggressive Conservation/Recycling/Groundwater minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	-8,525	-2,076	0	0	0	0	0	-10,601
1922	0	0	0	0	-616	-411	2,762	-3,065	-1,927	0	-655	-1,521	-5,433
1923	0	0	3	0	0	0	1,750	0	0	0	0	0	1,753
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	-22,990	0	-644	-1,532	-25,166
1928	3	0	0	0	0	-5,339	-501	0	0	0	0	0	-5,837
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	-34,806	-33,244	553	0	0	0	0	0	-67,497
1937	0	0	0	0	-413	-283	5,489	0	0	0	0	0	4,793
1938	0	0	-4,356	0	0	0	1,356	-3,444	0	-2,189	0	0	-8,633
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	-3,067	-3,922	-538	0	0	0	0	0	-7,527
1941	0	0	0	4,465	-502	-311	-485	0	-1,550	0	-655	-1,520	-558
1942	0	0	2	-1,480	0	-951	1,841	0	0	-2,188	0	0	-2,776
1943	0	0	0	0	1,270	-1,791	0	0	-2,056	0	0	-2,173	-4,750
1944	0	0	0	0	2	1	0	0	0	0	0	0	3
1945	0	0	0	0	-11,476	-22,968	876	0	0	0	0	0	-33,568
1946	0	21,285	0	0	0	-7,762	-2,283	0	0	0	0	0	11,240
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	-31,771	0	0	0	0	0	0	0	0	0	-31,771
1952	0	0	0	0	820	547	0	-3,380	0	-2,188	0	0	-4,201
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	-35,189	1	0	-3,209	1,155	0	-6,911	-2,188	0	0	-46,341
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	-12,474	-4,991	-3,324	3,923	0	-2,188	0	0	-19,054
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	-11,189	-19,829	0	0	0	0	0	0	0	0	0	0	-31,018
1965	0	0	0	-20,065	2	-14,515	7,212	0	0	0	0	21,421	-5,945
1966	0	-34	-2,285	0	0	-6,452	0	0	0	0	0	0	-8,771
1967	0	0	0	0	0	-3,028	-9,525	6,535	2,762	-2,188	0	-2,184	-7,628
1968	0	0	0	0	2	1	0	0	0	0	0	0	3
1969	0	0	0	-26,948	1,284	0	0	-1,047	-1,013	-2,188	0	0	-29,912
1970	0	0	0	26,810	-7,146	-15,760	0	0	0	0	0	0	3,904
1971	0	0	0	0	-3,647	-2,430	0	0	0	0	0	0	-6,077
1972	0	0	0	0	-12,278	0	0	0	0	0	0	0	-12,278
1973	0	0	0	0	0	-17,505	0	0	3,356	0	0	0	-14,149
1974	0	0	0	-3,817	0	-5,708	1,842	1	0	0	0	-2,174	-9,856
1975	0	0	0	0	2	1	-920	0	15,625	0	-655	-1,520	12,533
1976	2	0	0	0	0	0	0	0	0	0	0	0	2
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	2,874	0	0	0	2,874
1979	0	0	0	-2,934	0	-9,545	-921	475	0	0	0	0	-12,925
1980	0	0	0	26,986	-7,495	2,603	0	-1,047	-1,013	-2,188	0	0	17,846
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	-18,492	1,939	0	0	0	0	-2,188	0	-3,101	-21,842
1983	0	-1,841	2,664	0	0	0	1,154	-448	-921	-2,188	0	-2,183	-3,763
1984	-2,113	921	0	0	0	3,935	0	0	0	0	0	0	2,743
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	110	-7,675	4,603	2,855	2,762	0	0	0	2,655
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	-33,283	0	-655	-1,521	-35,459
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	10,670	-113	0	6,801	2,762	-2,188	0	-2,183	15,749
1996	0	0	0	0	8,656	-7,490	1,311	4,431	1,749	0	0	0	8,657
1997	0	-2,162	0	-2,646	1	0	0	0	0	0	0	0	-4,807
1998	0	0	0	-9,856	2	8,197	2,209	-368	0	-2,188	0	0	-2,004
1999	0	0	0	0	0	-3,806	3,403	0	-8,664	0	0	0	-9,067
2000	0	0	0	0	-2,163	0	0	0	10,301	0	0	0	8,138
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	-162	-20	-865	-341	-870	-2,103	207	149	-465	-320	-40	-2	-4,833

Table 4.5-8

Difference in Total La Grange Release to River (Acre-feet)

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending SJR Index Aggressive Conservation/Recycling/Groundwater minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1983	0	-1,841	2,664	0	0	0	1,154	-448	-921	-2,188	0	-2,183	-3,763
1969	0	0	0	-26,948	1,284	0	0	-1,047	-1,013	-2,188	0	0	-29,912
1995	0	0	0	0	10,670	-113	0	6,801	2,762	-2,188	0	-2,183	15,749
1938	0	0	-4,356	0	0	0	1,356	-3,444	0	-2,189	0	0	-8,633
1998	0	0	0	-9,856	2	8,197	2,209	-368	0	-2,188	0	0	-2,004
1982	0	0	0	-18,492	1,939	0	0	0	0	-2,188	0	-3,101	-21,842
1967	0	0	0	0	0	-3,028	-9,525	6,535	2,762	-2,188	0	-2,184	-7,628
1952	0	0	0	0	820	547	0	-3,380	0	-2,188	0	0	-4,201
1958	0	0	0	0	-12,474	-4,991	-3,324	3,923	0	-2,188	0	0	-19,054
1980	0	0	0	26,986	-7,495	2,603	0	-1,047	-1,013	-2,188	0	0	17,846
1978	0	0	0	0	0	0	0	0	2,874	0	0	0	2,874
1922	0	0	0	0	-616	-411	2,762	-3,065	-1,927	0	-655	-1,521	-5,433
1956	0	0	-35,189	1	0	-3,209	1,155	0	-6,911	-2,188	0	0	-46,341
1942	0	0	2	-1,480	0	-951	1,841	0	0	-2,188	0	0	-2,776
1941	0	0	0	4,465	-502	-311	-485	0	-1,550	0	-655	-1,520	-558
1986	0	0	0	0	110	-7,675	4,603	2,855	2,762	0	0	0	2,655
1993	0	0	0	0	0	0	0	0	-33,283	0	-655	-1,521	-35,459
1997	0	-2,162	0	-2,646	1	0	0	0	0	0	0	0	-4,807
1996	0	0	0	0	8,656	-7,490	1,311	4,431	1,749	0	0	0	8,657
1943	0	0	0	0	1,270	-1,791	0	0	-2,056	0	0	-2,173	-4,750
1937	0	0	0	0	-413	-283	5,489	0	0	0	0	0	4,793
1974	0	0	0	-3,817	0	-5,708	1,842	1	0	0	0	-2,174	-9,856
1975	0	0	0	0	2	1	-920	0	15,625	0	-655	-1,520	12,533
1965	0	0	0	-20,065	2	-14,515	7,212	0	0	0	0	21,421	-5,945
1936	0	0	0	0	-34,806	-33,244	553	0	0	0	0	0	-67,497
1984	-2,113	921	0	0	0	3,935	0	0	0	0	0	0	2,743
1979	0	0	0	-2,934	0	-9,545	-921	475	0	0	0	0	-12,925
1945	0	0	0	0	-11,476	-22,968	876	0	0	0	0	0	-33,568
1999	0	0	0	0	0	-3,806	3,403	0	-8,664	0	0	0	-9,067
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	-22,990	0	-644	-1,532	-25,166
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1946	0	21,285	0	0	0	-7,762	-2,283	0	0	0	0	0	11,240
1973	0	0	0	0	0	-17,505	0	0	3,356	0	0	0	-14,149
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	-2,163	0	0	0	10,301	0	0	0	8,138
1940	0	0	0	0	-3,067	-3,922	-538	0	0	0	0	0	-7,527
1923	0	0	3	0	0	0	1,750	0	0	0	0	0	1,753
1921	0	0	0	0	0	-8,525	-2,076	0	0	0	0	0	-10,601
1970	0	0	0	26,810	-7,146	-15,760	0	0	0	0	0	0	3,904
1951	0	0	-31,771	0	0	0	0	0	0	0	0	0	-31,771
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	-3,647	-2,430	0	0	0	0	0	0	-6,077
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	2	1	0	0	0	0	0	0	3
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1928	3	0	0	0	0	-5,339	-501	0	0	0	0	0	-5,837
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	-34	-2,285	0	0	-6,452	0	0	0	0	0	0	-8,771
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	2	1	0	0	0	0	0	0	3
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	-11,189	-19,829	0	0	0	0	0	0	0	0	0	0	-31,018
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	-12,278	0	0	0	0	0	0	0	-12,278
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	2	0	0	0	0	0	0	0	0	0	0	0	2
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 4.5-9

Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by SJR Index Year Type) — Aggressive Conservation/Recycling/Groundwater

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	26,505	22,062	51,153	130,736	195,849	250,253	204,441	194,878	215,371	78,864	31,620	77,330	1,479,061
Above Normal	18,182	31,500	73,749	78,723	129,963	114,036	93,321	82,944	23,193	14,739	14,739	14,736	689,825
Below Normal	18,058	18,665	25,785	19,559	35,935	39,012	56,992	58,008	4,463	4,612	4,612	4,463	290,164
Dry	20,742	17,730	17,945	17,522	25,852	25,876	29,552	30,537	4,349	4,494	4,494	4,349	203,440
Critical	14,534	11,590	12,560	11,644	10,518	11,644	20,489	21,172	2,975	3,074	3,074	2,975	126,250
All Years	20,294	20,791	39,330	62,497	95,675	108,970	96,207	91,694	69,767	28,125	14,297	27,611	675,258

Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by SJR Index Year Type) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	26,382	22,062	48,627	124,111	190,719	245,157	199,412	189,305	200,624	78,864	30,959	75,248	1,431,469
Above Normal	17,886	30,698	68,220	78,114	120,555	105,165	91,467	82,787	18,214	14,739	14,739	14,263	656,848
Below Normal	17,484	16,058	22,744	19,551	35,285	38,726	56,136	58,008	4,463	4,612	4,612	4,463	282,142
Dry	20,742	15,449	16,739	16,127	24,251	25,876	29,552	30,537	4,349	4,494	4,494	4,349	196,957
Critical	14,534	11,590	12,560	11,644	10,518	11,644	20,489	21,172	2,975	3,074	3,074	2,975	126,250
All Years	20,112	19,882	36,809	60,209	91,874	105,597	94,225	90,031	64,418	28,125	14,104	26,904	652,291

Difference in Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by SJR Index Year Type) — Aggressive Conservation/Recycling/Groundwater minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	123	0	2,526	6,626	5,129	5,096	5,029	5,572	14,747	0	661	2,083	47,592
Above Normal	297	802	5,528	609	9,408	8,871	1,853	157	4,979	0	0	473	32,977
Below Normal	574	2,607	3,041	8	650	286	856	0	0	0	0	0	8,022
Dry	0	2,282	1,205	1,395	1,601	0	0	0	0	0	0	0	6,483
Critical	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	181	909	2,522	2,288	3,801	3,372	1,982	1,663	5,349	0	193	708	22,968

Table 4.5-10

Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by SJR Index Year Type) — Aggressive Conservation/Recycling/Groundwater

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	26,505	22,062	51,153	130,736	195,849	250,253	204,441	194,878	215,371	78,864	31,620	77,330	1,479,061
Above Normal	18,182	31,500	73,749	78,723	129,963	114,036	93,321	82,944	23,193	14,739	14,739	14,736	689,825
Below Normal	18,058	18,665	25,785	19,559	35,935	39,012	56,992	58,008	4,463	4,612	4,612	4,463	290,164
Dry	20,742	17,730	17,945	17,522	25,852	25,876	29,552	30,537	4,349	4,494	4,494	4,349	203,440
Critical	14,534	11,590	12,560	11,644	10,518	11,644	20,489	21,172	2,975	3,074	3,074	2,975	126,250
All Years	20,294	20,791	39,330	62,497	95,675	108,970	96,207	91,694	69,767	28,125	14,297	27,611	675,258

Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by SJR Index Year Type) — Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	26,505	22,228	52,690	132,897	195,713	251,883	203,746	194,388	216,210	79,958	31,729	77,274	1,485,222
Above Normal	18,307	30,194	75,617	77,318	133,414	121,042	93,276	82,916	24,252	14,739	14,777	14,826	700,678
Below Normal	18,058	18,668	25,976	19,559	36,239	40,197	57,034	58,008	4,463	4,612	4,612	4,463	291,887
Dry	21,603	19,256	17,945	17,522	26,796	25,876	29,552	30,537	4,349	4,494	4,494	4,349	206,770
Critical	14,533	11,590	12,560	11,644	10,518	11,644	20,489	21,172	2,975	3,074	3,074	2,975	126,249
All Years	20,456	20,812	40,195	62,838	96,544	111,073	96,000	91,545	70,232	28,445	14,337	27,614	680,091

Difference in Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by SJR Index Year Type) — Aggressive Conservation/Recycling/Groundwater minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	-167	-1,537	-2,161	136	-1,630	695	489	-839	-1,094	-109	56	-6,161
Above Normal	-124	1,306	-1,869	1,404	-3,450	-7,006	45	28	-1,059	0	-38	-90	-10,853
Below Normal	0	-3	-190	0	-304	-1,185	-42	0	0	0	0	0	-1,724
Dry	-861	-1,525	0	0	-944	0	0	0	0	0	0	0	-3,330
Critical	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	-162	-20	-865	-341	-870	-2,103	207	149	-465	-320	-40	-2	-4,833

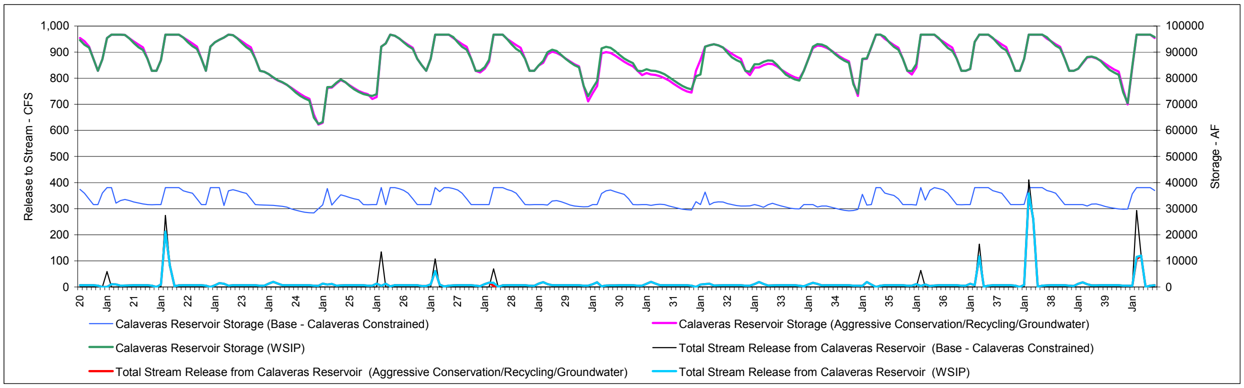
or up to almost an added month of release. Normally, the effect of a change in release would not affect the year's peak stream release rate during a year. However, infrequently, the alternative's effect on stream releases could manifest as an elimination of all flow during a year or as the only provision of flow that occurs in excess of minimum FERC flow requirements. Compared to the base setting, the alternative's effect to stream flow ranges from a reduction in releases (a potential delay in release of 6 days) to an increase in releases (a potential additional 4 days of release).

4.6 Calaveras and San Antonio Reservoirs, Alameda Creek and Downstream

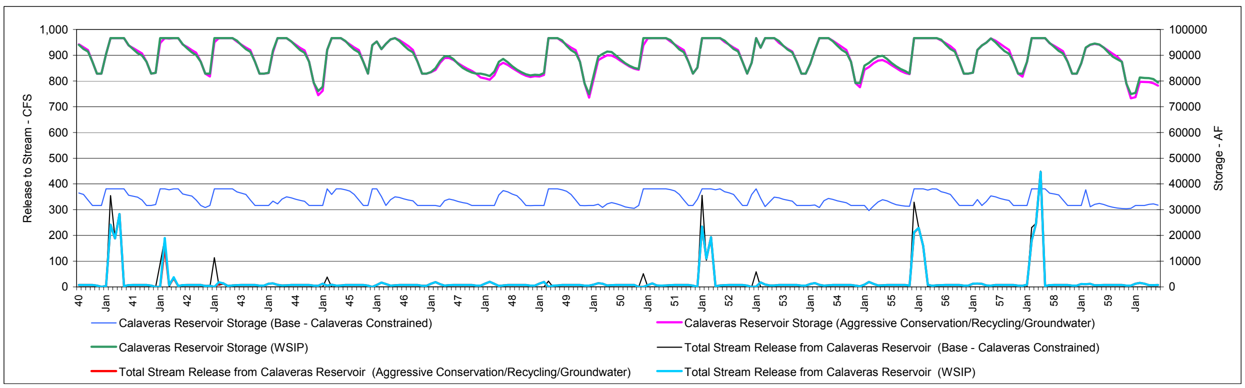
Compared to the WSIP setting, the operation of Calaveras Reservoir in the alternative setting is almost identical. Figure 4.6-1 illustrates a chronological trace of the simulation of Calaveras Reservoir storage and stream releases from Calaveras Dam. Shown in Figure 4.6-1 are the results for the WSIP, alternative, and base settings. Recognizing the different levels of system-wide deliveries served in each setting, the near identical operation of Calaveras Reservoir resulting from the two settings indicates that Calaveras Reservoir operations are mostly influenced by the principles that manage local watershed production. The differences in reservoir operation during the droughts of the 1960s and 1976-1977 are the result of modeling assumptions that balance reservoir storage among SFPUC reservoirs and the selection of the monthly SJPL conveyance rate. It is anticipated that the difference in Calaveras Reservoir operation in actual operations would be minimal, if any.

Figure 4.6-1
Calaveras Reservoir Storage and Stream Release

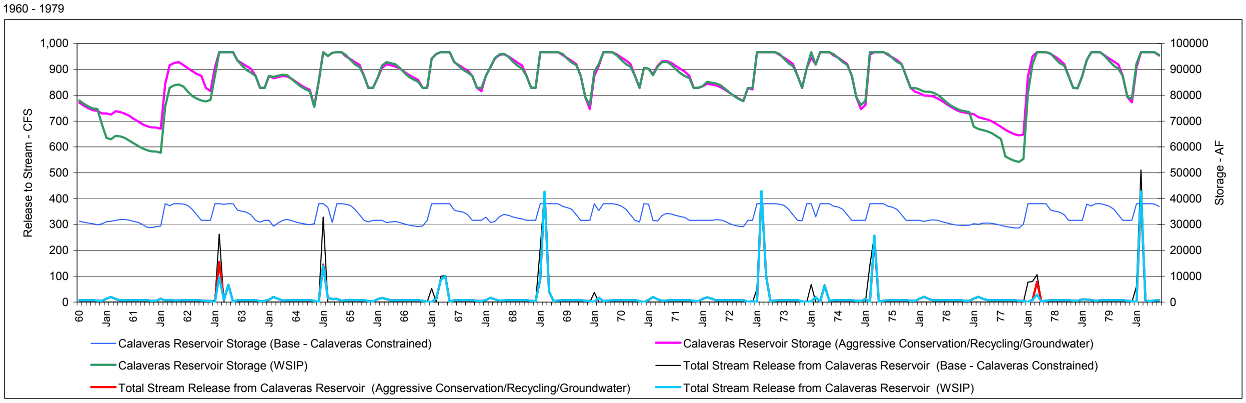
1920 - 1939



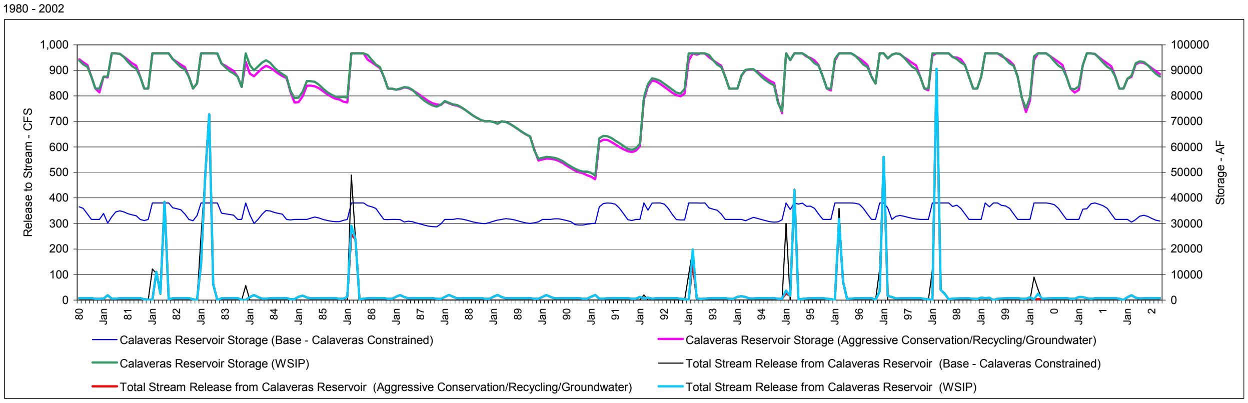
1940 - 1959



1960 - 1979

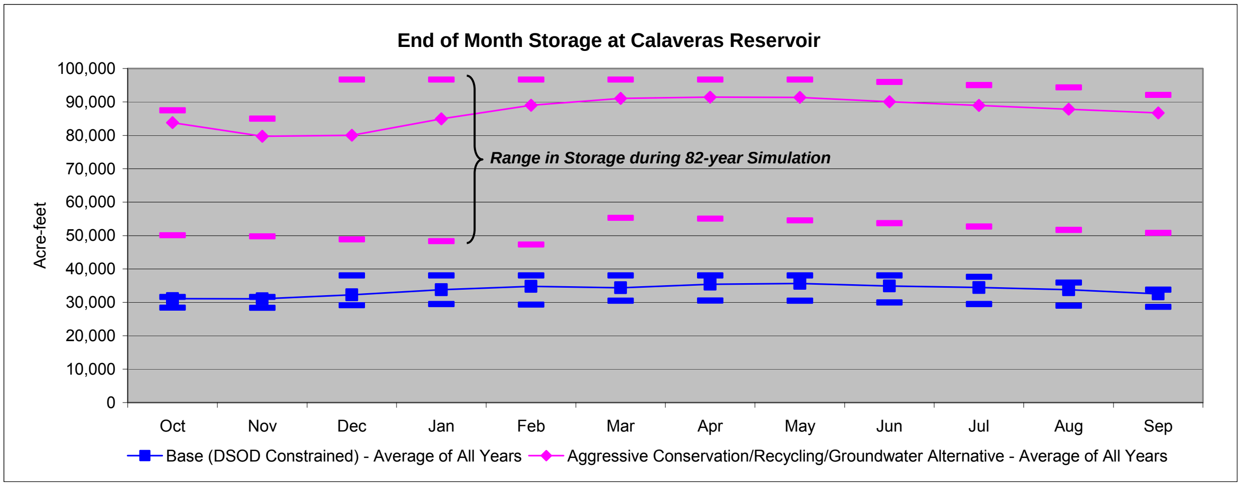


1980 - 2002



The difference in storage between the alternative and WSIP settings and the base setting is due to the restoration of the operational capacity of Calaveras Reservoir. Under both the alternative and WSIP settings, the full capacity of Calaveras Reservoir would be available, and a greater range in storage operation would occur. Figure 4.6-2 illustrates the average monthly storage in Calaveras Reservoir for the 82-year simulation, and the range in storage for each month for the alternative and base settings.

Figure 4.6-2



Compared to the WSIP setting, there would potentially be more or less release to Calaveras Creek below Calaveras Dam in the alternative setting. Both settings have fishery releases that are not included in the base setting. Calaveras Reservoir storage in the alternative setting is sometimes more and sometimes less than in the WSIP setting; however, in either direction, the difference is minor. Table 4.6-1 illustrates the difference in releases to Calaveras Creek between the alternative and WSIP settings (considered non-substantial). Supplementing the Figure 4.6-1 representation of Calaveras Dam stream releases and Table 4.6-1 is Table 4.6-2, illustrating releases for the alternative and WSIP settings, and the difference in releases between the two. Table 4.6-3 provides the same form of information for the alternative and base settings. The notable difference in releases between the alternative and base settings is the addition of the required flows to satisfy the 1997 MOU and the reduction of stream releases during wetter-year/wetter-season flows due to the restoration of Calaveras Reservoir operational capacity.

There would be very little if any difference in Alameda Creek diversions to Calaveras Reservoir in the alternative setting compared to the WSIP setting. With essentially the same storage conditions between the two, there would be no difference in diversions from the Alameda Creek watershed. With no difference in the diversion at Alameda Creek Diversion Dam, flow spilling past the diversion dam would be the same in the alternative setting. Table 4.6-4 illustrates the difference in flow below the Alameda Creek Diversion Dam between the alternative and WSIP settings (considered non-substantial). Table 4.6-5 illustrates the difference in flow below Alameda Creek Diversion Dam between the alternative and base settings. In this comparison, the reduction in flow below the diversion dam is due to the additional diversions to Calaveras Reservoir resulting from the restoration of reservoir operating capacity. Table 4.6-6 and Table 4.6-7 illustrate the flow past the Alameda Creek Diversion Dam, comparing the alternative, WSIP, and base settings by year type and the average of all years.

Table 4.6-1

Difference in Total Stream Release from Calaveras Reservoir (Acre-feet)

Aggressive Conservation/Recycling/Groundwater minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	0	0	0	0	0	0	0	0
1922	0	0	0	0	-9	0	0	0	0	0	0	0	-9
1923	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	0	0	0	0	0
1928	0	0	0	0	0	-713	0	0	0	0	0	0	-713
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	0	0	0	0	0	0	0	0	0
1937	0	0	0	0	0	-60	0	0	0	0	0	0	-60
1938	0	0	0	0	-136	0	0	0	0	0	0	0	-136
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	-487	0	0	0	0	0	0	0	-487
1941	0	0	0	0	0	0	0	0	0	0	0	0	0
1942	0	0	0	0	-1,920	0	-207	0	0	0	0	0	-2,127
1943	0	0	0	0	-294	0	0	0	0	0	0	0	-294
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	0	0	0	0	0	0	0	0	0
1946	0	0	0	0	0	0	0	0	0	0	0	0	0
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	-140	0	0	0	0	0	0	0	0	0	-140
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	3,290	0	0	0	0	0	0	0	3,290
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	288	0	0	0	0	0	0	0	0	288
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	-45	0	0	0	0	0	0	0	-45
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	-935	0	0	0	0	0	0	-935
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	2,982	0	0	0	0	0	0	2,982
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	-1,403	0	0	0	0	0	0	0	-1,403
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	-1,898	0	0	0	0	0	0	0	-1,898
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	-2,842	0	0	0	0	0	0	0	-2,842
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	-676	0	0	0	0	0	0	0	0	-676
1996	0	0	0	0	-750	0	0	0	0	0	0	0	-750
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	-871	0	0	0	0	0	0	0	-871
1999	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	-1,287	0	0	0	0	0	0	-1,287
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	0	0	-2	-5	-90	0	-3	0	0	0	0	0	-99

Table 4.6-2

Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Aggressive Conservation/Recycling/Groundwater

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	1,057	5,041	14,741	10,007	5,072	255	387	417	425	415	38,494
Above Normal	425	258	172	823	3,593	2,890	650	327	396	423	428	417	10,801
Normal	429	275	195	548	725	512	264	370	408	428	430	417	5,001
Below Normal	429	276	246	672	876	596	345	389	411	429	430	417	5,515
Dry	429	292	281	778	1,044	747	374	407	416	430	430	417	6,045
All Years	428	269	386	1,552	4,148	2,921	1,321	350	403	426	428	417	13,049

Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	1,065	5,083	15,133	10,007	5,085	255	387	417	425	415	38,949
Above Normal	425	258	172	806	3,657	2,849	650	327	396	423	428	417	10,807
Normal	429	275	195	548	725	556	264	370	408	428	430	417	5,046
Below Normal	429	276	246	672	876	596	345	389	411	429	430	417	5,515
Dry	429	292	281	778	1,044	747	374	407	416	430	430	417	6,045
All Years	428	269	387	1,557	4,238	2,921	1,323	350	403	426	428	417	13,148

Difference in Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Aggressive Conservation/Recycling/Groundwater minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-9	-42	-392	0	-13	0	0	0	0	0	-456
Above Normal	0	0	0	17	-64	41	0	0	0	0	0	0	-6
Normal	0	0	0	0	0	-45	0	0	0	0	0	0	-45
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-2	-5	-90	0	-3	0	0	0	0	0	-99

Table 4.6-3

Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Aggressive Conservation/Recycling/Groundwater

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	1,057	5,041	14,741	10,007	5,072	255	387	417	425	415	38,494
Above Normal	425	258	172	823	3,593	2,890	650	327	396	423	428	417	10,801
Normal	429	275	195	548	725	512	264	370	408	428	430	417	5,001
Below Normal	429	276	246	672	876	596	345	389	411	429	430	417	5,515
Dry	429	292	281	778	1,044	747	374	407	416	430	430	417	6,045
All Years	428	269	386	1,552	4,148	2,921	1,321	350	403	426	428	417	13,049

Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	1,736	9,221	16,641	9,968	5,024	0	0	0	0	0	42,590
Above Normal	0	0	184	2,731	5,911	3,096	459	0	0	0	0	0	12,382
Normal	0	0	216	364	882	353	0	0	0	0	0	0	1,815
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	419	2,437	4,645	2,656	1,076	0	0	0	0	0	11,232

Difference in Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Aggressive Conservation/Recycling/Groundwater minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	-680	-4,180	-1,899	39	48	255	387	417	425	415	-4,097
Above Normal	425	258	-12	-1,908	-2,318	-206	190	327	396	423	428	417	-1,581
Normal	429	275	-22	184	-157	159	264	370	408	428	430	417	3,186
Below Normal	429	276	246	672	876	596	345	389	411	429	430	417	5,515
Dry	429	292	281	778	1,044	747	374	407	416	430	430	417	6,045
All Years	428	269	-33	-884	-497	265	245	350	403	426	428	417	1,817

Table 4.6-4

Difference in Flow Passing Alameda Creek Diversion Dam (Acre-feet)

Aggressive Conservation/Recycling/Groundwater minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	0	0	0	0	0	0	0	0
1922	0	0	0	0	0	0	0	0	0	0	0	0	0
1923	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	0	0	0	0	0
1928	0	0	0	0	0	0	0	0	0	0	0	0	0
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	-1,272	0	0	0	0	0	0	0	-1,272
1937	0	0	0	0	0	0	0	0	0	0	0	0	0
1938	0	0	0	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	0	0	0	0	0	0	0	0	0
1941	0	0	0	0	0	0	0	0	0	0	0	0	0
1942	0	0	0	1,922	0	0	0	0	0	0	0	0	1,922
1943	0	0	0	457	-1,316	0	0	0	0	0	0	0	-859
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	0	0	0	0	0	0	0	0	0
1946	0	0	0	0	0	0	0	0	0	0	0	0	0
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	2,511	-2,746	-72	402	0	0	0	0	0	0	95
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	-586	0	0	0	0	0	0	0	0	-586
1974	0	0	0	2,096	0	1,320	0	0	0	0	0	0	3,416
1975	0	0	0	0	-671	0	0	0	0	0	0	0	-671
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	922	0	0	0	0	922
1984	0	0	3,332	0	0	0	0	0	0	0	0	0	3,332
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	1,034	0	752	0	0	0	0	0	0	1,786
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	215	0	0	0	0	0	0	0	0	215
1999	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	0	0	71	29	-41	30	0	11	0	0	0	0	101

Table 4.6-5

Difference in Flow Passing Alameda Creek Diversion Dam (Acre-feet) Aggressive Conservation/Recycling/Groundwater minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	-2,559	-1,353	0	0	0	0	0	0	0	-3,913
1922	0	0	0	0	0	0	0	0	0	0	0	0	0
1923	0	0	-2,856	-1,688	-1,004	0	0	0	0	0	0	0	-5,547
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	-3,210	0	0	0	0	0	0	0	-3,210
1927	0	0	0	0	0	0	373	0	0	0	0	0	373
1928	0	0	0	0	0	0	-156	0	0	0	0	0	-156
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	-2,367	0	0	0	0	0	0	0	-2,367
1937	0	0	0	0	-3,964	0	0	0	0	0	0	0	-3,964
1938	0	0	0	0	0	0	-156	0	0	0	0	0	-156
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	0	0	-156	0	0	0	0	0	-156
1941	0	0	0	-1,197	0	0	0	0	0	0	0	0	-1,197
1942	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	-1,316	0	0	0	0	0	0	0	-1,316
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	-4,471	0	0	0	0	0	0	0	-4,471
1946	0	0	-4,651	-1,522	0	0	0	0	0	0	0	0	-6,173
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	-5,524	0	0	0	0	0	0	-5,524
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	-2,793	-130	301	0	0	0	0	0	0	-2,622
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	-3,892	0	0	0	0	0	0	0	0	-3,892
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	-1,919	0	0	0	0	0	0	0	-1,919
1963	0	0	0	-2,219	0	0	0	0	0	0	0	0	-2,219
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	-1,921	0	0	0	3,250	0	0	0	0	0	1,329
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	-1,676	-1,872	0	0	0	0	0	0	0	-3,548
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	-4,247	0	-1,623	0	0	0	0	0	0	-5,870
1971	0	0	-613	0	0	0	0	0	0	0	0	0	-613
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	-4,926	0	0	0	0	0	0	0	0	-4,926
1974	0	0	-1,019	0	0	1,444	0	0	0	0	0	0	425
1975	0	0	0	0	-5,196	0	-156	0	0	0	0	0	-5,352
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	-4,152	-3,403	0	0	0	0	0	0	0	-7,556
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	-3,360	0	-101	0	0	0	0	0	0	-3,462
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	687	0	0	0	0	687
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	-3,578	0	0	0	0	0	0	0	-3,578
1993	0	0	0	0	0	651	0	0	0	0	0	0	651
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	-5,239	0	0	0	0	0	0	0	0	-5,239
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	-2,798	0	1,392	0	0	0	0	0	-1,406
2000	0	0	0	0	-4,567	0	0	0	0	0	0	0	-4,567
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	0	0	-135	-481	-502	-59	54	8	0	0	0	0	-1,115

Table 4.6-6

Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Aggressive Conservation/Recycling/Groundwater

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	28	1,379	6,269	7,982	5,751	2,962	173	0	0	0	0	24,544
Above Normal	7	23	843	2,575	3,896	3,237	969	0	0	0	0	0	11,551
Normal	0	6	585	264	813	459	117	6	0	0	0	0	2,250
Below Normal	0	0	18	45	106	191	2	0	0	0	0	0	361
Dry	0	0	17	0	163	0	6	0	0	0	0	0	186
All Years	1	12	565	1,818	2,578	1,922	803	35	0	0	0	0	7,734

Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	28	1,379	6,172	7,982	5,751	2,962	116	0	0	0	0	24,389
Above Normal	7	23	695	2,526	4,017	3,092	969	0	0	0	0	0	11,330
Normal	0	6	377	264	893	459	117	6	0	0	0	0	2,122
Below Normal	0	0	18	45	106	191	2	0	0	0	0	0	361
Dry	0	0	17	0	163	0	6	0	0	0	0	0	186
All Years	1	12	494	1,789	2,618	1,892	803	24	0	0	0	0	7,633

Difference in Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Aggressive Conservation/Recycling/Groundwater minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	97	0	0	0	58	0	0	0	0	155
Above Normal	0	0	148	49	-121	146	0	0	0	0	0	0	222
Normal	0	0	208	0	-80	0	0	0	0	0	0	0	129
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	71	29	-41	30	0	11	0	0	0	0	101

Table 4.6-7

Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Aggressive Conservation/Recycling/Groundwater

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	28	1,379	6,269	7,982	5,751	2,962	173	0	0	0	0	24,544
Above Normal	7	23	843	2,575	3,896	3,237	969	0	0	0	0	0	11,551
Normal	0	6	585	264	813	459	117	6	0	0	0	0	2,250
Below Normal	0	0	18	45	106	191	2	0	0	0	0	0	361
Dry	0	0	17	0	163	0	6	0	0	0	0	0	186
All Years	1	12	565	1,818	2,578	1,922	803	35	0	0	0	0	7,734

Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	28	1,379	6,967	8,099	5,757	2,972	130	0	0	0	0	25,331
Above Normal	7	23	1,184	3,672	5,292	3,096	692	0	0	0	0	0	13,968
Normal	0	6	914	868	1,785	906	126	6	0	0	0	0	4,611
Below Normal	0	0	18	45	106	191	2	0	0	0	0	0	361
Dry	0	0	17	0	163	0	6	0	0	0	0	0	186
All Years	1	12	700	2,299	3,079	1,982	750	27	0	0	0	0	8,849

Difference in Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Aggressive Conservation/Recycling/Groundwater minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	-697	-117	-6	-10	43	0	0	0	0	-788
Above Normal	0	0	-341	-1,097	-1,396	141	277	0	0	0	0	0	-2,416
Normal	0	0	-329	-604	-972	-447	-10	0	0	0	0	0	-2,361
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-135	-481	-502	-59	54	8	0	0	0	0	-1,115

Comparing the alternative and WSIP settings, differences in releases from Calaveras Dam to the stream, and differences to spills at Alameda Creek Diversion Dam, would result in differences in flow below the Alameda Creek and Calaveras Creek confluence. Table 4.6-8 illustrates the flow below the confluence for the alternative and WSIP settings. The modeled difference of these parameters has been described above as being non-substantial; thus, the combined effect of the differences at the confluence is considered non-substantial. Fishery releases for the 1997 MOU are assumed in both of the settings. Table 4.6-9 provides the same form of information for the alternative and base settings. The notable differences between the alternative and base settings (comparable to the difference between the WSIP and base settings) are the addition of required stream flows for the 1997 MOU and the reduction of wetter-year/wet season flows due to the restoration of Calaveras Reservoir storage.

Table 4.6-8

Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Aggressive Conservation/Recycling/Groundwater

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	430	326	2,780	12,319	23,911	16,744	8,636	605	417	430	430	417	67,444
Above Normal	437	327	1,259	3,996	8,266	6,689	1,929	430	417	430	430	417	25,026
Normal	430	304	1,006	1,081	1,924	1,298	539	435	417	430	430	417	8,712
Below Normal	430	298	324	858	1,217	1,007	419	430	417	430	430	417	6,677
Dry	430	298	324	813	1,274	816	423	430	417	430	430	417	6,502
All Years	431	310	1,130	3,780	7,256	5,275	2,360	465	417	430	430	417	22,701

Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	430	326	2,789	12,265	24,303	16,744	8,649	548	417	430	430	417	67,746
Above Normal	437	327	1,111	3,929	8,451	6,502	1,929	430	417	430	430	417	24,810
Normal	430	304	798	1,081	2,004	1,343	539	435	417	430	430	417	8,628
Below Normal	430	298	324	858	1,217	1,007	419	430	417	430	430	417	6,677
Dry	430	298	324	813	1,274	816	423	430	417	430	430	417	6,502
All Years	431	310	1,061	3,755	7,386	5,245	2,362	454	417	430	430	417	22,699

Difference in Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Aggressive Conservation/Recycling/Groundwater minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-9	55	-392	0	-13	58	0	0	0	0	-301
Above Normal	0	0	148	66	-185	187	0	0	0	0	0	0	215
Normal	0	0	208	0	-80	-45	0	0	0	0	0	0	84
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	70	24	-130	30	-3	11	0	0	0	0	2

Table 4.6-9

Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Aggressive Conservation/Recycling/Groundwater

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	430	326	2,780	12,319	23,911	16,744	8,636	605	417	430	430	417	67,444
Above Normal	437	327	1,259	3,996	8,266	6,689	1,929	430	417	430	430	417	25,026
Normal	430	304	1,006	1,081	1,924	1,298	539	435	417	430	430	417	8,712
Below Normal	430	298	324	858	1,217	1,007	419	430	417	430	430	417	6,677
Dry	430	298	324	813	1,274	816	423	430	417	430	430	417	6,502
All Years	431	310	1,130	3,780	7,256	5,275	2,360	465	417	430	430	417	22,701

Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	1	80	3,460	17,197	25,928	16,711	8,598	307	30	12	4	2	72,329
Above Normal	12	68	1,612	7,001	11,980	6,754	1,462	103	22	6	2	1	29,023
Normal	1	29	1,356	1,501	3,053	1,586	284	65	9	2	0	0	7,886
Below Normal	1	22	78	186	341	412	74	41	7	0	0	0	1,161
Dry	1	6	43	35	230	69	49	23	1	0	0	0	457
All Years	3	41	1,298	5,145	8,254	5,069	2,061	107	14	4	1	1	21,999

Difference in Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Aggressive Conservation/Recycling/Groundwater minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	-680	-4,877	-2,016	33	38	298	387	417	425	415	-4,884
Above Normal	425	258	-353	-3,006	-3,714	-65	467	327	396	423	428	417	-3,998
Normal	429	275	-351	-420	-1,129	-288	255	370	408	428	430	417	825
Below Normal	429	276	246	672	876	596	345	389	411	429	430	417	5,515
Dry	429	292	281	778	1,044	747	374	407	416	430	430	417	6,045
All Years	428	269	-168	-1,365	-998	206	299	358	403	426	428	417	702

A flow recapture facility in Alameda Creek below Calaveras Reservoir is incorporated in the alternative and WSIP settings. This facility is assumed to recapture flows explicitly released from Calaveras Dam for the 1997 MOU. The effect of the recapture is a reduction in the flow that occurs below the confluence of Alameda and Calaveras Creeks, but only to the extent that releases were explicitly made from Calaveras Reservoir for the 1997 MOU. Flows below this diversion have been estimated and noted as the flow above the Alameda and San Antonio confluence. Table 4.6-10 illustrates the flow at this location for the alternative and WSIP settings. The flow changes at this location are consistent with the changes noted for below the confluence of Alameda and Calaveras Creeks. These flow changes are considered non-substantial. Table 4.6-11 provides the same form of information for the alternative and base settings. The flows identified at this location indicate flow occurring below the confluence of Alameda and Calaveras Creeks (described above), with the addition of estimated stream accretions between the Alameda and Calaveras Creek confluence and the Alameda and San Antonio Creek confluence, minus the water assumed to be recaptured (diverted) by the SFPUC from the creek.

Table 4.6-10

Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Aggressive Conservation/Recycling/Groundwater

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,172	13,666	25,436	17,847	9,286	556	76	33	15	9	70,256
Above Normal	19	150	1,455	4,514	8,952	7,099	2,180	217	54	20	9	6	24,677
Normal	7	64	1,131	913	1,757	1,224	469	134	28	9	4	3	5,742
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	1,196	3,883	7,369	5,362	2,407	208	38	14	7	4	20,586

Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,180	13,611	25,828	17,847	9,299	498	76	33	15	9	70,558
Above Normal	19	150	1,308	4,448	9,137	6,913	2,180	217	54	20	9	6	24,462
Normal	7	64	922	913	1,837	1,269	469	134	28	9	4	3	5,658
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	1,127	3,859	7,499	5,332	2,409	197	38	14	7	4	20,583

Difference in Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Aggressive Conservation/Recycling/Groundwater minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-9	55	-392	0	-13	58	0	0	0	0	-301
Above Normal	0	0	148	66	-185	187	0	0	0	0	0	0	215
Normal	0	0	208	0	-80	-45	0	0	0	0	0	0	84
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	70	24	-130	30	-3	11	0	0	0	0	2

Table 4.6-11

Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Aggressive Conservation/Recycling/Groundwater

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,172	13,666	25,436	17,847	9,286	556	76	33	15	9	70,256
Above Normal	19	150	1,455	4,514	8,952	7,099	2,180	217	54	20	9	6	24,677
Normal	7	64	1,131	913	1,757	1,224	469	134	28	9	4	3	5,742
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	1,196	3,883	7,369	5,362	2,407	208	38	14	7	4	20,586

Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,968	18,668	27,692	17,977	9,358	513	76	33	15	9	78,470
Above Normal	19	150	1,981	7,819	13,060	7,467	1,861	217	54	20	9	6	32,664
Normal	7	64	1,676	1,881	3,611	2,007	479	134	28	9	4	3	9,902
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	1,567	5,733	9,022	5,616	2,356	199	38	14	7	4	24,656

Difference in Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Aggressive Conservation/Recycling/Groundwater minus Base - Calaveras Constrained

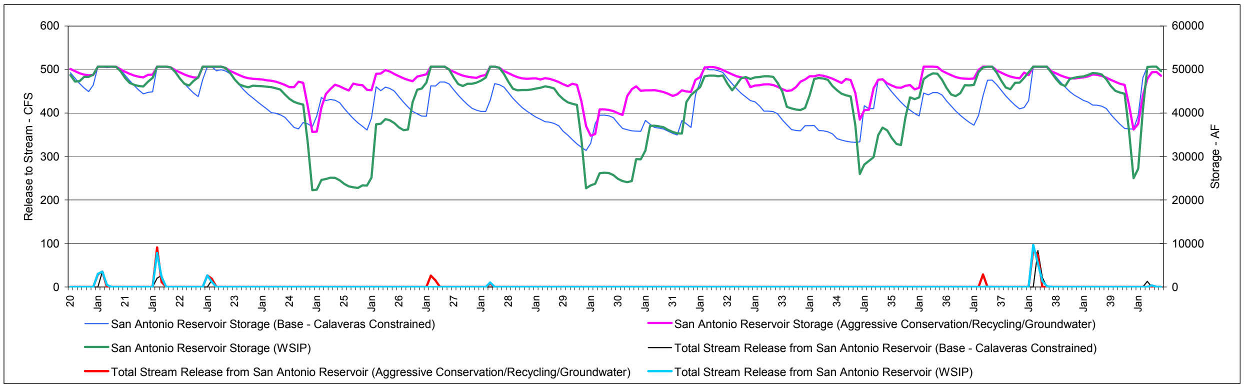
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-796	-5,002	-2,256	-131	-72	43	0	0	0	0	-8,214
Above Normal	0	0	-525	-3,305	-4,108	-367	319	0	0	0	0	0	-7,987
Normal	0	0	-545	-968	-1,854	-783	-10	0	0	0	0	0	-4,159
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-371	-1,850	-1,654	-254	50	8	0	0	0	0	-4,070

Compared to the WSIP setting, the alternative's San Antonio Reservoir operation would draw less from storage on annual basis, and particularly during cyclic maintenance. Figure 4.6-3 illustrates a chronological trace of the simulation of San Antonio Reservoir storage and stream releases from San Antonio Dam. Shown in Figure 4.6-3 are the results for the WSIP, alternative, and base settings. The difference in San Antonio Reservoir storage between the alternative and WSIP settings is mostly caused by the lesser demand of the alternative. Considering that Calaveras Reservoir storage is essentially the same between the settings, the difference in San Antonio Reservoir storage indicates the operational strategy to affect storage in San Antonio Reservoir more than storage in the other SFPUC Bay Area reservoirs. San Antonio Reservoir would retain more storage in the alternative setting compared to the WSIP setting.

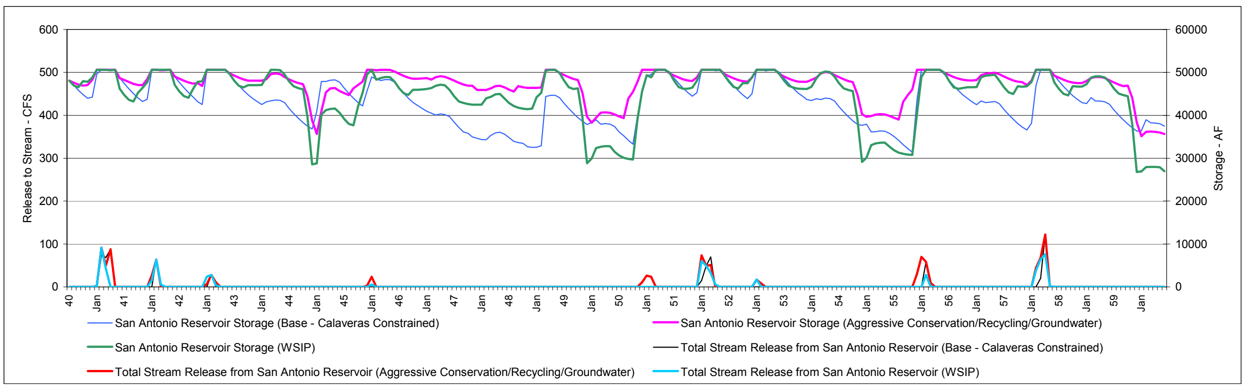
The difference in storage between the alternative and WSIP settings and the base setting is due to the restoration of the operational capacity of Calaveras Reservoir. In the base setting, the limited operating storage capacity at Calaveras Reservoir leads to a different operation at San Antonio Reservoir, one that retains relatively more stored water for system demands when the draw from Calaveras Reservoir is constrained due to limited storage. There is also a notable difference in storage operation between the alternative and WSIP settings and the base setting due to assumed maintenance. Assumed systematic maintenance of Hetch Hetchy conveyance facilities constrains diversions to the Bay Area from Hetch Hetchy every year, and particularly during every fifth year in the WSIP and alternative settings.

Figure 4.6-3
San Antonio Reservoir Storage and Stream Release

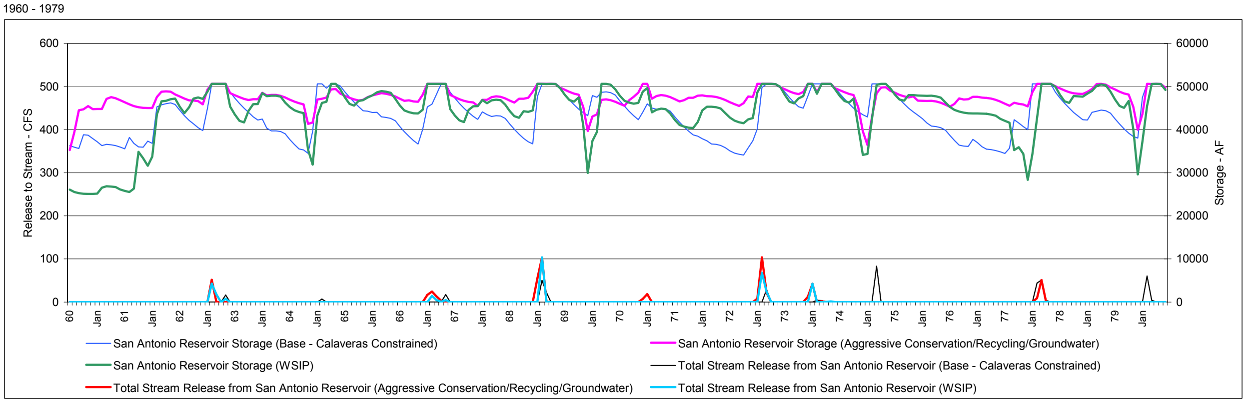
1920 - 1939



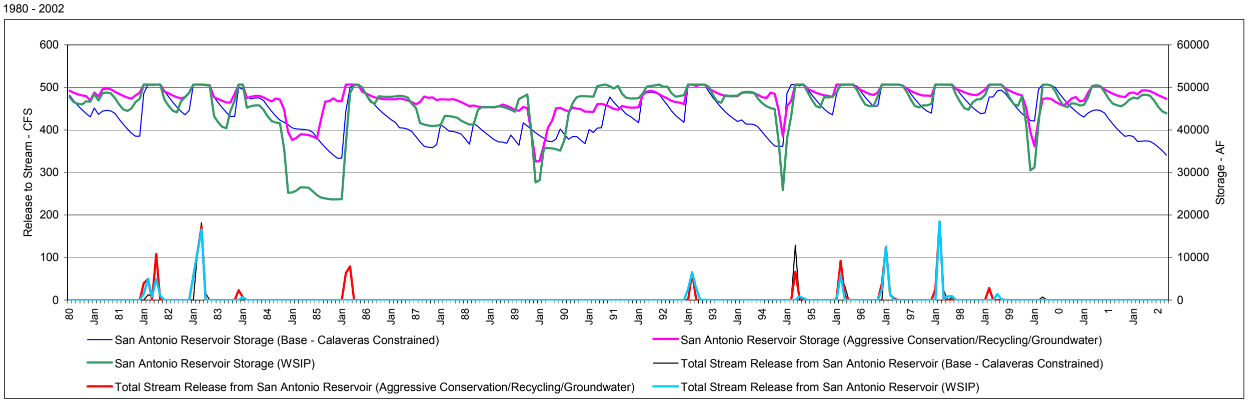
1940 - 1959



1960 - 1979

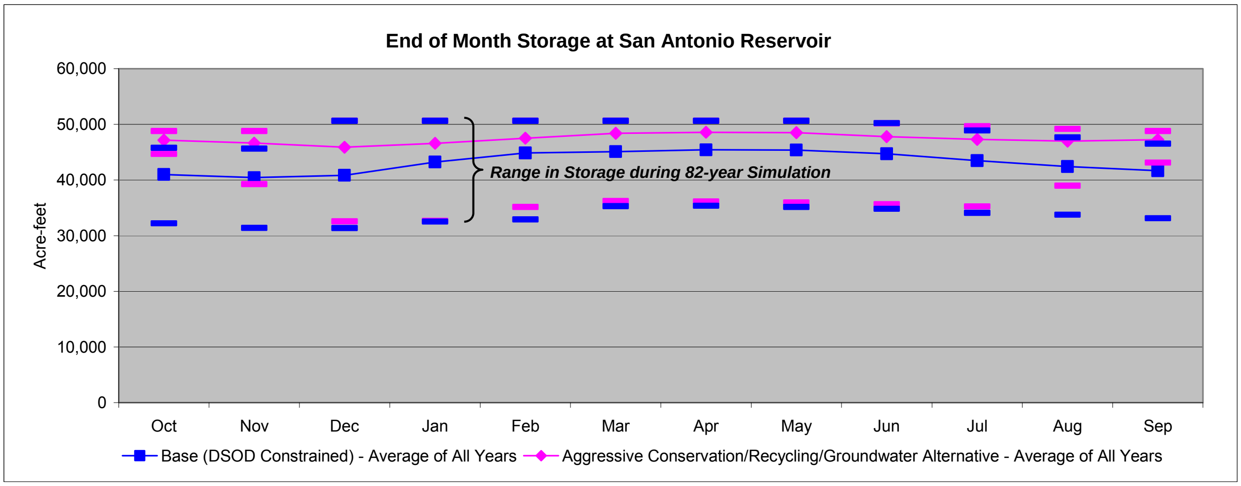


1980 - 2002



The reduction in diversion from Hetch Hetchy during these periods is accommodated in the system by the drawing of additional water from Bay Area reservoirs. The proportionate share of this operation is evident in the tracing of San Antonio Reservoir storage for the alternative and WSIP settings. Figure 4.6-4 illustrates the average monthly storage in San Antonio Reservoir for the 82-year simulation, and the range in storage for each month for the alternative and base settings. Compared to the base setting, the alternative would draw less storage from San Antonio Reservoir, typically retaining a fuller reservoir.

Figure 4.6-4



Very little change in stream releases below San Antonio Reservoir is anticipated between the alternative and WSIP settings. Table 4.6-12 illustrates the modeled release to San Antonio Creek from San Antonio Reservoir for the two settings and the differences for the average release during a year type. With a fuller reservoir operation at times during the winter, as seen in Figure 4.6-4, a decrease in the ability to regulate reservoir inflow and avoid stream releases would be expected. Given the sometimes rigid constraints within the modeling assumptions, the model will overestimate the frequency and magnitude of stream releases from San Antonio Reservoir under any of the investigated settings. The flexibility that occurs in actual operations would likely avoid most of the releases represented by the model. The modeled stream releases from San Antonio Reservoir and the difference between releases for the alternative and base setting are shown in Table 4.6-13. The differences between the two settings reflect a general increase in modeled releases. This modeled circumstance reflects the different resulting storage operation between the two settings as seen in Figure 4.6-3. In most circumstances the alternative setting storage at San Antonio Reservoir would be higher than projected for the base setting during the same period. This circumstance could lead to an occasionally greater modeled release for the alternative setting, which is reflected in the results. As described above, the model will overestimate the frequency and magnitude of releases from San Antonio Reservoir, and the actual releases from San Antonio Reservoir in any setting and the difference between settings are expected to be minor.

Flow below the confluence of Alameda and San Antonio Creeks is influenced by releases from San Antonio Creek and flow arriving at the location from Alameda Creek, which includes upstream impairment by SFPUC operations and facilities. Table 4.6-14 illustrates the flow below the confluence for the alternative and WSIP settings, and the differences in flow between the two. The difference in flow between the alternative and WSIP settings at this location are the net sum of the differences identified for flow reaching the location from Alameda Creek and San Antonio Creek. The difference in flow from upstream in Alameda Creek has previously been identified as non-substantial. Along with the conclusion that flow differences in San Antonio Creek are non-substantial, modeled differences below the confluence are also considered non-substantial.

Table 4.6-12

Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Aggressive Conservation/Recycling/Groundwater

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	265	1,913	3,632	2,333	1,222	0	0	0	0	0	9,365
Above Normal	0	0	84	479	1,530	475	0	0	0	0	0	0	2,568
Normal	0	0	126	251	28	30	0	0	0	0	0	0	435
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	94	522	1,031	560	238	0	0	0	0	0	2,445

Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	95	1,054	3,168	1,543	605	121	0	0	0	0	6,586
Above Normal	0	0	0	540	1,045	277	67	44	0	0	0	0	1,974
Normal	0	0	0	113	0	40	0	0	0	0	0	0	152
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	19	340	835	366	132	33	0	0	0	0	1,724

Difference in Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Aggressive Conservation/Recycling/Groundwater minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	170	859	464	790	617	-121	0	0	0	0	2,778
Above Normal	0	0	84	-60	485	198	-67	-44	0	0	0	0	594
Normal	0	0	126	139	28	-10	0	0	0	0	0	0	283
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	75	182	196	193	106	-33	0	0	0	0	721

Table 4.6-13

Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Aggressive Conservation/Recycling/Groundwater

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	265	1,913	3,632	2,333	1,222	0	0	0	0	0	9,365
Above Normal	0	0	84	479	1,530	475	0	0	0	0	0	0	2,568
Normal	0	0	126	251	28	30	0	0	0	0	0	0	435
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	94	522	1,031	560	238	0	0	0	0	0	2,445

Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	538	2,350	2,480	1,324	88	0	0	0	0	6,780
Above Normal	0	0	0	0	881	883	12	58	0	0	0	0	1,835
Normal	0	0	0	0	1	0	0	0	0	0	0	0	1
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	0	105	641	667	261	29	0	0	0	0	1,703

Difference in Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Aggressive Conservation/Recycling/Groundwater minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	265	1,375	1,282	-147	-102	-88	0	0	0	0	2,585
Above Normal	0	0	84	479	649	-408	-12	-58	0	0	0	0	733
Normal	0	0	126	251	27	30	0	0	0	0	0	0	435
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	94	417	390	-108	-22	-29	0	0	0	0	741

Table 4.6-14

Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Aggressive Conservation/Recycling/Groundwater

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,437	15,579	29,068	20,180	10,507	556	76	33	15	9	79,621
Above Normal	19	150	1,539	4,993	10,482	7,574	2,180	217	54	20	9	6	27,245
Normal	7	64	1,257	1,165	1,785	1,254	469	134	28	9	4	3	6,178
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	1,290	4,405	8,400	5,922	2,645	208	38	14	7	4	23,030

Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,276	14,666	28,996	19,390	9,903	619	76	33	15	9	77,144
Above Normal	19	150	1,308	4,987	10,182	7,190	2,248	262	54	20	9	6	26,435
Normal	7	64	922	1,026	1,837	1,308	469	134	28	9	4	3	5,810
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	1,145	4,199	8,334	5,698	2,541	229	38	14	7	4	22,307

Difference in Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Aggressive Conservation/Recycling/Groundwater minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	161	913	72	790	604	-63	0	0	0	0	2,477
Above Normal	0	0	231	6	300	385	-67	-44	0	0	0	0	810
Normal	0	0	335	139	-52	-54	0	0	0	0	0	0	367
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	145	206	66	223	104	-22	0	0	0	0	723

Table 4.6-15 illustrates the same information for the comparison between the alternative and base settings. Table 4.6-15 illustrates the larger differences in flow that would occur between the alternative and base settings. Those differences are particularly due to the effects of the restoration of Calaveras Reservoir operating capacity and the fuller San Antonio Reservoir in the alternative setting (if the fuller reservoir has any effect on steam releases).

Table 4.6-15

Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Aggressive Conservation/Recycling/Groundwater

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,437	15,579	29,068	20,180	10,507	556	76	33	15	9	79,621
Above Normal	19	150	1,539	4,993	10,482	7,574	2,180	217	54	20	9	6	27,245
Normal	7	64	1,257	1,165	1,785	1,254	469	134	28	9	4	3	6,178
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	1,290	4,405	8,400	5,922	2,645	208	38	14	7	4	23,030

Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,968	19,206	30,042	20,458	10,681	601	76	33	15	9	85,250
Above Normal	19	150	1,981	7,819	13,941	8,350	1,873	276	54	20	9	6	34,498
Normal	7	64	1,676	1,881	3,612	2,007	479	134	28	9	4	3	9,902
Below Normal	7	56	183	404	682	678	156	91	20	5	3	2	2,288
Dry	6	19	87	98	337	145	96	48	9	3	2	2	853
All Years	9	89	1,567	5,838	9,664	6,284	2,617	229	38	14	7	4	26,359

Difference in Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Aggressive Conservation/Recycling/Groundwater minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-532	-3,627	-974	-278	-174	-45	0	0	0	0	-5,629
Above Normal	0	0	-442	-2,825	-3,459	-776	307	-58	0	0	0	0	-7,253
Normal	0	0	-419	-716	-1,827	-753	-10	0	0	0	0	0	-3,725
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-277	-1,433	-1,263	-362	28	-21	0	0	0	0	-3,329

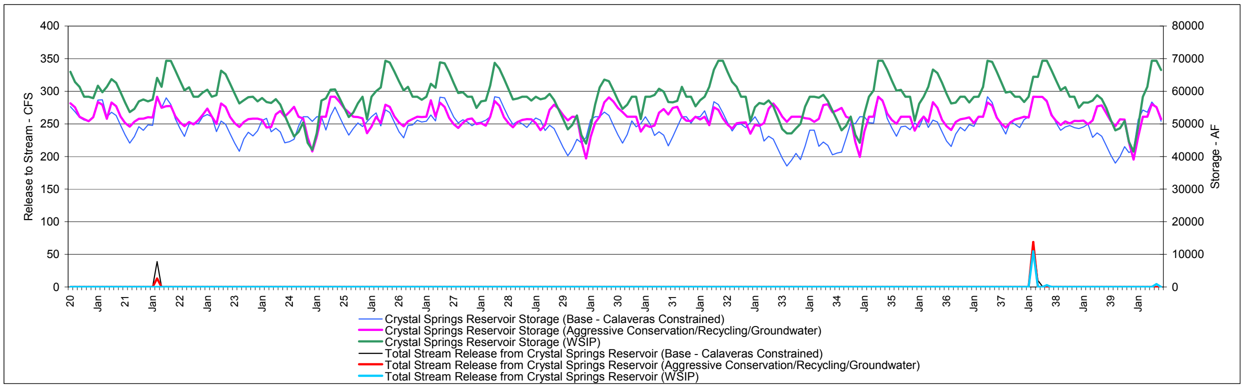
4.7 Crystal Springs and San Andreas Reservoirs

There are differences in Crystal Springs Reservoir operations between the WSIP setting and the alternative and base settings. Figure 4.7-1 illustrates a chronological trace of the simulation of Crystal Springs Reservoir storage and stream releases from Crystal Springs Dam. Shown in Figure 4.7-1 are the results for the WSIP, alternative, and base settings. Fundamental to the difference in storage operations between the WSIP setting and the alternative and base settings is the restoration of reservoir operation capacity in the WSIP setting, which does not occur in the alternative or base settings.[12] The result is the operation of Crystal Springs Reservoir at a lower maximum storage in the alternative and base settings. A second difference in Crystal Springs Reservoir storage between the alternative and WSIP setting is caused by the interaction of the increased demand served by the system's resources (a net 271-mgd for the alternative and a net 290-mgd demand for the WSIP in many years), which tends to lessen the operation range of the reservoir in the alternative setting. Replenishment of Crystal Springs Reservoir storage (as well as other Bay Area reservoirs) would be accelerated with less system-wide demand to serve. The alternative setting would provide less carry-over storage at Crystal Springs Reservoir into periods of drought, thereby causing additional draw from other resources to serve the same delivery. The magnitude of the draw of storage from Crystal Springs Reservoir depends partially on the discretionary assumptions of the model that proportion the use of storage among the Bay Area system reservoirs. In actual operations, some of the differences in result may not occur as system operators and prevailing hydraulic and hydrologic conditions may direct the operational effect of the different demand to an alternative apportionment of effect among the reservoirs. However, operation strategy prefers the retention of storage in the Peninsula Reservoirs, similar to the strategy used by the model. Figure 4.7-2 illustrates the average monthly storage in Crystal Springs Reservoir for the 82-year simulation, and the range in storage for each month for the alternative and WSIP settings.

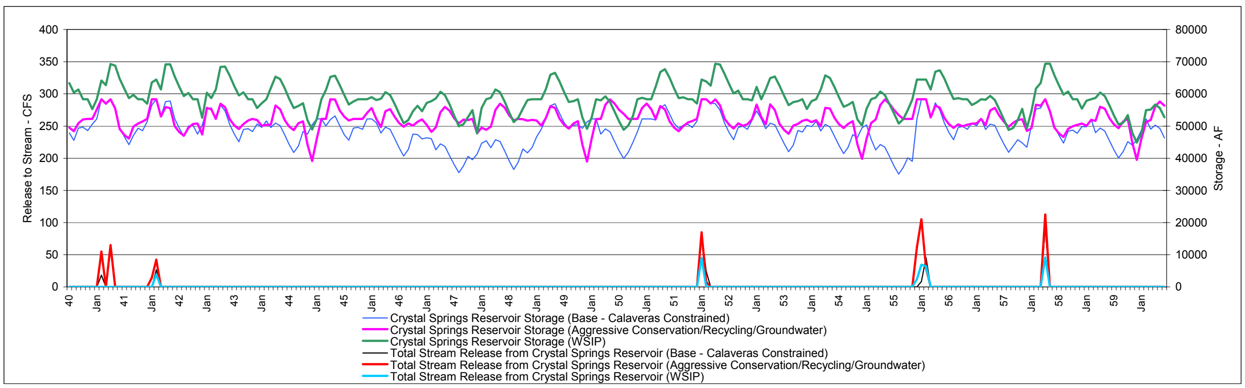
[12] The Lower Crystal Springs Dam Improvements (LCSDI) project is included in this alternative, but was not modeled. With the LCSDI project included in the alternative the hydrologic effects at Crystal Springs Reservoir would be comparable to the WSIP setting.

Figure 4.7-1
Crystal Springs Reservoir Storage and Release

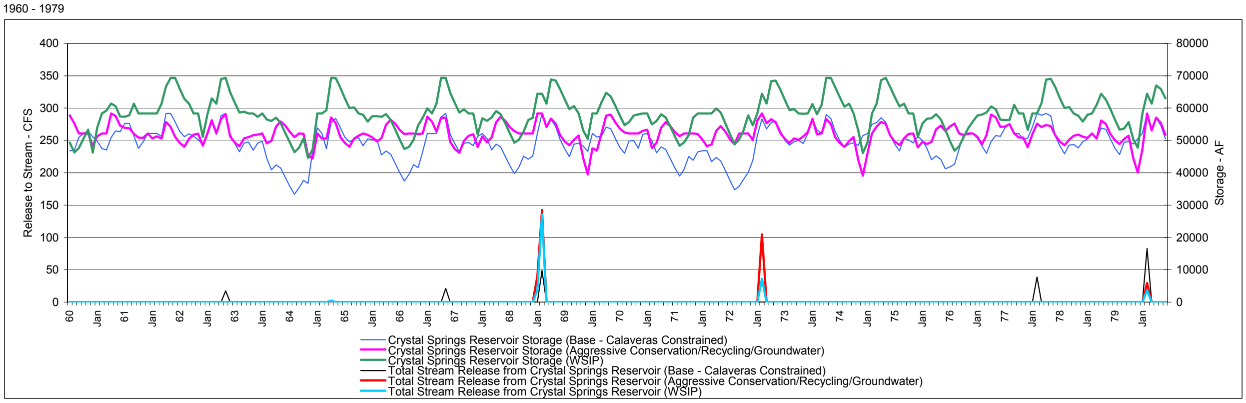
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

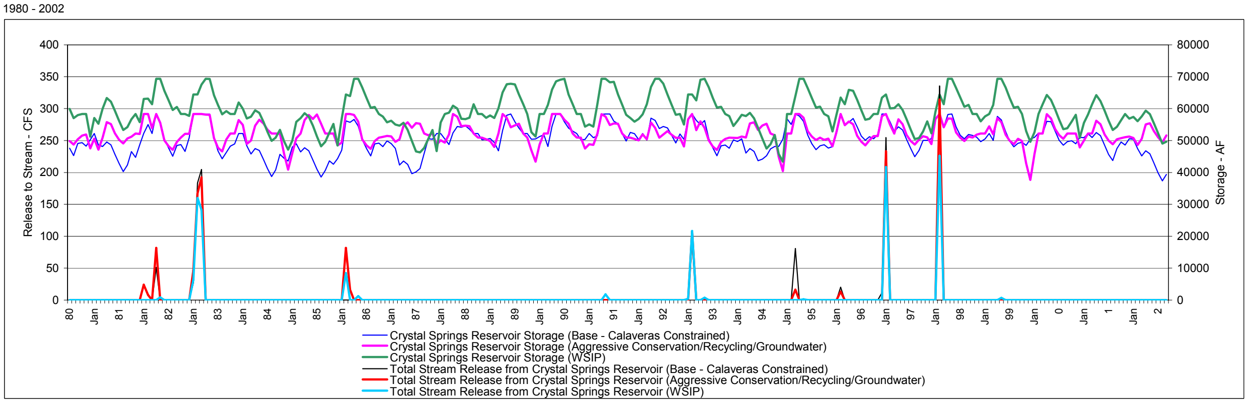


Figure 4.7-2

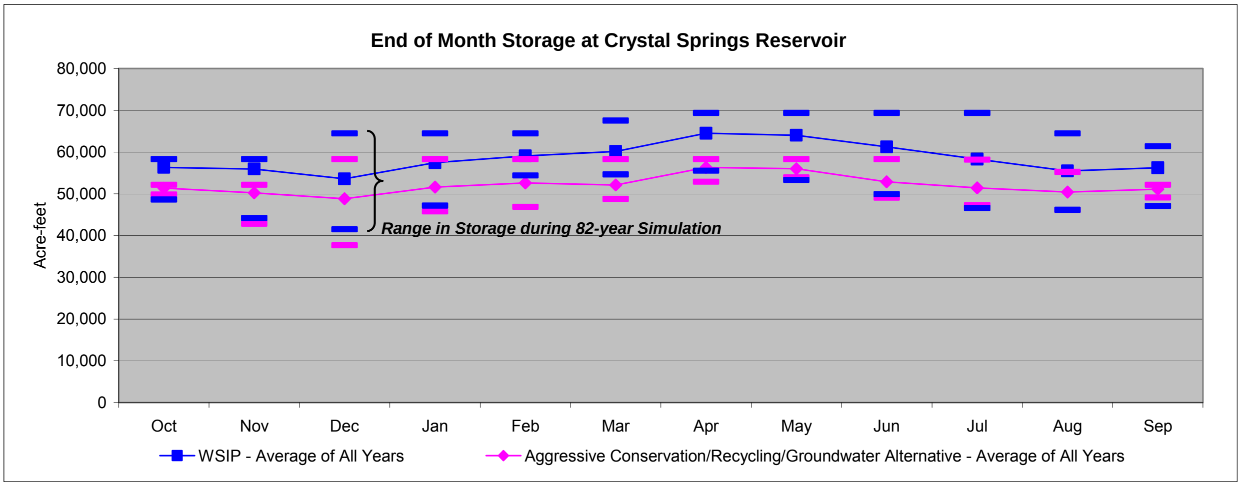


Figure 4.7-3 illustrates the average monthly storage in Crystal Springs Reservoir for the 82-year simulation, and the range in storage for each month for the alternative and base settings. The alternative setting would result in reservoir storage operating at a slightly higher average storage during some months, and the range of operating storage would typically be smaller in the alternative setting.

Figure 4.7-3

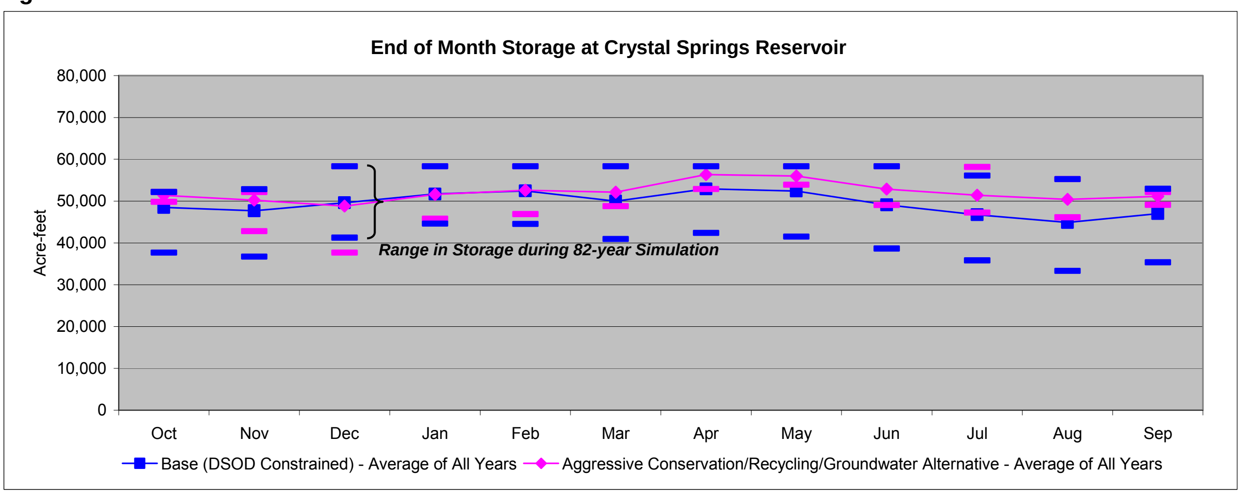


Table 4.7-1 illustrates the modeled alternative and WSIP stream releases from Crystal Springs Reservoir and the differences between the two settings. Modeling results indicate that an increase in the occasional release could occur. The potential difference is attributed to a narrower operating range of reservoir storage in the alternative setting. This narrower range in storage would lead to a greater potential for stream releases. In actual operations, it is anticipated that system operators would manage the reservoir system such that stream releases would be minimal under any setting, with the effect of essentially no difference between the alternative and WSIP settings. Similarly, Table 4.7-2 illustrates the stream releases for the alternative and base settings, and the difference in modeled flows between the two settings. A lesser draw down in Crystal Springs Reservoir storage associated with the alternative setting would lead to a decreased potential to regulate reservoir inflow, which would lead to additional risk in needing to make stream releases. However, as described above, actual system operations would attempt to minimize releases under any setting; thus, the difference in releases between the alternative and base setting would be minimal, if any.

Table 4.7-1

Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Aggressive Conservation/Recycling/Groundwater

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	237	2,106	3,643	862	963	0	0	0	0	0	7,812
Above Normal	0	0	0	0	437	0	0	0	0	0	0	0	437
Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	46	411	802	168	188	0	0	0	0	0	1,615

Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	47	1,296	2,512	542	170	54	0	0	0	0	4,623
Above Normal	0	0	0	8	354	0	8	42	0	0	0	0	412
Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	33	0	0	0	0	33
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	9	254	564	106	35	26	0	0	0	0	994

Difference in Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Aggressive Conservation/Recycling/Groundwater minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	190	809	1,131	320	793	-54	0	0	0	0	3,189
Above Normal	0	0	0	-8	83	0	-8	-42	0	0	0	0	25
Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	-33	0	0	0	0	-33
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	37	156	238	62	153	-26	0	0	0	0	621

Table 4.7-2

Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Aggressive Conservation/Recycling/Groundwater

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	237	2,106	3,643	862	963	0	0	0	0	0	7,812
Above Normal	0	0	0	0	437	0	0	0	0	0	0	0	437
Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	46	411	802	168	188	0	0	0	0	0	1,615

Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	44	1,433	2,889	1,134	756	81	0	0	0	0	6,336
Above Normal	0	0	0	0	608	0	0	63	0	0	0	0	671
Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	9	280	690	221	147	29	0	0	0	0	1,375

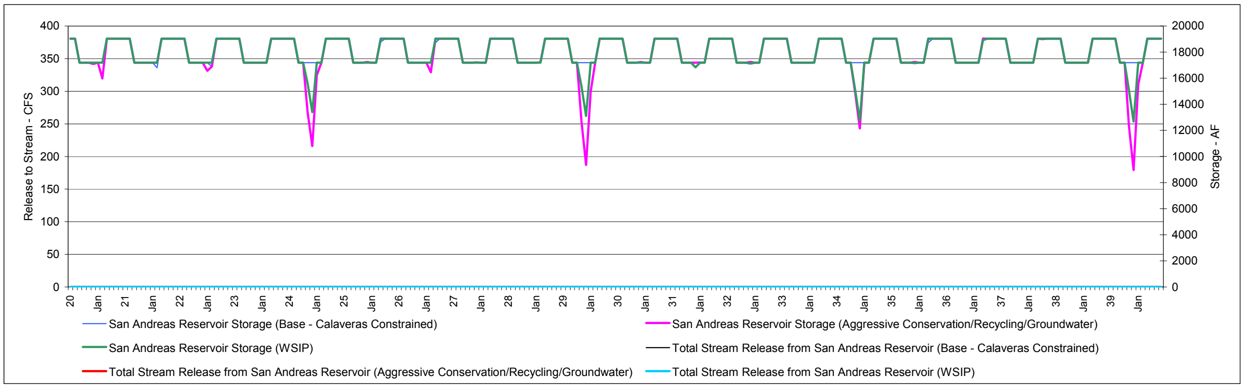
Difference in Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Aggressive Conservation/Recycling/Groundwater minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	193	673	755	-272	207	-81	0	0	0	0	1,476
Above Normal	0	0	0	0	-171	0	0	-63	0	0	0	0	-234
Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	38	131	112	-53	40	-29	0	0	0	0	239

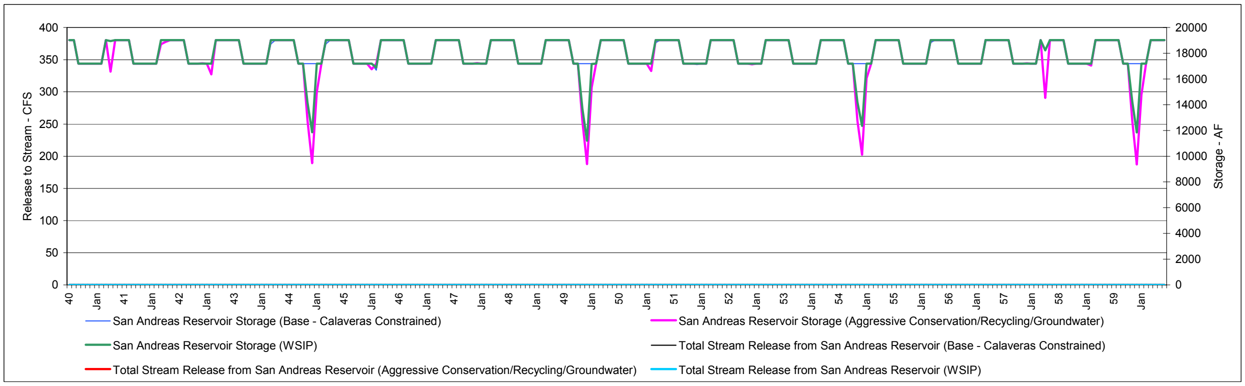
Reservoir storage at San Andreas Reservoir would follow a systematic filling and lowering each year; however, there would be slight differences in draw down between the alternative and WSIP settings, primarily because of the coincidental effects of different system-wide maintenance and differing water demands within each setting. Figure 4.7-4 illustrates a chronological trace of the simulation of San Andreas Reservoir storage and stream releases from San Andreas Dam. Shown in Figure 4.7-4 are the results for the WSIP, alternative, and base settings. There are no projected stream releases from San Andreas Reservoir in any setting. Compared to the base setting, Figure 4.7-4 illustrates the difference in storage operation every fifth year for the WSIP and alternative settings. These operations are the result of Hetch Hetchy conveyance maintenance, which is assumed to occur systematically in the alternative and WSIP settings. The maintenance constrains the amount of Hetch Hetchy water supplied to serve water demands in the Bay Area. As discussed previously, during these winter periods, the Bay Area reservoir system accommodates the reduction in imported supply by serving the Bay Area water deliveries with the local watersheds' runoff and storage. At San Andreas Reservoir, the serving of water demand affects the reservoir when additional required water production at Harry Tracy WTP associated with WSIP or the alternative exceeds the ability to maintain San Andreas Reservoir storage with pumping from Crystal Springs Reservoir. In the modeling, the conveyance capacity from Crystal Springs Reservoir is assumed to be same among all of the settings. The additional water demand of the WSIP and alternative require additional production from Harry Tracy WTP to be drawn from San Andreas Reservoir.

Figure 4.7-4
San Andreas Reservoir Storage and Stream Release

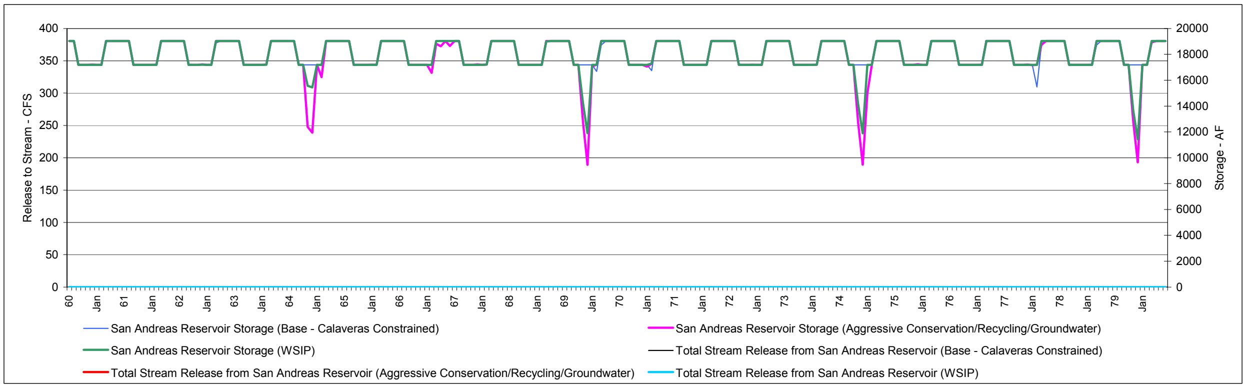
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

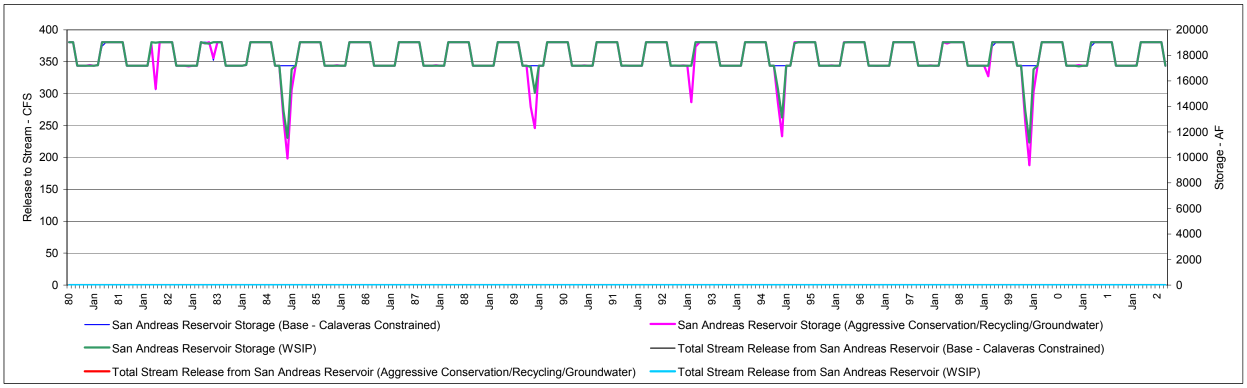
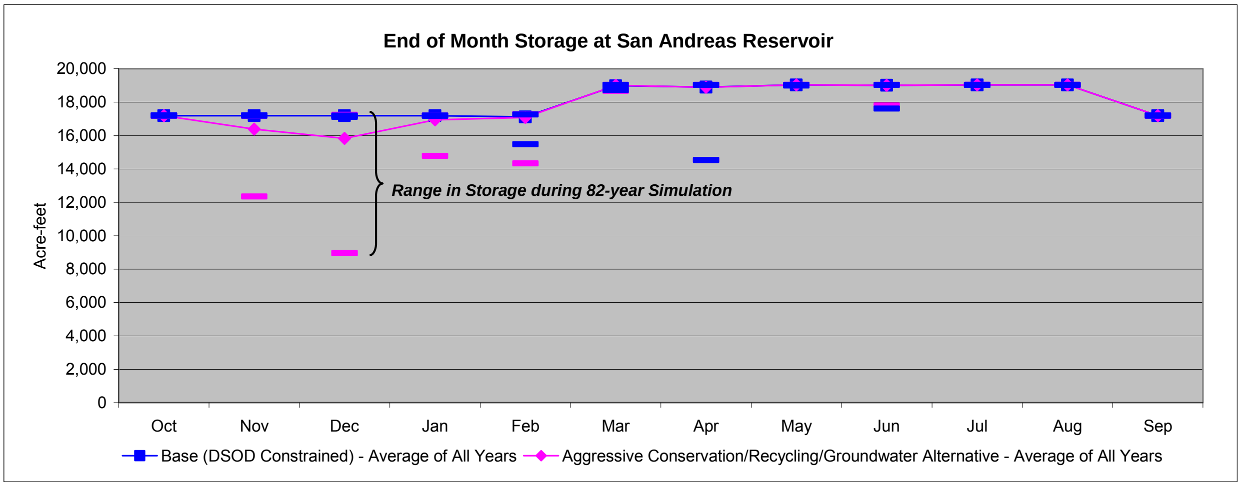


Figure 4.7-5 illustrates the average monthly storage in San Andreas Reservoir for the 82-year simulation, and the range in storage for each month for the alternative and base settings.

Figure 4.7-5



4.8 Pilarcitos Reservoir

Coastside CWD's water demand and its SFPUC purchase request are projected to increase within the WSIP planning horizon of year 2030. With the context of the 2030 purchase request of 300 mgd, Coastside CWD's portion has been estimated at about 3 mgd. This projected purchase request is approximately 1 mgd greater than its current purchase request. In the alternative, Coastside CWD's contribution to the 19 mgd of conservation, recycling, and groundwater is very small; therefore, Coastside CWD's purchase request in the alternative setting is assumed essentially equal to the WSIP setting. Recognizing the current physical constraints to deliveries from the SFPUC to Coastside CWD and the ongoing planning activities in the watershed, the precise means of serving Coastside CWD's additional purchase request and the resultant potential changes to the operation of SFPUC facilities and their affected environs are uncertain.[13]

Assuming a range of potential means to serve the additional purchase request from Coastside CWD, the following potential hydrologic effects to SFPUC facilities and their affected environs are identified:

- Due to limited yield from Pilarcitos Reservoir, additional diversions would be required from Crystal Springs Reservoir.
- If deliveries to Coastside CWD from Pilarcitos Reservoir increase during the winter season, these deliveries could potentially reduce storage in Pilarcitos Reservoir, thereby potentially reducing diversions to the San Mateo Creek watershed. Although the increased delivery would increase releases to Pilarcitos Creek from Pilarcitos Dam for a period of time, the increase would subsequently lead to a reduction in spills past Stone Dam.
- Additional wintertime deliveries could also potentially impair the ability to provide carry-over storage into the summer season from Pilarcitos Reservoir, and subsequently lead to an acceleration of the beginning of the season when releases to Pilarcitos Creek from Pilarcitos Reservoir consist only of the passage of reservoir inflow.
- An increase in summertime deliveries from Pilarcitos Creek could also accelerate the beginning of the season when releases to Pilarcitos Creek from Pilarcitos Reservoir consist only of the passage of reservoir inflow.

In the alternative setting, the hydrologic effects to the Pilarcitos Creek watershed would essentially be the same as those identified for the WSIP setting.

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[13] See "Analysis of SFPUC Pilarcitos / Coastside County Water District Operations", Memorandum by Daniel B. Steiner, March 8, 2007.

4.9 Additional Considerations Regarding the Aggressive Conservation Alternative

The hydrologic effects of Alternative 3, Aggressive Conservation, are described above. The additional observations noted during the formulation and analysis of the alternative are discussed below.

As configured, the alternative serves a total SFPUC purchase request of 300 mgd, and 29 mgd of the purchase request is met with conservation, recycled water, and groundwater programs. The amount of purchase request served by the regional system is a net 271 mgd compared to the net 290 mgd served in the WSIP setting.

The alternative does not implement the Westside Basin Groundwater Program, water transfers from MID/TID, or the restoration of Crystal Springs Reservoir operational capacity, which foregoes 30 mgd of yield during the SFPUC design drought.[14] The foregone yield during the design drought is partially offset in effect to customer deliveries by the 19 mgd of additional conservation provided by the customers that reduces the net delivery demand from the regional system. The net remaining difference between the reduction in yield and lesser regional system demand is accommodated by the imposing of greater shortages (rationing) to deliveries during the design drought. Although the 20-percent maximum rationing objective was achieved in the alternative setting, 4 years of 10 percent greater rationing was required during the 8½-year design drought period (e.g., imposing 10 percent rationing when in the WSIP setting no rationing was required, or imposing 20 percent rationing when in the WSIP setting 10 percent rationing was required). The water delivery protocols that provided a viable operation through the design drought, although resulting in a lesser LOS than the objectives of the WSIP, manifest in additional rationing in other drought periods in the alternative setting.

Without the MID/TID water transfer, the amount of water served from the Tuolumne River during the design drought is about the same as between the alternative and base settings, and is constrained by the size and configuration of SFPUC facilities and the amount of water available to the SFPUC during the period after the rights and entitlements of MID/TID are satisfied. However, during non-drought years when the availability of water to the SFPUC from the Tuolumne River is practicably not constrained, diversions greater than the base setting would occur to serve a portion of the increase in purchase request. The purchase request increases by 35 mgd while the customers' conservation, recycled water, and groundwater programs only offset 29 mgd of regional system demand, thus leaving 6 mgd to be served by other SFPUC resources. Commensurate with the difference, Tuolumne River diversions increase by approximately 5 mgd annually during the 82-year simulation period.[15]

To prevent an increase in diversions from the Tuolumne River in the context of the alternative (with the assumed level of conservation, recycled water, and groundwater programs), the SFPUC would be required to further erode the LOS for the 300 mgd of purchase request, reduce the purchase request, or implement additional sources of supply that do not rely on the Tuolumne River.

LOS Reliability Option

As described above, the alternative as configured does not achieve the water supply reliability LOS of the WSIP, requiring greater levels of shortage during drought than the WSIP. Although the maximum severity of shortage for any year of shortage (20 percent) is achieved, a greater level of shortage is required in 4 years during the design drought. The protocols to provide a viable operation during the design drought result in shortages being applied during other drought periods of the 82-year simulation. During the entire simulation period, there would still be an additional average 5 mgd of diversion from the Tuolumne River annually, due to the 271-mgd demand of the typical net regional system, which is greater than the current 265-mgd demand.

[14] The Lower Crystal Springs Dam Improvements (LCSDI) project is included in the alternative, but was not modeled. With the LCSDI project included in the alternative the hydrologic effects at Crystal Springs Reservoir would be comparable to the WSIP setting. The restoration of operational capacity at Crystal Springs Reservoir results in an additional 1 mgd of system firm yield during the Design Drought.

[15] The difference between the 6-mgd increase in purchase request and the 5 mgd of additional Tuolumne River diversion is due to delivery shortages occurring during the 82-year simulation period, which reduces the average amount of water delivered during the simulation period.

If the metric for attempting to prevent increases in Tuolumne River diversions was based on the long-term average annual diversion from the basin, a comparable diversion could occur by further eroding the LOS water supply reliability objective. Assuming delivery shortage (rationing) of up to 25 percent in any year, and applying that shortage at the first hint of drought, a long-term average annual diversion from the basin could result that essentially equals the level of diversions currently occurring. As in the configured alternative, there would continue to be greater diversions from the Tuolumne River during non-drought years; however, during drought, there would be less diversion than occurs in the alternative setting. The delivery shortages during the Design Drought would manifest as 7½ years of 25-percent shortage during the 8½-year period. Approximately 18 percent of the years (15 years) during the 82-year simulation would be subject to the 25-percent shortage.

Alternatively, the SFPUC could attempt to maintain no more than the current diversion from the Tuolumne River basin by reducing the LOS for the level of purchase request. This option would be similar to the No Purchase Increase Alternative described previously in Section 3. There would be a nexus between the amount of additional conservation, recycled water, and groundwater developed and the accepted increase in purchase request. The LOS for level of purchase request, reliability, and firm yield would all be less than the WSIP objectives.

Additional Water Supply Option

If LOS objectives are to be met with the alternative (with its assumed level of conservation, recycled water, and groundwater), with no objective of additional diversion of water from the Tuolumne River, the SFPUC must develop additional water supply resources that do not rely on Tuolumne River water. The nature of the additional supply could be similar to that described in Section 5, Desalination in San Francisco. The development of sufficient supply from supplemental resource(s) would be required to provide additional drought and non-drought supply to meet WSIP LOS objectives while not increasing diversions from the Tuolumne River. As described later in Section 5, the development of supplemental resources separate from the Tuolumne River would not eliminate the potential for year-to-year diversions to change from the base setting. System-wide changes to the regional system, such as a planned maintenance program for the Hetch Hetchy conveyance system, would inherently change the pattern of diversions from the Tuolumne River, which would manifest in year-to-year and seasonal differences between current and future diversions.

5. CEQA Alternative 4 – Lower Tuolumne River Diversion

CEQA Alternative 4 – Lower Tuolumne River Diversion Alternative would, similar to the proposed WSIP, rely primarily on Tuolumne River water to serve the increased system-wide demand. However, instead of the entire SFPUC Tuolumne River diversion originating from Hetch Hetchy Reservoir, the alternative would divert most of the increase in demand at facilities located on the lower Tuolumne River upstream of the confluence with the San Joaquin River. The alternative would provide supplemental releases to the lower Tuolumne River in excess of those currently required below La Grange Dam for FERC requirements. Supplemental releases above those currently required would also be provided to the Tuolumne River below O'Shaughnessy Dam coincident with the lower Tuolumne River diversion. The purpose of this alternative is to accommodate the increase in system-wide demand with the diversion of Tuolumne River water, while at the same time increasing flow conditions in the middle Tuolumne River (Hetch Hetchy Reservoir to Don Pedro Reservoir) and in the lower Tuolumne River below La Grange Dam.

The alternative would implement almost all of the proposed facilities for the proposed WSIP. The exception to the WSIP configuration and proposed facilities would be the specific improvements to the SJPL. Improvements and repairs would be made to the SJPL to ensure that conveyance would continue at the existing 290-mgd capacity. A new SFPUC diversion facility located in the Tuolumne River near its confluence with the San Joaquin River would be sized to recover up to 55 mgd of releases provided by the SFPUC. From the diversion point, the recovered water would be pumped to a new water treatment plant near the Tesla Portal where it would be filtered and disinfected prior to blending with Hetch Hetchy water in the Coastal Tunnel. Numerous new permits and institutional arrangements would be necessary to facilitate the diversion of water by the SFPUC from the lower Tuolumne River, including an arrangement with MID/TID to release SFPUC water into the river.[16]

During non-drought years, the SFPUC would serve the increase of 35 mgd in purchase requests through a combination of conservation, water recycling, and groundwater supply programs, increased diversions from the Tuolumne River, and greater utilization of the Bay Area watershed supplies associated with the restoration of operational storage capacity, primarily at Calaveras Reservoir.[17] The SFPUC would implement conservation, water recycling, and groundwater supply programs in the SFPUC retail service area to achieve the equivalent of 10 mgd of supply every year in all years. These programs would be in addition to demand management and conservation measures already accounted for in the 2030 purchase request for the retail service area.

In most years, the SFPUC could serve the projected 2030 water purchases of 300 mgd with its existing sources of water supply; however, these sources alone have not allowed for full water deliveries during past droughts, and would continue to be insufficient during future droughts as purchase requests increase. In this alternative, the SFPUC would serve the 2030 need for increased system firm yield with a combination of conservation, water recycling, and groundwater programs in the SFPUC retail service area, water transfers from the Turlock Irrigation District (TID) and Modesto Irrigation District (MID), a groundwater conjunctive-use program incorporating the Westside Basin Groundwater Program, and restoration of reservoir operating capacity at Crystal Springs and Calaveras Reservoirs. As with the WSIP, system-wide rationing would be limited to no more than 20 percent in any year.

The following described results for this alternative are derived from studies performed by the SFPUC during the investigation of Water Supply Option 3. Subsequent to those studies, several refinements to assumptions for water demands, facility configuration, and operations have changed for the proposed future SFPUC regional system, which would have slightly altered the studies incorporated into Water Supply Option 3. These changes are non-substantive in terms of conclusions derived concerning the alternative; however, due to this circumstance, a comparison of the explicit modeling results for this alternative with results for the WSIP setting or base setting requires caution, and qualitative descriptions are provided.

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[16] This setting is additionally described in *Water System Improvement Program (WSIP) Water Supply Option 3*, prepared by San Francisco Public Utilities Commission and Parsons, June 2006.

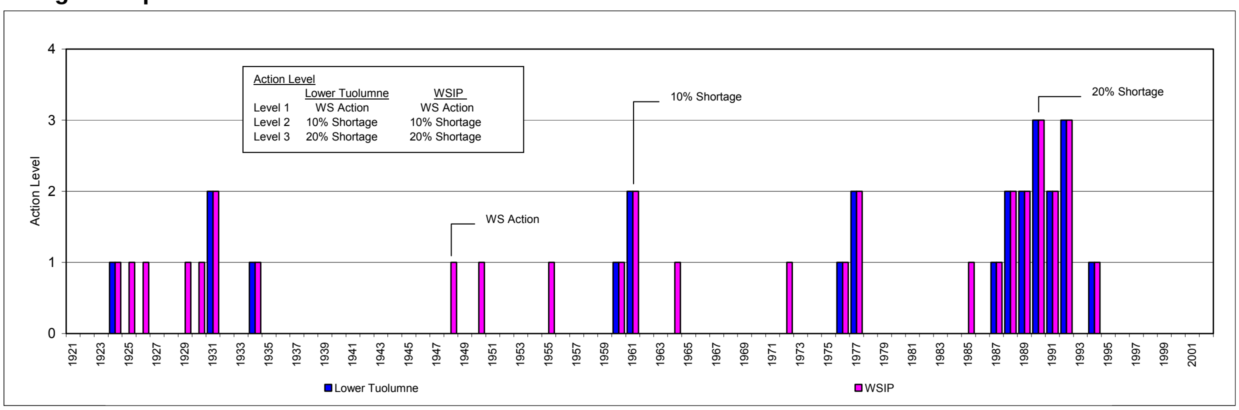
[17] The Lower Crystal Springs Dam Improvements project would be included in this alternative.

5.1 Water Deliveries and Drought Response Actions

In both the alternative and the WSIP settings, an average annual 300 mgd system-wide purchase request is served. Both settings include implementation of 10 mgd of conservation, water recycling, and groundwater supply programs in the SFPUC retail service area, with a net regional system demand of 290 mgd. Table 5.1-1 compares the drought response actions for the proposed program and the alternative settings. Figure 5.1-1 illustrates the drought response actions for the simulated 82-year historical period (1921-2002).

In Figure 5.1-1, years with bars showing a "1" or greater level of action indicate periods when a supplemental water supply action is initiated. In both the WSIP and alternative settings, the action is the use of the Westside Basin Groundwater Program to supplement SFPUC water deliveries. The water transfer from MID/TID is also occurring during these periods. Action levels greater than "1" indicate the imposition of delivery shortages (rationing) to SFPUC customers.

Figure 5.1-1
Drought Response Actions – Lower Tuolumne River Diversion and WSIP

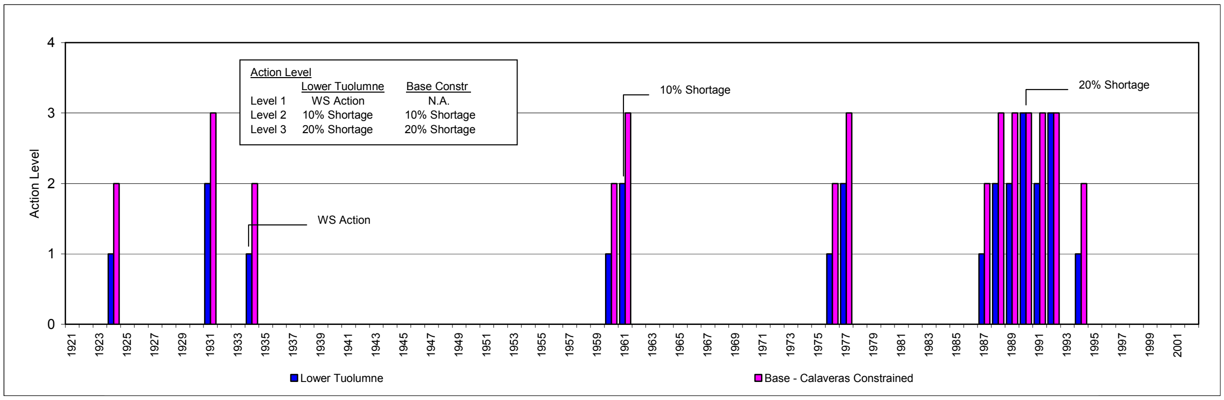


The need for water delivery shortages, in frequency and severity, would be the same for the alternative and WSIP settings, including during the design drought. Shortages would be no greater than 20 percent in any year. Although the WSIP setting indicates a greater frequency of use of the level 1 action (Westside Basin Groundwater Program), the indicated difference is partially a result of modeling discretion that was applied in the more recent WSIP studies and not consistently applied in the earlier Water Supply Option 3 studies. The modeling discretion concerned the explicit system storage level, at which the action is triggered. As described later concerning Bay Area reservoir storage, less depletion of local reservoir storage would be anticipated in the alternative setting because of the increased seasonal availability of conveyance from the Hetch Hetchy system. This would lead to a lesser need to trigger the supplemental groundwater program to retain local Bay Area reservoir storage. The increase in frequency of triggering the action associated with the WSIP is likely overstated.

The same form of information is shown in Figure 5.1-2 in comparing the alternative setting to the base setting. In modeling parlance, there is no level 1 action level in the base setting. Without supplemental resources, the existing system only has the delivery shortage measure available to cope with drought. This shortage measure is imposed during level 2 (10 percent) and level 3 (20 percent). These percentages of shortage are applied to both the alternative and base settings for these action levels. As evident in the illustration, the imposition of rationing occurs more frequent and to a greater extent in the base setting (level 2 and level 3 actions).

Figure 5.1-2 illustrates that, when comparing the base setting to the alternative setting, the supplemental resource (Westside Basin Groundwater Program) is triggered at times of drought, during periods when no supplemental resource is currently available to the system. The use of the supplemental resource during these times results in the elimination or reduction (or at least a non-increase in the severity) of delivery shortage.

Figure 5.1-2
Drought Response Actions – Base and Lower Tuolumne River Diversion



Not illustrated in Figure 5.1-1 or Figure 5.1-2 are the delivery shortages anticipated during the entire SFPUC Design Drought. Shortages during the Design Drought with the WSIP and alternative are maintained within the objective to limit the severity of shortage to no more than 20 percent. With the existing system (Calaveras and Crystal Springs Reservoirs constrained), the 20-percent limitation (cap) objective cannot be achieved during the last 18 months of the Design Drought, and a 25 percent shortage is applied.

5.2 Diversions from Tuolumne River

For the WSIP and base settings, the metric for illustrating the SFPUC diversion from the Tuolumne River Basin is the flow through the San Joaquin Pipeline (SJPL) originating at Moccasin Reservoir. In this alternative setting, additional water is diverted from the basin at the new diversion site, which is located in the lower Tuolumne River above its confluence with the San Joaquin River.

Table 5.2-1 illustrates the diversions and difference in diversions to the SJPL (from Moccasin Reservoir) for the proposed program and WSIP settings, averaged by month, by year type. Evident is the decrease in annual diversions associated with the alternative setting. Although the same system-wide level of deliveries occurs for the two settings, the specific locations of the SFPUC's Tuolumne River diversions differ. The difference in SJPL diversions between the WSIP setting and alternative setting is also illustrated in Figure 5.2-1, and the difference in average monthly diversion through the SJPL is shown, by year type, for the 82-year simulation period.

Table 5.2-1

Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Lower Tuolumne

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	24,616	18,989	0	10,109	9,130	10,394	20,427	24,497	23,880	27,589	27,589	25,318	222,537	220,982
Above Normal	25,407	18,684	0	14,539	13,132	14,551	23,341	26,246	25,399	27,589	27,589	25,183	241,660	241,064
Normal	24,795	19,276	0	14,628	13,212	18,017	26,411	27,351	26,469	27,589	27,589	24,052	249,388	249,331
Below Normal	25,295	19,226	0	19,923	17,994	19,979	26,699	27,085	26,212	27,589	27,589	23,937	261,528	262,013
Dry	24,676	19,219	0	19,682	17,777	19,979	26,699	27,232	26,411	27,589	27,470	22,384	259,117	260,732
All Years	24,967	19,076	0	15,811	14,281	16,600	24,723	26,487	25,677	27,589	27,566	24,184	246,962	246,939

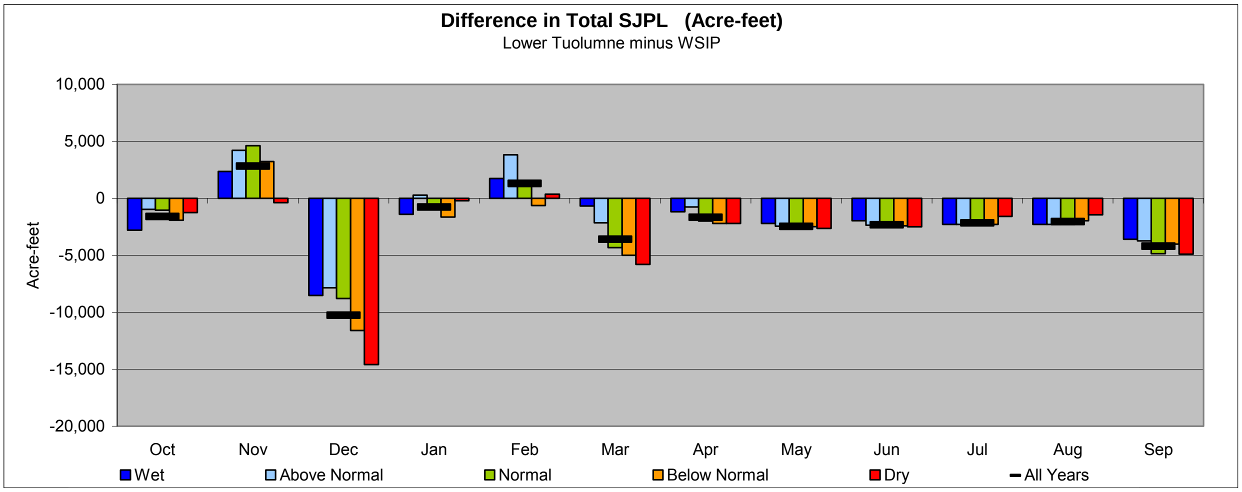
Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	27,417	16,624	8,533	11,512	7,401	11,072	21,613	26,698	25,836	29,873	29,873	28,909	245,359	242,680
Above Normal	26,381	14,460	7,852	14,254	9,306	16,705	24,111	28,687	27,761	29,873	29,873	28,909	258,169	258,169
Normal	25,830	14,656	8,776	15,448	12,041	22,339	28,403	29,873	28,909	29,873	29,873	28,909	274,929	274,849
Below Normal	27,220	15,998	11,595	21,574	18,621	24,976	28,909	29,571	28,617	29,873	29,548	27,945	294,447	295,146
Dry	25,931	19,593	14,583	19,883	17,417	25,782	28,909	29,873	28,909	29,165	28,904	27,281	296,229	298,165
All Years	26,562	16,241	10,254	16,568	12,982	20,191	26,392	28,945	28,011	29,735	29,617	28,391	273,887	273,872

Difference in Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Lower Tuolumne minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	-2,801	2,365	-8,533	-1,403	1,729	-678	-1,185	-2,200	-1,957	-2,284	-2,284	-3,591	-22,822	-21,698
Above Normal	-974	4,224	-7,852	285	3,826	-2,154	-769	-2,441	-2,362	-2,284	-2,284	-3,726	-16,509	-17,105
Normal	-1,035	4,621	-8,776	-820	1,171	-4,322	-1,991	-2,522	-2,440	-2,284	-2,284	-4,857	-25,541	-25,518
Below Normal	-1,926	3,228	-11,595	-1,651	-627	-4,997	-2,210	-2,485	-2,405	-2,284	-1,959	-4,008	-32,919	-33,133
Dry	-1,255	-374	-14,583	-202	360	-5,803	-2,210	-2,641	-2,498	-1,576	-1,434	-4,897	-37,112	-37,433
All Years	-1,594	2,835	-10,254	-756	1,299	-3,591	-1,669	-2,458	-2,333	-2,146	-2,051	-4,207	-26,925	-26,932

Figure 5.2-1



The lesser diversions from the Moccasin Reservoir source for the alternative setting during March through August is due to the assumed lesser conveyance capacity of the SJPL associated with the alternative setting. In the WSIP setting, conveyance is increased to 313 mgd, while in the alternative setting the capacity is not improved above the currently used 290-mgd capacity. The December reduction in conveyance is due to the annual maintenance associated with each setting. In the alternative setting, conveyance from the Moccasin Reservoir source is not available during December.

In the alternative setting, water would also be diverted by the SFPUC at a location in the lower Tuolumne River. The protocol for using the downstream diversion initiates with the local system calling for water from Hetch Hetchy. During March through August, the need is usually for all flow that can be provided because that period's system-wide delivery is greater than local watershed production. There is also an operational goal of the system to replenish and retain Bay Area reservoir storage, which calls for water from the Hetch Hetchy system. The 345-mgd capacity of the Coastal Tunnel physically limits the amount of water that could be conveyed from Hetch Hetchy, and determines the sizing of lower river diversion (345 mgd minus the 290-mgd capacity of the SJPL). During this season, the "first" 55 mgd is assigned to the lower Tuolumne River diversion. However, depending on the resultant SJPL residual, it may be slightly changed to provide an operation of the SJPL at one of its pre-set capacity rates. The SJPL is limited to operate at one of the set points, a minimum of 70 mgd (exceptions occur), zero during the maintenance period during December, or 210 mgd during November through March. During September through February, the lower Tuolumne River diversion fills in the call for Hetch Hetchy water that is greater than the available SJPL capacity (e.g., 290 mgd in October; 210 mgd in November, January, and February). During December, the SJPL capacity is zero, and the lower Tuolumne River diversion provides up to 55 mgd as needed. The lower Tuolumne River diversion is operated at assumed set points, 10, 20, 30, 40, 45, and 55 mgd.

Table 5.2-2 illustrates the modeled operation of the lower Tuolumne River diversion for the 82-year simulation period. The protocol generally produces a result that would develop releases and diversions during July and August; often but sporadic operation during March through June; more sporadic operation during November, January, and February; and a rare operation during October and September. Because of the SJPL outage during December, full operation of the diversion typically occurs. The "additional" flows occur below Hetch Hetchy Reservoir and La Grange. They do not reach beyond the Tuolumne River as they are recaptured at the lower Tuolumne River diversion. Table 5.2-3 illustrates the same diversion information in terms of monthly average volumes by year type.

The flow of the conveyance at the Coastal Tunnel fully describes the entire Tuolumne River diversion for the alternative. Figure 5.2-2 illustrates the average monthly diversion from the Tuolumne River Basin for the alternative and WSIP settings, and Table 5.2-4 illustrates the average monthly diversions for each setting and the differences between the two for each year type.

Table 5.2-2

Lower Tuolumne River Diversion (MGD)

Lower Tuolumne

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	0	0	55	0	0	50	55	55	55	55	55	0
1922	0	30	55	0	0	0	0	0	0	55	55	0
1923	0	0	55	0	0	50	55	55	55	55	55	0
1924	0	20	55	20	20	55	55	55	55	45	45	45
1925	45	0	45	0	0	45	45	45	55	55	55	0
1926	0	0	55	30	30	30	55	0	0	55	55	0
1927	0	0	55	0	0	0	0	55	55	55	55	0
1928	0	30	55	0	0	0	0	0	0	55	55	0
1929	0	0	55	0	0	55	55	55	55	55	55	0
1930	0	20	55	0	0	55	55	55	55	55	55	0
1931	0	20	55	20	20	55	55	55	55	45	45	0
1932	0	0	45	0	0	45	45	0	0	55	55	0
1933	0	20	55	20	20	55	55	55	55	55	55	55
1934	55	0	55	0	0	55	55	55	55	45	45	0
1935	0	20	45	0	0	45	45	45	45	55	55	0
1936	0	30	55	30	30	30	55	55	55	55	55	0
1937	0	20	55	20	20	0	55	0	0	55	55	0
1938	0	0	55	0	0	0	0	0	0	55	55	0
1939	0	0	55	0	0	55	55	55	55	55	55	0
1940	0	20	55	0	0	0	0	0	0	55	55	0
1941	0	20	55	0	0	0	0	0	0	55	55	0
1942	0	0	55	0	0	0	0	0	0	55	55	0
1943	0	20	55	0	0	0	55	0	0	55	55	0
1944	0	0	55	0	0	55	55	55	55	55	55	0
1945	0	20	55	20	20	20	55	0	0	55	55	0
1946	0	0	55	0	0	55	55	55	55	55	55	0
1947	0	0	55	0	0	55	55	55	55	55	55	0
1948	0	0	55	20	20	55	55	55	55	55	55	0
1949	0	20	55	20	20	30	55	0	0	55	55	0
1950	0	20	55	0	0	55	55	55	55	55	55	0
1951	0	0	55	0	0	30	55	0	0	55	55	0
1952	0	0	55	0	0	0	0	0	0	55	55	0
1953	0	20	55	0	0	50	55	55	55	55	55	0
1954	0	30	55	20	20	55	55	55	55	55	55	0
1955	0	20	55	0	0	55	55	55	55	55	55	0
1956	0	20	55	0	0	0	55	0	0	55	55	0
1957	0	0	55	0	0	55	55	55	55	55	55	0
1958	0	0	55	0	0	0	0	0	0	55	55	0
1959	0	0	55	0	0	50	55	55	55	55	55	0
1960	0	20	55	20	20	55	55	55	55	45	45	0
1961	0	10	45	20	20	45	45	45	45	45	45	0
1962	0	10	45	10	10	0	45	0	0	55	55	0
1963	0	30	55	0	0	20	0	0	0	55	55	0
1964	0	20	55	0	0	55	55	55	55	55	55	0
1965	0	20	55	0	0	50	0	0	0	55	55	0
1966	0	0	55	0	0	55	55	55	55	55	55	0
1967	0	0	55	0	0	0	0	0	0	55	55	0
1968	0	0	55	0	0	55	55	55	55	55	55	0
1969	0	30	55	0	0	0	0	0	0	55	55	0
1970	0	0	55	0	0	20	55	0	0	55	55	0
1971	0	0	55	0	0	55	55	55	55	55	55	0
1972	0	0	55	0	0	55	55	55	55	55	55	0
1973	0	0	55	0	0	0	55	0	0	55	55	0
1974	0	0	55	0	0	0	0	0	0	55	55	0
1975	0	0	55	0	0	0	0	0	0	55	55	0
1976	0	0	55	0	0	55	55	55	55	45	45	0
1977	0	10	45	10	10	45	45	45	45	45	45	0
1978	0	20	45	0	0	0	0	0	0	55	55	0
1979	0	30	55	0	0	50	55	55	55	55	55	0
1980	0	20	55	0	0	0	55	0	0	55	55	0
1981	0	20	55	0	0	55	55	55	55	55	55	0
1982	0	0	55	0	0	0	0	0	0	55	55	0
1983	0	0	55	0	0	0	0	0	0	55	55	55
1984	55	0	55	0	0	55	55	55	55	55	55	0
1985	0	0	55	0	0	55	55	55	55	55	55	0
1986	0	0	55	20	20	0	0	0	0	55	55	0
1987	0	0	55	20	20	55	55	55	55	45	45	0
1988	0	0	45	10	10	45	45	45	45	55	45	0
1989	0	0	45	10	10	45	45	45	55	55	45	0
1990	0	40	45	40	40	45	45	45	55	0	0	0
1991	0	0	45	0	0	45	45	0	0	55	45	0
1992	0	0	45	10	10	10	45	0	0	0	0	0
1993	0	0	45	0	0	0	0	0	0	55	55	0
1994	0	0	55	20	20	55	55	55	55	55	45	0
1995	0	20	45	0	0	0	0	0	0	55	55	0
1996	0	20	55	0	0	0	55	0	0	55	55	0
1997	0	0	55	0	0	50	55	55	55	55	55	0
1998	0	20	55	0	0	0	0	0	0	55	55	0
1999	0	0	55	0	0	0	0	0	0	55	55	0
2000	0	0	55	0	0	0	55	0	0	55	55	0
2001	0	20	55	20	20	50	55	55	55	55	55	0
2002	0	20	55	0	0	55	55	55	55	55	55	0
Avg (21-02)	2	10	53	5	5	31	38	29	29	53	52	2

Table 5.2-3

Lower Tuolumne River Diversion (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange)
Lower Tuolumne

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	863	5,054	119	107	595	950	327	317	5,232	5,232	317	19,111
Above Normal	308	1,137	5,120	280	253	1,371	2,275	1,175	1,137	5,232	5,232	0	23,520
Normal	268	1,036	5,113	297	269	3,211	4,632	3,211	3,165	5,232	5,232	0	31,665
Below Normal	0	758	5,120	784	708	4,812	4,956	4,253	4,170	5,176	5,064	298	36,099
Dry	327	691	4,935	1,011	913	4,697	4,776	4,667	4,575	4,162	4,043	259	35,055
All Years	180	898	5,070	499	451	2,941	3,520	2,726	2,672	5,012	4,965	174	29,108

Figure 5.2-2

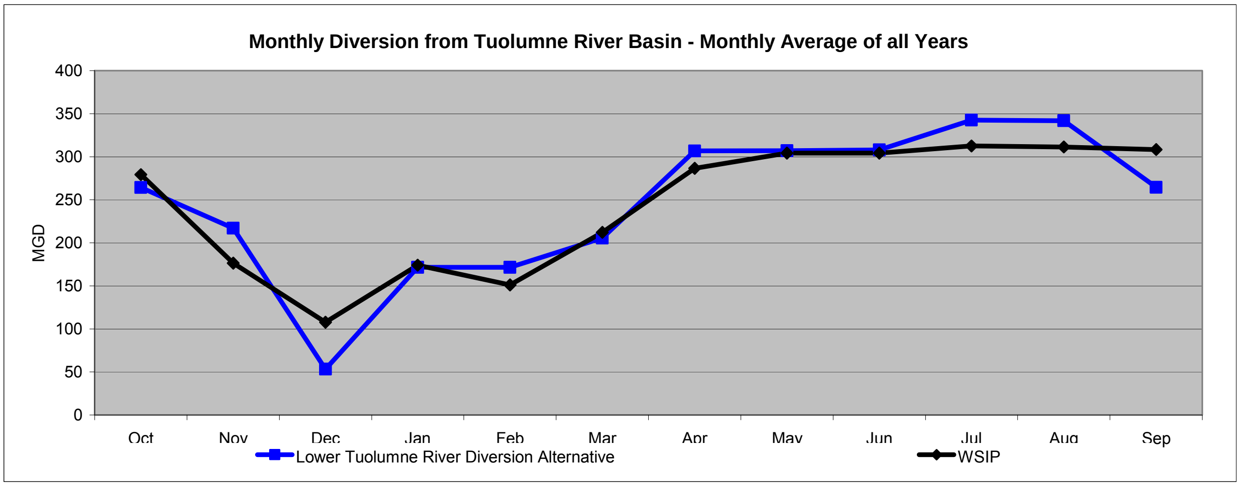


Table 5.2-4

Total Diversion from Tuolumne River Basin
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange)
Lower Tuolumne

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	24,616	19,852	5,054	10,227	9,237	10,988	21,377	24,824	24,196	32,822	32,822	25,635	241,651
Above Normal	25,715	19,821	5,121	14,819	13,385	15,921	25,616	27,421	26,537	32,822	32,822	25,183	265,183
Normal	25,062	20,312	5,114	14,924	13,480	21,227	31,044	30,562	29,634	32,822	32,822	24,052	281,056
Below Normal	25,295	19,984	5,121	20,706	18,702	24,791	31,655	31,339	30,382	32,766	32,654	24,235	297,630
Dry	25,003	19,909	4,935	20,692	18,690	24,676	31,475	31,900	30,986	31,752	31,514	22,643	294,175
All Years	25,147	19,974	5,070	16,310	14,732	19,541	28,243	29,214	28,350	32,601	32,532	24,358	276,072

Total Diversion from Tuolumne River Basin
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange)
WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	27,417	16,624	8,532	11,511	7,401	11,071	21,613	26,697	25,836	29,873	29,873	28,909	245,358
Above Normal	26,381	14,460	7,852	14,254	9,306	16,705	24,111	28,686	27,761	29,873	29,873	28,909	258,168
Normal	25,829	14,656	8,776	15,448	12,041	22,339	28,403	29,873	28,909	29,873	29,873	28,909	274,928
Below Normal	27,220	15,998	11,595	21,573	18,621	24,976	28,909	29,570	28,617	29,873	29,548	27,945	294,446
Dry	25,930	19,593	14,583	19,883	17,417	25,782	28,909	29,873	28,909	29,165	28,903	27,281	296,228
All Years	26,561	16,241	10,254	16,568	12,982	20,191	26,392	28,944	28,011	29,735	29,616	28,391	273,886

Difference in Total Diversion from Tuolumne River Basin
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange)
Lower Tuolumne minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	-2,801	3,228	-3,478	-1,284	1,837	-83	-236	-1,873	-1,640	2,949	2,949	-3,274	-3,706
Above Normal	-666	5,362	-2,731	565	4,079	-783	1,506	-1,265	-1,224	2,949	2,949	-3,726	7,015
Normal	-767	5,656	-3,663	-523	1,439	-1,112	2,641	690	725	2,949	2,949	-4,857	6,129
Below Normal	-1,925	3,986	-6,475	-867	81	-185	2,746	1,768	1,766	2,893	3,106	-3,710	3,184
Dry	-928	316	-9,647	809	1,273	-1,106	2,566	2,028	2,077	2,587	2,610	-4,638	-2,053
All Years	-1,414	3,733	-5,184	-258	1,750	-650	1,851	269	339	2,867	2,916	-4,033	2,186

The average total diversion from the Tuolumne River Basin is essentially the same for the alternative and the WSIP settings, with some variation between the two settings by year type.

The differences between the alternative's diversions from the Tuolumne River Basin and the base setting diversions are similarly illustrated. Table 5.2-5 illustrates the diversions and difference in diversions to the SJPL (from Moccasin Reservoir) for the alternative and base settings, averaged by month, by year type. This information is also illustrated in Figure 5.2-3 in terms of monthly average diversions for the simulation period. The average annual diversions associated with the alternative setting are about the same as for the base setting. The difference in diversions during December results from different facility maintenance assumptions for the two settings. The alternative incorporates a maintenance program that constrains conveyance through the SJPL during December. Following this maintenance period, larger diversions occur to replenish Bay Area reservoirs and to partially serve the additional demand associated with the alternative.

Table 5.2-5

Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Lower Tuolumne

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	24,616	18,989	0	10,109	9,130	10,394	20,427	24,497	23,880	27,589	27,589	25,318	222,537
Above Normal	25,407	18,684	0	14,539	13,132	14,551	23,341	26,246	25,399	27,589	27,589	25,183	241,660
Normal	24,795	19,276	0	14,628	13,212	18,017	26,411	27,351	26,469	27,589	27,589	24,052	249,388
Below Normal	25,295	19,226	0	19,923	17,994	19,979	26,699	27,085	26,212	27,589	27,589	23,937	261,528
Dry	24,676	19,219	0	19,682	17,777	19,979	26,699	27,232	26,411	27,589	27,470	22,384	259,117
All Years	24,967	19,076	0	15,811	14,281	16,600	24,723	26,487	25,677	27,589	27,566	24,184	246,962

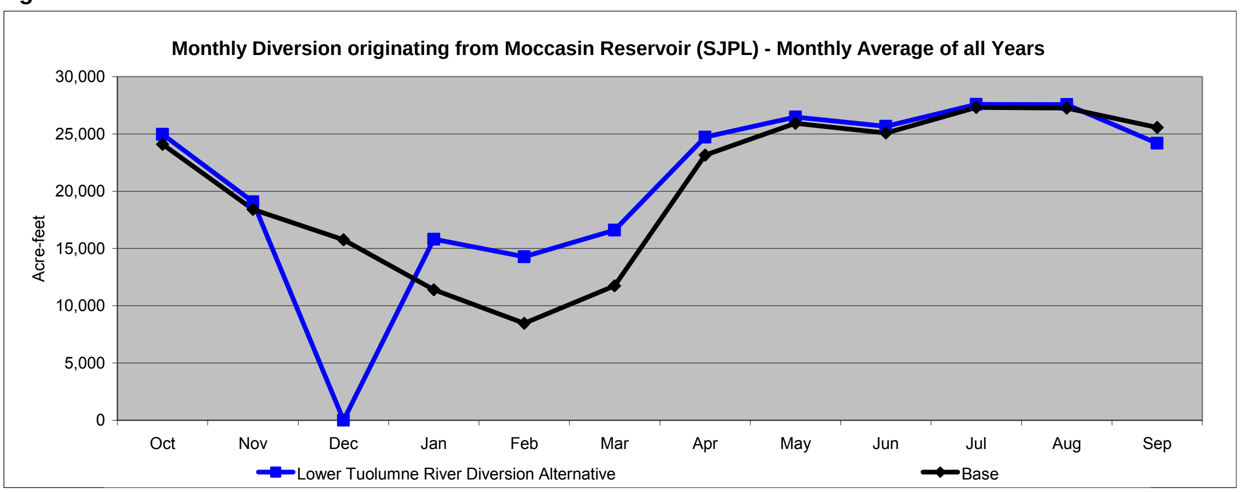
Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	24,260	18,126	13,783	8,028	6,015	7,433	16,031	23,070	22,326	27,589	27,589	26,009	220,258
Above Normal	24,176	17,926	14,204	9,100	6,157	9,279	20,309	24,679	23,883	27,589	27,589	25,887	230,776
Normal	23,368	19,046	14,390	9,930	6,864	10,632	25,951	27,054	26,181	27,589	27,589	26,009	244,601
Below Normal	24,959	17,980	17,964	15,726	11,808	15,334	26,699	27,589	26,699	26,917	26,917	25,670	264,263
Dry	23,665	19,046	18,433	14,080	11,386	15,936	26,699	27,232	26,354	26,876	26,578	24,225	260,509
All Years	24,097	18,413	15,763	11,398	8,459	11,737	23,147	25,930	25,093	27,311	27,253	25,565	244,165

Difference in Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Lower Tuolumne minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	357	863	-13,783	2,081	3,115	2,961	4,396	1,427	1,554	0	0	-691	2,280
Above Normal	1,231	758	-14,204	5,440	6,975	5,272	3,033	1,567	1,516	0	0	-704	10,884
Normal	1,427	230	-14,390	4,698	6,348	7,385	460	297	288	0	0	-1,956	4,787
Below Normal	336	1,245	-17,964	4,197	6,187	4,645	0	-504	-487	672	672	-1,733	-2,735
Dry	1,011	173	-18,433	5,602	6,391	4,043	0	0	58	714	892	-1,841	-1,392
All Years	870	662	-15,763	4,414	5,822	4,864	1,576	557	584	278	313	-1,381	2,797

Figure 5.2-3



In the alternative setting, additional SFPUC diversions occur at a location on the lower Tuolumne River. The flow of the conveyance at the Coastal Tunnel fully describes the entire Tuolumne River Basin diversion for the alternative. Figure 5.2-4 illustrates the average monthly diversion from the Tuolumne River Basin for the alternative and base settings, and Table 5.2-6 illustrates the average monthly diversions for each setting and the differences between the two for each year type. As illustrated in the discussion above, regarding the differences in basin diversions between the alternative and WSIP settings, the alternative essentially diverts the same amount of water from the basin as does the WSIP, with both settings diverting more than the base setting. The alternative diverts essentially the additional demand for the increase in purchase request and delivery reliability from the lower Tuolumne River.

Figure 5.2-4

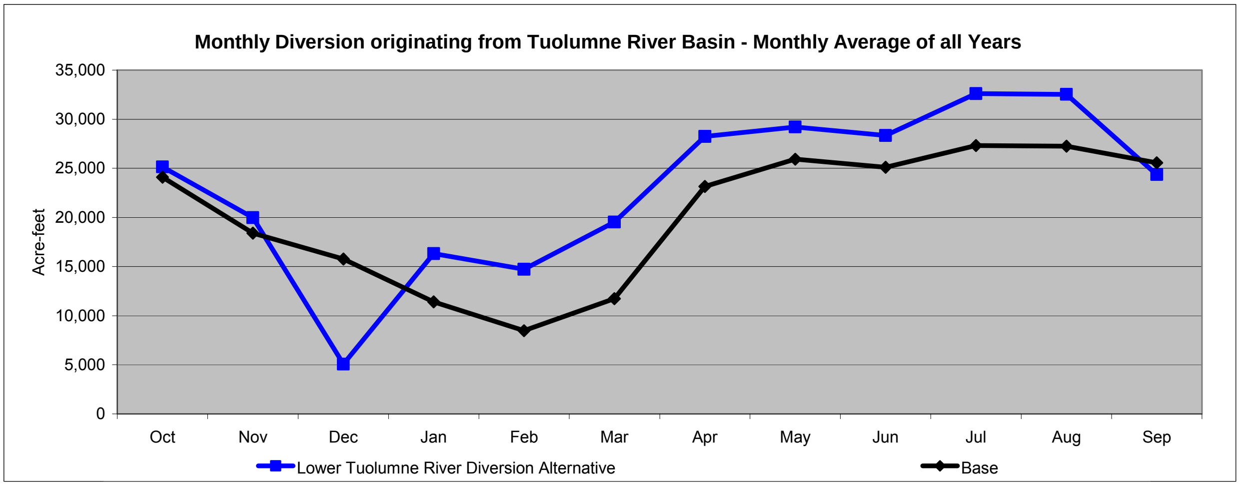


Table 5.2-6

Total Diversion from Tuolumne River Basin
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Lower Tuolumne

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	24,616	19,852	5,054	10,227	9,237	10,988	21,377	24,824	24,196	32,822	32,822	25,635	241,651
Above Normal	25,715	19,821	5,121	14,819	13,385	15,921	25,616	27,421	26,537	32,822	32,822	25,183	265,183
Normal	25,062	20,312	5,114	14,924	13,480	21,227	31,044	30,562	29,634	32,822	32,822	24,052	281,056
Below Normal	25,295	19,984	5,121	20,706	18,702	24,791	31,655	31,339	30,382	32,766	32,654	24,235	297,630
Dry	25,003	19,909	4,935	20,692	18,690	24,676	31,475	31,900	30,986	31,752	31,514	22,643	294,175
All Years	25,147	19,974	5,070	16,310	14,732	19,541	28,243	29,214	28,350	32,601	32,532	24,358	276,072

Total Diversion from Tuolumne River Basin
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	24,260	18,126	13,783	8,027	6,015	7,432	16,031	23,070	22,326	27,589	27,589	26,009	220,258
Above Normal	24,176	17,926	14,203	9,099	6,157	9,279	20,309	24,679	23,883	27,589	27,589	25,887	230,777
Normal	23,368	19,046	14,389	9,930	6,864	10,631	25,951	27,054	26,182	27,589	27,589	26,009	244,603
Below Normal	24,959	17,980	17,964	15,725	11,808	15,334	26,699	27,589	26,699	26,918	26,918	25,670	264,264
Dry	23,665	19,046	18,433	14,080	11,386	15,935	26,699	27,233	26,354	26,876	26,579	24,225	260,511
All Years	24,097	18,413	15,762	11,398	8,459	11,737	23,147	25,930	25,094	27,311	27,253	25,565	244,166

Difference in Total Diversion from Tuolumne River Basin
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Lower Tuolumne minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	357	1,726	-8,729	2,200	3,222	3,556	5,346	1,754	1,870	5,232	5,232	-374	21,393
Above Normal	1,539	1,895	-9,083	5,719	7,228	6,643	5,307	2,742	2,654	5,232	5,232	-704	34,406
Normal	1,695	1,266	-9,276	4,995	6,617	10,596	5,092	3,508	3,453	5,232	5,232	-1,956	36,453
Below Normal	336	2,004	-12,843	4,981	6,895	9,458	4,955	3,749	3,683	5,848	5,736	-1,435	33,366
Dry	1,338	863	-13,497	6,612	7,304	8,741	4,776	4,668	4,632	4,876	4,935	-1,582	33,664
All Years	1,050	1,561	-10,692	4,912	6,273	7,805	5,096	3,283	3,256	5,290	5,279	-1,207	31,906

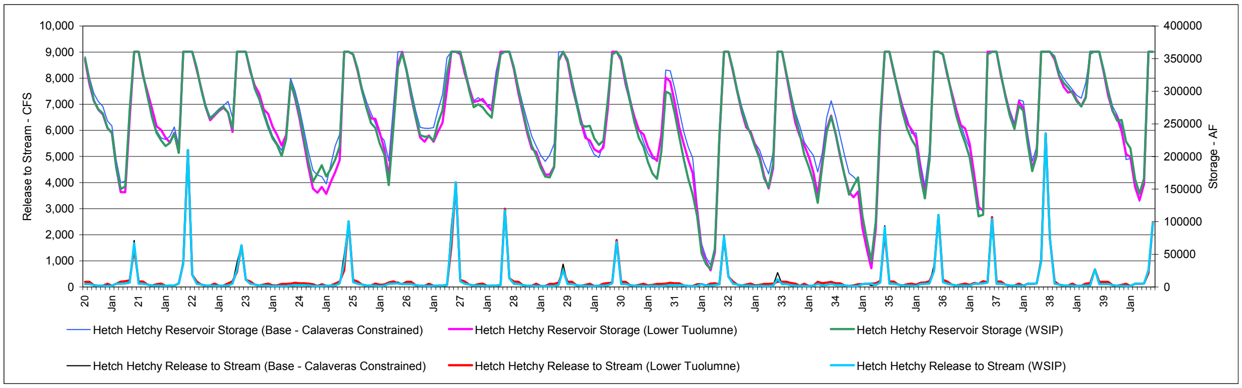
5.3 Hetch Hetchy Reservoir and Releases

Both the WSIP and alternative settings have the same underlying system-wide net demand for water (290 mgd), and would result in essentially the same draw of water from the Tuolumne River Basin. In the alternative setting, the need from the Bay Area system would be met from both diversion through the SJPL and the diversion in the lower Tuolumne River, and either diversion would still originate from water released from Hetch Hetchy Reservoir. Figure 5.3-1 illustrates a chronological trace of the simulation of Hetch Hetchy Reservoir storage and stream releases. Shown in Figure 5.3-1 are the results for the WSIP, base-Calaveras constrained ("Base – Calaveras Constrained") and alternative ("Lower Tuolumne") settings. Over the simulation period, the average annual release (Canyon Tunnel and stream release combined) from Hetch Hetchy Reservoir is about the same between the alternative and WSIP settings; however, the seasonal timing of the release is slightly different, predominantly due to the greater summer conveyance to the Bay Area system in the alternative setting and to the difference in conveyance maintenance. Table 5.3-1 illustrates the total releases from Hetch Hetchy Reservoir for the alternative and WSIP settings, and the difference between the two settings.

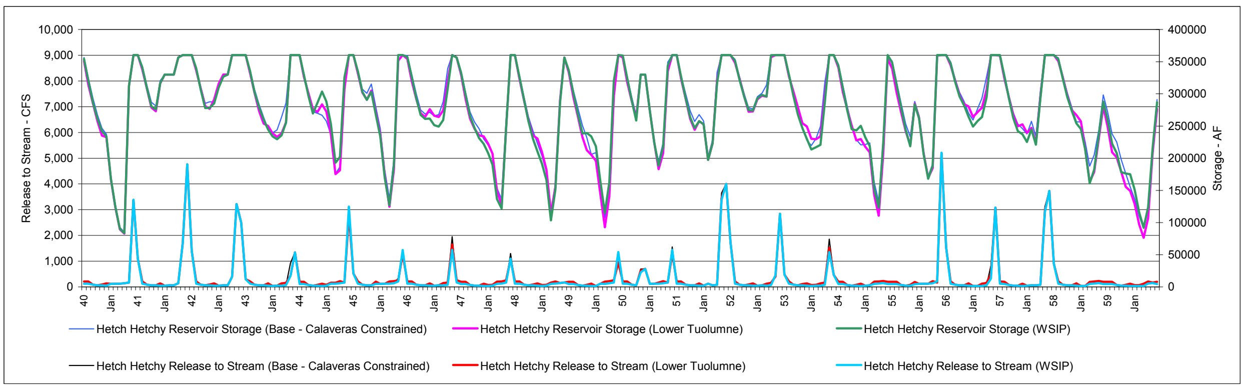
Storage in Hetch Hetchy Reservoir associated with the alternative setting could be either greater or less than anticipated for the WSIP setting, as seen in Figure 5.3-1. Figure 5.3-2 illustrates the average monthly storage for the alternative and WSIP settings.

Figure 5.3-1
Hetch Hetchy Reservoir Storage and Stream Release

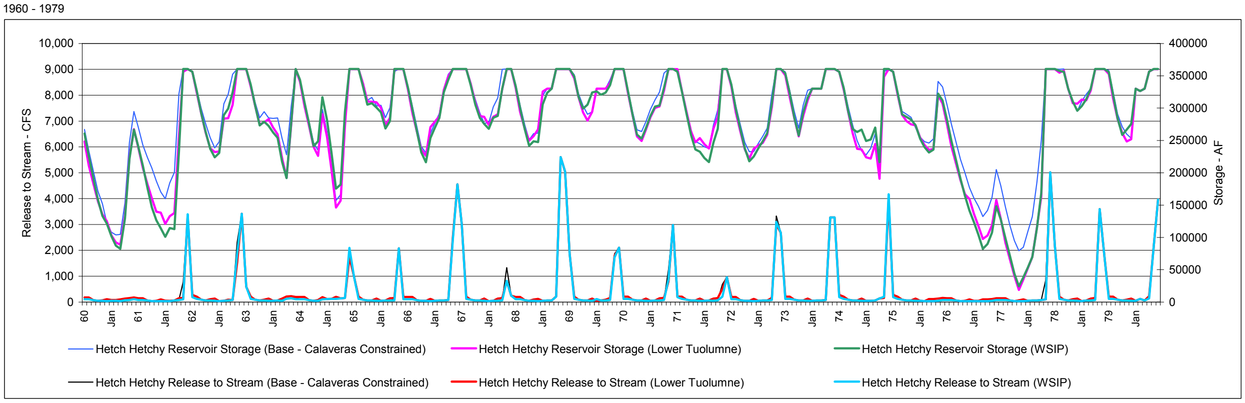
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

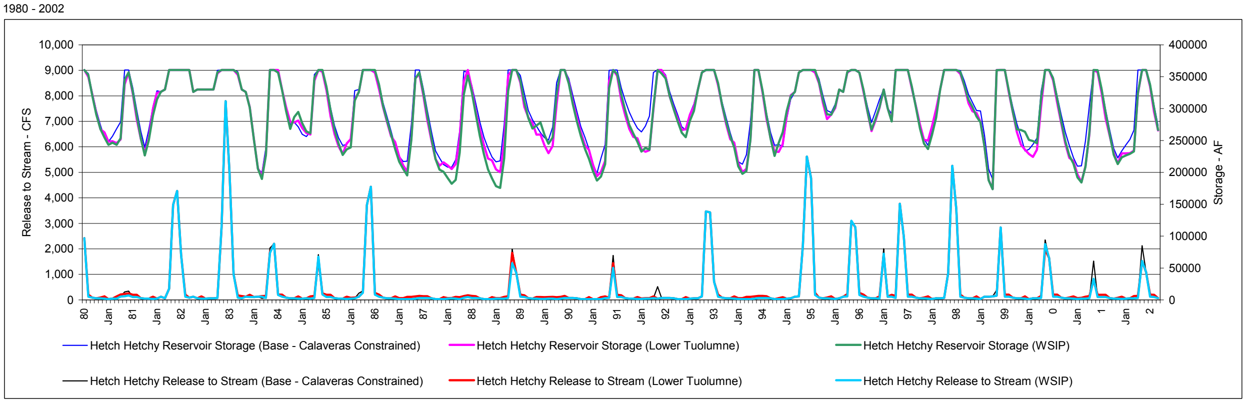


Table 5.3-1

Total Release from Hetch Hetchy Reservoir (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange)
Lower Tuolumne

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	33,218	26,119	25,210	40,453	43,830	55,651	60,211	228,218	348,593	205,316	53,494	33,884	1,154,195
Above Normal	31,242	33,931	28,655	42,991	50,695	57,330	69,597	146,607	260,579	92,958	42,475	32,404	889,463
Normal	30,483	25,452	16,252	26,201	36,275	44,461	57,114	155,057	190,067	59,335	42,302	31,080	714,079
Below Normal	30,626	25,143	10,580	25,415	27,763	47,572	57,090	110,977	106,190	43,420	41,439	30,484	556,700
Dry	30,237	24,975	11,022	25,587	26,895	36,196	44,609	58,402	54,259	39,003	38,766	28,408	418,360
All Years	31,156	27,182	18,375	32,180	37,144	48,345	57,861	139,582	191,729	87,523	43,653	31,257	745,987

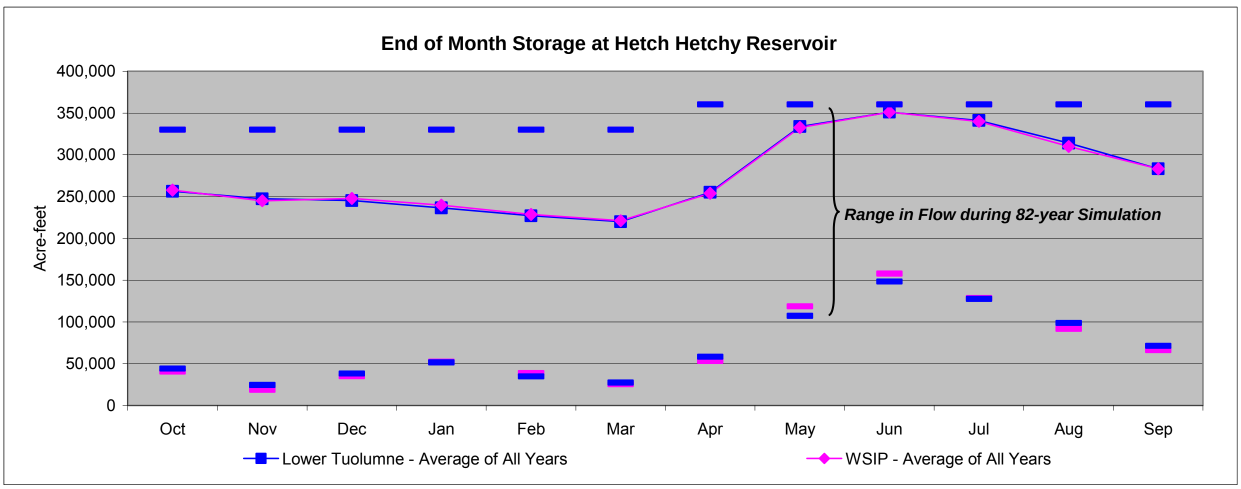
Total Release from Hetch Hetchy Reservoir (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange)
WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	36,134	23,063	28,547	42,219	40,887	53,752	59,883	228,164	349,966	205,070	51,221	37,019	1,155,924
Above Normal	32,330	27,836	29,984	43,071	48,601	56,030	67,921	150,556	263,777	92,821	39,526	36,129	888,582
Normal	31,245	19,796	20,124	28,153	34,961	44,608	54,332	154,996	192,895	58,107	39,353	35,936	714,503
Below Normal	32,551	21,157	16,963	26,236	27,508	47,790	53,197	108,239	105,608	41,174	38,334	34,194	552,951
Dry	31,164	24,658	20,465	24,733	25,437	37,148	41,269	57,450	53,095	36,417	36,155	33,046	421,037
All Years	32,679	23,331	23,223	32,926	35,542	47,964	55,448	139,625	192,864	86,237	40,869	35,262	745,969

Difference in Total Release from Hetch Hetchy Reservoir (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange)
Lower Tuolumne minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	-2,916	3,055	-3,337	-1,766	2,943	1,899	328	54	-1,373	246	2,273	-3,135	-1,729
Above Normal	-1,088	6,094	-1,329	-79	2,094	1,300	1,676	-3,949	-3,198	137	2,949	-3,725	881
Normal	-762	5,656	-3,872	-1,952	1,315	-147	2,782	61	-2,827	1,228	2,949	-4,856	-424
Below Normal	-1,925	3,986	-6,383	-822	255	-218	3,894	2,738	581	2,247	3,106	-3,709	3,749
Dry	-927	316	-9,443	854	1,458	-952	3,340	952	1,164	2,587	2,610	-4,638	-2,678
All Years	-1,523	3,851	-4,848	-746	1,602	381	2,413	-43	-1,135	1,286	2,784	-4,006	17

Figure 5.3-2



Hetch Hetchy Reservoir storage is drawn slightly more during summer in the alternative, as the combined release from Hetch Hetchy for the SJPL diversion (maximum 290 mgd) and the lower Tuolumne River diversion (maximum 55 mgd) are slightly greater than the combined releases for the SJPL diversion in the WSIP setting (maximum 313 mgd).

Similar to the WSIP setting comparison to the base setting, the comparison of the alternative setting's depiction of Hetch Hetchy Reservoir storage to the base setting storage would be a general reduction in storage for the alternative setting. The greater system-wide water demand of the alternative would draw additional water from Hetch Hetchy Reservoir. Figure 5.3-3 illustrates the average monthly storage for the alternative and base settings.

The difference in storage in Hetch Hetchy Reservoir attributed to the diversion effects of the alternative or WSIP settings compared to the base setting would manifest in differences in releases from O'Shaughnessy Dam to the stream. A different amount of available reservoir space in the winter and spring due to the WSIP would lead to a different ability to regulate inflow, thus potentially changing the amount of water released to the stream that is above minimum release requirements. In the case of the alternative, supplemental releases are explicitly made from Hetch Hetchy Reservoir to the stream to serve the diversion from the lower Tuolumne River. Figure 5.3-4 illustrates the difference in average monthly stream release from O'Shaughnessy Dam for the alternative and WSP settings by year type.

Figure 5.3-3

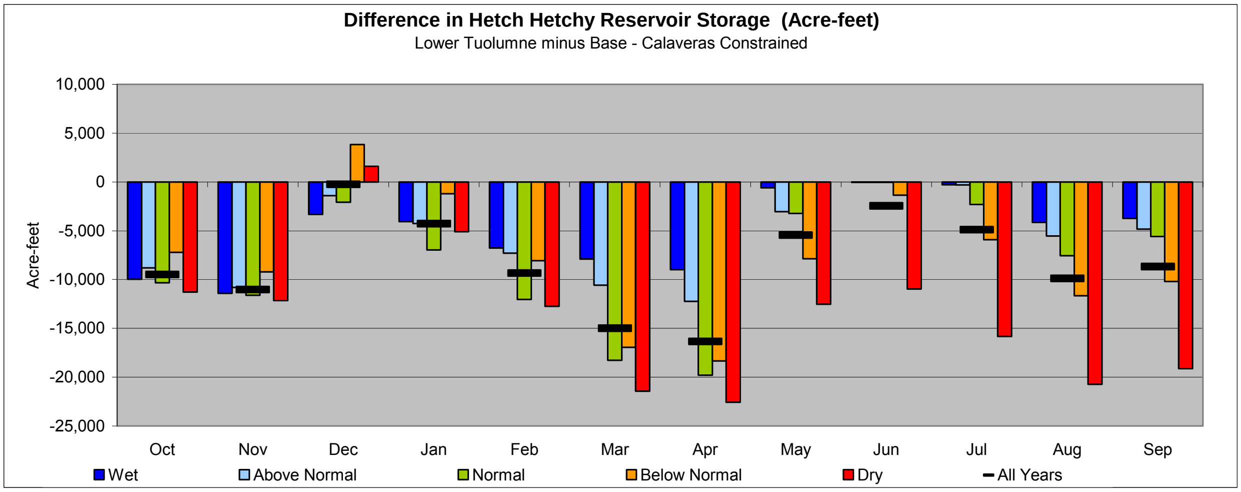


Figure 5.3-4

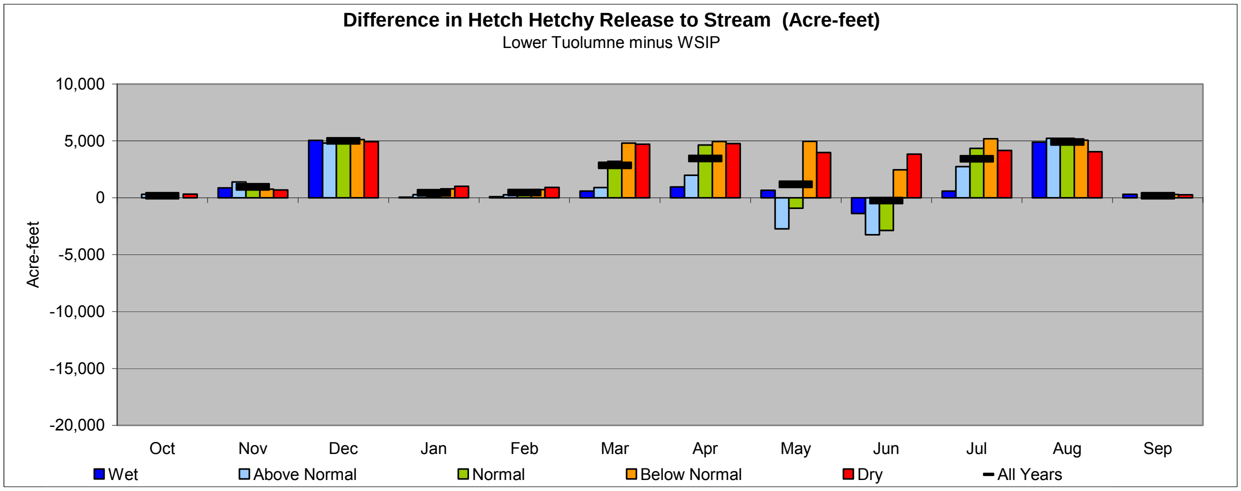


Figure 5.3-4 mirrors the results that were previously described regarding the lower Tuolumne River diversion. When the lower Tuolumne River diversion occurs, a corresponding release to the middle Tuolumne River from O'Shaughnessy Dam is made. A 5,000-acre-foot release is roughly equivalent to the 55-mgd diversion from the lower river.

Figure 5.3-5 compares stream releases from O'Shaughnessy Dam for the alternative and base settings. The change in release below O'Shaughnessy Dam in comparison to the base setting mostly mirrors the differences for the WSIP comparison. The exception occurs during the spring. The alternative draws additional water from Hetch Hetchy Reservoir to serve the greater system-wide demand, subsequently requiring greater replenishment of the reservoir, which typically results in a lesser stream release, predominantly during May or June, reflecting the months when releases to the stream above minimum release requirements are made in anticipation of filling the reservoir.

Supplementing Figure 5.3-4 (alternative comparison to WSIP) and Figure 5.3-5 (alternative comparison to base) are Table 5.3-2 and Table 5.3-3, which illustrate the difference in stream release from O'Shaughnessy Dam for the alternative compared to the WSIP and base settings, respectively.

Figure 5.3-5

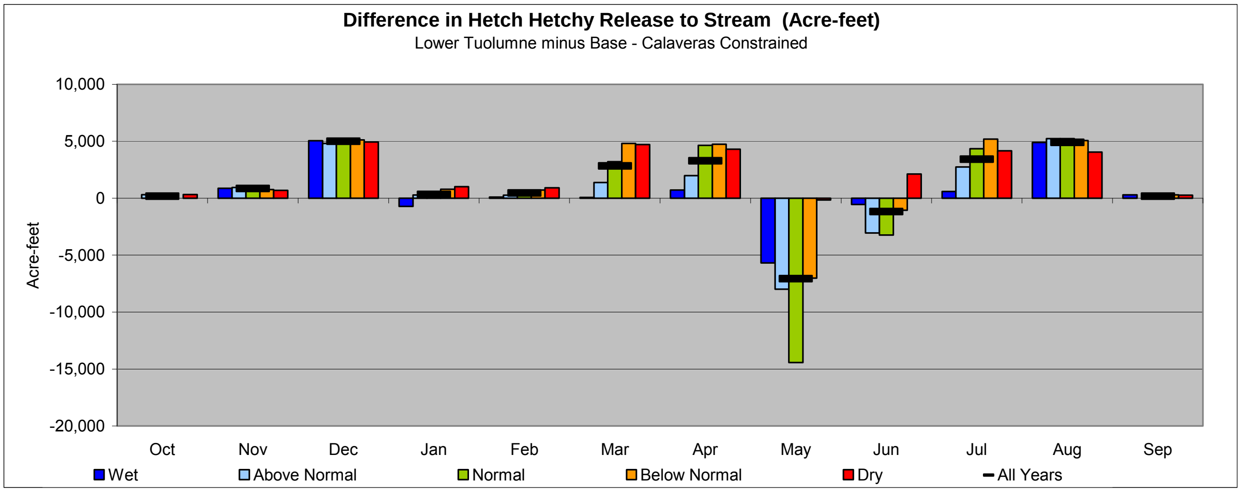


Table 5.3-2 and Table 5.3-3 illustrate the difference in stream release between the alternative setting and the WSIP and base settings, expressed in terms of a monthly volume (acre-feet) of flow. Although there are "enhanced" flows below O'Shaughnessy, the lower Tuolumne River diversion setting creates the same type of storage depletions at Hetch Hetchy Reservoir as the WSIP setting. These depletions affect the spills past O'Shaughnessy during replenishment, delaying the occurrence of releases to the stream in excess of minimum requirements. Figure 5.3-6 illustrates a sampling of the difference in stream releases below O'Shaughnessy Dam for the WSIP, alternative, and base settings. Illustrated are the additional flows during the year and the potential effect to releases during the reservoir's replenishment.

The difference in monthly flow below O'Shaughnessy Dam indicates a potential change in releases between the alternative and WSIP settings, ranging to a decrease of approximately 24,000 acre-feet. Considering the manner in which releases are determined and made to the stream, quantifying the effect of these changes in terms of average monthly flow (cfs) is not always meaningful.[18] Assuming that a change in release volume equates to a delay or earlier initiation of releasing 6,000 acre-feet per day, the difference in stream release from O'Shaughnessy Dam between the alternative and WSIP settings could be a delay in releases above minimum requirements by up to 4 days. Compared to the base setting, the delay could be up to 8 days. Normally, the effect of a delay in release would not affect the year's peak stream release rate during a year.

5.4 Lake Lloyd and Lake Eleanor

Compared to the operation in the WSIP setting, the operation of Lake Lloyd and Lake Eleanor are simulated to be essentially the same as in the alternative setting. Also, the operation resulting for the alternative and WSIP settings are essentially the same as in the base setting, because the Lake Lloyd and Lake Eleanor operation predominantly occur for the satisfaction of power generation needs and MID/TID entitlements to inflow. The lone exception in the simulation occurs during the prolonged drought of 1987-1992. During this drought period, there is a slightly different draw from Hetch Hetchy Reservoir in the different settings, which affects the amount of water released from Hetch Hetchy Reservoir to Don Pedro Reservoir; for satisfaction of MID/TID entitlements to inflow, this affects the amount of releases from Lake Lloyd. However, the effect is small and rarely occurs. A different storage level would result in Lake Lloyd manifesting as a change to releases to the stream above minimum requirements during a subsequent period of reservoir replenishment.

[18] See "Estimated Effect of WSIP on Daily Releases below Hetch Hetchy Reservoir", Memorandum by Daniel B. Steiner, December 31, 2006.

Table 5.3-2

Difference in Hetch Hetchy Release to Stream (Acre-feet)

Lower Tuolumne minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	5,232	0	0	4,757	5,064	5,233	-12,743	5,232	5,232	0	18,007
1922	0	2,762	5,232	0	0	0	0	779	0	0	5,232	0	14,005
1923	0	0	5,232	0	0	4,757	5,064	-5,229	0	0	5,232	0	15,056
1924	0	1,841	5,232	1,903	1,719	5,232	5,064	5,232	5,064	4,281	4,281	4,143	43,992
1925	4,281	0	4,281	0	0	4,281	4,143	-18,152	0	5,233	5,232	0	9,299
1926	0	0	5,232	2,854	2,578	2,854	5,064	0	0	5,232	5,232	0	29,046
1927	0	0	5,232	0	0	0	0	-23,846	0	3,311	5,232	0	-10,071
1928	0	2,762	5,232	0	0	0	0	3,849	0	5,232	5,232	0	22,307
1929	0	0	5,232	0	0	5,232	5,064	5,232	-1,793	5,232	5,232	0	29,431
1930	0	1,841	5,232	0	0	5,232	5,064	1,297	4,171	5,232	5,232	0	33,301
1931	0	1,841	5,232	1,903	1,719	5,232	5,064	5,232	5,064	4,281	4,281	0	39,849
1932	0	0	4,281	0	0	4,281	4,143	0	-3,334	0	5,232	0	14,603
1933	0	1,841	5,232	1,903	1,719	5,232	5,064	5,232	-5,933	5,615	5,232	5,064	36,201
1934	5,232	0	5,232	0	0	5,233	5,064	5,232	5,064	4,281	4,281	0	39,619
1935	0	1,841	4,281	0	0	346	4,143	4,281	-12,062	5,232	5,232	0	13,294
1936	0	2,762	5,232	2,854	2,578	2,854	5,064	375	0	5,233	5,232	0	32,184
1937	0	1,841	5,232	1,903	1,719	0	5,064	1,447	4,231	5,232	5,232	0	31,901
1938	0	0	5,232	0	0	0	0	2,941	0	0	5,232	0	13,405
1939	0	0	5,232	0	0	5,232	5,064	0	5,064	5,232	5,232	0	31,056
1940	0	1,841	5,232	0	0	0	0	-6,989	0	5,232	5,232	0	10,548
1941	0	1,841	5,232	0	0	0	0	0	-528	0	5,232	0	11,777
1942	0	0	5,232	0	0	0	0	-2	0	0	5,232	0	10,462
1943	0	1,841	5,232	0	0	0	40	0	0	0	5,232	0	12,345
1944	0	0	5,232	0	0	5,232	5,064	343	0	5,232	5,232	0	26,335
1945	0	1,841	5,232	1,903	1,719	1,903	5,064	0	-17,970	0	5,232	0	4,924
1946	0	0	5,233	0	0	5,233	5,064	2,479	-9,131	5,232	5,232	0	19,342
1947	0	0	5,232	0	0	5,232	5,064	12,508	5,064	5,232	5,232	0	43,564
1948	0	0	5,232	1,903	1,719	5,233	5,064	5,233	-611	5,232	5,232	0	34,237
1949	0	1,841	5,232	1,903	1,719	2,854	5,064	0	0	5,232	5,232	0	29,077
1950	0	1,841	5,232	0	0	5,233	5,064	5,233	-23,956	5,232	5,232	0	9,111
1951	0	4,180	0	0	0	2,854	5,064	0	-8,732	5,448	5,232	0	14,046
1952	0	0	5,232	0	0	0	0	3,618	0	0	5,232	0	14,082
1953	0	1,841	5,232	0	0	4,757	5,064	-3,214	0	0	5,232	0	18,912
1954	0	2,762	5,232	1,903	1,719	5,232	5,064	10,174	0	5,232	5,232	0	42,550
1955	0	1,841	5,232	0	0	5,233	5,064	5,233	5,064	5,232	5,232	0	38,131
1956	0	1,841	5,233	0	0	0	5,064	-2,536	-1,056	0	5,232	0	13,778
1957	0	0	5,232	0	0	5,232	5,064	11,737	0	5,232	5,232	0	37,729
1958	0	0	5,232	0	0	0	0	2,477	0	0	5,232	0	12,941
1959	0	0	5,232	0	0	4,757	5,064	5,233	5,064	5,232	5,232	0	35,814
1960	0	1,841	5,232	1,903	1,719	5,232	5,064	1,297	5,064	4,281	4,281	0	35,914
1961	0	921	4,281	1,903	1,719	4,281	4,143	4,281	4,143	4,281	4,281	0	34,234
1962	0	921	4,281	951	859	0	4,143	3,935	-4,173	5,233	5,232	0	21,382
1963	0	2,762	5,232	0	0	1,903	0	-19,448	0	0	5,232	0	-4,319
1964	0	1,841	5,232	0	0	5,232	5,064	5,233	5,064	5,232	5,232	0	38,130
1965	0	1,841	5,233	0	0	4,757	0	0	-20,970	0	5,232	0	-3,907
1966	0	0	5,232	0	0	5,232	5,064	0	5,064	5,232	5,232	0	31,056
1967	0	0	5,232	0	0	0	0	5,857	0	0	5,232	0	16,321
1968	0	0	5,232	0	0	5,232	5,064	-509	0	5,232	5,232	0	25,483
1969	0	2,762	5,232	0	0	0	40	0	0	0	5,232	0	13,266
1970	0	0	5,232	-3,935	0	1,903	5,064	3,341	0	5,232	5,232	0	22,069
1971	0	0	5,232	0	0	5,232	5,064	-4,322	0	1,297	5,232	0	17,735
1972	0	0	5,232	0	0	5,232	5,064	18,809	0	5,232	5,232	0	44,801
1973	0	0	5,232	0	0	0	5,064	-5,448	0	5,232	5,232	0	15,312
1974	0	0	5,232	0	0	0	0	0	0	5,233	5,232	0	15,697
1975	0	0	5,232	0	0	0	0	-2,359	-12,613	5,233	5,232	0	725
1976	0	0	5,232	0	0	5,232	5,064	5,232	5,064	4,281	4,281	0	34,386
1977	0	921	4,281	951	859	4,281	4,143	4,281	4,143	4,281	4,281	0	32,422
1978	0	1,841	4,281	0	0	0	0	0	0	0	5,232	0	11,354
1979	0	2,762	5,232	0	0	4,757	5,064	0	0	5,232	5,232	0	28,279
1980	0	1,841	5,232	0	0	0	5,064	-2	0	0	5,232	0	17,367
1981	0	1,841	5,232	0	0	5,232	5,064	5,233	5,064	5,232	5,232	0	38,130
1982	0	0	5,232	0	0	0	40	0	0	0	5,232	0	10,504
1983	0	0	5,232	0	0	0	0	-1,919	0	0	0	5,064	8,377
1984	5,232	0	5,233	0	0	1,297	5,064	1,795	0	1,297	5,232	0	25,150
1985	0	0	5,232	0	0	5,232	5,064	-5,033	2,684	5,232	5,232	0	23,643
1986	0	0	5,232	1,903	1,719	0	40	0	0	4,176	5,232	0	18,302
1987	0	0	5,232	1,903	1,719	5,232	5,064	5,232	5,064	4,281	4,281	0	38,008
1988	0	0	4,281	951	859	4,281	4,143	4,281	4,143	5,232	4,281	0	32,452
1989	0	0	4,281	951	859	4,281	4,143	24,654	0	5,232	4,281	0	48,682
1990	0	3,683	4,281	3,805	3,437	4,281	4,143	4,281	5,064	0	0	0	32,975
1991	0	0	4,281	0	0	4,281	4,143	0	11,085	5,232	4,281	0	33,303
1992	0	0	4,281	951	859	951	4,143	0	0	0	0	0	11,185
1993	0	0	4,281	0	0	0	0	-2	0	0	5,232	0	9,511
1994	0	0	5,232	1,903	1,719	5,232	5,064	5,232	5,064	5,232	4,281	0	38,959
1995	0	1,841	4,281	0	0	0	0	-2	0	0	5,011	0	11,131
1996	0	1,841	5,232	0	0	0	5,064	-1,262	0	5,233	5,232	0	21,340
1997	0	0	5,232	-1,158	0	4,757	5,064	0	0	5,232	5,232	0	24,359
1998	0	1,841	5,232	0	0	0	0	0	0	0	5,232	0	12,305
1999	0	0	5,232	0	0	0	0	420	127	5,232	5,232	0	16,243
2000	0	0	5,232	0	0	0	5,064	-12,589	0	5,232	5,232	0	8,171
2001	0	1,841	5,232	1,903	1,719	4,757	5,064	-2,213	5,064	5,232	5,232	0	33,831
2002	0	1,841	5,232	0	0	5,232	5,064	-1,481	0	5,232	5,232	0	26,352
Avg (21-02)	180	949	5,006	437	451	2,845	3,460	1,189	-242	3,419	4,899	174	22,766

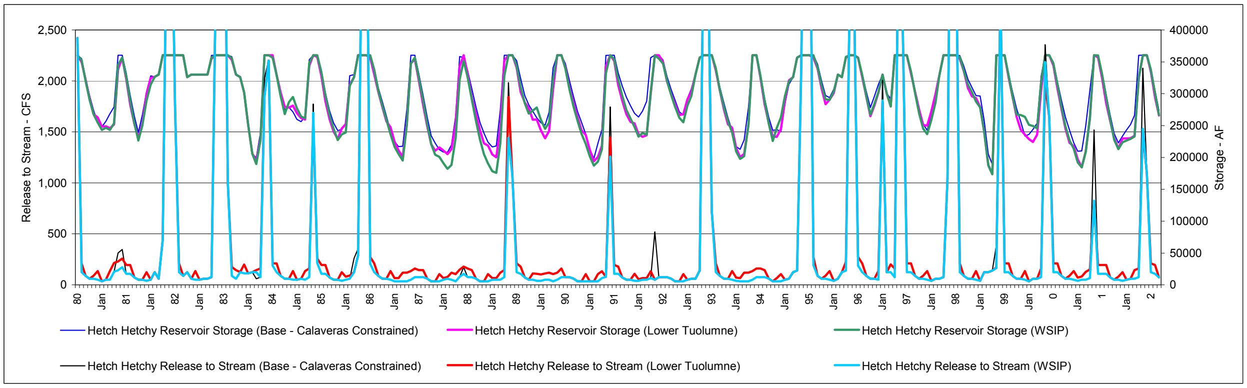
Table 5.3-3

Difference in Hetch Hetchy Release to Stream (Acre-feet)

Lower Tuolumne minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	5,232	0	0	4,757	5,064	5,233	-19,537	5,232	5,232	0	11,213
1922	0	2,762	5,232	0	0	0	0	-8,106	0	0	5,232	0	5,120
1923	0	0	5,232	0	0	4,757	5,064	-22,266	0	0	5,232	0	-1,981
1924	0	1,841	5,232	1,903	1,719	5,232	5,064	5,232	5,064	4,281	4,281	4,143	43,992
1925	4,281	0	4,281	0	0	4,281	4,143	-36,385	0	5,233	5,232	0	-8,934
1926	0	0	5,232	2,854	2,578	2,854	5,064	-2,913	0	5,232	5,232	0	26,133
1927	0	0	5,232	0	0	0	0	-48,034	0	3,311	5,232	0	-34,259
1928	0	2,762	5,232	0	0	0	0	0	0	5,232	5,232	0	18,458
1929	0	0	5,232	0	0	5,232	5,064	5,232	-15,016	5,232	5,232	0	16,208
1930	0	1,841	5,232	0	0	5,232	5,064	1,297	4,171	5,232	5,232	0	33,301
1931	0	1,841	5,232	1,903	1,719	5,232	5,064	5,232	5,064	4,281	4,281	0	39,849
1932	0	0	4,281	0	0	4,281	4,143	0	-5,970	0	5,232	0	11,967
1933	0	1,841	5,232	1,903	1,719	5,232	5,064	5,232	-20,883	5,615	5,232	5,064	21,251
1934	5,232	0	5,232	0	0	5,233	1,256	5,232	5,064	4,281	4,281	0	35,811
1935	0	1,841	4,281	0	0	4,281	4,143	4,281	-15,936	5,232	5,232	0	13,355
1936	0	2,762	5,232	2,854	2,578	2,854	5,064	-13,135	0	5,233	5,232	0	18,674
1937	0	1,841	5,232	1,903	1,719	0	5,064	-1,696	0	5,232	5,232	0	24,527
1938	0	0	5,232	0	0	0	0	-8,398	0	0	5,232	0	2,066
1939	0	0	5,232	0	0	5,232	1,256	4,045	5,064	5,232	5,232	0	31,293
1940	0	1,841	5,232	0	0	0	0	1,359	0	5,232	5,232	0	18,896
1941	0	1,841	5,232	0	0	0	0	0	-1,725	0	5,232	0	10,580
1942	0	0	5,232	0	0	0	0	-2	0	0	5,232	0	10,462
1943	0	1,841	5,232	0	0	0	40	0	0	0	5,232	0	12,345
1944	0	0	5,232	0	0	5,232	5,064	-30,360	0	5,232	5,232	0	-4,368
1945	0	1,841	5,232	1,903	1,719	1,903	5,064	0	-4,809	0	5,232	0	18,085
1946	0	0	5,233	0	0	5,233	5,064	-5,157	-9,131	5,232	5,232	0	11,706
1947	0	0	5,232	0	0	5,232	5,064	-18,938	5,064	5,232	5,232	0	12,118
1948	0	0	5,232	1,903	1,719	5,233	5,064	5,233	-12,666	5,232	5,232	0	22,182
1949	0	1,841	5,232	1,903	1,719	2,854	5,064	0	0	5,232	5,232	0	29,077
1950	0	1,841	5,232	0	0	5,233	5,064	5,233	-18,846	5,232	5,232	0	14,221
1951	0	-3,486	0	0	0	2,854	5,064	0	-14,945	5,448	5,232	0	167
1952	0	0	5,232	0	0	0	0	-12,532	0	0	5,232	0	-2,068
1953	0	1,841	5,232	0	0	4,757	5,064	-3,536	0	0	5,232	0	18,590
1954	0	2,762	5,232	1,903	1,719	5,232	5,064	-20,810	0	5,232	5,232	0	11,566
1955	0	1,841	5,232	0	0	5,233	5,064	5,233	5,064	5,232	5,232	0	38,131
1956	0	1,841	5,233	0	0	0	5,064	-5,342	-1,056	0	5,232	0	10,972
1957	0	0	5,232	0	0	5,232	5,064	-19,991	0	5,232	5,232	0	6,001
1958	0	0	5,232	0	0	0	0	-10,061	0	0	5,232	0	403
1959	0	0	5,232	0	0	4,757	5,064	5,233	5,064	5,232	5,232	0	35,814
1960	0	1,841	5,232	1,903	1,719	5,232	5,064	1,297	5,064	4,281	4,281	0	35,914
1961	0	921	4,281	1,903	1,719	4,281	4,143	4,281	4,143	4,281	4,281	0	34,234
1962	0	921	4,281	951	859	0	4,143	-37,719	-4,173	5,233	5,232	0	-20,272
1963	0	2,762	5,232	0	0	1,903	0	-47,716	0	0	5,232	0	-32,587
1964	0	1,841	5,232	0	0	5,232	5,064	5,233	1,256	5,232	5,232	0	34,322
1965	0	1,841	5,233	0	0	4,757	0	0	-7,756	0	5,232	0	9,307
1966	0	0	5,232	0	0	5,232	1,256	4,045	5,064	5,232	5,232	0	31,293
1967	0	0	5,232	0	0	0	0	-2,866	0	0	5,232	0	7,598
1968	0	0	5,232	0	0	5,232	5,064	-31,457	0	5,232	5,232	0	-5,465
1969	0	2,762	5,232	0	0	0	40	0	0	0	5,232	0	13,266
1970	0	0	5,232	0	0	1,903	5,064	-5,022	0	5,232	5,232	0	17,641
1971	0	0	5,232	0	0	5,232	5,064	-27,958	0	1,297	5,232	0	-5,901
1972	0	0	5,232	0	0	5,232	5,064	-10,648	0	5,232	5,232	0	15,344
1973	0	0	5,232	0	0	0	5,064	-19,842	0	5,232	5,232	0	918
1974	0	0	5,232	0	0	0	0	0	0	5,233	5,232	0	15,697
1975	0	0	5,232	0	0	0	0	0	-8,442	5,233	5,232	0	7,255
1976	0	0	5,232	0	0	5,232	5,064	5,232	5,064	4,281	4,281	0	34,386
1977	0	921	4,281	951	859	4,281	4,143	4,281	4,143	4,281	4,281	0	32,422
1978	0	1,841	4,281	0	0	0	0	-46,590	0	0	5,232	-310	-35,546
1979	0	2,762	5,232	0	0	4,757	5,064	0	0	5,232	5,232	0	28,279
1980	0	1,841	5,232	0	0	0	5,064	-2	0	0	5,232	0	17,367
1981	0	1,841	5,232	0	0	5,232	5,064	-5,174	-5,246	5,232	5,232	0	17,413
1982	0	0	5,232	0	0	0	40	0	0	0	5,232	0	10,504
1983	0	0	5,232	0	0	0	0	-5,050	0	0	0	5,064	5,246
1984	5,232	0	5,233	0	0	5,232	5,064	-9,950	0	1,297	5,232	0	17,340
1985	0	0	5,232	0	0	5,232	5,064	-10,268	2,684	5,232	5,232	0	18,408
1986	0	0	5,232	1,903	1,719	-8,478	-3,895	0	0	4,176	5,232	0	5,889
1987	0	0	5,232	1,903	1,719	5,232	5,064	5,232	5,064	4,281	4,281	0	38,008
1988	0	0	4,281	951	859	4,281	4,143	4,281	335	5,232	4,281	0	28,644
1989	0	0	4,281	951	859	4,281	4,143	-8,700	0	5,232	4,281	0	15,328
1990	0	3,683	4,281	3,805	3,437	4,281	4,143	4,281	5,064	0	0	0	32,975
1991	0	0	4,281	0	0	4,281	4,143	0	-17,889	5,232	4,281	0	4,329
1992	0	0	4,281	951	859	951	4,143	-28,918	0	0	0	0	-17,733
1993	0	0	4,281	0	0	0	0	-2	0	0	5,232	0	9,511
1994	0	0	5,232	1,903	1,719	5,232	5,064	5,232	5,064	5,232	4,281	0	38,959
1995	0	1,841	4,281	0	0	0	0	-2	0	0	5,011	0	11,131
1996	0	1,841	5,232	0	0	0	5,064	-1,262	0	5,233	5,232	0	21,340
1997	0	0	5,232	-13,234	0	4,757	5,064	0	0	5,232	5,232	0	12,283
1998	0	1,841	5,232	0	0	0	0	0	0	0	5,232	0	12,305
1999	0	0	5,232	0	0	0	0	-13,071	0	5,232	5,232	0	2,625
2000	0	0	5,232	0	0	0	5,064	-22,887	0	5,232	5,232	0	-2,127
2001	0	1,841	5,232	1,903	1,719	4,757	5,064	-44,880	5,064	5,232	5,232	0	-8,836
2002	0	1,841	5,232	0	0	5,232	5,064	-37,929	0	5,232	5,232	0	-10,096
Avg (21-02)	180	856	5,006	338	451	2,838	3,273	-7,059	-1,176	3,419	4,899	170	13,193

Figure 5.3-6
Hetch Hetchy Reservoir Storage and Stream Release (Sample with enlarged flow scale)



5.5 Flow below Tuolumne River and Cherry River Confluence

The flow that occurs below the confluence of the Tuolumne River and Cherry River is considered important to recreational activity (white water rafting) during May through September. To estimate the effect of Hetch Hetchy operations on the occurrence of flow at this location, HH/LSM monthly volumetric flow results were post-processed to reflect the daily and hourly shaping potential currently exercised by Hetch Hetchy operators to satisfy water and power objectives while accommodating the desires of recreational interests.[19] Compared to the WSIP setting, the alternative setting would typically result in greater flow at the location, particularly during July and August when the lower Tuolumne River diversion is occurring and coincidentally triggering a supplemental release to the middle Tuolumne River from O'Shaughnessy Dam. The supplemental release associated with a 55-mgd lower Tuolumne River diversion is approximately 85 cfs.

The same result essentially occurs in the comparison of the alternative setting to the base setting. However, in that comparison, the combined effect of the supplemental lower Tuolumne River diversion releases and the reduction to releases above minimum release requirements caused by system-wide demand increase replenishment typically leads to a reduction in flow at the location during May and June (the same underlying effect attributed to the WSIP setting). However, there would only be a rare occurrence when the shaped flow of the alternative would cross the threshold of being less than 1,000 cfs, as compared to greater than 1,000 cfs in the base setting. While in both the alternative and base settings there are occasional dry and critical years, there could be instances when the shaped flow would be less than 1,000 cfs; however, results indicate that it would be rare for the alternative setting to increase that frequency.

5.6 Don Pedro Reservoir and La Grange Releases

A change in Don Pedro Reservoir operation is caused by changes to inflow to and releases from the reservoir. The changes in inflow to the reservoir are the result of net changes within the operation of the upstream SFPUC facilities, described previously, and other changes in SFPUC operations associated with diversions to the Holm, Kirkwood, and Moccasin Powerhouses. In the alternative setting, the supplemental releases made from Hetch Hetchy Reservoir for the lower Tuolumne River diversion also affect inflow to Don Pedro Reservoir. The lower Tuolumne River diversion also affects releases from Don Pedro Reservoir.

Figure 5.6-1 illustrates the difference in inflow to Don Pedro Reservoir between the alternative and WSIP settings, averaged by month for each year type. The results are consistent with the intent of the alternative's operation, which shifts the effect of the increase in Tuolumne River diversion from upstream of Don Pedro Reservoir. Instead of reducing inflow to Don Pedro by diverting the additional flow to the SJPL from upstream, the otherwise diverted flow is released to the middle Tuolumne River and flows into Don Pedro Reservoir.

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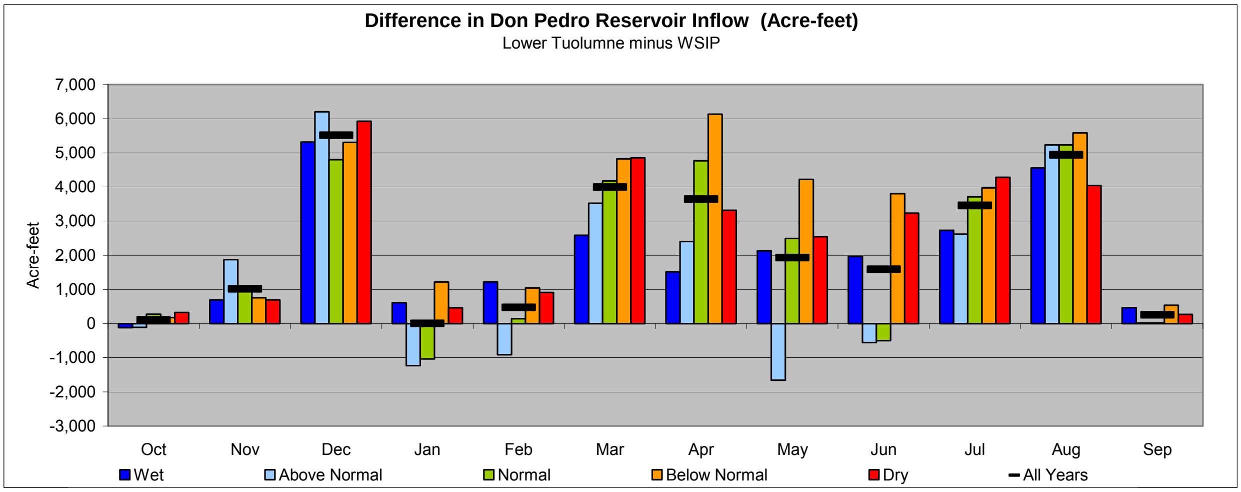
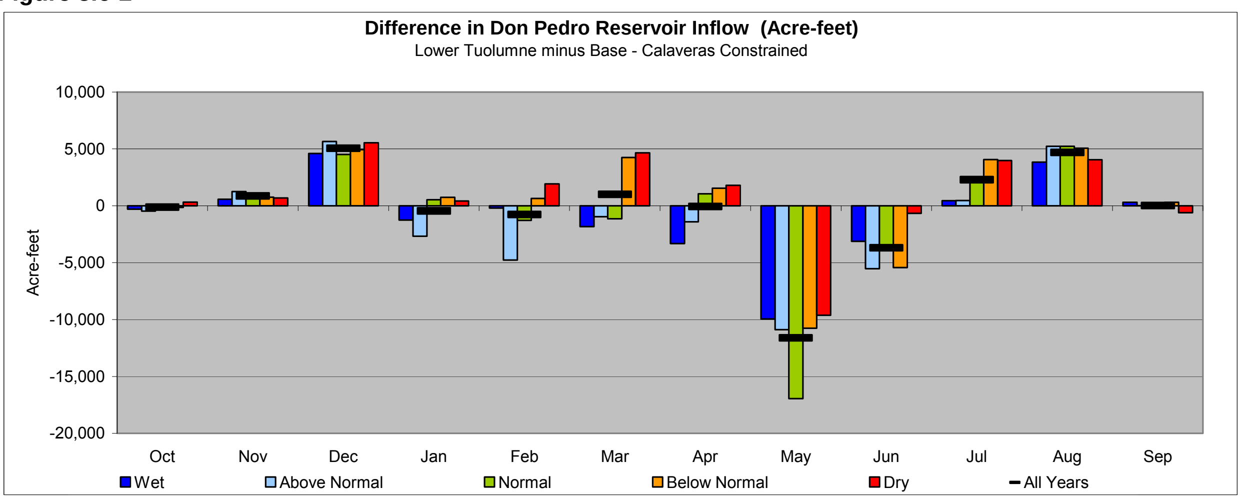
[19] See "HH/LSM Assumptions and Results – Proposed WSIP", Memorandum by Daniel B. Steiner, March 18, 2007.

Figure 5.6-1



The comparison of inflow to Don Pedro Reservoir between the alternative and base settings is illustrated in Figure 5.6-2. The illustration shows that all of the effects to inflow to Don Pedro Reservoir attributable to additional diversions from the Tuolumne River Basin are not eliminated with the lower Tuolumne River diversion. Shifts in the timing of inflow to Don Pedro Reservoir would occur due to changes in the seasonal operation of the entire SFPUC system, including a different maintenance program. Also, in this configuration of the alternative, there occurs an increase (albeit, a relatively small one) in upstream diversions to the Bay Area system.

Figure 5.6-2

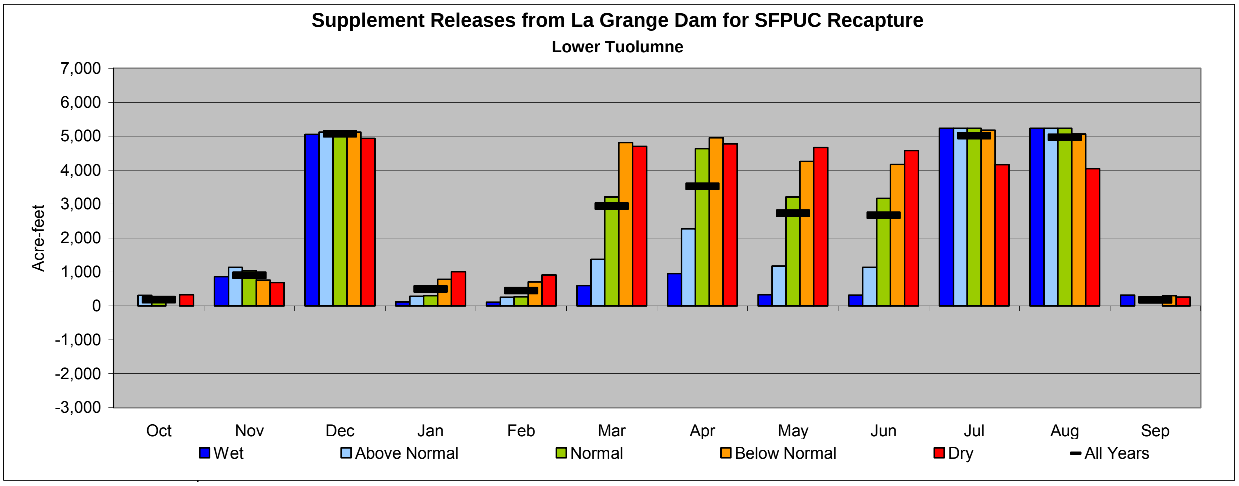


Generally coincident with the changes to inflow to Don Pedro Reservoir would be changes to releases from La Grange Dam to the lower Tuolumne River. The alternative setting assumes that the SFPUC diversion at the lower Tuolumne River location would recapture releases from La Grange Dam that are explicitly made for the diversion. These releases would be in addition to releases made for compliance to the FERC release requirements. Described previously (in Table 5.2-3) are the modeled diversions at the lower Tuolumne River diversion location. Table 5.6-1 illustrates the same information, expressed as average monthly flow rates by year type, that would supplement La Grange Dam releases to serve the SFPUC diversions. The supplemental flows are also illustrated in Figure 5.6-3.

Table 5.6-1

Supplemental Release at La Grange Dam for SFPUC Recapture - CFS (Average within Year Type - Grouped by Unimpaired Runoff at LaGrange)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
											Lower Tuolumne	
Wet	0	15	82	2	2	10	16	5	5	85	85	5
Above Normal	5	19	83	5	5	22	38	19	19	85	85	0
Normal	4	17	83	5	5	52	78	52	53	85	85	0
Below Normal	0	13	83	13	13	78	83	69	70	84	82	5
Dry	5	12	80	16	16	76	80	76	77	68	66	4
All Years	3	15	82	8	8	48	59	44	45	82	81	3

Figure 5.6-3



Compared to the WSIP setting, the inflow to Don Pedro Reservoir associated with the alternative setting is greater by about the amount of the diminishment of inflow that occurred between the WSIP setting and the base setting. Essentially, the same inflow to Don Pedro Reservoir occurs for either the alternative or the base setting. In the alternative setting, the inflow to Don Pedro Reservoir explicitly made by the SFPUC for the lower Tuolumne River diversion is assumed to pass through Don Pedro Reservoir as a supplemental release at La Grange Dam. Therefore, although the inflow to Don Pedro Reservoir associated with the alternative is essentially the same as for the base setting, an additional release from Don Pedro Reservoir (and La Grange Dam to the lower Tuolumne River) occurs, which depletes Don Pedro Reservoir storage by the amount of the supplemental release. This additional depletion of storage due to the supplemental release to the lower Tuolumne River is about the same as the depletion of storage associated with the WSIP. The depletion of inflow associated with the WSIP setting was caused by the diversion of additional water from upstream. The end result is that Don Pedro Reservoir storage is depleted by about the same amount in either the WSIP or alternative setting as compared to the base setting.

Although the alternative would increase the flow below La Grange Dam in many months, in many years, the resultant depletion of storage in Don Pedro Reservoir attributed to the alternative would subsequently manifest in reductions in releases from La Grange Dam to the stream in other months. The additional depletion of reservoir storage manifests as a reduction in subsequent releases below La Grange Dam in order to replenish reservoir storage. The differences in releases to the Tuolumne River from La Grange Dam would occur only when there would otherwise be releases in excess of minimum FERC flow requirements. With the net effect of changes in Don Pedro Reservoir inflow and releases resulting in a storage operation essentially the same as the WSIP setting, the alternative setting would result in the same magnitude of flow reductions during reservoir replenishment. Most notable would be the flow difference in a year, such as 1993, that follows the extensive drought of 1987-1992. Similar to the WSIP setting, the accumulated effect of the additional releases below La Grange Dam during this period could deplete the reservoir to an extent that the entire volume of flow that would have occurred in excess of FERC requirements in the base setting would have been eliminated during 1993, to replenish Don Pedro Reservoir. In other years, the depletion of storage associated with the alternative would delay the day that excess flow above FERC requirements would be released. Normally, the effect of the delay in release would not affect the year’s peak stream release rate during a year. However, infrequently, and as described for the period following the 1987-1992 drought, the alternative’s affect on stream releases could manifest as an elimination of all flows during a year that would otherwise occur in excess of minimum FERC flow requirements. Such a large and lengthy reduction in flow would not be common, and would result only because of the multi-year droughts.

5.7 Calaveras and San Antonio Reservoirs, Alameda Creek and Downstream

The analytical studies used to evaluate the alternative focused on depicting an alternative method of managing the SFPUC diversion of water from the Tuolumne River basin, i.e., the supplementing of flows in the middle and lower Tuolumne River and diverting of the increase in SFPUC demand from a location in the lower Tuolumne River. Those studies were used in support of developing Water Supply Option 3. Subsequent to those studies, refinements to the depiction of the Bay Area system and its operation have occurred that limit the direct use of HH/LSM results for illustrative purposes. The following qualitative descriptions of the comparison between the alternative, WSIP, and base settings have been developed from the review of HH/LSM results and engineering judgment. Overall, in the alternative setting, the Bay Area system would perform very much the same as in the WSIP setting.

Compared to the base setting, Calaveras Reservoir operations would substantively change in the alternative setting. With the restoration of Calaveras Reservoir operating capacity, the reservoir would be operated to a larger storage capacity. The operation of Calaveras Reservoir would be very similar to the operation described for the WSIP setting.

There would be two categorical changes in the regime of releases to Calaveras Creek below Calaveras Dam between the alternative and base settings. In the alternative setting, there would be the addition of the flows representing the flow objectives associated with the1997 MOU, and the reduction of stream releases during wetter-year/wetter-season flows due to the restoration of Calaveras Reservoir operational capacity.

Compared to the base setting, diversions from Alameda Creek to Calaveras Reservoir would increase in the alternative setting. With the current constraints on Calaveras Reservoir storage, diversions to Calaveras Creek are rejected. With the restoration of operational storage in the reservoir, the opportunity to divert water into the reservoir would increase.

Commensurate with changes in diversions from Alameda Creek to Calaveras Reservoir would be changes to the flow below the Alameda Creek Diversion Dam. Opposite in effect compared to diversions to Calaveras Reservoir, flow passing Alameda Creek Diversion Dam would decrease in the alternative setting. With operational capacity restored at Calaveras Reservoir, there would be more opportunity (and need) to divert Alameda Creek flows, thus reducing flow passing the dam.

Flow below the confluence of Alameda Creek and Calaveras Creek is affected by releases from Calaveras Dam to the stream, flow passing Alameda Creek Diversion Dam, and unregulated flow below Alameda Creek Diversion Dam and Calaveras Dam. As for the WSIP setting comparison, the notable differences between the alternative and the base settings are the addition of stream flows representing the 1997 MOU and the reduction of wetter-year/wet season flows due to the restoration of Calaveras Reservoir storage.

A flow recapture facility in Alameda Creek below Calaveras Reservoir is incorporated in the alternative setting. This facility is assumed to recapture flows explicitly released from Calaveras Dam in the representation of the 1997 MOU. The effect of the recapture is a reduction in the flow that occurs below the confluence of Alameda and Calaveras Creeks, but only to the extent that releases were explicitly made from Calaveras Reservoir. The flows at this location would be essentially the same as those described for the WSIP setting. The flows identified at this location indicate flow below the confluence of Alameda and Calaveras Creeks (described above), with the addition of estimated unregulated stream accretions between the Alameda-Calaveras Creek confluence and the Alameda-San Antonio Creek confluence, minus the water assumed to be recaptured (diverted) by the SFPUC from the creek.

The difference in San Antonio Reservoir storage between the alternative and base settings is the result of several factors, and is predominantly due to the restoration of the operational capacity of Calaveras

Reservoir, the use of SJPL flow for maintenance of Sunol Valley WTP production, and the maintenance of Hetch Hetchy conveyance. In the base setting, the limited operating storage capacity at Calaveras Reservoir leads to a different operation at San Antonio Reservoir, one that draws relatively more stored water for system demands when the draw from Calaveras Reservoir is constrained due to limited storage. The result is that the alternative setting would retain more storage in San Antonio Reservoir than in the base setting. There would very little change in stream releases below San Antonio Reservoir between the alternative, WSIP, and base settings, as the operational goal is to minimize releases to the stream. Flexibility within the balancing of storage among the Bay Area reservoirs would continue to facilitate this goal.

Flow below the confluence of Alameda and San Antonio Creeks is influenced by releases from San Antonio Reservoir and flow arriving at the location from Alameda Creek, which includes upstream impairment by SFPUC operations and facilities. The differences in flow at this location between the alternative and base settings are particularly due to the effects of the restoration of Calaveras Reservoir operating capacity in the alternative setting, and would be essentially the same as described for the differences between the WSIP and base settings.

5.8 Crystal Springs and San Andreas Reservoirs

Fundamental to the difference in storage operations at Crystal Springs Reservoir between the alternative setting and the base settings is the restoration of reservoir operation capacity in the alternative setting, which does not occur in the base setting. The result is the operation of Crystal Springs Reservoir at a higher maximum storage in the alternative setting. The operation of Crystal Springs Reservoir would be similar to the operation described for the WSIP setting.

Compared to the base setting, the alternative setting would generally result in a shifting of the maximum storage level and the range of reservoir operation to a greater volume (elevation), and the lower end of the monthly operating range would normally be greater in storage than in the base setting.

A difference in stream release below Crystal Springs Reservoir would be infrequent, and could be either an increase or decrease in the release. The potential difference is attributed to whether the alternative's operation would result in more or less available operational storage capacity at an instant compared to another setting. In actual operations, it is anticipated that system operators would manage the reservoir system such that stream releases would be minimal under any setting, with the effect of essentially no difference between the alternative, WSIP, and base settings.

Overall, Crystal Springs Reservoir, San Antonio Reservoir, and Calaveras Reservoir would tend to retain more storage during a year in the alternative setting as compared to the WSIP setting, and that result is even more dramatic when compared to the base setting. The alternative setting includes greater diversion capacity during the year from the Tuolumne River Basin, which is particularly used during the summer through the lower Tuolumne River diversion. The additional diversion capacity during the summer reduces the need to draw from Bay Area system storage, retaining greater storage in the Bay Area system during the summer and fall. The availability and use of the lower Tuolumne River diversion during December, when otherwise there would be no conveyance from Hetch Hetchy due to maintenance, also retains storage in the Bay Area system.

San Andreas Reservoir operations would generally be the same between the alternative, WSIP, and base settings. Reservoir storage would follow a systematic filling and lowering each year to manage runoff. However, different from the base and WSIP settings, the alternative setting would not typically result in an additional draw down of storage from San Andreas Reservoir during Hetch Hetchy conveyance maintenance periods. With the lower Tuolumne River diversion available during the period of conveyance maintenance, sufficient supplies and conveyance among the Bay Area system and the Tuolumne River system would negate the need to increase production at Harry Tracy WTP to compensate for the absence of Tuolumne River supply. The need to draw storage from San Andreas Reservoir to serve the demand at Harry Tracy WTP would be eliminated.

5.9 Pilarcitos Reservoir

Coastside CWD's water demand and its SFPUC purchase request are projected to increase within the WSIP planning horizon of year 2030. With the context of the 2030 purchase request of 300 mgd, Coastside CWD's portion has been estimated at about 3 mgd. This projected purchase request is approximately 1 mgd greater than its current purchase request. Recognizing the current physical constraints to deliveries from the SFPUC to Coastside CWD and the ongoing planning activities in the watershed, the precise means of serving Coastside CWD's additional purchase request and the resultant potential changes to the operation of SFPUC facilities and their affected environs are uncertain.[20]

Assuming a range of potential means to serve the additional purchase request from Coastside CWD, the following potential hydrologic effects to SFPUC facilities and their affected environs are identified:

- Due to limited yield from Pilarcitos Reservoir, additional diversions would be required from Crystal Springs Reservoir.
- If deliveries to Coastside CWD from Pilarcitos Reservoir increase during the winter season, these deliveries could potentially reduce storage in Pilarcitos Reservoir, thereby potentially reducing diversions to the San Mateo Creek watershed. Although the increased delivery would increase releases to Pilarcitos Creek from Pilarcitos Dam for a period of time, the increase would subsequently lead to a reduction in spills past Stone Dam.
- Additional wintertime deliveries could also potentially impair the ability to provide carry-over storage into the summer season from Pilarcitos Reservoir, and subsequently lead to an acceleration of the beginning of the season when releases to Pilarcitos Creek from Pilarcitos Reservoir consist only of the passage of reservoir inflow.
- An increase in summertime deliveries from Pilarcitos Creek could also accelerate the beginning of the season when releases to Pilarcitos Creek from Pilarcitos Reservoir consist only of the passage of reservoir inflow.

The alternative setting would result in the same potential effects in the Pilarcitos Creek watershed as in the WSIP setting.

[20] See "Analysis of SFPUC Pilarcitos / Coastside County Water District Operations", Memorandum by Daniel B. Steiner, March 8, 2007.

6. CEQA Alternative 5 – Oceanside Seawater Desalination Plant

CEQA Alternative 5 – Oceanside Seawater Desalination Plant Alternative (Desalination in San Francisco) would incorporate the production of 25 mgd of potable water from a desalination facility located near the Oceanside Water Pollution Control Plant in San Francisco. The 25 mgd of reverse osmosis production would be provided year-round in all years and served to the retail customers in the City and County of San Francisco.

The alternative would implement almost all of the proposed facilities for the proposed WSIP. The exception to the WSIP configuration and proposed facilities would be the specific improvements to the SJPL. Improvements and repairs would be made to the SJPL to ensure that conveyance would continue at the existing 290-mgd capacity. A SFPUC desalination plant and its appurtenant facilities would be constructed.[21]

During non-drought years, the SFPUC would serve the increase of 35 mgd in purchase requests through the supply derived from the desalination plant and a combination of conservation, water recycling, and groundwater supply programs, and greater utilization of the Bay Area watershed supplies associated with the restoration of operational storage capacity, primarily at Calaveras Reservoir.[22] The SFPUC would implement conservation, water recycling, and groundwater supply programs in the SFPUC retail service area to achieve the equivalent of 10 mgd of supply every year. These programs would be in addition to demand management and conservation measures already accounted for in the 2030 purchase request for the retail service area.

In most years, the SFPUC could serve the projected 2030 water purchases of 300 mgd with its existing sources of water supply; however, these sources alone have not allowed for full water deliveries during past droughts, and would continue to be insufficient during future droughts as purchase requests increase. In this alternative, the SFPUC would serve the 2030 need for increased system firm yield with a combination of conservation, water recycling, and groundwater programs in the SFPUC retail service area, water production from the desalination plant, a groundwater conjunctive-use program incorporating the Westside Basin Groundwater Program, and restoration of reservoir operating capacity at Crystal Springs and Calaveras Reservoirs. As with the WSIP, system-wide rationing would be limited to no more than 20 percent in any year. The water transfer program with MID/TID would not occur.

The following described results for this alternative are derived from studies performed by the SFPUC during the investigation of Water Supply Option 3. Subsequent to those studies, several refinements to assumptions for water demands, facility configuration, and operations have changed for the proposed future SFPUC regional system, which would have slightly altered the studies incorporated into Water Supply Option 3. Due to this circumstance, a comparison of the explicit modeling results for this alternative with results for the WSIP setting or base setting requires caution, and additional qualitative descriptions are provided.

6.1 Water Deliveries and Drought Response Actions

In both the alternative and WSIP settings, an average annual 300-mgd system-wide purchase request is served. With implementation of 10 mgd of conservation, water recycling, and groundwater supply programs in the SFPUC retail service area, the net regional system demand would be 290 mgd. Figure 6.1-1 illustrates the drought response actions for the simulated 82-year historical period (1921-2002).

In Figure 6.1-1, years with bars showing a “1” or greater level of action indicate periods when a supplemental water supply action is initiated. In both the WSIP and alternative settings, the action is the use of the Westside Basin Groundwater Program to supplement SFPUC water deliveries. Action levels greater than “1” indicate the imposition of delivery shortages (rationing) to SFPUC customers.

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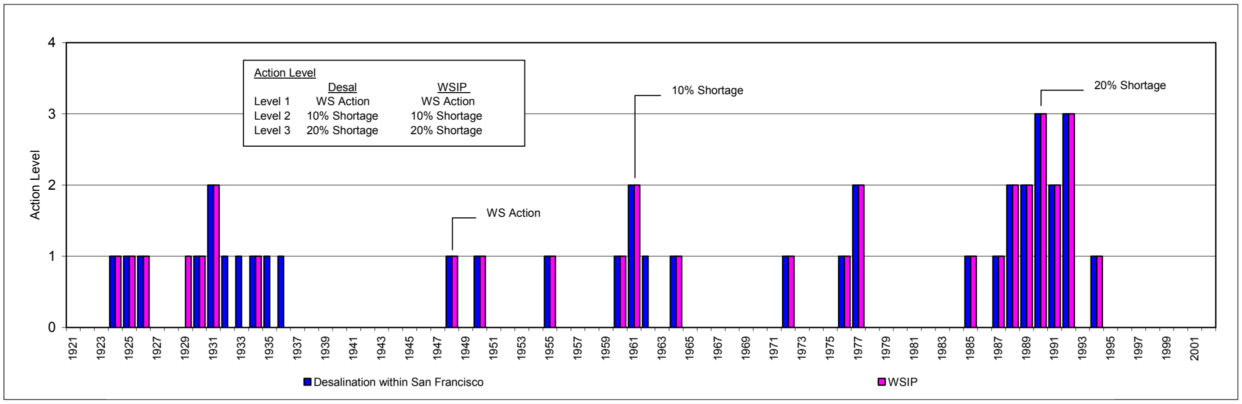
[21] This setting is additionally described in *Water System Improvement Program (WSIP) Water Supply Option 3*, prepared by San Francisco Public Utilities Commission and Parsons, June 2006.

[22] The Lower Crystal Springs Dam Improvements project would be included in this alternative.

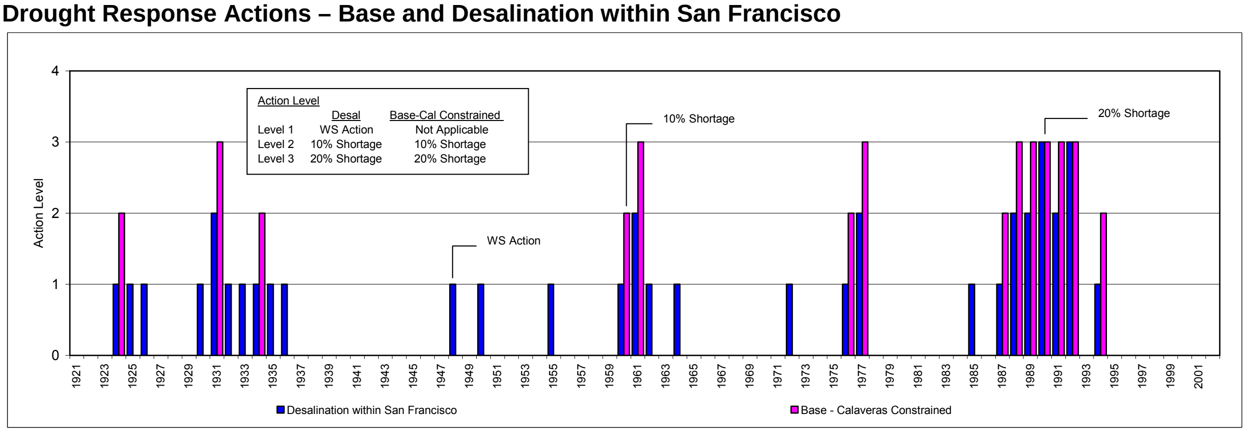
Figure 6.1-1
Drought Response Actions – Desalination within San Francisco and WSIP



The need for water delivery shortages, in frequency and severity, would be the same for the two settings, including during the design drought. Shortages would be no greater than 20 percent in any year. Although the WSIP and alternative settings indicate a different frequency of use of the level 1 action (Westside Basin Groundwater Program), the differences are partially a result of modeling assumptions that were applied in the more recent WSIP studies, which were not consistent with assumptions applied in the earlier Water Supply Option 3 studies. The modeling assumptions concern the explicit system storage level at which use of the action is triggered. As described later concerning Bay Area reservoir storage, less depletion of local reservoir storage would be anticipated in the alternative setting due to the availability of water supply production in the Bay Area system. This circumstance would lead to generally greater retention of Bay Area system storage due to the absence of conveyance constraints that limit the amount of Hetch Hetchy water that can be used seasonally to serve system-wide demand in the WSIP setting. The difference in frequency of triggering the action between the two settings is non-substantive.

The same form of information is shown in Figure 6.1-2 for the comparison of the alternative setting to the base setting. In modeling parlance, there is no level 1 action level in the base setting. Without supplemental resources, the existing system only has the delivery shortage measure available to cope with drought. This shortage measure is imposed during level 2 (10 percent) and level 3 (20 percent). These percentages of shortage are applied to both the alternative and the base settings for these action levels. As evident in the illustration, the imposition of rationing occurs more frequent and to a greater severity in the base setting (level 2 and level 3 actions). Figure 6.1-2 illustrates that, when comparing the base setting to the alternative setting, the supplemental resource (Westside Basin Groundwater Program) is triggered at times of drought, during periods when there currently is no supplemental resource available to the system. The utilization of the supplemental resource during these times results in the elimination or reduction, or at least a non-increase in the severity, of delivery shortage.

Figure 6.1-2
Drought Response Actions – Base and Desalination within San Francisco



Not illustrated in Figure 6.1-1 or Figure 6.1-2 are the delivery shortages anticipated during the entire SFPUC Design Drought. Shortages during the Design Drought with the WSIP and alternative are maintained within the objective to limit the severity of shortage to no more than 20 percent. With the existing system (Calaveras and Crystal Springs Reservoirs constrained), the 20-percent limitation (cap) objective cannot be achieved during the last 18 months of the Design Drought, and a 25 percent shortage is applied.

6.2 Diversions from Tuolumne River

For the alternative, WSIP, and base settings, the metric for illustrating the SFPUC diversion from the Tuolumne River Basin is the flow through the San Joaquin Pipeline (SJPL). Table 6.2-1 illustrates the diversions and difference in diversions to the SJPL for the proposed program and alternative settings, averaged by month, by year type. Evident is the decrease in annual diversions associated with the alternative setting. Although the same system-wide level of deliveries occurs for the two settings, the production of water supply by the desalination plant in San Francisco diminishes the use of the Tuolumne River water to serve the additional purchase request. The difference in SJPL diversions between the WSIP setting and the alternative setting is also illustrated in Figure 6.2-1. Illustrated is the difference in average monthly diversion through the SJPL by year type for the 82-year simulation period.

Table 6.2-1

Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Desalination within San Francisco

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	23,932	14,127	7,438	9,175	6,649	10,156	19,161	23,962	23,189	27,589	27,589	26,009	218,976
Above Normal	23,112	14,243	7,180	12,228	8,896	14,841	21,771	26,022	25,183	27,589	27,589	25,941	234,596
Normal	22,892	14,501	7,480	12,832	10,258	18,492	26,354	26,935	26,066	27,589	27,589	26,066	247,053
Below Normal	23,560	14,785	9,138	17,013	14,810	19,979	26,537	27,141	26,266	27,589	27,141	25,833	259,792
Dry	23,130	18,126	11,654	15,787	13,964	19,979	26,699	27,292	26,411	27,292	27,113	25,030	262,476
All Years	23,326	15,140	8,568	13,436	10,938	16,707	24,106	26,278	25,430	27,531	27,403	25,778	244,642

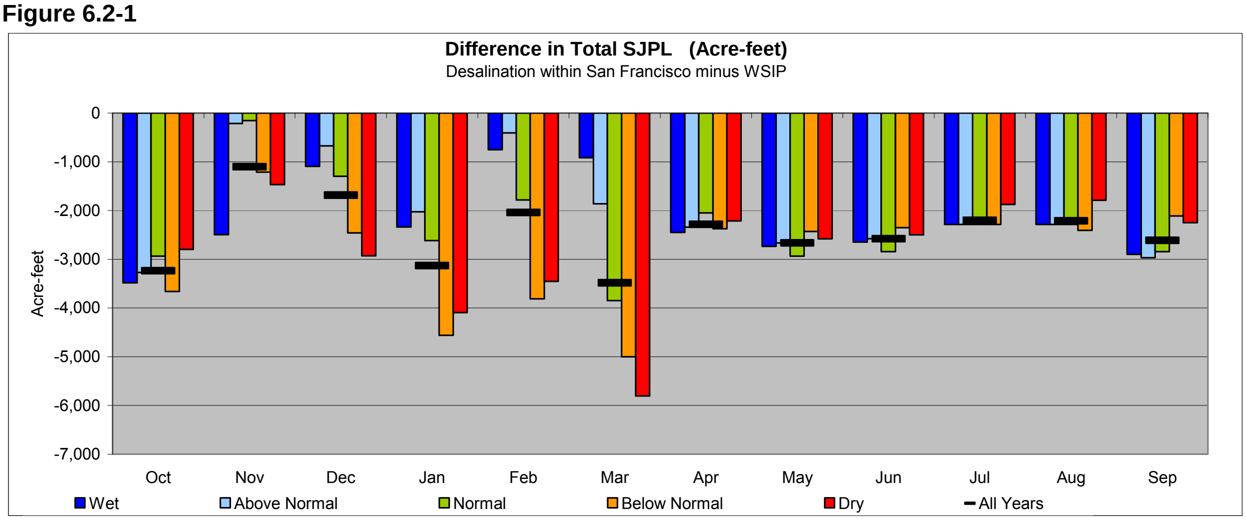
Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	27,417	16,624	8,533	11,512	7,401	11,072	21,613	26,698	25,836	29,873	29,873	28,909	245,359
Above Normal	26,381	14,460	7,852	14,254	9,306	16,705	24,111	28,687	27,761	29,873	29,873	28,909	258,169
Normal	25,830	14,656	8,776	15,448	12,041	22,339	28,403	29,873	28,909	29,873	29,873	28,909	274,929
Below Normal	27,220	15,998	11,595	21,574	18,621	24,976	28,909	29,571	28,617	29,873	29,548	27,945	294,447
Dry	25,931	19,593	14,583	19,883	17,417	25,782	28,909	29,873	28,909	29,165	28,904	27,281	296,229
All Years	26,562	16,241	10,254	16,568	12,982	20,191	26,392	28,945	28,011	29,735	29,617	28,391	273,887

Difference in Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Desalination within San Francisco minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	-3,485	-2,497	-1,094	-2,337	-752	-916	-2,451	-2,736	-2,647	-2,284	-2,284	-2,901	-26,383
Above Normal	-3,268	-217	-672	-2,026	-410	-1,863	-2,340	-2,664	-2,578	-2,284	-2,284	-2,968	-23,574
Normal	-2,938	-155	-1,296	-2,616	-1,783	-3,847	-2,049	-2,938	-2,843	-2,284	-2,284	-2,843	-27,876
Below Normal	-3,660	-1,213	-2,457	-4,561	-3,811	-4,997	-2,372	-2,429	-2,351	-2,284	-2,407	-2,112	-34,655
Dry	-2,801	-1,467	-2,929	-4,097	-3,453	-5,803	-2,210	-2,581	-2,498	-1,874	-1,790	-2,250	-33,753
All Years	-3,236	-1,100	-1,686	-3,131	-2,044	-3,484	-2,286	-2,667	-2,580	-2,204	-2,213	-2,613	-29,245

Figure 6.2-1



The lesser diversions for the alternative setting during March through August are due to the assumed lesser conveyance capacity of the SJPL associated with the alternative setting. In the WSIP setting, conveyance is increased to 313 mgd, while in the alternative setting the capacity is not improved above the currently used 290-mgd capacity. Differences during the fall, winter, and spring result from the lesser replenishment needed for Bay Area system storage from the Tuolumne River under the alternative setting. Also, less of the increase in demand is served from the Tuolumne River during this period.

The differences between the alternative's diversions from the Tuolumne River and the base setting diversions are similarly illustrated in Table 6.2-2 and in Figure 6.2-2. The average annual diversions associated with the alternative setting are about the same as those occurring for the base setting. However, there would be year-to-year differences and seasonal shifts in diversions. The seasonal shift in diversions between the two settings is due to different facility maintenance assumptions for the two settings. The alternative incorporates a maintenance program that constrains conveyance through the SJPL during November and December. Following this maintenance period, larger diversions occur to replenish Bay Area reservoirs. There would also be differences in management of storage due to the restoration of Calaveras Reservoir operational capacity and the occurrence of the desalination supply within the Bay Area system. All of these system-wide differences would result in changes in the use of the SJPL. While the overall average annual diversion through the SJPL in the alternative setting remained within 500 acre-feet of the base setting diversion, modeling results indicated that the difference in annual diversions could be as much as 35,000 acre-feet more or less than the base setting diversions in any particular year.

Table 6.2-2

Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Desalination within San Francisco

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	23,932	14,127	7,438	9,175	6,649	10,156	19,161	23,962	23,189	27,589	27,589	26,009	218,976
Above Normal	23,112	14,243	7,180	12,228	8,896	14,841	21,771	26,022	25,183	27,589	27,589	25,941	234,596
Normal	22,892	14,501	7,480	12,832	10,258	18,492	26,354	26,935	26,066	27,589	27,589	26,066	247,053
Below Normal	23,560	14,785	9,138	17,013	14,810	19,979	26,537	27,141	26,266	27,589	27,141	25,833	259,792
Dry	23,130	18,126	11,654	15,787	13,964	19,979	26,699	27,292	26,411	27,292	27,113	25,030	262,476
All Years	23,326	15,140	8,568	13,436	10,938	16,707	24,106	26,278	25,430	27,531	27,403	25,778	244,642

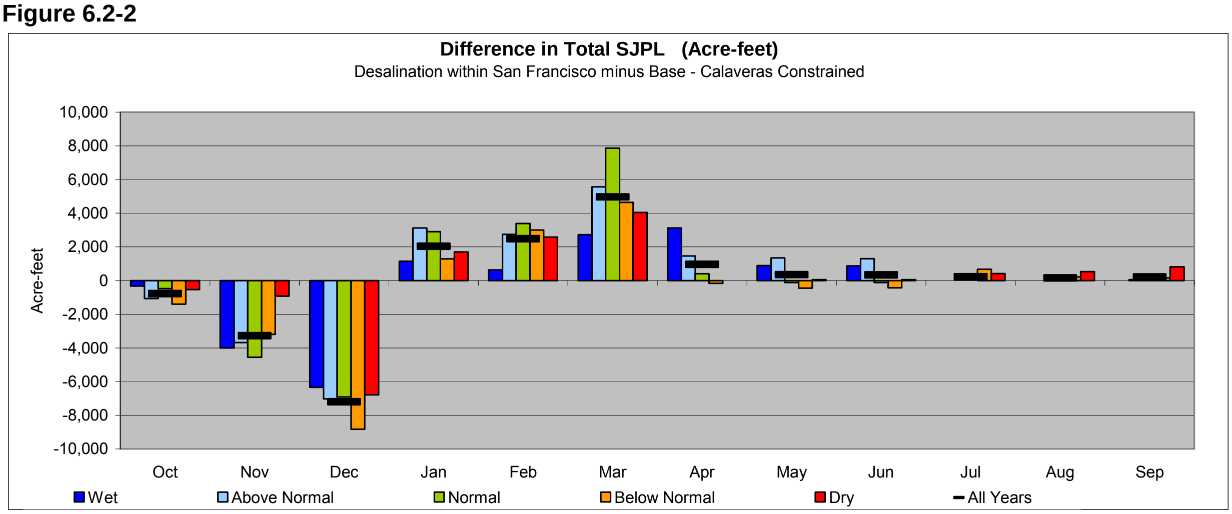
Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	24,260	18,126	13,783	8,028	6,015	7,433	16,031	23,070	22,326	27,589	27,589	26,009	220,258
Above Normal	24,176	17,926	14,204	9,100	6,157	9,279	20,309	24,679	23,883	27,589	27,589	25,887	230,776
Normal	23,368	19,046	14,390	9,930	6,864	10,632	25,951	27,054	26,181	27,589	27,589	26,009	244,601
Below Normal	24,959	17,980	17,964	15,726	11,808	15,334	26,699	27,589	26,699	26,917	26,917	25,670	264,263
Dry	23,665	19,046	18,433	14,080	11,386	15,936	26,699	27,232	26,354	26,876	26,578	24,225	260,509
All Years	24,097	18,413	15,763	11,398	8,459	11,737	23,147	25,930	25,093	27,311	27,253	25,565	244,165

Difference in Total SJPL (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Desalination within San Francisco minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	-327	-3,999	-6,345	1,147	634	2,723	3,130	892	863	0	0	0	-1,282
Above Normal	-1,063	-3,683	-7,024	3,128	2,740	5,563	1,462	1,343	1,300	0	0	54	3,820
Normal	-476	-4,546	-6,910	2,902	3,394	7,861	403	-119	-115	0	0	58	2,452
Below Normal	-1,399	-3,195	-8,826	1,287	3,003	4,645	-162	-448	-433	672	224	162	-4,471
Dry	-535	-921	-6,779	1,707	2,578	4,043	0	60	58	416	535	806	1,967
All Years	-772	-3,273	-7,195	2,038	2,479	4,970	959	348	337	220	151	213	477

Figure 6.2-2



6.3 Hetch Hetchy Reservoir and Releases

Both the WSIP and alternative settings have the same underlying system-wide net demand for water (290 mgd); however, the alternative supplements the SFPUC water supply with production from the desalination plant instead of from the Tuolumne River. The increase in system-wide demand is essentially served with a Bay Area water resource, which results in about the same residual demand for the Hetch Hetchy system. Figure 6.3-1 illustrates a chronological trace of the simulation of Hetch Hetchy Reservoir storage and stream releases. Shown in Figure 6.3-1 are the results for the WSIP, base-Calaveras constrained ("Base – Calaveras Constrained"), and alternative ("Desalination within San Francisco") settings.

Storage in Hetch Hetchy Reservoir associated with the alternative setting would be either equal to (when full) or greater than anticipated for the WSIP setting, as seen in Figure 6.3-1. With a lesser demand (compared to the WSIP setting) served from the Tuolumne River in the alternative setting, more storage would be retained in Hetch Hetchy Reservoir. Figure 6.3-2 illustrates the average monthly storage and range of reservoir storage for the alternative and WSIP settings.

With about the same diversion from the Tuolumne River, Hetch Hetchy Reservoir storage in the alternative setting would be similar to the storage depicted for the base setting. Figure 6.3-3 illustrates the average monthly storage and range of storage for the alternative and base settings. Hetchy Hetchy Reservoir storage is typically greater by the end of December in the alternative setting due to the effect of constrained conveyance for maintenance during November and December. The increase in storage is often diminished by early spring as additional Bay Area reservoir replenishment subsequent to the maintenance draws additional water from the Hetch Hetchy system. By the end of April, during about 60 percent of the years, the reservoir would be slightly fuller.

A difference in storage in Hetch Hetchy Reservoir attributed to the diversion effects of the alternative or WSIP settings compared to the base setting would manifest in differences in releases from O'Shaughnessy Dam to the stream. A different amount of available reservoir space in the winter and spring due to the alternative would lead to a different ability to regulate inflow, thus potentially changing the amount of water released to the stream that is above minimum release requirements. Figure 6.3-1 chronologically illustrates the average monthly stream release from O'Shaughnessy Dam for the alternative, WISP, and base settings. The average monthly releases and difference in releases to the stream from O'Shaughnessy Dam for the alternative and WSIP settings are illustrated in Table 6.3-1 and Figure 6.3-4. The same form of information for the alternative setting and base setting is illustrated in Table 6.3-2 and Figure 6.3-5.

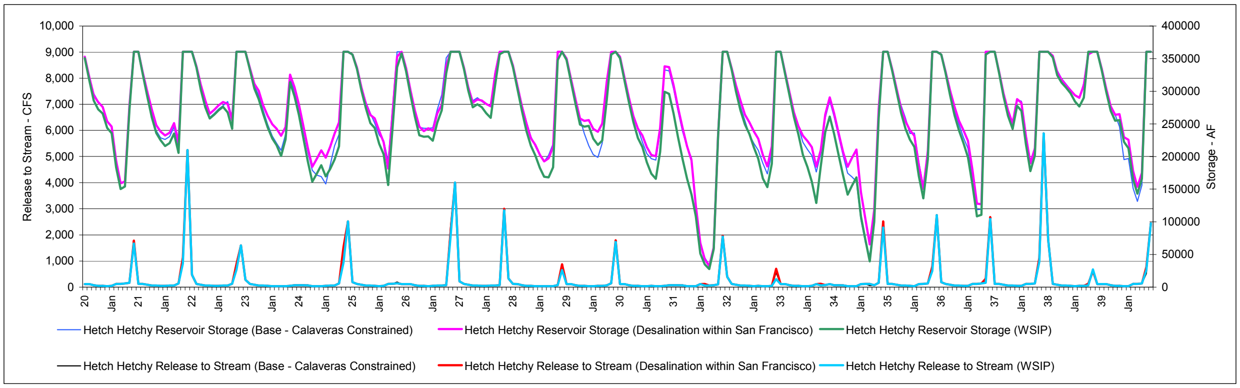
Compared to the WSIP setting, the alternative setting would typically result in an increase in stream releases during years and months when releases in excess of minimum requirements occur. As the reservoir would typically be fuller entering the reservoir filling season, there would be less ability to regulate inflow without releases in excess of minimum requirements.

Compared to the base setting, the alternative setting would result in alternating effects, ranging in effect from increases to decreases, and in some circumstances no change in releases. As described previously, essentially no change is anticipated in the long-term average diversion from the Hetch Hetchy system to serve the increased system-wide demand; however, year to year, there could be different amounts of diversions as compared to the base setting. These changes in diversions from year to year would lead to a change in storage from year to year in comparison to the base setting, and thus changes to releases at times. Over the 82-year simulation period, modeling results indicate that about a third of the time there would be no change to releases, about a third of the time there would be increases in releases, and about a third of the time there would be decreases in releases.

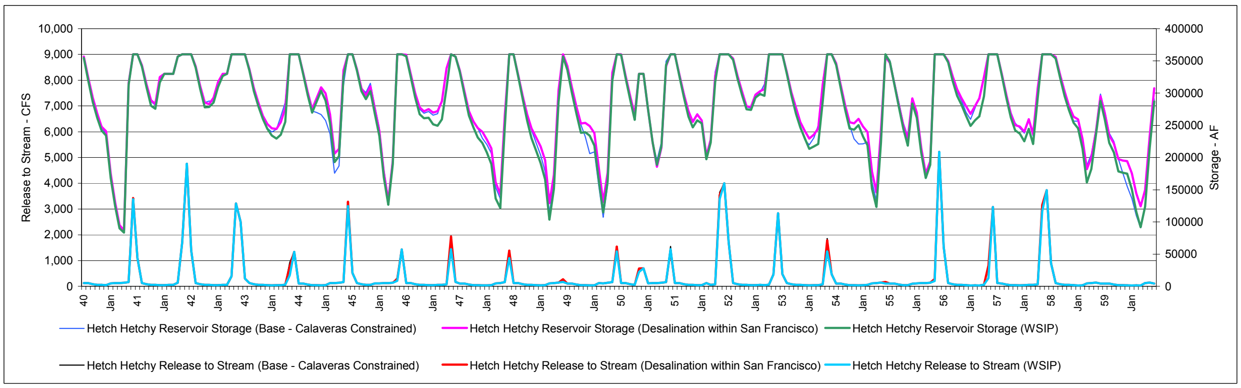
Table 6.3-1 and Table 6.3-4 illustrate the difference in stream release between the alternative setting and the WSIP and base settings, expressed in terms of a monthly volume (acre-feet) of flow. Considering the manner in which releases are determined and made to the stream, quantifying the effect of these

Figure 6.3-1
Hetch Hetchy Reservoir Storage and Stream Release

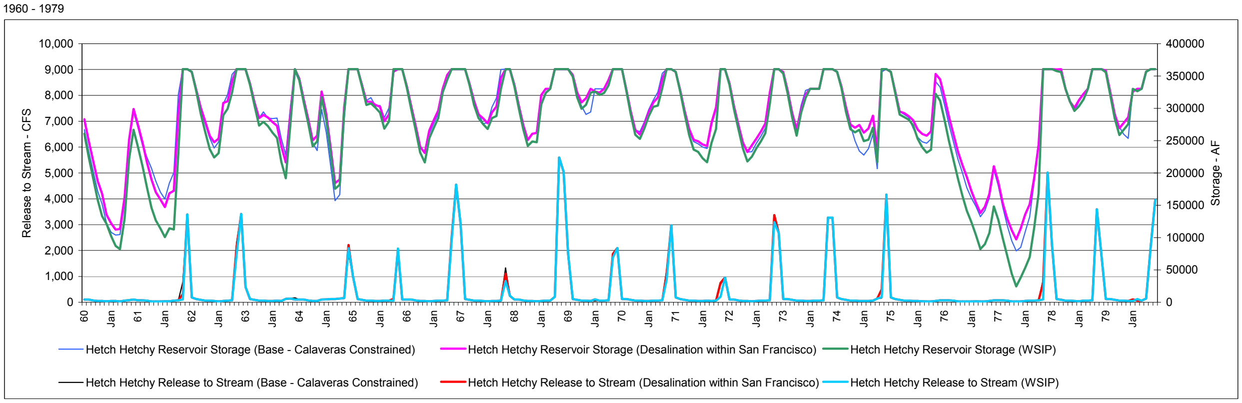
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

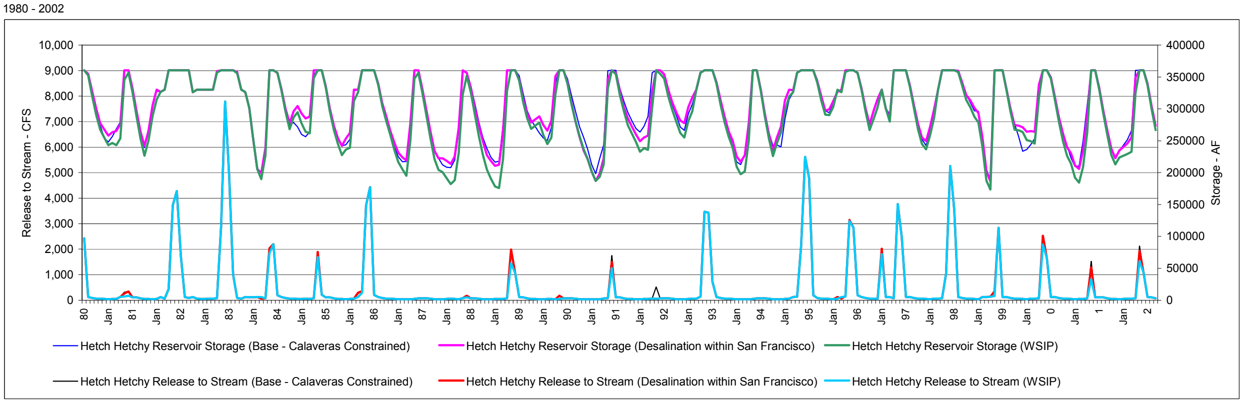


Figure 6.3-2

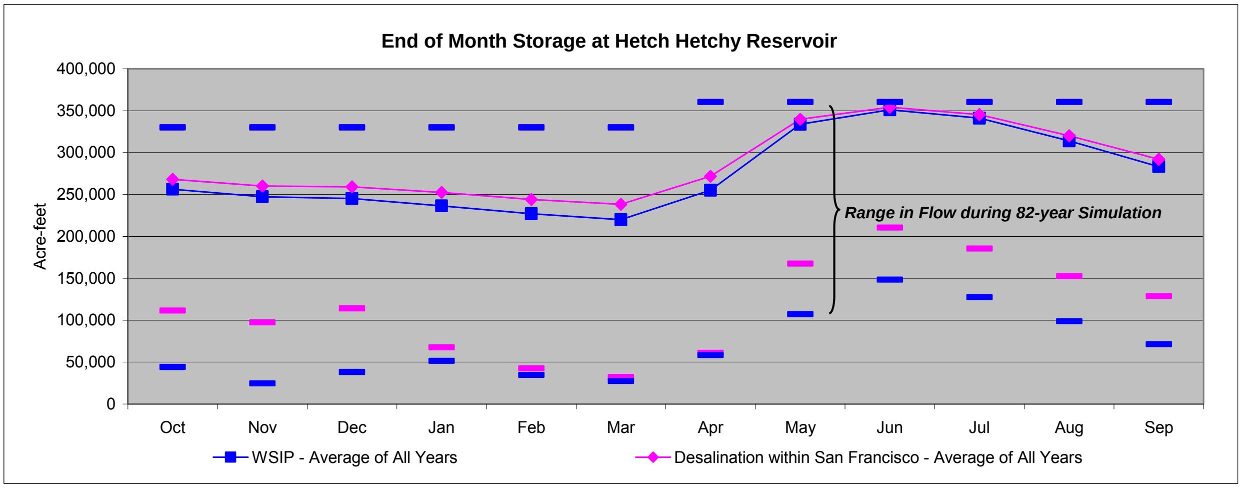


Figure 6.3-3

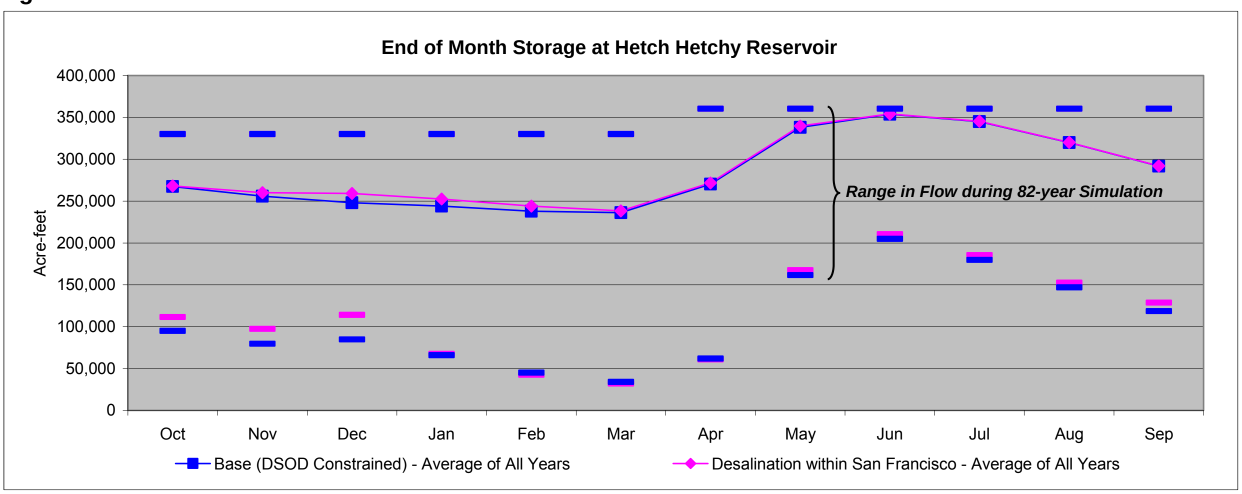


Table 6.3-1

Hetch Hetchy Release to Stream (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Desalination within San Francisco

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	3,378	3,031	3,124	11,348	4,695	5,804	8,790	154,062	271,048	125,059	11,310	5,335	606,984
Above Normal	3,400	5,733	5,435	4,033	5,354	5,309	7,885	79,178	185,748	23,302	7,686	5,316	338,378
Normal	3,343	3,235	3,051	3,355	4,128	4,557	5,817	89,574	114,843	10,299	7,513	5,123	254,838
Below Normal	3,363	3,255	2,821	2,622	2,851	3,891	5,436	45,611	46,267	6,927	6,818	4,345	134,208
Dry	3,266	3,161	2,729	2,460	2,469	3,105	3,816	11,419	9,991	5,285	5,285	3,861	56,846
All Years	3,351	3,703	3,449	4,728	3,904	4,535	6,356	75,638	125,346	33,709	7,711	4,797	277,227

Hetch Hetchy Release to Stream (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	3,378	3,031	3,124	10,290	4,917	5,165	8,544	148,523	270,615	125,059	11,310	5,316	599,271
Above Normal	3,400	5,282	5,435	4,033	4,936	5,772	7,808	73,003	184,183	23,302	7,686	5,316	330,156
Normal	3,343	3,235	3,051	3,355	4,128	4,557	5,817	77,459	113,463	10,299	7,513	5,123	241,343
Below Normal	3,363	3,255	2,821	2,622	2,851	3,891	5,212	34,660	42,164	6,927	6,818	4,345	118,930
Dry	3,266	3,161	2,729	2,460	2,469	3,105	3,340	9,651	8,283	5,285	5,285	3,861	52,893
All Years	3,351	3,609	3,449	4,522	3,861	4,506	6,153	68,297	123,484	33,709	7,711	4,793	267,446

Difference in Hetch Hetchy Release to Stream (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Desalination within San Francisco minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	1,058	-222	640	246	5,539	433	0	0	19	7,714
Above Normal	0	451	0	0	418	-463	77	6,175	1,564	0	0	0	8,222
Normal	0	0	0	0	0	0	0	12,116	1,380	0	0	0	13,496
Below Normal	0	0	0	0	0	0	224	10,951	4,103	0	0	0	15,278
Dry	0	0	0	0	0	0	476	1,769	1,709	0	0	0	3,953
All Years	0	93	0	207	43	29	203	7,340	1,862	0	0	4	9,782

Figure 6.3-4

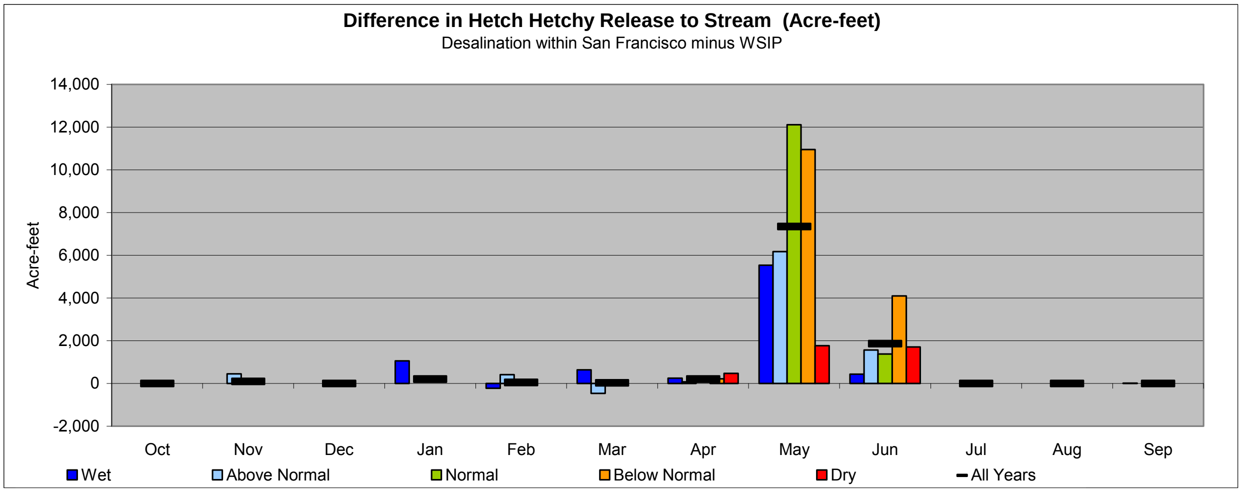


Table 6.3-2

Hetch Hetchy Release to Stream (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange)
Desalination within San Francisco

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	3,378	3,031	3,124	11,348	4,695	5,804	8,790	154,062	271,048	125,059	11,310	5,335	606,984
Above Normal	3,400	5,733	5,435	4,033	5,354	5,309	7,885	79,178	185,748	23,302	7,686	5,316	338,378
Normal	3,343	3,235	3,051	3,355	4,128	4,557	5,817	89,574	114,843	10,299	7,513	5,123	254,838
Below Normal	3,363	3,255	2,821	2,622	2,851	3,891	5,436	45,611	46,267	6,927	6,818	4,345	134,208
Dry	3,266	3,161	2,729	2,460	2,469	3,105	3,816	11,419	9,991	5,285	5,285	3,861	56,846
All Years	3,351	3,703	3,449	4,728	3,904	4,535	6,356	75,638	125,346	33,709	7,711	4,797	277,227

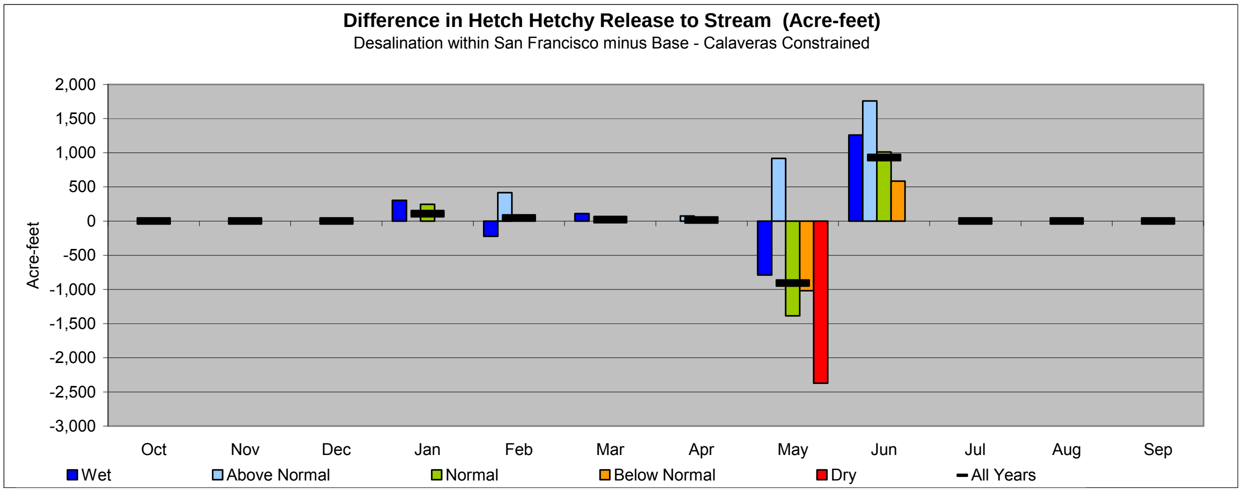
Hetch Hetchy Release to Stream (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange)
Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	3,378	3,031	3,124	11,045	4,917	5,695	8,790	154,853	269,789	125,059	11,310	5,335	606,325
Above Normal	3,400	5,733	5,435	4,033	4,936	5,309	7,808	78,261	183,990	23,302	7,686	5,316	335,208
Normal	3,343	3,235	3,051	3,109	4,128	4,557	5,817	90,958	113,833	10,299	7,513	5,123	254,966
Below Normal	3,363	3,255	2,821	2,622	2,851	3,891	5,436	46,628	45,681	6,927	6,818	4,345	134,639
Dry	3,266	3,161	2,729	2,460	2,469	3,105	3,816	13,790	9,991	5,285	5,285	3,861	59,217
All Years	3,351	3,703	3,449	4,621	3,861	4,514	6,340	76,545	124,417	33,709	7,711	4,797	277,018

Difference in Hetch Hetchy Release to Stream (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange)
Desalination within San Francisco minus Base - Calaveras Constrained

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	304	-222	110	0	-791	1,259	0	0	0	660
Above Normal	0	0	0	0	418	0	77	917	1,758	0	0	0	3,170
Normal	0	0	0	246	0	0	0	-1,384	1,011	0	0	0	-128
Below Normal	0	0	0	0	0	0	0	-1,017	586	0	0	0	-431
Dry	0	0	0	0	0	0	0	-2,371	0	0	0	0	-2,371
All Years	0	0	0	107	43	21	16	-908	929	0	0	0	209

Figure 6.3-5



changes in terms of monthly flow (acre-feet or cfs) is not always meaningful.[23] Assuming that a change in release volume equates to a delay or earlier initiation of releasing 6,000 acre-feet per day, the difference in stream release from O'Shaughnessy Dam between the alternative and WSIP settings could be additional days of releases in excess of minimum requirements by up to 7 days. Compared to the base setting, a range of up to 4 days of additional releases to a delay of up to 5 days of releases could occur. Normally, the effect of a delay or earlier start in release would not affect the year's peak stream release rate during a year. Table 6.3-3 and Table 6.3-4 illustrate the modeled monthly volumetric changes in stream release between the alternative and WSIP settings and the alternative and base settings, respectively.

6.4 Lake Lloyd and Lake Eleanor

Compared to the operation in the WSIP setting, the operation of Lake Lloyd and Lake Eleanor in the alternative setting is simulated to be essentially the same. Also, the operation resulting for the alternative and WSIP settings are essentially the same as in the base setting. These outcomes are the result of Lake Lloyd and Lake Eleanor operations predominantly occurring for the satisfaction of power generation needs and MID/TID entitlements to inflow. The lone exception in the simulation occurs during the prolonged drought of 1987-1992. During this drought period, there is a slightly different draw from Hetch Hetchy Reservoir in the WSIP setting as compared to the alternative and base settings, affecting the amount of water released from Hetch Hetchy Reservoir to Don Pedro Reservoir, which, for satisfaction of MID/TID entitlements to inflow, affects the amount of releases from Lake Lloyd. The effect is small and would rarely occur. The effect of a different storage level occurring is Lake Lloyd would manifest as a change to releases to the stream above minimum requirements during a subsequent period of reservoir replenishment. There would be no difference in the operation of the reservoirs between the alternative and base settings.

6.5 Flow below Tuolumne River and Cherry River Confluence

With little difference between the performance of the alternative setting and the base setting, the flow below the Tuolumne River and Cherry River confluence is anticipated to be the same in both settings. While both the alternative and base settings, during some dry and critical years, there could be instances when the shaped flow would be less than 1,000 cfs; however, results indicate that the alternative setting would rarely change that frequency. There would be slightly more flow at this location in the alternative setting as compared to the WSIP setting.

6.6 Don Pedro Reservoir and La Grange Releases

A change in Don Pedro Reservoir operation is caused by changes to inflow to the reservoir. The changes in inflow to the reservoir are the result of net changes within the operation of the upstream SFPUC facilities, described previously, and other changes in SFPUC operations associated with diversions to the Holm, Kirkwood, and Moccasin Powerhouses. Figure 6.6-1 illustrates the difference in inflow to Don Pedro Reservoir between the alternative and WSIP settings, averaged by month for each year type. The results illustrate how serving the increase in system-wide demand with the water supply from the desalination plant located in the Bay Area system would reduce the amount of diversion from the Hetch Hetchy system compared to the WSIP setting, thus resulting in more inflow to Don Pedro Reservoir. The comparison of inflow to Don Pedro Reservoir between the alternative and base settings is illustrated in Figure 6.6-2. The illustration shows the small effect to inflow to Don Pedro Reservoir attributable to the alternative. Shifts in the timing of inflow to Don Pedro Reservoir would occur due to changes in the seasonal operation of the entire SFPUC system, including a different maintenance program. While the overall average annual inflow to Don Pedro Reservoir in the alternative setting remained within 500 acre-feet of the base setting diversion, modeling results indicated that the difference in annual inflow could be as much as 30,000 acre-feet more or less than the base setting diversions in any particular year.

[23] See "Estimated Effect of WSIP on Daily Releases below Hetch Hetchy Reservoir", Memorandum by Daniel B. Steiner, December 31, 2006.

Table 6.3-3

Difference in Hetch Hetchy Release to Stream (Acre-feet)

Desalination within San Francisco minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	0	0	0	6,285	0	0	0	6,285
1922	0	0	0	0	0	0	0	14,428	0	0	0	0	14,428
1923	0	0	0	0	0	0	0	13,146	0	0	0	0	13,146
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	36,643	0	0	0	0	36,643
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	11,320	0	0	0	0	11,320
1928	0	0	0	0	0	0	0	3,849	0	0	0	0	3,849
1929	0	0	0	0	0	0	0	0	13,223	0	0	0	13,223
1930	0	0	0	0	0	0	0	0	4,007	0	0	0	4,007
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	3,554	0	0	0	1,885	0	0	0	5,439
1933	0	0	0	0	0	0	0	0	23,521	0	0	0	23,521
1934	0	0	0	0	0	0	3,808	0	0	0	0	0	3,808
1935	0	0	0	0	0	0	0	0	14,075	0	0	0	14,075
1936	0	0	0	0	0	0	0	10,680	0	0	0	0	10,680
1937	0	0	0	0	0	0	0	9,591	4,231	0	0	0	13,822
1938	0	0	0	0	0	0	0	9,324	0	0	0	0	9,324
1939	0	0	0	0	0	0	3,808	-4,045	0	0	0	0	-237
1940	0	0	0	0	0	0	0	7,327	0	0	0	0	7,327
1941	0	0	0	0	0	0	0	0	2,676	0	0	0	2,676
1942	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	21,582	0	0	0	0	21,582
1945	0	0	0	0	0	0	0	0	10,018	0	0	0	10,018
1946	0	0	0	0	0	0	0	4,532	0	0	0	0	4,532
1947	0	0	0	0	0	0	0	30,499	0	0	0	0	30,499
1948	0	0	0	0	0	0	0	0	17,542	0	0	0	17,542
1949	0	0	0	0	0	0	0	0	6,209	0	0	0	6,209
1950	0	0	0	0	0	0	0	0	11,568	0	0	0	11,568
1951	0	7,666	0	0	0	0	0	0	-2,188	0	0	0	5,478
1952	0	0	0	0	0	0	0	9,278	0	0	0	0	9,278
1953	0	0	0	0	0	0	0	322	0	0	0	0	322
1954	0	0	0	0	0	0	0	26,531	0	0	0	0	26,531
1955	0	0	0	0	0	0	0	0	3,808	0	0	0	3,808
1956	0	0	0	0	0	0	0	5,047	0	0	0	0	5,047
1957	0	0	0	0	0	0	0	30,123	0	0	0	0	30,123
1958	0	0	0	0	0	0	0	14,919	0	0	0	0	14,919
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	13,399	0	0	0	0	13,399
1963	0	0	0	0	0	0	0	17,085	0	0	0	0	17,085
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	6,934	0	0	0	6,934
1966	0	0	0	0	0	0	3,808	-4,045	0	0	0	0	-237
1967	0	0	0	0	0	0	0	7,742	0	0	0	0	7,742
1968	0	0	0	0	0	0	0	17,143	0	0	0	0	17,143
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	8,363	0	0	0	0	8,363
1971	0	0	0	0	0	0	0	14,663	0	0	0	0	14,663
1972	0	0	0	0	0	0	0	33,266	0	0	0	0	33,266
1973	0	0	0	0	0	0	0	17,125	0	0	0	0	17,125
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	18,345	0	0	0	0	18,345
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	40,360	0	0	0	310	40,670
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	3,935	-3,554	0	0	0	0	0	0	0	381
1981	0	0	0	0	0	0	0	7,368	10,310	0	0	0	17,678
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	1,957	0	0	0	0	1,957
1984	0	0	0	0	0	-3,935	0	11,745	0	0	0	0	7,810
1985	0	0	0	0	0	0	0	12,715	0	0	0	0	12,715
1986	0	0	0	0	0	10,235	3,935	0	0	0	0	0	14,170
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	3,808	0	0	0	3,808
1989	0	0	0	0	0	0	0	33,354	0	0	0	0	33,354
1990	0	0	0	0	0	0	0	7,831	0	0	0	0	7,831
1991	0	0	0	0	0	0	0	0	14,664	0	0	0	14,664
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	3,554	-3,935	1,311	2,785	0	0	0	0	3,715
1997	0	0	0	12,998	0	0	0	0	0	0	0	0	12,998
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	11,255	127	0	0	0	11,382
2000	0	0	0	0	0	0	0	20,792	0	0	0	0	20,792
2001	0	0	0	0	0	0	0	28,670	0	0	0	0	28,670
2002	0	0	0	0	0	0	0	24,892	0	0	0	0	24,892
Avg (21-02)	0	93	0	207	43	29	203	7,340	1,862	0	0	4	9,782

Table 6.3-4

Difference in Hetch Hetchy Release to Stream (Acre-feet)

Desalination within San Francisco minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	0	0	0	-509	0	0	0	-509
1922	0	0	0	0	0	0	0	5,543	0	0	0	0	5,543
1923	0	0	0	0	0	0	0	-3,891	0	0	0	0	-3,891
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	18,410	0	0	0	0	18,410
1926	0	0	0	0	0	0	0	-2,913	0	0	0	0	-2,913
1927	0	0	0	0	0	0	0	-12,868	0	0	0	0	-12,868
1928	0	0	0	0	0	0	0	0	0	0	0	0	0
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	4,007	0	0	0	4,007
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	3,554	0	0	0	-751	0	0	0	2,803
1933	0	0	0	0	0	0	0	0	8,571	0	0	0	8,571
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	3,935	0	0	10,201	0	0	0	14,136
1936	0	0	0	0	0	0	0	-2,830	0	0	0	0	-2,830
1937	0	0	0	0	0	0	0	6,448	0	0	0	0	6,448
1938	0	0	0	0	0	0	0	-2,015	0	0	0	0	-2,015
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	0	0	0	15,675	0	0	0	0	15,675
1941	0	0	0	0	0	0	0	0	1,479	0	0	0	1,479
1942	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	-9,121	0	0	0	0	-9,121
1945	0	0	0	0	0	0	0	0	23,179	0	0	0	23,179
1946	0	0	0	0	0	0	0	-3,104	0	0	0	0	-3,104
1947	0	0	0	0	0	0	0	-947	0	0	0	0	-947
1948	0	0	0	0	0	0	0	0	5,487	0	0	0	5,487
1949	0	0	0	0	0	0	0	0	6,209	0	0	0	6,209
1950	0	0	0	0	0	0	0	0	16,678	0	0	0	16,678
1951	0	0	0	0	0	0	0	0	-8,401	0	0	0	-8,401
1952	0	0	0	0	0	0	0	-6,872	0	0	0	0	-6,872
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	-4,453	0	0	0	0	-4,453
1955	0	0	0	0	0	0	0	0	3,808	0	0	0	3,808
1956	0	0	0	0	0	0	0	2,241	0	0	0	0	2,241
1957	0	0	0	0	0	0	0	-1,605	0	0	0	0	-1,605
1958	0	0	0	0	0	0	0	2,381	0	0	0	0	2,381
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	-28,255	0	0	0	0	-28,255
1963	0	0	0	0	0	0	0	-11,183	0	0	0	0	-11,183
1964	0	0	0	0	0	0	0	0	-3,808	0	0	0	-3,808
1965	0	0	0	0	0	0	0	0	20,148	0	0	0	20,148
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	-981	0	0	0	0	-981
1968	0	0	0	0	0	0	0	-13,805	0	0	0	0	-13,805
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	3,935	0	0	0	0	0	0	0	0	3,935
1971	0	0	0	0	0	0	0	-8,973	0	0	0	0	-8,973
1972	0	0	0	0	0	0	0	3,809	0	0	0	0	3,809
1973	0	0	0	0	0	0	0	2,731	0	0	0	0	2,731
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	20,704	4,171	0	0	0	24,875
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	-6,230	0	0	0	0	-6,230
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	3,935	-3,554	0	0	0	0	0	0	0	381
1981	0	0	0	0	0	0	0	-3,039	0	0	0	0	-3,039
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	-1,174	0	0	0	0	-1,174
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	7,480	0	0	0	0	7,480
1986	0	0	0	0	0	1,757	0	0	0	0	0	0	1,757
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	7,831	0	0	0	0	7,831
1991	0	0	0	0	0	0	0	0	-14,310	0	0	0	-14,310
1992	0	0	0	0	0	0	0	-28,918	0	0	0	0	-28,918
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	3,554	-3,935	1,311	2,785	0	0	0	0	3,715
1997	0	0	0	922	0	0	0	0	0	0	0	0	922
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	-2,236	0	0	0	0	-2,236
2000	0	0	0	0	0	0	0	10,494	0	0	0	0	10,494
2001	0	0	0	0	0	0	0	-13,997	0	0	0	0	-13,997
2002	0	0	0	0	0	0	0	-11,556	0	0	0	0	-11,556
Avg (21-02)	0	0	0	107	43	21	16	-908	929	0	0	0	209

Figure 6.6-1

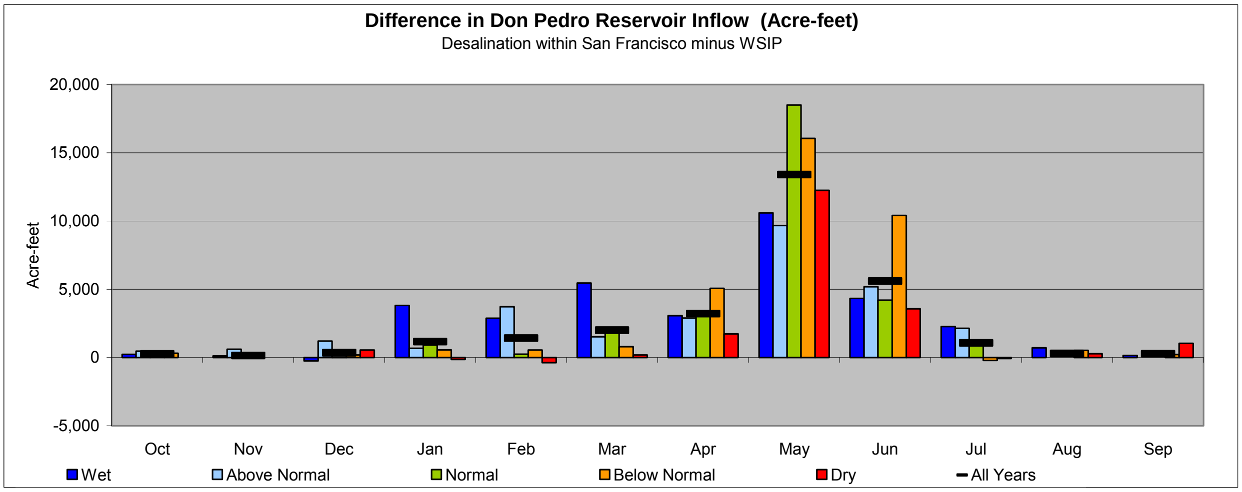
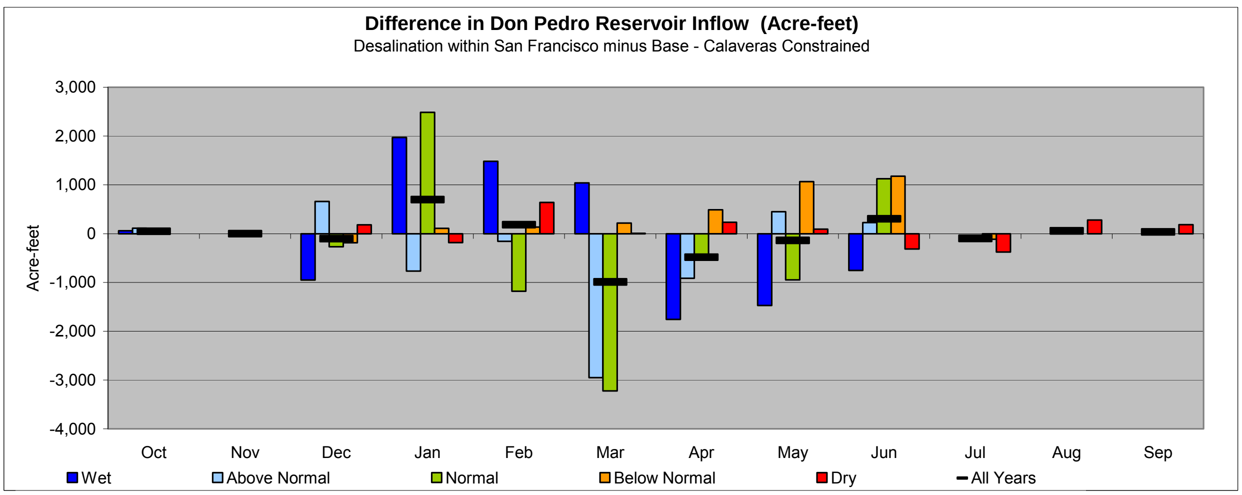


Figure 6.6-2

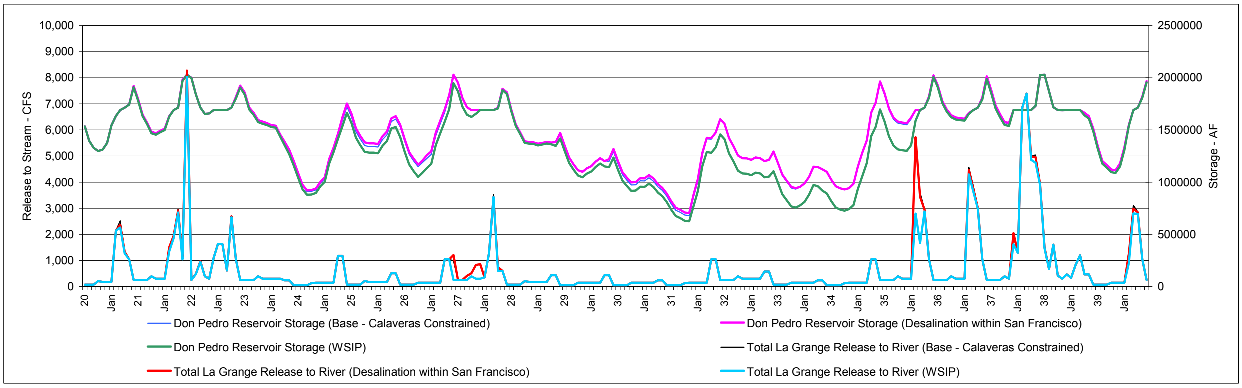


Essentially the same inflow to Don Pedro Reservoir occurs for the alternative and base settings. Figure 6.6-3 illustrates a chronological trace of the simulation of Don Pedro Reservoir storage and stream releases. Shown in Figure 6.6-3 are the results for the WSIP, base, and alternative settings. The alternative setting operation of Don Pedro Reservoir is essentially the same between the alternative and base settings. The lesser inflow to Don Pedro Reservoir associated with the WSIP setting would tend to deplete more storage from Don Pedro Reservoir than either the base or alternative settings, particularly during periods of sustained drought.

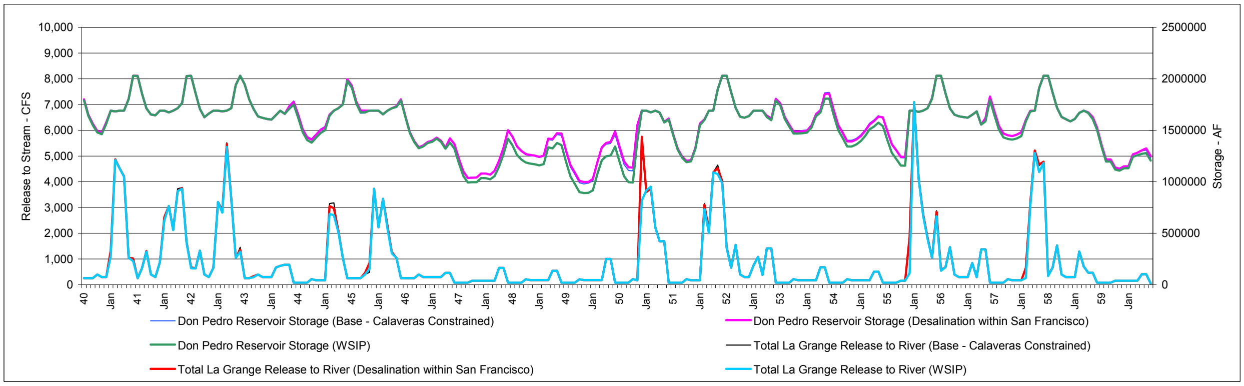
The additional depletion of reservoir storage in the WSIP setting manifests as a reduction in subsequent releases below La Grange Dam in order to replenish reservoir storage. The differences in release to the Tuolumne River from La Grange Dam would occur only when there would otherwise be releases in excess of minimum FERC flow requirements. In the alternative setting, the storage operation of Don Pedro Reservoir is essentially the same as the base setting, resulting in little difference in releases below La Grange Dam. As described previously, slight changes in inflow would occur between the alternative and base settings due to changes in the overall system-wide operation of the SFPUC system. The changes in inflow during periods when Don Pedro Reservoir would be passing inflow to maintain flood control space in the reservoir would manifest as a change in the amount of flow passed to the river. The overall average annual release to the Tuolumne River associated with the alternative is essentially the same as the water released in the base setting; however, there would be month-to-month and year-to-year differences.

Figure 6.6-3

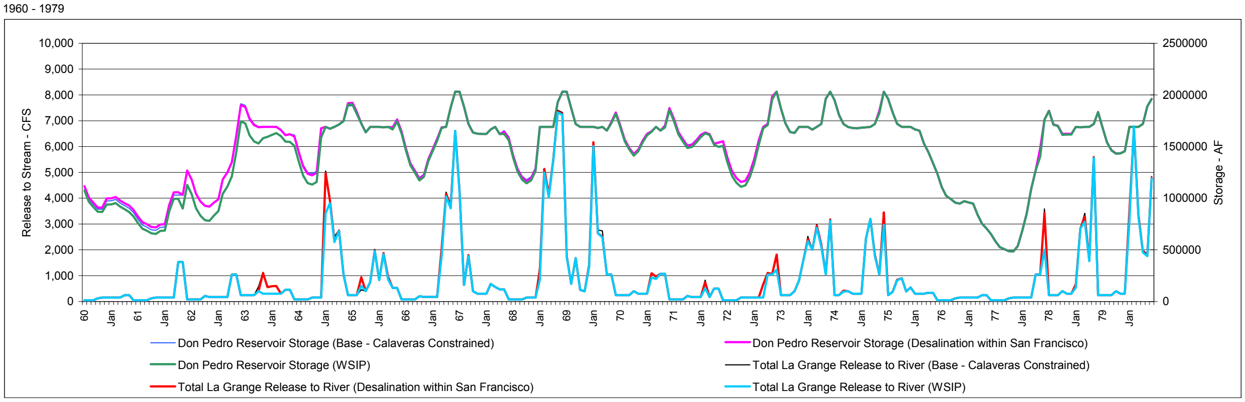
1920 - 1939



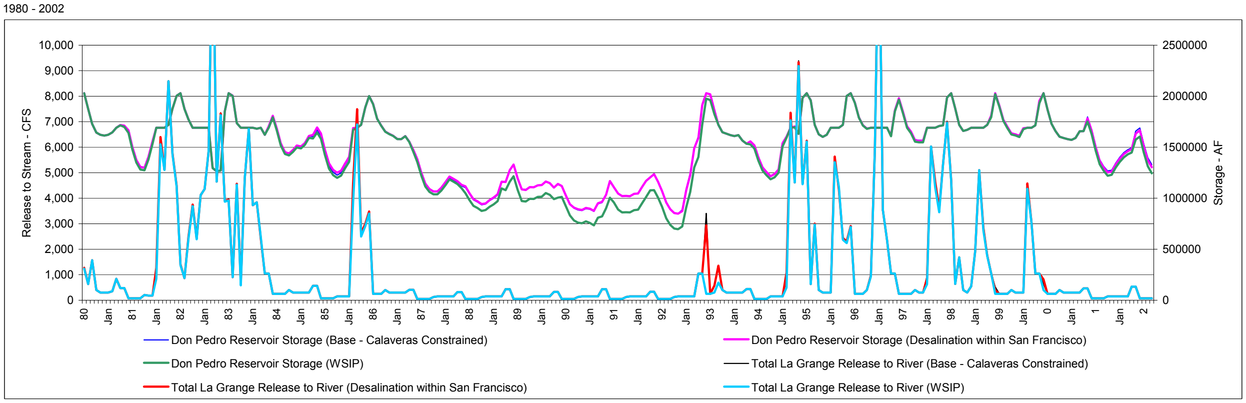
1940 - 1959



1960 - 1979



1980 - 2002



6.7 Calaveras and San Antonio Reservoirs, Alameda Creek and Downstream

The analytical studies used to evaluate this alternative focused on depicting an alternative method of serving the increase in system-wide demand through means other than the Tuolumne River. Those studies were used in support of developing Water Supply Option 3. Subsequent to those studies, refinements to the depiction of the Bay Area system and its operation have occurred that limit the direct use of HH/LSM results for illustrative purposes. The following qualitative descriptions of the comparison between the alternative, WSIP, and base settings have been developed from the review of HH/LSM results and engineering judgment. Overall, in the alternative setting, the Bay Area system would perform very much the same as the system performs in the WSIP setting; however, the occurrence of the alternative's supplemental water supply within the Bay Area system would provide an improved ability to retain storage in the Bay Area reservoirs. This would occur due to the absence of the effect of conveyance constraints in the Hetch Hetchy system during summer and the conveyance maintenance period. The need for water from the Hetch Hetchy system that would at times occur when conveyance could not fully deliver would be satisfied from production at the desalination plant, leaving the Bay Area reservoirs less depleted within a year.

Compared to the base setting, Calaveras Reservoir operations would substantively change in the alternative setting. With the restoration of Calaveras Reservoir operating capacity, the reservoir would be operated to a larger storage capacity. The operation of Calaveras Reservoir would be very similar to the operation described for the WSIP setting.

There would be two categorical changes in the regime of releases to Calaveras Creek below Calaveras Dam between the alternative and base settings. In the alternative setting, there would be the addition of the flows representing the flow objectives associated with the1997 MOU, and the reduction of stream releases during wetter-year/wetter-season flows due to the restoration of Calaveras Reservoir operational capacity.

Compared to the base setting, diversions from Alameda Creek to Calaveras Reservoir would increase in the alternative setting. With the current constraints on Calaveras Reservoir storage, diversions to Calaveras Creek are rejected. With the restoration of operational storage in the reservoir, the opportunity to divert water into the reservoir would increase.

Commensurate with changes in diversions from Alameda Creek to Calaveras Reservoir would be changes to the flow below the Alameda Creek Diversion Dam. Opposite in effect compared to diversions to Calaveras Reservoir, flow passing Alameda Creek Diversion Dam would decrease in the alternative setting. With operational capacity restored at Calaveras Reservoir, there would be more opportunity (and need) to divert Alameda Creek flows, and thus reduce flow passing the dam.

Flow below the confluence of Alameda Creek and Calaveras Creek is affected by releases from Calaveras Dam to the stream, flow passing Alameda Creek Diversion Dam, and unregulated flow below Alameda Creek Diversion Dam and Calaveras Dam. As with the WSIP setting comparison, the notable differences between the alternative and base settings are the addition of stream flows representing the 1997 MOU and the reduction of wetter-year/wet season flows due to the restoration of Calaveras Reservoir storage.

A flow recapture facility in Alameda Creek below Calaveras Reservoir is incorporated in the alternative setting. This facility is assumed to recapture flows explicitly released from Calaveras Dam in the representation of the 1997 MOU. The effect of the recapture is a reduction in the flow that occurs below the confluence of Alameda and Calaveras Creeks, but only to the extent that releases were explicitly made from Calaveras Reservoir. The flows at this location would be essentially the same as those described for the WSIP setting. The flows identified at this location indicate flow occurring below the confluence of Alameda and Calaveras Creeks (described above), with the addition of estimated unregulated stream accretions between the Alameda-Calaveras Creek confluence and the Alameda-San Antonio Creek confluence, minus the water assumed to be recaptured (diverted) by the SFPUC from the creek.

The difference in San Antonio Reservoir storage between the alternative and base settings is the result of several factors, and is predominantly due to the restoration of the operational capacity of Calaveras Reservoir, the use of SJPL flow for maintenance of Sunol Valley WTP production, and the maintenance of Hetch Hetchy conveyance. In the base setting, the limited operating storage capacity at Calaveras Reservoir leads to a different operation at San Antonio Reservoir, one that draws relatively more stored water for system demands when the draw from Calaveras Reservoir is constrained due to limited storage. The result is that the alternative setting would retain more storage in San Antonio Reservoir than in the base setting. There would very little change in stream releases below San Antonio Reservoir between the alternative, WSIP, and base settings, as the operational goal is to minimize releases to the stream. Flexibility within the balancing of storage among the Bay Area reservoirs would continue to facilitate this goal.

Flow below the confluence of Alameda and San Antonio Creeks is influenced by releases from San Antonio Reservoir and flow arriving at the location from Alameda Creek, which includes upstream impairment by SFPUC operations and facilities. The differences in flow at this location between the alternative and base settings are particularly due to the effects of the restoration of Calaveras Reservoir operating capacity in the alternative setting, and would be essentially the same as described for the differences between the WSIP and base settings.

6.8 Crystal Springs and San Andreas Reservoirs

Fundamental to the difference in storage operations at Crystal Springs Reservoir between the alternative setting and the base settings is the restoration of reservoir operation capacity in the alternative setting, which does not occur in the base setting. The result is the operation of Crystal Springs Reservoir at a higher maximum storage in the alternative setting. The operation of Crystal Springs Reservoir would be similar to the operation described for the WSIP setting.

Compared to the base setting, the alternative setting would generally result in a shifting of the maximum storage level and the range of reservoir operation to a greater volume (elevation), with the lower end of the monthly operating range normally greater in storage than in the base setting.

A difference in stream release below Crystal Springs Reservoir would be infrequent, and could be either an increase or decrease in the release. The potential difference is attributed to whether the alternative’s operation would result in more or less available operational storage capacity at an instant compared to another setting. In actual operations, it is anticipated that system operators would manage the reservoir system whereby stream releases would be minimal under any setting, with the effect of essentially no difference between the alternative, WSIP, and base settings.

Overall, Crystal Springs Reservoir, San Antonio Reservoir, and Calaveras Reservoir would tend to retain more storage during a year in the alternative setting as compared to the WSIP setting, and that result is even more dramatic when compared to the base setting. The alternative setting includes water supply production from a desalination plant located within the Bay Area system. The additional supply during the summer reduces the need to draw from Bay Area system storage, retaining greater storage in the Bay Area system during the summer and fall. The availability and use of the supplemental supply during December, when otherwise there would be no conveyance from Hetch Hetchy due to maintenance, also retains storage in the Bay Area system.

San Andreas Reservoir operations would generally be the same between the alternative, WSIP, and base settings. Reservoir storage would follow a systematic filling and lowering each year to manage runoff. However, in contrast to the base and WSIP settings, the alternative setting would not typically result in an additional draw down of storage from San Andreas Reservoir during Hetch Hetchy conveyance maintenance periods. With the desalination supply available during the period of conveyance maintenance, sufficient supplies and conveyance among the Bay Area system would negate the need to increase production at Harry Tracy WTP to compensate for the absence of Tuolumne River supply. The need to draw storage from San Andreas Reservoir to serve the demand at Harry Tracy WTP would be eliminated.

6.9 Pilarcitos Reservoir

Coastside CWD's water demand and its SFPUC purchase request are projected to increase within the WSIP planning horizon of year 2030. With the context of the 2030 purchase request of 300 mgd, Coastside CWD's portion has been estimated at about 3 mgd. This projected purchase request is approximately 1 mgd greater than its current purchase request. Recognizing the current physical constraints to deliveries from the SFPUC to Coastside CWD and the ongoing planning activities in the watershed, the precise means of serving Coastside CWD's additional purchase request and the resultant potential changes to the operation of SFPUC facilities and their affected environs are uncertain.[24]

Assuming a range of potential means to serve the additional purchase request from Coastside CWD, the following potential hydrologic effects to SFPUC facilities and their affected environs have been identified:

- Due to limited yield from Pilarcitos Reservoir, additional diversions would be required from Crystal Springs Reservoir.
- If deliveries to Coastside CWD from Pilarcitos Reservoir increase during the winter season, these deliveries could potentially reduce storage in Pilarcitos Reservoir, thereby potentially reducing diversions to the San Mateo Creek watershed. Although the increased delivery would increase releases to Pilarcitos Creek from Pilarcitos Dam for a period of time, the increase would subsequently lead to a reduction in spills past Stone Dam.
- Additional wintertime deliveries could also potentially impair the ability to provide carry-over storage into the summer season from Pilarcitos Reservoir, and subsequently lead to an acceleration of the beginning of the season when releases to Pilarcitos Creek from Pilarcitos Reservoir consist only of the passage of reservoir inflow.
- An increase in summertime deliveries from Pilarcitos Creek could also accelerate the beginning of the season when releases to Pilarcitos Creek from Pilarcitos Reservoir consist only of the passage of reservoir inflow.

The alternative setting would result in the same potential effects to the Pilarcitos Creek watershed as in the WSIP setting.

[24] See "Analysis of SFPUC Pilarcitos / Coastside County Water District Operations", Memorandum by Daniel B. Steiner, March 8, 2007.

APPENDIX H2-6

Memorandum

Subject: **HH/LSM Assumptions and Results – Proposed WSIP in Future Cumulative Setting**
From: **Daniel B. Steiner**
Date: **December 6, 2006**

1. Introduction

This memorandum summarizes the assumptions for and interprets the Hetch Hetchy Local Simulation Model (HH/LSM) results for the simulation of the Water System Improvement Program ("WSIP" or the "proposed program") in the "cumulative" setting. Because additional activities may occur separate from the WSIP, this analysis evaluates the future hydrologic effects that could occur as a result of such activities in combination with the WSIP. Two potential activities specific to the Tuolumne River Basin have been identified for the cumulative analysis: 1) the U.S. Fish & Wildlife Service (USFWS) "discretionary flows" below Hetch Hetchy; and 2) the Turlock Irrigation District (TID) river diversion project. The USFWS activity is explicitly modeled by HH/LSM, and is the topic of this paper; the TID project will be evaluated with post-processing of the HH/LSM results. The TID project would affect only the balance of river releases below La Grange Dam and Turlock Canal diversions, and would not affect the upstream operation of San Francisco facilities. A separate analysis of that cumulative action is being performed, the results of which are not included in this paper.

The San Francisco Public Utilities Commission (SFPUC) proposes to adopt and implement a WSIP to increase the reliability of the regional water system. The WSIP implements the service goals and system performance objectives established by the SFPUC for the Regional Water System in the areas of water quality, seismic reliability, delivery reliability, and water supply through the year 2030. The WSIP level of service objectives for water supply are to: 1) fully meet customer purchase requests in non-drought years through the planning year 2030, estimated at 300 million gallons per day (mgd) average annual delivery; and 2) provide drought-year delivery with a maximum system-wide delivery reduction (rationing) of 20 percent in any one year of a drought. These objectives correspond to a required system firm yield of 256 mgd in 2030.

The WSIP's effect on hydrology is described in a separate memorandum.[1] That memorandum discusses the components of the WSIP, the various modeling assumptions and performance and hydrologic results for the WSIP compared to the modeled existing setting (2005) with Calaveras Reservoir constrained by California Division of Safety of Dams (DSOD) restrictions, and the pre-2002 setting (with a Calaveras Reservoir operation prior to DSOD restrictions). The hydrology of the proposed program is primarily compared to the baseline condition of the Program Environmental Impact Report, i.e., the simulated current (2005) operation of the Regional Water System, assuming that the operation of Calaveras and Crystal Springs Reservoirs is constrained by DSOD restrictions. Primary hydrologic parameters such as projected water deliveries, reservoir storage, and stream flows are compared, and additional parameters that assist in identifying causes of hydrologic changes are also described as needed. The key hydrologic factors that lead to environmental impact assessment are also illustrated.

This analysis is based on both the projection of the WSIP operation in the year 2030 and the current operation of the Regional Water System.

2. USFWS Discretionary Flows

The USFWS has the discretion to require the release of additional water from Hetch Hetchy Reservoir. These releases amount to 15,000, 6,500, and 4,400 acre-feet during year types A, B, and C, respectively, as the year types are classified by the amount of precipitation and runoff at Hetch Hetchy Reservoir. Table 2-1 presents the criteria that determine the year type classification and the required basic releases

[1] See "HH/LSM Assumptions and Results – Proposed WSIP," Memorandum by Daniel B. Steiner, March 18, 2007.

to the Tuolumne River below O'Shaughnessy Dam. In addition to the basic release, during year types A and B, an additional release of 64 cubic feet per second (cfs) below Hetch Hetchy Reservoir can be required whenever Canyon Tunnel flow exceeds 920 cfs.

Table 2-1
Average Daily Required Fishery Release Schedule Below O'Shaughnessy Dam

	Year Type A		Year Type B		Year Type C
Month	Release (cfs)	Criteria[a, b]	Release (cfs)	Criteria[a, b]	Release (cfs)
January	50	8.80"	40	6.10"	35
February	60	14.00"	50	9.50"	35
March	60	18.60"	50	14.20"	35
April	75	23.00"	65	18.00"	35
May	100	26.60"	80	19.50"	50
June	125	28.45"	110	21.25"	75
July	125	575,000 acre-feet	110	390,000 acre-feet	75
August	125	640,000 acre-feet	110	400,000 acre-feet	75
September 1-14	100		80		75
September 15-30	80		65		50
October	60		50		35
November	60		50		35
December	50		40		35

[a] Precipitation indicator in inches is cumulative, measured at Hetch Hetchy Reservoir, starting October 1.
[b] Runoff indicator in acre-feet is the calculated inflow into Hetch Hetchy Reservoir commencing on the previous October 1.

Table 2-2 illustrates the assumed monthly basic release schedule and the discretionary release schedule used for the cumulative scenario. The analysis of the WSIP does not include the assumption of the discretionary release requirement. The implementation of the additional 64-cfs release as a condition of Canyon Tunnel diversions is applied dynamically within the HH/LSM.

Table 2-2
Modeled Monthly Minimum Release Below O'Shaughnessy Dam – Acre-feet

	Type A			Type B			Type C		
Month	F&W Release	Discre-tionary Release	Total Release	F&W Release	Discre-tionary Release	Total Release	F&W Release	Discre-tionary Release[a]	Total Release
October	3,689	0	3,689	3,074	0	3,074	2,152	0	2,152
November	3,570	0	3,570	2,975	0	2,975	2,083	0	2,083
December	3,074	0	3,074	2,460	0	2,460	2,152	0	2,152
January	3,074	0	3,074	2,460	0	2,460	2,152	0	2,152
February	3,362	0	3,362	2,802	0	2,802	1,961	0	1,961
March	3,689	0	3,689	3,074	0	3,074	2,152	0	2,152
April	4,463	0	4,463	3,868	0	3,868	2,083	0	2,083
May	6,149	0	6,149	4,919	0	4,919	3,074	0	3,074
June	7,438	0	7,438	6,545	0	6,545	4,463	0	4,463
July	7,686	6,000	13,686	6,764	2,600	9,364	4,612	1,800	6,412
August	7,686	6,000	13,686	6,764	2,500	9,264	4,612	1,800	6,412
September	5,316	3,000	8,316	4,284	1,400	5,684	3,669	800	4,469
Total	59,196	15,000	74,196	49,989	6,500	56,489	35,165	4,400	39,565

[a] If July first-of-month storage at Hetch Hetchy Reservoir is less than 210,000 acre-feet program will not make the discretionary release.

3. Results

3.1 Comparison to WSIP

For the area upstream of Don Pedro Reservoir operations, the cumulative setting replicates the WSIP setting, except for the discretionary releases. The additional discretionary releases below Hetch Hetchy Reservoir would at times occur at the expense of diversions to Canyon Tunnel, and at other times from storage of Hetch Hetchy Reservoir and the subsequent reduction of release to the river that would otherwise be above required minimum releases.

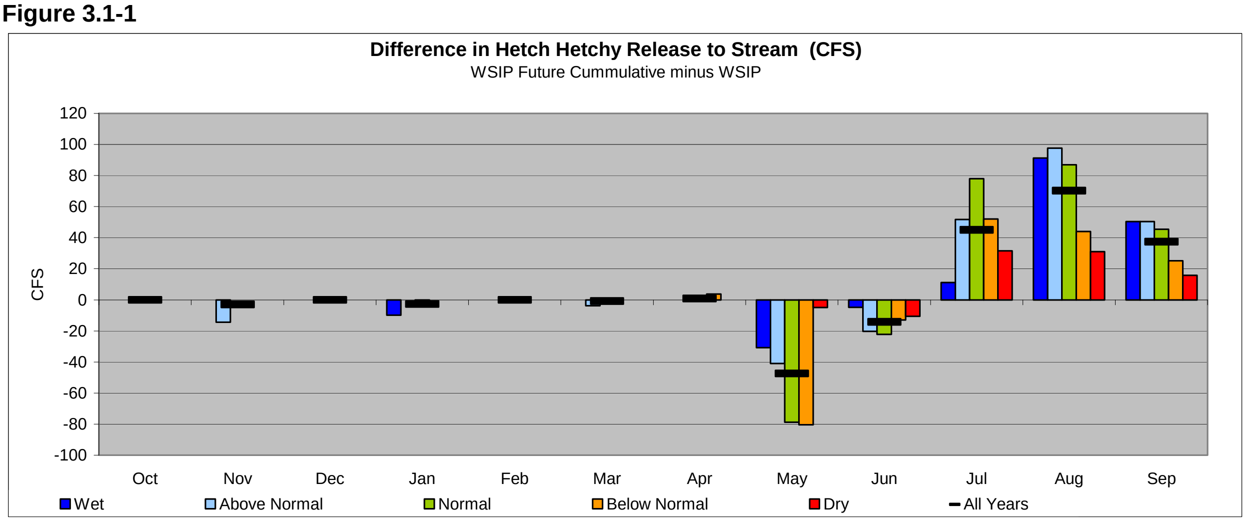
Table 3.1-1 illustrates the simulated releases below O'Shaughnessy Dam for the cumulative setting, depicted in average monthly flow (in cfs) in chronological sequence for the 1921-through-2002 modeling period. The values illustrate both periods of controlled releases for minimum release requirements and periods of excess release above minimum requirements (spills).

Table 3.1-2 illustrates the differences between releases anticipated with the WSIP and the cumulative settings. The values are illustrated in average monthly flow (in cfs), with positive values representing an increase in flow associated with the cumulative setting. The same data are shown in Table 3.1-3, arranged by descending order of wetness in the basin (La Grange unimpaired flow). Although the release requirement is based on a separate wetness index, the results show flow increases during the summer (July through September), with relatively larger increases during wetter years. During the wetter years, there sometimes appears to be no increase in flows during certain summer months (e.g., July). This is due to releases above minimum requirements (spills) in both settings, and the change in minimum release requirement has no effect on the release.

Table 3.1-2 illustrates that the additional summer releases would result in subsequent reductions in releases in some years, typically during May. This is consistent with the effect of additional demand from Hetch Hetchy Reservoir. Additional reservoir demand would lead to an additional draw on storage, which would require subsequent replenishment. The replenishment would occur through the additional capture of inflow, typically during May, when otherwise the inflow would spill to the river.

Table 3.1-4 illustrates the rank-ordered differences in monthly flow volumes (acre-feet). The reductions in springtime flow, due to replenishment, can accumulate to about 18,000 acre-feet (May 1989), but are typically less. As described for the effects of WSIP, this monthly reduction in flow would typically manifest as a delay of the day in which substantial dam releases are made to the stream.[2] In this extreme example, the delay could amount to about 6 days. Subsequent to this delay, releases would return to the level that would occur without the effect of the discretionary flows. Figure 3.1-1 illustrates the difference in flow between the WSIP and cumulative scenario by year type. The values represent the average flow change for all of the years within each year type classification. The graphic illustrates the increase in flow that would occur during summer due to the discretionary flows, and also the general decrease in flow that would occur during reservoir replenishment (decrease in spills) during spring.

Figure 3.1-1



2 See "Estimated Effect of WSIP on Daily Releases below Hetch Hetchy Reservoir," Memorandum by Daniel B. Steiner, December 2006.

Table 3.1-1

Hetch Hetchy Release to Stream (CFS)

WSIP Future Cummulative

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	50	50	40	50	125	124	139	164	1,607	223	223	140
1922	60	60	50	50	61	60	139	766	5,247	469	223	140
1923	60	60	50	50	61	60	129	490	1,600	275	223	140
1924	60	60	50	35	35	35	35	50	75	104	104	75
1925	35	35	35	50	61	60	139	836	2,519	287	223	140
1926	60	60	50	40	50	124	129	144	110	152	151	96
1927	50	50	40	50	61	60	75	1,754	4,010	287	223	140
1928	60	60	50	50	61	60	75	2,716	329	223	151	96
1929	50	50	40	40	35	35	35	80	483	152	151	96
1930	50	50	40	35	50	50	65	80	1,800	152	151	96
1931	50	50	40	35	50	35	35	50	75	104	104	75
1932	35	35	35	114	61	60	75	100	1,920	396	223	140
1933	60	60	50	35	50	35	35	50	184	152	151	96
1934	50	50	40	40	50	114	65	80	110	104	104	75
1935	35	35	35	114	125	60	75	164	2,273	223	223	140
1936	60	60	50	40	114	124	139	539	2,759	287	223	140
1937	60	60	50	50	125	124	139	164	2,533	223	223	140
1938	60	60	50	50	125	124	139	871	5,883	1,832	223	140
1939	60	60	50	40	50	50	65	680	110	152	151	96
1940	50	50	40	40	125	124	139	608	2,442	223	223	140
1941	60	60	50	114	125	124	139	164	3,305	1,102	223	140
1942	60	60	50	50	61	60	139	1,715	4,762	1,400	223	140
1943	60	60	50	50	61	60	391	3,215	2,503	296	223	140
1944	60	60	50	40	50	50	65	267	1,338	152	151	96
1945	50	50	40	50	125	124	139	164	3,070	519	223	140
1946	60	60	114	114	125	124	139	164	1,373	223	223	140
1947	60	60	50	50	61	60	75	1,203	174	152	151	96
1948	50	50	40	40	50	114	129	164	1,053	223	223	140
1949	60	60	50	40	50	114	129	144	174	152	151	96
1950	50	50	40	40	125	114	139	164	1,298	223	223	140
1951	60	320	699	114	125	124	139	164	1,444	223	223	140
1952	60	60	50	50	125	60	75	3,302	4,001	1,728	223	140
1953	60	60	50	50	61	50	65	304	2,836	478	223	140
1954	60	60	50	40	50	50	75	1,211	467	152	151	96
1955	50	50	40	50	61	114	129	144	110	152	151	96
1956	50	50	104	114	125	124	139	171	5,215	1,540	223	140
1957	60	60	50	35	35	35	65	176	3,081	223	151	96
1958	50	50	40	50	61	60	75	2,772	3,728	902	223	140
1959	60	60	50	35	35	114	129	144	110	152	151	96
1960	50	50	40	35	35	35	129	144	110	152	151	96
1961	50	50	40	50	50	35	65	80	110	104	104	75
1962	35	35	35	40	35	60	75	100	3,297	287	223	140
1963	60	60	50	35	50	60	75	1,598	3,417	595	223	140
1964	60	60	50	50	61	50	129	144	117	152	151	96
1965	50	50	104	114	125	124	139	164	2,020	1,001	223	140
1966	60	60	50	50	61	60	129	2,009	110	152	151	96
1967	50	50	40	50	61	60	75	2,265	4,549	3,012	223	140
1968	60	60	50	40	50	50	65	745	249	152	151	96
1969	50	50	40	50	61	60	213	5,603	5,043	1,885	223	140
1970	60	60	50	50	61	60	75	1,779	2,099	223	223	140
1971	60	60	50	50	61	60	75	745	2,977	223	223	140
1972	60	60	50	50	61	50	65	144	913	152	151	96
1973	50	50	40	50	61	60	75	2,998	2,679	223	223	140
1974	60	60	50	50	61	60	75	3,270	3,272	287	223	140
1975	60	60	50	50	50	60	139	164	4,097	287	223	140
1976	60	60	50	50	35	35	35	50	75	104	104	75
1977	35	35	35	35	35	35	35	50	75	75	75	62
1978	35	35	35	50	61	60	75	100	5,018	2,162	223	140
1979	60	60	50	40	61	60	75	3,594	1,804	223	223	140
1980	60	60	50	50	125	60	139	2,168	3,964	2,422	223	140
1981	60	60	50	35	50	50	129	144	174	152	151	96
1982	50	50	40	50	125	60	439	3,723	4,271	1,764	223	140
1983	124	60	50	50	61	60	75	2,881	7,789	4,923	1,000	140
1984	60	124	114	114	125	124	75	1,838	2,200	223	223	140
1985	60	60	50	50	61	50	75	1,607	214	152	151	96
1986	50	50	40	50	61	124	287	3,722	4,433	287	223	140
1987	60	60	50	35	35	35	35	50	75	104	104	75
1988	35	35	35	50	61	50	35	80	110	104	104	75
1989	35	35	35	50	50	50	75	1,144	1,057	223	151	96
1990	50	50	40	40	50	50	35	50	75	104	104	75
1991	35	35	35	35	35	35	65	80	1,172	152	151	96
1992	50	50	40	40	50	50	65	50	75	104	104	75
1993	35	35	35	50	61	60	139	3,467	3,430	717	223	140
1994	60	60	50	40	35	35	35	50	75	104	104	75
1995	35	35	35	50	61	124	139	2,135	5,620	4,783	287	140
1996	60	60	50	40	61	124	139	3,100	2,842	287	223	140
1997	60	60	50	1,652	125	124	75	3,767	2,469	223	223	140
1998	60	60	50	40	61	60	75	1,044	5,259	3,543	223	140
1999	60	60	50	40	125	124	139	164	2,710	223	223	140
2000	60	60	50	35	61	60	75	2,046	1,642	223	223	140
2001	60	60	50	40	50	50	65	573	110	152	151	96
2002	50	50	40	50	61	60	75	1,422	1,091	223	151	96
Avg (21-02)	54	58	56	71	70	73	104	1,063	2,061	593	196	118

Figure 3.1-2

Difference in Hetch Hetchy Release to Stream (CFS) WSIP Future Cummulative minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	0	0	0	0	0	0	0	0	-66	98	98	50
1922	0	0	0	0	0	0	0	-132	0	0	98	50
1923	0	0	0	0	0	0	0	-173	0	0	98	50
1924	0	0	0	0	0	0	0	0	0	29	29	13
1925	0	0	0	0	0	0	0	-102	0	98	98	50
1926	0	0	0	0	0	0	0	0	0	42	41	24
1927	0	0	0	0	0	0	0	-166	0	66	98	50
1928	0	0	0	0	0	0	0	-221	0	98	41	24
1929	0	0	0	0	0	0	0	0	-171	42	41	24
1930	0	0	0	0	0	0	0	-64	70	42	41	24
1931	0	0	0	0	0	0	0	0	0	29	29	13
1932	0	0	0	0	0	0	0	0	-12	0	98	50
1933	0	0	0	0	0	0	0	0	-121	42	41	24
1934	0	0	0	0	0	0	0	0	0	29	29	13
1935	0	0	0	0	0	-64	0	0	-10	98	98	50
1936	0	0	0	0	0	0	0	-78	0	98	98	50
1937	0	0	0	0	0	0	0	0	-78	98	98	50
1938	0	0	0	0	0	0	0	-100	0	0	98	50
1939	0	0	0	0	0	0	0	0	0	42	41	24
1940	0	0	0	0	0	0	0	-43	0	98	98	50
1941	0	0	0	0	0	0	0	0	-77	0	98	50
1942	0	0	0	0	0	0	0	0	0	0	98	50
1943	0	0	0	0	0	0	0	0	0	0	98	50
1944	0	0	0	0	0	0	0	-159	0	42	41	24
1945	0	0	0	0	0	0	0	0	-48	0	98	50
1946	0	0	0	0	0	0	0	-45	-57	98	98	50
1947	0	0	0	0	0	0	0	-238	0	42	41	24
1948	0	0	0	0	0	0	0	0	-42	98	98	50
1949	0	0	0	0	0	0	0	0	0	42	41	24
1950	0	0	0	0	0	0	0	0	-56	98	98	50
1951	0	-245	0	0	0	0	0	0	0	98	98	50
1952	0	0	0	0	0	0	0	-85	0	0	98	50
1953	0	0	0	0	0	0	0	-151	0	0	98	50
1954	0	0	0	0	0	0	0	-142	0	42	41	24
1955	0	0	0	0	0	0	0	0	0	42	41	24
1956	0	0	0	0	0	0	0	-34	0	0	98	50
1957	0	0	0	0	0	0	0	-142	0	98	41	24
1958	0	0	0	0	0	0	0	-142	0	0	98	50
1959	0	0	0	0	0	0	0	0	0	42	41	24
1960	0	0	0	0	0	0	0	0	0	42	41	24
1961	0	0	0	0	0	0	0	0	0	29	29	13
1962	0	0	0	0	0	0	0	0	-99	98	98	50
1963	0	0	0	0	0	0	0	-240	0	0	98	50
1964	0	0	0	0	0	0	0	0	7	42	41	24
1965	0	0	0	0	0	0	0	0	-76	0	98	50
1966	0	0	0	0	0	0	64	-66	0	42	41	24
1967	0	0	0	0	0	0	0	-131	0	0	98	50
1968	0	0	0	0	0	0	0	-78	0	42	41	24
1969	0	0	0	0	0	0	0	0	0	0	98	50
1970	0	0	0	-64	0	0	0	48	0	98	98	50
1971	0	0	0	0	0	0	0	-126	0	34	98	50
1972	0	0	0	0	0	0	0	-65	-47	42	41	24
1973	0	0	0	0	0	0	0	-98	0	98	98	50
1974	0	0	0	0	0	0	0	0	0	98	98	50
1975	0	0	0	0	0	0	0	-38	-70	98	98	50
1976	0	0	0	0	0	0	0	0	0	29	29	13
1977	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	98	50
1979	0	0	0	0	0	0	0	0	0	98	98	50
1980	0	0	0	0	0	0	0	0	0	0	98	50
1981	0	0	0	0	0	0	0	0	0	42	41	24
1982	0	0	0	0	0	0	0	0	0	0	98	50
1983	0	0	0	0	0	0	0	0	0	0	0	50
1984	0	0	0	0	0	0	0	1	0	34	98	50
1985	0	0	0	0	0	0	0	-81	0	42	41	24
1986	0	0	0	0	0	0	0	0	0	80	98	50
1987	0	0	0	0	0	0	0	0	0	29	29	13
1988	0	0	0	0	0	0	0	0	0	29	29	13
1989	0	0	0	0	0	0	0	-299	0	98	41	24
1990	0	0	0	0	0	0	0	0	0	29	29	13
1991	0	0	0	0	0	0	0	0	-87	42	41	24
1992	0	0	0	0	0	0	0	0	0	29	29	13
1993	0	0	0	0	0	0	0	0	0	0	98	50
1994	0	0	0	0	0	0	0	0	0	29	29	13
1995	0	0	0	0	0	0	0	0	0	0	94	50
1996	0	0	0	0	0	0	0	0	0	98	98	50
1997	0	0	0	-157	0	0	0	0	0	98	98	50
1998	0	0	0	0	0	0	0	0	0	0	98	50
1999	0	0	0	0	0	0	0	0	-128	98	98	50
2000	0	0	0	0	0	0	0	-142	0	98	98	50
2001	0	0	0	0	0	0	0	-253	0	42	41	24
2002	0	0	0	0	0	0	0	-109	0	98	41	24
Avg (21-02)	0	-3	0	-3	0	-1	1	-47	-14	45	70	37

Figure 3.1-3

Difference in Hetch Hetchy Release to Stream (CFS)

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending Unimpaired Runoff at LaGrange WSIP Future Cummulative minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1983	0	0	0	0	0	0	0	0	0	0	0	50
1995	0	0	0	0	0	0	0	0	0	0	94	50
1969	0	0	0	0	0	0	0	0	0	0	98	50
1982	0	0	0	0	0	0	0	0	0	0	98	50
1938	0	0	0	0	0	0	0	-100	0	0	98	50
1998	0	0	0	0	0	0	0	0	0	0	98	50
1997	0	0	0	-157	0	0	0	0	0	98	98	50
1956	0	0	0	0	0	0	0	-34	0	0	98	50
1967	0	0	0	0	0	0	0	-131	0	0	98	50
1980	0	0	0	0	0	0	0	0	0	0	98	50
1986	0	0	0	0	0	0	0	0	0	80	98	50
1952	0	0	0	0	0	0	0	-85	0	0	98	50
1978	0	0	0	0	0	0	0	0	0	0	98	50
1965	0	0	0	0	0	0	0	0	-76	0	98	50
1958	0	0	0	0	0	0	0	-142	0	0	98	50
1993	0	0	0	0	0	0	0	0	0	0	98	50
1941	0	0	0	0	0	0	0	0	-77	0	98	50
1951	0	-245	0	0	0	0	0	0	0	98	98	50
1922	0	0	0	0	0	0	0	-132	0	0	98	50
1984	0	0	0	0	0	0	0	1	0	34	98	50
1943	0	0	0	0	0	0	0	0	0	0	98	50
1942	0	0	0	0	0	0	0	0	0	0	98	50
1996	0	0	0	0	0	0	0	0	0	98	98	50
1974	0	0	0	0	0	0	0	0	0	98	98	50
1940	0	0	0	0	0	0	0	-43	0	98	98	50
1936	0	0	0	0	0	0	0	-78	0	98	98	50
1932	0	0	0	0	0	0	0	0	-12	0	98	50
1935	0	0	0	0	0	-64	0	0	-10	98	98	50
1999	0	0	0	0	0	0	0	0	-128	98	98	50
1945	0	0	0	0	0	0	0	0	-48	0	98	50
1927	0	0	0	0	0	0	0	-166	0	66	98	50
1963	0	0	0	0	0	0	0	-240	0	0	98	50
1975	0	0	0	0	0	0	0	-38	-70	98	98	50
1973	0	0	0	0	0	0	0	-98	0	98	98	50
1921	0	0	0	0	0	0	0	0	-66	98	98	50
1937	0	0	0	0	0	0	0	0	-78	98	98	50
1970	0	0	0	-64	0	0	0	48	0	98	98	50
2000	0	0	0	0	0	0	0	-142	0	98	98	50
1925	0	0	0	0	0	0	0	-102	0	98	98	50
1979	0	0	0	0	0	0	0	0	0	98	98	50
1946	0	0	0	0	0	0	0	-45	-57	98	98	50
1923	0	0	0	0	0	0	0	-173	0	0	98	50
1962	0	0	0	0	0	0	0	0	-99	98	98	50
1971	0	0	0	0	0	0	0	-126	0	34	98	50
1950	0	0	0	0	0	0	0	0	-56	98	98	50
1953	0	0	0	0	0	0	0	-151	0	0	98	50
1928	0	0	0	0	0	0	0	-221	0	98	41	24
1954	0	0	0	0	0	0	0	-142	0	42	41	24
2002	0	0	0	0	0	0	0	-109	0	98	41	24
1957	0	0	0	0	0	0	0	-142	0	98	41	24
1948	0	0	0	0	0	0	0	0	-42	98	98	50
1989	0	0	0	0	0	0	0	-299	0	98	41	24
1966	0	0	0	0	0	0	64	-66	0	42	41	24
1944	0	0	0	0	0	0	0	-159	0	42	41	24
1949	0	0	0	0	0	0	0	0	0	42	41	24
1985	0	0	0	0	0	0	0	-81	0	42	41	24
1972	0	0	0	0	0	0	0	-65	-47	42	41	24
1930	0	0	0	0	0	0	0	-64	70	42	41	24
1964	0	0	0	0	0	0	0	0	7	42	41	24
1955	0	0	0	0	0	0	0	0	0	42	41	24
1926	0	0	0	0	0	0	0	0	0	42	41	24
1933	0	0	0	0	0	0	0	0	-121	42	41	24
1991	0	0	0	0	0	0	0	0	-87	42	41	24
2001	0	0	0	0	0	0	0	-253	0	42	41	24
1947	0	0	0	0	0	0	0	-238	0	42	41	24
1960	0	0	0	0	0	0	0	0	0	42	41	24
1981	0	0	0	0	0	0	0	0	0	42	41	24
1968	0	0	0	0	0	0	0	-78	0	42	41	24
1959	0	0	0	0	0	0	0	0	0	42	41	24
1939	0	0	0	0	0	0	0	0	0	42	41	24
1929	0	0	0	0	0	0	0	0	-171	42	41	24
1990	0	0	0	0	0	0	0	0	0	29	29	13
1992	0	0	0	0	0	0	0	0	0	29	29	13
1994	0	0	0	0	0	0	0	0	0	29	29	13
1988	0	0	0	0	0	0	0	0	0	29	29	13
1934	0	0	0	0	0	0	0	0	0	29	29	13
1961	0	0	0	0	0	0	0	0	0	29	29	13
1976	0	0	0	0	0	0	0	0	0	29	29	13
1987	0	0	0	0	0	0	0	0	0	29	29	13
1931	0	0	0	0	0	0	0	0	0	29	29	13
1924	0	0	0	0	0	0	0	0	0	29	29	13
1977	0	0	0	0	0	0	0	0	0	0	0	0

Table 3.1-4

Difference in Hetch Hetchy Release to Stream (Acre-feet)

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending Unimpaired Runoff at LaGrange

WSIP Future Cummulative minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1983	0	0	0	0	0	0	0	0	0	0	0	3,000	3,000
1995	0	0	0	0	0	0	0	0	0	0	5,778	3,000	8,778
1969	0	0	0	0	0	0	0	0	0	0	6,000	3,000	9,000
1982	0	0	0	0	0	0	0	0	0	0	6,000	3,000	9,000
1938	0	0	0	0	0	0	0	-6,147	0	0	6,000	3,000	2,853
1998	0	0	0	0	0	0	0	0	0	0	6,000	3,000	9,000
1997	0	0	0	-9,665	0	0	0	0	0	6,000	6,000	3,000	5,335
1956	0	0	0	0	0	0	0	-2,094	0	0	6,000	3,000	6,906
1967	0	0	0	0	0	0	0	-8,027	0	0	6,000	3,000	973
1980	0	0	0	0	0	0	0	0	0	0	6,000	3,000	9,000
1986	0	0	0	0	0	0	0	0	0	4,943	6,000	3,000	13,943
1952	0	0	0	0	0	0	0	-5,253	0	0	6,000	3,000	3,747
1978	0	0	0	0	0	0	0	0	0	0	6,000	3,000	9,000
1965	0	0	0	0	0	0	0	0	-4,529	0	6,000	3,000	4,471
1958	0	0	0	0	0	0	0	-8,708	0	0	6,000	3,000	292
1993	0	0	0	0	0	0	0	0	0	0	6,000	3,000	9,000
1941	0	0	0	0	0	0	0	0	-4,592	0	6,000	3,000	4,408
1951	0	-14,599	0	0	0	0	0	0	0	6,000	6,000	3,000	401
1922	0	0	0	0	0	0	0	-8,120	0	0	6,000	3,000	880
1984	0	0	0	0	0	0	0	92	0	2,065	6,000	3,000	11,157
1943	0	0	0	0	0	0	0	0	0	0	6,000	3,000	9,000
1942	0	0	0	0	0	0	0	0	0	0	6,000	3,000	9,000
1996	0	0	0	0	0	0	0	0	0	6,000	6,000	3,000	15,000
1974	0	0	0	0	0	0	0	0	0	6,000	6,000	3,000	15,000
1940	0	0	0	0	0	0	0	-2,671	0	6,000	6,000	3,000	12,329
1936	0	0	0	0	0	0	0	-4,773	0	6,000	6,000	3,000	10,227
1932	0	0	0	0	0	0	0	0	-731	0	6,000	3,000	8,269
1935	0	0	0	0	0	-3,935	0	0	-576	6,000	6,000	3,000	10,489
1999	0	0	0	0	0	0	0	0	-7,605	6,000	6,000	3,000	7,395
1945	0	0	0	0	0	0	0	0	-2,844	0	6,000	3,000	6,156
1927	0	0	0	0	0	0	0	-10,236	0	4,078	6,000	3,000	2,842
1963	0	0	0	0	0	0	0	-14,740	0	0	6,000	3,000	-5,740
1975	0	0	0	0	0	0	0	-2,359	-4,171	6,000	6,000	3,000	8,470
1973	0	0	0	0	0	0	0	-6,024	0	6,000	6,000	3,000	8,976
1921	0	0	0	0	0	0	0	0	-3,923	6,000	6,000	3,000	11,077
1937	0	0	0	0	0	0	0	0	-4,662	6,000	6,000	3,000	10,338
1970	0	0	0	-3,935	0	0	0	2,982	0	6,000	6,000	3,000	14,047
2000	0	0	0	0	0	0	0	-8,719	0	6,000	6,000	3,000	6,281
1925	0	0	0	0	0	0	0	-6,241	0	6,000	6,000	3,000	8,759
1979	0	0	0	0	0	0	0	0	0	6,000	6,000	3,000	15,000
1946	0	0	0	0	0	0	0	-2,754	-3,366	6,000	6,000	3,000	8,880
1923	0	0	0	0	0	0	0	-10,652	0	0	6,000	3,000	-1,652
1962	0	0	0	0	0	0	0	0	-5,886	6,000	6,000	3,000	9,114
1971	0	0	0	0	0	0	0	-7,732	0	2,065	6,000	3,000	3,333
1950	0	0	0	0	0	0	0	0	-3,328	6,000	6,000	3,000	11,672
1953	0	0	0	0	0	0	0	-9,279	0	0	6,000	3,000	-279
1928	0	0	0	0	0	0	0	-13,563	0	6,000	2,500	1,400	-3,663
1954	0	0	0	0	0	0	0	-8,718	0	2,600	2,500	1,400	-2,218
2002	0	0	0	0	0	0	0	-6,728	0	6,000	2,500	1,400	3,172
1957	0	0	0	0	0	0	0	-8,719	0	6,000	2,500	1,400	1,181
1948	0	0	0	0	0	0	0	0	-2,528	6,000	6,000	3,000	12,472
1989	0	0	0	0	0	0	0	-18,389	0	6,000	2,500	1,400	-8,489
1966	0	0	0	0	0	0	3,808	-4,045	0	2,600	2,500	1,400	6,263
1944	0	0	0	0	0	0	0	-9,763	0	2,600	2,500	1,400	-3,263
1949	0	0	0	0	0	0	0	0	0	2,600	2,500	1,400	6,500
1985	0	0	0	0	0	0	0	-5,001	0	2,600	2,500	1,400	1,499
1972	0	0	0	0	0	0	0	-3,975	-2,778	2,600	2,500	1,400	-253
1930	0	0	0	0	0	0	0	-3,935	4,171	2,600	2,500	1,400	6,736
1964	0	0	0	0	0	0	0	0	438	2,600	2,500	1,400	6,938
1955	0	0	0	0	0	0	0	0	0	2,600	2,500	1,400	6,500
1926	0	0	0	0	0	0	0	0	0	2,600	2,500	1,400	6,500
1933	0	0	0	0	0	0	0	0	-7,174	2,600	2,500	1,400	-674
1991	0	0	0	0	0	0	0	0	-5,156	2,600	2,500	1,400	1,344
2001	0	0	0	0	0	0	0	-15,562	0	2,600	2,500	1,400	-9,062
1947	0	0	0	0	0	0	0	-14,613	0	2,600	2,500	1,400	-8,113
1960	0	0	0	0	0	0	0	0	0	2,600	2,500	1,400	6,500
1981	0	0	0	0	0	0	0	0	0	2,600	2,500	1,400	6,500
1968	0	0	0	0	0	0	0	-4,814	0	2,600	2,500	1,400	1,686
1959	0	0	0	0	0	0	0	0	0	2,600	2,500	1,400	6,500
1939	0	0	0	0	0	0	0	0	0	2,600	2,500	1,400	6,500
1929	0	0	0	0	0	0	0	0	-10,149	2,600	2,500	1,400	-3,649
1990	0	0	0	0	0	0	0	0	0	1,800	1,800	800	4,400
1992	0	0	0	0	0	0	0	0	0	1,800	1,800	800	4,400
1994	0	0	0	0	0	0	0	0	0	1,800	1,800	800	4,400
1988	0	0	0	0	0	0	0	0	0	1,800	1,800	800	4,400
1934	0	0	0	0	0	0	0	0	0	1,800	1,800	800	4,400
1961	0	0	0	0	0	0	0	0	0	1,800	1,800	800	4,400
1976	0	0	0	0	0	0	0	0	0	1,800	1,800	800	4,400
1987	0	0	0	0	0	0	0	0	0	1,800	1,800	800	4,400
1931	0	0	0	0	0	0	0	0	0	1,800	1,800	800	4,400
1924	0	0	0	0	0	0	0	0	0	1,800	1,800	800	4,400
1977	0	0	0	0	0	0	0	0	0	0	0	0	0

Results also indicate that an average annual increase in releases of approximately 5,000 acre-feet would occur below Hetch Hetchy Reservoir. The implementation of the discretionary releases would not cause a change to the water deliveries of the SFPUC or diversions in the San Joaquin Pipeline (SJPL). However, the additional release from the dam to the stream would result in less diversion to the Canyon Tunnel that would otherwise be released back to the Tuolumne River below Kirkwood Powerhouse. The reduction in these releases would generally occur between December and July during years when spill is anticipated from Hetch Hetchy Reservoir.

Hetch Hetchy Reservoir storage would be affected by the discretionary flows. Subsequent to the reservoir being filled in late spring, any additional demand from the reservoir would cause additional drawdown. Figure 3.1-2 is a chronological illustration of storage during the 1921-through-2002 modeling period. Annually, the additional summertime release would cause additional depletion of storage. However, this storage depletion would be followed by replenishment, due to reductions in diversions to Canyon Tunnel and reductions in following-period spills to the river.

Figure 3.1-3 presents the same information, by illustrating the anticipated change in storage of Hetch Hetchy Reservoir with the cumulative setting compared to the WSIP setting. The data are presented by year type, represented as the average of the storage of all years within a year type. As shown, storage is cumulatively depleted, beginning in summer, with storage normally replenished by the end of spring.

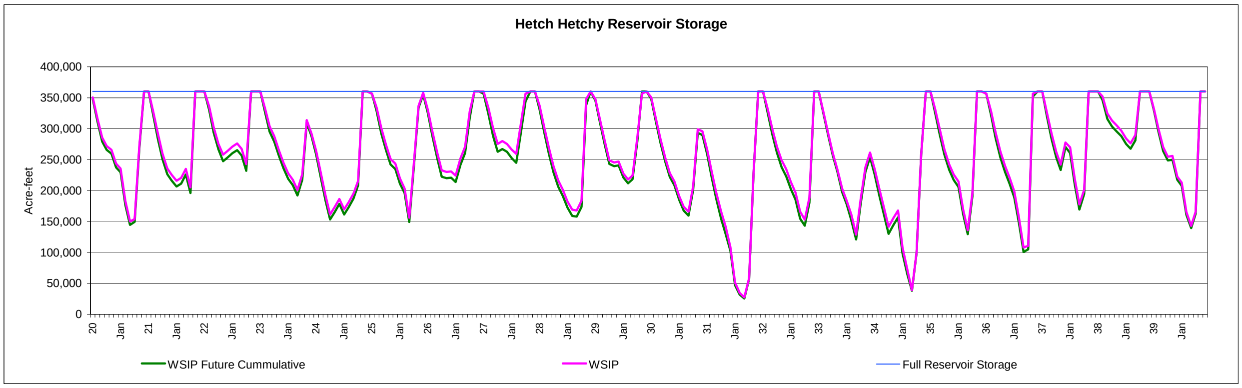
No additional notable hydrologic effects are apparent within the Hetch Hetchy system in the comparison of the WSIP and cumulative settings. The Cherry-Eleanor system would experience a near identical operation, with a rare exception during extended drought when a difference in reservoir storage balancing between Hetch Hetchy Reservoir and Lake Lloyd may occur due to Don Pedro Water Bank Account operations. This difference would be essentially unnoticeable within the discretion of existing operations.

The net effect of release operations from Hetch Hetchy Reservoir (Canyon Tunnel and stream releases) manifests as a change in inflow to Don Pedro Reservoir. Figure 3.1-4 illustrates this anticipated change between the WSIP and cumulative settings. The data are presented by year type averages. In terms of average annual inflow to Don Pedro Reservoir, there is no change; however, the distribution of inflow changes. With the slight changes in inflow to Don Pedro Reservoir, a slight increase in the summer, a corresponding increase in storage would occur at the end of the water year (September) during years when Don Pedro Reservoir storage is below the fall-time flood control storage limit. In some years, the storage in Don Pedro Reservoir would be slightly lower in the spring when inflow is reduced by discretionary release operation. Figure 3.1-5 illustrates the simulated difference between the WSIP and cumulative settings, shown by the average storage of all years within a year type. These changes in storage are negligible, and in part only a result of modeling assumptions that make constant the Districts' (Modesto Irrigation District and TID) allocation of water to their customers. If storage were anticipated to be greater, conceptually, the Districts could allocate additional water for delivery, and storage would be unaffected.

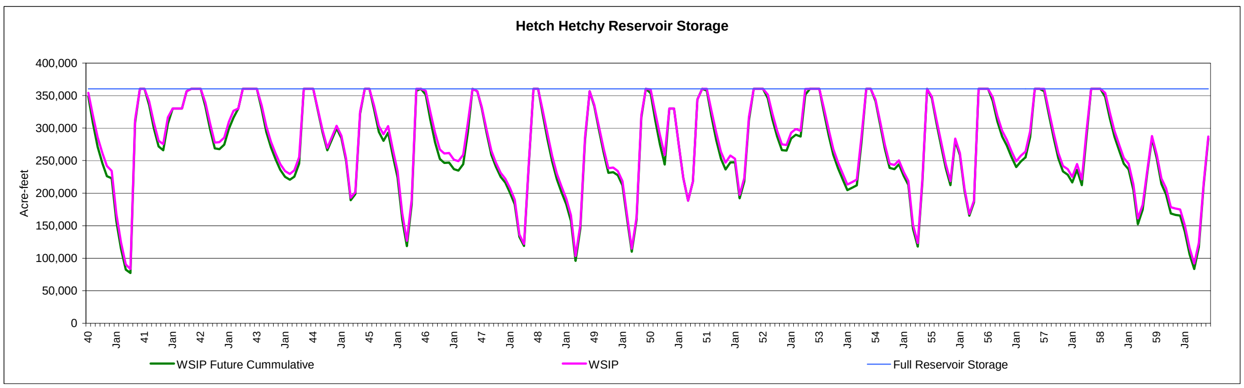
Minor changes to releases to the Tuolumne River from La Grange Dam could occur from the single factor of the discretionary releases from Hetch Hetchy Reservoir. Table 3.1-5 illustrates the chronological differences in release between the WSIP and cumulative scenario. The values are presented in terms of monthly volume of flow (acre-feet). The potential changes occur sporadically, and would generally occur as an increase in spill (release above minimum requirements) in some months during the fall and early winter (as greater storage in Don Pedro Reservoir causes earlier and greater spills for flood control) and as a decrease in some winter and early spring releases (when the reduction in inflow to Don Pedro is coincident with spills at La Grange Dam). The average annual flow past La Grange Dam would remain the same. The same information, concerning the difference in flow between the settings, is illustrated in Figure 3.1-6 in terms of average monthly flows by year type.

Figure 3.1-2
Hetch Hetchy Reservoir Storage

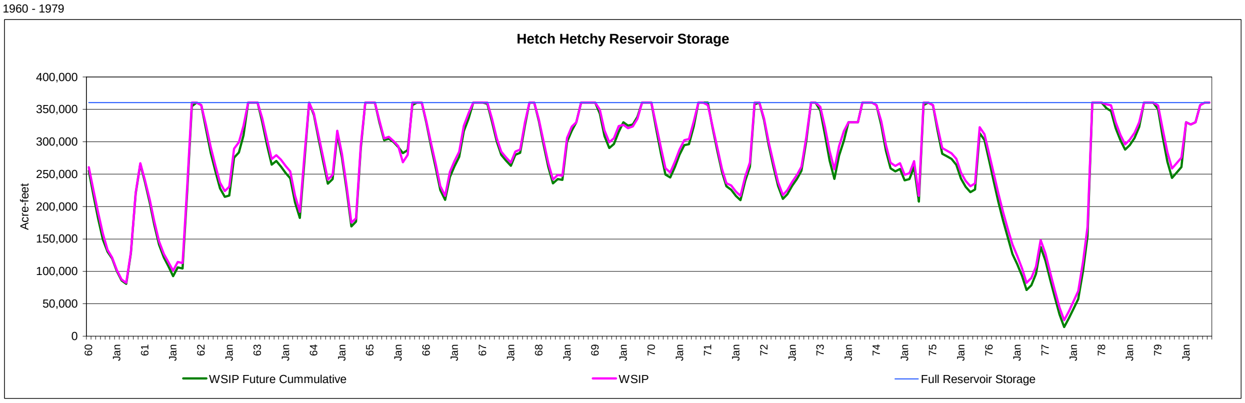
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

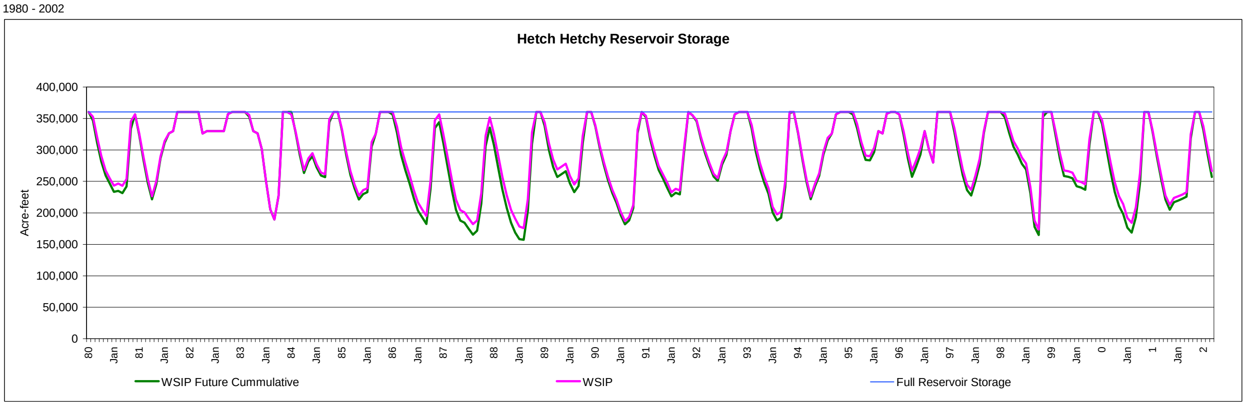


Figure 3.1-3

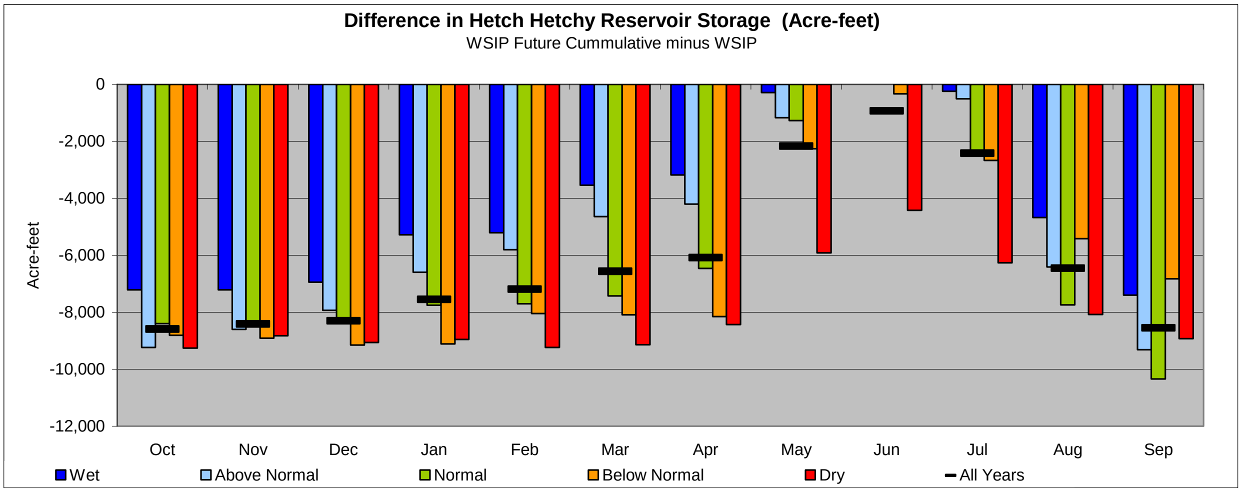


Figure 3.1-4

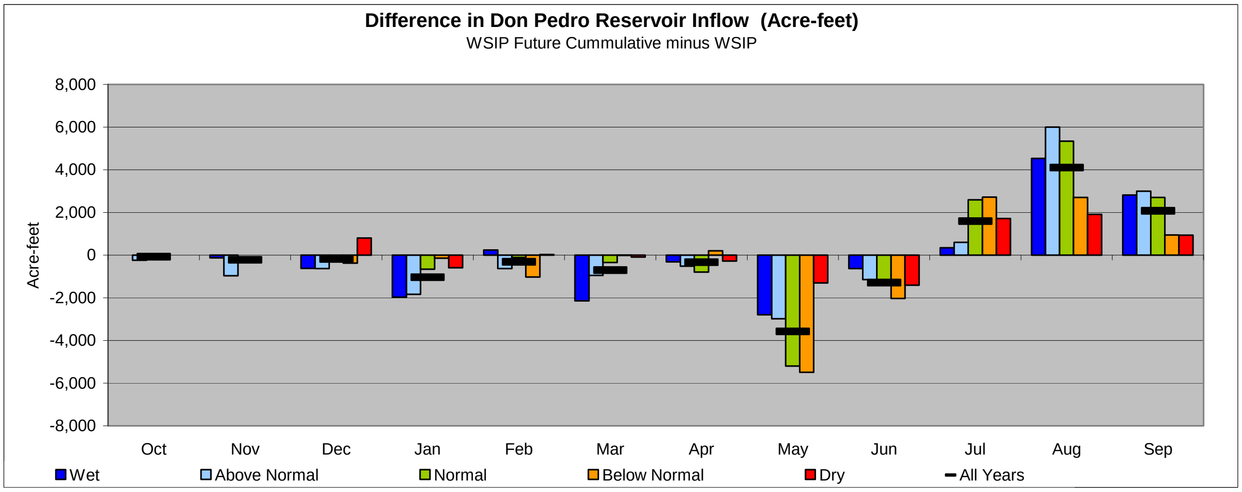


Figure 3.1-5

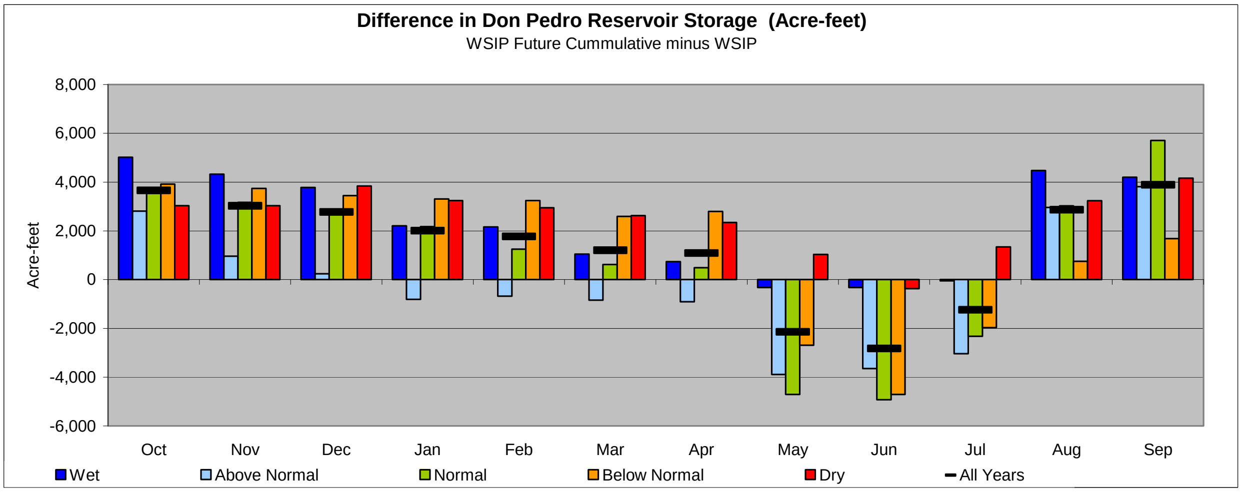


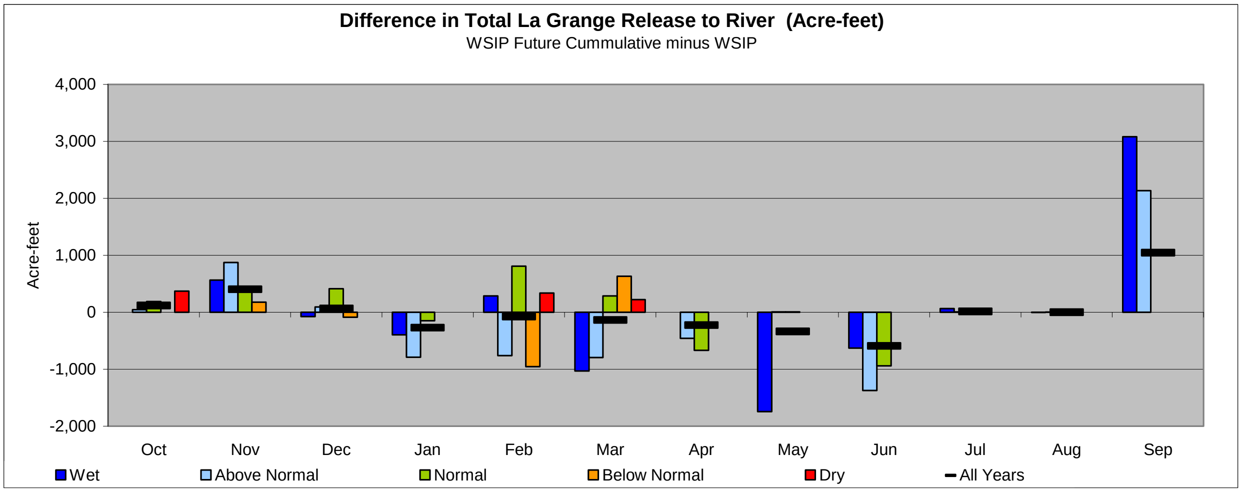
Table 3.1-5

Difference in Total La Grange Release to River (Acre-feet)

WSIP Future Cummulative minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	3,865	1,807	-763	0	0	0	0	0	4,909
1922	0	0	0	0	2,773	1,849	0	0	-9,072	0	29	6,053	1,632
1923	0	0	2,978	0	0	0	92	0	0	0	0	0	3,070
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	0	0	0	0	0
1928	0	0	4,078	0	0	0	0	0	0	0	0	0	4,078
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	-2,912	-2,172	-914	0	0	0	0	0	-5,998
1937	0	0	0	0	1,016	387	-1,713	0	0	0	0	0	-310
1938	0	0	2,262	0	0	-1,027	-1,197	-6,926	92	95	0	5,988	-713
1939	2,982	0	0	0	0	0	0	0	0	0	0	0	2,982
1940	0	0	0	0	-1,482	-1,401	-1,744	0	0	0	0	0	-4,627
1941	0	0	0	8,203	-1,982	-1,293	-1,937	0	-6,116	0	28	6,053	2,956
1942	0	0	2,978	-9,731	1	0	0	0	0	95	0	5,987	-670
1943	0	0	2,978	0	0	-10,655	92	0	187	0	0	6,082	-1,316
1944	0	0	0	0	1,787	1,192	0	0	0	0	0	0	2,979
1945	0	0	0	0	-3,256	-2,171	-364	0	0	0	0	0	-5,791
1946	0	6,021	-465	0	0	-1,541	-1,177	0	0	0	0	0	2,838
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	-7,353	0	0	0	0	0	0	0	0	0	-7,353
1952	0	0	0	0	4,060	2,707	1	-5,157	92	96	0	5,987	7,786
1953	0	0	0	2,978	-1	0	0	0	0	0	0	0	2,977
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	-3,483	0	0	-413	-365	0	-2,198	95	0	5,987	-377
1957	0	0	0	0	1,788	0	0	0	0	0	0	0	1,788
1958	0	0	0	0	289	116	77	-8,708	0	95	0	5,987	-2,144
1959	0	0	0	0	1,787	1,192	0	0	0	0	0	0	2,979
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	-3,528	0	0	-492	0	0	0	0	-4,913	-8,933
1966	0	2,996	-1,453	0	-18,453	9,527	0	0	0	0	0	0	-7,383
1967	0	0	0	0	0	8,416	5,605	-8,021	0	95	0	2,089	8,184
1968	0	0	0	0	1,791	1,194	0	0	0	0	0	0	2,985
1969	0	0	0	1,905	0	-6,118	92	95	93	95	0	5,987	2,149
1970	2,982	0	0	-12,745	2	1	0	0	0	0	0	0	-9,760
1971	0	0	0	0	7,287	4,858	0	0	0	0	0	0	12,145
1972	0	0	0	0	-1,354	0	0	0	0	0	0	0	-1,354
1973	0	0	0	0	0	0	0	0	-6,549	0	0	0	-6,549
1974	0	14,870	-1	-14,702	1	1	0	0	187	0	0	6,081	6,437
1975	1,921	0	0	0	636	424	0	0	-8,606	0	29	6,053	457
1976	2,983	0	0	0	0	0	0	0	0	0	0	0	2,983
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	-8,298	0	0	0	-8,298
1979	0	0	0	7,366	0	-910	-7,120	95	0	0	0	0	-569
1980	0	0	0	254	0	-1,903	92	96	92	96	0	5,987	4,714
1981	0	0	0	0	1,787	1,192	0	0	0	0	0	0	2,979
1982	0	0	0	-4,596	-2,974	-1,713	0	0	0	95	0	187	-9,001
1983	0	0	0	0	0	0	0	0	0	95	0	95	190
1984	-1,152	0	0	0	0	0	0	0	0	0	0	0	-1,152
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	4,398	-6,121	0	95	92	0	0	0	-1,536
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	-43	5,886	5,843
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	-1,162	-4,794	0	0	0	95	0	4,021	-1,840
1996	0	0	0	2,819	-6,681	1	92	95	92	0	0	0	-3,582
1997	0	9,037	0	-9,665	1	0	0	0	0	0	0	0	-627
1998	0	0	0	9,311	-1	-5,637	-3,813	634	0	95	0	5,987	6,576
1999	0	0	2,979	0	0	1,903	-3,000	0	0	0	0	0	1,882
2000	0	0	0	0	793	0	0	0	-8,507	0	0	0	-7,714
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	118	402	67	-270	-76	-135	-225	-338	-590	14	1	1,044	11

Figure 3.1-6



The changes in flow past La Grange Dam as a comparison between the WSIP and cumulative (with only the discretionary flow action) settings is relatively minor, and occur as a coincidence of change in inflow and flood control operations at Don Pedro Reservoir. The effect of larger or lesser releases at La Grange (shown by the volumes in Table 3.1-5) would manifest similarly to the effect described for WSIP changes. The change in volume would likely lead to a delay or earlier initiation of the day that releases are made in excess of minimum flow requirements. Most of changes illustrated would likely be managed with reservoir storage, and would lead to no change in river release.

The effect of the TID river diversion project on La Grange releases will be evaluated by layering on the absolute results for the La Grange releases to illustrate the combined cumulative effect of both the WSIP and the discretionary release actions.

With no change to the operation of the SJPL identified under the cumulative scenario, the local system operation would be identical to the WSIP. No changes in hydrologic effects would occur in the local system between the WSIP and cumulative settings.

3.2 Comparison to Base

The preceding discussion identifies the hydrologic parameters that, under the cumulative setting, differ from the WSIP setting. When comparing to the base setting, hydrologic effects associated with the cumulative setting would be consistent (identical) to those effects identified for the WSIP, except for the topic areas (parameters) described above. The following discussion presents those parameters compared to the base setting.

Table 3.1-1 illustrates the simulated releases below O'Shaughnessy Dam for the cumulative setting, depicted in average monthly flow (in cfs) in chronological sequence for the 1921-through-2002 modeling period. The values illustrate both periods of controlled releases for minimum release requirements and periods of releases above minimum requirements (spills).

Table 3.2-1 illustrates the differences between releases anticipated for the cumulative and base settings. The values are illustrated in average monthly flow (in cfs), with positive values representing an increase in flow associated with the cumulative setting. The same data are shown in Table 3.2-2, arranged by descending order of wetness in the basin (La Grange unimpaired flow). Although the release requirement is based on a separate wetness index, the results show flow increases during the summer (July through September), with relatively larger increases during wetter years. During the wetter years, there are instances in which no flow increases appear during certain summer months (e.g., July). This is due to releases above minimum requirements (spills) occurring in both settings, and the change in minimum release requirement has no effect on the release.

Table 3.2-1

Difference in Hetch Hetchy Release to Stream (CFS)

WSIP Future Cummulative minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	0	0	0	0	0	0	0	0	-180	98	98	50
1922	0	0	0	0	0	0	0	-277	0	0	98	50
1923	0	0	0	0	0	0	0	-450	0	0	98	50
1924	0	0	0	0	0	0	0	0	0	29	29	13
1925	0	0	0	0	0	0	0	-398	0	98	98	50
1926	0	0	0	0	0	0	0	-47	0	42	41	24
1927	0	0	0	0	0	0	0	-560	0	66	98	50
1928	0	0	0	0	0	0	0	-283	0	98	41	24
1929	0	0	0	0	0	0	0	0	-393	42	41	24
1930	0	0	0	0	0	0	0	-64	70	42	41	24
1931	0	0	0	0	0	0	0	0	0	29	29	13
1932	0	0	0	0	0	0	0	0	-57	0	98	50
1933	0	0	0	0	0	0	0	0	-372	42	41	24
1934	0	0	0	0	0	0	-64	0	0	29	29	13
1935	0	0	0	0	0	0	0	0	-75	98	98	50
1936	0	0	0	0	0	0	0	-297	0	98	98	50
1937	0	0	0	0	0	0	0	-51	-149	98	98	50
1938	0	0	0	0	0	0	0	-284	0	0	98	50
1939	0	0	0	0	0	0	-64	66	0	42	41	24
1940	0	0	0	0	0	0	0	92	0	98	98	50
1941	0	0	0	0	0	0	0	0	-97	0	98	50
1942	0	0	0	0	0	0	0	0	0	0	98	50
1943	0	0	0	0	0	0	0	0	0	0	98	50
1944	0	0	0	0	0	0	0	-658	0	42	41	24
1945	0	0	0	0	0	0	0	0	173	0	98	50
1946	0	0	0	0	0	0	0	-169	-57	98	98	50
1947	0	0	0	0	0	0	0	-749	0	42	41	24
1948	0	0	0	0	0	0	0	0	-245	98	98	50
1949	0	0	0	0	0	0	0	0	0	42	41	24
1950	0	0	0	0	0	0	0	0	30	98	98	50
1951	0	-374	0	0	0	0	0	0	-104	98	98	50
1952	0	0	0	0	0	0	0	-348	0	0	98	50
1953	0	0	0	0	0	0	0	-156	0	0	98	50
1954	0	0	0	0	0	0	0	-646	0	42	41	24
1955	0	0	0	0	0	0	0	0	0	42	41	24
1956	0	0	0	0	0	0	0	-80	0	0	98	50
1957	0	0	0	0	0	0	0	-658	0	98	41	24
1958	0	0	0	0	0	0	0	-346	0	0	98	50
1959	0	0	0	0	0	0	0	0	0	42	41	24
1960	0	0	0	0	0	0	0	0	0	42	41	24
1961	0	0	0	0	0	0	0	0	0	29	29	13
1962	0	0	0	0	0	0	0	-677	-99	98	98	50
1963	0	0	0	0	0	0	0	-699	0	0	98	50
1964	0	0	0	0	0	0	0	0	-57	42	41	24
1965	0	0	0	0	0	0	0	0	146	0	98	50
1966	0	0	0	0	0	0	0	0	0	42	41	24
1967	0	0	0	0	0	0	0	-272	0	0	98	50
1968	0	0	0	0	0	0	0	-582	0	42	41	24
1969	0	0	0	0	0	0	0	0	0	0	98	50
1970	0	0	0	0	0	0	0	-88	0	98	98	50
1971	0	0	0	0	0	0	0	-510	0	34	98	50
1972	0	0	0	0	0	0	0	-544	-47	42	41	24
1973	0	0	0	0	0	0	0	-332	0	98	98	50
1974	0	0	0	0	0	0	0	0	0	98	98	50
1975	0	0	0	0	0	0	0	0	0	98	98	50
1976	0	0	0	0	0	0	0	0	0	29	29	13
1977	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	-758	0	0	98	45
1979	0	0	0	0	0	0	0	0	0	98	98	50
1980	0	0	0	0	0	0	0	0	0	0	98	50
1981	0	0	0	0	0	0	0	-169	-173	42	41	24
1982	0	0	0	0	0	0	0	0	0	0	98	50
1983	0	0	0	0	0	0	0	-51	0	0	0	50
1984	0	0	0	0	0	64	0	-190	0	34	98	50
1985	0	0	0	0	0	0	0	-166	0	42	41	24
1986	0	0	0	0	0	-138	-66	0	0	80	98	50
1987	0	0	0	0	0	0	0	0	0	29	29	13
1988	0	0	0	0	0	0	0	0	-64	29	29	13
1989	0	0	0	0	0	0	0	-842	0	98	41	24
1990	0	0	0	0	0	0	0	0	0	29	29	13
1991	0	0	0	0	0	0	0	0	-574	42	41	24
1992	0	0	0	0	0	0	0	-470	0	29	29	13
1993	0	0	0	0	0	0	0	0	0	0	98	50
1994	0	0	0	0	0	0	0	0	0	29	29	13
1995	0	0	0	0	0	0	0	0	0	0	94	50
1996	0	0	0	0	0	0	0	0	0	98	98	50
1997	0	0	0	-354	0	0	0	0	0	98	98	50
1998	0	0	0	0	0	0	0	0	0	0	98	50
1999	0	0	0	0	0	0	0	-219	-130	98	98	50
2000	0	0	0	0	0	0	0	-309	0	98	98	50
2001	0	0	0	0	0	0	0	-947	0	42	41	24
2002	0	0	0	0	0	0	0	-702	0	98	41	24
Avg (21-02)	0	-5	0	-4	0	-1	-2	-182	-30	45	70	37

Table 3.2-2

Difference in Hetch Hetchy Release to Stream (CFS)

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending Unimpaired Runoff at LaGrange WSIP Future Cummulative minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1983	0	0	0	0	0	0	0	-51	0	0	0	50
1995	0	0	0	0	0	0	0	0	0	0	94	50
1969	0	0	0	0	0	0	0	0	0	0	98	50
1982	0	0	0	0	0	0	0	0	0	0	98	50
1938	0	0	0	0	0	0	0	-284	0	0	98	50
1998	0	0	0	0	0	0	0	0	0	0	98	50
1997	0	0	0	-354	0	0	0	0	0	98	98	50
1956	0	0	0	0	0	0	0	-80	0	0	98	50
1967	0	0	0	0	0	0	0	-272	0	0	98	50
1980	0	0	0	0	0	0	0	0	0	0	98	50
1986	0	0	0	0	0	-138	-66	0	0	80	98	50
1952	0	0	0	0	0	0	0	-348	0	0	98	50
1978	0	0	0	0	0	0	0	-758	0	0	98	45
1965	0	0	0	0	0	0	0	0	146	0	98	50
1958	0	0	0	0	0	0	0	-346	0	0	98	50
1993	0	0	0	0	0	0	0	0	0	0	98	50
1941	0	0	0	0	0	0	0	0	-97	0	98	50
1951	0	-374	0	0	0	0	0	0	-104	98	98	50
1922	0	0	0	0	0	0	0	-277	0	0	98	50
1984	0	0	0	0	0	64	0	-190	0	34	98	50
1943	0	0	0	0	0	0	0	0	0	0	98	50
1942	0	0	0	0	0	0	0	0	0	0	98	50
1996	0	0	0	0	0	0	0	0	0	98	98	50
1974	0	0	0	0	0	0	0	0	0	98	98	50
1940	0	0	0	0	0	0	0	92	0	98	98	50
1936	0	0	0	0	0	0	0	-297	0	98	98	50
1932	0	0	0	0	0	0	0	0	-57	0	98	50
1935	0	0	0	0	0	0	0	0	-75	98	98	50
1999	0	0	0	0	0	0	0	-219	-130	98	98	50
1945	0	0	0	0	0	0	0	0	173	0	98	50
1927	0	0	0	0	0	0	0	-560	0	66	98	50
1963	0	0	0	0	0	0	0	-699	0	0	98	50
1975	0	0	0	0	0	0	0	0	0	98	98	50
1973	0	0	0	0	0	0	0	-332	0	98	98	50
1921	0	0	0	0	0	0	0	0	-180	98	98	50
1937	0	0	0	0	0	0	0	-51	-149	98	98	50
1970	0	0	0	0	0	0	0	-88	0	98	98	50
2000	0	0	0	0	0	0	0	-309	0	98	98	50
1925	0	0	0	0	0	0	0	-398	0	98	98	50
1979	0	0	0	0	0	0	0	0	0	98	98	50
1946	0	0	0	0	0	0	0	-169	-57	98	98	50
1923	0	0	0	0	0	0	0	-450	0	0	98	50
1962	0	0	0	0	0	0	0	-677	-99	98	98	50
1971	0	0	0	0	0	0	0	-510	0	34	98	50
1950	0	0	0	0	0	0	0	0	30	98	98	50
1953	0	0	0	0	0	0	0	-156	0	0	98	50
1928	0	0	0	0	0	0	0	-283	0	98	41	24
1954	0	0	0	0	0	0	0	-646	0	42	41	24
2002	0	0	0	0	0	0	0	-702	0	98	41	24
1957	0	0	0	0	0	0	0	-658	0	98	41	24
1948	0	0	0	0	0	0	0	0	-245	98	98	50
1989	0	0	0	0	0	0	0	-842	0	98	41	24
1966	0	0	0	0	0	0	0	0	0	42	41	24
1944	0	0	0	0	0	0	0	-658	0	42	41	24
1949	0	0	0	0	0	0	0	0	0	42	41	24
1985	0	0	0	0	0	0	0	-166	0	42	41	24
1972	0	0	0	0	0	0	0	-544	-47	42	41	24
1930	0	0	0	0	0	0	0	-64	70	42	41	24
1964	0	0	0	0	0	0	0	0	-57	42	41	24
1955	0	0	0	0	0	0	0	0	0	42	41	24
1926	0	0	0	0	0	0	0	-47	0	42	41	24
1933	0	0	0	0	0	0	0	0	-372	42	41	24
1991	0	0	0	0	0	0	0	0	-574	42	41	24
2001	0	0	0	0	0	0	0	-947	0	42	41	24
1947	0	0	0	0	0	0	0	-749	0	42	41	24
1960	0	0	0	0	0	0	0	0	0	42	41	24
1981	0	0	0	0	0	0	0	-169	-173	42	41	24
1968	0	0	0	0	0	0	0	-582	0	42	41	24
1959	0	0	0	0	0	0	0	0	0	42	41	24
1939	0	0	0	0	0	0	-64	66	0	42	41	24
1929	0	0	0	0	0	0	0	0	-393	42	41	24
1990	0	0	0	0	0	0	0	0	0	29	29	13
1992	0	0	0	0	0	0	0	-470	0	29	29	13
1994	0	0	0	0	0	0	0	0	0	29	29	13
1988	0	0	0	0	0	0	0	0	-64	29	29	13
1934	0	0	0	0	0	0	-64	0	0	29	29	13
1961	0	0	0	0	0	0	0	0	0	29	29	13
1976	0	0	0	0	0	0	0	0	0	29	29	13
1987	0	0	0	0	0	0	0	0	0	29	29	13
1931	0	0	0	0	0	0	0	0	0	29	29	13
1924	0	0	0	0	0	0	0	0	0	29	29	13
1977	0	0	0	0	0	0	0	0	0	0	0	0

Table 3.2-1 shows that additional summer releases along with additional diversions due to the WSIP would result in subsequent reductions in releases in some years, typically during May. This is consistent with the effect of additional demand from Hetch Hetchy Reservoir. Additional reservoir demand would lead to a draw on storage, which then would require subsequent replenishment. The replenishment would occur primarily through the additional capture of inflow, typically during May, when otherwise the inflow would have spilled to the river.

Table 3.2-3 illustrates the rank-ordered differences in monthly flow volumes (acre-feet). The reductions in springtime flow, due to replenishment, can accumulate to about 58,000 acre-feet (May 2001), but typically would be less. This monthly reduction in flow would typically manifest as a delay of the day in which substantial dam releases are made to the stream.

Figure 3.2-1 illustrates the difference in flow between the cumulative base settings by year type. The values represent the average flow change for all of the years within each year type classification. The graphic illustrates the increase in flow that occurs during the summer due to the discretionary flows, as well as the general decrease in flow that would occur during reservoir replenishment (decrease in spills) in the spring due to the cumulative effect of the WSIP and discretionary flows.

Hetch Hetchy Reservoir storage would be affected by the WSIP and discretionary flows. Subsequent to the reservoir being filled in late spring, additional demand from the reservoir would cause additional drawdown in comparison to the base setting. Figure 3.2-2 illustrates a chronological depiction of Hetch Hetchy Reservoir storage during the 1921-through-2002 modeling period. Annually, the additional summertime release and increased diversions would cause depletion of storage in comparison to the base setting. Typically, however, this depletion of storage would be subsequently replenished by inflow and reductions in following-period spills to the river. The additional depletion can accumulate over a sequence of drought years when no spills occur from Hetch Hetchy Reservoir. Figure 3.2-3 presents the same information in summarizing the anticipated change in storage of Hetch Hetchy Reservoir between the cumulative and base settings. The data are presented by year type, represented as the average of the monthly storage of all years within a year type. As shown, storage is depleted beginning in summer, and is normally replenished by the end of spring.

The net effect of release operations from Hetch Hetchy Reservoir (Canyon Tunnel and stream releases) manifests as a change in inflow to Don Pedro Reservoir. Figure 3.2-4 illustrates the anticipated difference between the cumulative and base settings. The data are presented by year type averages.

Table 3.2-3

Difference in Hetch Hetchy Release to Stream (Acre-feet)

WSIP Future Cummulative minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	0	0	0	-10,717	6,000	6,000	3,000	4,283
1922	0	0	0	0	0	0	0	-17,005	0	0	6,000	3,000	-8,005
1923	0	0	0	0	0	0	0	-27,689	0	0	6,000	3,000	-18,689
1924	0	0	0	0	0	0	0	0	0	1,800	1,800	800	4,400
1925	0	0	0	0	0	0	0	-24,474	0	6,000	6,000	3,000	-9,474
1926	0	0	0	0	0	0	0	-2,913	0	2,600	2,500	1,400	3,587
1927	0	0	0	0	0	0	0	-34,424	0	4,078	6,000	3,000	-21,346
1928	0	0	0	0	0	0	0	-17,412	0	6,000	2,500	1,400	-7,512
1929	0	0	0	0	0	0	0	0	-23,372	2,600	2,500	1,400	-16,872
1930	0	0	0	0	0	0	0	-3,935	4,171	2,600	2,500	1,400	6,736
1931	0	0	0	0	0	0	0	0	0	1,800	1,800	800	4,400
1932	0	0	0	0	0	0	0	0	-3,367	0	6,000	3,000	5,633
1933	0	0	0	0	0	0	0	0	-22,124	2,600	2,500	1,400	-15,624
1934	0	0	0	0	0	0	-3,808	0	0	1,800	1,800	800	592
1935	0	0	0	0	0	0	0	0	-4,450	6,000	6,000	3,000	10,550
1936	0	0	0	0	0	0	0	-18,283	0	6,000	6,000	3,000	-3,283
1937	0	0	0	0	0	0	0	-3,143	-8,893	6,000	6,000	3,000	2,964
1938	0	0	0	0	0	0	0	-17,486	0	0	6,000	3,000	-8,486
1939	0	0	0	0	0	0	-3,808	4,045	0	2,600	2,500	1,400	6,737
1940	0	0	0	0	0	0	0	5,677	0	6,000	6,000	3,000	20,677
1941	0	0	0	0	0	0	0	0	-5,789	0	6,000	3,000	3,211
1942	0	0	0	0	0	0	0	0	0	0	6,000	3,000	9,000
1943	0	0	0	0	0	0	0	0	0	0	6,000	3,000	9,000
1944	0	0	0	0	0	0	0	-40,466	0	2,600	2,500	1,400	-33,966
1945	0	0	0	0	0	0	0	0	10,317	0	6,000	3,000	19,317
1946	0	0	0	0	0	0	0	-10,390	-3,366	6,000	6,000	3,000	1,244
1947	0	0	0	0	0	0	0	-46,059	0	2,600	2,500	1,400	-39,559
1948	0	0	0	0	0	0	0	0	-14,583	6,000	6,000	3,000	417
1949	0	0	0	0	0	0	0	0	0	2,600	2,500	1,400	6,500
1950	0	0	0	0	0	0	0	0	1,782	6,000	6,000	3,000	16,782
1951	0	-22,265	0	0	0	0	0	0	-6,213	6,000	6,000	3,000	-13,478
1952	0	0	0	0	0	0	0	-21,403	0	0	6,000	3,000	-12,403
1953	0	0	0	0	0	0	0	-9,601	0	0	6,000	3,000	-601
1954	0	0	0	0	0	0	0	-39,702	0	2,600	2,500	1,400	-33,202
1955	0	0	0	0	0	0	0	0	0	2,600	2,500	1,400	6,500
1956	0	0	0	0	0	0	0	-4,900	0	0	6,000	3,000	4,100
1957	0	0	0	0	0	0	0	-40,447	0	6,000	2,500	1,400	-30,547
1958	0	0	0	0	0	0	0	-21,246	0	0	6,000	3,000	-12,246
1959	0	0	0	0	0	0	0	0	0	2,600	2,500	1,400	6,500
1960	0	0	0	0	0	0	0	0	0	2,600	2,500	1,400	6,500
1961	0	0	0	0	0	0	0	0	0	1,800	1,800	800	4,400
1962	0	0	0	0	0	0	0	-41,654	-5,886	6,000	6,000	3,000	-32,540
1963	0	0	0	0	0	0	0	-43,008	0	0	6,000	3,000	-34,008
1964	0	0	0	0	0	0	0	0	-3,370	2,600	2,500	1,400	3,130
1965	0	0	0	0	0	0	0	0	8,685	0	6,000	3,000	17,685
1966	0	0	0	0	0	0	0	0	0	2,600	2,500	1,400	6,500
1967	0	0	0	0	0	0	0	-16,750	0	0	6,000	3,000	-7,750
1968	0	0	0	0	0	0	0	-35,762	0	2,600	2,500	1,400	-29,262
1969	0	0	0	0	0	0	0	0	0	0	6,000	3,000	9,000
1970	0	0	0	0	0	0	0	-5,381	0	6,000	6,000	3,000	9,619
1971	0	0	0	0	0	0	0	-31,368	0	2,065	6,000	3,000	-20,303
1972	0	0	0	0	0	0	0	-33,432	-2,778	2,600	2,500	1,400	-29,710
1973	0	0	0	0	0	0	0	-20,418	0	6,000	6,000	3,000	-5,418
1974	0	0	0	0	0	0	0	0	0	6,000	6,000	3,000	15,000
1975	0	0	0	0	0	0	0	0	0	6,000	6,000	3,000	15,000
1976	0	0	0	0	0	0	0	0	0	1,800	1,800	800	4,400
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	-46,590	0	0	6,000	2,690	-37,900
1979	0	0	0	0	0	0	0	0	0	6,000	6,000	3,000	15,000
1980	0	0	0	0	0	0	0	0	0	0	6,000	3,000	9,000
1981	0	0	0	0	0	0	0	-10,407	-10,310	2,600	2,500	1,400	-14,217
1982	0	0	0	0	0	0	0	0	0	0	6,000	3,000	9,000
1983	0	0	0	0	0	0	0	-3,131	0	0	0	3,000	-131
1984	0	0	0	0	0	3,935	0	-11,653	0	2,065	6,000	3,000	3,347
1985	0	0	0	0	0	0	0	-10,236	0	2,600	2,500	1,400	-3,736
1986	0	0	0	0	0	-8,478	-3,935	0	0	4,943	6,000	3,000	1,530
1987	0	0	0	0	0	0	0	0	0	1,800	1,800	800	4,400
1988	0	0	0	0	0	0	0	0	-3,808	1,800	1,800	800	592
1989	0	0	0	0	0	0	0	-51,743	0	6,000	2,500	1,400	-41,843
1990	0	0	0	0	0	0	0	0	0	1,800	1,800	800	4,400
1991	0	0	0	0	0	0	0	0	-34,130	2,600	2,500	1,400	-27,630
1992	0	0	0	0	0	0	0	-28,918	0	1,800	1,800	800	-24,518
1993	0	0	0	0	0	0	0	0	0	0	6,000	3,000	9,000
1994	0	0	0	0	0	0	0	0	0	1,800	1,800	800	4,400
1995	0	0	0	0	0	0	0	0	0	0	5,778	3,000	8,778
1996	0	0	0	0	0	0	0	0	0	6,000	6,000	3,000	15,000
1997	0	0	0	-21,741	0	0	0	0	0	6,000	6,000	3,000	-6,741
1998	0	0	0	0	0	0	0	0	0	0	6,000	3,000	9,000
1999	0	0	0	0	0	0	0	-13,491	-7,732	6,000	6,000	3,000	-6,223
2000	0	0	0	0	0	0	0	-19,017	0	6,000	6,000	3,000	-4,017
2001	0	0	0	0	0	0	0	-58,229	0	2,600	2,500	1,400	-51,729
2002	0	0	0	0	0	0	0	-43,176	0	6,000	2,500	1,400	-33,276
Avg (21-02)	0	-272	0	-265	0	-55	-141	-11,166	-1,780	2,770	4,314	2,223	-4,371

Figure 3.2-1

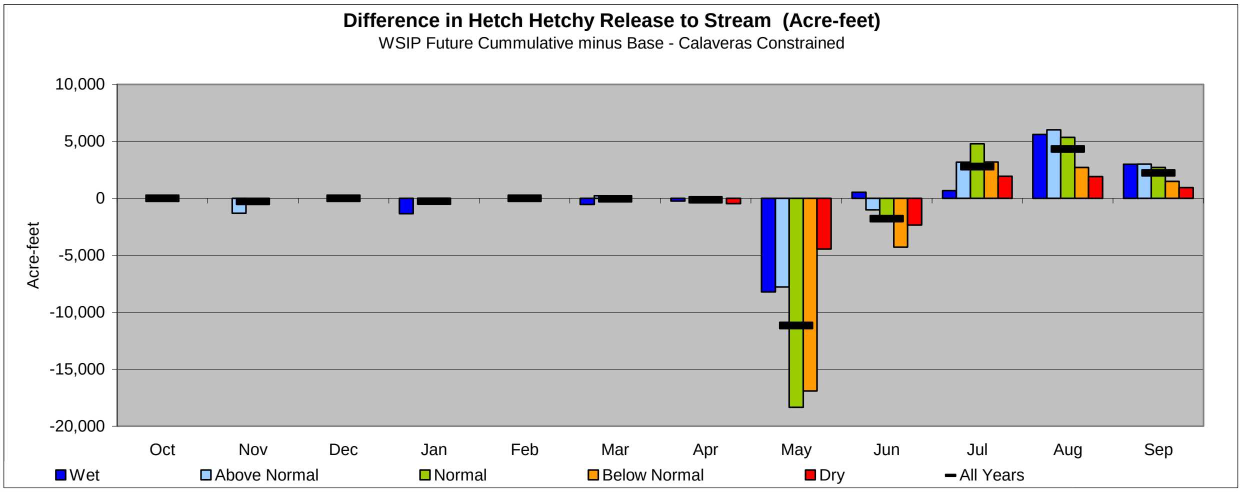
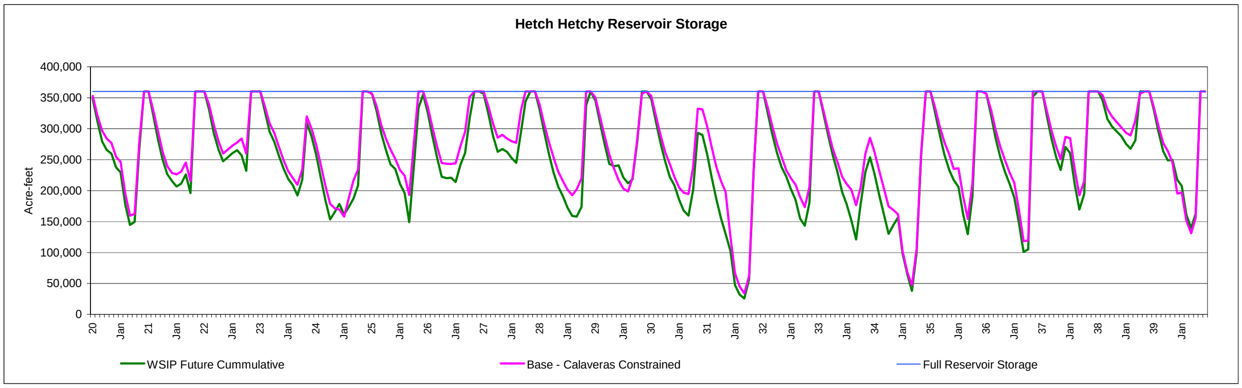
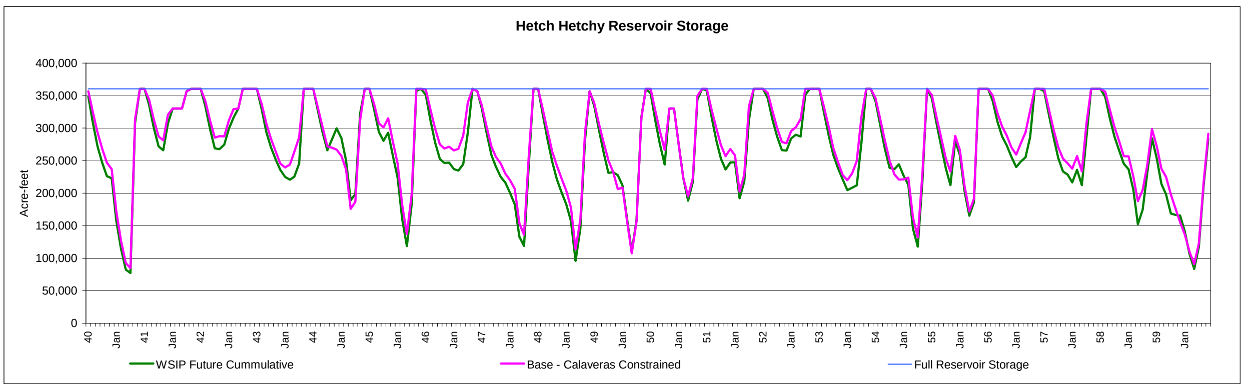

Difference in Hetch Hetchy Release to Stream (Acre-feet)
WSIP Future Cummulative minus Base - Calaveras Constrained
Acre-feet
10,000
5,000
0
-5,000
-10,000
-15,000
-20,000
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Wet
Above Normal
Normal
Below Normal
Dry
All Years

Figure 3.2-2
Hetch Hetchy Reservoir Storage

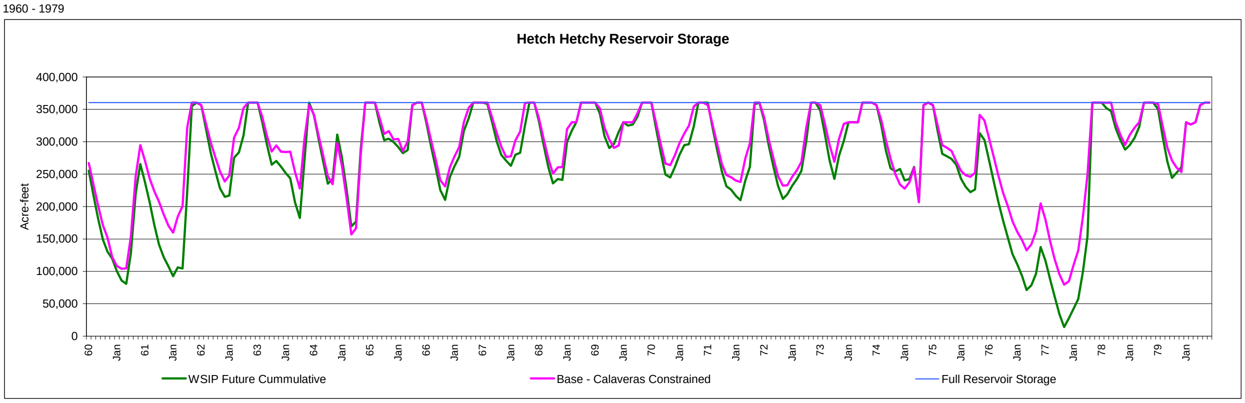
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

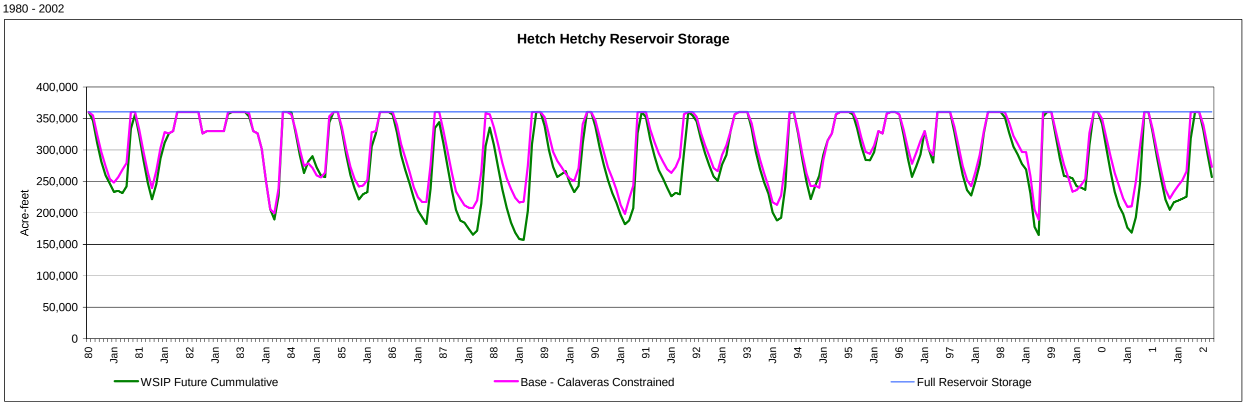


Figure 3.2-3

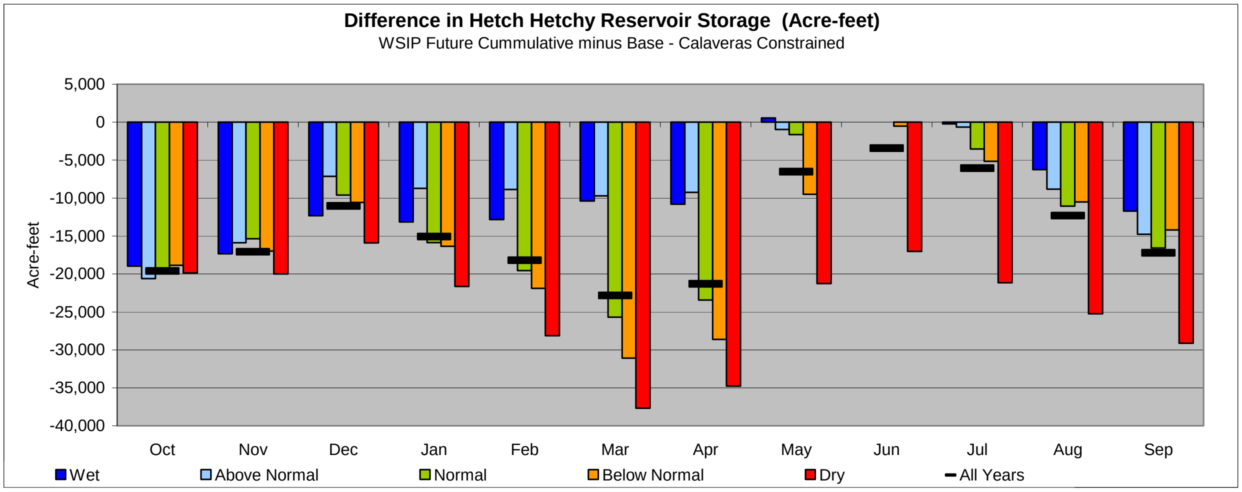
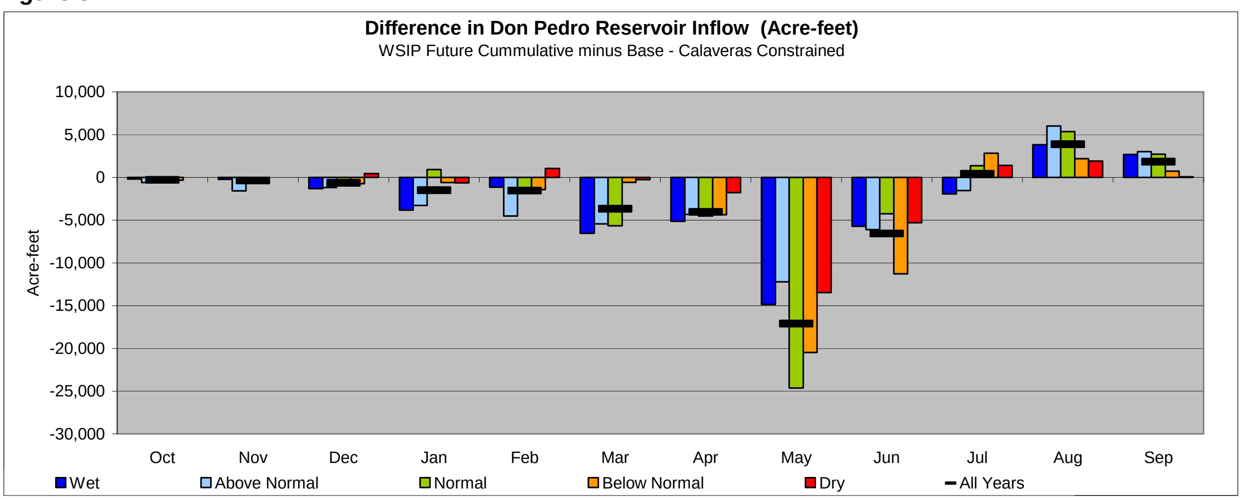


Figure 3.2-4

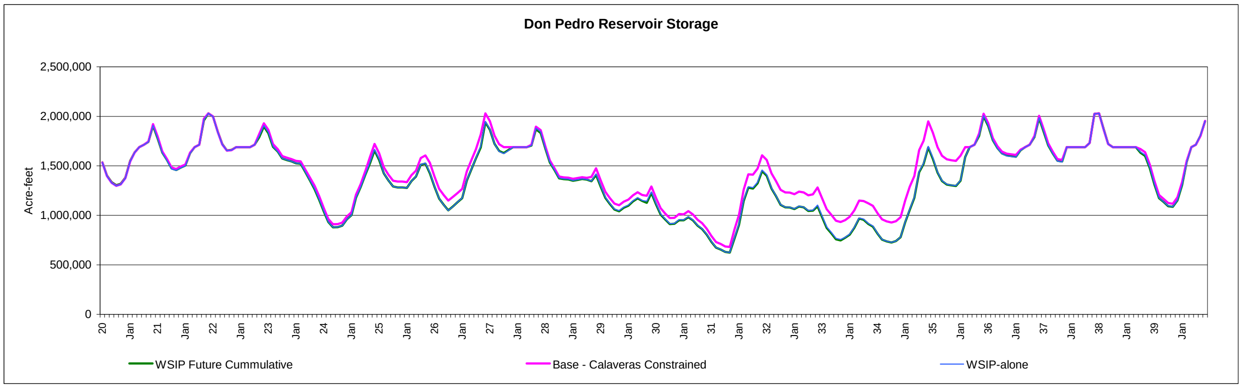


The average annual inflow to Don Pedro Reservoir would be reduced by about 30,000 acre-feet due to the WSIP, and this quantity would not change with the cumulative activity. Figure 3.2-5 shows simulated Don Pedro Reservoir storage chronologically for the modeling period. Figure 3.2-5 primarily compares the base and cumulative settings. The WSIP-alone setting is also illustrated in Figure 3.2-5, and is mostly included under the cumulative setting. As described above, there is very little change in storage operation between the WSIP and cumulative settings. The effects of the cumulative setting to Don Pedro Reservoir storage are essentially the same as those identified for the WSIP setting.

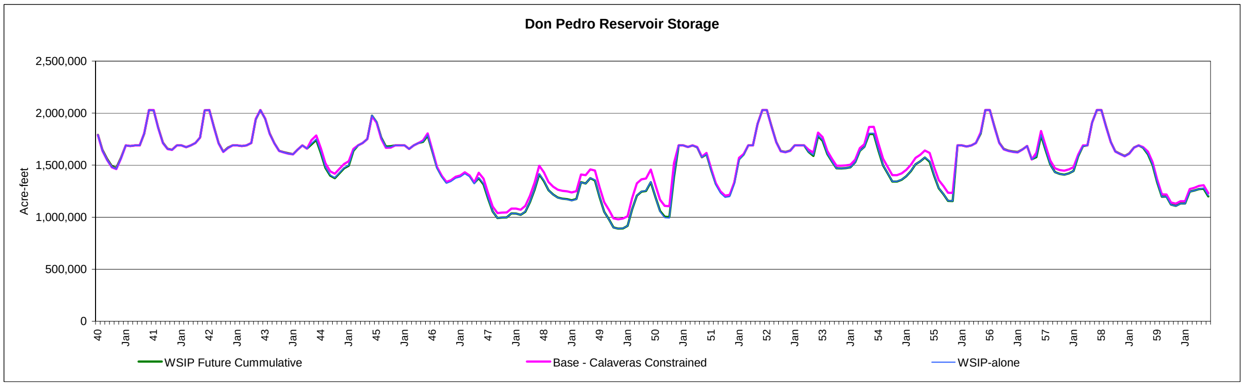
Changes in releases to the Tuolumne River from La Grange Dam would occur due to the WSIP and the single factor of the discretionary releases. These changes would be primarily caused by the WSIP, altered slightly (sometimes decreased, sometimes increased) by the effect of the discretionary flows at Hetch Hetchy Reservoir. Figure 3.2-6 illustrates the relative comparison of the base, cumulative, and WSIP-alone settings. Again, there is not much difference between the effects of the WSIP-alone setting and the cumulative setting when compared to the base setting. Table 3.2-4 shows the chronological differences in release between the base and cumulative settings, in terms of monthly volume of flow (acre-feet).

Figure 3.2-5
Don Pedro Reservoir Storage

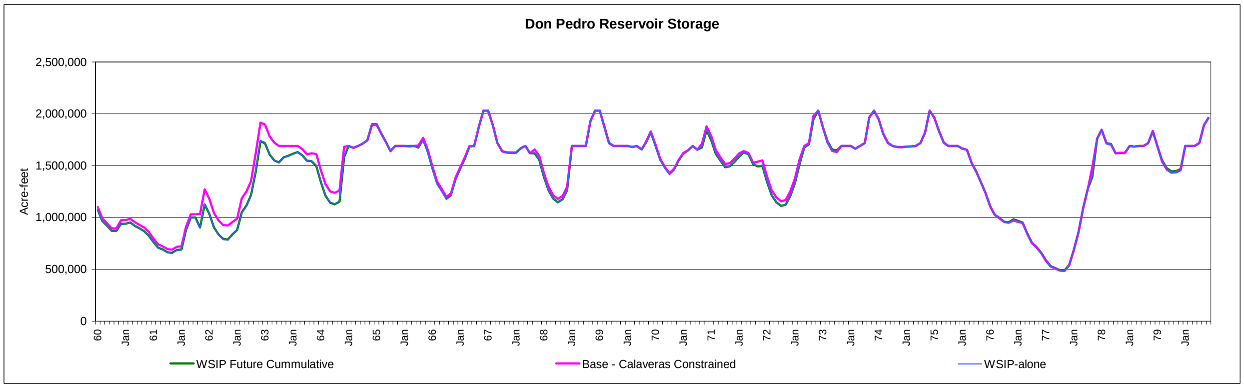
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

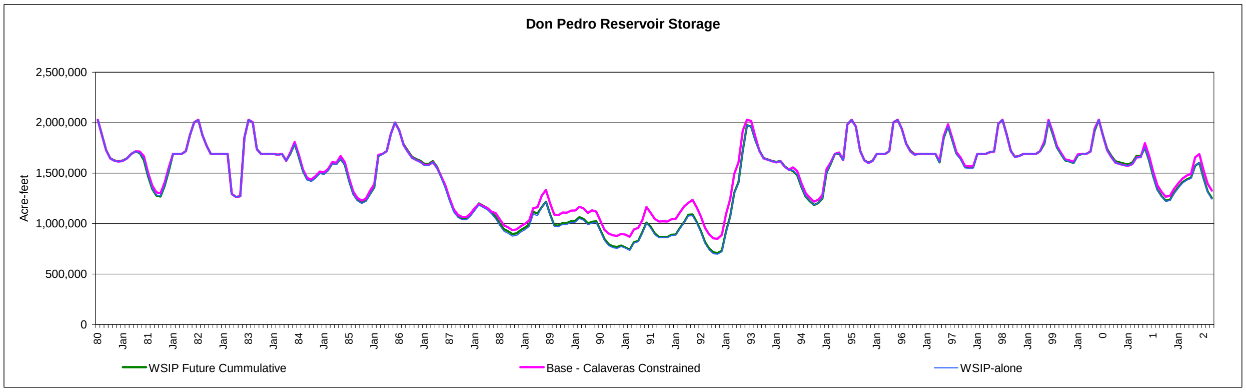
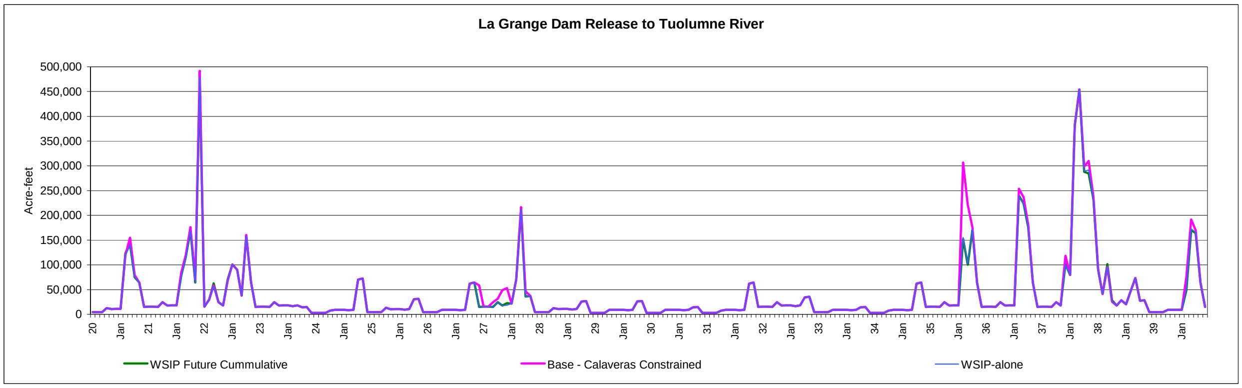
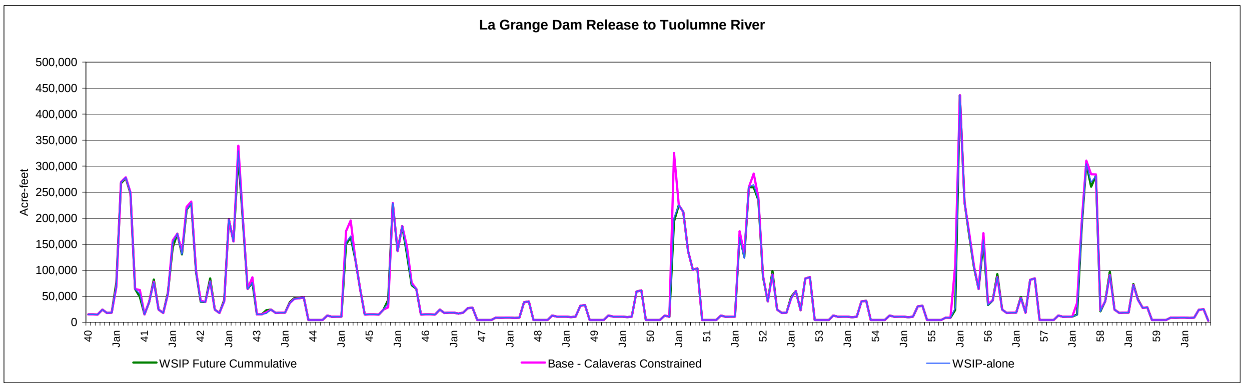


Figure 3.2-6
Release to the Tuolumne River from La Grange Dam

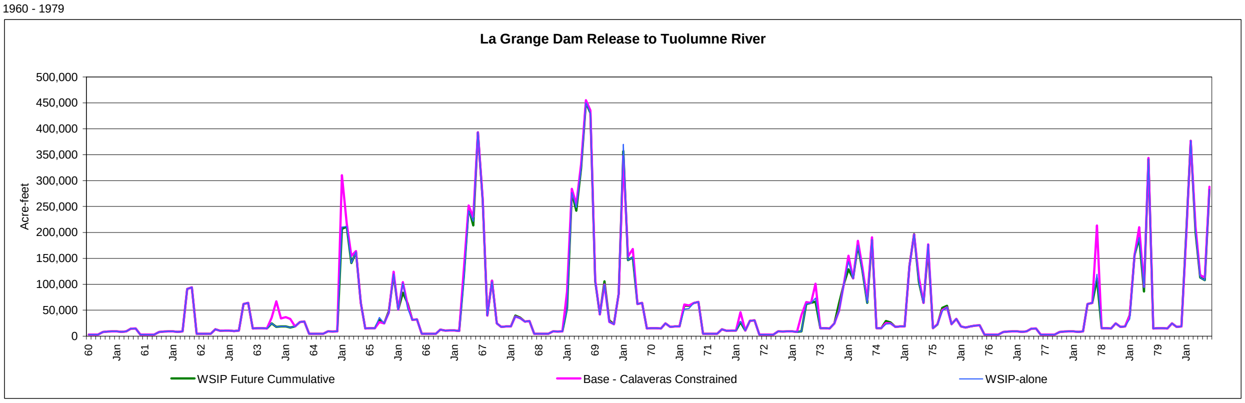
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

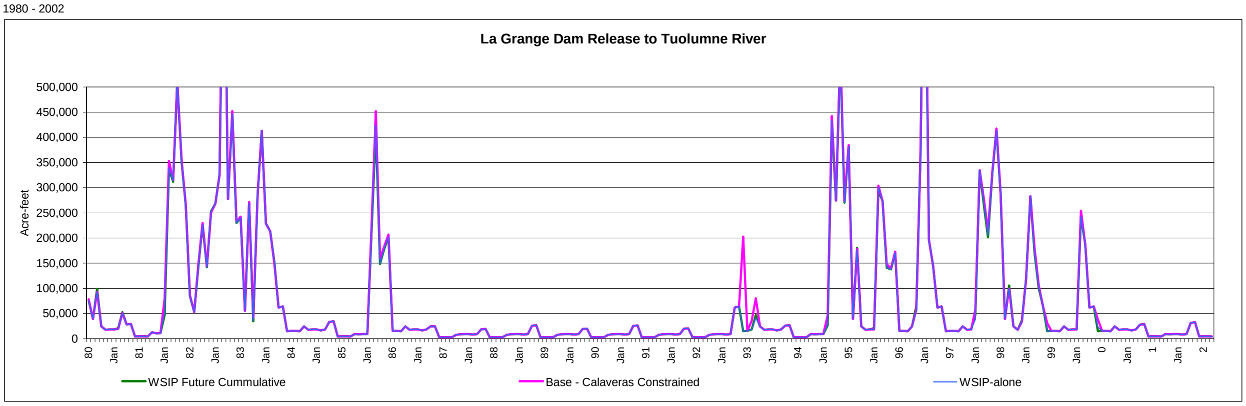


Table 3.2-4

Difference in Total La Grange Release to River (Acre-feet)

WSIP Future Cummulative minus Base - Calaveras Constrained

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	3,747	-13,917	-4,481	0	0	0	0	0	-14,651
1922	0	0	0	0	-6,014	-4,009	-7,365	-5,684	-23,668	0	-655	4,466	-42,929
1923	0	0	2,981	0	0	0	-2,117	0	0	0	0	0	864
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	-43,828	0	-644	-9,569	-54,041
1928	-6,886	-31,299	-30,186	0	0	-5,339	-10,773	0	0	0	0	0	-84,483
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	-154,326	-121,162	-5,971	0	0	0	0	0	-281,459
1937	0	0	0	0	-13,999	-12,693	-5,279	0	0	0	0	0	-31,971
1938	0	0	-16,576	0	0	-1,027	-10,341	-25,069	-4,880	-2,189	0	5,988	-54,094
1939	2,982	0	0	0	0	0	0	0	0	0	0	0	2,982
1940	0	0	0	0	-27,455	-20,894	-6,132	0	0	0	0	0	-54,481
1941	0	0	0	8,336	-2,500	-1,614	-2,438	0	-13,324	0	-655	4,467	-7,728
1942	0	0	2,980	-13,492	1	-3,805	-5,524	-2,855	-2,762	-2,188	0	5,987	-21,658
1943	0	0	2,978	0	0	-20,460	-4,879	0	-9,907	0	0	3,814	-28,454
1944	0	0	0	0	1,789	1,193	0	0	0	0	0	0	2,982
1945	0	0	0	0	-25,334	-32,206	-523	0	0	0	0	0	-58,063
1946	0	14,152	-465	0	0	-14,763	-4,998	0	0	0	0	0	-6,074
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	-131,631	2	0	0	0	0	0	0	0	0	-131,629
1952	0	0	0	0	-8,223	-5,481	1	-26,445	-4,880	-2,188	0	5,987	-41,229
1953	0	0	0	2,978	-1	0	0	0	0	0	0	0	2,977
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	-86,461	2	0	-4,767	-3,172	0	-15,485	-2,188	0	5,987	-106,084
1957	0	0	0	0	1,788	0	0	0	0	0	0	0	1,788
1958	0	0	0	0	-22,392	-8,958	-5,966	-24,196	-2,854	-2,188	0	5,987	-60,567
1959	0	0	0	0	1,787	1,192	0	0	0	0	0	0	2,979
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	-11,189	-49,491	-15,670	-18,132	-16,489	0	0	0	0	0	0	0	-110,971
1965	0	0	0	-103,767	-6,178	-13,480	-2,230	0	0	0	0	3,997	-121,658
1966	0	2,982	-5,810	0	-20,602	3,433	0	0	0	0	0	0	-19,997
1967	0	0	0	0	0	-13,321	-4,366	-16,187	0	-2,188	0	-190	-36,252
1968	0	0	0	0	1,793	1,195	0	0	0	0	0	0	2,988
1969	0	0	0	-31,821	-7,207	-12,633	-7,641	-5,043	-4,879	-2,188	0	5,987	-65,425
1970	2,982	0	0	8,905	-7,144	-16,078	0	0	0	0	0	0	-11,335
1971	0	0	0	0	-1,639	-1,092	0	0	0	0	0	0	-2,731
1972	0	0	0	0	-18,865	0	0	0	0	0	0	0	-18,865
1973	0	0	0	0	0	-31,528	-3,772	0	-34,750	0	0	0	-70,050
1974	0	14,870	-1	-26,139	2	-8,561	-5,524	-5,694	-4,229	0	0	3,813	-31,463
1975	1,921	0	0	0	638	425	-8,286	0	-8,731	0	-655	4,467	-10,221
1976	2,985	0	0	0	0	0	0	0	0	0	0	0	2,985
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	-102,498	0	0	0	-102,498
1979	0	0	0	627	0	-20,891	-9,330	-2,189	0	0	0	0	-31,783
1980	0	0	0	4,953	-1	-10,465	-4,880	-5,042	-4,880	-2,188	0	5,987	-16,516
1981	0	0	0	0	1,787	1,192	0	0	0	0	0	0	2,979
1982	0	0	0	-32,442	-16,653	-2,663	0	-2,854	-2,762	-2,188	0	-4,297	-63,859
1983	-2,949	-1,841	2,664	0	0	0	0	-5,799	-2,762	-2,188	0	-2,183	-15,058
1984	-7,162	0	0	0	0	3,935	0	0	0	0	0	0	-3,227
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	-11,928	-34,577	-11,300	-5,042	-4,879	0	0	0	-67,726
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	-187,962	0	-16,926	-33,299	-238,187
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	-20,168	-12,896	0	-12,997	-3,683	-2,188	0	1,743	-50,189
1996	0	0	0	2,819	-10,301	1	-6,721	-2,188	-2,118	0	0	0	-18,508
1997	0	6,781	0	-21,743	3	0	0	0	0	0	0	0	-14,959
1998	0	0	0	-10,808	2	-12,498	-12,652	-1,796	-3,774	-2,188	0	5,987	-37,727
1999	0	0	2,979	0	0	-9,514	-6,074	0	-16,264	0	0	0	-28,873
2000	0	0	0	0	-10,698	0	0	0	-23,262	0	0	0	-33,960
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	-211	-535	-3,320	-2,801	-4,814	-5,594	-1,985	-1,818	-6,451	-320	-238	306	-27,782

The effects of La Grange releases to the Tuolumne River between the cumulative and base settings are essentially the same as between the WSIP and base settings. The effect of lesser or greater releases at La Grange (shown by the volumes in Table 3.2-4) would manifest similarly to the effect described for WSIP changes. The change in volume would likely lead to a delay in, or earlier initiation of the day in which, releases are made above minimum flow requirements.

With no change to the operation of the SJPL identified under the cumulative setting, the local system would have an operation identical to the WSIP setting. In addition, when compared to the base setting, the hydrological effects would be the same as those identified for the WSIP setting.

APPENDIX H3

Temperature Modeling Report

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List of Tables

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1. Model Description

In addition to the Hetch Hetchy/Local Simulation Model (HH/LSM) analysis, a second model, VR_Temp, was used to assess the effects of the WSIP on water temperature in the Tuolumne River below La Grange Dam. As described in Chapter 5 of the PEIR, the WSIP would result in reduced flows at this location, which could elevate water temperatures and cause adverse effects on coldwater fisheries in the Tuolumne River. This modeling was not needed at other locations in the Tuolumne River system or in the Alameda Creek and Peninsula watershed systems because the predicted changes in flow would not occur at times when thermal conditions would be at issue.

VR_Temp was developed by Beth Neilson at Utah State University and Dr. Steve Chapra at Tufts University for application to the Virgin River in Utah. VR_Temp is a one-dimensional, surface heat balance and kinematic flow routing model developed based on the derivations found in Chapra (1997). The model is able to estimate maximum daily water temperatures and was constructed to allow different input time steps for meteorological data as well as point and distributed inflow sources. The model allows a single stream or river segment to be divided into computational cells or elements; stream networks are not modeled and tributaries are treated as a time-series input. VR_Temp was adapted for use on the Tuolumne River by Merritt-Smith Consultants.

Data requirements for the VR_Temp include time-series inputs for meteorological and hydrologic data, water temperature data for all inflows, and a description of the river channel geometry. The meteorological requirements are solar radiation, air temperature, relative humidity, and wind speed. Hydrologic data requirements include headwater flow (e.g., upstream inflow), tributary and distributed inflows, and diversions. Each inflow to the modeled river reach requires a corresponding water temperature. In addition, data regarding the geometry of the river is necessary, including lengths, elevations, and river-bottom widths.

2. Analysis Methodology

Application to the Lower Tuolumne River

The objective of simulating flow and temperature in the Tuolumne River was to compare water temperature at discrete points in the river under different management scenarios. A number of possible methods were considered, including empirical/statistical relationships, analytical approaches using a spreadsheet, a simple flow and temperature model, or a comprehensive basin-scale production model. The limitations of empirical models and spreadsheet models precluded their application. Further, for this fairly straightforward analysis, a large complex model was not desired (e.g., such models require considerable time to implement and populate with data). The VR_Temp model includes a flow model and the transport of heat, providing time series of daily temperatures—information readily used by biologists and similar scientists in assessing potential impacts of temperature change in aquatic systems.

The necessary data were gathered or estimated from available sources (Table 1) in order to implement the VR_Temp model on the Tuolumne River from La Grange Dam (river mile [RM] 52.5) to the confluence with the San Joaquin River (RM 0.0) (Figure 1). Dry Creek was the only major tributary modeled, entering the river at approximately RM 16.7.

TABLE 1
DATA SETS NECESSARY FOR MODEL COMPLETION

Data Type	Units	Reason Necessary	Availability
Bottom width	m	Reach characteristics	Estimated using USGS topographic maps (TopoQuad)
Slope	km/km	Reach characteristics	Estimated using USGS topographic maps (TopoQuad)
Segment length	km	Reach characteristics	Estimated using USGS topographic maps (TopoQuad)
La Grange outflow	cms	Headwater boundary condition	USGS 11289650
La Grange outflow temperature	^{o}C	Headwater boundary condition	wy9604TIDMID.xls
Dry Creek flow	cms	Inflow	USGS 11289950
Dry Creek water temperature	^{o}C	Inflow	No data
Flow in Tuolumne River at Modesto	cms	Calibration	USGS 11290000
Water temperature in Tuolumne River at Modesto	Calibration	Calibration	USGS 11290000
Air temperature	^{o}C	Meteorological conditions	CIMIS – Modesto
Wind speed	m/s	Meteorological conditions	CIMIS – Modesto
Relative humidity	%	Meteorological conditions	CIMIS – Modesto
Solar radiation	W/m^2	Meteorological conditions	CIMIS – Modesto

Unit Abbreviations:
m – meters
s – seconds
km – kilometer
cms – cubic meters per second
^{o}C – degrees Celsius
W – watt

Other Abbreviations:
USGS – U.S. Geological Survey
CDEC – California Data Exchange Center
CIMIS – California Irrigation Management Information System

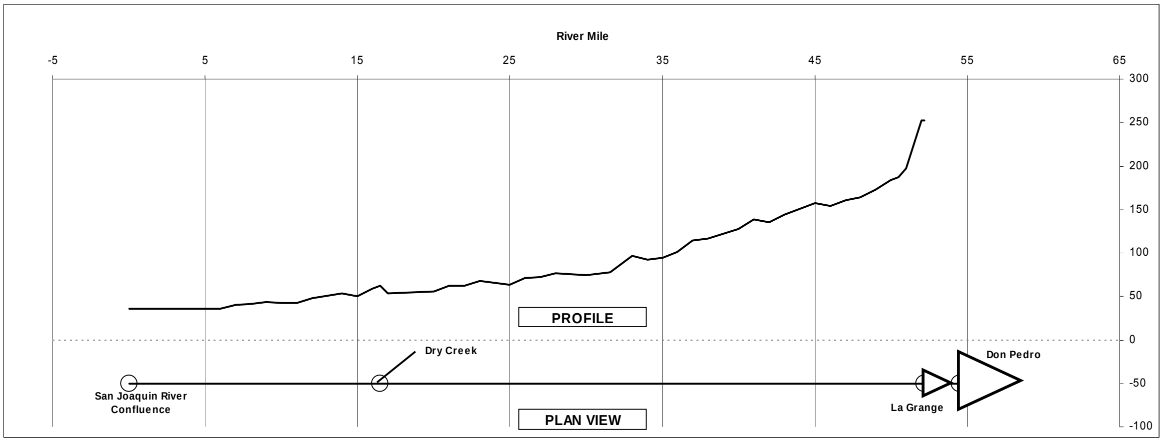

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Figure 1
Profile and Plan View Schematic of the Tuolumne River from La Grange Dam to the San Joaquin River

Model Calibration

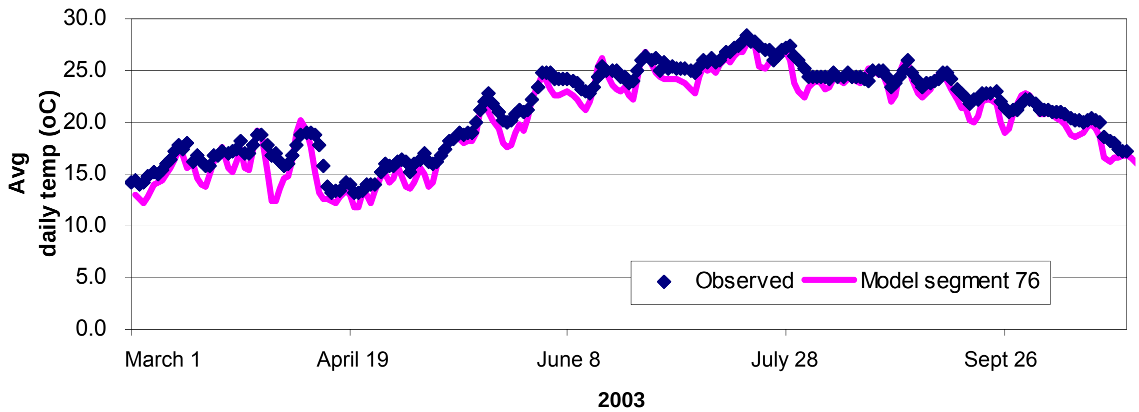
The model was calibrated for the period from March–October using data from 2003. This year was picked because, of the years for which data were available, 2003 provided the best variety in conditions (e.g., wet and dry periods). The model was run for eight months to focus on the period of the year when water temperatures were considered potentially important. Calibration results are shown in Figure 2, which shows that simulated temperatures are in good agreement with observations. Model performance was formally quantified using BIAS, MAE, and RMSE, as defined below, for maximum daily temperature, minimum daily temperature, and average daily temperature. Summary model performance statistics are presented in Table 2.

$$BIAS = \frac{1}{n}\sum_{i=1}^{n}\left(Temp_{modeled} - Temp_{measured}\right)$$

$$MAE = \frac{1}{n}\sum_{i=1}^{n}\left|Temp_{modeled} - Temp_{measured}\right|$$

$$RMSE = \left(\frac{1}{n}\sum\left[Temp_{modeled} - Temp_{measured}\right]^2\right)^{0.5}$$

Where n is the number of paired data points (observed and simulated).



NOTE: The modeled data are from the final calibration run.

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Figure 2
Modeled Versus Observed Temperature in the Tuolumne River at Modesto

TABLE 2
SUMMARY OF STATISTICS FOR MODEL CALIBRATION
(degrees Celsius)

	BIAS	MAE	RMSE
Maximum Daily Temperature	-0.13	0.84	1.26
Mean Daily Temperature	-0.99	1.08	1.71
Minimum Daily Temperature	-1.85	1.87	4.28

Model Application

Application of the flow and temperature model was based on comparative analysis. Specifically, a baseline conditions scenario (e.g., existing conditions, MEA3C[1]) was compared to a proposed scenario (e.g., the WSIP, MEA5HIN). Evaluation of simulated baseline results with simulated scenario results presumes that model uncertainty is approximately equal in both cases, and a direct comparison yields differences in "performance," which in this case is identified as a temperature difference. Figure 3 shows an example of such a comparison as a time series of water temperature at RM 45 in the Tuolumne River for mid-June, when the flow at La Grange Dam was 3,000 cfs for MEA3C and 250 cfs for MEA5HIN. A longitudinal profile of temperatures (daily average temperature from La Grange to the San Joaquin River) for the same period is shown in Figure 4.

[1] Temperature modeling was based on HH/LSM data output from model run MEA3C as the existing conditions, which is an earlier version of model run MEA3CHR, which was used as the existing conditions for the hydrologic analysis described in Appendix H1. The differences between the two versions are minor and would result in no substantive changes in the temperature modeling.

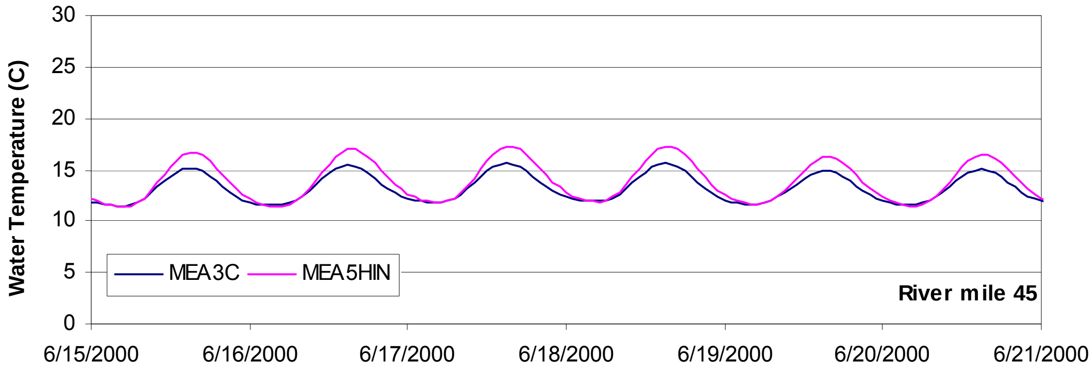

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Figure 3
Time Series of Simulated Water Temperature for MEA3C and MEA5HIN at RM 45 in the Tuolumne River

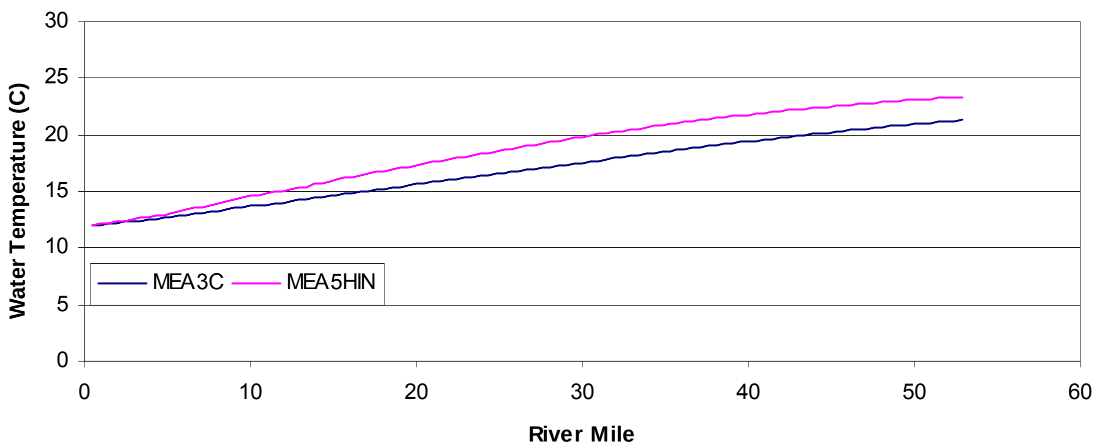

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Figure 4
Longitudinal Profile of Simulated Water Temperature for MEA3C and MEA5HIN for the Tuolumne River

3. Temperature Modeling Results

Two reaches of the Tuolumne River were examined: below Hetch Hetchy Dam and the reach from La Grange Dam to the San Joaquin River. Although the VR_Temp model was only applied to the river below La Grange, approaches for both reaches are outlined herein.

Tuolumne River Below Hetch Hetchy Reservoir

Although several months of the year are identified as having notable flow reductions in this reach, the vast majority of flow reductions occur during the time of year when thermal conditions are not at issue (Table 3). To further explore potential impacts, individual months from the complete record were examined. The criteria for selecting potential months of concern included:

- May through October flow (period when thermal loading in the foothills and mid-Sierra may be of concern), and
- Reductions in flow on the order of 50 percent or more, and
- Final base flows under 200 cfs.

TABLE 3
HETCH HETCHY RELEASE FLOW
(acre-feet)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
Existing Condition, MEA3C (2005)												
All Years	3,351	3,703	3,449	4,621	3,861	4,514	6,340	76,567	124,417	33,709	7,711	4,797
Wet	3,378	3,031	3,124	11,045	4,917	5,695	8,790	154,853	269,789	125,059	11,310	5,335
Above Normal	3,400	5,733	5,435	4,033	4,936	5,309	7,808	78,363	183,990	23,302	7,686	5,316
Normal	3,343	3,235	3,051	3,109	4,128	4,557	5,817	90,958	113,833	10,299	7,513	5,123
Below Normal	3,363	3,255	2,821	2,622	2,851	3,891	5,436	46,628	45,681	6,927	6,818	4,345
Dry	3,266	3,161	2,729	2,460	2,469	3,105	3,816	13,790	9,991	5,285	5,285	3,861
Future with Proposed Program, MEA5HIN (2030)												
All Years	3,351	3,609	3,449	4,522	3,861	4,506	6,153	68,297	123,484	33,709	7,711	4,793
Wet	3,378	3,031	3,124	10,290	4,917	5,165	8,544	148,523	270,615	125,059	11,310	5,316
Above Normal	3,400	5,282	5,435	4,033	4,936	5,772	7,808	73,003	184,183	23,302	7,686	5,316
Normal	3,343	3,235	3,051	3,355	4,128	4,557	5,817	77,459	113,463	10,299	7,513	5,123
Below Normal	3,363	3,255	2,821	2,622	2,851	3,891	5,212	34,660	42,164	6,927	6,818	4,345
Dry	3,266	3,161	2,729	2,460	2,469	3,105	3,340	9,651	8,283	5,285	5,285	3,861
% Change												
All Years	0	-3	0	-2	0	0	-3	-11	-1	0	0	0
Wet	0	0	0	-7	0	-9	-3	-4	0	0	0	0
Above Normal	0	-8	0	0	0	9	0	-7	0	0	0	0
Normal	0	0	0	8	0	0	0	-15	0	0	0	0
Below Normal	0	0	0	0	0	0	-4	-26	-8	0	0	0
Dry	0	0	0	0	0	0	-12	-30	-17	0	0	0

Based on these screening criteria, five dates were identified when thermal conditions may be of concern (Table 4).

TABLE 4
CURRENT AND PROPOSED MONTHLY AVERAGE FLOWS FOR CONDITIONS WHERE WATER TEMPERATURES MAY BE ADVERSELY AFFECTED: TUOLUMNE RIVER BELOW HETCH HETCHY
(cubic feet per second)

Date	MEA3C	MEA5HIN	Difference
May 1962	777	100	-677
May 1978	857	100	-757
May 1981	413	144	-169
May 1992	530	50	-470
May 1999	383	164	-219

Although water temperatures may be elevated in May, this month is the predominate snowmelt runoff month. Typically elevated temperatures would be short-lived (i.e., a "hot" spell), and snowmelt runoff from adjacent lands may ameliorate stream conditions. These five occurrences represent approximately one-half of 1 percent of the simulation period (five months out of 984 months). Other, less stringent screening criteria were examined (e.g., final base flows under 400 cfs versus 200 cfs), but, by and large, temperature conditions were limited to May. Overall, the impact is expected to be less than significant.

Tuolumne River Below La Grange Dam

La Grange Dam on the Tuolumne River is located at approximately RM 52.5. Releases from this point flow generally westward to the confluence with the San Joaquin River and subsequently to the Delta.

In downstream Tuolumne River reaches (and San Joaquin River reaches as well), meteorological conditions dominate thermal processes. Table 5 illustrates flow conditions for the existing and proposed conditions, as well as the percent change between the two regimes. For the vast majority of conditions, flow decreases occur during months when temperature conditions are not at issue (e.g., winter, summer); occur during high-flow conditions (i.e., when meteorological conditions would not affect temperature due to high flow); or are small deviations from the baseline. However, in a few instances (e.g., June in a normal year), flow reductions may affect the thermal regime of the Tuolumne River downstream of La Grange Dam. This impact could be further evaluated by inspecting existing daily temperature and flow data to determine if flow differences similar to the difference between existing and proposed conditions (shown for June in a normal year) results in a meaningful temperature impact. The reservoir generally attains isothermal conditions each winter, from year to year, and thermal carryover effects do not occur.

TABLE 5
MONTHLY FLOWS ATTRIBUTABLE TO EXISTING CONDITIONS (TOP), PROPOSED PROGRAM (MIDDLE), AND PERCENT CHANGE (BOTTOM) – TUOLUMNE RIVER BELOW LA GRANGE DAM
(cubic feet per second)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
Existing Condition, MEA3C (2005)												
All Years	20,456	20,812	40,677	62,838	96,370	111,086	96,005	91,545	70,251	28,445	14,337	27,614
Wet	27,559	22,492	61,154	158,619	200,916	267,649	216,636	243,574	241,822	110,617	35,503	94,716
Above Normal	19,703	31,993	68,013	75,452	147,873	155,200	131,049	81,465	88,529	16,277	18,922	27,774
Normal	18,888	17,236	37,139	51,177	91,185	95,734	79,283	80,277	16,527	9,992	9,992	9,670
Below Normal	17,763	17,993	21,100	16,941	23,829	17,911	33,630	34,751	4,025	4,160	4,160	4,025
Dry	18,583	13,822	15,496	14,083	19,361	22,004	21,134	21,838	3,347	3,459	3,459	3,347
Future with Proposed Program, MEA5HIN (2030)												
All Years	20,126	19,875	36,808	60,307	91,806	105,614	94,241	90,065	64,371	28,111	14,098	26,876
Wet	27,375	22,236	54,957	146,788	194,832	260,382	212,727	237,163	222,346	109,047	34,448	92,117
Above Normal	19,349	31,993	58,377	74,566	136,291	143,159	127,988	80,494	81,026	16,143	18,763	26,665
Normal	18,457	15,788	34,998	52,109	88,443	88,129	77,404	80,134	13,842	9,992	9,992	9,670
Below Normal	17,105	15,081	19,922	15,874	21,703	17,553	33,630	34,751	4,025	4,160	4,160	4,025
Dry	18,584	13,822	15,496	14,083	19,361	22,004	21,134	21,838	3,347	3,459	3,459	3,347
% Change												
All Years	-2	-4	-10	-4	-5	-5	-2	-2	-8	-1	-2	-3
Wet	-1	-1	-10	-7	-3	-3	-2	-3	-8	-1	-3	-3
Above Normal	-2	0	-14	-1	-8	-8	-2	-1	-8	-1	-1	-4
Normal	-2	-8	-6	2	-3	-8	-2	0	-16	0	0	0
Below Normal	-4	-16	-6	-6	-9	-2	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0

To further explore potential impacts, individual months from the complete record were examined. The criteria for selecting potential months of concern included:

- Months of April through October flow (period when thermal loading in the Central Valley may be of concern), and
- Reductions in flow on the order of 50 percent or more, and
- Final base flows under 400 cfs.

Four months were identified using these criteria, or approximately one-half of 1 percent of all months in the simulation period. Based on these screening criteria, three dates were identified when thermal conditions may be of concern (Table 6). Less strict criteria resulted in additional days being identified as potentially of concern. Although an occasional August or September date would be indicated during this sensitivity testing, the most prominent month was clearly June.

These flow reductions were assessed using the VR_Temp model. The model uses time series of flow and water temperature at La Grange Dam and associated time series of meteorological conditions to simulate

TABLE 6
CURRENT AND PROPOSED MONTHLY AVERAGE FLOWS FOR CONDITIONS WHERE WATER TEMPERATURES MAY BE ADVERSELY AFFECTED: TUOLUMNE RIVER BELOW LA GRANGE
(cubic feet per second)

Date	MEA3C	MEA5HIN	Difference
June 1927	1,424	250	-1,174
June 1993	2,996	250	-2,746
June 1999	523	250	-773

water temperature at 0.5-mile increments. Output is in the form of time series at each simulation point, or longitudinal profiles of temperatures along the river length; both types of output are included in the following analysis.

Simulation of June 1993 and June 1999 are shown to bracket the range of conditions that may occur—June 1993 being the extreme event, with over a 90 percent reduction in flow (Figures 5 through 8), and June 1999 representing a more modest event, with an approximate 50 percent reduction in flow (Figures 8 through 10).

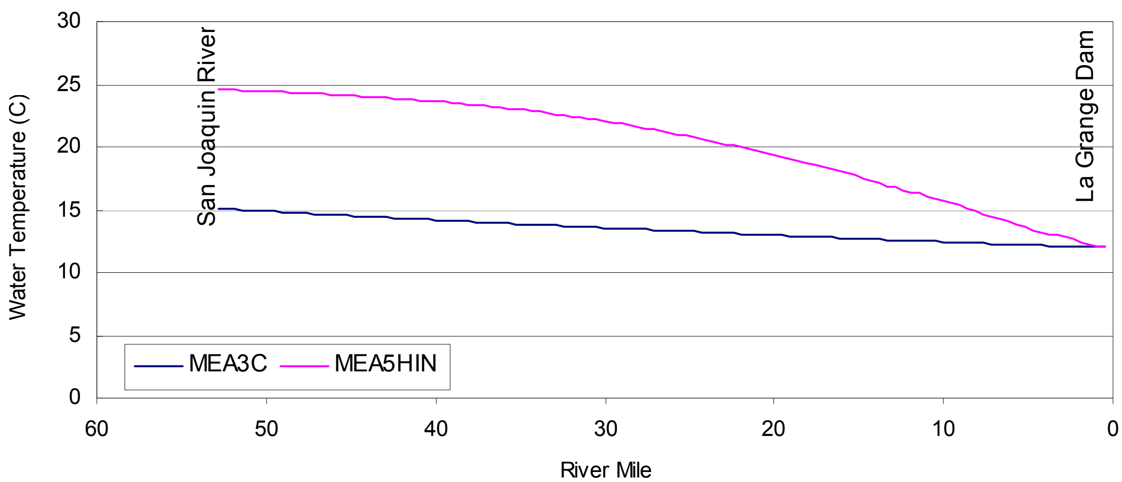

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Figure 5
Longitudinal Profile of Simulated Mean Daily Water Temperature from La Grange Dam to the San Joaquin River for MEA3C and MEA5HIN: June 15, 1927

For the large flow reduction in June 1993, water temperatures increase dramatically in the Tuolumne River below La Grange Dam. Releases from La Grange are largely below equilibrium temperature—the temperature at which water is in approximate equilibrium with meteorological conditions—because they originate from deep within Don Pedro Reservoir. Water temperatures rise steadily towards an equilibrium temperature of approximately 26 degrees Celsius (^{o}C) (Figure 5), but at a

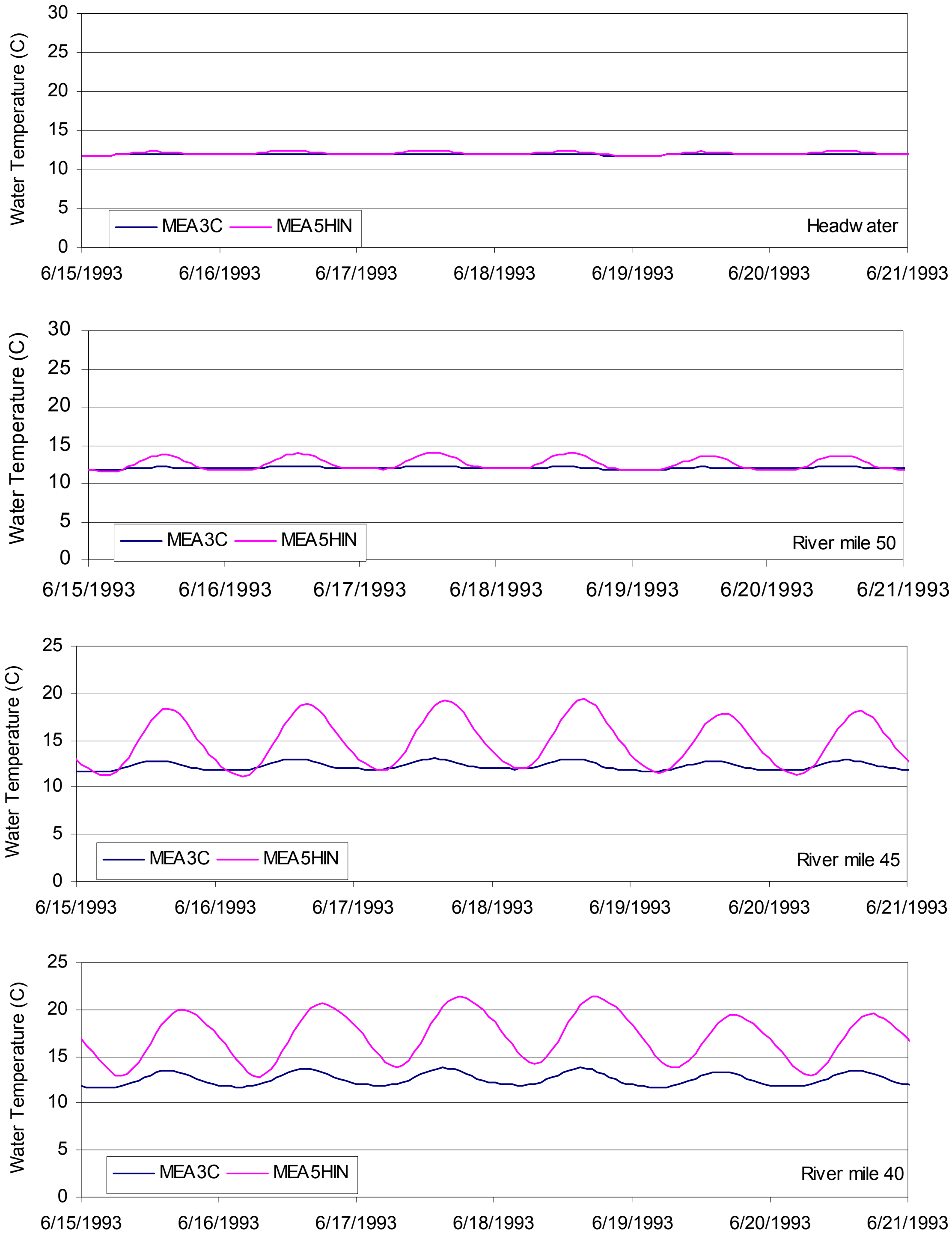

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Figure 6

Time Series of Simulated Mean Daily Water Temperature for MEA3C and MEA5HIN for (top to bottom) La Grange Dam, RM 50, RM 45, RM 40: June 15–21, 1993

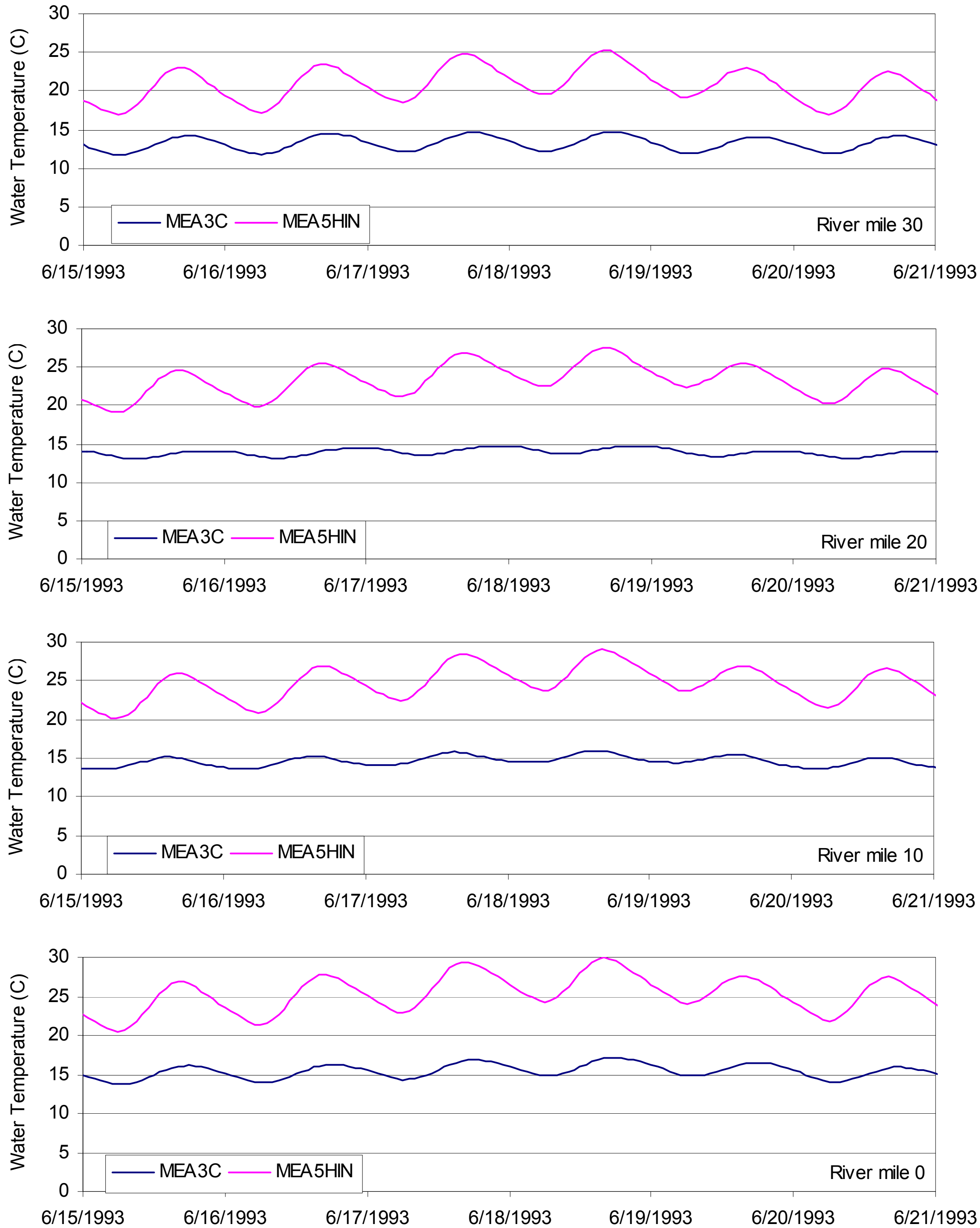

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Figure 7

Time Series of Simulated Mean Daily Water Temperature for MEA3C and MEA5HIN for (top to bottom) RM 30, RM 20, RM 10, RM 0 (confluence with San Joaquin River): June 15–21, 1993

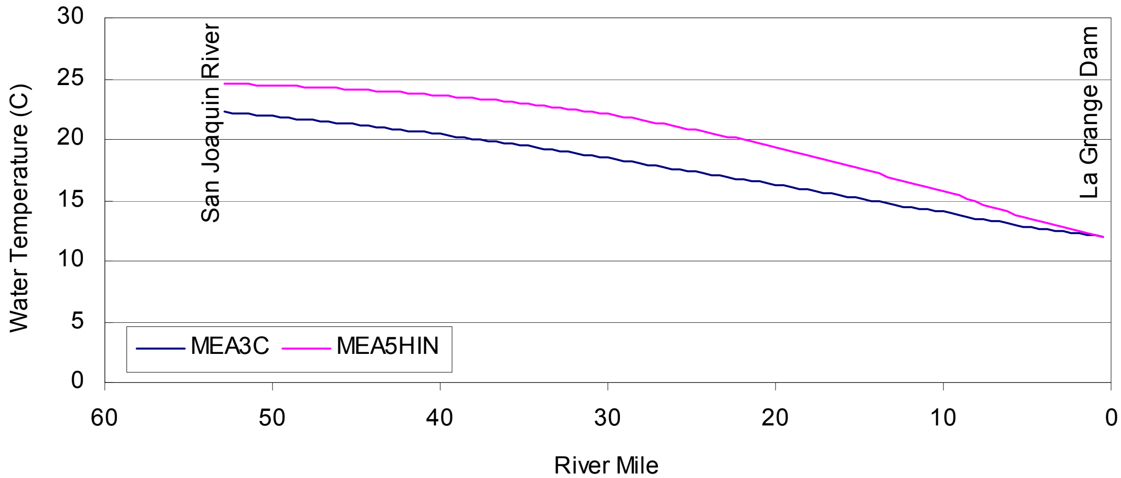

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Figure 8
Longitudinal Profile of Simulated Mean Daily Water Temperature from La Grange Dam to the San Joaquin River for MEA3C and MEA5HIN: June 15, 1999

much faster rate for the proposed conditions due to lower flows, which translate to longer transit times and shallower flow depths/volumes. The result is that daily mean temperatures are approximately 10 ^{o}C warmer under the proposed conditions by the time waters reach the San Joaquin River. Simulated time series for discrete locations along the river are presented in Figures 6 and 7. These data indicate the diurnal pattern of the river in response to the meteorological conditions, and clearly represent the changes in daily maximum and minimum temperatures under the two flow regimes. The larger flow, associated with current conditions, has a larger thermal mass and heats and cools much slower than the proposed flow. Thus, the proposed flow experiences not only a higher daily average temperature (Figure 5) than under the current condition, but also a larger diurnal range. The diurnal range at RM 40 is approximately 2 ^{o}C for current conditions and approximately 7 ^{o}C for proposed conditions, with maximum temperatures approaching 30 ^{o}C at the river’s mouth.

Conditions in June 1999 are not as disparate as in June 1993. Comparison of Figures 5 and 8 indicate that in 1999 the difference in daily average water temperatures at the San Joaquin River confluence are on the order of 2 ^{o}C as flows under both the current and future conditions rapidly approach equilibrium temperature. The diurnal range is similar at most locations between the two flow conditions, with the proposed lower-flow condition warmer overall than the current condition.

Overall, proposed operations may cause considerable deviation from the current condition in June, and an impact may occur.

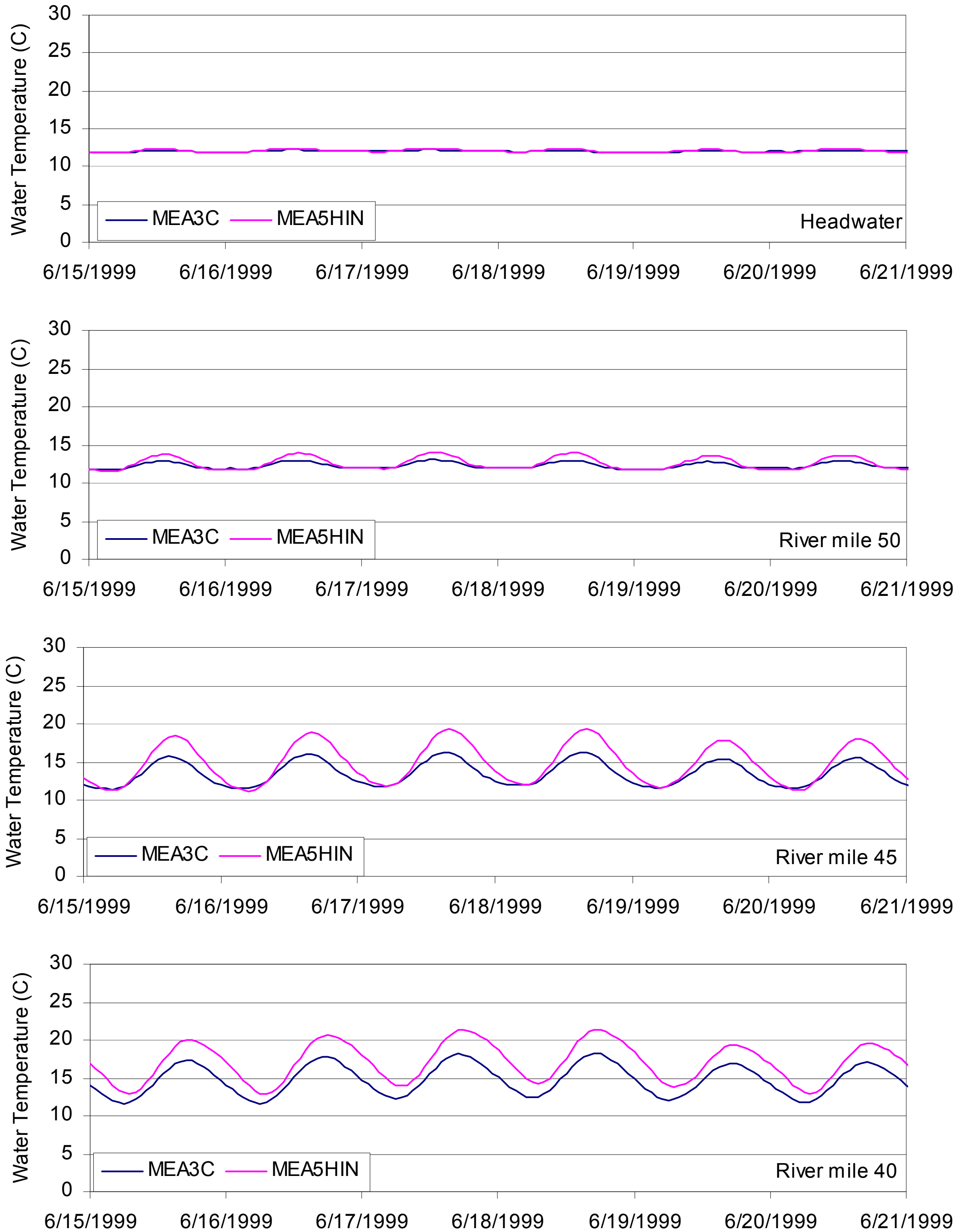

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Figure 9

Time Series of Simulated Mean Daily Water Temperature for MEA3C and MEA5HIN for (top to bottom) La Grange Dam, RM 50, RM 45, RM 40: June 15–21, 1999

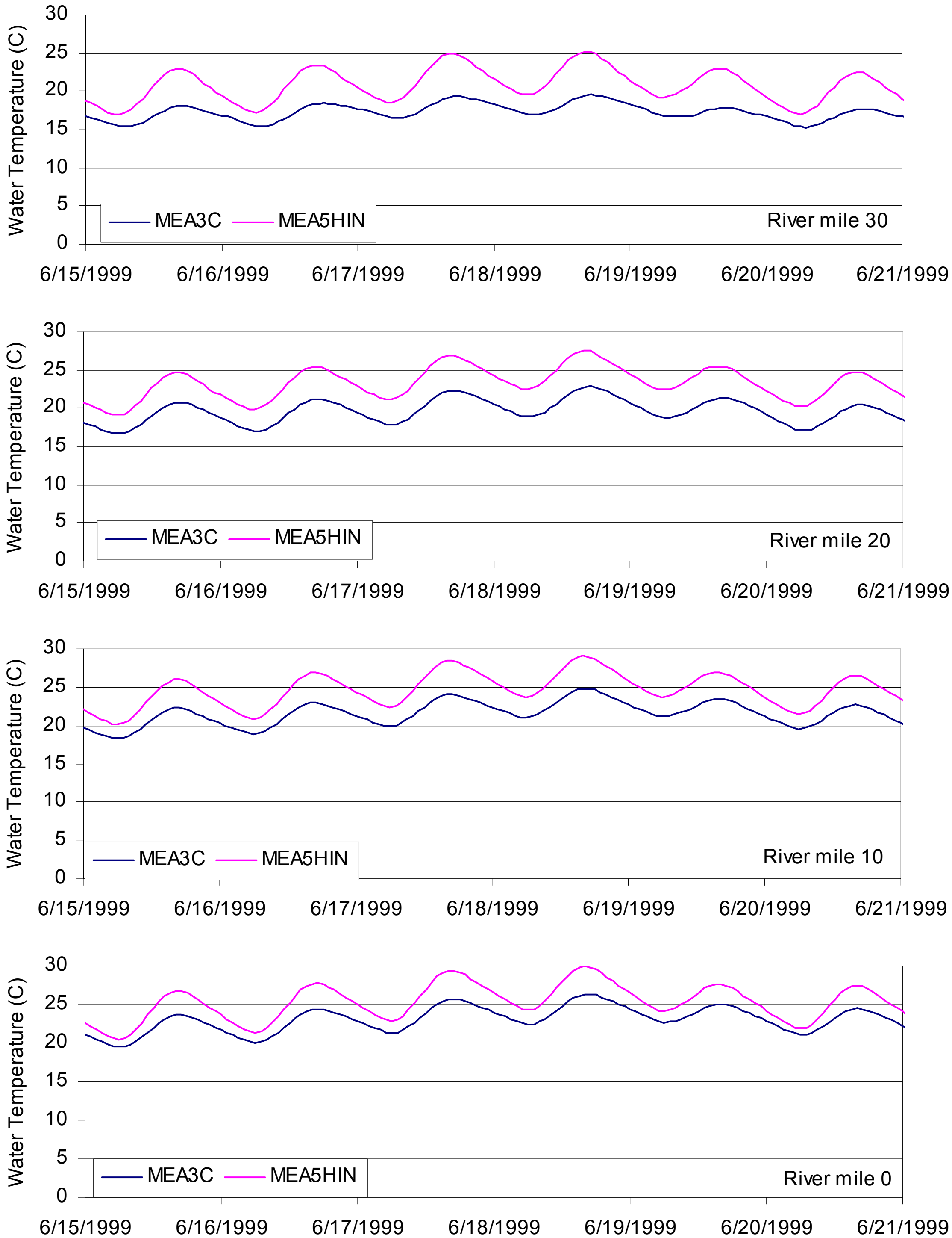

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Figure 10
Time Series of Simulated Mean Daily Water Temperature for MEA3C and MEA5HIN for (top to bottom) RM 30, RM 20, RM 10, RM 0 (confluence with San Joaquin River): June 15–21, 1999

References

Chapra, S.E., *Surface Water Quality Modeling*, McGraw-Hill, New York, 1997.

Appendix I
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[Since publication of the Draft PEIR, the General Manager is Ed Harrington.]

October 30, 2008

Final
Program Environmental Impact Report
Volume 6 of 8

For the
San Francisco Public Utilities Commission's

WATER SYSTEM IMPROVEMENT PROGRAM

Comments on Draft PEIR

San Francisco Planning Department File No. 2005.0159E
State Clearinghouse No. 2005092026

Draft PEIR Publication Date: June 29, 2007

Draft PEIR Public Hearing Dates:
September 5, 2007 in Sonora
September 6, 2007 in Modesto
September 18, 2007 in Fremont
September 19, 2007 in Palo Alto
September 20, 2007 in San Francisco
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City and County of San Francisco
San Francisco Planning Department

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City and County of San Francisco
San Francisco Planning Department

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11. Introduction to Comments and Responses

CHAPTER 11
Introduction to Comments and Responses

11.1 Purpose of the Final Environmental Impact Report

This is the first of three volumes of the Comments and Responses document, which was prepared to accompany the Draft Program Environmental Impact Report (Draft PEIR) on the San Francisco Public Utilities Commission's (SFPUC) Water System Improvement Program (WSIP or proposed program). The Draft PEIR was published by the San Francisco Planning Department on June 29, 2007 for public review and comment. The SFPUC has proposed the WSIP to increase the reliability of the SFPUC's regional water system with respect to water quality, seismic response, water delivery, and water supply and to meet water delivery needs to its customers through the year 2030. The WSIP would establish level of service goals and system performance objectives for the regional system, which provide the basis for a series of facility improvement projects, a proposed water supply option to serve increased water demands, and proposed operations during drought and nondrought periods.

The Draft PEIR described the proposed WSIP, identified the environmental consequences associated with implementation of the WSIP, specified mitigation measures to reduce significant and potentially significant impacts, and analyzed and compared the environmental effects of alternatives to the proposed program as required by the California Environmental Quality Act (CEQA). The Draft PEIR also included an analysis of three variants to the WSIP as requested by the SFPUC. The Comments and Responses document contains copies of comments received from the public and government agencies on the Draft PEIR and provides responses to those comments. The Draft PEIR (Volumes 1 to 5) together with the Comments and Responses document (Volumes 6 to 8) constitute the Final PEIR on the WSIP.

The Final PEIR is an informational document that the SFPUC must consider before approving the WSIP. The CEQA Guidelines (Section 15132) specify the following:

> The Final PEIR shall consist of:
>
> (a) The Draft PEIR or a revision of the draft
>
> (b) Comments and recommendations received on the Draft PEIR, either verbatim or in summary
>
> (c) A list of persons, organizations, and public agencies commenting on the Draft PEIR
>
> (d) The responses of the lead agency to significant environmental points raised in the review and consultation process
>
> (e) Any other information added by the lead agency

The Comments and Responses document was prepared pursuant to the CEQA Guidelines.

11.2 Environmental Review Process

On June 29, 2007, the San Francisco Planning Department published the Draft PEIR on the SFPUC's WSIP for public review and comment (State Clearinghouse No. 2005092019). The public review and comment period on the document was announced as lasting from June 29, 2007 through October 1, 2007, but was later extended to October 15, 2007. During the 108-day public review period, the San Francisco Planning Department received approximately 1,500 written comments sent through the mail or by hand-delivery, fax, or email as well as approximately 200 oral comments made at six public hearings.[1] A court reporter was present at each of the public hearings, transcribed the oral comments verbatim, and prepared written transcripts. Appendix J (Vol. 8) includes a summary of the Draft PEIR notification and public hearing process. Public hearings were held on the following dates and at the following locations:

- September 5, 2007 – Sonora Opera House, Sonora, CA
- September 6, 2007 – Thomas Downey High School, Modesto, CA
- September 18, 2007 – Fremont Main Library, Fremont, CA
- September 19, 2007 – Avenidas Senior Center, Palo Alto, CA
- September 20, 2007 – San Francisco City Hall, Planning Commission Chambers, San Francisco, CA
- October 11, 2007 – San Francisco City Hall, Planning Commission Chambers, San Francisco, CA[2]

On September 30, 2008, this Comments and Responses document was distributed for review to the San Francisco Planning Commission, the SFPUC, and all entities that submitted individual comment letters on the Draft PEIR.[3] On October 30, 2008, following the public review period for the Comments and Responses, the San Francisco Planning Commission certified the Final PEIR—consisting of the Draft PEIR and the Comments and Responses document—and determined it fulfills CEQA requirements. Upon Final PEIR certification, the SFPUC was then able to take action on the WSIP. However, prior to making a decision on the WSIP, the SFPUC reviewed and considered the certified Final PEIR and the associated Mitigation Monitoring and Reporting Program (MMRP). Consistent with CEQA Guidelines (Section 15097), the MMRP is a program for monitoring and reporting of the measures required to mitigate or avoid significant environmental effects in order to ensure that the mitigation measures and revisions identified in the Final PEIR are implemented. By adopting the CEQA findings and the MMRP, the SFPUC was then able to approve and adopt the WSIP or any portion/modification of the WSIP analyzed

1 A public hearing was also held before the San Francisco Landmarks Preservation Advisory Board on September 19, 2007. No members of the public attended the meeting, and thus a written transcript was not prepared. The comments of the Landmarks Board presented at that meeting were later submitted to the Planning Department in writing within the review period (see the L_SFLandmarks comment letter).

2 Because the comment period was extended, a second public hearing was held in San Francisco.

3 Commenters who submitted form letters were notified by mail or email regarding the availability of the Comments and Responses document and the locations where the document is available for viewing; these commenters were not sent a copy of the Comments and Responses document unless requested.

in the PEIR. As indicated in the CEQA findings (attached to the front cover of Volume 1), the SFPUC adopted the Phased WSIP Variant — a variation of the original WSIP described in Chapter 3 of the PEIR on October 30, 2008, subsequent to the certification action by the San Francisco Planning Commission.

[Additional discussion of the Phased WSIP Variant that was adopted by the SFPUC is provided in Section 13.4, Phased WSIP Variant (Vol. 7, Chapter 13).]

11.3 Report Organization

Due to the quantity of comments received on the Draft PEIR, the Comments and Responses document is separated into three volumes. Volume 6 consists of this introductory chapter and Chapter 12, which contains the comments received during the comment period. Chapter 11 includes a list of all commenters, and Chapter 12 includes copies of mailed letters and faxes, printouts of emails, and transcripts of oral comments received at the public hearings. All comments are coded and numbered to correspond to the responses provided in Volume 7. Volume 8 consists of all of the appendices.

In some cases, comment letters included extensive attachments. All attachments are acknowledged and have been considered during preparation of the responses. If the attachments contain direct comments on the adequacy or accuracy of the Draft PEIR, they are included along with the comment letters in Chapter 12 and are treated the same as individual comments. However, in other instances the attachments provide generic information supporting some aspect of an agency or organization's mission (e.g., description of a city's conservation program and activities) and are not directly related to the adequacy or accuracy of the Draft PEIR; those materials are not reproduced in this document but are available for review at the San Francisco Planning Department.[4] The attachments received with a particular letter are indicated at the end of each comment letter in Chapter 12, and Appendix K (Vol. 8) is a summary of all attachments received as part of comments on the Draft PEIR and indicates where copies of the attachments are available.

Volume 7 of the PEIR contains the responses to comments. Chapter 13 describes the organization of responses to the comments received on the Draft PEIR and also describes changes in the WSIP proposed by the SFPUC since publication of the Draft PEIR. Chapter 14 contains master responses, which provide a comprehensive discussion of issues that received numerous comments. Chapter 15 contains the individual responses directed to each specific comment, though in some cases, the reader is referred to a master response in Chapter 14 or to another individual response. Chapter 16 contains a consolidated set of all staff-initiated changes made to the Draft PEIR that resulted from: (1) changes made in response to the comments received on the Draft PEIR; (2) changes that reflect the WSIP revisions; or (3) changes to correct errors or to clarify information presented in the Draft PEIR. Volume 8 contains supporting documentation for information presented in the Comments and Responses document.

11.4 Organization of Comments and List of Commenters

In order to facilitate the preparation of responses, each comment set (i.e., a letter, email, or public hearing transcript) received on the Draft PEIR was coded, then broken down into individual comments and bracketed by topic or issue area; individual comments were then numbered. The individual comments are referenced alphanumerically by comment set code and comment number and are shown in the margins. The coding for the comment sets consists of a prefix indicating the category of commenter (see **Table 11.1**) followed by the initials or acronym of an agency/

4 The San Francisco Planning Department is located at 1650 Mission Street, Suite 400, San Francisco, California, 94103.

TABLE 11.1
COMMENTER CATEGORIES AND ABBREVIATIONS

Category of Commenter	Coding Abbreviation
Federal Agency	F
State Agency	S
Local and Regional Agency	L
Group	SI
Citizen	C

organization or the first five letters of a person's last name. Within each comment set, the individual topics or issue areas are bracketed and numbered sequentially. For example, the first comment in the first set of comments from the Bay Area Water Supply and Conservation Agency (a local agency) is L_BAWSCA1-01. Comments submitted via email, via U.S. Postal Service, or during a public hearing are all coded and numbered in the same way; if a single agency, interest group, or individual submitted comments more than once, a number is added at the end of the comment letter code to indicate multiple submittals by the same commenter (e.g., L_BAWSCA2 represents a second comment set, received either in a separate letter or as part of the oral comments presented at a public hearing).

Multiple copies of two form letters were received as comments on the Draft PEIR. The text in the Form Letter 1 submittals is the same or varies only slightly and the Form Letter 2 submittals were identical; therefore, to avoid excessive duplication of responses, each form letter is treated as a single comment letter. A sample of each form letter is presented in Section 12.7 of this document. A list of the people who signed and/or submitted a form letter is shown below in Table 11.7. All Form Letter 1 submittals are included in Appendix L (Vol. 8).

In some cases, signatures on comment letters were illegible. Illegible signatures on individual citizen comment letters are identified in **Table 11.6** as Unreadable 1 through 5, and illegible signatures on form letters are identified in **Table 11.7** as Unidentified Names 1 through 69.

Tables 11.2 through **11.7** list all persons and organizations that submitted comments on the Draft PEIR during the comment period (June 29, 2007 through October 15, 2007), as well as those comments received through December 31, 2007. Volume 7 of this Comments and Responses document provides written responses to these comments. Appendix M (Vol. 8) contains comment letters received after December 31, 2007; these comments are not responded to individually, but Appendix M includes cross reference for each of these letters to either a master response or another response that includes a discussion of related issues. **Table 11.8** lists all citizens who telephoned the SFPUC General Manager's office during the comment period to voice their concern about the proposed program. The San Francisco Planning Department acknowledges receipt of these comments, and individual written responses to these telephone messages are not included in the Comments and Responses document since they do not address the adequacy or accuracy of the environmental analysis or identify any other significant environmental issue requiring a response.

TABLE 11.2
FEDERAL AGENCIES THAT SUBMITTED COMMENTS ON THE DRAFT PEIR

Comment Letter Format	Comment Letter ID	Name of Commenter	Title	Organization/ Affiliation	Date of Letter
Email	F_NPS-GGNRA	Brian O'Neill	General Superintendent	National Park Service, Golden Gate National Recreation Area	11/06/07
Email	F_NPS-Yos	Michael Tollefson	Superintendent	National Park Service, Yosemite National Park	10/15/07
Mail	F_USBR	Richard J. Woodley	Regional Resources Manager	U.S. Department of the Interior, Bureau of Reclamation	11/06/07
Mail	F_USDAFS	Tom Quinn	Forest Supervisor	U.S. Department of Agriculture, Forest Service	10/03/07
Email	F_USFWS	G. Mendel Stewart	Manager	U.S. Department of the Interior, Fish and Wildlife Service, San Francisco Bay National Wildlife Refuge Complex	09/26/07

TABLE 11.3
STATE AGENCIES THAT SUBMITTED COMMENTS ON THE DRAFT PEIR

Comment Letter Format	Comment Letter ID	Name of Commenter	Title	Organization/ Affiliation	Date of Letter
Mail	S_Caltrans	Tom Dumas	Chief of Office for Metropolitan Planning	California Department of Transportation	07/23/07
Mail	S_CC	Sam Schuchat	Executive Officer	Coastal Conservancy	9/17/07
Mail	S_CDFG1	W.E. Loudermilk	Regional Manager	California Department of Fish and Game	10/01/07
Mail	S_CDFG2	Charles Armor	Regional Manager, Bay Delta Region	California Department of Fish and Game	10/01/07
Mail	S_CSA	Sally Lieber	Assemblywoman, 22nd District	California State Assembly	10/01/07
Mail	S_DWR	Christopher Huitt	Staff Environmental Scientist	California Department of Water Resources, Floodway Protection Section	7/13/07
Mail	S_RWQCBCV	Greg Vaughn	Senior Engineer	Regional Water Quality Control Board, Central Valley Region	10/12/07
Mail	S_RWQCBSF	Keith H. Lichten	Senior Engineer	Regional Water Quality Control Board, San Francisco Bay Region	9/26/07

TABLE 11.4
LOCAL AND REGIONAL AGENCIES THAT SUBMITTED COMMENTS ON THE DRAFT PEIR

Comment Letter Format	Comment Letter ID	Name of Commenter	Title	Organization/ Affiliation	Date of Letter
Mail	L_ACCDA	Bruce Jensen	Senior Planner	Alameda County Community Development Agency	10/15/07
Email	L_ACFCWCD	Kwablah Attiogbe	Environmental Services	Alameda County Flood Control and Water Conservation District	10/1/07
Mail	L_ACWD	Paul Piraino	General Manager	Alameda County Water District	9/26/07
Email	L_BAWSCA1	Arthur Jensen	General Manager	Bay Area Water Supply and Conservation Agency	10/1/07
Hand-delivered, PH	L_BAWSCA2	Arthur Jensen	General Manager	Bay Area Water Supply and Conservation Agency	9/20/07
PH Sonora	L_BAWSCA3	Nicole Sandkulla	Senior Water Resources Engineer	Bay Area Water Supply and Conservation Agency	9/5/07
PH Modesto	L_BAWSCA4	Nicole Sandkulla	Senior Water Resources Engineer	Bay Area Water Supply and Conservation Agency	9/6/07
PH SF1	L_BAWSCA5	Steven Miller	Lawyer	Bay Area Water Supply and Conservation Agency	9/20/07
PH SF2	L_BAWSCA6	Arthur Jensen	General Manager	Bay Area Water Supply and Conservation Agency	10/11/07
Mail	L_BCDC	Sara Polgar	Planner	San Francisco Bay Conservation and Development Commission	9/6/07
Mail	L_Brisbane	Randy Breault	Director of Public Works	City of Brisbane	9/27/07
Mail	L_Burlgme	Syed Murtuza	Director of Public Works	City of Burlingame Public Works Department	9/20/07
Mail	L_CalWater	Thomas Salzano	Water Resources Planning Supervisor	California Water Service Company	9/28/07
Mail	L_CCWD	Leah Orloff	Senior Water Resources Specialist	Contra Costa Water District	10/1/07

PH Sonora = Public Hearing Transcript, Sonora, September 5, 2007
PH Modesto = Public Hearing Transcript, Modesto, September 6, 2007
PH Fremont = Public Hearing Transcript, Fremont, September 18, 2007
PH Palo Alto = Public Hearing Transcript, Palo Alto, September 19, 2007
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Hand-delivered, PH = Written comments hand delivered or dropped in the Comments Box at one of the public hearings

TABLE 11.4 (Continued)
LOCAL AND REGIONAL AGENCIES THAT SUBMITTED COMMENTS ON THE DRAFT PEIR

Comment Letter Format	Comment Letter ID	Name of Commenter	Title	Organization/ Affiliation	Date of Letter
Email	L_CoastsideCWD	Joe Guistino / Cathleen Brennan	Interim General Manager / Water Resources Analyst	Coastside County Water District	9/24/07
Mail	L_DalyCty	Patricia Martel	City Manager	City of Daly City	10/1/07
Mail	L_DSRSD	Bert Michalczyk	General Manager	Dublin San Ramon Services District	9/28/07
Mail	L_EBMUD	William Kirkpatrick	Manager of Water Distribution Planning	East Bay Municipal Utility District	8/27/07
Mail	L_EBRPD	Chris Barton	Senior Planner	East Bay Regional Park District	10/1/07
Mail	L_FosterCty	Ramon Towne	Director of Public Works	City of Foster City	10/1/07
Email	L_Fremont	Rene Dalton		City of Fremont, Transportation and Operations Department	10/9/07
Mail	L_Hayward	Robert Bauman	Director of Public Works	City of Hayward Department of Public Works	9/17/07
Mail	L_Hillsb	Cyrus Kianpour	City Engineer	Town of Hillsborough	9/27/07
Mail	L_LAHCFD	Dorothy Price	President	Los Altos Hills County Fire District	9/21/07
Mail	L_LosAltosH	Craig Jones	Mayor	Town of Los Altos Hills	9/14/07
Email	L_Menlo1	Kent Steffens	Director of Public Works	City of Menlo Park	10/1/07
PH Fremont	L_Menlo2	Kirsten Keith	Employee	Menlo Park Planning Commission	9/18/07
PH Palo Alto	L_Menlo3	Kelly Fergusson	Mayor	City of Menlo Park	9/19/07
PH Modesto	L_MID	Walt Ward	President of the Board of Directors	Modesto Irrigation District	9/6/07
Email	L_MID-TID1	Walter Ward / Robert Nees	Assistant General Manager / Assistant General Manager	Modesto Irrigation District / Turlock Irrigation District	10/1/07
Mail	L_MID-TID2	Walter Ward / Robert Nees	Assistant General Manager / Assistant General Manager	Modesto Irrigation District / Turlock Irrigation District	10/29/07

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TABLE 11.4 (Continued)
LOCAL AND REGIONAL AGENCIES THAT SUBMITTED COMMENTS ON THE DRAFT PEIR

Comment Letter Format	Comment Letter ID	Name of Commenter	Title	Organization/ Affiliation	Date of Letter
Mail	L_Millbr	Ronald Popp	Director of Public Works	City of Millbrae	9/28/07
Mail	L_Milpts	Thomas Williams	City Manager	City of Milpitas	9/27/07
Mail	L_MtnVw	Cathy Lazarus	Public Works Director	City of Mountain View	9/28/07
Email	L_Newark	John Becker	City Manager	City of Newark	10/1/07
Mail	L_PaloAlto	Yoriko Kishimoto	Mayor	City of Palo Alto	9/25/07
Mail	L_PHWD1	Daniel Seidel	President	Purissima Hills Water District	9/28/07
PH Palo Alto	L_PHWD2	Daniel Seidel	President	Purissima Hills Water District	9/19/07
Mail	L_RdwdCty	Peter Ingram (sent by Chu Chang)	Community Development Services Director	Redwood City	9/27/07
Mail	L_SanJose	Mansour Nasser	Deputy Director, Water Resources Division	City of San Jose	9/27/07
Email	L_SBruno	Barbara A. Brenner	Stoel Rives, Attorney at Law	City of San Bruno	10/1/07
Email	L_SClara1	Gloria Sciara	Development Review Officer	City of Santa Clara Planning Division	8/28/07
Mail	L_SClara2	Robin Saunders	Director of Water and Sewer Utility	City of Santa Clara Water and Sewer Utilities	8/23/07
Mail	L_SCVWD1	Keith Whitman	Deputy Operation Officer	Santa Clara Valley Water District, Water Supply Management Division	9/26/07
PH Palo Alto	L_SCVWD2	Amy Fowler	Staff Member	Santa Clara Valley Water District	9/19/07
Mail	L_SFBayTrl	Laura Thompson	Project Manager	San Francisco Bay Trail	9/24/07
PH SF1	L_SFCPC1	Christina Olague	Commissioner	San Francisco City Planning Commission	9/20/07
PH SF1	L_SFCPC2	Michael Antonini	Commissioner	San Francisco City Planning Commission	9/20/07
PH SF1	L_SFCPC3	Kathrin Moore	Commissioner	San Francisco City Planning Commission	9/20/07

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TABLE 11.4 (Continued)
LOCAL AND REGIONAL AGENCIES THAT SUBMITTED COMMENTS ON THE DRAFT PEIR

Comment Letter Format	Comment Letter ID	Name of Commenter	Title	Organization/ Affiliation	Date of Letter
PH SF2	L_SFCPC4	Kathrin Moore	Commissioner	San Francisco City Planning Commission	10/11/07
PH SF2	L_SFCPC5	Michael Antonini	Commissioner	San Francisco City Planning Commission	10/11/07
Email	L_SFLandmarks	Robert Cherny	Vice President	Landmarks Preservation Advisory Board	9/27/07
Mail	L_SJVAPCD	Arnaud Marjollet	Permit Services Manager	San Joaquin Valley Air Pollution Control District	10/1/07
Mail	L_SLDWWKC	Daniel Nelson, Thomas W. Birmingham, and James Beck	Executive Director, General Manager, and General Manager	San Luis & Delta-Mendota Water Authority, Westlands Water District, and Kern County Water Agency	10/1/07
Email	L_Snnyvl	Jamie McLeod / James Craig	Associate Planner / Superintendent of Field Services	City of Sunnyvale	9/28/07
Mail	L_StanCoERC	Raul Mendez	Senior Management Consultant	Stanislaus County Environmental Review Committee	8/27/07
Email	L_Stanford	Clifford (Mike) Goff	Director of Utilities	Stanford University*	10/1/07
Email	L_TCCC	George Segarini	President & CEO	Tuolumne County Chamber of Commerce*	10/1/07
Email	L_TUD1	Peter J. Kampa	General Manager	Tuolumne Utilities District	9/28/07
Mail	L_TUD2	Barbara Balen	Board President	Tuolumne Utilities District	9/10/07
PH Sonora	L_TUD3	Peter J. Kampa	General Manager	Tuolumne Utilities District	9/5/07
Mail	L_Tuol1	Mark Thornton	Chairman, Tuolumne County Board of Supervisors	Tuolumne County	9/25/07
Email	L_Tuol2	Mark Thornton	District 4 Supervisor, Tuolumne County	Tuolumne County	10/15/07
Mail	L_Zone7	G.F. Duerig	General Manager	Alameda County Flood Control and Water Conservation District, Zone 7	10/1/07

*These commenters are classified under "Local Agencies" even though they are technically "Groups." Stanford University is in this category to be with the other BAWSCA members, and Tuolumne County Chamber of Commerce is in this category to be with the Tuolumne County agencies.

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TABLE 11.5
GROUPS THAT SUBMITTED COMMENTS ON THE DRAFT PEIR

Comment Letter Format	Comment Letter ID	Name of Commenter	Title	Organization/ Affiliation	Date of Letter
Email	SI_ACA1	Jeff Miller	Director	Alameda Creek Alliance	10/01/07
PH Fremont	SI_ACA2	Jeff Miller	Director	Alameda Creek Alliance	09/18/07
Email	SI_ACT	David T. Smernoff, Ph.D.	Board Vice President	Acterra: Action for a Sustainable Earth	09/28/07
Email	SI_CAC1	Steve Lawrence	Vice Chair	Citizens Advisory Committee to the SFPUC	08/17/07
Email	SI_CAC2	Steve Lawrence	Vice Chair	Citizens Advisory Committee to the SFPUC	10/15/07
Mail	SI_Caltrout	Brian Stranko	Chief Executive Officer	California Trout	09/28/07
Email	SI_CAREP	Buddy Burke / Virginia Chang Kiraly	CA REP President & CA REP Vice President	Republicans for Environmental Protection, Protection Commissioner, California Commission for Economic Development	10/14/07
PH Palo Alto	SI_CI	Katherine Forrest	Member	Commonwealth Institute	09/19/07
Mail	SI_CNPS	Amanda Jorgenson	Executive Director	California Native Plant Society	09/25/07
Email	SI_CNPS-EB1	Laura Baker	Conservation Committee Chair	California Native Plant Society, East Bay Chapter	10/01/07
PH Fremont	SI_CNPS-EB2	Lech Naumovich		California Native Plant Society, East Bay Chapter	09/18/07
Email	SI_CNPS-SCV1	Kevin Bryant	President, Santa Clara Valley Chapter	California Native Plant Society, Santa Clara Valley Chapter	10/01/07
Mail	SI_CNPS-SCV2	Libby Lucas	Conservation	California Native Plant Society, Santa Clara Valley Chapter	10/15/07
Email	SI_CNPS-WLJ	Tedmund Swiecki	Conservation Committee Co-Chair	California Native Plant Society, Willis Jepson Chapter	10/01/07
Email	SI_CRS	Meredith Wingate / Brad Drda	Director Clean Energy Policy Design and Implementation Program	Center for Resource Solutions	09/26/07

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TABLE 11.5 (Continued)
GROUPS THAT SUBMITTED COMMENTS ON THE DRAFT PEIR

Comment Letter Format	Comment Letter ID	Name of Commenter	Title	Organization/ Affiliation	Date of Letter
Email	SI_CSERC	Brenda Whited	Staff Biology	Central Sierra Environmental Resource Center	09/10/07
Email	SI_CWA1	Jennifer Clary	Water Policy Analyst	Clean Water Action	10/01/07
PH SF1	SI_CWA2	Jennifer Clary	Water Policy Analyst	Clean Water Action	09/20/07
Mail	SI_D3Dem1	Tony Gantner	President	District 3 Democratic Club	09/20/07
PH SF1	SI_D3Dem2	Tony Gantner	President	District 3 Democratic Club	09/20/07
Mail	SI_EcoCtr	Martin Bourque	Executive Director	Ecology Center	10/03/07
Email	SI_EnvDef	Spreck Rosekrans	Senior Analyst	Environmental Defense	10/01/07
Mail	SI_Greenp	Krikor Didonian		Greenpeace	09/22/07
Email	SI_GWWF1	Cindy Charles	Conservation Chair	Golden West Women Flyfishers	09/29/07
PH SF1	SI_GWWF2	Cindy Charles	Chairperson	Golden West Women Flyfishers	09/20/07
Email	SI_KSWC	Joseph Vaile	Campaign Director	Klamath-Siskiyou Wildlands Center	09/27/07
Mail	SI_MenloBP	J. Wesley Skow	Attorney	Menlo Business Park LLC (on behalf of DLA Piper US LLP)	12/12/2007
Email	SI_NCFFSC	Dougald Scott	Chair	NCCFFF Steelhead Committee	09/23/07
Email	SI_PacInst	Peter Gleick	President	Pacific Institute	10/01/07
Email	SI_PilarCrk	Tim Frahm	Chair	Pilarcitos Creek Advisory Committee	9/28/2007
Email	SI_RHH1	Jerry Cadagan	Board Member/Founder	Restore Hetch Hetchy; Committee to Save Lake Merced	09/30/07
Hand-delivered, PH	SI_RHH2	Bob Hackamack	Tech/Engineering Chair	Restore Hetch Hetchy	09/05/07
PH Sonora	SI_RHH3	Bob Hackamack	Tech/Engineering Chair	Restore Hetch Hetchy	09/05/07
PH Sonora	SI_RHH4	Jerry Cadagan	Board Member/Founder	Restore Hetch Hetchy; Committee to Save Lake Merced	09/05/07

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TABLE 11.5 (Continued)
GROUPS THAT SUBMITTED COMMENTS ON THE DRAFT PEIR

Comment Letter Format	Comment Letter ID	Name of Commenter	Title	Organization/ Affiliation	Date of Letter
Email	SI_SCCCC	Mondy Lariz		Santa Clara County Creeks Coalition	09/28/07
PH SF1	SI_SFNeigh	Joan Girardot		Coalition for San Francisco Neighborhoods	09/20/07
Mail	SI_SierraC1	Blaine Rogers		Sierra Club, Tuolumne Group	09/24/07
PH Modesto	SI_SierraC2	Sandra Wilson	Chair	Sierra Club	09/06/07
PH Palo Alto	SI_SierraC3	Bill Young	Member	Sierra Club	09/19/07
PH Palo Alto	SI_SierraC4	Richard Zimmerman	Member	Sierra Club	09/19/07
PH SF1	SI_SierraC5	Gwynn MacKellen	Member	Sierra Club	09/20/07
PH SF1	SI_SierraC6	John Rizzo	Executive Committee Member	Sierra Club, San Francisco Bay Chapter	09/20/07
PH SF2	SI_SierraC7	John Rizzo	Executive Committee Member	Sierra Club, San Francisco Bay Chapter	10/11/07
Mail	SI_SPUR	Laura Tam	Sustainable Development Policy Director	San Francisco Planning and Urban Research Association	10/01/07
Mail	SI_SWC	Terry Erlewine	General Manager	State Water Contractors	09/25/07
PH Sonora	SI_TCFB	Stan Kellogg	President	Tuolumne County Farm Bureau	09/05/07
Email	SI_TROA	Stephen Welch	President	Tuolumne River Outfitters Association	10/01/07
Email	SI_TRT1	Amy Meyer	Founding Member	Tuolumne River Trust	09/28/07
PH Sonora	SI_TRT2	Cynthia King	Sierra Nevada Program Director	Tuolumne River Trust	09/05/07
PH Sonora	SI_TRT3	Galen Weston	Part-time Employee	Tuolumne River Trust	09/05/07
PH Modesto	SI_TRT4	Meg Gonzalez	Director of Community Outreach and Education	Tuolumne River Trust	09/06/07
PH Modesto	SI_TRT5	Patrick Koepele	Central Valley Program Director	Tuolumne River Trust	09/06/07
PH Modesto	SI_TRT6	Eric Wesselman	Executive Director	Tuolumne River Trust	09/06/07

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TABLE 11.5 (Continued)
GROUPS THAT SUBMITTED COMMENTS ON THE DRAFT PEIR

Comment Letter Format	Comment Letter ID	Name of Commenter	Title	Organization/ Affiliation	Date of Letter
PH Fremont	SI_TRT7	Eric Wesselman	Executive Director	Tuolumne River Trust	09/18/07
PH Palo Alto	SI_TRT8	Peter Drekmeier	Bay Area Program Director	Tuolumne River Trust	09/19/07
PH SF1	SI_TRT9	Eric Wesselman	Executive Director	Tuolumne River Trust	09/20/07
PH SF2	SI_TRT10	Peter Drekmeier	Bay Area Program Director	Tuolumne River Trust	10/11/07
Mail	SI_TRT-CWA-SierraC	Peter Drekmeier, Jennifer Clary, John Rizzo		Tuolumne River Trust, Clean Water Action, Sierra Club	10/01/07

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TABLE 11.6
CITIZENS WHO SUBMITTED COMMENTS ON THE DRAFT PEIR

Comment Letter Format	Comment Letter ID	Name of Commenter	Date of Letter
PH Palo Alto	C_AdamsA	Amy Adams	09/19/07
Mail	C_Agarw	Sambhu Agarwala	09/20/07
Mail	C_AllenC	Casey Allen	09/20/07
Mail	C_AllenT	Thomas Allen	09/22/07
Email	C_Allis	Rita Allison	08/28/07
Mail	C_Alter	Grudy Alter	09/20/07
Email	C_Arons	Eric Arons	09/14/07
Mail	C_Bail	Christopher Bail	09/28/07
Mail	C_Barbe1	John Barbey	10/01/07
PH SF1	C_Barbe2	John Barbey	09/20/07
Mail	C_Barsa	Cris Barsanti	09/10/07
PH Palo Alto	C_Beauj	Cedric De La Beaujardiere / Susan Stansbury	09/19/07
Mail	C_Berg	Bonnie Berg	09/11/07
Email	C_Berko	Allan Berkowitz	09/07/07
Mail	C_Berli	Gabie Berliner	09/20/07
Mail	C_Bevia	John Beviacqua	09/19/07
Email	C_Bigos	Marty Bigos	10/01/07
Hand-delivered, PH	C_Blake	Martin Blake	09/05/07
Email	C_Bourk	Sean Bourke, MD	09/11/07
PH Sonora	C_BoutiD	Dolores Boutin	09/05/07
PH Sonora	C_BoutiF	Fred Boutin	09/05/07
Email	C_BramlD1	Darryl Bramlette	09/06/07
Email	C_BramlD2	Darryl Bramlette	09/27/07
PH Sonora	C_BramlD3	Darryl Bramlette	09/05/07
PH Modesto	C_BramlD4	Darryl Bramlette	09/06/07
Email	C_Brand	Jobst Brandt	09/24/07
Mail	C_Breso	Mark Bresolin	10/11/07
PH	C_Britt	Beverly Britts	09/05/07
Email	C_BrookL	Liz Brooking	09/11/07
Email	C_Bryan	Louis Bryan	10/01/07
Mail	C_Bucki	Keith Buckingham	09/20/07
PH SF1	C_Bug	June Bug	09/20/07
Email	C_Byron	Juan Byron	09/19/07
PH Fremont	C_Cant	John Cant	09/18/07
Mail	C_Caugh	Robert Caughlan	09/24/07

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TABLE 11.6 (Continued)
CITIZENS WHO SUBMITTED COMMENTS ON THE DRAFT PEIR

Comment Letter Format	Comment Letter ID	Name of Commenter	Date of Letter
Mail	C_Chase	Birgit Chase	09/20/07
Email	C_Chiap	Lynn Chiapella	09/30/07
PH SF1	C_Chode	Bernie Chodeu	09/20/07
Mail	C_Clark1	Ann Clark / Katherine Howard	09/20/07
PH SF1	C_Clark2	Ann Clark	09/20/07
Mail	C_Closs	Gary Clossman	09/18/07
Mail	C_Colem1	Caroline Coleman	No date
Mail	C_Colem2	Caroline Coleman	09/21/07
Mail	C_Colli	Robert Collin	09/27/07
Mail	C_Dahli	Leland & Shirley Dahlin	09/08/07
Email	C_Davey	Mary Davey	09/09/07
Email	C_David	Joel Davidson	10/01/07
PH Sonora	C_DayJ	Joseph Day	09/05/07
Mail	C_DayL	Lisa Day	09/20/07
PH Palo Alto	C_Dippe	Dan Dippery	09/19/07
PH SF1	C_Dough	Denise Dougherty	09/20/07
Email	C_Dulma	Diane Dulmage	09/18/07
Mail	C_Duper	Fred Duperrault	09/25/07
Email	C_Eddy1	Jeb Eddy	09/30/07
PH Palo Alto	C_Eddy2	Jeb Eddy	09/19/07
Mail	C_Elbiz	Elaine Elbizri	09/24/07
PH Palo Alto	C_EllioC	Claire Elliott	09/19/07
PH Sonora	C_EllioP	Patricia Elliott	09/05/07
PH Fremont	C_Ellis	Dave Ellison	09/18/07
Mail	C_Farnu	Benjamin L. Farnum	10/01/07
Email	C_Fenwi	Jan Fenwick	09/30/07
Email	C_Field	David Fielding	10/01/07
Email	C_Fiore	John and Janet Fiore	10/01/07
Mail	C_Flani	M. Flanigan	09/20/07
Mail	C_Flemi	E. Fleming-Hasegaue	09/20/07
Mail	C_Flynn	Kirsten Flynn	09/27/07
Email	C_Fox	Peter Fox	09/25/07
PH Sonora	C_Gado	Jimmy Gado	09/05/07
Email	C_Garba	Caroline Garbarino	09/22/07
Mail	C_Garci	Ruben Garcia	09/20/07
PH Sonora	C_Gelma	Robert Gelman	09/05/07

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TABLE 11.6 (Continued)
CITIZENS WHO SUBMITTED COMMENTS ON THE DRAFT PEIR

Comment Letter Format	Comment Letter ID	Name of Commenter	Date of Letter
Email	C_Genov	Marylyn Genovese	09/29/07
Email	C_Goite	Ernest Goitein	10/14/07
PH SF1	C_Goken	Shawna Gokener	09/20/07
Email	C_Goldf	Kathleen Goldfein	09/25/07
Email	C_Goodm	Rebecca Goodman	09/26/07
Email	C_Grave	Ben Graves	09/27/07
Email	C_GreenD	David Greene	09/11/07
Email	C_GreenK	Katherine Greene	09/21/07
PH Sonora	C_GrinnD	Doris Grinn	09/20/07
PH Sonora	C_GrinnJ	Jim Grinnell	09/20/07
Mail	C_Gross	Andrew Gross	09/20/07
Mail	C_Hacka1	Bob Hackamack	10/01/07
Email	C_Hacka2	Bob Hackamack	10/15/07
Email	C_Hall	Diana Hall	10/15/07
Mail	C_Hamil	Kimberly Hamilton-Lam	09/20/07
Mail	C_Hanke	Carol Hankermeyer	09/25/07
PH SF1	C_Hasso	Tomer Hasson	09/20/07
Mail	C_Helld	Alex Helldoevker	08/15/07
Mail	C_Henry	Leah Henry	09/20/07
Email	C_HerroK	Kristin Herron	09/25/07
Email	C_Hest	Christopher Hest	10/16/07
Mail	C_Higgi	Sidney Higgins	09/20/07
Email	C_Hoel	Jeff Hoel	10/01/07
Mail	C_Hoffm	Jeff Hoffman	09/20/07
Email	C_Hsiun	Pei-Lin Hsiung	10/12/07
PH Sonora	C_Hughe1	Noah Hughes	09/05/07
PH Modesto	C_Hughe2	Noah Hughes	09/06/07
Mail	C_Ikemo	Kile Ikemoto	08/15/07
Email	C_Isaac	Marian Isaac	09/28/07
Email	C_Izmir	Richard Izmirian	10/01/07
Mail	C_JohnM	Mitchell Johnson	09/13/07
Mail	C_JohnSie	Sieglinde Johnson	09/20/07
PH SF1	C_JohnsSil	Silvia Johnson	09/20/07
Email	C_Joye	Lindsay and Ken Joye	09/11/07
Email	C_Kahn	Mike Kahn	09/17/07
Mail	C_Kalin	Gwynn Kaliner-MacKellen	09/20/07

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TABLE 11.6 (Continued)
CITIZENS WHO SUBMITTED COMMENTS ON THE DRAFT PEIR

Comment Letter Format	Comment Letter ID	Name of Commenter	Date of Letter
PH SF1	C_Kalma	Emeric Kalman	09/20/07
Mail	C_Keebr	Suzanne Keebra	10/01/07
Email	C_Kelle	Michael Kelleher	10/01/07
Mail	C_Kim	Michelle Kim	09/20/07
Email	C_KingC	Carl King	10/01/07
Email	C_KingD	David King	10/01/07
Email	C_KingK	Kenneth King	10/15/07
Hand-delivered, PH	C_Krame1	John Kramer	09/05/07
Email	C_Krame2	John Kramer	10/11/07
Mail	C_Lee	Aldora Lee	09/25/07
Mail	C_Leet	Ben Leet	08/16/07
Mail	C_Lewin	Linda Lewin	09/20/07
PH Palo Alto	C_Liebe	Sidney Liebes	09/19/07
Email	C_Lim	Kingman Lim	09/11/07
Mail	C_Look	Carissa Look	09/20/07
Email	C_LoVuo	Judith LoVuolo-Bhushan	09/24/07
Email	C_Lowry	Janet Lowry	10/01/07
Hand-delivered, PH	C_Lubin	Sheri Lubin	09/19/07
Email	C_Lundb	Erik Lundberg	09/19/07
Email	C_Maddo	Tyana Maddock	09/18/07
PH Palo Alto	C_Madou	Ramses Madou	09/19/07
Mail	C_Magol	Nick Magol	09/20/07
PH Palo Alto	C_Marcu	Mary Jane Marcus	09/19/07
PH Palo Alto	C_Margo	Elliot Margolies	09/19/07
Email	C_Marsh	James Marshall	09/09/07
Email	C_MartiM	Michael Martin	09/26/07
Mail	C_MartiS	Sofia Martinez	08/15/07
PH Palo Alto	C_Mater	Len Materman	09/19/07
Mail	C_McCle	Jonathan McClelland	09/26/07
Mail	C_McCol	Karl McCollom	11/07/07
Mail	C_McCon	Mike McConnell	09/07/07
Mail	C_McFar	Keith & Luella McFarland	09/13/07
Email	C_McKee	Julie McKee	09/29/07
Hand-delivered, PH	C_Means1	Robert Means	09/18/07
PH Fremont	C_Means2	Robert Means	09/18/07
PH	C_Melna	Christina & Chet Melnarik	09/18/07

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TABLE 11.6 (Continued)
CITIZENS WHO SUBMITTED COMMENTS ON THE DRAFT PEIR

Comment Letter Format	Comment Letter ID	Name of Commenter	Date of Letter
PH	C_Mensi	Bill Mensing	09/06/07
Mail	C_Menuz	Karen Menuz	09/09/07
Mail	C_Merlo	Steven Merlo	09/20/07
Email	C_Mijac	Ivo Mijac	10/01/07
Email	C_Mille	Eric Millette	10/01/07
Email	C_MindeN	Naomi Mindelzun	09/20/07
Email	C_MindeR	Robert E. Mindelzun	09/23/07
Email	C_Neal	Peter Neal	09/21/07
Mail	C_Nore	Erna Nore	09/26/07
Email	C_Noren1	William Noren	10/10/07
PH Fremont	C_Noren2	William Noren	09/18/07
Email	C_Okuzu	Margaret Okuzumi	10/12/07
PH SF1	C_Olsen	Jenna Olsen	09/20/07
Hand-delivered, PH	C_ONeil	Kay O'Neill	09/19/07
PH Sonora	C_Owen	Ellie Owen	09/05/07
Mail	C_Pagli	Anne Pagliarulo	09/20/07
Mail	C_Parke	Doug Parkes	09/29/07
Mail	C_Perl	Kathy Perl	09/20/07
PH Sonora	C_Picku	Ron Pickup	09/05/07
Email	C_Poult	J. Poulton	09/26/07
Mail	C_Raffa	Paul Raffaeli	10/01/07
Mail	C_Raube	David Raube	10/01/07
Email	C_Reedy	Mark Reedy	09/19/07
Hand-delivered, PH	C_Reich	Stefani Reichle	09/05/07
Mail	C_Richa	Matthew Richardson	09/06/07
PH Palo Alto	C_Roger	Leah Rogers	09/19/07
Email	C_Ross	Jim Ross	10/03/07
Email	C_Rowe	Trish Rowe	10/11/07
Email	C_SchmiR	Ron Schmidt	09/11/07
Email	C_Schri	Judy Schriebman	09/25/07
Email	C_Schul	Urs Schuler	09/17/07
Mail	C_Shea	Kelly Shea	09/20/07
Email	C_Simpk	John Simpkin	09/14/07
Hand-delivered, PH	C_Sloan	Ann Sloan	09/06/07
Mail	C_SmithE	Evan Winslow Smith	09/26/07

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CITIZENS WHO SUBMITTED COMMENTS ON THE DRAFT PEIR

Comment Letter Format	Comment Letter ID	Name of Commenter	Date of Letter
Email	C_SmithP	Paul Smith	09/30/07
Email	C_Sprin	Cindy Spring	09/25/07
Mail	C_Stein	Peter Steinhart	09/26/07
PH Sonora	C_Sturt	Jon Sturtevant	09/05/07
Email	C_Sugar	Marc Sugars	09/26/07
Email	C_Sundb	Karen Sundback	10/01/07
Email	C_Symon	Barbara Symons	09/20/07
PH Modesto	C_TayloJ	Jean Taylor	09/06/07
Email	C_TayloS	Scott Taylor	10/01/07
Hand-delivered, PH	C_Teves	M. Teves	09/19/07
Email	C_Thaga	Betsy Thagard	09/25/07
Email	C_Tholl	Julia Thollaug	09/11/07
Mail	C_Thoma	Dennis Thomas	05/02/07
Email	C_Toth	Tibor Toth	09/04/07
Email	C_Tubma	Marianna Tubman	09/26/07
Email	C_Tucke	Kristen Tucker	09/11/07
Mail	C_Unreadable1	Unreadable commenter name	09/20/07
Mail	C_Unreadable2	Unreadable commenter name	08/15/07
Mail	C_Unreadable3	Unreadable commenter name	09/20/07
Mail	C_Unreadable4	Unreadable commenter name	08/15/07
Mail	C_Unreadable5	Unreadable commenter name	08/15/07
Email	C_Urdan	Matthew Urdan	09/27/07
Email	C_Vadop	Paul Vadopalas	10/01/07
Email	C_VermeJ	Jim Vermeys	9/30/07
Email	C_VermeK	Karen Vermeys	09/24/07
Mail	C_Voyik	Ashleigh Voyikes	08/15/07
Mail	C_Vrana	Leo Vrana	09/20/07
Email	C_Walke	Patricia Walker	10/13/07
Email	C_Walls	Pete Wallstrom	09/27/07
Email	C_Weiss	Richard Weiss	09/26/07
Mail	C_Westc	Bart Westcott	09/12/07
Email	C_Willi	Doris Williams	09/25/07
Email	C_Wingf	Polly P. Wingfield	09/11/07
Email	C_Wolf	Elizabeth Wolf	09/24/07
Mail	C_Zimme	Benita Zimmerman	09/28/07

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TABLE 11.7
CITIZENS WHO SUBMITTED FORM LETTER COMMENTS ON THE DRAFT PEIR

Form 1

Keren Abra
Tom Adams
Karen Boudreaux
Katie Bramlett
Eric Brooks
Susan Burgenbauch
Leslie Chew
Nick Colin
John Cordes
Colette Crutcher
Michael/Tom Duncan/Richard
Don Ehrlich
Don Eichelberger
Ruben Garcia
Peter Gass
Julian Giardinelli
Richard and Valerie Girling
Sami Goski
Barry Hermanson
Carole Herron
Lia Hillman
Mark Jones
Cassandra Kyle
Gary Laufman
Joseph and Vicki/John
Leidner/Radogno
Victoria Lewis
Kirk Lumpkin
Michele Luncy
Laurie McCann
Mary L. McDonnell
Sara Meghrouni
Gale Melton
Mariella Mey
Mark Mills-Thysen
Elan Minvielle
Denis Mosgofian
Kevin Neeson
Chad Nichols
Lauren Nickell
Erica Pederson
Ed Pike
Kevin Rayhill
Dorothy Reinhardt
Janine Richman
Mija Riedel
Hedi Saraf
Patrick Schmitz
Kent Schneeveis
Tara Schubert
Peter, Bonnie, Benard Seidman
Kate Stepan
Maury and Susan Stern
Olav Strawe
Megan Sullivan
Allen Todd
Terry A. Trumbull
Catherine Vowles
Tes Welborn
J. Wong
Ebbe Roe Yovino-Smith

Form 2

Alice Abbott
Bashir Abdullah
Trip Adler
Monika Aeschbacher
Joshua Agan
Bunardi Aiechlanski
Robert Alna
Trudy Alter
Lydia Alva
Bylgia Amadour
Susan Amden
Anna Andersen
Sara Anderson
B.J. Anderson
Kyle Anderson
Theresa Andrews
Max Andrews
Mitchell Aourls
Gary Apter
Lisa Arena
Joe Aristo
Marilyn Arnest
David Artis
Elizabeth Ashcroft
Lani Asher
Nicola Atkins
Laura Atkins
Sarikka Attoe
Sylvia Augustiniok
N. Ausschnitt
Vai Aven
Phyllis Ayer
Richard Babb
J. Bacani
Samuel Bagdorf
Shaun Bailey
Marilyn Bair
John Baker
Yvonne Baker
William Baker
Marilyn Bancel
Teresa Baom
Linda Barnett
Randall Barry
Dirk Bartels
Gail Bartlett
Jason Baum
Nikki Beach
Bruce Beal
Devena Beal
Blanche Bebb
Jessica Bell
Nikki Bengal
Lawrence Bernard
Nellie Bertucci
Max Betkouski
James Biggs
Jon Birnbaum
Sandra Bishop
Gillian Blair
Alex Blanchad
Dian Blomquist
Phil Bloomfield
Ron Boeck
Jordan Bogash
Raymond Bohn
Mitchell Bonner
Sherry Boschert
Sherry Boschert
Alex Boyd
John Boyes
Ava Breembaum
William Breen
Kristina Brennan
Janet Brewer
Simone Brille
Carlos Brito
Ralph Brott
Bruce Brown
Maureen Brown
Geoffrey Brown
Tom Browne
Mary Browne
Kent & Jennifer Brownlow
Jordan Brownwood
William Bryant
William Bryant
Lynne Buchholz
Flavia Buda
Michael Buel
Brad Buethe
Ann Burke
Jean Burkhead
Adam Burnett
Jacklyn Button
Davis C
Paul Cahill
Benjamin Caldwell
Susan Calender
Robert Campbell
Matt Campbell
Isaac Campbell
Amy Canalino
Robert Cangelosi
Alma Canindin
Elizabeth Carbajal
Marion Cardinal
Arthur Carey
Caitlin Carini
Rebecca Carino
Hugnette Carleton
Lance Carnes
Kathleen Casey
Gloria Catricala

TABLE 11.7 (Continued)
CITIZENS WHO SUBMITTED FORM LETTER COMMENTS ON THE DRAFT PEIR

Form 2 (cont.)

Leslie Cele
Andria Cercio
Arthur Cerf
Lauren Cha
Lyzanan Chaires
Chan
Kelly Chang
Anne Chang
Loretta Chardin
Elvina Charley
Pearl Chen
Eric Chesmar
May Chin
Karen Christenson
Jonah Christian
Winston Christian
Pelletier Christiane
Kerry Chung
Jesse Church
Mike Burbank Cindy Roberts
Scott Clark
Jackson Clawson
Judy Clayton
Laurence Clement
Nancy Coe
Steven Cohen
Kimberly Cohen
K. Colburn
Dan Coleman
Caroline Coleman
Christopher Concolino
John Conley
Jean Conner
J. Maureen Cook
Gibbons Cooney
Alison Corson
James Corwin
Scott Corwin
Jesse Costello-Good
Curtis & Debi Cournale
John Cowan
Carolyn Crampton
Mr. & Mrs. William Crowe
Elizabeth Curda
John Curran
Tonette Cyprien
Chris Czerkies
Maria Dais
Peter Dalton
Micheal Daly
Tina Dang
Denise D'Anne
Clayton Dart
Michelle Davidson
Sierra Davidson
Ludmilla Davis
George Davis
Claude Davis
Ian Dedrick
Carole Deeb
Matthew Denckla
Martin Denefeld
Sherley Denney
Gertrude Denney
Ernest Dernburg
Ray & Helen Desai
Peter Desmond
Madeline Dessat
Deirdre Devine
Maria Dichov
Matt Dietz
Mark Dillan
Jacqueline Dion
Sofia DiPadova
Ralph DiPadova
Okori Dixon
Fumiko Docker
Claudia Doerr
Janelle Dong
E. Donnelly
Justin Dorsey
Robert Dower
Annie Du
Maria Ducey
Larey Dunn
S. J. Dunne
Mary Dunning
Natalia Dusov
Betty Cornell Eberhardt
Harvey Eckmann
Tom Eckstrom
Scott Edwards
David Egert
Lynne Eggeri
Charlie Scott Elaine Michaud
Gretchen Elliott
Scott Ellis
Jessica Ellis
Ernest Ely
John Emami
Jeri Engstrand
Aviva Enoch
Julie Enright
Jack Ermen
John Erskine
John & Leigh Escobedo
J. Esfacio
Jonathen Esillies
Chris Esparcia
Douglas Estes
Mark Evans
Debra & Brad Evans
Maxamilienne Ewalt
David Fairley
Deborah Farkas
Carol Farley
Geoff Farrell
Alice Farrelly
Michael Fay
Marla Feher
Gavin Feiger
Mike Fernandez
Ron Ferrato
Kristina Fialova
David & Audrey Fielding
June Finis
Raul Fion
Eve Fisher
E. Fleming
Paul Flores
Stephen Follansbee
Susan Ford
Muriel Forlerer
Michael Fornalski
Chiara Fox
Elizabeth Franczak
Ellen Frank
Martina Frank
Deborah Frankel
Mark Freeman
Elena Freiwald
Yee-chung Fu
Genevieve Fujimoto
Ryan Gamlin
Andrea Gara
Albert Garcia
Tamayer Garcia
Kevin Garden
Michele Garside
Claudia Gaytan
Anne-Marie Gearhart
Arlene Getz
Sean Gibson
Rose Gillen
Judy Ginsburg
Justin Glosvenor
Randall Goetsl
Kristina Goldberg
Jim Goldstein
David Gonzalez
Chris Goodfellow
Deborah Goodson
Jazmin Gorge
Kevin Gottesman
Erica Gould
Robbie Gould
L. Gourley
Don Graham
T.J. Grasshoff
David Gray
Debra Green
Pamela Green
D. Green
Lyn Grigonis
Bill Grindell
L. Grithner
Paul Groose
M.Bruce Grosjean
Lee Grygo
Daniel Guaraldi
Maijala Guerr
Judith Guerriero
George Guie
Pearl Gunsell
Morgan Gwynn
Ursula Haas
Lucile Hackett
Jessica Hahn
Robert Hall
Thomas Hall
Samuel Hall
Brittany Hall

TABLE 11.7 (Continued)
CITIZENS WHO SUBMITTED FORM LETTER COMMENTS ON THE DRAFT PEIR

Form 2 (cont.)

Dean Halpern
F. Hammer
Nedzada Handukic
Jim Hannah
Kristin Hansen
Aimee Harcos
Gabriel Harlow
Craig Harmer
Lisa Harms
Tom Harold
Richard Harrigan
Richard Harrigan
Jill Harris
Tina Harris
Janet Harrison
R. Hayden
Elizabeth Haylock
Loie Hayward
Craig Hecker
Michelle Hecnt
Tim Heiman
Bob Henderson
Corey Hennessy
Ann Henry
Karen Herman
Gustavo Hernandez
Donald Heyneman
John Hicks
Maggie Hill
Mary Hill
Frederick Hirth
Frederick Hirth
Nan Ho
Phillip Hoehn
Mr. & Mrs. William Hogan
Bettie Holaday
Edward Holden
Donald Holley
Jan & Maurice Holloway
Thelma Holmer
Arune Hoover
Cornelia Hoppe
Inge Horton
Carmen Horton
Julia Horvath
Leonard Horwitz
Mark Hotsenpiller
Deborah Howard-Page
Edward Howden
Julianne Howe
Keith Howell
Ying Hsiao
Vicky Huang
Sarah Hudson
Ellen Hughes
Joan & Jack Hughes
Sarah Hummingbird
Karyn Hunt
David Hunter
Lisa Hunter
Carolyn Hutchinson
Lois Hyatt
Jennifer Hymp
Mara Iaconi
Sacha Ielmorini
Eva Ihle
Monica Incerti
Al Inddicato
Hretna Ingadottir
Ernesto Inuro
Rosa Iversen
Zach Ives
Gwendolyn Jacobsen
John Jameson
Denise Jameson
Roy Jarl
Patty Jaundzems
Yari Jeada
Gerald Griffin Jean Clements
Sara Jobin
Diana Scott Joel Schechter
Barbara Johnson
Beverly Johnson
Wiebke Johnson
Linda Jolie
Lori Jones
Jerone Jones
Robin Jones
Myra Jones-Taylor
S. Jordan
Richard Jorgensen
Derek Jostad
Barbara Jue
Marlena Jury
Lisa Kadyk
Eve Kamakea
Elizabeth Kaplan
Jane Kastner
Paula Katz
Fran Kearney
James Keeffe
Audra Kefe
Larry Kelleher
Erwin Kelly
Joan Kelly
Kerri Kelting-Leslie
Wilbert Kemp
Nancy Kenyon
Sabrina Kesler
Sanjay Kewlani
David Keyes
Daniel Kim
Jana King
James Kinsinger
John Kliment
Joseph Knight
Eni Knight
Barbara Kockerols-Alvarez
Carolyn Koester
Blanche Korfmacher
Ana Kreo
Brooke Krohn
Godelieve Kuppens
Amy Kyle
Alex Labanda
Matt Lafferty
Tomi Lahdesneki
Heather Laing-Obstbaum
Theresa Lamb
Theresa Lamb
Barbara Lane
Patricia Langdell
Nechama Langer
Lanoir
Steven Lanum
Melissa Laulle
Curt Lawson
Gary Lea
Alice Leach
Elizaberth Leaf
Joan Leaf
Joan & Elizabeth Leaf
Kelly Leber
Gloria Lee
Preey Lehartowicz
Troy Leone
Salvatore Lesata
David Lesseps
Linda Lewin
Deborah Lewis
Erin Li
Alan Li
Eric Liaw
Harry Lieberman
Lori Liederman
Clifford Liehe
Ho Lin
Irving Lind
Sara Lind
Inavk Linenthal
Lawrence Lipkind
Kelly Liu
Alyss Lochen
Brice Lockord
Esther Lomeli
Jean Long
Jacques Longval
Gary Lopez
James Lovette-Black
Patrisha Lowder
Molley & Rich Lowry
Marshall Luck
Nancy Ludcke
Patricia Luddington
Oscar Luna
Torborg Lundell
T.J. Lupis
Kim Lynn
Barbara Lyon
Xiue Ma
Regina Macias
Gwynn MacKellen
Mary Mackin
Miles Madison
Paul Malhin
Karen Malm
Maria Mansi
Ron Mantingh
Bruce Marcucci
Barbara Margolis
Eli Marias
Maria Markoff

TABLE 11.7 (Continued)
CITIZENS WHO SUBMITTED FORM LETTER COMMENTS ON THE DRAFT PEIR

Form 2 (cont.)

Ziliana Martinez
Marcello Martinez
Joseph Martinez
Eric Wells Maryanne Razzo
Caryn Mason
David Massen
Elisabeth Matkin-Sullins
Mary Matrux
Erna Matula
Kelly Maughan
Seth Mausner
Lawrence Maxwell
Alan McAllister
Scarlett McCahill
Michelle McCarron
K. McClune
Alexandra McCormack
Tracey McCormick
Brian McCracken
Norine McCulley
Mary McDonnell
Allison McDonough
R. McEachern
Doyle McGolden
K. McKenna
John McKenna
Bill McLaughlin
Judith McManigal
Joseph Meant
Guadolupe Mecron
Dorothy Medlin
Sue Mehrings
Karen Menuz
Carmen Meraza
John Merchant
Michael Merk
Fred Merrick
Barbara Messmore
Brad Meyers
Chad Michel
Chad Michel
Nica Michoch
Florence Miller
Christine Mills
David Milne
Kala Milosevich
David & Nancy Milton
Buffy Mitchell
Miryum Mochkin
Julian Montellanos
Montez
E. Mooney
Jubilith Moore
Alberto Moran
Joe Moriarty
Colin Morris
Richard Morris
John Morris
Richard Morris
Dennis Mosgofian
Karen Mount
Klaus Muehlmann
Gloria Mundt
Geraldine Murphy
Joanna Murphy
Elizabeth Murrens
Chloe Lewis Myles Conley
Robert Myska
Louise Nakamura
Katrina & Peter Nardini
Julia Nash
Bill Nasser
Jonas Nattoom
Lawrence Nelson
Suzanne Nelson
Vanessa Nelson
Fiya Nelson
Troy Nergaard
Denny Ng
El Ng
Lan Ngo
Marilyn Nichols
Noreen Nieden
Stephanie Niemann
Caitlin No Name Entered
Willard Norley
David Nuegowski
Zilma Nuns
Jessica Nusbaum
Eric Nyman
William O Arge
Patricia O' Neill
Vera Obermeyer
Melody O'Donnell
Claudine Offer
O'Finnegan
Austin Okane
Megan O'Leary
Andrea O'Leary
Pamela Olson
Maureen O'Neal
Eing Ong
Gene O'Ovidio
Trudy Opitz
John O'Reilly
Nicole Osborn
Chris Oshaben
Duke Otoshi
Carolyn Ozarchuk
Paula Page
M. Pains
Jean Palmeter
Sophia Papageorgiou
Holly Pataki-Bettin
Ruth Patschhkowski
Jay Patton
Jon Gatto Paul Colfer
Eli Payton
Sebastian Peck
John Pendleton
Anita Pereira
Tina Perez
Adele Perez
Marco Antonio Perez
Jack Perkins
Dana Perrigan
Jeffrey Perrone
Chris Petaja
Stefanie Peter
Faith Petric
Beth Pewther
Andrea Pfaff
Greta Phillips
Tim Phillips
Susannah Phillips
Nora Phillips
Maryte Piazza
Marianna Pieck
Patricia Pierce
Ed Pike
Alex Pineda
Nancy Piotrowski
John Piva
Wendy Poinsor
Benito Polo
P.D. Poole
Luke Powell
Laurle Prescott
Mariah Price
Louis Prisco
Lisa Prochello
Megan Pruiett
T. Przybeck
Judith Pynn
Brad Quarstrom
Carlos Quintanilla
Gina Quintinilla
JC Rafferty
Lynn Ragghianti
Gaylin Raisler
Lord Ramsey
Sanjay Ranchod
Stephen Randall
Rebecca Rankin
Martin Ratcliff
Charles Rathbone
Patricia Reid
Dale Reihart
D.J. Reilly
M. Reynolds
Judy Reynolds
Jeanne Rice
Gary Richmond
Samantha Rieter
Lillyane Rietmann
Jose Rios
Olga Rios
Michael Ritter
Micca Rivera
Deborah Robbins
Rachel Galsoul Robert Halsy
Lois Roberts
Robin Roberts
Betty Roi
David Romaro
Eddy Rose
Eunice Rosenberg
Isadore Rosenthal
Mitzi Ross
Janet Rossi
Antonio Rossi
Bruce Rueppel

TABLE 11.7 (Continued)
CITIZENS WHO SUBMITTED FORM LETTER COMMENTS ON THE DRAFT PEIR

Form 2 (cont.)

Olivia Ruiz
Kris Spangler Ruth Schlesinger
Patricia Rutherford
Michael Ryan
Frank Ryan
M. Ryan
Carina Ryan Wechsler
Rob Rynski
Mitchell Sacks
Jason Salfi
Kadie Salfi
Canyon Sam
Oscar Samarran
Manuel Sanchez
Xenia Sanders
Luis Santiago
Melissa Sarenae
Lauren & Matt Satlak
Giancarlo Scalise
Joel & Laine Schipper
Susan Schneider
Michele Schoal
David Schott
David Schott
Brigitte Schulz
Edward Schuster
David Scortpimo
Jeanie Scott
Pamela Scrutton
Kinney Shah
Louis Bennett Shauna Sadowski
Cynthia Shaw
Daniel & Helen Sheehan
Kenneth Sherey
Brian Sherry
Tina Shih
Mary Lynn Shimek
Suzanne Shinkle
Esther Shon
Steve Shovelind
Brad Shutzberg
Dano & Elizabeth Silva
Kenneth Silveria
Robert Simac
Case Simmons
Adam Simonoff
Michael Simpson
Marcia Sitaske
Dorothy Skylok
Suellen Sleamaker
Ray Sloan
Susan Smith
Kris Smith
G. Austin Smith
J. Smith
Emily Smith
Aura Smithers
Regina Sneed
Chris Sommerfield
L.E. Sorenson
Carol Soto
Geraldine Souzis
Kathryn Spence
Michelle Spicher
Jim Sprague
Laura Sriclesky
Sridlaran Srivatsan
Fred Stabell
L. Stansfield
Loriel Starr
Kim Steele
Steenbogen
Christina Stephens
Heather Sterner
Leta Sternes
Marilyn Stettler
Jesse Stevens
Claudia Stillwell
Joel Streicker
Adam Strom
Kina Sullivan
Ben Sun
Sara Sunderek
Karin Surber
David McIlhenny
Susan Burkhardt
Katherine Swan
Walter Swan
Walter Swan
Joshua Switzky
Edda Sydow
Paula Symonds
Benilda Taft-Kiewek
Blodwen Tarter
Alicia Tavlen
Ian Tawes
Anna Taylor
LeeAnn Taylor
Jennifer Templin
Rose Terrell
Rakia Thabet
Valentine Thaler
Carol Thenot
Kat They
Nanci Thibs
Callie Thomas
Andrea Hacher Thompson
James Thompson
Benjamin Thompson
Richard Thompson
Pete Thompson
Charles Thornburgh
Thea Miller Thornton Smith
Joelle Tirindelli
Nelson Tobar
Zac Tobias
Alex Tokar
Adrienne Toomey
Flora Torres
Andrew Tosiello
Mary Tovar
Kavita Trivedi
Arthur James Ulam
Karen Ulring
Pat Umhinger
Dan Unger
Harrison Unreadable
Lilly Urbach
George Ushanoff
Elise Vaccarest
Geraldine Vahey
Sylvia Valdez
Paget Valentzas
Barbara Valverde
Edward Van Eqri
M. Van Gils
Paul Van Houten
Laurens Vaneveld
Sally Vangundy
Stephanie Vasilev
Susan Vaughan
Candace Vee
David Velasquez
Randol Venderford
Matthew Vespa
Joe Viallcrino
John Victorino
Villarroel
Martine Vincent
Jane Vincent Corlett
Claire Visconti
Eleanor Visser
Charles Wagner
Johanna Wald
Pamela Wallach
Charles Ward
Paul Washington
Bruce Watts
Lyn Watts
Robert Watts
Catherine Wayland
Marilyn Webb
John Webster
Stefani Wedl
Catherine Wehrmeister
Abby Weidner
Linda Weiner
Tes Welborn
Ann Wellington
Doug Wentworth
Andrea Werplman
Debbie West
N. West
Ruth Wetherford
Jeanne Wetzel Chinn
Patty Wheeler
Kathleen White
Mani White
Douglas White
Monroe Whitley
David Willey
Roger Williams
Cynthia Wilsey
Heather Wilson
William Wilson
Elizabeth Wilson
Recha Winkelman
Grace Wi-Santiago
Carl Wolf
Jonathan Wolfe
Carol Wong
F. Wong

TABLE 11.7 (Continued)
CITIZENS WHO SUBMITTED FORM LETTER COMMENTS ON THE DRAFT PEIR

Form 2 (cont.)

Donald Woods	Julian Zepeda	Unreadable Name #9
Danny Wright	Eric Zivian	Unreadable Name #10
Huang Xinhng	Marya Zlatnik	Unreadable Name #11
Karyn Yandar	Mike Zucksworth	Unreadable Name #12
Henry Yang	Lonn	Unreadable Name #13
Alice Yavorsky	Unreadable Name #1	Unreadable Name #14
Larry Yavorsky	Unreadable Name #2	Unreadable Name #15
Leslie Yip	Unreadable Name #3	Unreadable Name #16
Jeff Younker	Unreadable Name #4	Unreadable Name #17
Chris Yu	Unreadable Name #5	Unreadable Name #18
Diane Zacher	Unreadable Name #6	Unreadable Name #19
Noe Zamoro Flores	Unreadable Name #7	
Turek Zarzycki	Unreadable Name #8	

TABLE 11.8
CITIZENS WHO TELEPHONED SFPUC GENERAL MANAGER'S OFFICE

Barbara Alvarez	Annette Jansen	Ron Stone Smith
Carole Benjamin	Margo Johnson	Martha Nobel
Beth Booth	Mark Justman	Jessa Tewald
Marueen Brown	Elizabeth Kaplan	Anastasia Piandaca
Ken Buckman	Ann R. Levitian	Marysia Springenberg
Ellen Culver	Jary Lopez	Karen Ulring
Caller Fordham	John Manning	Noreen Wheedon
Janet Harrison	Shannon McEntee	Jennifer Wirt
Christopher Harkness	Regina Murdoch	
Sam Harkness	Andrea Naharo	

12. Comment Letters

12.1 Federal Agencies

FEDERAL AGENCIES

FEDERAL AGENCIES THAT SUBMITTED COMMENTS ON THE DRAFT PEIR

Comment Letter Format	Comment Letter ID	Name of Commenter	Title	Organization/ Affiliation	Page
Email	F_NPS-GGNRA	Brian O'Neill	General Superintendent	National Park Service, Golden Gate National Recreation Area	12.1-1
Email	F_NPS-Yos	Michael Tollefson	Superintendent	National Park Service, Yosemite National Park	12.1-1
Mail	F_USBR	Richard J. Woodley	Regional Resources Manager	U.S. Department of the Interior, Bureau of Reclamation	12.1-2
Mail	F_USDAFS	Tom Quinn	Forest Supervisor	U.S. Department of Agriculture, Forest Service	12.1-4
Email	F_USFWS	G. Mendel Stewart	Manager	U.S. Department of the Interior, Fish and Wildlife Service, San Francisco Bay National Wildlife Refuge Complex	12.1-5

F_NPS-GGNRA

United States Department of the Interior

NATIONAL PARK SERVICE
Golden Gate National Recreation Area
Fort Mason, San Francisco, California 94123

IN REPLY REFER TO:

L76 (GOGA-PLAN)

NOV - 6 2007

San Francisco Planning Department
Attention: Paul Maltzer, Environmental Review Officer
WSIP PEIR
1650 Mission Street, Suite 400
San Francisco, CA 94103

Re: SFPUC Water System Improvement Program Draft Program Environmental Impact Report (PEIR)

Dear Mr. Maltzer:

Thank you for forwarding a copy of the Notice of Preparation and a copy of the PEIR. Please consider these comments and include them in the official record for the project.

We appreciate the thorough description and disclosure of the Scenic Easement and Scenic and Recreation Easement administered by the Golden Gate National Recreation Area for Peninsula watershed lands. The reference to Canada Road as the demarcation should be deleted. 01 We can provide you with a more accurate map to reference. Due to this interest and because of an agreement between the SFPUC and the GGNRA titled *Joint Communications Procedures Between the San Francisco Public Utilities Commission and the Golden Gate National Recreation Area for Routine Work and Special Projects within the San Francisco Peninsula Watershed*, we request to be considered a stakeholder agency during planning for the subsequent project-specific CEQA environmental documents. 02 We would like to participate in project development, receive advance notification of meetings, and assist in creating mitigations for potential impacts. Specifically, we are interested in collaborating with the SFPUC on the projects in the Peninsula Region: Crystal Springs/San Andreas Transmission Upgrade (PN-2), Harry Tracy WTP (PN-3), Lower Crystal Springs Dam Improvements (PN-4), and the Pulgas Balancing Reservoir Rehabilitation (PN-5).

We are specifically concerned about the potentially significant but mitigatable impacts to existing land uses, visitor access and experience, visual character, impacts on wetlands and aquatic resources, historic resources, traffic safety hazards as well as the unavoidable significant impacts to sensitive biological and historic resources. Hopefully by working together, we can ensure watershed resources are protected to the greatest extent feasible and that our interests in the easements are protected. 03

Thank you for the opportunity to comment and your coordination with the GGNRA on these important capital improvements projects. Please call Karen Cantwell on my staff at (415) 561-4842 with questions or for further coordination.

Sincerely,

Brian O'Neill

Brian O'Neill
General Superintendent

F_NPS-Yos

United States Department of the Interior

NATIONAL PARK SERVICE
Yosemite National Park
P.O. Box 577
Yosemite, California 95389

IN REPLY REFER TO:
A3815 (YOSE-SUPT)

Mr. Paul Maltzer, Environmental Review Officer, WSIP PEIR
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, California 94103

Dear Mr. Maltzer:

Yosemite National Park appreciates the opportunity to provide comments on the Draft Program Environmental Impact Report of the Water System Improvement Program proposed by the San Francisco Public Utilities Commission (SFPUC). The partnership that has been forged between our respective agencies in protecting the upper Tuolumne River watershed is mutually beneficial, as outlined in our 5-year cooperative "Hetch Hetchy Watershed Protection Agreement," executed in 2005.

Yosemite National Park would like to see the SFPUC both model and intensively monitor the impacts of this potential water release regime along the Tuolumne River to determine if the water delivery amounts, duration and seasonal timing will have any adverse impacts on the riverine ecosystem. The SFPUC should continue detailed studies that would address scenarios to include multiple drought years, persistent sub-average precipitation and other climate change impacts. We do not feel that current baseline data and modeling analysis can provide enough information for a comprehensive assessment of potential impacts. 01

We are also concerned about the impacts to cultural resources in the Hetch Hetchy area of Yosemite National Park. The SFPUC needs to define a plan to address the protection of archeological resources. For example, we do not see a comprehensive approach to protecting possibly exposed sites within the park boundaries from "pot hunters." We request a process that clarifies the roles of the SFPUC and the NPS for protecting archeological resources, and provides for notification if, during a draw down, there is any potential risk to archeological resources. 02

We look forward to working with you and your staff on this plan and other endeavors. If you have any questions, contact me at (209) 372-0238.

Sincerely,

/S/ Michael J. Tollefson, Superintendent

(Original signature on file)

United States Department of the Interior

BUREAU OF RECLAMATION
Mid-Pacific Regional Office
2800 Cottage Way
Sacramento, California 95825-1898

NOV 0 6 2007

RECEIVED

NOV 0 9 2007

CITY & COUNTY OF S.F
PLANNING DEPARTMENT
MEA

IN REPLY
REFER TO:

MP-440
MP-4.10

San Francisco Planning Department
Attention: Mr. Paul Maltzer
Environmental Review Officer, WSIP PEIR
1650 Mission Street, Suite 400
San Francisco, CA 94103

Subject: Draft Program Environmental Impact Report for the San Francisco Public Utilities Commission's Water System Improvement Program

Dear Mr. Maltzer:

The Bureau of Reclamation respectfully submits this comment letter on the subject Draft Program Environmental Impact Report (DPEIR) for the Water System Improvement Program (WSIP). Reclamation asks that you accept these very important comments into the record for the DPEIR.

Reclamation has significant reservations with the discussion of impacts to the San Joaquin River and Delta in Section 5.3. of the DPEIR. This section assumes that reductions in San Joaquin River flow and Delta inflow caused by the WSIP would be mitigated by a corresponding change in the Central Valley Project (CVP) and State Water Project (SWP) operations, but fails to discuss the impacts caused by the WSIP to fisheries, water quality, and water users who receive water from the CVP and SWP. The lack of analysis of the WSIP's significant impacts causes the DPEIR to fail to meet the California Environmental Quality Act (CEQA) requirement that all reasonably foreseeable environmental impacts be discussed in an EIR. 01

Section 5.3.1-5 discusses impacts to the San Joaquin River caused by the WSIP:

> "The SWRCB has established flow objectives for the San Joaquin River at Vernalis, just upstream of the Sacramento–San Joaquin Delta. Almost all of the time, the reductions in San Joaquin River flow attributable to the WSIP would not be sufficient to cause flow in the river at Vernalis to fall below the objective. Very infrequently, following protracted droughts, reductions in San Joaquin River flow attributable to the WSIP would be sufficient to cause flow in the river at Vernalis to fall below the objective. *Under these circumstances, (Reclamation), the agency responsible for compliance with objectives for the San Joaquin River, would be expected to increase releases from New Melones* 02

> *Reservoir on the Stanislaus River to meet the flow objectives at Vernalis.* Thus, the WSIP would not alter flow in the San Joaquin River below its confluence with the Tuolumne River such that it would be substantially outside the range experienced under existing conditions nor result in a violation of flow objectives." DPEIR, at 5.3.1-38 (emphasis added). 02 cont.

Thus, the DPEIR seeks to assign responsibility for mitigation of impacts to the San Joaquin River to Reclamation, without discussing the impacts to CVP operations caused by such an assignment. The same is true for the WSIP's impacts to the Delta:

> "The reductions in flow in the Tuolumne River below La Grange Dam attributable to the WSIP would also reduce inflow to the Sacramento–San Joaquin Delta. The SWRCB has established objectives for Delta outflow as measured at Chipps Island, just upstream of Suisun Bay. Almost all of the time, the reductions in Delta inflow attributable to the WSIP would not be sufficient to cause Delta outflow to fall below the objective. Very infrequently, following protracted droughts, reductions in Delta inflow attributable to the WSIP would be sufficient to cause Delta outflow to fall below the objective. *Under these circumstances, the USBR and DWR, the respective operators of the Central Valley Project and State Water Project, would be expected to decrease their diversions so that the Delta outflow objectives were met.* Thus, the WSIP would not alter flow in the Sacramento–San Joaquin Delta such that it would be substantially outside the range experienced under the existing condition." DPEIR, at 5.3.1-38, 39 (emphasis added). 03

Again, no analysis is provided on the impacts caused by the decrease in diversions by the CVP and SWP required to mitigate for the WSIP's impacts.

The City and County of San Francisco (CCSF) has established informal significance standards for impacts related to water supplies:

> "The CCSF has not formally adopted significance standards for impacts related to water supplies, but generally considers that implementation of the proposed program would have a significant water supply impact if it were to:
>
> • Result in substantial adverse changes in operations or substantial decreases in water deliveries for water users, as measured by significant changes in reservoir storage, timing or rate of river flows, or water quality 04
> • Violate any water quality standards or otherwise substantially degrade water quality." DPEIR, at 5.3.4-4.

The DPEIR does not apply these standards to WSIP-related impacts to the San Joaquin River and Delta. Instead, it merely concludes that these impacts will be mitigated by changes in operations by the CVP or SWP (or both):

> "Changes in flow in the Tuolumne River below La Grange Dam attributable to the WSIP would affect flows in the San Joaquin River from its confluence with the Tuolumne River to the Delta. The Delta standards include flow and quality objectives for the San Joaquin

River at Vernalis, just upstream of the point where the San Joaquin River flows into the Delta. *Very infrequently, following protracted droughts, reductions in San Joaquin River flow attributable to the WSIP could make it necessary for (Reclamation), the agency responsible for compliance with water quality and flow objectives for the San Joaquin River, to increase releases from New Melones Reservoir to meet the objectives at Vernalis.*" DPEIR, at 5.3.4-5 (emphasis added).

"The WSIP would typically reduce Delta inflow in wet and above-normal years when the Delta is in excess conditions and Delta outflow is so great that the export limits do not limit pumping by the State Water Project and Central Valley Project. Under these conditions, the WSIP would reduce Delta inflow and outflow by the same amount, but would have no effect on the (SWP's) and (CVP's) ability to pump water from the Delta. There could be rare occasions when the WSIP would reduce Delta inflow during excess *conditions but when the export limits do affect pumping by the (SWP) and (CVP). Under these conditions, the WSIP would reduce Delta outflow and could potentially reduce pumping by the (SWP) and (CVP) by 35 percent of the WSIP-induced reduction in Delta inflow. However, the (SWP) and (CVP) may choose to comply with the export limits by releasing more water from upstream reservoirs rather than by limiting pumping.*" DPEIR, at 5.3.4-10,11 (emphasis added). 04 cont.

As with the discussion of impacts to CVP and SWP operations in section 5.3.1, section 5.3.4 does not analyze the impacts to the CVP and SWP caused by the WSIP – instead, it assumes that the CVP and SWP will automatically take the actions necessary to mitigate for the effects caused by the WSIP, and merely concludes with the following:

"Given the very small magnitude and low frequency of potential effects on Delta flows, the impact of the WSIP on water availability and quality at water agencies' and other diverters' diversion points in the Delta would be *less than significant*, and no mitigation measures would be required." DPEIR, at 5.3.4-11 (emphasis in original). 05

The CCSF considers water supply programs to have significant impacts if they adversely affect deliveries to water users or water quality. Protracted droughts by definition create circumstances where deliveries to water users and water quality are adversely affected. However, the DPEIR fails to apply this standard to WSIP operations during drought conditions – instead, it avoids a finding of significance by shifting the mitigation burden to the CVP and SWP.

The DPEIR does not discuss the potentially significant impacts caused by reoperating the CVP and SWP to mitigate for the impacts caused by the WSIP. CVP operations on the San Joaquin and Stanislaus Rivers are subject to many regulatory requirements and agreements between parties on the San Joaquin River system (including the San Joaquin River Agreement). Any additional demands on this system (such as the WSIP demands described in the DPEIR) make it more difficult to meet flow and water quality objectives, and may cause agreements to be no longer valid. The CVP and SWP are subject to significant operational constraints on their Delta operations (and further constraints are anticipated to protect Delta smelt) - during times of protracted drought, mitigation for the impacts of the WSIP will cause significant impacts to CVP 06

and SWP operations. The failure of the DPEIR to analyze these impacts thus violates CEQA's mandate to discuss all reasonably foreseeable impacts. 06 cont.

Reclamation appreciates your consideration of these comments, and asks that the deficiencies in the DPEIR identified above be corrected before the final version of this document is published and a decision made on the WSIP. Please contact Mr. Ray Sahlberg, Regional Water Rights Officer, at (916) 978-5249 if you have any questions.

Sincerely,

Richard J. Woodley
Regional Resources Manager

USDA United States Department of Agriculture
Forest Service
Stanislaus National Forest
19777 Greenley Road
Sonora, CA 95370
(209) 532-3671
FAX: (209) 533-1890
TTY/TDD: (209) 533-0765
http://www.fs.fed.us/r5/stanislaus

File Code: 1500/2520
Date: October 1, 2007

Paul Maltzer
Environmental Review officer
San Francisco Planning Department
WSIP PEIR
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Maltzer:

The Stanislaus National Forest is submitting comments on the Hetch Hetchy Water System Improvement Project.

Our comments center on actions which affect the Stanislaus National Forest's resources, which in the Environmental Impact Report (EIR) most closely relates to the discussion on the stretch from Hetch Hetchy to Don Pedro Reservoir. Our concerns include, but are not limited to:

12.1-4

1) Changes in water flows and the specifics on how water diversions will be increased. 01

2) Effects of the change in water flows on biological and aquatic resources. 02

3) Recreational impacts to National Forest visitors, particularly those people who recreate on Cherry Lake (Lake Lloyd Reservoir), Cherry Creek and the Tuolumne River, including those who fish and those who enjoy river rafting. Effects are projected on recreation due to a decrease in minimum rafting flows. 03

4) Resource environmental studies, such as the river system ecology, have not been completed making it difficult to comment on any of the proposed alternatives. 04

There has been inadequate communication and coordination by the City and County of San Francisco, San Francisco Public Utilities Commission, with the Forest Service to identify and propose mitigation on the effects of the proposal on Stanislaus National Forest resources. The Raker Act provides regulatory authority to the Department of Agriculture for the protection of public lands affected by the project. We have not had the opportunity to provide potential mitigation nor have we had the opportunity to discuss potential effects of the project on the Forest's resources. 05 Thus, we request additional time be made available for us to provide comments and mitigation following a discussion with the City and County regarding the proposal. We also request a copy of the Comments and Responses document. 06

F_USDAFS

At this point, due to the conceptual nature of the impacts and mitigation that are described in the EIR, we favor an alternative which does not divert additional water which would affect the Stanislaus National Forest. 07

We are submitting these written comments to the address above as well as submitting them electronically to wsip.peir.comments@gmail.com.

Sincerely,

TOM QUINN
Forest Supervisor

cc: Deb Romberger, James Frazier, Groveland District Ranger, Dave Campodonico

United States Department of the Interior

FISH AND WILDLIFE SERVICE
San Francisco Bay National Wildlife Refuge Complex
9500 Thornton Avenue
Newark, California 94560

SEP 2 6 2007

San Francisco Planning Department
Attention: Paul Maltzer, Environmental Review Officer, WSIP PEIR
1650 Mission Street, Suite 400
San Francisco, CA 94103

SUBJECT: Comments regarding the Draft Program Environmental Impact Report (PEIR) for the San Francisco Public Utilities Commission's Water System Improvement Program

Dear Mr. Maltzer:

The Don Edwards San Francisco Bay National Wildlife Refuge (Refuge) appreciates the
opportunity to comment on the San Francisco Public Utilities Commission's Water System
Improvement Program. We are the property owner adjacent to the Commission's pipeline in the
Newark area including the access routes to a portion of the pipeline. We are extremely concerned
about the potential wildlife and habitat impacts associated with the project to replace BDPL Nos. 01
1 and 2 that run through the Refuge (see attached map). We would like to relay the following
specific comments on the PEIR:

- *Noise, vibration and human disturbance to wildlife during construction and operation.* The
pipeline is located in wetland habitat that supports the endangered California clapper rail and
salt marsh harvest mouse, as well as numerous migratory bird species. These species rely on
this environment for breeding, nesting, foraging and roosting. We are concerned that 02
construction and operation activities may displace these species temporarily and/or
permanently from this area. We request that construction activities not occur during sensitive
breeding and nesting periods for these species.

- *Habitat disturbance.* We are concerned about the project's anticipated access needs to the
pipeline during the construction and operation phase. It is unclear if wetlands on the Refuge
and Refuge-managed property will be adversely impacted. In order to meet our
congressionally mandated requirements, we would need to be very restrictive in allowing
work to be conducted on or near the Refuge. Since the pipeline is surrounded on both sides 03
by wildlife habitat including species listed as threatened and endangered, we are also
concerned with the potential for take of wildlife during construction and maintenance
activities.

- *Underground pipeline.* We support decommissioning portions of BDPL Nos. 1 and 2
between the Newark Valve Lot and the Ravenswood Valve Lot, and constructing the Bay
Division Pipeline 5 underground. We recommend that SFPUC remove the aboveground
infrastructure in order to restore this area to wetland habitat. Leaving the pipeline in place
will either require ongoing maintenance which causes regular impacts to wildlife and 04
endangered species or, if maintenance is not conducted, the pipeline would collapse into the
marsh directly impacting this delicate resource. The short-term impacts associated with its
removal would be better then the long-term impacts of leaving it. All impacts would have to
be mitigated.

- *Dumbarton Rail.* We understand that the Dumbarton Rail Project is also going on in the
area. We recommend that you coordinate activities with San Mateo County Transit District 05
to minimize habitat impacts for both projects.

- *Dredge material.* We understand that dredge material will be produced from placing the
pipeline underground. We are interested in acquiring clean dredge material for use in 06
wetland restoration associated with the South Bay Salt Pond restoration project.

Thank you for including our comments during your comment period. Because of the potential
impact to listed species, we recommend you also coordinate with the Service's Division of 07
Endangered Species at the Sacramento Fish and Wildlife Office. They can be contacted at 916-414-6600. If you have questions regarding the Refuge, please contact Clyde Morris, Manager Don Edwards San Francisco Bay NWR, at 510-792-0222, x25.

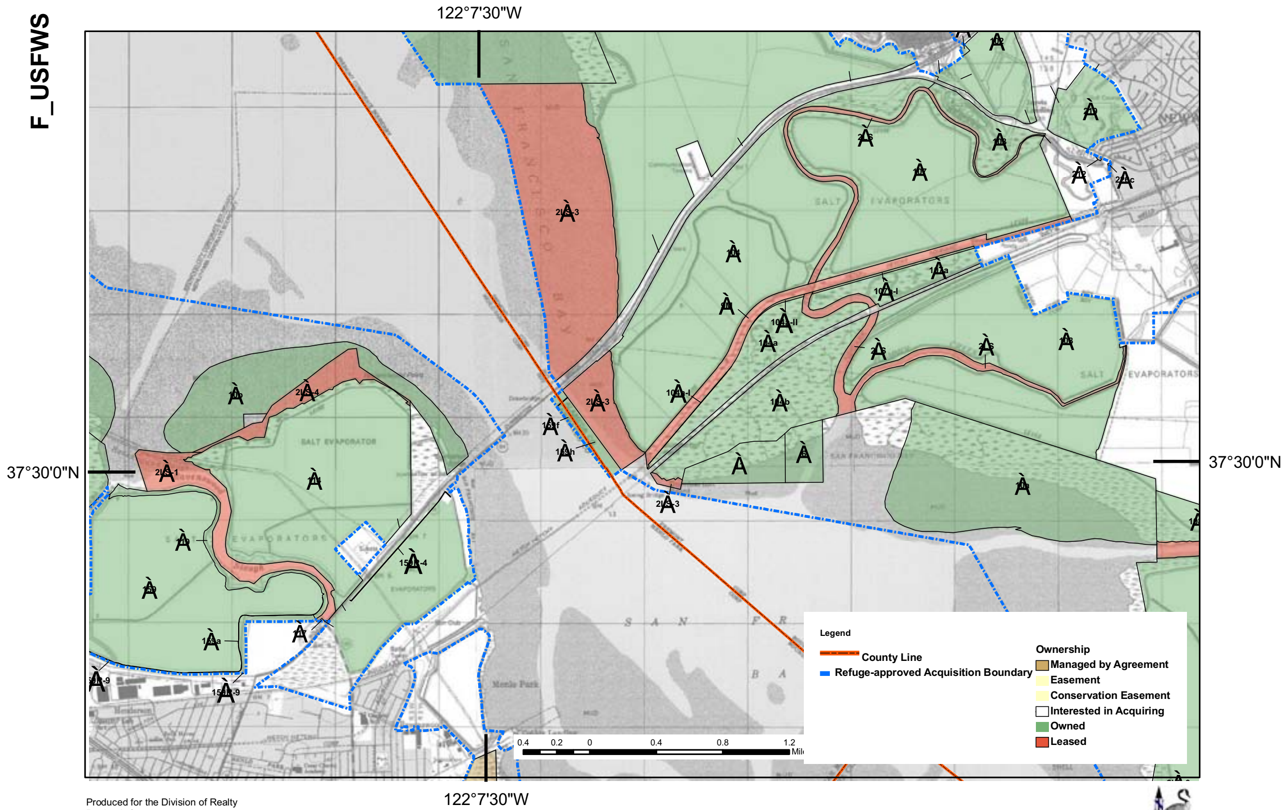
Sincerely,

G. Mendel Stewart

G. Mendel Stewart
Manager, San Francisco Bay
National Wildlife Refuge Complex

cc: Cay Goude, U.S. Fish and Wildlife Service
Amy Hutzel, Coastal Conservancy

F_USFWS



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Meridian: Mt. Diablo
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UTM ZONE 10N
NAD 83

12.2 State Agencies

STATE AGENCIES

STATE AGENCIES THAT SUBMITTED COMMENTS ON THE DRAFT PEIR

Comment Letter Format	Comment Letter ID	Name of Commenter	Title	Organization/ Affiliation	Page
Mail	S_Caltrans	Tom Dumas	Chief of Office for Metropolitan Planning	California Department of Transportation	12.2-1
Mail	S_CC	Sam Schuchat	Executive Officer	Coastal Conservancy	12.2-1
Mail	S_CDFG1	W.E. Loudermilk	Regional Manager	California Department of Fish and Game	12.2-4
Mail	S_CDFG2	Charles Armor	Regional Manager, Bay Delta Region	California Department of Fish and Game	12.2-4
Mail	S_CSA	Sally Lieber	Assemblywoman, 22nd District	California State Assembly	12.2-24
Mail	S_DWR	Christopher Huitt	Staff Environmental Scientist	California Department of Water Resources, Floodway Protection Section	12.2-25
Mail	S_RWQCBCV	Greg Vaughn	Senior Engineer	Regional Water Quality Control Board, Central Valley Region	12.2-27
Mail	S_RWQCBSF	Keith H. Lichten	Senior Engineer	Regional Water Quality Control Board, San Francisco Bay Region	12.2-30

S_Caltrans

07/23/2007 08:30 12099487164 CALTRANS PAGE 02/02

STATE OF CALIFORNIA—BUSINESS, TRANSPORTATION AND HOUSING AGENCY ARNOLD SCHWARZENEGGER, Governor

DEPARTMENT OF TRANSPORTATION
P.O. BOX 2048 STOCKTON, CA 95201
(1976 E. CHARTER WAY/1976 E. DR. MARTIN
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Flex your power!
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July 23, 2007

10-Var Counties
SCH# 2005092026
SFPUC Water System
Improvement Project

Diana Sokolove
City and County of San Francisco
Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Ms. Sokolove:

The California Department of Transportation (Department) appreciates the opportunity to have reviewed the Draft Environmental Impact Report for the proposed project to modify and improve the SFPUC Water System through the counties of San Joaquin, Stanislaus, and Tuolumne. The Department has the following comments:

- Please contact the Department for any planned construction of pipeline crossing the State facilities.
- An Encroachment Permit will be required for work (if any) done within the Department's right of way. This work is subject to the California Environmental Quality Act. Therefore, environmental studies may be required as part of the encroachment permit application including biological, cultural resources, and exposure to hazardous materials. A qualified professional must conduct any such studies undertaken to satisfy the Department's environmental review responsibilities. Ground disturbing activities to the site prior to completion and/or approval of required environmental documents may affect the Department's ability to issue a permit for the project. Furthermore, if engineering plans or drawings will be part of your permit application, they should be prepared in standard units. 01

If you have any questions, please contact Annette Clark at (209) 948-3909 (e-mail: annette_clark@dot.ca.gov) or me at (209) 941-1921.

Sincerely,

Annette Clark

Tom Dumas, Chief
Office of Metropolitan Planning

c: SMorgan CA Office of Planning and Research

"Caltrans improves mobility across California"

S_CC

Coastal Conservancy

RECEIVED
OCT 01 2007
CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
M.E.A.

September 17, 2007

San Francisco Planning Department
Attention: Paul Maltzer, Environmental Review Officer, WSIP PEIR
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Maltzer:

Thank you for the opportunity to review the Draft Program Environmental Impact Report (PEIR) for the San Francisco Public Utilities Commission's Water System Improvement Program (WSIP).

The State Coastal Conservancy acts with others to preserve, protect and restore the resources of the California Coast. The San Francisco Bay Area Conservancy Program was created by the State Legislature in 1997 as a special program within the State Coastal Conservancy to help public agencies and private nonprofit organizations preserve open space, protect and restore fish and wildlife habitat, promote the use of habitat restoration projects for environmental education, provide public access to open space areas, and restore urban waterfronts in the nine Bay Area counties.

The Conservancy's comments on the PEIR for the WSIP are connected to the South Bay Salt Pond Restoration Project (SBSP Project). The Conservancy is facilitating the restoration, public access, and flood management planning for the SBSP Project, in coordination with the landowners, U.S. Fish and Wildlife Service and California Department of Fish and Game, and the local flood control agencies, Santa Clara Valley Water District and Alameda County Flood Control and Water Conservation District, as well as many other partners and stakeholders. We are currently in the process of producing the Final EIR/EIS for the SBSP Project. The Draft EIR/EIS, as well as the public comments, can be viewed at www.southbayrestoration.org. 01

The Conservancy supports the construction of a new Bay Division Pipeline 5, due to the fact that it would be underground from the Newark Valve Lot to the Ravenswood Valve Lot. The five mile "Bay Tunnel" segment of the pipeline would pass under marshlands, mudflats, and open Bay water. While there will be construction and maintenance impacts that need to be planned during species windows and mitigated, the tunnel is preferable to the existing aboveground Bay Division Pipelines Nos. 1 and 2, which pass over 02

1330 Broadway, 13th Floor
Oakland, California 94612-2530
510·286·1015 *Fax:* 510·286·0470

marshlands, reducing the amount of wildlife habitat and blocking the movement of wildlife, including endangered species.

The PEIR states in Table S.2 on Page S-14 that the portions of BDPL Nos. 1 and 2 between the Newark Valve Lot and the Ravenswood Valve Lot will be decommissioned, but that decommissioning is not part of this project. As part of the construction of the "Bay Tunnel", this five-mile segment of BDPL Nos. 1 and 2 needs to be decommissioned and physically removed. Without the physical removal of the pipelines, constructing the "Bay Tunnel" loses its potential benefits to fish and wildlife habitat and simply results in the addition of construction impacts to the existing impacts from BDPL Nos. 1 and 2. If the plan is to decommission this portion of the pipeline, it should be included in the Programmatic EIR and physical removal of the pipeline should be planned. The short term impacts of the removal outweigh the long-term impacts of maintenance and potential deterioration of the pipelines. The SFPUC should also consider that physical removal of BDPL Nos. 1 and 2 through the Bay and marshlands may partially mitigate for activities in the Bay and marshlands contemplated as part of the WSIP. 02 cont.

The SBSP Project could benefit from any clean dredge material produced as a result of construction of the "Bay Tunnel". Many of the former salt ponds are subsided and the placement of dredge material on the pond bottoms would raise the elevation to a level more suitable for tidal marsh restoration. The Conservancy requests that the SFPUC coordinates with the SBSP Project, particularly with the Don Edwards San Francisco Bay National Wildlife Refuge, as the "Bay Tunnel" project proceeds, to determine the potential use of dredge material for salt pond restoration. 03

The construction of the "Bay Tunnel" and physical removal of the BDPL Nos. 1 and 2 could also assist with completion of a gap in the San Francisco Bay Trail. The Bay Trail is a planned recreational corridor that, when complete, will encircle San Francisco Bay and San Pablo Bay with a continuous 500-mile network of bicycling and hiking trails. It will connect the shoreline of all nine Bay Area counties, link 47 cities, and cross the major toll bridges in the region. To date, approximately 290 miles of the alignment—over half the Bay Trail's ultimate length—have been completed.

A major gap in the Bay Trail exists between Highway 84 and the Ravenswood Open Space Preserve. The City of Menlo Park, in an effort to develop alternatives for completing this gap, conducted a Bay Trail Feasibility Study (the final Feasibility Study report was completed January 5, 2005). The completion of this gap is of interest to the Conservancy for two reasons. One is that the Conservancy's enabling legislation includes completion of regional trails, such as the Bay Trail, as an objective. The Conservancy provides block grants to the Bay Trail project at ABAG to help achieve this goal. The second reason is the connection between this trail gap and the trails that will be built as part of the SBSP Project. All of the alternatives for the SBSP Project include completion of the Bay Trail through the project area, including the Ravenswood Pond Complex (attached are the 2 action alternatives for the Ravenswood ponds). The trail connection between Pond SF2 in the Ravenswood Pond Complex and the Ravenswood Open Space Preserve to the south is difficult primarily due to the presence of the 04

S_CC

Dumbarton Rail right of way. Another factor, however, is the presence of the BDPL Nos. 1 and 2. The Conservancy asks that as the "Bay Tunnel" project proceeds, the SFPUC coordinates and works cooperatively with the Conservancy and ABAG's Bay Trail project regarding completion of this Bay Trail gap through SFPUC lands. 04 cont.

Thanks for this opportunity to comment on the PEIR for the San Francisco Public Utilities Commission's Water System Improvement Program. Any questions can be directed to Amy Hutzel, San Francisco Bay Area Program Manager at (510) 286-4180 or ahutzel@scc.ca.gov.

Sincerely,

Sam Schuchat
Executive Officer

cc. Laura Thompson, San Francisco Bay Trail
Mendel Stewart, Don Edwards San Francisco Bay National Wildlife Refuge

S_CC

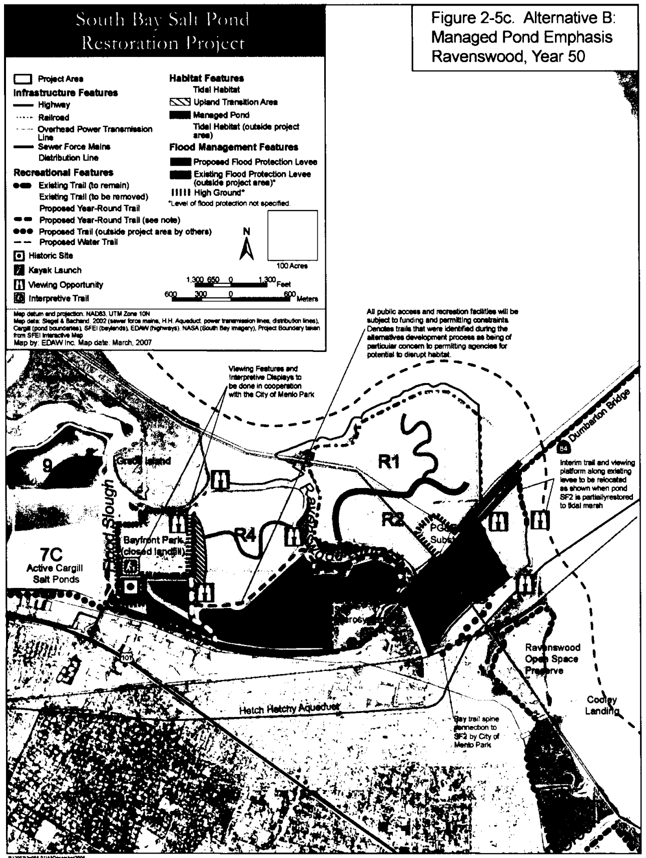

Figure 2-5c. Alternative B: Managed Pond Emphasis Ravenswood, Year 50

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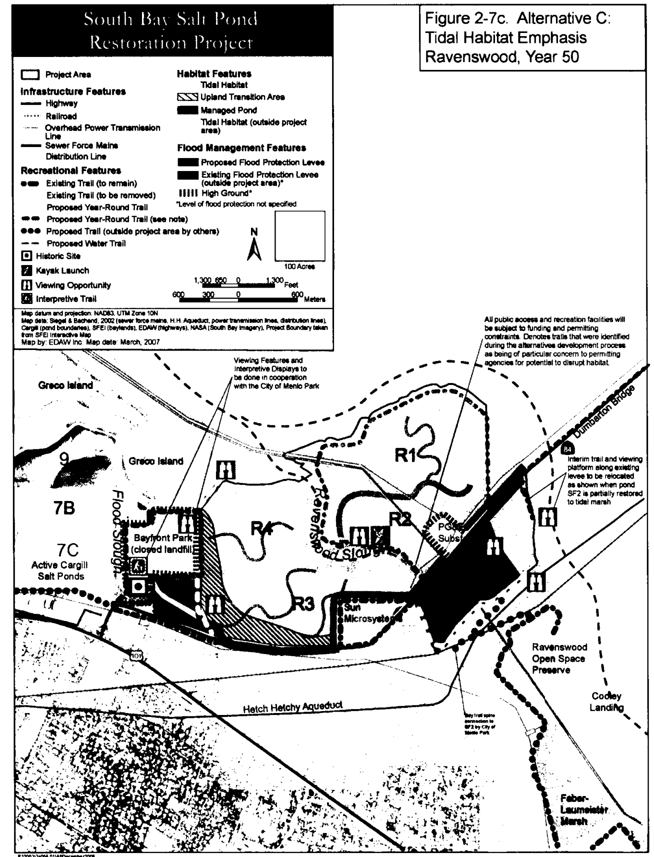

Figure 2-7c. Alternative C: Tidal Habitat Emphasis Ravenswood, Year 50

S_CDFG1

State of California - The Resources Agency ARNOLD SCHWARZENEGGER, Governor
DEPARTMENT OF FISH AND GAME
http://www.dfg.ca.gov
POST OFFICE BOX 47
YOUNTVILLE, CALIFORNIA 94599
(707) 944-5500

October 1, 2007

Mr. Paul Maltzer
Environmental Review Officer
San Francisco Planning Department: WSIP PEIR.
1650 Mission Street, Suite 400
San Francisco, California 94103

Dear Mr. Maltzer:

Subject: Case No. 2005.0159E, SCH No. 2005092926, Draft Program Environmental Impact Report for the San Francisco Public Utilities Commission's Water System Improvement Program

Moccasin Creek State Fish Hatchery Flow Protection:

For more than fifty years, the Department of Fish and Game has operated its Moccasin Creek Trout Hatchery facility, located downstream of Priest Reservoir, using a water supply supplied pursuant to an agreement between the Department and Hetch Hetchy Water and Power. We have been informed by local operations staff that in future years, maintenance of the HHWP facilities could require temporary interruption of water flows to the hatchery for some substantial periods, and that this could occur annually or nearly annually. If flow interruptions occur, it will have a devastating effect on fish hatchery operations and will adversely affect the Department's ability to meet statewide trout production goals. These goals are now legislatively mandated, within Fish and Game Code Section 12007. 01

Given the scope of major infrastructural changes planned and articulated through the subject Programmatic EIR/EIS, we believe it is reasonable to request that alternatives, such as bypass pipelines or other features, be considered that could effectively remediate the impacts of the planned maintenance on our facility operations. 02

Sincerely,

W. E. Loudermilk

W.E. Loudermilk
Regional Manager

State of California - The Resources Agency ARNOLD SCHWARZENEGGER, Governor
DEPARTMENT OF FISH AND GAME
http://www.dfg.ca.gov
POST OFFICE BOX 47
YOUNTVILLE, CALIFORNIA 94599
(707) 944-5500

October 1, 2007

S_CDFG2

Mr. Paul Maltzer
Environmental Review Officer
San Francisco Planning Department: WSIP PEIR.
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Maltzer:

Subject: Case No. 2005.0159E, SCH No. 2005092926, Draft Program Environmental Impact Report for the San Francisco Public Utilities Commission's Water System Improvement Program

The California Department of Fish and Game (DFG) has reviewed the draft Program Environmental Impact Report (PEIR) for the Water System Improvement Program (WSIP) being proposed by the San Francisco Public Utilities Commission (SFPUC). The SFPUC proposes to adopt and implement the WSIP to increase the reliability of the regional water system, which provides drinking water to 2.4 million people in San Francisco, San Mateo, Santa Clara, Alameda, and Tuolumne counties. WSIP implementation would involve using additional water supplies to serve customer needs through 2030 as well as constructing repairs and improvements to many facilities within the existing system located in Tuolumne, Stanislaus, San Joaquin, Alameda, Santa Clara, San Mateo, and San Francisco counties.

DFG, a Trustee Agency under the California Environmental Quality Act (CEQA), is responsible for the conservation, protection, and management of the State's biological resources. The purpose of DFG's comments is to provide guidance to the SFPUC to ensure that, if the WSIP is implemented, biological resources are protected. Like the PEIR, DFG has organized comments beginning with the WSIP and proceeding with comments by each respective watershed (i.e.,Tuolumne River, Alameda Creek and San Francisco Peninsula).

<u>WSIP</u>

Please be advised that for any activity that will divert or obstruct the natural flow, or change the bed, channel, or bank (which may include associated riparian resources) of a river or stream, or use material from a streambed, DFG may require a Streambed Alteration Agreement (SAA), pursuant to Section 1600 et seq. of the Fish and Game Code, with the applicant. The PEIR identifies several existing points of water diversion and could be subject to Section 1600 01 et seq. of the Fish and Game Code. These include: Alameda Creek Diversion Dam, Stone Dam, and Early Intake Diversion Dam. However, given the complex nature of the SFPUC's water transport, other PODs may also exist and be subject to Section 1600 et seq. of the Fish and Game Code.

Issuance of SAAs is subject to CEQA. DFG, as a responsible agency under CEQA, will consider the CEQA document for the project. The CEQA document should fully identify the potential impacts to the stream or riparian resources and provide adequate avoidance, mitigation, monitoring and reporting commitments for completion of the agreement. To obtain information about the SAA notification process, please access our website at www.dfg.ca.gov/1600; or to request a notification package, contact the Streambed Alteration Program at (707) 944-5520. 01 cont.

TUOLUMNE RIVER

The Tuolumne River flows from the crest of the Sierra Nevada westward to its confluence with the San Joaquin River. The San Joaquin River flows north to the Sacramento–San Joaquin Delta, which then from the Delta discharges to the San Francisco Bay Estuary and the Pacific Ocean. Surface water bodies in the Tuolumne River system that could be affected by the proposed program include the Tuolumne River, Cherry Creek, Eleanor Creek, and a quarter-mile reach of Moccasin Creek. Several reservoirs could be affected by the WSIP, including Hetch Hetchy Reservoir, Lake Lloyd, Lake Eleanor, and Don Pedro Reservoir. Because the Tuolumne River drains to the San Joaquin River and the Sacramento–San Joaquin Delta, these water bodies could also be affected by the WSIP. The proposed program could affect flow in the streams and water levels and water quality in the reservoirs.

Upper Tuolumne River Watershed (Below O'Shaughnessy Dam but including Cherry Valley Dam and Lake Eleanor)

The PEIR states that the implementation of the WSIP would have a less than significant impact on stream flow from O'Shaughnessy, and that releases are subject to an instream flow agreement set in 1987 between the U.S. Department of Interior and the SFPUC. In addition, the PEIR also states that the WSIP has the potential to have a significant negative impact on terrestrial biological resources along the Tuolumne River below O'Shaughnessy Dam. This analysis implies that the 1987 instream flow agreement could be inadequate to maintain riparian habitat for wildlife along the Tuolumne River below O'Shaughnessy Dam. We recommend the 1987 instream flow agreement be re-evaluated and appropriately revised to consider the geomorphic processes that maintain alluvial features and riparian habitat. 02

In addition, it should consider the life histories of resident native fish and special status species such as: State-listed endangered 03

Willow flycatcher (*Empidonax traillii*); State species of special concern foothill yellow-legged frog (FYLF) (*Rana boyii*) and western pond turtle (*Clemmys marmorata*); and Federal Threatened California red-legged frog (CRLF) (*Rana draytonii*). A re-evaluation of the 1987 flow agreement may provide insight leading to an appropriate flow regime that could accommodate the needs of the SFPUC and the needs of biological resources below O'Shaughnessy Dam. 03 cont.

We applaud and encourage the SFPUC to continue their ongoing efforts to better characterize the relationships between regulated flow, physical habitat, and the biological communities in the upper Tuolumne River watershed (McBain and Trush 2006, McBain and Trush 2007). The intensive effort the SFPUC has invested into characterizing these relationships presents a firm scientific foundation to re-evaluate and possibly revise the1987 instream flow agreement. We recommend that a re-evaluation and possible revision of the 1987 flow agreement be incorporated into mitigation measure 5.3.7-2. Section 11 of the Raker Act requires the City and County of

San Francisco (CCSF) to comply with applicable state law, including but not limited to, DFG codes 5937 and 1600 et seq. and the CESA; we request that the SFPUC collaborate with us to implement mitigation measure 5.3.7-2. We look forward to working with the SFPUC, the public, and the other agencies in the upper Tuolumne River watershed.

Mitigation Measure 5.3.7-2

The PEIR proposes mitigation measure 5.3.7-2 to offset WSIP impacts on terrestrial biological resources due to potential effects on riparian habitat and special status species. Measure 5.3.7-2 would manage releases from Hetch Hetchy Reservoir to recharge riverside meadows, including the Poopenaut Valley. The PEIR states that well-managed, timely releases under 5.3.7-2, in addition to groundwater and plant population monitoring, would likely maintain meadow conditions in the Poopenaut Valley. 04

We recommend that monitoring of meadow systems along the Tuolumne River not be limited to groundwater and plant population surveys, but be expanded to include the monitoring of aquatic habitat or ecosystems. Botanical surveys are a useful tool in monitoring how meadow systems react to certain management activities (Wexielman et al. 2003; Ratliff 1985). However, it is unclear how sensitive botanical surveys are in detecting changes to aquatic habitat or ecosystems that can potentially occur with implementation of 5.3.7-2. For example, changes in stream hydrology resulting in stream bank failure or channel incision could have adverse impacts to the aquatic and riparian habitat and ecosystem (Micheli and Kirchner 2002), which may only be reflected over time in species composition/diversity that are described in botanical surveys. A community ecology approach to monitoring meadow systems may be a more effective approach in detecting changes in community structure, especially in a complex and relatively pristine system such as Poopenaut Valley. Furthermore, additional monitoring is required in order to generate sufficient data demonstrating that operations at O'Shaughnessy Dam comply with Fish and Game code 5937. Fish and Game code 5937 states that "[t]he owner of any dam shall allow sufficient water at all times to pass through a fishway, or in the absence of a fishway, allow sufficient water to pass over, around or through the dam, to keep in good condition any fish that may be planted or exist below the dam." We recommend that 5.3.7-2 include fishery surveys in order to analyze the impacts of pulse releases on the fishery. We recognize that implementing a comprehensive protocol may be costly and difficult, which is why we recommend that the SFPUC work with us in addition to the U. S. Fish and Wildlife Service (USFWS), National Park Service, and the U. S. Forest Service when implementing a monitoring protocol for mitigation measure 5.3.7-2. 04 cont.

Lower Tuolumne River (Below New Don Pedro)

The PEIR states that the implementation of WSIP would have no impact on the current minimum instream flow requirement set by the Federal Energy Regulatory Commission (FERC) in the 1996 Fishery Settlement Agreement. DFG is concerned that the current FERC required flow regime (i.e. PEIR's CEQA baseline conditions) may not be sufficient to prevent salmon populations in the Tuolumne River from declining. In fact, we have evidence demonstrating that adult Tuolumne River fall-run Chinook salmon *(Oncorhynchus tshawytscha)* produced at a given spring flow has declined by about 50% (mean of 6,805 recruits) since the FERC Settlement Agreement (FSA) was implemented in 1996. The decline is statistically significant based on an F-test comparison of two flow recruitment regression models: one based on the period from 1980 to 1990 and the other based on the period from 1998 to 2003. We believe that, as proposed, WSIP would make these conditions worse for Tuolumne River salmonids, thus exacerbate the current decline of this population. 05

To address this concern, DFG wrote a letter dated August 1, 2007 to Secretary Kathleen Bose of the FERC and requested the FERC to direct the Modesto Irrigation District (MID) and Turlock Irrigation District (TID) to provide higher magnitude and greater duration instream flows during the spring period of each year in order to assure acceptable salmon smolt survival and assure that the now-critically-impaired salmon populations will remain intact until a new license is considered for Project 2299 in 2014. In this letter, DFG presents evidence, which is summarized below, that demonstrates strong correlations between this observed population decline and the conditions of reduced spring flow and elevated spring water temperature, as directly caused by the operations of project 2299.

The CEQA environmental baseline conditions in the lower Tuolumne River are essentially driven by the operations of project 2299 which, for reasons we identify below, are creating conditions that are not suitable for the anadromous fisheries in the Tuolumne River. Although we recognize that the CCSF are not the licensees for project 2299, it is irrefutable that the actions of the SFPUC on the Tuolumne River at Early Intake, Cherry Valley Dam, and Hetch Hetchy and Lake Eleanor reservoirs influence the timing, duration, and magnitude of water releases from the New Don Pedro Dam. Increased diversion of waters from a river system which currently lacks sufficient flow to support sustainable anadramous fisheries including Federally Threatened Central Valley steelhead (*Oncorhynchus mykiss iridieus*) should be considered a significant cumulative impact. Although the proposed increase in diversion in itself may (arguably) not be deemed significant, when viewed in conjunction with project 2299, existing SFPUC diversions, and other diversions from the Tuolumne River, the effects are cumulatively considerable [see CCR Title 14, section15065(a)(3)]. In this context, *we believe the proposed project has the potential to cause anadromous fish populations to drop below self-sustaining levels and further reduce the number and restrict range of Federally Threatened Central Valley steelhead* – thereby requiring a finding of significant effect (CCR Title 14, section 15065 (a)(1)). Therefore, we respectfully request the SFPUC use alternative water sources other than Tuolumne River system to meet purchase requests in 2030 and drought year demands, at least until Project 2299 can properly address the inadequacies in the current flow regime for the purpose of creating, enhancing and supporting a sustainable anadromous fishery in the lower Tuolumne River. 05 cont.

Documented Tuolumne River Salmon Population Decline

Strong evidence exists that the Tuolumne River fall-run Chinook salmon population has declined severely. Historically, this fall run was documented (USFWS 1940) to annually exceed 72,000 escaping (i.e., spawning) adults. This number became reduced severely, coincidentally with, and in part caused by, water diversions and dams which were developed and operated on the Tuolumne River. Immediately prior to the operation of the New Don Pedro Project, fall-run Chinook salmon numbers annually reached 20,000 to 25,000 escaping adults, but unfortunately, the instream flow and other fishery protection measures included in the original Project 2299 license were inadequate to stem the continuing decline of salmon. By the time of the 1996 Fisheries Settlement Agreement, salmon numbers had progressively declined to less than 1,000 adults annually. This decline, both overall and when dissected into various life-stage survival components, very strongly correlates with Tuolumne River flow inadequacy during critical salmon life-stages.

In 1997, a record high water year produced substantial project spill, essentially rendering moot the fishery effects of Project 2299 water operations, as well as the effects of some of the out-of-tributary influences on juvenile salmon survival during that year. Absent those controlling influences, the salmon experienced much greater juvenile survival and downstream migration success. Accordingly, in 2000, when most of these fish returned to the Tuolumne River as adults, we documented runs well in excess of 18,000 individuals. Unfortunately, that benefit was short-lived. Since 2000, and after normal Project 2299 operations resumed, the Tuolumne River salmon escapements have again sharply declined. As of 2006, the Tuolumne River escapement population had dwindled to about 600 returning adults. This represents an order-of-magnitude salmon population reduction, during the time when the Fishery Settlement Agreement Flows and other "protective conditions" under that agreement were in full effect.

<u>Effects of Out-of-tributary Salmon Population Controllers</u>

Within the San Joaquin River watershed, there are four major tributaries; three of which support fall-run salmon populations. These populations are controlled: i) by an array of limiting factors within the specific tributaries, ii) by limiting effects of water operations, water quality, temperature and other parameters within the downstream San Joaquin River and delta, and iii) by oceanic mortality, including sport and commercial angling. Separating the quantitative effects of these various population controllers presents a challenge, given the limitation of being only able to observe and measure salmon success at the earliest (i.e., fry-smolt) and latest (i.e., escapement) stages.

Some biologists believe ocean harvest and Delta water diversions and exports are the sources of substantial adult population limiting mortality across the San Joaquin river watershed. Both ocean harvest and Tuolumne salmon escapement are compared (years 2000 through 2006) in Figure 11 (attached Appendix). Delta exports and Tuolumne River adult brood year production trends were compared (years 1998 through 2004) in Figure 12 (attached Appendix). Based upon these figures, we believe neither ocean harvest, as described by the multi-agency Central Valley Harvest Index, nor South Delta export trends correlate significantly with Tuolumne River escapement or brood production year trends. This suggests (i.e. infers) that neither ocean harvest nor Delta exports, even though they are sources or mortality, are strong controllers of the Tuolumne River salmon population.

05 cont.

The deployment of hatchery operations on only one of the San Joaquin River tributaries provides a useful comparative tool to separate the importance of in-tributary effects upon salmon survival and population levels. Within the San Joaquin River watershed, a salmon hatchery operation exists only on the Merced River. Most of the production of that hatchery is released into the Merced River directly, with lesser numbers of juveniles being released below the confluence of Merced and San Joaquin rivers. These latter releases are a part of basin-wide salmon downstream (juvenile) migrant survival studies.[1]

[1] These studies are required pursuant to the Vernalis Adaptive Management Program in which water operators on the several major tributaries coordinate downstream flows for the purpose of reversing declines in San Joaquin River salmon populations.

The process of hatching and rearing the juvenile salmon in a controlled, out-of-river hatchery environment essentially circumvents any dependency of these eggs or juveniles upon water and other habitat conditions within the natural channel of the Merced River tributary. So, to the extent that the most important salmon population controllers are located within the tributary habitat, the hatchery reared eggs and juvenile salmon should not be exposed to those controllers and as such their survival should be unaffected. As such, returning adult numbers should not vary as a feature of differential in-tributary conditions. Conversely, to the extent that the principal population controllers exist in areas downstream from the Merced River and other major tributary habitats (e.g., in the main-stem San Joaquin River, Delta, or Pacific Ocean), as is asserted on the Tuolumne River by the Licensees, then we would logically expect the post-hatchery-released Merced River salmon to experience those same limiting factors and thus be affected similarly to the salmon leaving the Tuolumne and Stanislaus rivers. Consequently, we would expect the Merced River returning adult population to be similarly reduced in magnitude.

This comparison between neighboring rivers provides a useful indication of where and when, within the salmon life history, the key limiting factors are occurring. In fact, since the Merced River Hatchery has been in operation and juvenile survival has been regularly artificially supported, the Merced River salmon population has been maintained at much more numerous and stable levels than the populations within the Tuolumne and Stanislaus rivers, which have experienced similar water-year sequences, but in which salmon juveniles have been exposed to in-tributary limiting factors. The evidence thus strongly suggests that these salmon populations are substantially affected and controlled by in-tributary limiting factors, rather than oceanic or other downstream controlling features.

05 cont.

<u>Tuolumne River Salmon Population Controllers: Flow Magnitude, Timing and Duration</u>

Figures 2 and 3 (attached Appendix) show trends in fall and spring flow within the Tuolumne River. Tuolumne River fall (i.e., spawning) flows, from 1997 through 2003 are essentially uniform in release timing and magnitude, and do not significantly correlate with observed brood-year reductions. Spring rearing and downstream conveyance flow releases (April and May) for years 1998 through 2004 do strongly correlate survival across a variety of different water/brood-years. Figure 4 (attached Appendix) shows the annual Tuolumne River flow at La Grange, versus salmon escapement occurring 2.5 years later (past evidence reflects that salmon escapement is typically dominated by three-year-old returning adults). We reiterate that this reflects a very consistent relationship between spring flow reduction and escapement reduction in the Tuolumne River between escapement years 2000 and 2006.

To investigate the relationship between spring flow (magnitude, frequency/ duration) and salmon escapement 2.5 years later, spring flows for the period 2000- 2006, were categorized by both flow and frequency/duration of occurrence. We used 1500 cfs increments, encompassing the range from 1500 cfs or less to 7500 cfs, for the April and May period of each year (see attached Table 1). We note a very clear trend in spring flow magnitude and duration, which strongly correlates with Tuolumne River adult salmon production. This relationship prevails regardless of whether annual escapement or brood-year cohort production metrics are used. Figure 5 (enclosed Appendix) shows the statistical correlation between La Grange spring flow level and Tuolumne River adult salmon brood year production (e.g. linear r-square = 0.97, non-linear r-square = 0.82).

Relationship of Salmon Production to Water Temperature:

In addition to assessing Tuolumne River spring flow as a factor in Tuolumne River salmon production declines, spring Tuolumne River (Modesto measurement station) water temperature was evaluated as a factor affecting Tuolumne River salmon brood year production. Figure 6 (see attached Appendix) shows the statistical relationship between spring daily flow and water temperature at Modesto from 1998 through 2006 (We point out the linear r-square = 0.99). This represents strong (i.e., statistically valid) evidence that water temperatures at the Modesto measurement station are driven primarily by Tuolumne River instream flow releases from Project 2299. 05 cont.

To determine if variation in spring water temperature frequency occurred during production years 1998 through 2004 (years consistent with 2000 through 2006 escapements), spring water temperatures were categorized in 1°C increments from 15 to 20°C (59 to 68°F) (Table 2 see enclosed). Substantial variation across this critical salmon thermal range occurred among spring Tuolumne River temperatures during this period. Years with colder spring water temperatures clearly produced higher adult escapement 2.5 years later than was observed under warmer springtime conditions. We note that when spring water temperatures in the Tuolumne River at Modesto were below 15°C (the U.S. Environmental Protection Agency (EPA) Region 10 Water Temperature Threshold Standard for Tributary Out-migrating Juvenile Chinook Salmon smolts), Tuolumne River adult salmon brood year production was at its highest.

Figure 7 (attached) shows the statistical relationship between spring Tuolumne River water temperature at Modesto and both annual escapement (e.g. non-linear r-square = 0.75) and brood year production trends (e.g. non-linear r-square = 0.65). These correlations infer that water temperature is an important variable influencing adult salmon production trends in the Tuolumne River. We note that due to the demonstrated influence of instream flow releases upon water temperatures, the thermal regime within the Tuolumne River, downstream of New Don Pedro Dam results directly from Licensees' Project 2299 operations.

12.2-8

Lower Tuolumne Fishery Impact Conclusion

In conclusion, we have observed a very dramatic decline in Tuolumne River salmon adult escapement between 2000 and 2006 while the Fishery Settlement Agreement flow regimes and other protective features have been in place. We have observed a strong relationship between this observed population decline and the conditions of reduced spring flow and elevated spring water temperature, as directly caused by the operations of project 2299. As mentioned earlier, we recognize that the City and County of San Francisco are not the licensees for project 2299; however, it is irrefutable that the actions of the SFPUC on the Tuolumne River at Early Intake, Cherry Valley Dam, and Hetch Hetchy, and Lake Eleanor reservoirs influence the water releases from the New Don Pedro Dam. 05 cont. Increased diversion of waters from a river system which currently lacks sufficient flow to support sustainable anadromous fisheries (including Federally Threatened steelhead) should be considered a significant cumulative impact. Although the proposed increase in diversion in itself may (arguably) not be deemed significant, when viewed in conjunction with project 2299, existing SFPUC diversions, and other diversions from the Tuolumne River, the effects are cumulatively considerable [see CCR Title 14, section15065(a)(3)]. In this context we believe the *WSIP has the potential to cause anadramous fish populations to drop below self-sustaining levels and further reduce the number and restrict range Federal Threatened Central Valley steelhead* – thereby requiring a finding of significant effect [CCR Title 14, section 15065 (a)(1)]. Given the dramatic decline in Tuolumne River salmon adult escapement between 2000 and 2006; we believe that if implemented as proposed, the WSIP would only exacerbate the current decline of anadromous fisheries in the Tuolumne River. Consequently, we respectfully request that the SFPUC use alternative water sources other than the Tuolumne river system or implement water conservation measures to meet drought year demands and 2030 purchase requests, at least until Project 2299 can properly address the inadequacies in the current flow regime for the purpose of creating, enhancing and supporting a sustainable anadromous fishery in the lower Tuolumne River. 06

Proposed Mitigation to Offset WSIP Impacts to Fisheries Below La Grange Dam

The PEIR justifiably acknowledges that the WSIP would have a significant impact on fisheries in the Tuolumne River below La Grange dam. The PEIR proposes two mitigation measures to offset the WSIP impacts on fisheries (5.4-3a and 5.4-3b). These mitigation measures are presented from, and based on, a firm scientific foundation (McBain and Trush 2000). However, in light of recent science (Mesick et al. 2007), we believe these mitigations are potentially inadequate to reduce WSIP's impacts on fisheries in the lower Tuolumne River to *less than significant*. 07

Mitigation Measure 5.4-3a

The PEIR states that implementation of this mitigation measure will require the SFPUC to pursue a water transfer arrangement with MID/TID and/or water agencies such that demand on Don Pedro Reservoir as a result of conservation, improved delivery efficiency, inter-agency water transfer or use of an alternative supply such as groundwater. Although we support the continued development of the mitigation measure, the high degree of uncertainty causes us concern that this mitigation may not be sufficient to offset WSIP's impacts on fisheries in the Tuolumne River. If this mitigation measure is implemented, the terms and conditions of the transfer agreement should be disclosed to the public to determine the adequacy of the mitigation and the impacts to resources. We also believe that this mitigation measure could potentially be transferring WSIP impacts to another watershed, which would likely require the SFPUC to mitigate its own mitigation. For these reasons, we believe that this mitigation measure has potential to be inadequate to offset WSIP impacts to fisheries to *less than significant* threshold. 07 cont.

Alternatively, we will actively support and provide technical assistance to the SFPUC and CCSF in further developing this mitigation measure in order to increase use of water recycling/conservation strategies, and conjunctive groundwater. We request that as part of this mitigation measure, the SFPUC implement and mandate enforceable water recycling/conservation strategies or upgrades for its wholesale customers and their constituents that elect not to use feasible water recycling/conservation strategies or upgrades. We highly recommend that the SFPUC become more assertive with its wholesale customers for the purpose of conserving water and to ensure that growth is feasible with respect to the water supply that is currently available. We look forward to working with the CCSF, SFPUC and other resource agencies to provide comments during the environmental review of this mitigation measure.

Mitigation Measure 5.4-3b

The PEIR proposes to offset impacts to fisheries by implementing gravel augmentation projects and/or removal of gravel quarry pits. The objective of these projects would be to introduce enhance spawning gravel and fill in instream gravel pits occupied by fish predators. Mesick et al. 2007 developed a Tuolumne River Management Conceptual Model (Model) that includes a limiting factor analysis of the Tuolumne River populations, unanswered management questions and related testable hypotheses, and recommended studies and experimental instream flow schedules needed to test the hypotheses. Part of their limiting factor analysis included a preliminary analysis of previous habitat restoration projects that are similar to the projects proposed in this mitigation measure. This preliminary analysis produced hypotheses and experiments that test the hypotheses. In light of analysis presented by Mesick et al. 2007, which is partially summarized below, we question the ability of 5.4-3b to mitigate WSIP's 08

impacts on fisheries to *"less than significant."* We have reason to believe that the projects under 5.4-3b are potentially inadequate to reduce WSIP's impacts to *"less than significant."* We concur with and support the hypotheses and purposed experiments presented by Mesick et al. 2007. If WSIP is implemented as proposed, we request the SFPUC and CCSF to consider the hypotheses set forth by Mesick et al. 2007 when planning mitigation measures in the lower Tuolumne River.

Spawning Habitat Restoration (from Mesick et al. 2007)

Preliminary analyses suggests that although the degraded condition of the spawning habitat in the Tuolumne River limits the production of fry, more fry are currently being produced than can be supported by the rearing habitat. If true, then gravel augmentation and restoring sediment transport will not substantially increase adult recruitment.

The preliminary analysis is based on rotary screw trap captures in the Tuolumne River. At least 7,300,000 and 3,500,000 juveniles were produced in the Tuolumne River in 1999 and 2000, respectively. The estimates are based on rotary screw trap catches at the 7/11 site (RM 38.6), which is downstream of the majority of the spawning habitat in the Tuolumne River (Turlock Irrigation District and Modesto Irrigation District 2005); only a portion of the migratory period was sampled during both years and so the true estimates are probably higher. It is likely that these numbers far exceeded the capacity of the rearing habitat, because only 0.4% of these fish in 1999 and 1.4% of these fish in 2000 survived to a smolt-size at the downstream Tuolumne River trap at Grayson (RM 5.2). 08 cont.

Smolt production also appears to be controlled by the quality of the rearing habitat and not the production of fry in the Stanislaus River. After implementing a spawning habitat restoration project in the Stanislaus River that added spawning-sized gravel to 18 sites between Goodwin Dam and Oakdale in summer 1999 (Carl Mesick Consultants 2002), juvenile production, which was measured with a rotary screw trap at Oakdale (RM 40), increased by 32% in spring 2000 compared to spring 1999 (Figure 15 see attached). However, there was no increase in the number of smolt-sized fish that migrated from the river in spring 2000 compared to spring 1999 (Figure 15) as measured with rotary screw traps at Caswell Park (RM 5 see attached) even though the mean flow from March 1 to June 15 at Goodwin Dam was nearly identical (1,497 cfs) in 1999 and 2000.

Fish Predators (from Mesick et al. 2007)

It is likely that high winter and spring flows reduce predation by largemouth bass (*Micropterus salmoides*), smallmouth bass (*M. dolomieu*), Sacramento pikeminnow (*Ptychocheilus grandis*), and striped bass (*Morone saxatilis*) on juvenile salmon in the Tuolumne River and that predation rates are abnormally high where predator habitat was enhanced by in-river gravel extractions. Although the initial studies indicated that predation by largemouth and smallmouth bass in the large captured mine pits is a major source of mortality in the Tuolumne River (Turlock Irrigation District and Modesto Irrigation District 1992b), there is uncertainty about the importance of predation relative to other rearing habitat limitations and there is uncertainty about the importance of other predator species, such as Sacramento pikeminnow and striped bass.

The initial studies conducted by EA indicated that very few bass contained juvenile salmon in their stomachs except during May 1990 when 93,653 hatchery reared salmon smolts were released at Old La Grange Bridge for survival studies (Table 5 see enclosed). Furthermore, predation by black bass should have been unusually high during the drought conditions of 1989 and 1990 when EA conducted their studies, and so typical predation rates by black bass should be much lower than those shown in Table 5. There is no evidence that restoring the large pond at Special Run Pool 9 and isolating the pond at Special Run Pool 10 reduced predation rates or improved the survival of juvenile salmon in the Tuolumne River (Turlock Irrigation District and Modesto Irrigation District 2005).

We also suspect that the electrofishing methods used by EA (Turlock Irrigation District and Modesto Irrigation District 1992b) were selective for largemouth and smallmouth bass, which utilize cover compared to striped bass and Sacramento pikeminnow, which tend to utilize open water. Radio tracking studies conducted by S.P. Cramer & Associates in 1998 and 1999 in the Stanislaus River (Demko and others 1998, SPCA unpublished data) suggest that the survival of large naturally produced and hatchery juveniles, 105 to 150 mm fork length, with gastrically implanted transmitters and 12-inch external whip antennas, was less than 10% during May and June (Demko and others 1998). Three striped bass collected had radio tagged juvenile Chinook salmon in their stomachs and striped bass were observed near the locations where many of the tagged juveniles ceased their migration. However, there is uncertainty as to whether the tagging procedure affected the fish's vulnerability to predators. Gastric implantation is stressful to juvenile salmonids and the whip antenna impairs their swimming ability (Vogel, personal communication, see "Notes"). During the 1998 SPCA studies, only 73% of the fish survived the tagging procedure and no observations were made to verify that tagging did not affect the fish's behavior (Demko and others 1998). Another potential predator of juvenile salmon in the Tuolumne River is the adult Sacramento pikeminnow, which forms large schools in 3 to 8 foot deep ditch-like channels called Special Run-Pools. Sport anglers report that large adults frequently have numerous salmon fry in their stomachs particularly during January and February. 08 cont.

Proposed Lower Tuolumne Fishery Mitigation Conclusion

We support the development of mitigation measure 5.4-3a in order to increase use of water recycling/conservation strategies and conjunctive groundwater. We 09

also recommend that the SFPUC become more involved with wholesale customers to address responsible growth with respect to the current water supply capabilities. We request that, as part of this mitigation measure, the SFPUC implement and mandate enforceable water recycling/conservation strategies or upgrades for its wholesale customers and their constituents that elect not to use feasible water recycling/conservation strategies or upgrades. 09 cont.

Although the SFPUC and CCSF have built mitigation measure 5.4-3b from a firm scientific foundation, recent evidence and preliminary analysis suggests that the projects described in 5.4-3b may not be an effective mitigation measure in the current flow regime, let alone in the reduced flow regime being proposed by the WSIP. We request that the SFPUC and CCSF consider the hypotheses and proposed experiments describe by Mesick et al. 2007, when developing mitigation measures for fishery enhancements on the lower Tuolumne River. We also recommend that the SFPUC and CCSF coordinate with the National Marine Fisheries Service (NMFS), USFWS, and DFG to develop adequate mitigation measures for the lower Tuolumne River fishery. 10

ALAMEDA CREEK

The SFPUC manages the Alameda Creek watershed portion of the regional system with the primary objective of conserving local watershed runoff for delivery to customers. Therefore, the Alameda reservoirs are managed to capture winter and early spring runoff in order to maximize storage and water delivery to customers during the winter months, while Hetch Hetchy runoff is stored for summer and fall delivery. This interconnectivity of the Alameda and Hetch Hetchy systems provides for substantial flexibility in operations.

The proposed WSIP system operations would affect the two SFPUC reservoirs in this watershed—Calaveras and San Antonio Reservoirs—as well as some reaches of Alameda Creek and its tributaries. Within the CCSF owned watershed, Calaveras Creek and Arroyo Hondo drain directly to Calaveras Reservoir, and Alameda Creek flow is diverted into Calaveras Reservoir via the Alameda Creek Diversion Tunnel through operation of the Alameda Creek Diversion Dam. Farther downstream, San Antonio Creek drainage flows to San Antonio Reservoir, which is also used to store water from the Hetch Hetchy system and, periodically, water from Calaveras Reservoir. Downstream of its confluence with San Antonio Creek, Alameda Creek continues flowing through the Sunol Valley and then through Niles Canyon, eventually draining to San Francisco Bay.

Calaveras Reservoir and Calaveras Creek below the reservoir

Calaveras Reservoir is currently operated to conserve local watershed runoff for integration into the SFPUC regional water supply; however, due to Division of Safety of Dams (DSOD) restrictions, the water level in Calaveras Reservoir has 11 been considerably lower since the end of 2001 than in previous years. Reservoir storage is constrained to approximately 37,800 acre-feet, about 40% capacity. Under the WSIP, Calaveras would be restored to its full design capacity (approximately 96,800 acre-feet), which would allow the SFPUC to maximize the use of local watershed supplies. Furthermore, fishery releases from the reservoir (measured below the confluence of Alameda and Calaveras creeks) and flow recapture would be implemented under the WSIP in accordance with a 1997 Memorandum of Understanding (MOU) with DFG, regarding releases of water from Calaveras Reservoir and maintenance of minimum storage levels from July through October to enhance fishery habitat, improve the coldwater fishery resources downstream of Calaveras Dam, and enhance warm-water native fisheries in the lower reach of the creek.

The SFPUC, under the aforementioned 1997 MOU with DFG, agreed to specific flow releases to provide habitat for resident rainbow trout and other native fish species downstream of Calaveras Reservoir based on the knowledge of fish migration barriers being present in the lower downstream reaches of Alameda Creek. At this time, there is continuing work to remove or remediate the downstream fish barriers (e.g. BART weir, USGS gauge, etc.). As these barriers are removed or retrofitted for adequate fish passage, the SFPUC will need to assess adequate flows for anadromous steelhead trout, the native resident fish community, FYLF, and CRLF and will need to renegotiate with DFG such that adequate flows from Calaveras Reservoir, San Antonio Reservoir and the Alameda Creek diversion dam are released or bypassed to provide suitable resource protection and comply with Fish and Game Code 5937. 11 cont.

Before the SFPUC releases water from Calaveras Reservoir to comply with the DFG 1997 MOU, DFG recommends that the SFPUC propose and submit to DFG and USFWS an invasive specie eradication plan to eliminate or suppress populations of bullfrog and non-native centrarchids from the Calaveras reservoir watershed. We are aware that Calaveras Reservoir has a healthy population of bullfrog (*Rana catesbeiana*). We are concerned this population will jeopardize the success of the SFPUC mitigation projects surrounding Calaveras Reservoir for California tiger salamander (*Ambystoma californiense*) and CRLF. We are also concerned that flow releases from Calaveras Reservoir, without having screens at the intake towers, could be a mechanism for expanding the range of bullfrogs and non-native centrarchids. Expanding the range of these species in the Alameda Creek watershed would likely have a significant negative impact on special status species such as FYLF, juvenile rainbow/steelhead trout, California tiger salamander and CRLF. Part of this plan should include the following measures:

1) A specific plan to screen as per DFG screening criteria at the new intake tower/adit(s) at Calaveras Reservoir.
2) Implementation of a comprehensive multi-year eradication program aimed at different life stages of invasive species (e.g. bullfrogs, and

12.2-11

non-native centrarchids) in Calaveras reservoir, San Antonio reservoir and the stock ponds in both watersheds.

3) Adaptive management measures that can be swiftly implemented if invasive species migrate or escape from the reservoir during uncontrolled releases.

Part of the environmental review for the Calaveras Dam Replacement project should be an assessment of operations of the water elevation during critical periods of migration for the landlocked steelhead/rainbow trout. The SFPUC should ensure that Calaveras Reservoir is operated such that fish passage is maintained between the reservoir and Arroyo Hondo by keeping reservoir water elevations as high as possible during the period when adult trout migrate upstream from the reservoir through the end of the downstream (adult and juvenile trout) migration season. 11 cont.

Alameda Creek between the Diversion Dam and Calaveras Creek Confluence

The Alameda Creek diversion dam and tunnel divert water from the upper Alameda Creek watershed to Calaveras reservoir. Inflow at the diversion dam is diverted into the tunnel up to the maximum capacity of the tunnel, about 650 cfs. Inflow to the diversion dam that exceeds the tunnel capacity flows past the diversion dam and continues downstream in Alameda Creek. Diversions from Alameda Creek to Calaveras Reservoir have been substantially reduced because of the DSOD restrictions on Calaveras Reservoir. The SFPUC is unable to capture most local watershed runoff from upper Alameda Creek, and post 2002 flows in Alameda Creek below the diversion dam have been substantially greater than they were prior to 2002. The rediversion of flows from Alameda creek at the diversion dam affects two reaches of the creek: the reach between the diversion dam and the confluence with Calaveras Creek and the reach below the confluence with Calaveras Creek (see impact 5.4.1-2).

Mitigation Measure 5.4.1-2 and 5.4.5-3(a)(b)

To offset impact 5.4.1-2, the PEIR proposes to implement mitigation measure 5.4.5-3a Minimum Flows for resident trout on Alameda Creek and 5.4.1-2 Diversion Tunnel. Measure 5.4.5-3a, requires the SFPUC to develop and carry out as part of the implementation of the Calaveras Dam Replacement project, an operation plan to implement minimum stream flows when precipitation generates runoff into the creek below the Alameda Creek Diversion Dam (ACDD) to the Calaveras Creek confluence from December 1 through April 30 to support resident trout spawning and egg incubation. The operation plan will identify the specific minimum flow requirements to support resident trout spawning and egg incubation, a detailed monitoring plan to survey and document trout spawning and egg incubation, and any diversion facility modifications that are needed to implement the minimum stream flows. The PEIR continues by stating that a 12 monitoring plan will be provided to appropriate resource agencies for review and comment and will subsequently be implemented by the SFPUC staff. At the completion of the monitoring period (5-10 years) the SFPUC shall produce a draft comprehensive report describing the methods, data collected, and results used to assess the performance of the minimum stream flow in provided suitable habitat for resident trout spawning and egg incubation. The PEIR states, that if monitoring indicates that this measure does not sustain the resident trout fishery in this reach, then the SFPUC shall either modify the minimum stream flow to enhance downstream habitat conditions to fully meet the mitigation requirement or also implement mitigation measure 5.4.3-3b Diversion Restrictions or Fish Screens (further described below). 12 cont.

Measure 5.4.1-2 states that the SPFUC will establish and implement written operational criteria for the Alameda Creek Diversion Dam that directs that the diversion dam and tunnel shall be operated to pass flows down Alameda Creek when diversion of those flows is not required to maintain desired levels in Calaveras Reservoir in order to provide the maximum possible days of winter and spring flows in Alameda Creek below the diversion dam. The PEIR states that this mitigation measure reinforces the way the SPFUC generally operates the diversion tunnel now: that diversion gates are closed in the spring once desired Calaveras reservoir storage have been reached.

Mitigation Measure 5.4.3-3a

We support the continued developed of this mitigation measure; however, we are concerned about the lack of scope involved in the objectives and monitoring protocol described in this mitigation measure. There are viable populations of Federal Threatened CRLF and State Species of Special Concern FYLF in Alameda Creek at Camp Ohlone (Bobzien and Didonato 2007). When sufficient flows are bypassed from the ACDD, Alameda Creek from the ACDD to Little Yosemite provides about 2.5 to 3 miles of suitable habitat for both species. We believe that an objective of this mitigation measure should include providing sufficient bypass flows to support viable populations of CRLF and FYLF. Consequently, the monitoring protocol described in this mitigation measure should include monitoring how these amphibian populations respond to the bypass flows. If this mitigation measure is implemented successfully, we would expect the population dynamics of these populations to be similar to those at Camp Ohlone. Therefore, we recommend that success of this objective be partially determined by using the Camp Ohlone amphibian population as a model. 13

This mitigation measure calls for evaluating success after five to ten years of monitoring. We recommend that the SFPUC coordinate with us frequently throughout the monitoring program to evaluate the results. As the monitoring results are evaluated, testable-hypotheses and adaptive management measures

testing these hypotheses should be formulated and incorporated into mitigation measure 5.4.5-3b.

Currently, there are migration barriers for Federal Threatened Central Coast Steelhead present in the lower downstream reaches of Alameda Creek. As these barriers are removed or retrofitted for adequate fish passage, the SFPUC will need to reassess this mitigation measure to provide adequate flows for anadromous steelhead trout, the native resident fish community, FYLF, and CRLF and will need to renegotiate with DFG such that adequate flows from the ACDD are bypassed to provide suitable resource protection and comply with Fish and Game Code 5937. 13 cont.

We look forward to working with the SFPUC and CCSF in developing and monitoring the success of this mitigation measure.

Mitigation Measure 5.4.3-3b

The PEIR states that if, after 10 years of monitoring, results for Measure 5.4.5-3a indicate that the measure does not sustain the resident trout population in Alameda Creek below the ACDD, the SFPUC shall also implement additional measures as follows: either implement restrictions on diversions to Calaveras Reservoir to protect the downstream resident rainbow trout fishery during the critical spawning period (December 1 to April 30) or install and operate a fish passage barrier to "screen" the diversion facility.

We support the development of this mitigation measure for the purposes of having a contingency plan for mitigation measure 5.4.3-3a. We recommend that if, after 5-10 years of monitoring, results for 5.4.5-3 indicate the measure does not sustain resident rainbow trout, CRLF, and FYLF populations, that the following be also evaluated and, if feasible, incorporated into this mitigation measure. 14

1.) The ACDD be decommissioned and removed.
2.) The ACDD be retrofitted to accommodate fish passage to comply with DFG code 5901.
3.) Other adaptive management measures that might arise during the analysis of monitoring results.

Furthermore, we believe ten years is too long to consider screening the tunnels at the ACDD. The diversion tunnels at the ACDD should be screened concurrently with the Calaveras Dam Replacement project in order to comply with DFG codes 5980 et seq.

Mitigation Measure 5.4.1-2

We believe this mitigation measure should be re-evaluated and be developed in coordination with mitigation measure 5.4.5-3a. Implementation of this mitigation measure means the SFPUC diverts all of the early winter storms (up to 650 cfs) only to leave portions of storms after Dec. 1 to bypass the ACDD. Given the boulder-bedrock character of Alameda Creek, if early winter flows are diverted to Calaveras Reservoir, late season flows could go subterranean only to recharge groundwater. Consequently, only bypassing late season flows may be insufficient to maintain flowing water in Alameda Creek. We recommend that appropriate hydrologic studies be conducted in Alameda Creek from the diversion dam to Little Yosemite in order to determine the amount of flow required during various water years to bypass sufficient instream water to support the different life stages of resident native fish, FYLF and CRLF. 15

San Francisco Peninsula

San Mateo Creek Watershed

The SFPUC operates four water supply reservoirs on the San Francisco Peninsula: Pilarcitos, Upper and Lower Crystal Springs, and San Andreas reservoirs. The four reservoirs and two streams (San Mateo Creek and Pilarcitos Creek) on the Peninsula could be affected by the WSIP. San Mateo Creek, and its tributary San Andreas Creek, flow southward in the rift valley formed by the San Andreas fault and then turn east, flowing to San Francisco Bay. Pilarcitos Creek also flows southward, but it turns to the west and flows to the Pacific Ocean. The SFPUC's water supply facilities on the San Francisco Peninsula lie within two watersheds, the San Mateo Creek and Pilarcitos Creek watersheds, which are referred to collectively as the Peninsula watershed.

San Mateo creek Below Crystal Springs Reservoirs

The SFPUC operates the upper and lower Crystal Springs Reservoirs (Reservoirs) to store water from local watersheds and water imported from the Tuolumne River, and Pilarcitos and San Mateo creeks. Since 1983, the SFPUC has been forced by the Division of Safety of Dams to change the management of the Reservoirs by reducing the historic storage capacity of the Reservoirs from 68,300 acre-feet to 58,000 acre-feet. Under the WSIP, the SFPUC proposes to change the management of the Reservoirs by operating the Reservoirs at full storage capacity. The SFPUC manages these Reservoirs to collect as much runoff as possible from the upper San Mateo Creek watershed. Most of the time, the SFPUC captures all of the runoff from the upper watershed and no water is released to San Mateo Creek below Lower Crystal Springs Dam (LCSD). Under the WSIP, the SFPUC proposes to operate the Reservoirs as they are currently operated. Releases to San Mateo Creek are proposed to occur infrequently, as they do under existing condition, and are proposed to be of a similar magnitude. 16

The Reservoirs should be managed to store water and to support fish and wildlife in the Reservoirs and in lower San Mateo Creek. DFG requests that the SFPUC provide flow releases to the stream channel below LCSD to encourage riparian habitat complexity, invertebrate productivity, adequate dissolved oxygen, low water temperatures, improved water quality, provide habitat complexity for federal threatened CRLF and Federal and State Endangered San Francisco garter snake (*Thamnophis sirtalis tetrataenia*), rearing habitat for juvenile steelhead and spawning habitat for adult steelhead. DFG requests that the SFPUC propose and submit to DFG for approval, flows regimes for various water years from LCSD immediately following the completion of the LCSD improvement project. During the interim, DFG recommends that the SFPUC implement a monitoring program in the San Mateo Creek watershed that would generate sufficient data to determine an adequate flow regime from LCSD to comply with Fish and Game code 5937, which states that "the owner of any dam shall allow sufficient water at all times to pass through fishways, or in the absence of a fishway, allow sufficient water to pass over, around or through the dam, to keep in good condition any fish that may be planted or exist below the dam..." This monitoring program should include the following:

1.) Stream gauges to assess flows and water temperatures in upper and lower San Mateo Creek. Stream gauges should also be placed in the tributaries to the reservoirs. 16 cont.

2.) A habitat-based stream assessment for upper/lower San Mateo Creek and Laguna Creek done at a seasonally appropriate time period that incorporates habitat and life history criteria of resident rainbow trout, steelhead, CRLF and San Francisco garter snake.

3.) A fish passage study of potential barriers on lower San Mateo Creek.

4.) A hydrologic study to determine the amount of water that is needed to support steelhead through critical reaches under various water year conditions within the reaches affected by WSIP (i.e. upper San Mateo Creek and Laguna Creek) and reaches of lower San Mateo Creek below LCSD.

5.) A hydrologic study to assess the instream channel capacity in various reaches throughout lower San Mateo creek.

6.) The SFPUC should collect baseline data on lower San Mateo Creek and determine appropriate success criteria to reach when the flow regime has been implemented. Such baseline data should include:

   a. Diversity and abundance of fish in lower San Mateo Creek.

   b. Diversity and abundance of aquatic insects.

c. Instream habitat assessment for Central coast ESU steelhead and riparian habitat assessment focused at the life history of CRLF and San Francisco garter snake.

d. Water quality monitoring of the following parameters:

i. Water temperature

ii. Dissolved oxygen

iii. Water chemistry (e.g. turbidity, pH, containments etc)

The SFPUC should assess adequate flows for steelhead and should submit flow regime proposals to DFG such that adequate flows are released. Although there have not been formal studies and agreements that have set a minimum instream flow requirements for LCSD and Stone Dam, it does not exempt the SFPUC from complying with Fish and Game code 5937, 1600 et seq. or the Endangered Species Act. DFG recognizes and encourages the ongoing effort the SFPUC has invested in attempting to restore steelhead populations in Alameda Creek; however, the SFPUC shouldn't limit this effort to the Alameda Creek watershed and should extend a similar restoration effort to San Mateo Creek watershed and other watersheds that the SFPUC owns and manages (e.g. Pilarcitos and San Antonio). 16 cont.

Crystal Springs Reservoirs

The Notice of Preparation for the LCSD improvement project proposes the future minimum pool elevation to be 277.4 feet. We are uncertain if the reservoirs will have a hydrological disconnect that can be defined by an active channel between the reservoir and the tributaries that Steelhead/rainbow trout use for spawning. The WSIP could severely impact the population of *Oncorhynchus mykiss* spp. in the reservoirs especially if there are no hydrological connections or defined channels when *Oncorhynchus mykiss* spp. are migrating to/from the tributaries.

The lack of active channels and hydrological connections could impede migration and therefore have a significant negative impact on out-migrating smolts and spawning adult *Oncorhynchus mykiss* spp. Consequently, as part of the environmental review of WSIP and the LCSD improvement project DFG recommends the SFPUC conduct surveys to: 17

1.) Identify when *Oncorhynchus mykiss* spp make spawning runs in upper San Mateo Creek and Laguna Creek.

2.) Identify when smolts and adult *Oncorhynchus mykiss* spp are out-migrating from the tributaries to the reservoir.

3.) Determine if there are hydrological connections and defined active channels that fish can migrate through between the reservoir and the tributaries during periods of the year critical for migration of steelhead/rainbow trout.

4.) Propose a mitigation strategy if it is determined that hydrological disconnects and lake of active channels constitutes a fish passage barrier. 17 cont.

Pilarcitos Watershed

Pilarcitos Creek rises on the eastern flanks of Montara Mountain in the Coast Ranges. The creek flows southward through the mountains before turning westward and discharging to the Pacific Ocean at Half Moon Bay. Rainfall in the Pilarcitos Creek watershed is variable, ranging from 26 inches annually at the coast to 42 inches near Pilarcitos Reservoir. The approximately 27-square-mile Pilarcitos Creek watershed consists primarily of relatively rugged uplands, characterized by shrubs and grasslands. The CCSF owns substantial portions of the upper watershed, and the Peninsula Open Space Trust protects large areas of the lower watershed above Arroyo Leon. Developed lands within the watershed are primarily agricultural and are located along the lower reaches of the stream corridors. Residential land uses are also present in the watershed, generally along roadways. Other land uses include a cemetery on Highway 92 at Skyline Boulevard, a sanitary landfill in upper Corrida Los Trancos Canyon, and a quarry in Nuff Creek Canyon.

Pilarcitos Creek

The PEIR states that WSIP would have significant impacts on surface water quality (5.5.3-2), fisheries (impacts 5.5.5-4, 5.5.5-5), sensitive habitats and key special-status species (impacts 5.5.6-4, 5.5.6-5) in Pilarcitos Reservoir and along Pilarcitos Creek below the reservoir. To mitigate these impacts the SFPUC proposes mitigation measure 5.5.3-2 Revised Operations Plan for Pilarcitos Watershed Facilities. The PEIR states that implementation of 5.5.3-2 will require the SFPUC to develop an operations plan for Pilarcitos Reservoir, Stone Dam, and associated diversions that would manage storage in Pilarcitos Reservoir and releases to Pilarcitos Creek so that flows in Pilarcitos Creek between Pilarcitos Reservoir and Stone Dam would be similar to those that occur under the existing condition. As a result of the operation plan, storage in Pilarcitos reservoir would be similar under WSIP as they are in existing conditions. 18

DFG supports the SFPUC in revising operations in the Pilarcitos watershed. We support this operational revision provided that the SFPUC utilize the wealth of science that has been done to characterize steelhead use and habitat in the Pilarcitos watershed (*"An analysis of Sediment Mobilization in Pilarcitos Creek," "Evaluation of Flow-Habitat Relationships Downstream of Stone Dam," "Pilarcitos Aquatic Habitat and Fish Population Surveys" and "Pilarcitos Operations"*). These studies could provide a firm foundation for operational revisions to consider the welfare of Federally Threatened Central Coast steelhead, San Francisco garter snake and CRLF in the watershed, above and below Stone Dam. We agree with the CCSF in that the best opportunity for steelhead restoration in the Pilarcitos Creek arises from the SFPUC's proposed multi-billion dollar capital improvement program (CCSF 2002). We believe that the development of this mitigation measure should include the recommendations for steelhead restoration that have been previously presented by the National Marine Fisheries Service (NMFS, 2006, NMFS 2004, NMFS 2002, NMFS 2003). The NMFS recommendations that we believe should be evaluated and included in mitigation measure 5.5.3-2 are the following:

1.) Complete removal of Old Stone Dam.

2.) Partial removal of Old Stone Dam

3.) Retrofitting Old Stone Dam to accommodate fish-passage.

4.) Flushing flows from Pilarcitos Lake to transport aggraded sediment in the channel.

5.) Instream flow assessment for the purposes of implementing a bypass flows regime from Pilarcitos Lake and Stone Dam that would accommodate steelhead migration, spawning, and rearing in lower Pilarcitos Creek.

18 cont.

We appreciate your consideration of our comments. DFG personnel are available for consultation regarding resources and strategies to minimize impacts. If you have questions please contact Dan Wilson, Environmental Scientist, at (707) 944-5534 or Greg Martinelli, Water Conservation Supervisor, at (707) 944-5570.

Sincerely,

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12.2-17

APPENDIX

Tables

Figures

12.2-18

Table 1. Tuolumne River Spring Flow Comparison (1997 thru 2003)

Tuolumne River April & May La Grange Flow Frequency Comparison							
	Year						
Flow Range (cfs) Categories	1998	1999	2000	2001	2002	2003	2004
1500		20	42	61	61	61	61
3000	9	32	13				0
4500	22	9	6				0
6000	22						0
7500	8						0
Total (# of Days)	61	61	61	61	61	61	61
Average	4492	1863	1353	633	540	579	706
Median	**4490**	**1950**	**1120**	**618**	**553**	**551**	**636**
Escapement (+2.5 Yrs)	17873	8782	7173	2163	1984	500	500
Recruitment (Brood Year)	***43119***	***10504***	***7083***	***5644***	***2335***	***2102***	***877***

Note: Salmon production in the Tuolumne River begins to rise sharply consistent with spring period flows approaching 2000 cfs and takes off consistent with flows approaching 4500 cfs.

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Table 2. Tuolumne River Spring Flow and Water Temperature

Tuolumne at Modesto April & May Water Temperature Comparison							
	Years						
Categories	1998	1999	2000	2001	2002	2003	2004
<=15	61	47	33	11	11	12	17
16		0	8	10	6	11	5
17		1	5	5	4	11	3
18		1	1	11	10	4	14
19		2	2	12	5	10	10
20		1	2	0	10	3	1
Total # Days	61	52	51	49	46	51	50
Average	**12.1**	**14.2**	**15.7**	**17.9**	**18.0**	**17.1**	**17.3**
Median	12.2	12.9	14.9	17.2	17.9	16.7	17.5
Mean Flow (cfs)	4567	1894	1375	644	549	589	717
Escapement (+2.5 Yrs)	17873	8782	7173	2163	1984	500	500
Recruitment (Broodyear)	**43119**	**10504**	**7083**	**5644**	**2335**	**2102**	**877**

Note: Salmon production in the Tuolumne River begins to rise sharply consistent with smolt out-migration (e.g. spring period) water temperatures drop to 15°C (59°F)and really take off when water temperatures are at 12°C (54°F). Consistent with Table 1, and Graph ??, spring water temperatures in the Tuolumne River are primarily controlled by spring flow level. A Tuolumne River spring flow of 2000 cfs would produce water temperature of about 14°C (57°F) while a flow of 4500 would produce a corresponding water temperature of about 12°C (54°F).

Table 3. Stanislaus River Spring Flow Comparison (1998 thru 2004)

Stanislaus River April & May Ripon Flow Frequency Comparison							
	Year						
Categories	1998	1999	2000	2001	2002	2003	2004
500				3	0	0	19
1000			11	26	33	51	27
1500		22	10	24	28	10	15
2000	17	39	40	8			
2500	44						
Total (# of Days)	61	61	61	61	61	61	61
Average	2022	1476	1408	1074	977	817	722
Median	**2040**	**1530**	**1540**	**1340**	**969**	**705**	**682**
Escapement (+2.5 Yrs)	8498	7033	7787	5902	4015	3500	3022
Recruitment (Brood Year)	**31602**	**11015**	**5678**	**10726**	**7309**	**9142**	**2574**

Note: Salmon production in the Stanislaus River begins to rise sharply consistent with spring period flows approaching 1500 cfs and takes off consistent with flows approaching 2000 cfs.

19 cont.

Table 4. Merced River Spring Flow Comparison (1998 thru 2004)

Merced River April & May Stevinson Flow Frequency Comparison							
	Year						
Categories	1998	1999	2000	2001	2002	2003	2004
750		28	38	39	48	50	45
1500		18	12	22	13	11	16
2250		11	11				
3000	57	4					
3750	4						
Total (# of Days)	61	61	61	61	61	61	61
Average	2665	1037	780	707	489	580	550
Median	**2659**	**1136**	**522**	**554**	**358**	**553**	**405**
Escapement (+2.5 Yrs)	13076	10844	10706	3079	4320	2921	2150
Recruitment (Brood Year)	**22884**	**13295**	**6205**	**7436**	**6488**	**6658**	**1614**

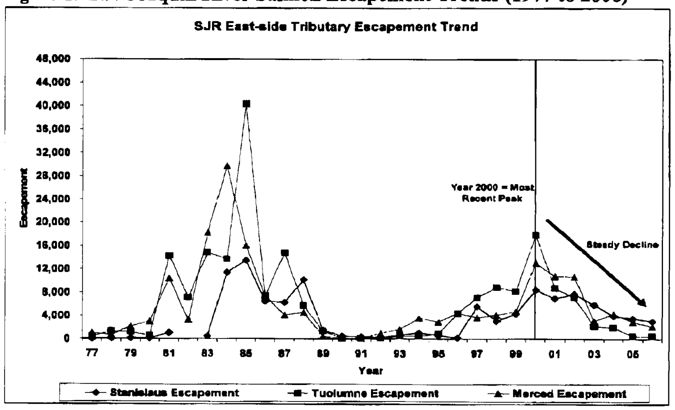
Note: Salmon production in the Merced River begins to rise sharply consistent with spring period flows approaching 1100 cfs and takes off consistent with flows approaching 2600 cfs.

12.2-19

Table 2. EA Engineering, Science, and Technology predation studies in the lower Tuolumne River in 1989 and 1990.

Sampling Dates	La Grange Flows (cfs)	% Largemouth Bass with juvenile salmon in their stomachs	% Smallmouth Bass with juvenile salmon in their stomachs	Origin of Juvenile Salmon
4/19 to 5/17, 1989	40 – 121	3.6% (2/56)	8.6% (5/58)	Naturally Produced
1/29 to 3/27, 1990	142 – 174	2.1% (2/97)	3.1% (1/32)	Naturally Produced
4/25 to 4/28, 1990	187 – 207	2.6% (2/76)	6.3% (1/16)	Naturally Produced
5/2 to 5/4, 1990	299 -572	26% (40/152)	33.3% (6/18)	CWT Hatchery

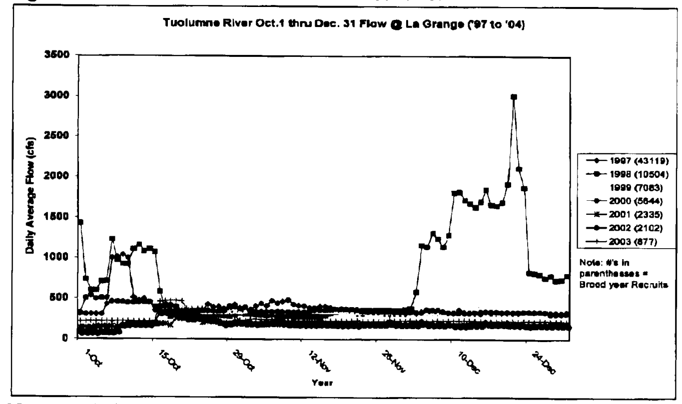
Figure 1. San Joaquin River Salmon Escapement Trends (1977 to 2006)



The year 2000 was the last peak salmon production period for each SJR east-side tributary. Since 2000, each east-side tributary's escapement has steadily declined with the Tuolumne River escapement "bottoming out" at levels lower than both the Stanislaus and Merced Rivers.

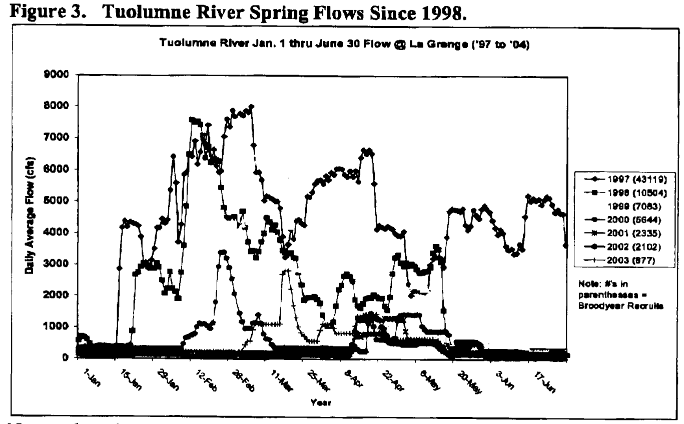
19 cont.

Figure 2. Tuolumne River Fall Flows Since 1998.



Note: With the exception of 1998, there is overlap (e.g. consistency) in the fall spawning flow patterns that does not correspond well with variation in future year escapement suggesting that fall flow has less influence upon adult production than other potential production related variables.

Figure 3. Tuolumne River Spring Flows Since 1998.

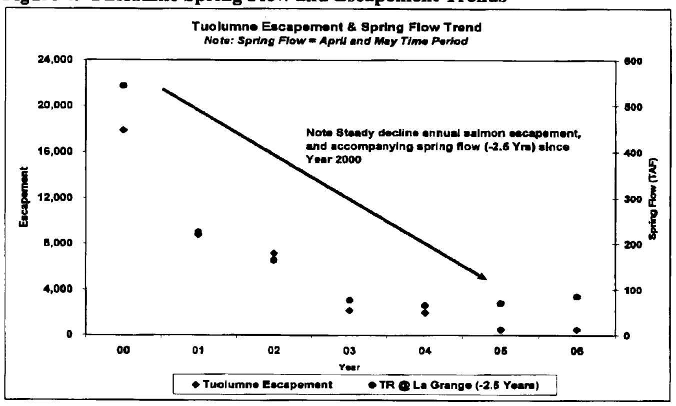


Note: There is a sharp contrast, and consistent pattern, in both winter and spring flow between for the years comprising the 2000 to 2006 escapements (here depicted as 1997 thru 2003 brood production years). Wherein both winter, and spring, flow magnitude and duration have diminished with each successive year. At spring flow levels of about

19 cont.

1500 cfs, salmon production begins to sharply fall. The importance of winter flow can be seen comparing years 1998 (red line), 1999 (yellow line), and 2000 (green line). In years where short duration winter pulse combined with a low spring pulse (year 2000) occur fewer salmon are produced than years with moderate winter and spring pulse flows (year 1999) and, far fewer salmon that years with when higher magnitude and longer duration winter pulse flow combined with elevated spring flow (year 1998) occurs. 19 cont.

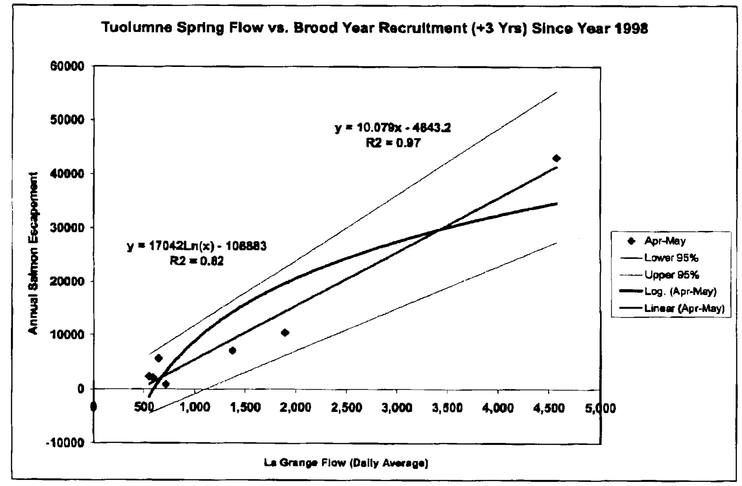
Figure 4. Tuolumne Spring Flow and Escapement Trends



Note similarity between annual escapement and spring period flow allocation volume

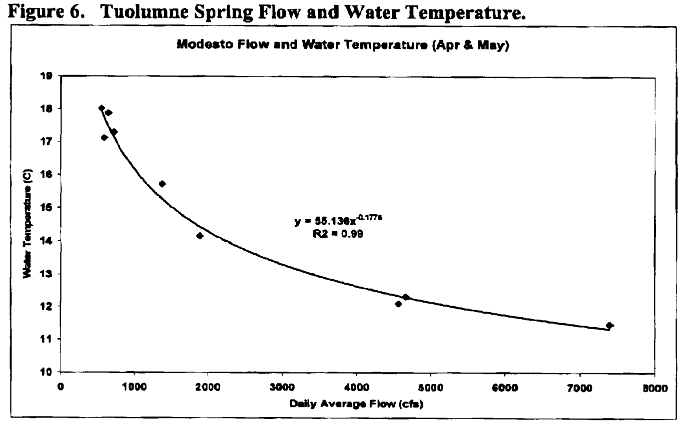
Figure 5. Tuolumne Spring Flow and Brood Year Recruitment Production

12.2-20



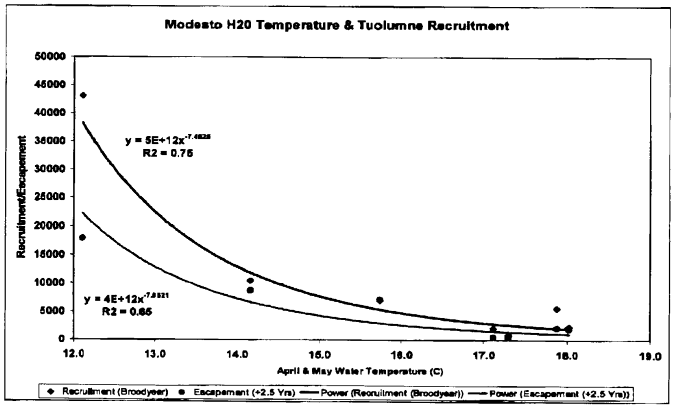
Note how the non-linear log normal relationship drops in r-square (e.g. line fitness) value and fails have proximity to empirical escapement data values >750. The use of brood year recruitment values improves the linear fitness (e.g. r-square value) suggesting that the relationship between brood year recruitment production is, under these value ranges, linear in nature. 19 cont.

Figure 6. Tuolumne Spring Flow and Water Temperature.



Note: The relationship between Tuolumne River (at Modesto) flow and water temperature is for the years 1998 thru 2006. A broad range of flows is included in this Figure. Water temperature data for the years 1998 thru 2000 was calculated using Hughson (River Mile 23.6) water temperature data, and its very strong linear relationship with Modesto (River Mile 16) water temperature (R2=0.98). Water temperature drops sharply with a corresponding increase in Tuolumne River flow.

Figure 7. Tuolume River Spring Water Temperature and Adult Salmon Production



Note: There is a sharp increase in production, whether measured by annual escapement or by brood year production, consistent with Tuolumne River (at Modesto) water temperature decline during the spring period (e.g. April and May) annual escapement years 2000 thru 2006 and for brood production years 1997 thru 2003. Said differently, water temperatures exceeding 15°C (59°F) in the Tuolumne River at Modesto concurrently, and consistently, occur with sharply diminished adult salmon production in the Tuolumne River since escapement year 2000.

19 cont.

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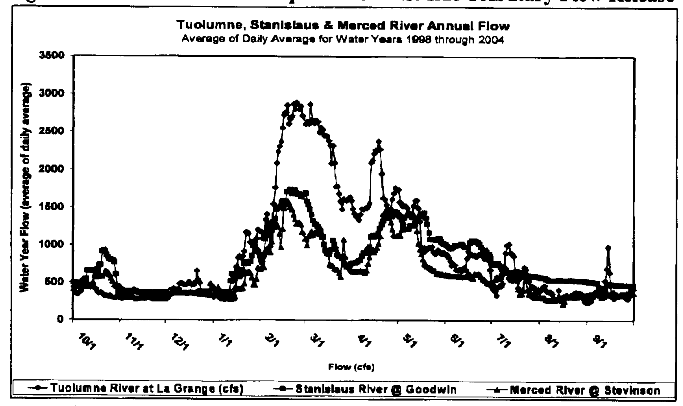
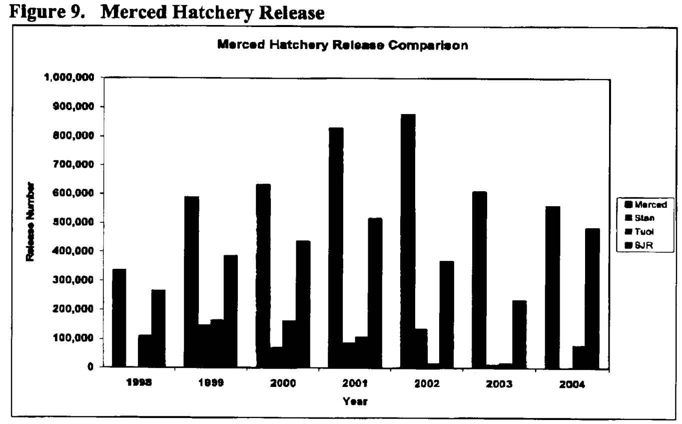
Figure 8. Coordinated San Joaquin River East-side Tributary Flow Release



Note: Flows for the three San Joaquin River east-side tributaries have been consistently managed, during the fall, winter and spring, since the late 1990's. The Tuolumne is by far the largest basin with a watershed area of 1540 square miles, as compared to the Stanislaus at 1075 square miles and the Merced at 1273 square miles[2].

Figure 9. Merced Hatchery Release



Note: The Merced River has received the vast majority of hatchery produced salmon smolts since 1998. Returns of Merced Hatchery smolts are consistent with release

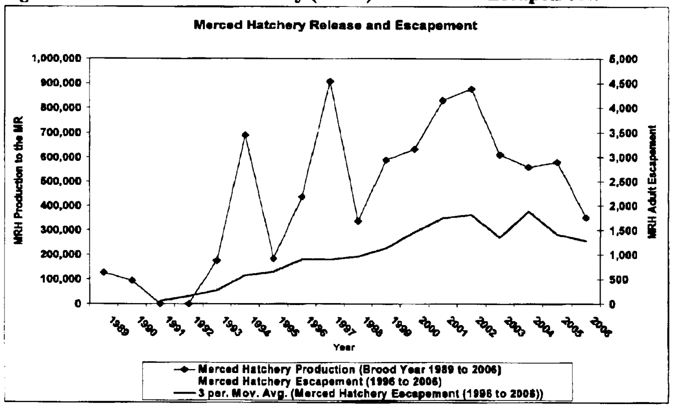
19 cont.

[2] From http://www.delta.dfg.ca.gov/afrp/ws_stats

12.2-22

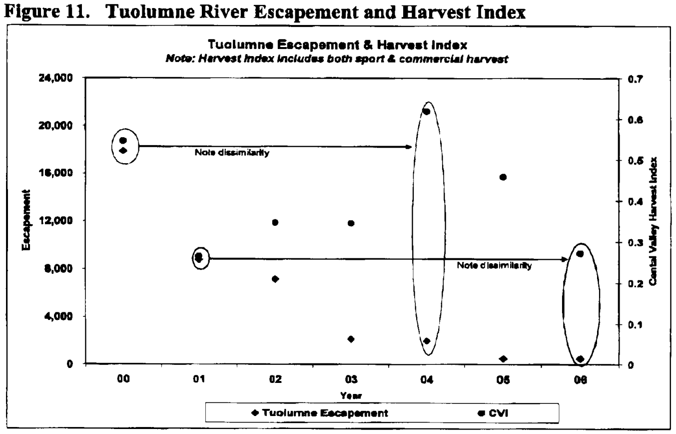
location (e.g. a smolt released into the Merced is likely to return as an adult to the Merced etc.). San Joaquin River released smolts tend to return as adults to the Merced River (from data obtained from coded-wire-tag recoveries).

Figure 10. Merced River Hatchery (MRH) Release and Escapement.



Note: The Merced River Hatchery (MRH) escapement trend is a moving three year average to account for variation in adult return age. As MRH releases into the Merced River increased MRH escapement trend also increased.

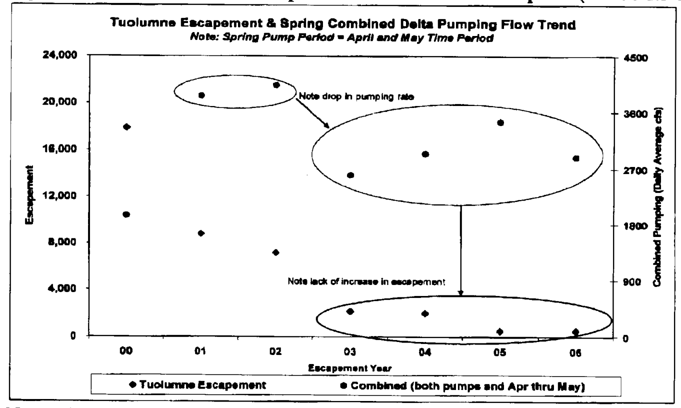
Figure 11. Tuolumne River Escapement and Harvest Index



19 cont.

Note dissimilarity between CVI values and escapement estimates. This suggests that something other than ocean harvest is influencing salmon escapement in the Tuolumne River.

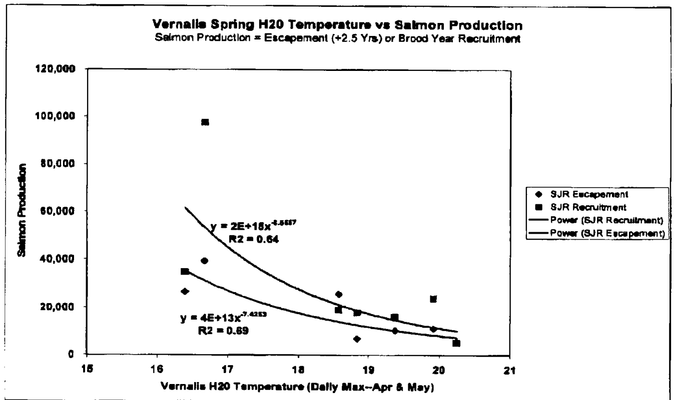
Figure 12. Tuolume River Escapement and South Delta Exports (minus 2.5 Years).



Notes: i) Pumping year is 2.5 years earlier than Escapement year (e.g. Escapement Year 2000 corresponds to Delta Pump Year 1998); ii) even though there appears to be a connection between Escapement Years 2000-2002 and Combined Pumping rates for 1998-2001, when pumping rates lowered for the 2003-2006 Escapement Years salmon escapement did not show a corresponding increase. This lack of consistent relationship suggests that something else besides Delta Spring Time Pumping is controlling Tuolumne River salmon escapement abundance.

Figure 13. Vernalis Spring Water Temperature and Tuolumne Salmon Production

19 cont.



Note: The correlation between spring Vernalis water temperature and Tuolumne River salmon production (both annual escapement and brood year production). Tuolumne River salmon production sharply rises consistent with Vernalis flow water temperatures <18°C (64°F).

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cont.

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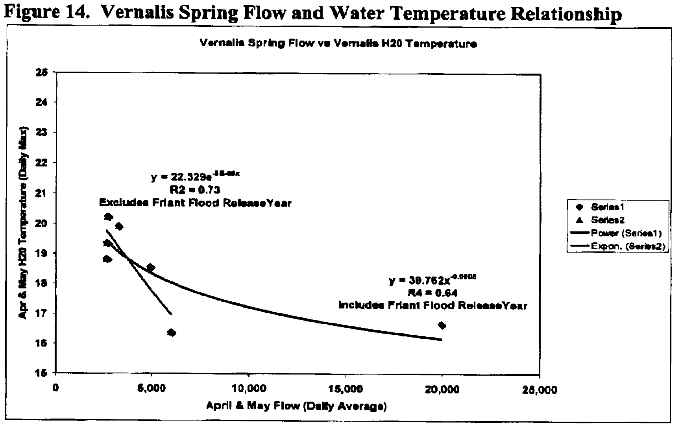
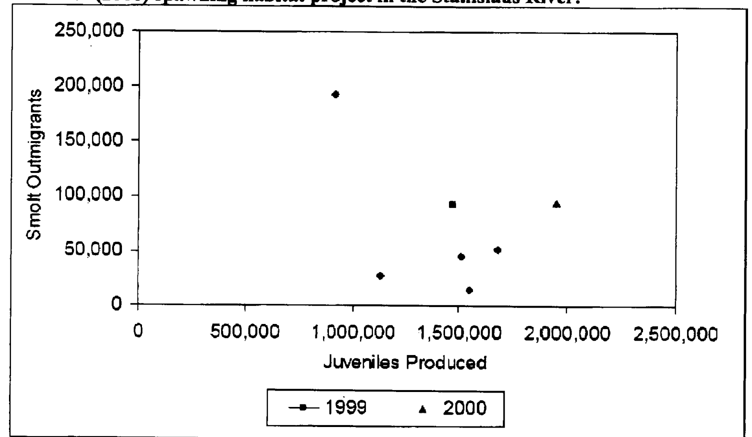
Figure 14. Vernalis Spring Flow and Water Temperature Relationship



Note: The apparent data outlier is associated with Friant flood control releases. Excluding this data point causes the correlation between spring Vernalis flow and spring Vernalis water temperature to sharply increase.

Figure 15. Juvenile Production and Smolt Outmigrants relationship before (1999) and after (2000) spawning habitat project in the Stanislaus River.



Note: The estimated abundance of all sizes of juveniles that passed the Oakdale screw trap (RM 40) plotted with the estimated abundance of smolt out-migrants (> 70 mm Fork Length) at the Caswell State Park screw traps (RM 5) in the Stanislaus River from 1998 to 2004. The Knights Ferry Gravel Replenishment Project (KFGRP) constructed 18 spawning beds in the Stanislaus River in summer 1999. A comparison of the 1999 and 2000 estimates provides the best evaluation of the effects of gravel augmentation on juvenile and smolt production, because they occurred immediately before and after the KFGRP and they were both affected by similar spring flows between February 1 and June 15 (7,394 cfs and 6,940 cfs, respectively) and similar numbers of spawners (2,600 and 3,200 Age 3 equivalent fish, respectively). (From Mesick et al. 2007)

19
cont.

Office of Assemblywoman Sally J. Lieber
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Mountain View, CA 94041

Telephone: 408.277.2003
Fax: 408.277.2084
e-mail: assemblywoman.lieber@assembly.ca.gov

Facsimile Transmittal

To: Bill Wycko **Fax:** (415) 558-6409

Date: 10/1/07 **Phone:**

Re: Hetch Hetchy PEIR Comments **Page:** 1 of 3

From:
- [x] Assemblywoman Lieber
- [ ] Harry Adams
- [ ] Monica Smith
- [ ] Joyce Iwasaki
- [ ] Leslie Bulbuk
- [ ] Marta Donayre

- [x] Urgent
- [ ] For Your Information
- [ ] Please Comment
- [ ] Please Reply
- [ ] Please Sign and Return

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Assembly
California Legislature

SALLY J. LIEBER
ASSEMBLYWOMAN, TWENTY-SECOND DISTRICT
SPEAKER PRO TEMPORE

CHAIR, SELECT COMMITTEE ON MOBILE HOMES
COMMITTEE ON INSURANCE
COMMITTEE ON JUDICIARY
COMMITTEE ON LOCAL GOVERNMENT
COMMITTEE ON HEALTH

September 28, 2007

Bill Wycko, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Wycko,

We are arriving at a critical juncture in the development and implementation of the SFPUC's Water System Improvement Program. We appreciate the efforts the San Francisco Planning Department in preparing the draft PEIR. Many local agencies, elected officials and consumers have been waiting eagerly for the release of the draft.

Many of our constituents are served by some of the 27 cities, water districts and water companies represented by the Bay Area Water Supply and Conservation Agency. We share the view of the importance and urgency to rebuild the regional water system's infrastructure in order to protect the health and well-being of over 2 million residents and 31,000 businesses. We believe this primary goal must be reiterated and focused upon throughout this process. 01

The draft PEIR has provoked concerns about additional diversion of water from the Tuolumne River. We urge you to undertake more comprehensive studies of the alternatives that minimize new diversions. The "Environmentally Superior Alternative" presented in the draft certainly seems to be a direction that the Planning Department should more fully explore in the final PEIR. 02

Implementation of more water conservation, efficiency, and recycling is the best way to lessen impacts on the Tuolumne River while promoting a sustainable water plan for the Bay Area. We know BAWSCA, its member agencies and our Bay Area consumers have done an exceptional job in reducing residential use so that we have among the lowest per capita utilization in the state. 03

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10/01/2007 13:57 FAX 6502102000 ASSEMBLY DISTRICT OFF 22 003/003

We are aware that BAWSCA is committed to even greater conservation measures. The possibilities of urban and agricultural agencies working together to reduce net diversions in the future seem hopeful and worthy of energetic collaborative efforts. Investing in agricultural conservation, as proposed by BAWSCA and supported by Environmental Defense, appears to be cost-effective in providing water, increased agricultural conservation and could benefit the lower Tuolumne. 04

The balance of urban, suburban and agricultural water needs along with the need for environmental protection of such treasures as the Tuolumne River will be a difficult, but solvable, issue over time. The one thing that is clear and immediate is the need to avoid potential catastrophe of the collapse of our water delivery system from a major earthquake. The repair of the infrastructure must remain front and center throughout this process. 05

Therefore, we urge the Planning Department seriously consider BAWSCA's idea to improve the "Environmentally Superior Alternative" and finalize the PEIR promptly after receiving and considering all comments it receives, and that the Planning Commission certify the PEIR so that San Francisco can move ahead with rebuilding the Hetch Hetchy water system to protect the health, safety and economic well being of our region. 06

Thank you for your efforts.

Sincerely,

SALLY J. LIEBER
Assemblywoman, 22nd District
Speaker pro Tempore
California State Assembly

IRA RUSKIN
Assemblymember, 21st District
California State Assembly

SJL:ha

cc: San Francisco Public Utilities Commissioners

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STATE OF CALIFORNIA -- THE RESOURCES AGENCY

ARNOLD SCHWARZENEGGER, Governor

DEPARTMENT OF WATER RESOURCES
1416 NINTH STREET, P.O. BOX 942836
SACRAMENTO, CA 942360001
(916) 653-5791

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JUL 23 2007
CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
M.E.A.

July 13, 2007

Diana Sokolove
City and County of San Francisco, Planning Department
1650 Mission Street, Suite 400
San Francisco, California 94103-2479

San Francisco Public Utilities Commission's (SFPUC) Water System Improvement Program
State Clearinghouse (SCH) Number: 2005092026

The project corresponding to the subject SCH identification number has come to our attention. The limited project description suggests your project may be an encroachment on the State Adopted Plan of Flood Control. You may refer to the California Code of Regulations, Title 23 and Designated Floodway maps at http://recbd.ca.gov/. Please be advised that your county office also has copies of the Board's designated floodways for your review. If indeed your project encroaches on an adopted food control plan, you will need to obtain an encroachment permit from the Reclamation Board prior to initiating any activities. The attached Fact Sheet explains the permitting process. Please note that the permitting process may take as much as 45 to 60 days to process. Also note that a condition of the permit requires the securing all of the appropriate additional permits before initiating work. This information is provided so that you may plan accordingly. 01

If after careful evaluation, it is your assessment that your project is not within the authority of the Reclamation Board, you may disregard this notice. For further information, please contact me at (916) 574-1249.

Sincerely,

Christopher Huitt
Staff Environmental Scientist
Floodway Protection Section

cc: Governor's Office of Planning and Research
State Clearinghouse
1400 Tenth Street, Room 121
Sacramento, CA 95814

Encroachment Permits Fact Sheet

Basis for Authority
State law (Water Code Sections 8534, 8608, 8609, and 8710 – 8723) tasks the Reclamation Board with enforcing appropriate standards for the construction, maintenance, and protection of adopted flood control plans. Regulations implementing these directives are found in California Code of Regulations (CCR) Title 23, Division 1.

Area of Reclamation Board Jurisdiction
The adopted plan of flood control under the jurisdiction and authority of the Reclamation Board includes the Sacramento and San Joaquin Rivers and their tributaries and distributaries and the designated floodways.

Streams regulated by the Reclamation Board can be found in Title 23 Section 112. Information on designated floodways can be found on the Reclamation Board's website at http://recbd.ca.gov/designated_floodway/ and CCR Title 23 Sections 101 - 107.

Regulatory Process
The Reclamation Board ensures the integrity of the flood control system through a permit process (Water Code Section 8710). A permit must be obtained prior to initiating any activity, including excavation and construction, removal or planting of landscaping within floodways, levees, and 10 feet landward of the landside levee toes. Additionally, activities located outside of the adopted plan of flood control but which may foreseeable interfere with the functioning or operation of the plan of flood control is also subject to a permit of the Reclamation Board.

Details regarding the permitting process and the regulations can be found on the Reclamation Board's website at http://recbd.ca.gov/ under "Frequently Asked Questions" and "Regulations," respectively. The application form and the accompanying environmental questionnaire can be found on the Reclamation Board's website at http://recbd.ca.gov/forms.cfm.

Application Review Process
Applications when deemed complete will undergo technical and environmental review by Reclamation Board and/or Department of Water Resources staff.

Technical Review
A technical review is conducted of the application to ensure consistency with the regulatory standards designed to ensure the function and structural integrity of the adopted plan of flood control for the protection of public welfare and safety. Standards and permitted uses of designated floodways are found in CCR Title 23 Sections 107 and Article 8 (Sections 111 to 137). The permit contains 12 standard conditions and additional special conditions may be placed on the permit as the situation warrants. Special conditions, for example, may include mitigation for the hydraulic impacts of the project by reducing or eliminating the additional flood risk to third parties that may caused by the project.

Additional information may be requested in support of the technical review of

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your application pursuant to CCR Title 23 Section 8(b)(4). This information may include but not limited to geotechnical exploration, soil testing, hydraulic or sediment transport studies, and other analyses may be required at any time prior to a determination on the application.

Environmental Review
A determination on an encroachment application is a discretionary action by the Reclamation Board and its staff and subject to the provisions of the California Environmental Quality Act (CEQA) (Public Resources Code 21000 et seq.). Additional environmental considerations are placed on the issuance of the encroachment permit by Water Code Section 8608 and the corresponding implementing regulations (California Code of Regulations – CCR Title 23 Sections 10 and 16).

In most cases, the Reclamation Board will be assuming the role of a "responsible agency" within the meaning of CEQA. In these situations, the application must include a certified CEQA document by the "lead agency" [CCR Title 23 Section 8(b)(2)]. We emphasize that such a document must include within its project description and environmental assessment of the activities for which are being considered under the permit.

Encroachment applications will also undergo a review by an interagency Environmental Review Committee (ERC) pursuant to CCR Title 23 Section 10. Review of your application will be facilitated by providing as much additional environmental information as pertinent and available to the applicant at the time of submission of the encroachment application.

These additional documentations may include the following documentation:

- California Department of Fish and Game Streambed Alteration Notification (http://www.dfg.ca.gov/1600/),
- Clean Water Act Section 404 applications, and Rivers and Harbors Section 10 application (US Army Corp of Engineers),
- Clean Water Act Section 401 Water Quality Certification, and
- corresponding determinations by the respective regulatory agencies to the aforementioned applications, including Biological Opinions, if available at the time of submission of your application.

The submission of this information, if pertinent to your application, will expedite review and prevent overlapping requirements. This information should be made available as a supplement to your application as it becomes available. Transmittal information should reference the application number provided by the Reclamation Board.

In some limited situations, such as for minor projects, there may be no other agency with approval authority over the project, other than the encroachment permit by Reclamation Board. In these limited instances, the Reclamation Board may choose to serve as the "lead agency" within the meaning of CEQA and in most cases the projects are of such a nature that a categorical or statutory exemption will apply. The Reclamation Board cannot invest staff resources to prepare complex environmental documentation.

Additional information may be requested in support of the environmental review of your application pursuant to CCR Title 23 Section 8(b)(4). This information may include biological surveys or other environmental surveys and may be required at anytime prior to a determination on the application.

California Regional Water Quality Control Board
Central Valley Region
Karl E. Longley, ScD, PE, Chair

Linda S. Adams
Secretary for Environmental Protection

Sacramento Main Office
11020 Sun Center Drive #200, Rancho Cordova, California 95670-6114
Phone (916) 464-3291 • FAX (916) 464-4645
http://www.waterboards.ca.gov/centralvalley

Arnold Schwarzenegger
Governor

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OCT 19 2007
CITY & COUNTY OF S.F.
PLANNING DEPARTMENT

12 October 2007

San Francisco Planning Department
Attn.: Mr. Paul Maltzer
Environmental Review Officer
1660 Mission Street, Suite 500
San Francisco, CA 94103-2414

Comments on Draft Program Environmental Impact Report for the San Francisco Public Utilities Commission's Water System Improvement Program, SCH No. 2005092026

Dear Mr. Maltzer:

We have reviewed the Draft Program Environmental Impact Report (PEIR) for the San Francisco Public Utility Commission's (SFPUC) Water System Improvement Program (WSIP). The goals and objectives of WSIP include the following:

- **Water Quality:** (A) Design improvements to meet current and foreseeable future federal and state water quality requirements; (B) Provide clean, unfiltered water originating from Hetch Hetchy Reservoir and filter all other surface water sources; and (C) Continue to implement watershed protection measures.
- **Seismic Reliability:** (A) Design improvements to meet current seismic standards; (B) Deliver basic service to the East/South Bay, Peninsula, and San Francisco within 24 hours after a major earthquake (229 million gallons per day [mgd] and deliver to at least 70 percent of the turnouts). (C) Restore facilities to meet average-day demand of 300 mgd within 30 days after a major earthquake.
- **Delivery Reliability:** (A) Provide operational flexibility to allow planned maintenance shutdowns of individual facilities without interruption of service; (B) Provide operational flexibility to minimize risk of service interruption due to unplanned facility upsets or outages; (C) Provide operational flexibility and system capacity to replenish local reservoirs as needed; (D) Meet estimated average annual demand of 300 mgd for 2030 under the conditions of one planned shutdown of a major facility for maintenance concurrent with one unplanned facility outage.
- **Water Supply:** (A) Meet average annual water purchase requests from retail and wholesale customers during nondrought years through 2030 (estimated average annual demand of 300 mgd for 2030); (B) Meet dry-year delivery needs through 2030 while limiting rationing to a maximum 20 percent system-wide reduction in water service during extended droughts; (C) Diversify water supply options during nondrought years and drought periods; (D) Improve use of new water sources and drought management, including use of groundwater, recycled water, conservation, and transfers.

- **Sustainability:** (A) Manage natural resources and physical systems to protect watershed ecosystems; (B) Meet, at a minimum, all current and anticipated legal requirements for protection of fish and other wildlife habitat; and (C) Manage natural resources and physical systems to protect public health and safety.
- **Cost-effectiveness:** (A) Ensure cost-effective use of funds; (B) Maintain gravity fed system; and (C) Implement regular inspection and maintenance program for all facilities.

Based on the information provided in the Draft PEIR, Central Valley Regional Water Quality Control Board (Water Board) staff offer the following comments to advise the SFPUC of our concerns.

Comment 1
Section 4.5: Hydrology and Water Quality, Regulatory Framework, Water Quality Regulations, Page 4.5-9.

The discussion of Water Quality Regulations in Section 4.5 should be expanded to clarify that the Water Board also issues WDRs to regulate discharges of waste into waters of the State that are outside federal jurisdiction as defined under the Clean Water Act (CWA), including isolated waters under the Supreme Court's SWANCC and Rapanos decisions. 01

Please also note that the Water Quality Control Plan for the Sacramento and San Joaquin River Basins (Basin Plan) was last revised in February 2007. A copy of the revised Basin Plan can be obtained at http://www.waterboards.ca.gov/centralvalley/water_issues/basin_plans/index.html .

Comment 2
Section 4.5: Hydrology and Water Quality, Regulatory Framework, Beneficial Uses, Pages 4.5-9 and 4.5-10.

The discussion of beneficial uses indicates that beneficial uses of surface waters serve as the basis for establishing water quality objectives and discharge prohibitions to attain beneficial use goals. This discussion should be expanded to indicate that beneficial uses are designated in Water Quality Control Plans (Basin Plans) for surface waters and ground water basins. These beneficial uses serve as the basis for establishing water quality objectives and discharge prohibitions to attain the goal of achieving the highest water quality consistent with maximum benefit to the people of the state. Table 4.5-1 lists the designated beneficial uses for water bodies that may be affected by the WSIP. Please expand this table to include the beneficial uses for the Tuolumne River and groundwater basins that may be affected by the WSIP. As listed in Table II-1 of the Basin Plan, the beneficial uses of the Tuolumne River include the following: 02

- **Source to (New) Don Pedro Reservoir include Municipal (i.e. see Figure II-1 in the Basin Plan)**: Municipal and Domestic Supply (MUN); Agricultural Supply (AGR); Hydropower Generation (POW); Water Contact Recreation (REC-1); Non-water Contact Recreation (REC-2); Warm Freshwater Habitat (WARM); Cold Freshwater Habitat (COLD); and Wildlife Habitat (WILD).

- **New Don Pedro Reservoir:** MUN (Potential); POW; REC-1; REC-2; WARM; COLD; and WILD.
- **New Don Pedro Dam to San Joaquin River:** MUN (Potential); AGR; REC-1; REC-2; WARM; COLD; Migration of Aquatic Organisms (MIGR); Spawning, Reproduction, and/or Early Development (SPWN); and WILD. 02 cont.

Unless otherwise designated by the Regional Water Board, all ground waters in the Region are considered as suitable or potentially suitable, at a minimum, for MUN, AGR, industrial service supply (IND), and industrial process supply (PRO). Criteria for making exceptions to beneficial uses of ground waters are provided on Page II-3.00 of the Basin Plan.

Comment 3
Section 4.5: Hydrology and Water Quality, Regulatory Framework, Construction in Waters of the State and of the United States, Page 4.5-12; and Section 4.6, Biological Resources, Regulation of Activities in Wetlands, Page 4.6-32.

The discussions of Construction in Waters of the State and United States in Section 4.5 and Regulation of Activities in Wetlands in Section 4.6 should be expanded to clarify that the Water Board has regulatory authority over construction in waters of the United States and waters of the State, including activities in wetlands, under both the CWA and the State of California's Porter-Cologne Water Quality Control Act (California Water Code, Division 7). Under the CWA, the Water Board has regulatory authority over actions in waters of the United States, through the issuance of water quality certifications (certifications) under Section 401 of the CWA, which are issued in conjunction with permits issued by the Army Corps of Engineers (ACOE) under Section 404 of the CWA. When the Water Board issues Section 401 certifications, the project is also regulated under State Water Resources Control Board Order No. 2003-0017-DWQ, "General Waste Discharge Requirements for Dredge and Fill Discharges That Have Received State Water Quality Certification" which requires compliance with all conditions of this Water Quality Certification. Activities in areas that are outside of the jurisdiction of the ACOE (e.g., isolated wetlands, vernal pools, or stream banks above the ordinary high water mark) are regulated by the Water Board, under the authority of the Porter-Cologne Act. Activities that lie outside of ACOE jurisdiction may require the issuance of either individual or general WDRs. 03

Comment 4
Section 4.5: Hydrology and Water Quality, Impact 4.5-1: Degradation of water bodies as a result of erosion and sedimentation or a hazardous materials release during construction, Pages 4.5-21 through 4.5-28; and Section 6.2: SFPUC Construction Measures, Measure #3: Onsite air and water quality measures during construction, Page 6-4.

The text indicates the WSIP will result in less than significant impacts to water bodies as a result of erosion and sedimentation or a hazardous materials release during construction. The rationale for this conclusion is that all projects will be required to implement best management practices (BMP) specified in SFPUC Construction Measure #3 (onsite air and water quality measures during construction). In addition, projects outside of San Francisco that disturb more than 1 acre will have to comply with either the NPDES Permit for Small Linear Projects or the NPDES General Permit for Construction, which require the BMPs to be implemented in 04 accordance with stormwater pollution prevention plans (SWPPP). In San Francisco, projects would be subject to Article 4.1 of the San Francisco Public Works which requires, at a minimum, the development of an erosion and sediment control plan to reduce the impact of runoff from construction sites.

SFPUC Construction Measure #3 includes many effective BMPs, such as preservation of existing vegetation and stabilization of site ingress/egress locations, to minimize erosion. However, scheduling is not included in SFPUC Construction Measure #3 and should be used as a BMP for all WSIP projects. Scheduling should be used to phase construction to limit areas and periods of disturbance to the maximum extent practicable and to minimize the area of disturbed soil during the wet season. Scheduling should also be used to coordinate construction activities with implementation of appropriate erosion and sediment control BMPs. 04 cont.

Comment 5
Section 4.6: Biological Resources. Impacts, Significance Criteria, Page 4.6-37.

The third bullet under the significance criteria for biological impacts should be expanded to include wetlands protected under the State of California's Porter-Cologne Water Quality Control Act. 05

Comment 6
Section 4.6: Biological Resources, Impact 4.6-1: Impacts on wetlands and aquatic resources, Page 4.6-43; and Section 6.3: Mitigation Measures to Minimize Facilities Impacts, Mitigation Measure 4.6-1a: Wetlands Assessment, and Mitigation Measure 4.6-1b: Compensation for Wetlands and Other Biological Resources, Pages 6-11 and 6-12.

The discussion of impacts on wetlands and aquatic resources in Section 4.6 discloses that impacts on wetlands are assumed to occur for all WSIP projects that involve surface disturbance. We also acknowledge and appreciate mitigation measures presented in Section 6.3. To mitigate potential impacts to wetlands and aquatic features, a qualified wetland scientist will assess and delineate wetlands potentially occurring at project sites (Mitigation Measure 4.6-1a), and site-specific mitigation measures will be identified as part of the project specific CEQA reviews (Mitigation Measure 4.6-1b). Mitigation Measure 4.6-1b states that when a WSIP project will affect jurisdictional wetlands, the SFPUC will implement avoidance measures, restoration procedures, and compensatory creation or enhancement. 06

We acknowledge and appreciate these mitigation measures, and wish to emphasize that under the Porter-Cologne Act, the Water Board has jurisdiction over wetlands of any type, including areas that are outside of ACOE jurisdiction under the CWA. In addition, Mitigation Measure 4.6-1b should be expanded to include measures to minimize impacts to wetlands. For all impacts to wetlands, the SFPUC will be required to demonstrate to the Water Board that they have avoided and minimized impacts to the maximum extent practicable before considering compensation measures.

Comment 7
Section 4.6: Biological Resources, Impact 4.6-1: Impacts on wetlands and aquatic resources, Page 4.6-43. 07

The PEIR should note that the discussion of potential changes to jurisdictional determinations pending outcomes of recent federal court cases only pertains to federal jurisdiction under the CWA. State jurisdiction under the Porter-Cologne Act will not be affected by the pending outcomes of recent federal court cases and has not been affected by earlier decisions, such as the Tulloch, SWANCC, and Rapanos decisions. To regulate impacts to waters of the State that are outside federal jurisdiction, the Water Board may issue either individual or general WDRs. 07 cont.

Comment 8
Section 5.2: Plans and Policies, Federal Statutes and Agreements, Clean Water Act, Page 5.2-6.

The discussion of the CWA includes requirements under Section 404 of the Act; however, requirements under Section 401 of CWA were not provided in this discussion. Under Section 401 of CWA, every applicant for a federal permit or license for any activity which may result in a discharge to a water body must obtain State Water Quality Certification (Certification) that the proposed activity will comply with state water quality standards. Most Certifications are issued in connection with CWA Section 404 permits for dredge and fill discharges. Please revise the discussion of the CWA in Section 5.2 to include requirements under Section 401 of the Act. 08

Comment 9
Section 5.3: Tuolumne River System and Downstream Water Bodies, Impact 5.3.7-2: Impacts on Alluvial Features that Support Meadow and Riparian Habitat along the Tuolumne River from O'Shaughnessey Dam to Don Pedro Reservoir, Pages 5.3.7-15 through 5.3.7-22; and Section 6.4: Mitigation Measures to Minimize Water Supply and System Operations Impacts, Mitigation Measure 5.3.7-2, Controlled Releases to Recharge Groundwater in Streamside Meadows and Other Alluvial Deposits, Pages 6-49 through 6-50.

On page 5.3.7-15 of Section 5.3, the text indicates that the two primary factors influencing riparian ecological resources are hydrology and geomorphology because of the following:

- Flood flows create open sites for colonization by new individuals and are important in determining the period of saturation in the root zone.
- High flows determine the extent and type of habitats in meadow and riparian systems by recharging groundwater. 09
- Minimum flows maintain groundwater levels and affect the extent and diversity of riparian, meadow, and aquatic habitats.

Impact 5.3.7-2 indicates that there are potentially significant impacts on wet meadow and riparian habitats along the Tuolumne River between O'Shaughnessey Dam to Don Pedro Reservoir. These impacts occur because of changes in geomorphologic processes and reductions in groundwater recharge primarily in the Poopenaut Valley. Under Mitigation Measure 5.3.7-2, the SFPUC proposes to manage reservoir releases in a pattern that provides flows of a magnitude to inundate the meadows and streamside alluvial deposits for as long as possible (i.e. pulse flows). The SFPUC also proposes to collect baseline data and follow up monitoring to evaluate whether the proposed pulse flows are meeting the objective of maintaining and improving wet meadow habitat. Some of the baseline data needed may be available from the study effort in Poopenaut Valley performed collaboratively by the National

Park Service, U.S. Forest Service and SFPUC to evaluate sediment transport and deposition relationships. Water Board staff appreciate the SFPUC's effort to mitigate effects on meadow and riparian habitats. As waters of the State, meadows and riparian habitat provide beneficial uses, such as endangered species habitat, that need to be protected. As a result, Water Board Staff recommend using the baseline studies to evaluate the effectiveness of pulse flows and verify that minimum flows are sufficient to ensure the continued health of riparian and meadow systems in the upper Tuolumne River watershed. 09 cont.

Comment 10
Section 5.7: Cumulative Projects and Impacts Related to WSIP Water Supply and System operations, Subsection 5.7.6 Climate Change and Global Warming, Pages 5.7-92 through 5.7-97.

The discussion on climate change in Section 5.7 evaluates effects from reductions in annual snowpack, increased precipitation in the form of rain, and shifts in seasonal precipitation. We acknowledge and appreciate the difficulty in assessing impacts related to climate change because of the uncertainty associated with the models. However, the discussion on climate change should be expanded to include a discussion of potential effects resulting from changes in the frequency and duration of extreme climatic events, such as droughts and flood events. 10

The projections by the Intergovernmental Panel on Climate Change (IPCC) summarized indicate that more intense precipitation and drought events are likely to occur in the 21st century. These predictions are summarized in Table 9.6 of Climate Change 2001: The Scientific Basis (http://www.grida.no/climate/ipcc_tar/wg1/pdf/TAR-09.PDF). On Page 891 in Climate Change 2007: The Physical Science Basis, the IPCC's review of regional climate models also found increases in extreme temperature events in California, prolonged hot spells and increased diurnal temperature range (http://ipcc-wg1.ucar.edu/wg1/Report/AR4WG1_Print_Ch11.pdf). Although there is no clear scientific consensus on the quantification of these extreme events, a qualitative assessment acknowledging the uncertainties in climate models should be performed to evaluate whether changes in operations will exacerbate adverse effects associated with extreme climatic events.

Conclusion
Please contact Xavier Fernandez at 510-622-5685 xafernandez@waterboards.ca.gov at the San Francisco Bay Regional Board office or me at (916) 474-4742 if you have any questions.

Greg Vaughn
Senior Engineer
Stormwater / Water Quality Certification Unit

cc: State Clearinghouse
Xavier Fernandez, San Francisco Bay Regional Board, Oakland

12.2-30

California Regional Water Quality Control Board
San Francisco Bay Region

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Arnold Schwarzenegger
Governor

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PLANNING DEPARTMENT
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Date: SEP 26 2007
File No. 2198.09/2178.05/2188.05 (XF)

San Francisco Planning Department
Attn.: Mr. Paul Maltzer
Environmental Review Officer
1660 Mission Street, Suite 500
San Francisco, CA 94103-2414

Subject: Comments on Draft Program Environmental Impact Report for the San Francisco Public Utilities Commission's Water System Improvement Program
SCH No. 2005092026

Dear Mr. Maltzer:

We have reviewed the Draft Program Environmental Impact Report (PEIR) for the San Francisco Public Utility Commission's (SFPUC's) Water System Improvement Program (WSIP). The goals and objectives of WSIP include the following:

1. **Water Quality:** (A) Design improvements to meet current and foreseeable future federal and state water quality requirements; (B) Provide clean, unfiltered water originating from Hetch Hetchy Reservoir and filter all other surface water sources; and (C) Continue to implement watershed protection measures.
2. **Seismic Reliability:** (A) Design improvements to meet current seismic standards; (B) Deliver basic service to the East/South Bay, Peninsula, and San Francisco within 24 hours after a major earthquake (229 million gallons per day [mgd] and deliver to at least 70 percent of the turnouts). (C) Restore facilities to meet average-day demand of 300 mgd within 30 days after a major earthquake.
3. **Delivery Reliability:** (A) Provide operational flexibility to allow planned maintenance shutdowns of individual facilities without interruption of service; (B) Provide operational flexibility to minimize risk of service interruption due to unplanned facility upsets or outages; (C) Provide operational flexibility and system capacity to replenish local reservoirs as needed; (D) Meet estimated average annual demand of 300 mgd for 2030 under the conditions of one planned shutdown of a major facility for maintenance concurrent with one unplanned facility outage.

4. **Water Supply:** (A) Meet average annual water purchase requests from retail and wholesale customers during nondrought years through 2030 (estimated average annual demand of 300 mgd for 2030); (B) Meet dry-year delivery needs through 2030 while limiting rationing to a maximum 20 percent system-wide reduction in water service during extended droughts; (C) Diversify water supply options during nondrought years and drought periods; (D) Improve use of new water sources and drought management, including use of groundwater, recycled water, conservation, and transfers.
5. **Sustainability:** (A) Manage natural resources and physical systems to protect watershed ecosystems; (B) Meet, at a minimum, all current and anticipated legal requirements for protection of fish and other wildlife habitat; and (C) Manage natural resources and physical systems to protect public health and safety.
6. **Cost-effectiveness:** (A) Ensure cost-effective use of funds; (B) Maintain gravity fed system; and (C) Implement regular inspection and maintenance program for all facilities.

Based on the information provided in the Draft PEIR, San Francisco Bay Regional Water Quality Control Board (Water Board) staff offers the following comments to advise the SFPUC of our concerns.

Comment 1
Section 4.5: Hydrology and Water Quality, Regulatory Framework, Water Quality Regulations, Page 4.5-9.

The discussion of Water Quality Regulations in Section 4.5 should be expanded to clarify that the Water Board also issues Waste Discharge Requirements (WDR) to regulate discharges of waste into waters of the State that are outside federal jurisdiction as defined under the Clean Water Act (CWA), including isolated waters under the Supreme Court's SWANCC and Rapanos decisions. 01

Please also note that revisions to the San Francisco Bay Basin Water Quality Control Plan (SF Basin Plan) were recently approved by the Office of Administrative Law. The effective date of the revised plan is December 22, 2006. A copy of the revised SF Basin Plan can be obtained at http://www.waterboards.ca.gov/sanfranciscobay/basinplan.htm.

Comment 2
Section 4.5: Hydrology and Water Quality, Regulatory Framework, Beneficial Uses, Pages 4.5-9 and 4.5-10. 02

The discussion of beneficial uses indicates that beneficial uses of surface waters serve as the basis for establishing water quality objectives (WQOs) and discharge prohibitions to attain beneficial use goals. This discussion should be expanded to indicate that

12.2-31

beneficial uses are designated in Water Quality Control Plans (Basin Plans) for surface waters, groundwater basins, and in the case of the San Francisco Bay Basin, wetlands. The beneficial uses designated in the Basin Plans serve as the basis for establishing WQOs and discharge prohibitions to attain the goal of achieving the highest water quality consistent with maximum benefit to the people of the state. Table 4.5-1 lists the designated beneficial uses for water bodies that may be affected by the WSIP. Please expand this table to include the beneficial uses for groundwater basins that may be affected by the WSIP as listed in Table 2-2 of the SF Basin Plan. Table 2-2 can be obtained at http://www.waterboards.ca.gov/sanfranciscobay/basinplan/web/tab/tab_2-02.pdf. Please include a footnote stating that beneficial uses for specific wetland sites affected by the WSIP will be determined as needed based on the process described in Chapter 4 of the SF Basin Plan. 02 cont.

Comment 3
Section 4.5: Hydrology and Water Quality, Regulatory Framework, Construction in Waters of the State and of the United States, Page 4.5-12; and Section 4.6, Biological Resources, Regulation of Activities in Wetlands, Page 4.6-32.

The discussions of Construction in Waters of the State and United States in Section 4.5 and Regulation of Activities in Wetlands in Section 4.6 should be expanded to clarify that the Water Board has regulatory authority over construction in waters of the United States and waters of the State, including activities in wetlands, under both the CWA and the State of California's Porter-Cologne Water Quality Control Act (California Water Code, Division 7). Under the CWA, the Water Board has regulatory authority over actions in waters of the United States, through the issuance of water quality certifications (certifications) under Section 401 of the CWA, which are issued in conjunction with permits issued by the Army Corps of Engineers (ACOE) under Section 404 of the CWA. When the Water Board issues Section 401 certifications, the project is also regulated under State Water Resources Control Board Order No. 2003-0017-DWQ, "General Waste Discharge Requirements for Dredge and Fill Discharges That Have Received State Water Quality Certification" which requires compliance with all conditions of this Water Quality Certification. Activities in areas that are outside of the jurisdiction of the ACOE (e.g., isolated wetlands, vernal pools, or stream banks above the ordinary high water mark) are regulated by the Water Board, under the authority of the Porter-Cologne Act. Activities that lie outside of ACOE jurisdiction may require the issuance of either individual or general Waste Discharge Requirements (WDRs). 03

Comment 4
Section 4.5: Hydrology and Water Quality, Regulatory Framework, NPDES Waste Discharge Regulations, Municipal Stormwater Permits, Pages 4.5-12 and 4.5-13. 04

This Section describes requirements and provisions in municipal stormwater permits for Alameda, Santa Clara, and San Mateo Counties. Included in this description is the following statement: "Projects completed in a public right-of-way, such as pipeline projects proposed as part of the WSIP, are exempt from the C.3 requirements when both sides of the right-of-way are developed." This statement is incorrect. The exemption for projects in a public right-of-way is only for reconstruction projects within a public street or road right-of-way, where both sides of the right-of-way are developed.

Please also note that the Water Board is in the process of developing a Municipal Regional Urban Runoff Phase I NPDES Stormwater Permit (MRP) that will replace the municipal stormwater permits for these counties. The purpose of the MRP is to improve regional consistency in permit requirements and to require more specific actions than previous stormwater permits. The administrative draft was issued on May 1, 2007, and can be obtained from the Water Board's website at http://www.waterboards.ca.gov/sanfranciscobay/mrp.htm. A revised draft is expected shortly and will be available at the same address. 04 cont.

Comment 5
Section 4.5: Hydrology and Water Quality, Impact 4.5-1: Degradation of water bodies as a result of erosion and sedimentation or a hazardous materials release during construction, Pages 4.5-21 through 4.5-28; and Section 6.2: SFPUC Construction Measures, Measure #3: Onsite air and water quality measures during construction, Page 6-4.

The text indicates the WSIP will result in less than significant impacts to water bodies as a result of erosion and sedimentation or a hazardous materials release during construction. The rationale for this conclusion is that all projects will be required to implement best management practices (BMPs) specified in SFPUC Construction Measure #3 (onsite air and water quality measures during construction). In addition, projects outside of San Francisco's combined sewer system that disturb more than 1 acre will have to comply with either the NPDES Permit for Small Linear Projects or the NPDES General Permit for Construction, which require the BMPs to be implemented in accordance with permit requirements and stormwater pollution prevention plans (SWPPP). The text further states, that projects within the area served by the combined sewer in San Francisco would also be subject to Article 4.1 of the San Francisco Public Works Code which requires, at a minimum, the development of an erosion and sediment control plan to reduce the impact of runoff from construction sites that are 0.5 acres or more in size. Projects within the area served by a separate sewer system in San Francisco would be subject to the Statewide General Permit for Stormwater Discharges from Small Separate Storm Sewer Systems. 05

SFPUC Construction Measure #3 includes many effective BMPs, such as preservation of existing vegetation and stabilization of site ingress/egress locations, to minimize erosion. However, scheduling is not included in SFPUC Construction Measure #3 and should be used as a BMP for all WSIP projects. Scheduling should be used to phase

construction to limit areas and periods of disturbance to the maximum extent practicable and to minimize the area of disturbed soil during the wet season. Scheduling should also be used to coordinate construction activities with implementation of appropriate erosion and sediment control BMPs. In addition, the SFPUC should allow 60 days for the Water Board to review and accept SWPPPs prior to commencement of construction activities. 05 cont.

Comment 6
Section 4.5: Hydrology and Water Quality, Impact 4.5-2: Depletion of groundwater resources, Sunol Valley Region, Pages 4.5-29 and 4.5-30; Section 4.6: Biological Resources, Impact 4.6-3: Impacts on key special status species –direct mortality and/or habitat effects; and Section 6.3: Mitigation Measures to Minimize Facilities Impacts, Mitigation Measure 4.5-2: Site Specific Groundwater Analysis and Identified Measures and Mitigation Measure 4.6-1a: Wetlands Assessment, Page 6-9.

The discussion in Section 4.5 indicates potentially significant impacts to groundwater resources in the vicinity of the New Irvington Tunnel project because construction of the existing Irvington Tunnel in the 1930's resulted in depletion of groundwater resources in the area (Impact 4.5-2). In addition, the text in Section 4.6 indicates that dewatering during the New Irvington Tunnel Project could alter surface water features thereby potentially impacting key special status species, such as the California red-legged frog and California tiger salamander.

We acknowledge and appreciate mitigation measures presented in Section 6.3. The measures to mitigate detrimental effects related to depletion of groundwater (Mitigation Measure 4.5-2) include taking an inventory of springs and wells in the area of the planned tunnel and conducting a project-specific analysis as part of the California Environmental Quality Act (CEQA) review process for the Irvington Tunnel Project. If a significant impact is identified in the project-specific CEQA review, measures such as altering groundwater withdrawal rates and/or providing alternate water supply for affected users will be implemented to mitigate impacts to groundwater resources and beneficial uses. To mitigate potential impacts to wetlands and aquatic features, a qualified wetland scientist will assess and delineate wetlands potentially occurring at project sites (Mitigation Measure 4.6-1a), and site-specific mitigation measures will be identified as part of the project-specific CEQA reviews (Mitigation Measure 4.6-1b). 06

In addition to Mitigation Measure 4.5-2, the PEIR mitigation measures should include evaluating indirect effects on aquatic and riparian habitat associated with lowering of groundwater levels. This should be accomplished by expanding Mitigation Measure 4.6-1a to include sensitive habitat in and around springs and creeks in the area around the New Irvington Tunnel Project. If potentially significant impacts to aquatic and/or riparian habitat are identified, then Mitigation Measure 4.6-1b should be used to (1) avoid the impact, (2) minimize unavoidable impacts, and (3) compensate for unavoidable impacts. The Water Board will review the use this three-step process when reviewing project impacts. We will also require appropriate mitigation for unavoidable impacts as part of project review. Please revise the PEIR to include a citation of the three-step review process described above and in Comment 11. 06 cont.

Comment 7
Section 4.5: Hydrology and Water Quality, Impact 4.5-3: Construction dewatering discharges to surface waters and construction related discharges of treated water, Pages 4.5-31 through 4.5-33.

The PEIR discloses that dewatering of groundwater will be required for projects requiring excavation below the groundwater table. The dewatered groundwater may contain sediments and contaminants that could degrade water quality. The text further explains that discharges of groundwater to surface water may be possible under the General Construction Permit. The PEIR should note that discharges of dewatered groundwater are possible under the General Construction Permit provided that it can be demonstrated that the water is uncontaminated. The PEIR further states that in the San Joaquin Region, the dewatering discharges may be performed in accordance with the General Order for Dewatering and Other Low Threat Discharges to Surface Waters, and for any discharge to land, it may be possible to perform the discharge in accordance with the State General Waste Discharge Requirements for Discharges to Land with a Low Threat to Surface Waters. The PEIR also acknowledges that an individual National Pollutant Discharge Elimination System (NPDES) permit, or a waiver, may be required. 07

The discussion of potential permits under which dewatered groundwater may be discharged should be expanded to include General Permits in the San Francisco Regions. These include the following General NPDES Permits:

- General NPDES Permit for VOC Cleanups (Order No. R2-2004-0055);
- General NPDES Permit for Fuel Cleanups (Order No. R2-2006-0075);
- General NPDES Permit for Groundwater Dewatering (Order No. R2-2006-0075).

Please note that before discharging under any general permit, the SFPUC must submit a completed Notice of Intent (NOI) that includes a dewatering plan with appropriate treatment and monitoring specifications. The SFPUC should also allow at least 60 days for Water Board review and acceptance of NOIs and dewatering plans.

Comment 8
Section 4.5: Hydrology and Water Quality, Impact 4.5-5: Degradation of water quality and increased flows due to discharges to surface water during operation, Crossover Facilities and Pipelines, Pages 4.5-41 through 4.5-49.

The text indicates that discharges of chlorinated and chloraminated water from crossover facilities and pipelines will occur in the Sunol Valley, Bay Division, Peninsula, and San Francisco Regions of the WSIP. The PEIR states that "These discharges would be dechlorinated or dechloraminated and would occur at a rate that would not cause erosion or downstream flooding." However, historical discharges from pipelines and crossover facilities have impacted water quality and beneficial uses despite BMPs to prevent adverse effects from these discharges. As a result, we recommend that the SFPUC evaluate the potential to plumb blow off valves, crossover facilities, and other potable water discharge locations to treatment plants and sanitary sewers, where feasible. 08

Comment 9
Section 4.5: Hydrology and Water Quality, Impact 4.5-6: Degradation of water quality as a result of alteration of drainage patterns or an increase in impervious surfaces, Pages 4.5-49 through 4.5-54.

The text indicates that projects in the Sunol Valley, Bay Division, Peninsula, and San Francisco Regions of the WSIP will result in increases or replacement of impervious surfaces. The text goes further to state that stormwater treatment is required for projects creating or replacing 10,000 square feet or more of impervious surface, but that this threshold only applies to specific projects and not to a cumulative set of projects such as the WSIP. However, this is only correct if the locations of a cumulative set of projects under a single program are noncontiguous, and/or are not part of a single common plan of development. As a result, the text should be revised to reflect that contiguous projects under WSIP will be required to meet this threshold. For instance, both the Additional 40-mgd Treated Water Supply (SV-3) and SVWTP-Treated Water Reservoirs (SV-5) projects will create new impervious surfaces and will occur at the Sunol Valley Water Treatment Plant. As a result, the 10,000 square foot threshold would apply to the cumulative area of new impervious surfaces created by these projects. Further, to the extent that projects are part of a single common plan of development that cumulatively exceeds 10,000 square feet of new or replaced impervious surface, the smaller amount of impervious surface from each sub-project would be require appropriately sized stormwater treatment BMPs. Appropriately sized treatment must be based on the following hydraulic design criteria: 09

Volume Hydraulic Design Basis: Treatment BMPs whose primary mode of action depends on volume capacity, such as detention/retention units or infiltration structures, shall be designed to treat stormwater runoff equal to:

1. the maximized stormwater quality capture volume for the area, based on historical rainfall records, determined using the formula and volume capture coefficients set forth in Urban Runoff Quality Management, WEF Manual of Practice No. 23/ ASCE Manual of Practice No. 87, (1998), pages 175-178 (e.g., approximately the 85th percentile 24-hour storm runoff event); or,
2. the volume of annual runoff required to achieve 80 percent or more capture, determined in accordance with the methodology set forth in Appendix D of the California Stormwater Best Management Practices Handbook, (1993), using local rainfall data.

Flow Hydraulic Design Basis: Treatment BMPs whose primary mode of action depends on flow capacity, such as swales, sand filters, or wetlands, shall be sized to treat:

1. 10% of the 50-year peak flow rate;
2. or the flow of runoff produced by a rain event equal to at least two times the 85th percentile hourly rainfall intensity for the applicable area, based on historical records of hourly rainfall depths; or, 09 cont.
3. the flow of runoff resulting from a rain event equal to at least 0.2 inches per hour intensity.

The text in Section 4.5 also states that projects disturbing more than 1 acre of land would be required to include post-construction erosion and sediment control BMPs in the SWPPP prepared for the project. Please also note that under the municipal stormwater permits, the post-construction erosion and sediment control BMPs for projects creating or replacing more than 1 acre of impervious surface must also comply with requirements in the Hydrograph Modification Management Plans for Alameda, Santa Clara, and San Mateo Counties.

We appreciate and acknowledge the watershed management actions pertaining to onsite stormwater collection and drainage systems. We are especially concerned that these actions continue in perpetuity (i.e. for the life of the system/facility) and are implemented at all SFPUC facilities, including, but not limited to, maintenance and access roads, corporation yards, and parking lots.

Comment 10
Section 4.6: Biological Resources. Impacts, Significance Criteria, Page 4.6-37.

The third bullet under the significance criteria for biological impacts should be expanded to include wetlands protected under the State of California's Porter-Cologne Water Quality Control Act. 10

Comment 11
Section 4.6: Biological Resources, Impact 4.6-1: Impacts on wetlands and aquatic resources, Page 4.6-43; and Section 6.3: Mitigation Measures to Minimize Facilities Impacts, Mitigation Measure 4.6-1a: Wetlands Assessment, and Mitigation Measure 4.6-1b: Compensation for Wetlands and Other Biological Resources, Pages 6-11 and 6-12.

The discussion of impacts to wetlands and aquatic resources in Section 4.6 discloses that impacts to wetlands are assumed to occur for all WSIP projects that involve surface disturbance. The PEIR should note that under the Porter-Cologne Act, waters of the State are defined as "any water, surface or underground, including saline waters, within the boundaries of the State." Based on this definition, the SF Basin Plan states that "Wetlands water quality control is therefore clearly within the jurisdiction of the State and Regional Boards." As a result, the Water Board has jurisdiction over wetlands of any type, including isolated wetlands under the Supreme Court's SWANCC and Rapanos decisions.

The PEIR proposes two measures to mitigate potential impacts to wetlands and aquatic features. First, a qualified wetland scientist will assess and delineate wetlands potentially occurring at project sites (Mitigation Measure 4.6-1a). Second, site-specific mitigation measures will be identified as part of the project-specific CEQA reviews (Mitigation Measure 4.6-1b). Mitigation Measure 4.6-1b states that when a WSIP project will affect jurisdictional wetlands, the SFPUC will implement avoidance 11
measures, restoration procedures, and compensatory creation or enhancement.

We wish to emphasize that all wetlands are within the Water Board's jurisdiction. To protect wetlands, the Water Board adopted U.S. EPA's Section 404(b)(1), "Guidelines for Specification of Disposal Sites for Dredge or Fill Material," dated December 24, 1980, in the SF Basin Plan for determining the circumstance under which filling of wetlands, streams or other waters of the State may be permitted. Section 404(b)(1) Guidelines prohibit all discharges of fill material into regulated waters of the United States, unless a discharge, as proposed, constitutes the least environmentally damaging practicable alternative that will achieve the basic project purpose.

The Guidelines sequence the order in which proposals should be approached: (1) Avoid - avoid impacts to waters; (2) Minimize - modify project to minimize impacts to waters; and, (3) Mitigate – once impacts have been fully minimized, compensate for unavoidable impacts to waters. When it is not possible to avoid impacts to water bodies, disturbance should be minimized. Mitigation for lost water body acreage and functions through restoration or creation should only be considered after disturbance has been minimized. Where impacts cannot be avoided, the creation of adequate mitigation habitat to compensate for the loss of water body acreage, functions and values must be provided.

As a result, the SFPUC will be required to obtain appropriate approvals from the Water Board for wetland fill. Applications for these approvals must demonstrate to the Water Board that impacts to wetlands have been avoided and minimized to the maximum extent practicable before considering compensation measures. Mitigation Measure 4.6-1b should be expanded to reflect this by stating that measures will be implemented to minimize unavoidable impacts to wetlands before implementing restoration, enhancement, or creation activities. 11 cont.

Cumulative and indirect impacts to wetlands must also be prevented. Indirect impacts include: deposition of sediments; erosion of substratum; additional water (flooding); reduced water supply or flows; creating a condition of pollution; shading; and, watershed degradation.

Comment 12
Section 4.6: Biological Resources, Impact 4.6-1: Impacts on wetlands and aquatic resources, Page 4.6-43.

The PEIR should note that the discussion of potential changes to jurisdictional determinations pending outcomes of recent federal court cases only pertains to federal jurisdiction under the CWA. State jurisdiction under the Porter-Cologne Act will not be affected by the pending outcomes of recent federal court cases and has not been affected by earlier decisions, such as the Tulloch, SWANCC, and Rapanos decisions. To regulate impacts to waters of the State that are outside federal jurisdiction, the Water Board may issue either individual or general WDRs. 12

Comment 13
Section 5.2: Plans and Policies, Federal Statutes and Agreements, Clean Water Act, Page 5.2-6.

The discussion of the CWA includes requirements under Section 404 of the Act; however, requirements under Section 401 of CWA were not provided in this discussion. Under Section 401 of CWA, every applicant for a federal permit or license for any activity which may result in a discharge to a water body must obtain State Water Quality Certification (Certification) that the proposed activity will comply with state water quality standards. Most Certifications are issued in connection with CWA Section 404 permits for dredge and fill discharges. Please revise the discussion of the CWA in Section 5.2 to include requirements under Section 401 of the CWA. 13

Comment 14
Section 5.4: Alameda Creek Watershed Streams and Reservoirs, Subsection 5.4.2: Geomorphology, Impact 5.4.2-1: Effects on channel formation and sediment transport along Calaveras Creek, and Impact 5.4.2-2: Effects on channel formation and sediment transport along Alameda Creek downstream of diversion dam, Pages 5.4.2-1 through 5.4.2-4.

The description of geomorphology and sediment transport characteristics beginning on Page 5.4.2-1 should include a discussion of Luna Leopold's effective work concept, particularly as modified by GeoSyntech's recent work on creeks dominated by fine grained sediment (GeoSyntech 2002). This concept suggests that relatively frequent moderate flows cumulatively transport a large proportion of total sediment in streams and control channel stability, or instability. Even low flows (less than 60 percent of bankfull) were found to mobilize fine grained bed material although bulk gravels were undisturbed (Carling 1987 as cited in GeoSyntech 2002). Furthermore, sediment load, particle size range, input timing and mechanisms, and longitudinal distribution were all determined to be important in the development of geomorphic surfaces and instream deposits, both of which serve as the foundation for riparian and aquatic habitat. As a result, a change in either the discharge or sediment load may initiate adjustments to channel morphology that impact the beneficial uses of the stream.

The text on page 5.4.2-2 states that the SFPUC will discharge about 900 cubic yards per year of sediment accumulated behind the Alameda Creek Diversion Dam. In addition, there are significant and unmitigatable effects on stream flow along Alameda Creek between the diversion dam and the Calaveras Creek confluence (Impact 5.4.1-2). Specifically, flows above 650 cubic feet per second (cfs) will be significantly reduced, and flows below 650 cfs will be virtually eliminated. As a result, flows occurring during major storms will resemble flows currently occurring during small storms and flows during small storms will be virtually nonexistent. The overall effect will be to reduce the frequency of low and moderate flows (i.e. flows currently associated with small storms will only occur during major storms) while eliminating high flows (i.e. flows currently associated with major storms will not occur). Changes in both the timing of sediment input and water flows have the potential to impact channel shape and sediment transport along Alameda Creek downstream of the diversion dam (Impact 5.4.2-2). 14

The text on pages 5.4.1-19 through 5.4.1-25 indicates that there will be changes in the timing and magnitude of flows as a result of the WSIP. Reduced winter flows would occur in years with above average rainfall. New instream fishery releases would increase flows in summer months. We support fisheries releases; however, it is important that these releases as well as other operational changes be performed in a manner that does not result in detrimental impacts to stream geomorphology.

The evaluation of effects on channel formation and sediment transport along Calaveras Creek and along Alameda Creek downstream of the diversion dam (Impacts 5.4.2-1 and 5.4.2-2) should be revised to include an assessment of the expected effects on stream geomorphology resulting from changes in frequency, magnitude and duration of low, moderate and high flows, and the timing of sediment inputs. To account for the cumulative effect of small and moderate flows, continuous modeling over a period of record rather than focusing on a particular return period flow (e.g. 3.5-year flow) should be used for this assessment. Please incorporate continuous modeling into the impact assessment in the PEIR, or include it as a mitigation requirement in the PEIR. 14 cont.

Reference:

GeoSyntec Consultants. 2002. Hydromodification Management Plan Literature Review, Santa Clara Valley Urban Runoff Pollution Prevention Program. (A compact disc with an electronic copy of this literature review is enclosed.)

Comment 15

Section 5.4: Alameda Creek Watershed Streams and Reservoirs, Subsection 5.4.3: Surface Water Quality, Impact 5.4.3-3: Effects on water quality along Calaveras, San Antonio, and Alameda Creeks, Alameda Creek-Reach 1, Page 5.4.3-11.

The text on page 5.4.2-2 states that the SFPUC will discharge about 900 cubic yards per year of sediment accumulated behind the Alameda Creek Diversion Dam. Releasing this sediment though sluice gates has the potential to impact the water quality downstream of this discharge. However, the PEIR does not include an evaluation of potential water quality impacts associated with the sluicing of sediment from behind the diversion dam. It also does not indicate whether the sediment is expected to be released in a single event or multiple events. As a result, the PEIR should be revised to include an assessment of potential impacts on beneficial uses and/or water quality as a result of releasing sediment. This assessment should, at a minimum, include; (1) the expected frequency, magnitude, and timing of sediment releases; (2) any associated changes in total dissolved solids (TDS) and/or turbidity; (3) the expected fate and transport of the sediment; and (4) any associated changes in benthic macroinvertebrate or fish spawning habitat. Sediment discharges that have the potential to exceed WQOs in the SF Basin Plan should be considered significant impacts. The following WQOs should be considered in the assessment: 15

- **TDS in the Alameda Creek Watershed above Niles:**
  - 250 milligrams per liter (mg/l) (90 day-arithmetic mean)
  - 360 mg/l (90 day-90th percentile)
  - 500 mg/l (daily maximum)

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- **Sediment:** The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses. The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses.

  Controllable water quality factors shall not cause a detrimental increase in the concentrations of toxic pollutants in sediments or aquatic life.

- **Settable Material:** Waters shall not contain substances in concentrations that result in the deposition of material that cause nuisance or adversely affect beneficial uses.

- **Suspended Material:** Waters shall not contain suspended material in concentrations that cause nuisance or adversely affect beneficial uses. 15 cont.

- **Turbidity**: Waters shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses. Increases from normal background light penetration or turbidity relatable to waste discharge shall not be greater than 10 percent in areas where natural turbidity is greater than 50 NTU.

Adverse effects on beneficial uses would include, but are not limited to, clogging of spawning beds with fine grained sediment, and covering of benthic macroinvertebrate habitat with excessive sediment.

If the evaluation identifies significant impacts to beneficial uses and/or water quality, mitigation for these impacts must be developed and proposed. Mitigation may include operational changes that modify the frequency in which sediment is sluiced from behind the dam or modify the frequency and duration of water diversions, or changes in sediment management that could preclude the current sediment discharge method.

Comment 16

Section 5.7: Cumulative Projects and Impacts Related to WSIP Water Supply and System operations, Subsection 5.7.6 Climate Change and Global Warming, Pages 5.7-92 through 5.7-97.

The discussion on climate change in Section 5.7 evaluates effects from reductions in annual snowpack, increased precipitation in the form of rain, and shifts in seasonal precipitation. We acknowledge and appreciate the difficulty in assessing impacts related to climate change because of the uncertainty associated with the models. However, the discussion on climate change should be expanded to include a discussion of potential effects resulting from changes in the frequency and duration of extreme climatic events, such as droughts and flood events. 16

California Environmental Protection Agency
Recycled Paper

The projections by the Intergovernmental Panel on Climate Change (IPCC) summarized indicate that more intense precipitation and drought events are likely to occur in the 21st century. These predictions are summarized in Table 9.6 of Climate Change 2001: The Scientific Basis (http://www.grida.no/climate/ipcc_tar/wg1/pdf/TAR-09.PDF). On Page 891 in Climate Change 2007: The Physical Science Basis, the IPCC's review of regional climate models also found increases in extreme temperature events in California, prolonged hot spells and increased diurnal temperature range (http://ipcc-wg1.ucar.edu/wg1/Report/AR4WG1_Print_Ch11.pdf). Although there is no clear scientific consensus on the quantification of these extreme events, a qualitative assessment acknowledging the uncertainties in climate models should be performed to evaluate whether changes in operations will exacerbate adverse effects associated with extreme climatic events. 16 cont.

Closing
Please contact Xavier Fernandez at 510-622-5685 or xafernandez@waterboards.ca.gov with any questions or comments.

Sincerely,

Keith H. Lichten, P.E.
Senior Engineer

Enc: Hydromodification Management Plan Literature Review, Santa Clara Valley Pollution Prevention Program

Cc: Mr. Robert Smith, USACE
Mr. Dan Wilson, CDFG
Mr. Michael Monroe, EPA
Mr. Ryan Olah, FWS

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Interagency Permitting Task Force Contact List

Name	Agency	Address	Telephone Number/E-Mail
Robert F. Smith	U.S. Army Corps of Engineers	1455 Market Street, SPNOR-R San Francisco, CA 94103-1398	415-503-6792/ robert.f.smith@usace.army.mil
Ryan Olah	U.S. Fish and Wildlife Service Chief, Coast Bay Delta Branch	2800 Cottage Way W-2605 Sacramento, CA 95825	916-414-6623 Ryan_Olah@fws.gov
Mike Monroe	U.S. Environmental Protection Agency	75 Hawthorne Street San Francisco, CA 94105	415-972-3453 Monroe.Michael@epa.gov
Dan Wilson	California Department of Fish and Game	P.O. Box 47 Yountville, CA 94599	707-944-5534 Dwilson@dfg.ca.gov

12.3 Local and Regional Agencies

LOCAL AND REGIONAL AGENCIES

LOCAL AND REGIONAL AGENCIES THAT SUBMITTED COMMENTS ON THE DRAFT PEIR

Comment Letter Format	Comment Letter ID	Name of Commenter	Title	Organization/ Affiliation	Page
Mail	L_ACCDA	Bruce Jensen	Senior Planner	Alameda County Community Development Agency	12.3-1
Email	L_ACFCWCD	Kwablah Attiogbe	Environmental Services	Alameda County Flood Control and Water Conservation District	12.3-2
Mail	L_ACWD	Paul Piraino	General Manager	Alameda County Water District	12.3-9
Email	L_BAWSCA1	Arthur Jensen	General Manager	Bay Area Water Supply and Conservation Agency	12.3-18
Hand-delivered, PH	L_BAWSCA2	Arthur Jensen	General Manager	Bay Area Water Supply and Conservation Agency	12.3-94
PH Sonora	L_BAWSCA3	Nicole Sandkulla	Senior Water Resources Engineer	Bay Area Water Supply and Conservation Agency	12.6-9
PH Modesto	L_BAWSCA4	Nicole Sandkulla	Senior Water Resources Engineer	Bay Area Water Supply and Conservation Agency	12.6-33
PH SF1	L_BAWSCA5	Steven Miller	Lawyer	Bay Area Water Supply and Conservation Agency	12.6-87
PH SF2	L_BAWSCA6	Arthur Jensen	General Manager	Bay Area Water Supply and Conservation Agency	12.6-125
Mail	L_BCDC	Sara Polgar	Planner	San Francisco Bay Conservation and Development Commission	12.3-97
Mail	L_Brisbane	Randy Breault	Director of Public Works	City of Brisbane	12.3-98
Mail	L_Burlgme	Syed Murtuza	Director of Public Works	City of Burlingame Public Works Department	12.3-100

LOCAL AND REGIONAL AGENCIES THAT SUBMITTED COMMENTS ON THE DRAFT PEIR (Continued)

Comment Letter Format	Comment Letter ID	Name of Commenter	Title	Organization/ Affiliation	Page
Mail	L_CalWater	Thomas Salzano	Water Resources Planning Supervisor	California Water Service Company	12.3-101
Mail	L_CCWD	Leah Orloff	Senior Water Resources Specialist	Contra Costa Water District	12.3-102
Email	L_CoastsideCWD	Joe Guistino / Cathleen Brennan	Interim General Manager / Water Resources Analyst	Coastside County Water District	12.3-103
Mail	L_DalyCty	Patricia Martel	City Manager	City of Daly City	12.3-109
Mail	L_DSRSD	Bert Michalczyk	General Manager	Dublin San Ramon Services District	12.3-116
Mail	L_EBMUD	William Kirkpatrick	Manager of Water Distribution Planning	East Bay Municipal Utility District	12.3-117
Mail	L_EBRPD	Chris Barton	Senior Planner	East Bay Regional Park District	12.3-118
Mail	L_FosterCty	Ramon Towne	Director of Public Works	City of Foster City	12.3-122
Email	L_Fremont	Rene Dalton		City of Fremont, Transportation and Operations Department	12.3-123
Mail	L_Hayward	Robert Bauman	Director of Public Works	City of Hayward Department of Public Works	12.3-124
Mail	L_Hillsb	Cyrus Kianpour	City Engineer	Town of Hillsborough	12.3-130
Mail	L_LAHCFD	Dorothy Price	President	Los Altos Hills County Fire District	12.3-133
Mail	L_LosAltosH	Craig Jones	Mayor	Town of Los Altos Hills	12.3-134
Email	L_Menlo1	Kent Steffens	Director of Public Works	City of Menlo Park	12.3-135
PH Fremont	L_Menlo2	Kirsten Keith	Employee	Menlo Park Planning Commission	12.6-55
PH Palo Alto	L_Menlo3	Kelly Fergusson	Mayor	City of Menlo Park	12.6-80
PH Modesto	L_MID	Walt Ward	President of the Board of Directors	Modesto Irrigation District	12.6-40
Email	L_MID-TID1	Walter Ward / Robert Nees	Assistant General Manager / Assistant General Manager	Modesto Irrigation District / Turlock Irrigation District	12.3-141

LOCAL AND REGIONAL AGENCIES THAT SUBMITTED COMMENTS ON THE DRAFT PEIR (Continued)

Comment Letter Format	Comment Letter ID	Name of Commenter	Title	Organization/ Affiliation	Page
Mail	L_MID-TID2	Walter Ward / Robert Nees	Assistant General Manager / Assistant General Manager	Modesto Irrigation District / Turlock Irrigation District	12.3-148
Mail	L_Millbr	Ronald Popp	Director of Public Works	City of Millbrae	12.3-148
Mail	L_Milpts	Thomas Williams	City Manager	City of Milpitas	12.3-149
Mail	L_MtnVw	Cathy Lazarus	Public Works Director	City of Mountain View	12.3-153
Email	L_Newark	John Becker	City Manager	City of Newark	12.3-154
Mail	L_PaloAlto	Yoriko Kishimoto	Mayor	City of Palo Alto	12.3-154
Mail	L_PHWD1	Daniel Seidel	President	Purissima Hills Water District	12.3-158
PH Palo Alto	L_PHWD2	Daniel Seidel	President	Purissima Hills Water District	12.6-70
Mail	L_RdwdCty	Peter Ingram (sent by Chu Chang)	Community Development Services Director	Redwood City	12.3-160
Mail	L_SanJose	Mansour Nasser	Deputy Director, Water Resources Division	City of San Jose	12.3-161
Email	L_SBruno	Barbara A. Brenner	Stoel Rives, Attorney at Law	City of San Bruno	12.3-164
Email	L_SClara1	Gloria Sciara	Development Review Officer	City of Santa Clara Planning Division	12.3-166
Mail	L_SClara2	Robin Saunders	Director of Water and Sewer Utility	City of Santa Clara Water and Sewer Utilities	12.3-167
Mail	L_SCVWD1	Keith Whitman	Deputy Operation Officer	Santa Clara Valley Water District, Water Supply Management Division	12.3-171
PH Palo Alto	L_SCVWD2	Amy Fowler	Staff Member	Santa Clara Valley Water District	12.6-73
Mail	L_SFBayTrl	Laura Thompson	Project Manager	San Francisco Bay Trail	12.3-172
PH SF1	L_SFCPC1	Christina Olague	Commissioner	San Francisco City Planning Commission	12.6-102
PH SF1	L_SFCPC2	Michael Antonini	Commissioner	San Francisco City Planning Commission	12.6-103

LOCAL AND REGIONAL AGENCIES THAT SUBMITTED COMMENTS ON THE DRAFT PEIR (Continued)

Comment Letter Format	Comment Letter ID	Name of Commenter	Title	Organization/ Affiliation	Page
PH SF1	L_SFCPC3	Kathrin Moore	Commissioner	San Francisco City Planning Commission	12.6-104
PH SF2	L_SFCPC4	Kathrin Moore	Commissioner	San Francisco City Planning Commission	12.6-121
PH SF2	L_SFCPC5	Michael Antonini	Commissioner	San Francisco City Planning Commission	12.6-121
Email	L_SFLandmarks	Robert Cherny	Vice President	Landmarks Preservation Advisory Board	12.3-173
Mail	L_SJVAPCD	Arnaud Marjollet	Permit Services Manager	San Joaquin Valley Air Pollution Control District	12.3-174
Mail	L_SLDWWKC	Daniel Nelson, Thomas W. Birmingham, and James Beck	Executive Director, General Manager, and General Manager	San Luis & Delta-Mendota Water Authority, Westlands Water District, and Kern County Water Agency	12.3-175
Email	L_Snnyvl	Jamie McLeod / James Craig	Associate Planner / Superintendent of Field Services	City of Sunnyvale	12.3-184
Mail	L_StanCoERC	Raul Mendez	Senior Management Consultant	Stanislaus County Environmental Review Committee	12.3-186
Email	L_Stanford	Clifford (Mike) Goff	Director of Utilities	Stanford University	12.3-187
Email	L_TCCC	George Segarini	President & CEO	Tuolumne County Chamber of Commerce	12.3-190
Email	L_TUD1	Peter J. Kampa	General Manager	Tuolumne Utilities District	12.3-190
Mail	L_TUD2	Barbara Balen	Board President	Tuolumne Utilities District	12.3-192
PH Sonora	L_TUD3	Peter J. Kampa	General Manager	Tuolumne Utilities District	12.6-17
Mail	L_Tuol1	Mark Thornton	Chairman, Tuolumne County Board of Supervisors	Tuolumne County	12.3-193
Email	L_Tuol2	Mark Thornton	District 4 Supervisor, Tuolumne County	Tuolumne County	12.3-197
Mail	L_Zone7	G.F. Duerig	General Manager	Alameda County Flood Control and Water Conservation District, Zone 7	12.3-198

ALAMEDA COUNTY COMMUNITY DEVELOPMENT AGENCY
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CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
M E A

October 15, 2007

Environmental Review Officer, WSIP PEIR
1650 Mission Street, Suite 400
San Francisco, CA 94103

Re: San Francisco Water System Improvement Program (WSIP) – County of Alameda General Comments on the Program and Program Environmental Impact Report (PEIR)

Dear Environmental Review Officer:

Alameda County Community Development Agency (CDA) staff have reviewed the available information for the proposed WSIP. The WSIP, if approved, would result in significant and necessary changes to the water treatment and delivery system that provides San Francisco and numerous Bay Area communities with a dependable source of high-quality water for all applications. The program would include upgrades to pipelines, aqueducts and water treatment facilities at many locations along the route from the Hetch Hetchy Reservoir to the service area, which includes local customers in four different counties.

Upon review by the County, the PEIR appears to be accurate in its description of possible environmental impacts. Impacts to land use, visual quality, biology, traffic and transportation, air quality and noise are identified, and where possible, mitigation measures are identified to reduce the levels of significance for the impacts. Where impacts cannot be mitigated, the PEIR identifies these as unavoidable impacts, for which Findings of Overriding Consideration would need to be adopted. Alameda County staff concurs with these analyses. 01

A significant portion of the program pertains to the water delivery route that crosses lands in unincorporated Alameda County, along the Hetch Hetchy Aqueduct. The program includes a number of improvements to portions of the system in eastern Alameda County from the eastern County boundary, across the Livermore Valley, across and through the coast ranges, through the Sunol Valley and on to the boundary with the City of Fremont. The program would largely affect facilities and lands currently owned and operated by the City of San Francisco for the purposes of water delivery and treatment; however, in some cases, lands not currently owned by San Francisco would need to be utilized in order to effect the improvements specified in the WSIP. 02

The lands owned by the City of San Francisco, in most cases, are designated for land use by the County of Alameda General Plan (the *East County Area Plan*, [ECAP], as amended, May, 2002) for Water Management (WM), while the private lands along the route are designated for either Large Parcel Agricultural (LPA) or Resource Management (RM). While these land use designations generally permit the presence and construction of necessary infrastructure, the ECAP also has a number of other issue-specific policies related to land use, biology, visual resources, growth-inducement, and other critical issues. Wherever the program would result in construction or modified operational activities on any of these lands, the SFPUC must apply to the County of Alameda for a Finding of General Plan Conformance under the State of California Government Code, Section 65402.

12.3-1

In addition, for any specific projects under the WSIP that would result in construction or operation on privately-owned lands within the unincorporated area of Alameda County, the SFPUC and/or landowner would need to apply to the County for either a Conditional Use Permit (CUP, for permanent program features or major activities that would last longer than six [6] months, or an Administrative CUP (for temporary or minor activities that would last less than six [6] months) (Reference Alameda County General Ordinance Code, Title 17, Zoning, Section 17.06.040, Conditional uses - Board of zoning adjustments, Paragraph J.). 02 cont.

Each of these matters would need to be addressed on a project-by-project basis.

The program also includes descriptions of projects that would be implemented in the Sunol Valley, on or near lands that may currently be under Alameda County Surface Mining Permits (SMPs), and possibly also on lands for which the State of California has determined include Regionally Significant Construction Aggregate Resources (RSCAR). The Hetch Hetchy Aqueduct route itself, as it currently exists, has been excluded from this designation; however, it is bounded on both sides by lands bearing the State RSCAR designation as it crosses the Sunol Valley floor.

If any project of the WSIP would include significant alterations to the pattern of mining currently being conducted under existing County SMPs, revisions to those SMPs and associated reclamation plans may be necessary under the County Surface Mining Ordinance (SMO), with possible review by the State Department of Conservation, Division of Mined Land Reclamation. These matters would also need to be addressed on a project-by-project basis. 03

Similarly, if any project constructed or use implemented pursuant to the WSIP would threaten the potential to extract any minerals in an area designated as a RSCAR, then under State Public Resources Code, Division 2, Chapter 9 (Surface Mining and Reclamation Act, SMARA), Sections 2762 and/or 2763, the lead agency would be required to initiate a duly noticed public process, wherein a statement is prepared specifying reasons why the new use would be permitted, that statement also being submitted to the State Geologist for review and comment. These matters would also need to be addressed on a project-by-project basis.

This concludes our comments on the WSIP. If you have any questions, please do not hesitate to contact me at (510) 670-6527 or at bruce.jensen@acgov.org.

Sincerely,

Bruce Jensen
Senior Planner,
Alameda County Planning Department

COUNTY OF ALAMEDA
PUBLIC WORKS AGENCY
399 Elmhurst Street • Hayward, CA 94544-1307
(510) 670-5480

October 1, 2007

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CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
M E A

Mr. Paul Maltzer
Environmental Review Officer, WSIP PEIR
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103
E-mail: wsip.peir.comments@gmail.com
Facsimile: 415.558.6409
Telephone: 415.558.6377

Dear Mr. Maltzer:

Subject: Comments on Draft Program Environmental Impact Report (Draft PEIR) for the San Francisco Public Utilities Commission's Water System Improvement Program (WSIP) Case # 2005.0159E SCH#200509026

The Alameda County Flood Control and Water Conservation District (District) has reviewed the City's Environmental Impact Report entitled: *Draft Program Environmental Impact Report (dPEIR) For the San Francisco Public Utilities Commission's proposed Water System Improvement Program (WSIP).*

Below are the District's comments on the dPEIR. The comments are in two categories: General and Specific. The general comments are followed by specific statements from the dPEIR. Each specific statement is followed by District comments *italicized.*

General District Comments

1. *Throughout the dPEIR, please provide temperature measurements in both degrees, Celsius (ºC) as well as in degrees Fahrenheit (ºF), or include in your conversion factors.* 01

2. *On July 31, 2007, the Alameda County Flood Control and Water Conservation District and the Alameda County Water District entered into an Agreement to design a fish passage facility over the BART weir and middle inflatable dam in the Alameda Creek Flood Control Channel. This is a logical step in the 10-year effort (in which the SFPUC has participated) to improve steelhead passage and habitat throughout the Alameda Creek watershed. The* 02

NOP for the improvement of the BART weir and middle inflatable dam for fish passage will be circulated by December 2007. 02 cont.

3. *Prior to circulating the NOP for this dPEIR, the District, in accordance with Sections 21104 and 21153(a), provided a list of programmed projects which included the improvements to the BART weir for fish to your environmental consultants in December 2006. None of the projects on the list were considered in preparing this dPEIR. There are significant implications of your project on lower Alameda Creek. For example:* 03

- *Additional diversion of flows from Alameda Creek by up to 50% will further hinder the ability of steelhead to navigate through the lower reaches of the creek. Lower flows in the channel would result in higher water temperature and increased mortality. These direct impacts ("take" under Section 9 of the Endangered Species Act (ESA)) require thorough discussion to quantify the level of the obvious impacts and appropriately mitigated. Additional diversions will effectively eliminate anadromous species reestablishment anywhere in the watershed. This diversion of flows is inconsistent with the SFPUC's fish habitat improvement rationale for removal of the Sunol and Niles dams.* 04

- *The assertion in the NOP for this dPEIR was that "big picture" concept would be addressed. To this end, the effects of the project in light of climate change, including global warming, on the threatened species was inadequately addressed.* 05

- *Since 1997, multiple stakeholders, including the SFPUC, have spent countless resources to determine how best to enhance steelhead runs and improve steelhead habitat throughout the Alameda Creek watershed. To stress in the dPEIR that there is no steelhead habitat above the BART weir is erroneous and contrary to SFPUC's participation in the Alameda Creek Fisheries Workgroup effort to restore steelhead in this watershed.*

- *Upstream habitat has been compromised by diversion of flows into reservoirs. This is one of the principal reasons that the Central California Coast ESU became listed as threatened by USFWS in 1997. The BART weir is only a barrier to upstream migration precisely because there are insufficient flows through that corridor! Besides, the species is known for its persistency to navigate over structures higher than the BART weir, and there have been periodic sightings of the species upstream of the BART weir. The flows necessary during critical period to get to the spawning grounds are missing!* 06

- *The dPEIR uses of hypothetical scenarios to support no impacts to steelhead are flawed and misleading and renders the dPEIR inadequate. Please revise the dPEIR to address the potential "take" of Onchorynchus mykiss under Section 9 of the ESA and provide appropriate mitigation for these impacts.*

4. *The proposed increased diversions of flows from Alameda Creek will further subject steelhead to greater stress and possibly lead to the extinction of the species in this watershed! The District recommends that SFPUC scale back flow diversions to levels below*

the current rate of diversion to support and improve the habitat of the threatened steelhead species. SFPUC should emphasize conservation measures which are on par with 21st century technologies and comply with current environmental laws and regulations.

5. *SFPUC diverts 86% of surface runoff from Upper Alameda Creek watershed above Sunol Valley (specifically San Antonio and Arroyo Hondo tributaries), yet impacts to steelhead are not addressed in the dPEIR. A reason the species was listed by USFWS includes habitat destruction due to a lack of sufficient flows. In 2006, SFPUC removed two (2) barriers to improve the habitat. Construction of a fish passage structure over the BART weir and the middle inflatable dam are scheduled for 2010. The dPEIR failed to discuss effects of the proposed additional diversion of flows on these known projects in accordance with CEQA Sections 15065 (a) and (b) and 15130, and Sections 9 and 10 of the ESA. Furthermore, how would this increased flow diversion rate affect emergency response downstream?*

6. *It appears that much of the discussion in the dPEIR is focused on the BART weir. The fact is steelhead habitat currently exists within the project limits and is independent of the BART weir. This obvious omission renders the dPEIR incomplete requiring major rewrite and re-circulation in accordance with Public Resources Code, Section 21064.5; 21080 subd(c)(2); and CEQA guidelines 15070 subd.(b)(1).* 06 cont.

7. *Location of the SV-2 Alameda Creek Fishery Enhancement Project should be identified on a map. If there are no steelhead (I presume this is the species in question), why enhancement? To be consistent with the "big picture" as stated in the NOP, an explanation is warranted and any impact identified should be mitigated and the dPEIR re-circulated for public comments.*

8. *The flows suggested to be released from Calaveras Reservoir under the Alameda Creek Fisheries Enhancement Project (SV-2) should be available for steelhead below the proposed recapture facility; otherwise, it would impair steelhead upstream migration further downstream.*

9. *The justification for increased water diversions from Alameda Creek is seriously flawed because there is no rationale for using an older 2000 ABAG data for the demand analysis when more recent 2005 ABAG data that demonstrates less water use needs exists.* 07 *Additionally, why was water use efficiency not adequately reviewed and analyzed? Why was no use analysis performed? Emphasis on aggressive recycling and conservation would negate the need for additional water diversion from Alameda Creek. Please revisit your analysis using the most current data and appropriately address the impacts and re-circulate the revised dPEIR for public comments.* 08

10. *The fact that the SFPUC has failed to address steelhead in the Calaveras Dam replacement project in this dPEIR to provide a context for the "big picture" is a serious inadequacy of the dPEIR. The SFPUC has been an active member of the Alameda Creek Fisheries Workgroup* 09

since its inception. There is, therefore, no rational basis for not acknowledging or not knowing that anadromous steelhead exists above the BART weir on SFPUC lands! 09 cont.

11. *Existing SFPUC water pipelines that cross District Channel and creek inverts create hydraulic constriction and flooding potential upstream of the crossings. There is potential liability associated with said crossings. The District requests that none of the proposed pipelines crosses the District's facilities at any elevation above the invert bottom. Furthermore, any such crossings must provide a minimum of 3 ft clearance from the inverts bottom.* 10

12. *The proposed reservoir releases into Flood Control facilities would result in significant impact on the downstream segments of Alameda Creek. It is critical that Flood Control District be notified and agreed with the proposed SFPUC release protocols for both Calaveras and San Antonio dams.* 11

13. *Based on the general comments above, please change the following Initial Study checklist items:* 12

 Transportation and Circulation
 (a) Change from Less than Significant to Potentially Significant.

 Biological Resources
 (a, b, c, d) Change from Less than Significant to Potentially Significant.

 Hydrology and Water Quality
 b) and c) Change from Less than Significant to Potentially Significant.

Specific District Comments

The following Specific Comments are based principally on dPEIR discussions on sections of the WSIP in within Alameda County. The relevant section is identified (where possible) and the text is identified and followed by the District's comment in *italics*.

Statement

On page one of NOP, it states, "The PEIR will address the "big picture" issues (including the program's growth inducement potential and the associated secondary effects of growth, cumulative effects, system tradeoffs, and program alternatives) and will identify programmatic mitigation measures." 13

District Comment

An important missing aspect of the "big picture" in the dPEIR is the discussion of the federally listed species Oncorhynchus mykiss. Even if SFPUC is planning to undertake individual project level CEQA review sometime in the future (subsequent EIR), the "big *picture" now requires discussion of all the known impacts of the WSIP. How can a thorough evaluation of the project impact in a subsequent EIR be accomplished if it is not acknowledged in the programmed EIR, especially an obvious impact such as flow diversion on the threatened steelhead?*

SFPUC has been a major player in the effort to restore steelhead to the watershed. In fact, in 2006, Sunol and Niles dams were removed to enhance fish habitat as SFPUC General Manager, Susan Leal, proclaimed in a press release dated September 19, 2006:

> *"The removal of these dams demonstrates our commitment to restoring steelhead on the Alameda Creek even as we work to rebuild the seismically vulnerable Calaveras Dam…."*
>
> *And SFPUC's Natural Resources Division Manager, Tim Ramirez, also stated:*
>
> *"This is an exciting time for those of us who care about Alameda Creek and steelhead restoration… we are working collaboratively with environmental groups, state and federal agencies and other water agencies to work towards the common goal of restoration of fish populations in Alameda Creek."*

What has happened to these pronouncements? How can the dPEIR then dismiss the effects of the WSIP on the restoration of steelhead in the Alameda Creek Watershed? 13 cont.

12.3-4

Statement

On page 20, 3.1, Program EIR Level of Analysis, it states: "According to the CEQA Guidelines, Section 15168, a program EIR is one type of environmental review document that may be used to evaluate a plan or program that has multiple components (projects and actions) or to address a series of actions that are related."

District Comment

This statement in the NOP set the tone for the preparation of the dPEIR. However, the dPEIR failed to adequately address the effects of the WSIP in accordance to the following bullets from the NOP:

- *"• Provide for a more exhaustive consideration of effects and alternatives than would be practical in an EIR on an individual action"*
- *"• Ensure consideration of cumulative impacts that might not be evident in a case-by-case or project-by-project analysis"*

The dPEIR is not exhaustive and fails to acknowledge and consider the effects of the project on steelhead, a federally listed species. In 2006, SFPUC removed two dams within the watershed. The reason provided for the removal was to improve steelhead habitat. What has happened within a year to dismiss the species outright from the watershed? How does the SFPUC, a 10-year partner on steelhead restoration effort in

the Alameda Creek Watershed, reconcile the dismissive language in the dPEIR with the pronouncements by the General Manager and Natural Resources Manager of SFPUC? The dPEIR is inadequate and needs major work per Section 15168(c)(5) of CEQA.

Statement

On page S-67, the dPEIR states, "Reduced winter and spring flows in Alameda Creek above the BART weir would limit migration and spawning if steelhead were to gain access upstream."

District Comment

This statement is hypothetical and misleading. Reduced flows during winter and spring may be due to drought conditions or excessive diversion of water from the creek. By limiting the statement to a specific hypothetical scenario, the statement is at best confusing, misleading, and minimizes the significance of the upper watershed for full steelhead recovery. Indeed it ignores one of the reasons (habitat loss) the Central California Coast Steelhead ESU was listed "threatened" under Sections 9 and 10 of the Endangered Species Act. Please revise the statement to read: <u>Normal or enhanced winter and spring flows in Alameda Creek above the BART weir (highly regulated by SFPUC and DWR) would increase migration and spawning opportunities for steelhead</u>. By revising the statement, the impacts associated with the current and proposed increased diversion rates becomes clear. 13 cont.

Statement

On page 5.4.1-4, the dPEIR states, "In 2006, the SFPUC completed removal of the Sunol and Niles Dams as part of an effort to restore creek flows and fish habitat along this reach of Alameda Creek…"

District Comment

The District supports the effort to "restore creek flows and native habitat for threatened steelhead." Sunol and Niles dams removal for restoring steelhead habitat was a major step in the long effort to restore a viable steelhead fishery in the watershed. Statements elsewhere in the dPEIR contradict this stated purpose and would cause significant singular and cumulative impacts to the species and defeat the 10-year effort by the Alameda Creek Fisheries Workgroup to restore habitat, improve access, and remove barriers throughout the watershed. The Fisheries Workgroup effort is supported by SFPUC. The impacts of the WSIP requiring mitigation have not been adequately addressed and mitigated per Section 21001 of the Public Resources Code and, therefore, the dPEIR requires major revision and re-circulation for public comments.

Statement

The dPEIR states that there is "no current steelhead migration above the BART weir…"

District Comment

The dPEIR statement is inaccurate because steelhead migration over the BART weir has occurred every year, at least since 2001, when recordkeeping began. A steelhead implanted with a tracking device has also been remotely recorded above the BART weir moving towards the upper watershed.

The BART weir is a temporal, not total, barrier to steelhead, i.e., it is passable to steelhead under certain flows. At higher flows, steelhead migrates pass the BART weir. Furthermore, steelhead has been transported yearly above the BART weir under the auspices of the Fisheries Workgroup with authorization from California Department of Fish and Game (CADFG) and National Marine Fisheries Services (NMFS). With the removal of both Niles and Sunol Dams in 2006, and upon completion of the scheduled improvement to the BART weir by 2010 (or sooner), prior to WSIP construction start date in 2011, steelhead will be able to migrate up into Alameda Creek watershed to spawn. SFPUC is fully aware of these improvements. What provision is SFPUC making in the WSIP to provide adequate flows to support these efforts consistent with Section 15125 of CEQA?

Steelhead habitat exists throughout the watershed. The WSIP impacts on this fragile habitat are a "take" under the ESA requiring analysis of the impacts and providing mitigation accordingly.

12.3-5

13 cont.

Statement

On page 4.6-2 of the dPEIR, in reference to rainbow trout being a key special-status species within the Alameda Creek watershed, and footnote number 5, "…rainbow trout and steelhead are the same species of trout…"

District Comment

The District wishes to re-emphasize the statement made under footnote number 5 and suggests rainbow trout and steelhead be used interchangeably as special status species. Additionally, this footnote contradicts the assertion made throughout the dPEIR that no steelhead exists within the project limits. Since steelhead (or if you prefer rainbow trout) is acknowledged to be in the watershed, the dPEIR is inadequate. Please revise the dPEIR to discuss the impacts and re-circulate the dPEIR for public comments.

Statement

On page 4.6-19 to 20, the dPEIR states, "…other barriers, including the BART weir …continues to block anadromous fish passage…"

District Comment

The BART weir is only a temporal and not a total barrier to steelhead, i.e., it is currently passable to steelhead under certain flows. Under higher discharges and minimal or no diversion of flows, steelhead migrates pass the BART weir. Secondly, the dPEIR statement is inaccurate because steelhead has been recorded since 2001 upstream of the BART weir (even if it is due to assistance). This is an error based on faulty analysis that has led to an erroneous "no impact conclusion."

The question dPEIR failed to answer adequately is: what is the impact of the proposed additional diversion of flows from the Alameda Creek into reservoirs has on steelhead life cycle? The project environmental setting description needs to be revised to capture the presence of habitat for the steelhead within the WSIP project limits and the full effects of the proposed project on anadromous species and its habitat identified analyzed and mitigation provided.

Statement

On page 5.4.1-4, the PDEIR states, "…a flow control structure …provides grade control and is a barrier to fish passage along this reach."

District Comment

The BART weir is not a grade control structure but rather a structure designed to protect the footings of the BART and UPRR bridge crossings and to describe it as such is misleading.

13 cont.

The BART weir is considered an upstream migration barrier under certain flows and not a downstream migration barrier, it and the middle inflatable dam are scheduled for improvement by 2010, well ahead of the WSIP construction schedule. Furthermore, SFPUC has been involved in the effort to facilitate fish passage over the weir for the last 10 years. To use the presence of the BART weir to justify a "no steelhead habitat" to avoid discussion of the potential impact of not removing the diversion dam, and denial of adequate flows to support steelhead migration in the dPEIR is misleading and disingenuous.

The real major "barriers" to steelhead migration in the watershed are the diversion of water into reservoirs and storage facilities which leave the species with no means of moving into upstream habitats. Fish needs water to swim!

The District requests that the document be revised to fully describe the project impacts as proposed in the context of the "big picture" as described in the project NOP and appropriate mitigation provided.

Statement

On page 5.4.5-2, the dPEIR states, "The Sunol and Niles Dams were partially removed in September 2006, eliminating them as obstacles to fish passage."

District Comment

The District supported the SFPUC on removing Sunol and Niles dams for steelhead habitat enhancement. The dPEIR failure to analyze the impact of its WSIP on steelhead in the context of the "big picture" is in stark contrast to the earlier pronouncements. 13 cont.

Statement

On page 5.4.5-3 of the dPEIR, in reference to lower Alameda Creek, "…the reach provides habitat for warm water fish such as largemouth bass."

District Comment

What was the basis for the statement that the lower reach of Alameda Creek provides habitat for warm-water fish? The statement leaves the reader with an erroneous impression that the lower reach solely provides warm-water fish habitat. The dPEIR fails to mention that lower Alameda Creek reach, including the estuarine zone, is an ideal transition zone suited for smolt development and acclimatization. There are ongoing studies in this reach to identify steelhead habitat enhancement opportunities. 14

Furthermore, the "big picture" which the dPEIR failed to address is the multi-agency, multidiscipline, multiyear ongoing South Bay Salt Pond Restoration along the Alameda Creek Estuary. The "lower reach" is thirsting from lack of flows principally due to existing diversion to reservoirs in the upper watershed. The failure to discuss the impact of water diversion on this reach of Alameda Creek is a significant omission rendering the dPEIR inadequate. The District requests that the dPEIR be revised and identified impacts mitigated.

Statement

On page 5.4.5-4, the dPEIR states, "rainbow trout and steelhead are the same species of trout (*O. mykiss*)."

District Comment

How can the dPEIR assert the absence of steelhead in the watershed while acknowledging that the rainbow trout and steelhead are the same species? If they are the same species, then the WSIP will have significant impact on the habitat warranting full discussion and mitigation. The dPEIR is inadequate. 15

Statement

On page 5.4.5-6, the statement, "In recent years, individual steelhead were captured near the BART weir by *citizen group…*"

District Comment

In addition to the statement, offspring of gravid-anadromous salmonids, which moved above the BART weir (either naturally or with assistance), invariable migrate back over the BART weir into the ocean only to return year in, year out into Alameda Creek. How else do you explain the annual occurrences of steelhead and intermittent occurrences of Chinook salmon in Alameda Creek? Does this not lend credence to the fact that steelhead habitat exists?

12.3-6

Statement

On page 5.4.5-6, the dPEIR states, "the presence of migratory barriers, notably the BART weir, prevents upstream movement of migratory steelhead."

District Comment

Once again the statement is misleading. It is uncertain that steelhead cannot migrate upstream beyond the BART weir under higher flows. It is apparent that lower flows limit steelhead navigation over the BART weir. This structure pales in comparison to natural barriers that steelhead are known to navigate with ease. The dPEIR is incomplete because it focuses erroneously on the BART weir rather than on effects of the project on steelhead habitat within the project limits. This has resulted in failure to discuss the consequences of flows diversion on steelhead upstream migration into these habitats. 15 cont.

The existing conditions are best described as follows: [The presence of barriers, notably the BART weir, prevents upstream movement of migratory steelhead under low flows conditions]. The dPEIR should be revised to address the steelhead habitat within the project limits caused by water diversions. The "big picture" is flows and how it affects the species habitat and journey into the upper watershed habitat. These are both individually and cumulatively significant impacts requiring mitigation.

Statement

On page 5.4.5-7 to 9, the dPEIR states, "other migration barriers along the creek have been or are in the process of being removed…"

District Comment

The dPEIR rightly addresses the removal of dams by the EBRPD, and ACWD plans to provide fish passage at their upper inflatable dam. It, however, failed to mention the ACWD and the District's scheduled fish passage project over the BART weir and middle inflatable dam. The joint effort by the two entities is necessary to ensure that the entire corridor barriers are improved at the same time (information provided to SFPUC December 2006 per Sections 21101 and 21153(a)). The NOP for this joint effort will be out in December 2007. Please revise your dPEIR to address these omissions, erroneous conclusions, and provide mitigation to address the obvious impacts that water diversion and lack of flows to support the federally listed species in accordance with Sections 9 and 10 of the Endangered Species Act.

Statement

On page 5.4.5-9, in reference to the fish passage structure over the BART weir and the middle inflatable dam, the dPEIR states, "there is currently no schedule or budget for this project, and environmental review has yet to begin."

District Comment

This statement is incorrect. As acknowledged in the dPEIR, the District has sponsored several studies looking at various design options to provide steelhead passage over the BART weir. The results of these studies led the District to conclude that any structure which provides fish passage over the BART weir must also accommodate the ACWD Middle Inflatable Dam. It is for this reason that the District and ACWD entered into Memorandum of Agreement (MOA) to construct a fish passage facility over both barriers concurrently. The NOP for this project will be out in December 2007.

Statement

On page 5.4.5-9 of the dPEIR, in reference to the USGS Niles gauging station weir/concrete apron being a potential barrier.

District Comment

On February 28, 2007, a male steelhead was collected below the BART weir, surgically implanted with a radio-transmitter, and transported upstream to the scour pool below the USGS Niles gage located on SFPUC property. The steelhead was remotely monitored both up and downstream of the Niles gage structure. The structure did not appear to hinder movement and is not a barrier to upstream migration. Rather, the most significant barrier to the species use of the watershed habitats is lack of flows to which this document has woefully failed to address contrary to the "big picture" approached asserted in the NOP and inconsistent with Section 15168(5) of CEQA. 15 cont.

Habitat presence in the watershed is independent of the BART weir. Important conditions for the continual survival of the species are water and flows an important abiotic component of a functioning habitat. One gets the impression that the dPEIR for WSIP was written to avoid any discussion of the flows diversion impacts on sustainable viable fish population and habitat in the watershed.

The USGS Niles gage weir has recently been identified as falling apart and may not last another wet season. SFPUC has requested a multi-agency coordination meeting to address the future of this structure. The District supports this effort and is providing funding to coordinate the meeting. If SFPUC decides to remove or improve this barrier on their property to fish passage, the District will support that effort as long as the gage station functions are preserved.

Statement

On page 5.4.5-11, the dPEIR states, "there is no current steelhead migration above the BART weir…it is speculative to assess the specific impacts that system operations…might have on the potential future restoration of steelhead…"

District Comment

This statement is inconsistent with definition of special status on page xxx of Volume 1 of 5 of the dPEIR. Since 2001 steelhead have been sighted and moved over the BART weir to locations in Niles Canyon yearly under the auspices of the Alameda Creek Fisheries Workgroup. The recent removal of both Niles and Sunol dams in 2006 and the scheduled BART weir fish ladder by 2010, will assure steelhead migration upstream Alameda Creek and its tributaries in the watershed. Based on the past, current, and future projects described in the dPEIR, the WSIP will result in cumulative impact on the habitat (CEQA Sections 21061, 21002.1, and 15003(b)). The document requires major revision to address these impacts.

SFPUC has been a partner in the 10-year effort to improve steelhead habitat in the Alameda Creek Watershed and is aware of the projects downstream. Because the species is listed under ESA, Section 9 of the ESA requires projects that may affect listed species to provide mitigation. No mitigation for the species has been identified in the dPEIR even though the WSIP clearly will result in substantial impact on steelhead. Why? 15 cont.

Finally, what is speculative about the 10-year effort to restore fish habitat in the Alameda Creek Watershed? What is speculative about SFPUC staff advocating for stream flows analysis for the creek through the Fishery Workgroup? What is speculative about Section 10 of the ESA? What is speculative about the current rate of flow diversion from the Alameda Creek Watershed into reservoirs? This dPEIR is woefully inadequate. It requires major revision to address the impacts that it failed to acknowledge. Please revise your document to address these potentially significant impacts and re-circulate for public comments.

Statement

In reference to Table 5.4.5-2, Summary of Impacts – Fisheries in Alameda Creek Watershed, Stream, and Reservoirs.

District Response

The dPEIR failed to adequately address significant impacts on steelhead in Alameda Creek from the middle inflatable dam to its outfall with San Francisco Bay reach. This is 9.5 miles of unaccounted for creek segment that will be impacted with diversions of flows requiring mitigation.

Statement

On page C-2, regarding the statement, "…Calaveras Reservoir would operate to release up to 6,300 afy (5.5 mgd) of water to Alameda Creek in support of fisheries."

District Comment

Releases from Calaveras Reservoir should be operated for fisheries enhancement. The most important fisheries resources to support in this watershed are the threatened steelhead. Flow releases from Calaveras Reservoir must be sufficient to support all life stages of steelhead throughout the stream segments from the base of Calaveras Dam to the mouth of Alameda Creek at San Francisco Bay. The document failed to adequately address this impact in any detail in stark contrast to the increased diversions described in the dPEIR. This increased diversion is a significant "take" requiring mitigation and need not be deferred until a subsequent EIR phase. Please revise your document to identify this impact and provide appropriate mitigation.

Statement

On page C-21, in reference to SV-1 (Alameda Creek Fishery Enhancement) preliminary construction schedule occurring in 2011 and SV-2 (Calaveras Dam Replacement) preliminary construction schedule occurring during 2009 to 2011.

District Comment

The District and the Alameda County Water District entered into an MOA to construct a fish passage facility over the BART weir and middle inflatable dam within the Alameda Creek Flood Control Channel by 2010. The NOP for this project is due in December 2007. The BART Weir construction timeline is well ahead of the 2011/2012 completion schedule of the SV-1 and SV-2 projects. 15 cont.

The SFPUC staff has openly commented that they would rather construct the WSIP (SV-1 and SV-2) prior to entertaining the construction of the fish ladder over the BART weir and middle inflatable dam. Could this be the reason for not addressing the WSIP project impacts on the Steelhead in the dPEIR, subsequent EIR notwithstanding?

Statement

In reference to Table III.E-3: Special Status Animals Species Potentially Occurring in the Alameda Watershed dPEIR in Appendix D Biological Resources: Special Status Species in Alameda and Peninsula Watersheds.

District Comment

The lack of reference to any fish, including steelhead, as a special-status species within the Alameda Creek watershed appears to be misleading. The Central California Coast Steelhead (Oncorhynchus mykiss) ESU was listed in 1997 as threatened and identified as such in the CNDDB. Every year since 2001, steelhead have been observed in the Alameda Creek watershed. Occurrence of the species in the watershed affirms the potential "take" associated with the WSIP dPEIR requiring mitigation.

Thank you for the opportunity to comment on this dPEIR. Given the substantial errors documented in this dPEIR, a revised document would need to be re-circulated in accordance with Section 150703.5 of CEQA. We would appreciate a response to our comments. If you have any questions, please contact Mr. Emmanuel da Costa at 510.670.6479, mannyd@acpwa.org. 16

Very truly yours,

Kwablah Attiogbe
Environmental Services

KA
cc: Arthur Valderama

ACWD
ALAMEDA COUNTY WATER DISTRICT

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September 26, 2007

Mr. Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103-2414

Dear Mr. Maltzer:

Subject: SFPUC Water Supply Improvement Program: Draft Program Environmental Impact Report

The Alameda County Water District (ACWD) appreciates this opportunity to comment on the Draft Program Environmental Impact Report for the SFPUC's Water Supply Improvement Program (WSIP). ACWD's specific comments on the WSIP Draft Program EIR (DPEIR) are provided in the attached table. The following narrative addresses ACWD's reliance on San Francisco Regional Water supplies, ACWD's support for improving the Regional Water System, and the need for the DPEIR to adequately address local impacts in the Alameda Creek Watershed.

ACWD Background and Future Purchase Estimates

ACWD supplies water to a population of over 320,000 in the cities of Fremont, Newark and Union City and relies on purchases from the San Francisco Regional Water system for approximately 20% of its supplies. ACWD's other supplies include imported water from the State Water Project (40%) and local sources (40%). ACWD's local supplies include groundwater from the underlying Niles Cone Groundwater Basin and runoff from the Alameda Creek Watershed. This local runoff, along with State Water Project (SWP) water, is percolated into the Niles Cone Groundwater Basin through recharge in Alameda Creek itself and through recharge ponds within and adjacent to the Quarry Lakes Regional Recreational Area. The water is subsequently recovered through groundwater production wells and provided as a potable supply to ACWD's customers.

In 1995 ACWD completed its Integrated Resources Planning Study which provides the foundation for ACWD's long-term water supply strategy. This multi-faceted strategy includes:

- Water conservation;
- Local conjunctive use;
- Off-site groundwater banking;
- Desalination of brackish groundwater; and
- Recycled water.

Over the past twelve years ACWD has implemented many components of this strategy including: a comprehensive water conservation program; improvements to the local groundwater recharge program; securing 150,000 acre-feet of off-site groundwater storage in Kern County; and implementation of Northern California's first brackish groundwater desalination facility. ACWD is currently in the process of expanding the capacity of this desalination facility and also has begun planning for a recycled water supply. Implementation of this comprehensive water management program means that ACWD will be able to meet its projected 2030 demands with <u>no increase</u> in its purchases from the SFPUC above ACWD's historical purchases, or ACWD's existing contractual entitlement (13.76 mgd). 01

Support for Implementation of the WSIP

As one of the SFPUC's larger wholesale customers, ACWD has a profound interest in seeing the SFPUC successfully execute its multi-billion dollar WSIP. We share with the residents of San Francisco the same desire for a high quality water supply and a reliable storage and conveyance system that will serve the present and future needs of the San Francisco Bay Area at a reasonable cost. 02

ACWD also supports the Bay Area Water Supply and Conservation Agency's (BAWSCA's) proposal that the final PEIR further describe and analyze the DPEIR's Modified WSIP Alternative (the environmentally superior alternative) and that the final PEIR explore the feasibility of the Bay Area water customers financially supporting water conservation with agricultural interests on the lower Tuolumne River that will result in no net decrease in flows on the lower Tuolumne. BAWSCA's proposal is to conserve even more agricultural water resulting in a net increase in lower Tuolumne River flows. This additional water could then be available to support greater flows in the lower Tuolumne River, deployed at times and in volumes most beneficial for salmon and other important species in the lower Tuolumne River. Under BAWSCA's proposal, the implementation of the WSIP can improve, rather than degrade, flow conditions in the lower Tuolumne River. 03

Need to Address Alameda Creek Watershed Impacts

Similar to addressing the Tuolumne River impacts, the DPEIR should also include a program to fully mitigate for flow impacts in the Alameda Creek Watershed. At almost 700 square miles, the Alameda Creek Watershed is the largest local watershed tributary to San Francisco Bay. This watershed is an important local resource in the Bay Area with much of the upper watershed remaining in pristine, natural condition. Alameda Creek provides many beneficial uses including 04

Mr. Paul Maltzer
Page 3 of 3
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fisheries and riparian habitat for a wide variety of species, as well as serving as a vital source of water supply to the communities in ACWD (Fremont, Newark and Union City).

For that reason, ACWD's comments on the DPEIR, provided in the attached table, focus on ensuring that potential downstream impacts in the Alameda Creek Watershed, including the fishery resources and water supply to the Niles Cone Groundwater Basin, are adequately evaluated, and that full mitigation is provided for any adverse impacts. As these comments illustrate, the DPEIR is inadequate because of its failure to address: (1) downstream impacts to ACWD's water supplies from Alameda Creek and the Niles Cone Groundwater Basin, and (2) potential impacts to steelhead trout, a federally-protected species. Both of these impacts need to be addressed prior to finalization of the DPEIR. 04 cont.

We look forward to your consideration of this comment letter and continuing to work with the SFPUC throughout the implementation of the WSIP. If you have questions, please contact Doug Chun, Water Quality Manager at (510) 668-6510, or Eric Cartwright, Water Resources Planning Manager at (510) 668-4206.

Sincerely,

Paul Piraino
General Manager

Attachment
ec

L_ACWD

Attachment: ACWD Comments on San Francisco Water Supply Improvement Program Draft PEIR

Comment No.	WSIP DPEIR Item of Concern	Summary of DPEIR Coverage of Item	ACWD Concerns regarding adequacy of DPEIR	ACWD Proposed Resolution
1	Section 3.8 Proposed Facility Improvement Projects, Table 3.10 Page 3-50	The DPEIR provides a description of the Alameda Creek Fishery Project in which is stated that the project would recapture the water released as part of the Calaveras Dam project.	The DPEIR does not indicate that the quantity of water to be "recaptured" would be limited to the quantity being released upstream. If more water is diverted at this recapture facility than is being released upstream, then there would be downstream flow impacts, including potential fishery impacts and water supply losses at ACWD's groundwater recharge facilities.	The DPEIR should clarify that the recapture facility would not capture any additional quantity of water than that which is being released upstream. If this is not the case, then the DPEIR should quantify the additional amount of water (beyond the upstream releases) and provide for measures to mitigate for downstream impacts.
2	Section 4.5, Hydrology and Water Quality; Bay Division Region, Page No. 4.5-6 to 4.5-7	This section provides information for the major water bodies and watersheds with beneficial use that could be affected by the Bay Division Region projects.	The DPEIR fails to address the Niles Cone Groundwater Basin which coincides with WSIP Facility Construction Projects BD-1, BD-2, and BD-3. The Niles Cone Groundwater Basin underlies the ACWD service area and provides approximately 40% of the water supply to a population of over 320,000 in Fremont, Newark and Union City	The DPEIR should include hydrology and water quality information, including an impact analysis and mitigation measures, for the Niles Cone Groundwater Basin wherever it coincides with WSIP Facility Construction Projects.
3	Hydrology and Water Quality: Section 4.5-2, Impact 4.5-1: Construction Impacts, Pages 4.5-21 to 28	The DPEIR describes possible water quality impacts during construction due to erosion, sedimentation and hazardous materials release.	The DPEIR should acknowledge that possible discharges to creeks and waterways in the Alameda Creek watershed could have impacts on downstream water intakes (i.e. at ACWD diversion facilities in the Flood Control Channel). ACWD would need immediate notification of any spills or discharges that could impact water quality.	The DPEIR should include an analysis of possible impacts on downstream water intakes at ACWD's facilities in the Flood Control Channel, and include in the mitigation measures development of a notification plan between SFPUC and ACWD in the event of a spill or release to any waterways in the Alameda Creek system.

05

L_ACWD

Comment No.	WSIP DPEIR Item of Concern	Summary of DPEIR Coverage of Item	ACWD Concerns regarding adequacy of DPEIR	ACWD Proposed Resolution	
4	Hydrology and Water Quality: Section 4.5-2, Impact 4.5-3, Pages 4.5-31 to 37	The DPEIR describes possible water quality impacts from dewatering and construction-related discharges in the Alameda Creek watershed.	The DPEIR does not mention that discharges could impact downstream water users in the Alameda Creek watershed if control measures fail. ACWD would need notification of any discharges to the Alameda Creek system that may contain contaminants due to failure of the proposed control measures.	The DPEIR should include a discussion of possible control measure failures and downstream impacts on ACWD's diversion and groundwater recharge facilities. Include in the mitigation measures development of a notification plan between SFPUC and ACWD in the event of contaminants being released to any waterways in the Alameda Creek system.	05 cont.
5	Hydrology and Water Quality: Section 4.5-2 Impact 4.5-4 Pages 4.5-37 to 41	The DPEIR describes possible flooding and water quality impacts associated with impeding or redirecting flood flows. In the Sunol Valley region, flooding impacts are considered potentially significant.	The DPEIR does not mention that flooding and possible sediment and contaminant releases could affect downstream water users. ACWD would need notification of flood events with known contaminant releases related to construction, or flood events related to construction that could have an impact on ACWD's inflatable dam and groundwater recharge operations.	The DPEIR should include a discussion of possible impacts on ACWD's diversion and groundwater recharge facilities. Include in mitigation measures development of a notification plan between SFPUC & ACWD.	06
6	Hydrology and Water Quality: Section 4.5-2, Impact 4.5-5 Pages 4.5-41 to 49	The DPEIR describes impacts due to degradation of water quality and increased flows due to discharges to surface water during operations	The DPEIR does not mention that changes in flow conditions in Alameda Creek could affect ACWD's rubber dam and diversion operations in the Alameda Creek Flood Control Channel.	The DPEIR should include a discussion of possible impacts of discharges on Alameda Creek flow conditions and ACWD's downstream inflatable dam and diversion operations. Include in the mitigation measures development of a notification plan between SFPUC and ACWD for such events.	07

L_ACWD

Comment No.	WSIP DPEIR Item of Concern	Summary of DPEIR Coverage of Item	ACWD Concerns regarding adequacy of DPEIR	ACWD Proposed Resolution	
7	Section 4.11 "Pipelines" (subsection) This subsection discusses the setting and impacts of the pipeline projects. Page 4.11-10, 11, 12	The DPEIR states that pipeline construction activities could result in disruption and/or damage to existing utilities if they are not properly identified prior to construction. The section text indicates that pipelines would be identified during design, and detailed engineering and construction plans would be prepared as a condition of approval "…for either a utility excavation permit or an encroachment permit."	The ACWD water distribution system pipelines cross the existing BDPL Nos. 1 and 2 at many locations along the SFPUC right-of-way between Irvington Portal and the Newark Valve Lot. Construction of the proposed welded steel pipeline within this right-of-way is expected to impact many, if not all, of these pipeline crossings. ACWD wants to ensure potential utility conflicts are identified and resolved well in advance of the project construction phase.	In order to avoid any problems that may adversely impact ACWD's pipelines and/or ACWD's ability to provide water service to our customers, the SFPUC should coordinate with ACWD during the project planning and design phases to minimize the impacts associated with conflicting water facilities.	08
8	Section 4.11, various pages including: 4.11-14, "Bay Division Region" 4.11-22 & 23, "Siting Impacts"	The DPEIR states that the WSIP projects may result in the need for relocation of utilities and such relocations would have the potentially significant impacts. However, these impacts would be mitigated to a less than significant impact by implementation of "SFPUC Construction Measure #1, neighborhood noticing and identification of public utility lines prior to commencing construction".	Neighborhood noticing and identification of utilities *will not* reduce the potential for construction impacts to a less than significant level.	ACWD requests that SFPUC coordinate with ACWD and obtain ACWD review and concurrence with the project design and planned protective measures, prior to releasing the plans for construction (this would entail a modification to Mitigation Measure 4.11-1h, see below).	
9	Attachment 4-A, "Public Services and Utilities" (subsection), page 41 Mitigation Measure 4.11-1g (erroneously listed as -2g)	The mitigation measure indicates that SFPUC or its contractor will reconnect any utility lines disconnected in the course of construction.	Without an on-site ACWD inspector, disconnection and/or reconnection of ACWD pipelines may result in damages to ACWD facilities and/or water service disruptions to ACWD's customers.	The proposed mitigation measure should also include prior notification and coordination with ACWD such that either ACWD can perform necessary work in advance of SFPUC construction, or ACWD can provide an inspector for any construction work that involves ACWD facilities, whichever ACWD determines to be most appropriate. Disinfection,	

Comment No.	WSIP DPEIR Item of Concern	Summary of DPEIR Coverage of Item	ACWD Concerns regarding adequacy of DPEIR	ACWD Proposed Resolution	
				flushing and bacteriological testing of reconnected lines should be done in accordance with AWWA Standard C651.05 for main disinfection.	08 cont.
10	Attachment 4-A, "Public Services and Utilities" (subsection), page 41 Mitigation Measure 4.11-1h	The mitigation measure indicates SFPUC or its contractors will coordinate final construction plans and specifications with affected utilities.	Coordination needs to take place long before plans are finalized in order to allow for preparations (such as utility relocations) to be completed in an orderly way. Also, SFPUC should commit that the plans and specification shall be *approved* by ACWD in advance of being finalized.	The mitigation measure should state that SFPUC will coordinate plans and specifications with affected utilities throughout the design process. Plans and specifications relating to ACWD facilities shall be approved by ACWD before being released for construction.	
11	Section 5.4.1.1 – Alameda Creek Watershed Streams and Reservoirs, Stream Flow and Reservoir Water Levels, Setting Page 5.4.1-1 to 5.4.1-4	The DPEIR description of the Alameda Creek Watershed Boundary covers the entire upper watershed, but downstream, extends only to Niles Canyon (as shown on Figure 5.4.1-1).	This description of the watershed boundary is not complete. From Niles Canyon, Alameda Creek extends downstream approximately 12 miles to San Francisco Bay. Correspondingly, the watershed also extends to San Francisco Bay, and includes portions of the Cities of Fremont, Newark and Union City. This downstream section of the creek (channelized in the 1970's by the US Army Corps of Engineers and called Alameda Creek Flood Control Channel) provides multiple beneficial uses including groundwater percolation and water supply, flood control, recreation, fish habitat and migratory corridor, and riparian habitat. The Niles Cone Groundwater Basin underlies the Flood Control Channel and has historically been recharged from flows in Alameda Creek. This groundwater basin, managed by ACWD, provides approximately 40% of the water supply to a population of over 320,000 in Fremont, Newark and Union City. The Flood Control Channel also provides fish habitat and a riparian corridor. By not including this downstream segment in	The DPEIR should be revised to include the downstream section of the watershed to San Francisco Bay. Analyses of potential impacts to stream flows, flood control, fisheries and riparian habitat in the Flood Control Channel and groundwater percolation and water supply in the underlying Niles Cone Groundwater Basin should be included in the DPEIR. The DPEIR should include mitigation measures, if necessary, for any significant impacts in this downstream section of the watershed.	09

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Comment No.	WSIP DPEIR Item of Concern	Summary of DPEIR Coverage of Item	ACWD Concerns regarding adequacy of DPEIR	ACWD Proposed Resolution	
			the DPEIR analyses, the DPEIR does not provide an adequate analysis of potential downstream impacts to water supply, flood control and fisheries in this section of the creek and watershed.		09 cont.
12	Section 5.4.1.2 – Alameda Creek Watershed Streams and Reservoirs, Impacts, Approach to Analysis Page 5.4.1-17 to 5.4.1-18	The Baseline Conditions used in the analyses of impacts downstream of Calaveras Reservoir is based on existing operating conditions of Calaveras Reservoir. This includes the 2001 Division of Safety of Dams (DSOD) requirements that Calaveras Reservoir be operated at approximately 40% of its maximum capacity (due to DSOD's concern about the seismic stability of the dam). This Baseline Condition also includes the associated operation of the Alameda Creek Diversion Dam (ACDD), which diverts water to fill Calaveras Reservoir. Under existing conditions with DSOD restrictions, the Alameda Creek Diversion Dam has passed significantly more Alameda Creek flows downstream then under pre-2001 operations (prior to the DSOD restriction).	The DPEIR indicates that the Calaveras Dam project will not be fully implemented until 2012, thereby resulting in over ten years of operations under the current DSOD restrictions. Because of this extended timeframe, it is appropriate to utilize the operations of Calaveras and ACDD under the DSOD restrictions as the Baseline Conditions. In order to determine downstream impacts on flows, the DPEIR should rely solely on these Baseline Conditions to compare against the projected flows under the proposed Program.	ACWD supports the use of the Baseline Conditions under the existing DSOD requirements for Calaveras Reservoir and the associated diversions at Alameda Creek Diversion Dam.	10

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Comment No.	WSIP DPEIR Item of Concern	Summary of DPEIR Coverage of Item	ACWD Concerns regarding adequacy of DPEIR	ACWD Proposed Resolution
13	Section 5.4.1.2 – Alameda Creek Watershed Streams and Reservoirs, Impacts, Approach to Analysis Page 5.4.1-18	As documented in the DPEIR (Appendix H), projected changes to streamflows and reservoir levels attributed to implementation of the WSIP are evaluated through the use of the Hetch-Hetchy/Local Simulation Model (HH/LSM). All modeling of impacts to Alameda Creek flows was conducted on a monthly time step. These results are presented as average monthly flows. In the discussion of model limitations, the PEIR notes that "the model results were not solely relied upon when evaluating flows in creeks immediately downstream of SFPUC reservoirs that normally have minimal flow or are affected by SFPUC operations for time periods less than a month in duration." Operator experience and knowledge are cited as additional considerations for the evaluation.	The monthly model time step is not sufficient to capture day-to-day flow impacts that may be significant. In addition, the PEIR does not provide enough detail about the day-to-day evaluations that were based on "operator experience and knowledge." Winter and spring flows in Alameda Creek and its tributaries are highly variable, and are primarily a function of the daily rainfall conditions. It is common for daily flows within a month to vary widely, with peak flows occurring during and directly after a rainfall event. Flows quickly recede after these periods of rainfall. Because of these wide variations in daily flows, the use of a monthly time step to evaluate downstream flow impacts is not adequate. For instance, implementation of the WSIP program may significantly reduce stream flows for a portion of a month (with significant impacts to fisheries and downstream water supplies) while keeping water in the creek for the remainder of the month. However, with the use of average monthly flows in the HH/LSM, the impacts of significantly reducing flows during a portion of the month would be obscured, or entirely overlooked in the DPEIR impact analysis.	The DPEIR should analyze downstream flow impacts utilizing a daily time-step for the Alameda Creek watershed. Given the highly variable flow conditions in the watershed, a daily time step is necessary to analyze and properly assess impacts to both fisheries and water supply. As an example, ACWD utilizes a spreadsheet based operational model, utilizing a daily time step, with over 70 years of daily hydrology on Alameda Creek. This ACWD model is used for the planning and operation of ACWD water supply facilities in the Alameda Creek Flood Control Channel. In order to facilitate the implementation of a similar daily hydrologic model of the SFPUC's Alameda Creek watershed operations, ACWD can provide the SFPUC with daily input data, including hydrologic data from the watershed.

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Comment No.	WSIP DPEIR Item of Concern	Summary of DPEIR Coverage of Item	ACWD Concerns regarding adequacy of DPEIR	ACWD Proposed Resolution
14	Section 5.4.1.2 – Alameda Creek Watershed Streams and Reservoirs, Impacts, Impact 5.4.1-4: Effects of flow along Alameda Creek below the confluence of San Antonio Creek Page 5.4.1-39 to 5.4.1-40	The DPEIR analyzes impacts to downstream flows on Alameda Creek below the confluence with San Antonio Creek. This represents the furthest downstream flow impact analysis that is provided in the DPEIR. The results from the impact analyses indicates that winter/spring flows would be reduced by an average of approximately 50% during normal years, and approximately 30% during above normal and wet years. The DPEIR states that these impacts would be dampened by inflows from downstream tributaries and characterizes this impact as "less than significant".	The DPEIR does not adequately address potential downstream impacts to flows. Specific deficiencies include: 1. The DPEIR does not include an evaluation of flow impacts downstream in Niles Canyon or in the Flood Control Channel. An impact assessment in both of these reaches is required to determine potential impacts to fisheries, riparian habitat and water supply (see comment no. 11 above, regarding need to address full extent of Alameda Creek Watershed in impact analysis). 2. The impact assessment is based on a hydrologic model utilizing a monthly time step. As discussed in comment no. 13 above, the impact analyses for flows in the Alameda Creek watershed should utilize a daily time step. This is necessary to account for the highly variable flow conditions that occur within any given month during winter and spring conditions. 3. The DPEIR's assertion that flow impacts would be "dampened" by inflows from other tributaries is not supported by any technical analyses or documentation.	In order to adequately address potential downstream impacts to flows in Alameda Creek, the DPEIR should be revised: 1. The impact assessment should include downstream Alameda Creek flow impacts both in Niles Canyon and in the Flood Control Channel. The impact assessment should address potential flow related impacts to fisheries as well as water supply impacts to ACWD groundwater recharge operations. 2. The flow impact analyses should be performed with a daily hydrologic model in order that potential impacts under the wide variations in daily flows can be accurately evaluated. 3. The DPEIR should provide technical evaluation of the mitigating impacts of "flow dampening" from downstream tributaries. This analysis should also be performed with a hydrologic model with a daily time step. 4. The impact conclusions should be re-evaluated based on the revised technical analysis, as described above. The level of significance of the downstream flow impacts in Niles Canyon and

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Comment No.	WSIP DPEIR Item of Concern	Summary of DPEIR Coverage of Item	ACWD Concerns regarding adequacy of DPEIR	ACWD Proposed Resolution	
				the Flood Control Channel should be made in consultation with ACWD to determine potential water supply impacts, and with qualified biologists to determine impacts to fisheries, aquatic and riparian habitat. 5. The DPEIR should also include mitigation measures to develop a joint communications/notification plan between SFPUC and ACWD to minimize the impacts of day-to-day and hour-to-hour changes in streamflows that could affect ACWD's downstream operations and facilities.	12 cont.
15	Section 5.4.2.2 – Geomorphology, Impacts: Page 5.4.2-2 to 5.4.2-4	The PEIR notes that under WSIP, uncontrolled reservoir releases could result in increased erosion, sediment transport and deposition downstream of Calaveras Dam compared to current conditions, but that it would be similar to long-term conditions that formed the channel and would be less than significant.	Given that Baseline Conditions should be used as the basis to determine impacts, it is inappropriate to base the level of significance on a comparison with conditions other than Baseline Conditions (i.e. before Calaveras DSOD restrictions). Also, the DPEIR does not consider any impacts on geomorphology and sediment transport in Alameda Creek downstream of Calaveras Creek and through Niles Canyon and the Flood Control Channel. In addition, the DPEIR does not address the possible impact of additional debris loading downstream due to changes in flows; this can be a significant issue for ACWD's downstream facilities. For instance, logs and other floating debris can damage or puncture ACWD inflatable dams in the Alameda Creek Flood Control Channel.	1. The DPEIR should evaluate the significance determination based solely on the Baseline Conditions, (as described in the DPEIR on pages Page 5.4.1-17 to 5.4.1-18). 2. The DPEIR should include an evaluation of downstream impacts on geomorphology and sediment transport in Niles Canyon and the Alameda Creek Flood Control Channel. 3. The DPEIR should also include an evaluation of downstream debris loading as a possible downstream impact at ACWD's groundwater recharge facilities in the Alameda Creek Flood Control Channel.	13

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Comment No.	WSIP DPEIR Item of Concern	Summary of DPEIR Coverage of Item	ACWD Concerns regarding adequacy of DPEIR	ACWD Proposed Resolution	
16	Section 5.4.3.1 Setting/Surface Water Quality, (including Tables 5.4.3-3 and 5.4.3-4) Pages 5.4.3-4 to 5.4.3-6	The DPEIR cites ACWD temperature data from Alameda Creek at the mouth of Niles Canyon with a reference to "ACWD, 2007," but the reference at the end of the section is to ACWD's website, which does not contain this data.	ACWD has several concerns regarding this item: 1) Reference is incorrect; 2) ACWD temperature and TDS data may not be subject to the rigorous QA/QC procedures that would be required for data used in scientific studies, and therefore should not be used for purposes other than an indication of general conditions (unless otherwise specified by ACWD); 3) Text on 5.4.3-4 notes that the data is from the monitoring station at the mouth of Niles Canyon near Mission Blvd., but Tables 5.4.3-3 & 4 cite the location as "near Sunol." These appear to be two different locations.	The DPEIR should be modified to: 1) Provide appropriate reference; 2) Include disclaimer that data QA/QC is not to the level of scientific studies; 3) Clarify monitoring location.	14
17	Section 5.4.3.1 Setting/Surface Water Quality Page 5.4.3-5	The DPEIR states "... most of the summer and fall flows in Alameda Creek below its confluence with Arroyo de la Laguna originate from the South Bay Aqueduct. This South Bay Aqueduct water may be warmer and is higher in total dissolved solids (TDS) than the flows in Alameda Creek originating from the Sunol Valley watershed."	The statement that most summer & fall flows below the confluence of Arroyo de la Laguna are due to releases of South Bay Aqueduct (SBA) water into Alameda Creek is incorrect. The amount of SBA contributions to Alameda Creek flow can vary greatly from year to year depending on the year type, and from day to day depending on operations. Flows in Alameda Creek during these times are also highly dependant on other discharges within the watershed, and often a significant portion of the flow passing through Niles Canyon originates in Arroyo de la Laguna. Additionally, no data is provided to substantiate the claim that SBA water is warmer and higher in TDS. Air and water temperature studies conducted by Hanson Environmental (October 2002) concluded that, based on the available data, "no apparent pattern or trend was detected in (Alameda Creek) water temperature that could be directly attributable to releases from the South Bay Aqueduct into Alameda Creek".	Remove generalized statement about SBA water or expand discussion about the variations in SBA contributions to flow conditions and the other variables (Arroyo de la Laguna flow, quarry discharges, etc.) that can contribute flow during summer and fall. Unless the SFPUC can cite specific data or studies, remove incorrect statements that claim that SBA water released into Alameda Creek is warmer than local watershed inputs.	15

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Comment No.	WSIP DPEIR Item of Concern	Summary of DPEIR Coverage of Item	ACWD Concerns regarding adequacy of DPEIR	ACWD Proposed Resolution	
18	Section 5.4.3.2 Surface Water Quality – Impacts	The DPEIR determines that water quality impacts are less than significant based on an analysis of a small number of water quality parameters, including temperature, dissolved oxygen and nutrients.	This section does not address the possibility of turbidity impacts due to changing operational and flow conditions under the WSIP. Increased turbidity at lower flows could affect ACWD groundwater recharge operations. Specifically, high turbidity in flows captured by ACWD's downstream facilities may significantly reduce the percolation capacity at ACWD's recharge ponds. In addition, ACWD may lose significant water supplies if, because of high turbidity, ACWD cannot divert and percolate this water and must instead bypass it.	This section should include an analysis of the impacts of WSIP operations and flows on downstream turbidity in the Flood Control Channel and potential impacts to ACWD's groundwater recharge operations. Any water supply or operational impacts to ACWD should be fully mitigated.	16
19	Section 5.4.4, Groundwater Page 5.4.4.1 and Impact 5.4.4-1 Page 5.4.4-6	The PEIR states that, "Because the proposed program would not affect upstream areas in the Livermore Valley or lower areas in the Niles Cone (which is below the SFPUC's infiltration galleries), this section focuses on describing the groundwater conditions and potential WSIP impacts in the Sunol Valley". Under a later discussion of groundwater impacts (Impact 5.4.4-1) the DPEIR states that "impacts on groundwater in the Niles Cone would be dampened by inflow from non-SFPUC watershed streams and aquifers, removal of the Sunol and Niles Dams, and ongoing withdrawals at the infiltration galleries above the water temple; as a result, impacts are expected to be minimal."	The DPEIR incorrectly states that the proposed program would not impact the Niles Cone Groundwater Basin. As described above, the Niles Cone Groundwater Basin underlies the Alameda Creek Flood Control Channel (which historically has provided the majority of the recharge for the basin) and provides approximately 40% of the water supply to the communities of Fremont, Newark and Union City. The DPEIR has already acknowledged that winter and spring flows in Alameda Creek (below the confluence with San Antonio Creek) will be reduced by over 50% in normal years. Given ACWD's reliance on these winter and spring flows to replenish the Niles Cone Groundwater Basin (and to protect the Basin from seawater intrusion from San Francisco Bay), the Niles Cone would, in fact, be affected by the proposed WSIP. Under Impact 5.4.4-1, the DPEIR is incorrect	The DPEIR should include an analysis of potential impacts to the Niles Cone Groundwater Basin and ACWD's water supplies from the Niles Cone Groundwater Basin. This impact analysis should consider potential impacts due to changes in timing, quantity, and quality of flows in the Alameda Creek Flood Control Channel. The impact analyses should use the Baseline Conditions as described in Section 5.4.1.2 (post DSOD requirements for Calaveras operations) and should consider ACWD's facilities and operations utilized for groundwater recharge in the Flood Control Channel and adjacent percolation ponds. The DPEIR should also include mitigation for any resulting impacts to water supply or water quality in the Niles Cone	17

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Comment No.	WSIP DPEIR Item of Concern	Summary of DPEIR Coverage of Item	ACWD Concerns regarding adequacy of DPEIR	ACWD Proposed Resolution	
			in stating that impacts to Niles Cone would be dampened by inflow from other streams, removal of Sunol and Niles Dam, and ongoing withdrawals at the infiltration gallery. First, the removal of Sunol and Niles Dams is not part of the WSIP, and in fact occurred several years prior to the release of this Draft PEIR. Second, the infiltration galleries referred to result in a net loss of supplies to Niles Cone, and thus would provide no "dampening" effects. Third, inflows from non-SFPUC tributaries would not change as a result of the WSIP program, and therefore would not offset the loss of water supplies to the Niles Cone Groundwater Basin.	Groundwater Basin.	17 cont.
20	Section 5.4.5.1 - Alameda Creek Fisheries: Potential Steelhead Restoration Page 5.4.5-11	The DPEIR does not include any analysis of the WSIP's potential impacts to steelhead in the Alameda Creek Watershed. The DPEIR's rationale for this approach is that, under existing conditions, steelhead cannot access the upper watershed (i.e. upstream of the BART weir), and therefore, the WSIP implementation would not impact steelhead upstream of the BART weir. The DPEIR also states that since a number of steps are required before steelhead can access the upper watershed, it would be "speculative" to assess the specific impacts that the WSIP operations may have on a future restored steelhead fishery.	The DPEIR's failure to evaluate steelhead impacts is based on an incorrect and incomplete assessment of the current status of steelhead fishery in Alameda Creek and the ongoing steelhead fishery restoration efforts. The DPEIR does not consider the following facts in its approach to evaluating impacts to a steelhead fishery: (1) Under existing conditions, there are annual sightings of steelhead in the Alameda Creek system. Multiple sightings of steelhead in the Alameda Creek Flood Control Channel have been documented every year since 1998 by Alameda Fishery Workgroup members. These steelhead are attracted to the Alameda Creek watershed by the winter and spring flows. As noted above, implementation of the WSIP would substantially reduce winter and spring Alameda Creek flows (by up to 50% in normal years according to the WSIP's impacts analysis for Alameda Creek flows below the	The DPEIR should correctly describe: (1) the current status of steelhead in the lower watershed (i.e. under existing conditions steelhead are sighted annually in the flood control channel below the BART weir) and (2) the on-going efforts to provide access to the upper watershed, including the recent ACWD/ACFC&WCD Agreement that provides for preliminary design of a fish passage facility with a goal of constructing this facility by the year 2010. Given this corrected information, the DPEIR should address potential impacts of the WSIP on both the existing steelhead downstream in the Flood Control Channel, and a future restored steelhead population in the	18

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Comment No.	WSIP DPEIR Item of Concern	Summary of DPEIR Coverage of Item	ACWD Concerns regarding adequacy of DPEIR	ACWD Proposed Resolution	
			confluence below San Antonio Creek). Flow reductions of this magnitude may adversely impact steelhead that currently access Alameda Creek below the BART weir. (2) There is an active program to restore steelhead to the upper watershed through the Alameda Creek Fisheries Restoration Workgroup. A MOU signed by the Workgroup stakeholders, including the SFPUC, documents the process that the Workgroup members are taking to restore steelhead. This MOU also provides a commitment to conduct the studies necessary to determine flow requirements for a restored steelhead fishery. The first phase of these studies is near completion. (3) There is an active and on-going program to address fish passage in the Alameda Creek Flood Control Channel. For example, ACWD and Alameda County Flood Control and Water Conservation District (ACFC&WCD) have prepared conceptual designs for fish passage at the BART weir and ACWD's inflatable dams. More recently ACWD and ACFC&WCD governing boards approved an Agreement to provide for preliminary design of a fish ladder to provide passage at the BART weir and middle inflatable dam. Under this Agreement, the timeline for constructing the fish ladder is by the year 2010 (two years before the completion of the Calaveras Dam project). ACWD's Capital Improvement Program, adopted by the ACWD Board in 2007, also provides for funding for ACWD's share of this project costs in the years 2007 through 2010.	upper watershed. The DPEIR should include mitigation measures to avoid adverse impacts to flows needed for the existing steelhead returning to the Alameda Creek Flood Control Channel and the planned future restored steelhead fishery. This analysis should consider impacts along the full length of Alameda Creek, from SFPUC facilities in the upper watershed downstream to San Francisco Bay.	18 cont.

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Comment No.	WSIP DPEIR Item of Concern	Summary of DPEIR Coverage of Item	ACWD Concerns regarding adequacy of DPEIR	ACWD Proposed Resolution	
21	Section 5.4.5.2 - Alameda Creek Fisheries: Impacts – Impact 5.4.5-6 Effects on fisheries along Alameda Creek downstream of San Antonio Creek Page 5.4.5-21 to 5.4.5-22	The DPEIR impact analysis focuses primarily on fishery impacts related to San Antonio Creek and reservoir operations. DPEIR conclusion is that impacts would be "less than significant". The DPEIR provides no discussion of downstream fishery impacts in Sunol Valley, Niles Canyon or the Flood Control Channel.	The DPEIR discussion of impacts to fishery resources along Alameda Creek below the confluence with San Antonio Creek is incomplete. Under existing conditions there is significant fishery habitat in Alameda Creek downstream of the confluence with San Antonio Reservoir. The fishery resources have been documented by the Department of Fish and Game, the Alameda Creek Fishery Workgroup, and others. The DPEIR's flow analyses also indicates that winter/spring flows below in Alameda Creek below the confluence would be reduced by approximately 50% during normal years. Given these substantial flow reductions, and the extent of the existing downstream fishery resources in Sunol Valley, Niles Canyon and the Flood Control Channel, the DPEIR evaluation of fishery-related impacts is incomplete without an evaluation of potential impacts in these downstream reaches.	The DPEIR should include an evaluation of potential impacts to Alameda Creek fishery resources downstream of the San Antonio confluence. This impact evaluation should address potential impacts to fisheries downstream to San Francisco Bay and include Sunol Valley, Niles Canyon, and the Alameda Creek Flood Control Channel.	19
22	Section 5.7 Cumulative Projects and Impacts Related to WSIP Water Supply and System Operations Page No. 5.7-55	Figure 5.7-3 Future Projects in the Alameda Creek Watershed Considered in the Cumulative Analysis.	The figure shows facilities in wrong locations.	The DPEIR should be revised to correct the following facility locations: 1.) ACWD Wells (actual location is south of Alameda Creek) 2.) The BART Weir 3.) ACWD Upper Inflatable Dam, AC-6 "Upper Inflatable Dam Fish Passage Project", and AC-2b "Alameda Creek Pipeline No. 1 Fish Screen." These projects are all in the same vicinity just downstream of the Mission Blvd. bridge.	20

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Comment No.	WSIP DPEIR Item of Concern	Summary of DPEIR Coverage of Item	ACWD Concerns regarding adequacy of DPEIR	ACWD Proposed Resolution	
23	Surface Water Hydrology and Water Quality: Section 6.3.4, Pages 6-9 to 10	The DPEIR outlines mitigation measures for water quality and hydrology.	The DPEIR does not provide mitigation measures that include notification of ACWD in the event of any flow changes or water quality contamination events that could affect ACWD's downstream rubber dam and diversion facility operations. (See comments on impacts 4.5-1, 4.5-3, 4.5-4, 4.5-5.) A coordinated notification plan is vital to protection of ACWD's water resources.	The DPEIR should include an additional mitigation measure that includes a commitment to develop a coordinated notification plan between SFPUC and ACWD for events that could unexpectedly alter flows or release contaminants that could affect ACWD's downstream operations.	21
24	Section 6.4.3 – Alameda Creek Watershed Streams and Reservoirs: Mitigation Measure 5.4.1-2: Diversion Tunnel Operation Page 6-51 to 6-52	This mitigation item directs the SFPUC to "establish and implement written operational criteria" for Alameda Creek Diversion Dam (ACDD) operations. As described in the DPEIR, the operating criteria would give priority to diverting water to Calaveras, and once Calaveras storage targets are met, the water would be passed downstream.	The proposed "mitigation" measure does not provide any real mitigation for downstream flow impacts since the operational criteria will simply document the operation of the facility.	This mitigation measure should be revised to provide actual mitigation of the impacts due to reduced flows downstream of the ACDD.	
25	Section 6.4.3, Streamflow & Reservoir Water Levels - System Measures Pages 6-51 to 52	The DPEIR does not include any mitigation for altered streamflows and the possible effects on ACWD's downstream operations.	Alterations of streamflows caused by the WSIP (on a day-to-day and hour-to-hour basis) could have significant impacts on real-time operations at ACWD's downstream rubber dams and diversion facilities.	The DPEIR should include an additional mitigation measure that includes development of a joint communications/notification plan between SFPUC and ACWD to minimize the impacts of day-to-day and hour-to-hour changes in streamflows that could affect ACWD's downstream operations and facilities.	22

L_ACWD

Comment No.	WSIP DPEIR Item of Concern	Summary of DPEIR Coverage of Item	ACWD Concerns regarding adequacy of DPEIR	ACWD Proposed Resolution	
26	Section 6.4.3 – Alameda Creek Watershed Streams and Reservoirs: Mitigation Measure 5.4.5-3a: Minimum Flows for Resident Trout on Alameda Creek Page 6-52 to 6-54	Under this mitigation measure, the SFPUC would provide a minimum flow downstream of the ACDD from Dec 1 to April 30 to support resident trout spawning and egg incubation. The quantity of flow is not specified – rather the DPEIR states that the SFPUC will complete the studies needed to "determine the appropriate minimum stream flow for this reach of the creek". The DPEIR notes that a minimum flow of 10 cfs "has been suggested".	The proposed flow releases under this mitigation measure are contingent on future studies by the SFPUC. Therefore this measure will not provide for any real mitigation if the SFPUC chooses to release minimal amounts based on its own staff recommendations. The SFPUC has already conducted numerous fishery and hydrologic studies of this section of the creek. Indefinite deferral of a determination of the amount of flow is impermissible under CEQA.	Based on the existing studies and consultation with Department of Fish and Game biologists, the DPEIR should commit to a minimum level of flow releases for fisheries, rather than rely on future studies by SFPUC staff.	23
27	Section 7.3.4 Growth in Water Demand Compared with Growth in Population and Employment Page 7-32 to 7-36	The DPEIR provides a comparison of projected growth in water demands versus projected growth in employment and population. This section includes a table (Table 7.10) that provides a comparison for specific agencies that lists the customer's demands as "Percentage of Total 2030 Demand". A discussion is also provided for each wholesale customer, including ACWD (page 7-35). Under the ACWD discussion it is stated that ACWD's 2030 water purchase estimate is approximately 15% higher than its 2001 water purchase. This section also states that the employment projection used in the SFPUC's demand study is about 25% higher than the employment projections incorporated in the general plans of the cities in ACWD service area (Fremont, Newark, and Union City).	ACWD has the following concerns regarding this section of the DPEIR: 1. Table 7.10 expresses the wholesale customers' projected demands as a function of the total demand in the area served by the San Francisco Regional Water System. However, the table does not indicate that, in ACWD's case, only approximately 25% of ACWD's projected demand will be met by purchases from the San Francisco system. As currently configured, this table provides a misleading characterization that ACWD has the highest projected demand of water from the San Francisco System. 2. The DPEIR does not recognize that ACWD's estimated 2030 purchase of water from the SFPUC (13.76 mgd) is within its existing contractual maximum, and is no greater than ACWD's historical purchases. For instance in fiscal year 2006/07, ACWD purchased its full contractual quantity from	The DPEIR should be revised as follows: 1. Table 7.10 should be revised to note that ACWD's estimated 2030 water purchases from the SFPUC are only 25% of ACWD's 2030 demand. 2. The DPEIR should correctly state that ACWD's 2030 purchase estimate is: (a) no more than ACWD's existing contractual entitlement (13.76 mgd), and (b) no more than ACWD has historically purchased from the SFPUC. 3. Rather than compare the 2030 ABAG employment projections against the 2020 general plan employment projections, the DPEIR should be revised to	24

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Comment No.	WSIP DPEIR Item of Concern	Summary of DPEIR Coverage of Item	ACWD Concerns regarding adequacy of DPEIR	ACWD Proposed Resolution
			the SFPUC, and is not requesting an amount greater than this historical usage for its 2030 purchase estimate. 3. The comparison between the employment projections provided by ABAG and the cites's general plans is misleading. The planning horizon for the cities' general plans is the year 2020, whereas the ABAG projections are for the year 2030. If the ABAG projections for the year 2020 are utilized, the difference between the two approaches (ABAG versus general plans) is much less (approximately 10%).	compare the 2020 ABAG employment projections versus the 2020 general plan projections.
28	General Comment		Since ACWD relies on the BDPLs as sources for blending and water distribution, any potential disruption of these sources may impact ACWD's ability to meet customer demands and fire flow requirements.	SFPUC should work with ACWD to review potential operational impacts of any project options which may involve disruption of the BDPL Nos. 1 and 2.

24 cont.

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BAWSCA
Bay Area Water Supply & Conservation Agency

Comments on the Draft Program Environmental Impact Report for the San Francisco Public Utilities Commission's Water System Improvement Program

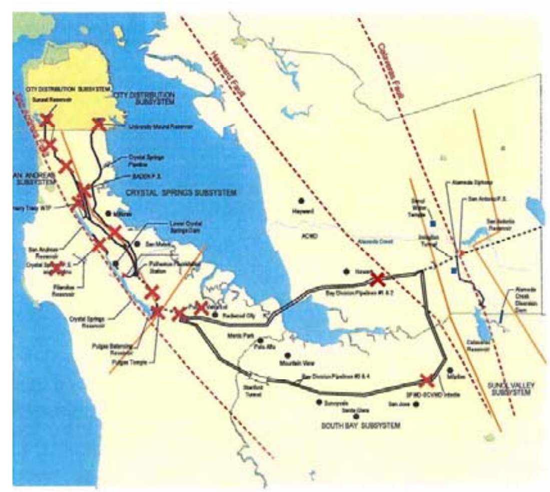

Figure shows water system facilities expected to fail in major earthquake on the San Andreas Fault

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COMMENTS ON THE DRAFT PROGRAM ENVIRONMENTAL IMPACT REPORT FOR THE SAN FRANCISCO PUBLIC UTILITIES COMMISSION'S WATER SYSTEM IMPROVEMENT PROGRAM

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BAWSCA
Bay Area Water Supply & Conservation Agency

Hand Delivery

October 1, 2007

Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
WSIP PEIR
1650 Mission Street, Suite 400
San Francisco, CA 94103

Re: Program Environmental Impact Report; Water System Improvement Program

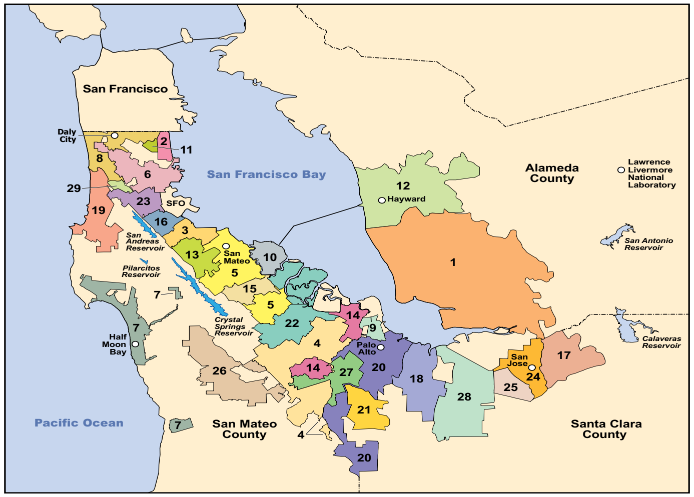
Dear Mr. Maltzer:

The Bay Area Water Supply and Conservation Agency (BAWSCA) appreciates the opportunity to offer comments on the comprehensive draft Program Environmental Impact Report (PEIR) which the Planning Department has prepared for the Water System Improvement Program (WSIP) being developed by the San Francisco Public Utilities Commission (SFPUC).

1. BAWSCA'S INTEREST IN THE WSIP

BAWSCA is an independent special district whose board of directors represents the 27 long-term contract customers of San Francisco in Alameda, San Mateo and Santa Clara counties. These neighboring communities include 16 cities, 9 water districts, an investor-owned public utility and Stanford University. The individual customers are listed, and their service areas are depicted, on Figure 1.

Figure 1. Map of BAWSCA Service Area



1 Alameda County Water District
2 City if Brisbane
3 City of Burlingame
4 CWS - Bear Gulch
5 CWS - Mid-Peninsula
6 CWS - South San Francisco
7 Coastside County District
8 City of Daly City
9 City of East Palo Alto
10 Estero Municipal Improvement District
11 Guadalupe Valley MID
12 City of Hayward
13 Town of Hillsborough
14 City of Menlo Park
15 Mid-Peninsula Water District
16 City of Millbrae
17 City of Milpitas
18 City of Mountain View
19 North Coast County Water District
20 City of Palo Alto
21 Purissima Hills Water District
22 City of Redwood City
23 City of San Bruno
24 City of San Jose (North)
25 City of Santa Clara
26 Skyline County Water District
27 Stanford University
28 City of Sunnyvale
29 Westborough Water District

Many of these customers rely on San Francisco for 100% of the water they distribute. All but one obtain more than 50% of their supply from the San Francisco regional system. Collectively, they purchase over two-thirds of the water which the SFPUC distributes, and pay over two-thirds of the cost of the regional water system. (In fiscal year 2006-07, customers represented by BAWSCA paid SFPUC over $100 million.) The water purchased from San Francisco is redistributed to over 1.7 million residents in the neighboring communities that rely on the San Francisco regional system. Their interest, individually and collectively, in a reliable water system, and therefore in the Water System Improvement Program evaluated in the draft PEIR, is plain to see.

2. ORGANIZATION OF BAWSCA'S COMMENTS

This letter addresses the major themes of the PEIR, with particular emphasis on the basic purpose of, and urgency for, the WSIP, and on the alternatives to it described in the draft PEIR. Attachment 1 to this letter contains our more specific, section-by-section review of the draft PEIR. We are also submitting separately bound volumes that provide additional information on, and illustrations of, wholesale customers' water conservation and efficiency measures, recycled water projects, and the "Smart Growth" that is encouraged by land use policies of San Francisco's neighboring communities. Finally, many of the individual wholesale customers which are members of BAWSCA will be submitting comments separately, addressing the elements of the draft PEIR that affect them directly and providing their individual perspectives on the PEIR and the program itself. 01

3. SUMMARY OF BAWSCA COMMENTS

- The draft PEIR is a conscientious, and largely successful, effort to satisfy the requirements of the California Environmental Quality Act (CEQA) for program EIRs.
- However, the description of the program in the draft PEIR does not convey to the reader the fundamental purpose of, and driving motivation for, the WSIP: to protect the 2.5 million people who live in the area served by the San Francisco regional water system from the catastrophic consequences of the system's failure during an earthquake. Nor does it convey the urgency with which those residents, their elected officials, and the State Legislature expect the WSIP to be prosecuted to completion.

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- Several of the alternatives to the WSIP presented in the draft PEIR are considerably worse from the environmental, public safety, public health, resource allocation and urban planning perspectives than the WSIP.
- The variant which would limit maximum systemwide rationing to 10% of normal use avoids significant environmental and economic harm in the Bay Area and can be achieved with no additional impact on flows in the lower Tuolumne River or to the agricultural economy in the San Joaquin Valley lands bordering the River. The economic impacts of the proposed program, which tolerates systemwide rationing up to 20% of normal use, are severe and are not adequately described in the draft PEIR.
- By contrast, the "Environmentally Superior Alternative" does indeed appear to be superior to the basic WSIP. It is described in only the most abbreviated, outline form in the draft PEIR. If we understand it correctly, its cornerstone is water agencies in the Bay Area providing economic incentives to encourage the Turlock Irrigation District and/or the Modesto Irrigation District, which currently divert large amounts of water from the Tuolumne River, to implement additional water conservation and reuse practices, thereby conserving at least the same amount of water as that to be diverted by the SFPUC over and above the City's existing contractual commitments to its wholesale customers. BAWSCA endorses this alternative, although we believe its environmental values can be further enhanced, as we describe below in Section 7.

01 cont.

4. THE FUNDAMENTAL PURPOSE OF THE WSIP -- PROTECTION AGAINST DISASTER

The need for the WSIP is rooted in the hard science of plate tectonics. The San Francisco Bay Region lies on the boundary zone between two of the tectonic plants (the Pacific Plate and the North American Plate) that make up the Earth's outer shell. The relentless motion of these plates as they grind past each other builds up strains that will eventually be released on the region's many faults. A stark reality which those who live or work in the Bay Area must face is that geological forces of immense power will inevitably, violently and without warning be released in the earth beneath their homes, schools, hospitals, offices, factories, public utilities, and transportation systems. The map included below as Figure 2, entitled "Earthquake Shaking

02

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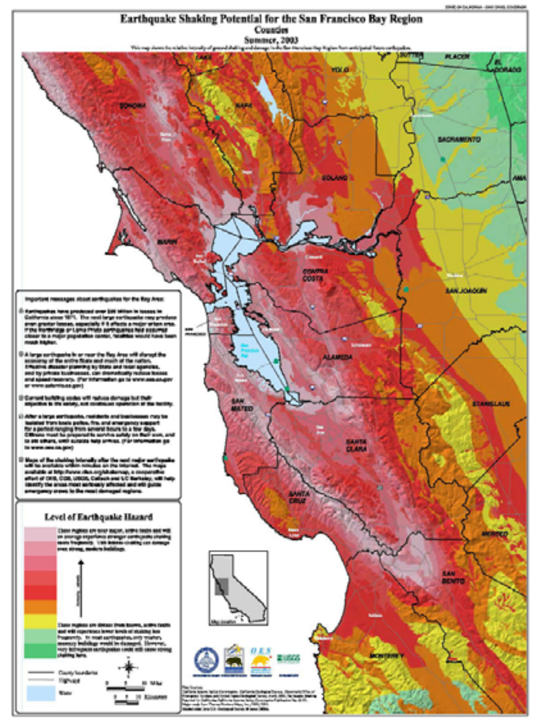
Potential for the San Francisco Bay Region Counties" graphically illustrates the potential of high intensity seismic activity concentrated in the four counties served by the San Francisco regional water system.

02 cont.

Figure 2.



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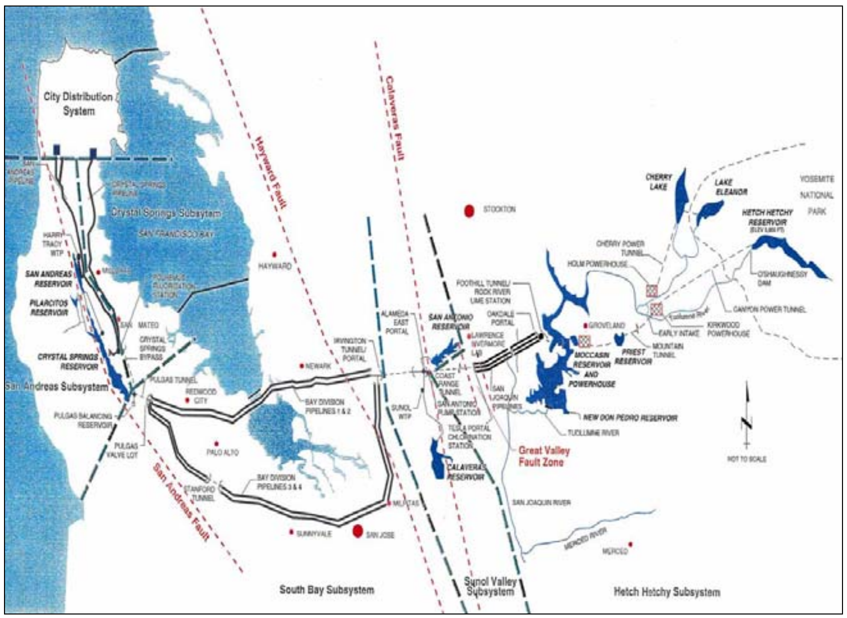
Many of the regional water system facilities are located on, or very near, one or more active faults. The map reproduced as Figure 3 shows the location of the "backbone" storage, transmission, and treatment facilities in relation to the faults. The Calaveras Fault is directly below Calaveras Reservoir in Alameda County and crosses the pipelines that carry Hetch Hetchy water into the Bay Area. The San Andreas Fault is directly below both San Andreas and Crystal Springs Reservoirs in San Mateo County. The Hayward Fault intersects all four of the pipelines that deliver water from the East Bay to San Francisco, the Peninsula, and South Bay communities. 02 cont.

Figure 3. Water System Facilities Cross Four Active Faults



Source: San Francisco Public Utilities Commission

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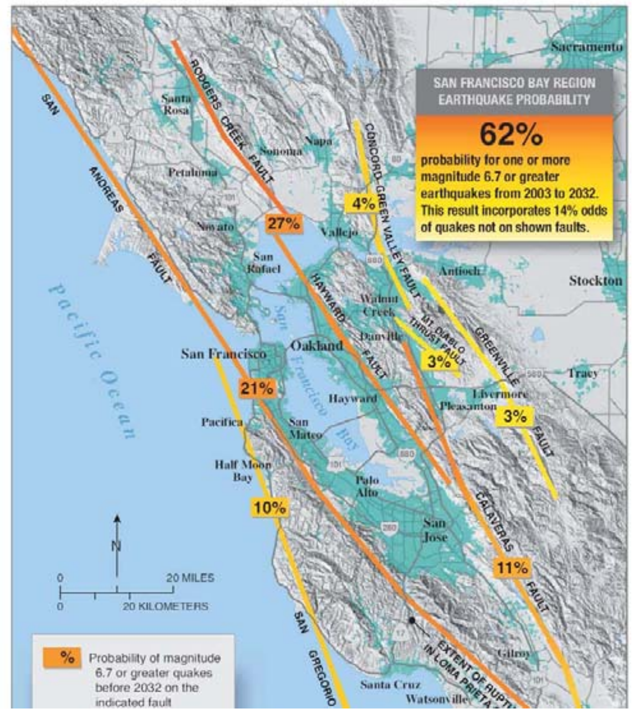
<u>The odds of a major earthquake striking the Bay Area in the near future are high.</u> On the basis of research conducted since the 1989 Loma Prieta earthquake, U.S. Geological Survey (USGS) and other scientists have concluded that there is a better than 60% chance of at least one magnitude 6.7 or greater earthquake, capable of causing widespread damage, occurring before 2032. (See Figure 4.) 02 cont.

Figure 4. San Francisco Bay Region Earthquake Probability



Source: USGS at http://earthquake.usgs.gov/regional/nca/wg02/media.php

12.3-24

The San Francisco earthquake of 1906 toppled buildings and shattered water systems from Santa Clara to Santa Rosa. Without water, San Francisco was unable to fight the fires that eventually consumed the City. The 1989 Loma Prieta earthquake caused billions of dollars of damage in San Francisco, Oakland, Santa Cruz and other communities. More recently, the consequences of the 1991 Oakland Hills firestorm would have been unimaginable had the municipal water system been inoperable. The following photographs (Figures 5 through 7) demonstrate the urgent need for the WSIP.

Figure 5. Damage to San Francisco Marina District Buildings from 1989 Loma Prieta Earthquake

Source: U.S. Geological Survey

02 cont.

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Figure 6. Aftermath of 1906 San Francisco Earthquake

Source: Karl V. Steinbrugge Collection, Earthquake Engineering Research Center, University of California, Berkeley.

Figure 7. 1991 Oakland Hills Firestorm

Source: NASA Ames Research Center

02 cont.

1345071.8

San Francisco Water System is old and poorly maintained. Most of the backbone facilities of the regional water system are over 40 years old; many date from the 19th Century, as can be seen from Table 1 below, which identifies key components of the regional system that the SFPUC considers at high risk of failure.

TABLE 1
SFPUC Regional Facilities at High Risk of Earthquake Damage

Facility	Location (County)	Constructed
Calaveras Dam	Alameda	1925
San Antonio Pump St.	Alameda	1968
Sunol Valley Treatment Plant	Alameda	1966
Alameda Siphons (3)	Alameda	1934,1953,1967
Irvington Tunnel	Alameda	1930
Bay Division Pipelines (4)	Alameda/Santa Clara/ San Mateo	1932,1936,1952,1967
Crystal Springs Pump St.	San Mateo	1975
Crystal Springs Bypass	San Mateo	1970
Lower Crystal Springs Dam	San Mateo	1898
Pilarcitos Dam	San Mateo	1866
San Andreas Dam	San Mateo	1875
San Joaquin Pipelines (3)	San Joaquin	1932,1953,1968
Coast Range Tunnel	Alameda/San Joaquin	1934

Source: San Francisco Public Utilities Commission

These structures were not designed to modern seismic engineering standards, and they have suffered decades of neglect. In June 1994, the San Francisco Board of Supervisors received a "Management Audit" of the San Francisco Water Department from the Board's Budget Analyst.

The audit reported:

> The Water Supply and Treatment Division [of the San Francisco Water Department] performs practically no preventive maintenance on the water supply facilities other than to its water treatment plants and certain valves in the Sunol area. As a result of this poor maintenance program, the Department's water supply and treatment facilities are deteriorating more rapidly than they would if they had been maintained well. The water supply system has aged and, without proper maintenance, the potential for outages has increased. Pipeline corrosion, inoperable valves, and aged support structures contribute to reduced reliability.

03

12.3-25

Eight years later, a Public Utilities Infrastructure Task Force appointed by then-Mayor Willie Brown confirmed the assessment of a system in disrepair:

> The Task Force and the PUC agree that the City's 100 year old public utility infrastructure is suffering from decades of deferred maintenance and less than benign neglect . . . .

As shown in Figure 8 below, the current state of disrepair of the regional water system infrastructure can no longer be tolerated.

Figure 8. Deteriorating Water System Infrastructure

San Joaquin Pipeline showing extensive corrosion damage.

Source: San Francisco Public Utilities Commission

Water erupts from break in San Joaquin Pipeline in 2002.

Source: San Francisco Public Utilities Commission

One of two 70 year old pipelines crossing San Francisco Bay.

Source: Arthur Jensen

03 cont.

The system is likely to fail in a major earthquake. Given the facilities' age, physical condition and proximity to active faults, it is not surprising that the engineering consensus is that many of these critical facilities would fail in a serious earthquake.

Calaveras Reservoir is normally the SFPUC's largest reservoir in the Bay Area. But, as shown in Figure 9, it has been drained to 30-40% of its capacity by order of the California Division of Safety of Dams, due to that agency's concern that it would not survive a large earthquake.

Figure 9. Calaveras Reservoir at Reduced Capacity

Source: San Francisco Public Utilities Commission

12.3-26

The following excerpts from engineering reports submitted to the SFPUC are illustrative. The reports consider three facilities that connect the Bay Area to the Hetch Hetchy water system and to Calaveras Reservoir. 03 cont.

> **Bay Division Pipelines:** Given a large earthquake on the Hayward Fault in Fremont, it is very likely that both the Bay Division Pipelines No. 3 and 4 will break open. Leak rates will approach 300,000 gallons per minute. Total loss of water will be about 178 million gallons before breaks can be valved off. *Source: "Analysis of Bay Division Pipelines 3 & 4 at the Hayward Fault," prepared for the City of San Francisco Utilities Engineering Bureau, G&E Engineering Systems Inc., Report 22.02.06, Revision 0, August 24, 1999.*

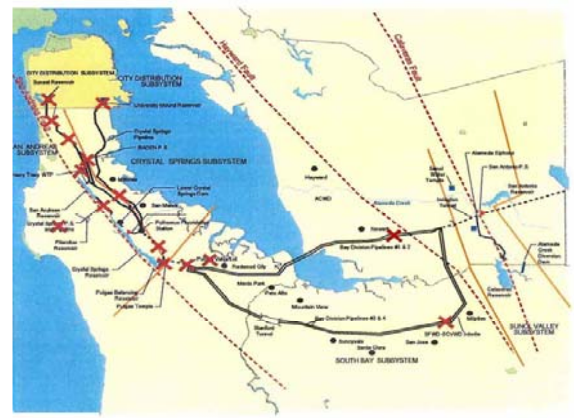
> **Alameda Siphons:** The Alameda siphons are three buried pipelines, each 3,000 feet long, which cross the Calaveras fault. The pipelines, the oldest of which was constructed in 1934, are suffering from joint separation damage due to fault creep. Recent studies indicate that horizontal and vertical movements of up to 3 feet and 1.5 feet, respectively, can be expected during a maximum credible earthquake on the main trace of the Calaveras fault. None of these siphons were designed to withstand the movements associated with such a major seismic event. *Source: "Irvington Tunnel # 2 and Siphons Modifications," Executive Summary, Woodward-Clyde Consultants, prepared for the City of San Francisco Utilities Engineering Bureau, November, 1991.*

> **Irvington Tunnel:** All Hetch Hetchy water plus that supplied by reservoirs located in the East Bay flows through this 3.5 mile long tunnel. It is a critical

> lifeline facility to the 2.7 million people served by the system. Constructed in 1930, the tunnel has not been inspected or maintained since 1966 because it cannot be taken out of service due to high water demands and the lack of redundant facilities. Recent seismic studies have found the tunnel is subject to 6-inch movements on local minor faults that would result from major earthquake events on the nearby Hayward and Calaveras faults. The tunnel was not designed to accommodate even these small movements. Either fault is likely to generate, within the next 30 years, a maximum credible earthquake. *Source: "Irvington Tunnel # 2," Preliminary Engineering Study, Phase 4, Woodward-Clyde Consultants, prepared for the City of San Francisco Utilities Engineering Bureau, November 27, 1991.*

The maps reproduced as Figures 10 through 13 show the facilities that SFPUC expects to fail as a result of earthquakes.

Figure 10. SFPUC Facilities Assumed to Fail in the Event of an Earthquake on the San Andreas Fault (Red Xs Indicate At-Risk Facilities) 03 cont.



Source: San Francisco Public Utilities Commission

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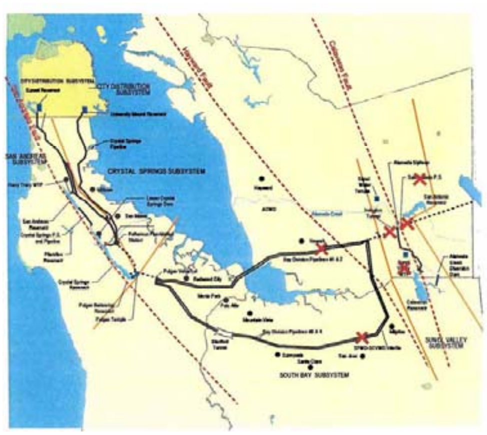
Figure 11.
SFPUC Facilities Assumed to Fail in the Event of an Earthquake on the Calaveras Fault
(Red Xs Indicate At-Risk Facilities)

Source: San Francisco Public Utilities Commission

Figure 12.
SFPUC Facilities Assumed to Fail in the Event of an Earthquake on the Hayward Fault
(Red Xs Indicate At-Risk Facilities)



Source: San Francisco Public Utilities Commission

03 cont.

12.3-27

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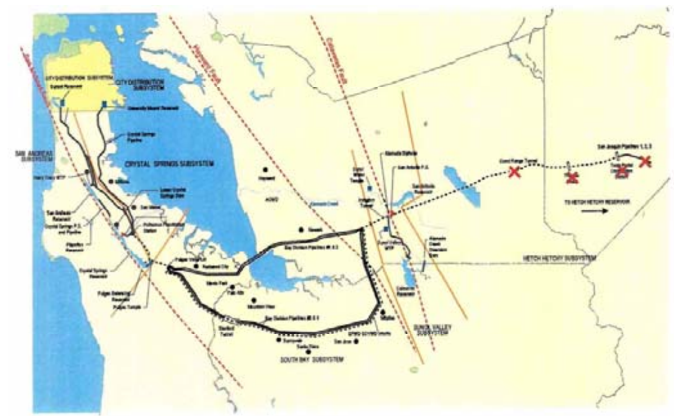
Figure 13.
SFPUC Facilities Assumed to Fail in the Event of an Earthquake on the Great Valley Fault
(Red Xs Indicate At-Risk Facilities)



Source: San Francisco Public Utilities Commission

03 cont.

Losing access to water for 30 days or more will create severe public health and safety dangers for millions of people. In 2001, the Bay Area Water Users Association (predecessor to BAWSCA) commissioned G&E Engineering Systems to describe the consequences to Bay Area communities from earthquake damage to SFPUC's water system. The report, a copy of which is included as Attachment 2, was prepared by John Eidinger, a civil engineer greatly respected for his expertise in water system performance during and after earthquakes.

After confirming the SFPUC's own estimates of outages on the SFPUC water system from 20 to 60 days, Dr. Eidinger pointed out some of the very practical consequences: 04

- Water will be unavailable for basic sanitation: bathing and flushing toilets will not be possible.
- Water will be unavailable for drinking or preparing food.
- Hospitals, skilled nursing facilities and other institutions such as universities, will have to close and relocate patients and students elsewhere.

- After a few days, firefighters will be without water necessary to fight fires, the incidence of which increases after earthquakes.

04 cont.

Extended Loss of Water Will Have Disastrous Economic Consequences. In October 2002, the Bay Area Economic Forum issued a report entitled "Hetch Hetchy Water and the Bay Area Economy."[1] The report based its conclusions on previous engineering analyses prepared for the SFPUC of the water system facilities likely to fail in a major earthquake on each of four active faults and on the time required to restore service.

The report is sobering:

> A major reduction of water supplies will have serious effects on many of those most vulnerable -- the homebound elderly, children, hospital and nursing home patients, families displaced from their homes by earthquakes and fire. In attempting to minimize those impacts, local water agencies must make difficult choices within their service territories in assigning priority for water delivery. It is only after emergency, public health and drinking water needs are met that water might be made available for commercial and industrial uses. At the end of the rationing queue, and with few cost-effective alternatives, many businesses will be at serious risk.
>
> Interviews with Bay Area commercial and industrial water users suggest the serious operational and economic impacts that would result from a Hetch Hetchy system failure. The most immediate and damaging impacts from a service interruption are in two areas:
>
> *Health and Safety.* Businesses across the board say they would feel compelled to close buildings that could not provide running water in sinks, toilets and drains, and adequate water or pressure for fire sprinkling systems. Bottled water and portable toilets would be a limited and temporary solution at best.
>
> *Plant operations.* Most large commercial and industrial complexes have rooftop cooling towers that run water through fan powered chillers. The water is then routed to building subsystems for drinking and sanitation, for filtration and use in industrial processes, and into closed fire protection and cooling system loops. Even a closed loop system loses water through evaporation and needs replenishing, or chillers will overheat and automatically close down. That in turn shuts off air conditioning, temperature-controlled laboratory environments, computer server clusters

05

12.3-28

[1] The Bay Area Economic Forum is a partnership between the Association of Bay Area Governments and the Bay Area Council. The economic analyses in the Report were carried out by Dr. David Sunding and other economists from the University of California at Berkeley.

> and water cooled equipment such as electrical generators and vacuum pumps.
>
> Based on these considerations alone, most businesses experiencing a loss or severe reduction in water supply beyond 2-3 days would probably suspend operations or close down altogether.
>
> *(Hetch Hetchy Water and Bay Area Economy, p. 14)*

The Bay Area Economic Forum report estimated that potential economic losses from a water supply interruption to the portions of the Bay Area served by the San Francisco regional water system would total <u>at least</u> $28.7 billion for a major earthquake on the San Andreas Fault and $17.2 billion for a similar event on the Hayward Fault. The components of the loss are quantified as shown Table 2:

TABLE 2
Economic Loss From Water Supply Interruption

	San Andreas Fault	Hayward Fault
Business Losses		
Manufacturing	$4.35 billion	$3.45 billion
Wholesale/retail	7.70 billion	5.60 billion
Professional/scientific Technical	1.60 billion	.63 billion
Accommodations/Food Services	.54 billion	.20 billion
Total Business Losses	**$14.2 billion**	**$9.9 billion**
Residential Losses	**$3.8 billion**	**$1.5 billion**
Fire Damage (water related)	**$10.7 billion**	**$5.8 billion**
TOTAL ESTIMATED LOSSES	**$28.7 billion**	**$17.2 billion**

Source: Bay Area Economic Forum Report "Hetch Hetchy Water and the Bay Area Economy," p. 29.

In addition to these quantifiable near-term damages, the report observed that "the Bay Area economy would suffer irreversible long-term damage due to the failure of many businesses to reopen because of losses incurred during disruption, the permanent relocation of other businesses outside the region due to water security concerns, and the reluctance of new businesses to locate here for similar reasons. These permanent economic losses are difficult to estimate without more study, but would almost certainly be on a large scale."

05 cont.

The State Legislature Acts

In 2002, the California legislature enacted AB 1823, the Wholesale Regional Water System Security and Reliability Act (Water Code Section 73500 *et seq.*). In passing this landmark legislation, the Legislature made specific and important findings about the risks the WSIP is designed to minimize.

> The reliability of [the San Francisco regional] water infrastructure system is of vital importance to the health, welfare, safety, and economy of the region that it supplies.
>
> In turn, this region is of vital importance to the entire State of California, because of the resident industries, universities, and commercial enterprises that employ millions of Californians and generate billions of dollars in exports and tax revenues to the state.
>
> The regional water system is old, and designed to outdated seismic safety standards. The system either crosses, is located on, or is adjacent to, three major active earthquake faults, including the Calaveras fault, the San Andreas fault and the Hayward fault. Engineering investigations have disclosed that the system is at risk of catastrophic failure in a major earthquake. Many areas in all four counties served by the system face interruptions in their supplies of potable water for up to 30 days, and some areas could be without water for as long as 60 days. 06
>
> Interruptions in water supply of this magnitude and duration to a densely populated metropolitan region would be disastrous for public health and safety and for the regional and state economy. In addition, uncontrolled releases of water from pipelines, tunnels, and reservoirs could create severe flood damage and environmental harm to fish and wildlife habitat in the communities in which water facilities are located.
>
> Californians in neighboring counties, including those Californians outside the immediate service area of the regional system, will benefit from the implementation of the act adding this section. Access to a reliable supply of water is an important component of the infrastructure necessary to a prosperous metropolitan economy.
>
> The state has concerns for the health, safety, and the economic strength of the region that warrant requiring San Francisco to take prudent steps to upgrade the regional water system in a timely manner.
>
> *(Stats. 2002, Chapter 831, Section 1(c) through (h))*

San Francisco's Response

While San Francisco opposed AB 1823, once it became law San Francisco political leadership, and its voters, took action. Measures passed by the voters in November 2002 embodied San Franciscans' recognition of the dangers posed by the fragile condition of the regional water system and their intention that the system be rehabilitated without delay.

Measure A authorized the SFPUC to issue $1.6 billion in revenue bonds to restore the system, by far the largest bond issue in the City's history. The principal argument in favor of the measure, signed by a majority of the Board of Supervisors, warned:

> If a serious quake were to occur today, there is a high probability that water delivery to San Francisco could be interrupted for more than two months. This would threaten our ability to fight fires after an earthquake and lead to an economic disaster as we attempted to recover without a stable water supply.
>
> (Arguments in favor, including that submitted by former San Francisco Mayor and current United States Senator Diane Feinstein, are attached as Attachment 3.) 07

Measure E amended the City's Charter to give the SFPUC direction to fix the system and new authorities to enable it to do so quickly and efficiently. The measure added Section 8B.120 to the Charter; the new section reads, in part:

> Hetch Hetchy Water and Power System is an irreplaceable asset of the people of the City and County of San Francisco. The system is fundamental to the economic vitality of San Francisco and the Bay Area. The voters of the City and County of San Francisco are committed to preserving and protecting the system as well as safeguarding the extraordinary quality of the water from Yosemite and local watersheds. The voters find that the protection, maintenance and repair of the system are among their highest priorities.
>
> San Francisco faces an unprecedented challenge: to restore its aging water system to ensure a reliable Bay Area water supply through the next century. Repairs must be accomplished as quickly as possible to avoid system outages, which could be caused by natural disasters such as earthquake.

Conclusion

It is now over five years since Governor Gray Davis signed AB 1823 into law. Much planning and analysis (including this draft PEIR) has been completed since then. But very little actual construction has been accomplished. The City and its neighboring communities remain at risk of being cut off from water after a major earthquake. 07 cont.

5. MOST OF THE ALTERNATIVES CONSIDERED IN THE DRAFT PEIR ARE WORSE THAN THE WSIP 08

A. No Program Alternative. The No Program Alternative is unacceptable as a matter of social policy. It offers no environmental benefits when compared to the WSIP as proposed, and it risks an environmental, as well as human, disaster. Finally, it is of doubtful legality. 09

Abandoning the program will extend indefinitely the period of time that 2.5 million people remain exposed to the risks that the WSIP is designed to avoid. The draft PEIR identifies several of the consequences of the No Program Alternative under the heading of Feasibility. 10

> The No Program Alternative would place the regional system at significant risk to seismic hazards, increased facility failures, and increased supply shortages on a day-to-day basis, as well as result in prolonged service disruptions to many customers in the event of an earthquake or other emergency due to inadequate facility redundancy and operational flexibility. In addition, this alternative could add substantial long-term costs due to the increased likelihood of facility failures and increased need for emergency repairs and replacement in the event of an earthquake or other emergency." We agree. We also agree that it "would raise some fundamental institutional issues regarding the ability of the SFPUC to fulfill its basic mission to provide reliable, high quality and affordable water to its customers.
>
> *(draft PEIR p. 9-27)*[2]

[2] While only feasible alternatives to a project need to be evaluated in an EIR (14 Cal. Code Regs. §15126.6(a)), consideration of the No Project Alternative, even if infeasible, is mandatory (14 Cal. Code Regs. §15126.6(e)(1)).

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From the perspective of environmental harm, if an earthquake were to disrupt the supply of water to the Bay Area and the fires that typically accompany earthquakes in cities were to burn through large areas, a significant amount of carbon would be released to the atmosphere and polluted runoff would contaminate local streams and San Francisco Bay. The uncontrolled release of water from damaged pipelines could result in erosion and other environmental harm. In terms of human impact, water cascading from a shattered dam could result in far more serious consequences for those unfortunate enough to live or work in the path of the flood waters. 11

Moreover, a conscious adoption by San Francisco of the No Program Alternative would violate its contract obligation to wholesale customers to use its best efforts to keep the system in "good working order and repair" and would trigger reviews by the California Department of Public Health and the California Seismic Safety Commission, under AB 1823. 12

B. The "No Purchase Request Increase" Alternative. The stated purpose of this Alternative is to "avoid or minimize the potential growth-inducing effects and secondary effects of growth associated with providing more water to the regional customers." (draft PEIR p. 9-41) But the draft PEIR acknowledges that limiting the amount of water San Francisco sells to its neighboring communities to 184 mgd (instead of the 209 mgd anticipated by the WSIP) is unlikely to have the desired effect. ("Thus, the growth-inducement potential under this alternative could be similar to that of the proposed program…. [T]he growth would occur anyway[.]" (draft PEIR p. 9-47) Furthermore, the draft PEIR also states that "withholding additional supply from the regional system to the wholesale customers would not necessarily 13

reduce the growth in the communities within the service area." (draft PEIR p. S-77) The draft PEIR observes on page 9-40 that, in the event that the SFPUC were to limit future water sales, the neighboring communities that purchase water from San Francisco would most likely pursue supplemental supply sources to accommodate the growth that is already planned for their communities. The draft PEIR also recognizes that tapping these alternative sources would itself have negative environmental impacts, but does not rigorously analyze those impacts. 14

Assuming that this Alternative could achieve its objective (limiting growth in the neighboring communities), the environmental impacts associated with growth would not be avoided. If growth were not to occur in the neighboring communities, it would be displaced to the periphery of the Bay Area, and eastward into the Central Valley. We agree with the draft PEIR's conclusion that the environmental impacts associated with such displaced growth, largely low-density and dispersed, would likely be far greater than those associated with the high-density, infill development which the WSIP seeks to accommodate in the existing SFPUC service area. 15

(1) Growth Within the Existing Service Area Minimizes the Environmental Impacts of Development. "Smart Growth" is a philosophy of land-use planning that is designed to avoid urban sprawl by advocating compact, transit-oriented development, with a range of housing choices. Why is Smart Growth smart? In addition to significant social and economic benefits of providing housing near where people work, Smart Growth offers considerable environmental benefits. Increased use of public transportation results in less traffic congestion, with a decrease in environmentally damaging emissions. Compact, dense housing results in lower per capita use of water and energy, with attendant environmental benefits. (See U.S. Environmental Protection Agency: *What Are The Environmental Benefits of Smart Growth*) A 2000 study found that compact development in New Jersey would produce 40 percent less water pollution than more dispersed development patterns. (Rutgers University, Center for Urban Policy and Research. *The Costs and Benefits of Alternative Growth Patterns: The Impact Assessment of the New Jersey State Plan* 2000, available at http://www.nj.gov/dca/osg/plan/impact.shtml.) 16

A concise, comprehensive statement of the purpose and benefits of Smart Growth appears in a recent issue of The Yodeller, published by the San Francisco Bay Chapter of the Sierra Club. Its author, Katie Crecelius, a founding member of the Marin Environmental Housing Collaborative, makes the following points: 17

- The Bay Area economy needs thoughtful, controlled, "smart" development. Stopping real-estate development would stifle

our economy, upon which we depend for jobs and for tax income to pay for parks, police, schools, roads, etc.

- The lack of housing affordable to workers creates significant difficulties for Bay Area employers in recruiting and retaining employees.
- To support thoughtful development while protecting Bay Area open-space buffers and greenbelts, elected officials need to allow higher densities in infill areas.
- To begin to reduce greenhouse-gas emissions, we need increased opportunities for public transportation. Public transportation ridership depends upon population and job concentration near transit stops. 17 cont.
- To reduce vehicle miles traveled, the Bay Area needs housing located near job centers. This housing needs to be affordable for households of all income ranges.
- Land within walking distance of public transportation is precious. Such a scarce resource should be fully utilized.

(*The Yodeller, September-October, 2007, p.4)*

Planned growth in San Francisco's neighboring communities is consistent with these goals and realities. Most of San Francisco's neighboring communities are already built up and largely urbanized, located close to transit corridors and transportation hubs. Most of the large development projects recently built or currently planned within the SFPUC service area will utilize compact building design in already existing communities near a variety of transportation choices. Such development creates a range of housing opportunities and choices while preserving open space, natural beauty, and critical environmental habitats. 18

Four examples indicated below as Figure 14 demonstrate the Smart Growth trend in San Francisco's neighboring communities. Other examples are collected in Volumes 2 through 6.

12.3-32

Figure 14. Examples of Smart Growth

18 cont.

Bay Meadows Project in San Mateo, is a mixed-used development located on a former practice horseracing track adjacent to the actual horseracing track. It is a thriving residential, office and retail community that includes 734 housing units for multifamily and single family residents, 98,000 square feet for retail purposes as well as 750,000 square feet of office space. It is also approximately a half a mile away from the Hillsdale Commuter Rail Station, providing a convenient commute to San Jose and San Francisco. The Sierra Club currently features Bay Meadows in "Building Better, A Guide to America's Best New Development Project" and has also endorsed an expansion of the Bay Meadows Project to create Bay Meadows II.

Whisman Station in Mountain View, is located on the former 40-acre GTE complex site. This project features 500 units, all within easy walking distance from a new lightrail station.

The Crossing in San Bruno, is a 20-acre mixed use master planned development located on a former U.S. Navy facility. The Crossing is located near shopping and is less than one half mile from the new San Bruno BART Station. The Crossing has received national attention for both its transit-oriented development characteristics and its potential to redefine the City of San Bruno. The Crossing will include 1,063 multifamily and senior housing residences, 300 to 500 hotel rooms, a recreation center and commercial uses.

Rivermark in Santa Clara consists of 1800 units of medium and high density housing. Its compact design requires significantly less irrigation than more traditional single family developments. Rivermark makes extensive use of recycled water. In April 2004, Rivermark won 17 awards from the Home Builders Association of Northern California including the Community of the Year Award for High Density Homes in Northern California.

(2) The PEIR Should Include a More Thorough Analysis of the Consequences of Displaced Growth. The California Department of Finance forecasts that, by 2030, more than 45 million people will live in California, an increase of 37% over the State's population in 2000. (Cal. Dept. of Finance Projections available at http://www.dof.ca.gov) These people will live somewhere. If growth does not occur in the SFPUC service area, it is likely to occur instead on the eastern and southern fringes of the Bay Area, as well as in the communities on the western borders of the San Joaquin Valley. These fast growing communities are already under extreme development pressure. A recent California Supreme Court case indicates that the environmental consequences of displaced growth should be considered in the preparation of an EIR. (*Muzzy Ranch, Co. v. Solano County Airport Land Use Commission* (2007) 41 Cal. 4th 372.) However, the draft PEIR does not compare the impacts of such displaced growth to the impacts of the growth the WSIP will accommodate in San Francisco and its immediately adjacent neighboring communities. At a minimum, such a comparison should address the following four potential impacts. 19

(a) Air Pollution. One consequence of the expansion outward from the urban core of the Bay Area is the need to drive. Although most Californians (even city dwellers) love their cars, residents of more compactly developed areas drive less than those who live in low-density, suburban/exurban areas where driving is a necessity. (Sierra Club, *Sprawl Report 2001*; see also Sierra Club *Fact Sheet. Population Growth and Suburban Sprawl: A Complex Relationship*) The Metropolitan Transportation Commission estimates that the weekday vehicle miles traveled (VMT) per person in Solano County will increase by 71% between 2007 and 2030. (MTC *Projections 2007* and *Projections 2030*) By contrast, the MTC projects VMT in San Mateo County to increase over the same time period at less than a third of that rate. Increased air pollution is the one of the most obvious effects of increased automobile traffic. Pollution caused by motor vehicles has demonstrable environmental and health impacts, as well as contributing to the inexorable warming of our planet's atmosphere. 20

(b) Water Pollution. Increased driving can also affect water quality. Exhaust particles from tailpipes are deposited on roadways, leaving a toxic residue that is washed into waterways by rainfall. Such storm water runoff is a major contributor to water 21 quality problems. (EPA, *Our Built and Natural Environment* (2001) at p. 15; see also NRDC *Paving Our Way to Water Shortages*) More cars require more roads, impervious to runoff. Not only does increasing the area of impervious surfaces lead to higher runoff volumes, but it can cause larger and more frequent incidents of local flooding, longer periods of below-normal stream levels, reduced groundwater recharge, and other negative effects such as increased sedimentation, increased water acidity, and higher water temperatures. (EPA, *Our Built and Natural Environment* at p.19) 21 cont.

(c) Water Demand and Infrastructure. Displaced growth outside of the service area will not only impact water quality, but will also put increased stress on water supplies. People living in the hotter inland counties have substantially higher per-capita water use than those living in more urbanized coastal areas. Unlike the Smart Growth within the SFPUC service area, characterized by dense, compact housing, inland areas generally have single family homes on large lots. These larger lots have higher water use--especially outdoor water use. In fact, outdoor water demand for typical residential lots in an inland area is between two and three times higher than in the more compactly developed areas that make up most of the SFPUC service area. (Public Policy Institute, *Lawns and Water Demand in California*, (2006))

According to the Sierra Club, households in low density subdivisions (one-acre lots) use more than twice as much water per household as households in more densely developed areas (1/3 acre lots). (www.sierraclub.org/sprawl/density/water.asp) Water consumption is again reduced by half when there are ten households per acre. Much of San Mateo County's population lives in areas where there are between 10 and 25 people per acre. This population density is expected to increase by 2030, as most areas will add 1-5 people per acre, and some areas of the county will add as many as 25 people per acre. (MTC *Projections 2005* as expressed in *Focusing Our Vision: Network of Neighborhoods*, available at http://gis.abag.ca.gov/website/fov/viewer.htm.) By comparison, average density in San Joaquin County is only eight persons per acre. 22

Adding population to already built-up areas requires little in the way of increased infrastructure. By contrast, displaced growth in the outer fringes of the Bay Area will require new roads, treatment plants, storage tanks, and water distribution and sewer collection mains, all of which carry their own environmental impacts. 22 cont.

(d) Loss of Agricultural Land and Endangered Species Habitats. Outside San Francisco itself, and the densely populated Bay Plain, the Bay Area still supports orchards, ranches, and farms. Indeed, these agricultural lands are essential components of the increasingly popular Farmers' Markets which provide local produce to urban residents. According to the Greenbelt Alliance, these are the lands most directly threatened by development, while San Francisco and the neighboring communities to which it supplies water contain very few such areas.

The Greenbelt Alliance's 2006 report "At Risk: The Bay Area Greenbelt" stresses that the neighboring communities that are San Francisco's wholesale customers are NOT the communities at risk of conversion to sprawl. (See excerpts from Report included as Attachment 4.) In a county-by-county analysis, the report highlights the following about the BAWSCA area: 23

- San Mateo County is singled out as "a leader in protecting land over the last five years." The report notes that since 2000, "four new BART stations in the County and the connection of BART to Caltrain at Millbrae have created valuable new opportunities for regional integration and smart growth in San Mateo County."
- Since 2000, the City of San Jose has protected more than 20,000 acres of land. The City envisions the gradual redevelopment of the industrial North First Street area (served only by SFPUC water) as a high density residential area.
- In Alameda County, the report acknowledges Fremont's hillside protection ordinance and describes the County as having "made significant progress in securing its greenbelt." The "hot spots" at risk of conversion to sprawl are outside the SFPUC service area, mainly in the east county cities of Livermore, Pleasanton, and Dublin.

23 cont.

While sprawl is a concern in the eastern portion of Alameda County, the Central Valley is at even greater risk of losing its agricultural base to overdevelopment. The Central Valley's best farmland is being developed quickly and with alarming inefficiency, often by converting actively farmed land into "ranchettes." (American Farmland Trust, *The Future is Now: Central Valley Farmland at the Tipping Point*) These properties can be as large as 20 acres and are not farmed at all. Not only do such ranchettes house very few people on a large amount of land, they also pose challenges to agriculture from land use conflicts, making it increasingly expensive for those who wish to continue to farm the land. Finally, they contribute to land price inflation, which provides incentives for farmers to sell even more land for development.

Displaced growth will also destroy land that is the habitat of important species. In fact, habitat destruction is the main factor threatening 80 percent or more of the species listed under the Endangered Species Act. (EPA, *Our Built and Natural Environments* at p. 13) For example, in 2001, the U.S. Fish and Wildlife Service designated more than four million acres of land near Livermore, on the eastern fringe of the Bay Area, as essential for the recovery of the threatened California red-legged frog, which breeds in the weedy creeks hidden in the hollows of this landscape. Today, only 11 percent of that original landscape remains as a viable habitat for this threatened species. (See Attachment 4.)

The Natural Resource Defense Council lists ten ways to improve the Bay Area's environment. The top four are: <u>conserve energy</u>, <u>conserve water</u>, <u>drive less</u>, and <u>move to a compact neighborhood</u>. (*The Green Gate: NRDC's Environmental Guide to the San Francisco Bay Area*) The WSIP accommodates growth while permitting all four of these goals to be achieved. Displaced growth that is likely to occur under the "no more water" alternative likely will achieve none of them.

24

(3) Most of the Planned Growth to be Accommodated by the WSIP Has Already Been Analyzed in CEQA-Approved Documents. The draft PEIR compares the growth projections used as the basis for each of the wholesale customers' 2030 water demand estimates, and the growth projections presented in general plans of jurisdictions in the SFPUC service area that have already undergone CEQA analysis. The draft PEIR concludes that these

24 cont.

two growth projections are generally comparable. We agree. Attachment 1 contains a more detailed discussion of the adequacy of the draft PEIR's analysis of growth-induced impacts.

25

(4) A Decision by San Francisco to Restrict Water Deliveries to Neighboring Bay Area Communities Jeopardizes San Francisco's Water Rights. A fundamental principle of California water law is that appropriative water rights, including those obtained prior to 1914, may be lost through non-use. *Smith v. Hawkins* (1895) 110 Cal. 122. A pronouncement by San Francisco that it will forego any future increase in diversions from the Tuolumne River, beyond those necessary to satisfy existing contractual commitments, risks the permanent loss of those valuable rights, with consequences that need to be described in the final PEIR.

In addition, such a decision, motivated by a desire to exercise control over development outside San Francisco's jurisdictional boundaries, would be inconsistent with (1) the premises underlying the Raker Act, (2) BAWSCA agencies' status as co-grantees of the Raker Act, (3) San Francisco's responsibility under California law as fiduciary of assets acquired from the federal government, and (4) the existing policy of the SFPUC Resolution No. 93-0084.

26

<u>**Conclusion**</u>

The "No Purchase Request Increase" Alternative is not likely to achieve its stated goal of limiting growth in San Francisco's neighboring communities. Moreover, this goal runs counter to sound public policy. This Alternative will discourage Smart Growth in the urbanized core of the Bay Area, and will encourage instead sprawl at the periphery and in the Central Valley, with environmental impacts far more significant those of the WSIP. Finally, its feasibility is questionable given the hazardous legal and political uncertainties that surround this misguided alternative.[3]

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[3] Under CEQA, a program's legality must be considered in determining feasibility. (See Guidelines section 15364 ("Feasible" means "capable of being accomplished . . . taking into account economic, environmental, legal, social, and technological factors.")

C. The Aggressive Conservation/Water Recycling/Local Groundwater Alternative. The wholesale customers already have a diverse supply portfolio, including water recycling and local groundwater, as well as desalination. These alternative sources meet one third of the customers' supply needs. Given the wholesale customers' current low water use and the conservation and local supply projects that they already have in place or have built into their projections of demand, we agree with the draft PEIR's conclusion that it is not feasible to reduce demand for water from the regional system by an additional 19 mgd. 27

(1) The Draft PEIR Rightly Concludes that the Assumption of an Additional 19 Mgd of Water Conservation and Recycling is Infeasible.

(a) Residential per capita water use in the Bay Area is lower than in any other region of California. BAWSCA member agencies and their customers are dedicated to conserving and recycling water. While residential per capita use in the San Francisco Bay Area is the lowest of any of the ten hydrologic regions in the State, the 1.7 million residential customers of BAWSCA members use less than the average for the Bay Area as a whole. (See Table 3.) 28

TABLE 3
Total Residential Demand by Hydrologic Region

Region	**Total Residential Demand (Gallons Per Person Per Day)**
Colorado River	338
South Lahontan	265
Tulare Lake	242
San Joaquin River	220
South Coast	132
North Lahontan	133
Sacramento River	177
Central Coast	116
North Coast	123
San Francisco Bay Region*	97
SF Wholesale Customers	**88**

Source: California Department of Water Resources, The California Water Plan Update, May 2005, Bulletin 160-05 Public Review Draft

* *The San Francisco Bay Region includes all or portions of nine Bay Area counties*

12.3-35

Even though the wholesale customers' per capita use is less than that in all other regions of the State, residential per capita water demand is still projected to decrease 3%, from 88 gallons per capita per day (gpcpd) in 2005 to 86 gpcpd in 2030. (*Projected Water Usage for BAWSCA Agencies*, Brown and Caldwell (2006)) Gross per capita water demand (which includes water use by industrial, commercial, institutional, and municipal customers) in the wholesale service area is also projected to decrease, from 165 gpcpd in FY 2005 to 160 gpcpd in 2030. (*BAWSCA Annual Survey*, FY 2005/2006, *Projected Water Usage for BAWSCA Agencies*, Brown and Caldwell)

(b) Wholesale customers have outpaced southern California companies in water conservation.. Some have argued that the Bay Area should be able to achieve savings similar to those achieved by the Metropolitan Water District in Southern California: a 16% reduction in water use from 1990 to 2003 despite a 14% increase in population. (*From Tuolumne to Tap: Pursuing a Sustainable Water Solution in the Bay Area,* Tuolumne River Trust (July 2007) p. 22) In fact, the customers served by the BAWSCA agencies have reduced their use significantly over a similar period. Despite an 18% increase in population between 1986 and 2003, overall water demand remained flat and residential per capita demand decreased by 11%. Today's residential per capita water use is 15% less than it was in 1986, before the last drought, and 23% less than before the drought of 1976-1977. (*BAWSCA Annual Survey*, FY 2005/2006) 28 cont.

Moreover, despite its recent downward trend, per capita use in Southern California is still higher than that of the wholesale customers, and will remain higher in 2030. (*Regional Urban Water Management Plan* (MWDSOC, November 2005); *Projected Water Usage for BAWSCA Agencies*) Consider the following comparisons:

- In 1986, the gross per capita water use in Metropolitan Water District's service area was 200 gpcpd, 10% higher than for the wholesale customer area in that year (182 gpcpd).
- Metropolitan Water District's gross per capita water use in 2030 is projected to be 191 gpcpd, 19% higher than the corresponding projected demand of 160 gpcpd in the

wholesale customers' service area in 2030. (*Projected Water Usage for BAWASCA Agencies*)

Looking to the future, the wholesale customers are projecting a 19% increase in population and 31% increase in employment. (*SFPUC 2030 Purchase Estimates Technical Memorandum*, URS (2004)) Despite this increase in population and jobs, wholesale customer water demand (including sources other than the regional system water) is predicted to increase by only 19%. (*SFPUC 2030 Purchase Estimates Technical Memorandum*) 28 cont.

(2) The Neighboring Communities Have Committed to Increased Water Use Efficiency as Part of Their Plans for 2030. The wholesale customers, collectively, anticipate 13 mgd savings from implementation of conservation programs in their service areas as well as 25 mgd of conservation savings due to continuous implementation of the existing plumbing codes. These conservation savings have already been built into the forecast of demand used in the PEIR. In developing their 2030 purchase estimates, the wholesale customers examined the nine quantifiable California Urban Water Conservation Council Best Management Practices for Urban Water Conservation plus an additional 23 water conservation measures. (*SFPUC Wholesale Customer Water Conservation Potential*)

In addition to conservation "best management practices" implemented by individual wholesale customers, BAWSCA has implemented regional water conservation programs since 1998 and has expanded these programs to include: 29

- Water Efficient Residential Washing Machine Rebate Program
- School Water Education Program
- Large Landscape Audit Program
- Low Water Use Landscape Education Classes (for landscape designers and gardeners)
- Water Efficient Landscape Educational CD-ROM
- High-Efficiency Toilet Rebate Program

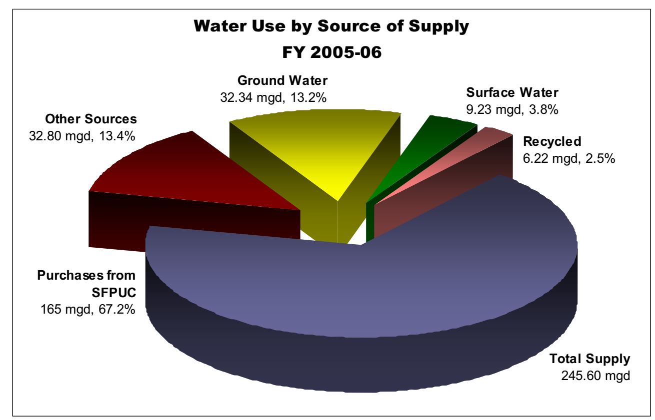
In addition, in fiscal year 2007-2008, BAWSCA will be adding a commercial washing machine rebate program. BAWSCA has joined with the SFPUC in the "Water Saving Hero" public

education campaign, with billboards, posters, newspaper display ads, and radio spots featuring ordinary people adopting simple water conservation practices in everyday life. The Fiscal Year 2006-2007 report on BAWSCA's conservation programs, along with a Water Efficient Landscape educational CD, is included as Attachment 5. 29 cont.

(3) Collectively, the Agencies that Purchase Water From the SFPUC Have a Diversified Portfolio of Water Supplies to Meet the Demands of Their Customers. In addition to purchases from the regional water system, BAWSCA agencies have already developed local water supplies (including surface water, desalinated water, groundwater, and recycled water), as well as contracts with the State Water Project and Santa Clara Valley Water District.

Figure 15 below shows the distribution of supply sources utilized by the BAWSCA agencies in FY 2005/2006. (*BAWSCA Annual Survey*, FY 2005/2006) 30

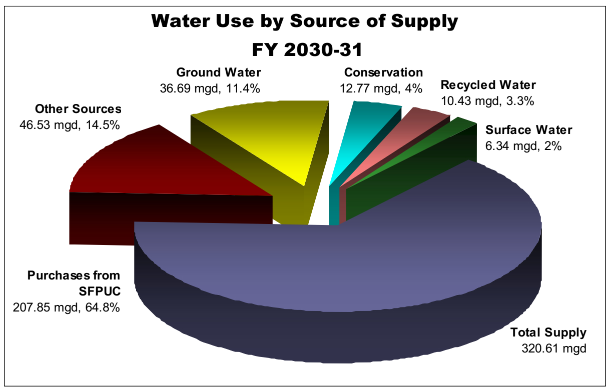
Figure 15.



Currently, 81 mgd (about 33% of the total wholesale customer water demand) is provided by sources other than the San Francisco regional water system. 30 cont.

By 2030, the contribution from sources other than the San Francisco regional system is projected to increase by 40%, to 113 mgd. (*BAWSCA Annual Survey*, FY 2005/2006) Desalination will increase from 5 mgd to 10 mgd and recycled water from 6 mgd to 10 mgd. The largest contribution to increased water supply from a non-regional system source will come from water conservation: 38 mgd, which includes the 13 mgd in new conservation programs shown in Figure 16, and the 25 mgd attributable to installation of water-efficient, code-compliant plumbing fixtures which is embedded in the wholesale customers' demand projections themselves and therefore not evident in Figure 16.

Figure 16.



31

By contrast, San Francisco is nearly 100% reliant on the regional system for meeting demands of its in-City and other retail customers such as the San Francisco Airport. San Francisco has had plans for decades to increase its groundwater and recycled water supplies, but San Francisco's only recycled water plant, the McQueen Treatment Plant in Golden Gate Park, was shut down in 1981. Since that time, San Francisco has developed less than 1 mgd of tertiary-treated 32

recycled water which is used for wash-down operations within the water treatment plant itself. (*San Francisco Urban Water Management Plan* (2005)) The additional 10 mgd of conservation, recycling and groundwater in the San Francisco retail area that the WSIP projects to be achieved by 2030 will finally bring San Francisco more in line with the water supply operations of its wholesale customers. 32 cont.

(4) There are Significant Negative Impacts Associated with this Alternative Including Impacts on Public Health, Demand Hardening and Environmental Impacts Identified in the Draft PEIR. The goal of the Aggressive Conservation Alternative is to address the impacts to the Tuolumne River, Alameda Creek, and the Peninsula watershed that are associated with the preferred Program. In fact, the Modified WSIP alternative does a significantly better job at reducing the overall identified impacts. Moreover, the Aggressive Conservation Alternative creates three additional potentially significant water supply and system operations impacts when compared to the Modified WSIP. Specifically, the Aggressive Conservation Alternative would have the following impacts beyond the Modified WSIP: 33

- Impacts on the rainbow trout fishery resources between Alameda Creek and Calaveras Reservoir; 34
- Impacts on the recreational experience of hikers on the Alameda Creek in the Sunol Regional Wilderness resulting from reduced in stream flows during winter and early spring months; and 35
- Impacts on visual effects along the Alameda Creek in the Sunol Regional Wilderness area resulting from WSIP-induced reduction in stream flows. 36

(a) <u>Demand Hardening makes droughts harder to bear, such that increased rationing may have significant economic and lifestyle impacts</u>. One by-product of the Aggressive Conservation Alternative is the hardening of demand in the service area. Water conservation activities "harden" demand since they incorporate continuous water savings into baseline demands. Therefore, the next increment of water use reduction becomes significantly more difficult to achieve. When demand is hardened, a water supplier faces greater challenges 37 in achieving rationing targets without significant impacts on residential, business and industrial customers.[4]

A recently released study "Measures to Reduce the Economic Impacts of a Drought-Induced Water Shortage in the SF Bay Area" (Public Financial Management/Bay Area Economic Forum (PFM/BAEF) (May 2007)) examined the economic impacts of water rationing on the commercial and industrial sectors in the SFPUC's service area. One key finding of this analysis addressed the impact of demand hardening and acknowledged that "Residential demand becomes more difficult to reduce as additional conservation measures are implemented; demand hardening is real." (PFM/BAEF Report)

The draft PEIR also recognizes the consequences of demand hardening:

> As a result of the water use efficiency or demand "hardening" that would be further institutionalized through this alternative, customers would have limited options for accommodating a period requiring 20 percent or more rationing in terms of what water uses they could cutback. Customers would have already increased their water use efficiency and eliminated less efficient uses such as many types of conventional outdoor use (e.g., landscape irrigation, car washing). In these cases, the water use cutbacks required to achieve 20 percent or more rationing would involve reductions in more essential water uses, such as indoor uses for cleaning and bathing, which could cause greater hardship on customers.
> *(draft PEIR, p. 9-54.)*

> Although the information on effects of water shortages during drought is limited, studies completed to date indicate that rationing cutbacks of 15 to 20 percent can have substantial economic impact on commercial, industrial and residential sectors as well as lifestyle effects on residents. [R]equiring rationing of up to 20 percent during a drought of customers who have already implemented aggressive conservation and water recycling would result in more severe economic and lifestyle effects.
> *(draft PEIR, p. 9-31)*

37 cont.

[4] Consider the example of toilet upgrades. In the past, a common toilet may have used seven gallons per flush ("gpf"). Today, the current standard toilet uses 1.6 gpf. The latest High Efficiency Toilets ("HET") improve performance by at least an additional 20%, to 1.28 gpf or less. Whereas in the 1980s a residential customer could save seven gallons by the simple act of flushing the toilet only once every other use, similar conservation-driven behavior now will save less than two gallons. The State of California has recognized the existence of demand hardening and the negative impact it has on the ability of retail water users to duplicate their response to previous droughts (DWR, 2005).

As a water agency and its customers significantly increase water use efficiency and harden the water demand, the planned level of drought rationing and its impacts on the customers and community must be given serious consideration. Just because customers have been able to reduce water use historically during a drought by some percentage does not mean that the same customers can achieve similar water reductions in the future with similar efforts. See discussion in Section 6 below for more detail about the impacts of rationing.[5] 37 cont.

(b) Aggressive conservation could negatively impact greenscapes. While residences in most of the neighboring communities have higher outdoor water use than those in the completely urbanized San Francisco, the water used to maintain these green spaces is by no means wasted. The California Legislature has recognized the social and environmental values of greenscapes in metropolitan areas. "Landscapes are essential to the quality of life in California by providing areas for active and passive recreation and as an enhancement to the environment by cleaning air and water, preventing erosion, offering fire protection, and replacing ecosystems lost to development." (California Water Code Section 65593)

Trees and shrubs not only sequester carbon, thereby reducing emissions of greenhouse gasses, but provide shade that can lower energy costs. According to the Sierra Club, mature trees and tall shrubs around homes can lower air-conditioning costs by up to 40 percent. (*Sierra Magazine*, July/August 2007 at p. 50) Indeed grass sequesters CO_2 and stories it underground in roots and soil. (M. Pollan, The Omnivore's Dilemma, p. 197-98) 38

San Francisco itself appreciates the benefits of the urban forest. The San Francisco Department of the Environment's 2007-2009 Strategic Plan notes that "trees provide environmental and economic benefits through improving air and water quality, increasing property values, lowering building energy use, and providing an experience of nature." (Department of the Environment, City and County of San Francisco: *Strategic Plan 2007-2009*, December 4, 2006 at p.

[5] Demand hardening is, in itself, not a reason to limit water-conserving activities. However, conservation must be accommodated by providing greater reliability during drought, through measures such as increased surface or groundwater storage or water transfers. The environmental impacts of increased storage sufficient to bolster the drought reliability of the system have not been considered in the draft PEIR, although the option of additional dry year water transfers from agricultural areas has. 37 cont.

12; see also *City and County of San Francisco Urban Forest Plan* (2006)) In addition, "trees improve public health and well being by reducing UV radiation exposure, providing restorative healing for people with illness, and creating safe public spaces." (Department of the Environment, City and County of San Francisco: *Strategic Plan 2007-2009* at p. 12) In order to maintain its urban forest, the San Francisco's Department of Public Works has a total of ten water trucks that water the City's trees on a weekly basis. 38 cont.

(c) <u>Increased water use during summer/fall is not just for landscaping</u>. Contrary to recent suggestions, the increase in water use in the wholesale customers' service area during the warm summer and fall months is not due solely to outdoor irrigation. Rather, the increased water use in warmer weather is substantially caused by the use of water for cooling critical public health, educational, commercial, and industrial facilities.

San Francisco's climate differs from that of the majority of its neighboring communities. In the summer, fog typically blankets the western half of San Francisco -- cooling the entire city -- while most other parts of the Bay Area enjoy a moderate Mediterranean climate with sunny warm days. While these weather differences impact water use for outside irrigation, other important uses of water are also affected by warmer weather, uses that have nothing to do with lawn watering. 39

- Water is used for cooling purposes in many industrial processes (such as chip fabrication), other manufacturing facilities, and computer server "farms" essential to operation of the internet.

- Hospitals, schools, libraries, and other commercial/industrial buildings contain people and equipment that generate heat and must be cooled. Cooling towers that recycle water are one cost-effective method of heat exchange and use less electrical power, and have fewer environmental impacts than some alternatives.

Cooling towers are used in many buildings inside San Francisco. However, since San Francisco's weather pattern is cool in summer and relatively uniform throughout the year, its building cooling demands are also relatively consistent throughout the year. Water used for

cooling inside San Francisco cannot therefore readily be segregated as a seasonal use through the inspection of water records. Conversely, in the warmer portions of the Bay Area, where summer temperatures typically hover in the high 70s to 90s, use of water for cooling purposes shows up as a seasonal increase in water use during the summer and fall periods. 39 cont.

It therefore is wrong to assume that the increased seasonal use in the BAWSCA service area is driven solely by outdoor landscaping.

6. THE "VARIANT" WHICH LIMITS WATER RATIONING DURING DROUGHTS TO 10% OF NORMAL SYSTEMWIDE USE IS ENVIRONMENTALLY AND ECONOMICALLY SUPERIOR 40

The WSIP preferred program incorporates a goal of limiting rationing during droughts to a maximum of 20% <u>systemwide</u>. We believe that presenting this goal as a single systemwide percentage without describing how the reductions will be allocated between San Francisco's retail users and the wholesale customers is misleading. For example, if San Francisco were to administer the rationing program so that reductions within San Francisco were limited to 10%, achieving a 20% <u>systemwide</u> reduction would require an average cutback in use by wholesale customers collectively of nearly 25%. 41

The environmental and economic consequences of a 25% <u>year round</u> reduction in water use in the wholesale service area would be severe and are not addressed in the draft PEIR. For example, the draft PEIR does not address the impact on commercial and industrial entities, for which water is either a significant component of the end product or essential to manufacturing processes, or both. While the draft PEIR does not address such impacts, there is good research on this issue. A copy of the report, "An Economic Evaluation of the Water Supply Reliability Goal in the SFPUC Water System Improvement Plan," prepared by William Wade, Ph.D., a resource economist, is included as Attachment 6. 42

The report's principal findings are troubling, though not surprising. Two points stand out:

- A small number of industrial sectors, for which water is a critical component of the production process, represent a very large share (over 80%) of total manufacturing output in the region. Chief among these industries are computer/electronic products and food and beverage products ($207 billion in 2001). The emerging biotech industry is also water-dependent.

- These industries are particularly sensitive to curtailments in water supply. The impact of a 20% water supply deficiency on shipments from these industries located in the wholesale customer service area is estimated at nearly $7.7 billion annually, whereas a 10% cutback results in "only" a $2.5 billion cost. The difference ($5.2 billion) far exceeds the $181 million cost estimated by the SFPUC staff of improving the SFPUC system's reliability from 80% to 90%, as shown on the SFPUC's Water Supply Matrix: Water Supply Options 2030 included as Exhibit A to the Wade Report.[6]

The impact of this potentially extreme rationing is severe when considered in light of the City's experience in the last drought. The Governor's Advisory Drought Planning Panel in its December 2000 Critical Water Shortage Contingency Plan reported:

> Among large urban agencies' water development projects, the City and County of San Francisco experienced the greatest reduction in storage, having only about 22 percent of its total system storage capacity left by 1991.

The implications of that depletion in storage was made evident in the SFPUC's response to a survey distributed in 1990 by the California Department of Water Resources:

> Q: What are your alternatives if 1991 is as dry or drier than 1990 and if 1991 is as dry as 1977?
>
> A: If 1991 is as dry or drier than 1990 or 1977, a rationing program to cut normal use by <u>50 percent</u> will be necessary to avoid running out of water if 1992 is also dry.

The SFPUC itself summed it up clearly in its June 1993 Report to the Federal Energy Regulatory Commission:

> "Nowhere else in the state was rationing imposed on a major urban area to such a degree for so long a period."

42 cont.

12.3-40

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[6] As discussed previously, based on the experience of the last drought, a 20% reduction on a systemwide basis would require reductions greater than 20% in San Francisco's neighboring communities. The economic impacts would therefore be more severe than those projected in the Wade report, which assumes that a 20% reduction in industrial/commercial customers' water supply would be the worst case.

In addition, the SFPUC's then-General Manager, Anson Moran, in a 1994 affidavit submitted to the Federal Energy Regulatory Commission, eloquently described the consequences of shortage:

> The consequences of potential shortages include economic, socio-economic, environmental, and personal (human) impacts.
>
> What makes San Francisco's situation unusual is the consequence of being wrong in our forecast. Because of our entitlement structure, and limited conveyance and treatment capacity, an additional, unforecasted year of drought could literally result in empty reservoirs, no entitlements, and little or no alternate source of water. We could have no water to serve our 2.3 million customers.
>
> In the spring of 1991 these consequences achieve a sobering clarity. I became acutely aware of the physical constraints of the City's water conveyance, treatment and delivery facilities; the availability of, and limitations to movement of supplemental emergency water supplies into the City's system; and the uncertainty as to when the drought would finally end. Due to the extremely limited conveyance and treatment capacity system to bring other emergency sources of water to the City, the City must rely on storage in the Tuolumne River basin to ride out droughts. The City just does not have other sources to call on during drought, such as turning on pumps. In addition, I had first-hand information as to the direct and indirect adverse impacts that were occurring to the City's customers as the result of water shortages.
>
> Situated within the drought, I weighed all the above factors and supported the operation rule that is currently used by the City in practice, and incorporated in the planning studies submitted to FERC. That plan was tested as it was developed and is the direct product of real, on-the-line decision making. When considering all the factors associated with the City's entitlements to water, its physical system, and the dire consequences of just being wrong in the forecasting of the length of drought that may hit the City, I can not agree with any comment that the City's operation rule is overly conservative.
>
> Mr. Moran's complete affidavit is included as Attachment 7.

42 cont.

Furthermore, the WSIP must also be analyzed in light of the City's own policy, found in the City Charter, to assign a higher priority to water delivery than to power generation. Limits on generation of electric power to avoid impacts on water availability should be incorporated into all variants and alternatives in order to both reduce the need to impose rationing, as well as

43

stress on other water supply sources required to offset avoidable shortages in SFPUC water deliveries during droughts. 43 cont.

The WSIP anticipates that water to offset San Francisco's diminished entitlements to Tuolumne River which occur during dry years will be secured through agreements with Turlock Irrigation District (TID) and/or Modesto Irrigation District (MID), to utilize "credits" to San Francisco's water bank account" in New Don Pedro Reservoir. A dry-year transfer with TID/MID, providing access to additional Tuolumne River water for the Bay Area during 44 drought, need not (and should not) come at the expense of either diminished flows in the lower Tuolumne River nor agricultural production. Rather, it could be supplied through conjunctive use of the substantial groundwater reserves available. Central Valley growers, including those in TID/MID, regularly rely on short-term increases in groundwater pumping during dry years -- precisely what conjunctive management of groundwater is intended to do.

The draft PEIR states that the 10% "variant" would "result in slightly increased average annual Tuolumne River diversions over the 82-year hydrologic record compared to the proposed program, but due to rounding, the levels of diversion appear to be the same." (draft PEIR, 45 Table 8, fn. a) The final PEIR should describe more precisely the volumetric difference in a dry year to meet the 10% goal, although we expect that this amount will be relatively modest, particularly when compared to MID and TID diversions.

7. BAWSCA SUPPORTS THE ENVIRONMENTALLY SUPERIOR ALTERNATIVE AND RECOMMENDS THAT THE FINAL PEIR EVALUATE IT IN MORE DETAIL

The draft PEIR describes a Modified WSIP Alternative, which it identifies as the Environmentally Superior Alternative. This alternative differs from the WSIP as proposed, by incorporating three interrelated components:

<u>One</u>: Modifications to the planned operations of three local reservoirs intended to lessen 46 the impact of the WSIP on local streams (Alameda Creek and Pilarcitos Creek) and on riparian habitat (the oak woodlands near Crystal Springs Reservoir).

<u>Two</u>: Additional water conservation, local groundwater and recycling projects to be carried out by the wholesale customers, intended to compensate for the reductions in system

supply caused by the three operational modifications described above and, potentially, to reduce demand for additional diversions from the Tuolumne River.

<u>Three</u>: A "transfer" of "conserved water" from Turlock Irrigation District (TID), Modesto Irrigation District (MID), or some other agency which would reduce demand within their service areas for water from New Don Pedro Reservoir, thereby avoiding the reduction in flows in the Tuolumne River below New Don Pedro that would otherwise occur as San Francisco's diversions to the Bay Area gradually increase as envisioned by the WSIP.

The draft PEIR explains why this is considered to be the environmentally superior alternative:

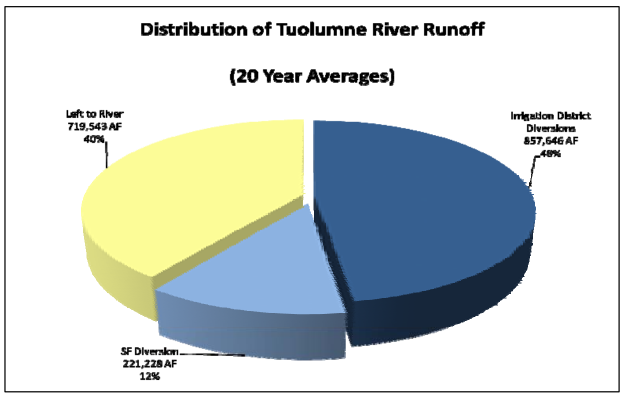
> The Modified WSIP Alternative is considered to be the environmentally superior alternative. It would reduce key impacts of the proposed WSIP on natural resources along the lower Tuolumne River, along Alameda Creek below the diversion dam, at Pilarcitos Creek, and in Crystal Springs Reservoir, but it would continue to meet the WSIP's primary goals and objectives. Like the WSIP, this alternative would maximize the use of existing facilities and the largely gravity-driven system without also requiring the construction of additional major facilities called for under many other alternatives, or substantially increasing the energy demand of 46 cont. the system or need for pumping. While some of the other alternatives would avoid or lessen certain WSIP impacts, they would also result in substantial additional impacts that the WSIP would not generate, because these alternatives would require substantial additional major facilities and affect other environmental resources in different geographic locations in addition to those affected by the WSIP. . . .
>
> The Modified WSIP Alternative includes implementation of more conservation, water recycling and local groundwater projects within the regional service area than under the WSIP, which would require construction of some additional facilities in some areas not affected by the WSIP. However, while construction of these facilities would cause temporary construction disruption and related environmental impacts, long-term implementation of these regional conservation, water recycling, and local groundwater projects would offset impacts of the operational modifications proposed under the Modified WSIP Alternative on the Tuolumne River. Depending on the extent of these projects implemented by wholesale customers in collaboration with the SFPUC, they could also help reduce the amount of additional diversion required from the Tuolumne River to serve the 2030 customer purchase requests.
>
> *(draft PEIR, p. 9-96)*

BAWSCA supports the Environmentally Superior Alternative and recommends that the Final PEIR provide a more detailed description of how its centerpiece (the reduction in demand for water from New Don Pedro) is to be achieved.[7] 46 cont.

Agricultural Conservation

As Figure 17 indicates, San Francisco and the wholesale customers are not the most significant users of Tuolumne River water. In fact, almost half of the Tuolumne River runoff is used for agricultural production. San Francisco's diversion currently represents about 12% of that flow and would increase only to 13% by 2030, assuming the increase in demand projected in the WSIP. 47

Figure 17.



Source: Turlock Irrigation District

Central to the Modified WSIP is the "transfer" of water conserved by TID and MID such that demand from New Don Pedro Reservoir would be reduced, avoiding the reduction in flows in

7 A more in-depth analysis would also be responsive to San Francisco Board of Supervisors' Resolution 321-08. 46 cont.

12.3-42

the Tuolumne River below La Grange that would otherwise occur under the WSIP, and where the WSIP's significant environmental impacts would occur.[8]

The large majority of the water currently diverted by TID and MID is, as their names suggest, used for agricultural irrigation. The draft PEIR does not describe how approximately 15,000-20,000 acre feet per year (AF/Y) of the approximately 800,000 AF/Y applied to irrigated agriculture in the two districts could be conserved. Some possibilities are mentioned indirectly in the portion of the draft PEIR that addresses possible environmental impacts of mitigation measures themselves:

- Water use efficiency and conservation for agricultural, residential and commercial users
- Land use changes, either agricultural to urban, or more water intensive (e.g., pasture) to less intensive (e.g., orchard)
- Conjunctive use of groundwater
- Recycled water
- Tiered water pricing
- Land fallowing of agricultural lands.

(draft PEIR, p. 6-63) 47 cont.

Agriculture in the Central Valley is part of our shared history and culture and contributes significantly to California's economy. For this reason, BAWSCA does not support the notion of permanently fallowing agricultural lands as an on-going source of water for the Bay Area. Similarly, decisions about which crops to cultivate are best made by individual growers familiar with local conditions and market forces.

8 Two of the subsidiary aspects of the Environmentally Superior Alternative uniquely affect individual BAWSCA member agencies and warrant specific caveats. First, BAWSCA support for meeting Coastside County Water District's increased demand by pumping from Crystal Springs rather than by gravity flow from Pilarcitos Lake is conditioned on the economic impact of that approach (increased power costs) being borne by all users of the regional water system, including San Francisco, rather than solely by Coastside County Water District. Second, BAWSCA support for increased stream flow in a particular reach of Alameda Creek despite its possible impact on system yield is not meant to suggest that BAWSCA disagrees with Alameda County Water District comments that more water should be released and allowed to flow through lower Alameda Creek to the Bay, in order to support restoration of steelhead to the upper reaches of the Creek.

Nor do we believe that greater urbanization of the Central Valley is likely to result in less water use, on a per acre basis, than agriculture.[9] Finally, the pricing of water is an internal matter statutorily delegated to the elected governing boards of the irrigation districts, whose informed judgment should be respected, particularly by urbanized communities 100 miles away.

Rather, we propose a bold and visionary approach, suggested only obliquely by the Environmentally Superior Alternative, in which Bay Area water agencies would provide economic incentives to encourage TID and/or MID, the Cities of Modesto and Turlock, or individual growers, canners and orchardists to voluntarily implement water conservation measures at no cost to them, that would save both money and water, with resulting benefits to all stakeholders. There appear to be several opportunities available in both districts to conserve water. 47 cont.

The point of this comment is not to identify the most promising of these opportunities. The irrigation districts are much more capable of doing that. Rather, the point of the comment is merely to corroborate the feasibility of the concept at the center of the Environmentally Superior Alternative and demonstrate the benefits that it can provide to agriculture, the urban Bay Area, and to the lower Tuolumne River.

Arrangements of this precise kind are now in place in California, on a much greater scale. For example, the Imperial Irrigation District has contracted to transfer over 300,000 acre feet a year to San Diego and other coastal cities served by the Metropolitan Water District of Southern California. The IID's "Efficiency Conservation Definite Plan" adopted in May 2007 contains very detailed analyses of the costs/benefits and water savings achievable by a range of irrigation efficiency measures. It provides a possible road map for the Bay Area and TID and/or MID to follow.[10]

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[9] In the TID/MID area, an acre of homes uses about the same amount of water as an acre of irrigated crops.

[10] The Environmentally Superior Alternative has the additional benefit of not jeopardizing San Francisco's water rights. And the water rights of MID and MID can also be fully protected by virtue of Water Code provisions designed to encourage water conservation and the use of recycled water and groundwater in lieu of surface water, e.g., Water Code Sections 1010-1011. We understand that TID 48

From a purely financial perspective, Bay Area water agencies should be willing to provide monetary contributions sufficient to support implementation of the most cost-effective mix of these alternatives. Many might be prepared to subsidize water conservation in the TID/MID area at levels that go beyond those necessary to simply offset the diversions by San Francisco to meet gradually increasing urban demands in the Bay Area. In fact, BAWSCA's board of directors has recommended that the final PEIR should explore the feasibility of Bay Area water customers financially supporting water efficiencies in TID/MID that will result in <u>more</u> water remaining in New Don Pedro than is currently the case, even <u>after</u> taking increased diversions by San Francisco into account. This additional water could then be available to support <u>greater</u> flows in the lower Tuolumne River, deployed at times and in volumes most beneficial for salmon and other important species in the lower Tuolumne River. 49

In sum, BAWSCA believes there are opportunities for partnerships with agricultural interests such that more water can flow through the lower Tuolumne while still providing the water necessary to accommodate environmentally sound, infill growth planned in San Francisco and its neighboring communities. 50

<u>Additional Conservation and Recycling in the BAWSCA Service Area.</u>
BAWSCA also supports the component of the Environmentally Superior Alternative that calls for additional water conservation, recycling and local groundwater development to be achieved in the BAWSCA service area. But, just as we believe the agricultural conservation component of this alternative can be improved, so that the WSIP results in more water being made available in the lower Tuolumne River than would be the case under any of the other alternatives, we also believe that this component can be improved. Specifically, rather than involve SFPUC in this aspect, we recommend that BAWSCA and its member agencies be given the responsibility for achieving these results. 51

In enacting the Bay Area Water Supply and Conservation Act in 2002, the Legislature took note of the anomalous situation which the wholesale customers of SFPUC occupy in relation to San Francisco. They are dependent for a vital and limited resource on a monopoly supplier not 52

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has utilized these statutory filing mechanisms to document savings achieved through installation of drip irrigation systems that have already replaced flood irrigation in areas of that district. 48 cont.

regulated by the California Public Utilities Commission and in which they have no political representation. (Water Code Section 81301(a))

The Legislature also found that:

> The San Francisco regional system is . . . susceptible to severe water shortages during periods of below average precipitation because of insufficient storage and the absence of contractual arrangements for alternative dry year supplies.
>
> The lack of a local, intergovernmental, cooperative governance structure for the San Francisco regional system prevents a systematic, rational, cost-effective program of water supply, water conservation, and recycling from being developed, funded, and implemented.
>
> *(Water Code Section 81301(b), (c))*

BAWSCA has express statutory authority to:

- "Plan, finance, acquire, construct, maintain and operate facilities for the collection, transmission, treatment, reclamation, reuse and conservation of water." (Water Code Section 81420);
- "Conduct studies of the water supplies available to its members and their current and future demand for water," as well as "develop plans for projects and programs that can assist its members to meet those future water needs." (Water Code Section 81445);
- Carry out any "project" or "work" which are broadly defined to include water conservation measures and programs, facilities for the conjunctive use of surface water and groundwater and facilities for the transmission of recycled water." (Water Code Sections 81306, 81308, and 81420)

52 cont.

Since its formation in 2003, BAWSCA has developed, and implemented, at its own expense, effective water conservation programs that augment those administered by is member agencies. The range of these programs has steadily expanded, as the current Water Conservation Report (Attachment 5) demonstrates. We submit that the development of an additional 5 to 10 mgd of

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water savings through conservation, local groundwater or recycled water within communities that are members of BAWSCA (over and above those agencies' current commitments) will be far more feasible if the initiative and coordination is taken by BAWSCA -- an independent government agency established specifically for that purpose, which is representative of and responsive to the communities in which those projects and programs are to be built or implemented.

In order to generate funds for these programs, SFPUC should include in wholesale rates a "water conservation" charge. The amount of this charge should be determined by BAWSCA's board of directors, the revenue should be collected by SFPUC and forwarded to BAWSCA regularly, and the utilization of the funds should be decided by BAWSCA's board of directors. The SFPUC should limit its conservation, groundwater, and recycling activities to programs and projects within the limits of the City and County of San Francisco or on outside properties owned by the City, such as the Sharp Park Golf Course in Pacifica.

53 cont.

Thank you for considering this letter, the detailed comments which appear at Attachment 1, and the materials in the accompanying Volumes.

Sincerely,

Arthur R. Jensen
General Manager

Enclosures

cc: Board of Directors, Bay Area Water Supply and Conservation Agency

ATTACHMENT 1

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Detailed Section-by-Section Comments on the Program Environmental Impact Report for the Water System Improvement Program

Below are the comments from the Bay Area Water Supply and Conservation Agency that are more narrowly focused and presented as a section-by-section review of the draft PEIR.

Summary Section

p. S-2 to p. S-23: The summary section does not highlight historical examples of problems encountered with operation of the existing regional water system which need immediate attention and which are the premise of the need for the WSIP. Below are some examples of failures on the regional water system over the last twenty years:

- San Joaquin Pipeline No. 3 (SJPL 3) failed in the San Joaquin Valley at the same time that the Sunol Valley Water Treatment Plant was shutdown for maintenance. This situation caused an immediate loss of water supplied from two sources including the Hetch Hetchy and Calaveras Reservoir supplies.
- San Andreas Pipeline No. 3 ruptured, flooding school property on the Peninsula.
- A loss of supply from Hetch Hetchy was caused by failures on the SJPL system near Mountain Tunnel.
- During heavy rains the Hetch Hetchy supply was lost for a period of six weeks at the same time power outages occurred at the Harry Tracy Water Treatment Plant.
- During heavy rains, San Mateo Creek was flooded in an attempt to lower Crystal Springs Reservoir elevation which rose to within inches of spilling over the 4 foot high stop logs. DSOD demanded that the reservoir be lowered to avoid the stop logs from floating out of their holding rack which can cause disastrous flooding. Lack of reservoir storage capacity can also cause uncontrolled spills. During one such event the Mills Hospital first floor in San Mateo was flooded. 54
- A valve-exercising program that is part of necessary maintenance of the transmission system has been nonexistent due to fear that valve might be able to be reopened, leaving major pipelines closed and causing regional water losses.
- A planned dewatering of the Stanford Tunnel to inspect the integrity of the tunnel was halted to avoid risks involved in having an extended shutdown.
- A landslide occurred on the peninsula near the existing Crystal Springs Bypass Tunnel. This tunnel was shut down as a precaution so that if further land movement caused the tunnel to break it would not result in flooding. If the line failed it could produce an estimated 900 mgd rush of water into San Mateo Creek causing public health, safety and

environmental harm. The Harry Tracy Water Treatment Plant is the only source of water to the north of the tunnel, serving the northern peninsula and San Francisco. SFPUC staff stayed on site around the clock to put the tunnel back in service in case treatment plant operations were disrupted. 54 cont.

- Multiple emergency shutdowns of the water treatment facilities have been made due to aging and unreliable equipment.
- The San Antonio Pipeline failed causing immediate shutdowns and flooding.

p. S-2, Program Description, 2nd paragraph: This paragraph should clarify that the City and County of San Francisco is the single largest customer of the regional water system, using 1/3 of the total water developed, and being nearly 100% dependent on the regional water system. 55

p. S-2, Program Description, 2nd paragraph: The draft PEIR states "Some of the wholesale customers have sources of water in addition to what they receive from the SFPUC regional system, while others rely completely on the SFPUC for supply." In fact, 13 of the BAWSCA agencies have diverse water supply portfolios that include recycled water, desalinated water, local groundwater, and local or imported surface water. Figure A below provides detail on the current diversified water supply portfolios of the combined BAWSCA agencies. BAWSCA agencies have committed to increasing the diversity of their water supply portfolio in the future with increased use of recycled water, conjunctive use of groundwater supplies, and implementation of water conservation as shown in Figure B below. 56

Figure A

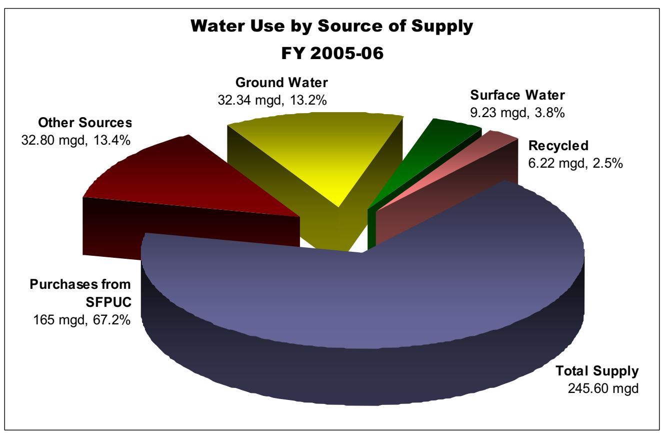
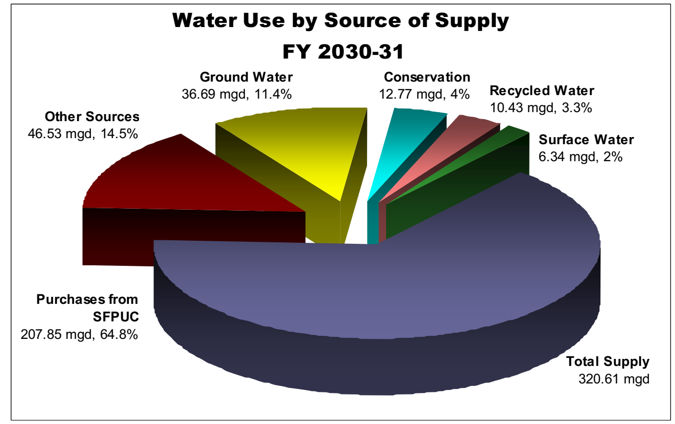


Figure B



56 cont.

p. S-5, Figure S.3 and p. 5.1-6, Figure 5.1-2: This figure shows historical and projected water <u>deliveries</u>, not water demands. Some of the projected water demand will be met by sources other than purchases from the SFPUC regional water system. The data label for the projected period (right-hand side of graph) should be changed to read "Annual Average Forecasted Deliveries" (not ".....Forecasted Demand"). 57

p. S-23, Figure S.7: The Master Schedule shown should be updated to reflect most current WSIP Quarterly Report. Also, please clarify whether this timeline shows the project close-out dates adopted by the Commission or revised project close-out dates that have not yet been formally adopted by the Commission. 58

p. S-26, Facility Construction Effects, 4th bullet: The report identifies certain facilities as having historical significance. Information about whether these identified sites are classified in local or state registries as historical sites should be provided. 59

p. S-65, 1st bullet (Proposed Program): Regarding the concern raised by some commentors about the impact of this program objective, fundamental principals dictate that water quality from the best source is the most reliable means of eliminating uncertainties associated with contamination and public health risk. Water quality regulations are becoming more stringent 60 with many more trace organics being detected, raising public health concerns. Options for source water downstream of the current intake are influenced by runoff and contamination from many other sources due to human activity. The uncertainty about endocrine disruptors and other contaminants may result in increased health risk and higher levels of treatment. A treatment scheme capable of producing a similar water quality would include reverse osmosis and activated carbon among other processes which require more energy and disposal problems that have negative impacts on the environment. Public concern over drinking water is a leading issue resulting in diminished public confidence and higher use of bottled water which carries its own set of issues related to trace organic contamination and disposal of packaging and containers. 60 cont.

Chapter 2 – Existing Regional Water System

p. 2-8, Sunol Valley Faculties: Please add a description of the San Antonio Pumping Facility to this section and explain its importance to reliable operation of the overall system. 61

p. 2-12, Bay Division Facilities: Further clarity would be helpful regarding the SCVWD intertie and its function. The statement is made that SCVWD is currently returning supplies to the SFPUC at an average rate of 5 mgd through the intertie. This is confusing since it does not state whether this is short-term or long-term. In fact, this action is in accordance with the agreement with SCVWD and the action is short-term. Please clarify since statement implies the intertie supplies a long-term supplemental supply of 5 mgd. 62

p. 2-27, System Maintenance: It is important that this section be modified to highlight problems with the existing system operation which require resolution by the WSIP. Specifically, this section should: 63

- Highlight that the WSIP improvements are necessary to overcome aging infrastructure and operational problems impacting the health and safety of the 2.5 million customers of the system.
- Clarify those operational areas and issues which act as drivers for the WSIP. There is no information on what is expected to occur during a major seismic event or other facility failures which occur too frequently. Include examples of how operations and maintenance are being impacted.
- Provide information on the difficulty operations staff currently face whenever it is necessary to shutdown portions of the existing system for maintenance purposes. The most extreme examples include no ability to take Irvington and Pulgas Tunnels out of service. The report should clarify why the Irvington Tunnel inspection frequency is different than the desired 10-year cycle for tunnel inspections.

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p. 2-28, System Maintenance: Some additional examples of recent outages that support the need for the WSIP are: 63 cont.

- San Joaquin Pipeline No. 3 (SJPL 3) failed in the San Joaquin Valley at the same time that the Sunol Valley Water Treatment Plant was shutdown for maintenance. This situation caused an immediate loss of water supplied from two sources including the Hetch Hetchy and Calaveras Reservoir supplies.
- San Andreas Pipeline No. 3 ruptured causing flooding of school property on the Peninsula.
- A loss of supply from Hetch Hetchy was caused by failures on the San Joaquin Pipeline system near Mountain Tunnel.
- During heavy rains the Hetch Hetchy supply was lost for a period of six weeks at the same time power outages occurred at the Harry Tracy Water Treatment Plant.
- During heavy rains, San Mateo Creek was flooded in an attempt to lower Crystal Springs Reservoir elevation which rose to within inches of spilling over the 4 foot high stop logs. DSOD demanded that the reservoir be lowered to avoid the stop logs from floating out of their holding rack which can cause disastrous flooding. Lack of reservoir storage capacity can also cause uncontrolled spills. During one such event the Mills Hospital first floor in San Mateo was flooded.
- A valve-exercising program that is part of necessary maintenance of the transmission system has been nonexistent due to fear that valve might be able to be reopened, leaving major pipelines closed and causing regional water losses.
- A planned dewatering of the Stanford Tunnel to inspect the integrity of the tunnel was halted to avoid risks involved in having an extended shutdown.
- The text cites one example related to the landslide that occurred on the peninsula near the existing Crystal Springs Bypass Tunnel. The text should cite the consequences if the endangered portion of the system had been damaged: It was estimated that if the line failed it could produce a 900 mgd rush of water into San Mateo Creek causing public health and safety and environmental concerns. The Harry Tracy Water Treatment Plant is the only other source of water to the north of the Crystal Springs Bypass Tunnel, serving the northern peninsula and San Francisco. SFPUC staff were stationed at the site on a 24 hour-7 day basis to put the tunnel back in service in case the treatment plant operations were disrupted.
- Multiple emergency shutdowns of the water treatment facilities have been made due to aging and unreliable equipment.
- The San Antonio Pipeline failed causing immediate shutdowns and flooding of rights of way.

Chapter 3 – Program Description

p. 3-9, Table 3.2: The WSIP goal for seismic reliability is different than what was presented in the NOP for this PEIR. The demand level for basic service 24 hours after a major seismic event has been increased from 215 mgd to 229 mgd. The text discusses detailed analyses conducted since the level of service goals were formulated by the Commission. Clarifying language is needed to explain how these subsequent studies support refining this goal. 64

p. 3-14, 3rd paragraph, Water Supply Studies: The statement is made "As described below, the Commission selected the 20 percent maximum system wide reduction in water service during drought periods for further study." The draft PEIR does not provide sufficient justification for the stated 20% rationing goal. Such a critical decision should be an informed, well-documented decision. The justification for the decision to have a 20% rationing goal should be included in the PEIR. The document should provide more analysis of the possible extent of rationing throughout the service area, up to 40% in some communities. It should also address the environmental and public health impacts of extreme rationing. These include loss of greenspace and landscaping and loss of water for sanitation, cooling and domestic use. In addition, a comparison to the rationing goals of other major water utilities having comparable levels of water use and demand hardening should be presented. 65

p. 3-14, 4th paragraph, Water Supply Studies: The last sentence of this paragraph should be changed to provide greater clarity. Specifically, the sentence should clarify that the "12 to 40 percent" reductions apply to the wholesale customers NOT the individual retail water customers within each jurisdiction, who will also experience different levels of reduction. 66

p. 3-18, Table 3.3: It is important to note that the BAWSCA agencies have **already committed** to the identified levels of water conservation (13-15 mgd) and recycling (9-10 mgd) in 2030 shown on this table in comparison to the conservation (0-4 mgd) and recycling (0-4 mgd) values identified for the SFPUC. To date, the SFPUC has not committed to any level of increased water conservation or recycling in 2030, and have treated water conservation and recycling in San Francisco as a component of the WSIP. 67

p. 3-19, Table 3.4: City of Menlo Park is 100% reliant on water from the SFPUC. Footnotes "a" and "c" should not be used for this city. 68

p. 3-22, Purchase Estimates: The draft PEIR does not fully describe how the wholesale customers have included conservation potential into their demands. Each wholesale customer conducted a cost-effectiveness analysis to select conservation measures to which it would commit above and beyond implementation of the plumbing codes and the measures recommended by the California Urban Water Conservation Council. In addition, the draft PEIR should describe in detail the wholesale customers' diversified water supply portfolio. 69

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Attachment 1

p. 3-22, Recycled Water Potential, second sentence: The numbers in this sentence need to be corrected. The corrected sentence should read "The studies indicated that there is a range of about 20.1-25.0 mgd recycled water potential in addition to the existing and planned recycled water supply within the BAWSCA area." (RMC, 2004). 69 cont.

p. 3-25, bullet "E. Regional Recycled Water Projects," WSIP Project Refinement and Other WSIP Components: This bullet refers to the SFPUC consideration of the development of recycled water projects in areas outside of their jurisdiction in coordination with other agencies. While the SFPUC and other willing jurisdictions can partner to implement mutually agreeable projects, it is important to note that SFPUC participation is not necessary and in fact, may not be desired. The Bay Area Water Supply and Conservation Agency (BAWSCA) was created by the wholesale customers of the San Francisco regional water system with an expressed power to develop, implement, and fund regional water resources programs, including recycled water projects, as may be deemed appropriate by the Board of Directors. In addition, San Francisco may not necessarily be the lead agency in any such joint project. As a public agency, BAWSCA can be the lead agency in any project that it chooses to develop. Please clarify text accordingly. 70

p. 3-27, Water Quality Level of Service: Other water quality regulations of significance to the SFPUC that should be referenced are the Stage 2 disinfection by-products rule, Candidate Contaminant List, California Action Levels, and California Public Health Goals. 71

p. 3-27, Section 3.5.2 & 3.5.3: System performance under major seismic and reliability event scenarios with a completed WSIP show deliveries surpassing the some level of service objectives. For example, the last paragraph on p. 30 states "With implementation of the WSIP projects, this delivery capability would increase to 313 mgd, surpassing the level of service objective." Clarifying language is needed to explain which level of service objective is the limiting criterion for sizing a particular project and how, in some scenarios, meeting some objectives allows other level of service objectives to be exceeded. In general, if a facility is sized to meet one of several objectives, the facility may be able to operate beyond other minimum levels of performance. 72

p. 3-31, Table 3.7: The phrase "Delivery During a Hetch Hetchy Water Quality Event" should be clearly defined with a footnote to this table and language in the text. If there is a "water quality event," it is unclear whether <u>any</u> water can be served. 73

p. 3-32, Other Goals and Objectives, 1st paragraph: The statement is made "The SFPUC has included these program goals as fundamental elements of the WSIP, although the WSIP does not establish quantitative levels of service for the sustainability and cost-effectiveness goals." Do guiding principles exist regarding these goals in the absence of quantifiable levels of service? 74

p. 3-39, Proposed System Operations Strategy: BAWSCA is pleased that the future regional system operations assumed in this PEIR includes "Assigning a higher priority to water delivery over hydropower generation." The continuation of this priority, called "Water First Policy," is consistent with the legislature's intent upon passing AB1823. 75

p. 3-39, Proposed System Operations Strategy: The text should add other operating objectives that are used by the SFPUC in operating the regional water system: minimizing reservoir spillage; meeting local reservoir replenishment requirements; and providing effective emergency response and recovery. 76

p. 3-39, Proposed System Operations Strategy: When citing the operating objective of maximizing local reservoir storage, there is no mention that this strategy can result in reservoir spills and, in extreme cases, downstream flooding. The WSIP should address downstream flood control improvements to support this operating strategy. 77

p. 3-43, 1st paragraph, Water Supply and Storage Operations Strategy: Section 6 of the current Interim Water Shortage Allocation Plan sets forth an Annual Schedule which is to be followed by the SFPUC and its wholesale customers during periods of water shortage. Under this schedule, the SFPUC is to provide to its wholesale customers an estimate of the available water supply and, by March 31st of any drought year, a formal declaration of the existence of a water shortage emergency. 78

p. 3-43, Instream Flow Releases: The draft PEIR assumes that the SFPUC's current agreement with TID and MID, to pay them to provide all the additional water, if any, required for fishery releases when FERC imposes new requirements in 2016, will continue. Please provide specific strategies or approaches which may be used to provide additional water for fishery releases if needed. 79

p. 3-46, 1st full paragraph, Water Delivery Operations Strategy: The statement is made "At present, depending on hydrologic conditions and the transmission capacity of pipelines, the replenishment of local reservoirs can take more than one year to complete." Will the WSIP increase replenishment rates and decrease replenishment time? If so, by how much in terms of mgd or months? 80

p. 3-46, 1st full paragraph, Water Delivery Operations Strategy: The statement is made "The addition of redundant facilities and hydraulic capacity upgrades would also increase the system's transmission capability so that local reservoirs in the Alameda and Peninsula watersheds can continue to be replenished during maintenance periods to maintain higher average annual storage levels, thus ensuring that water would be available for use during emergencies or droughts, while also continuing to meet ongoing customer demands." BAWSCA concurs that this is an important operational necessity. The ability to replenish the local reservoirs is a critical component of providing water supply reliability. 81

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p. 3-48, 1st paragraph, Maintenance and Asset Management Strategy: The statement is made "The SFPUC has limited ability to shut down some of the tunnels and pipelines while still meeting customer demand. The transmission system needs additional tunnels and/or pipelines to provide redundant capabilities to enable shutdown, inspection, and maintenance of some major components of the existing system." The PEIR should strongly state the fact that currently some tunnels and pipelines cannot be taken out of service for inspection, routine maintenance or emergency repairs without major reductions in water delivery. 82

p. 3-49, Table 3.10, Project SJ-3: The project description for the San Joaquin Pipeline System states "Note: While the current preferred alternative would construct 16 miles of pipelines, as much as 22 miles of pipelines could be constructed depending on the results of a conditions assessment of the existing pipelines." BAWSCA supports this statement and has expressed support for the continued retention of this modification as part of its comments on the NOP for this specific project: 83

> The project scope indicates that an 86 inch pipeline connected to the west of the San Joaquin River from the cross over to Tesla portal be constructed. The CER [Conceptual Engineering Report] for this project indicates that, depending on the condition assessment of the existing San Joaquin River crossings, a fourth crossing denoted as Alternative 5 may be considered. This potential should be included in the NOP for review until the final determination is made.

p. 3-51, Table 3.10, Project SV-4: The project description makes the statement "The new tunnel would be a redundant water transmission facility to the existing Irvington Tunnel." While this is a true statement, it fails to address why this redundancy is important. The statement made earlier in the PEIR on p. 3-48, 1st paragraph should be referenced as part of this description ("The transmission system needs additional tunnels and/or pipelines to provide redundant capabilities to enable shutdown, inspection, and maintenance of some major components of the existing system.") so that the purpose for this tunnel is clearly understood. 84

p. 3-63, Table 3.12: Table 3.12 indicates significant overall need for staffing increases, however does not refer to a staffing plan that demonstrates whether or how the work can be accomplished. . The staffing needs for shutdown support during construction should be analyzed and addressed in such a plan and the final PEIR should more fully analyze and disclose the staffing challenges. 85

p. 3-82, Proposed Construction Schedule: The statement is made "there would be an intense period of construction from 2009 to 2010, when 18 of the 22 projects would be constructed concurrently." Is this correct? Will all the projects be constructed concurrently in one year or rather will they be "in construction" during this period? Change wording as appropriate. 86

p. 3-86, Required Actions and Approvals: Affected wholesale customers must review, approve and possibly fund any additional conservation, recycling and groundwater projects that are proposed in their service areas as part of an alternative. 87

Chapter 4 – WSIP Facility Projects – Setting and Impacts

p. 4.16-13, Geology, Soils, and Seismicity, Impact 4.16-2: It is stated "implementation of the WSIP would collectively result in *beneficial* effects related to the seismic safety of the regional water system." The "beneficial effects related to the seismic safety of the regional water system" after implementation of the WSIP should be illustrated with graphic and tabular data from previous seismic vulnerability studies. 88

Chapter 5 – WSIP Water Supply and System Operations – Setting and Impacts

p. 5.1-4, Section 5.1.3, Proposed Water Supply Option and System Operations: The text describes the proposed water supply option for non-drought year and drought year water supplies. One identified component of the drought year water supply is rationing. The following sections of the chapter discuss the impacts of the various water supply components, but give very little detail about the direct and indirect impacts of the rationing component beyond what is identified with associated drought year groundwater pumping. Additional information about rationing impacts should be presented in this section. 89

p. 5.1-5, 1st full paragraph, Proposed Water Supply Option and System Operations: The statement is made "Although no major changes are proposed under the WSIP with respect to regional system operations, there would be some operational refinements (described in Chapter 3, Section 3.7)." These refinements to operations should be clarified to include modification of reservoir seasonal storage levels and more flexibility for system maintenance. 90

p. 5.1-17, Proposed Water Supply Option and System Operations: The report states that spills or releases from local reservoirs will occur and states that they will last only a few days. The report does not acknowledge that a full reservoir cannot control a maximum credible event or storm which will then cause the reservoir to spill uncontrolled. Downstream impacts due to flooding should be addressed. 91

Chapter 6 – Mitigation Measures

p. 6-189, References: The tables in Section 6.6 refer to a number of published regulations and policies. Full citation (derived from reference lists embedded in Chapters 4 and 5) would enhance the utility of Tables 6.3 through 6.7. 92

Chapter 7 – Growth-Inducement Potential and Indirect Effects of Growth

Part 1 of BAWSCA's comments stressed that the large majority of the planned growth to be accommodated by the WSIP has already been analyzed in CEQA-approved documents. There are two areas in which analysis of the impacts of growth can be expanded. However, the potentially un-analyzed impacts of growth are either the same as those already analyzed, or so small as to be insignificant.

The first category of potentially un-analyzed growth impacts are those that have been analyzed in CEQA documents, mostly general plans from jurisdictions served by the regional water system, although not for the same length of time as called for in the WSIP. The reason for this potential discrepancy is that none of the general plans' horizons extend to 2030. The draft PEIR concludes that the growth accommodated by the WSIP in years beyond those analyzed in general plans (mostly the years 2020-30) would have impacts that are substantially similar to, though incrementally greater than, the impacts identified in local general plan CEQA documents (p.7-60; see also Table E.5.1.) We agree with this assessment. 93

The second category of potentially un-analyzed growth impacts are those that might occur in territories not covered in prior CEQA documents at all. However, this growth represents an insignificant portion of the total planned regional growth. Appendix E.5 of the draft PEIR lists those planning documents that have already received CEQA analysis. Table 7.4 shows the projected changes in population and employment for all the jurisdictions within the service area. A comparison of these two documents reveals that less than 8% of the total population growth in the wholesale service area, and less than 5% of the employment growth, has not undergone CEQA review for the effects of the WSIP's planned growth. Put another way, the impacts of over 90% of the growth that will be accommodated by the WSIP have already been addressed in previous CEQA analyses.

Chapter 8 – WSIP Variants and Impact Analysis

Chapter 8 describes and analyzes the potential environmental effects of three identified WSIP variants: All Tuolumne (Variant 1); Regional Desalination for Drought (Variant 2); and 10% Rationing (Variant 3).

The use of variants in a proposed program is not common in CEQA documents. The overview clearly distinguishes the discussion in this chapter from the CEQA alternatives presented in Chapter 9. The text needs to further explain the utility of the analysis in the context of CEQA. One of the variants (Variant 2 – Regional Desalination for Drought) is carried forward into the formal CEQA alternatives analysis. 94

A comparison of the results of the impact analyses for each of these variants provides a useful sensitivity analysis for the project components in the proposed WSIP as well as some of the early policy decision making. For example:

> With the exception of the Bay Area Regional Desalination Project (BARDP) component of Variant 2, all three variants would have the same significant unavoidable or potentially significant unavoidable impacts as the proposed program….The greatest differences among the proposed program and the variants are associated with facilities-related impacts of the BARDP (p. 8-77, WSIP Variants and Impact Analysis)

> ...although the water supply and system operations impacts of the variants differ somewhat from those of the proposed program, the magnitude of the differences is small and not sufficient to change either the significance determinations or the mitigation measures identified for the WSIP. (p. 8-77, WSIP Variants and Impact Analysis) 95

> ...with the exception of the BARDP component of Variant 2, the variants would have the same areas of controversy, the same unavoidable effects, and the same irreversible environmental changes as the proposed program. (p. 8-83, WSIP Variants and Impact Analysis)

By slightly changing the proposed water source or level of rationing for each of the variants, the resulting impacts analysis provides an understanding of the sensitivity of impacts associated with the proposed program. Two important conclusions can be made based on the results of this sensitivity analysis:

1. The environmental impacts of a Bay Area Regional Desalination Project are far greater than the impacts of providing additional water supply reliability through increased diversions from the Tuolumne River.
2. Greater reliability can be provided with a 10% rationing limit without causing any increased impacts to the environment.

Chapter 9 - CEQA Alternatives

p. 9-4, Table 9-2: There should be an attempt to quantify the existing level of service beyond "not defined" in order to better correlate with the conclusions presented in Table 9-6 "Summary of Ability of Alternatives to Meet Program Objectives." Quantitative data on existing system performance for this purpose could be extracted from Chapter 3, Tables 3.6 and 3.7. 96

p. 9-16, Table 9-6: While this table identifies whether the individual alternatives meet the program objectives, including "Ensure cost-effective use of funds," nowhere in this chapter are the actual total costs of individual alternatives presented. CEQA does not require an economic analysis, however a presentation of the economics of the proposed program and identified alternatives is crucial as part of the final decision making process. Given the wide range of costs associated with the supply components of the various alternatives, full disclosure of the known costs of the alternatives being considered is important as part of the public debate concerning the decision being made. 97

p. 9-16, Table 9-6, Water Quality Objectives: One water quality objective is "Design improvements to meet current and foreseeable future federal and state water quality requirements." In evaluating whether an alternative meets this objective, consideration must be given to the fundamental principles that dictate that water quality from the best source is the most reliable means of eliminating uncertainties associated with contamination and public health risk. Water quality regulations are becoming more stringent with many more trace organics being detected, raising public health concerns. Options for source water downstream of the current intake are influenced by runoff and contamination from many other sources due to human activity. The uncertainty about risks from endocrine disruptors and other contaminants may result in increased health risk and higher levels of treatment. A treatment scheme capable of producing a similar water quality would include reverse osmosis and activated carbon among other processes which require more energy and disposal problems that have negative impacts on the environment. Public concern over drinking water is a leading issue resulting in diminished public confidence and higher use of bottled water which carries its own set of issues related to trace organic contamination and disposal of packaging and containers. 98

p. 9-17, Table 9-7: Another column should be added to this table showing the results of the water supply and system operations impact analysis results for the Proposed Program to more easily see the comparison to the alternatives. In reviewing this table, some summary comparisons can be made: 99

- Comparing to the Proposed Program, the Modified WSIP reduces 17 water supply and system operations impacts from "Potentially Significant, Mitigatable" to "Less than Significant"

- Comparing to the No Purchase Request Alternative, the Modified WSIP reduces 7 water supply and system operations impacts from "Potentially Significant, Mitigatable" to "Less than Significant"

- The No Action Alternative has the same identified "Potentially Significant, Mitigatable" water supply and system operations impacts as the Proposed Program

99 cont.

p. 9-26, last paragraph, No Program Alternative, Sec. 9.2.2: If the wholesale customers were to seek alternative supplies, they would have to use some, if not most of the Bay Area portion of the of the existing San Francisco regional waster system infrastructure. The draft PEIR does not fully disclose the constraints on this system. Understanding of these constraints is essential to know if the environmental impacts of the potential use of alternative supplies by the wholesale customers has been thoroughly analyzed and disclosed. For example, if the existing San Francisco regional system infrastructure is not available for these purposes, then the environmental impacts from the construction of a new supplemental water distribution system necessary to deliver alternative supplies could be greater than the impacts of the WSIP and should be disclosed as part of the final PEIR. 100

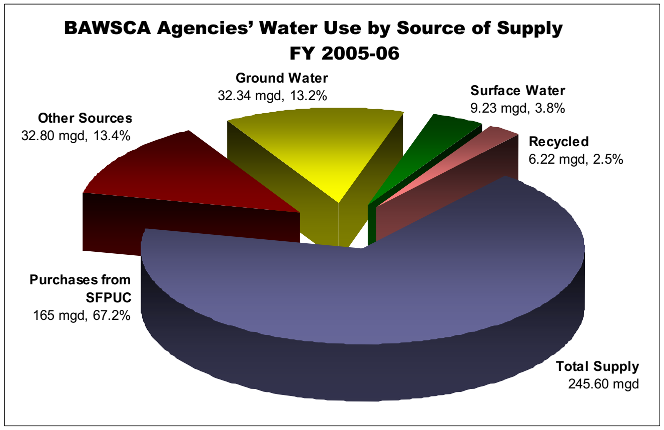
p. 9-26, last paragraph, No Program Alternative, Sec. 9.2.2: Regarding the statement that agricultural water use is decreasing because agricultural water users are selling water rights or contracts to urban agencies, another model to explain this result has also appeared. Specifically, some urban customers are investing in conservation in the agricultural regions and contracting to buy the conserved water, without land fallowing or selling of water rights. 101

p. 9-28, first paragraph, No Program Alternative, Sec. 9.2.2: The draft PEIR states that the wholesale customers have factored in additional conservation and recycling into their 2030 demands. In fact, by 2030, the wholesale customers expect to have an additional 9 mgd of recycled and desalinated water as well as 13 mgd from active conservation. (BAWSCA Annual Survey, FY 2005-06.) 102

p. 9-48 and 9-49, Aggressive Conservation/Water Recycling and Local Groundwater Alternative: The evaluation and analysis of the Aggressive Conservation/Water Recycling and Local Groundwater Alternative in the PEIR must consider the existing water demands and supply sources as well as projections for future water demand and water supply diversity.

First, the diversification of water supplies today is very different when comparing the City and County of San Francisco with the BAWSCA agencies. Thirteen of the BAWSCA agencies have diverse water supply portfolios that include recycled water, desalinated water, local groundwater, and local surface water. Figure C below provides detail on the current diversification of existing water supply portfolios. By comparison, Figure D shows the sources of supply for the San Francisco Retail System in the year 2000. 103

Figure C



103 cont.

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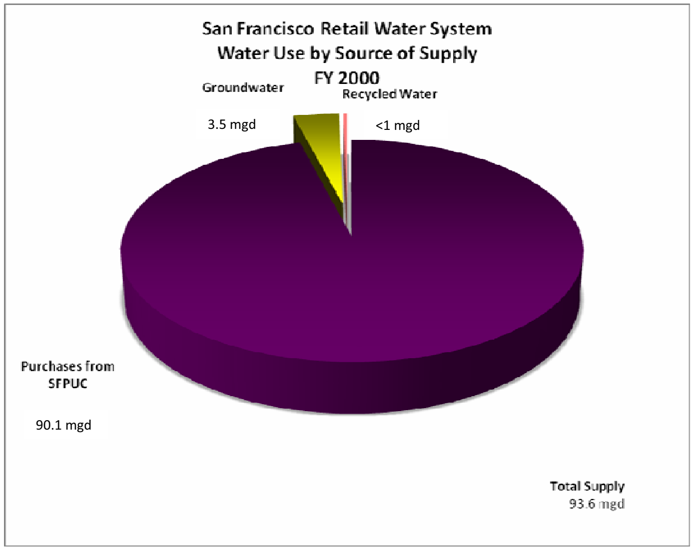
Figure D



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cont.

BAWSCA agencies have committed to increasing the diversity of their water supply portfolio in the future with increased use of recycled water, conjunctive use operation of groundwater supplies, and implementation of water conservation in 2030 as shown in Figure E below. Again, for comparison purposes, Figure F shows the planned sources of supply for the San Francisco Retail System in 2030 including an assumption that the conservation and water recycling component of the WSIP is implemented.

Figure E

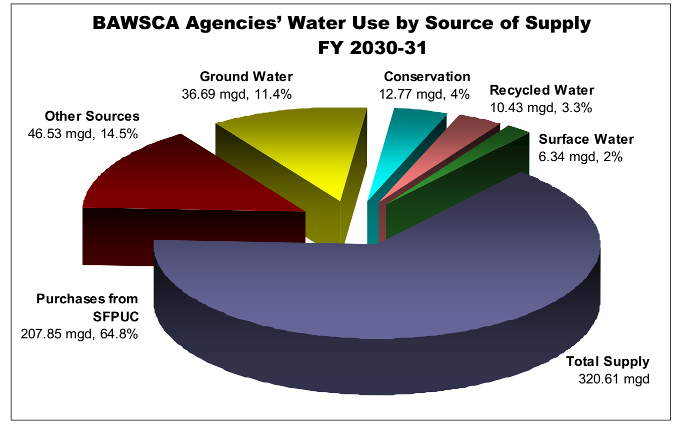
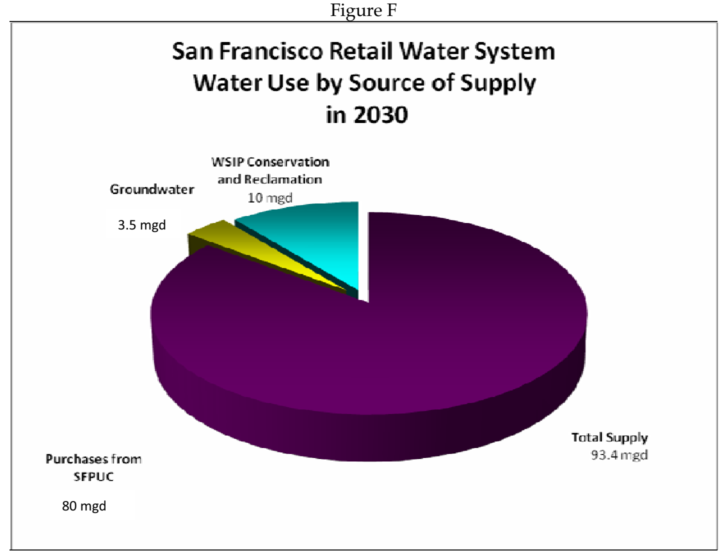


Figure F



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cont.

Other Comments Relating to Section 3.4.4, Water Demand Studies, and Supporting Studies for PEIR

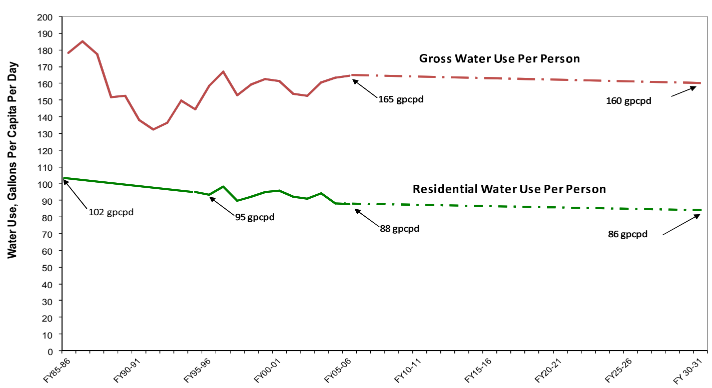
Since the release of the draft WSIP PEIR, several organizations have made critical statements questioning BAWSCA member agencies' water use characteristics and demand projections, which are included in the PEIR's supporting documents.

BAWSCA would like to offer the following comments and information on Section 3.4.4 "Water Demand Studies" of the PEIR and in response to the statements that have been made. Below is a summary of those comments made and BAWSCA's responses for purposes of clarifying similar issues in the PEIR.

- Critical Statement: The wholesale customers anticipate that the single-family residential per-capita outdoor water use will increase from 39 gpcpd in 2001 to 40 gpcpd in 2030; Per capita water use is projected to increase for the wholesale customers, further indicating that they lack effective conservation programs.

  BAWSCA Response: As documented in the technical memorandum "*Projected Water Usage for BAWSCA Agencies*" (Brown and Caldwell, Nov. 2006), while the single-family residential per-capita outdoor water use for the BAWSCA member agencies will increase from 39 gpcpd in 2001 to 40 gpcpd in 2030, total single family residential per-capita use will <u>*decrease*</u> from 96 gpcpd to 86 gpcpd over the same period (although current 2005-06 per capita use is actually 88 gpcpd) and gross per capita use will <u>*decrease*</u> from 165 gpcpd currently to 160 gpcpd in 2030. Figure G below presents historical and projected gross and residential per capita use in the BAWSCA area.

Figure G 104



<u>Data Sources</u>
Historical Data: BAWSCA Annual Surveys
Projected Data: Projected Water Usage for BAWSCA Agencies Technical Memo, Brown and Calldwell, Nov. 2006

- Critical Statement: The SFPUC's "Proposed Program" ignores conservation, efficiency, and recycling measures that their own studies found could eliminate the need to divert more water from the Tuolumne by at least 74%.

  BAWSCA Response: This statement is incorrect. In fact, the WSIP includes implementation of over 23 mgd of conservation and recycling in the BAWSCA service area by 2030 as well as an additional 10 mgd of conservation and recycling in San Francisco by 2030. 105

- Critical Statement: The SFPUC should conduct a study to determine the maximum technical potential for conservation and efficiency savings within the SFPUC service territory.

  BAWSCA Response: Such a study was completed in March 2006, the "*SFPUC Investigation of Regional Water Supply Option No. 4 (RWSO4)*" (URS, March 2006). This study presented the results of a comprehensive analysis of water conservation, water recycling, and naturally renewable groundwater projects that could be implemented to meet future water demands without additional diversion from the Tuolumne River. While this report does identify areas of potential additional opportunities that could be implemented to reduce the need for additional Tuolumne River diversion, the study concludes: 106

  > The total "high range" yield for the three categories of RWSO4 projects is approximately 28.5 mgd. The "high range" yield is the <u>**maximum**</u> possible from the combination of water conservation, recycling, and renewable groundwater projects. Because some of these projects are only considered potentially eligible and because the feasibility of many of the projects is unknown, this Technical Memorandum concludes <u>**that RWSO4 will not meet**</u> the 35 mgd increase in normal year SFPUC system demand by the year 2030. (emphasis added)

- Critical Statement: "the non-residential sector is responsible for over 80% of the projected 2030 demand increase."

  BAWSCA Response: This statement is incorrect. 53.4% of the projected total increase in demand is associated with non-residential water use. The difference in the non-residential sector between 2001 actual (91 mgd) and 2030 projected (120.5 mgd) is 29.5 mgd, which represents 53.4% of the total increase in demand. 107

- Critical Statement: "over 40 percent of the increase in non-residential demand is due to outdoor use."

  BAWSCA Response: This statement is incorrect. As documented in the technical 108
  memorandum "*Projected Water Usage for BAWSCA Agencies*" (Brown and Caldwell, Nov. 2006), the difference in the non-residential sector between 2001 (actual) and 2030 (projected) is 29.5 mgd. Of this amount, the increase in *outdoor use* is 9.4 mgd, or 32%.

- Critical Statement: The PEIR and associated demand studies failed to account for the impact rising price of water has on consumption.

  BAWSCA Response:

  First, all of the BAWSCA agencies meet the CUWCC Best Management Practice #11 for Pricing.

  Second, the demand studies that form the basis for the PEIR did incorporate the future cost of water (estimated at $1,070/acre-foot) when analyzing the cost-effectiveness of each individual conservation and water recycling measure. This allowed the individual BAWSCA member agencies to identify the cost-effective water supply alternatives available to them based on the future cost of water.

  Third, the demand studies that form the basis for the PEIR are based on an end-use 109
  model. This type of model differs from straight per capita or land use-based forecasting approaches in that it uses growth in number of accounts and a complete breakdown of water uses by account type (end uses) to forecast water demands. Using an end-use model allows more consideration of the effects of targeted conservation measures than is possible with a per capita or land use demand model. One characteristic of utilizing an end-use model is that very specific conservation measures are identified and evaluated for all end uses of water that can be identified. The result is that water use and available conservation activities are broken down very specifically. These individual conservation measures are then applied to end uses and the resulting water demand after conservation activities is determined. Because of this, applying a general elasticity value to this resulting demand, in an attempt to "mimic" the effect of pricing increases, would in fact then double-count much of the already identified and planned savings. Put another way, the specific conservation measures evaluated as part of an end use model provide clarity and specificity as to how a customer would achieve conservation savings in response to pricing structures designed to encourage water conservation.

- Critical Statement: "A study conducted by the Irvine Ranch Water District in California, for example, showed that evapotranspiration controllers reduced outdoor water use for large residential users by 24 percent."

  BAWSCA Response: BAWSCA is currently awaiting results from a multi-year study being conducted on weather-based irrigation controllers and their effectiveness. This
  study is a grant-funded effort in the San Francisco Bay Area headed by EBMUD and 110
  includes EBMUD, SCWA, CCWD, ACWD, SCVWD, and the City of Davis. Results of the study will not be out for another year or so. It is important to review the results of this study prior to implementing any irrigation controller rebate program, as the study should demonstrate actual water savings potential in *climatologic and hydrologic areas similar to the BAWSCA agencies,* as opposed to studies from Southern California or elsewhere in the country.

- Critical Statement: "Recent conservation assessments indicate that there are a substantial number of cost effective technologies that can drastically reduce residential water demand – both indoor and outdoor – to levels far below those projected for the wholesale and retail customers. For example, a 1997 study by the American Water Works Association (AWWA) found that conservation could reduce indoor water use from 65 gpcpd to 45 gpcpd for single-family homes, a savings of over 30 percent."

  BAWSCA Response: According to the report *Water and Energy Savings From High Efficiency Fixtures and Appliances in Single Family Homes* (EPA, 2005):

  > The mean daily household indoor use for the three groups during the
  > baseline was 175 gpcpd, which dropped 39 percent to 107 gpcpd after the 111
  > installation of the new high-efficiency fixtures and appliances.

  For the houses studied in the service area of East Bay Municipal Utilities District in the San Francisco Bay Area, the pre-retrofit total residential water use was 187.6 gpcpd and the post-retrofit use was 123.9 gpcpd, a difference of 63.7 gpcpd or 33.95%. These findings support the fact that household retrofits with efficient plumbing fixtures can significantly reduce residential water use. However, the study shows that residential water use in other parts of the San Francisco Bay Area is significantly higher currently than that for BAWSCA, including that for BAWSCA's projected 2030 use. As stated earlier in these comments, total single family residential per capita water use will decrease from the current level of 88 gpcpd to 86 gpcpd in 2030.

ATTACHMENT 2

12.3-56

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Impact of Earthquakes on BAWUA Customers

Summary Report

Prepared for:
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G&E Report 54.01.01, Revision 0X
November 23, 2001
(includes minor revisions by BAWUA)

Introduction

This report describes what might happen to deliveries of water to BAWUA customers resulting from earthquake-induced damage to the SFPUC water system after two significant and likely earthquakes: a magnitude 7.9 earthquake on the San Andreas fault or a magnitude 7.1 earthquake on the Hayward fault. Unless otherwise noted below, estimated restoration times refer to SFPUC regional system. Damage to local distribution systems may further impede water from reaching the actual end-user. Water deliveries may be non-potable during the time water is restored to customers.

San Andreas M 7.9 Earthquake

This earthquake will be very damaging to the main pipelines, tunnels, water treatment plants and pump stations in the Peninsula portions of the SFPUC system. No new water supply from the SFPUC system will be available until repairs are made to the most critical pipeline and tunnel infrastructure; this will take between 20 and 30 days, depending on location within the SFPUC system. Projected impacts to BAWUA customers are as follows:

- 349,000 people (Brisbane, Burlingame, Colma, Foster City, Hillsborough, Millbrae, Pacifica, San Mateo, South San Francisco, parts of Belmont and Daly City): Water supply is lost to almost all customers in about 24 hours. No water via the piped system for about 30 days. After 30 days, about 35% of customers will have water restored, ramping up to 100% of customers in about 58 days.

- 140,000 people (San Bruno, most of Daly City): Water supply is lost to almost all customers in about 24 hours. There is no water to most of the piped system for several days. Then, water supply is restored to most people at severe rationing levels within 30 days. After 30 days water is supplied to most people at near normal levels. 112

- 277,000 people (East Palo Alto, Los Altos Hills, Menlo Park, Palo Alto, Redwood City, Woodside, parts of Belmont and North San Jose): Water supply is lost to almost all customers in about 24 hours. There is no water via the piped system for about 20 days. After 20 days, about 35% of customers will have water restored, ramping up to 100% of customers in about 34 days.

- 334,000 people (Mountain View. Santa Clara, Stanford University and Sunnyvale): Water supply is lost to almost all customers in about 24 hours. No water to most of the piped system for a few days. After 14 days, about two-thirds of customers will have water restored, ramping up to 100% of customers at near normal levels in about 34 days.

- 511,000 people (Hayward, Fremont, Newark and Union City). Damage to local distribution pipelines, especially those near the bay, will cause between 3% and 20% of customers to lose all water supply for up to a few days after the earthquake

- 800,000 people (San Francisco). Damage to local distribution pipelines, especially those serving the lower elevation north waterfront, downtown and South of Market areas, will lead to loss of all water supply to those areas within 8 to 24 hours after the earthquake. Water supply to the western and higher elevation parts of the City will be

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lost to localized areas within a few hours after the earthquake. Damage to all the major transmission pipelines serving San Francisco will prevent re-supply of the City, causing most of the City to lose nearly all water supply within about 72 hours. Limited portions of the City served by unbroken parts of the salt-water auxiliary water supply system may have access to salt water for fire fighting purposes. For up to 30 days, a portion of the City could get non-potable water if it is decided to pump Lake Merced water into the potable water system; most of the remainder of the City will have no water. Some of the transmission pipelines are restored to service 30 days after the earthquake, and about three-quarters of the City will then have water. Essentially all customers get water restored within 45 days.

Hayward M 7.1 Earthquake

This earthquake will be very damaging to the main pipelines, tunnels, water treatment plants and pump stations in the East Bay portions of the SFPUC system. No new water supply from the SFPUC system will be available to the East Bay and parts of the South Peninsula areas until repairs are made to critical pipeline and tunnel infrastructure; this will take between 20 and 30 days, depending on location within the SFPUC system. Given the expected damage patterns, BAWUA customers should expect the following:

- 200,000 people (East Palo Alto, Hayward, Woodside, parts of Menlo Park, North San Jose, Palo Alto and Redwood City). Water supply is lost to almost all customers in about 24 hours. There is no water via the piped system for about 20 days. After 20 days, about 35% of customers will have water restored, ramping up to 100% of customers in about 35 days. For up to 60 days after the earthquake, water supply will be intermittent (sufficient at night time, on-and-off in the day time). 112 cont.

- 725,000 people (Fremont, Milpitas, Newark, Santa Clara, Sunnyvale, Union City and parts of Stanford University). Water supply is lost to almost all customers in about 24 hours. There is no water to most of the piped system for a few days. Water supply to about one-half of customers is restored within 15 days. Then, water supply to about two-thirds of customers is restored within 20 days, which is when the SFPUC system is sufficiently repaired to start making limited deliveries again. For up to 60 days after the earthquake, water supply will be intermittent.

- 800,000 people (San Francisco). Damage to local distribution pipelines, especially those near the bay, will cause between 5% and 20% of customers to lose all water supply within 24 hours after the earthquake, with most of these customers reconnected to the system within ten days after the earthquake. For up to 60 days after the earthquake, there may be insufficient water available to supply all of San Francisco, if the decision is made to divert limited water supplies to meet the requirements of Peninsula and South Bay suburban customers. If the decision is made to divert water, then San Francisco customers will have to greatly reduce demand, or else there will be localized intermittent water outages.

- 710,000 people (northern Peninsula and areas not listed above). Damage to local distribution pipelines, especially those near the bay, will cause between 2% and 15% of customers to lose all water supply for up to a few days after the earthquake. For up to 60 days after the earthquake, water supply will be intermittent (sufficient at night time, on-and-off in the day time).

Impacts to Affected BAWUA Customers

For the first one to three days after either a San Andreas M7.9 or Hayward M7.1 earthquake, a large portion of affected people will likely stay home, to take care of immediate family matters and damage to local residences. If residential structures suffer little to moderate damage, most people will continue to live at home, while some will relocate to stay with friends or family outside the affected zone. If residential structures suffer considerable damage, people will have to relocate to various types of emergency shelters like school gymnasiums.

During the first few days, most people in the areas with water outages will obtain drinking and cooking water from bottled water suppliers. Within a day or two, water supply for sanitation and washing purposes will become a high priority for people. People without water at their residences beyond one or two days will either relocate to emergency shelters / hotels, move in with family outside of the affected area, or suffer the inconvenience of obtaining bottled water and/or water from emergency distribution locations for all of their needs.

Faced with water outages that could last up to 20 to 60 days, there will be substantial impacts to local communities. Most emergency care facilities (hospitals) will likely have to relocate their patients to other hospitals if their facility loses piped water supply for more than a day or so. People will tend to become "disillusioned" with their water agencies if piped water is not restored within about 4 to 10 days. Economic activity in the areas without piped water supply will drop by about 50-70%; most affected businesses will furlough their employees for the interim; "marginal" companies may not ever recover.

A large earthquake will ignite fires in many locations. Many of these fires will ignite due to leaking natural gas pipes; short circuits in electrical systems; unattended cooking and tipped-over heating appliances when PG&E electric power is restored; spillage of flammable materials, etc. Fire fighters will be able to make good use of local water supplies in tanks until the water within the tanks runs out, likely within 6 to 18 hours after the earthquake. Fire fighting efforts at fire locations that are located too far away from a water supply (either because of broken water pipes, or the system has become depressurized), will be largely ineffective; the buildings (and a few around them) will be left to burn down. If it is very windy at the time of the earthquake (about 2% to 5% chance), fires that cannot be rapidly controlled before the local water supply is exhausted will likely spread; in densely constructed areas, one or two uncontrolled ignitions could lead to conflagrations involving 10s to 100s to 1000s of structures.

Basis of this Report

This report was prepared using the findings described in the "Phase II – Regional System Overview" report of the SFPUC Facilities Reliability Program (January 2000), coupled with trends that have occurred to local water distribution systems in recent earthquakes around the world. Further engineering evaluations of individual components of each water system can refine the results presented herein. The water outages described in this report are no more severe than what has actually been experienced to modern metropolitan urban areas that have recently experienced large earthquakes. For example, the city of Kobe, Japan (population 1,500,000 people), was impacted by a magnitude 7 earthquake in 1995; the resulting damage to the water

112 cont.

system resulted in water outages lasting up to 90 days. For BAWUA customers, the dominant reason for lengthy water outages is damage to pipelines that cross soil liquefaction areas (the San Francisco Bay Area has many such pipelines and many such soil areas); and that major pipelines cross faults (the SFPUC system has all 4 of its major pipelines cross the Hayward fault). Another important cause of damage is the intense level of ground shaking that will occur near the faults, which will greatly overload the vintage water facilities built near them, like reservoir outlet towers and tunnels – most of these facilities were not designed for anything much more than about one-quarter the level of ground shaking that they will likely be subjected to in future earthquakes.

For the interested reader, detailed reports on the performance of water systems in recent earthquakes are available from the American Society of Civil Engineers (www.asce.org), Technical Council on Lifeline Earthquake Engineering: Kobe, Japan, 1995 (monograph 15); Izmit, Turkey 1999 (monograph 17); Chi-Chi Taiwan, 1999 (monograph 18); Bhuj, India, 2001 (monograph 19). In all of these earthquakes, damage to water systems led to water outages lasting between weeks to several months for urban areas of 100,000s to 1,000,000s of population.

112 cont.

ATTACHMENT 3

12.3-59

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A Water Bonds

Digest

by Ballot Simplification Committee

THE WAY IT IS NOW: San Francisco's water system supplies drinking water to about 2.4 million people in San Francisco and the Bay Area. This water is stored at Hetch Hetchy Reservoir and in other reservoirs in the Sierra and in Alameda and San Mateo counties. Some of the water is piped more than 150 miles to reach the Bay Area. Many of the water system's pipelines, tunnels and other facilities are in need of repair or replacement. Some of these are located on or near fault lines, and are vulnerable to damage in an earthquake.

THE PROPOSAL: Proposition A is a revenue bond that would authorize the City to borrow $1,628,000,000 to pay for improvements to its water system. The money would be used to:

- Upgrade and strengthen the system's pipelines, tunnels and other facilities against earthquakes;
- Upgrade the system used to store water and pipe it to the Bay Area;
- Upgrade the water distribution system in San Francisco;
- Meet future water quality standards; and
- Increase water system capacity.

Rates charged to water system customers in San Francisco would be increased over time to repay these bonds. San Francisco landlords could pass on to tenants in rent-controlled units half the increase in water rates resulting from the bond. Suburban water system users would finance and pay for their share of improvements to the water system.

If in the future the San Francisco Board of Supervisors determines that it is cheaper to pay for water system improvements by joining with suburbs to create a Regional Water Financing Authority, then a surcharge will be imposed on San Franciscans to cover the additional costs including to pay for the operating expenses of the Authority.

A "YES" VOTE MEANS: If you vote "Yes," you want the City to borrow $1,628,000,000 to make water system improvements, to be paid for with increased water rates.

A "NO" VOTE MEANS: If you vote "No," you do not want the City to borrow $1,628,000,000 for these purposes.

Controller's Statement on "A"

City Controller Edward Harrington has issued the following statement on the fiscal impact of Proposition A:

In my opinion, should the proposed bond issue of $1,628,000,000 be authorized and bonds issued at current interest rates, based on a single bond sale and level redemption schedules, the cost would be approximately $85,000,000 annually for thirty (30) years for a total approximate cost including debt service of $2,551,000,000.

This bond amount represents increases ranging between 5% and 12% annually between 2003 and 2015 in water rates for San Francisco consumers, the source of repayment for these bonds. For the average single family residential service in San Francisco this cost is equivalent to an increase of approximately $26.42 per month above the current rate of $14.43 per month, for a total of $40.85 per month by 2015.

The City typically does not issue all authorized bonds at one time; if these bonds are issued over several years, the actual debt service may be somewhat less than the maximum amount shown herein.

Before the bonds are issued, the City will need to amend the Residential Rent Stabilization and Arbitration Ordinance. This amendment is to provide landlords the ability to pass through 50% of the costs resulting from increased water rates to residential tenants. Under current financing assumptions, the average tenant in a four unit building would pay approximately $10.56 per month by 2015.

How Supervisors Voted on "A"

On July 22, 2002 the Board of Supervisors voted 8 to 3 to place Proposition A on the ballot.

The Supervisors voted as follows:
Yes: Supervisors Ammiano, Daly, Gonzalez, Leno, Maxwell, McGoldrick, Newsom, and Peskin.
No: Supervisors Hall, Sandoval, and Yee.

THIS MEASURE REQUIRES **50%+1** AFFIRMATIVE VOTES TO PASS.

ARGUMENTS FOR AND AGAINST THIS MEASURE IMMEDIATELY FOLLOW THIS PAGE. THE FULL TEXT BEGINS ON PAGE **P-19**.
SOME OF THE WORDS USED IN THE BALLOT DIGEST ARE EXPLAINED ON PAGE **P-3**.

A Water Bonds

PROPONENT'S ARGUMENT IN FAVOR OF PROPOSITION A

Should a major earthquake strike San Francisco's Hetch Hetchy water system must be ready.

If a serious quake were to occur today, there is a high probability that water delivery to San Francisco could be interrupted for more than two months. This would threaten our ability to fight fires after an earthquake and lead to an economic disaster as we attempted to recover without a stable water supply.

When San Franciscans came together in common purpose to build Hetch Hetchy nearly 100 years ago, we showed we were a city that knew how to do things right. Now, it is time for our generation to show that we know how to safeguard this civic treasure.

After years of study and rigorous review, the city is going forward with Proposition A to seismically-strengthen and repair the deteriorated system.

Hetch Hetchy brings more than vital water; it provides tremendous financial benefits to the people of San Francisco. Because of our ownership of the system, San Francisco will pay for just 30 percent of the cost of regional repairs. Our suburban customers will pay the rest - $2 billion. And our water rates will be competitive with neighboring counties in the Bay Area. Hetch Hetchy also provides San Francisco free water and power for critical city needs such as the Municipal Railway, Public Schools, San Francisco General Hospital and other city facilities.

12.3-60

Now is the time to safeguard this civic treasure. The system crosses three major earthquake faults and is vulnerable.

A city cannot live without water. That's why Board President Tom Ammiano and Supervisors Peskin, Maxwell, Daly, Leno and McGoldrick have joined with the Chamber of Commerce, environmental activists and leaders from throughout San Francisco to support Proposition A.

Please Vote YES on Proposition A.

Supervisors Tom Ammiano, Aaron Peskin, Sophie Maxwell, Chris Daly, Mark Leno and Jake McGoldrick

San Francisco Chamber of Commerce

REBUTTAL TO PROPONENT'S ARGUMENT IN FAVOR OF PROPOSITION A

Proposition A triples water rates, raises rents and gives away control of our water system to the suburbs.

Don't fall for the scare campaign. Though our water delivery system must be made seismically safe, there is an alternative plan that would cost 75% less - and keeps San Francisco voters, not suburban politicians, in control of our water system.

The political establishment supports this measure because it helps to create a new bureaucracy called The Regional Water Finance Authority. This Authority will control spending and set your water rates. You the ratepayer or renter will pay the costs of this new bureaucracy.

Current law requires a vote of the public to increase water rates. This important decision must remain in the hands of voters and certainly not the hands of politicians.

Please read the ballot question and you will see that the devil is in the details. See through the fear campaign and keep what Congress gave San Francisco more than 80 years ago.

Please join us in saying **NO to THE WATER GRAB.** Vote No on Prop A!

The Coalition for San Francisco Neighborhoods

San Francisco Taxpayers & Homeowners Association

San Francisco Hotel Council

The Residential Builders Association

The Coalition for Better Housing

The San Francisco Association of Realtors

San Francisco Apartment Association

Professional Property Management Association of San Francisco

Golden Gate Restaurant Association

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A Water Bonds

PAID ARGUMENTS IN FAVOR OF PROPOSITION A

SENIORS SUPPORT THE REPAIR AND RENEWAL OF OUR WATER SYSTEM! PAY NOW OR PAY MUCH MORE LATER. **VOTE YES ON PROP A.**

Margaret Griffin, Vice-President, SENIOR ACTION NETWORK
Denise D'Anne, Treasurer, SENIOR ACTION NETWORK

The true source of funds used for the printing fee of this argument is SENIOR ACTION NETWORK.

Hetch Hetchy is the largest source of high quality drinking water in California. It delivers water to all San Franciscans and several peninsula communities -- about 3 million people are served.

The Hetch Hetchy water system needs overhauling: new pipes that are seismically upgraded to meet modern safety standards; reinforcement of city reservoirs, such as in the Sunset, that provide water to 60% of San Francisco and serve as emergency supply; and modernized pump stations that move water throughout the city.

It would be foolhardy not to repair this system. Throughout California, there are communities searching for high quality drinking water. We have it and we must keep it.

I urge you to vote "Yes" on Proposition A.

Dianne Feinstein, U.S. Senator, former Mayor, former Supervisor

The true source of funds used for the printing fee of this argument is Save Hetch Hetchy Committee - Yes on A: A Business & Labor Coalition to Safeguard Our Water Supply.

The three largest contributors to the true source recipient committee are: 1. California Alliance for Jobs 2. Engineering and Utility Contractors Association 3. San Francisco Chamber of Commerce 21st Century Committee.

State Senator Jackie Speier says "it is not a question of ***if*** a major earthquake will strike the Bay Area. It is a question of ***when.***" I agree.

Hetch Hetchy's aging pipes cross three active earthquake faults: the Calaveras, the Hayward, and the San Andreas. A 7.0 earthquake could cut water to 2.4 million residents of the Bay Area for up to 60 days. Emergency crews would be unable to fight fires, and hospitals would be unable to function properly. This is a risk that we cannot afford to take.

Senator Speier and I speak with passion borne of a love of this great city when we implore you to help Save Hetch Hetchy for our generation and for generations to come.

History will judge us by our vote on November 5.

Please, vote yes on A.

Jane Morrison, Chair, San Francisco Democratic Party

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The three largest contributors to the true source recipient committee are: 1. California Alliance for Jobs 2. Engineering and Utility Contractors Association 3. San Francisco Chamber of Commerce 21st Century Committee.

Join the San Francisco Democratic Party in Voting YES on A.

Proposition A is a vital public safety priority for all San Franciscans. We must protect our water supply and preserve the Hetch Hetchy system.

A major earthquake will strike sooner, or later.

We must be ready.

Don't Delay. Vote YES ON A!

San Francisco Democratic Party

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The three largest contributors to the true source recipient committee are: 1. California Alliance for Jobs 2. Engineering and Utility Contractors Association 3. San Francisco Chamber of Commerce 21st Century Committee.

The San Francisco Chamber of Commerce Urges YES on A.

As representatives of the business community, we know that our economy will wither if we cannot protect our water supply. A major earthquake will knock out water to our city for months. That will create an immediate danger as we fight fires in the aftermath of an earthquake, and a long-term disaster as we try to rebuild our economy without water.

We have waited too long already. Now is the time for the entire city to unite behind Proposition A.

A. Lee Blitch, President and CEO, San Francisco Chamber of Commerce

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The three largest contributors to the true source recipient committee are: 1. California Alliance for Jobs 2. Engineering and Utility Contractors Association 3. San Francisco Chamber of Commerce 21st Century Committee.

The Harvey Milk Democratic Club Urges Yes on A.

Rebuilding Hetch Hetchy is a priority that must be shared by every San Francisco community. For our health, for our safety and for the economic security of our city - VOTE YES ON A.

Harvey Milk Democratic Club

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PAID ARGUMENTS IN FAVOR OF PROPOSITION A

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It's a sound plan. Vote Yes on Prop A.

A Blue Ribbon Panel made up of experts in water supply, planning, finance and the environment met to independently evaluate the Prop A Capital Improvement Program.

We found the plan to be solid, well designed and achievable. We urge San Franciscans to support this long overdue measure.

Restoring the Hetch Hetchy water supply system is necessary to protect the public health and is good for all San Franciscans.

Please vote YES on A.

Jim Chappell, President, SPUR (San Francisco Planning & Urban Research Association), Blue Ribbon Panel Convener

The true source of funds used for the printing fee of this argument is Save Hetch Hetchy Committee - Yes on A: A Business & Labor Coalition to Safeguard Our Water Supply.

The three largest contributors to the true source recipient committee are: 1. California Alliance for Jobs 2. Engineering and Utility Contractors Association 3. San Francisco Chamber of Commerce 21st Century Committee.

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The Hetch Hetchy system was an engineering marvel when it was constructed nearly 90 years ago. However, now it does not meet modern earthquake safety requirements. Many of the water system's pipelines and structures are at the end of their useful life and require replacement or rehabilitation before they fail.

Water from the dam in the Sierra Nevada flows across three major earthquake faults as it travels in pipelines over 167 miles to the City of San Francisco and the Bay Area. The risk of a significant earthquake is high. Furthermore, there are system components without redundancy. Standards and technology have improved dramatically since construction in 1914, and should be implemented to help protect this vital system and assure all City users of a constant water supply.

We mush rehabilitate and/or replace pipelines and structures as well as incorporate modern seismic safety standards to protect our water supply system.

Please join the American Society of Civil Engineers, San Francisco Section, in support of Proposition A.

Jennifer Webber

The true source of funds used for the printing fee of this argument is Save Hetch Hetchy Committee - Yes on A: A Business & Labor Coalition to Safeguard Our Water Supply.

The three largest contributors to the true source recipient committee are: 1. California Alliance for Jobs 2. Engineering and Utility Contractors Association 3. San Francisco Chamber of Commerce 21st Century Committee.

Vote Yes on Prop A.

The Hetch Hetchy water system is the pride of our city, but all agree that it is in need of repair.

We San Franciscans must demonstrate that we won't neglect one of our most precious possessions by protecting Hetch Hetchy from earthquakes and collapse. Proposition A will help preserve this vital system and keep it in the hands of San Francisco while maintaining our partnership with our suburban customers. The economic benefits that San Francisco enjoys will continue.

Proposition A should be a priority for everyone.

Please Vote Yes on Prop A.

Jim Lazarus, Former Deputy Mayor

The true source of funds used for the printing fee of this argument is Save Hetch Hetchy Committee - Yes on A: A Business & Labor Coalition to Safeguard Our Water Supply.

The three largest contributors to the true source recipient committee are: 1. California Alliance for Jobs 2. Engineering and Utility Contractors Association 3. San Francisco Chamber of Commerce 21st Century Committee.

Vote Yes on Prop A!

We work in San Francisco to keep your lights on, but we know it's just as important to have water come from the tap.

Please join us in supporting Proposition A it's about protecting a vital resource, it's about clean water, and it's about jobs.

Yes on A.

IBEW Local 1245

The true source of funds used for the printing fee of this argument is IBEW Local 1245.

Proposition A will allow San Francisco to produce recycled water for the first time. This can help recharge the Westside Basin Aquifer and reduce our dependence on the Hetch Hetchy reservoir.

Vote Yes on A!

San Francisco Tomorrow

The true source of funds used for the printing fee of this argument is San Francisco Tomorrow.

PAID ARGUMENTS IN FAVOR OF PROPOSITION A

The Hetch Hetchy water system is San Francisco's life line. SPUR believes that Proposition A is a well researched, well-prepared investment in the long term future of our water system.

Improvements to the system will be paid for over time. Customers who live outside the city will pay their share up front. The plan puts the most important work first, in the interests of shoring up the system's ability to withstand earthquakes.

Because this is a revenue bond, it will be paid for out of customers' fees; it will not raise taxes.

Together with Proposition E, a companion measure that gives the Public Utilities Commission the tools it needs to get the job done on time and on budget, we can protect our water supply for the next century.

SPUR recommends a yes vote on Prop A.

For the full ballot analysis, see www.spur.org

SPUR

The true source of funds used for the printing fee of this argument is SPUR Urban Issues Committee.

The three largest contributors to the true source recipient committee are: 1. John Weeden 2. Frankie Lee 3. Vince Hoenigman.

Join me in voting Yes on Prop A.

The Hetch Hetchy water system is part of what makes San Francisco a unique place to live, but the system is aging and in need of repair.

Proposition A would direct our money to where it is needed to fix the rusting and decaying pipelines. These repairs will keep our water clean and make sure an earthquake will not leave us without water.

Now is the time to cast a vote that will keep San Francisco a one-of-a-kind city.

Please, vote yes on A.

Congresswoman Nancy Pelosi

The true source of funds used for the printing fee of this argument is Save Hetch Hetchy Committee - Yes on A: A Business & Labor Coalition to Safeguard Our Water Supply.

The three largest contributors to the true source recipient committee are: 1. California Alliance for Jobs 2. Engineering and Utility Contractors Association 3. San Francisco Chamber of Commerce 21st Century Committee.

San Franciscans Unite to Preserve Hetch Hetchy - Vote YES on A.

San Francisco has always been a city of great vision. Proposition A is our chance to renew that vision by preserving our water system.

Nearly 80 years ago, our city united to create the world-class Hetch Hetchy water system. Now, we must unite again to invest in system repairs and to ensure San Francisco's continued ownership of this vital utility.

Please join us in voting YES on A.

Senator John Burton
Assemblyman Kevin Shelley

The true source of funds used for the printing fee of this argument is Save Hetch Hetchy Committee - Yes on A: A Business & Labor Coalition to Safeguard Our Water Supply.

The three largest contributors to the true source recipient committee are: 1. California Alliance for Jobs 2. Engineering and Utility Contractors Association 3. San Francisco Chamber of Commerce 21st Century Committee.

Proposition A will ensure that we take the necessary steps to fix our water system. The repair of Hetch Hetchy will guarantee us clean water for years to come.

The rebuild will also create jobs and give people skills to continue in the industry after the Hetch Hetchy project is completed.

We must support Proposition A. The clean water and jobs are a win-win for all San Franciscans.

Please vote Yes on A.

Supervisor Sophie Maxwell

The true source of funds used for the printing fee of this argument is Save Hetch Hetchy Committee - Yes on A: A Business & Labor Coalition to Safeguard Our Water Supply.

The three largest contributors to the true source recipient committee are: 1. California Alliance for Jobs 2. Engineering and Utility Contractors Association 3. San Francisco Chamber of Commerce 21st Century Committee.

Help Keep San Francisco Safe - Vote Yes on A.

San Francisco didn't just fall down in 1906 - it burned down. One of the major reasons was lack of water in the aftermath of the earthquake.

Our Hetch Hetchy system is now more than 80 years old. Experts say it will not withstand a major quake. That is why we must unite and Vote Yes on A.

Sheriff Michael Hennessey

The true source of funds used for the printing fee of this argument is Save Hetch Hetchy Committee - Yes on A: A Business & Labor Coalition to Safeguard Our Water Supply.

The three largest contributors to the true source recipient committee are: 1. California Alliance for Jobs 2. Engineering and Utility Contractors Association 3. San Francisco Chamber of Commerce 21st Century Committee.

Water Bonds A

PAID ARGUMENTS IN FAVOR OF PROPOSITION A

Proposition A is needed to protect one of the City's most valuable assets: Hetch Hetchy and our City's water supply. Failure to protect our water supply would place this City at great economic risk. Prop A will also make ecological improvements to our water system that is long overdue.

I ask all San Franciscans to join me in supporting Proposition A.

City Treasurer Susan Leal

The true source of funds used for the printing fee of this argument is Susan Leal.

Join District 11 Democrats and Vote Yes on Prop A.

Water is a precious resource that must be safeguarded, and fixing our our unique Hetch Hetchy water system will help do that.

Proposition A will allow San Francisco's entry into the use of recycled water - a much needed conservation measure.

Proposition A is a fair proposal.

Vote Yes on A.

District 11 Democrats

The true source of funds used for the printing fee of this argument is Save Hetch Hetchy Committee - Yes on A: A Business & Labor Coalition to Safeguard Our Water Supply.

The three largest contributors to the true source recipient committee are: 1. California Alliance for Jobs 2. Engineering and Utility Contractors Association 3. San Francisco Chamber of Commerce 21st Century Committee.

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Organized Labor Supports Prop A.

Making prudent investment in vital infrastructure is the basis of a strong community.

Proposition A is a fair and balanced measure that creates jobs for working men and women and will allow us to upgrade our water system so it can withstand a major earthquake.

Please join us in voting Yes on Prop A.

Operating Engineers Local 3

The true source of funds used for the printing fee of this argument is Save Hetch Hetchy Committee - Yes on A: A Business & Labor Coalition to Safeguard Our Water Supply.

The three largest contributors to the true source recipient committee are: 1. California Alliance for Jobs 2. Engineering and Utility Contractors Association 3. San Francisco Chamber of Commerce 21st Century Committee.

The San Francisco Labor Council Urges Yes on Prop A.

Proposition A will create thousands of jobs and help preserve millions of dollars of city revenue we need to fund basic services. Organized labor urges all working people to join with us in supporting Proposition A.

Save Hetch Hetchy!

Robert Boileau, Vice President, San Francisco Labor Council

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The three largest contributors to the true source recipient committee are: 1. California Alliance for Jobs 2. Engineering and Utility Contractors Association 3. San Francisco Chamber of Commerce 21st Century Committee.

In life, until some unforeseen loss, we take for granted the commonplace - such as air, water, the social and physical infrastructure around us, and parenthetically, the municipal professionals who help support that network.

Our members kept Hetch Hetchy water flowing despite years of unconscionable deferred maintenance; Prop A provides the tools to repair and retrofit San Francisco's water-related infrastructure to safe, 21st Century standards.

Yes on Prop A.

Professional & Technical Engineers, Local 21 (IFPTE/AFL-CIO)
Howard Wong, A.I.A., President
Kathleen Price, P.E., San Francisco Vice President
Ron K. Dicks, Vice President, Legislative & Political Action

The true source of funds used for the printing fee of this argument is Professional & Technical Engineers, Local 21 (IFPTE/AFL-CIO).

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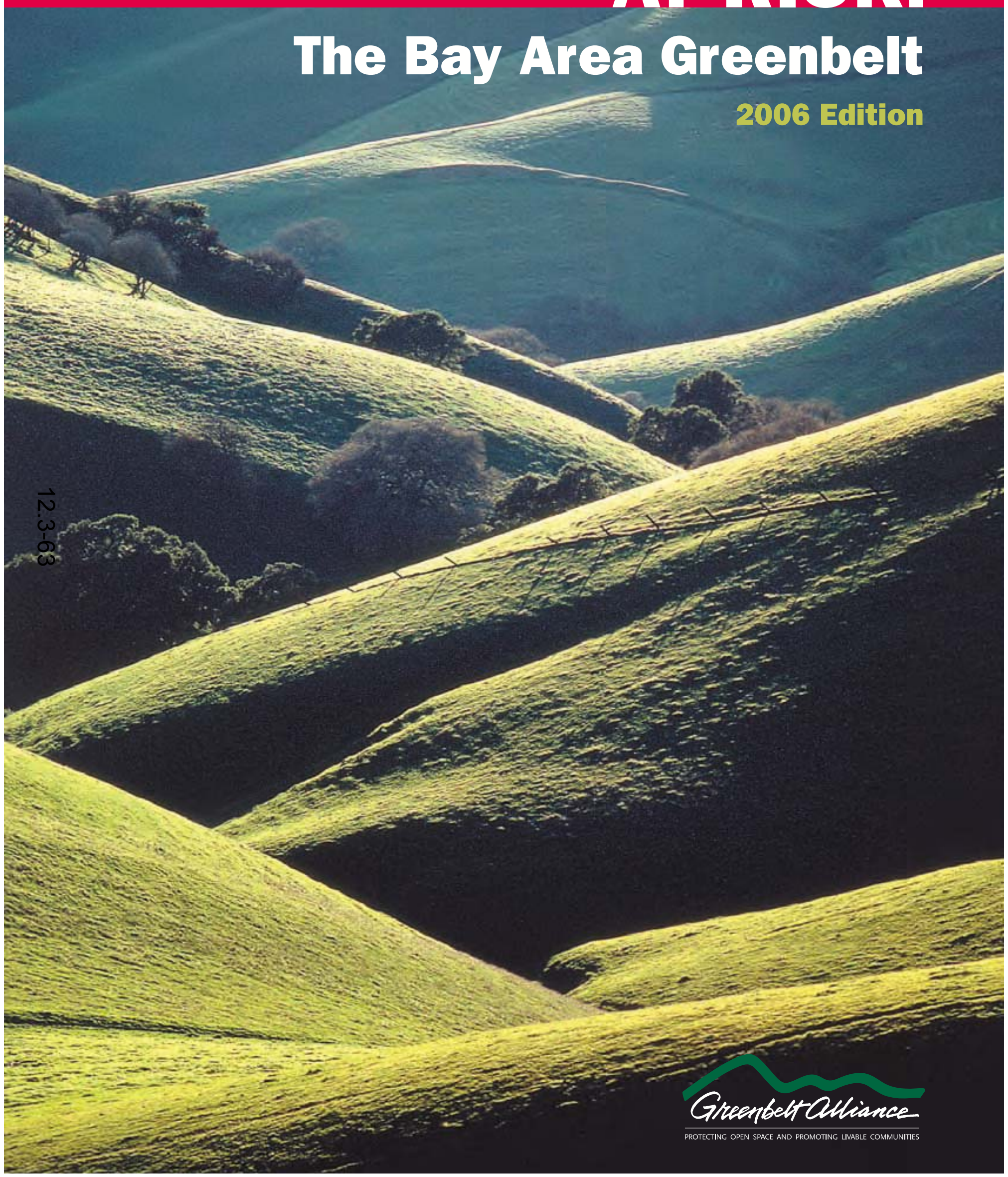
ATTACHMENT 4

AT RISK:
The Bay Area Greenbelt
2006 Edition



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12.3-64

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Alameda County

County progress, Tri-Valley pressure

General Assessment

Alameda County has made significant progress in securing its greenbelt, but challenges remain. The 2000 elections in particular were a landmark in the county's land-use history, with voters passing crucial greenbelt protection measures. Going forward, more responsible city policies will be needed, as well as continued vigilance against developer-backed attempts to roll back growth limits.

Hot Spots

The east county cities of Livermore, Pleasanton, and Dublin remain the focus of land-use controversies in Alameda County. Virtually all of the county's 15,000 acres that remain at high risk are around these cities. The flat ranchlands north of Livermore remain a prime target of developers, despite an urban growth boundary protecting the area. Developer Pardee Homes placed an initiative on the 2005 ballot to allow 2,450 houses on 1,500 acres of the land, but failed thanks to the concerted efforts of local activists. Despite the progress made in recent years, the growth pressures in these Tri-Valley cities could still increase Alameda County's total urbanized area by more than 10% in just the next 10 years.

Bright Spots

The passage of Measure D by county voters in 2000 laid down a key cornerstone for long-term greenbelt protection in Alameda County. The measure established a county urban growth boundary, prohibited subdivision of ranchlands in the east county, and encouraged investment in existing urbanized areas, extending regulatory protection to as much as 150,000 acres of farm, ranch and habitat lands. In the same election, Dublin voters passed Measure M to protect 4,000 acres of hill country, and county voters overwhelmingly passed the transit-friendly transportation sales tax Measure B.

Progress continued in 2002, when Fremont also passed a hillside protection ordinance, and the Livermore City Council established the North Livermore Urban Growth Boundary, connecting to the existing South Livermore Urban Growth Boundary to complete the boundary around the city. In 2004, voters in the western parts of Alameda and Contra Costa County bolstered financial support for the western, more heavily used parts of the East Bay Regional Park District, by passing Measure CC in the 2004 elections.

	ACRES
High Risk	15,000
Medium Risk	11,100
Low Risk	203,000
Urban	144,000
Protected	104,700
Total	477,800

The County Board of Supervisors also has maintained its important policy of requiring large minimum lot sizes for rural parcels, helping to preserve the viability of remaining agricultural lands.

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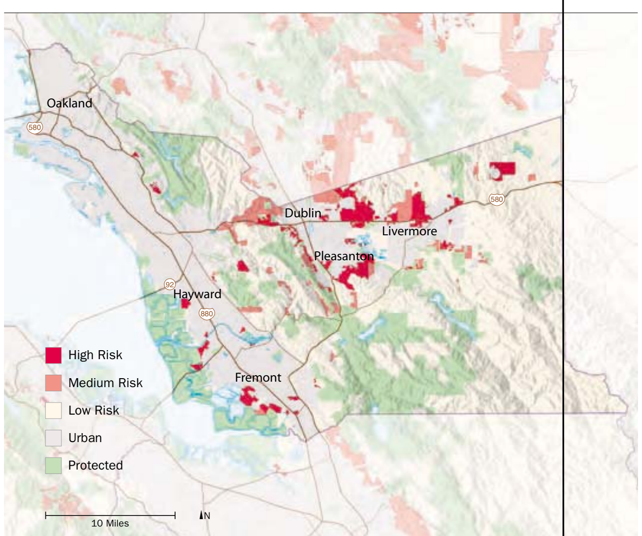

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San Mateo County

From greenbelt protection to smart infill

General Assessment

San Mateo County solidified its status as a leader in protecting greenbelt land over the last 5 years. With large public land holdings and active land protection activities by the Mid-Peninsula Regional Open Space District and the Peninsula Open Space Trust, San Mateo's total acreage of land at risk is relatively small, totaling 10,200 acres.

Hot Spots

As with Marin County, San Mateo's primary challenge lies in making its already urbanized areas more affordable and livable, so that it can continue to accommodate its share of future Bay Area growth and improve social equity. In general, a changing economic and political climate has contributed to a lessening of growth pressures around the coastal cities of Half Moon Bay and Pacifica, although much of the land around those cities remains at medium risk of development.

Bright Spots

The Mid-Peninsula Regional Open Space District won authorization to expand its jurisdiction all the way to the Pacific Coast in 2004, 6 years after voters recommended the change. This move complements the Peninsula Open Space Trust's "Saving the Endangered Coast" campaign, launched in 2001, which has protected more than 14,000 acres in western San Mateo County. A major effort to restore some of the Bay's lost wetlands by acquiring and restoring salt ponds has also protected baylands on the edge of Menlo Park.

In 2000, Mori Point, a coastal promontory above Pacifica that had been the focus of many development proposals, was permanently protected as part of the Golden Gate National Recreation Area.

Since 2000, four new BART stations in the county and the connection of BART to CalTrain at Millbrae have created valuable new opportunities for regional integration and smart growth in San Mateo County. In 2004, Measure A, a transit-friendly transportation sales tax, won voter approval, further enhancing San Mateo County's infill potential. In 2005, the City of San Mateo approved a good example of transit-oriented development, Bay Meadows Phase II, which would replace the aging Bay Meadows racetrack with a new neighborhood next to a CalTrain station. The "Grand Boulevard" effort to revitalize El Camino Real will also help accommodate new growth and better use urbanized land in both San Mateo and Santa Clara County.

	ACRES
High Risk	2,000
Medium Risk	8,200
Low Risk	100,400
Urban	71,100
Protected	107,800
Total	289,500

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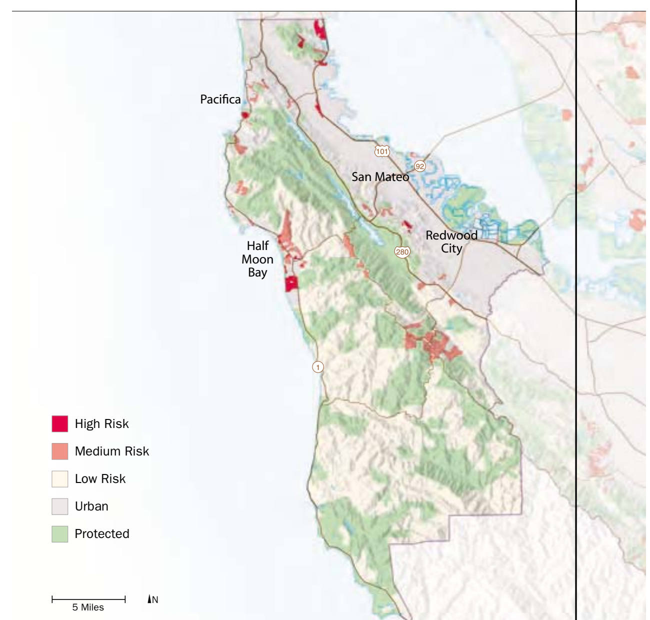

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Santa Clara County

A sprawling past and changing future

12.3.65

General Assessment

Today, Santa Clara County faces crucial decisions about its future. The proposal to develop housing for up to 80,000 people in Coyote Valley in southeast San Jose, and ongoing sprawl pressure in Morgan Hill and Gilroy, mean that planning actions made in south Santa Clara in the next few years will shape the county for decades to come.

Hot Spots

Ever since the City of San Jose began its latest round of planning for the development of Coyote Valley in 1999, it has been one of the largest development hot spots in the Bay Area. The City's goal is the creation of 25,000 homes and 50,000 jobs on 6,800 acres of land—essentially the creation of an entire new town. Unfortunately, the City's plans for the valley thus far have not lived up to its stated smart growth goals.

The far southern end of the county also remains a key hot spot, as Morgan Hill and Gilroy grapple with sprawl pressures both from Silicon Valley and the south. Morgan Hill began studying an expansion of its urban growth boundary in 2003; 1,250 acres of farmland outside the boundary are now at risk. Likewise, the Gilroy City Council voted in 2002 to allow development on 660 previously protected acres of the Santa Clara County Agricultural Preserve. In 2005, Gilroy passed up an opportunity to join the county's open space district. South of Gilroy, Sargent Ranch, 6,500 acres of farmland and wildlife habitat, remains under threat in spite of the defeat in 2001 of a major development proposal.

Bright Spots

With these threats, there have also been some important improvements in the county. In 2000, San Jose residents voted to strengthen the City Council's urban growth boundary, protecting more than 20,000 acres. In 2001, the City Council passed 15 general plan amendments encouraging infill and affordable housing, and the City now has large-scale plans to redevelop the industrial North First Street area and add thousands of new homes to the downtown. In 2002, county property owners voted to provide $80 million over 10 years to fund the Santa Clara County Open Space Authority.

	ACRES
High Risk	21,300
Medium Risk	54,000
Low Risk	377,600
Urban	185,100
Protected	201,800
Total	839,800

In 2006, Santa Clara County voters will decide on an initiative to prevent sprawl development and parcelization on rural county land.

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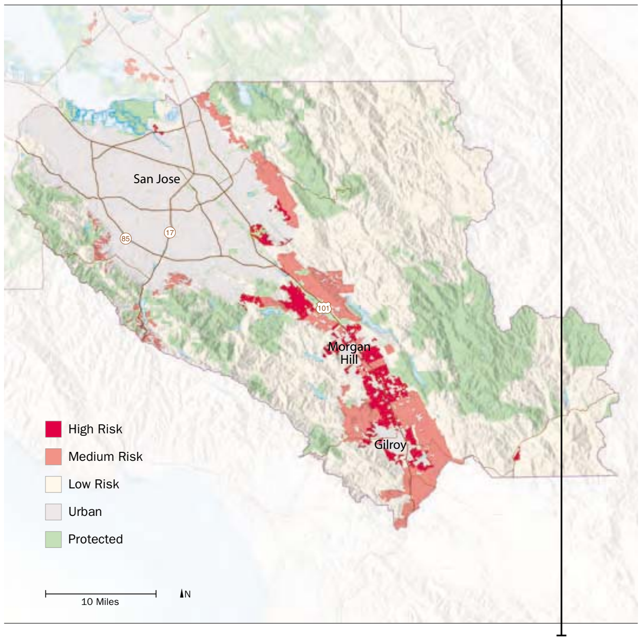

ATTACHMENT 5

BAWSCA
Bay Area Water Supply & Conservation Agency

WATER CONSERVATION PROGRAMS ANNUAL REPORT FY2006/07

Prepared by:

Nicole Sandkulla, Sr. Water Resources Engineer

Benjamin Pink, Water Resources Planner

September 2007

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Introduction

The Bay Area Water Supply and Conservation Agency (BAWSCA) represents the interests of 25 cities and water districts and two private utilities, that purchase water from the San Francisco regional water system. A map showing the agencies is presented in Figure 1. The entities provide water to 1.7 million people, businesses and community organizations in Alameda, Santa Clara and San Mateo counties.

BAWSCA has been implementing efficient water conservation programs for its member agencies for over five years. Although the main responsibility for conservation lies within the individual member agencies, BAWSCA offers regional programs that serve to augment the programs offered by the agencies.

BAWSCA member agencies implement water conservation for several significant reasons including:

- Water conservation extends the limited supply of water available for both current and future water needs;
- Water conservation is good public policy; 114
- Water conservation increases the drought reliability of the existing water system; and
- Water conservation saves money for both the agency and the customer.

In FY 2006/2007, 20 member agencies participated in one or more of the four conservation programs offered by BAWSCA with a total budget of over $632,000.

Organization of this Report

This report is broken down into these specific sections:

- BAWSCA Area Water Supply and Demand Characteristics
- BAWSCA Water Conservation Programs Overview
- BAWSCA Conservation Programs in Detail

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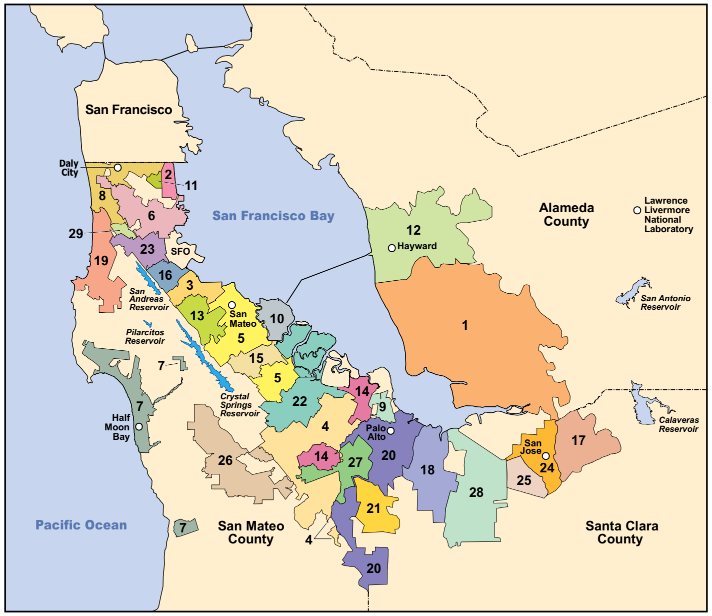
Figure 1: BAWSCA Agencies Map



Legend

- **1** Alameda County Water District
- **2** City of Brisbane
- **3** City of Burlingame
- **4** CWS – Bear Gulch
- **5** CWS – Mid-Peninsula
- **6** CWS – South San Francisco
- **7** Coastside County Water District
- **8** City of Daly City
- **9** City of East Palo Alto
- **10** Estero Municipal Improvement District
- **11** Guadalupe Valley MID
- **12** City of Hayward
- **13** Town of Hillsborough
- **14** City of Menlo Park
- **15** Mid-Peninsula Water District
- **16** City of Millbrae
- **17** City of Milpitas
- **18** City of Mountain View
- **19** North Coast County Water District
- **20** City of Palo Alto
- **21** Purissima Hills Water District
- **22** City of Redwood City
- **23** City of San Bruno
- **24** City of San Jose (North)
- **25** City of Santa Clara
- **26** Skyline County Water District
- **27** Stanford University
- **28** City of Sunnyvale
- **29** Westborough Water District

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cont.

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BAWSCA Area Water Supply Characteristics

Current Diverse Water Supply Portfolio

The water supply for the BAWSCA agencies comes from a variety of sources as seen in Figure 2. The majority of the water used by the BAWSCA agencies is purchased from the San Francisco Public Utilities Commission (SFPUC) coming from the Tuolumne River.

In addition to purchases from the regional water system, BAWSCA agencies have developed local water supplies (including surface water, desalinated water, groundwater, and recycled water), as well as contracts with the State Water Project and Santa Clara Valley Water District, to meet the water needs of their customers.

Figure 2 shows the breakdown of supply sources utilized by the BAWSCA agencies in FY 2005/2006. Currently, about 33% of the total BAWSCA agencies' water demands are met by sources other than the San Francisco Regional Water System. By 2030, this proportion will increase to 35%.

Increasing Diversity in 2030 Water Supply Portfolio

BAWSCA agencies have also committed to increasing the diversity of their water supply portfolio in the future with increased use of recycled water, conjunctive use operation of groundwater supplies, and implementation of water conservation. Figure 3 provides the breakdown of water use by supply source in 2030 as projected by the BAWSCA agencies. Factoring in the level of conservation that the agencies have committed to, total water demand in 2030 is projected to be 308 MGD.

Per Capita Water Demand Continues to Decrease

The per capita water demand for residential uses will continue to decrease. Residential per capita water demand of the wholesale customers is projected to decrease 3%, from 89 gpcpd in 2005 to 86 gpcpd in 2030. Today's residential per capita water use is 15% less than before the drought that began in 1986 and 23% less than before the drought of 1976-1977. Residential per capita water use of wholesale customers is less than in other parts of California, and is less than the average for the San Francisco Bay Region as a whole. Projected gross per capita water demand, including water used by businesses and industry, for the BAWSCA agencies is expected to stay about the same in 2030. Gross per capita water demand was 162 gallons per capita per day (gpcpd) in 2001 compared to projected use of 160 gpcpd in 2030. This actually represents a decrease of 2 gpcpd or 1%.

The per capita water demand for residential uses will continue to decrease. Residential per capita water demand of the wholesale customers is projected to decrease 3%, from 89 gpcpd in 2005 to 86 gpcpd in 2030. Today's residential per capita water use is 15% less than before the drought that began in 1986 and 23% less than before the drought of 1976-1977. Residential per capita water use of wholesale customers is less than in other parts of California, and is less than the average for the San Francisco Bay Region as a whole.

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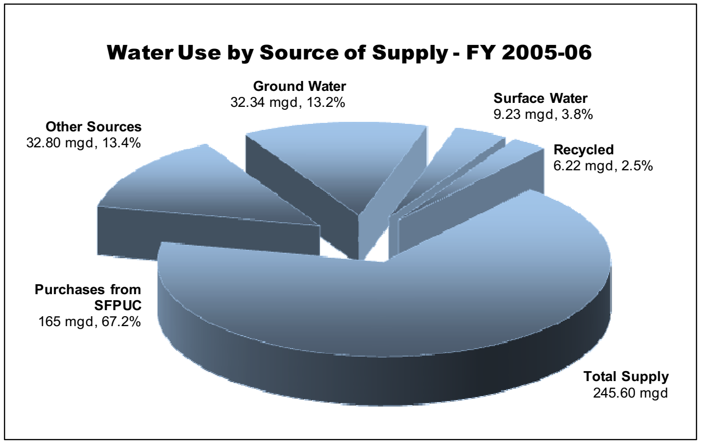

Figure 2: Current Diverse Water Supply Portfolio

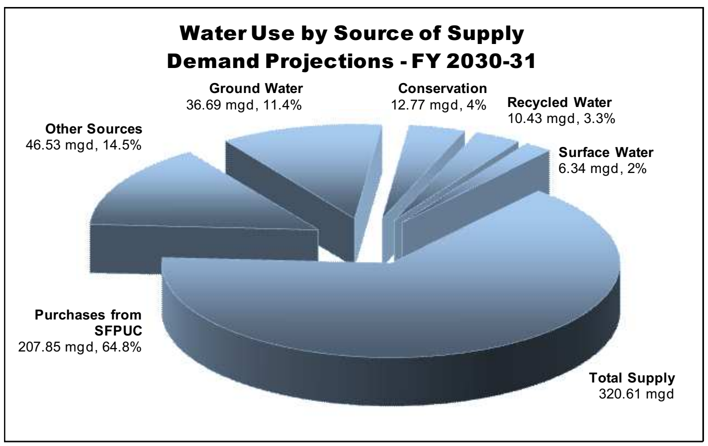

Figure 3: Future Diversity in Water Supply Portfolio

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BAWSCA Water Conservation Programs Overview

BAWSCA has been implementing efficient water conservation programs for its member agencies for over five years. Although the main responsibility for conservation lies within the individual member agencies, BAWSCA offers regional programs that serve to augment the programs offered by the agencies.

BAWSCA member agencies implement water conservation for several significant reasons including:

- Water conservation extends the limited supply of water available for both current and future water needs;
- Water conservation is good public policy;
- Water conservation increases the drought reliability of the existing water system; and
- Water conservation saves money for both the agency and the customer.

In creating its water conservation program, BAWSCA has followed several key principles:

1. The programs are developed for the BAWSCA agencies and by the BAWSCA agencies. It is very important that BAWSCA's conservation programs are designed to meet the specific needs and requirements of the BAWSCA agencies.
2. The programs must offer increased water savings at a lower cost to the agency and the customer.
3. Most programs are paid for by participating BAWSCA agencies; those that participate pay the full cost of the program.

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In FY 2006/07, BAWSCA offered the following regional water conservation programs to its member agencies:

- Residential Washing Machine Rebate Program
- School Education Program (Water-Wise School Education Kits)
- Large Landscape Audit Program
- Landscape Education Classes
- Landscape Educational CD-Rom

Each of these programs is better administered at a regional level through BAWSCA rather than at the local agency level. BAWSCA provides these programs in a cost-effective and efficient manner. BAWSCA is also active in investigating and securing grant awards for regional conservation programs that fit the needs of its member agencies.

Twenty member agencies now participate in one or more of the conservation programs offered by BAWSCA. BAWSCA agencies have expressed a continued desire to participate in the ongoing and new conservation programs that BAWSCA will be offering in FY2007/08. The new BAWSCA

12.3-69

Commercial Clothes Washer Rebate Program for FY2007/08 already has nine agencies signed up to participate for a total of $77,600 which is equivalent to 353 commercial clothes washer rebates at $220 each.

Figure 4 shows the level of participation in BAWSCA water conservation programs since FY 2001/02. Detailed information on each program appears in the following sections. As the data in Figure 4 shows, overall participation levels in each of the BAWSCA programs has been on the rise since FY2001/02.

Figure 5 shows the level of participation in BAWSCA water conservation programs in terms of total dollars spent by all agencies per program since FY2001/02. The figure shows that in terms of the total dollars spent per program, the Residential Washing Machine Rebate Program is the highest.

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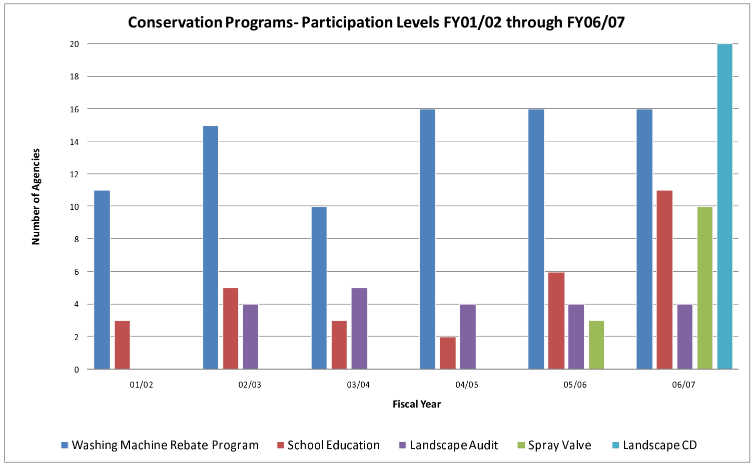

Figure 4: Agency Participation in BAWSCA Programs Increases in Last Five Years

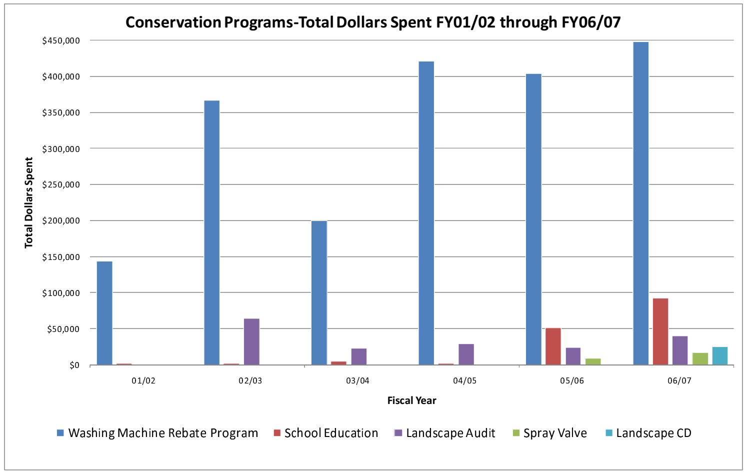

Figure 5: Agency Funding For Programs with BAWSCA Quadruples in 5 Years

114
cont.

BAWSCA Conservation Programs in Detail

I. <u>Residential Washing Machine Rebate Program Continues Success</u>

The Residential Washing Machine Rebate Program (WMRP) began on October 1, 2001. In 2002, the regional program expanded with eight other Bay Area water agencies joining to offer a single Bay Area Water Utility Clothes Washer Rebate Program covering a region of 2.7 million residential customers. In addition to BAWSCA, other participants in this regional program include Contra Costa Water District, Zone 7 Water Agency, East Bay Municipal Utility District, Alameda County Water District, Santa Clara Valley Water District, Marin Municipal Utility District, Sonoma County Water Agency, City of Davis, and beginning July 1, 2006, the SFPUC.

For the last several years, the participating Bay Area water agencies have been successful in applying for and receiving grant funding from the State including Proposition 13 and Proposition 50 funds. The total grant amount awarded to the Bay Area under Proposition 13 was $2.1 million and BAWSCA's share of this amount was $236,250. This grant award was utilized by the BAWSCA agencies for the WMRP starting in July 2004. The total grant amount awarded to the Bay Area under Proposition 50 was $1,534,350 and BAWSCA's share of this amount was $187,500. This grant award was utilized by the BAWSCA agencies starting in July 2006.

In May 2007, this program was awarded a $2,981,350 Proposition 50 Grant and BAWSCA's share is $300,000. This grant award is planned to be utilized beginning January 2008 Through BAWSCA's successful efforts to secure these grants, all BAWSCA member agencies have had access to grant funds to increase customer participation and achieve overall cost-effectiveness of the program while funds were available.

BAWSCA member agency participation in this program has been strong since it began. There are 16 agencies that participated in the FY2006/07 program. Details for level of program implementation and BAWSCA agency participation are shown in Table 1.

To date, a total of 14,640 rebates have been paid to customers for an estimated savings of 229.8 AF/Yr.; or enough water to serve over 900 households per year.

114 cont.

Table 1: Residential Washing Machine Rebate Program Summary FY2001/02 to 2006/07

Residential WMRP	FY 2001/02	FY 2002/03	FY 2003/04	FY 2004/05	FY 2005/06	FY 2006/07
Number of Participating BAWSCA Agencies	11	15	10	16	16	16
Total Rebates	1,244	3,091	1,805	2,914	2,332	3,254
Est. Savings (AF/Yr.)	19.5	48.4	28	46	37	50.9
Total $ Paid to Customer	$125,325	$336,200	$178,400	$379,375	$404,113	$449,100

II. School Education Program Grows Based on First Year Success

The Water-wise School Education Kit Program involves the distribution of a kit to 5th grade students. The kit enables the students to install water saving devices and perform a water audit in their home. The concept with the kit is that it provides a water conservation curriculum that can be easily implemented by teachers, easily understood and taken back into the home by the students, and includes methods to quantify the water savings as a result of taking the actions in the curriculum. The kits are consistent with BAWSCA's approach to offering public education and outreach regarding water conservation.

BAWSCA has contracted with Water-wise Consulting Company for implementation of this program. Water-wise offers a turn-key program in which they work directly with the school and teachers in the individual service area to provide the kits, which are produced by Water-wise, into the classrooms.

The kits are typically taken home by the students, who may share the learning experience with family members. The energy and water efficient devices contained in the kits are installed in the home and the family is able to calculate the water savings resulting from each device. Essentially, the kit allows the student to perform in-home water audit.

After the student performs the audit and installs the water and energy saving devices, affidavits signed by the parents are returned to the school, collected by the teacher, and forwarded to Water-wise for program documentation of implementation and resulting savings.

The following projected cumulative 10 year savings are expected per participating student sponsored:

- 2,098 Kwh of electricity
- 441 therms of gas
- 174,515 gallons of water
- 174,515 gallons of wastewater

The Water-wise School Education Kit Program assists participating agencies in implementing several Best Management Practices for Urban Water Conservation:

- BMP 1: Residential Surveys
- BMP 2: Residential Audits
- BMP 8: School Education

FY2005/06 was the first year that BAWSCA agencies participated in this program. The program was continued again successfully in FY2006/07. This program has proven to be a cost-effective means of achieving water conservation savings in the home and educating students on the value of water. Table 2 provides the detailed information for this program's implementation. To date, 4,425 students have participated in this program with an estimated total lifetime water savings of 1,422 AF.

114 cont.

Table 2: School Education Program Summary FY2005/06 and FY2006/07

BAWSCA School Education Program (Water-wise School Education Kits)	FY 2005/06	FY 2006/07
# Participating BAWSCA Members	6	11
Number of Participants (# of kits disbursed)	1,554	2,871
Est. Annual Water Savings/Kit (gallons)	17,451	17,451
Est. Total Lifetime Savings for Kits Installed (based on 60% installation rate) (acre-feet)	499.3	922.4
Total Spent By All Agencies	$51,671	$93,023
Cost of Lifetime Water Savings ($/AF)	$103	$101

12.3-71

III. Landscape Audit Program Continues to Improve and Expand

The Landscape Audit Program was first offered to BAWSCA member agencies in FY 2002/03. This BAWSCA program offers access to a turn-key program that enables the participating BAWSCA agency to meet the requirements of the California Urban Water Conservation Council's Best Management Practice (BMP) #5 in a cost-effective manner.

The program offers services for the development and monthly distribution of landscape water budgets for selected accounts and actual large landscape surveys to assess landscape watering needs. A key component of the program is ongoing monitoring/tracking of actual water use and estimated water savings for the sites surveyed.

The large landscape audit program has been improving since its inception as a BAWSCA program. For FY2007/2008, modifications to the scope of services were made to accommodate large residential properties into the program in addition to commercial sites. This will allow participation in the program by BAWSCA agencies that have large residential sites with large areas of outdoor landscaping.

Details of program implementation and agency participation are shown in Table 3. Results from the FY2006/2007 program show a savings of 25% reduced water use relative to 2002. Taking into account the effect of significant rainfall experienced in March and April 2006, the actual savings achieved as a result of the program are about 10%-15% of overall water use. The estimated cost of water saved is about $50 to $75 per acre-foot. 114 cont.

Table 3: Landscape Audit Program Summary FY2002/03 to 2006/07

Landscape Audit Program	FY 2002/03	FY 2003/04	FY 2004/05	FY 2005/06	FY 2006/07
# Participating BAWSCA Members	4	5	4	5	6
Est. Savings for that Year (acre-feet)*		299	212	520	543
Total spent by all agencies	$65,132	$23,802	$29,663	$24,720	$23,362
Cost Per Acre/Foot Saved		$59	$90	$37	$43

*savings are calculated on a calendar year basis

IV. High Efficiency Toilet/Urinal Direct Install Program

The Direct-Install High-Efficiency Toilet Replacement Program was eagerly anticipated as an important water conservation program for FY2006/07. Targeted at the commercial and multi-family residential sectors, this program should have been a turn-key, relatively easy to implement program that could provide real results in terms of water savings. Unfortunately, the FY2006/07 program had several implementation issues that resulted in the program not being successful. At the end of the fiscal year, BAWSCA chose not to exercise the option to extend the contract with SJ Water and instead let the contract expire.

The BAWSCA agencies have expressed a continued desire for this program in FY2007/08. As such, BAWSCA staff has been working to repackage this program with an alternative contractor. BAWSCA staff will bring this item before the Board of Directors in the coming months for potential action.

V. Regional Landscape Education Classes Well Attended

This year BAWSCA collaborated with the City of Millbrae and Redwood City to offer landscape classes throughout the springtime from the beginning of February through the end of April. These classes were designed to introduce homeowners to the concepts of sustainable landscape design, focusing on creating a beautiful water-efficient garden. A total of 12 classes were held around the service area of the BAWSCA member agencies. Figure 6 presents a copy of the front side of the flyer for the classes. 114 cont.

BAWSCA specifically sponsored a total of four landscape education classes over the course of the month of April that were held in Palo Alto, Burlingame, Half Moon Bay, and Hayward. The BAWSCA sponsored classes were entitled: *Landscaping with Native Plants* (instructors Chris Todd and Patricia Evans), *Sustainable Landscape Design* (instructor Alrie Middlebrook), *Smart Gardening* (instructor Steve Gill), *and Water-wise Landscape Design* (instructor Candice Stein). The classes had an attendance of as high as 50 people. Total attendance for the four BAWSCA classes was approximately 110 people. Each person attending the classes was offered a free landscape educational CD-Rom produced by BAWSCA entitled *Water-Wise Gardening in the Bay Area.*

Figure 6: Flyer for the 2007 Water Efficient Landscaping Class Series

114 cont.

VI. Region-wide Native Garden Tours

This year BAWSCA sponsored two native garden tours that took place in the months of April and May. Each tour was designed to showcase homes around the Bay Area that have beautiful water conserving gardens comprised primarily of California native plants.

The first tour was the *Going Native Garden Tour,* which took place in San Mateo and Santa Clara Counties on Sunday April 29th. This tour showcased 45 gardens that were visited a total of 6,688 times. The locations of the gardens in this tour ranged from as far north as the Cities of Belmont and Redwood City and south to Saratoga in Santa Clara County.

12.3-72

The other tour, *Bringing Back the Natives Garden Tour,* took place in Alameda and Contra Costa Counties on Saturday April 28 and May 5. This tour featured 63 total gardens that were visited by a total of 13,330 people over the two Saturdays. Gardens in this tour ranged in location from Berkeley and Walnut Creek to Fremont, Alameda, and Hayward. Figures 7 and 8 show the flyers for the two native garden tours.

114 cont.

Figure 7: Flyer for the 2007 Going Native Garden Tour

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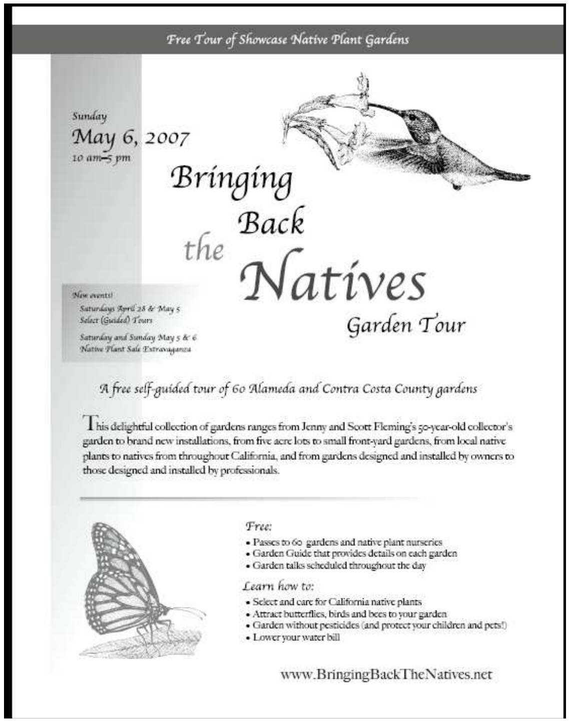

Figure 8: Flyer for the 2007 Bringing Back the Natives Garden Tour

114 cont.

VII. Innovative Landscape Educational CD-Rom is Released

This year BAWSCA completed the landscape educational CD-Rom entitled *Water-Wise Gardening in the Bay Area*. This new CD-Rom is full of information on how to garden beautifully while saving water. It displays outstanding water efficient garden photographs, with links to the plants that compose them. The photography is primarily composed of sites in the Bay Area, specifically those locations in the service areas of BAWSCA member agencies in Alameda, San Mateo, and Santa Clara Counties. The software offers a searchable plant database and a garden resource encyclopedia containing a multitude of water-wise, how-to gardening information. Also included are watering recommendations that are specifically tailored to the user's location within the Bay Area. The user can create their own plant shopping list as they navigate through the photography, which they then can print and take to

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their local water-wise nursery. The watering tips are customized for the user based on their location in the Bay Area; for example coastal residents will see watering schedules that reflect coastal fog rather than hotter inland conditions.

The CD-Rom was made available to the BAWSCA member agencies. **A total of 6,825 CDs were ordered by of 20 of the BAWSCA agencies.** Based on the size of this order, a reduced price was secured from the contractor which benefitted all agencies participating. BAWSCA will also be making the CDs available to interested citizens free of charge.

The CD-Rom came enclosed in a four-panel mailer that is shown in Figure 9 below.

Figure 9: Mailer Panel from the Water-Wise Gardening CD-Rom

114 cont.

VIII. Additional Activities

BAWSCA Website Update

In addition to the water conservation programs listed above, one significant activity undertaken in FY2006/07 was the updating of the conservation areas on the BAWSCA website. The website content was updated to reflect all current conservation programs. The updated site now displays content in four categories related to water conservation: Residential Indoor, Residential Outdoor, Commercial Programs, and School Programs. There is now also a page of water conservation related links that direct users to other important conservation websites. The updated site can be viewed at http://www.bawsca.org/conserve.html.

Drought Outreach Campaign: Water Saving Hero

In May 2007, San Francisco Public Utilities Commission (SFPUC) and BAWSCA announced a request for a ten percent voluntary water use reduction due to the continuing dry conditions. In July 2007 the SFPUC and BAWSCA partnered to launch a regional public education campaign focusing on our dry year message. The initial campaign success prompted other water agencies including the Santa Clara Valley Water District, Contra Costa Water District and Zone 7 Water Agency to join. The result was the launch of an unprecedented campaign aimed at reminding residents and businesses to curb water use in the summer and fall period.

The campaign's theme is [be a] "Water Saving Hero" and features ordinary people adopting simple water conservation practices in their everyday lives, such as washing full loads of laundry and watering gardens during the cool morning hours. The ads are currently featured on billboards, transit stations, buses, trains, newspapers and the radio throughout the region. The effort also features a new website www.WaterSavingHero.com, where any Bay Area residents can link directly to their local water agency's conservation programs and cash rebate information.

The campaign ads and billboards will run through the fall of 2007. Figures 10 and 11 below are examples of billboard and print advertising as part of this campaign.

Figure 10: Ray Samuels Water Saving Hero Campaign Ad

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Figure 11: Frank Chen Water Saving Hero Campaign Ad

BAWSCA Water Conservation Programs for FY2007/08

For FY2007/08, BAWSCA will offer the following programs:

1. Residential Washing Machine Rebate Program
2. School Education Program (Water-wise School Education Kits)
3. Landscape Audit Program
4. High Efficiency Toilet/Urinal Direct Install Program
5. Landscape Education Classes
6. Native Garden Tours
7. Landscape Educational CD-Rom
8. Commercial Clothes Washing Machine Rebate Program (NEW)

114 cont.

Response to BAWSCA's program offerings for FY2007/08 has been very good to date. The Landscape Audit Program has six agencies signed up to participate; this includes several new agencies participating this year. The School Education Program has nine agencies signed up. The Residential Washing Machine Rebate program has 16 agencies signed up.

In addition, a new program will be added for FY2007/08: the Commercial Clothes Washing Machine Rebate Program. This unique program is a partnership between the energy utility, PG&E, and the water agencies. The program involves offering a combined water and energy rebate to commercial customers who retrofit their facilities with new high efficiency commercial washing machines. This program is a benefit to BAWSCA in that it is a partially grant funded program; all program administration costs, rebate processing service costs, and marketing costs will be paid by the grant. The only cost to the participating BAWSCA member agencies is the cost of the water rebate itself. As a new program, the Commercial Washing Machine Rebate Program already looks to be very successful with a total of 13 agencies already signed up. 114 cont.

Prospective Program

In addition, BAWSCA has expressed interest in joining with the SFPUC to launch the Cooling Tower Feasibility Study. This would be a study of the potential water savings available in the BAWSCA/SFPUC service area through the implementation of a cooling tower conductivity controller retrofit program. A grant application for partial funding of this study was submitted to the State Department of Water Resources but was not successful. BAWSCA intends to pursue the study with SFPUC without the grant funding.

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ATTACHMENT 6

AN ECONOMIC EVALUATION OF THE WATER SUPPLY RELIABILITY GOAL IN THE SFPUC WATER SYSTEM IMPROVEMENT PLAN

12.3-76

Report to the

San Francisco Bay Area Water Supply & Conservation Agency

115

By

William W. Wade, Ph.D.

Energy and Water Economics

May 2005

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AN ECONOMIC EVALUATION OF THE WATER SUPPLY RELIABILITY GOAL IN THE SFPUC WATER SYSTEM IMPROVEMENT PLAN

William W. Wade

1. Introduction and Executive Summary

In February 2005, the San Francisco Public Utilities Commission (SFPUC) authorized its General Manager to forward to the San Francisco Planning Commission a draft report summarizing the principal goals of its Water System Improvement Plan. The final version of the document, "Water System Improvement Plan: Prepared for the Programmatic Environmental Impact Report," (WSIP) was sent to the Planning Commission and publicly released on February 28, 2005.

The Bay Area Water Supply & Conservation Agency (BAWSCA) is a regional government agency established in 2003. It comprises the 28 cities, water districts and other water suppliers in San Mateo, Santa Clara and Alameda counties that purchase some or all of their water from the SFPUC. 115 cont.

BAWSCA commissioned Energy and Water Economics to review the portion of the WSIP that addresses water supply reliability during drought, specifically, the goal of providing no more than 80 percent of normal demand during a "design drought."

The principal findings of this report are:

(a) The process by which the SFPUC selected the goal of 80 percent reliability was superficial and far below the analytic standard employed by comparable urban water agencies in California and the United States.

(b) SFPUC's analytic process failed to consider the costs to Bay Area communities of the water shortages that would be imposed through mandatory rationing to accommodate a 20 percent system-wide supply shortfall.

(c) Even a preliminary review of published economic literature shows that the loss of production from water-intensive Bay Area industries resulting from a 20 percent cutback in their water supply would far exceed the estimated cost of improving the SFPUC system's reliability from 80 percent to 90 percent.

Based on these findings, this report recommends that the SFPUC revisit the WSIP's reliability goal. In doing so, it should employ economic principles commonly used in water supply planning to identify the most efficient level of water reliability. In the short run, this reconsideration should focus on the relative cost-benefit ratios of the provisionally selected 80 percent goal in comparison with a goal of a 90 percent reliable supply.

2. The SFPUC Adopted its Drought Reliability Goal Without Considering the Costs of Water Shortages to its Customers

Reliable delivery of basic utility services (electricity, natural gas, communications, water and sewer) is an expected part of contemporary urban life -- at least in developed industrial societies such as California. 115 cont.

There are a variety of definitions of reliability. The CalFed Bay Delta program formalized water reliability as:

> ". . . the probability that a system does not fail, or conversely, it is the probability of a system failure subtracted from one."

More simply put, reliability is the measure of a utility's ability to deliver uninterrupted service. It is apparent that the larger the investment in long-term reliability, the less frequent and less severe will be the shortages experienced.

The objectives of water supply reliability planning are (1) to determine the most effective way of achieving an additional increment of reliability at the least cost, and (2) to ascertain whether the benefits, in terms of avoided shortage costs and losses, justify the costs of adding that increment. This is commonly referred to in the utility planning literature as Least Cost Planning (LCP). LCP has been embraced widely in California.

The approach uses information about the costs and losses associated with shortages of varying severity and duration as well as the costs of long-term and contingency water management options. In order to make an informed judgment about the appropriate level of supply reliability, the decision-maker needs to know not merely the cost of providing an increment of additional supply, but the costs to society of NOT providing that supply increment -- the economic impacts and other costs of shortage.

The SFPUC adopted its 80 percent reliability goal with very limited information about the costs of achieving three levels of reliability:

Option A	Option B	Option C
100 percent	90 percent	80 percent

and no information about the costs of providing less than 100 percent reliability.

The goals of these alternatives appear on a one-page chart entitled "Water Supply Matrix" that was presented to the SFPUC but is not included in the WSIP. It is attached as Exhibit A. The facilities or other measures associated with the incremental costs of 90 percent or 100 percent reliability are not identified clearly, but apparently reflect the cost of increasing the height of Calaveras Dam in Alameda County and/or various mixes of options including desalination, recycling, groundwater, transfers and conservation. 115 cont.

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The cost of each level, in millions of dollars, was estimated as follows:

Option A	Option B	Option C
100 percent	90 percent	80 percent
$1,222	$603	$422

Thus, the difference between achieving an 80 percent level of reliability and a 90 percent level was estimated at $181 million, over 25 years.

SFPUC did not attempt to quantify the economic costs and losses of a 20 percent shortage, nor the costs of the less demanding levels of rationing that would be required to cope with less severe, but more frequent, droughts. Neither does the

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SFPUC anticipate how shortages would be distributed geographically. In the 1987-1992 drought, the SFPUC imposed different levels of rationing on its in-City retail customers and its wholesale customer agencies in the neighboring counties.[1]

The WSIP is fatally flawed, from the perspective of economic analysis, by its failure to include the effect of shortage costs in its evaluation process. Determining an efficient level of reliability requires consideration of two curves -- one representing the incremental costs of reliability improvements and the other representing the costs of incrementally more severe water shortages. The intersection of these two curves – the point where incremental costs are equal – is the least cost mix of resources, the efficient level of reliability management.

This can be illustrated by a simple figure, drawn from a recent California Department of Water Resources publication.[2]

Figure 1 contains three cost curves. Curve 1 is the cost of increasing reliability, which includes both the cost of supply augmentation and the agency's costs of managing the drought. Curve 2 is the societal cost of enduring water shortages. Both the total expected water management and contingency management costs (Curve 1) and the expected shortage-related losses (Curve 2) are a function of the level of demand reduction or supply enhancement response options implemented. Both curves are affected by the availability, cost, and effectiveness of contingency management (e.g., transfers, rationing programs, etc.). While the total cost of the management and response options increases as reliability increases, the expected shortage-related losses decrease as a consequence of the increased reliability. The total expected water service system cost (Curve 3) is the sum of these costs and losses. The lowest point 115 cont.

[1] In general, inside City use was to be reduced by approximately 14 percent, while wholesale communities faced an aggregate 27 percent reduction, under the 10/60 formula employed by SFPUC to achieve a system wide 22 percent goal.

[2] CDWR, LCPSIM Background, 2002.

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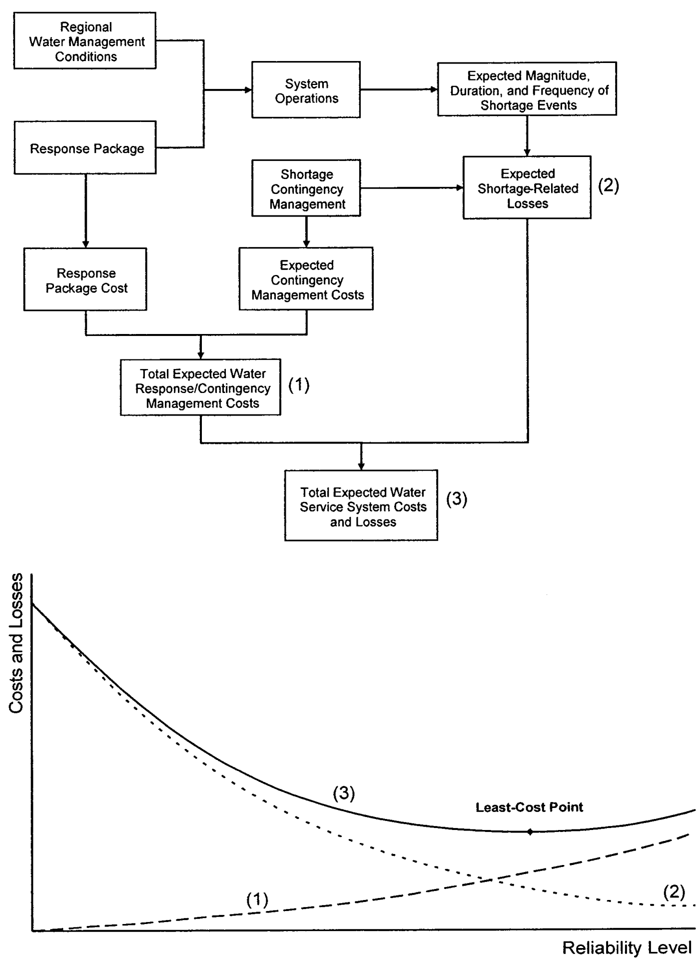
Figure 1. Least Cost Planning Conceptual Diagram



115 cont.

on this curve represents the level of reliability provided by the most economically efficient mix of resource costs and remaining shortage costs.[3]

The SFPUC did not attempt to determine the costs of shortage. Without both reliability enhancement costs and shortage costs imposed on society, SFPUC is unable to make even the most rough-cut approximation of the balance between the costs of improved reliability and its benefits. Without this information, no economic basis exists to find the least cost point among the three options.

3. <u>The Economic Costs to the Bay Area of Water Shortages Can be Determined</u>

The State Water Resources Control Board began its hearings on water quality standards for the Bay Delta in 1987. The extended California drought began at approximately the same time. Together, these two events became the impetus for a substantial effort by economists to quantify the costs of urban water shortages and, reciprocally, the value of reliable water supplies. The California Urban Water Agencies (CUWA), a consortium of major California urban water suppliers including the SFPUC, played an important role in this process.

115 cont.

Examples of the economic literature that emerged at the time of the Bay Delta hearings and the last drought are included in the references to this Report. Two studies in which the author of this report participated addressed the economic effects of water shortage on the two major customer segments of urban water suppliers: residential and industrial.

In a study commissioned by the Metropolitan Water District of Southern California, the author estimated the economic value of landscape losses based on a scientific horticultural survey of drought effects on Santa Barbara vegetation.[4] Research sponsored by CUWA into industrial water use revealed that shortages of

[3] The minimum point of the two cost curves is equivalent to the intersection of the incremental cost curves.

[4] William Wade, Mary Renwick, et al., "The Cost of Water Shortages: Case Study of Santa Barbara," Metropolitan Water District of Southern California, 1991.

between 15 to 30 percent produced extremely large economic losses due to decreased production in water-intensive industries.[5]

The water shortage cost literature generated by the last drought evolved into more formalized water reliability valuation studies and eventually led to the modeling process called Least Cost Planning, described by the above Figure 1. Least Cost Planning methodologies today underlie Integrated Resource Planning.

More immediately relevant, SFPUC relied on the work done by the author to estimate the regional economic costs to the Bay Area from water shortages. In a report submitted in 1993 to the Federal Energy Regulatory Commission (FERC),[6] the SFPUC utilized the output elasticities of water identified in CUWA's 1991 report to correlate an industrial firm's change in production to a reduction in water supply.[7]

The SFPUC report to FERC estimated the direct economic impact, as measured by the reduced value of shipments, of a 15 percent cutback in supply to the largest water using industrial sectors in the SFPUC service area at $305 million per year. 115 cont.

When the secondary impacts[8] of the reduced industrial output are taken into account, SFPUC estimated the total loss would increase to $397 million per year.

Some of the key findings in SFPUC's 1993 report include:

"• The economic impact resulting from a water supply cutback will be concentrated in two industries: electronic components and accessories, and computer and office equipment. Other industries could experience larger production cutbacks, but their economic impact will be small by comparison, except for the beverage industry.

[5] William Wade, Julie Hewitt, et al., "Cost of Industrial Water Shortages," Spectrum Economics Report to CUWA, November 1991.

[6] Hetch Hetchy Water and Power Department, Response to Data Request Concerning FERC Opinion 420: New Don Pedro Project, June 8, 1993.

[7] The output elasticity of water estimates the percentage change in production due to the percentage change in water input.

[8] Secondary impacts reflect reduced economic activity in other sectors of the economy due to reduced spending by firms and employees of the industry directly affected.

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- A 15 percent cutback in water supply could reduce direct shipments from the electronic component industry by $68,000,000, and $163,000,000 from the computer equipment industry. The secondary impact could increase the loss from these two industries to $294,000,000.
- A 15 percent cutback in water supply could result in more than 2,000 jobs lost in the two industries and their ancillary service areas.
- At a 15 percent cutback in water supply, the beverage industry would experience the largest production cutback of 10.4 percent and lost sales of approximately $72,400,000."

The direct economic cost of a 15 percent reduction in deliveries to key water-dependent industries ($305 million in 1990 dollars) is itself larger than the cost ($181 million, apparently in 2005 dollars) of enhancing the SFPUC's reliability level from 80 percent to 90 percent. The direct loss figure does not take into account indirect losses in other industrial sectors. Nor does it include the costs to government in terms of reduced sales tax and income tax revenues.

Nearly 15 years have passed since the data on which the SFPUC's 1993 report was based were collected. Is there any reason to think that a comparable reduction in water deliveries in, for example, 2010 would have less serious economic impacts? 115 cont.

Based on more recent published economic analyses of water supply and on the author's preliminary review of water use and census data, the answer is "NO." In fact, recent production values for a similar subset of water-dependent industries shows that the costs of water shortage will be greater than during the last drought.

4. The Cost of a Renewed Water Shortage, Measured Solely in Terms of Reduced Industrial Output, Will Greatly Exceed the Cost of Improving System Reliability to 90 Percent

In the Bay Area, a higher percentage of water is used for industrial, commercial and governmental operations (38%) than is the case in California generally (32%).[9] This allocation is a bit more pronounced in the SFPUC wholesale service area, where, in 2001 for example, 39% of the water distributed was devoted to these non-residential

[9] CDWR, Urban Water Use in California, Bulletin 166-4 (August 1994).

uses. In those wholesale communities where significant industrial activity is concentrated, the percentage of water devoted to industrial/commercial/institutional use is even higher, as can be seen in Table 1.

Table 1: High Non-Residential Water Use Areas

	Residential	Non-Residential	Purchases from SFPUC (MGD)
Guadalupe Valley M.I.D.	13%	87%	0.3
San Jose (North)	19%	81%	4.9
Menlo Park	40%	60%	3.8
Santa Clara (North)	44%	56%	4.0
South San Francisco (CWS)	44%	56%	8.3
Milpitas	45%	55%	11.2
Brisbane	50%	50%	0.4
Mountain View	51%	49%	11.0
Palo Alto	58%	42%	13.3
Sunnyvale	60%	40%	9.7
Source: SFPUC Water Demand Forecast, Appendix C, 2004			

The companies that account for the majority of industrial sector water use are those in the computer equipment and electronic component manufacturing categories.[10] These water-dependent industries that are the backbone of the Bay Area economy. The significance of their contribution to the regional economy has grown dramatically since the CUWA survey was completed in 1991, as can be seen from a comparison of Table 2 and Table 3.

115 cont.

[10] Hetch Hetchy Water and Power Department Report, pp. 106-07.

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Table 2: Value of Manufacturing Shipments - 1990
(in millions of dollars)

	Alameda	San Mateo	Santa Clara	Total
Total Manufacturing	$15,300	$4,400	$36,600	$56,300
Water Critical Industries	$9,700	$1,600	$273,00	$38,600
Percentage of County	63%	36%	75%	69%
Source: CUWA, Cost of Industrial Shortages, Appendix C, 1991				
Note: Census of Manufacturers 1987 forecast to 1990 by the Center for Continuing Study of the California Economy.				

The share of total manufacturing output represented by water critical industries in the three counties for 1990 was 69 percent. This rose to 83 percent in 2001.

Table 3: Estimated Value of Manufacturing Shipments - 2001
(in millions of dollars)

	Alameda	San Mateo	Santa Clara	Total
Total Manufacturing	**$38,346**	**$13,116**	**$155,875**	**$207,336**
Fabricated metal products	$1,972	$562	$2,352	$4,886
Computer and electronic products	$16,297	$6,214	$125,346	$147,857
Electrical equipment and appliances	$908	$175	$2,191	$3,274
Food products	$2,498	$806	$1,397	$4,701
Beverage products	$2,154	$362	$712	$3,228
Paper manufacturing	$749	$171	$616	$1,535
Chemical manufacturing	$2,000	$2,328	$3,262	$7,590
Water Critical Industries Subtotal	**$26,578**	**$10,617**	**$135,876**	**$173,072**
Percent of County	**69%**	**81%**	**87%**	**83%**

Note: Estimated value of shipments based on ratio of wages and salaries to shipments from 1997 Census of Manufacturing and wages and salaries provided for 2001. Placeholder values until publication of 2002 Census of Manufacturing.

115 cont.

Table 3 shows that the total value of manufacturing shipments nearly quadrupled between 1990 and 2001, (from $56.3 Billion to $207.3 Billion) while the value of shipments from water critical manufacturing industries more than quadrupled (from $38.6 Billion to $173.1 Billion).

In some industries, water is an essential element of the production process, not ancillary to plant production for employee use. For example, about 75 percent of water use in the food products industry is employed directly in the process. Water essentially is the product for many beverage processors. Microchips are manufactured in a wet environment with much necessary rinsing. Biotechnology, an emerging industry in the Bay Area, requires water. Genentech, for example, is the largest industrial user of water in South San Francisco. Over 75% of the water used in its South San Francisco plant is employed directly in the manufacturing process, while R&D uses account for most of the remainder. Genentech's explanation of the importance of water is short and to the point:

"What are our raw materials?
- Genetically modified cells
- Water"[11]

What would be the effects of a new round of water rationing imposed on these industries? The 1991 CUWA study estimated the impact of 15% and 30% water supply reductions on the water critical industries in six Northern California counties. Using the same methodology employed in the CUWA study, it is possible to estimate the effect of 10%, 15% and 20% cutbacks on the water critical industries of Alameda, San Mateo and Santa Clara counties, benchmarked to 2001 revenues. The results are shown on Table 4.

Table 4 shows that the estimated value of current production losses in these water critical industries ranges from $2.5 billion to $7.7 billion per year. The estimates are based on the countywide values in Table 3, adjusted to reflect the portion of each county's industrial customers served by the SFPUC, as presented in the Bay Area

115 cont.

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[11] Genentech – A Biotech Case Study: Water Sustainability in Silicon Valley (May 2004).

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Economic Forum 2002 report "Hetch Hetchy and the Bay Area Economy." The figures are San Mateo 100%, Alameda 50% and Santa Clara 80%.

Table 4: Effect of Water Shortage on BAWSCA Water Critical Industries

	Output Elasticities of Shortage		Lost Value of Shipments – 2001 (in millions of dollars) Imposed Supply Shortage		
	15%	30%	10%	15%	20%
Fabricated metal products	0.15	0.41	$51	$211	$281
Computer and electronic products	0.18	0.27	$2,064	$4,643	$6,191
Electrical equipment and appliances	0.18	0.27	$43	$96	$129
Food products	0.27	0.35	$86	$167	$222
Beverage products	0.69	1.14	$139	$343	$458
Paper manufacturing	0.40	0.70	$42	$109	$145
Chemical manufacturing	0.12	0.20	$71	$178	$238
Subtotal: Water Critical Industries	na	na	**$2,495**	**$5,747**	**$7,663**

Note: BAWSCA industry is assumed to be 100% of San Mateo; 80% of Santa Clara; 50% of Alameda; following the assumption in Sunding et al., p. 23.

115 cont.

These estimates are conservative in that they use the production relationships developed 15 years ago in the CUWA study. In the intervening years, water use efficiency in these industries has improved as companies have invested in water conservation. The industrial water use survey reported in the CUWA study found ongoing conservation projects aimed at reuse and recirculation of water costing many thousands of dollars for each acre-foot saved.[12] The SFPUC 1993 study for FERC reported that "managers interviewed felt they had squeezed most of the potential water savings out of cooling, personal and landscape uses."[13] These improvements in efficiency have "hardened" demand. As a result, a reduction in water supply today will produce a greater loss in production than the corresponding reduction would have done 15 years ago.

[12] See Section 6 of Cost of Industrial Water Shortages.

[13] Hetch Hetchy Water and Power Department Report, p. 115.

Moreover, the estimated losses in Table 4 do not include the secondary economic impacts -- the "ripple" effects that the loss of output and wages in these water critical industries would have on other sectors of the economy. Nor do they account for the loss in sales and income tax revenue to local governments.

Additionally, water shortages will impose costs on the commercial sector of the economy. Two of the most important components of this sector in the Bay Area are hotels/motels and restaurants. Those two categories are among the largest users of water in the region – accounting for over 40% of all commercial water use.[14] Most of the water use in the hospitality/tourism sector is "indoor" use: very little is devoted to landscape irrigation. Costs to the commercial sector are not included in the $2.5 - $7.7 billion cost estimate, nor are the effects of rationing on hospitals, schools and other institutional users.

5. <u>The SFPUC Also Failed to Take the Costs of Shortages to Residential Customers into Account</u>

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Costs that water shortages impose on residential customers should not be overlooked. The value of water supplies for residential uses can be estimated by residential customers' "willingness to pay." Economists measure a person's willingness to pay for a good with reference to the demand curve. The aggregate demand curve allows estimates of how much people are willing to pay for each additional unit of the good or service. Consumers pay a charge for water that can be seen as a lower bound estimate of their willingness to pay. We know that consumers are willing to pay at least that much because they *do* pay that much. They may be willing to pay considerably more than this—particularly if the alternative were water shortages. The difference between what they are *willing to pay* and what they are charged is the *consumer surplus*, also known as the net benefit.

The California Department of Water Resources has developed a data base of consumer surplus values, which represent an amount each household would be willing to pay <u>in addition to its existing water bill</u> to avoid a shortage of a given size. (See

[14] Hetch Hetchy Water and Power Department Report, p. 104.

Appendix Table 1.) A preliminary calculation using CDWR values, updated to 2005 dollars, the Association of Bay Area Governments just-completed census of households, and residential water use data compiled by SFPUC and BAWSCA suggests that residential customers in the SFPUC wholesale service area attach high values to greater reliability. Table 5 shows the magnitude of annual residential values at stake but omitted in the WSIP planning process. The number of projected households from ABAG's 2005 projections is multiplied by the percentage of Single Family and Multi-Family Households and then by the respective willingness to pay values from Appendix Table 1. The results are shown at the bottom of Table 5.[15]

These numbers show that, given today's population, the value to residents in the SFPUC wholesale service area territory of avoiding a 20 percent shortage is approximately $97 million per year. Any supply portfolio that could improve that reliability with an annualized cost of less than that amount would be of benefit to the residential customers in the region. The values on Table 5 may be low.[16] As shown in the table, the benefit from improving reliability increases over time, as the population grows.

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[15] Costs on Table 5 assume that a single-family housing unit uses, on average, 0.3 AF of water per year while a multi-family housing unit uses, on average, 0.2 AF per year. They also assume that 95% of residential water use in San Mateo County is supplied by the SFPUC, with the corresponding percentages being 31% and 23% in Alameda and Santa Clara counties, respectively.

[16] Rationing systems adopted during a drought could shift a larger burden of a system-wide shortfall to the residential sector. Hence, a system-wide 20% shortfall might impose the cost of a 25% shortage on residential customers. Moreover, CDWR adjusts upward the values for both demand hardening and for multiyear events.

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Table 5: Residential Reliability Values for BAWSCA Households							
Households	**2000**	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**
San Mateo	254,104	261,280	268,450	278,650	289,550	298,260	305,390
Santa Clara	565,863	595,550	628,670	660,850	692,440	725,090	762,720
Alameda	523,366	542,540	564,780	590,880	618,870	647,370	677,400
Total	1,343,333	1,399,370	1,461,900	1,530,380	1,600,860	1,670,720	1,745,510

Source: ABAG Projections 2005

Single Family Housing	72.4%
Multi-Family Housing	27.6%

Source: SFPUV 2004 Demand Forecast

Annual Reliability Values BAWSCA Area - (in millions of dollars)							
WTP to avoid 15% shortage	$63	$65	$68	$71	$74	$77	$80
WTP to avoid 20% shortage	$93	$97	$101	$105	$110	$114	$118
WTP to avoid 25% shortage	$132	$136	$142	$148	$154	$160	$166

Source: CDWR WTP * 2005 ABAG Household Projection adjusted to reflect percentages of county population served by SFPUC [0.95 for San Mateo; 0.23 for Santa Clara; 0.31 for Alameda].

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6. Conclusion: The SFPUC Should Reconsider the Water Reliability Goal in the WSIP, Taking Economics into Account

The industrial and residential shortage cost estimates provided in this report are preliminary and approximate. They are starting points used simply to illustrate that SFPUC has omitted them from the WSIP, that they are large, and that they far exceed the SFPUC's estimates of incremental costs to improve system reliability to 90%, or, for that matter, 100%. They could be used, along with estimates of the cost of reliability options, to develop lifecycle benefits to compare with lifecycle costs of proposed options, in order to assess whether the improvement in reliability is beneficial from the point of view of avoided social and economic costs. The analytic process is more complicated than simply comparing values in Tables 4 and 5 to engineering and construction costs. To fully develop the analysis, the SFPUC would have to develop the costs of an array of reliability management alternatives, together with the expected shortage in each year of the project life of those supply alternatives. The California Department of Water Resources and the Metropolitan Water District of Southern

California have been employing analytic methods of this kind for nearly 20 years. References cited in this paper will lead the interested reader to the appropriate tools and approaches.

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APPENDIX

Table 1: Residential Reliability Values

Willingness to Pay to Avoid Event (2005 Dollars)			Value per Acre-Foot (2005 Dollars)
	AF/Year/Household		
Foregone Use	0.3	0.2	
0%	$0	$0	$0
5%	$23	$15	$76
10%	$68	$45	$226
15%	$130	$87	$434
20%	$205	$137	$685
25%	$289	$193	$964
30%	$376	$251	$1,254
35%	$463	$309	$1,544

Source: LCPSIM II, Feb 2005, updated with CPI.

Based on Carson and Mitchell. SWRCB Bay-Delta Hearings, State Water Contractors Exhibit 51. "Economic Value of Reliable Water Supplies." June 1987.

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115 cont.

EXHIBIT A

115 cont.

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WATER SUPPLY MATRIX			
Water Supply Options 2030			
	A 100% Delivery	B 90% Delivery	C 80% Delivery
Amount Delivered During Designed Drought	300	277	254
Existing Firm Yield	226	226	226
Difference (Amount Delivered During Designed Drought minus Firm Yield)	74	51	28
Increased Surface Storage			
Increased Calaveras (420,000)	30		
Increased Calaveras (200,000)		10	10
SFPUC System Water Supply Options			
Desalination	14		
WSIP Cost of Project Bundles ($M)	$734	$167	$167
Non WSIP SFPUC System Water Supply Options			
Conservation	5.6	5.6	5.6
Recycling	19	14	
Ground Water	7	7	7
Transfers	15	15	15
Supply Options	90.6 MGD	51.6 MGD	37.6 MGD
Total 25 Year Cost for Non WSIP Options ($M)	$488	$436	$255

Baseline Assumptions:

1) Assumes consistency with Stewardship Policy and Principles.
2) Meet Purchase Requests.
3) Calaveras rebuilt at 97,000 acrefeet (minimum at original capacity).
4) Design drought of 8 1/2 years.
5) Existing yields assumes annual average of 86 mgd for fish flows at O'Shaughnessy, Cherry, Eleanor and Moccasin. Does not include payments for flows nor recreational releases.

ATTACHMENT 7

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UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Turlock Irrigation District
and
Modesto Irrigation District

Project No. 2299

AFFIDAVIT OF ANSON B. MORAN

I, Anson B. Moran, do hereby declare as follows:

1. I am General Manager of the Public Utilities Commission for the City and County of San Francisco, and have been so employed since December, 1993. Prior to my appointment to this position, I was General Manager of the Hetch Hetchy Water and Power Department since 1988. Prior to that position, I was Assistant General Manager, Finance for the San Francisco Public Utilities Commission. I Joined the Public Utilities Commission in 1980.

2. I serve on the Boards of the California Water Education Foundation and California Municipal Utilities Association, and am currently Chairman of the California Urban Water Agencies. I have a Bachelor of Science in Electrical Engineering from Worcester Polytechnic Institute and a Master of Arts in Urban Studies from Occidental College.

3. I am responsible for the actions of the Hetch Hetchy Water and Power Department and San Francisco Water Department which supply water to a population of approximately 2.3 million people within the counties of Tuolumne, Alameda, Santa Clara, San Mateo, and San Francisco.

4. In this affidavit, I address the subject of the planning and operation the City's water facilities during drought.

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Specifically, I address the basis of the procedures the City used to determine the rationing that was implemented during the recent drought, and which are incorporated in the City's water supply planning studies.

5. The City's "operation rule" was developed during the course of the recent 1987-1992 drought. Never before had such a sustained drought been experienced by the City. The onset of the drought really began in 1986, the point in time when the City's reservoirs were last filled, and continued until June, 1993 when the City's reservoirs finally refilled to full capacity. This drought spanned approximately 7 years.

6. Water deliveries to City customers at the time the drought began amounted to approximately 293 million gallons per day (MGD) (328,000 acre-feet per year). During the 1987-1992 period the City received from Tuolumne River runoff an average of only 151,500 acre-feet per year, and from local Bay area water sources approximately 20,700 acre-feet per year. The deficit between water supplies and water demands during the drought became readily apparent as the drought progressed, requiring an extreme dependence on Tuolumne River reservoir storage to partially close the gap.

7. The City proceeded with operations at the onset of the drought in accordance with procedures based on the experience of many years of historical operation, including the knowledge of previous drought events such as had occurred in 1976-1977. The operation of the City's facilities in accordance with rules based only on historical data proved to be a mistake.

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cont.

8. The City learned the painful lesson as to the adverse impacts that are caused by not planning for a drought worse than any experienced to date. This lesson was driven home when the hydrology of the Tuolumne River and the City's operations through 1990 and early 1991 had created a situation where a 45 percent rationing program among City customers was initiated - a level of rationing that was found to be intolerable and not achievable.

9. The City and its customers implemented numerous drought-related and long-term water conservation programs to lessen water demand, with water demand ultimately being reduced by approximately 30 percent as compared to pre-drought deliveries. The City also purchased water from other entities to narrow the gap between supplies and demands. These actions along with a fortuitous storm during the spring of 1991 allowed the City to regain control of its system and efforts moved forward to better plan for the reliability of the City's water deliveries.

10. Significant questions regarding how the City would operate its water system had to be addressed. Several of these questions were as follows:

- How much water should the City maintain in storage in one year to assure water deliveries during the next year?
- To what level and for what duration can the City expect its customers to reduce water use?
- How long a period should the City expect the drought to continue?
- During the drought period, what water supplies (e.g., inflow to City reservoirs) should be expected to occur?

116 cont.

12.3-89

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The answers to these fundamental questions are intertwined, and result in the operation rule that the City now uses to guide City water delivery operations.

11. However, underlying the answers to these questions is an appreciation of the risk that is inherent in operating to any rule. In the case of the City's water deliveries, risk is the product of the probability (frequency) of water shortages and the consequences of those shortages.

12. The frequency of potential shortages is forecasted with modeling tools that integrate assumptions for each of the above questions.

13. The consequences of shortages include economic, socio-economic, environmental, and personal (human) impacts.

14. What makes San Francisco's situation unusual is the consequence of being wrong in our forecast. Because of our entitlement structure, and limited conveyance and treatment capacity, an additional, unforecasted year of drought could literally result in empty reservoirs, no entitlements, and little or no alternate source of water. We could have no water to serve our 2.3 million customers.

15. In the spring of 1991 these consequences achieve a sobering clarity. I became acutely aware of the physical constraints of the City's water conveyance, treatment and delivery facilities; the availability of, and limitations to movement of supplemental emergency water supplies into the City's system; and the uncertainty as to when the drought would finally end. Due to the extremely limited conveyance and treatment capacity system to

116 cont.

bring other emergency sources of water to the City, the City must rely on storage in the Tuolumne River basin to ride out droughts. The City just does not have other sources to call on during drought, such as turning on pumps. In addition, I had first-hand information as to the direct and indirect adverse impacts that were occurring to the City's customers as the result of water shortages.

16. Situated within the drought, I weighed all the above factors and supported the operation rule that is currently used by the City in practice, and incorporated in the planning studies submitted to FERC. That plan was tested as it was developed and is the direct product of real, on-the-line decision making. When considering all the factors associated with the City's entitlements to water, its physical system, and the dire consequences of just being wrong in the forecasting of the length of drought that may hit the City, I can not agree with any comment that the City's operation rule is overly conservative.

116 cont.

12.3-90

I declare under penalty of perjury that the foregoing is true and correct.

Date: Jan 26, '94

Anson B. Moran

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COVERS & PHOTOS OF VOLUMES 2 THROUGH 6

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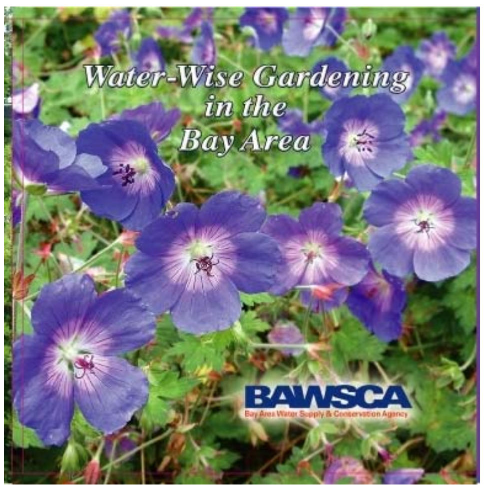
12.3-91

BAWSCA
Bay Area Water Supply & Conservation Agency

CONSERVATION, SMART GROWTH AND LOCAL SUPPLY PROGRAMS



VOLUME 2
OCTOBER 1, 2007

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CONSERVATION, SMART GROWTH AND LOCAL SUPPLY PROGRAMS

Rivermark in Santa Clara

VOLUME 3
OCTOBER 1, 2007

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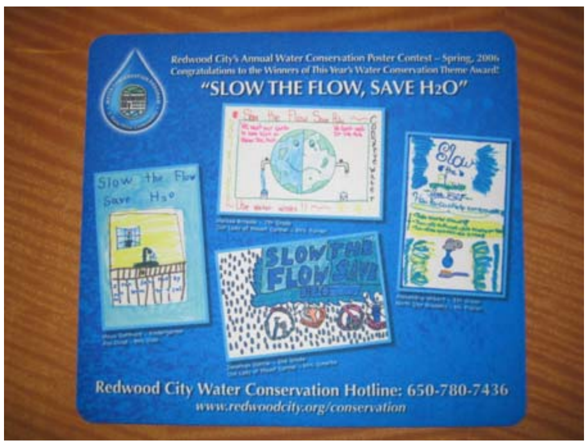
Bay Area Water Supply & Conservation Agency

CONSERVATION, SMART GROWTH AND LOCAL SUPPLY PROGRAMS



Mouse pad from Redwood City Water Conservation Program

VOLUME 4
OCTOBER 1, 2007

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BAWSCA

Bay Area Water Supply & Conservation Agency

CONSERVATION, SMART GROWTH AND LOCAL SUPPLY PROGRAMS

Alameda County Water District's Drought Tolerant Garden

VOLUME 5
OCTOBER 1, 2007

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Bay Area Water Supply & Conservation Agency

CONSERVATION, SMART GROWTH AND LOCAL SUPPLY PROGRAMS

Redwood City Water Conservation Program Materials

VOLUME 6
OCTOBER 1, 2007

Statement from Arthur Jensen, General Manager
Bay Area Water Supply and Conservation Agency about
San Francisco's Draft Program Environmental Impact Report
for its Water System Improvement Program

RECEIVED AT CPC HEARING 9-20-07
2005.0159E WATER SYSTEM IMPROVEMENT PROGRAM (SOKOLOVE)

September 20, 2007

BAWSCA is an independent special district whose board of directors represents the 27 long-term contract customers of San Francisco in Alameda, San Mateo and Santa Clara counties. BAWSCA members purchase over two-thirds of the water which the SFPUC distributes, and pay over two-thirds of the cost of the regional water system. BAWSCA has been working diligently to evaluate the PEIR and will shortly be submitting extensive written comments. Today, we highlight three key issues.

First, the PEIR should more clearly emphasize the critical importance of completing the WSIP to protect the public health and safety of 2.5 million people that live in the Bay Area. We must not lose sight of why the WSIP is necessary and of the urgency with which it must be prosecuted. 01

- Many of the regional water system's tunnels, reservoirs and pipelines are located on--or cross--one or more active faults.
- There is greater than a 60% chance of a major earthquake before 2032. It is not a question of if such an earthquake will happen. But when. 02
- Following a major earthquake, the flow of water to communities could be disrupted for 30 to 60 days. The WSIP is necessary to protect the millions of people who live in this area from the catastrophic consequences of the water system's failure.

Second, BAWSCA member agencies and their customers are dedicated to conserving and recycling water. Residential customers of BAWSCA members use less water on a per capita basis than residents in all other regions of the State. Indeed, residential water use by the 1.7 million people in San Francisco's neighboring communities is lower than the average for the Bay Area as a whole. Today's residents use 23 percent less water than they did before the 1976 drought. As population grows, BAWSCA, its member agencies and their customers will implement additional conservation measures and water recycling so that residential per capita water use is actually expected to decline despite the forecasted population growth. 03

Third, contrary to some recent public statements, San Francisco and BAWSCA are not the most significant users of Tuolumne River water. Almost half of the Tuolumne River runoff is used for agricultural production. While BAWSCA actively pursues additional conservation efforts in its own service area, it also makes sense to encourage further conservation from agricultural users of Tuolumne River water. 04

The Modified WSIP, identified in the PEIR as the Environmentally Superior Alternative, suggests a partnership with agricultural interests to conserve Tuolumne River water, while keeping agricultural stakeholders whole, so that water delivered to the Bay Area would be offset by agricultural water conservation. BAWSCA supports such a partnership. It hopes, in its written comments, to support and enlarge upon the ideas presented in the PEIR and will suggest ways to achieve a net savings on the River while still providing the water necessary to accommodate environmentally sound, infill growth planned in San Francisco and its neighboring communities.

Delivered by Steven Miller on behalf of Arthur Jensen at the public hearing held in San Francisco on September 20, 2007
Attchments (5)

12.3-94

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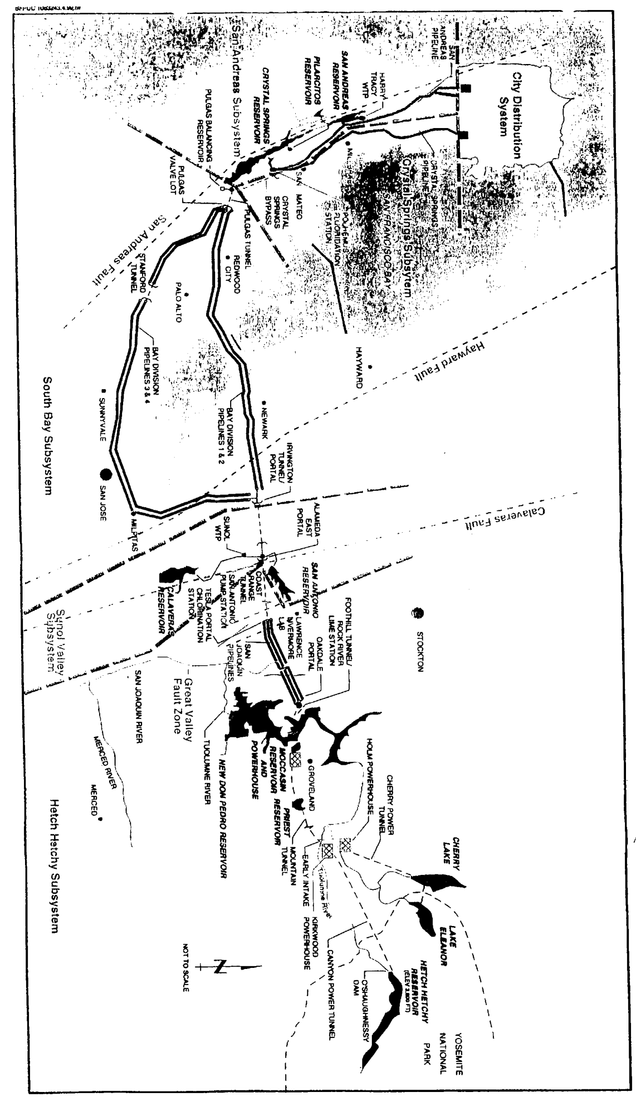
WATER SYSTEM FACILITIES CROSS FOUR ACTIVE FAULTS



SFPUC FACILITIES RELIABILITY PROGRAM
FIGURE 2
OVERVIEW OF SUBSYSTEMS

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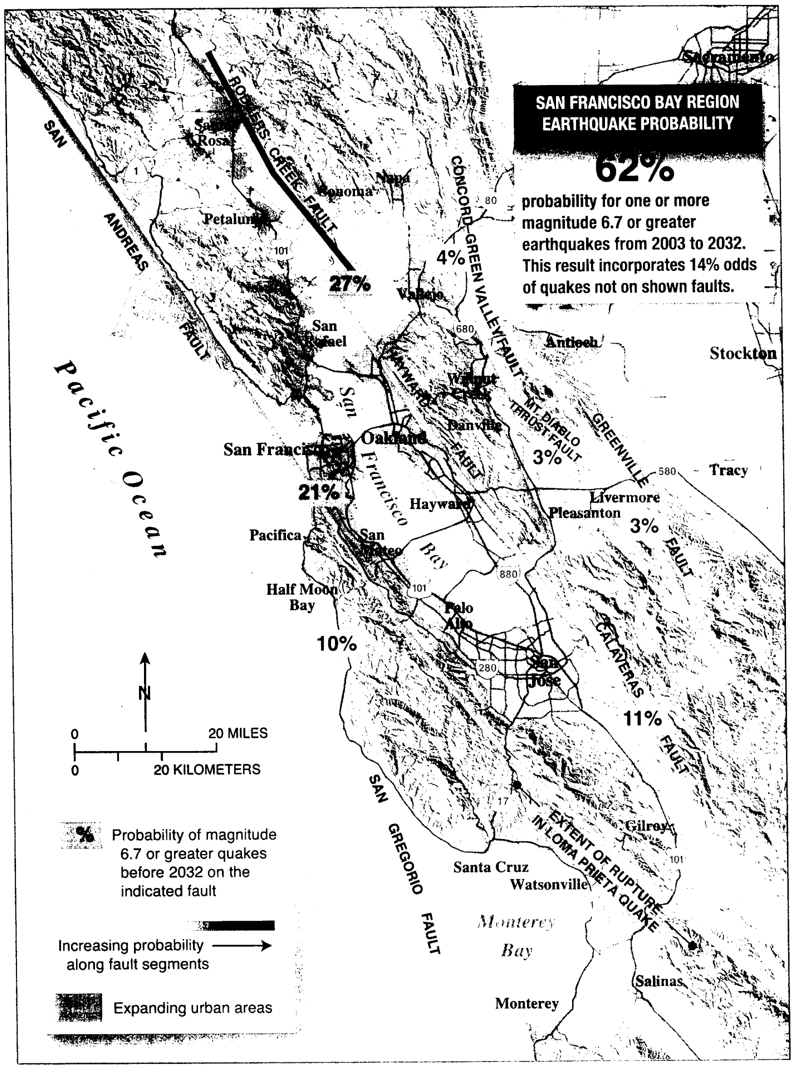

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STATE-WIDE PER CAPITA RESIDENTIAL WATER DEMAND

SAN FRANCISCO WHOLESALE CUSTOMERS' DEMAND IS LOWEST IN STATE

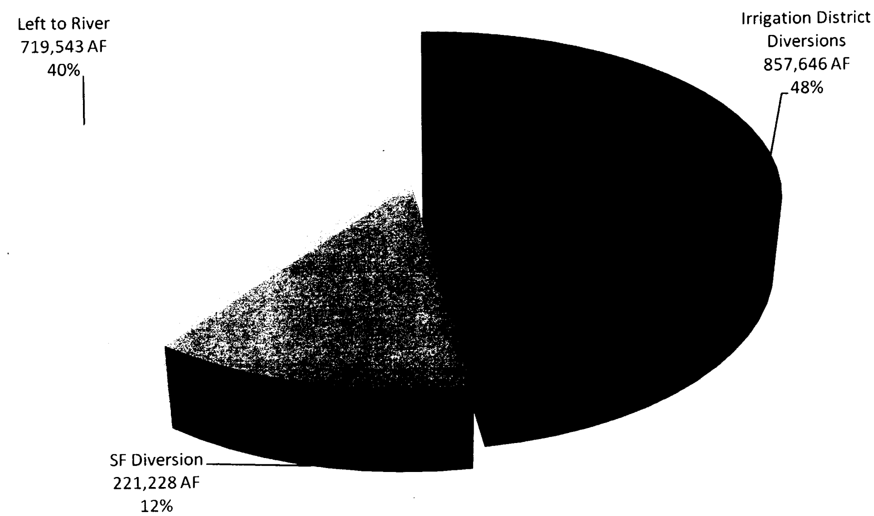
Region	Total Residential Demand (Gallons Per Person Per Day)
Colorado River	338
South Lahontan	265
Tulare Lake	242
San Joaquin River	220
South Coast	132
North Lahontan	133
Sacramento River	177
Central Coast	116
North Coast	123
San Francisco Bay Region*	97
SF Wholesale Customers	**88**

Source: DWR 2005 water plan

** The San Francisco Bay Region includes all or portions of nine Bay Area counties*

Distribution of Tuolumne River Runoff

(20 Year Averages)



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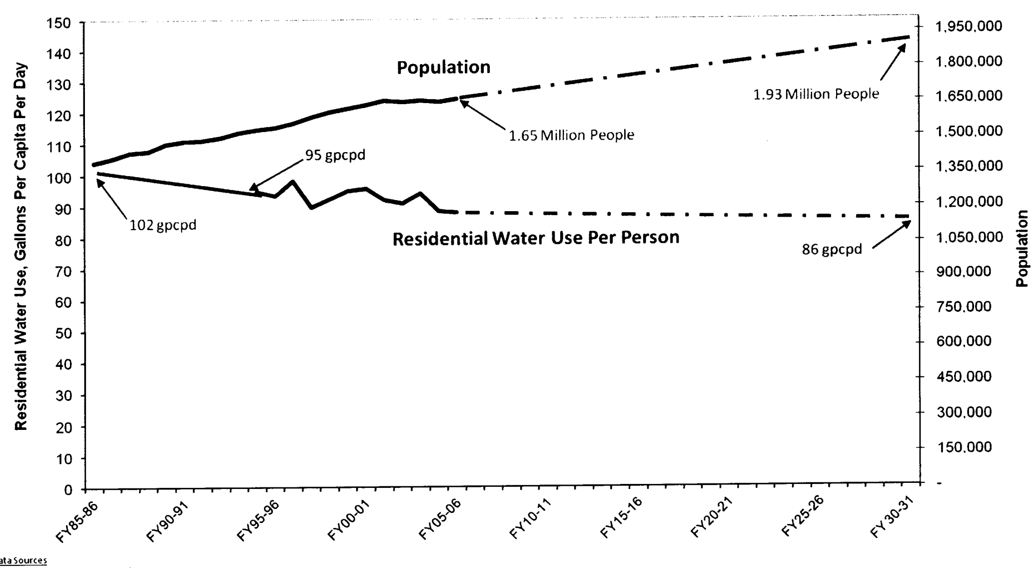
Residential Water Use In Neighboring Communities Demonstrates Increasing Water Conservation



Data Sources
Historical Data: BAWSCA Annual Surveys
Projected Data: Projected Water Usage for BAWSCA Agencies Technical Memo, Brown and Calldwell, Nov. 2006

Making San Francisco Bay Better

September 6, 2007

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PLANNING DEPARTMENT
MEA

Diana Sokolove
City and County of San Francisco
Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103-2479

Subject: BCDC Inquiry File No. MC.MC.0704.1 San Francisco Public Utility Commission's Water System Improvement Program Draft Program Environmental Impact Report. (State Clearinghouse #2005092026.)

Dear Ms. Sokolove:

Thank you for the opportunity to comment on the Water System Improvement Program Draft Program Environmental Impact Report (DEIR) for the San Francisco Public Utility Commission. The DEIR is dated June 2007, and was received in our office on July 2, 2007. The Commission has not reviewed the DEIR, so the following comments are based on the *San Francisco Bay Plan* (Bay Plan) and the McAteer-Petris Act and staff review of the DEIR.

Project Description. As described in Tables 3.10 (page 3-52) and C.1 (page C-4) of the DEIR, the Bay Division Pipeline Tunnel (BD-1) project includes a "(n)ew "Bay Tunnel" segment of BDPL No. 5 ... extending five miles from Newark Valve Lot to Ravenswood Valve Lot, crossing under San Francisco Bay and adjacent marshlands; BDPL Nos. 1 and 2 would tie into the tunnel at both ends and would be decommissioned between Newark and Ravenswood Valve Lots." (The DEIR states that decommissioning of the existing tunnel is not part of the proposed project.) The map in Figure 3.5a shows approximately where the new tunnel segment will cross the Bay.

The descriptions in Chapter 3 and Appendix C also indicate that the BD-1 project will include new facilities at eight valve lot (or house) locations along the pipeline, and that project construction will require staging space at the drive and receiving shaft locations at either end of 01
the Bay Tunnel segment. However, the locations of the valve lots and the construction activities associated with the BD-1 project are unclear from these project descriptions. Additionally, the map figures included in the DEIR do not show these locations. As a result, we cannot determine if these project components fall within BCDC jurisdiction. The language in Table C.1 (page C-4) and in 4.3 Land Use and Visual Quality section (last paragraph under Bay Division Region, *Land Use*, page 4.3-5) suggests that the locations of the project components are known more accurately than they are presented in the DEIR. If this is the case, the project description should have a more accurate description of these locations.

The new tunnel segment of the BD-1 project falls within BCDC jurisdiction. For the purpose of this comment letter, we have assumed that the valve lot and construction staging project components are within the Commission's jurisdiction.

Plans and Policies. Under *Other Land Use Plans and Policies* (page 4.2-8), the DEIR describes the Commission as having "authority to issue or deny permit applications for placing 02
fill, extracting materials, or changing the use of any land, water, or structure within the area of its jurisdiction and to enforce policies aimed at protecting the bay and its shoreline." The EIR

should also specifically state BCDC's jurisdiction as all areas of San Francisco Bay up to mean high tide, and in areas of marsh up to 5 feet above mean sea level, a shoreline band lying 100 feet inland from the Bay, as well as salt ponds, managed wetlands and certain waterways.

The DEIR recognizes that the Bay Division Pipeline Tunnel (BD-1) project includes approximately five miles of tunnel under the Don Edwards San Francisco Bay Wildlife Refuge, Newark Slough, and San Francisco Bay, and that this "project could be subject to certain provisions contained in the SF Bay Plan." The EIR should explicitly state that the BD-1 project 02 cont.
will be subject to Bay Plan policies concerning placement of fill in the Bay and dredging, and that certain other Bay Plan policies may also apply, depending on the final project plans. To be consistent with the level of description for other relevant policies and plans in the DEIR, the applicable Bay Plan policies on Safety of Fill and Dredging should be referenced in this section as well. Additionally, the EIR should reference the Bay Plan policies on Public Access that may apply in BCDC permits issued for BD-1 projects.

The discussion of *Consistency of WSIP Projects with Other Applicable Land Use Plans and Policies* (p. 4.2-16) should address program consistency with the additional Bay Plan policies that have not been identified in the San Francisco Bay Plan description under *Other Land Use Plans and Policies*.

Biological Resources. BCDC's Bay Plan findings and policies on Fish, Other Aquatic Organisms and Wildlife; Tidal Marshes and Tidal Flats; and Salt Ponds address protection of these resources. The discussion of the *Regulatory and Conservation Planning Framework* (beginning page 4.6-23) in the Biological Resources section of the DEIR should reference these 03
applicable Bay Plan policies and state that, in reviewing permit applications for projects within its jurisdiction, BCDC relies on these Bay Plan policies to ensure protection of habitats and biological resources.

Fresh Water Inflow. Bay Plan findings and policies on Fresh Water Inflow into the Bay state, in part, that fresh water flows of the Sacramento and San Joaquin Rivers create a "delicate relationship between fresh and salt water" that "helps determine the ability of the Bay to support a variety of aquatic life and wildlife." Further, the Bay Plan finds that "fresh water flows from the Sacramento and San Joaquin Rivers into the Delta and the Bay have been reduced in the past by diversions of federal, state, and local governments for agricultural, industrial, and domestic uses. Additional diversions are being sought, and further substantial diversions could change the salt content of Bay water and thereby adversely affect the ability of the Bay to support a great variety of aquatic life." BCDC's Fresh Water Inflow policies require 04
that "diversions of fresh water should not reduce inflow into the Bay to the point of damaging the oxygen content of the Bay, the flushing of the Bay, or the ability of the Bay to support existing wildlife."

The EIR should address whether diversions of freshwater from the Tuolumne River proposed in the preferred alternative will negatively impact the Bay as described in the Bay Plan findings and policies. BCDC's Fresh Water Inflow policies should also be described in Section 5.2.3 Relevant Plan, Policies and Planning Actions as well as Section 5.3.6 under *Regulatory Setting*.

Sea Level Rise and Safety of Fills. Bay Plan findings and policies anticipate the need for planning associated with safety of fills and sea level rise. The Safety of Fills findings recognize that "Bay water levels are likely to increase in the future because of a relative rise in sea level... Relative rise in sea level is the sum of: (1) a rise in global sea level and (2) land elevation change 05
(lifting and subsidence) around the Bay." Policy 5 states, in part, "...structures on fill or near the shoreline should be above the highest estimated tide level for the expected life of the project water level during the expected life of the project or be sufficiently protected by levees..." Additionally, Policy 6 states, "local governments and special districts with responsibilities for

L_BCDC

flood protection should assure that their requirements and criteria reflect future relative sea level rise and should assure that new structures and uses attracting people are not approved in flood prone areas or in areas that will become flood prone in the future, and that structures and uses that are approvable will be built at stable elevations to assure long-term protection from flood hazards." 05 cont.

Projects in BCDC jurisdiction that involve bay fill must be consistent with the Bay Plan policies on safety of fill and sea level rise. The EIR should include these Bay Plan policies in the Regulatory Framework discussion in Chapter 4.5 on Hydrology and Water Quality (beginning on page 4.5-9), and consider sea level rise-related flooding impacts under Impact 4.5-4, Bay Division Region.

If you have any questions regarding this letter, please contact Joe LaClair by phone at 415 352-3656 or email joel@bcdc.ca.gov.

Sincerely,

SARA POLGAR
Planner

L_Brisbane

CITY OF BRISBANE
50 Park Place
Brisbane, California 94005-1310
(415) 508-2100
Fax (415) 467-4989

September 27, 2007

San Francisco Planning Department
Attention: Paul Maltzer
Environmental Review Officer, WSIP PEIR
1650 Mission Street, Suite 400
San Francisco, CA 94103

Subject: Draft PEIR, SFPUC Water System Improvement Program

Dear Mr. Maltzer:

Thank you for the opportunity to review the SFPUC Water System Improvement Program Draft PEIR. The City of Brisbane and Guadalupe Valley Municipal Improvement District have reviewed the document and offer the following comments:

General Comments:

- The City of Brisbane and Guadalupe Valley Municipal Improvement District (GVMID) rely entirely on the SFPUC for potable water supply; therefore, we find it imperative that SFPUC meet the seismic and reliability goals of the WSIP in a timely manner. 01
- The City of Brisbane and GVMID support the Modified WSIP Alternative as the preferred alternative. 02

Specific Comments:

- The Draft PEIR lists Brisbane in TABLE 3.11 as an affected jurisdiction to Project No. SF-2. The City of Brisbane and GVMID are not mentioned as a participating member of a conjunctive-use program under the Regional Groundwater Projects (SF-2) in Chapter 5 of the Draft PEIR; the City of Brisbane should be removed from TABLE 3.11 as an affected jurisdiction to Project No. SF-2. It should be noted that the City of Brisbane and GVMID are located outside the limits of the South Westside Groundwater Basin and no viable source of a dependable groundwater supply has been documented to the knowledge of city staff. 03

- The Draft PEIR TABLE 7.3 and TABLE E.2.1 correctly show a large projected increase in water demand for the City of Brisbane and GVMID between 2001 and 2030 (111 percent and 153 percent, respectively). This is primarily due to a 416.6 percent and 27.6 percent projected increase in employment for the City of Brisbane and GVMID, respectively (noted on Table E.3.5) and a 45.1 percent and 249.3 percent projected increase in residential population for the City of Brisbane and GVMID, respectively (noted on Table E.3.6). The large projected percentage increase in employment and residential population is due principally to the fact that the City of Brisbane and GVMID have significant acreage of zoned but not yet developed areas (i.e., the 655-acre brownfield Baylands site and the 76-acre Sierra Point closed landfill site represent one-third of the City's land base that is above sea level and not covered by the San Francisco Bay) which create statistically obvious impacts when anticipated water demand from these sites is applied to the small existing (2001 data) residential population bases (3,174 and 446 for the City of Brisbane and GVMID, respectively) and small existing (2001 data) employment population bases (3,789 and 4,442 for the City of Brisbane and GVMID, respectively). 04

  - The two attached documents listed below illustrate the City's work to manage its growth and continue its water conservation efforts during future development:

Attachment A	Brisbane and Smart Growth
Attachment B	Brisbane and GVMID Water Conservation Practices

- The Draft PEIR TABLE E.3.38 again notes the increase in future water demands for the City of Brisbane and GVMID between 2005 and 2030. On Page E.3-45 of the Draft PEIR it is noted that Brisbane and GVMID have increased water demands with either large projected increases in employment or population, but not both. This is correct and it has been explained above that the large percentage increases to either the employment or residential population is enough to cause statistically obvious impacts to the future daily water demand.

- The Draft PEIR PAGE E.2-5 notes that the total daily water demand for GVMID in Fiscal Year (FY) 2002/2003 of 0.36 mgd is slightly higher than the 2001 base 05

year daily water demand of 0.32 mgd. It is correct that GVMID experienced a slight increase in daily water demand for FY 2002/2003; however, it should be noted that total daily water demand for GVMID in subsequent years show a downward trend in daily water demand (0.33 mgd in FY 2003/2004, 0.31mgd in FY 2004/2005 and 0.27 mgd in FY 2005/2006). Similarly, the City of Brisbane has shown a decrease in daily water demands from the 2001 base year daily water demand of 0.44 mgd to 0.39 mgd in FY 2005/2006. 05 cont.

- The Draft PEIR TABLE E.2.5 includes a list of SFPUC wholesale agencies that have current or planned recycled water projects under study. The City of Brisbane and GVMID have been actively involved in a South San Francisco-San Bruno Recycled Water Feasibility Study since this information on recycled water potential was tabulated as part of the December 2004 Wholesale Customer Recycled Water Potential Technical Memorandum. 06

Thank you for the opportunity to comment on this project. We look forward to reviewing the FEIR when available. Should you have additional questions, please call me at 415-508-2130.

Very truly yours,

Randy L. Breault, P.E.
Director of Public Works/City Engineer
City of Brisbane & Guadalupe Valley Municipal Improvement District

RB/jf

Encl: Attachment A-Brisbane and Smart Growth
Attachment B-Brisbane and GVMID Water Conservation Practices

Cc: City Manager, Council Members
Director of Planning & Community Development, John Swiecki
Arthur Jensen, BAWSCA

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PLANNING DEPARTMENT
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The City of Burlingame

PUBLIC WORKS DEPARTMENT
(650) 558-7230

CITY HALL - 501 PRIMROSE ROAD
BURLINGAME, CALIFORNIA 94010-3997

CORPORATION YARD
(650) 558-7670

20 September, 2007

Mr. Paul Maltzer
Environmental Review Officer, WSIP PEIR
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, California, 94103

VIA ELECTRONIC AND REGULAR MAIL

Subject: Comments from the City of Burlingame on the Draft Program Environmental Impact Report for the SFPUC's Water System Improvement Program

Dear Mr. Maltzer:

The City of Burlingame ("Burlingame") is submitting this letter in response to the Draft Program Environmental Impact Report ("PEIR") for the San Francisco Public Utilities Commission's ("SFPUC's") Water System Improvement Program ("WSIP"), dated June 2007.

Burlingame has reviewed the SFPUC report and a brief summary of concerns and comments is included below. These concerns relate to (1) projections of Burlingame's requests for SFPUC water in 2030, and (2) demand hardening and the effects of 20% supply cutbacks during dry years.

Projection of Burlingame's 2030 Purchase Requests

As expressed to the SFPUC in Burlingame's letter to Paula Kehoe dated 8 April 2005 (Burlingame, 2005), the projected quantity of water that Burlingame will purchase from SFPUC in 2030 ("2030 purchase projection") that is included in the WSIP PEIR differs from the more conservative 2030 purchase projections developed by Burlingame for planning purposes. This conservative projection was developed as part of Burlingame's 2004 Water System Master Plan ("WSMP") and was updated in the 2005 Urban Water Management Plan ("UWMP") based on new population projections published by the Association of Bay Area Governments. Burlingame considers the WSIP 2030 purchase projection of 4.68 million gallons per day ("MGD"), a target non-conservative goal for which we will strive to meet, but recognizes that this goal makes assumptions regarding four key factors, listed below:

- Population and employment growth, 01
- The percentage of old fixtures in Burlingame and the water use per fixture,
- The percentage of old fixtures that will naturally be replaced in Burlingame and associated water savings per year,
- Water savings achieved due to implementation of water conservation measures.

Though Burlingame will attempt to meet the 2030 purchase projection goals included in the WSIP, for planning purposes, we will continue to rely on the more conservative water purchase projections contained in the UWMP to size water system infrastructure improvements. This projection estimates an average daily purchase request of approximately 5.03 MGD in 2030.

Support of WSIP Variant 3 – Maximum of 10% Dry Year Supply Reductions

In an efforts to ensure a sufficiently reliable water supply to meet the future demands of its customers, Burlingame is concerned with the dry year supply reductions proposed in the PEIR for the WSIP and two of the three WSIP Variants (Variant 1: All Tuolumne, and Variant 2: Regional Desalination for Drought). As water conservation measures are implemented within Burlingame's service area and throughout the SFPUC's entire wholesale customer area, there is increasingly less flexibility during dry years to save additional water to meet cutbacks in supply. Given this projected hardening of demand, Burlingame is concerned that the 20% supply reduction proposed for the WSIP during dry years (for 3.5 years out of an 8 year design drought) will place significant strain on Burlingame's customers.

In particular, Burlingame is concerned with the potential for economic loss resulting from water supply 02
reductions during a drought. According to SFPUC's recent study *Measures to Reduce the Economic Impacts of a Drought-Induced Water Shortage in the SF Bay Area* (SFPUC, 2007), annual losses of between $15 million and $32 million are expected throughout the region under a 10% water supply reduction. Economic losses between $51 million and $98 million are expected to occur under a 20% water supply reduction. Burlingame's share of this projected loss is estimated to range from approximately $500,000 under a 10% supply reduction to as much as $1.7 million under a 20% supply reduction. Thus to minimize the burden of economic loss during dry years, Burlingame considers WSIP Variant 3: 10% Rationing as a preferred option to the WSIP, Variant 1, and Variant 2, which would require supply cutbacks of up to 20%. Furthermore, as the WSIP Variant 2 option projects even more years with 20% supply cutbacks (5.5 out of an 8 year drought), Burlingame considers this option the least desirable of the four options presented in the PEIR.

Please contact Matt Zucca at (650) 292-9100 or myself at (650) 558-7230 if you have any questions.

Very truly yours,

THE CITY OF BURLINGAME

Syed Murtuza, P.E.
Director of Public Works

cc: Jim Nantell, City Council, City
Arthur Jensen, P.E., BAWSCA
Nicole Sandkulla, P.E., BAWSCA

References:

Burlingame, 2005. Letter to Ms. Paula Kehoe, San Francisco Public Utilities Commission regarding Year 2030 Water Purchase Projections for the City of Burlingame, dated 8 April 2005

SFPUC, 2007. Measures to Reduce the Economic Impacts of a Drought-Induced Water Shortage in the SF Bay Area, prepared for the San Francisco Public Utilities Commission, dated 3 May 2007.

CALIFORNIA WATER SERVICE COMPANY
1720 NORTH FIRST STREET • SAN JOSE, CA 95112-4598
(408) 367-8200

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PLANNING DEPARTMENT
MEA

September 28, 2007

Paul Maltzer, Environmental Review Officer
San Francisco Planning Department - WSIP PEIR
1650 Mission Street, Suite 400 San Francisco, CA 94103

Re: California Water Service Company's Comments on the SFPUC WSIP PEIR

Dear Mr. Maltzer,

The following comments on the Program Environmental Impact Report (PEIR) for the SFPUC's Water System Improvement Program (WSIP) are provided by California Water Service Company Water (Cal Water).

Cal Water supports the SFPUC's proposed Water System Improvement Program, which is intended to improve the water supply reliability of the regional water system that serves 2.4 million residents, including 235,250 Cal Water customers that reside in San Mateo County on the San Francisco Peninsula. Cal Water supports SFPUC approach to establishing this supply reliability by addressing the needed repairs to the aging infrastructure, retrofits of the water system where it is exposed to seismic and other safety hazards, assure continued compliance with water quality standards through system upgrades, adding redundancy to critical facilities and the enhancement of supplies to meet customer demands during both drought and non-drought years. Cal Water appreciates that the goals and objectives of the WSIP not only call for providing the supply reliability through the means stated above, but also call for the sustainability of these efforts through protections of the natural resources and public health and safety, while striving to achieve these in a cost effective manner. 01

Cal Water has reviewed the entire PEIR document, but has made a critical examination of the following sections:

Section 5.6 Westside Groundwater Basin Resources
Chapter 7: Growth Inducement Potential and Indirect Effects of Growth.
Appendix E: Growth Inducement and Supporting Information

Westside Groundwater Basin Resources

Cal Water has long been a supporter of conjunctive use programs. We have been an active partner with the SFPUC, Daly City and San Bruno regarding the development of a conjunctive use program in the Westside Basin. Section 5.6 of the PEIR presents an accurate and complete assessment of the setting for this program and the impacts that it may have. The banking of surplus supplies through in-lieu replenishment methods during periods of abundant precipitation, 02

DISTRICT OFFICES: ANTELOPE VALLEY • BAKERSFIELD • BAYSHORE • BEAR GULCH • CHICO • DIXON • EAST LOS ANGELES • KERN RIVER VALLEY • KING CITY • LIVERMORE • LOS ALTOS • MARYSVILLE • OROVILLE • RANCHO DOMINGUEZ • REDWOOD VALLEY • SALINAS • SELMA • STOCKTON • VISALIA • WESTLAKE • WILLOWS

CALIFORNIA WATER SERVICE COMPANY

followed by the extraction of these banked supplies during drought and emergencies is a sound, beneficial process to protect and perpetuate the groundwater resources. It has been successfully employed in other areas of the state to provide drought protection, and Cal Water anticipates the eventual implementation of this conjunctive use program. 02 cont.

Growth Projections

The projected growth as presented in the PEIR is based on modeling done in 2003 and has been found to be inline with current projections. Growth in Cal Water's Districts will be mainly redevelopment in established neighborhoods since land is not available for new housing developments. This modus operandi for the three Districts has been and will be the increased densification with replacement of single family homes with multi unit homes and buildings. Given this growth limiting nature, it is important to note that the District's per capita demand has remained constant. 03

Local Supply Enhancement Projects

Cal Water avidly supports the approval of all projects that will improve the reliability and maximize the availability of locally produced water. One such project is the replacement of the Calaveras Dam. This vital project will restore this local supply reservoir to its original 96,800 acre-foot capacity and enable future enlargement as demand conditions dictate. Maximizing locally produced water improves supply reliability for all SFPUC customers, since water captured and held locally can reduce the impact of conveyance outages during maintenance and emergencies. 04

Conservation and Recycling

As discussed in the PEIR in section 3.8 regarding Project SF-3 which includes recycled water supply projects at various locations on the west side of San Francisco. Cal Water supports this project and other recycled water projects and would like to have these sources made available for purchase outside the jurisdictional boundaries of the respective producer. Purchase of recycled water would benefit Cal Water's SSF District by offsetting water currently being used for landscaping, particularly by the cemeteries in the City of Colma. Cal Water appreciates the role that the SFPUC has previously taken to be an active partner in recycled water investigations. Cal Water strongly urges the SFPUC, the Bay Area Water Supply and Conservation Agency (BAWSCA) and other applicable local water agencies and organization to consider ways of expanding the role of recycled water as a means of developing enhanced supply reliability throughout the San Francisco Bay area. 05

L_CalWater

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Cal Water is continuing its effort in reducing demand by identifying potential users for recycled water by developing Water Supply and Facilities Master Plans for the three districts that purchase SFPUC water. In addition to these plans, Cal Water details its conservation efforts in each of its district's Urban Water Management Plans and participates in public outreach programs as detailed in the following attachments. 05 cont.

Thank you for your time.

Sincerely,

Thomas A. Salzano
Water Resources Planning Supervisor

Attachments:
a) Examples of different types of water savings devices
b) Events Cal Water has participated in
c) Urban Water Management Plans for Bear Gulch, Mid Peninsula, and South San Francisco Districts.

L_CCWD

CONTRA COSTA WATER DISTRICT
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PLANNING DEPARTMENT

October 1, 2007

Mr. Paul Maltzer
Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103-2479

Subject: Contra Costa Water District comments on the San Francisco Public Utilities District Draft Program Environmental Impact Report for the Water System Improvement Program

Dear Mr. Maltzer:

Contra Costa Water District (CCWD) appreciates this opportunity to comment on the Draft Program Environmental Impact Report (DPEIR) for the San Francisco Public Utilities Commission's (SFPUC's) proposed Water Supply Improvement Program (Program). CCWD commends the SFPUC on its strong efforts to improve water supply reliability through capital projects that reduce the likelihood of facilities failures from seismic events or other causes.

The Program includes increases in diversions of up to 25 MGD from the Tuolumne River upstream of the Sacramento-San Joaquin Delta (Delta). CCWD supplies drinking water diverted from the Delta to approximately 550,000 people in northern, central and eastern Contra Costa County, so new diversions from the Tuolumne River system have the potential to reduce both the quantity and quality of CCWD's water supply through changes to San Joaquin River inflow to the Delta. CCWD requests that the SFPUC review the DPEIR analysis of impacts to in-Delta water users with this in mind, and augment or revise them as appropriate.

In particular, CCWD has the following concerns:

- **Delta water quality.** The DPEIR provides information on potential changes to Tuolumne and San Joaquin River flows, but the analysis does not include the resultant changes to Delta water quality. These changes could be determined by, for example, running the Delta Simulation Model (DSM2). DSM2 modeling would also permit analysis of changes to Central Valley Project and State Water Project operations that would be required to meet Delta flow and salinity standards. Access to the DSM2 water quality results would allow CCWD to analyze our operations with and without the Project, and to evaluate the Project impacts. 01

L_CCWD

Mr. Paul Maltzer
San Francisco Planning Department
October 1, 2007
Page 2

- **Significance criteria for in-Delta water users**. Section 5.3.4.2 lists the following significance criteria for surface water supplies:

  > The proposed program would have a significant water supply impact if it were to:
  > - Result in substantial adverse changes in operations or substantial decreases in water deliveries for water users, as measured by significant changes in reservoir storage, timing or rate of river flows, or water quality
  > - Violate any water quality standards or otherwise substantially degrade water quality

  However, the PDEIR analysis of effects on Delta water users focuses only on the first part of the second bullet point, potential violations of Delta water quality standards, and does not include potential impacts to CCWD. CCWD operates to a delivered water quality goal set by our Board of Directors of no more than 65 milligrams per liter chloride concentration. This means that CCWD's operations are determined by source water quality, and that increases in Delta salinity caused by the Project could potentially affect CCWD's ability to meet the delivered water quality goal and could further affect CCWD's water supply reliability. Impacts could occur due to source water salinity increases, even if no standards are violated. The PDEIR should include analysis of potential impacts to CCWD and of the potential for significant impacts to occur in the absence of standards violations. 02

If you have any questions regarding CCWD's comments or would like additional information to supplement your analyses, please call me at (925) 688-8083, or call Marianne Guerin at (925) 688-8344.

Sincerely,

Leah Orloff
Senior Water Resources Specialist

LSO/MG:wec

Attachment

L_CoastsideCWD

COASTSIDE COUNTY WATER DISTRICT

September 24, 2007

Cathleen Brennan
Water Resources Analyst
Coastside County Water District
766 Main Street
Half Moon Bay, CA 94019
cbrennan@coastsidewater.org

Paul Maltzer
Environmental Review Officer, WSIP, PEIR
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103
wsip.peir.comments@gmail.com

Dear Mr. Paul Maltzer:

Coastside County Water District appreciates the opportunity to comment on the San Francisco Public Utilities Commission's (SFPUC) Water System Improvement Program (WSIP) PEIR-Draft. Coastside County Water District supports the overall goals of the WSIP:

- Maintain high quality water 01
- Reduce vulnerability to earthquakes
- Increase delivery reliability and improve the ability to maintain the system
- Meet customer water supply purchase requests in non-drought and drought periods
- Enhance sustainability in all system activities
- Achieve a cost effective, fully operational system

Because these goals are important to Coastside County Water District, the District found it necessary to clarify certain information and descriptions pertaining to our service area and operations. Our primary concerns are in regards to the discussions on the Pilarcitos facilities and Upper Crystal Springs Reservoir facilities. Coastside County Water District is the only wholesale customer that has intake facilities in Upper Crystal Springs Reservoir and in the Pilarcitos Watershed, so any physical or operational modifications would directly impact our operations.

766 MAIN STREET, HALF MOON BAY, CALIFORNIA 94019 650-726-4405

The Bay Area Water Supply and Conservation Agency (BAWSCA) is submitting separate comments on the SFPUC's WSIP PEIR-Draft. Coastside County Water District is a member of BAWSCA and supports BAWSCA's efforts to represent the wholesale customers through its comments on the WSIP PEIR-Draft.

Attached are Coastside County Water District's comments on the WSIP PEIR-Draft. Please feel free to contact me at 650-726-4405 x11 to inquire about any of the comments.

Sincerely,

Joe Guistino
Interim General Manager

Cathleen Brennan
Water Resources Analyst

Attachments: Coastside CWD's comments on WSIP PEIR-Draft

cc Nicole Sandkulla, Sr. Water Resources Engineer
Bay Area Water Supply and Conservation Agency
155 Bovet Road, Suite 302
San Mateo, CA 94402

Chapter	Section	Page(s)	Comments	
			Summary	
Summary	S.2	S-4	The service area for Coastside County Water District (Coastside CWD) shows two non-contiguous areas. The southern non-contiguous area will not be developed, according to the County of San Mateo and the eastern non-contiguous area is property used for Coastside CWD's facilities only.	02
Summary	S.2	S-7	WSIP Goals and Objectives: Coastside CWD supports the system performance objectives listed in on Table S.1.	03
Summary	S.3	S-56	The summary of water supply impacts and mitigation measures mentions that a revised operations plan for Pilarcitos Watershed facilities will be developed and implemented. Since Coastside CWD is a wholesale customer of the Pilarcitos Watershed facilities, Coastside CWD should be included in the development and implementation of an operations plan for these facilities.	04
Summary	S.3	S-57	The summary of water supply impacts and mitigation measures mentions that there will be impacts on Upper Crystal Springs Reservoir. Since Coastside CWD is a wholesale customer and has intake facilities in Upper Crystal Springs Reservoir, Coastside CWD should be included in the development of an adaptive management plan to minimize adverse effects. The periodic drawdown of reservoir water levels for maintenance may affect the intake facilities owned and operated by Coastside CWD.	05
Summary	S.3	S-62	Although the PEIR Draft concluded that the WSIP could support more growth in Half Moon Bay than is forecasted in the adopted general plan, growth is strictly controlled by the City of Half Moon Bay and the County of San Mateo (San Mateo County Local Coastal Program (LCP).	06

L_CoastsideCWD

Chapter	Section	Page(s)	Comments	
			Existing Regional Water System	
2	2.3.4	2-24	The following sentence does not correctly characterize how Coastside CWD uses Pilarcitos Reservoir/Stone Dam facilities – "*In the Summer months, when Coastside CWD's water demand is at its seasonal maximum, its water supply from Pilarcitos Creek is supplemented by water pumped from Crystal Springs Reservoir.* ". Coastside CWD's does not supplement Pilarcitos Creek water supply with Crystal Springs Reservoir supply. Due to limitations of the infrastructure and system design, Coastside CWD can use Pilarcitos Creek or Crystal Springs Reservoir – Coastside CWD can't use both sources simultaneously. When demand is more than Pilarcitos Creek can meet, Coastside CWD switches to Crystal Springs to meet the demand.	07
			Program Description	
3	3.7.1	3-43	This section acknowledges that there are concerns regarding stream flows in Pilarcitos Creek below Stone Dam and acknowledges that there are experimental releases and studies to address these concerns. As the only wholesale customer that uses Pilarcitos Creek facilities as a water supply, Coastside CWD has a vested interest in any operational and physical changes made to the Pilarcitos Creek Reservoir, Pilarcitos Creek, and Stone Dam. Coastside CWD should be included in any process that SFPUC initiates to accommodate changes in the Pilarcitos Creek watershed.	08
3	3.7.3	3-46	Coastside CWD supports the fact that the proposed system upgrades would optimize water storage in the Peninsula watersheds, so that they can continue to be replenished during periods of maintenance and ensure that water would be available for use during emergencies or droughts.	09

L_CoastsideCWD

Chapter	Section	Page(s)	Comments	
			WSIP Water Supply and System Operations – Setting and Impacts	
5	5.2.3	5.2-21	Coastside CWD is a participant in the workgroup for the Pilarcitos Creek Integrated Watershed Management Plan. This process has identified issues that may have a bearing on the operation and management of Pilarcitos Reservoir and Stone Dam.	10
5	5.5.1	5.5.1-9	As mentioned earlier Chapter 3, The National Marine Fisheries Service (NMFS) has raised concerns regarding flows in Pilarcitos Creek. The statement describing that the only water releases from Pilarcitos Reservoir, after it has filled, is the amount requested from Coastside CWD - may not be accurate. There are also releases to Lower Crystal Springs Dam that occur with the releases for Coastside CWD. The SFPUC is releasing water on an experimental basis currently and the Pilarcitos Creek Integrated Watershed Management Plan process may identify the need to continue releases or to manage releases differently.	11
5	5.5.1	5.5.1-11	Coastside County Water District tries to maximize the Pilarcitos Creek (reservoir) source because it is gravity fed compared to Crystal Springs, which needs to be pumped. Due to infrastructure constraints, once the demand is higher than what Pilarcitos can supply, Coastside CWD must switch to Crystal Springs to meet demand. As mentioned before, Coastside CWD can't operate Pilarcitos Creek and Crystal Springs simultaneously.	12
5	5.5.1	5.5.1-13	To meet Coastside CWD's future demand, the PEIR suggests that future demand will be met from the increased use of both Crystal Springs and Pilarcitos Creek. The PEIR also mentions that this might require the construction of new facilities. In order for Coastside CWD to increase its use of Pilarcitos Creek, new facilities would be required. At a minimum, a larger pipe would be required to convey the water from Pilarcitos Creek. Currently, Coastside CWD maximizes the use of Pilarcitos Creek to the greatest extent possible. Any new facilities would be scrutinized for potential impacts and would need to comply with the coastal	13

Chapter	Section	Page(s)	Comments	
			development permit and local coastal plans and the environmental review process. Based on past experience on the Coastside, the process to upgrade or install new facilities will be time intensive and costly. If the water supply improvement process results in operational changes that result in more reliance on Pilarcitos, the new facilities required should be characterized and identified as soon as possible.	13 cont.
5	5.5.1	5.5.1-20	As mentioned before, Coastside CWD already maximizes use of Pilarcitos Creek, so descriptions of taking additional water from Pilarcitos facilities would not be possible without new facilities and/or upgraded facilities. In addition, there is the Pilarcitos Integrated Watershed Management Plan process taking place and findings from this process may also influence the management of Pilarcitos Reservoir and Stone Dam.	14
5	5.5.3	5.5.3-5	Since Coastside CWD takes raw water from Crystal Springs, any increases in nitrogen and phosphorous and any increased potential for algae growth would have a direct effect on the water treatment processes. Coastside CWD would like to be informed of any changes in raw water quality in a timely manner, so that the proper adjustments to treatment can be taken to ensure high quality drinking water is delivered to Coastside CWD customers.	15
5	5.5.3	5.5.3-6	The report concludes that the adverse impacts of the WSIP on water quality in Crystal Springs Reservoir would be less than significant (LS) and no mitigation is required. An increase in algae would impact Coastside CWD's water treatment. Is there any more data or information regarding the possible increase in algae growth in Upper Crystal Springs? Can you please provide more details as to why the minor water quality changes are classified as LS in Upper Crystal Springs Reservoir?	
5	5.5.5	5.5.5-3	It is mentioned that the National Marine Fisheries Service (NMFS) is interested in developing fish passages on Pilarcitos Creek. The alternatives mentioned are	16

Chapter	Section	Page(s)	Comments	
			complete or partial removal of Stone Dam and construction of a fish ladder at Stone Dam. The partial and complete removal of Stone Dam could impact Coastside CWD's diversion at Stone Dam unless new facilities are provided for the diversion. Coastside CWD would like to be included in the process for any modification of Stone Dam.	16 cont.
5	5.5.7	5.5.7-3	Pilarcitos Creek is described in the WSIP PEIR Draft as running through Golden Gate National Recreation Area. A map of the Golden Gate Biosphere Reserve shows that Pilarcitos Reservoir and upper Pilarcitos Creek are in the San Francisco Peninsula Watershed and is designated as "other public lands". We could find no reference of the Pilarcitos Watershed as being part of the Golden Gate National Recreation Area. There is no recreation activity in the Pilarcitos watershed that is known to Coastside CWD.	17
			Mitigation for Chapter 5 Impacts	
5	5-A	5-A-10	Coastside CWD has a vested interest in the proposed "*Revised Operations Plan for Pilarcitos Watershed Facilities*" and requests that we be involved directly with developing this proposed operations plan.	18
			Mitigation Measures	
6	6.4.4	6-56	Coastside CWD has a vested interest in the proposed "*Revised Operations Plan for Pilarcitos Watershed Facilities*" and requests that we be involved directly with developing this proposed operations plan.	
			Growth Inducement Potential and Indirect Effects of Growth	
7	7.3.5	7-40 7-41	Growth is managed by multiple agencies and plans in the Coastside CWD service area. There are growth management provisions in the San Mateo County Local Coastal Program (LCP) and the City of Half Moon Bay has land use provisions in	19

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Chapter	Section	Page(s)	Comments	
			the Half Moon Bay Local Coastal Program (LCP) and Land Use Plan. The coastal development permit for the crystal springs project limits the number of connections in the Coastside CWD service area. Connections are categorized as priority and non-priority, so Coastside CWD is restricted not only in number of connections but type of connection. In addition to the limitation on connections, the coastal development permit limits the amount of water that Coastside CWD can take from Crystal Springs Reservoir. The PEIR Draft discusses the differing population projections for the Coastside CWD service area. There are difficulties in projecting population growth in a service area, especially when the service area includes only partial areas of city and county jurisdictions. It also requires assumptions about occupancy of the new and existing residential dwellings in the service area. Since different organizations may have different assumptions, it is likely that the projections will differ from organization to organization. Coastside CWD makes every attempt to maximize the use of local sources, but there are institutional, environmental and political barriers to maintaining and developing these water supply sources. Planning for future water demand requires Coastside CWD to plan for increased reliance on the SFPUC.	19 cont.
7	7.4.1	7-60	Although the PEIR Draft concluded that the WSIP could support more growth in Half Moon Bay than is forecasted in the adopted general plan, growth is strictly controlled by the City of Half Moon Bay and the County of San Mateo (San Mateo County Local Coastal Program (LCP)). There are a limited number of connections that are allowed in the service area.	20

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Chapter	Section	Page(s)	Comments	
			WSIP Variants and Impact Analysis	
8	8.5	8-60	The PEIR Draft - Table 8.7 – explains that the increased demand for Coastside CWD will be met by Coastside CWD taking more water from the Pilarcitos Creek (Stone Dam) under all the variants, resulting in less flow down stream of Stone Dam on Pilarcitos Creek. As mentioned in other comments, Coastside CWD currently maximizes it use of Pilarcitos Creek at Stone Dam. Unless the conveyance pipe and other facilities are improved, Coastside CWD will not be able to significantly increase use of Pilarcitos Creek (Stone Dam and Pilarcitos Reservoir).	21
8	8.5.1	8-71 8-72	Since Coastside CWD has intake facilities located in Upper Crystal Springs Reservoir, Coastside CWD is sensitive to the potential for lower reservoir operating levels mentioned as an impact for variant 1. Due to current operational and infrastructure limitations, the assumption that Coastside CWD would be able to increase its diversions from Pilarcitos Creek may not be possible.	22
			CEQA Alternatives	
9	9.2.1	9-13	Table 9-5 describes the estimated drought year shortages expected under each alternative. Coastside CWD has serious concerns about the alternatives that show there will be shortages of over 20%. Shortages requiring reductions of over 20% would impact health and safety in our service area. The regulatory and voluntary efforts to reduce overall water demand and promote the most water efficient technologies and behaviors results in a lower water demand under normal conditions. This "demand hardening" will affect the ability of most residential, institutional, and commercial consumers to meet mandatory curtailment requirements over 20%.	23

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Chapter	Section	Page(s)	Comments	
9	9.2.1	9-14	Table 9-6 is summary of alternatives and their ability to meet the program objectives. Coastside CWD has concerns about the alternatives that fail, partially fail or there is uncertainty in meeting the seismic reliability objectives.	24
9	9.2.2	9-39	The description of Coastside CWD meeting its increased demand with Pilarcitos Creek and the potential adverse effects on Pilarcitos Reservoir needs clarification. As a supply source, Coastside CWD has maximized its use of Pilarcitos with the current infrastructure. Assuming that the infrastructure is not improved and demand increased in the service area, Coastside CWD would switch over to Crystal Springs Reservoir earlier. The result being that there might be more water in Pilarcitos Reservoir because Coastside CWD would not be able to use it as a source due to the limited gallons per minute available through the current infrastructure.	25
9	9.2.3	9-46	The description of Coastside CWD meeting its increased demand with Pilarcitos Creek and the potential adverse effects on Pilarcitos Reservoir needs clarification. As a supply source, Coastside CWD has maximized its use of Pilarcitos with the current infrastructure. Assuming that the infrastructure is not improved and demand increased in the service area, Coastside CWD would switch over to Crystal Springs Reservoir earlier. The result being that there might be more water in Pilarcitos Reservoir because Coastside CWD would not be able to use it as a source due to the limited gallons per minute available through the current infrastructure.	
9	9.2.4	9-57 9-58	The description of Coastside CWD meeting its increased demand with Pilarcitos Creek and the potential adverse effects on Pilarcitos Reservoir needs clarification. As a supply source, Coastside CWD has maximized its use of Pilarcitos with the current infrastructure. Assuming that the infrastructure is not improved and demand increased in the service area, Coastside CWD would switch over to Crystal Springs Reservoir earlier. The result being that there might be more water	

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Chapter	Section	Page(s)	Comments	
			in Pilarcitos Reservoir because Coastside CWD would not be able to use it as a source due to the limited gallons per minute available through the current infrastructure.	
9	9.2.5	9-66	The description of Coastside CWD meeting its increased demand with Pilarcitos Creek and the potential adverse effects on Pilarcitos Reservoir needs clarification. As a supply source, Coastside CWD has maximized its use of Pilarcitos with the current infrastructure. Assuming that the infrastructure is not improved and demand increased in the service area, Coastside CWD would switch over to Crystal Springs Reservoir earlier. The result being that there might be more water in Pilarcitos Reservoir because Coastside CWD would not be able to use it as a source due to the limited gallons per minute available through the current infrastructure.	25 cont.
9	9.2.6	9-73	The description of Coastside CWD meeting its increased demand with Pilarcitos Creek and the potential adverse effects on Pilarcitos Reservoir needs clarification. As a supply source, Coastside CWD has maximized its use of Pilarcitos with the current infrastructure. Assuming that the infrastructure is not improved and demand increased in the service area, Coastside CWD would switch over to Crystal Springs Reservoir earlier. The result being that there might be more water in Pilarcitos Reservoir because Coastside CWD would not be able to use it as a source due to the limited gallons per minute available through the current infrastructure.	
9	9.2.8	9-79	The modified WSIP alternative, which is the environmentally preferred alternative, would meet Coastside CWD's increased demand from Crystal Springs Reservoir as opposed to meeting the increased demand with Pilarcitos Creek, as described in the program alternative. The increased pumping costs would have an impact on Coastside CWD. Coastside CWD encourages the SFPUC to consider making improvements to both the Pilarcitos facilities and Coastside CWD's Crystal Springs	26

Chapter	Section	Page(s)	Comments	
			facilities, so that there is more flexibility and reliability. Improvements to both the Pilarcitos facilities and the Crystal Spring facilities are consistent with the goals and objectives of the WSIP. Improvements on the Pilarcitos facilities could offer more flexibility in the operation of Pilarcitos Reservoir and Stone Dam. This flexibility could benefit the aquatic habitat and meet the increasing demand for Coastside CWD in a cost effective manner.	26 cont.
9	9.3.1	9-90	The statement that "*The SFPUC currently services Coastside CWD primarily from the Pilarcitos Reservoir*" may not be accurate. Pilarcitos is Coastside CWD's preferred choice over Crystal Springs, but on average we meet approximately 25% of our demand from Pilarcitos and approximately 50% of our demand from Crystal Springs. And since Coastside CWD already maximizes the use of Pilarcitos the "*No Purchase Request Increase Alternative*" would not lessen the impacts on Pilarcitos Reservoir and Creek.	27

COASTSIDE COUNTY WATER DISTRICT

DALY CITY · CALIFORNIA

City of Daly City

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October 1, 2007

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CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
M E A

Mr. Paul Maltzer
San Francisco Planning Department
City and County of San Francisco
1660 Mission Street, 5th Floor
San Francisco, CA 94103

Subject: Water System Improvement Program – PEIR

Dear Mr. Maltzer:

The City of Daly City appreciates the opportunity to provide comments on the draft Program Environmental Impact Report (PEIR) prepared for the Water System Improvement Program (WSIP) being developed by the San Francisco Public Utilities Commission (SFPUC). Our correspondence intends to provide a summary background of Daly City, concerns on some of the major themes within the WSIP PEIR draft, and focused comments on proposals pertinent to our community. Daly City's intent in providing these comments is to help correct any errors or omissions, provide clarifications, and expand upon existing descriptions aimed at strengthening the document itself. It should be stated upfront that Daly City believes the PEIR represents a thorough and comprehensive effort that satisfies the requirements of the California Environmental Quality Act, and our agency's commentary is aimed at constructively moving the document toward certification and ultimate approval in order to advance the necessary work scope set forth under the WSIP. 01

A summary background of Daly City helps identify its interest in moving the WSIP forward. Daly City, incorporated in 1911, is located in the northern part of San Mateo County, adjacent to the southern boundary of the City and County of San Francisco. Daly City is one of twenty-seven agencies of the Bay Area Water Supply and Conservation Agency (BAWSCA) and is the last wholesale agency on the line served by the Hetch Hetchy and local reservoir system. Interstate Highway 280 (I-280), running north and south, divides Daly City into two geographically distinct areas with different development characteristics. Older neighborhoods, comprised of medium-density, single-family housing, are located on the eastern side of I-280. West of I-280, development is newer, primarily built after 1949, and shares a number of similarities with homes on the westside of San Francisco as pertains to lot size and climate. In this area, lower-density, single-family houses are concentrated around shopping centers often dedicated to serving regional rather than local population. Limited manufacturing enterprises in the City are located near the Cow Palace in the Bayshore neighborhood located on the eastside of I-280. 02

Daly City is a center for retail trades, primarily home furnishings and appliances, apparel, general merchandise and restaurants. Major shopping centers include Serramonte Shopping Center, Westlake Shopping Center, Pacific Plaza and the Mission Street (El Camino Real) retail corridors. Daly City is the most populous city in San Mateo County, exceeding 100,000 residents in 1997. Its current 2007 population is 106,160. Between 2005-2030, Daly City's population is estimated to increase to 115,651 persons, while the number of households is expected to increase by a modest 4 to 5 percent to 38,100. According to Daly City's General Plan, 53 percent of the community is currently residential, 16 percent open space, 12.5 percent is public facilities, 10.3 percent commercial, 7 percent vacant, and 1.2 percent other uses. Office and retail sites are located in the Sullivan Avenue/Civic Center, Junipero Serra Boulevard, Serramonte Plaza, Bayshore and Gateway Plaza areas and total approximately 120 acres. An example of recent development activity that follows the basic principles of Smart Growth is the Pacific Plaza Development with its anchor tenants Autodesk and Genysis, along with accompanying retail establishments adjacent to the Daly City BART Station, a major transit hub. Daly City is nationally recognized for promoting the safety of its existing housing supply through its award-winning Project Homesafe and progressive second-unit housing ordinance. This ordinance provides for the legalization of new and existing owner-occupied houses with in-law secondary units. Over 1,800 Project Homesafe permits have been issued. Daly City is also actively engaged with the Peninsula Habitat for Humanity to secure additional housing within in-fill lots.

02 cont.

Daly City has eleven metered pipeline connections to the SFPUC regional system that normally contribute 55 to 57 percent of the City's supply. The remaining 43 to 45 percent is derived from six municipal production wells within the Westside Basin that can produce upwards of 4.25 mgd with an historic pumping average of 3.75 mgd. Five of Daly City's municipal wells were noted as being highly protected from potential pathways of contamination and a sixth well as being moderately protected as part of its Drinking Water Source Assessment. Results from the triennial Lead and Copper Testing, completed in August 2007, were again under notification levels. Daly City's 90th percentile results for lead were <0.005 mg/l (0.015 mg/l notification level), and for copper were 0.0049 mg/l (1.5 mg/l notification level).

03

Daly City's water rates, effective July 1, 2007, continue to incorporate a basic bimonthly charge based on meter size coupled with an inclining block rate structure for usage over six units of water as a means to encourage continued conservation. Daly City residents have responded to drought conditions and have demonstrated continued conservation as evidenced by having among the lowest residential per capita usage (53.7 gpcpd) and lowest gross per capita consumption (65.2 gpcpd) among other BAWSCA agencies and is consistent with the lower regional Bay Area overall water usage when compared against other statewide regions throughout California. Daly City continues to actively participate in regional, cost-effective water conservation programs. An example is its residential washing machine rebate program in which 1,634 rebates have been processed since 2004 with an average bimonthly savings of two

04

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units (1,496 gallons) among rebate participants. This program alone has saved 14,666,784 gallons.

04 cont.

The City Council of Daly City has directed staff to preserve the groundwater aquifer for municipal purposes and has embarked on two important water supply programs with the SFPUC: conjunctive use and recycled water. Daly City entered into an in-lieu pilot conjunctive use program with the SFPUC with the goal of enhancing regional water resource management. In October 2002, as a result of available surplus SFPUC system water, Daly City agreed to utilize more surface water with a corresponding decrease in its groundwater pumpage. This action provided the opportunity to observe the response of the Basin from in-lieu recharge that took place as a result of the reduction in pumping. The in-lieu pilot conjunctive use program terminated in early-May 2007, and initial results show that approximately 12,000 acre-feet of additional water has been stored locally in the aquifer.

05

In August 2004, Daly City's Tertiary Recycled Water Facility (through its subsidiary, the North San Mateo County Sanitation District) began delivering full Title 22 compliant public contact irrigation water to the Olympic Club. Soon after, water deliveries included the Lake Merced Golf Club and Daly City's Westlake Park. During the 2005 irrigation season, deliveries included the San Francisco Golf Club. The SFPUC contributed $1 million toward the $7.34 million project, and discussions are underway to examine the feasibility of service to San Francisco's Harding Park Golf Course. Since its initiation, some 537 million gallons have been delivered, lessening the demand on local groundwater for irrigation use.

06

Daly City's review notes three major themes in which general comments are provided. These include a request for a more robust discussion of seismic risk, analysis of water conservation, and advocacy in support of a 10% rationing as a program level of service.

07

Daly City's review of the PEIR indicates that the urgent purpose of the WSIP can be strengthened by a more robust description of the very real seismic safety risks to Bay Area residents and the resulting extensive economic consequence to the local economy. While the SFPUC's specific level of service goal of delivering a basic level of service within 24 hours after a major earthquake is laudable, existing water system outage estimates, which range from twenty to sixty days following a catastrophic earthquake, are frightening beyond comprehension. The devastation of the Gulf Coast from Hurricane Katrina gave ample warning of the potential impact to a community. But unlike a hurricane that can be seen and forecast in advance, no such advance warning comes from an earthquake. There is ample evidence from the United States Geological Survey regarding the 60% probability of a significant, magnitude 6.7 or greater, seismic event on the San Andreas, Hayward and Calaveras Faults in the very near future – from 2003 to 2032 – that gives one pause. It does not appear that the draft PEIR prominently describes the very real risk facing users of the SFPUC regional and local water system. An expanded discussion should be provided in the final PEIR to give needed urgency to the purpose in which the WSIP is intending to address and protect the 2.4 million residents dependent upon the regional water system.

08

Water conservation is recognized as a major component associated with the WSIP. Daly City and its residents recognize the importance of locally efficient and effective water conservation measures. However, a cornerstone proviso in any conservation measure must include cost effectiveness. Daly City has participated in the modeling and economic analysis of 32 conservation measures using the Demand Management Least-Cost Planning Decision Support (DSS) model. The results for Daly City showed savings of 0.44 million gallons per day (mgd) under Program B by the year 2030. Based on the conclusions from the DSS modeling, Daly City made a determination that the water savings associated with Program B made the most sense in regard to what could be realistically achieved given the baseline consumption characteristics of the Daly City service area and planned development. Any minor incremental water savings associated with Program C was considered not feasible in large part due to diminishing returns that the model demonstrated. Daly City's local Program B results are by no means insignificant insofar as they demonstrate continued benefits and water savings accounting for a zero net gain over time by the year 2030 despite increases in local population and continued economic development. Water conservation efforts throughout Daly City are included in this review as Exhibit #1.

However, it must also be noted that program savings as currently set forth under Program B are not intended to be rigid in application but rather a tool to demonstrate range of savings of selected measures implemented together. Daly City's goal is 0.44 mgd and how the community reaches that goal must be quantified as being the most cost-effective and implementable in order to achieve sustainable success. Furthermore, while it would be speculative at best to exceed the 0.44 mgd goal, that does not suggest in any way that Daly City would not take into account future cost-effective measures that would improve upon its targeted Program B commitment. 09

The existing program level of service providing for a maximum 20% system wide reduction in water service during extended droughts ought to be re-examined as the WSIP moves forward. During its public scoping meetings, SFPUC staff submitted its evaluation that a maximum 10% systemwide rationing in water service could be achieved through additional investment of $181 million into the WSIP. Daly City contends such an increased investment is not only cost-effective, but prudent policy development in light of the existing $4.3 billion WSIP program scope. At issue for Daly City is the reasonableness of achieving an additional 20% drought cutback in light of its current usage profile demonstrating local residents are practicing water conservation behaviors. Of the approximate 22,576 active water accounts, 82% are single-family dwellings, 12% multi-family units, 3% commercial/industrial and 3% landscape and other. The average residential per capita consumption, accounting for 94% of Daly City's accounts, is 53.7 gpcpd; and Daly City's gross per capita consumption of 65.2 gpcpd. Moreover, 12% of Daly City water users consume 6 ccf or less during a bimonthly billing cycle, 54% consume between 7 to 18 ccf bimonthly, and another 24% consume between 19 to 30 units bimonthly. While increased conservation during a drought is reasonably expected, especially among higher users, almost two-thirds of Daly City residential household customers use 18 ccf or less during a 60-day billing cycle. Daly City's question is to what extent did demand hardening play in originally 10

determining the 20% maximum? As the PEIR correctly notes, demand hardening from permanent water use reductions will make it more difficult for an agency to duplicate previous water use reduction goals during a future drought. From the existing local usage noted, Daly City believes WSIP Variant 3-10% Rationing is a more realistic and prudent policy to follow. 10 cont.

The following section notes specific and focused comments associated with the draft WSIP PEIR. Its intent is to expand, clarify or correct information as needed, but in no way should be construed as indicating anything but Daly City's contention that the PEIR should move expeditiously toward certification. For ease in review, page number and section, and/or footnote reference will be used.

<u>*Page S-5, Figure S.3*</u>
It is noted Annual Average Forecasted Demands cross into the 300 mgd range around 2025, demonstrating such demand is not instantaneous but occurs incrementally eighteen years from now. 11

<u>*Page S-6*</u>
Daly City concurs with proposed water supply approach to meet increased 35 mgd purchase requests. 12

<u>*Page S-8*</u>
WSIP level of service goal maximizing 20% systemwide rationing in any one year of drought needs to be re-reviewed in favor of Water Supply Variant 3-10% Rationing as noted by Daly City's earlier comments. 13

<u>*Page S-8*</u>
Daly City expects to continue working with SFPUC toward implementing a groundwater conjunctive use project. 14

<u>*Page S-18, Table S.2*</u>
Project Description for SF-3, Recycled Water Projects, may want to include potential to develop local recycled projects with other outside agencies to avoid potential scoping conflicts in the future. 15

<u>*Page S-34, Table S.4, Mitigation Measure 4.5-5*</u>
Stormwater Treatment data developed under joint Daly City/SFPUC Lake Merced Pilot Stormwater Enhancement Project might help serve as a baseline. Also, groundwater sampling around Lake Merced and Daly City as part of conjunctive use analysis might also be of assistance. 16

<u>Page S-59, Table S.8, Mitigation Measures Westside Groundwater Basin</u>

<u>Impact 5.6-1</u> Daly City concurs with the Less Than Significant Determination on the South Westside Groundwater Basin.

<u>Impact 5.6-2</u> Daly City concurs with N/A Determination for South Westside Groundwater 17
Basin.

<u>Impact 5.6-3</u> Daly City concurs with Less Than Significant Determination on the South Westside Basin, but must caution that existing understanding of a pathway for potential seawater impact that may affect the Basin is north of Lake Merced through the Sunset District of San Francisco.

<u>Page S-62</u>
The modest "growth" within Daly City will primarily be in-fill lots aimed at mixed-use
developments to diversify current mix of residential with commercial. Smart Growth project 18
examples in Daly City are included in this review as an Exhibit #2.

<u>Page S-64, Areas of Controversy, Demand Estimates/Customer Purchase Requests</u>
Noting issues brought up during PEIR scoping process is very helpful. The demand purchase
request methods being criticized fail to note the projections were uniformly applied using the
best available information when determining Daly City's demand numbers. This examination
occurred from March 2003 to February 2005. The real issue, if any, should not focus on newer 19
available information but whether the methodology used was conducted in a consistent manner.

The numbers provided during this examination used ABAG Projections 2002 figures in an endeavor to provide legally-required rigor and consistency.

<u>Page S-72</u>
Daly City concurs with Variant 3-10% Rationing as a preferred alternative as noted in its previous comments.

<u>Page S-73</u>
Daly City understands a No Program Alternative is required under the law but does not consider 20
it a viable option in light of seismic risk now facing the system. Daly City also rejects the No
Purchase Request Increase Alternative as a viable program consideration because of its narrow
focus and questionable, at best, environmental benefit. Daly City, as well as other urbanized Bay
Area jurisdictions, is incorporating Smart Growth concepts into its land use decisions aimed, in
part, at improved water use efficiency.

<u>Page S-74</u>
With respect to the Aggressive Conservation/Water Recycling and Local Groundwater
Alternative, Daly City is troubled by the notion that any future system demands would only be
met through additional conservation efforts, recycling or groundwater projects. The PEIR
correctly notes the unfeasibility of such an approach and the environmental impacts of such a 21
strategy, including an increase in drought rationing to 25%. Daly City is committed to cost-
effective and sustainable water conservation as previously noted under its Program B
commitment, is actively engaged in expanding its recycled water deliveries to new customers to
maximize its 2.77 mgd rated capacity, and is reviewing operational and contractual approaches to
formalize a permanent conjunctive use program within the Westside Basin.

<u>Page S-78, 2nd full paragraph</u>
Daly City supports the Bay Area Water Supply and Conservation Agency's (BAWSCA's)
proposal that the final PEIR further describe and analyze the draft PEIR's Modified WSIP
Alternative (the environmentally superior alternative) and that the final PEIR explore the
feasibility of the Bay Area water customers financially supporting water conservation with
agricultural interests on the lower Tuolumne River that will result in no net decrease in flows on 22
the lower Tuolumne. BAWSCA's proposal is to conserve even more agricultural water resulting
in a net increase in lower Tuolumne River flows. This additional water could then be available
to support greater flows in the lower Tuolumne River, deployed at times and in volumes most
beneficial for salmon and other important species in the lower Tuolumne River. Under
BAWSCA's proposal, the implementation of the WSIP can improve, rather than degrade, flow
conditions in the lower Tuolumne River.

<u>Page 3-17, Demand Projection Methodology</u>
The real issue to be examined is the application of methodology used at the time when forecast of
future demand numbers was requested and put together in answer to the question posed. The 23
existence of new information or application of other criteria must be weighed against consistency
in how the numbers were developed.

<u>Page 3-18, Table 3.3, Summary of Water Supply Assumptions and 2030 Demand Projections</u>
Daly City appreciates the correct notation contained under Footnote (f) of summarizing the
manner how Daly City staff used a range of potential groundwater use to calculate its future
demand. In doing so, it was determined it would be prudent to provide both an anticipated high
range of future demand purchases and not simply rely upon "status quo" operation. Daly City's 24
point was to provide a future demand calculation that included at least two wells remaining in
operation constituting lowest production yield, as well as historic pumpage constituting
sustainable production yield as a means to more properly address the significant policy question
that it was being asked to answer. This internal decision to provide a range of purchase demands
was not taken lightly.

However, Daly City is concerned with the column "2030 Projected Demand (with Plumbing Code Savings)" of 9.1 mgd. While the number is correct, it could be misleading. Daly City has committed to Program B savings of 0.44 mgd by 2030 for a Projected Demand of 8.67 mgd. From Daly City's perspective, this notes an anticipated no net increase of water demand in Daly City by the year 2030. 24 cont.

Page 3-19, Table 3-4
For the City of Daly City, the change in Water Purchases from SFPUC is consistent with the range of projected purchases showing an anticipated high and low amount as explained previously. The higher amount shown is consistent with a scenario of at least two wells remaining in operation affecting the mix of water supply. This mix must also be balanced with conservation goals under Program B measures. 25

Page 3-22, Purchase Estimates, second sentence
Daly City believes the sentence can be improved by acknowledging an estimated range of purchases "took into account local scenarios as a means to better provide demand estimates". As noted earlier, in calculating its future demand out to the year 2030, Daly City felt it prudent to include a scenario of two production wells remaining in operation constituting lowest production yield pumpage, along with historical pumpage constituting sustainable yield. 26

Page 3-25, Paragraph E
The paragraph should be expanded to include ability for SFPUC to also work with other local agencies to provide recycled water to San Francisco so the reader is more fully aware of efforts to include recycled water into the mix of supply options. 27

Page 3-34, Section 3.6.1, Proposed Non-drought Water Supply – Footnote 20
The footnote's second to last paragraph states, "Program C represents an upper bound of conservation that is considered achievable and fundable." Daly City considers this statement problematic as it infers any and all conservation measures are implementable. Such an overarching statement neglects the fact that under the DSS Model used to calculate and forecast future demands to 2030, some Program C measures were not deemed cost-effective and/or achievable by some agencies because of unique local characteristics that include demographics, climate and land use and, therefore, run counter to the implication of the footnote. 28

Page 3-39, top of page, first sentence
It should be clarified that under the proposed groundwater conjunctive use program that "an additional" 8,100 acre-feet of water per year is anticipated. The use of the term "additional" is an important consideration that distinguishes conjunctive use from normal historical groundwater pumping. 29

Page 3-39, Footnote 23
The description should be clarified to note the conjunctive use program has been designed to provide an additional extraction capacity of approximately 8,100 acre-feet in a dry year. 30

Page 3-42, first full paragraph, last sentence
This should be clarified so it's understood that conjunctive use participants increasing groundwater pumping and thereby reducing the amount of purchase requests does not create a temporary reduction in system demand but instead provides that available capacity for other users who do not possess alternate supplies. 31

Page 3-55, Table 3.10
Within the description of Project SF-2, Groundwater Projects, Daly City expects that any use of groundwater within San Francisco would remain consistent with Daly City's efforts to preserve the groundwater basin for municipal purposes – in other words, the highest and best use. 32

Page 3-60, Table 3.11
As it pertains to affected jurisdictions, Daly City should be marked off on Project SF-3 as an "X" or, at the very least, an "A", as it is involved with the SFPUC in its examination of providing recycled tertiary water to Harding Park Golf Course. 33

Page 5.6-1, Section 5.6.1.1, Westside Groundwater Basin
It is Daly City's understanding that of the 45 square mile area of the Westside Ground Basin, 14 square miles are in San Francisco and the remaining 31 are in San Mateo County. 34

Page 5.6-5, Section 5.6.1.2, Monitoring Network and Program
Reference is made to the In-Lieu Recharge Study, the actual language from the agreements initiated reads "Aquifer Recharge Study". 35

Page 5.6-8, Irrigation Pumping
The recycled water was made available from the North San Mateo County Sanitation District, a subsidiary of the City of Daly City. As a point of reference, total 2005 deliveries of recycled water to the golf clubs was 155.24 million gallons. 36

Page 5.6-8, Footnote 8
Daly City records show a range of 278-305 afy as opposed to the 120-150 afy quoted in the footnote. 37

Page 5.6-13, Section 5.6.1.5, Lake Merced
The last sentence of the first paragraph reads, "However, Lake Merced has not been used as a potable water supply since the 1930's." Since there are a number of misperceptions among the public regarding Lake Merced as a water supply, it might be helpful to include the actual Basin Plan beneficial uses for Lake Merced. Such information would to provide an enhanced understanding of efforts to better shepherd intent of WSIP projects. 38

Page 5.6-13, Section 5.6.1.5, Lake Merced
The third paragraph focuses on the decline of lake levels. The paragraph also provides an opportunity to provide a description associated with the rapid rise of the lake beginning in the early 1930's and quickly peaking in the 1940's, and how the lake was originally operated as a systemwide balancing reservoir as part of the regional distribution system. This description would go a long way in order to keep fluctuating lake levels in perspective. See also *Figure 5.6.7, Page 5.6-14.* 38 cont.

Page 5.6-15, First full paragraph
The paragraph describes that Lake Merced is connected to the shallow aquifer. However, for years a public perception was allowed to persist that Lake Merced was a surface expression of the groundwater basin that directly linked groundwater pumpage with decline in water levels. A more accurate description of this inter-relationship exists and should be incorporated within the PEIR in order to both bolster that lake levels are indirectly connected to the deep pumping aquifer, and that lake levels and groundwater pumpage can be separately and distinctly managed.

Page 5.6-16 to 17, Section 5.6.1.7, Seawater Intrusion
The description associated with Daly City's groundwater pumpage and lowering to over 120 feet below msl reads as though levels continue to be lowered instead of having reached a stabilized level. The misperception that may be created requires correction. Additionally, the description does not go far enough because LSCE's examination of the Basin indicated that because of the physical barrier west of the Daly City pumping area, seawater intrusion was more likely much farther to the north in San Francisco's Sunset District, where the physical barrier thinned out. 39

Page 5.6-17, Section 5.6.1.9, In-Lieu Recharge Study
From the executed agreement, the title was "Aquifer Recharge Study", a minor point. However, results from Daly City from October 2002 to May 2007, in which some 12,000 acre-feet of groundwater was stored within the basin, can be used to better describe the concept. Daly City's interest in participating in a conjunctive use program is consistent with the City Council's direction to preserve the groundwater aquifer for municipal purposes – deemed as the highest best use of the resource. 40

Page 5.6-21, Well Permitting Requirement
With respect to Daly City's Chapter 13.20 of the Municipal Code, while it is true existing provisions do not include overdraft conditions, Section 13.20.070 allows for denial of permit when judged not to be in the public interest. The definition should be included within the text description to better define Daly City's legal authority. 41

Page 5.6-25, South Westside Groundwater Basin, 2nd paragraph, last sentence
This should be amended to read, "During drought conditions, the SFPUC would be able to reduce the quantity of SFPUC system water delivered to participating pumpers and the stored 42

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groundwater, or banked water, would be available for local use to supplement supplies from the regional water system." The amended sentence is intended to clarify anticipated operation.

Page 5.6-26, top of page
In describing withdrawals, it would be helpful to clarify conjunctive use groundwater pumping would be restricted to the amount of water banked. This clarification would help distinguish conjunctive use pumping from historical pumping within the Basin.

Page 5.6-26, Footnote 15, second sentence
Clarified to read, "The program is being designed to provide an extraction capacity of approximately 8,100 acre-feet of additional water during a drought year (an equivalent of about 7 mgd). The purpose of the clarification is to better describe intent of conjunctive use program. 42 cont.

Page 5.6-29, South Westside Groundwater Basin
First sentence clarified that participating pumpers would be able to extract conjunctive use groundwater up to the amount of water stored. Purpose is to provide better description of intended program.

Program 5.7-86, Irrigation Pumping
Recycled water was made available from the North San Mateo County Sanitation District, a subsidiary of the City of Daly City, as a substitute irrigation supply. 43

Page 5.7-87, Municipal Pumping
First bullet point needs correction to clarify summary. The 4,212 afy is equivalent to 3.76 mgd existing pumping as a baseline amount consistent with Daly City's historical 3.75 mgd pumping average established for the Aquifer Recharge Study conducted from October 2002 to May 2007. Reference also *Table 4.4, pages 4-5.* 44

Page 5.7-91, top of page, 2nd bullet point
Under the proposed conjunctive use program, the participating pumpers… Edit to clarify the description. 45

Page 7-15, Table 7.2
Daly City concurs with the numbers presented and the accompanying Footnote (e) describing range of purchases based on groundwater usage. Please see detailed discussion within text of this review. 46

Page 7-15, Table 7.2, footnote (e)
The footnote correctly notes manner in which a range of system demand was calculated linked to local groundwater production scenarios when estimating future purchases. See also earlier commentary on why range of purchase demands was selected.

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San Francisco Planning Department

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Page 7-18, Table 7.3
Daly City concurs with numbers presented but must caution against potential misconceptions
regarding the upwards of 44% change of purchase. Some may erroneously construe and
incorrectly misrepresent that number, which would be unfortunate. The number represents a
range consistent with local scenarios presented as it pertains to groundwater pumpage. The 47
number represents a potential change in the mix of local water supply that one should reasonably
expect as part of a detailed examination of local demands. The mix of supply must also take into
account anticipated conservation and balance that consideration as part of the public policy
debate.

Page 7-33, Table 7.10
Daly City concurs with numbers presented but notes the Water Demand percentage, which is 48
correct, does not include conservation of 0.44 mgd under Program B. This comment is provided
so the information presented is not misconstrued.

Page 7-41, City of Daly City Description
While the description itself is correct, the absence of a discussion regarding anticipated savings
associated with Program B water conservation may lead some to misconstrue the information.
The paragraph discusses mix of supply as a function of the historical balance within Daly City
between groundwater pumpage and surface water purchases. That mix of supply options must be
balanced against anticipated system demands from 2005 to 2030 in which conservation under 49
Program B by the year 2030 shows no net increase in overall demand but some peaking of
demand, as high as 9.27 mgd by 2020 before achieving an end result of 8.67 mgd by 2030 as
conservation measures kick in. As it pertains to a discussion of growth inducement, this kind of
recognition associated with water conservation needs to be further incorporated into this section
of the PEIR.

Page 8.33, Section 8.4.1, Description Variant 3-10% Rationing
As noted earlier in this review, Daly City believes 10% maximum systemwide rationing is
economically and environmentally preferable over the existing 20% maximum established as a 50
level of service goal. Daly City is concerned about demand hardening within its community
based on existing low residential per capita per day usage, constituting 94% of existing customer
base.

Page E.1-2, Table E.1.1
Daly City concurs with the data provided for our agency.

Page E.2-2, Table E2.1
Daly City concurs with the data provided for our agency as it is consistent with range of purchase 51
estimates provided. However, Daly City must note its concern over the mischaracterization of
the 44% change in purchases by 2030 as being tantamount to an overly inflated estimate in
support of continued wasteful suburban practices, as some would attest. The 44% change in
purchase estimate is the direct result of Daly City's scenario regarding groundwater pumping in

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which a sustainable yield amount and a lowest anticipated yield amount were provided. The 44%
value should be measured against the mix of supply, groundwater or surface water, and balanced 51
against local water conservation under Program B which demonstrates an anticipated no net cont.
increase in the total amount of water demand in Daly City.

Page E2-7, second to last paragraph
Attached, for the record as Exhibit #3, is Daly City's April 26, 2004 correspondence to
BAWSCA in support of the new/renovated commercial use created for Daly City. Daly City's
concern with an element of the DSS was its reliance on current General Plan and/or Housing
Element absent other locally prepared, publicly vetted, and adopted planning documents. The 52
inability to include these other local planning efforts was deemed as potentially penalizing Daly
City. Daly City's review of 51 projects associated with these locally-adopted specific plans
utilized standard calculations in gallons per day per capita, or in gallons per square foot, in
arriving at the 0.57 mgd increase through 2010. The point of this comment is to note local
efforts to comply with a defensible, consistent and transparent process in determining the
increased demand amount.

Page E2-14, Table E.2.4
Daly City concurs with the numbers shown for our agency on projected conservation savings.

Page E2-17, Table E.2.5, Recycled Water Potential

Daly City needs to clarify and correct some of the numbers shown.

Current (2004) recycled water projects should be corrected from 0.001 to 0.01, consistent with
planned expanded deliveries to Marchbank Park and Junipero Serra Boulevard landscaped
medians. Also, the reader needs to understand the numbers are driven to show offset to the
regional water system so that the deliveries from the North San Mateo County Sanitation District 53
to the Olympic Club, Lake Merced Golf Club and San Francisco Golf Club since 2004 could not
be included.

Daly City would like to correct the column for Projects under Study from zero to 0.53 mgd to
better represent actual and ongoing discussions to expand recycled water within the community
that intends to offset system supply.

Page E2-18, Table E.2.6, Summary of 2030 Demand Projections
Footnote (e) correctly summarizes the range of estimates provided by Daly City as it pertains to
groundwater usage. The numbers must also be balanced against anticipated water conservation
savings.

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Page E3-6, Table E3.4, Employment and Population Estimates
Daly City notes that both the starting point and endpoint values for employment and population are correct. There are very slight differences in numbers in our records as opposed to those shown for 2005 and 2025, but the numbers are not deemed significant.

Page E3-7, Table E3.5, Employment
As noted above, starting point numbers and endpoint numbers are same as Daly City records but there is a slight variance in numbers presented between the period of 2005-2025 and 2005-2030, but the variance is not deemed significant. 54

Page E3-8, Table E3.6, Population
As noted above, starting point numbers and endpoint numbers are same as Daly City records but there is a slight variance in numbers presented between the period of 2005-2025 and 2005-2030, but the variance is not deemed significant.

Page E3-43, Table 3.37
Daly City concurs with the numbers presented but must caution the number shown for 2030 does not include Program B water conservation potential of 0.44 mgd. 55

Thank you, Mr. Maltzer, for your attention and assistance in incorporating Daly City's comments into the final PEIR document for the WSIP. Daly City recognizes the challenges in crafting a draft PEIR and acknowledges the thoroughness and conscientious effort clearly exhibited. As noted earlier, Daly City contends the draft PEIR and anticipated responses satisfies the legal requirements set forth under CEQA. Daly City's comments are aimed at constructively moving the PEIR forward toward certification and approval. Any comments or questions associated with this submittal can be directed to Patrick Sweetland, Director of Water and Wastewater Resources, by telephone at (650) 991-8201 or email at psweetland@dalycity.org.

Sincerely,

Patricia E. Martel
City Manager

PEM/ps

Attachments: Exhibit #1, Daly City Water Conservation Program
Exhibit #2, Smart Growth
Exhibit #3, Letter to BAWSCA

DUBLIN SAN RAMON SERVICES DISTRICT

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September 28, 2007

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PLANNING DEPARTMENT
MEA

San Francisco Planning Department
Attn: Mr. Paul Maltzer, Environmental Review Officer
WSIP PEIR
1650 Mission Street, Suite 400
San Francisco, CA 94103

Subject: Comments - Draft PEIR for SFPUC Water System Improvement Program

Dear Mr. Maltzer:

Dublin San Ramon Services District (DSRSD) appreciates the opportunity to review and comment on the subject Draft Program Environmental Impact Report (PEIR) for SFPUC Water System Improvement Program.

While each water system in the State is unique, all water agencies share one common planning requirement: providing a base water supply during a water supply shortage whether caused by drought, regulatory requirements or system failure. Section "S.1 Introduction and Purpose of the PEIR" provides the statement "...to increase the reliability of the regional water system that serves 2.4 million people in San Francisco and the San Francisco Bay Area." Table 3.2 lists the following specific goals and objectives: "Provide operational flexibility to minimize the risk of service interruptions due to unplanned facility upsets or outages"; "Diversify water supply options during ... drought periods"; and "improve use of ...groundwater, recycled water,...and transfers".

Section 3.4.6.E identifies potential projects covered by the PEIR as "...recycled water projects that would be located outside San Francisco in coordination with other jurisdictions." DSRSD is one of a number of jurisdictions that may be able to provide recycled water to San Francisco. Such projects could increase San Francisco's system reliability during a water supply shortage and could be a factor in regional water management solutions that would benefit several water suppliers. 01

Water supply in California can be highly variable by watershed as a result of either drought or seismic activities. Having interconnections with the watersheds or groundwater basins of other jurisdictions may also assist San Francisco in increasing water supply reliability. DSRSD

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September 28, 2007

(working closely with our wholesaler, Zone 7 Water Agency) is one of several jurisdictions that could assist San Francisco by providing an opportunity for increased reliability through interconnection, water exchanges, and similar water management techniques that would have multiple beneficiaries. There is also some potential for such projects to provide water for fisheries enhancement and other environmental values.

DSRSD recommends that the following project refinement be added to the PEIR on page 3-25. 01 cont.

> "**3.4.6.G: Regional Interconnecting Projects.** The SFPUC expects to consider and develop some interconnection projects to surface and/or groundwater supplies, and perhaps to recycled water supplies, of other jurisdictions located outside of San Francisco that will increase system reliability and provide regional water management benefits during times of water supply shortages. As these projects are developed and designed, they will be reviewed to determine the appropriate level of environmental review."

If you have any questions, please feel free to call Dave Requa, District Engineer at 925.875.2244.

Sincerely,

Bert L. Michalczyk
General Manager

cc: Jill Duerig, General Manager – Zone 7 Water Agency

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EAST BAY MUNICIPAL UTILITY DISTRICT

August 27 2007

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CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
M E A

Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103-2479

Re: Draft Program Environmental Impact Report for the San Francisco Public Utility Commission's Water System Improvement Program

Dear Mr. Maltzer:

East Bay Municipal Utility District (EBMUD) appreciates the opportunity to comment on the Draft Program Environmental Impact Report (EIR) for the San Francisco Public Utility Commission's Water System Improvement Program. Even though the property is located outside of EBMUD's Ultimate Service Boundary and Service Area, EBMUD requests to be kept on the project mailing list, to receive the Final EIR and Mitigation Monitoring and Reporting Plan, and to reserve the option to comment at the certification hearing. 01

If you have any questions concerning this response, please contact David J. Rehnstrom, Senior Civil Engineer, Water Service Planning at (510) 287-1365.

Sincerely,

William R. Kirkpatrick
Manager of Water Distribution Planning

WRK:TNS:sb
sb07_239.doc

375 ELEVENTH STREET • OAKLAND • CA 94607-4240 • TOLL FREE 1-866-40-EBMUD

East Bay Regional Park District

2950 PERALTA OAKS COURT PO BOX 5381 OAKLAND CALIFORNIA 94605 ... 569 4319 TDD 510 633 0460 WWW.EBPARKS.ORG

October 1, 2007

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CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
MEA

San Francisco Planning Department
Attn: Paul Maltzer, Environmental Review Officer
WSIP PEIR
1650 Mission Street, Suite 400
San Francisco, CA 94103

Sent Via E-Mail on 10.01.07
(wsip.peir.comments@gmail.com)

RE: EAST BAY REGIONAL PARK DISTRICT (EBRPD) COMMENTS ON SFPUC WATER SYSTEM IMPROVEMENT PROGRAM (WSIP) DRAFT PEIR

Dear Mr. Maltzer:

12.3-118

Thank you for providing East Bay Regional Park District ("District") with a copy of the Draft Program Environmental Impact Report (DPEIR) for San Francisco Public Utilities Commission's (SFPUC) WSIP Project. The District owns or manages several parks that abut San Francisco Water District (SFWD) watershed lands and leases 3,812 acres of land from SFPUC as part of the Sunol and Ohlone Regional Wilderness parks. Scoping comments were previously submitted to SFPUC by the District for the following projects that are directly or indirectly related to the WSIP Project:

- October 12, 2005 – Scoping comments for SFPUC Water System Improvement Program.
- November 9, 2005 – Scoping comments for SFPUC Calaveras Dam Replacement.
- August 16, 2007 - Scoping comments for SFPUC Habitat Reserve Program.
- September 4, 2007 – Scoping comments for Sunol valley Water Treatment Plant.

The District's Master Plan establishes its commitment to preserve natural and cultural resources, open space, parks and trails for enjoyment and recreation for generations to come. Changes to management practices or construction of new facilities within the watershed could affect the resources the District manages in and around SFWD's

watershed lands. Based on the project description, analysis and maps provided in the DPEIR ("PEIR"), WSIP projects associated with the Sunol Valley Region and projects contributing to biological and water quality impacts to Alameda Creek are of particular concern to the District for managing resources in the following regional parks:

1.	Sunol Regional Wilderness	6,858 acres
2.	Ohlone Regional Wilderness (including camp Ohlone)	9,736 acres
3.	Mission Peak Regional Preserve	2,998 acres
4.	Vargas Plateau Regional Preserve	1,030 acres
5.	Quarry Lakes Regional Recreation Area	538 acres
6.	Coyote Hills Regional Park	978 acres
		(Total: 22,138)

The District has extensive experience in managing and enhancing natural and cultural resources and open space on more than 97,000 acres of land and 1,100 miles of trails in Alameda and Contra Costa County. We recognize the SFPUC's commitment to provide a reliable water supply to its customers and the challenges it faces in constructing and operating the infrastructure needed to meet this demand in a fashion that minimizes impacts on the environment. In continuing with its cooperative relationship with SFPUC in managing open space and watershed lands, we provide the following comments for consideration under the California Environmental Quality Act for the Water Supply Improvement Program:

I. Recreation:

The PEIR establishes significance standards related to recreation and considers that implementation of the proposed program would have a recreational impact if it were to cause environmental impacts (such as air quality or noise effects) that would indirectly result in deterioration in the quality of the recreational experience (PEIR, P. 4.12-17). In determining whether project impacts may deteriorate the quality of the recreational experience it is necessary to understand the types of activities that are associated with the "recreational experience". Our Master Plan describes recreational activities that its park users experience while enjoying the lands it manages - these activities include nature appreciation, hiking, biking, equestrian use, camping, picnicking, photography, painting, and birding. Any disruption or deterioration of park users experience while engaging in these activities is of concern to the District and may result in a significant environmental impact under CEQA. 01

The PEIR does not recognize that there are several impact categories, such as traffic, air quality, visual/aesthetics, biological resources and noise that could disrupt or deteriorate the experience of park users as a result of the project. Other than a brief discussion of construction impacts in Volume 2 (PEIR, p. 4.12-18) and combined recreational and visual/recreational impacts in Volume 3 (PEIR, PP. 5.4.7-1 and 5.4.7-5), in determining the potential effects on recreational resources, the PEIR relies on the conclusions of impact findings from sections of the report that do not specifically evaluate the project's impacts on recreational resources. The PEIR's analysis of recreational impacts could be improved to help the public better understand and evaluate potential indirect environmental impacts 02 the project may have on recreational resources. The District offers the following comments regarding the projects potential impacts on recreational resources: 02 cont.

1. Traffic -

   a. Temporary closure of Calaveras Road between Geary Road and Felter Road to through traffic during construction of the Calaveras Dam project could impact recreational resources as follows:

      i. Park visitors currently enjoy a scenic drive when they come to visit Sunol Regional Wilderness with little or no congestion or delay. The proposed road closure would block access to the park from Santa Clara County and eliminate this secondary access route to the park. This alternate route is also a desirable route for nature viewing. 03

      ii. Closure of this secondary access route coupled with an increase in traffic volumes with up to 50 -190 worker vehicle trips (PEIR, P. 4.8-18) and up to 180 a.m. and p.m. peak hour truck trips would present a formidable obstacle to park users attempting to access the park. This considerable increase in traffic volume could discourage park users from visiting Sunol and Ohlone Regional Parks because of congestion, delay and associated road hazards. The impact of the road closure and increased vehicle trips on park users should be evaluated in the PEIR at a programmatic level for collective and cumulative impacts and at the project level in subsequent CEQA analysis.

      iii. The PEIR may not provide enough programmatic information to establish performance standards from which future project specific CEQA analysis can draw from. A range of mitigation measures should be identified at the program level to minimize these impacts to park visitors. Some of these measures should include:

         1. Consulting with EBRPD to evaluate the vehicle/visitor demand to Sunol Regional Wilderness and incorporate these findings into the traffic control plan for each project utilizing Calaveras Road for construction. The traffic control plan should recognize peak demand hours for park use and minimize its traffic volumes to not overlap with these hours. This may require that construction traffic be significantly restricted or prohibited during holidays and weekends. 04

         2. Prohibit or restrict construction traffic for the Calaveras Dam Replacement project (SV-2) from using Calaveras Road from the north.

         3. Requirement that SFPUC be the sole agency responsible for notifying the public of the proposed closure of Calaveras Road.

SFPUC should provide proper signage at appropriate locations, informational pamphlets and displays for park users at informational kiosks and other outreach efforts (newspaper, radio and television press releases).

         4. SFPUC should provide us with an opportunity to review and comment on the traffic control plan for each project impacting this area and coordinate public outreach and information/ notification of road closures with us well in advance of closures. Public notification efforts should also identify the specific locations, durations and alternatives means of access to public trails. 04 cont.

      iv. Most of the construction related traffic impacts related to this road closure are concluded to have a less than significant impact with mitigation because of the temporary nature of the impact. It is unclear from the PEIR if the closure will be for two to three (PEIR, P. 4.8-12; P. 4.3-15) years or two years (PEIR, P. 4.8-22). In order to ensure certainty as to the temporary nature of this closure, a performance based mitigation measure should be adopted for when the road must re-open. Without such standard, insufficient information is provided on the temporary nature of these impacts. 05

      v. It is unclear which trails will be restricted due to the closure of Calaveras Road (PEIR, P. 4.8-22) – more information should be provided in the PEIR for trail users to better evaluate and understand how the project will restrict trail use and how this impact will be mitigated to a less than significant level. 06

   b. The increase in traffic volumes from construction activities, especially truck trips on County roads and local streets, could rapidly accelerate the deterioration of roadway surfaces along haul routes. The PEIR should address how these roadway surfaces will be maintained in good condition during and after the project is completed. 07

   c. Mitigation Measure 4.16-6c does not provide a level of certainty that traffic impacts could be mitigated with the implementation of a traffic control plan because it provides too much flexibility for whether or not identified standards for the plan are required or optional (PEIR, P. 6-33). The measure says that these standards “could” include. The words “shall include but not be limited to” would result in a more predictable outcome of successfully implementing this mitigation measure. 08

2. Air Quality – Levels of fugitive dust and criteria pollutants will drastically exceed BAAQMD significance thresholds (PEIR, P. 4.9-24) as a result of the project. The District recognizes that for the purpose of the PEIR sensitive receptors are generally associated with certain land uses (schools, day-care centers, hospitals & convalescent homes). However, because of the close proximity of the construction 09

and associated vehicle traffic to Sunol and Ohlone parks, sensitive receptor consideration should be given to park visitors such as children, the elderly and active persons engaged in strenuous exercise that use the parks. Poor air quality and associated health risks may diminish the recreational experience of park users. The PEIR should analyze this potential impact at a programmatic level and provide mitigation for this potential impact in order for park users (especially young families, the elderly and joggers/cyclists) to better understand and evaluate the air quality impacts of the WSIP. 09 cont.

3. Visual/Aesthetics - Park visitors are attracted to the natural beauty and views they enjoy and experience in the parks and surrounding areas. Any actions that may diminish this experience may have a significant impact on recreational resources. The PEIR recognizes that distant views of SFPUC facilities may be available from public trails in the Sunol Regional Wilderness (PEIR, 4.3-2). However, it does not recognize these views as visual resources in its impact analysis (PEIR, P 4.3-8). Given the broad range of projects that could alter views from the Sunol and Ohlone parks, the PEIR and subsequent project level CEQA review should recognize views from these parks as visual resources and minimize project impacts to these resources. 10

Using the Alameda Watershed Management Plan (WMP) design guidelines may not sufficiently mitigate for visual/aesthetic impacts resulting from the WSIP because the WMP serves as guideline document without any clear substantive requirements for preserving visual resources – the goals and policies section of the WMP do not provide any guidance on how to apply its subjective design guidelines in a fashion that would result in the protection or preservation of visual/aesthetic resources. Where known visual impacts will occur but the exact location and design has not yet been established, such as with the Calaveras Dam Replacement project (including the borrow site & haul road), the PEIR should establish citing criteria or designate generally acceptable locations for siting/placement of these projects. 11

Policy WA-9 of the WMP requires that if new facilities require additional new locations that view shed studies be conducted to minimize, eliminate or conceal the violation of scenic values. The PEIR evaluates the applicability of this policy on page 5.4.7-4 and concludes that since no new facilities are required for the project that view shed studies are not required. This conclusion may be true for most of the WSIP, however, for the Calaveras Dam replacement project, construction impacts will result in the permanent loss of riparian natural communities in the vicinity of the new dam and associated roads, staging areas and borrow site (PEIR, P. 4.6-55). Although not technically a new facility location, the impact area necessary for the construction of this project is well beyond the original facility location and should require a view shed study as called for by WMA, Policy WA-9. EBRPD should be consulted to assist in determining the locations from which this view shed analysis should be conducted for views from District managed lands. 12

4. Biological Resources – In its effort to maintain the recreational experience of its park users, we are actively involved in management activities aimed to preserve existing plant life and fish and wildlife habitat in the parks we manage and 13

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surrounding watersheds. Reduced flows in Alameda Creek as a result of the project (PEIR, P. 5.4.7-5) is of particular concern to us because we operate and manage several parks that feature Alameda Creek as a focal recreational feature (Sunol, Coyote Hills, Quarry Lakes and Vargas Plateau). Maintaining flows in Alameda Creek to maximize benefits to amphibians and anadromous fish species in Alameda Creek is a priority for the District. 13 cont. The adopted Land Use Plan for Sunol and Ohlone Wilderness Regional Preserves calls for the District to coordinate the timing of water releases for the Calaveras Dam with the SFPUC to maximize the benefits to these species. 14 In addition to considering the recommendations of the Alameda Creek Fisheries Restoration Workgroup, as part of mitigation measure 5.4.5-3a, the SFPUC should consider giving us an opportunity to review and comment on the operation plan for establishing minimum flows for resident trout in Alameda Creek. This cooperative effort will ensure that the resource management efforts of the District and SFPUC are coordinated in a fashion that best preserves and enhances these resources. 15

The PEIR concludes that the project would result in permanent loss of sensitive riparian natural communities (PEIR, P. 4.6-55) and that implementation of mitigation measures for these impacts would compensate for these impacts. The SFPUC's Habitat Reserve Program was identified as an option for implementing offsite habitat compensation (PEIR, P. 4.6-56). We would like to reiterate our concern over the use of lands already conserved and managed for watershed protection for use as habitat mitigation lands for new capital projects (also see the August 16, 2007 EBRPD Notice of Preparation comment letter for the Habitat Reserve Program). Preservation can be a feasible means for reducing the impact of lost habitat; however, using already protected watershed lands that are already effectively managed for habitat protection (as a result of watershed and water quality management objectives) would result in a net loss of the resource. Therefore, any proposed use of existing SFPUC watershed preserve land for mitigation for project impacts may be considered inadequate under CEQA unless the mitigation were to rehabilitate or enhance disturbed or marginal habitat areas within the watershed. 16

The effectiveness of conservation easements over private lands may be insufficient for ensuring long-term management and enhancement of habitat due to the difficulty associated with enforcing land use restrictions on present and future property owners. In addition, public access is generally not allowed on such lands, even when acquired with public funds. Fee purchase of mitigation lands will ensure that there are no problems enforcing land use restrictions and assuring that long-term management can occur. 17

5. Noise - An increase in 5dB CNEL over existing noise levels is generally considered a significant noise impact. The PEIR should evaluate noise impacts to park users in this context. Construction activities and increased traffic volumes should be evaluated for noise impacts to park users where haul roads or construction activities will be audible from parks. 18

II. General Comments:

1. The PEIR should recognize that regional parks have land use plans that guide the management of our parks. 19

2. The PEIR should address if some of the WSIP projects would need an encroachment permit from EBRPD where access is needed to District owned properties and trails (lands that are not leased by EBRPD from SFPUC) - it is unclear from the maps provided if any WSIP project will encroach onto District property (also see comment II.3 below). 20

3. The PEIR states that the Irvington Tunnel (SV-4) would tunnel below a portion of Mission Peak Regional Park (PEIR, P. 4.12-23), however, the maps provided indicate that this project is nearly a mile north of Mission Peak Regional Park. This statement should be clarified in the PEIR and sufficient mapping detail should be provided to show where the tunnel will cross under Mission Peak Regional Park. Providing this information will help the District evaluate the potential impacts of this crossing and determine the ownership of this portion of the park and types of approvals that may be needed. 21

4. Mitigation measure 4.5-4b is intended to prevent potential flooding impacts associated with the Alameda Creek Fishery Enhancement (SV-1). It is unclear from the project description what the project will actually involve or where it could be located. As a result, there is insufficient project detail in the PEIR to demonstrate that project impacts associated with SV-1 can be mitigated with the proposed mitigation measures. Construction of a diversion dam or concrete weir could alter the drainage of surface flows in Alameda Creek, causing flooding or siltation (PEIR, P. 4.5-39) – this impact cannot be evaluated without basic essential information such as the location of the proposed project. This deficiency may be augmented by including in the project description or as an additional mitigation measure siting criteria or generally acceptable sites that could accommodate the project without causing flooding or siltation. 22

5. Our public safety division provides fire and law enforcement/police services district wide - the Public Services and Utilities chapter of the PEIR should recognize this and include EBRPD Fire Department in the list of agencies SFPUC will coordinate with for fire suppression planning and response for construction activities, including the review and approval of traffic control plans (Mitigation Measure 4.8-1). 23

6. Based on the information provided in the PEIR, it appears that the borrow and spoils area will be located at the south end of the Calaveras Reservoir on north and east facing slopes. The PEIR should use this information to more accurately disclose the Calaveras Dam project's programmatic impacts to biological and visual/aesthetic resources. This conclusion is based on information provided in the PEIR where the location of the borrow area is identified as being at the south end of the Calaveras Reservoir (PEIR, P. 4.10-19) and north and east facing slopes in the immediate vicinity of the dam (PEIR, P4.3-38). 24

III. Clarifications/Corrections:

1. Reference to the WSIP Habitat Reserve Program (HRP) appears to be incorrect on page 6-55. Section 3.11 (Proposed Construction Schedule) is referenced for the WSIP – the correct reference is Section 3.12.3 (Page 3-84). 25

2. Page 5.4.7-1, "Alameda Creek Recreation and Visual Quality" – the PEIR does not disclose that Alameda Creek is adjacent to Vargas Plateau Regional Preserve, Quarry Lakes Regional Recreation Area and Coyote Hills Regional Park. These parks should be considered in the impact analysis. 26

We look forward to continuing our long established cooperative working relationship with the SFPUC in managing open space and watershed lands in the East Bay. We requests a copy of the FEIR when it becomes available (one hard copy and CD are preferred). Thank you for the opportunity to comment on the Water System Improvement Program Draft PEIR and the SFPUC's consideration of our comments. If you have any questions or comments, please contact me at (510) 544-2627.

Sincerely,

Chris Barton
Senior Planner
Environmental Review/GIS Department

City of Foster City

ESTERO MUNICIPAL IMPROVEMENT DISTRICT

610 FOSTER CITY BOULEVARD
FOSTER CITY, CA 94404-2222
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October 1, 2007

Mr. Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street
Suite 400
San Francisco, CA 94103-2479

Subject: DRAFT PROGRAM ENVIRONMENTAL IMPACT REPORT FOR THE SAN FRANCISCO PUBLIC UTILITY COMMISIONS (SFPUC) WATER SYSTEM IMPROVEMENT PROGRAM - (PLANNING DEPT. FILE NO. 2005.0159E)

Dear Mr. Maltzer:

The Estero Municipal Improvement District (EMID), representing 35,330 residential customers and 25,356[1] employees and business users' thank you for the opportunity to comment on the Draft Program Environmental Impact Report for the San Francisco Public Utility Commissions Water System Improvement Program - (Planning Dept. File No. 2005.0159E).

One goal of EMID's stated Policy Calendar is to "Pursue Reliable and Uninterruptible Alternative Sources of Water Supply" and the proposed Water System Improvement Program (WSIP) will help achieve this goal.

We have over 35,000 residential customers and 25,000 employees and business users that rely 100 percent on the SFPUC water supply. With the probability of a major seismic event occurring within the next 30 years, we encourage the retrofit work to begin immediately as a defined Capital Improvement Project system rehabilitation program. 01

The following are our specific review comments on referenced Tables and text:

<u>TABLE 3.3 Summary of Water Supply Assumptions & 2030 Demand Projections</u> (page 3-18) 02

On March 1, 2004, the EMID Board of Directors gave concurrence to the SFPUC Capital Improvement Program Wholesale Customers Demand Projections.

[1] Table E3.4 (page E.3-6 of DEIR for year 2005)

Mr. Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
Page 2
October 1, 2007

The concurrence form was submitted to the SFPUC in February of 2004 and the 2030 demand projection was approved for 6.8 MGD not a range of 6.20 – 6.80 MGD, this should be noted on all of the subsequent Tables that reference the range of Demand Projections. (Table 3.4; Table 7.2; Table 7.3; Table E.1.1; Table E.2.1 and Table E.2.6). 02 cont.

Text Comments:

<u>Estero MID</u> (page 7-43)

It is correctly noted that EMID and the City of Foster City city limit /boundary lines do not coincide.

This point is referenced to reinforce the text reference on page 7-43 as follows:

> "The difference between the demand study and general plan projections is "probably" due both to the general plan's horizon of 2010 and the fact EMID serves more than Foster City". 03

Based on the above, all of the Tables and text references of the population of the City of Foster City should not be used to calculate the projected water demand. All water demands and projected flows include Foster City and the portion of the City of San Mateo that is east of the Marina Lagoon. This area within the City of San Mateo includes residential, hotels, commercial/retail and office use.

<u>General Comments:</u>

EMID staff supports the Modified WSIP and concurs that it meets the WSIP goals with less environmental impacts. In addition, the adoption of the 10% rationing goal rather than the 20% goal is a much more desirable approach since our residents and business community relies on the SFPUC for its entire water supply. 04

EMID recognizes the challenges of even a 30 to 90 day water outage scenario and the threat to the public health, safety and economic impact. EMID has been working with the San Mateo County Office of Emergency Services to develop an Emergency Sanitation Annex Plan to address an extended water outage event. The importance of the complete rehabilitation of the Hetch Hetchy system cannot be ignored. Staff will continue to monitor and develop the Emergency Sanitation Annex Plan as it relates to a long-term water outage and the community sanitation needs. 05

Mr. Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
Page 3
October 1, 2007

Thank you for the opportunity to comment on the Draft EIR, we look forward to its implementation. If you need any clarifications to the above comments, please do not hesitate to contact me at 650-286-3270.

Very truly yours,

Ramon M. Towne , P.E.
Director of Public Works

cc: James C. Hardy, District Manager
Richard Marks, Community Development Director
Norm Dorais, Maintenance Manager
Ignatius Nelson, Water Superintendent
Art Jensen, General Manager, BAWSCA
Nicole Sandkulla, Senior Water Resource Engineer, BAWSCA

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Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

City of Fremont Comments - Draft PEIR Water System Improvement Program

1 message

Rene Dalton <rdalton@ci.fremont.ca.us> **Tue, Oct 9, 2007 at 10:24 AM**
To: wsip.peir.comments@gmail.com

Dear San Francisco Planning Department,

Thank you for the opportunity to comment on the Draft PEIR Water System Improvement Program. The City apologizes for the late submittal of these comments and hope that this submittal could still be considered. The City comments regarding the Draft PEIR Water System Improvement Program Project are as follows:

1. Page 4.8-13, Bay Division Region, first paragraph of the document calls for the use of cut-and-cover method for construction across major arterial streets in Fremont such as Mission Boulevard, Paseo Padre Parkway and Fremont Boulevard. City of Fremont recommends that the project consider as a first alternative jack-and- bore method at all arterial streets in Fremont and cut and cover method for residential streets. 01

2. Traffic Control Measures in addition to SFPUC Construction Measure #5 should include City Standard requirements such as CA MUTCD and 2006 Caltrans Standard Plans. 02

3. Application for encroachment permit and traffic control plan review shall be submitted two (2) months in advance to the City of Fremont. Enclosed for applicants information and use are the City of Fremont Encroachment Application and Fremont staff contact information or see the following link: 03

http://www.fremont.gov/Permits/EngineeringPermits/default.htm

4. Closure of bicycle trails and maintenance access road if there is no way to re-route the traffic at north of Paseo Padre Parkway should be coordinated with City staff, Afshin Abtahi, 510 494-4724. 04

5. Site specific plans must be submitted for all work within City limits impacting the City's transportation network. 05

Thank you for the opportunity to comment on the Draft PEIR Water System Improvement Program. If you have any questions or need additional information please contact me directly.

Sincerely,

Rene Dalton
City of Fremont
Transportation & Operations Department
39550 Liberty Street
P.O. Box 5006
Fremont, CA 94537-5006

tel. (510) 494-4535
fax (510) 494-4751
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Encroachment Permit.pdf
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CITY OF

HAYWARD

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SEP 2 0 2007

CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
MEA

September 17, 2007

Mr. Paul Maltzer
Environmental Review Officer
WSIP PEIR
1650 Mission Street, Suite 400
San Francisco, CA 94103

Subject: Comments on the Water System Improvement Program Draft Program Environmental Impact Report – San Francisco Planning Department File No. 2005.0195E – State Clearinghouse No. 2005092026

Dear Mr. Maltzer:

This letter is to provide comments on the above referenced Program Environmental Impact Report (PEIR) for the San Francisco Public Utilities Commission (SFPUC) Water System Improvement Program (WSIP). The PEIR was prepared in accordance with the California Environmental Quality Act and is now undergoing the requisite public review and comment process prior to certification. As one of the largest wholesale customers of the regional water system, Hayward has a keen interest in the certification of the PEIR and in the expeditious implementation of the system improvements, and thus offers the following comments in the spirit of cooperation and support.

The regional water system provides 100% of Hayward's water system supply to its 146,000 residents, two hospitals, over 30 educational facilities, including a state university and a community college, government centers, and numerous commercial and industrial entities. A reliable supply of water is fundamental to the health, safety, and economic well-being of our community. Hayward has taken many steps to improve its distribution and storage facilities, investing significant resources into seismic upgrades and reinforced pipelines. Now we are urging SFPUC to take the lead to increase the delivery reliability of the regional system and to take the next major step in this process by certifying the PEIR at the earliest possible date.

<u>General Comments</u>

We would first like to offer comments about the overall PEIR document. We recognize that the CEQA PEIR process functions to provide information about potentially significant environmental affects of the WSIP and possible means of reducing or

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L_Hayward

eliminating those impacts. The process is not intended to evaluate the merits of the program per se. However, the Draft PEIR can and should convey the urgent need to address the system reliability issues given the severe health, safety and environmental harm that could result from uncontrolled releases of water from reservoirs and large pipes. The potential impacts are acknowledged in the 2002 Assembly Bill 1823, the Wholesale Regional Water System Security and Reliability Act, which obligates the SFPUC to implement certain improvement projects. More recently, the severe adverse consequences and devastating environmental impacts of delayed maintenance and upgrades have been seen in catastrophic events such as Hurricane Katrina and the collapse in Minneapolis of the I-40 bridge over the Mississippi River.

In Hayward's opinion, construction of the improvements needed to improve the reliability of the water system is the most critical aspect of the WSIP. The PEIR correctly points out that much of the SFPUC regional water system was constructed in the early 1900s, and is at risk for system failure. The regional system crosses a number of earthquake faults, and yet many of the facilities do not meet current seismic standards. The regional system has already been required to significantly reduce storage in the Calaveras Reservoir due to seismic safety hazards. Additional redundancy in some critical facilities is needed to increase the reliability of water delivery, particularly in the event of an earthquake. And, while the system currently meets or exceeds existing water quality standards, upgrades are needed to maintain compliance with current and anticipated standards. The projects to address these urgent problems need to be placed on the critical path. 01

The WSIP also includes projects to provide additional water supplies to meet estimated future demand. Although Hayward's projected water consumption is expected to increase, for reasons that will be further explained, we consider the development of additional water supplies to meet demand in 2030 to be less urgent at this time. We acknowledge that there are issues to be resolved among various stakeholders regarding future demand, but given that the future demand is based on 2004 projections and long-term forecasts, and that the full demand is not expected to be realized for some 23 years, there is sufficient time to work through mutually agreeable solutions and develop appropriate agreements. We urge the SFPUC not to delay the certification of the PEIR and implementation of critical reliability projects due to issues related to future demand. 02

<u>Hayward-Specific Comments</u>

The PEIR correctly states that Hayward's projected demand in 2030 is substantial and higher than the projected growth in population and employment alone. It is important to note that Hayward's demand projections were prepared in accordance with the methodology used to estimate future demand from all wholesale customers. Hayward, like many other agencies, requested some modifications to the model to account for specific local conditions. The data that formed the basis for our requests was carefully scrutinized by SFPUC and the modeler in order to maintain the integrity of the process. The reason that the water demand estimates differ from population and employment projections are discussed in the PEIR, and it is not our intention to restate what has 03 already been described. But we do feel it is important to add Hayward's perspective to the discussion. To that end, the following paragraphs explore some of the main features of Hayward development, both residential and industrial, in order to more fully explain Hayward's unique situation, relative to many other regional water system wholesale customers.

Residential Water Demand

Hayward is the largest public wholesale customer of the regional water system. Our residents, however, have per capita water use that is among the lowest of all SFPUC's wholesale customers. Had this not been the case, the volume and percentage increases in estimated future water usage would have been lower, as the base usage would be higher. And, in spite of the projected increases in 2030, Hayward's projected per capita use in 2030 is still expected to be within the mid-range of other regional water customers. This is an important point, because Hayward is essentially expecting to "catch up" with other communities in terms of neighborhood amenities and their attendant water demands.

The lower-than-average use is due in part to the high density housing that has been built in the past, with little attention to landscaping, and because likewise many of the single-family homes have limited or no landscaping. While this scarcity of landscaping is advantageous from a water use standpoint, it is not a desirable feature for our community, and the City is actively working to change the situation. While the City is fully committed to best water conservation practices, any enhancements to the existing landscaping on these sites will inevitably result in a water use increase. 03 cont.

A recent housing needs assessment prepared by the Association of Bay Area Governments (ABAG) indicates the need for Hayward to plan for the building of nearly 3,400 housing units during the next seven years in order to keep pace with population growth. Hayward will continue to experience in-fill development, redevelopment of underutilized sites, and development of remaining large parcels within its adopted urban limit line, while some cities on the Peninsula are essentially "built out." An example of potential development that was not even in view when the demand study was prepared is the Route 238 Bypass Corridor Land Use Study to develop a plan to utilize parcels no longer needed for the Route 238 Bypass project. The study area totals over 350 acres, and the planning study for these parcels is just getting underway. Among the major study objectives is the City's desire to accommodate sufficient housing, including affordable housing, and other uses to support population increases and workforce needs for the full spectrum of the population and to reduce traffic congestion and improve air quality.

For some of the new development through the City, larger-than-average lot sizes are anticipated because of the intended design of the housing. However, even these "larger" lots are considerably smaller than in some other Bay Area communities. Also, new homes on average sized lots will have more extensive landscaping than is currently found on many existing lots. A review of actual current water usage for similar homes constructed in the past few years indicate that current water usage is between 400 to 600 gpd, compared with our average of about 300 gpd for existing homes.

However, Hayward is also committed to the principles of Smart Growth, and where appropriate, is developing neighborhoods that are compact, walkable, and transit oriented. Landscaping is intended to enhance the livability of the community. The first attachment to this letter includes descriptions of recently constructed and proposed developments in Hayward to provide a sense of the type of Smart Growth development that is encouraged. These housing developments are redevelopment projects, located on formerly underutilized sites. All of the projects are within walking distance of a Bay Area Rapid Transit (BART) station and close to retail and commercial facilities.

At the same time, existing homes are being purchased and rehabilitated, including installation of landscaping, due to the relative affordability of Hayward properties compared with those on the Peninsula or in the South Bay. And, while homes are comparatively affordable in Hayward, they are still expensive in terms of dollars, so many existing homeowners are choosing to upgrade their Hayward property to protect their investment and as a matter of pride. Some property owners who are interested in selling their properties are installing landscaping to make their homes more marketable. Residential improvements are encouraged by the City through the Housing Rehabilitation and Neighbor Initiatives Programs, which provide grants and loans for eligible projects. Hayward's General Plan expressly encourages the rehabilitation and upkeep of residential properties to generally improve property values and quality of life for residents. 03 cont.

As properties improve, water usage can be expected to rise, particularly due to increased outdoor use. Thus, the model appropriately assumes that a certain number of renovated properties would increase water usage to an average of 400 gallons per day (gpd). This is the usage that we are seeing in newly constructed homes in Hayward with typical contemporary landscaping, and still very reasonable compared with similar uses elsewhere.

It is important to emphasize that the increased residential usage does not result from "lush landscaping" with water-intensive plantings, rather it is based on installation of typically low water use plants and shrubs. In fact, the City adopted a Water Efficient Landscaping Ordinance nearly fifteen years ago to regulate the type of plant materials and irrigation systems that are used in new development and has a Landscape Architect on staff to ensure conformance with the Ordinance. This Ordinance will be updated in accordance with the provisions of Assembly Bill 1881, and Hayward is also developing a Bay Friendly Landscaping Ordinance. The City provides classes and other resources to educate and encourage water efficient landscaping. Nonetheless, the City is committed to improving the overall appearance of the City, similar to the appearance of many Peninsula and South Bay communities, and we realistically expect that the water usage for new housing will exceed that of our current residential averages as a result.

Industrial Water Demand

Regarding this customer sector, Hayward's industrial development patterns differ from those in Peninsula cities. Although Hayward's business population grew in the 1990s, we did not have nearly the same level of economic development experienced in other communities. While a number of business parks and industrial sites were built, a significant portion of this industrial space was and continues to be underutilized for warehousing and other similar uses. There was much less high tech manufacturing and other water-intensive uses in Hayward that characterized industrial development in other communities. A key General Plan strategy is to reverse this practice and to focus business attraction and retention efforts on "…employment generators, high performance, fast growing firms and community-service retail, as well as high technology and other industries that will enhance the local economy." Hayward is currently implementing this strategy.

In recent years, the high cost of space and housing has prompted a number of manufacturing and food processing businesses, typically large water users, to leave the more expensive Peninsula and South Bay areas. Many have chosen to relocate to the Central Valley and other lower cost regions within the State, or to leave California altogether. However, some have opted to move their operations to more affordable cities within the Bay Area, such as Hayward, with access to needed workforce and public transportation. This transition has created a water allocation opportunity in many Peninsula and South Bay cities, as the uses are typically replaced by much less water use intensive research and development and office complexes. However, this redistribution of industrial use has and is expected to continue to shift some water demand to Hayward, not in the form of one or two high water use businesses, but in the situating of a variety of moderate and steady manufacturing entities. 03 cont.

Hayward's growing industrial base reflects much diversity in terms of types of industries. As noted in the previous paragraph, there are no "mega" water-using businesses in Hayward, the closure of which would cause a significant decline in overall water usage. Rather, there are an increasing number of food and beverage processors, biotechnology firms, and high tech companies that, in aggregate, contribute significantly to Hayward's industrial water demand. This is an important distinction between Hayward and some other Bay Area communities where a few very large businesses consume a significant portion of water, and their closure or reduced production can cause a significant reduction in water use.

Conclusion

Hayward has been and will remain committed to responsible and cost effective water conservation. The second attachment lists a number of programs that have been implemented in the past or are currently underway.

Recognizing that the desire for improved landscaping and other home features, and the City's desire to attract businesses, must be balanced with careful management of resources, the City is currently working closely with other SFPUC wholesale municipal customers, through BAWSCA, to develop cost effective regional water conservation programs and will continue to implement City-specific programs as well. The second

attachment describes a number of programs that have been implemented in the past or are currently underway.

We need to be mindful of the fact that the projections were developed in 2004 for estimated water use in 2030, over 25 years in the future. A 25-year planning horizon suggests that some of the underlying assumptions will change over the years. The estimates were prepared using the best data available and our current knowledge about local conditions and development patterns. However, regardless of the residential and business development that occurs in our community, Hayward's long-standing commitment to water conservation and responsible water use will remain unchanged. 03 cont.

We appreciate the opportunity to provide these comments.

Sincerely,

Robert A. Bauman
Director of Public Works

cc: Fran David, Acting City Manager
Susan Daluddung, Director of Community and Economic Development
Arthur Jensen, Bay Area Water Supply and Conservation Agency

Attachments: Smart Growth Development
Water Conservation Program Descriptions

CITY OF
HAYWARD
HEART OF THE BAY

12.3-127

CITY OF HAYWARD
SMART GROWTH DEVELOPMENT

The City of Hayward is committed to the Smart Growth principles of developing neighborhoods that are compact, walkable, mixed use and transit oriented. A number of recently constructed developments and approved conceptual plans illustrate this commitment.

Atherton Place Townhomes

Built in 1997, this 83-unit townhome project is bounded by C Street, D Street and Atherton Street. It is adjacent to the Hayward BART station and downtown Hayward.

City Walk Townhomes

Completed in 2003, this 77-unit housing development is located at the corner of C Street and Watkins Street, just across from the BART Station. This project represents the City's continuing efforts to repopulating the downtown core with a customer base through the construction of higher density housing.

Renaissance Walk

Renaissance Walk is a city block bounded by C Street, D Street, Atherton Street, and Watkins Street. A total of 46 condominium units were constructed in 2005, in a series of four-plex, tri-plex, and duplex buildings that appear as larger homes in traditional California styles. The homes are within walking distance of BART.

L_Hayward

Studio Walk

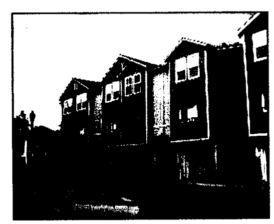
This development of 70 loft units, completed in 2005, brings a new housing product to Hayward. The project density is 35 units per net acre, with three story (40 foot) high buildings composed of 1,454 square foot, two story units at grade and 1,667 square foot flats above. The project maintains a street presence with entry doors providing direct access to Atherton Street. It is within walking distance of BART.

Amador Village Condominiums

This 155-unit rental condominium development in the Burbank/Cannery area was completed in 2000. It is located on Amador Village off of D Street and is within walking distance of the Hayward BART Station and the Hayward downtown.

Pinnacle City Centre

This 192-unit rental condominium development located in the Burbank/Cannery area at the corner of C and Grand Streets was completed in 1999. It is located approximately two blocks from the Hayward BART station and within walking distance of downtown.

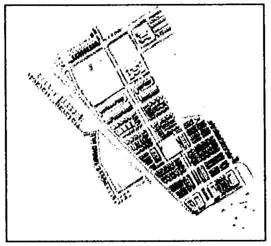


Grand Terrace

These 235 townhomes were approved by the City Council in July of 2000 and continue the contemporary adaptation of the row house concept developed at Atherton Place. Perimeter units are oriented to face the street and have individual raised porches. At a net density of about 35 units per acre, these two- and three-bedroom units are within walking distance of the downtown BART station.

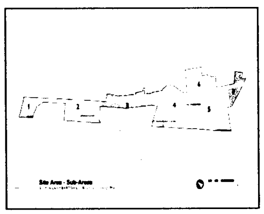
12.3-128

Cannery Area Plan Implementation



The Cannery Area, located just west of downtown Hayward is an older industrial area now surrounded by the Burbank neighborhood. In 2001 the City adopted the Cannery Area Design Plan. The Plan's primary focus is the redevelopment of the central 55+ acres which will include the development of approximately 750-850 housing units, a new, elementary school, and an expanded Cannery Park. Key elements of the Plan include access to the nearby Bay Area Rapid Transit (BART) and AMTRAK/Capitol Corridor lines and neighborhood retail uses to serve the residents of the community. The Local Government Commission's Center for Livable Communities recognized the Cannery Plan with an Ahwanee Award in 2001, noting that the Plan "demonstrates many of the Ahwanee Principles in a single project. The Plan will provide a seamless connection to the surrounding neighborhoods."

South Hayward BART/Mission Boulevard Plan



The land use plan for the Mission Boulevard Corridor between Harder Road and Industrial Boulevard and including the South Hayward BART station was completed in June 2006. Among the goals of the Plan is to "provide for intensified land uses to encourage the development of a transit-friendly, smart growth area near an existing BART station." The planning area encompasses about 240 acres. The number of new housing units is expected to range from 1,600 to 3,200, depending on development proposals.

L_Hayward

CITY OF
HAYWARD
HEART OF THE BAY

CITY OF HAYWARD
WATER CONSERVATION PROGRAM

The City of Hayward has a long-standing and active commitment to water conservation. As an original signatory to the California Urban Water Conservation Council Memorandum of Understanding (MOU), the City has implemented a number of cost effective demand management measures and consumer education programs to reduce water usage among our residential, commercial and industrial customers. In addition to our external customers, the City has also put into place water conservation practices and resources to reduce usage at City properties, most notably in landscape irrigation and system leak detection. The Water Conservation Program's success is demonstrated by the relatively low per capita consumption.

The following is a brief summary of the programs and practices that the City is currently implementing, or has offered in the past, to reduce water use.

<u>Appliance and Fixture Replacements</u>

- Household Fixture Replacements. Water conservation kits, consisting of water efficient showerhead, faucet aerators, toilet displacement bags, and leak detection tablets were made available at no cost to customers. About 5,000 kits were distributed in 1999 and 2000. More recently, water conserving devices have been distributed to families as part of the Water Wise school education program (see below). Similar to the original water conservation kit in content, the Water Wise kit provides high quality fixtures and water use audits and activities.

- Residential Toilet Replacement Rebates. The City offered rebates for the replacement of an existing toilet with a 1.6 gpf model between 2000 and 2003. As a result, close to 900 toilets, using up to 7 gallons per flush, were replaced with water efficient units.

- Commercial and Multifamily High Efficiency Toilet Replacements. The City participates in a regional program to replace existing toilets and urinals with high efficiency models in business and multifamily settings. This is a direct install program. The program experienced some start-up delays during its first year and is expected to be active in 2007-08.

- Residential Washing Machine Rebates. This regional program provides rebates for the purchase of an Energy Star rated clothes washing machine. The City has participated since its inception in 2001 and has issued 1,300 rebates to date.

- Commercial Washing Machine Rebates. Through the CUWCC Smart Rebates Program, the City is offering rebates for the purchase of a commercial washing machine, typically found in coin operated laundries and multi-family laundry facilities. The City has been allocated a total of 25 rebates based on available CUWCC funding and program participation.

- Cooling Tower Controller Rebates. Again through the CUWCC Smart Rebates Program, a financial incentive is offered for the installation of a cooling tower control to increase the number of cycles prior to discharging water used for cooling purposes. This program is getting underway at this time.

- Pre-Rinse Spray Valves. About 150 food related businesses, more than one-half of all such businesses in Hayward, have been equipped with a pre-rinse spray valve to reduce the water used for cleaning dishes and cooking utensils. The valves, which were installed between 2003 and 2007, were provided at no cost to the businesses

Price Signals

- Water Usage Rates. The City introduced an inclining block water rate structure in 1993 to encourage water customers to reduce their use. The rate schedule originally had two tiers; in 2003, it was expanded to three tiers. The first tier (1 to 10 units) rate is the base rate. The cost of second tier usage (11 to 30 units) is about 18% above the first tier, while highest block (over 30 units) has a substantially higher cost, at about 23% over the second tier. About 25% of the City's water is sold at the two lower rates.

  The current annual average residential water use in Hayward is 20 hundred cubic feet (ccf) per billing period, which results in a water use charge of $46.80. Customers whose usage reaches the ceiling amount within the second rate tier see a water use charge of $72.10 or 54% above the annual average. If an additional 10 units of water is used in a billing period, the water usage charge would climb to $103.30, more than twice as high as the average billing. While the issue of price signals and price elasticity is still being explored in the water conservation community, Hayward's water rate structure and water use rates deliver incentives to minimize water use.

- Service Charge. Hayward has one of the lowest service (or fixed) charges among Bay Area water agencies. This is significant because it means that customer billings are primarily driven and affected by water use. The basic charge for a 5/8" meter was, for many years, held at $3.50 per month. A modest increase to $4.50 was approved effective October 2007. In FY 2006-07, the revenue for water service totaled $22 million. Of that total, only about 10% was derived from service charges, with the remainder coming from water usage charges. The City remains committed to a rate structure in which the fixed charges remain low and most of the operating revenue is obtained through use-based fees.

12.3-129

- Wastewater Charges. The City of Hayward is one of the few agencies which offer a residential wastewater rate structure that is based on wastewater discharge and provides an incentive to minimize water use. Customers that use ten or fewer units of water in a billing period are automatically billed the lowest (Lifeline) sewer rate, which is about 30% of the top rate. Customers that use between 11 and 15 units pay the middle (Economy) rate, which is about 60% of the top rate. The top sewer rate is applied when water usage exceeds 15 units. This is a practical method for implementing wastewater rates that are aligned with water usage, since wastewater metering is still impractical. Customers do not need to apply for the lower wastewater rate tiers; they are applied automatically based on meter readings.

Consumer Education

- Water Efficient Landscape Classes. The City sponsors a class each year, taught by a noted expert in water efficient landscaping, for residential customers. This past year, close to 90 people expressed interest in the class, exceeding the City's best estimate based on participation in previous years and in other jurisdictions. Accordingly, in the future we will increase the number of sessions to accommodate more participants.

- Water Efficient Landscaping Information. Hayward offers residential free brochures and a GardenSoft CD to encourage water conserving landscaping. The CD is a particularly effective tool for helping customers design and install a landscaping plan that does not sacrifice beauty for water efficiency. The information and CDs are available through the City's website, Revenue office, at special events, and by request.

- School Education. The City offers the WaterWise curriculum (developed by Resource Action) to fifth grade classrooms. This program includes teaching aids, activity books, and CDs. Students also receive high quality showerheads and faucet aerators for installation in their homes. The response to the program has been excellent. In two years, the program has been provided to 35 classrooms, reaching nearly 1,000 students.

- Water Efficient Landscape Ordinance. The City Council adopted a Water Efficient Landscape Ordinance in 1993 to ensure that landscaping in new development met certain standards for water efficiency. The City has on staff a landscape architect who reviews landscaping plans for conformance with the ordinance and ensures that the final installation meets the City's standards. (Note: The City will update the Ordinance, in accordance with Assembly Bill 1881, when the model is available from the Department of Water Resources.)

- Special Events. The City participates in a variety of special events, including local fairs, festivals, and business activities, to provide information and devices to encourage water conservation.

- Billing Inserts. Customers receive information with their bills providing ideas for conserving water, both indoors and outdoors. The inserts are typically purchased from the AWWA and thoroughly researched and credible.

- Consumption Tracking. Water bills enable consumers to track their water use from year to year by providing information about water use for the same period in the previous year.

- Website Information. The City's website includes information about the City's current water conservation programs and general water conservation ideas, including a link to H2Ouse.org, the CUWCC's innovative conservation website.

City-Specific Water Conservation Activities

- Landscape Irrigation Staffing. The City funds two dedicated positions within the Water Operating Fund to manage irrigation systems on all public streets, public right-of-ways, and City-owned properties. These staff members monitor and maintain the systems to ensure that watering times are appropriate for the weather conditions and the sprinkler heads are correctly adjusted to minimize waste.

- Evapotranspiration (ET) Controller Installations. To date, the City has installed about 10 ET controllers to manage watering needs, particularly in new developments. Ultimately the City plans to install 75 such controllers. Currently, water savings of about 25 percent at each site are being achieved. Once the system is fully upgraded and centrally controlled, water savings are expected to be in the range of 40%.

- Leak Detection Survey and Repair. In order to address the issue of unaccounted-for-water, the City retained a contractor in 2006-07, to identify leaks through a comprehensive leak detection survey. This work had been previously done in 1995. The survey indicated that the distribution system is quite sound, with just a very few small leaks located. Hence, the City is planning to concentrate next on meter testing and replacement to reduce the difference between wholesale water purchased and retail distribution.

In addition to continuing its existing programs, Hayward is currently evaluating and considering other efforts to increase water use efficiency, including continued participation in regional rebate and education programs. Hayward will be implementing all actions required by Assembly Bill 1880, including updating the Water Efficient Landscape Ordinance and requiring separate irrigation meters under certain conditions.

TOWN OF HILLSBOROUGH

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CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
M E A

DEPARTMENT OF PUBLIC WORKS

September 27, 2007

Mr. Paul Maltzer
Environmental Review Officer, WSIP, PEIR
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

RE: Comments for the Draft Program Environmental Impact Report (DPEIR)
Water System Improvement Program (WSIP)

Dear Mr. Maltzer:

The Town of Hillsborough supports the overall goals and objectives of the San Francisco Public Utilities Commission Water System Improvements Program to enhance the reliability, seismic performance, water quality, as well as cost effectiveness of the water delivered for the regional water system, as outlined in the Draft Program Environmental Impact Report. The Town finds the DPEIR to be a comprehensive document analyzing the environmental impacts of the projects and alternatives as required by law. The Town has the following comments: 01

- The DPEIR should further analyze and discuss the seismic performance and potential failure of the existing system and the critical importance of completing the WSIP to protect the public health and safety of the people who live in the Bay Area. The regional system is the main source of water for the Town and the region. The DPEIR does not discuss the need and urgency to repair the regional system to avoid failure in a significant seismic event. There is a 60 percent probability of a major earthquake occurrence in the Bay Area from now to 2030 that could disrupt the regional water system for 30 to 60 days. We recommend that the DPEIR establish the economic impact of not completing the projects (excluding injuries and loss of life) compared to the cost of system reconstruction, in a seismic event. The DPEIR should discuss the catastrophic impact on public health and safety in a significant seismic event and the need for expeditious and urgent repair of the regional system consistent with AB 1823. Furthermore, we request that SFPUC proceed with completion of improvements to the regional water system as soon as possible and avoid any delays arising out of re-evaluation of the projects. 02

San Francisco Planning Department
Mr. Paul Maltzer
September 27, 2007
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03

- The DPEIR evaluates several alternatives to the project as required by CEQA. The Town of Hillsborough supports the modified WSIP as the preferred alternative. This alternative would reduce key impacts on natural resources along the lower Tuolumne River, Alameda Creek below the diversion dam at Pilarcitos Reservoir and Creek as well as Crystal Springs Reservoir and will continue to meet the WSIP primary goals and objectives. This alternative will also maximize the use of the existing system and facilities without requiring construction of additional facilities or substantially increasing

04

the energy demand to meet the needs of the customers. The Town of Hillsborough also supports the Bay Area Water Supply and Conservation Agency's (BAWSCA's) proposal that the final DPEIR further describe and analyze the DPEIR's Modified WSIP Alternative (the environmentally superior alternative) and that the final DPEIR explore the feasibility of the Bay Area water customers financially supporting water conservation with agricultural interests on the lower Tuolumne River that will result in no net decrease in flows on the lower Tuolumne. BAWSCA's proposal is to conserve even more agricultural water resulting in a net increase in lower Tuolumne River flows. This additional water could then be available to support greater flows in the lower Tuolumne River, deployed at times and in volumes most beneficial for salmon and other important species in the lower Tuolumne River. Under BAWSCA's proposal, the implementation of the WSIP can improve, rather than degrade, flow conditions in the lower Tuolumne River.

05

We also recommend that DPEIR discuss the possibility that the new contract with the wholesale purchasers while establishing fixed entitlements, that SFPUC consider transferability among purchasers in the new contract. The Town also supports Bay Area Water Supply and Conservation Agency to take the lead on conservation regionally funded through water rates.

06

- The DPEIR discusses the water supply needs of the region by year 2030. DPEIR references the Water Supply Master Plan (SFPUC 2000) as a guidance document for the SFPUC service area, and SFPUC Water Supply Options Report (2007), the most current evaluation of water supply for the region. The Town acknowledges the need to evaluate the future water supply needs, however, we are concerned that the priority should remain on fixing the regional system's performance and reliability.

  The need to plan for 2030 water supply should not delay meeting the level of service goals to ensure the current regional system will continue meeting the existing needs. We further recommend the level of service goals for the existing system be attained sooner, even if it results in delays in meeting 2030 water supply goals. The Town strongly urges SFPUC to proceed with the program expeditiously to ensure reliable

07

delivery of water to the SFPUC customers. The water supply analysis for 2030 also assumes a 20% rationing to allocations during drought periods. We request that a 10%

San Francisco Planning Department
Mr. Paul Maltzer
September 27, 2007
Page 3

07 cont.

rationing variant be considered since it will increase the reliability of the system in drought years and will significantly reduce the economic impact on the region.

08

- The WSIP as proposed will result in construction and upgrade of facilities within the Town of Hillsborough boundaries. We request SFPUC to address the following issues upon better definition of each project within the Town:

  - Public Outreach
  - Air Quality
  - Traffic
  - Noise
  - Impact on Schools
  - Construction dewatering and impact on local facilities
  - Erosion Control and Geology

09

- The Town of Hillsborough has taken significant measures to comply with the SFPUC's recent request for a 10% BAWSCA and member agencies voluntary reduction in water usage and actively support implementation of additional water conservation program measures and water recycling to make effective use of limited water supplies. Following are some examples of our efforts:

  Smart Irrigation Month: The Town participated in the Irrigation Association's campaign to reduce outdoor water usage. Weekly articles on outdoor water conservation appeared in the "What's New" section of the Town's website. Town residents also received a "Smart Irrigation Month" brochure with their utility bill in July. An article also appeared in the Town's quarterly newsletter.

  Water Wise Gardening CD: The Town purchased five hundred CDs for dissemination to interested Town residents. The Town advertised the CDs in its quarterly Newsletter, on its website and in Town Hall itself.

  Water Wise Education Kit: The Town purchased one-hundred and eighty Water Wise Education Kits for FY 2007/08, enough for every 5th grade student attending the Hillsborough City School District.

  Be A Water Saving Hero: The Town participates in the regional awareness campaign by posting campaign information on the Town website, inserting brochures in residents' utility bills and making the brochures available to Town residents at Town Hall.

  Rebate Programs Washing Machines: The Town continues to participate in the BAWSCA sponsored washing machine rebate program.

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Mr. Paul Maltzer
September 27, 2007
Page 4

Landscape Audit Program: The Town has applied for, was accepted to participate in and has dedicated funding for, the BAWSCA Landscape Audit Program. Funding has been dedicated by the Town Council for each of the next three fiscal years.

Water Main Flushing: After some study and consideration, the Town has combined its water main flushing and fire flow testing activities. This has resulted in a significant reduction in water being discharged into storm drains by Town staff during routine maintenance and testing of its water infrastructure.

Town Hall Irrigation System: The Town is refurbishing the Town Hall landscape irrigation system to ensure water conservation.

Water Conservation Garden: The Town is refurbishing its Water Conservation Garden so it will continue to serve as a model example for Town residents interested in drought tolerant landscaping.

Green Building Guidelines: The Town is in the process of considering Green Building guidelines for future Town facilities and for certain residential construction projects. Water conservation is a significant component of these guidelines.

Grey Water Systems: The Town is researching "closed" grey water systems with potential residential application. This system uses grey water captured from the bathroom sink for toilet flushing. The Town will purchase and test at least one of these systems in its own facilities. 09 cont.

Smart Irrigation Controllers: The Town continues to research Smart Irrigation Controllers and model rebate programs. The Town purchased and tested a Smart Controller at its Vista Park facility. The Town hopes to incorporate a Smart Controller rebate program into its Landscape Audit Program in the coming fiscal year.

Water Flushing Conservation Methods: The Town continues to research conservation solutions for the Town's water main flushing activities. The Town is also researching the placement of mobile water tanks to hold flushed water for use by Town staff and building contractors.

Low Flow Devices: The Town continues to research innovative low flow devices that may be of interest to our residents. The results of our research will be made available on the Town's website.

Town Website Water Conservation Page: The Town is in the process of improving its Public Works web pages, which will include a dedicated "water conservation" page. Residents will find in depth water conservation tips and guidelines on this page, as well as links to other water conservation websites.

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San Francisco Planning Department
Mr. Paul Maltzer
September 27, 2007
Page 5

We look forward to working with SFPUC and all other stakeholders' for expeditious improvements to the regional water system.

Sincerely,

Cyrus Kianpour, P.E., PLS
City Engineer

cc: John Fannon, Council Member
Martha DeBry, Public Works Director

LOS ALTOS HILLS
COUNTY FIRE DISTRICT

Los Altos Hills County Fire District

P.O, Box 1766 Los Altos, CA 94023-1766

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CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
M E A

September 21, 2007

San Francisco Planning Department
Att: Paul Maltzer, Environmental Review Officer, WSIP-PEIR
1650 Mission Street, Suite 400
San Francisco, CA 94103

Subject: San Francisco Water Supply Improvement Program (WSIP)
Comments on Programmatic Environmental Impact Report (PEIR)

Dear Mr. Maltzer:

The Los Altos Hills County Fire District draws water from Purissima Hills Water District and the California Water Service systems, both of which are affected by the WSIP. The PEIR addresses regional water supply issues that are critical to reliable water supply for fire fighting in Los Altos Hills. Without a reliable water supply, there are billions of dollars of property at risk of fire including Foothill Jr. College with 18,000 enrolled students, a public elementary school, a large private school, over 3,000 high value residential buildings and thousands of acres of hilly woodland and grassland.

The recent Stanford Hills fire and the Stevens Creek wildfires on our borders posed grave threats to our community, and could have created fire disasters. The Town includes extensive acreage of undeveloped hillside land and borders regional parkland and preserves that provide wildlife habitat for many species, all of which are at risk of loss by wildfire. 01

Recent court orders to "stop pumping" from Delta water sources to preserve fish spawns have severely reduced the reliability of the Delta supply and could affect water availability to California Water Service. This plus the lack of usable groundwater in our area, accentuate the need to improve the reliability of the SFPUC's Hetch–Hetchy and Calaveras supplies, as the only viable supply available for fire fighting. While the Purissima Hills Water District has adequate local storage capacity, it is totally dependent on SFPUC's supply to fill its tanks.

Growth within the City of San Francisco and the communities served by the SFPUC's regional water supply system is expected to require an increase in the amount of water drawn from an already over-utilized Tuolumne River supply. The District has unresolved reservations about increases in the drawdown of water from this resource. The District encourages the SFPC and the SFBoS to consider conservation measures and additional restrictions on water use in order to protect the valuable natural resource. 02

Our District already has firmly established water conservation measures in place including water-saving foaming apparatus on all of our trucks, and protocols to minimize water use when testing

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hydrants. All pressure and flow testing of hydrants by our staff is coordinated with the water company personnel so that main flushing and bacterial testing is done simultaneously, saving water. 02 cont.

Los Altos Hills County Fire District therefore urges the San Francisco Planning Commission, and the San Francisco Board of Supervisors to approve and certify the PEIR without further modifications or variation. We urge rapid completion of the environmental review process and implementation of WSIP improvements to reduce the extreme risk of disastrous wildfire and economic catastrophe resulting from lack of a reliable water supply. 03

Very truly yours,

Dorothy Price

Dorothy Price, President
Los Altos Hills
County Fire District

LOS ALTOS HILLS
CALIFORNIA

September 14, 2007

RECEIVED

SEP 2 5 2007

CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
MEA

San Francisco Planning Department
Att: Paul Maltzer, Environmental Review Officer, WSIP-PEIR
1650 Mission Street, Suite 400
San Francisco, CA 94103

Subject: San Francisco Water Supply Improvement Program (WSIP)
Comments on Programmatic Environmental Impact Report (PEIR)

Dear Mr. Maltzer

The PEIR addresses regional water supply issues that are critical to reliable water supply and fire safety in Los Altos Hills. Los Altos Hills is served by Purissima Hills Water District and by California Water Service systems, both of which are affected by the WSIP. The lack of a reliable water supply places billions of dollars of property at risk of fire including Foothill Jr. College with 18,000 enrolled students, a public elementary school, a large private school, and over 3,000 high value residential buildings.

The recent Stanford Hills fire and the Stevens Creek wildfires posed grave threats to our
community. The Town includes large acreage of undeveloped hillside land and borders regional 01
parkland and preserves that provide wildlife habitat for many species, all of which are at risk of
loss by wildfire.

Recent court rulings and "stop pumping" orders on Delta water sources to preserve fish spawns have severely reduced the reliability of the Delta supply. We therefore cannot rely on the Santa Clara Valley Water District, and there is no usable groundwater resource in our area. This accentuates the need to improve the reliability of the SFPUC's Hetch–Hetchy and Calaveras supplies, as the only viable supply available to us.

Planned growth within the City of San Francisco and the communities served by the SFPUC's
regional water supply system is expected to require an average of 300 mgd by the year 2030.
This can be met utilizing the Tuolumne River supply within the limits of the SFPUC's legally 02
entitled water rights, water transfers and conservation through 2030 according to the proposed
WSIP.

"Smart Growth" has been a key principle in Los Altos Hills since its incorporation in 1956, with
a minimum residential lot size of 1 acre. The resulting low density development has reduced
water demands per acre by 20 to 100+ percent over water consumption in neighboring cities 03
where six to ten dwellings or more per acre is the norm. While per capita water usage appears
higher, the net effect is that planned growth in Los Altos Hills has reduced total demand for the
area.

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Conservation measures are already firmly established in irrigation practices, in plumbing codes, in landscaping design, plan review and water system operations. Further water savings may be marginal when compared to the reductions already achieved. For example, the two schools with large athletic fields in our Town have already converted to artificial turf to save water. Nevertheless conservation continues to be a high priority and recent initiatives are listed below.

- Resolution 122-06 was enacted in December 2006 coordinating efforts with Purissima
  Hills Water District to reduce water usage on new landscape projects; promote water
  conservation through public education and consider incentives for property owners to 04
  conserve water.
- The Conservation Element of the Town's General Plan was revised in April 2007 to improve protection and conservation of the Town's water resources including five policies, nine programs, and adoption of best management practices.
- A new Water Conservation Subcommittee was formed to develop and implement the Council adopted resolution, policies and programs.

Los Altos Hills therefore urges the San Francisco Planning Commission, and the San Francisco
Board of Supervisors to approve and certify the PEIR without further modifications or variation.
We urge rapid completion of the environmental review process and implementation of WSIP 05
improvements to reduce the extreme risk of catastrophe resulting from a seismically deficient
and unreliable water supply system.

Very truly yours,

Craig A.T. Jones
Mayor
Town of Los Altos Hills

KELLY FERGUSSON
MAYOR

ANDREW COHEN
MAYOR PRO TEM

JOHN BOYLE
COUNCIL MEMBER

RICHARD CLINE
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CITY OF MENLO PARK

701 LAUREL STREET, MENLO PARK, CA 94025-3483
www.menlopark.org

October 1, 2007

San Francisco Planning Department
Attention: Paul Maltzer, Environmental Review Officer, WSIP PEIR
1650 Mission Street, Suite 400
San Francisco, CA 94103

Subject: Comments on the Draft Program Environmental Impact Report (PEIR) for the San Francisco Public Utilities Commission (SFPUC) Water System Improvement Program (WSIP)

Dear Mr. Maltzer:

Thank you for the opportunity to comment on the WSIP PEIR. The City of Menlo Park appreciates your willingness to consider these comments.

As a long-time wholesale customer of the SFPUC, the Menlo Park Municipal Water District serves approximately 10,000 residents and numerous other businesses and institutions, including local schools and a Department of Veterans Affairs hospital. The Menlo Park Municipal Water District currently relies on the SFPUC for 100 percent of its water supply. A sustained water system outage would have devastating impacts to our community members, institutions, and local economy. Given the current vulnerability of the regional water system to damage from seismic events, it is imperative to proceed expeditiously with the projects outlined in the WSIP. 01

Menlo Park's comments will focus in particular on some of the construction impacts associated with the WSIP. Project BD1, the Bay Division Reliability Upgrade, includes a new 120-inch diameter, five-mile long tunnel under San Francisco Bay that will be constructed from a staging area in Menlo Park. Project BD1 also includes a new 72-inch diameter pipeline that will travel through Menlo Park for approximately 2.6 miles. Menlo Park would like to work cooperatively with the SFPUC to plan for reasonable construction mitigation measures that will minimize the construction impacts to local residents and businesses. We understand that as a program-level EIR, some of the details regarding Project BD1 are simply not available at this time and a project-level EIR is being planned. 02

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Please consider the following specific comments:

1) **More work is needed to identify noise impacts and mitigations.** Section 6.3.9 describes Mitigation Measure 4.10-1a and states, "SFPUC Construction Measure #6 for noise requires compliance with local noise ordinances to the extent feasible." A copy of Menlo Park's noise ordinance is attached for reference. Menlo Park requests that the PEIR or project-level EIR for Project BD1 conduct more thorough studies of potential construction noise and ways to mitigate for it. The "to the extent feasible" language in this mitigation measure leaves the community with no way to evaluate how significant noise impacts may be, and therefore no meaningful way to comment on the impacts of construction noise levels as part of the EIR process. We urge the SFPUC to examine Menlo Park's noise ordinance, identify mitigation measures capable of meeting the noise levels in the ordinance, and adopt these measures as part of Project BD1. 03

2) **Settlement monitoring is needed where the proposed Bay Tunnel crosses under existing levees in Menlo Park.** Impact 4.5-4 provides for Mitigation Measure 4.5-4b, Site Specific Flooding Analysis and Identified Measures. The City of Menlo Park requests that a site-specific analysis be performed for the Bay Tunnel portion of Project BD1. This tunnel will pass under existing levees along the shore of San Francisco Bay. The tunneling operation and ground disturbance in the vicinity of the levee have significant potential to induce settlement, which would subject the area to greater risk of tidal flooding. Much of the alignment of Project BD1 through Menlo Park is in an area designated by the Federal Emergency Management Agency as a flood hazard zone. A settlement monitoring and mitigation plan should be developed as part of the project-level EIR for Project BD1. 04

3) **Construction working hours need to be better defined and more reasonable truck hauling requirements should be developed.** Impact 4.10-2, Temporary Noise Disturbance Along Construction Haul Routes, does not currently include sufficient mitigation measures. Construction of the Bay Division #5 pipeline as part of Project BD1 calls for the construction of a 72-inch diameter pipeline adjacent to residences in Menlo Park. Residences will be only 20 to 30 feet from the planned pipeline trench. The mitigation measures under this impact appear to allow up to 80 truck trips per hour except during nighttime hours, defined as 10 p.m. to 7 a.m. Menlo Park believes this is an unreasonable level of impact in residential neighborhoods. Construction hours should be customized in consultation with local jurisdictions to reflect the character of the adjacent area. Trenching and truck hauling from 7 a.m. to 10 p.m. is unreasonable in residential neighborhoods! 05

4) **More work is needed to identify and mitigate for temporary traffic impacts.** Mitigation Measures 4.8-1a and 4.8-1b are designed to address a variety of temporary traffic impacts. These measures require site-specific traffic control plans, which are certainly necessary to address traffic safety. As a mitigation measure however, they are not sufficient to mitigate impacts to a less than significant level. Even with these mitigation measure in place detours, temporary street closures, loss of parking, and limited access to businesses and residences will be experienced, which should be considered a significant environmental impact. More work is needed to address site specific traffic impacts. Without disclosing which streets will be closed for what duration, the PEIR is currently insufficient to conclude that temporary traffic impacts have been properly mitigated to less than significant levels. The City of Menlo Park requests that the project-specific EIR for Project BD1 evaluate and consider additional mitigation measures for temporary traffic impacts. These measures should be developed well before projects are put out to bid. With smaller projects it is common to simply leave traffic control up to the contractor. Given the scale of Project BD1, this approach would inevitably lead to conflict, delays, and claims for extra work from the contractor. Menlo Park would like to work cooperatively with the SFPUC to better identify construction traffic routing and appropriate mitigation measures as part of project design. 06

5) **Establish a vibration monitoring program for Project BD1.** Mitigation Measure 4.10-3a includes specific values for allowable vibration. More information is needed to better understand how these values were established. The tunneling and large-scale trenching required under Project BD1 could generate substantial vibration in nearby residences and businesses. Simply stating a limit in the specifications as required by the mitigation measure is insufficient. A monitoring program should be developed and implemented to ensure that the contractor complies with the stated limits. 07

6) **Menlo Park currently receives 100 percent of its water supply from the SFPUC.** Table 3.1, which lists BAWSCA members, includes an asterisk for Menlo Park indicating multiple sources of supply. The City of Menlo Park has multiple water companies operating within its political boundaries. However, the Menlo Park Municipal Water District is the specific entity that is a BAWSCA member, and it currently receives 100 percent of its water supply from the SFPUC. Please correct Table 3.1 by removing the asterisk from Menlo Park. 08

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Thank you for considering the City's comments. Please call me at 650-330-6781 if you have questions.

Sincerely,

Kent Steffens
Director of Public Works

Attachments: Menlo Park Municipal Code Chapter 8.06, Noise

cc: Mayor and Members of City Council
Glen Rojas, City Manager
William McClure, City Attorney
Art Jensen, Executive Director - BAWSCA

Title 8 PEACE, SAFETY AND MORALS*

Chapter 8.06 NOISE

12.3-137

8.06.010 Declaration of policy.

It is declared to be the policy of the city to protect the peace, health and safety of its citizens from unreasonable noises from all sources including, but not limited to, those specified in this chapter. (Ord. 892 § 2 (part), 1999).

8.06.020 Definitions.

The definitions set forth in this section shall govern its construction.

(1) **"A-Weighting"** means a filter network designed to transform a frequency spectrum to that which is heard by the human ear.

(2) **"Construction activities"** means the grading, demolition, alteration, repair or remodeling of existing structures and construction of new structures including the use of power equipment in connection with activities. "Construction activities" does not include radios or other forms of amplified music on a construction site.

(3) **"Daytime"** means the period from seven (7) a.m. to ten (10) p.m. daily.

(4) **"Decibel (dB)"** means a unit for measuring the amplitude of sound, equal to twenty (20) times the logarithm to the base ten (10) of the ratio of the pressure of the sound measured to the reference pressure, which is twenty (20) micropascals.

(5) **"Delivery"** means the delivery or pickup or the arrival for delivery or pickup of goods, wares and merchandise by the use of a motorized vehicle, other than an automobile or train.

(6) **"Equivalent-energy level (Leq)"** means the level of a steady-state noise that has the same sound energy as a given time-varying noise.

(7) **"Holidays"** means the follow days: New Year's Day, Martin Luther King Day, President's Day, Memorial Day, Independence Day, Labor Day, Veterans Day, Thanksgiving, and Christmas

Day.

(8) **"Impulsive sound"** means sound of short duration, usually less than one (1) second, with an abrupt onset and rapid decay. Examples of impulsive sounds include explosions, drop impacts and firearm discharge.

(9) **"Motor vehicles"** means any and all self-propelled vehicles as defined in the Vehicle Code of the state, including all on-highway types of vehicles subject to registration under said code and all off-highway type of motor vehicle subject to identification under said code.

(10) **"Multifamily dwelling"** means any housing unit where two (2) or more dwellings are separated by a common wall, floor or ceiling, including but not limited to apartments, condominiums and townhouses.

(11) **"Nighttime"** means the period from ten (10) p.m. to seven (7) a.m. daily.

(12) **"Noise disturbance"** means any source of sound which exceeds the noise limitations permitted in Section 8.06.030. For purposes of this section sources of sound shall include but not be limited to the following: amplified music, loudspeakers, radios, televisions, stereos, musical instruments, powered toys or models, swimming pools or spas, industrial machinery, manufacturing equipment, pile drivers, air compressors, paint sprayers, motors, pumps, blowers, air conditioners, cooling towers, ventilating fans, fork lifts, loaders, tractors, animals, concerts, mechanical equipment, human voices, electrical appliances, vacuum cleaners, powered equipment, chain saws, beepers, motor vehicles and attached equipment not operated on a street or highway, etc.

(13) **"Noise level"** means the amplitude of sound pressure referenced to twenty (20) micropascals, measured in decibels, using the A-weighting network (for the purposes of this chapter).

(14) **"Noise level measurement"** means the procedure of measuring sound consisting of the usage of a precision sound level meter (SLM), as defined in the section, set to "fast" response. If the sound level meter is analog with a VU meter, then the response shall be "slow" unless the noise issue is impulsive. The meter must be calibrated before any measurements and the microphone shall be a minimum of three and one-half (3 1/2) feet from any wall, floor or other large sound reflecting surface. The meter shall be protected from wind or other extraneous noise by the use of screens, shields or other appropriate devices.

(15) **"Precision sound level meter"** means a sound pressure level measuring instrument which conforms to the American National Standards Institute (ANSI) specification S1.4 for Type 1 or Type 2 measuring instruments.

(16) **"Powered equipment"** means a motorized device powered by electricity or fuel used for construction, demolition and property or landscape maintenance or repairs. Powered equipment includes but is not limited to: lawn mowers, hedgers, parking lot sweepers, saws, sanders, motors, pumps, generators, blowers, wood chippers, vacuums, drills and nail guns (but specifically excluding internal fuel combustion engine leaf blowers).

(17) **"Residential property"** means any property legally used for a single family or multifamily dwelling as defined in Section 16.04.240.

(18) **"Sound-amplifying equipment"** means any machine or equipment or device for the amplification of the human voice, music or any other sound. Sound-amplifying equipment shall not be construed as including automobile radios (which are covered by the California Vehicle Code), warning devices on authorized emergency vehicles or horns or other warning devices on other vehicles used for traffic safety purposes.

(19) **"Work personally done by resident or property owner"** means work undertaken by the property owner/resident. Resident/property owner may be assisted by a family member, friend or other persons. (Ord. 895 § 5, 1999; Ord. 892 § 2 (part), 1999).

8.06.030 Noise limitations.

(a) Except as otherwise permitted in this chapter, any source of sound in excess of the sound level limits set forth in Section 8.06.030 shall constitute a noise disturbance. For purposes of determining sound levels from any source of sound, sound level measurements shall be made at a point on the receiving property nearest where the sound source at issue generates the highest sound level. Sound level measurements shall be made with a precision sound level meter (Type 1 or 2) set to A-weighting, and "fast" response for fluctuating sound. Slow or fast response may be used for continual sources. For repetitive, impulsive sound, the one (1) second rms maximum level (Lmax) shall be used. For continuous sound, use the average level or Leq. In multifamily residential structures, the microphone shall be placed no closer than three and one-half (31/2) feet from the wall through which the source of sound at issue is transmitting. The microphone shall also be placed five (5) feet above the floor regardless of whether the source of sound at issue transmits through the floor, ceiling or wall.

(1) For all sources of sound measured from any residential property:

(A) "Nighttime" hours--fifty (50) dBA,

(B) "Daytime" hours--sixty (60) dBA;

(2) For all sources of sound within a multifamily residential structure transmitting through a common interior partition (wall, floor or ceiling) from one (1) dwelling unit to another:

(A) "Nighttime" hours--thirty-five (35) dBA,

(B) "Daytime" hours--forty-five (45) dBA;

(3) Corrections for character of sound: In the event the alleged offensive noise contains a steady, audible tone, such as a whine, screech, beating, pulsating, throbbing or hum the standards set forth in Section 8.06.030(a)(1) and (2) shall be reduced by five (5) dB.

(b) Any and all excessively annoying, loud or unusual noises or vibrations such as offend the peace and quiet of persons of ordinary sensibilities and which interfere with the comfortable enjoyment of life or property and affect at the same time an entire neighborhood or any considerable number of persons shall be considered a noise disturbance.

(c) It shall be unlawful to create, permit, allow or maintain a noise disturbance in Menlo Park. (Ord. 892 § 2 (part), 1999).

12.3-138

8.06.040 Exceptions.

The following are exceptions to the noise limitations set forth in Section 8.06.030. These activities may occur at other times provided they meet the noise levels set forth in Section 8.06.030.

(a) **Construction Activities.**

(1) Construction activities between the hours of eight (8) a.m. and six (6) p.m. Monday through Friday,

(2) Residents/property owners personally undertaking construction activities to maintain or improve their property on Saturdays, Sundays or holidays between the hours of nine (9) a.m. and five (5) p.m.,

(3) A sign, containing the permitted hours of construction activities exceeding the noise limits set forth in Section 8.06.030, shall be posted at all entrances to a construction site upon the commencement of construction, for the purpose of informing contractors and subcontractors and all other persons at the construction site of the basic requirements of this chapter. The sign shall be at least five (5) feet above ground level and shall consist of a white background with black letters,

(4) Notwithstanding any other provision set forth above, all powered equipment shall comply with the limits set forth in Section 8.06.040(b);

(b) **Powered Equipment.**

(1) Powered equipment used on a temporary, occasional or infrequent basis operated between the hours of eight (8) a.m. and six (6) p.m. Monday through Friday. No piece of equipment shall generate noise in excess of eighty-five (85) dBA at fifty (50) feet,

(2) Residents/property owners personally using powered equipment to maintain their property and/or residence on Saturdays, Sundays or holidays between the hours of nine (9) a.m. and five (5) p.m. No piece of equipment shall generate noise in excess of eighty-five (85) dBA at fifty (50) feet.

(c) **Internal Fuel Combustion Engine.** Gasoline powered leaf blowers operated in accordance

with and during hours as permitted by Chapter 8.07 (Leaf Blowers);

(d) **Deliveries.**

(1) Deliveries to food retailers and restaurants,

(2) Deliveries to other commercial and industrial businesses between the hours of seven (7) a.m. and six (6) p.m. Monday through Friday and nine (9) a.m. to five (5) p.m. Saturdays, Sundays and holidays;

(e) **Occasional Social Gatherings.** Occasional social gatherings between eleven (11) a.m. and eleven-thirty (11:30) p.m.; provided, the noise level for the occasional social gathering measured from any adjacent residential property does not exceed sixty-five (65) dBA;

(f) **Street Sweeping/Parking Lot Sweeping.** Street sweeping/parking lot sweeping Monday through Friday between the hours of seven (7) a.m. and six (6) p.m. anywhere in the city; and street sweeping between the hours of four-thirty (4:30) a.m. to six (6) p.m., Monday through Friday on the following streets/public parking plazas: El Camino Real, Santa Cruz Avenue (between Merrill Street and Johnson), Oak Grove Avenue (between University Avenue and Merrill Street), Menlo Avenue, Doyle Street, Curtis Street, Chestnut Street, Evelyn (between Santa Cruz and Menlo Avenue), Crane Street (between Menlo Avenue and Oak Grove Avenue), Maloney Lane, Johnson Lane, University Avenue (between Menlo Avenue and Oak Grove Avenue), Merrill Street, Willow Road (between Bay Front Expressway and Middlefield Road), O'Brien Drive, Hamilton Avenue (south of Willow Road), Adams Drive, Adams Court, Casey Court, Hamilton Court, Haven Avenue, Independence Drive, Chrysler Drive, Jefferson Drive, Constitution Drive, Kelly Court, Haven Court, Commonwealth Drive, Chilco Street (from Bay Front Expressway to the Dumbarton spur railway line), and Sand Hill Road (from Highway 280 to Santa Cruz), and all public parking plazas in the central business district (the area between El Camino Real, University Avenue, Menlo Avenue and Oak Grove Avenue);

(g) **Garbage Collection.** Garbage collection Monday through Friday between the hours of six (6) a.m. to six (6) p.m., throughout the city; and between the hours of two (2) a.m. to six (6) p.m., Monday through Friday, and between the hours of six (6) a.m. and six (6) p.m., on Saturdays, for properties abutting the following streets: El Camino Real, Santa Cruz Avenue (between Merrill Street and Johnson), Oak Grove Avenue (between University Avenue and Merrill Street), Menlo Avenue, Doyle Street, Curtis Street, Chestnut Street, Evelyn (between Santa Cruz and Menlo Avenue), Crane Street (between Menlo Avenue and Oak Grove Avenue), University Avenue (between Menlo Avenue and Oak Grove Avenue), Merrill Street, Willow Road (between Bay Front Expressway and Gilbert), O'Brien Drive, Hamilton Avenue (south of Willow Road), Adams Drive, Adams Court, Casey Court, Hamilton Court, Haven Avenue, Independence Drive, Kelly Court, Haven Court, Commonwealth Drive, Chilco Street (between Bayfront Expressway to the Dumbarton spur railway line), Chrysler Drive, Jefferson Drive and Constitution Drive;

(h) **Animals.** Sounds from animals or birds unless such animal or bird howls, barks, meows, squawks, or makes other noises continuously and/or incessantly for a period of five (5) minutes or intermittently for one-half (1/2) hour. For the purposes of this section, the animal or bird noise shall not be deemed a disturbance if a person is trespassing or threatening to trespass upon private property in or upon which the animal or bird is situated or if the noise is for any other legitimate cause, such as someone teasing or provoking the animal or bird. (Ord. 895 § 6, 1999; Ord. 892 § 2 (part), 1999).

8.06.050 Exemptions.

The following noise disturbances shall be exempt from the noise limitations set forth in Section 8.06.030:

(a) **Sound Generated by Motor Vehicles.** Sound generated by motor vehicles, trucks and buses operated on streets and highways, aircraft, trains, and other public transport.

(1) This exemption shall not apply to the operation of any vehicle including any equipment attached to any vehicle (such as attached refrigeration and/or heating units or any attached auxiliary equipment) for a period in excess of ten (10) minutes in any hour while the vehicle is stationary, for reasons other than traffic congestion.

(2) This exemption shall not apply to vehicles equipped with sound amplifiers which are not exempt. No person shall operate or drive any vehicle or cause any vehicle to be operated or

driven, or otherwise used, on any public street, which vehicle is equipped with a sound amplifying device or other machine or device for the production or reproduction of sound, which causes sound to carry onto private property or causes sound to be heard by others using the public streets or thoroughfares which exceeds the noise levels established in Section 8.06.030;

(b) **Emergencies.** Emergency repairs that deal with health or safety risk and emergency generators or powered equipment used during a power outage or other emergency;

(c) **Emergency Warning Devices.** Emergency warning devices such as fire alarms, burglar alarms, warning devices on emergency vehicles and train horns. This exemption shall not apply to the sounding of any burglar or fire alarm or any motor vehicle burglar alarm, except for emergency purposes, unless such alarm is terminated within ten (10) minutes of activation and no more than two (2) false activations within a four (4) hour period;

(d) **City and State Projects.** City and state construction work performed by the city and/or the state, their respective agents or contractors, for city and/or state maintenance, repair or construction projects which cannot be performed from seven (7) a.m. to six (6) p.m. Monday through Friday;

(e) **Special Events.** Any event or use for which a special event permit has been issued by the city that specifically allows noise levels to be exceeded;

(f) **Use Permits.** Any use for which a use permit has been issued by the city that specifically allows noise levels to be exceeded;

(g) **Athletic Fields/Playgrounds/Parks/Public Tennis Courts/Public Recreation Facilities.** From seven (7) a.m. to ten (10) p.m. any organized athletic events or activities occurring on athletic fields, playgrounds, parks, tennis courts or other public recreation facilities owned or operated by a school district, the city or the county; provided, no amplified music or sound system is utilized. (Ord. 892 § 2 (part), 1999).

12.3-139

8.06.060 Temporary permits, special event permits and use permits.

(a) If an applicant can demonstrate that a diligent investigation of available noise abatement techniques indicates that compliance with the requirements of this chapter would be impractical or unreasonable, the director of community development may issue a permit to allow an exclusion from the provisions contained in all or part of this chapter with appropriate conditions to minimize the public detriment caused by such exclusions. Any such permit shall be of as short duration as possible up to three (3) months, but renewable once for up to an additional three (3) month period upon showing of good cause, and shall be conditioned upon details and a schedule for compliance.

(b) The director of community development, or his/her designee, shall have authority to issue special event permits for special events which occur no more frequently than twice per calendar year. The nature, time and notice procedures of such permit process, including criteria for approval, shall be established by the director of community development. Any person dissatisfied with the decision of the director of community development may appeal such decision within ten (10) days of the date of such decision in accordance with Section 16.92.210.

(c) If an applicant can demonstrate that a diligent investigation of available noise abatement techniques indicates that compliance with the requirements of this chapter would be impractical or unreasonable, a use permit to allow an exclusion from the provisions contained in all or part of this chapter may be issued by the planning commission pursuant to the terms and provisions of Chapter 16.82, with appropriate conditions to minimize the public detriment caused by such exclusion. (Ord. 892 § 2 (part), 1999).

8.06.065 Ministerial permits.

(a) The director of community development, or his/her designee, shall issue a permit exempting an existing industrial facility from the provisions of this chapter and the provisions of Section 16.08.095 if the following objective standards are met by the applicant:

(1) The facility is on land that is zoned for industrial uses as of the effective date of the ordinance codified in this chapter* and is located on the San Francisco Bay side of State Highway 101 and

north of the Dumbarton spur railway line.

(2) The facility is at least twenty (20) acres in size. (The facility may be comprised of one (1) or more contiguous parcels under common ownership and use.)

(3) As of January 1, 1999, the facility conducted multi-shift operations that included night-time and weekend operations.

(4) All stationary sources of noise from the facility do not exceed the following noise levels as measured at a residential property line that is closest to the fence-line of the facility: sixty (60) dBA between the hours of six (6) a.m. and ten (10) p.m.; and fifty-seven (57) dBA between the hours of ten (10) p.m. and six (6) a.m. (If multiple residential property lines are the same distance from the facility fence-line and no one residence is closer, the facility operator shall carry-out qualification noise monitoring at the residential property line that receives the greatest amount of noise from the facility.) The date of the qualification noise monitoring by the applicant shall be specified by the director of community development. The qualification noise monitoring on the date specified by the director shall occur during four (4), ten (10) minute periods with one (1) each at mid-morning (nine (9) to ten (10) a.m.), mid-afternoon (three (3) to four (4) p.m.), late evening (ten (10) to eleven (11) p.m.), and early morning (five (5) to six (6) a.m.). An independent noise consultant chosen and paid for by the applicant, and subject to the approval of the director, shall conduct the qualification noise testing.

(5) The initial application for a permit pursuant to this Section 8.06.065 is filed with the director of community development within six (6) months of the effective date of this chapter.*

(b) A facility that has been issued a permit pursuant to this Section 8.06.065 shall operate its permitted facility in such a manner that all sources of noise on the facility do not exceed sixty (60) dBA as measured at residential property lines between the hours of six (6) a.m. and ten (10) p.m., or fifty-seven (57) dBA as measured at residential property lines between the hours of ten (10) p.m. and six (6) a.m.; provided, however, that mobile sources of noise on the facility (i.e., conventional over-the-road vehicles and powered industrial tractors or forklifts) may exceed the noise limits of this section for brief periods when vehicles are entering and exiting the site as part of shift changes.

(c) Every facility that is issued a permit pursuant to this Section 8.06.065 shall:

(1) Identify an individual with primary responsibility for noise monitoring and noise control at the facility;

(2) Maintain a log of any noise complaints received by the facility and a log of actions taken to respond to such complaints;

(3) Maintain a formal internal engineering review process that will ensure that any proposed changes at the facility that could significantly increase the noise from the facility are identified prior to the change and appropriately engineered so that the facility does not exceed the noise limitations specified in Section 8.06.065(b);

(4) For equipment located outside of buildings or on rooftops that is a significant noise source, at the time of replacement because of equipment breakdown, inefficiency, inadequate capacity or obsolescence, put forth a good-faith effort to replace such existing equipment with equipment that is designed and installed so as to reduce the noise level from the facility;

(5) Establish a formal inspection and preventive maintenance program for all pieces of equipment located outside of buildings or on rooftops that are significant noise sources at the facility (such a program should be designed to prevent noise problems from developing because of mechanical problems with the equipment and to detect significant changes in equipment noise levels during inspections so as to prevent nuisance noise complaints);

(6) Undertake an annual program of noise monitoring. The annual program of monitoring shall include, at a minimum, monitoring for three (3) consecutive weekdays and two (2) consecutive weekend days during which noise monitoring measurements occur for ten (10) minute periods, four (4) times per day during: mid-morning (nine (9) to ten (10) a.m.); mid-afternoon (three (3) to four (4) p.m.); late evening (ten (10) to eleven (11) p.m.); and early morning (five (5) to six (6) a.m.). The annual program of noise monitoring shall be designed to: (A) ensure compliance with the requirements of Section 8.06.065(b); (B) identify any significant changes in noise levels; and (C) identify possible opportunities for noise reduction. The annual program shall be a self-monitoring program at the option of the facility; provided, however, the director of community development shall have discretion to periodically request independent verification of such

monitoring data by an independent noise consultant chosen and paid for by the facility and subject to the approval of the director;

(7) Prepare and submit to the director of community development a report on the efforts to monitor and reduce the noise associated with the operation of the facility and to respond to any noise complaints (the noise monitoring and abatement report). The operator shall submit the noise monitoring and abatement report annually on February 1st following the issuance or renewal of a permit pursuant to this section. The noise monitoring and abatement report shall include a summary list of any noise complaints received during the reporting period and the actions taken, and describe: the results of the annual program of noise monitoring as set forth above; ongoing monitoring and maintenance of existing equipment in order to control noise; any specific noise reduction efforts during the reporting period, including specific projects and capital outlays, to reduce the amount of noise from the permitted facility; and any future plans to attempt to further reduce the noise generated from the operation of the facility.

(d) A permit issued pursuant to this Section 8.06.065 may be revoked by the director of community development if the director establishes by a preponderance of the evidence that sources of noise from the facility consistently exceeded the limits as specified above in Section 8.06.065(b) for eight (8) days within any twenty-eight (28) day period, except for construction work undertaken by the facility under a city building permit and conducted between the hours of eight (8) a.m. and six (6) p.m. Monday through Friday.

(e) A permit issued pursuant to this Section 8.06.065 shall be valid for an initial term of ten (10) years. A facility may apply for the renewal of a permit at any time prior to the expiration of the prior permit. The term of any renewed permit shall be five (5) years.

(f) Any decision of the director of community development pursuant to this Section 8.06.065 shall be subject to appeal as provided in Section 16.92.210. (Ord. 892 § 2 (part), 1999).

* Editor's Note: Ordinance 892, which enacted Chapter 8.06, is effective on May 20, 1999.

8.06.070 Time for compliance.

(a) Nonresidential operations in existence prior to May 20, 1999, shall be granted a six (6) month period within which to comply with provisions of this chapter. Any facility not in compliance by the end of such six (6) month period may apply for a temporary permit, as described in Section 8.06.060(a) to be excluded from the provisions of this chapter. This section shall apply only to nonresidential facilities already in existence or for which work of improvement had commenced prior to the date this chapter went into effect.*

(b) Except as provided in subsection (a) of this section, or as provided in Section 8.06.065, all other operations in existence prior to the date this chapter went into effect* shall have three (3) months to comply with the provisions of this chapter or apply for a temporary permit for additional time to comply. (Ord. 892 § 2 (part), 1999).

* Editor's Note: Ordinance 892, which enacted Chapter 8.06, is effective on May 20, 1999.

8.06.080 Administration.

The provisions of this chapter shall be administered by the chief of police and his or her authorized representatives, except where expressly provided otherwise. All other officers and employees of the city shall assist and cooperate in the administration and enforcement of this chapter. (Ord. 892 § 2 (part), 1999).

8.06.090 Violations.

First time violators will be warned and subsequent violations of the provisions of this chapter shall be guilty of an infraction and shall be punished as provided in Chapter 1.12.010(b). (Ord. 892 § 2

(part), 1999

<< previous | next >>

Modesto Irrigation District
The Power to Grow

WATER & POWER
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October 1, 2007

Paul Maltzer
Environmental Review Officer
WSIP DEIR
1650 Mission Street, Suite 400
San Francisco, California 94103

Dear Mr. Maltzer:

As senior water rights holders and long-time stewards of the Tuolumne River, the Turlock and Modesto irrigation districts ("Districts") welcome the opportunity to provide comments on the Draft Program Environmental Impact Report ("PEIR") for the San Francisco Public Utilities Commission's Water System Improvement Program ("WSIP"). Written comments submitted on October 25, 2005 and April 26, 2007, during earlier phases of the EIR process, are attached hereto and incorporated herein by reference.

We offer the following comments on the June 29, 2007 version of the Draft PEIR.

General Comments

The Districts strongly support the City and County of San Francisco's ("CCSF") efforts to replace an aging infrastructure and to make the necessary earthquake retrofits and other improvements needed to meet modern seismic standards. However, we are concerned about the proposed operational changes and how those changes may impact the Tuolumne River flows or the Districts' water supplies.

The Districts previously requested copies of the models used by the CCSF in analyzing the impacts associated with the WSIP to evaluate the proposed project to determine if: (1) the assumptions made with respect to the Districts' operations are correct; (2) the impacts to the Districts' water and power resources; and (3) the impacts to the Tuolumne River and its fishery resources. Our review of the Draft PEIR reemphasized the need for the Districts to review the models in order to be able to provide informed comments on the Draft PEIR. For example, the logic and assumptions that the hydrologic model uses in its decision process are not clear and there are unexplained inconsistencies. It appears the maximum Don Pedro capacity stated on page 5.3.1-32 is too high, monthly storage values for Don Pedro shown on Table 2.6.3 of Appendix H2-1 appears incorrect, and the model appears to use incorrect criteria for the Districts' dry water year operations resulting in incorrect Don Pedro Reservoir storage numbers. Consequently, we are renewing our request for the models. In addition, we request a 60-day 01

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extension of the comment period after receipt of the models to allow for a full evaluation of the models and to enable the Districts to supplement the comments contained herein. 01 cont.

The WSIP relies upon assumptions related to the various water rights and entitlements claimed by the CCSF. The Draft PEIR should provide sufficient information to substantiate the validity of those rights, and the ability to increase the CCSF diversions from the Tuolumne River. With that rationale, the Districts can then evaluate the adequacy of the CCSF claims. 02

The stated fundamental principles guiding the WSIP are (1) "maintaining a clean, unfiltered water originating from Hetch Hetchy Reservoir…" and (2) to "maintain gravity-driven system." (Draft PEIR, page 5-6). This, of course, is understandable given that it is the best quality water available to CCSF and is delivered by gravity. However, CCSF uses these principles to reject alternatives to the project that would result in significantly less environmental impact on the Tuolumne River. It is also important to note that the surface water treatment technology used by most other water suppliers in California are available to meet water quality requirements for other water supply sources, and that most other water suppliers must use pumps to pressurize systems. Such programs can be more costly, but are available to help meet the CCSF's water supply needs. Conformance with the two fundamental principles and other specific "goals and objectives" are not sufficient grounds by themselves to summarily dismiss other available alternatives with less environmental impact. 03

Specific Comments

WSIP Flow and Volume Numbers Need to be Clarified

It is difficult for the Districts as well as other reviewers to evaluate the potential impacts of the WSIP or the validity of the assumptions made in modeling and evaluating the Tuolumne River system, without clarification of the flow and volume numbers used in the analysis. As previously indicated by the Turlock Irrigation District ("TID") in its April 26, 2007 letter, the CCSF should be clear in the Draft PEIR whether millions gallons per day ("MGD") numbers are intended to express an instantaneous rate of flow, such as cubic feet per second ("cfs"), or a total volume of water, such as acre-feet ("AF"). For clarity, we asked if the MGD is intended as an average rate of flow, then the expected minimum to maximum range of flow rates must be disclosed. If MGD is being used for a total volume of water, then both the MGD number and the intended AF number should be reported. 04

The MGD and AF numbers requested in the April 26, 2007 letter form the heart of the Tuolumne River issues and are absolutely necessary for meaningful analysis of the adequacy of the Draft PEIR. A preliminary review of the Draft PEIR shows that these issues have not been clarified as requested. As a result, it is unclear what the anticipated diversion amounts and flows will be with the WSIP, and how they differ from current conditions. Providing the aforementioned data, in a clear format, is essential for Districts to evaluate the WSIP. The Districts renew their request for the models; that the CCSF provide the requested flow data in tabular format; and that sufficient time is given to review the additional data and provide comments.

Paul Maltzer
Environmental Review Officer
WSIP DEIR
October 1, 2007
Page 3

Proposed Water Transfers

Under Section 3.6.2 "Proposed Drought Water Supply" (pages 3-36 and 3-38) the Draft PEIR envisions the transfer of 27,000 AF of water from the Districts to the CCSF. The Districts do not believe there is sufficient water within the watershed under dry conditions to support the transfers as described in the Draft PEIR. It is inappropriate, therefore, to include the proposed transfer as a part of the CCSF's water supply plan. In addition, the Draft PEIR's discussion of the proposed water transfer from the Districts is [wholly] inadequate for CEQA purposes. A project-specific EIR is legally required to describe the proposed transfer in detail and to thoroughly assess all potential impacts. 05

The Draft PEIR does not discuss the publicly announced proposed Oakdale Irrigation District ("OID") water transfer involving a water exchange with the Modesto Irrigation District ("MID") and, consequently, does not state whether the proposed OID water transfer is intended to substitute for or to be in addition to the CCSF's proposed TID-MID water transfer. If the 28,000 AF OID transfer is intended to be in addition to the 27,000 AF TID-MID transfer, then the potential cumulative environmental impact of some 55,000 AF being eliminated from the Upper Tuolumne River and from the Lower Tuolumne River and the Delta could be significant. 06

Water Quality Impairments may Worsen with Additional Diversions Proposed by WSIP

The San Joaquin River system and its tributaries are currently listed as impaired for a variety of water quality parameters, with others being proposed. For example, the Department of Fish and Game has asked the Central Valley Regional Water Quality Control Board to "list" the San Joaquin River system as "impaired" for temperature, under Section 303(d) of the Clean Water Act. The Draft PEIR proposes increases in mean daily river temperatures of 1-2 degrees Celsius during 15% of the months modeled (page 5.3.3-19), which would be significant, if the river system is already "impaired." Any reductions in lower Tuolumne River flow could exacerbate current conditions. The impacts to the Tuolumne River or San Joaquin River water quality by the WSIP should be thoroughly evaluated and mitigation measures proposed where necessary to ensure that implementation of the WSIP would not result in reduced water quality or increased burdens on other water agencies within the San Joaquin River system. 07

Additional Instream Flow Requirements

In Section 3.7.1, page 3-43, the Draft PEIR states, "Although the fishery release requirements that FERC may impose in 2016 cannot be anticipated at this time, the CCSF assumes, for the purposes of the WSIP, that it will be able to continue its current agreement with TID and MID to pay them to provide all the additional water, if any, required for the fishery releases." CCSF should not assume that it will be able to purchase water from the Districts to meet its future instream flow requirements. 08

While the increased diversions proposed under the WSIP accrue solely to CCSF's benefit, they could potentially result in future measures being imposed by the Federal Energy Regulatory

Paul Maltzer
Environmental Review Officer
WSIP DEIR
October 1, 2007
Page 4

Commission ("FERC"), or other regulatory agencies. Under Article 8(a) of CCSF's Fourth Agreement with the Districts, CCSF has agreed that "any burdens or change in conditions imposed on account of benefits accruing to City shall be borne by City." As such, any new or additional water release requirements imposed on the Districts as a result of CCSF's increased diversions are to be borne by CCSF. 08 cont.

The CCSF should include in their analysis additional releases down the Tuolumne River to meet future instream flow requirements due to the future actions of the FERC, or other regulatory agencies. To accommodate the ability to increase instream flows, yet still provide the necessary water supplies to its customers, the CCSF should re-evaluate the potential opportunities to recapture some of those flows at a lower point in the system.

Compliance with the Raker Act Requirements

The Hetch Hetchy project, as described in the Draft PEIR, was developed under the authority of the Raker Act. The Raker Act, enacted by Congress in 1913, is a conditional grant of an easement through Yosemite National Park. It was the intent of the Raker Act that San Francisco first develop and use its own water resources before exporting Tuolumne River supplies. It states that CCSF may not export from beyond the San Joaquin Valley any more water of the Tuolumne watershed "than, together with the waters which it now has or may hereafter acquire, shall be necessary for its beneficial use for domestic and other municipal purposes." (38 Stat. 242, section 9(h).)

As stated in the Draft PEIR, the CCSF must adhere to the Raker Act. The program evaluated in the Draft PEIR proposes to increase diversions from the Tuolumne River. With today's technology there are additional resources available to the CCSF and its customers, that were not available in 1913, when the Raker Act was enacted, that if implemented, would eliminate the necessity for the CCSF to divert additional water from the Tuolumne River, and would continue to keep the CCSF in compliance with the Raker Act. Desalinization, advanced treatment processes, conservation options, reclamation projects, and other measures are now available which can provide significant water supplies. Many of these alternatives are evaluated in the Draft PEIR but were determined, for one reason or another, to not be in keeping with the key project principles or objectives. The Raker Act requirements supersede any project principles or objectives the CCSF may establish. As a result, the other alternatives must be fully developed before additional diversions from the Tuolumne River are considered. 09

Additionally, the portions of the Draft PEIR that deal with the expansion of water service appear to be driven by the future needs of the CCSF wholesale customers. Consistent with the Raker Act provisions, these additional needs should first be met through local and other available resources before proposing additional supplies be taken from the Tuolumne River. It is unrealistic to expect that the CCSF could accommodate all future demands of its wholesale customers by drawing additional supplies from the Tuolumne River watershed. Likewise, it would be imprudent for the CCSF to add additional wholesale customers.

Therefore, the Draft PEIR should evaluate the potential options for meeting future needs through the use of local and other available resources, and not rely so heavily upon the Tuolumne River watershed for its supply. 09 cont.

Reduction in Power Supplies

The Draft PEIR acknowledges that implementation of the WSIP will result in lower inflows and operating levels at the Don Pedro Reservoir which will reduce the Districts' hydroelectric production at its powerhouse. The impact of this loss, which is projected to be 14,000 mega-watt hours of clean, renewable energy each year (Draft PEIR page 5.3.9-3), has not been adequately addressed. 10 At a minimum, an evaluation should be made as to the impact, both to the Districts and the state as a whole, of replacing the renewable energy from a thermal resource and mitigation measures identified. This is particularly important in light of current laws and rules requiring the limiting the emissions of greenhouse gases. Simply dismissing the reduction of hydroelectric generation as deminimus is not sufficient.

Potential Impacts Resulting from Climate Change

The Districts question the adequacy of the Draft PEIR's analysis of the potential effects of climate change on the WSIP. A detailed analysis needs to be preformed on the potential impacts 11 to Tuolumne River water supplies resulting to the measures contained within the WSIP, with specific attention given to the proposed increased diversions and in-stream flow requirements.

CCSF's Lower Tuolumne River Diversion Alternative and
Adequacy of CCSF's Proposed Lower Tuolumne River Mitigation Measures

It is inappropriate to take additional water supply from the Tuolumne River watershed to supply to the San Francisco Bay Area when such an action results in redirected impacts to the river system. Additional supplies needed to meet demands within the San Francisco Bay Area should be supplied by resources available to CCSF in their service area. 12

More consideration should be given to the Lower Tuolumne Diversion and the two desalination options, which were determined to have less environmental impacts to the Tuolumne River watershed. We do not believe the evaluation of those options were adequate. All three were superior to the WSIP and the Modified WSIP in terms of reduced impacts to the Tuolumne River system.

Furthermore, the proposed mitigation measures designed to address the potential impacts of diverting more water from the Tuolumne River are inadequate. For example, the Draft PEIR envisions only one mile of river channel restoration as compensation for the long-term reduction 13 in Tuolumne River flows. In addition, there is no mitigation proposed for the impacts to the Districts associated with the reduced power generation that may result from the WSIP's proposed operational changes.

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The Districts appreciate the opportunity to provide these preliminary comments on the Draft PEIR. We anticipate that these preliminary comments will be addressed and incorporated into the Final PEIR; that the model and detailed information will be forthcoming; and that additional time will be provided to enable the Districts to complete their evaluation and provide additional comments.

Should you have any questions regarding these comments, please do not hesitate to contact Robert M. Nees at TID (209-883-8214) or Walter Ward at MID (209-526-7459).

Sincerely,

Walter P. Ward
Assistant General Manager
Water Operations
Modesto Irrigation District
P.O. Box 4060
Modesto, California 95352

Robert M. Nees
Assistant General Manager
Water Resources & Regulatory Affairs
Turlock Irrigation District
P.O. Box 949
Turlock, California 95380

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CITY & COUNTY OF S.F
PLANNING DEPARTMENT

October 2, 2007

Paul Maltzer
Environmental Review Officer
WSIP DEIR
1650 Mission Street, Suite 400
San Francisco, California 94103

Dear Mr. Maltzer:

Please find attached copies of the two letters referenced in the Turlock and Modesto irrigation districts' comment letter on the Draft PEIR, submitted October 1, 2007. These letters, dated October 25, 2005 and April 26, 2007, were previously submitted to the City and County of San Francisco as a part of the EIR process, and are therefore already a part of the record.

For your ease of reference, we had intended to include additional copies of the letters as a part of the October 1st comment submittal. It has come to our attention that they were inadvertently left off of the October 1st submittal. As a result, we are forwarding the additional copies now.

A copy of both letters was also sent via email.

Should there be any questions regarding the comments, please do not hesitate to contact Robert Nees at (209)883-8214 or Walter Ward at (209)526-7459.

Sincerely,

Debra C. Liebersbach
Water Planning Department Manager
Turlock Irrigation District
P.O. Box 949
Turlock, California 95380

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TURLOCK IRRIGATION DISTRICT
333 EAST CANAL DRIVE
POST OFFICE BOX 949
TURLOCK, CALIFORNIA 95381
(209) 883-8300

Don Pedro Dam and Powerhouse

October 25, 2005

San Francisco Planning Department
Attn: Paul Maltzer, Environmental Review Officer
WSIP PIER
30 Van Ness Avenue Suite 4150
San Francisco, CA 94103

Dear Mr. Maltzer:

Thank you for the opportunity to comment on the San Francisco Public Utilities Commission's Water System Improvement Program (WSIP) document (dated February 28, 2005) prepared for the Programmatic Environmental Impact Report (the "WSIP Scoping Report"). The District's staff also reviewed the SFPUC Purchase Estimates and Water Supply Options Current Conditions and Year 2030 report, revised draft dated June 28, 2005 (the "Water Supply Options Report"). It is my hope that our comments will warrant special attention, given our status as the senior water right holder on the Tuolumne River. 14

As a long-time partner on the river with the City and County of San Francisco, the District is disappointed that CCSF staff did not discuss with the District the proposed water transfers from the District before the proposal was publicly announced. 15

The District concurs with the proposed action by the SFPUC to remove the proposed fourth pipeline from the WSIP. In making these comments, the District will assume that the fourth pipeline will in fact be excluded from the WSIP. 16 The District is also pleased to see that the SFPUC acknowledges that under agreements between the City and the Districts regarding the Don Pedro Project (specifically the 4th Agreement), the City has an obligation to contribute water for FERC-order fish flows for the lower Tuolumne River. 17

The District is still reviewing and analyzing the information contained in the above reports. The following is a partial list of major issues that we have identified thus far and we ask that they be specifically addressed in the appropriate environmental documents going forward:

1. The water needs analysis in the WSIP is driven by SFPUC's artificial Design Drought.[1] The Design Drought consists of the 1987-92 Drought plus 2 ½ years of the 1976-77 Drought. The 1987-92 Drought was in SFPUC's own words the "most extreme 18

[1] WSIP Scoping Report, pp. 17-18.

TID

historically experienced drought"[2] and the 1976-77 Drought was the most severe short-term drought of record for the Tuolumne River. To put the WSIP's water needs analysis in proper perspective, the EIR must include a parallel analysis that would compare the WSIP's Design Drought with the hydrology from the actual parallel historical period, 1987-94. 18 cont.

2. In order for the District to analyze the data and conclusions contained in the two reports and in the eventual EIR, the District requests that the SFPUC provide the District with an executable copy of each of the hydrologic/hydraulic computer models the SFPUC is employing "to simulate the system in order to most accurately estimate system capacity and capability under future demand conditions"[3] and to model the Districts' operation of Don Pedro Reservoir. As partners on the Tuolumne River, it is important that the District understands how CCSF is analyzing the data and deriving its conclusions. 19

3. CCSF states that "Illustrated in Figure 7 is the circumstances that Tuolumne River diversions during the Design Drought do not materially change with the increase in purchases..."[4] However, CCSF states that ultimately they are only going to increase their baseline by 35 mgd[5] during "Most Years" and 33 mgd during "Dry-Years." That ultimately, recycling and conservation "might" approach 10 mgd, rationing could be as high as 20% and the 117 mgd of the ultimate demand of 417 mgd will include rationing and reclaimed water. The District would like the EIR to address the impact of increasing both dry water year and average water year diversions from the Tuolumne River under existing baseline conditions to the respective increased mgd numbers needed to supply 417 mgd if the conservation and recycling programs are not completely successful. 20

4. The EIR should address whether CCSF is modeling an eventual water treatment scenario for its entire water supply. While Hetch Hetchy water currently undergoes minimal treatment, the District is interested to know if CCSF plans eventually to treat all of its water supply and how that may fit within the WSIP. 21

5. In light of Environmental Defense's legal opinion on CCSF's water rights, the EIR should include an analysis of the specific water rights CCSF would be relying upon to support its increased Tuolumne River diversions. 22

6. It is imperative that the WSIP define the characteristics of "additional water supply via district transfers." As the District has seen no official proposal and as such, has neither discussed nor accepted any terms for a transfer, the EIR must address this issue. The SFPUC regional water supply system "draws approximately 85% of its water from a 23

[2] Water Supply Options Report, p. 7.
[3] WSIP Scoping Report, p. 27.
[4] Water Supply Options Report, p. 27.
[5] Both reports use million gallons per day (MGD). At times, it not clear whether the reports are using MGD as an instantaneous rate of flow like cubic feet per second or as a total volume of water like acre-feet (AF). Also, when MGD is use as a rate of flow, the expected minimum to maximum range of flow rates is not disclosed. If MGD is being used for a total volume of water, then both the MGD number and the intended AF number should be reported, e.g., 100 MGD (112,000 AF) per year, and where a range of MGD flow rates are expected, then the expected minimum to maximum range should be reported.

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single remote watershed, feeding a single aqueduct system, delivering water 120 miles by gravity to Bay Area reservoirs and users."[6] That statement dramatically emphasizes that proposed water transfers from the Districts would place even further reliance on that "single remote watershed" and would not meet the SFPUC Program Objectives of providing reliable water and optimizing the system's ability to withstand disasters.[7] 23 cont.

Again, thank you for giving us the opportunity to comment on the WSIP. I look forward to hearing from you. Please feel free to contact me directly at (209) 883-8211 with any questions.

Sincerely,

Larry Weis

Larry Weis
General Manager/CEO
Turlock Irrigation District

[6] WSIP Scoping Report, p. 4.
[7] WSIP Scoping Report, p. 20.

TURLOCK IRRIGATION DISTRICT
333 EAST CANAL DRIVE
POST OFFICE BOX 949
TURLOCK, CALIFORNIA 95381
(209) 883-8300

Don Pedro Dam and Powerhouse

April 26, 2007

VIA FAX (415) 558-6409 & U.S. Mail

San Francisco Planning Department
Attn: Paul Maltzer, Environmental Review Officer
1660 Mission Street, Suite 500
San Francisco, CA 94103-2414

Re: Case No. 2007.0118E – San Joaquin Pipeline System Project

Dear Mr. Maltzer,

Thank you for the opportunity to comment on the proposed scope and content of the Environmental Impact Report for the proposed San Joaquin Pipeline System Project of the Water System Improvement Program (WSIP) as summarized in the Notice of Preparation of an Environmental Impact Report and Notice of Public Scoping Meeting dated March 28, 2007 (Notice). It is my hope that our comments will warrant special attention given our status as a senior water right holder and a partner with the City and County of San Francisco (CCSF) and the Modesto Irrigation District (MID) on the Tuolumne River and as a CEQA Responsible Agency for certain aspects of the WSIP (discussed below). Our comments dated October 25, 2005, are attached hereto and incorporated herein by reference. 24

Based upon the new information being provided by CCSF in the Notice and at the April 18 Scoping Meeting in Modesto, TID has the following comments on the proposed scope and content of the EIR:

1. **CCSF Needs to Clarify the WSIP Water Numbers.**

As previously pointed out by TID, CCSF staff uses the term "million gallons per day" or "MGD" in its WSIP documents. Many times, it not clear whether MGD is intended to express an instantaneous rate of flow, such as cubic feet per second (cfs), or a total volume of water, such as acre-feet (AF). Also, when MGD is intended as a rate of flow, the expected minimum to maximum range of flow rates are not disclosed. If MGD is being used for a total volume of water, then both the MGD number and the intended AF number must be reported for clarity, e.g., 100 MGD (112,000 AF) per year, and where a range of MGD flow rates are intended, then the expected minimum to maximum range should be reported. 25

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For example, page 13 of the September 6, 2005 Notice of Preparation for the WSIP (Case No. 2005.0159E), states that the SFPUC would "Acquire up to 25 mgd of supplemental dry-year Tuolumne River water through water transfer agreements with Modesto Irrigation District and/or Turlock Irrigation District." Since a rate of 1 MGD for 365 days is 1,120 AF, 25 MGD can mean 28,000 AF per year. In Table 3, page 31 of June 28, 2005 Revised Draft SFPUC Purchase Estimates and Water Supply Options Current Conditions and Year 2030 Projections, lists a "Districts' Transfer" of 29,000 AF per year.

Over the last two years of WSIP planning, TID has noticed that the various numbers reported by CCSF have varied, which is understandable; however, it is difficult to ascertain what the current numbers being used are. Therefore, it is important that the DEIR clearly provide the following numbers* and the basis for their calculation in the CEQA documents: 25 cont.

Metric	Existing Baseline (???? – 200?)	New WSIP Numbers (2030 Level of Service)
San Joaquin Pipeline instantaneous maximum rate of flow	290 MGD ??? 449 cfs ???	313 MGD 484 cfs
San Joaquin Pipeline average annual delivery	260 MGD ??? _______ AF	300 MGD ??? _______ AF
San Joaquin Pipeline average daily flow when any one segment of the system is taken out of service for maintenance	____ MGD ____ cfs	271 MGD 419 cfs
San Joaquin Pipeline average annual delivery during the 30% driest water years (Critical and Dry water years)	_______ MGD _______ AF	_______ MGD _______ AF [projected]
Tuolumne River System Firm Yield	_______ MGD _______ AF	_______ MGD _______ AF
Local System Firm Yield	_______ MGD _______ AF	_______ MGD _______ AF
Total System Firm Yield	_______ MGD _______ AF	_______ MGD _______ AF

*TID staff could not ascertain the current numbers for many of the above key metrics from the WSIP documents so question marks and the blank spaces have been inserted as placeholders.

2. **Impacts of Global Warming on CCSF's Tuolumne River Water Supply.**

At the request of CCSF Hetch Hetchy Water and Power staff, TID staff ran an analysis of the possible impacts of global warming on the Tuolumne River watershed runoff using its state-of-art Hydrologic Forecasting Analysis Model (HFAM) developed by Dr. Norman 26

Crawford for the period 1931 to 2000. The preliminary results of the computer runs have been shared with CCSF staff. This EIR and the Programmatic EIR (PEIR) need to address the potential impact of global warming on CCSF's Tuolumne River System Firm Yield. 26 cont.

3. **<u>Project Alternative – Increased Diversions and Districts' Transfer through New Lower Tuolumne River Diversion.</u>**

Any permitted increase in diversions from the Tuolumne River and any mutually agreed upon water transfers from TID and/or MID should be made through a new lower Tuolumne River diversion facility, which would in part mitigate for any such increased diversions or water transfers.

TID has successfully completed the CEQA review process and is now in the design phase for its Regional Surface Water Supply Project. TID's project would divert up to 66 cfs of water from the Lower Tuolumne River at River Mile (RM) 26 near Fox Grove via an existing infiltration gallery with a maximum diversion capacity of 100 cfs that was constructed in 2003 in anticipation of the project and as part of a major riparian habitat restoration project, Special Run Pool 9, in which CCSF participated. The to-be-constructed water treatment plant will have a capacity to treat and deliver up to 42.5 MGD (47,680 AF per year) of surface water to the communities of Ceres, Hughson, Keyes, South Modesto, and Turlock within TID. This project will also benefit Chinook salmon and rainbow trout in the twenty-six mile stretch of the Tuolumne River from La Grange Dam to the infiltration gallery through increased instream flows especially during the summer months of drier water years.

27

CCSF's EIR should describe and evaluate a similar but larger diversion, treatment, and delivery project that would tie into the San Joaquin Pipeline. For example, a 100 cfs (64.6 MGD or up to 72,200 AF per year) diversion and treatment facilities at two possible locations on the Tuolumne River. The diverted surface water would be treated and delivered via a pipeline from the treatment plant to the San Joaquin Pipeline. The alternative diversion locations could be at the following general areas:

- At RM 25 and would include the riparian habitat restoration of Special Run Pool 10. This would be very similar to TID's project at RM 26 in that it would be in the gravel-bedded reach of the lower Tuolumne River where a buried infiltration gallery can be effectively employed.

- Nearer the mouth of the Tuolumne River within the sand-bedded reach of the river. The advantage of this location would be to provide additional flow for a much longer stretch of the river and a location that would be closer in distance to the San Joaquin Pipeline.

Adding a lower Tuolumne River diversion would also provide an alternative water supply when a segment of the San Joaquin Pipeline needed to be shut down for construction, maintenance, or emergencies. In fact, consideration should be given to constructing this

alternative first to lessen the impact on water deliveries from San Joaquin Pipeline shutdowns due to WSIP construction work or operational emergencies. 27 cont.

4. **<u>TID as a CEQA Responsible Agency for Certain Aspects of the WSIP.</u>**

The WSIP's proposed dry year water transfer from TID to CCSF described in Paragraph 1 above, the lower Tuolumne River diversion described in Paragraph 3, and most likely implementation of other aspects of the WSIP affecting TID's Tuolumne River water rights or water or power operations would require the discretionary approval of TID. The CEQA Guideline, specifically 14 Cal Code Reg § 15381, defines a "Responsible Agency" as including "all public agencies other than the Lead Agency which have discretionary approval over the project." TID would like to reach agreement with CCSF on TID's role as a Responsible Agency with regards to those proposed WSIP activities that are within TID's area of expertise and/or that are subject to TID's approval. 28

5. **<u>Coordination of the PEIR and the Specific Regional EIRs.</u>**

TID learned at the Scoping Meeting that the WSIP consists of 35 proposed regional projects and 35 proposed local projects and that the PEIR is intended to be the overarching CEQA document for all 70 projects. TID's proposed Lower Tuolumne River Diversion Alternative raises significant water supply alternatives, which presumably will be discussed in the PEIR, and illustrates that the PEIR and regional specific projects need to be closely coordinated. However, it is unclear from what CCSF has presented to date, how CCSF intends to insure that these separate but intertwined CEQA processes will be coordinated both as to scope and depth of environmental analysis and as to the timing of those different processes. 29

Thank you for giving us the opportunity to comment. I look forward to hearing from you. Please feel free to contact me directly at (209) 883-8211 if you have any questions or need additional information.

Sincerely,

Roger K. Masuda
General Counsel

For Larry Weis
General Manager
Turlock Irrigation District

L_MID_TID2

12.3-148

Modesto Irrigation District
The Power to Grow

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October 29, 2007

Ms. Diana Sokolove
San Francisco Planning Department
Major Environmental Analysis Division
1650 Mission Street, Suite 400
San Francisco, CA 94103-2479

Re: Hetch Hetchy/Local Simulation Model (HH/LSM) used in developing the Draft Program Environmental Impact Report (PEIR) on the Water System Improvement Program (WSIP)

Dear Ms. Sokolove:

Thank you for the information provided in your transmittal of October 4th. The CD contained some of the information previously requested. However, it did not contain an executable copy of the hydrologic/hydraulic models, or the modeling assumptions utilized in the analysis.

As stated in our earlier comments, the Districts require both the executable files, as well as the output files and modeling assumption documentation to adequately evaluate and "determine: (1) if the assumptions made with respect to the District's operations are correct; (2) the impacts to the Districts' water and power resources; and (3) the impacts to the Tuolumne River and its fishery resources." 01

Please provide the Districts with the aforementioned models, and simulation information as soon as possible to enable us to finalize our comments on the proposed WSIP. The requested 60-day time extension submitted in the Districts' October 1st comment letter is reiterated here. The additional time is required for the Districts to fully evaluate the models and provide any supplemental comments that may be necessary. If there are any questions regarding the information requested, please do not hesitate to contact Wes Monier, at (209) 883-8321 for clarification. 02

Sincerely,

MODESTO IRRIGATION DISTRICT

Walter P. Ward
Assistant General Manager
Water Operations
Modesto Irrigation District
P.O. Box 4060
Modesto, California 95352

TURLOCK IRRIGATION DISTRICT

Robert M. Nees
Assistant General Manager
Water Resources & Regulatory Affairs
Turlock Irrigation District
P.O. Box 949
Turlock, California 95381

L_Millbr

City of Millbrae

621 Magnolia Avenue, Millbrae, CA 94030

September 28, 2007

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PLANNING DEPARTMENT
MEA

San Francisco Planning Department
Attention: Paul Maltzer, Environmental Review Officer
WSIP PEIR
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Maltzer:

The city of Millbrae appreciates the opportunity to support and comment on the comprehensive draft Program Environmental Impact Report (PEIR) which the Planning Department has prepared for the Water System Improvement Program (WSIP) developed by the San Francisco Public Utility Commission (SFPUC). This small bedroom community is completely reliant on potable water from the Hetch Hetchy Water System. We have explored the potential availability of ground water within our jurisdiction and found none. We have also explored the potential for providing recycled water to the Green Hills Golf Course and our schools but found the estimated costs to upgrade our waste water treatment plant processes and install a distribution system to be exorbitant and unaffordable at this time. We have also aggressively pursued water conservation best management practices since the early 90s and believe we have been a leader in this area with dedicated conservation staffing. It is crucial to the life and well-being of our community that the ability of SFPUC's water system to with stand earthquakes be improved as well as its long term reliability. 01

The draft we believe will satisfy the requirements of CEQA for program EIRs. We are also concerned that the urgency and critical nature of the work outlined in the WSIP has not been sufficiently highlighted in the PEIR. The loss of San Francisco PUC's Hetch Hetchy Water System for even one week would have a catastrophic effect on this region economically, medically, environmentally, and politically. The loss of this system for any length of time would likely affect the entire nation. We believe it is absolutely crucial to the viability of this region that the WSIP be prosecuted with all due haste. No project contained in the WSIP should be separated from the whole program because each piece is necessary to achieve a seismically safe and reliable system that can consistently produce high quality drinking water. 02

We support the "Environmentally Superior Alternative" outlined in PEIR. However, we 03
believe the PEIR is weak in distinguishing between the amount of water taken from the Tuolumne River by the SFPUC's system and the others who take water from the Tuolumne River. The SFPUC's share of water taken from the River is currently about 12% and even with the combined increases from retail and wholesale users would only 04

San Francisco Planning Department
September 28, 2007
Page 2

increase the total SFPUC draw to 13%. We believe this fact needs to be addressed in the PEIR. 04 cont.

We appreciate that the SF Planning Department will be evaluating the economic and environmental impacts of 10%, 20% and 30% water supply reductions due to droughts. We believe the current 20% reduction goal in the PEIR would have devastating economic and environmental impacts from which the entire Bay Area may not recover for decades, if ever. We are pleased that some economic evaluation of various levels of forced drought reductions in water supply will be evaluated. 05

Thank you for the opportunity to comment on the SFPUC's WSIP PEIR. We enthusiastically support a comprehensive review of the PEIR within the time limits planned by your department. We are very concerned that any delays would significantly increase the costs of the $4.3 billion WSIP, especially in the current busy construction environment. Again, we believe completion of the projects identified in the WSIP on schedule is critical to maintaining both the near-term and long-term seismic survivability and reliability of the SFPUC's water system and the well being of our community.

Sincerely,

Ronnald Popp
Director of Public Works

Cc:
Marc Hershman, Mayor and BAWSCA Board Member
Ralph Jaeck, City Manager
Ralph Petty, Community Development Director
David Petrovich, City Planner

CITY OF MILPITAS

455 East Calaveras Boulevard, Milpitas, California 95035-5479 • www.ci.milpitas.ca.gov

September 27, 2007

San Francisco Planning Department
Paul Maltzer, Environmental Review Officer, WSIP PEIR
1650 Mission St., Suite 400
San Francisco, CA 94103

Subject: City of Milpitas Comments on the SFPUC's Water System Improvement Program Draft Programmatic Environmental Impact Report

Dear Mr. Maltzer:

The City of Milpitas supports the SFPUC Water System Improvement Program (WSIP), and we appreciate the opportunity to review and provide comment on the draft PEIR. The WSIP is urgently needed to rehabilitate the aging SFPUC water delivery system. It provides necessary seismic upgrades to help the system withstand the major earthquakes that will inevitably strike this region. 01

The SFPUC system provides approximately 60% of the City of Milpitas water supply. The health and safety of our residents and economic viability of our businesses absolutely depend upon the continuing reliability of the system. Indeed, much of the San Francisco Bay Area quality of life and economic prosperity are directly due to this vital resource, so we urge the SFPUC to proceed with the WSIP without delay. 02

We have identified the following items that need to be corrected or clarified in the PEIR.

1. **Milpitas Water Supply.** Please make the following clarifications in Section 7.3.6 (Customer-Specific Summaries) in the City of Milpitas summary and wherever the Milpitas water supply is discussed. 03
   - Include the City's three sources: SFPUC (61%), Santa Clara Valley Water District (32%), and recycled water (7%).
   - Include a statement that the City of Milpitas maintains separate potable distribution systems that are not blended under normal conditions. 04
   - Include a statement that the City of Milpitas' projected increase in water demand will occur mainly in the Santa Clara Valley Water District service area and will not impact SFPUC's water system. In the year 2030, the estimated Milpitas demand for SFPUC water supply is 8.20 mgd which is less than the City's current Supply Assurance amount of 9.232 mgd, so no impact is expected. The following data is an excerpt from Table 3-1 of the City of Milpitas 2005 Urban Water Management Plan. 05

Source	2004-05	2029-30	difference
SFPUC	6.77 mgd	8.20 mgd	1.43 mgd
SCVWD	3.53 mgd	7.13 mgd	3.60 mgd
Recycled Water	0.72 mgd	1.77 mgd	1.05 mgd
Total	11.02 mgd	17.10 mgd	6.08 mgd

05 cont.

- Include the following text: "The City purchases water from the South Bay Recycling Program and distributes it to irrigation customers via 19 miles of recycled pipelines to more than 160 irrigation customers. Recycled water use decreases the amount of potable water the City needs to purchase, thus lowering potable water demands. The City is actively promoting appropriate use of recycled water and will increase its use in the future. The City anticipates that 10% of its water use in 2030 (1.77 million gallons per day, mgd) will be recycled water." 06

2. **Milpitas Water Demand.** In Section 7.3.6 (Customer-Specific Summaries) in the City of Milpitas summary, include a reference to Table 7.2 (Summary of 2030 Demand Projections, Water Supply Assumptions, and SFPUC Purchase Estimates) so it is clear where the referenced 48 percent and 46 percent come from. 07

3. **Water Conservation.** In Section 7.3.6 (Customer-Specific Summaries) in the City of Milpitas summary, include the following text:

The City of Milpitas is committed to water conservation. The adopted 2002 Midtown Specific Plan for redevelopment of this urban center includes policies requiring water conservation and use of recycled water (see item # 11 below for more details). The proposed Transit Area Specific Plan is expected to contain similar policies requiring water conservation and recycled water use. The City Council adopted Ordinance 238 titled "Water Efficient Landscapes" in 1993; see Attachment # 1. The City Council adopted Ordinance 240 titled "Water Conservation" in 1994; see Attachment # 2. See Attachment # 3 for samples of literature and program details. Estimates of water savings made for the period January 1993-October 2000 totaled 136 million gallons. The programs have continued since October 2000 but we have not tracked the savings. 08

Residential Programs: Milpitas residents have demonstrated their ability to conserve water with a per capita water use just under **80 gallons per day** as shown in Figure 4-4 from the City of Milpitas 2005 Urban Water Management Plan. Residents are conserving water by requesting free Water Wise House Calls. A technician from the Santa Clara Valley Water District will check for leaks as well as provide tips for water conservation. Residents are also conserving by participating in rebate programs for high efficiency toilets, washing machines, and shower heads. Some of these programs have been offered for over the last 10 years!

- Over **5,658 showerheads** given away in past 10 years
- Over **2,105 faucet aerators** given away in past 10 years
- Over **5,033 toilet rebates** given away in past 10 years
- Over **2,231 washing machine rebates** given away in past 12 years
- Over **227 Water Wise House Calls** were performed in the past 2 years

Commercial Programs: Commercial and industrial customers can track their water usage by **borrowing water meters** from the City. Commercial washing machine rebates are also available. Large industrial customers recognize the value of saving water; actual data from three Milpitas customers are shown in the table below:

	2000 Usage	2006 Usage	Savings
Company A	200,964 hcf	68,007 hcf	132,957 hcf **66%**
Company B	110,268 hcf	66,565 hcf	43,703 hcf **40%**
Company C	49,608 hcf	36,412 hcf	13,196 hcf **27%**

1 hcf = 748 gallons

08 cont.

Landscape Irrigation: The Santa Clara Valley Water District offers an Irrigation Technical Assistance Program to help evaluate the business' irrigation system as well as offer water saving techniques. **112** Milpitas sites have taken advantage of this program over the past 10 years. Landscaping for new developments are reviewed to insure compliance with AB 325 (City ordinance 238 Water Efficient Landscapes). For the past 10+ years, this amounted to 244 applications for **10,271, 805 square feet**.

Recycled Water: The City of Milpitas started delivering recycled water for landscape irrigation in 1997. The program has grown to 164 irrigation customers. Over 2 billion gallons of recycled water were used during the period of October 1997 through June 2006. There are plans to add about 70 more customers over the next few years. Some areas of the Midtown Specific Plan and the proposed Transit Area Specific Plan landscape area are intended to use recycled water for landscape irrigation.

4. **Project No. SV-2 (Calaveras Dam Replacement).** Indicate in Table 3.10 (WSIP Facility Improvement Projects), Table 3.12, and wherever Project No. SV-2 is mentioned that the City of Milpitas could experience construction-related traffic for this project. Vehicles over 4-tons traveling through Milpitas are required to follow approved routes as shown on Attachment # 4 (Truck Route Map). 09

5. **Project No. BD-2 (BDPL 3 & 4 Crossovers).** Indicate in Table 3.10 (WSIP Facility Improvement Projects), Table 3.12, and wherever Project No. SV-2 is mentioned that Milpitas is adjacent to the project site and is listed as an alternative site under consideration. Vehicles over 4-tons traveling through Milpitas are required to follow approved routes as shown on Attachment # 4 (Truck Route Map). Add a comment: If the project is relocated to Milpitas, then Milpitas requirements for noise, traffic, vibrations, etc., will be followed. 10

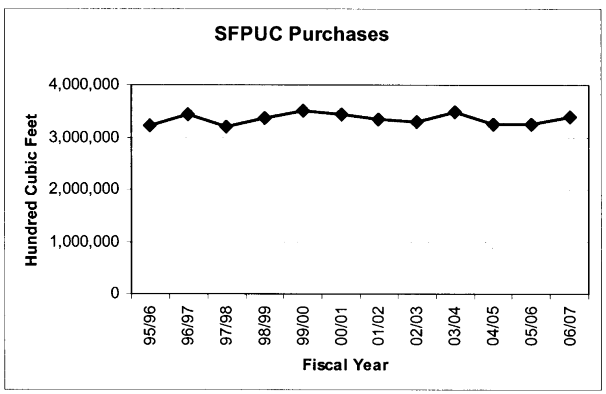
6. **Cumulative Impacts:** Construction has already begun for selected projects within the Milpitas Midtown Specific Plan area. The City of Milpitas anticipates approval of the Proposed Transit Area Specific Plan in 2007. This Plan encompasses redevelopment of 437 acres of land to a Transit Village with high-density mixed-use development. Construction is anticipated to begin shortly after Plan approval and continue over a 20-25 year period. Include the Midtown and Transit Area Specific Plans in Table 4.17-3 Cumulative Projects. 11

7. **Growth:** In Section 7.1.2 (Summary of Conclusions) on page 7-6, we disagree with the 2nd bullet that states *"Milpitas and East Palo Alto have experienced high rates of growth more recently."* The PEIR did not provide the source of data for this statement, so we assume that the "high rates of growth" refers to population.

We developed the following table showing populations for selected BAWSCA agencies. The data was extracted from BAWSCA's 2005-06 Annual Survey (Table V) and shows that there are many other agencies that have higher rates of growth than Milpitas.

	FY 1995-96	FY 2005-06	% Chg
Coastside	13,500	17,372	28.7%
Stanford	22,346	27,715	24.0%
Westborough	9,940	12,000	20.7%
Santa Clara	98,300	108,700	10.6%
Palo Alto	56,850	62,148	9.3%
Milpitas	59,725	64,998	8.8%
East Palo Alto	24,500	25,696	4.9%

Also, as the chart below shows, Milpitas' SFPUC purchases have remained fairly stable since 1995. 12



8. **Milpitas Customer-Specific Summary.** Section 7.3.6 (Customer-Specific Summaries) makes reference to growth that is due to large single-family residential categories that assumes larger homes with higher outdoor water usage. This assumption is incorrect and **does not accurately** reflect the City of Milpitas General Plan Land Use Element, previously approved Midtown 13

Specific Plan (2002), or the currently proposed Transit Area Specific Plan. The goals, policies, and objectives of these plans encourage and promote high-density residential development (20-60 dwelling units per acre) and mixed-used Transit Oriented Development (TOD). As stated below, both specific plans would generate a combined total of approximately 11,400 dwelling units (over a 20 year time period) which are high-density residential (not large single family homes). Milpitas does not have land available for large single family development.

The City is committed to **Smart Growth** and has been incorporating Smart Growth designs into many developments. City voters adopted **Measure Z** in 1998, which prohibits extension of City services such as water and sewer to the hillsides. The City adopted the **Midtown Specific Plan** in 2002, which incorporates high-density housing within the urban core. In addition, the City is currently developing the proposed **Transit Area Specific Plan**, located at the intersection of the existing light rail system and future BART system, that incorporates high-density mixed-use developments reaching up to 60 dwelling units per acre.

Both the Midtown Specific Plan and the Transit Area Specific Plan are in conformance with the Transit Village Development Act. They promote:

- Neighborhoods centered around a transit area with a variety of housing styles and retail centers;
- Access to an intermodal transit system consisting of light rail, pedestrian paths, bicycle routes, and future BART; and 13 cont.
- Infill development that preserves open space.

Water demands are conservatively based upon 2.7 persons per household for both the Midtown Specific Plan and Transit Area Specific Plan. However, with further analysis the population estimates for the Transit Area Specific Plan was based upon 2.52 persons per household, which partially explains the discrepancy of water demand compared to the population growth rate. Note that the Milpitas 2002 Water Master Plan includes an increase in Floor Area Ratio (FAR) for several non-residential zonings in the Midtown Specific Plan, which would increase the water demand per acre. The proposed Transit Area Specific Plan also includes FAR increases for several non-residential zonings.

Revise text to indicate the future trend for the City of Milpitas is "smart growth" with high-density residential housing.

Revise the billing categories in the demand model to eliminate the new single family residential category that assumes larger homes with higher outdoor water usage and replace with high density residential housing as described in the adopted 2002 Midtown and Proposed Transit Area Specific Plans.

Revise PEIR text accordingly.

9. **Table 7.8 (Population Estimates: Water Demand vs. General Plan), page 7-28.** We do not believe that the quoted "Water Customer – Selected Population Projection for 2030" for Milpitas is correct. It needs to be revised from 88,841 to 95,014. The 2002 General Plan population of 77,100 (Table 2-1 in the General Plan) already includes the 4,860 dwelling units from the Midtown Specific Plan. Replace footnote b with the following text: "The projected 14

population is based upon the population shown in the General Plan (77,100) plus the additional population accommodated by the proposed Milpitas Transit Area Specific Plan to account for 7,109 additional units with an assumed density of 2.52 persons per unit (an added population of 17,914, bringing the total population projection to 95,014). Upon adoption of the proposed Transit Area Specific Plan, the City will amend the General Plan." 14 cont.

10. **Elmwood Residential & Commercial Development, page E.6-2.** Revise text to indicate that this development does not receive SFPUC water, but receives District water for potable use and recycled water for some parks. 15

11. **Section E.4.2 (Santa Clara County).** Please add the following text below the existing Milpitas text. 16

Midtown Specific Plan and Transit Area Specific Plan

The City of Milpitas has two major specific plans that will impact the future development and land use within the City: 1) Midtown Specific Plan (adopted March 2002) and 2) Transit Area Specific Plan (currently being developed).

Midtown Specific Plan

The Midtown Specific Plan was adopted by the City of Milpitas in March 2002, and the plan provides for a new vision for approximately 1,000 acres of land. The overall strategy in the Midtown Specific Plan Area is to create a mixed-use community that includes high-density, transit-oriented housing and a central community "gathering place" while maintaining needed industrial, services and commercial uses. Key elements of the plan include:

- Allowing for up to 4,860 new housing units.
- High density residential development (31 to 40 units/per gross acre).
- Transit-Overlay Development (TOD) Zoning within 2000 ft. (41 to 60 units/per gross acre).
- Mixed-use to allow mixture of retail, office, housing services, and public/quasi-public uses.
- Create lively pedestrian-friendly environment.
- 20% Parking Reduction.
- Encourage assembly of parcels along S. Main Street to promote orderly development.

Included in the Midtown Specific Plan are:

- Policy 6.2: Reduce water consumption through a program of water conservation measures, such as use of recycled water, water saving features, and drought-tolerant landscaping.
- Policy 6.4: Continue to require new residential, commercial and industrial development south of the Hetch-Hetchy right-of-way to install recycled water lines with other utilities serving the site. Require conversion of landscape irrigation to recycled water as soon as available. Use recycled water to irrigate landscaping associated with street landscaping and the creek trail system as feasible.

Transit Area Specific Plan 16 cont.

The Transit Area Specific Plan was initiated in November 2004 to promote and encourage high- density residential and mixed-use development around the proposed new Milpitas BART Station located near Capitol Avenue and Montague Expressway. Currently, the Environmental Impact Report (EIR), General Plan and Zoning Change Amendments are being completed. It is anticipated that the Milpitas Planning Commission and City Council will consider the Transit Area Specific Plan within the next few months. Key elements of the plan includes:

- Allowing for up to 7,109 new housing units
- High density residential development (20 to 40 units/per gross acre)
- Transit-Overlay Development (TOD) Zoning within 2000 ft. (41 to 60 units/per gross acre)
- Mixed-use development (280,000+ sq. ft. commercial retail, 750,000+ sq. ft. professional office space)
- Open Space for passive and active recreational use
- 20% Parking Reduction
- Construction of a New BART Station

It is anticipated that this Plan will also include policies regarding water conservation and recycled water use.

Copies of the Midtown Specific Plan are available upon request, and the Transit Area Specific Plan is scheduled to be circulated for comment shortly.

If you have questions, please contact Kathleen Phalen at (408) 586-3345 or kphalen@ci.milpitas.ca.gov.

Sincerely,

Thomas C. Williams
City Manager

cc: BAWSCA General Manager
Public Works Director/City Engineer
Planning Director
City Attorney
Utility Engineer

Attachment # 1	City of Milpitas Ordinance 238 Water Efficient Landscape
Attachment # 2	City of Milpitas Ordinance 240 Water Conservation
Attachment # 3	Water Supply and Conservation Programs (Binder)
Attachment # 4	City of Milpitas Truck Route Map

CITY OF MOUNTAIN VIEW

Public Works Department • 500 Castro Street • Post Office Box 7540 • Mountain View, California 94039-7540
650-903-6311 • FAX 650-903-6499

September 28, 2007

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PLANNING DEPARTMENT
MEA

MR PAUL MALTZER—ENVIRONMENTAL REVIEW OFFICER
WSIP PEIR—SAN FRANCISCO PLANNING DEPARTMENT
1650 MISSION STREET SUITE 400
SAN FRANCISCO CA 94103

Dear Mr. Maltzer:

The City of Mountain View appreciates the opportunity to provide comments regarding the comprehensive June 2007 Program Environmental Impact Report (PEIR) prepared by the City of San Francisco Planning Department for the San Francisco Public Utilities Commission's (SFPUC's) proposed Water System Improvement Program (WSIP) to improve the reliability of its Hetch-Hetchy regional water system.

City of Mountain View staff believes the PEIR should include a more focused discussion and greater emphasis on the urgent need to implement the WSIP improvements to protect the public health, safety and economic well-being of the more than 2.4 million Bay Area residents, businesses and community organizations that rely on the Hetch-Hetchy water system. 01

The urgent need to improve the short- and long-term seismic reliability and safety of the Hetch-Hetchy regional water system was the catalyst for the passage of AB 1832, the Wholesale Regional Water System Security and Reliability Act, and the environmental review process currently under way for the WSIP.

The PEIR should also more thoroughly acknowledge the aggressive efforts undertaken by jurisdictions and agencies throughout the Bay Area, including the City of Mountain View, to manage current and future water demand. Detailed information regarding the City of Mountain View's water conservation, water reclamation and resource-efficient land use practices is provided in Attachment 1 to this letter. 02

City of Mountain View staff has thoroughly reviewed the PEIR document and found no significant errors in the document's presentation of statistical or other information pertaining to the City of Mountain View. The City would, however, like to clarify that water service within its jurisdictional boundaries is provided by a City-owned and operated water utility, not a separate water service agency. 03

L_MtnVw

Mr. Paul Maltzer
September 28, 2007
Page 2

The City of Mountain View thanks the City of San Francisco Planning Department for the opportunity to provide comments regarding the PEIR.

Please contact me or Linda Forsberg, Business and Internal Services Manager, at (650) 903-6329 if you have any questions or require additional clarification regarding these comments.

Sincerely,

Cathy R. Lazarus
Public Works Director

CRL/LF/8/PSD
701-09-25-07L-E^

Enclosure

cc: CM, APWD—Hosfeldt, USM, BISM, SCE—Turner, SAA—Skinner

L_Newark

CITY OF NEWARK, CALIFORNIA

37101 Newark Boulevard • Newark, California 94560-3796 • (510) 793-1400 • FAX (510) 794-2306

October 1, 2007

Paul Maltzer, Environmental Review Officer
WSIP PEIR
1650 Mission Street Suite 400
San Francisco, CA 94103

Dear Mr. Maltzer:

Thank you for the opportunity to review and comment on the Program Environmental Impact Report for the San Francisco Public Utilities Commission's Water System Improvement Program (WSIP).

We understand the draft document currently under review is for the entire WSIP and project level analysis of individual facility improvements will be considered separately for each of the 22 projects that constitute the WSIP. The City of Newark will be directly impacted by Bay Division Pipeline #5 Reliability Upgrade, as well as the Bay Tunnel Project, within the boundaries of the City of Newark. Mitigation to minimize public inconvenience, ensure public safety including proper traffic control and emergency access during construction, as well as full mitigation of impacts to improvements disrupted by the project both during and as a result of construction, are the primary concerns of the City of Newark. The specific impacts and the proposed mitigation need to be addressed with the project level environmental analysis. 01

It should also be noted that the presence of a lease does not relieve the SFPUC from mitigating environmental impacts as a result of the project. Expenditure for environmental mitigation, being for a public purpose, cannot be deemed a gift of public funds. Further comment will be reserved for the more detailed project level environmental analysis. 02

Sincerely,

John Becker
City Manager
(510) 790-7272

web site: www.newark.org

email: webmaster@newark.org

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City of Palo Alto

Office of the Mayor and City Council

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SEP 26 2007

CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
MEA

September 25, 2007

Paul Maltzer, Environmental Review Officer, WSIP PEIR
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Re: **Draft Program Environmental Impact Report for the San Francisco Public Utilities Commission's Water System Improvement Program**

Dear Mr. Maltzer,

The City of Palo Alto receives all of its potable water supplies from the regional water system operated by the San Francisco Public Utilities Commission (SFPUC). Palo Alto has great interest in the Water System Improvement Program (WSIP) that aims to repair and upgrade the regional water system to increase its reliability. Palo Alto understands that the completion of the Draft Program Environmental Impact Report (PEIR) for the WSIP is a significant step towards timely completion of the urgent seismic improvement projects needed for improved earthquake reliability.

Summary of Comments

- Palo Alto commends the City of San Francisco for completing the very comprehensive PEIR for the WSIP. Preparing the Draft PEIR is a major undertaking and Palo Alto commends San Francisco on its substantial effort. Overall, Palo Alto would support a finding that the Draft PEIR on SFPUC's WSIP is adequate and, therefore, satisfies CEQA requirements.
- Palo Alto appreciates the precious nature and high quality of the water supplies delivered to it in a manner that utilizes a well-engineered system designed to flow by gravity from the pristine mountain source to end users in the Bay Area, and knows that the aging system of pipes, tunnels, dams and water treatment plants is in dire need of upgrades.
- Palo Alto urges San Francisco to move expeditiously to implement the seismic improvement projects contained in the WSIP as they are urgent for earthquake reliability. Palo Alto's City Council has named emergency preparedness as one of its top priorities. 01
- Palo Alto supports the environmentally superior alternative identified in the Draft PEIR, the "Modified WSIP" alternative. This alternative would result in less severe environmental impacts, particularly on the lower Tuolumne River. Palo Alto supports reducing diversions from the lower Tuolumne River as it believes that there is significant potential to conserve or recycle water rather than diverting more water from the river.
- Palo Alto believes there is a significant opportunity for implementing conservation measures through cooperative effort between the Bay Area's wholesale water purchasers and other diverters of Tuolumne River water. Palo Alto would support and commit to pay its share for aggressive conservation measures in these areas as well as in the SFPUC service area. Palo Alto is also committed to implementing cost-effective conservation and water recycling projects in Palo Alto itself.

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- The WSIP should limit drought year reductions to no more than 10% per year. Palo Alto is concerned that a plan that incorporates up to 20% cutbacks in drought years discourages long-term investments in conservation measures by providing what amounts to a "penalty" for maximizing conservation in non-drought years. 01 cont.
- The PEIR should clarify how the 2030 water demand projections were developed using Palo Alto's Comprehensive Plan, which incorporates population and employment figures only through 2010. Further, the PEIR should explain the inconsistency between ABAG's 2030 population projections for Palo Alto and the population forecast used in the PEIR. Palo Alto considers the PEIR estimates to be reasonable and realistic based on anticipated development and historic growth rates for the City. 02
- The WSIP project schedule should be coordinated with Palo Alto's Gunn High School to minimize construction impacts of Project BD-2 on the school, its students, and any other users of the facilities. 03

The City of Palo Alto respectfully submits the following more detailed comments on the subject Draft PEIR:

1. **Palo Alto strongly supports timely completion of the seismic improvement projects contained in the WSIP.** Palo Alto has understood since 1999 that a large earthquake in the Bay Area could result in parts of the SFPUC service area being without water for up to 60 days. The Palo Alto City Council adopted Resolution #7986 (Attachment A) in July 2000 urging the SFPUC to take immediate steps to safeguard the regional water system from earthquakes and to secure water supplies for dry years. Subsequently, City Council adopted Resolutions #8135 and #8136 (Attachments B and C) in support of bills in the state legislature that would form entities that could provide funding for the projects to upgrade and repair the regional water system. 04

   The Palo Alto City Council has determined that emergency preparedness is the first of its top four priorities and strongly supports projects such as the WSIP that would increase the seismic preparedness for the community and better ensure its health and safety. Palo Alto has also supported major local capital projects to improve the reliability of the Palo Alto water distribution system.

2. **Palo Alto supports the "Modified WSIP" alternative, which is identified as the environmentally superior alternative.** Palo Alto believes that completing the seismic upgrades and repairs of the regional water system are critical. While ensuring adequate water supply for the future is important, it is not nearly as urgent as completing the seismic improvements to the regional system. Since water use by San Francisco's wholesale customers remains below the amount committed in the existing Master Water Contract, there is time to explore the development of alternate resources, including recycled water and more aggressive conservation measures. Palo Alto strongly supports the development of these alternate resources and is especially supportive of searching for water conservation opportunities wherever they make the most sense, including in the service areas of Modesto and Turlock Irrigation Districts (MID and TID). 05

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3. **Palo Alto believes that the transfers of conserved water from MID and TID that are part of the Modified WSIP alternative should be aggressively pursued, as this may be potentially the least expensive and most effective "new" water supply available for the regional water system.** Because MID and TID are by far the largest diverters of water from the Tuolumne River, they are an obvious source of conservation opportunities that would result in minimizing total river diversions. Palo Alto advocates that SFPUC's wholesale customers pay for the best conservation measures, wherever they exist, to improve environmental conditions on the Tuolumne River. Palo Alto supports aggressive pursuit of conservation opportunities in the MID and TID service areas and would support creating a net increase to flows in the lower Tuolumne River to improve environmental conditions. Palo Alto is concerned about the environmental impacts identified on the lower Tuolumne River and supports significant improvements. 06

4. **Palo Alto strongly supports efficient use of natural resources, including water.** Attachment D contains ordinances, resolutions, guidelines, policies, and reports that document that support. For example, Palo Alto adopted enforceable water use regulations in 1989 that made certain wasteful practices illegal, such as landscape runoff and using potable water to wash vehicles. In March 1991, Palo Alto produced a booklet "Using the Palo Alto Landscape Guidelines" to educate the public and developers on how to use effective water management methods such as automatic controller use, adjusting irrigation for evapotranspiration rates, zone planting for water needs, water budgeting, separating irrigation meters, etc. to limit water used for landscape irrigation. Palo Alto enforces landscape water efficiency standards that are in compliance with the State of California's Water Conservation in Landscaping Act (AB 325). 07

5. **Palo Alto also strongly supports stewardship of the natural environment, including responsible management of water resources and smart growth practices.** In October 2005, Palo Alto adopted modified Ahwahnee Water Principles. These principles address issues such as water contamination, storm water runoff, flood damage, and reliability of water supply. The principles promote compact community design, preservation of natural habitats, reduction of runoff, appropriate landscaping, use of permeable surfaces, dual plumbing for nonpotable water uses, and use of water conservation technologies. Palo Alto understands the relationship between land use practices and natural resource stewardship. Many of the Ahwahnee Water Principles are reflected in Palo Alto's land use ordinances and practices. For example, in 2005, Palo Alto's application for a Priority Development Area designation near a transit station with the potential for in-fill growth was approved. In 2006, Palo Alto adopted an ordinance amending its Municipal Code in support of pedestrian and transit oriented development combining district, to implement Palo Alto's Housing Element and Comprehensive Plan policies in support of resource conservation. An amendment to the Municipal Code in 2007 promotes sustainable landscaping (Chapter 18.40.130), stream corridor protection (Chapter 18.40.140), and storm water quality protection (Chapter 18.40.150). Also, in 2007, Palo Alto adopted an ordinance amending Municipal Code Chapters 18.76 and 18.77, which address Palo Alto's Sustainability Policy and Green Building practices. 08

6. **Palo Alto has long offered robust energy and water conservation programs, services and technical support, to its residential and business customers.** As a provider of natural gas and electricity as well as water, the City of Palo Alto Utilities can effectively promote efficiency improvements by informing customers through its Utilities bill inserts. Attachment E contains past bill inserts specifically related to water efficiency. Along with bill inserts, City of Palo Alto Utilities has produced and/or distributed marketing materials to its customers to promote efficiency. Attachment F contains a sampling of marketing materials specific to water efficient programs and practices. City of Palo Alto Utilities also makes extensive use of advertisements in print media to get out the message on efficiency. Attachment G contains copies of ads and articles promoting water efficiency. City of Palo Alto Utilities also has an active school education program to encourage efficient use of resources. Attachment H is a collection of materials, including workbooks, flyers, and brochures used in school water efficiency education programs.

7. **Palo Alto's efforts to manage demand citywide are effectively illustrated in the graphic showing actual water consumption since 1965 in Attachment I.** Palo Alto's water usage peaked in 1976 at almost 20,000 acre-feet per year (AFY). After lowered consumption during the 1976-1977 drought period, usage rebounded to almost 19,000 AFY in 1988. Efforts to curb consumption during the extended drought period from 1988 to 1992 were successful with consumption since the drought ranging between 14,000 AFY and 15,000 AFY. Consumption projections for the future are flat at about 15,000 AFY, far lower than actual usage in 1976 despite increases in population and economic activity in Palo Alto over the last 30 years. 09

8. **During both the 1976-77 and the 1988-1992 drought periods, Palo Alto implemented an extensive public education program on water conservation.** Palo Alto produced many materials designed to educate the public about the drought and promote water efficiency. A sampling of these materials is found in Attachment J.

9. **Palo Alto has long structured its residential retail water rates to promote efficient use of water.** Since July 1976, Palo Alto has had an "increasing block rate structure" for residents. Increasing block rates increase as the quantity used increases. This rate structure is considered by the California Urban Water Conservation Council to be water conserving pricing. Attachment K contains Palo Alto's residential water rates since July 1976. During the 1988-1992 drought, Palo Alto was able to achieve the goals for water use cutbacks by increasing the differential between the rates in lower and higher use tiers. Because the conservation pricing, extensive public education, conservation programs, use restrictions and related enforcement practices that were used were so effective, Palo Alto did not need to implement rations or limits for residential customers during that drought.

10. **Palo Alto's ongoing efforts to encourage and invest in conservation are not well served by the proposed drought-time rationing goal of cutbacks of up to 20%.** With the threat of a pre-determined rationing goal, Palo Alto and other wholesale customers may have difficulty continuing to invest in conservation measures and recycled water projects. To the extent that demands are limited and wastes are eliminated, getting an 10

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additional 20% reduction in usage is and will be difficult. The Draft PEIR evaluated a "water supply variant" with 10% maximum drought reduction and determined that the environmental impacts of such an option were similar to the impacts of the proposed program and that the average annual diversions from the Tuolumne River would be the same over a long period of time. Besides increasing supply reliability, the 10% rationing option would reduce the inevitable economic impact resulting from the extended reduction of water supplies. Palo Alto supports the 10% maximum drought reduction "water supply variant" and encourages San Francisco to select that option. In concert with the pursuit of additional conserved water from MID and TID, this option could result in no additional diversions from the Tuolumne River in droughts than the proposed program. 10 cont.

11. **The Draft PEIR addresses the concept of an additional intertie with the Santa Clara Valley Water District (SCVWD), but presents it only as a strategy that affects water supply sources.** This concept, which Palo Alto raised in its written comments regarding the Notice of Preparation of the PEIR, would increase desirable redundancy and operational flexibility for both regional systems (SFPUC and SCVWD) and offers improved emergency response. The concept could help meet or exceed the Level of Service goals for the project relating to seismic reliability and deliverability. The PEIR discusses a dry year transfer concept and a future water supply source for the SFPUC regional system and rejects those ideas with good reasons. However, the concept of using a new intertie for emergencies is not given adequate discussion. Such an intertie would be created by extending SCVWD's West Pipeline from the point where it currently ends at Foothill Expressway and Fremont Avenue in Mountain View to Foothill Expressway and Page Mill to Bay Division Pipelines 3&4. Alternately, the West Pipeline could be paralleled back to SCVWD's Rinconada Water Treatment Plant to improve reliability for both regional systems. 11

12. **Palo Alto understands that one of the crossovers between Bay Division Pipelines 3&4 for WSIP Project BD-2 is located in Palo Alto.** The site for the crossover in Palo Alto is identified in the Draft PEIR is "near Barron Creek, adjacent to the running track and sports fields at Gunn High School." According to the Draft PEIR, the project includes a valve vault of approximately 3,750 square feet with the drainage outfall located on the site and that piping to connect the facility to outfalls would be required. In addition, a control building (3 to 8 feet high) for electrical and mechanical equipment at the valve vault is required. Section 4.3 of the PEIR should include an elevation/schematic of the control building and/or vault so the reader has an understanding of what the facility will look like and how it may visually impact sensitive areas. Many of the mitigation measures for WSIP project impacts located within Palo Alto involve construction. The PEIR should state that mitigation measures may not violate City ordinances, including, but not limited to, noise and nuisance ordinances. In addition, Palo Alto expects to be involved in and consulted at an early stage in this project. 12

The City of Palo Alto respectfully submits the following comments with reference to specific sections and pages on the subject Draft PEIR:

13. **Pages 4.3-17 and 6-4** list several mitigations for construction impacts. The first measure listed on page 6-4, Neighborhood Notice, in and of itself is not mitigation. This measure may make it more palatable to neighboring residents because they will know when construction will occur, but it doesn't reduce the impact. As a substitute mitigation, Palo Alto suggests coordinating with Gunn High School in order to limit construction of the crossover to times during the school year that would be least likely to result in noise and other construction impacts on school activities. 13

14. **Page 4.3-22** mentions that additional right of way/easement could be needed for the crossover outfall at the Gunn/Veteran's Administration hospital location. The PEIR should identify how much additional land will be required, when that will be determined and where it will be located.

15. **Page 4.3-40** of the PEIR is ambiguous as to whether the control building and/or vault will be visible from Foothill Blvd. If it will not to be visible, then no mitigation is needed. If it is going to be visible, then it should be so stated in the PEIR.

16. **On page 4.12-10**, the first two sentences of the City of Palo Alto section should read: "Palo Alto has a total of 4,358 acres of parkland and open space areas including 32 City urban parks encompassing approximately 200 acres and several large open space and nature preserves. Foothills Park is approximately 1400 acres and the Arastradero Preserve is approximately 610 acres." Many of the City parks are dedicated parks, created by ordinance. The City Charter bans substantial building, construction, reconstruction, or development upon or with respect to any dedicated park lands except pursuant to ordinance subject to referendum. 14

17. **Page 6-6** in the last paragraph under the Cultural Resources section should clarify that it is San Francisco's Planning Department and Environmental Review Officer that will be responsible for these actions. 15

18. **Section 7.3** needs to be clarified regarding the population and employment forecasts used for the water demand projections and assumptions. The discussion should be clear that the City's projected population and employment forecasts in the PEIR for the year 2030 are assumed to be extrapolated from the Palo Alto 2010 Comprehensive Plan; the forecasts used in the analysis are within 10% and 16% of the 2010 Comprehensive Plan population and employment figures, respectively. ABAG's projected 2030 population growth cited in the PEIR for Palo Alto's Sphere of Influence is over 33% higher than the 2030 population projection for Palo Alto used in the PEIR. The PEIR does not explain why ABAG's population projections are significantly higher than the population projections used for the water demand plan given that both are for a 2030 horizon. The PEIR should explain that the City considers the forecast used in the PEIR to be a reasonable and realistic projection of Palo Alto's anticipated growth through 2030. Historically, Palo Alto has grown very slowly; the 2000 census showed a 5% increase in 16

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population over a thirty year period from 1970. Although in the last seven years, Palo Alto has experienced unprecedented new housing development resulting in an 8% increase in population (still far below the ABAG projections), this growth cannot be sustained given Palo Alto's limited land availability and redevelopment potential; therefore, the City considers the PEIR 2030 population forecast, which is approximately a 10% growth increase from our 2010 Comprehensive Plan projected population, to be a reasonable increase. 16 cont.

Palo Alto commends the City of San Francisco for completing the very comprehensive PEIR for the WSIP, especially in the context that the WSIP is a significant step towards timely completion of the urgent seismic improvement projects needed for improved earthquake reliability.

Sincerely,

Yoriko Kishimoto
Mayor

Attachments:

A. Resolution No. 7986 – Resolution of the Council of the City of Palo Alto Recommending that the San Francisco Public Utilities Commission Take Prompt Action to Improve Regional Water Supply Reliability and Quality.
B. Resolution No. 8135 - Resolution of the Council of the City of Palo Alto in Support of Legislation Allowing the Formation of a Regional Water Agency, Specifically Senate Bill 1870, the Bay Area Water Reliability Financing Authority Act
C. Resolution No. 8136 - Resolution of the Council of the City of Palo Alto in Support of Legislation Allowing the Formation of a Regional Water Agency, Specifically Assembly Bill 2058, the Bay Area Water Regional Water Supply and Conservation Agency Act
D. Water Policies and Reports Regarding Water
E. City of Palo Alto Utilities Bill Inserts
F. City of Palo Alto Utilities Marketing Material
G. Advertisements and Articles relating to Water Efficiency
H. City of Palo Alto Utilities School Education Program Materials
I. City of Palo Alto Annual Water Supply Purchases Since 1965 and Long-Term Purchase Forecast
J. City of Palo Alto Utilities School Special Drought Materials
K. City of Palo Alto Utilities Residential Water Rate Schedules (since July 1976)

cc: Art Jensen, General Manager of the Bay Area Water Supply and Conservation Agency

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Purissima Hills Water District

September 28, 2007

Mr. Paul Maltzer, Environmental Review Officer, WSIP-PEIR
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, California 94103

Subject: **San Francisco Water Supply Improvement Program (WSIP) Comments on Programmatic Environmental Impact Report (PEIR)**

Dear Mr. Maltzer:

Purissima Hills Water District serves 6,000 people in Los Altos Hills with excellent quality water from the San Francisco Public Utilities Commission system. The PEIR addresses regional water supply issues that are critical to reliable water supply and fire safety in Los Altos Hills. The lack of a reliable water supply places billions of dollars of property at risk of fire including Foothill Jr. College with 18,000 enrolled students, a public elementary school, a large private high school, and over 3,000 high value residential buildings. 01

Background
Fifty-one years ago, soon after San Francisco constructed the Bay Division 3 and 4 pipelines, Purissima Hills Water District was formed to tap into this reliable and high quality water supply to replace a multitude of poor quality water wells. We, along with Palo Alto, Hayward, Burlingame, Millbrae, and other Districts have come to rely on the Hetch-Hetchy system as our primary supply source, since we have no other realistic supply options.

Fifty years ago, the Town of Los Altos Hills was founded with the objective of preventing uncontrolled development in the rural foothills just south of Palo Alto and Los Altos that enveloped the Purissima Hills service area. The Town founders established a principle of "Smart Development" to protect the abundant natural resources and prevent over-building by adopting a minimum lot size of one acre.

Since its inception, the Town has transitioned from apricot and prune orchards and a one room school house, to a desirable residential community with many large and beautiful homes. The Town has grown into a vibrant, environmentally oriented community in parallel with the economic growth of Silicon Valley. People from all around the area come to Los Altos Hills for education, walking, hiking, biking, and horse-back riding and to

enjoy the extensive open space preserves and adjacent parklands and natural and manmade amenities of the community.

Unjustified Criticism
We take offense at the mis-characterization of our Town as a community of water wasters who squander water for irrigating lawns. In our situation, using per capita water consumption as a measure of waste is misleading and contrary to the facts. Per capita figures ignore the impact of 18,000 students and faculty who outnumber the resident population by over 2:1. Adoption of "Smart Development" principles actually reduced water consumption in the Hills to between one-half to one-tenth that of neighboring communities on a per acre basis. These communities, with six to ten homes per acre and high density condominiums and apartments, use far more water per acre than we do. As a District that uses less than 1% of the Hetch-Hetchy supply, our daily consumption is far less than the amount of unaccounted water that leaks each day from the pipes in San Francisco. 02

Sense of Urgency
For most of this decade San Francisco has been laboring to develop a master plan for making the long overdue seismic improvements contained in the Water System Improvement Program. These vital improvements are in reality emergency measures that are exempt from CEQA requirements. Immediately after the Loma Prieta earthquake, East Bay MUD, the sister water utility across the Bay, developed a detailed plan for seismic improvements to their system. They are 95% complete with construction and in operation. By contrast, San Francisco has been in the EIR stage for the past two years, and is expected to continue for another three to five years for individual projects. 03

Eighteen years after Loma Prieta, we cannot wait any longer. Every day without the seismic improvements in place puts the life safety of 2.4 million people in jeopardy and risks a catastrophic loss of property resulting in wreckage of the local economy. The risk assessment included in the WSIP indicates a potential outage of up to 60 days from a major earthquake on the Hayward or San Andreas faults. The PEIR does not adequately address the catastrophic economic impacts of such a disaster. Within the past month, we have had two serious fires near our District, one on adjacent Stanford University's antenna site and one in Stevens Creek Park. Without a reliable water supply, our Town, Stanford, and the nearby businesses could have gone up in smoke, with billions of dollars of property loss, potential loss of life and immense destruction of the natural environment and wildlife. 04

Population and Water Use
We believe that "growth inducement" is a non-issue and that claims to discredit the increased water demands for 2030 are unsubstantiated. The growth documented in the WSIP to support the 300 MGD demand by 2030 is based on planned growth— derived, analyzed and approved by the legislative bodies of each entity, as well as ABAG. As history has shown, the growth will occur, not as a self-fulfilling prophesy, but as a natural 05

result of the Bay Area's economic dynamics and attractions. To ignore this growth would be irresponsible on the part of the SFPUC's planners. 05 cont.

Furthermore, the projected demand already includes the adoption of an array of conservation measures, including relative effectiveness developed by a consulting engineer. As documented by BAWSCA, per capita water consumption in the Bay Area has actually decreased significantly. While technology may offer more means for water conservation in the future, experience has shown that with the Best Management Practices already in place and demand reductions already achieved, further improvements are likely to be marginal. 06

Desalination

With regard to the proposed desalination modification, we are of the opinion that it will not improve reliability or provide a substitute for surface water or banked water in an emergency. Desalination is an energy intensive process; it contributes "Greenhouse" gas because of the energy usage; it relies on electricity that will not be available during an earthquake; and it produces brine that is damaging to the environment. Major desalination plants such as at Santa Barbara have been deactivated because of the extreme cost. By contrast, the use of stored surface water allows delivery to users entirely by gravity, and produces clean hydroelectric power with no Greenhouse emissions or environmental damage. 07

Conclusion

We eagerly support the WSIP as it was developed, as analyzed in the PEIR, and without variations or further modifications except for those that would speed up project implementation. We urge the San Francisco Planning Department and Planning Commission to proceed without delay to complete the PEIR as expeditiously as possible, and to work diligently to certify the document as required by CEQA so the time critical work of WSIP implementation can proceed without delay. 08

Editorial comments and corrections regarding portions of the PEIR documents are enclosed.

Sincerely,

Daniel J Seidel

Daniel Seidel, President
Purissima Hills Water District

Enclosure

PURISSIMA HILLS WATER DISTRICT
ERROR CORRECTIONS FOR THE SFPUC PEIR

- Section 7, Page 52, has a typographical error when referring to the Town's population as 94,555. The population of the Town of Los Altos Hills is on the order of 9,455. 09
- Table E3.12, E3.24, and E3.35 lists employment for Los Altos Hills in the 2,700-2,800 range. This is in error. There are no commercial enterprises in Los Altos Hills. There are, however, commercial enterprises in Los Altos which has the same zip code of 94022. Institutional employment in Los Altos Hills is in the 450-470 range. 10
- Section 7, Page 62, and Town of Los Altos Hills General Plan (1975), General Plan Path Element (1996), Housing Element (2002), Circulation Element (1999), and Land Use, Open Space, and Recreation Elements. ***The last section was updated in April 2007.*** 11
- Section 7, Page 90, Town of Los Altos Hills Land Use, Open Space, and Recreation Elements, http://www.losaltoshills.ca.gov/government/town-documents.html (Website accessed March 15, 2006), not dated. ***This section was adopted in April 2007.***

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September 27, 2007

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CITY & COUNTY OF S.F
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San Francisco Planning Department
Attention: Paul Maltzer, Environmental Review Officer
WSIP PEIR
1650 Mission Street, Suite 400
San Francisco, CA 94103

Subject: **Case No. 2005.0159E, Draft Program Environmental Impact Report for the San Francisco Public Utilities Commission's Water System Improvement Program**

Dear Mr. Maltzer:

Thank you for providing the City of Redwood City (City) the opportunity to comment on the Draft Program Environmental Impact Report for the San Francisco Public Utilities Commission's (SFPUC) Water System Improvement Program (WSIP PEIR). The comments transmitted in this letter represent the combined comments of all City departments with interest in and/or responsibility for WSIP projects within the City's boundaries. Our comments are organized from general to specific topics.

Support for WSIP and PEIR

The City of Redwood City is a member of the Bay Area Water Supply and Conservation Agency (BAWSCA) and receives 100 percent of its potable water supply from the San Francisco regional water system. The Redwood City water utility serves over 83,000 people by supplying approximately 13,000 acre-feet of water annually. Our customers include individual single family homes, mixed use and stand-alone multi-family residential developments, schools, hospitals, a wide variety of retail services, the high tech industry, heavy industrial uses, the Port of Redwood City, recreational facilities, and other important contributors to the local community and regional economy. Just as these customers rely on the City to provide them with an uninterrupted and high quality potable water supply, the City relies on the San Francisco regional water system for this same uninterrupted and high quality water supply. Redwood City, therefore, supports the WSIP and believes that its importance and need cannot be understated. 01

While the Program Description chapter (Chapter 3) of the PEIR adequately describes the goals, objectives and details of the individual projects and water supply options associated with the Program, the **overarching urgency of program implementation** is somehow lost. This urgency is clearly conveyed in the program's legislative impetus, AB 1823, and needs to be communicated in the Summary and Program Description chapter. 02

The City of Redwood City also supports the programmatic approach to the environmental review for the WSIP. We believe the PEIR meets the requirements of the California Environmental Quality Act (CEQA) for program EIRs. 03

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Relationship of WSIP to Bay Division Pipeline Reliability Upgrade Project

The WSIP facility improvement project with the greatest potential to impact Redwood City is the Bay Division Pipeline Reliability Upgrade Project (BDPL Nos. 1 and 2), described in Section 3.8 of PEIR, Proposed Facility Improvement Projects. This is accurately reflected in Table 3.11 on page 3-60 of the PEIR. As you are aware, the San Francisco Planning Department is currently conducting project-level CEQA review for this project (Case No. 2005.0164E). Redwood City submitted a comment letter on the Notice of Preparation (NOP) for that project on July 7, 2006, and continues to work in collaboration with SFPUC engineering staff on the design drawings for this project. Rather than comment on the BDPL project through the WSIP PEIR, we will continue our involvement with SFPUC on this project through the project-level CEQA process. Based on recent communication with SFPUC staff, we understand that the Draft EIR for the BDPL project is scheduled for public release in early 2008. 04

Specific Comments

Section 3.4.4 – Water Demand Studies: This section describes the methodology and assumptions used by the SFPUC to develop the water demand projections that provide the basis for 2030 water purchase estimates from the SFPUC regional water system. These projections were developed in close collaboration with BAWSCA and its member agencies, including Redwood City. The City has reviewed this section and concurs with the water purchase estimates assumed for Redwood City. As noted in PEIR Tables 3.3 and 3.4, Redwood City's water purchase estimate from the regional water system in 2030 is a range of 11.60 to 12.60 million gallons per day (mgd). Redwood City's initial best estimate (April 2005) of future water purchases was 12.6 mgd, which is the value used for SFPUC planning purposes and evaluation in the PEIR. This methodology is supported by Redwood City. The future water purchase estimate was revised to 11.6 mgd in November 2005 to reflect implementation of the Redwood City recycled water project. Redwood City's contractual supply assurance from the regional water system is 10.93 mgd (12,243 acre feet per year). 05

Section 4.12.1 – Recreational Resources Setting: Recreational resources in Redwood City that could be affected by the BDPL project are described on page 4.12-11. Minor corrections should be made to the acreages of the parks described in this section. Fleishman Park is 0.64 acres, Hawes Park is 1.59 acres, and Red Morton Park is 30.89 acres. 06

Section 4.17.2 – Projects Considered in Cumulative Analysis: This section describes the cumulative projects identified by local and regional agencies that are assumed for the cumulative impacts analysis. The projects selected for Redwood City are still relevant, but it would be helpful to know the cut-off date used for project selection. Please identify for the reader the **date** this list was developed. 07

Section 7.3.6 – Customer-Specific Summaries: This section summarizes information regarding water demand and growth projections for each wholesale customer, as well as the consistency between the growth called for in the adopted general plan and that which could be supported by the WSIP. Page 7-53 contains the discussion for the City of Redwood City. The following correction should be made to the third paragraph in that discussion. The customer-selected population projection used for Redwood City in the demand study was the City's 2003 Urban Water Management Plan (UWMP). This document was chosen because the general plan in effect at the time the demand projections were prepared (2004) was the Redwood City Strategic General Plan adopted in 1990, and the 2003 UWMP contained the most current population, employment and growth projections for the City at that time. Contrary to the text in the WSIP, the 1990 Strategic General Plan **does not** contain a buildout population projection, and its horizon year is **2000,** not 2020 as indicated in the PEIR. Table 7.8 should also be corrected to indicate that the Redwood City population projection shown in the column titled "General Plan Population Projection for General Plan Projection Year" is the ABAG projection, not the City's 08

General Plan projection. The column titled "General Plan Projection Year" should either be changed to 2000 or changed to the projection date used by the ABAG reference. The reference to the population projections in the Downtown Precise Plan EIR is accurate. 08 cont.

It should be noted that Redwood City is in the process of developing a new General Plan. The General Plan will contain a Water Supply Element that is based on the City's most recent 2005 UWMP. The Water Supply Element will also highlight the significant water conservation actions the City has and will continue to implement, and will discuss how the City's Smart Growth principles support these water conservation efforts and overall water use efficiency in Redwood City.

<u>Section 9.2.4 – Aggressive Conservation/Water Recycling and Local Groundwater Alternative:</u> We understand that the purpose of this alternative is to identify potentially **new** conservation, recycling and renewable groundwater projects that, together with existing supplies, could meet the SFPUC system-wide normal year demand of 300 mgd in the year 2030. These projects would be in addition to those already identified in the WSIP. Table 9-11 on page 9-50 of the PEIR shows low and high range yields (in mgd) for various recycled water, groundwater and conservation projects that could conceivably make greater contributions to water supply than are assumed for the WSIP (thus, we assume, the term "aggressive" for this alternative). The Redwood City recycled water project is identified in the table as a Category 2 project, which are defined as "eligible projects in early planning stages." The table indicates that the recycled water project could generate an additional low range yield of 2.2 mgd and a high range yield of 4.5 mgd. This information is accurate, and was provided to the SFPUC as part of its preparation of a Technical Memorandum on Investigation of Regional Water Supply Option No. 4 (March 6, 2006). 09

We look forward to continued involvement in this project. Please do not hesitate to contact me if you need additional information or clarification on any of the comments provided in this letter.

Sincerely,

Chu Chang for Peter Ingram
Community Development Services Director
Voice: 650-780-7379
Fax: 650-780-0128
E-mail: pingram@redwoodcity.org

Copy: Nicole Sandkulla, BAWSCA

CITY OF SAN JOSE
CAPITAL OF SILICON VALLEY

Environmental Services Department
MUNICIPAL WATER SYSTEM DIVISION

September 27, 2007

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CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
M E A

Paul Maltzer, Environmental Review Officer, WSIP PEIR
San Francisco Planning Department,
1650 Mission Street, Suite 400,
San Francisco, CA 94103

SUBJECT: Water System Improvement Program PEIR Comments

Dear Mr. Maltzer:

The City of San Jose Municipal Water System (SJMWS) has reviewed the Programmatic Environmental Impact Report (PEIR) for San Francisco Public Utility Commission's (SFPUC) Water System Improvement Program (WSIP), and is pleased to provide comments and supplemental information supporting some of the WSIP's statements and conclusions. We believe the WSIP is a critically important and time sensitive project, which will ensure a reliable, sustainable system for the millions of local citizens who rely on the SFPUC for all or a portion of their water supply. San Jose is committed to working with our community to conserve natural resources and safeguard the environment for future generations. SJMWS generally supports the PEIR as written, and would like to take this opportunity to express support of the environmentally superior alternative, namely, the Modified WSIP, which will ensure continued delivery of a vital resource to the public while simultaneously promoting conservation and environmental preservation. 01

The WSIP highlights the need for local communities to work together in order to promote efficient use of supplies, and SJWMS has demonstrated continued support of this approach in its operations. The City of San Jose serves potable and recycled water to several portions of San Jose, including part of the North San Jose/Alviso area. SJMWS's North San Jose/Alviso service area meets its water demands through a combination of potable and recycled water supplies. Currently, 90% of demands are met by potable water from SFPUC, and 10% is supplied from recycled water. Additionally, SJMWS has implemented a wide range of conservation measures in order to reduce customer demands. While SJMWS generally supports the PEIR's project analysis, we would like to take this opportunity to provide corrections and supplemental facts to the information relating to San Jose. 02

3025 Tuers Road, San José, CA 95121 *tel* Administration (408) 277-4218, Engineering (408) 277-3671
Operations & Maintenance (408) 277-5180, Customer Service (408) 277-4036 *fax* (408) 277-4954

Water Conservation

Water conservation activities for the SJMWS are implemented by the City of San Jose's Water Efficiency Program (WEP) and the Santa Clara Valley Water District (SCVWD). WEP has focused primarily on implementing indoor water conservation programs throughout the San Jose/Santa Clara Water Pollution Control Plant's tributary area. The SCVWD implements both indoor and outdoor water conservation programs throughout Santa Clara County. A sample of historic and current conservation programs, information, brochures and marketing materials promoted within the Santa Clara County area is included in Attachment A. In addition to these regional efforts, the City of San Jose has implemented additional water conservation policies, including Water Waste Prevention ordinances and inverted block rates to promote the efficient use of potable water supplies (see Attachment B). 03

SJMWS has been a signatory of the California Urban Water Conservation Council (CUWCC) since 1995. As a signatory, SJMWS is obligated to implement several conservation programs and submit Best Management Practice Activity Reports and Coverage Reports to the CUWCC reporting database on a biennial basis.

The City of San Jose is currently in the process of developing a City Water Conservation Plan (Plan), which will outline the City's commitment to increasing citywide water conservation by 30,000 acre-feet per year by 2030. The Plan will build upon the above mentioned programs and policies to outline the steps the City will take towards accomplishing this goal, and is anticipated to be presented for City Council adoption in spring 2008.

Growth

The City's North San Jose Area Development Policy (Policy) will guide the ongoing growth and development of the North San Jose area as an important employment center for San Jose. The Policy is a long-range planning effort, addressing future potential growth and development needs with an emphasis on efficient and sustainable development. The Policy promotes smart growth principles, and key goals of the effort include:

- Proactively plan for growth to allow more industrial development in a way that benefits current San Jose residents.
- Allow up to an additional 27 million square feet of research and development and office space in North San Jose. 04
- Bring up to 83,000 new jobs to San Jose, providing additional job opportunities for San Jose residents.
- Concentrate up to 16 million square feet of the new research and development and office space in a 600 acre Urban Corporate Center core area along the light rail corridor.
- Develop an average 1.2 FAR in the core area with typical buildings of 6-10 stories.
- Focus on high-tech and corporate headquarters development.
- Create a rich pedestrian environment within the core area to encourage use of the transit system.
- Generate approximately $520 million in funding for the construction of local and regional transportation improvements.

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- Provide new high-density residential development (up to 32,000 units) in close proximity to employment centers.

The North San Jose/Alviso area currently consists of mostly commercial and industrial development, with pockets of residential areas throughout. Industrial and commercial customers currently account for the largest percentage of water use within SJMWS' North San Jose/Alviso (NSJMWS) service area. With additional development adhering to the Policy guidelines, it can be expected that residential water use will eventually account for most of the water use within the NSJMWS area. Please see Attachment C for additional information on the Policy. 04 cont.

Water Supply and Demand Projections

The City of San Jose has historically demonstrated an effort to expand water supply sources in an effort to conserve the limited potable supplies available to the area. In continuing to promote efficient use of water supplies and to ensure a reliable supply for the public, NSJMWS' current and projected demands will be met from a variety of sources. ***The PEIR incorrectly states that "all current and projected demands adjusted for conservation will be met with SFPUC supplies." The projected demands listed in the PEIR do not account for the water demands to be met from sources other than the SFPUC.*** (see Attachment D) Future demands (adjusted for conservation) in the NSJMWS area will actually be supplied from a variety of sources, including SFPUC potable deliveries, recycled water, and groundwater. 05

Recycled water has been supplied to the NSJMWS area since 1998, and the system has continued to expand since that time. Recycled water is supplied to the area for a variety of uses, including irrigation, industrial processing, and dual plumbing (see Attachment E). As of the end of 2006, recycled water has supplied nearly 1.3 billion gallons to the NSJMWS area (see Figure 1). Throughout the past 5 years, recycled water has consistently accounted for between nine and eleven percent of the area's total water supply. Ultimately, when the area has been developed in accordance with the above mentioned Policy, recycled water is projected to account for almost 30% of the area's total water supply. The PEIR states that NSJMWS' 2030 demands will be met entirely with SFPUC supplies, while it is actually estimated that SFPUC supplies will only account for 59% of the area's total demands, with the remaining demands to be met with groundwater and recycled water. 06

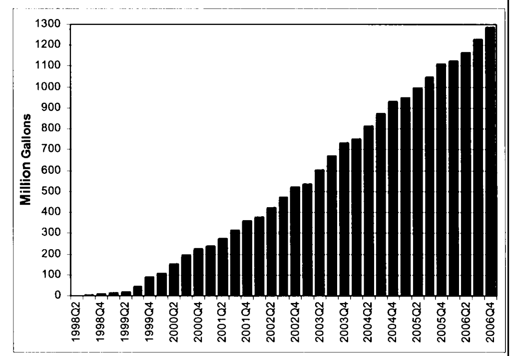

Figure 1. Cumulative Recycled Water Use in the NSJMWS Area

The expanded use of recycled water plays an integral role in meeting the increased demands associated with development of the NSJMWS area (see Figure 2). The City of San Jose, both as a recycled water wholesaler and retailer, employs many programs and strategies designed to encourage

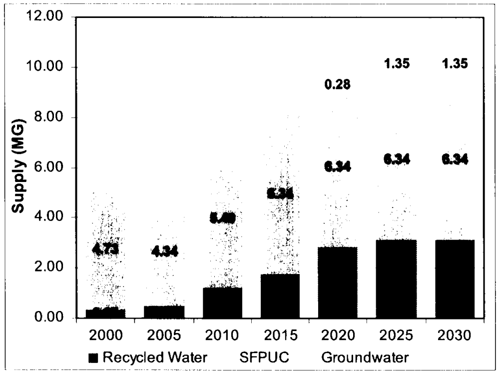

Figure 2. Historic and Projected Water Use in the NSJMWS Area

the use of recycled water, including grants, incentive programs, discounted rates, recycled water usage guidelines, and public education and outreach (see Attachment F). Additionally, if a development is located in the vicinity of the recycled water distribution system, the City's Municipal Code requires the use of recycled water for all landscaped areas in excess of ten thousand square feet. Continued and expanded implementation of these programs and requirements will help in growing the future use of recycled water. 06 cont.

While future water demands in the NSJMWS area will be met with a variety of sources, a reliable supply from the SFPUC system is an essential component to ensure that public needs continue to be met. Implementation of the WSIP will greatly improve the seismic and delivery reliability of a system which would otherwise be at great risk of catastrophic failure when the next large seismic event occurs. 07

The City of San Jose appreciates the opportunity to participate in the WSIP planning process, and looks forward to continued collaboration with the SFPUC with the goal of providing a high quality, reliable supply of water to the public. If you have any questions regarding any of the information provided, please feel free to contact me at (408) 277-4218.

Sincerely,

Mansour Nasser

Mansour Nasser, P.E.
Deputy Director, Water Resources Division
Environmental Services Department
City of San Jose

cc: Art Jensen, BAWSCA
Chuck Reed, Mayor and BAWSCA Board of Directors
John Stufflebean, Director, Environmental Services Department

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ATTACHMENT D

Incorrect SJMWS demand projection citations within the PEIR include:

- Chapter 3, Table 3.3 "Summary of Water Supply Assumptions and 2030 Demand Projections"
- Chapter 3, Table 3.4 "Summary of SFPUC 2030 Purchase Estimates" (delete footnote "c")
- Chapter 7, Table 7.2 "Summary of 2030 Demand Projections, Water Supply Assumptions, and SFPUC Purchase Estimates"
- Chapter 7, Table 7.3 "Summary of Base-Year and Projected 2030 Demand and Purchase Estimates"
- Chapter 7, Section 7.3.6 "Customer-Specific Summaries"
- Appendix E, Table E.2.1 "Summary of Base-Year and Projected 2030 Demand and Purchase Estimates"
- Appendix E, Table E.2.5 "Summary of Recycled Water Potential for the SFPUC Service Area (mgd)"
- Appendix E, Table E.2.6 "Summary of 2030 Demand Projections, Water Supply Assumptions, and SFPUC Purchase Estimates"

08

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October 1, 2007

San Francisco Public Utilities Commission
1155 Market Street, 4th Floor
San Francisco, CA 94103

Re: City of San Bruno Comments to SFPUC Water System Improvement Program, Draft Program EIR

Dear Commission:

The City of San Bruno ("San Bruno") appreciates the opportunity to provide the following comments to the Draft Program Environmental Impact Report ("PEIR") for the Water System Improvement Program ("WSIP").

PEIR, pp. S-18 and 3-56; also p. C-9 PEIR indicates as part of a regional conjunctive-use project, the SFPUC would construct about 10 new groundwater production wells in San Mateo County to develop about 6 mgd of potable groundwater for use as a supplemental drought-year supply. In nondrought years under this project, the SFPUC would provide potable water from the regional system to customers in Daly City, San Bruno, and South San Francisco to substitute for groundwater currently used for municipal purposes, thereby reducing groundwater pumping and allowing the groundwater basin to recharge naturally. In drought years, the groundwater would be available for local use to supplement the regional system water. This project would require agreements with the affected agencies see (Section 3.13). 01

San Bruno Comment The references to 6 mgd (6,700 AFY) and 10 wells are inconsistent with the 8,100 AFY and 15 wells currently used to describe the conjunctive use project. The rate of extraction changes the impact to the groundwater resource, so the actual anticipated production rate should be used, not an average including years without production. Groundwater use may be regional as well as local.

PEIR, pp. 3-18, 3-19, 5.7-87, 7-15, 7-18, 7-54, E.1-2. e.2-2, e.2-18; tables 3.3, 3.4, 7.2, 7.3, E.1.1, E.2.1, E.2-6 San Bruno Demand Projections. 02

San Bruno Comment San Bruno's projected cessation of groundwater is based on a worst-case groundwater scenario. San Bruno plans on maintaining its groundwater production capacity and

Oregon
Washington
California
Utah
Idaho

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utilizing groundwater supplies in the future. Please refer to San Bruno's UWMP, Table 13, footnote c. 02 cont.

PEIR, p. 3-42 As part of the WSIP, the SFPUC would utilize a groundwater conjunctive-use program in the Westside Groundwater Basin in northern San Mateo County. Under this program, wholesale customers in this area (such as Daly City, California Water Service Company, and San Bruno, which currently pump groundwater to meet a portion of their potable demand) would receive additional supplies from the regional system during nondrought years to offset their groundwater pumping, and would cease pumping and allow the aquifer to recharge naturally. In exchange, those customers would increase groundwater pumping during drought periods, thereby reducing the amount of their purchase requests during a drought and creating a temporary reduction in system demand. 03

San Bruno Comment The PEIR should be clear that the program is "proposed" as the local agencies have not agreed to terms.

PEIR, p. 3-72 An estimated 14 new groundwater wells in San Francisco, Daly City, San Bruno, and South San Francisco (Groundwater Projects, SF-2). 04

San Bruno Comment This reference is inconsistent with the 15 wells currently used to describe the conjunctive use project in San Mateo County alone.

PEIR, pp. 5.6-8, 5.7-86 As of 2006, Cal Water had not resumed pumping and San Bruno had resumed pumping at rates of approximately 1.5 mgd (1,700 afy). 05

San Bruno Comment San Bruno's 2006 groundwater production was 1,955 AF.

PEIR, p. 5.6-17 The City of San Bruno is constructing two monitoring wells along the bay side that should provide additional insight into the mechanisms preventing seawater intrusion. 06

San Bruno Comment This sentence should state, "The City of San Bruno constructed two monitoring wells clusters in 2006 along the bay side that have provided additional geologic information and allow for monitoring of groundwater levels and groundwater quality at different depths along the bay margin."

PEIR, p. 5.6-17 In the South Westside Groundwater Basin, manganese has exceeded the secondary drinking water standard in San Bruno and Daly City. 07

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Page 3

San Bruno Comment Clarify that exceedances are for untreated water prior to treatment. Treated water meets secondary standards. 07 cont.

PEIR, pp. 5.6-17, 5.7-86 The total increase in groundwater storage is approximately 13,000 acre-feet. 08

San Bruno Comment The PEIR should include the basis for the 13,000 AF estimate (water levels and estimated aquifer properties).

PEIR, pp. 5.6-21 thru 5.6-22 In accordance with Section 4.68.225 of the San Mateo County Code, the San Mateo County Environmental Health Division would not grant a well permit for a large well in a public park, cemetery, or golf course that could potentially cause overdraft of the South Westside Groundwater Basin or be located in an area subject to a specific and localized groundwater problem. 09

San Bruno Comment Section 4.68.225 applies to all wells except residential use, temporary construction, cathodic protection, geophysical exploration/monitoring, and emergency wells for drinking water purposes, not just public park, cemetery, or golf course wells.

PEIR, p. 5.6-25 During drought conditions, the SFPUC would be able to reduce the quantity of SFPUC system water delivered and the stored groundwater or banked water would be available for local use to supplement supplies from the regional water system. 10

San Bruno Comment It should be clarified that a portion of the banked water may be introduced into the regional water system under specified conditions.

PEIR, p. 5.6-26 The SFPUC would construct about 10 new groundwater production wells in San Mateo County with the capacity to develop about 7 mgd (or nearly 8,100 afy) of potable groundwater as a supplemental drought-year supply for the participating pumpers. The PEIR also suggests that groundwater withdrawals would be restricted to the amount of water banked. 11

San Bruno Comment 10 wells is inconsistent with the 15 wells currently used to describe the conjunctive use project. Supplemental supply would be for participating pumpers and for the regional system.

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San Francisco Public Utilities Commission
October 1, 2007
Page 4

Under the proposed project participating pumpers can pump both their "previously pumped quantities" as well as the quantity of banked water resulting from the project. Furthermore, the proposed cunjunctive use program does not restrict pumping as described. Existing pumpers rights to pump groundwater are not altered as a result of the proposed project. 11 cont.

PEIR, p. 5.7-87 The 2006 UWMP for San Bruno does not yet reflect long-term participation in the SFPUC's proposed conjunctive-use program, but participation in this program is expected to be included in the next revision of its UWMP. 12

San Bruno Comment Change to "but, if approved, participation in this program is expected to be included in the next revision of its UWMP."

PEIR, p. 5.7-90 To the south of this area, future pumping includes up to approximately 0.27 mgd (300 afy) of pumping from private wells and negligible irrigation pumping by the City of Burlingame. 13

San Bruno Comment Text should mention municipal pumping in future pumping estimates.

PEIR, p. 5.7-91 Although in a drought year, pumping under the Regional Groundwater Projects, in combination with municipal pumping by the participating pumpers could temporarily exceed historic high groundwater withdrawal rates, the proposed operating agreement(s), executed between the SFPUC and the participating pumpers, would outline allowable operating parameters for pumping during drought years to avoid adverse long-term conditions; an operating committee would be formed to develop annual operating maintenance plans as well as an annual operating schedule. 14

San Bruno Comment The text "could temporarily exceed" is more accurately stated as "is anticipated to significantly exceed." It should also be noted that the proposed agreements do not alter existing pumpers rights as to groundwater use.

PEIR, p. 5.7-91 Implementation of the operating agreement(s) would ensure that impacts related to basin overdraft, saltwater intrusion, and land subsidence would be less than significant. 15

San Bruno Comment Add "by, among others, restricting pumping from conjunctive use project wells should groundwater levels fall below historical lows."

San Francisco Public Utilities Commission
October 1, 2007
Page 5

PEIR, p. 5.7-91 Because there are no other planned future uses of groundwater in this portion of the basin, other than the those existing uses described above that would continue, and impacts of the WSIP would be less than significant due to implementation of the proposed operating agreement(s), cumulative groundwater impacts would be less than significant. 16

San Bruno Comment Under the proposed project participating pumpers can pump both their "previously pumped quantities" as well as the quantity of banked water resulting from the project. Furthermore, the proposed cunjunctive use program does not restrict pumping as described. Existing pumpers rights to pump groundwater are not altered as a result of the proposed project.

PEIR, p. 5.7-100 City of San Bruno Public Draft Urban Water Management Plan. December 2006. 17

San Bruno Comment Utilize the final UWMP, dated January 2007 and used elsewhere in the document.

PEIR, p. E.3-38 Not applicable for UWMP population projections. 18

San Bruno Comment San Bruno UWMP is available and contains population projections based on the draft general plan with comparisons to previous projections.

Best regards,

Barbara A. Brenner

BB:eah

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Diana Sokolove <wsip.peir.comments@gmail.com>

Inquiry from the City of Santa Clara re: Public Hearing for the SFPUC's Water System Improvement Program

Gloria Sciara <gsciara@ci.santa-clara.ca.us> **Tue, Aug 28, 2007 at 3:39 PM**
To: wsip.peir.comments@gmail.com

** High Priority **

Dear Agency

Can you advise if this PEIR contains work in Santa Clara, regarding the "Bay Division Pipeline 3 and 4 Crossover Facilities Project".? If so, then we need to review the EIR. 01

Thank you for your quick response.

Gloria Sciara, AICP
Development Review Officer
City of Santa Clara
1500 Warburton Avenue
Santa Clara, CA 95050
(408) 615-2453
(408) 247-9857 (FAX)

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Water & Sewer Utilities

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AUG 27 2007

CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
MEA

August 23, 2007

Paul Maltzer, Environmental Review Officer, WSIP PEIR
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Maltzer:

The City of Santa Clara is pleased to offer our comments on the Water System Improvement Program (WSIP) Programmatic Environmental Impact Report (PEIR). The City of Santa Clara supports the PEIR as written. The City of Santa Clara also supports the San Francisco Public Utilities Commission's (SFPUC) WSIP preferred alternative as it is currently proposed. We urge the SFPUC to proceed with the current WSIP and not re-engineer projects. The WSIP is critical to ensuring a sustainable, reliable water system for both the City and County of San Francisco and the other bay area communities that also rely on the SFPUC system. The City is very concerned about potential service interruptions caused by earthquake damage to the SFPUC system or failure of critical infrastructure as a result of deferred maintenance. Such interruptions would not only cause disruption to a critical supply of water within Santa Clara but would even more significantly wreak havoc on our regional economy. The lack of redundancy in critical operational and delivery facilities is also of great concern given that maintenance has been deferred for many years on these critical facilities. 01

The City of Santa Clara is committed to the efficient use and sustainability of all of our regional water supplies. The City has demonstrated this commitment through the implementation of extensive water conservation, use of recycled water, and smart growth development. The following is a brief description of these programs and activities we are providing in order to help clarify the extent and benefits of these programs. 02

Water Conservation

The City of Santa Clara has a demonstrated commitment to water conservation. The City has a full compliment of water conservation programs that provide reductions for a wide variety of water uses. Copies of the various brochures and program descriptions are enclosed for reference. The individual programs are listed in the table below. Highlights of just some of these programs are also described in brief below. Detailed descriptions of the programs and 03

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FAX (408) 247-0784
www.ci.santa-clara.ca.us

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estimates of the volume of water conserved are located in the City 2005 Urban Water Management Plan.

Demand Management Measure	City Program	District Program Augmented by the City	District Program
Water audits and incentives		X	
Residential plumbing retrofits		X	
Distribution system	X		
Metering and commodity rates	X		
Large landscapes		X	
Public information		X	
School education		X	
High efficiency clothes washer rebate			X
Commercial, industrial, and institutional accounts			X
Conservation pricing	X		
Conservation coordinator	X		
Water waste prohibitions	X		
Ultra low flow toilets			X
Wet Program	X		

03 cont.

Water Audit and Incentives

- *Residential leak detection*- According to the AWWA report Residential Ends Uses of Water (AWWA, 1999) leaks account for 13.7% of the water used inside an average home. The primary source of leaks is toilets. The City offers free leak checks to residents in an effort to reduce the amount of water lost through leaks.
- *WaterWise House Calls* - According to the District's literature, the average program participant reduced their water usage by 30 gallons per day as a result of the audit.

Residential Plumbing Retrofits

- *Ultra Low Flush Toilet programs.* The Ultra Low Flush Toilet Programs have taken a number of different forms over the years. Initially rebates were offered as an incentive to consumers to purchase Ultra Low Flush Toilets. A full service program offered the opportunity for residents to have an Ultra Low Flush Toilet installed for a nominal fee of $50 has been offered. One program consisted of distribution events where free low flow toilets are distributed to residents. A past program also offered a full service installation program exists for elderly, low income, and disabled individuals to provide qualifying individuals the opportunity to have an Ultra Low Flow Toilet installed at no cost to the resident. The current program offers a rebate for High Efficiency Toilets (HET)

Paul Maltzer, Environmental Review Officer
August 23, 2007
Page 3

- Free low flow devices such as showerheads and aerators have been distributed by City staff since the conservation program's inception.
- *High Efficiency Washer Rebate Program* - The District offers rebates for the purchase of high efficiency washers by residents or commercial facilities. According to District literature, the average household reduces water usage by 5,100 gallons per year by switching to a high efficiency washer.

Large Landscapes

- *Irrigation Technical Assistance Program (ITAP)-* The program was created by the District in 1994 to assist landscape managers improve efficiency of their irrigation systems. According to the District literature, the average commercial/multi family residential site reduces water usage by 600 to 800 hundred cubic feet per acre per year after participating in the program.

Public Information Program

- Water conservation and the programs referenced above are promoted within the City by means of newspaper articles, educational displays, and public events.

School Education

- The District operates an extensive public information and education program directed at school age children. In 1994, the District's Public Information Office hired a full-time, fully credentialed educator who holds lifetime Teaching and Administrative Services credentials to coordinate the school education programs. This included developing school programs, contracting with the Youth Science Institute for additional instructors, and supervising university student interns as classroom assistants. In 2001 a second, bilingual educator joined the district's full-time staff to assist with the program. As of 2005, over 4,000 students have been educated through this program.

WET Program

The Water Efficient Technology (WET) program is a conservation program that offers rebates to commercial and industrial customers for the installation of innovative water saving technologies. A rebate amount of up to $50,000 is available for each project. The specific rebate amount is based on the amount of water savings and the cost of the technologies installed. Examples of the types of projects and the amount of water saved are shown in the table below. These savings are permanent and will continue on into the future. WET program's combined 426 acre-feet of annual water savings comes at an very cost effective average cost of $1300/AF/yr.

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cont.

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Paul Maltzer, Environmental Review Officer
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Date	Facility	Project	Rebate	Demand reduction (AF/Y)
6/17/2005	Intel Corp	RO Reject in cooling towers	$9,688	5.6
6/17/2005	Intel Corp	RO Reject in cooling towers	$48,492	27.8
6/17/2005	Intel Corp	RO Reject in cooling towers	$50,000	36.1
6/17/2005	Intel Corp	RO Reject in cooling towers	$31,672	18.2
5/25/2004	Reaction Technologies	Air scrubber retrofit	$28,545	18.9
6/27/2002	Intel Corp	Industrial wastewater reuse	$31,608	18.1
5/24/2001	Vishay Siliconix	RO reject reuse	$50,000	50.1
4/19/2001	Micro Chem	Closed loop chiller	$1,112	0.6
1/19/2001	Hadco Corp	Rinse modification	$47,988	27.5
1/19/2001	Hadco Corp	Rinse modification	$46,878	30.0
1/19/2001	Hadco Corp	Rinse modification	$47,601	29.6
10/13/2000	Hadco Corp	Automate a manual process	$476	0.3
3/31/2000	Hadco Corp	Rinse process improvements	$50,000	29.6
12/16/1999	Peninsula Coating Services	Industrial water recycled	$3,316	1.9
6/29/1999	Intel Corp	RO Reject reuse	$44,753	95.2
6/25/1999	Analog Devices	Upgrade DI water system	$36,648	21.0
5/14/1999	Intel Corp	Water reuse	$27,044	15.5
		Total	$555,821	426.0

Recycled Water

The City's recycled water system has been in operation since 1989. The City's recycled water program has grown significantly from the original system which merely supply irrigation to the City's golf course and a truck filling station (see Figure 4). The City has aggressively pursued customers for recycled water including its use in industrial processes, residential irrigation and dual plumbed buildings for toilet and urinal flushing. One of the largest recent developments in Santa Clara, the Rivermark development, which represents a 10% increase in the City's population, make extensive use of recycled water including irrigation for parks, a school, median strips, commercial and residential landscaping. In addition, the 1800-

Figure 1 Rivermark Development

03
cont.

Paul Maltzer, Environmental Review Officer
August 23, 2007
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residence Rivermark development consists of medium and high density housing with significantly less irrigated area than more traditional single family developments. The Rivermark development is pictured on the previous page.

Figure 2 Santa Clara University

The City has also pursued more traditional uses for recycled water as a drought proof water source for large turf area irrigation in commercial settings. The customers currently using recycled water for large scale landscape irrigation include Santa Clara University, the Great America Theme Park, the 49ers' training facility, Santa Clara Municipal Golf Course and the Mission City Cemetery.

The City has also promoted the use of recycled water in industrial processes such as paperboard manufacturing. California Paperboard has significant success in switching their pulping process over to using 80% recycled water. 03 cont.

Other uses for recycled water continue to be explored as well such as recycled water in cooling towers as at the City's new 147 MW Don Von Raesfeld Power Generation Facility. This state-of-the-art low emission generation facility represents one of the largest recycled water users in the City.

Recycled water use in the City has grown to the point where recycled water constitutes more than 10% of the total water supply to the City. Recycled water use has been steadily increasing over the years as seen in the graph below. In fiscal year 2006/07, recycled water customers used 994 million gallons of this highly treated, plentiful, drought proof water supply.

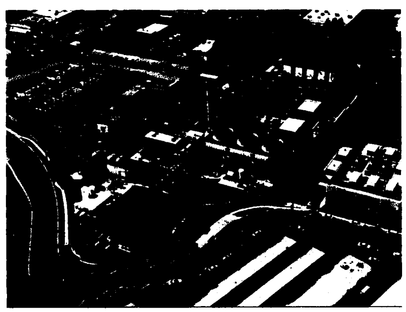


Figure 3 Don Von Raesfeld Power Generation Facility

L_SClara2

Paul Maltzer, Environmental Review Officer
August 23, 2007
Page 6

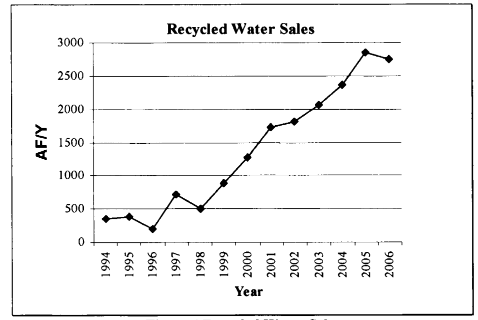


Figure 4 Recycled Water Sales

03 cont.

The City continues to promote recycled water and look for additional customers for recycled water that will replace potable water use. The next major pipeline extension to be funded by SBWR will supply recycled water to the City's Central Park as well as three schools and some street frontage landscaping. This will convert approximately 150 AF/year of potable water irrigation to recycled water usage. Two other pipeline alignments are identified for supply to commercial/industrial areas of the City. Although these pipeline extensions are not currently proposed for funding due to the reduction in flows to the WPCP, an additional 300 to 400 AF/year of recycled water could be utilized, primarily for irrigation and cooling. The City also continues to explore other non traditional uses for recycled water such as cooling water for large data centers.

Smart Growth 04

Santa Clara is a growing and thriving City. Most of the developments within the last 5 years have been higher density or mixed use developments and most of these projects were redevelopment of existing properties. These redevelopments are typically very compact, close to transportation corridors, and have minimal landscaped areas resulting in minimal outside

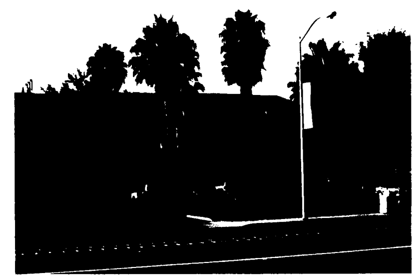
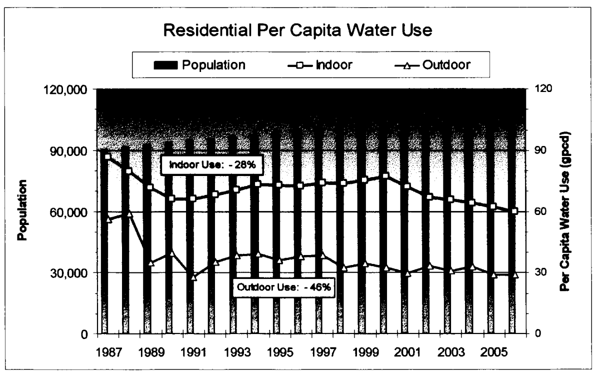


Figure 5 Example of mixed use development

water use. The City's last General Plan Amendment (2002) provided for up to 7500 added residential dwelling units including an additional 2000 residential units with new designations for sites along El Camino Real as mixed use (commercial with residential) similar to that shown in Figure 4. The City's 2030 water demand projections includes this and probable future General Plan revisions and/or Amendments that would allow further in-fill and increased density near transportation hubs like the downtown multi-modal (train) station and proposed BART extension. The State's projections for regional housing needs will assign (via ABAG) approximately an additional 5900 housing units to the City of Santa Clara which will be addressed in the next planning period. 04 cont.

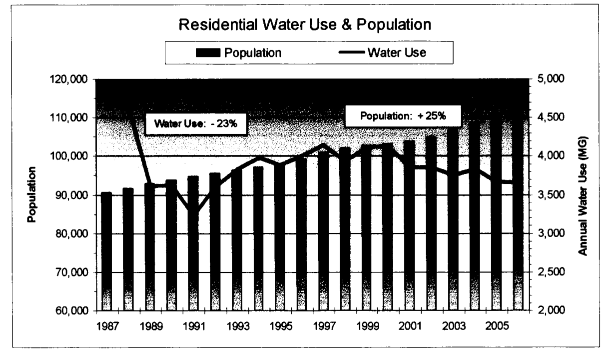
Documented results

The results of these water conservation, recycled water and Smart Growth programs are documented and measurable. Over the last 20 years the residential per capita water usage has decreased significantly. This steady decrease in the residential per capita water use is vividly displayed in the graph below. As shown in the graph below, by 2006 the residential per capita water use declined to just 89 gallons/person/day for combined indoor and outdoor water use. Over this 20 year period indoor per capita water use decreased by 28% and outdoor per capita water use decreased by 46%. 05



While it is true that over the last 20 years the City's populations has increased by 25%, the residential water demand has stayed relatively flat or decreased due to water conservation, changes in the plumbing code and the use of recycled water as shown by the graph below.

L_SClara2



05 cont.

As outlined above, the City of Santa Clara is concerned about the reliability and sustainability of its water supply and the water supplies of its neighboring cities. We have made investments and taken the steps available to us to ensure our ability to supply water to the residents and businesses that call Santa Clara home. However, as noted earlier we have significant concerns regarding the reliability of the SFPUC system. Therefore, we urge the SFPUC to proceed with the preferred alternative WSIP as expeditiously as possible. 06

If you have any questions regarding the information in these comments, please feel free to contact me at (408) 615-2011.

Sincerely,

Mr. Robin G. Saunders
Director of Water and Sewer Utility

cc: Mr. Art Jensen, General Manager BAWSCA
Mr. Pat Kolstad, City Council and Santa Clara Member BAWSCA Board of Directors
Mr. Kevin Riley, Director of Planning & Inspection, CSC

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Santa Clara Valley Water District

5750 ALMADEN EXPWY
SAN JOSE, CA 95118-3686
TELEPHONE (408) 265-2600
FACIMILE (408) 266-0271
www.valleywater.org
AN EQUAL OPPORTUNITY EMPLOYER

September 26, 2007

Mr. Paul Maltzer
Environmental Review Officer
Water System Improvement Program PEIR
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Subject: Comments on the Draft PEIR

Dear Mr. Maltzer:

The Santa Clara Valley Water District (District) provides wholesale drinking water supply for 1.7 million residents and is the primary water resources manager for Santa Clara County. We manage the conjunctive use of surface and groundwater resources to ensure that water supply is reliable to meet current and future demands. We actively manage the groundwater basin to optimize beneficial uses and aggressively protect the groundwater basin from contamination and minimize inelastic land surface subsidence.

As you well know, San Francisco Public Utilities Commission (SFPUC) and the District share the responsibility of providing a clean, safe and reliable water supply to cities and entities in the northern portion of Santa Clara County. SFPUC supply comprises 15% of the overall water supply in Santa Clara County and constitutes 100% of the water supply to some cities.

We expect SFPUC to continue providing its water supply in Santa Clara County and meet the projected 2030 purchase requests submitted by the wholesale customers. This expectation is described and documented in the District's and the cities' 2005 Urban Water Management Plans. The cities collaborated with SFPUC on its demand projection and water use efficiency studies and arrived at reasonable and defensible projections on future water needs. These water supply and demand projections constitute the foundation of water resources planning for the next 30 years, for the cities, SFPUC and the District.

We urge San Francisco to adopt the proposed Water System Improvement Program (WSIP) and meet all the program goals and objectives. Any diminution in levels of service provided by SFPUC could result in significant impacts to water resources in Santa Clara County with associated environmental and socio-economic consequences. 01

Santa Clara Valley had a legacy of land subsidence in the 1920's and 1930's due to over-extraction of ground water. Through the District's water importation and conjunctive use management, land subsidence was halted by the late 1960's and the District has been vigilant in preventing its re-occurrence. Understandably, we are very concerned with any potential re-directed impacts on our groundwater basin and local or imported surface water resources due to SFPUC's reduction in supplies or level of service provided to Santa Clara County. We also urge San Francisco to fully address any potential impacts on water supplies for the State Water Project and Central Valley Project users. 02

L_SCVWD1

We support SFPUC's goal to maximize water conservation, recycling and desalination. The District has been very aggressive in implementing programs to maximize water use efficiency and further diversify our sources of supply. We believe these program areas are ideal for SFPUC and the District to partner with local land-use entities in their implementation. However, there are practical limits in "implementability" of these programs and they cannot be used as "stand-alone" substitute alternatives or variants because they fail to meet the overall program goals. 03

We look forward to San Francisco addressing our concerns adequately and adopting the PEIR and WSIP expediently so that the critical work of securing the water supply for the Bay Area communities can begin.

Sincerely,

Keith Whitman
Deputy Operating Officer
Water Supply Management Division

SAN FRANCISCO
BAY TRAIL

RECEIVED

SEP 25 2007

CITY & COUNTY OF S.F.
PLANNING DEPARTMENT

September 24, 2007

San Francisco Planning Department
Attention: Paul Maltzer, Environmental Review Officer, WSIP PEIR
1650 Mission Street, Suite 400
San Francisco, CA 94103

Subject: **Draft Program Environmental Impact Report for the San Francisco Public Utilities Commission Water System Improvement Program**

Dear Mr. Maltzer:

On behalf of the San Francisco Bay Trail Project, I am submitting comments on the Draft Program Environmental Impact Report (PEIR) for the San Francisco Public Utilities Commission's Water System Improvement Program (WSIP).

The Bay Trail Project is an organization administered by the Association of Bay Area Governments (ABAG) that coordinates implementation of the Bay Trail. When complete, the Bay Trail will be a continuous 500-mile network of bicycling and hiking paths encircling both the San Francisco and San Pablo bays. It will link the shoreline of all nine Bay Area counties, passing through 47 cities, and will cross major toll bridges in the region. To date, 290 miles of the proposed trail network has been developed.

The proposed Water System Improvement Program intersects with the Bay Trail alignment in the Bay Division Section (BD-1), specifically in Menlo Park. Please see the attached map showing the location of existing and proposed Bay Trail segments in this area (Exhibit A). The Bay Trail Project supports construction of the new Bay Division Pipeline 5, proposed as a five-mile underground pipeline from the Newark Valve Lot to the Ravenswood Valve Lot, because once underground, the new "Bay Tunnel" segment of the pipeline will have less impact on the adjacent marshland and recreation areas and may assist with completion of a gap in the Bay Trail. 01

The following comments should be considered as part of this environmental analysis:

- On page 4.12-7, the Draft PEIR states that the Bay Trail is a 400-mile corridor with 280 miles constructed. This should be corrected to state that, when complete, the Bay Trail will be a 500-mile corridor and 290 miles currently exist. 02

Administered by the Association of Bay Area Governments
P.O. Box 2050 • Oakland California 94604-2050
Joseph P. Bort MetroCenter • 101 Eighth Street • Oakland California 94607-4756
Phone: 510•464•7935
Fax: 510•464•7970

L_SFBayTrl

- On page S-14, Table S.2, the Draft PEIR states that portions of the above-ground Bay Division Pipeline Nos. 1 and 2 between the Newark Valve Lot and the Ravenswood Valve Lot will be decommissioned, but that decommissioning is not part of the project. We strongly recommend that the BDPL Nos. 1 and 2 be decommissioned *and* physically removed to reduce the existing impacts to habitat and allow for the closure of a Bay Trail gap in this area. 03

- On page 4-12-22, Table 4.12-2, the following should be added to "Potentially Affected Recreational Resources" for BD-1, Bay Division Pipline Reliability Upgrade: Ravenswood Open Space Preserve, San Francisco Bay Trail. 04

- On page 4.12-24, the Ravenswood Open Space Preserve and the San Francisco Bay Trail should be added to the list of recreational amenities in the vicinity of the pipeline alignment for the BDPL Reliability Upgrade Project (BD-1).

- A major gap in the Bay Trail exists in Menlo Park between the Dumbarton Bridge and the Ravenswood Open Space Preserve. In 2005, the City of Menlo Park completed a feasibility study, funded by the Bay Trail Project and the Coastal Conservancy, identifying feasible alternatives for completing this gap. Completion of this gap is difficult because of the Dumbarton Rail right-of-way and the presence of the BDPL Nos. 1 and 2. This important section of the Bay Trail is necessary to connect the existing Dumbarton Bridge pathway to existing trails in the Ravenswood Open Space District and future trails that will be constructed as part of the South Bay Salt Pond Restoration Project. Once completed, this gap will serve as a key regional commute route and recreational link. As the Water System Improvement Project moves forward, we request that the San Francisco Public Utilities Commission coordinate with the Bay Trail Project, the Coastal Conservancy and the Midpeninsula Regional Open Space District to complete this Bay Trail gap. 05

Thank you for the opportunity to comment on the PEIR. Please contact me at (510) 464-7935 or laurat@abag.ca.gov if you have any questions.

Sincerely,

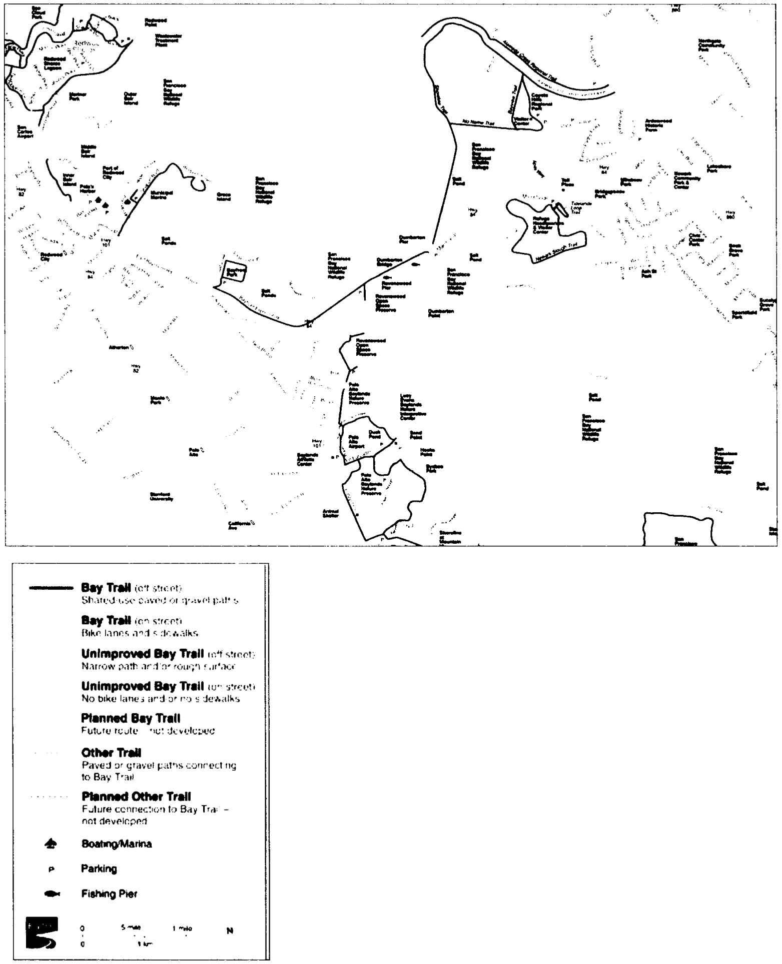
Laura Thompson

Laura Thompson
Bay Trail Project Manager

cc: Amy Hutzel, Coastal Conservancy
Michael Reeves, Midpeninsula Regional Open Space District

L_SFBayTrl

Exhibit A: San Francisco Bay Trail Within the Vicinity of the San Francisco Public Utilities Commission's Water System Improvement Program



L_SFLandmarks

LANDMARKS PRESERVATION ADVISORY BOARD

1650 Mission Street, Suite 400 | San Francisco, CA 94103-2479 TEL: 415.575.6916 | FAX: 415.558.6409

September 27, 2007

Mr. Bill Wycko
Acting Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Wycko,

On September 19, 2007, the Landmarks Preservation Advisory Board (Board) held public hearings and took public comment on the Draft Environmental Impact Report (DEIR) for the Water System Improvement Program dated June 30, 2007. After discussion the Board arrived at the following comments:

- The Board suggested including historic trees, garden, and landscaping in the project level evaluation. 01
- Historic and cultural resources were not mentioned at all in Chapter 9, CEQA Alternatives. The Board requests that these resources be included in the impact analysis of this chapter. 02
- The Board recommended that examples of historical materials and equipment that could be salvaged should be included into the mitigation measures. 03
- The Board suggested including in the historical context the opposition of building the system from PG&E, Spring Valley Water Company, and Great Western Power. The Board further recommended looking into the role of the Federal Government in funding part or all of the extension to O'Shaughnessy Dam in the 1930s. 04
- The Board would like to see clarification in the historical property list and confirm that the eligibility information came from SHPO/Feds. 05
- The Board suggested looking at the labor history, and the significance for the project of the population groups that worked on it as part of the historical context statement. 06
- The Board asked for clarification regarding project level impacts and coordination with the National Historic Preservation Act should there be any federal involvement. 07
- The Board stated its interest in ensuring that the water system as a whole as well as interconnected segments be evaluated as potential 08

historic and cultural resources, and that the possible existence of such resources not be lost during individual project level environmental review. 08 cont.

The Board appreciates the opportunity to participate in review of this environmental document.

Sincerely,

Robert Cherny, Vice President
Landmarks Preservation Advisory Board

San Joaquin Valley
AIR POLLUTION CONTROL DISTRICT

October 1, 2007

RECEIVED
OCT 03 2007
CITY & COUNTY OF S F
PLANNING DEPARTMENT
MEA

Paul Maltzer
San Francisco Planning Department
WSIP PEIR
1650 Mission Street, Suite 400
San Francisco, CA 94103

Project: SFPUC Water System Improvement Program

Subject: CEQA comments regarding the Draft PEIR for the Water System Improvement Program for the San Francisco Public Utilities Commission

District Reference No: 200701227

Dear Mr. Maltzer:

The San Joaquin Valley Air Pollution Control District (District) has reviewed the project referenced above and concurs with the findings in the Air Quality section of the Draft PEIR.

District staff is available to meet with you and/or the applicant to further discuss the regulatory requirements that are associated with this project. If you have any questions or require further information, please call Jon Klassen at (559) 230-5843 and provide the reference number at the top of this letter. 01

Sincerely,

David Warner
Director of Permits Services

for
Arnaud Marjollet
Permit Services Manager

DW: jk

Seyed Sadredin
Executive Director/Air Pollution Control Officer

Northern Region
4800 Enterprise Way
Modesto, CA 95356-8718
Tel: (209) 557-6400 FAX: (209) 557-6475

Central Region (Main Office)
1990 E. Gettysburg Avenue
Fresno, CA 93726-0244
Tel: (559) 230-6000 FAX: (559) 230-6061
www.valleyair.org

Southern Region
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Bakersfield, CA 93301-2373
Tel: (661) 326-6900 FAX: (661) 326-6985

San Luis & Delta-Mendota Water Authority
P O Box 2157
Los Banos, CA 93635
Phone: 209/826-7866
Fax: 209/826-9698

Westlands Water District
P. O. Box 6056,
Fresno, California 93703-6056,
(559) 224-1523, FAX (559) 241-6277

Kern County Water Agency
3200 Rio Mirada Drive
Bakersfield, CA 93308
(661) 634-1400
(661) 634-1428 fax

October 1, 2007

San Francisco Planning Department
Attn: Paul Maltzer
Environmental Review Officer, WSIP PEIR
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Maltzer,

The San Luis & Delta-Mendota Water Authority ("Authority"), Westlands Water District ("Westlands"), and Kern County Water Agency ("KCWA") respectfully submit this comment letter on the Draft Program Environmental Impact Report ("Draft PEIR") for the San Francisco Public Utilities Commission's ("SFPUC") Water System Improvement Program ("WSIP").

The Authority, which was formed in 1992 as a joint powers authority, consists of 32 member public agencies,[1] each of which contracts with the United

[1] The member agencies of the Authority are: Banta-Carbona Irrigation District; Broadview Water District; Central California Irrigation District; Centinella Water District; City of Tracy; Columbia Canal Company; Del Puerto Water District; Eagle Field Water District; Firebaugh Canal Water District; Fresno Slough Water District; Grassland Water District; James Irrigation District; Laguna Water District; Mercy Springs Water District; Oro Loma Water District; Pacheco Water District; Pajaro Valley Water Management Agency; Panoche Water District; Patterson Water District; Plain View Water District; Pleasant Valley Water District; Reclamation District 1606; San Benito County Water District; San Luis Canal Company; San Luis Water District; Santa Clara Valley Water District; Tranquillity Irrigation District; Turner Island Water District; West Side Irrigation District; West Stanislaus Irrigation District; Westlands Water District; and Widren Water District.

L_SLDWWKC

States Department of the Interior, Bureau of Reclamation ("Reclamation"), for supply of water from the Central Valley Project ("CVP"). The Authority's member agencies hold contracts with Reclamation for the delivery of approximately 3.3 million acre-feet of CVP water. Of that amount, the Authority's member agencies use approximately 2.7 million acre-feet of CVP water on agricultural lands within the western San Joaquin Valley, San Benito County, and Santa Clara County, California; 200,000 to 250,000 acre-feet of CVP water for municipal and industrial uses, including those within the Silicon Valley; and approximately 300,000 to 350,000 acre-feet of CVP water for environmental purposes, including for waterfowl and wildlife habitat in the San Joaquin Valley, California.

Westlands, a member of the Authority, is a California water district with a right to receive up to 1,150,000 acre-feet of CVP water annually. Westlands uses this water for municipal and industrial purposes, as well as for irrigation of approximately 500,000 acres on the west side of the San Joaquin Valley in Fresno and Kings Counties. Westlands' farmers produce more than 60 high quality commercial food and fiber crops sold for the fresh, dry, canned, and frozen food markets, both domestic and export. More than 50,000 people live and work in the communities that are dependent on Westlands' agricultural economy.

KCWA is a special act district organized and existing under California Water Code Appendix, Chapter 99 and is the largest agricultural contractor of State Water Project ("SWP") water. KCWA has a contract with the California Department of Water Resources ("DWR") for up to 998,730 acre-feet of SWP Table A water annually. KCWA is a wholesaler of SWP water for both agricultural and municipal and industrial uses. KCWA contracts with thirteen individual water districts in Kern County (also known as "member units") who supply the SWP water directly to water users for agricultural use. KCWA also contracts for the delivery of treated water supplies with four water purveyors who supply water directly to residents of the City of Bakersfield and surrounding areas. The service area for these member units and purveyors encompasses all the territory within the San Joaquin Valley portion of Kern County. The SWP provides a portion of, and in some cases the entire, water supply for approximately 719,000 acres of prime farmland, of which approximately 240,000 acres are permanent crops, and some 500,000 residents of Kern County.

The Authority, Westlands, and KCWA understand and appreciate the efforts of the SFPUC to meet the water demands of its customers. However, any such action must be pursued only after considering the reasonably foreseeable effects of the action, and either mitigating those impacts that are significant or finding that the significant impacts are unavoidable and overridden by the benefit of the actions. The fact that the City and County of San Francisco long ago dammed and diverted flows of the Tuolumne River, reducing flow in the San Joaquin River and inflow into the Sacramento-San Joaquin Rivers Delta ("Delta"), does not mean that the City and County of San Francisco can now ignore its impacts. The City and County of San Francisco cannot implement its WSIP by increasing its diversions without analyzing the impacts of that action on downstream resources. The Draft PEIR suggests that is exactly what the SFPUC is attempting.

The Draft PEIR contains no meaningful analysis of WSIP impacts on the San Joaquin River or the Delta, a considerable void in analysis for a project that could divert from the Tuolumne River as much as 89,761,996,921 additional gallons of water in a given year. Without such an analysis, the SFPUC cannot determine if the WSIP has significant effects on environmental conditions (habitat, fishery resources, etc.) within the San Joaquin River and the Delta or on water 01 users that depend on either waterbody for their water supply. The lack of analysis also precludes the SFPUC from mitigating its significant impacts or making a statement of overriding consideration, if significant impacts result. Those failures cause the Draft PEIR to violate California Environmental Quality Act ("CEQA").[2]

In addition, without a proper impact analysis, the SFPUC cannot determine if the WSIP runs counter to its own policy. The SFPUC's "Water Enterprise Environmental Stewardship Policy," a copy of which is attached, contains a commitment to "ensure that all operations of the SFPUC water system . . . protect and restore native species and the ecosystems that support them." Without an accurate understanding of all of the potential impacts of the WSIP, the SFPUC cannot reasonably assess whether the WSIP will protect and restore native species and the ecosystems that support them. In fact, a good first step towards 02 the SFPUC's commitment might be a reduction in the SFPUC's diversions from the Tuolumne River and pursuit of operational plans that reduce San Francisco's dependence on water currently diverted around the periphery of the Delta. Resolution Number 321-07 from the Board of Supervisors for the County and City of San Francisco directed the SFPUC to do just that.

On or about June 12, 2007, the Board of Supervisors for the County and City of San Francisco recognized the importance of the WSIP, but nonetheless

[2] The failure to analyze impacts to the San Joaquin River and to the Delta has significance for more then just CEQA compliance. To the extent the WSIP impacts the San Joaquin River and/or the Delta, species protected under the federal and state Endangered Species Acts may be affected, an affect that would require additional regulatory compliance with the federal and state Endangered Species Acts.

In addition, based upon an agreement between the City of San Francisco and the United States Department of the Interior ("DOI"), it appears that the DOI may have to undertake a discretionary action, prior to implementing any project that expands, alters, or otherwise modifies SFPUC water and power facilities along the Tuolumne River. If that is the case, the SFPUC should recognize that the DOI will comply with the National Environmental Policy Act, prior to the SFPUC certifying the final program environmental impact report for the WSIP and before the WSIP is implemented.

urged the SFPUC "to fully analyze a water supply alternative in the Program Environmental Report that will not result in increased diversions of freshwater from the Tuolumne River." The Board of Supervisors made its plea after recognizing:

> . . . More than half of the Tuolumne River's natural flow is diverted for urban and agricultural use, which has diminished the ecological value of the Tuolumne River watershed and the Sacramento-San Joaquin Delta, and
>
> * * * 02 cont.
>
> . . . Increasing diversion of water from the Tuolumne River watershed could further damage the health of the watershed and jeopardize the fish and wildlife species that depend on the Tuolumne for their survival.

(Board of Supervisors for the County and City of San Francisco, Resolution No. 321-07, a copy of which is attached.) Without a proper impact analysis, the SFPUC cannot determine if the WSIP or the alternatives considered in the Draft PEIR are consistent with the clear policy direction provided by the Board of Supervisors for the County and City of San Francisco.[3]

I. Overview Of CEQA And The Requirements Of An Environmental Impact Report

CEQA operates as an important means for holding public officials accountable and for ensuring public participation in the planning process. When "CEQA is scrupulously followed, the public will know the basis on which its responsible officials either approve or reject environmental action, and the public, being duly informed, can respond accordingly to action with which it disagrees." (*Laurel Heights Improvement Assn. v. Regents of the University of California,* 03 (1988) 47 Cal.3d 376, 392.) "[A] paramount consideration is the right of the public to be informed in such a way that it can intelligently weigh the environmental consequences of any contemplated action and have an appropriate voice in the formulation of any decisions." (*Environmental Planning and Information Council v. County of El Dorado* (1982) 131 Cal.App.3d 350, 354.) "[T]he requirement of a detailed environmental statement helps insure the integrity of the process of decision by precluding stubborn problems or serious criticisms from being swept under the rug.'" (*Sutter Sensible Planning, Inc. v. Board of Supervisors* (1981) 122 Cal.App.3d 813, 820.)

[3] The resolution of the Board of Supervisors for the County and City of San Francisco raises the questions whether the Draft PEIR must consider an alternative that reduces the amount of water the SFPUC currently appropriates from the Tuolumne River.

The California Supreme Court has explained that the environmental impact report is the "heart of CEQA" and an "environmental 'alarm bell' whose purpose it is to alert the public and its responsible officials to environmental changes before they have reached ecological points of no return." (*Laurel Heights Improvement Assn.*, *supra,* 47 Cal.3d at p. 392.) The environmental impact report is the "primary means" of ensuring that the public agencies "take all action necessary to protect, rehabilitate, and enhance the environmental quality of the state." (*Ibid.* [quoting Pub. Resources Code, § 21001, subd. (a)].) An environmental impact report must identify the environmental effects of a proposed project and evaluate ways of avoiding or minimizing those effects if they are significant. (Pub. Resources Code, §§ 21002, 21002.1(a), 21061.) 03 cont.

II. Specific Deficiencies Of The Draft PEIR

The Draft PEIR suffers from three main legal deficiencies. First, the Draft PEIR fails to adequately analyze impacts of the WSIP caused by reduced inflow to the San Joaquin River and thus the Delta. Second, the Draft PEIR uses an outdated environmental baseline to evaluate impacts. Third, the Draft PEIR includes an alternatives analysis that relies upon speculation and questionable assumptions. To be legally sufficient, the Draft PEIR must be revised to address these inadequacies. 04

A. The Draft PEIR Ignores Potentially Significant Impacts To The Delta

Through inappropriate, unsupported, and unlawful conclusions, the Draft PEIR fails to consider potentially significant adverse impacts. The Draft PEIR concludes: "the effects of the WSIP on flow along San Joaquin River and in the Delta would be *less than significant*, and no mitigation measures would be required." (Draft PEIR, p. 5.3.1-39.) The basis for that conclusion is two-fold. The San Joaquin River impact discussion in the Draft PEIR explains:

> The [State Water Resources Control Board] has established flow objectives for the San Joaquin River at Vernalis, just upstream of the Sacramento–San Joaquin Delta. Almost all of the time, the reductions in San Joaquin River flow attributable to the WSIP would not be sufficient to cause flow in the river at Vernalis to fall below the objective. Very infrequently, following protracted droughts, reductions in San Joaquin River flow attributable to the WSIP would be sufficient to cause flow in the river at Vernalis to fall below the objective. Under these circumstances, the [United States Bureau of Reclamation], the agency responsible for compliance with objectives for the San Joaquin River, would be expected to increase releases from New Melones Reservoir on the Stanislaus River to meet the flow objectives at Vernalis. Thus, the WSIP would not alter flow in 05

> the San Joaquin River below its confluence with the Tuolumne River such that it would be substantially outside the range experienced under existing conditions nor result in a violation of flow objectives.

(Draft PEIR, p. 5.3.1-38.)

Using similarly faulty logic, the Draft PEIR explains why the WSIP will have less than significant impacts on the Delta:

> The reductions in flow in the Tuolumne River below La Grange Dam attributable to the WSIP would also reduce inflow to the Sacramento–San Joaquin Delta. The [State Water Resources Control Board] has established objectives for Delta outflow as measured at Chipps Island, just upstream of Suisun Bay. Almost all of the time, the reductions in Delta inflow attributable to the WSIP would not be sufficient to cause Delta outflow to fall below the objective. Very infrequently, following protracted droughts, reductions in Delta inflow attributable to the WSIP would be sufficient to cause Delta outflow to fall below the objective. Under these circumstances, [Reclamation] and DWR, the respective operators of the Central Valley Project and [SWP], would be expected to decrease their diversions so that the Delta outflow objectives were met. Thus, the WSIP would not alter flow in the Sacramento–San Joaquin Delta such that it would be substantially outside the range experienced under the existing condition. 05 cont.

(Draft PEIR, pp. 5.3.1-38-39.) The Draft PEIR does not analyze impacts of CVP or SWP re-operation or impacts if the CVP or SWP is not re-operated. CEQA requires those evaluations.

1. CEQA Requires Analysis Of All Reasonably Foreseeable WSIP-Related Impacts

CEQA requires the evaluation of all reasonably foreseeable environmental impacts of a proposed project. (CEQA Guidelines § 15151 ["An evaluation of the environmental effects of a proposed project need not be exhaustive, but the sufficiency of an EIR is to be reviewed in the light of what is reasonably feasible"].) "[A]n EIR must include an analysis of the environmental effects" when they are "a reasonably foreseeable consequence of the initial project." (*Laurel Heights Improvement Assn., supra,* 47 Cal.3d at 396.) "Reasonably foreseeable requires the use of 'best efforts' to find out and disclose impacts." (CEQA Guidelines § 15144). To satisfy that well established rule, the Draft PEIR must consider the effects of reduced San Joaquin River flow and Delta inflow attributable to the WSIP. The Draft PEIR does not do that.

San Francisco Planning Department
Attn: Paul Maltzer, Environmental Review Officer
October 1, 2007
Page 7

Prior to rendering its "less than significant effects" conclusion, the Draft PEIR states that reductions in San Joaquin River flow and inflow to the Delta, at times, "would not be sufficient to cause flow in the river at Vernalis to fall below the objective" and "would not be sufficient to cause Delta outflow to fall below the objective." (Draft PEIR, p. 5.3.1-38.) Those statements do not constitute analyses, as required by CEQA. Nowhere in the Draft PEIR does it explore whether changes in flow impacts resources, notwithstanding satisfaction of water quality objectives. It simply makes the statements and provides the conclusion.

Similarly, the Draft PEIR states that reductions in Tuolumne River flow caused by the WSIP, at times, would be sufficient to cause exceedances of one or more water quality objectives. (Draft PEIR, p. 5.3.1-38-9.) The Draft PEIR again fails to consider the effects of those exceedances. Instead, it simply states that Reclamation and/or DWR will re-operate the CVP or SWP to ensure the WSIP does not: (1) alter San Joaquin River flow or Delta inflow beyond the range experienced under existing conditions, or (2) cause a violation of water quality objectives.[4] These statements do not amount to impact analyses.

The failure of the Draft PEIR to consider impacts with the San Joaquin River and the Delta is made more egregious by discussions in the Draft PEIR that suggest proper analyses of the impacts would show potentially significant effects. The Draft PEIR recognizes that its water diversion will increase salinity levels of all affected waterways, (Draft PEIR, pp. 5.3.3-7, 5.3.3-20), and increase the temperature of the water in the San Joaquin River and the Delta. (Draft PEIR, pp. 5.3.3-14, 5.3.3-15-16, 5.3.3-19.) 05 cont.

In sum, none of the statements cited above absolve the SFPUC from responsibility for analyzing the potential significant environmental impacts resulting from the WSIP.[5] None of these statements support a conclusion that the

[4] The SFPUC is well aware the San Joaquin River Agreement settled issues, at least in part, related to responsibility for the San Joaquin River Portion of the 1995 Water Quality Control Plan for the Bay Delta Estuary objectives that can be reasonably met through flow measures. The agreement was based on hydrologic and regulatory conditions at the time. If the SFPUC intends to implement the WSIP, as described in the Draft PEIR, by shifting additional burdens to Reclamation, the basis for the San Joaquin River Agreement could be undermined and may cause the agreement to terminate. The San Joaquin River Agreement, in section 13.2, provides: "It is the intent of all parties that this Agreement is to be re-negotiated and/or terminated, as appropriate, in the event of changes to the basic water supply, water rights, assumptions, facts or circumstances upon which this Agreement is based".)

[5] In the Draft PEIR, the Authority, Westlands, and KCWA found no analysis or modeling results of conditions in the San Joaquin River of the Delta, including analysis of impacts to biological resources in those water bodies. That failure must be caused by the conclusion in those sections addressing water supply and system operations that flow in the San Joaquin River and Delta will not change beyond the range experienced under existing conditions, or cause a violation of water quality objectives. As presented herein, that failure and the underlying basis for it render the Draft PEIR legally inadequate.

12.3-178

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impacts of the WSIP would be *less than significant*. The cursory fashion in which the conclusion is rendered deprives the public of informed participation and precludes informed decision-making. (*San Joaquin Raptor/Wildlife Rescue Center v. County of Stanislaus* (1994) 27 Cal.App.4th 713, 722; *Galante Vineyards v. Monterey Peninsula Water Management Dist.* (1997) 60 Cal.App.4th 1109, 1117; *Berkeley Keep Jets Over the Bay Committee v. Board of Port Commissioners of the City of Oakland* (2001) 91 Cal.App.4th 1344, 1355.)

2. CEQA Requires Analysis Of The Impacts Of Reclamation's Reasonably Foreseeable Efforts To Mitigate For Reduced Delta Inflows

The Draft PEIR must evaluate whether Reclamation and DWR can and will re-operate the CVP and SWP to mitigate for the impacts of the WSIP on San Joaquin River flow and Delta inflow. The Draft PEIR must also evaluate the environmental impacts of the CVP and/or SWP re-operations if the re-operation occurs. The Draft PEIR does not conduct any of those analyses. Such failures violate CEQA. (CEQA Guidelines 15126.4(a)(1)(D); *Save Our Peninsula Committee v. Monterey County Bd. of Supervisors* (2001) 87 Cal.App.4th 99 [Court required the EIR to evaluate the environmental impact of the off-set water credits being used as mitigation].) The Court of Appeal has recently instructed: 05 cont.

> When agencies--even agencies with antagonistic positions--comply with their responsibilities for environmental review under CEQA, their action should be taken after consideration of the other's position and, as a result, their action may achieve a measure of coordination that would not have existed without that review.

(*County Sanitation District No. 2 of Los Angeles County et al. v. County of Kern* (2005) 127 Cal.App.4th 1544, 1603.) Currently, unevaluated but reasonably foreseeable impacts will result from changes in CVP and/or SWP re-operations resulting from the WSIP.

As an example, to mitigate for the impacts of the WSIP on San Joaquin River flow, the Draft PEIR states Reclamation "would be expected to increase releases from New Melones Reservoir on the Stanislaus River." (Draft PEIR, p. 5.3.1-38.) That CVP facility currently provides for flood control, irrigation and municipal water supplies, hydroelectric production, recreation, and fish and wildlife enhancement. Increased uses of water from New Melones Reservoir for WSIP mitigation would compromise Reclamation's ability to meet those existing purposes it serves. The Draft PEIR does not consider what might occur to those purposes if CVP water is used for WSIP mitigation.

Similarly, the Draft PEIR states, when reductions in Delta inflow attributable to the WSIP would be sufficient to cause Delta outflow to fall below the objective, Reclamation and DWR "would be expected to decrease their diversions so that the Delta outflow objectives were met." (Draft PEIR, p. 5.3.1-38-9.) The referenced diversions are used to provide water to approximately 25 million people and to approximately 3 million acres of highly productive farm land. Many of the water demands of those people and lands are not being met and may not be met in the future. To the extent the WSIP further restricts those diversions, the unmet demand would only increase and potentially a significant effect would result. As examples, reduced water supply available to those people and lands, could: (1) compromise CVP and/or SWP facilities (the integrity of conveyance and storage facilities), (2) cause land to be fallowed, and thus degrade air quality through increased dust, or (3) could increase groundwater use, and thus result in land subsidence. Again, none of the aforementioned impacts are identified, no less considered. 05 cont.

B. The Baseline Is Inaccurate And Irrelevant

The Draft PEIR uses 2005, the date of the Notice of Preparation, as the environmental baseline. However, since 2005, environmental conditions and regulatory requirements within the San Joaquin River watershed and Delta ecosystem have changed dramatically. Without updating the baseline accordingly, the analyses in the Draft PEIR are legally insufficient under CEQA.

An accurate baseline is essential to the preparation of a legally sufficient environmental impact report. The purpose of the baseline is to provide a point from which the WSIP can measure its impacts from the "real conditions on the ground." (*City of Carmel-by-the-Sea v. Board of Supervisors* (1986) 183 Cal.App.3d 229, 246; *County of Amador v. El Dorado County Water Agency* 1999 76 Cal.App.4th 931, 952.) Thus, an accurate baseline ensures that the Environmental Impact Report measures the impacts of a proposed WSIP on the existing environment, not a hypothetical situation. (*Id.,* at p. 955.) 06

While the environmental setting at the time the Notice of Preparation is published will "normally" constitute the baseline for a project, courts will find environmental impact reports legally inadequate when the conditions at the time of the Notice of Preparation no longer adequately reflect environmental conditions. (See *Friends of Eel River v. Sonoma County Water Agency* (2003) 108 Cal.App.4th 859, 874-875 [court directed decertification of an environmental impact report when the environmental setting did not accurately include impacts of water diversions on salmonid species or proposals to curtail diversions]; *Mira Monte Homeowners Association v. County of Ventura* (1985) 165 Cal.App.3d 357, 363-367 [court directed decertification of an environmental impact report when, several days prior to County approval, evidence was presented that existing impacts on wetlands were greater than initially identified and no new environmental analysis was conducted].)

> [T]he date for establishing baseline cannot be a rigid one. Environmental conditions may vary from year to year and in some cases it is necessary to consider conditions over a range of time periods. In some cases, conditions closer to the date the project is approved are more relevant to a determination of whether the project's impacts will be significant.

(*Save Our Peninsula Committee v. Monterey County Board of Supervisors* (2001) 87 Cal.App.4th 99, 125.) Because of the significant changes in environmental conditions and regulatory requirements within the San Joaquin River watershed and Delta ecosystem, the "normal" baseline cannot apply. Persisting with the use of an obsolete baseline provides responsible decision-makers and the public with an inaccurate description of the environmental impacts of the WSIP. A more current baseline is required. 06 cont.

C. Alternatives Analysis Unlawfully Relies Upon Questionable Assumptions And Pure Speculation

The analysis of alternatives is an essential and important component of an environmental impact report. (*Planning and Conservation League v. Department of Water Resources* (2000) 83 Cal.App.4th 892, 919-20.) "[I]t is the policy of the state that public agencies should not approve projects as proposed if there are feasible alternatives or feasible mitigation measures available which would substantially lessen the significant impacts of such projects…" (Pub. Resources Code, § 21002.) "Without meaningful analysis of alternatives in the EIR, neither the courts nor the public can fulfill their proper roles in the CEQA process." (*Planning and Conservation League, supra,* 83 Cal.App.4th at p. 920.)

The Draft PEIR's failure to adequately analyze WSIP-related impacts caused by reduced flows in the San Joaquin River and inflows into the Delta renders the alternatives analysis incomplete and legally deficient. Additionally, much of the alternatives analysis relies on questionable assumptions and pure speculation. For example, in rejecting the No WSIP Alternative as the environmentally superior alternative, the Draft PEIR concludes that, due to aging infrastructure and facilities, a similar level of repairs will be required regardless of whether the WSIP is implemented. (Draft PEIR, p. 9-95.) The Draft PEIR offers the same explanation for why the No WSIP Alternative will not ultimately reduce impacts on the Tuolumne River, as the need for additional water deliveries will ultimately lead the SFPUC or its customers to develop additional facilities which, in turn, will have additional and potentially more significant environmental impacts. (*Ibid.*) The problem with relying on assumptions of future conditions is that they simply may not come to pass. CEQA requires more than this type of guesswork. It mandates "comparative, quantitative analysis" of the relevant environmental impacts of the project alternatives. (*Kings County Farm Bureau v. City of Hanford* 07

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(1990) 221 Cal.App.3d 692, 733-734.) Absent such an analysis, the Draft PEIR is legally insufficient. 07 cont.

The Authority, Westlands, and KCWA appreciate your consideration of these comments and ask the SFPUC to take all necessary steps to correct the deficiencies in the Draft PEIR before it is certified and a decision is made on the WSIP.

Very truly yours,

Daniel G. Nelson
Executive Director
San Luis & Delta-Mendota Water Authority

Thomas W. Birmingham
General Manager
Westlands Water District

James M. Beck
General Manager
Kern County Water Agency
Attachments

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SAN FRANCISCO Public Utilities Commission

Water Enterprise Environmental Stewardship Policy
Published: 09/12/2006 | Updated: 03/06/2007
Published By: Land and Natural Resources Division

SFPUC Water Enterprise Environmental Stewardship Policy
FINAL
June 27, 2006

The mission of the San Francisco Public Utilities Commission (SFPUC) is to serve San Francisco and its Bay Area customers with reliable, high quality, and affordable water and wastewater treatment while maximizing benefits from power operations and responsibly managing the resources—human, physical, and natural—entrusted to its care.

The purpose of the Water Enterprise Environmental Stewardship Policy is to establish long-term management direction for SFPUC-owned lands and natural resources affected by operation of the SFPUC water system within the Tuolumne River, Alameda Creek, and Peninsula watersheds. Environmental stewardship is a fundamental component of the Water Enterprise mission, and a responsibility of all Water Enterprise employees.

The SFPUC is committed to responsible natural resources management that protects and restores viable populations of native species and maintains the integrity of the ecosystems that support them for current and future generations. The SFPUC strives to become a leader in science-based and collaborative environmental stewardship in order to continue providing high-quality and reliable water supplies to San Francisco residents and SFPUC customers.

Watershed Management

The SFPUC will proactively manage the watersheds under its responsibility in a manner that maintains the integrity of the natural resources, restores habitats for native species, and enhances ecosystem function. The SFPUC believes that partnership and collaboration with agencies, communities and other stakeholders in the watersheds are the best way to maximize investment in environmental stewardship.

To the maximum extent practicable, the SFPUC will ensure that all operations of the SFPUC water system (including water diversion, storage and transport), construction and maintenance of infrastructure, land management policies and practices, purchase and sale of watershed lands, and lease agreements for watershed lands protect and restore native species and the ecosystems that support them. In cases where the SFPUC has limited control, but where impacts of its operations exist, the SFPUC will work with responsible parties to improve ecosystem health.

It is the policy of the SFPUC to operate the SFPUC water system in a manner that protects and restores native fish and wildlife downstream of SFPUC dams and water diversions, within SFPUC reservoirs, and on SFPUC watershed lands. Releases from SFPUC reservoirs will (consistent with the SFPUC mission described above, existing agreements, and applicable state and federal laws), mimic the variation of the seasonal hydrology (e.g., magnitude, timing, duration, and frequency) of their corresponding watersheds in order to sustain the aquatic and riparian ecosystems upon which these native fish and wildlife species depend.

The SFPUC will actively monitor the health of the terrestrial and aquatic habitats both under SFPUC ownership and affected by SFPUC operations in order to continually improve ecosystem health. Relevant performance measures and indicators will be used to evaluate the effectiveness of implementation efforts under this policy.

Other SFPUC Lands

Rights of way and properties in urban surroundings under SFPUC management will be managed in a manner that protects and restores habitat value where available, and encourages community participation in decisions that significantly interrupt or alter current land use in these parcels.

Public Involvement

The SFPUC believes that public engagement is key to ensuring successful environmental stewardship. To that end, SFPUC will:

- Solicit input and collaboration on its plans and implementation from all interested and affected parties, including local, state, and federal agencies, non-governmental organizations, and members of the public.
- Encourage development of recreational uses that are compatible with protection and restoration of natural resources, and water quality and water supply reliability goals.
- Include communities and stakeholders in monitoring, restoration and other stewardship activities to the extent possible.
- Provide information and reports to the public that track activities related to implementation of this policy.

Implementation Strategy

The Environmental Stewardship Policy will be integrated into SFPUC Water Enterprise planning and decision-making processes and also directly implemented through a number of efforts. Below are examples of areas for integration and specific activities that will further the goals of this policy.

- Implementation and updating of the existing Alameda and Peninsula Watershed Management Plans.
- Development of Habitat Conservation Plans for the Alameda and Peninsula Watersheds.
- Development and implementation of the Watershed and Environmental Improvement Program, which will cover the Tuolumne River, Alameda Creek, and Peninsula watersheds.
- Development of the Lake Merced Watershed Plan.
- Active participation in local forums, including coordination with Yosemite National Park Service and Stanislaus National Forest in the Tuolumne River watershed, the Tuolumne River Technical Advisory Committee, the Alameda Creek Fisheries Restoration Workgroup, the Pilarcitos Creek Restoration Workgroup, and the Lake Merced Task Force.
- Integration of the policy into the Water System Improvement Program and individual infrastructure projects (i.e., repair and replacement programs).
- Ensure that the policy guides development of project descriptions, alternatives and mitigation for all SFPUC projects during the environmental review process under CEQA and/or NEPA.
- Seek support for and encourage all employees to integrate environmental stewardship into daily operations through communication and training.

12.3-181

Location:
http://sfwater.org/detail.cfm/MC_ID/20/MSC_ID/357/C_ID/3159

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Amendment of the Whole
in Board
6/12/07

FILE NO. 070754 RESOLUTION NO. 321-07

[Resolution urging environmental analysis of water supply alternatives that will not increase diversions of freshwater from the Tuolumne River and urging active implementation of conservation and recycled water programs.]

Resolution urging the San Francisco Planning Department to fully analyze a water supply alternative in the Program Environmental Impact Report that will not result in increased diversions of freshwater from the Tuolumne River and urging the San Francisco Public Utilities Commission to undertake and implement water conservation and recycled water programs.

WHEREAS, San Francisco is committed to building a sustainable urban environment, and

WHEREAS, San Francisco's environmental code encompasses objectives in a broad range of topic areas including air quality, biodiversity, energy, climate change, ozone depletion, food and agriculture, hazardous materials, human health, parks, open spaces and streetscapes, solid waste, transportation, water and wastewater, and

WHEREAS, Impacts due to San Francisco's use of natural resources extend beyond the city limits, and

WHEREAS, San Francisco owns and operates a water system that serves not only the city residents but also approximately 1.7 million people in San Mateo, Santa Clara, Tuolumne and Alameda Counties, and

WHEREAS, The San Francisco Public Utilities Commission is engaged in a critically important Water System Improvement Program to repair, replace and modernize aging and seismically vulnerable elements of its water system, and

WHEREAS, The San Francisco Planning Department will soon issue a draft Program Environmental Impact Report, which is a necessary component for the speedy implementation of the Water System Improvement Program, and

WHEREAS, Approximately eighty five percent of the water delivered by San Francisco's water system is diverted from the Tuolumne River, and

WHEREAS, More than half of the Tuolumne River's natural flow is diverted for urban and agricultural use, which has diminished the ecological value of the Tuolumne River watershed and the Sacramento-San Joaquin Delta, and

WHEREAS, Increasing diversion of water from the Tuolumne River watershed could further damage the health of the watershed and jeopardize the fish and wildlife species that depend on the Tuolumne for their survival, and

WHEREAS, Other California cities have successfully shown that they can reliably serve water to increasing populations without increasing the diversions from the natural environment by their conservation efforts; and

WHEREAS, It is in the City's and the public's long term interest to develop alternative methods of meeting the demand for water, including using less water and recycling water for various uses; and

WHEREAS, The San Francisco Public Utilities Commission is well-positioned to undertake efforts to educate the public about water conservation and develop programs to conserve water and recycle water; and

WHEREAS, Providing the Board of Supervisors and the citizenry with the most well documented analysis of a water supply alternative that will not result in increased diversions is in the public interest, now, therefore be it

RESOLVED, That the San Francisco Board of Supervisors urges the San Francisco Public Utilities Commission to explore and develop water supply options that will not divert more water from the Tuolumne River, including but not limited to (1) aggressively and actively developing and encouraging water conservation and

efficiency efforts, and (2) examining and developing programs and projects for the use of recycled water; and be it further

RESOLVED, That the San Francisco Board of Supervisors, pursuant to the City's stewardship responsibility for the Tuolumne River, urges the San Francisco Planning Department and Public Utilities Commission to fully analyze a water supply alternative in the Program Environmental Impact Report that will not result in increased diversions of freshwater from the Tuolumne River.

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City and County of San Francisco
Tails
Resolution

City Hall
1 Dr. Carlton B. Goodlett Place
San Francisco, CA 94102-4689

File Number: 070754 **Date Passed:**

Resolution urging the San Francisco Planning Department to fully analyze a water supply alternative in the Program Environmental Impact Report that will not result in increased diversions of freshwater from the Tuoumne River and urging the San Francisco Public Utilities Commission to undertake and implement water conservation and recycled water programs.

June 5, 2007 Board of Supervisors — AMENDED, AN AMENDMENT OF THE WHOLE BEARING NEW TITLE

Ayes: 9 - Alioto-Pier, Ammiano, Daly, Elsbernd, Maxwell, McGoldrick, Mirkarimi, Peskin, Sandoval
Absent: 2 - Dufty, Jew

June 5, 2007 Board of Supervisors — CONTINUED AS AMENDED

Ayes: 9 - Alioto-Pier, Ammiano, Daly, Elsbernd, Maxwell, McGoldrick, Mirkarimi, Peskin, Sandoval
Absent: 2 - Dufty, Jew

June 12, 2007 Board of Supervisors — AMENDED, AN AMENDMENT OF THE WHOLE BEARING SAME TITLE

Ayes: 10 - Alioto-Pier, Ammiano, Daly, Dufty, Elsbernd, Maxwell, McGoldrick, Mirkarimi, Peskin, Sandoval
Absent: 1 - Jew

June 12, 2007 Board of Supervisors — ADOPTED AS AMENDED

Ayes: 10 - Alioto-Pier, Ammiano, Daly, Dufty, Elsbernd, Maxwell, McGoldrick, Mirkarimi, Peskin, Sandoval
Absent: 1 - Jew

12.3-183

L_SLDWWKC

File No. 070754

I hereby certify that the foregoing Resolution was ADOPTED AS AMENDED on June 12, 2007 by the Board of Supervisors of the City and County of San Francisco.

Kay Gulbengay
Interim Clerk of the Board

JUN 22 2007

Date Approved

Mayor Gavin Newsom

File No. 070754

CITY OF SUNNYVALE CALIFORNIA

September 28, 2007

San Francisco Planning Department
Att: Paul Maltzer, Environmental Review Officer, WSIP PEIR
1650 Mission Street, Suite 400
San Francisco, CA 94103

Re: Response to Draft Program Environmental Impact Report for Water System Improvement Program

Mr. Maltzer:

The City of Sunnyvale appreciates the opportunity to review and respond to the Draft Program Environmental Impact Report (DPEIR) for Water System Improvement Program (WSIP). We have a few comments on the content of the report, and would also like to add some information related to the City of Sunnyvale (Sunnyvale), as a water customer of San Francisco.

Sunnyvale is correctly identified as a wholesale water customer of the San Francisco Public Utilities Commission (SFPUC). As a wholesale water customer, Sunnyvale is providing a complete response, from the perspective of an agency that is impacted by, and that benefits from, the work proposed for the WSIP.

The DPEIR correctly presents information previously provided to the SFPUC by Sunnyvale. However, we noted that the actual data on the Sunnyvale recycled water program differs notably from the 2004 projections. The Summary of Recycled Water Potential Table for the SFPUC Service Area (Table E.2.5 of the PEIR) lists Sunnyvale's 2004 projection as 0.81 MGD. The City's strong commitment to water conservation is demonstrated by the fact that the actual recorded water savings for 2004 was 1.5 MGD. Sunnyvale is committed to maintaining the 1.5 MGD level through 2030. 01

<u>**General Comments on Draft Program Environmental Impact Report**</u>

The City has general comments on the following issues:

a) ***Timing of Construction*** *(scheduling)* – given the safety concerns associated with the potential loss of water and the unpredictability of earthquakes, the Sunnyvale strongly advocates for the work being completed as soon as possible. 02

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L_Snnyvl

b) ***Schedule of Priorities*** *(scheduling)* – given the high earthquake potential, Sunnyvale advocates for the most vulnerable aspects of the work being completed first. Specifically, Sunnyvale recommends that the Calaveras Dam Replacement (SV-2) and the Seismic upgrade of BDPL pipelines Nos. 3 and 4 at Hayward Fault (BD-3) be the first projects completed. 02 cont.

c) ***System Capacity*** *(design)* – Sunnyvale recommends that the conveyance system be designed to provide the full volume of the future projected need for the Bay Area. While most of the existing system appears to already provide such capacity, the volume of water that flows through the system should be based on policy and programs, not limited by capacity. 03

d) ***Amount of Water Made Available*** *(policy)* – this issue can be discussed and resolved during construction of the system upgrades. Sunnyvale recommends an overall plan be established for all of the parties that draw from the water systems, including the urban and rural users, and a plan be established to maximize the utility of the water used while maintaining basic levels in the streams to address environmental concerns. The plan may include urban users subsidizing the development of new water management systems in rural areas to reduce the overall water demand through alternative irrigation systems. 04

e) ***Environmental Impacts*** *(policy)* – the City of Sunnyvale has established policy that promotes environmental protection. While the proposed plan does not suggest any direct impacts, or proposed mitigations, on the city, Sunnyvale is generally in support of solutions that minimize negative impacts on the environment, including severe impacts on stream flow. Given its commitment to supporting alternative energy sources, Sunnyvale is also concerned with negative impacts on hydrogenation, which is a green power source. 05

f) ***System Maintenance*** *(budgeting)* – Sunnyvale strongly recommends that a maintenance fund be established that requires an annual set-aside that is allocated to a fund earmarked exclusively for the on-going maintenance of the system. The fund should be restricted to a fixed schedule of maintenance and not be allowed for any other type of expenditure, including standard system operations. 06

<u>**Smart Growth, Water Conservation, Recycled (Reclaimed) Water**</u>

As referenced above, Sunnyvale has a long-standing commitment to environmental stewardship. Sunnyvale has incorporated "Smart Growth" and natural resource conservation into our current land use planning and development policies and practices. Smart Growth principles include promoting higher density growth in urban areas, including Mixed Use and Transit-Oriented Developments. This discourages sprawl, which protects the environment through reduced impacts on air quality, non-renewable fuel sources, and increased per capita water use.

During the public discussion on the DPEIR, concerns have been raised about the Bay Area's need for additional water from the Tuolumne River/Hetch-Hetchy System. The need is based on projected growth. California is expected to continue to grow significantly over the next 20 years. Encouraging those newer Californians to live in urban areas is the best way to minimize the overall environmental impact of that growth.

Even if the population growth is less than anticipated, more housing is being planned for in the South bay to address the current housing demand. The ratio of jobs to housing in Santa Clara County is too high – people who work in the area are unable to live here. That results in long commutes, which negatively impacts air quality and promotes the use of fossil fuels. At full build-out of the General Plan, Sunnyvale would have 2.5 jobs per housing unit. In the past five years, Sunnyvale has approved higher density residential and industrial developments in the Downtown Specific Plan, Moffett Park Specific Plan, El Camino Specific Plan, and is currently reviewing a proposal for a Mixed Use combining zoning district. Sunnyvale is seeking to build more housing units, and recently approved a General Plan Amendment from Industrial to Residential to allow for residential development on approximately 60 more acres. 07

Consistent with its strong commitment to environmental stewardship, Sunnyvale has utilized and promoted a number of programs aimed at water conservation. These include water saving devices, pricing techniques, educational programs, converting a wastewater treatment plant to a recycled water production plant and distribution system, and other similar programs, policies and services. The City of Sunnyvale's Water Resources Sub-Element of the General Plan includes the following goal and action statement:

***GOAL A**: MANAGE FUTURE DEMANDS TO ENSURE THAT EXISTING AND REALISTICALLY CERTAIN FUTURE WATER SUPPLIES WILL BE ADEQUATE.*

> ***Action Statements A.1b** Support reasonable, cost-effective, and environmentally sound water supply enhancement projects of San Francisco Water Department / Hetch-Hetchy and Santa Clara Valley Water District.* 08

In support of water conservation, Sunnyvale is active in the following areas (also see attached folder with services and program information):

Water Supply and Distribution Program
- Residential plumbing retrofit – providing low-flow showerheads and aerators to residents free of charge.
- System water audits, leak detection, and repair – all accounts are metered for accountability purposes, with the City offering help to residential customers to

determine if a leak exists in the property and implementing a city-wide pipeline leak detection program.
- Metering with commodity rates – the City encourages all new commercial, industrial, and multi-family developments to have dedicated water meters and separate accounts for landscape irrigation.
- Conservation pricing – Sunnyvale has an inverted rate structure involving different rate blocks with a minimum rate for basic water requirements, and rate increases for increased water usage.
- Recycled water – the City set up a pipeline system based on the concentration of potential customers, and has converted approximately 90 private and public sites, including the City's Baylands Park and municipal golf course, to recycled water for irrigation of turf areas.
- Regulated conservation in landscaping – Ordinance 19.38.070 regulates conservation in landscaping and applies to new and rehabilitated landscaping for public and private development projects.
- Water Waste Prohibition – the City has a list of non-essential water practices that are prohibited in Sunnyvale, such as broken or defective plumbing, sprinklers, watering or irrigation systems; water escaping and flowing into gutters or streets; using potable water to wash sidewalks, driveways, etc. unless an automatic shutoff valve is used; installation of a single pass cooling process in new construction; etc. 08 cont.
- Public information and school education programs – Sunnyvale offers a water pollution and conservation outreach program spearheaded by Water Pollution Control Plant staff. The program teaches youth about the function of wastewater treatment, water pollution prevention and water conservation. The Creek Education program, also offered, provides watershed, urban runoff, water pollution prevention, storm water, creek education, water conservation and wastewater information
- The City also participates in several of Santa Clara Valley Water District's water conservation programs, such as the Irrigation Technical Assistance Program (ITAP) for conservation in large landscapes; water audits for residential, industrial and commercial customers; High Efficiency clothes washer rebates; Ultra-Low-Flow toilet replacement programs; etc.
- In City facilities, install and use conservation devices, including new and experimental units where practical for benefit, study and publicity, as appropriate. Including, waterless and/or low water urinals, auto flush toilet valves, auto on/off faucets, low flow faucets
- The Public Safety Department has instituted the use of synthetic hose, to replace cotton jacketed hose, eliminating the need to use water to wash the hose.
- The Public Safety Department trains emergency responders to make runoff management at emergencies a high priority and to take early steps to mitigate fluid and other contaminant infiltration into the storm drains by means of dykes, adsorbents and other appropriate methods.

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Sunnyvale Supports the Water System Improvement Program

Sunnyvale strongly supports the WSIP being implemented as soon as possible to enable the Sunnyvale to continue to meet our goals. Sunnyvale has actively engaged in water conservation programs for several years and is committed to continuing those programs. Sunnyvale will advocate to ensure that sufficient water is available to allow for: 09

- Future residential growth (already committed through our General Plan),
- Maintenance and/or growth of a healthy economy, and
- Emergency needs.

Based on the brief summary of information provided in the DPEIR, it appears that the "environmentally superior alternative" may provide the basis for the best solution. Sunnyvale supports the Bay Area Water Supply and Conservation Agency (BAWSCA) proposal that the final PEIR further describe and analyze the Modified WSIP Alternative (the environmentally superior alternative). This may include exploring the feasibility of the Bay Area water customers financially supporting water conservation with agricultural interests on the lower Tuolumne River that will result in no net decrease in flows on the lower Tuolumne. BAWSCA's proposal is to conserve even more agricultural water, resulting in a net increase in lower Tuolumne River flows. This additional water could then be deployed at times and in volumes most beneficial for salmon and other important species in the lower Tuolumne River. Under BAWSCA's proposal, the implementation of the WSIP can improve, rather than degrade, flow conditions in the lower Tuolumne River. 10

Again, thank you for the opportunity to review and comment on the Draft Program Environmental Impact Report for the San Francisco Public Utility Commission's Water System Improvement Program. If there is need for any follow-up questions, discussion, or notification, please contact the following:

Jamie McLeod, Associate Planner
(408) 730-7429, jmcleod@ci.sunnyvale.ca.us

James Craig, Superintendent of Field Services
(408) 730-7558, jcraig@ci.sunnyvale.ca.us

Sincerely,

James G. Craig, P.E.
Superintendent of Field Services

ENCL: Water Conservation Programs and Services Information Folder

Cc: Marvin A. Rose, Director of Public Works
Hanson Hom, Director of Community Development

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Stanislaus County
Striving to be the Best

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STANISLAUS COUNTY ENVIRONMENTAL REVIEW COMMITTEE

August 27, 2007

Paul Maltzer
Environmental Review Officer
WSIP PEIR
1650 Mission Street, Suite 400
San Francisco, CA 94103

SUBJECT: **ENVIRONMENTAL REFERRAL – AVAILABILITY OF DRAFT PROGRAM ENVIRONMENTAL IMPACT REPORT FOR THE SAN FRANCISCO PUBLIC UTILITIES COMMISSION'S WATER SYSTEM IMPROVEMENT PROGRAM**

Mr. Maltzer:

The Stanislaus County Environmental Review Committee (ERC) has reviewed the subject project and has the following comment(s):

- Applicant shall determine, to the satisfaction of the Department of Environmental Resources (DER), that a site containing (or formerly containing) residences or farm buildings, or structures, has been fully investigated (via Phase I study and Phase II study if necessary) prior to the issuance of a grading permit. If zoning will change from agricultural land to a commercial or residential zoning designation, DER recommends research be conducted to determine if pesticides were used on the proposed development site; if confirmed, suspect site areas should be tested for organic pesticides and metals. Any discovery of underground storage tanks, former underground storage tank locations, buried chemicals, buried refuse, or contaminated soil shall be brought to the immediate attention of DER. 01
- The construction/improvement project areas within Stanislaus County may be located at identified soil and/or groundwater contamination sites. Prior to construction activities, contact DER Site Mitigation staff and provide APNs or addresses to verify.

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- Applicant should contact the Department of Environmental Resources regarding appropriate permitting requirements for hazardous materials and/or wastes. Applicant and/or occupants handling hazardous materials or generating hazardous wastes must notify the Department of Environmental Resources relative to: (Calif. H&S, Division 20)

  A. Permits for the underground storage of hazardous substances at a new or the modification of existing tank facilities.
  B. Requirements for registering as a handler of hazardous materials in the County.
  C. Submittal of hazardous materials Business Plans by handlers of materials in excess of 55 gallons or 500 pounds of a hazardous material or of 200 cubic feet of compressed gas.
  D. The handling of acutely hazardous materials may require the preparation of a Risk Management Prevention Program that must be implemented prior to operation of the facility. The list of acutely hazardous materials can be found in SARA, Title III, Section 302. 01 cont.
  E. Genera tors of hazardous waste must notify the Department of Environmental Resources relative to the: (1) quantities of waste generated; (2) plans for reducing wastes generated; and (3) proposed waste disposal practices.
  F. Permits for the treatment of hazardous waste on-site will be required from the Hazardous Materials Division.
  G. Medical waste generators must complete and submit a questionnaire to the Department of Environmental Resources for determination if they are regulated under the Medical Waste Management Act.

The ERC appreciates the opportunity to comment on this project.

Sincerely,

Raul Mendez, Senior Management Consultant
Environmental Review Committee

cc: ERC Members

L_Stanford

Stanford University
Land, Buildings & Real Estate
Sustainability and Energy Management
UTILITIES DIVISION
327 BONAIR SIDING, 2ND FLOOR
STANFORD, CA 94305-7272

Mr. Paul Maltzer
Environmental Review Officer
Water System Improvement Program PEIR
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

October 1, 2007

Comments Sent by Email: wsip.peir.comments@gmail.com

Subject: Review Comments from Stanford University about San Francisco's Draft Program Environmental Impact Report for its Water System Improvement Program

Dear Mr. Maltzer,

Stanford University (Stanford) appreciates the opportunity to comment on the comprehensive draft Program Environmental Impact Report (PEIR) that the Planning Department has prepared for the Water System Improvement Program (WSIP) being developed by the San Francisco Public Utilities Commission (SFPUC). Stanford supports the WSIP goals and objectives and the comprehensive PEIR document analyzing the environmental impacts and program alternatives, as required by law. Stanford also supports the Bay Area Water Supply and Conservation Agency's (BAWSCA) proposal that the final PEIR further describe and analyze the draft PEIR's Modified WSIP Alternative (the environmentally superior alternative) and that the final PEIR explore the feasibility of the Bay Area water customers financially supporting water conservation with agricultural interests on the lower Tuolumne River that will result in no net decrease in flows on the lower Tuolumne. 01

Our comments are presented below as general and specific comments. In the specific comments we also provide additional information about Stanford's Water Conservation and Reuse Program to ensure that SFPUC has accurate information when questions about Stanford's water use and efficiency arise.

General Comments and Stanford University's Interest in the WSIP

As a member of BAWSCA, Stanford strongly supports sustainable water supplies and efficient water use. Stanford uses SFPUC water for its domestic water supply, and separately provides non-potable water for irrigation, and groundwater for back-up and emergency supply.

1. **For a reliable regional water supply system, SFPUC needs to proceed with the WSIP to restore and improve its infrastructure and reservoir capacity.** It is imperative for Stanford as well as Stanford University Hospitals – that are regional emergency support facilities - to have a reliable, high quality domestic water supply for the health and safety of its community, including a large dependent resident student population that relies on the university for their critical needs. Academic, research, and support facilities also rely on the high quality of the SFPUC water. 02

L_Stanford

2. **AB 1823 warns that following a major earthquake, the flow of water to communities could be disrupted for 30 to 60 days.** Given this warning, the PEIR should more clearly emphasize the critical importance of completing the WSIP and improving the system's current vulnerability to seismic events. Improvement of the SFPUC water supply system will protect health and safety of the people that live in the Bay Area today. We fully support BAWSCA comments, which discuss this critical issue of seismic risk in more detail. 03

3. **Stanford is already managing an aggressive water conservation and reuse program in addition to using non-potable water for irrigating most (85%) campus grounds.** We meter practically every building and outdoor use on campus and track our water use and trends. However, given that Stanford has been rigorous and successful in its conservation by reducing its water use by 17 percent, demand hardening has resulted and even with improving technologies, fewer opportunities remain for reducing water use, particularly during drought or other water shortage conditions. We clarify in the comments below our water-efficiency program and reasons for requesting additional domestic water allocation from SFPUC. 04

<u>Specific Comments and Clarification about Water Use at Stanford University</u>

1. **Losing access to SFPUC domestic water for 30 days or more will create severe operating problems for Stanford.** Following a major earthquake, SFPUC estimates potential for outages on the SFPUC water system from 30 to 60 days. (AB1823)

2. **The heating and cooling needs for both Stanford University and the two Stanford Hospitals are primarily served by a Central Energy Facility (CEF).** This facility produces chilled water and steam supply that are distributed throughout the campus. The chilled water serves more than 85 of the largest academic and medical research buildings, as well as Stanford hospitals and clinics. The steam supply serves more than 100 major facilities. These campus cooling and heating distribution systems are very efficient and save water as well as energy. The efficiency of the CEF chilled water and steam production is highly reliant on the high quality SFPUC water. The CEF produces the chilled water and steam and it uses almost 25 percent of our purchased SFPUC domestic water. Cooling towers at the CEF recycle the cooling water 10-15 times, which is extremely efficient and made possible by carefully managing the very high quality (low mineral content) SFPUC water. If we use groundwater (from wells with high mineral content) or recycled water (due to its low quality) we could only cycle the water one to two times in the cooling towers before it would be discharged to the sanitary sewer. Therefore, using groundwater or recycled water would likely require at least five times more water as well as more energy for pre-treatment and pumping. 05

3. **Stanford University Hospitals (Stanford Hospital and Clinics and Lucille Packard Children's Hospital) are considered critical emergency facilities** by Santa Clara County Office of Emergency Services and the community served by these hospitals depend on these critical facilities in times of disaster. Disruption to the SFPUC water supply would disrupt the cooling and steam supply, both critical for routine and emergency operations at the hospitals.

4. **Stanford University research and support facilities also rely on the cooling and steam as well as high quality SFPUC water supplies.** Computer hubs, pumps, electron microscopes, lasers, and virtually all research processes requiring cooling could not function without the chilled water supply used for re-circulating cooling systems. The consequences of lack of chilled water could significantly impact or shut down space cooling for temperature-controlled laboratory environments and computer server clusters, as well as building equipment requiring cooling.

5. **Stanford research facilities, similar to other biotech and hi-tech facilities in the San Francisco Bay Area, also use high-level water purification systems.** Water purification systems such as reverse osmosis (RO), are most efficient when using very high quality SFPUC water, typically using about two gallons of SFPUC water to produce one gallon of high purity water. However, with worse quality water, such as groundwater or recycled water, the process would use much more water and energy and require significant pre-treatment, which in turn would generate more water waste.

6. **Although Stanford has wells for emergency backup supply, using this hard, high mineral-content groundwater for an extended period, at a minimum, could cause operational problems**, as well as permanent damage to critical facilities and equipment, and would definitely use significantly more water.

7. **Stanford's Water Conservation and Recycling Programs reduce water demand and result in efficient water use.** We strongly support multi-faceted water efficiency programs for the long-term to effectively and sustainably manage our limited water supplies. Stanford has one of the most aggressive conservation programs in San Francisco Bay Area (Stanford adopted an enhanced plan C, with 20 site-specific water conservation measures). Since 2000, Stanford has reduced its domestic water use by 17 percent, due to water conservation. We are also constructing a recycled water facility for flushing high efficiency toilets and urinals, and some non-potable uses. Stanford is also the first university to join the California Urban Water Conservation Council as of December 2006. 05 cont.

8. **Stanford has retrofitted 95 percent of academic bathroom fixtures and is already irrigating 85 percent of the academic campus grounds with non-potable water.** Although continued maintenance of existing systems and improvements in technology will help improve efficiency in new and existing buildings, Stanford has already instituted the majority of its water conservation measures. We front-loaded water conservation and efficiency to enable us to stretch our water supply for new academic and student housing buildings.

9. **Stanford is fortunate to have diverse water supplies that enable us to manage water resources judiciously through smart growth, aggressive conservation, using recycled water, and local groundwater resources.** However, we may not be able to fully rely on the non-potable local supplies during droughts. Moreover, efficient on-going water management, by its virtue (maximizing efficiency), does reduce further opportunities for additional significant reductions.

10. **Stanford is committed to managing water resources efficiently; however, continued campus growth will require an additional high quality water supply.** Currently, Stanford purchases only 1.3 percent of total SFPUC-supplied water for wholesale customers. Although we will continue stretching our water supplies through efficient use, the campus is gradually growing. Our current General Use Permit (GUP) was approved by Santa Clara County in 2000, and we are confident that we can remain within our current allocation for the duration of the GUP; however, in order to assist with SFPUC planning, we project and are requesting an additional 1.167 mgd to cover the post-GUP period.

11. **Unlike much of the Bay Area, Stanford has not built out its facilities and will continue to grow to meet the need for high quality educational and research facilities.** In addition, the current GUP includes a significant increase in the 24-hour resident population on campus by providing more on-campus housing for graduate students and faculty. Stanford houses 95 percent of its undergraduate students and is planning to increase housing to house 80 percent of its graduate students. This increase in on-campus housing does not reflect population growth, but rather gives current commuting students and faculty the opportunity to become residents. This change has clear environmental benefits in reducing commuter traffic, but we believe that increasing the number of on-campus residents will likely increase water use.

12. **Campus growth will increase on the main campus.** Stanford is planning smart growth by concentrating its development in the main campus to minimize regional impacts from commute traffic. Stanford is also providing easy alternative (pedestrian, bicycle, or community shuttle) access to its facilities for the campus community. 05 cont.

13. **Per capita use is not an appropriate metric for Stanford's water consumption, because nearly 50 percent of Stanford's domestic water is used for academic research and support facilities.** Specifically, almost 25 percent of the domestic water use is for the CEF equipment and space cooling and heating of academic and hospital buildings. The SFPUC water is the most efficient (energy and water-efficient) to use for the CEF due to its high quality and the ability to recycle it 10-15 times. Additionally, 22 percent of Stanford's domestic water is used by research and academic programs. Another 27 percent is used by student housing and dining, mostly indoors, and only 23 percent is used by residential leaseholders.

14. **Problems with Mandatory Rationing to a Maximum of 20 Percent System-wide** (PEIR: p. 3-33)
We believe that conservation and recycling are key to stretching water supplies; however, we also see a need for fair treatment of utilities that can demonstrate that their water conservation programs are resulting in water savings. To this end, Stanford University and others who have invested their resources in reducing water consumption have to be treated fairly when mandates for water use reductions are dictated for all water agencies. These mandatory reductions should recognize and incorporate a separate scale for reductions for agencies that have hardened their water use due to demonstrated significant efficiencies from long-term conservation. As other agencies move forward with aggressive conservation, the ability of the region to accept 10 to 20 percent cutbacks without additional allocations could be very problematic. 06

Stanford is fortunate to have other sources of water in addition to the high quality domestic water from SFPUC. However, our local water sources are limited, especially during droughts, and also require prudent management. We need to reserve well capacity for emergency supplies, not routinely use them, in order to preserve aquifer supplies during droughts. Reduction in availability of non-potable water or groundwater would significantly impact Stanford's flexibility in managing water supplies and further increase reliance on SFPUC domestic water supply. Stanford's non-potable water supply would be limited or possibly not available during droughts; therefore we would expect this reduction in local water availability to be factored into regional mandatory use reduction formulas.

Factors negatively affecting availability of Stanford's local supplies include: 06 cont.

- Drought impacts on Stanford's non-potable water supply for irrigation.
- Potential regulatory requirements reducing availability of local water.
- Potential over-reliance and overuse of groundwater, reducing groundwater supply.

Thank you for this opportunity to comment on SFPUC's WSIP and the comprehensive PEIR document. We look forward to working with SFPUC to ensure this important program is implemented without delay.

Sincerely,

Clifford (Mike) Goff
Director of Utilities
Stanford University

Cc: Art Jensen
Chris Christofferson
Charles Carter

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TUOLUMNE COUNTY CHAMBER OF COMMERCE

222 South Shepherd Street, Sonora, CA 95370 · (209) 532-4212 · Fax (209) 532-8068
Web page: http://www.tcchamber.com · email: info@tcchamber.com

"Vision In Action"

October 1, 2007

Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Maltzer:

The Tuolumne County Chamber of Commerce is opposed to the San Francisco's Public Utilities Plan (SFPUC) to take more water from the Tuolumne River. 01

On March 14, 2007 the Chamber Board of Directors adopted a policy statement on water that "Strongly supports improving the state's surface water storage capacity." It also state's the importance of protecting existing water sources in the county. 02

We support the alternatives identified in your draft document that protect the Tuolumne River from new diversions. Requiring more water conservation, efficiency, and recycling is the best way to lessen impacts on the Tuolumne River while promoting a sustainable water plan for agencies supplied all or in part by the San Francisco Water System. 03

The Chamber also believes the SFPUC should adopt a policy of reducing diversions from the Tuolumne River and do a watershed study to assess the environmental impacts of the WSIP. 04

Sincerely,

George Segarini
President & CEO

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TUOLUMNE UTILITIES DISTRICT

18885 NUGGET BLVD • SONORA, CA 95370
(209) 532-5536 • Fax (209) 536-6485

September 28, 2007

Mr. Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
WSIP PEIR
1650 Mission Street, Suite 400
San Francisco, CA 94103

Re: San Francisco Public Utilities Commission – Water System Improvement Program; Program Environmental Impact Report (PEIR)

Dear Mr. Maltzer:

The Tuolumne Utilities District (TUD) respectfully submits the following comments on the San Francisco Public Utilities Commission's Water System Improvement Program (WSIP) PEIR. TUD will be actively engaged in all hearings, proceedings, permitting and future actions related to this project.

TUD is the agency responsible for providing water supply to a population of 44,000 in Tuolumne County. As such, TUD is primarily concerned with continued water supply availability in the County of Origin to support current and future economic growth and ecosystem health. It is the position of TUD that the continued export of water from the County of Origin to serve the unrelenting growth in the Bay Area, particularly outside of the boundaries of the City and County of San Francisco, is both irresponsible and in conflict with the provisions of its entitlements under the Raker Act.

Given the current state of water crisis in the state, responsible public water agencies are adopting and implementing regional and interregional water management strategies which balance the needs of all water consumers, including the environment. It is prudent water management to plan for diversification of the community's water supply portfolio.

The PEIR is severely limited in its alternatives development with regard to supply diversification. For each supply alternative, the analysis seems to assume that the proposed project or program must meet the increased water supply objective on its own, rather than considering a diversified mix of smaller scale conservation, desalination, interconnection, groundwater sources, increased recycling as well as limiting, versus prohibiting, increases in wholesale purchase requests. For example, the PEIR neglects to evaluate the opportunity to install a smaller, year-round desalination facility in conjunction with a water recycling program which irrigates only agricultural lands, commercial and industrial landscaping. 01

The PEIR addresses only the negative political and economic impacts associated with denying future wholesaler purchase requests. The PEIR disregards the opportunity to evaluate 02 limiting new purchase requests which could be based on the level at which its wholesaler perform with regard to conservation and recycling efforts. Limiting new purchase requests will result in increased public acceptance of recycled water use and enhanced tolerance of aggressive conservation measures. 02 cont.

It is our understanding that on October 18, 2005, the County of Tuolumne submitted numerous comments and concerns for consideration during the public scoping process in preparation for the WSIP - PEIR. TUD agrees with and supports the October 18, 2005 County comments and supports their concerns and position stated in their September 25, 2007 PEIR response as well. 03

Upon review of the draft PEIR, we find that although many of the County's comments were discussed in the PEIR analysis, their concerns were not adequately addressed, and the findings and conclusions made in support of the recommended alternative lack adequate evaluation and consideration as follows:

1) **Water conservation and water recycling** - The PEIR estimates that requests to wholesale agencies to implement conservation measures at 20% during drought will result in a commensurate 20% reduction in supply needs. Unless conservation measures are strictly enforced and set at a higher percentage than the desired 20% conservation policy goal, it is highly unlikely that a 20% usage reduction will occur. The percentage of water usage reduction during conservation measures should be validated in the PEIR using industry standards, which are typically based on the water year rather than an arbitrary percentage.

   In addition, the PEIR assumes demand hardening during water conservation without documentation to show that hardening is occurring, or validation of the level at which its wholesale agencies are currently enforcing conservation, or the level of customer performance during previous conservation measures.

   The PEIR further states the assumption that water conservation and recycling can partially, but not fully meet the WSIP delivery reliability and water supply performance objectives. This assumption was developed based on cursory input from the wholesale customers, rather than research, analysis and presentation of factual data. No tables or data are included in the PEIR showing: 04

   a) The current level of water conservation and customer performance in each of the agencies served,
   b) The maximum possible level of conservation prior to demand hardening.
   c) The Average Daily Dry Weather flows into the wastewater plants in each of the wholesaler communities,
   d) The amount of treated wastewater effluent currently discharged into local waterways and the bay from each of the wastewater facilities,
   e) Total amount of treated effluent currently available for use on recycled water projects,
   f) Location of recycled water facilities and possible expansion areas,

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   g) An inventory of park, agricultural, industrial and commercial facilities which can be easily converted to irrigation with recycled water. 04 cont.

   Lacking the information detailed above, the maximum potential supply of recycled and conserved water to offset demand can not be accurately determined. Therefore, the PEIR does not adequately meet the requirement of the Raker Act to utilize local water sources before increasing Tuolumne diversions, nor does it adequately evaluate the positive and negative impacts of reduced wastewater discharges into receiving waters throughout the Bay Area. 05

   In Chapter 9, the PEIR places negative public perception of the use of recycled water in a higher priority position, to avoid, versus the significant negative environmental impacts identified through increased diversions from the Tuolumne River. 06

2) In its consideration of year-round desalination, the emphasis in the PEIR again appears to be in avoiding public acceptance concerns and cost avoidance rather than maximizing local water sources. The estimated environmental impacts of the desalination plant are overstated without substantive study or data presented. 07

3) The PEIR discusses the possibility of interconnection with the Santa Clara Valley Water District (SCVWD), but rejects this option due to the fact that water from SCVWD is only available during wet years, when it is not needed. The PEIR does not evaluate the option of charging the groundwater basin with water from the SCVWD during wet years, but rather contemplates the use of water received during wet years through transfer agreements with MID and TID to charge the groundwater basin. 08

In addition, the PEIR contemplates the transfer of water from the Modesto Irrigation District (MID) and Turlock Irrigation District (TID) during drought and non drought years to meet demand objectives. The entire factual basis for the recommended alternatives contained in the PEIR is flawed, as it is based on water to be transferred from a variety of public agencies, under agreements not yet consummated. The agencies from which the water transfers are contemplated:

   a) May or may not have the legal authority to approve such transfers;
   b) May not have adequate water supply or water rights to accomplish the transfer during all years, including drought;
   c) Do not have adequate infrastructure in place to deliver the water and construction of such may be determined impractical; 09
   d) May not approve water transfer agreements altogether or may impose conditions which considerably modify the flow assumptions, viability of alternatives and mitigation measures contained in the PEIR.

Although not revealed or evaluated in the PEIR, the MID/TID water transfers are presumably occurring as the result of proposed infrastructure improvements to convey water from the Oakdale Irrigation District's (OID) main canal on the Stanislaus River to the Modesto Reservoir. This water supply in Modesto Reservoir is proposed to be used to offset impacts to the Tuolumne River below New Don Pedro, caused by increased diversions from the

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Tuolumne River by the SFPUC above Don Pedro. Any water use from the Stanislaus River to meet the SFPUC demand objectives must be disclosed and evaluated in the PEIR. 09 cont.

In addition, without knowing the terms and conditions of agreements to be reached in the future with MID, TID and OID, it is impossible to adequately evaluate the environmental impacts of any related projects or water transfers.

The PEIR develops and supports critical project alternatives and mitigation measures which are based on the assumed success of these transfer agreements. A minimum of three water agencies in TID, MID and OID must publicly discuss and approve such agreements with the SFPUC before the alternatives analysis contained in the PEIR can be considered valid.

10 The Raker Act at Section 9(h) specifically mandates the beneficial use of water which San Francisco has or may acquire in the future, prior to increasing its use of water from the Tuolumne River. As previously stated, the SFPUC has available to it many options for increasing it's own supply including aggressive water conservation practices implemented and enforced in accordance with industry standards, as well as a stable source and increasing supply of recycled water.

11 The recommended alternative in the PEIR is based on flawed analysis which lack supporting data, is intended for cost avoidance and convenience of the SFPUC customers, and containing projects which incite the least local political controversy, all at the expense of the County of Origin of the Tuolumne River. Additional diversions from either the Tuolumne or Stanislaus Rivers will be vigorously opposed by the Tuolumne Utilities District.

Respectfully,

Peter J. Kampa
General Manager

Cc: Barbara Balen, President Tuolumne Utilities District
Senator Dianne Feinstein
Senator Barbara Boxer
Congressman George Radanovich
Senator Dave Cogdill
Assemblyman Tom Berryhill
Stan Kellogg, Tuolumne County Farm Bureau
Dan Gallery, District Legal Counsel
Mark Thornton, Chairman, Tuolumne County Board of Supervisors
Jim Goodrich, General Manager GCSD

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COMMENT CARD

San Francisco Planning Department
Draft Program Environmental Impact Report on the
SFPUC's Proposed Water System Improvement Program
Sonora, CA. September 5, 2007

Thank you for participating in tonight's public hearing on the Draft Program Environmental Impact Report (PEIR) for the San Francisco Public Utilities Commission's proposed Water System Improvement Program (WSIP). This is also an opportunity for you to submit written comments on the Draft PEIR for the proposed WSIP.

Written comments will be accepted through close of business on Monday, October 1, 2007. Written comments may be submitted in one of three ways:

1. Leave your written comments in the designated "Comment Box" tonight. These cards are provided for your convenience.
2. Mail your comments by October 1, 2007 to the San Francisco Planning Department, Attention: Paul Maltzer, Environmental Review Officer, WSIP PEIR, 1650 Mission Street, Suite 400, San Francisco, CA 94103
3. E-mail written comments to wsip.peir.comments@gmail.com

CONTACT INFORMATION

Name: Barbara Balen - Board President
Affiliation: Tuolumne Utilities District (TUD)
Address: 10181 Von Kleiben Rd.
City, State, Zip: Sonora, CA 95370
Phone or E-mail: 209 · 532 · 3544

WRITTEN COMMENTS Write clearly and continue on back. Use multiple sheets if needed.

01 I am reinforcing the comments made by my General Manager - Pete Kampa. TUD recycles 100% of our wastewater. SFPUC PEIR needs to focus on agressively recycling & re-use of existing H2O supply. Spend the $ on toilet-to-toilet infrastructure. It is your only Source of reliable H2O. H2O transfers is paper H2O The environment is your customer also, it needs water. Tuo. River flows were already establi when designated W&S. Thank you.

Tuolumne County
Administration Center
2 South Green Street
Sonora, California 95370

Phone (209) 533-5521
Fax (209) 533-6549

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CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
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Alicia L. Jamar
Clerk of the Board of Supervisors

Elizabeth Logan
Assistant Clerk

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COUNTY OF TUOLUMNE

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Paolo Maffei, *Second District*
Teri A. Murrison, *Third District*
Richard H. Pland, *Fifth District*

September 25, 2007

Mr. Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
WSIP PEIR
1650 Mission Street, Suite 400
San Francisco, CA 94103

Re: San Francisco Public Utilities Commission - Water System Improvement Program; Program Environmental Impact Report (PEIR)

Dear Mr. Maltzer:

The County of Tuolumne is submitting PEIR comments on the San Francisco Public Utilities Commission's Water System Improvement Program (WSIP) PEIR. The County will be involved through out the WSIP implementation.

October 18, 2005 this Board submitted scoping comments to be considered by the San Francisco Planning Department when developing the PEIR. That letter is attached for your reference.

It is the County's conclusion that the San Francisco Planning Department, in its preferred alternative identified in the PEIR, has not maximized water conservation and recovery options in lieu of additional water diversion from the Tuolumne River. Our Board was clear in the October 18th, 2005 scoping comment letter that alternatives to additional water diversion must be considered more aggressively than demonstrated in the preferred PEIR alternative. 01

This letter is drafted with the intent to identify and reestablish Tuolumne County's primary concerns, as outlined in the October 18th, 2005 letter regarding the WSIP objectives and implementation and recommends that the San Francisco Planning Department seriously consider the County's comments.

Reduced flows will harm the Tuolumne River's trout, salmon, and steelhead fisheries. The diversion would also degrade whitewater recreation and cause economic harm to Sierra communities that depend on seasonal recreation. San Francisco's proposal to divert more water from the Tuolumne River jeopardizes past conservation efforts and the future health of the watershed. As the County of Origin the County believes it is necessary for the San Francisco Planning Department to consider all mitigating circumstances that will most benefit the County of Tuolumne and choose an alternative that will eliminate the need to increase water diversions from the Tuolumne River, see the attached Board of Supervisor Resolution. If the San Francisco Planning Department proceeds with the selected PEIR alternative, as the preferred alternative, and the San Francisco Public Utilities Commission adopt that alternative to carry out WSIP implementation, the County will evaluate and exercise the necessary legal remedies to see that no further water diversions from the Tuolumne River occur. 02

If you have any questions, please contact Steve Boyack, Natural Resources Analyst at (209) 533-5511.

Respectfully,

Mark V. Thornton

Mark V. Thornton, Chairman
Tuolumne County Board of Supervisors

Enclosure
Cc: Senator Dianne Feinstein
Senator Barbara Boxer
Congressman George Radanovich
Senator Dave Cogdill
Assemblyman Tom Berryhill
Craig Pedro, County Administrator
Gregory Oliver, County Counsel
Steve Boyack, Natural Resources Analyst
Bev Shane, Director, CDD
Pete Kampa, General Manager, TUD

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Alicia L. Jamar
Clerk of the Board of Supervisors

Elizabeth Logan
Assistant Clerk

BOARD OF SUPERVISORS
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Mark V. Thornton, *Fourth District*
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Jim Peterson, *Third District*
Richard H. Pland, *Fifth District*

October 18, 2005

Mr. Paul Maltzer
San Francisco Planning Department
30 Van Ness, Suite 4150
San Francisco, CA 94103

Re: San Francisco Public Utilities Commission - Water System Improvement Program
Case Number 2005.0159E

Dear Mr. Maltzer:

Thank you for allowing Tuolumne County to submit scoping comments on the San Francisco Public Utilities Commission's Water System Improvement Program (WSIP). The County will be involved throughout the drafting and completion of the Program Environmental Impact Report (PEIR).

During the October 5, 2005 scoping meeting, at the Sonora Opera Hall, several comments were made by governmental and non-governmental agencies, utility municipalities and Tuolumne County citizens. Although many issues and concerns were discussed, the County believes the San Francisco Planning Department must consider the following when developing the PEIR:

1. The PEIR must consider the effects of all potential demand side improvements and other water conservation measures on the overall water needs analysis.
2. The PEIR must consider the effects of all possible waste water recovery and reutilization on the overall water needs analysis.
3. The PEIR must consider the effects of all improvements to capture and store storm water runoff on the overall water needs analysis.
4. The PEIR must consider the effects of inclusion of water desalinization processes on the overall water needs analysis.

03

5. Through your water needs analysis if you determine that there is a substantial water savings with other water source alternatives, will that result in eliminating of the need to divert additional water from the Tuolumne River or even a lessening of the amount of water currently diverted from the Tuolumne River? 03 cont.
6. Your analysis of additional water diversions from the Tuolumne River needs to address the potential impacts on the County's Tuolumne River water rights as the County of Origin. 04
7. An economic analysis must be completed on the environmental effects on Tuolumne County residents, businesses and tourism prior to approving additional diversions of water from the Tuolumne River. 05
8. If systemwide improvements include system redundancy for health and safety purposes, where is the line drawn between redundancy for health and safety and increasing capacity to serve additional customers? 06
9. How is San Francisco going to integrate and prepare for the variability of the Sierra Nevada snow pack as discussed in the California Water Plan Update? 07
10. How does your plan integrate with the Turlock Irrigation District, Modesto Irrigation District, CALFED - Bay Delta Program, Tuolumne County and any other users of the Great Central Valley Watershed? Your analysis of cumulative impacts must address potential impacts to the Tuolumne River, San Joaquin River and Bay Delta ecosystem caused by reasonably foreseeable projects of other entities. 08
11. How does your plan integrate with emerging Comprehensive Management Plans within Yosemite National Park and Tuolumne River Wild and Scenic Plans within the Stanislaus National Forest and the Yosemite National Park? 09
12. Lower water flows on the Tuolumne River will put greater demands on the Stanislaus River Watershed for meeting recreational and downstream water quality needs. This in turn impacts Tuolumne County, which receives the majority of its drinking water from the Stanislaus River. How does your plan consider the County's long-term sustainable water needs and the needs of down stream users if additional water flows in the Tuolumne River are diverted? 10

Paul Maltzer
October 18, 2005
Page 3

13. The sentence at the bottom of page 9 and top of page 11 of San Francisco's Notice of Preparation makes it clear that San Francisco intends to take whatever steps are necessary to retain its filtration exemption. We understand that EPA regulations regarding water quality requirements relating to cryptosporidium are being tightened. The PEIR must discuss alternatives to continued non-filtration, and must discuss mitigation measures if further recreational restrictions are imposed at Hetch Hetchy Reservoir. 11

14. A catastrophic fire in the GCSD service area would have devastating impacts on the environment and on the Tuolumne River. You must consider the unique position of the Groveland Community Services District (GCSD) and the fact that its rural water system provides for environmental and residential safety in the event there is a fire. The County believes you must consider lessening the rationing percentage specific to GCSD for safety reasons. 12

15. The PEIR must consider the effects of inclusion of surface water and ground water conjunctive use programs that reduce the impacts of seasonal and long-term watershed yields. 13

16. Significant groundwater infiltrates into the Mountain Tunnel relative to GCSD's annual water demand, and GCSD pays a surcharge for lost power revenue. GCSD should receive a credit for the infiltration of groundwater that leaves its service area, or the elimination of the surcharge altogether. In addition, the infiltration of groundwater into the water system must be accounted for and addressed in the overall water needs analysis. Furthermore, the PEIR must comply with the Tuolumne County Ordinance Code 13.20 et al. as the Code pertains to groundwater export via San Francisco's water system. 14

17. The WSIP calls for the Mountain Tunnel to be closed down for maintenance on an annual basis. The project should assist GCSD in finding a water supply of equal quality during times of tunnel maintenance.

18. Since most of the improvements to the water system are made west of Groveland, GCSD should not be asked to help pay for those improvements downstream of Groveland. 15

19. Since the Raker Act is essentially a federal license and a portion of San Francisco's water system resides on federal land, what role will the National Environmental Policy Act play in this review? 16

20. Per the City Charter when will City Officials deem the Hetch Hetchy water and hydroelectric systems complete and merged? 17

Paul Maltzer
October 18, 2005
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County of Origin

The possible reduction in flow of the Tuolumne River could have a profound effect on Tuolumne County's recreation, biological, riparian and economic resources. As the County of Origin the County believes it is necessary for the PEIR to consider all mitigating measures that will have an impact on Tuolumne County. 18

In the past, this Board of Supervisors has brought to the attention of San Francisco the inequities of their method of bidding construction contracts, especially for construction projects that occur in Tuolumne County. This Board considers it necessary for San Francisco to consider equally bids from local Tuolumne County contractors or even give higher consideration for local Tuolumne County contractors who bid on projects within Tuolumne County. 19

The County has not taken an official position regarding the restoration of Hetch Hetchy Valley. The County recommends that an economic analysis of alternatives discussed in the PEIR be broad in scope and include all alternatives for operation of the water system. 20

During the Sonora public scoping meeting, San Francisco staff advised the participants that San Francisco staff will only provide responses to those questions that they determine to be within the scope of the project. The County believes that San Francisco has the responsibility to respond to all of the questions as part of the scoping process.

The County recommends that the San Francisco Planning Department, during its review of the scoping comments, consider the County's issues and concerns during the subsequent drafting of the corresponding Draft Program Environmental Impact Report.

If you have any questions, please contact Steve Boyack, Natural Resources Analyst at (209) 533-5511.

Sincerely,

Paolo Maffei, Chairman
Tuolumne County Board of Supervisors

Paul Maltzer
October 18, 2005
Page 5

Cc: Senator Dianne Feinstein
Senator Barbara Boxer
Congressman George Radanovich
Assemblyman Dave Cogdill
Senator Charles Poochigian
Mayor Gavin Newsom
San Francisco County Board of Supervisors
C. Brent Wallace, County Administrator
Gregory Oliver, County Counsel
Steve Boyack, Natural Resources Analyst
Bev Shane, Director, CDD
Gary Egger, General Manger, TUD
Jim Goodrich, General Manager, GCSD

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No. 140-07

Filed September 25, 2007

By [signature]
Clerk of the Board of Supervisors

RESOLUTION
OF THE BOARD OF SUPERVISORS OF THE COUNTY OF TUOLUMNE

WHEREAS, California is experiencing a serious water shortage and is likely to continue to do so in coming years due to drought, a long term trend toward warmer rains and earlier mountain runoff, a lack of storage capacity and population growth; and

WHEREAS, the Tuolumne River is a local, regional, and national treasure from its headwaters high in Yosemite National Park to its confluence with the San Joaquin River and contributes a vitally important water source to the Bay Delta ecosystem; and

WHEREAS, the waters of the Tuolumne River also sustain Agriculture, rural and urban communities, diverse natural and biological resources, and recreational uses that generate significant revenue for Tuolumne County and downstream economies; and

WHEREAS, Agriculture is an important industry requiring affordable, high quality, reliable water for food and fiber production, provides critically important sustenance for society in general, and provides numerous quality of life benefits to residents of the region, the State of California and the Nation; and

WHEREAS, 60% of the Tuolumne River is presently diverted for rural and urban uses and users currently depend on Tuolumne River water for a wide variety of needs including those above; and

WHEREAS, a section of the upper Tuolumne River is highly valued for its natural resource qualities, public benefit, and has been named a federally-designated Wild and Scenic River, and

WHEREAS, the Tuolumne River from headwaters to confluence supports a series of unique habitats and diverse biological communities that include migratory waterfowl, peregrine falcons, bald eagles, mule deer, black bears, foothill yellow-legged frogs, Sierra Nevada red fox, rainbow trout, steelhead, and Chinook salmon; and

WHEREAS recreation including boating and fishing on the Tuolumne River, Cherry Reservoir and Lake Don Pedro are important components of high quality of life experiences for people in the State and for local economies; and

WHEREAS, the San Francisco Public Utilities Commission (SFPUC) currently diverts 265 million gallons of water from the Tuolumne River daily and its proposed Water System Improvement Program (WSIP) seeks to divert an additional 25 million gallons of water per day from the Tuolumne River; and

WHEREAS; the SFPUC's WSIP Draft Program Environmental Impact Report (PEIR) fails to properly identify and address all the environmental, Agriculture, rural and urban, and recreational use impacts to Tuolumne County, downstream areas and the San Joaquin Water Shed including the Stanislaus River that would be generated by diverting additional water from the Tuolumne River; and

L_Tuol1

WHEREAS, water conservation and efficiency measures are the cheapest, easiest, and least destructive ways to meet demand and extend supply; and

WHEREAS, SFPUC has not demonstrated a sincere and sufficient effort to implement voluntary and/or mandatory conservation measures to the individual, private, and government agencies it serves; and

WHEREAS, significant potential exists for SFPUC to increase present conservation, recycling, and other efficiency measures.

NOW THEREFORE, BE IT RESOLVED that the Tuolumne County Board of Supervisors unequivocally opposes San Francisco PUC's proposed diversion of an additional 25 million gallons of water a day from the Tuolumne River, and

BE IT FURTHER RESOLVED that the County will seek and exercise the necessary legal remedies to see that no further water diversions occur from the Tuolumne River.

ADOPTED BY THE BOARD OF SUPERVISORS OF THE COUNTY OF TUOLUMNE ON 9/25/07,

AYES:	1st Dist. ———	NOES:	1st	Dist. Bass
	2nd Dist. Maffei			Dist.
	3rd Dist. Murrison	ABSENT:		Dist.
	4th Dist. Thornton			Dist.
	5th Dist. Pland	ABSTAIN:		Dist.

Mark V. Thornton

CHAIR OF THE BOARD OF SUPERVISORS

ATTEST: [signature]
Clerk of the Board of Supervisors

No. 40-07

L_Tuol2

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

Tuolumne River PEIR

Mark Thornton <mvt3@sbcglobal.net> **Mon, Oct 15, 2007 at 9:10 PM**
To: wsip.peir.comments@gmail.com

Mr. Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
WSIP PEIR
1650 Mission Street, Suite 400
San Francisco, CA 94103

Re: San Francisco Public Utilities Commission (SFPUC) - Water System Improvement Program; Program Environmental Impact Report (PEIR)

Dear Mr. Maltzer:

Thank you for extending the PEIR comment period, but I believe the comment period should have been extended longer.

This letter is to re-enforce my concerns regarding two primary issues:

1. I believe the San Francisco Planning Department (SFPD) has not fully considered the economic impacts to the rafting industry that exists in Tuolumne County should the SFPUC decide to divert an additional 25 million gallons of water per day from the Tuolumne River. 01

2. I believe Tuolumne County has water rights on the Middle Fork and South Fork of the Tuolumne River. The SFPD has not addressed the County's water rights concerns in the PEIR. 02

In addition, I must restate my position that there is not enough baseline data and has not been enough time to gather baseline data to properly analyze the environmental consequences of diverting additional water from the Tuolumne River. 03 Furthermore, not only have you not addressed better water conservation and recycling in the Bay Area you 04 have not answered Tuolumne County's concerns about you arrangement within Lake Don Pedro. 05

Finally, I believe the PEIR is also deficient in addressing the water diversion and impacts in relation to the goals and strategies of the Sierra Nevada Frame Work and CalFed. Your PEIR should embrace a comprehensive watershed management approach which extends from the Sierra Nevada Crest to the Bay Area. 06

Thank you for addressing these concerns,

Sincerely,

Mark V. Thornton
District 4 Supervisor, Tuolumne County

ZONE 7 WATER RESOURCES MANAGEMENT

ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

100 NORTH CANYONS PARKWAY, LIVERMORE, CA 94551-9486 PHONE (925) 454-5000

October 1, 2007

Mr. Paul Maltzer
Environmental Review Officer, WSIP PEIR
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Subject: SFPUC's Water System Improvement Program Draft Programmatic Environmental Impact Report

Dear Mr. Maltzer:

Thank you for the opportunity to review and comment on the Draft Programmatic Environmental Impact Report (DPEIR) for SFUPC's Water System Improvement Program (WSIP). Zone 7 has reviewed the DPEIR in the context of Zone 7's mission to provide drinking water, non-potable water for agriculture/irrigated turf, flood protection, and groundwater and stream management within the Livermore-Amador Valley. We offer the following comments for your consideration.

Zone 7 manages 425 square miles of the Upper Alameda Creek Watershed consistent with flood protection needs and in support of groundwater recharge operations that provide peak period water supply and drought protection in the Livermore-Amador Valley. In working with the resource agencies, Zone 7 has found that stream management projects are frequently viewed holistically and impacts are considered cumulatively. As such, Zone 7 is concerned that impacts to fisheries downstream of its service area are adequately addressed given their indirect effects on the management of upstream water resources.

In Section 5.4.5 – Fisheries of the DPEIR, SFPUC states that because the existing BART Weir is an impediment to steelhead migration, spawning and juvenile rearing, implementation of the WSIP will not impact steelhead migration; therefore, no impact analysis or conclusion was developed in the DPEIR. This conclusion is based on an incomplete assessment of the current status of steelhead fishery in Alameda Creek and the ongoing restoration efforts. The Alameda County Flood Control & Water Conservation District (ACFC&WCD) and the Alameda County Water District (ACWD) currently have an approved agreement to provide for fish passage designs at the BART weir and ACWD's middle inflatable dam to open up steelhead fish passage by the year 2010. In addition, as recognized in the DPEIR, the Alameda Creek Fisheries Restoration Workgroup, in which SFPUC, ACWD, Zone 7, and PG&E are participating, is conducting flow studies to determine flow requirements for a restored steelhead fishery. Finally, there have been annual steelhead sightings documented in the Alameda Creek Flood Control Channel. The implementation of the WSIP will substantially reduce winter and spring flows in Alameda Creek by up to 50% in normal years. This reduction may adversely impact flows available to steelhead that currently access Alameda Creek below the BART weir. Therefore, despite the BART weir being an impediment to upstream steelhead migration, implementation of the WSIP may have an impact on fisheries downstream of the BART weir. With these considerations, it would be prudent for SFPUC to analyze impacts implementing the WSIP will have on steelhead migration, assuming the BART weir could potentially be removed or modified in the future to become less of a migration barrier. 01

In addition to the Alameda Creek flow issues, Zone 7 is concerned about two other aspects of the WSIP. About 80 percent of Zone 7's water supply is conveyed by the State Water Project (SWP) through the Delta and into our service area. As a State Water Contractor (SWC), Zone 7 is concerned with impacts to SWP supplies and Delta water quality. SFPUC proposes to reduce inflow into the Don Pedro Reservoir, which will result in reduced inflow into the Tuolumne River and the Delta via the San Joaquin River. Although the flow reductions generally would be less than 200 cfs, there would be several years in which the flow reduction during a single month would exceed 1,000 cfs. A flow reduction of this scale would likely result in significant negative impacts to Delta water quality and/or SWP supply. As a member of the SWC Board of Directors, Zone 7 supports SWC's recommendation that the SFPUC either (1) adopt the Modified WSIP Alternative as the preferred alternative with appropriate supporting environmental analysis or (2) provide an analysis of WSIP implementation attempting to adjust the timing of Don Pedro Reservoir refill both to reduce the scale of monthly flow reductions in Tuolumne River below La Grange Dam and to coincide with periods of excess conditions in the Delta. 02

Finally, Zone 7 supports the exploration of water management techniques such as interconnections and water exchanges among SFPUC and other jurisdictions such as the Dublin San Ramon Service District, which would provide a regional benefit to water supply reliability. Having interconnections with the watersheds or groundwater basins of other jurisdictions may also assist San Francisco in increasing its own water supply reliability. 03

Again, we appreciate the opportunity to comment on this document. If you have any questions or comments, please feel free to contact me at your earliest convenience at 925-454-5000 or Mary Lim at 925-454-5036.

Sincerely,

G.F. Duerig
General Manager

cc: Kurt Arends, Vince Wong, Karla Nemeth, David Houts, Mary Lim
Paul Piraino and Eric Cartwright, ACWD
Bert Michalcyzk and Dave Requa, DSRSD

12.4 Groups

GROUPS

GROUPS THAT SUBMITTED COMMENTS ON THE DRAFT PEIR

Comment Letter Format	Comment Letter ID	Name of Commenter	Title	Organization/ Affiliation	Page
Email	SI_ACA1	Jeff Miller	Director	Alameda Creek Alliance	12.4-1
PH Fremont	SI_ACA2	Jeff Miller	Director	Alameda Creek Alliance	12.6-52
Email	SI_ACT	David T. Smernoff, Ph.D.	Board Vice President	Acterra: Action for a Sustainable Earth	12.4-12
Email	SI_CAC1	Steve Lawrence	Vice Chair	Citizens Advisory Committee to the SFPUC	12.4-13
Email	SI_CAC2	Steve Lawrence	Vice Chair	Citizens Advisory Committee to the SFPUC	12.4-13
Mail	SI_Caltrout	Brian Stranko	Chief Executive Officer	California Trout	12.4-14
Email	SI_CAREP	Buddy Burke / Virginia Chang Kiraly	CA REP President & CA REP Vice President	Republicans for Environmental Protection, Protection Commissioner, California Commission for Economic Development	12.4-14
PH Palo Alto	SI_CI	Katherine Forrest	Member	Commonwealth Institute	12.6-77
Mail	SI_CNPS	Amanda Jorgenson	Executive Director	California Native Plant Society	12.4-15
Email	SI_CNPS-EB1	Laura Baker	Conservation Committee Chair	California Native Plant Society, East Bay Chapter	12.4-15
PH Fremont	SI_CNPS-EB2	Lech Naumovich		California Native Plant Society, East Bay Chapter	12.6-56
Email	SI_CNPS-SCV1	Kevin Bryant	President, Santa Clara Valley Chapter	California Native Plant Society, Santa Clara Valley Chapter	12.4-33
Mail	SI_CNPS-SCV2	Libby Lucas	Conservation	California Native Plant Society, Santa Clara Valley Chapter	12.4-36

GROUPS THAT SUBMITTED COMMENTS ON THE DRAFT PEIR (Continued)

Comment Letter Format	Comment Letter ID	Name of Commenter	Title	Organization/ Affiliation	Page
Email	SI_CNPS-WLJ	Tedmund Swiecki	Conservation Committee Co-Chair	California Native Plant Society, Willis Jepson Chapter	12.4-38
Email	SI_CRS	Meredith Wingate / Brad Drda	Director Clean Energy Policy Design and Implementation Program	Center for Resource Solutions	12.4-38
Email	SI_CSERC	Brenda Whited	Staff Biology	Central Sierra Environmental Resource Center	12.4-40
Email	SI_CWA1	Jennifer Clary	Water Policy Analyst	Clean Water Action	12.4-40
PH SF1	SI_CWA2	Jennifer Clary	Water Policy Analyst	Clean Water Action	12.6-92
Mail	SI_D3Dem1	Tony Gantner	President	District 3 Democratic Club	12.4-41
PH SF1	SI_D3Dem2	Tony Gantner	President	District 3 Democratic Club	12.6-88
Mail	SI_EcoCtr	Martin Bourque	Executive Director	Ecology Center	12.4-41
Email	SI_EnvDef	Spreck Rosekrans	Senior Analyst	Environmental Defense	12.4-42
Mail	SI_Greenp	Krikor Didonian		Greenpeace	12.4-47
Email	SI_GWWF1	Cindy Charles	Conservation Chair	Golden West Women Flyfishers	12.4-48
PH SF1	SI_GWWF2	Cindy Charles	Chairperson	Golden West Women Flyfishers	12.6-89
Email	SI_KSWC	Joseph Vaile	Campaign Director	Klamath-Siskiyou Wildlands Center	12.4-48
Mail	SI_MenloBP	J. Wesley Skow	Attorney	Menlo Business Park LLC (on behalf of by DLA Piper US LLP)	12.4-49
Email	SI_NCFFSC	Dougald Scott	Chair	NCCFFF Steelhead Committee	12.4-51
Email	SI_PacInst	Peter Gleick	President	Pacific Institute	12.4-53
Email	SI_PilarCrk	Tim Frahm	Chair	Pilarcitos Creek Advisory Committee	12.4-78
Email	SI_RHH1	Jerry Cadagan	Board Member/Founder	Restore Hetch Hetchy; Committee to Save Lake Merced	12.4-79

GROUPS THAT SUBMITTED COMMENTS ON THE DRAFT PEIR (Continued)

Comment Letter Format	Comment Letter ID	Name of Commenter	Title	Organization/ Affiliation	Page
Hand-delivered, PH	SI_RHH2	Bob Hackamack	Tech/Engineering Chair	Restore Hetch Hetchy	12.4-82
PH Sonora	SI_RHH3	Bob Hackamack	Tech/Engineering Chair	Restore Hetch Hetchy	12.6-11 12.6-23
PH Sonora	SI_RHH4	Jerry Cadagan	Board Member/Founder	Restore Hetch Hetchy; Committee to Save Lake Merced	12.6-12 12.6-24
Email	SI_SCCCC	Mondy Lariz		Santa Clara County Creeks Coalition	12.4-82
PH SF1	SI_SFNeigh	Joan Girardot		Coalition for San Francisco Neighborhoods	12.6-96
Mail	SI_SierraC1	Blaine Rogers		Sierra Club, Tuolumne Group	12.4-83
PH Modesto	SI_SierraC2	Sandra Wilson	Chair	Sierra Club	12.6-41
PH Palo Alto	SI_SierraC3	Bill Young	Member	Sierra Club	12.6-67
PH Palo Alto	SI_SierraC4	Richard Zimmerman	Member	Sierra Club	12.6-68
PH SF1	SI_SierraC5	Gwynn MacKellen	Member	Sierra Club	12.6-88
PH SF1	SI_SierraC6	John Rizzo	Executive Committee Member	Sierra Club, San Francisco Bay Chapter	12.6-95
PH SF2	SI_SierraC7	John Rizzo	Executive Committee Member	Sierra Club, San Francisco Bay Chapter	12.6-127
Mail	SI_SPUR	Laura Tam	Sustainable Development Policy Director	San Francisco Planning and Urban Research Association	12.4-83
Mail	SI_SWC	Terry Erlewine	General Manager	State Water Contractors	12.4-85
PH Sonora	SI_TCFB	Stan Kellogg	President	Tuolumne County Farm Bureau	12.6-5
Email	SI_TROA	Stephen Welch	President	Tuolumne River Outfitters Association	12.4-86
Email	SI_TRT1	Amy Meyer	Founding Member	Tuolumne River Trust	12.4-88
PH Sonora	SI_TRT2	Cynthia King	Sierra Nevada Program Director	Tuolumne River Trust	12.6-
PH Sonora	SI_TRT3	Galen Weston	Part-time Employee	Tuolumne River Trust	12.6-13

GROUPS THAT SUBMITTED COMMENTS ON THE DRAFT PEIR (Continued)

Comment Letter Format	Comment Letter ID	Name of Commenter	Title	Organization/ Affiliation	Page
PH Modesto	SI_TRT4	Meg Gonzalez	Director of Community Outreach and Education	Tuolumne River Trust	12.6-32
PH Modesto	SI_TRT5	Patrick Koepele	Central Valley Program Director	Tuolumne River Trust	12.6-36
PH Modesto	SI_TRT6	Eric Wesselman	Executive Director	Tuolumne River Trust	12.6-38
PH Fremont	SI_TRT7	Eric Wesselman	Executive Director	Tuolumne River Trust	12.6-49
PH Palo Alto	SI_TRT8	Peter Drekmeier	Bay Area Program Director	Tuolumne River Trust	12.6-64
PH SF1	SI_TRT9	Eric Wesselman	Executive Director	Tuolumne River Trust	12.6-91
PH SF2	SI_TRT10	Peter Drekmeier	Bay Area Program Director	Tuolumne River Trust	12.6-124
Mail	SI_TRT-CWA-SierraC	Peter Drekmeier, Jennifer Clary, John Rizzo		Tuolumne River Trust, Clean Water Action, Sierra Club	12.4-89

Alameda Creek Alliance
PO Box 192 • Canyon, CA • 94516 • (510) 499-9185
e-mail: alamedacreek@hotmail.com
web site: http://www.alamedacreek.org

Sent via e-mail to wsip.peir.comments@gmail.com on October 1, 2007

October 1, 2007

San Francisco Planning Department
Attention: Paul Maltzer
Environmental Review Officer, WSIP PEIR
30 Van Ness Avenue, Suite 4150
San Francisco, CA 94103

Alameda Creek Alliance Comments on WSIP Draft PEIR

Attached are the comments of the Alameda Creek Alliance (ACA) on the Draft Program Environmental Impact Report (DPEIR) for the SFPUC's Water System Improvement Program (WSIP). The ACA is a community watershed group dedicated to the protection and restoration of the natural ecosystems of the Alameda Creek watershed. The ACA has over 1,450 members that live in or near the Alameda Creek watershed. The ACA has been working to restore steelhead trout and salmon to Alameda Creek and to protect endangered species in the Alameda Creek watershed since 1997.

The ACA supports the SFPUC's efforts to make needed repairs and earthquake safety retrofits to its water system, however we also expect the rebuilt water system infrastructure in the Sunol Valley (including Calaveras Dam and Reservoir, Alameda Diversion Dam, and San Antonio Reservoir) to be operated to allow restoration of steelhead trout and salmon to Alameda Creek. We have some serious concerns with the DPEIR. The failure of the DPEIR to address impacts to anadromous fish in Alameda Creek and its inadequate mitigation measures for special-status species has the potential to jeopardize the SFPUC's time table for implementing the WSIP projects. 01

We are very concerned that two of the WSIP projects proposed in the Sunol Valley Region, the Calaveras Dam Replacement Project and the Alameda Creek Fishery Enhancement Project, include proposals to divert additional streamflow from Alameda Creek, water diversions that which would severely impact native fish and other aquatic wildlife in Alameda Creek. The SFPUC already diverts 86% of the stream flows tributary to the Sunol Valley, from Alameda, Calaveras and San Antonio Creeks, with significant, unmitigated impacts to native fish and wildlife. 02

The SFPUC continues to illegally operate Calaveras and San Antonio Reservoirs, with no minimum bypass flows to keep native fish downstream in good condition. It is questionable whether the SFPUC has a legal water right to divert Alameda Creek streamflow at the Alameda Diversion Dam, and the WSIP plan to divert almost <u>all</u> of the winter and spring stream flows from upper Alameda Creek at this dam is unacceptable. 03 (03 cont.) It is inconceivable that the Calaveras Dam replacement, a major infrastructure project that should address and remedy the impacts of the dam on Alameda Creek fisheries, does not include adequate minimum flows for anadromous fish nor mitigations commensurate with the impacts of the operation of the dam. 04

With other agencies planning fish passage projects in lower Alameda Creek that could allow steelhead trout and chinook salmon to return to the upper watershed by 2010 (before construction of Calaveras Dam is complete), we are extremely disappointed that the WSIP does not include planning, environmental benefits and adequate mitigations for sustaining steelhead and salmon in Alameda Creek. 05

The ACA has made every effort since 2001 to communicate our concerns and suggestions regarding the SFPUC's Sunol Valley projects with potentially significant impacts to the fisheries of Alameda Creek, to every level of the SFPUC, at numerous public forums and meetings, and in numerous written comments. In 2005, 68 Bay Area conservation groups called on the SFPUC to improve its stewardship of local and regional watershed lands, specifically asking the SFPUC to restore stream flows in Alameda Creek sufficient to sustain steelhead and rainbow trout, protect rare fish populations in SFPUC reservoirs, remove the Alameda Diversion Dam, and abandon plans to construct a controversial dam as part of the Fishery Enhancement Project. 06

The public expects the SFPUC to operate a water system that adequately protects and restores the watersheds and wildlife habitats under the SFPUC's management. The WSIP should reflect this stewardship obligation and the PEIR should adequately analyze and mitigate for reasonably foreseeable significant impacts to all special-status species and rare habitats. 07

Sincerely,

Jeff Miller
Director, Alameda Creek Alliance

THE DPEIR FAILS TO CONSIDER IMPACTS AND INCLUDE ADEQUATE MITIGATIONS FOR ANADROMOUS FISH

The DPEIR approach to the issue of potential steelhead restoration in Alameda Creek is that since "there is no current steelhead migration above the BART weir" (page S-67) in lower Alameda Creek, there can be no impacts to steelhead from implementation of the WSIP. The DPEIR states:

> "For the purposes of full disclosure the PEIR provides this discussion of steelhead in lower Alameda Creek, and the potential for steelhead to be restored to the upper reaches of Alameda Creek (above the BART Weir). However, because this steelhead access does not currently exist and there is no current steelhead migration above the BART Weir, there would be no impact on steelhead migration, spawning, or juvenile rearing upstream of the BART Weir as a result of WSIP implementation. Further, as described in the preceding discussion, since a number of steps are required before steelhead migration further upstream can occur, it is speculative to assess the specific impacts that system operation under the WSIP might have on the potential future restoration of steelhead. Thus, no impact analysis or conclusion is developed in this PEIR. If and when steelhead are restored, the SFPUC will be required to conform its system operations to comply with the applicable Endangered Species Act requirements."

08

This approach is nonsensical. The WSIP contemplates construction and operation of facilities that will last decades, if not centuries. Over a dozen public agencies are working Alameda Creek restoration projects that will bring steelhead trout and salmon back into upper Alameda Creek, very likely before environmental review and construction have been completed for WSIP projects in the Sunol Valley. Operations of Calaveras Dam and other WSIP facilities are certain to impact these fish. It makes no sense to install major infrastructure and conduct environmental review for operating procedures that may then need to be modified or replaced to comply with wildlife protection laws.

Furthermore, on July 31, 2007, the Alameda County Flood Control and Water Conservation District and the Alameda County Water District signed a Memorandum of Understanding (MOU) for an agreement to develop a preliminary design of a fish passage facility in the Alameda Creek flood control channel. The MOU states the goal of these agencies to "have the Fish Passage Facility constructed by the end of calendar year 2010," before construction of Calaveras Dam begins. This facility will provide fish passage for anadromous fish past the BART weir and the middle ACWD rubber dam, the primary barriers to steelhead migration up lower Alameda Creek.

The lower ACWD rubber dam is scheduled for removal in 2008. The ACWD operates the upper ACWD rubber dam to have the dam deflated during winter storm events, which will allow some anadromous fish to bypass the dam and migrate into Niles Canyon during some winter flows. The next significant fish passage barriers on Alameda Creek are the USGS gaging station weir in lower Niles Canyon, owned by the SFPUC and

likely not a barrier to fish migration at higher flows, and a PG&E gas pipeline crossing in the Sunol Valley. The DPEIR (Table 5.7-13) states that the PG&E gas pipeline crossing fish passage project is scheduled for completion by 2009.

The construction of Calaveras Dam from 2009 through 2011 or 2012 clearly has a reasonably foreseeable impact on steelhead trout that could access Alameda Creek by 2010. The DPEIR claims that it is "speculative to assess the specific impacts that system operation under the WSIP might have on the potential future restoration of steelhead." As discussed above, it is not speculative to consider the impacts of the construction and operation of WSIP projects on migratory fish. Indeed, it is known that stream flows contemplated in the WSIP will be inadequate to protect steelhead and salmon. The DPEIR must assess potential impacts to all anadromous fish in Alameda Creek, including steelhead trout, chinook salmon and Pacific lamprey. 08 cont.

<u>Status of Fisheries</u>

Pacific lamprey are designated a state Species of Concern, and have declined severely in California. The species was petitioned for federal ESA listing in 2003. Pacific lamprey have been found recently in only three other streams in the Bay Area - Coyote Creek, Conn Creek and Sonoma Creek - so the Alameda Creek lamprey population is quite significant. Adult lamprey already have passage into upper Alameda Creek and are known to occur from the lower Sunol Valley through Sunol Regional Park. The DPEIR fails to discuss or analyze the impacts of WSIP projects on lamprey and whether proposed stream flows are adequate to keep lamprey populations below SFPUC dams in good condition. The DPEIR discussion of Alameda Creek fisheries (5.4.5-2) states that SFPUC fishery monitoring has documented successful lamprey spawning and rearing within Niles Canyon in recent years. The Alameda Creek Alliance citation given, *Comments on Central California Coast steelhead status review, October 19, 2004 (ACA, 2004)*, does not refer to lamprey. There is also documentation of lamprey in Alameda Creek from the Sunol Valley up to near the Calaveras Creek confluence. 09

The DPEIR discussion of Alameda Creek historical fisheries (section 5.4.5.1) should acknowledge that Alameda Creek also supported coho salmon and chinook salmon, and that there is historical evidence of steelhead trout in Arroyo de la Laguna, Arroyo Mocho, and Arroyo Valle – these occurrences have been extensively documented by the Alameda Creek Alliance (see http://www.alamedacreek.org/About_Alameda_Creek/Alameda%20Creek%20salmonid%20documentation%203-8-06.pdf). 10

The DPEIR discussion of the regulatory status of steelhead/rainbow trout should mention the SFPUC's role in eliminating proposed ESA protections for resident rainbow trout in Alameda Creek, and the resultant removal of Alameda Creek from designated critical habitat protections for Central California Coast steelhead. 11

The National Marine Fisheries Service (NMFS) proposed in June of 2005 to include resident trout and some landlocked steelhead, including those in Alameda Creek, as part of the Central Coast steelhead population, based on genetic evidence that Alameda Creek's resident fish are similar to adult ocean-run steelhead. Studies published by the U.S. Geological Survey in 1999 and 2003 demonstrated that native Alameda Creek rainbow trout and reservoir fish above SFPUC dams are genetically related to wild steelhead in the Central Coast steelhead population. The studies analyzed fin clips from adult steelhead captured at the Fremont BART weir in recent years by ACA volunteers, rainbow trout populations in upper Alameda Creek and its tributaries collected by Alameda County in 1999, and landlocked reservoir trout from surveys conducted by the SFPUC. Landlocked trout behind the two SFPUC reservoirs are thought to be the descendants of the original migratory steelhead run in Alameda Creek and represent the best native gene pool for restoring steelhead below the dams. 11 cont.

The SFPUC lobbied against listing Alameda Creek trout, despite compelling genetic evidence that these fish are descendants of wild steelhead, and the final NMFS determination in December 2005 excluded resident fish and excluded Alameda Creek from designated critical habitat for Central Coast steelhead. This issue will likely be revisited by the courts and NMFS, and it is foreseeable that resident rainbow trout in SFPUC reservoirs and in Alameda Creek could be listed under the ESA.

PROPOSED WATER SUPPLY OPERATIONS IN THE DPEIR FAIL TO COMPLY WITH STATE AND FEDERAL WILDLIFE PROTECTION LAWS AND THE SFPUC ENVIRONMENTAL STEWARDSHIP POLICY AND THE DPEIR HAS AN INCOMPLETE DISCUSSION OF REGULATORY REQUIREMENTS, REQUIRED ACTIONS AND APPROVALS

The WSIP states (pages S-10 and 3-39) that the proposed SFPUC water system operation strategy includes "complying with all water quality, environmental, and public safety regulations" and "meeting all downstream flow requirements." The DPEIR (page 3-43) claims that the SFPUC "will meet, at a minimum, all current and anticipated legal requirements for protection of fish and other wildlife habitat."

<u>State Fish and Game Codes</u>

The DPEIR fails to discuss relevant California Fish and Game Codes and California Department of Fish and Game (CDFG) requirements to protect native fish and wildlife.

The SFPUC currently operates Calaveras and San Antonio Reservoirs with no minimum bypass flows to keep native fish downstream in good condition, in violation of California Fish and Game Code §5937. California Fish and Game Code §5937 requires that the owner of a dam allow sufficient water to pass through a fishway or dam, to keep in "good condition" any fish that may be planted or exist below the dam. The law applies to any dam regardless of when it was built. 12

The California Department of Fish and Game submitted comments on the Notice of Preparation for the DPEIR on November 22, 2005, stating that "at this time, both the Alameda Creek Diversion Dam and Calaveras Reservoir are out of compliance with Fish

and Game Code 5937 which requires dam owners to release enough water to keep downstream fish populations in good condition."

Under the WSIP, the SFPUC proposes to operate the Alameda Diversion Dam in a manner that will violate §5937, diverting almost the entirety of late fall through spring flows from upper Alameda Creek, which will clearly fail to keep fish populations downstream of the diversion dam in good condition. The SFPUC also has not demonstrated that the proposed operation of Calaveras and San Antonio Reservoirs under the WSIP will keep fish populations downstream of these dams in good condition. The SFPUC must show that the minimum flows proposed for Calaveras Reservoir will maintain healthy fish and wildlife populations downstream. The CDFG commented that the SFPUC "will need to assess adequate flows for anadromous steelhead trout and will need to renegotiate with DFG such that adequate flows are released to comply with Fish and Game Code 5937."

The CDFG commented that the DPEIR should "consider utilizing the SFPUC's related water storage facilities within the Alameda Creek watershed (i.e., San Antonio Reservoir) to meet the needed minimum bypass flows in the affected reach of Alameda Creek and in particular passage flows needed through Sunol Valley." The WSIP does not include consideration of any minimum flows from San Antonio Reservoir. 12 cont.

The proposed operation of the Alameda Diversion Dam without fish passage violates California Fish and Game Code §5901, which makes it illegal to maintain any device which prevents or impedes the passing of fish up and down stream. The diversion dam blocks the upstream and downstream movements of both resident and transient fishes, including resident rainbow trout. Once fish passage projects in lower Alameda Creek are completed, the diversion dam could block upstream and downstream migration of steelhead trout. Operation of the diversion dam not only affects fish migration past the diversion dam, but also potential fish passage through Little Yosemite, by diverting the majority of the annual flow of upper Alameda Creek. Reducing the frequency of high flow periods downstream of the diversion dam reduces fish passage opportunities through Little Yosemite.[1]

The WSIP should also include feasible fish passage provisions for Calaveras and San Antonio Dams. Calaveras and San Antonio Dams block the upstream and downstream movements of both resident and migratory fishes, including steelhead trout.[2] The reservoir trout populations appear to be descended from native steelhead populations isolated behind the dam.[3] Calaveras Dam blocks steelhead access to the upper Calaveras watershed including its tributaries Arroyo Hondo, Smith, and Isabel Creeks, likely the

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[1] Gunther, A. J. et al. 2000. An Assessment of the Potential for Restoring a Viable Steelhead Trout Population in the Alameda Creek Watershed. Prepared for the Alameda Creek Fisheries Restoration Workgroup.
[2] San Francisco Public Utilities Commission (SFPUC). 2005. Population Size Estimates for Adult Rainbow Trout (*Oncorhynchus mykiss*) in San Antonio and Calaveras Reservoirs. Technical Memorandum No. 2-04-006, October 2005. Water Quality Bureau, Sunol, CA.
[3] Nielsen, J. L. 2003. Population Genetic Structure of Alameda Creek Rainbow/Steelhead Trout - 2002. Final Report Submitted to Hagar Environmental Science December 4, 2003. US Geological Survey, Alaska Science Center, Anchorage, Alaska.

best historical steelhead spawning and rearing habitat in the entire Alameda Creek watershed. San Antonio Dam blocks steelhead access to San Antonio and Indian Creeks. 12 cont. These dams prevent gene flow between trout populations above and below the reservoirs, and may be affecting the long-term genetic viability of reservoir and stream populations.

<u>1997 MOU for Flows from Calaveras Reservoir</u>

The WSIP references a Memorandum of Understanding (MOU) the SFPUC signed with CDFG in 1997, to release up to 6,300 acre-feet per year of water to Calaveras and Alameda Creeks for enhancement of fisheries and the other natural resources. Compliance with the MOU would restore minimal stream flows to approximately five miles of Alameda Creek, at which point the water would be recaptured and diverted back into the SFPUC's water supply system.

To date the SFPUC has not released water for this purpose, but the WSIP proposes releasing these flows after completion of construction of Calaveras Dam. The DPEIR (pages 5.4.1-9 and 5.4.1-10) claims that implementation of the 1997 MOU is "hindered by the lack of sufficient cold-water storage in Calaveras Reservoir' and that the releases are "on hold due to lack of sufficient cold-water storage in the reservoir." The SFPUC has also stated in its *Final Conceptual Engineering Report* for Calaveras Dam that the 1997 MOU flows have "not been fully implemented because of the current limitations on storage" and "because of the storage restriction ordered by DSOD at the reservoir."

This is a misrepresentation of the limitations the DSOD drawdown places on the SFPUC's ability to immediately release flows from the reservoir. Although current water storage in Calaveras Reservoir is at 60% less than the maximum before the DSOD 13 drawdown, the SFPUC's yield (available treated water supply) from Calaveras has apparently only been minutely affected by the DSOD operating restrictions on Calaveras Reservoir. According to the Notice of Preparation for the WSIP PEIR published by the SFPUC in 2005, Calaveras yield was 219 mgd, fully 98% of the normal system yield of 223 mgd. This means that water was available for flow releases to Calaveras Creek and Alameda Creek, but that the SFPUC chose to divert this water to its water treatment plant instead. As discussed below, the resident trout population below Calaveras Dam is not being kept in good condition - low summer flows and high water temperatures have reduced native rainbow trout to remnant populations in upper Alameda Creek.

The MOU flows are intended to benefit resident rainbow trout in five miles of stream, and were not intended to meet the habitat needs of anadromous fishes such as steelhead trout, salmon, or lamprey. The MOU also allows these flow releases to be recaptured downstream in the vicinity of the Sunol Valley Water Treatment Plant. It is important to note that the MOU flows are required minimum stream flows at the confluence of Calaveras and Alameda Creeks, not flows that must be released from Calaveras Reservoir. During most winters, the flows required under the MOU from November 1 through March 15 could be met by natural stream flow in Alameda Creek, thus requiring little or no flow releases from Calaveras Reservoir by the SFPUC. For normal and wet water years, summer releases would be the only truly enhanced stream flow, so that in

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most years the SFPUC would release only 3,150 acre-feet under the proposed Project. The DPEIR fails to discuss the rationale and scientific basis for the proposed flow schedule and whether these flows are adequate for all life stages of anadromous, or for that matter, resident fish. These flows will not allow for upstream and downstream migration of anadromous fish and will not provide rearing habitat for fish below the recapture point. The WSIP should include adequate flows for anadromous fish without downstream recapture as part of the operating criteria for the rebuilt Calaveras Reservoir.

The California Department of Fish and Game stated in their comments on the Notice of Preparation for the DPEIR on November 22, 2005, that the SFPUC must:

> "provide flow releases to the stream channel below Calaveras Reservoir dam to encourage riparian vegetation growth, invertebrate productivity, 13 cont. adequate dissolved oxygen, low water temperatures, and provide some rearing habitat for juvenile steelhead trout and spawning adult steelhead trout. The SFPUC, under the aforementioned 1997 MOU with DFG, agreed to specific flow releases to provide habitat for resident rainbow trout and other native fish species downstream of Calaveras Reservoir based on the knowledge of fish migration barriers being present in the lower downstream reaches of Alameda Creek. At this time, however, there is active fish passage remediation at these barriers. The SFPUC will need to assess adequate flows for anadromous steelhead trout and will need to renegotiate with DFG such that adequate flows are released to comply with Fish and Game Code 5937."

<u>Questions About SFPUC Water Rights</u>

The DPEIR discussion of existing water rights and entitlements (Section 2.5.1) does not mention the potential lack of a valid water right for the Alameda Diversion Dam, and also fails to mention that existing water rights can be adjudicated by the Sate Water Board to protect beneficial uses, including fisheries.

It is questionable whether the SFPUC has a legal water right to divert Alameda Creek streamflow at the Alameda Diversion Dam. The SFPUC has a valid pre-1914 appropriative right for Calaveras Dam and reservoir, but this water right does not mention the Alameda Creek diversion dam and tunnel, which were not built until the 1930s. The 14 WSIP plan to divert almost <u>all</u> of the winter and spring stream flows from upper Alameda Creek at this dam violates Fish and Game Code §5937. As noted by the State Water Resources Control Board in a DPEIR scoping comment letter to the SFPUC dated October 3, 2005, "an appropriative water right issued by the State Water Board is also required for any increased diversion from Alameda Creek."

In a letter submitted during the scoping phase for the PEIR, the State Water Resources Control Board (SWRCB) stated, "the DEIR should include sufficient information for the State Water Board to use the document for water right permitting purposes. Therefore, the document should evaluate the availability of unappropriated water after taking into consideration prior rights and the water required to maintain public trust resources. Division staff recommends that any evaluation utilize a cumulative flow impairment methodology, such as the assessment method described in the *Guidelines for Maintaining Instream Flows to Protect Fisheries Resources Downstream of Water Diversions in Mid-California Coastal Streams (Draft)* prepared by NOAA Fisheries Service and the Department of Fish and Game and dated June 17, 2002." The impact evaluation in the DPEIR does not employ a cumulative flow impairment methodology and falls short of answering the question of whether there is sufficient water available to maintain public trust resources. 14 cont.

The DPEIR should mention that in 2001 the SWRCB estimated that the entire Alameda Creek watershed is 72% "impaired," impairment representing the ratio of water appropriation under existing water rights to estimated stream flow, and that in 2002 the state Department of Water Resources DWR concludes the Alameda Creek watershed is "fully appropriated" and no further water diversions will be considered.

Misinterpretation of the Raker Act

The discussion of the Raker Act in the WSIP misinterprets the Act. The Raker Act, Section 9(h) provides:

> "That the said grantee shall not divert beyond the limits of the San Joaquin Valley any more of the waters from the Tuolumne watershed than, together with the waters which it now has or may hereafter acquire, shall be necessary for its beneficial use for domestic and other municipal purposes."

Since San Francisco must fulfill its "beneficial use" water needs with "waters which it now has or may hereafter acquire," Tuolumne River water must be a source of last resort for San Francisco. The DPEIR has interpreted this section of the Raker Act as follows: "section 9(h) of the Raker Act requires San Francisco to make full use of its local sources of water." The Notice of Preparation interpreted this requirement in the Raker Act in an overly narrow way: 15

> "under the WSIP, the regional water system would continue to comply with the conditions of all applicable institutional and planning requirements, including: . . . maximizing use of water from local watersheds."

The Raker Act does not define the "water which it now has" as "water from local watersheds." It is true that San Francisco "now has" water rights to water from Bay Area creeks including Alameda Creek. However, it is also true that San Francisco "now has" waters that it is discharging from waste water treatment plants that could be recycled, and waters recoverable through water use efficiency and water conservation measures.

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Federal Endangered Species Act

The federal Endangered Species Act (ESA) prohibits unauthorized take of listed species. The DPEIR does not ensure that WSIP projects will be in compliance with the ESA, specifically with regards to adequate stream flows for steelhead trout in Alameda Creek.

The DPEIR claims that the U. S. Army Corps of Engineers (USACE) will not need to consult with the National Marine Fisheries Service (NMFS) on steelhead trout impacts for the operation of Calaveras Dam. The DPEIR states:

> "the UASCE is required under Section 7 of the ESA to consult with NMFS and the USFWS on designated species to obtain a biological opinion of no jeopardy and an incidental take statement. NMFS also advised the SFPUC that while the USACE would need to initiate a Section 7 consultation with NMFS on the Calaveras Dam Replacement project, it was unlikely that operation of Calaveras Dam would adversely affect steelhead in the area below the BART Weir by making conditions unsuitable for successful steelhead spawning, egg incubation, or juvenile rearing. For this reason, NMFS advised that the steelhead issues above the BART Weir would not be addressed in the Calaveras Dam Replacement project Section 7 consultation, and that incidental take coverage for steelhead in the upper watershed would have to be obtained through a habitat conservation plan (HCP) or through a re-initiated USACE consultation on the Calaveras Dam Replacement project after the lower passage problems are remedied." 16

This is incorrect. It would be illegal for the Corps to fail to consult on the impacts to steelhead. As noted above, steelhead trout will potentially have access to Alameda Creek stream reaches affected by the operation of Calaveras Reservoir (and San Antonio reservoir and the Alameda Diversion Dam) by 2010, including the Niles Canyon, Sunol Valley, Little Yosemite, and lower Calaveras Creek reaches managed by the SFPUC. It is reasonably foreseeable that listed anadromous steelhead will return to SFPUC stream reaches before or shortly after construction of Calaveras dam and will be significantly affected by operation of the SFPUC dams.

The DPEIR states that "if and when steelhead are restored, the SFPUC will be required to conform its system operations to comply with the applicable Endangered Species Act requirements." However, the DPEIR must analyze the reasonably foreseeable impacts to steelhead and other anadromous fish now, since it is highly probable that these species will be present in Alameda Creek during the construction and operation of the proposed Sunol Valley WSIP projects. Future operation of SFPUC dams and diversions to comply with the ESA requirements for steelhead will be dependent on current planning and inclusion of appropriate infrastructure in the WSIP projects.

The discussion of the Regulatory and Conservation Planning Framework in the DPEIR (p 4.6-23) mentions the need for consultation with federal wildlife agencies on listed species. The DPEIR should also discuss published recovery plans for listed species potentially affected by the WSIP and ensure that WSIP activities are consistent with these recovery plans. 16 cont.

Water Enterprise Environmental Stewardship Policy

One of the stated Program Goals of the WSIP is to enhance sustainability in all system activities and more specifically to manage natural resources and physical systems to protect watershed ecosystems. To further clarify their commitment to environmental stewardship, the SFPUC adopted the Water Enterprise Environmental Stewardship Policy in 2006. The policy states, "It is the policy of the SFPUC to operate the SFPUC water system in a manner that protects and restores native fish and wildlife downstream of SFPUC dams and water diversions, within SFPUC reservoirs, and on SFPUC watershed lands."

The DPEIR description of how the SFPUC manages the Alameda Creek watershed (page 5.4.1-3) with the "primary objective of conserving local watershed runoff for delivery to customers" and how it plans to operate Calaveras Reservoir and the Alameda Diversion Dam (pages 3-14, 3-39, and 5.4.1-7), appears to conflict with this policy. The proposed system operation strategy is to "maximize use of water from local watersheds." 17

Although the stewardship policy is cited in section 5.2.3 of the DPEIR, it is missing from Table 2.3, SFPUC Water Resource Policies Related to the WSIP. The SFPUC Water Enterprise Environmental Stewardship Policy is a foundational policy for the WSIP, and should be listed as a policy upon which the WSIP is supposed to be based, not simply one the WSIP should be "consistent" with. The Policy establishes environmental stewardship as a fundamental component of the Water Enterprise mission and was adopted with the explicit intent that implementation of the policy would occur through: "Integration of the policy into the Water System Improvements." Because the proposed WSIP program will have significant impacts on native fish and wildlife populations in the Alameda Creek watershed, the SFPUC has failed to "integrate" the Environmental Stewardship Policy into the WSIP.

THE DPEIR OMITS CONSIDERATION OF IMPACTS TO SEVERAL SPECIAL-STATUS SPECIES

The ACA has provided the SFPUC with specific information about the occurrence of special-status species as part of formal and informal comments on the Alameda Watershed Management Plan, Calaveras Dam Project, Alameda Creek Fishery Enhancement Project, Sunol valley Water Treatment Plant Project, Habitat Reserve Program, Habitat Conservation Plan, and WSIP PEIR scoping. Not all of this information is reflected in the DPEIR.

The SFPUC should publicly make available the species surveys and reports cited in the DPEIR (such as Entomological Consulting Services 2004 and 2005, Leeman 2006, Loran 2006), before the public and regulatory agencies can determine if adequate surveys have 18

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been done for special-status species and if the assessment of potential impacts is reasonable. For example, for special-status plants, surveys may need to be made over several years to determine whether plant species are present, since plants do not necessarily germinate or flower in every year. Likewise, for many species, the Fish and Wildlife Service and CDFG have published protocol surveys to properly determine whether a species is present – the DPEIR should discuss whether protocol-level surveys have been completed for any special-status species.

Bay Checkerspot Butterfly

For the Bay checkerspot butterfly, the 2004 Entomological Consulting Services report referenced in the DPEIR (the 2005 report has not been publicly available) was based on surveys that did not specify how many days were spent searching for butterflies, how thorough the searches were, and exactly what dates the searches began and concluded. The 2004 report noted that "flight season for the Bay Checkerspot butterfly was already underway" when surveys started on an unspecified date in March. Since flight season for the Bay checkerspot butterfly can begin in late February and is typically four to six weeks in length, and it is known that the flight season began early in 2004 due to unseasonably warm weather, depending on when in March the surveys began, the surveys could have missed all or most of the butterflies of the 2004 flight season. Since individual adult butterflies live approximately ten days, the surveys could easily have missed butterflies that emerged early in the season. 18 cont.

The 2004 report also expressed the opinion that that the species is unlikely to occur in serpentine grassland habitats containing the checkerspot's larval and adult food plants within the Alameda Creek watershed. The U. S. Fish and Wildlife Service considers any site with appropriate habitat within the vicinity of the butterfly's range to be potentially occupied. Given the fact that populations of the checkerspot historically occurred north of the watershed at Mt. Diablo and south of the watershed in Santa Clara County, and the acknowledgment in the 2004 report that there are patches of the checkerspot's primary larval food plant growing in association with adult food plants (albeit in low abundance), there is potential for undetected populations of the checkerspot to persist within the watershed. Since the species is so rare, with only two known populations in existence, the SFPUC has an obligation to presume the species may be present and protect the remaining patches of habitat, no matter how fragmented.

Berkeley Kangaroo Rat

The DPEIR fails to consider potential impacts to the Berkeley kangaroo rat (*Dipodomys heermanni berkeleyensis*), which has recently been potentially rediscovered by the East Bay Regional Park District on ridges east of Calaveras Reservoir. The CDFG scoping comments on the PEIR noted that:

> "The Berkeley kangaroo rat has been considered extinct, but was historically known to live in a few locations near the hills of Berkeley, Eureka Peak, Orinda Lake, Mt. Diablo, and Calaveras Reservoir; it was

> found in the 1940's near the vicinity of Calaveras Dam. The Berkeley kangaroo rat should be added to the list of species present and assessments of the population (including genetic analyses) should be performed. A survey protocol for Berkeley kangaroo rat should be developed in concert with DFG and the U. S. Fish and Wildlife Service (USFWS). The SFPUC should conduct comprehensive surveys to determine conclusively whether the species is present in the area. If detected, the SFPUC should consider the impacts of covered activities on the Berkeley kangaroo rat. If shown to still exist, the species would likely be a candidate for emergency Federal listing."

Any impacts to the Berkeley kangaroo rat or suitable habitat for the species should be considered significant and should be avoided due to the rarity of this species.

<u>San Joaquin Kit Fox</u>

The DPEIR discusses potential impacts to the San Joaquin kit fox in the San Joaquin region, but fails to consider potential impacts in the Sunol Valley region. As noted in the DPEIR, a kit fox was seen near the former Sunol Dam site in 2006, suggesting "a small population may be reestablishing itself in the area." Any kit fox in the Sunol region 18 cont.
would be very significant, since this would be the western-most population of the species. Any impacts to the kit fox or suitable habitat for the species should be considered significant and should be avoided due to the rarity of this species.

<u>Calaveras Reservoir Species</u>

The DPEIR analysis of the potential impacts to special-status species at Calaveras Reservoir (page 5.4.6-1) omits impacts to landlocked steelhead/rainbow trout, California red-legged frog, California tiger salamander, and Alameda whipsnake during construction of the new dam. The impacts on rainbow trout could be particularly significant – the *Final Conceptual Engineering Report* for the Calaveras Dam Project mentions the potential for evacuating the reservoir to deadpool elevation, in other words nearly draining the reservoir, which could devastate the Calaveras Reservoir trout population. The DPEIR fails to discuss the impacts of the construction of Calaveras Reservoir on rainbow trout in the reservoir and Arroyo Hondo (page 5.4.5-1). The CDFG has also raised the issue of maintaining fish passage and connectivity between the reservoir and Arroyo Hondo so that trout can migrate into and out of Arroyo Hondo.

MITIGATIONS PROPOSED FOR SIGNIFICANT IMPACTS TO SPECIAL-STATUS SPECIES AND HABITATS ARE INADEQUATE

<u>Alameda Diversion Dam Operation</u> 19

The WSIP proposes to operate the Alameda Diversion Dam to divert almost <u>all</u> of the late fall, winter and spring stream flows from upper Alameda Creek. Aside from the questionable legality of this plan, the DPEIR acknowledges that this would nearly

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eliminate low and moderate (1 to 650 cfs) flows in Alameda Creek downstream of the diversion dam that currently occur when the diversion gates are closed, and substantially reduce many higher (greater than 650 cfs) flows. The DPEIR categorizes this as a significant and unavoidable impact. We concur that the impact would be significant but the impact is clearly avoidable if the SFPUC removes the diversion dam or operates it in a lawful manner that protects fish and wildlife downstream of the dam.

The proposed operation of the diversion dam would be to divert all but 1 cfs of flow when the gates are open up to a flow of 650 cfs. Diverting the entire stream flow (except 1 cfs) and cutting the frequency of peak flows during December through May will clearly affect downstream fish passage, fish rearing, amphibian populations, and stream temperatures. The SFPUC has bypassed most flows past the diversion dam since 2002, and trout and aquatic resources below the diversion dam are dependent upon these natural stream flows.

The DPEIR acknowledges that:

> "under the WSIP, there is no requirement for maintaining minimum instream flows within Alameda Creek at the diversion dam to support fishery habitat downstream of the dam. The proposed diversion of most Alameda Creek flows below 650 cfs would result in a significant change in hydrologic conditions in Alameda Creek downstream of the diversion dam when compared to existing conditions. Diversion of most or all flows 19 cont.
> during the late winter and spring months could adversely affect the ability of resident rainbow trout to spawn and for eggs to successfully incubate in this reach. The diversion dam is equipped with control gates but does not include a positive barrier fish screen or other protective devise that would exclude trout or other fish from being entrained through the diversion structure into Calaveras Reservoir. Trout and other fish species inhabit Alameda Creek upstream of the diversion dam and may be diverted from the creek into the reservoir under the WSIP, preventing fish passage to downstream reaches of Alameda Creek. Passage through the diversion dam, however, has the potential to result in increased stress, physical abrasion, and vulnerability of fish to predation mortality within the reservoir, and other potentially adverse effects. Passage of fish over the diversion dam downstream in Alameda Creek may also result in stress and potential injury to trout and other fish species."

The DPEIR proposes the following mitigations for operation of the Alameda Creek Diversion Dam (Measure 5.4.1-2):

> "The SFPUC will establish and implement written operational criteria for the Alameda Creek Diversion Dam that directs that the diversion dam and tunnel shall be operated to pass flows down Alameda Creek when diversion of those flows is not required to maintain desired levels in Calaveras Reservoir in order to provide the maximum possible days of

winter and spring flows in Alameda Creek below the diversion dam. This measure reinforces the way the SFPUC generally operates the diversion tunnel now: that diversion gates are closed in the spring once desired Calaveras Reservoir storage have been reached. However, at times additional flows have been diverted from Alameda Creek after reservoir storage levels have been achieved such that the "excess" water has subsequently been released from the reservoir to maintain the appropriate water level. This measure would formalize Alameda Creek diversion procedures to maintain flows in Alameda Creek to the extent they are not needed to achieve required reservoir storage. This measure would reduce the flow reduction impact but not to a level that is less than significant."

This is a ridiculous mitigation measure, essentially promising to not divert the remainder of stream flows that are not diverted. Bypassing stream flows based solely on whether or not they are needed for water supply, without regard for the instream flow needs of downstream fish and wildlife is not an adequate mitigation measure. The DPEIR maintains that "after implementation of the WSIP, flow in this 2.85-mile reach of Alameda Creek below the diversion dam would approximate conditions experienced between 1935 and 2001." The DPEIR provides no information that the dam was operated legally or in a manner that adequately protected fish and wildlife during this period.

The mitigation measures also include Measure 5.4.5-3b, Diversion Restrictions or Fish Screens:

> "If, after 10 years of monitoring results for Measure 5.4.5-3a, Minimum Flows for Resident Trout in Alameda Creek, indicate that the measure does not sustain the resident trout population in Alameda Creek below the diversion dam, then the SFPUC shall also implement additional measures as follows: either implement seasonal restrictions on Alameda Creek diversions to Calaveras Reservoir to protect the downstream resident trout fishery during the critical spawning period (December 1 through April 30) or install and operate a fish passage barrier to "screen" the diversion facility (screening could consist of a behavioral barrier, such as electrical or sound barrier that deters fish, or a physical barrier – such as a screen facility)."

This mitigation measure is also inadequate, since it promises to continue to illegally divert Alameda creek stream flow for another decade, without necessarily bypassing flows sufficient to keep fish and wildlife downstream in good condition during that decade. Similarly, if the diversion tunnel is currently injuring or harming fish, it legally needs to be screened now, not in 10 years. The DPEIR acknowledges that Fish and Game Code Section 5980 contains requirements for an intake screen or other suitable method for avoiding and minimizing fish entrainment at the Alameda Creek Diversion Dam. The DPEIR also acknowledges that the Diversion Dam could block migration to any migrating steelhead that travel upstream of the Little Yosemite area. This would be a significant (and illegal) impact that is not mitigated in the WSIP. If and when steelhead

19 cont.

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trout migrate upstream to the Little Yosemite and the diversion dam, the SFPUC has an obligation to ensure adequate stream flow, and a fish ladder or dam removal for fish passage at that time.

Minimum Flows for Resident Trout

The DPEIR fails to consider impacts and include adequate mitigations for resident fish.

The DPEIR contains mitigation measure 5.4.5-3a:

> "The SFPUC shall develop and carry out as part of the implementation of the Calaveras Dam Replacement (SV-2) project, an operational plan to implement minimum stream flows when precipitation generates runoff into the creek below the diversion dam to the Calaveras Creek confluence from December 1 through April 30 to support resident trout spawning and egg incubation. This is the period when winter precipitation typically would produce flows for spawning and egg incubation. The operational plan will identify the specific minimum flow requirements to support resident trout spawning and egg incubation, a detailed monitoring plan to survey and document trout spawning and egg incubation and any diversion facility modifications that are needed to implement the minimum stream flows. Minimum flow requirements to support resident trout spawning and egg incubation vary depending on stream reach conditions. Although site-specific studies are needed to determine an appropriate minimum flow requirement for each specific creek reach, based on the general size and characteristics of the Alameda Creek channel immediately downstream of the diversion structure it has been suggested that a minimum flow on the order of 10 cfs may be needed to support trout spawning and egg incubation. The SFPUC's Natural Resources Division will complete the site-specific studies needed to determine the appropriate minimum stream flow for this reach of the creek; studies may show that the minimum flow requirement is more or less than 10 cfs. This minimum flow requirement would be met when precipitation would naturally generate runoff in the creek (below the diversion dam) under unimpaired conditions between December 1 and April 30. When precipitation generates runoff in the creek, the SFPUC shall provide for bypass of flow up to the required minimum flow amount. The operational plan will allow for adapting minimum flow amounts to support resident trout spawning and egg incubation based on the monitoring results and best available scientific information."

This mitigation measure is likely inadequate to mitigate for the impacts of Calaveras Dam and the Alameda Diversion Dam on steelhead trout, Pacific lamprey, and chinook salmon, as it is targeting flows for resident trout, and does not provide for adequate flows for in-migration or out-migration of anadromous fish.

19 cont.

The DPEIR also seems to suggest that adequate flows for resident trout may not be implemented until after 10 years of monitoring. There is information indicating that the SFPUC may not currently be keeping resident trout below Calaveras Reservoir in good condition. The SFPUC has conducted annual monitoring since 1998 of Alameda Creek fisheries in a study reach including Calaveras Creek below Calaveras Dam, and Alameda Creek from the confluence with Calaveras Creek downstream to the Sunol Valley Water Treatment Plant. SFPUC monitoring data from 1998-2004 shows that observations of resident rainbow trout in this study reach have declined dramatically: 55 trout were observed in 1998; 5 trout in 1999; 5 trout in 2000; 3 trout in 2001; 1 trout in 2002; 2 trout in 2003; and 0 trout in 2004. The DPEIR does not contain adequate information to determine whether the 10 cfs proposed to support trout spawning and egg incubation will be sufficient. The DPEIR does not specify which stream reaches will have 10 cfs and which time of year. 10 cfs of cold water during summer that reaches areas where trout are rearing will provide more significant benefit than 10 cfs released during winter storms.

The DPEIR claims this measure "addresses the decrease in flow below the diversion dam that would occur under the WSIP as a result of re-instituting flow diversions to Calaveras Reservoir once the dam is replaced…and the loss of fish from the lower creek system that would result from fish entrainment through the unscreened diversion tunnel to Calaveras Reservoir." This measure does not address the impacts to rainbow trout and steelhead in Alameda Creek between the diversion dam and the Calaveras Creek confluence. 19 cont.

The DPEIR promises that if monitoring indicates that this measure does not sustain the resident trout fishery in this reach, then the SFPUC shall either modify the minimum stream flow to enhance downstream habitat conditions to fully meet the mitigation requirement or also implement mitigation measure 5.4.6-3, Operational Procedures for Calaveras Dam Releases:

> "During project-level CEQA review on the Calaveras Dam Replacement project (SV-2), the SFPUC will develop operational procedures for managing planned releases from Calaveras Dam to minimize habitat impacts on amphibians, their egg masses, and tadpoles. The goal of such releases, apart from benefits to fish, is to mimic a more natural pattern of hydrology regime as much as possible. The procedures will specify the minimum amount and frequency of planned releases and the rate of the increase and decrease of any individual release event. One of the specific goals of such releases would be to reduce the risk of mortality to breeding amphibians. Such operational procedures will be developed prior to completion of construction of the Calaveras Dam Replacement project. In addition, instream flow releases required under CDFG agreement with SFPUC (see Table 5.4.1-9) would begin upon completion of construction."

There is no evidence that the 1997 MOU flows are adequate to maintain rainbow trout or native amphibians such as the California red-legged frog or foothill yellow-legged frog that inhabit stream reaches below SFPUC dams. The potential releases under measure

5.4.6-3 would begin no earlier than 10 years after the construction of Calaveras Dam. What if the resident trout population below the SFPUC dams is extirpated by then? Mimicking the natural hydrograph will potentially benefit native stream amphibians, but again this measure is delayed 10 years. 19 cont.

Fishes

For all the reasons discussed above, the DPEIR contains inadequate or no mitigation measures for potential significant impacts of the construction and operation of WSIP projects on steelhead trout, chinook salmon or Pacific lamprey.

Mitigation measures for fishes (mitigation measure F1) should include: fencing cattle out of all spawning habitat in fish-bearing streams (lower Arroyo Hondo Creek and lower San Antonio and Indian Creeks above the reservoirs, and Alameda Creek below the reservoirs) to protect trout redds, spawning habitat and riparian vegetation; eradicating introduced bass from Calaveras and San Antonio Reservoirs to reduce predation on the small landlocked trout populations in the reservoirs; and increasing the dissolved oxygen content in Calaveras and San Antonio Reservoirs to provide adequate habitat for reservoir trout (the current dissolved oxygen levels are aimed at drinking water quality standards and are not necessarily adequate for cold water fish). 20

Butterflies

The proposed mitigations for listed butterfly species (mitigation measure I.3) states that "suitable habitat for Bay checkerspot and callippe silverspot butterflies will be avoided." "Suitable habitat" needs to be defined as any area with host plants or the ability to support host plants. As mentioned above, the Alameda Creek watershed contains fragmented, but nonetheless significant, potential habitat for these species. The DPEIR does not include mitigation measures for the potential impacts of dust from construction activities or roads – according to the U.S. Fish and Wildlife Service, adult and early larval stages of these butterflies are susceptible to mortality from dust.

Burrowing Owl

21

The proposed mitigations for western burrowing owls include passive relocation (mitigation measure B.3). For most passive relocations of burrowing owls conducted in California there is no way of knowing where the evicted owls go or whether they are able to breed successfully in other areas. The SFPUC mitigations should include monitoring of the areas where owls are evicted to determine the success of any passive relocation. Passive relocation of owls can work if the birds are moved short distances (i.e. under 5 miles) and the habitat they are moved to is managed for them. Burrowing owls should never be translocated or forced to move to unprotected private property. Predators must also be taken into consideration - if owls are moved from an area where they have only been exposed to feral cats, red-tailed hawks and northern harriers, they will probably do poorly if moved to an area with coyotes or red foxes. The SFPUC should commit to monitoring and managing habitat for moved owls and purchasing replacement habitat if moved owls do not successfully breed.

San Joaquin Kit Fox

The proposed mitigations for the San Joaquin kit fox include a provision that "limited destruction of potential dens may be allowed" if they are not currently in use. For the reasons discussed above, there should be no destruction of any potential kit fox dens allowed in the Sunol Valley region.

Mitigation Ratios

Mitigation for impacts to wetlands and aquatic resources should be at a greater than 1:1 replacement ratio for created wetlands, since created wetlands rarely have the same habitat value and function as natural wetlands.

Any impacts that have the potential to extirpate a local population of a special-status species (such as the kit fox or Berkeley kangaroo rat), affect essential breeding or migration habitat, or destroy or degrade designated critical habitat for a listed species should be mitigated at a much higher ratio than 1:1.

21 cont.

Habitat Reserve Program

As discussed in the ACA's August 28, 2007 letter to the SFPUC regarding the proposed Habitat Reserve Program, the reliance on mitigations proposed in the HRP may be inadequate to mitigate for potentially significant impacts to special-status species in the Sunol Valley for several reasons:

- The acreage of habitat protection proposed under the HRP is not sufficient to mitigate for the impacts to biological resources and habitat contemplated in the WSIP;
- The HRP includes very little protection of at-risk habitat for affected species through acquisition of or conservation easements on high biological value private land at risk of development;
- The HRP attempts to give the SFPUC mitigation credit for land management activities that should already be required to protect endangered and sensitive species, or are good management practices that should already be employed by the SFPUC as good stewardship of our public lands; and
- The HRP proposes conservation easements on public lands that are already owned by the SFPUC, of questionable benefit to sensitive species since these lands should be at no risk of development or mismanagement.

22

THE DPEIR CONTAINS INSUFFICIENT INFORMATION TO CLAIM MITIGATIONS WILL REDUCE IMPACTS TO LESS THAN SIGNIFICANT

As noted in the CDFG comment letter to the SFPUC on the Calaveras Dam Project dated November 22, 2005, the SFPUC needs to provide information as part of the environmental review process that will allow the public and regulatory agencies to

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determine if impacts have been properly assessed and if mitigations are adequate.

The DPEIR fails to provide information on the following issues raised by the CDFG two years ago:

- A habitat-based stream assessment for Calaveras, Arroyo Hondo, and Alameda Creeks, done at a seasonally appropriate time period that incorporates habitat and life history criteria of species which may be impacted by the Calaveras Dam Project.
- A hydrologic study to determine the amount of water that is needed to support steelhead trout through critical reaches under various water year conditions within the reaches affected by the Calaveras Dam Project, specifically the reach of Alameda Creek from Alameda Creek Diversion Dam downstream to Alameda Creek's confluence with Arroyo de la Laguna.
- A specific proposal to provide minimum bypass flows for both Calaveras Dam and the Alameda Creek Diversion Dam for maintenance of habitat for fish and other aquatic species, taking into account current and projected water operation scenarios of the SFPUC's regional water system.
- An analysis of current and projected operational scenarios for Calaveras Reservoir and their impacts to the existing population of land-locked steelhead trout that utilize Calaveras Reservoir and Arroyo Hondo throughout various stage of the steelhead trout's life cycle. This study should include a plan to preserve the existing population of steelhead trout during interim operations (preconstruction) and post construction operations of Calaveras Dam. The concerns to be addressed include the following:

a) Maintain fish passage between the reservoir and Arroyo Hondo by keeping reservoir water elevations as high as possible during the period when adult trout migrate upstream from the reservoir through the end of the downstream (adult and juvenile trout) migration season.
b) Maintain channel integrity (maintain active channel / minimize delta / maximize hydrological connectivity) of Arroyo Hondo.
c) Maintain physical carrying capacity for trout in Calaveras Reservoir during the summer and fall period by keeping water elevations as high as possible.
d) Maintain adequate water temperatures and dissolved oxygen for trout in the reservoir throughout the summer and fall periods. The concentration of dissolved oxygen in reservoirs is often the limiting factor for trout survival in San Francisco Bay Area reservoirs. DFG recommends targeting a specific dissolved oxygen concentration of 7 mg/L so as to minimize impacts to landlocked steelhead especially during times of lowered surface water elevation (current operations as per DSOD requirements).
e) Provide flow releases to the stream channel below Calaveras Reservoir dam to encourage riparian vegetation growth, invertebrate productivity, adequate dissolved oxygen, low water temperatures, and provide some rearing habitat for juvenile steelhead trout and spawning adult steelhead trout.
f) Eliminate or minimize the loss of adult and juvenile trout from Alameda Creek through the Alameda Creek Diversion Dam.
g) Determine how operation and interim operation of Calaveras Reservoir could alter the operation of San Antonio Reservoir and result in adverse conditions for the adfluvial trout population in San Antonio Reservoir. DFG recommends that impacts to fisheries

23 cont.

upstream and downstream of San Antonio Reservoir be avoided as much as possible. If avoidance is not possible, impacts should be minimized and mitigated.

• A mitigation plan that assesses the potential impacts of the SFPUC's proposal to rebuild Calaveras Dam with a wider core that would accommodate enlargement of the dam in the future. The NOP states that although the "SFPUC does not reasonably foresee the need for a larger dam beyond one that restores the reservoir's historic capacity; the dam would be designed to allow potential future reuse of dam components without requiring otherwise more extensive dam removal and rebuilding if an enlargement were ever undertaken in the future." DFG recommends that the Calaveras Reservoir dam not be built to accommodate future size increases based on DFG's concern that future increases of the dam's surface water elevation could potentially extirpate the adfluvial population of steelhead trout as well as that of the foothill yellow-legged frogs. Raising the surface water elevation will likely also have serious impacts to the California red-legged frog, CTS, foothill yellow-legged frog, western pond turtle, Alameda whipsnake, Calliope silverspot butterfly, and a number of other special status plants and animals.

• A specific plan to screen as per DFG screening criteria at the new intake tower/adit(s) at Calaveras Reservoir and at the intake of the diversion at the Alameda Creek Diversion Dam so as to be in compliance with Fish and Game Code Section 6100.

• A specific plan to provide fish passage at the new Calaveras Reservoir dam and the Alameda Creek Diversion Dam so as to be in compliance with Fish and Game Code Sections 5901.

23 cont.

THE DPEIR RELIES UPON SPECULATIVE MITIGATIONS FOR SIGNIFICANT IMPACTS TO SPECIAL-STATUS SPECIES

It is speculative to rely upon the proposed Habitat Reserve Program speculative to mitigate for impacts to special-status species and habitat, since the amount and quality of habitat to be acquired and preserved is not yet defined, nor is it assigned to specific WSIP impacts. 24

The DPEIR discusses possible future flows to support rainbow/steelhead trout. The DPEIR references the flows studies being conducted by the Alameda Creek Fisheries Restoration Workgroup. At this point these are just studies, not a commitment on the part of SFPUC to provide adequate flows for steelhead or resident trout. Similarly, SFPUC plans to incorporate flow strategies into its Alameda Watershed Habitat Conservation Plan are speculative at this point. 25

The DPEIR fails to adequately consider water recycling and conservation alternatives

The DPEIR claims it is not feasible for the WSIP to meet 2030 purchase requests with reasonably foreseeable water conservation, recycled water and groundwater projects. The DPEIR underestimates the potential for water conservation and recycling, as numerous other municipalities have shown that an aggressive conservation and recycling program is possible. The proposed levels of water conservation (4%) and recycling (3%) in the DPEIR are unreasonably low. 26

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Also, there is a discrepancy between the conservation and recycling goals set by the SFPUC and its wholesale customers in the Bay Area Water Users Association (BAWSCA). The BAWSCA Water Supply Master Plan from 2000 requires that wholesale customers employ their best efforts to use all sources of water owned or controlled by them, including groundwater. The SFPUC has identified numerous conservation, recycling, and groundwater possibilities that are available to wholesale customers, but the DPEIR does not adequately analyze these alternatives. 26 cont.

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September 28, 2007

Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103
via email: wsip.peir.comments@gmail.com

Dear Mr. Maltzer,

On behalf of the Board of Directors, staff and members of Acterra I write this letter in regard to the SFPUC Water System Improvement Program Draft Programmatic Environmental Impact Report (PEIR). Acterra provides solution-oriented environmental services, including an integrated climate change response program, to members in the BAWSCA service area.

While we strongly support the seismic upgrade of the Hetch Hetchy water system, we find the PEIR flawed in fundamental ways. 01

First, and most important is the unnecessary coupling of seismic upgrades with diversion of water from the Tuolumne River. The SFPUC is attempting to link a "mother and apple pie issue" with a highly controversial plan to divert water from a federally-designated Wild and Scenic River. Clearly the plan is to force through a massive diversion of fresh water under cover of public safety. We believe that public policy decisions should be made based on the merits of the proposal, rather than riding on the coat tails of un-related proposals. 02

Public comments and the position of BAWSCA (The Almanac, Sept. 26, 2007, p.23) clearly indicate a desire to refine and improve the environmental impact analysis of the seismic upgrade portion of the PEIR, and to de-couple water demand and water supply issues from the water system improvement projects.

Hence, we strongly support the alternatives identified in the DPEIR that protect the Tuolumne River from new diversions. Requiring more water conservation, efficiency, and recycling is the best way to lessen 03

impacts on the Tuolumne River while promoting a sustainable water plan for the Bay Area. 03 cont.

Second, their are a number of flawed analyses concerning projected water demand, and the impact of water diversion on the Tuolumne River. Most alarming, we note the absence of any discussion of the impact of climate change on the Tuolumne river watershed. The State of California predicts that global warming could reduce the Sierra snowpack by 5% by 2030 and as much as 33% by 2060. Climate change will have a significant impact on all of California's water supply. These changes will include variation in the seasonality of precipitation (e.g. winter drought, extreme rainfall events/flooding, etc.), changes in precipitation amounts and intensity, and attendant changes on riparian ecology. These changes will further stress riparian ecosystems, especially those like the Tuolumne that are already impacted by human activities. Additionally, regional impacts of climate change will force alteration of water-use patterns, specifically in agriculture and urban outdoor water use. None of these impacts are taken into consideration in the PEIR, let alone an analysis of the obvious serious ecological consequences of increased diversion **coupled to** climate change. 04

In sum, any serious analysis of the future water demand to be met by increased diversion of the Tuolumne river into the Hetch Hetchy system must use: robust models for projecting water demand; improved analysis of the capacity of water conservation, water use efficiency and recycling to reduce demand in the face of growth; improved analysis of the upper watershed, and serious consideration of the impacts of climate change on the water supply and ecology of the Tuolumne river. 05

Hence Acterra strongly encourages the SFPUC to drop Tuolumne river diversion from the seismic upgrade projects and to re-visit water demand issues at a later date when a serious analysis can be done independently of the much needed, time-critical system improvements. Continued insistence on coupling these unrelated issues will un-necessarily delay the seismic improvements. 06

Sincerely,

David T. Smernoff, Ph.D.
Board Vice-President

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Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

Draft PEIR

Steve Lawrence <splawrence@sbcglobal.net> **Fri, Aug 17, 2007 at 6:51 PM**
To: wsip.peir.comments@gmail.com

Comments concerning the Draft PEIR for WSIP:

1. In section 2.4.3 it is asserted that a schedule complying with AB 1823 was submitted in or by March 2003. I do not believe so. The schedule does not show completion by 2010 of half of the capital program's projects in dollar terms.
2. The Fig. 3.6 Preliminary Construction Schedule is odd, and out-of-date. Jobs that have long been combined are shown separately: example: Advanced Disinfection + Tesla Portal Disinfection; also, Additional 40 + SVWTP Treated Water Res. Jobs that are large are not shown: University Mound, Crystal Springs #2, Alameda Siphon #4, Crystal Springs Bypass Tunnel, as examples. 01 Moreover, the schedule is fanciful; there is very little chance that all the work shown as starting in 2009 will start then, and no chance that all that is shown finishing by 2011 and 2012 will be substantially complete then. For this program SFPUC has never kept a schedule, and it certainly cannot keep this one. Why is it "Preliminary", and why is it sourced 2006? Is it trying to not be current? Perhaps; it shows Crystal Springs - San Andreas Transmission as completing in 2013 when the 5/07 CER shows the job completing March 2015, fifteen months later. So the schedule that is presented is not the latest or best schedule, rather it is obsolete; why? What else in the Draft PEIR is intentionally stale?
3. Desalination plant. Does the Draft PEIR say what electricity to run the plant would cost per kWh? It is estimated that 7500 kWh per million gallons would be required at Pittsburgh as water is less saline. One hopes that this estimate is made in realization that the plant will need to start production when fresh water flows ebb, so saline content will increase when the plant is needed; also saline content will rise as global warming swamps the Bay. I would like to see recognition of the foregoing in the document. Also, it would be nice to see a comparison of GWGs, Hetch Hetchy water vs desal water, so that the decision makers and public can compare both dollar 02 and environmental cost. Does the plant run 24/7? Must it run and draw juice during peak demand times, when electricity is most expensive (hot days July and August, say 4:00 pm)? Or does it produce its water at night when juice may be cheaper, and when night surplus capacity obviates the need for new plant? Unfortunately, peak water demand will likely occur during hot July/August days, but water storage may allow plant production to avoid times of peak electricity demand (and cost)--one hopes.
4. Throughout, the Draft PEIR analyzes the past 82 years. But it seems likely that the climate is changing, warming. Picking how it will change is not possible with consensus; any choice would be criticized. Still, choosing to ignore climate change is picking an unlikely--and benign--basis for analysis. Might express 03 recognition of the conundrum improve the decision-makers' full consideration?
5. Has global warming been considered? It seems likely to raise demand for water in 2030, especially in the service area where air conditioning, landscaping and fires may take more water.
6. Does water consumption rise during epidemics such as flu, SARs, bird flu or bioterror? We have not had such 04 for a long period, but prudent planning may call for a factor of safety.
7. What would the facilities needed for the alternative called Lower Tuolumne Diversion cost? What is the elevation for the intake, and is it at risk of Delta flooding? Would choosing this alternative, compared to the 05 preferred alternative, mean losing hydropower (thereby boosting global warming gas emissions)?
8. I hope there is a person who can master the complexity found in the Draft PEIR. I hope they sit on the Commission. I find it daunting. 06 Some of the larger charts, especially, do not help this reader; rather they overwhelm.

Thank you for your hard work producing the document, and for considering these comments.

Steve Lawrence, citizen of San Francisco, and Vice-chair and member of the Citizens Advisory Committee to PUC

SI_CAC2

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Diana Sokolove <wsip.peir.comments@gmail.com>

Draft PEIR--further comments

Steve Lawrence <splawrence@sbcglobal.net> **Mon, Oct 15, 2007 at 2:17 PM**
To: wsip.peir.comments@gmail.com

Please accept these further questions concerning the Draft PEIR of late June 2007 for WSIP:

1. The preferred option requires buying water from the districts during dry years, 23 mgd. There is no contract for the same. Why is this a wise plan? Won't the districts have SFPUC over a barrel? Didn't PUC promise to 01 expand the system because it was vulnerable to drought? Expanding the system is relying on ourselves. Isn't a preferred option that relies on others for needed water contrary to the will of the voters of 2002?
2. The system is said in the draft PEIR to be "highly dependent upon storage". Yet WSIP eliminated plans for storage. (Sunol Reservoir, an enlarged Calaveras Dam and reservoir, and downsized storage at SVWTP Expansion). How much storage is needed? Is that presented? If not, explain why it is not important to calculate 02 and present how much storage is needed to weather the design drought when the system is "highly dependent upon storage".
3. Under the preferred option SF must conserve 4 mgd more than it will with plumbing code changes; sometimes called "aggressive conservation" or "Package C". Why isn't this set out so that all can see what will be 03 expected? What aggressive conservation efforts will be needed if the preferred option, or modified preferred option, is selected?
4. (Replace my 8/17 item 4 with this, please:) Environmental impacts are examined and analyzed assuming a repeat of precipitation and weather conditions that repeats the historical record, 82 years mostly during the 20th Century. Global warming almost certainly means that the upcoming years will be far less benign. So while rationing would be required only about 10% of the time assuming the old benign climate, and buying water 04 from the districts in about 29% of the years, it seems likely that the future will be less rosy. Why not present a more realistic future? a) Likewise, snow pack will be less, and snow melt faster. Yet doesn't the draft PEIR assume that water will flow into Hetch Hetchy in years ahead as it has in years past? Why is this a good assumption to make?
5. Who pays for Recycled Water? Do the wholesale customers? Why should SF reduce its take from the regional system in order to allow wholesale customers to increase theirs when the cost of recycled water in SF is so 05 high? a) If northern San Mateo County recycled water is used for Harding, will Recycled Water from the WSIP program not be used for Harding? What will be done with that expensively procured capacity then?
6. Does the proposed option take 25 or 27 mgd more from the Tuolumne River? If 27, it seems not to add up: 27 06 + 10 = 37; 300 - 265 = 35. If 25, well, why use 27 in the Draft PEIR?
7. Exploration of the desalination option won't be completed when a final decision is made whether to go with the preferred option. a) Desal at Pittsburg assumes 7500 kW per million gallons to make potable product. Explain how the assumed salinity of input water was determined to come to this figure. Surely you increased salinity because when the desal plant is needed, the flow of fresh water will be low. 07 Did you further decrease it for rise in sea levels? b) Where does the electricity for desal come from? From Hetchy power? If not, how much will it cost? If it comes from Hetchy, how is it transmitted to the plant, or can you trade with PG&E, providing power to it where convenient, while PG&E supplies the desal plant? (This adds to 8/17's item 3.)
8. When it is said that 245 mgd average will be taken from the Tuolumne, does that include Tuolumne water purchased from the districts, or is this figure for water taken by the RWS without compensation to the districts? 08 See table 8.5 or 8-5 ff.

Thank you, Steve Lawrence

SI_Caltrout

CALIFORNIA TROUT

KEEPER OF THE STREAMS

September 28, 2007

Paul Maltzer
Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Re: Tuolumne River Water Diversions

Dear Mr. Maltzer:

On behalf of California Trout's more than 7,500 members and supporters I am writing to express our deep concern about the San Francisco Public Utilities Commission's plan to take more water from the Tuolumne River. Because the plan fails to adequately identify and address environmental impacts to the River, it is imperative that the Commission undertakes additional studies before finalizing this document. 01

California Trout supports alternatives that protect the Tuolumne River from new diversions. Requiring greater water conservation, greater efficiency, and greater recycling is the best way to reduce impacts to the Tuolumne River while promoting a sustainable water plan for the Bay Area. 02

Thank you for your consideration to this request.

Sincerely,

Brian Stranko
Chief Executive Officer

BS:jsf

Bay Area Office: 870 Market Street, Suite 528 • San Francisco, CA 94102 • (415) 392-8887
Fax: (415) 392-8895 • http://www.caltrout.org

SI_CAREP

October 14, 2007

Paul Maltzer, Environmental Review Officer
Water System Improvement Program PEIR
San Francisco Planning Department

Dear Mr. Maltzer:

The California Chapter of Republicans for Environmental Protection (CA REP) is urging the San Francisco Public Utilities Commission (SFPUC) to undertake additional studies of the Tuolumne River before finalizing the PEIR. We believe that the environmental review made by the SFPUC's plan to take 25 million gallons per day <u>more</u> water from the Tuolumne River by 2030 fails to adequately identify and address all of the environmental impacts to the Tuolumne. We urge SFPUC to undertake additional studies of the Tuolumne River before finalizing this document. 01

Protecting the Tuloumne is not only environmentally sound but also economically sensible. California is world renown for its recreational facilities, thus, enabling the tourism industry to be one of Califronia's leading economic drivers. Taking more water from the Tuolumne will harm important habitat for fish and wildlife, including chinook, salmon, and rainbow trout, degrade world-class recreation opportunities, and worsen San Francisco Bay-Delta water quality. Because of these factors, our rivers, such as the Tuolumne, attract visitors to California, our legendary landmarks, such as Yosemite National park, and the beautiful state parks that surround the Tuloumne. 02

Further, CA REP supports fiscal responsibility and accountability. While we support the Water System Improvement Program's (WSIP) to upgrade and refit the Hetch Hetchy water system so that it is seismically sound, we believe the water diversion component in the EIR will cause delay to the entire $4.3 billion project. Unnecessary cost delays coupled with the cost to divert Tuolumne River water will be very expensive. Moreover, water rates in San Francisco are projected to triple by 2015 and will increase significantly in other Bay Area cities, as well. The cost to businesses, such as agriculture, health care, and manufacturing, will be unnecessarily burdensome and have a trickle-down effect with transaction costs being passed to consumers and taxpayers. Therefore, CA REP urges SFPUC to be mindful of the fiscal impacts by not moving forward to divert water from the Tuolumne River. 03

CA REP supports water conservation, efficiency, and recycling measures. Indeed, we support the alternatives identified in your study that would eliminate the need to divert more water from the Tuolumne by at least 74%. We also support and urge SFPUC to follow best practices of other metropolitan areas, such as Seattle and Los Angeles, especially in the face of rapid population growth.

Requiring more water conservation, efficiency, and recycling is the best way to lessen impacts to the Tuolumne River while promoting a sustainable water solution for the San Francisco Bay Area. The Bay Area is known for its environmental stewardship and leadership, so CA REP hopes SFPUC will take a leadership role in water efficiency and conservation. Therefore, CA REP urges SFPUC to undertake additional studies and consider the preferred alternatives in its initial study so that the Tuolumne River will be protected for future generations. 04

Sincerely,

Buddy Burke,
CA REP President

Virginia Chang Kiraly
CA REP Vice President
Commissioner, California Commission for Economic Development

SI_CNPS

California Native Plant Society

2707 K Street, Ste. 1 • Sacramento, CA 95816-5113 • (916)447-2677 • FAX (916)447-2727

September 25, 2007

Mr. Paul Maltzer
Environmental Review Officer, WSIP PEIR
San Francisco Planning Department
1650 Mission
Street, Suite 400,
San Francisco, CA 94103
wsip.peir.comments@gmail.com

RE: San Francisco Public Utilities Commission WSIP DEIR

Dear Mr. Maltzer:

The California Native Plant Society (CNPS) appreciates the opportunity to comment on the *Water System Improvement Project (WSIP DEIR)*. CNPS is a non-profit organization of more than 10,000 professional and amateur botanists, scientists and lay persons distributed in 33 chapters throughout California. The mission of the CNPS is to increase the understanding and appreciation of California's native plants and to preserve them in their natural habitat through science, education, advocacy, horticulture and land stewardship.

The proposed WSIP asks for the removal of an additional 25 million gallons of water per day (mgd) from the already impacted Tuolumne River. This river is an important natural resource which is home to many native plants and animals. Withdrawal from the river would take place in the Sierra Nevada in the upper watershed where it magnifies the primary impacts upon the riparian communities at the source. But the impacts extend to the San Francisco/San Joaquin Delta where freshwater flows are already heavily depleted. The Tuolumne is the largest remaining source of freshwater to the San Joaquin River. There are also impacts across San Joaquin, Alameda, Santa Clara, and San Mateo counties from individual components of the system, and planned water withdrawals from creeks in Alameda and San Mateo counties. 01

We oppose the withdrawal of additional water because we believe that a concerted effort towards water conservation should precede additional projects which would cause significant environmental impact. We believe it is completely feasible to conserve the equivalent of 38 mgd for 2.4 million people, or about 15 gallons per day per person with education, cooperation and creativity.

Thank you for your consideration of the above comments.

Sincerely,

Amanda Jorgenson
Executive Director

Dedicated to the preservation of California native flora

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California Native Plant Society
East Bay Chapter
Conservation Committee

October 1, 2007

Paul Maltzer
Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103-2479

Dear Mr. Maltzer:

The East Bay Chapter of the California Native Plant Society (EBCNPS) appreciates the opportunity to comment upon the Draft Programmatic Environmental Impact Report (PEIR) for the San Francisco Public Utility Commission's Water System Improvement Program (WSIP). These comments are intended to supplement the statements that we made at the public hearing in Fremont on September 18th.

The California Native Plant Society (CNPS) is a non-profit organization of more than 10,000 laypersons and professional botanists in 32 chapters across the state. Our mission is to increase the understanding and appreciation of California's native plants and to preserve them in their natural habitat through scientific activities, education, and conservation.

While the chief focus of EBCNPS's concerns is upon the impacts that the WSIP will have upon the native flora throughout the system, we are especially concerned with impacts to native flora in Alameda County and with the role that local demand for water by the SFPUC's customers in the East Bay plays in driving the project. 01

General Considerations

Program Goals and Objectives

We believe that the general WSIP goals of assuring water quality, seismic reliability, delivery reliability, adequate water supply, and sustainability in a cost-effective way to its customers are basic responsibilities of the SFPUC. We believe that these goals are also reasonable and attainable. Many of the *qualitative* system performance objectives listed in Table S.1 are also reasonable steps to achieving the goals of the project. 02

However, there is a fundamental gap between the qualitative objectives and the quantified assumptions, particularly with respect to the overestimation of the perceived need (as distinct from demand) for water and the underestimation of the capacity of the 03

SFPUC and its customers for conserving water. We believe that this gap is created and maintained by a traditional and outmoded approach to solving the problem of water scarcity. In this approach the SFPUC operates as agent in a competing marketplace to get more water for its customers from dwindling supplies of surface flows. What is required is a more forward-thinking perspective whereby the SFPUC acts as steward of a limited supply that must be carefully husbanded. 03 cont.

The SFPUC has heard repeatedly from the public and from reliable water experts that the best approach to meeting demand is to reassess demand in light of much more intensive conservation efforts. Examples of other major metropolitan water districts in the west that have adopted this approach are available as models, including those mentioned in the Pacific Institute's Report referenced above.

A more recent example is provided by the Helix Water District of San Diego County which has undertaken 14 innovative conservation measures. Despite a population increase from 1990 of 3.02%, the annual per-capita water use has gone down from 0.19 afpc to 0.18 afpc, a decrease of 4.73%. It appears that the drought of 1990 resulted in permanent changes in water use habits—the actual use in 2000 was lower than that projected in the 1995 Urban Water Management Plan. Since 1990, Helix has been actively implementing the wise water management practices suggested by the California Urban Water Conservation Council and is a signatory to the council's best management practices (BMPs). Like all agencies that signed on, Helix agreed to implement 14 BMPs and to track progress toward meeting the intent of these goals (Bader, C. 2007. "Drip by Drip." *Water Efficiency*. Mar-Apr. Forester, Santa Barbara, CA) 04

Indeed SFPUC's own retail customers in the City of San Francisco show a decline in demand of 4.7 mgd, an excellent first step. The assumption that the SFPUC can do better with less underlies all of our comments on the draft PEIR since that issue lies at the crux of analyzing the impacts of the WSIP.

Methodologies, Models, and Supporting Documents

We find that certain methodologies and models that were used to ascertain biological resources, impacts, General Plan compliance, water demand, and mitigation were either flawed or simply the wrong tool. We make general observations in this section and more precise remarks under relevant sections below. 05

We also believe that the omission of any attempt to model or estimate global warming and its impacts upon water supplies and future need undermines the credibility of the EIR. Indeed, California Attorney General Jerry Brown has filed a CEQA claim against San Bernardino County for failing to address effects of global warming in its EIR for its General Plan update. (Barbara Schussman, Bingham McCutchen Law Offices, http://www.bingham.com/Media.aspx?MediaID=4936). Although it is impossible to know yet the full scope of the impacts of global warming upon the state's water supplies, the PEIR must make some attempt to include it in its determination of CEQA alternatives. The PEIR makes no reference to the California Water Plan Update 2005 which contains relevant current papers and discussions (see, for instance, "Accounting 06

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for Climate Change," Roos, DWR). There are also excellent discussions on conservation and more innovative approaches to achieving efficiency (see "California 2030: An Efficient Future," Glieck and Cooley, Pacific Institute for Studies in Development, and Groves, Pardee RAND Graduate School). 06 cont.

There is an overall serious imbalance between the degree to which water demand and water flows have been painstakingly researched and documented and the relative lack of detail in identifying, documenting, and addressing impacts, especially to biological resources. There are dozens of charts, maps, and tables with data presented on water flows, variants, and scenarios, but only several tables and maps, and an incomprehensibly small bibliography on biological resources. There is one vegetation map per project region each of which has very general plant community information from the California Gap Analysis. There is no information from the Manual of California Vegetation (Sawyer and Keeler-Wolf, 1995) which contains the most recent classification of plant communities in the state. 07

There is also an imbalance in terms of general time frames and time scales used to make determinations. For instance, hydrological data from many decades (80+ years) are used to determine drought conditions, water flows, etc. in an effort to predict future drought conditions up to 2030. Yet, other than some few data on fish populations, there are no historical data presented to show the impacts upon the various watersheds and loss of habitat and species populations that have resulted from impoundment and withdrawal of water over the past century. The hydrological database is a readily available source of information, probably because water has been a commodity which has been bought and sold, while wildlife and plant resources have not been subject to such close accounting. Nonetheless, there are studies available that indicate a significant decline in riparian species from the loss of riparian habitat over the course of the past century (see The Manual of California Vegetation, Sawyer and Keeler-Wolf, 1995 for a discussion of riparian plant communities in California, and "The Riparian Bird Conservation Plan," California Partners in Flight and the Riparian Habitat Joint Venture, 2000). In place of relevant data, the PEIR makes broad sweeping statements about the massive alterations wrought in the environment from Hetch Hetchy to the Bay from water diversions and then dismisses the subject as outside the scope of the document. 08

Although there are a bewildering number of pages to the EIR, in some cases, the information has not been presented concisely enough to make clear determinations about the important conclusions to be drawn or the information is separated into different volumes. For instance, in the discussion of the various CEQA alternatives listed, it is impossible to get a clear understanding of the differences in impacts upon fish and riparian habitat that each alternative would have in the Alameda Creek watershed without having to go back to the chapter in which each particular reach of the creeks is identified. A second example is Table 3.12 that displays construction and operations assumptions in which reference is made under Existing Land Use to crossing the Cargill salt ponds with a portion of the Bay Division project. It's not clear whether this pipeline/tunnel has any portion above ground on protected public lands. It's therefore impossible to determine what the specific impacts to wetland habitat and species would be and what permits 09

would then be required. This information then turns up in a separate volume in Table C- 09
6 in Appendix C. cont.

Finally, given the array of programs that the SFPUC will be administering on its lands
including HCPs for both the Peninsula and Alameda Creek watersheds, the Habitat
Reserve Program throughout the entire WSIP system, various watershed management
plans, and the watershed environment improvement program (WEIP), there is ample
opportunity for the SFPUC to work at cross purposes, lose information, or simply
overburden itself with the task of coordination. It appears that already important 10
information on biological resources concerning plant species has not been incorporated
despite it having been submitted three years ago. We are attaching Dianne Lake's letter
to the SFPUC (July, 2004) in which she addresses omissions of CEQA-protected plants
from the scoping for the Alameda HCP. We suggest that the SFPUC undertake
coordination of these efforts at the earliest possible date, that all biological resources be
cross-referenced so that each project or program is working off of the same database, and
that the public be included in discussions of how these programs will interface.

Specific Considerations

<u>Water Demand and Patterns of Growth in East Bay Cities</u>

As part of its attempts to address water demand as a function of growth and development,
the PEIR refers to the General Plans of the cities in the SFPUC's service area. In the East
Bay, those cities include Hayward, Newark, Union City, and Fremont. The last three are
customers of the Alameda County Water District, a wholesale customer of the SFPUC.
Together the increase in purchase requests from these four cities accounts for a fifth of 11
the total 2030 purchase estimates of the SFPUC's Wholesale Service Area. The PEIR
briefly reviews the growth trends and policies for each city by looking at population and
employment projections and the General Plans that have been adopted to guide each
city's growth. In so doing, the PEIR attempts to find the "goodness of fit" between each
city's growth projections, its plans and policies to guide that growth, and its projected
water demand. The aim is to rectify the overall purchase requests from each wholesale
customer.

Hayward

None of these four cities has passed a growth ordinance. The City of Hayward is the
SFPUC's largest wholesale water customer. Its water purchases for FY 2001/2002 were
17.61 mgd, and its 2030 purchase estimates are 27.95, an increase of 10.34 mgd, the
largest proportional as well as absolute increase of all the wholesale customers. The 12
increase in demand is based largely on the assumption of development in the Hayward
hills of big, upscale "view" homes. These homes are built on larger lots with more
extensive landscaping that requires more water than older homes on smaller lots.
Irrigation for landscaping is one water use that can be tremendously pared down with
proper planning and implementation. Since these homes constitute a sector not yet fully
built and therefore subject to planning requirements, the City could cap water use for
irrigation purposes or impose a strict tier system for water rates.

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Although the PEIR does not mention this, the hills above Hayward are part of the High
Hazard Zone for Wildfire. As such, residents of these homes can be required by local fire
departments to manage vegetation up to 100 feet from their homes and other structures
according to recent state legislation. Wise water planning on the part of the City could
involve requiring low water-use *and* fire-safe landscaping as part of new development.
Although it is beyond our scope to assess the relative preparedness of Hayward's water 12
supply in the event of a WUI fire, it is worth noting that one of the fundamental reasons cont.
that the 1991 Tunnel Fire in the Oakland Hills escaped control by firefighters was the
failure of the water supply system. A second documented factor was the absence of fire-
safe landscaping around homes. An important part of determining the growth footprint of
new hills developments is forecasting the actual water needs of the area as distinct from
the demand for water.

Alameda County Water District

The Alameda County Water District (ACWD), serving the cities of Newark, Fremont,
and Union City, gets a portion of its water from the SFPUC, a portion from groundwater
sources in the lower part of Alameda Creek, and 40% of its water from the Delta. This
past summer, the California Department of Water Resources temporarily turned off the
pumps that move water from the Delta to ACWD and other water agencies throughout
the state to protect the endangered Delta smelt. Although pumping has resumed, it's
clear that there will be repeated legal challenges to water diversions around the Delta.
The Summer, 2007 newsletter to the ACWD's customers contained an article about a 13
recent analysis of Delta issues by the Public Policy Institute of California. The report
recommended five different alternatives, two of which would reduce Delta water to cities
and farms. The AWCD wrote, *"As we have recently experienced with the shutdown of
Delta pumps, any solution that is based on reducing Delta exports would have immediate
and significant impacts to the local economy and health and well-being of families and
businesses in the Tri-City area."* In the same newsletter there were helpful "tips" on
saving water, but no imperative or requirement to conserve. The ACWD is in a good
position, with the help of the SFPUC, to shift from simply supplying water to its Tri-City
customers to instituting a coordinated plan for recycling water in these three cities as a
way to reduce its dependence upon the uncertainties of Delta water.

Fremont

In analyzing Fremont's growth patterns, the PEIR refers to "*goals related to growth
management articulated in the 2003 Fremont General Plan Land Use Element [which]
include conservation of the city's open space resources (Goal LU4) and protection of
"sensitive hill face and uses in the remainder of the hill area" consistent with the area's* 14
character and environmental constraints (Goal LU6)" (E.4-2). Interestingly, the
Fremont City Council also recently endorsed the Ahwahnee Principles for Resource-
efficient Communities, a set of principles designed to help local governments plan for
smart growth. However, despite these good intentions, the City of Fremont is actively
pursuing locating the Oakland A's new proposed baseball stadium in its own open space
land, despite the zoning in its General Plan and the specific Ahwahnee Regional Principle

that recommends locating large public facilities such as museums and stadiums in the urban core to minimize the impacts to open space, traffic and air quality. As yet, there are no projected figures for water demand for the stadium and the residential community that has been proposed to accompany it. It is unlikely that the enormous water requirements of such a facility were factored into the water purchase estimates of Fremont since plans for the stadium were only announced this past year. However, the stadium is a highly visible example of the gap between the language of intent of a General Plan and its implementation by city government. 14 cont.

Conservation Choices

It is nearly impossible to make sense of portion of the PEIR regarding the method by which the SFPUC attempted to ascertain willingness on the part of its wholesale customers to reduce demand through various conservation measures. It is understandable that each wholesale customer will have different end users with differing needs for water. However, without knowing the specific reasons why certain customers chose to embrace or reject any of the Programs (A,B,or C) or the rationale for the particular composition of each of these programs, it is impossible to assess a customer's commitment to water conservation. 15

A better approach would be to begin by requiring all BAWSCA members to endorse the Ahwahnee Water Principles of 2005 which are designed to help local governments envision and implement more sustainable water use practices. The Local Government Commission (LGC), a non-profit organization that assists local government agencies to deal effectively with large resource questions, has helped municipalities all over the country to plan for water needs so that each city doesn't reinvent the wheel. With 28 wholesale customers in close proximity to each other, the SFPUC is in a prime position to encourage a more systematic approach to conservation on the part of its customers.

<u>Mitigation of Growth-inducing Impacts</u>

The PEIR is required to identify growth-inducing impacts of the WSIP and to mitigate them. Again, the PEIR uses locally derived information to buttress its position that the project itself is not inherently growth-inducing, that local governments are in good control of their own growth, and that they are appropriately mitigating for the impacts of development. In this case, the PEIR makes use of the method of examining several EIRs from local (Bay Area) large-scale developments to see whether the EIRs identify and mitigate for impacts. One example cited from this very small sample is the One Quarry Road Residential Project in Brisbane. It's not clear from the project description in the PEIR whether the project is still being proposed despite being rejected by Brisbane voters in an election last year or whether the voters ultimately prevailed in defeating the project— whatever the case, it's an odd example to use to show that cities are reconciling large-scale projects with their General Plans or instituting adequate mitigations for them. Projects that incur such formidable opposition that they end up on a ballot and are defeated by local voters are rarely shining examples of environmentally suitable projects. A far better metric to use to determine how well a city complies with its General Plan would be to review the number of times that amendments and zoning changes have been 16

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made to accommodate development or to inquire whether the city planning department is familiar with the California Natural Diversity Database as a resource incorporated into planning decisions. 16 cont.

<u>Alternative Analysis of Water Demand in the SFPUC</u>

The Pacific Institute, a non-profit organization that "provides research and policy analysis on threats to environmental, equitable, and economic sustainability" prepared a report, "From the Tuolumne to the Tap: Pursuing a Sustainable Water Solution for the Bay Area" that analyzes in depth the assumptions that drive the SFPUC's approach to analyzing water demand. EBCNPS endorses their findings. These six recommendations are: 17

1. Re-evaluate the projections of future water demand and conservation potential in light of flaws and inaccuracies in the studies.
2. Conduct a study to determine the maximum technical potential for conservation and efficiency savings within the SFPUC service territory.
3. Meet any additional water demand through increased investment in conservation, efficiency, and recycling.
4. Target future conservation efforts and recycling development in the areas of projected new demand growth, especially outdoor uses.
5. Pursue a new water sales agreement that will cap the sale of water from the Tuolumne River at current levels and encourage conservation, efficiency, and recycling.
6. Adopt policy to reduce diversions from the Tuolumne River over time.

<u>Biological Resources</u>

Basic Description

The PEIR Executive Summary refers on page 3-81 to the method by which the potential for sensitive plant species will be assessed in the project level EIRs: *The biologist would carry out a site survey by walking or driving over the project site, as appropriate, to note the general resources and whether any habitat for special status species is present. The biologist would then document the survey with a brief letter report or memo, setting* forth *the date of the visit, whether habitat for special status species is present, providing a map of description showing where sensitive areas exist within the site, and identifying any appropriate avoidance measures.* 18

This approach is inadequate in several ways: first, this level of survey should be conducted for the PEIR, not just the later project-level EIRs, in each of its project areas. Since extensive previous documents have already been prepared for the Alameda Watershed Management (WMP) and scoping for the HCP both of which included public comment, it is odd that the SFPUC still does not have a large database for the natural resources in the Alameda Creek watershed. The SFPUC may wish to review documents prepared for the East Bay Municipal Utility District in the mid 1990's by Dr. Robert Stebbins in which detailed priority lists were created to track and study various indicator and keystone species in its East Bay lands as a means to assessing the health of the watershed. Assuming the WSIP PEIR is certified, there will be huge momentum to approve each individual project. If sensitive status species exist, their presence should be used to influence the design of the WSIP as a system, not just for individual projects. 18 cont.

Second, the type of initial screening process to determine the potential for special status species of plants is entirely inadequate. Instead, focused floristic surveys at several times during the growing season and preferably over several years must be conducted to determine with any degree of reliability whether special status plants exist. 19

Currently, the description and depiction of what CEQA-protected plants are to be found on Alameda Creek watershed lands and on the Bay Division portion of the project are inadequate. Table 5.4.6-2 (Potential for Occurrence of Key Special-Status Plants and Plant Species of Concern in the WSIP Alameda Program Area) does not include all CEQA-protected plants that have the potential for occurrence in the watershed. The PEIR does not include reference to Dianne Lake's database of locally rare, significant, and unusual plant species in Alameda County though many of these are protected by CEQA. We are attaching a list of those plants along with a letter submitted to the SFPUC for its scoping process for its Alameda Creek Watershed Habitat Conservation Plan (see discussion above). 20

In addition, we include a letter from EBCNPS to the Alameda County Board of Supervisors regarding its moratorium on development along creeks in unincorporated areas of the county. This letter lists those creeks, including Alameda Creek, San Antonio Creek, Arroyo de Laguna, and their tributaries, that have the potential for sensitive status plant species and communities. It also references Todd Keeler-Wolf's recommendation that plant community surveys be performed along those specific creeks. The moratorium is still in place and should be referenced in the PEIR along with the Alameda County's *Specific Plan: Riparian Areas Flood Plain Zoning* (Alameda County Planning Department).

Figure 4.6-1a depicts the habitat types in the WSIP study area including the Sunol Valley and Bay Division project areas. Its source is the California Gap Analysis Project, 2005. The Gap Analysis is not a sufficiently fine filter for purposes of analyzing impact. The map does not depict the detail described in the narrative portions in which 6 sensitive plant communities are identified. We do not agree with the PEIR's conclusion that the remnant areas are too small to be mapped for a programmatic document (but could be mapped in a project-level EIR) since the document also concludes that there are significant impacts of the WSIP to these communities. 21

Impacts

As mentioned above, without current data from plant surveys using appropriate protocols, the PEIR cannot determine what the plant resources are in the project area. It follows that it is also therefore impossible to determine the true level of impacts. 22

A second problem in the approach to the analysis is the derivation of the level of significance of impact. SFPUC has not formally adopted significance standards for impacts related to biological resources. Instead there are qualitative criteria which are not fully measurable. These qualitative criteria are based on assumptions of substantiality which in turn are based upon three principal components (see PEIR pp 4.6-37-38): 23

magnitude and duration of the impact (substantial/not substantial)
uniqueness of the affected resource (rarity)
susceptibility of the affected resource to disturbance

Without quantified baseline data, no meaningful conclusions may be drawn about impacts. We recommend that focused surveys be initiated, that all sensitive plant communities be fully mapped according to currently accepted protocols, and that all CEQA-protected plants be surveyed and mapped. Appropriate levels of impact can then be determined along with proper mitigations. 24

A third problem with analysis of impacts derives from the time scales used. At various points in the PEIR the time scales vary according to whether water supply data are being analyzed for adequacy or whether biological resources are being considered for impact. On page 5.4.1-17, under Approach to Analysis, the document states with respect to impacts upon the Alameda Creek watershed:

For the purpose of impact analysis, CEQA Guidelines Section 15125 (a) considers the existing conditions baseline to be those conditions in existence at the time the environmental review is initiated, as marked by issuance of the notice of preparation (NOP). For the WSIP, the existing baseline used for the impact analysis reflects the range of hydrologic conditions that have resulted since the DSOD restrictions were imposed in December 2001 and continued through issuance of the NOP in 2005, and which are expected to continue until such time that a restored reservoir begins refilling. This PEIR does not use the historical range of hydrologic conditions that existed prior to the DSOD restriction as the basis of impact analysis of the WSIP impacts on stream flow. 25
And from an accompanying footnote: …*this environmental setting will normally constitute the baseline physical conditions by which the lead agency determines whether an impact is significant.*

By utilizing the relatively brief time period during which the Calaveras Reservoir has been at less than capacity, the PEIR can frame the context of impact in such a way as to minimize the finding of impact. However, in terms of restoration of habitat and mitigation, it makes more sense to view impacts over a longer period of time, particularly with plant communities such as woodlands.

As a result of these problems in the approach to analysis as described above, the PEIR can draw certain conclusions about the lack of significance of an impact. For instance, on page 5.4.6-22 under Impact 5.4.6-4: Effects on riparian habitat and related biological resources along Alameda Creek, from the confluence with Calaveras Creek to the confluence with San Antonio Creek: 26

Sensitive riparian communities in this section of Alameda Creek include sycamore alluvial woodland, Central Coast arroyo willow riparian forest, valley oak woodland, and white alder riparian forest. The WSIP would substantially reduce winter flows compared to those under existing conditions (they would be similar to, by slightly muted from, flows in the reach directly below the diversion dam). The change in flows would have no effect on woodland communities; for stand regeneration, sycamore woodland requires flows similar to unimpaired flows. The slight reduction in flows (as it relates to stand regeneration for willow and alder riparian forest) would be offset by increased summer flows under the 1997 MOU. Sustained winter and summer minimum flows could facilitate the conversion of existing riparian habitats, such as sycamore alluvial woodland and valley oak woodland, to alder-and willow-dominated habitats, but the extent of this potential impact would be small. Overall, these impacts would offset one another; as a result the impact on sensitive habitats would be less than significant, and no mitigation measures would be required. 26 cont.

The conversion of the rare sycamore alluvial woodland community cannot be considered to be an insignificant impact. In this manner, the PEIR's findings of level of significance of impacts must be seriously questioned.

Mitigations

EBCNPS has already submitted detailed comments on the SFPUC's Habitat Reserve Program (HRP), the chief mitigation measure for the WSIP. As we mentioned in those comments, it is impossible to assess the adequacy of the mitigations in advance of a more detailed description of the exact nature of the biological resources and the presumed impact upon them. 27

CEQA Alternatives

EBCNPS does not endorse any of the CEQA alternatives described in the PEIR since we believe the fundamental analysis of water supply and demand is flawed. 28

Instead, we recommend that the draft PEIR be re-circulated. Given the problems in methodology that our letter outlines, we believe that the conditions apply under which CEQA guidelines require a lead agency to re-circulate an EIR. CEQA Guidelines Section 15088.5 requires that a lead agency re-circulate an EIR when significant new information is added to the EIR after public notice for public review of the Draft EIR, but prior to certification. "Information" can include changes in the project or environmental setting as well as additional data or other information. New information added to an EIR is not "significant" unless the EIR is changed in a way that deprives the public of meaningful opportunity to comment upon a substantial adverse environmental effect of the project, or a feasible way to mitigate or avoid such an effect (including a feasible project alternative) that the project proponents have declined to implement. "Significant new information" requiring re-circulation includes, for example, a disclosure showing that: 29

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1. a new significant environmental impact would result from the project or from a new mitigation measure proposed to be implemented;
2. a substantial increase in the severity of an environmental impact would result unless mitigation measures are adopted that reduce the impact to a level of insignificance; 29 cont.
3. a feasible project alternative or mitigation measure considerably different from others previously analyzed would clearly lessen the environmental impacts of the project, but the project proponents decline to adopt it; and/or
4. the draft EIR was so fundamentally and basically inadequate and conclusory in nature that meaningful public review and comment were precluded.

We look forward to commenting further as individual project-level EIRs for the WSIP are released. Please do not hesitate to call (510-849-1409) if you have any questions.

Sincerely,

Laura Baker
Conservation Committee Chair
East Bay Chapter of the California Native Plant Society

Attachment to CNPS Comments on WSIP PEIR

California Native Plant Society

East Bay Chapter [illegible] Berkeley, CA 94705

July 19, 2004

Alameda Watershed HCP
Land and Resources Management Section
San Francisco Public Utilities Commission
1657 Rollins Rd.
Burlingame, CA94010

Dear Director,

The Conservation Committee of the East Bay Chapter of the California Native Plant Society (CNPS) has reviewed the list of special status plant species proposed for coverage in the Alameda Watershed Habitat Conservation Plan (AW HCP) of the San Francisco Public Utilities Commission (SFPUC). We have also reviewed the evaluation criteria used to determine the list, and the checklist of plant species observed in the Alameda Watershed HCP study area compiled by Jones & Stokes in May and June of 2003.

CNPS is devoted to preserving the native flora and habitat of California and, as such, we are pleased to see the efforts thus far towards protecting the native flora and habitat on SFPUC lands in Alameda County.

However, we also feel that the current effort does not go far enough.

Three plant species listed as rare statewide by CNPS that are known from the watershed are not included in the list of protected species nor on the evaluation list: *Legenere limosa* (CNPS List 1B) occurs in Ohlone Regional Wilderness; *Monardella antonina* ssp. *antonina* (CNPS List 3) occurs at two sites in Sunol Regional Wilderness; *Lessingia hololeuca* (CNPS List 3) is known historically (1940) from Calaveras Reservoir. 30

In addition, *Campanula exigua*, *Malacothamnus hallii* and *Lessingia micradenia* var. *glabrata* (all CNPS List 1B) were on the evaluation list but were rejected as being out of range. However, *Campanula exigua* was vouchered in Sunol Regionl Wilderness in 1973. *Malacothamnus hallii* may have been known historically (1878) from Calaveras Reservoir (voucher site is unclear). In 2002 specimens of *Lessingia nemaclada* were found in Ohlone Regional Wilderness with some characters similar to *L. micradenia* var. *glabrata*. Hybrids of the two species have been found elsewhere and could occur in the Alameda watershed. Thus, these three species should be added to the list of species proposed for coverage.

Attachment to CNPS Comments ON WSIP PEIR

CNPS List 4 species are not included in your evaluation list and several occur in the Alameda Watershed, either on SFPUC lands or on adjacent lands owned by the East Bay Regional Park District (EBRPD) within the watershed. CNPS List 4 plants are generally of limited distribution in California and most are locally rare as well. As such, they qualify for inclusion in the AW HCP under the criteria listed at the end of the evaluation list in Appendix E and in step 2 of the March 20 2003 memo "Draft Covered Species Criteria" which refer to plants that are "unlisted and not rare but the covered activities may affect a substantial portion of the species' range or important habitat for this species." List 4 species that are known to occur in the Alameda Watershed area are: *Acanthomintha lanceolata*, *Calochortus umbellatus*, *Clarkia concinna* ssp. *automixa*, *Eriogonum umbellatum* var. *bahiiforme*, *Eriophyllum jepsonii*, *Galium andrewsii* var. *gatense*, *Linanthus acicularis*, and *Linanthus ambiguus*. Of these, only *Linanthus ambiguus* is currently known to occur in the HCP study area, the rest being on EBRPD lands, but habitat is present for them in the HCP study area and thus there is a strong potential for them to occur there and they should be included in the HCP plan.

There is also no mention of rare or significant plant communities proposed for coverage. Several communities considered as rare or threatened by the California Department of Fish and Game (CDFG) occur on the watershed, including Sycamore Alluvial Woodland, perennial native grasslands, serpentine communities, and willow riparian woodlands.

In addition, we are very concerned that no mention is made of, nor protection proposed for, locally rare species. The East Bay Chapter of CNPS has been tracking the native flora of Alameda and Contra Costa Counties for many years and has developed a ranking system that assesses local native plants by their rarity or endangerment in the two-county area.* Plants with a ranking of A1, A2, or A1x (occurring in only five or less places in Alameda and Contra Costa Counties) are afforded protection under the California Environmental Quality Act (CEQA) in sections 15380 and 15125(a) which address species of local concern and place special emphasis on environmental resources that are rare or unique to a region. 30 cont.

A table is attached of state and locally rare species that are known to occur either currently or historically in the Alameda Watershed. Of the 162 species in this table, only three are included on your list of special status species proposed for coverage under the AW HCP: *Helianthella castanea*, *Monardella villosa* var. *globosa*, and *Streptanthus albidus* ssp. *peramoenus*.

Thirty-seven of the species in the table are known to occur on SFPUC land managed by the SFPUC, and 19 occur on SFPUC land leased to the EBRPD within the HCP study area. One hundred eighteen species occur on lands owned by the EBRPD that are outside of the study area but within the Alameda watershed.

The table is an updated version of a list of CEQA protected plants occurring on San Francisco Water District lands in Alameda County that was sent to Michael Carlin, Director of Planning at the SFPUC on March 5, 2003 by Tony Morosco, then president of

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the East Bay Chapter of CNPS, and also on June 14, 2003 to Cheryl Davis, the Acting Assistant General Manager of Operations at the SFPUC and to Jon Ballestros at the Roberts Group as part of our original comments on the HCP. According to the description in Chapter 3.3.2 of sources used to determine the special-status plant species to be covered by the HCP, this list was not consulted. Nor was the publication *Unusual and Significant Plants of Alameda and Contra Costa Counties* by Dianne Lake (6th edition, 2001, CNPS, East Bay Chapter) which lists the state and locally rare plant species that are found in the two-county area.

Locally rare species are highly important because they often represent range limits and disjunct populations, often indicating somewhat different or stronger genetic makeup. These peripheral and isolated populations can be the only hope for the continuation of a species in the event of catastrophic events that can wipe out large populations at a time through climatic and geological shifts or the spread of contagious pathogens from one plant to another in areas where a plant is more common and populations are in close proximity to each other. Earthquakes, flooding, exotic weed and insect invasions, and other events have demonstrated the vulnerability of many of our native plants countless times in countless places. It has also been demonstrated many times that peripheral populations are the last to disappear when a species begins to decline where it is more common, again indicating that peripheral and isolated populations may have some genetic variations that make them less vulnerable to pathogens and other types of attacks. 30 cont.

In addition, these isolated populations can often indicate the presence of special features where they occur that are not present in other seemingly similar habitats. Geological variations, microclimates, limited pollinator distributions, water tables and water flow patterns, etc. are some of the factors that can contribute to the presence of these isolated populations. By preserving these populations, we can learn more about the ecology and interactions of their habitats and the processes that control species survival and species declines. It is important to remember that organisms in a habitat or environment depend on each other in many ways, some of which science has not yet discovered. Removal of even one organism can have a domino effect that can result in ecological disaster in an area.

Thus, the preservation of these populations of locally rare species is of the utmost importance.

In an area where so many locally rare species occur, protection, as well as further study of those populations, is highly important. Since the purpose of a Habitat Conservation Plan is to protect important habitats in an area, the locations of both state and locally rare plants must be determined through further field surveys and research, and protection must be afforded to them in the AW HCP.

Finally, although we realize that the plant checklist provided in Appendix B was compiled from surveys conducted only in May and June of 2003 and therefore is necessarily incomplete, we would like to alert the SFPUC and Jones & Stokes to the presence of the following additional plant species known to currently occur in the

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Alameda Watershed study area: *Athyrium felix-femina, Perideridia californica, Artemisia dracunculus, Mentha arvensis, Mentha pulegium, Stachys pycnantha, Plantago major, Rumex conglomeratus, Rumex salicifolius var. denticulatus, Clematis lasiantha, Rhamnus ilicifolia, Rubus discolor, Salix laevigata, Salix exigua, Cordylanthus pilosus, Mimulus cardinalis, Carex nudata, Carex senta, Eleocharis acicularis, Scirpus acutus var. occidentalis, Scirpus cernuus, Juncus xiphioides, Calochortus argillosus, Melica imperfecta,* and *Hainardia cylindrica.*

Thank you for the opportunity to comment on this portion of your HCP, and we wish you well as you pursue this worthy endeavor.

Sincerely,

Dianne Lake
diannelake@yahoo.com
Conservation Committee Member and Unusual Plants Coordinator
California Native Plant Society, East Bay Chapter
PO Box 5597, Elmwood Station
Berkeley, CA 94705 30 cont.

*The CNPS East Bay Chapter ranking system is as follows (the 162 species referred to in the text are all ranked as *A, A1, A1x or A2):

- *A1, *A2: Statewide listed rare plants occurring in Alameda and Contra Costa Counties
- A1: Plants occurring in 2 regions or less in Alameda and Contra Costa Counties
- A1x: Plants presumed extirpated from Alameda and Contra Costa Counties
- A2: Plants occurring in 3 to 5 regions here, or otherwise threatened
- B: Plants occurring in 6 to 9 regions here, or otherwise threatened
- C: A Watch List – species occurring in more than 10 regions here, but with potential threats

30 cont.

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Rare, Unusual and Significant Plants of the SFPUC Watershed in Alameda County
Rare Statewide or Protected under CEQA as Locally Significant or Unique
CNPS, East Bay Chapter, 2004
(Note: Statewide rare plants are listed in upper case)

Species Name	CNPS East Bay Rank	Locations on Alameda Watershed	On SFPUC Property	On SFPUC Property Leased by EBRPD	On EBRPD Property	Habitat	Comments
ACANTHOMINTHA LANCEOLATA	*A1	OhlnP, SunlOh, SunlP			X	Chaparral; Serpentine	State CNPS List 4
Agoseris apargioides ssp. apargioides	A1	OhlnP			X	Forest; Grassland; Scrub; Sand or Sandstone	
Allium amplectens (?)	A2	(OhlnP-ID?)			X	Dry Open Slopes; Serpentine; Woodland; Misc. habitats	
Allium bolanderi var. bolanderi	A1	OhlnP			X	Chaparral; Serpentine; Woodland	
Allophyllum divaricatum	A2	OhlnP			X	Chaparral; Sand or Sandstone; Woodland	
Anisocarpus madioides (?) (Madia madioides in Jepson Manual)	A1	(SunlP-ID?)		?	?	Forest; Redwood Forest; Woodland	
Antirrhinum multiflorum	A1	(Nls-Loc?), SunlOh	?		X	Burns; Gravel; Rock, Tallus or Scree	Only current known site in East Bay
Aquilegia eximia (A. formosa is more common)	A2	SFWDSunl	X			Serpentine	
Arabis breweri var. breweri	A1	SunlOh			X	Rock, Tallus or Scree; Serpentine	
Artemisia dracunculus	A1	AlaCkSV, SunlF, SunlMg	X		X	Misc. habitats	
Asclepias speciosa	A1	SnAntoRsvr	X			Misc. habitats	
Astragalus didymocarpus var. didymocarpus (A. gambelianus is more common)	A1	SunlP		X		Grassland	
Calamagrostis nutkaensis (?)	A1x	(SunlMg-ID?)			X	Coastal Strand; Freshwater Marsh; Forest; Redwood Forest	

30 cont.

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Species Name	CNPS East Bay Rank	Locations on Alameda Watershed	On SFPUC Property	On SFPUC Property Leased by EBRPD	On EBRPD Property	Habitat	Comments
CALOCHORTUS UMBELLATUS	*A2	SunlP			X	Chaparral; Scrub; Woodland	State CNPS List 4
Calycadenia truncata	A2	OhlnP, SFWDAr, SunlP	X		X	Rock, Tallus or Scree; Scrub	
Calystegia malacophylla ssp. pedicellata	A2	SunlP			X	Chaparral; Scrub; Serpentine	
Camissonia graciliflora	A2	OhlnP			X	Dry Open Slopes; Grassland; Scrub; Woodland	
Camissonia intermedia	A2	SunlP			X	Burns; Scrub	
Camissonia strigulosa	A1	OhlnP			X	Grassland; Sand or Sandstone	Only current known site in East Bay
CAMPANULA EXIGUA	*A2	SunlP			X	Chaparral; Rock, Tallus or Scree; Serpentine	State CNPS List 1B. Evaluation list indicates this is out of range but it was vouchered at Sunol in 1973
Carex heteroneura var. heteroneura	A1	MssnPk			X	Forest; Grassland; Rock, Tallus or Scree	Only current known site in East Bay
Carex nebrascensis	A2	SFWDSunl	X			Misc. Wetlands	
Carex nudata	A2	(Nls-1972), SunlP	X	X		Rock, Tallus or Scree; Riparian; Sand or Sandstone areas	
Carex ovalis	A1	OhlnP			X	Misc. Wetlands	Only current known site in East Bay
Carex senta	A2	AlaCkSV	X			Riparian areas; Misc. Wetlands	
Cercis occidentalis	A1	SFWDSunl, (SunlAr-1866)	X			Chaparral; Dry Open Slopes; Riparian; Woodland	
Cheilanthes covillei	A2	OhlnP, (SunlP-1970)			X	Rock, Tallus or Scree	
Cheilanthes intertexta	A2	OhlnP			X	Rock, Tallus or Scree	
Chorizanthe membranacea	A2	OhlnP, SunlP	X		X	Chaparral; Dry Open Slopes; Grassland; Woodland; Misc. habitats	

30 cont.

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Species Name	CNPS East Bay Rank	Locations on Alameda Watershed	On SFPUC Property	On SFPUC Property Leased by EBRPD	On EBRPD Property	Habitat	Comments
Chorizanthe polygonoides var. polygonoides	A1	OhlnP			X	Gravel; Sand or Sandstone	Only current known site in East Bay
Chrysothamnus nauseosus ssp. mohavensis	A2	OhlnP, SunlOh			X	Scrub	
CLARKIA CONCINNA SSP. AUTOMIXA (ssp. concinna is more common)	*A1	(Nls-1938), OhlnP, PlstnRdg	?		X	Woodlands	State CNPS List 4
Clarkia purpurea ssp. viminea (ssp. quadrivulnera is more common)	A2	(Nls-1972)	?			Misc. habitats	
Claytonia gypsophiloides	A2	OhlnP			X	Rock, Tallus or Scree; Serpentine	
Collinsia bartsiifolia var. davidsonii(?)	A1	(OhlnP-ID?)			X	Sand or Sandstone	
Collinsia bartsiifolia var. unknown	A1	SunlOh, SunlP			X	Sand or Sandstone	
Collinsia parviflora	A2	OhlnP, PlstnRdg			X	Misc. habitats	
Cordylanthus rigidus ssp. rigidus	A1	SunlP		X		Chaparral; Forest; Woodland	
Cornus glabrata	A1	(PlstnRdg – ID?), (SunlT-1972)	?		X	Riparian	
Crocidium multicaule (?)	A1	(OhlnP-ID?)			X	Grassland; Sand or Sandstone; Woodland	
Cryptantha decipiens	A1	(OhlnP-ID?), SFWDAr	X		X	Grassland; Scrub; Sand or Sandstone	
Cuscuta californica var. californica	A1	SFWDSunl, SunlP	X		X	Chaparral; Grassland; Misc. habitats	
Delphinium californicum ssp. californicum	A2	MssnPk, OhlnP, SunlP			X	Chaparral	
Draba cuneifolia var. integrifolia	A1	SunlF, SunlMg			X	Misc. habitats	Only current known sites in East Bay
Elatine californica	A1	OhlnP			X	Freshwater Marsh	

30 cont.

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Species Name	CNPS East Bay Rank	Locations on Alameda Watershed	On SFPUC Property	On SFPUC Property Leased by EBRPD	On EBRPD Property	Habitat	Comments
Eleocharis parishii	A2	AlaCkSV, MssnPk	X		X	Sand or Sandstone; Misc. Wetlands	
Elymus stebbinsii	A2	SunlP			X	Chaparral; Dry Open Slopes; Forest	
Epilobium torreyi	A2	OhlnAr, (SunlP-ID?)			X	Riparian	
Erigeron reductus var. angustatus	A1	SunlP		X		Rock, Tallus or Scree; Sand or Sandstone areas; Woodlands	Only current known site in Alameda County. Recently found in northern Santa Clara County on SFPUC property
Eriogonum angulosum	A2	(Nls-1888), SunlP	?		X	Sand or Sandstone; Misc. habitats	
Eriogonum fasciculatum var. foliolosum	A1	SunlMg			X	Dry Open Slopes	
Eriogonum fasciculatum var. polifolium	A1	SunlMg			X	Dry Open Slopes; Dry Washes; Scrub	
Eriogonum luteolum var. luteolum	A2	OhlnP			X	Gravel; Sand or Sandstone; Serpentine	
ERIOGONUM TRUNCATUM (historical-1940)	*A1x	(Nls-1888)	?			Chaparral; Grassland; Sand or Sandstone; Misc. habitats	State CNPS List 1A
ERIOGONUM UMBELLATUM VAR. BAHIIFORME	*A2	(Nls-1888), OhlnP	?		X	Rock, Tallus or Scree; Serpentine	State CNPS List 4
ERIOPHYLLUM JEPSONII	*A2	SunlP			X	Chaparral; Serpentine; Woodland	State CNPS List 4
Eryngium castrense	A1	OhlnAr			X	Freshwater Marsh; Vernal Pools; Misc. Wetlands	Only current known site in Alameda County
Festuca elmeri	A2	(Nls-1972), SnAntoRsvr	X			Riparian	
GALIUM ANDREWSII SSP. GATENSE	*A2	OhlnAr, OhlnP			X	Chaparral; Serpentine; Woodland	State CNPS List 4
Galium trifidum var. pacificum	A2	SunlP			X	Misc. Wetlands	Only current known site in Alameda County

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30 cont.

Species Name	CNPS East Bay Rank	Locations on Alameda Watershed	On SFPUC Property	On SFPUC Property Leased by EBRPD	On EBRPD Property	Habitat	Comments
Gilia achilleifolia ssp. achilleifolia (ssp. multicaulis is more common)	A2	MssnPk, (Nls-1938), OhlnP, SunlOh, SunlP, (SunlT-1925)	?		X	Misc. habitats	
Glyceria occidentalis	A2	OhlnP, PlstnRdg			X	Misc. Wetlands	
Gnaphalium canescens ssp. microcephalum	A2	Nls, SunlF	?		X	Chaparral; Dry Open Slopes	
HELIANTHELLA CASTANEA	*A2	SunlP	X		X	Chaparral; Grassland; Woodland	CNPS List 1B. Already on SFPUC list of species proposed for protection in AW HCP. Note: Plants at Sunol are intermediate to Helianthella californica
Heterotheca oregona var. rudis	A1	SunlP		X		Dry Washes; Riparian	Only current known site in Alameda County. Recently found in northern Santa Clara County on SFPUC property
Heterotheca oregona var. scaberrima	A1	Nls, (SunlT-1886), (SunlVy-1916)	?			Dry Washes	
Hoita macrostachya	A2	AlaCkSV, SFWDSunl, SnAntoRsvr, SunlOh, SunlP	X	X	X	Freshwater Marsh; Riparian	
Hordeum jubatum	A2	SunlP			X	Misc. habitats	
Horkelia californica ssp. dissita	A2	OhlnP, SFWDPlstn	X		X	Riparian; Misc. Wetlands	
Hydrocotyle verticillata	A2	AlaCkSV	X			Freshwater Marsh	Only current known site in Alameda County
Hydrophyllum occidentale	A2	OhlnP			X	Chaparral; Riparian; Woodland; Misc. habitats	
Hypericum formosum var. scouleri	A1	(Nls-1905)	?			Freshwater Marsh; Riparian	
Idahoa scapigera	A1	OhlnP			X	Misc. Wetlands	Only current known site in East Bay

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Species Name	CNPS East Bay Rank	Locations on Alameda Watershed	On SFPUC Property	On SFPUC Property Leased by EBRPD	On EBRPD Property	Habitat	Comments
Isopyrum occidentale	A1	OhlnP			X	Chaparral; Forest; Woodland	Only current known site in East Bay
Juncus ensifolius(?)	A1	(SunlP-ID?)			X	Misc. Wetlands	
Keckiella corymbosa	A1	OhlnP, SFWD	X		X	Rock, Talus or Scree	
Lasthenia glaberrima	A2	SFWDSunl	X			Vernal Pools; Misc. Wetlands	
LATHYRUS JEPSONII VAR. JEPSONII (?)	*A2	(Nls-1970-ID)	?			Brackish Marsh; Freshwater Marsh	State CNPS List 1B. Habitat doesn't seem likely – most sites are in delta area. Voucher should be examined
Layia chrysanthemoides	A1	SunlP		X		Grassland	
Layia gaillardioides	A2	SunlP	X			Scrub; Woodland	
Leersia oryzoides	A1	Nls	?			Freshwater Marsh; Riparian; Misc. Wetlands	
LEGENERE LIMOSA	*A1	OhlnP			X	Vernal Pools; Misc. Wetlands	State CNPS List 1B. Only current known site in East Bay
Leptochloa fascicularis	A2	SunlP				Misc. Wetlands	Only current known site in Alameda County
Lessingia filaginifolia var. filaginifolia (var. californica is more common)	A2	(Nls-1969), PlstnRdg, SunlP	X		X	Grassland; Scrub; Woodland	
LESSINGIA HOLOLEUCA (historical-1940)	*A1x	(ClvrsRsvr-1940)	X			Grassland; Serpentine	State CNPS List 3
Lessingia nemaclada	A1	OhlnP			X	Dry Open Slopes; Rock, Talus or Scree; Woodland; Misc. habitats	Only current known site in East Bay
Lewisia rediviva var. rediviva	A2	OhlnP			X	Rock, Talus or Scree; Serpentine	
Limnanthes douglasii ssp. douglasii	A1	SunlOh			X	Vernal Pools; Misc. Wetlands	Only current known site in East Bay, but may not be a natural site
Limosella acaulis	A2	OhlnP, PlstnRdg			X	Misc. Wetlands	

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Species Name	CNPS East Bay Rank	Locations on Alameda Watershed	On SFPUC Property	On SFPUC Property Leased by EBRPD	On EBRPD Property	Habitat	Comments
LINANTHUS ACICULARIS	*A1	PlstnRdg			X	Chaparral; Grassland; Woodland	State CNPS List 4
LINANTHUS AMBIGUUS	*A2	OhlnP, SFWDSunl, SunIP	X		X	Grassland; Serpentine	State CNPS List 4
Linanthus dichotomus	A2	OhlnP, SFWDAr, SunIP	X		X	Gravel; Rock, Tallus or Scree; Sand or Sandstone; Serpentine	
Lithophragma parviflorum var. parviflorum	A2	OhlnP			X	Misc. habitats	
Lomatium nudicaule	A2	OhlnP, SFWDAr	X		X	Rock, Tallus or Scree; Woodlands	
Lotus strigosus	A1	(Nls-1972), SunIP	?		X	Chaparral; Scrub	
Ludwigia peploides ssp. peploides	A2	(Nls-1972)	?			Freshwater Marsh; Riparian; Misc. Wetlands	
Lupinus bicolor var. tridentatus (var. umbellatus is more common)	A1	(Nls-1904)	?			Misc. habitats	
Lycopus americanus (?)	A1	(SunIP-ID?)			X	Freshwater Marsh; Riparian	
Lythrum californicum	A2	MssnPk, (Nls-1972)	?		X	Misc. Wetlands	
Madia anomala	A1	(SunIP-1970)		X		Grassland	
MALACOTHAMNUS HALLII(?) (M. fasciculatus in Jepson Manual)	*A1	(ClvrsRsvr-1878, Loc?)	X			Chaparral	State CNPS List 1B
Mentzelia affinis	A2	SunlMg, SunIP			X	Grassland; Sand or Sandstone; Woodland	
Mentzelia laevicaulis (historical-1969)	A1x	(Nls-1969)	?			Dry Washes; Rock, Tallus or Scree; Sand or Sandstone	
Mentzelia lindleyi	A2	Nls, OhlnP, SFWDAr, SunIP	X		X	Rock, Tallus or Scree; Scrub; Woodlands	

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Species Name	CNPS East Bay Rank	Locations on Alameda Watershed	On SFPUC Property	On SFPUC Property Leased by EBRPD	On EBRPD Property	Habitat	Comments
MICROPUS AMPHIBOLUS(?)	*A1	(PlstnRdg-ID?)			X	Dry Open Slopes; Grassland; Rock, Tallus or Scree	State CNPS List 3
Microseris elegans	A2	SunIP			X	Grassland; Vernal Pools	Only current known site in Alameda County
Mimulus douglasii	A2	OhlnP			X	Chaparral; Gravel; Rock, Tallus or Scree; Serpentine; Woodland	
Mimulus pilosus	A2	AlaCkSV, (Nls-1967), SunlOh, SunIP	X	X	X	Dry Washes; Gravel; Riparian; Sand or Sandstone	
Minuartia pusilla	A2	OhlnP			X	Chaparral; Forest	
Mirabilis californica	A1	MssnPk			X	Chaparral; Dry Open Slopes; Dry Washes; Grassland; Rock, Tallus or Scree; Sand or Sandstone; Woodland	
Moehringia macrophylla	A1	OhlnP			X	Forest; Rock, Tallus or Scree; Serpentine; Woodland	Only current known site in Alameda County
MONARDELLA ANTONINA SSP. ANTONINA	*A1	SunlF, SunlMg			X	Chaparral; Rock, Tallus or Scree; Woodland	State CNPS List 3. Only current known sites in Alameda County
MONARDELLA VILLOSA SSP. GLOBOSA (ssp. villos is more common)	*A2	SunIP			X	Chaparral; Woodland	State CNPS List 1B. Already on SFPUC list of species proposed for protection in AW HCP
Navarretia intertexta ssp. intertexta	A1	OhlnP			X	Vernal Pools; Misc. Wetlands	Only current known site in Alameda County
Nicotiana quadrivalvis	A2	SunIP		X		Dry Open Slopes; Dry Washes	
Orobanche vallicola	A2	SunIP		X		Forest; Woodland	
Oxalis albicans ssp. pilosa	A2	(Nls-1968)	?			Chaparral; Grassland; Scrub	
Papaver californicum	A2	(SunIP-198? but not seen since)		X		Burns; Woodland	

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30 cont.

Species Name	CNPS East Bay Rank	Locations on Alameda Watershed	On SFPUC Property	On SFPUC Property Leased by EBRPD	On EBRPD Property	Habitat	Comments
Pectocarya penicillata	A1	SunlMg			X	Misc. habitats	Only current known site in Alameda County
Pectocarya pusilla	A2	MssnPk, OhlnP, SunlMg, SunlP			X	Grassland; Woodland; Misc. habitats	
Penstemon centranthifolius	A2	SFWDAr, SunlMg	X		X	Chaparral; Sand or Sandstone; Woodland	
Penstemon heterophyllus var. purdyi	A2	SFWDAr	X			Chaparral; Forest; Grassland	
Perideridia californica	A2	SnAntoRsvr, SunlOh, SunlP	X	X	X	Riparian	
Phacelia breweri	A2	OhlnP, (SunlP-ID?)			X	Chaparral; Rock, Tallus or Scree; Woodland	
Phacelia divaricata	A2	OhlnP, SFWDAr	X		X	Chaparral; Grassland; Woodland	
Phacelia malvifolia	A2	OhlnP, SunlP			X	Gravel; Sand or Sandstone	
Phacelia ramosissima var. ramosissima	A1	OhlnP	X		X	Dry Open Slopes; Dry Washes; Grassland; Misc. habitats	
Phacelia rattanii	A1	(SunlOh-1971)			X	Rock, Tallus or Scree	
Phacelia tanacetifolia	A2	(Nls-1904)	?			Gravel; Sand or Sandstone	
Pinus coulteri	A2	OhlnAr, OhlnP, SunlP			X	Chaparral; Forest	
Plagiobothrys tenellus	A2	OhlnP			X	Misc. habitats	
Plectritis congesta	A2	MssnPk			X	Coastal Bluff; Woodland	
Pleuropogon californicus	A2	OhlnP			X	Riparian areas; Misc. Wetlands	
Psilocarphus tenellus var. globiferus(?) (var. tenellus is more common)	A1	PlstnRdg-ID?			X	Vernal Pools; Misc. Wetlands	
Quercus chrysolepis var. nana	A2	OhlnP			X	Chaparral; Scrub	
Quercus durata var. durata	A2	SunlP			X	Chaparral; Serpentine	
Quercus palmeri	A1	SunlMg			X	Rock, Tallus or Scree	
Ribes aureum var. gracillimum	A1	(Nls-1894)	?			Riparian areas; Misc. habitats	
Ribes speciosum	A1	MssnPk			X	Chaparral; Scrub	

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Attachment to CNPS comments on WSIP PEIR

30 cont.

Species Name	CNPS East Bay Rank	Locations on Alameda Watershed	On SFPUC Property	On SFPUC Property Leased by EBRPD	On EBRPD Property	Habitat	Comments
Rorippa curvisiliqua	A2	SunlP		X		Freshwater Marsh	
Rumex maritimus	A2	SunlP		X		Brackish Marsh; Salt Marsh	
Rumex salicifolius var. denticulatus	A2	OhlnP, SFWDSunl, SnAntoRsvr, SunlOh	X	X	X	Misc. Wetlands	
Salix melanopsis	A1	Nls, (SunlVy-1916)	?			Riparian	Only current known site in East Bay
Scutellaria siphocampyloides	A1	OhlnP, SunlOh, (SunlP-1970)		X	X	Riparian areas; Misc. habitats	
Senecio flaccidus var. douglasii	A2	OhlnP, SFWDSunl, SunlP, (SunlVy-1916)	X		X	Dry Washes; Rock, Tallus or Scree; Sand or Sandstone	
Sidalcea diploscypha	A2	OhlnP			X	Grassland; Woodland	Only current known site in Alameda County
Silene verecunda ssp. platyota	A2	SunlF			X	Forest; Woodland	
Stachys ajugoides var. ajugoides (var. rigida is more common)	A2	(Nls-1972)	?			Misc. Wetlands	
Stachys bullata (?) (S. ajugoides var. rigida is more common)	A1	(SunlP-ID?)		?	?	Dry Open Slopes; Misc. habitats	
STREPTANTHUS ALBIDUS SSP. PERAMOENUS	*A2	SFWDSunl, SunlP	X		X	Chaparral; Dry Open Slopes; Grassland; Serpentine	State CNPS List 1B. Already on SFPUC list of species proposed for protection in AW HCP
Tonella tenella	A2	OhlnP, SunlP		X	X	Riparian areas; Misc. habitats	
Trifolium albopurpureum var. olivaceum	A2	OhlnP, SunlP			X	Misc. habitats	
Trifolium barbigerum var. andrewsii(?)	A1	OhlnP			X	Misc. habitats	
Trifolium barbigerum var. barbigerum	A2	OhlnP, PlstnRdg			X	Misc. habitats	
Trillium ovatum ssp. ovatum(?)	A2	(PlstnRdg-ID?)			X	Forest; Redwood Forest	

Species Name	CNPS East Bay Rank	Locations on Alameda Watershed	On SFPUC Property	On SFPUC Property Leased by EBRPD	On EBRPD Property	Habitat	Comments
Trisetum canescens	A2	(ClvrsRd-1964)	X			Forest; Misc. habitats	
Tropidocarpum gracile	A2	(SunlP-1970)		X		Alkali areas; Grassland	
Viola douglasii	A1	OhlnP			X	Grassland; Riparian; Serpentine	
Viola purpurea ssp. purpurea	A2	OhlnP, SunlP			X	Chaparral; Scrub; Woodland	
Viola purpurea ssp. quercetorum	A2	OhlnP			X	Grassland; Scrub	
Viola sheltonii	A2	OhlnP			X	Woodlands	
Vulpia microstachys var. confusa (var. pauciflora is more common)	A2	SunlP			X	Dry Open Slopes; Grassland; Sand or Sandstone; Scrub	

NOTE: Plant species followed by "(?)" have taxonomic or distribution problems and it is not clear if they occur here.

Dates indicated for historical species refer to last known record in the Alameda-Contra Costa Counties area.

Explanation of Ranks
***A1 or *A2**: Species in Alameda and Contra Costa counties listed as rare, threatened or endangered statewide by federal or state agencies or by the state level of CNPS.

A1x: Species previously known from Alameda or Contra Costa Counties, but now believed to have been extirpated, and no longer occurring here.

A1: Species currently known from 2 or less regions in Alameda and Contra Costa Counties.

A2: Species currently known from 3 to 5 regions in the two counties, or, if more, meeting other important criteria such as small populations, stressed or declining populations, small geographical range, limited or threatened habitat, etc.

Explanation of Location Site Codes
AlaCkSv – Alameda Creek in Sunol Valley, between Geary Rd. and San Antonio Reservoir
ClvrsRd – Calaveras Rd. from Geary Rd. to Alameda/Santa Clara boundary
ClvrsRsvr – Calaveras Reservoir or nearby
MssnPk – Mission Peak Regional Park
Nls – Niles Canyon (Note: Specific sites are unknown for most of these species and it is not clear if they occur on SFPUC property or not)

Explanation of Location Site Codes (cont.)
OhlnAr – Private land near Ohlone Regional Wilderness
OhlnP – Ohlone Regional Wilderness
PlstnRdg – Pleasanton Ridge Regional Park
SFWDAr – San Francisco Water District Property in Alameda County
SFWDPlstn – San Francisco Water District Property near Pleasanton Ridge
SFWDSunl – San Francisco Water District Property near Sunol Regional Wilderness
SnAntoRsvr – San Antonio Reservoir or nearby
SunlAr – Sunol area (unknown if refers to town, park, or valley)
SunlF – Sunol Regional Wilderness – Flag Hill
SunlMg - Sunol Regional Wilderness – Maguire Peaks
SunlOh - Sunol Regional Wilderness – Camp Ohlone area
SunlP - Sunol Regional Wilderness
SunlT – Town of Sunol
SunlVy – Sunol Valley

Attachment to CNPS Comments on WSIP PEIR

California Native Plant Society

East Bay Chapter P.O. B... Berkeley, CA 94705

May 4, 2006

Alameda County Board of Supervisors
1221 Oak Street
Oakland, CA 94607

RE: Support for the proposed moratorium on development in riparian areas in Alameda County – Board of Supervisors meeting on May 4, 2006 – Item #16.

Dear Esteemed Alameda County Supervisors:

The East Bay Chapter of CNPS (EBCNPS) thanks to Board of Supervisors for hearing our comments regarding the proposed moratorium on creek development in the unincorporated areas of Alameda County. The California Native Plant Society is a non-profit organization of more than 10,000 laypersons, professional botanists, and academics organized into 32 chapters throughout California. The Society's mission is to increase the understanding and appreciation of California's native plants and to preserve them in their natural habitat through scientific activities, education, and conservation.

Our goal is to provide science-based information on the ecological significance of the existing streams and associated riparian corridors, highlighting the fact that the ecological significance of these stream systems is born from the connectivity between the active channel (blue-line stream), the riparian area, and their associated floodplains[1]. The protection of these significant areas requires a policy that will encompass and protect the entire stream system as initially promulgated and agreed upon in the Draft Environmental Impact Report (DEIR) entitled *Specific Plan: Riparian Areas Flood Plain Zoning*, written by the Alameda County Planning Department. 31

EBCNPS is concerned with the lack of regulatory compliance with the DEIR and the repercussions that may ensue due to the County's non-compliance. The DEIR outlines a three step process by which active channels (streams) and their associated riparian areas and vegetation, and the floodplain. These areas are to be prioritized, studied, and finally areas are to be designated as significant areas on the "Assessors Blocks" books. This plan was certified by the Alameda County Board of Supervisors on November 4th, 1976.

EBCNPS would like to present known ecological information supporting the ecological significance of 13 of the 29 creeks listed in the abovementioned certified DEIR. The following creeks have known to have significant ecological value which may include 1) rare vegetation communities, 2) federally protected species, or 3) species

[1] Robert J. Naiman, Henri Decamps, and Michael Pollock. 1993. The Role of Riparian Corridors in Maintaining Regional Biodiversity, *Ecological Applications*, (3) 2, pp. 209-212

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Attachment to CNPS Comments on WSIP PEIR

California Native Plant Society

protected under CEQA[2]. Although precise surveys and designations are the responsibility of the county, the CNPS vegetation team, led by California Department of Fish and Game biologist Todd Keeler-Wolf, has determined the need for surveys as prescribed in the DEIR of 1976. Todd Keeler-Wolf is the author of definitive methods for vegetation community identification[3] that have been adopted and/or utilized by California State Parks and the National Park Service among others, and his expertise in this area is well recognized. Creeks are listed in alphabetic order within the three designations of concern promulgated by CNPS: Creeks and riparian areas with known significant ecological value with regulatory protection, Creeks and riparian areas with high probability of having ecological significance and regulatory protection, and Creeks and riparian areas which require surveying in order to determine their ecological significance (CNPS does not have enough information to comment on these creeks).

Creeks and riparian areas with known significant ecological value with regulatory protection

Alameda Creek - Alameda creek is a high priority, particularly upstream from the gravel mines near the Hwy 680 crossing. A large stand of sycamores occurs between the gravel pits and Welch Creek Rd. Good riparian and associated upland watershed vegetation and habitat up Welsh Creek and other tributaries of Alameda creek above the gravel pits and into Sunol Regional Wilderness. This includes the Sycamore grove along San Antonio Creek both above and below San Antonio Dam. The portion of Alameda creek meandering through the Sunol area and Niles Canyon is of particular interest for Unusual and Significant species. 31 cont.

Altamont Creek - This drainage has some interesting springs and seeps with alkaline vegetation that is quite unusual for Alameda Co. Definitely some other wetland features exist in the vicinity of Brushy Peak (Brushy Creek drainage etc.). This drainage and Arroyo las Positas should be treated collectively here due to their hydrological and ecological connectivity. This drainage supports an abundance of Alkali vegetation communities and *Atriplex* spp. such as *A. depressa* and *A. joaquiniana* as well as *Centromadia parryi* ssp. *congdonii*. Areas of vegetation communities dominated by *Allenrolfea occidentalis* are also present.

Arroyo Mocho - A fine stand of sycamores on exists in the lower reaches of the stream. Excellent watershed values and good riparian in upper reaches above junction of del Valle Rd and Mines Road make this is one of the most biodiverse watersheds in Alameda Co. Serpentine soils and associated flora of the Mines Road portion of this drainage are especially sensitive for reasons of both serpentine communities and species.

Arroyo las Positas – Please see comments on Altamont Creek and its associated flora. Additionally, potential areas of vernal pools (vernal pool associates) may be present

[2] Lake, Dianne. 2004. *Rare, Unusual and Significant Plants of Alameda and Contra Costa Counties.* Seventh Edition. East Bay Chapter, California Native Plant Society, Sacramento, CA.
[3] Sawyer, John O. and Todd Keeler-Wolf. 1995. *A Manual of California Vegetation.* California Native Plant Society, Sacramento, CA

Attachment to Comments by CNPS on NSIP PEIR

California Native Plant Society

outside of the top-of-bank of this drainage, especially in areas of private land that haven't been surveyed.

Arroyo del Valle - Near south Livermore this drainage supports a large grove of *Platanus racemosa* (a sensitive natural community[3]). A majority of this community is located within Sycamore Grove Park and is protected but a small amount of this community may extend outside of the park. Although sycamore grove below the dam has suffered as a result of summer realease from the reservoir, the sycamore stand at Sycamore Grove park is still viable and much of the drainage above the Reservoir ranging south to Eylar Mountain is diverse and largely unspoiled.

Collier Canyon - Much private, un-surveyed land exists there they may support species found within the riparian corridor. Suitable habitat for alkaline vegetation communities and CEQA-protected species such as *Centromadia* spp. and *Atriplex* spp. are present.

Corral Hollow Creek - Interesting riparian and northern range limits of several species including Desert Olive (*Foresteria pubescens*) along this creek. This creek is probably the best example of an "east-side" San Joaquin River tributary in the county. Additionally, its tributaries are key here for Unusual and Significant species of both plants and animals (notably reptiles).

Tassajara Creek - The upper drainage in Contra Costa Co. is a high quality stream system. Riparian woodland is present in the lower portion (constituted of oaks and willows). However, probably heavy fragmentation and development pressure affects this creek. Also, alkaline sensitive natural communities and special status species here such as *Centromadia* spp. and *Atriplex* spp. are present.

31 cont.

Creeks and riparian areas with areas ecological significance with regulatory protection requiring more inventory and study of specific significant plants and communities

Collier Creek
Crow Creek
Cull Creek
Palomares Creek
San Leandro Creek
Sinbad Creek

Creeks and riparian areas which require surveying in order to determine their ecological significance (CNPS does not have enough information to comment on these creeks)

Alamo Creek
Arroyo de la Laguna
Arroyo Seco
Castro-Kelly Creek

Attachment to CNPS Comments on NSIP PEIR

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Castro Creek
Cametano Creek
Chabot Creek
Collier Canyon Creek
Cottonwood Creek
Dublin Creek
Eden Creek
Hollis Canyon Creek
Martin Canyon Creek
San Lorenzo Creek
Sulphur Creek
Ward Creek

In addition to providing known information about creek habitats, a second list of CEQA-protected plant species for thirteen (13) of the listed creeks: ***Alameda**, **Altamont**, Arroyo Mocho, Arroyo las Positas, Arroyo del Valle, Collier Canyon, Corral Hollow, Cull, Palomares, San Leandro, San Lorenzo, Sinbad,* and *Ward.* Please find these lists attached as appendices to the end of this document. Creek lists are organized alphabetically.

31 cont.

EBCNPS recommends that the County of Alameda Board of Supervisors adopt the presented moratorium on development in all areas delineated and described in the DEIR of 1976. EBCNPS recommends that the moratorium be enacted with the following conditions: a) the moratorium will restrict any new development in the areas delineated by the adopted DEIR: blue-line, riparian, and floodplain areas, and b) the moratorium be enacted for an indefinite period of time until Alameda county comes under compliance. Until further study can be conducted, and the adopted plan be enacted, the County of Alameda is in a state of non-compliance which may result in serious repercussions for both the environment and the people it serves.

Thank you for the opportunity to participate in this important proceeding and helping Alameda County maintain its commitment to environmental sustainability. If you have any questions, please contact me at (510) 734-0335

Sincerely,

Lech Naumovich
Conservation Analyst
California Native Plant Society
East Bay Chapter

Attachment to Comments by CNPS on WSIP PEIR

California Native Plant Society

Rare and Unusual Plants of Alameda Creek

(Statewide Rare Plants in Upper Case)

31 cont.

East Bay Rank	Species
A1	Antirrhinum multiflorum
A2	Aquilegia eximia (A. formosa is more common)
A1	Artemisia dracunculus
A2	Carex nebrascensis
A2	Carex nudata
A2	Carex senta
A1	Cercis occidentalis
A2	Chrysothamnus nauseosus ssp. mohavensis
*A1	CLARKIA CONCINNA SSP. AUTOMIXA (ssp. concinna is more common)
A2	Clarkia purpurea ssp. viminea (ssp. quadrivulnera is more common)
A1	Cornus glabrata
A2	Cuscuta californica var. californica
A2	Eleocharis parishii
A1	Erigeron reductus var. angustatus
A2	Eriogonum angulosum
A2	Eriogonum fasciculatum var. foliolosum
*A1	ERIOGONUM TRUNCATUM
*A2	ERIOGONUM UMBELLATUM VAR. BAHIIFORME
A2	Festuca elmeri
A2	Gnaphalium canescens ssp. microcephalum
*A2	HELIANTHELLA CASTANEA
A1	Heterotheca oregona var. rudis
A1	Heterotheca oregona var. scaberrima
A2	Hoita macrostachya
A2	Hydrocotyle verticillata
A1	Hypericum formosum var. scouleri
*A2	JUGLANS CALIFORNICA VAR. HINDSII
*A2	LATHYRUS JEPSONII VAR. JEPSONII
A2	Leersia oryzoides
A1	Limnanthes douglasii ssp. douglasii
*A2	LINANTHUS AMBIGUUS
A2	Lotus strigosus
A1	Lupinus bicolor var. tridentatus (var. umbellatus is more common)
A1x	Mentzelia laevicaulis
A2	Mentzelia lindleyi
A2	Mimulus pilosus
A2	Nicotiana quadrivalvis
A2	Orobanche vallicola
A2	Oxalis albicans ssp. pilosa
A2	Perideridia californica
A2	Phacelia tanacetifolia
A2	Pinus coulteri
A2	Polygonum hydropiperoides
A1	Ribes aureum var. gracillimum
A2	Rorippa curvisiliqua

Attachment to Comments by CNPS on WSIP PEIR

California Native Plant Society

31 cont.

A2	Rumex maritimus
A2	Rumex salicifolius var. denticulatus
A1	Salix melanopsis
A1	Scutellaria siphocampyloides
A2	Senecio flaccidus var. douglasii
A1	Sparganium erectum ssp. stoloniferum
A2	Stachys ajugoides var. ajugoides (var. rigida is more common)
*A2	STREPTANTHUS ALBIDUS SSP. PERAMOENUS
A2	Tonella tenella

12.4-32

Attachment to CNPS Comments on WSIP PEIR

California Native Plant Society

Rare and Unusual Plants of Arroyo Mocho

(Statewide Rare Plants in Upper Case)

East Bay Rank	Species
*A2	ACANTHOMINTHA LANCEOLATA
A1	Achnatherum lemmonii
A2	Allium amplectens
A1	Allium bolanderi var. bolanderi
*A1	ALLIUM SHARSMITHAE
A2	Allophyllum divaricatum
A1	Antirrhinum multiflorum
A2	Aquilegia eximia (A. formosa is more common)
A1	Artemisia dracunculus
*A1	ASTRAGALUS BREWERI
A1?	Astragalus oxyphysus(?)(A. asymmetricus is more common)
*A1	BALSAMORHIZA MACROLEPIS VAR. MACROLEPIS
A2	Berberis aquifolium var. dictyota
A1	Calochortus invenustus
A2	Calycadenia truncata
A2	Calystegia malacophylla ssp. pedicellata
A2	Camissonia graciliflora
A2	Carex nudata
A2	Castilleja applegatei ssp. martinii
A2	Ceanothus leucodermis
A1	Chaenactis glabriuscula var. glabriuscula
A1	Chaenactis glabriuscula var. megacephala
A2	Cheilanthes covillei
A2	Cheilanthes intertexta
A2	Chrysothamnus nauseosus ssp. mohavensis
*A1	CIRSIUM FONTINALE VAR. CAMPYLON
*A1	CLARKIA BREWERI
A2	Clarkia modesta
A2	Claytonia gypsophiloides
A2	Collinsia parviflora
*A1	COREOPSIS HAMILTONII
A1	Cornus glabrata
A1	Crocidium multicaule
A1	Cryptantha clevelandii
A2	Cryptantha torreyana
A2	Delphinium californicum ssp. californicum
*A1	DELPHINIUM CALIFORNICUM SSP. INTERIUS
*A1	DELPHINIUM GYPSOPHILUM SSP. GYPSOPHILUM
A1	Delphinium parryi ssp. parryi
A1	Descurainia pinnata ssp. menziesii
A2	Dicentra chrysantha
A2	Eleocharis parishii
A2	Eriogonum luteolum var. luteolum
*A2	ERIOPHYLLUM JEPSONII
A2	Eschscholzia caespitosa
A2	Festuca elmeri
A2	Forestiera pubescens

31 cont.

Attachment to CNPS Comments on WSIP PEIR

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*A2	FRITILLARIA AGRESTIS
*A1	FRITILLARIA FALCATA
A1	Garrya congdonii
A1	Garrya fremontii
A1?	Helianthella californica var. californica(?)
A1	Heterotheca oregona var. scaberrima
A2	Hoita macrostachya
A1	Holozonia filipes
A2	Hydrophyllum occidentale
A1	Isopyrum stipitatum
A2	Keckiella breviflora var. breviflora
A2	Layia gaillardioides
A1x	Lepidospartum squamatum (historical-1933)
A2	Lewisia rediviva var. rediviva
*A2	LINANTHUS AMBIGUUS
A2	Linanthus dichotomus
A2	Lithophragma parviflorum var. parviflorum
A2	Lomatium caruifolium var. caruifolium
A2	Lomatium nudicaule
A1	Lotus crassifolius var. crassifolius
A1	Lupinus bicolor var. tridentatus (var. umbellatus is more common)
A2	Mentzelia lindleyi
A2	Microseris campestris
A1?	Mimulus androsaceus(?)
A1	Mimulus bolanderi
A2	Mimulus douglasii
A2	Mimulus douglasii
A1?	Mimulus floribundus(?)
A1	Mimulus kelloggii
A2	Mimulus pilosus
A2	Mimulus pilosus
A1	Mimulus rattanii
*A1	MONARDELLA ANTONINA SSP. ANTONINA
A2	Nicotiana quadrivalvis
A2	Orobanche bulbosa
A1	Pediomelum californicum
A2	Perideridia californica
A2	Phacelia breweri
A2	Phacelia divaricata
A1x	Phacelia egena
A2	Phacelia malvifolia
A2	Phacelia ramosissima var. ramosissima
A1	Phacelia rattanii
A2	Phacelia tanacetifolia
A2	Pinus coulteri
A2	Plagiobothrys tenellus
A2	Quercus durata var. durata
A1	Ribes aureum var. gracillimum
A2	Ribes quercetorum
A2	Rumex salicifolius var. denticulatus
A1	Salix breweri
A1	Scirpus koilolepis
A1	Scutellaria siphocampyloides

31 cont.

Attachment to CNPS Comments on WSIP PEIR

California Native Plant Society

A2	Senecio flaccidus var. douglasii
A1?	Stachys bullata(?)(S. ajugoides var. rigida is more common)
A1	Streptanthus breweri var. breweri
A1	Stylocline gnaphaloides
A2	Tonella tenella
A1	Viola douglasii
A2	Viola purpurea ssp. quercetorum
A2	Viola sheltonii
A2	Vulpia microstachys var. confusa (var. pauciflora is more common)
A1	Zigadenus venenosus var. venenosus (Z. fremontii is more common)

31 cont.

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

CNPS-Santa Clara Valley response to draft PEIR

Kevin Bryant <mtngreen17@verizon.net> **Mon, Oct 1, 2007 at 4:10 PM**
To: wsip.peir.comments@gmail.com

October 1, 2007

Paul Maltzer, Environmental Review Officer

San Francisco Planning Department

1650 Mission Street, Suite 400

San Francisco, CA 94103

Re: SFPUC Water System Improvement Program ("WSIP"), Program EIR

Dear Mr. Maltzer,

I am writing to you on behalf of the Santa Clara Valley Chapter of the California Native Plant Society. We represent a diverse cross section of citizens concerned about the conservation, protection and restoration of native plants and their habitat in this state. We have reviewed the draft PEIR ("the Plan") issued by your department, and have several concerns about it.

Inadequate Level of Detail

From an overall perspective, we find the PEIR lacking sufficient detail and analysis to be able to support its own conclusions of the future needs of the regional water system, the environmental impact of the proposed projects, and what it proposes to be as appropriate mitigation measures. In many instances, the Plan acknowledges its possible lack of sufficient detail or completeness, and indicates that a subsequent Project 01

Report will be complete, addressing all concerns.

There are twenty-two WSIP Facility Improvement Projects listed in Table S.2. As of the final date of the public comment period for this PEIR, the SFPUC has only published NOPs/EIRs for nine of the Projects. The Plan's lack of detail and reliance on Project EIRs that are unavailable to the public at this time, make it impossible for the public to determine the validity of the impact analysis and its related mitigation measures provided in the Plan. We urge the SFPUC to timely publish all twenty-two projects, so they can be analyzed together, in a more coherent context. We also request that the commission provide local work sessions for each project, in the geographical areas affected by the projects. 01 cont.

Flawed Analysis of Demand Needs and Underestimate of Conservation Measures

We share the goals stated in Table S.1, and recognize the merit of maintaining high water quality and delivery reliability, providing for seismic and structural reliability, sustainable and cost effectiveness, and meeting customer needs. But, we are troubled by the analysis offered regarding the water supply needs and measures to meet them. 02

We do not believe that adequate consideration has been given to conservation measures. The PEIR substantially overestimates water demand in Santa Clara County because of faulty assumptions and flawed data sources. The total population of users is a biased and uses an invalid sampling method, resulting in an overstatement of future needs. The analysis also fails to take into consideration the reductions in demand achievable by conservation. We endorse the critiques of the demand analysis by the Pacific Institute[1] and the Loma Prieta Chapter of the Sierra Club. If this Plan is implemented as proposed it will have a substantial growth-inducing effect on Santa Clara County resulting in increased pressure on open space and demand for services and infrastructure, which are in no way covered by the proposed mitigations. We strongly urge that this PEIR be re-drafted reflecting more realistic projections of growth needs and conservation potential based on the findings cited above of the Pacific Institute. 03

Insufficient Impact Analysis and Mitigation Measures

Mitigations to compensate for the WSIP are proposed, by the Habitat Reserve Program[2] ("HRP") to take place in advance of actual analysis of impacts. And these have insufficient site specific data on which sound decisions can be made. 04

Data on impacts at specific sites must be presented and analyzed and mitigations designed which are appropriate and adequate to the expected project consequences. The information for both mitigations and impacts is far too sketchy for this document. It is not clear from the Plan where some of these mitigations would be, or if they are feasible, or perhaps already completed by some other agency. The Plan should specifically identify the mitigations anticipated, and verify their status as new mitigations, or if piggybacking or in any way related to a pre-existing mitigation, what the new mitigation effort is arising from this Plan.

Several of the mitigations presented lack any detail as to what the mitigation would be. A few examples cited below from Table S.4 exemplify this:

Measure 4.6-1a, Wetlands Assessment

"Wetland scientist will determine whether wetlands could be affected…and if so, perform a wetland delineation and develop mitigation."

Measure 4.6-3b, Standard Mitigation Measures for Key Special-Status Plants and Animals

"Implement measures to reduce impacts on key special-status species."

The HRP described its efforts in its NOP as the "coordinated and consolidated approach to compensate for habitat impacts" resulting from this Plan. Where, for example would the HRP's seventy-five acres of serpentine grassland be found? Would this be an acquisition of new land? The Santa Clara County HCP/NCCP is proposing acquiring thousands of acres of serpentine grassland in their county as mitigation for takes of serpentine endemics. How will this affect any contemplated acquisition? 04 cont.

The information on site impacts is equally vague. There is better data currently available from several sources which should be included and analyzed in the DEIR. Data is being developed by the Upland Habitat Goals project of the Bay Area Open Space Council which should be consulted. In the area of the Calaveras Reservoir data from the CNDDB show a population of most beautiful jewelflower (*Streptanthus albidus* ssp. *peramoenus*) in the Arroyo Hondo, (R. Preston, 2003). The habitat for the callippe silverstreak butterfly, the Johnny-jump-up (*Viola pedunculata*) larval plant was mapped by R. Arnold (ca 2005) and provided to the SFPUC.

Diversion of 25 million gallons per day from the Tuolumne River

We do not support this measure. The impact on the Tuolumne River is not sufficiently known to offer a diversion plan of 25 million gallons per day. There has not been a comprehensive study of the Tuolumne River in over fifteen years, and several sections of the proposed diversion lack strong scientific documentation. While the SFPUC began a study of the impact on the Tuolumne River in 2006, several years of study are required to provide sufficient data and analysis of the impact. Absent further information as to the environmental impact of this substantial change to the Tuolumne River, we find the Plan deficient. 05

In total, our organization believes that this proposed DEIR is fundamentally flawed for the reasons cited above. We think that the cumulative impact of the twenty-two WSIP projects will be staggering, significantly more environmentally harmful in the aggregate than this Plan envisions. In the attached Appendix A, we have identified several specific deficiencies in this Plan. We do not consider this an exhaustive list, but merely representative of the many inadequacies of the Plan. We urge your department to reject this Plan as it is currently drafted and send it back to the SFPUC for significant revisions. 06

Regards,

Kevin Bryant

President, Santa Clara Valley Chapter

California Native Plant Society

Cc: Pacific Institute

Sierra Club, Loma Prieta Chapter

Appendix A

Specific Examples of Matters of Concern

I. Inadequate Level of Detail

a. Calaveras Dam Replacement, though deferred due to land and water rights negotiation, is included as integral part of PEIR and Habitat Reserve Program but, without specifics on extensive excavation of Calaveras Creek and watershed, its proposed advance mitigation compounds cumulative impacts to vegetative habitat. 07

b. Pilarcitos Creek's emergency diversions to San Andreas and Crystal Springs Reservoirs are not detailed as to sustainable stream flows needed for 947-acre California endangered and federally threatened Marbled murrelet critical habitat. 08

c. This PEIR in legend on Figure 5.7-4 PP-1a states "Peninsula Watershed Habitat Conservation Plan (sub-project of Alameda WMP)" which is only reference to a doubling up on biological resource evaluation in two 09

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distinctly different watershed that has not been mentioned before in scoping documents or in Peninsula WMP. Is this an accurate statement of plans for an' under the radar' environmental review? 09 cont.

II. Flawed analysis of Demand Needs and Under Estimate of Conservation Measures

a. There appears to be bias in data sources used in 'demand needs' analysis, and with an invalid sampling of total population users it overstates future water needs. 10
b. Figure S.3 Annual Average Historical and Projected Future Customer Purchase Requests illustrates this critical difference between water usage by SFPUC Retail Water Customers and Wholesale Water Customers 11
c. Lack of substantiation of need for water use increases seems evident in requests by Alameda County Water District, Hayward, City of Santa Clara, Milpitas, City of San Jose (North), and City of East Palo Alto, where recycled water is readily available for anticipated shoreline development. Reduced water treatment plant outflows would result in less salt marsh conversion, and more in 40 mgd increase. 12
d. Upstream conservation capabilities exist for Stanford University who requests a 76% increase and Purissima Hills Water District a 51% increase. Purissima Hills Water District with 2100 connections is credited in PEIR with 94,555 residences in its 2000 sphere of influence, when it services part of Town population of 7902. 13

III. Insufficient Impact Analysis and Mitigation Measures

a. CEQA Law and Guidelines #15126 requires that all phases of a project must be considered when evaluating its impact on the environment and this includes c.) mitigation measures proposed to minimize the significant effects. 14

b. Cumulative Impacts, Mandatory Findings of Significance and Tiering are CEQA constraints that are not satisfactorily adhered to in this all-encompassing project. 15

c. In particular this entire PEIR is predicated on diversion of 25 mgd of Tuolumne River water from its upper watershed which may, as seen in 'Significant Effects' of CEQA "conflict with adopted plans and goals of community where it is located and interfere substantially with movement of any resident or migrating fish or wildlife species". The Tuolumne and San Joaquin Rivers have plans. 16

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[1] A Review of the San Francisco Public Utilities Commission's Retail and Wholesale Customer Water Demand Projections (2007).

[2] 2006 1505E.

Paul Maltzer
Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103-2479

October 15, 2007

Dear Mr. Maltzer,

In consideration of the extension of response time for comments upon the San Francisco Public Utility Commission's Water System Improvement Program (WSIP) Draft Programmatic Environmental Impact Report (PEIR), please accept an addendum to my attachment to the California Native Plant Society, Santa Clara Valley Chapter's letter of October 1, 2007, in regards substantive concerns of inadequacy in the PEIR.

~ A plan to increase Calaveras Reservoir capacity with the Calaveras Dam Replacement the PEIR states on page 9-118 has been rejected by SFPUC due to time constraints in satisfying DSOD requirements, but is dam replacement height to be at a level that will accommodate this future enlarged reservoir and if so, when can public input be made? Then, if present reservoir level is to remain, why are not sediment basins incorporated around Calaveras Reservoir (as exist on Crystal Springs and San Andreas Reservoirs) to extend life of reservoir capacity and create sites for feasible wetlands mitigation? Proposed mitigation associated with Calaveras Dam in regards recontouring streams, removing instream grade structures and natural (erosion controlling) habitats such as Coyote Bush, is to be geomorphologically engineered on existing stream flow data? Revegetation of restored stream channels based on historic hydrology is not proposed? 01

~ Pilarcitos Creek and Pilarcitos Reservoir impacts due to diversions to Crystal Springs and San Andreas Reservoirs are evaluated as less than significant without addressing environmental degradation of the 947-acre critical habitat of the Marbled murrelet, a California endangered and federally threatened species. This small seabird feeds at sea but nests "inland in mature conifer forests with open-crown canopies such as Douglas fir, western hemlock, Sitka spruce, coastal redwood, and mountain hemlock forests". Pilarcitos Creek flows through length of this critical habitat between Pilarcitos Lake and Stone Dam so can alteration, diminution or seasonal cessation of this streamflow so degrade health of the conifer forest as to impact critical Marbled murrelet habitat? Can PEIR provide model of data on amounts and timing of Pilarcitos flow diversions? Is there an evaluation of impacts to Half Moon Bay's groundwater basin as a result of upstream Pilarcitos Creek diversions? In drought will this cause saltwater intrusion? As treated water is stored in Crystal Springs and San Andreas Reservoirs, will transfer of this water to Pilarcitos Reservoir, as reserve, affect water quality to a degree that might impact critical habitat, native grasses and wetlands or special status species? 02

~ Is PEIR legend on Figure 5,7-4 PP-1a accurate when it states "Peninsula Watershed Habitat Conservation Plan (sub-project of Alameda WMP)"? Not only are these two watersheds distant geographically, but they are distinctly different biological regions. What mention of this is referenced in Peninsula Watershed Management Plan DEIR? 03

Much of Peninsula Watershed is a designated California Department of Fish & Game Refuge and as such qualifies for special level of conservation practices and protection. Surrounded by State, County and Open Space District parkland it provides continuity of wildlife corridor and high caliber vegetative habitat which needs to be accurately surveyed or its integrity will be diminished if not lost. Please reference the grassland vegetation designations as detailed by Toni Corelli, Rare Plant Botanist, in comment on this PEIR and with supporting maps and California Native Species Field Survey of Lessingia arachnoidea occurring throughout serpentine bunchgrass grassland between Crystal Springs Reservoir and #280. If this area is slated for high disturbance, could grassland specialists of our Native Plant Society collect seeds or salvage plantings? Can this PEIR confirm where mitigation serpentine grassland acreage is to be found? Will SFPUC provide alternatives to joining Peninsula and Alameda watershed HCP's? 04

~ In Volume 4 of 5, Page 6-5 SFPUC Construction Methods 8. Biological Resources: mentions that the biologist would carry out a site survey by walking or driving over project site to note general resources and presence of habitat for special status species. Is this survey protocol acceptable to California Department of Fish & Game? We do urge SFPUC to conduct surveys on foot and over a representative period of seasons and in wet and dry years. If they cannot conduct scientific surveys due to lack of staff or cost of consultants CNPS might field volunteers to assist project site assessment. As so much of terrain to be impacted by this Hetch Hetchy upgrade is pristine or at least so long undisturbed as to be an exceptional biological resource, could special BMP's be mandated for cleaning of boots and any construction equipment for project? Can special BMP's be instituted to reduce all possible introduction of invasives? 05

~ In regards Crystal Springs Reservoir, modified operation to manage inundation levels, as discussed in Section 5.5, it is preferred alternative if reservoir levels are adjusted to preserve the oak woodland habitat (as achieved prior to 1983) and not drown wetlands and request analysis of cumulative impacts of 'treated reservoir' waters on vegetation. Where would oak woodland mitigation acreage be reserved and will it be one for one? What impact will raised water levels have on sediment basins sited around reservoirs? 06

~ Flawed analysis of Demand Needs and Under Estimate of Conservation Measures is a critical element of PEIR and support data for assumptions must be given reevaluation? Please review legislative mandates that show water conservation is a State level issue; AB325, AB1881, and AB2717 clearly support 'water smart landscapes' for California.

~ Communities listed as requesting sizable water supply increases should be questioned for some substantiation of need and for documentation of water conservation efforts. Can data for these water supply requests be forwarded to State for verification? This is a consideration not only in regards to submitted landscape plans and ordinances, but State Water Resources has base data on public and private wells permitted in area. 07

~ Upstream conservation reservoirs and underground water tanks are essential elements of SFPUC facilities but shouldn't emphasis be placed on customers and water retail contractors incorporating these backup supply capabilities into their community plans?

~ Then, analysis of cumulative impacts resulting from increased water supply should include San Francisco Bay saltmarsh conversion from increased sewage plant outflow, an increase in flood hazards (from development runoff from impervious surfaces) to low lying and shoreline communities, and a loss of open space? Growth inducement potential in foothills and in higher density shoreline development would acerbate both these scenarios, as would predicted effect of global warming on rising Bay tide levels? Is State Department of Water Resources review mandated for evaluation of base data? 08

~ Recycled water use is way behind projections in areas such as North San Jose and East Palo Alto should place that as an option before considering use of groundwater. 09

~ Costs of alternate water supply sources such as desalination are almost prohibitive and when factored into general public's water bill (if caused by waste and careless consumption by privileged citizenry) can cause undue hardship. San Francisco's City Charter has as mandate (2) Establish equitable rates sufficient to meet and maintain operation, maintenance and financial health of the system: (7) Develop and implement a comprehensive set of environmental justice guidelines for use in connection with its operation and projects in the city. When San Francisco citizens approved bond money to upgrade SFPUC Hetch Hetchy system didn't they intend to receive equitable rates? 10

City Charter mandate (4) is to 'Protect and manage lands and natural resources used By SFPUC to provide utility services consistent with applicable laws in an environmentally sustainable manner.' Please take this mandate to heart and do not 'go lite' on evaluating impacts to biological resources. If time permitted I could cite many instances in the PEIR which do not fully reflect anticipated impacts to these resources. 11

SFPUC lands provide, to a large degree, a last frontier of unimpacted natural habitat. Please avail yourselves of all possible private volunteer assistance in preserving some vestige of this original California landscape. 12

Thank you for your kind consideration of these concerns.

Libby Lucas

Libby Lucas, Conservation
Santa Clara Valley Chapter
California Native Plant Society
174 Yerba Santa Ave., Los Altos, CA 94022

SI_CNPS-WLJ

Willis L. Jepson Chapter
California Native Plant Society
Serving Solano County

October 1, 2007

Mr. Paul Maltzer
Environmental Review Officer, WSIP PEIR
San Francisco Planning Department
1650 Mission Street, Suite 400,
San Francisco, CA 94103
wsip.peir.comments@gmail.com

RE: San Francisco Public Utilities Commission WSIP DEIR

Dear Mr. Maltzer:

The Willis L. Jepson Chapter of the California Native Plant Society (Solano County) appreciates the opportunity to comment on the *Water System Improvement Project (WSIP DEIR)*. The California Native Plant Society (CNPS) is a non-profit organization of more than 10,000 laypersons, professional, and academic botanists organized into 32 chapters throughout California. The mission of the CNPS is to increase the understanding and appreciation of California's native plants and to preserve them in their natural habitat through scientific activities, education, and conservation.

The proposed WSIP asks for the removal of an additional 25 million gallons of water per day (mgd) from the already impacted Tuolumne River. This river is an important natural resource which is home to many native plants and animals. Withdrawal from the river would take place in the Sierra Nevada in the upper watershed where it magnifies the primary impacts upon the riparian communities at the source. But the impacts extend to the San Francisco/ San Joaquin Delta where 01
freshwater flows are already heavily depleted. Further reductions in flow through the Delta have the potential to further destabilize this fragile ecosystem which has already been severely impacted. The Tuolumne is the largest remaining source of freshwater to the San Joaquin River. There are also impacts across San Joaquin, Alameda, Santa Clara, and San Mateo counties from individual components of the system, and planned water withdrawals from creeks in Alameda and San Mateo counties.

We oppose the withdrawal of additional water because we believe that a concerted effort towards water conservation should precede additional projects which would cause significant environmental impact. We believe it is completely feasible to conserve the equivalent of 38 mgd 02
for 2.4 million people, or about 15 gallons per day per person with education, cooperation and creativity.

Thank you for your consideration of the above comments.

Sincerely,

Tedmund J. Swiecki, Ph.D.
Conservation Committee Co-Chair
Willis L. Jepson Chapter, California Native Plant Society
phytosphere@phytosphere.com

SI_CRS

Diana Sokolove <wsip.peir.comments@gmail.com>

SFPUC Environmental Review of Tuolome River

1 message

Meredith Wingate <mwingate@resource-solutions.org> **Wed, Sep 26, 2007 at 3:46 PM**
To: wsip.peir.comments@gmail.com
Cc: Jake.McGoldrick@sfgov.org, gavin.newsom@sfgov.org, Brad Drda <bradrda@gmail.com>

Hello,
Please find attached my letter to Mr. Paul Maltzer, Environmental Review Officer at the San Francisco Planning Department regarding environmental review of the San Francisco Public Utilities Commission's plan to take more water from the Tuolumne River.
Thx,

Meredith Wingate
Director Clean Energy Policy Design and Implementation Program
Center for Resource Solutions
Ph: 415/561-2107
mwingate@resource-solutions.org
www.resource-solutions.org

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SI_CRS

September 26, 2007

Mr. Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Maltzer:

Your environmental review of the San Francisco Public Utilities Commission's plan to take more water from the Tuolumne River fails to adequately identify and address all of the environmental impacts to the River. I urge you to undertake additional studies before finalizing this document. 01

The Tuolumne River supports a diverse biological community and as the largest of three major tributaries to the San Joaquin River, the Tuolumne River contributes much-needed freshwater to the San Francisco Bay-Delta. About 60% of the Tuolumne River is already diverted for urban and rural uses, and increasing diversion will do further harm to the River. As part of its Water System Improvement Program (WSIP), the San Francisco Public Utilities Commission (SFPUC) has proposed diverting an additional 25 million gallons of water per day from the Tuolumne River. 02

Water conservation and efficiency measures are the cheapest, easiest, and least destructive ways to meet demand and extend supply. The SFPUC's "preferred alternative" ignores conservation, efficiency, and recycling measures that their own studies found could eliminate the need to divert more water from the Tuolumne by at least 74%. Per capita water use is projected to increase for wholesale customers, indicating they lack effective conservation programs. 03

Decreasing reliance on the Tuolumne is critical not only for protecting the health of the River, but also for preparing for the future uncertainty of the Sierra snowpack as a result of global warming. By pursuing a plan to divert additional water from the Tuolumne River, the SFPUC risks delaying their capital program, causing cost overruns and failing to increase the reliability of the water supply. 04

Recommendations

The SFPUC should re-evaluate its projections for future water demand and conservation potential in light of flaws and inaccuracies in their studies. You should conduct a study to determine the maximum technical potential for conservation and efficiency savings within the SFPUC service territory. 05 Any additional demand should be met through increased investment in conservation, efficiency, and recycling. The SFPUC should adopt a policy of reducing diversions from the Tuolumne River over time. 06 A comprehensive watershed study should be completed to adequately assess the environmental impacts of the WSIP. 07 I support the alternatives identified in your draft document that protect the Tuolumne River from new diversions. Only by ensuring that healthy amounts of water continue to flow into the Tuolumne River can we protect this irreplaceable natural treasure. 08

Sincerely,

Meredith Wingate
Brad Drda
233 18th Ave.
San Francisco, CA 94121

CC:
Supervisor Jake McGoldrick
Mayor Gavin Newsom

SI_CSERC

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

Comments from CSERC

Brenda Whited <brendaw@cserc.org> **Mon, Sep 10, 2007 at 11:35 AM**
To: wsip.peir.comments@gmail.com

Central Sierra Environmental Resource Center
P.O. Box 396
Twain Harte, CA 95383

September 10, 2007

San Francisco Planning Department
Attention: Paul Maltzer
Environmental Review Officer, WSIP PEIR
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Maltzer,

We at the Central Sierra Environmental Resource Center (CSERC) would like to emphasize our position in agreement with the views of the Tuolumne River Trust regarding the proposed Water System Improvement Program by the San Francisco Public Utilities Commission. We concur with the Tuolumne River Trust that there are immeasurable benefits to both wildlife and recreation in leaving the water in the Tuolumne River. 01

The Aggressive Conservation/Water Recycling and Local Groundwater Alternative is an excellent plan that should precede any additional diversion of water from the Tuolumne River. San Francisco lags behind other major metropolitan areas in water conservation, and with increased water conservation and recycling, San Francisco could potentially reduce consumption of water from the Tuolumne River rather than increase consumption. We encourage the SFPUC and citizens of San Francisco and surrounding counties to implement these conservation efforts before further degrading the already sensitive Tuolumne River habitat. 02

Thank you for taking the time to consider our comments. Feel free to contact CSERC if you have any further questions.

Sincerely,

Brenda Whited
Staff Biologist

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CLEAN WATER ACTION

October 1, 2007

Bill Wycko, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Ste. 400
San Francisco, CA 94103
VIA FACSIMILE: (415) 558-6409

Re: WSIP Draft PEIR Comments – Case # 2005.0159E

Dear Mr. Wycko:

On behalf of Clean Water Action, I would like to add the following comments to those submitted in conjunction with Tuolumne River Trust and the Sierra Club.

Our organization submitted scoping questions in October 2005 which have not been adequately addressed in this document, specifically;

There has been insufficient analysis of the ability of the program to meet current and foreseeable regulations. The Stage 2 Disinfection Byproducts Rule, adopted concurrently with the Long Term 2 Enhanced Surface Water Treatment Rule, is neither mentioned nor analyzed in the document. If no system changes will be required to meet the new rule, that determination and the justification for it should be included in this document. However, the level of disinfection byproducts currently found in the system is not sufficiently low to warrant an assumption of compliance with the Phase 2 Rule. 01

The impact of increased discharge to San Francisco Bay is not evaluated. Most of the increased demand is projected to occur in the South Bay. Because there is less scouring and mixing in this portion of the Bay, water quality is already compromised to such an extent that current regulations require tertiary treatment of all discharges. The increased pollutant loading that can be anticipated as a result of the additional demand should be analyzed in this document. 02

Thank you for allowing us the opportunity to comment on this document.

Sincerely,

Jennifer Clary
Water Policy Analyst

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111 New Montgomery St. Suite 600
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2005.0159E
WATER SYSTEM IMPROVEMENT PROGRAM
(SEKOLOVSKI)

District 3 Democratic Club
P.O. Box 330512
San Francisco, CA 94133
d3dc@hotmail.com

HEARINGS ON DRAFT PROGRAM EIR ON SFPUC WATER SYSTEM IMPROVEMENT PROGRAM

Thursday, September 20, 2007
City Hall, Room 400

COMMISSIONERS, Tony Gantner, President, District Three Democratic Club.

Our Club is deeply concerned about any action taken by the PUC that would allow more water to be diverted from the Tuolumne River. We believe that: The Rights of the Environment are Equal to Human and Civil Rights, and that Compassion for the Environment is as Compassion for our Fellow Human Beings.

Within that belief system, the proposed diversions---on their face---are presumptively harmful to fisheries and sensitive riparian habitat. It is our understanding that the draft EIR released by the PUC does not properly indentify and address the impacts of taking more water from the Tuolumne, and that such diversions would be for cutomers outside of San Francisco. 01 We realize that growth projections for the Bay Area over the next generation are pressuring the PUC to allow these increased diversions---but the rights of---and compassion for---the environment must be acknowledged. There must be limits to growth's impact on the environment---conservation and recycling are one solution. 02 In this City which can rightly be called the cradle of environmentalism, do not betray your heritage---the Tuolumne fisheries are as much entitled to healthy ecosytems as each of you is entitled to live in a clean and green urban environment.

Thank you.

SI_EcoCtr

ecology center

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CITY & COUNTY OF S.F.
PLANNING DEPARTMENT

10/3/07

Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Maltzer:

Your environmental review of the San Francisco Public Utilities Commission's plan to take more water from the Tuolumne River fails to adequately identify and address all of the environmental impacts to the River. We urge you to undertake additional studies before finalizing this document. Only by ensuring that healthy amounts of water continue to flow into the Tuolumne River can we protect this irreplaceable natural treasure. 01

The Ecology Center is a membership-based ecological resource for the East Bay. One of our many functions is to bring pioneering sustainable living projects, such as the water-recycling greywater system at the Berkeley Eco House, to our members and the public as an alternative to increasing consumption.

We support the alternatives identified in your draft document that protect the Tuolumne River from new diversions. Requiring more water conservation, efficiency, and recycling is the best way to lessen impacts on the Tuolumne River while promoting a sustainable water plan for the Bay Area.

Conservation and recycling are the way of the future, in water as in other resources. Many other metropolitan areas have been able to reduce their water consumption even while growing, but the SFPUC projects Bay Area water demand to increase. The SFPUC's own studies found that conservation, efficiency, and recycling measures could reduce the need to divert more water from the Tuolumne. 02

Clearly the Bay Area could take advantage of more opportunities for water conservation and recycling than it does currently. Since water conservation and efficiency measures are the cheapest, easiest, and least destructive ways to meet demand and extend supply, conservation and development of recycling strategies is the only sensible route for meeting Bay Area water needs.

Sincerely,

Martin Bourque
Executive Director
(510) 548-2220 X 234

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environmental defense
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October 1, 2007

Mr. Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission St., Suite 400
San Francisco, CA 94103.

Re: Environmental Defense comments regarding the Draft Program Environmental Impact Report on the San Francisco Public Utilities Commission's Water System Improvement Program

Dear Mr. Maltzer:

Environmental Defense appreciates the opportunity to comment on the Draft Program Environmental Impact Report (PEIR) for the San Francisco Public Utilities Commission's (SFPUC) Water System Improvement Program (WSIP).

The WSIP is a comprehensive program with two stated interrelated but distinct goals: (1) to repair and modernize the SFPUC's aging and seismically vulnerable infrastructure, and (2) to develop additional water supplies to meet anticipated future demands in the SFPUC service area.

Environmental Defense fully supports the timely completion of projects necessary to repair existing infrastructure and protect the SFPUC's water supply system from earthquakes or other disasters. These projects are critical to ensure the reliable delivery of water supplies to Bay Area communities and should be completed as soon as possible. 01

The appropriate formulation of additions to the SFPUC's water supply portfolio that meets anticipated future needs is less clear. Fortunately, future needs are developed gradually and the program to meet them need not be fully developed at this time.

Environmental Defense recommends that the Planning Commission pursue such a two-tiered approach that accommodates timely completion of infrastructure repair projects and a thoughtful deliberate approach to a water supply portfolio that meets anticipated future demand. 02

The remainder of these comments will focus on aspects of the SFPUC's water supply portfolio that should be considered, including not only items analyzed in the Draft PEIR but others as well.

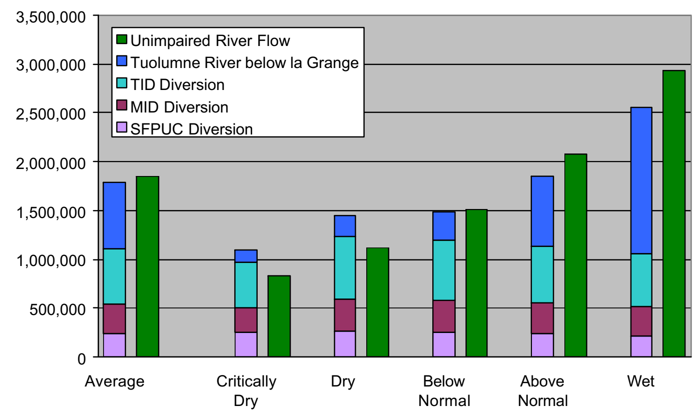
Diversions from the Tuolumne River

The alternatives considered in the Draft PEIR include up to 35 million gallons per day in increased diversions from the lower Tuolumne River to the San Francisco Bay Area. While the 03

proposed increase might be considered only a small portion of overall Tuolumne flows, Environmental Defense believes that it is time to put water back into California's rivers and streams, especially those in the Central Valley and Bay Delta watershed, rather than take more water out.

Figure 1 below provides a graphical view of how Tuolumne River flows are managed, reflecting operations of the Turlock and Modesto Irrigation Districts and of the San Francisco Public Utilities Commission (under its "Unconstrained" alternative). Note that while the lower river retains 38% of its flows on average, in dry and critically dry years it retains only 14% and 12%, respectively, of its natural flow. 03 cont.

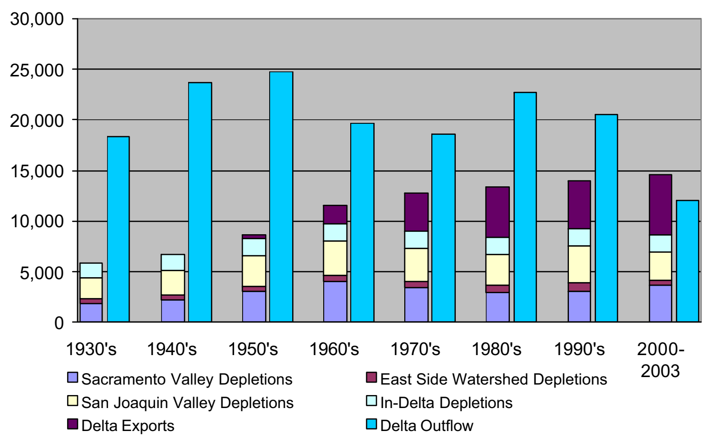
Environmental Defense concurs with the Draft PEIR that further dewatering the lower Tuolumne River would cause further harm to the river's health and make it more difficult for the river to support naturally reproducing Chinook salmon. 04



Additional diversions of water from the lower Tuolumne River would have impacts on the lower San Joaquin River and Bay-Delta estuary as well. The Delta's woes are well known, including the federal court ruling in late August that restricts exports at the State and federal pumps to prevent the extinction of Delta smelt. These new export restrictions are entirely due to increased flow requirements on two reaches of the lower San Joaquin River, specifically Old and Middle Rivers. 05

If the Tuolumne River is further depleted, so too will be the lower San Joaquin River. Either Delta smelt and other pelagic fish will suffer, or State and federal contractors will be forced to give up water to accommodate the additional diversions on the Tuolumne River. 05 cont.

Figure 2 provides an overview of how development of water supplies in the Bay-Delta and Central Valley Watershed has increased over time. Environmental Defense believes it is time to reverse this trend and leave more, not less, water in our rivers. 06



Accordingly, Environmental Defense is pleased that the Bay Area Water Supply and Conservation Association has chosen to pursue an approach that would invest in agricultural conservation in the Central Valley. BAWSCA's plan would more than offset incremental diversions to meet demand in the Bay Area, allowing additional flows to be managed for the benefit of the lower river[1]. There is precedent for similar arrangements in other parts of California, including mechanisms for verifying that reduced consumptive use actually takes place. Such a program would meet anticipated needs in the Bay Area and improve conditions in the lower Tuolumne River and Bay-Delta as well. 07

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[1] This approach is outlined in BAWSCA's staff memorandum, September 14, 2007. The memorandum and Environmental Defense's letter of support for this approach are attached.

Lower Tuolumne Diversion

Environmental Defense supports the alternative considered in the PEIR that would install a diversion point on the lower Tuolumne River just above its confluence with the San Joaquin River, from which water would be diverted into the San Joaquin Pipelines. Such a diversion point would provide two principle benefits. First, it would increase flows and provide benefits to the health of the lower Tuolumne River. Second, it would provide the SFPUC important physical access to the lower Tuolumne River that would be indispensable in case access to its diversion point at Early Intake were rendered inoperable for any reason. 08

Such a diversion would need to be constructed so that its does not entrain fish. Presumably, a "gallery" under the river could be designed for this purpose. Additionally, this water would likely need to be filtered, either before being put into the San Joaquin Pipelines, or at the existing plant in Sunol. While it is understandable that the SFPUC may prefer not to add filtration capacity, doing so would add a level of water supply reliability that may well justify the cost.

Connection to the California Aqueduct

The Draft PEIR, in part citing the desire to avoid filtration, failed to consider a connection to the California Aqueduct (or Delta-Mendota Canal). The PEIR did consider, as described above, a lower Tuolumne River diversion point that would likely require filtration.

What makes sense, in terms of increased flexibility, is a filtration plant near the confluence of the Tuolumne and San Joaquin Rivers, which is also near the California Aqueduct. Combined, these facilities would add important diversity to the SFPUC system, which could, under some scenarios, avoid interruption of water supplies to 2.4 million people in San Francisco and other Bay Area communities. 09

To be clear, a physical connection to the California Aqueduct might only be used under emergency circumstances. It might never be used. There is no reason that the SFPUC should not rely on the high quality Tuolumne River for its imported water supply. The suggestion to connect the SFPUC to the California Aqueduct is not intended to mean that the SFPUC would rely on Delta supplies. It is a suggestion that the SFPUC could prevent potentially critical water supply outages by installing the physical capacity, along with institutional agreements with other parties as necessary, to access Delta supplies as backup in case Tuolumne supplies are not available or adequate.

Conservation / Water Use Efficiency

Environmental Defense supports aggressive urban water conservation programs. We have not closely followed the details of recent discussions of what is "feasible" within the SFPUC retail and wholesale service territories, but believe that the definition of feasibility should include the consideration that conserved water supplies help to protect the natural environment. We believe 10 the discussion of how much urban conservation is desirable should be continued as a water supply portfolio is developed. 10 cont.

Groundwater

We believe the SFPUC should pursue increased use of groundwater in dry years, as described in various PEIR alternatives. 11

Desalination

The Draft PEIR considers desalination as a potential source of water in two different ways: (1) a plant to be built near the beach in San Francisco and operated every year, and (2) a plant that would be co-owned with other Bay Area water agencies and used only in dry years. Environmental Defense believes both ideas are worthy of consideration and should be more fully developed but strongly cautions that desalination brings significant challenges as well. First, any project must address issues including the entrainment of fish and wildlife along with voluminous brine disposal considerations. Second, while desalination technology is improving, the energy needs are still significant and must be considered in light of California's commitment to reduce greenhouse gas emissions as specified by AB32. The cost of any desalination plant should reflect a plan to provide either energy through renewable resources or full mitigation for emissions incurred by its energy use. 12

Alameda Creek and Calaveras Dam

Environmental Defense supports replacement of Calaveras Reservoir to its design capacity of 97,000 acre-feet. 13

Environmental Defense supports restoration of steelhead trout in Alameda Creek. We believe that steelhead restoration will be best achieved if the Alameda Diversion Dam is removed and fishery flows, without downstream recapture, are incorporated in the operating criteria of the rebuilt Calaveras Reservoir. 14

Thank you for the opportunity to comment on the Draft PEIR. We look forward to continuing to work with the San Francisco Planning Department and the Public Utilities Commission to find ways to provide a reliable supply of high quality water to Bay Area communities as we protect and restore our natural environment.

Spreck Rosekrans
Senior Analyst

e
environmental defense
finding the ways that work

September 18, 2007

Ms. Rosalie O'Mahony
Chair, BAWSCA Board of Directors
155 Bovet Road, Suite 302
San Mateo, California 94402

Re: Water Supply Objectives

Dear Ms. O'Mahony:

Environmental Defense has reviewed the staff memorandum, September 14, 2007, titled "Presentation and Discussion of Proposed BAWSCA Comments on Draft PEIR for Water Supply Improvement Program".

We concur with BAWSCA staff in two important respects.

First, we agree that it is urgent to complete improvements to aging and seismically vulnerable infrastructure as soon as possible.

Second, we are pleased and encouraged that BAWSCA has identified investments in agricultural conservation as a way to provide water supply for its members while increasing flows in the lower Tuolumne River. This is essentially the approach Environmental Defense laid out as far back as 1983 when we published "Trading Conservation Investments for Water". We believe this plan, if properly implemented, presents a cost-effective way to provide water to the urban Bay Area, improve on-farm conservation, and benefit not only the lower Tuolumne River but the lower San Joaquin River and Bay-Delta as well. 15

As BAWSCA pursues opportunities to improve agricultural conservation, we trust it will aggressively pursue conservation among its urban customers as well. In addition, while the plan may improve conditions on the lower river, we continue to have an interest in finding ways both to restore Hetch Hetchy Valley in Yosemite National Park and to protect the stretch of the river between Hetch Hetchy and Don Pedro Reservoir. 16

We look forward to working with BAWSCA in this and other efforts to improve our environment while providing reliable water supplies to California's cities and farms.

Sincerely,

Spreck Rosekrans
Senior Analyst

California Office · 5655 College Avenue · Suite 304 · Oakland, CA 94618 · Tel 510 658 8008 · Fax 510 658 0630 · www.environmentaldefense.org
New York, NY · Washington, DC · Boulder, CO · Raleigh, NC · Austin, TX · Boston, MA   Project Office : Los Angeles, CA

TO: Board of Directors, BAWSCA

FROM: Art Jensen, General Manager
Ray McDevitt, Legal Counsel

DATE: September 14, 2007

RE: **Presentation and Discussion of Proposed BAWSCA Comments on Draft PEIR for Water Supply Improvement Program**

On June 29, the San Francisco Planning Department released for public review a five-volume draft of the Program Environmental Impact Report (PEIR) on the SFPUC's Water Supply Improvement Program (WSIP). Comments are due by October 1. BAWSCA staff, working with consultants, have carefully reviewed the lengthy and detailed draft PEIR. We have worked closely with the Technical Advisory Committee (TAC), comprising staff from each of BAWSCA's members, to develop a coordinated response.

The purpose of this report is to provide BAWSCA's Directors a summary of our analysis of the draft and our approach to preparing comments on it. The September 20th board meeting will include presentations and discussion of key concepts included in our comments to obtain board direction prior to finalizing and submitting written comments on the PEIR.

SUMMARY OF ANALYSIS AND PROPOSED COMMENTS

The Draft PEIR Meets the Legal Requirements of CEQA

The draft PEIR is a conscientious effort to satisfy CEQA requirements for Program EIRs. It provides a clear description of the program (the WSIP), the environmental impacts it is likely to cause, ways to mitigate the impacts identified where possible, and a range of alternatives to the program as formulated by the SFPUC, including an "environmentally superior alternative." It is an objective document prepared by competent professionals in a variety of disciplines. While it is not perfect by any means, there are no fundamental or pervasive flaws. In our view, it satisfies the standard for EIRs established by California courts.

Basic Aims of BAWSCA's Comments

BAWSCA comments on the draft PEIR will, of course, point out errors in the document. But they will go beyond that to proactively supplement the draft's treatment of important topics which are given less emphasis or analysis than we think they deserve. BAWSCA's comments will:

1. Refocus attention on the underlying reason for the WSIP – the protection of 2.5 million people from the human and economic catastrophe that would result from a 30-60 day interruption of water after a major earthquake.

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2. Provide additional facts that demonstrate BAWSCA members' success in developing diverse portfolios of water supply sources, their customers' frugal use of water compared to the rest of California, and their plans for future increased efficiency in the use of potable water supplies.

3. Support the "Environmentally Superior Alternative" and encourage the SF Planning Department to expand the description of the alternative in the final PEIR. The core of this alternative – that the Bay Area support agricultural water conservation efforts in the Tuolumne River Basin itself - has the prospect of satisfying a broad range of environmental and economic goals and warrants more detailed analysis.

Organization of BAWSCA's Comments

1. BAWSCA will focus on the regional picture. Individual agencies will provide specific information on water use within their service areas, including current and planned-for conservation and development of alternate sources; projected growth in population, jobs, and water use; and the impact of curtailed water deliveries during drought in their communities.

2. BAWSCA comments will be separated into two sections. Section One will address three broad themes, while Section Two will contain detailed comments to correct, clarify, or expand the treatment of specific issues on a section-by-section basis.

Main Themes in BAWSCA's Comments

1. It is urgent to complete the rehabilitation of the regional system as soon as possible.

   The draft PEIR is surprisingly thin on the basic reason for the WSIP: to protect public health and safety and the economic well-being for 2.5 million existing residents and over 31,000 businesses in the counties of Alameda, Santa Clara, San Mateo and San Francisco. BAWSCA will review the Bay Area's exposure to seismic hazards, the USGS estimated probability of a major earthquake by 2030, the regional water system's heightened risks (key facilities directly on or over faults, old, history of poor maintenance) the SFPUC's forecast of facilities likely to fail in a major earthquake, and the public health, safety and economic consequences of an extended (30-60 day) lack of water to the metropolitan area.

2. Most alternatives to the WSIP discussed in the PEIR have serious defects.

   - No Project. With this alternative, the metropolitan area remains at risk of the system's catastrophic failure in an earthquake, as well as more of frequent outages due to failures of aging components.

   - No More Water for Wholesale Customers. The draft PEIR states that this alternative is intended to limit growth in the BAWSCA service area and thereby avoid the environmental impacts associated with growth (traffic, air pollution, etc.). The BAWSCA response will be twofold. First, this tactic is not likely to succeed in achieving its goal, since BAWSCA agencies may secure water from other sources (with their own environmental consequences) or add people and jobs as contemplated in their general plans without additional water supplies. Second, if growth in the BAWSCA service area is prevented or delayed in this manner, the environmental consequences would be worse. Growth would simply be deflected to the periphery of the Bay Area or into the Central Valley -- with more severe impacts on air quality, carbon emissions, and water use. "Smart growth" of the kind now encouraged by communities in the already urbanized Bay Area core (i.e., the BAWSCA service area) is environmentally preferable to diffuse growth on agricultural lands at the fringes of the region or even beyond.

- Aggressive Conservation and Recycling. The draft PEIR recognizes that it is not feasible to meet all of the region's projected growth in demand through 2030 solely from intensified conservation, building more recycled water plants, and pumping more groundwater within the BAWSCA service area. It also recognizes the environmental impacts of such a strategy. One such impact that deserves further attention is the impact that "hardening" demand through conservation has on a community's ability to further reduce water use during a drought. The draft recognizes that this alternative would require more severe (25% systemwide) rationing during droughts and that this would occur much more often. BAWSCA will address the environmental and economic harm that a 25% systemwide reduction would have and recommend that the final PEIR clarify how a 25% system-wide reduction would be applied to San Francisco retail customers as compared to wholesale customer agencies. The comments will also explain why a goal of 10% maximum systemwide rationing (included in the draft PEIR as a "variant") is economically and environmentally preferable.

3. The "Environmentally Superior Alternative" holds promise and should be more thoroughly analyzed in the final PEIR.

This alternative assumes a more realistic goal of achieving an additional 5 mgd in water conservation or recycling in BAWSCA service area by 2030. The centerpiece of this alternative is for Bay Area communities to support water efficiency initiatives in the agricultural areas adjacent to the Tuolumne River itself – specifically Modesto Irrigation District (MID) and Turlock Irrigation District (TID). MID and TID together divert about 50% of the average flow of the river at New Don Pedro, whereas San Francisco and BAWSCA combined use is only about 12%. (And even the additional demand forecast for 2030 represents only a 1.6% increase in total Tuolumne River diversions.) 17

BAWSCA, with the assistance of experts in agricultural irrigation and natural resource economics, has identified opportunities for saving considerable amounts of water in the MID/TID area at considerably less cost than comparable efforts in the Bay Area, where major investments in water efficiency have already been made. In fact, it may be possible to support water efficiency measures in the MID/TID service areas that would more than offset incremental San Francisco diversions necessary to meet gradually increasing Bay Area demand. These additional savings could then be committed to provide water at the times and in the quantities most beneficial for salmon in the lower Tuolumne River. The alternative could be further improved by the new water agreement

allowing BAWSCA agencies to freely exchange water entitlements among themselves. This alternative offers the prospect of (1) allowing Bay Area communities continued access to high quality drinking water, (2) not only maintaining, but increasing, flows in the lower Tuolumne River, and (3) supporting growers in their efforts to keep prime agricultural land in production. 17 cont.

CONCLUSION

We look forward to reviewing these points with the board, answering questions and providing further background to our proposal that BAWSCA endorse the Environmentally Superior Alternative.

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September 18, 2007

Ms. Rosalie O'Mahony
Chair, BAWSCA Board of Directors
155 Bovet Road, Suite 302
San Mateo, California 94402

Re: Water Supply Objectives

Dear Ms. O'Mahony:

Environmental Defense has reviewed the staff memorandum, September 14, 2007, titled "Presentation and Discussion of Proposed BAWSCA Comments on Draft PEIR for Water Supply Improvement Program".

We concur with BAWSCA staff in two important respects.

First, we agree that it is urgent to complete improvements to aging and seismically vulnerable infrastructure as soon as possible.

Second, we are pleased and encouraged that BAWSCA has identified investments in agricultural conservation as a way to provide water supply for its members while increasing flows in the lower Tuolumne River. This is essentially the approach Environmental Defense laid out as far back as 1983 when we published "Trading Conservation Investments for Water". We believe this plan, if properly implemented, presents a cost-effective way to provide water to the urban Bay Area, improve on-farm conservation, and benefit not only the lower Tuolumne River but the lower San Joaquin River and Bay-Delta as well.

As BAWSCA pursues opportunities to improve agricultural conservation, we trust it will aggressively pursue conservation among its urban customers as well. In addition, while the plan may improve conditions on the lower river, we continue to have an interest in finding ways both to restore Hetch Hetchy Valley in Yosemite National Park and to protect the stretch of the river between Hetch Hetchy and Don Pedro Reservoir.

We look forward to working with BAWSCA in this and other efforts to improve our environment while providing reliable water supplies to California's cities and farms.

Sincerely,

Spreck Rosekrans
Senior Analyst

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New York, NY · Washington, DC · Boulder, CO · Raleigh, NC · Austin, TX · Boston, MA   Project Office : Los Angeles, CA

GREENPEACE

September 22, 2007

Paul Maltzer,
Environmental Review Officer
Water System Improvement Program PEIR
San Francisco Planning Department
1660 Mission Street, Suite 500
San Francisco, CA 94103-2414

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CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
M E A

Dear Mr Maltzer,

I am writing on behalf of Greenpeace to express our concern with the current plan as laid out by the SFPUC to divert an additional 25 million gallons of water from the Tuolumne River every day. The SFPUC already diverts one third of the River's water. In total we divert 60% of the Tuolumne's water for urban and rural usage. Diverting more of the water will have a serious impact on wildlife, the surrounding ecosystems and the Bay Area Delta that relies on the Tuolumne for freshwater. 01

The modeling used to determine the anticipated increase in water demand by the Draft Program Environmental Impact Report (PEIR) is flawed thus inflating projected future needs. 02 Additionally the PEIR fails to properly identify and address all of the impacts of taking more water from the Tuolumne River due to the fact that it lacks an adequate and current baseline study of the Upper Tuolumne River. 03 The PEIR also fails to address the impact climate change will have on precipitation in the Tuolumne River basin. Additional studies should be undertaken before finalizing the PEIR. 04

Conservation and environmental awareness are values that the Bay Area prizes. However when it comes to water usage we are not doing enough. Metropolitan areas such as Seattle and Los Angeles have managed to reduce their water demand in the face of growth. The draft PEIR identifies conservation measures and Greenpeace supports those measures. Conservation, efficiency and recycling are the best way to provide for the needs of the Bay Area in a sustainable manner while protecting this vital resource and a California treasure from further diversions. 05

Sincerely,

Krikor Didonian
Greenpeace

75 Arkansas Street, Suite 1, San Francisco, CA 94107, USA • tel: (415) 255-9221 • fax (415) 255-9201 • www.greenpeaceusa.org

SI_GWWF1

September 29, 2007

Mr. Paul Malzer
Environmental Review Officer, WSIP PEIR
1650 Mission Street, Suite 400
San Francisco, CA 94103

Re: Draft Program Environmental Impact Report, WSIP

Dear Mr. Malzer:

I am writing to you as Conservation Chairperson on behalf of the Golden West Women Flyfishers, a 25 year old angling club with a long history of supporting conservation, environmental and educational efforts. We have approximately 125 members in Northern California. Please accept these comments for the record on the Draft Program EIR.

We strongly object to the increased diversions from the Tuolumne River which is enduring more than a 60% diversion rate since it would put this wonderful fishery at great risk. I have personally fished many sections of the river, from the Poopenaut Valley to the area above the Don Pedro Reservior as well as the lower Tuolumne. 01

We are currently working hard to restore and protect the threatened Central Valley Steelhead which reside below La Grange dam and also to provide adequate flows for the Fall Run Chinook salmon which are at an extremely low population level due to low water flows. To divert more water out of this beleagered river, which is designated as Wild and Scenic, would do great harm to these fish. 02

We urge reassessment of water needs in the future and consideration of increased water conservation and efficiency of usage.

Thank you for your consideration,

Cindy Charles
Conservation Chair
Golden West Women Flyfishers

12.4-48

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Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

Water System Improvement Program

Joseph Vaile <joseph@kswild.org> **Thu, Sep 27, 2007 at 10:59 AM**
To: wsip.peir.comments@gmail.com

Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Maltzer:

Many of our members and supporters are frequent visitors to both the Tuolumne River and the great City of San Francisco. We are concerned that your environmental review of the San Francisco Public Utilities Commission's plan to take more water from the Tuolumne River fails to adequately identify and address all of the environmental impacts to the River. We urge you to undertake additional studies before finalizing this document. 01

We support the alternatives identified in your draft document that protect the Tuolumne River from new diversions. Requiring more water conservation, efficiency, and recycling is the best way to lessen impacts on the Tuolumne River while promoting a sustainable water plan for the Bay Area. 02

Only by ensuring that healthy amounts of water continue to flow into the Tuolumne River can we protect this irreplaceable natural treasure.

Sincerely,

/s/ Joseph Vaile

--
Joseph Vaile
Campaign Director
Klamath-Siskiyou Wildlands Center
POB 102 Ashland OR 97520
p: 541-488-5789
http://www.kswild.org

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OUR FILE NO. 347919-6

December 12, 2007

Paul Maltzer
Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Re: Draft Program EIR for the San Francisco Public Utilities System Water System Improvement Program

Dear Mr. Maltzer:

We are writing in response to the Draft Environmental Impact Report ("DEIR") for the proposed San Francisco Public Utility Commission ("SFPUC") Water System Improvement Program ("WSIP"). We represent Menlo Business Park LLC, owner of a business park in Menlo Park, California, which likely will be affected by the construction activities that are planned as part of the Bay Division Pipeline Reliability Upgrade Project (the "Project") portion of the WSIP. Project impacts of particular concern include traffic, parking, and public safety. It is our understanding that the SFPUC will address these issues in project-level environmental review and we are submitting comments to the Project EIR team under separate cover. We want to share these concerns with the Program EIR team as well in the event the SFPUC elects to include analyses or mitigation in the WSIP EIR. 01

Background

Menlo Business Park LLC ("MBP") is the owner of Menlo Business Park, a 50-acre/15 building complex located east of the 101 Freeway in the City of Menlo Park, California (see attached map). MBP provides high quality, modern industrial and research and development facilities in a planned campus environment with landscaping, on-site parking, and very high standards of tenant service. Current tenants include Boise-Cascade (Office Max), United Parcel Service, PPD Discovery, DepoMed and a variety of high technology and biotech firms. The property has also served as corporate headquarters for two of the Peninsula's success stories, Cisco Systems, which outgrew the MBP facility and Guidant, which was purchased by Johnson & Johnson. 02

In 1983, the predecessor of MBP, Dumbarton Distribution Center, purchased from the City and County of San Francisco ("CCSF") multiple easements on CCSF land directly adjacent to the business park. MBP and its tenants use these easements for, among other things, parking, ingress, egress, and landscaping. It is our understanding that the Bay Division Pipeline Reliability Upgrade Project will involve excavating and installing a new water transmission pipeline in the easement area. The goal of MBP is to avoid or minimize any adverse Project-related impacts to MBP or its tenants.

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Comments

MBP understands that the nature of a "program" EIR on a project program of this scale is inherently general, and we wish to bring to your attention specific concerns of MBP related to the Bay Division Pipeline Reliability Upgrade Project that are not addressed in the WSIP DEIR. We ask that the SFPUC address these issues in the "project-level" environmental review. Specifically we are concerned about: (1) the disruption of traffic circulation and pedestrian access at and in the vicinity of Menlo Business Park, (2) the displacement of parking at Menlo Business Park and street parking in the vicinity of Menlo Business Park, and (3) the logistics of returning the construction work areas at Menlo Business Park to pre-Project conditions. 03

Traffic and Circulation

As recognized by the Department in the WSIP DEIR, the Bay Division Pipeline Reliability Upgrade Project is located in an urbanized area making the "open-cut trench" method of construction likely to result in significant impacts on traffic operations.[1] The WSIP DEIR traffic analysis appropriately considers the impact to regional transportation. Equally significant, however, are the localized traffic and circulation issues. At Menlo Business Park, Project construction activities may disrupt or block access to driveways and streets, and access to buildings. MBP is concerned about the Project-impacts on Menlo Business Park facilities and operations, and on the operations of MBP tenants. Many MBP tenants have regular shipments of equipment, supplies, hazardous materials and products from their buildings and require continuous access to their properties. MBP is also concerned that the construction activities could interfere with the ability of emergency response providers (e.g., police, fire and ambulance) to access the MBP facilities. As noted above, some MBP tenants use or handle hazardous materials in their operations and it is important that emergency response providers are able to access each of the buildings in the event of fire or other emergency. Finally, MBP is concerned about potential safety hazards if employees or customers need to walk through a construction work area or from remote off-site parking areas. 04

WSIP DEIR Mitigation Measure 4.8-1a states that SFPUC construction contractors will prepare a traffic control plan to "minimize traffic and on-street parking impacts on any streets affected by construction of the proposed program."[2] Measure 4.8-1a goes on to state that elements of this plan *could* include using steel trench plates to maintain access to driveways and private roads.[3] While MBP supports the development of traffic control plans to reduce potential Project impacts, it is unable to assess the effectiveness of the mitigation measure without more specific discussion of the particular plan elements and/or without appropriate performance standards. We ask that the Draft EIR for the Bay Division Pipeline Reliability Upgrade Project include traffic analyses and mitigation to assure continuous access to 05

[1] Draft Environmental Impact Report for the San Francisco Public Utilities Commission's Water System Improvement Program ("DEIR WSIP") 4.8-13
[2] DEIR WSIP 6-30.
[3] DEIR WSIP 6-30

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San Francisco Planning Department
December 12, 2007
Page Three

private properties when construction crews are not actively constructing the underground pipeline.[4] We understand that this level of analysis may be more appropriately addressed in the project-level EIR and we want to ensure that this analysis will in fact take place. 05 cont.

Parking

In addition to restricting ingress and egress to Menlo Business Park, the Project activities may affect tenant access to parking at Menlo Business Park. Multiple MBP tenants currently utilize parking facilities located in the CCSF easement area. Excavating this area is likely to reduce temporarily the number of parking spots at Menlo Business Park, and cause MBP tenants and patrons to park in adjacent or nearby parking facilities (if available) or on surrounding streets. The Project activities may also disrupt customer patronage to tenant businesses and could present a safety hazard to pedestrians. The parking analysis in the WSIP DEIR focuses primarily on the impacts to public parking on city streets and does not address impaired parking on-site, and the direct and indirect impacts of the on-site parking dislocation. 06

It is not clear from the Project NOP if this impact will be addressed in the Project DEIR. Because parking lots could be effectively blocked during construction and portions may be temporarily unusable, the Project DEIR should assess these impacts and include mitigation, including coordination with MBP and individual business owners. Through such advance planning and related construction scheduling, it may be possible to reduce or avoid many potential adverse impacts. For example, it may be possible to develop and implement shared-parking arrangements among the impacted businesses or to otherwise make arrangements for alternative parking within a reasonable safe walking distance, or to coordinate the construction schedule so as to prevent disrupting the businesses operations. 07

Property Condition

The WSIP DEIR also does not specifically address the logistics of post-construction restoration work. The SFPUC Standard Construction Measures specifies that "upon project completion, the construction contractor will return the SFPUC project site to its general condition before construction, including re-grading of the site and re-vegetation of disturbed areas." [5] The timeline on this site restoration work is unclear. It is our hope that the trench will be backfilled and graded so that it can be re-paved and back in use by the tenants as soon as possible. 08

[4] Similar language was included in the EIR prepared by the California Public Utilities Commission for Pacific Gas & Electric Company's Jefferson-Martin Transmission Project: "At all times shall provide the ability to quickly lay a temporary steel plate trench bridge upon requires to ensure driveway access to business and residences and shall provide continuous access to properties when not actively construction the underground cable alignment. If trench stability could be compromised by this, the construction contractor may defer a request for access to the soonest possible time until the stability of the trench has been assured, provided 48 hrs of notice given to property owner." (PG&E Jefferson-Martin 230 kV Transmission Project Final EIR, Mitigation Measure L-7a (p. D.2-35)).
[5] DEIR WSIP 3-82.

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San Francisco Planning Department
December 12, 2007
Page Four

Again, we understand that the WSIP DEIR is a program-level analysis and that the Department may intend to address these issues in the project-level DEIR. Thank you for the opportunity to comment on the WSIP DEIR. We look forward to working with you on this project. 09

Very truly yours,

DLA Piper US LLP

J. Wesley Skow

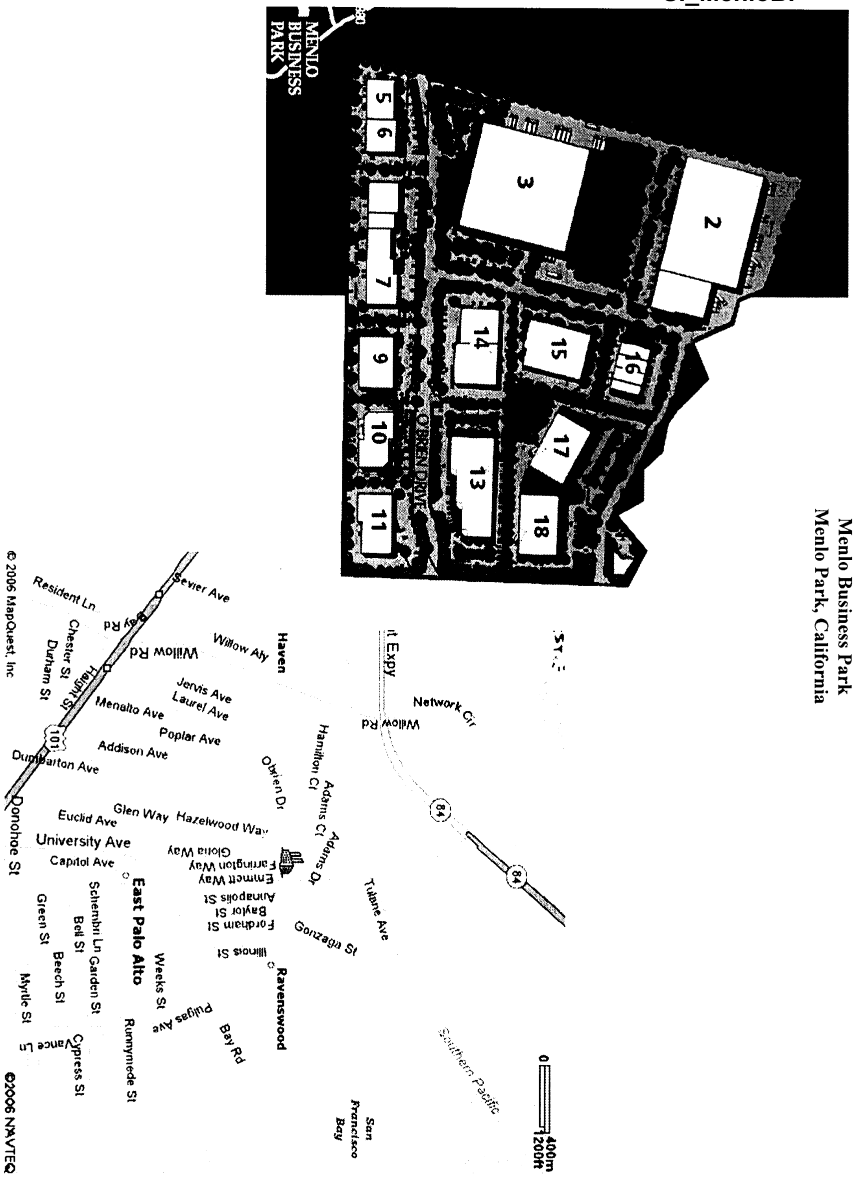
Admitted to practice in California

Attachment
cc: John Tarlton

JWS:pa
SANF1\382516.2

SANF1382852.1

SI_MenloBP



Menlo Business Park
Menlo Park, California

SI_NCFFSC

Northern California/Nevada Federation of Fly Fishers
STEELHEAD COMMITTEE

September 23, 2007

Paul Malzer
Environmental Review Officer, WSIP PEIR
1650 Mission St., Suite 400
San Francisco, CA 94103

Re: Draft Program Environmental Impact Report, WSIP

Dear Mr. Malzer,

I am the chairman of the Steelhead Committee of the Northern California/Nevada Council of the Federation of Fly Fishers (NCCFFF). The NCCFFF is dedicated to the sport of fly fishing and fish conservation. We have approximately 900 regular members with about 6,000 members in affiliated clubs. I request that you include my written comments for the record on behalf of the NCCFFF Steelhead Committee.

Tuolumne River Flows

At a time when salmonid populations in the lower Tuolumne River are at near all time lows because of reduced flows, the WSIP proposes to divert an additional 25 million gallons per day. This means 25 mgd not reaching Don Pedro Reservoir and 25 mgd not available for release to support the already stressed salmon and steelhead populations in the lower Tuolumne.

Fall run Chinook salmon were historically documented to annually exceed 72,000 spawning adults. The 2006 estimate for returning adult Chinook salmon was 625. In the last 50 years, numbers have fluctuated between 45,000 to fewer than 100 individuals, with a steady downward trend. Biologists from California Department of Fish and Game, National Marine Fisheries, and U.S. Fish and Wildlife agree that the numbers of returning adult salmon is strongly correlated to flow volumes in the Tuolumne below the La Grange Dam.

The relationship between flow and fish is clearly stated in a recent letter from Steven A. Edmondson of the National Marine Fisheries Service to the Federal Energy Regulatory Commission regarding the Don Pedro Dam on the Tuolumne River: 01

> *"To date, studies conducted in the Tuolumne River (and in other Central Valley rivers) indicate that as spring flow magnitude and duration increases, the following responses occur: 1) salmon smolt survival increases; 2) water temperature decreases; 3) predation of salmonids decreases; 4) entrainment of salmonids decreases; 5) disease prevalence in salmonids decreases; and 6) both juvenile and adult salmon abundance increases. In addition, emerging science indicates that winter flow magnitude and duration, in addition to spring flow magnitude and duration, is important in determining smolt abundance, which is the primary life history stage influencing adult salmon escapement."*

The Tuolumne River historically supported large runs of sea-run steelhead trout (*O. mykiss*), now listed as threatened under the Federal Endangered Species Act. Present sightings of adult steelhead in the Tuolumne are few and far between. As with the depleted salmon runs, the consensus among agency biologists is that the depressed numbers of steelhead are due to low flows, especially in the summer months. In fact, agency biologists have concluded that existing summer flow regimes in the lower Tuolomne are inadequate for a viable steelhead population.

The DPEIR lists the impact of reduced flows in the lower Tuolumne as *potentially significant*. It goes on to state that the impact may be reduced to *less-than-significant* if SFPUC can reach agreement with the Don Pedro irrigation districts. If agreement with the districts cannot be reached, the DPEIR calls for implementing a Fisheries Habitat Enhancement plan, which supposedly would reduce the negative impact to *less-than-significant* through habitat improvement. As a result of these assumptions, *Table 5.3.6-4 Summary Of Impacts* in the DPEIR includes: "*Impact 5.3.6-4: Effects on fishery resources along the Tuolumne River below La Grange Dam – PSM* [Potentially Significant impact, can be mitigated to less than significant]." 01 cont.

The DPEIR seriously errs in this *PSM* designation. Even if SFPUC can reach an agreement with the irrigation districts, there will still be reduced flows in the lower Tuolumne. The only difference being the deficits will be charged to the irrigation districts rather than SFPUC. As to Fisheries Habitat Enhancement plan, the consensus among agency biologists is that habitat improvement will not be effective without improved river flows.

Three criteria for determining what constitutes a *significant fisheries impact* are presented on page 5.3.6-24 in the DPEIR. Considering the overwhelming scientific evidence which demonstrates the detrimental effects of reduced flows on steelhead and salmon populations, the WSIP for the lower Tuolumne meets all three criteria and therefore should be designated as having a ***significant fisheries impact.*** The DPEIR should be changed to reflect this.

San Joaquin River and the Sacramento–San Joaquin Delta

Just as the WSIP would reduce flows in the Tuolumne River between La Grange Dam and its confluence with the San Joaquin River, it would do the same in the San Joaquin River from the confluence to the Delta. The same adverse impacts of low flow on salmonid populations apply here. The DPEIR again errs when it assigns a *LS* [Less than Significant impact, no mitigation required] designation for this reach of the San Joaquin River. Clearly, the reduced flows and concomitant increase in temperature will adversely affect the movement and survival of salmonid populations. 02

There is no doubt that the Sacramento/San Joaquin Delta ecosystem is on the brink of collapse, and scientists agree that increased diversions and increased exports of Delta water are the principal causes of this decline. Implementation of the WSIP would result in 25 mgd less water reaching the Delta. This is a negative impact not addressed in the DPEIR.

Alameda Creek

A number of fish passage barriers on Alameda Creek have prevented adult steelhead from returning to their spawning grounds in the Alameda Creek watershed. The lowest of these barriers (the BART Weir) effectively blocks passage to any suitable steelhead habitat. 03

It now appears that all of the fish passage barriers will be removed by 2010 and steelhead will again have access to the sea and their spawning habitat. The SFPUC, ACWD and ACFCD are to be commended for their efforts to remove these barriers and reestablish steelhead in the Alameda Creek watershed.

The augmented flow schedule below the confluence of Alameda and Calaveras Creeks (Table 5.4.1-9) should be modified to extend the 20 cfs flows through May 15. Such a change will ensure *O. mykiss* spawning and migration success during late spring. This schedule may be modified when the Fisheries Restoration Workgroup flow studies are completed and comprehensive flow strategy is worked out. 03 cont.

The SFPUC is to be commended for its plans to implement a minimum flow plan for Alameda Creek below the diversion dam. When completed, the plan should be made available for public comment.

In Summary

The WSIP calls for diverting an additional 25 mgd from the Tuolumne River to help meet projected increases in demand through 2030. There is no doubt that such diversions will severely impact the already stressed steelhead and salmon populations of the Tuolumne and San Joaquin Rivers. While SFPUC is obliged to provide a safe and reliable water supply to citizens of San Francisco, it can do so without harming Tuolumne steelhead and salmon.

The WSIP and DPEIR do not adequately address strategies and conservation measures that could replace the 25 mgd diversions from the Tuolumne River. Some strategies and conservation measures include: water options and price incentives for wholesale customers to reduce their demand; incentives to reduce outdoor water use; and more stringent conservation requirements for wholesale customers. 04

Thank you for consideration of these comments.

Sincerely,

Dougald Scott

Dougald Scott, Chair
NCCFFF Steelhead Committee
116 Allegro Drive
Santa Cruz, CA 95060
831.427.1394

PACIFIC INSTITUTE
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SI_PacInst

October 1, 2007

Paul Maltzer
Environmental Review Officer, WSIP PEIR
1650 Mission St., Suite 400
San Francisco, CA 94103

Dear Mr. Maltzer,

I serve as President of the Pacific Institute, an independent research institute in Oakland, California. I am writing with selective comments on the San Francisco Public Utility Commission's Draft Program Environmental Impact Report (PEIR) for the Water System Improvement Program (WSIP). We appreciate your careful consideration of the PEIR.

12.4-53

The SFPUC undertook a WSIP to increase the reliability of the regional water system through improvements with respect to water quality and supply, seismic response, and water delivery. We commend the San Francisco Public Utility Commission (SFPUC) for its efforts to improve seismic and delivery reliability, particularly given the region's vulnerability to earthquakes and other natural hazards. However, we question the SFPUC's assertion that "Additional supplies are needed to satisfy current demand in drought years as well as to meet future demand." Our analysis suggests this fundamental assumption may be incorrect. 01

In August 2006, the Pacific Institute conducted an independent review of the SFPUC's demand projections for its wholesale and retail customers. Our report concluded that significant untapped potential exists for reducing water use while providing for population growth and economic development, and that the water planning documents and efforts in the region underestimate this potential. The potential for recycled water to offset potable supplies is also underestimated. More specifically, we found the following: 02

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- Per-capita demand for the wholesale customers is projected to increase over current (2001) per-capita demand, despite numerous studies that show that substantial cost-effective reductions in per-capita demand are possible with available technologies and policies. 03
- The analysis of SFPUC retail and wholesale demand does not include price-driven efficiency improvements, despite an estimated quadrupling of the price of water from the SFPUC by 2015. 04
- Increases in residential demand are largely due to outdoor water use. For the wholesale and retail customers, per-capita outdoor use is projected to increase, indicating that the proposed conservation does not adequately address this use. 05
- The non-residential sector is responsible for over 80 percent of the projected 2030 demand increase. About 35 percent of that increase is due to outdoor use. 06
- Future demand for the wholesale customers is not adequately evaluated. The forecasting method has two important errors that can lead to potentially large inaccuracies when forecasting demand: it assumes that the current composition of commercial and industrial businesses within the non-residential sector will not change over time, and it ignores the variability in water use in both quantity and purpose among users in the non-residential sector. 07
- The wholesale demand study may overestimate future employment, thereby inflating 2030 non-residential demand. Recent data indicates that economic growth in the San Francisco Bay Area has been slower than expected, and consequently, the job outlook for the region has been adjusted downward. A slower economic growth rate reduces projected water demand for the non-residential sector and suggests that the demand forecast should be adjusted according to the most current information available. 08
- For the wholesale and retail customers combined, the conservation activities proposed in the PEIR reduces 2030 demand by only four percent. Recent water conservation assessments indicate that the conservation potential identified in this demand analysis is too low. For example, SFPUC wholesale customers often fail to implement well-understood efficiency improvements and thereby fail to achieve water-use reductions achieved by utilities elsewhere. 09

- The potential to expand recycling and reuse of water to meet future demand appears to have been significantly underestimated. These options would further reduce the need to identify new supply sources, such as additional withdrawals from the Tuolumne River. 10

We include a copy of this report for your review. Below we provide recommendations for both improving the modeling and assessment efforts and capturing additional conservation and efficiency savings. 11

Recommendations: Modeling and Assessment Efforts

1. Non-residential demand is an important driver for future demand increases, and as a result, an adequate assessment of future demand and conservation potential is critical. The SFPUC should re-evaluate non-residential demand projections for its wholesale customers using industry-specific economic growth projections, water use, and conservation potential. Initial efforts should be regional in scope or focus on those agencies with high non-residential water use. If the projections from the new analysis differ substantially from those of the Demand Side Management Least-Cost Planning Decision Support System model, detailed analyses should be conducted for each of the wholesale customers. 12

2. As the price of water increases, demand decreases, particularly for non-residential and outdoor uses. Because the SFPUC expects to quadruple the price of water by 2015, the effects of projected water price increases should be integrated into the demand projections. Failing to do so may result in an overestimate of future demand and revenue shortfalls. 13

3. Estimates of the maximum, cost-effective conservation potential should be determined for each measure, major end use, and district or wholesale/retail user. The definition of "cost-effective" must be broadened beyond the utility perspective and should include benefits to consumers and quantification of the value of maintaining ecosystem flows in the Tuolumne River. 14

4. Better data are needed on the type of non-residential account and the water use associated with that account. The SFPUC and its wholesale customers must also standardize reporting methods. A focus on outdoor water use is especially needed. 15

5. Modeling efforts should include multiple scenarios so as to determine a range of future demand. 16

6. A better assessment of the potential for using recycled water for different end uses is needed. 17

7. Future studies should include the impact of climate change on projected demand and supply. 18

Recommendations: Conservation Implementation

1. Each agency should assess what is driving demand growth and measures to reduce that demand. Agencies must take a more pro-active role in identifying ways to reduce demand growth, particularly in new developments. 19

2. The SFPUC and its wholesale customers should implement water and wastewater rate structures that encourage water conservation among their customers and fund conservation programs. 20

3. All agencies should sign the California Urban Water Conservation Council Memorandum of Understanding and work to meet all applicable Best Management Practices. 21

4. SFPUC and the Bay Area Water Supply and Conservation Agency (BAWSCA) should work together to establish more effective regional water conservation and recycling programs. 22

5. Institutional mechanisms should be developed to encourage wholesale customers to move more effectively toward efficiency improvements. This can include cross-agency information sharing, consistent conservation programs and targets, economic incentives for demand reductions, conservation pricing for wholesale customers, regular reassessment of program effectiveness and implementation, and improvements in conservation data collection and reporting. 23

6. Serious consideration should be given to capping purchases from the SFPUC at current levels. BAWSCA and the SFPUC should institute financial incentives to encourage conservation efforts and financial disincentives to discourage demand growth. For example, water marketing among the wholesale agencies would allow water saved through conservation efforts by one agency to be sold to another agency, thereby promoting economic efficiency. 24

Thank you again for the opportunity to comment on the Draft PEIR.

Sincerely,

Dr. Peter H. Gleick
President: Pacific Institute
Member: U.S. National Academy of Sciences
Academician: International Water Academy, Oslo, Norway

APPENDIX A

A Review of the San Francisco Public Utilities Commission's Retail and Wholesale Customer Water Demand Projections

Pacific Institute

A Review of the San Francisco Public Utilities Commission's Retail and Wholesale Customer Water Demand Projections

Heather Cooley
Pacific Institute for Studies in Development, Environment, and Security

Oakland, California

12.4-56

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About the Pacific Institute

Founded in 1987 and based in Oakland, California, the Pacific Institute for Studies in Development, Environment, and Security is an independent, nonprofit organization that provides research and policy analysis on issues at the intersection of sustainable development, environmental protection, and international security.

The Pacific Institute strives to improve policy through solid research and consistent dialogue with policymakers and action-oriented groups, both domestic and international. By bringing knowledge to power, we hope to protect our natural world, encourage sustainable development, and improve global security. This report comes out of the Institute's Water and Sustainability Program.

More information about the Institute, staff, directors, funders, and programs can be found at www.pacinst.org and www.worldwater.org.

A Review of the San Francisco Public Utilities Commission's Retail and Wholesale Customer Water Demand Projections

July 2007

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Abbreviations and Acronyms

AF: acre-feet
ABAG: Association for Bay Area Governments
AWWA: American Water Works Association
BAWS: Bay Area Water Stewards
BAWSCA: Bay Area Water Supply and Conservation Agency
BMP: Best Management Practice
CUWCC: California Urban Water Conservation Council
DSS model: Demand Side Management Least-Cost Planning Decision Support System model
E: exempt
gpcd: gallons per capita per day
gped: gallons per employee per day
gpf: gallons per flush
mgd: million gallons per day
MOU: Memorandum of Understanding
NCE: not cost-effective
SFPUC: San Francisco Public Utilities Commission
UFW: unaccounted-for-water
$/MG: dollars per million gallons
WSIP: Water System Improvement Program

Introduction

The Pacific Institute is one of the nation's leading centers for assessing water conservation and efficiency potential. In August 2006, the Tuolumne River Trust asked the Institute to review the San Francisco Public Utilities Commission (SFPUC) wholesale and retail customer water demand projections and the companion reports on water conservation and recycled water as part of an effort to understand the potential for 25
increasing the efficient use of water in the region.[1] This report provides that review and concludes that significant untapped potential exists for reducing water use while providing for population growth and economic development, and that the water planning documents and efforts in the region underestimate this potential.

The SFPUC, a department of the City and County of San Francisco, provides water, wastewater, and power services to residents of San Francisco County (referred to as the **retail customers**). SFPUC also delivers water to 28 wholesale water agencies located on the San Francisco Peninsula and along the southern East Bay (referred to as the **wholesale customers**). In late 2004, the SFPUC formally initiated a Water System Improvement Program (WSIP) to "increase the reliability of the system with respect to water quality, seismic response, water delivery, and water supply to meet water delivery needs in the service area through the year 2030."[2] The objective of the water supply
component is to fully meet 2030 purchase requests during non-drought years and to 26
provide sufficient water such that water supply would be reduced by a maximum of 20 percent during any one year of a drought.

To determine 2030 purchase requests, the SFPUC commissioned a series of comprehensive assessments on the water demand, conservation potential, and recycled water potential of its retail and wholesale customers. Based on these studies, demand is projected to increase by 38 million gallons per day (mgd) for the wholesale customers and decline by about 5 mgd for the retail customers. To meet these additional demands,

[1] The Tuolumne River Trust is a non-profit organization dedicated to promoting the stewardship of the Tuolumne River and its tributaries to ensure a healthy watershed.
[2] SFPUC. 2005. Notice of preparation of an environmental impact report and notice of public scoping meetings. San Francisco, California.

purchases from the SFPUC system are projected to increase 35 mgd by 2030.[3] The SFPUC expects to satisfy this increased demand by relying upon a 25 mgd increase in diversions from the Tuolumne River plus an additional 10 mgd from conservation, water recycling, and groundwater supply programs within the SFPUC retail service area.

At the request of the San Francisco Board of Supervisors, the SFPUC examined the potential of a regional option that relies only on groundwater, recycled water, and regional conservation measures to offset the projected 35 mgd increase in system demand.[4] This study found that the "high range" yield from these projects is 28 mgd. Because the feasibility of many of these options is unknown, the study concludes that no such regional solution exists. 26 cont.

Our analysis, however, reveals that the wholesale and retail demand studies may significantly overestimate future regional demand for water and underestimate the potential for cost-effective demand management and recycled water and therefore are inadequate. More specifically, we found the following: 27

- Per-capita demand for the wholesale customers is projected to increase over current (2001) per-capita demand, despite numerous studies that show that substantial cost-effective reductions in per-capita demand are possible with available technologies and policies. 28
- The analysis of SFPUC retail and wholesale demand does not include price-driven efficiency improvements, despite an estimated quadrupling of the price of water from the SFPUC by 2015. 29
- Increases in residential demand are largely due to outdoor water use. For the wholesale and retail customers, per-capita outdoor use is projected to increase, indicating that the proposed conservation does not adequately address this use. 30

[3] SFPUC. 2005. Notice of preparation of an environmental impact report and notice of public scoping meetings. San Francisco, California.
[4] URS Corporation and San Francisco Public Utilities Commission. 2006. Investigation of Regional Water Supply Option No. 4. Technical Memorandum. Prepared for the San Francisco Public Utilities Commission.

- The non-residential sector is responsible for over 80 percent of the projected 2030 demand increase. About 35 percent of that increase is due to outdoor use. 31
- Future demand for the wholesale customers is not adequately evaluated. The forecasting method has two important errors that can lead to potentially large inaccuracies when forecasting demand: it assumes that the current composition of commercial and industrial businesses within the non-residential sector will not change over time, and it ignores the variability in water use in both quantity and purpose among users in the non-residential sector. 32
- The wholesale demand study may overestimate future employment, thereby inflating 2030 non-residential demand. Recent data indicates that economic recovery in the San Francisco Bay Area has been slower than expected, and consequently, the job outlook for the region has been adjusted downward. Slower economy reduces projected water demand for the non-residential sector and suggests that the demand forecast should be adjusted according to the most current information available. 33
- For the wholesale and retail customers combined, the proposed conservation reduces 2030 demand by only four percent. Recent water conservation assessments indicate that the conservation potential identified in the demand analysis is low. For example, SFPUC wholesale customers often fail to implement well-understood efficiency improvements and thereby fail to meet water-use reductions achieved by utilities elsewhere. 34
- The potential to expand recycling and reuse of water to meet future demand appears to have been significantly underestimated. These options would further reduce the need to identify new supply sources, such as additional withdrawals from the Tuolumne River. 35

Based on these findings, we conclude that the demand and conservation studies are inadequate and fail to realize efficiency levels achieved elsewhere. While no analysis is perfect, these flawed studies inform purchase estimates that, in turn, form the basis of future long-term water contracts. It is critical that water demand forecasts are based on good data and appropriate assumptions, and that water contracts are written in such a way as to encourage conservation and efficiency improvements. We close our analysis with a 36 series of recommendations that will improve the modeling and assessment efforts as well as encourage the implementation of cost-effective conservation measures. 36 cont.

Regional Water Agencies

37 The San Francisco Public Utilities Commission (SFPUC), a department of the City and County of San Francisco, provides water, wastewater, and power services to residents of San Francisco County. In addition, SFPUC provides water to 28 wholesale customers located on the San Francisco peninsula and along the southern East Bay through contractual agreements. A few retail customers are also located in isolated communities in Tuolumne County. Twenty-six of the customers are public (cities and water districts) and two are private utilities (Stanford and California Water Service Co.). In total, SFPUC provides water services to 2.4 million people in San Francisco, San Mateo, Santa Clara, Alameda, and Tuolumne Counties.[5] About 32 percent of the water from the SFPUC system is delivered to retail customers within San Francisco, and the remaining 68 percent goes to wholesale customers and large retail customers outside of San Francisco.[6,7]

38 The Bay Area Water Supply and Conservation Agency (BAWSCA) was created in 2003 to represent the interests of the 28 cities and water agencies that purchase water from the SFPUC. BAWSCA has the authority to coordinate water conservation, supply, and recycling activities; acquire water and make it available on a wholesale basis; finance projects, including regional water system improvements; and build facilities jointly with other public agencies. Thus far, BAWSCA and the SFPUC have coordinated only one project, a pre-rinse spray valve program, but are exploring additional opportunities. Regional partnerships will likely lead to greater cost-effectiveness for some conservation programs.

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[5] Approximately 1.6 million people are outside the City and County of San Francisco.
[6] The large retail customers include the San Francisco County Jail, San Francisco International Airport, and Lawrence Livermore National Laboratory.
[7] URS Corporation. 2004. SFPUC Wholesale Customer Water Demand Projections: Technical Report. Prepared for the San Francisco Public Utilities Commission. Pg 1-2.

Water Resources

39 SFPUC retail and wholesale customers depend upon a variety of water sources to meet their needs, including local surface and groundwater; imported water from the SFPUC and the State (via the State Water Project); and recycled water. In FY 2001-2002, water from the SFPUC supplied 70 percent of the wholesale and retail customers needs. This average, however, hides substantial variation among customers. The City of Hayward, for example, received 100 percent of its supply from the SFPUC, whereas the City of Santa Clara received only 16 percent of its supply from the SFPUC.[8]

Current Conservation Programs and Policies

40 The SFPUC and wholesale agencies participate in a range of ongoing conservation programs, most of which are based on the California Urban Water Conservation Council (CUWCC) Memorandum of Understanding Regarding Urban Water Conservation in California (MOU). The MOU is a voluntary agreement in which participants implement a set of Best Management Practices (BMPs) with specified implementation schedules and coverage requirements. The SFPUC and 13 of the 28 wholesale customers are signatories of the MOU.[9]

41 Table 1 shows the BMPs implemented by the SFPUC wholesale customers. Those BMPs that target commercial, industrial, and institutional uses, BMPs 5 and 9, show the lowest levels of participation. Metering (BMP 4), residential clothes washer rebates (BMP 6), school education (BMP 8), and conservation pricing (BMP 11) show the highest level of participation. 42 Although agencies may be implementing a BMP, they may not meet the full coverage requirements of that BMP and thus may not be in compliance with the MOU. 43 Additionally, the CUWCC BMPs are the minimum level of conservation that agencies should be implementing and do not, by themselves, indicate that an agency has made a strong commitment to conservation. The BMPs have not been substantially

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[8] URS Corporation. 2004. SFPUC Wholesale Customer Water Demand Projections: Technical Report. Prepared for the San Francisco Public Utilities Commission. Pg. 1-3.
[9] An additional four wholesale customers are located within the Santa Clara Valley Water District, which is a signatory to the MOU, and participate in the District's conservation programs

updated in many years, and they do not include all cost-effective water efficiency options. 43 cont.

BAWSCA and the Santa Clara Valley Water District, which also supplies water to eight SFPUC wholesale customers, are MOU signatories as well and thus implement the CUWCC BMPs among their members. BAWSCA, in particular, implements conservation programs that supplement those programs offered by its member agencies. Table 2 shows the conservation programs offered by BAWSCA, the number of agencies that participate in these programs, and the total amount spent in FY 2005-06. In FY 2005-06, 16 member agencies participated in at least one of BAWSCA's five conservation programs.[10] Nearly 80 percent of the money was spent on washing machine rebates. Although the other programs have been shown to be cost-effective, participation is low. In FY 2006-2007, BAWSCA intends to add two new programs: a cooling tower retrofit program and high-efficiency toilet replacement program. 44

The SFPUC implements conservation programs among its retail customers and participates in a number of regional programs. As shown in Table 1, the SFPUC implements all of the BMPs. The SFPUC also coordinates with BAWSCA on implementing a pre-rinse spray valve program and participates in a regional washer rebate program. 45

[10] Sandkulla, N. and B. Pink. 2006. Water Conservation Programs: Annual Report. Bay Area Water Supply and Conservation Agency.

Table 1: Conservation Best Management Practices Implemented by SFPUC Wholesale Customers

Member	BMP 1	BMP 2	BMP 3	BMP 4	BMP 5a	BMP 5b	BMP 6	BMP 7	BMP 8	BMP 9a	BMP 9b	BMP 11	BMP 12	BMP 13	BMP 14
Alameda County Water District	NCE	X	X	X	X	X	X	X	X	X	X	X	X	X	NCE
Brisbane, City of				X			X	X				X		X	
Burlingame, City of	X	X	X	X		X	X	X	X	X	X	X			X
CWS - Bear Gulch District	NCE	X	X	X			X	X	X			X	X	X	X
CWS - Mid Peninsula District	NCE	X	X	X			X	X	X			X	X	X	X
CWS - South San Francisco District	NCE	X	X	X	X		X	X	X			X	X	X	X
Coastside County Water District		X	X	X	X	X	X	X	X		X	X	X	X	X
Daly City, City of	NCE	X	X	X	X	X	X	X	X	X	NCE	X	X	X	NCE
East Palo Alto, City of		X	X	X			X	X	X			X	X		
Estero MID/Foster City			X	X			X	X				X	X	X	X
Guadalupe Valley MID				X			X	X				X	X	X	
Hayward, City of		X	X	X			X	X				X	X	X	X
Hillsborough, Town of				X			X	X				X	X		
Menlo Park, City of			X	X			X	X				X	X	X	
Mid-Peninsula Water District	X	X	X	X			X	X	X			X			
Millbrae, City of	X	X	X	X	X		X	X	X		X	X	X	X	X
Milpitas, City of	X	X	X	X	X		X	X	X	X		X	X	X	X
Mountain View, City of	X	X	X	X	X		X	X	X	X	X	X	X	X	X
North Coast County Water District	X	X	X	X			X	X	X			X	X	X	X
Palo Alto, City of	X	X	X	X	X		X	X	X	X	X	X	X	X	X
Purissima Hills Water District	X	X	X	X			X	X				X		X	X
Redwood City, City of	X	X	X	X	X	X	X	X	X		X	X	X		X
San Bruno, City of				X			X	X	X			X			
San Jose, City of (portion of north SJ)	X	X	X	X	X		X	X	X	X	X	X	X	X	X
Santa Clara, City of	X	X	X	X	X		X	X	X	X		X	X	X	X
Skyline County Water District		X	X	X			X		E			X			X
Stanford University	X	X	X	X	X		X	X			X	X	X	X	X
Sunnyvale, City of	X	X	X		X		X	X	X	X		X		X	X
Westborough Water District	X		X	X			X					X	X	X	X
SFPUC Retail	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Note:
NCE = Not Cost Effective; E = Exempt
Sources:
BAWSCA. 2006. Annual Survey: FY 2004-05. San Mateo, California.
SFPUC. 2005. Urban Water Management Plan. San Francisco, California.

Best Management Practices (BMPs)

BMP 1: Residential Water Surveys
BMP 2: Residential Retrofit
BMP 3: System Audits, Leaks
BMP 4: Metering with Commodity
BMP 5a: Large Landscape Audits
BMP 5b: Water Budgets
BMP 6: Residential Clothes Washer
BMP 7: Public Information
BMP 8: School Education
BMP 9a: Commercial Water Audits
BMP 9b: Ultra Low Flow Toilets/Urinals
BMP 11: Conservation Pricing
BMP 12: Conservation Coordinator
BMP 13: Water Waste Prohibition
BMP 14: Residential Ultra Low Flow

Table 2. BAWSCA Conservation Program Summary

	FY 2005-2006	
	Number of Participating Agencies	Dollars Spent
Washing machine rebates	16	$404,997
Pre-rinse spray valve replacement	3	$9,750
School education	6	$51,671
Landscape audit	4	$24,720
Landscape Education Classes	BAWSCA wide	$3,173
Total		$494,311

Source: Sandkulla, N. and B. Pink. 2006. Water Conservation Programs: Annual Report. Bay Area Water Supply and Conservation Agency. San Mateo, California.

Conservation pricing has been shown to be an effective means of reducing water waste and is included in the CUWCC BMPs (BMP 11). The CUWCC recognizes increasing block rates and uniform volumetric rates as conservation rate structures. By this definition, all of the wholesale customers employ some form of conservation pricing: 17 of the 27 wholesale agencies institute increasing block water rates, by which the unit cost of water increases as the volume consumed increases, and the remaining 10 wholesale agencies use uniform volumetric water rates, by which the *unit cost* of water is independent of the volume consumed. [11,12] Among its wholesale customers, SFPUC charges a uniform volumetric water rate. The SFPUC implements increasing block water rates for all of its retail customers except governmental/institutional and irrigation uses, which have uniform volumetric rates.[13] The SFPUC has also instituted increasing block rates for wastewater for its residential customers, but uniform volumetric wastewater rates for all other customers. 46

Historically, the price of water has been low, failing to cover the cost of providing water services. These low costs provide a disincentive to water conservation and perpetuate wasteful water use. Increasingly, agencies have realized the importance of appropriate 47

[11] Report says 27 agencies because information is not provided on Stanford.
[12] BAWSCA. 2006. Bay Area Water Supply and Conservation Agency Annual Survey: FY 2004-05. San Mateo, California.
[13] Prior to June 2006, Proposition H prohibited the SFPUC from increasing or restructuring its water rates.

pricing policies. Although uniform rates are considered a form of conservation pricing, increasing block rates are among the most effective ways to encourage water conservation. A recent study on water-rate structures in the southwest United States found that per-capita water use is typically lower in cities with dramatically increasing block rates.[14] Aside from encouraging water-use efficiency, increasing block rates provide a number of other benefits, such as providing water at a lower cost for basic needs and stabilizing revenue for the utility.[15] Other pricing mechanisms, such as seasonal rates or priority pricing, can also effectively reduce water waste. The SFPUC and its wholesale customers should evaluate and implement water and wastewater rate structures that encourage water conservation among all of their customers. 47 cont.

Water Conservation Projections

The SFPUC commissioned two separate modeling studies on future water demand for its retail and wholesale customers. For the wholesale customers, future water demand with passive (i.e., plumbing codes alone) and active conservation programs was evaluated using the Demand Side Management Least-Cost Planning Decision Support System (DSS) model.[16,17] To forecast 2030 water demand with plumbing codes alone, the DSS model relies on demographic and employment projections, combined with the effects of natural fixture replacement due to the implementation of plumbing codes. 48

To forecast demand with additional conservation measures for each wholesale customer, an initial set of 75 conservation measures was screened by a committee comprised of personnel from the wholesale customers based on qualitative criteria: technology/market maturity, service area match, customer acceptance/equity, and if better measures are available. The 31 measures that passed the initial screening process were combined to 49

[14] Western Resource Advocates. 2003. Smart Water: A Comparative Study of Urban Water Use Efficiency Across the Southwest. Boulder, Colorado.
[15] Western Resource Advocates. 2006. Water Rate Structures in New Mexico: How New Mexico Cities Compare Using This Important Water Use Efficiency Tool. Boulder, Colorado.
[16] Here, I refer to the natural replacements of fixtures due to plumbing codes as "passive" conservation measures, i.e., these savings occur without any effort on the part of the water utility. Conservation measures that would require additional effort are referred to as "active" programs.
[17] Maddaus, W., Maddaus, M. 2004. Evaluating Water Conservation Cost-Effectiveness with an End Use Model, Proceedings Water Sources 2004, American Water Works Association.

49 cont. avoid duplication and take advantage of economies of scale, a process that resulted in 22 new measures. Ten additional Best Management Practices (BMPs) were added to produce a final set of 32 conservation measures. The DSS model then individually evaluated these 32 measures for each wholesale customer using a cost-benefit analysis from the utility perspective.[18] Conservation measures were combined to form three programs (A, B, and C) with increasing levels of water savings. Each program as a whole was then evaluated with the DSS model to avoid the duplication of costs and benefits. It is important to note that programs differ among wholesale customers. For example, Program A for the Alameda County Water District consists of different conservation measures than Program A for the City of Menlo Park.

50 Demand projections for the SFPUC retail customers were analyzed separately and with a different model (the Hannaford model) from that of the wholesale customers. Like the DSS model, the Hannaford model established 2030 baseline conditions that accounted for demographic and employment projections and implementation of the plumbing codes. An initial set of 48 conservation measures were then evaluated according to the costs and benefits of each measure from the "utility" perspective. A customer-utility benefit-cost ratio was also calculated. The initial 48 measures were reduced to 38 measures, which were then put into three packages (Packages A, B, and C). These three packages "represent a range of conservation potential that is considered cost-effective and achievable for long-range planning purposes."[19] Although the basic structure of the models was similar, treatment of non-residential demand varied significantly; this is discussed in greater detail later in the report (see page 31-38).

51 The conservation programs that the SFPUC retail and wholesale customers selected demonstrate a significant difference in their commitment to conservation in terms of the number of conservation measures implemented. For each wholesale customer, Program B, which contained fewer than 10 measures on average, was selected as the recommended program. The total 2030 waters savings for all 27 wholesale customers

[18] While the community perspective was included in the analysis, this perspective was not used to calculate the cost-efficiency of each measure or program.
[19] Hannaford, M.A. 2004. City and County of San Francisco Retail Water Demands and Conservation Potential. Prepared for the San Francisco Public Utilities Commission.

51 cont. was 14.5 mgd. Each wholesale customer was then allowed to pick which measures it deemed feasible, yielding an adjusted Program B with a 2030 total water savings of 13.4 mgd, or four percent less than projected 2030 demand with plumbing codes alone.[20] By contrast, Package C was selected as the recommended program for the SFPUC retail customers. Package C, which the SFPUC believes represents its full conservation potential, consists of 38 measures with an estimated 2030 water savings of 4.5 mgd, or five percent less than projected 2030 demand with plumbing codes alone. Throughout this report, the water use reductions from Program B and Package C for the wholesale and retail customers, respectively, are referred to as the "proposed conservation."

52 A cost-benefit analysis can be conducted from a number of perspectives, which determines the costs and benefits included in the analysis. Both the DSS and Hannaford models assess the economics of the conservation measures and programs from the "utility" perspective. Although community costs and benefits are discussed secondarily, they are not used to evaluate the measures. The utility perspective is based on costs and benefits to the water utility; whereas the community perspective is based on costs and benefits to the water utility *and* customer and can include energy savings, as well as savings from reduced landscape chemical and fertilizer application, less landscape maintenance, and reduced detergent application for dishwashers and washing machines.[21]

53 The utility perspective is much narrower than either the customer or community perspectives and misses important water-use efficiency cost savings that make many water-efficiency measures substantially cost-effective. The classic example is the high-efficiency clothes washer, which may not save sufficient water at present to cover their higher initial capital costs (although this is increasingly less true, as their costs come down). Water utilities therefore often view them as inappropriate for water conservation programs. Yet they have substantial energy savings as well, which makes them tremendously cost-effective to the consumer. Environmental benefits from greater instream flow are also likely, although these benefits are difficult to quantify and are rarely included in any economic analyses. When they are included, they typically have

[20] The wholesale customers, however, are not required to implement these measures; rather, they agreed to reduce their water use by the 13 mgd that the adjusted Program B indicates is possible.
[21] Vickers, A. 2001. Handbook of Water Use and Conservation. Waterplow Press, Amherst, Massachusetts.

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the effect of making efficiency and conservation estimates even more economically attractive. 53 cont.

Analysis and Review of Water Demand

Total Water Demand

Figure 1 shows historic water demand and projected demand to 2030 for the SFPUC retail and wholesale customers. Two estimates for 2030 demand are shown: demand with implementation of plumbing codes alone and with implementation of plumbing codes plus the proposed conservation. The plumbing codes apply to toilets, urinals, showerheads, and faucets. Clothes washers are also included after 2007. 54

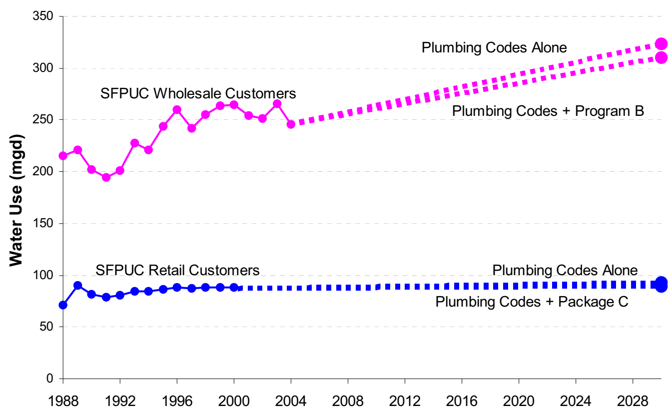

Figure 1: Historic (Solid Line) and Projected (Dotted Line) Demand for the SFPUC Wholesale and Retail Customers.

Figure 1 highlights dissimilar water use trends for the retail and wholesale customers. Water demand for the retail customers has remained relatively constant since 1988. In the future, conservation and efficiency improvements are sufficient to temper water-use increases due to population and economic growth. For the wholesale customers, however, water demand has increased over time. While demand has been fairly stable since 1996, population and economic growth are projected to increase water demand significantly 54 cont.

over the next 25 years. Note that water demand increases for the wholesale customers have not been linear, reflecting a range of sometimes conflicting factors that affect water use. A short, drought-induced reduction in water use in the late 1980s and early 1990s, for example, was followed by a rapid increase in water use. 54 cont.

Table 3 shows current (2001 for the wholesale customers and 2000 for the retail customers) and projected demand for the wholesale and retail customers. Wholesale demand is projected to increase over time due to a projected 19 percent and 31 percent increase in population and employment, respectively. With plumbing codes alone, wholesale demand is expected to reach 323.7 mgd in 2030, or 19 percent above 2001 levels. The proposed conservation moderates this growth slightly, reducing 2030 demand to 310.2 mgd, or four percent less than demand with plumbing codes alone.

For the retail customers, conservation is sufficient to temper water-use increases due to population and economic growth. Retail demand declines slightly (0.2 mgd) between 2000 and 2030 with implementation of plumbing codes alone despite a 12 percent and 25 percent increase in population and employment, respectively. Conservation measures, contained within Package C, reduce 2030 demand by an additional 4.5 mgd, or five percent below levels with plumbing codes alone. In total, water demand is projected to decline by 4.7 mgd between 2000 and 2030. 55

Overall demand (both retail and wholesale customers) is projected to increase by 51.2 mgd, or 14 percent, between 2001 and 2030 with implementation of the plumbing codes alone. Additional conservation helps mitigate this increase. With the proposed conservation, system demand is projected to increase by 33.3 mgd, or 9 percent, to 399.1 mgd in 2030.

Table 3 highlights substantial variation in water demand changes among wholesale and retail customers. Demand is projected to increase for most customers, although demand for seven of the 28 wholesale customers will remain constant or even decline. Demand increases for four of the customers (Alameda County Water District, Hayward, Milpitas, and Santa Clara) account for nearly 80 percent of the total demand increase (Table 3). 56

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These four agencies, however, accounted for only 30 percent of 2001 total water demand, and thus are responsible for a disproportionate amount of 2030 demand growth. 56 cont.

Table 3. Current and projected (2030) water demand (mgd) with implementation of plumbing codes alone and plumbing codes plus proposed conservation.

Customer	Current	2030 Plumbing Codes	2030 Plumbing Codes + Proposed Conservation	Demand Change with Proposed Conservation
Alameda County Water District	**51.1**	**59.3**	**56.1**	**5.00**
Brisbane, City of	0.4	0.9	0.9	0.46
Burlingame, City of	4.8	4.9	4.7	-0.10
CWS - Bear Gulch District	13.4	13.9	12.9	-0.50
CWS - Mid Peninsula District	17.2	18.1	17.3	0.10
CWS - South San Francisco District	8.9	9.9	9.3	0.40
Coastside County Water District	2.6	3.2	3.0	0.40
Daly City, City of	8.7	9.1	8.7	0.00
East Palo Alto, City of	2.5	4.8	4.6	2.10
Estero MID/Foster City	5.8	6.8	6.8	1.00
Guadalupe Valley MID	0.3	0.8	0.7	0.38
Hayward, City of	**19.3**	**28.7**	**27.9**	**8.60**
Hillsborough, Town of	3.7	3.9	3.6	-0.10
Los Trancos County Water District	0.1	0.1	0.1	0.03
Menlo Park, City of	4.1	4.7	4.6	0.50
Mid-Peninsula Water District	3.7	3.8	3.7	0.00
Millbrae, City of	3.1	3.3	3.2	0.10
Milpitas, City of	**12.0**	**17.7**	**17.1**	**5.10**
Mountain View, City of	13.3	14.8	14.5	1.20
North Coast County Water District	3.6	3.8	3.8	0.20
Palo Alto, City of	14.2	14.7	14.1	-0.10
Purissima Hills Water District	2.2	3.3	3.2	1.00
Redwood City, City of	11.9	13.4	12.6	0.70
San Bruno, City of	4.4	4.5	4.3	-0.10
San Jose, City of (portion of north SJ)	5.2	6.5	6.3	1.10
Santa Clara, City of	**25.8**	**33.9**	**32.8**	**7.00**
Skyline County Water District	0.2	0.3	0.3	0.13
Stanford University	3.9	6.8	6.2	2.30
Sunnyvale, City of	24.8	26.8	26.0	1.20
Westborough Water District	1.0	0.9	0.9	-0.09
SFPUC Wholesale Customer	272.2	323.7	310.2	38.0
SFPUC Retail	93.6	93.4	88.9	-4.70
Total SFPUC System	365.8	417.1	399.1	33.3

Note: "Current" refers to the years 2000 and 2001 for the retail and wholesale customers, respectively. The wholesale customers shown in bold are responsible for nearly 80 percent of the total demand increase. Demand change refers to the difference between current demand and 2030 demand with implementation of the plumbing codes plus the proposed conservation.

Gross Per-Capita Demand

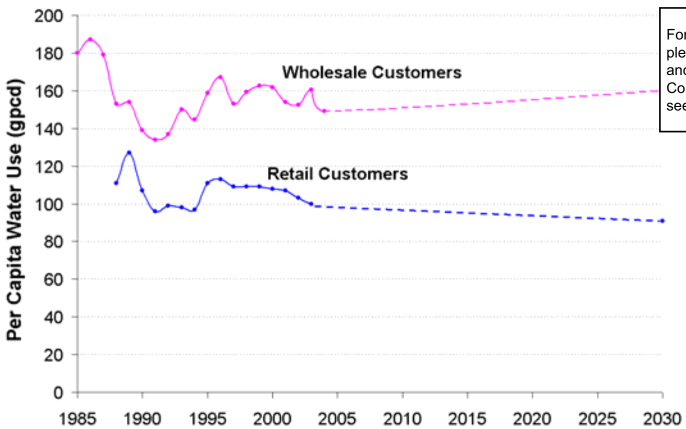
Per-capita demand patterns mimic water-use patterns but are more revealing. Figure 2 shows historic and projected gross per-capita demand for the wholesale and retail customers.[22] For the wholesale customers, per-capita demand reached a high of 187 gpcd in the mid-1980s but declined precipitously during the drought of the late 1980s and early 1990s. Like water demand, per-capita demand for the wholesale customers has been relatively constant since 1996. Projected 2030 per-capita demand increases slightly over 2005 levels but is similar to the per-capita estimates in previous years. 57

For retail customers, gross per-capita demand has declined over time. Per-capita reached a peak of 127 gpcd in 1989 but declined during the drought.[23] Since 1996, per-capita demand has declined steadily. By 2030, per-capita demand is projected to decline to 91 gpcd, nearly ½ of the per-capita demand of the wholesale customers. We note that simple comparisons of gross per-capita water demand between the wholesale and retail customers can be misleading because water use is affected by a variety of economic and demographic factors, such as housing type and density and the type of businesses present in a given region. Local climate conditions and water-use efficiency also affect demand. 58

While per-capita demand comparisons between the SFPUC retail and wholesale customers can be misleading, a comparison of the trends over time, however, is revealing. Since the drought of the late 1980's and early 1990's, per-capita water use has declined for the retail customers but remained constant for the wholesale customers. Thus suggests that water-use efficiency for the retail customers has improved but remains unchanged for the wholesale customers. Projections to 2030 indicate that these efficiency improvements are still not being implemented effectively for the wholesale customers despite the development of numerous technologies and policies to cost-effectively reduce water waste. For example, Seattle Public Utilities successfully reduced per-capita demand from 150 gpcd in 1985 to 105 gpcd in 2004 through higher water rates, plumbing codes, 59

[22] Gross per-capita demand includes UFW.
[23] Good data is not available for the years 1993 through 1995. Per-capita estimates during these years are likely higher than shown.

conservation, and improved system operation.[24] Likewise, East Bay Municipal Utility District reduced per-capita demand from 210 gpcd in 1970 to 155 gpcd in 2005 through a variety of conservation measures.[25] 59 cont.



For Comment 60, please see pp. 12.4-67 and 12.4-68, and for Comment 61, please see page 12.4-71

Figure 2: Historic (solid line) and Projected (dotted line) Gross Per-Capita Demand with Plumbing Codes Plus Proposed Conservation.

Analysis and Review of the Wholesale and Retail Customer Demand and Conservation Potential

This section reviews and analyzes the demand and conservation potential for the SFPUC wholesale and retail customers. Our analysis indicates that the proposed conservation programs fail to capture the substantial amount of water savings that are possible, particularly for outdoor and non-residential uses. Demand projections for the SFPUC 62

[24] Seattle Public Utilities. 2006. Demographics and Water Use Statistics. Seattle, Washington. http://www.seattle.gov/util/About_SPU/Water_System/History_&_Overview/DEMOGRAPHI_200312020908145.asp.
[25] East Bay Municipal Utility District. 2005. Water Conservation/Water Recycling Annual Report. Oakland, California. http://www.ebmud.com/about_ebmud/publications/annual_reports/2005_wc_rw_ar.pdf

retail and wholesale customers do not include price-driven efficiency improvements, despite an estimated quadrupling of the price of water purchased from the SFPUC by 2015. The conservation savings identified in the analysis are low, in comparison to savings achieved in recent water conservation assessments and in other water districts. For example, a recent Pacific Institute study concludes that existing, cost-effective technologies could reduce California's current (2000) urban demand by nearly 30 percent.[26] As a result, per-capita water use remains high, particularly for the wholesale customers.

Price-Driven Efficiency

Pricing is an important tool that allows water managers to reduce wasteful water use. The responsiveness of water demand to changes in water price is referred to as the price elasticity of water demand and is commonly expressed as a positive or negative decimal. If the price doubles and water use drops by 20 percent, for example, the price elasticity of water is -0.20. The price-elasticity can vary by region, water use (indoor vs. outdoor), customer type, etc. 62 cont.

A recent survey of price-elasticity factors by the Pacific Institute found that typical California price-elasticities of demand are around -0.20 for single-family homes, -0.10 for multi-family homes, and -0.25 for the non-residential sector.[27,28] Given that the SFPUC projects that price will quadruple over a 12-year period, from $383 per acre-foot ($1,177 per million gallons) in 2003 to $1,603 per acre-foot ($4,919 per million gallons) in 2015, price will likely be an important driver of conservation in the coming years.[29,30] Neither the SFPUC retail nor wholesale demand analyses, however, consider price-driven efficiency, citing concerns about double-counting conservation savings. While this concern is valid, the projected conservation is so low that double counting is also likely

[26] Gleick, P.H., D. Haasz, C. Henges-Jeck, V. Srinivasan, G. Wolff, K. Cushing, and A. Mann. 2003. Waste Not, Want Not: The Potential for Urban Water Conservation in California." Pacific Institute for Studies in Development, Environment, and Security. Oakland, California.
[27] A price-elasticity of -0.2 means that if price increases by 100 percent, demand would decline by 20 percent.
[28] Gleick, P.H., H. Cooley, and D. Groves. 2005. California Water 2030: An Efficient Future. Pacific Institute for Studies in Development, Environment, and Security. Oakland, California.
[29] Ellen Levin. 2006. Personal Communication. September 22, 2006.
[30] Dollar amounts are in real dollars.

low. A better mechanism is needed to incorporate the effects of price in future demand projections.

Failing to account for price-driven efficiency can create revenue shortfalls. As the price of water goes up, discretionary water use will decline, thereby reducing revenues. Rates 62 cont.
must be designed to account for this effect. As noted in a report to the Washington Legislature, "The key to ensuring adequate revenues is anticipation of the potential for a reduction in sales and design of rates based on reduced sales, rather than existing sales."[31] Overestimating demand can also result in the construction of unnecessary or over-sized facility, further exacerbating revenue concerns.

Demand Change by Sector

Figures 3 and 4 show changes in wholesale and retail customer demand between 2000/2001 and 2030 by sector with implementation of the plumbing codes plus the proposed conservation. For the wholesale customers, the total demand increase is 38.0
mgd between 2000 and 2030. The non-residential sector accounts for about two-thirds of 63
that increase, or 24.1 mgd. Over 40 percent of the increase in non-residential demand is due to outdoor use. Residential demand growth, largely due to increases in outdoor water use, accounts for the remaining one-third of total demand growth.

For the retail customers, conservation and efficiency are projected to reduce total demand. With the proposed conservation, 2030 demand for the non-residential sector is 3.1 mgd greater than 2000 demand. All of the projected increase in non-residential
demand is due to indoor use. Residential demand and unaccounted-for-water (UFW) 64
decline by 6.5 mgd and 1 mgd, respectively. Thus reductions in residential water demand and UFW are sufficient to offset increases in non-residential demand, and total demand declines by 4.7 mgd.

[31] Washington Water Utilities Council, Washington State Department of Health, and Economic and Engineering Services, Inc. 1995. Conservation-Oriented Rates for Public Water Systems in Washington. Report to the Legislature. http://www.mrsc.org/Subjects/Environment/water/doh331-113.pdf

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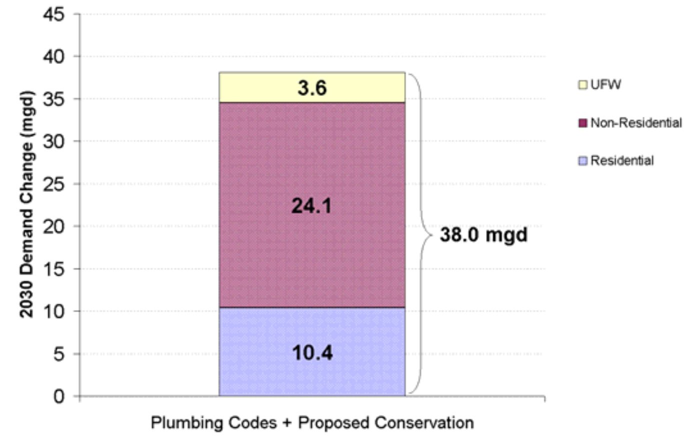

Figure 3: Demand Change between 2001 and 2030 for the wholesale customers by sector.

Figure 4. Demand Change between 2000 and 2030 for the retail customers by sector.

Residential Water Use Projections

Historic Per-Capita Water Demand

Total residential per-capita water use has been relatively constant since the mid- to late-1980s for both the retail and wholesale customers (Figure 5). Short-term, annual variations are likely a result of climatic variation.[32] Because detailed historic per-capita water-use estimates were not available for the wholesale and retail customers, we are 65
unable to perform a comprehensive analysis of per-capita water use trends over time. For example, we are unable to distinguish single-family from multi-family use. Likewise, we are unable to separate indoor and outdoor use. Despite these limitations, we can draw some general conclusions about residential water use trends over time.

As shown in Figure 5, total residential per-capita water use has been constant. Since the 1980's, however, indoor per-capita water use has likely declined due to the implementation of plumbing codes and other conservation programs, such as the BMPs. While indoor efficiency improvements could be countered by an increase in the fraction of single-family units, which tend to have higher water-use rates than multi-family units, 66
housing data indicates that the fraction of single-family units was fairly constant between 1990 and 2005 for both the wholesale and retail customers (Table 4). The relative constancy of total residential per-capita water use and fraction of single-family residences suggests that water-use reductions from indoor efficiency improvements were countered by increases in outdoor water use.

[32] Note that water-use trends for the retail customers are similar but less variable than those of the wholesale customers. Because outdoor water use is a minor component of retail demand, per-capita water 60
use is less sensitive to annual climate variations.

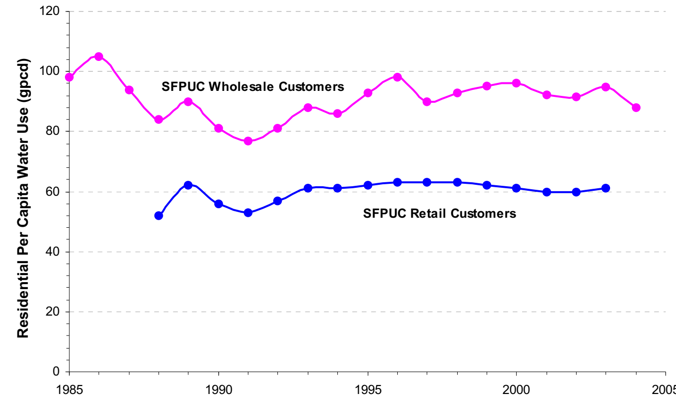

Figure 5. Historic Residential Per-Capita Water Demand for the SFPUC Wholesale and Retail Customers.

Figure 5 also shows that per-capita water demand for the wholesale customers is about 50 percent higher than that of the retail customers, in part due to demographic and climatic differences between the regions. The City and County of San Francisco have a larger fraction of multi-family units, whose residents have fewer fixtures and appliances and as a result, tend to use significantly less water than those living in single-family units (Table 67
4). Additionally, outdoor water use in the City and County of San Francisco is low due to cool summer temperatures and dense housing with few yards. Both of these factors tend to lower average residential per-capita water use. Differences in water-use efficiency, however, cannot be determined from the historic data but are discussed below.

Table 4. Percent single-family housing units for the wholesale and retail customers.

	1990	1995	2000	2005
Wholesale Customers	63%	63%	63%	62%
Retail Customers	32%	32%	33%	31%

Note:
The wholesale customer estimate is based on city-wide data for those cities served by the wholesale customers. The estimate for the retail customers is based on data for the City and County of San Francisco.
Sources:
State of California, Department of Finance. 2000. City/County Population and Housing Estimates, 1991-2000, with 1990 Census Counts. Sacramento, California.
State of California, Department of Finance. 2006. E-5 Population and Housing Estimates for Cities, Counties and the State, 2001-2006, with 2000 Benchmark. Sacramento, California.

Projected Per-Capita Water Demand

Tables 5 and 6 show current and projected per-capita water demand estimates for single-family and multi-family customers, respectively.[33] In 2001, single-family water demand averaged 108 gpcd for the wholesale customers. Note the tremendous variation among wholesale customers; in some areas, per-capita water demand was 300 gpcd due, in large part, to high outdoor water use. The proposed conservation reduces average single-family total water demand by 10 gpcd to 98 gpcd, or by only 9 percent. These savings are from reductions in indoor water use. For most wholesale customers, improvements in outdoor water use are small, and in some areas, outdoor water use is projected to increase. In Hayward, for example, single-family outdoor water use is expected to nearly double, from 22 gpcd in 2001 to 43 gpcd in 2030. Likewise, single-family outdoor water use for the Purissima Hills Water District is projected to increase from 226 gpcd in 2001 to a staggering 332 gpcd in 2030. 68

For the wholesale customers, water demand reductions are larger for multi-family customers than for single-family customers (Table 6). Nearly all wholesale customers project a reduction in water demand, from an average of 75 gpcd in 2001 to 64 gpcd in 2030, a savings of nearly 15 percent. These savings are due to efficiency improvements 69

[33] Current is defined as 2001 for the wholesale customers and 2005 for the retail customers.

60 cont.

in indoor water use, as average outdoor water use is projected to remain constant at 14 gpcd. 69 cont.

Projected single-family and multi-family demand reductions for the retail customers are more substantial than those for the wholesale customers. By 2030, projected single-family water demand is 51 gpcd, a 10 gpcd or 16 percent reduction over 2005 per-capita demand. Demand reductions for the multi-family customers are even greater. Projected multi-family demand is 47 gpcd, an 11 gpcd or 19 percent reduction over 2005 per-capita demand. While projected savings by single-family and multi-family residential retail users results from reductions in indoor water use, outdoor water use remains only a minor component of total use. 70

Comparison with Other Conservation Studies

Recent conservation assessments indicate that there are a substantial number of cost-effective technologies that can drastically reduce residential water demand – both indoor and outdoor – to levels far below those projected for the wholesale and retail customers. For example, a 1997 study by the American Water Works Association (AWWA) found that conservation could reduce indoor water use from 65 gpcd to 45 gpcd for single-family homes, a savings of over 30 percent.[34] The largest reductions were realized by replacing inefficient toilets and clothes washers with more efficient models. 71

Similarly, a Seattle study found that conservation and efficiency could substantially reduce indoor water use. Installing new, water-efficient fixtures and appliances reduced single-family indoor water use from 64 gpcd to 40 gpcd, a savings of nearly 40 percent, and far below the 2030 levels projected in the SFPUC studies. The largest reductions were achieved by installing efficient toilets and clothes washers. Further, homeowners rated the performance, maintenance, and appearance of the efficient appliances higher than the older appliances.[35]

[34] AWWA WaterWiser. 1997. Residential Water Use Summary – Typical Single Family Home.
[35] Mayer, P.W., W.B. DeOreo, and D.M. Lewis. 2000. Seattle Home Water Conservation Study: The Impacts of High Efficiency Plumbing Fixture Retrofits in Single-Family Homes. Aquacraft, Inc. Water Engineering and Management.

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Table 5: Baseline and Projected Single-Family Residential Per-Capita Water Use Estimates.

Customer	Current			2030		
	Total (gpcd)	Indoor (gpcd)	Outdoor (gpcd)	Total (gpcd)	Indoor (gpcd)	Outdoor (gpcd)
Alameda County Water District	107	72	35	93	58	35
Brisbane, City of	72	63	9	62	53	9
Burlingame, City of	108	70	38	87	53	34
CWS - Bear Gulch District	169	71	98	143	55	88
CWS - Mid Peninsula District	109	72	37	90	55	35
CWS - South San Francisco District	76	63	13	59	47	12
Coastside County Water District	72	60	12	59	48	11
Daly City, City of	65	56	9	54	46	8
East Palo Alto, City of	71	64	7	57	51	6
Estero MID/Foster City	115	78	37	113	74	39
Guadalupe Valley MID	89	67	22	78	56	22
Hayward, City of	83	61	22	114	71	43
Hillsborough, Town of	291	122	169	255	106	149
Los Trancos County Water District	134	52	82	116	47	69
Menlo Park, City of	141	86	55	122	73	49
Mid-Peninsula Water District	106	64	42	90	49	41
Millbrae, City of	94	64	30	78	49	29
Milpitas, City of	87	62	25	93	55	38
Mountain View, City of	109	72	37	95	59	36
North Coast County Water District	76	57	19	66	47	19
Palo Alto, City of	145	83	62	127	67	60
Purissima Hills Water District	311	85	226	412	80	332
Redwood City, City of	103	68	35	87	53	34
San Bruno, City of	79	66	13	61	50	11
San Jose, City of (portion of north SJ)	88	72	16	75	59	16
Santa Clara, City of	126	73	53	123	63	60
Skyline County Water District	118	73	45	97	54	43
Stanford University	-	-	-	-	-	-
Sunnyvale, City of	122	78	44	107	64	43
Westborough Water District	72	66	6	59	53	6
SFPUC Wholesale Customer Weighted Average	**108**	**69**	**39**	**98**	**58**	**40**
SFPUC Retail	**61**	**56**	**4**	**51**	**47**	**5**

Note: The 2030 per-capita estimates include implementation of the plumbing codes plus the proposed conservation. For the wholesale customers, “current” refers to the year 2001. Values for the SFPUC retail customers are for 2005.

Table 6: Baseline and Projected Multi-Family Residential Per-Capita Water Use Estimates.

Customer	Current			2030		
	Total (gpcd)	Indoor (gpcd)	Outdoor (gpcd)	Total (gpcd)	Indoor (gpcd)	Outdoor (gpcd)
Alameda County Water District	78	66	12	65	53	12
Brisbane, City of	50	44	6	41	35	6
Burlingame, City of	77	65	12	63	51	12
CWS - Bear Gulch District	73	63	10	59	49	10
CWS - Mid Peninsula District	68	61	7	50	43	7
CWS - South San Francisco District	62	60	2	48	46	2
Coastside County Water District	66	59	7	56	49	7
Daly City, City of	63	55	8	53	45	8
East Palo Alto, City of	56	50	6	41	36	5
Estero MID/Foster City	86	72	14	76	62	14
Guadalupe Valley MID	-	-	-	-	-	-
Hayward, City of	72	54	18	60	43	17
Hillsborough, Town of	-	-	-	-	-	-
Los Trancos County Water District	-	-	-	-	-	-
Menlo Park, City of	78	60	18	67	49	18
Mid-Peninsula Water District	69	62	7	57	50	7
Millbrae, City of	67	58	9	53	45	8
Milpitas, City of	67	61	6	57	51	6
Mountain View, City of	77	64	13	67	54	13
North Coast County Water District	65	55	10	55	45	10
Palo Alto, City of	96	78	18	80	63	17
Purissima Hills Water District	-	-	-	-	-	-
Redwood City, City of	77	60	17	83	61	22
San Bruno, City of	65	55	10	52	42	10
San Jose, City of (portion of north SJ)	82	69	13	68	55	13
Santa Clara, City of	80	62	18	70	52	18
Skyline County Water District	-	-	-	-	-	-
Stanford University	-	27	12	-	31	9
Sunnyvale, City of	89	69	20	77	57	20
Westborough Water District	61	54	7	50	43	7
SFPUC Wholesale Customer Weighted Average	**75**	**61**	**14**	**64**	**51**	**14**
SFPUC Retail	**58**	**58**	**0**	**47**	**47**	**0**

Note: The 2030 per-capita estimates include implementation of the plumbing codes plus the proposed conservation. For the wholesale customers, “current” refers to the year 2001. Values for the SFPUC retail customers are for 2005.

The savings achieved in the AWWA and Seattle studies are supported by a recent Pacific Institute study, which quantified the potential for water conservation and efficiency improvements in California's urban water use. The study concludes that existing, cost-effective technologies could reduce California's current (2000) residential indoor use by 39 percent. Outdoor water-use savings, estimated at 33 percent, are equally impressive and "result from improved management practices, better application of available technology, and changes in landscape design away from water-intensive plants." [36] Reductions in outdoor water use have the added benefit of improving water-system reliability by reducing both average and peak water demand. 71 cont.

The modest improvements in outdoor water-use efficiency projected for the wholesale customers indicate that additional attention and effort must be focused on reducing outdoor water use. Studies have shown that a number of outdoor conservation measures are cost-effective and yield substantial water savings, but these measures are rarely well integrated into demand forecasts or actual conservation programs and they appear to be absent here as well. The cities of Austin, Texas and Las Vegas, Nevada offer rebates or direct payments for removing water-intensive grasses and maintaining water use below budgets established by the city.[37] A study conducted by the Irvine Ranch Water District in California, for example, showed that evapotranspiration controllers reduced outdoor water use for large residential users by 24 percent,[38] and the District has run outdoor conservation efficiency programs for many years. The City of Santa Monica offers funding for new or remodeled innovative garden designs that include one or more of the following: native plants, water-efficient plants, water-efficient irrigation systems, stormwater catchment systems, graywater systems, and/or other innovative water-saving features. They note that "Research shows that converting turf and other water-thirsty plants, and traditional, high-volume spray sprinkler irrigation systems to California 72

[36] Gleick, P.H., D. Haasz, C. Henges-Jeck, V. Srinivasan, G. Wolff, K. Cushing, and A. Mann. 2003. Waste Not, Want Not: The Potential for Urban Water Conservation in California." Pacific Institute for Studies in Development, Environment, and Security.
[37] City of Austin, Texas Water Conservation. 2006. http://www.ci.austin.tx.us/watercon/landscape.htm
[38] Hunt, T. et al. 2001. Residential Weather-Based Irrigation Scheduling: Evidence from the Irvine "ET Controller" Study. Irvine Ranch Water District. http://www.irwd.com/Conservation/FinalETRpt%5B1%5D.pdf

friendly plants and water-efficient irrigation systems, can save up to 80% of water and 60% of maintenance costs."[39]

In addition, training programs for landscape professionals and application of efficiency technologies have also been shown to provide significant water savings. The Municipal Water District of Orange County initiated a Landscape Performance Certification Program targeting large landscape customers with dedicated irrigation meters in Orange County, California. The program provides technical training sessions to landscape contractors and property managers (includes homeowner associations) and prepares water budgets for all sites owned or managed by the company. Sites are then assessed for compliance with the water budget, and property managers or landscape contractors are awarded a bronze, silver, or gold certification award based on the level of compliance. Companies that achieve certification are promoted with the intention of increasing market opportunities. It is estimated that each customer saves approximately 765 gallons per day on average, a 20 percent reduction of their outdoor water use, at a cost of $165 per acre-foot – well below the current cost of water and far below the cost of new supply.[40] Educating landscape professionals about native and low-water-use plants and rebates available may also help increase participation in outdoor conservation programs. While results will vary regionally for all outdoor water-efficiency measures, the significant water use in landscaping and the large potential for savings suggest that more aggressive outdoor conservation programs are warranted. 72 cont.

Recent California legislation may also encourage additional indoor and outdoor water-use efficiency improvements. A bill signed in 2004, AB 2717, directed the CUWCC to convene a task force (the Landscape Task Force) to examine ways to improve the efficiency of new and existing irrigated urban landscapes. The Landscape Task Force compiled a comprehensive list of 43 recommendations that would save an estimated 600,000 to 1,000,000 acre-feet per year at an average cost of $250 to $500 per acre- 73

[39] City of Santa Monica. Grants for Landscaping. 2006. http://santa-monica.org/epd/news/Landscaping_Grant.htm.
[40] A&N Technical Services, Inc. 2004. Evaluation of the Landscape Performance Certification Program. Prepared for the Municipal Water District of Orange County, the Metropolitan Water District of Southern California, and the U.S. Bureau of Reclamation, Southern California Area Office. http://www.mwdoc.com/documents/LPC-Evaluation_000.pdf

foot.[41] A subsequent bill, AB 1881, implements a number of these recommendations, including requiring local agencies to adopt a model ordinance that is at least as effective at conserving water as the updated state model ordinance. The bill also requires the California Energy Commission to adopt performance standards and labeling requirements for landscape irrigation equipment. AB 1881, authored by Assemblyman John Laird and approved by Governor Schwarzenegger in September 2006, will contribute to even greater outdoor efficiency improvements. 73 cont.

Plumbing code standards have been shown to be extremely effective in reducing demand, and a second bill, vetoed by Governor Schwarzenegger, AB 2496, would have updated the 1991 plumbing code standards for toilets and urinals. AB 2496 called for new plumbing standards to reduce the toilet flush volume from 1.6 gallons per flush (gpf) to 1.3 gpf and the urinal flush volume from 1.0 gpf to no more than 0.5 gpf. These new standards would have reduced 2030 residential and non-residential indoor water use by about 5 percent.[42] In his veto message, the Governor indicated that it was not yet clear that the technology was ready for widespread use. These toilets are already standard in Australia, Japan, and other countries, and it is only a matter of time before these standards are adopted in California. 74

Non-Residential Water Use Projections

For the wholesale and retail customers combined, increases in non-residential water use account for over 80 percent of the total 2030 demand increase. About 35 percent of the projected increase in non-residential demand is due to outdoor use. Because the wholesale customers account for 90 percent of the projected growth in non-residential demand, the following analysis and discussion will focus on those customers. 75

Our analysis indicates that the employment assumptions are significantly higher than are likely to materialize and that this assumption alone leads to an overestimate of future

[41] Landscape Task Force citation. 2005. Water Smart Landscapes for California: AB 2717 Landscape Task Force Findings, Recommendations, & Actions.

[42] Here we assume that all residential and non-residential toilets in the SFPUC service area are 1.6 gpf in 2030, and all urinals are 1.0 gpf (a highly conservative estimate). Replacing these toilets and urinals would reduce 2030 residential and non-residential indoor water use by about five percent. 61

water demand. Additionally, the forecasting method is inadequate, failing to recognize differences in water use among customers in the non-residential sector and potential changes in the composition of the non-residential sector over time. The forecasting method for the retail customers provides a better model and should be applied to the wholesale customers. In addition, a substantial fraction of the demand growth is due to outdoor use 75 cont.

Employment Projections

Increases in non-residential demand among the wholesale customers are largely driven by large projected increases in employment. In the DSS model, employment is projected to increase by over 31 percent between 2001 and 2030, rising from 1.13 million in 2001 to 1.49 million in 2030. These projections were based on the Association of Bay Area Governments' (ABAG) employment projections, released in 2002.[43] In 2005, however, ABAG revised the employment projections for the 9-county San Francisco Bay Area: "PROJECTIONS 2005 forecasts over 46,000 fewer jobs than Projections 2002. This is a result of the slow pace of job growth in the Bay Area during the early part of the forecast. The pace has been so slow that it has caused ABAG to reduce the long-term job outlook somewhat."[44] For the 9-county area, 46,000 fewer jobs represent only a one or two percent decline; because there is likely substantial regional variation, however, the effect on the wholesale customers is not immediately clear. Nevertheless, this downward revision reduces the projected growth in water demand for the non-residential sector and suggests that the demand forecast should be adjusted according to the most current information available. 76

Historical employment data provides further evidence that the employment projections used in the DSS study are extremely high and unlikely to materialize. Figure 6 shows the total number of commercial and industrial accounts for the wholesale customers between 1998 and 2005 and projections to 2030. Like the DSS model, we assume that the average number of users per account is constant, i.e., the number of employees per non-residential 77

[43] ABAG produces biennial population and employment projections for the 9-county San Francisco Bay Area. These 9 counties include Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma Counties.

[44] ABAG. 2005. ABAG Projections 2005: Summary of Findings. http://planning.abag.ca.gov/currentfcst/summary1.html

account does not change between 1998 and 2030. During the late 1990's, California's economy was strong, in part due to growth in the Internet sector and related fields; by 1999, the statewide unemployment rate was a low 4.9 percent, the lowest rate in 30 years.[45] Unemployment rates were likely even lower among the SFPUC wholesale customers, many of whom are dependant on computer-related industries. As the dot-com bubble burst in late 2000 through 2001, the region's economy experienced a mild economic downturn, as indicated by a slight dip in Figure 6. Jobs throughout the region recovered more slowly than expected and have been fairly stable since 1998. Because of the slow growth in recent years, the 2030 employment projections assumed in the DSS model are unlikely and should be adjusted. Furthermore, the projected employment growth is substantially greater than the 19 percent projected population growth. While employment growth can exceed population growth, such a large discrepancy is highly unusual given the low unemployment rate in the region. This suggests the need for a re-evaluation with another, more realistic employment projection. 77 cont.

12.4-72

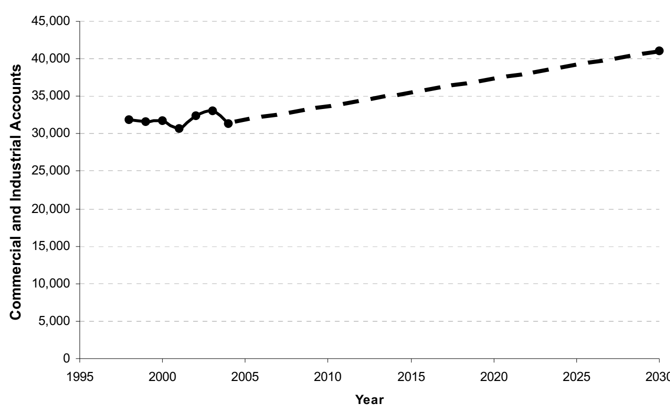

Figure 6: Historic (solid line) and Projected (dashed line) Account Growth for the Wholesale Customers.
Source: BAWSCA annual surveys from FY 1998-99 to FY 2004-05.

[45] Levy, S. 2000. "The California Economy: Outlook and Issues for the Next Ten Years." In Employment and Health Policies for Californians Over 50. Conference Proceedings. January 2000. http://ihps.ucsf.edu/conf_proc_jan2000/

Non-Residential Forecasting Method

As described previously, the DSS model relies on employment projections, combined with the implementation of plumbing codes and the proposed conservation measures to forecast future demand. This process as applied to the non-residential sector is described in greater detail below:

1. Base-year (2001) conditions are established
   - **Water Use by Account**: For each wholesale customer, base-year (2001) water use for the commercial and industrial sectors is divided by the number of commercial and industrial accounts, respectively. This yields an estimate of water use per account for the commercial and industrial sectors. If insufficient data is available, the commercial and industrial sectors are combined and one water-use number is calculated.
   - **Users Per Account**: The number of users per account are developed by dividing the base-year (2001) employment figure in each wholesale customer service area by the number of accounts billed in that year (2001). 78
   - **Fixture models**: Fixture models establish base-year fixture conditions (number of high-volume and low-volume fixtures) according to water usage data and additional water-use and fixture replacement studies. These models integrate plumbing codes over time to establish future fixture conditions.
2. Forecasting future (2030) demand
   - **Employment Growth**: The number of users per account is held constant, allowing projected employment growth to be translated into account growth.
   - **Demand Projections**: The model then forecasts future water use for each wholesale customer based on the account water use (adjusted to reflect plumbing code implementation) and growth in the number of accounts.
   - **Additional Conservation**: Conservation measures were applied by specifying the target user group and end use (e.g., irrigation), market penetration, measure water savings, and measure life.

This forecasting method is inadequate. It has two important errors which can lead to potentially large inaccuracies when forecasting demand: it assumes that the current composition of commercial and industrial businesses within the non-residential sector will not change over time, and it ignores the variability in water use in both quantity and purpose among users in the non-residential sector. These inadequacies are discussed in greater detail below.

The DSS model applies the economic growth rate to all non-residential accounts equally, thereby assuming that all subsectors grow at the same rate. This is highly unlikely. Table 7 shows the current (2000) and projected employment by subsector for the 9-county San Francisco Bay Area. The sector growth rates vary tremendously. For example, employment in the health and educational services and information subsectors [traditionally lower water-using sectors] is projected to increase by nearly 50 percent. Employment in the agriculture and natural resources and manufacturing and wholesale subsectors [traditionally higher water-using sectors], however, is projected to grow by a more modest four percent and 17 percent, respectively. Because of the differences in the employee growth rate across the region, the composition of the non-residential sector will likely change considerably over time. 79

Table 7: Current (2000) and Projected Regional Employment by Economic Subsector.

Sector	2000	2030	Change
Ag and Natural Resources	24,470	25,470	4.1%
Construction	231,380	339,350	46.7%
Manufacturing and Wholesale	685,480	798,630	16.5%
Retail	402,670	531,270	31.9%
Transportation and Utilities	177,940	212,970	19.7%
Information	177,440	265,740	49.8%
Financial and Leasing	283,350	411,540	45.2%
Prof. Managerial Services	568,260	780,650	37.4%
Health and Educ. Services	623,590	941,730	51.0%
Arts, Rec., and Other Services	432,440	625,750	44.7%
Government	146,440	187,500	28.0%
Total Jobs	3,753,460	5,120,600	36.4%

Note: Regional projections for Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma Counties.
Source: Association for Bay Area Governments. 2005. ABAG Projections 2005: Current Forecast. http://planning.abag.ca.gov/currentfcst/regional.html

The DSS model also ignores differences in water use among users in the non-residential sector. Water is used in various quantities and for a variety of purposes among customers within the non-residential sector. Table 8 shows water-use coefficients in gallons per employee per day (gped) for various establishments in the non-residential sector. Note the tremendous range in water use. For example, water use in hospitals is about 124 gped whereas water use in hotels is nearly twice that amount. For golf courses, water use is estimated at 7,718 gped. Thus the industries present in a given area strongly influence the water use of the non-residential sector, a finding that is not reflected in the DSS model. 79 cont.

In combination, these omissions can lead to potentially large inaccuracies. Water-use variability among subsectors combined with uncertain changes in the composition of the non-residential sector lead to inaccurate estimates of water use in the non-residential sector. Because total demand growth is driven largely by changes in the non-residential sector, a more accurate, comprehensive analysis based on industry-specific growth and water-use rates should be employed. Such an analysis was performed for the SFPUC retail customers and should be applied to the wholesale customers.

The proposed conservation reduces 2030 non-residential demand by a mere four percent. While a quantitative assessment of the conservation potential in the non-residential sector is beyond the scope of this report, the conservation potential identified for the SFPUC wholesale and retail customers is weak and misses important efficiency opportunities. Although few of the conservation savings are a result of efforts to reduce non-residential demand, other conservation assessments have concluded that the actual conservation potential of the non-residential sector is substantially higher. A recent report by the Pacific Institute finds that existing, cost-effective technologies could reduce California's current (2000) water use for the non-residential sector by 26 percent.[46] Savings vary by industry, but are largest for schools, office buildings, golf courses, retail stores, and restaurants. Recirculating cooling towers, x-ray water recycling units, and restaurant pre- 80

[46] Gleick, P.H., D. Haasz, C. Henges-Jeck, V. Srinivasan, G. Wolff, K. Cushing, and A. Mann. 2003. Waste Not, Want Not: The Potential for Urban Water Conservation in California." Pacific Institute for Studies in Development, Environment, and Security. Oakland, California.

rinse spray valves are among a few of the most promising technologies.[47] Similarly, the Santa Clara Valley Water District commissioned a survey of 26 commercial, industrial, 80 cont.
and institutional facilities and found that water conservation measures could reduce water use by 38 percent.[48] These studies suggest that additional emphasis should be placed on reducing non-residential water use.

Table 8: Water Use Coefficients by SIC Code or Establishment Type in the Non-Residential Sector

SIC	Description	gped
806	Hospitals	124
	Office Buildings	127
	Retail	156
357, 36, 38	High Tech	203
34	Fabricated Metals	215
701, 704	Hotels	240
58	Restaurants	265
8219, 9382	Schools	282
721	Laundries	980
201	Meat Processing	1,149
202	Dairy Products	1,568
22	Textiles	1,660
208	Beverages	2,169
203	Preserved Fruits and Vegetables	2,487
262	Paper Mills	5,260
7992	Golf Courses	7,718
263	Paperboard Mills	10,320
261	Pulp Mills	12,590
291	Petroleum Refining	14,676

Note:
gped = gallons per employee per day
Source: Compiled from Appendices E and F in Gleick, P.H., D. Haasz, C. Henges-Jeck, V. Srinivasan, G. Wolff, K. Cushing, and A. Mann. 2003. Waste Not, Want Not: The Potential for Urban Water Conservation in California." Pacific Institute for Studies in Development, Environment, and Security. Oakland, California.

[47] Gleick, P.H., D. Haasz, C. Henges-jeck, V. Srinivasan, G. Wolff, K. Cushing, and A. Mann. 2003. Waste Not, Want Not: The Potential for Urban Water Conservation in California." Pacific Institute for Studies in Development, Environment, and Security.
[48] Pollution Prevention International, Inc. 2004. Commercial, Institutional, and Industrial Water Use Survey Program: Final Report. Prepared for the Santa Clara Valley Water District. http://www.cuwcc.org/uploads/tech_docs/CII_H2OUse_Survey_Prgrm_Final_Rpt_04-05-25.pdf

Recycling and Reuse

Water reclamation, or recycling, refers to the process of treating wastewater to make it suitable for reuse. Reclamation can augment water supplies, as well as provide a means to treat wastewater and reduce environmental discharge. From a technical standpoint, wastewater can be treated to drinking water standards. Public perception, however, constrains potable reuse of recycled water, and it is typically reserved for irrigation, commercial and industrial purposes, toilets, and other non-potable uses. These uses, however, can be significant, and substantial fractions of some demands are likely to be met in the future with recycled water. The current and potential use of recycled water for the SFPUC retail and wholesale customers were evaluated separately and are discussed in greater detail below.

The *Wholesale Customer Recycled Water Potential Technical Memorandum* evaluates 81
the current and potential use of recycled water for the SFPUC wholesale customers.[49] According to this study, nine recycled water projects currently (2004) produce 12.6 mgd of water in the wholesale customer service area.[50] This water is used for a number of purposes, including irrigation and commercial end uses and wetland restoration. By 2020, recycled water projects for which wholesale agencies have completed planning studies, secured funding, and have begun or will start construction will provide an additional 6.3 to 7.8 mgd of water. The total recycled water potential for 2020 for SFPUC wholesale customers is estimated to range from 39.6 to 46.0 mgd, of which 8.9 mgd would be used for environmental restoration and the remaining 30.7 to 37.1 mgd would offset potable water use.[51]

The *Recycled Water Master Plan Update* evaluates the current and potential use of 82
recycled water for the SFPUC retail customers.[52] The SFPUC's current use of recycled

[49] Raines, Melton & Carella, Inc. (RMC). 2004. Wholesale Customer Recycled Water Potential Technical Memorandum. Prepared for the San Francisco Public Utilities Commission.
[50] Yield does not include recycled water use within wastewater treatment plants.
[51] The total recycled water project potential was based on summing the yields from the current (2004) projects, the "planned and being implemented" projects, and the "under study or previously studied" projects.
[52] RMC Water and Environment. 2006. City and County of San Francisco Recycled Water Master Plan Update. Prepared for the San Francisco Public Utilities Commission.

water is limited to two golf courses in San Francisco. The report concludes that feasible recycling projects can provide an estimated 11.8 mgd of non-potable water by 2030. The recycled water would be used primarily for irrigation, but also for commercial and industrial uses. Additional opportunities exist, such as using recycled water for residential irrigation or street cleaning/sweeping, but the uses are considered “less feasible” at this time and were not well quantified.

Despite the promising potential of recycled water identified within the SFPUC service area, recycling and reuse will provide only 13 mgd in 2030, or 3 percent of the retail and wholesale customers 2030 water demand (Figure 7). Of this total, the wholesale customers would produce 9 mgd, and the SFPUC would produce 4 mgd. This is only a fraction of the identified potential and is low in comparison to what has been achieved elsewhere (see below). Further, the outdoor and non-residential sectors are driving future demand growth. Recycled water can effectively offset increased freshwater demands for these sectors, highlighting the value of maximizing use of this resource. 82 cont.

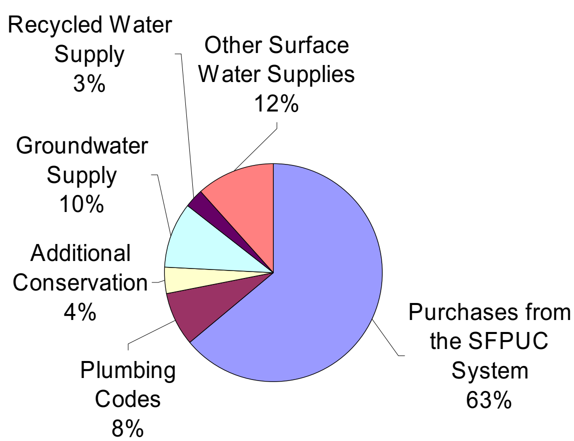

Figure 7: SFPUC Retail and Wholesale Customer 2030 Water Demand and Supply Estimates.

Implementing recycled water projects is not without challenges, and these challenges must be overcome to realize the full potential of recycled water. Challenges are associated with “securing outside funding necessary to make the project cost-effective, gaining public support, establishing new partnerships, and managing recycled water quality/salinity.”[53] Recycled water, however, has become an increasingly important component of the water-supply portfolios for water districts throughout the United States, suggesting that these challenges can and have been overcome. For example, the Irvine Ranch Water District, in Southern California, currently meets nearly 20 percent of its total demand with recycled water.[54] In 2004, the South Florida Water Management District reused over 25 percent of the total wastewater treated.[55] And more recently, a new residential community in Ventura County, California has decided to use recycled water for all of its landscaping needs at an estimated cost of $200 per acre-foot.[56] This suggests that significant opportunities exist to increase recycling and reuse throughout the region, effectively lessening the need to identify and develop new water supplies. 83

Conclusions

The SFPUC wholesale and retail demand studies project substantial increases in 2030 water demand, largely from the region’s wholesale customers. To meet these additional demands, purchases from the SFPUC are projected to increase by 35 mgd. The SFPUC relies upon a 25 mgd increase in diversions from the Tuolumne River plus an additional 10 mgd from conservation, water recycling, and groundwater supply programs within the SFPUC retail service area to meet future purchase requests from its retail and wholesale customers. 84

Our analysis, however, reveals that current studies may significantly overestimate future regional demand for water and underestimate the potential for cost-effective demand

[53] Raines, Melton & Carella, Inc. (RMC). 2004. Wholesale Customer Recycled Water Potential Technical Memorandum. Prepared for the San Francisco Public Utilities Commission.
[54] Irvine Ranch Water District. 2005. Urban Water Management Plan. http://www.irwd.com/BusinessCenter/UWMP-2005-F.pdf
[55] South Florida Water Management District. 2004. Annual Agency Reuse Report. http://www.sfwmd.gov/org/wsd/wsconservation/pdfs/reuse/final2004annualreusereport.pdf
[56] Richards, S. 2006. Community to use reclaimed water. Ventura County-Star. August 15, 2006.

management. A straightforward re-examination of conservation scenarios, using more plausible employment projections, more accurate non-residential water use estimates, and a price-driven conservation component would likely produce a more realistic 2030 demand forecast and identify priority policies for cost-effective efficiency improvements, recycling, and reuse. 84 cont.

Pacific Institute Recommendations

Modeling and Assessment Efforts

1. Non-residential demand is an important driver for future demand increases, and as a result, an adequate assessment of future demand and conservation potential is critical. The SFPUC should re-evaluate non-residential demand projections for its wholesale customers using industry-specific economic growth projections, water use, and conservation potential. Initial efforts should be regional in scope or focus on those agencies with high non-residential water use. If the projections from the new analysis differ substantially from those of the DSS model, detailed analyses should be conducted for each of the wholesale customers. 85

2. As the price of water increases, demand decreases, particularly for non-residential and outdoor uses. Because the SFPUC expects to quadruple the price of water by 2015, the effects of projected water price increases should be integrated into the demand projections. Failing to do so may result in an overestimate of future demand and revenue shortfalls. 86

3. Estimates of the maximum, cost-effective conservation potential should be determined for each measure, major end use, and district or wholesale/retail user. The definition of "cost-effective" must be broadened beyond the utility perspective and should include the value of ecosystem flows. 87

4. Better data are needed on the type of non-residential account and the water use associated with that account. The SFPUC and its wholesale customers must also standardize reporting methods. A focus on outdoor water use is especially needed. 88

5. Modeling efforts should include multiple scenarios so as to determine a range of future demand. 89

6. A better assessment of the potential for using recycled water for different end uses is needed. 90

7. Future studies should include the impact of climate change on projected demand and supply. 91

Conservation Implementation

1. Each agency should assess what is driving demand growth and measures to reduce that demand. Agencies must take a more pro-active role in identifying ways to reduce demand growth, particularly in new developments. 92

2. The SFPUC and its wholesale customers should implement water and wastewater rate structures that encourage water conservation among their customers and fund conservation programs. 93

3. All agencies should sign the CUWCC MOU and work to meet all applicable Best Management Practices. 94

4. SFPUC and BAWSCA should work together to establish more effective regional water conservation and recycling programs. 95

5. Institutional mechanisms should be developed to encourage wholesale customers to move more aggressively toward efficiency improvements. This can include cross-agency information sharing, consistent conservation programs and targets, economic incentives for demand reductions, conservation pricing for wholesale customers, regular reassessment of program effectiveness and implementation, and improvements in conservation data collection and reporting. 96

6. Serious consideration should be given to capping purchases from the SFPUC at current levels. BAWSCA and the SFPUC should institute financial incentives to encourage conservation efforts and financial disincentives to discourage demand growth. For example, water marketing among the wholesale agencies would allow 97

water saved through conservation efforts by one agency to be sold to another agency, thereby promoting economic efficiency. 97 cont.

PILARCITOS CREEK ADVISORY COMMITTEE

9/28/2007

San Francisco Planning Department
Environmental Review Officer
WSIP PEIR
1650 Mission Street, Suite 400
San Francisco, Ca 94103

By email; wsip.peir.comments@gmail.com

Atten; Paul Maltzer,

Mr. Maltzer,

The Pilarcitos Creek Advisory Committee (Committee) is a watershed stakeholder organization made up of various interest groups in Half Moon Bay. The Committee has representatives from the environmental, agricultural, commercial fisheries and restoration communities. Our mission is to restore habitat conditions within the watershed for the native plant and animal communities and the public benefit of enhanced water quality. The Committee was initially established by the Dept of Fish and Game and the Regional Water Quality Control Board (Region 2) in 1993.

SFPUC has been an important stakeholder in our coastal watershed for over 100 years and has been a participant at our Committee meetings.

The initial phase of the Committee's work was to provide local oversight in the development of an initial "Restoration Plan" for the watershed (finalized in 1996). Subsequent to the development of the Plan, our Committee then advocated for projects which were identified in the Plan. Many of those projects have now been completed.

More recently, the SFPUC has been an active partner in a new initiative, an Integrated Watershed Planning Project for the Pilarcitos. This plan, funded by the State of California, is underway with strong support from the SFPUC staff, thru contribution of staff effort and dollar expenditure.

In each step of this decade long progression of steps (which has included agency driven watershed plans, public outreach and formal forums and now a State funded IWMP) there has been a recognition that only by thoughtful management and use of the waters developed within the Pilarcitos basin would we be able to restore and enhance aquatic habitats and "balance" the beneficial uses of the waters of Pilarcitos Creek (which includes domestic, agriculture, cold water fisheries and recreation).

It has been the position of the PCAC that the current system of upper watershed impoundments owned and operated by the SFPUC have reduced opportunities to 01

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PILARCITOS CREEK ADVISORY COMMITTEE

accomplish the goals of "restoration and balance" supported by our Committee and the community at large. 01 cont.

With that background, the PCAC would like to make the following comments on the PEIR;

1. The PCAC appreciates the clear narrative explanation of the cross basin transfer of Pilarcitos Creek water, through the Coastal Mountains (through tunnels) over into the San Mateo Creek vicinity watersheds (impounded in Crystal Springs Res and others) as written in Vol. 1 Pg 157. The result of this transfer leads to the dewatering of the Pilarcitos Creek below the SFPUC operated Stone Dam during summer months, and the alteration of a winter storm hydrograph in Pilarcitos in the winter. **The PCAC would suggest that the significance of impacts of this cross basin transfer should be more closely analyzed and commented on in the PEIR with regards to the alteration of both winter and summer hydrographs, especially as they relate to the habitat of threatened and endangered species found I the riparian corridor during low summer and fall flows.** 02
2. A combination of statements in the PEIR (for example Vol 3 Pgs 393.394) explain that no intentional releases are made below Stone Dam and the "flow in the creek immediately below the dam consisted only of leakage through the spillway boards and seepage through the dam". Further, the PEIR states that no releases are required to maintain minimum stream flows in Pilarcitos Creek. The PCAC believes these statements conflict with "minimum bypass" requirements of both CDFG and NOAA Fisheries, mandated for the protection of sensitive aquatic species. **The PCAC requests that significant impacts which result from the lack of bypass flows should be analyzed in the PEIR. We believe that the historical failure to maintain minimum flows in no way limits SFPUC's obligation to heed state and federal laws.** 03
3. The Flows in Pilarcitos Creek are further discussed in Vol. 3 pages 403,404. In those paragraphs are described the winter "spills" which occur over Stone Dam into Pilarcitos in the wet months of wet years. This discussion reminds the PCAC of the physical conditions and age of both Pilarcitos Lake and Stone Dam. Each of the structures are over 100 years old. **The PCAC would suggest that the PEIR should look at the significance of impacts if these structures were they to fail (in terms of habitat, property and potential human loss in case of breach).** This issue was brought to our attention in a recent San Mateo County Grand Jury report. 04
4. **The PCAC has significant issue with the "Impact Conclusions" noted in the PEIR** which state,

   > "The WSIP would not alter the character of Pilarcitos Creek immediately below Stone Dam. Flow in the creek immediately below the dam is intermittent under the existing condition and would continue to be intermittent with the WSIP, so no adverse hydrologic effects would occur. With the WSIP, total spills to the creek immediately below Stone Dam would be reduced, but the magnitude of the flows in the lower reaches of the creek would be similar to those under existing conditions. Therefore, adverse impacts on water levels in Pilarcitos Reservoir and 05

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PILARCITOS CREEK ADVISORY COMMITTEE

on flow along Pilarcitos Creek below Stone Dam would be *less than significant*, and no mitigation measures would be required."

The PEIR is suggesting that the "baseline conditions" for Pilarcitos Creek below Stone Dam are established by the SFPUC's policy of "no discharge". That policy has led to the dewatering of Pilarcitos Creek, the blockage of migration for the native steelhead population and has had further negative impacts due to the reduction of available beneficial habitat to sensitive aquatic species such as the Red Legged Frog. The statement also ignores the substantial "leakage" discharge of recent years. **We feel that this acceptance of an artificial and manipulated "baseline condition" is not an appropriate condition from which to assess impacts**. We believe that the continuation of the current policy of "no discharge" will simply allow the existing significant impacts to this watershed to continue. 05 cont.

We suggest that a more appropriate "base line condition" should be considered. That condition would be one of a controlled spill or release out of Stone Dam, which more closely mimicked the natural flows above the SFPUC impoundments. This "baseline condition" existed this year due to "experimental releases" from Stone Dam by SFPUC, with clear increases in flows demonstrated at the Highway 1 USGS gauge approximately 10 river miles downstream. 06

Over $1,000,000 in public dollars and many thousands of dollars and hours of Landowner efforts have gone into restoring and enhancing in stream habitat conditions in the Pilarcitos watershed. SFPUC's management of Stone and Pilarcitos dams, consistent with protection of in stream conditions, is critical to the success of recovery of Steelhead populations and other aquatic species and is critical also for our joint Integrated Watershed Management Planning efforts. 07

Thank you very much for the opportunity to comment.

Sincerely,

The Pilarcitos Creek Advisory Committee
c/o Tim Frahm, current Chair
315 Magnolia Street
Half Moon Bay, Ca 94019

Jerry Cadagan
13225 Sylva Lane
Sonora CA 95370
Ph 209-536-9278
Email - socialchr@aol.com

San Francisco Planning Department September 30, 2007
WSIP PEIR
1650 Mission Street – Suite 400
San Francisco, CA 94103

Attn: Paul Maltzer, Environmental Review Officer

By email to wsip.peir.comments@gmail.com

Ladies/Gentlemen:

Introduction. These are my comments on the Draft Program Environmental Impact Report ("PEIR") for the San Francisco Public Utilities Commission's ("SFPUC") Water System Improvement Program ("WSIP").

To put in the correct context the comments below it is instructive to begin with a succinct statement, taken directly from court decisions, of the applicable standards in determining the legal sufficiency of an Environmental Impact Report under CEQA. The following explanation is found in Association of Irritated Residents vs. County of Madera, 107 Call. App. 4th 1383, 133 Cal. Rptr. 2d 718 (2003):

> "When assessing the legal sufficiency of an EIR, the reviewing court focuses on adequacy, completeness and a good faith effort at full disclosure. (*County of Amador v. El Dorado County Water Agency* (1999) 76 Cal.App.4th 931, 954, 91 Cal.Rptr.2d 66 (*Amador*).) "The EIR must contain facts and analysis, not just the bare conclusions of the agency." (*Santiago Water Dist. v. County of Orange* (1981) 118 Cal.App.3d 818, 831, 173 Cal.Rptr. 602.) "An EIR must include detail sufficient to enable those who did not participate in its preparation to understand and to consider meaningfully the issues raised by the proposed project." (*Laurel Heights Improvement Assn. v. Regents of University of California* (1988) 47 Cal.3d 376, 405, 253 Cal.Rptr. 426, 764 P.2d 278 (*Laurel Heights*).)" 01

Keeping in mind the foregoing common sense set of standards for assessing the adequacy and sufficiency of an EIR, the following specific comments are offered, while noting that the below comments do not cover all respects in which the PEIR appears to be inadequate and legally insufficient. Time only allowed coverage of certain issues that might not be covered by other commentators. 02

1. The very heart of the environmental issues raised by the WSIP and the PEIR is the preference of SFPUC to meet the alleged increased 35 million gallons a day ("MGD") demand by extracting 25 MGD additional from the Tuolumne River while generating 10 MGD through some combination of conservation, water recycling, and groundwater supply programs. PEIR Section 3.6.1 states that about 4 MGD of the 10 MGD will come from recycled water projects.

SFPUC's Recycled Water Master Plan - March 2006 ("RWMP") can be found at ---
http://sfwater.org/detail.cfm/MC_ID/13/MSC_ID/165/MTO_ID/290/C_ID/2920)

At page ES-7 of the RWMP it says that in San Francisco alone there is the real potential for feasible water recycling to the tune of 11.8 MGD – that's almost 2 MGD more than the EIR says SFPUC plans to develop from the combined resources of conservation, recycling and groundwater throughout the service area.

Then at page ES-10 the RWMP says so-called Phase I of recycled water projects would target only 4.5 MGD of the 11.8 MGD of existing demand. The RWMP continues at page ES-10 simply saying, "The remaining potential demand represents future for expansion of the recycled water system to additional customers that are not planned to be served at this time."

a. Stated bluntly, the RWMP is simply uninformative as to why additional demand is not intended to be served in Phase 1 and when in the future that demand for recycled water will be met. It may be acceptable to some for the RWMP to be so deficient; it is not acceptable for the PEIR to not address those fundamental questions. Recall one of the principles stated above: "An EIR must include detail sufficient to enable those who did not participate in its preparation to understand and to consider meaningfully the issues raised by the proposed project." San Francisco's expressed intent to extract 25 MGD from the Tuolumne River is the single largest issue raised by the proposed project. In order for those "who did not participate" in the PEIR's preparation to meaningfully be able to evaluate the consequences of San Francisco's plans for greater extractions from the Tuolumne they must have much more information regarding the alternatives, including the admitted potential for much greater recycling in San Francisco. Only then can the readers of the PEIR determine whether it is reasonable that SF wants to take from the Tuolumne two and one-half times as much water as it and its customers are prepared to generate through conservation, recycling and groundwater resources.

The need for a much more thorough analysis in the PEIR of the potential for water recycling in San Francisco alone is accentuated by San Francisco's astoundingly poor record of water recycling. In connection with a draft of the Recycled Water Master Plan, this commentator submitted a six page comment letter to the SFPUC in November 2005. Below is a paragraph from that letter putting into context San Francisco's water recycling record.

02 cont.

SI_RHH1

"p. 22 – Footnote "a." to Table 2-1 references the May 2000 State Water Resources Control Board ("SWRCB") Survey of municipal recycling facilities. It is inexcusable for the draft RWMP to use that reference when it is common knowledge that an updated Survey was released in 2002, and updated in 2003. The draft RWMP "References" (p. 137) acknowledges this fact. It is inexplicable how the preparers of Table 2-1 cite the older Survey. Nonetheless, both Surveys are evidence of the accuracy of the Committee's prior statements that SFPUC exaggerates its commitment to water recycling and is, in fact, light years behind the rest of the state. First, compare the two Surveys. The 2000 Survey shows 234 recycled water facilities with an aggregate capacity of 401,910 acre feet per year ("AFY"). The 2002 Survey shows 278 plants with a capacity of 544,979 AFY; about a 35% increase in capacity over a two to three year period. Second, look at the list of facilities in the 2002 Survey and break it down by County. There are only 7 out of California's 58 counties not represented. San Francisco shows up with one facility – the Southeast plant with an alleged design flow of 85 MGD and an annual capacity of 6066 AFY. The reality is that a few trucks are washed each year at the Southeast plant. Thus, the fact is that there are eight counties in California doing no meaningful water recycling --- Alpine (population-1,210), Modoc (population-9,350), Trinity (population-13,100), Colusa (population-19,450), Glenn (population-26,800), San Benito (population-55,900), Sutter (population-81,900) and San Francisco (population-793,000)."

02 cont.

b. The PEIR needs to better address the question of future water recycling efforts by SFPUC's wholesale customers. PEIR Section 9.2.4 states that future water demand numbers of those customers takes into account their future recycling plans. Much more detail than is found in Table 9-11 needs to be provided so that the decision makers and interested parties can determine whether the wholesale customers, like San Francisco, are only willing to meet a fraction of feasible recycled water demand with actual projects. Only then can the readers of the PEIR determine whether it is reasonable that San Francisco wants to take from the Tuolumne two and one-half times as much water as it and its customers are prepared to generate through conservation, recycling and groundwater resources.

03

c. Subparagraphs a. and b. above address the need for the PEIR to more adequately and completely analyze water recycling alternatives, so that decision makers and interested parties can meaningfully consider the issues raises by SFPUC's preferred alternative of extracting 25 MGD from the Tuolumne, while only generating 10 MGD through conservation, recycling and groundwater. There is another aspect of the untapped potential for recycling in San Francisco and the service area that ought to be addressed in the PEIR. Section 9(h)of the Raker Act provides that San Francisco may not export from beyond the San Joaquin Valley any more water of the Tuolumne watershed "than, together with the water which it now has or may hereafter acquire, shall be necessary for its beneficial use for domestic and other municipal purposes." One acknowledged water law scholar has suggested that this provision may require San Francisco to develop available local resources, such as recycling and desalination, before looking to the Tuolumne River for additional water. (See Appendix C to Environmental Defense's Paradise Regained: Solutions for Restoring Yosemite's Hetch Hetchy Valley, 2004.) This commentator has not looked for legal authority on the question of whether an environmental impact report need discuss legal obstacles to the completion of a proposed project. However, common sense says that if there are significant

04

potential legal obstacles, they ought to be mentioned if there is to be an adequate, complete and good faith effort at full disclosure. 04 cont.

2. Chapter 10 of the PEIR lists 20 significant adverse environmental impacts resulting from the project that the PEIR concedes probably can't be eliminated, or reduced to a less-than significant level by other mitigation measures. 20 adverse environmental impacts that can't be fixed is a lot. Why not think bold and add one over-reaching mitigation measure to help soften the blow of the 20 individual problems that can't be fixed? There is case authority under CEQA that says that a governmental entity can satisfy the mitigation requirement by simply making a commitment to study an issue (Sacramento Old City Assn. v. City Council (1991) 229 Cal. App. 3d 1011, 280 Cal. Rptr. 478). That case involved the expansion of the city's convention center and construction of an office building. The EIR discussed several potential measures to mitigate the impacts on traffic and parking. The city did not adopt specific mitigation measures but committed to study the problem and prepare a transportation management plan. The court concluded that the city had "committed itself to mitigating the impacts" and stated that the EIR's consideration, discussion, and analysis of the mitigation measures supported the city's finding that the mitigation measures were "required in, or incorporated into" the project, under section 21081 of CEQA. 05

San Francisco could make a similar commitment to cooperate in the removal of O'Shaughnessey Dam and the restoration of the valley so long as certain conditions were met. A statement of commitment from the SFPUC or San Francisco's Board of Supervisors might read as follows:

"It is the policy of the City and County of San Francisco that Yosemite National Park's Hetch Hetchy Valley should be restored, and the reservoir covering the Valley should be removed. Reservoir removal should occur after the water and power currently supplied by the reservoir are fully replaced. Water and Power replacement must take place without any increase in water or power rates or property tax rates for San Francisco residents and businesses; and without any increase in the cost of government to the City of San Francisco. San Francisco elected officials and city employees shall support restoration of Hetch Hetchy Valley, and shall do their best to gain the replacement water and power supplies." 06

Note that the statement makes it abundantly clear that San Francisco would only support removal of O'Shaughnessy Reservoir if the lost power and water were fully replaced and if there was no additional cost to San Francisco residents and businesses. Stated more bluntly, a "no cost" mitigation option available to San Francisco would be a simple statement of policy that it will not continue to obstinately oppose valley restoration or even study of valley restoration, so long as those efforts result in no harm to San Francisco.

3. On page S-8 and elsewhere in the PEIR it is stated without qualification that SFPUC proposes to secure a water transfer with Turlock and/or Modesto Irrigation Districts to provide supplemental dry-year water from The Tuolumne 07

River. Remembering that an essential element of an EIR is "a good faith effort at full disclosure", the PEIR should go further. Have the irrigation districts agreed to such a water transfer? Have they even been asked? Is it not true that representatives of the districts have publicly stated that they don't intend to be involved in such transfers? Again, here as elsewhere, the PEIR must include sufficient detail for the reader to consider meaningfully the issues raised by the project. 07 cont.

Respectfully Submitted,

Jerry Cadagan

SI_RHH2

SF Planning Dept WSIP PEIR initial response at Sept 5, 2007 meeting at Sonora Opera Hall

I am Bob Hackamack, Tech/Engin Chair of Restore HH, home address P O Box 1886, Twain Harte.

It is apparent that the SF Planning Dept and its consultant have put forth significant effort in preparing the PEIR. I complement you. There are minor errors which are understandable. I learned several things that I did not know about the regional system. These are good reference manuals.

I want to explain how the preferred alternate called WSIP is disconnected from reality, but that a combination with alternatives will be a workable and wise solution.

1. You correctly stated that John Freeman projected his 1912 plan would ultimately provide 400 mgd of supply from TR, but you failed to say that the SFPUC didn't build the system according to Freeman's plan. Rather, the system was built for maximum hydroelectric profit, which resulted in a drastic reduction of firm yield. (2-36 & 7) 01

With a simple calculation on your preferred alternative, I find firm yield of HH is 207 mgd, plus 13 mgd from local sources for a sum of 220 mgd during the design drought, with 17% of reduced supply coming from rationing of 45 mgd. This leaves HH Res empty at the end of the 8.5 year design drought. No prudent manager will use that plan, so expect no rationing the first year with 25% rationing thereafter, the same as in past droughts. (2-19, Figure 2.5)

I ask you, why would your BofS agree to a tripling of water rates to pay for this WSIP and now tolerate the PEIR telling the ratepayers they will get a system that plans for up to 25% rationing every 13 or 26 or 41 years? 02 Your rate payers deserve better service for what they are going to be paying. (2-19, Figure 2.5)

2. The solution is obvious: Cap diversion from the TR at say 207 mgd and get all total needs above 220 mgd from water efficiency which is a very economical source, plus recycled treated waste water for landscape, and industrial and commercial cooling, groundwater banking inside your service area and by groundwater exchange outside, plus purchase, plus desal of brackish water. 03 Do all those things together and drought rationing will be tiny.

In other words, get busy to cut back from the preset 230 plus mgd so you can reach a sustainable level. At a capped average diversion of 207 you will have lots of entitlement to put into groundwater banking as exchange storage for drought. (S-8, Figure S.4 and SFPUC data for WY 2006)

I favor the options dealing with Aggressive Conservation/Water Recycling and Local Groundwater, plus added 04 groundwater banking and conjunctive, purchase, desal, and lower TR diversion. (S-74 and Chapter 8 & 9)

3. To move forward smoothly on this project, you must cap your take from the TR because you are obviously building 46% of the length of the 4th barrel that virtually guarantees more river diversion, in 05 spite of SFPUC saying last year that it abandoned the 4th barrel because of the cost. (3-49)

4. Last, you did not respond adequately to the Raker Act provision I spoke about here in this hall in Oct '05 requiring you to develop all water supplies in your and the wholesale service areas before diverting from the TR, as stated in Sec 9 (h) of the Act. The best you say about developing supplies in your PEIR scoping is "improve use of new water sources". This is totally unacceptable as a goal. 06 The proper goal would be to build a sustainable water supply system for the 21st Century as your predecessors did for the 20th Century. (Appendix A page 10 Water Supply, fourth bullet)

Bob Hackamack, P.E.

SI_SCCCC

Santa Clara County Creeks Coalition

Advocates for living streams

MEMBER ORGANIZATIONS
Committee for Green Foothills
Guadalupe/Coyote RCD
Northern California Council - Federation of Fly Fishers
Santa Clara Valley Audubon Society

September 28, 2007

Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Maltzer:

Santa Clara County receives water from the San Francisco Public Utilities Commission's Hetch Hechy pipeline and the Tuolumne River providing relief and diversification of our local water 01 supplies but even so the Santa Clara County Creeks Coalition opposes any increase in diversions from this critically important river.

We also feel that the Draft Program Environmental Impact Report (PEIR) used flawed modeling 02 to determine the anticipated increase in water demand, thus inflating projected future needs. We also feel that it fails to adequately identify and address all of the environmental impacts to the River. 03 Additional studies must be undertaken before finalizing this document.

Water conservation and efficiency measures are the cheapest, easiest to implement, and least destructive ways to meet demand and extend water supply. When it comes to water conservation, the Bay Area lags far behind other metropolitan areas such as Seattle and Los Angeles that are reducing water consumption even in the face of growth.

04

We do support alternatives identified that protect the Tuolumne River from new diversions. Requiring more water conservation, efficiency, and recycling is the best way to lessen impacts on the Tuolumne River while promoting a sustainable water plan for the Bay Area.

Only by ensuring that healthy amounts of water continue to flow into the Tuolumne River can we protect this irreplaceable natural treasure.

Sincerely,

Mondy Lariz

Mondy Lariz

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San Francisco Public Utilities Commission

To Whom It May Concern:

The Use of Water from the Tuolumne River for Urban Use.:

The snow pack of the Sierras, much of it located in a Yosemite National Park, is a convenient source of clean water for natural systems, agriculture system and urban systems. Since these systems are interlock by the needs for water, any change in one effect the other. Thus any plan to change water allocations for any systems, requires thought, research and negations that address the overall success of all the systems. To study the environmental change over time, is fundamental to the policy making process. Therefore it is important that scientific baseline studies be started, continued and evaluated over time.

Populations of living things, in natural or urban setting, follow much the same direction toward unchecked growth that is infinite in scope. In nature, the process of natural selection will mold the population to the carrying capacity of the environment as each habitat has a finite capacity. In the urban areas, planning for finite population or usage of finite resources reduces the process of natural selection. Before looking to watershed for more water, it is important to the planning process to look for ways for the San Francisco Public Utilities Commission to find sustainable methods through conservation, the use of modern technology for water monitoring, reusing waste water and efficiency in water use at all levels. Since it is humans and their cultural items that use water, government planning needs to address the finite nature of water and plan construction around these limits. 01

Blaine Rogers
[signature]
Tuolumne Group of the Sierra Club
Sonora, Calif.
September 19, 2007

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PLANNING DEPARTMENT
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October 1, 2007

Bill Wycko
Environmental Review Officer, WSIP PEIR
San Francisco Planning Department
1650 Mission St., Suite 400
San Francisco, CA 94103

Dear Mr. Wycko:

The SPUR Sustainable Development Committee appreciates the opportunity to provide comments on the draft Program Environmental Impact Review (PEIR) of the SFPUC's Water System Improvement Program (WSIP). This document has not been reviewed by the SPUR Board of Directors, and as such does not represent the official position of SPUR. It does represent an effort by the members of the SPUR Sustainable Development committee to provide constructive comment on that substantial document. Our comments are focused on three areas: 01

1. The purpose of the WSIP: seismic reliability
2. Conservation and efficiency modeling
3. Drought and climate change modeling and assumptions.

First, we reassert SPUR's support for the Tuolumne River and the Water System Improvement Program. In 2002, SPUR convened an independent expert "Blue Ribbon Committee" to review the SFPUC Program to Improve Reliability of the Water and Sewer Systems, which on May23, 2002 issued its final report expressing confidence in the work of R. W. Beck on the SFPUC's Capital Improvement Program. Thereafter, on October 1, 2002, SPUR expressed its strong support for Proposition A, the $ 1.6 billion Hetch Hetchy Water Bond, by vote of its Board of Directors. SPUR's long history of leadership and support for the Tuolumne River and Hetch Hetchy additionally includes the designation of the Tuolumne as a Wild and Scenic River.

SPUR believes that seismic and delivery reliability upgrades to our water system are a public investment priority. In the spirit of this support, we want the final PEIR to be as robust and compelling a document as possible, including recommendations to provide the most stable, reliable water supply to the Bay Area while minimizing significant negative environmental effects on the river and its ecosystems.

1. The purpose of the WSIP: seismic reliability 02

Recent state and local laws overwhelmingly support improving the reliability of the San Francisco regional water system, including 2002's AB 1823, Measure A, and Measure E.[1] These measures all found that disruptions to the regional water system could have

[1] *AB 1823 Assembly Bill Chaptered, Wholesale Regional Water System Security and Reliability Act,* (California State Assembly and Senate) 2002. Official California Legislative Information, www.leginfo.ca.gov

severe, disastrous impacts on public health and the Bay Area's economy. San Francisco voters authorized, and SPUR strongly supported, the largest bond in the city's history for the SFPUC to restore the system, and amended the city's charter to emphasize a high priority on protecting and repairing the system as quickly as possible. Many of the regional water system's facilities are old–some over 100 years–and were not constructed under modern seismic standards. The SFPUC considers several major facilities to be at high risk of failure from earthquake events on the Hayward, San Andreas, and Calaveras faults. 02 cont.

Our committee recommends the final PEIR strongly reiterate the primary purpose of the WSIP–to improve the reliability of the water system that serves 2.5 million people in the Bay Area. The urgency of these upgrades and the implementation of the capital program should not be minimized or delayed by any debate over growth and the Bay Area's projected needs in 2030. In this era of world-wide construction cost escalation, we are naturally concerned, as is the SFPUC and the other parties to the system, about cost overruns due to delays, and emphasize that existing public policy stresses quick, efficient seismic retrofitting and delivery reliability as the WSIP's most significant priorities.

2. Conservation and efficiency modeling

We recommend more robust implementation of conservation and efficiency measures by both San Francisco's retail customers and the SFPUC's wholesale customers. According to the draft PEIR, wholesale customers projected a 19% increase in population and a 30% increase in the number of jobs. Total water demand, including commercial and industrial uses and driven by increased employment, will only go up only 19% by 2030, reflecting increased water conservation and recycling. Total per capita water demand, including commercial and industrial use, will remain flat in spite of the increased number of jobs. Wholesale customers have committed to implementing a suite of proven water conservation measures in addition to demand reductions due to passive conservation achieved through plumbing codes. Wholesale purchase requests from the regional water system will also be reduced by an increase in water recyling and desalination. 03

San Francisco will also experience growth in population and employment, both which exert additional demands for water. However, San Francisco water demand is expected to decline as much as 11%, in spite of an expected 12% growth in population. This decrease in demand is due to a plan to begin water recycling and increase water conservation in the city.

The SFPUC's preferred alternative to the WSIP, as reviewed in the PEIR, recommends that water be diverted from the Tuolumne River in order to meet the remaining water needs of both retail and wholesale customers in 2030. The draft PEIR also presents an "Environmentally Superior Alternative" that requires water recycling to begin in San Francisco and more water conservation than the wholesale customers have currently committed to implement. SPUR believes this alternative represents a better approach.

We believe San Francisco's WSIP should exceed or meet the California Urban Water Conservation Council Best Management Practices for Water Conservation. We are encouraged that both San Francisco and the wholesale customers evaluated the cost effectiveness potential of water conservation measures beyond those currently listed as Best Management Practices. However, we believe all of the agencies should continuously be improving their water conservation practices.[2] We recommend the final PEIR more fully describe and evaluate the Environmentally Superior Alternative, including the ways this additional level of conservation might be attained. 03 cont.

3. Drought and climate change modeling and assumptions

The draft PEIR acknowledges that climate change and global warming are a fact. Drought cycles are also a reality in California. We are concerned about the effects of combined forces of drought and climate change on the Hetch Hetchy system. Potential impacts could vary from an unsustainable level of instream flow, to the inability to meet delivery needs. We recommend that the PEIR seriously consider the combined effects of drought and climate variability. Absent a serious evaluation, it cannot be said that global warming will not negatively affect the WSIP.

In the SFPUC design drought model of 8.5 years, approximately 6 years are drought, dry, below-normal or normal-restoring years. With 60% of its water diverted at present, the Tuolumne River is already affected by these types of conditions, and would be at greater risk during an extended drought cycle, which could occur unpredictably due to future climate change. However, the draft PEIR concludes that climate change will have a minimal effect on the river. It states that current models of California water systems do not reflect potential global warming conditions, and that the existing Hetch Hetchy Local Simulation Model, based on 84 years of hydrologic records, is a more accurate predictor of impacts that may occur in the future. The draft concludes that the effects of climate change and global warming will not be measurable until near mid-century, at which time adjustments can be made. Without analyzing the combined and cumulative effects of two potential hydrological scenarios in the future – drought and climate change – the PEIR's conclusion that global warming will not affect the WSIP is unsubstantiated. 04

In other California jurisdictions, conservation, flexible management plans and regional strategies have been identified as best management practices in drought and climate risk scenarios. For example, recognizing the challenges and uncertainties of climate change and global warming, the East Bay Municipal Utilities District (East Bay MUD) analyzed and quantified possible climate change and global warming impacts, and developed operation models that included flexible management plans, efficiency and conservation. East Bay MUD became the first water district to join the California Climate Action Registry. 05

Following the local leadership of East Bay MUD, we recommend that the PEIR further address the combined effects of climate change and drought cycles to ensure that the

[2] Water conservation is a proven, efficient, reliable approach that is compatible with and supportive of local needs, growth, and development. (Nelson, Barry, Schmitt, Monty, Cohen, Ronnie, Ketabi, Noushin, Wilkinson, Robert, 2007. *In Hot Water, Water Management Strategies to Weather the Effects of Global Warming,* Natural Resources Defense Council, New York, NY)

Tuolumne River and its interconnected ecosystems are not exposed to potential, irreversible harm and damage. This, in turn, would protect water delivery reliability, and the health, safety, environmental, and economic stability of the Bay Area.

We believe that climate change should be further examined, but not at the expense of delaying the urgently needed seismic improvements to the regional water system. The PEIR should require that as the WSIP projects move forward, the climate change issues will be rigorously addressed and not merely swept aside for future generations to resolve. 05 cont.

Conclusion: Sustainability and the draft PEIR

The San Francisco Bay Area has a worldwide reputation for its strong commitment to sustainability, ecosystem protection, and climate change action.

The final PEIR developed for San Francisco's Water System Improvement Program should reinforce what San Francisco has already accomplished. The Environmentally Superior Alternative relies on increased levels of water conservation and recycling that represents a cost-effective strategy for the WSIP to protect the environment and provide growth and development for customers' needs. 06

Because of the potential risk to the river and its interconnected rivers, streams, delta, and eco-systems, the final PEIR should carefully analyze the effect of additional water loss to the Tuolumne. The final PEIR should evaluate additional opportunities to mitigate or avoid decreased flows in the lower Tuolumne River. Finally, the Bay Area's growing awareness of climate change, and our vulnerability to water being in the wrong places at the wrong time, strongly highlight the need for our water system to be as robust as possible for any future climate scenario. 07

The SPUR Sustainable Development Committee believes that the SFPUC can and should be a model of water leadership in the 21st century, and hopes you will receive these comments in that light. SPUR stands ready to support the SFPUC in this endeavor.

Sincerely,

Laura Tam
Sustainable Development Policy Director
on behalf of the SPUR Sustainable Development Committee

cc: Diana Sokolove

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September 25, 2007

Mr. Paul Maltzer
Environmental Review Officer
Water System Improvement Program DPEIR
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Maltzer:

The State Water Contractors (SWC) submits these comments regarding the Draft Program Environmental Impact Report (DPEIR) for the San Francisco Public Utilities Commission's (SFPUC) Water System Improvement Program (WSIP). As described in the DPEIR, the SFPUC proposes through the WSIP to increase the reliability of the regional water system, which provides drinking water to the City of San Francisco and areas of San Mateo, Santa Clara, Alameda, and Tuolumne Counties. WSIP implementation would provide for additional water supply to serve customers through 2030 as well as construction repairs and improvements to many facilities within the existing SFPUC system.

The SWC is an organization representing 27 of the 29 public water entities[1] that hold contracts with the California Department of Water Resources (DWR) for the delivery of water from the State Water Project (SWP). Collectively, the members of the SWC provide all, or a part, of the water supply delivered to approximately 23 million Californians, roughly two-thirds of the State's population. The members of the SWC provide this water to retailers, who, in turn, serve it to consumers throughout the San Francisco Bay Area, the San Joaquin Valley, the Central Coast, and Southern California.

The SWP supply delivered through the Sacramento-San Joaquin Delta constitutes a significant portion of the supplies available to SWC members. As a result, the SWC is very interested in matters affecting the quantity and quality of water supplies in the Delta. As described in the DPEIR, implementation of the WSIP would reduce inflow to Don Pedro Reservoir, resulting in reduced reservoir storage. During hydrologically wet periods, more inflow would be required to refill the reservoir storage, resulting in reduced flow in Tuolumne River below La Grange Dam and, as a result, reduced inflow to the Delta from the San Joaquin River. Reduced inflow to the 01

[1] Alameda County Zone 7 Water Agency, Alameda County Water District, Antelope Valley-East Kern Water Agency, Casitas MWD on behalf of the Ventura County Flood Control District, Castaic Lake Water Agency, Central Coast Water Authority on behalf of the Santa Barbara FC&WCD, City of Yuba City, Coachella Valley Water District, County of Kings, Crestline-Lake Arrowhead Water Agency, Desert Water Agency, Dudley Ridge Water District, Empire West-Side Irrigation District, Kern County Water Agency, Littlerock Creek Irrigation District, The Metropolitan Water District of Southern California, Mojave Water Agency, Napa County FC&WCD, Oak Flat Water District, Palmdale Water District, San Bernardino Valley MWD, San Gabriel Valley MWD, San Gorgonio Pass Water Agency, San Luis Obispo County FC&WCD, Santa Clara Valley Water District, Solano County Water Agency, and Tulare Lake Basin Water Storage District.

1121 L Street, Suite 1050 • Sacramento, California 95814-3944 • 916.447.7357 • FAX 916.447-2734 • www.swc.org

Mr. Paul Maltzer
September 25, 2007
Page 2

Delta from the San Joaquin River can result in negative impacts to both Delta water quality and the SWP supply.

As shown in Table 5.3.4-4 of the DPEIR, reductions in Tuolumne River flow below La Grange Dam attributable to the WSIP would occur most frequently during the months of January through June in wet and above normal years. Although the flow reductions generally would be less than 200 cfs, there would be several years in which the flow reduction during a single month would exceed 1,000 cfs. A flow reduction of this scale would likely result in significant negative impacts to Delta water quality and/or SWP supply. 01 cont.

Alternatively, the DPEIR identifies the Modified WSIP Alternative as the environmentally superior alternative. The Modified WSIP Alternative would meet the WSIP's objectives while reducing key impacts associated with implementation of the WSIP. As stated on pages 9-78 and 9-79 of the DPEIR, under the Modified WSIP Alternative:

> *"...a transfer of conserved water would be acquired for use every year, not only as a dry-year supplement, and doing so would avoid the WSIP impacts on the lower Tuolumne River below La Grange that result from the SFPUC increasing its diversions from the Tuolumne River."* 02

Due to the likely significant negative impacts associated with implementation of the WSIP described above, the SWC recommends that the SFPUC either (1) adopt the Modified WSIP Alternative as the preferred alternative with appropriate supporting environmental analysis or (2) provide an analysis of WSIP implementation attempting to adjust the timing of Don Pedro Reservoir refill both to reduce the scale of monthly flow reductions in Tuolumne River below La Grange Dam and to coincide with periods of excess conditions in the Delta. 03

We appreciate your consideration of our comments. If you have any questions, please feel free to contact me at (916) 447-7357.

Sincerely,

Laura King Moon for

Terry L. Erlewine
General Manager

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

PEIR comments

ARTA River Trips <arta@arta.org> **Mon, Oct 1, 2007 at 12:08 PM**
Reply-To: arta@arta.org
To: wsip.peir.comments@gmail.com

Dear SFPUC –

Attached are my comments on the PEIR for the WSIP. I have also appended them to the bottom of this e-mail in case the attachment doesn't work.

Sincerely submitted,

Stephen Welch

President

Tuolumne River Outfitters Association

October 1, 2007

San Francisco Planning Department

Paul Maltzer, Environmental Review Officer

WSIP PEIR

1650 Mission Street, Suite 400

San Francisco, CA 94103

Dear Mr. Maltzer,

Thank you for the opportunity to comment on the Draft PEIR for San Francisco Public Utilities Commission's Water Service Improvement Plan.

These comments represent the views of the six commercial outfitters who are permitted to conduct whitewater rafting trips on the Tuolumne River between Holm Powerhouse and Don Pedro Reservoir. The viability of our businesses, the quality of our trips and the satisfaction of our guests are all dependent on reliable and adequate flows downstream of SFPUC facilities.

We are opposed to any changes to the system that would or could potentially degrade the quality of our trips. The withdrawal of additional water from the river as described in the WSIP could be detrimental to our businesses however these negative impacts can be mitigated by management and operational decisions 01
outside the WSIP.

For the past several years we have worked together with SFPUC staff to develop a mutual understanding of our respective needs and constraints. During this time, each party has been accommodating and has made adjustments to help the other; power generation has been scheduled to allow for early releases from Holm Powerhouse to facilitate rafting trips and rafting trips have been modified to fit the daily, weekly and seasonal schedules of Hetch Hetchy operations. Great progress has been made and the arrangement seems to be working well; we hope to see this relationship and cooperation continue.

The PEIR describes this relationship and situation accurately; however there are some technical points and specific figures regarding recreational flows that need official clarification. These comments will focus on Section 5.3.8 Recreational and Visual Resources and more specifically on the portions of that section that pertain to whitewater recreation flows.

02

One of the confusing and misleading premises behind the specific figures in the PEIR has to do with the context of the terms "minimum" and "adequate". The "minimums" we have expressed and that the PEIR cites are based on and influenced by our understanding of the Hetch Hetchy system and of the financial and water supply needs of San Francisco. In the same way that "*if SFPUC were to operate solely to meet its own municipal and retail demand for energy or to maximize revenue from power sales, it would generate hydropower during the midday period only*"; if we were to operate the system "*solely to meet our own recreational needs and to maximize the quality of our trips, we would generate hydropower to produce higher flows, earlier and longer release periods and longer seasons*."

Our "minimums" are based on system constraints, Hetch Hetchy operational goals and the SFPUC policy of "water-first"; they represent a "survival" scenario, not an "optimal" scenario. If a restaurant can ONLY obtain four-ounce chicken breasts and cabbage, it will say that four-ounce chicken breasts and cabbage are the minimum ingredients that it needs to provide a meal. But, if patrons prefer eight-ounce chicken breasts and coleslaw, (the "optimal" meal), the prudent restaurant will try to find and provide them. The restaurant may be able to survive on the minimums, but in order to prosper, the restaurant needs to meet the needs of its patrons by offering the optimal meal.

The "minimums" expressed in the PEIR are four-ounce chicken breasts and cabbage; the "optimals" are as follows: 02 cont.

Volume of water in the river: 1,500 to 2,000 cfs

Days per week of reliable flows: 7

Hours per day of reliable flows: 8 (peak flow at Meral's Pool by 7:00 am)

Weeks per season of reliable flows: 31 (March 15 – October 15)

In terms of the PEIR, the third paragraph on Page 5.3.8-10 should read:

> A ~~900 cfs~~ 1,100 cfs flow at Lumsden Campground is the minimum required for whitewater paddleboats and oar boats; a ~~600 cfs~~ 900-cfs flow is the minimum required for kayaks ~~and oar boats~~, and a ~~1200 cfs~~ 1,500 to 2,000-cfs flow is considered optimal. The commercial outfitters prefer ~~a six-hour~~ an eight-hour release, but a ~~three-hour~~ four-hour release allows them to launch one-, two-, or three-day trips. 03

Under current operating conditions and during the "core" part of our season (June through August) the "minimum" flows in the stretch of river on which we operate are delivered from the Cherry Lake/Holm Powerhouse side of the system. While changes to the Hetch Hetchy/Kirkwood Powerhouse side of the system could potentially impact us, these impacts, as described in the PEIR, can be mitigated through operational changes and concessions on the Cherry side.

It is our sincere hope and expectation that the current "minimum" flows and the potential for future "optimal" flows will not be jeopardized by the Water System Improvement Plan. 04

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Sincerely submitted on behalf of the six commercial outfitters on the Tuolumne River (ARTA River Trips, All-Outdoors, OARS, Whitewater Voyages, Sierra Mac and Zephyr Whitewater.

Stephen Welch

President

Tuolumne River Outfitters Association

24000 Casa Loma Road

Groveland, CA 95321

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Gmail

Diana Sokolove <wsip.peir.comments@gmail.com>

Water System Improvement Program PEIR

1 message

Amy Meyer <a7w2m@earthlink.net> **Fri, Sep 28, 2007 at 12:58 PM**
To: wsip.peir.comments@gmail.com

September 28, 2007

Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103 via e-mail

Dear Paul:

I was one of the founding members of the Tuolumne River Trust. I became involved in preserving the Tuolumne because of its incredible biological and recreational attributes. We helped designate 70 miles of the river as "Wild and Scenic" in 1984. I understand the need for rehabilitation of the Hetch Hetchy delivery system, but I do not want it to take place at the expense of the Tuolumne River.

01

The new threat to the Tuolumne is the prospective diversion of more water than it can give up without severely damaging the splendid diversity of its ecological communities—from the free-flowing headwaters in the mountains to its freshwater outflow into San Francisco Bay. More than 60% of the river is already diverted, and the proposed additional diversion would remove another 25,000,000 gallons per day. Considering the threat of global warming and a smaller snow melt than we have enjoyed in recent times, we ought to do everything we can to keep as much water as possible flowing in the river.

Other large cities have reduced water consumption. The service area of the Hetch Hetchy system has not utilized all possible methods of conservation and recycling. One conspicuous area ripe for improvement and much more widespread use is the development of "gray water" systems for irrigation.

02

Scott MacDonald, Assistant General Manager of the SFPUC, said in the September 24, 2007 SF Examiner, "Despite recent water rate increases, San Franciscans still pay lower water rates than most other Bay Area and California cities, including San Diego, Los Angeles, Oakland, Berkeley, Palo Alto and San Jose."

It seems to me that the SFPUC's pricing structure does not encourage enough conservation and recycling of water to meet increased water demand. That is where some of the investment in our water system needs to go, and that is what the SFPUC should be emphasizing in order to preserve the flow of the Tuolumne River.

Sincerely yours,
Amy Meyer

Amy Meyer
a7w2m@earthlink.net

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OCT 01 2007

CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
OPERATIONS

October 1, 2007

Mr. Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission St., Suite 400
San Francisco, CA 94103

Re: Comments regarding the Draft Program Environmental Impact Report (DPEIR) for the San Francisco Public Utilities Commission's Water System Improvement Program (WSIP)

Dear Mr. Maltzer:

The Tuolumne River Trust, Clean Water Action and Sierra Club appreciate the opportunity to comment on the Draft Program Environmental Impact Report (DPEIR) for the San Francisco Public Utilities Commission's (SFPUC) Water System Improvement Program (WSIP). Our groups wholeheartedly support the timely completion of projects needed to repair aging and seismically-vulnerable infrastructure in order to protect the SFPUC's water supply system from earthquakes and other disasters.

The WSIP also includes a proposal to divert more water from the Tuolumne River to meet an anticipated increase in demand among the SFPUC's wholesale customers. Our review of the water supply aspects of the WSIP, and the DPEIR, uncovered several technical flaws and pitfalls. The attached comments provide greater detail on these shortcomings that we hope the San Francisco Planning Department will find useful in completing an adequate environmental review.

Creating a water plan for 2030 presents a unique opportunity for San Francisco, and the SFPUC's wholesale customers, to become a leader in water use efficiency, conservation and recycling. By pursuing a sustainable path, the Bay Area can increase water supply reliability and become a better steward of the Tuolumne and Bay Area Watersheds. As we work to pursue collaborative approaches through the planning and environmental review process, we welcome the opportunity to discuss our comments with you in greater detail.

Sincerely,

Peter Drekmeier
Tuolumne River Trust

Jennifer Clary
Clean Water Action

John Rizzo
Sierra Club, SF Bay Chapter

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Executive Summary

Comments on the WSIP DPEIR from Tuolumne River Trust,
Sierra Club and Clean Water Action
October 1, 2007

The Tuolumne River Trust, Sierra Club and Clean Water Action have reviewed the Draft Program Environmental Impact Report (DPEIR) for the proposed Water System Improvement Program (WSIP). Our combined comments focus on inadequacies in the DPEIR regarding the proposal to divert additional water from the Tuolumne River.

There are a number of areas in which the DPEIR fails to produce adequate baseline data, relies on flawed modeling, or reaches erroneous conclusions. It is difficult, if not impossible, to predict the impacts of diverting additional water from the Tuolumne River without adequate information, modeling and analysis.

The DPEIR attempts to assess the impacts to biological resources of WSIP-related flow changes with little or no reference to current biological conditions. This lack of information regarding current biological conditions creates two problems: (1) there is no biological baseline against which to compare conditions under the WSIP, and (2) there is no indication that current conditions are satisfactory with respect to a desired condition or legal requirements. As a result, there is no way to interpret the meaning of the DPEIR's claims that biological conditions under WSIP would be acceptable because WSIP would produce "small," "infrequent" or "rare" changes from current conditions. 01

Following is a summary of our primary concerns:

- Some studies referenced in the DPEIR were incomplete drafts. For example, a 1992 instream flow study conducted by the United States Department of Fish and Wildlife never moved beyond its draft stage, and the data is now 15 years old. The study concluded that minimum flow releases below O'Shaughnessy Dam needed to be increased; however, this recommendation was never adopted.
- The DPEIR lacks data on the health of Chinook salmon (a species of special concern) and steelhead trout (listed as "threatened"). The Chinook salmon population has declined from a high of approximately 130,000 in 1944 to just a few hundred individuals in recent years. The DPEIR presents no analysis of current population size for steelhead.
- Studies referred to in the DPEIR are old, outdated and may no longer be accurate. For example, there has not been a comprehensive study of the upper Tuolumne River in over fifteen years. Without information on baseline conditions, the DPEIR fails to assess the impacts of the proposed diversion in this part of the watershed.
- The DPEIR concludes, without any critical analysis, that hydrological and meteorological conditions in the next 82 years will be identical to those in the preceding 82 years. The analysis dismisses the potential impact of climate change on precipitation and river hydrology, and failed to identify or consider trends over the 82-year period.

- According to the DPEIR, per-capita demand for wholesale customers is projected to increase over current demand, despite numerous studies that show that substantial cost-effective reductions are possible using available technologies and policies. More specifically:
  - The analysis of future water demand does not include price-driven efficiency improvements, despite an estimated quadrupling of the price of water from the SFPUC by 2015.
  - Per-capita outdoor water use is projected to increase, indicating that the proposed conservation does not adequately address this issue.
  - The forecasting method for future water demand assumes that the current composition of commercial and industrial businesses will not change, and it ignores the variability in water use in the non-residential sector.
  - The wholesale demand study may overestimate future employment, thereby inflating 2030 non-residential demand.
  - The DPEIR did not adequately analyze the full potential for water conservation and recycling. It ignores a 2006 SFPUC study that identified measures that would reduce the need for more diversion by 74%.

- The DPEIR fails to define thresholds of significance in measurable, quantifiable terms. It consistently confuses the frequency of an event with the severity of its impact. A severe impact (*e.g.*, a seismic incident) could be significant even if it is unlikely to occur frequently. By the same token, a frequent impact (*e.g.*, a modest level of soil erosion each time it rains) could be cumulatively significant even if a single occurrence would have only a small impact.

- The DPEIR obscures analysis of potential impacts related to flow fluctuations by aggregating data into monthly averages. However, many biological, hydrological, and geomorphological processes respond to changes in flow on a daily or hourly basis. 01 cont.

- It is unclear whether the SFPUC has the right to divert more water from the Tuolumne. The SFPUC's pre-1914 appropriative right was for storage of water for hydroelectric power generation. Hydropower generation is considered a non-consumptive use right because the water is returned to the stream system.

- A proposal to enter into water transfer agreements with the Modesto and Turlock Irrigation Districts (MID/TID) is uncertain because the Districts have not expressed interest in the plan.

- Two proposed fishery habitat restoration projects are problematic because they mitigate for different problems than what would be created by reduced flows.

- In some cases, the SFPUC would rely on other agencies to meet flow objectives. However, the California Environmental Quality Act (CEQA) requires that mitigation measures "must be fully enforceable through permit conditions, agreements, or other legally binding instruments."

- The DPEIR fails to address the impact of recent Delta pump rulings on releases from Don Pedro Reservoir.

In conclusion, the Tuolumne River Trust, Sierra Club and Clean Water Action have identified numerous inadequacies in the WSIP DPEIR. Please see our complete comments for a thorough evaluation.

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COMMENTS ON THE WSIP DPEIR

From the Tuolumne River Trust, Sierra Club and Clean Water Action

October 1, 2007

The Tuolumne River Trust, Sierra Club and Clean Water Action have reviewed the Draft Program Environmental Impact Report (DPEIR) for the proposed Water System Improvement Program (WSIP). Our combined comments focus on inadequacies in the DPEIR regarding the proposal to divert additional water from the Tuolumne River.

Our comments are organized under three main categories:

1. Inadequate Studies/Lack of Baseline Data
2. Flawed Modeling/Analysis
3. Faulty Assumptions

In addition to the various comments made in this letter, we offer a number of additional specific comments in Attachment A.

We also include the following Attachments:

Attachment A:	Matrix of additional comments.
Attachment B:	Tables 1 and VI from *Instream Flow Requirements for Rainbow and Brown Trout in the Tuolumne River Between O'Shaughnessy Dam and Early Intake*, Michael Aceituno for the U.S. Fish and Wildlife Service, 1992.
Attachment C:	Graph of decline of Chinook salmon.
Attachment D:	*Central Valley Steelhead*, Dennis R. McEwan, 2001.
Attachment E:	*In Hot Water: Water Management Strategies to Weather the Effects of Global Warming*, Natural Resources Defense Council, 2007.
Attachment F:	Reports on Climate Change and the Sierra Snowpack.
Attachment G:	*Leaders talk climate change at Hetch Hetchy*, Union Democrat, September 24, 2007.
Attachment H:	*A Review of the San Francisco Public Utilities Commission's Retail and Wholesale Customer Water Demand Projections*, Pacific Institute for Studies in Development, Environment and Security, 2007.
Attachment I:	Studies on Water Conservation.
Attachment J:	Selected presentations from "Sustainable Water Supply Briefing," September 28, 2006.

General: Water Enterprise Environmental Stewardship Policy

"It is the policy of the SFPUC to operate the SFPUC water system in a manner that protects and restores native fish and wildlife downstream of SFPUC dams and water diversions, within SFPUC reservoirs, and on SFPUC watershed lands." So states the SFPUC's Water Enterprise Environmental Stewardship Policy (WEESP) adopted in 2006. 02

The Policy establishes environmental stewardship as a fundamental component of the Water Enterprise mission, and was adopted with the explicit intent that implementation of the policy would occur through: "Integration of the policy into the Water System Improvement Program and individual infrastructure projects (i.e., repair and replacement programs)," and by ensuring "that the policy guides development of project descriptions, alternatives and mitigation for all SFPUC projects during the environmental review process under CEQA 02 cont.
and/or NEPA."

The WEESP is a foundational policy for the WSIP, but is missing from Table 2.3 (DPEIR, Vol. 1, p. 2-46). Because the proposed program would have significant impacts on downstream native fish and wildlife populations, the SFPUC has failed to "integrate" the Environmental Stewardship Policy into the WSIP.

I. INADEQUATE STUDIES / LACK OF BASELINE DATA

There are a number of areas in which the DPEIR fails to produce adequate 03
baseline data. It is difficult, if not impossible, to predict the impacts of diverting additional water from the Tuolumne River without adequate information.

The DPEIR attempts to assess the impacts to biological resources of WSIP-related flow changes with little or no reference to current biological conditions. This lack of knowledge regarding current biological conditions creates two problems: (1) there is no biological baseline against which to compare conditions under the WSIP, and (2) there is no indication that current conditions are satisfactory with 04
respect to a desired condition or legal requirements. As a result, there is no way to interpret the meaning of the DPEIR's claims that biological conditions under WSIP will be acceptable because WSIP will produce "small" or "infrequent" or "rare" changes from current conditions.

This section of our comments addresses the lack of baseline data in the following areas:

a) A 1992 Instream Flow Study Was Never Completed
b) Lack of Data on the Decline of Chinook Salmon
c) Lack of Data on Steelhead Trout 05
d) Lack of Baseline Data for the Upper Tuolumne
e) Lack of Data on Impacts to Streamside Meadows
f) Lack of Data on the Potential Impacts of Climate Change
g) Lack of Data on Groundwater Resources

a) <u>A 1992 Instream Flow Study Was Never Completed</u>

Pursuant to California State Fish and Game Code § 5937[1], the SFPUC is obligated 06
to maintain healthy populations of fish below its dams. Before assuming that

[1] Fish & Game C. § 5937 states, in pertinent part: "The owner of any **dam** shall allow sufficient water at all times to pass through a fishway, or in the absence of a fishway, allow sufficient water to pass over,

meeting minimum flow standards is adequate to maintain healthy fish and wildlife populations in the future, the SFPUC must show that its minimum flow standards are currently maintaining healthy fish and wildlife populations. The baseline documentation, particularly for the reach below O'Shaughnessy Dam, fails to demonstrate this due to the lack of recent studies.

The DPEIR references the rough draft of a report entitled "Instream Flow Requirements for Rainbow and Brown Trout in the Tuolumne River Between O'Shaughnessy Dam and Early Intake." This report was never completed, and 06 cont.
the draft is more than 15 years old, however, it states:

> "In 1988, the U.S. Fish and Wildlife Service's Instream Flow Incremental Methodology (IFIM) was applied to the Tuolumne River below Hetch Hetchy Reservoir…An annual fishery allocation of between 59,207 acre-feet and 75,363 acre-feet is recommended, based on the findings of the instream flow study."[2]

The study concluded that minimum flow releases below O'Shaughnessy needed to be increased (see "Attachment B"), however, this recommendation was never adopted.

In a letter submitted during the scoping phase for the DPEIR, the State Water Resources Control Board stated, "it appears that the DEIR should include sufficient information for the State Water Board to use the document for water right permitting purposes. However, the document still fails to evaluate the availability of unappropriated water after taking into consideration prior rights 07
and the water required to maintain public trust resources. Division staff recommends that any evaluation utilize a cumulative flow impairment methodology, such as the assessment method described in the *Guidelines for Maintaining Instream Flows to Protect Fisheries Resources Downstream of Water Diversions in Mid-California Coastal Streams (Draft)* prepared by NOAA Fisheries Service and the Department of Fish and Game and dated June 17, 2002."

The impact evaluation in the DPEIR does not employ a cumulative flow impairment methodology and falls short of answering the question of whether there is sufficient water available to maintain public trust resources.

08

If recent fish population surveys are lacking for the upper watershed, how was the SFPUC able to determine if public trust resources are being maintained currently, let alone with the WSIP?

around or through the **dam**, to keep in good condition any **fish** that may be planted or exist below the **dam**."

[2] Michael Aceituno for the U.S. Fish and Wildlife Service. 1992. "Instream Flow Requirements for Rainbow and Brown Trout in the Tuolumne River Between O'Shaughnessy Dam and Early Intake"

12.4-92

b) Lack of Data on the Decline of Chinook Salmon

Historically, the Tuolumne River supported at least two distinct runs of Chinook salmon – spring and fall, and populations in this river were believed to be "very large" (Yoshiyama et al. 2001).[3] By the early 1950s, the Tuolumne's spring-run Chinook were extirpated. The fall-run Chinook salmon population has declined from a high of approximately 130,000 in 1944 to just a few hundred individuals in recent years (see "Attachment C").

The 1996 Federal Energy Regulatory Commission (FERC) Order Amending the License for the New Don Pedro Project, which was based on the 1995 Settlement Agreement, to which the San Francisco Public Utilities Commission was a signatory, required a restoration program for Chinook salmon and 10-years of monitoring. Despite the implementation of four of the ten required restoration projects, the salmon population continues to decline. Additionally, monitoring has shown that flows do have a strong influence on the number of adult salmon that return to spawn. Additional withdrawals of water from the Tuolumne will only compound the problem and further harm a population of fish that is already on the verge of extirpation. The DPEIR must explain the reasons for the decline in Chinook salmon. 09

As best we can tell, TID and MID routinely divert less than the total amount of water guaranteed under their water rights. In approximately 72% of years TID/MID combined diversions are less than their water rights as reported in the DPEIR. Average diversions (861,451 afy) are approximately 44% of the computed maximum annual allotment (1,940,000 afy). Apparently, TID and MID do not routinely divert their total annual entitlement. This suggests that these two entities may have latitude to increase their usage if they feel the need to do so. As a result, the DPEIR's assumption that annual TID/MID diversions would remain constant at 867,000 afy seems unrealistic. An adequate analysis of the proposed SFPUC diversion must include an estimate of future water use by these agencies and an analysis of the cumulative impact of all future increases in diversions from the Tuolumne River. 10

c) Lack of Data on Steelhead Trout

Steelhead trout (*Oncorhynchus mykiss*) were listed as a "threatened" species under the federal Endangered Species Act in 1998, and retain that protected status today. Yet, the DPEIR presents no analysis of current population size for steelhead (or the alternate life-history form, commonly called "rainbow trout"). Instead, the DPEIR relies on a FERC report from 1995 that concludes that steelhead do not occur in the Tuolumne or occur there only rarely. In fact, more recent reports have concluded that steelhead spawning does occur on the 11

[3] R.M. Yoshiyama, E.R. Gerstung, F.W. Fisher, and P.B. Moyle. 2001. "Historical and Present Distribution of Chinook Salmon in the Central Valley Drainage of California" *in* "Contributions to the biology of Central Valley Salmonids," Volume 1, *ed.* Randall Brown. California Dept. of Fish and Game. Fish Bulletin 179.

Tuolumne River; for example, McEwan (2001)[4] (see "Attachment D") provides a detailed account of reports of this species on the Tuolumne in recent years. An adequate draft PEIR must include current information about steelhead presence and population. (*See* CEQA Guidelines § 15125(a))[5] 11 cont.

Because the DPEIR references no monitoring program that would accurately assess the status of *O. mykiss* in the Tuolumne River, there is no way to evaluate the numerical response of this species to proposed flow changes. Perhaps more importantly, because SFPUC and other users of the Tuolumne hydrosystem have not yet established a monitoring program for *O. mykiss*, there is no way to tell whether *current* operating practices for the Tuolumne River hydrosystem produce acceptable conditions for this or other important fish species. The DPEIR does mention that the SFPUC is about to implement a monitoring program, but results do not exist today. It is quite possible that current operations lead to unacceptable conditions for Central Valley steelhead and that these operations violate requirements of the Endangered Species Act and other laws and regulations, such as Fish and Game Code § 5937. 12

The fact that steelhead were historically abundant in the Tuolumne (Yoshiyama et al., 2001; Lindley et al., 2006[6]) and are "rare" today emphasizes the need to operate the Tuolumne hydrosystem in ways that encourage steelhead population growth.

An adequate review and mitigation proposal for impacts to anadromous species, including *O. mykiss*, requires that the SFPUC implement a comprehensive monitoring system on the Tuolumne River below La Grange Dam for several years. Results from this monitoring are needed before impacts can be adequately assessed or mitigated, and should be in hand before flow reductions on the Tuolumne are proposed and analyzed, let alone approved or implemented. *See Sundstrom v. County of Mendocino* (1988) 202 Cal. App. 3d 296, 306-08 (studies essential to adequate CEQA review must precede project approval). 13

d) Lack of Baseline Data for the Upper Tuolumne

There has not been a comprehensive study of the upper Tuolumne River in over fifteen years. Without information on baseline conditions, the DPEIR does not adequately assess the impacts of the proposed diversion in this part of the watershed. 14

In 2006, the SFPUC initiated the first comprehensive study of the upper Tuolumne River in over 15 years. Initial findings from the first year of study

[4] Dennis R. McEwan. 2001. "Central Valley Steelhead."

[5] (Draft EIR "must include a description of the physical environmental conditions in the vicinity of the project, as they exist at the time the notice of preparation is published....")

[6] Lindley, ST, RS Schick, A Agrawal, M Goslin, TE Pearson, E Mora, JJ Anderson, B May, S Greene, C Hanson, A Low, D McEwan, RB MacFarlane, C Swanson, and JG Williams. 2006. Historical population structure of Central Valley steelhead and its alteration by dams. San Francisco Estuary and Watershed Science 4(1) Art. 3.

show significant alteration of the natural hydrology, especially in dry years and "recovery" years following dry years, when the SFPUC restores reservoir levels.

The National Park Service initiated its "Tuolumne Wild and Scenic River Comprehensive Management Plan" in 2006. This plan will cover the 54 miles of designated Wild and Scenic River within Yosemite National Park, including the six-mile reach of the Tuolumne River, downstream of the Hetch Hetchy Reservoir, that passes through the Poopenaut Valley. The intended purpose of the plan is to establish the overall goals and vision for the river corridor. It will provide broad, conceptual-level management objectives that may amend the *General Management Plan for Yosemite National Park* (1980) for the river corridor. 14 cont. The draft environmental impact statement is scheduled for release in 2008, with the final report expected in 2009 (NPS, 2006b, 2007). (DPEIR Vol. 3, 5.2-16)

As with the DPEIR's failure to provide current information regarding the presence of steelhead, its lack of current baseline data regarding the upper Tuolumne River provides no rational basis for conclusions regarding the potential impacts of increased water diversions on the upper Tuolumne and associated resources. *See* CEQA Guidelines § 15125(a) (quoted above). With no immediate need for additional water supply or the proposed diversion, any proposal to divert additional water from the Tuolumne must be tabled until these two studies have been completed.

e) Lack of Data on Impacts to Streamside Meadows

The DPEIR acknowledges that it does not provide baseline data as to the "extent, species composition and condition of the existing meadow vegetation within the Poopenaut Valley." (p. 6-50.). It speculates that some (but not all) of this data may be available in the study mentioned above, but the DPEIR does not provide it. The DPEIR states in footnote 5 (page 6-50) that this ongoing study will 15 "examine sediment transport and deposition relationships with flow." It does not mention the collection of data regarding the extent of rare or endangered plant species or impacts to wildlife.

For these other impacts, the DPEIR states that baseline data collection surveys will be conducted in future years, with the implication that this would be well after the Final PEIR is approved. This is inadequate under CEQA. There are no assurances or approval stages to guarantee that this data collection will actually occur. CEQA requires the project agency preparing the DPEIR to provide the 16 data that describe the existing environmental setting. Without baseline data as to the current condition of the meadows and other features of the Poopenaut Valley, it is impossible to perform an adequate analysis of the impacts of the WSIP project on native meadow vegetation, the animals that depends on the vegetation, other natural resources, and access by recreational users.

Measure 5.3.7-2, "Controlled releases to recharge groundwater in streamside meadows and other alluvial deposits," requires the SFPUC to manage releases 17 from O'Shaughnessy Dam during the spring to recharge groundwater in the riverside meadows in the Poopenaut Valley. It does not specify the time or

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magnitude of these releases. This measure appears to assume that flows would 17 not need to be increased, just released in a different manner. cont.

The DPEIR does not provide any supporting studies that detail how current SFPUC operations interact with the downstream meadows. In fact, the most recent ecological study of the Upper Tuolumne Watershed could only hypothesize about the relationship between flows and meadows in the riparian corridor and recommends future monitoring in order to understand this relationship. 18

Without completed studies that illuminate the meadow/groundwater dynamics, the SFPUC cannot know whether substantial flow increases will be necessary in order to protect the sensitive habitats and special-status species. Without the proper studies, it is speculative to assume that any flow release pattern adjustments will mitigate the impacts on these sensitive habitats.

There are no mitigations proposed or discussed for Recreational and Visual Resources for the Poopenaut Valley. This section simply states, "none required" without explanation. As a popular destination for recreational hikers within 19 Yosemite National Park, the DPEIR should identify possible impacts to access for recreational users due to changes in dam releases.

f) Lack of Data on the Potential Impacts of Climate Change

The longstanding consensus in the scientific community about the reality and potential large-scale impacts of global climate change has recently been accepted as a matter of public policy. Indeed, in Section 5.7.6, the DPEIR provides a sampling of recent studies and analyses that address this potential problem. Unfortunately, the DPEIR dismisses the potential impact of climate change on WSIP impacts. The report states, "There is no clear scientific consensus on exactly how global warming will quantitatively affect California water supplies…" (DPEIR Vol. 3, 5.7.-92). But exact quantification of the effects of climate change is not a prerequisite to having to examine these effects in an environmental analysis. *See, e.g., NRDC v. Kempthorne* (U.S. Dist. Court, E.D. Cal., 5/30/07) 2007 WL 1577896 at *38 - *41 (despite uncertainties, impacts of 20 climate change must be analyzed in evaluating impacts of water project operations on protected fish species).

Each of the general trends listed in this section, for which the DPEIR recognizes a scientific consensus, indicate that the SFPUC's reliance on the 82-year hydrological record for this system will overestimate water availability and underestimate water demands. In other words, an analysis built solely around the historic hydrological patterns in the Tuolumne basin underestimates the potential impacts of removing more water from the Tuolumne system. The DPEIR's "thumbnail" analysis of a 1.5°C increase in temperature between 2000 and 2025 is weak. It minimally addresses only one of the likely patterns resulting from global climate change identified in the DPEIR itself:

> "Reduction in the average annual snowpack due to a rise in the snowline and a shallower snowpack in the low- and medium-elevation zones such as in the Tuolumne River basin, and a shift in snowmelt runoff to earlier in the year" (DPEIR Vol. 3, 5.7.-92)

This "back of the envelope" analysis concludes that, because the shift in seasonal snowpack and snowmelt over the next 20 some odd years will be "within the current range of interannual variation in runoff…" there will be no significant impact of global warming. This conclusion ignores the fact that, during the last several decades, changes in hydrological conditions have been the primary culprit in declines of one species in the Tuolumne (steelhead) and several species in the larger Sacramento-San Joaquin system (Chinook salmon, Delta smelt, green sturgeon) that necessitated protection under the Endangered Species Act. The report should not equate "change within the historical range" with "no impact."

Other changes resulting from existing climatological trends that will persist over the next 20 years (such as decreased vegetative growth, decreasing water quality in the Delta, increased need for irrigation water, etc.) are not analyzed at all in the DPEIR. Even a simple translation of air temperature changes into water temperature changes in stretches of the Tuolumne and San Joaquin Rivers where fish species may be impacted was not attempted. 20 cont.

The DPEIR must do a much more complete analysis of global climate change impacts. Modeling an increase in temperature should encompass the following parameters:

- Increase in evaporation and transpiration from all system reservoirs.
- Increase in in-stream water temperature.
- Potential water quality impacts from increase in algae formation and other organic matter due to increased runoff and higher temperatures.
- Increase in water demand for agriculture.
- Impacts to riparian resources.
- Impacts of dwindling snowpack:
    - Smaller snowpack due to later onset of winter snow season.
    - Earlier snowmelt and peak runoff.
    - Reduction in water content of snow.
    - Increase in precipitation falling as rain rather than snow will change the operation of reservoirs, particularly Eleanor and Cherry, whose watersheds lie at lower elevations than Hetch Hetchy. This will require a change in reservoir operation which, when combined with the change in reservoir operations based on 300mgd demand, will result in a greater cumulative impact than that studied in the DPEIR.
- Reduction in hydropower generation.

Further, the increase is water usage assumed in this program is in conflict with California statute (AB 32, 2006), which mandates a 25% decrease in greenhouse gas (GHG) emissions by 2020. This statute should be cited in Chapter 4.2 (Vol. 2) and the impacts analyzed. The projected increase in gross per capita water use 21

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assumed in the 2030 demand figure will increase the per capita GHG emissions due to increases in energy used for water treatment, use and disposal. The impacts should be analyzed for each of the alternatives, and mitigation proposed to ensure that each is in compliance with state law. 21 cont.

The argument that "there is no consensus" regarding the magnitude of changes over the next 20+ years is specious – mathematical models are specifically designed to assess the impact of changed assumptions on system outcomes. The hydrological and temperature models utilized by the DPEIR can be run with a range of different inputs predicted by the variety of climate change studies cited in the DPEIR.

In July of 2007, the Natural Resources Defense Council published *In Hot Water: Water Management Strategies to Weather the Effects of Global Warming* (see Attachment E). This paper outlines specific measurable impacts that have been identified with temperature increase. For instance:

- Snow levels are predicted to rise 500 feet for every degree Celsius of temperature rise. (This differs from the results of the modeling included in the DPEIR.) 22
- The increase in evaporation and transpiration due to a 2 degree Celsius increase in temperature would reduce mean annual runoff by 4-12%. (This has not been included in the modeling in the DPEIR.)
- The risk of a 100-year flood event will grow larger in the 21st century, rising from a 1 percent chance in any given year to as high as a 6 percent chance. This means occasional extreme events will become much more common.

Numerous studies exist that explore how climate change might affect the Sierra snowpack (see Attachment F). At a meeting of water industry leaders in September 2007, SFPUC spokesman Tony Winnicker said, "Water utilities, in many ways, are the first responders to the effects and consequences of global climate change," (see Attachment G). His acknowledgement emphasizes the need to consider the impacts of climate change in the WSIP DPEIR.

g) <u>Lack of Data on Groundwater Resources</u>

The document contends that impacts limited to shallow groundwater aquifers would be less than significant, since municipal and irrigation wells typically access deep aquifers. However, domestic wells typically access shallow groundwater, and a significant number of Central Valley residents rely on domestic wells for their drinking water supply. The DPEIR must review information at the county level and estimate the number of domestic wells in the vicinity of the Tuolumne River in order to make a rational determination on the significance of the impact. Because these residents have fewer alternatives than municipal water users, the impact of a loss of supply would be greater for them. This is a potentially significant, although mitigable, impact. 23

While it is appropriate to use conservative values for water system planning and for CEQA analysis, the combination of a lack of historic data and the failure to consider the potential of using local stormwater supply to enhance natural 24 aquifer recharge has led to an underestimate of the yield of the Westside Groundwater Basin. This, in turn, increases the impact on the Tuolumne River, as shortfalls in local supply are expected to be met by increased withdrawals from the Tuolumne. 24 cont.

The DPEIR should confirm at the beginning of Section 5.6 that both local and regional groundwater projects are subject to project-level CEQA review. 25

Figures 5.6-3 and 5.6-4 give some idea of historic pumping levels from municipal users of the aquifer, but contain only one data point (from 1965) for total withdrawals. Figure 5.6-4 is particularly baffling, as it shows only municipal usage for the period since 2000, a period when the aquifer has been closely monitored. In order to better understand past and current usage (and thus future sustainable yield) of the aquifer, it would be helpful to have these figures reflect total pumping volumes. The narrative in this section is confusing as it contains many individual pieces of data that would be more easily understood if contained in a table. 26

The DPEIR states that the amount of groundwater used for irrigation of the Golden Gate National Cemetery in San Bruno is undetermined (page 5.6-8)? Why is this so? Is this an unmetered use, and if so, what is the plan to measure this use? 27

The conjunctive use program outlined in the WSIP for the South Westside Groundwater Basin (p. 5.6-25) relies on passive recharge of the groundwater supplies and withdrawals based upon historic pumping levels. However, the available capacity of this aquifer exceeds the capacity of Crystal Springs Reservoir. The DPEIR should evaluate the potential of a proactive recharge program that uses local stormwater (for example, the same stormwater that Daly City is planning to dispose of in the ocean as part of its Vista Grande project) as a resource to increase the yield of the aquifer, reduce flooding, and meet increasingly rigorous NPDES stormwater regulations. 28

Impact 5.6-5 addresses contamination of drinking water due to groundwater pumping in the Westside Groundwater Basin. According to the analysis, current wells in this basin already exceed the drinking water standard for nitrates, an acute contaminant. Furthermore, sites for production wells have been identified as part of the basin management plan, and groundwater testing at these locations has shown similar contamination. Given this fact, a Source Water Assessment should be part of the DPEIR, and potential actions to address the contamination identified. 29

II. FLAWED MODELING/ANALYSIS

There are a number of areas in which the DPEIR uses flawed modeling or improper analysis of data to achieve its conclusions. It is difficult, if not impossible, to predict the impacts of diverting additional water from the Tuolumne River without adequate modeling and analysis. 30

This section of our comments addresses problems with flawed modeling or improper analysis of data in the following areas:

a) The DPEIR Uses Inflated Water Demand Projections
b) Underestimated Potential for Conservation and Recycling
c) Impacts of Reduced Flows on Hydrology and Geomorphology
d) Failure to Define Thresholds of Significance 30 cont.
e) Aggregation of Data into Time-Steps that Lack Relevance to Biological, Hydrological, or Geomorphological Processes
f) Lack of Significance Criteria for Groundwater Impacts
g) HH/LSM Modeling Methodology
h) HH/LSM Modeling Conclusions
i) Tables Are Inconsistent with Narrative

a) <u>The DPEIR Uses Inflated Water Demand Projections</u>

In *A Review of the San Francisco Public Utilities Commission's Retail and Wholesale Customer Water Demand Projections* (Attachment H), the Pacific Institute states:

> "Our analysis, however, reveals that the wholesale and retail demand studies may significantly overestimate future regional demand for water and underestimate the potential for cost-effective demand management and recycled water and therefore are inadequate."

Specifically, the study found:

- Per-capita demand for wholesale customers is projected to increase over current (2001) per-capita demand, despite numerous studies that show that substantial cost-effective reductions in per-capita demand are possible with available technologies and policies.
- The analysis of SFPUC retail and wholesale demand does not include price-driven efficiency improvements, despite an estimated quadrupling of the price of water from the SFPUC by 2015. 31
- Increases in residential demand are largely due to outdoor water use. For the wholesale and retail customers, per-capita outdoor use is projected to increase, indicating that the proposed conservation does not adequately address this issue.
- Future demand for the wholesale customers is not adequately evaluated. The forecasting method is flawed in that it assumes that the current composition of commercial and industrial businesses within the non-residential sector will not change over time, and it ignores the variability in water use in both quantity and purpose among users in the non-residential sector.
- The wholesale demand study may overestimate future employment, thereby inflating 2030 non-residential demand. Recent data indicates that economic recovery in the San Francisco Bay Area has been slower than expected, and consequently, the job outlook for the region has been adjusted downward. A slower economy would reduce projected water

demand for the non-residential sector. The demand forecast should be adjusted according to the most current information available. 31 cont.

By inflating demand projections, the DPEIR attempts to justify increased water diversion from the Tuolumne River. However, the water supply may then induce growth beyond ABAG and General Plan projections. The DPEIR states, "*SFPUC Projections (Section 7.2)*. Accurate demand projections are important in ensuring that future water supplies will be adequate while not surpassing the needs of planned growth." (Vol. 4, 7-5). The DPEIR goes on to state, "In some jurisdictions (Foster City, Half Moon Bay, and Burlingame), the WSIP could support more population growth than is forecasted in adopted general plans. In other jurisdictions (East Palo Alto, Foster City, San Bruno, Fremont, Newark, and Union City), the WSIP could support more employment growth than is forecasted in the adopted general plans of the respective jurisdictions." (Vol. 1, p. S-62)

The expanded water supply would accommodate a 28.8% increase in employment and a 16.8% increase in population between 2005 and 2030 in its service area. This is about 5% more jobs and 5% less population than what the EIR estimates the general plans would allow. The DPEIR cites the environmental analysis done for the general plans in its service area. None of these plans has a time horizon that extends to 2030, so it is speculative to make conclusions about consistency. It is also speculative to assume that the local jurisdictions would plan for a continuing rate of growth beyond their horizon years, as assumed in the DPEIR. So it cannot be concluded that the EIRs done for the general plans adequately cover the growth allowed by the increased water supply. The DPEIR acknowledges this fact on p. 7-35 and p. 7-69. The DPEIR finds that the water supply growth is generally consistent with ABAG projections to the year 2025, but ABAG projections are not subject to environmental review. 32

Furthermore, the DPEIR looks at the indirect effects of the growth it would accommodate on air quality, traffic, and water quality, but not on the other factors mandated by CEQA: Land Use, Population and Housing; Noise, Biological Resources, Geology, Agriculture, Public Services, Cultural Resources, and Visual Resources. 33

The DPEIR acknowledges (p. 7-70) that the environmental analysis done for the general plans, on which it relies, did not address impacts on greenhouse gas emissions and global warming. This is an issue on which the Attorney General has sued San Bernardino County for inadequacies in its general plan EIR. The DPEIR fails to address this vital issue. 34

The project-level impacts on growth also depend on the mitigation measures identified in the general plan EIRs, as noted on page 7-71 and Appendix E, Section E.6. Thus, there is insufficient mitigation for the impacts for the projects up to the year 2030. 35

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The DPEIR also must address how infrastructure redundancy measures, such as building a second New Irvington Tunnel, would increases system capacity and growth potential. 36

b) <u>Underestimated Potential for Conservation and Recycling</u>

The Master Water Sales Agreement requires that wholesale customers employ best efforts to use all sources of water owned or controlled by them, including groundwater (San Francisco Public Utilities Commission (SFPUC) and Bay Area Water Users Association (BAWUA), Water Supply Master Plan, April 2000).

The SFPUC's report entitled *Investigation of Regional Water Supply Option 4* (March 2006) identified numerous conservation, recycling, and groundwater possibilities available to the wholesale customers. However, the DPEIR did not adequately analyze this alternative – it just used some information from the report with no additional analysis. The report identifies existing conservation potential to eliminate the need for 74% of the proposed diversion.

Although industry trends show a decrease in gross per capita water demand, the wholesale agencies are predicting an *increase* in gross per capita water consumption. The DPEIR should investigate this discrepancy and determine whether the 2030 demand forecast accurately reflects industry trends. 37

According to the Pacific Institute the conservation measures included by the wholesale customers of the SFPUC have several critical flaws:

- The 4% average conservation savings identified by the wholesale agencies is a significant understatement of potential savings.
- Planned conservation efforts focus almost wholly on indoor water use, even though 60% of the planned increase in demand is projected to come from outdoor water use.
- The demand estimate fails to take into account foreseeable changes in conservation standards.

The same report finds shortfalls in the analysis of the recycled water potential for the wholesale agencies, which is projected at 3% of 2030 demand. This falls well short of the recycling goals for the state of California of 1.5 million acre feet per year by 2030, or those of local agencies – 6% of total demand for the East Bay Municipal Utility District and 10% for the Santa Clara Valley Water District. Again, this document should investigate this discrepancy and determine whether the 2030 demand forecast accurately reflects industry trends. 38

While the SFPUC and the BAWSCA agencies have committed to implementing additional conservation measures and recycled water and groundwater projects as part of WSIP, the SFPUC further studied the potential and identified additional conservation, recycling, and renewable groundwater projects that could yield 28.5 mgd. The SFPUC has proposed to pursue 10 mgd of that potential; however, the remaining 18.5 mgd is not currently being considered as part of the WSIP. 39

The wholesale conservation study also identified an additional 6 mgd of savings that could be achieved through cost-effective conservation programs. However, the wholesale customers did not factor those savings into their purchase request 39 cont.
to the SFPUC. As a result, the DPEIR is based on flawed demand and supply projections despite the availability of additional analyses.

The actual demand and supply projections, including the water conservation potential studies that were used in developing the demand projections evaluated in the WSIP, also were flawed. The SFPUC conducted studies to determine the water conservation potential for their retail and wholesale customers. The studies estimated how much water would be saved by 2030 through the natural replacement of fixtures due to implementation of the existing plumbing code, as well as through active conservation measures. For the study of conservation potential in the retail area of San Francisco, the SFPUC considered 48 different conservation measures and selected 38 for implementation as part of its plan. 40
The wholesale conservation study initially considered a set of 75 measures, but, on average, selected fewer than 10 to include in their conservation plan.

All of the conservation measures selected by the wholesale agencies were deemed cost-effective based on the estimated future cost of water at $1,100/acre-foot. The wholesale customer study identified an additional 6 mgd of *cost-effective* conservation savings that could be achieved by 2030; however, the wholesale customers have chosen not to pursue those savings without providing sufficient justification or explanation. The wholesale conservation study also failed to determine the *total cost-effective* conservation potential of the region.

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(Please see and comment on Attachments I and J regarding the potential for water conservation and recycling..) 41

c) <u>Impacts of Reduced Flows on Hydrology and Geomorphology</u>

Changes in freshwater flow stored and released from behind dams on the Tuolumne will impact local hydrology, fish resources, and geomorphic characteristics of the Tuolumne; hydrological and biotic resources affected by the WSIP may extend downstream through the San Joaquin River and, potentially, into the Sacramento-San Joaquin Delta. Changing (and in most cases, reducing) freshwater releases in the Tuolumne system may affect changes in fish populations (including, in particular, federally protected steelhead (*O. mykiss*)) by altering the volume of available spawning, incubation, rearing, and emigration habitat and by altering water quality (e.g., temperature and chemical 42
concentrations), and geomorphological characteristics (e.g., the abundance and quality of spawning substrate or rearing habitat). The timing and magnitude of freshwater releases have an obvious impact in hydrological characteristics of the river, including water quality characteristics such as flow rate, temperature, and chemical concentrations. In addition, flow reductions (as proposed under the WSIP) may lead to changes in local and regional groundwater tables as recharge rates are altered and groundwater pumping rates increase (a potential outcome of the WSIP that receives little attention). Furthermore, changes in the magnitude and inter-annual distribution of peak flows in the Tuolumne (and

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specifically, truncation of the high-magnitude end of the hydrograph) may impact geomorphic attributes of the river continuum (such as channel depth and breadth, bank and bed armoring, particle size distribution) which may, in turn, affect biological resources in the river. 42 cont.

The DPEIR incorrectly dismisses the potential for hydrological and geomorphological impacts by arguing that changes in flow will be "within the current range" of flow fluctuations. This casual dismissal does not suffice for analysis.

d) <u>Failure to Define Thresholds of Significance</u>

The DPEIR persistently fails to define significant impacts in measurable, quantifiable terms. Thus, it is not possible to evaluate when truly significant impacts will occur. Impact thresholds should be (a) quantifiable (b) measurable (c) defensible and (d) account for **both** the severity and frequency of an impact. 43
A severe impact (*e.g.*, a seismic risk connected to a project) could be significant even if it is unlikely to occur frequently. By the same token, a frequent impact (*e.g.*, a modest level of soil erosion each time it rains) could be cumulatively significant even if a single occurrence would have only a small impact.

The DPEIR consistently confuses the frequency of an event (also poorly defined in the report) with the severity of the impact. Thus, there is a proliferation of words like "occasional," "rare," "uncommon," and "sometimes" that are intended to alleviate concern that impacts will be significant. However, if an impact is severe, it really does not matter how frequent it is. Thus, when the 44
report concludes (on page 5.3.6-33) that the impact of flow reduction and temperature increases on emigrating salmonid juveniles is "infrequent" and thus, not significant, this assessment is incomplete because it does not incorporate the severity of the potential impact (nor does it define "infrequent").

Another indication of the poorly defined impact thresholds is that the DPEIR routinely assumes that changes that are not "substantially out of the range experienced under current conditions" are insignificant. Under this logic, if mean conditions (of temperature, or flow, or sediment transport) under the WSIP approximate the low (or high) range of current variation, there has not been an 45
impact of the WSIP. This kind of logic leads, step-by-step, to serious cumulative impacts. For example, if the WSIP is adopted, could a *subsequent* plan also claim "no significant impact" if the changes *it* produced still fit just inside the extreme end of the "range" produced by the WSIP?

e) <u>Aggregation of Data into Time-Steps that Lack Relevance to Biological, Hydrological, or Geomorphological Processes</u>

The DPEIR obscures analysis of potential impacts related to flow fluctuations on the Tuolumne River by aggregating data over coarse time-steps. For example, the hydrological modeling used throughout the report produces output on a 46
monthly time-step. This level of resolution may be valuable for water balance equations and estimates of "average" changes in monthly flow, but it does not

allow insight into variations that are the components of that "average" – the weekly, daily, and even hourly conditions that actually affect biological, hydrological, and geomorphological conditions on the Tuolumne River. So, for example, on page 5.3.6-31 the DPEIR states that, under some conditions, average monthly flows will be reduced by 25% (the conditions are documented elsewhere). This means that sometimes flow reductions will be greater than 25% 46 cont.
-- that is the nature of an average. Whereas the report "analyzes" the impact of a 25% habitat reduction, the reality is that about _ of the time under these conditions, habitat reductions will be worse than 25%. Even in months with these conditions when habitat is actually reduced exactly 25% on average, the flow reduction during any particular day or week can be greater than 25% (again, that is the nature of an average).

Similarly, in some places the DPEIR aggregates historic flow patterns across different "water-year types" (e.g. wet years, above normal years, etc.) and then analyzes changes anticipated under WSIP from these average, within "water-year type," conditions. As a result, the DPEIR tends to understate potential impacts to biological, hydrological, and geomorphological features of the Tuolumne River due to implementation of the WSIP. First, it should be noted that some of the average changes in flow are themselves potentially significant (see Tables 5.3.1-5 and 5.3.1-6, for examples). But, the report fails to note or 47
discuss that this kind of change is only the "average" change expected for a given month in this "water-year type" under the WSIP. Changes in any particular year (of a given water-year type) may be greater than or less than this average. Because the DPEIR **never** reports the variance or the range around the means it presents, the reader has no way of assessing what kind of faith to place in the averages.

The problem with the DPEIR's reliance on monthly (or even more coarse "Water-year-type") averages is that many biological, hydrological, and geomorphological processes respond to changes in flow at a much finer time step. Fish and other organisms experience actual habitat reductions, as these occur on an hourly, daily, or weekly basis, not the average monthly habitat reductions The DPEIR presents no assessment (even a very general assessment) regarding the appropriate hydrological time-step needed to analyze different impacts. For example, biological resources may respond to flow-related 48
temperature changes on the scale of one or a few days. On the other extreme, river geomorphology may not change at all as a result of reduced flows in one year; however, a persistent reduction in peak flows can cause significant changes in river geomorphology on broad spatial scales (e.g., channel downcutting and meander patterns), or on fine spatial scales (e.g., bank and bed armoring) that are biologically significant (*see* TNC 2006 for a review).

Another example of this tendency to underestimate impacts is provided on pages 5.3.4-6 of the report. The DPEIR concludes that most impacts to Tuolumne River flows below La Grange Dam will occur in relatively wet years. This is true; however, a review of table 5.3.4-4 indicates that flow reductions would have 49
occurred in 20% (5 of 25) of dry and below normal years and in more than 10% (16 of 125) of months between October and April during those years under WSIP.

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The DPEIR tends to ignore flow impacts during years of "below normal" and lower runoff because it finds that such impacts will be "rare" or "infrequent". But given that biological resources may already be stressed during these periods, the failure to analyze flow reductions during these periods is unacceptable. 49 cont.
Again, we wish to emphasize that biological resources are not living in the "average" low flow condition, they are experiencing the conditions that actually occur for variable lengths of time; thus, the average "below normal" year condition is not a relevant metric for assessing impacts.

The meaning and proper application of averages should also be included in a discussion of model resolution, as the two are intrinsically linked. Monthly averages represent the peak of a normal distribution (and many hydrologic variables are not normally distributed) and do not incorporate information about the true distribution or its range (i.e., the tails of a distribution). As a result, 50
variability seen in daily and or weekly flows cannot be directly assessed using monthly averages. Therefore, any conclusion about the potential effects of the WSIP on daily and weekly flows is only an assumption based upon somewhat subjective measures.

f) Lack of Significance Criteria for Groundwater Impacts

The City and County of San Francisco has not formally adopted significance criteria for impacts related to groundwater, but generally considers that implementation of the WSIP would have a significant groundwater impact if it were to:

- Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of preexisting nearby wells would drop to a level that would 51
not support existing land uses or planned uses for which permits have been granted).
- Substantially impair a water body's ability to support beneficial uses designated by the State Water Resources Control Board or Regional Water Quality Control Board.
- Otherwise substantially degrade water quality.

This document should set measurable criteria for groundwater impacts. As written, this is a subjective rather than scientific assessment.

g) HH/LSM Modeling Methodology

The HH/LSM is, in essence, a reservoir and system routing model that uses an 82-year historical period of record for analysis of the effects of the WSIP. Several issues regarding model development and error estimation persist. Modeling scenarios developed with the HH/LSM consist of two types: a base-line scenario meant to simulate hydrologic conditions of the system over the period of record using 2005 (base-line year) conditions, and alternative scenarios including the WSIP scenario and Variants 1, 2, and 3. Results from both the base-line model

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and each variant including the WSIP are then compared. Several issues about the modeling approach are apparent:

- *Modeling Error:* Models of any sort inherently contain error. The amount of model error depends on the accuracy of the data inputs, potential error in the underlying model calculations, and the factors that are incorporated or not incorporated into the model. Model error can potentially be significant. Most error is reduced through model calibration (comparing outputs with actual values and altering the model logic or assumptions until differences are minimized). Although this is standard practice, no mention of calibration and error reduction efforts and final error rates for the HH/LSM were discussed in the DPEIR. The accuracy of projections generated by the HH/LSM under the WSIP scenario is impossible to evaluate because there is no indication of how closely model projections reflect actual outcomes. Furthermore, because the base-line model contains inherent, unknown error and the scenarios contain inherent, unquantified error, any comparison of the scenarios with the baseline (or among scenarios) contains inherent, unquantified error. We found no discussion of analytical or model error in the DPEIR.

  Model error produces uncertainty around model outputs (estimates). For example, if model error is ±5% for a given output, then the model output (which represents the "mean expected" output given the inputs) is only accurate to within ±5%. For instance, during some extremely dry periods in some years, the HH/LSM model predicts that flows below 52
O'Shaughnessy Dam may be reduced up to 90% of average flow. However, if the error rate is 5%, then the model is really saying that average flows reductions expected in this area are between 85% and 95%.

  Another potential difficulty with conducting a comparative analysis between modeled scenarios is possible compounding of model error. For example, if both the base-line model and the Variant model (in this case the WSIP scenario) have an inherent error of 5% (for illustration purposes), then the potential error of any analytical comparison could be up to 10%.

  Model error (uncertainty regarding the mean estimate) increases as one uses inputs that are at the extremes of the range of data used to create relationships in the model. For analysis of the WSIP (and other variants), the HH/LSM model was applied to conditions that are towards the extremes of those that were used to construct the fundamental relations in the model. In other words, the mathematical relationships used to construct the model become more tenuous as the input conditions deviate further from the norm. Further complications with model errors arise when attempting to translate averaged monthly-modeled results to finer time scales, as these typically have a much greater variance.

  We could not find a discussion of model error rates anywhere in the DPEIR; certainly, they were not incorporated into the analysis conducted

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in and conclusions reached by the report. This could have significant implications for possible impacts of the WSIP, yet these implications are not mentioned in the DPEIR. This is particularly important because some 52
conditions modeled under the WSIP scenario represent extremes that are cont.
not seen in current conditions and are thus not reflected in the 82-year record.

h) <u>HH/LSM Modeling Conclusions</u>

Conclusions presented in the DPEIR about the possible effects of WSIP implementation based upon the assumptions put forth in the HH/LSM and within the context of the report reflect monthly means; they are limited when evaluating effects at shorter time-scales and they do not incorporate deviations from mean projections (i.e. error). Potential effects resulting from changes in the 53
distribution of daily, weekly, and peak flows are given only minor consideration. Of these, peak flows are the most difficult to predict, and the analysis of WSIP impacts on the occurrence, magnitude, and duration of peak flows is simplistic. Since peak flows are critical for channel geomorphology and stream ecology, this is a significant issue. In short, because of the limitations of the HH/LSM model, the DPEIR does not fully describe the effect of WSIP implementation on peak, daily, or weekly flows; this limits the actual analytical usefulness of the HH/LSM outputs for analysis in the DPEIR.

i) <u>Tables Are Inconsistent with Narrative</u>

On numerous occasions, the tables presenting data are inconsistent with the narratives that refer to them. For instance, on page 9-88, Section 9.3.1, the Comparison of Alternatives (subsection Tuolumne River Watershed) says, "Table 9-7 summarizes the potentially significant impacts on the Tuolumne River...from 54
each of the alternatives." Then on page 89 the DPEIR states, "Four alternatives...would **avoid** this significant impact associated with the delay in spring releases." Yet, Table 9-7 does not agree with this narrative. It states that the alternatives will have "similar impact" to the proposed project, or the "same as proposed project."

III. FAULTY ASSUMPTIONS

There are a number of areas in which the DPEIR bases its conclusions on faulty assumptions. This section of our comments identifies erroneous conclusions in the following areas:

a) Questions about SFPUC Water Rights
b) MID/TID Transfer Agreements Are Not Certain 55
c) The 1997 FERC Settlement Agreement Will Affect Future Transfers
d) Effects on Flow along the San Joaquin River and the Sacramento-San Joaquin Delta
e) HH/LSM Primary Assumptions
f) The Historic Record of Calculated Runoff that Supplies the Hetch Hetchy System Does Not Accurately Reflect Future Conditions

g) Alternatives Analysis Improperly Quantifies the Demand, Yield and Drought Impact of All Alternatives 55 cont.

a) Questions about SFPUC Water Rights

The discussion of Tuolumne River water rights in the DPEIR fails to address the issues raised by the State Water Resources Control Board in its letter of October 3, 2005, which states:

> "For the City and County of San Francisco, the water rights were quantified in *Meridian Limited v. City and County of San Francisco et al.* It appears that the pre-1914 appropriative right was solely for storage of water. The project listed in the NOP is a direct diversion project. Any new diversions must be accomplished pursuant to an appropriative right obtained from the State Water Resources Control Board... In reviewing the Meridian case, Division staff notes that most of the water appropriated from the Tuolumne River for the Hetch Hetchy project was used for hydroelectric power generation. Hydropower generation is considered a non-consumptive use right because the water is returned to the stream system. In general, a non-consumptive water right cannot be used as the basis for new, consumptive uses of water." 56

The Raker Act clearly limits the amount of water that San Francisco can divert from the Tuolumne River. In addition to requiring San Francisco to release water to meet the senior water rights of Turlock Irrigation District and Modesto Irrigation District, the Act further limits Tuolumne diversions because San Francisco may not divert more water than is "necessary" from the Tuolumne.

Raker Act Section 9(h) provides:

> "That the said grantee shall not divert beyond the limits of the San Joaquin Valley any more of the waters from the Tuolumne watershed than, together with the waters which it now has or may hereafter acquire, shall be necessary for its beneficial use for domestic and other municipal purposes."

Since San Francisco must fulfill its "beneficial use" water needs with "waters which it now has or may hereafter acquire," Tuolumne River water must be a source of last resort for San Francisco. San Francisco has interpreted this section of the Raker Act as follows: "section 9(h) of the Raker Act requires San Francisco to make full use of its local sources of water."

The Notice of Preparation interpreted this requirement in the Raker Act in an overly narrow way:

> "under the WSIP, the regional water system would continue to comply with the conditions of all applicable institutional and planning requirements, including: . . . maximizing use of water from local watersheds." 57

The Raker Act does not define the "water which it now has" as "water from local watersheds." It is true that San Francisco "now has" water rights to water from Bay Area creeks including Alameda, Arroyo Hondo, Calaveras, San Antonio, San Mateo, Pilarcitos, and San Andreas. However, it also is true that San Francisco "now has" waters that it is discharging from waste water treatment plants that could be recycled, and waters recoverable through water use efficiency and water conservation measures. 57

The Raker Act requires San Francisco to use the "waters which it now has" (normally described by the SFPUC as its "local sources of water") to the full extent possible. Then, and only then, may San Francisco divert water from the Tuolumne River. "Local sources of water" should include local creeks, groundwater, conservation, recycling, and desalination. San Francisco must maximize water from these sources before it proposes to increase the amount of water it diverts from the Tuolumne River.

b) MID/TID Transfer Agreements Are Not Certain

As stated in the DPEIR, the proposed MID/TID water transfer "involves some uncertainty because its implementation depends on the SFPUC negotiating and reaching agreement with MID/TID and possible other water agencies." (p. 6-48) The measure would require that MID/TID conserve water or meet their needs with an alternative water source so that releases from Don Pedro Reservoir remain unchanged.

The DPEIR does not present any evidence that the Districts are interested in pursuing any such agreement with the SFPUC nor that the SFPUC and the Districts are even in discussions regarding such an arrangement. In fact, in scoping comments submitted to the Planning Department in October 2005, the Turlock Irrigation District indicated that the SFPUC has not approached the District regarding any water transfer arrangements. It stated: 58

> "As a long-time partner on the river with the City and County of San Francisco, the District is disappointed that CCSF staff did not discuss with the District the proposed water transfers from the District before the proposal was publicly announced...It is imperative that the WSIP define the characteristics of 'additional water supply via district transfers.' As the District has seen no official proposal and as such, has neither discussed nor accepted any terms for a transfer, the EIR must address this issue."

The DPEIR states that if the SFPUC is unable to secure a water transfer arrangement with MID and TID, then it will conduct one of two fishery habitat restoration projects (5.3.6-4b, Fishery Habitat Enhancement): spawning gravel enhancement or removal of a former gravel quarry pit from the river corridor. These proposed mitigation measures are problematic for several reasons.

First, the gravel augmentation project proposed in 5.3.6-4b would enhance the spawning phase of the salmon life-cycle, while changes in flow would primarily 59 harm out-migration and rearing of juveniles. In other words, the proposed mitigation measure is mitigating for a different problem that what is created by reduced flows. Although gravel augmentation is probably needed as a result of spawning gravel degradation due to dam operations, the impact and the mitigation are poorly matched in this case. 59 cont.

Secondly, the alternative mitigation proposed in 5.3.6-4b (removal of a former gravel quarry) is of dubious benefit. The Turlock Irrigation District, as part of its obligation under the 1996 FERC Order, has completed a pond removal project at the "SRP-9" site. The project was intended to reduce predator habitat, however, the results do not show any success in achieving this goal. In fact, the District's assessment was that the project "was not successful in reducing largemouth bass linear density during the low flow years that have occurred since project construction" and "the project appears to have increased smallmouth bass abundance at the site relative to pre-project conditions at other SRP sites" (2005 Summary Report, p 3-48). 60

Thirdly, these projects do not consider impacts specifically to steelhead trout. Steelhead have a different life cycle and different habitat requirements than Chinook salmon. Steelhead are listed as "Threatened" under the Endangered Species Act, and as such, it is illegal to harm these fish in anyway.

In the Tuolumne, steelhead typically up-migrate in the winter and spring and summer-over in the river. As such, these fish require cool waters, below 65^{0}F, preferably below 60^{0}F. Further withdrawals would only serve to exacerbate the high temperatures already experienced in the river, particularly in the summer when air temperatures along the river frequently climb above 100^{0}F. None of the projects proposed by the SFPUC would mitigate the impacts to steelhead. 61

There is no evidence that implementation of one of these fishery habitat enhancement projects would be an effective measure for mitigating the impacts of reducing flows in the Tuolumne River below La Grange Dam. 62

Finally, the DPEIR fails to identify the impacts on the Tuolumne River between the Hetch Hetchy Reservoir and the Don Pedro Reservoir if the MID/TID transfers were approved. 63

c) The 1996 FERC Settlement Agreement Will Affect Future Transfers

"TID and MID own and operate Don Pedro Reservoir (built under the New Don Pedro Project) and are solely responsible as project licensees for meeting the Federal Energy Regulatory Commission (FERC) requirements for fishery releases. Nevertheless, under the Fourth Agreement with TID and MID (see Chapter 2, Section 2.5.3), the SFPUC may be required to provide water for these FERC-imposed fishery releases from Don Pedro Reservoir if TID and MID demonstrate that their water entitlements are being adversely affected by providing the flows. 64

The SFPUC, TID, and MID entered into two funding agreements to implement

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the FERC Settlement Agreement; the SFPUC now pays TID and MID to provide all of the additional water required under the 1996 FERC order amending the requirements for fishery releases from Don Pedro Reservoir. The current FERC license expires in 2016, at which time TID and MID will be required to apply for a new license for hydroelectric operations on Don Pedro Reservoir. As part of the license renewal, FERC may modify the fishery release requirements. Although the fishery release requirements that FERC may impose in 2016 cannot be anticipated at this time, the SFPUC assumes, for purposes of the WSIP, that it will be able to continue its current agreement with TID and MID to pay them to provide all of the additional water, if any, required for the fishery releases." (Vol. 1, 3-43) 64 cont.

The SFPUC cannot assume future FERC flows will stay constant. In fact, they are likely to increase due to dwindling salmon numbers and the listing of steelhead. As noted, the SFPUC/CCSF may be responsible for increasing fishery releases as part of re-licensing in 2016. However, the CCSF also make the false assumption that the funding agreement with MID and TID will continue. The funding agreements between MID, TID and the CCSF do not guarantee that MID and TID will cover all fishery releases under the FERC Settlement of 1995.

d) Effects on Flow along the San Joaquin River and the Sacramento-San Joaquin Delta

Under Impact 5.3.1-5, the DPEIR acknowledges that "following protracted droughts, reductions in San Joaquin River flow attributable to the WSIP would be sufficient to cause flow in the river at Vernalis to fall below the objective. Under these circumstances the USBR would be expected to increase releases from New Melones on the Stanislaus River to meet the flow objectives at Vernalis."

It goes on to read, "following protracted droughts, reductions in Delta inflow attributable to the WSIP would be sufficient to cause Delta outflow to fall below the objective. Under these circumstances the USBR and DWR (operators of CVP and SWP) would be expected to decrease diversions from the Delta so that Delta outflow objectives are met." 65

The conclusion of a less than significant impact is based on San Joaquin and Delta flow objectives being met by other agencies, which is outside of the control of the SFPUC. Under CEQA, any mitigation measures relied upon to reduce otherwise significant impacts to a level of insignificance "must be fully enforceable through permit conditions, agreements, or other legally binding instruments." (CEQA Guidelines § 15126.4(a)(2)). The DPEIR's assumption that USBR and DWR will make up for flows lost to increased Tuolumne River diversions is not a mitigation measure enforceable at all by SFPUC, let alone "fully enforceable." Moreover, in light of the frequent failure of USBR and DWR to provide sufficient flows for fish and water quality protection in the Delta in the past, this assumption is not well-founded.

In 1958 the CCSF applied to the Department of Interior for a change of location for their aqueduct right-of-way as provided under Section 2 of the Raker Act. In approving the change, DOI also required a revised schedule and study for minimum water releases from O'Shaughnessy Dam. In March 1987 the CCSF and DOI signed an agreement stating that the CCSF would fund **four-year** fish and habitat studies that would determine if flows in the upper Tuolumne should be increased. The CCSF further agreed to adjust minimum releases as set forth in said Agreement and a previous 1985 Flow Agreement. The CCSF contracted with the United States Fish and Wildlife Service (USFWS) to conduct the study. 66

On July 20, 1992 the USFWS completed a draft of this study and called for increased flows. However, a revised and increased flow schedule was never adopted or implemented by the SFPUC or the CCSF, and the USFWS study was never completed. Given these contractual agreements, the CCSF is legally obligated to complete the study and augment flows from O'Shaughnessy Dam. Complying with these agreements may be compatible with increasing diversions by 25 mgd at the same time. However, the DPEIR makes no effort to analyze the impact that these required flow increases would have on the CCSF's plan to increase diversions from the Tuolumne by 25 mgd, and seems to assume these agreements would have no impact.

Additionally, the recent ruling by Judge Wanger to protect the endangered Delta smelt will impact both inflows and pumping from the Delta. That means that loss of Tuolumne River inflows will have a significant impact, and that additional releases from south of the Delta storage in the Central Valley Project (CVP) and State Water Project (SWP) will be not be available for this purpose. The DPEIR must also address the impacts of the Delta pumps rulings on water releases from La Grange and New Melones Dams. 67

e) HH/LSM Primary Assumptions

The conclusions presented in the DPEIR regarding the potential impact of WSIP implementation on all components of the regional water supply system, especially the Tuolumne River, rely upon some of the assumptions maintained in the HH/LSM model and application of these assumptions to analysis of HH/LSM modeling results. Of the assumptions presented in the HH/LSM model, several are conditional and dependent upon the resolution of ongoing negotiations; other assumptions suppose unchanging conditions between 2005 base-line conditions and the target 2030 WSIP conditions. Among the questionable assumptions are: 68

- *The SFPUC will execute a water transfer agreement with both TID and MID that makes available to the SFPUC an additional 23 million gallons/day from Hetch Hetchy Reservoir (5.1-5, 5.3.6-33, Appendix H1-5).* This condition is contingent upon an agreement with TID and MID to allow the SFPUC to withdraw more water from its water bank account in Don Pedro Reservoir than is currently being withdrawn. The specifics of how the SFPUC proposes to repay this water to TID and MID have not been discussed, most likely because negotiations are ongoing and an

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agreement has not been reached. However, since inflow into Don Pedro Reservoir will be reduced during most years, as determined by the HH/LSM and reported in the DPEIR, TID and MID will be required to capture more inflow in order to make up for this deficit. 68 cont.

- *TID and MID diversions from La Grange will be the same as those that were diverted during the base year (2005) (Appendix H2-1 Page 5).* The basis for this assumption is not discussed in the DPEIR. It is highly unlikely that TID and MID water requirements in the 2030 target year will be the same as they are now. The DPEIR assumes that current TID/MID combined diversions are ~ 867,000 acre-feet/year (App H, Tables on pages 48 and 49). However, in Vol. 1 section 2.3 (p. 37), the DPEIR implies that TID/MID's total water rights exceed 1.9 million acre-feet (when natural river flows at La Grange can support that volume of diversion). Thus, based on information in the DPEIR, it appears that TID/MID sometime divert less than their water right would allow. The assumption that they will not increase water diversions over the project period is questionable at best. MID's 2005 Urban Water Management Plan estimates an increase in demand of 70% by the year 2030. Additionally, the DPEIR's section on global climate change (Vol. 3, 5.7.6) acknowledges that with regional increases in temperature, agricultural water needs are anticipated to increase as well. 69

f) The Historic Record of Calculated Runoff that Supplies the Hetch Hetchy System Does Not Accurately Reflect Future Conditions

The DPEIR assumes, without any critical analysis, that hydrological and meteorological conditions in the next 82 years will be identical to those in the preceding 82 years. The DPEIR includes no analysis of the probability or return period of meteorological events. The only discussion of the probability of an event is that a 30% chance exists that the region will experience a drought greater than or equal to the 1987 – 1993 drought within the next 82 years (Appendix H, section 1.3.1, p. 13). This statement refers to studies that are not cited. Although this assessment may reflect the historic record, trends in hydrological and meteorological conditions that are already being observed (*see above* "Inadequacy or Lack of Monitoring Baseline") are not accounted for in the hydrological analysis, despite the fact that the DPEIR acknowledges the scientific consensus that global climate change has already occurred and will continue to impact this region in the immediate future. 70

The blind reliance on the 82-year hydrological record is a serious flaw in the DPEIR as global climate change can affect nearly every input into and assumption of the HH/LSM model and, thus, the outputs that define the impacts of the WSIP scenario (and other alternatives). An increase in the frequency of droughts of any magnitude has the potential to significantly impact system operation. If the return period for such conditions decreases (i.e., droughts occur with greater frequency), then several droughts may be experienced sequentially. According to the HH/LSM analysis, the hydrosystem is most vulnerable during less-than-normal and dry years (during extremely dry years alternate sources and rationing are maximized) and wet years following a drought period. This will increase the magnitude and duration of stress on the entire system. For further discussion, see the section on climate change and global warming above. 70 cont.

The failure to incorporate observed or predicted meteorological trends into the hydrological projections is particularly significant because error estimates (model error) are already missing from the results presented in the DPEIR and the report does not indicate that the models were run under alternative input assumptions that would reflect potential variability in environmental conditions.

g) <u>Alternatives Analysis Improperly Quantifies the Demand, Yield and Drought Impact of All Alternatives</u>

Table 9-4 offers a description of the CEQA alternatives. Although each alternative includes a different estimate for conservation and recycling, the same 300 mgd figure for 2030 system demand is used in all except the "No Increased Purchase Request" alternative. Since water conservation and recycling *reduce* that demand figure, it should be changed to reflect the revised demand for each of the alternatives. For example, the no supplemental water alternative identifies 29 mgd in conservation/recycling/groundwater. The yield of the conservation and recycling projects should be subtracted from the 300 mgd 2030 demand figure to determine the actual demand under that scenario. 71

While it is appropriate to maintain a number that reflects conserved water in the service area, including that number in the calculation of actual water use improperly inflates customer demand and skews modeling of drought year shortages. Similarly, it is unclear how the drought model is changed to reflect the varying supply alternatives. The "Level of Service" discussion in Chapter 8 for the program variants provides an analysis of the impact of a change in demand on the design drought.

The discussion of "demand hardening" on page 9-54 is vague and unquantified, and is not accompanied by a discussion of the reduced number of dry years due to the reduction in demand, or by a discussion of the modeling results. The fact that 60% of the increased 2030 water demand is for outdoor use would seem to "soften" the drought shortage figure, as outdoor conservation is the most easily enforced and has fewer economic impacts. 72

The no additional diversions alternative assumes that there will be no conjunctive use program for the Westside Basin aquifer. While the scope of the program may be reduced due to limitations on Tuolumne River withdrawal, aquifer replenishment will still occur due to replacement of groundwater with reclaimed water for irrigation, potential for stormwater recharge, and reduced pumping due to conservation. 73

IV. ADDITIONAL COMMENTS

a) <u>Does the WSIP Comply with NEPA?</u>

Chapter 5 of the DPEIR acknowledges that changes in the water releases from the Hetch Hetchy reservoir due to the WSIP will impact the Poopenaut Valley, a popular hiking destination and fragile wetlands ecosystem inside of Yosemite National Park. The DPEIR acknowledges impacts to the physical landscape of the Valley, including streamside alluvial deposits and meadow resources. Given that the WSIP will have an impact on a national park, is any federal approval necessary, and if so, what NEPA compliance is the relevant agency undertaking? 74

b) <u>Inadequate Public Noticing of the San Francisco Hearing</u>

The public was not adequately notified of the DPEIR hearing held on September 20, 2007 in front of the San Francisco Planning Commission, which is the body tasked with determining the adequacy of the document. We believe at least one additional hearing before the San Francisco Planning Commission must be held before the DPEIR is approved.

The meeting was noticed in the San Francisco Examiner on September 10, only 10 days before the hearing. Given the size of the DPEIR (more than 3,000-pages), this was not a reasonable amount of time to expect the general public to review the document and prepare informed comments.

Public notice was not given as to the time of the meeting until September 17, just three days before the meeting. The start time was not published in a newspaper, and the WSIP DPEIR item was not taken up until more than five hours after the meeting began.

The meeting began at 1:30 pm. The starting time for the WSIP item was identified as 5 pm, again, only three days before the hearing. The actual time the item was taken up was 7pm. Several dozen members of the public arrived at the hearing at 1:30 pm. It is not reasonable to expect the public to wait for five hours to testify. 75

At the hearing, the San Francisco Planning Commission was not given a presentation or briefing on the WSIP, and several Commissioners complained about the lack of information.

Planning Commissioner Christina Olague chided the SFPUC, saying it was "irresponsible" for the commission to not have been given a presentation on the project. The Commissioner requested that one or two additional public hearings be held for the WSIP DPEIR.

The result was that members of the public were giving comments to the DPEIR decision-making body without the benefit of having the governing body being properly prepared, thus giving comments in a vacuum.

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Prepared by the Tuolumne River Trust
October 1, 2007

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
3	5.1.4	12	Table 5.1-1 Modeling Assumptions Used In The CEQA Analysis Displays a list of modeling assumptions made in the development of the HH/LSM model run for the CEQA analysis.	This table includes some of the primary assumptions used in the CEQA analysis. Not included in this list are the assumption that TID/MID diversions and entitlements will remain static (as indicated in Appendix H), and that the SFPUC will be able to negotiate an agreement with TID and MID for the transfer of 27,000 acre-feet per year. These are rather large assumptions and must be identified as the entire analysis rests on their validity.	76
3	5.1.4	12	Table 5.1-1 Modeling Assumptions Used In The CEQA Analysis Displays a list of modeling assumptions made in the development of the HH/LSM model run for the CEQA analysis.	An even larger assumption, that the entire hydrological modelling process relies on, is that means, variances, and patterns in the 82-year hydrological record for this system (a) were constant (i.e. temporal trends were not directional) and (b) will be representative of the project period (2007-2030). Neither of these assumptions is accurate as patterns in regional climate (e.g. temperatures, drought frequency, etc.) appear to have been directional through the 82-year hydrological record and that directional change is predicted to continue through the project period (*see, for example, DPEIR Sect 5.7.6 "Climate change and gobal warming")*. As a result, the 82-year hydrological record, upon which these analyses are based, may offer only a weak approximation of conditions anticipated through the project period. Specifically, the hydrological record of the past 82 years is likely to overestimate the supply of water and underestimate the demand for that water (particularly by agricultural users under business-as-usual assumptions).	77
			Table 5.1-1 Modeling Assumptions Used In The CEQA Analysis Displays a list of modeling assumptions made in the development of the HH/LSM model run for the CEQA analysis.	The temporal availability of that water is likely to change. As a result, analyses of the WSIP based on this record are likely to underestimate the potential hydrological impacts of the program and the biotic and geomorphological impacts that are related to hydrological conditions.	78

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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
3	5.1.4	14	Paragraph two under the heading Model Limitations describes model limitations as they apply to the Pilarcitos Reservoir	What are the specific limitations/deficiencies in the HH/LSM model that preclude its application to the Pilarcitos watershed? How do these model limitations impact analyses of other hydrosystem components and/or the hydrosystem overall? Again, very little metadata regarding the accuracy and limitations of the HH/LSM models is provided in the text. As a result, it is impossible for the reader to evaluate whether the model is being applied appropriately or whether model outputs are being interpreted with enough caution.	79
3	5.1.4	15	Table 5.1-2 describes model features and their respective outflow parameters.	Model outputs are reported in acre-feet while corresponding charts shown in previous chapters and sections report these values in either elevation or cubic-feet per second. Units of measure should be consistent throughout the report to improve readability and ease of analysis.	80
3	5.1.4	15	Table 5.1-2 describes model features and their respective outflow parameters.	Some system outputs are presented in "acre-feet" whereas others are presented in "million gallons". This makes analysis and comparisons difficult. Units of measure should be consistent throughout the report to improve readability and ease of analysis.	81
3	5.1.4	17	Paragraphs one and two describe the possible implications of the monthly time interval used in the DPEIR analysis. "...in some cases, the modeling limitation of only providing information at a monthly time interval required additional considerations ... when simulating intermittent phenomena such as infrequent spills or releases from reservoirs that may last only a few days"	We agree that the modelling river flows at a monthly time-step is a "limitation" of the WSIP analyses because it does not account for "short-term variations" in flow volume or quality below dams in this hydrosystem. As noted above, the impact of these "short-term variations" (i.e. those on a daily or weekly time scale) may be significant and are worthy of consideration and documentation. Unfortunately, although this passage indicates that "operator knowledge" was used to "refine" analysis of the WSIP, these "refinements" are not available to the reader and thus the true impact of the WSIP on hydrological, biological, and geomorphological features cannot be determined.	82
3	5.1.4	17	Paragraph four describes the possible implications of the monthly time interval used in the PEIR analysis. "HH/LSM results were refined or teired to provide additional insight into the effects of the WSIP on stream flow for time periods of less than a month"	How were monthly results for Hetch-Hetchy releases "refined or tiered to provide additional insight into the effects of WSIP on stream flow for time periods of less than a month" ? As noted elsewhere, the inability of model results produced at a monthly time-step to capture the ecological, hydrological, and geomorphological implications of WSIP is a major concern. Thus, methods used to produce this finer grained resolution of WSIP impacts, and insights gained from it, are of great interest. Without documentation of the methods used to produce, and the insights gained from, this "refinement", the reader cannot evaluate the true impacts of the flow changes produced by the WSIP.	83
3	5.2	3	Table 5.2-1 Applicable federal, state, and local statutes and agreements	There is no mention of California State Fish and Game Code § 5937 that requires: "The owner of any dam shall allow sufficient water at all times to pass through a fishway, or in the absence of a fishway, allow sufficient water to pass over, around or through the dam, to keep in good condition any fish that may be planted or exist below the dam."	84

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Volume	Section	Page Number	What the DPEIR says ("" indicate direct quote, otherwise paraphrase)	Our Comment	
3	5.3.1	12	Paragraph 2 refers to an agreement between USDOI and SFPUC requiring minimum stream flow from Hetch Hetchy reservoir. "...the agreement provides for an additional supplemental release, depending on hydrologic year type, subject to the completion of a fish habitat study and the determination of appropriate timing for the release..."	The Hetch Hetchy Fishery Investigation was initiated but never completed or adopted by the SFPUC. To our knowledge the several studies required under this agreement were never completed or adopted by the SFPUC. The failure of SFPUC to have completed and adopted the studies it agreed to indicates that the PUC does not know the condition of fish populations below O'Shaugnessy Dam or the impacts that its hydrosystem operation has had on fish populations or habitat resources. As a result, statements made about the current condition of fish populations in this stretch of river and the impacts of WSIP on fish resources in this stretch of river are highly speculative. Also, this failure to document fish populations and habitat conditions below O'Shaugnessy Dam calls in to question whether the PUC can claim to be in adherence with California Fish and Game Code § 5937 that requires maintenance of healthy fish populations below dams.	85
3	5.3.1	13	Table 5.3.1-2 "Schedule of Daily Minimum Required Releases to Support Fisheries Below O'Shaughnessy Dam"	A 1992 draft of the USFWS report "*Instream flow requirements for rainbow trout in the Tuolumne River between O'Shaugnessy Dam and Early Intake*" documented a "detailed instream flow analysis using the Service's ... IFIM" technique. This was the first of four studies agreed to by the SFPUC to document and mitigate the impacts of new facilities on and diversions from the Tuolumne, although, to our knowledge, this study has never been finalized or adopted by the PUC. Table VI on page 26 of that draft document (attached) called for substantial impacts in releases from O'Shaughnessy for the protection of fish populations over what is reported in Table 5.3.1-2 of the DPEIR. Specifically, flows during Year Type C (dry years) were 43-100% higher in the USFWS draft report than those reported under the DPEIR.	86
3	5.3.1	13	Table 5.3.1-2 "Schedule of Daily Minimum Required Releases to Support Fisheries Below O'Shaughnessy Dam"	Throughout this DPEIR, the SFPUC maintains that maintenance of mandatory minimum flows are sufficient to maintain fish populations below dams in the Tuolumne hydrosystem. No evidence is presented to support that assertion. The PUC could have monitored fish populations and fish habitat availability in the Tuolumne to assess whether hydrosystem operations impact fish populations. Indeed, one might argue that they are required to do so under State Fish and Game Code § 5937 and under agreements with USFWS and non-profit organizations such as the Tuolumne RIver Trust. Yet, there is no indication that the trout populations or important habitat variables (spawning and rearing habitat availability) have been measured in this reach since the draft USFWS report was completed in 1992. As a result, there is no way to determine the impact on fish populations of actual flows in this reach of the Tuolumne.	87

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Volume	Section	Page Number	What the DPEIR says ("" indicate direct quote, otherwise paraphrase)	Our Comment	
3	5.3.1	22	Figure 5.3.1-8 presents the modelled average changes in reservoir releases from Hetch Hetchy with corresponding changes in the range of potential storage at Hetch Hetchy.	This figure compares monthly average ranges of storage, not the actual statistical range. As a result, this presentation could lead the reader to conclude that reservoir storage will not be significantly impacted in any month of any years; indeed, the DPEIR makes this claim on page 24 of this section. However, actual changes in the range of storage at Hetch Hetchy are, in some months, far greater than the **average** changes depicted here. Analysis of the data used to create this Figure (HH/LSM Result Viewer v. 1.0) indicate that, in some months, the range of resevoir storage under WSIP may change as much as 69%.	88
3	5.3.1	24	Sentence 6 of paragraph two states: "The WSIP would not alter water levels in Hetch Hetchy Reservoir such that they would substantially be outside the range experienced under the existing condition."	What constitutes being "outside of the existing range" is not explicitly defined. Figure 5.3.1-8 shows the **range** in modelled average reservoir storage increases approximately 25% to 30% (all of this additional **range** translates into potential **reductions** in actual reservoir storage) over the current condition during June, with an increased range (**potential reduction in storage**) of approximately 10% to 20% persisting through October. These potential changes in reservoir storage, at least during peak demand, seem to constitute a significant deviation from current conditions.	89

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[illegible]	[illegible]	[illegible]	What the DPEIR says [illegible]	Our Comment	
			Sentence 6 of paragraph two states: "The WSIP would not alter water levels in Hetch Hetchy Reservoir such that they would substantially be outside the range experienced under the existing condition."	Our analysis of the percent difference between the modeled storage for Hetch Hetchy compared with that during the period of record reveals that, in some instances, the range in reservoir storage changed up to 69% (this analysis was conducted using data from the HH/LSM Result Viewer Version 1.0). Although the frequencies of these effects are limited over the entire extent of the period of record, this difference shows that the range in modeled reservoir values could increase well beyond what is implied (i.e., significant change).	90
3	5.3.1	18	Discussing water quality objectives for the Sacramento-San Joaquin Delta. "These objectives have been the subject of much controversy and have frequently been revised. Some issues remain unresolved, including the degree to which parties that divert water upstream of the Delta are responsible for meeting Delta objectives."	This passage and the discussion that precedes it indicate three things: 1) Flow objectives for the Delta (and lower San Joaquin) are changing and increasing over time 2) SFPUC diversions affect San Joaquin flow in the Delta, and 3) The SFPUC's responsibility for maintaining San Joaquin flow and water quality standards are unresolved. Nowhere else in this DPEIR does the SFPUC address these facts and uncertainties or the question that stems from them: How will the WSIP affect the SFPUC's ability to respond to future demands for increased flows downstream to protect water quality? Given the tremendous uncertainties surrounding the future water needs in the Delta and the SFPUC's legal responsibilities to maintain that water quality, how can the SFPUC consider additional constraints on their ability to provide water by allocating it to customers outside of San Francisco?	91

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[illegible]	[illegible]	[illegible]	What the DPEIR says [illegible]	Our Comment	
3	5.3.1	19	Paragraphs covering the "Vernalis Adaptive Management Program"	Here again, the DPEIR makes clear that downstream requirements for Tuolumne River water may increase in the future, in this case, to protect fishery resources as agreed to under the "San Joaquin River Agreement". It's very name implies that the VAMP may determine that additional flows are needed to protect fish in the lower San Joaquin River and/or Delta (that is the meaning of "adaptive management"). Yet, the WSIP would appear to foreclose opportunitied for increasing flows downstream (and it may jeopardie the ability to provide for existing flow requirements). The DPEIR fails to adequately address the impacts (legal, political, or biological) or foreclosing options related to increasing flows in the San Joaquin as necessary to protect fish populations.	92
3	5.3.1	20	Section titled "Significance Criteria" "The proposed program would have a significant impact if it were to: Substantially alter stream flows such that they were outside of the range of pre-project conditions and result in adverse hydrological effects."	What does "pre-project" mean in this context? If it means pre-Tuolumne River hydrosystem (prior to construction of La Grange, Don Pedro, or O'Shaughnessy Dams), then it is hard to believe that the WSIP would not lead to conditions that violate this significance criteria. If it means pre-WSIP conditions, then the impact threshold implicitly assumes that "adverse" hydrological impacts cannot occur unless flows are "outside of the **range" experienced under current conditions. Given the deterioration of conditions on the Tuolumne and San Joaquin River during the past several decades (e.g. the listing of steelhead as federally "threatened")**, it is not clear that current operations are an acceptable baseline for comparison. Continued deviations (e.g. WSIP) from an impacted state (current conditions) may lead to cumulative impacts. The report fails to consider whether flows may need to be *increased* on the Tuolumne to restore fish populations, water quality, and geomorphic processes.	93

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3	5.3.1	23	Figure 5.3.1-9 Presents modelling of Hetch Hetchy storage and releases to the Tuolumne River under historical conditions.	There are too many panels to this figure and too much information in each one to present them all on one page. As a result of packing each of these panels into such a small space, their ability to convey information is lost. For example, real changes in storage and flow are obscured because the range on the y-axis is so large and the space allocated to the image is so small. For example, whereas most changes in storage and flow "look" very small because of the format of these graphs, that obscures significant changes in the percentage of water released from Hetch Hetchey that occur in 2001 and 2002. Also the change in storage expected to occur under WSIP in the winter 1987, 1988, and 1989 looks minor but actually amounts to reductions between 10-25% of what they were without WSIP.	94
3	5.3.1	25	Impacts of flow along the Tuolumne River below O'Shaughnessy Dam. Fourth full paragraph states "... the greatest reduction in stream flow would occur in normal, below normal, and dry years ..."	Basically, this statement says that flow will be affected in most years; which contradicts an earlier statement that flows will not be affected or affected minimally in most years.	95
3	5.3.1	25	Impacts of flow along the Tuolumne River below O'Shaughnessy Dam. Paragraph three discusses the possible changes to release schedules to the Tuolumne with implementation of the WSIP.	What would happen to the stated pattern if inflows were consistently reduced during a dry period? Would flow releases to the Tuolumne be delayed indefinitely until the reservoir is filled to capacity? There is no discussion of alternate release schedules or operational practices and their affect on the Tuolumne if the reservoir does not fill to capacity.	96
3	5.3.1	25	Impacts of flow along the Tuolumne River below O'Shaughnessy Dam. Paragraph three discusses the possible changes to release schedules to the Tuolumne with implementation of the WSIP.	Flows may follow the same pattern in normal and above normal years, but presumably, the magnitude of releases will be less even though the pattern of releases will be the same. This in turn translates to a reduction in peak and sustained flows in this reach as a result of the WSIP during dry periods.	97
3	5.3.1	26	Table 5.3.1-5 Estimated Average Monthly Flows For The Tuolumne River Below O'Shaugnessy Dam Under Various Conditions Provides a column by-column comparison between flows in the Tuolumne during all water year types for both the modeled current condition and conditions under WSIP.	The table illustrates the differences between the averaged indexed (over the period of record) Tuolumne flows below Hetch Hetchy and modeled flows under WSIP conditions. The "Difference and Percent Change" panel of this table shows only an **average** of all modelled percent differences in flows expected to result from the WSIP. This incorrectly suggests that the maximum percent decrease that can be expected under WSIP for all hydrologic year types is 30%. As stated in the DPEIR, Tuolumne flows below O'Shaugnessy Dam (reflective of releases from Hetch Hecthy) will be reduced up to to 90% in certain years.	98
			Table 5.3.1-5 Estimated Average Monthly Flows For The Tuolumne River Below O'Shaugnessy Dam Under Various Conditions Provides a column by-column comparison between flows in the Tuolumne during all water year types for both the modeled current condition and conditions under WSIP.	Biotic and geomorphological resources will not experience the average flow reduction; they will experience the actual flow reduction in a given month, which, in some cases, may be up to 90%. Thus, this table limits the reader's ability to assess the true potential impacts of WSIP implementation on stream flows in the Tuolumne below O'Shaugnessy Dam. These impacts are likely to be far greater than implied by the average impacts presented in the table.	99

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3	5.3.1	26	Table 5.3.1-6 Estimated Average Monthly Flows For The Tuolumne River Below La Grange Dam Under Various Conditions Presents deviations under WSIP from the average of monthly average flows under various "water-year types".	How were the "existing condition" and "Future with WSIP" values calculated? Presumably the former were based on the hydrologic record and the latter estimate is based on model runs which use the historical data as input? How many model runs were conducted? What is the variance in these estimates (i.e., how much estimation "error" exists)? A formal analysis of environmental variability and model error is required here (and throughout the hydrological sections of this report) in order to understand the level of certainty that we have regarding estimates of mean conditions). As presented, there is no way to evaluate the potential accuracy of modelling projections in the DPEIR because the reader does not know whether projections are accurate to within ±1%, ±10%, or ±100%.	100
3	5.3.1	26	Table 5.3.1-6 Estimated Average Monthly Flows For The Tuolumne River Below La Grange Dam Under Various Conditions Presents deviations under WSIP from the average of monthly average flows under various "water-year types".	Regardless of the exact method of calculation, aggregating (averaging) by month across many years (within the different water-year type categories) obscures the potential impact of changes under WSIP. There will be variance from the mean in these estimated changes in stream flow under WSIP because there is variance in flows under existing conditions and there is error (variance) in the model used to estimate flows under WSIP conditions. Impacts are caused by **extremes** in flow (high or low) more than by estimates of **average** flow. Since variances are not presented (*see above*) we cannot know the true extremes of flow to which the Tuolumne will be subjected. As a result, these **average** estimates are meaningless for purposes of understanding risks to biological, hydrological, and geomorphic features of the Tuolumne.	101

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			Table 5.3.1-6 Estimated Average Monthly Flows For The Tuolumne River Below La Grange Dam Under Various Conditions Presents deviations under WSIP from the average of monthly average flows under various "water-year types".	As mentioned elsewhere in these comments, hydrologic flow regimes often have response periods (usually weekly and daily) that are shorter than the monthly scale at which the DPEIR presents results. Thus, on a daily or weekly basis, actual flows will be lower than those indicated in this table approximately 50% of the time (that is the nature of an average). Therefore, where flow declines are anticipated under the WSIP, the true impact of those decreases in flow are underestimated by the averages presented in these tables. Rather than presenting simple "average" estimated deviations from "average" flow conditions that existed in previous years, the DPEIR should include some estimate of maximum daily (or at least weekly) deviations from current conditions.	102
3	5.3.1	28	The first sentence under the heading "Impact Conclusions" states: "The WSIP would not alter flow in the Tuolumne River below O'Shaughnessy Dam such that it would be outside the range experienced under the existing condition, nor would the flow alterations result in adverse hydrologic effects or be sufficient to change the character of the river."	The statement does not summarize the preceeding discussion of the effects of WSIP implementation on flows at smaller time-steps. That discussion indicates that the HH/LSM model cannot assess the effect of WSIP on flows with time steps of less than one month. Because the potential effects of the WSIP on these types of flows cannot be determined or modeled, the claim regarding the impact of the WSIP on Tuolumne flows below O'Shaughnessy Dam is incomplete. The claim that flows will not be outside of the range experienced under the current condition is also misleading. Table 5.3.1-5 shows a percent difference of average monthly flows up to 30% during dry years, with a potential percent difference of up to 90% in some months of some years during extremely dry years.	103
			The first sentence under the heading "Impact Conclusions" states: "The WSIP would not alter flow in the Tuolumne River below O'Shaughnessy Dam such that it would be outside the range experienced under the existing condition, nor would the flow alterations result in adverse hydrologic effects or be sufficient to change the character of the river."	The data presented here clearly show the potential for a significant deviation from the modeled range under normal conditions, and as such, the referenced statement is not supported. The DPEIR minimizes the possible impacts of the WSIP on Tuolumne flows, and limits the reader's ability to assess this claim. Furthermore, the fact that what constitutes a significant deviation from normal is not quantified (or clarified) elsewhere in the PEIR makes assessing changes in stream flow between modeled scenarios difficult.	104

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3	5.3.1	28	Impacts Conclusions re: Flow along the Tuolumne River below O'Shaughnessy Dam First full paragraph states: "The WSIP will not alter stream flow in the Tuolumne River below O'Shaughnessy Dam such that it would be substantially outside the range experienced under existing conditions, nor would the flow alterations result in adverse hydrological effects or be sufficient to change the character of the river."	This statement is based on many incompletely stated assumptions; it is little more than an assertion. The report acknowledges that daily and weekly sustained and peak flows could very well be affected by a delay in releases and a reduction in the volume of releases. Such volume reductions are anticipated in about 20 years (during the spring) in the 82 year simulation. The DPEIR admits that analysis of the effect of the WSIP on peak flows cannot be conducted because the model uses a monthly time-step, and peak flows usually last only a few hours or days. Yet, it is these peak flows that will determine "the character" of the River below O'Shaugnessy Dam.	105
3	5.3.1	28	Impacts of Flow along the Tuolumne River below O'Shaughnessy Dam First (partial paragraph) states: "Peak flows in years when runoff is less (dry years) might be reduced by the WSIP, depending on decisions made by reservoir operators."	This statement is vague. When Hetch Hetchy does not fill to capacity (as has occurred almost 25% of the time over the period of record), what exactly will happen to the magnitude, frequency, and duration of peak flows in this reach? The answer to this question can have broad implications for fish and wildlife habitat and changes in geomorphology.	106
3	5.3.1	28	Impacts of Flow along the Tuolumne River below O'Shaughnessy Dam First full paragraph states: "...the effects of the WSIP on flow along the Tuolumne River below O'Shaughnessy Dam would be less than significant..."	This claim should be amended to state that monthly affects *may be* less than significant and that daily and weekly affects cannot be assessed. Mitigation measures may be required if changes in daily and weekly flow regimes affect habitat and adversely affect stream morphology.	107
3	5.3.1	29	Section: Impact 5.3.1-2 Effects on Flow along Cherry Creek below Cherry Dam	A comparable graphical summary as the one provided for Hetch Hetchy Reservoir Volumes (Figure 5.3.1-8) is not provided. This creates the impression that such data are not available (which, most likely, is not the case). A similar chart should be included to supplement the discussion of reservoir storage under the heading Water Storage and Water Levels in Lake Loyd, and so that changes in the range in storage between the current condition and conditions under WSIP can be evaluated. This is especially important since these changes are not summarized elsewhere, and that, as stated, operation of Lake Loyd may change after periods of drought to satisfy TID and MID flow requirements and compensate for reductions in Don Perdro Reservoir storage due to reductions in Hetch Hetchy releases. Because Lake Loyd will most likely experience a change in water elevation, the actual magnitude and frequency of such changes should be analyzed and documented.	108

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3	5.3.1	35	Table 5.3.1-6 Estimated Average Monthly Flows for the Tuolumne River Below La Grange Dam Under Various Conditions Presents deviations under WSIP from the average of monthly average flows under various "water-year types."	The table illustrates the differences between the averaged indexed (over the period of record) modeled Tuolumne flows below La Grange Dam and modeled flows under WSIP conditions. The Difference and Percent Change section of the table shows only an **average** of the range of possible percent differences in flows anticipated under the WSIP. This presentation incorrectly suggests that the maximum percent decrease that can be expected under WSIP for all hydrologic year types is 25%. Yet, as stated in the DPEIR, Tuolumne flows at La Grange Dam will be reduced up to 92% during some months in some years.	109
			Table 5.3.1-6 Estimated Average Monthly Flows for the Tuolumne River Below La Grange Dam Under Various Conditions Presents deviations under WSIP from the average of monthly average flows under various "water-year types."	Biotic and geomorphological resources will not experience the average flow reduction; they will experience the actual flow reduction in a given month, which, in some cases, may be up to 92% Thus, as presented, this table impedes assessment of the true potential impacts of WSIP implementation on stream flows in the Tuolumne below La Grange Dam. These impacts are likely to be far greater than implied by the (already substantial) average impacts presented in the table.	110
3	5.3.1	35	Table 5.3.1-6 Estimated Average Monthly Flows for the Tuolumne River Below La Grange Dam Under Various Conditions	Even as presented, this table indicates that there will be substantial reductions of flow in the Tuolumne River under most conditions. Of the 60 Month-by-"year type" combinations presented, more than 1/3 are expected to show average flow reductions of greater than 5%. This reduction in flow can have serious impacts on hydrological, biological, and geomorphological features of the Tuolumne River that are not analyzed by the DPEIR.	111

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3	5.3.1	37	Paragraph two continues a discussion of the WSIP on the operation of Don Pedro Reservoir and Tuolumne releases below La Grange: "Although the WSIP would commonly reduce winter and spring flow in the river below La Grange Dam, it would not affect very infrequent large peak flows produced primarily by rainstorms."	The model used for this analysis is based on a monthly time-step while peak flow usually occurs over a much shorter period. Thus, this statement cannot be derived from model output (as output is in a monthly time-step) and must rely on some undocumented source of information. It is not clear whether release operations change as a result of these infrequent storm events or whether this refers only to flows that enter the River below La Grange dam. This should be clarified. In either case, the hydrological model cannot inform us about the impact of weekly and daily peak flows, even though these are probably important in determining impacts to aquatic habitat and river geomorphology.	112
3	5.3.1	38	The first sentence under the heading "Impact Conclusions" states: "The WSIP would not alter flow in the Tuolumne River below La Grange Dam such that it would be substantially outside the range experienced under the existing condition, nor would flow alterations result in adverse hydrologic effects or be sufficient to change the character of the river."	The statement does not summarize the preceeding discussion of the effects of WSIP implementation on flows at smaller time-steps. This discussion indicates that the HH/LSM model cannot assess the effect of WSIP on flows with time steps of less than one month. For example, in a month with **average** flows that are 25% below current conditions (such as June of "Above Normal" years), flows on any given day, or during any given week may be above or below the 25% average reduction. Flow reductions in excess of the average should occur about half the time, but the extent, duration, and frequency of these reductions in daily or weekly flow are unknown because the model does not produce output on that fine a scale. Because the potential effects of the WSIP on these types of flows cannot be determined or modeled, the claim regarding the impact of the WSIP on Tuolumne flows below La Grange Dam is unsupported.	113
3	5.3.1	38	The first sentence under the heading "Impact Conclusions" states: "The WSIP would not alter flow in the Tuolumne River below La Grange Dam such that it would be substantially outside the range experienced under the existing condition, nor would flow alterations result in adverse hydrologic effects or be sufficient to change the character of the river."	Once again, the significance threshhold for significant impacts is not adequate to protect biological populations, hydrological characteristics, and geomorphological processes of the Tuolumne River. Under the DPEIR's formulation, flows that do not lie **substantially outside the range experienced under existing conditions** do not consititute a significant impact. From this perspective, even if the WSIP consistently reduced average monthly flows to the low end of their current "range", there would be no impact. There is simply no analysis in the DPEIR (or anywhere else) that would support such a finding. Similarly, there is no analysis that demonstrates that *current* operating practices and diversion schedules adequately protect aquatic resources in th Tuolumne River.	114
3	5.3.1	38	The first sentence under the heading "Impact Conclusions" states: "The WSIP would not alter flow in the Tuolumne River below La Grange Dam such that it would be substantially outside the range experienced under the existing condition, nor would flow alterations result in adverse hydrologic effects or be sufficient to change the character of the river."	The data presented here clearly show the potential for a significant deviation from the modelled range under normal conditions; so, the referenced statement is not supported. This presentation minimizes the apparent impact of the WSIP on Tuolumne flows, and limits the reader's ability to assess this claim. Furthermore, because there is no quantification or definition of a ""substantial" deviation from the range experienced under existing conditions, assessing the significance of changes in stream flow between modeled scenarios is difficult. Similarly, it is difficult to determine what kind of changes would affect the "character of the river" because no measures or definition of that character are provided nor are thresholds proposed that would indicate when a "substantial" change in river character has occurred.	115

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3	5.3.1	38	The last sentence of the first paragraph under the heading Impact 5.3.1-5 "Effects on Flow Along the San Joaquin River and the Sacramento-San Joaquin Delta" states: "Flow reductions of these magnitudes would be rare events ocurring four or five times in the 82-year period of hydrologic record."	"Rare" is a subjective term. There is no *apriori* definition of what "rare" means or whether "rare" events are those whose imapcts can be ignored. This substitution of frequency with severity of impact recurs throughout the document. It is unjustified and cannot subsitute for specific definitions of changes in frequency (rare, occassional, infrequent) or actual analyses of the severity of impact.	116
3	5.3.1	38	The last sentence of the first paragraph under the heading Impact 5.3.1-5 Effects on flow along the San Joaquin River and the Sacramento-San Joaquin Delta states: "Flow reductions of these magnitudes would be rare events ocurring four or five times in the 82-year period of hydrologic record."	Although the frequency of these events is <10% in the period of record, no information is provided about the distribution of these events. If they occur in sequential years or sequential months, such a prolonged reduction in flows could have deleterious effects on fisheries and ecosystems downstream. Even if they do not occur sequentially, such major changes in flow would likely have an impact on salinity intrusion and water quality (e.g., dissolved oxygen) in Sacramento-San Joaquin Delta.	117
3	5.3.1	38	The paragraph under the heading "Impact Conclusions" summarizes impacts to the Tuolumne below Don Pedro after implementation of the WSIP "Overall, the effects of the WSIP on flow along the Tuolumne River below La Grange Dam would be *less than significant,* and no mitigation measures would be required ."	This conclusion is based on a finding that monthly average flows under WSIP will not exceed current flows and that mimimum flows are governed by an agreement that will be maintained. However, this ignores the fact that the distribution of river flows (within those extremes) may change dramatically. The change in distribution of flow rates (principally, a truncation of the upper part of the hydrograph) could "be sufficient to change the character of the river". This statement refers to an analysis of monthly flows (the time-step at which the model was run), but not weekly and daily flows. In fact, as stated in the DPEIR, some releases could be delayed by several days or up to a week under some hydrologic conditions. Therefore, the monthly resolution of analysis obscures the potential impact of WSIP implementation on daily and weekly flows.	118
3	5.3.2	5	Geomorphological impacts -- approach to analysis "No modeling or field measurements have been performed to estimate program-generated changes in sediment transport in the Tuolumne River"	The analysis of sediment transport and gravel bed conditions in the Tuolumne is purely qualitative and largely speculative. Because there are no studies of baseline (historic) or current substrate conditions for much of the Tuolumne, it is impossible to know (a) how substrate conditions have changed over time, (b) the response of substrate to operational changes in the Tuolumne, or (c) the current state of Tuolumne River substrate.	119
3	5.3.2	5	Geomorphological impacts -- approach to analysis. "No modeling or field measurements have been performed to estimate program-generated changes in sediment transport in the Tuolumne River"	Steelhead, rainbow trout, and introduced trout species use gravel as a substrate for spawning and incubation. Steelhead juveniles also use pores in the streambed to hide (Williams 2006). The quality of this substrate (e.g. sediment size distribution) can have substantial impacts on a river's ability to support spawning salmonids (Kondolf 1997, 2000). Gravel degradation (bed armoring via slow sedimentation) is a major force driving the loss of salmonid spawning habitat in the Central Valley (Kondolf 1997, TNC 2006). The lack of information about current spawning gravel availability or how it is changing over time (and in response to hydrosystem operations, is a major flaw in this DPEIR. There is no way to evaluate the impact of WSIP to spawning habitat for salmonids without this information.	120

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3	5.3.2	6	The first paragraph attempts to characterize the frequency of geomorphically significant peak flows in the Tuolumne River by comparing them to the periodicity seen in the Clavey River	It is not at all clear that the rate and frequency of geomorphic processes on the Clavey and Tuolumne River are comparable. Where is the evidence for this comparison?	121
3	5.3.2	7	The second sentence of the first (partial paragraph) under section 5.3.2.1 discusses the potential effect of WSIP implementation on sediment transport below O'Shaugnessy Dam, and states: "However, because the changes in peak flow would occur infrequently, they would not expect to result in a substantial change in erosion or siltation rates."	The duration and magnitude of peak flows will be uniformally reduced under WSIP between O'Shaugnessy Dam and Don Pedro Reservoir. Thus, a reduction in stream power available to move sediment must be expected. Simply stating that alterations to peak flows would be "infrequent" does not characterize the extent of the potential impact to geomorphic processes in the river. [This is another example of the DPEIR's practice of substituting frequency for magnitude of impact]. In some months, peak flows will be diminished in frequency, duration, and magnitude. These variables are the primary components in determining potential stream sediment transport. Thus, sediment movement will be undeniably altered, although the magnitude of the impact cannot be determined with the information provided here.	122
			The second sentence of the first (partial paragraph) under section 5.3.2.1 discusses the potential effect of WSIP implementation on sediment transport below O'Shaugnessy Dam, and states: "However, because the changes in peak flow would occur infrequently, they would not expect to result in a substantial change in erosion or siltation rates."	The reduction in Tuolumne sediment transport can be expected to increase armoring of gravel beds which would reduce available salmonid spawning habitat. Also, the persistent reduction in peak flows can be expected to gradually reduce the availability of interstitial spaces where juvenile rainbow trout overwinter.	123
3	5.3.2	7	The second sentence of the first (partial paragraph) under section 5.3.2.1 discusses the potential effect of WSIP implementation on sediment transport below O'Shaugnessy Dam, and states: "However, because the changes in peak flow would occur infrequently, they would not expect to result in a substantial change in erosion or siltation rates."	Curiously and unfortunately, the DPEIR makes no reference to the USFWS' draft IFIM report from 1992 wherein the Service assessed the abundance and distribution of available spawning and rearing habitat for native and introduced trout species in this stretch of river. Undoubtedly, this information is now out-of-date, however, it would serve as a basis for comparison if measures of gravel quality and abundance were made to day. That comparison would allow an assesmenet of how reservoir operations impact sediment transport in the Tuolumne between Hetch-Hetchy and Don Pedro dam.	124
3	5.3.2	7	The second to the last sentence of the final paragraph of section 5.3.2 discusses the potential effect of WSIP implementation on sediment transport below La Grange Dam, and states: "However, because WSIP-induced changes in peak flow would occur infrequently, they would not expect to result in a substantial change in erosion rates, siltation rates, or channel form."	Peak flows will be uniformally reduced under WSIP below La Grange Dam, as will the duration and magnitude of such events. Thus, a reduction in available stream power to move sediment is expected, whether this occurs on a regular basis or an irregular basis. Considering that the HH/LSM does not consider potential impacts on a daily or weekly scale, little can be said about the weekly and daily hydrology of this reach, other than that in some months over some years, peak flows will be diminished in frequency, duration, and magnitude, and as these variables are primary components in determining potential stream sediment transport, sediment movement will be undeniably altered, although the extent of alteration cannot be determined. Additionally, as previously mentioned in Section 5.3.1-4 page 37, implementation of the WSIP will likely reduce the magnitude and number of pulse flows from Don Pedro Reservoir in years where releases are above the minimum required. This will reduce the frequency and magnitude of sediment-moving flows.	125

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[illegible]	[illegible]	[illegible]	What the DPEIR says ("" if direct quote, otherwise paraphrase)	Our Comment	
3	5.3.2	7	The second to the last sentence of the final paragraph of section 5.3.2 discusses the potential effect of WSIP implementation on sediment transport below La Grange Dam, and states: "However, because WSIP-induced changes in peak flow would occur infrequently, they would not expect to result in a substantial change in erosion rates, siltation rates, or channel form."	The use of the term "infrequently" is misleading because "infrequent" high flows perform the majority of the geomorphic work in streams like the Tuolumne. The DPEIR presents no information regarding the abundance and distribution of spawning gravel below La Grange Dam. This is a major data gap given that both fall-run Chinook salmon and the federally threatened Central Valley steelhead use this stretch of river for spawning. Both species depend on the presence of high quality spawning gravel for egg deposition and incubation. Gravel quality deteriorates inexorably below dams that severely regulate peak flows (e.g. Kondolf 1997). The persistent slow armoring of spawning gravels is believed to be a major cause of the decline in available spawning habitat below dams in the Central Valley (e.g., Lindley et al, 2006; TNC 2006, Williams 2006).	126
			The second to the last sentence of the final paragraph of section 5.3.2 discusses the potential effect of WSIP implementation on sediment transport below La Grange Dam, and states: "However, because WSIP-induced changes in peak flow would occur infrequently, they would not expect to result in a substantial change in erosion rates, siltation rates, or channel form."	Given that the abundance of both fall-run Chinook salmon and steelhead has declined severely on the Tuolumne (McEwan 2001; Lindley et al, 2006; Williams 2006), it is surprising that the DPEIR did not analyze spawning gravel conditions (and the effect of current and proposed water system operations on those conditions) more thoroughly.	127

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[illegible]	[illegible]	[illegible]	What the DPEIR says ("" if direct quote, otherwise paraphrase)	Our Comment	
3	5.3.3	3	Table 5.3.3-2 "Maximum summer-fall water temperatures in the Tuolumne River from La Grange Dam to Modesto 1996-2004. This table provides information on maximum temperatures along the longitudinal profile of the Tuolumne River.	There is useful information in this table but it is far from comprehensive or well-explained. These are maximum river temperatures, but are they "instantaneous" maxima, maximum daily average, or was some other time scale employed? Organisms are capable of withstanding short term exposure to certain temperatures even if they cannot tolerate those temperatures for a full day or week. Therefore, the temporal scale of these data is a very important consideration. Temperatures are categorized as < or > 20 °C. There is no explanation of why this temperature cut-off was used. Nine years of data are presented but none of them reflect "critically dry" conditions, so the overall distribution of temperatures may by skewed towards lower water temperatures.	128
3	5.3.3	3	Table 5.3.3-2 "Maximum summer-fall water temperatures in the Tuolumne River from La Grange Dam to Modesto 1996-2004. This table provides information on maximum temperatures along the longitudinal profile of the Tuolumne River.	Temperatures presented are summer maxima. Maximum temperatures are useful for evaluating lethal effects to fish and other biota; however, other important temperature thresholds are not addressed by these data and are not reported or discussed elsewhere in the text. For example, metamorphosis of salmonid juveniles (smoltification) into seagoing fish may be impeded by high temperatures in the spring. Whereas reservoirs allow for release of artificially cold waters during the summer, the same thermal intertia can cause them to release artificially warm water during fall, winter, and spring when smoltification occurs. For steelhead, temperatures above 11-12°C inhibit smoltification whereas for fall-run Chinook, the temperature threshold may be closer to 17°C (Richter and Kolmes 2005). Artificially high winter and spring temperatures below dams (i.e. those that inhibit smoltification) may be an important force in the decline of Central Valley steelhead (McEwan 2001).	129
			Table 5.3.3-2 "Maximum summer-fall water temperatures in the Tuolumne River from La Grange Dam to Modesto 1996-2004. This table provides information on maximum temperatures along the longitudinal profile of the Tuolumne River.	The DPEIR should present information regarding current spring and winter temperature impacts resulting from hydrosystem operations and those anticipated under the WSIP and global warming scenarios and relate these to potential impacts on fish populations in the Tuolumne and San Joaquin Rivers.	130
3	5.3.3	16	Last paragraph, last sentence states: "...the impact of the WSIP on water quality in Hetch Hetchey Reservoir in the Tuolumne River would be less than significant..." And 5.3.6 page 3 second (full) paragraph states: "Water temperatures within [this same stretch of river] have been observed to exceed the maximum daily temperatures of 21°C."	These statmentes are internally inconsistent. **Any** increase in the frequency, duration, and magnitude of water temperatures in this stretch above 21 degrees C may constitute a significant impact to resident rainbow trout in this stretch of river.	131

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[illegible]	[illegible]	[illegible]	What the DPEIR says ("" indicate direct quote, otherwise paraphrased)	Our Comment	
3	5.3.3	16	Last paragraph, last sentence states: "...the impact of the WSIP on water quality in Hetch Hetchy Reservoir in the Tuolumne River would be less than significant..." And earlier: "On very rare occassions under existing conditions … the water quality objective that limits increases in water temperature to 5 degrees Fahrenheit to protect coldwater fish would likely be exceeded. ... In the future, with the WSIP, very infrequent exceedences of the water quality standard would continue to occur, but could last longer by several days or weeks than under the existing conditions."	These statements are internally inconsistent and generally not well supported. Because no quantifiable, measureable significance thresholds were employed for evaluating this impact, its "significance" is difficult to determine. Once again, the DPEIR confounds frequency with severity of impact. The water quality objective mentioned is in place because exceeding it is expected to cause significant impacts to coldwater fish populations (e.g., salmon and trout). The fact that such exceedences have occurred in the past does not justify their occurence under the WSIP and certainly does not allow for increasing the duration of the violation. The DPEIR does not present any analysis of the **severity** of this impact to coldwater fish resources. If the impact is severe, then its frequency is not very relevant. Indeed, the fact that violations occur currently suggests that current operations are inadequate to protect the Tuolumne's coldwater fish resources.	132
			Last paragraph, last sentence states: "...the impact of the WSIP on water quality in Hetch Hetchy Reservoir in the Tuolumne River would be less than significant..." And earlier: "On very rare occassions under existing conditions … the water quality objective that limits increases in water temperature to 5 degrees Fahrenheit to protect coldwater fish would likely be exceeded. ... In the future, with the WSIP, very infrequent exceedences of the water quality standard would continue to occur, but could last longer by several days or weeks than under the existing conditions."	This impact is of particular concern if water temperatures and water demands increase, as is expected under global climate change. Under global climate change scenarios, the frequency, duration, and magnitude of such violations of water quality objectives may all increase., The DPEIR's reliance on the 82-year hydrological record prevents any analysis of this possibility.	133

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[illegible]	[illegible]	[illegible]	What the DPEIR says ("" indicate direct quote, otherwise paraphrased)	Our Comment	
3	5.3.3	18 & 1[illegible]	Figures 5.3.3-3 and 5.3.3-4 depict modeled temperature changes along the longitudinal profile of the river under two different reference environmental scenarios under current operating practices and under WSIP.	No indication of optimal or threshold temperatures is provided, so, for illustration purposes, we will use 20oC as a threshold temperature for impacts; steelhead experience sublethal negative consequences of elevated temperatures above this threshold (Reese and Harvey 2002, Richter and Komes 2005). Under existing operational rules and June 1993 environmental conditions, temperatures in the Tuolumne (as depicted in the DPEIR) do not exceed 20oC but they would exceed the threshold after ~25mi under WSIP operations. Under current operating conditions and June 1999 environmental conditions, steelhead may have experienced negative impacts more than 37mi downstream of La Grange dam, but under WSIP they would be expected to experience unsuitable temperatures beyond ~22miles below La Grange. Thus WSIP is expected to increase temperatures above a critical biological repsonse threshold over a large and measureable stretch of the Tuolumne River. The impacts of such changes in temperature under WSIP should be fully evaluated. Other biologically meaningful thresholds should be evaluated as well.	134
			Figures 5.3.3-3 and 5.3.3-4 depict modeled temperature changes along the longitudinal profile of the river under two different reference environmental scenarios under current operating practices and under WSIP.	Again, the potential impact of global warming has not been evaluated. Simply adding a given annual temperature increase to river temperatures is simplistic, but would give some sense of the potential loss of salmonid rearing habitat in the Tuolumne.	135

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3	5.3.3	19	Second full paragraph states: "...[temperature increases below La Grange dam] would be less than significant..." And "Water quality objectives for the Tuolumne require that water temperatures not be increased by more than 5oF. The WSIP would comply with this objective almost all the time. On rare occassions ... there would be exceedences of the objective, but these rare exceedence would not impair the river's ability to support ... designated beneficial uses ... including coldwater fisheries."	These statements are internally inconsistent and generally not well supported. Because no quantifiable, measureable significance thresholds were employed for evaluating this impact, its "significance" is difficult to determine. However, the water quality objective mentioned was instituted to protect resources dependent on cold water. The DPEIR's insistence that violations would be "rare" is subjective and not relevant. The **severity** of the impact is not evaluated at all. The basis for the DPEIR's claim that temperature impacts would not impair benificial uses is not provided.	136
3	5.3.3	20	First (partial) paragraph states: "....most of the reductions in flow would occur from February through June in wet or above -normal years when flow in the San Joaquin River is at its seasonal maximum. As a consequence, most of the time, WSIP induced changes in flow would have little effect on water quality in the San Joaquin River." Second paragraph states: "Almost all of the time, reductions in San Joaquin RIver flow attributable to the WSIP would not be sufficient to cause salinity ... at Vernalis to rise above the objective." This paragraph then expresses that water quality problems in the lower San Joaquin River are the responsiblity of the USBR and that that agency would take corrective actions..	Another way of saying this is: The WSIP ***will*** cause water quality violations in the lower San Joaquin River and Delta occassionally and the USBR will have to mitigate that impact. Again the DPEIR confounds frequency with severity of impact. The terms used to describe frequency of impacts are vague and subjective. The **severity** of the impact is not evaluated; however, the DPEIR plans actions that anticipate violations of environmental regulations that would appear to be significant. Also, the DPEIR's assumption that the USBR will have to mitigate any water quality impacts caused by implementation of the WSIP is not supported.	137
3	5.3.3	10 & 1	Table 5.3.3-6 identifies water quality objectives in the project area. Dissolved oxygen objectives are identified for the San Joaquin River, Tuolumne River, and other Delta waters. The lower San Joaquin River DO threshold is identified as 6.0 mg/L between September 1 and November 30.	The table does not display the 5.0mg/L standard that exists between December 1 and August 31. More importantly, the subsequent analysis of water quality impacts does not address impacts to dissolved oxygen in the lower San Joaquin River (specifically the Stockton Deepwater Ship Channel - SDWSC) that may result from WSIP operations. Part of the reason for frequent water quality violations in the SDWSC are low flow rates in the Lower SJR (Physcial Process Model; http://www.sjrdotmdl.org/concept_model/about.htm).	138
			Table 5.3.3-6 identifies water quality objectives in the project area. Dissolved oxygen objectives are identified for the San Joaquin River, Tuolumne River, and other Delta waters. The lower San Joaquin River DO threshold is identified as 6.0 mg/L between September 1 and November 30.	These low flows may be exacerbated and prolonged due to flow reductions from the Tuolumne under WSIP. The impact of flow rate reductions on DO concentrations in the lower SJR must be evaluated. This analysis should account for the fact that violations of the DO standard in the SDWSC are already frequent (Stevens et al. 2006); thus, it could be argued that status quo releases from the Tuolumne hydrosystem are lower than those required to maintain water quality standards. Any increase in the frequency, duration and magnitude of low DO events in the lower SJR or Delta may represent a significant impact of the WSIP.	139

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3	5.3.4	5	Paragraph 3 provides a summary discussion of the potential impacts on winter and spring Tuolumne River flows below La Grange Dam during dry years. "The WSIP would have no effect on flow in the Tuolumne River below La Grange Dam or the San Joaquin River under [below normal and drier years]"	In general, the analysis of flow during drier years is not given much attention. This may occur because the report erroneously concludes that flow changes will not occur during drier years. As stated multiple times through the DPEIR, drought year conditions have the potential to adversely affect river flows due to reductions in reservoir volume and increased municipal demand. Changes in irrigation demands are likely to be correlated (negatively) with the availability of freshwater (i.e., water year type) but these are not discussed. It is true that, under "critical year" types, the report indicates no change from current conditions as a result of the WSIP (*See table 5.3.4-4)*. However, under "Below Normal" conditions, flows are reduced under the WSIP in several months of 3 of the 12 years (25%) considered in the record. Similarly, flow reductions occur in 2 of 13 (15%) of "Dry" years in the record. Thus, it is an overstatement to say the WSIP would have "no effect" on Tuolumne River flows below La Grange Dam.	140
3	5.3.4	6	Paragraph 2 provides a summary discussion of the changes in modeled releases from La Grange Dam. "Occassionally, changes are in the range of 1,000 cfs to a little over 3,000 cfs."	The use of the word "occassionally" is misleading. This is another example of the DPEIR's persistent substitution of frequency for severity of impact. This statement of potential flow reductions is not meaningful out of context. A meaningful context is provided by Table 5.3.1-1 on p. 5.3.1-12. This table shows mean monthly flows below La Grange Dam from 1974-2004 do not exceed 1,884 cfs (mean flow during February). Reducing flows 1,000 to 3,000 cfs represents a major reduction in flow when compared to average monthly flows of 1,884 cfs.	141
			Paragraph 2 provides a summary discussion of the changes in modeled releases from La Grange Dam. "Occassionally, changes are in the range of 1,000 cfs to a little over 3,000 cfs."	Another specific example of the potential flow reductions is in Table 5.3.4-4 which reveals that flows during a water year like 1964 would be reduced in several months. During Novembers of years like 1964 (a "Dry year"), flows would be reduced by 832 cfs. Table 5.3.1-1 reveals that average flows (i.e. higher than those expected in "dry" years) below La Grange Dam for November are 368 cfs. This reveals that reductions in flow under WSIP are as much as 225% of the average flow. That is a rather large impact.	142
3	5.3.4	7	Table 5.3.4-4 Average Monthly Changes In Tuolumne River Flow Below La Grange Dam Attributable To the WSIP Provides a summary of average monthly changes in river flow below La Grange Dam.	The table provided is virtually unreadable, and does not lend itself to an analysis of changes in flows beneath La Grange Dam attributable to the WSIP.	143

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3	5.3.4	10	Paragraph 2 provides a summary discussion of the potential impacts on Tuolumne River flows below La Grange Dam and the San Joaquin River during dry years . "Occassionally, changes [in river flow] are in the range of 1,000 cfs to a little over 3,000 cfs."	This statement of potential flow reductions is not meaningful out of context. A meaningful context is provided by Table 5.3.1-1 on p. 5.3.1-12 as it shows that mean monthly flows below La Grange Dam from 1974-2004 do not exceed 1,884 cfs (mean flow during February). This average includes all years and, clearly, flows may be higher in wet years; but the fact remains that reducing flows 1,000 to 3,000 cfs represents a major reduction in flow.	144
			Paragraph 2 provides a summary discussion of the potential impacts on Tuolumne River flows below La Grange Dam and the San Joaquin River during dry years . "Occassionally, changes [in river flow] are in the range of 1,000 cfs to a little over 3,000 cfs."	Additional context for this flow reduction can be found in Table 5.3.4-1 on page 5.3.4-3) which provides flow and water quality objectives for the SJR at Vernalis. The Tuolumne provides a significant fraction of these flows (see DPEIR, p. 5.3.1-16). The table reveals that, during wet and above normal years (the years when we might expect Don Pedro refilling to occur following a prolonged drought), minimum required flows at Vernalis are between 5,730 and 8,620 cfs. Reduction in Tuolumne flow of between 1,000 and 3,000 cfs represent a significant impediment to maintaining flow and water quality objectives in the SJR and downstream in the Delta (part of the rationale for these flows is maintenance of salinity standards in the Delta).	145
3	5.3.6	2	First (partial) paragraph states: "the SFPUC has initated a fishery monitoring program within the river to assess potential effects of project operations on habitat quality and availability for resident trout and other fish species that over time will provide additional site-specific information on the effects of seasonal and interannual variation in stream flows on fishery populations..."	Details of this monitoring program are unavailable. It is not clear that the monitoring program has begun. **Results** from this kind of monitoring program are required to determine the potential impacts of WSIP operations. Without this monitoring, there is no baseline with which to compare impacts to fisheries that result from WSIP. A monitoring program that begins after the adoption of the WSIP cannot be used to evaluate the potential impacts of the WSIP.	146

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4	5.3.7	2	Second (full) paragraph lists two studies of fish populations in the Tuolumne below Hetch Hetchy and an unspecified number of observations of rainbow and brown trout spawning in this reach.	All of these observations and studies are over 15 years old (the most recent is from 1992). The estimate of 7,000 total adult rainbow trout and brown trout in the stretch below O'Shawughnessy Damand Early Intake is outdated.	147
4	5.3.7	2 & 3	Third (full) paragraph refers to a USFWS 1992 study of available habitat in the Tuolumne River below O'Shaughnessy Dam. And On page 5.3.6-3, (first partial paragraph) "the stream flow study did not identify physical habitat as a major limiting factor, although seasonal water temperatures were identified as a factor affecting both brown and rainbow trout within the river."	The reference to this study is curious given that the study is a "rough draft" and has never been adopted by the SFPUC, despite the fact that it is 15 years old. This study called for substantially higher minimum flows in this stretch of the Tuolumne than the minimum flows identified by the DPEIR (see Table VI of USFWS 1992). If the SFPUC accepts the validity of this study (as implied by its citation here), then why has it not cited this study's recommendations regarding minimum instream flows in this stretch of the Tuolumne? The study is now over 15 years old; thus, the fact that physical habitat was not believed to be limiting at the time the study was written, does not mean that it is not limiting today. Operation of dams tends to degrade downstream physical rearing habitat conditions inexorably and gradually (Williams 2006; TNC 2006).	148
3	5.3.6	15	Table 5.3.6.2 Tuolumne River Spawning Survey Summary	These results are in some cases different from those presented in AFRP data; the difference is inexplicable. We present our Figure 1 (from the AFRP website: http://www.delta.dfg.ca.gov/afrp/documents/Doubling_goal_graphs_032807.ppt#281,35,Slide 35) to review Chinook salmon populations on the Tuolumne. Clearly, populations since 2000 and from 1988 through 1999, were well below the AFRP recovery goal of 38,000 fall run Chinook salmon. Indeed, only 500 fish returned in each of the last two years of record (2005 and 2006). The 1992-2006 average (8,941 fall-run) is <50% of the 1967-1991 average which the AFRP uses as its "baseline condition". The DPEIR's tepid insinuation that Chinook salmon populations are in better condition than they were prior to the FERC settlement agreement (page 15) is not supported.	149

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3	5.3.6	18	First paragraph states: "Water temperatures in the lower Tuolumne River are in the 25-30 °C range for an extended period of time during the summer in many locations... and are unsuitable for steelhead." And FERC concluded that no significant populations of steelhead/rainbow trout are present in the lowe Tuolumne system.	McEwan (2001) concludes that there is "substantial evidence" that a self-sustaining population of steelhead exists in the San Joaquin River. His report documents very large *O. mykiss* with all the morphological characteristics of anadromous steelhead as recently as January 2001. Certainly, steelhead populations were known to exist in the Tuolumne historically (McEwan 2001; Lindley et al. 2006). Thus, this paragraph serves as an indictment of the steelhead spawning and rearing conditions created by dams in the Tuolumne River. Maintenance of these "unsuitable" conditions (not to mention further degredation of conditions required by spawning steelehad) may constitute a violation of California Dept. of Fish and Game Code and/or the Federal Endangered Species Act. This is another example demonstrating that the baseline against which the WSIP is compared may itself represent unacceptable conditions.	150
			First paragraph states: "Water temperatures in the lower Tuolumne River are in the 25-30 oC range for an extended period of time during the summer in many locations... and are unsuitable for steelhead." And FERC concluded that no significant populations of steelhead/rainbow trout are present in the lowe Tuolumne system.	The 1996 FERC report that the DPEIR references is out-of-date and was conducted before the species was listed under the ESA. This may account for the lack of documented sightings of steelhead in the FERC report. As McEwan (2001:15) notes: "Until very recently, steelhead were considered by some to have been exterpated from the San Joaquin River system ..). However, this conclusion was based on little information and no field studies."	151
3	5.3.6	18	Second paragraph states: "...only 10 of the fish in this extended period of snorkel survey were in excess of 400 millimeters in length, suggesting that large anadromous steelhead probably occur in the system very infrequently"	The logical foundation for this statement is seriously flawed. *O. mykiss* come in two forms, resident (called "rainbow trout") and migratory (called "steelhead"). These two forms are indistinguishable until migration occurs. All *O. mykiss*, whether they become resident "rainbow trout" or anadromous "steelhead" pass through a stage where they are smaller than 400mm. Also, steelhead juveniles are expected to emigrate to marine waters (as "smolt") at lengths below ~200mm (CDFG 1996). Thus, any of the fish observed by the snorkel survey may have become anadromous steelhead.	152

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3	5.3.6	18	Steelhead/Rainbow Trout -- in general	"Steelhead" and "rainbow trout" are two life history forms of the same species. Some populations of this species are "polymorphic," meaning that resident "rainbow trout" can produce anadromous "steelehad" offspring and vice-versa. The extent and distibution of "polymorphic" populations in the Central Valley is undocumented. The mere fact that *o. mykiss* are observed in the Tuolumne indicates a strong possibility that the stream produces "steelhead" during at least some years. These steelhead are legally protected under the ESA.	153
3	5.3.6	18	Largemouth and smallmouth bass. Section states: "Non-native largemouth and smallmouth bass have colonized the lower Tuolumne River, taking advantage of the low-velocity, and pond-like habitats of the river...below RM 25....Both the low flow and high water temperatures in this reach stress juvenile salmon and enhance predation by bass".	These statements are correct. They indicate (a) that curent conditions created in the River by hydrosystem operations support non-native species impacts on native species of concern (particularly fall-run Chinook salmon and threatened steelhead) and (b) that operations that further reduce flow and increase temperatures in the Tuolumne will increase the spatial extent and magnitude of impacts of these non-native species. Changes anticipated by the WSIP will increase temperatures and reduce flows in the lower Tuolumen and thus increase impacts to species-of-concern by non-native predators.	154
3	5.3.6	20	First full paragraph: "Bass density could thus be reduced by recontouring the channel to enhance riffle and run habitats, combined with manipulation of flow to increase velocities....[this] would be expected to benfit out-migrating juvenile salmon."	No reference to literature, studies, or magnitudes of change are provided to support or parameterize this statement. Also, the paragraph ignores a more obvious solution to invasive bass problems in the Tuolumne: increase flows and storage in the Tuolumne hydrosystem decrease temperatures and decrease suitable habitat for these bass species. Changes anticipated by the WSIP would have the opposite impact.	155
3	5.3.6	24	Significance criteria: "The CCSF has not formally adopted significance standards for impacts related to fisheries, but generally considers that implementation of the proposed program would have fisheries impact if it were to: Have substantial adverse effect ... on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the CDFG, NMFS, or USFWS....[or] Have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels ... substantially reduce the number or restrict the range of an endangered, rare, or threatened species"	Failure to adopt a formal, quantifiable, measureable threshold for determining significant impacts is a persistent and major flaw of the DPEIR. Ther is no way to evaluate the magnitude of changes caused by the proposed plan because the significance thresholds lack a rigorous definition. For example "substantial" impacts are not defined. On the other hand, the Andromous Fish Restoration Program (AFRP) defines the goal of doubling anadromous fish populations above their baseline averages. Also, the Federal Endangered Species Act prohibits "Take" of endangered species; this is a much more rigorous, quantifiable, and measurable standard than "substantial reduction."	156
3	5.3.6	26	Effects on fishery resources along the Tuolumne River between Hetch Hetchy Reservoir and Don Pedro Reservoir. Indicates that minimum flow requirements below Hetch Hetchy (as described in Table 5.3.1-2) are met.	The USFWS draft instream flow report (1992) recommended that the minimum flows in the referenced table be revised upward substantially (see Table VI of the draft report). The failure of the SFPUC to adopt these recommendations may already have impacted fish populations in this area. The DPEIR's adherence to the older standards suggests that the WSIP will continue to impact rainbow trout populations. In general, because the SFPUC lacks a recent evaluation of rainbow trout populations in this area or habitat conditions in this area, it is hard to see how the imapcts of WSIP can be evaluated for this resource.	157

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3	5.3.6	26	Final paragraph states: "In spring months…operations under…WSIP would reduce average monthly flows between 4 and 30 percent…the greatest percentage reduction would occur in normal, below-normal, and dry years …[and] the modeling tool used for this analysis reports information in a monthly time step; it cannot provide weekly or daily information about flow releases...the flow reduction would not occur evenly over a month..."	The effect of presenting results in a monthly time-step is accurately portrayed here. If **monthly average** flows are reduced up to 30 percent, daily and weekly flows will sometime decrease **more than** 30% because the flow reduction will "not occur evenly over the month". Given their magnitude and timing (i.e., in drier years), these flow reductions may have serious impacts on rainbow trout populations in this reach.	158
3	5.3.6	27	Final two paragraphs discuss temperature impacts on rainbow trout populations in this reach. "This potential temeprature increase [under certain drought conditions water released from HH could be 10 to 12 °C warmer than under non-WSIP operations] would result in a less-than-significant impact on the fisheries in this reach [because] it would occur infrequently [and this temperature increase would not occur during the spawning period for rainbow trout."	First, the anticipated temperature increase violates the Central Valley RWQCB objective of limiting temperature changes in rivers to < 5°C (objective referenced on page 28 of this section); the frequency of this violation is not relevant -- it is still a violation that can be avoided by operating the hydrosystem correctly. A sudden 10-12oC temperature increase during the fall would likely have deleterious effects on trout as they prepare to overwinter. The DPEIR's dismissal of any impact is simply not supported by any literature reference. The temperature analysis does not account for the impact of regional climate change. Section 5.7.6 allows that there may be a 1.5 oC increase throughout the watershed over the project period. How would this direct temperature impact affect water temperatures and fish populations? Also, the increased temperatures, decreased water supplies, and increased demand for water created by regional climate change would all be expected to cause an increase in the frequency of conditions that produce the extreme temperature increases envisioned in this section of the DPEIR.	159
3	5.3.6	28	First full paragraph: "Potential impacts to resident fish population inhabiting the river are less than significant…"	Actual quantifiable analysis of this impact is not presented in the DPEIR, which simply dismisses the impact. A quantifiable impact assesment is made more difficult by the SFPUC's lack of a current baseline for this population or river conditions in this area. The draft studies from 1992 are too old and preliminary to provide a current baseline.	160

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Specific comments on the hydrologic, geomorphic, and fishery impacts of the WSIP
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October 1, 2007

Volume	Section	Page Number	What the DPEIR says ("" indicate direct quote, otherwise paraphrased)	Our Comment	
3	5.3.6	28	Impact 5.3.6-4 states: "Changes in [hydrological conditions] have the potential to affect the quality and availability of habitat for resident and anadromous fish species. Chinook salmon is the species of most concern in this reach of the River. …Steelhead, which is a federally listed threatened species, may inhabit the river in low abundance."	We agree that hydrological changes anticipated under the WSIP are likely to impact Chinook salmon populations and steelhead populations on the Tuolumne below La Grange Dam. It is not clear why the DPEIR focusses on Chinook salmon, given that steelhead are an ESA listed species, their numbers are lower, and they are exposed to conditions on the Tuolumne year-round (because they rear in freshwater for two years before emigrating to the ocean). The fact that Steelhead may inhabit the River in "low numbers" cannot serve as a justification to ignore their requirements. Indeed, their lower numbers and more protected status indicate that *current* Tuolumne hydrosystem operations are inadequate to protect this species and that any additional impacts created by the WSIP are particularly significant.	161
			Impact 5.3.6-4 states: "Changes in [hydrological conditions] have the potential to affect the quality and availability of habitat for resident and anadromous fish species. Chinook salmon is the species of most concern in this reach of the River. …Steelhead, which is a federally listed threatened species, may inhabit the river in low abundance."	The extemely low populations of fall-run Chinook salmon observed in the Tuolumne in recent years (figure 1) also indicate that Tuolumne hydrosystem operations provide inadequate protection for this species-of-concern. Even slight, marginal habitat impairment caused by WSIP operations may be interpreted as significant impacts against this highly impacted baseline condition.	162

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[illegible]	[illegible]	[illegible]	What the DPEIR says ("" indicates direct quote, otherwise paraphrase)	Our Comment	
3	5.3.6	29	Bulleted list at the top of the page presents potential mechanisms for adverse effects on fishery habitat.	An important impact mechanism missing from this list is: Reduction in salmonid spawning gravel quality and quantity as a result of reduced frequency, duration and magnitude of peak flows. Hydrosystem operations tend to impact salmonid spawning gravel inexorably over time. This occurs as a result of reduced spawning gravel recruitment (via erosion) and sedimentation and armoring of available spawning gravel (Kondolf 1997, TNC 2006, Williams 2006) This impact is believed to be a major cause of salmonid decline in the Central Valley of California (TNC 2006). Reductions in peak flow magnitude, duration, and frequency are a critical impact of the WSIP and the DPEIR has not analyzed the impacts of reduced sediment transport on spawning/rearing habitat availability.	163
3	5.3.6	29	Final paragraph discusses projected changes in flow over a variety of water year types and references Table 5.3.6-1.	See numerous earlier comments regarding the effect of aggregating flow reductions across water year types as in Table 5.3.6-1. Despite the DPEIR's efforts to characterize flow changes as "infrequent," the anticipated flow reductions in the Tuolumne River under WSIP will undoubtedly reduce sediment transport rates in the River. This reduction in sediment transport may translate into accelerated degradation of spawning substrate for salmonids and rearing habitat for numerous fish species. The fact that most of these reductions occur only during the highest flow periods actually *increases* the impact on sediment transport since most sediment transport occurs during high-flow events. As a result of the truncation of the upper end of the natural hydrograph, WSIP can be expected to reduce recruitment of spawning gravel to the river and increase gradual armoring of spawning substrate, making it unsuitable for salmonid spawning.	164
3	5.3.6	31	First (partial paragraph): "...in some years, when the flow reductions are more substantial, the WSIP changes would adversely affect juvenile fall-run Chinook salmon rearing habitat." And First (full) paragrap: "Based on the magnitude of the stream flow changes, it is not expected that flow reductions under the WSIP would result in significant adverse impacts on juvenile fall-run Chinook salmon migration."	The DPEIR correctly identifies that there will likely be impacts to fall-run Chinook salmon from implementation of the WSIP. Its assesment of which DPEIR flow reduction would cause an impact, the frequency of those events, and the life stages that would be impacted are unsupported -- they represent a guess. Actual impacts could be far more frequent and affect more parts of the life-cycle than the report admits. For example, the relationship between flow and juvenile outmigration success and rate are poorly understood (Williams 2006).	165
3	5.3.6	31	Second full paragraph states: "...Flow reductions in June would likely result in seasonally elevated water temperatures and a corresponding reduction in the linear extent of suitable habitat for steelhead/rainbow trout rearing..." And "Changes in flow in June of average wet years ... would have a minor effect on steelhead/rainbow trout...a reduction in average monthly flow in June of approximately 102 cfs would cause a moderate change in habitat conditions, potentially affecting oversummering steelhead/rainbow trout as well as reducing physical habitat within the river for other aquatic species."	We quantify the modeled linear reduction in habitat for two different June model scenarios (see comments re: Figures 5.3.3-3 and 5.3.3-4). The DPEIR could have done a similar (or more comprehensive) quantifiable analysis to back up this assertion. What is the defintion of a "minor" effect" How does it differ from a "moderate change in habitat conditions"? As stated elsewhere in these comments, the **average** monthly reduction of flows by 25% (under some conditions) means that sometimes flow reductions will be greater than 25%. Reducing habitat space by 1/4 for periods of a month or more would be expected to have a large impact on populations. The population discussed here is a federally-threatened population; the DPEIR acknowledges that steelhead are "rare" in this stretch of the river. Reducing their habitat by 25% or more from time to time seems inadvisable.	166

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[illegible]	[illegible]	[illegible]	What the DPEIR says ("" indicates direct quote, otherwise paraphrase)	Our Comment	
3	5.3.6	31	Third full paragraph states: "Almost all the time, WSIP-induced flow reductions ...would have no effect on temperature [below La Grange Dam]." And "On very rare occassions, WSIP-induced flow reduction would cause mean daily temperature increases of 10oC downstream near the San Joaquin River..."	It is difficult to understand how the DPEIR calculated daily temperature increases when their hydrological model does not produce daily flow estimates. The volume of flow has a huge impact on the temperature gain of water as it flows through the Tuolumne. Without knowing the flow on a given day, calculation of temperatures for that flow are problematic. The DPEIR should provide a more detailed description of how it conducted that modelling. The DPEIR again confuses frequency with severity of impact. Without changing their meaning, these two sentences could be rewritten to say: Sometimes WSIP induced-flow reductions would impact temperatures in the river in ways that would have determinetal effects on rearing salmonids.	167
			Third full paragraph states: "Almost all the time, WSIP-induced flow reductions ...would have no effect on temperature [below La Grange Dam]." And "On very rare occassions, WSIP-induced flow reduction would cause mean daily temperature increases of 10oC downstream near the San Joaquin River..."	The severity and frequency of these temperature-related impacts would be expected to increase because of expected increases in regional temperature (see DPEIR Sect 5.7.6 "Climate change and gobal warming"). These temperature-related impacts must be reanalyzed to account for the effect of regional air temperatures and related impacts on flow volume and timing. Even seemingly small increases in temperature can have dramatic effects on salmonid survival and reproductive success (Richter and Kolmes 2005).	168

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[illegible]	[illegible]	[illegible]	What the DPEIR says ("" indicate direct quote, otherwise paraphrase)	Our Comment	
3	5.3.6	32	First (partial) paragraph: The flow reduction would reduce available habitat in the entire reach of the river used by juvenile salmonids below La Grange Dam. The elevated temperatures, although infrequent, would truncate the length of the river reach suitable for juvenile salmonids. These adverse effects on flows and temperature in the river under the WSIP would not substantially alter or degrade fishery habitat or jeopardize the continuation of the fishery populations in the lower Tuolumne River in most years. And The WSIP's small but incremental contribution to adverse effects on the lower river would make planned restoration of habitat and fishery resources more difficult.	What does it mean that WSIP-induced flow alterations will only jeopardize the continued existence of fish populations *some of the time*? This is nonsensical. Again the frequency of the impact is not nearly as important as the severity of the impact when the severity is potentially catastrophic. We agree that the WSIP's significant contribution to adverse effects on the lower river would make planned restoration of fish species in this area more difficult.	169
3	5.3.6	32	First (partial) paragraph: Proposes implemetation of Measure 5.3.6-4a, "Avoidance of Flow Changes by reducing demand for Don Pedro Reservoir Water." And/or Proposed implemetation of Measure 5.3.6-4b "Fishery Habitat Enhancement," if 5.3.6-4a is not possible.	The ability to implement (mitigation) measure 5.3.6-4a is completely speculative as it involves procuring water from TID and MID. The prospects for this seem unlikely but, until an agreement is in place, it is doubtful that this proposal can serve as a mitigation measure because it is outside of the SFPUC's control. The alternative mitigation measure 5.3.6-4b does not respond to the anticipated impact. The impact is related to loss of habitat due to decreased flows and associated increased temperature. Physcial habitat restoration may be necessary in this area but it will not change the impact of substantial flow reductions and temperature increases.	170
3	5.3.6	32	Last paragraph (p32) states: "Increased water temperatures, particularly during the late spring juvenile salmonid migration period... would also be expected to adversely affect juvenile salmon survival."	Agreed	171

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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
3	5.3.6	33	Inflow to the lower San Joaquin River from the Tuolumne River would not be less than the minimum stream flow specified in the FERC license of the Don Pedro Project. As a result of this minimum flow requirement, the WSIP would not have a significant impact on flows...	Maintenance of minimum flows specifed by FERC does not equate to protection of the San Joaquin or Lower Tuolumne's fish resources. Indeed, that minimum requirement was established before steelhead were listed as threatened and before their presence was confirmed in the Tuolumne River. Quoting from Calfed (2000): *It is important to note that all of the agreed upon or proposed flows (AFRP, Tuolumne River Settlement Agreement, FERC, VAMP, Davis-Grunsky, and DFG recommended flows) in the Stanislaus, Tuolumne, and Merced Rivers were designed to facilitate Chinook salmon recovery, and little or no consideration was given to steelhead recovery in the design of these flow strategies. Flow and temperature requirements of steelhead will need to be evaluated and integrated into the proposed flow regimes.*	172
3	5.3.6	33	Last Paragraph states: "To the extent that infrequent reduction in flow and corresponding increases in water temperature occur during the spring... WSIP operations would contribute to adverse impacts on habitat conditions for downstream migrating Chinook salmon and steelhead. However, this potential impact would occur so infrequently that it does not represent a significant impact to fishery resources."	Once again, the significance threshhold for significant impacts is not adequately defined. If severe impacts occur only "infrequently" does that mean they are not significant? What is the threshold of severity frequency that defines a significant impact? These threshods must be laid out and justified in advance, otherwise the assesment of impacts amounts to no more than wishful thinking. Steelhead are listed as a threatened species. Fall-run Chinook salmon are a species of special concern. Numbers of both species are severely reduced on the Tuolumne from historic norms. As a result, any negative impact to these species that results from a discretionary action (like WSIP) must be regarded with extreme caution. Also, given the historic decline in these populations, it is highly likely that current operations of the Tuolumne hydrosystem provide inadequate protection for these species -- thus, marginal decreases in habitat quality from this already highly impacted state cannot be regarded as insignificant.	173
	H1.3.1	13	Paragraph 4 provides a description of drought planning inputs to the HH/LSM model and states: "Studies suggest that there is a 30 percent chance that the SFPUC system will experience a drought in the next 75 years equal to or more severe than the 1987-1992 drought."	No citation of these "studies" is provided.	174

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[illegible]	[illegible]	[illegible]	[illegible]	Our Comment	
Appendix H	H1.3.1	15	Paragraph three describes the possible implications of the monthly time interval used in the DPEIR analysis, and states: "In additional instances such as the analyses of flow effects below Hetch Hetchy Reservoir and Alameda Creek Diversion Dam, HH/LSM results have been refined or tiered to provide additional insight to the effects of the WSIP upon stream flow for periods less than a month."	What methods were used to "tier" monthly results to analyze effects of the WSIP on stream flows below Hetch Hetchy Reservoir and Alameda Creek Diversion Dam for periods less than a month? Using a monthly interval for analysis limits the feasibility of conducting analyses of the effects of the WSIP on daily and weekly flow regimes. Considering that the monthly time-step constitutes a serious limitation for analysis of the proposed changes to daily and weekly hydrologic flow regimes, data resulting from the "tiering" process, analysis of these data, and the methods used to produce that data and analysis should be provided.	175
Appendix H	H1.3.1	16	Table 5.1-2 describes model features and their respective outflow parameters.	Only accumulated precipitation is presented as a model input for Hetch Hetchy Reservoir. Why were Lakes Eleanor and Lloyd excluded as inputs?	176
Appendix H	H2-1	49	Table 1-2 Summary of Modeling Results (Part 1/2) Provides a summary list of setting characteristics and modeling assumptions for the HH/LSM model.	Under the item Study Average Production & Disposition (1921-02) and the sub-items TID Diversion and MID Diversion assumes that both TID and MID diversions will remain static. What is the basis for this assumption? On page 5.7-92 of Volume 3, the DPEIR identified that the studies of global climate change summaried in Table 5.7-21, indicate that "changes in urban and agricultural water demand" and increases in evaporation and concomitant increased irrigation need" are likely outcomes of climate changes in the Central Valley and southern Sierra Nevada. Thus, the assumption that TID and MID agricultural water demands in 2030 will remain the same is unsupported.	177
Appendix H	H2-1	49	Table 1-2 Summary of Modeling Results (Part 1/2) Provides a summary list of setting characteristics and modeling assumptions for the HH/LSM model.	Under the item Study Average Production & Disposition (1921-02) and the sub-item Water Bank Account water transfers from TID and MID supplies are presumed to be 27,000 acre-feet. Has the SFPUC reached an agreement with TID and MID on this proposed transfer? If so, where is the documentation of that agreement? If not, because this assumption has a high degree of uncertainty, modelling results based on this assumption also have a high degree of uncertainty.	178
Appendix H	H2-1	55	Table 2.1-1 Provides a list of differences in total modeled system-wide delivery with implementation of WSIP	The data contained is difficult to review in this format. These types of data should be displayed as a single hydrograph or a set of hydrographs. Presenting extensive datasets as long table without corresponding graphs makes it very difficult to compare between the two scenarios. Without entering the data into a statistical or graphical software package, the reader cannot accomplish the required comparisons.	179
Appendix H	H2-1	61	Table 2.3-3 provides a list of differences in total modeled system-wide delivery with implementation of WSIP.	The data contained is difficult to review in this format. These types of data should be displayed as a single hydrograph or a set of hydrographs. Presenting extensive datasets as long tables without corresponding graphs makes it very difficult to compare between the two scenarios. Without entering the data into a statistical or graphical software package, the reader cannot accomplish the required comparisons.	180

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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Appendix H	H2-1	62	Table 2.3-3 provides a list of differences in total modeled system-wide delivery with implementation of WSIP.	The data contained is difficult to review in this format. These types of data should be displayed as a single hydrograph or a set of hydrographs. Presenting extensive datasets as long tables without corresponding graphs makes it very difficult to compare between the two scenarios. Without entering the data into a statistical or graphical software package, the reader cannot accomplish the required comparisons.	181
Appendix H	H2-1	63	Table 2.3-3 provides a list of differences in total modeled system-wide delivery with implementation of WSIP.	The data contained is difficult to review in this format. These types of data should be displayed as a single hydrograph or a set of hydrographs. Presenting extensive datasets as long tables without corresponding graphs makes it very difficult to compare between the two scenarios. Without entering the data into a statistical or graphical software package, the reader cannot accomplish the required comparisons.	182
Appendix H	H2-1	65	Table 2.3-4 provides a list of differences in total modeled Hetch Hetchy delivery with implementation of WSIP.	The data contained is difficult to review in this format. These types of data should be displayed as a single hydrograph or a set of hydrographs. Presenting extensive datasets as long tables without corresponding graphs makes it very difficult to compare between the two scenarios. Without entering the data into a statistical or graphical software package, the reader cannot accomplish the required comparisons.	183
Appendix H	H2-1	66	Table 2.3-5 provides a list of differences in total modeled Hetch Hetchy delivery with implementation of WSIP.	The data contained is difficult to review in this format. These types of data should be displayed as a single hydrograph or a set of hydrographs. Presenting extensive datasets as long tables without corresponding graphs makes it very difficult to compare between the two scenarios. Without entering the data into a statistical or graphical software package, the reader cannot accomplish the required comparisons.	184
Appendix H	H2-1	67	Table 2.3-6 provides a list of differences in total modeled Hetch Hetchy delivery with implementation of WSIP.	The data contained is difficult to review in this format. These types of data should be displayed as a single hydrograph or a set of hydrographs. Presenting extensive datasets as long tables without corresponding graphs makes it very difficult to compare between the two scenarios. Without entering the data into a statistical or graphical software package, the reader cannot accomplish the required comparisons.	185
Appendix H	H2-1	71	Table 2.4-1 provides a list of differences in total modeled Lake Lloyd releases to Cherry Creek.	The data contained is difficult to review in this format. These types of data should be displayed as a single hydrograph or a set of hydrographs. Presenting extensive datasets as long tables without corresponding graphs makes it very difficult to compare between the two scenarios. Without entering the data into a statistical or graphical software package, the reader cannot accomplish the required comparisons.	186
Appendix H	H2-1	75	Tables 2.6-1 through 2.6-8 provide lists of differences in total modeled Don Pedro Reservoir storage.	These data are difficult to review in this format. These types of data should be displayed as a single hydrograph or a set of hydrographs. Presenting extensive datasets as long tables without corresponding graphs makes it very difficult to compare between the two scenarios. Without entering the data into a statistical or graphical software package, the reader cannot accomplish the required comparisons.	187

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[illegible]	[illegible]	[illegible]	What the DPEIR says ("" indicate direct quote, otherwise paraphrased)	Our Comment	
4	6.4.2	48	Measure 5.3.6-4a states: "The SFPUC will pursue a water transfer arrangment with MID/TID and/or other water agencies such that the water acquired is developed through actions that result in reduction of demand on Don Pedro Reservoir as a result of conservation, improved delivery efficiency, inter-agency water transfer or use of an alternative supply such as groundwater....The counsequent increase in water storage in Don Pedro Reservoir would offset the reduction in inflow ... attributable to WSIP [and thus] the release pattern from La Grange Dam would be the same or similar to the existing condition ..."	None of these potential sources of "new" water for Don Pedro Reservoir are confirmed. SFPUC cannot guarantee that these new water sources will become available or that their size or the timing of their availability will be sufficient to completely mitigate impacts 5.3.6-4 and 5.3.7-6. Given that (a) MID and TID currently divert less than their water right allows and there is every reason to believe that their needs for water will increase (especially given the trends expected to continue from global warming); reaching an agreement in which TID/MID divert less water than under current conditions seems hopelessly optimistic.	188
4	6.4.2	48	Measure 5.3.6-4b states: "If Measure 5.3.6-4a is not implemented, then the SFPUC will mitigate potential fishery effects on the lower Tuolumne River by implementing one of the following two habitat enhancement actions....gravel augmentation or isolating or filling a captured former gravel quarry pit along the river."	The first alternative (gravel augmentation) has nothing to do with the impact identified. Impacts 5.3.6-4 and 5.3.7-6 have to do with reductions in juvenile salmonid rearing and migration habitat. Gravel augmentation will increase spawning habitat for these species. Spawning habitat may indeed be limiting to these species; however, because the SFPUC has not monitored spawning habitat availability or use in this stretch of the river, we cannot assess the effect of current hydrosystem operations on spawning habitat availability. Restoring spawning gravel will not mitigate for impacts to the later life stage; indeed it may exacerbate that impact by increasing densities of juveniles competing for limited rearing habitat.	189

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[illegible]	[illegible]	[illegible]	What the DPEIR says ("" indicate direct quote, otherwise paraphrased)	Our Comment	
			Measure 5.3.6-4b states: "If Measure 5.3.6-4a is not implemented, then the SFPUC will mitigate potential fishery effects on the lower Tuolumne River by implementing one of the following two habitat enhancement actions....gravel augmentation or isolating or filling a captured former gravel quarry pit along the river."	The second alternative (isolating a former quarry) would be expected to benefit rearing salmonids because it would reduce habitat for their predators. There is no analysis of the current impact of predators in this quarry on Chinook salmon or steelehad (the magnitude of these impacts are bound to be somewhat different); therefore the mitigative effect of isolating this captured quarry cannot be evaluated. Impact 5.3.7-6 deals with likely impacts to terrestrial species that rely on riparian habitat; neither of the proposed alternatives under Measure 5.3.6-4b would have any beneficial effect on these species/habitats.	190
			Measure 5.3.6-4b states: "If Measure 5.3.6-4a is not implemented, then the SFPUC will mitigate potential fishery effects on the lower Tuolumne River by implementing one of the following two habitat enhancement actions....gravel augmentation or isolating or filling a captured former gravel quarry pit along the river."	By suggesting the need to restore spawning gravel in the Tuolumne River, the SFPUC indicates that it believes spawning gravel quality and/or availability are insufficient in this area. Because current hydrosystem operations in this area are almost certain to have had some impact on spawning substrate quantity and quality in this area, the SFPUC should be required to monitor both salmonid spawning habitat and salmonid rearing habitat to determine which of these habitat types is limiting in this stretch of river.	191

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Volume	Section	Page number	What the DPEIR says ("" indicate direct quote, otherwise paraphrase)	Our Comment
4	6.4.2	48	Measure 5.3.6-4b states: "If Measure 5.3.6-4a is not implemented, then the SFPUC will mitigate potential fishery effects on the lower Tuolumne River by implementing one of the following two habitat enhancement actions….gravel augmentation or isolating or filling a captured former gravel quarry pit along the river."	In 1992, the USFWS conducted an evaluation of salmonid spawning habitat upstream of Don Pedro Dam; it is not clear why the SFPUC has not conducted a similar (or more comprehensive) analysis of spawning and rearing habitat availability under different flow regimes in the lower Tuolumne. Given that Tuolumne hydrosystem operations impact spawning and rearing conditions for native salmonids in the lowerTuolumne, it seems that the SFPUC should be required to conduct such monitoring to ensure that its operations do not impact the threatened Central Valley steelhead population or the ESA-candidate fall-run Chinook salmon population. 192

Attachment B

(From *Instream Flow Requirements for Rainbow and Brown Trout in the Tuolumne River Between O'Shaughnessy Dam and Early Intake,* Michael Aceituno for the U.S. Fish and Wildlife Service, Draft, 1992.)

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Table I. The minimum amounts of water to be released from Hetch Hetchy Reservoir to the Tuolumne River at O'Shaughnessy Dam by water year schedule along with additional "mitigation" water provided under agreement in 1985.

Month	Minimum Monthly Release Schedule (CFS) A	B	C	Cumm. Precip. (In.) or runoff (AF) A >	B > C
January	50	40	35	8.8	6.1
February	60	50	35	14.0	9.5
March	60	50	35	18.6	14.2
April	75	65	35	23.0	18.0
May	100	80	50	26.6	19.5
June	125	110	75	26.5	21.3
July	125	110	75	575,000	390,000
August	125	110	75	640,000	400,000
September 1-15	100	80	75	---	---
September 16-30	80	65	50	---	---
October	60	50	35	---	---
November	60	50	35	---	---
December	50	40	35	---	---
MINIMUM RELEASE (AF)	59,207	49,994	35,197		
Added "mitigation" release for water year (AF)	15,000	6,500	4,400		
TOTAL ANNUAL FISHERY ALLOCATION (AF)	74,207	56,494	39,597		

(See reverse for recommended instream flow schedule.)

DRAFT 3-28-07

Attachment C

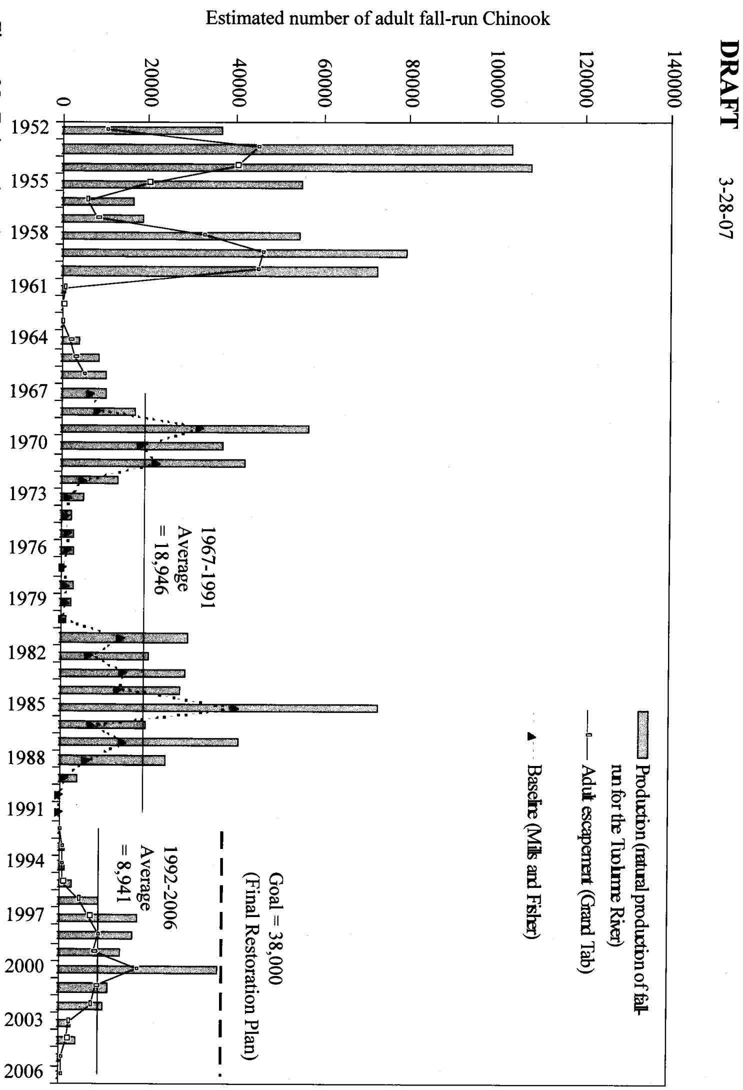

Figure 35. Estimated yearly natural production, and in river escapements of Tuolumne River adult fall-run Chinook salmon. 1952 - 1966, and 1992 - 2006 numbers are from CDFG Grand Tab (January 31, 2006). Baseline numbers (1967 - 1991) are from Mills and Fisher (CDFG, 1994).

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Table VI. Annual instream flow schedule recommended for the maintenance of rainbow and brown trout within the Tuolumne River Between O'Shaughnessy Dam and Early Intake.

		Minimum Instream Flow Schedules					
		A		B		C	
Month	Days	cfs	Ac-Ft.	cfs	Ac-Ft	cfs	Ac-Ft
January	31	85	5,227	70	4,304	50	3,074
February	28	85	4,721	70	3,888	60	3,332
March	31	85	5,227	70	4,304	60	3,689
April	30	100	5,951	70	4,165	75	4,463
May	31	100	6,149	70	4,304	100	6,149
June	30	125	7,438	125	7,438	125	7,438
July	31	150	9,223	135	8,301	125	7,686
August	31	150	9,223	135	8,301	125	7,686
September 1-15	15	125	3,719	100	2,975	100	2,975
September 16-30	15	100	2,975	70	2,083	80	2,380
October	31	85	5,227	70	4,304	60	3,689
November	30	85	5,058	70	4,165	60	3,570
December	31	85	5,227	70	4,304	50	3,074

193 cont.

COMMENT SI_TRT-CWA-SierraC-195:

This comment is comprised of the attachment indicated below, which is an exact duplicate of Comment Letter SI_PacInst.

Attachment H: Pacific Institute for Studies in Development, Environment and Security, *A Review of the San Francisco Utility Commission's Retail and Wholesale Customer Water Demand Projections*. July 2007. 195

Studies on Water Conservation

1. **EPA Case Studies**

"Cases in Water Conservation; how efficiency programs help water utilities save water and avoid costs." July 2002. Report on case studies of regional areas and their success in water conservation; including Irvine Ranch, Seattle and the Metropolitan Water District of Southern California.
http://www.epa.gov/watersense/docs/utilityconservation_508.pdf

2. **Seattle**

"Water Conservation Potential Assessment; Executive Summary." May 1998. Document about Seattle and its water program.
http://www.seattle.gov/util/stellent/groups/public/@spu/@csb/documents/webcontent/spu01_002152.pdf

"Potential Benefits of Water Supply Regionalization: A Case Study of the Seattle and Everett Water Systems"
http://www.tag.washington.edu/papers/papers/Reese-etal.2000.ASCE-Conf-Proc.0-7844-0517-4.pdf

3. **Metropolitan Water District of Southern California** 196

"Investing for the Future: Achievements in Conservation, Recycling and Groundwater Recharge" (annual progress report to the California State Legislature from the Metropolitan Water District of Southern California). February 2007.
http://www.mwdh2o.com/mwdh2o/pages/yourwater/sb60_06/SB60_2007_web.pdf

4. **Water Rates used in "Tuolumne to the Tap"**

Seattle
http://www.seattle.gov/util/Services/Water/Rates/WHOLESALE_2003120209103210.asp

Metropolitan Water District of Southern California:
http://www.mwdh2o.com/mwdh2o/pages/finance/finance_03.html

5. **"The Impacts of High Efficiency Plumbing Fixture Retrofits in Single-Family Homes." Prepared by Aquacraft, Inc. Water Engineering and Management.**

Seattle
http://www.cuwcc.org/enduse_studies/Seattle_Final_Report_Dec-2000.pdf

Tampa, FL.
http://www.tomthetoiletman.com/tampa_report.pdf

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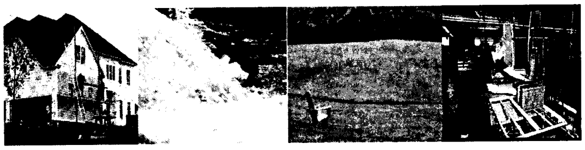
A Review of the SFPUC Retail and Wholesale Customer Demand Projections



Sustainable Water Supply Briefing
September 28, 2006

Heather Cooley
Peter Gleick
Pacific Institute, Oakland, CA

PACIFIC INSTITUTE

Summary

- We reviewed current and projected water demand and conservation programs for SFPUC wholesale and retail customers.
- Demand increases are projected to vary dramatically from user to user.
- Demand increases are driven by non-residential and outdoor uses.
- Projected conservation programs inadequately address projected demand.
- Better efficiency studies are needed.

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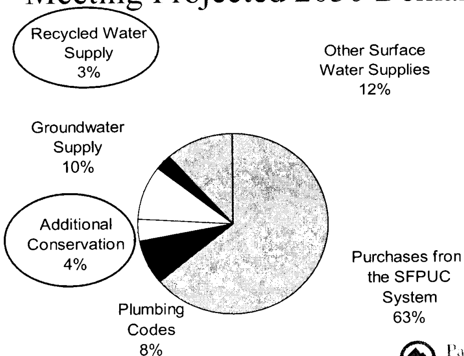
Meeting Projected 2030 Demand



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SFPUC Assumed Conservation Programs

- Wholesale Customers (Program B)
  - Fewer than 10 measures
  - Estimated savings: 13.4 mgd
- Retail Customers (Package C)
  - 38 measures
  - Estimated savings: 4.5 mgd

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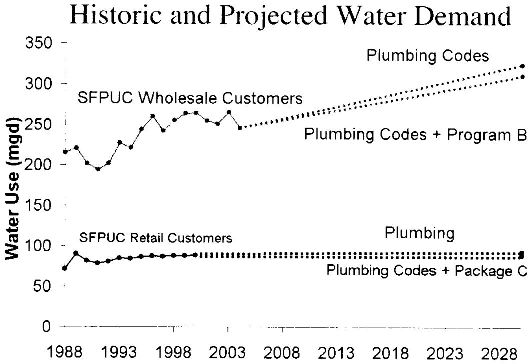
Historic and Projected Water Demand



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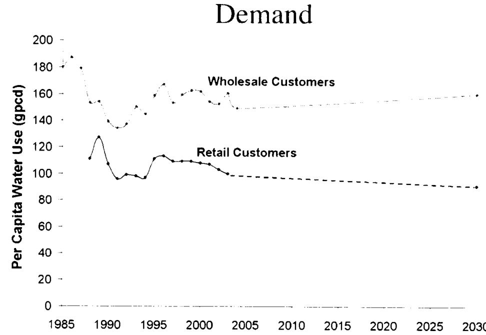
Historic and Projected Gross Per-Capita Demand



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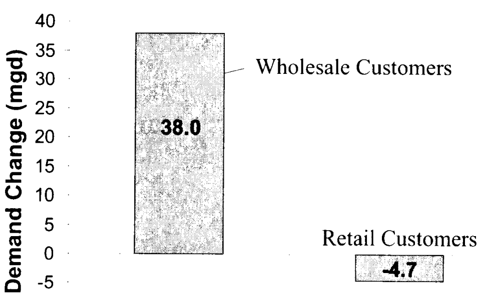
Demand Change (Current - 2030)



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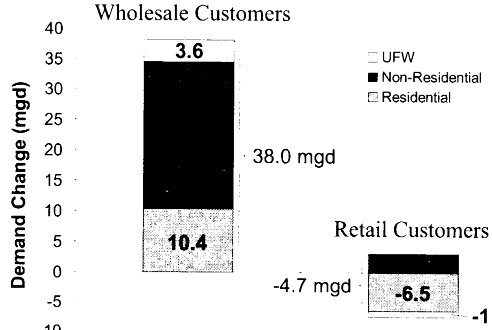
Demand Change (Current - 2030)



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Residential Per-Capita Demand (gpcd)

		Current		2030	
Customer	Sector	Indoor	Outdoor	Indoor	Outdoor
Wholesale	Single-family	69	**39**	58	**40**
Retail	Single-family	56	4	47	5

Efficient Indoor Water Use

AWWA: 45 gpcd

Seattle Study: 40 gpcd

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Non-Residential Demand

- Accounts for over **80%** of demand increase
- Employment projections too high
- Forecast method for wholesale customers is inadequate.
- Conservation measures fail to reduce demand to levels achieved elsewhere.

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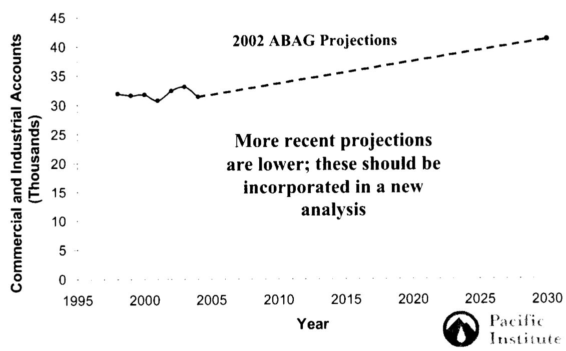
197 cont.

Employment Projections



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Forecast Method (Wholesale, Non-Residential Customers)

- Assumes that all non-residential users grow at the same rate (31.3% in accounts by 2030)
- Assumes water use among these non-residential users is the same
- This approach appears to overestimate 2030 demand.

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Non-Residential Conservation

- Proposed conservation reduces non-residential demand by 4%.
- Santa Clara Valley Water District study: 38%
- Pacific Institute study: 39% (minimum cost-effective savings of 26%)

Price-Driven Efficiency

- Price-driven efficiency improvements are **not** considered separately.
- But we know that water demand **IS** elastic.
- Water prices projected to quadruple by 2015 (in real dollars).

197 cont.

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Conclusions

- Demand increases are driven by non-residential and outdoor uses.
- Proposed conservation programs do not address these projected demands.
- Non-residential demand and conservation potential are inadequately evaluated.
- Price-driven conservation is not included.
- Projected recycled water use is small.

Recommendations

- More emphasis needs to be placed on reducing outdoor water use.
- Non-residential demand and conservation potential must be reassessed using industry-specific data on economic growth, water use, and conservation potential.
- Price-driven conservation must be included.
- Recycled water use must be expanded.

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Review of SFPUC Wholesale Demand Projections for 2030

Edward R. Osann
Potomac Resources, Inc.
September 28, 2006

Documents Reviewed

- Sustainable Water Supply Briefing Background Information Package 2006
- Wholesale Customer Demand Projections Technical Report (URS 2004)
- 2030 Purchase Estimates Technical Memorandum (URS 2004)
- Settlement Agreement and Master Water Sales Contract 1984

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Key findings of the SFPUC Analysis

- Increased demand for water
  - +52 mgd suburban (+19%)
  - SF retail decrease
- Anticipated increases in SFPUC purchases
  - +35 mgd suburban (+19%)
  - SFPUC retail decrease
- 2030 Purchases *above* Supply Assurance
  - +24 mgd (+13%)
- Increased diversions from Tuolumne & Delta
  - ???

Has the Case Been Made for Increasing the Assured Supply?

- Are there shortcomings in the regional demand forecast?
- How sensitive is the projected demand to unmodeled factors, new technologies?
- Are there shortcomings in the conservation practices of individual wholesale customers?
- Are the demand increases contained in the forecast truly compelling?

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Are there shortcomings in the regional demand forecast?

- Pricing and elasticity
  - Missing analysis of the effects of rising costs for water and wastewater service on future demand;
  - Lack of consideration of pricing as a conservation strategy.
- 'Unaccounted for' water (e.g., leaks, unauthorized uses)
  - Crude projection of increased losses in lockstep with increased demand;
  - Lack of consideration of loss reduction as a conservation measure.

How sensitive is projected demand to new developments?

- New plumbing standards now on the Governor's desk (AB 2496)
  - Effective 2011, all new toilets must be 1.3 gpf, approx. 18 % more efficient
- New clothes washer standards pending before the Secretary of Energy
  - Effective 2010, all new washers in CA must have max WF of 6.0, approx. 30% more efficient
- 'Smart' Irrigation controllers -- weather based, moisture sensing
  - Performance still being verified, but 10% improvement should be obtainable

198 cont.

Are there gaps in the conservation practices of individual wholesale customers?

Considerations --

- Efficiency comes in small increments, no one 'silver bullet'
- Demand management is not static, but a continuous process of seeking out cost-effective opportunities to save water
- Areas of highest demand growth may present best opportunities for leadership and new savings

Where is the Growth in Demand?

6 Systems Comprise 70% of Demand Growth

Hayward	9.4 mgd	+49%
Alameda County	8.2 mgd	+16%
Santa Clara	8.1 mgd	+31%
Milpitas	5.7 mgd	+48%
Stanford	2.9 mgd	+76%
East Palo Alto	2.3 mgd	+92%
total	36.6 mgd	+32%

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Weak Price Signals for Water

	rate type	relative to average of all BAWSCA agencies ($2.55/ccf)
Hayward	3-tier	below av
Alameda County	uniform	below av
Santa Clara	uniform	below av
Milpitas	2-tier*	above av
Stanford	NA	
East Palo Alto	uniform	below av

*second tier starts 50% above average use

No Price Signal for Wastewater

BMP 11 calls for all signatories that provide both water and sewer service to employ volumetric rates for both.

	rate type	type of service
Hayward	flat	collection & treatment
Alameda County	NA	
Santa Clara	flat	collection
Milpitas	flat	collection
Stanford	NA	
East Palo Alto	flat	collection

198 cont.

Are the demand increases contained in the forecast truly compelling?

Hayward	*existing* SFR outdoor use projected to nearly double; 'nicer' landscaping
Alameda Cty	residential growth is all outdoors
Santa Clara	2/3 of projected increase in SFPUC purchase is growth on UAF (leaks/unauthorized uses)
Milpitas	new SFR and commercial use is over 50% outdoor use
Stanford	lake system use is nearly doubled
East Palo Alto	60% of new demand is new commercial development

Not 'bad' uses, but all present opportunities for intervention

Are the demand increases contained in the forecast uncontrollable?

Overall wholesale demand growth in outdoor use (20 mgd) and leaks and unauthorized uses (3.5 mgd) is comparable to the inferred increase in the Assured Supply (24 mgd)

Targeted strategies will dampen these demands:

- Outdoor: A combination of pricing strategies, site plan review, and technology deployment (incentives, requirements)
- Water losses: reject basing 'sufficiency' on fixed percentages; water accounting as per new AWWA M-36 manual, component analysis to determine cost-effective interventions

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Review of the Role of Price in SFPUC Water Demand Forecasts

Thomas W. Chesnutt, Ph.D.
tom@antechserv.com
A & N Technical Services, Inc.
http://www.antechserv.com
September 28, 2006

Outline

- Summary
- Construct Validity—Which Water Demand?
- Questions—How was Price Handled?
- Some Answers—what could water price be integrated into water demand?

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Overall Assessment of Water Demand Forecasts

- A consistent application of a consistent model
- A transparent modeling effort
- A monumental amount of work
- A programmatic focus on conservation programs
- A great improvement over that which preceded

Opportunities for Improvement

- Determinants of Demand—
  - better explanation of demand drivers improve long run prediction: human choice is involved
- Seasonality—Not all gallons are created equal
- More measurement, fewer assumptions
- Focus on customer demand
  - willingness to pay for safe reliable water service
- Need for the Utility to use WUE to
  - Communicate the value of water service

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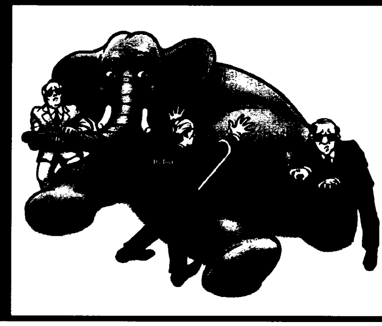
What is Water Demand?

If we are going to forecast it,
We should know what it is.

See Merritt, 2004,

Different notions of water demand



Different notions of water demand

Engineer – may view demand in terms of "demand load" – a production requirement, need

Water Planner – water demand as supply provided, use

Wastewater Planner – concerned with water use not consumed, but disposed

Financial Planner -- demand as revenue-producing consumption;

Economist – demand as a choice-based relationship between quantity and price, sometimes conditional on quality and reliability

Three Types of "Demand" Models

Water Requirements Model
Water Use Model
Water Demand Model

199 cont.

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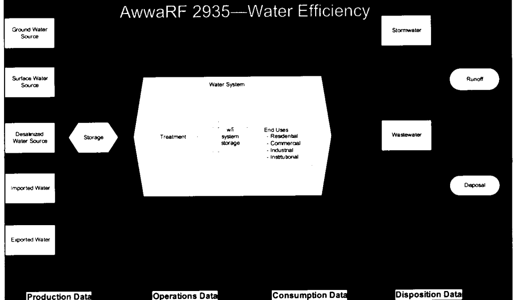
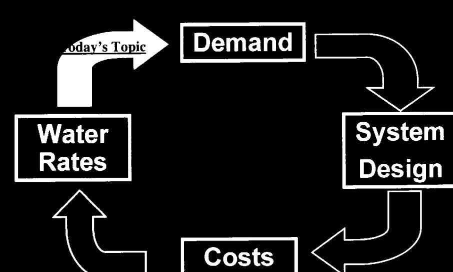
Flow of Water

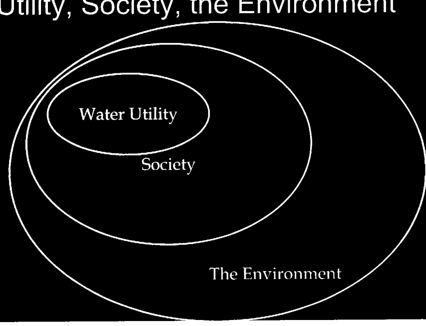
AwwaRF 2935—Water Efficiency



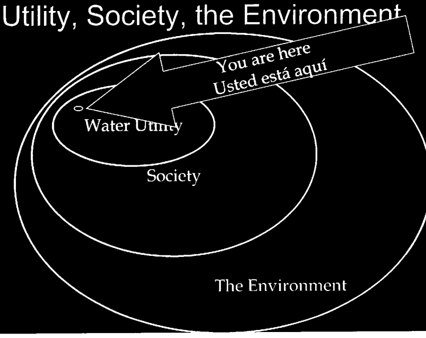
Flow of Dollars



Utility, Society, the Environment



Utility, Society, the Environment



199 cont.

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Flow of Water – Environmental View

Water Uses

Environmental
- forest/brush-land (ET)
- fishery flows
- stream morphology
- aquatic habitat (E&T)
- riparian habitat (ET)
- terrestrial habitat (ET)
- ecosystem restoration

Urban
- private sanitation
- public sanitation
- private landscape (ET)
- public landscape (ET)
- industrial cooling (E)
- industrial processing
- leakage and spillage

Agricultural
- range (ET)
- crop (ET)
- system (E&T)
- leaching
- seepage and spillage
- cultural

Recreational
- water sports
- game habitat (E&T)
- fishing habitat

Water Flowpaths

Sub-Basin Inflows
A. precipitation, all areas
B. surface inflows
C. subsurface inflows
D. imported water
E. desalinization

Sub-Basin Outflows
A. crop ET
B. landscape ET
C. natural vegetation ET
D. riparian habitat ET
E. aquatic habitat E&T
F. direct evaporation E
G. surface
H. subsurface

Internal Flows
A. reservoir releases
B. river & stream
C. river diversion
D. canal & pipeline
E. deliveries to users
F. seepage
G. deep percolation
H. GW extractions
I. surface runoff or spill
J. surface return
K. subsurface return
L. flows to salt sinks
M. recycling

Source Jack Keller

Questions Posed to Me

1. Was the future price of water appropriately considered when developing the 2030 water demand projections and conservation potential projections?
2. How could pricing issues have been more appropriately considered in these projections?
3. What are the risks of not appropriately considering the impact of water pricing?
4. What mechanisms (i.e. rate structures, stewardship fees) could the SFPUC and/or BAWSCA employ in order to finance regional conservation programs?
5. Given that the SFPUC and their wholesale customers will sign a new water sales agreement in 2009, are there any contractual elements you would recommend they consider that would enhance regional water conservation efforts?

199 cont.

Questions and Answers

Q1. Was the future price of water appropriately considered when developing the 2030 water demand projections and conservation potential projections?

A1. Price does not directly affect water demand forecasts. This is a shortcoming.

Why worry about Price?

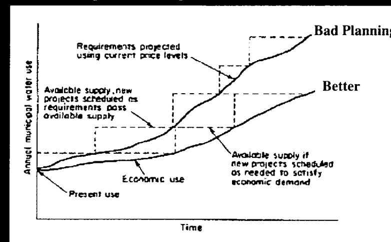

FIGURE 12-10 Projection of municipal water use.

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Understanding Water Demand

Lesson 1: **Price influences demand.**

Lesson 2: **"Price elasticity" is the percentage change in demand induced by a one percent change in price, all other factors being constant.**

Lesson 3: **Demand can be thought of as the sum of demands for different end uses of water.**

Lesson 4: **Demand for outdoor uses are more price-elastic than demand for indoor uses.**

A summary from Phase I report of the CUWCC Urban Retail Water Rates Project:
October 1994.

Understanding Water Demand, cont.

Lesson 5: **Demand for water during peak (summer) periods is greater than demand during off-peak (winter) periods.**

Lesson 6: **Residential water demand is inelastic--The response of residential demand to rate changes, though not zero, is small.**

Lesson 7: **Demand is more elastic in the long run than in the short run.**

Lesson 8: **Demand is influenced by forces other than price—including population growth, the economic cycle, weather, and income growth.**

Lesson 9: **The response of demand is more difficult to predict for large changes in price.**

199 cont.

Demand Analysis

Ingredients needed for planning
- **a forecast of the** **of future water demand**
- **a forecast of the** **of future water demand**
- **quantification of the** **surrounding future water demand**
- **quantification of the** **of water demand to changes in rates**
- **an accounting of the** **achieved by demand-side management**
- **an estimate of the potential** **achievable through demand-side management**

Questions and Answers

Q2. How could pricing issues have been more appropriately considered in these projections?

A2. The logical next steps for water demand forecasting include developing a better depiction of the long-run determinants of water demand.

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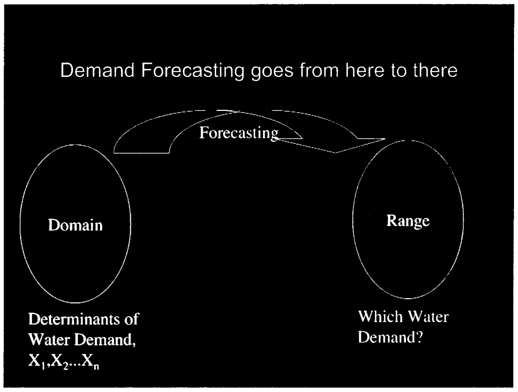

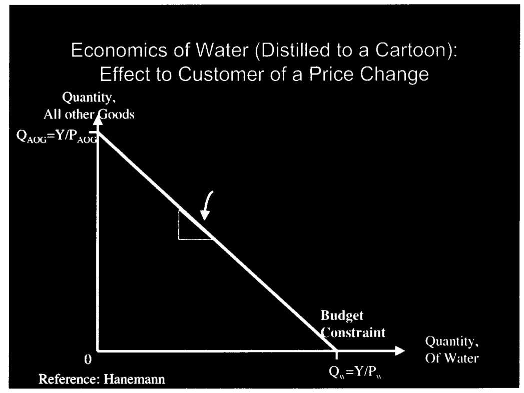

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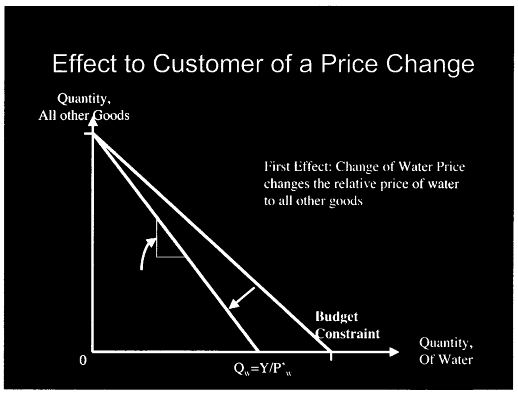

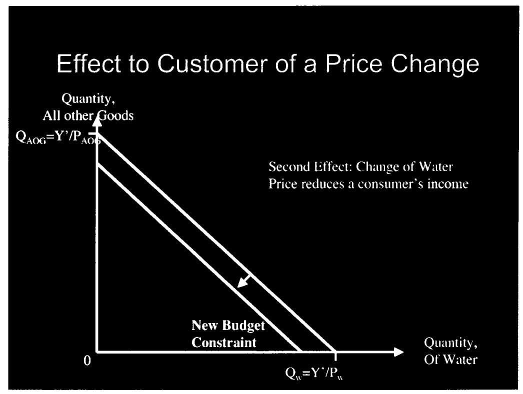

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Questions and Answers

Q3. What are the risks of not appropriately considering the impact of water pricing?

A3. Short term sales forecasts will be off. Potential for revenue shortfalls.
Unexpected net revenue shortfall can affect other utility plans (recycled water, water use efficiency, etc.)

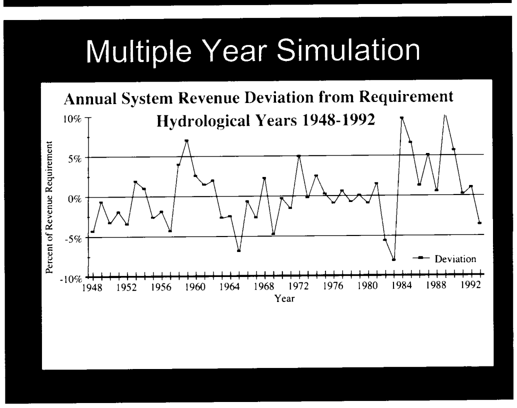
Why worry about Pricing and Planning?

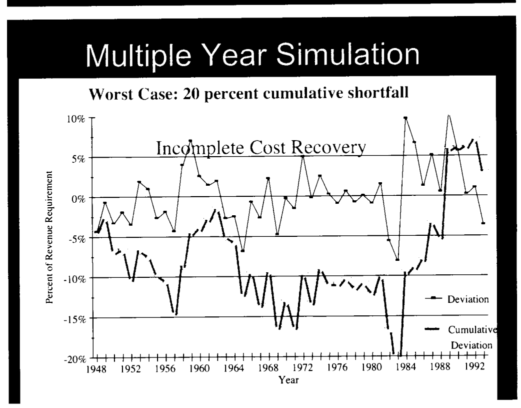
Besides Demand Response on long range planning

Short run financial effects—water utilities without sustainable financing cannot aggressively consider improvements in service provided

Sticky rate adjustments = chronic under recovery

199 cont.





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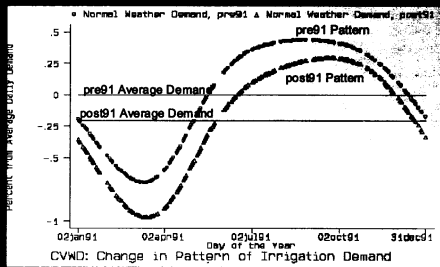
One response to price— 23 Percent Demand Reduction



Example of an aggressive tiered rate tied to account level water budget **with** customer outreach—Capistrano Valley WD.

Questions and Answers

Q4. What mechanisms could the SFPUC and/or BAWSCA employ in order to finance regional conservation programs?

A4. Alternatives include:

- Volumetric charge for regional conservation funding
- Regional WUE implementation (one stop shopping)
- Dedicated funding from tiered pricing

199 cont.

In a Situation of Resource Scarcity…

Water Use Efficiency (WUE) programs can provide customers with the information needed to balance new costs with their benefits.

There are economies of scale in the provision of information on WUE measures.

Questions and Answers

Q5. Given that the SFPUC and their wholesale customers will sign a new water sales agreement in 2009, are there any contractual elements you would recommend they consider that would enhance regional water conservation efforts?

A5. Regional Implementation of Conservation

- Sustainable Financing for Conservation
- Water Rate Reform—get your signals straight
- Research and Measurement of Demand

12.5 Citizens

CITIZENS

CITIZENS WHO SUBMITTED COMMENTS ON THE DRAFT PEIR

Comment Letter Format	Comment Letter ID	Name of Commenter	Page
PH Palo Alto	C_AdamsA	Amy Adams	12.6-75
Mail	C_Agarw	Sambhu Agarwala	12.5-1
Mail	C_AllenC	Casey Allen	12.5-1
Mail	C_AllenT	Thomas Allen	12.5-2
Email	C_Allis	Rita Allison	12.5-2
Mail	C_Alter	Grudy Alter	12.5-3
Email	C_Arons	Eric Arons	12.5-3
Mail	C_Bail	Christopher Bail	12.5-4
Mail	C_Barbe1	John Barbey	12.5-5
PH SF1	C_Barbe2	John Barbey	12.6-86
Mail	C_Barsa	Cris Barsanti	12.5-6
PH Palo Alto	C_Beauj	Cedric De La Beaujardiere / Susan Stansbury	12.6-76
Mail	C_Berg	Bonnie Berg	12.5-7
Email	C_Berko	Allan Berkowitz	12.5-7
Mail	C_Berli	Gabie Berliner	12.5-8
Mail	C_Bevia	John Beviacqua	12.5-8
Email	C_Bigos	Marty Bigos	12.5-9
Hand-delivered, PH	C_Blake	Martin Blake	12.5-9
Email	C_Bourk	Sean Bourke, MD	12.5-10
PH Sonora	C_BoutiD	Dolores Boutin	12.6-6
PH Sonora	C_BoutiF	Fred Boutin	12.6-9
Email	C_BramlD1	Darryl Bramlette	12.5-10
Email	C_BramlD2	Darryl Bramlette	12.5-11
PH Sonora	C_BramlD3	Darryl Bramlette	12.6-15
PH Modesto	C_BramlD4	Darryl Bramlette	12.6-35
Email	C_Brand	Jobst Brandt	12.5-12
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CITIZENS WHO SUBMITTED COMMENTS ON THE DRAFT PEIR (Continued)

Comment Letter Format	Comment Letter ID	Name of Commenter	Page
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Mail	C_Bucki	Keith Buckingham	12.5-15
PH SF1	C_Bug	June Bug	12.6-100
Email	C_Byron	Juan Byron	12.5-16
PH Fremont	C_Cant	John Cant	12.6-47
Mail	C_Caugh	Robert Caughlan	12.5-17
Mail	C_Chase	Birgit Chase	12.5-17
Email	C_Chiap	Lynn Chiapella	12.5-18
PH SF1	C_Chode	Bernie Chodeu	12.6-97
Mail	C_Clark1	Ann Clark / Katherine Howard	12.5-18
PH SF1	C_Clark2	Ann Clark	12.6-98
Mail	C_Closs	Gary Clossman	12.5-23
Mail	C_Colem1	Caroline Coleman	12.5-24
Mail	C_Colem2	Caroline Coleman	12.5-24
Mail	C_Colli	Robert Collin	12.5-25
Mail	C_Dahli	Leland & Shirley Dahlin	12.5-25
Email	C_Davey	Mary Davey	12.5-26
Email	C_David	Joel Davidson	12.5-26
PH Sonora	C_DayJ	Joseph Day	12.6-22
Mail	C_DayL	Lisa Day	12.5-27
PH Palo Alto	C_Dippe	Dan Dippery	12.6-67
PH SF1	C_Dough	Denise Dougherty	12.6-101
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Mail	C_Duper	Fred Duperrault	12.5-28
Email	C_Eddy1	Jeb Eddy	12.5-29
PH Palo Alto	C_Eddy2	Jeb Eddy	12.6-78
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PH Palo Alto	C_EllioC	Claire Elliott	12.6-72
PH Sonora	C_EllioP	Patricia Elliott	12.6-16
PH Fremont	C_Ellis	Dave Ellison	12.6-49
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Email	C_Fenwi	Jan Fenwick	12.5-31
Email	C_Field	David Fielding	12.5-32
Email	C_Fiore	John and Janet Fiore	12.5-32
Mail	C_Flani	M. Flanigan	12.5-33
Mail	C_Flemi	E. Fleming-Hasegaue	12.5-33
Mail	C_Flynn	Kirsten Flynn	12.5-34

CITIZENS WHO SUBMITTED COMMENTS ON THE DRAFT PEIR (Continued)

Comment Letter Format	Comment Letter ID	Name of Commenter	Page
Email	C_Fox	Peter Fox	12.5-34
PH Sonora	C_Gado	Jimmy Gado	12.6-17
Email	C_Garba	Caroline Garbarino	12.5-35
Mail	C_Garci	Ruben Garcia	12.5-35
PH Sonora	C_Gelma	Robert Gelman	12.6-22
Email	C_Genov	Marylyn Genovese	12.5-36
Email	C_Goite	Ernest Goitein	12.5-36
PH SF1	C_Goken	Shawna Gokener	12.6-99
Email	C_Goldf	Kathleen Goldfein	12.5-37
Email	C_Goodm	Rebecca Goodman	12.5-37
Email	C_Grave	Ben Graves	12.5-38
Email	C_GreenD	David Greene	12.5-38
Email	C_GreenK	Katherine Greene	12.5-39
PH Sonora	C_GrinnD	Doris Grinn	12.6-19
PH Sonora	C_GrinnJ	Jim Grinnell	12.6-20
Mail	C_Gross	Andrew Gross	12.5-39
Mail	C_Hacka1	Bob Hackamack	12.5-40
Email	C_Hacka2	Bob Hackamack	12.5-40
Email	C_Hall	Diana Hall	12.5-41
Mail	C_Hamil	Kimberly Hamilton-Lam	12.5-41
Mail	C_Hanke	Carol Hankermeyer	12.5-42
PH SF1	C_Hasso	Tomer Hasson	12.6-90
Mail	C_Helld	Alex Helldoevker	12.5-42
Mail	C_Henry	Leah Henry	12.5-43
Email	C_HerroK	Kristin Herron	12.5-43
Email	C_Hest	Christopher Hest	12.5-44
Mail	C_Higgi	Sidney Higgins	12.5-44
Email	C_Hoel	Jeff Hoel	12.5-45
Mail	C_Hoffm	Jeff Hoffman	12.5-47
Email	C_Hsiun	Pei-Lin Hsiung	12.5-48
PH Sonora	C_Hughe1	Noah Hughes	12.6-21
PH Modesto	C_Hughe2	Noah Hughes	12.6-35
Mail	C_Ikemo	Kile Ikemoto	12.5-48
Email	C_Isaac	Marian Isaac	12.5-49
Email	C_Izmir	Richard Izmirian	12.5-49
Mail	C_JohnM	Mitchell Johnson	12.5-50
Mail	C_JohnSie	Sieglinde Johnson	12.5-51

CITIZENS WHO SUBMITTED COMMENTS ON THE DRAFT PEIR (Continued)

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PH SF1	C_JohnsSil	Silvia Johnson	12.6-100
Email	C_Joye	Lindsay and Ken Joye	12.5-51
Email	C_Kahn	Mike Kahn	12.5-52
Mail	C_Kalin	Gwynn Kaliner-MacKellen	12.5-52
PH SF1	C_Kalma	Emeric Kalman	12.6-99
Mail	C_Keebr	Suzanne Keebra	12.5-53
Email	C_Kelle	Michael Kelleher	12.5-54
Mail	C_Kim	Michelle Kim	12.5-54
Email	C_KingC	Carl King	12.5-55
Email	C_KingD	David King	12.5-55
Email	C_KingK	Kenneth King	12.5-56
Hand-delivered, PH	C_Krame1	John Kramer	12.5-56
Email	C_Krame2	John Kramer	12.5-57
Mail	C_Lee	Aldora Lee	12.5-58
Mail	C_Leet	Ben Leet	12.5-59
Mail	C_Lewin	Linda Lewin	12.5-59
PH Palo Alto	C_Liebe	Sidney Liebes	12.6-70
Email	C_Lim	Kingman Lim	12.5-60
Mail	C_Look	Carissa Look	12.5-60
Email	C_LoVuo	Judith LoVuolo-Bhushan	12.5-61
Email	C_Lowry	Janet Lowry	12.5-61
Hand-delivered, PH	C_Lubin	Sheri Lubin	12.5-62
Email	C_Lundb	Erik Lundberg	12.5-63
Email	C_Maddo	Tyana Maddock	12.5-63
PH Palo Alto	C_Madou	Ramses Madou	12.6-67
Mail	C_Magol	Nick Magol	12.5-64
PH Palo Alto	C_Marcu	Mary Jane Marcus	12.6-63
PH Palo Alto	C_Margo	Elliot Margolies	12.6-76
Email	C_Marsh	James Marshall	12.5-64
Email	C_MartiM	Michael Martin	12.5-65
Mail	C_MartiS	Sofia Martinez	12.5-66
PH Palo Alto	C_Mater	Len Materman	12.6-80
Mail	C_McCle	Jonathan McClelland	12.5-66
Mail	C_McCol	Karl McCollom	12.5-67
Mail	C_McCon	Mike McConnell	12.5-67
Mail	C_McFar	Keith & Luella McFarland	12.5-68
Email	C_McKee	Julie McKee	12.5-68

CITIZENS WHO SUBMITTED COMMENTS ON THE DRAFT PEIR (Continued)

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Hand-delivered, PH	C_Means1	Robert Means	12.5-69
PH Fremont	C_Means2	Robert Means	12.6-53
PH	C_Melna	Christina & Chet Melnarik	12.5-69
PH	C_Mensi	Bill Mensing	12.5-70
Mail	C_Menuz	Karen Menuz	12.5-71
Mail	C_Merlo	Steven Merlo	12.5-71
Email	C_Mijac	Ivo Mijac	12.5-72
Email	C_Mille	Eric Millette	12.5-73
Email	C_MindeN	Naomi Mindelzun	12.5-73
Email	C_MindeR	Robert E. Mindelzun	12.5-74
Email	C_Neal	Peter Neal	12.5-74
Mail	C_Nore	Erna Nore	12.5-75
Email	C_Noren1	William Noren	12.5-76
PH Fremont	C_Noren2	William Noren	12.6-54
Email	C_Okuzu	Margaret Okuzumi	12.5-76
PH SF1	C_Olsen	Jenna Olsen	12.6-94
Hand-delivered, PH	C_ONeil	Kay O'Neill	12.5-77
PH Sonora	C_Owen	Ellie Owen	12.6-16
Mail	C_Pagli	Anne Pagliarulo	12.5-77
Mail	C_Parke	Doug Parkes	12.5-78
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PH Sonora	C_Picku	Ron Pickup	12.6-19
Email	C_Poult	J. Poulton	12.5-79
Mail	C_Raffa	Paul Raffaeli	12.5-79
Mail	C_Raube	David Raube	12.5-81
Email	C_Reedy	Mark Reedy	12.5-81
Hand-delivered, PH	C_Reich	Stefani Reichle	12.5-82
Mail	C_Richa	Matthew Richardson	12.5-82
PH Palo Alto	C_Roger	Leah Rogers	12.6-78
Email	C_Ross	Jim Ross	12.5-83
Email	C_Rowe	Trish Rowe	12.5-84
Email	C_SchmiR	Ron Schmidt	12.5-84
Email	C_Schri	Judy Schriebman	12.5-85
Email	C_Schul	Urs Schuler	12.5-85
Mail	C_Shea	Kelly Shea	12.5-86
Email	C_Simpk	John Simpkin	12.5-86
Hand-delivered, PH	C_Sloan	Ann Sloan	12.5-87

CITIZENS WHO SUBMITTED COMMENTS ON THE DRAFT PEIR (Continued)

Comment Letter Format	Comment Letter ID	Name of Commenter	Page
Mail	C_SmithE	Evan Winslow Smith	12.5-87
Email	C_SmithP	Paul Smith	12.5-88
Email	C_Sprin	Cindy Spring	12.5-88
Mail	C_Stein	Peter Steinhart	12.5-89
PH Sonora	C_Sturt	Jon Sturtevant	12.6-18
Email	C_Sugar	Marc Sugars	12.5-89
Email	C_Sundb	Karen Sundback	12.5-90
Email	C_Symon	Barbara Symons	12.5-90
PH Modesto	C_TayloJ	Jean Taylor	12.6-40
Email	C_TayloS	Scott Taylor	12.5-91
Hand-delivered, PH	C_Teves	M. Teves	12.5-91
Email	C_Thaga	Betsy Thagard	12.5-92
Email	C_Tholl	Julia Thollaug	12.5-92
Mail	C_Thoma	Dennis Thomas	12.5-93
Email	C_Toth	Tibor Toth	12.5-93
Email	C_Tubma	Marianna Tubman	12.5-94
Email	C_Tucke	Kristen Tucker	12.5-94
Mail	C_Unreadable1	Unreadable commenter name	12.5-95
Mail	C_Unreadable2	Unreadable commenter name	12.5-95
Mail	C_Unreadable3	Unreadable commenter name	12.5-96
Mail	C_Unreadable4	Unreadable commenter name	12.5-96
Mail	C_Unreadable5	Unreadable commenter name	12.5-97
Email	C_Urdan	Matthew Urdan	12.5-97
Email	C_Vadop	Paul Vadopalas	12.5-98
Email	C_VermeJ	Jim Vermeys	12.5-98
Email	C_VermeK	Karen Vermeys	12.5-99
Mail	C_Voyik	Ashleigh Voyikes	12.5-99
Mail	C_Vrana	Leo Vrana	12.5-100
Email	C_Walke	Patricia Walker	12.5-101
Email	C_Walls	Pete Wallstrom	12.5-102
Email	C_Weiss	Richard Weiss	12.5-102
Mail	C_Westc	Bart Westcott	12.5-103
Email	C_Willi	Doris Williams	12.5-103
Email	C_Wingf	Polly P. Wingfield	12.5-104
Email	C_Wolf	Elizabeth Wolf	12.5-104
Mail	C_Zimme	Benita Zimmerman	12.5-105

C_Agarw

Sambhu Agarwala
601 Van Ness Ave #710
San Francisco, CA 94102
(415) 441-4031

September 20, 2007

RECEIVED
SEP 20 2007
CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
M E A

Dear Commissioners,

I am writing today because I am very concerned with the possibility of taking more water out of Tuolumne River. The environmental impacts that would occur as a result of the extra water being diverted, far out weigh the need for more lawns and suburban sprawl across East Bay, which is where 60% of water would be sent, as I understand. I think its a huge mistake, ~~and~~ you should focus your ~~efforts~~ on increasing water conservation and recycling programs. 01

I truly hope that you take these public comments into serious consideration before you make a horrible decision ~~that~~ that would affect all walks of life for generations to come.

Thank you.

Sambhu Agarwala

C_AllenC

To: The City of S.F.

From: Casey Allen
204 Tocoloma Ave
S.F. CA 94134

RECEIVED
SEP 20 2007
CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
M E A

[illegible]llo,

Thank you for your time. I am writing today to prevent more water from being taken out of the Tuolumne River. This Moter is before the Planning Commission today 9/20/07 Special Meeting item #21. I am unable to attend later today so here are my thoughts. 01

One of the many problems is the negative affects on wildlife. This will 02
cause Bio-diversity loss, and is bad for business in that area. 03

Please look at alternatives like other cities. We should be leaders in protecting the environment.

[signature]

C_AllenT

Paul Maltzer/CTYPLN/SFGOV

09/25/2007 09:07 AM

To Diana Sokolove/CTYPLN/SFGOV@SFGOV
cc
bcc
Subject Fw: Water System Improvement Program (WSIP) diversion of more water from the Tuolumne River.

----- Forwarded by Paul Maltzer/CTYPLN/SFGOV on 09/25/2007 09:07 AM -----

"Thomas W. Allen" <tallen@baconsulting.net>

09/22/2007 07:05 AM

To <paul.maltzer@sfgov.org>
cc
Subject Water System Improvement Program (WSIP) diversion of more water from the Tuolumne River.

This is a bad idea. Please do not do it. 01

Tom Allen

Thomas W. Allen, Principal

Bay Area Consulting Group LLC

One Market

San Francisco, CA 94105

Getting Business Results from IT

tallen@baconsulting.net
Tel: 415.990-0240
FAX: 415-634-3248
www.baconsulting.net

C_Allis

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

RE: Tuolumne River

Rita Allison <rallison48@sbcglobal.net> **Tue, Aug 28, 2007 at 11:28 AM**
To: wsip.peir.comments@gmail.com

I would urge you to reconsider diverting 25 million gallons from the Tuolumne. We need to protect the river and instead educate the public about native and drought-tolerant landscaping...homes can be attractively landscaped without acres of water-thirsty lawns. With conservation and sustainable landscaping we can protect the river. 01

C_Alter

Trudy Alter
373 Warren Dr.
SF, Calif. 94131
415-731-3190

RECEIVED
SEP 20 2007
CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
M E A

More water should not be taken out of the Tuolumne River - I understand about 60% is taken out now — that's enough. Other options: recycling, more conservation & whatever "great" minds should be able to come up with 01

12.5-3

C_Arons

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

Tuolumne Water

Eric Arons <ericarons@gmail.com> **Fri, Sep 14, 2007 at 6:43 PM**
To: wsip.peir.comments@gmail.com

Please take no additional water from the Tuolumne. Protect the river habitat and protect recreational boating. 01

Eric Arons
49 Dorland St.
San Francisco, CA 94110

COMMENT CARD

San Francisco Planning Department
Draft Program Environmental Impact Report on the
SFPUC's Proposed Water System Improvement Program
Fremont, CA. September 18, 2007

Thank you for participating in tonight's public hearing on the Draft Program Environmental Impact Report (PEIR) for the San Francisco Public Utilities Commission's proposed Water System Improvement Program (WSIP). This is also an opportunity for you to submit written comments on the Draft PEIR for the proposed WSIP.

Written comments will be accepted through close of business on Monday, October 1, 2007. Written comments may be submitted in one of three ways:

1. Leave your written comments in the designated "Comment Box" tonight. These cards are provided for your convenience.
2. Mail your comments by October 1, 2007 to the San Francisco Planning Department, Attention: Paul Maltzer, Environmental Review Officer, WSIP PEIR, 1650 Mission Street, Suite 400, San Francisco, CA 94103
3. E-mail written comments to wsip.peir.comments@gmail.com

CONTACT INFORMATION

Name: Christopher Bail
Affiliation:
Address: 132 El Bosque Drive
City, State, Zip: San Jose, CA 95134
Phone or E-mail: bailcj@yahoo.com

WRITTEN COMMENTS Write clearly and continue on back. Use multiple sheets if needed.

I urge you to cancel plans to divert any more water from the Tuolumne River.
If you consider the value of the river, it is easy to see the destructive effects that further diversion would have. The river is at the heart of a wonderfully diverse ecosystem that would be threatened by the loss of the water. The river also supports recreational activity. 01

12.5-4

C_Bail

WRITTEN COMMENTS (Continued)

The fact is that 60% of the river's water is already diverted for rural and urban uses. Also, the total volume of river water that the Tuolumne has is threatened by global warming. The SFPUC's growth only model predicts increased demand without considering the important steps that can be taken toward mitigating the increased demand. These are increased conservation efforts, improved efficiency in the uses of water, and recycling. If cities in Southern California are able to mitigate their demand for water significantly using these three factors, the SF Bay Area should, as an environmentally minded community, be able to champion similar effort. 02

Faced with the reduction in river volume due to global warming, the SFPUC should decide not to divert even more water than the 60% that is already diverted. As less destructive alternatives are available, one could even consider that it may be possible to lessen the diversion, not just blindly taking water from an already sensitive situation. 03

Thank you for your consideration.
Sincerely,
[signature]
Christopher Bail

JOHN BARBEY
50 LIBERTY STREET
SAN FRANCISCO, CALIFORNIA 94110

October 1, 2007

To: San Francisco Planning Commission
1650 Mission Street, 4th floor
San Francisco, CA 94103-2414

Re: San Francisco Public Utilities Commission – Draft PEIR for SFPUC Water System Improvement Program

Honorable Commissioners :

Thanks to minimal notification to the public in San Francisco (ie Sept. 10th **print** ad in the S.F. Examiner), I had not even heard of this critical Draft PEIR for the SFPUC Water System Improvement Program until the evening of September 18th 2007 by word of mouth.

SFPUC was kind enough to give me a print copy of this immense 5 volume document late Tuesday afternoon, and I have been struggling through the 4000 + pages for much of the last 5 days between personal obligations on a very busy weekend.

As you have read and perused this vast report, I hope that you have borne solemnly in mind your primary responsibility to safeguard San Francisco's share of this water supply, and in fact to augment our city's share in light of the large upward boom in residential & commercial construction which I expect and hope may continue for some years. The burgeoning vertical expansions South of Market are actually a very sensible and well-construed way of expanding the residential and commercial capacity of San Francisco with as little impact to the rest of our built city as possible. The extra surge of prosperity that will ensue will allow this City to finance essential 21st Century improvements like high-speed "bullet train" interstate rail connections, and to upgrade our aging municipal infrastructure – one of the most basic elements of which is the water supply.

Hasn't the supply capacity of our huge Hetch Hetchy Water System for ourselves & our 27 large suburban customers in the Peninsula & 'Silicon Valley' almost been reached ? The April 2007 'Los Altos Hills General Plan' (one of our suburban customers) states frankly (on page 9., 01

subsection 321.) "Capacity limitations in the Hetch Hetchy system may be reached in 6 to 8 years, or sooner in times of drought." And in light of the constant escalation of urban development in our area, should we not be pursuing every means possible to **increase** our water supply capacity ?? The existing water system was not even intended to suffice **forever** !! 01 cont.

In light of the above, I was shocked to see that additional seismically-safe dams & water impoundments to augment this water storage for San Francisco to thus supply & promote additional population growth in this City, or provide alternate supply in the event of Climate (global warming) or Seismic Disaster, had long been rejected in this Water System Improvement Program (WSIP). There even seems to be some doubt about whether to design and construct a large Desalination Plant (Volume 5, page 186, Appendix H2-5). In San Francisco, we have been gambling for many decades that there may not be a repeat of the full seismic event that the City experienced in 1906, now added to this are the lively new concerns that there are in fact serious changes to Global Climate (re 'An Inconvenient Truth,' 'Not A Drop to Drink,' 'When the Rivers Run Dry,' etc.), which could result in serious drought years for Northern California and our San Francisco Bay Area in particular. Could SFPUC at least approve the Desalination Plant so that we have some minimal **drought-proof** water supply for San Francisco, so that we have a fighting chance to survive such disaster ? Remember that **alternative supply** could also be needed in the event of **terrorist** attack. Could 'Home Security' Funds not help with this last necessary precaution ? 02

As we are NOT one of the most impacted areas of the United States for water supplies (consider the foreboding plight of Las Vegas, San Diego, and the rest of the Southwest for example), and are also one of the most affluent areas of the United States, national sympathy for our water problems even if there **is** major political change soon, may be rather limited. So, we must be very wary of our geographic & demographic challenges in the near future, and take the first steps to avoid catastrophe as soon as possible.

I was also dismayed to see a rather cavalier assumption that San Francisco customers will continue to conserve water at the present extraordinary low rates of consumption, since we have human (huge population approaching 800,000, which may exceed this) and landscaping needs that will only INCREASE if there is serious drought, or fire disaster (our city is closely built, mainly with wood). I cannot imagine that all the water-saving diligence that my fellow citizens have undertaken here in San Francisco was done with the idea that our 03

C_Barbe1

suburban customers should then freely squander all that we have saved. Any favoritism exposes us to grave danger, and unfair suffering. 03 cont.

This Draft WSIP also makes rather confident predictions about exactly how much population growth, consumption, etc will occur in our area. How on earth do they arrive at these putative figures and how reliable are they ?! 04

Lastly, even though we are obligated to consider the rich natural environment that our Hetch Hetchy system has interfered with by the Raker Act, I certainly hope that the vast human populations of our region willing to live in some of the heaviest densities known in the United States are also considered an intrinsic part of this environment. The meticulous attention given to the problems of sport fishermen, and a not overly threatened species of trout, at the expense of the sole water supply of millions of people, seems excessive. Sorry if this sounds "anthropocentric," but Marine Biology is very advanced now in the 21st Century, and there are other methods of preserving this sturdy trout species while this vast water supply system is upgraded, retrofitted, and repaired.

Very Sincerely,

John Barbey

tel..415-305-2012

mailing address: P.O.Box 192114, San Francisco, CA 94119

P.S. I also do not understand the "tiered rate" system for rate payers announced. What difference is there between homeowners and other property owners in San Francisco that could justify this ??

CC: SFCC Mayor Gavin Newsom
SFCC Board of Supervisors
San Francisco Public Utilities Commission

C_Barsa

RECEIVED
SEP 10 2007
CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
MEA

COMMENT CARD

San Francisco Planning Department
Draft Program Environmental Impact Report on the SFPUC's Proposed Water System Improvement Program
Sonora, CA. September 5, 2007

Thank you for participating in tonight's public hearing on the Draft Program Environmental Impact Report (PEIR) for the San Francisco Public Utilities Commission's proposed Water System Improvement Program (WSIP). This is also an opportunity for you to submit written comments on the Draft PEIR for the proposed WSIP.

Written comments will be accepted through close of business on Monday, October 1, 2007. Written comments may be submitted in one of three ways:

1. Leave your written comments in the designated "Comment Box" tonight. These cards are provided for your convenience.
2. Mail your comments by October 1, 2007 to the San Francisco Planning Department, Attention: Paul Maltzer, Environmental Review Officer, WSIP PEIR, 1650 Mission Street, Suite 400, San Francisco, CA 94103
3. E-mail written comments to wsip.peir.comments@gmail.com

CONTACT INFORMATION

Name: Cris Barsanti
Affiliation:
Address: P.O. Box 851
City, State, Zip: Columbia CA 95310
Phone or E-mail: crisjim@crisjim.com

Because the Tuolumne River was designated a Wild and Scenic River in 1984, certain concessions allowing for recreational opportunities are mandated. It is currently difficult, in many years to get adequate flows for an adequate number of hours per day, for optimum white water boating on the Tuolumne River from Meral's Pool to Wards Ferry Bridge. It is anticipated that with increased water demand by SFPUC, the lack of adequate river flows for an adequate number of hours per day would become even more the norm rather than the exception. If this becomes the case, the tenets of the Wild and Scenic Rivers Act would be violated to a further extent than they are currently. SFPUC would be risking lawsuits on behalf of recreational users which might further delay any planned capital improvements. 01

Regarding water conservation and water recycling, the city and county of San Francisco is far below the standard for other large cities both in the state of California and throughout the west in general. How can San Francisco justify taking water from an out of county source, particularly from Tuolumne County which recycles a considerable amount of its water and which is currently on water rationing due to drought conditions. San Francisco should pursue a more aggressive water conservation and water recycling program before even considering taking more water from the Tuolumne River for water sales and power generation. 02

C_Berg

BONNIE BERG
127 LOWELL
PALO ALTO
CALIFORNIA
94301

SAN FRANCISCO CA 941
12 SEP

RECEIVED
SEP 17 2007
CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
MEA

Mr. Paul Maltzer
Environmental Review Office
San Francisco Planning Dept.
1650 Mission Street
Suite 400
San Francisco, CA 94103

480

9/11/07

Dear Mr. Maltzer,

The Tuolumne River is in danger.

I am relying on you, Mr. Maltzer, to urge the city of San Francisco to reasses its water-demand projections and plans; to protect the Tuolumne River. Water conservation and recycling must be required rather than water diversion. 01

Thankyou!

Bonnie Bergin

C_Berko

Diana Sokolove <wsip.peir.comments@gmail.com>

Tuolumne diversion

Allan Berkowitz <ecorabbi@earthlink.net> **Fri, Sep 7, 2007 at 2:38 PM**
To: wsip.peir.comments@gmail.com

I strongly oppose the proposal to divert 25 million gallons/day of the Tuolumne River. It is simply unconscionable to place the river in jeopardy. 01

I register my opinion for the following steps to be taken at this time:

- The SFPUC should re-evaluate its projections for future water demand and conservation potential in light of flaws and inaccuracies in their studies. 02
- The SFPUC should conduct a study to determine the maximum technical potential for conservation and efficiency savings within the SFPUC service territory.
- Any additional demand should be met through increased investment in conservation, efficiency, and recycling.
- The SFPUC should adopt a policy of reducing diversions from the Tuolumne River over time. 03
- A comprehensive watershed study should be completed to adequately assess the environmental impacts of the WSIP. 04

Thank you

Allan Berkowitz
ecorabbi@earthlink.net
Nurture nature...and nature will nurture you!

C_Berli

From Gabie Berliner
120 Commonwealth Ave.
S.F. 94118
751-3766

RECEIVED
SEP 20 2007
CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
M E A

Members of the PUC

I am writing to urge you not to approve taking more water from the Tuolumne River. To do so would be an irreversable tragedy. We are in a time when it is urgent to protect our environment, not strip our natural resources from the face of the earth. To reduce the flow of the Tuolumne would end its wild + scenic status + undoubtedly effect much of our wildlife that depends on it. I rafted that river + hate to think future generations of nature-loving folks would be deprived of that experience 01

Thank you.

C_Bevia

Dear Mr. Maltzer:

We cannot and should not divert another 25 million gallons of water daily from the Tuolumne river, especially now that the fall Chinook salmon runs are in extreme jeopardy and that the the Tuolumne is an important spawning river. We must begin to look elsewhere for our water needs, principely towards conseravation and recycling of existing water supplies, rather than further depleting a healthy river system. Thank you. 01

John Beviacqua
[signature]
1306 Shelter Creek Lane
San Bruno Ca 94066

RECEIVED
S P 19 2007
CITY & COUNTY OF
PLANNING DEPARTMENT
M E A

C_Bigos

Diana Sokolove <wsip.peir.comments@gmail.com>

No More Diversions From The Tuolumne!

Marty Bigos <mbigos@gladstone.ucsf.edu> **Mon, Oct 1, 2007 at 4:00 PM**
To: wsip.peir.comments@gmail.com

Paul Maltzer, Environmental Review Officer
Water System Improvement Program PEIR
San Francisco Planning Department

Dear Mr. Maltzer:

As a resident of San Francisco and an avid hiker in the Sierras I am opposed to withdrawing any more water to support sprawl development in the Bay Area. 01

I support the alternatives to diversion that protect the Tuolumne. More water conservation, efficiency, and recycling are the best ways to both protect the River, and provide permanently sustainable water for the San Francisco Bay Area. 02

Marty Bigos
141 Fairmount St.
SF CA 94131

C_Blake

COMMENT CARD

San Francisco Planning Department
Draft Program Environmental Impact Report on the
SFPUC's Proposed Water System Improvement Program
Sonora, CA. September 5, 2007

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3. E-mail written comments to wsip.peir.comments@gmail.com

CONTACT INFORMATION

Name: MARTIN BLAKE

Affiliation:

Address: P.O. BOX 741

City, State, Zip: Columbia, CA 95310

Phone or E-mail: ~~[illegible]~~ martinblake@attinet

WRITTEN COMMENTS Write clearly and continue on back. Use multiple sheets if needed.

Take no more water out! Please practice conservation and let our natural rivers remain as they are. It is the heritage that belongs to all Americans 01

C_Bourk

Diana Sokolove <wsip.peir.comments@gmail.com>

Tuolomne River water diversion

Sean Bourke <sbourke1@yahoo.com> **Tue, Sep 11, 2007 at 12:59 PM**
To: wsip.peir.comments@gmail.com

Writing as a concerned citizen opposed to diversion of additional 25 millions of water per day by the SFPUC from the Tuolomne River. I believe it encourages waste, jeopardizes valuable habitat, and would have a deleterious environmental impact overall. 01

Thank you,

Sean Bourke, M.D.
10 Tynan Way
Portola Valley, CA 94028

C_BramID1

Diana Sokolove <wsip.peir.comments@gmail.com>

SFPUC's WSIP

Bramlette@aol.com <Bramlette@aol.com> **Thu, Sep 6, 2007 at 10:09 AM**
To: wsip.peir.comments@gmail.com
Cc: ron@hetchhetchy.org

I was in attendance at the “Public Hearing on the San Francisco Public Utilities Commission proposed Water System Improvement Program (WSIP)” on September 05, 2007 in Sonora California. I understand that this was an “Environmental Impact Meeting”. I agree with most of the environmental concerns that was presented at that meeting.

What I have failed to understand is the logic that the San Francisco Public Utilities Commission is using to support this proposed Water System Improvement Program. I do not understand how the key elements of this program can be achieved with out additional major environmental impacts on the Tuolumne River area. 01

I have also failed to understand why the San Francisco Public Utilities Commission has not considered using new technology to achieve all of the key elements.

Please see attached file.

Bramlette Consulting
7700 Ruth Ridge Road
Jamestown, California 95327
Phone (209) 984-1251
Cell (209) 352-2274

Ltr to SFPDPEIR-2.doc
33K

Bramlette Consulting
Specializing in System Engineering on High Technology Programs
7700 Ruth Ridge Road, Jamestown, California 95327
Phone: 209-984-1251, Cell: 209-352-2274
E-mail: Bramlette@aol.com
Darryl Bramlette, CEO

Subject: **San Francisco Public Utilities Commission's (SFPUC) Water System Improvement Program**

What I have failed to understand is the logic that the San Francisco Public Utilities Commission is using to support this proposed Water System Improvement Program. I do not understand how the key elements of this program can be achieved with out additional major environmental impacts on the Tuolumne River area.

I have also failed to understand why the San Francisco Public Utilities Commission has not considered using new technology to achieve all of the key elements.

One said technology would be desalinization. Desalination is being used more and more around the world to provide people with needed freshwater. Most of the United States has, or can gain access to, ample supplies of fresh water for drinking purposes. But, fresh water can be in short supply in some parts of the country (and world). And, as the population continues to grow, shortages of fresh water will occur more often, if only in certain locations. In some areas, salt water (from the ocean, for instance) is being turned into freshwater for drinking.

A promising method to desalinate seawater is the "reverse osmosis" method. Right now, the high cost of desalinization has kept it from being used more often, as it can cost over $1,000 per acre-foot to desalinate seawater as compared to about $200 per acre-foot for water from normal supply sources. Desalinization technology is improving and costs are falling, though, and Tampa Bay, FL is currently desalinizing water at a cost of only $650 per acre foot. As both the demand for fresh water and technology increase, you can expect to see more desalinization occurring, especially in areas, such as California and the Middle East.

12.5-11

Another method is The Modular High-Temperature Gas-Cooled Reactor (MHTGR) this system can supply an adequate supply of fresh water and electric power which are the essential requirements for a high quality of life. In many regions of the U.S., an acute need for new sources of fresh water is emerging as a consequence of sustained drought conditions, high local population growth and deterioration of existing water supplies from contamination and overuse. Although desalinization has been a major water source for Middle East countries and island nations, it has not been a significant source of water in the U.S. However the need for both water and electric power is a significant problem in populous regions with high growth projections. The MHTGR is an energy source for both water and power production which has the potential to overcome barriers to using nuclear power as a prime energy source for producing fresh water. The plant is divided into three process areas: the Nuclear Island (NI), the energy conversion area (ECA), and the water production plant (WPP). High- pressure superheated steam from the NI is converted to electric power in the ECA. Reject heat from the ECA in the form of hot circulating water is supplied to the WPP as the energy source for desalinating seawater. About 20% of the seawater supplied to the WPP is converted to fresh water and the remainder is returned to the ocean as slightly concentrated brine. 02

Of the more than 7,500 desalination plants in operation worldwide, 60% are located in the Middle East. The world's largest plant in Saudi Arabia produces 128 MGD of desalted water. In contrast, 12% of the world's capacity is produced in the Americas, with most of the plants located in the Caribbean and Florida. To date, only a limited number of desalination plants have been built along the California coast, primarily because the cost of desalination is generally higher than the costs of other water supply alternatives available in California (e.g., water transfers and groundwater pumping). However, as drought conditions occur and concern over water availability increases, desalination projects are being proposed at numerous locations in the state Why not in San Francisco?

Environmental impacts not addressed in the Scoping Meeting on the San Francisco Public Utilities Commission proposed Water System Improvement Program:

1) The increased delivery demands on the **salt water encroachment**. (Several methods have been examined for the control of saltwater encroachment. These techniques have included reduction of groundwater withdrawals, repositioning of withdrawal locations, utilization of recharge basins or injection wells to artificially maintain freshwater pressure, interception of intruding saltwater through a line of pumping wells parallel to the coastline, and emplacement of a subsurface groundwater barrier between the coastline and pumping wells. Reduction of groundwater withdrawals and relocation of pumping wells are the techniques found to be most effective and economically feasible in the control of saltwater encroachment. Run-off water, river flow, to offset encroachment.) 03

2) The increased delivery demands on the Tuolumne River watershed. (With the majority of the San Francisco's Water System Improvement Program based on a Hydrologic Cycle the demands will never meet the supply.) 04

Diana Sokolove <wsip.peir.comments@gmail.com>

SFPUC hearings on the draft Program Environmental Impact Report

Bramlette@aol.com <Bramlette@aol.com> **Thu, Sep 27, 2007 at 5:02 PM**
To: peter@tuolumne.org
Cc: wsip.peir.comments@gmail.com, ron@hetchhetchy.org, cameronconsults@comcast.net

To: Peter Drekmeier
Bay Area Program Director
Tuolumne River Trust
Subject: : San Francisco Public Utilities Commission's (SFPUC) Water System Improvement Program (WSIP)

I am sadden that with all the efforts of those who spoke, only a small number addressed the problems. *"The vast majority of those who spoke – more than 90% – favored the $4.3 billion seismic upgrades to the Hetch Hetchy water system, but expressed serious concerns about the proposal to divert an additional 25 million gallons of water per day from the Tuolumne River."*

The number one problem: San Francisco needs more water!
The number two problem: the increasing diversion will do further harm to the Tuolumne River. 01

We all know that San Francisco will need more water in the future, we also know that we do not have any more water to "give" San Francisco from the Tuolumne River. So why did the vast majority favor "*the $4.3 billion seismic upgrades to the Hetch Hetchy water system, but expressed serious concerns about the proposal to divert an additional 25 million gallons of water per day from the Tuolumne River."* This does not solve any problems. Also this vast majority has not provided a plan to meet the future demands for water for San Francisco. Therefore: no solution for problem number one or two!

Now lets talk about requiring more water conservation, efficiency, and recycling. This is also not an answer to lessening impacts on the Tuolumne River while promoting a sustainable water plan for the Bay Area. The projected need for water in San Francisco bay area will be far more than they can get from Tuolumne River even with more water conservation, efficiency, and recycling. 02

If this goes the way San Francisco Public Utilities Commission wants it to go, they also will not have a solution for either problem. The Tuolumne River and it's environment can not give up more water.

In summery, the San Francisco Public Utilities Commission should start an environmental impact report on the development of alternative sources of Water. San Francisco could be a leader in the development of desalination for California and the rest of the nation. Also by introducing reduction of groundwater withdrawals, repositioning of withdrawal locations, utilization of recharge basins or injection wells to artificially maintain freshwater pressure San Francisco could set a standard for the rest of California and the nation. By doing the above, San Francisco and California could return to our children, grandchildren and all future generations "The Grand Canyon of the Tuolumne River". 03

This is a solution to both problems!

A win-win for all!

If this response has not been directed to the correct department, please forward it. If anyone has any questions or if I can be of any assistance please feel free to contact me.

Bramlette Consulting
Darryl Bramlette, CEO
7700 Ruth Ridge Road
Jamestown, California 95327
Phone (209) 984-1251
Cell (209) 352-2274
E-mail: Bramlette@aol.com

Diana Sokolove <wsip.peir.comments@gmail.com>

Tuolumne River

Jobst Brandt <jobst.brandt@stanfordalumni.org> **Mon, Sep 24, 2007 at 12:29 PM**
To: wsip.peir.comments@gmail.com

24 Sep 07

Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Maltzer:

I am displeased by the packaging of improvements to San Francisco Water Department aqueducts and the diversion of water from Sierra rivers.

Put on separate ballots, I think you'll find broad support for improving the system and hardly any for taking more water from already depleted rivers. The issues are not related in kind, one being a maintenance issue, the other, water policy. Historically water policy has been made to serve real estate interests that invite growth at the expense of current residents. 01

Please separate these issues lest it be seen as a deception.

Sincerely,

Jobst Brandt
(650) 323 1549 res
(650) 804 5693 cel
351 Middlefield Road
Palo Alto CA 94301
jobst.brandt@stanfordalumni.org

C_Breso

October 11, 2007

Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Maltzer:

As a kayaker of the Tuolumne River I am concerned about your environmental review of the San Francisco Public Utilities Commission's plan to take more water from the Tuolumne River as it fails to adequately identify and address all of the environmental impacts to the River. Only by ensuring that healthy amounts of water continue to flow into the Tuolumne River can we protect this irreplaceable natural treasure and ensure that future generations will be able to enjoy this amazing river canyon. I urge you to undertake additional studies before finalizing this document. 01

As other communities in California are pursuing conservation of water resources, the SFPUC's "preferred alternative" ignores conservation, efficiency, and recycling measures that their own studies found could eliminate the need to divert more water from the Tuolumne by at least 74%. When it comes to water conservation, the Bay Area lags far behind other metropolitan areas such as Seattle and Los Angeles that are reducing water consumption even in the face of growth. As a region known for a strong environmental ethic, the Bay Area should be a leader in water efficiency and conservation. 02

I support the alternatives identified in your draft document that protect the Tuolumne River from new diversions. Requiring more water conservation, efficiency, and recycling is the best way to lessen impacts on the Tuolumne River while promoting a sustainable water plan for the Bay Area.

Sincerely,

Mark W. Bresolin
8049 Tetotom Park Way
Antelope, CA 95843

C_Britt

COMMENT CARD

San Francisco Planning Department
Draft Program Environmental Impact Report on the
SFPUC's Proposed Water System Improvement Program
Sonora, CA. September 5, 2007

Thank you for participating in tonight's public hearing on the Draft Program Environmental Impact Report (PEIR) for the San Francisco Public Utilities Commission's proposed Water System Improvement Program (WSIP). This is also an opportunity for you to submit written comments on the Draft PEIR for the proposed WSIP.

Written comments will be accepted through close of business on Monday, October 1, 2007. Written comments may be submitted in one of three ways:

1. Leave your written comments in the designated "Comment Box" tonight. These cards are provided for your convenience.
2. Mail your comments by October 1, 2007 to the San Francisco Planning Department, Attention: Paul Maltzer, Environmental Review Officer, WSIP PEIR, 1650 Mission Street, Suite 400, San Francisco, CA 94103
3. E-mail written comments to wsip.peir.comments@gmail.com

CONTACT INFORMATION

Name: Beverly Britts
Affiliation: Teacher
Address: P.O. Box 613
City, State, Zip: Columbia, CA 95310
Phone or E-mail: 6eb052@

WRITTEN COMMENTS Write clearly and continue on back. Use multiple sheets if needed.

It's time for San Francisco to be alert to wise actions regarding conservation and recycling of a variety of resources, and especially, in this case, water, [illegible]. S.F. can to do its part on implementing efficient measures that restrict/redefine perhaps, water use. What requirements have 01

residents

C_Britt

WRITTEN COMMENTS (Continued)

already been made on Bay Area residents? many of whom enjoy the year-round beauty of our area. Many years ago the Bay Area was my home, and at the time, I did not even think about the detrimental effects of water consumption in relation to the Tuolumne River – How many residents in the Bay Area have been informed of the the key impacts regarding the result of taking more water, of actions they could take & to make a difference. – The solution then rests in the hands of residents in the Bay Area, in a shift in consciousness, to conserve, to see their water as a resource to be treasured. 01 cont.

12.5-14

Please send me a copy of the CD

C_BrookL

Liz Brooking
<etbrooking@earthlink .net>
09/12/2007 08:59 AM

To <bill.wycko@sfgov.org>
cc
bcc
Subject FW: Please Protect the Tuolumne River

I understand from Mr Maltzer's email reply that you are assuming his duties, therefore I am forwarding you this note.
Many thanks for your consideration.
Liz Brooking

------ Forwarded Message

From: Liz Brooking <etbrooking@earthlink.net>
Date: Tue, 11 Sep 2007 21:56:22 -0700
To: <YOSE_Planning@nps.gov>, <gavin.newsom@sfgov.org>, <paul.maltzer@sfgov.org>
Conversation: Please Protect the Tuolumne River
Subject: Please Protect the Tuolumne River

Dear Mayor Newsom, Mr. Paul Maltzer and Commissioner Ryan L Brooks

We should employ a more conservative approach to our use of natural resources - and, it should be a priority to educate the public as to the value of conservation.

We continue to consume water and other resources beyond what is really needed and reasonable to coexist with nature.

-Why can't we pass laws to stop individuals and businesses from hosing down the sidewalks when a broom is usually sufficient. 01
-Let's recycle and reclaim more water.
-Shouldn't we be rationing water as a matter of course?

The Tuolumne is a beautiful place and home to many species. I urge you to meet our water needs and protect the Tuolumne River for future generations through conservation and recycling, rather than by withdrawing more water and depleting the river.

Thank you,

Liz Brooking
3045 Jackson Street #202
San Francisco, CA 94115

------ End of Forwarded Message

C_Bryan

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

toulumne letter

Louis Bryan <louis.sf@gmail.com> **Mon, Oct 1, 2007 at 6:43 PM**
To: wsip.peir.comments@gmail.com

Paul Maltzer, Environmental Review Officer
Water System Improvement Program PEIR
San Francisco Planning Department

Dear Mr. Maltzer:

I urge you to do additional studies of the Tuolumne River before finishing your environmental review of the SFPUC's plan to take more water from it. 01

I believe that the Tuolumne should be protected from any new diversions.

Sincerely,

Louis Bryan
770 Noe Street
San Francisco CA 94114

C_Bucki

Keith Buckingham.
80 Vicksburg St
San Francisco, CA
94114
(415) 826 3940
Sept. 20th 2007.

RECEIVED
SEP 20 2007
CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
MEA

Dear Commissioners;

I am writing because of my concern for the SF Public Utilities Commission plan to withdraw more water from the Tuolumne River. It is my understanding that, while the PUC is trying to plan for growth and provide resources, the growth projections seem to be excessive. 01

Instead, it is my strong feeling that water conservation should be pursued more aggressively in the plan, with increasing pricing if necessary to reflect the true cost of providing water. It is my understanding that other large metropolitan areas, such as Seattle and Los Angeles, have succeeded in providing for growth while limiting water usage. In the Bay Area, with our history of innovation and environmentally sensitive population I hope that we may also be able to limit our water usage. 02

Yours sincerely
Keith Buckingham

Diana Sokolove <wsip.peir.comments@gmail.com>

Conserve water, stop groundwater overdraft, restore instream fisheries & recreation

juan byron <jbyron@sbcfoundation.org> **Wed, Sep 19, 2007 at 8:24 PM**
To: wsip.peir.comments@gmail.com
Cc: bill.young@sierraclub.org

To: Paul Maltzer, Environmental Review Officer, WSIP PEIR, SF Planning Department
From: Juan Byron, customer, 545 Moore Road Woodside, CA 94062-1108
Re: Please implement conservation, not Water System Improvement Program
September 19, 2007

Thank you for the opportunity to review the 5 volume proposed Water System Improvement Program. I appreciate your consideration of the following constructive criticisms:

1) The proposal documents a trend (from 1965 to now) of decreased water use per customer, yet your water demand projections conflict with historical data. My experience as a homeowner and water customer over more than 20 years is that residential and commercial customers are conserving water and can easily use 10% less water if "incentivized" to do so by increasingly tiered water rates. 01

2) The 82 year hydrologic record upon which the proposal is based tends to ignore earlier historical, geological and anthropologic evidence that pre-modern and modern societies thrived in your service area for hundreds of years with almost no water storage or distribution. 02

3) The "significant impacts" and "lesser impacts" identified for the Tuolumne, Alameda and Peninsula watersheds are all unacceptable since voluntary conservation of water is more economical and effective for both the consumer and the utility. I believe engineering best practices will allow seismic upgrade of the water distribution system without the above impacts because of the vastly redundant nature of the nine major reservoirs and multiple parallel pipelines that characterize this system. 03

4) Continuing overdraft of the Westside Groundwater Basin, lowering of Lake Merced's water level, and likely contamination of drinking water due to groundwater pumping are all unacceptable impacts given that voluntary conservation of water in SFPUC's service region would meet realistic water supply objectives. Depleting our local groundwater truly leaves us exposed to catastrophic risks, since this groundwater ought to be able to sustain life and important commerce regardless of deliveries from the Sierras. Why use up local groundwater now, when it should be a reserve? If SFPUC is truly concerned about providing adequate water quantity and quality, it would negotiate, legislate and litigate an end to salinization and selenium poisoning of nearby water sources by our "uphill" neighbors like customers in the Westlands Water District. 04

5) The WSIP proposal seems to be inappropriately aimed inflated growth inducement by stream diversion and groundwater overdraft. Rather than just acknowledging the substantial impacts (increased traffic, air pollution, water pollution, global warming and decreased quality of life) caused by WSIP, please implement a version of the modified WSIP with the least diversion from the Tuolumne River and the least environmental impact. The "no purchase request increase" alternative should be combined with the least environmentally impacting modified WSIP alternative. It is not right for SFPUC to encourage "Los Angeles-like" traffic jams and pollution by making more water available than the service area needs. 05

6) Several of your "least environmentally impacting" alternatives are seriously flawed by continuing groundwater overdraft. Please re-frame as many alternatives as possible to include aggressive conservation but exclude using groundwater at a level which draws it below maximum storage capacity. 06

7) The "year round desalinization" alternative should be recognized as a bad idea due to direct costs and indirect costs such as from the air pollution (global warming) and water pollution (salt concentrate pumping) which will result. 07

8) The "regional desalinization for drought" alternative deserves further study, but should be implemented cautiously so as not to harm users by global warming and increased growth. I envision plants which run as little as possible until mandatory conservation (rationing) has been tried for a year. 08

9) Please raise the rates for all water users in a tiered manner which is explicitly directed at getting everyone to conserve water. 09

10) Please continue to study the "remove O'Shaughnessy Dam" alternative, since you should be offsetting any loss of income (from hydropower sales) with increased water fees. O'Shaughnessy Dam impounds only a small part of the system's water. Hetch Hetchy Valley could be restored as a national treasure within a generation. A modern Congress could be convinced to reverse the process which allowed SF to flood Yosemite National Park, especially since SF does not have the influence that it had 100 years ago. 10

In closing, I respectfully remind SFPUC that more than a generation of Americans have been exposed to the exploitative history of bay area water development through authors including David Brower, Marc Reisner, Wallace Stegner, Donald Worster, William Kahrl, Robert Righter and Kevin Starr. Many of us now agree with the assessment of John Wesley Powell, a trained engineer and hydrologist, that we must live within the resources of our small regional watersheds. "Meeting water supply objectives" does not impress us, when the objectives are to increase water supply beyond sustainable levels at a cost that includes destroying the fishery industry, fouling our already marginal air quality, crowding our already over-crowded roadways and increasing global warming. Many now recognize that the natural environment SFPUC is responsible for stewarding has both a economic value and the (increasingly rare) aesthetic values described by John Muir. 11

Sincerely, Juan Byron

C_Caugh

RECEIVED
SEP 24 2007
CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
MEA

COMMENT CARD

San Francisco Planning Department
Draft Program Environmental Impact Report on the
SFPUC's Proposed Water System Improvement Program
Palo Alto, CA. September 19, 2007

Thank you for participating in tonight's public hearing on the Draft Program Environmental Impact Report (PEIR) for the San Francisco Public Utilities Commission's proposed Water System Improvement Program (WSIP). This is also an opportunity for you to submit written comments on the Draft PEIR for the proposed WSIP.

Written comments will be accepted through close of business on Monday, October 1, 2007. Written comments may be submitted in one of three ways:

1. Leave your written comments in the designated "Comment Box" tonight. These cards are provided for your convenience.
2. Mail your comments by October 1, 2007 to the San Francisco Planning Department, Attention: Paul Maltzer, Environmental Review Officer, WSIP PEIR, 1650 Mission Street, Suite 400, San Francisco, CA 94103
3. E-mail written comments to wsip.peir.comments@gmail.com

CONTACT INFORMATION

Name: Robert Caughlan
Affiliation:
Address: 1777 Borel Place #309
City, State, Zip: San Mateo CA 94402
Phone or E-mail: RCAUGHLAN@AOL.COM

WRITTEN COMMENTS Write clearly and continue on back. Use multiple sheets if needed.

Only a few people mentioned population as the driving force for all our water needs. FAMILY Planning should be one of your main public education goals! 01

C_Chase

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SEP 20 2007
CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
MEA

BIRGIT CHASE
39 DEMING STREET
SAN FRANCISCO
CA 94114-1022
tel 415 431-9933

I am writing today to prevent more water ~~to~~ being taken from the Toulumne River. The watershed for the Toulumne River is a delicate landscape and it would be devastating to the environment to remove more water for the Toulumne River. We have all the water we need and water conservation should be encouraged instead of destroying one of the most beautiful area in the US. 01

Thank you
Birgit Chase

C_Chiap

Diana Sokolove <wsip.peir.comments@gmail.com>

Hetch Hetchy PEIR

lchiapella@juno.com <lchiapella@juno.com> **Sun, Sep 30, 2007 at 1:08 AM**
To: wsip.peir.comments@gmail.com
Cc: City.Council@cityofpaloalto.org

To Whom It May Concern:

I urge the SFPUC to support the NO SUPPLEMENTAL TUOLUMNE RIVER SUPPLY.

SFPUC already takes as much as 265 mgd or 60% of Tuolumne River supply. I could not find SFPUC's total water right, but I suspect in a severe drought situation it could be all of the flow.

SFPUC is in a position to create a "dry" river bed because of it's extreme water right and it's profit motive to sell the excess at very high rates to its users south of San Francisco. There appears to be limited conservation efforts since the average usage of users in some communities has increased over the last decade. 01

Water pricing encourages excessive usage and little conservation. San Francisco has established an excessively large amount of water for it's first tier or "lifeline" residential usage. Some Southern California water districts establish "lifeline" residential usage at 3 units per month, not 7 units as is common here in Northern California.

Furthermore the price for water units above 7 units does not increase no matter how many units a residence uses. No attempt has been made to price water in a way that encourages conservation, as was done during the severe drought years when 4-7 rate tiers were in effect in Palo Alto. Residential usage fell dramatically. 02

SFPUC is guilty of encouraging more water usage by it's pricing methodology. Palo Alto and other Hetch Hetchy users followed suit.

According to a recent water audit from Santa Clara County, water loving landscapes account for at least 60% of water usage in residential and many commercial campuses. Almost all of this water is of drinking water quality, rather than recycled treated water.

Conspicuous consumption is everywhere. Water runs down the gutters nightly because of poor irrigation systems. Grass and lush tropical gardens abound in this semi-arid Mediterranean climate. 03

I intend to contribute as much as I can to the inevitable law suit that will accompany any SFPUC recommendation to take another 25 mgd from the Tuolumne. Conservation, recycling, and reusing is the answer.

Sincerely,

Lynn Chiapella
631 Colorado Avenue
Palo Alto, CA 94306

12.5-18

C_Clark1

To: The San Francisco Public Utilities Commission
The San Francisco Planning Department

From: Ann Clark, Ph.D.
Katherine Howard, ASLA

Date: September 20, 2007

Subject: Review and Comments on the Draft Program Environmental Impact Report (PEIR)
San Francisco Public Utilities Commission Water System Improvement Program (WSIP)

RECEIVED
SEP 20 2007
CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
M E A

This review looks at possible impacts and significant environmental issues in four areas: (1) the Hetch Hetchy Water Delivery Infrastructure Costs and Finances, (2) Drought, Climate Change, and Global Warming, (3) Water Use and Demand for More Tuolumne River Water, and (4) Mitigation Alternatives. 01

We support the retrofitting and renovation of the Hetch Hetchy infrastructure and the water delivery system. We trust that the final PEIR includes recommendations that avoid or will mitigate significant negative environmental effects for Hetch Hetchy, the Tuolumne River and connected eco-systems and water ways.

(1) <u>Hetch Hetchy Water Delivery Infrastructure Costs and Finances</u>

The PEIR's $4.3 billion estimated Water System Improvement Program (WSIP) includes the Hetch Hetchy infrastructure and water delivery system to SFPUC's 28 wholesale customers (primarily Peninsula, East/South Bay municipal and private organizations) and San Francisco City and County retail customers.

According to the draft PEIR, SFPUC wholesale customers' water demand is approximately 67% of the system's water. San Francisco retail customers' water demand is 33%.

a) Significant Environmental Effect Issues

The $4.3 billion bond indebtedness—which can be reasonably expected to increase over the course of the project—is a major concern. 02

One of the major overall WSIP goals and objectives is to "ensure cost-effective use of funds." [1] The environmental mitigations are an integral legal part of the complete WSIP program and its funding. If mitigations

1. City and County of San Francisco Planning Department, 2007. *Draft Program Environmental Impact Report for the San Francisco Public Utilities Commission's Water System Improvement Program,* Vol. 4: Chapter 9, CEQA Alternatives, Table 9-1.

required as a part of the cumulative environmental impact of the entire program are not funded, legal problems may result.[2]

The draft PEIR appears to indicate that San Francisco retail customers will be largely responsible for bond costs, water conservation requirements, and high water rate increases. San Francisco voters have agreed already to carry the burden of a $1.6 billion bond. 02 cont.

Who will pay for the remaining $2.7 + billion? Unfortunately, information in the draft PEIR is insufficient to determine if there will be adequate resources for the completion of the mitigations required for the over-all system improvement program.

b) Specific Requests for Final PEIR Report Analysis and Data

To ensure adequate and sufficient financial resources to complete legally required program environmental impact mitigations, both a detailed program costs analysis and documentation of how an equitable, proportional distribution of program costs will be achieved must be included in the final PEIR. Costs for each of the wholesale and retail customers should be based on water use and mandated conservation goals.

Because the SFPUC 2009 contract will have a collective environmental impact on the water system improvement program, a detailed environmental analysis of the 2009 contract needs to be included in the final PEIR. Separating the environmental review of the program from that of the contract is an illegal partition that prevents adequate review. 03

Because the wholesalers are required by AB 1823 to reimburse SFPUC for the wholesalers' share of costs, the final PEIR needs to include specific 2009 contract conditions for equitable, proportionate rates and charges for water use, including wholesale and retail incentives for water conservation requirements.

(2) <u>Drought, Climate Change, and Global Warming</u>

Although the draft PEIR addresses drought cycles, climate change, and global warming, the draft PEIR does not sufficiently analyze the potentially disastrous, exponential harm to the Tuolumne River brought about by the coalescing of the cumulative effects of drought cycles, climate change, and global warming. 04

a) Significant Environmental Effect Issues

The draft PEIR is limited and narrow in its review of climate change and global warming. The lack of adequate, up-to-date research and analysis is highly environmentally significant for the WSIP and the draft PEIR.

2. September 11, 2007: San Francisco Public Utilities Commission Regular Meeting: Commissioners discussed a possible cost increase from $4.3 to $4.6/ $5 billion as well as possible cost-driven reductions. No decisions were reached.

12.5-19

i) A Drought-Cycle State and Water Resources

Despite pictures of sun bathers on beaches and postcards of surfers on ocean waves, California is a drought-cycle state.

The PEIR design draft model is in 8.5 year intervals. Although there are variances in this model, 6 years are drought, dry, below normal or restoring years. In restoring years, additional river water is needed to refill the depleted Hetch Hetchy reservoir and other resources. 04 cont.

Because of the rate of current water diversions (60%), the Tuolumne River is immediately affected by drought, dry, below normal and normal restoring years. Continually, the river is at risk.

To augment water from the Tuolumne during difficult dry periods, the draft PEIR recommends diverting an additional 23 mgd of Tuolumne water from yet-to-be negotiated agreements with Modesto and Turlock Irrigation Districts. But the Modesto and Turlock Districts are also caught in California's drought cycle. The additional 23 mgd of water would be an additional draw down of water from the Tuolumne. 05

Without considering changes due to climate change and global warming, the Tuolumne remains a river constantly at risk.

The draft PEIR concludes that climate change and global warming are insignificant and have minimal, if any, effect on the river. Moreover, the PEIR concludes that the effects of climate change and global warming will not be significantly understood until near mid-century, at which time adjustments can be made. 06

The draft PEIR endorses a "use now and worry later" policy. A no-action response policy is insufficient and inadequate. Such a policy places the Tuolumne and all its connected eco-systems and water ways at great risk.

b) Effective Environmental Practices

Instead of a "use now and worry later" policy, the East Bay Municipal Utilities District (East Bay MUD) examined possible climate change and global warming impacts. Planning and operation models were developed. As a result, East Bay MUD took pro-active steps to protect its water system. The plan includes water efficiencies, conservation, and flexible 07 management strategies. East Bay MUD is cited as the first water district to join the California Climate Action Registry.

Leadership and action plans have developed across the western states in California, Arizona, Oregon, and Montana. Conservation, flexible management strategies, and coordinated regional plans have been identified as best practices. There is no excuse for the SFPUC not to develop and carry out these best management practices. 07 cont.

We all understand the critical importance of emergency and earthquake plans and preparedness. In the 21st century, the same is true for climate change, global warming, and drought cycles. The final PEIR must include a pro-action plan, and not a "use now and worry later" policy.

c) Specific Requests for Final PEIR Report Analysis and Data

Additional PEIR research and analysis is needed to address the exponential effects of climate change, global warming, and drought cycles as well as to protect the Tuolumne and all its eco-systems from potentially serious, significant environmental impacts. Conservation requirements, water efficiencies, and mitigations must be developed and implemented.

San Francisco's proposed no-action policy is a red flag for environmental challenges and criticisms. No-action ignores the importance of on-going conservation activities and effective management plans to protect the river; guard the safety and reliability of the water delivery system; ensure economic growth and meet customer needs. 08

The final PEIR should focus on conservation, recycling, re-use, and delivery management efficiencies as water first priorities. These are proven, cost-effective strategies that protect the environment and support growth and development. There is no excuse for the SFPUC not to take action. Volume 3, Chapter 5, 5.7.6 needs to be revised with adequate mitigations developed and implemented.[3]

(3) <u>Water Use and Demand for More Tuolumne Water</u>

At this time, 60% of the Tuolumne River is diverted for water consumption. The draft PEIR recommends that additional water be diverted from the river in order to meet the needs of wholesaler customers. 09

a) Significant Environmental Effect Issues

In the draft PEIR, there are major discrepancies in the assumptions, research models, and recommendations applied to the wholesalers and

[3] City and County of San Francisco Planning Department, 2007. *Draft Program Environmental Impact Report for the San Francisco Public Utilities Commission's Water System Improvement Program,* Vol. 3: Chapter 5, 5.7.6.

12.5-20

retail customer. The discrepancies and assumptions result in diametrically opposed policies for water use and active conservation.

A double standard is established. For example, additional mandatory conservation will not be required for wholesalers, but will be required for retail customers.

i) Double Standard: Discrepancies and Assumptions

<u>Wholesale customers</u>. Based on the assumption of "more growth, more water", the draft PEIR recommends an <u>increase</u> in water diverted from the Tuolumne to meet the growth needs of wholesalers. Wholesale conservation goals are left to suggested methods and parameters in "respective urban water management plans".[4]

As a result, the wholesale model not only offers limited incentives for water conservation, but also does not penalize additional water usage. The wholesale model produces a significant negative environmental effect—extra demand on water and less demand for conservation. 09 cont.

<u>San Francisco retail customers</u>. The assumption is "more growth, less water" for San Francisco retail customers. This model predicts a <u>decrease</u> in San Francisco water and an increase in growth and development. The model follows the lead of proven conservation and growth policies.

Various PEIR estimates predict San Francisco's water will decline between 4% and 11%. The decline will occur at the same time San Francisco's population is expected to increase by 12% and San Francisco employment by 25%.

San Francisco's water use decline is factored on a PEIR required 10 mgd conservation goal which includes groundwater supplies, recycling, and reuse. The San Francisco model produces a water first conservation priority—a positive environmental effect.

b) A Water First Conservation Priority: Effective Environmental Practice

A major over-all goal and objective of WSIP is to "improve use of new water sources and drought management including use of groundwater, recycled water, conservation, and transfers". [5] 10

4. . City and County of San Francisco Planning Department, 2007. *Draft Program Environmental Impact Report for the San Francisco Public Utilities Commission's Water System Improvement Program,* Vol. 4: Chapter 9, pg.62
5. Ibid: Chapter 9, CEQA Alternatives: Table 9-1.

In the Metropolitan Water District of Southern California, water use decreased 16% in a thirteen year period (1990-2003). Population increased by 14%. The MWD includes Los Angeles. During a thirty-five year period, retrospective, longitudinal data indicate 2005 Los Angeles water use is close to the 1970 water use with increases in population during the thirty-five year growth period.

Other cities and water districts have reduced water use during times of growth and development. Denver, Boston, and Seattle combine conservation, recycling, reuse, and efficient water management as a means to support growth and development. These water methods are cost-effective and reliable. Moreover, they construct a systemic, long-term approach to sustainable water management and use. 10 cont.

There is no excuse for SFPUC not to adopt water conservation measures without delay.

c) Specific Requests for Final PEIR Report Analysis and Data

Additional research is needed for an in-depth analysis of districts and cities in California and the United States which have decreased water use and met growth needs. The analysis should look at how these areas (now and in the future) differ from the SFPUC area and how they are the same. The analysis should address how San Francisco can specifically use methods and procedures from these models to facilitate the development and implementation of water first conservation policies to meet current and anticipated growth. The analysis should also address methods and procedures that would not be effective for SFPUC, and why the methods would not be effective. 11

Based on CEQA requirements, additional research is needed to provide expanded regional analysis of specific wholesale project growth needs that have an impact on the San Francisco Bay Area region. Significant impacts include major residential developments, large businesses, shopping centers, commercial, hotel and motel expansions, government and educational growth, and industrial, manufacturing, and processing plants. Based on this research and analysis, the final PEIR needs to develop an environmental plan to incorporate program-based and project-specific wholesale plans and conservation methods into an integrated system of local and regional planning and environmental protection.

Expanded research is needed to analyze fully the twenty-one year plan to divert additional water from the Tuolumne. Year by year, the research must evaluate the aggregate and collateral effects of less and less river water each year on (1) the health and welfare of the river, (2) potentially endangered species and habitats, and (3) all the eco-systems, including the 12

delta, that receive water from the Tuolumne. Based on the expanded research, the analysis needs to determine which sustainable environmental alternatives and superior mitigation methods are required in WSIP and the 2009 contract to address long-term environmental protection for the Tuolumne and all its interconnected environments. Although research is presented in the draft PEIR, this research does not address fully the over-all effects of long-term river water diversions and the necessary 2009 contract requirements to ensure the future, on-going health and welfare of the river. 12 cont.

The mitigations in Volume 2, Chapter 4, Attachment 4-A: Mitigation Measures to Minimize Facilities Impacts; Volume 3, Chapter 5, Attachment 5-A: Mitigation Measures to Minimize Water Supply and System Operations Impacts,: Volume 4, Chapter 6, Summary of all Impacts and Mitigation Measures, Tables: 6.3 through 6.15, and Chapter 9, CEQA Alternatives will need to be revised when the additional research and analysis recommended in sections 2-c and 3-c of this response are completed.[6] 13

d) Equitable Conservation: Specific Request for PEIR Alternative Mitigations

To avoid the complications and challenges of disproportionate standards, inequitable costs, and questionable assumptions, the final PEIR must analyze and recommend standards in which equitable and proportionate conservation requirements are mandatory for all wholesale and retail customers.

An Example of Equitable Conservation

The draft PEIR states that SFPUC wholesale customers use approximately 67% of SFPUC water while San Francisco retail customers use 33%.

Although estimates may vary, by 2030 the wholesale customer use increases to 77%. San Francisco use declines to 23%, with 10 mgd required conservation. Equitable conservation can be factored by correlating water demand with conservation requirements (million gallons per day, mgd). 14

Example of Equitable Conservation Requirements to 2030

SFPUC	Water Demand	Conservation Requirement
San Francisco Retail	23%	10 mgd
Wholesale Providers	77%	34 mgd
Total	100%	44 mgd

[6] City and County of San Francisco Planning Department, 2007. *Draft Program Environmental Impact Report for the San Francisco Public Utilities Commission's Water System Improvement Program,* Volumes 2,3,4: Chapters 4,5,6, 9: Attachment 4-A, pp 4-10, Attachment 5-A: Tables 6.3-6.15, Table 9-3.

An extensive list of possible water conservation measures for SFPUC wholesalers is available from the SFPUC. [7]

Equitable and proportionate conservation and efficiencies are in line with SFPUC's current tiered water rates, charges, policies, and practices. 14 cont.

Using draft PEIR data, the present level of Tuolumne water use combined with equitable and proportionate efficiency requirements and conservation are sufficient to meet growth and development needs in 2030. We can conclude that wholesale growth and development are feasible, without diverting additional water from the Tuolumne.

(4) Mitigation Alternatives

The Aggressive Conservation/Water Recycling and Local Ground Water, No Supplemental Tuolumne River Supply alternative is the environmentally superior mitigation. The draft PEIR/WSIP preferred alternative is inadequate. [8] 15

The 21st Century and Water Challenges
San Francisco's Sustainable Environmental Responsibility

San Francisco is known for its leading edge in green projects, sustainable design, environmental protection, and global warming and climate change awareness. The final PEIR/WSIP has the responsibility to reflect San Francisco's environmental leadership, 16

It is important that the San Francisco PUC and the San Francisco Planning Department work closely with the San Francisco Department of Environment and the Mayor's Office of City Greening to develop the best possible SFPUC water system improvement program and 2009 water contract. Together, San Francisco and SFPUC can become the leading edge in water management, efficiencies, and conservation. There is no excuse for this not to happen.

Contact Person
Ann Clark, Ph.D.
2000 Monterey Blvd., San Francisco, CA 94127 Telephone and fax: 415 566-4729

[7] San Francisco Public Utilities Commission: Bureau of Environmental Management 2007. Wholesale Customer Water Conservation Potential Technical Report, http//sfwater.org

[8] City and County of San Francisco Planning Department, 2007. *Draft Program Environmental Impact Report for the San Francisco Public Utilities Commission's Water System Improvement Program,* Vol. 4: Chapter 9, CEQA Alternatives, pg. 9-7.

C_Clark1

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2. *A Crisis of Mismanagement, Real Solutions to the World's Water Problems,* 2003. International Rivers Network, Berkeley, CA.

3. California Department of Water Resources, 2000. *City of New Albion, California, Sample 2000 Urban Water Management Plan.*

4. California Environmental Protection Agency, Los Angeles Regional Water Control Board, www.waterboards.ca.gov/losangeles

5. California Environmental Protection Agency, San Francisco Bay Regional Water Quality Control Board, www.waterboards.ca.gov/sanfranciscobay

6. City and County of San Francisco Planning Department, 2007. *Draft Program Environmental Impact Report for the San Francisco Public Utilities Commission's Water System Improvement Program.* San Francisco File Number. 2005-0159E, State Clearing House Number 2005092026.

7. Cooley, Heather, 2007. *A Review of the San Francisco Public Utilities Commission's Retail and Wholesale Customer Water Demand Projections*, Pacific Institute for Studies in Development, Environment, and Security, Oakland, CA.

8. Dempsey, Heather, Wesselman, Eric, 2007. *From the Tuolumne to the TAP, Pursuing a Sustainable Water Solution for the Bay Area,* Tuolumne River Trust, San Francisco, CA, Modesto, CA, Sonora, CA.

9. East Bay Municipal Water District website: www.ebmud.com

C_Clark1

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10. Metropolitan Water District of Southern California website: www.mwdh2o.com

11. Nelson, Barry, Schmitt, Monty, Cohen, Ronnie, Ketabi, Noushin, Wilkinson, Robert, 2007. *In Hot Water, Water Management Strategies to Weather the Effects of Global Warming,* Natural Resources Defense Council, New York, NY.

12. San Francisco Public Utilities Commission: Bureau of Environmental Management, 2007. *Wholesale Customer Water Conversation Potential Technical Report*. http://sfwater.org

13. Save the San Joaquin River Coalition, 2004. *Restoring the San Joaquin River*, www.SaveTheSanJoaquin.org

14. Sheffler, Gabe, 2007. *Summary of Water Supply Options, Draft Programmatic Environmental Impact Report, San Francisco Public Utilities Commission's Water System Improvement Program,* Environmental Defense, Oakland, CA; New York, NY; Washington, DC; Boulder, Co; Raleigh, NC; Austin, TX; Boston, MA. Project Office: Los Angeles, CA.

15. *The Coming Storm Preparing for a Warming Water World*, 2003. International Rivers Network, Berkeley, CA.

C_Closs

Gray Clossman
1944 Tasso Street
Palo Alto, CA 94301
650-387-3514
18 September, 2007

Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Maltzer,

Please do not take additional water from the Tuolumne River. Moderate conservation measures will allow the Bay Area to grow while using the same amount of Tuolumne water. 01

At my vacation home in Tuolumne County I watch the Tuolumne River rapids. There is no water to spare in the river.

Of course, in Palo Alto we drink Tuolumne water. I support the Hetch Hetchy system and its existing dam and diversions, however, we should take no more water from the river. Fortunately, we do not need to.

Sincerely,

Gray Clossman

Gray Clossman

12.5-24

C_Colem1

Dear Commissioner Ryan L. Brooks,

01 How can you possibly allow the environmental degradation that would come as a result of ~~your~~ pulling more water from the Tuolumne? As the Sierra snowpack shrinks, Sierra rivers, like the Tuolumne, will become an increasingly unreliable source of water. Pulling more water from this river, for lawn watering is just ludicrous. Why give lawns clean pure drinking water when we already have water shortages across California? We can recycle water, from our showers & sinks and use that water for our lawns. There are so many possibilities for conservation that will sustain our cities growing water needs. San Francisco is supposed to be an environmentally friendly city. ~~[illegible]~~ Other cities like L.A. and Seattle have met their growing water needs through conservation. Can we do the same? Please?

Caroline Coleman
~~[illegible]~~ 308 Anza St.
San Francisco, CA
94118

C_Colem2

Dear Paul ~~[illegible]~~ Maltzer,

01 Please do not authorize the enormous water grab that will threaten so much fish & plant wildlife ~~of~~ the Tuolumne River. The effects are tremendous & I urge you to undertake additional studies or not go through w/ the project at all. There are so many alternatives that will help SF meet its growing water needs through conservation. Other cities like L.A. & Boston have had similar programs for a long time & they have proved successful. We can do it too. Please don't allow the draining of the Tuolumne

Caroline Coleman USF Junior

... FRANCISCO CA 941
20 SEP 2007 PM 4 T

Paul Maltzer
Environmental Review Officer
1650 Mission St. Suite 400
San Francisco, CA 94103

331 Anza St. Apt. 314A
San Francisco, CA
94118

C_Colli

RECEIVED

OCT 0 1 2007

CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
M E A

September 27, 2007

Paul Maltzer, Environmental Review Officer
SF Planning Department
1650 Mission Street #400
San Francisco, CA 94103

Re: Tuolumne River Water Theft

I speak as a native Californian who has rafted and backpacked in that most beautiful of God's creations, the Sierra, and I speak in opposition to the SF Public Utilities Commission plan to increase the already glutinous amount of river water they are currently removing from this pristine waterway.

This river is not a Utility that falls into Ronald Reagan's view of one of our natural resources---"If you've seen one redwood tree, you've seen them all". 01

Desk-bound bureaucrats who dwell in the forest of numbers, never having engaged in the spiritual communion of the wilderness, do not have the right to rape our environment using false statistics which are based upon predictions of unknown origin to suit their stilted justification.

They have not addressed, with any vision, the ramifications of global warming, which has already motivated the State of California to predict that the Sierra snowpack will be increasingly reduced over the coming years----- 02 the winter of 2006 has recently borne this out.

About 60% of the Tuolumne is already being diverted. Any more diversion will seriously affect the fresh water supply into the SF Bay and surrounding wetlands, thereby threatening the entire Bay Area ecosystem.

Many other cities have already incorporated proven conservation and recycling measures that are saving water resources. For the City that was 03 once recognized as "The City That Knows How"---San Francisco is turning its back on leadership and innovation. Please rethink this dangerous plan of draining our rivers, and think conservation, recycling and efficiency.

Sincerely,
Robert Collin
Robert Collin
147 Temelec Circle, Sonoma, CA 95476

C_Dahli

Lee & Shirley Dahlin
P.O. Box 124
Soulsbyville CA 95372

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SEP 1 3 2007

CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
M E A

September 8, 2007

Paul Maizer
Environmental Review Officer
WS,P PEIR
1650 Mission St., Suite 400
San Francisco, CA 94103

RE: Tuolumne River water to San Francisco

Dear Mr Maizer,

This letter is to state our response to SFPUC/City & Co San Francisco's request to take more water from the Tuolumne River, Tuolumne County, CA.

Allowing any further water allotments on the Tuolumne River would be detrimental to Tuolumne County – Tuolumne County
01 needs the water! Please, do not allow any more gallons of water to go to the San Francisco area.

San Francisco & the area it serves, needs to conserve water as we do here in Tuolumne County – this can be done through education and mandates.

Sincerely,

Leland Dahlin *Shirley Dahlin*
LELAND DAHLIN SHIRLEY DAHLIN

C_Davey

Diana Sokolove <wsip.peir.comments@gmail.com>

Tuolumne River

Jack & Mary Davey <daveymob@sbcglobal.net> **Sun, Sep 9, 2007 at 2:40 PM**
To: wsip.peir.comments@gmail.com

Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Paul Maltzer,

As a San Francisco Peninsula resident, I am greatly disturbed by the proposal of the San Francisco Public Utilities Commission to divert an additional 25 million gallons of water per day from the Tuolumne River. This designated Wild and Scenic River contributes much needed freshwater to the San Francisco Bay and is a valuable asset to our watershed and the Bay Area. 01

Please make sure that the San Francisco Public Utility Commission re-evaluates its proposal and puts its research into finding and encouraging alternative ways of conserving water. This precious river needs to remain as it is!

Respectfully,

Mary Davey, Director Ward 2
Midpeninsula Regional Open Space District.

C_David

Diana Sokolove <wsip.peir.comments@gmail.com>

Tuolumne River Protection

Joel Davidson <joelscottd@earthlink.net> **Mon, Oct 1, 2007 at 8:53 AM**
To: wsip.peir.comments@gmail.com

Paul Maltzer and San Francisco Planning Department,
I am writing as a frequent visitor to Yosemite and user of the crystal, clear water of the Tuolumne river.
I have lived in Palo Alto for the last 37 years. I beg you and the San Francisco Planning Department to protect this pristine, natural treasure through strong conservation efforts and use of recycling water programs rather than increasing water diversion. I am a strong advocate and practicer of conservation in my own water use. I've recently had a personal water audit for my own home which I am happy to say was quite conservative use. I, also, as secretary of my homeowner's association condo complex had a water audit for our complex by the Santa Clara County Water District and we are now in the process of implementing the recommendations from their report. Our water savings and use should allow us significant savings in water and costs. I urge you with all my heart please develop a sustainable water plan and protect our precious water resources. 01
Thank you for your consideration to allow my grandchildren (4) to experience the wild beauty of the Tuolumne River.
Sincerely,
Joel Davidsdon
504 Thain Way
Palo Alto, CA 94306

C_DayL

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SEP 2 0 2007

CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
M E A

Lisa Day
436 Capistrano Avenue
San Francisco, CA 94112

Commissioner Ryan Brooks, President
San Francisco Public Utilities Commission
C/O Sierra Club SF Bay Chapter
2530 San Pablo Avenue, Ste. I
Berkeley, CA 94702

Dear President Brooks,

With its headwaters in Yosemite National Park, the Tuolumne River is a national jewel that is home to an outstanding native trout fishery, bald eagles, black bears, and thrilling whitewater.

Unfortunately, instead of increasing water conservation and recycling efforts, the San Francisco PUC plans on meeting future water demand by taking more water out of the Tuolumne, a federally designated Wild and Scenic River.

I urge you to meet our water needs and protect the Tuolumne River for future generations through conservation and recycling rather than withdrawing more water and depleting the Tuolumne River. 01

The fate of the Tuolumne River rests in your hands.

Sincerely,

[signature]

Lisa Day

12.5-27

C_Dulma

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

save the Tuolumne ecosystem + conserve

Diane <d.dulmage@earthlink.net> **Tue, Sep 18, 2007 at 8:16 PM**
Reply-To: d.dulmage@earthlink.com
To: wsip.peir.comments@gmail.com
Cc: Peter Drekmeier <Peter@tuolumne.org>

Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Paul,

The Tuolumne River already supplies water for 2.4 million people in the Bay Area. This potential increase in water intake from the Tuolumne River threatens further damage to the riparian ecosystem that includes bald eagles, spotted owls, prairie hawk and wild trout. Previous increased withdrawals reduced the chinook salmon population to less than 100 fish. Populations have rebounded back to 18,000 after more water was released into the river. 01

Increased withdrawals from the Tuolumne River may also decrease the amount of freshwater that flows into the San Francisco Bay-Delta Estuary. I was just on the Delta, in the growing town of Pittsburg, and the water doesn't smell too great! Plus, the resulting change in water chemistry in the estuary may threaten the health of this ecosystem that supports 750 species, 18 of which are listed as threatened or endangered. 02

Solutions
Withdrawing more water from the Tuolumne River is not necessarily the only option we have to meet our water needs in the future. One way to add to our water supply is to reduce usage. Although we have already made tremendous progress in conserving water (total water use in the US is the same as it was in 1975), there is the potential for even greater water savings. A study conducted by the Pacific Institute shows that we can save 1/3 of current urban water usage with existing technologies. Simple household retrofits can save the average household 22,000 gallons of water a year. More aggressive conservation techniques can ensure that we have enough water for our ecosystem as well as the human population.

Recycled water is another option that could conserve even more water. By reusing treated wastewater for non-potable sources such as landscape irrigation, toilet flushing and other industrial uses, even less water would be required out of the Tuolumne River. Some golf courses, parks and schools have already started using recycled water for irrigation without any complaints of illness. This drought-proof resource, if expanded, could potentially provide a greater share of non-potable water uses and reduce the stress on our water system. 03

One intriguing new option is desalination of brackish water. Once considered cost-prohibitive, new technologies are making desalination more feasible. The Alameda County Water District recently brought a desalination plant in Newark, which receives slightly brackish water resulting from saltwater intrusion into groundwater thus decreasing the amount of salt that needed to be extracted. Feasibility studies have already been conducted and a proposed schedule has the project completed by December 2009. 04

C_Dulma

Utilizing aggressive water conservation techniques, using more recycled water and constructing desalination plants are all ways of attacking the water supply issue at both the demand and supply ends. These resources may even be more cost-effective in the long run as water saved is water earned. Perhaps, more importantly, these options can ensure a sufficient water supply for the present and future generations without endangering the health of the Tuolumne River and the San Francisco Bay Delta-Estuary ecosystems. 05

Best Regards,

Diane

Diane Dulmage
Consultant, Scientific Certification Systems (although this letter is a personal one)
d.dulmage@earthlink.net

C_Duper

COMMENT CARD

San Francisco Planning Department
Draft Program Environmental Impact Report on the
SFPUC's Proposed Water System Improvement Program
Palo Alto, CA. September 19, 2007

Thank you for participating in tonight's public hearing on the Draft Program Environmental Impact Report (PEIR) for the San Francisco Public Utilities Commission's proposed Water System Improvement Program (WSIP). This is also an opportunity for you to submit written comments on the Draft PEIR for the proposed WSIP.

Written comments will be accepted through close of business on Monday, October 1, 2007. Written comments may be submitted in one of three ways:

1. Leave your written comments in the designated "Comment Box" tonight. These cards are provided for your convenience.
2. Mail your comments by October 1, 2007 to the San Francisco Planning Department, Attention: Paul Maltzer, Environmental Review Officer, WSIP PEIR, 1650 Mission Street, Suite 400, San Francisco, CA 94103
3. E-mail written comments to wsip.peir.comments@gmail.com

CONTACT INFORMATION

Name: Fred Duperrault

Affiliation:

Address: 500 W. Middlefield Rd., #45

City, State, Zip: Mountain View, CA 94043

Phone or E-mail:

WRITTEN COMMENTS Write clearly and continue on back. Use multiple sheets if needed.

Dear Mister Maltzer:

It appears to me, after hearing the comments at the SFPUC hearing in Palo Alto, last week, that it would be wrong to divert an additional 5 million gallons of water from the Tuolumne River each day. Conservation and recycling seems to me to ~~be~~ be the most wiser option. 01

Sincerely, Fred Duperrault

C_Eddy1

Diana Sokolove <wsip.peir.comments@gmail.com>

Inadequate EIR re Tuolumne

Jeb Eddy <jeb@mac.com> **Sun, Sep 30, 2007 at 9:04 PM**
To: wsip.peir.comments@gmail.com
Cc: Peter Drekmeier <Peter@tuolumne.org>

Dear Mr. Maltzer,

I attended and spoke at the public meeting in Palo Alto a few days ago.

THE CASE FOR DRAWING SO MUCH ADDITIONAL WATER from the Tuolumne River IS NOT PROVEN by the simple, almost linear projections based on estimated population growth. 01

YES by all means make SEISMIC protections, as soon as possible. 02

BUT...

WE MUST and CAN and WILL CONSERVE declining water resources, at every point, from the mountains to our fields and taps. MARKETS with PRICES, along with ranges of use, different levels of risk, and other flexible analyses and response mechanisms instead of per capita estimates are essential as we enter times of the greatest challenges man has ever faced. 03

I urge you to greatly reduce the proposed draw-down from the Tuolumne until revised, better quality investigation is done. If and only if a solid case is made should this option be considered further.

Thank you.

Sincerely,

Jeb Eddy
2579 Cowper St.,
Palo Alto, CA 94301
650-327-7091
jeb@mac.com

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SEP 28 2007
CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
M E A

Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

September 24, 2007

Dear Mr. Maltzer,

While it is necessary to safeguard our assurance of continued healthy water supply to the community all possible effects must be weighed carefully.

The environmental review of the San Francisco Public Utilities Commission's plan to take more water from the Tuolumne River fails to adequately identify and address all of the environmental impacts to the River. I urge you to undertake additional studies before finalizing this document. 01 In contrast to other metropolitan areas that have managed to reduce water demand in the face of growth, the anticipated 14% increase in demand projected by the SFPUC is large and out of step for the Bay Area. 02

I support the alternatives identified in your draft document that protect the Tuolumne River from new diversions. Requiring more water conservation, efficiency, and recycling is the best way to lessen impacts on the Tuolumne River while promoting a sustainable water plan. 03 The PEIR fails to properly identify and address all of the impacts of taking more water from the Tuolumne River. This failure largely stems from the lack of an adequate baseline study of the Upper Tuolumne River – a comprehensive study has not been conducted in over 15 years. 04

Only by ensuring that healthy amounts of water continue to flow into the Tuolumne River can we protect this irreplaceable natural treasure.

With sincerest intentions,

Elaine Elbizri
2515 Greer Road,
Palo Alto
CA 94303

Benjamin L. Farnum, D.D.S.
1420 Phelps Ave.
San Jose, CA 95117

10-1-07

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OCT 03 2007

CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
M E A

Mr. Paul Maltzer
S.F. Planning Dept.
1650 Mission St. Suite 400
San Francisco, CA 94103

Dear Mr. Maltzer,

I am very disturbed to hear that S.F. water plans involve taking more water from the Tuolumne River. Why not do what Los Angeles did when the courts told them they had to limit water withdrawal from the Mono Basin. See page 6 - Mono Lake Newsletter - Fall 07 - enclosed.

I have never heard or read of any water conservation in San Francisco. My county (Santa Clara) supplies free low flow shower heads + faucet aerators (see Sierra Club insert Vol 27 # 10 enclosed. It's just an example of what can be done. 01

If Los Angeles is using the same amount of water they used thirty years ago and they have 4 million people, I'd say that's pretty darn impressive! Why can't S.F. and other users of Hetch Hetchy water do the same (or better)?

Thank you for reading this note and for considering my suggestions.

Ben Farnum D.D.S.

e-mail <scooterben@sbcglobal.net>

12.5-30

C_Farnu

Statewide water droplets

by Geoffrey McQuilkin

DWP's Nichols departs

In July, Los Angeles Department of Water & Power (DWP) Commissioner Mary Nichols was appointed by Governor Schwarzenegger to chair the California Air Resources Board. As a result she has resigned from the DWP Commission. Her leadership skills will be of great benefit in Sacramento, where her new duties include implementing California's landmark global warming legislation.

Nichols had been the Commission's point person on Eastern Sierra matters and the leader of conceptual discussions about how DWP land holdings in Mono County might receive a guarantee of remaining open space (see page 7 for more). Commission Chair David Nahai will now fill that role and continue these discussions, commenting: "We remain resolutely committed to the protection and preservation of DWP lands in Mono County, to the ongoing fulfillment of all environmental standards, and to the continuing improvement of our relationship with Mono County and its residents."

Recycled water legislation AB 1481 advances

Recycled water projects are critical tools for Los Angeles to control water use. Important legislation (AB 1481) authored by Assemblyman De La Torre would standardize permitting requirements for use of recycled water for landscape irrigation.

Committee Executive Director Geoff McQuilkin testified in support of this legislation earlier this year and the bill is currently in the final stages of development in the State Senate. DWP officials hope to quickly increase use of recycled water—thus offsetting use of fresh Sierra water—if the new procedures take effect.

Water Board sees recycled water as critical

The State Water Resources Control Board will be promoting use of recycled water through a new policy due out this fall. The draft policy explains why recycled water use is in the best interest of the state and how Regional Water Boards can write permits to encourage use of recycled water while assuring the public that human health and the environment will be protected. At its center, the policy proposes the development of groundwater basin management plans to determine how increasing salts from all waters, not just recycled water, will be monitored and treated.

State Water Board members Gary Wolff and Frances Spivy-Weber have taken the lead in developing this policy. Spivy-Weber notes that the policy is particularly important in light of recent dry conditions in the Sierra and the West, increasingly dire predictions of hydrologic uncertainty in the future due to climate change, and the rising cost of energy to deliver imported water to Southern California. Further details are available at *www.waterboards.ca.gov*.

Los Angeles tops four million

Los Angeles' population grew by more than 37,000 people last year, state demographers reported this past summer. That pushes the city population to just over four million people. Los Angeles is still the country's second-largest city (New York City is first).

How do all those Angelinos get their water? Mono Lake supporters well know that the Eastern Sierra provides a tremendous amount of water to the city of Los Angeles. But take heart: through cutting edge conservation and reclamation programs—many of them advocated and supported by the Mono Lake Committee—the city is using the same amount of water it did thirty years ago despite the population increase. ❖

Geoff McQuilkin is the Committee's Executive Director. He saw his youngest daughter Ellery off to her first day of preschool this fall.

Mono Lake parcel from page 3

owned by MMSA includes all property portions west of Highway 395, including the existing structures and virtually all of the proposed subdivision sites. Recognizing the critical importance of this property, MMSA paid a premium of a half million dollars—and spent untold hours in lengthy negotiations. The final sale price was $4 million; a recently updated appraisal valued the land at $3.5 million. All the development rights associated with the property have transferred to MMSA.

This is the second time MMSA has taken ownership of the property. However this time there are no options or buyback clauses that would allow the Cunninghams to regain ownership in the future.

Mono Lake supporters familiar with this issue will note that 10% of the property remains under the ownership of the Cunninghams. This sliver of land is located east of Highway 395, between the highway and the boundary of the Mono Lake Tufa State Reserve. The Cunninghams' goals for the land are unclear, but rumor has it that they may seek to pursue a shaky claim of ownership to State Reserve lands.

12.5-31

C_Farnu

Farnum. Ben

1420 Phelps Av
San Jose CA 95117-3645

Volume 27, Issue 10 **October 2007**

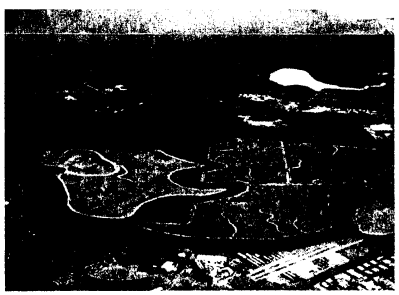
Monthly Meeting Information

When: THURSDAY Oct 11th 7:30pm
GRG General Meeting
Saratoga Library Community Room

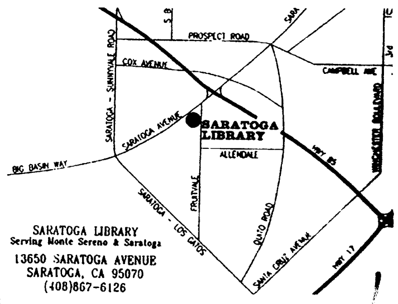
Salt Pond Restoration in San Francisco Bay
Clyde Morris, Refuge Manager,
Don Edwards San Francisco Bay NWR
U.S. Fish and Wildlife Service

Topic: The restoration of 15,000 acres of former Cargill commercial salt ponds for wildlife habitat

www.southbayrestoration.org
www.fws.gov/desfbay/AboutSF.htm



The Loma Prieta Chapter of the Sierra Club has been actively involved in the planning process for how the salt ponds will be restored. Of particular note is the possibility of increasing tidal marsh habitat for the endangered species: clapper rail and salt marsh harvest mouse.



Being Green – by Bob Groff

Water has been in the news again. Water rates are going up and the snow pack in the Sierra, where our water comes from, is going down. Using less water is becoming a must. There are some simple things you can do to save water. Putting in low-flow shower heads and faucet aerators will save water and you can get them free in Santa Clara County by calling the Water Conservation Hotline at (408) 265-2607, ext 2554. You can also schedule a free Water-Wise house call in Santa Clara County by calling 1-800-548-1882. In San Benito, call (831) 637-4378 for free showerheads, faucet aerators, and appointments. San Benito will even install the devices for you. There are also rebates for replacing your water thirsty lawn with drought tolerant plants and for upgrading specific items. Call the above numbers for more information. Give it a try. It is up to each one of us.

These steps could be taken by San Francisco.

Calendar

C_Fenwi

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

Approve PEIR

FenwickJan@aol.com <FenwickJan@aol.com> **Sun, Sep 30, 2007 at 11:48 PM**
To: wsip.peir.comments@gmail.com

Paul Maltzer, Environmental Review Officer:

Being an "environmentalist" I am very concerned about our water future and misinformation that Peter Drekmeier and the Tuolumne RiverTrust are putting forth. I understand that the comment period for the PEIR closes at 5 pm on Monday.

Some points below refute what the TRT is saying:

For example, the voluntary 10% water conservation program in the SFPUC service area (including BAWSCA) has achieved a 13 % reduction in water demand in the last six months according to Susan Leal, and as reported at the BAWSCA meeting last Thursday night. Drekmeier was there. -- No mention of this in his Monday letter, because it doesn't suit his objective--- "an inconvenient truth". Also the River is not a 162 mile river that "Cascades", most of it meanders through the Central Valley, and only about 27 miles of it (in the Canyon) is designated "Wild and Scenic". Another point (not mentioned): the proposed SFPUC diversion from the Tuolumne is but 8/10 of one percent more of the average river flow." (SFPUC currently diverts about 12%. So they would be diverting about 12.8%). "Modesto and Turlock are the big water diverters, but TRT cannot get any traction with them and San Francisco is a much better target, and is in line with the legacy of John Muir. ... If we have a big recession, or if more conservation is achieved, the need may be even less. Meanwhile, if we have a big earthquake we could be out of water with catastrophic impact on a scale that matches or exceeds the Katrina impact on New Orleans. The legal challenges by NRDC and decision by Federal Judge Wanger regarding Delta pumping, places even more reliance on Hetch-Hetchy for an assured supply to the peninsula and East Bay. 01

Finally, he (Peter) states that the SFPUC's plan to increase diversions will delay the seismic improvements and result in cost overruns. What he does not say is that the TRT will sue San Francisco unless it drops the diversion plan. This threat was made in the BAWSCA meeting last Thursday. The effect of a lawsuit (standard environmental practice) is to delay the program, but the intervenors have no accountability or responsibility for adverse consequences."

Thus, my concern. It has taken the SFPUC YEARS to get to this point. We MUST move forward with the seismic upgrades. Thank you ! Jan Fenwick Past Board member of the Purissima Hills Water District.

C_Field

Diana Sokolove <wsip.peir.comments@gmail.com>

Don't take more water from the Tuolumne!

David Fielding <dhfielding@mindspring.com> **Mon, Oct 1, 2007 at 1:38 PM**
To: wsip.peir.comments@gmail.com

Please stop the draining of the Tuolumne River .... NOT necessary with proper conservation! 01

Thank you.

David Fielding

C_Fiore

Diana Sokolove <wsip.peir.comments@gmail.com>

NO Tuolumne River destruction to sell to wasteful East Bay water hogs and sprawl

1 message

JEFiore@aol.com <JEFiore@aol.com> **Mon, Oct 1, 2007 at 9:33 PM**
To: wsip.peir.comments@gmail.com

San Francisco is not in the business of selling water to hogs in the East Bay. I am ashamed of my city that we would even be considering such destructive, unethical, illogical, inappropriate actions. 01
John and Janet Fiore

****
See what's new at http://www.aol.com

C_Flani

To Commissioner Ryan L Brooks, President
SFPUC

I understand the SFPUC plans on meeting future water demand by taking more water out of the Tuolumne, a Federally designated Wild & Scenic River.

Why not meet water needs & protect the Tuolumne River for future generations through conservation & recycling? 01

Sincerely,

M. Flanigan
1501 Leavenworth St #12
SF Cal 94109

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C_Flemi

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Sierra Club

Please protect the rivers —
We need our rivers and our water. 01

E. Fleming-Hasegawa

Thursday, September 27, 2007

Kirsten Flynn
471 Matadero Ave.
Palo Alto, CA 94306

Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Maltzer,

I do not support the current environmental review of the S.F. Public Utilities Commission's plan to divert more water from the Tuolumne River. This river is an asset to the state as it is, offering recreation opportunities to the citizens of California, 01
habitat to native species, and fresh water to our own Bay Delta system. Decreased snow pack from drought years is already affecting the flow of this river, we cannot afford further diversions.

However I was very pleased to see some of your alternative suggestions: requiring conservation efforts, increased efficiency and water recycling. The reality is that we will have to do these things anyway, as population grows. Let's get our water 02
consumptive culture thinking about conservation sooner rather than later. I would strongly support this kind of effort.

Enough is enough, it is time to prioritize the health of our Wild and Scenic rivers, and stop whittling away the water that flows through these watersheds. They are one of the legacies of this great state and should be treasured and protected.

Thank you for your attention to this letter.

Yours sincerely,

Diana Sokolove <wsip.peir.comments@gmail.com>

Personal Tuolumne perspective

Peter Fox <peter@peterfoxphotography.com> **Tue, Sep 25, 2007 at 1:17 PM**
To: wsip.peir.comments@gmail.com
Cc: Peter Drekmeier <pdrekmeier@earthlink.net>

Dear Mr Maltzer;

The day the Tuolumne was designated Wild and Scenic is very clear in my memory. I was guiding on the river that day. The crystal water and dramatic canyon seemed especially beautiful.

My perspective on the Tuolumne comes from two points of view. I am a Palo Alto home owner who enjoys the pristine water that comes out of my tap. I also have an intimate knowledge of the river, having guided it's white water for 27 years. It is hard to put the value of a wild river into hard facts and figures. There are few things that really change people in this world. I have seen hundreds of people changed by just a day or two on the Tuolumne. In an America more and more dominated by concrete shopping canters and corporate franchising, it is essential to
maintain the resources where nature can touch a person's life. There is very little that accomplishes this, like a white 01
water river; and there are very very few rivers that can be compared to the Tuolumne. The complexity of it's rapids, the isolation of the canyon, and the sheer beauty of the river itself make running it an experience that few forget.

Our Bay Area community, and our world need more resources like the Tuolumne river, where we experience something that make us all a little more humble and appreciative of the fragile natural world that is our home. One can lecture about global warming and the need to protect our environment. My experience, is that the Tuolumne river speaks for itself and for this world with an eloquence that is more persuasive than anything we can say.

Thank you,

Peter Fox

Peter Fox
peter@peterfoxphotography.com
w.650-324-4664

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

Protect The Tuolumne River Through Conservation

Yogabear23@aol.com <Yogabear23@aol.com> **Sat, Sep 22, 2007 at 1:19 PM**
To: wsip.peir.comments@gmail.com, bill.young@sierraclub.org
Cc: mikebuczek@netscape.net, mikimcal@yahoo.com, Yogabear23@aol.com, rabbitbluemusic@yahoo.com

September 22, 2007

Mr. Paul Maltzer
Environmental Review Officer, WSIP PEIR
San Francisco Planning Department

Dear Mr. Maltzer,

Please act to protect the Tuolumne River for future generations by requiring water conservation, efficiency, and recycling, **instead of taking more water from this river.**
The SFPUC should re-evaluate its projections for future water demand and conservation potential for these reasons:

- The PEIR uses flawed modeling to determine the anticipated increase in water demand, thus inflating projected future needs. Other metropolitan areas (especially Seattle and Los Angeles) have managed to reduce water demand even in the face of growth. 01
- The PEIR fails to properly address all of the impacts of taking more water from the river because it lacks an adequate baseline study. A comprehensive study has not been done for 15 years, and a current study will not be completed in this review period. 02
- The PEIR does not take into consideration the impact of climate change on precipitation in the Tuolumne River watershed. 03

Decreasing reliance on the Tuolumne is critical not only for protecting the health of the River, but also for preparing for the future uncertainty of the Sierra snowpack due to global warming.

Water conservation and efficiency measures are the cheapest, easiest, and least destructive ways to meet demand and extend supply.

Respectfully, Caroline Garbarino, Technical Editor, Palo Alto, CA.

Dear Planning Commission,

Please make meetings available to people, by meeting after working hours.

I wanto to express my opinion about taking more water from the river. I want to express my total oposition to the PUC taking additional water from the tuolumne River.
no more water! 01

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SEP 20 2007
CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
M E A

Ruben Garci
620 Joost Ave
San Francisco, 94127
Global Exchange

Diana Sokolove <wsip.peir.comments@gmail.com>

Tuolumne River

Marylyn Genovese <marylyn23@sbcglobal.net> **Sat, Sep 29, 2007 at 6:29 PM**
To: wsip.peir.comments@gmail.com

To: Paul Maltzer, Environmental Review Officer
San Francisco Planning Department

Your environmental review of the San Francisco Public Utilities Commission's plan to take more water from the Tuolumne River fails to adequately identify and address all of the environmental impacts to the River. I urge you to re-evaluate the projections for future water demand and conservation potential and to undertake additional studies before finalizing this document. 01

I believe that decreasing reliance on the Tuolumne is critical not only for protecting the health of the River, but also for preparing for the future uncertainty of the Sierra snowpack as a result of global warming. 02

I support the alternatives identified in your draft document that protect the Tuolumne River from new diversions. Requiring more water conservation, efficiency, and recycling is the best way to lessen impacts on the Tuolumne River while promoting a sustainable water plan for the Bay Area.

Sincerely,

Marylyn Genovese
463 Forest Ave.
Palo Alto, CA 94301

Ernest Goitein
167 Almendral , Atherton, California 94027

October 14, 2007

Paul Maltzer, Environmental Review Officer
Water System Improvement Program PEIR
San Francisco Planning Department

Subject: Tuolumne River

Dear Mr. Maltzer:

Section 5.3 of the PEIR relates to the Tuolumne Watershed. The maps, tables and flow data are informative and are a great resource to get a better understanding of the complex hydrological and meteorological interactions and their effect on the biological resources in the watershed.

The additional water diversion from the Tuolumne River will have a significant effect, as is summarily acknowledged in the slide show presentation (#17, 21 & 22). 01
Since these effects are irreversible and, since there are other means of obtaining sustainable water supply for the SF Bay Area, further diversion from the Tuolumne River is not an acceptable solution.

I urge that other means be considered. For example, conservation; water recycling/gray water use; reduced water allocation to certain agricultural crops; price structures reflecting higher cost for excessive consumption; encouraging composting toilets where appropriate; changes in the Uniform Building Code to require separate plumbing for gray water; incentives for planting drought resistant gardens. I am sure there are many more creative ideas that should be considered. The natural resource of the Tuolumne must not be sacrificed or reduced in any way. The River is our heritage. 02

Cordially,

Ernest Goitein

C_Goldf

Diana Sokolove <wsip.peir.comments@gmail.com>

Tuolumne River environmental review

Kass <vz22@yahoo.com> **Tue, Sep 25, 2007 at 11:19 AM**
To: wsip.peir.comments@gmail.com

(Date)

Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Maltzer:

I support the alternatives identified in your draft document that protect the Tuolumne River from new diversions. Requiring more water conservation, efficiency, and recycling is the best way to lessen impacts on the Tuolumne River while promoting a sustainable water plan for the Bay Area.

Please note that I believe guidance for water conservation should be in terms of absolute use as well as percentages. Recent requests to reduce water usage by "20%' in the Bay Area does not adequately recognize those of us who have never stopped conservation of water since the last drought. My water usage today is almost alway less than the 100 gal per day (including sprinklers) recommended at the heighth of the last drought, due to xeriscaping and changing personal habits to permanently reduce water usage. It is half that in the winter. If everyone did the same, then there would be no need to take more water from the Tuolumne, even if population increased. 01

Please do a more thorough environmental review of the San Francisco Public Utilities Commission's plan to take more water from the Tuolumne River. The initial review fails to adequately identify and address all of the environmental impacts to the River, the Delta and the San Francisco Bay. I urge you to undertake additional studies before finalizing this document. 02

Only by ensuring that healthy amounts of water continue to flow into the Tuolumne River and the SF Bay can we protect this irreplaceable natural treasure.

Best wishes,

Kathleen M. Goldfein
3163 Alma Street
Palo Alto, CA 94306

12.5-37

C_Goodm

Diana Sokolove <wsip.peir.comments@gmail.com>

Protecting the Tuolumne River

Rebecca <arrbecca@yahoo.com> **Wed, Sep 26, 2007 at 6:00 PM**
To: wsip.peir.comments@gmail.com

Dear Mr. Maltzer,

As an environmentally conscious San Francisco resident, I appreciate your recent review of the PUC's plan to withdraw more water from the Tuolumne River. However, I encourage you to delve further into the issues at hand before making any final decisions. 01

Before taking more water out of this valuable resource, it is essential to consider both the habitats and marine life of this river. Whereas there are alternatives to increased water extraction, such as water recycling and conservation, the Tuolumne animals and habitats have no choice but to be subject to our decisions. 02

Please consider the big picture and make the right decision. The Bay Area is lucky to be home to some important and wonderful resources. Let's keep it that way.

Sincerely,
Rebecca Goodman

C_Grave

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

Tuolumne River Environmental Review

Ben Graves <bgraves@stanford.edu> **Thu, Sep 27, 2007 at 3:51 PM**
To: wsip.peir.comments@gmail.com

Sept. 27. 2007

Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Maltzer:

Your environmental review of the San Francisco Public Utilities Commission's plan to take more water from the Tuolumne River fails to adequately identify and address all of the environmental impacts to the River. I urge you to undertake additional studies before finalizing this document. 01

I support the alternatives identified in your draft document that protect the Tuolumne River from new diversions. Requiring more water conservation, efficiency, and recycling is the best way to lessen impacts on the Tuolumne River while promoting a sustainable water plan for the Bay Area. With some of the leading educational, social and political institutions in the US, if not the world in our area, other metropolitan areas look to San Francisco for guidance, leadership and inspiration. Let us continue to lead the way by working together to set a precedent for sustainable resource management. Any investment in the conservation of natural resources such as energy and water will pay-off in the long run and ensure our ability to compete and succeed in the world market, not to mention a healthy and beautiful place for future generations to raise their families. 02

Sincerely,

Ben Graves
3504 Hillcrest Dr.
Belmont, CA 94002

--
   /\   Ben Graves
  /=\./\   Stanford University 2007
 /-=-\=_ Tel: 650-773-2125

C_GreenD

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

SFPUC proposal to divert more water from Tuolumne River

David Greene <dg@bayarearesearch.org> **Tue, Sep 11, 2007 at 1:28 PM**
To: wsip.peir.comments@gmail.com

Dear Paul Maltzer,

A brief note in support of the environmentalists' campaign for SFPUC to re-evaluate its projections for future water demand and conservation, and to determine the potential for conservation and 01
efficiency savings. They should adopt a policy of REDUCING diversions 02
from the Tuolumne River over time, not increasing them. It's long overdue for our water management policies to take into account the impact of climate change on precipitation in the Tuolumne River 03
watershed. Conservation and efficiency should be our primary policy focus for a more sustainable water management future. 04

Best regards,

--
David Greene
3144 David Avenue
Palo Alto CA 94303
phone 650 493-4425
dg@BayAreaResearch.org

C_GreenK

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

Tuolumne River under consideration for further diversion

Greene, Kat <Kat_Greene@intuit.com> **Fri, Sep 21, 2007 at 2:57 PM**
To: wsip.peir.comments@gmail.com

Mr. Malzer,

I learned that the river is being considered for further diversion for human water consumption. This deeply concerns me. Over half the water from this river is already diverted, having far-reaching consequences on the habitat it used to supply. I'd like to see reference to studies which show decreases in mammals, reptiles, and flora since the diversion began.

Please consider conservation and other methods of using what we have before taking more water away from the islands of wildlife we have left. Please revisit your study. I think there are important pieces missing. 01

I hope as a steward of public resources that you will represent my thoughts on this matter.

Thank you for your consideration,

Katherine Greene

C_Gross

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SEP 20 2007
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PLANNING DEPARTMENT
MEA

9/20/07

Dear Board of SUPERVISORS:

I am writing Today to prevent more water from being taken from the TUOLUMNE RIVER. Instead I urge you to increasing water conservation and recycling programs, This is a far better, The alternative to allowing 60% of The Rivers water to be sent to feed more lawns and Urban sprawl across The EAST BAY. By pursuing a plan to divert additional water from the TUOLUMNE RIVER The SF PUC risks delaying their Capital program causing cost overruns, and failure to increase the reliability of the water supply. 01

Thank you

Andrew J. Gross

ANDREW J. GROSS

Tel. 415-673-9381

Addr 1355 PINE ST. SF CA 94109

C_Hacka1

Bob Hackamack
PO Box 1886
Twain Harte CA 95383-1886
October 1, 2007

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PLANNING DEPARTMENT
MEA

Mr. Paul Maltzer, Environmental Review Officer, WSIP PEIR
San Francisco Planning Department
1650 Mission St, Suite 400
San Francisco CC 94103
wsip.peir.comments@gmail.com

The Planning Department Draft PEIR for the SFPUC WSIP provided much information, but not enough on five questions:

I ask that the San Francisco Planning Department to expand the discussion in the PEIR for the impacts on San Francisco's numerous water rights on the Tuolumne River[1] of the SFPUC establishing a temporary or permanent policy for reduction in diversion from the Tuolumne River every year by using other measures[2] for reducing demand to the present average annual export[3] to reduce the hardship of rationing on their customers during drought[4]. 01

For the same question, discuss the impact of export reduction from the Tuolumne River on the operation under the Raker Act[5].

For the same question, discuss the impact of the Lower Tuolumne Diversion[6] on San Francisco's water rights. 02

For the same question, discuss the impact of the Lower Tuolumne Diversion[6] on the operation of the Raker Act[5].

For the same question, discuss the impact of the Lower Tuolumne Diversion[6] on the operation of the four agreements among SF, TID, and MID[7]. 03

Also, discuss the impact of lowered flow in the lower Tuolumne River on recreational activities of boating, duck hunting by boat, bass fishing by boat and from shore, and swimming and picnicking at the Stanislaus County parks and fishing accesses[8]. 04

Please note that the "improving and enlarging the Lower Cherry Aqueduct"[9] may not be provided for in Raker Act documents and a full EIR is requested. 05

Footnotes:
1. PEIR Section 2.5.1
2. PEIR Section 9.2.4, conservation, water efficiency, recycling, ground water, conjunctive use in the service area, other than purchase; Section 8.3.3, desal in the service area or nearby; and ground water banking in counties outside the service area
3. PEIR Figure 2.4, p 2-18, 82% of 265 mgd = 217 mgd in your base year for the PEIR of 2005
4. PEIR Figure 2.5, p 2-19 "up to 25%"
5. PEIR Section 2.4.2 and p 2-37
6. PEIR p 9-60 through 62
7. PEIR Section 2.5.2
8. PEIR p 6.4.2, p 6-51; and 5.7-38
9. PEIR p 5.7-6

Bob Hackamack P.E.

C_Hacka2

Bob Hackamack
PO Box 1886
Twain Harte CA 95383-
1886

October 15, 2007

Mr. Paul Maltzer, Environmental Review Officer, WSIP PEIR
San Francisco Planning Department
1650 Mission St, Suite 400
San Francisco CA 94103
wsip.peir.comments@gmail.com

Mr. Maltzer:

I appreciate the extra review time to make comments on the DPEIR for the WSIP. The Planning Department Draft provided much information, but not enough on the Raker Act compliance.

The Raker Act portions of the PEIR, Section 2.4.2 page 2-33 & 4, and Section 2.5.1 page 2-37, or elsewhere do not address the question I raised in the scoping meeting in October 2005 relating to the requirement that the City develop local supplies before diversion from the Tuolumne River as stated in Section 9(h) of the Act. Specifically, the WSIP is not developing the full amount of ground water, stressing water efficiency adequately and planning little recycling of waste water for cooling and landscape purposes as is required by the Act. Developing desal alone is not adequate compliance. Please discuss plans for compliance with this requirement in the City and in the service areas. 01

C_Hall

Diana Sokolove <wsip.peir.comments@gmail.com>

Tuolumne River Water Plan - comment

Diana Hall <dianahall39@yahoo.com> **Mon, Oct 15, 2007 at 8:55 AM**
To: wsip.peir.comments@gmail.com

Attn: Paul Maltzer

I urge you to support an environmentally sustainable plan for Tuolumne River usage that emphasizes conservation and recycling. Taking more water from the Tuolumne will be detrimental to wildlife and the natural environment as a whole. 01

More efficient water use and a more diverse mix of water supplies would also minimize the risks associated with a shrinking snowpack that is expected as a result of climate change. 02

Let's safeguard the Tuolumne River for future generations.

Diana Hall

812 Calderon Ave.

Mountain View CA 94041

C_Hamil

San Francisco Public Utilities Commission
+ San Francisco Planning

Sept. 20, 2007

I write the following as I was not able to return and speak before the board.

I can appreciate the San Francisco Public Utilities Commission's necessity to plan for future water needs. However, I do not agree with the proposal to divert an additional 25 million gallons a day from the Tuolumne River.

Since it appears that outdoor water use drives 60% of the anticipated increase in water demand, I urge water conservation as the top priority for meeting future water needs. Water conservation is cheap, relatively easy and much less destructive to the environment.

The Bay Area drastically lags behind other metropolitan areas when it comes to water conservation. I believe if a vast metropolis such as Los Angeles is able to implement conservation measures so that a precious body of water known as Mono Lake is allowed to recover from near extinction, then the Bay Area, a region known for strong environmental ethics, certainly has the capacity to be a leader in water efficiency and conservation in order to protect the health of the Tuolumne River. 01

Diversion of additional water from the Tuolumne River is destructive to the environment, wasteful and irresponsible. Again, let me stress, **conservation** is the key to he health of the Tuolumne River, and to the future water needs of the Bay Area,

Thank you,

Kimberly Hamilton-Lam
840 26th Ave.
San Francisco, CA 94121
415-668-8740

RECEIVED
SEP 20 2007
CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
M E A

C_Hanke

Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

RECEIVED
SEP 26 2007
CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
M E A

Sept. 25, 2007

Dear Mr. Maltzer,

I am strongly opposed to the plan for more water diversion from the already heavily impacted Tuolumne River. Approximately 60% is currently diverted for urban and rural use. Continuing to take more from the river seems to violate its 1984 designation as a Wild and Scenic River. 01

Bay Area residents need to become water conscious and realize the urgency to be much more efficient in outdoor water use. I understand that 60% of the new diversion is targeted for that purpose. We fall far behind other California metropolises in water conservation. 02

The Tuolumne River is the main tributary to the San Joaquin River flowing into the San Francisco Bay-Delta. The Delta is already under stress, and more diversion of fresh water could cause serious damage from the invasion of salt water, disrupting the estuarine ecosystem. 03

I support the alternatives proposed in your draft document that protect the river from new diversions. I urge you to protect the magnificent Tuolumne River. 04

Sincerely,

Carol Hankermeyer

Carol Hankermeyer
Environmental Educator

C_Helld

8/15/07

Dear Commissioner Brooks,

With so many water conservation technology, with a water ~~[illegible]~~ crisis already at hand in California, why would you take water from the Tuolumne, especially to water lawns? Clean water used for watering lawns? Believing that we can ~~take~~ keep taking water from rivers such as the Tuolumne is insane. Rivers are not permanent sources of water, especially, as I said before, for watering lawns, which can easily be ~~[illegible]~~ watered with previously used water. On top of the sheer stupidity that the ~~sheer~~ thought of this ~~products~~ project emmits, it is also a waste of money. Money that could easily be used for more practical purposes such as the constantly growing homeless problem that areas such as San Francisco face. So, please rethink your views on this ~~subject~~ project and realize the idiocy of this water plan. 01

Sincerely
alex Helldorfer

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PLANNING DEPARTMENT
M E A

C_Henry

RECEIVED

SEP 20 2007

CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
M E A

3:15 p.m.

Dear Commissioner Brooks.

Taking water that keeps our wildlife thriving is a preposterous idea. Taking water from the animals and plants that rely on this river as a source of life. The animals and plants along the beautiful banks of the Tuolumne River need the water more than people who need to water their lawns. The right choice would be to let the nature be. Make the right choice. 01

Sincerely

Leah Henry

C_HerroK

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

Water grab from Tuolumne River

kghcool@aol.com <kghcool@aol.com> Tue, Sep 25, 2007 at 6:20 PM
To: wsip.peir.comments@gmail.com

Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Maltzer:

My name is Kristin and I am very concerned with the possibility of a taking more water out of the Tuolumne River. The environmental impacts that would occur as a result of the extra water being diverted, far out weight the need for more lawns and suburban sprawl across the East Bay, which is where 60% of the water would be sent to. I think that this is a huge mistake and a problem that has many other possible solutions. You should instead focus your efforts on increasing water conservation and recycling programs. This is a far better alternative for the river, the environment, the wildlife, our cities, and us. I truly hope that you take all of the public's comments into serious consideration before you make a horrible decision that would affect all walks of life for generations to come. 01

Sincerely,

Kristin Herron
310 Esplanade Ave. # 70 Pacifica CA
94044

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

tuolomne river future--please save this river

Christopher Hest <kayakasia@yahoo.com> **Tue, Oct 16, 2007 at 12:06 PM**
To: wsip.peir.comments@gmail.com

I write in hopes of persuading you and others to drop the plans to increase water takes from the Tuolomne. The T is already at risk of losing its unique status in California's natural heritage and I think that the evidence submitted by DFG and other concerned parties should rule out further diversions. Please let's all save this incredible resource for all Californians. 01

Christopher Hest
64 Carmel Street
San Francisco CA 94117

Paul Maltzer/CTYPLN/SFGOV
09/25/2007 09:29 AM

To Diana Sokolove/CTYPLN/SFGOV@SFGOV
cc
bcc
Subject Fw: the Tuolumne

----- Forwarded by Paul Maltzer/CTYPLN/SFGOV on 09/25/2007 09:29 AM -----

Sidney Higgins <slensal@gmail.com>
09/20/2007 04:09 PM

To paul.maltzer@sfgov.org
cc
Subject the Tuolumne

Dear Sir, Only a friggin' idiot would think of taking more water from the Tuolumne River, or from any other river. HULLO! More conservation, conservation, conservation!!!!!! Be part of the solution, not the problem. Leave the Tuolumne alone. Sincerely, a water conserver in Los Angeles, Sidney Higgins 01

Diana Sokolove <wsip.peir.comments@gmail.com>

Draft Program EIR re SFPUC's Water System Improvement Program

Jeff Hoel <jeff_hoel@yahoo.com> **Mon, Oct 1, 2007 at 1:10 PM**
To: wsip.peir.comments@gmail.com
Cc: jeff_hoel@yahoo.com, kcapone@sfwater.org

San Francisco Planning Department
Attention: Paul Maltzer, Environmental Review Officer
WSIP PEIR
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Maltzer:

Here are my comments about the WSIP DPEIR
(San Francisco Planning Department File No. 2005.0159E,
State Clearinghouse No. 2005092026).

In general, the DPEIR is written to cover the possibilities that SFPUC's treated water could contain either chlorine or chloramine as the residual disinfectant; but occasionally it fails to mention both possibilities. Is it SFPUC's intent to have covered both possibilities consistently? 01

Does SFPUC believe that for the WSIP described in the DPEIR, there would be more environmental impact if chloramine were the residual disinfectant than if chlorine were the residual disinfectant? If not, why not? If so, would SFPUC be willing to switch from chloramine to chlorine, at least for the duration of the WSIP construction projects?

Thanks very much.

Jeff

Jeff Hoel
731 Colorado Avenue
Palo Alto, CA 94303

PS: Please see my more detailed comments and questions below. Thanks.

PPS: I became a member of Citizens Concerned About Chloramine (CCAC) on 9-26-07, and I have been attending their meetings for a while. I agree with their point of view that SFPUC shouldn't be using chloramine as a residual disinfectant until scientific human health studies can show it's safe. This message is from me personally, and does not necessarily represent the views of CCAC.

==

Detailed comments and questions:

6-29-07 (updated 7-6-07):
"Public Notice: Availability of Draft Program Environmental Impact Report"

<http://sfwater.org/detail.cfm/MC_ID/13/MSC_ID/167/C_ID/3512/ListID/6>

The above webpage says the DPEIR can be viewed online here:
<http://www.sfgov.org/site/planning_index.asp?id=37672>

The DPEIR mentions "chloramine" or "chloramines" or "chloramination" in these sub-documents:
(Google "site:www.sfgov.org/site/uploadedfiles/planning (chloramine OR chloramines OR chloramination)" 10 hits.)

Glossary:
<http://www.sfgov.org/site/uploadedfiles/planning/vol1_glossary_wsip-dpeir.pdf>

No comments or questions.

Chapter 2:
<http://www.sfgov.org/site/uploadedfiles/planning/vol1_ch2_wsip-dpeir.pdf>

No questions or comments.

Chapter 3:
<http://www.sfgov.org/site/uploadedfiles/planning/vol1_ch3_wsip-dpeir.pdf>

Table 3.12 mentions that project SF-2 has this operational change:

> Increased chlorination or chloramination supplies during drought years only, ... 02

Why? (If SFPUC is providing less water, as it does in a drought, why does it need more supplies?)

Chapter 4, Sections 4.1 to 4.5:
<http://www.sfgov.org/site/uploadedfiles/planning/vol2_sec4-1_to_4-5_wsip-dpeir.pdf>

Page 4.5-17:

> Discharge of Chlorinated Water
>
> Because chlorine is toxic to aquatic life in both freshwater and saltwater, the SWRCB considers that every discharger that uses chlorine has the potential to cause acute toxicity due to total residual chlorine (TRC) in freshwater and chlorine-produced oxidants in saltwater.

SWRCB thinks chloramine is even worse: 03
<http://www.swrcb.ca.gov/rwqcb2/Agenda/08-9-06/08-09-064eosr.doc>
"... chlorine toxicity to aquatic life persists longer in chloramine-treated water."

Page 4.5-21:

> In general, implementation of the WSIP projects would not have direct long-term effects on the hydrology or water quality of regional and local surface waters. However, short-term

construction impacts could result in erosion or sedimentation or discharge of construction-related pollutants to local water bodies, causing water quality effects.

Could short-term construction impacts also result in discharge of chlorinated or chloraminated water (which might not be classified as a construction-related "pollutant" per se)?

Operation of some projects could also result in the discharge of chlorinated or chloraminated water, treated stormwater, or recycled water to water bodies, causing potential water quality effects.

Why "potential"? *If* water is discharged, aren't the water quality effects actual?

I have the impression that chloraminated water would have a worse environmental impact than chlorinated water, because chlorine dissipates from water more readily than chloramine and because chloramine is typically used at a higher concentration than chlorine. Does SFPUC have that impression too? Is it relevant to the DPEIR? Did SFPUC consider the possibility of switching its residual disinfectant from chloramine to chlorine during construction (and/or subsequent operation!) to minimize environmental impact of discharges, both accidental and unavoidable?

Page 4.5-32:

... the following action pertaining to dechlorination of water prior to discharge would be implemented as part of the WSIP projects....

03 cont.

What does this mean if the residual disinfectant is chloramine?

Page 4.5-42:

While both chlorine and chloramine are effective disinfectants for potable water,

This dependent clause is misleading. Chlorine is orders of magnitude more effective than chloramine at killing E. coli and rotavirus. <www.who.int/water_sanitation_health/dwq/S04.pdf>

the discharge of chlorinated or chloraminated water into natural waters can be detrimental due to the toxicity of chlorine, ammonia, and chloramine to aquatic organisms. Chlorine residuals (both free and combined) are acutely toxic to aquatic organisms at low concentration and are persistent due to their stability.

Chloramine is much more "persistent" than chlorine.

What literature supports the view that chlorine, ammonia, and chloramine are toxic to aquatic organisms? Does the literature say specifically for each of these chemicals how toxic it is to which aquatic organisms?

Are humans considered to be aquatic organisms? If not, is the DPEIR nevertheless concerned about the toxicity of chlorine, ammonia, and chloramine to humans?

The San Francisco Bay Basin Plan standard for residual chlorine is 0.0 milligrams per liter

This document mentions four limits, all less than 0.02 mg/L but not zero: <www.tritac.org/documents/summaries/2006_05_Water_Issue_Summaries.pdf>

It is claimed that (the ionized form of) ammonia is not harmful, so that if only the chlorine portion of chloramine is removed, that's good enough. But is it really good enough? In Chapter 5, Section 5.5, it says that before chloraminated water is put into Crystal Springs Reservoir, the chlorine part is "completely" removed and "most" of the ammonia part is removed. I assume that is done because it is thought to be necessary.

03 cont.

Chapter 4, Section 4.6:
<http://www.sfgov.org/site/uploadedfiles/planning/vol2_sec4-6_wsip-dpeir.pdf>

No questions or comments.

Chapter 4, Sections 4.7 to 4.11:
<http://www.sfgov.org/site/uploadedfiles/planning/vol2_sec4-7_to_4-11_wsip-dpeir.pdf>

No questions or comments.

Chapter 4, Sections 4.12 to 4.17:
<http://www.sfgov.org/site/uploadedfiles/planning/vol2_sec4-12_to_4-17_wsip-dpeir.pdf>

No questions or comments.

Chapter 5, Section 5.5:
<http://www.sfgov.org/site/uploadedfiles/planning/vol3_sec5-5_wsip-dpeir.pdf>

Page 5.5.3-1:

In 2005,

On February 2, 2004....

the SFPUC changed the method it uses to disinfect water in order to comply with drinking water standards. Formerly, the SFPUC disinfected water with chlorine; now it uses chloramine, a chemical compound that contains both chlorine and ammonia. Ammonia is a form of nitrogen that rapidly decomposes in natural waters to another form of nitrogen called nitrate. Past studies have shown that the growth of algae in Crystal Springs Reservoir is limited by lack of nitrogen and phosphorous [sic], both of which are plant nutrients; therefore an increase in the concentration of either could increase the growth of algae. To avoid the discharge of nitrogen and the possible consequent increase in algae concentration in Crystal Springs Reservoir, the SFPUC constructed dechloramination facilities at the same time it constructed chloramination facilities. The dechloramination facilities completely remove the chlorine and remove most of the ammonia from water before it is discharged into Crystal Springs Reservoir. The use of chloramine as a disinfectant has resulted in a small increase in the concentration of nitrate in Crystal Springs Reservoir (SFPUC, 2006).

04

(I looked for the cited document online but didn't find it.)

Quantitatively, how much ammonia is removed -- and how much remains?

If the ammonia in chloramine is not completely removed when water enters Crystal Springs Reservoir, must it be removed later, before free chlorine primary disinfection can occur in the treatment plant(s) fed by Crystal Springs Reservoir? 04 cont.

(In this PDF file, phosphorus is misspelled as "phosphorous" 7 times.)

Appendix A:
<http://www.sfgov.org/site/uploadedfiles/planning/vol5_apdx-a_wsip-dpeir.pdf>

Section 6.2.1 (page 51) says that comments have been received about topics:

... including use of chloramines for disinfection and
effect of chloramines on pipe materials.

How can I view these comments?

What pipe materials will be used in the project described by the DPEIR? What documents the effect of chloramines on these materials? 05

Appendix C:
<http://www.sfgov.org/site/uploadedfiles/planning/vol5_apdx-c_wsip-dpeir.pdf>

No comments or questions.

September 20, 2007

RECEIVED
SEP 21 2007
CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
MEA

Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Maltzer:

I am strongly opposed to the San Francisco Public Utilities Commission's (SFPUC) proposal to divert an additional 25 million gallons of water per day from the Tuolumne River as part of its Water System Improvement Plan (WSIP). The SFPUC already diverts one third of the Tuolumne's water and 60% of the river's water is already diverted. Taking large amounts of water from a river is very harmful to the river, its surrounding ecosystems, and the plants and animals that depend on the river and the ecosystems. Too much water is already diverted from the Tuolumne River; the SFPUC should not exacerbate these harms by taking even more water. 01

The San Francisco ballot initiative that authorizes the WSIP was promoted as a badly need repair for San Francisco's water system. As the campaign coordinator for Sierra Club's "No on Prop A" campaign I was part of a coalition opposing that ballot initiative because of the environmental harm that would be caused by taking even more water from the Tuolumne, even though initiative proponents insisted that no additional water would be diverted. Unfortunately, our analysis of the initiative proved to be correct: the WSIP is as much about taking more water out of the Tuolumne in order to promote development of open space, which will cause further environmental harm, as it is about repairing our aging water system. I find the dishonest tactics of the proponents of this project to be rather egregious. 02

The large majority of us in San Francisco are strong proponents of protecting the environment. Unfortunately, the SFPUC promotes several projects outside of San Francisco, such as this one, that are very environmentally destructive. The actions of the SFPUC outside of San Francisco are in direct opposition to the will of the residents of our city. Please reconsider this ill advised plan to do further harm to the Tuolumne River, its ecosystems and wildlife by taking even more water from this river. The environment deserves better and the residents of San Francisco deserve actions from the SFPUC that are in harmony with our environmental concerns, not actions that are opposed to them. 03

Sincerely,

Jeff Hoffman

Jeff Hoffman
132 B Coleridge Street
San Francisco, CA 94110-5113

C_Hsiun

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

Comment on Draft Program Environmental Impact Report (PEIR)

Pei-Lin Hsiung <plhsiung@stanford.edu> **Fri, Oct 12, 2007 at 9:40 PM**
To: wsip.peir.comments@gmail.com
Cc: bill.young@sierraclub.org

Dear Mr. Maltzer:

Your environmental review of the San Francisco Public Utilities Commission's plan to take more water from the Tuolumne River fails to adequately identify and address all of the environmental impacts to the River. I urge the SFPUC to undertake additional studies to determine the maximum technical potential for conservation and efficiency savings before finalizing this document. 01

I strongly believe that requiring more water conservation, efficiency, and recycling is the best way to lessen impacts on the Tuolumne River. When it comes to water conservation, the Bay Area lags far behind other metropolitan areas such as Seattle and Los Angeles that are reducing water consumption even in the face of growth. 02

As a region known for a strong environmental ethic, the Bay Area should be a leader in water efficiency and conservation. The SFPUC should adopt a policy of reducing diversions from the Tuolumne River over time, with additional demand met through increased investment in conservation, efficiency, and recycling. Only by ensuring that healthy amounts of water continue to flow into the Tuolumne River can we protect this irreplaceable natural treasure.

Sincerely,

Pei-Lin Hsiung
397 College Ave. Apt. C
Palo Alto, CA 94306

C_Ikemo

08-15-07

Dear Commissioner Brooks

How can you even think about taking water from the Tuolumne river and giving it to people so that they can water their lawns? 2.5 million gallons of water a day is alot of water. People can and should recycle their water if they are going to use it for landscaping. Please don't pull more water from the river, there are many more different things the city could do. 01

Kyle Ikemoto

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SEP 20 2007
CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
MEA

C_Issac

Diana Sokolove <wsip.peir.comments@gmail.com>

Tuolumne River plan

Marian Isaac <MIsaac01@att.net> **Fri, Sep 28, 2007 at 2:25 PM**
To: wsip.peir.comments@gmail.com

Dear Mr. Maltzer,

I hope you will move San Francisco to developing water conservation, recycling and development of desalination to procure water for the Bay Area. 01

Taking more from the Tuolumne, which is already an overworked river, will be destructive to all of the wildlife, and the lands that live because of the river.

I was born and raised in San Francisco, and am very disappointed, actually stunned, that San Francisco would try for such an anti-environmental grab. Such an action is disgusting.

California is facing environmental disasters. Depleting one of the few remaining rivers is the wrong thing to do. The alternatives I mention above are the only reasonable and ethical courses to take.

Sincerely,

Marian Isaac
Modesto CA.
MIsaac01@att.net

C_Izmir

Richard Izmirian
2215 Eaton Avenue
San Carlos, CA 94070

October 1, 2007

Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Re: WSIP PEIR

Dear Mr. Maltzer:

I have reviewed Section 5.5 in volume 3 of the referenced document, with regard to the impacts of the project on San Mateo Creek and Pilarcitos Creek, both in San Mateo County.

The document states that San Francisco PUC is not required to release water past its dams in these two important watersheds. The document does not explain why it believes it is exempt from Section 5937 of the State Fish and Game code, or why it believes that NOAA requirements and the Federal Endangered Species Act do not apply. 01

The document goes on to say that SFPUC does not release water into the stream beds downstream from the dams to maintain adequate streamflow for fish, and that it will not do so.

The PEIR then asserts that because the actions of the Water Department have made the creeks intermittent, this is the baseline condition for analyzing impacts. The baseline condition should be an approximation of the historic flow before dam construction.

This section of the PEIR should be re-written to recognize the SFPUC's responsibility to release adequate flows downstream of its dams, and fully describe the benefits of meeting those responsibilities. 02

Thank you for the opportunity to comment.

C_Izmir

Sincerely,

Richard Izmirian

C_JohnM

Visit www.mitchelljohnson.com

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SEP 13 2007

CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
M E A

Postcard Rate

Dear Paul,

You and I both know that the Tuolumne River needs to be protected. I won't bore you with quotes from the TR Trust or other activist websites. Many people are upset about San Francisco's current proposal to increase diversion of the Tuolumne water. Please do the right thing and see that the Planning Department pursues a policy of conservation. Thank you

Mitchell 01

SAN FRANCISCO CA 94
11 SEP 2007 PM 4

Mitchell Johnson
3110 Alameda de las Pulgas
Menlo Park, CA 94025 USA
New Phone: (650) 537-1493

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SEP 13 2007

CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
M E A

Paul Maltzer
Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

94103+2480

C_JohnSie

Paul Maltzer/CTYPLN/SFGOV	To	Diana Sokolove/CTYPLN/SFGOV@SFGOV
	cc	
09/25/2007 09:30 AM	bcc	
	Subject	Fw: Tuolumne River Diversion

----- Forwarded by Paul Maltzer/CTYPLN/SFGOV on 09/25/2007 09:30 AM -----

"Sieglinde Johnson" <sjsiggy@cox.net>	To	<paul.maltzer@sfgov.org>
09/20/2007 05:39 PM	cc	
	Subject	Tuolumne River Diversion

Dear Mr. Malzer.

T am very much opposed to further diversion of the Tuolumne River. A healthy river system has many environmental benefits. Conservation and recycling programs should be instituted , first. 01

Sieglinde Johnson
616 Mystic View
Laguna, Beach, CA 92651

C_Joye

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

Promote water efficiency - don't take more water from the Tuolumne

Lindsay Joye <ljoye@pacbell.net> **Tue, Sep 11, 2007 at 7:32 PM**
Reply-To: ljoye@pacbell.net
To: wsip.peir.comments@gmail.com

Dear SFPUC,
Our family had the great pleasure of spending three days on the mighty "T" this summer and are dismayed to learn that the SFPUC is planning to take even more water from the Tuolumne.

Please look at other progressive water agencies to model their conservation programs before taking this step. Incentive programs coupled with new landscape standards can make a large impact on Bay Area water usage. A comprehensive watershed study should be completed to adequately assess the environmental impacts of this proposed Water System Improvement Program. 01

Thank you,
Lindsay & Ken Joye
3793 Park Blvd.
Palo Alto, CA 94306

C_Kahn

Diana Sokolove <wsip.peir.comments@gmail.com>

Tuolumne - more conservation

Mike Kahn <Mike@kahncious.net> **Mon, Sep 17, 2007 at 11:35 PM**
To: wsip.peir.comments@gmail.com

Dear Mr. Maltzer and SFPUC,

Please strongly consider increased efforts in water conservation and water recycling instead of taking more water from the Tuolumne, or any other water source for that matter. Water is only going to become more precious in the future and we need to start reducing consumption instead of sucking all our resources dry. 01

Thank you,
Mike Kahn

511 Walker Dr., #4
Mountain View, CA 94043
(for identification only, do not send any mail)

650-269-1264 cell
mike@kahncious.net

12.5-52

C_Kalin

Gwynn Kaliher-MacKellen
143 Howth St
San Francisco, CA 94112
925-323-9047

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SEP 20 2007
CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
MEA

It is inexcusable to withdraw more water from our natural treasure, the Tuolumne River in Yosemite, when we have the means to meet our water needs already. Grey water systems, native plants, educational campaigns + incentives to encourage conservation, water-saving appliances, and many other options are currently available to provide enough water for the Bay Area's growing population. Our rivers are already in danger because of climate change. Think about the future of California. Golf courses are not the future. Protect the Tuolumne. 01

Thank you,

Gwynn Kaliher-MacKellen

COMMENT CARD

San Francisco Planning Department
Draft Program Environmental Impact Report on the
SFPUC's Proposed Water System Improvement Program
Palo Alto, CA. September 19, 2007

Thank you for participating in tonight's public hearing on the Draft Program Environmental Impact Report (PEIR) for the San Francisco Public Utilities Commission's proposed Water System Improvement Program (WSIP). This is also an opportunity for you to submit written comments on the Draft PEIR for the proposed WSIP.

Written comments will be accepted through close of business on Monday, October 1, 2007. Written comments may be submitted in one of three ways:

1. Leave your written comments in the designated "Comment Box" tonight. These cards are provided for your convenience.
2. Mail your comments by October 1, 2007 to the San Francisco Planning Department, Attention: Paul Maltzer, Environmental Review Officer, WSIP PEIR, 1650 Mission Street, Suite 400, San Francisco, CA 94103
3. E-mail written comments to wsip.peir.comments@gmail.com

CONTACT INFORMATION

Name: Suzanne Keebr
Affiliation: Creative Health Network
Address: 4076 Orme St
City, State, Zip: Palo Alto 94306
Phone or E-mail: 650 493-1373

WRITTEN COMMENTS Write clearly and continue on back. Use multiple sheets if needed.

There are two separate issues
1 To retrofit Hetch Hetchy - yes do it ASAP! 01

2 - The Environmental issue - should be separate - 02
We must conserve + recycle water - do not take more out

12.5-53

C_Keebr

WRITTEN COMMENTS (Continued)

of the Tuolumne River - ↑ 02 cont.
We - all of us - must keep our wilderness as pure as we can -
People need the truth - we cannot for the good of all of us + our grandchildren just keep consuming -
Recycled water is used in many places - New homes should be built with outlets to make it easy to use grey water for the garden etc.

It is time to wake up
All of us - Thank you for
Putting Earth First!

Suzanne Keebr

C_Kelle

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

Tuolumne

Michael Kelleher <michael.kelleher@gmail.com> **Mon, Oct 1, 2007 at 7:40 PM**
To: wsip.peir.comments@gmail.com

To:

Paul Maltzer, Environmental Review Officer
Water System Improvement Program PEIR
San Francisco Planning Department

Dear Mr. Maltzer:

I write you in response to the approval for diverting additional water from the Tuolumne River for sale by the SFPUC. My background in ground and surface water hydrology, consumer finance, and raising children in San Francisco allows me to appreciate the complexities, economics, and long-term impacts of decisions such as this one. Further, I am an Eagle Scout, avid fly-fisher, and have been enjoying California (and drinking her waters) since 1976.

I imagine that, while you appreciate public concern and applaud the effort of people such as myself to voice them, your decisions are most heavily driven by your view of the economics of the situation with respect to the legislated environmental constraints such as EIR's. The time frame of such economic decisions is critically important. Money certainly has time-value, but our natural resources have an inverse value. To me it seems the longer we protect them, the better we understand them, and the more value we can derive from them in the future. Once gone, they are prohibitively expensive to recreate. 01

Margaret Thatcher said, "I never make a decision until I have to." As you have cleared the constraint of the commission, you are perhaps not obligated to divert or sell the waters. Please give careful consideration to the recommendations you get from all sides and make a decision that will benefit Californians in perpetuity.
In gratitude for you consideration of my voice,

--
Michael Kelleher
Culann's Hounds
http://www.sfhounds.com
http://www.Myspace.com/sfhounds
http://www.cdbaby.com/culannshounds2

12.5-54

C_Kim

RECEIVED
SEP 20 2007
CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
M E A

Michelle Kim
3591 19th Street
San Francisco, CA
94110

Dear Council,

I am writing to you today to implore you to take another look at the planned redirection of 25 million gallons of water from the Tuolumne River to Bay area commercial interests. In the interest of California wildlife and conservancy, I truly believe this action is an outdated response to our water needs. We have seen water needs in other urban centers such as Los Angeles and Seattle met through water recycling and conservation. I believe that San Francisco and the Bay Area should be a leader in these issues and am dissappointed to learn of our government's current plans. We need a long term, sustainable solution to our growing water demands and the solution must be back by sound science, research and projections of our our water demand. Please reevaluate the environmental and economic consequences of your decision. Thank you for your time. 01

Michelle Kim

C_KingC

Diana Sokolove <wsip.peir.comments@gmail.com>

Re: SF PUC Water System Improvement Program

1 message

Carl King <ck3@mayfieldmortgage.com> **Mon, Oct 1, 2007 at 4:59 PM**
To: wsip.peir.comments@gmail.com

To Whom It May Concern,

I believe that the plan to divert significant additional flows from the Tuolumne River does not provide adequate consideration of the unique recreational benefits of this Wild and Scenic river, nor to the need to keep its flow is reserve for future contingency in the event of short- or long-term reduction in Sierra snow pack. Please emphasize conservation over additional diversions. 01

Regards,

Carl King

2351 Santa Catalina Street
Palo Alto CA 94303

C_KingD

Diana Sokolove <wsip.peir.comments@gmail.com>

(no subject)

David King <dking@berkeley.edu> **Mon, Oct 1, 2007 at 1:18 PM**
To: wsip.peir.comments@gmail.com

please help stop the cancereous proliferation of urban sprawl which is ruining our wild lands & our agricultural lands. 01
best,
david king

hhmi mass spectrometry laboratory
uc berkeley

C_KingK

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

Draft PEIR: SF needs to conserve first!

ken king <exeditor2003@yahoo.com> **Mon, Oct 15, 2007 at 11:27 AM**
To: wsip.peir.comments@gmail.com
Cc: bill.young@sierraclub.org

Dear Paul Maltzer,

As a Californian born and raised here, I want to weigh in and say that conserving our natural resources, limited thought they might be, is vastly more important than engineering short term solutions that are costly and environmentally destructive. Therefore it is absolutely imperative that San Francisco pursue sustainable alternatives to diverting more water from the Tuolumne River. 01

I have read the draft and the arguments pro and con and know that you don't need to have them recited back, but I hope that you and your agency will go the extra distance to think creatively and economically, not to mention environmentally, in imagining the impact of your decison fifty and even one hundred years from now.

Thank you for your consideration of my comments,

Kenneth King
633 Terrace Avenue
Half Moon Bay, CA 940019

650 726 4268

C_Krame1

COMMENT CARD

San Francisco Planning Department
Draft Program Environmental Impact Report on the
SFPUC's Proposed Water System Improvement Program
Sonora, CA. September 5, 2007

Thank you for participating in tonight's public hearing on the Draft Program Environmental Impact Report (PEIR) for the San Francisco Public Utilities Commission's proposed Water System Improvement Program (WSIP). This is also an opportunity for you to submit written comments on the Draft PEIR for the proposed WSIP.

Written comments will be accepted through close of business on Monday, October 1, 2007. Written comments may be submitted in one of three ways:

1. Leave your written comments in the designated "Comment Box" tonight. These cards are provided for your convenience.
2. Mail your comments by October 1, 2007 to the San Francisco Planning Department, Attention: Paul Maltzer, Environmental Review Officer, WSIP PEIR, 1650 Mission Street, Suite 400, San Francisco, CA 94103
3. E-mail written comments to wsip.peir.comments@gmail.com

CONTACT INFORMATION

Name: John H. Kramer

Affiliation:

Address: P.O. Box 400

City, State, Zip: Vallecito, CA 95251

Phone or E-mail: johnhkramer@gmail.com

WRITTEN COMMENTS Write clearly and continue on back. Use multiple sheets if needed.

01 1. How does the project address counties of origin water rights

02 2. Why did the preferred alternative raise the controversial issue of additional water extraction that will cause delays and may endanger the project?

3. Please send a CD of the full DPEIR to my address

Diana Sokolove <wsip.peir.comments@gmail.com>

Re: Comment period extended for DRAFT PEIR for SFPUC's Water System Improvement Program

John Howard Kramer <johnhkramer@gmail.com> **Thu, Oct 11, 2007 at 10:14 PM**
To: Diana Sokolove <wsip.peir.comments@gmail.com>

How convenient of you to provide this method of submitting a comment to the SFPUC. My comment is that this is a blatant water grab that has severe consequences for Tuolumne County, the rafting industry and ranchers. Have you adequately addressed and balanced the environmental impacts that will result from the economic stagnation brought about by this export of the water from the foothills? How can the fisheries survive? How can we continue to meet downstream commitments for healthy flows low in salt? The water you propose to take is put to maximum beneficial use now. 01

Why have you chosen a preferred alternative that is sure to encumber the project in legal wrangling, slowing the implementation of vitally needed seismic retrofits of the water delivery system? 02

John H. Kramer, PhD
4253 Red Hill Rd Box 400
Vallecito, CA 95251
johnhkramer@gmail.com

On 10/8/07, **Diana Sokolove** <wsip.peir.comments@gmail.com> wrote:

ATTENTION!

THE COMMENT PERIOD FOR THE DRAFT PROGRAM ENVIRONMENTAL IMPACT REPORT ON THE SAN FRANCISCO PUBLIC UTILITIES COMMISSION'S WATER SYSTEM IMPROVEMENT PROGRAM HAS BEEN EXTENDED.

WRITTEN COMMENTS MAY BE SUBMITTED TO THE PLANNING DEPARTMENT UNTIL:

5:00 P.M. ON OCTOBER 15, 2007.

AN INFORMATIONAL PRESENTATION AND HEARING TO RECEIVE THE PLANNING COMMISSION'S AND THE PUBLIC'S COMMENTS ON THE DRAFT PROGRAM ENVIRONMENTAL IMPACT REPORT WILL BE HELD ON

OCTOBER 11, 2007 AT 1:30 PM OR LATER.

THE HEARING WILL BE HELD AT SAN FRANCISCO CITY HALL IN ROOM 400, 1 DR. CARLTON B. GOODLETT PLACE. ADDITIONAL INFORMATION IS PROVIDED BELOW.

A Draft Program Environmental Impact Report (Draft PEIR) has been prepared by the City and County of San Francisco Planning Department in connection with this program. A summary presentation of the contents of the Draft PEIR is available online, and the complete document can be viewed at the following locations:

Online at:
www.sfgov.org/site/planning/mea (or by linking to this site from http://PEIR.sfwater.org)

In print at:
San Francisco Planning Department, 1660 Mission Street, 1st Floor, Planning Information Counter (copy of Draft PEIR only is available).

By appointment at the San Francisco Public Utilities Commission by calling 1-866-231-1337 or e-mailing PEIRappointments@sfwater.org (copy of Draft PEIR and associated reference materials are available).

Any of the libraries listed at the end of this e-mail (copy of Draft PEIR and key reference materials are available).

You may submit comments to the Planning Department using any of the following means:

Provide oral or written comments at any of the five public hearings

Mail written comments to the San Francisco Planning Department,
Attention: Environmental Review Officer, WSIP PEIR, 1650 Mission Street, Suite 400, San Francisco, CA 94103

E-mail written comments to wsip.peir.comments@gmail.com.

The San Francisco Planning Department will prepare written responses to comments received during the public review period in a Comments and Responses document. If you have any questions about the environmental review of the WSIP, please leave a message for the Planning Department at:

1-866-231-1337.

LIBRARIES WHERE YOU CAN VIEW THE DRAFT PEIR:

Alameda County:
Alameda County/City of Fremont Library: 2400 Stevenson Boulevard, Fremont

San Francisco County:
San Francisco Main Library: 100 Larkin Street, San Francisco

San Joaquin County:
Stockton - San Joaquin County Public Library: 605 North El Dorado Street, Stockton

San Mateo County:
City of San Mateo Main Library: 55 West 3rd Avenue, San Mateo

Santa Clara County:
San Jose - Dr. Martin Luther King, Jr. Library: 150 East San Fernando, San Jose

Stanislaus County:
Modesto Library: 1500 I Street, Modesto

Tuolumne County:
Tuolumne County Library: 480 Greenley Road, Sonora

If you would like to be removed from this distribution list, please respond with UNSUBSCRIBE in the subject line.

COMMENT CARD

San Francisco Planning Department
Draft Program Environmental Impact Report on the
SFPUC's Proposed Water System Improvement Program
Palo Alto, CA. September 19, 2007

Thank you for participating in tonight's public hearing on the Draft Program Environmental Impact Report (PEIR) for the San Francisco Public Utilities Commission's proposed Water System Improvement Program (WSIP). This is also an opportunity for you to submit written comments on the Draft PEIR for the proposed WSIP.

Written comments will be accepted through close of business on Monday, October 1, 2007. Written comments may be submitted in one of three ways:

1. Leave your written comments in the designated "Comment Box" tonight. These cards are provided for your convenience.
2. Mail your comments by October 1, 2007 to the San Francisco Planning Department, Attention: Paul Maltzer, Environmental Review Officer, WSIP PEIR, 1650 Mission Street, Suite 400, San Francisco, CA 94103
3. E-mail written comments to wsip.peir.comments@gmail.com

CONTACT INFORMATION

Name: Aldora Lee, Ph.D

Affiliation: –

Address: 745 Menlo Ave, #4

City, State, Zip: Menlo Park, CA 94025

Phone or E-mail:

WRITTEN COMMENTS Write clearly and continue on back. Use multiple sheets if needed.

See attached.

Thanks for the opportunity to comment.

12.5-58

C_Lee

COMMENT CARD

SFPUC's Environmental Impact Report of the proposed Water System Improvement Program

Written comments:

The focus of this report should be on seismic safety considerations. Seismic safety upgrades need to be undertaken ASAP. 01

* The evidence for taking an additional 25 million gallons of water per day is not warranted by the analysis presented. The current recommendations have many negative long-term environmental impacts. 02

Statistical time-series analyses used to forecast future needs can be simple or nuanced. The data analysis does not sufficiently take into consideration relatively recent developments in water conservation and recycling. 03 Also, the impact of global warming, which affects the annual snow pack which feeds our Sierra rivers and streams, is absent. 04

It appears that the equivalent of a butter knife, rather than a scalpel, has been used in the projections prepared. The planners should require more sophisticated data analyses, on which to base recommendations.

San Francisco Public Utilities
Commissioner Ryan L. Brooks

August 16, 2007

In 2002 I backpacked the Grand Canyon of the Tuolumne from White Wolf to Tuolumne Meadows. Three days and two nights. We did it too fast. I have not been back, but wish I would. That canyon --- !!!

Every year thousands go up there and have such a rich experience.

I have been to Kibbe Lake three times, and to Cherry Lake a few more than that. I may go this year to hike around Lake Eleanor.

I know you plan to divert below the dams,below Hetch Hetchy and Cherry Lake Reservoir. I think Cherry Lake area is dramatically underdeveloped! Sierra Club might not like to hear that, but it is greatly under-utilized for recreation. You might think of developing more of Cherry Lake, and drawing less water from it and the Tuolumne River.

Yosemite is marvelous, but it is too overused. Cherry could be a mecca of vacationers who want the boat, fish, hike, relax experience. It needs trails, and a lodge for visitors, and more camping areas north of the only camping area on the lake. One friend of mine took a kayak across the lake one year to camp with a group on the far shore and hike up the canyon.

I urge you to use conservation techniques for conserving water in the city of San Francisco. 01
Also, let me throw in a wild card, I urge you to vote for a tax on wealth in the U.S. A. This is the fairest, quickest method to establish aggregate demand (purchasing power) and keep our economy going. Fair distribution of wealth will do much to decrease the drain on our resources. Today, while riding my bike around Lake Chabot in San Leandro I thought of a plan for a general strike once a month, 12 times a year, with the purpose of studying our community. We would stop forging ahead in the wrong direction so quickly, develop informed democratic programs, distribute income and wealth more equitably, and have more inclination to travel to Hetch Hetchy and beyond. What wilderness will do for one's imagination. Send me a note, I'll send you an essay on A Wealth Tax to Eliminate Poverty. (See Milken Institute Review, 3rd Quarter, 2003, article by professor Edward Wolff, Where Has All the Money Gone?)

Ben Leet
14377 Bancroft Ave. #18
San Leandro, CA 94578
benleet@earthlink.net

Ben Leet

Sept. 20, 2007

To the S F Planning Commission:

I am writing to convey my concern with the idea of taking more water from the Tuolumne River. The environmental impacts that would occur as a result of extra water being diverted far outweigh the need for more lawns & suburban sprawl across the East Bay, the destination for 60% of the water. 01

I think this is a terrible mistake and a problem that can be solved in many other ways. You should instead focus your efforts on increasing water conservation and recycling programs. This is a far better alternative for the river, the environment, wildlife, our cities and us. 02

I truly hope that you take these public comments into serious consideration before you make the horrible decision that would affect all life in California for generations to come.

Sincerely,
Linda Lewin
6315 Geary #5
S.F, CA 94121

RECEIVED
SEP 20 2007
CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
MEA

C_Lim

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

please do not divert water for SFPUC

Kingman G Lim <kingmanl@fastmail.fm>
Tue, Sep 11, 2007 at 2:28 PM
To: wsip.peir.comments@gmail.com

Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Please do not allow any additional water to be diverted from the Hetch Hetchy system! I support water conservation. The water in Tuolumne should stay there for the trees, animals, and plants that rely on them for survival. Thank you. 01

Kingman Lim
2147 Parker St
Berkeley, CA 94704
--
kingmanl@fastmail.fm

C_Look

RECEIVED
SEP 2 0 2007
CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
MEA

Carissa Look 440 Utah St
San Francisco, CA
94110
(774) 521 8790

I am very concerned with the proposed water grab from the Tuolumne River. The environmental impacts of this withdraw would far outweigh the "need" of sprawl across the East Bay for landscaping purposes.

Water conservation and recycling are much better options to help us meet increasing water demands. Even Los Angeles has managed to utilize these methods to keep their water demand flat in the face of growth. Let us continue to outshine smog and sprawl-ridden LA and pursue other alternatives to the water grab from the Tuolumne River.

Thank you very much for your time and consideration. 01

Sincerely,

Carissa Look
440 Utah St
San Francisco, CA
94110
(774) 521-8790
carissalook@gmail.com

C_LoVuo

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

Tuolumne River

Bhushans@aol.com <Bhushans@aol.com> **Mon, Sep 24, 2007 at 1:20 PM**
To: wsip.peir.comments@gmail.com

Dear Mr. Maltzer, Protecting our rivers in California is a high priority. The Tuolumne River is threatened by the proposed increase in water diversion. The riparian habitat and pure water needed by wildlife and people can best be protected by increasing conservation efforts. There are many concerned environmentalists who want to work with you to find a win win solution to our shared concerns about water supply in this state. 01

One in particular, Peter Drekmeier, past founder of Bay Area Action (now Acterra) is one person who is thoughtful and willing to give you time, effort and assistance to bring about a conservation plan that will save the river, and bring ample water supply to our communities. I hope you will work cooperatively with Mr. Drekmeier and his associates to the benefit of the California riparian habitat, and cities and town that rely on an adequate water supply.

Thank you,

Judith LoVuolo-Bhushan
3838 Mumford Place
Palo Alto, CA. 94306
415-412-3011

C_Lowry

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

No Diversions From The Tuolumne! Conserve and recycle FIRST

1 message

Sf194122@aol.com <Sf194122@aol.com> **Mon, Oct 1, 2007 at 9:42 PM**
To: wsip.peir.comments@gmail.com

Mr. Maltzer:
I could not believe it when I heard about this wasteful plan being proposed by my own city, a city I moved to because I thought we were forward-thinking, environmentally conscious, and ethical.

I support alternatives that protect the Tuolumne from any new diversions. More water conservation, efficiency, and recycling are the intelligent and ethical ways to protect the Tuolumne and provide sustainable water for San Francisco and anyone to whom we sell water. Stop the sprawl, conserve, use intelligent means to retain local rainwater, and we and the East Bay would have enough water. 01

We can do much, much better than destroy the Tuolumne.
Janet Lowry
1859 9th Ave.
San Francisco, Calif. 94122

****

12.5-62

COMMENT CARD

San Francisco Planning Department
Draft Program Environmental Impact Report on the
SFPUC's Proposed Water System Improvement Program
Palo Alto, CA. September 19, 2007

Thank you for participating in tonight's public hearing on the Draft Program Environmental Impact Report (PEIR) for the San Francisco Public Utilities Commission's proposed Water System Improvement Program (WSIP). This is also an opportunity for you to submit written comments on the Draft PEIR for the proposed WSIP.

Written comments will be accepted through close of business on Monday, October 1, 2007. Written comments may be submitted in one of three ways:

1. Leave your written comments in the designated "Comment Box" tonight. These cards are provided for your convenience.
2. Mail your comments by October 1, 2007 to the San Francisco Planning Department, Attention: Paul Maltzer, Environmental Review Officer, WSIP PEIR, 1650 Mission Street, Suite 400, San Francisco, CA 94103
3. E-mail written comments to wsip.peir.comments@gmail.com

CONTACT INFORMATION

Name: Sheri Lubin
Affiliation: Acterra
Address: 3921 East Bayshore Road
City, State, Zip: Palo Alto CA 94303
Phone or E-mail: sheril@acterra.org

WRITTEN COMMENTS Write clearly and continue on back. Use multiple sheets if needed.

I am in full support of having an alternative plan of conservation and conservation outreach. We can save water by replacing lawns and sod growing operations with native plants that requiring significantly less water and no chemical fertilizers. Water recycling should 01

WRITTEN COMMENTS (Continued)

be mandatory for both residential, business and agricultural purposes. In this time of climate change we need sustainable plans for water usage - not dams. We should be offering rebates to people that replace their lawns with low or no water use landscapes. 01 cont.

C-Lundb

Diana Sokolove <wsip.peir.comments@gmail.com>

Against Increasing Flows on the Tuolumne River

Erik Lundberg <erik@addrev.com> **Wed, Sep 19, 2007 at 9:52 PM**
To: wsip.peir.comments@gmail.com

I strongly oppose increasing flows on the Tuolumne River. It is a fragile ecosystem and I enjoy taking my children up there for fly fish. Please do not destroy this wonderful river by pumping up the flows. There are other alternatives. 01

C_Maddo

Diana Sokolove <wsip.peir.comments@gmail.com>

Spare the Tuolumne!

Tyana Maddock <tmaddock@friendsoftheriver.org> **Tue, Sep 18, 2007 at 1:17 PM**
To: wsip.peir.comments@gmail.com

Please do not further damage the Tuolumne by diverting an additional 25 million gallons per day!! We love and depend on this river. Thank you for your consideration. 01

Tyana Maddock

1133 Normal Ave.

Chico, CA 95928

"If there is magic on this planet, it is contained in water." - Loren Eiseley

C_Magol

Nick Magol
2017 Mission St San Francisco CA 94110
415-973-[illegible]

I am writing today to voice my strong opposition to the proposed water development plan diverting millions of gallons of water a day from the Tuolumne. I urge you to act as an example in water conservation. We are at a time of climate environmental crisis and it is time that we create inovative ways to contribute to a sustainable solution rather than perpetuate the problem. 01

RECEIVED

SEP 20 2007

CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
M E A

C_Marsh

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

Fwd: SF water plan

Jim & Darlene Marshall <jimdar@pacbell.net> **Sun, Sep 9, 2007 at 6:22 PM**
To: wsip.peir.comments@gmail.com
Cc: bill.young@sierraclub.org

Dear Mr. Maltzer,

As you go through the process of evaluating changes to the water use plans please take serious our obligations to future generations. Please work to select a plan that is sustainable and far-sighted. The Tuolumne River and its watershed need to remain vibrant and flowing for future people to enjoy, not just for a few years more. We should require more conservation and better efficiency standards, recycling and other measures to reduce, or at least not increase, our take of this river system's gallons. 01

Sincerely,

James H. Marshall

Michael Martin, Ph.D.
P.O. Box 2216
Mariposa, CA 95338

September 26, 2007

Paul Maltzer, Environmental Review Officer
Water System Improvement Program PEIR
San Francisco Planning Department

Dear Mr. Maltzer:

I am a home owner in Tuolumne County, specifically in the Hetch Hetchy Subdivision, Block 5, Lot 2, Groveland. My home is on the Middle Fork of the Tuolumne River. I am a flyfisherman, as well as a professional fisheries biologist.

Your environmental review of the San Francisco Public Utilities Commission's plan to
consume (divert) more water from the Tuolumne River fails to adequately identify and
address all of the potential environmental impacts to the River, specifically how 14%
more diversions in the upper Tuolumne River basin with affect critical habitat in the
lower Tuolumne River, specifically spring-run Chinook salmon, fall-run Chinook
salmon, and Steelhead trout, along with potential impacts to the upper Tuolumne River 01
watershed. These federally recognized “threatened” or “species of concern” - designated
populations (ESU) will arguably require more water than less in future years. I urge you
to undertake additional studies of the lower Tuolumne River to provide protection and
enhancement of these depleted fisheries, before finalizing this document. There should
be no more diversions of the Tuolumne River at the expense of the San Joaquin River
Delta receiving water environment, period.

Your report shows that the majority of the potential future demand resides outside of San
Francisco. I recommend that you let those entities solve their water demand problems by
other means. Over ½ of the demand is outdoor water use and is a major cause for the
increased demand. Water conservation and efficiency measures, along with recycling, 02
should eliminate the need for additional future water supplies. There is uncertainty
regarding future increases in demand, as several demand factors in the analysis such as
projected growth, may have major challenges or be reduced because of economic
difficulties. As an owner in the upper river watershed, and I am concerned that increased 03
water diversions will reduce my property values, as well as my own, as well as tourists,
recreational opportunities. I am also concerned with the potential effects of atmospheric
shifts, such as global warming, and how that will affect (reduce) water supply. In
California, history has demonstrated how during critical water short years, full wet
weather deliveries continue for municipal and agricultural users, while natural resources 04
take the short end of the deal and brunt of the injuries and damages. Your feasibility
studies must include an analysis of the effects of drought and water shortage, and how

C_MartiM

San Francisco proposes substitute water demand (=supply) (i.e., reduced diversion from
the Tuolumne River) during those critical times. It is very clear that reduced water flows 04 cont.
in the San Joaquin River basin has resulted in seriously depressed recruitment of
anadromous Salmonid populations in the basin rivers.

I support all of the alternatives identified in your draft document that protects the
Tuolumne River from new diversions in future years. Requiring more water
conservation, efficiency, and recycling at the demand source is the best way to lessen
impacts to the Tuolumne River while promoting a sustainable water solution for the San
Francisco Bay Area. This will also afford more protection to the upper Tuolumne River 05
watershed fisheries and recreational usage. The San Francisco water scheme and power
generation operations have degraded the integrity of the downstream Tuolumne River
watershed. Further diversions will certainly maintain that degradation, and greatly limit
opportunities for restoration of those resources that depend upon the river. Your EIR
lacks sufficient description of the potential impacts upon the lower Tuolumne River,
especially with respect to anadromous fish populations, Chinook salmon and Steelhead
trout. It also fails to address consistency with on-going State and Federal resource 06
agency activities, studies, and actions that may be compromised by additional water
diversions in the upper Tuolumne River. I recommend that additional feasibility studies
and mitigation evaluation (and implementation where necessary) be included in your EIR
analyses, prior to adoption of the proposed water plan.

Only by reducing diversion and off-stream uses of water can we protect the anadromous fishes of the lower Tuolumne River and other San Joaquin River reaches, along with protecting the existing recreational fisheries of the upper Tuolumne River Watershed.

Sincerely,

Michael Martin, Ph.D.

C_MartiS

RECEIVED

SEP 20 2007

CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
M E A

AUGUST 15, 2007

DEAR COMMISSIONER BROOKS -

WHEN I FIRST HEARD THAT PEOPLE WANTED TO TAKE MORE WATER FROM THE TUOLOMNE RIVER TO USE FOR THEIR LAWNS I WAS ASTONISHED I COUDNT BELIEVE THAT YOU AND OTHERS ARE ACTUALLY CONSIDERING TO TAKE MORE WATER. WHY GIVE LAWNS PURE DRINKING WATER WHEN WE ALREADY HAVE WATER SHORTAGES AND CONTINUE TO HAVE WATER ISSUES? WHY DONT WE/YOU TRY TO FIND BETTER SOLUTIONS FOR THIS WATER ISSUE RECYCLING WATER IS A GREAT WAY TO SOLVE THIS PROBLEM; LAWNS WILL STILL BE WATERED AND THE TUOLUMNE RIVER CAN STILL STAY AS A WATER SOURCE. WE NEED TO LOOK IN THE FUTURE WE NEED TO MAKE SURE WE KEEP THIS RIVER AS A WATER SOURCE. 01

SINCERELY,
SOFIA MARTINEZ

12.5-66

C_McCle

Sept 26, 2007

Paul Maltzer, Environmental Review Officer
San Francisco Planning Dept.
1650 Mission St. Ste 400
San Francisco, Ca. 94103

RECEIVED

OCT 01 2007

CITY & COUNTY OF S.F
PLANNING DEPARTMENT
M E A

Dear Sir,

I am writing to you about the upcoming review of the Hetch-Hetchy water system. Current operations are already a heavy burden on the Tuolumne River eco-system. It would be unconscionable to consider any further withdrawals from the river without first implementing all possible conservation measures which should include waterless urinals in all public buildings, a collection system for runoff falling on all impervious, man made surfaces, and a system that rewards residents and businesses for conserving more than the mean usage funded by charging those that use more than the mean. 01

Our rivers are treasures that are worth far more than their "usable" water. California's rivers are already heavily degraded by the projects of the 20th century. San Francisco has a reputation as one of the more environmentally conscious municipalities. It would be a shame to tarnish that by further degradation of the Tuolumne.

Please enter this letter into the offical comments.

Sincerely,
Jonathan McClelland

Jonathan McClelland
4740 Hall Rd.
Santa Rosa, Ca. 95401

C_McCol

RECEIVED
NOV 13 2007
CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
MEA

November 7, 2007

Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Maltzer,

The environmental review performed by the San Francisco Public Utilities Commission to take more water from the Tuolumne River does not identify and address the environmental impacts of the river. There is a lack of information regarding the impacts of taking more water from the Tuolumne River. A lack of adequate baseline data of the Upper Tuolumne River does not provide an accurate picture of the outcomes of dewatering the Tuolumne. A new study was begun in 2006, however it was not completed in time to be part of the review process. Please take additional studies before finalizing this document. 01

Instead of taking water from the Tuolumne, I encourage you to take the alternatives in your draft document that protect the Tuolumne River from new diversions. These include more water conservation and water recycling. San Francisco is the leader in environmental action and your plan should parallel this trend. 60% of the Tuolumne River is already diverted for urban and rural uses and increasing diversion will do further harm to the river. Requiring more water conservation, efficiency, and recycling is the best way to lesson impacts on the Tuolumne River while promoting a sustainable water plan for the Bay Area. 02

Please protect this national treasure and make sure adequate water flow to the "T" keeps flowing.

Sincerely,

Karl McCollom

Karl McCollom
4670 Indian Peak Rd.
Mariposa, CA 95338

C_McCon

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SEP 07 2007
CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
MEA

COMMENT CARD

San Francisco Planning Department
Draft Program Environmental Impact Report on the
SFPUC's Proposed Water System Improvement Program
Sonora, CA. September 5, 2007

Thank you for participating in tonight's public hearing on the Draft Program Environmental Impact Report (PEIR) for the San Francisco Public Utilities Commission's proposed Water System Improvement Program (WSIP). This is also an opportunity for you to submit written comments on the Draft PEIR for the proposed WSIP.

Written comments will be accepted through close of business on Monday, October 1, 2007. Written comments may be submitted in one of three ways:

1. Leave your written comments in the designated "Comment Box" tonight. These cards are provided for your convenience.
2. Mail your comments by October 1, 2007 to the San Francisco Planning Department, Attention: Paul Maltzer, Environmental Review Officer, WSIP PEIR, 1650 Mission Street, Suite 400, San Francisco, CA 94103
3. E-mail written comments to wsip.peir.comments@gmail.com

CONTACT INFORMATION

Name: Mike McConnell

Affiliation: Tuolumne County resident

Address: 21436 Green Oaks Ct.

City, State, Zip: Sonora CA 95370

Phone or E-mail: mlm@sonnet.com

WRITTEN COMMENTS Write clearly and continue on back. Use multiple sheets if needed.

I am a 33 year resident of Tuolumne County and I'm a licenced General Engineering Contractor. The trend of growth and waste must be curbed. Taking more water from the Tuolumne is not the solution. Its time to conserve and use what you have. 01

M

C_McFar

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SEP 13 2007
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MEA

Keith & Luella McFarland
13661 LaPaloma Road • Los Altos Hills, CA 94022
650 ~~415~~ 948 3323

Paul Maltzer, Environmental Officer
San Francisco Planning Dept.
1650 Mission Street Suite 400
San Francisco, Ca 94103

Dear Paul,

Although population ~~problems~~ pressures are the underlying cause of most environmental degradation, everything possible must be done to preserve the quantity and quality of our river systems.

We hope you will do everything possible to preserve the integrity of the Tuolumne River. 01

Thank you,

Keith H. McFarland

C_McKee

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

(no subject)

julie mckee <jhmckee021849@yahoo.com> **Sat, Sep 29, 2007 at 4:51 PM**
To: wsip.peir.comments@gmail.com

Sustainable water plans include conservation, not further destruction of rivers! 01

C_Means1

COMMENT CARD

San Francisco Planning Department
Draft Program Environmental Impact Report on the
SFPUC's Proposed Water System Improvement Program
Fremont, CA. September 18, 2007

Thank you for participating in tonight's public hearing on the Draft Program Environmental Impact Report (PEIR) for the San Francisco Public Utilities Commission's proposed Water System Improvement Program (WSIP). This is also an opportunity for you to submit written comments on the Draft PEIR for the proposed WSIP.

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2. Mail your comments by October 1, 2007 to the San Francisco Planning Department, Attention: Paul Maltzer, Environmental Review Officer, WSIP PEIR, 1650 Mission Street, Suite 400, San Francisco, CA 94103
3. E-mail written comments to wsip.peir.comments@gmail.com

CONTACT INFORMATION

Name: Robert Means
Affiliation:
Address: 1421 Yellowstone Ave.
City, State, Zip: Milpitas, CA 95035
Phone or E-mail: rob.means@electric-bikes.com

WRITTEN COMMENTS Write clearly and continue on back. Use multiple sheets if needed.

As with our need to address carbon emissions, we can best address our water needs through conservation! See "The 11th Hour" for reasons why we must act boldly to preserve our environment. 01

C_Melna

COMMENT CARD

San Francisco Planning Department
Draft Program Environmental Impact Report on the
SFPUC's Proposed Water System Improvement Program
Fremont, CA. September 18, 2007

Thank you for participating in tonight's public hearing on the Draft Program Environmental Impact Report (PEIR) for the San Francisco Public Utilities Commission's proposed Water System Improvement Program (WSIP). This is also an opportunity for you to submit written comments on the Draft PEIR for the proposed WSIP.

Written comments will be accepted through close of business on Monday, October 1, 2007. Written comments may be submitted in one of three ways:

1. Leave your written comments in the designated "Comment Box" tonight. These cards are provided for your convenience.
2. Mail your comments by October 1, 2007 to the San Francisco Planning Department, Attention: Paul Maltzer, Environmental Review Officer, WSIP PEIR, 1650 Mission Street, Suite 400, San Francisco, CA 94103
3. E-mail written comments to wsip.peir.comments@gmail.com

CONTACT INFORMATION

Name: Christina + Chet Melnarik
Affiliation: self, Fremont Resident
Address: 37316 Third St
City, State, Zip: Fremont CA 94536
Phone or E-mail: cecniles@sbcglobal.net

WRITTEN COMMENTS Write clearly and continue on back. Use multiple sheets if needed.

My husband and I have spent a great deal of time hiking, rafting and kayaking in and along the Tuolumne River (the "T"). We have introduced our children to this marvelous river – in the Yosemite back country, Tuolumne Meadows, and at sites well outside park boundries.

(over)

WRITTEN COMMENTS (Continued)

This river is vital to a healthy ecosystem in northern California.

The impact of diverting extra water from this river on the surrounding ecosystem far outweighs the ~~benefit~~ benefit that may be derived from the additional water to bay area residents. 01

The bay area water districts should be a model of conservation, grey water usage, and other recycling methods.

We have taught and will continue to teach our children how to reuse, recycle, and conserve. We want our utilities commissions to be equally dedicated to preserving and wisely using our natural resources.

COMMENT CARD

San Francisco Planning Department
Draft Program Environmental Impact Report on the
SFPUC's Proposed Water System Improvement Program
Modesto, CA. September 6, 2007

Thank you for participating in tonight's public hearing on the Draft Program Environmental Impact Report (PEIR) for the San Francisco Public Utilities Commission's proposed Water System Improvement Program (WSIP). This is also an opportunity for you to submit written comments on the Draft PEIR for the proposed WSIP.

Written comments will be accepted through close of business on Monday, October 1, 2007. Written comments may be submitted in one of three ways:

1. Leave your written comments in the designated "Comment Box" tonight. These cards are provided for your convenience.
2. Mail your comments by October 1, 2007 to the San Francisco Planning Department, Attention: Paul Maltzer, Environmental Review Officer, WSIP PEIR, 1650 Mission Street, Suite 400, San Francisco, CA 94103
3. E-mail written comments to wsip.peir.comments@gmail.com

CONTACT INFORMATION

Name: Bill Mensing
Affiliation: 1036 Amherst Ave.
Address: Tuolumne River Trust
City, State, Zip: Modesto, Calif 95350
Phone or E-mail: 205 5233621

WRITTEN COMMENTS Write clearly and continue on back. Use multiple sheets if needed.

Leave the river alone!! Any solution but river water. 01

C_Menuz

Sept 9, 2007

Dear Paul Maltzer

I am strongly opposed to taking more water from the Tuolumne River. Consumers will use all the water given to them, creating a never ending demand for more water. Instead, by limiting water consumers can be encouraged to conserve water & spur industry to develop water saving devices. 01

California's rivers need water to maintain natural environments. It is time to make a sustainable plan, instead of always trying to take more than we already have.

Sincerely,

Karen Menuz

Ms. Karen Menuz
Apt. 10
744 Guerrero St
San Francisco, CA 94110

C_Merlo

20 Sept 2007

I came to the planning commission meeting today to address the issue of taking even more water from the Tuolumne River. Since the item was moved on the agenda from 1:30 until 5:00, I am not able to stay.

Please consider this issue very carefully. 60% of the river's water is already being diverted. That leaves only 40% for what is refered to as "Mother Nature." There is an amazing wilderness between the Hetch Hetchy Dam and the San Joaquin River. You need to be at least as concerned about that wilderness as you are for future construction in the Bay Area. We as citizens can, and should, do more, ~~to~~ much more, to use that 60% of the river's water more efficiently. 01

Let the wilderness keep its 40%!

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SEP 20 2007
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PLANNING DEPARTMENT
MEA

Stephen Merlo
708 Douglass St.
S.F. CA 94114

415-920-9668

Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Maltzer:

Your environmental review of the San Francisco Public Utilities Commission's plan to take more water from the Tuolumne River fails to adequately identify and address all of the environmental impacts to the River. I urge you to undertake additional studies before finalizing this document.

I believe we need to implement a mandatory landscaping policy that requires the installation of only native vegetation and drip irrigation technology to all new commercial projects going forward and provide tax-credits for existing commercial operations to change over to native vegetation. Google Inc. recently installed native plants in their corporate headquarters, so their project would provide a good case study for others to learn and model after.

Here are the benefits of Native Plants:

- Drought resistant
- Deer and bug resistant
- Disease resistant
- Requires less energy inputs
- Lower maintenance costs than traditional non-native landscaping 01

And here are some reasons why we cannot continue business as usual:

- Decreasing snow pack is predicted for the future due to global warming, which amounts to less water for drinking and irrigation for all Californians
- The state had its lowest water supplies this past year/winter
- The drought in Southern California will further exasperate the potential water crises by diverting more water from the Sierra's.

Some ideas to ponder….

When people deal with reality

- We have many options and choices to work with
- We have time to be proactive
- We can implement conservation and efficiency
- We have economic stability

When reality deals with people

- We have little or no options/choices
- *There will be* hard, difficult, sacrifices, shortages and severe economic consequences/hardships
- We have no time to be procative; we can only be reactive

C_Mijac

I support the alternatives identified in your draft document that protect the Tuolumne River from new diversions. Requiring more water conservation, efficiency, and recycling is the best way to lessen impacts on the Tuolumne River while promoting a sustainable water plan for the Bay Area. 01 cont.

Only by ensuring that healthy amounts of water continue to flow into the Tuolumne River can we protect this most irreplaceable natural treasure.

Sincerely,

Ivo Mijac
1611 Washington Street, #2
San Francisco, CA 94109-3111
415.567.6801

C_Mille

Diana Sokolove <wsip.peir.comments@gmail.com>

keep the water in the Tuolumne River

Eric Millette <eric@ericmillette.com> **Mon, Oct 1, 2007 at 12:43 PM**
Reply-To: eric@ericmillette.com
To: wsip.peir.comments@gmail.com

To: Paul Maltzer, Environmental Review Officer Water System Improvement Program PEIR San Francisco Planning Department

Dear Mr. Maltzer:

Please don't take any more water out of our Sierra Rivers!

Let's get more conservation measures in place instead!! 01

Thank you,

Eric Millette

656 2nd Ave
San Francisco, CA 94118

12.5-73

C_MindeN

Diana Sokolove <wsip.peir.comments@gmail.com>

Tuolumne River

Bob Mindelzun <mindelzu@stanford.edu> **Sun, Sep 23, 2007 at 2:02 PM**
To: wsip.peir.comments@gmail.com

Paul Maltzer
Environmental Review Officer
San Francisco Planning Department

Dear Sir:

Like so many of my fellow citizens, I am extremely concerned about the SFPUC proposal to divert the 25 million gallons of water per day from the Tuolumne River.

Rather than diversion, this issue needs conservation and use of maximal efficiency for solution. 01

I urge you to support a reduced diversion from this Wild and Scenic River; a California Natural Treasure.

Thank you for your attention.

Professor Robert E. Mindelzun MD
Stanford University

C_MindeR

Diana Sokolove <wsip.peir.comments@gmail.com>

Tuolumne River

Bob Mindelzun <mindelzu@stanford.edu> **Thu, Sep 20, 2007 at 6:11 PM**
To: wsip.peir.comments@gmail.com

from Naomi Mindelzun;
I am extremely concerned about the SFPUC proposal to divert the additional 25 million gallons of water per day from the Tuolumne River, and urge you to re-evaluate the SFPUC projections,and instead adopt a policy of reducing diversions from the river over time. 01
Please do not ignore conservation and efficiency measures in regard to this issue.
Thank you.

C_Neal

Diana Sokolove <wsip.peir.comments@gmail.com>

Comments on WSIP PEIR

Peter Neal <pneal1@mindspring.com> **Fri, Sep 21, 2007 at 1:20 PM**
Reply-To: pneal1@mindspring.com
To: wsip.peir.comments@gmail.com

Dear Mr. Paul Maltzer,

I wholeheartedly support the seismic upgrades and water system delivery improvements in the WSIP. These are necessary and urgent projects that need to be addressed without delay.

However, I am very opposed to the plan to divert more of the Toulumne River, and I do not believe the report adequately addresses the impact of this action. Nor have water conservation measures been properly evaluated and factored in to the plan to divert more Toulumne water. This beautiful wild river and its ecosystem should not be sacrificed to support water-hungry lawns, golf courses, and commercial landscaping. In fact, it seems incongruous and illogical to even include this recommendation in the WSIP. It is a conservation issue, not an infrastructure issue. 01

I strongly suggest that you decouple the Toulumne diversion plan from the rest of the WSIP. To include it is akin throwing out the baby with the bath water.

Peter Neal
3880 El Centro
Palo Alto, CA 94306

12.5-75

COMMENT CARD

San Francisco Planning Department
Draft Program Environmental Impact Report on the
SFPUC's Proposed Water System Improvement Program
Fremont, CA. September 18, 2007

Thank you for participating in tonight's public hearing on the Draft Program Environmental Impact Report (PEIR) for the San Francisco Public Utilities Commission's proposed Water System Improvement Program (WSIP). This is also an opportunity for you to submit written comments on the Draft PEIR for the proposed WSIP.

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1. Leave your written comments in the designated "Comment Box" tonight. These cards are provided for your convenience.
2. Mail your comments by October 1, 2007 to the San Francisco Planning Department, Attention: Paul Maltzer, Environmental Review Officer, WSIP PEIR, 1650 Mission Street, Suite 400, San Francisco, CA 94103
3. E-mail written comments to wsip.peir.comments@gmail.com

CONTACT INFORMATION

Name: Erna R. Nore
Affiliation: Tuolumne River Trust
Address: 700 Vasona St.
City, State, Zip: Milpitas, CA 95035
Phone or E-mail:

WRITTEN COMMENTS Write clearly and continue on back. Use multiple sheets if needed.

Thank you for providing this public hearing. As a Milpitas resident + consumer of Tuolumne River water I appreciate the need to update the system.

As a hiker in the Sierra I also appreciate wild + natural places. I hope the Tuolumne River will be kept in a healthy condition that will benefit fish, other wildlife + human recreation.

WRITTEN COMMENTS (Continued)

I try to conserve + recycle water as much as possible. I hope the SFPUC will pursue plans for conservation + recycling in order to prevent taking any more water from the Tuolumne River. I agree with the speakers at this meeting that our precious water should be used more wisely to prevent waste. 01

If we destroy our planet Earth we make it uninhabitable for human beings along with other life forms.

Sincerely,

Erna R. Nore

C_Noren1

Diana Sokolove <wsip.peir.comments@gmail.com>

Tuolumne River water usage

1 message

Lola Noren <lnoren@sbcglobal.net> **Wed, Oct 10, 2007 at 12:21 PM**
To: wsip.peir.comments@gmail.com

Paul Maltzer, Environmental Review Officer
Water System Improvement Program PEIR
San Francisco Planning Department

Dear Mr. Maltzer:

Your environmental review of the San Francisco Public Utilities Commission's plan to take more water from the Tuolumne River does not adequately identify and address all of the environmental impacts to the River. I urge you to undertake additional studies of the Tuolumne River before finalizing this document. 01

I support the alternatives identified in your draft document that protect the Tuolumne River from new diversions. 02

Requiring more water conservation, efficiency, and recycling is the best way to lessen impacts to the Tuolumne River while promoting a sustainable water solution for the San Francisco Bay Area. 03

The public should have been steered down the conservation/sustainable use road long before this.

Personally, I think that agribusiness wastes a whole lot more water than the cities do; however, I think the usage by the city requires more energy resources to transport it to the tap, heat it for use, and then clean it before disposal. Therefore the issue must be addressed on two fronts, personal/company use and agribusiness uae. 04

In this day and age of technology, there are several major water savers that have not been implemented in society. Those along with cutting out the pork waste in agribusiness would go a long way towards easing up the burden on our limited water resources so that in the future, the only options left for water management are not negative ones 05

In the mean time, by ensuring that healthy amounts of water continue to flow into the Tuolumne River can we protect this irreplaceable natural wonder.

Please move water conservation to the top of the priority list where it should be!

Sincerely,

William W. Noren
37878 2nd Street
Fremont, CA 94536
510-744-0884

12.5-76

C_Okuzu

Diana Sokolove <wsip.peir.comments@gmail.com>

WSIP PEIR comments

Margaret Okuzumi <okuzumi@silcon.com> **Fri, Oct 12, 2007 at 12:04 AM**
To: wsip.peir.comments@gmail.com

I am writing to provide comment on the WSIP PEIR. CEQA requires that the PEIR properly identifies and addresses the environmental impacts of the project. The PEIR must be amended to include information on baseline conditions of the Upper Tuolumne River. If a recent comprehensive study of baseline conditions is not available, then such a study must be conducted in order to provide per CEQA an accurate assessment of the environmental impacts of drawing an additional 25 million gallons a day from the Tuolumne River. 01

These impacts include impacts to fish populations such as Chinook salmon and steelhead; pollution in the San Francisco Bay Delta, and degradation in quality of recreational opportunities such as rafting. An alternative that includes of drawing an additional 25 million gallons/day from the Tuolumne cannot possibly be the environmentally preferable alternative when it supplies more water for growth than is planned for in local general plans. I am opposed to taking more water from the Tuolumne River. 02

Even given the flaws in the PEIR to date, it should be evident that the environmental superior alternative is one than requires water agencies to pursue additional water conservation and recycling instead of taking more water from this wild and scenic river. I have noticed a number of wasteful practices and waste of water in my local area such as companies that run sprinklers even when it's raining, and which have sprinklers that direct water onto the street or sidewalk instead of on to the landscaping. There is also much more that can be done to encourage consumers of all types to landscape so as to save water and virtually eliminate the need to irrigate, such as companies, individual homeowners, and homeowner's associations for condo and townhouse complexes where individuals may have more difficulty getting the association to implement water-wise gardening practices. Such an education program, such as the work that EBMUD has done, and other incentives to conserve and recycle, will ultimately prove more sustainable than relying on increasingly scarce water from the Sierras. 03

The PEIR must accurately identify impacts using realistic rather than inflated employment projections. The PEIR should identify as most environmentally preferable the alternative that emphasizes conservation and recycling over one that relies on consuming more of an ecologically precious resource, namely the water in a wild and scenic river.

Thank you for the opportunity to comment and your attention to these comments.

Sincerely,

Margaret Okuzumi
749 Winstead Ter
Sunnyvale, CA 94087

C_ONeil

COMMENT CARD

San Francisco Planning Department
Draft Program Environmental Impact Report on the
SFPUC's Proposed Water System Improvement Program
Palo Alto, CA. September 19, 2007

Thank you for participating in tonight's public hearing on the Draft Program Environmental Impact Report (PEIR) for the San Francisco Public Utilities Commission's proposed Water System Improvement Program (WSIP). This is also an opportunity for you to submit written comments on the Draft PEIR for the proposed WSIP.

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2. Mail your comments by October 1, 2007 to the San Francisco Planning Department, Attention: Paul Maltzer, Environmental Review Officer, WSIP PEIR, 1650 Mission Street, Suite 400, San Francisco, CA 94103
3. E-mail written comments to wsip.peir.comments@gmail.com

CONTACT INFORMATION

Name: KAY O'NEILL

Affiliation: CITIZEN - WATER USER

Address: 485 NINTH AVE.

City, State, Zip: MENLO PARK, CA 94025

Phone or E-mail: KAYONEILL@MINDSPRING.COM

WRITTEN COMMENTS Write clearly and continue on back. Use multiple sheets if needed.

DO NOT TAKE PRECIOUS WATER FROM OUR RIVERS. THIS IS A SHORT SIGHTED SOLUTION TO A MUCH LARGER PROBLEM. AGRICULTURAL + INDUSTRIAL USE SHOULD BE REVIEWED, AND NOT SUBSIDIZED. LOOK AT THE MARKET, NOT JUST THE DEMAND. ENCOURAGE CONSERVATION & VALUE OUR WATER RESOURCES. 01

12.5-77

C_Pagli

RECEIVED
SEP 20 2007
CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
M E A

Anne Pagliarulo
436 Capistrano Avenue
San Francisco, CA 94112

Commissioner Ryan Brooks, President
San Francisco Public Utilities Commission
C/O Sierra Club SF Bay Chapter
2530 San Pablo Avenue, Ste. I
Berkeley, CA 94702

Dear President Brooks,

With its headwaters in Yosemite National Park, the Tuolumne River is a national jewel that is home to an outstanding native trout fishery, bald eagles, black bears, and thrilling whitewater.

Unfortunately, instead of increasing water conservation and recycling efforts, the San Francisco PUC plans on meeting future water demand by taking more water out of the Tuolumne, a federally designated Wild and Scenic River. 01

I urge you to meet our water needs and protect the Tuolumne River for future generations through conservation and recycling rather than withdrawing more water and depleting the Tuolumne River.

The fate of the Tuolumne River rests in your hands.

Sincerely,

Anne Pagliarulo

Anne Pagliarulo

C_Parke

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OCT 0 1 2007
CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
M E A

September 29, 2007

Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Maltzer:

I write as a concerned citizen as it relates to the Water Improvement Program (WIP) Program
Environmental Impact Report (PEIR). While the seismic upgrades are critical to maintaining the
water delivery infrastructure, I feel that the plan to divert additional water from the Tuolumne
River is premature. Given this clear distinction in the plan between the seismic upgrades and the 01
amount of water being distributed, it would be ideal to have the WIP split out in a way which
will provide an opportunity to approve each separately. This will allow for the seismic upgrades
to commence as soon as possible, while the environment impacts of additional diversions to meet
demand can be researched further.

Regarding the demand estimates and the plan to divert additional water from the Tuolumne, the
forecast seems to pay little attention to conservation measures as well as affects of price changes
on demand. It's surprising that only 4% of the demand is expected to be met with conversation
measures in light of the fact that an increase in per capital use is expected, with outdoor use 02
contributing 60% of the increase. This is counter to the trend in other metropolitan areas, as well
as the trend in the energy market to conserve. I encourage the SFPUC to challenge their
constituency to invest in conservation and recycling programs, similar to the drive in the energy
market. Why can't water supply and demand be managed in a similar way? Rebates, education 03
programs, scaled water rates that discourage waste, water credit trading, tax credits, recycling
programs etc., can all be effective tools to meet demand, and should be the focus of SFPUC
investment, not the diversion of more water from an already exploited resource. In addition to
unconvincing demand projections, there seems to be little known about the affects of additional 04
diversions on the Tuolumne River drainage ecosystem. A comprehensive study should be
required before additional diversions are approved.

I encourage the SFPUC to protect and restore our natural resources by exploring other options for meeting future water demand, rather then increasing diversions on the Tuolumne River.

Sincerely,

[signature]

Doug Parkes
1036 High St
Palo Alto, CA 94301

C_Perl

Kathy Perl - Sierra Club Member + S.F. Citizen
152 Chattanooga St.
S.F. CA. 94114
641-0940

RECEIVED
SEP 20 2007
CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
M E A

To whom it May Concern:

I am writing to take a stand against further environmental
impact, which would result from increasing the amount of
water taken from the wild and scenic Tuolumne River.
It is wrong-thinking to continue depleting our precious
and already strained natural resources, rather than to
enforce conservation, recycling and explore desalination 01
options. Not to mention educating people about the
grave danger to our planet from overpopulation.
Please save the Tuolumne River and the life
systems it supports!

Kathy Perl

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

Water Conservation and the Tuolumne River

jcpoulton@comcast.net <jcpoulton@comcast.net> **Wed, Sep 26, 2007 at 12:34 PM**
To: wsip.peir.comments@gmail.com

Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400

Dear Mr Maltzer:

I believe that your environmental review of the San Francisco Public Utilities Commission's plan to take more water from the Tuolumne River is flawed. It appears that all you want is more water, not taking into question the impact on the river or the people that live on or near its banks. There appears to be no conservation in your plans. I urge you to take time for additional studies before implementing or finalizing this document. 01

I support the alternatives identified in your draft document that protect the Tuolumne River from future diversions. We need more consideration of ways to better and more efficiently use the water we have now.

Sincerely,

J. C. Poulton
2010 Palmer Drive
Pleasanton, CA 94588

"Paul Raffaeli" <PaulRa@synnex.com>
10/01/2007 04:12 PM

To <Bill.Wycko@sfgov.org>
cc
bcc
Subject FW: Save the Tuolumne

Hello Bill,
Please see below message.

Thanks,

Paul

From: Paul Raffaeli
Sent: Monday, October 01, 2007 10:39 AM
To: 'paul.maltzer@sfgov.org'
Subject: FW: Save the Tuolumne

Paul,
These points below are well outlined and well founded.
Please do not push to divert any more water from the "T". 01
Conservation is the way to go.

Thanks,

Paul Raffaeli
3937 Braeburn Ct.
San Jose, CA 95130.

****

Don't Let San Francisco Suck The Wild Tuolumne Dry!

Write a letter today to encourage the SFPUC to drop its proposal to divert more water from the Tuolumne and focus on water use efficiency and recycling to meet future water needs.

The San Francisco Public Utilities Commission (SFPUC) is pushing a "Water Improvement System Program" that proposes to divert an additional 25 million gallons of water daily from the Tuolumne Wild & Scenic River. San Francisco already diverts 60 percent of the river's water. The SFPUC "Improvement Program" could significantly reduce flows in the Tuolumne, which is one of the most popular whitewater and wild trout rivers in California. The SFPUC is using a flawed analysis that inflates future water needs, while underestimating how future needs could be met by increased water use efficiency and water recycling. 02

Please read the Key Points below, cut and past what you wish, add your own words, and send your letter to:
Paul Maltzer, Environmental Review Officer

Water System Improvement Program PEIR
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103
paul.maltzer@sfgov.org
Fax 558.6409

Key Points

Background

- From its headwaters in Yosemite National Park, the Tuolumne River cascades 162 miles before joining the San Joaquin River and flowing into the San Francisco Bay-Delta.
- The Tuolumne River supports a diverse biological community, including migratory waterfowl, raptors (including peregrine falcons and bald eagles), mule deer, black bears, foothill yellow-legged frogs, Sierra Nevada red fox, rainbow trout, steelhead and Chinook salmon.
- As the largest of three major tributaries to the San Joaquin River, the Tuolumne River contributes much-needed freshwater to the San Francisco Bay-Delta.
- The Tuolumne River offers unparalleled outdoor recreation opportunities, hosting thousands of hikers, whitewater boaters, anglers, and family campers each year.
- The Tuolumne was designated a Wild and Scenic River in 1984. 03

The Threat

- In total, about 60% of the Tuolumne River is already diverted for urban and rural uses, and increasing diversion will do further harm to the River.
- As part of its Water System Improvement Program (WSIP), the San Francisco Public Utilities Commission (SFPUC) has proposed diverting an additional 25 million gallons of water per day from the Tuolumne River.
- The SFPUC already diverts one-third of the Tuolumne River as it flows through Yosemite National Park.
- Outdoor water use alone is driving 60% of the anticipated increase in water demand.

Inadequate Studies/Flawed Analysis

- The Draft Program Environmental Impact Report (PEIR) used flawed modeling to determine the anticipated increase in water demand, thus inflating projected future needs.
- In contrast to other metropolitan areas that have managed to reduce water demand in the face of growth, the anticipated 14% increase in demand projected by the SFPUC is large and out of step for the Bay Area. 04
- The PEIR fails to properly identify and address all of the impacts of taking more water from the Tuolumne River. This failure largely stems from the lack of an adequate baseline study of the Upper Tuolumne River; a comprehensive study has not been conducted in over 15 years. A new study was initiated in 2006, but will not be completed in time to inform the environmental review process. 05
- The PEIR does not take into consideration the impact of climate change on precipitation in the Tuolumne River watershed. The State of California predicts that global warming could reduce the Sierra snowpack by 5% by 2030 and as much as 33% by 2060. 06

Conservation, Efficiency and Recycling

- Water conservation and efficiency measures are the cheapest, easiest, and least destructive ways to meet demand and extend supply.
- The SFPUC's "preferred alternative" ignores conservation, efficiency, and recycling measures that their own studies found could eliminate the need to divert more water from the Tuolumne by at least 74%. 07
- Per capita water use is projected to increase for wholesale customers, indicating they lack effective conservation programs.
- When it comes to water conservation, the Bay Area lags far behind other metropolitan areas such as Seattle and Los Angeles that are reducing water consumption even in the face of growth. As a

C_Raffa

region known for a strong environmental ethic, the Bay Area should be a leader in water efficiency and conservation. 07 cont.

Other Points

- Decreasing reliance on the Tuolumne is critical not only for protecting the health of the River, but also for preparing for the future uncertainty of the Sierra snowpack as a result of global warming. 08
- By pursuing a plan to divert additional water from the Tuolumne River, the SFPUC risks delaying their capital program, causing cost overruns and failing to increase the reliability of the water supply. 09

Recommendations

- The SFPUC should re-evaluate its projections for future water demand and conservation potential in light of flaws and inaccuracies in their studies. 10
- The SFPUC should conduct a study to determine the maximum technical potential for conservation and efficiency savings within the SFPUC service territory.
- Any additional demand should be met through increased investment in conservation, efficiency, and recycling. 11
- The SFPUC should adopt a policy of reducing diversions from the Tuolumne River over time. 12
- A comprehensive watershed study should be completed to adequately assess the environmental impacts of the WSIP. 13

Learn More

- Visit the Tuolumne River Trust website at http://www.tuolumne.org/
- The Draft EIR is available at www.sfgov.org/site/planning_index.asp?id=37672 (Scroll down to "Public Utility Commission (PUC) Projects: SF PUC Water System Improvement Program DPEIR.")
- For more information, contact the Tuolumne River Trust at peter@tuolumne.org or (415) 292-3531.

C-Raube

COMMENT CARD

San Francisco Planning Department
Draft Program Environmental Impact Report on the
SFPUC's Proposed Water System Improvement Program
Modesto, CA. September 6, 2007

Thank you for participating in tonight's public hearing on the Draft Program Environmental Impact Report (PEIR) for the San Francisco Public Utilities Commission's proposed Water System Improvement Program (WSIP). This is also an opportunity for you to submit written comments on the Draft PEIR for the proposed WSIP.

Written comments will be accepted through close of business on Monday, October 1, 2007. Written comments may be submitted in one of three ways:

1. Leave your written comments in the designated "Comment Box" tonight. These cards are provided for your convenience.
2. Mail your comments by October 1, 2007 to the San Francisco Planning Department, Attention: Paul Maltzer, Environmental Review Officer, WSIP PEIR, 1650 Mission Street, Suite 400, San Francisco, CA 94103
3. E-mail written comments to wsip.peir.comments@gmail.com

CONTACT INFORMATION

Name: David Raube
Affiliation: Grape grower
Address: 4455 Roeding Road
City, State, Zip: Ceres, CA 95307
Phone or E-mail:

WRITTEN COMMENTS Write clearly and continue on back. Use multiple sheets if needed.

Without a doubt S.F. will need more water for a growing ~~area~~ population. However, there is a definite limit to how much can be drawn from the Tuolumne & still have a river. So make plans for more water conservation including desalinazion & reclaiming waste water which is much ~~to~~ less expensive. No more river water! 01

C-Reedy

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

SFPUC PEIR comments

MarkR2121@aol.com <MarkR2121@aol.com> **Wed, Sep 19, 2007 at 5:58 PM**
To: wsip.peir.comments@gmail.com
Cc: bill.young@sierraclub.org

September 19, 2007

Environmental Review Officer, WSIP PEIR
San Francisco Planning Dept.

Dear Environmental Review Officer,

I would like to comment on the draft Program EIR for the SFPUC's $4.3 billion water system upgrade. The Program EIR indicates that additional diversions could result in damage to fisheries and sensitive riparian habitat, increased pollution problems in the S.F. Bay Delta and diminished recreational opportunities. I therefore urge that San Francisco protect the Tuolumne River for future generations by requiring water conservation, efficiency and recycling to the maximum extent possible to eliminate or greatly reduce the need for additional diversions from the river. Also, San Francisco should pursue a sustainable water plan that will fully protect the watersheds of the Bay Area and the Sierra Nevada. 01

Thank you.

Mark Reedy
Sunnyvale, CA

C_Reich

COMMENT CARD

San Francisco Planning Department
Draft Program Environmental Impact Report on the
SFPUC's Proposed Water System Improvement Program
Sonora, CA. September 5, 2007

Thank you for participating in tonight's public hearing on the Draft Program Environmental Impact Report (PEIR) for the San Francisco Public Utilities Commission's proposed Water System Improvement Program (WSIP). This is also an opportunity for you to submit written comments on the Draft PEIR for the proposed WSIP.

Written comments will be accepted through close of business on Monday, October 1, 2007. Written comments may be submitted in one of three ways:

1. Leave your written comments in the designated "Comment Box" tonight. These cards are provided for your convenience.
2. Mail your comments by October 1, 2007 to the San Francisco Planning Department, Attention: Paul Maltzer, Environmental Review Officer, WSIP PEIR, 1650 Mission Street, Suite 400, San Francisco, CA 94103
3. E-mail written comments to wsip.peir.comments@gmail.com

CONTACT INFORMATION

Name: Stefan Reichle

Affiliation:

Address: PO Box 621 Jamestown CA 95327

City, State, Zip:

Phone or E-mail: 209 984 499

WRITTEN COMMENTS Write clearly and continue on back. Use multiple sheets if needed.

I grew up in the Bay Area and moved to Tuolumne County 5 years ago. I have a deep pride in the progressive values of the Bay Area, and am shocked that cities like LA, Boston, and Seattle are besting SF in water conservation and reuse. I know the Bay Area can lead in this arena if the political will follows the heart values of the people who live there and develops the means to let them. thank you. 01

C_Richa

Diana Sokolove <wsip.peir.comments@gmail.com>

Public Comment on SFPUC's WISP

Richardson, Matt - SFMH <Matt.Richardson2@chw.edu> **Thu, Sep 6, 2007 at 12:28 PM**
To: "wsip.peir.comments@gmail.com" <wsip.peir.comments@gmail.com>
Cc: "matt_richardson@hotmail.com" <matt_richardson@hotmail.com>

Hello,
My comments are simple

1. no increase in water removal from the Tuolumne river. 01
2. increase marketing/public awareness programs to reduce/conserve water use (current programs are insufficient) 02
3. increase water recycling 03
4. NO new dams in California - old technology, and there isn't enough water in the rivers anyway 04
5. if you're wanting reliability - it's time for De-sal 05

Thank you,
Dr. Richardson
Doctor of Physical Therapy

Matthew J. Richardson, PT, DPT
Saint Francis Memorial Hospital
Center for Sports Medicine
900 Hyde Street
San Francisco, CA 94109
415-353-6400
www.saintfrancismemorial.org

<<...OLE_Obj...>>

Paul Maltzer/CTYPLN/SFGOV

10/09/2007 02:54 PM

To Diana Sokolove/CTYPLN/SFGOV@SFGOV
cc
bcc
Subject Fw: SAVE THE TUOLUMNE RIVER

----- Forwarded by Paul Maltzer/CTYPLN/SFGOV on 10/09/2007 02:53 PM -----

Jim Ross <jameswross@hotmail.com>

10/03/2007 09:32 PM

To <paul.maltzer@sfgov.org>
cc
Subject SAVE THE TUOLUMNE RIVER

Dear Paul,

I sincerely appreciate you taking the time to understand the possibilities of enough water for everyone be they SF area customers and river users both human and fish. It is a disgrace that San Francisco has rested on it's laurels of Hetch Hetchy and the Tuolumne and now lags behind the nation in even minimal water conservation. More, more, more is not the answer...we are past that point of simplistic thought in environmental concerns. I urge you to Step Up to a new world of possibility and responsibility.

Background

- From its headwaters in Yosemite National Park, the Tuolumne River cascades 162 miles before joining the San Joaquin River and flowing into the San Francisco Bay-Delta.
- The Tuolumne River supports a diverse biological community, including migratory waterfowl, raptors (including peregrine falcons and bald eagles), mule deer, black bears, foothill yellow-legged frogs, Sierra Nevada red fox, rainbow trout, steelhead and Chinook salmon.
- As the largest of three major tributaries to the San Joaquin River, the Tuolumne River contributes much-needed freshwater to the San Francisco Bay-Delta.
- The Tuolumne River offers unparalleled outdoor recreation opportunities, hosting thousands of hikers, whitewater boaters, anglers, and family campers each year. 01
- The Tuolumne was designated a Wild and Scenic River in 1984.

The Threat

- In total, about 60% of the Tuolumne River is already diverted for urban and rural uses, and increasing diversion will do further harm to the River.
- As part of its Water System Improvement Program (WSIP), the San Francisco Public Utilities Commission (SFPUC) has proposed diverting an additional 25 million gallons of water per day from the Tuolumne River.
- The SFPUC already diverts one-third of the Tuolumne River as it flows through Yosemite National Park.
- Outdoor water use alone is driving 60% of the anticipated increase in water demand.

Inadequate Studies/Flawed Analysis

- The Draft Program Environmental Impact Report (PEIR) used flawed modeling to determine the anticipated increase in water demand, thus inflating projected future needs. 02
- In contrast to other metropolitan areas that have managed to reduce water demand in the face of growth, the anticipated 14% increase in demand projected by the SFPUC is large and out of step for the Bay Area.
- The PEIR fails to properly identify and address all of the impacts of taking more water from the Tuolumne River. This failure largely stems from the lack of an adequate baseline study of the Upper Tuolumne River; a comprehensive study has not been conducted in over 15 years. A new study was initiated in 2006, but will not be completed in time to inform the environmental review 03

process. 03 cont.

- The PEIR does not take into consideration the impact of climate change on precipitation in the Tuolumne River watershed. The State of California predicts that global warming could reduce the Sierra snowpack by 5% by 2030 and as much as 33% by 2060. 04

Conservation, Efficiency and Recycling

- Water conservation and efficiency measures are the cheapest, easiest, and least destructive ways to meet demand and extend supply.
- The SFPUC's "preferred alternative" ignores conservation, efficiency, and recycling measures that their own studies found could eliminate the need to divert more water from the Tuolumne by at least 74%. 05
- Per capita water use is projected to increase for wholesale customers, indicating they lack effective conservation programs.
- When it comes to water conservation, the Bay Area lags far behind other metropolitan areas such as Seattle and Los Angeles that are reducing water consumption even in the face of growth. As a region known for a strong environmental ethic, the Bay Area should be a leader in water efficiency and conservation.

Other Points

- Decreasing reliance on the Tuolumne is critical not only for protecting the health of the River, but also for preparing for the future uncertainty of the Sierra snowpack as a result of global warming. 06
- By pursuing a plan to divert additional water from the Tuolumne River, the SFPUC risks delaying their capital program, causing cost overruns and failing to increase the reliability of the water supply. 07

Recommendations

- The SFPUC should re-evaluate its projections for future water demand and conservation potential in light of flaws and inaccuracies in their studies. 08
- The SFPUC should conduct a study to determine the maximum technical potential for conservation and efficiency savings within the SFPUC service territory. 09
- Any additional demand should be met through increased investment in conservation, efficiency, and recycling.
- The SFPUC should adopt a policy of reducing diversions from the Tuolumne River over time. 10
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Learn More

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- The Draft EIR is available at www.sfgov.org/site/planning_index.asp?id=37672 (Scroll down to "Public Utility Commission (PUC) Projects: SF PUC Water System Improvement Program DPEIR.")
- For more information, contact the Tuolumne River Trust at peter@tuolumne.org or (415) 292-3531.

I appreciate your support of our environment.

Smiles,
Jim
Playmeister: The Creator Network

C_Rowe

Diana Sokolove <wsip.peir.comments@gmail.com>

(no subject)

1 message

Trish Rowe <trowe@earthlink.net> **Thu, Oct 11, 2007 at 1:36 PM**
To: wsip.peir.comments@gmail.com

Dear SFPUC,

I was born in San Francisco, raised in San Carlos, educated at UC Davis, and I have worked and lived in Tuolumne County since 1976. I lobbied against the New Melones Dam Project not because I do not believe in hydropower, but for all of the ill-fated and unsubstantiated reasons attached to that project. Thousands of people in and around Tuolumne County ache from the loss of an incredible river flow, with accompanying educational, recreational and functional resources. I said then and I will say again, let us look at *how* we manage water -- usage and conservation, lifestyle, appropriate-for-the-environment/climate residential and commercial landscape, and local and statewide community policy addressing these vital- to-our-lives concerns. I wholeheartedly concur with the statement provided you by the California Department of Fish and Game: 01

"...it is irrefutable that the actions of the SFPUC on the Tuolumne River at Early Intake, Cherry Valley Dam, and Hetch Hetchy, and Lake Eleanor reservoirs influence the water releases from the New Don Pedro Dam. Increased diversion of waters from a river system which currently lacks sufficient flow to support sustainable anadromous fisheries (including Federally Threatened steelhead) should be considered a significant cumulative impact...In this context we believe the WSIP has the potential to cause anadramous fish populations to drop below self-sustaining levels and further reduce the number and restrict range Federal Threatened Central Valley steelhead – thereby requiring a finding of significant effect [CCR Title 14, section 15065 (a)(1)]. Given the dramatic decline in Tuolumne River salmon adult escapement between 2000 and 2006; we believe that if implemented as proposed, the WSIP would only exacerbate the current decline of anadromous fisheries in the Tuolumne River. Consequently, we respectfully request that the SFPUC use alternative water sources other than the Tuolumne river system or implement water conservation measures to meet drought year demands and 2030 purchase requests..." 02

Respectfully,

Trish Rowe

C_SchmiR

Diana Sokolove <wsip.peir.comments@gmail.com>

Save the Tuolumne ...

Ron Schmidt <ronstreehouse@earthlink.net> **Tue, Sep 11, 2007 at 3:19 PM**
To: wsip.peir.comments@gmail.com

Stop the PUC plan to divert an additional 25 million gallons of water per day from the Tuolumne River in the Hetch Hetchy upgrade effort. Such egregious interference with the fragile ecosystem is criminal and will distort whatever vulnerable balance remains. SAVE THE TUOLUMNE ... 01

Ron Schmidt
515 John Muir Dr., A501
San Francisco, CA 94132

Paul Maltzer/CTYPLN/SFGOV	To	Diana Sokolove/CTYPLN/SFGOV@SFGOV
	cc	
09/25/2007 09:08 AM	bcc	
	Subject	Fw: Tuolumne water diversion

----- Forwarded by Paul Maltzer/CTYPLN/SFGOV on 09/25/2007 09:08 AM -----

Judy Schriebman <judy@leapfrogproductions.com>	To	paul.maltzer@sfgov.org
	cc	
09/22/2007 12:45 PM	Subject	Tuolumne water diversion

Dear Mr. Maltzer:

It has come to my attention that the San Francisco Public Utilities Commission (SFPUC) is pushing a "Water Improvement System Program" that proposes to divert an additional 25 million gallons of water daily from the Tuolumne Wild & Scenic River. San Francisco already diverts 60 percent of the river's water. The SFPUC "Improvement Program" could significantly reduce flows in the Tuolumne, which is one of the most popular whitewater and wild trout rivers in California. The SFPUC is using a flawed analysis that inflates future water needs, while underestimating how future needs could be met by increased water use efficiency and water recycling. 01

The Tuolumne was designated a Wild and Scenic River in 1984. Surely this plan will severely impact it and the wildlife that depend upon it. The proposal seems more in keeping with the thinking of the 50's than current times, which look for recycling and water efficiency use to lessen the impact on our free ranging rivers. 02

I urge you to focus on these last means to provide water to your residents, rather than drawing off more water and threatening this magnificent river. Reclamation and reduced usage are what we are successfully using in our area to meet our water needs, as river flows are needed more and more to protect habitat and fish populations.

Sincerely,

Judy Schriebman
--

Judy Schriebman for LGVSD
415-472-3345
http://www.electjudy.org/

Please Vote on Tues. Nov. 6!

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

Tuolumne River Water

tinaxurs <tinaxurs@foothill.net> **Mon, Sep 17, 2007 at 9:49 AM**
To: wsip.peir.comments@gmail.com

Hello;
Please take no additional water out of the Tuolumne river anywhere at any time. This is the time to start conserving in any way possible, water as well as any other natural resource we have been squandering thus far. 01
Thank you!
-- urs schuler, Kelsey, CA.

C_Shea

RECEIVED

SEP 20 2007

CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
M E A

Dear Commissioner Brooks,

It is an enviromental absurdity to pull more water from the Tuolumne River. The enviromental effects would be devastating, and unneeded. The futility of this destruction is too much to bear for the concerned residents of San Francisco. As other cities such as Seattle and Los Angeles can learn to conserve so can we. I'll see you at the hearing. 01

Sincerely,
Kelly Shea

C-Simpk

Diana Sokolove <wsip.peir.comments@gmail.com>

Tuolumne Water

John Simpkin <jsimpkin@hotmail.com> **Fri, Sep 14, 2007 at 7:45 PM**
To: wsip.peir.comments@gmail.com

Please DO NOT extract more water from the Tuolumne River. It is a wonderful river with great beauty that is enjoyed by thousands of people every year. 01

John Simpkin

____
Capture your memories in an online journal!
http://www.reallivemoms.com?ocid=TXT_TAGHM&loc=us

COMMENT CARD

San Francisco Planning Department
Draft Program Environmental Impact Report on the
SFPUC's Proposed Water System Improvement Program
Modesto, CA. September 6, 2007

Thank you for participating in tonight's public hearing on the Draft Program Environmental Impact Report (PEIR) for the San Francisco Public Utilities Commission's proposed Water System Improvement Program (WSIP). This is also an opportunity for you to submit written comments on the Draft PEIR for the proposed WSIP.

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1. Leave your written comments in the designated "Comment Box" tonight. These cards are provided for your convenience.
2. Mail your comments by October 1, 2007 to the San Francisco Planning Department, Attention: Paul Maltzer, Environmental Review Officer, WSIP PEIR, 1650 Mission Street, Suite 400, San Francisco, CA 94103
3. E-mail written comments to wsip.peir.comments@gmail.com

CONTACT INFORMATION

Name: Ann C. Sloan / Ron Sloan

Affiliation: resident of Tuolumne County

Address: 23949 Quaker Lane

City, State, Zip: Twain Harte, Ca 95383

Phone or E-mail: 209 586 2635, blackcat@mlode.com

WRITTEN COMMENTS Write clearly and continue on back. Use multiple sheets if needed.

01 We are totally against giving away our water to any County. We do not have sufficient for our growing population & for our acres of forest lands at risk of fires nor our creek + river needs. We are going to learn more about this so we can successfully fight!

12.5-87

Evan Winslow Smith

RECEIVED
SEP 28 2007
CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
MEA

September 26, 2007

Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Maltzer,

I am writing to urge you to address the environmental impacts of diverting water from the Tuolumne River.

As a resident of the Bay Area for over 45 years, I grew up drinking Hetch Hetchy water and I understand both its quality and value. As a youth I saw the Tuolumne River firsthand, by raft and foot, and know it as a raw and wild scenic treasure that would likely suffer irreparable damage from additional water diversion. As a former park ranger in Yosemite National Park, I understand the need for a wise use policy that balances the needs of people and the requirements of healthy ecosystems.

I cannot, in good conscience, allow the Tuolumne River's natural wonders and resources to be lost due to lack of foresight, for my daughter and all generations to come. Enjoying natural places like the Tuolumne River are *what* we live for, using them wisely is *how* we protect them. Let's not waste its water on unsustainable and inappropriate uses.

While I support the need for seismic upgrade to Hetch Hetchy Dam, I implore you to further study the potential to the Tuolumne River and commit to water conservation, recycling, and efficient use as the best solution to creating a sustainable water plan for the SF Bay Area. 01

Sincerely,

Evan Winslow Smith

1935 Edgewood Road Redwood City California 94062 (650) 369-5700 ews@evanwinslowsmith.com

Diana Sokolove <wsip.peir.comments@gmail.com>

Tuolumne River Water Theft

Mjandpasmith@aol.com <Mjandpasmith@aol.com> **Sun, Sep 30, 2007 at 12:52 AM**
To: wsip.peir.comments@gmail.com, letters@mercurynews.com, grmjam@goldrush.com, mike.honda@mail.house.gov, senator@boxer.senate.gov, Feinsteinpress@
Cc: Mjandpasmith@aol.com

Cut the waste! Especially, cut the tremendous waste by agribiz that exceeds all other water wastage combined, even as they use a majority of California's water. Right now the plan is to give them the Tuolumne River, as we've done with other rivers in the past and more to come.

We don't have to shut down the truck farms or orchards. Just stop growing rice and cotton and alfalfa where it should not be grown. Do that by charging farm water rates that are closer to real costs, and not a huge subsidy carried on the backs of industry and California's householders. 01

Look, farmers are a tiny minority of Californians and get laughably minute productivity from water they use, compared to business, industrial, and residential users. Start weaning the handful of millionaire farmers from the taxpayers' teats. They could be encouraged to grow a different crop mix in a less wasteful way and still make their millions. But they won't do that if we just roll over and give them a bigger share of the water while they waste enough water to wash every CA car and driveway daily.

Please, don't just pee away the Tuolumne to further enrich the alfalfa barons.

Paul Smith, Los Gatos and Twain Harte

Diana Sokolove <wsip.peir.comments@gmail.com>

Tuolumne River

Cindy Spring <spring5@mindspring.com> **Tue, Sep 25, 2007 at 12:00 PM**
To: wsip.peir.comments@gmail.com

Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Maltzer,

I urge you to take into account all the environmental factors involved in the proposals regarding the Tuolumne River. 01
My chief concern is the protection of habitat for the fish and other wildlife that depend for their lives on the river.

I believe we have barely begun to learn how conservation measures can be used to provide more water for humans. 02

Please keep me abreast of the EIRs that pertain to this matter.

Thank you.

Cindy Spring
6886 Pinehaven Rd.
Oakland, CA 94611

C_Stein

Peter Steinhart
717 Addison Ave.
Palo Alto, CA 94301

RECEIVED
SEP 2 6 2007
CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
M E A

Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Maltzer,

I am writing to comment on the Draft PEIR for the WSIP. I take no issue
with the analysis of the proposed seismic upgrades. But I see no need to bundle
into this upgrade program a proposal to increase diversions from the Hetch Hetchy 01
System. And in rushing to tack onto the retrofit an additional diversion, I believe
the Environmental Impact Report falls short of what is necessary. I believe the
report uses flawed modeling to inflate future water demands and understates the
efficacy of conservation. The PUC's own studies show that conservation 02
measures could easily eliminate three-quarters of the need for any increased
diversion. And I believe the discussion of potential impacts of global warming on
the Tuolumne's future flows is inadequate. The discussion defers global warming
impacts to a period beyond the purview of the project and shrugs off impacts as
being "within the same range that occurs under both the existing and proposed 03
operations and management of the system" – a range which includes of course
drought year levels which, spread out over years or decades by global warming,
would have devastating impact on fish and wildlife. More study of the upper
Tuolumne River is needed before effects can be adequately assessed. Climate
change could also cause increased diversions from the Tuolumne to have 04
significant impacts on the health of the Sacramento Delta and San Francisco Bay.

Sincerely,

Peter Steinhart

Peter Steinhart

C_Sugar

Diana Sokolove <wsip.peir.comments@gmail.com>

Regarding PEIR of SFPUC Tuolumne River plan

Marc Sugars <m_sugars@yahoo.com> **Wed, Sep 26, 2007 at 10:59 AM**
To: wsip.peir.comments@gmail.com

Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

September 26, 2007

Dear Mr. Maltzer:

I am writing you in regards to the environmental review of the San Francisco Public Utilities Commission's plan to take
more water from the Tuolumne River. I urge you to carry out additional studies before finalizing this report so that all 01
of the environmental impacts of this plan are taken into account.

Diverting additional water will have serious impacts on the ecology of the Tuolumne River watershed. More efforts
should be focused on exploring more sustainable alternatives mentioned in your report such as water conservation,
efficiency, and recycling. These methods have been shown to help reduce water demand in other metropolitan 02
areas. Not only will this help protect this valuable and awe-inspiring watershed but it will also help us decrease our
reliance on a water source that may not provide the amount of water it once did due to global warming.

Thank you for your time,

Marc Sugars
2332 18th Ave.
San Francisco, CA 94116

C_Sundb

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

Tuolumne River

1 message

Karen Sundback <sundback@sbcglobal.net> **Mon, Oct 1, 2007 at 8:24 AM**
To: Paul Maltzer <wsip.peir.comments@gmail.com>

Mr. Maltzer,

The Tuolumne River Diversion Debate is a tough one. Presently this portion of Tuolumne River feeds the Delta. California voters rejected a peripheral canal around the Delta in 1982. Now that Governor Schwarzenegger is taking a different approach from his own blue ribbon water panel and is supporting the peripheral canal, who gets water rights to this portion of the Tuolumne River if the peripheral canal gets the okay? 01

Many of us would like to save the Tuolumne River. However, with the peripheral canal looming in the background, this becomes a more difficult issue.

Thank you for your consideration.

Karen Sundback

Karen Sundback

12.5-90

C_Symon

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

SFPUC's WSIP DPEIR

new.leaf <new.leaf@earthlink.net> **Thu, Sep 20, 2007 at 1:04 PM**
To: wsip.peir.comments@gmail.com
Cc: Barbara Symons <new.leaf@earthlink.net>

Paul Maltzer, Environmental Review Officer
San Francisco Planning Dept.
1650 Mission Street, Suite 400
San Francisco, CA 94103

September 20, 2007

Paul Maltzer,

I do NOT want the SFPUC to accept the current Draft PEIR for SFPUC's Proposed Water System Improvement Program. I was at the Public Hearing on this issue in Palo Alto last night, September 19, 2007, and am strongly opposed to this Draft PEIR.

I demand the SFPUC separate two issues that are now combined in the current Draft PEIR. Separate:

1) Seismic Upgrades of the water delivery system, which is obviously needed, from

2) The plan to divert an additional 25 million gallons per day more of the Tuolumne River, which has NOT been accurately studied, planned, and addressed and is environmentally unsound.

The above are two separate environmental issues inappropriately joined into one single Draft Program Environmental Impact Report. 01

I demand that the SF Public Utilities Commision:

1) Reject the current Draft PEIR.

2) Separate these two SF water supply issues: Seismic Upgrades and Increased Tuolumne River Usage.

3) Create two new Draft PEIRs, one for each issue.

4) Have two NEW public hearings on each separate issue.

SFPUC, Reject this Draft PEIR!

N. L.
Resident of Ten Years
Palo Alto Area, CA

C_TayloS

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

FW: SFPUC Water System Improvement Program

1 message

Scott Taylor <staylor@laclinica.org> **Mon, Oct 1, 2007 at 9:02 AM**
To: wsip.peir.comments@gmail.com

Scott Taylor
3451 E. 12th Street
Oakland, CA 94601
ph (510) 535-3511
fax (510) 535-4301
STaylor@laclinica.org

From: Scott Taylor [mailto:staylor@laclinica.org]
Sent: Monday, October 01, 2007 9:11 AM
To: 'wisp.peir.comments@gmail.com'
Subject: SFPUC Water System Improvement Program

12.5-91

To Whom It May Concern:
I am writing you concern the Water System Improvement Program. While all would agree that the system needs a major upgrade, I would strongly urge not to take more water from the Toulumne River. We need to take the step to conserve and reuse water instead always taking more. Our rivers are already being sucked dry. 01
No more water from the Toulumne.
Thanks,
Scott Taylor

Scott Taylor
3451 E. 12th Street
Oakland, CA 94601
ph (510) 535-3511
fax (510) 535-4301
STaylor@laclinica.org

C_Teves

COMMENT CARD

San Francisco Planning Department
Draft Program Environmental Impact Report on the
SFPUC's Proposed Water System Improvement Program
Palo Alto, CA. September 19, 2007

Thank you for participating in tonight's public hearing on the Draft Program Environmental Impact Report (PEIR) for the San Francisco Public Utilities Commission's proposed Water System Improvement Program (WSIP). This is also an opportunity for you to submit written comments on the Draft PEIR for the proposed WSIP.

Written comments will be accepted through close of business on Monday, October 1, 2007. Written comments may be submitted in one of three ways:

1. Leave your written comments in the designated "Comment Box" tonight. These cards are provided for your convenience.
2. Mail your comments by October 1, 2007 to the San Francisco Planning Department, Attention: Paul Maltzer, Environmental Review Officer, WSIP PEIR, 1650 Mission Street, Suite 400, San Francisco, CA 94103
3. E-mail written comments to wsip.peir.comments@gmail.com

CONTACT INFORMATION

Name: M. Teves
Affiliation: resident
Address: 884 College Ave
City, State, Zip: Palo Alto CA
Phone or E-mail:

WRITTEN COMMENTS Write clearly and continue on back. Use multiple sheets if needed.

Why hasn't 'Conservation' been asked of us? Why are we still allowed to pour limitless gallons of water on our lawns and down our drains? 01
Conservation first – not this

C_Thaga

Paul Maltzer/CTYPLN/SFGOV

09/25/2007 09:28 AM

To Diana Sokolove/CTYPLN/SFGOV@SFGOV
cc
bcc
Subject Fw: Tuolomne River "Improvement Program"

----- Forwarded by Paul Maltzer/CTYPLN/SFGOV on 09/25/2007 09:27 AM -----

"Betsy Thagard" <betsythagard@yahoo.com>

09/20/2007 02:06 PM

Please respond to <betsy@greenplanetproperties.com>

To <paul.maltzer@sfgov.org>
cc
Subject Tuolomne River "Improvement Program"

Dear Sir:

I am writing to urge the SFPUC to drop its proposal to divert more water from the Tuolumne River.

Decreasing reliance on the Tuolumne is critical not only for protecting the health of the river, but also for preparing for the future uncertainty of the Sierra snowpack as a result of global warming.
Instead of proposing more water withdrawals from the Tuolumne, The SFPUC should adopt a policy of reducing diversions from the Tuolumne River over time. 01
In adopting such a policy, the SFPUC should conduct a study to determine the maximum potential for conservation and efficiency savings within the SFPUC service territory. Any additional demand for water within its territory should be met through increased investment in conservation, efficiency, and recycling.
Thank you for working to protect the Tuolomne River by reducing water withdrawals over time. 02

Betsy Thagard
1937 Carleton Street
Berkeley, CA 94704

C_Tholl

Diana Sokolove <wsip.peir.comments@gmail.com>

Tuolumne

Julia Thollaug <feelingroovy1018@yahoo.com> **Tue, Sep 11, 2007 at 2:36 PM**
To: wsip.peir.comments@gmail.com

Dear Sir/Madam,

I recently was informed of the SFPUC's plan to divert 25 millions gallons of water per day from the Tuolumne. I think this plan would be extremely detrimental to our state's ecosystem and I hope that you will refuse this request. We drain too much water from our watersheds already. Please do not divert more water from the Tuolumne. 01

Sincerely,

Julia Thollaug

C_Thoma

Recycled Paper

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SEP 20 2007
CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
M E A

May 2, 2007

Ryan Brooks
SF PUC
c/o Sierra Club Bay Chapter
2530 San Pablo Ave.
Berkeley, CA 94702

Dear Ryan Brooks,

I join with the Sierra Club in urging the San Francisco Public Utilities Commission to protect the federally designated wild-and-scenic Tuolumne River from any additional diversions of water. 01

Meet future needs of water through conservation and recycling as other regions in the West have done such as the Seattle regional water system and the Metropolitan Water District of Southern California.

Sincerely,

Dennis Thomas

Dennis Thomas
147 St. Germain
Pleasant Hill, CA 94523

C_Toth

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

PEIR comments - no more water from Tuolumne.

Tibor Toth <TToth@hilmarcheese.com> **Tue, Sep 4, 2007 at 4:12 PM**
To: wsip.peir.comments@gmail.com

I am writing to express my concern over taking more water from the Tuolumne river to pursue more water for the Bay Area.

While I understand the need to provide fresh water to a growing community, there is also the responsibility of the community to get the water with a minimal impact to the environment in a sustainable fashion. The bottom line is the Delta and River basin has long suffered from a lack of water which has resulted in high salt levels in the Valley. 01
The delicate balance in one of the world's most productive farming community is being hurt by the urban sprawl which has outgrown its natural resources.

A better and sustainable, although more expensive, solution is to use membrane technology to use sea water for fresh water. This technology has been well proven and is economically feasible with an increase in use tax for the people that need the water in the Bay Area. The energy to run the pumps can be utilized from wind and tide power that is also locally available and renewable. This forces the Bay Area communities to see where their water is growing instead of just relying on taking the snowfall in the Sierra's. And remember, if there's a drought in the Bay Area, there's the same drought in the Sierra's. Stealing from the Tuolumne River is not a solution, it's a bad environmental loan. 02

You can not continue to steal the water from the Delta so you don't have to pay as much money to fuel the Bay Area's growth. The Bay Area is a huge economic power - use that power to invest in their own water. Countries all over the world use thousands of membrane units to deliver clean water. There is no reason that the Bay Area shouldn't do the same.

Tibor Toth
2120 Carleton Drive
Turlock, CA
209-656-2205

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

Comments on WSIP

Marianna <taraihito@yahoo.com> **Wed, Sep 26, 2007 at 10:00 PM**
To: Paul Maltzer <wsip.peir.comments@gmail.com>
Cc: bill.young@sierraclub.org

Dear Paul / Environmental Review (SFPUC),

I'm a resident and homeowner in unincorporated Redwood City, and I'm writing to ask you to improve SFPUC's Water Supply Improvement Plan. Thanks for working on this, thinking ahead and preparing a draft Environmental Impact Report. However SFPUC's water plan is based on inflated projections, and does not do enough to protect the Tuolumne River and other watersheds. 01

Please make plans for more conservation and creative reuse of water, and rely less on drawing water from the Tuolumne River. As we can see this year already, the snow pack is likely to be more variable due to climate change and the ecosystems in the mountains and in the Bay ARea will be more stressed by climatic extremes. The fish and the plant life (which protect the watersheds and help filter rainwater) need the water more than we do. The correct response is more conservation and careful use of water, not higher use of river water. A more diverse mix of supplies will reduce risk for us and reduce stress on ecosystems . 02

I don't believe that the population will increase significantly in this area because the housing prices are too high, and salaries are not keeping up. I can only afford my house because we bought 10 years ago. Those who do move here are likely to be in more dense housing which won't need so much water for landscaping. 03

There is much that can be done by individuals, businesses and municipalities to conserve water. I'm happy that Redwood City has taken proactive steps such as offering low-water toilets free. I urge you to use your clout by insisting on aggressive water conservation measures and watershed protection, now - before climate change worsens the situation. THis will also save money for everyone. 04

Sincerely,

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

Tuolomnee River Project

Kristen Tucker <ktucker22@sbcglobal.net> **Tue, Sep 11, 2007 at 6:58 PM**
To: wsip.peir.comments@gmail.com

I am writing you to urge you to please leave the plans for further water diversion from the Tuolumne river out of the Hetch Hetchy upgrade project. We all need to focus on conserving and recycling water better before we take more from our already over-taxed rivers. 01

Sincereley,
Kristen Tucker
San Francisco

C_Unreadable1

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SEP 2 0 2007

CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
M E A

12.5-95

I am writing today in response to the proposal to take vast volumes of water from the ~~too Fo~~ Tuolumne River. The idea that we will dry up this wild and scenic river to feed east bay sprawl is appalling. The cities of the east bay can supply their water needs through conservation and improved engineering.

Other cities such as Seattle and Los Angeles have done this. They have achieved growth rates the east bay desires while keeping water usage flat. There is no reason that an area as innovative and rich as the bay area cannot do the same. We're every bit as smart, sensible, and resourceful as they are.

Instead we are proposing to draw down one of the very natural wonders that draws people to this area of the country. We are choosing to do so at a time when our snow pack is being depleted and flows will be declining. We can make a wiser choice. We can choose to ~~preserve~~ conserve and apply sound engineering to preserve the river for our own ~~F~~ old age, for our children's lives, and for future residents of this region. We are not consumers of today. We are ~~gu~~ guardians of tomorrow's Future

01

C_Unreadable2

8/15/07

DEAR COMMISSIONER BROOKS

01 I WRITE THIS LETTER IN ORDER TO PLEASE ASK YOU TO NOT PULL OUT ANY MORE WATER FROM THE TUOLUMNE RIVER. THINK ABOUT YOUR FAMILY AND FRIENDS! WOULD YOU LIKE TO LIVE IN A CITY OR COUNTRY WHERE YOU HAD BARELY ANY WATER?? I DON'T THINK SO, SO THINK ABOUT IT AND DON'T DO IT.

SINCERELY,

[signature]

P.S... SEE YOU AT THE HEARING!!

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SEP 2 0 2007

CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
M E A

C_Unreadable3

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SEP 2 0 2007

CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
M E A

Dear Commissioner Brooks,

01 The tremendous amount of water that is demanded by residents is ridiculous. The Tuolumne River is one of the most important water sources and trying to siphon more water out of it, especially for a reason such as watering plants and their lawns, is absolutely absurd. People who 'need' ~~water~~ perfectly good drinking water to water their lawns ~~are~~ obviously don't appreciate the people around us and our environment. ~~There are so many individuals out there~~ everything needs water to survive. What happens when we have a shortage in it? Please do NOT let water out of the Tuolumne River. ~~Are~~ Just think about it. Why give it to people who just need it to grow a single, dirty ~~flower piece of~~ patch of grass when you can use it the right way ~~&~~ use it when you really need it. Give it to those who really need it. Make the right decision.

Sincerely,

C_Unreadable4

August 15, 2007

To Commissioner Ryan L. Brooks, President of San Francisco Public Utilities Commission.

I recently was informed of the plan to take 25 million gallons of water out of the Tuolumne River. I feel this is such an opsered plan due to the fact that the water will not be used for drinking but to water lawns in four countres. There are so many other way we can water lawns such as using recycled water. With such a huge water crisis at hand in California I do not feel pulling out more water is the ausuer. I strongly opose this plan. 01

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SEP 2 0 2007

CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
M E A

Sincerely

12.5-96

C_Unreadable5 8/15/07

Dear Commissioner [illegible]

I strongly hope that after reading a number of letters from the USF [illegible] students, you will seriously consider taking that large amount of water out of the beautiful Tuolumne River, there are other options, & your resources to research them. 01

Sincerely,

[illegible signature]

12.5-97

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SEP 20 2007
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PLANNING DEPARTMENT
M E A

C_Urdan

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Diana Sokolove <wsip.peir.comments@gmail.com>

Tuolumne River

msurdan@aol.com <msurdan@aol.com> **Thu, Sep 27, 2007 at 4:38 PM**
To: wsip.peir.comments@gmail.com

September 27, 2007

Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Maltzer:

I am a whitewater rafter who travels to California every May and August to take advantage of the unequaled recreational opportunities of the Sierras, California's National Parks, and of course, Yosemite and the Tuolumne River. My love for the Tuolumne goes back over 30 years when my family took a vacation to Yosemite and we drove to Tuolumne Meadows. Even back in the summer of 1975 when I was only 10 years old, I was struck by the river's beauty in this beautiful meadow. One of my strongest memories of childhood family vacations is stepping into the gentle waters of the Tuolumne as it meandered across the highway while waiting for my father to secure backcountry hiking permits for us before our week long hike along its banks to its source.

I have returned often to that special place known as Tuolumne Meadows, and often I have repeated that backcountry hike. More recently, I have become a whitewater enthusiast. I have rafted the Tuolumne over a dozen times, including the Class V Cherry Creek Section. The Tuolumne River is a very special river to me, as it is to million of others who have visited it and to those countless millions who depend on it to provide them with drinking water. However, I don't believe the Tuolumne can support any more than it already does.
Your environmental review of the San Francisco Public Utilities Commission's plan to take more water from the Tuolumne River fails to adequately identify and address all of the environmental impacts to the River. I urge you to undertake additional studies before finalizing this document. 01

I support the alternatives identified in your draft document that protect the Tuolumne River from new diversions. Requiring more water conservation, efficiency, and recycling is the best way to lessen impacts on the Tuolumne River while promoting a sustainable water plan for the Bay Area. 02

Only by ensuring that healthy amounts of water continue to flow into the Tuolumne River can we protect this irreplaceable natural treasure.

Even though I currently live in North Carolina, I am a member of the Tuolumne River Trust Organization, and I hope you take my comments into consideration as seriously as those who live in San Francisco, the Bay Area, and the rest of California.
Sincerely,

Matthew S. Urdan
13077 Highway 19 West
Bryson City, North Carolina 28713

C_Vadop

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

Comment on SFPUC's Proposal

Paul Vadopalas <paulvadopalas@california.com> **Mon, Oct 1, 2007 at 3:33 PM**
To: wsip.peir.comments@gmail.com

I attended Public Hearing on September 19, 2007 in Palo Alto at Avenidas.

My comments are:

Given the projected population growth, requirements for additional water will never cease . The availability of water is limited. We do not have the ability to create glaciers or snow-packs in the Sierras. We cannot damn more rivers, or pump more water from the existing water table without hurting or destroying our ecological system and economic base. The only way to produce drinkable water is by building desalination plants. This is the reality all public utilities in California will face.
Lets leave the few remaining untamed rivers alone, and apply technology to solve our projected water shortage problems. 01

Respectfully,

Paul Vadopalas
829 Northampton Dr.
Palo Alto, CA 94303

C_VermeJ

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

Tuolumne River water plan

Jim Vermeys <jimmypaul@jps.net> **Sun, Sep 30, 2007 at 11:01 AM**
To: wsip.peir.comments@gmail.com

Dear Mr. Maltzer:

I have been enjoying benefits of the Tuolumne River my entire life (46 years). I have fished, camped, rafted, watched my brother get married standing next to it, swam, hiked, lived and loved in, on and around that river. I urge you to take a better look at the environmental impact your plan would have on my favorite river. 01

Please consider better water conservation, efficiency and an improved recycling program rather than take water from the Tuolumne.

Thank you.

Jim Vermeys
Martinez, CA

C_VermeK

Diana Sokolove <wsip.peir.comments@gmail.com>

Tuolumne River

Karen Vermeys <kvermeys@sbcglobal.net> **Mon, Sep 24, 2007 at 4:45 PM**
To: wsip.peir.comments@gmail.com

We are annual campers of Berkeley Tuolumne Camp, and in all the many, many years I've been a Tuolumne camper, I have never seen our river so low!

Therefore, I am very much against using water from the Tuolumne River. Please reconsider to ensure that the water level will go no lower than it is now (which actually would be dry!). 01

Thank you,

Karen Vermeys

C_Voyik

August 15, 2007

Dear Commissioner Brooks,

With all of the water problems and issues we are having in California, why would you let this plan pass? Just imagine: If you pass this plan, our clean drinking water will be used on something that would not be affected by recycled water. People need clean water, not plants. Do not get me wrong, plants need clean water to an extent, but not as bad as humans. Just think - you don't want to be worrying about your water! Think about it! If you extract more water from the Tuolumne, it will be left dry eventually. Don't do it! Be the bigger man! 01

Sincerely,
Ashleigh Voyikes.

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SEP 20 2007
CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
M E A

To whom it may concern:

I am writing today to express my opposition to the Public Utilities Commission's plans to take more water out of the Tuolomne River. I feel these plans are not in our best interest for several reasons, but I wish only to express two of them in writing.

First, we are facing the very real possibility of a drought, and as such, we have ~~the~~ a responsibility to the future not to increase water consumption. We should instead focus more energy toward water conservation and water recycling. If Seattle & Los Angeles can meet their increased water demand without using more water, so should we here in the Bay Area. 01

Secondly, this river is beautiful, and home to diverse wildlife. We should not do anything to harm this area. 02

-over-

12.5-100

C_Vrana

I hope you will take the proper steps to make the Bay Area a leader in water conservation. 02 cont.

Sincerely Yours,

Leo Vrana

Leo Vrana
415-260-2180
1827 48th AVE
San Francisco, CA 94122

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PLANNING DEPARTMENT
M E A

C_Walke

Law Office Of
Patricia L. Walker
Attorney At Law
300 Arlington Way
Menlo Park, Ca 94025-2319

(650) 328-1072 Telephone
(650) 328-9119 Facsimile
plwalker@pacbell.net

October 13, 2007

Paul Maltzer
Environmental Review Officer, WSIP PEIR
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Draft PEIR – Hetch Hetchy Infrastructure Upgrade

Dear Mr. Maltzer:

The purpose of this letter is to comment on proposals to increase water supplies as part of the seismic upgrade to the Hetch Hetchy system.

I live in Menlo Park and am a user of Hetch Hetchy water. I also spend significant time walking and birdwatching around the San Francisco Bay and hiking and backpacking in California's mountains and wilderness areas.

12.5-101

I have been aware for a long time that the SFPUC is many years overdue in maintaining and upgrading the Hetch Hetchy delivery system infrastructure, and I applaud the PUC for embarking on the seismic upgrade so necessary to ensure a reliable water supply. However, I am concerned that the PUC is considering additional projects, i.e., stream diversion and increasing water supplies, as part of the seismic upgrade and maintenance project. Developing new sources of drinking water as part of this project is ill-advised. 01

The draft Program Environmental Impact Report (PEIR) is flawed in many respects, including:

- Additional water supplies are outside of the scope of the long overdue maintenance project. We the water customers do not want any further delays on the maintenance project. 01 cont.

- Water customers will be incurring significant increases in water bills for the purpose of securing and maintaining the present source of water. We do not want to pay for legal battles to be incurred because the PUC is adding an additional task of diverting more water from a wild and scenic river.

- It is no longer disputed that global climate change is occurring and that citizens and government agencies must take immediate action to adjust to that reality. It is not disputed that last winter's rains were below average. This reality requires SFPUC to undertake immediate conservation measures. 02

C_Walke

- Even without global warning and the current low rainfall concerns, California should have been implementing strong water conservation measures since the last drought. Significant areas of California have a desert climate, but Californians use water as it were an unlimited resource —lawns, tropical flower gardens, flood irrigation, large-scale commodity agriculture instead of food production. Californians have shown a lack of political will with regard to mandatory water conservation measures. The SFPUC must take the lead to reduce water demand within its service area. 02 cont.

- The PEIR fails to address the many environmental impacts of increased diversion of water from the Tuolumne River, including the impact on the watershed and the projected reduction of the volume of water in the Tuolumne due to reduced snowpack.

- Water conservation and efficiency measures are the cheapest, easiest, and least destructive ways to meet demand and extend supply. 03

- The PEIR does not address the potential increase of water supplies by water recycling. The State Water Resources Control Board and the Regional Water Resources Control Boards are currently considering water recycling programs and standards. The PEIR does not take these programs into account.

I urge the SFPUC to perform the seismic upgrades to the Hetch Hetchy infrastructure without diverting additional water from the Tuolumne River or any other watershed. Instead, the SFPUC should immediately undertake water conservation measures to reduce diversion from our stressed watersheds.

Thank you.

Very truly yours,

Patricia L. Walker

Patricia L. Walker

C_Walls

Diana Sokolove <wsip.peir.comments@gmail.com>

Comments on the PEIR for the WSIP.

Pete at Momentum Rafting <pete@momentumriverexpeditions.com> **Thu, Sep 27, 2007 at 10:49 AM**
To: wsip.peir.comments@gmail.com

Dear Mr. Maltzer:

As both a frequent visitor and huge fan of both the Tuolumne River and San Francisco I urge you to take another look at your environmental review of the San Francisco Public Utilities Commission's plan to take more water from the Tuolumne River before finalizing it. 01

The Tuolumne is an irreplaceable natural treasure, one of the most beautiful and unique rivers in the world. Alternatives requiring more water conservation, efficiency, and recycling are the best way to lessen impacts on the Tuolumne River, and reduce long-term infrastructure costs. Other cites have managed to grow while reducing water consumption. The Bay area is known for having a strong environmental ethic and I have no doubt that the area could easily become a leader in water conservation. 02

Around 60% of the water in the basin is already diverted. Good flows in the Tuolumne River are critical to protecting the river as one of our natural treasures and as a unique recreational playground.

Kind Regards,

Pete Wallstrom.
1257 Siskiyou Blvd #1178
Ashland, Or 97523

C_Weiss

Diana Sokolove <wsip.peir.comments@gmail.com>

(no subject)

Richard Weiss <helpsaverivers@richard.weiss.name> **Wed, Sep 26, 2007 at 8:02 PM**
To: wsip.peir.comments@gmail.com

Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Maltzer:

I have hiked and rafted much of the Tuolumne river from Tuolumne Meadows to New Don Pedro Reservoir. Its beauty and environmental value are unmatched in Sierra, indeed, in California. I also work in San Francisco and appreciate the high quality of the water there.

Your environmental review of the San Francisco Public Utilities Commission's plan to take more water from the Tuolumne River fails to adequately identify and address all of the environmental impacts to the River. I urge you to undertake additional studies before finalizing this document. 01

I support the alternatives identified in your draft document that protect the Tuolumne River from new diversions. Requiring more water conservation, efficiency, and recycling is the best way to lessen impacts on the Tuolumne River while promoting a sustainable water plan for the Bay Area. Using pristine water from the Tuolumne to flush our toilets and water our lawns just doesn't make sense. 02

Only by ensuring that healthy amounts of water continue to flow into the Tuolumne River can we protect this irreplaceable natural treasure.

Sincerely,

Richard Weiss
helpsaverivers@richard.weiss.name
615 Santa Ray Avenue
Oakland, CA 94610

Ask me how to become a river guide and help save California rivers.

C_Westc

BART WESTCOTT
Consulting – Investments
722 SOUTHAMPTON DRIVE • PALO ALTO, CA 94303
TEL 650.465.0969 | FAX 650.326.5220
bart@bmilesw.com

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SEP 13 2007
CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
M E A

September 12, 2007

Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Maltzer:

The PUC's proposal to divert additional water from the Tuolumne stands out as an unnecessary and destructive approach to a complex, long-term problem better approached in other ways.

I urge you to carefully study the Tuolumne River Trust's recommendations as an extremely useful starting point. 01

Bart Westcott

C_Willi

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

protect Tuolumne river

doris.sings@mindspring.com <doris.sings@mindspring.com> **Tue, Sep 25, 2007 at 11:55 AM**
Reply-To: doris.sings@mindspring.com
To: wsip.peir.comments@gmail.com, bill.young@sierraclub.org

Dear Mr. Walzer

Mr. Paul Maltzer
Environmental Review Officer, WSIP PEIR
San Francisco Planning Department

Dear Mr. Maltzer,

Please act to protect the Tuolumne River for future generations by requiring water conservation, efficiency, and recycling, instead of taking more water from this river. 01
The SFPUC should re-evaluate its projections for future water demand and conservation.

The PEIR uses flawed modeling to determine the anticipated increase in water demand, thus inflating projected future needs. Other metropolitan areas (especially Seattle and Los Angeles) have managed to reduce water demand even in the face of growth. 02
The PEIR fails to properly address all of the impacts of taking more water from the river because it lacks an adequate baseline study. A comprehensive study has not been done for 15 years, and a current study will not be completed in this review period. 03
The PEIR does not take into consideration the impact of climate change on precipitation in the Tuolumne River watershed.
Decreasing reliance on the Tuolumne is critical not only for protecting the health of the River, but also for preparing for the future uncertainty of the Sierra snowpack due to global warming. 04

Water conservation and efficiency measures are the cheapest, easiest, and least destructive ways to meet demand and extend supply. 05

Thank you for your attention to this matter.

Sincerely,

Doris Williams
Member of Sierra Club, Acterra, Audubon Society

C_Wingf

Diana Sokolove <wsip.peir.comments@gmail.com>

Save the Tuolumne!!!!!

ppwing@aol.com <ppwing@aol.com> **Tue, Sep 11, 2007 at 2:15 PM**
To: wsip.peir.comments@gmail.com

Dear Sirs:
Please don't be short sighted and allow this river to be drained! 01
Please help protect this national treasure!
Thank you,
Polly P. Wingfield
6 Elder Ct
Menlo Park, CA 94025

Email and AIM finally together. You've gotta check out free AOL Mail! - http://mail.aol.com

C_Wolf

Diana Sokolove <wsip.peir.comments@gmail.com>

Our beautiful Tuolumne River

Elizabeth Wolf <elizabeth@thewolfs.info> **Mon, Sep 24, 2007 at 3:47 PM**
To: wsip.peir.comments@gmail.com

Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Maltzer:

I really hope you'll do more research before you finalize your documents. It is very necessary to know the facts before we get into a really sad situation. I have been on the periphery of the SF Public Utilities Commission, so I am only just beginning to learn about the importance of this commission. I urge you not to be hasty in your decision-making. 01

The Tuolumne River is such a gorgeous place. Please treat it kindly.

Sincerely,

Elizabeth Wolf

C_Zimme

RECEIVED

OCT 01 2007

CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
M.E.A.

September 28, 2007

Mr. Paul Maltzer
Environmental Review Officer
1650 Mission Street; Suite 400
San Francisco, CA 94103

Re: Protect the Tuolumne River

Dear Mr. Maltzer:

I am writing to you as a native San Franciscan who is concerned about the fate of one of our most valuable natural resources, the Tuolumne River. The river provides not only beauty but is a natural habitat to many fish as well. The conservation of the Tuolumne River is of the utmost important issue at hand right now.

I urge you to support a sustainable water plan that will protect our watersheds in the Bay Area and Sierras before this irreplaceable natural treasure is gone forever. We must conserve the river rather than increase water diversion. The results will be disastrous if we don't take action to preserve the Tuolumne River. Right now they are diverting close to 60% of the Tuolumne and any more diversion will threaten the entire ecosystem in the Bay Area. 01

Thank your for taking serious action to conserve and recycle this most precious natural resource for us now and for the future generations.

Sincerely,

Benita Zimmerman
1812 Devereaux Drive
Burlingame, CA 94010

(650) 259-7797

12.5-105

12.6 Public Hearing Transcripts

PUBLIC HEARING TRANSCRIPT

Sonora, California

Sonora Opera House, Sonora, California
September 5, 2007

(PH Sonora)

INDEX OF PUBLIC HEARING TRANSCRIPT

Sonora Opera House, Sonora, CA - September 5, 2007

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Sonora	C_BoutiD	Dolores Boutin	Citizen	Public Hearing Transcript, Sonora, 9/5/07, pp. 11-13
Sonora	SI_TRT2	Cynthia King	Sierra Nevada Program Director, Tuolumne River Trust	Public Hearing Transcript, Sonora, 9/5/07, pp. 14-16
Sonora	C_BoutiF	Fred Boutin	Citizen	Public Hearing Transcript, Sonora, 9/5/07, p. 17
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Sonora	SI_RHH4	Jerry Cadagan	Board Member/Founder, Restore Hetch Hetchy & Committee to Save Lake Merced	Public Hearing Transcript, Sonora, 9/5/07, pp. 23-25, p. 48-49
Sonora	SI_TRT3	Galen Weston	Part-time Employee, Tuolumne River Trust	Public Hearing Transcript, Sonora, 9/5/07, pp. 25-29
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Sonora Opera House, Sonora, CA - September 5, 2007

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12.6-1

PUBLIC HEARING

DRAFT PROGRAM ENVIRONMENTAL IMPACT REPORT

SAN FRANCISCO PUBLIC UTILITIES COMMISSION'S

PROPOSED WATER SYSTEM IMPROVEMENT PROGRAM

SONORA OPERA HOUSE

250 SOUTH WASHINGTON STREET

SONORA, CALIFORNIA

SEPTEMBER 5, 2007

REPORTED BY: DEBORAH FUQUA, CSR #12948

APPEARANCES

DIANA SOKOLOVE, SENIOR ENVIRONMENTAL PLANNER
San Francisco Planning Department
Major Environmental Analysis Division
(Moderator)

KELLEY CAPONE and HEATHER POHL
San Francisco Public Utilities Commission

LESLIE MOULTON, PROJECT MANAGER
- and -
JOYCE HSIAO, DEPUTY PROJECT MANAGER
ESA + Orion Consultant Team

ALFRED WILLIAMS, PUBLIC INVOLVEMENT COORDINATOR
Alfred Williams Consultancy

12.6-2

PUBLIC SPEAKERS

Stan Kellog	Patricia Elliott
Dolores Boutin	Jimmy Gado
Cynthia King	Pete Kampa
Fred Boutin	Jon Sturtevant
Nicole Sandkulla	Ron Pickup
Bob Hackamack	Doris Grinn
Jerry Cadagan	Jim Grinnell
Galen Weston	Noah Hughes
Darryl Bramlette	Robert Gelman
Ellie Owen	Joseph Day

---o0o---

Wednesday, September 5, 2007 6:32 o'clock p.m.

---o0o---

P R O C E E D I N G S

ALFRED WILLIAMS: Ladies and gentleman, again, welcome. This is the public hearing on the Draft Program Environmental Impact Report on the San Francisco Public Utilities Commission's Proposed Water System Improvement Program.

Can you hear? You can hear. Okay.

With that, I'd like to introduce Diana Sokolove, who is with the San Francisco Planning Department.

DIANA SOKOLOVE: Good evening, and welcome again to tonight's hearing. My name is Diana Sokolove, and I'm a senior environmental planner with the San Francisco Planning Department, Major Environmental Analysis Division, and I will be the moderator for tonight's hearing.

And I also just want to introduce some people who are working on the program and on the environmental review process. Tonight, Kelly Capone, who is standing in the back of the room, is with the San Francisco Public Utilities Commission, or SFPUC. Heather Pohl, next to her, is also with the PUC working on the program.

Also here tonight is the project manager for the consultant team and the deputy project manager with the ESA + Orion consultant team, Leslie Moulton and Joyce Hsiao. And also here is Al Williams. And he's our public involvement coordinator for this program. So he'll be collecting speaker cards and can also assist you with anything you might need.

And this is one of five public hearings on the draft program environmental impact report. And we will be providing essentially the same information and opportunities for you to comment at each of the hearings.

12.6-3

So here's our agenda for tonight. We'll just take a few moments to introduce this process to you and give you some instructions on how you can comment. And then we'll open up the hearing for public comment.

So just some meeting reminders. Hopefully you signed in when you came into the room. If you didn't, please do so before you leave, and please sign your name clearly and legibly so that we can keep in touch with you throughout the process.

And if you do plan on speaking tonight, I hope that you filled out a speaker card. You can pick these up at the front table when you come in the door. And I think some of our folks have some extra ones that they

can be pass around.

I will be calling up speakers from these cards in the order I received them. So be sure you fill one out if you want to speak tonight.

Another item you may wish to pick up is a comment form so you can submit written comments on this comment form. You can hand them to me tonight, or leave them in the comment box at the back of the room, or you can mail or fax them later. And we will give you information where you can mail them later in the presentation.

Restrooms are located in -- restrooms are located in the back of the room, right back here [indicating]. And also, please turn off the ringer -- please turn off the ringers on your cell phones and pagers, and be sure to leave the room if you need to make a call. We really appreciate that.

Also, please note that we do have a court reporter present this evening here who is making a transcript of tonight's proceedings. And the transcript will become part of the public record of this environmental review process.

So the purpose of tonight's hearing: We are here to receive your comments on the environmental impact report on the Water System Improvement Program.

12.6-4

Staff are not here to answer your comments today. And comments will be transcribed, and your comments will be responded to in a comments and responses document that the San Francisco Planning Department will be preparing.

The comments and responses document, again, will respond to all verbal and written comments. And just to be really clear, this is not a hearing to consider approval or disapproval or modification of the proposed program. That hearing will be held by the San Francisco Public Utilities Commission following the final program environmental impact report certification hearing, which is held by the San Francisco Planning Commission.

So if you wish to submit written comments, you can do so, again, by submitting them to me tonight or you can drop off comments in the comment box at the back of the room. You can mail them or e-mail them at the address shown here on the screen. And also your agenda tonight, the address for mailing them or e-mailing them is on that.

And also, if you wish to get a copy of the document, the program environmental impact report, on CD, if you would when you fill out this comment card just leave a note for us asking us to send you a copy

of the CD.

And just to be clear, the Planning Department will accept public comments on the draft program EIR until 5:00 p.m. on Monday, October 1st.

So the draft program EIR is available for viewing at the San Francisco Planning Department and the San Francisco Public Utilities Commission and also at several libraries throughout the study area. And it's also available on line.

And again, you can find out the addresses of these libraries on your agenda or on the notice of availability. And all those materials are here tonight. Here's our schedule. We have a 90-day public review period which started on June 29th and ends at 5:00 p.m. on October 1st.

And we have a series of public hearings that we're going to be holding this month. This is the first of the public hearings tonight in Sonora. We'll be in Modesto, Fremont, Palo Alto, and also in San Francisco.

We will be, as I mentioned, responding to your comments in writing in a comments and responses document that we hope to publish next spring. And following publication of the comments and responses document, we will be holding a certification hearing in

12.6-5

front of the San Francisco Planning Commission.

So now we're ready to open up the hearing for public comment. And we ask that you just follow a few rules. First, as I've already noted tonight, this is a hearing for the PUC to receive your comments on the draft program environmental impact report. So please direct your comments to the adequacy and accuracy of the information in the environmental impact report.

Again, please submit a speaker card if you wish to speak. And I'll be calling out names from those cards in groups of three so you can get ready to come up and speak. And I'll call those names in the list as I received them.

And when you are ready to speak, step up to the microphone and state your name and address clearly and slowly for the court reporter to transcribe that information so that we can provide you with our responses to your comments.

In the interest of time, please keep your comments limited to three minutes. Al Williams will be keeping track of time tonight. We just want to make sure everybody has a chance to speak. And we also realize that you may have more than three minutes of information to share with us. We definitely respect that, so that's why we have our comment cards. And

there are certainly other ways that you can supplement your verbal comments with written comments.

Does anyone else want to submit a speaker comment card tonight?

Again, I'll be calling up your name in groups of three, so -- just so that you can get ready.

Stan Kellog, Dolores Boutin, and Cynthia King. And the microphone -- you can use this microphone up here, or you can use this microphone up in the front of the room.

STAN KELLOG: Somebody help me out. SI_TCFB

Thank you.

First of all, excuse me. I have never been known as a public speaker. So forgive me if I stutter, stumble, slip, or fall, but the bottom line -- my name is Stan Kellog. I'm the president of the Tuolumne County Farm Bureau.

SI_TCFB-01

And what we are here to say is that any time one drop of water leaves Tuolumne County, it has a negative impact on our county. Period.

On the flip side of that -- this is not Farm Bureau talking; this is me personally talking. This is not the avenue -- this is not the venue to distribute this kind of literature (indicating).

We need our water. We are facing major, major

12.6-6

water problems. And anything that gets taken from us will very much affect us in the future.

I talked to an individual today, expressing my concerns about this water taking. And he told me -- he is in development, construction. He says, "If we don't give them what they want, they will just move up here."

Well, how about just let them move down a little farther south?

We are opposed to taking any water from Tuolumne County.

SI_TCFB-01 cont.

Thank you.

DIANA SOKOLOVE: Before you sit down, could you please give us your address for the record? If you don't mind, if you could just say it for the record.

STAN KELLOG: Stan Kellog, Tuolumne County Farm Bureau, Box 675, Jamestown, California 95367, whatever.

DIANA SOKOLOVE: Thank you.

Dolores Boutin.

C_BoutiD

DOLORES BOUTIN: Why do we fill out cards if we do that?

Okay. I live in Tuolumne. I've lived here for 25 years or so. I'm going to read what I wrote so that I don't forget anything. The first question, main question is, why does San Francisco think it has a right to take any more water from the Tuolumne than it

C_BoutiD-01

already does? Almost 100 years ago, this fight was fought. They won; we lost.

Last fall during the salmon run, I was on the Tuolumne River. It was during salmon spawning time. There were only a few salmon that could be seen. Old-timers there told us that the river used to be thick, so thick you can almost walk across the river on their backs. Now, nothing.

Lack of natural river flows affect the whole ecology of the riparian habit, not just the salmon but everything else around it. We are part of that. If we don't see that all of that affects us, something is wrong with our viewpoint.

The river flow affects the delta and the bay and all the humans and human activities involved around those too. So it's not just the plants and animals. It's us.

The proposal from San Francisco is a taking from a national park that happened a long time ago. That's bad enough, but they're sending it through pipes and tunnels to a city far away for their benefit only. This was done through political pressure a long time ago as basically a theft of our local water. Now the San Francisco Public Utilities Commission wants to take even more, using our local resources for their own

C_BoutiD-01 cont.

economic benefit.

Already 6 percent is diverted. No more. Water, especially good water, is big business worldwide, not only for its direct use but also for its use in producing electricity and the money that that brings. It comes down to power and money instead of what's right.

Simply put, San Francisco Public Utilities Commission has no right to take more water from the Tuolumne River. Twenty-five million gallons a day is what they're proposing extra, beyond what they have. They must be pirates at heart. "Take whatever you can get away with," is the name of the game.

The population is growing in the San Francisco area, as everywhere else in California, including here. The need for water needs to be met through wise use and conservation. There's going to be less and less water through global warming and more and more people as people decide to move to California. Say no to these people.

C_BoutiD-01 cont.

DIANA SOKOLOVE: Would you mind stating your name and address for the record?

DOLORES BOUTIN: Dolores Boutin, P.O. Box 1450, Tuolumne 95379.

DIANA SOKOLOVE: Cynthia King.

CYNTHIA KING: Hello. Hi, everybody. It's great to see you all here tonight. My name is Cynthia King, and I'm the Sierra Nevada program director for the Tuolumne River Trust. The Tuolumne River Trust works to promote the stewardship of the Tuolumne River and its tributaries to ensure a healthy watershed. We have offices here in Sonora, Modesto, and San Francisco.

Thank you for coming to Sonora to listen to the concerns of Tuolumne County residents. Those of us in Tuolumne County who rely on the Tuolumne River for recreation, business, and personal renewal will suffer greatly if San Francisco pursues their plans to divert the additional 27 million gallons of water a day from the river.

With 50 percent of the Tuolumne already diverted for agricultural and urban uses, the Tuolumne is already an exceptionally hard-working river. As one of California's Wild and Scenic rivers and home to the largest run of Chinook salmon in the San Joaquin basin, the Tuolumne is an irreplaceable natural resource.

As the largest tributary to the San Joaquin River, the Tuolumne also contributes much-needed fresh water to the San Francisco Bay Delta upon which millions of Californians rely.

In our review of the draft PEIR, we found a

12.6-8

number of serious inadequacies that need to be addressed in the final report. I will touch on just a few of them here, and the Tuolumne River Trust will be submitting written comments before the public comment period ends.

The first problem is the lack of an adequate baseline of the Upper Tuolumne River. A comprehensive study of current conditions has not been conducted in over 15 years. Without knowing the condition of the river today, including its fisheries, riparian habit, and associated species, it's impossible to assess the impact that additional diversions might cost.

SI_TRT2-01

The second problem: The modeling used to estimate future water demands upon which the diversion proposal is based also contains a number of flaws. These flaws include using out-dated employment projections and ignoring the effect the expected price increase will have on future demands. San Francisco is planning to increase the price of water to the wholesale customers by three times, and they didn't take out its recount [sic] in modeling future demand.

These flaws led to inflated demand projections, and they need to be corrected in the final report.

SI_TRT2-02

Further, the mitigation measures proposed to

SI_TRT2-03

off-set impacts on juvenile Chinook salmon are inadequate. While the proposed restoration projects are worthy efforts, implementation of just one of these projects is inadequate to address the fishery impacts associated with the in-stream flow reductions and temperature increases expected for the Lower Tuolumne.

SI_TRT2-03 cont.

Finally, as a city and county that has greatly benefited from Tuolumne River water for generations, it is San Francisco's duty as it looks to the future to be a good steward and to pursue a water plan that will protect the Tuolumne for future generations.

Fortunately, San Francisco has an opportunity to adopt a sustainable water plan which does not rely on increased Tuolumne diversions.

If you're interested in learning more about those opportunities, please see our new report that was released called "From the Tuolumne to the Tap: Pursuing Sustainable Water Solutions for the Bay Area." We strongly encourage San Francisco to move in a sustainable direction before they cause any more harm to the Tuolumne River.

Thank you.

DIANA SOKOLOVE: If you could please add your name and your address.

CYNTHIA KING: My name is Cynthia King, P.O. Box

933, Sonora, California 95370.

DIANA SOKOLOVE: Thank you.

Fred Boutin. C_BoutiF

FRED BOUTIN: Yes. I am a resident of Tuolumne County and of Tuolumne. My primary objection to the draft environmental impact report is that it's misnamed. It's not a water system improvement program; it's a water system expansion program. That should be rightly named what it is. C_BoutiF-01

The environmental -- the final environmental impact report needs to include studies to show what potential there is, the maximum potential for water conservation within the San Francisco Public Utility Commission service territory. And really, they should be -- the report should be outlining where they're intending to market this water that they're planning to divert. C_BoutiF-02

Thank you.

I'm at P.O. Box 1450, Tuolumne, 95379.

DIANA SOKOLOVE: And please state your name for the record.

FRED BOUTIN: It's the same as I stated at the beginning, Fred Boutin.

DIANA SOKOLOVE: Nicole Sandkulla. L_BAWSCA3

NICOLE SANDKULLA: Good evening. My name is

Nicole Sandkulla. I'm with the Bay Area Water Supply and Conservation Agency. Our address is 155 Bovet Road, Suite 302, San Mateo, California 94402. I have a statement to read from Arthur Jensen, our general manager.

San Francisco's draft program environmental impact report for its Water System Improvement Program is undergoing careful review by the Bay Area Water Supply and Conservation Agency and its 27 member agencies that purchase water from San Francisco's regional water system for 1.7 million residents, businesses, and community institutions in Alameda, Santa Clara, and San Mateo counties.

While BASWCA's review of the draft PEIR continues, we find it to be a good, comprehensive document, analyzing the environmental impacts and program alternatives as required by law. BASWCA will submit written comments to correct apparent errors and expand the discussion of future water demands, alternative water supplies, and water conservation efforts.

One issue the PEIR should more clearly emphasize is the critical importance of completing the Water System Improvement Program to protect the public health and safety of the people who live in the Bay L_BAWSCA3-01

12.6-10

L_BAWSCA3-01 cont.

Area today.

Four active faults cross the major pipelines, tunnels, and reservoirs that provide water to 2.5 million people in our counties and San Francisco. There is a 60 percent probability that a major earthquake will occur in the Bay Area between today and 2032.

Following a major earthquake, the flow of water to communities could be disrupted for 30 to 60 days. The impacts to public health and safety would be catastrophic. The economic impacts, not counting injuries and loss of life, are estimated to be at least seven times the cost of rebuilding the aging water system.

L_BAWSCA3-02

The Water System Improvement Program includes projected uses for BAWSCA's agencies. These agencies in Alameda, San Mateo, and Santa Clara counties and their customers are dedicated to saving water and safeguarding the environment.

Today the average resident in the service area uses 15 percent less water per day than in 1986 and 23 percent less than in 1976.

In the Bay Area, residential water use per person is lower than the average for the State of California. And residential water use per person in

L_BAWSCA3-02 cont.

the BAWSCA area is lower than the average in the Bay Area.

BAWSCA and its agencies actively support implementation of additional conservation measures and water recycling to make the most effective use of limited water supplies. The water management issues addressed in the draft program environmental impact report --

UNIDENTIFIED SPEAKER: Time's up.

NICOLE SANDKULLA: -- are no longer issues. The projected growth is not going to happen tomorrow. The earthquake might.

L_BAWSCA3-02 cont.

Protecting existing people from a known catastrophe that could result from a highly probable earthquake is an urgent issue that the WSIP is designed to address.

Thanks.

DIANA SOKOLOVE: Just a reminder, thank you, Nicole, for stating your name and address when you came up. If everyone can do that before you come up, that would be great.

Also, I don't need any assistance in moderating the meeting. So if you would just leave that to me, that will be fine.

Bob Hackamack is the next speaker.

12.6-11

BOB HACKAMACK: I'm Bob Hackamack, P.O. Box 1886, Twain Harte, California. I'm a representative of the group Restore Hetch Hetchy. I'm their technical and engineering chairman.

It's apparent that the contractors and the planning staff have worked very hard on this document. And I compliment you for your work. There's some minor errors that are understandable. And I've learned several things about the Water Supply Project from reading your report. This is a good reference material. Thank you.

(Staff handing different microphone)

BOB HACKAMACK: Hmm. I feel like singing.

SI_RHH3-01

I want to explain how the preferred alternative called the WSIP is disconnected from reality, but that the combination of the alternatives that you presented, will make a workable plan.

You've correctly stated that John Freeman in 1912 projected that the Tuolumne River had a plan, and it might produce 400 million gallons a day.

But you failed to say that the San Francisco PUC did not build the project the way John had foreseen, that that has drastically reduced the amount of water availability, so you can't look forward to 400 million gallons a day but something drastically less.

SI_RHH3-01 cont.

Now, the reason the PUC did that was maximum profit from hydropower, not water supply.

I find that the yield of your project is 207 million gallons a day during your designed drought. But no prudent manager is going to follow the plan that you have in mind. The first year, no rationing; second year, full 25 percent, got-to-catch-up-type thing.

So I ask you, why would your board of supervisors approve this huge amount of money for a project that's going to triple the rates and now come back and have to tell them that, "Well, every 13 or 26 years or 41 years, you're going to have 25 percent rationing for the duration of the drought"? The rate payers deserve a better system than you're offering them.

DIANA SOKOLOVE: Sir, if you could wrap up your comments.

SI_RHH3-02

BOB HACKAMACK: Sure. Of the exports at 207 million gallons a day, you, for all the other needs that you have, go to the recycling, the aggressive conservation, the purchase of water, to avoid the Tuolumne diversion and the other things that you listed in the alternatives.

DIANA SOKOLOVE: Thank you.

Jerry Cadagan.

SI_RHH4

JERRY CADAGAN : My name is Jerry Cadagan. I reside at 13225 Sylva Lane, Sonora 95370. I am here speaking as an individual, but in the interest of full disclosure and for purposes of identification, I will acknowledge publicly and privately, I'm on the Board to Restore Hetch Hetchy. I'm a founder of an organization that nobody in this room's heard of probably called the Committee to Save Lake Merced. And I've dealt with the San Francisco Public Utilities Commission on environmental issues in San Francisco for 15 years. So I have a little experience. And I am a long-time member of the Tuolumne River Trust.

I'm probably the first speaker to really address the adequacy of the EIR. That's all right. I understand you.

The Chapter 10 lists 20 significant negative adverse environmental impacts resulting from the project proposed by San Francisco.

The EIR goes on to acknowledge that they can't eliminate those adverse impacts, and they can't limit them by any mitigation measures they've come up with.

SI_RHH4-01

I have a bold idea to improve the environmental impact report. And I mentioned being involved in the Restore Hetch Hetchy effort. I didn't hear any boos; I didn't hear any cheers. That's about

12.6-12

what I expected here.

I am not here proposing that San Francisco mitigate all the environmental impacts of its project by single-handedly restoring Hetch Hetchy Valley.

All I suggest is that San Francisco follow the accepted case law under CEQA in California and use as a mitigation measure a commitment to take a simple non-monetary step. That step would be to agree to cooperate in the restoration of the valley so long as certain conditions laid out by San Francisco were met.

And I'm not going the read the whole statement of commitment, but basically, reservoir removal would occur only after water and power currently supplied by the reservoir are fully replaced. Water and power replacement must take place without any increase in water or power rates or property rates for San Francisco residents and businesses and without any increase in the cost of delivering it to the city of San Francisco.

SI_RHH4-01 cont.

What I'm essentially saying is, have a mitigation measure -- add to the ones you've already got in here, which are inadequate to solve 20 of the major problems -- San Francisco saying, "We're okay with restoration, as long as we don't get hurt."

To date, they're unwilling to say that. "We

12.6-13

want 25 more million gallons of water, but we won't even think about possible restoration of Hetch Hetchy Valley."

SI_RHH4-01 cont.

That is a legitimate mitigation measure. Thank you.

UNIDENTIFIED SPEAKER: Could San Francisco --

DIANA SOKOLOVE: I'm sorry, ma'am. If you'd like to speak, can you fill out a speaker card, and we will certainly call you up to speak.

UNIDENTIFIED SPEAKER: This is a question about the very limited amount of time --

DIANA SOKOLOVE: Ma'am, I need you to fill out a speaker card in order to speak.

UNIDENTIFIED SPEAKER: -- a very limited amount of time that we're allotted for --

DIANA SOKOLOVE: I'm sorry. I really do need you -- just -- because everybody is here, they all want to speak. We need to give everybody a chance to speak. And I would --

UNIDENTIFIED SPEAKER: You need to give them more time and not try and do this in an hour and a half for your convenience. Just give us more time.

DIANA SOKOLOVE: So Galen Weston is the next speaker.

SI_TRT3

GALEN WESTON: Hello. Galen Weston, 21149 Lyons

Bald Mountain Road is my address.

I'm a Sonora resident and also work part-time for the Tuolumne River Trust. So it is -- and I grew up fishing, swimming, exploring, and rafting in the Tuolumne and its tributaries, so it's with great personal and professional connection with the river that I'm speaking tonight.

Looking over the program environmental impact report, I was very disappointed to see the preferred alternative called for increased diversions from the Tuolumne River by 27 million gallons a day, in addition to other important and non-controversial projects, such as seismic upgrades and general maintenance as the previous speaker mentioned, you know, there is great threat to the water system in San Francisco due to seismic activity.

Since the San Francisco Board of Supervisors has already clearly instructed the SFPUC to pursue a water plan that protects the health of the Tuolumne and does not include additional diversions from the river, I'm really unsure as to why you would want to risk holding up this entire project by burdening it with the controversial and unnecessary proposal to increase your diversions from the Tuolumne.

SI_TRT3-01

When the citizens of the United States,

SI_TRT3-02

through an act of Congress in 1913, granted San Francisco the unprecedented privilege of constructing a reservoir in the midst of Yosemite National Park, the city was given clear direction to fully utilize any current or future water supplies before tapping into the Tuolumne River.

Instead of honoring that pact with the nation, the City is now using wildly inflated demand projections to justify increased diversions from the Tuolumne.

SI_TRT3-02 cont.

Now I'll move on to some specific shortcomings in the environmental review. As Cynthia mentioned, the environmental impact report is inadequate in its evaluation of the potential impact because you guys don't have the studies to provide an adequate baseline of conditions on the river right now. Basically, we can't tell where we're going if we don't know where we are.

Much of EIR is base on a single, unfinished fish and wildlife study conducted back in 1992. And that study itself indicated that flows might need to be increased below Hetch Hetchy to ensure the health of the river's rainbow trout fishery.

SI_TRT3-03

But in any event, the City needs more than a handful of 15-year-old studies to convince me that

taking an additional 27 million gallons per day off the river won't significantly affect flows, fish, wildlife or recreation.

Now just cruising through a few more comments, because I'm going to run out of time.

San Francisco seems to expect other agencies to pick up their slack when it comes to water conservation. So this report is inadequate. for example, some of the mitigation measures this report discusses, in the event of drought years, include asking the Modesto and Turlock irrigation districts to conserve water in order to meet minimum fish flow requirements.

SI_TRT3-04

Similarly, the EIR indicates increased flows from the Bureau of Reclamation near the Stanislaus may be needed to mitigate for decreased freshwater flows into the Delta.

There are no contracts or agreements lined up to this effect, so these ideas are not in any way appropriate mitigation. And further, San Francisco should take responsibility for its own conservation instead of trying to farm out this responsibility to other water agencies.

SI_TRT3-05

And just in closing, by committing to meet increased levels of demand in the future, San Francisco

12.6-15

is foreclosing on opportunities to improve conditions on the Tuolumne and San Joaquin rivers and the Delta.

And one more thing: I'm encouraged to see that the report includes an alternative that calls for present conservation and recycling that can meet San Francisco's water needs without taking more water from the Tuolumne. And I really encourage you to come back with a final draft that has that as the option that you're going to go with. SI_TRT3-06

Thanks a lot.

DIANA SOKOLOVE: Darryl Bramlette.

C_BramlD3

DARRYL BRAMLETTE: Good evening. My name is Gerald Bramlette, 7700 Ruth Ridge Road, Jamestown, California.

I really represent Bramlette Consulting. And it has no connection at all with the water resource people here at all.

I attended this meeting last year and started doing some research. And I do see that there's really a problem that San Francisco has, but they're not addressing it at all. And with all the Ph.D.'s they have down there on their staff and with all the money they've put into this, they're totally lacking in solving their problem.

Their answer is to go get more water from a C_BramlD3-01

source that doesn't have more water. Their answer is to rebuild on technology that's 80-plus years old. They're ignoring we're in the 21st century. San Francisco can get water. They can do desalinization. Desalination. They have a nice large body of water which they can work on. They don't have to have the Tuolumne. They don't have to have all these other resources that they're trying to take from other communities. C_BramlD3-01 cont.

They can also go into conservation within their own city and, like the speaker before me said, not go out and ask our neighbors to do such. C_BramlD3-02

Also, looking at a little bit of research, they're not supposed to be selling the water to other communities. They are making money off of this also. If you take a look real carefully, they're making good money off of it. C_BramlD3-03

So I think if I look at this thing all the way back down, it's not the people of San Francisco's water demands. It's the demands of the pockets or the coffers of the San Francisco City.

With that, I'm going to rest my case.

Thank you very much for having us speak this evening. And I would like to have a response to my paper, though, that I wrote last year from the people.

12.6-16

C_Owen

DIANA SOKOLOVE: Ellie Owen.

ELLIE OWEN: Ellie Owen, 12098 Wards Ferry Road, Groveland.

I got a friend who just hiked up to the glacier at the Tuolumne River. He was going to camp on a stream -- there were several streams. He had an option -- on the way up, but they were all dried up. So he went up to the glacier. And the glacier was small.

C_Owen-01

So my question is, how do you calculate the yield from that glacier? Our GCSD manager from Groveland said there's an unlimited amount of water. Well, that's hard to believe.

My second question is, if we continue with drought years, how do we figure global warming into that? That's an unknown. I mean, isn't that part of the real equation right now? That's another question I have.

I would like it if these meetings were longer. And I also would like it if people would answer our questions because we need to know the answers to our questions. And we need to share that with everyone else. So I think that's a good idea.

C_EllioP

DIANA SOKOLOVE: Patricia Elliot.

PATRICIA ELLIOT: My name is Patricia Elliot. I

live at 12186 Bear Creek Road in Groveland, California, 95321.

I've been a resident of this county for four years. And I was instrumental in the Wild and Scenic move in 1984 for the Tuolumne River. I presently am the chair of the South Tuolumne County Planning Commission.

And my concern is the amount of activity we're seeing as people from the coast, and mostly from San Francisco, who are now able to sell their little cottages for a million dollars and racing up here to buy our acreage. And the demand for water and projects up here is of real concern to me as I see things coming across our board that will directly affect Groveland and Big Oak Flat.

For the past five years, we have been in a conflict over 400 homes that want the Hetch Hetchy water. And as Ms. Owen said, that the GCSD -- this is our governing body, now, four people -- we have no mayor. We're not a certified town -- but four people who are elected every two or three years -- and it's a controversial election -- can decide whether to route Hetch Hetchy water to homes behind Pine Mountain Lake.

C_EllioP-01

So I'm very, very concerned with what San Francisco draining more water out of Tuolumne and the

12.6-17

Tuolumne River will do to the future of our small community of 3,000 people in Groveland, 200 people in Big Oak Flat. But you will here a loud voice from us against taking the water out of the Tuolumne River.

C_EllioP-01 cont.

DIANA SOKOLOVE: Next speaker is Jimmy Gado.

C_Gado

JIMMY GADO: Good evening. My name is Jimmy Gado, and I'm a resident of Tuolumne County. I live in Columbia, California, P.O. Box 851, Columbia, 95310.

I've been a resident of Tuolumne County for 33 years, and I've been employed in the white water rafting industry for the last 27 years, part of those as an owner of a company that operated on the Tuolumne and now as an employee of a company that operates on the Tuolumne.

I'm concerned about the draft EIR's use of figures for average flow on the Tuolumne, which doesn't really mean anything when it comes to recreational use on the Tuolumne. There's a certain flow that's needed in order for rafting to occur on the Tuolumne River. And those flows were historically there while the Wild and Scenic was enacted and the recreational uses were protected on the Tuolumne. And I'm concerned that any additional taking of water by San Francisco and other Bay Area counties will cause an adverse impact to the rafting industry on the Tuolumne.

C_Gado-01

So I just would like to say that I'm opposed to any more water being taken from the Tuolumne, particularly before San Francisco and all of its water purchasers enact much better water conservation and recycling programs.

C_Gado-02

Thank you.

DIANA SOKOLOVE: Next speaker is Pete Kampa.

L_TUD3

PETE KAMPA: Pete Kampa, General Manager, Tuolumne Utilities District, 17245 Valley Okay Drive, Sonora.

I am here representing myself and also representing the Tuolumne Utilities District.

In some cursory comments, this document is huge. It's going to take us a long time to get through.

Number one, we request that there be a time extension on comments. It's really important for a small utility with significant potential impacts from any project constructed in this area.

L_TUD3-01

Tuolumne Utility District consumes most of the County of Tuolumne, from the Stanislaus in the north to the Tuolumne in the south, serving 44,000 in population. We currently recycle nearly a hundred percent of our wastewater. And when we look at the -- the fact that the EIR contemplates a very small percentage -- it's in the range of 4 million gallons a

12.6-18

day -- our current recycled water is about 1.8 million in Tuolumne County. So they're contemplating for the whole Bay Area 4 million.

I really think the EIR should look at maximum possible recycling of wastewater and use on parks and also new residential development. It's extremely important. L_TUD3-02

Also one of the major flaws in the EIR is the fact that it's based on contracts with major water utilities that are not yet completed. The contracts have not yet been developed, the terms and conditions. And it's not proven up whether these agencies in Turlock or Modesto have the right to divert that amount of water from the Tuolumne.

In addition, there's consideration being given to supplementing that water through the Stanislaus, which is our primary interest. I think that that needs to be much more closely analyzed -- and also the fact that those agreements should at least be detailed in some draft stage in some memorandum so that the PEIR can adequately address it because it's completely based on those transfers. L_TUD3-03

And if you have those needs and those needs are true, without the transfer from the Tuolumne, those other numbers need to be analyzed. So there's no way

to analyze it without the agreements. L_TUD3-03 cont.

The rationing of 20 percent is extremely small. That is not even an industry standard. It's something that we would -- we asked for it this year in just the typical dry years, Tuolumne Utilities. In the industry, it's not unusual to go up to 50 percent and then have provisions in there for different classes of users to restrict more, based on necessity. L_TUD3-04

I think you need to look more closely at industry standards in conservation, as well as the practices based on the water year. In Tuolumne County, if the water year is 50 percent, we target 50 percent reduction. You don't get what you ask for. If you say 20 percent, you get much less. L_TUD3-05

The last thing is the fact that Turlock and Modesto and Oakdale have vehemently opposed any new water sales of surplus water. And they just don't exist in those agencies.

DIANA SOKOLOVE: The next speaker is John Sturtevant.

C_Sturt

JON STURTEVANT: I'm Jon Sturtevant. I live at 18127 Apple Colony Road, Tuolumne, California 95379.

Back in the early '90s I worked for the Mono Lake Committee. And they worked very hard when they worked with L.A. Water and Power to have a win-win situation. Their main goal was to get L.A. to conserve more water. Everybody said, "Oh, yeah. That will happen."

But it did happen. People sweep their driveways, they don't wash their cars so often. They have 20 to 25 percent more population, and yet they use the same amount of water that they used 20 years ago. So if you guys would seriously address the issue of conservation, you might not need the 25 million gallons. That would be a win for us who live on the river because I canoe on it and hike around it with my Sierra Club friends. And it would also be a win for the folks in the Bay Area.

So be serious about conservation, and think "win-win."

C_Sturt-01

C_Picku

DIANA SOKOLOVE: Ron Pickup.

RON PICKUP: My name is Ron Pickup, Box 62 Soulsbyville, California. I was born, raised, and have lived in Tuolumne County most of my life. And as a fly-fisherman, writer, and photographer, I greatly value the unique recreation and beauty of our Wild and Scenic Tuolumne River.

As I testified at your last meeting with us, I believe taking any more water from the Tuolumne than presently used would be a real slap in the face of a

C_Picku-01

county of origin that has already provided you 20 million gallons a day from our river.

I ask you to respect and fully appreciate the important legacy the Tuolumne River provides our county. In addition to its considerable recreation and economic values, it provides us with a strong sense of place and identity. And we don't want to lose that identity.

I suggest the Commission take a three-day trip down the Tuolumne and experience this sense of place for themselves, firsthand. I also ask that you follow the San Francisco Board of Supervisors' recommendation, the Tuolumne River Trust advice, and the findings of your own studies to develop a more sustainable water supply through conservation, efficiency, and recycling as many other major cities have accomplished.

C_Picku-01 cont.

I thank you for coming up and taking our input.

C_GrinnD

DIANA SOKOLOVE: Doris Grinn.

DORIS GRINN: I'm a little disappointed that San Francisco is coming up here and giving us such a small sound byte of information when we're addressing an historic issue, the Tuolumne River, namesake county, all the concerns that the previous speaker just talked about.

12.6-20

We should be able to voice our opinion without little timers and have an hour and a half from San Francisco.

At what point does San Francisco stop impacting the riparian and water habitats of the river and the watershed that provides their domestic water source? At what point do they stop impacting it? At what point do they recognize the value of the natural world, the natural ecological habitat of rivers, the icon of life? At what point do they recognize that that is a value resource unto itself and stop taking more, taking landscapes with Hetch Hetchy and now taking more and more?

C_GrinnD-01

At what point is the riparian doctrine of water law implemented in this situation where we're looking at -- the riparian doctrine addresses in-stream flows for the ecological and aquatic health; at what point does the riparian doctrine allow priority over the extractions of water for domestic use?

I protest that the vestiges of civilization, that being San Francisco, continue to extract and degrade the natural ecological system and the rivers to maintain their expanding populations.

At what point does civilization -- and I'm not just talking about San Francisco and the Tuolumne

River; this is an age-old pattern. This is an archaic pattern of civilization destroying the upstream, the aquatic habitat to maintain and expand. At what point does San Francisco, which is some sort of vestige of environmental consciousness, when do they recognize this is -- this is the time to make a line and say, "Well, maybe we'll get into more water conservation. Maybe we'll be more conscious about what we're using," and stop degrading the upstream environment?

C_GrinnD-01 cont.

Thank you.

DIANA SOKOLOVE: Jim Grinnell.

C_GrinnJ

JIM GRINNELL: Thank you for the opportunity to speak. My name is Jim Grinnell. I live at 191 Elk Drive, Sonora. My great-great-grandfather had four sections of land in what is now Denair. And in 1904, San Francisco wanted to get water from what is now Hetch Hetchy. And Congress denied them.

In 1906 you had a great fire. After that, San Francisco got the right through Congress to take water and basically build the Hetch Hetchy system.

The deal that San Francisco was able to make -- well, let me say this. San Francisco became what it is because of Tuolumne County and the mining and all of this that was up in this area.

I'll be done in two minutes.

12.6-21

The deal, I think, was, a dollar and a half per acre foot is all San Francisco paid for that water. And San Francisco has sold over $150 million worth of water to the downstream Peninsula cities.

It seems to me that what San Francisco should do is stop selling water if they're short, because you're selling off the excess. You should be paying Tuolumne County, Merced County, Stanislaus County and these other counties that the water would have been used for. But now the water is gone because you've taken it.

It's time for conservation and reduction and reducing development in San Francisco if they're short of resources. But please don't take ours. C_GrinnJ-01

Thank you.

DIANA SOKOLOVE: Is there anyone who would like to speak who hasn't already spoken tonight? Can you please fill out a speaker card.

Robert Gelman.

NOAH HUGHES: Noah Hughes. Sorry.

C_Hughe1

DIANA SOKOLOVE: Okay. Just state your name and address.

NOAH HUGHES: My name is Noah Hughes. I'm at 20192 Gibbs Drive, Sonora, California 95370. I'm an earth science teacher down in Modesto. I grew up down

there in Modesto, and I've lived in Sonora for the last ten years or so. I'm a kayaker. I've spent a lot of the best moments of my life on the Tuolumne River.

So I'd like to make a couple of comments. First of all, about the draft program environmental impact report, a technical point: You based your flow projections, your future flow projections, off of monthly mean flows. Those are meaningless when it comes to environmental impacts. C_Hughe1-01

And monthly mean flows, monthly average flows don't mean anything to insects, humans or fish or kayakers. It's the amount of water that's in the river at that point in time. So your data is inadequate to make the projections that you're making. And it won't ever stand up in a court of law.

So given that fact, plus the fact that the board of supervisors do not support your preferred alternative, I really wonder where we're going with all this and what it's really all about. C_Hughe1-02

And in terms of water security for the communities in the Bay Area and customers of SFPUC, don't take more of our water so that you can sell it and make more money to make up for the money that was misspent back in the '90s that was supposed to go to all of the upgrades. That was documented in a series C_Hughe1-03

12.6-22

of articles in the San Francisco Chronicle that that money was squandered and misspent and didn't go to the upgrades that were supposed to be made.

C_Hughe1-03 cont.

Don't make it sound like it's going to be our fault if San Francisco gets in real trouble in an earthquake. This system, this alternative, is just demanding more and creating more demand. It's becoming less sustainable and less safe. Do what San Francisco's [sic] done. Do what Boston's done. Do what Seattle's done and reduce demand and put more slack in the system and make it safer.

Thanks a lot.

C_Gelma

DIANA SOKOLOVE: Robert Gelman.

ROBERT GELMAN: Good evening. My name is Robert Gelman. And I have dual residences, here in Tuolumne County and also in San Mateo County. My addresses are 321 Fuller Street, Redwood City and 240 Reservoir Road in Sonora.

So I have some questions about this. Why 25 million gallons? Why not 50 million gallons? 150? More? Why not? Well, I think we've heard a few good reasons why not tonight.

C_Gelma-01

Regarding the draft program EIR, many speakers have pointed out that the data it contains is fairly ancient; it doesn't take into consideration the climate

C_Gelma-02

science that we're now dealing with and many other environmental concerns.

C_Gelma-02 cont.

So as someone who can see both sides of this issue, I think it is incumbent upon the Commission to take another look at that EIR.

Thank you.

C_DayJ

DIANA SOKOLOVE: Joseph Day.

JOSEPH DAY: Good evening. My name is Joseph Day. I live at 716 Arbona Circle, Sonora, California. I grew up in the Bay Area. And I grew up on Hetch Hetchy water, so I know how good it is.

And I used to live in San Francisco. But I think you've got enough water coming from us. I think the real big problem is that, as populations grow on the coast, you're going to be demanding more and more of the water that originates in the Sierra Nevada watershed. And if you continue to take more, it's going to stifle the growth in the foothills or restrict what we currently are doing.

Pete Kampa already mentioned the potential transfers of water possibly from New Melones to make possible your plans. I find that very dangerous. We need to have that water supply. We have, I believe, 9,000 acre feet that is potentially usable for us here in Tuolumne County. And if our water rights are eroded

C_DayJ-01

12.6-23

by continued takings, I think that's a dangerous thing. C_DayJ-01 cont.

And as a speaker mentioned previously, there is a very large supply of water called the Pacific Ocean that you could use.

Looking at older numbers, I find that over $125 million is earned every year through sales of water and power generation by the SFPUC. An acre foot at the wholesale rate is over $500. When you start looking at the cost of de-sal, that's getting pretty close.

So I think the Bay Area could probably afford to invest in de-sal, and it really should start thinking about supplying their own water instead of taking more of ours. So that's essentially what I wanted to say. C_DayJ-02

DIANA SOKOLOVE: So is there anyone else who would like to speak tonight who has not spoken?

(No response)

DIANA SOKOLOVE: One of the main reasons why we do limit the number of minutes that you have is really just to make sure that everybody gets a chance to speak and that everybody gets home at a reasonable hour. But we do have some more time.

So if folks want to come back out and supplement your comments, you may do so. If you would

just -- you should probably get a sheet of paper and make sure that people just fill that out again.

For folks who are taking off, thanks for coming tonight. Thank you for speaking.

And folks who want to stay and listen to some more comments, please do so.

Take your seats. We do have a few more speakers. And if you need to have a conversation, if you could just take that outside the room, I'm sure people here who are speaking would greatly appreciate that. Thanks.

First speaker, Bob Hackamack. Bob again. Again, if folks want to take their conversations outside in respect to the people who are speaking again.

SI_RHH3 cont.

BOB HACKAMACK: Thank you, Diana, for letting folks come back. I was speaking before about the yield of the Hetch Hetchy system as only 207 million gallons a day. I wanted to go on to tell you that you're presently diverting north of 230 million gallons a day, and that gap is going to get you in trouble.

Now, it seems to me that, to make this project move forward smoothly, you're going to have to cap your diversions because it's obvious from the write-up that you're potentially building the fourth barrel of the

12.6-24

pipeline. At least in this iteration, you're going to build 46 percent of it, the miles of it. And those are the hardest 46.

So it's pretty obvious from what others have said that, once you hit that fourth pipeline, you're just going to continue taking more and more water without limit.

All you have in your mind are the words of John Freeman. "We can get 400 million, so let's go for it." But that's just not the way it is.

The reason that you can't do that is that you have ignored the feed to all these benefits in the first place.

In Section 9.(h) it says you have to develop all the water that you have in your city before you can take any from the Tuolumne. And you have not done that. Many people have referred to that already, and it's obvious that you have to develop the water in your service area, the bounds of the service area. And no one has spoken about that.

SI_RHH3-03

Diana spoke about the project, but she didn't say that they're going do anything to reduce their demand. And it's up to you to do that when you're contracting with them.

I wanted to say that the people who built this

system in the 20th century did a great job. And it's up to you, now, to build a good system, a serviceable system for the 21st century. And you're on the wrong track at this moment.

SI_RHH4 cont.

DIANA SOKOLOVE: Jerry Cadagan.

JERRY CADAGAN: Thank you for a second bite at the apple. I'm Jerry Cadagan, Sonora. I did prepare comments in case there was an overflow here. I've got another comment on the sufficiency of analysis, sufficiency of the information provided.

It is stated throughout the EIR and stated in newspaper articles, San Francisco said they need 35 million gallons more water between now and the year 2030. They say they are going to take 25 million gallons of that 35 million out of our Tuolumne River.

They say they're going to generate the other 10 million gallons a day through some combination of conservation of water recycling and groundwater resources.

And I cannot find in the 3,000-page EIR -- and I will confess, it may be buried in some appendices or some table -- a breakdown of that 10 million gallons a day. In other words, they're saying, "Tuolumne County, we want 25 million gallons a day more of your water. We're going to provide 10 million gallons a day through

SI_RHH4-02

some kind of recycling, conservation, and groundwater extraction," but I can't find where.

But what I can find on San Francisco's own Web site is their own recycled water master plan. Now, remember those 10 million gallons a day, they're going to do that -- in the aggregate, recycling, conservation, groundwater, presumably some of their customers are going to be contributing to that 10 million.

San Francisco's own recycled water master plan says, in San Francisco alone, there's feasible water recycling potential to the tune of 11.8 million gallons a day. That's almost 2 million gallons a day more than they are offering to contribute from the aggregate of the entire Peninsula, San Francisco, recycling, conservation, et cetera.

SI_RHH4-02 cont.

The EIR has got to address these issues. Thank you very much.

DIANA SOKOLOVE: Jim Grinnell.

JIM GRINNELL: Jim Grinnell. Just a follow-up on my previous comments.

I don't know what San Francisco is currently paying to Congress for -- to the United States government for this water that would otherwise be in the Tuolumne River, but in the early days, it was a

dollar and a half per acre foot. And that's around -- 300,000 gallons is an acre foot. It's 43,500 -- or anyway, it's a lot of water at a very low price per gallon.

Tuolumne County is so poor that this county, as of the 1st of July, had to close its county hospital because it doesn't have the money. Some of the money that San Francisco gets from selling the water should come to Tuolumne County.

Thank you.

DIANA SOKOLOVE: Doris -- sorry.

DORIS GRINN: It's Doris Grinn, P.O. Box 3053, Sonora.

And I want to commend all of the very informative, intelligent, and stimulating comments that are made today.

And I'm very disappointed that San Francisco was putting these time limits on, holding up the little cards, pressuring, forcing everybody to triage their presentation. And then we have all this extra time afterwards.

I really feel you people need to hear us, not cut us off with little timers. This is an issue for us. It's an issue that you folks should be listening to, not cutting us off, not saying, "Oh, sorry. It's time for you to stop." And then for us to have time left afterwards -- it's obviously poor planning for moderating.

So I think, if we have any more of these, you need to just listen to what people have to say.

Thank you.

DIANA SOKOLOVE: Anyone else who would like to speak tonight?

(No response)

DIANA SOKOLOVE: So again we'll be providing responses to your comments in writing.

I'm sorry. We do have one more speaker. Any others?

DOLORES BOUTIN: Dolores Boutin again.

12.6-26

Basically, it gets down to my wondering why is San Francisco asking for this extra amount of water? Because they can get it through the recycling; that's in the report. There are other alternatives. That's in the report.

The only thing I can figure out is, you ask for as much as you possibly can in hopes that you'll get something and that nobody will pay any attention. You ask for the extra amount of water so that you can sell it so you can make more money. You can sell the electricity; you can sell the water. That's it. Just

plain rip off.

Thank you.

DIANA SOKOLOVE: Anyone else?

(No response)

DIANA SOKOLOVE: Well, thanks again for coming, and thanks for those who spoke. And have a good evening.

(Whereupon, the proceedings concluded at 7:47 o'clock p.m.)

12.6-27

STATE OF CALIFORNIA)
) ss.
COUNTY OF MARIN)

I, DEBORAH FUQUA, a Certified Shorthand Reporter of the State of California, do hereby certify that the foregoing proceedings were reported by me, a disinterested person, and thereafter transcribed under my direction into typewriting and is a true and correct transcription of said proceedings.

I further certify that I am not of counsel or attorney for either or any of the parties in the foregoing proceeding and caption named, nor in any way interested in the outcome of the cause named in said caption.

Dated the 13th day of September, 2007.

DEBORAH FUQUA
CSR NO. 12948

PUBLIC HEARING TRANSCRIPT
Modesto, California

Thomas Downey High School, Modesto, California
September 6, 2007

(PH Modesto)

INDEX OF PUBLIC HEARING TRANSCRIPT

Thomas Downey High School, Modesto, CA - September 6, 2007

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Modesto	SI_TRT6	Eric Wesselman	Executive Director, Tuolumen River Trust	Public Hearing Transcript, Modesto, 9/6/07, pp. 21-25
Modesto	L_MID	Walt Ward	President of the Board of Directors, Modesto Irrigation District	Public Hearing Transcript, Modesto, 9/6/07, pp. 25-26
Modesto	C_TayloJ	Jean Taylor	Citizen	Public Hearing Transcript, Modesto, 9/6/07, pp. 26-27
Modesto	SI_SierraC2	Sandra Wilson	Chair, Sierra Club	Public Hearing Transcript, Modesto, 9/6/07, pp. 27-29

PUBLIC HEARING

DRAFT PROGRAM ENVIRONMENTAL IMPACT REPORT

SAN FRANCISCO PUBLIC UTILITIES COMMISSION'S

PROPOSED WATER SYSTEM IMPROVEMENT PROGRAM

THOMAS DOWNEY HIGH SCHOOL CAFETERIA

1000 COFFEE ROAD

MODESTO, CALIFORNIA

6:30 P.M.

SEPTEMBER 6, 2007

REPORTED BY: DEBORAH FUQUA, CSR #12948

APPEARANCES

DIANA SOKOLOVE, SENIOR ENVIRONMENTAL PLANNER
San Francisco Planning Department
Major Environmental Analysis Division
(Moderator)

KELLEY CAPONE and HEATHER POHL
San Francisco Public Utilities Commission

JOYCE HSIAO, DEPUTY PROJECT MANAGER
ESA + Orion Consultant Team

ALFRED WILLIAMS, PUBLIC INVOLVEMENT COORDINATOR
Alfred Williams Consultancy

PUBLIC SPEAKERS

Meg Gonzalez	Eric Wesselman
Nicole Sandkulla	Walt Ward
Darryl Bramlette	Jean Taylor
Noah Hughes	Sandra Wilson
Patrick Koepele	

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Thursday, September 6, 2007 6:28 o'clock p.m.

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P R O C E E D I N G S

ALFRED WILLIAMS: Good evening, ladies and gentlemen. I'd like to ask you to take a seat, please. We want to get started with the program.

Good evening, and welcome to the public hearing for the San Francisco Planning Department on the Draft Program Environmental Impact Report on the San Francisco Public Utilities Commission's Proposed Water System Improvement Program.

The program this evening is going to be moderated by Diana Sokolove, who is a senior environmental planner for the San Francisco Planning Department.

DIANA SOKOLOVE: Hi. Good evening, and welcome to tonight's public hearing on the Water System Improvement Program. My name is Diana Sokolove, and I'm the senior environmental planner with the San Francisco Planning Department, and I'll be the moderator for tonight's hearing.

And I also just want to introduce some key folks who are working on the program and also on the environmental review process.

Kelly Capone, who's in the back over there, is with the San Francisco Public Utilities Commission. She's working on the program. And Heather Pohl is also with the PUC working on the program. And they are certainly available to answer any questions you may have after the formal portion of the hearing.

And I just want to introduce to you Joyce Hsiao, who is with the ESA + Orion consultant team. And she can help you navigate through the document a little bit if you have questions.

And there's some public involvement folks around to help you with speaker cards and help direct you in any other way. Al Williams is over here; he'll be collecting the cards.

Just so you know, this is one of five public hearings that we're holding on the Water System Improvement Program, Program Environmental Impact Report. We had one last night in Sonora and we're going to have a few more. And we'll be providing the same opportunity to comment and the same information at each hearing.

So here's our agenda for tonight. Sorry the screen might be a little hard to see because of the sun, but I'm just going to make a few opening remarks, and then we're going to open it up quickly for public comment.

Just some meeting reminders, hopefully when you came in, you signed in at the front table. That's really our only way to keep in touch with you. So hopefully you signed your name legibly and clearly.

And if you do plan on speaking tonight, please fill out a speaker card. They're available at the front table, and also folks around here have some more, so if you need one, please ask.

And another item you may wish to pick up is a comment form, just looks like this (indicating). So if you want to make comments on the document, you can drop this off with me tonight, or you can leave them at the front table where you came into the room, or you can always mail it in later. And also if you -- should you decide that you'd like to get a CD of the document, just write that on the bottom of the comment form, and we'll be sure to mail that to you.

Restrooms are located over here to my right, "boys" and "girls." And also, please, if you don't mind, turn off your cell phones and pagers. And if you do need to take a call, if you'd be so kind as to step outside the room, we'd appreciate it.

Also, we do have a court reporter here this evening who is transcribing the hearing, and the transcript will become part of the public record for hearing.

And so the purpose, why we are here tonight, this is a hearing to receive your comments on the adequacy and accuracy of the environmental impact report, or the EIR, for the Water System Improvement Program.

During the public comment portion of the hearing, we're not here to answer your comments or respond to your comments. We can help you and respond to comments and your questions after the hearing is over, but technically we're going to be taking your comments and responding to them formally in writing in a comment and responses document.

Also, this is not a hearing to consider whether the Public Utilities Commission should approve or disapprove or modify the proposed program. So please direct your comments to the adequacy of the environmental impact report.

Here is where you can submit written comments (indicating). And also, if you picked up an agenda for tonight's hearing, the address to submit written comments is on that agenda. So you don't have to take all this down, but here is the information for you. And the Planning Department will accept comments through close of business at 5:00 p.m. on October 1st.

The draft program EIR is available for viewing at the San Francisco Public Utilities Commission and also at the San Francisco Planning Department. It's also available at several public libraries throughout the study area, and it's also available on line. And the addresses of where you can view the Program Environmental Impact Report are also on the agenda.

Here's our schedule. We have a 90-day public review period from June 29th through October 1st of 2007. Several public hearings in September -- one tonight in Modesto, and then we'll been going to Fremont, Palo Alto, and then in front of the San Francisco Planning Commission in San Francisco.

Then we'll be preparing responses, written responses, to all of your comments. And that will be in the form of a comments and responses document, which we hope to publish in the spring of 2008. And we will been certifying the program environmental impact report in front of the San Francisco Planning Commission also in the spring.

So now, we are ready to open the floor for comments. Just a few notes, as I've already noted tonight, this is a hearing on the draft program environmental impact report, not necessarily here to decide whether to approve or modify the proposed

12.6-32

program.

Also, again, please submit a speaker card if you would like to speak tonight. And I'll be calling names off of those cards. So when I call your name, please step up to the microphone, state your name, and please state your address for the record as slowly and clearly as you can.

And also, we'll be keeping track of time. Although I realize that you may have more to share than three minutes will allow, please limit your comments to three minutes. If we have some more time at the end, we can call you back up. I just want to make sure everybody has a chance to speak and everybody gets home at a reasonable hour tonight.

And Al Williams will be holding up cards to let you know how much time you have left. So if he holds up a "2," you have two minutes left.

So anyone else who hasn't submitted a speaker card who wants to speak?

(No response)

DIANA SOKOLOVE: Well, I don't have that many speakers tonight, so I just want to offer, if you want to take a little bit more time than three minutes, I'm sure we'll be able to accommodate you.

So the first speaker I have on my list is Meg

Gonzalez.

SI_TRT4

MEG GONZALEZ: Okay. Meg Gonzalez, 1000 Wellington Drive, Modesto, California.

I'm the director of Community Outreach and Education Tuolumne River Trust. Since our organization is going to be submitting written comment on this proposal or on this draft PEIR and other staff here tonight are going to address some of the technical aspects of this report, I thought that I'd take the opportunity to highlight some of the positive actions that are take place along the Lower Tuolumne River.

These are locally supported initiatives designed to restore some of the ecological integrity of the river that has been lost over time and to preserve the qualities of this local gem that enhances the livability of surrounding communities.

SI_TRT4-01

Such efforts would inevitably be undermined and potentially derailed by the Water System Improvement Plan being considered tonight. So anyone that's been down to the river here in Modesto, you can tell just by looking at it that it's not in a pristine state. Indeed, spawning salmon populations are at an all-time low. Riparian habitat loss has been extensive and water quality compromised.

That said, the past decade has seen a flurry

12.6-33

of efforts to restore the river's natural environment and enhance recreational opportunities for surrounding communities.

The Lower Tuolumne River Parkway is collection of projects stretching from LaGrange Dam to the river's confluence with the San Joaquin River. The parkway combines private and public restoration activities to enhance habitat and provide public use opportunities that are compatible with existing private interests.

The Trust recently celebrated the completion of one of its projects on the lower river: a 250-acre floodplain restoration project at the river's Big Bend. The City of Modesto Parks, Recreation and Neighborhood Department is completing the first phase of the Tuolumne Regional River Park that will enhance the community's access to and enjoyment of the river as it runs through the park in Modesto.

The cities of Ceres and Waterford are also working on the development of their own river parkways. Such initiatives have caught the attention of local, state, and government officials. Senator Barbara Boxer, Congressman Dennis Cardoza and Assemblyman Tom Berryhill have all pledged political and financial support to this work.

Another exciting project is the Trekking the

Tuolumne Outdoor Education Program, a California science-standards-based initiative that teaches literally thousands of elementary school children about the Tuolumne River. One of the most important messages that we hope the students take away from this experience is that of stewardship of the river, a lesson that the San Francisco's Public Utilities Commission can benefit from.

The Trust has recently published a document called "From the Tuolumne to the Tap," which presents overwhelming evidence that San Francisco's proposal to take more water is unfounded and unnecessary.

We need to keep the water in the Tuolumne River for its health and for the health of our communities.

Thank you.

DIANA SOKOLOVE: Nicole Sandkulla.

L_BAWSCA4

NICOLE SANDKULLA: Thank you. Nicole Sandkulla, 1155 Bovet Road, Suite 302, San Mateo, California 94402. And I'm here on behalf of Art Jensen, General Manager of the Bay Area Water Supply and Conservation Agency, who has a statement for you.

The San Francisco Draft Program Environmental Impact Report for its Water System Improvement Program is undergoing careful review by the Bay Area Water

Supply and Conservation Agency and its 27 member agencies that purchase water from the San Francisco Regional Water System for 1.7 million residents, businesses, and communities in Alameda, Santa Clara and San Mateo counties.

While BAWSCA's review of the draft EIR continues, we find it to be a good, comprehensive document, analyzing the environmental impacts and program alternatives as required by law.

BAWSCA will submit written comments to correct apparent errors and expand discussion of future water demands, alternative water supplies, and water conservation efforts.

One issue the PEIR should more clearly emphasize is the critical importance of completing the WSIP to protect the public health and safety of the people that live in the Bay Area today. L_BAWSCA4-01

Four active faults cross the major pipelines, tunnels, and reservoirs that provide water to 2.5 million people in our counties and San Francisco. There is a 60 percent probability that a major earthquake will occur in the Bay Area between today and 2032.

Following a major earthquake the flow of water to communities could be disrupted for 30 to 60 days.

The impacts to public health and safety would be catastrophic. The economic impacts, not counting injuries and loss of life, are estimated to be at least seven times the cost of rebuilding the aging water system.

The WSIP includes projected use for the BAWSCA's member agencies. These agencies in Alameda, San Mateo, and Santa Clara counties and their customers are dedicated to conserving water and safeguarding the environment.

Today the average resident in the service area uses 15 percent less water per day than in 1986 and 23 percent less water than in 1976. L_BAWSCA4-02

In the Bay Area, residential water use per person is lower than the average for the State of California. And residential water use per person in the BAWSCA area is lower than the average for the Bay Area. BAWSCA and its agencies actively support water recycling to make the most effective use of limited water supplies.

The water management issues addressed in the draft program EIR are a longer term issue. The projected growth is not going to happen tomorrow. The earthquake might. Protecting existing people from a known catastrophe that could result from highly

12.6-35

probably earthquakes is an urgent issue that the WSIP is designed to address.

Thank you.

C_BramlD4

DIANA SOKOLOVE: Darryl Bramlette.

DARRYL BRAMLETTE: Darryl Bramlette, 7700 Ruth Ridge Road, Jamestown, California, Tuolumne County.

I spoke last night at the meeting up in Sonora. I didn't get a chance to compliment the team on their report because it is an excellent report, considering the task that they were given because, actually, if you take a look at it, they were given a task to do an environmental study on something that's basically impossible because there is no more water that people can get out of the Hetch Hetchy.

And the problem is, yes, San Francisco and the Peninsula needs more water. So the money would have been better spent if they'd have changed the project to look for alternative sources.

C_BramlD4-01

San Francisco Bay is a source for water. And the technology has moved out from about eight years ago when we were talking about restoring and making a principal supply for water in that area.

So I'm recommending very highly, and have done so in the past, that San Francisco Utility Commission actually do a study, environmental impact study, right

C_BramlD4-01 cont.

in San Francisco on putting in desalination so that they can have water for the future and Hetch Hetchy can remain maybe the way it is today or maybe even better because they would not have to have the flow of water from the Tuolumne River.

So in considering, I do appreciate their responses to the environmental impact. But I think it's against the wrong project, and I hope that they get the chance to turn it around and do it appropriately.

And I thank you for your time this evening, and I thank the committee.

C_Hughe2

DIANA SOKOLOVE: Noah Hughes.

NOAH HUGHES: My name is Noah Hughes, and I'm at 20192 Gibbs Drive in Sonora, California 95370.

And I'd like to start out by saying thanks again to you guys for allowing us to give our talk and, in some cases twice -- last night's meeting and tonight.

But I do have a little bit of dual citizenship. I live in Sonora. I grew up in Modesto, spent a lot of time on the Tuolumne River. And I work down here at Modesto Junior College, where I teach a class called "Earth Science."

C_Hughe2-01

One of the topics we talk about a lot in Earth

12.6-36

Science is natural resources and the acquisition of natural resources. And we sort of try to look at the natural resources through the lens of sustainability. So I would sort of like to echo the sentiment of a previous speaker, Nicole Sandkulla, that we need this -- this document to more accurately address public health and safety of the WSIP.

However, in my opinion, when you look at this through the lens of sustainability, by taking more water from a finite resource and allowing yourself more customers or more demand for that water, you have not moved toward sustainability. And therefore, you have not really addressed the long-term health and safety of a community by taking a step away from sustainability. By increasing demand and -- increasing demand on what's already a very hard-working river, we sort of moved away from that.

So examples of some cities that have actually moved towards sustainability would be, for instance, Seattle, where they have reduced withdrawals from local rivers by 15 percent in the last 20 years while serving 20 percent more people. That creates more slack in the system. That is safe. That is sustainability. It rewards itself.

I would like that type of thing to be

C_Hughe2-01 cont.

addressed in the environmental impact report.

C_Hughe2-01 cont.

And another comment, again, good job on what you guys have done, but it was sort of an impossible task to evaluate the environmental impacts with a poor data set to work with. One of the issues with data is the resolution of your data. And the resolution of the data that you are working with is too coarse. You are using monthly mean flows from the Tuolumne, a monthly average, if you will. And that cannot adequately address the needs of the ecosystem up there because it just takes a couple days without water to start to impact the ecosystem systems, riparian ecosystems, and the economy, based on recreation up there.

So even though you might get a big flow later on, so your monthly average looks pretty good, really from an ecosystem environmental impact perspective, your data is inadequate. So that is a serious flaw in the environmental impact report.

C_Hughe2-02

So, thank you so much.

DIANA SOKOLOVE: Patrick Koepele.

SI_TRT5

PATRICK KOEPELE: My name is Patrick Koepele, and I'm the Central Valley program director for the Tuolumne River Trust at 829 - 13th Street in Modesto, 95354. I'm also a rafter. I've rafted on the Upper

Tuolumne, and I like to canoe quite a bit on the Lower Tuolumne as well. And I wanted to thank you for coming to Modesto to listen to our comments.

Those of us who rely on the Tuolumne River for business, recreation, and personal renewal will suffer greatly if San Francisco pursues their plans to divert an additional 27 million gallons of water a day from the river.

I'll focus my comments on the impacts we feel the proposed withdrawals will have on the Tuolumne River below Don Pedro Lake. On the Lower Tuolumne River, many groups have come together to improve the habitat for many species, but most notably Chinook salmon. Several projects have been completed to date. SI_TRT5-01

The river is in a state of transition but is far from recovered. In fact, this past year saw only 625 Chinook salmon return to the Tuolumne, the lowest number since 1994. This is sad for a river that for a long time supported more than 60,000 fish annually and has been the focus of so much restoration work.

Taking water from the river would be like taking air from San Francisco. People need air, and fish need water. Furthermore, steelhead trout have been designated a threatened species by the National Fisheries Service, and the Tuolumne River is habit for SI_TRT5-02

these fish. Again, taking water from the Tuolumne would harm these fish by negatively impacting temperatures and reducing the frequency, duration, and magnitude of high flows. SI_TRT5-02 cont.

Finally, the riparian forest along the Tuolumne River will also be negatively impacted by reduction of flows. For example, cottonwood trees require periodic inundation to help them spread their seeds to germinate. Withdrawing more water from the Tuolumne will reduce the frequency and duration of inundation, thereby negatively impacting the riparian corridor. SI_TRT5-03

The proposed mitigation for this reduction of water in the lower Tuolumne is inadequate and, frankly, unmitigatable. While projects that add gravel and reduce sedimentation are needed, they aren't the same as fish and water. You can build miles of spawning gravels, but if those gravels don't have water running over them, they wouldn't produce more fish. SI_TRT5-04

Instead of increasing withdrawals, we encourage San Francisco and the entire Bay Area to show leadership by implementing significant water conservation measures. SI_TRT5-05

As Noah Hughes mentioned, the Bay Area lags behind other metropolitan areas, like Seattle and Los

12.6-38

Angeles, that are reducing water consumption even in the face of growth. As a region known for a strong environmental ethic, the Bay Area should be a leader in water efficiency and conservation. Thank you.

SI_TRT5-05 cont.

DIANA SOKOLOVE: Eric Wesselman.

ERIC WESSELMAN: Eric Wesselman, Executive Director of the Tuolumne River Trust, 5915 Thornhill Drive, Oakland, California, 95641.

SI_TRT6

As has been stated by other trust staff here tonight, we will be providing thorough written comments as well by the deadline date later this month, and we're working on those now with our attorneys and expert consultants and also provide I guess what we determine to be overarching problems, flaws, inadequacies with the draft EIR that -- I think point to a number of them, then follow-up, detailed comments that will be included in our statements.

No doubt -- at the outset, I would say that there's no doubt that there's a need for this project in the areas of repairs and retrofits and upgrades to the Hetch Hetchy system and the San Francisco water supply system and the infrastructure in the Bay Area. That is, no doubt needed.

And the problem -- and especially for seismic concerns. I think that the problem is that this poison

SI_TRT6-01

pill issue, increasing diversions from the Toulumne River by somewhere between 25 and 27 mgd -- which is, by the way, one of problems with the draft PEIR, there's different numbers there. And this poison pill of increased diversions threatens to delay the needed retrofits and upgrades to the system.

SI_TRT6-01 cont.

And speaking then specifically to the need for the increase in diversions, that is not adequately outlined or justified in the draft PEIR. And primarily, this is because the -- I would say three main -- well, because overall, the demand projections for water in the Bay Area are inflated. I mean, they're based on flawed data and analysis in three key ways.

One, it doesn't factor the relation between the price of water and demand for water. As price goes up, we all know that the consumption of a product tends to go down. And water is like that. It is elastic, or certainly not inelastic.

Yet in the analysis, rather than treating these demand projections, it has not considered the relation to the rising price of water tripling over 15 years and the corresponding decreasing demand for water. It didn't analyze that effect at all.

The second thing, it used allocated employment

SI_TRT6-02

projections that they -- they got from the Association of Bay Area Governments for employment projections that are inflated, and it's obvious they've sued the figures from '02 that were then updated in '05. And it showed, I think, it's 48,000 less or fewer jobs in the Bay Area. And that would result in another lower projected demand for water in that time period.

So that, in going from draft to final, they should incorporate the latest employment projections and then alter the water demand projections accordingly.

Third, there's an increase in per capita demand which is simply out of step. And it demonstrates inefficient use of water and of a resource that's held in public trust. So increase in per capita use, that's not a justifiable relief for the project specifically meaning the 25 mgd.

SI_TRT6-02 cont.

Second, and another category of problems is this analogy about known impact assessment for analysis. Looking at the baseline problems that Noah Hughes brought up, there hasn't been an adequate study of the watershed for years and years.

In fact, it's been 15 years since there was even a draft study of the status of the watershed put out. And the draft EIR references and relies on that

SI_TRT6-03

study a lot. And that's problematic because it's old, and it was never even finished. So you can't know what the impacts are. You can't adequately analyze the impacts of the project if you don't know your starting point. You don't know where you're going unless you know your history. So without adequate baseline data, the EIR is inadequate. End of story.

SI_TRT6-03 cont.

The third key point, the EIR didn't adequately factor in legal obligations. TID and MID have been covering fish recovery flows for years. The San Francisco PUC has been paying TID to do this. There's no -- the EIR assumes that this will continue. But to our knowledge, there's no written contract or no agreement between irrigation districts and San Francisco that this is going to continue. So that means San Francisco needs to provide this water, and that would cause a problem with taking even more water off the river.

SI_TRT6-04

Another one is the impacts in the Delta. The Tuolumne flows into the San Joaquin. The San Joaquin flows into the San Francisco Bay Delta, which we all know is in crisis. And the EIR doesn't adequately analyze the impacts to the Delta. And San Francisco likes to ignore that it has any relationship to the Delta, of course, because they don't want to get caught

SI_TRT6-05

12.6-40

up in that mess. But that's politics. This is supposed to be science.

It actually assumes -- it does find some impact in the EIR, but it assumes that the Bureau of Reclamation will mitigate for those impacts. But again, I'm not aware of any acknowledgment there that they will do that. So that's a problematic assumption that adds up inadequacy. SI_TRT6-05 cont.

Thanks for your time, and thanks for your work on this project.

L_MID

DIANA SOKOLOVE: Walt Ward.

WALT WARD: Good evening. Walter Ward, Modesto Irrigation District, 1231 - 11th Street, Modesto, California 95354. I only have some very general comments tonight. We will be providing specific written comments.

And towards that end, given the significance of the scope and range of this project, the magnitude of the documents under review, we would respectfully request that you extend the public comment period for at least another 30 days. I think it merits that kind of thorough understanding by the public. So I'll make that request. L_MID-01

More pointedly -- and again, we will provide written comments by the deadline if it isn't

extended -- but one comment that I do want to make tonight is to bring out the idea that the EIR, in our review, fails to clearly identify which projects will be subject to a subsequent, specific project-level EIR.

Some of the projects will probably be cure-all, programmatic, but in particular, the notion of a dry-year transfer from MID and TID to San Francisco is silent in the EIR. And we think, although that project has some intriguing ideas, it merits a very high-level of scrutiny and evaluation. And the EIR, as it now stands, does not identify that it would be extended to a project level. And we -- we have that concern. L_MID-02

C_TayloJ

DIANA SOKOLOVE: Jean Taylor.

JEAN TAYLOR: A few days ago, I sent a letter to the Modesto Bee regarding the condition of the Tuolumne River. I live on Santa Fe Avenue, Modesto, California. I've lived there 37 years. And I have never seen the river in this horrible condition it is now. It's green. It's slimy. And we have riparian rights. We can irrigate from the river, but it's a real problem. I have another hundred feet to even reach the river and constantly have to clean the slime off my foot path.

I just have a concern for the river. It's a real blessing for a community to have a river go C_TayloJ-01

12.6-41

through it. It's a recreational thing that -- you can't use it now. It's horrible. How can the fish survive in it? I'm just very concerned about the condition of the river and that something needs to be done that they don't take more water from it.

C_TayloJ-01 cont.

DIANA SOKOLOVE: Sandra Wilson.

SI_SierraC2

SANDRA WILSON: Hi. My name is Sandra Wilson, I live at 704 Tokay Avenue, Modesto 95350. I'm the chair of the local Sierra Club, and we'll be providing more detailed comments. But I did want to bring up a few things. I go to a lot of sprawl meetings. And I'm constantly told -- ask the question, "Why do we have to grow?"

And I'm constantly told that it's because San Francisco and the Bay Area has stopped growing. So it brings up the question, "Why do we need to give them 27 million gallons of water out of the Tuolumne when we stand to lose a great deal?"

As part of the Sierra Club, I lead hikes along the Tuolumne. And I also do a salmon walk. Last year, we were very hard pressed to find the salmon to show people. I think we found a dead one. But last year, there were record lows. So there's a lot of concern about the salmon and the rest of the wildlife. If the river dries up, what happens to the otters that you see

SI_SierraC2-01

up around LaGrange? There are so many things that depend on the river today.

Also, as a community, here in Stanislaus County, we have put a lot of time and money and energy into creating a regional park, a Tuolumne River Regional Park, a park that revolves around the river. And what do we lose? What is our environmental impact if we have the Tuolumne Ditch Regional Park because we don't have enough water left? I mean, it just doesn't seem like -- you know, what happens to all the years of planning and the time and the energy and money that we've put into building a park like this, if we're going to lose the river, and the benefits that it provides our community.

The river also flows down into San Joaquin Wildlife Refuge. And we've spent a lot of money there. And the wildlife refuge plans to grow. And one of its concerns is water. Losing more water is going to affect the marsh habitat that's need for migrating birds. That whole park was created for the Aleutian geese, which are going extinct because of losing migrating habitat for winter feeding. What happens to the birds in the park?

Those are all things that need to be addressed.

SI_SierraC2-01 cont.

12.6-42

And also, I think it's really unfair not to consider the Delta in this. Just last week we had a court case on Grant [phonetic] Damn upheld. We need to consider the water in the Delta because the water in the Delta provides the basic food that the salmon need before they swim upstream into the Tuolumne to spawn. So if you don't take that into account, you're really not addressing the salmon population on the Tuolumne River.

SI_SierraC2-02

So for us, another area that I think is important to consider is global warming. We've seen a lot of changes in our weather. You know, we're just not getting the snow pack that we used to get. How does that affect our overall water supplies running into Hetch Hetchy Reservoir? I still think you ought to be taking this further and looking at other ways of providing the needs of San Francisco.

SI_SierraC2-03

San Francisco is the wealthiest -- one of the wealthiest cities in the entire country. Yet here they are in this situation. They stand to take so much from us and Stanislaus County and the people living all up and down the Tuolumne River and, of course, all the wildlife and the animals that, for us -- you know, it's a limited resource. And once it's gone, it doesn't come back.

So I'd ask you to take all of these things into account.

DIANA SOKOLOVE: Is there anyone else who hasn't spoken who wants to speak tonight?

(No response)

DIANA SOKOLOVE: Anyone else who has spoken who wants to speak again?

(No response.)

DIANA SOKOLOVE: Okay. Well, thank you for coming tonight, and thank you for your comments, and thanks to everyone who spoke.

Again, here's where you can submit written comments (indicating). And have a good evening.

(Whereupon, the proceedings concluded at 7:06 o'clock p.m.)

STATE OF CALIFORNIA   )
)   ss.
COUNTY OF MARIN   )

I, DEBORAH FUQUA, a Certified Shorthand Reporter of the State of California, do hereby certify that the foregoing proceedings were reported by me, a disinterested person, and thereafter transcribed under my direction into typewriting and is a true and correct transcription of said proceedings.

I further certify that I am not of counsel or attorney for either or any of the parties in the foregoing proceeding and caption named, nor in any way interested in the outcome of the cause named in said caption.

Dated the 16th day of September, 2007.

DEBORAH FUQUA

CSR NO. 12948

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PUBLIC HEARING TRANSCRIPT

Fremont, California

Fremont Main Library, Fremont, California
September 18, 2007

(PH Fremont)

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Fremont	SI_TRT7	Eric Wesselman	Executive Director, Tuolumen River Trust	Public Hearing Transcript, Fremont, 9/18/07, pp. 12-17
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Fremont	L_Menlo2	Kirsten Keith	Employee, Menlo Park Planning Commission	Public Hearing Transcript, Fremont, 9/18/07, pp. 24-25
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PUBLIC HEARING

DRAFT PROGRAM ENVIRONMENTAL IMPACT REPORT

SAN FRANCISCO PUBLIC UTILITIES COMMISSION'S

PROPOSED WATER SYSTEM IMPROVEMENT PROGRAM

FREMONT MAIN LIBRARY, FUKAYA ROOM

2400 STEVENSON BOULEVARD

FREMONT, CALIFORNIA

SEPTEMBER 18, 2007

REPORTED BY: DEBORAH FUQUA, CSR #12948

APPEARANCES

DIANA SOKOLOVE, SENIOR ENVIRONMENTAL PLANNER

San Francisco Planning Department

Major Environmental Analysis Division

(Moderator)

KELLEY CAPONE and HEATHER POHL

San Francisco Public Utilities Commission

LESLIE MOULTON, PROJECT MANAGER

ESA + Orion Consultant Team

PUBLIC SPEAKERS

John Cant	Robert Means
Dave Ellison	William Noren
Eric Wesselman	Kirsten Keith
Jeff Miller	Lech Naumovich

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Tuesday, September 18th, 2007 6:30 o'clock p.m.

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P R O C E E D I N G S

DIANA SOKOLOVE: Okay. Folks, we're going to get started. Thanks for coming tonight. Good evening. My name is Diana Sokolove, and I'm a senior environmental planner with the San Francisco Planning Department. The Planning Department is the lead agency under CEQA for preparation of the environmental document on the Water System Improvement Program, and the San Francisco Public Utilities Commission is the project sponsor. We are two different departments in two separate entities.

I'm going to be the moderator for tonight's meeting, and I just want to introduce some other folks who are here with us tonight. Kelly Capone is the environmental project manager with the San Francisco Public Utilities Commission. She's at the back of the room. With her is Heather Pohl, also with the PUC. And they're available after the hearing to answer any questions you may have about the proposed program.

Leslie Moulton is the project manager for the ESA + Orion joint venture, the consultant team for the environmental impact report.

And we have some public involvement folks here, also with the San Francisco Public Utilities

Commission. Jim Marks is here in the audience, and there's some other folks here too.

Actually, if the public involvement folks -- you may want to stand up and just let folks know who you are.

And those folks can help answer questions after the hearing.

So this is one of five public hearings on the Water System Improvement Program, Program Environmental Impact Report. And we are essentially providing the same information at every public hearing, although you are more than welcomed to attend each one.

Here's our agenda for tonight (indicating). Just to provide some quick introductory remarks, and then we'll open up the hearing for public comment.

Some meeting reminders. Hopefully you signed in when you came in and you took some copies of our hand-outs, such as our meeting agenda, which has the information where you can submit comments on the environmental impact report. And please do submit a speaker card if you want to speak tonight. This is what it looks like (indicating). And you can submit them to Andrea here at the computer.

And also, you may also wish to pick up a comment form. And that's what this looks like. It's a comment card. If you want to submit written comments tonight, this is an opportunity for you to do that. And you can give them to me personally, or you can just leave them in the box here.

Restrooms are located out this door and to the right. And also, if you wouldn't mind please turning off your cell phones and pagers and just to make sure that, if you want to take a call, you step outside the room. I'm sure everybody would really appreciate that.

Again, be sure no food or drink other than water in this room. And as you see, we do have a court reporter here this evening who is taking a formal transcript of the proceedings. And the transcript will become part of the public record for this environmental impact report.

We are here tonight to receive your comments on the adequacy and accuracy of the environmental impact report and the Water System Improvement Program. Your comments will be transcribed and responded to formally in a comments-and-responses document prepared by the San Francisco Planning Department. And we are not here to answer your questions tonight as part of the formal public hearing, but we can try to answer some of your questions after the formal public portion of the meeting has closed.

Again, this is not a hearing to consider approval or disapproval of the proposed program. That hearing will be held by the San Francisco Public Utilities Commission following the final program environmental impact report certification hearing, which is presided over by the San Francisco Planning Commission.

Here's where you can submit written comments on the environmental impact report (indicating). And again, if you picked up an agenda, that information is also on the agenda. And a reminder that the Planning Department, my department, will accept comments by close of business on October 1st. The environmental impact report is available on line. It's also available in print at the Planning Department and at the Public Utilities Commission and at several libraries throughout the program study area, including the Fremont Main Library here.

And if you would like a copy of the environmental impact report on CD, that's something that you can put on this comment form and just let us know and we can mail you one.

Here is an overview of our schedule, our environmental review schedule (indicating). We are holding a 90-day public review period starting June

29th through October 1st of this year and, again, five public hearings. Tonight, we're in Fremont. We'll be in Palo Alto tomorrow night. And on Thursday we'll be at the San Francisco Public Utilities -- I'm sorry -- the San Francisco Planning Commission.

And if you haven't seen it already, the agenda for the Planning Commission hearing is up on the Web. It has been released, and there's a time certain for 5:00 p.m. And all that really means is that we won't be starting the hearing on the document before 5:00 p.m., but it could start later than 5:00. So it just means it won't start before 5:00.

We'll be preparing, as I mentioned, responses to all of your comments. And we will hopefully release that document, the comments and responses document, in the spring of next year. And then the San Francisco Planning Commission will hold a certification hearing to consider whether to approve the adequacy and accuracy of the environmental document.

So just some rules for the comments session tonight. Again, please comment on the environmental impact report, its accuracy, its adequacy. Please, again, submit a speaker card to speak. And I will call your names to come up to speak, and you can either speak at the microphone up here at the front of the

12.6-47

room or we have a portable microphone that we can give you. So wherever is most comfortable for you. And when you come up to speak, please state your name and your address for the record.

We do have a general standard of keeping your comments limited to three minutes, but we don't have that many speakers tonight. So just be as brief as you can and consider your comments to be a summary of your main verbal comments. And you can certainly submit additional comments, written comments, to me or to the environmental review officer through the 1st of October.

C_Cant

So is the first speaker I have is John Cant.

JOHN CANT: I am John Cant. I live in Fremont. And I seem to recall being in this room two years ago on a very similar topic. And perhaps I'll sound the same way as I did then.

C_Cant-01

My first major issue has to do with whether the SFPUC -- which we all understand has to maintain and improve a massive water supply system -- whether the Commission is paying sufficient attention to minimizing, insofar as possible, the demand for water in the overpopulated Bay Area.

And I would submit that this is not happening at all, that there is by far insufficient attention being paid to conservation and efficiency of water use. This can be done in metropolitan areas. It's being done in Los Angeles. And I know Los Angeles has a lot of guilt to atone for, but still, if Los Angeles can do something in terms of efficiency and conservation, then perhaps we, who are reputed to be more environmentally sensitive, should do even better.

Also, I might call attention to the example of Seattle, which has a much more enlightened approach to acquisition and use of water. So this can be done. As far as I can tell, the Commission is paying very little attention to it.

As a minor example, when I water my garden -- which I do, I confess -- I am using water which I believe 60 percent comes from the Sierra Nevada which, to me, is obscene that we here in Fremont can be watering our gardens, washing our cars, using a large amount of water from the Sierra Nevada with no recycling, no system for gray water. So that's my first point.

C_Cant-01 cont.

My second has to do with the proposed -- or I guess it's program environmental impact report. And Chapter 6 deals with the habitat reserve program.

Now, I'm not debating whether the Commission needs to pay attention to its facilities, make

C_Cant-02

improvements. There's going to be a lot of construction, earth moving, and so on. And those are bound to have negative environmental impacts. The issue is whether they -- the proposal suggests adequate mitigation.

And I'd like to call attention to, I think, an important letter by Jeff Miller of the Alameda Creek Alliance to Paul Maltzer of the San Francisco Planning Division [sic], dated August 28th -- it's available through the Alameda Creek Alliance website -- that explains in considerable depth just why the Habitat Reserve Program, whose aim is to mitigate impacts to habitats for sensitive species, comes nowhere near doing an adequate job. For one thing, the simple acreage is not sufficient.

C_Cant-02 cont.

So to summarize, it seems to me we in the Bay Area ought to figure out better ways and help the Commission push us into those ways, push our more recalcitrant neighbors into those ways of reducing water use in spite of growth, which can be done, and second, while working to maintain and safeguard the water supply system, obviously important, that the negative effects on the habitats that surround us in a very ecologically diverse area, those negative effects are dealt with properly.

C_Cant-03

12.6-49

C_Ellis

C_Ellis-01

Thank you.

DIANA SOKOLOVE: Dave Ellison.

DAVE ELLISON: Good evening. I live here in Fremont, and I recognize the need to upgrade our -- to give us all water and to make it seismically safe. But I have hiked the Tuolumne River, and I've rafted it and seen the flora and the fauna that it sustains. And I'm concerned about taking more water out of it, especially since this morning, as always, I was at my local health, club and after I swam, I went into the shower, and I lathered up. Then I turned on the water and turned the water off.

Meanwhile, when I walked in there were about eight people in the same room just standing there, leaving the water running. They were there when I arrived; they were still there when I left. I went out to the sinks to shave, and I sort of, you know, rinse off my razor, turn the water off, shave, rinse off my razor. Meanwhile, the gentlemen on either side just flipped the taps and let the water run.

I see when I go for walks in the evenings where water -- you know, gallons and gallons and gallons of water that was supposed to be irrigating grass is just going right down into the sewer because it's just left running or something is broken or what

C_Ellis-01 cont.

have you.

I guess I just echo my predecessor's comments. Before we go upsetting yet another pristine wilderness, maybe we should look at our own habits, and maybe part of this plan should be an outreach to us to educate us that water is not an unlimited -- in unlimited supply. And if we just changed our habits, we wouldn't need all that new water.

Thank you.

SI_TRT7

DIANA SOKOLOVE: Eric Wesselman.

ERIC WESSELMAN: Thanks. Hi, Eric Wesselman, executive director of the Tuolumne River Trust based out of San Francisco, Modesto, and Sonora.

I thought I'd start by saying the WSIP certainly includes a number of necessary projects -- seismic upgrades, retrofits, and repairs on the system -- that we've got to move forward on and move forward quickly.

SI_TRT7-01

Unfortunately, the WSIP also includes a proposal to take more water out of our natural environment for use here in the Bay Area; 25 million gallons per day would come from the wild and scenic Tuolumne River. So the Toulumne River already supplies more than half the river's volume for rural and urban uses. In other words, the majority of the river is

SI_TRT7-01 cont.

already diverted. So taking more water from this wild and scenic river will do more harm to the environment, which is simply unacceptable at this point. We should be talking about putting more water back into the environment.

And while I'm concerned about impacts to the Toulumne River, I'm also concerned about redirected impacts to other watersheds. If we don't take more water from the Tuolumne, where else does it come from?

SI_TRT7-02

Well, our answer is that it should come from conservation, recycling, and other efficient, sort of water-smart, sustainable measures, which are abundant and plentiful and cost effective in this day and age. We're not in the last century anymore.

SI_TRT7-03

More to the point, this draft EIR doesn't adequately define the need for this increased diversion. The science behind the increase in demand for the Bay Area, these 28 wholesale customers, is based on really flawed and flimsy and terrible science provided by the SFPUC and their 28 wholesale customers.

And to point out, and foremost, we're dealing with a situation where the relationship between price and demand wasn't analyzed at all. So as price goes up, which the SFPUC indicates will more than triple over the next 12 years, that's going to have an impact

SI_TRT7-03 cont.

on demand. There's a relationship between price and demand. It's not inelastic. So as price goes up, demand will go down. By how much? We don't know because it wasn't analyzed in the demand projections.

SI_TRT7-04

That's a technical flaw that makes this EIR inaccurate.

Secondly, the SFPUC conducted its own study just last year that found that the vast majority of their projected increase in demand could be met through efficiency, conservation, and recycling. Yet that study wasn't relied on at all in the draft EIR or in the reformulation of the new demand projections.

SI_TRT7-05

And thirdly, the demand projections rely on out-dated employment projections from the Association of Bay Area Governments. They used 2002 data for their job employment growth. Now, in 2005, ABAG re-released that data, and it was adjusted downward by tens of thousands of jobs. So if you have less jobs, you have less growth in water demand in the commercial sector. Ergo, the demand projections should be adjusted downward accordingly. Yet nothing was done when the draft EIR analyzed these inflated demand projections.

SI_TRT7-06

And fourthly, just out of principle, we're talking about an increase in per capita demand. So not only is the area's water use in the 28-wholesale-customer region projected to increase, SI_TRT7-06 cont.

it's projected to increase per person.

So this is unacceptable in this day and age. We should be becoming more efficient, using less water per person to do the same thing, through efficiency. It's like driving a hybrid car cross-country versus an SUV. You get the job done. You still get across the country. You just use less resources to do it. It's the same thing with efficiency. So we should be looking at decreasing per capita water use, not increasing it.

SI_TRT7-07

The DPEIR also failed to assess the environmental impacts of taking more water off the Tuolumne River. In a couple of key areas, this is true. First, there's no adequate baseline defined for the current environmental status of the Toulumne watershed. So there were no studies done or the studies were done more than a decade and a half ago and were never completed. So we don't know what the current status is.

So how can you forecast and figure out what the environmental implications or impacts will be taking of taking more water out of the system? If you don't know where you're coming from, you don't know where you're going. So that needs to be done. We need to have an adequate baseline first.

SI_TRT7-08

Secondly, we're dealing with a subjective definition of what constitutes a significant environmental impact in the draft EIR. Significant impacts should be defined with measurable and quantifiable criteria. And by having loosey-goosey, quite frankly, terms and a subjective definition of what constitutes a significant impact, the DPEIR fails in that area. It is inadequate. It needs to be quantifiable.

SI_TRT7-09

Thirdly, global warming was not -- was never really evaluated at all. It's mentioned in the draft document, but it was really -- it was a punt. It's hard to analyze, and a lot of things are hard to analyze. It's hard to analyze and project what future water demand is going to be in the year 2030. And if we think we can do that, then we need to also adequately analyze what we think is going to happen due to global warming. There's a lot of climate models out there. You run them a few hundred times, get some good data. And that wasn't done at all.

And instead, the Planning Department, SFPUC, and the wholesale customers relied on hydrologic data from the last 82 years. While that's necessary and important in a useful data set to include in models, it -- the planning document didn't look at the trends

12.6-52

in that data, didn't look at what happened over those 82 years. Were there trends towards decreasing Sierra snowpack at that time? What other trends should be noted about our water supply in the Sierras?

In addition, it doesn't look at climate change, because we know that in the last 82 years what happened is not what's going to happen over the next 82 years because of a whole host of things, most notably, I'd argue, due to global warming, which will have an impact on the Sierra snowpack. We all know it. It's going to change the hydrologic nature of this watershed.

And then on a subjective note, the SFPUC and the wholesale customers are now talking about increasing their reliance on the Sierra -- on the source out of the Sierra Nevada at a time when we know it's going to be less reliable, less sustainable because of global warming and a whole host of other issues.

SI_TRT7-09 cont.

So I'll stop there and look forward to providing written comments. Thanks for the extra time.

SI_ACA2

DIANA SOKOLOVE: Jeff Miller.

JEFF MILLER: Hi. Jeff Miller. I'm the director of the Alameda Creek Alliance, and we've been working since 1997 to restore Alameda Creek. And we now have

over 1400 members that live in and near the watershed. And I'm going to comment mostly on Sunol Valley projects that have to do with Alameda Creek and particularly the fishery issues.

And looking through the programmatic EIR, the main comment is that there's a couple projects in particular that we're concerned about, Calaveras Dam obviously being in largest one, that's the primary water source from Alameda Creek and the largest infrastructure project that's being contemplated.

Currently the PUC diverts, by its calculations, 86 percent of all stream flows in the Upper Alameda Creek Watershed into its water system. So that doesn't leave a lot for fish and wildlife. And under the Calaveras Damn project in the EIR, the PUC is claiming no impact to steelhead because they're not back in the system yet. Well, downstream, a couple agencies are working on fish passage projects. Our main barrier to steelhead in the flood control channel -- two agencies just signed an agreement to try complete that project by 2010, which is before construction of Calaveras Reservoir would begin.

So in our mind, looking at a long-term project like this and operation of Calaveras Dam, there has to be an analysis of impacts to steelhead in this EIR.

SI_ACA2-01

12.6-53

Also, there needs to be a commitment to adequate stream flows for steelhead trout. There's flows contemplated for resident fish which are not going to be adequate for migratory fish. They're certainly going to improve things for rainbow trout but are not going to adequately address flow needs for steelhead.

And another thing I'd point out, that obeying current laws, such as Fish & Game codes requiring minimum flows for native fish, is not an adequate mitigation measure. That's compliance, not mitigation. So the mitigation measures in there that merely contemplate complying with laws that haven't been complied with is not going to be adequate.

SI_ACA2-01 cont.

There's two projects in particular that are disturbing because they actually propose increasing diversion of water from Alameda Creek over what's currently diverted, and that's the Calaveras Dam project, where the Alameda diversion dam on Upper Alameda Creek is contemplated to be operated in such a way that it diverts nearly all of the flow from Upper Alameda Creek.

And I'd point out that that's illegal, for one thing, and also does not adequately analyze what the impact is, nor mitigate it. And we're calling on the

PUC to actually remove the Alameda diversion dam.

And the other is the fishery enhancement project, which is designed to recapture flows that are anticipated to be released from Calaveras Reservoir. This is the result of a legal settlement in the 1990s. And these are flows that are contemplated for instream fish -- so for rainbow trout. And the recapture project, unfortunately, also includes a clause that will have the PUC capturing their historic annual diversions, including water they used to divert from the Sunol filter galleries, which are no longer used, which would probably dry up Alameda Creek below the project site.

SI_ACA2-01 cont.

So these are both impacts that aren't analyzed. And then lastly, I just want to put a pitch in again for conservation, water recycling and efficiency. And this needs to be done so that additional water doesn't have to be taken from Alameda Creek or from the Tuolumne.

SI_ACA2-02

Thank you.

C_Means2

DIANA SOKOLOVE: Robert Means.

ROBERT MEANS: Okay. This is starting to feel a little bit like an experience I had nearly five or six years ago with the BART extension where the experts come in with their solution for how to do things and

12.6-54

they're not particularly interested in the public comment because they know the way they want to do it. But I'm here to give my public comment anyway.

The demand for this extra water coming from Tuolumne, apparently, seems rather unjustified. We've had a number of people talk about efficiency, conservation, and recycling being the best solutions. And my expertise comes from the energy and transportation realms. And these three values of efficiency, conservation, and recycling make so much sense there that that's actually being implemented by PG&E, who sells electricity. They're encouraging all of us to put in CFL's and cut back on our usage because they understand that, long-term, that's what makes the most sense economically for them.

C_Means2-01

And then we get into our environmental consequences and just the health effects from the pollution from generating electricity, et cetera, in this case, the health effects of the environment, of taking yet more water. We're already taking -- what is it 60 percent we're taking out? We're talking about jerking that up to 66 percent of the water when we could conserve and get that extra water that's projected on what sounds like, maybe, faulty projections.

I haven't had a chance to do the numbers, but it seems to me that projecting -- what are we talking -- 23 years out into the future is difficult to start off with. But given that we've got major changes coming down the pipeline, like global warming and possible population collapse -- I'd encourage all you folks to learn more about the 11th hour and some of the other crises that we're facing in addition to global warming -- we may not need all that water, especially since, if we're actually -- we're expecting the water use per capita to increase?

C_Means2-02

We're getting more efficient. We have been getting more efficient. And we will continue to get more efficient because it's cheaper to do it that way. So focus on conservation, not on stealing some more water from the river that -- who is that going to really benefit, large corporations again? Who is making these decisions? Is this another thing like the Cheney Energy Task Force, where the decisions are made by the corporations and then inflicted upon us?

Thank you for your time.

DIANA SOKOLOVE: William Noren.

C_Noren2

WILLIAM NOREN: Thank you for this time. I appreciate being able to stand up and talk to all my fellow citizens here about the situation we find

C_Noren2-01

12.6-55

ourselves in and again somebody trying to take our natural resources and use it in ways that we don't prefer to have them used. I hope a lot of you understand that we don't need to use nearly as much water as we do in our society, but because of the things our society believes we need to have, we just continue to use water the way we do.

There's been some experimental facilities for waste disposal, human waste disposal, that doesn't take any water. I lived that way in Australia for quite a while, in a city. This wasn't in the boonies in a hole in the ground or anything. And it's just a lifestyle change. It's an understanding. It's getting past our ignorance and "oh, it's going to smell." It's a place where water isn't that important to use for that particular thing. And also once you start doing that, you don't have to have these huge, massive facilities to clean the water because we didn't use it for that in the first place.

I grew up in Redwood City. And when I was a little boy, I used to go out in the creeks and catch frogs and look for snakes and all that kind of stuff. And I'd like for my son to do that. We live over in Niles, next to the creek. And right now, I don't feel comfortable him going in there, knowing what's floating

C_Noren2-01 cont.

around in the water, and knowing that there isn't adequate water flushed out of the system, what's being put on the land out there and what's being used.

So my big point is that, if we make decisions for ourselves and not let the people in charge who are making decisions downwards instead of coming upwards and looking towards the future, then we'll be allowing the future generations to use the resources the way that they'd like to see them instead of cutting them off now and not letting them have a say or even being able to participate in the wonderful nature that we have.

Over on the peninsula, they put almost all of the creeks underground. And where I grew up, there wouldn't be a chance for my son to play. So I think it's important that we do all that we can to make sure that the people making these decisions aren't doing it for the their own personal reasons or for the reasons of a very select few.

Thank you.

C_Noren-01 cont.

DIANA SOKOLOVE: Kristen Keith.

L_Menlo2

KRISTEN KEITH: Good evening. My name is Kirsten Keith, and I'm here from Menlo Park. I'm the chair of the Menlo Park Planning Commission. And we're just trying to make sure that our city is also represented

12.6-56

and that we attend all these meetings and have a say.

And I want to encourage anybody who has not read "Cadillac Desert" to go out and read it because it's a great historical perspective on water in California and across the West in our nation, and it's well worth the read.

L_Menlo2-01

WILLIAM NOREN: Are you suggesting that they might be doing another water grab, like they've documented in that book?

KIRSTEN KEITH: I'm just saying that, if anybody wants to get some background and information about water politics, that this is a good book to read. And it gives you a great overall perspective of water politics in California and across the Western states.

L_Menlo2-01 cont.

So thanks.

DIANA SOKOLOVE: Is there anyone else who wants to speak?

LECH NAUMOVICH: Sorry. I've come a little bit late.

SI_CNPS-EB2

My name is Lech Naumovich, and I'm representing the California Native Plant Society. I'm representing the East Bay Chapter, and we work in the two-county area of Alameda and Contra Costa counties as well as throughout the state of California. We have about 10,000 members that are very active in

conservation issues.

And although this doesn't immediately seem like a native plant issue, it's very germane to us. First of all, I know this has been echoed -- this has been said a number of times, and I want to echo it. There's an alternative out there that talks about aggressive conservation and water recycling and local groundwater alternatives. And we fully support this alternative.

SI_CNPS-EB2-01

We don't think there's -- we do want to see an upgrade to the system in terms of the delivery to the city and the folks there. We think they deserve to have clean, good water. But we didn't think there's any reason to have any additional diversions out of Tuolumne.

SI_CNPS-EB2-02

We don't think there's any reason to have any diversions out of Alameda Creek. There are a number of grass roots groups that have started from the ground up with a lot of hard work and working towards restoring our native fish out there -- fishes, actually, a number of species. Those efforts would be greatly undermined by this project.

And although that is also not, obviously, a native plant issue, the riparian corridor and its native plants and associated vegetation out there is.

SI_CNPS-EB2-03

12.6-57

So we don't think that's any sort of reasonable alternative.

SI_CNPS-EB2-03 cont.

In terms of the numbers here, it's pretty amazing. Take you back to a grad school class I took on international water policy, and folks may know these numbers.

But did you know on average in Israel they reuse their water four times? They withdraw it, and they recycle and use it four times. Do you know what it is in this state? About 10 percent of the water is reused a second time.

So in terms of aggressive conservation, recycling, in terms of the world and if you take a larger vision and a broader picture of how we utilize water resources, we are much lower on the spectrum.

Now, folks might argue, "Well, look, we're going to require a lot more energy to do that filtration, reuse that water." That's not necessarily true either. There are a lot of mechanisms which are very energy neutral in order to produce extra water at a minimal cost.

SI_CNPS-EB2-04

And finally, we think it's really important -- I know there are a number of previous water agreements, especially with Modesto and Turlock irrigation districts -- I think it would be really important for

SI_CNPS-EB2-05

the consultants and the agencies to flesh that out and understand what kind of parameters we're working with within there.

SI_CNPS-EB2-05 cont.

And then finally, we want to ask for adequate botanical surveys. We have these huge numbers of ecosystems that will be impacted and woodlands and vernal pools and serpentine and areas that are going to be inundated -- and we've seen all that. But we really want to see a really strong pitch for why we need to divert more water from Toulumne, from the Alameda Creek watershed and other watersheds on the peninsula.

SI_CNPS-EB2-06

Thank you.

DIANA SOKOLOVE: Anyone else?

(No response.)

DIANA SOKOLOVE: Okay. Well, thanks for coming tonight, and thanks to everyone who spoke. And you'll see, again, here is where you can submit written comments by October 1st (indicating).

Have a good evening.

(Whereupon, the proceedings concluded at 7:15 o'clock p.m.)

STATE OF CALIFORNIA)
) ss.
COUNTY OF MARIN)

I, DEBORAH FUQUA, a Certified Shorthand Reporter of the State of California, do hereby certify that the foregoing proceedings were reported by me, a disinterested person, and thereafter transcribed under my direction into typewriting and is a true and correct transcription of said proceedings.

I further certify that I am not of counsel or attorney for either or any of the parties in the foregoing proceeding and caption named, nor in any way interested in the outcome of the cause named in said caption.

Dated the 1st day of October, 2007.

DEBORAH FUQUA

CSR NO. 12948

PUBLIC HEARING TRANSCRIPT

Palo Alto, California

Avenidas Senior Center, Palo Alto, California
September 19, 2007

(PH Palo Alto)

INDEX OF PUBLIC HEARING TRANSCRIPT

Avenidas Senior Center, Palo Alto, CA - September 19, 2007

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PUBLIC HEARING

DRAFT PROGRAM ENVIRONMENTAL IMPACT REPORT

SAN FRANCISCO PUBLIC UTILITIES COMMISSION'S

PROPOSED WATER SYSTEM IMPROVEMENT PROGRAM

AVENIDAS SENIOR CENTER

450 BRYANT STREET

PALO ALTO, CALIFORNIA

SEPTEMBER 19, 2007

REPORTED BY: DEBORAH FUQUA, CSR #12948

APPEARANCES

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San Francisco Planning Department

Major Environmental Analysis Division

(Moderator)

KELLEY CAPONE and JIM MARKS

San Francisco Public Utilities Commission

JOYCE HSIAO, DEPUTY PROJECT MANAGER

ESA + Orion Consultant Team

PUBLIC SPEAKERS

Mary Jane Marcus	Amy Fowler
Peter Drekmeier	Amy Adams
Ramses Madou	Elliot Margolies
Dan Dippery	Cedric deLa Beaujardiere
Bill Young	Katherine Forrest
Richard Zimmerman	Leah Rogers
Sidney Liebes	Jeb Eddy
Daniel Seidel	Kelly Fergusson
Clare Elliot	Len Materman

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Wednesday, September 19, 2007 6:29 o'clock p.m.

12.6-60

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P R O C E E D I N G S

ALFRED WILLIAMS: Good evening, ladies and gentlemen. I'm going to ask you to take your seats, please. We'd like to get started for the hearing.

Good evening, ladies and gentlemen. Welcome to the San Francisco Planning Department's hearing on the Draft Program Environmental Impact Report of the San Francisco Public Utilities Commission's Water System Improvement Program.

Oh, I'm sorry. That was just a dry run.

Welcome to the San Francisco Planning Department's hearing on the San Francisco Public Utilities Commission's proposed Water System Improvement Program. Our facilitator for this evening's meeting is Ms. Diana Sokolove of the San Francisco Public Utilities Planning Department.

DIANA SOKOLOVE: Thanks, Al.

Hi. Good evening, and welcome to tonight's environmental hearing on the Draft Environmental Impact Report for the San Francisco Public Utilities Commission's Water System Improvement Program.

My name is Diana Sokolove, and I'm a senior environmental planner with the San Francisco Planning Department. And the San Francisco Planning Department

is the lead agency under the California Environmental Quality Act for environmental evaluation of projects that are sponsored by or within the City and County of San Francisco. And this project is sponsored by the San Francisco Public Utilities Commission, so we are separate entities in separate departments. And I do represent the Planning Department.

I will be the moderator for tonight's hearing, as Al mentioned. And I also want to just introduce some key folks who are here tonight to help answer questions after the public comments portion of the hearing. Tonight we have Kelley Capone, who is standing in the back of the room. And she is with the San Francisco Public Utilities Commission. And we have Jim Marks, who is with the San Francisco Public Utilities Commission Communications Department. We also have Joyce Hsiao, who is with the ESA + Orion joint venture. They are the consultant team who helped my department prepare the environmental impact report . And also some public involvement folks here tonight, who are here to collect comment cards and also help to answer any questions you may have. So feel free to chat with them as well later this evening.

And just so you know, this is one of five public hearings that we're holding on the environmental

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impact report. And we are providing essentially the same information at every hearing. Last night we were in Fremont, and a couple weeks ago we were in Sonora and Modesto. Tonight we're here, in Palo Alto. Tomorrow we'll be at the San Francisco Planning Commission hearing.

And for those of you who may want to attend that hearing, the hearing normally starts at 1:30, but we have a time certain for the public hearing portion for this project, and that is at 5:00 o'clock. What that means is that it won't start before 5:00. It may not start exactly at 5:00, but it won't start before 5:00. So you won't have to be there from 1:30 on, waiting for the hearing.

So our brief agenda for tonight -- hopefully you signed in when you came in. We'll do sign-in, introductions, and I'll say a few remarks. Then we'll open up the hearing for public comment.

Some meeting reminders, again, hopefully you signed in and picked up a copy of the agenda for tonight's hearing. If you didn't sign in, please do so before you leave. It's our way to keep in touch with you throughout this process. And if you do plan on speaking tonight, I hope you filled out a speaker card. They look something like this, although mine's in

color. The ones we have here are black and white. And if you do plan to speak and you filled out a speaker card, please, as soon as you can, hand those in to Andrea over here. We just need to get a sense of how many people are going to be speaking tonight.

Another item you may wish to pick up is a comment card. This is a form that you can fill out if you want to submit comments tonight in writing. If you don't want to speak, you just want to submit some comments in writing, you can submit this card directly to me or you can put it in the written comments box at the back of the room, or you can always mail or fax this in later, and we'll give you our contact information.

Restrooms are located out this door here, and -- well, actually, there are some right here, but there are also another set out this door here and to the right.

And please, please turn off your cell phones and pagers. And if you need to take a call, please step outside the room and take your call outside.

And just so you know, we do have a court reporter here tonight. And she is transcribing this hearing, and that transcript will become part of the public record for the environmental review process for this program.

So we are here tonight to receive your comments on the adequacy and accuracy of the program environmental impact report on the Water System Improvement Program. We really want to get your thoughts on the quality of the document, the quality of the analysis.

We are not here to hear your comments on the merits of the program. We really want your comments on the adequacy of the environmental document. And all of your comments will be recorded, and we will respond to each and every one of them in a document called the "Comments and Responses Document."

And tonight, the comments that you make, again, we will respond to those formally in writing. But this is not a question-and-answer session, so we are just here to record and take your comments.

Also, this is not a hearing to consider approval or disapproval of the proposed program. That hearing will come after the hearing by the San Francisco Planning Commission, which will certify whether the environmental analysis is adequate and accurate. Then the San Francisco Public Utilities Commission will consider whether to approve, modify, or adopt the proposed program.

You can submit written comments in a variety of ways -- by e-mail, by fax. You can phone them in. You can mail them in. We have all that information, most of that information, up on the screen. We also have it on your agenda tonight so you can take that with you. And please note that the Planning Department -- that's my department -- will accept comments on the adequacy and accuracy of the environmental analysis by October 1st, close of business.

There are also several places where you can look at the draft program environmental impact report. We do have a copy in the back of the room here that you can look at right back here. And we also have the impact report in several libraries throughout the study area, so you can look at the impact report in any one of those places. You can also look at the environmental impact report at the San Francisco Planning Department or at the San Francisco Public Utilities Commission.

And if you'd like to receive a CD of the document, that's another way that you can use this comment card. You can request the CD, and we'll mail you one. So just let us know if you'd like one.

So this is just a brief overview of our

12.6-63

schedule. We have a 90-day public review period, which is twice as long as the mandated public review period, starting at the end of June and runs through October 1st, close of business. As I mentioned, several public hearings. Tonight we are in Palo Alto, and tomorrow in San Francisco.

We will prepare a comments-and-responses document, as I mentioned, and we hope to publish that in the spring of next year. And we also hope to have the documents certified as adequate and accurate in spring of 2008.

So again, anybody holding on to a comment card, if you wouldn't mind please submitting those right now.

Well, given that we only have about ten speakers, typically we limit your comments to about three minutes. That's if we have several speakers. And tonight I would just ask that you keep your comments as brief as possible, that you consider your public hearing comments or verbal comments as a summary of the overall comments on the document. And you certainly can supplement those in writing. So let's take about three minutes or so. We will generally keep track of time, but you can take up a little bit more time if you need it.

And what I'll do is, I will call your name up from the list of speaker cards that I have. You can step up to the microphone here at the front of the room, or I believe we have a mobile microphone. So if you feel more comfortable staying at your seat, you can certainly speak from there.

Please state your name clearly and your address when you walk up to the microphone to speak so that we have that for the record and we can get back to you with responses to your comments.

So again, take about three minutes, but you can take a little bit more time if you need it.

I have the first speaker, Anita Dippery.

ANITA DIPPERY: I'm passing.

DIANA SOKOLOVE: Okay. First speaker, Mary Jane Marcus.

C_Marcu

MARY JANE MARCUS: Hello. Sorry. I wasn't expecting to go first.

My name is Mary Jane Marcus. And I need to say my address?

521 Addison Avenue in Palo Alto, California, just down the street. This is the first time I've ever come to a hearing or spoken at a hearing. And I'm getting nervous. But the reason I'm here is that usually the actions we take here, our conceptions and

C_Marcu-01

12.6-64

so forth -- we don't really know where things come from and how we're effective. But this, in this recommendation, we know that we can do things here in Palo Alto, here in Silicon Valley that will prevent having to take 25 million extra gallons a day from the Tuolumne River where a lot of us go.

And I just think it's such an incredible opportunity to really let people know that what we do has a direct impact on the places we go. And so I guess I talked to you briefly beforehand, and she said that you got your information about conservation measures from talking to wholesalers. But I would suggest that you go to the public and say if we don't do these things, we're going to take this much more from Tuolumne, and what do we want to do?

C_Marcu-01 cont.

I mean, if I knew someone's sick, I'm probably going to give blood. If you don't know -- I mean, I think what wholesalers would recommend without the public being involved or knowing what the impact of what we're doing is, it would be different.

So I really want to get out there that what we're doing has an impact, and they see what we can do in terms of conservation. And I think people would take more action.

And I know -- I can give everyone my phone

number. I'm personally committed to do whatever it takes to not use the Tuolumne. You know, if I have to, like, shower in the rain or whatever. But -- I won't be that extreme because I want to represent the normal person. But seriously, I mean, I will rally as many people as possible, whatever is needed, not to increase our intake because I want to go in the opposite direction.

C_Marcu-01 cont.

And I think it's sending a really bad message right now, with global warming and everything, that the Bay Area, the forefront of the kind of "watt com" area, the green economy, that we're not able to reduce our water consumption.

So that's my comment. And like I said, anyone can come find me or -- (650)575-1945. You can call me any time. If you're not getting much success with other citizens, I'll go bang on their doors and help.

So that's it.

DIANA SOKOLOVE: Okay. The next speaker is Peter Drekmeier.

SI_TRT8

PETER DREKMEIER: Good evening. My name is Peter Drekmeier. I'm a Bay Area program director for the Tuolumne River Trust. And I just want to start by saying that our organization and every other conservation organization I'm aware of supports the seismic upgrades to the Hetch Hetchy system. That's not controversial. And we'd like to see that move forward as quickly as possible.

SI_TRT8-01

What we are adamantly opposed to is the proposal to divert another 25 million gallons of water a day from the Tuolumne River. And to put that in perspective, that's the equivalent of more than 1,000 large swimming pools pulled every day from this wonderful wild and scenic river.

SI_TRT8-02

First, I want to point out that the projected increase in demand for water in the -- for 2.4 million people who consume Hetch Hetchy water is inflated. The studies were very dated. They're looking at old technology. We are shifting from manufacturing to service and information, which uses considerably less water. And that wasn't taken into consideration. It also doesn't look at the impact of increasing prices on consumption.

In San Francisco, the cost of water is expected to more than triple. And we expect to see that in other areas of the consumer area. And that is definitely going to have an impact on consumption. One thing that's very telling is, in this report, they're projecting that per capita consumption of water is expected to increase in this area.

SI_TRT8-02 cont.

And that goes against everything we're seeing across the country. You look at places like Seattle or Los Angeles, they've grown without increasing consumption. And the Santa Clara Valley Water District, over the last 20 years, has remained flat despite the dot com boom. So that's something that we need to take into consideration. The Bay Area is very conservation minded, and there's a lot more potential for conservation and recycling here.

SI_TRT8-03

It also has not examined the full potential for water recycling and conservation in the area. It's only looking at 3 percent increase of recycling, of water recycling. Now, 60 percent of the water that's being demanded is for outdoor irrigation. That's a great opportunity for using recycled water and for conservation through drip irrigation systems.

SI_TRT8-04

Second, I want to point out that many of the studies are inadequate. They're dated. And we don't have adequate baseline data, especially for fish and other species that depend on the river. And it's really impossible to measure the impacts if we don't have that baseline data.

An example is, there's a study used from 1992 that was never completed, but it's used in the EIR. And one thing it did encourage was increasing minimum flows for fish, which was never done. So we have some information on Chinook salmon in the Lower Tuolumne. We've seen that species in decline, so already we know that the system is pushed beyond the limits that are good for the species. And we have very, very little information on steelhead trout, which is a threatened species. And that needs to be studied.

SI_TRT8-04 cont.

Another problem is, in the modeling, things are averaged in a way that really doesn't make sense for various species. For example, they're using monthly average flows versus daily flows. And for fish and other species, it's a daily flow that really has an impact. So that needs to be looked at.

SI_TRT8-05

The biggie here is that the EIR mentions global warming but doesn't discuss it. And that's going to have a huge impact on the ecosystem. What they do is they look at the last 82 years of data and assume that the level of water is going to remain the same over the next 82 years or so. But we know that global warming is going to have an impact on the snowpack. And the State of California actually predicts that the snowpack will decline by 33 percent by 2060. And so any water diversion is going to be a much higher percentage in the future than it is right now. And that's a fatal flaw in this EIR.

SI_TRT8-06

Last, I just want to mention there are some assumptions made that are really unfounded. One is that the Modesto Irrigation District and the Turlock Irrigation District will agree to water transfers. But in fact, those negotiations, as far as I know, last I heard, had not even begun. And in Modesto, the MID spokesperson said that they're opposed to this plan. And so it's going to be very difficult to get that water transfer for the Lower Tuolumne. And even if it did go through, there's still the potential problem of 25 million gallons of water per day less in the 25 miles of wild and scenic river between Hetch Hetchy and Don Pedro.

SI_TRT8-07

So I want to encourage anyone who would like to follow our work on this to come see me afterwards, and I'll make sure that I get your contact information.

And we will be submitting more complete comments on this by the October 1st deadline.

And great to see so many people here coming out in Palo Alto. It's a very conservation-minded community. I agree with the last speaker, that we have a lot of potential here to really make a difference. And again, looking forward to working with you on that.

Thank you all.

DIANA SOKOLOVE: Next speaker is Ramses Madou.

C_Madou

RAMSES MADOU: Well, going after Peter is a little bit hard. My name is Ramses Madou. My address is 3680 Bryant Street, here, in Palo Alto.

I'm here really to express my support for a conservation-minded plan. As it stands now, as Peter was just saying, 25 million gallons leaving the river, leaving it with -- leaving the biological species living there with much less resources than they need, seems that we could push our use of resources down to kind of keep the support for them there. C_Madou-01

And that's pretty much all I have to say. All the points have already been made by the last two speakers.

Thank you.

C_Dippe

DIANA SOKOLOVE: The next speaker is Dan Dippery.

DAN DIPPERY: Good evening. My name is Dan Dippery. I live in Menlo Park.

Couple of things that Peter left out that I think are quite relevant. Evidently, the Utility Commission had their own study on conservation and efficiency and recycling, and they found that the need to divert more money [sic] from the Tuolumne could be reduced by 74 percent. I think that's an important figure. So I think it should be very prominent in the EIR because it's obviously the critical need here. C_Dippe-01

The other thing that I'm proposing is that the PUC should conduct a study to determine the maximum technical potential for conservation efficiency, in other words, not just kind of a sketchbook thing but really go into details of what could be done so that we don't have to take this additional water from the river. C_Dippe-02

That's all. Thank you.

SI_SierraC3

DIANA SOKOLOVE: The next speaker is Bill Young.

BILL YOUNG: Thank you. My name is Bill Young. I'm the conservation coordinator with the Sierra Club Loma Prieta Chapter. Thank you for this opportunity to comment on the PEIR.

The Sierra Club believes that the draft PEIR ignores the risks that global warming presents for the Bay Area water supply. The PEIR also neglects to fully study the impacts of increased draw-down of the Tuolumne River and on local watersheds as well. The PEIR also fails to identify the sustainable water supply measures as alternatives. It encourages water waste instead of efficiency. SI_SierraC3-01

The PEIR fails to recognize that our rivers and creeks are finite and variable resources. Increased draw-down will have serious effects on these watersheds. The PUC needs to reduce reliance on the

12.6-68

Tuolumne River and local creeks, such as the Pilarcitos. A comprehensive watershed study should be completed to adequately assess the environmental impacts of the WSIP and to develop regional watershed protection and restoration programs.

SI_SierraC3-02

Climate change effects also were not adequately studied for the PEIR. The PEIR does not take into account the impact of climate change on precipitation in Tuolumne River watershed. As the Sierra Nevada snowpack shrinks due to the effects of climate change, Sierra rivers like the Tuolumne will become increasingly unreliable sources of water. By increasing dependence on the Tuolumne, San Francisco's proposal exposes the Bay Area to greater risk of water shortages.

Decreasing reliance on the Tuolumne is critical not only for protecting the health of the river but also for preparing for the future uncertainty of the Sierra snowpack as a result of global warming.

SI_SierraC3-03

The PUC's preferred alternative does not take advantage -- full advantage of the benefits of more efficient water use and water supply diversification. It ignores much-needed water conservation measures which would ensure a sustainable water supply and protect our watersheds instead of just taking more

SI_SierraC3-04

water from the wild and scenic Tuolumne River.

The Sierra Club believes that there are more cost effective and less environmentally harmful ways to secure and maintain a clean, reliable water supply. We support increased water efficiency in both urban and agricultural sectors, the use of groundwater storage, and the safe expansion of water reclamation and water recycling.

The PUC must invest in water resources in the most efficient way and reducing consumption. This would put the Bay Area on a path towards water sustainability, more efficient water use, and a more diverse mix of water supplies would also minimize the risk associated with shrinking snowpack that is expected as a result of climate change.

SI_SierraC3-04 cont.

Thank you.

Oh, also I have some petition sheets -- could I hand those in to you -- of signatures concerning the EIR.

DIANA SOKOLOVE: Let's talk after the hearing.

BILL YOUNG: Okay. Thank you.

DIANA SOKOLOVE: Richard Zimmerman.

SI_SierraC4

RICHARD ZIMMERMAN: Good evening. I'm Richard Zimmerman. I'm with the Water Sustainability Committee of the Loma Prieta Chapter of the Sierra Club.

I'd just like to say that the Sierra Club supports the seismic re-fit of the system.

SI_SierraC4-01

However, water conservation is the cheapest easiest, least destructive way to meet future demands and to extend our scarce supply or water. However, the PEIR preferred alternative ignores these measures in large part and simply asks for more water from the already overstressed Tuolumne River and therefore is inadequate.

The Bay Area lags far behind other metropolitan areas that are reducing water consumption even in the face of growth.

The Bay Area should be a leader in water efficiency and conservation. The SFPUC must provide strong leadership to make water conservation a fact in the Bay Area rather than a hope and must not simply give in to user demands for more water.

SI_SierraC4-02

Water usage in the United States has decreased by 20 percent since 1980. But the SFPUC projects an increase in water usage for the wholesalers represented by BAWSCA. That's an actual increase in the amount of water used as well as a per capita increase. The BAWSCA wholesalers forecast a 19 percent increase in water usage in 2030 over 2000, 2001. They also forecast a 19 percent population growth in the same

SI_SierraC4-03

period. However, the retail users are forecast to use less water in 2030 than they currently do, but with a population growth of almost 12 percent. Clearly we need to reduce the amount of water use by the wholesalers, not increase it. And it's certainly possible.

In Seattle, for example, while serving 20 percent more users, the regional water system there reduced water use by 15 percent from 1985 to 2005 and is currently committed to reducing water use by an additional 1 percent annually. We should do that too. The California Urban Water Conservation Council reported in 2003 that, quote, "Data on residential water use is currently showing that outdoor water usage is as much as 50 to 60 percent of residential consumption," end quote. Further, outside water usage according to the PEIR, is responsible for about 60 percent of the increase in demand. This represents an opportunity for water conservation not being addressed in the PEIR.

The best standard of practices used by many water companies do not include residential landscaping guidelines. We should immediately implement such a program throughout the SFPUC area. As an example, in Las Vegas, of all places, water users can get a rebate

SI_SierraC4-03 cont.

12.6-70

for replacing grass to zero-scape. Austin, Texas has a similar program, as do many cities in arid climates. We should do that here too.

SI_SierraC4-03 cont.

Thank you.

DIANA SOKOLOVE: Chris Sullivan.

CHRIS SULLIVAN [PHONETIC]: I have nothing to say at this time.

DIANA SOKOLOVE: The next speaker is Sidney Liebes.

C_Liebe

SIDNEY LIEBES: I'd like to endorse the remarks of Peter Drekmeier and his other conservation colleagues and add a comment which addresses perhaps a more global perspective, an overarching one. It's not much that the PUC can do anything about, but I have to clear my conscience.

Perhaps the greatest failing of our culture, I believe, is its failure to assume responsibility for the long-term future. If we had done so, we would not have an overpopulated planet, mass extinction of species, exhaustion of resources, and be debating global warming, proposing the Tuolumne be further diverted. It's past time to say "enough is enough."

C_Liebe-01

DIANA SOKOLOVE: Daniel Seidel.

L_PHWD2

DANIEL SEIDEL: Good evening. My name is Daniel Seidel. I'm the president of the Board of Directors of

Purissima Hills Water District, a public water district that serves 6,000 customers in Los Altos Hills with the pure water that we buy wholesale from the San Francisco Public Utilities Commission.

And I don't have any quarrel with the conservation measures that have been advocated and so forth previously because we have a very active water conservation program within our own district, and we live in a very conservation-minded community.

But I prepared some comments here to reinforce our interest not only conservation but in getting this program going so that the hazards and the risk that we are exposed to daily by not having an upgraded system can be ameliorated, corrected as soon as possible. That is our greatest risk right now.

So let me read my comments. I'll try to be brief.

For the past 73 years, water from Hetch Hetchy has flowed by gravity 140 miles to our taps, providing an economical and pure regional supply. The system draws less than 12 percent of the Tuolumne River's production and now serves over 2.4 million people in San Francisco and 27 Bay Areas cities and districts.

Fifty-one years ago, our direct was formed to connect into this high quality water supply. We, along

L_PHWD2-01

with Palo Alto, Hayward, Burlingame, Millbrae -- a whole raft of cities -- depend on this system and basically have no other alternative source of water supply that is natural.

In the 44 years that I have lived in Santa Clara County, I have seen Los Altos Hills transition from apricot and prune orchards, a one-room school house, to a vibrant conservation-minded residential community that parallels the economic growth of Silicon Valley. Our town hall, for example, is powered completely by solar power. Come out and visit. You would be impressed to see that.

The typical water, per capita water consumption values for our district that you read in the report and elsewhere are meaningless, mainly because of the 18,000 students we serve at Foothill College, which is basically three times the population we serve. That's not included in the calculations. So it looks like we're using all kinds of water, but basically, we have a lot of transient people, employees in the school district that we serve that doesn't get factored into that.

Let me just say that our district uses less than -- of all the water that's produced for the San Francisco -- we use less than 1 percent. We're small

L_PHWD2-01 cont.

potatoes, basically. But we're very interested in the seismic upgrades and the reliability of the system that we're so dependant on. So are all these other agencies and districts and cities that we've already mentioned. That's the big risk.

L_PHWD2-01 cont.

Now, the San Francisco WSIP has been a long time in the making. Immediately after Loma Prieta earthquake in 1989, the East Bay MUD, the sister utility in Oakland, big water utility, developed a plan for seismic improvements in their system. Right now, they're 95 percent complete and in operation. They've done it.

San Francisco, by comparison, guess where we are. 18 years later, we're still in the EIR stage. And we're going to continue to be in the EIR stage -- we've been it in for two years now. But I hear now we're going to be in it for another three to five years until we find finally get some construction going on and get these risks reduced.

But we can't wait any longer. Every day without the seismic improvements in place puts the life safety of 2.4 million people in jeopardy. Risks are catastrophic loss of property and wreckage of the local economy worse than Katrina imposed on New Orleans. Believe me.

L_PHWD2-02

12.6-72

Let me conclude by just saying that we eagerly support the Water Supply Improvement Program -- it's many years in the making -- the analysis in the programmatic EIR, and we hope it goes through without further modifications.

And we urge the Planning Department and the Planning Commission to proceed without delay to complete the PEIR process as expeditiously as possible and to work diligently to certify a document as required by CEQA so the critical improvements can be made posthaste.

L_PHWD2-02 cont.

Thank you.

DIANA SOKOLOVE: The next speaker is Claire Elliot.

C_EllioC

CLAIRE ELLIOTT: Hi. My name is Claire Elliot, and I'm a resident of Palo Alto at 271 Chestnut Avenue. And I have to agree with everybody who's commented about the importance of the seismic upgrades. It scared the heck out of me to read in the paper that we don't even have three days' supply of water if an earthquake were to remove our Hetch Hetchy supply. As a parent, that really makes me nervous. So the first time I really understood was tonight that these two things are linked together. I don't know if there's a possibility to separate them, but to me, it makes sense

C_EllioC-01

to separate it, given that the EIR will take another several years to process. I'd love to see the seismic upgrades happen sooner.

C_EllioC-01 cont.

But as far as the diversion from the Tuolumne, I think that would be a total travesty. And I don't think the EIR addresses all of the concerns of downstream water impact. I don't think it addresses something that a lot of people aren't aware of, which is that all the diversion we're currently doing into the San Francisco Bay through our treatment plant is converting many, many acres of salt marsh into fresh water marsh. And we have so little salt marsh left because of all the fill that's gone on in the bay. We really should not be diverting any more fresh water into this area.

C_EllioC-02

And as an environmental -- I was a water quality engineer for several years, and I have experience to know that we have technologies to treat water that's been used once before. And we are very spoiled in this area not to have experienced that. Most of the country is using re-used water because they bring their water from places like the Mississippi River, where there's outfall from the town above that is providing their water supply.

So we need to learn how to use these

C_EllioC-03

technologies to make our water that's been reused -- all of our water we're drinking, we're not creating new water. It's the water that Lincoln drank, that Cleopatra drank. So we should be able to drink the same water that we once used before. If not drink it, at least water our golf courses with it.

C_EllioC-03 cont.

And currently I'm an environmental educator. And I am seeing huge changes coming through the education of our children. And in the year 2030, which is what we're projecting for, most of these children that will be adults at that time will have gone through environmental education programs and will have learned the importance of conservation and will be able to plant native plants in their garden because they know it's the right thing to do to prevent 60 percent of our water -- this diversion that they're talking about, I read, is for outdoor use. And I do not want to see more lawns taking up this water that's coming from a beautiful wild and scenic river.

Thank you.

L_SCVWD2

DIANA SOKOLOVE: The next speaker is Amy Fowler.

AMY FOWLER: Good evening. I'm Amy Fowler, staff at Santa Clara Valley Water District. Thank you for the opportunity to provide comments on the draft programmatic EIR.

The Santa Clara Valley Water District -- which I'll shorten to call "the District" -- provides wholesale drinking water supply for 1.7 million residents and is the primary water resources manager for Santa Clara County. We manage the conjunctive use of surface and groundwater resources to make sure that water supply is reliable to meet current and future demands.

We actively manage the groundwater basin to optimize beneficial uses and aggressively protect the groundwater basin from contamination and minimize inelastic land surface subsidence.

As you all know, the San Francisco Public Utilities Commission and the District share the responsibility of providing a clean, safe, and reliable water supply to cities and entities in the northern portion of Santa Clara County. San Francisco PUC supply comprises 15 percent of the overall water supply in Santa Clara County and constitutes 100 percent of the water supply to some cities.

L_SCVWD2-01

We expect San Francisco PUC to continue providing this water supply in Santa Clara County and meet the projected 2030 purchase requests submitted by the wholesale customers. This expectation is described and documented in the District's and the City's 2005

L_SCVWD2-02

Urban Water Management Plans. The cities collaborated with San Francisco PUC on its demand projection and water-use efficiency studies and arrived at reasonable and defensible projections on future water needs. These water supply and demand projections constitute the foundation of water resources planning for the next 30 years for the cities, San Francisco PUC, and the Santa Clara Valley Water District.

We urge San Francisco to adopt the proposed water system improvement program and meet all the program goals and objectives. Any diminution in levels of service provided by San Francisco PUC could result in significant impacts to water resources in Santa Clara County with associated environmental and social, economical consequences.

Santa Clara Valley had a legacy of land subsidence in the 1920s and '30s due to over extraction of groundwater. Through water importation and conjunctive use management, land subsidence was halted by the late 1960s, and the District has been vigilant in preventing its reoccurrence. Understandably, we are very concerned with any potential redirected impacts on our groundwater basin and local or imported surface water resources due to San Francisco PUC's reduction in supplies or level of service provided to Santa Clara

L_SCVWD2-02 cont.

County.

We also urge San Francisco to address fully any potential redirected impacts on water supplies for the Safe Water Project and Central Valley Project users.

We support San Francisco PUC's goal to maximize water conservation, recycling, and desalination. The District has been very progressive in implementing programs to maximize water use efficiency and further diversify our sources of supply. We believe these program areas are ideal for San Francisco PUC and the District to partner with local cities and land-use entities in their implementation. However, there are practical limits in implementability of these programs. And they cannot be used as stand-alone substitute alternatives or variants because they fail to meet the overall program goals.

We look forward to San Francisco addressing our concerns adequately and adopting the current EIR and Water System Improvement Program expediently so that the critical work of securing the water supply for the Bay Area communities can begin.

L_SCVWD2-02 cont.

Thank you.

DIANA SOKOLOVE: The next speaker is Amy -- Adams? Sorry.

C_AdamsA

AMY ADAMS: It's Adams, like John Quincy.

I'm Amy Adams. I live in Palo Alto on Clark Way. I just want to make a couple comments. First, I grew up in Michigan, where there's lots and lots of water. And we had tornados. So when I moved here and I found out that much of our water comes from a gravity-fed place very far away and there's earthquakes and it's coming through big pipes, that made me a bit nervous. So I definitely agree that the seismic upgrade should be a priority.

C_AdamsA-01

However, I'm a little bit confused as to why that's related to the volume of water in the EIR. I think those should be two separate points that are addressed. It's, to me, like having a hole in your shoe and going into the store getting a new shoe and deciding you also need a belt or a hat. It's part of the same system. It's your clothing, something that needs to get fixed potentially, but I don't think it needs to necessarily be addressed at the same time or in the same process. So I hope that making those decisions would not delay the other.

C_AdamsA-02

The other point I wanted to make was just, I think that we need to look closely -- we had the Santa Clara Valley Water District representative speaking earlier. I think we need to look carefully at what the

C_AdamsA-02 cont.

district really has done since they're providing 15 percent of our district's total water supply. They have a number of amazing, both residential and commercial and agricultural, programs going on. And I think that part of it is actually citizens actually taking part and participating in these things.

There's rebates for using high efficiency clothes washers, high efficiency toilets going into commercial sites. There's, like, a list of 20 different things that they do that are either for residential or commercial conservation. And people, individual people, can get, actually, rebates for that.

And I think that we need to take a good look as citizens at what we're doing with our water. We can look at Arizona, and people have more arid landscapes. And do we need this many golf courses? Do we need this amount of fresh water out sprinkling -- sprinklers broken, sprinkling sidewalks, and et cetera?

And I just think that we as citizens and as a government -- because I don't think it's going to happen nationally. I don't think our national government is going to step forward with conservation issues and accept that global warming is a real issue. We have to take a step locally, regionally, and look at water conservation and not divert water away from a

12.6-76

C_AdamsA-02 cont.

river.

That's just an easy answer. I think we have to make some more harsh, difficult choices.

DIANA SOKOLOVE: The next speaker is Elliot Margolies.

C_Margo

ELLIOT MARGOLIES: Hi. I'm Elliot Margolies. I'm a resident of Palo Alto at 3858 El Centro Street.

And I have a lot of respect for the PUC's challenge of balancing human needs for water with preserving nature's sustainability and am fully appreciative of the seismic upgrades that are really needed. But I want to address the diversion of water from the Tuolumne River.

I know that the PUC has been long making these plans and studies, probably way before the movie "An Inconvenient Truth" came out, but I think that a lot of us have really shifted our sense of priorities in the last few years when global warming has now become a reality that most of us accept and feel very concerned about.

C_Margo-01

And I really feel that, to review the amount of conservation and recycled water that our community is willing to implement, it's really important to do that now because the figures are going to come out very differently. I'm very confident that our community is

C_Margo-01 cont.

ready to step up and to really change the equation much more so.

And there's no question that, over the coming years, there's going to be more and more reasons coming our way to do so. And so to refigure this -- and the day of putting our conveniences as cities and industries over and above the sustainability of the resources we depend on, those days are over.

And we now depend on our leaders, like the PUC, to put plans forward that reflect our own growth and awareness about these important issues.

thanks.

C_Beauj

DIANA SOKOLOVE: I know I'm not going to say the next name correctly, so please forgive me in advance. Cedric deLa -- sorry, sorry.

CEDRIC deLA BEAUJARDIERE: No worries. It's okay. I get that all the time.

My name is Cedric deLa Beaujardiere. You say it like it's spelled. I'm at 741 Josina Avenue in Palo Alto, 94306. And I'm here on behalf of myself as well as on behalf of my fiancee Susan Stansbury [phonetic], same address, who couldn't make it tonight. She's the director of a non-profit called Connections and also of a project called Valley of Hearts Delight, which seeks to protect local farmland which has been lost a lot.

12.6-77

And she bade me to mention some water conservation steps that we can all take individually and collectively as supported by our governments that we can do in the garden.

Some of them would be native and drought-tolerant plants which require less water, mulching to keep in moisture, using drip and micro-flow irrigation, also rainwater harvesting and gray water reuse. The City of Palo Alto, for instance, has a gray water system which they feed to large customers.

And there's many more in the home as well. There's things like re-circulating pumps that send water back to the hot water heater instead of running it down the drain when you're waiting for the shower to heat up or the faucet to heat up, just sending it back to the water heater. So those are available things.

So these sort of things can be incentivized by local governments and non-profits or businesses and residents taking it on their own. I think the cost that would be otherwise used to divert more water from the Tuolumne, that would be a great source of funding for such incentive programs and probably much more efficient for the long run.

C_Beauj-01

So I do support the seismic upgrades, but I think that we should actually not divert more water

C_Beauj-02

from the Tuolumne and, in fact, try to divert less over time.

C_Beauj-02 cont.

Thank you very much.

DIANA SOKOLOVE: The next speaker is Katherine Forrest.

SI_CI

KATHERINE FORREST: Hi, I'm Katherine Forrest, and I'm president of the board of Commonweal Institute, a progressive think tank in the Bay Area here.

One thing that concerns me is the interlinkage between the problems we're facing here because we're dealing with global warming, we're dealing with water problems, we're dealing with preservation of animal and plant species. And these are all interrelated to each other.

I certainly don't think that just trying to increase the amount of water flow that comes into -- to the ultimate end users is the way to go and that the State, if anything, should put a higher priority on the conservation ends of things. Predictions are we're going to have at least 55 million people in this state. So there's an incredible amount of continuing growth that we can anticipate.

In particular, I think that the State can play a role and -- whether it's through the PUC and then ultimately through the legislature -- in beginning to

SI_CI-01

12.6-78

work back and put some both carrots and sticks on local government. And the carrots and sticks would have to do with rules having to do with conservation at the local level, products -- I mean, there was mention of incentives for products like low-water-use toilets, low-water-use washing machines. But there could also be penalties. And so you have both an incentive to go for a more water-frugal way of living as also a disincentive for spending too much water out of the public, what's available to us.

And finally, also another thing that could happen potentially for local governments is to have incentives on them to change some of their permitting. And I'm thinking particularly in terms of construction permitting in allowing gray water systems for individual homes and also having constraints on the size of pipes that bring water into properties and the -- putting in irrigation systems for watering large lots of land instead of letting it go to native plants.

SI_CI-01 cont.

Thank you.

C_Roger

DIANA SOKOLOVE: Leah Rogers.

LEAH ROGERS: I'm Leah Rogers, a resident of Menlo Park and trained in groundwater hydrogeology. I've spent a lot of time over the last couple decades looking at a lot of water balances. And one thing that

C_Roger-01

always amazes me is how little of our water goes to thirsty people. And I think that so much of it goes to industrial and agricultural uses that are highly inefficient.

How many of us have driven through the Central Valley and seen open canals of water on a really hot day and wondered how much of that actually gets to the plants? I mean, there's a lot of wonderful technologies for drip irrigation. I think there's also a lot of wonderful technologies for reprocessing industrial and agricultural waters.

And so I guess my question is, how can we rob more money from our wild -- rob more water from our wild and scenic rivers when it's clearly a minor, minor part of what needs to be done. It's an interim solution, insignificant, with really negative results and probably irreversible results.

So I think we need to really look at where the deep pockets are in this equation and its agricultural and industrial use. All of us as end users pulling together, but we need to point the finger and really look at how our water is valued.

C_Roger-01 cont.

Thank you.

C_Eddy2

DIANA SOKOLOVE: The next speaker is Jeb Eddy.

JEB EDDY: Hi. I'm Jeb Eddy, 35-year resident

12.6-79

here of Palo Alto. Family name is Eddy, E-D-D-Y.

There's a street up in San Francisco by that exact same name. My family and I, we think we might be related to the guy William Eddy, who was the first civil engineer, city engineer, and surveyor for the City of San Francisco in 1849. And his map is the one that was sent up to Oregon to allow the State of California to become a state in the Union because that was the nearest place you could register a map.

So I've been interested in some planning issues for a long time, although personally I wasn't around back in those days. One of my sons has a master's degree in forestry. The other son has just started his graduate program at UC Berkeley in the energy and resources program.

Our family has been interested in, concerned about stuff like this for a long time. And we live here because I struggled my way through a well-known business school down the street.

C_Eddy2-01

One of this things that really struck me as I was looking over some of the material for the planning that's been done so far is that a six-letter word, one of my favorites, doesn't show up in the document at all, M-A-R-K-E-T.

There's almost no discussion of using the

C_Eddy2-01 cont.

dynamic -- we're going into one of the greatest periods of trying to figure out markets in human history, exactly as the speaker from Commonwealth just said, the integrated complexity of all this stuff is tremendous. And we need to introduce some serious influence of markets.

As you perhaps know, those of you who read the San Francisco Chronicle, what's the lead story in today's paper? "Congestion Pricing For Traffic." What a great idea. Bloomberg is stirring around this pot in New York City. It is already a fabulously profit-making activity in London. Traffic is down. The London program made something like 100 million pounds of profit last year.

C_Eddy2-02

If we are smart -- let's -- the thing that bothered me so much about looking over the way some of the demand forecasting was done is, okay, we're going to do our sort of per capita estimates, multiply that by the number of capitas, and that becomes the target for supply.

I don't think that's the way market works. If we have market influences in the decision process here, we could have different kinds of water supply for different kinds of users and different kinds of needs, determined on more of an open-market basis, changing

12.6-80

the market structures over time, but not simply saying, "Yeah, it's going to be this much demand. We have to fill it." I think it's a profound mistake.

One of the few things I remember from going to this business school 35 years ago, a great question, "What business are you in?"

Meeting fixed demand based on numbers that were invented, you know, five or more years ago is not a reflection of the conditions that we are in now.

C_Eddy2-02 cont.

So the seismic upgrade stuff, absolutely, yes.

But failing to adapt our consumption to the realities of global warming and other supply issues I think is a significant mistake.

Last point, anybody here from Sacramento?

Guess not. I've heard multiple times that the metropolitan statistical area of Sacramento has basically been built with no water meters. I see some nods. Is that possibly true? No water meters, don't have any idea how much water they use.

If we use prices and significant measures of our personal consumption, our industrial consumption, we can do a lot better than I think the plan proposed so far.

Thank you.

L_Menlo3

DIANA SOKOLOVE: Next speaker is Kelly Fergusson.

HONORABLE KELLY FERGUSSON: Good evening. I'm Kelly Fergusson. I'm the Mayor of Menlo Park. And Menlo Park is a wholesale water purchaser from SFPUC. And I'm just here tonight with Kent Stephans, our public works director, to listen to comments and to absorb the comments and your remarks.

L_Menlo3-01

Thank you.

C_Mater

DIANA SOKOLOVE: The next speaker is Len Materman.

And if you wouldn't mind giving us your address either before you speak or if you could fill this out, we need to be able to get back in touch with you to respond to your comments.

LEN MATERMAN: Sure. Thank you. I'm in San Carlos.

Really just two points on the adequacy of the document. The PEIR states that there is no clear scientific consensus on how global warming will affect water supplies, yet it also states that predicted changes are within the range that occurs under existing and proposed operations.

I've found their conclusion that there's no clear consensus yet they can estimate kind of the effect of global warming and how this will shake out over the next 30 years to be both inconsistent and inaccurate.

C_Mater-01

12.6-81

And I also found the fact that they devoted three whole pages to the topic of global warming and its influence on the snowpack out of the hundreds or probably more than hundreds of pages over there to be inadequate.

C_Mater-01 cont.

So I'm trying to use those words up there.

Second point, in terms of the assessment of the document on natural resources and species, I felt that they did take a look at species, yet they didn't take a look the ecosystems within which those species operate adequately. And that there are real and knowable negative economic impacts of projects that don't look at ecosystems and the services and the economic values they provide.

And because those things are knowable and because those things are real, I found this document to be inadequate in its assessment of on the environmental impact on the species involved.

C_Mater-02

I guess my last point is, earlier this week, the State PUC came out with a document related to energy. But I thought it would be instructive for us here because what that document says, among other things, is, quote, "We need to have our utilities thinking long-term and strategically to make energy efficiency business as usual, a part of everyday life

in California."

And of course, we're talking about water here today, but I think the idea still hold for this document. In so many ways, the Bay Area and San Francisco is at the forefront of thinking nationally on so many topics. I wish that in the context of water it would do the same.

Thanks very much.

DIANA SOKOLOVE: Is there anyone else who wants to speak who has not submitted a speaker card?

(No response)

DIANA SOKOLOVE: Okay. Well, that closes the public comment portion of this hearing. Thank you for coming tonight. Again, here up on our screen is where you can submit written comments if you wish to further supplement your verbal comments tonight. Thank you, and have a very good evening.

(Whereupon, the proceedings concluded at 7:33 o'clock p.m.)

12.6-82

STATE OF CALIFORNIA)
) ss.
COUNTY OF MARIN)

I, DEBORAH FUQUA, a Certified Shorthand Reporter of the State of California, do hereby certify that the foregoing proceedings were reported by me, a disinterested person, and thereafter transcribed under my direction into typewriting and is a true and correct transcription of said proceedings.

I further certify that I am not of counsel or attorney for either or any of the parties in the foregoing proceeding and caption named, nor in any way interested in the outcome of the cause named in said caption.

Dated the 2nd day of October, 2007.

DEBORAH FUQUA
CSR NO. 12948

PUBLIC HEARING TRANSCRIPT

San Francisco, California

San Francisco City Hall, Planning Commission Chambers, San Francisco, California
September 20, 2007

(PH SF1)

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PUBLIC HEARING

DRAFT PROGRAM ENVIRONMENTAL IMPACT REPORT

SAN FRANCISCO PUBLIC UTILITIES COMMISSION'S

PROPOSED WATER SYSTEM IMPROVEMENT PROGRAM

SAN FRANCISCO CITY HALL

PLANNING COMMISSION CHAMBERS

1 DR. CARLTON B. GOODLETT PLACE

SAN FRANCISCO, CALIFORNIA

SEPTEMBER 20, 2007

REPORTED BY: DEBORAH FUQUA, CSR #12948

APPEARANCES

SAN FRANCISCO PLANNING COMMISSION

President Dwight Alexander

Commissioner Moore

Commissioner Bill Lee

Commissioner Antonini

Commissioner Olague

Commissioner Sue Lee

Secretary Avery

SAN FRANCISCO PLANNING DEPARTMENT

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San Francisco Public Utilities Commission

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JOYCE HSIAO, DEPUTY PROJECT MANAGER

ESA + Orion Consultant Team

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PUBLIC SPEAKERS

John Barbey	John Rizzo
Steven Miller	Joan Girardot
Gwynn MacKellen	Bernie Chodeu
Tony Gantner	Ann Clark
Cindy Charles	Shawna Gokener [phonetic]
Tomer Hasson	Emeric Kalman
Eric Wesselman	Silvia Johnson
Jennifer Clary	June Bug [phonetic]
Jenna Olsen	Denise Dougherty [phonetic]

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Thursday, September 20th, 2007 6:54 o'clock p.m.

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P R O C E E D I N G S

SECRETARY AVERY: Commissioners, you're now going to take Item No. 21, Case No. 2005.059E, Water System Improvement Program. This is a public hearing to receive public comment on the draft environmental impact report.

DIANA SOKOLOVE: Good evening --

COMMISSIONER SUGAYA: Excuse me, before you start.

I'm going to have to recuse myself on this item. The company that I work for prepared the historic resources evaluation for the Water System PEIR. So I have a conflict of interest.

COMMISSIONER BILL LEE: I move to recuse Commissioner Sugaya.

SECRETARY AVERY: On the motion to recuse Commissioner Sugaya, Commissioner Moore?

COMMISSIONER MOORE: Aye.

SECRETARY AVERY: Commissioner Sugaya?

COMMISSIONER SUGAYA: Aye.

SECRETARY AVERY: Commissioner Bill Lee?

COMMISSIONER BILL LEE: Aye.

SECRETARY AVERY: Commissioner Antonini?

COMMISSIONER ANTONINI: Aye.

SECRETARY AVERY: Commissioner Alexander?

PRESIDENT ALEXANDER: Aye.

SECRETARY AVERY: Commissioner Olague?

COMMISSIONER OLAGUE: Aye.

SECRETARY AVERY: Commissioner Sue Lee?

COMMISSIONER SUE LEE: Aye.

SECRETARY AVERY: Thank you. Commissioner Sugaya is excused.

DIANA SOKOLOVE: Okay. Good evening, President Alexander, Members of the Commission. My name is Diana Sokolove. And I'm a senior environmental planner with the Major Environmental Analysis Division of the San Francisco Planning Department.

This is a hearing to receive comments on the draft program environmental impact report for the San Francisco Public Utilities Commission's Water System Improvement Program. It's Case No. 2005.0159E.

The public comment period for the draft program environmental impact report began on June 29th of 2007 and will end on October 1st, also in 2007. The Planning Department also held four other public hearings this month for the Water System Improvement Program, Program Environmental Impact Report throughout the program study area to take public comment on the EIR. And the proceedings from those hearings will be

included in the comments and responses document.

This is not a hearing to consider approval or disapproval of the proposed program. That hearing will be held by the San Francisco Public Utilities Commission following certification of the program environmental impact report by this commission.

Therefore, comments today should be directed to the adequacy and accuracy of the information contained in the environmental impact report rather than the merits of the proposed program. Also as you know, staff is not here to -- generally not here to answer public comments today. Comments will be transcribed and responded to in writing in the comments-and-responses document, which we hope to publish in the spring of 2008.

Members of the public who would like to speak this evening should speak slowly and clearly so that the court reporter who we have here tonight can produce an accurate transcript which will become part of the public record for this environmental review process. Also, commentors should state their name and address so that they can be properly identified and so that they can be sent a copy of the comments-and-responses document when completed.

After comment from the general public, we will also take any comments that the Commission may have on the draft program environmental impact report. This concludes the presentation on this matter.

Unless the Commissioners have any questions, I respectfully request that you open up the hearing for public comment.

PRESIDENT ALEXANDER: Thank you. We are now open for public comment, and I do have speaker cards.

John Sarbie [sic] followed by Steven Miller and Gwynn MacKellen.

C_Barbe2

JOHN BARBEY: Excuse me. My name is John Barbey, with a "B." I live at 50 Liberty Street, San Francisco, California 94110.

C_Barbe2-01

My concerns are very simple. I have not seen the documentation. This was not tremendously well noticed. I understand there was a tiny notice in the Examiner, which is nearly impossible to obtain in its paper form, a paper ad on September 10th. The full documentation, I understand, fills a book box, which is 12 by 16, and fills the box right up to the lid. It's 3,000 pages. You know, there's a matter of time that we have to peruse this information.

C_Barbe2-02

And my concern is very simple. I hope that you are safeguarding the water supply into San Francisco and the future water supply, as I believe in

C_Barbe2-02 cont.

increasing housing here in the city. I think it's a big priority for us. We have to remain a competitive destination as we have somehow managed to be.

And I think in the past, we simply assumed that we would receive priority on this system and that our supply would be safeguarded. I'm hearing amazing stories about conservation being the solution. Certainly conservation has to be prioritized too, but my brother lives in Durango, Colorado. They have no water. Even the Animas River is drying up. He gets water delivered to his house every week.

We are an enormous, huge city. Imagine a similar catastrophe if we had a serious water shortage or if we had to help our neighbors in the East Bay because they had a serious water shortage.

This is of tremendous huge priority for San Francisco, the city itself, never mind all the other cities that depend on this. But I think we're the ones who made this system. We're the ones who should be safeguarded. We're a very vulnerable big city, and I think this is, in some ways, a simple problem. And I certainly hope this report addresses that correctly.

We simply cannot take baths in Sparkletts water. It's just too horrible to consider. Thank you very much.

L_BAWSCA5

PRESIDENT ALEXANDER: Thank you.
Steven Miller.

STEVEN MILLER: Good evening, Commissioners. I'm Steven Miller. I'm a lawyer for the Bay Area Water Supply and Conservation Agency, BAWSCA. And I'm here representing BAWSCA and its general manager, Arthur Jensen. BAWSCA is an independent special district whose board of directors represents 27 long-term contact customers of San Francisco. BAWSCA members purchase over two-thirds of the water which the SFPUC distributes and pays over two thirds of the cost of the regional water system.

BAWSCA will shortly be submitting extensive written comments. Today we'd just like to highlight three key issues.

L_BAWSCA5-01

First, the PEIR should more clearly emphasize the critical importance of completing the WSIP to protect the public health and safety of the 2 1/2 million people that live in the Bay Area. We must not lose site of why the WSIP is necessary and the urgency with which it should be prosecuted.

This is not the world's greatest -- many of the regional water system's facilities are located on or cross one or more active faults. There's a greater than 60 percent chance of a major earthquake before the

L_BAWSCA5-01 cont.

year 2032. It is not a question of if such an earthquake will happen but when. Following such an earthquake, the flow of water to communities could be disrupted for 30 to 60 days. The WSIP is necessary to protect the millions of people who live in this area from the catastrophic consequences of the water system's failure.

L_BAWSCA5-02

Second, BAWSCA member agencies and their customers are dedicated to conserving and recycling water. Residential members of BAWSCA members use less water than residents of all other regions of the state. Indeed, residential use in San Francisco's neighboring communities is lower than the average for the Bay Area as a whole. As population grows, BAWSCA, its member agencies and their customers, will implement additional conservation measures and water recycling, so the residential per capita water use is actually expected to decline, despite the forecasted population growth.

L_BAWSCA5-03

Third, contrary to recent public statements, San Francisco and BAWSCA are not the most significant users of Tuolumne River water. Almost half of the Tuolumne River runoff is used for agricultural production.

While BAWSCA actively pursues additional conservation efforts in its own service area, it also

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makes sense, good sense, to encourage further conservation from agricultural users of Tuolumne River water. The modified WSIP, identified in the PEIR as the environmentally superior alternative, suggests a partnership with agricultural interests to conserve Toulumne River water while keeping agricultural stakeholders whole so that water delivered to the Bay Area would be offset by agricultural water conservation.

BAWSCA supports such a partnership. It hopes in its written comments to support and enlarge upon the ideas presented in the PEIR, and will suggest ways to achieve a net savings on the river while still providing the water necessary to accommodate environmentally sound in-fill growing plans for San Francisco.

L_BAWSCA5-03 cont.

PRESIDENT ALEXANDER: Thank you.

STEVEN MILLER: Thank you. I have copies of these slides if anybody would like them.

PRESIDENT ALEXANDER: Thank you.

Gwynn MacKellen.

SI_SierraC5

GWYNN MacKELLEN: Hello. My name is Gwynn MacKellen, and I live at 143 Howth Street in San Francisco. I work for the San Francisco Bay Chapter of the Sierra Club, and I want to thank the Planning

Commission for letting me speak.

I also wanted to let you know that the public truly cares about this issue. It's concerned with the PUC's plans to withdraw more water from Yosemite and the Tuolumne River.

A bunch of Sierra Club members were here earlier and left all these public comments. And this is a picture of them.

Also, many Sierra Club members and San Francisco residents sent cards indicating their support for water conservation and recycling to protect the Toulumne. Here are those cards (indicating).

There are a total of 800 comments. So clearly many people are not pleased with the current plan to allow more water-heavy landscaping at the expense of our wildlife and natural treasures. We have a chance to meet our water needs in an environmentally responsible way. Please take these public comments into account. Thank you.

SI-SierraC5-01

PRESIDENT ALEXANDER: Tony Gantner.

SI_D3Dem2

TONY GANTNER: Commissioners, good evening. Tony Gantner, President, District 3 Democrat Club. I live at 235 Chestnut Street, San Francisco, 94133.

Our club is deeply concerned about any action taken by the PUC that would allow more water to be

SI-D3Dem2-01

12.6-89

diverted from the Tuolumne River. We believe that the rights of the environment are equal to human civil rights and that compassion for the environment is as impassioned as for our fellow human beings.

SI-D3Dem2-01 cont.

Within that belief system, the proposed diversions on their face are presumptively harmful to fisheries and sensitive riparian habitats. It is our understanding that the draft EIR released by the PUC does not properly identify and address the impacts of taking more water from the Tuolumne and that such diversions would be for customers outside of San Francisco.

SI-D3Dem2-02

We realize that growth projections for the Bay Area over the next generation are pressuring the PUC to allow these increased diversions, but the rights of and compassion for the environment must be acknowledged. There must be limits to gross impact on the environment. Conservation and recycling are one solution.

SI-D3Dem2-03

In this city which can rightly be called the cradle of environmentalism, do not betray your heritage. The Toulumne fisheries are as much entitled to help the ecosystems as each of you is entitled to live in a clean and green urban environment. Thank you.

SI_GWWF2

PRESIDENT ALEXANDER: Thank you.

Cindy Charles.

CINDY CHARLES: Good evening. My name is Cindy Charles, and I live at 403 Willard Street, San Francisco, 94117. I'm a conservation chairperson for the Golden West Women Fly Fishers. And I'm also a member of the Steelhead Committee of the Northern California Council-Federation of Fly Fishers. I'm a native San Franciscan, and the Tuolumne River is really very special to me. I fish all over California, and it's my favorite river.

And one of the reasons why is that's where I caught my first fish as a kid. I caught my first fish on a fly, an artificial lure, there. I also caught the largest trout I've landed to date. I brought you a picture of it because I like showing pictures of my fish.

That's a 19-inch brown trout. It was caught below the Hetch Hetchy Dam in Pupino [phonetic] Valley. So I'm here to represent anglers of Northern California. We are very concerned that the plan as it stands increases the water diversion to extremely high levels. Already the Tuolumne River has diversions in the range of 70 to 80 percent. And I know irrigation further down contributes to that.

SI-GWWF2-01

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But this water system is already compromised. And to further divert more water is just unthinkable. Also, further down the road is the Sacramento Delta. And everyone knows it's suffering. It needs every bit of fresh water that it can get in order to help turn that fishery around.

SI-GWWF2-01 cont.

The anglers are also very concerned about the proposed increased diversions on the Alameda Creek watershed. My club and several other clubs are working to restore steelhead passage so the fish can go from the ocean back up to where they were born and spawn. And we're working on removing dams. And if you're taking more water out of there, that's not helping the fish any either.

SI-GWWF2-02

So we will be submitting a more detailed comment letter, and I thank you for your time.

PRESIDENT ALEXANDER: Thank you. Tomer Hasson followed by Eric Wesselman and Jennifer Clary.

TOMER HASSON: My name is Tomer Hasson. I live at 2191 - 21st Avenue in the Sunset.

C_Hasso

First of all, I want to put my support behind the seismic upgrades and most of the Water System Improvement Plan. I think it's about time that the Bay Area has a secured source of water. And I commend all of you guys for taking on that larger project.

C_Hasso-01

I do take issue, though, with the water diversion from the Tuolumne River. We're talking about a wild and scenic river in which 60 percent of its flow is already diverted for urban and rural use. And as you know, you're threatening an additional 25 million gallons a day from the river. And basically, most of that will be going for outdoor use to increase lawns and our parks, the green of our lawns and parks, which basically says to me that we're more -- we have much more -- I'm sorry.

We view the green of our lawns and parks much more important than we do actually a federally protected wild and scenic river. The simple fact that the PEIR equates an increase in population to an increase in water is exactly wrong -- or increase in use of water is exactly wrong. Other major metropolitan areas, such as Seattle and Los Angeles, have been able to decrease water usage in the face of population growth by focusing on conservation and recycling measures.

C_Hasso-02

The draft PEIR also uses flawed modeling to determine anticipated water demand. The anticipated 14 percent increase in demand is excessively large and out of step for the Bay Area. And let me point out to you that, not only do we have flawed methods in our

C_Hasso-03

population projections for the Bay Area, but our increase in demand, that increase in demand of 14 percent is reflected in per capita use, which is also set to increase over the next 20 years.

I fail to understand why a person 20 years from now is going to be using more water than I do today. But that's besides the point because that per capita increase will supposedly increase, even though the price of water is expected to triple in the next decade, according to the SFPUC.

But even if that 14 percent increase in demand does hold, then a majority of that demand can be met by conservation, efficiency building, and recycling measures.

The SFPUC's own studies indicate that such measures, which I remind you are the cheapest, easiest and least destructive ways to meet demand and extend supply, could eliminate the need to divert more water from the Tuolumne by 74 percent.

My simple point here is that other large metropolitan areas have been able to do this with little effort. The Bay Area, the leader in the environmental movement and environmental ethic, should be ahead of everyone, not far behind. I also invite you to please revisit the studies and new methodology

C_Hasso-03 cont.

within the draft PEIR.

C_Hasso-03 cont.

And please revisit the concept of global warming. The State of California projects that global warming will reduce the Sierra snowpack by 5 percent by 2030, and by 33 percent by 2060.

C_Hasso-04

PRESIDENT ALEXANDER: Thank you. Eric Wesselman.

TOM MARASAN: Thank you. I appreciate your time.

SI_TRT9

ERIC WESSELMAN: Good evening. My name is Eric Wesselman. I'm the executive director of the Tuolumne River Trust.

For over 25 years, the Tuolumne River Trust has been working to protect and restore this wild and scenic river. But now, the San Francisco Public Utilities Commissioners and their wholesale customers are proposing to take an additional 25 million gallons of water out of this river each and every day.

And as I stand here in San Francisco, I think it's important to note that it's not even for San Francisco. This is being [sic] for sales to the wholesale customer, which projects demand increase of 25 million gallons from the Tuolumne alone.

The Toulumne, as I said, is a wild and scenic river, and more than half of the river is already diverted. And while much of that is for rural or agricultural uses or urban uses in other parts of the

SI_TRT9-01

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state, the increase in demand is coming from the Bay Area. So the single largest threat to the Tuolumne River is the San Francisco plan to divert an additional 25 million gallons per day.

SI_TRT9-01 cont.

And I think more to the point, the draft EIR does not adequately justify or define the need for more water. For instance, the draft is based on the fundamentally flawed analysis that didn't look at the relationship between the price of water, moving into the future, and the demand for water. It's not inelastic. It's elastic. As price goes up, as has been mentioned, a tripling of price over the next decade or two will lead to a decrease in demand.

So that was not analyzed or looked at in the analysis done by the SFPUC, the wholesale customers, or the Planning Department. So I'd recommend that that be reevaluated, and that that would reduce demand projections in the future.

SI_TRT9-02

Second, the SFPUC's own study wasn't used that found that much of the demand increase could be met through sustainable sources, such as recycling and conservation. And that should be looked at and incorporated.

SI_TRT9-03

Finally, there is a use of outdated employment projections from the Association of Bay Area

SI_TRT9-04

Governments that used '02 data. And '05 data became available which decreased the job -- the employment projections moving into the future, which means less growth in the commercial sector, which means less water use.

While it's not great for the region's economy, it's a reality, and we ought to be looking at that in terms of planning for the future use of our resources.

SI_TRT9-04 cont.

Additionally, there's an increase in per capita use. And as an objective note, it's simply not acceptable in this day and age to project an increase in water use per person.

SI_TRT9-05

And I think -- my time is running short. By that, while the bulk of the WSIP is focused on needed repairs and seismic upgrades -- and we whole-heartedly endorse that and support that -- we're concerned that it includes this poison pill of taking more water off of a wild and scenic river that is already largely diverted. And that threatens to delay these needed seismic improvements and retrofits and repairs. So that should be looked at. And I think it would be of concern to the wholesale customers.

SI_TRT9-06

Thank you for your time.

PRESIDENT ALEXANDER: Thank you. Jennifer Clary.

JENNIFER CLARY: Thank you. Excuse me.

SI_CWA2

My name is Jennifer Clary. I'm here in my professional capacity today as the water policy analyst for Clean Water Action. And I just want to thank you all for listening to this. All of us folks back here, we've been soaked in this for five years. And we just come in and talk about stuff. And I know that you all read the five-volume report overnight before you came here. And I just want to thank you for listening to us. And we're trying to keep our comments brief, but there's a whole lot of detail that will be going into in our written comments. And I hope you'll have a chance to look at that.

Clean Water Action has been tracking this program for more than five years. We supported the bond to rebuild the system. We think it's vital that we have a reliable water supply. But of course, your job here is, in ensuring that we have a viable water supply, to ensure sure that this document is adequate.

SI_CWA2-01

And we have lots of serious concerns about the adequacy of document. One concern that I'd like to note today is the four pages -- the four-page review of the impact of climate change on the program. And in -- I understand that it's a difficult, new science but the fact of the matter is that, if this report does not adequately asses the process of climate change, it's

SI_CWA2-01 cont.

not going to be an adequate document, and it's going to be challenged.

They did take a look at the impact of temperature increase and found that it could result in a 7 percent decrease in run-off, but they said that's within the range of expected -- the range of historic data. The difficulty with this is it's not part of the range. It's additive. And how do you create -- how do you measure the cumulative effect of climate change?

And in addition, there's other impacts of climate change that aren't looked at here. In the local reservoirs, you have more evaporation, you have increase in algae blooms, which is a big concern for water agencies. You have an increase in temperature in the river which could require more flow releases for fish.

So there are things that aren't really studied and aren't even referred to in the document that really have to be taken care of. If we have a snow melt -- or if we have a snow, that means the timing of the run-off changes, and that changes the way you operate a reservoir. And that's something that should be looked at and estimated here.

And of course, there could be an increase in environmental water demand, and, as I mentioned, not

12.6-94

just for the middle fork of the Tuolumne but below Don Pedro. And the PUC will have a responsibility for that as well. Remember that the Tuolumne feeds into the San Joaquin River and goes down into the Delta. So don't think that this project isn't part of that whole mess.

And finally, there is another good silver lining to this, which is the most cost-effective way to reduce greenhouse gas emissions is through water conservation. So these demand numbers don't take into account that we're going to be looking for cheap ways to save energy before 2030.

SI_CWA2-01 cont.

Thank you.

C_Olsen

PRESIDENT ALEXANDER: Thank you. Jenna Olsen.

JENNA OLSEN: Hello. My name is Jenna Olsen. I live on Vallejo Street in San Francisco. My full address is on my speaker card.

I imagine all of you Commissioners and most of the people in this room, everyone in this room, walked by the house that is on display right in front of City Hall today. It is MKlotus House. It has a green roof. It has native landscaping on the outside. It has a gray water system. It has a rainwater catchment system to use that rainwater for the little bit of water that is needed for the landscaping. It's part of West Coast Green, which is a conference going on in Bill Graham

C_Olsen-01

Center this week and this weekend. If you haven't had a chance to look at the house, I encourage you to go there tomorrow or Saturday.

Mayor Newsom gave one of the keynote speeches this morning at that conference. And he talked about San Francisco's leadership on the environment and sustainability. He talked about San Francisco's leadership on greenhouse gasses, transportation, waste diversion.

Did he talk about San Francisco's leadership on water? No. He did not.

That's a problem.

Is the PEIR that's in front of you the document of a leading city in environmental sustainability? No. It's not. It's inadequate for all the reasons you've heard tonight. It did not even consider an option that would have not taken more water out of the Tuolumne River. San Francisco should be a leader. It should be showing the way in water use efficiency, water conservation, and environmental restoration, sustainability.

I encourage you to do this right, do it over so that a year or two from now Mayor Newsom can give another speech where he talks about what a leader San Francisco is in water and in finishing the earthquake

C_Olsen-01 cont.

12.6-95

C_Olsen-01 cont.

retrofits as well.

And thank you for that. I also would like to submit to the record the appalling nature with which this hearing was publicized. I have printouts from both the Planning Department and the SFPUC Web sites from yesterday. I had a very hard time finding out what time this hearing was going to be. It was listed as 1:30 on the SFPUC Web site, even though it was apparently for 5:00 o'clock today.

So I just would like to say that I think more people would have been interested in this if it had been better noticed. Thank you.

SI_SierraC6

PRESIDENT ALEXANDER: Thank you. John Rizzo.

JOHN RIZZO: John Rizzo, 1621 Waller Street, 94117, San Francisco. I'm here today, Commissioners, in my capacity as former chair of the Sierra Club's San Francisco Bay Chapter. I'm a current executive committee member. I'm also representing Sierra Club California.

SI_SierraC6-01

And we are opposing the 25-million-gallon-per-day additional water grab from the Tuolumne River, and we'll be submitting comments in conjunction with the other environmental groups in the package.

SI_SierraC6-02

But I'm just going to talk about one very

SI_SierraC6-02 cont.

small aspect of the EIR, and that's on growth, the impacts of the additional water on growth. Additional review is necessary to bring the impacts of the growth numbers up to 2030 and also to review the impacts of the ABAG projects which only go 2025.

The expanded water supply would accommodate a 28.8 increase in employment and 16.8 increase in population between 2005 and 2030 in the service area. This is about 5 percent more jobs and 5 percent less population than what the EIR estimates that the general plans would allow.

The document cites the environmental analysis done by the general plans for the service areas. It doesn't do it itself, doesn't do the analysis itself. But none of the plans has a time horizon that extends to 2030. So it is speculative to make conclusions about consistency.

It is also speculative to assume that the local jurisdictions will plan for a continuing rate of growth beyond their horizontal years as assumed in the EIR. So it cannot be concluded that the EIRs done for the general plans adequately cover the growth allowed by the increased water supply. The EIR acknowledges this fact on Page 7-35 and Page 7-69.

The EIR finds that the water supply growth is generally consistent with ABAG projections to the year 2025, but ABAG projections are not subject to environmental review. So this area is completely inadequate. They have done no work in this. This EIR is full of this.

SI_SierraC6-02 cont.

Another big area, which I don't have time to go into, is the water flows. They simply do not have any idea of what the impact of taking this water will do to the river flows and what it will do to the fish. They don't have enough of a baseline -- they don't have the science; they don't have the numbers. We need a much more multi-year longer study to get that. And we're not there.

SI_SierraC6-03

So there's many other areas. I just wanted to point out this one on sprawl.

Thank you.

SI_SFNeigh

PRESIDENT ALEXANDER: Thank you. Joan Girardot.

JOAN GIRARDOT: Joan Girardot, Coalition for San Francisco Neighborhoods. My home address is on my speaker card. Because an EIR is an informational tool for decision makers, besides being accurate, adequate, and complete, it should be clear. And I would like to offer some points that I think need to be clarified.

The benchmark year that is chosen is 2001, as far as demand. And it is stated that 261 million

SI_SFNeigh-01

gallons a day were delivered in that year. And we're going to a goal of 300 mgd.

However, if you review the historic tables, which I have here, the average going back over the years is around 240 million gallons a day that has actually been delivered. So it's a big jump from 240- to 300-. It puts everything in a different perspective from 261- to 300-. I think that should be clarified and the historic table should be included in the document.

SI_SFNeigh-01 cont.

Number two, the growth outside of the city -- it has been stated -- I think it should be clarified in the document -- the 25 million gallons a day proposed to be extracted from the Tuolumne is going to the suburbs, not for use by San Franciscans who planned, designed, engineered, built, and paid for this system.

A next point of clarification is the discussion of conservation. We're looking at our whole customers as a whole. But within the city itself according to PUC documents, the average resident of San Francisco uses 61.19 gallons of water per day. That is lower than any of our customers.

And 61.19 gallons per day is 12 percent below what the EPA recommends for indoor water usage. And we have negligible outdoor usage. The outdoor usage in

SI_SFNeigh-02

12.6-97

the city is from our Rec and Park Department. And I think it would be helpful to have a table in the document that listed the per capita water usage per day of all of the 28 customers in comparison with the citizens of San Francisco. I think it would be very helpful.

SI_SFNeigh-02 cont.

The other thing is -- so we need to clarify where we're going with conservation within the city. Of course there is room for plumbing fixtures, et cetera, but 61 gallons per person per day is so low -- I want this clarified. And this nonsense about further conservation by the residents of the city -- we are already doing our job.

Then the last point is I want clarification about recycled water. Because the document presumes that we're freeing up --

SI_SFNeigh-03

PRESIDENT ALEXANDER: Thank you.

I have no other speakers cards. Is there anyone else deciding to comment on this item?

BERNIE CHODEU: Now you have a speaker card for Bernie Chodeu.

C_Chode

I would just underscore what Jennifer Clary has indicated, that I am a believer in global change. And the inadequacy of the EIR in recognizing that issue is an issue for you as a Planning Commission and as

C_Chode-01

staff. And that is, the 30 percent less snowpack and so forth will affect the ability of this city to meet its future water needs, especially with regard to the now discredited housing element, as Kathy Devencenzi indicated at the State appeals court, others, that states that we have adequate water supply and infrastructure.

C_Chode-01 cont.

Until there is mitigation with our conservation measures and a change in city's political policy to accommodate its 200,000 proposed growth and commercial expansion, this Commission and its staff needs to be directed to mitigate its issuance of permits that allows further growth.

Thank you, and I hope I've directed you in some truthful expansion of your meeting.

PRESIDENT ALEXANDER: Thank you. State your name.

BERNIE CHODEU: I did. But I'll repeat it. Bernie Chodeu in case you didn't remember me secretary secretary thank you.

ANN CLARK: Mr. Chair, I have a respectful question because I'm new to this. I have copies of written comments. Do I need to give one to each of you?

PRESIDENT ALEXANDER: You can just place it on the rail. If you have one for each of us, that's great.

12.6-98

If not, the single is fine.

ANN CLARK: But it will get submitted?

PRESIDENT ALEXANDER: It will get submitted.

ANN CLARK: I'll do that.

C_Clark2

I'm Ann Clark. And my name and my address is on the card. And I'm living in San Francisco. I'll speak very quickly as being your last person.

The comment cards that -- the report that you have is going to address actually three main issues. One has to do with the Hetch Hetchy water delivery infrastructure costs and finance. We do thoroughly support, by the way, the work that's being done in order to protect the Hetch Hetchy and its infrastructure.

C_Clark2-01

This is about the cost and the finances, whether you have enough money to do this project. And if you don't have enough money, what's going to happen? And usually the knee jerk reaction is to cut mitigations. That, of course, I think, would cause some legal concerns.

The SFPUC Commissioner last week said he is betting on the over, if he went to Las Vegas, on this project. And I think we'd all bet on the over, that this is going to go over cost. So we are asking that there be an environmental impact study in terms of what

C_Clark2-01 cont.

will be done as a result of however this develops in the future.

C_Clark2-02

Secondly -- and I don't know if I'm saying this right, the gentleman from BAWSCA -- is that the one? Bay Area Something -- I'm new, so I don't know that -- mentioned something about general promises from wholesale cost customers and working out agreements with the agricultural group. Remember the W-S-I-P, the WSIP, is directly connected to the 2009 contract. That's directly connected to the WSIP, so there's an integral connection between the two.

When you do contracts, that's going to have to be looked at in an environmental, stable way. You need a review of that contract because that is an integral part of the plan. So if they are coming forward agreements that are in the contract, not good faith agreements but contractual agreements with agricultural users or contractual agreements with promises to do more conservation, contractual agreements with definitive terms, they have got to be in the contract. If they're not there, they are not there, and they shouldn't be considered.

C_Clark2-03

Second point is drought and climate change and global warming. You've already heard that the study of that is really limited and narrow. There is a study of

12.6-99

drought. But what's really bothering us is there's not a study of what happens if there's drought, climate change and global warming, what would be the exponential effects from now to 2030 if those coalesce.

And in a drought cycle state, which we are, we are going to see some effects come through. And these need to be carefully studied.

C_Clark2-03 cont.

PRESIDENT ALEXANDER: Thank you.

ANN CLARK: So I'll leave you with the rest of the report.

C_Goken

SHAWNA GOKENER [phonetic]: Good evening, Commissioners. Shawna Gokener. My address is 667 O'Farrell, Apartment 10, 94109.

"Compassion" means understanding and action. And it seems that we don't have the understanding necessary of how to preserve our water supply, which is one of the most sacred things that a city's duty is to do. So I really think we need to step back and really look at this very carefully and know that there's a great deal of public concern. And we need to think far into the future before we take answer actions and be compassionate about water supply.

C_Goken-01

PRESIDENT ALEXANDER: Thank you. Next speaker, please.

C_Kalma

EMERIC KALMAN: Thank you. My name is Emeric

Kalman, member of the public. And my address is on my speaker card.

On September 19, yesterday, the San Francisco Landmarks Preservation Advisory Board has on the on the agenda an announcement on this item, which is today, on agenda at the Planning Commission.

And says here, that, "The draft environment impact report was published on August 31st, 2007. The Planning Commission will hold a public hearing to receive comments on the draft EIR to submit to the Planning Department. Written comments on the draft EIR will be accepted in the Planning Department until 5:00 p.m. on until Tuesday, October 16."

The public didn't know about this documentation. And the first time appeared in the newspaper was published in the Examiner on September 10, ten days ago and said that this hearing will be September 20, which is today.

So the public was given ten days to read the material, which I think is -- I don't know 30 points something like that, a bit of material, and maybe 3,000 pages; I'm not sure. So the public needs more time to read it study it and have comment on it. It's unbelievable that the City gives ten days of this crucial documentation to make comments on it. I think

C_Kalma-01

12.6-100

it's a joke. And I will ask whoever can forward this within ten days to study, to give an answer, why is just ten days on it?

C_Kalma-01 cont.

PRESIDENT ALEXANDER: Thank you.

Is there anyone else desiring to speak on this item?

C_JohnsSil

SILVIA JOHNSON: Those who -- my name is Silvia Johnson. I live at 1230 Market Street, 94102, San Francisco, California.

And I don't think that this water and distance is greatly allowed study on it. And other people at the environmental, that resource is needed and know where there's water already. That we don't have anything to worry about in the mountain of the -- over here. And I've written stories on the water that been in revisions.

And I think that also an environmental control is -- you know, more time it needs for this to be read because not only that, thinking of when the inclusion that I have a -- what you call anxiousness to be able to handle all this kind of -- stop Silvia's, you know, progress. And I'm going to change that.

I found that it don't do much to get this whole life back together. And I'm sorry if I do, you know, that -- because of environment that is -- I'm

C_JohnsSil-01

fighting every day. And I'm going to proceed. And my idea is what is going on where we can see the results, and that I'm going -- been through a lot. And I am glad -- you know, learn about more about the conversation.

And I reviewed a lot of this [unintelligible]. And I think this is what their's scared of, you know, for environment. And I don't -- the police -- I didn't give a report on what should be done. They've already told that. The police have already, you know, made an arrangement that needs to be solved.

But I don't want what why they're scared of somebody that can, you know, show you in the future, to keep everything whole. And because this advantage of that's speeding things too fast. I've only been out of jail now for four months. And you know, I've suffered enough. I think that this will be reviewed a whole lot more. Thank you.

C_JohnsSil-01 cont.

PRESIDENT ALEXANDER: Is there anyone else desiring to comment on this item?

C_Bug

JUNE BUG [phonetic]: Hi. My name is June Bug, and I'm 31-year San Francisco native. And I live at 618 Buchanan Street, over in the Western Addition.

I am here to really express importance as somebody who's worked with the Conservation Corps. I

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worked with the Conservation Corps back in 2000. I'm also somebody who dealt with homelessness as a child, eight years old, and dealt with a different strategy in water and public systeMs. And I'm also somebody that, on a spiritual level, really identifies with water.

All of these things combined, my concern would be "improvement" doesn't usually mean taking something away. "Improvement" usually means something that you want to preserve. And even if we're at a certain percentage, as people living in San Francisco being really conservative with the water, that doesn't mean we stop there. That means we keep moving forward. That should be an encouragement for us to continue making that even a more amazinger [sic] percentage.

I don't see how taking water out of a river is going to improve a water program -- to improve a water system. So I really have a lot of concerns about what the San Francisco Public Utilities Commission is trying to propose here as somebody who is very, very concerned about our water, due to the fact that -- I mean, there's rumors that one day we'll be fighting L.A. for our water.

C_Bug-01

So I think that we really need to take a look at this. Thank you.

PRESIDENT ALEXANDER: Thank you.

Is there anyone else deciding to comment?

C_Dough

DENISE DOUGHERTY [phonetic]: Hello. I'm 52-year resident of California. My name is Denise Dougherty. And I live at 216 Eddy in San Francisco. I was born in Castro Valley, which -- and I never left the Bay Area unless I went overseas for a while.

And I learned they had a few different approaches to their water usage. And they used old water to water their lawns. Even when I was a child, I could never understand, why would they use drinking water to water their lawns? You know, water is such a precious resource.

I think we need to restructure our water usage as well as our energy usage. Our resources are becoming less and less as the population grows. So we need to restructure a lot of things. Our lifestyles need to be restructured. And I can go on and on about that, but I have only three minutes.

So we need to make use of, like, old water they call it gray water, reclaimed water. I'm sure you know all about that.

C_Dough-01

But the Tuolumne River, it's just the most obvious choice because it's so clean. But there's so many other ways to get water than taking it from the Tuolumne. There really are.

And that's about all I have to say. I thank you very much for listening. I'm against this.

PRESIDENT ALEXANDER: Thank you.

Is there anyone else desiring to comment on this item?

(No response)

PRESIDENT ALEXANDER: Seeing none, public comment is closed. The Department will continue to take comments on this item until 5:00 o'clock, October 10th, I believe the date is? Oh, October 1st. So I encourage you to submit your written comments to the Department.

Commissioner Olague?

L_SFCPC1

COMMISSIONER OLAGUE: I think my comments are related more to the process than the contents of the draft EIR at this point.

I feel a little bit -- I'm sorry. I want to apologize to members of the public who are here. We had about 40 people in blue T-shirts that were here to speak to the issue, and we're down to one now.

Thank you for sticking around and providing us with that documentation, the 800 signatures of people who have concerns about this draft EIR.

L_SFCPC1-01

But I wanted to point out exactly what we're commenting on today. For the benefit of the public, I

wanted to sort of point out the size of the document the people are commenting on today [indicating]. It's like close to 4,000 pages of documentation, this draft EIR. And basically, I think we waited a little long to have this hearing. I know what we did what was legally required, but sometimes I think we do need to go above and beyond that.

It's a 4,000-page document. This is one of -- four of five volumes that we're required to review. And to have only one period of public comment, and we're -- what's today's date? September -- 20th. So people are basically being given, what, 10 or 11 days to respond.

And I know that this document has been out there for a long time, but I think in the future, when we have this size of a document to really review and to expect the public to comment on, we need to provide more than one public comment period about it. I think this is just too important to just sort of rely on only one public comment period ten days before the date that these comments are due.

L_SFCPC1-01 cont.

L_SFCPC1-02

One of my concerns also is that this is a project that's ultimately going to be decided by the Public Utilities Commission, I believe. So it's not even a project that we're ultimately going to be

12.6-103

approving.

L_SFCPC1-02 cont.

And I have serious concerns about the fact that we're being asked to judge the adequacy of an EIR without the benefits of any real briefing from the PUC about the project itself. I think that I -- I think that that's just irresponsible.

So before I actually am able to adequately evaluate and fairly evaluate the accuracy of an EIR, I need to understand the project. I need to understand it within some context. And I think that it's going to be necessary to understand exactly what the project is.

L_SFCPC1-03

And I'd like to have some information from the PUC, maybe a hearing, a briefing; I don't know. But I think that it's important for us to understand that before actually giving -- you know, actually fairly evaluating the adequacy of the EIR sort of in a vaccum without the benefits of understanding deeply what the project is.

So I'm going to -- I'm requesting that a hearing be held about the project itself before this Commission, so we can be evaluating this EIR within the context of the project.

DIANA SOKOLOVE: Thank you for your comment. I'll certainly talk to the PUC about that.

COMMISSIONER OLAGUE: Thank you.

And again, thanks to the members of the public. And I hope that there's some written things. I'd like to understand a little bit more, too, the concerns of the Sierra Club and others. I know that three minutes isn't enough time to really state all that needs to be stated.

L_SFCPC2

PRESIDENT ALEXANDER: Commissioner Antonini.

COMMISSIONER ANTONINI: Thank you all for coming and testifying. And again, my apologies for the fact that we didn't hear this at the time that it was announced.

I think that what -- I've read this over, and I think it is -- you know, in my estimate, it is an adequate statement. However, I understand some comments were made tonight.

L_SFCPC2-01

I guess the first thing is, we didn't get a lot of discussion on, is the fact this is moving forward. And that's very important because, you know, the system does need to be upgraded, seismically improved. And this is probably something that I think everyone agrees upon.

And we have a huge fiduciary responsibility because of the size of the system. It goes far beyond just the city and county of San Francisco. It's a huge area and part of the Bay Area. So what we do here is

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L_SFCPC2-01 cont.

extremely important.

L_SFCPC2-02

I think there were comments made about the per capita usage and that perhaps the projections were overly high. And I think that that is something that could be looked at here. However, to the extent that they are lower if there is conservation or there are factors that make the per capita consumption lower than is projected, it's probably a good thing.

So I think that it's important that the study err on both -- to both sides and examine all the different possibilities that might exist. I think it was interesting to hear that the per capita consumption in San Francisco is 61 gallons per day. I think that that's pretty low. It's interesting that -- you know, I don't know that it's realistic that the rest of the the Bay Area is going to be that low, given the fact that there's a lot less pavement in a lot of those other parts of the Bay Area, and their consumption for outdoor use is probably a lot higher.

But anyway, I appreciate the work here, and I'm interested in, you know, going forward and getting as much information as I can from PUC on this.

PRESIDENT ALEXANDER: Thank you.

Commissioner Moore.

L_SFCPC3

L_SFCPC3-01

COMMISSIONER MOORE: I want to weigh in on the

L_SFCPC3-01 cont.

side of not finding enough forward-leading concepts in this entire document. If we are moving into greener sustainability, which has been talked about now for quite some time, I believe that this document shows very little. It is, I think, an engineered response.

L_SFCPC3-02

And while I strongly support the idea of seismic safety and a healthy, deliverable system in all circumstances, I question how we look at projections of growth, how we look at projections of increased water consumption, the effect on scenic resources, and not looking at how we are transforming the urban environment.

Just coming back from Europe, where the cities are not as over-asphalted as we are -- certain sidewalks have partially pervious surfaces. All of our surfaces are hermetically sealed. All of our streets do not allow the repercolation of rainwater into the groundwater, and on and on and on and on -- I think this is a backward-looking document in its own right.

And I hope that there is a way of, at least at this moment, opening up to those concerns which we're currently celebrating across the street. There's a Green Conference across the street. We are trying to be the greenest city in the country. And we're subscribing to a document which really does not address that at all.

At least there should be a chapter in here which tries to create a horizon or a future by which we are moving ourselves away from conventional concepts.

PRESIDENT ALEXANDER: Thank you, Commissioners.

SECRETARY AVERY: Okay. Thank you very much. That concludes the public hearing for this item.

(Whereupon, the proceedings concluded at 7:51 o'clock p.m.)

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STATE OF CALIFORNIA)
) ss.
COUNTY OF MARIN)

I, DEBORAH FUQUA, a Certified Shorthand Reporter of the State of California, do hereby certify that the foregoing proceedings were reported by me, a disinterested person, and thereafter transcribed under my direction into typewriting and is a true and correct transcription of said proceedings.

I further certify that I am not of counsel or attorney for either or any of the parties in the foregoing proceeding and caption named, nor in any way interested in the outcome of the cause named in said caption.

Dated the 3rd day of October, 2007.

DEBORAH FUQUA
CSR NO. 12948

PUBLIC HEARING TRANSCRIPT

San Francisco, California

San Francisco City Hall, Planning Commission Chambers, San Francisco, California
October 11, 2007

(PH SF2)

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San Francisco City Hall, Planning Commission Chambers, San Francisco, CA - October 11, 2007

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PUBLIC HEARING

DRAFT PROGRAM ENVIRONMENTAL IMPACT REPORT

SAN FRANCISCO PUBLIC UTILITIES COMMISSION'S

PROPOSED WATER SYSTEM IMPROVEMENT PROGRAM

SAN FRANCISCO CITY HALL

PLANNING COMMISSION CHAMBERS

1 DR. CARLTON B. GOODLETT PLACE

SAN FRANCISCO, CALIFORNIA

OCTOBER 11, 2007

REPORTED BY: DEBORAH FUQUA, CSR #12948

APPEARANCES

SAN FRANCISCO PLANNING COMMISSION

President Dwight Alexander

Commissioner Moore

Commissioner Bill Lee

Commissioner Antonini

Commissioner Olague

Commissioner Sue Lee

Secretary Avery

SAN FRANCISCO PLANNING DEPARTMENT
MAJOR ENVIRONMENTAL ANALYSIS DIVISION
Diana Sokolove, Senior Environmental Planner

SAN FRANCISCO PUBLIC UTILITIES COMMISSION
Susan Leal, General Manager
Tony Irons, Deputy General Manger

PUBLIC SPEAKERS

Peter Drekmeier   John Rizzo

Art Jensen

Thursday, October 11th, 2007 3:24 o'clock p.m.

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P R O C E E D I N G S

SECRETARY AVERY: Okay. The Planning Commission is back the session.

Commissioners, I had just called into the record Item No. 10, the informational presentation on the Water System Improvement Program.

DIANA SOKOLOVE: Good afternoon, President Alexander and Members of the Commission. My name is Diana Sokolove. I'm a senior environmental planner with the San Francisco Planning Department, Major Environmental Analysis Division.

The item before you is a hearing to receive comments on the Draft Program Environmental Impact Report on the San Francisco Public Utilities Commission's Water System Improvement Program. The case number is 2005.0159(E). The public comment period for this environmental report began on June 29th, 2007 and extends to 5:00 p.m. close of business on October 15th, 2007.

The Planning Department also held five other public hearings throughout the Water System Improvement Program study area to take public comment on the Draft Program Environmental Impact. One of those hearings

was held before this Commission on September 20th. The proceedings from all of those hearings will be reported in the comments and responses document.

So prior to opening up the hearing for public comment, Susan Leal, with the San Francisco Public Utilities Commission, will make a few remarks, and then Tony Irons will give a presentation on the proposed program. And then I'll provide an overview of the Program Environmental Impact Report.

SUSAN LEAL: Good afternoon, Commissioners. Susan Leal, General Manager, San Francisco Public Utilities Commission.

We're pleased to be here today, pleased to have an opportunity to give a brief presentation on our water system. We understand, as we are in the comment period, it is just that, a comment period, but it does provide us with an opportunity to give you Commissioners a better understanding of how our system works. So with that, I will turn it over to my deputy general manager, Tony Irons, and he will walk you through how this system works and what we're up against in the seismic repairs of that system.

PRESIDENT ALEXANDER: Thank you.

TONY IRONS: Thank you, Susan, Commissioners. Tony Irons, Deputy General Manager, SFPUC.

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Over here (indicating) there are some boards that you might reference. And I believe the information on these is also in the executive summary of the PDIR, but I'll kind of walk you through a brief history of this program and why we're doing it.

Susan and I have both been at the PUC since -- for three years, a little over three years. And when we came there, the City and the PUC had been working on this program intermittently for a long time. What we found was a series of projects, approximately 77 projects, each one with a brief outline of what its characteristics were.

My first stop, actually, the day I got -- came to the PUC to work with Susan was to see Paul Maltzer in the Environmental Review office and ask him how far along the environmental review had progressed. He said, "It has not because the PUC has not given the City Planning a program." That, in large part, was true.

So the first task before us was to create a program that could be reviewed for its environmental impacts and commented on by the public. That involved figuring out what all -- why all of these projects were being done.

So I went to individual project managers and

said, "You're in charge of X, Y, and Z projects. Why are we doing those?"

And they gave an answer, but the answers, when you aggregated them, didn't define a system; they didn't define an overarching purpose. So we delegated ourselves to go to Public Utilities Commission and asking them if they would adopt level-of-service goals such that we might be able to then have a design basis and an integrated system that related to goals that the Commission had adopted relative to this whole program.

Those goals are outlined here, and they're also in the executive summary of the PEIR. In essence, there are four categories: seismic reliability -- and I'll touch on a brief history of that in a moment -- delivery reliability -- which is very important -- water quality, and water supply.

In the first instance, back in the I believe early '90s, the Bay Area Economic Forum published documents that basically stated in the event of a major earthquake on any one of the three major faults that this system crosses, the economic impact of that, of a cessation of water of up to 60 days in the Bay Area, would be catastrophic.

And the State kind of responded by passing three pieces of legislation. One stipulated that these

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certain major projects would be done and certain moneys would be spent and outlined a time table for those -- not statutorily but a time table at the inception of the project.

The next was that the suburban customers who receive water from us are incorporated as an agency; whereas they had been a loose amalgam beforehand, they are a State-authorized agency. So the State acted, basically saying to the City, "You need to do this, and you need to do it now because there is great danger to the health and well-being of the Bay Area if you don't do it."

We have established a time table, a goal, which is, the end of 2014, to have this program completed. And the reasons for that are the danger to the public health and safety in this entire area should a major earthquake occur.

So the seismic reliability goal was established as, after a major event, there would be basic water service. And that is defined as 215 million gallons of water a day to the customer base within 24 hours. And there would be full water service restored within 30 days.

Those are very aggressive goals. And they are, frankly, more aggressive than other jurisdictions

have. But we cross three earthquake faults so that the likelihood of a major event occurring is far greater in our system, which is essentially a linear system from Hetch Hetchy Reservoir to Fisherman's Wharf.

The delivery reliability kind of harkened to the notion that this system had to have this major program done for it because there has been inadequate maintenance in the system for 70 years, that the revenues generated by the Public Utilities Commission were routinely delivered to the City's general fund instead of repairing the water system.

So that criteria was that this system needs to be maintained, and we need to be able to deliver average-day water while one major either pipeline or storage system is out of service and another one concurrently in an unplanned outage of some sort. So that's the criteria for the maintenance component.

The water quality stipulates that we will comply with all present and known future water quality regulations, either from the federal, state, or local governments. And the water supply identifies two overarching issues. One is a delivery capacity of an average of 300 million gallons of water a day to the overall surface area and that, during a drought, there would be a maximum rationing of 20 percent of average

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delivery of water. And that would be incrementally imposed.

Now, those guidelines, Commissioners, provide us, as management to this program, the ability to actually design all of these individual projects as an interwoven continuum. And they establish the design basis for each one.

You can see here (indicating) -- and I don't know how I'm going to do this. When I was actually managing the City Hall project, I worked really, really hard to get the podium over there and the Commissioners here so the public could see the same documents the Commission could see. But I failed in that effort.

In any event, the system stretches 167 miles from the Hetch Hetchy Reservoir in Yosemite National Park, behind the Hetch Hetchy Dam, which is wholly owned by the City and County San Francisco -- and the authority to do so derives from the Raker Act, which was passed by an act of Congress. It's federal legislation passed in 1914, I believe -- '13, which gave the City of San Francisco the authority to collect the waters behind the O'Shaughnessy Dam and deliver them to the Bay Area.

Michael O'Shaughnessy, whose bust is in the Van Ness entry to City Hall and in the International

Water Hall of Fame, was the engineer. And he was a brilliant, brilliant man. It was entirely constructed, the entire system constructed, by City employees. And that includes the dam, all of the tunnels, all of the treatment plants that actually were not originally constructed, but subsequently -- the entire delivery system, constructed by City employees.

This program starts at the Tesla Portal. This program does not have work to the north or to the east of the Foothill Tunnel. All of the components are to the west of the Foothill Tunnel. And that is -- these improvements would have to be done irrespective of what water is delivered to whom, when, or how much. All of the improvements are a result of deterioration of the system and the necessity to provide for earthquake protection.

As we go down through the system, San Francisco is at the very end, and so the water that we get is a measure of the vitality of the system. And San Francisco -- actually, San Franciscans use per capita less water than any of the other customers. And there are good reasons for that. It's a very dense urban environment, there are very few lawns. I mean, there are good reasons.

But I think one thing that's important to note

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is that, after the severe drought of the late '80s early '90s, the water consumption throughout the entire customer base dropped precipitously and did not rise again. Unlike power -- after the blackouts, there was a reduction of use of electrical power, but it has risen back up to its pre-blackout levels. That's not the case with water, and that's very heartening to us.

So that's -- the level of service established for us the design basis for going forward with this and the criticality of the system as it relates to the likelihood -- which is from today, I believe, 62 percent likelihood of a major event on either the Calaveras Fault, the Hayward Fault or the San Andreas Fault within the next 15 years. It gives us a time frame that we have to respond to.

So with that, what I'll do is walk you through some of the very large projects. I won't bring you through every project. Some are larger; some are smaller. But the very large ones kind of encompass the notion of the criticality and the size of the program.

The program is the largest capital undertaking the City has ever endeavored. It's $4.3 billion worth of work. And Commissioners, it is a City-run, City-managed program, which is highly unusual for an infrastructure program of this sort. Typically cities

or counties or states would hire a consultant -- a Bechtel or a Flour or whatever -- to come in and run their program.

The City is has elected not to do that by agreement between the Mayor and the unions who represent folks that I'm in charge of. And that agreement is that it is a City-run, City-managed program. I feel very comfortable with that. It's extremely difficult. It presents us with very difficult challenges. And we do need to bring in professional consultants to design the dams, the wastewater -- the water treatment plants, the major infrastructure because our city engineers, they are very, very good, but they have never designed those massive infrastructure things.

But it kind of harkens back to the days of Michael O'Shaughnessy. It was originally built by City employees, 100 percent, the entire system.

So with that, let's walk through a few of the major projects.

Uh-oh. Technological glitch.

There it is. This shows the project development cycle. And I wanted to touch on this, because there's a component here that I think is of great interest to us, to the City, and perhaps to this

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Commission.

We have chosen to design 100 percent concurrent with the environmental review. And we are very aware that there is substantial risk involved in doing that, that at the end of the environmental review, the project may be different than the project that was being designed during that concurrent process.

We are willing to take that risk because we have very little time to enact this program. Doing $4 billion worth of work over principally a six-year time span is extremely challenging. So we've decided to take the risk on designing concurrent with environmental review.

This -- this cycle description here shows where the planning phase is and those elements of planning that then allow us to drop down into the environmental review and where, during the environmental review, we feel comfortable then beginning the design work.

Now, in every instance it shows the design phase ending before construction begins. That, in fact, may not be the case in some of these. We may opt to do a bridging design build on some of the very large projects. We haven't made that determination yet.

We do know that our biggest challenge is

actually getting contractors to bid on these projects. These are different contractors than work in San Francisco now. These are contractors that have to post a 3- or $400 million bond and build dams and tunnels and water treatment plants.

Okay. This is one of the major projects (indicating). This is the farthest major project to the east. This is the San Joaquin pipeline system. I think many of you may recall that three years ago -- two years ago, this -- the program called for an entirely new fourth barrel on the San Joaquin pipeline. That is what had been proposed by the folks running the program for a number of years.

Susan asked for a top-to-bottom review of the efficacy of that proposal because the potential existed for the diversion of a great amount of water from the Tuolumne River. Whether the PUC chose to or not, the physical infrastructure would be there to accomplish it. And it would be also, from my viewpoint, extremely expensive and very intrusive. So we developed an alternative to that that did not necessitate a fourth barrel on the San Joaquin pipeline system. We're very happy with that.

It was modified to install a number of crossovers along the three existing pipes and two stubs

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on either end to relieve the hydrostatic pressure so that the amount of water that can pass through there does meet the level-of-service goals but does not exceed them. And that is the case with each one of the major projects that we are going to be developing, that we will meet in the most cost-effective way, the most efficient way, the minimum requirements of the level-of-service goals.

This shows -- this is a photograph of a failure in the San Joaquin pipeline system that took place in I think it was the mid '80s. Those pipes are pre-stressed concrete pipes, one whole reach of them. They are subject catastrophic failure because they are concrete with pre-stressed wire inside the concrete. The wire corrodes over time. And when it gives -- concrete has no tensile strength -- the entire pipe blows outwards. Actually, above this photograph, there is a cow on top of the water plume. That didn't make it in there. That is out in the Central Valley. When those things go, it's really, really catastrophic. There's an enormous amount of water that goes out. So there is a program to rehabilitate those three existing pipes.

This is the Calaveras Dam. I think about seven or eight years ago, the Division of Safety of

Dams which oversees the -- has jurisdiction over the Calaveras Dam, the Crystal Springs Dam, and also the terminal reservoirs in San Francisco which are considered, in effect, dams -- they have jurisdiction. They determined that there was a seismic -- potential for seismic failure at the Calaveras Dam and ordered us to reduce the volume of water behind it by 60 percent. There is now 30 percent of its original carrying capacity [sic]. So we've been operating the system for a number of years now with no reserve in the Calaveras Reservoir, which, in terms of drought, is extremely dangerous for us.

So one of the major programs here is to build a new Calaveras Dam just slightly downstream of the existing one to maintain the same amount of water behind the dam that preexisted before the Division of Safety of Dams ordered its reduction. And that project is a very expensive project. That's a $230-or-40 million dam construction project. And the significance there to us pertains to our overarching obligation to defend the natural environment. And the watersheds around the Calaveras Reservoir, the Alameda Creek watersheds are very, very important to the health of that entire area.

This is a photograph of a portal on the

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Irvington Tunnel. Now, all the waters come down from the Hetchy Reservoir. And there's an obligation in the federal act, the Raker Act, that stipulates that first we must use water from local runoff. And that's the Calaveras Dam and the Crystal Springs Reservoir -- the Calaveras Reservoir being a much more productive reservoir in terms of runoff than Crystal Springs. But the Raker Act stipulates that we have to use local water first.

That local water constitutes about 15 percent of all the water we deliver to our customers, 85 percent coming from the Hetch Hetchy Reservoir through this single aqueduct, down to the entire southern reach below us in Santa Clara, Alameda County, San Mateo County and into San Francisco.

All the water coming from there passes through the Irvington Tunnel. No one has been able to inspect that tunnel for 40 years because, in order to get into it, you have to shut the water off to 2 1/2 million people. That's not tenable. Therefore, the conclusion was it's absolutely necessary to have a redundant tunnel.

The other component here that was of overriding concern, that portal that you see there is subject to failure and landslides following a

significant earthquake. Were that to happen, millions of people would have no water because it would not be able to go through the Irvington Tunnel. So we are -- one of our major projects is the construction of a new tunnel.

This project is not particularly large in the scale of a number of our projects. It's about $65 million. It is, however -- or $80 million. It is, however, critical. The Alameda siphons are just north of the Calaveras Reservoir, just to the west of the Irvington Tunnel. The fault, the Calaveras Fault, passes directly underneath the existing three siphons of the Alameda siphons as the water progresses to the Irvington Tunnel. So we're building a fourth siphon which is earthquake resistant and can withstand the maximum earthquake on that fault.

Next. This is the largest project in the collection of projects that we have, Commissioners. This is a total of $572 million. And it is the amalgam of water transport facilities including a new tunnel across the southern region of San Francisco Bay. The tunnel option is, for us, a much, much better option. It is environmentally far superior to any other option. The existing water pipes go through very, very sensitive wetlands. We can't get out to them to maintain them because we can't pass through the waters. We can't get permission to pass through the waters. And therefore we've determined to build a new tunnel under the southern reach of the San Francisco Bay.

The whole project, the pipeline repairs, the seismic renovation to the pipelines and the tunnel, is nearly $600 million. It is absolutely critical to our ability to deliver water to the Peninsula and to San Francisco to the Harry Tracy Water Treatment Plant to be able to get it safely across the bay and to be able, in the future, to maintain those conveyance facilities.

12.6-115

This project is Crystal Springs-San Andreas Transmission Upgrade. And I'm kind of now bringing you up the Peninsula. The Crystal Springs Reservoir and Pillarcitos Reservoir -- well, the Crystal Springs Reservoir feeds water into the Harry Tracy Water Treatment Plant. And we bring water from Hetchy to recharge Crystal Springs when there is a surplus of Hetchy water that is ours.

Approximately between 1- and 1.8 billion gallons a day of water comes out of the reservoir on an average day. And of that, 300 million gallons is water that is diverted for the use of this entire system of customers. The rest of the water goes to the irrigation districts -- Modesto and Turlock Irrigation

Districts. They have senior water rights. They get first call on it. And they get far more water than the San Francisco system.

But it is imperative for us to be able to deliver water safely out of the Harry Tracy Water Treatment Plant, which is located down at the Crystal Springs Reservoir off 280, up through the Peninsula. And that transmission system is in serious need of repair. So this project addresses the repair of that delivery system.

And finally, in San Francisco, there are three terminal reservoirs. It's kind of like the question of in-city generation of power. When we reviewed the water system, we concluded it was absolutely necessary to have in-city storage of major water facilities. In the event that the system went out, there is a period of time in which there is sufficient water to fight fires and to provide basic water needs. That's what those three terminals, Sunset Reservoir, University Mound Reservoir, and Summit Reservoir are our terminal reservoirs as part of the regional project.

And finally, the recycled water component of this is a $200 million effort to build recycled water plants on the western side of the city and deliver those for use to all of the green spaces in Golden Gate

12.6-116

Park and to be able to reduce our reliance on waters from the Tuolumne River. And that is a very aggressive program. It will, in my view, the recycled water program, expand.

We're looking, Commissioners, very hard in our Wastewater Master Plan at significant opportunities to recycle water on the wastewater side so they may be combined into a much more aggressive recycled water program in San Francisco.

It, to me, is kind of a sad testimony; San Francisco doesn't have nor ever has had one drop of recycled water in it. And we're the most progressive city in the country. So we're working really hard to radically change that in the near future.

So with that, that's a brief overview of our system and some of the major projects. I didn't, in the interest of time, go into all 27, but that should give you a fairly broad view of what we're doing with our staff of approximately 300 city employees and a variety of internationally renowned consultants over at the PUC.

So if you have questions on the system, I'd be happy to answer them.

PRESIDENT ALEXANDER: Thank you very much --

TONY IRONS WITNESS: You are very welcome.

PRESIDENT ALEXANDER: -- for a thorough presentation.

DIANA SOKOLOVE: Hi. This is Diana Sokolove of the San Francisco Planning Department. And I'm just going to give an overview of the Program Environmental Impact Report that we released at the end of June on the Water System Improvement Program.

So this is just an overview of the organization of the Program EIR -- if we can get this up. I guess it takes a moment.

There we go. Volume I includes a summary of the program, and it includes major findings, summary of the program description, and a summary of the alternatives that we evaluated in the Program Environmental Impact Report.

Volume II includes the impacts of the facilities projects, the projects that Tony Irons just mentioned earlier. Most of the projects that are listed there are included in the impact assessment in that volume.

Volume III looks at the impacts of the water supply strategy that the SFPUC is proposing, bringing more water into the area to serve customer demand through 2030.

And Volume IV looks at mitigation measures,

12.6-117

growth inducement impacts, and also the alternatives to the proposed program. Volume IV also looks at variants to the program, which is a little different than CEQA alternatives. The variants are variations on the water supply strategy that the Public Utilities Commission actually specifically asked that Planning look at the impacts of, even though they're not necessarily CEQA alternatives. So it's a little bit different.

So again, we do have an analysis, a very thorough analysis, of the environmental effects of the facility improvement projects. And those projects are located in five regions as we've kind of chopped the entire PUC Water System area into five different regions -- San Joaquin, Sunol Valley, Bay Division, Peninsula, and San Francisco regions.

We looked at construction impacts that may begin in 2008 through 2015. And we looked at mostly the fact that a lot of these projects are going to result in construction impacts. So there's impacts related to noise and air quality and traffic and those kinds of things and they're -- air quality, they're all -- those kinds of things are addressed in that section.

Here's all the areas, the environmental resource areas that we looked at for impacts related to

facility improvement projects, all of the standard areas that you look at in a CEQA document -- noise, air quality, recreation, energy, hazards, et cetera.

So we found, just to give you a summary of the key findings of the Environmental Impact Report, that many of the impacts would be less than significant because the PUC would be complying with existing regulations. They have adopted watershed management plans that ensure that they're complying with regulations and their own policies and regulations, and that also the PUC has a set of standard construction measures that it's going to apply for every construction project in the WSIP.

So that's why you'll see those findings -- for the most part, it's less than significant, although I do feel as though the analysis is pretty conservative. If we didn't feel like a regulation or some sort of -- or an existing measure could reduce impacts to less than significant or ensure that impacts would be less than significant, we would certainly call it significant. And a lot of those impacts that are called as significant can be reduced to less than significant with mitigation.

We do have -- in terms of mitigation, we do look at measures to avoid impacts entirely or at least

12.6-118

to minimize the significant effects. And you can see the kind of range of mitigation measures that we look at. We look at making sure that the projects are sited properly, that if there's any way to site a facility to avoid impact on a wetland, we're putting that in the document.

We're talking about controlling noise through different -- there's different ways that you can control noise -- and making sure that erosion and sedimentation doesn't occur with implementation of these projects. And we also look at doing surveys and making sure that we are protecting the resources the best that we can through this environmental process.

So we also look at the environmental effects of the water supply strategy that the PUC is proposing. And the Water System Improvement Program, as you know, does propose to increase diversions from the Tuolumne River and would modify system operations to meet customer purchase requests through 2030. And some of the effective resources would be the different watersheds throughout the study area, including the Tuolumne River Watershed, Alameda Watershed, Peninsula Watershed, including Pillarcitos Watershed, and the West Side Groundwater Basin.

Actually, you can see these watersheds on the

screen here. Here's the Tuolumne Watershed. It's hard to see with the text on there, but down here is the Alameda Watershed and Peninsula Watershed. And West Side Groundwater Basin is near San Francisco.

So in our water supply impact analysis, we do look at how the PUC is proposing to change system operations, and that can cause changes in the water levels in the reservoirs. And it could cause changes in the amount of water that's released from the reservoirs. And we looked at how those changes would impact our resource areas such as biological resources, recreational resources, aesthetics, et cetera. And we did use what's called a Hetch Hetchy local simulation model to determine impacts in the study area.

So here are our water supply impact areas that we looked at: stream flow and reservoir levels, geomorphology; we looked at surface water quality and surface water supplies; we looked at impacts on fish, impacts on biological resources, and also of course recreational and visual resources.

So I'll just quickly go through the different impacts, the key impacts, that we came up with in the different watersheds. We found impacts on biological resources in the Poopenaut Valley below Hetch Hetchy Reservoir. We do have impacts on fisheries and

12.6-119

riparian resources also along the Tuolumne River. So we certainly called those out in the document.

In Alameda Creek, as Tony mentioned, one of the major projects is the Calaveras Dam replacement project. And that has a bearing upon many of the impacts that are included in the Alameda Creek Watershed analysis. So we looked at the changes in stream flow because the PUC will -- after -- since the DSOD restriction on Calaveras Dam, the PUC has not been taking water off of Alameda Creek to fill the dam. So the PUC would resume that process and restore the existing capacity in the Calaveras Dam through the Calaveras Dam project. So we looked at stream flow below Alameda Creek and the Alameda Creek diversion dam.

We looked at fisheries and riparian resources and the effects of diverting water off the creek on those resources and, of course, the effects on riparian habitat and recreational visual resources.

In the peninsula as, again, as Tony mentioned, some of the major projects are the Lower Crystal Springs Dam Project, repairing that dam, and also the Crystal Springs-San Andreas Pipeline Project. So in that watershed, we looked at water quality and fishery resources, the effects on those resources by repairing

the dam. And we also looked at biological resources and looked at the effects on the different creeks in the watershed.

In the Westside Groundwater Basin, the proposed project includes conjunctive use program that looks at developing groundwater resources. So we looked at impacts in the north Westside Groundwater Basin and also the south Westside Groundwater Basin, in terms of saltwater intrusion and any way that any of these projects could cause overdraft in the groundwater basin. So we certainly looked at all of those effects.

And as you can see, we do have -- we do show impacts in the Program EIR on basin overdraft, seawater intrusion due to increased pumping in that basin. We look at changes in water levels in Lake Merced, potential contamination of drinking water due to groundwater pumping.

And we do propose a wide range of system operations mitigation measures, in other words, ways that the PUC can operate its system a little differently to try to avoid these impacts. We look at managing releases from reservoirs. And also the PUC is proposing a habitat conservation program that we're looking at and using that to reduce impacts on resources, specifically biological resources and fisheries. And we look at revised operations for Pillarcitos and also just making sure that, in the groundwater basin, that we're not causing overdraft or seawater intrusion.

The Program EIR also includes an analysis of the growth inducement effects of the proposed program. And we are concluding that, removing an obstacle to growth by providing this water to serve future demand, that the Water System Improvement Program would remove water supply limitations as an obstacle to growth. So we do show that there would be a growth-inducing impact in the service area or in the area that's served by the PUC.

12.6-120

In our CEQA Alternatives Analysis, we identify alternatives that would reduce our less-than-significant impacts of the proposed program and also meet most of the basic project objectives, program objectives, as required by CEQA. So the program alternatives that we look at address the water supply and the demand level served and also the number and scale of the facility improvement projects that are proposed by the PUC.

So here is the range of alternatives that we looked at. We have the No-Program Alternative, which is required by CEQA. And we have the No Purchase

Request Increase Alternative, which looks at not increasing the water supply to meet customer purchase requests through 2030. We look at an aggressive conservation and water recycling alternative. We look at changing the diversion of water supply to the Lower Tuolumne River. We also look at -- a couple alternatives look at de-sal, one at Oceanside, which is in San Francisco near the zoo, and then there's another one that is a regional de-sal plant that involves a consortium of water purveyors in the Bay Area.

And then we look at what we call the Modified Water System Improvement Program, which we identify as the environmentally preferable alternative. And it really incorporates a lot of the mitigation measures we have in the document and also incorporates some additional revised operations of the Water System.

These (indicating) are just some other alternatives that we considered since we heard from a lot of folks, members of the public, during the scoping. So we were careful to look at all the alternatives that were suggested to us during scoping and anything else that the PUC may have looked at through developing its Water System Improvement Program. And in the document, we discuss very carefully why we rejected these alternatives from

12.6-121

detailed consideration in the environmental report.

So that concludes my presentation. And are there any questions from the Commission on either my presentation or for the PUC?

PRESIDENT ALEXANDER: Thank you.

Commissioner Moore?

L_SFCPC4

COMMISSIONER MOORE: I have a question for Mr. Irons, please.

I think the report is terrific. I'm totally impressed by your daring step to work with local people and not outsource this project, which is typically done, and we all know about it. I hope you will not have the overruns that many of the large nationally important projects have shown. I'm sure you will manage it in a way that will not have it.

L_SFCPC4-01

I'm interested of why Region 6, Hetch Hetchy Region, did not have any problems -- because it's unusual.

L_SFCPC4-02

TONY IRONS: The facilities that are in the Hetch Hetchy Region are the O'Shaughnessy Dam and then a series of tunnels and penstocks and powerhouses. There are three hydroelectric powerhouses up there, which are not relative to the delivery of water but more relative to the generation of power. And then the water goes through a series of tunnels.

Those tunnels are granite tunnels. And while they do need periodic lining, they are maintenance rather than capital projects. So there were no capital projects that needed attention in that area.

COMMISSIONER MOORE: You have a couple of smaller reservoirs, but they do not show any impact from seismic activity. You have, like, the Priest, the Moccasin reservoirs -- which I assume are part of the system.

L_SFCPC4-03

TONY IRONS: That's right. There are no major earthquake faults there.

PRESIDENT ALEXANDER: Thank you.

Commissioner Antonini?

L_SFCPC5

COMMISSIONER ANTONINI: Yeah, Mr. Irons, I have a couple of questions. Thank you for an excellent presentation.

I guess as we talk about some of the parts of the project and the fourth pipeline option, which was not -- or fourth barrel, I guess, more properly, was -- in the San Joaquin system was not chosen, one issue I guess I have in terms of seismic was, by having an alternate pipeline at some other location a distance away, would you prevent, you know, a seismic event from taking the whole system out because you have, you know, two different pipelines; you've got the existing

L_SFCPC5-01

pipeline and then you have an alternate pipeline? I mean, I know that was probably considered as a safety measure perhaps.

L_SFCPC5-01 cont.

TONY IRONS: Yes, Commissioner, it was. There is no active major fault in the San Joaquin Region. They're all to the west of that; the first one is the Calaveras and then the Hayward and then the San Andreas Fault. There are splinter faults that are through there, but there has never been major activity on them.

The issue of the San Joaquin pipelines is that they traverse 50 miles, 47 miles of the Central Valley. They are principally underground. And it's necessary -- when we say the average water delivered on an average day is 300 million gallons a day, that is average on a year-round basis. During the summertime, there are demands upwards above 400 million gallons a day when the water is -- the usage is the greatest.

The San Joaquin pipeline system needs to be able to deliver water that is normally used during the high periods without the potential of failure. So it was concluded -- and I think a number of our Commissioners really kind of agreed with the general manager that the importance, the real importance, in the San Joaquin system was to have three existing pipelines in a state of good repair rather than simply

leaving them in a bad repair and putting a brand-new pipeline in, that it was more prudent to have three in a state of good repair.

COMMISSIONER ANTONINI: Thank you. And in keeping with that, I would assume that the new pipe you talked about -- the concrete having no tensile strength -- would the new pipes be non-concrete or something with greater tensile strength?

L_SFCPC5-02

TONY IRONS: We are in the process of investigating and repairing two of the pipelines. They were incrementally put in from 1934, 19- -- early 1960's and 1970's. The 1970, the most recent pipeline, is the reinforced concrete, pre-stressed concrete pipe. That is the most vulnerable. The newest one is the most vulnerable. The others are steel pipelines and riveted steel. And they were put in as population grew.

And I think -- you know, I think it's right to say that the vision of this -- this is truly a remarkable water system because of the way O'Shaughnessy designed it. It's known internationally as an incredibly special system. It uses no energy to pump water all the way from the Sierras to San Francisco. The issue through the San Joaquin pipelines was to make sure that there was sufficient head,

12.6-123

sufficient water to go through.
So I think that really was the driving force in adding additional pipelines was the additional water needs. Our feeling is that we do not need to create a conveyance facility that is capable of conveying more water than we actually need.
COMMISSIONER ANTONINI: And finally in regards to the Bay Division pipeline and you talked about the tunnel options would replace the lines that currently, I believe, go above water and are on stilts or something above the bay -- L_SFCPC5-03
TONY IRONS: That's right.
COMMISSIONER ANTONINI: -- would those remain or those would be removed? L_SFCPC5-03 cont.
TONY IRONS: Those pipelines -- there's a set that is above the water and some are submarine. The ones that are submarine we would probably leave, we are going to leave. And I actually don't know if we are right now still considering -- still considering removing the above-grade ones --
(Sotto voce discussion)
TONY IRONS: No. We're decommissioning them but not removing them.
And you can see those water pipes when you drive over the Dumbarton Bridge. They're directly to

the south. The issue with doing any work on them is really the wetlands that are on both sides. It's very, very sensitive wetlands. So I believe the final analysis was, from an environmental point of view, it is better simply to leave them than to try and tear them out from the subsoils.
COMMISSIONER ANTONINI: Well, my other point being sort of similar to the other discussion is you have an alternate line there if you needed it in an emergency that might be available were something to happen. You could run it through there. L_SFCPC5-04
TONY IRONS: Absolutely. And I did briefly mention, but I'd like to reiterate, the San Joaquin pipeline system, the addition of the redesign in place of an additional fourth barrel includes a series of three crossover valves. One exists right now. It's being renovated and expanded. But what that basically does for that entire water conveyance system is allows us to take certain reaches of one pipe out of service without taking the entire pipe out of service so that at no point in time do you have only two pipes. You have in essence 2 2/3 or 2 1/2 or whatever is necessary to allow the volume of water to continue. So the crossovers are a good solution to that problem.
COMMISSIONER ANTONINI: Thank you, Mr. Irons.

12.6-124

TONY IRONS: You're welcome.

PRESIDENT ALEXANDER: Thank you, Ms. Leal, Mr. Irons, and Ms. Sokolove. Thank you very much for an excellent presentation. I think it gives us a good framework in which to the review the Draft EIR.

We want to now open for public comments. I do have some speaker cards. Peter Drekmeier?

SI_TRT10

PETER DREKMEIER: Good afternoon, Chair Alexander and Commissioners. Thank you for the opportunity to address you today.

My name is Peter Drekmeier. And I'm the Bay Area Program Director for Tuolumne River Trust, and we appreciate the opportunity to comment on the Draft PEIR, also appreciated the presentations by Mr. Irons and Ms. Sokolove and appreciate the good work they're doing.

Our organization is 100 percent supportive of the seismic upgrades to the Hetch Hetchy system. However, we're very, very concerned about the proposal to divert up to 25 million gallons of water per day additionally from the Tuolumne River. And to put that in perspective, that's the equivalent of 1,000 large swimming pools every day in addition to what's already being withdrawn. SI_TRT10-01

So we have worked with the Sierra Club and

Clean Water Action to provide comments, over 60 pages. I don't know if you'll get to read them all. But we also have a short executive summary. And unfortunately, I don't have enough copies for everyone, but I do have a few copies that I'll leave here for you.

I'm not going to talk so much about our comments right now, but I want to address an issue that's going to be coming up. And it's the proposal to work out a water transfer agreement with Modesto Irrigation District and Turlock Irrigation District, or MID-TID. And it sounds great on the surface, "We'll pay farmers to conserve water so that there's no net loss of water in the Tuolumne system." But there's two problems to this.

First of all, SFPUC withdraws water at Hetch Hetchy, and any conservation would take place 30 miles downstream at Don Pedro Reservoir. So we have impacts to 30 miles of river, about seven miles in Yosemite national park, 18 miles of world class white-water rafting, and home to a number of species, some rare and some threatened. SI_TRT10-02

And the problem is, we don't have a lot of information on the biological resources because many of the studies are dated, some 15 years old or more, never SI_TRT10-03

12.6-125

completed. So our comments were focused mainly on the lack of baseline data, on flawed modeling and faulty assumptions.

SI_TRT10-03 cont.

I see I don't have a lot more time. I was going to read a few things from the MID-TID letter and from the Fish and Game letter, but I'll just sum those up.

First of all, MID-TID have a lot of concerns with this project. And they're not sure there's enough water to do a transfer agreement, and they're uncertain about future releases below Don Pedro. And that's because Fish and Game has pointed out the current flows are inadequate for the Anadromous fish there -- Chinook salmon and the federally threatened Steelhead trout.

And what's probably going to happen in 2016, when the FERC relicensing takes place, is they're going to decrease the flows at LaGrange Dam below Don Pedro. So you're in a tricky position -- I don't envy you -- when it comes time to certify the EIR.

SI_TRT10-04

PRESIDENT ALEXANDER: Thank you.

PETER DREKMEIER: We hope you'll do your best. Thank you.

PRESIDENT ALEXANDER: Art Jensen?

L_BAWSCA6

ART JENSEN: Art Jensen, General Manager, Chief Executive Officer of the Bay Area Water Supply and

Conservation Agency.

Mr. President, Members of the Commission, the Bay Area Water Supply and Conservation Agency, or BAWSCA, represents 27 agencies in Alameda, San Mateo, and Santa Clara counties that purchase water from San Francisco's regional water system and serve it to 1.7 million residents and businesses and community institutions in those counties. They in turn pay two thirds of the costs, roughly, for the operation, maintenance and construction of the regional system.

We've carefully reviewed the PEIR, and overall we believe that it's a well-crafted document. Your staff did an excellent job. It's a very conscientious effort and largely successful, we believe, in meeting CEQA's requirements.

There are two areas where we believe it can be improved. First, the Draft PEIR does not convey the great risk which we all face, nor the urgency for rebuilding the regional water system without delay.

Mr. Irons' presentation, I think, introduced you to the issues associated with the water system traversing four earthquake faults. And those earthquakes could occur at any time. The impacts to public health and safety would be dramatic. The Bay Area Economic Forum study which he cited cites figures

L_BAWSCA6-01

12.6-126

of $20 billion worth of damage. So obviously the investment is a well-centered one.

L_BAWSCA6-01 cont.

Second, the draft PEIR does not describe or analyze the environmentally superior alternative in the detail to which it's warranted. We believe it's an excellent alternative which your staff has come up with in their analysis of the alternatives proposed.

L_BAWSCA6-02

The moderate-city-growth employment forecast for both San Francisco and the BAWSCA area will create a need for additional water over the coming decades. Unlike the urgent problem with the earthquakes, the growth problem will occur over decades, and we have time to solve it.

Our agencies are already committed to meeting a portion of their demands by conserving and recycling 23 million gallons a day worth of water. Those are in the baseline projections that were examined.

The environmentally superior alternative includes an ambitious, legally feasible request for an additional 5 to 10 percent MGD of water conservation and recycled water from our agencies, above and beyond the 23 to which they're already committed.

The centerpiece of the environmentally superior alternative is for Bay Area water customers to financially support water conservation in the

L_BAWSCA6-03

agricultural areas adjacent to the Tuolumne River equal in amount to any additional diversions to the Bay Area. This could avoid net reductions in the Lower Tuolumne River, a portion of the river most important to the salmon and to the other endangered species in the lower part of the river.

L_BAWSCA6-03 cont.

We believe it's an excellent opportunity, has great promise. And our board of directors recommends that you would explore an even greater possibility, and that is, a larger investment in agricultural water conservation to create a net increase in flow in the Lower Tuolumne River, in other words, conserve more than we intend to divert -- we might need to divert to the Bay Area.

L_BAWSCA6-04

PRESIDENT ALEXANDER: Thank you.

ART JENSEN: Thank you.

PRESIDENT ALEXANDER: John Rizzo.

SI_SierraC7

JOHN RIZZO: Good afternoon. I'm John Rizzo with the Sierra Club.

We fully support the critical earthquake upgrades. Our comments to the PEIR focus on the inadequacy of the environmental review of the proposal to divert an additional 25 million gallons a day from the Tuolumne River, a federally designated wild and scenic river.

SI_SierraC7-01

Our comments include some of these points: Inadequate analysis of the impacts inside Yosemite National Park due to changes of releases; faulty urban growth statements that rely on published studies that don't cover the time period up to 2030 and have not undergone environmental review; inadequate baseline data for river flows and fish populations, inadequate mitigations for impacts to rivers and fish, lack of consideration for the effect of global climate change on future snow packs and river flows; for faulty demand projections -- there are many other inadequacies as well.

SI_SierraC7-02

SI_SierraC7-03

SI_SierraC7-04

SI_SierraC7-05

SI_SierraC7-06

SI_SierraC7-07

But other organizations have also pointed out similar problems with the proposed diversion. The San Luis & Delta Mendota Water Authority, Westlands Water District, and Kern County Water agencies were critical. They opposed the proposed diversions from Tuolumne River, saying that there isn't enough data to show the effect on the San Joaquin River watershed and the Delta ecosystem.

I quote, "The failure of the Draft PEIR to consider impacts with the San Joaquin River and Delta is made more egregious by discussions in the Draft PEIR that suggest proper analysis of the impacts which show potentially significant effects."

SI_SierraC7-08

These water agencies also quote the San Francisco Board of Supervisors' resolution that expresses serious concerns with the proposed diversion.

SI_SierraC7-09

The California Fish & Game Department said, "In this context, we believe that the proposed project has the potential to cause Anadromous fish populations to drop below self-sustaining levels, and restrict the range of federally threatened Central Valley Steelhead. Therefore, we respectfully request the SFPUC use alternative water sources other than the Tuolumne River system to meet the purchase request of 2030."

SI_SierraC7-10

They also have a statement about the -- Yosemite that I referred to before. They recommend that the 1987 Instream Flow Agreement be re-evaluated.

SI_SierraC7-11

The Tuolumne County Board of Supervisors has passed a resolution opposing the proposed diversion and threatening legal action to San Francisco.

SI_SierraC7-12

The increased diversion puts this much-needed project at risk. The best way to correct this inadequate Draft PEIR is to drop the proposed increased diversion from the WSIP project. Thank you.

SI_SierraC7-13

PRESIDENT ALEXANDER: Thank you. Is there anyone else desiring to comment on this item?

(No response)

PRESIDENT ALEXANDER: Seeing none, public comment is closed. Written comments can be submitted up until October -- 5:00 p.m., October 15 at the Planning Commission offices. Thank you.

(Whereupon, the proceedings concluded at 4:42 o'clock p.m.)

12.6-128

STATE OF CALIFORNIA)
) ss.
COUNTY OF MARIN)

I, DEBORAH FUQUA, a Certified Shorthand Reporter of the State of California, do hereby certify that the foregoing proceedings were reported by me, a disinterested person, and thereafter transcribed under my direction into typewriting and is a true and correct transcription of said proceedings.

I further certify that I am not of counsel or attorney for either or any of the parties in the foregoing proceeding and caption named, nor in any way interested in the outcome of the cause named in said caption.

Dated the 25th day of October, 2007.

DEBORAH FUQUA
CSR NO. 12948

12.7 Form Letters

FORM LETTERS

CITIZENS WHO SUBMITTED FORM LETTER COMMENTS ON THE DRAFT PEIR

Form 1

Keren Abra
Tom Adams
Karen Boudreaux
Katie Bramlett
Eric Brooks
Susan Burgenbauch
Leslie Chew
Nick Colin
John Cordes
Colette Crutcher
Michael/Tom Duncan/Richard
Don Ehrlich
Don Eichelberger
Ruben Garcia
Peter Gass
Julian Giardinelli
Richard and Valerie Girling
Sami Goski
Barry Hermanson
Carole Herron
Lia Hillman
Mark Jones
Cassandra Kyle
Gary Laufman
Joseph and Vicki/John
Leidner/Radogno
Victoria Lewis
Kirk Lumpkin
Michele Luncy
Laurie McCann
Mary L. McDonnell
Sara Meghrouni
Gale Melton
Mariella Mey
Mark Mills-Thysen
Elan Minvielle
Denis Mosgofian
Kevin Neeson
Chad Nichols
Lauren Nickell
Erica Pederson
Ed Pike
Kevin Rayhill
Dorothy Reinhardt
Janine Richman
Mija Riedel
Hedi Saraf
Patrick Schmitz
Kent Schneeveis
Tara Schubert
Peter, Bonnie, Benard Seidman
Kate Stepan
Maury and Susan Stern
Olav Strawe
Megan Sullivan
Allen Todd
Terry A. Trumbull
Catherine Vowles
Tes Welborn
J. Wong
Ebbe Roe Yovino-Smith

Form 2

Alice Abbott
Bashir Abdullah
Trip Adler
Monika Aeschbacher
Joshua Agan
Bunardi Aiechlanski
Robert Alna
Trudy Alter
Lydia Alva
Bylgia Amadour
Susan Amden
Anna Andersen
Sara Anderson
B.J. Anderson
Kyle Anderson
Theresa Andrews
Max Andrews
Mitchell Aourls
Gary Apter
Lisa Arena
Joe Aristo
Marilyn Arnest
David Artis
Elizabeth Ashcroft
Lani Asher
Nicola Atkins
Laura Atkins
Sarikka Attoe
Sylvia Augustiniok
N. Ausschnitt
Vai Aven
Phyllis Ayer
Richard Babb
J. Bacani
Samuel Bagdorf
Shaun Bailey
Marilyn Bair
John Baker
Yvonne Baker
William Baker
Marilyn Bancel
Teresa Baom
Linda Barnett
Randall Barry
Dirk Bartels
Gail Bartlett
Jason Baum
Nikki Beach
Bruce Beal
Devena Beal
Blanche Bebb
Jessica Bell
Nikki Bengal
Lawrence Bernard
Nellie Bertucci
Max Betkouski
James Biggs
Jon Birnbaum
Sandra Bishop
Gillian Blair
Alex Blanchad
Dian Blomquist
Phil Bloomfield
Ron Boeck
Jordan Bogash
Raymond Bohn
Mitchell Bonner
Sherry Boschert
Sherry Boschert
Alex Boyd
John Boyes
Ava Breembaum
William Breen
Kristina Brennan
Janet Brewer
Simone Brille
Carlos Brito
Ralph Brott

CITIZENS WHO SUBMITTED FORM LETTER COMMENTS ON THE DRAFT PEIR (Continued)

Form 2 (cont.)

Bruce Brown
Maureen Brown
Geoffrey Brown
Tom Browne
Mary Browne
Kent & Jennifer Brownlow
Jordan Brownwood
William Bryant
William Bryant
Lynne Buchholz
Flavia Buda
Michael Buel
Brad Buethe
Ann Burke
Jean Burkhead
Adam Burnett
Jacklyn Button
Davis C
Paul Cahill
Benjamin Caldwell
Susan Calender
Robert Campbell
Matt Campbell
Isaac Campbell
Amy Canalino
Robert Cangelosi
Alma Canindin
Elizabeth Carbajal
Marion Cardinal
Arthur Carey
Caitlin Carini
Rebecca Carino
Hugnette Carleton
Lance Carnes
Kathleen Casey
Gloria Catricala
Leslie Cele
Andria Cercio
Arthur Cerf
Lauren Cha
Lyzanan Chaires
Chan
Kelly Chang
Anne Chang
Loretta Chardin
Elvina Charley
Pearl Chen
Eric Chesmar
May Chin
Karen Christenson
Jonah Christian
Winston Christian
Pelletier Christiane
Kerry Chung
Jesse Church
Mike Burbank Cindy Roberts
Scott Clark
Jackson Clawson
Judy Clayton
Laurence Clement
Nancy Coe
Steven Cohen
Kimberly Cohen
K. Colburn
Dan Coleman
Caroline Coleman
Christopher Concolino
John Conley
Jean Conner
J. Maureen Cook
Gibbons Cooney
Alison Corson
James Corwin
Scott Corwin
Jesse Costello-Good
Curtis & Debi Cournale
John Cowan
Carolyn Crampton
Mr. & Mrs. William Crowe
Elizabeth Curda
John Curran
Tonette Cyprien
Chris Czerkies
Maria Dais
Peter Dalton
Micheal Daly
Tina Dang
Denise D'Anne
Clayton Dart
Michelle Davidson
Sierra Davidson
Ludmilla Davis
George Davis
Claude Davis
Ian Dedrick
Carole Deeb
Matthew Denckla
Martin Denefeld
Sherley Denney
Gertrude Denney
Ernest Dernburg
Ray & Helen Desai
Peter Desmond
Madeline Dessat
Deirdre Devine
Maria Dichov
Matt Dietz
Mark Dillan
Jacqueline Dion
Sofia DiPadova
Ralph DiPadova
Okori Dixon
Fumiko Docker
Claudia Doerr
Janelle Dong
E. Donnelly
Justin Dorsey
Robert Dower
Annie Du
Maria Ducey
Larey Dunn
S. J. Dunne
Mary Dunning
Natalia Dusov
Betty Cornell Eberhardt
Harvey Eckmann
Tom Eckstrom
Scott Edwards
David Egert
Lynne Eggeri
Charlie Scott Elaine Michaud
Gretchen Elliott
Scott Ellis
Jessica Ellis
Ernest Ely
John Emami
Jeri Engstrand
Aviva Enoch
Julie Enright
Jack Ermen
John Erskine
John & Leigh Escobedo
J. Esfacio
Jonathen Esillies
Chris Esparcia
Douglas Estes
Mark Evans
Debra & Brad Evans
Maxamilienne Ewalt
David Fairley
Deborah Farkas
Carol Farley
Geoff Farrell
Alice Farrelly
Michael Fay
Marla Feher
Gavin Feiger
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Ron Ferrato
Kristina Fialova
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June Finis
Raul Fion
Eve Fisher
E. Fleming
Paul Flores
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Muriel Forlerer
Michael Fornalski
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Ellen Frank
Martina Frank
Deborah Frankel
Mark Freeman
Elena Freiwald
Yee-chung Fu
Genevieve Fujimoto
Ryan Gamlin
Andrea Gara
Albert Garcia
Tamayer Garcia
Kevin Garden
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Claudia Gaytan
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Arlene Getz
Sean Gibson
Rose Gillen
Judy Ginsburg
Justin Glosvenor
Randall Goetsl
Kristina Goldberg
Jim Goldstein

CITIZENS WHO SUBMITTED FORM LETTER COMMENTS ON THE DRAFT PEIR (Continued)

Form 2 (cont.)

David Gonzalez
Chris Goodfellow
Deborah Goodson
Jazmin Gorge
Kevin Gottesman
Erica Gould
Robbie Gould
L. Gourley
Don Graham
T.J. Grasshoff
David Gray
Debra Green
Pamela Green
D. Green
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Thomas Hall
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Dean Halpern
F. Hammer
Nedzada Handukic
Jim Hannah
Kristin Hansen
Aimee Harcos
Gabriel Harlow
Craig Harmer
Lisa Harms
Tom Harold
Richard Harrigan
Richard Harrigan
Jill Harris
Tina Harris
Janet Harrison
R. Hayden
Elizabeth Haylock
Loie Hayward
Craig Hecker
Michelle Hecnt
Tim Heiman
Bob Henderson
Corey Hennessy
Ann Henry
Karen Herman
Gustavo Hernandez
Donald Heyneman
John Hicks
Maggie Hill
Mary Hill
Frederick Hirth
Frederick Hirth
Nan Ho
Phillip Hoehn
Mr. & Mrs. William Hogan
Bettie Holaday
Edward Holden
Donald Holley
Jan & Maurice Holloway
Thelma Holmer
Arune Hoover
Cornelia Hoppe
Inge Horton
Carmen Horton
Julia Horvath
Leonard Horwitz
Mark Hotsenpiller
Deborah Howard-Page
Edward Howden
Julianne Howe
Keith Howell
Ying Hsiao
Vicky Huang
Sarah Hudson
Ellen Hughes
Joan & Jack Hughes
Sarah Hummingbird
Karyn Hunt
David Hunter
Lisa Hunter
Carolyn Hutchinson
Lois Hyatt
Jennifer Hymp
Mara Iaconi
Sacha Ielmorini
Eva Ihle
Monica Incerti
Al Inddicato
Hretna Ingadottir
Ernesto Inuro
Rosa Iversen
Zach Ives
Gwendolyn Jacobsen
John Jameson
Denise Jameson
Roy Jarl
Patty Jaundzems
Yari Jeada
Gerald Griffin Jean Clements
Sara Jobin
Diana Scott Joel Schechter
Barbara Johnson
Beverly Johnson
Wiebke Johnson
Linda Jolie
Lori Jones
Jerone Jones
Robin Jones
Myra Jones-Taylor
S. Jordan
Richard Jorgensen
Derek Jostad
Barbara Jue
Marlena Jury
Lisa Kadyk
Eve Kamakea
Elizabeth Kaplan
Jane Kastner
Paula Katz
Fran Kearney
James Keeffe
Audra Kefe
Larry Kelleher
Erwin Kelly
Joan Kelly
Kerri Kelting-Leslie
Wilbert Kemp
Nancy Kenyon
Sabrina Kesler
Sanjay Kewlani
David Keyes
Daniel Kim
Jana King
James Kinsinger
John Kliment
Joseph Knight
Eni Knight
Barbara Kockerols-Alvarez
Carolyn Koester
Blanche Korfmacher
Ana Kreo
Brooke Krohn
Godelieve Kuppens
Amy Kyle
Alex Labanda
Matt Lafferty
Tomi Lahdesneki
Heather Laing-Obstbaum
Theresa Lamb
Theresa Lamb
Barbara Lane
Patricia Langdell
Nechama Langer
Lanoir
Steven Lanum
Melissa Laulle
Curt Lawson
Gary Lea
Alice Leach
Elizaberth Leaf
Joan Leaf
Joan & Elizabeth Leaf
Kelly Leber
Gloria Lee
Preey Lehartowicz
Troy Leone
Salvatore Lesata
David Lesseps
Linda Lewin
Deborah Lewis
Erin Li
Alan Li
Eric Liaw
Harry Lieberman
Lori Liederman
Clifford Liehe
Ho Lin
Irving Lind
Sara Lind
Inavk Linenthal
Lawrence Lipkind
Kelly Liu

CITIZENS WHO SUBMITTED FORM LETTER COMMENTS ON THE DRAFT PEIR (Continued)

Form 2 (cont.)

Alyss Lochen
Brice Lockord
Esther Lomeli
Jean Long
Jacques Longval
Gary Lopez
James Lovette-Black
Patrisha Lowder
Molley & Rich Lowry
Marshall Luck
Nancy Ludcke
Patricia Luddington
Oscar Luna
Torborg Lundell
T.J. Lupis
Kim Lynn
Barbara Lyon
Xiue Ma
Regina Macias
Gwynn MacKellen
Mary Mackin
Miles Madison
Paul Malhin
Karen Malm
Maria Mansi
Ron Mantingh
Bruce Marcucci
Barbara Margolis
Eli Marias
Maria Markoff
Ziliana Martinez
Marcello Martinez
Joseph Martinez
Eric Wells Maryanne Razzo
Caryn Mason
David Massen
Elisabeth Matkin-Sullins
Mary Matrux
Erna Matula
Kelly Maughan
Seth Mausner
Lawrence Maxwell
Alan McAllister
Scarlett McCahill
Michelle McCarron
K. McClune
Alexandra McCormack
Tracey McCormick
Brian McCracken
Norine McCulley
Mary McDonnell
Allison McDonough
R. McEachern
Doyle McGolden
K. McKenna
John McKenna
Bill McLaughlin
Judith McManigal
Joseph Meant
Guadolupe Mecron
Dorothy Medlin
Sue Mehrings
Karen Menuz
Carmen Meraza
John Merchant
Michael Merk
Fred Merrick
Barbara Messmore
Brad Meyers
Chad Michel
Chad Michel
Nica Michoch
Florence Miller
Christine Mills
David Milne
Kala Milosevich
David & Nancy Milton
Buffy Mitchell
Miryum Mochkin
Julian Montellanos
Montez
E. Mooney
Jubilith Moore
Alberto Moran
Joe Moriarty
Colin Morris
Richard Morris
John Morris
Richard Morris
Dennis Mosgofian
Karen Mount
Klaus Muehlmann
Gloria Mundt
Geraldine Murphy
Joanna Murphy
Elizabeth Murrens
Chloe Lewis Myles Conley
Robert Myska
Louise Nakamura
Katrina & Peter Nardini
Julia Nash
Bill Nasser
Jonas Nattoom
Lawrence Nelson
Suzanne Nelson
Vanessa Nelson
Fiya Nelson
Troy Nergaard
Denny Ng
El Ng
Lan Ngo
Marilyn Nichols
Noreen Nieden
Stephanie Niemann
Caitlin No Name Entered
Willard Norley
David Nuegowski
Zilma Nuns
Jessica Nusbaum
Eric Nyman
William O Arge
Patricia O' Neill
Vera Obermeyer
Melody O'Donnell
Claudine Offer
O'Finnegan
Austin Okane
Megan O'Leary
Andrea O'Leary
Pamela Olson
Maureen O'Neal
Eing Ong
Gene O'Ovidio
Trudy Opitz
John O'Reilly
Nicole Osborn
Chris Oshaben
Duke Otoshi
Carolyn Ozarchuk
Paula Page
M. Pains
Jean Palmeter
Sophia Papageorgiou
Holly Pataki-Bettin
Ruth Patschhkowski
Jay Patton
Jon Gatto Paul Colfer
Eli Payton
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John Pendleton
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Marco Antonio Perez
Jack Perkins
Dana Perrigan
Jeffrey Perrone
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Stefanie Peter
Faith Petric
Beth Pewther
Andrea Pfaff
Greta Phillips
Tim Phillips
Susannah Phillips
Nora Phillips
Maryte Piazza
Marianna Pieck
Patricia Pierce
Ed Pike
Alex Pineda
Nancy Piotrowski
John Piva
Wendy Poinsor
Benito Polo
P.D. Poole
Luke Powell
Laurle Prescott
Mariah Price
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T. Przybeck
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Brad Quarstrom
Carlos Quintanilla
Gina Quintinilla
JC Rafferty
Lynn Ragghianti
Gaylin Raisler
Lord Ramsey
Sanjay Ranchod
Stephen Randall
Rebecca Rankin
Martin Ratcliff

CITIZENS WHO SUBMITTED FORM LETTER COMMENTS ON THE DRAFT PEIR (Continued)

Form 2 (cont.)

Charles Rathbone
Patricia Reid
Dale Reihart
D.J. Reilly
M. Reynolds
Judy Reynolds
Jeanne Rice
Gary Richmond
Samantha Rieter
Lillyane Rietmann
Jose Rios
Olga Rios
Michael Ritter
Micca Rivera
Deborah Robbins
Rachel Galsoul Robert Halsy
Lois Roberts
Robin Roberts
Betty Roi
David Romaro
Eddy Rose
Eunice Rosenberg
Isadore Rosenthal
Mitzi Ross
Janet Rossi
Antonio Rossi
Bruce Rueppel
Olivia Ruiz
Kris Spangler Ruth Schlesinger
Patricia Rutherford
Michael Ryan
Frank Ryan
M. Ryan
Carina Ryan Wechsler
Rob Rynski
Mitchell Sacks
Jason Salfi
Kadie Salfi
Canyon Sam
Oscar Samarran
Manuel Sanchez
Xenia Sanders
Luis Santiago
Melissa Sarenae
Lauren & Matt Satlak
Giancarlo Scalise
Joel & Laine Schipper
Susan Schneider
Michele Schoal
David Schott
David Schott
Brigitte Schulz
Edward Schuster
David Scortpimo
Jeanie Scott
Pamela Scrutton
Kinney Shah
Louis Bennett Shauna Sadowski
Cynthia Shaw
Daniel & Helen Sheehan
Kenneth Sherey
Brian Sherry
Tina Shih
Mary Lynn Shimek
Suzanne Shinkle
Esther Shon
Steve Shovelind
Brad Shutzberg
Dano & Elizabeth Silva
Kenneth Silveria
Robert Simac
Case Simmons
Adam Simonoff
Michael Simpson
Marcia Sitaske
Dorothy Skylok
Suellen Sleamaker
Ray Sloan
Susan Smith
Kris Smith
G. Austin Smith
J. Smith
Emily Smith
Aura Smithers
Regina Sneed
Chris Sommerfield
L.E. Sorenson
Carol Soto
Geraldine Souzis
Kathryn Spence
Michelle Spicher
Jim Sprague
Laura Sriclesky
Sridlaran Srivatsan
Fred Stabell
L. Stansfield
Loriel Starr
Kim Steele
Steenbogen
Christina Stephens
Heather Sterner
Leta Sternes
Marilyn Stettler
Jesse Stevens
Claudia Stillwell
Joel Streicker
Adam Strom
Kina Sullivan
Ben Sun
Sara Sunderek
Karin Surber
David McIlhenny
Susan Burkhardt
Katherine Swan
Walter Swan
Walter Swan
Joshua Switzky
Edda Sydow
Paula Symonds
Benilda Taft-Kiewek
Blodwen Tarter
Alicia Tavlen
Ian Tawes
Anna Taylor
LeeAnn Taylor
Jennifer Templin
Rose Terrell
Rakia Thabet
Valentine Thaler
Carol Thenot
Kat They
Nanci Thibs
Callie Thomas
Andrea Hacher Thompson
James Thompson
Benjamin Thompson
Richard Thompson
Pete Thompson
Charles Thornburgh
Thea Miller Thornton Smith
Joelle Tirindelli
Nelson Tobar
Zac Tobias
Alex Tokar
Adrienne Toomey
Flora Torres
Andrew Tosiello
Mary Tovar
Kavita Trivedi
Arthur James Ulam
Karen Ulring
Pat Umhinger
Dan Unger
Harrison Unreadable
Lilly Urbach
George Ushanoff
Elise Vaccarest
Geraldine Vahey
Sylvia Valdez
Paget Valentzas
Barbara Valverde
Edward Van Eqri
M. Van Gils
Paul Van Houten
Laurens Vaneveld
Sally Vangundy
Stephanie Vasilev
Susan Vaughan
Candace Vee
David Velasquez
Randol Venderford
Matthew Vespa
Joe Viallcrino
John Victorino
Villarroel
Martine Vincent
Jane Vincent Corlett
Claire Visconti
Eleanor Visser
Charles Wagner
Johanna Wald
Pamela Wallach
Charles Ward
Paul Washington
Bruce Watts
Lyn Watts
Robert Watts
Catherine Wayland
Marilyn Webb
John Webster
Stefani Wedl
Catherine Wehrmeister
Abby Weidner
Linda Weiner
Tes Welborn

CITIZENS WHO SUBMITTED FORM LETTER COMMENTS ON THE DRAFT PEIR (Continued)

Form 2 (cont.)

Ann Wellington
Doug Wentworth
Andrea Werplman
Debbie West
N. West
Ruth Wetherford
Jeanne Wetzel Chinn
Patty Wheeler
Kathleen White
Mani White
Douglas White
Monroe Whitley
David Willey
Roger Williams
Cynthia Wilsey
Heather Wilson
William Wilson
Elizabeth Wilson
Recha Winkelman
Grace Wi-Santiago
Carl Wolf
Jonathan Wolfe
Carol Wong
F. Wong
Donald Woods
Danny Wright
Huang Xinhng
Karyn Yandar
Henry Yang
Alice Yavorsky
Larry Yavorsky
Leslie Yip
Jeff Younker
Chris Yu
Diane Zacher
Noe Zamoro Flores
Turek Zarzycki
Julian Zepeda
Eric Zivian
Marya Zlatnik
Mike Zucksworth
Lonn
Unreadable Name #1
Unreadable Name #2
Unreadable Name #3
Unreadable Name #4
Unreadable Name #5
Unreadable Name #6
Unreadable Name #7
Unreadable Name #8
Unreadable Name #9
Unreadable Name #10
Unreadable Name #11
Unreadable Name #12
Unreadable Name #13
Unreadable Name #14
Unreadable Name #15
Unreadable Name #16
Unreadable Name #17
Unreadable Name #18
Unreadable Name #19

C_FORM1

Public Comments Needed by October 1st to PROTECT THE TUOLUMNE RIVER!

Take action to stop the San Francisco Public Utilities Commission (SFPUC) from harming the Tuolumne River by signing this comment letter. Please send it to the Tuolumne River Trust in the enclosed envelope so we can deliver it before the October 1st deadline. You can find more information and take action on our website: www.tuolumne.org Thank you for your support!

To: Paul Maltzer, Environmental Review Officer
Water System Improvement Program PEIR
San Francisco Planning Department

Dear Mr. Maltzer:

Your environmental review of the SFPUC's plan to take more water from the Tuolumne River fails to adequately identify and address all of the environmental impacts to the River. I urge you to undertake additional studies of the Tuolumne River before finalizing this document. 01

I support the alternatives identified in your draft document that protect the Tuolumne River from new diversions. Requiring more water conservation, efficiency, and recycling is the best way to lessen impacts to the Tuolumne River while promoting a sustainable water solution for the San Francisco Bay Area. 02

Only by ensuring that healthy amounts of water continue to flow into the Tuolumne River can we protect this irreplaceable natural wonder.

Sincerely,

Name: Mary Louise McDonnell
Address: 7 Aquavista Way
City, State, Zip: San Francisco, CA 94131

C_FORM2

Protect the Tuolumne River!

To: Commissioner Ryan L. Brooks, President
San Francisco Public Utilities Commission

With its headwaters in Yosemite National Park, the Tuolumne River is a national jewel that is home to an outstanding native trout fishery, bald eagles, black bears, and thrilling whitewater.

Unfortunately, instead of increasing water conservation and recycling efforts, the San Francisco PUC plans on meeting future water demand by taking more water out of the Tuolumne, a federally designated Wild and Scenic River. 01

I urge you to meet our water needs and protect the Tuolumne River for future generations through conservation and recycling rather than withdrawing more water and depleting the Tuolumne River.

The fate of the Tuolumne River rests in your hands.

Sincerely,

Name: Elise Vaccarest
Address: 1640 Vallejo St. #6
City: S.F. State: CA Zip: 94123
Phone: 415/775-7593
E-mail:

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October 30, 2008

Final
Program Environmental Impact Report
Volume 7a of 8

For the
San Francisco Public Utilities Commission's
WATER SYSTEM IMPROVEMENT PROGRAM

Responses to Comments

San Francisco Planning Department File No. 2005.0159E
State Clearinghouse No. 2005092026

Draft PEIR Publication Date: June 29, 2007

Draft PEIR Public Hearing Dates:
September 5, 2007 in Sonora
September 6, 2007 in Modesto
September 18, 2007 in Fremont
September 19, 2007 in Palo Alto
September 20, 2007 in San Francisco
October 11, 2007 in San Francisco

Draft PEIR Public Comment Period: June 29, 2007 through October 15, 2007
Comments and Responses Publication Date: September 30, 2008
Final PEIR Certification Date: October 30, 2008

City and County of San Francisco
San Francisco Planning Department

October 30, 2008

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City and County of San Francisco
San Francisco Planning Department

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13. Introduction to Responses and WSIP Revisions

CHAPTER 13
Introduction to Responses and WSIP Revisions

13.1 Overview of Responses to Comments

Organization

This is Volume 7 of the Program Environmental Impact Report (PEIR) on the San Francisco Public Utilities Commission's (SFPUC) Water System Improvement Program (WSIP or proposed program) and presents the responses to comments received on the Draft PEIR. Copies of the comments are contained in Volume 6, and appendices to the Comments and Responses are contained in Volume 8; together, Volumes 6, 7, and 8 make up the Comments and Responses document. The Draft PEIR, published on June 29, 2007, consists of Volumes 1 through 5, and when combined with the Comments and Responses document (Volumes 6, 7, and 8), constitutes the Final PEIR on the WSIP.

The Comments and Responses document is separated into three volumes. Volume 6, Comments, consists of two chapters. Chapter 11 in Volume 6 is an introductory chapter that describes the purpose of the Final PEIR as well as the organization and coding of the comments; it includes a list of all agencies, organizations, and individuals that submitted comments on the Draft PEIR and describes the coding system used to identify individual comments. Chapter 12 contains copies of all comments received on the Draft PEIR and identifies each comment by alphanumeric code.

Volume 7, Responses, consists of Chapters 13 through 16. This chapter, Chapter 13, describes the organization of the responses to the comments received on the Draft PEIR and also describes changes in the WSIP that have been proposed by the SFPUC since publication of the Draft PEIR. The SFPUC has proposed revisions to the WSIP in three areas, either in response to comments received on the Draft PEIR or as part of its ongoing system operations and planning. These revisions include: (1) changes in the project descriptions of two WSIP facility improvement projects (both of which help reduce impacts associated with the projects as originally proposed) which affect overall system operations; (2) updated water system assumptions and corresponding updates in the system modeling and results; and (3) development of the Phased WSIP Variant, a "hybrid" program that is a combination of the proposed program and one of the alternatives analyzed in the Draft PEIR. As described below, none of these changes to the WSIP affect the impact conclusions presented in the Draft PEIR; they do not result in new or more severe environmental impacts than those previously disclosed in the Draft PEIR.

Chapter 14 contains master responses, which provide comprehensive discussions to respond to select sets of issues that received multiple comments, and it includes cross-references to the individual comments being addressed using the alphanumeric codes shown in Volume 6, Chapter 12. Chapter 15 presents the individual responses directed specifically to each comment; in some cases, the reader is referred to a master response in Chapter 14 or to another individual response that addresses the same issue. Chapter 16 contains text changes to the Draft PEIR that resulted from: (1) changes made in response to comments received on the Draft PEIR; (2) changes that reflect the WSIP revisions; or (3) changes to correct errors or to clarify information presented in the Draft PEIR. Volume 8, Appendices, provides supporting documentation for information presented in the Comments and Responses document.

Responses

As required by Section 15132 of the Guidelines for the California Environmental Quality Act (CEQA Guidelines), the responses in this volume address significant environmental issues raised by commenters during the review period. They are intended to provide clarification and refinement of information presented in the Draft PEIR and, in some cases, to correct or update information in the Draft PEIR. In some instances, the text of the Draft PEIR has been revised in response to a comment, and the revised text is included as part of the response. The reader is referred to Volume 6, Chapter 11, Tables 11.2 through 11.7, for a complete list of commenters and the alphanumeric comment identification codes.

Due to the repetitiveness of many issues raised by commenters, Chapter 14 includes master responses that provide a more comprehensive discussion of related issues. Chapter 15 includes responses to every individual comment, although sometimes a response refers the reader to either a master response or another response. The responses to the individual comment letters in Chapter 15 are organized by commenter type (federal, state, or local/regional agency; special interest group; or citizen) and referenced by the alphanumeric code corresponding to the comment. Responses to oral comments received during public hearings (see Section 12.6, Public Hearing Transcripts, in Vol. 6, Chapter 12) are integrated with the responses to written comments and are included in Chapter 15 by commenter type.

Many comments received on the Draft PEIR did not address the adequacy or accuracy of the environmental analysis or did not identify any other significant environmental issue requiring a response; rather, these comments were directed toward the perceived merits or demerits of the proposed WSIP, provided information, or expressed an opinion without specifying why the Draft PEIR analysis was inadequate. The San Francisco Planning Department, as the CEQA lead agency, acknowledges the receipt of these types of comments; however, limited responses are provided to these comments as they do not relate to the adequacy or accuracy of the Draft PEIR or otherwise raise significant environmental issues.

Where a response to a comment includes a change to the text of the Draft PEIR, the text changes are shown in <u>underline</u> for additions and ~~strikethrough~~ for deletions.

Some issues received a substantial number of comments from numerous commenters, demonstrating common concerns among agencies, special interest groups, and members of the public. For these issues, a comprehensive discussion of the issue and related topics is presented as a master response in Chapter 14 of this document. Each master response provides an integrated and comprehensive response to a particular issue and related concerns. The master responses are listed below:

- 14.1 Master Response on WSIP Purpose and Need
- 14.2 Master Response on Demand Projections, Conservation, and Recycling
- 14.3 Master Response on Proposed Dry-Year Water Transfer
- 14.4 Master Response on PEIR Appropriate Level of Analysis
- 14.5 Master Response on Water Resources Modeling
- 14.6 Master Response on Upper Tuolumne River Issues
- 14.7 Master Response on Lower Tuolumne River Issues
- 14.8 Master Response on Delta and San Joaquin River Issues
- 14.9 Master Response on Alameda Creek Fishery Issues
- 14.10 Master Response on Modified WSIP Alternative
- 14.11 Master Response on Climate Change

13.2 Program Description Changes Affecting System Operations

Since publication of the Draft PEIR in June 2007, the SFPUC has modified the project descriptions of two of the facility improvement projects—the Alameda Creek Fishery Enhancement (SV-1) and Calaveras Dam Replacement (SV-2) projects—and these proposed changes would affect overall system operations (SFPUC, 2008a). These modifications were made due to the numerous comments received on the potential impacts on future steelhead fishery resources in the Alameda Creek watershed as well as to actions taken in July 2007 by other agencies in the watershed. The SFPUC has incorporated project revisions and protective measures into these two projects to reduce the WSIP's potential to affect habitat conditions for potential future-occurring steelhead in the upper watershed. The project revisions would occur regardless of steelhead presence or absence in the upper watershed, while the protective measures were designed to reduce the WSIP's potential to affect habitat conditions for potential, future-occurring steelhead in the Alameda Creek watershed in the event that man-made barriers in Alameda Creek are removed and steelhead gain access to the upper watershed.

The proposed project revisions and protective measures would provide both a long-term strategy to ensure habitat protection as well as interim measures in the event that regulatory agencies have determined steelhead to be present above the BART weir, construction of the Calaveras Dam Replacement project is complete, and the Alameda Watershed Habitat Conservation Plan is yet to be finalized. Please refer to **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14) for further description of the project revisions and protective measures.

In summary, the following project revisions have been incorporated into the Alameda Creek Fishery Enhancement (SV-1) and Calaveras Dam Replacement (SV-2) projects:

- The Calaveras Dam Replacement project would include facility modifications at the Alameda Creek Diversion Dam (ACDD) to construct a new bypass structure needed to implement bypass stream flows.

- If a structural alternative involving construction of a recapture facility is selected under the Alameda Creek Fishery Enhancement project, the recapture facility would be located at the downstream end of the reach of Alameda Creek between the lower Sunol Valley and the confluence with Arroyo de la Laguna. As an alternative to the recapture facility, the SFPUC may coordinate with other water agencies to develop and implement other means of recapturing fishery enhancement flows consistent with the 1997 California Department of Fish and Game Memorandum of Understanding (CDFG MOU).[1]

The project components designed to provide protective measures for future-occurring steelhead in the upper Alameda Creek watershed would include the following:

- An operational plan to provide minimum stream flows to support steelhead spawning below the ACDD to the confluence with Calaveras Creek when precipitation naturally generates runoff and flow in the creek, including the site-specific studies needed to determine the specific minimum stream flow requirements to support steelhead spawning in this reach of the creek.

- A detailed monitoring plan to survey and document steelhead spawning, subject to review and comment by the appropriate resource agencies.

- Interim minimum flows would be implemented consistent with the 1997 CDFG MOU, with the additional requirement that these flows would be achieved through bypass flows at the ACDD at all times when flows are available in upper Alameda Creek, rather than through releases at Calaveras Dam, and with the following conditions:

  – The SFPUC would provide seasonal flow bypasses at the ACDD and/or flow releases from Calaveras Dam, either (1) without recapture or (2) with recapture at a point approximately at the downstream end of the reach of Alameda Creek between the lower Sunol Valley and the confluence with Arroyo de la Laguna, below critical riffle locations or lower in the creek, between December 1 and June 30 (combined adult and juvenile migration period) in an amount equivalent to the flow release schedule provided in the 1997 CDFG MOU.

  – As an alternative to the recapture facility, the SFPUC would coordinate with other water agencies to develop and implement other means of recapturing enhancement flows consistent with the 1997 CDFG MOU at a location downstream of the reach of Alameda Creek between the lower Sunol Valley and the confluence with Arroyo de la Laguna.

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1 Under the 1997 CDFG MOU, the SFPUC and CDFG reached agreement on the magnitude and timing of flows to be released from Calaveras Reservoir for the purposes of improving fishery habitat conditions. The MOU includes provisions for the SFPUC to divert flows from Alameda Creek to the SFPUC regional system at a suitable downstream location equivalent to the magnitude and timing of these releases; the MOU refers to this as "recapture."

In Draft PEIR Tables S.2 and 3.10 (Vol. 1, Summary, p. S-12, and Chapter 3, p. 3-50), the following text related to the location and description of these two facility improvement projects is revised to incorporate information about these recently initiated planning efforts:

No.	Project Title	Location of Preferred Project	Project Description
SV-1	Alameda Creek Fishery Enhancement	Structural Alternatives: Alameda Creek in Sunol Valley, downstream of Calaveras Dam	This project would recapture the water released as part of the Calaveras Dam project (SV-2) and return it back to the regional system for use. A number of structural and non-structural recovery alternatives are under consideration for this project, including: a water recapture facility downstream of the Sunol Valley WTP, conjunctive groundwater use, horizontal collector wells, or other groundwater recovery systems yet to be defined. Other alternative designs for this project could be developed. If a structural alternative involving construction of a recapture facility is selected, the recapture facility would be located at the downstream end of the reach of Alameda Creek between the lower Sunol Valley and the confluence with Arroyo de la Laguna. As an alternative to the recapture facility, the SFPUC may coordinate with other water agencies to develop and implement other means of recapturing fishery enhancement flows consistent with the 1997 CDFG MOU.
SV-2	Calaveras Dam Replacement	Sunol Valley, immediately downstream of existing dam and at the Alameda Creek Diversion Dam	This project would provide for the planning, design, and construction of a replacement dam at Calaveras Reservoir to meet seismic safety requirements. The new dam would provide for a reservoir with the same storage capacity as the original reservoir (96,800 acre-feet), but the replacement dam would be designed to accommodate enlargement of the dam in the future. The preferred project would include construction of: • New earthfill dam • New intake tower and new outlet valve for water releases for instream flow requirements • New or rehabilitated outlet works for seismic safety and improved operations and maintenance • New bypass structure at the Alameda Creek Diversion Dam As part of this project, Calaveras Reservoir and the proposed bypass structure at the diversion dam would be operated to release up to 6,300 acre-feet per year (5.5 mgd) of water to Alameda Creek in support of fisheries in compliance with the 1997 CDFG MOU. When flow is available in Alameda Creek, releases would be made through the proposed bypass structure at the Alameda Creek Diversion Dam and would be supplemented as necessary with releases from Calaveras Dam.

These project description modifications would generally reduce the impacts identified in the Draft PEIR, and, in some cases, would reduce impacts from potentially significant to less than significant (i.e., Impacts 5.4.7-1 and 5.4.7-2). The refined impact analyses associated with these project description modifications, including the discussions on Impacts 5.4.7-1 and 5.4.7-2, are presented in Chapter 16, Staff-Initiated Text Changes (Vol. 7).

13.3 Updated Water System Assumptions and Modeling

As described in the Draft PEIR (Vol. 3, Chapter 5, p. 5.1-9), the SFPUC utilizes a computerized water supply planning model to assist in the evaluation of its water systems operations—the Hetch Hetchy/Local Simulation Model (HH/LSM). Data from the HH/LSM were used in the Draft PEIR to evaluate the impacts of WSIP water supply and system operations on resources in the Tuolumne River, Alameda Creek, and Peninsula watersheds (Vol. 3, Chapter 5). In 2008, subsequent to publication of the Draft PEIR, the SFPUC conducted updated model runs using more recent input assumptions for several model parameters as part of its ongoing system planning and management. The revised input assumptions included the following:

- Adjusted capacity for Crystal Springs Reservoir based on recent survey data
- More accurate assumptions for Pilarcitos facilities operations
- Improved data regarding the historical hydrology in the Alameda Creek watershed
- Updated agricultural demands in the service areas of the Modesto Irrigation District (MID) and Turlock Irrigation District (TID) to be consistent with data used in recent statewide planning documents
- Refinement in the water release protocols at Don Pedro Reservoir

Review of the 2008 model output indicated that the results are generally consistent with the 2007 results used in the Draft PEIR impact analyses of water supply and system operations, and that the analyses and impact determinations presented in the Draft PEIR remain valid. With one exception, no changes in the Draft PEIR impact approach, analysis, or conclusions are necessary for the water supply and system operations impact assessments. The sole exception is the approach to the analysis of impacts on Pilarcitos watershed resources, for which only semi-quantitative data were previously available. Therefore, the 2008 data were used to conduct a refined impact analysis of the Pilarcitos watershed resources; no new impacts were identified in the refined analysis. The results of the refined impact analysis for the Pilarcitos watershed are summarized below, and the complete refined impact analysis is presented in Chapter 16, Staff-Initiated Text Changes.

In select instances, the Draft PEIR text and tables presenting the 2007 results have been updated with the 2008 results where useful to reflect this more current information; it should be noted that there are no changes in any of the impact analyses or conclusions as a result of the revised model data. In addition, review of the 2008 HH/LSM data provided additional insight in understanding the potential range and magnitude of impacts, and some revisions to the Draft PEIR text based on the updated HH/LSM modeling are included in Chapter 16, Staff-Initiated Text Changes, to provide refinement and clarification of the impact discussions. However, no staff-initiated text changes are provided in Chapter 16 to replace 2007 results with the updated 2008 results if the impact approach, analysis or conclusions are unaffected by the updated modeling.

One of the notable outcomes of the updated HH/LSM output is a refinement in the estimated magnitude of dry-year water transfers that would be required under the WSIP. The 2007 model results used in the Draft PEIR indicated that an equivalent of 23 million gallons per day (mgd) (annual average over the 8.5-year design drought) of supplemental Tuolumne River water obtained through water transfer agreements with TID and MID would be required to meet the WSIP level of service objectives (see Vol. 1, Chapter 3, p. 3-36). The updated 2008 analysis indicates that this number would be 26 mgd. Please refer to **Section 14.3, Master Response on Proposed Dry-Year Water Transfer** (Vol. 7, Chapter 14) for further explanation of this updated information.

Refined Pilarcitos Watershed Impact Analysis

The refined impact analysis for the Pilarcitos Creek watershed involved updated modeling using the HH/LSM as well as biological field reconnaissance. The refined analysis enabled a more precise identification of the potential impacts of the WSIP in that watershed. No new impacts were identified that were not documented in the Draft PEIR, but several impacts identified as potentially significant in the Draft PEIR were reevaluated and determined to be less than significant. Analysts were able to reclassify terrestrial biological and fishery impacts at Pilarcitos Reservoir and terrestrial biological impacts at Pilarcitos Creek between the reservoir and Stone Dam as less than significant. The revised impacts are reflected in Chapter 16, Staff-Initiated Text Changes.

In the Draft PEIR, a mitigation measure was proposed that would lessen or eliminate all potentially significant adverse impacts of the WSIP in the Pilarcitos Creek watershed (Measure 5.5.3-2, Revised Operations Plan for Pilarcitos Watershed Facilities). Under the revised operations plan identified in this measure and with the WSIP in place, the SFPUC would develop protocols that would enable it to operate its Pilarcitos Creek watershed facilities just as it does under the existing conditions. Future operations would mimic existing operations as closely as possible and, consequently, there would be little or no change in environment impacts. However, an attempt to develop the protocols led to the conclusion that the revised operations plan envisaged under Measure 5.5.3-2 would be technically challenging and that other more practical solutions are available.

More practical mitigation measures to replace Measure 5.5.3-2 were developed subsequent to publication of the Draft PEIR and are included in Volume 7, Chapter 16. The replacement mitigation measures would reduce the potential impacts of the WSIP in the Pilarcitos Creek watershed to a less-than-significant level. They include:

- Measure 5.5.3-2a, Low-Head Pumping Station at Pilarcitos Reservoir, which would lessen fishery and water quality impacts in Pilarcitos Creek between Pilarcitos Reservoir and Stone Dam
- Measure 5.5.5-5, Establish Flow Criteria, Monitor and Augment Flow, which would lessen fishery impacts in Pilarcitos Creek below Stone Dam

Because Measure 5.5.3-2a could itself result in potentially significant water quality, fisheries, and terrestrial biological impacts at Pilarcitos Reservoir, two additional measures were developed to mitigate these impacts. The potential water quality and fisheries impacts in Pilarcitos Reservoir would be reduced to a less-than-significant level through implementation of Measure 5.5.3-2b, Aeration System at Pilarcitos Reservoir; this measure also addresses potentially significant impacts on fisheries in Pilarcitos Creek below the reservoir. The potential terrestrial biological impacts at Pilarcitos Reservoir due to Measure 5.5.3-2a would be reduced to a less-than-significant level through implementation of Measure 5.5.3-2c, Habitat Monitoring and Compensation.

13.4 Phased WSIP Variant

Introduction

In March 2008, the SFPUC determined that it would like the option to consider approval and implementation of a variation of the WSIP called the Phased WSIP Variant (SFPUC, 2008b; SFPUC, 2008c). The SFPUC identified this variation in order to consider a program scenario that would involve *full implementation of the proposed WSIP facility improvement projects* to ensure that the public health, water quality, seismic safety, and delivery reliability goals are achieved as soon as possible, but a *phased implementation of water supply delivery through 2030*. Phasing the water supply element of the WSIP would allow the SFPUC and its wholesale customers to focus first on implementing additional local recycled water, groundwater, and demand management actions while minimizing additional diversions from the Tuolumne River. Under this variant, the SFPUC would establish an interim, mid-term planning horizon—the year 2018. If the SFPUC adopts this variant, it would make a decision about future water supply to its customers through 2018 *only* and defer a decision regarding long-term water supply until after 2018. All WSIP goals and level of service objectives that are not related to 2030 water supply levels would be achieved under this variant, and all individual WSIP facility improvement projects proposed by the SFPUC would be constructed.

Under this variant, the SFPUC would limit average annual water deliveries supplied from its watersheds to 265 mgd. This generally represents the base-year level of supply delivered from the SFPUC watersheds through the regional water system to both the retail and wholesale customers analyzed in the Draft PEIR.[2] The SFPUC would maintain the 265 mgd average annual delivery of surface water from the SFPUC watersheds to existing levels through 2018. At the same, through 2018, the SFPUC would implement the delivery and drought reliability element of the WSIP, including proposed dry-year transfers from MID/TID coupled with the Westside Basin conjunctive use program, which would increase average annual diversions from the Tuolumne River by about 2 mgd over the existing conditions.

[2] The SFPUC watersheds that supply surface water to the regional system include the local watersheds—the Alameda Creek and Peninsula watersheds—and the Tuolumne River watershed. Under this variant, similar to existing conditions, the Tuolumne River watershed would provide approximately 85 percent and the local watersheds would provide approximately 15 percent of the water supply delivered to customers.

By 2018, the demand on the SFPUC regional water system is projected to be 285 mgd, consisting of 91 mgd for the retail customers and 194 mgd for the wholesale customers, based on the purchase requests developed by the wholesale customers as part of the WSIP planning process. To satisfy the remaining 20 mgd of demand on the regional system through 2018 while holding deliveries from the SFPUC watersheds to 265 mgd, the SFPUC proposes development of local conservation, recycled water, and groundwater projects within its service area. As proposed under the WSIP, the Phased WSIP Variant would develop 10 mgd of local supply and supply offsets through conservation, recycled water and groundwater projects in San Francisco. The SFPUC also proposes to develop an additional 10 mgd of local conservation, recycled water, and groundwater within the service area under this variant through one of the following three approaches:

- The SFPUC, wholesale customers, and Bay Area Water Supply and Conservation Agency (BAWSCA) partner to develop an additional 10 mgd in local conservation, recycled water, and groundwater within the service area; or
- BAWSCA and the wholesale customers develop an additional 10 mgd in local conservation, recycled water, and groundwater within the wholesale customer service area, independent of the SFPUC; or
- Individual wholesale customers develop 10 mgd of additional conservation, recycled water, and groundwater on their own within their individual services areas.

The SFPUC has initiated discussions with BAWSCA and the wholesale customers to determine the best approach to develop the additional 10 mgd of local supply/conservation needed under this WSIP variant to fully meet the wholesale customer needs through 2018.

By 2018, the SFPUC would reevaluate the wholesale customer delivery amount and consider whether to maintain these delivery limitations from the SFPUC watersheds through 2030 or increase them, and whether and how to provide additional supply to the wholesale customers. In the years approaching 2018, the SFPUC would update demand projections for its wholesale and retail customers and reevaluate customer water delivery needs and water supply options. As part of the process, the City and County of San Francisco (CCSF) would conduct additional environmental studies and CEQA review as appropriate to address the SFPUC's recommendation regarding water supply and proposed water system deliveries after 2018.

The following subsections describe the Phased WSIP Variant in more detail and summarize the environmental impacts associated with this variant based on the analysis in the PEIR. In summary, this variant includes the following key program elements:

- Full implementation of WSIP facility improvement projects.
- Water supply delivery to wholesale and retail regional system customers through 2018 of at least 275 mgd average annual target delivery, and up to an additional 10 mgd of conservation, recycled water, and groundwater developed in one of the three approaches described above. This includes 91 mgd for the retail customers and 184–194 mgd for the wholesale customers.

- Water supply sources include: 265 mgd average annual delivery from the SFPUC watersheds (i.e., the Tuolumne River watershed and the local watersheds), 10 mgd of conservation, water reuse, and groundwater developed by the SFPUC within San Francisco but used to meet regional system delivery needs, and up to an additional 10 mgd of conservation, water reuse, and groundwater developed in one of the three approaches described above.

- Dry-year water transfer from MID/TID of about 2 mgd coupled with the Westside Groundwater Basin conjunctive-use project to meet the drought-year goal of limiting rationing to no more than 20 percent on a systemwide basis.

- Reevaluation of 2030 demand projections, potential regional system demand (purchase requests), and water supply options by 2018, and SFPUC decision in 2018 regarding regional water system deliveries after 2018.

As further described below, the potential environmental effects of the Phased WSIP Variant fall within the range of impacts already evaluated in the Draft PEIR for the WSIP and the alternatives. This program variation is similar to the No Purchase Request Increase Alternative analyzed in the Draft PEIR. That alternative also limits average annual regional water system deliveries from the SFPUC watersheds to approximately 265 mgd, but it does so through 2030, while the Phased WSIP Variant only establishes this limit through 2018. Although the Phased WSIP Variant does not include a specific water supply proposal beyond 2018, for purposes of environmental impact analysis and comparison to the proposed WSIP and other alternatives evaluated in the PEIR, the following discussion assesses the range of water supply that could be provided under this variant through 2030. On the low end of the range, after 2018 and through 2030 under the Phased WSIP Variant, deliveries from the SFPUC watersheds could continue to be limited to 265 mgd, similar to the No Purchase Request Increase Alternative. On the high end of the range, after 2018 and through 2030, the SFPUC could propose to increase surface water deliveries from the watersheds and meet the additional projected 2030 demands of up to 15 mgd on the regional water system for a total demand of 300 mgd, which could include average annual deliveries from the SPFUC watersheds of up to 280 mgd coupled with up to 20 mgd of local conservation, recycled water, and groundwater previously implemented in the first phase by 2018. This would provide the retail customers with 91 mgd and the wholesale customers with 209 mgd in average annual deliveries. This high-end scenario would be similar to the Modified WSIP Alternative, which assumes 10 mgd of conservation, recycled water, and groundwater in San Francisco and 10 mgd of conservation, recycled water, and groundwater in the wholesale service area.

The No Purchase Request Increase Alternative is discussed in Draft PEIR Section 9.2.3 (Vol. 4, Chapter 9, pp. 9-40 to 9-47) and Section 9.3 (pp. 9-84 to 9-96). Also relevant are the analyses of the No Program Alternative (Section 9.2.2, pp. 9-23 to 9-40), the Aggressive Conservation/Water Recycling and Local Groundwater Alternative (Section 9.2.4, pp. 9-47 to 9-59), and the Modified WSIP Alternative (Vol. 4, Chapter 9, Section 9.2.8, pp. 9-78 to 9-84; and Vol. 7, Chapter 14, Section 14.10, Master Response on Modified WSIP Alternative).

Description of SFPUC and Wholesale Customer Actions

SFPUC Actions

Water Delivery

Table 13.1 summarizes the SFPUC average annual water deliveries to its retail and wholesale customers under the WSIP, the No Purchase Request Increase Alternative, and the Phased WSIP Variant. Under the Phased WSIP Variant, the SFPUC proposes to establish an interim delivery amount through the year 2018, and then to either maintain this same delivery amount through 2030 or increase it, possibly up to the level proposed under the WSIP.

TABLE 13.1
SFPUC AVERAGE ANNUAL WATER DELIVERIES UNDER THE PHASED WSIP VARIANT

Supply Source	SFPUC Regional System Average Annual Water Deliveries (mgd)		
	Existing Condition 2005	WSIP (Proposed Program) 2030	Phased WSIP Variant 2018
SFPUC Watersheds			
Retail customers[a]	91	81	81
Wholesale customers	174	209	184
Total	**265**	**290**	**265**
Local Conservation, Recycled Water, and Groundwater (not included in purchase requests)			
Retail customers	0	10	10
Wholesale customers	0	0	0 – 10 [b]
Total	**0**	**10**	**10 – 20**
Total from all sources	**265**	**300**	**275 – 285**

a The SFPUC retail customer deliveries include 1 mgd delivered to Castlewood in the Pleasanton area that is supplied by local groundwater rather than from the regional system. Thus, although this delivery amount is included in the SFPUC retail customer delivery total, 90 mgd represents the current and future deliveries to retail customers that are and will continue to be made from the regional system.
b A range is provided because 10 mgd may be provided by SFPUC in partnership with BAWSCA and wholesale customers or BAWSCA and wholesale customers may choose to separately develop this 10 mgd.

The 2030 regional system water deliveries shown in Table 13.1 for the WSIP reflect wholesale customer purchase requests of 209 mgd (see the Draft PEIR, Vol. 1, Chapter 3, pp. 3-16 to 3-22 for a discussion of the wholesale customer purchase requests developed for the WSIP). Under the WSIP, the 2030 combined retail and wholesale customer purchase requests of 300 mgd would be met with up to 290 mgd of supply from the SFPUC watersheds and 10 mgd from local conservation, recycled water, and groundwater projects developed in San Francisco and used to meet the overall regional system needs. Under the Phased WSIP Variant, the regional system target delivery for the wholesale customers in 2018 would range from 184 mgd to 194 mgd, depending on how BAWSCA and wholesale customers elected to develop the required additional

10 mgd of local conservation, recycled water, and groundwater needed. If the SFPUC and BAWSCA partnered to jointly develop the additional 10 mgd of local supply and conservation and made it part of the regional system supply portfolio, then the wholesale customer delivery target for the regional water system would be 194 mgd to match their purchase requests. If BAWSCA and/or the wholesale customers decided to develop the additional 10 mgd of conservation, recycled water, and groundwater independent of the SFPUC and not make it part of the regional system supply portfolio, then the wholesale customer delivery target from the regional system would be 184 mgd.

Although the SFPUC would only make a decision regarding water supply through 2018 under the Phased WSIP Variant, after 2018 and through 2030 it is possible that average annual deliveries to the wholesale customers could range from 184 mgd to 209 mgd, as shown in Table 13.1 (or 199 mgd, on the high end if it is an assumed additional 10 mgd of local conservation, recycled water and groundwater programs is implemented by 2018). If after 2018 the SFPUC decides to maintain the 184 mgd average annual limit on SFPUC watershed deliveries to the wholesale customers, then by 2030 the SFPUC regional water system deliveries to the wholesale customers could be up to 25 mgd less than their 209 mgd purchase request amount, although it is possible that, in combination with the additional local conservation, recycled water, and groundwater already developed during the first phase of this variant, the wholesale customers could receive up to their full 2030 purchase request amount of 209 mgd with no shortfall.

Table 13.2 (which is similar to Draft PEIR Table 9.4) summarizes the key characteristics of the Phased WSIP Variant in comparison to the WSIP and other select alternatives considered in the Draft PEIR. Under the Phased WSIP Variant, the SFPUC would continue to rely on water supply sources from local watersheds and the Tuolumne River for up to 265 mgd average annual deliveries and would continue to implement the proposed 10 mgd of conservation, water recycling, and groundwater projects in San Francisco that is included in the WSIP through 2018. An additional 10 mgd of local conservation, water recycling, and groundwater projects could be developed by the SFPUC and/or BAWSCA/wholesale customers. Information on retail and customer purchase requests after 2018 would be confirmed, and target deliveries and water supply sources would be determined.

Table 13.3 (which is similar to Draft PEIR Table 9.5) compares average annual Tuolumne River diversions and drought-year shortages for the Phased WSIP Variant and the proposed program. Under the Phased WSIP Variant, by 2018 only 2 mgd of additional water diversion from the Tuolumne River over existing levels would be needed (on an average annual basis). This limited additional diversion over existing levels would occur in order to meet the WSIP delivery and drought reliability objectives, but no additional Tuolumne River diversions would be made through 2018 for the purpose of serving demand increases.

One objective of this program variant is to minimize increased diversions from the Tuolumne River and to maintain SFPUC deliveries from its watersheds as close to current levels as possible for the near term through 2018, at which time supply delivery needs and the need for additional Tuolumne River deliveries would be reevaluated. To meet the total projected customer water

TABLE 13.2
DESCRIPTION OF PHASED WSIP VARIANT IN COMPARISON TO WSIP AND NO PURCHASE REQUEST INCREASE ALTERNATIVE
(SIMILAR TO DRAFT PEIR TABLE 9.4)

Program Element	Existing Condition	Proposed Program	No Purchase Request Increase Alternative	Phased WSIP Variant	
Planning Year	2005	2030	2030	2018	2030
Retail Customer Purchase Request (2018 / 2030)	91 mgd / NA	91 mgd / 91 mgd	91 mgd / 91 mgd	91 mgd	91 mgd (to be reevaluated by 2018)
Wholesale Customer Purchase Request (2018 / 2030)	174 mgd / NA	194 mgd / 209 mgd	194 mgd / 209 mgd	194 mgd	209 mgd (to be reevaluated by 2018)
SFPUC Regional System Target Delivery Level (annual average)	265 mgd	300 mgd	275 mgd	275 to 285 mgd	To be determined
Target Delivery from SFPUC Watersheds	265 mgd	290 mgd	265 mgd	265 mgd	To be determined
SFPUC Wholesale Customer Target Delivery (annual average for 2018 / 2030)	NA	194 mgd / 209 mgd	184 mgd / 184 mgd	184 mgd / 194 mgd	To be determined
SFPUC Water Supply Sources (during nondrought and drought periods)	▪ 265 mgd from: - Local watersheds (with Calaveras and Crystal Springs Reservoirs operating at reduced levels based on Division of Safety of Dams restrictions); and - Tuolumne River	▪ 290 mgd from: - Local watersheds (with Calaveras and Crystal Springs Reservoirs restored) - Tuolumne River, with increased average annual diversions of about 24 mgd ▪ 10 mgd from: - Recycled water/groundwater/ additional conservation in San Francisco	▪ 265 mgd from: - Local watersheds (with Calaveras and Crystal Springs Reservoirs restored) - Tuolumne River, with increased average annual diversions of about 3 mgd ▪ 10 mgd from: - Recycled water/groundwater/ additional conservation in San Francisco	▪ 265 mgd from: - Local watersheds (with Calaveras and Crystal Springs Reservoirs restored) - Tuolumne River, with increased average annual diversions of about 2 mgd ▪ 10 mgd from: - Recycled water/ groundwater/additional conservation in San Francisco ▪ 10 mgd from: - SFPUC and/or BAWSCA/wholesale customers to develop additional local conservation, recycled water, groundwater in service area	To be determined after further demand, supply studies
Other Water Supply Sources (during nondrought and drought periods)	None	None	▪ *Wholesale customers expected to pursue conservation reuse and/or supplemental supply or conservation to make up for 2030 SFPUC delivery shortfall*	▪ *See above, SFPUC and/or BAWSCA/wholesale customers to develop additional 10 mgd of local conservation, recycled water, or groundwater; or BAWSCA and/or wholesale customers to pursue other supplemental supplies*	

TABLE 13.2 (Continued)
DESCRIPTION OF PHASED WSIP VARIANT IN COMPARISON TO WSIP AND NO PURCHASE REQUEST ALTERNATIVE
(SIMILAR TO DRAFT PEIR TABLE 9.4)

Program Element	Existing Condition	Proposed Program	No Purchase Request Increase Alternative	Phased WSIP Variant
Supplemental Dry-Year Water Supply Sources (for implementation during drought periods only)	None	▪ Additional Tuolumne River diversions from TID and MID transfers of 25 mgd, average over design drought. (This diversion is accounted for in the increased average annual diversion shown above under SFPUC Water Supply Sources.) ▪ Westside Basin conjunctive use, 6 mgd (average over design drought)	▪ Additional Tuolumne River diversions from TID and MID transfers of 1 mgd, average over design drought. (This diversion is accounted for in the increased average annual diversion shown above under SFPUC Water Supply Sources.) ▪ Westside Basin conjunctive use, 6 mgd (average over design drought) ▪ *Wholesale customers expected to pursue supplemental dry-year supply (e.g., water transfer) to make up for drought period supply shortfalls*	▪ Additional Tuolumne River diversions from TID and MID transfers of 2 mgd, average over design drought. (This diversion is accounted for in the increased average annual diversion shown above under SFPUC Water Supply Sources.) ▪ Westside Basin conjunctive use, 6 mgd (average over design drought) ▪ *Wholesale customers expected to pursue supplemental dry-year supply (e.g., water transfer) to make up for drought period supply shortfalls*
Maximum Drought Rationing Policy	No defined limit, but assumed incidental rationing of up to 25%	20%	20% at reduced target delivery level	20% at reduced target delivery level
System Firm Yield	219 mgd	256 mgd	234 mgd	234 mgd
WSIP PEIR Facility Improvement Projects	None	All projects	All projects	All projects
Other Facility Improvements	None	None	None by the SFPUC *Wholesale customers expected to develop other facilities or projects to meet additional demand*	*SFPUC and/or BAWSCA/wholesale customers expected to develop other facilities or projects to meet additional demand*
Delivery, Operations, and Maintenance	As described in Chapter 2, Section 2.3	Improved to meet WSIP goals and objectives (as described in Chapter 3, Section 3.8)	Similar to proposed program (but adjusted for the reduced target delivery level)	Similar to proposed program (but adjusted for the reduced target delivery level)
Permits, Approvals, and other Decisions/Actions	As described in Chapter 2, Sections 2.4 and 2.5	▪ San Francisco Planning Commission certifies Final PEIR ▪ SFPUC adopts CEQA findings/ mitigation monitoring and reporting program and approves and adopts the WSIP ▪ Water transfer agreements with TID and MID ▪ Operating agreements with Daly City, San Bruno, and California Water Service Company for Westside Basin conjunctive-use program ▪ Water sales agreements with retail and wholesale customers (see Chapter 3, Section 3.13)	Same as proposed program except: ▪ Transfer agreements with TID and MID for 1 mgd instead of 23 mgd during drought years ▪ *Agreements with California Department of Health Services for any new drinking water sources developed by wholesale customers that would be introduced into the regional system* ▪ *Permits for any new recycled water projects developed by wholesale customers*	Same as proposed program except: ▪ Transfer agreements with TID and MID for 1 mgd instead of 23 mgd during drought years ▪ *Agreements with California Department of Health Services for any new drinking water sources developed by SFPUC and/or BAWSCA/wholesale customers that would be introduced into the regional system* ▪ *Permits for any new recycled water projects developed by SFPUC and/or BAWSCA/ wholesale customers*

Italic text indicates expected action by wholesale customers.

SOURCE: SFPUC, 2008.

TABLE 13.3
AVERAGE ANNUAL TUOLUMNE RIVER DIVERSIONS AND DROUGHT-YEAR SHORTAGES FOR THE SELECTED ALTERNATIVES[a]
(SIMILAR TO DRAFT PEIR TABLE 9.5)

Scenario	Estimated Tuolumne River Diversions Over the 82-Year Period of Hydrologic Record[b]		Drought-Year Shortages Based on 82-Year Period of Hydrologic Record				Drought-Year Shortages During Design Drought (8.5 years)		
	Average Annual Increase by the SFPUC[c] (mgd)	Average Annual Diversions by the SFPUC (mgd)	Years of Shortages (10% Shortage)	Years of Shortages (20% Shortage)	Years of Shortages (>20% Shortage)	No. of Years Drought-Year Supplies Triggered	Years of Shortages (10% Shortage)	Years of Shortages (20% Shortage)	Years of Shortages (25% to 30% Shortage)
Existing Conditions (2005)	N/A	221	6 out of 82 (1 in 14 years)	8 out of 82 (1 in 10 years)	None	N/A	1	5	1.5
Proposed Program (WSIP 2030)	24	245	6 out of 82 (1 in 14 years)	2 out of 82 (1 in 41 years)	None	24	3	3.5	None
Phased WSIP Variant (2018)	2	223	6 out of 82 (1 in 14 years)	2 out of 82 (1 in 41 years)	None	15	3	3.5	None

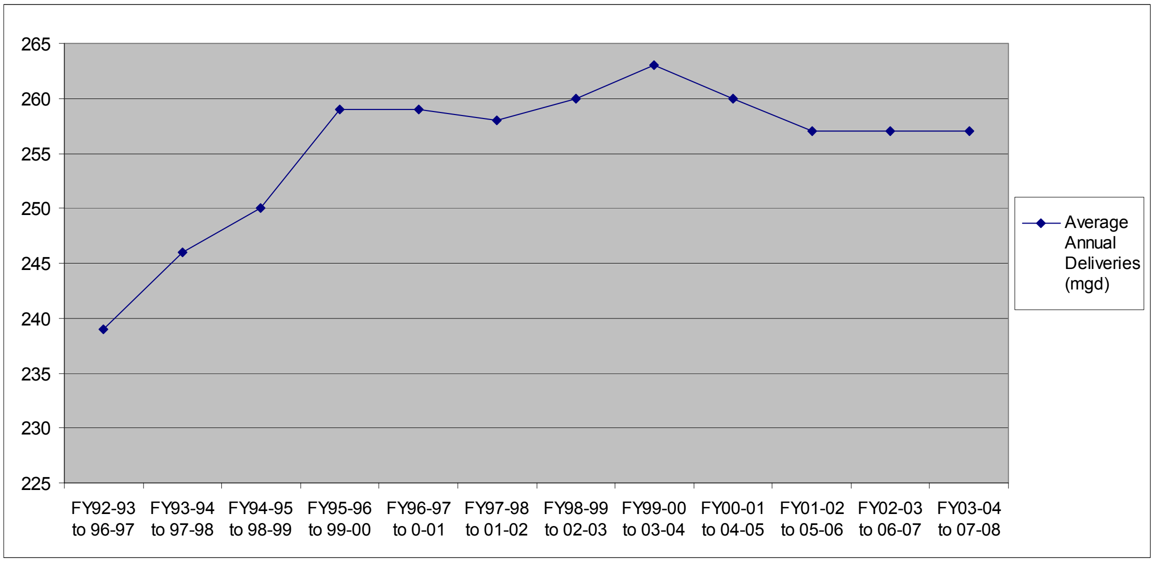
[a] Results from 2008 HH/LSM analyses using updated and refined modeling assumptions. The numbers are not directly comparable to those in Draft PEIR Table 9.5, which are based on 2007 HH/LSM analyses.
[b] Diversion levels represent the average annual amount modeled over the 82-year historical hydrology. Even with a zero average annual increase in diversions, there would still be year-to-year variations in diversions compared to the existing condition due primarily to modified system operations for maintenance and implementation of the conjunctive-use program.
[c] Represents the difference in average annual diversions modeled over 82-year historical hydrology, but does not represent year-to-year variation. Thus, even with zero average annual increase in diversions, there would still be year-to-year variations in diversions compared to the existing condition due primarily to modified system operations for maintenance and implementation of the conjunctive-use program.

delivery needs through 2018 and maintain Tuolumne River diversions at or close to current levels, the SFPUC would implement its proposed 10 mgd of in-city recycled water and groundwater projects and conservation actions plus work with BAWSCA and the wholesale customers to implement another 10 mgd of local recycled water, groundwater, and conservation actions (or BAWSCA and wholesale customers might elect to implement this additional local conservation and supply development themselves without the SFPUC). The SFPUC plans to implement projects to achieve its in-city 10 mgd by 2014 (see Draft PEIR Vol. 1, Chapter 3, p. 3-55 for a description of the proposed Groundwater Projects [WSIP project SF-2]; p. 3-56 for a description of the proposed Recycled Water Projects [WSIP project SF-3]; and Figure 3.6, p. 3-62 for the proposed implementation schedule). Since publication of the Draft PEIR, the wholesale customers have also taken steps to develop the necessary local projects (see the discussion below under the heading Wholesale Customer Actions for further information). The SFPUC will determine with BAWSCA the best way to develop the additional 10 mgd of supply (supply offsets) needed to meet the full wholesale customer needs by 2018.

In implementing the Phased WSIP Variant, the need could arise to temporarily increase deliveries from the Tuolumne River and local watersheds over the 265 mgd average annual target levels to meet customer water delivery needs in the near term, because it might not be possible to implement all of the local projects and actions in time to meet increasing customer demands. The impact analysis for the Phased WSIP Variant recognizes that, between now and 2018, deliveries from the Tuolumne River and local watersheds might increase above the 265 mgd average annual level (to a possible 275 to 285 mgd average annual) for up to a few years. By 2018, and perhaps well before, it is expected that local projects would provide sufficient local supply and conservation to bring SFPUC watershed deliveries back down to current levels, close to 265 mgd.

Under the Phased WSIP Variant, the SFPUC would monitor sales to ensure that annual average sales delivered from the SFPUC watersheds are limited to an average annual of 265 mgd through 2018. The SFPUC would measure and review annual average sales at the close of each fiscal year. **Figure 13.1** presents the five-year rolling average for the past 15 years of actual deliveries from the SFPUC watersheds (from fiscal year 1992/1993 through fiscal year 2007/2008) for the combined retail and wholesale customers. As shown on the graph, the highest five-year rolling average water delivery from the SFPUC watersheds via the regional water system to date was 263 mgd between fiscal year 1999/2000 and fiscal year 2003/2004. Since that time, this average has declined and leveled at 257 mgd for each of the past three years.

In consideration of public health and safety, the SFPUC would not cease water deliveries to customers in the event that total sales in water deliveries from the SFPUC watersheds exceed 265 mgd. However, in the event that sales from the SFPUC watersheds go above the 265 mgd average annual restriction, the SFPUC would provide financial incentives as a mechanism to encourage customers to develop the necessary local supply and conservation programs and discourage additional use of supply from the SFPUC watersheds.



SFPUC Water System Improvement Program . 203287

Figure 13.1
SFPUC Regional Water System Deliveries – Five-Year Rolling Average

Facility Improvement Projects

Under this variant, the SFPUC would implement the same 22 facility improvement projects as proposed under the WSIP. There would be no difference in the proposed facility sizing, design, siting, or operation between this variant and the WSIP. Although the total average water deliveries from the regional water system would be less under this variant (275 to 285 mgd) than those under the WSIP (300 mgd), the facilities design and sizes would remain the same. Facility design and size are determined by several factors, and reducing the water supply delivery target alone would not reduce the required size of the proposed facilities. The SFPUC determined that individual facilities throughout the regional water system must be designed and sized to meet overall system performance objectives for seismic reliability, water delivery reliability, maintaining high water quality, and meeting water supply goals (SFPUC, 2008d). Sizing for many system components is primarily driven by the need to replenish local storage following a drought, seismic event, unplanned outage, or maintenance shutdown period such that the local system has enough stored water to meet 90 days of demand strictly from the local system; facility sizing is also determined by the need to meet water delivery demand while performing maintenance or in the event of an emergency outage.

Wholesale Customer Actions

The wholesale customers have obligations, through laws, contracts, and other legal instruments, to provide water service to their customers. As described in the Draft PEIR (Vol. 1, Chapter 3, pp. 3-16 to 3-22), the wholesale customers, in conjunction with the SFPUC, conducted a comprehensive assessment of future water use within their service areas and identified the amount of water needed from the SFPUC, in addition to increased water conservation, to meet customer needs through 2030. The SFPUC wholesale customer purchase requests for 2030, developed as part of the WSIP, total 209 mgd. By approximately 2018, wholesale customer demand on the SFPUC regional system is projected to increase to 194 mgd.

Under the Phased WSIP Variant, the wholesale customers would receive 184 mgd on an average annual basis from the SFPUC watersheds until 2018. The SFPUC is proposing to obtain the remaining 10 mgd needed to meet the projected 194 mgd wholesale customer demand through the development of additional local conservation, recycled water, and groundwater projects. As described above, this additional 10 mgd increment of supply/conservation could either be developed jointly by the SFPUC and BAWSCA and become part of the regional system supply portfolio or it could be developed independently by BAWSCA and/or the wholesale customers and remain separate from the regional system supply portfolio. The SFPUC is meeting with BAWSCA to discuss the best way to develop this additional increment of supply.

How the 265 mgd Limit on Deliveries from the SFPUC Watersheds Could Affect the Wholesale Customers

The ability of each individual wholesale customer to implement additional demand management and/or secure additional water supplies varies. Sixteen of the 27 wholesale customers rely on the SFPUC for 100 percent of their supply (see **Table 13.4**). Only eleven of the 27 wholesale customers have other sources of supply in addition to the SFPUC deliveries: nine have other sources of surface water, groundwater, and/or local recycled water supply and two others have only local recycled water supply. **Table 13.5** (which is the same as Draft PEIR Table 7.2) indicates which agencies have sources of supply other than the SFPUC. The Alameda County Water District (serving Fremont, Newark, and Union City) has a combination of local groundwater (including direct pumping and use of groundwater resources as well as desalination of brackish groundwater from its salinity intrusion barrier well system along the bay shoreline), imported surface water supply from the Delta delivered through the State Water Project (SWP), and local recycled water, in addition to its SFPUC supply. California Water Service Company (three districts), Coastside County Water District, Daly City, and Mountain View each have one or more local resources, including groundwater, surface water, and/or recycled water. Palo Alto and Redwood City both have some local recycled water.

In the South Bay, eight of the SFPUC wholesale customers also lie within the Santa Clara Valley Water District (SCVWD), and some of these customers receive supply from both the SCVWD and the SFPUC. The SCVWD is a special district under state law and is required to serve the inhabitants of its service area. SCVWD is both a state water contractor receiving imported water from the Delta via the SWP and a federal water contractor receiving Delta water from the Central Valley Project (CVP). In addition, the SCVWD manages local surface and groundwater resources for its customers and actively manages a conjunctive-use program that includes groundwater replenishment with imported surface water to manage groundwater use. SFPUC wholesale customers that also receive water from the SCVWD include Stanford University (which also has some local surface water resources), Mountain View, Sunnyvale (which also has local groundwater and recycled water), Santa Clara (which also has substantial local groundwater

TABLE 13.4
SFPUC WHOLESALE CUSTOMERS – SUPPLY SOURCES

SFPUC Wholesale Customers	
Customers Relying on the SFPUC for 100% of Supply	**Customers with Other Supply Sources**
California Water Service (Mid-Peninsula)	Alameda County Water District
City of Brisbane	California Water Service (Bear Gulch and South San Francisco)[a]
City of Burlingame	Coastside County Water District [a]
City of East Palo Alto	City of Daly City
Estero Municipal Improvement District	City of Milpitas
Guadalupe Valley Municipal Improvement District	City of Mountain View [a]
City of Hayward	City of Palo Alto [a]
Town of Hillsborough	City of Redwood City [a]
City of Menlo Park	City of Santa Clara
Mid-Peninsula Water District	Stanford University
City of Millbrae	City of Sunnyvale
North Coast County Water District	
Purissima Hills Water District	
City of San Bruno	
City of San Jose (North)	
Skyline County Water District	
Westborough Water District	

[a] These wholesale customers receive 25 percent or less of their supply from other sources; the SFPUC provides 75 percent or more.

resources and recycled water), and Milpitas (which also has local recycled water). Palo Alto and Purissima Hills Water District lie within the SCVWD service area but do not receive water from the SCVWD. In total, the SFPUC provides about 54 mgd, or 56.4 percent, of the supply to meet the demand of these eight SCVWD customers.

In summary, for five of the 11 customers who have other sources of water supply in addition to the SFPUC supply, the other supply sources make up 25 percent or less of their supply and the SFPUC provides the remaining 75 percent of supply or more. Hence, only a few of the wholesale customers have other substantial sources of supply besides the SFPUC.

Supply shortfalls from the SFPUC regional water system could also affect individual wholesale customers differently because of differences in their supply agreements with the SFPUC. As discussed in the Draft PEIR (Vol. 1, Chapter 2, pp. 2-43 and 2-44, and Vol. 4, Chapter 7, pp. 7-13 and 7-14), the SFPUC currently holds individual agreements with its wholesale customers. A Master Water Sales Agreement between the CCSF and each of the wholesale customers establishes wholesale water rates, cost allocation, water supply allocation, and use of local water. Under the Master Sales Agreement, the CCSF has agreed that the wholesale customers may collectively purchase up to 184 mgd on an average annual basis, subject to reductions in the event

TABLE 13.5
SUMMARY OF 2030 DEMAND PROJECTIONS, WATER SUPPLY ASSUMPTIONS, AND SFPUC PURCHASE ESTIMATES
(SAME AS DRAFT PEIR TABLE 7.2)

Customer	A	B	C	D	E	F	G	H	I	J
	2030 Projected Demand (with Plumbing Code Savings) (mgd[a])	2030 Projected Conservation Savings (mgd[a])	2030 Demand Adjusted for Conservation (mgd[a])	2030 Projected Use of Recycled Water (mgd[a])	2030 Projected Use of Ground-water Sources (mgd[a])	2030 Projected Use of Other Surface Water Sources (mgd[a])	2030 Projected Demand Adjusted for Use of Other Sources and Conservation (mgd[a])	2030 Purchase Estimates (mgd[a])	Percent of Total 2030 Demand (with Plumbing Code Savings) met by SFPUC Purchases	Percent of 2030 Demand Adjusted for Conservation met by SFPUC Purchases
			(A - B)				(C - D - E - F)		(H/A)	(H/C)
Alameda County Water District	59.3	3.16	56.14	1.40	13.98	27.00	13.76	13.76	23%	25%
City of Brisbane	0.93	0.04	0.89				0.89	0.89	96%	100%
City of Burlingame	4.9	0.20	4.7				4.70	4.70	96%	100%
CWS–Bear Gulch District[b,c]	14.06	0.93	13.13			1.37	11.76	11.76	84%	90%
CWS–Mid-Peninsula District[b]	18.1	0.86	17.24				17.24	17.24	95%	100%
CWS–South San Francisco District[b]	9.9	0.56	9.34		1.37		7.97	7.97	81%	85%
Coastside County Water District[d]	3.2	0.18	3.02		0 – 0.30	0 – 0.48	2.24 – 3.02	2.24 – 3.02	70 – 94%	74 – 100%
City of Daly City[e]	9.1	0.44	8.66		1.34 – 3.76		4.90 – 7.32	4.90 – 7.32	54 – 80%	57 – 85%
City of East Palo Alto	4.8	0.16	4.64				4.64	4.64	97%	100%
Estero MID[f]	6.8	0.00 – 0.60	6.2 – 6.8				6.20 – 6.80	6.20 – 6.80	91 – 100%	100%
Guadalupe Valley MID[f]	0.81	0.10	0.71				0.71	0.71	88%	100%
City of Hayward	28.7	0.76	27.95				27.95	27.95	97%	100%
Town of Hillsborough	3.9	0.20	3.7				3.70	3.70	95%	100%
City of Menlo Park	4.7	0.16	4.54				4.54	4.54	97%	100%
Mid-Peninsula Water District	3.8	0.10	3.70				3.70	3.70	97%	100%
City of Millbrae[g]	3.3	0.08 – 0.11	3.19 – 3.27				3.19 – 3.22	3.19	97%	99 – 100%
City of Milpitas	17.7	0.61	17.09	1.77		7.13	8.19	8.20	46%	48%
City of Mountain View	14.8	0.24 – 1.21	13.59 – 14.56		0.05	1.30	12.24 – 13.21	13.20	89%	91 – 97%
North Coast County Water District	3.8	0.00 – 0.19	3.62 – 3.80				3.62 – 3.80	3.61 – 3.80	95 – 100%	100%
City of Palo Alto[h]	14.4	0.60	13.76	0.76			13.00	13.00	91%	94%
Purissima Hills Water District	3.3	0.08	3.22				3.22	3.22	98%	100%
City of Redwood City[i]	13.4	0.59 – 1.02	12.38 – 12.81	0 – 1.00			11.38 – 12.81	11.60 – 12.60	87 – 94%	94 – 98%
City of San Bruno	4.5	0.19	4.32				4.32	4.30	96%	100%
City of San Jose (North)[j]	6.5	0.16	6.34				6.34	6.34	98%	100%
City of Santa Clara	33.9	1.00	32.90	4.00	19.99	4.00	4.91	4.90	14%	15%
Skyline County Water District	0.31	0.01	0.30				0.30	0.30	97%	100%
Stanford University	6.8	0.70	6.10			1.90	4.20	4.20	62%	69%
City of Sunnyvale	26.8	0.70	26.10	1.50	2.60	9.90	12.10	12.10	45%	46%
Westborough Water District[k]	1.03	see note k	1.03				1.03	1.03	100%	100%
Total, Wholesale Service Area	**324**	**13 – 15**	**308 – 311**	**9.4 – 10.4**	**39.3 – 42.1**	**52.6 – 53.1**	**203 – 209**	**204 – 209**	**63 – 65%**	**66 – 67%**
SFPUC Retail Service Area[l]	**93.4**	**0 – 4**	**89.4 – 93.4**	**0 – 4**	**2.5 – 4.5**	**0**	**81 – 91**	**80 – 91**	**86 – 97%**	**89 – 97%**
TOTAL	**417**	**13 – 19**	**398 – 404**	**9.4 – 14.4**	**41.8 – 46.6**	**52.6 – 53.1**	**284 – 300**	**284 – 300**	**68 – 72%**	**71 – 74%**

NOTE: Numbers may not sum due to rounding.
a mgd = million gallons per day.
b CWS = California Water Service Company.
c CWS–Bear Gulch District includes the former Los Trancos County Water District.
d The upper range purchase estimate assumes loss of all local water sources (surface water and groundwater) and the lower range estimate assumes continuation of local sources; both estimates assume Level B water conservation.
e The purchase estimate range reflects a range of potential groundwater usage established under a pilot project, from the sustainable yield (3.76 mgd) to the lowest annual production yield (1.34 mgd), according to Daly City's best estimate of 2030 water purchases (SFPUC, 2004).
f MID = Municipal Improvement District.
g 2030 conservation savings is based on URS 2004c and the City's UWMP as confirmed by the City (Popp, 2007).
h 2030 demand and conservation savings are based on information provided by the City of Palo Alto to the SFPUC (City of Palo Alto, 2005a).
i In November 2005, Redwood City informed the SFPUC that it would be purchasing its low-range estimate of 11.6 mgd due to anticipated implementation of 1 mgd of recycled water in 2030 (City of Redwood City, 2005a). The high-range purchase estimate total of 300 mgd published in URS 2004b remains the SFPUC 2030 purchase estimate total for planning purposes, to be consistent with the previous and ongoing WSIP studies. The purchase estimate range originally submitted apparently reflects the average of the City's estimated conservation savings range plus the originally estimated range of recycled water use.
j Portion of north San Jose only.
k Demand and purchase estimates are based on Westborough Water District's 2005 UWMP, as requested by the District in a letter to the SFPUC (Westborough Water District, 2007). The UWMP discusses ongoing and planned future demand management programs but does not quantify conservation savings in relation to the demand and purchase estimate. The District's original estimate of water purchases indicated conservation savings of 0.020 mgd (SFPUC, 2004).
l The low range of the SFPUC retail customer purchase estimate reflects the identified groundwater, recycled water, and conservation programs totaling 10 mgd in San Francisco that are included as part of the WSIP proposed water supply option.

SOURCES: URS, 2004a; URS, 2004b; URS, 2004c; URS, 2006; SFPUC, 2004; SFPUC, 2007; City of Palo Alto, 2005a; Popp, 2007; City of Redwood City, 2005a; Westborough Water District, 2005 ; Westborough Water District 2007.

of a drought, water shortage, earthquake or other natural disaster, or rehabilitation and maintenance of the system; the 184 mgd amount is referred to as the “supply assurance.” The agreement also requires that the wholesale customers employ best efforts to use all sources of water owned or controlled by them, including groundwater. The terms of individual agreements vary among the wholesale customers. In general, there are individual supply assurances for each wholesale customer with two exceptions (see Vol. 5, Appendix E, Table E.1.1, p. E.1-2 for each customer’s existing supply assurance from the SFPUC regional water system). The wholesale customers have varying amounts of their individual supply assurance remaining. All but two wholesale customers are under their current supply assurance by some amount, and two agencies have exceeded their individual supply assurance caps; however, collectively, the wholesale customers remain below the 184 mgd supply assurance cap established by the Master Sales Agreement.

The first exception to the SFPUC’s supply assurance contracts involves the City of Hayward and the Estero Municipal Improvement District (Estero MID) (serving primarily Foster City and some portions of San Mateo County). Contracts with these two agencies do not specify a limit on purchases from the SFPUC. For these two agencies, the CCSF has agreed to meet all of their water needs in excess of other water sources owned or controlled by them. The agreement with Estero MID expires in 2011, while the agreement with the City of Hayward has no termination date. A specified amount (28 mgd) of the total 184 mgd wholesale customer supply assurance has been set aside by the wholesale customers to meet the long-term supply needs of Hayward and Estero MID. However, Hayward alone projects that it will need to purchase up to 28 mgd from the SFPUC by 2030 (just under 10 mgd more than its fiscal year 2001/2002 delivery purchase). Estero MID has requested purchase of up to 6.8 mgd by 2030. Thus, the combined usage for these two agencies is projected to exceed the 28 mgd reserved for them. If this occurs, then the other wholesale customers would have to reduce their purchases in order to accommodate Hayward and Estero MID deliveries. The Master Sales Agreement provides a method for proportional reduction in the other wholesale customers’ supply guarantee in the event that Hayward and Estero MID exceed the supply amount reserved for them.

The second exception to the SFPUC supply assurance contracts involves the Cities of San Jose and Santa Clara. The SFPUC sells water to these two entities on a temporary, interruptible basis; neither city has a supply assurance contract with the SFPUC. As a result, deliveries to these two cities are not accounted for in the 184 mgd supply assurance cap established in the Master Sales Agreement. In fiscal year 2001/2002, these two cities purchased a combined total of 8.26 mgd from the SFPUC system. As part of the WSIP planning and development process, they submitted a request to purchase an additional 2.98 mgd, for a combined total 2030 purchase request of 11.24 mgd. The SFPUC serves northern San Jose, while the remainder of San Jose is served by the SCVWD. The City of Santa Clara receives less than 20 percent of its supply from the SFPUC. Within Santa Clara, however, the SFPUC supply constitutes nearly 90 percent of water supply to the northern part of the city (north of Highway 101), which is largely isolated from the rest of the city’s water system. For Santa Clara to serve this area from a source other than the SFPUC, it would not only need to secure the additional supply but also to extend major new infrastructure. Similarly, in San Jose, the SFPUC supply serves the northern San Jose area. Although San Jose and Santa Clara lie within the SCVWD, the District does not have available supply or the necessary treatment plant capacity or infrastructure reaching these areas that could provide service to compensate for a reduction in SFPUC deliveries; major new facilities would need to be constructed to serve these areas.

In the future under the Phased WSIP Variant through 2018, the Cities of San Jose and Santa Clara could face partial or complete SFPUC water delivery reductions as the other wholesale customers with supply assurance contracts increase their deliveries up to their supply assurance limits and Hayward and Estero MID continue to increase their purchase requests beyond a combined 28 mgd. The San Francisco Planning Department received letters from the SCVWD, the City of San Jose, the City of Santa Clara, and BAWSCA concerning the proposed Phased WSIP Variant (see Vol. 8, Appendix M for copies of these letters). Each of these agencies expressed concern that neither San Jose nor Santa Clara have good alternative treated water supply sources, and that increasing local groundwater pumping would have environmental consequences associated with over-pumping. Historically, over-pumping of groundwater was an issue for these communities and resulted in appreciable land subsidence that was remedied through a combination of actions, including the use of surface water supplies from the SFPUC to reduce the need for pumping. (Refer to the discussion below under the heading Environmental Effects of the Phased WSIP Variant for further information on the potential environmental effects of groundwater pumping increases by San Jose and Santa Clara.)

If SFPUC supplies to San Jose and Santa Clara were interrupted due to increased demand among the remaining wholesale customers, these entities could rely entirely on the SCVWD to meet the portion of their existing demand now being met by the SFPUC. As noted in the SCVWD water supply planning documents, the District relies on the SFPUC to continue to meet the supply needs of these two customers in the future. The SCVWD has not made plans to serve these customers from the supplies that they manage. Similarly, if any of the other customers do not have their demand increases met through the SFPUC, then these customers could increase their reliance on the SCVWD to meet that portion of increased demand.

Water Supply Options

As discussed in the Draft PEIR for the No Purchase Request Increase Alternative (and the No Program Alternative), if the SFPUC does not fully meet the wholesale customer purchase requests, it is assumed that the wholesale customers, either individually or collectively, would pursue supplemental supply sources and/or additional conservation and/or water recycling projects to make up the shortfall in SFPUC water deliveries under this scenario. BAWSCA represents the SFPUC wholesale customers and has the authority to pursue and secure water supplies on behalf of the wholesale customers as well as to coordinate recycled water and conservation projects to benefit its members.

Local Options

Draft PEIR Section 9.2.4, Aggressive Conservation/Water Recycling and Local Groundwater Alternative (Vol. 4, Chapter 9, pp. 9-47 to 9-59) and Section 9.2.8, Modified WSIP Alternative (Vol. 4, Chapter 9, pp. 9-78 to 9-84) provide a discussion of the additional, potential conservation, recycled water, and groundwater projects that could be implemented by the wholesale customers beyond those projects accounted for in their 2030 purchase request. This information is summarized below. These projects could potentially be implemented to develop the additional 10 mgd of local supply and/or conservation required under the Phased WSIP Variant by 2018, assuming these projects are feasible (see **Table 13.6**, below, which is the same as PEIR Table 9.11). Most of the projects have been developed on a very conceptual level and have technical, institutional, and financial issues to overcome prior to implementation; and contain uncertainties with regard to water quality issues, end-users, long-term sustainable yield, and production rates. The SFPUC is interested in working with BAWSCA and the wholesale customers in the further development of local conservation, recycled water, and/or groundwater projects to meet the full customer supply needs through 2018. The SFPUC is considering the creation of financial mechanisms to support actions in the wholesale customer service areas as well as direct participation in local projects (SFPUC, 2008c).

In March 2008, BAWSCA authorized a study, called the BAWSCA Water Conservation/Recycling Implementation Plan, to identify the specific conservation actions needed to secure an additional 10 mgd of supply savings through conservation savings and reclamation by 2030, as was indicated to by BAWSCA in its comments on the Draft PEIR (see Vol. 6, Section 12.3, Comment L_BAWSCA1-53). BAWSCA moved in August 2008 to secure a consultant to prepare the plan, which is scheduled to be completed by the end of June 2009. The plan will include a 10-year implementation plan showing proposed actions, schedules, costs, and funding alternatives to achieve the combined commitments shared by BAWSCA and its member agencies to achieve a total of 58 mgd of water conservation and recycling between 2001 and 2030 (BAWSCA, 2008b). The commitment to develop 10 mgd of local recycled water and conservation is in addition to the amount the wholesale customers previously committed to in the development of their 2030 purchase requests as part of the WSIP planning process (BAWSCA, 2008a).

As discussed in the Draft PEIR analysis of the Aggressive Conservation/Water Recycling and Local Groundwater Alternative (Vol. 4, Chapter 9, pp. 9-47 to 9-59), studies to date suggest that it would be difficult for the wholesale customers to develop sufficient local conservation, reuse, and groundwater projects to meet their full 2030 needs. Thus, after 2018, if the SPFUC decides to continue limiting deliveries from its watersheds to 265 mgd, it could be difficult for the SFPUC, BAWSCA, and the wholesale customers to develop sufficient additional local supply through groundwater, recycled water, and conservation to satisfy projected 2030, long-term demands. With respect to the potential for additional local groundwater development, the wholesale customers with appreciable groundwater resources (i.e., Daly City, Santa Clara, Sunnyvale, and Alameda County Water District) are already maximizing or planning to maximize their use of this supply, while other customers have no or only a limited potential for groundwater development. As shown on Table 13.6, the wholesale customers identified potential groundwater projects totaling just under 3 mgd. The wholesale customers with groundwater resources risk the potential for overdrafting their local aquifers if they increase the use of this resource. This is a particular concern for South Bay communities such as San Jose and Santa Clara that have a history of over-pumping groundwater, land subsidence, and loss of aquifer storage capacity.

TABLE 13.6
POTENTIAL REGIONAL RECYCLED WATER, GROUNDWATER, AND CONSERVATION PROJECTS
(SAME AS DRAFT PEIR TABLE 9.11)

Location/Jurisdiction	Type of Supply	Description	Low-Range Yield (mgd)	High-Range Yield (mgd)
Category 1 – Projects Likely to be Implemented				
City of Daly City	Recycled Water	Expansion of recycled water uses from an existing facility to irrigate an additional park and landscape medians	-	0.01
North Coast County Water District/San Francisco	Recycled Water	Various irrigation uses for school grounds and highway uses	0.15	0.58
		Subtotal Category 1	**0.15**	**0.6**
Category 2 – Eligible Projects in Early Planning Stages				
Mountain View	Recycled Water	Irrigation and industrial usage – joint project with City of Palo Alto	-	1
Various	Conservation	Eight conservation measures to be implemented by a regional body	2.3	5.7
Various	Conservation	Seven additional conservation measures to be implemented by a regional body	0.6	1.5
Palo Alto	Recycled Water	Irrigation in Palo Alto and East Palo Alto	-	1
Cal Water–Mid-Peninsula	Groundwater	New well in Mid-Peninsula District for potable use	-	1
Cal Water–Bear Gulch	Groundwater	New well shared with Menlo Park for potable use	-	1
East Palo Alto	Groundwater	Reestablish use of existing well	-	0.5
Redwood City	Recycled Water	Expand recycled water system for use by additional customers outside of service area	2.2	4.5
South San Francisco and San Bruno	Recycled Water	Replace current groundwater irrigation uses with recycled water	-	0.3
		Project Overlap Adjustment[1]		(1.5)
		Subtotal Category 2	**5.1**	**15**
Category 3 – Potentially Eligible Projects for Future Consideration				
Menlo Park	Groundwater	Groundwater well for emergency use	Unknown	Unknown
Sunnyvale	Recycled Water	Extend existing recycled water project	-	0.7
Various	Conservation	Eight additional conservation measures to be implemented by a regional body	0.5	1.4
Burlingame	Groundwater	Rehabilitate existing well	-	0.02
Burlingame	Recycled Water	Irrigation of commercial landscaping	-	0.25
		Project Overlap Adjustment		(0.14)
		Subtotal Category 3	**0.5**	**2.23**
Total			**5.75**	**~19**

1 Project overlap adjustment represents the amount of potential conservation program savings overlap with respect to other projects to avoid double counting.

SOURCE: SFPUC, 2007b.

Imported Supply and/or Desalination Options

Other options for potential supplemental water sources that the wholesale customers could pursue to make up for the SFPUC water delivery shortfall that could occur under this variant are seawater or brackish water desalination and surface water transfers, potentially coupled with conjunctive groundwater use and/or additional surface water storage. These potential supplemental supply options are discussed in the Draft PEIR, primarily in Section 9.2.2, No Program Alternative (Vol. 4, Chapter 9, pp. 9-25 to 9-40), but also in Section 9.2.3, No Purchase Request Increase Alternative (Vol. 4, Chapter 9, pp. 9-40 to 9-47).

Regarding water purchases or transfers, statewide trends indicate that while urban water use is increasing, agricultural water use is decreasing, in part because agricultural water users are selling water rights or contracts to urban agencies (DWR, 2005). Potential sources of supplies for the wholesale customers include water-rights holders north of the Delta, in the Delta, or south of the Delta. The agencies with the rights to the greatest quantities of water in the state—the U.S. Bureau of Reclamation (USBR) and California Department of Water Resources (DWR)—would not be sources of new water supply contracts/agreements because of their commitments to existing contractors and to the protection, restoration, and enhancement of fish and wildlife habitat. The wholesale customers and/or BAWSCA could face challenges to water purchases and transfers pertaining to restrictions associated with entitlements, contracts, and water rights; permitting requirements; effects caused by the cessation of water application to an area (e.g., land fallowing, economic impacts); Delta pumping restrictions; and wheeling arrangements[3] (Johnson and Loux, 2004). Existing water delivery infrastructure could theoretically be used through agreements with other agencies (such as the DWR, USBR, SFPUC, SCVWD, East Bay Municipal Utility District, or Alameda County Water District) to convey water to the wholesale customers, if and when system capacity is available. Construction or expansion of interties or connecting pipelines in urban areas would likely be required.

Since the Draft PEIR was released in June 2007, a series of events has affected the feasibility of executing water transfers that involve moving water from or through the Sacramento–San Joaquin River Delta. These events are primarily related to endangered species issues and include: the DWR's 10-day shutdown of the State Water Project (SWP) Delta diversions in the summer of 2007 to protect delta smelt; the Judge Wanger decision in late 2007 regarding delta smelt("Wanger 2007 Decision"), which imposed interim export pumping restrictions tied to flow conditions on Old and Middle Rivers in the Delta; the Judge Wanger decision to invalidate the Biological Opinion for the coordinated operations plan for the CVP and SWP known as the OCAP (Operations Criteria & Plan) on anadromous fish, including steelhead, winter-run and spring-run salmon, and green sturgeon (Wanger Decision 2008); the Endangered Species Act reconsultation now in progress for the OCAP, which will establish revised long-term operating requirements for the CVP and SWP operations to protect endangered species (replacing both the Wanger 2007 and Wanger 2008 decisions); and the proposed Bay Delta Conservation Plan, which includes alternatives for substantially modifying conveyance facilities and operations for the state and federal water systems that now use the Delta for conveyance, and for which the state and

[3] Wheeling arrangements are agreements to use existing infrastructure owned by a third party to transport/convey water from a source to a customer.

federal environmental review processes have recently been initiated (spring 2008). This series of events has made the potential for securing a water transfer from an entity north of the Delta less feasible now than it was when the Draft PEIR was published.

Another potential source of supplemental water for the wholesale customers could be increased agricultural water conservation in the San Joaquin Valley such that surface water conserved in these agricultural areas could then be delivered to the Bay Area. BAWSCA and some of its member agencies have proposed the implementation of additional agricultural water conservation beyond that included in the Modified WSIP Alternative (refer to Vol. 7, Chapter 14, **Section 14.10, Master Response on Modified WSIP Alternative**). According to these proposals, the water saved would accumulate in Don Pedro Reservoir and could be used to increase flows in the Tuolumne River below La Grange Dam or could be conveyed to water users in the Bay Area via a water exchange agreement with TID and MID. The SFPUC regards any project intended to increase agricultural water conservation beyond the level needed to reduce the impacts of the WSIP to a less-than-significant level to be separate from the WSIP. Any such agreements would be undertaken independently of the WSIP. If the Modified WSIP Alternative, or this element of it, is selected as the preferred course of action, the SFPUC would work with TID, MID, or another water agency to develop the transfer of conserved water that is included in the Modified WSIP Alternative. BAWSCA could choose to pursue a separate agricultural water conservation project to augment this transfer, but if the SFPUC were to participate in the project, it would be considered a distinct action from the WSIP or any alternative/variant of the WSIP. This is one option BAWSCA and its member agencies could pursue in order to secure a supplemental supply.

Use of seawater or brackish water desalination technologies to supplement supplies would involve the construction and operation of a desalination plant and related infrastructure. Such a project could occur on a local or regional level. For example, the Alameda County Water District has developed a local desalination facility to treat brackish groundwater pumped from local wells to blend with other drinking water supplies. The SFPUC is currently participating in a study on a potential regional desalination facility that might serve multiple Bay Area communities. The Draft PEIR includes a description of the facilities and environmental impacts of desalination in Section 9.2.6, Year-round Desalination at Oceanside Alternative (Vol. 4, Chapter 9, pp. 9-66 to 9-74) and Section 9.2.7, Regional Desalination for Drought Alternative (Vol. 4, Chapter 9, pp. 9-74 to 9-78). Desalination represents a potential new local source of water.

Ability to Meet Program Objectives

Table 13.7 (similar to Draft PEIR Table 9.6) summarizes the ability of the Phased WSIP Variant to meet the program objectives as compared to the WSIP and select other alternatives. Through 2018, the Phased WSIP Variant would meet many, but not all, of the program objectives. Given the proposed 265 mgd annual average limitation on deliveries from the SFPUC watersheds, the wholesale customers would receive up to 184 mgd from the SFPUC watersheds and would need to quickly develop an additional 10 mgd of local supply and conservation by 2018. Because the Phased WSIP Variant has not already identified specific local projects for implementation to secure the additional 10 mgd needed to fully meet the wholesale customer demand through 2018,

TABLE 13.7
SUMMARY OF ABILITY OF ALTERNATIVES TO MEET PROGRAM OBJECTIVES[a]
(SIMILAR TO DRAFT PEIR TABLE 9.6)

Objectives	Proposed Program	No Program Alternative	No Purchase Request Increase Alternative	Phased WSIP Variant
Water Quality				
Design improvements to meet current and foreseeable future federal and state water quality requirements?	Yes	Yes	Yes	Yes
Provide clean, unfiltered water originating from Hetch Hetchy Reservoir and filter all other surface water sources?	Yes	Yes	Yes	Yes
Continue to implement watershed protection measures?	Yes	Yes	Yes	Yes
Seismic Reliability				
Complies with current seismic standards?	Yes	No	Yes	Yes
Capable of delivering basic service to all regions in the service area following a major earthquake?	Yes	No	Partial	Partial
Facilities restored to meet average-day demand within 30 days of a major earthquake?	Yes	No	Partial	Partial
Delivery Reliability				
Provides operational flexibility to allow for planned maintenance without service interruptions?	Yes	No	Yes	Yes
Provides operational flexibility and system capacity to replenish local reservoirs, as needed?	Yes	No	Yes	Yes
Capable of minimizing risk of service interruption due to unplanned facility upsets or outages?	Yes	No	Yes	Yes
Capable of serving average 2030 demand of 300 mgd with one planned shutdown of a major facility and one unplanned facility outage?	Yes	No	Partial	Partial
Water Supply				
Meets average annual purchase requests of 300 mgd during nondrought years for system demands through 2030?	Yes	Partial	No, 275 mgd	No, 275–285 mgd
Meets 20% systemwide rationing limit during droughts?	Yes	No	Partial	Partial
Meets system firm yield of 256 mgd?	Yes	No	No	No
Diversifies water supply options during nondrought and drought periods?	Yes	No	Yes	Yes
Improves use of new water sources and drought management, including use of groundwater, recycled water, conservation, and transfers?	Yes	No	Yes	Yes

TABLE 13.7 (Continued)
SUMMARY OF ABILITY OF ALTERNATIVES TO MEET PROGRAM OBJECTIVES[a]
(SIMILAR TO DRAFT PEIR TABLE 9.6)

Objectives	Proposed Program	No Program Alternative	No Purchase Request Increase Alternative	Phased WSIP Variant
Sustainability				
Manages natural resources and physical systems to protect watershed ecosystems?	Yes	Yes	Yes	Yes
Meets current and anticipated legal requirements for protection of fish and other wildlife habitat?	Yes	Yes	Yes	Yes
Manages natural resources and physical systems to protect public health and safety?	Yes	No	Yes	Yes
Cost-effectiveness				
Ensure cost-effective use of funds?	Yes	No and likely greater cost	Unknown, but greater cost	Unknown, but greater cost
Maintains gravity-driven system?	Yes	Yes	Yes	Yes
Implement regular inspection and` maintenance program for all facilities?	Yes	No	Yes	Yes

NOTES:

a This assessment is based on SFPUC actions under each alternative only and does not account for the actions that BAWSCA and/or the wholesale customers might take in order to make up for any shortfall in the regional system's ability to meet the program objectives. See text for a discussion of the ability of each alternative to meet the objectives. In general, the terms in the table are used as follows:

Yes: Indicates that the alternative would fully meet the sub-objective at an equivalent level to the WSIP.

Partial: Indicates that the alternative could meet the objective in part, but it would not fully meet the objective at an equivalent level to the WSIP due to variation associated with the alternative, such as the reduced delivery targets, additional facility requirements, and associated issues. Both the No Purchase Request Increase Alternative and the Phased WSIP Variant would include the full set of WSIP facilities. Thus, the facilities would be capable of delivering and managing supplies to fully meet the 2030 WSIP objectives, but the proposed supply scenarios under these alternatives would not; as a result, these alternatives/variants would only partially meet the full WSIP objective.

No: Indicates that the alternative would not meet the sub-objective.

there is less certainty that this variant could meet the SFPUC's water supply objective compared to the WSIP. It appears feasible to develop additional local conservation, recycled water, and groundwater to provide another 10 mgd, but there is substantial additional work to be completed in order to develop, review, approve, and implement these local actions and projects by 2018. Thus, due to this uncertainty, the table indicates that Phased WSIP Variant would only *partially* achieve those objectives associated with fully meeting customer purchase requests. The Phased WSIP Variant would meet the drought reliability objective at the reduced water supply delivery level.

The Phased WSIP Variant would fully meet the WSIP level of service goal for water quality (although the SFPUC would not be responsible for the quality of any supplemental water supply pursued by the wholesale customers under this scenario). Seismic reliability would be improved over existing conditions; however, because this variant would limit water supply to the SFPUC customers through 2018, this option would not meet the WSIP objective of providing 300 mgd average-day demand through 2030.

Delivery reliability of the regional system would be similar to that under the WSIP; however, this variant would only partially meet those objectives because it would not meet the average annual projected demand of 300 mgd in 2030 under maintenance or outage conditions but instead would meet a reduced target delivery set for 2018. Similar to the WSIP, comprehensive and regular repair and maintenance of the regional system would occur under this variant without service interruptions, and the risk of service interruptions due to unplanned facility upsets or outages would be minimal. Facilities would be in place to replenish local reservoirs as needed to prepare for drought, and the system would remain predominantly gravity-driven.

The Phased WSIP Variant would achieve the WSIP's water supply level of service goal during nondrought periods through the year 2018, but would not achieve the 2030 WSIP program goal. This variant would meet the WSIP objective of limiting drought-year rationing to a maximum of 20 percent systemwide, but it would achieve this objective at the reduced delivery level only.

Environmental Impacts of the Phased WSIP Variant Compared to those of the WSIP

The environmental effects of the Phased WSIP Variant would be similar to those described for the No Purchase Request Increase Alternative if the SFPUC decides to continue limiting average annual water deliveries from the SFPUC watersheds to 265 mgd beyond the year 2018. If the SFPUC decides in 2018 to increase water deliveries from the SFPUC watersheds to the wholesale customers, then the environmental impacts would be the same or similar to those evaluated for the WSIP or the Modified WSIP Alternative.

Facility Construction and Operation Impacts

WSIP Facility Improvement Projects

The Phased WSIP Variant would have the same impacts associated with proposed facility construction and operation as the WSIP. The 22 facility improvement projects proposed under the WSIP would also be implemented under the Phased WSIP Variant to meet the intent of the water quality, seismic reliability, delivery reliability, and water supply goals of the WSIP. All four of these goals are factored into the decision on how to size the WSIP's individual facility improvement projects. Even if the average annual diversions from the Tuolumne River were to remain within the current historical levels, the SFPUC would move forward with all projects as identified and sized under the WSIP in order to provide improved reliability and operational flexibility to perform the maintenance that has been deferred in the past and that is necessary in the future (SFPUC, 2008d).

Other Facilities Potentially Developed by the Wholesale Customers

The types of projects that the wholesale customers might pursue to reduce demand and/or supplement the surface water supplies delivered by the regional water system from the SFPUC watersheds, and the potential facility and operations impacts associated with such projects are discussed in the Draft PEIR in Section 9.2.2, No Program Alternative (Vol. 4, Chapter 9, pp. 9-34 to 9-37) and Section 9.2.4, Aggressive Conservation/Water Recycling and Local Groundwater Alternative (Vol. 4, Chapter 9, pp. 9-55 to 9-57).

In general, certain types of impacts are common to water supply transfers/acquisition and include: the cessation of water application to lands irrigated by the water being transferred; changes related to flows, fisheries, and water quality; and impacts caused by the use of existing or the construction of new infrastructure. Typically, the water-rights holder previously applied the water to agricultural land. If water is taken from agricultural customers, rather than implementing agricultural conservation measures, the transfer can result in the conversion of agricultural land to nonagricultural land. Beneficial environmental effects (related to retiring drainage-impaired lands, reducing the application of pesticides, etc.) can also occur. The need for new facilities and/or changes in the operations of existing facilities depend on the source of supply (e.g., the Tuolumne River through transfers with TID and MID, water-rights holders north of the Delta, in the Delta, or south of the Delta), the quantity of supply, the means of conveyance, and any additional storage requirements. Construction or expansion of interties or connecting pipelines could be required, potentially resulting in impacts similar to those described for the WSIP pipeline projects. The types of impacts associated with water supply acquisition projects are summarized in **Table 13.8** (which is the same as Draft PEIR Table 9.10). Depending on the facilities needed to convey the supplemental supplies to the wholesale customer service areas, the construction and operation of such facilities could result in a full range of construction and operational impacts similar to those described in Chapter 4 (Vol. 2) for the WSIP facilities in the South Bay and Peninsula areas (such as traffic, air quality, noise, energy use, waste disposal, and vibration).

TABLE 13.8
SUMMARY OF POTENTIAL IMPACTS AND MITIGATION STRATEGIES ASSOCIATED WITH REPRESENTATIVE WATER SUPPLY ACQUISITION PROJECTS
(SAME AS DRAFT PEIR TABLE 9.10)

Actions Associated with Water Supply Acquisition Projects	Potential Impacts	Mitigation Strategy
Supplemental Water Supply Source		
Increased Water Use Efficiency/Conservation (e.g., conversion to drip irrigation); tiered water pricing	Reduced groundwater recharge. Exposure of soils to wind erosion leading to air quality impacts. Could lead to increased groundwater pumping.	None required. See below regarding increased groundwater pumping.
Conversion of More Water-Intensive to Less Water-Intensive Crops, Land Fallowing	Land fallowing could create pressure to convert land to urban uses and loss of agricultural land. Economic impacts to community.	Include consideration of farming interests in decision-making process for transfer.
Increased Groundwater Pumping/Conjunctive Use of Groundwater	Groundwater level reductions and overdraft if there is insufficient sustainable yield to accommodate increased pumping. Water quality issues include decreased aesthetic quality in drinking water (hardness, tastes, odors), health risk from potential contaminants in groundwater basin.	Determine sustainable yield of the basin, implement monitoring program, regulate groundwater pumping to preserve safe yield, provide treatment and/or blending if necessary to remove contaminants and control taste and odor. Local assistance programs for remediation of affected wells.
Delta Diversions	Potential impacts on sensitive Delta fisheries including: winter-run, spring-run Chinook salmon, Delta smelt, steelhead trout, and Delta splittail.	Compliance with existing and future pumping requirements related to threatened and endangered species protection.
	Changes in Delta inflow, outflow. Potential impacts on flows associated with wheeling Delta transfers through the Delta, resulting in secondary impacts on Delta fisheries and other biological resources.	Transfer would require review/approval by applicable regulatory agencies. Analysis of flow impacts and commitment to minimize adverse secondary impacts on biological resources (e.g., through transfer timing, pumping restrictions).
	Water quality for the Delta and downstream water users (including salinity, bromides, potential contaminants from agricultural and industrial runoff, taste and odor problems, disinfection byproducts, and temperature).	Compliance with existing and future applicable water quality control. Regulations. Treatment to bring up to water quality equitable to Tuolumne River.
	Water quality for the Delta and downstream water users (including salinity, bromides, and temperature).	Transfer would require review/approval by applicable regulatory agencies. Analysis of flow impacts and commitment to minimize adverse impacts on other water users (e.g., through transfer timing, pumping restrictions).

TABLE 13.8 (Continued)
SUMMARY OF POTENTIAL IMPACTS AND MITIGATION STRATEGIES ASSOCIATED WITH REPRESENTATIVE WATER SUPPLY ACQUISITION PROJECTS

Actions Associated with Water Supply Acquisition Projects	Potential Impacts	Mitigation Strategy
Facilities Required		
Conveyance	Mostly temporary impacts from construction of pipelines, valves, and pumps (disturbance of soils, surface water quality, biological resources, cultural resources, air quality, traffic, noise, land use, hazardous materials, aesthetics).	Most impacts associated with facility construction could be mitigated to a less-than-significant level with the types of measures identified in Chapter 6. As is the case with the proposed WSIP facilities, some impacts (e.g., short-term noise and traffic) could be unavoidable.
Pumping	Noise, energy consumption, air pollutant emissions from energy consumption.	Muffle noise. Use energy-efficient pumps and alternative energy sources.
Treatment	Temporary construction impacts, including land use, traffic, noise and air quality impacts. Potential long-term impacts could include increase in energy consumption, air pollutant and greenhouse gas emissions from energy consumption.	Use standard construction mitigations. Use energy-efficient pumps and alternative energy sources.
Groundwater Basin Storage of Surface Water	Potential degradation of groundwater quality, hydrofracturing (injection).	Pretreatment, groundwater quality monitoring, groundwater basin modeling, modifications to recharge and pumping practices.
Storage – Development of New Offstream Storage	Temporary and long-term impacts from construction of dam, pipelines, pumps, and appurtenant features (direct and indirect impacts on wetland and upland fish and wildlife and attendant habitat; impacts related to cultural resources, air quality, traffic, noise, land use, aesthetics, etc.).	Most impacts associated with facility construction could be mitigated to a less-than-significant level with the types of measures identified in Chapter 6. Some impacts would likely be unavoidable.

If desalination technologies were used to supplement supplies, implementation of a desalination project to augment wholesale customer water supplies would result in the full range of construction impacts at the proposed facility location (such as traffic, air quality, noise, and vibration) as well as operational impacts related to aquatic resources, water quality, energy consumption, air quality, visual resources, land use and planning, traffic, and greenhouse gas emissions. The programmatic impacts of construction and operation of a desalination facility are described in the Draft EIR under WSIP Variant 2, Regional Desalination for Drought (Vol. 4, Chapter 8 (pp. 8-24 to 8-32).

Similar to the Aggressive Conservation/Water Recycling and Local Groundwater Alternative, the Phased WSIP Variant could also result in construction and operation of extensive additional recycled water and groundwater facilities in the wholesale customer service areas; thus, collective impacts in the Bay Division and Peninsula Regions and associated cumulative effects would occur. The types of impacts associated with implementation of the local recycled water and groundwater projects are summarized in **Table 13.9** (which is the same as Draft PEIR Table 9.12) and generally relate to construction of new infrastructure, water quality, and groundwater resources, and operational uses of energy and long-term air quality emissions.

Water Supply and Systems Operations Impacts

Tables 13.10, **13.11**, and **13.12** show the significance of the environmental impacts of the Phased WSIP Variant in the Tuolumne River, Alameda Creek, and Peninsula watersheds compared to the potentially significant impacts identified for the WSIP. Under the Phased WSIP Variant, the SFPUC would limit deliveries from the SFPUC watersheds to 265 mgd on an average annual basis, which would include 184 mgd to the wholesale customers and 81 mgd to the retail customers. In 2018, the SFPUC would decide whether to continue this limit on deliveries from the SFPUC watersheds or to increase it after completing further demand and supply option studies. The impact summary tables show the significance of impacts for the Phased WSIP Variant as the SFPUC proposes to implement it through 2018, and also for a potential 2030 implementation scenario that includes an increase in deliveries from the SFPUC watersheds up to the full level provided under the WSIP. The effects of the Phased WSIP Variant through 2018 would be similar to those described for the No Purchase Request Increase Alternative. For the 2030 scenario, while the SFPUC plans to reconsider water demand and water supply and make a later decision about the appropriate amount of SFPUC watershed deliveries after 2018, this 2030 scenario represents a potential “worst-case” impact assessment with respect to the potential level of effect on the SFPUC watersheds, particularly the Tuolumne River watershed, that might occur under the Phased WSIP variant. For this 2030 scenario, the impacts of the Phased WSIP Variant are the same as those of the Modified WSIP Alternative, since it assumes that 20 mgd of local conservation, recycled water, and groundwater projects would be implemented by 2018.

Tuolumne River Watershed

The significant impacts of the WSIP and the Phased WSIP Variant in the Tuolumne River watershed are shown in Table 13.10. Overall, the impacts of the Phased WSIP Variant through 2018 would be less than the impacts of the WSIP.

TABLE 13.9
SUMMARY OF POTENTIAL IMPACTS AND MITIGATION STRATEGIES FOR RECYCLED WATER AND GROUNDWATER PROJECTS
(SAME AS DRAFT PEIR TABLE 9.12)

Potential Impact	Mitigation Strategy
Groundwater Resources. Potential for increased groundwater pumping, groundwater level reductions, and overdraft if there is insufficient sustainable yield to accommodate increased pumping.	Determine sustainable yield of the basin, implement monitoring program, regulate groundwater pumping to preserve safe yield.
Surface Water, Groundwater Quality, and Public Health Issues. Recycled water applied to the irrigated lands would infiltrate through the subsurface levels, potentially affecting surface and groundwater quality. Groundwater may have contaminants with potential health effects. Groundwater lowers the aesthetic quality of the water through increased hardness, and potential for tastes and odors.	Comply with Title 22 Water Recycling Criteria. Groundwater may require disinfection, treatment and/or blending.
Energy use. Operation of both recycled water and groundwater projects would require increased energy use for treatment and distribution, and pumping. Increased energy production to support these activities along with plant operation would, in turn, generate additional air pollutant emissions, including greenhouse gases emissions.	Energy efficiency measures.
Treatment. Temporary construction impacts (disturbance of soils, surface water quality, biological resources, cultural resources, air quality, traffic, noise, land use, hazardous materials). Potential long-term impacts could include odor, depending on treatment processes and location relative to sensitive receptors. Plant operations could also generate long-term noise, traffic, and visual impacts depending on facility site location(s)and increased energy consumption and air pollutant emissions. **Pumping.** (groundwater pumping station)	Most impacts associated with facility construction could be mitigated to a less-than-significant level with the types of measures identified in Chapter 6. As is the case with the proposed WSIP facilities, odor control features (scrubbers) could reduce any odor impacts to a less-than-significant level.
Conveyance. Mostly temporary impacts from construction of pipelines, valves, and pumps (disturbance of soils, surface water quality, biological resources, cultural resources, air quality, traffic, noise, land use, hazardous materials, aesthetics).	Most impacts associated with facility construction could be mitigated to a less-than-significant level with the types of measures identified in Chapter 6. As is the case with the proposed WSIP facilities, some impacts (e.g., short-term noise and traffic) could be unavoidable.
Storage. Temporary construction impacts (disturbance of soils, surface water quality, biological resources, cultural resources, air quality, traffic, noise, land use, hazardous materials) and potential long-term impacts based on site-specific characteristics (e.g., slope stability, location within a scenic viewshed).	Most impacts associated with facility construction could be mitigated to a less-than-significant level with the types of measures identified in Chapter 6. As is the case with the proposed WSIP facilities, some impacts (e.g., short-term noise and traffic) could be unavoidable. Prepare and implement recommendations from a geotechnical study, implement measures to reduce visual contrast with surroundings (e.g., backfilling, earth-tone paint).

TABLE 13.10
SUMMARY OF SIGNIFICANT WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR PHASED WSIP VARIANT – TUOLUMNE RIVER WATERSHED

Impact	Impact Description	Proposed Program – 2030	Phased WSIP Variant – 2018[a]	Phased WSIP Variant – 2030 Scenario[b]
Section 5.3.6, Fisheries				
Impact 5.3.6-4: Effects on fishery resources along the Tuolumne River below La Grange Dam.				
	In wet or above-normal years when Don Pedro Reservoir is being filled, changes in the timing and duration of releases from the reservoir would decrease average monthly flows along the lower Tuolumne River beneath La Grange Dam. The greatest average flow reductions would occur during June and could result in elevated water temperatures. Changes in stream flow and water temperature would result in a reduction in the linear extent of suitable habitat for rearing Chinook salmon and oversummering steelhead/rainbow trout, potentially causing adverse affects on these fish populations in the lower Tuolumne River.	PSM	LS when average annual deliveries from the watersheds are maintained at 265 mgd or less; PSM if deliveries exceed 265 mgd	PSM
Section 5.3.7, Terrestrial Biological Resources				
Impact 5.3.7-2: Impacts on meadow/alluvial features along the Tuolumne River below O'Shaughnessy Dam.				
▪ Sensitive habitats	Delayed snowmelt releases, reductions in flow, and the resulting reduction in groundwater recharge would result in an incremental reduction in the extent and diversity of wetland and riparian habitats, including sensitive wetland and riparian habitats in the Poopenaut Valley.	PSM	PSM	PSM
▪ Key special-status species	A reduction in wetland and riparian habitat would reduce suitable breeding habitat for key special-status species potentially occurring along this reach (e.g., foothill yellow-legged frog, California red-legged frog, and willow flycatcher), the populations of which are already critically reduced in the Sierra Nevada.	PSM	PSM	PSM
▪ Other species of concern	A reduction in the extent and diversity of wetland and riparian habitats would reduce habitat quality and extent for animal and plant species of concern.	PSM	PSM	PSM
▪ Common habitats and species	All habitats affected by the WSIP are considered sensitive. The WSIP could affect a large number of common animal species that depend on sensitive meadows and larger riparian areas for food and cover.	PSM	PSM	PSM
Impact 5.3.7-6: Impacts on biological resources along the Tuolumne River below La Grange Dam.				
▪ Sensitive habitats	Delayed spring releases and reductions in average and total flow (particularly during and following an extended drought) below La Grange Dam would reduce or eliminate suitable conditions for the recruitment of some riparian species along the river.	PSM	LS when average annual deliveries from the watersheds are maintained at 265 mgd or less PSM if deliveries exceed 265 mgd	PSM

TABLE 13.10 (Continued)
SUMMARY OF SIGNIFICANT WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR PHASED WSIP VARIANT – TUOLUMNE RIVER WATERSHED

Impact	Impact Description	Proposed Program – 2030	Phased WSIP Variant – 2018[a]	Phased WSIP Variant – 2030 Scenario[b]
Section 5.3.7, Terrestrial Biological Resources (cont.)				
▪ Key special-status species	Because of the known presence of key special-status species and the very limited amount of remaining suitable habitat along this reach of the Tuolumne River, this incremental impact would be potentially significant.	PSM	LS when average annual deliveries from the watersheds are maintained at 265 mgd or less PSM if deliveries exceed 265 mgd	PSM
▪ Other species of concern	Species of concern that would be adversely affected by changes in the extent and quality of suitable riparian habitat include western pond turtle, several bat species, and a wide variety of riparian- and marsh-associated bird species.	PSM	LS when average annual deliveries from the watersheds are maintained at 265 mgd or less PSM if deliveries exceed 265 mgd	PSM
▪ Common habitats and species	The populations of common species that depend on riparian habitat could be adversely affected by the alteration of habitat.	PSM	LS when average annual deliveries from the watersheds are maintained at 265 mgd or less PSM if deliveries exceed 265 mgd	PSM

LS = Less than Significant, no mitigation required
SM or PSM = Significant or Potentially Significant, can be Mitigated to less than significant
SU or PSU = Significant Unavoidable or Potentially Significant Unavoidable, cannot be mitigated to less than significant

[a] Under the Phased WSIP Variant through 2018, the SFPUC would limit the average annual SFPUC watershed deliveries to 265 mgd (approximately current levels).
[b] While the SFPUC would not make a decision about regional system deliveries for 2030 until 2018, for purposes of impact analysis a potential "worst-case" 2030 scenario was evaluated for the Phased WSIP Variant that assumes SFPUC watershed deliveries would increase after 2018 up to the 280 mgd level proposed under the Modified WSIP Alternative.

TABLE 13.11
SUMMARY OF SIGNIFICANT WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR PHASED WSIP VARIANT – ALAMEDA CREEK WATERSHED

Impact	Impact Description	Proposed Program – 2030	Phased WSIP Variant – 2018[a]	Phased WSIP Variant – 2030 Scenario[b]
Section 5.4.1, Stream Flow and Reservoir Water Levels				
Impact 5.4.1-2: Effects on flow along Alameda Creek below the diversion dam.				
	In all year types, system operations under the WSIP would increase diversions from Alameda Creek to Calaveras Reservoir between the months of December and May, nearly eliminating low and moderate (1 to 650 cubic feet per second) flows in Alameda Creek downstream of the diversion dam and substantially reducing many higher (greater than 650 cubic feet per second) flows that have occurred since 2002. The resultant reduction in stream flows and alteration of the stream hydrograph is considered an adverse effect.	SU	SU	SU
Section 5.4.5, Fisheries				
Impact 5.4.5-3: Effects on fishery resources.				
	Following implementation of the Calaveras Dam Replacement project (SV-2), operation of Calaveras Reservoir and the Alameda Creek Diversion Dam would be restored to pre-2002 conditions. A substantial increase in diversions from Alameda Creek to Calaveras Reservoir would reduce flows in this stretch of the creek, despite proposed bypass flows at the diversion dam. Diversion of most or all flows during late winter and spring months would reduce the ability of resident rainbow trout to spawn and for eggs to incubate; additional monitoring would be needed to determine the effectiveness of proposed bypass flows. In addition, the increased diversion of flows to the reservoir would divert fish from Alameda Creek to the reservoir, prevent fish passage to downstream reaches of the creek, and increase the potential for fish entrainment since there are currently no screens on the diversion.	PSM	PSM	PSM
Section 5.4.6, Terrestrial Biological Resources				
Impact 5.4.6-1: Impacts on riparian habitat and related biological resources in Calaveras Reservoir.				
▪ Sensitive habitats	Increased reservoir storage elevations would result in inundation and permanent loss of seasonal wetlands, seeps, perennial freshwater marsh, and riparian habitat that have established since 2002.	PSM	PSM	PSM
▪ Key special-status species	Since 2002, foothill yellow-legged frogs have occupied approximately 10,000 linear feet of stream channel along Arroyo Hondo between the maximum reservoir elevation mandated by the Division of Safety of Dams and the spillway elevation. Higher maintained reservoir levels would reduce the length of this high-quality habitat along the creek and adversely affect existing populations of foothill yellow-legged frog.	PSM	PSM	PSM
Impact 5.4.6-2: Effects on riparian habitat and related biological resources along Alameda Creek from below the diversion dam to the confluence with Calaveras Creek.				
▪ Key special-status species	A reduction in the frequency, duration, and magnitude of flows below the diversion dam would reduce the total available aquatic breeding habitat and food sources for California red-legged frog and foothill yellow-legged frog populations that currently occupy this reach of Alameda Creek.	PSM	PSM	PSM

TABLE 13.11 (Continued)
SUMMARY OF SIGNIFICANT WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR PHASED WSIP VARIANT – ALAMEDA CREEK WATERSHED

Impact	Impact Description	Proposed Program – 2030	Phased WSIP Variant – 2018[a]	Phased WSIP Variant – 2030 Scenario[b]
Section 5.4.6, Terrestrial Biological Resources (cont.)				
Impact 5.4.6-3: Effects on riparian habitat and related biological resources along Calaveras Creek from Calaveras Reservoir to the confluence with Alameda Creek.				
▪ Key special-status species	Future outlet works at Calaveras Dam would have the capacity to make higher-volume releases than under existing conditions. Depending on the timing and volume of operational releases, they could adversely affect the reproductive success of special-status amphibian species along this reach (e.g., California red-legged frog and foothill yellow-legged frog).	PSM	PSM	PSM
Impact 5.4.6-4: Effects on riparian habitat and related biological resources along Alameda Creek from Calaveras Creek to San Antonio Creek.				
▪ Key special-status species	Depending on annual rainfall and localized site conditions along this creek segment, changes in winter and summer flows along this reach could result in both beneficial and adverse impacts on habitat for California red-legged frog and foothill yellow-legged frog populations.	PSM	PSM	PSM
Section 5.4.7, Recreational and Visual Resources				
Impact 5.4.7-1: Effects on recreation.				
	Operations under the WSIP would substantially reduce flows along Alameda Creek in the Sunol Regional Wilderness during winter and early spring months and adversely affect the recreational experience for hikers. *(Note: The Draft PEIR determined this impact to be PSM, but due to the change in the project description of the Calaveras Dam Replacement project (SV-2), this impact determination is revised to LS.)*	LS	LS	LS
Impact 5.4.7-2: Visual effects.				
	WSIP-induced reductions in stream flows along Alameda Creek would substantially change the quality of visual resources in the Sunol Regional Wilderness. *(Note: The Draft PEIR determined this impact to be PSM, but due to the change in the project description of the Calaveras Dam Replacement project (SV-2), this impact determination is revised to LS.)*	LS	LS	LS

LS = Less than Significant, no mitigation required
SM or PSM = Significant or Potentially Significant, can be Mitigated to less than significant
SU or PSU = Significant Unavoidable or Potentially Significant Unavoidable, cannot be mitigated to less than significant

[a] Under the Phased WSIP Variant through 2018, the SFPUC would limit the average annual SFPUC watershed deliveries to 265 mgd (approximately current levels).
[b] While the SFPUC would not make a decision about regional system deliveries for 2030 until 2018, for purposes of impact analysis a potential “worst-case” 2030 scenario was evaluated for the Phased WSIP Variant that assumes SFPUC watershed deliveries would increase after 2018 up to the 280 mgd level proposed under the Modified WSIP Alternative.

TABLE 13.12
SUMMARY OF SIGNIFICANT WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR PHASED WSIP VARIANT – PENINSULA WATERSHED

Impact	Impact Description	Proposed Program – 2030	Phased WSIP Variant – 2018[a]	Phased WSIP Variant – 2030 Scenario[b]
Section 5.5.3, Surface Water Quality				
Impact 5.5.3-2: Water quality in Pilarcitos Reservoir and along Pilarcitos Creek.				
	Proposed operations would generally be within the same range as existing conditions, although replacement Measure 5.5.3-2a would cause Pilarcitos Reservoir to be drawn down earlier in the summer compared to existing conditions. Water temperature could increase and dissolved oxygen content could be reduced. *(Note: The Draft PEIR determined this impact to be PSM, and with the refined impact analysis for the Pilarcitos Creek watershed, this impact determination remains PSM due to impacts resulting from implementation of a replacement mitigation measure.)*	PSM	LS	PSM
	During dry years, summertime releases from Pilarcitos Reservoir to Pilarcitos Creek would be reduced to reservoir inflow at an earlier date than they are under the existing condition. This would increase the temperature of instream flows between Pilarcitos Creek and Stone Dam and reduce the creek's ability to support designated cold freshwater habitat along this reach.	PSM	LS	PSM
	During wet and above-normal years, the volume of spills over Stone Dam would be reduced compared to the existing condition.	LS	LS	LS
Section 5.5.5, Fisheries				
Impact 5.5.5-1: Effects on fishery resources in Crystal Springs Reservoir.				
	Elevated water levels in Crystal Springs Reservoir would inundate approximately 1,500 linear feet of trout spawning habitat upstream of the reservoir along Laguna and San Mateo Creeks.	PSU	PSU	PSU
Impact 5.5.5-4: Effects on fisheries resources in Pilarcitos Reservoir.				
	Proposed operations would be within the same range as existing conditions, although replacement Measure 5.5.3-2a would cause Pilarcitos Reservoir to be drawn down earlier in the summer compared to existing conditions. This would reduce the volume and quality of coldwater habitat available for resident fish species. *(Note: The Draft PEIR determined this impact to be PSM, and with the refined impact analysis for the Pilarcitos Creek watershed, this impact determination remains PSM due to impacts resulting from implementation of a replacement mitigation measure.)*	PSM	LS	PSM
Impact 5.5.5-5: Effects on fisheries resources along Pilarcitos Creek below Pilarcitos Reservoir.				
	Under the WSIP, the extended period of no or very little flow in Pilarcitos Creek below Pilarcitos Reservoir during summer months of dry years would result in significant impacts on resident trout, other resident fish species and aquatic resources, and habitat quality and availability for anadromous steelhead. Increased drawdown of Pilarcitos Reservoir would increase the temperature of releases in summer and fall and reduce the quality and availability of habitat for coldwater fish species.	PSM	LS	PSM

TABLE 13.12 (Continued)
SUMMARY OF SIGNIFICANT WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR PHASED WSIP VARIANT – PENINSULA WATERSHED

Impact	Impact Description	Proposed Program – 2030	Phased WSIP Variant – 2018[a]	Phased WSIP Variant – 2030 Scenario[b]
	A reduction in the frequency and magnitude of spills over Stone Dam would reduce flows along the lower reach. Reduced instream flows during winter months would adversely affect migratory fish habitat.	PSM	LS	PSM
Section 5.5.6, Terrestrial Biological Resources				
Impact 5.5.6-1: Impacts on biological resources in Upper and Lower Crystal Springs Reservoirs.				
▪ Sensitive habitats	Implementation of the Lower Crystal Springs Dam Improvements project (PN-4) would raise average monthly water levels in Crystal Springs Reservoir and result in a short-term reduction in the overall extent of freshwater marsh as the reservoir fills. Proposed changes in operations would maintain maximum reservoir levels during summer for longer periods than under existing conditions, which could affect the composition and structure of riparian habitats. In addition, sensitive upland habitats that are unable to tolerate these longer periods of inundation would be lost.	PSM	PSM	PSM
▪ Key special-status species	Elevated reservoir levels would inundate existing populations of special-status plant species, including serpentine-associated fountain thistle and Marin western flax, and their habitat could be permanently lost. The extent of available habitat for San Francisco garter snake and California red-legged frog would be temporarily reduced during reservoir refill, but wetland habitat that would establish at higher elevations could be more extensive. Raised reservoir levels would provide greater opportunities for largemouth bass and other predators to access frogs and snakes. Periodic drawdown during planned maintenance could adversely affect San Francisco garter snake foraging habitat.	PSM	PSM	PSM
▪ Other species of concern	Changes in wetland habitat due to reservoir refill and proposed operations would adversely affect reptile and bird species of concern, particularly if permanent changes in the composition of wetland vegetation occur. Permanent loss of upland habitat, including upland trees, grassland, and coastal scrub, would result in significant impacts on several bird and mammal species of concern. Serpentine- and grassland-associated plant species unable to tolerate extended periods of inundation would be lost.	PSM	PSM	PSM
▪ Common habitats and species	Due to the extent of area involved, impacts on common habitats and species would be significant.	PSM	PSM	PSM
Impact 5.5.6-4: Impacts on biological resources in Pilarcitos Reservoir.				
▪ Key special-status species	Proposed operations would be within the same range as existing conditions, although replacement Measure 5.5.3-2a would cause Pilarcitos Reservoir to be drawn down earlier in the summer compared to existing conditions. This would affect the extent of suitable habitat for California red-legged frog and San Francisco garter snake due to earlier reservoir drawdown in some years. Special-status species that utilize adjacent upland vegetation would not be affected. *(Note: The Draft PEIR determined this impact to be PSM, and with the refined impact analysis for the Pilarcitos Creek watershed, this impact remains PSM due to impacts resulting from implementation of a replacement mitigation measure.)*	PSM	LS	PSM

TABLE 13.12 (Continued)
SUMMARY OF SIGNIFICANT WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR PHASED WSIP VARIANT – PENINSULA WATERSHED

Impact	Impact Description	Proposed Program – 2030	Phased WSIP Variant – 2018[a]	Phased WSIP Variant – 2030 Scenario[b]
Impact 5.5.6-5: Impacts on biological resources along Pilarcitos Creek.				
▪ Sensitive habitats	In summer months of dry years, an extended period of no or little flow in Pilarcitos Creek between Pilarcitos Reservoir and Stone Dam could stress riparian vegetation, but existing vegetation appears to be adapted to periods of dryness. *(Note: The Draft PEIR determined this impact to be PSM, but due to the refined impact analysis for the Pilarcitos Creek watershed, this impact determination is revised to LS.)*	LS	LS	LS

LS = Less than Significant, no mitigation required
SM or PSM = Significant or Potentially Significant, can be Mitigated to less than significant
SU or PSU = Significant Unavoidable or Potentially Significant Unavoidable, cannot be mitigated to less than significant

[a] Under the Phased WSIP Variant through 2018, the SFPUC would limit the average annual SFPUC watershed deliveries to 265 mgd (approximately current levels).
[b] While the SFPUC would not make a decision about regional system deliveries for 2030 until 2018, for purposes of impact analysis a potential "worst-case" 2030 scenario was evaluated for the Phased WSIP Variant that assumes SFPUC watershed deliveries would increase after 2018 up to the 280 mgd level proposed under the Modified WSIP Alternative.

The WSIP would result in a reduction in the average annual volume of water released from O'Shaughnessy Dam and a change in the pattern of monthly and daily releases to the Tuolumne River below the dam (Draft PEIR, Vol. 3, Chapter 5, Section 5.3.1). The reduced release volume and altered flow regime would affect fisheries and terrestrial biological resources in the river below O'Shaughnessy Dam. Various quantitative factors or metrics were considered in determining the significance of the WSIP's impacts on fisheries and terrestrial biological resources. Several of the metrics relate to conditions in May, the month in which the effects of the WSIP would be the greatest in the reach of the river below O'Shaughnessy Dam. The following factors were evaluated over the 82-year hydrologic record:

- WSIP-caused reduction in average annual releases from O'Shaughnessy Dam
- Average WSIP-caused delay in May releases (in days)
- Maximum WSIP-caused delay in May releases (in days)
- Frequency of more than two-day delay in May releases caused by the WSIP
- Percentage reduction in May releases in all hydrologic years due to the WSIP
- Percentage reduction in May releases in dry years due to the WSIP
- Increase in the number of months when only minimum required releases are made as a result of the WSIP

These factors were considered together to arrive at significance conclusions with respect to the WSIP's impacts on fisheries and terrestrial biological resources in the Tuolumne River below O'Shaughnessy Dam, as shown in Table 13.10.

The WSIP would also result in a reduction in the average annual volume of water released from La Grange Dam and a change in the pattern of monthly and daily releases to the Tuolumne River below the dam. The reduced release volume and altered flow regime would affect fisheries and terrestrial biological resources in the river below La Grange Dam (see Vol. 3, Chapter 5, Section 5.3.1). A similar procedure (as was described above for the reach of the river below O'Shaughnessy Dam) was used to determine the significance of WSIP impacts on fisheries and terrestrial biological resources in the reach of the river below La Grange Dam. However, several of the metrics used in the analysis relate to conditions in June, because June is the month in which the effects of the WSIP would be greatest in this reach of the river.

Under the Phased WSIP Variant, while average annual deliveries from the SFPUC watersheds would be limited to 265 mgd such that there would be no increase in diversion from the Tuolumne River to serve additional demand, there would be a small increase in average annual Tuolumne River diversions of 2 mgd in order to implement the WSIP delivery and drought reliability elements for system customers through 2018. As a result of this small increase in average annual Tuolumne River diversion, like the WSIP, the Phased WSIP Variant with the 265 mgd delivery limitation from the SFPUC watersheds would result in a reduction in the average annual volume of water released from O'Shaughnessy Dam to the Tuolumne River, potentially affecting monthly and daily release patterns, (Vol. 3, Chapter 5, Section 5.3.1). Under the WSIP, the reduced volume and changed release pattern would have a potentially significant impact on the terrestrial biological resources of streamside meadows and other alluvial features in the reach of the river between Hetch Hetchy and Don Pedro Reservoirs, particularly in the sensitive Poopenaut Valley (Vol. 3, Chapter 5, Section 5.3.6). Although flow changes would be much less with the Phased WSIP Variant through 2018 than with the WSIP, the impacts of the Phased WSIP Variant on terrestrial biological resources was still determined to be *potentially significant* because of the sensitivity of biological resources in the Poopenaut Valley. Accordingly, under the Phased WSIP Variant with the 265 mgd delivery limitation from the SFPUC watersheds, the SFPUC would still need to implement Mitigation Measure 5.3.7-2, Controlled Releases to Recharge Groundwater in Streamside Meadows and Other Alluvial Deposits (Vol. 4, Chapter 6, pp. 6-49 and 6-50) to reduce potentially significant impacts on biological resources.

As described in the previous paragraph, under the Phased WSIP Variant there would be a small increase in average annual diversions from the Tuolumne River of 2 mgd in order to implement the delivery and drought reliability elements of the WSIP through 2018. As a result, like the WSIP, the Phased WSIP Variant would result in a reduction in the average annual volume of water released from La Grange Dam to the Tuolumne River and a change in monthly and daily release patterns, although again, it would be a much smaller reduction. Under the WSIP, the reduced volume and changed release pattern would have a potentially significant adverse impact on fisheries and terrestrial biological resources in the Tuolumne River below La Grange Dam. Flow changes with the Phased WSIP Variant with the 265 mgd delivery limitation from the SFPUC watersheds would be much less than those under the WSIP, and the impacts of the Phased WSIP Variant on fisheries and terrestrial biological resources were determined to be less than significant. However, as previously discussed in the description of the Phased WSIP Variant, while the SFPUC proposes to limit average annual deliveries from its watersheds to 265 mgd (approximately the current level), it recognizes that it might be necessary to allow a short-term increase in watershed deliveries beyond 265 mgd (up to 275 mgd) while the SFPUC and/or BAWSCA and the wholesale customers implement the local conservation, recycled water, and groundwater projects needed to meet increasing demands through 2018. For the purpose of impact analysis, it was assumed conservatively that watershed deliveries could increase above 265 mgd for a few years until all of the local projects needed to generate the required 20 mgd of local supply and conservation have been fully implemented. In addition, a conservative, worst-case assumption of a short-term increase in watershed deliveries to 275 mgd was used. If the 265 mgd limit on watershed deliveries were exceeded, then there could be potentially significant impacts on the lower Tuolumne River during that time, until average annual diversions were reduced to 265 mgd (representing existing conditions). Although the impacts on the lower Tuolumne River would be of lesser magnitude than those of the WSIP (which assumed a watershed delivery level of 290 mgd) and would be temporary (on the order of a few years), the potential effects of the Phased WSIP Variant on fisheries and terrestrial biological resources in this reach of the river are conservatively considered to be *potentially significant*. The SFPUC would monitor annual water deliveries from its watersheds, and, if average annual deliveries from the SFPUC watersheds exceeded the 265 mgd limit, the SFPUC would implement Mitigation Measure 5.3.6-4a, Avoidance of Flow Changes by Reducing Demand for Don Pedro Reservoir Water, or 5.3.6-4b, Fishery Habitat Enhancement and Measure 5.3.7-6, Lower Tuolumne River Riparian Habitat Enhancement. The SFPUC would continue to implement the necessary measure(s) until the average annual SFPUC watershed deliveries are 265 mgd or less. Similar to the WSIP, implementation of Measure 5.3.6-4a is the preferred mitigation approach, and for the Phased WSIP Variant, the amount of conserved water required to reduce the impact to less than significant would be proportional to the amount of increased diversions from the Tuolumne River contributing to exceeding the 265 mgd restriction.

Alameda Creek Watershed

The significant impacts of the WSIP and the Phased WSIP Variant in the Alameda Creek watershed are shown in Table 13.11. The impacts of the Phased WSIP Variant, both with and without the 265 mgd limitation on SFPUC watershed deliveries, and the impacts of the WSIP would be the same or very similar. The reason the impacts in the Alameda Creek watershed would be the same or similar is that they would result primarily from facility improvements and restoration of the historical reservoir capacity at Calaveras Reservoir rather than from demand increases. Facility improvements would be the same for the WSIP and the Phased WSIP Variant.

Peninsula Watershed

The significant impacts of the WSIP and the Phased WSIP Variant in the Peninsula watershed are shown in Table 13.12. The impacts of the Phased WSIP Variant, both with and without the 265 mgd limitation on SFPUC watershed deliveries, and the impacts of the WSIP in the San Mateo Creek watershed would be the same or very similar. The reason the impacts in this watershed would be the same or similar is that they would result primarily from implementation of the facility improvement projects and restoration of Crystal Springs Reservoir capacity rather than from demand increases. Facility improvements would be the same for the WSIP and the Phased WSIP Variant.

With both the WSIP and the Phased WSIP Variant under the “worst-case” 2030 scenario (without the 265 mgd delivery limitation from the SFPUC watersheds), Pilarcitos Reservoir would be drawn down at an earlier date in some summers than it is under the existing condition (Vol. 3, Chapter 5, Section 5.5.1). As a result, releases to Pilarcitos Creek from the reservoir would be reduced to reservoir inflow earlier in the year than under the existing condition. The flow reduction in the creek between Pilarcitos Reservoir and Stone Dam would have a significant adverse impact on water quality and fisheries. In addition, under the WSIP and the 2030 Phased WSIP Variant scenario, the volume of wintertime spills over Stone Dam would be reduced compared to the existing condition. The reduction in the volume of spills would have an adverse impact on fisheries in Pilarcitos Creek below Stone Dam. These same phenomena would occur with the Phased WSIP Variant through 2018 with the 265 mgd delivery limitation, but their magnitude would be much less than with the WSIP. Consequently, the impacts of the Phased WSIP Variant through 2018 on water quality and fisheries in Pilarcitos Creek were determined to be less than significant. Under the Phased WSIP Variant through 2018, no mitigation measures would be needed in the Pilarcitos Creek watershed.

Secondary Effects of Growth

The Phased WSIP Variant would have the same growth-inducement potential through 2018 as the WSIP because the SFPUC (possibly with the cooperation of BAWSCA and the wholesale customers) would provide the additional water supply to meet 2018 purchase requests. However, depending on the decision on water supply in 2018, this variant could result in less growth inducement if the SFPUC decides to maintain the 265 mgd restriction on deliveries from the SFPUC watersheds, or on the high end, it could result in the same growth-inducement potential as the WSIP if it decides to fully meet a 2030 purchase request of 300 mgd. Similar to the WSIP, any growth-inducement increment attributable to this variant would be considered significant and unavoidable.

References – Introduction to Responses and WSIP Revisions

Bay Area Water Supply and Conservation Agency (BAWSCA), Meeting Minutes from Board of Directors Meeting, Held at Foster City Community Building, Foster City, CA, March 20, 2008a.

Bay Area Water Supply and Conservation Agency (BAWSCA), Request for Proposals for a Water Conservation/Recycling Implementation Plan, July 18, 2008b.

California Department of Water Resources (DWR), *Preparing for California's Next Drought, Changes Since 1987–92*, July 2000.

Johnson, Karen E. and Loux, Jeff, *Water and Land Use: Planning Wisely for California' Future*, 2004.

San Francisco Public Utilities Commission (SFPUC), Memorandum from Ed Harrington, General Manager, SFPUC and Michael P. Carlin, Assistant General Manager – Water, SFPUC to Diana Sokolove, Major Environmental Assessment, San Francisco Planning Department regarding Calaveras Dam Replacement Project and Alameda Creek Fishery Enhancement Project Description, July 16, 2008a.

San Francisco Public Utilities Commission (SFPUC), Letter from Susan Leal, SFPUC General Manager, to Diana Sokolove, Senior Planner at San Francisco Planning Department, RE: SFPUC Programmatic Environmental Impact Report (PEIR) for Water System Improvement Program (WSIP), dated March 21, 2008b.

San Francisco Public Utilities Commission (SFPUC), Letter from Ed Harrington, SFPUC General Manager, to Diana Sokolove, Senior Planner at San Francisco Planning Department, RE: Analysis of Variant to Water System Improvement Program (WSIP) Programmatic Environmental Impact Report (PEIR), dated May 2, 2008c.

San Francisco Public Utilities Commission (SFPUC), Memorandum from Michael P. Carlin, Assistant General Manager – Water, SFPUC to Diana Sokolove, Major Environmental Assessment, SF Planning Department regarding Water System Improvement Program Facilities Capacity, July 29, 2008d.

14. Master Responses

14.1 Master Response on WSIP Purpose and Need

14.1.1 Introduction

Overview

This master response addresses the issues commenters raised on the need for and objectives of the WSIP. Commenters were concerned with the overall combination of goals and objectives of the WSIP as well as with the level of detail provided in the Draft PEIR on these issues. Many commenters expressed an opinion that the Draft PEIR did not adequately describe the needs and deficiencies of the regional water system and the importance for improving the seismic and delivery reliability of the system.

The Draft PEIR provides background information on the purpose and need for the WSIP but does not discuss these issues in great depth; however, these issues do factor into the decision-making process (i.e., project approval), the WSIP bond measure, and the selection of the CEQA alternatives. This master response emphasizes and expands on the benefits of the proposed program but does not address comments related to the program's environmental effects; those comments are bracketed and responded to separately in Chapter 15 and/or in other master responses as appropriate.

This master response is organized by the following subtopics:

14.1.2 Purpose of the WSIP
14.1.3 Need for Seismic Reliability
14.1.4 Need for Water Supply and Drought Reliability
14.1.5 Seismic Improvements and Water Supply
14.1.6 Economic Evaluation of the Need for the WSIP

Commenters

Commenters that addressed this topic include:

Federal Agencies

- None

State Agencies

- California State Assembly – S_CSA

Local and Regional Agencies

- Bay Area Water Supply and Conservation Agency – L_BAWSCA1, L_BAWSCA2, L_BAWSCA3, L_BAWSCA4, L_BAWSCA5, L_BAWSCA6
- City of Hayward – L_Hayward
- City of Menlo Park – L_Menlo1
- City of Millbrae – L_Millbr
- City of Milpitas – L_Milpts

- City of Mountain View – L_MtnVw
- City of Palo Alto – L_PaloAlto
- City of Redwood City – L_RdwdCty
- City of San Jose – L_SanJose
- City of Santa Clara – L_SClara
- Los Altos Hills County Fire District – L_LAHCFD
- Purissima Hills Water District – L_PHWD1, L_PHWD2
- Stanford University (BAWSCA member) – L_Stanford
- Town of Hillsborough – L_Hillsb
- Town of Los Altos Hills – L_LosAltosH

Groups

- Acterra, Action for a Sustainable Earth – SI_ACT
- Environmental Defense – SI_EnvDef
- San Francisco Planning and Urban Research Association – SI_SPUR
- Tuolumne River Trust – SI_TRT3, SI_TRT6, SI_TRT9

Citizens

- Adams, Amy – C_Adams
- Allen, Casey – C_AllenC
- Bramlette, Darryl – C_BramlD
- Brand, Jobst – C_Brand
- Chiapella, Lynn – C_Chiap
- Elliott, Claire – C_EllioC
- Elliott, Patricia – C_EllioP
- Keebra, Suzanne – C_Keebr
- Kim, Michelle – C_Kim
- Kramer, John – C_Krame
- Martin, Michael – C_MartiM
- Neal, Paul – C_Neal
- Parkes, Doug – C_Parke
- Poulton, J – C_Poult
- Raffaeli, Paul – C_Raffa
- Ross, Jim – C_Ross
- Steinhart, Peter – C_Stein
- Symons, Barbara – C_Symon
- Walker, Patricia – C_Walke

PEIR Section Reference

The Draft PEIR addresses this topic area in the following locations: Vol. 1, Summary, Section S.2, pp. S-2 to S-6; Vol. 1, Chapter 2, Section 2.1, p. 2-1, and Section 2.3, pp. 2-16 to 2-31; Vol. 1, Chapter 3, Sections 3.3, 3.4, and 3.5, pp. 3-5 to 3-32; and Vol. 2, Chapter 4, Section 4.4.1, pp. 4.4-4 to 4.4-13.

14.1.2 Purpose of the WSIP

Comment Summary

This section of this master response responds to all or part of the following comments:

S_CSA-01	L_BAWSCA2-02	L_Millbr-02
S_CSA-05	L_BAWSCA3-01	L_Milpts-02
L_BAWSCA1-02	L_BAWSCA4-01	L_MtnVw-01
L_BAWSCA1-04	L_BAWSCA5-01	L_RdwdCty-02
L_BAWSCA1-54	L_BAWSCA6-01	L_SanJose-07
L_BAWSCA1-63	L_PaloAlto-04	L_Stanford-02

L_BAWSCA1-82	L_PaloAlto-05	SI_SPUR-02
L_BAWSCA1-84	L_PHWD2-02	C_Chiap-01
L_BAWSCA1-112	L_PHWD1-04	
L_BAWSCA2-01	L_Menlo1-01	

Summary of Issues Raised by Commenters

- Requests for a more detailed discussion of the overall need for the WSIP and of the potential consequences of not implementing the proposed program.
- Requests for a more detailed discussion of the importance of the WSIP to public health and safety.
- Requests for an expanded description of the needs and deficiencies of the existing regional water system.

Response

As described in the Draft PEIR (Vol. 1, Chapter 2, p. 2-1), the SFPUC developed and designed the WSIP to increase the overall reliability of the regional water system which services 2.4 million people in San Francisco, San Mateo, Santa Clara, Alameda, and Tuolumne Counties. The reliability of the water infrastructure system is of vital importance to the public health, safety, and drinking water needs of the Bay Area, including the welfare of residents, universities, state institutions, health care facilities, businesses, commercial and industrial complexes, and research and development facilities. The San Francisco Bay Area employs millions of Californians and generates billions of dollars in exports and tax revenues to the state. Catastrophic failure of the regional water system would be disastrous for public health and safety, and for the regional and state economies. Failure of the regional water system would present serious implications for Bay Area communities, including for the most vulnerable segments of the population—homebound elderly, children, hospital and nursing home patients, and families that could be displaced from their homes—particularly if failure of the regional system were to happen concurrent with earthquakes and fire. In addition, damage to water supply infrastructure in the event of an earthquake could result in uncontrolled releases of water from pipelines, tunnels, and reservoirs and create severe flood damage and environmental harm to fish and wildlife habitat in the communities in which water facilities are located, which stretch 160 miles from Yosemite National Park to San Francisco.

Existing Needs and Deficiencies

Maintenance Needs

Regular maintenance of regional facilities is needed to maintain the seismic and delivery reliability of the overall system. As described in the Draft PEIR (Vol. 1, Chapter 2, p. 2-1), the regional water system is comprised of over 280 miles of pipeline, over 60 miles of tunnels, 11 reservoirs, 5 pump stations, and 2 water treatment plants. Many of these components were built in the 1800s and early 1900s using now-outdated construction materials and/or methods, and were not designed to meet modern seismic engineering standards. Pipelines, tunnels, treatment and pumping facilities, and other related facilities all require maintenance (see Draft PEIR, Vol. 1, Chapter 2, Section 2.3.6). Maintenance of these facilities, which includes inspections and minor repairs/upkeep as well as major repairs, replacement, and/or rehabilitation, is a fundamental part of regional system operations and often requires that these facilities be completely shut down for up to 45 days or more. The most important facilities to maintain are also the most critical for system operations, making it inherently difficult to take them out of service for extended periods of time for inspection or repair. As a result, several key components of the system, including tunnels, dams, and other critical regional water system facilities, have been poorly maintained or have not been not maintained at all for decades.

Deferred Maintenance Has Reduced Overall System Reliability

As described in the Draft PEIR (Vol. 1, Chapter 2, pp. 2-27 and 2-28), unplanned outages have occurred periodically throughout the regional system for various reasons, including aging and deteriorating infrastructure. Specific examples of facility outages that have recently occurred include:

- In August 1996, a rupture in San Joaquin Pipeline No. 3 due to failure of the pipeline material resulted in a reduction of water delivered from the Hetch Hetchy system to the Bay Area, from 230 million gallons per day (mgd) to 150 mgd for a period of three weeks. The pipeline failure caused an unplanned discharge of over 10 million gallons of water at a rate of 200 to 400 cubic feet per second, flooded the surrounding cattle range land, and created a 1,000-foot-long erosion gully. In November 2002, there was another similar rupture in a different location on the same pipeline.

- In 1990, the 60-inch-diameter San Andreas No. 3 prestressed-concrete pipeline ruptured violently in an urban area of South San Francisco, sending waves of water across a schoolyard and turning cars over.

- During the 1996/1997 rainy season, a landslide originating on the hillside above the Crystal Springs Bypass Pipeline buried a 350-foot segment of the roadway in which the pipeline is aligned. The pipeline was taken out of service for several months to prevent a potentially disastrous discharge if the pipeline were to break. This incident revealed the vulnerability of the Crystal Springs Bypass Pipeline to seismically induced landslides.

Because funding has not been provided to replace facilities at the end of their service life, a tremendous amount of resources go into repairing broken equipment, which in turn causes facility outages, delays in operational schedules, and a shift of resources away from scheduled maintenance programs. Aging pump stations, such as the Baden, Crystal Springs, and San Antonio Pump Stations, are particularly susceptible to equipment failures and could result in outages or decreased operating capacity. Deteriorating valves that operators use to control pipe flow are critical links that affect the SFPUC’s ability to isolate facilities for maintenance; some valves were historically installed without a redundant line or isolation valves, making them difficult or impossible to exercise and maintain without shutting down the system.

Pipelines are particularly susceptible to leakage or failure along segments where there is prestressed-concrete cylinder piping; leakage or failure has occurred in recent years on parts of the San Joaquin No. 3, San Antonio, Bay Division No. 4, Crystal Springs No. 2, and San Andreas No. 3 Pipelines, the repair of which has taken from several days to several months. Seismic safety and flooding issues at Calaveras Dam and Lower Crystal Springs Dam (described below under the heading Reduced Storage Capacity) have restricted the normal operating capacity of the system. The deferred maintenance and inspections of key infrastructure, such as the Irvington, Pulgas, and Crystal Springs Bypass Tunnels, have increased the susceptibility of the system to failure and unplanned outages. The frequency and magnitude of unplanned outages would be substantially reduced with increased replacement at the end of service life, increased operating flexibility, and regular maintenance and inspection, thereby substantially improving overall system reliability.

Seismic Vulnerability

Many of the key components of the regional water system are located in a seismically active region. The Draft PEIR (Vol. 2, Chapter 4, pp. 4.4-4 to 4.4-13) describes the regional faulting and seismic hazards along the SFPUC regional water system. The major faults in the vicinity of the regional water system are shown in Figure 4.4-1 (pp. 4.4-7 and 4.4-8). As shown in Figure 4.4-1, several key storage, transmission, and treatment facilities are traversed by, or located very near to, one or more active faults. All four of the major transmission pipelines that carry water from the East Bay to the South Bay, Peninsula, and San Francisco communities are intersected by one or more active faults. Calaveras Reservoir (in Alameda County), and San Andreas and Crystal Springs Reservoirs (in San Mateo County) are traversed by the Calaveras and San Andreas faults, respectively. Further, as described in the Draft PEIR, the U.S. Geological Survey Working Group on California Earthquake Probabilities concluded that there is a 62 percent probability of a magnitude 6.7 or greater earthquake, capable of causing widespread damage, occurring in the San Francisco Bay region in the 30-year period between 2003 and 2032 (Vol. 2, Chapter 4, p. 4.4-5). Although the San Joaquin region is relatively seismically inactive compared to the Bay Area, earthquakes on any of the active faults in the greater Bay Area could also produce groundshaking and associated seismic hazards in this region. The combination of outdated building methods, aging infrastructure, lack of deferred maintenance, and regional seismicity place several of the key facilities at a high risk of catastrophic failure in the event of a major earthquake. As discussed in the Draft PEIR (Vol. 1, Chapter 3, pp. 3-27 and 3-28), the results of seismic reliability studies conducted by the SFPUC indicate that a major earthquake on the San Andreas, Hayward, or Calaveras fault under existing conditions could result in unplanned outages and a drastic disruption of service to all SFPUC customers for more than 14 days and possibly more than 30 days. Refer to Section 14.1.3 below for additional information regarding the vulnerability of the regional water system to seismic hazards.

Need for Drought Planning and Preparedness

Past experience with droughts has reinforced the critical importance of planning for future drought events. The term “drought event” refers to all years or sequences of years when hydrological/meteorological conditions indicate that water supplies may not be adequate to fully meet customer demands and the SFPUC needs to modify its operating procedures and implement drought response actions (Draft PEIR, Vol. 1, Chapter 3, Section 3.5.4). As described in the Draft PEIR (Vol. 1, Chapter 2, Section 2.3.5), the regional water system has experienced drought periods in the last 30 years, most notably the droughts from 1976 to 1977, and from 1987 to 1992. As the 1987–1992 drought progressed, the SFPUC was forced to adopt a mandatory rationing program to impose rationing on customers that resulted in a near 25 percent annual systemwide reduction in water deliveries. Due to the wide variation in types of water users in the regional service area, the program resulted in a wide variation in cutbacks experienced by different customers, ranging from about 20 percent in areas with cooler climates to 40 percent in areas with warmer climates. In the later stages of the six-year drought, the SFPUC initiated programs to achieve a 45 percent reduction in systemwide deliveries, but these programs were averted when a series of storms in March 1991 provided relief.

The potential impacts of a severe drought are based on the frequency, duration, severity, and spatial extent of the drought, and the degree to which a population, water user, or sector of the economy is vulnerable to the effects of a drought (e.g., rainfall/runoff, amount of water in storage, availability of supplemental dry-year supplies). As discussed below, a reduction in the overall storage capacity due to reservoir restrictions imposed by the Division of Safety of Dams (DSOD) has reduced the system firm yield of the regional water system and further impaired the ability of the system to meet water deliveries to current customers during a prolonged drought. Major droughts (such as the 1987–1992 drought) can have substantial direct and indirect impacts on the state and regional economy, environment, and society as a whole. Direct impacts of drought are characteristically biophysical and include reduced water levels, increased fire hazards, a reduction in agricultural production and forest productivity, and adverse impacts on wildlife and fisheries, among others. Indirect impacts are consequential and can include impacts on public health and safety, increased food prices, reduced quality of life, reduced income for water-intensive industries, and increased unemployment. Studies indicate a 30 percent chance that the regional water system will experience a drought in the next 75 years that is equal to or more severe than the 1987–1992 drought, the most extreme recorded drought to affect the regional system (see Draft PEIR, Vol. 1, Chapter 3, p. 3-14). As described below, the future storage capacity and system firm yield of the regional water system are two factors affecting the vulnerability of the system to future drought impacts.

Reduced Storage Capacity

The regional water system is highly dependent on storage to be able to serve water under a variety of meterological/hydrological and operating conditions. While the Hetch Hetchy system provides the majority of water to the regional system, local Bay Area reservoirs are operated to maximize the yield for water deliveries and carryover storage and to provide critical backup or redundancy in the event of water quality problems, transmission disruptions in the Hetch Hetchy system, emergencies, critical maintenance, and droughts. In 1983, the DSOD placed operating restrictions on Lower Crystal Springs Dam due to concerns regarding the ability of the dam to retain water during major flood events, reducing the historical water storage capacity of Crystal Springs Reservoir by approximately 10,900 acre-feet, or about 15 percent (see Draft PEIR, Vol. 1, Chapter 2, Table 2.2, p. 2-6). In terms of operating storage capacity, the DSOD restrictions on Crystal Springs Reservoir are equivalent to 1 mgd of water (annual average over 8.5-year design drought) (Vol. 1, Chapter 3, p. 3-36).

In 2001, the DSOD also placed interim operating restrictions on Calaveras Dam due to the dam's inability to meet current seismic stability criteria at normal operating levels. The restrictions on

Calaveras Dam reduced the total storage capacity of the reservoir by 60 percent and the total, combined working storage capacity of the SFPUC's local reservoirs by over 30 percent. From the perspective of emergency preparedness, the DSOD restriction on Calaveras Dam has reduced the SFPUC's total reservoir storage, including its emergency storage capacity, by over 58,000 acre-feet (see Vol. 1, Chapter 2, pp. 2-10 and 2-11). The loss of operating storage capacity at Calaveras Reservoir resulting from the DSOD restrictions represents an equivalent of 7 mgd of water (annual average over 8.5-year design drought) (Vol. 1, Chapter 3, p. 3-36). Thus, the DSOD restrictions and related decreases in reservoir storage capacities currently impair the ability of the regional system to adequately serve customer water demands in the event of water quality problems, transmission disruptions in the Hetch Hetchy system, emergencies, critical maintenance, and droughts.

Reduced System Firm Yield

"System firm yield" refers to the average annual water delivery that can be sustained throughout an extended drought. As described above, DSOD operating restrictions on Lower Crystal Springs and Calaveras Dams have reduced system firm yield, impairing the SFPUC's ability to serve water deliveries to current customers during an extended drought (Vol. 1, Chapter 2, p. 2-25). In normal and wet years, when there is a system upset such as unusual water quality conditions in any of the SFPUC reservoirs, the regional system includes a number of operational bypasses and backup facilities that allow the SFPUC to modify normal operations in order to serve existing water demand and continue to meet water quality standards. The DSOD operating restrictions placed on Lower Crystal Springs and Calaveras Dams have reduced the system firm yield such that, under the existing condition, the regional water system is even more constrained in its ability to meet existing water demand during a prolonged drought. Without supplemental dry-year water supplies and the restoration of historical water storage capacity in Bay Area reservoirs, the SFPUC cannot meet current demand at its desired goal of no greater than 20 percent rationing in any single year of a drought. These conditions would be further exacerbated by future increases in water demand, resulting in potentially disastrous effects on the communities, businesses, and economy of the Bay Area.

Background and Development of the WSIP

The overall need for and objectives of the WSIP are described in the Draft PEIR (Vol. 1, Chapter 3, p. 3-5). The need for a comprehensive, systemwide program to address the existing needs and deficiencies described above, as well as to plan for future needs, is predicated on the basic mission of the SFPUC, which is in part:

> To serve San Francisco and its Bay Area customers with reliable, high-quality and affordable water, while maximizing benefits from power operations and responsibly managing the resources entrusted to its care.

The WSIP would address the existing needs and deficiencies of the regional water system; that is, decreased seismic and delivery reliability and increased risk of failure due to aging and deteriorating infrastructure; increased vulnerability to seismic hazards due to proximity to active earthquake faults and because certain facilities were historically constructed with building materials that do not meet current seismic standards; the need for system upgrades to improve the

SFPUC's ability to maintain compliance with current water quality standards and to meet anticipated future water quality standards under a range of operating conditions without reducing system reliability; the lack of adequate infrastructure redundancy, which would remove constraints to maintenance and improve delivery reliability in the event of an emergency or system failure; and insufficient water supplies to satisfy current water demand in drought years. In addition, implementation of the WSIP would address the ability of the regional water system to serve projected 2030 demand (purchase requests) in all hydrologic year types and improve overall system reliability.

Reliability, Hydraulic, and Hydrologic Models

The SFPUC began planning for major system improvements over a decade ago and has conducted numerous planning and engineering studies of the regional water system with respect to its vulnerability, reliability, performance, operations, water supply, watershed management, and water quality. As described in the Draft PEIR (Vol. 1, Chapter 3, Section 3.4), the SFPUC primarily used three models—reliability, hydraulic, and hydrologic models—to determine the appropriate performance objectives and level of service goals and to develop the scope of the WSIP facility improvement projects.

- *Reliability Model*. This statistical model was used to evaluate the ability of the system to meet identified targets when subjected to earthquakes on the San Andreas, Hayward, and Calaveras faults, as well as to quantify the risk of system components to failure when subjected to earthquake hazards under both existing and improved conditions.

- *Hydraulic Model*. The hydraulic model was used to determine transmission pipeline and tunnel capacities, which were then used as input to the hydrologic model (see below) to analyze system operations under existing and potential alternative future conditions. This model was used to analyze the hydraulic characteristics of the existing water system and to assist in determining facility sizing for WSIP facility improvement projects.

- *Hydrologic Model*. This model, referred to as the Hetch Hetchy/Local Simulation Model (HH/LSM), was used to simulate the monthly operation of all major water transmission and storage facilities in the regional water system under existing conditions, and to predict system operation under various alternative future conditions using historical hydrology for the 82-year period from July 1920 to September 2002. For additional information on the HH/LSM, see Draft PEIR Section 5.1 (Vol. 3, Chapter 5) and Appendix H (Vol. 5) as well as **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14).

Water Supply Studies

To provide guidance on addressing the needs of the regional water system through 2030, the SFPUC prepared several studies that evaluated various water supply options based on facilities requirements, costs, environmental effects, water quality impacts, and institutional and regulatory issues (described in Draft PEIR Vol. 1, Chapter 3, Section 3.4.1). The water supply studies provided guidance on demand management strategies and needed improvements related to system infrastructure. The studies also examined drought-related strategies for meeting customer demand during extended periods of drought. The water supply options analyses resulted in the proposed water supply strategy described in the Draft PEIR (Vol. 1, Chapter 3, pp. 3-33 to 3-39).

System Performance Studies

To evaluate the vulnerability and reliability of the regional water system, the SFPUC conducted extensive engineering analyses and studies as described in the Draft PEIR (Vol. 1, Chapter 3, pp. 3-15 and 3-16). The studies used a statistical, risk-based approach to examine hazards and deficiencies at existing facilities, assessed their reliability, and determined the risk to the overall system presented by hazards such as earthquakes, landslides, flood, fire, and general wear and tear under a range of conditions. The SFPUC conducted system assessment and performance analyses of the WSIP with respect to seismic and delivery reliability over the identified range of conditions, and developed level of service objectives for seismic and delivery reliability. The results of the engineering studies indicated that the existing system would fail to meet the WSIP seismic and delivery level of service objectives under most operating conditions, and that the performance of the system would continue to decline in the future if no improvements were made. These results were used to develop the numerous facility improvement projects that address the identified system deficiencies, particularly with respect to aging infrastructure and seismic hazards. Refer to the discussion under the heading Need for Seismic Reliability, below, for more detailed information regarding the seismic analyses conducted by SFPUC and the level of service objectives used to develop WSIP facility improvement projects.

Water Demand Studies

To assess future water needs in the SFPUC service area through 2030, the SFPUC, in collaboration with its wholesale customers and the Bay Area Water Supply and Conservation Agency (BAWSCA), conducted comprehensive planning studies to assess future water demands as well as the potential for water conservation programs and the use of recycled water to offset demand for potable water supplies in retail and wholesale customer areas (Vol. 1, Chapter 3, Section 3.4.4). Upon completion of the demand, conservation, and recycled water studies, the wholesale customers and the SFPUC (for the retail service area) submitted their best estimates of purchases from the SFPUC regional system in 2030. A high-range estimate of 300 mgd was used for planning purposes to establish the delivery reliability and water supply objectives for the proposed program. This 300 mgd accounts for a level of customer-committed conservation/recycled water programs and use of other supplies, as summarized in the SFPUC planning studies in Draft PEIR Table 3.3 (Vol. 1, Chapter 3, p. 3-18) and Table 7.2 (Vol. 4, Chapter 7, p. 7-15). Refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14) for a detailed description of customer demand projections as well as the conservation programs and recycling projects proposed by the SFPUC in San Francisco and by the SFPUC's wholesale customers in their respective service areas.

WSIP Goals and Objectives

The goals and objectives of the WSIP are founded on two fundamental principles pertaining to the existing regional water system: (1) maintaining a clean, unfiltered, water source from the Hetch Hetchy system, and (2) maintaining a gravity-driven system. The WSIP goals and objectives are presented in Table 3.2 of the Draft PEIR (Vol. 1, Chapter 3, p. 3-9). In summary, the overall goals of the WSIP for the regional water system are to:

- Maintain high-quality water and a gravity-driven system
- Reduce vulnerability to earthquakes
- Increase delivery reliability and improve maintenance of facilities
- Meet customer water supply needs in nondrought and drought conditions
- Enhance sustainability
- Achieve a cost-effective, fully operational system

Proposed WSIP Levels of Service

To achieve the these goals and system performance objectives, the WSIP also identifies level of service goals that describe and, in many cases, more specifically quantify what the regional water system proposes to achieve under the WSIP, and that thereby guide the water supply actions, facility improvements, operations, and maintenance requirements included in the proposed program. The proposed changes in levels of service with implementation of the WSIP as compared to existing conditions are shown in Table 3.5 of the Draft PEIR (Vol. 1, Chapter 3, p. 3-26). The WSIP level of service goals can be summarized as follows:

- *Water Quality Level of Service*. Ensure compliance with all existing and anticipated federal, state, and local drinking water requirements under a range of operating conditions, including catastrophic events such as a major earthquake.

- *Seismic Reliability Level of Service*. Reduce the regional system's vulnerability to earthquakes; provide basic service to at least 70 percent of customer turnouts in each region within 24 hours after a major earthquake; and restore facilities to meet average-day demand within 30 days after a major earthquake.

- *Water Delivery Reliability Level of Service*. Address the overall operations of the regional system with respect to its ability to deliver water to customers under a variety of conditions, such as reservoir replenishments during planned maintenance, unplanned outages, and loss of any one water source.

- *Water Supply Level of Service*. Assure an adequate supply of water to deliver to customers through the 2030 planning horizon during both nondrought and drought periods, and provide drought-year delivery with a maximum systemwide rationing of 20 percent.

In addition to program goals and objectives in the areas of water quality, seismic reliability, delivery reliability, and water supply, the WSIP includes program goals and objectives in the areas of sustainability and cost-effectiveness.

WSIP Facility Improvement Projects

The WSIP facility improvement projects and proposed water supply option and associated modifications in system operations have been designed to meet the level of service objectives and to ensure the water delivery needs are served in the SFPUC service area through 2030 while reducing impacts on the environment and on existing resources. Table 3.10 of the Draft PEIR (Vol. 1, Chapter 3, pp. 3-49 to 3-56) describes the WSIP facility improvement projects that are necessary to improve the regional water system to meet the goals and objectives of the WSIP with respect to seismic reliability, water quality, delivery reliability, and water supply. The table also shows the objectives to which each individual facility project contributes.

Proposed Water Supply Option

As described in the Draft PEIR (Vol. 1, Chapter 3, Section 3.6), under the WSIP the SFPUC would serve its customers in nondrought years through increased diversions of Tuolumne River and local watershed sources to supplement current Tuolumne River diversions and local watershed supplies in combination with 10 mgd of groundwater/recycled water/conservation projects in San Francisco. During drought periods, the SFPUC would augment the nondrought water supplies with implementation of a groundwater conjunctive-use program in the Westside Groundwater Basin, water transfers with the Turlock and Modesto Irrigation Districts, and restoration of the capacities of Calaveras and Crystal Springs Reservoirs; dry-year delivery assumes a maximum 20 percent systemwide rationing in any one year of a drought.

Management and Asset Management Strategy

As described in the Draft PEIR (Vol. 1, Chapter 3, Section 3.7.4), as part of the proposed changes in system operations, the WSIP includes implementation of a Management and Asset Management Strategy that includes provisions for regular maintenance, repair and replacement, and renewal. The plan uses a 20-year timeline and focuses initially on the major transmission pipelines and tunnels of the regional water system under the WSIP, but can be expanded to a more comprehensive maintenance program to cover the maintenance needs for other facilities in the regional system, including dams, powerhouses, chemical stations, pump stations, treatment plants, balancing reservoirs, valve lots, and other pipelines. The improvements to the transmission system under the WSIP would allow the SFPUC to meet its maintenance goals. System operations under the WSIP would allow planned facility inspection, repair, and maintenance without interrupting customer service, and the SFPUC could schedule planned facility shutdowns to accommodate ongoing system demand. Overall, the proposed program would enable the SFPUC to conduct previously deferred maintenance and repair work throughout the regional system, thereby extending the useful life of facilities and improving overall system reliability.

14.1.3 Need for Seismic Reliability

Comment Summary

This section of this master response responds to all or part of the following comments:

S_CSA-01	L_BAWSCA1-112	L_BAWSCA4-01	L_Hillsb-02
S_CSA-05	L_BAWSCA2-01	L_BAWSCA5-01	L_PHWD1-03
L_BAWSCA1-03	L_BAWSCA2-02	L_BAWSCA6-01	L_Menlo1-01
L_BAWSCA1-04	L_BAWSCA3-01	L_Hayward-01	L_Stanford-03

Summary of Issues Raised by Commenters

- The Draft PEIR does not adequately describe the urgent need for seismic repairs and catastrophic consequences of system failure in the event of an earthquake.

Response

The Draft PEIR clearly identifies seismic hazards as one of the fundamental driving forces in the development of the WSIP. The Draft PEIR (Vol. 2, Chapter 4, pp. 4.4-4 to 4.4-13) describes the regional faulting and seismic hazards along the SFPUC regional water system. Figure 4.4-1 (pp. 4.4-7 and 4.4-8) shows the major active and potentially active faults in the vicinity of the system. One of the WSIP's overall goals for the regional water system is to reduce vulnerability to earthquakes, and the system performance objectives for seismic reliability indicate that the WSIP facility improvement projects would be designed to meet current seismic standards, to deliver basic service to the service area within 24 hours after a major earthquake, and to restore facilities within 30 days after a major earthquake (Vol. 1, Chapter 3, pp. 3-8 and 3-9). These goals and objectives recognize the need to improve the system's ability to prepare for and withstand an earthquake as well as to restore services following an earthquake.

WSIP System Assessment for Level of Service Objectives

As described in the Draft PEIR (Vol. 1, Chapter 3, Section 3.4.2), the SFPUC conducted an extensive series of seismic reliability analyses to evaluate the delivery reliability of existing facilities and the performance of the overall system following a major earthquake event on the San Andreas fault (magnitude 7.9), Hayward fault (magnitude 7.3), and Calaveras fault (magnitude 6.9). The seismic analyses accounted for all of the hazards associated with these earthquakes, including groundshaking, surface fault rupture, liquefaction, and landslides. The results of the analyses were used to estimate the underlying questions posed by each of the level of service objectives:

- **Delivery After a Major Earthquake** – How much water would be delivered by the regional water system after a major earthquake?
- **Percentage of Turnouts that Receive Water** – What percentage of the turnouts in each customer group would receive water after an earthquake?
- **Post-Earthquake Recovery** – How would the regional system recover after an earthquake? After 30 days, how much would the system be able to deliver?

The seismic reliability analysis identified the ability of the existing system to meet quantitative level of service objectives, identified and described the deficiencies in the existing system, and identified the WSIP projects that are needed to meet the level of service objectives. Delivery reliability following a major earthquake was evaluated on a customer group basis, and delivery to individual turnouts within a customer group could vary. The three customer groups in the service area consisted of the South Bay (Alameda/Santa Clara/southern San Mateo County), Peninsula (northern San Mateo County), and San Francisco. Because seismic hazards and damage to facilities following an earthquake cannot be predicted in an exact manner, the uncertainty inherent in the analysis is estimated at 10 percent, meaning that there is a 10 percent or less chance that the actual delivery or percentage of turnouts that receive water would be less than shown.

The post-earthquake delivery analysis estimated how much water the regional system could deliver after a major earthquake to each customer group, and the percentage of turnouts within each customer group that would receive water. **Table 14.1-1** shows the estimated volume of water the

TABLE 14.1-1
DELIVERY WITHIIN 24 HOURS AFTER A MAJOR EARTHQUAKE

Customer Group	Level of Service Objective (mgd)	San Andreas Fault		Hayward Fault		Calaveras Fault	
		Existing System (mgd)	With WSIP (mgd)	Existing System (mgd)	With WSIP (mgd)	Existing System (mgd)	With WSIP (mgd)
South Bay	104	27	122	10	131	0	145
Peninsula	44	3	54	3	61	3	64
City of San Francisco	81	0	83	0	83	0	87
Total System	229	30	267	24	278	3	297

SOURCE: SFPUC, 2006.

system could deliver, expressed in million gallons per day (mgd), following a major earthquake. The results of the analysis indicate that the existing system falls drastically short of meeting the level of service objective of delivering a systemwide total of 229 mgd and providing basic service to at least 70 percent of the turnouts within each customer group within 24 hours after a major earthquake on any of the three major regional faults. For example, the studies estimated that after a major earthquake on the Calaveras fault, the existing system would only deliver a total of 3 mgd to all customer groups, which falls 226 mgd short of the systemwide WSIP level of service objective, and would not be capable of delivering any water to the South Bay and San Francisco customer groups. In fact, the analysis estimated that under any of the three earthquake scenarios, no water would be delivered to San Francisco. After completion of the WSIP, the analysis indicated that the regional system would be capable of meeting the delivery level of service objective systemwide and individually for each customer group (SFPUC, 2006).

Table 14.1-2 shows the estimated percentage of turnouts within each customer group that would receive water within 24 hours following a major earthquake. The results of the analysis indicate that the regional water system without implementation of the WSIP would deliver basic service to an estimated 0 to 14 percent of the turnouts in each customer groups, compared to the 70 percent WSIP level of service objective. After full implementation of the WSIP, the percentage of turnouts under each customer group that would receive water would exceed the level of service objective (SFPUC, 2006).

The post-earthquake recovery analysis determined the percentage of water the regional water system would be capable of delivering 30 days after a major earthquake. This analysis included a facility outage scenario that assumed that facilities with a probability of failure greater than 25 percent would be out of service after the occurrence of a major earthquake, and used estimated repair times as a basis for determining how many of the damaged facilities would be brought back to service after 30 days. The delivery capability of the system was then estimated based on the facilities that could be returned to service in 30 days. As shown in **Table 14.1-3**, 30 days after a major earthquake on the San Andreas fault, the regional system would only be capable of delivering 8 mgd to San Francisco; 31 mgd would be delivered to San Francisco following a major earthquake

TABLE 14.1-2
PERCENTAGE OF TURNOUTS THAT WOULD RECEIVE WATER WITHIN 24 HOURS AFTER A MAJOR EARTHQUAKE

Customer Group	Level of Service Objective	San Andreas Fault		Hayward Fault		Calaveras Fault	
		Existing System	With WSIP	Existing System	With WSIP	Existing System	With WSIP
South Bay	70%	14%	72%	0%	85%	0%	93%
Peninsula	70%	2%	79%	2%	98%	2%	100%
City of San Francisco	70%	0%	80%	0%	100%	0%	100%
Total System	70%	8%	79%	1%	92%	1%	96%

SOURCE: SFPUC, 2006.

TABLE 14.1-3
POST-EARTHQUAKE RECOVERY: DELIVERY 30 DAYS FOLLOWING A MAJOR EARTHQUAKE

Customer Group	Level of Service Objective (mgd)	San Andreas Fault		Hayward Fault		Calaveras Fault	
		Existing System (mgd)	With WSIP (mgd)	Existing System (mgd)	With WSIP (mgd)	Existing System (mgd)	With WSIP (mgd)
South Bay	150	191	257	57	257	197	257
Peninsula	64	56	102	32	102	90	102
City of San Francisco	86	8	104	31	104	91	104
Total System	300	255	463	120	463	378	463

SOURCE: SFPUC, 2006.

on the Hayward fault, compared to the 86 mgd level of service objective for San Francisco. The critical outages under the San Andreas earthquake scenario include the Harry Tracy Water Treatment Plant (WTP), Bay Division Pipelines Nos. 1 and 2, and Sunset and University Mound Reservoirs. For the Hayward earthquake, the critical outages include the Irvington Tunnel, Bay Division Pipelines Nos. 1 and 2, Bay Division Pipelines Nos. 3 and 4, and Harry Tracy WTP (SFPUC, 2006).

Table 14.1-4 shows the most critical WSIP projects that help address the seismic reliability deficiencies and contribute to meeting the seismic reliability objectives. The table also indicates the seismic event for which the project is critical and the seismic benefits provided. As indicated in Tables 14.1-1 through 14.1-3, following completion of all WSIP facility improvement projects, the reliability of deliveries that would be achieved immediately after a major earthquake, the percentage of turnouts that would receive basic water service immediately after an earthquake, and the level of delivery that could be restored after 30 days would meet or exceed the WSIP level of service objectives.

TABLE 14.1-4
KEY WSIP PROJECTS FOR SEISMIC RELIABILITY

	WSIP Facility Improvement Project	Earthquake Scenario			Seismic Reliability Benefits and Deficiencies Addressed
		San Andreas Fault	Hayward Fault	Calaveras Fault	
SV-2	Calaveras Dam	X	X	X	• Addresses potential for failure of Calaveras Dam • Improves delivery reliability of facilities that supply water to Sunol Valley WTP
SV-4	New Irvington Tunnel		X	X	• Provides redundancy for outage of Irvington Tunnel • Improves delivery reliability to all customer groups
BD-1	Bay Division Pipeline (BDPL) Reliability Upgrade	X	X	X	• Increases hydraulic capacity of BDPLs • Provides redundancy for outages along BDPL Nos. 1 and 2 • Improves delivery reliability to all customer groups
BD-2	BDPL 3 and 4 Crossovers	X	X		• Reduces impacts of BDPL outages • Improves delivery reliability to South Bay customers
BD-3	BDPL 3 and 4 Seismic Upgrade at Hayward Fault		X		• Improves delivery reliability to South Bay customers
PN-1	Baden and San Pedro Valve Lots	X			• Improves seismic reliability of Baden and San Pedro Valve Lots • Improves delivery reliability to Peninsula and San Francisco customers
PN-2	CS/SA Transmission	X			• Improves seismic reliability of facilities that supply water to Harry Tracy WTP • Improves delivery reliability to all customer groups
PN-3	HTWTP Long-Term	X	X	X	• Improves seismic reliability of Harry Tracy WTP • Increases sustained capacity of Harry Tracy WTP to 140 mgd • Improves delivery reliability to all customer groups
SF-1	SAPL 3 Installation	X			• Provides redundancy for deliveries to Peninsula high-pressure zone and city of San Francisco customers

SOURCE: SFPUC, 2006.

14.1.4 Need for Water Supply and Drought Reliability

Comment Summary

This section of this master response responds to all or part of the following comments:

S_CSA-01	L_BAWSCA1-11	L_LosAltosH-01	L_Milpts-01
L_BAWSCA1-03	L_BAWSCA1-112	L_PHWD1-01	L_MtnVw-01
L_BAWSCA1-04	L_LAHCFD-01	L_PHWD2-02	L_SClara2-01

Summary of Issues Raised by Commenters

- The Draft PEIR does not adequately describe the impacts on public health and safety that would result from disruption of water service following an earthquake.
- Requests for additional discussion of the importance of drought reliability.

Response

Importance of Water Supplies Following an Earthquake

The SFPUC recognizes that the dependability of public utilities and infrastructure following an earthquake is a major concern with respect to public health and safety. Strong groundshaking produced by a major earthquake on the San Andreas, Hayward, or Calaveras fault could cause serious damage to water transmission and distribution facilities and rupture gas mains and fuel lines. Interruption of water supplies resulting from damage to distribution or transmission infrastructure could disrupt the delivery of vital emergency and government services, threatening public health and safety as well as the environment. The ability of the regional system to deliver water immediately after an earthquake would be especially important for firefighting if ruptured gas mains and fuel lines were to start fires, as occurred following the San Francisco earthquake of April 18, 1906, which toppled buildings and caused gas and water mains to twist and break, crippling the city's water supply. The loss of water in the San Francisco distribution and transmission system following the earthquake caused 4.5 square miles of San Francisco to burn to the ground, left over 200,000 people homeless, and caused hundreds of deaths (USGS, 2008).

As stated in the Draft PEIR (Vol. 1, Chapter 3, p. 3-28), the results of the SFPUC's seismic reliability studies indicated that, under existing conditions, a major earthquake on the San Andreas, Hayward, or Calaveras fault would result in unplanned outages and a drastic disruption of service to all SFPUC customers for more than 14 days and possibly more than 30 days. During the first days following an earthquake, most people in areas with water outages could likely obtain drinking and cooking water from bottled water suppliers. Within a day or two, water for sanitation, personal hygiene, and food cleaning and preparation could become scarce, resulting in an increased risk of infection and gastroenteritis. Disruptions in the delivery of potable water through the municipal distribution system could impair the ability of hospitals and health care institutions to provide services, and these facilities could be overwhelmed by the need for additional services.

As described in the Draft PEIR (Vol. 1, Chapter 3, pp. 3-27 and 3-28), implementation of the WSIP would greatly reduce the regional system's vulnerability to earthquakes and would enable the SFPUC to ensure water service to customers within a defined period following a major earthquake. Critical facilities would be upgraded to meet current seismic standards to improve the system's ability to withstand seismic damage, and construction of redundant facilities and backup/standby power would improve the SFPUC's ability to restore service following a major earthquake.

Impacts of Drought

As evidenced by the 1987–1992 drought, reductions in water supplies during a prolonged drought event can result in impacts on residential users, businesses, industry, and government. Severe and prolonged rationing can limit the use of water supplies to serve basic human needs and can increase fire risk. As described above in Section 14.1.2, the regional system is currently operating at a reduced system firm yield due to DSOD restrictions on local dams and reservoirs, and, in the event of an extended drought, the SFPUC would have to impose systemwide rationing similar to that imposed during the historical droughts, possibly up to 25 percent.

As described in the Draft PEIR (Vol. 1, Chapter 3, pp. 3-31 and 3-32), implementation of the WSIP would greatly reduce the regional system's vulnerability to droughts and would enable the SFPUC to reduce both the frequency and magnitude of systemwide rationing. The system firm yield would be increased to 256 mgd, and there would be supplemental dry-year water supplies, which would increase overall system reliability and reduce the potential hardship on customers during droughts. Although a maximum systemwide rationing of 20 percent could still be imposed, the frequency of this level of rationing would be greatly reduced, estimated to occur approximately once every 41 years over the 82-year hydrologic record (Vol. 4, Chapter 9, Table 9.5, p. 9-13).

14.1.5 Seismic Improvements and Water Supply

Comment Summary

This section of this master response responds to all or part of the following comments:

L_Hayward-02	SI_TRT6-01	C_EllioC-01	C_Raffa-09
SI_ACT-02	SI_TRT9-06	C_Keebr-01	C_Ross-07
SI_ACT-06	C_AdamsA-01	C_Krame1-02	C_Symon-01
SI_EnvDef-02	C_BramlD2-01	C_Neal-01	C_Walke-01
SI_TRT3-01	C_Brand-01	C_Parke-01	

Summary of Issues Raised by Commenters

- The San Francisco Planning Department, as lead agency, should use a two-tiered approach for CEQA review that separates the seismic improvements from the WSIP water supply and additional Tuolumne River diversions.

Response

California case law, statutory requirements by the state and federal governments, and the SFPUC's contractual obligations to its wholesale customers require that the SFPUC develop a comprehensive plan that ensures the provision of water supplies in a manner that addresses demand and water supply availability under various hydrological/meteorological scenarios as well as in the event of natural disasters and catastrophes. These regulatory provisions and contractual obligations require the SFPUC to secure a reliable water supply capable of serving demand, implement the necessary facility upgrades, construct new facilities to meet future conditions, and design such facilities with sufficient capacities to meet future conveyance needs. Particularly with a complex system such as the SFPUC regional water system, these components must be developed through an integrated planning process in order to effectively achieve level of service goals and objectives and to avoid wasteful expenditures through improper design. Because full implementation of these components is necessary to achieve the level of service goals and objectives, a programmatic approach to CEQA compliance is needed to capture the full spectrum of environmental impacts and to ensure that appropriate CEQA alternatives are developed based on the same level of service goals and objectives.

As a public water utility, the SFPUC is vested with a public interest to provide services considered vital for public health and welfare. The SFPUC is granted special rights (e.g., the right to pursue eminent domain and acquisition of water rights under state law, rights-of-way under the Raker Act) by the government and is heavily regulated to ensure public safety. Under the common law doctrine,[1] the SFPUC, like other public water utilities, holds several obligations to the public, including a "duty to serve" and continuity of service. The "duty to serve" principle requires that the SFPUC adequately and efficiently serve all members of the public located within its service area in a reasonable, non-discriminatory manner. Beyond this obligation, the SFPUC must ensure continuity of service in a safe and reliable manner, which requires that the SFPUC maintain excess capacity to ensure spikes and seasonal peaks in demand can be accommodated and do not drain existing supplies (Monte de Ramos, 2004).

The SFPUC, like all major urban water suppliers, must look ahead many years in order to secure new water supplies to meet growing demands and undertake the capital programs required to meet that demand. The California Urban Water Management Planning Act (California Water Code, Division 6, Part 2.6, Sections 10610 through 10656), as amended in 2001, was passed in response to the California legislature's concern that the state's water supply agencies might not be engaged in adequate long-term planning. The act requires water suppliers generally, and the SFPUC and its wholesale customers, to prepare and update urban water management plans at five-year intervals that describe and quantify, to the extent practicable, future water demand, water supplies, and water reliability in five-year increments, to a minimum of 20 years or as far as data are available. The projected 20-year water supply must account for three scenarios: a normal or average water year; a single dry water year; and multiple dry water years.

1 Common law refers to the body of laws not currently expressed in statutes or previously codified; these types of laws are created by precedent and are upheld by past precedential decisions in relevant courts.

In predicting 20-year water demands, urban water agencies must rely on "data from the state, regional, or local service agency population projections." Thus, for example, to the extent that any of the wholesale customers with land use planning authority served by the SFPUC (chiefly cities) anticipate large population increases in their adopted general plans, those customers are required to identify how existing and planned water sources meet planned development. General plans (prepared by the local land use agency) and the urban water management plan (prepared by the urban water supplier) design a blueprint of the municipality's growth over the next 20 years and ensure the water supplies are sufficient to serve the zoning actions of the local land use agency. Within the regional water system, in some cases the local land use agency and the urban water supplier are the same entity, and in many cases they are not. Under California Water Code Sections 10910 through 10912, as amended in 2001 (also known as Senate Bill [SB] 610), an urban water supplier must consult with the cities and counties in its service area when those entities propose development projects of a certain magnitude (e.g., residential projects with more than 500 dwelling units or a retail or business establishment employing more than 1,000 persons or having more than 250,000 square feet). The water supplier must accommodate future development projects either by identifying the water sources available to serve such development or by identifying the plans it would follow to obtain new water supplies for such development, unless the water supplier "finds and determines that the ordinary demands and requirements of water customers cannot be satisfied without depleting the water supply of the distributor to the extent that there would be insufficient water for human consumption, sanitation, and fire protection" (also see California Water Code Section 350).

Urban water suppliers are also subject to 2001 state legislation commonly known as the "Kuehl Bill" (SB 221), after its author State Senator Sheila Kuehl (see Government Code Section 66473.7). SB 221 requires any city or county considering the approval of a proposed subdivision map for more than 500 units to consult with the relevant water supply agency to determine whether adequate water is available for the proposed subdivision, as well as for "existing and planned future uses" (including agriculture) over the next 20 years, under "normal, single-dry, and multiple-dry year" scenarios. If water supplies are inadequate, SB 221 expressly allows a developer to work with the urban water supplier to pursue new supplies. This legislation prohibits local land use agencies from approving a project if supplies are insufficient and, like the Urban Water Management Planning Act, requires urban water suppliers to constantly consider and take the necessary steps to address the growth planned for the next 20 years by the cities and counties within the supplier's service area.

Existing contractual agreements between the SFPUC and its wholesale customers, which are represented by BAWSCA, obligate the SFPUC to supply an annual average of 184 mgd to its wholesale customers, subject to reductions in the event of a drought, water shortage, earthquake, or other natural disaster, or rehabilitation or maintenance of the system. The 184 mgd is referred to as "the supply assurance" and remains effective following termination of the 1984 Settlement Agreement and Master Sales Water Contract (Master Water Sales Agreement) held between the SFPUC and each of its wholesale customers. In addition to the Master Water Sales Agreement, the SFPUC holds individual wholesale water contracts that specify the SFPUC's obligations to each customer (see Draft PEIR Vol. 1, Chapter 2, Section 2.5.5).

In addition to the SFPUC's obligations to provide water to its retail and wholesale customers in consideration of future growth within its service area, the state legislature has mandated that the SFPUC rebuild and seismically retrofit the regional water system. California Assembly Bill (AB) 1823, known as the Wholesale Regional Water System Security and Reliability Act, imposes various requirements on wholesale regional water systems and applies directly to the City and County of San Francisco (CCSF) and the SPFUC regional water system. Designed to protect the health, safety, and economic well-being of the 2.4 million people that depend on the regional water system, AB 1823 provides a process to ensure that the system is rebuilt and retrofitted as soon as possible. AB 1823 includes the requirement that the regional water system be retrofitted so as to distribute water on an equitable basis during an interruption of supply after an earthquake or other catastrophe (California Water Code, Division 20.5, Section 73500).

For the reasons described above, the SFPUC addressed future growth and water demand and could not disregard supply augmentation issues during the formulation of the WSIP. Further, facility improvements designed in accordance with future capacity requirements avoid wasteful expenditures and improper design. As described in the Draft PEIR (Vol. 1, Chapter 3, pp. 3-1 to 3-9), the WSIP establishes program goals for improvements to the regional system and level of service objectives for system performance in the areas of water quality, seismic reliability, delivery reliability, and water supply. The proposed facility improvement projects and water supply and system operations under the WSIP are an integrated whole designed to meet the program objectives and enable the SFPUC to continue to fulfill its basic mission of providing reliable, high-quality water to its customers. Thus, the SFPUC developed the WSIP as a comprehensive program to improve the regional system, and the San Francisco Planning Department determined that the collection of WSIP facility improvement projects combined with the water supply and system operations modifications should be treated as a single, integrated program during CEQA analysis. Only this programmatic approach was capable of capturing the full spectrum of environmental impacts and ensuring that appropriate CEQA alternatives were developed based on the same level of service goals and objectives.

The PEIR has been prepared as a program EIR in compliance with CEQA Guidelines Section 15168(a), which specifies that a program EIR may be used to evaluate a plan or program that has multiple components (projects and actions) or to address a series of projects or actions that cover a broad geographic scale. The PEIR addresses the environmental effects of the WSIP as a *whole program*, the purpose of which is to improve the ability of the regional water system to deliver water to the SFPUC service area through the year 2030 and to increase the overall reliability of the system.[2] To accomplish this goal, the Draft PEIR includes a combination of program-level and project-level analyses. The PEIR provides a program-level analysis of the major environmental effects of implementing the WSIP facility improvement projects, including those related to seismic improvements, and identifies programmatic mitigation measures to

2 Although implementation of all of the WSIP projects is required to fully meet the program objectives, the San Francisco Planning Department has determined that several of the WSIP projects have independent utility for CEQA purposes and can undergo environmental review independent of the PEIR. The independent utility projects would not: increase SFPUC water supplies, increase the normal operating capacity of the regional water system, change the manner in which water is dispersed, increase the storage capacity of the system, or increase or alter the nature of the treatment capacity of the system.

reduce the impacts of these projects. The program-level analysis in the Draft PEIR frames the nature and magnitude of these effects and assumes that more detailed, project-level review of the individual projects will be conducted separately as provided for under CEQA. In addition to the program-level analysis of the proposed improvements, the Draft PEIR also evaluates the overall effects associated with implementing the WSIP as a whole. This evaluation includes an analysis of the combined impacts resulting from construction of all of the WSIP facility improvement projects (Vol. 2, Chapter 4, Section 4.16) as well as a project-level impact analysis of implementing the proposed water supply option through 2030 (Vol. 3, Chapter 5). By evaluating the environmental effects of both the facility improvement projects and the proposed water supply option, the PEIR provides a more comprehensive analysis of environmental effects and alternatives than would be practical on a project-by-project basis and allows for the consideration of broad-policy alternatives and program-wide mitigation measures early in the process. In addition, preparation of a program EIR has ensured the consideration of cumulative impacts that might not have been evident in the separate, project-level analyses.

The SFPUC takes seriously its duties to provide sufficient water supplies to its customers when such supplies are needed to serve planned growth and to meet its contractual obligations. As a prudent water system manager, the SFPUC chose to consider future demand at the same time it identified necessary seismic upgrades. From an engineering and design standpoint, it would have been imprudent, impractical, and inefficient for the SFPUC to conduct an overall assessment of how to make the system stronger and more reliable without also considering future demand during the 20-year planning period imposed by law.

Finally, CEQA does not preclude the CCSF from considering supply augmentation components together with seismic retrofit and upgrade components. No provision of CEQA prevents an agency from combining various elements together as one project. In fact, agencies have broad discretion to define projects as they see fit, and thus have substantial leeway in selecting the components of a project analyzed in a single EIR. Therefore, it is entirely within the CCSF’s discretion to combine components related to seismic safety and reliability as well as water supply augmentation into a single, long-term project (i.e., the WSIP).

As described in Section 13.4 (Vol. 7, Chapter 13), subsequent to the publication of the Draft PEIR, the SFPUC requested that the PEIR include environmental review of a variation of the WSIP referred to as the Phased WSIP Variant. This variant, developed in response to comments received on the Draft PEIR, would consist of full implementation of the proposed WSIP facility improvement projects together with phased implementation of the water delivery component. This variant would achieve the WSIP goals and level of service objectives for water quality and seismic and delivery reliability, but it would defer a decision regarding long-term water supply until after 2018. Nonetheless, as discussed in Section 13.4, the PEIR analyzes the potential environmental effects of the Phased WSIP Variant as an integrated program and describes the range of potential effects that could occur by 2030 under this variant. Consistent with CEQA guidelines for a program EIR, this PEIR addresses the Phased WSIP Variant as a whole program and determined that the environmental effects fall within the range of alternatives already evaluated in the Draft PEIR. Please refer to Section 13.4, Phased WSIP Variant (Vol. 7, Chapter 13), for further discussion.

14.1.6 Economic Evaluation of the Need for the WSIP

Comment Summary

This section of this master response responds to all or part of the following comments:

L_BAWSCA1-05	L_Tuol1-05	C_Krame2-01
L_BAWSCA1-115	C_AllenC-03	C_MartiM-03
L_Hillsb-02	C_EllioP-01	C_Poult-01
L_Millbr-05	C_Kim-01	C_Stein-01

Summary of Issues Raised by Commenters

- The economic impacts of mandatory rationing should be addressed in the PEIR.
- An economic analysis of the environmental effects on Tuolumne County residents, businesses, and tourism should be conducted prior to approving additional diversions from the Tuolumne River.

Response

Under CEQA, the economic impacts of a proposed project are not treated as significant impacts on the environment (CEQA Guidelines Section 15131[a]). While economic evaluations are beyond the scope of this PEIR, CEQA Guidelines Section 15131(b) states that the "economic or social effects of a project may be used to determine the significance of physical changes caused by the project."

CEQA requirements aside, with respect to the economic impacts of mandatory rationing on wholesale customers, it is not clear that the WSIP level of service objective of a maximum 20 percent systemwide rationing would result in physical changes sufficient enough to warrant an analysis of its economic effects. With implementation of the WSIP, the regional system firm yield would increase to 256 mgd, and the overall system reliability with respect to delivery to customers during droughts would improve substantially over existing conditions. The results of the HH/LSM modeling of the proposed program indicate that the frequency of 20 percent systemwide rationing would be about 2 out of the 82 years, or 1 in 41 years (Vol. 4, Chapter 9, Table 9.5, p. 9-13). This infrequent rationing would not result in substantial physical environmental effects.

Furthermore, the possibility that a lower rationing objective (e.g., 15 percent) might result in a different future economic scenario than the 20 percent objective does not translate into an adverse environmental effect of the 20 percent rationing objective proposed under the WSIP. For CEQA purposes, the key comparison is between existing conditions and future conditions with the WSIP (and its 20 percent rationing objective), and this comparison shows a very considerable improvement over current conditions rather than any adverse effects. This improvement would in part take the form of reduced economic consequences compared with those that would occur in the event of a major earthquake or similar disaster under the No Program Alternative. Any economic impacts under a future 20 percent rationing scenario and a future 15 percent rationing scenario cannot be characterized as an adverse effect or consequence of adopting the 20 percent rationing objective.

The 20 percent maximum systemwide rationing objective proposed under the WSIP is lower than the maximum rationing objectives of other large water agencies in California. For example, the East Bay Municipal Utility District (EBMUD), which serves a population of approximately 1.3 million in parts of Alameda and Contra Costa Counties, and the Metropolitan Water District of Southern California, which serves a population of 14.8 million, both maintain a maximum rationing reduction goal of 25 percent during critical water supply shortages (EBMUD, 2005; Metropolitan Water District of Southern California, 2005). Most importantly, however, is the fact that implementation of the WSIP would also improve the performance of the regional water system under both drought and nondrought conditions, thus resulting in an overall benefit to retail and wholesale customers compared to the existing condition by reducing the magnitude and frequency of significant water shortages.

While economic evaluations are beyond the scope of the PEIR, the Draft PEIR does analyze the environmental effects that some commenters perceive could cause economic impacts for Tuolumne County residents, businesses, and tourism. The Draft PEIR analyzed the effects of the WSIP on Tuolumne River stream flows to identify any consequent impacts on recreational as well as other resources, and determined that the WSIP would not substantially alter stream flows such that they would be outside the range of pre-project conditions (Vol. 1, Chapter 5, pp. 5.3.1-21 to 5.3.1-39). The Draft PEIR (Vol. 3, Chapter 5, Section 5.3.8) also evaluated the effects of the WSIP on recreational resources, including whitewater rafting in the Tuolumne River and Cherry Creek. The analysis concluded that impacts on recreation would be less than significant, and that no mitigation was required. The impact of the WSIP on whitewater rafting was determined to be typically limited to a delay in releases from Hetch Hetchy Reservoir by an average of two days (and up to eight days) in May or June of most years. Thus, the impact analysis suggests that, because the alteration of stream flows under the WSIP would be within the range of pre-project conditions, and typically limited to a delay in releases by an average of two days, the economic effects would be very modest, if noticeable at all. The Draft PEIR analysis indicates that the WSIP would not result in economic effects that would in turn result in a significant degradation of the physical environment.

14.2 Master Response on Demand Projections, Conservation, and Recycling

14.2.1 Introduction

Overview

This master response addresses comments and questions about water demand projections, water use patterns, and the effectiveness and extent of conservation measures and recycled water programs within the SFPUC service area to offset demand for potable water. Commenters raised questions about the water demand models used in the wholesale and retail service areas and the differences between the two models, the levels of employment growth assumed in the demand models, the efforts of the SFPUC and its wholesale customers to implement conservation and recycled water programs, and whether more could be done in these areas to limit the increase in future demand for potable supplies. The demand projections and estimates of 2030 purchases necessarily entail the use of assumptions about factors that cannot be known or predicted with absolute certainty. With respect to forecasting, CEQA Guidelines Section 15144 states the following:

> Drafting an EIR or preparing a Negative Declaration necessarily involves some degree of forecasting. While foreseeing the unforeseeable is not possible, an agency must use its best efforts to find out and disclose all that it reasonably can.

The analysis in the Draft PEIR is consistent with CEQA Guidelines Section 15144. The Draft PEIR analysis describes in detail the demand methodology (Vol. 5, Appendix E.2) and presents a detailed review and comparison of the demographic projections used in the demand models with more recent projections (Vol. 4, Chapter 7, p. 7-22, and Vol. 5, Appendix E.3).

The comments addressed in this master response largely critique the SFPUC's demand projections as too high and the conclusions regarding conservation and recycled water potential as too low. As discussed in this response, the SFPUC and its technical consultants relied on reasonable assumptions and used accepted methodologies to forecast demand and conservation and recycled water potential within the service area, and the Draft PEIR reflects the City and County of San Francisco's (CCSF) best efforts at analysis and disclosure. Even if the SFPUC overestimated demand and underestimated conservation and recycled water potential, the likely effect would be a reduction in the use of water from the Tuolumne River and local watersheds, which could result in a reduction in impacts on those watersheds. Also, to the extent the SFPUC has overestimated demand based on growth projections, the PEIR may overestimate the impacts associated with induced growth. The comments regarding the accuracy of conservation and recycled water potential may be taken into account by decision-makers in evaluating the feasibility of alternatives, but do not indicate that the PEIR underestimated the impacts of the WSIP.

This master response is organized by the following subtopics:

14.2.2 Demand Projections and Methodology
14.2.3 Conservation and Recycling

Commenters

Table 14.2-13, presented at the end of Section 14.2, lists the commenters that submitted comments on water demand projections, conservation, and recycling.

PEIR Section Reference

The Draft PEIR addresses demand projections, conservation, and recycling in the following locations: Vol. 1, Chapter 3, Section 3.3 (introduction) and Section 3.4.4, pp. 3-8 and 3-16 to 3-22; Vol. 4, Chapter 7, Sections 7.1.2, 7.2.2, 7.3 (introduction), 7.3.1, 7.3.2, 7.3.3, 7.3.4, and 7.3.6, pp. 7-6 to 7-8, 7-14 to 7-33, and 7-34 to 7-58; and Vol. 5, Appendices E.2 and E.3.

14.2.2 Demand Projections and Methodology

Comment Summary

This section of this master response responds to all or part of the following comments:

L_ACFCWD-07	SI_CNPS-SCV2-07	SI_PacInst-86	C_Eddy1-01
L_BAWSCA1-69	SI_CRS-05	SI_PacInst-87	C_Eddy2-01
L_BAWSCA1-104	SI_GreenP-02	SI_PacInst-88	C_Eddy2-02
L_BAWSCA1-107	SI_NCFFSC-04	SI_PacInst-89	C_Garba-01
L_BAWSCA1-108	SI_PacInst-01	SI_SCCCC-02	C_Gelma-01
L_BAWSCA1-109	SI_PacInst-02	SI_SierraC4-03	C_Genov-01
L_BAWSCA2-03	SI_PacInst-03	SI_SierraC6-02	C_GreenD-01
L_BAWSCA3-01	SI_PacInst-04	SI_SierraC7-03	C_Hamil-01
L_DalyCty-04	SI_PacInst-05	SI_SierraC7-07	C_Hanke-02
L_DalyCty-19	SI_PacInst-06	SI_SPUR-03	C_Hasso-02
L_DalyCty-49	SI_PacInst-07	SI_TRT2-02	C_Hasso-03
L_PaloAlto-07	SI_PacInst-08	SI_TRT3-02	C_Helld-01
L_SFCPC2-02	SI_PacInst-12	SI_TRT6-02	C_Ikemo-01
L_SFCPC3-02	SI_PacInst-13	SI_TRT7-03	C_Lee-03
L_Tuol1-03	SI_PacInst-15	SI_TRT7-04	C_MartiM-02
L_TUD1-02	SI_PacInst-16	SI_TRT7-05	C_Means2-01
L_TUD2-01	SI_PacInst-28	SI_TRT8-02	C_Means2-02
L_TUD3-02	SI_PacInst-30	SI_TRT8-03	C_MindeN-01
L_TUD3-05	SI_PacInst-31	SI_TRT9-02	C_Okuzu-03
L_Tuol1-02	SI_PacInst-32	SI_TRT9-04	C_Oneil-01
L_Tuol1-03	SI_PacInst-33	SI_TRT9-05	C_Parke-02
L_Tuol2-04	SI_PacInst-47	SI_TRT-CWA-SierraC-32	C_Raffa-03
SI_ACT-04	SI_PacInst-50	SI_TRT-CWA-SierraC-37	C_Raffa-04
SI_ACT-05	SI_PacInst-54	SI_TRT-CWA-SierraC-72	C_Raffa-10
SI_ACT-06	SI_PacInst-57	SI_TRT-CWA-SierraC-195	C_Ross-08
SI_CAC2-0	SI_PacInst-58	SI_TRT-CWA-SierraC-199	C_Schri-01
SI_Caltrout-02	SI_PacInst-59	C_Agarw-01	C_Stein-02
SI_CNPS-EB1-03	SI_PacInst-62	C_Bail-02	C_Tubma-01
SI_CNPS-EB1-04	SI_PacInst-67	C_Barbe1-04	C_Unreadable4-01
SI_CNPS-EB1-17	SI_PacInst-70	C_Berg-01	C_Willi-02
SI_CNPS-EB1-28	SI_PacInst-75	C_Berko-02	
SI_CNPS-EB2-04	SI_PacInst-76	C_BramlD2-02	
SI_CNPS-SCV1-01	SI_PacInst-77	C_Bucki-01	
SI_CNPS-SCV1-03	SI_PacInst-79	C_Chiap-03	
SI_CNPS-SCV1-11	SI_PacInst-85	C_Clark1-09	

Summary of Issues Raised by Commenters

Numerous comments asserted that the modeling used to project future water demand was flawed. The more specific comments asserting that "the demand analysis is flawed" or that the analysis results in "inflated demand" stem from three main criticisms of the demand methodology: (1) the use of the Association of Bay Area Government's (ABAG) *Projections 2002* as the source of nonresidential (employment) growth rates; (2) the use, in the wholesale customer service area, of ABAG's forecasts of total jobs rather than industry-specific projections, which (commenters assert) (a) fails to capture differences in growth rates of different nonresidential sectors, and (b) fails to account for different water use rates by different sectors; and (3) the fact that the future price of water is not included as a factor in the demand models. Other comments focused on the results of the demand projections. On the whole, the comments fell into the following categories:

- Employment projections – use of ABAG's *Projections 2002*
- Use of total jobs projections for the wholesale customer service area
- Effects of the future cost of water on projected demand
- Per-capita demand
- Substantiation of the need for sizable water supply increases
- Outdoor water use
- Requests that demand projections be reevaluated

This master response presents an overview of the demand projections and related studies conducted for the WSIP, followed by a discussion of each of the topics listed above; specific comments addressing these issues are summarized, followed by a response.

Overview of Demand Projections Conducted for the WSIP

As described in the Draft PEIR (Vol. 1, Chapter 3, p. 3-16 and 3-17, and Vol. 5, Appendix E.2), the SFPUC, in collaboration with its wholesale customers and the Bay Area Water Supply and Conservation Agency (BAWSCA), conducted comprehensive planning studies from 2002 to 2006 to assess future water demands as well as the potential for water conservation programs and the use of recycled water to offset demand for potable water supplies in its retail and wholesale customer service areas. These studies, which provided a basis for 2030 water purchase estimates from the SFPUC regional water system, include the following:

- SFPUC Wholesale Customer Water Demand Projections Technical Report (URS, 2004a)
- SFPUC Wholesale Customer Water Conservation Potential Technical Report (URS, 2004b)
- SFPUC Wholesale Customer Recycled Water Potential Technical Memorandum (RMC, 2004)
- City and County of San Francisco Retail Water Demands and Conservation Potential (Hannaford and Hydroconsult, 2004)
- City and County of San Francisco Recycled Water Master Plan (RMC, 2006)
- SFPUC 2030 Purchase Estimates Technical Memorandum (URS, 2004c)

The studies established total demand for the 2000/2001 base year in the entire SFPUC service area from all water sources (about 366 million gallons per day [mgd]), of which about 261 mgd was purchased from the SFPUC regional water system. SFPUC wholesale customers met the balance of their supply needs from other water sources and conservation. The demand studies project that total service area demand in 2030 is approximately 417 mgd.[1] Of this total, approximately 300 mgd would be purchased from the SFPUC system; the remaining 117 mgd would be met through other supply sources available to customers, primarily water purchases from other agencies, customers' local groundwater sources, additional water recycling, and conservation. For the water conservation and recycled water potential studies, the SFPUC and its technical consultants worked in close consultation with the wholesale customers to identify suites of theoretically feasible and cost-effective conservation programs for each customer and to determine each customer's potential to develop recycled water projects that might replace part of their demand that would otherwise be met by potable supplies. Based on this information, the customers submitted their best estimates of 2030 water purchases from the SFPUC. Each customer's estimates of conservation savings and the use of recycled water, groundwater, and other supply sources as well as its 2030 purchase estimate is shown in Draft PEIR Table 3.3 (Vol. 1, Chapter 3, p. 3-18) as well as Table 7.2 (Vol. 4, Chapter 7, p. 7-18).

The Draft PEIR (Vol. 1, Chapter 3, pp. 3-17 to 3-20 and Vol. 5, Appendix E.2) summarizes the steps involved in establishing base-year water usage and projecting future demand to 2030 using end-use demand models for the wholesale and retail customer service areas. Demand Side Management Least-Cost Planning Decision Support System (DSS) end-use models[2] were used in the wholesale service area and a similar end-use model was used in the retail service area. As the PEIR indicates, the SFPUC selected the end-use models over other forecasting methods (such as forecasting water use by land use type or on a simple per-capita basis) because end-use models allow for a more accurate representation of changing conditions, such as the future impact of plumbing and appliance codes and the effects of additional specific-use planned conservation (URS, 2004a).

In addition, as described in the Draft PEIR (Vol. 4, Chapter 9, pp. 9-47 to 9-51), the SFPUC, in cooperation with its wholesale customers and BAWSCA, undertook a study to assess the potential for additional conservation and recycled water projects, including potential regional projects, that were not already considered to be implemented locally by 2030 as part of the WSIP purchase estimates. The results of this study provided the basis for the Aggressive Conservation/ Water Recycling and Local Groundwater Alternative evaluated in the Draft PEIR (Vol. 4, Chapter 9, pp. 9-47 to 9-59) as well as an element of the Modified WSIP Alternative (Vol. 4, Chapter 9, pp. 9-78 to 9-84).

1 Total 2030 demand (417 mgd) includes expected savings due to compliance with existing plumbing codes, which contain efficiency requirements. Total SFPUC service area 2030 demand without plumbing code savings is estimated at 453 mgd.
2 A DSS model was prepared to forecast demand for each wholesale customer (URS, 2004a).

Employment Projections – Use of ABAG's *Projections 2002*

Representative comments on this topic include:

- *Wholesale demand study may overestimate future employment, thereby inflating 2030 nonresidential demand. [SI_PacInst-08, SI_TRT-CWA-SierraC-01]*
- *Employment projections used in the demand model were based on ABAG employment projections released in 2002. In 2005, ABAG revised the employment projections for the nine-county San Francisco Bay Area:* Projections 2005 *forecasts over 46,000 fewer jobs than* Projections 2002. *[SI_PacInst-76]*
- *The wholesale demand study may overestimate future employment, thereby inflating 2030 nonresidential demand. Recent data indicate that the economic recovery in the San Francisco Bay Area has been slower than expected and consequently the job outlook for the region has been adjusted downward. A slower economy would reduce projected water demand for the nonresidential sector. The demand forecast should be adjusted according to the most current information available. [SI_TRT-CWA-SierraC-31]*
- *Demand modeling methodology used employment projections from ABAG that are inflated. The SFPUC used employment projections from 2002 that were updated in 2005. The later projections showed 48,000 fewer jobs[3] in the Bay Area. Using the projections published by ABAG in 2005 would result in another lower projected demand for water. In going from Draft to Final PEIR, the latest employment projections should be incorporated and the water demand projections altered accordingly. [SI_TRT6-02]*
- *Outdated ABAG employment projections from 2002 were used. 2005 data became available, which decreased the employment projections moving into the future, which means less growth in the commercial sector, which means less water use. [SI_TRT9-04]*
- *The projected employment growth is substantially greater than the projected population growth. While employment growth can exceed population growth, such a large discrepancy is highly unusual given the low unemployment rate in the region. This suggests the need for a reevaluation with another more realistic employment projection. [SI_PacInst-77]*
- *The projections rely on faulty urban growth statements that in turn rely on published studies that don't cover the time period up to 2030 and have not undergone environmental review. [SI_SierraC6-02, SI_SierraC7-03]*

Response

Comparison of Projections 2002 and Projections 2005

Projections 2002 was the current ABAG projections series at the time the water demand estimates were prepared. As such, it was the appropriate projections series to use at that time. Since then, *Projections 2003*, *2005*, and *2007* have been released. The Draft PEIR (Vol. 4, Chapter 7, pp. 7-22 to 7-26, and Vol. 5, Appendix E.3, pp. E.3-9 to E.3-35) reviews changes between ABAG *Projections 2002*, *2003*, and *2005* and compares the later projections to the

[3] Because *Projections 2005* reports a finding of 46,000 fewer new jobs compared to *Projections 2002* and does not indicate a difference of 48,000 jobs in its analysis, it is assumed that this reference to 48,000 jobs is a misstatement, and that the commenter refers to the comparison of the two projections series discussed in *Projections 2005* and this response.

assumptions used in projecting 2030 water demand. (*Projections 2007* was released after Draft PEIR preparation and could not be considered prior to publication of the environmental document.) The review indicates that, although the later projections series (2003 and 2005) have lower estimates of current (2005) employment and somewhat steeper growth curves between 2005 and 2030, the general trends for the three are similar; the net result of the two principal changes in the later projections series (lower current population and employment combined with more growth between now and 2030) is that the estimates for the WSIP horizon year of 2030 are similar (Vol. 4, Chapter 7, p. 7-22 to 7-25).

Table 14.2-1 presents the comparison shown in Draft PEIR Table E.3.31 (Vol. 5, Appendix E.3, p. E.3-33) with supplementary information on percentages. The table quantifies the variation in employment estimates for the nine-county Bay Area, the four-county area served in whole or part by SFPUC water, and the area generally served by SFPUC water customers.

TABLE 14.2-1
ABAG PROJECTIONS OF EMPLOYMENT IN 2025 AND 2030: SUMMARY COMPARISON

Area	Year	Projections 2002	Projections 2003	Projections 2005	Projections 2003 as % of Projections 2002	Projections 2005 as % of Projections 2002	Projections 2005 as % of Projections 2003
Nine-County Bay Area	2025	4,932,590	4,982,800	4,788,330	101%	97%	96%
	2030		5,226,400	5,120,600			98%
Four-County Area	2025	3,682,510	3,739,920	3,516,890	102%	96%	94%
	2030		3,911,320	3,765,020			96%
SFPUC Water Customers[a]	2025	2,169,600	2,184,360	2,032,650	101%	94%	93%
	2030		2,265,410	2,173,400			96%

[a] Estimates for the wholesale service area are based on the geographic area assignments used in the Draft PEIR (see Vol. 5, Appendix E.3, Tables E.3.A.1 and E.3.A.2, pp. E.3-48 and E.3-49), which are more generalized than those used for the actual demand projections.

SOURCE: Draft PEIR, Vol. 5, Appendix E.3, Table E.3.31, p. E.3-33.

Although *Projections 2002* does not provide forecasts for 2030, the text discussion in *Projections 2005* presents a comparison of the expectations of job growth from 2000 to 2030 for the two projections series. According to that discussion, *Projections 2005* forecasts 46,000 fewer new jobs for the nine-county Bay Area by 2030 than does *Projections 2002*, as noted in some comments.[4] *Projections 2005* provides this comparison of *Projections 2002* and *Projections 2005* employment (and population) growth for the period from 2000 to 2030 as a way to highlight the changes resulting from the smart-growth assumptions that were incorporated into the ABAG methodology beginning with *Projections 2003*. With respect to this comparison, ABAG states:

[4] The website cited by one commenter as the source for the *Projections 2002–Projections 2005* comparison (http://planning.abag.ca.gove/currentfcst/summary1.html) no longer provides the information cited in the comment. It is assumed that the information cited (“ABAG Projections 2005: Summary of Findings”) is similar to the text discussion introducing and summarizing *Projections 2005* discussed herein.

> The earlier forecast, with some caveats, can be viewed as a "base-case" forecast. In other words, *Projections 2002* is an estimate of future activity in the Bay Area without the implementation of Smart Growth policies (ABAG, 2004, p. 4).

The comparison of *Projections 2002* and *Projections 2005* presented in *Projections 2005* includes a table comparing the projected job growth of the two projections series by county, as well as for the nine-county region as a whole (ABAG, 2004, pp. 4 to 7). Information from this table for the four counties served in whole or part by SFPUC water is presented in **Table 14.2-2**. As shown, *Projections 2005* forecasts 22,930 fewer new jobs for the four-county area by 2030 than does *Projections 2002* (as compared to 46,000 fewer for the nine-county region).

TABLE 14.2-2
COMPARISON OF PROJECTED EMPLOYMENT GROWTH (NEW JOBS): PROJECTIONS 2005 AND PROJECTIONS 2002

	Change in Employment, 2000–2030 (Number of New Jobs)		
County	**Projections 2002**	**Projections 2005**	**Difference**
Alameda County	314,540	338,710	24,170
San Francisco County	161,810	186,590	24,780
San Mateo County	128,060	120,500	-7,560
Santa Clara County	360,160	295,840	-64,320
Total	**964,570**	**941,640**	**-22,930**

NOTE: Information shown is for the entire county.

SOURCE: ABAG, 2004, Table 2, p. 7.

The comparison of the two projections series for the four counties indicates that *Projections 2005* anticipates greater job gains for Alameda and San Francisco Counties than does *Projections 2002*, while San Mateo and Santa Clara Counties are expected to gain fewer jobs. These changes in expectations are consistent with the detailed comparisons of *Projections 2002*, *Projections 2003*, and *Projections 2005* presented in Draft PEIR Appendix E.3 (Vol. 5, pp. E.3-9 to E.3-35), and with the characterization of the job losses in the early part of this decade as the "dot-com bust": San Mateo and Santa Clara Counties, the heart of Silicon Valley, lost the greatest number of jobs.

Table 14.2-3 compares the difference in the projections of *total* employment in each of the four counties for all years that are reported in both *Projections 2002* and *Projections 2005* (2000 through 2025) as well as for 2030.[5] Similar to the comparison of new jobs above, this table shows that the job loss was most severe in Santa Clara County (employment estimate for 2005) and that Santa Clara and San Mateo Counties are not expected to recover the lost existing and projected jobs by 2030. In Alameda and San Francisco Counties, in contrast, the lost jobs are expected to be

5 *Projections 2002* does not provide projections for 2030; county-level data for 2030 presented here are based on the comparison of *Projections 2002* and *Projections 2005* forecasts of new jobs presented in *Projections 2005* (ABAG, 2004).

TABLE 14.2-3
DIFFERENCE IN EXISTING AND PROJECTED TOTAL EMPLOYMENT: PROJECTIONS 2005 MINUS PROJECTIONS 2002

	2000	2005	2010	2015	2020	2025	2030[a]
Alameda[b]	-1,520	-42,900	-38,610	-29,820	-11,430	7,770	22,650
San Francisco[b]	8,070	-80,680	-66,370	-45,940	-21,750	5,600	32,850
San Mateo[b]	-9,300	-75,170	-65,430	-58,050	-47,110	-32,250	-16,860
Santa Clara[b]	-48,200	-227,020	-223,780	-211,750	-179,500	-146,740	-112,520
Four-County Total	-50,950	-425,770	-394,190	-345,560	-259,790	-165,620	-73,880

[a] The comparison of *Projections 2002* and *Projections 2005* for 2030 is based on information presented in *Projections 2005*.
[b] Information shown is for the entire county.

SOURCES: ABAG, 2001; ABAG, 2004.

recovered by 2025; that is, in those two counties, *Projections 2005* forecasts greater employment by 2025 than does *Projections 2002*. In *Projections 2005*, ABAG estimates that the four-county area had 50,950 fewer jobs in 2000 than were estimated in *Projections 2002* and nearly 426,000 fewer jobs in 2005 than were expected when *Projections 2002* was published. The difference in total employment in 2030 (73,880) reflects the difference in expectations of job growth in the four counties from 2000 to 2030 (22,930 fewer new jobs forecasted, discussed above) plus the lower estimate of jobs in 2000 assumed in *Projections 2005* (50,950 fewer than were estimated for 2000 in *Projections 2002*).

As discussed in the Draft PEIR (Vol. 4, Chapter 7, p. 7-22), ABAG updates its projections series frequently (typically, every other year) to reflect new information about existing conditions as well as recent and emerging trends. Projections may be revised upward or downward depending on the understanding of a variety of factors and conditions that influence future growth. In terms of the PEIR analysis, even if the SFPUC overestimated demand based on employment projections that have been lowered in ABAG's subsequent projections, the likely effect would be a reduction in the use of water from the Tuolumne River and local watersheds, which could result in a reduction in impacts on those watersheds, not an underestimation of the WSIP's impacts. To the extent the SFPUC has overestimated demand based on employment growth projections, the WSIP PEIR may overestimate the impacts associated with induced growth and with increased diversions of imported water.

In addition, at the same time *Projections 2005* reduced the estimates of total employment in 2030, the estimates of total population in 2030 were increased. According to *Projections 2005*, the projected growth in population for the nine-county Bay Area will result in 330,000 more residents in 2030 than were projected in *Projections 2002.* The population increase is based on an expectation that Bay Area communities, recognizing the pressures on natural and fiscal resources created by the growth of urban areas, would adopt smart growth policies that would lead to more intensive development in the existing urbanized areas.

Table 14.2-4, which is based on Draft PEIR Tables E.3.31 and E.3.32 (Vol. 5, Appendix E.3, pp. E.3-33 and E.3-34), summarizes the changes in expected employment and population growth between *Projections 2002* and *Projections 200*5 for 2025.[6] This table shows that ABAG reduced its forecast of total employment in 2025 by about 6 percent (a reduction of about 137,000 jobs for the areas generally served by the SFPUC's water customers), but increased its forecast of total population by about 5 percent (an increase of about 130,600 residents).

TABLE 14.2-4
ABAG PROJECTIONS OF EMPLOYMENT AND POPULATION IN 2025: SUMMARY COMPARISON

Area	Year	Projections 2002	Projections 2005	Projections 2005 as % of Projections 2002
		Employment		
SFPUC Water Customers	2025	2,169,600	2,032,650	94%
		Population		
SFPUC Water Customers	2025	2,693,000	2,823,600	105%

SOURCE: Draft PEIR, Vol. 5, Appendix E.3, Tables E.3.31 and E.3.32.

The net effect of the *Projections 2005* expectations (more population and less employment) on 2030 water demand is that the reduction in demand due to fewer jobs would be offset to some extent by an increase in demand due to increased population.

In any case, fluctuations in each successive ABAG *Projections* series are to be expected. As noted above, if it turns out that the SFPUC has overestimated demand, the likely effect would be that less water would be used than was projected, which could result in fewer or less severe impacts on the Tuolumne River and local watersheds and potentially fewer or less severe impacts associated with growth.

Projections 2007

While the Draft PEIR compares ABAG's *Projections 2002* forecasts with those of *Projections 2003* and *Projections 2005*, *Projections 2007* was released after Draft PEIR preparation and could not be considered prior to publication of the environmental document, as noted above. *Projections 2007* and *Projections 2005* use the same estimate of jobs in 2000 (which, as discussed above, are somewhat lower than was assumed in *Projections 2002* and *Projections 2003*). *Projections 2007* shows a slightly greater loss of jobs by 2005 than did *Projections 2005*, and a slightly slower recovery or growth in new jobs between 2005 and 2030 than was forecasted in *Projections 2005*. As a consequence, *Projections 2007* forecasts fewer jobs in 2030 for all four counties served (partly or entirely) by SFPUC water than were forecasted in *Projections 2002*.

6 Projections for 2025 rather than 2030 are presented because 2025 is the *Projections 2002* horizon year.

Similar to *Projections 2003* and *Projections 2005*, *Projections 2007* forecasts somewhat greater population growth than does *Projections 2002* (with about 200,000 more people forecasted in the four-county area by 2025, the last year for which *Projections 2002* provides forecasts). **Figure 14.2-1** presents a comparison of the expectations of job and population growth for the four counties served (partly or entirely) by SFPUC water in the four ABAG projections series.

How Projections Were Used in the End-Use Demand Models

Although the demand modeling incorporated the retail service area and wholesale customer-selected projections of future employment and population levels to project future water demand, the models actually applied the *rate* of growth reflected in selected projections to existing water accounts in order to project growth in demand, as explained in Draft PEIR Chapter 7 (Vol. 4, p. 7-14). The demand models are not based on per-capita consumption, but rather are end-use models. Therefore, the estimates of future population and employment were not used to calculate future demand on a per-capita basis. *Projections 2002* forecasts a slower rate of growth from 2005 to 2030 than does *Projections 2003*, *Projections 2005*, or *Projections 2007*. As discussed above and in Draft PEIR Chapter 7 (Vol. 4, pp. 7-23 and 7-24), the estimates of employment in 2005 provided in *Projections 2005* are noticeably lower than those of *Projections 2002* or the customer-selected estimates of employment for that same year. This is due to the decline in jobs between 2000 and 2005 reflected in *Projections 2005* as compared to *Projections 2002*. Overall, *Projections 2002* and *Projections 2005* show a similar growth rate between 2000 and 2030.[7] The population and employment estimates incorporated in the demand modeling are used in the PEIR because they provide a reasonable expression of growth assumptions that allows for comparisons with other forecasts of future growth, such as those in general plans and ABAG projections. However, as noted, it was the growth rates reflected in the projections that were applied in the demand models.

ABAG as Projections Source

Some comments assert that the employment projections are unrealistic or that the difference in employment and population growth rates is unusual and that the demand projections should be reevaluated using “more realistic” employment projections. The demand modeling for the wholesale customers relied on ABAG projections, which are based on a consensus-driven process to validate ABAG’s work with local cities, as the best source of employment projections; the ABAG numbers were not altered. ABAG is the official regional planning agency of the San Francisco Bay region; it was selected as a credible source, as its projections are relied on by many agencies throughout the Bay Area. The comments asserting that the ABAG projections are unrealistic provide no evidence in support of this assertion, nor do they suggest an alternative source that would have more credibility than ABAG as a source of regional employment projections for the wholesale customer service area. The demand modeling for San Francisco also relied on ABAG data, in conjunction with County Business Patterns data.

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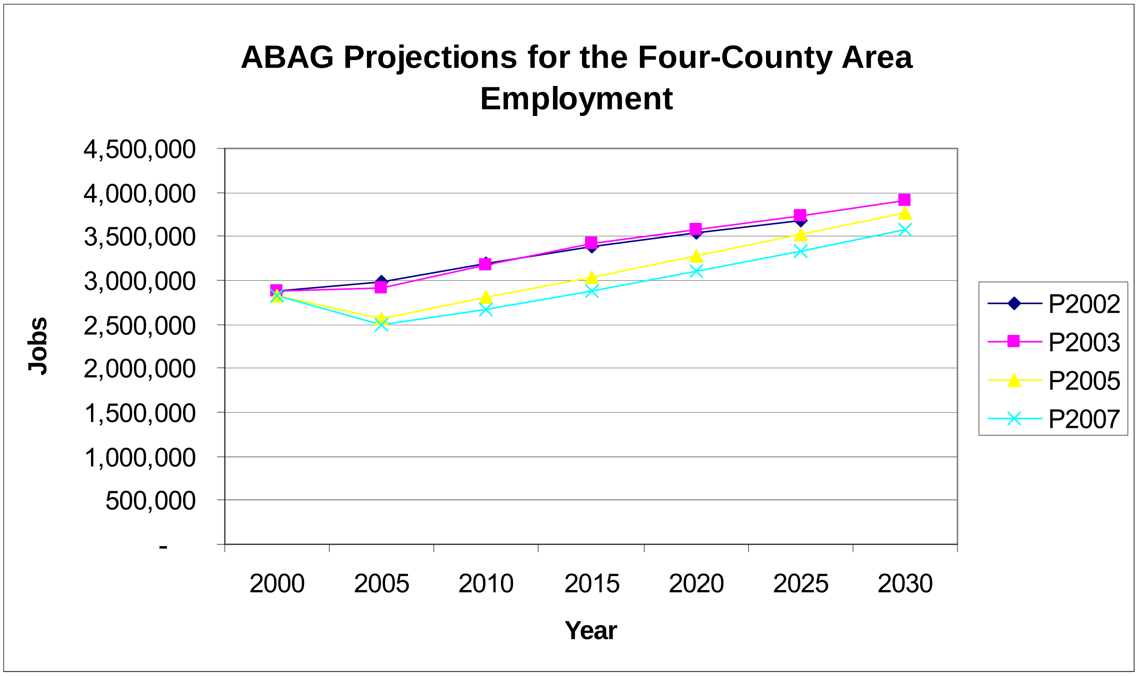
7 As noted previously, assumptions about *Projections 2002* estimates for 2030 are based on ABAG’s comparison of *Projections 2002* and *Projections 2005* for the period 2000 to 2030.



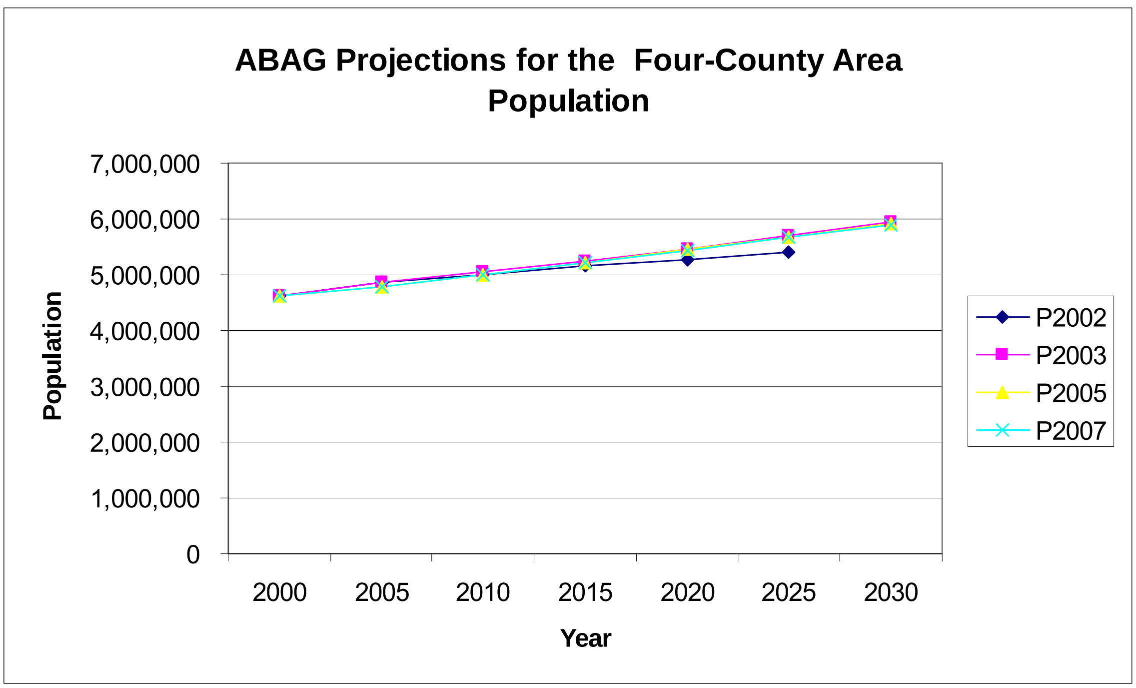


Figure 14.2-1
ABAG Employment and Population Projections
for the Four-County Area

Projections to 2030

The comments that "growth statements" rely on published studies that do not cover the time period up to 2030 and have not undergone environmental review apparently refer to the use of ABAG's *Projections 2002* in the water demand models. The statement that ABAG's *Projections 2002*—the source of many of the population and employment projections used in the water demand models—only provides forecasts to 2025 is correct. Similarly, most of the other projections sources selected by the water customers[8] did not extend to 2030, the WSIP planning horizon. As described in the Draft PEIR (Vol. 5, Appendix E.2, p. E.2-6), it was therefore necessary to extend the projections to 2030 for use in the demand models (refer to the referenced page in Appendix E.2 for a summary of the methodology used to extend the forecasts to 2030). Thus, contrary to the implication of several comments on this issue, the level of growth assumed in the WSIP demand projections extends to the WSIP horizon year of 2030. This is the level of growth that was considered in Draft PEIR Chapter 7, Analysis of Growth-Inducement Potential and Indirect Effects of Growth (Vol. 4, pp. 7-1 to 7-91). The Draft PEIR compares the population and employment projections assumed in the water demand modeling with ABAG's *Projections 2005* forecasts—which include projections for 2030—for the years 2005, 2025, and 2030; refer to Draft PEIR pp. 7-23 to 7-26 (Vol. 4, Chapter 7).

Environmental Review of ABAG Projections

Some comments correctly noted that ABAG projections are not subject to environmental review. This fact does not, by itself, make such projections unreliable, nor do such projections constitute a "project" that would normally be subject to environmental review. They constitute information, not policies, and have been treated as such in the PEIR and in the demand modeling. In any event, despite not being subject to CEQA, ABAG projections are frequently cited as the projections source in general plans and similar planning documents, which are subject to environmental review under CEQA. Here, the Draft PEIR growth-inducement analysis (Vol. 4, Chapter 7, pp. 7-19 to 7-59) compares projections assumed in the SPFUC demand study with those of jurisdictions' adopted general plans.

Use of Total Jobs Projections for the Wholesale Customer Service Area

Representative comments on this topic include:

- *The forecasting methodology has two important errors that can lead to potentially large inaccuracies in forecasted demand: it assumes that the current composition of commercial and industrial businesses within the nonresidential sector will not change over time, and it ignores the variability in water use in both quantity and purpose among users in the nonresidential sector. [SI_PacInst-07, SI_PacInst-79, SI_TRT-CWA-SierraC-31] The DSS model applies the economic growth rate to all nonresidential accounts equally, thereby assuming that all subsectors grow at the same rate. This is highly unlikely. [SI_PacInst 79]The SFPUC should reevaluate nonresidential demand projections for its*

8 As discussed in the Draft PEIR (Vol. 4, Chapter 7, p. 7-14), although *Projections 2002* was used for all but two water customers for employment forecasts and for most of the population forecasts used in the demand models, about one-third of the wholesale customers used other projections sources for their population forecasts.

wholesale customers using industry-specific economic growth projections, water use, and conservation potential. [SI_PacInst-12]

- *A more accurate, comprehensive analysis based on industry-specific growth and water-use rates, such as the analysis performed for the SFPUC retail customers, should be employed and applied to the wholesale customers. [SI_PacInst-79] The projected increase in water demand for the 2.4 million people who consume Hetch Hetchy water is inflated. The studies of projected water demand are looking at old technology. The shift from manufacturing to service and information, which use considerably less water, wasn't taken into consideration. [SI_TRT8-02]*

Response

Comments that the DSS modeling ignores differences in water use among users in the nonresidential sector are incorrect. The DSS models used the monthly billing data classifications provided by the individual water agencies. Typical classifications included the following:

- Commercial
- Industrial
- Public or Institutional
- Municipal

The modelers verified the classification of certain types of accounts, such as hospitals and schools, and collected data to quantify water used by certain types of users, such as restaurants and hotels.

One comment refers to Standard Industrial Classification (SIC) code water use coefficients to illustrate differences in water use by different types of businesses. The fact that different types of land uses entail different levels of water use is acknowledged and reflected in the demand modeling. However, unless more is known about given enterprises, such per-employee water use coefficients can be misleading. For example, hospitals have a low water use coefficient (refer to Table 8 of Comment SI_PacInst-79 [Vol. 6, Chapter 12, Section 12.4]); however, because hospitals have so many employees, water use by hospitals can be very high. As a type of business, hospitals would be ranked by the DSS modelers near the top of the list for nonresidential water users in the wholesale service area, contrary to their ranking by SIC code water use coefficients. Therefore, unless no baseline nonresidential water use data were available, and employment projections by SIC code were available, per-employee water use coefficients would be of little value in a demand projection. Baseline water usage provides a more reliable measure of actual nonresidential water use for different types of accounts. The DSS models used actual water use data for existing accounts to establish baseline water usage for each wholesale customer.

With respect to nonresidential growth rates, the DSS demand models did not use the overall job-growth rate for ABAG's entire nine-county area (or the job-growth rate for the four-county area served by the SFPUC) in modeling the growth in nonresidential demand in the wholesale customer service area, as some comments imply. The DSS modeling was conducted at the individual wholesale customer service area level.

Industry-specific growth projections were used to model demand for the retail service area[9] (the city of San Francisco). Some commenters stated that this methodology should have been used in the wholesale service area, and that failure to use industry-specific projections and water use rates resulted in inflated demand projections. However, while it was possible to take this approach for the retail service area demand projections, the SFPUC determined that using industry-specific projections in the wholesale service area would be impractical and would likely result in projections that are no more reliable (or even less reliable) than the methodology used. The industry-specific methodology cannot currently be used in the wholesale service area for the following reasons:

a) ABAG projections are tabulated by jurisdictional boundaries.[10] In contrast to San Francisco, whose jurisdictional boundaries coincide with the retail service area for which demand projections were developed, few of the wholesale customers' service area boundaries coincide with jurisdictional boundaries, and some of the service areas include large areas of unincorporated county lands (refer to Draft PEIR Table 7.1, Vol. 4, Chapter 7, p. 7-12). While it is possible to assign population and total employment to service areas based on the percentage of a service area within a jurisdiction, the assignment of jobs by specific classifications would be much more problematic because jobs (especially certain categories of jobs) tend to be concentrated within small subsections of the service areas.

b) The wholesale customers assign a billing category (such as commercial, industrial, public or institutional, and municipal) to individual meter accounts. However, the categories used by each of the 27 wholesale customers are not necessarily consistent with the categories used by the other wholesale customers. Nor are the categories used by the wholesale customers consistent with the industry-specific employment categories used by ABAG, which makes a direct correlation of accounts with ABAG industry categories impossible. Each meter account has an "identifier" that includes the address of the water meter and the name of the person and organization who receives the water bill. In some cases, it is possible to correlate a particular account to an ABAG category based on the account name; however, such instances are the exception rather that the rule.

   Because appropriate data are not currently available, a door-to-door survey of businesses would be required, in many cases, in order to use industry-specific projections. Such a survey could require the breakdown of a single water account into multiple categories to conform with ABAG's classification system (for example, if "professional and managerial" and "financial and leasing" businesses occur within a single building, the water account currently categorized as "commercial" would require multiple ABAG categories). Assuming such surveys were conducted and the billing systems would accommodate it, a code could then be added to the accounts to allow the sorting of data by the new classifications. While it may be possible and desirable to do this in the future, it would be a costly and time-consuming task that the SFPUC deemed infeasible to implement for all of the wholesale customers at this time. In addition, even with business categories that are comparable to ABAG's, the problem of appropriately apportioning a jurisdiction's job projections by category to the service area discussed in (a), above, would remain.

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[9] The retail service area model used composite employee water use rates with ABAG industry-specific employment projections to project nonresidential water demand, as described in the Draft PEIR (Vol. 1, Chapter 3, Section 3.4.4, p. 3-20).

[10] This includes projections for each incorporated city and for the city plus any unincorporated area within the city's planning area.

Moreover, it is not apparent that this approach would contribute significantly to the accuracy of the demand projections. ABAG's employment projections use a shift-share methodology that incorporates assumptions about future shifts in employment among economic sectors. As noted above, the DSS modeling was conducted at the level of individual water agency service areas, which would capture projected employment dynamics at that level.

The wholesale service area currently has over 1.1 million jobs, and total service area water demand (for residential and nonresidential use) in 2030 is expected to increase by 52 mgd, or 19 percent. Current water use (i.e., 2001 base-year demand) accounts for 84 percent of the water demand projected for 2030. Given the percentage of overall demand represented by future demand, the issues discussed above, and the fact that the DSS modeling relied on reasonable assumptions based on ABAG employment projections for each wholesale customer service area, the San Francisco Planning Department believes that the modeling effort provided a reasonable, conservative forecast for use in the Draft PEIR, which reflects the CCSF's best effort at analysis and disclosure. Furthermore, in light of the impracticality of the suggested approach, there is no evidence that this approach would yield a more reliable result.

Effects of the Future Price of Water on Projected Demand

Representative comments on this topic include:

- *Flaws in modeling demand include ignoring the effect the expected price increase will have on future demand. [SI_TRT2-02]*
- *The analysis of future water demand does not include price-driven efficiency improvements, despite an estimated quadrupling of the price of water from the SFPUC by 2015. [SI_PacInst-04, SI_TRT-CWA-SierraC-01]*
- *As the price of water increases demand decreases, particularly for nonresidential and outdoor uses. Because the SFPUC expects to quadruple the price of water by 2015, the effects of water price increases should be integrated into the demand projections. Failing to do so may result in an overestimate of future demand and revenue shortfalls. [SI_PacInst-13]*
- *Given the projected increase in water price, price will likely be an important driver of conservation in the coming years, but neither the wholesale nor retail demand analyses consider price-driven efficiency due to concerns about double counting. [SI_PacInst-62]*

Response

Some comments criticized the end-use demand models for not incorporating the effects of the future price of water on projected demand. Such comments are based on the economic premise that water demand is price-elastic, meaning that as the price of water increases, demand will decrease. According to these comments, the demand models fail to incorporate the expected quadrupling of the price of water by 2015, resulting in demand projections that are higher than if the future price of water had been adequately considered.

It is acknowledged that water use is influenced to some extent by changes in price. Price elasticity studies indicate that while water users respond to price increases by decreasing use, declines in use are small compared to the changes in price; that is, these studies indicate that water demand is relatively price-inelastic (DWR, 1998). The price elasticity of water demand can vary by region, water use, customer type, and other factors, as one comment correctly states (refer to Comment SI_PacInst-62 [Vol. 6, Chapter 12, Section 12.4]). Since outdoor water use is commonly assumed to be discretionary, the low outdoor water use within San Francisco suggests that water demand in the retail service area is less price-elastic than in other parts of the state. Please refer to **Response SI_PacInst-62** (Vol. 7, Chapter 15, Section 15.4) for a more detailed discussion of the price elasticity of water demand.

Consideration of Water Price in WSIP Background Studies

Even if water demand is relatively inelastic, it is expected that price will be an important driver of conservation in coming years. However, in the background technical studies conducted for the WSIP, price is considered in the *conservation potential* studies rather than in the end-use water *demand* models used in the retail and wholesale service areas. As described in the Draft PEIR (Vol. 5, Appendix E.2, pp. E.2-12 to E.2-15), cost-benefit analyses were conducted in both the wholesale and retail service areas to determine whether given conservation measures would be cost-effective. In the analysis of whether given conservation measures would be cost-effective and therefore selected for implementation (assuming the measures were also determined to be effective and feasible for the individual agencies to implement), “the major benefit to wholesale customers was the avoided price of purchased SFPUC water. Because the cost of water is scheduled to increase… the estimated future (2015) price was used in [the] study” (URS, 2004b). The projected water savings from the conservation measures selected for implementation, along with supplies from other water sources, were deducted from projected demand to arrive at the customers’ 2030 purchase estimate, and the wholesale customers were aware of the estimated future price of water when they submitted the purchase estimates. Thus, “price-driven efficiency improvements”—that is, conservation measures to which customers have committed in order to avoid future water costs—have been incorporated in the *purchase estimates* submitted to the SFPUC. However, the mechanism through which these price-driven efficiency improvements were identified was the cost-benefit analyses conducted as part of the conservation potential studies, not as part of the water demand studies. This approach provides a reliable method of quantifying the effects of price-driven efficiency improvements.

Some comments suggest that price needs to be factored into the demand modeling as well as considered in the cost-benefit analyses of conservation measures. However, the SFPUC and its technical consultants are concerned that factoring price into both the demand models and the cost-benefit analyses would result in the double-counting of conservation savings. In modeling demand (as opposed to conservation potential), the challenge would include assessing the degree to which a water customer reduces water use in response to the price of water *apart from* participating in a conservation program—installing water saving fixtures or equipment under a rebate program, for example. To date there are no known studies that would allow the modelers to separate the effects of price and the rebate program (Maddaus, 2008).

According to the SFPUC's DSS technical consultant (Mr. Bill Maddaus of Maddaus Water Management), most literature on the responsiveness of demand to price assumes that all water savings are due to price policies. For example, a study of water use in Seattle, Phoenix, and Tucson concluded that "[a]n examination of the long-term water usage by these three water utilities demonstrates that significant reductions in water usage are possible with the support of conservation-oriented rates. This appears particularly true if these rates are implemented in conjunction with active water conservation programs" (Cuthbert, 1996). The three water utilities in this study have had long-standing water conservation programs, and although the author was able to detect a water reduction, he could not separate the reductions due to price or non-price conservation programs (Maddaus, 2008). Thus, the approach taken by the SFPUC and its technical consultants of considering the effects of the future cost of water in the evaluation of conservation potential provides a more reliable and quantifiable means to estimate the effects of future water costs than would consideration of the effects of cost on demand, for which a tested and reliable methodology has not yet been demonstrated.

Revised Estimate of the Future Price of Water

As discussed above and in the Draft PEIR (Vol. 5, Appendix E.2, p. E.2-12 and E.2-15), cost-benefit analyses were prepared for the conservation measures that were considered for implementation in the wholesale and retail service areas, and cost-benefit analyses were also conducted for each of the three programs of conservation measures (Programs A, B, and C) that were compiled for the retail service area and each wholesale customer, in order to determine program cost-effectiveness (URS, 2004c). As discussed above, because the price of water is expected to increase, the estimated future price of water was used in these evaluations. Although the cost-benefit analyses showed that many of the individual conservation measures and each of the compiled conservation programs was cost-effective, the incremental cost of adopting conservation measures in addition to those measures the agency had selected for implementation (or for moving from implementing Program A to B or from Program B to C) was a less important factor in an agency's decision not to adopt additional measures than were concerns about the feasibility of implementing additional measures. Practical constraints related to implementing additional measures, such as the need to add additional conservation program staff that might be triggered by the addition of one or more measures (to those already selected for implementation), was a more important consideration, especially for smaller water districts with limited staff. The measures and programs of compiled measures were found to be cost-effective based on the estimated future (2015) cost of water at the time the technical studies were prepared. Since then, the SFPUC's estimate of the future (2015) price of water has increased, from approximately three times the 2003 price assumed in the conservation potential study to approximately four times the 2003 price, according to the price quoted by SFPUC staff cited in Comment SI_PacInst-62 (Vol. 6, Chapter 12, Section 12.4).

Because many of the conservation measures were found to be cost-effective based on the earlier (lower) estimated future price, the effect of the revised future price on the number of measures and conservation programs implemented by the wholesale customers may be minor. Some of the individual measures previously found not to be cost-effective are now likely to be found cost-effective, and those already found to be cost-effective would be more cost-effective. However, since the wholesale customers identified feasibility constraints rather than costs as a limitation to implementing additional measures, the increase in future cost will not necessarily translate into more measures being implemented. Nevertheless, it is reasonable to expect that as the price of water increases and measures become more cost-effective as a result, some existing barriers to implementing additional conservation measures may be overcome, at least in some cases. It would be up to each wholesale customer, not the SFPUC, to determine whether additional conservation would be feasible as well as cost-effective in light of rising water prices.

Finally, in considering the effect of the future cost of water, it should also be noted that the rise in raw water cost will translate into smaller increases in retail prices, on a percentage basis, because other costs (such as fixed costs, chemical costs, and salaries) are not forecasted to rise as quickly.

The purchase estimate submitted by each wholesale customer represents the customer's best estimate of water purchases in 2030. Acknowledging the role that the cost of water plays in purchase decisions, each estimate states that the "estimate is subject to change based on changed conditions, such as the future cost of water." The conservation potential studies incorporated the best information available at the time they were conducted, including the estimated future cost of water. If, due to revised estimates of the future cost of water or other factors, the SFPUC underestimated conservation potential, the effect of implementing more conservation than is currently considered feasible would likely be a reduction in the use of water from the Tuolumne River and local watersheds. As noted in the introduction to this response, comments about the accuracy of conservation potential may be taken into account by decision-makers in evaluating the feasibility of alternatives, but do not indicate that the PEIR underestimated the impacts of the WSIP. Please refer to **Response SI_PacInst-62** for additional information on the use of water pricing as a water agency tool and **Response SI_PacInst-47** regarding tiered pricing rate structures (these responses are provided Vol. 7, Chapter 15, Section 15.4).

Per-Capita Demand

Representative comments include the following:

- *Per-capita demand for the wholesale customers is projected to increase over current (2001) per-capita demand, despite numerous studies showing that substantial cost-effective reductions in per-capita demand are possible with available technology and policies. [SI_PacInst-03]*
- *The increase in per-capita demand is simply out of step. It demonstrates inefficient use of water and of a resource that's held in public trust. [SI_TRT6-02]*
- *It's telling that projected per-capita consumption is expected to increase in this area. [SI_TRT8-02]*

Response

Some comments cited an alleged projected increase in per-capita demand in the SFPUC wholesale customer service area as evidence that the demand studies are faulty, based on the supposition that per-capita demand should not be expected to increase given improvements in technology, plumbing code effects, and other factors. Some comments also cite the Draft PEIR as the source of per-capita figures in making this claim. However, the statement that per-capita demand in the SFPUC service area is increasing is incorrect. The weighted average per-capita values in all sectors[11] are projected to decrease between 2001 and 2030, both *without* active conservation programs (due to implementation of plumbing codes) and *with* active conservation; in the latter case the decrease is greater. For example, the gross per-capita weighted average demand for the wholesale customer service area calculated for the 2001 base year is 168 gallons per-capita per day (gpcd) (SFPUC, 2006, p. 150); projected demand for 2030 is 167 gpcd without planned conservation (SFPUC, 2006, p. 156) and 160 gpcd with planned conservation (SFPUC, 2006, p. 162). While it is the case that per-capita demand is projected to increase for some individual wholesale customers, the trend within the service area as a whole shows a decrease in per-capita demand, as these figures demonstrate. In the retail service area, projected gross per-capita demand with plumbing codes, without additional conservation, is 103 gpcd in 2005[12] and 96 gpcd in 2030 (SFPUC, 2006, p. 129); with additional conservation, projected gross per-capita demand is 102 gpcd in 2005 and 91 gpcd in 2030 (SFPUC, 2006, p. 130). In addition, the Draft PEIR does not present per-capita information. The information cited in this response is based on SFPUC calculations using the demand models, but wholesale customer demand was not projected based on per-capita consumption but rather on the end-use of water and growth in water accounts (as discussed above in this master response). Per-capita demand information was prepared by the SFPUC in response to specific requests by participants at the September 2006 Sustainable Water Supply Briefing; for more information on this briefing, refer to the introduction to the **Responses to Pacific Institute Comments** (Vol. 7, Chapter 15, Section 15.4). Increases in demand for the individual wholesale customers and the retail service area are shown in Draft PEIR Table 7.3 (Vol. 4, Chapter 7, p. 7-18) and described in Section 7.3.6, Customer-Specific Summaries (pp. 7-34 to 7-59).

The following two more specific comments were submitted on this topic:

- *For the wholesale customers, per-capita demand reached a high of 187 gpcd in the mid-1980s, declined precipitously during the drought of the late 1980s and early 1990s, and has been relatively constant since 1996. Projected 2030 per-capita demand increases slightly over 2005 levels but is similar to the per-capita estimates in previous years. [SI_PacInst-57]*

Response

The per-capita demand projections for 2030 are based on average annual demand projections assuming "normal year" precipitation levels in the service area, similar to the 2001 base-year conditions assumed for the modeling. Lower-than-normal water use in 2005 and 2006 is attributable to above-normal precipitation in the wholesale customer service area, which would

[11] That is, total per-capita consumption and gross per-capita consumption for single-family residential, multifamily residential, and nonresidential sectors.

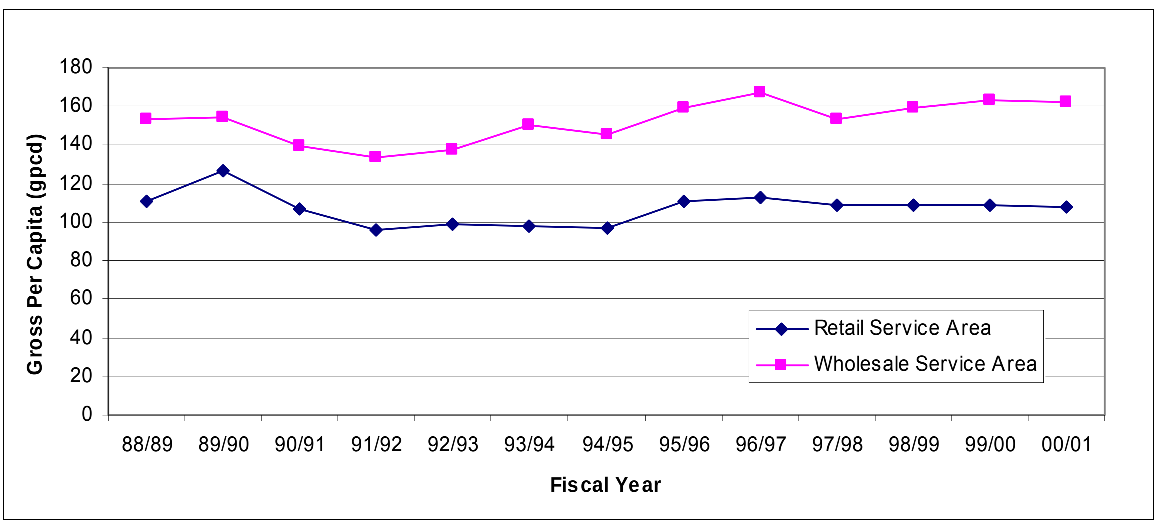
[12] The Sustainable Water Supply Briefing materials (SFPUC, 2006) do not include an estimate of gross per-capita demand for 2000 (the base year for the retail service area demand study), which is why the 2005 estimate is presented here. Total per-capita *consumption* (i.e., not including unaccounted-for water losses) in the retail service area in fiscal year 2000/2001 was 97 gpcd (SFPUC, 2006, p. 128).

account for the dip in per-capita demand for those years (Maddaus, 2008). Refer also to the figure in following response.

- *For retail customers, gross per-capita demand has declined over time. Per-capita demand reached a peak of 127 gpcd in 1989, declined during the drought, and has declined steadily since 1996. By 2030, per-capita demand in the retail service area is projected to decline to 91 gpcd, nearly half of the per-capita demand of the wholesale customers. Simple comparisons of gross per-capita water demand between the wholesale and retail customers can be misleading because water use is affected by a variety of economic and demographic factors, such as housing type and density and the type of businesses present in a given region. Local climate conditions and water-use efficiency also affect demand. [SI_PacInst-58]*

Response

For fiscal years 1988/1989 through 2000/2001 (the years that available data were provided to the Pacific Institute for retail and wholesale customers), gross per-capita demand values show similar patterns, as illustrated in **Figure 14.2-2**, below. These patterns indicate that use declined during the drought period of the late 1980s through the early 1990s and increased thereafter to a peak in the mid-1990s; between the mid-1990s peak and fiscal year 2000/2001, use patterns diverged slightly, with more variability in the wholesale customer service area, although usage in both the wholesale and retail areas remained lower than during the mid-1990s peak. The decline in use for fiscal year 1994/1995 per-capita was due to a wet year (Maddaus, 2008). As noted in the comment, a variety of economic and demographic factors, including housing type and density, the type of commercial and industrial activities in the region, climate, and existing levels of water use efficiency can affect per-capita demand. Some of these factors are likely responsible for the differences in the degree of change in per-capita demand over time in the retail and wholesale customer service areas.



SFPUC Water System Improvement Program ▪ 203287

SOURCE: Maddaus, 2008.

Figure 14.2-2
Historical Gross Per-Capita Demand – SFPUC Customers

Substantiation of the Need for Sizable Water Supply Increases and Documentation of Water Conservation Efforts

Representative comments on this topic include:

- *Communities requesting sizable water supply increases should be questioned for some substantiation of need and for documentation of water conservation efforts. [SI_CNPS-SCV2-07]*

Response

Some comments suggested that communities requesting sizable water supply increases should be questioned and required to substantiate the need for the increased water and to document their water conservation efforts. As discussed above and described in the Draft PEIR (Vol. 5, Appendix E.2), the demand projections were developed following reasonable, accepted methodologies and based on the best demographic information available at the time. The SFPUC and its DSS modeling consultant worked in close consultation with the wholesale customers to develop the demand projections, and evaluated any requests for customer-specific model adjustments to ensure such adjustments were reasonable, could be substantiated, and were in agreement with land use planning documents. For example, for some wholesale customers, one or more new account categories with higher usage rates were included in the service area demand modeling. The rationale for the new account categories is discussed in the Draft PEIR (Vol. 5, Appendix E.2, p. E.2-7), and the specific reasons for each new category are summarized in Table E.2.2 (pp. E.2-8 and E.2-9). The adjustments made to customers' accounts are also discussed, if applicable, in the customer-specific summaries in Chapter 7 (Vol. 4, pp. 7-35 to 7-59). The Draft PEIR also discusses SFPUC Policy 00-0110, which encourages the wise use of water resources by the CCSF and the SFPUC's suburban customers, including conservation, water recycling, and groundwater development (Vol. 1, Chapter 2, p. 2-46). For information on the conservation efforts in the SFPUC service area, refer to Section 14.2.3, below.)

Outdoor Water Use

Representative comments on this topic include:

- *Increases in residential demand are largely due to outdoor water use. For wholesale and retail customers, per-capita outdoor use is projected to increase, indicating that the proposed conservation does not adequately address this use. [SI_PacInst-05]*
- *The nonresidential sector is responsible for over 80 percent of the projected 2030 demand increase. About 35 percent of that increase is due to outdoor use. [SI_PacInst-06]*
- *For wholesale customers, the total demand increase is 38 mgd between 2000 and 2030. The nonresidential sector accounts for about two-thirds of that increase, or 24.1 mgd. Over 40 percent of the increase in nonresidential demand is due to outdoor use. Residential demand growth, largely due to increases in outdoor water use, accounts for the remaining one-third of total demand growth in the wholesale service area. [SI_PacInst-63]*
- *Outdoor water use alone is driving 60 percent of the anticipated increase in water demand. [SI-TRT8-03, C_Raffa-03]*

Response

Because these figures could not have been derived from information presented in the Draft PEIR or the technical memoranda prepared for the wholesale and retail customer service areas, it is assumed that the comments and figures on outdoor demand are based on material provided by the SFPUC and BAWSCA (SFPUC, 2006) as background information for the September 2006 Sustainable Water Supply Briefing; for a description of this briefing, refer to the introduction to the **Responses to Pacific Institute Comments** (Vol. 7, Chapter 15, Section 15.4).

Residential

Regarding the references to increased residential demand, note that although residential demand among several customers is projected to increase, the increases are relatively small. The SFPUC calculates that overall, with plumbing codes and planned conservation programs, residential demand in the entire SFPUC service area would increase by only 3 mgd,[13] despite the estimated 17 percent increase in population in the service area over the planning horizon.

On a per-capita basis, residential demand would decrease. The SFPUC calculated the following estimates of outdoor residential per-capita demand based on the per-capita demand tables presented in the background information for the Sustainable Water Supply Briefing (SFPUC, 2006, Section 6, Attachments 1 and 3):

- For the retail service area, despite a projected increase in the outdoor residential per-capita demand of 0.2 gpcd,[14] the overall residential per-capita demand would decrease approximately 14 gpcd.

- For the wholesale service area, despite a projected increase in the outdoor residential per-capita demand of about 1 gpcd, the overall weighted average wholesale residential per-capita demand (with conservation and plumbing codes) would decrease by 21 gpcd.[15]

Proposed conservation measures would address residential outdoor use. As shown in Table 14.2-7 in Section 14.2.3 below, most of the wholesale customers have included conservation measures that address residential outdoor use in conjunction with their "high-range" purchase estimate.[16] Of the three that did not, Estero Municipal Improvement District and North Coast County Water District included conservation and outdoor measures in conjunction with their "low-range" purchase estimate, and Los Trancos County Water District has since merged with California

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[13] This calculation is based on the tables showing projected demand by individual customer presented in the background information for the Sustainable Water Supply Briefing (SFPUC, 2006, Section 3, Attachment 4).

[14] Due to rounding, the figures presented in Section 6, Attachment 1 of SFPUC 2006 (pp. 128 and 130) suggest that outdoor residential demand is projected to increase by 1 gpcd; however, the actual projected increase is 0.2 gpcd (from 1.43 to 1.61 gpcd). (The projected 1.61 gpcd outdoor residential per-capita demand in 2030 is an estimate based on 3 percent outdoor use.)

[15] Note that this calculation is based on the overall weighted average wholesale *residential* per-capita demand excluding unaccounted-for water and, obviously, nonresidential per-capita demand. The data in Response SI_PacInst-30 includes residential and nonresidential as well as unaccounted-for water.

[16] As shown in Draft PEIR Table 3.3 (Vo1. 1, Chapter 3, p. 3-18) and Table 7.2 (Vol. 4, Chapter 7, p. 7-15), some customers submitted a purchase estimate range for 2030, depending on achievement of a range of potential savings from conservation and recycled water use. (That is, the high end of the purchase estimate range would correspond to achievement of the low end of the conservation/recycling estimate and vice versa.)

Water Service–Bear Gulch, which has included outdoor measures in its purchase estimate baseline conservation program.

The conservation savings associated with these outdoor measures is summarized as follows:

- For the retail service area, the per-capita retail residential outdoor use is projected to increase by 0.3 gpcd without additional conservation and by 0.2 gpcd with additional conservation.
- For the wholesale service area, the weighted average per-capita wholesale residential outdoor use is projected to increase by 3 gpcd without additional conservation and by 1 gpcd with additional conservation.

Therefore, implementation of the conservation measures to which the SFPUC and the wholesale customers have committed would save approximately 0.1 gpcd of retail customer residential outdoor use and 2 gpcd of wholesale customer residential outdoor use.

Nonresidential

The statement that the nonresidential sector in the SFPUC service area is responsible for over 80 percent of the projected 2030 demand increase and that about 35 percent of that increase is due to outdoor use is correct. These figures refer to the combined demand of the nonresidential sector in the retail and wholesale customer service areas, taking into account plumbing code and projected conservation savings. The statement that the increase in nonresidential demand in the wholesale customer service area accounts for about two-thirds of the increase in the wholesale customer service area is correct. However, using the DSS models, the SFPUC calculated the slightly different figures indicated below. Demand referenced here takes into account plumbing code savings and active conservation. (Refer to **Response SI_PacInst-63** [Vol. 7, Chapter 15, Section 15.4] for additional specific calculations.)

- The total demand increase in the wholesale customer service area is 36.8 mgd, not 38 mgd.
- The nonresidential sector in the accounts for 23.6, not 24.1 mgd, of the increase in demand in the wholesale customer service area.
- About 39 percent, not over 40 percent, of the increase in wholesale customer nonresidential demand is due to outdoor use.

Overall Outdoor Demand

The statement that 60 percent of 2030 water demand is for outdoor irrigation appears to be based on information provided by BAWSCA for the Sustainable Water Supply Briefing. The BAWSCA information was provided as part of a package of material (SFPUC, 2006) requested by briefing participants. According to BAWSCA, the increase in outdoor consumption from 2001 to 2030 (20.2 mgd) represents 58 percent of the total increase in consumption over that period (34.6 mgd) (SFPUC, 2006, p. 32). Note that the figures in the cited reference refer to consumption for 2001 and 2030, which is somewhat different from the figures of total demand (which includes consumption and unaccounted-for water) shown in the Draft PEIR. Some comments on increased outdoor water use imply that outdoor water use is equivalent to water use for irrigation and landscaping. In addition to these uses, nonresidential outdoor uses also include cooling, pools and fountains, wash-down of facilities, and external leakage; residential outdoor uses also include pools and fountains, wash-down of houses, car washing, and external leakage. Some comments recommend that recycled water be used to replace potable supplies for nonresidential outdoor uses. Please refer to Section 14.2.3 for a discussion of conservation measures and recycled water use addressing outdoor water demand. Tables 14.2-7 and 14.2-8, below, show the conservation measures, including outdoor measures, to which the SFPUC and the wholesale customers have committed.

Requests for Reevaluation of Demand Projections

Representative comments on this topic include:

- *The SFPUC should reevaluate its projections for future water demand and conservation potential in light of flaws and inaccuracies in its studies. [SI_CNPS-EB1-17, SI_CRS-05, C-Raffa-10]*

- *These flaws led to inflated demand projections and they need to be corrected in the Final PEIR. [SI_TRT2-02]*

- *In going from Draft to Final PEIR, the analysis should incorporate the latest employment projections and then alter the water demand projections accordingly. [SI_TRT6-02]*

Response

The SFPUC's demand projection effort was comprehensive, thorough, and appropriate for long-range planning purposes. The demand methodology utilized reasonable assumptions and the best information available at the time. The PEIR reflects the CCSF's best efforts to disclose information about the demand studies and their results as well as the environmental impacts of the WSIP as required under CEQA. As the responses to the specific comments above indicate, revision or reevaluation of the 2030 demand projections is not warranted.

14.2.3 Conservation and Recycling

Comment Summary

This section of this master response responds to all or part of the following comments:

L_ACFCWD-08	SI_PacInst-72	C_Dippe-02	C_Means2-01
L_BAWSCA1-29	SI_PacInst-80	C_Dough-01	C_Means2-02
L_BAWSCA1-67	SI_PacInst-81	C_Dulma-03	C_Melna-01
L_BAWSCA1-69	SI_RHH1-03	C_Duper-01	C_Menuz-01
L_BAWSCA1-104	SI_SFNeigh-03	C_Eddy1-03	C_Merlo-01
L_BAWSCA1-106	SI_SierraC4-02	C_Elbiz-02	C_Mijac-01
L_BAWSCA1-110	SI_SierraC4-03	C_EllioC-03	C_Mille-01
L_BAWSCA1-111	SI_TRT1-01	C_Ellis-01	C_MindeN-01
L_BAWSCA2-03	SI_TRT1-02	C_Farnu-01	C_MindeR-01
L_DalyCty-04	SI_TRT5-05	C_Field-01	C_Nore-01

L_DalyCty-49
L_PaloAlto-07
L_SCVWD1-03
L_SCVWD2-02
L_SFCPC3-02
L_TUD1-02
L_TUD1-04
L_TUD2-01
L_TUD3-02
L_TUD3-05
L_Tuol1-02
L_Tuol1-03
L_Tuol2-04
SI_ACA1-15
SI_ACA1-26
SI_ACA2-02
SI_ACT-03
SI_ACT-05
SI_CAC2-03
SI_Caltrout-02
SI_CAREP-04
SI_CI-01
SI_CNPS-01
SI_CNPS-EB1-03
SI_CNPS-EB1-04
SI_CNPS-EB1-12
SI_CNPS-EB1-15
SI_CNPS-SCV1-03
SI_CNPS-SCV1-13
SI_CNPS-SCV2-07
SI_CNPS-WLJ-02
SI_CRS-03
SI_CRS-05
SI_CSERC-02
SI_D3Dem1-02
SI_D3Dem2-03
SI_EcoCtr-02
SI_EnvDef-10
SI_GreenP-05
SI_KSWC-02
SI_NCFFSC-04
SI_PacInst-09
SI_PacInst-15
SI_PacInst-20
SI_PacInst-24
SI_PacInst-36
SI_PacInst-43
SI_PacInst-46
SI_PacInst-51
SI_PacInst-53
SI_PacInst-59
SI_PacInst-62
SI_PacInst-68
SI_PacInst-71
SI_TRT7-02
SI_TRT8-02
SI_TRT9-03
SI_TRT-CWA-SierraC-31
SI_TRT-CWA-SierraC-37
SI_TRT-CWA-SierraC-38
SI_TRT-CWA-SierraC-39
SI_TRT-CWA-SierraC-40
SI_TRT-CWA-SierraC-41
SI_TRT-CWA-SierraC-198
C_AdamsA-02
C_Agarw-01
C_Allis-01
C_Alter-01
C_Bail-02
C_Barbel-03
C_Barsa-02
C_Beauj-01
C_Berg-01
C_Berko-02
C_Bevia-01
C_Bigos-02
C_Blake-01
C_BoutiF-02
C_BramlD2-02
C_BramlD3-02
C_Breso-02
C_Britt-01
C_BrookL-01
C_Bucki-02
C_Byron-01
C_Byron-03
C_Byron-09
C_Cant-01
C_Cant-03
C_Chase-01
C_Chiap-01
C_Chiap-02
C_Chiap-03
C_Clark1-07
C_Clark1-08
C_Clark1-09
C_Clark1-10
C_Clark1-11
C_Clark1-14
C_Clark1-16
C_Closs-01
C_Colem2-01
C_Colli-03
C_Dahli-01
C_Davey-01
C_David-01
C_DayL-01
C_Dippe-01
C_Flani-01
C_Flynn-02
C_Gado-02
C_Garci-01
C_Genov-01
C_Genov-02
C_Goite-02
C_Goldf-01
C_Goodm-02
C_Grave-02
C_GreenD-01
C_GreenD-04
C_GreenK-01
C_GrinnJ-01
C_Hall-01
C_Hall-02
C_Hamil-01
C_Hanke-02
C_Hasso-03
C_Helld-01
C_HerroK-01
C_Hsiun-01
C_Hsiun-02
C_Ikemo-01
C_Issac-01
C_JohnsM-01
C_JohnsSie-01
C_Joye-01
C_Kahn-01
C_Kalin-01
C_Keebr-02
C_Kim-01
C_KingC-01
C_KingK-01
C_Lee-03
C_Leet-01
C_Lewin-02
C_Lim-01
C_Look-01
C_LoVuo-01
C_Lowry-01
C_Lubin-01
C_Maddau-01
C_Magol-01
C_Marcu-01
C_Margo-01
C_Marsh-01
C_MartiM-05
C_MartiS-01
C_McCle-01
C_McCol-02
C_McCon-01
C_McKee-01
C_Means1-01
C_Noren1-03
C_Noren1-04
C_Okuzu-03
C_Oneil-01
C_Pagli-01
C_Parke-02
C_Parke-03
C_Perl-01
C_Picku-01
C_Poult-01
C_Raffa-04
C_Raffa-07
C_Raffa-11
C_Raube-01
C_Reedy-01
C_Reich-01
C_Richa-02
C_Richa-03
C_Ross-02
C_Ross-05
C_Ross-08
C_Ross-09
C_Schri-02
C_Schul-01
C_Shea-01
C_SmithE-01
C_Sprin-02
C_Stein-02
C_Sturt-01
C_Sugar-02
C_TayloS-01
C_Teves-01
C_Thaga-02
C_Thoma-01
C_Tubma-02
C_Tubma-04
C_Tucke-01
C_Unreadable1-01
C_Unreadable3-01
C_Unreadable4-01
C_Urdan-02
C_VermeJ-01
C_Vrana-01
C_Walke-02
C_Walls-02
C_Weiss-02
C_Willi-01
C_Willi-02
C_Willi-05
C_Zimme-01

Summary of Issues Raised by Commenters

Submittals on the Draft PEIR contained several hundred comments addressing conservation and recycling in some manner. Many (about 150) of these comments stated that any additional demand should be met through increased conservation, efficiency, and recycling.[17] While these comments stem from concerns about impacts on the Tuolumne River, Alameda Creek, and Peninsula watersheds (including Pilarcitos Creek), they essentially conveyed an opinion about the WSIP and the program alternatives; a number of the comments expressed support for the Aggressive Conservation/Water Recycling and Local Groundwater Alternative evaluated in Draft PEIR Chapter 9 (Vol. 4, pp. 9-47 to 9-59). These comments regarding how conservation and recycling will be incorporated into the WSIP or an alternative of the WSIP are acknowledged. As described in Chapter 1 (Vol. 1, p. 1-12), Chapter 3 (Vol. 1, pp. 3-86 to 3-88), and Chapter 11 (Vol. 6, pp. 11-1 and 11-2), the San Francisco Planning Commission will consider all comments received on the Draft PEIR as well as these responses in considering certification of the Final PEIR. If the SFPUC accepts the certified Final PEIR and associated CEQA findings, the SFPUC would adopt the CEQA findings and then approve and adopt the WSIP or an alternative of the WSIP analyzed in the PEIR. Other comments on conservation and recycling were more specific, raising issues that in part pertained to the content of the PEIR. Examples of these comments included requests for additional studies on feasible conservation and recycling, and criticisms of conservation levels in the Bay Area compared to conservation levels in other metropolitan areas.

Many of these comments suggested a lack of information regarding existing and planned conservation and recycling among the wholesale and retail customers, and the technical studies undertaken by the SFPUC. Accordingly, this section of the master response is organized as follows:

- *Background*. This section presents an overview of conservation and recycling associated with the WSIP and related studies conducted by the SFPUC.
- *Frequently Submitted Comments Addressing Conservation and Recycling*. This section presents the most frequently submitted comments expressing specific concerns about conservation and recycling.

Background

Existing and planned conservation in the SFPUC retail and wholesale customer services areas breaks down as follows:

1) *Plumbing Code Savings* – Water savings assumed to occur as a result of the natural replacement of fixtures under current plumbing codes (passive conservation).

2) *Existing and Planned Conservation Measures*

    a. *Projected Conservation Measures* – Water savings that will occur from the continued implementation of conservation programs already in place.

[17] Examples include C_Raffa-11, C_Breso-02, C_GreenD-02, C_Ross-09, C_Thaga-02, C_VermeJ-01, and C_Willi-02.

b. *Additional Conservation Measures* – Water savings that will result from implementation of additional conservation measures planned by the SFPUC and its wholesale customers.

Table 14.2-5 summarizes 2030 water savings associated with conservation. Table 14.2-5 contains references to Draft PEIR Table 3.3 (Vol. 1, Chapter 3, p. 3-18) to assist the reader in correlating the numbers with the information presented in the Draft PEIR.

TABLE 14.2-5
SUMMARY OF 2030 WATER SAVINGS DUE TO EXISTING AND PROPOSED CONSERVATION (in mgd)

	Wholesale	Retail	Total
Plumbing Code Savings (not explicitly shown in Draft PEIR Table 3.3)	25.4	10.3	35.7
Projected Conservation Savings (programs in place)[a] (included in Table 3.3)	7.7	0.64	8.34
Savings from Additional Conservation Measures (planned)[b] (included in Table 3.3)	5 – 7.3	0 – 3.36	5 – 10.7
Total Conservation Savings, excluding plumbing code savings (Column B, Table 3.3)	13 – 15	0 – 4	13 – 19
Total Conservation Savings, including plumbing code savings	38 – 40	10 – 14	49 – 55

[a] Existing savings based on savings identified for Program/Package A in URS, 2004b and Hannaford and Hydroconsult, 2004.
[b] Additional savings based on the difference between total 2030 conservation savings shown in Draft PEIR Table 3.3 and savings from measures currently being implemented.

SOURCES: URS, 2004b; Hannaford and Hydroconsult, 2004; SFPUC, 2004.

Plumbing Code Savings (Passive Conservation)

Water fixtures are replaced over time due to failure, aging, or remodeling and must be replaced by more efficient models, as required by plumbing codes. Future water savings from plumbing code implementation were estimated based on assumptions regarding the average annual rate of fixture replacement (as discussed in Draft PEIR Appendix E.2, Vol. 5, pp. E.2-7 to E.2-10). The water savings due to compliance with existing plumbing codes in the SFPUC service area was estimated to be approximately 36 mgd in 2030. However, because the end-use models used in the demand analyses incorporated the effects of plumbing codes on demand, the estimated 36 mgd savings from this "passive conservation" has already been subtracted from estimates of future water demand (Vol. 1, Chapter 3, p. 3-17, footnote). Because these savings are reflected in reduced demand,[18] they are not shown as "2030 Projected Conservation Savings" (column B) in Draft PEIR Table 3.3 (Vol. 1, Chapter 3, p. 3-18) and therefore are not apparent.

[18] 2030 demand unadjusted for plumbing code savings would be 453 mgd, as compared to 417 mgd shown in Draft PEIR Table 3.3 (Vol. 1, Chapter 3, p. 3-18).

Conservation Studies

As part of its water supply planning efforts for the WSIP, the SFPUC conducted comprehensive studies (listed in Section 14.2.2, above) to assess future water conservation potential in the wholesale and retail service areas. The studies assessed potential savings from continued implementation of existing conservation practices and from implementation of potential additional indoor and outdoor conservation measures for residential and nonresidential customers. The wholesale service area conservation potential was evaluated in close consultation with the wholesale customers.

The conservation potential studies for the wholesale and retail service areas are summarized in the Draft PEIR (Vol. 1, Chapter 3, p. 3-21) and described in more detail in Appendix E.2 (Vol. 5, pp. E.2-10 to E.2-16). Conservation measures were initially screened for various factors, such as the commercial availability of technology, customer acceptance/equity, the relative effectiveness of the measures, and the appropriateness of the measure or technology considering such factors as climate, building stock, and lifestyle. Following this initial qualitative screening, the remaining measures were combined together to avoid duplication and to take advantage of economies of scale, and some measures that had failed the initial screening were combined with similar measures that had passed the screening to create an equitable and workable program (URS, 2004b, p. 2-4). Eventually, 48 measures in the retail service area and 32 measures in the wholesale service area were retained for further consideration. The measures were evaluated for feasibility and cost-effectiveness. The cost-benefit analysis considered costs and benefits from both the standpoint of the water agency and the standpoint of the retail water customers (URS, 2004b). Measures included rebate and incentive programs for installing water-saving devices, city/county ordinances requiring the installation of water-saving devices, and educational outreach and award programs that promote water use reduction in businesses and landscaping. The conservation measures were compiled into three “programs” or “packages”[19] of measures generally considered to be feasible and cost-effective, as follows:

- *Program/Package A* – Conservation measures currently being implemented. Program/ Package A measures were estimated to result in savings of 7.7 mgd in the wholesale service area and 0.64 mgd in the retail service area; refer to Draft PEIR Table E.2.4 (Vol. 5, Appendix E.2, p. E.2-14) and Table 14.2-5, above.

- *Program/Package B* – Program A measures plus additional conservation measures considered to be the most readily implemented and achievable; considerations included social acceptance of the measures and the costs of implementation. Program/Package B measures (including measures in Program/Package A) were estimated to result in savings of 14.5 mgd in the wholesale service area and 3.9 mgd in the retail service area; refer to Draft PEIR Table E.2.4 (Vol. 5, Appendix E.2, p. E.2-14).

- *Program/Package C* – Program A and B measures plus conservation measures considered to be the upper bound of potentially feasible and cost-effective measures. Although all measures included in Programs/Packages A, B, and C were, by definition, assumed to be feasible and cost-effective (at least theoretically), some measures in Program/Package C are not presently

[19] The retail service area study used the term “package” while the wholesale service area study used “program” to describe the three suites of measures compiled for each customer.

technologically or financially feasible, but were included based on the assumption that the technology would improve (Hannaford and Hydroconsult, 2004). Program/Package C measures (including measures in Programs/Packages A and B) were estimated to result in additional savings of 19.6 mgd in the wholesale service area and 4.45 mgd in the retail service area; refer to Draft PEIR Table E.2.4 (Vol. 5, Appendix E.2, p. E.2-14).

The actual conservation measures that met the customers' screening criteria differed for each water customer; as a result, each Program/Package A, B, and C was unique to the water customer.

Existing and Planned Conservation Measures

Following the assessments of potential conservation savings (URS, 2004b; Hannaford and Hydroconsult, 2004), the SFPUC and each wholesale customer submitted their specific estimates of 2030 conservation savings with their estimates of 2030 water purchases from the SFPUC. These estimates of conservation savings are shown in Draft PEIR Table 3.3 (Vol. 1, Chapter 3, p. 3-18). In general, the wholesale customers' estimates of conservation savings are similar to Program B savings levels, whereas the SFPUC submitted an estimated savings range of 0.64 to 4.02 mgd for the retail service area.[20] Table 14.2-5, above, shows the total projected 2030 savings from implementation of conservation measures and includes a breakdown in the savings expected from the continuation of existing measures and from the additional measures to which the SFPUC and the wholesale customers have committed under the WSIP.

Table 14.2-6 describes the existing and planned conservation measures for the SFPUC service area. **Table 14.2-7** and **Table 14.2-8** show existing and planned conservation measures for the retail service area and the wholesale customers, respectively, and indicate those measures that are California Urban Water Conservation Council (CUWCC) best management practices (BMPs) and those measures identified as part of the *SFPUC Wholesale Customer Water Conservation Potential* (URS, 2004b) and *City and County of San Francisco Retail Water Demands and Conservation Potential* (Hannaford and Hydroconsult, 2004). The projected 2030 conservation savings from existing and proposed conservation programs (excluding passive conservation) totals 13–15 mgd for the wholesale area and 0–4 mgd for the retail area, as shown in Table 14.2-5, above, and Draft PEIR Table 3.3.

In addition, as discussed below under the heading Additional Conservation and Recycling Potential, subsequent to completion of the conservation potential studies and the customers' submittal of estimated 2030 conservation savings, the SFPUC, in conjunction with its wholesale customers and BAWSCA, undertook a study to assess the potential to develop a regional program to implement additional conservation and recycling programs in the SFPUC service area.

Existing Recycled Water Projects

In the wholesale service area, 14 recycled water projects currently produce approximately 12.6 mgd of recycled water. Recycled water is used for stream flow augmentation, wetlands

[20] This range reflects the original estimates of Programs A and C for the retail service area; errata published on August 28, 2005 (after the purchase estimates were submitted) adjusted Program C to 4.45 mgd. The SFPUC has subsequently committed to implementing the Program C measures in the retail service area.

restoration, and irrigation at commercial/industrial facilities, golf courses, cemeteries, and parks; the use of recycled water does not always replace a potable water supply (this is typically the case when recycled water is used for environmental purposes like stream flow augmentation and wetland restoration). According to the *SFPUC Wholesale Customer Recycled Water Potential Technical Memorandum* (RMC, 2004), of the 12.6 mgd produced by current (2004) recycled water projects, an estimated 4.3 mgd replaces potable supplies. There are no existing recycled water projects in the SFPUC retail service area.

Proposed Recycled Water Projects

As part of its water supply planning efforts, the SFPUC also conducted studies (listed in Section 14.2.2, above) to evaluate recycled water potential in the wholesale and retail service areas. The recycled water potential studies identified additional projects that were considered relatively certain to be implemented in the near future, as well as projects in the early planning stages that were considered possible but less certain. The studies indicated that potentially feasible recycled water projects could produce from 6.3 to 33.4 mgd in the wholesale customer service area and up to 6 mgd in the retail customer service area. Draft PEIR Table E.2.5 (Vol. 5, Appendix E.2, p. E.2-17) summarizes the recycled water potential for the SFPUC service area. Challenges associated with implementing the recycled water projects include costs and funding, gaining public support, establishing new partnerships to improve feasibility, and managing water quality (RMC, 2004). As shown in Draft PEIR Table 3.3 (Vol. 1, Chapter 3, p. 3-18), the wholesale customers estimate that about 10 mgd of recycled water will replace potable supplies in 2030. Additional recycled water projects that do not replace potable supplies (e.g., recycled water used for marsh or wetland restoration projects) are not shown in Table 3.3.

The *Recycled Water Master Plan* (RMC, 2006) assesses the feasibility of recycled water projects in the Westside area of San Francisco and identifies projects with the potential to provide approximately 6.2 mgd of recycled water. The first phase of these projects, which provides 4.1 mgd of recycled water, is included in the WSIP, as shown in the 2030 demand projections.

Summary of Projected 2030 Conservation and Recycling

Table 14.2-9 summarizes the estimated savings from conservation and recycled water projects to which the SFPUC and the wholesale customers have committed as part of WSIP planning. As shown, existing and planned conservation and recycled water use is expected to offset demand for potable water by a minimum of 22.3 mgd, excluding savings from plumbing codes (and by a minimum of 58 mgd with savings from plumbing codes included).

Additional Conservation and Water Recycling Potential

As part of the WSIP planning process, the SFPUC, in cooperation with its wholesale customers and BAWSCA, also undertook a study to assess the potential for additional conservation and recycled water projects, including potential regional projects that were not identified in the previous studies or already considered to be implemented locally by 2030. This study considered projects that could be feasible if implemented regionally, including ones that may have been found to be infeasible for individual customers. This study, *Investigation of Regional Water*

TABLE 14.2-6
DESCRIPTION OF EXISTING AND PROPOSED/PLANNED BEST MANAGEMENT PRACTICES AND CONSERVATION MEASURES WHOLESALE AND RETAIL CUSTOMERS

MEASURES FOR INDOOR WATER USE

Residential Measures

- Clothes Washer Rebate/Homeowners. Provide a rebate on new water-efficient clothes washers for homeowners.
- Clothes Washer Rebate/Apartment Complexes. Provide a rebate to new apartment complexes over a certain size with a common laundry room equipped with efficient washing machines.
- Dishwasher Rebate. Provide a rebate or voucher for high-efficiency dishwashers (4.5 gallons per load).
- Residential ULF Toilet Rebate. Provide a rebate to homeowners to replace an existing high-volume toilet with a new ultra-low-flow toilet.
- Require 1.6-gal/flush Toilets Replace on Sale. Work with the real-estate industry to require a certificate of compliance be submitted to the water utility verifying that a plumber has inspected single-family and multifamily properties and that efficient fixtures were either present or installed at the time of sale, before the close of escrow.
- Rebates for 6/3 Dual-Flush or 4-liter Toilets. Provide a rebate or voucher for the retrofit of a 6/3 dual-flush, 4-liter, or equivalent very low water use toilet. Rebate amounts would reflect the incremental purchase cost and would be in the range of $50 to $100 per toilet replaced.

Other Residential Measures

- Residential Plumbing Retrofits. Provide owners of pre-1992 homes with retrofit kits that contain easy-to-install low-flow showerheads, faucet aerators, and toilet tank retrofit devices.
- Home Leak Detection and Repair. Use leak detection equipment to determine whether and where leaks are occurring on the premises and provide a plumber to the customer to repair leaks for free.
- Incentives for Retrofitting Sub-metering. Rescind any regulations that prohibit sub-metering of multifamily buildings and encourage sub-metering (a method in which multi-tenant properties bill tenants for individual measured utility usage) through water audits and direct mail promotions and/or incentives to building owners.
- Require Sub-metering in New Multifamily Units. Require all new multifamily units to provide sub-meters on individual units.
- Metering with Commodity Rates. Require meters for all new service connections. Establish a program for retrofitting existing unmetered service connections, and read meters and bill customers by volume of use.

Nonresidential Audit Measures

- Hotel/Motel Water Audits. Provide free water audits to hotels and motels covering bathrooms, kitchens, ice machines, cooling towers, and irrigation system schedules.
- Water Audit. Provide conservation potential goals for nonresidential accounts and offer assistance in the form of audits and employee education.
- Audits – Hospitals. Provide water audits to hospitals.
- Audits – Laundry Self-Serve Rebates. Offer laundromat managers or washing machine leasing companies incentives to retrofit or use efficient clothes washers.
- Audits – Schools and Universities. Provide water audits to schools and universities.
- Audits – Schools and Universities, Toilets. Provide toilet rebates or vouchers to schools and universities.

Other Nonresidential Measures

- Low-Flow Spray Rinse Nozzles. Provide free installation of 1.6-gal/minute spray nozzles for the rinse/clean operations in restaurants and other commercial kitchens.
- Hotel Retrofits (w/ financial assistance). Following a free water audit, offer participating hotels a rebate for identified water savings. Provide a rebate schedule for certain efficient equipment such as air-cooled ice machines for hotels that do not participate in an audit.
- Replace Inefficient Water-Using Equipment. Provide a rebate for a standard list of water-efficient equipment, including icemakers, dishwashers, and cooling towers, to replace once-through cooling, irrigation controllers, and certain process equipment.
- Cooling Tower Regulations. Prohibit the discharge of cooling tower blowdown unless the total dissolved solids in the water are at least a certain level (ensures 5 to 10 cycles of concentration).
- New Hotel Water Audit (WAVE). This program encourages hotels to do their own water audit and then analyze their water use with the software provided. The software identifies water saving projects and computes paybacks. Hotels that agree to participate in the program also agree to install cost-effective water conserving equipment.
- Steamers – Restaurants. Provide rebates or vouchers to restaurants that purchase electric steam cookers.
- Coin-op Laundry Incentive. Offer incentives to apartment and coin-op laundry managers to retrofit or use efficient clothes washers. The rebate would either go to the manager or the washing machine leasing company.
- ULF Toilet and Urinal Rebates. Provide rebates to pre-1994 businesses with high-use fixtures for commercial ULF toilets (1.6-gal/flush) and commercial ULF urinals (1.0-gal/flush).
- Require 0.5-gal/flush Urinals in New Buildings. Require new buildings be fitted with 0.5-gal/flush urinals.

MEASURES FOR OUTDOOR WATER USE

Homeowner Landscaping Measures

- New Home Efficient Irrigation. Provide information for planting water-efficient landscaping, including avoiding strip turf sections that are difficult to water efficiently and using native plants that do not require supplemental watering. Information would be mailed or provided in brochures with the water bill. Informational displays at water utility offices and nurseries could also be provided.
- Landscape Requirements (turf limitations / regulations). Enforce existing requirements on the use of native or low-water-using plants for landscaping purposes. Proof of compliance would be necessary to obtain a water connection on all new multifamily residential and commercial projects. Non-compliers would face a surcharge on their water bill until they complied.
- Xeriscape Education. Sponsor training for the staff of stores where plants and irrigation equipment are sold to educate sales people about the benefits of native (low-water-use) plants and efficient irrigation.
- Homeowner Irrigation Classes. Sponsor classes at stores where irrigation equipment is sold or other suitable venues on the selection and installation of efficient equipment (drip irrigation, smart controllers, low-volume sprinklers, etc.) and low-water-use plants.

Measures for Large-Scale Irrigation

- Water Budgets. Provide a monthly irrigation water use budget as information on the water bill for all irrigators of landscapes larger than one acre with separate irrigation accounts.
- ET Controller Rebates. Provide a rebate for the latest state-of-the-art irrigation controllers with onsite temperature sensors or a signal from a central weather station that modifies irrigation times at least weekly (preferably daily) as the weather changes.
- Financial Incentives for Complying with Water Use Budget. Link a landscape water budget to a rate schedule that penalizes the account holder for exceeding its water budget and rewards them for using less than the budget.
- Irrigation Upgrade Incentives. Provide rebates for selected types of irrigation equipment upgrade.
- Require Dedicated Irrigation Meters. Require new accounts with a substantial amount of irrigated landscape to have dedicated landscape meters, and charge on a separate rate schedule that recognizes the high peak demand placed on the system by irrigators.
- Large Landscape Conservation Audits. Provide free landscape water audits to all public and private irrigators of landscapes larger than one acre with separate irrigation accounts upon request.

Nonresidential Measures

- Water Brooms. Provide water brooms to nonresidential customers. Savings are based on reduced flow rate and labor time. It is estimated that water brooms reduce the flow rate from 8.4 gal/minute to 3.6 gal/minute and labor time is reduced in half.
- Artificial Turf Program for Schools and Universities. Provide incentives for schools and universities to use artificial turf in playgrounds/athletic fields.
- City/SFPUC Landscaping. Provide free landscape water audits and financial incentives for irrigation upgrades to all city departments.

OTHER MEASURES

Residential Measure

- Residential Water Surveys. Offer indoor and outdoor water surveys to existing single-family and multifamily residential retail customers with high water use; provide customized report to homeowners.

Public Information / Education Measures

- Public Information Program. Provide public education to raise awareness of conservation measures available to retail customers. Programs could include poster contests, speakers to community groups, radio and television time, and printed educational material such as bill inserts, etc.
- School Education Programs. Implement a school education program to promote water conservation and water-conservation-related benefits. Programs include working with school districts and private schools in the water suppliers' service area to provide instructional assistance, educational materials, and classroom presentations that identify urban, agricultural, and environmental issues and conditions in the local watershed.

Water Utility / City Department Measures

- Water Utility / City Department Water Reduction Goals. Provide water use reduction goals for metered city and county accounts and offer audits and employee education.
- Retail Conservation Pricing. Promote water-conserving retail water rate structures. Recognize that each agency or water enterprise fund has a unique rate-setting system and history.
- Conservation Coordinator. Designate a water conservation coordinator and support staff whose duties include coordinating and overseeing conservation programs and best management practice (BMP) implementation, preparing and submitting the Council BMP Implementation Report, and communicating and promoting water conservation issues to agency senior management.
- Water Waste Prohibition. Enact and enforce measures prohibiting gutter flooding, single-pass cooling systems in new connections, non-recirculating systems in all new conveyer car wash and commercial laundry systems, and non-recycling decorative water fountains.
- System Audits, Leaks. Complete an annual prescreening system audit to determine the need for a full-scale system audit. Agencies shall advise customers whenever it appears possible that leaks exist on the customer's side of the meter, perform distribution system leak detection when warranted and cost-effective, and repair leaks when detected.

Nonresidential Measures

- Commercial Water Audits. Provide a free water audit to high-water-use commercial accounts that evaluates ways for the business to save water and money.
- Business Award Program. Sponsor an annual awards program for businesses that significantly reduce water use. Provide a plaque, presented at a lunch with the mayor.
- Large New Project Incentives. Provide incentives for conservation on new/proposed large nonresidential projects.

SOURCES: SFPUC, 2004b; Hannaford and Hydroconsult, 2004.

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TABLE 14.2-7
EXISTING AND PROPOSED CONSERVATION MEASURES AND BEST MANAGEMENT PRACTICES
SFPUC RETAIL SERVICE AREA

Measure / BMP No.	Measure	Implemented?
RESIDENTIAL SINGLE-FAMILY		
BMP 2	Residential Plumbing Retrofits	E
BMP 4	Metering with Commodity Rates	E
1a / BMP 6	Clothes Washer Rebate – 25 gal/load rebate	E
1b / BMP 6	Clothes Washer Rebate – 17 gal/load rebate	E
1c / BMP 6	Clothes Washer Rebate – 17 gal/load rebate	E
2	Toilets – 6/3 or 4-liter Rebates	P
3 / BMP 14	Toilets – ULF Rebate	E
7	Toilets – Retrofit	N
8	Toilets – 1.6-gal/flush Replace on Sale	P
4 / BMP 7	Public Information	E
5	Leak Detection/Repair	N
6 / BMP 1	Water Surveys	E
7	Retrofit: 1.75-gal/minute showerheads	N
45	Dishwasher Rebate	P
BMP 11	Retail Conservation Pricing	E
BMP 12	Conservation Coordinator	E
RESIDENTIAL MULTIFAMILY		
BMP 2	Residential Plumbing Retrofits	E
BMP 4	Metering with Commodity Rates	E
9a / BMP 6	Clothes Washer Rebate – 25 gal/load rebate	E
9b / BMP 6	Clothes Washer Rebate – 17 gal/load rebate	E
9c / BMP 6	Clothes Washer Rebate – 17 gal/load rebate	E
2	Toilets – 6/3 or 4-liter Rebates	P
3 / BMP 14	Toilets – ULF Rebate	E
7	Toilets – Retrofit	N
8	Toilets – 1.6- gal/flush Replace on Sale	P
10	Incentives for Retrofitting Sub-metering	N
11	Require Sub-metering in New Units	P
6 / BMP 1	Water Surveys	E
7	Retrofit: 1.75-gal/minute Showerheads	N
BMP 11	Retail Conservation Pricing	E
BMP 12	Conservation Coordinator	E
NONRESIDENTIAL MEASURES		
BMP 4	Metering with Commodity Rates	E
BMP 5	Large Landscape Audits	E
BMP 8	School Education Programs	E
BMP 9	Commercial, Industrial, and Institutional Water Conservation	E
BMP 11	Retail Conservation Pricing	E
BMP 12	Conservation Coordinator	E
BMP 13	Water Waste Prohibition	E
14	Landscape Audits	P
16	Business Award Program	P
17	Water Audits	P
19	Urinals – ULF Rebate	P

TABLE 14.2-7 (Continued)
EXISTING AND PROPOSED CONSERVATION MEASURES AND BEST MANAGEMENT PRACTICES
SFPUC RETAIL SERVICE AREA

Measure / BMP No.	Measure	Implemented?
NONRESIDENTIAL MEASURES (cont.)		
37	Urinals – Require 0.5-gal/flush	P
19	Toilets – ULF Rebate	P
20	Replace Inefficient Water-Using Equipment	P
21	Large New Project Incentives	P
24	Audits – Hospitals	P
25	Audits – Laundry Self-Serve Rebates	E
26	Audits – Schools/Universities	P
27	Audits – School/University Toilets	N
28	Audits – School/University Landscaping	P
29	School/University Artificial Turf	N
31	Low-Flow Sprayers – Grocery/Flower	P
32	Low-Flow Sprayers – Restaurants	P
46	Steamers – Restaurants	P
42	Cooling Towers	N
44	City/SFPUC – Water Broom	P
14	City/SFPUC – Landscaping	P
44	Water Broom	P
33	Audits – Hotels/Motels	P
34	New Hotel Water Audit (WAVE) Program	N
35	Require Toilet Retrofit on Sale	P
36	Hotel Retrofit with Financial Assistance	P

KEY:
E = Conservation measure currently being implemented. Existing program information is based on measures shown as California Urban Water Conservation Council (CUWCC) Best Management Practices (BMPs) currently being implemented or listed in Program A (measures currently being implemented) in the *City and County of San Francisco Retail Water Demands and Conservation Potential* (Hannaford and Hydroconsult, 2004, pp. 26 and 43). For more information on the CUWCC BMPs, refer to www.cuwcc.org.
P = Additional measures committed to. Future program information is based on measures listed in either Program B or C (and not already identified as an existing program) in Appendix B30 of *Investigation of Regional Water Supply Option No. 4 Technical Memorandum* (SFPUC, 2007, Appendix D).
N = Measure listed in *City and County of San Francisco Retail Water Demands and Conservation Potential* (Hannaford and Hydroconsult, 2004, p. 43) and Appendix B30 of *Investigation of Regional Water Supply Option No. 4 Technical Memorandum* (SFPUC, 2007, Appendix D) but not selected for implementation as part of Program A, B, or C.

Outdoor Measure
Indoor Measure
Indoor and/or Outdoor Measure

SOURCES: SFPUC, 2007; Hannaford and Hydroconsult, 2004.

TABLE 14.2-8
EXISTING AND PLANNED CONSERVATION MEASURES AND BEST MANAGEMENT PRACTICES
SFPUC WHOLESALE CUSTOMERS

	RESIDENTIAL MEASURES																	NONRESIDENTIAL MEAURES																				
SFPUC WHOLESALE CUSTOMER	Residential Plumbing Retrofit	Clothes Washer Rebate	Residential ULF Toilet Rebate	Require 1.6-gal/flush Toilets Replace on Sale	Rebates for 6/3 Dual-Flush or 4-liter Toilets	Incentives for Retrofitting and Sub-metering	Require Sub-metering Multifamily Units	Rebate Efficient Clothes Washers	Metering with Commodity Rates	New Home Efficient Irrigation	Xeriscape Education	Homeowner Irrigation Classes	ET Controller Rebates	Landscape Requirements	Home Leak Detection and Repair	Residential Water Surveys	Public Information Program	ULF Toilet and Urinal Rebates	Require 0.5-gal/flush Urinals	Coin-op Laundry Incentive	Restaurant Low-Flow Spray Rinse Nozzles	New Hotel Water Audit (WAVE)	Hotel Retrofit (with financial assistance)	Replace Inefficient Water-Using Equipment	Large Landscape Conservation Audits	Water Budgets	Financial Incentives for Complying with Water Use Budgets	Require Dedicated Irrigation Meters	Irrigation Upgrade Incentives	Hotel / Motel Water Audits	Commercial Water Audits	Business Award Program	Water Utility / City Department Water Reduction Goals	System Audits, Leaks	School Education	Conservation Pricing	Conservation Coordinator	Water Waste Prohibition
SFPUC No.	2	5	9	10	12	18	19	20		16	14	15	13	21	11	1	6	8	28	17	22	24	25	27	3	4	29	31	30	23	7	26	32					
CUWCC BMP No.	2	6	14						4							1	7	9b							5a	5b					9a			3	8	11	12	13
Alameda County Water District	E	E	NCE		P			P	E				P			P	E	E		P	P				E	E	P		P	P	E			E	E	E	E	E
Brisbane		E							E								E									P										E		E
Burlingame	E	E	E						E		P					E	E	E								E					E			E	E	E		
CWS Company – Bear Gulch District[a]	E	E	E		P				E		P	P				P	E	P			P													E	E	E	E	E
CWS Company – Mid-Peninsula District	E	E	E		P			P	E		P					P	E	P			P									P				E	E	E	E	E
CWS Company – South San Francisco District	E	E	E		P				E		P						E				P				P					P	P			E	E	E	E	E
Coastside County Water District	E	E	E						E		P					P	E	E			P				E	E	P							E	E	E	E	E
Daly City	E	E	P		P			P	E		P					NCE	E	P			P				E	E	P				E			E	E	E	E	E
East Palo Alto	E	E	P		P	P		P	E		P	P				P	E			P					P						P			E	E	E	E	
Estero Municipal Improvement District[b]		E							E								E																	E		E		E
Guadalupe Valley Municipal Improvement District		E							E								E									P										E		E
Hayward	E	E	E						E	P	P	P	P				E	P			P				P					P	P			E		E	E	E
Hillsborough		E							E	P	P		P			P	E																			E		
Menlo Park	P	E							E		P						E				P					P								E		E	E	E
Mid-Peninsula Water District	E	E							E							E	E				P													E	E	E		
Millbrae	E	E	E						E				P			E	E	E			P				E	P								E	E	E	E	E
Milpitas	E	E	E						E							E	E	P			P				E	P				P	E			E	E	E	E	E
Mountain View	E	E	E						E							E	E	E			P				E						E			E	E	E	E	E
North Coast County Water District	E	E	E						E							E	E																	E	E	E	E	E
Palo Alto	E	E	E		P				E				P			E	E	E		P	P				E					P	E	P		E	E	E	E	E
Purissima Hills Water District	E	E	E						E				P			E	E																	E		E		E
Redwood City	E	E	E					P	E				P			E	E	E		P	P				E	E	P		P		P			E	E	E	E	
San Bruno		E	P		P				E		P						E	P			P														E	E		
San Jose North	E	E	E		P				E				P			E	E	E			P			P	E				P	P	E			E	E	E	E	E
Santa Clara	E	E	E						E		P		P			E	E	P			P				E					P	E			E	E	E	E	E
Skyline County Water District	E	E	E						E							P		P			P									P				E		E		
Stanford University	E	E	E		P				E				P	P		E	E	E	P		P				E	P								E		E	E	E
Sunnyvale	E	E	E					P								E	E	P			P				E						E			E	E	E		E
Westborough Water District		E	E						E							E	P																	E		E	E	E

[a] Includes Los Trancos County Water District.
[b] Implementation in 2030 of the existing programs shown is not assumed under the high end of the purchase estimate range submitted by Estero Municipal Improvement District and the corresponding low end of the submitted conservation savings range estimate (0 mgd).

E = Conservation measure currently being implemented. Existing program information is based on measures shown as current conservation BMPs being implemented by SFPUC wholesale customers or listed in Program A (measures currently being implemented) in *SFPUC Wholesale Customer Water Conservation Potential Technical Report* (URS, 2004b, pp. A-8 to A-9 and Appendix D). (With a few exceptions the existing programs are also shown as included in purchase estimate baseline program for 2030 in Appendix B of *Investigation of Regional Water Supply Option No. 4 Technical Memorandum*, the based in for information on future measures shown in this table.)

P = Additional measures committed to. Future program information is based on measures shown as included in purchase estimates baseline program (and not already identified as an existing program) in Appendix B of *Investigation of Regional Water Supply Option No. 4 Technical Memorandum* (SFPUC, 2007, Appendix D).

NCE = Not cost-effective, based on information on current conservation BMPs being implemented by SFPUC wholesale customers in *SFPUC Wholesale Customer Water Conservation Potential Technical Report* (URS, 2004b, pp. A-8 to A-9). (Measures identified as currently not cost effective but included in the purchase estimates baseline program in Appendix B of *Investigation of Regional Water Supply Option No. 4 Technical Memorandum* [SFPUC, 2007, Appendix D] are shown here as P.)

Crosshatching = Measure is both residential and nonresidential.
Outdoor Measure
Indoor Measure
Indoor and/or Outdoor Measure

SOURCES: URS, 2004b; SFPUC, 2007.

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TABLE 14.2-9
TOTAL ESTIMATED 2030 WATER SAVINGS FROM CONSERVATION AND RECYCLING
(in mgd)

	Wholesale	Retail	Total
Plumbing Code Savings (passive conservation)	25.4	10.3	35.7
Projected Conservation Savings (programs in place)[a]	7.7	0.64	8.3
Savings from Additional Conservation Measures (planned)[b]	5 – 7.3	0 – 3.36	5 – 10.7
Savings from Existing Recycled Water Projects that Offset Potable Water Use	4.3	0	4.3
Savings from Additional Recycled Water Projects that will Offset Potable Water Use (planned)[c]	4.7 – 5.7	0 – 4	4.7 – 9.7
Total Savings from Conservation and Recycling, excluding Plumbing Code Savings	21.7 – 25	0.6 – 8.0	22.3 – 33.0
Total Savings from Conservation and Recycling, including Plumbing Code Savings	47.1 – 50.4	10.9 – 18.3	58 – 68.7

[a] Existing savings based on savings identified for Program/Package A in URS, 2004b and Hannaford and Hydroconsult, 2004.
[b] Additional savings based on the difference between total 2030 conservation savings shown in Draft PEIR Table 3.3 and savings from measures currently being implemented.
[c] Additional recycled water in the wholesale service area is based on the projected 2030 use of 9 to 10 mgd, which is an increase of 4.7 to 5.7 mgd from what was being done in 2004.

SOURCES: URS, 2004b; Hannaford and Hydroconsult, 2004; SFPUC, 2004, RMC 2004.

Supply Option No. 4 Technical Memorandum (SFPUC, 2007, Appendix D), provided the basis for the Aggressive Conservation/Water Recycling and Local Groundwater Alternative analyzed in the Draft PEIR (Vol. 4, Chapter 9, pp. 9-47 to 9-59).

The Regional Water Supply Option No. 4 study identified and evaluated 53 recycled water and groundwater projects for their potential to offset demand on the SFPUC regional water system, and evaluated regional conservation programs consisting of between 8 and 23 conservation measures to be implemented in addition to the conservation programs already planned locally by SFPUC customers. The SFPUC assessed these 53 potential projects to determine their eligibility for the Regional Water Supply Option No. 4 program. Eligibility was based on the ability of the project to offset SFPUC supplies. Projects that were determined to be ineligible were not considered further. Projects that were considered eligible or potentially eligible were evaluated for likelihood of implementation based on available information derived during the early planning stages, such as information on feasibility, cost, conceptual engineering, environmental review, community support, and specifications. These projects were categorized as follows: Category 1 (about 11 mgd) included projects likely to be implemented by 2030; Category 2 (15.2 mgd) included eligible projects in the early planning stages; and Category 3 (2.25 mgd) included potentially eligible future projects that might offset SFPUC regional water system supplies by 2030. The SFPUC subsequently incorporated the Category 1 San Francisco local projects into the WSIP.[21]

The remaining projects that could potentially provide up to 19 mgd of water supply have varying degrees of feasibility. As the analysis of the Aggressive Conservation/Water Recycling and Local Groundwater Alternative indicated, there are numerous uncertainties with regard to water quality, end-users, long-term sustainable yield, and public acceptance issues (related to the use of recycled water for nonpotable uses). In addition, issues related to institutional arrangements, funding sources, or permitting requirements could render any one of these projects infeasible. Further, the proposed levels of service under the WSIP assume that, during drought years, the SFPUC would be able to impose systemwide rationing of up to 20 percent; the feasibility of requiring 20 percent rationing during drought periods would be questionable under this alternative due to demand hardening.[22] Elements of this alternative were also incorporated into the Modified WSIP Alternative (see Vol. 4, Chapter 9, pp. 9-78 to 9-84), which the Draft PEIR identified as the environmentally superior alternative. Please also refer to **Section 14.10, Master Response on Modified WSIP Alternative** (Vol. 7, Chapter 14, Section 14.10.3).

Frequently Submitted Comments Addressing Conservation and Recycling[23]

As indicated in the introductory text to Section 14.2.3, many comments expressed the opinion that any additional demand should be met through increased conservation, efficiency, and recycling; a smaller number of comments specifically advocated that the SFPUC adopt the Aggressive Conservation/Water Recycling and Local Groundwater Alternative or the Modified WSIP Alternative (both of which include more conservation and recycling than would occur with the proposed program). Those opinions are acknowledged. The comments addressed below represent the most frequently submitted comments on this topic *beyond* those expressing that opinion. In this section, each comment (or summary of like comments) is presented in italics and followed by a response. In addition, numerous comments suggested specific conservation measures that the SFPUC and/or the wholesale customers should undertake; these suggested measures are grouped at the end of this subsection.

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21 These include recycled water projects that provide about 4 mgd, local groundwater projects in San Francisco, and participation in a regional conjunctive-use project providing about 3 to 5 mgd (Draft PEIR, Vol. 1, Chapter 3, pp. 3-55 and 3-56).

22 Demand hardening refers to the increasing inelasticity of demand as additional conservation measures are implemented (refer to Draft PEIR Vol. 4, Chapter 9, p. 9-28).

23 Several related topics are not addressed in this master response. Comments specifically addressing the wholesale customers with the largest share of the projected increase in demand were submitted and addressed in the responses to individual letters. Refer to the following comments/responses for more information on this topic: **SI_CNPS-EB1-11** through **SI_CNPS-EB1-14** (Vol. 7, Chapter 15, Section 15.4). A number of comments addressed Raker Act requirements related to the development of water supplies in the SFPUC service area prior to additional diversions from the Tuolumne River. For information on this topic, refer to **Response L_TUD1-05** (Vol. 7, Chapter 15, Section 15.3). Lastly, BAWSCA submitted numerous comments describing its objections to the Aggressive Conservation/Water Recycling and Local Groundwater Alternative. For more information on this topic, refer to **Comments/Responses L_BAWSCA-27** through **L_BAWSCA-39** (Vol. 6, Chapter 12, Section 12.3 and Vol. 7, Chapter 15, Section 15.3).

- *The SFPUC's preferred alternative ignores conservation and efficiency recycling measures that their own studies found could eliminate the need to divert more water from the Tuolumne River by at least 74 percent. [Representative comments: C_Raffa-07, C_Breso-02, C_Ross-05, C_Stein-02, C_Hasso-03, C_Picku-01, C_Poult-01]*

The reference in these comments is to the report *Investigation of Regional Water Supply Option No. 4 Technical Memorandum* (SFPUC, 2007, Appendix D) described above. The preceding discussion describes the conservation and recycling associated with the proposed program; the Aggressive Conservation/Water Recycling and Local Groundwater Alternative (Draft PEIR Vol. 4, Chapter 9, pp. 9-47 to 9-59) includes additional conservation and recycling projects described in the Water Supply Option No. 4 report, but not included in the proposed program. As indicated in the Draft PEIR (p. 9-49), this alternative could meet up to 74 percent of the additional projected 2030 average annual water supply need; however, at least 6 mgd of this projected demand would be unmet, and this alternative would also provide less drought reliability compared to the WSIP, requiring an increased frequency of rationing.

- *The SFPUC should conduct a study to determine the maximum technical potential for conservation and efficiency savings within the SFPUC service territory. [Representative comments: SI_CRS-05, C_Berko-02, C_BoutiF-02, C_Dippe-02, C_Hsiun-02, C_Raffa-11, C_Ross-09, C_Thaga-02]*

The SFPUC did conduct such a study—the *Investigation of Regional Water Supply Option No. 4 Technical Memorandum* described above.

- *Water conservation measures are the cheapest, easiest, and least destructive ways to meet demand and extend supply. [Representative comments: SI_SierraC4-02, C_Hasso-03, C_Means1-01, C_Raffa-07, C_Ross-05, C_Walk-03, C_Willi-05]*

Comments acknowledged. The PEIR authors concur that conservation measures are less detrimental to the environment than the development of water supplies; this is one of the reasons the Draft PEIR included multiple alternatives involving higher levels of conservation and recycling and reduced diversions from the Tuolumne River, including the Aggressive Conservation/Water Recycling and Local Groundwater Alternative and the Modified WSIP Alternative. (The Draft PEIR does not address the costs of conservation measures.)

- *Per-capita water use is projected to increase for wholesale customers, indicating they lack effective conservation programs. [Representative comments: C_Raffa-07, C_Ross-05]*

The Draft PEIR does not present per-capita information, nor were future demands projected based on per-capita consumption, as discussed in Section 14.2.2, above. As that discussion indicates, per-capita demand for the wholesale customer service area is not projected to increase; the average weighted per-capita demand for residential and nonresidential sectors is projected to decrease, both with and without additional conservation programs. While it is the case that per-capita demand is projected to increase for some individual wholesale customers, the overall trend within the service area shows a decrease in per-capita demand.

Per-capita demand is influenced by a range of factors, including economic, demographic, and climatic conditions. Consequently, comparisons between different areas can be misleading unless the specific factors influencing the demand are understood. In addition, the methodology used to measure water use and calculate per-capita demand may vary. Numerous comments assert that per-capita demand in the wholesale service area is high compared to other areas, with some comments citing per-capita demand as evidence that conservation measures are ineffective. The DWR's California Water Plans provide useful information on how the Bay Area compares with the rest of the state. Per-capita demand in each hydrologic region in the state, based on information in the 1995 and 2005 California Water Plans (DWR, 1998; DWR, 2005), is shown in **Tables 14.2-10** and **14.2-11**, below. As the tables indicate, the San Francisco Bay region had the second lowest per-capita water usage in the state in 1995, and the lowest urban and residential per-capita usage in the state in 2000.[24] The information in each table is from the same source, and the per-capita estimates shown in each table were calculated using consistent factors and methodology; therefore, these tables provide a reasonable means to compare average usage rates in different parts of the state.

The San Francisco Bay hydrologic region includes more than the SFPUC service area, and low per-capita residential demand within the city of San Francisco (where there is comparatively less outdoor water use than in other areas) would serve to lower the average per-capita rate for the region as a whole. Therefore, the per-capita information for the San Francisco Bay hydrologic region does not definitively establish that per-capita demand in the wholesale customer service area is relatively low. Per-capita demand information provided by the SFPUC for the September 2006 Sustainable Water Supply Briefing does, however, suggest that per-capita demand in the wholesale service area compares favorably to that in other parts of the state.

Table 14.2-12 presents 2001 and 2030 estimates for single-family and multifamily residential per-capita use for the wholesale customers. As noted above, comparisons between different areas can be misleading unless the underlying dynamics of the given areas, as well as the factors and methodology used to calculate given statistics, are understood. In addition to these constraints, per-capita demand information provided for the Sustainable Water Supply Briefing (SFPUC, 2006) does not include estimates for total residential per-capita consumption, preventing a direct comparison of total residential demand. Nevertheless, based on the 2001 per-capita estimates of single-family residential use in the wholesale service area (which would be higher than total residential use) and the 2000 DWR information on residential usage (Table 14.2-11), it appears that the per-capita residential use for the wholesale customers is relatively low. The wholesale customers' weighted average gross per-capita demand for the 2001 base year—166 gpcd (SFPUC, 2006)—also compares favorably to urban per-capita usage in other parts of the state.

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24 Although the information in Tables 14.2-10 and 14.2-11 is from two editions of the *California Water Plan*, it should be noted that the per-capita information for 1995 (Table 14.2-10) is provided as shown in the 1995 *California Water Plan* (DWR, 1998), whereas the per-capita information for 2000 (Table 14.2-11) was calculated from information on the hydrologic regions provided in the *California Water Plan Update 2005* (DWR, 2005). Therefore, while each table provides a means for comparing different regions for the given year, comparisons *between* the tables would be misleading, since somewhat different methodologies and factors were used to calculate the per-capita information. For example, weather-normalized data were used to compute the 1995 per-capita information and conveyance losses were excluded, whereas the 2000 per-capita information was calculated for this PEIR based on total urban water use (and the subset of residential water use) data and population data provided for each hydrologic region in the 2005 plan.

TABLE 14.2-10
PER-CAPITA WATER USE[a] BY HYDROLOGIC REGION – 1995
(in gpcd)

Hydrologic Region	Usage
Colorado River	564
North Lahontan	411
San Joaquin River	310
Tulare Lake	298
Sacramento River	286
South Lahontan	282
North Coast	249
South Coast	208
San Francisco Bay	**192**
Central Coast	179

[a] Includes residential, commercial, industrial, and landscape use supplied by public water systems and self-produced surface and groundwater. Does not include recreational use, energy production use, and losses from major conveyance facilities. Data are normalized.

SOURCE: DWR, 1998,Table 4.10.

TABLE 14.2-11
TOTAL URBAN AND RESIDENTIAL PER-CAPITA WATER USE
BY HYDROLOGIC REGION – 2000
(in gpcd)

Hydrologic Region	Total Urban Use[a]	Residential Use[b]
Colorado River	1,006	338
South Lahontan	333	265
Tulare Lake	310	242
San Joaquin	306	216
Sacramento River	296	177
Mountain Counties[c]	259	171
North Lahontan	361	138
South Coast	208	132
North Coast Hydrogeologic Region	208	123
Central Coast	181	116
San Francisco Bay	**156**	**97**

[a] Total urban per-capita water use is based on urban water use data (including residential, commercial, industrial, landscape, energy production, and related usage) and population data provided for each hydrologic region in the *California Water Plan Update 2005*.
[b] Residential per-capita water use is based on interior and exterior residential water use (components of total urban use) and population data provided for each hydrologic region in *California Water Plan Update 2005*.
[c] Mountain Counties hydrologic region, shown in the 2005 plan, is not included as a region in the 1995 plan.

SOURCE: DWR, 2005.

**TABLE 14.2-12
WEIGHTED AVERAGE RESIDENTIAL PER-CAPITA DEMAND
WHOLESALE CUSTOMER SERVICE AREA, 2001 AND 2030
(in gpcd)**

Wholesale Customers	2001 Single-Family Residential	2001 Multifamily Residential	2030 Single-Family Residential (without additional conservation)	2030 Multifamily Residential (without additional conservation)	2030 Single-Family Residential (with conservation)	2030 Multifamily Residential (with conservation)
Weighted Average	108	75	103	67	98	64

SOURCE: SFPUC, 2006.

The above evidence suggests that per-capita water use in the wholesale service area is, in fact, relatively low. Lower per-capita use, however, may suggest that the potential for additional conservation would also be relatively low. The information on projected 2030 per-capita residential demand shown in Table 14.2-12 indicates that the continued implementation of plumbing codes and planned conservation measures will continue to reduce per-capita demand within the service area. Regarding changes in per-capita outdoor demand in the wholesale and retail service areas, refer to the discussion in Section 14.2.2, above, under the heading Outdoor Water Use. For additional response on this topic, refer to Section 14.2.3 under the heading Per-Capita Demand.

Many comments compared the Bay Area's water consumption and conservation to that of other areas or water utilities.

- *In contrast to other metropolitan areas that have managed to reduce water demand in the face of growth, the anticipated 14 percent increase in demand projected by the SFPUC is large and out of step for the Bay Area. [Representative comments: C_Elbizri-02, C_Garba-01, C_Hasso-03, C_Raffa-04, C_Ross-02, C_Schri-01, C_Thoma-01]*

- *The conservation savings identified in the analysis are low in comparison to savings achieved in recent water conservation assessments and in other water districts. [SI_PacInst-62]*

- *When it comes to conservation, the Bay Area lags far behind other metropolitan areas such as Seattle and Los Angeles that are reducing water consumption even in the face of growth. As a region known for a strong environmental ethic, the Bay Area should be a leader in water efficiency and conservation. [Representative comments: C_Breso-02, C_Bucki-02, C_Cant-01, C_Dippe-01, C_Garba-01, C_Hanke-02, C_Hasso-02, C_Hsuin-02, C_Picku-01, C_Raffa-07, C_Reich-01, C_Ross-05, C_Sugar-02, C_Shea-01, C_Thoma-01, C_Willi-02, C_Unreadable1-01]*

These comparisons with other areas apparently refer to studies of water conservation and other demand management programs cited in comments submitted by the Pacific Institute and possibly studies identified in Comment SI_TRT-CWA-SierraC-196,[25] although this latter comment presents a list of studies with no discussion or analysis. As discussed above, statewide studies conducted by the DWR indicate that per-capita consumption in the Bay Area is lower, not higher, than in Los Angeles. Where comments addressed specific studies from other areas, the SFPUC's DSS technical consultant reviewed the examples in-depth and found, for various reasons (summarized in the responses below), that the studies do not support the assertion that the Bay Area is conserving less than other areas (Maddaus, 2008).

The water savings achieved in one area may not be directly transferable to another area. Water use can vary widely between regions, and even within a region, due to differences in the factors that influence water use (e.g., climate, land use—including the type, density, and size of residential housing, and the types of commercial, industrial, and other nonresidential land uses—and economic factors), specific characteristics of water use patterns (e.g., average gallons per flush for existing fixtures), and differences in the methodology used to report demand (e.g., whether/how factors such as existing conservation and unaccounted-for water are reflected in demand). Consequently, absent an understanding of such factors, the assumption that a percent reduction through conservation achieved in one area can be achieved in another is overly simplistic. As noted above, the lower existing usage in the Bay Area suggests that water savings or reductions achieved in areas that use water more intensively are not comparable to the Bay Area.

Note also that these comments and the ones citing more specific examples from other areas (discussed below) do not address the rationing that would be imposed during drought periods under the WSIP and the attendant demand hardening that could occur. Refer to **Response SI_PacInst-27** (Vol. 7, Chapter 15, Section 15.4) for more information on demand hardening.

- *Projections to 2030 indicate that water use efficiency improvements are still not being implemented effectively for the wholesale customers despite the development of numerous technologies and policies to cost-effectively reduce water waste. For example, Seattle Public Utilities successfully reduced per-capita demand from 150 gpcd in 1985 to 105 gpcd in 2004 through higher water rates, plumbing codes, conservation, and improved system operation. Likewise, EBMUD reduced per-capita demand from 210 gpcd in 1970 to 155 gpcd in 2005 through a variety of conservation measures. [SI_PacInst-59]*

Comparisons of long-term per-capita demand between areas with substantially different economic, demographic, and climatic conditions can be misleading, unless the comparisons can be substantiated by a scientific analysis that accounts for the different conditions. The reasons for changes in per-capita demand are unique to the dynamics of an individual water service area and its customers. Regarding the decrease in per-capita demand experienced by EBMUD, one relevant factor is that during the time period cited (1970–2005) one of EBMUD's largest industrial users, a refinery, began to recycle water. The use of recycled water dramatically cut the refinery's water use and reduced overall usage in EBMUD's service area. Regarding the experience of Seattle Public Utilities, again, as noted, comparisons between utilities that have different economic, demographic, and climatic conditions can be misleading, and may be

[25] These comment letters are provided in Vol. 6, Chapter 12, Section 12.4.

especially problematic when the methodology used to measure water use and calculate per-capita demand (which can vary) is not known. Table 14.2-10, above, summarizes DWR's comparison of per-capita water use among the state's hydrologic regions; as noted in the table, the DWR used normalized water use data for its calculations and a consistent methodology to calculate the per-capita estimates.

- *Recent conservation assessments indicate that there are a substantial number of cost-effective technologies that can drastically reduce indoor and outdoor residential water demand to levels far below those projected for the wholesale and retail customers. A 1997 study by the American Water Works Association (AWWA) found that conservation could reduce indoor water use from 65 gpcd to 45 gpcd for single-family homes, a savings of over 30 percent. The largest reductions were realized by replacing inefficient toilets and clothes washers with more efficient models. A Seattle study found that installing new, water-efficient fixtures and appliances reduced single-family indoor water use from 64 gpcd to 40 gpcd, a savings of nearly 40 percent and far below the 2030 levels projected in the SFPUC studies. The savings achieved in these studies are supported by a recent Pacific Institute study that quantified the potential for water conservation and efficiency improvements in California's urban water use and concluded that existing cost-effective technologies could substantially reduce California's current residential indoor and outdoor water use. [SI_PacInst-71]*

As discussed above, the water savings achieved in one area may not be directly transferable to another area, and an understanding of the factors that influence water use is necessary to avoid overly simplistic comparisons. The specific water conservation measures mentioned in the comment (replacement of fixtures and appliances with less water-intensive models and water-efficient landscaping) have already been considered by the SFPUC and its wholesale customers and are included in existing and proposed conservation programs (refer to Tables 14.2-6 through 14.2-8). (As shown in the tables, the SFPUC and all of the wholesale customers participate in clothes washer rebate programs, and nearly all participate in low-flow toilet rebate programs.) The SFPUC's DSS technical consultant prepared the following information on the studies cited (Maddaus, 2008).

American Water Works Association Study. The 1997 AWWA study cited in this comment is actually a WaterWiser website posting that was based on preliminary data. The final report on the study, entitled *Residential End Uses of Water*, was published by the AWWA Research Foundation and AWWA in 1999. The results presented in the final report indicated that, for the 12 cities where measurements were made, the average usage for single-family residences was 69 gcpd, and the range was 57 to 84 gcpd (AwwaRF and AWWA, 1999). The report did not conclude that water use could be reduced by 30 percent (to 45 gcpd) through conservation measures such as replacing toilets and clothes washers; this conclusion is an extrapolation based on certain assumptions and on preliminary data, rather than on the final reported data.

Seattle Study. Although the "Seattle study" is cited as documentation for a general indoor water use reduction potential of 40 percent, it was a small pilot study that involved retrofitting 37 homes (DeOreo et al., 2001). The study documented a water savings of 37.7 percent in clothes washer use and computed a water savings of about 5.6 gpcd, which is the value used in the SFPUC conservation potential technical assessment. Other significant water savings were achieved by replacing toilets (10.9 gpcd) and fixing leaks (4.3 gpcd), although showerheads and faucet aerators were also replaced. The Seattle study reported an average pre-retrofit flush volume of 3.6 gallons per flush and a post-retrofit flush volume of 1.4 gallons per flush. SFPUC studies determined the 2001 average flush volume in the wholesale customer service area to be 3 gallons per flush, and therefore the level of savings reported in the Seattle study would not apply; if this retrofit project had been conducted in the wholesale customer area, less water would have been saved. The toilets used in the Seattle study, called high-efficiency toilets, were considered in the SFPUC conservation potential analysis (URS, 2004b) as conservation measure 12 (rebates), and as New Measure NM1 (direct installations) in the Regional Water Supply Option No. 4 study (SFPUC, 2007, Appendix D) (which provided the basis for the additional savings considered in the Aggressive Conservation/Water Recycling and Local Groundwater Alternative). The post-retrofit period measurements for the Seattle study were made within one year of the original retrofit, and no follow-up measurements have been conducted. However, the experience of the SFPUC and the DSS technical consultant has shown that the reported savings due to leak reduction in toilets are not permanent, but disappear over time as the new toilets begin to leak. Some of the savings reported in the Seattle study apparently resulted from behavioral changes, such as a 1.7 gpcd savings due to a reduction in the number of baths. Studies of other conservation measures involving behavioral changes have documented that such savings are not permanent.[26]

Pacific Institute Report. The commenter states that the AWWA and Seattle studies are supported by the water savings potential for California reported in Pacific Institute's 2003 report *Waste Not, Want Not: The Potential for Urban Water Conservation in California*. The shortcomings of the cited AWWA and Seattle studies with respect to their applicability and relevance to the Bay Area are discussed above. This Pacific Institute report is not applicable because it estimates savings for the state of California as a whole and includes individual measures that are not applicable to the wholesale customers, such as installation of water meters in Central Valley communities. Estimates of water savings potential based on a peer-reviewed summary of all published literature is available in the CUWCC *BMP Cost and Savings Study* (A&N Technical Services, 2005); the October 2004 version of this study was used in the SFPUC conservation potential technical analysis (URS, 2004b, Table 3-2).

- *Studies in Austin, Texas and Las Vegas, Nevada, and in the Irvine Ranch Water District, City of Santa Monica, and Municipal Water District of Orange County in California, show that a number of outdoor conservation measures are cost-effective and yield substantial water savings, providing evidence that more can be done in the wholesale customer service area to reduce outdoor water use. Examples of measures include rebates or direct payments for removing water-intensive grass and maintaining water use budgets below levels established by the city (Austin and Las Vegas); use of evapotransporation (ET) controllers (Irvine Ranch Water District); funding for new and remodeled garden design that uses native plants, water-efficient plants, water-efficient irrigation systems, landscape*

[26] For example, the decline in residential water audit savings, which rely on behavioral changes, is well documented in the literature (refer to the *BMP Costs and Savings Study*, A&N Technical Services, 2005). Consequently, the reported savings of 23.7 gpcd will likely decline substantially over time. The wholesale customer conservation potential study accounted for the decline in savings that is expected to occur over time, as documented in relevant studies (Maddaus, 2008).

> *audits, stormwater catchment systems, or graywater systems as well as other innovative water-saving features (City of Santa Monica); and programs to train landscape professionals (Municipal Water District of Orange County). [SI_PacInst-72]*

As discussed above, because of differences in the factors that influence water use (e.g., climate and land use), comparisons between water savings in different areas can be misleading. Water savings achieved in arid places like Austin and Las Vegas are not transferable to the Bay Area, where the climate is substantially different. The DSS technical consultant prepared the following information on the other studies cited in this comment (Maddaus, 2008).

Irvine Ranch Study. The Irvine Ranch study of ET controllers mentioned in the comment found a range of savings that were reported over a number of years in different reports. The later reports in the series were more scientific in that they addressed some anomalies in the data and had more post-retrofit data. The correct, final figure for the reduction in outdoor use is 16 percent, as reported in the CUWCC's *BMP Costs and Savings Study* (A&N Technical Services, 2005). This savings is compatible with the values used in the wholesale customer conservation potential study (URS, 2004b, Table 3-2).

Please also refer to Comment L_BAWSCA1-110 (Vol. 6, Chapter 12, Section 12.3), in which BAWSCA indicates that the results of a three-year study on the effectiveness of ET controllers in the Bay Area are expected in about a year. As stated in this comment, BAWSCA is awaiting these results to inform its decisions regarding any ET controller rebate program. Table 14.2-8, above, shows the wholesale customers currently committed to implementing ET controllers.

Municipal Water District of Orange County's Landscape Program. According to the comment, Orange County's Landscape Performance Certification Program targets large landscape customers that have dedicated irrigation meters. The program provides technical training sessions for landscape contractors and property managers, prepares water budgets, and follows up with site assessments for compliance with the water budgets. Based on compliance with the water budgets, bronze, silver, or gold certificates are awarded, and companies that achieve certification are promoted. The program is estimated to save each customer an average of 765 gallons per day, a 20 percent reduction in outdoor use.

For the SFPUC conservation potential study conducted for the wholesale customers, the amount of turf (grass lawn, field, etc.) within each customer area was estimated. Various conservation measures—including CUWCC BMP 5 (Large Landscape Conservation), water budgets (with a unit savings of 15 percent), and ET controllers (with a unit savings of 15 percent)—similar to those in the Orange County program—were applied to sites with large areas of turf. The latter two measures combined were estimated to produce more savings per unit than the 20 percent savings cited for the Orange County program. Because the wholesale customers, for the most part, have far fewer large turf areas and a cooler climate than Orange County, the overall effect for all wholesale customers is likely to be less than for all of Orange County (refer to Table 14.2-8, above, which shows the wholesale customers currently committed to implementing these measures).

- *The conservation potential identified for the SFPUC wholesale and retail customers is weak and misses important efficiency opportunities. Other conservation assessments [citing a 2003 statewide study by the Pacific Institute and a survey conducted by the Santa Clara Valley Water District (SCVWD)] have concluded that the actual conservation potential of the nonresidential sector is substantially higher. [SI_PacInst-80]*

For reasons noted above, the estimated savings identified in the Pacific Institute study cited in this comment are not directly applicable to the wholesale service area. The Pacific Institute study's estimated savings are for the state of California as a whole, and the study includes individual measures that are not applicable to the wholesale customers, such as the installation of water meters in Central Valley communities. Regarding the three examples of promising technologies cited in this comment (pre-rinse spray valves, cooling towers, and x-ray machines), the SFPUC and BAWSCA are implementing a pre-rinse spray valve program in the SFPUC service area (as noted in Comment SI_PacInst-38 [Vol. 6, Chapter 12, Section 12.4]), and the SFPUC participates in a regional program that offers rebates for a range of water saving devices, including cooling towers and x-ray machines (SFPUC, 2006, p. 7).[27]

The SCVWD survey cited in this comment (of 26 commercial, industrial, and institutional facilities) is not representative of all nonresidential customers in that water district or of the SFPUC wholesale customers. Twenty-six customers is a small sample, and the sample was self-selected (participants volunteered for a water survey). The comment states that the Santa Clara survey identified a "conservation potential of 38 percent." It has been the experience of the DSS technical consultant and other water supply professionals that only a fraction of identified conservation potential is actually implemented. For example, in the mid-1990s the Metropolitan Water District of Southern California conducted the most comprehensive Commercial, Industrial, and Institutional (CII) study ever undertaken. Sweeten and Chaput (1997) analyzed the results of 179 CII surveys taken at a broad range of sites, from large industrial facilities to smaller commercial and institutional sites. Overall, the surveys identified a potential savings of 29 percent; however follow-up telephone surveys found that only 30 percent of this estimated savings (i.e., less than one-third of the estimated 29 percent) was reported to have been implemented (Sweeten and Chaput, 1997). Thus, the overall savings from this intensive effort was estimated to be 8.7 percent of pre-survey water use. Actual water use reductions or persistence were not measured, and long-term savings may be less (Maddaus, 2008).

Over the past nine years, the DSS technical consultant (Maddaus Water Management) who conducted the wholesale customer demand and wholesale customer conservation potential studies (URS, 2004a, 2004b) has prepared water conservation assessments for over 115 communities in the United States, including 67 in California. In the past five years, this firm has completed studies in multiple Bay Area communities, including studies for Sonoma County and the Marin Municipal Water District (MMWD). The savings in these other areas are comparable to the savings identified in the wholesale customer service area, particularly considering that per-capita water use in the wholesale area is low compared to California averages. For example, in 2006 and

[27] In addition, BAWSCA has indicated interest in joining the SFPUC to launch a cooling tower feasibility study to assess the water savings that could be achieved from a cooling tower retrofit program; refer to Comment L_BAWSCA-114 (Vol. 6, Chapter 12, Section 12.3).

2007, Maddaus worked with MMWD to develop four conservation program alternatives (Programs A through D). For programs with comparable conservation measures, the projected 2030 water savings (including the conservation programs and the effects of plumbing codes) ranged from 13 percent (Program A) to 17 percent (Program D). This is 3 percent higher than the total savings identified for the SFPUC service area of 10 to 14 percent (Maddaus, 2008).

Regarding the relationship between the implementation of long-term conservation measures and the imposition of short-term cutbacks in water use during drought periods, refer to **Response SI_PacInst-27** (Vol. 7, Chapter 15, Section 15.4).

- *Additional mandatory conservation will not be required for the wholesale customers, but will be required for retail customers. The wholesale model does not penalize additional water usage. [Representative comment: C_Clark1-09]*

This and similar comments warrant clarification regarding (1) the actions proposed by the SFPUC as part of the WSIP versus the actions proposed by the wholesale customers, and (2) the CCSF's authority to require wholesale customers to do more conservation. The future conservation programs described above for the wholesale customer service area are proposed by, and would be carried out by, the wholesale customers; those in the retail service area would be carried out by the SFPUC as part of the WSIP. The two alternatives that require greater levels of conservation and recycling than the proposed program—the Aggressive Conservation/Water Recycling and Local Groundwater Alternative and the Modified WSIP Alternative—assume that the wholesale customers would actively and willingly participate, in coordination with the SFPUC, in developing additional conservation and recycling programs. However, although BAWSCA supports the Modified WSIP Alternative (with changes outlined in Comments L_BAWSCA-51 through L_BAWSCA-53), it opposes the Aggressive Conservation/Water Recycling and Local Groundwater Alternative based on the wholesale customers' current low water use and the conservation and local supply projects they already have in place (see Comment L_BAWSCA1-27 [Vol. 6, Chapter 12, Section 12.3]). Regarding the SFPUC's authority to require more conservation, the SFPUC does have the regulatory authority to impose conservation programs in the retail customer service area; however the SFPUC's ability to influence the wholesale customers is limited to its contractual agreements with them.

- *Over half of the demand is outdoor water use and is a major cause for the increased demand. Water conservation and efficiency measures, along with recycling, should eliminate the need for additional future water supplies. [Representative comments: C_MartiM-02, C_Chiap-03, C_Hanke-02, C_Helld-01, C_Parke-02, C_Raffa-03]*

As indicated in Section 14.2.2, outdoor water use does account for 58 percent of the increase in projected demand in the wholesale customer service area, according to BAWSCA data; outdoor water use includes irrigation as well as uses such as cooling. Table 14.2-8 of this master response shows the conservation measures to which the wholesale customers have committed during normal and wet years; the measures in green apply to outdoor water uses. These measures reduce but do not eliminate the projected increase in demand associated with outdoor use. For example, in the retail service area, the per-capita residential outdoor use is projected to increase by 0.3 gpcd without additional conservation and by 0.2 gpcd with additional conservation; in the wholesale service area, the weighted average per-capita wholesale residential outdoor use is projected to increase by 3 gpcd without additional conservation and by 1 gpcd with additional conservation. The potential to use recycled water in nonresidential outdoor applications (such as for cooling and landscape irrigation) is recognized; however, some constraints limit the potential to use recycled water in specific areas or applications. As discussed above, challenges associated with implementing recycled water projects include costs and funding, public acceptance, development of partnerships to improve the feasibility of recycled water projects, and managing water quality.

As discussed in the Draft PEIR, during prolonged dry years, SFPUC customers would be subject to 20 percent systemwide rationing under the WSIP. Although drought management strategies would likely differ somewhat among customers, urban rationing programs typically shift the worst impacts to outdoor water uses, particularly residential exterior and commercial landscaping uses. Consequently, short-term, dry-year conservation measures implemented by SFPUC customers in response to rationing are very likely to target outdoor use.

Conservation Measures Suggested by Commenters

A number of commenters suggested the following specific conservation measures that could help reduce diversions from the Tuolumne River:

- *Prevent individuals from hosing down sidewalks. [C_BrookL-01]*
- *Offer rebates to residents that replace lawns with native plants. [C_Lubin-01]*
- *Provide incentives to conserve water. [C_Byron-09, C_Joye-01]*
- *Provide public education about the need for and methods of water conservation. [C_Britt-01, C_BrookL-01, C_Ellis-01]*
- *Raise water rates in a tiered manner. [C_Byron-01, C_Eddy2-02]*

As shown in Tables 14.2-6, 14.2-7, and 14.2-8, the SFPUC and the wholesale customers are currently implementing or committed to implementing conservation measures similar to those suggested above. The SFPUC and most of the wholesale customers have landscaping requirements and offer programs to encourage residents to switch to low-water-use plants and implement efficient irrigation, such as homeowner irrigation classes, xeriscape education, and irrigation upgrade incentives. Almost all of the wholesale customers (along with the SFPUC) implement conservation education programs. For its nonresidential customers, the SFPUC has planned programs for landscape audits and water-broom measures. The SFPUC and all of the wholesale customers currently implement conservation pricing (the CUWCC's BMP 11). These water conservation programs are also described in Comment L_BAWSCA1-114 (Vol. 6, Chapter 12, Section 12.3). The programs vary by agency, as each agency has evaluated the programs it believes would be most cost-effective based the characteristics of the service area.

Comments from special interest groups also suggested several programmatic water conservation measures. These comments include the following:

- *Each agency should assess what is driving demand growth and measures to reduce that demand. Agencies must take a more proactive role in identifying ways to reduce demand growth, particularly in new developments. [SI_PacInst-19]*

The factors that contribute to future demand were assessed in the end-use demand models used to develop the demand projections in the wholesale and retail service areas. These factors typically included the specific water use characteristics of single-family and multifamily residential, commercial, and industrial uses within each service area, other factors that applied to the given service area, and the extent of future population and job growth expected in each service area. The SFPUC conducted studies to identify the potential for conservation measures and the use of recycled water to offset demand, working closely with each customer to identify all feasible conservation potential. The projected conservation savings, use of recycled water, and use of other potable sources were factored into the purchase estimates submitted by San Francisco and each wholesale customer to the SFPUC. The Draft PEIR thoroughly describes, evaluates, and discloses the assumptions, methodologies, and results of these studies consistent with CEQA requirements (CEQA Guidelines Section 15144).

- *All agencies should sign the CUWCC's Memorandum of Understanding Regarding Urban Water Conservation in California (MOU) and work to implement all BMPs. [SI_PacInst-21]*

The SFPUC and 14 wholesale customers are signatories to the MOU, and three other wholesale customers (not signatories themselves) participate via the SCVWD, which is a CUWCC signatory. Tables 4.2-7 and 14.2-8, above, indicate the CUWCC BMPs currently being implemented in the wholesale and retail service areas.

- *Purchases from the SFPUC should be capped at current levels and financial incentives/disincentives should be instituted to encourage conservation/discourage growth in demand. [SI_PacInst-24]*

A No Purchase Request Increase Alternative was evaluated in the Draft PEIR (Vol. 4, Chapter 9, pp. 9-40 to 9-47), as were two variations of the Aggressive Conservation/Water Recycling and Local Groundwater Alternative, one with and one without supplemental water from the Tuolumne River (pp. 9-47 to 9-59). None of these was identified as the environmentally superior program alternative (pp. 9-95 and 9-96). Refer to **Responses SI_PacInst-47** and **SI_PacInst-62** (Vol. 7, Chapter 15, Section 15.4) regarding conservation pricing and tiered rate structures, and to Tables 14.2.7 and 14.2.8, above, regarding conservation measures the SFPUC and its wholesale customers are implementing or have committed to implement under the WSIP.

- *Local governments should be provided incentives to change their construction permitting to allow greywater systems for individual homes and to limit large irrigation systems. [SI_CI-01]*

The current state standards provide for the use of graywater for subsurface irrigation only (California Code of Regulations, Title 24, Part 5, Appendix G). The SFPUC has no legislative or permit authority over individual wholesale customer service areas. Refer to "Measures for Large-Scale Irrigation" in Table 14.2-6 regarding large irrigation systems.

- *The SFPUC and its wholesale customers should implement water and wastewater rate structures that encourage water conservation among their customers and fund conservation programs. [SI_PacInst-20]*

The SFPUC and each of the wholesale customers have adopted the CUWCC's BMP 11, Conservation Pricing (refer to Tables 14.2-7 and 14.2-8). Please also refer to **Response SI_PacInst-62** and **Response SI_PacInst-47** (Vol. 7, Chapter 15, Section 15.4) regarding the use of water pricing as a water agency tool and tiered pricing rate structures, respectively. The SFPUC and the wholesale customers currently fund and implement conservation programs, and the 2030 purchase estimates reflect savings from the implementation of additional measures to which the customers have committed.

- *The SFPUC and BAWSCA should work together to establish more effective regional conservation and recycling programs; institutional mechanisms should be developed to encourage wholesale customers to move more effectively toward efficiency improvements. [SI_PacInst-22]*

The SFPUC is currently evaluating methods of encouraging additional conservation among its wholesale water customers; refer to the description of the Modified WSIP Alternative (Vol. 4, Chapter 9, pp. 9-78 to 9-84).

TABLE 14.2-13
SUBMITTALS CONTAINING COMMENTS ON
WATER DEMAND PROJECTIONS, CONSERVATION, AND RECYCLING
ADDRESSED IN THIS MASTER RESPONSE

Comment Letter ID	Name of Commenter
Federal Agencies	
None	
State Agencies	
None	
Local and Regional Agencies	
L_ACFCWD	Alameda County Flood Control and Water Conservation District (ACFCWD)
L_BAWSCA1, L_BAWSCA2	Bay Area Water Supply and Conservation Agency (BAWSCA)
L_DalyCty	City of Daly City
L_PaloAlto	City of Palo Alto
L_SFCPC2, L_SFCPC3	San Francisco City Planning Commission
L_SCVWD1, L_SCVWD2	Santa Clara Valley Water District
L_Tuol1, L_Tuol2	Tuolumne County
L_TUD1, L_TUD2, L_TUD3	Tuolumne Utilities District
Groups	
SI_ACA1, SI_ACA2	Alameda Creek Alliance
SI_ACT	Acterra Action for a Sustainable Earth
SI_CAC2	Citizens Advisory Committee to PUC
SI_Caltrout	California Trout
SI_CAREP	Republicans for Environmental Protection
SI_CI	Commonwealth Institute
SI_CNPS, SI_CNPS-EB1, SI_CNPS-EB2, SI_CNPS-SCV1, SI_CNPS-SCV2, SI_CNPS-WLJ	California Native Plant Society
SI_CRS	Center for Resource Solutions
SI_CSERC	Central Sierra Environmental Resource Center
SI_D3Dem1, SI_D3Dem2	District 3 Democratic Club
SI_EcoCtr	Ecology Center
SI_EnvDef	Environmental Defense
SI_Greenp	Greenpeace
SI_KSWC	Klamath-Siskiyou Wildlands Center
SI_NCFFSC	Northern California/Nevada Council of the Federation of Fly Fishers Steelhead Committee
SI_PacInst	Pacific Institute
SI_RHH1	Restore Hetch Hetchy
SI_SCCCC	Santa Clara County Creeks Coalition

**TABLE 14.2-13 (Continued)
SUBMITTALS CONTAINING COMMENTS ON
WATER DEMAND PROJECTIONS, CONSERVATION, AND RECYCLING
ADDRESSED IN THIS MASTER RESPONSE**

Comment Letter ID	Name of Commenter
Groups (cont.)	
SI_SFNeigh	Coalition for San Francisco Neighborhoods
SI_ SierraC4, SI_SierraC6, SI_SierraC7	Sierra Club
SI_SPUR	San Francisco Planning and Urban Research Association
SI_TRT1, SI_TRT2, SI_TRT3, SI_TRT5, SI_TRT6, SI_TRT7, SI_TRT8, SI_TRT9	Tuolumne River Trust
SI_TRT-CWA-SierraC	Tuolumne River Trust/Clean Water Action/Sierra Club, SF Bay Chapter
Citizens	
C_AdamsA	Adams, Amy
C_Agarw	Agarwala, Sambhu
C_Allis	Allison, Rita
C_Alter	Alter, Grudy
C_Bail	Bail, Christopher
C_Barbe1	Barbey, John
C_Barsa	Barsanti, Cris
C_Beauj	De La Beaujardiere, Cedric, and Sustan Stansbury
C_Berg	Berg, Bonnie
C_Berko	Berkowitz, Allan
C_Bevia	Beviacqua, John
C_Bigos	Bigos, Marty
C_Blake	Blake, Martin
C_BoutiF	Boutin, Fred
C_BramlD1, C_BramlD2, C_BramlD3	Bramlette, Darryl
C_Breso	Bresolin, Mark
C_Britt	Britts, Beverly
C_BrookL	Brooking, Liz
C_Bucki	Buckingham, Keith
C_Byron	Byron, Juan
C_Cant	Cant, John
C_Chase	Chase, Birgit
C_Chiap	Lynn Chiapella
C_Clark1	Clark, Anne, and Katherine Howard
C_Closs	Clossman, Gary
C_Colem2	Coleman, Caroline

**TABLE 14.2-13 (Continued)
SUBMITTALS CONTAINING COMMENTS ON
WATER DEMAND PROJECTIONS, CONSERVATION, AND RECYCLING
ADDRESSED IN THIS MASTER RESPONSE**

Comment Letter ID	Name of Commenter
Citizens (cont.)	
C_Colli	Collin, Robert
C_Dahli	Dahlin, Leland and Shirley
C_Davey	Davey, Mary
C_David	Davidson, Joel
C_DayL	Day, Lisa
C_Dippe	Dippery, Dan
C_Dough	Dougherty, Denise
C_Dulma	Dulmage, Diane
C_Duper	Duperrault, Fred
C_Eddy1, C_Eddy2	Eddy, Jeb
C_Elbiz	Elbizri, Elanie
C_EllioC	Elliott, Claire
C_Ellis	Ellison, Dave
C_Farnu	Farnum, Benjamin L.
C_Field	Fielding, David
C_Flani	Flanigan, M.
C_Flynn	Flynn, Kirsten
C_Gado	Gado, Jimmy
C_Garba	Garbarino, Caroline
C_Garci	Garcia, Ruben
C_Gelma	Gelman, Robert
C_Genov	Genovese, Marylyn
C_Goite	Goitein, Ernest
C_Goldf	Goldfein, Kathleen
C_Goodm	Goodman, Rebecca
C_Grave	Graves, Ben
C_GreenD	Greene, David
C_GreenK	Greene, Katherine
C_GrinnJ	Grinnell, Jim
C_Hall	Hall, Diana
C_Hamil	Hamilton-Lam, Kimberly
C_Hanke	Hankermeyer, Carol
C_Hasso	Hasson, Tomer
C_Helld	Helldoevker, Alex
C_HerroK	Herron, Kristin

**TABLE 14.2-13 (Continued)
SUBMITTALS CONTAINING COMMENTS ON
WATER DEMAND PROJECTIONS, CONSERVATION, AND RECYCLING
ADDRESSED IN THIS MASTER RESPONSE**

Comment Letter ID	Name of Commenter
Citizens (cont.)	
C_Hsiun	Hsiung, Pei-Lin
C_Ikemo	Ikemoto, Kile
C_Isaac	Isaac, Marian
C_JohnsM	Johnson, Mitchell
C_JohnSie	Johnson, Sieglinde
C_Joye	Joye, Lindsay and Ken
C_Kahn	Kahn, Mike
C_Kalin	Kaliner-MacKellen, Gwynn
C_Keebr	Keebra, Suzanne
C_Kim	Kim, Michelle
C_KingC	King, Carl
C_KingK	King, Kenneth
C_Lee	Lee, Aldora
C_Leet	Leet, Ben
C_Lewin	Lewin, Linda
C_Lim	Kingman, Lim
C_Look	Look, Carissa
C_LoVuo	LoVuolo-Bhushan, Judith
C_Lowry	Lowry, Janet
C_Lubin	Lubin, Sheri
C_Madou	Madou, Ramses
C_Magol	Magol, Nick
C_MartiM	Martin, Michael
C_Marcu	Marcus, Mary Jane
C_Margo	Margolies, Elliot
C_Marsh	Marshall, James
C_MartiM	Martin, Michael
C_MartiS	Martinez, Sofia
C_McCle	McClelland, Jonathan
C_McCol	McCollom, Karl
C_McCon	McConnell, Mike
C_McKee	McKee, Julie
C_Means1, C_Means2	Means, Robert
C_Melna	Melnarik, Chrstina and Chet
C_Menuz	Menuz, Karen

**TABLE 14.2-13 (Continued)
SUBMITTALS CONTAINING COMMENTS ON
WATER DEMAND PROJECTIONS, CONSERVATION, AND RECYCLING
ADDRESSED IN THIS MASTER RESPONSE**

Comment Letter ID	Name of Commenter
Citizens (cont.)	
C_Merlo	Merlo, Steven
C_Mijac	Mijac, Ivo
C_Mille	Millette, Eric
C_MindeN	Mindelzun, Naomi
C_MindeR	Mindelzun, Robert
C_Nore	Nore, Erna
C_Noren1	William, Noren
C_Okuzu	Okuzumi, Margaret
C_Oneil	O'Neill, Kay
C_Pagli	Pagliarulo, Anne
C_Parke	Parkes, Doug
C_Perl	Perl, Kathy
C_Picku	Pickup, Ron
C_Poult	Poulton, J.C.
C_Raffa	Raffaeli, Paul
C_Raube	Raube, David
C_Reedy	Reedy, Mark
C_Reich	Reichle, Stefani
C_Richa	Richardson, Matthew
C_Ross	Ross, Jim
C_Schri	Schriebman, Judy
C_Schul	Schuler, Urs
C_Shea	Shea, Kelly
C_SmithE	Smith, Evan Winslow
C_Sprin	Spring, Cindy
C_Stein	Steinhart, Peter
C_Sturt	Sturtevant, Jon
C_Sugar	Sugars, Marc
C_TayloS	Taylor, Scott
C_Teves	Teves, M.
C_Thaga	Thagard, Betsy
C_Thoma	Thomas, Dennis
C_Tubma	Tubman, Marianna
C_Tucke	Tucker, Kristen
C_Unreadable1	Unreadable commenter name

TABLE 14.2-13 (Continued)
SUBMITTALS CONTAINING COMMENTS ON
WATER DEMAND PROJECTIONS, CONSERVATION, AND RECYCLING
ADDRESSED IN THIS MASTER RESPONSE

Comment Letter ID	Name of Commenter
Citizens (cont.)	
C_Unreadable3	Unreadable commenter name
C_Unreadable4	Unreadable commenter name
C_Urdan	Urdan, Matthew
C_VermeJ	Vermeys, Jim
C_Vrana	Vrana, Leo
C_Walke	Walker, Patricia
C_Walls	Wallstrom, Pete
C_Weiss	Weiss, Richard
C_Willi	Williams, Doris
C_Zimme	Zimmerman, Benita

14.3 Master Response on Proposed Dry-Year Water Transfer

14.3.1 Introduction

Overview

This master response addresses questions about the proposed dry-year water transfer included as part of the WSIP's water supply option. Commenters raised questions regarding the feasibility of the proposed transfer; whether the Turlock Irrigation District (TID) and/or the Modesto Irrigation District (MID) have agreed to such a transfer; and the validity of evaluating the proposed transfer when no official agreement among the agencies has been made. This master response is organized by the following subtopics:

14.3.2 Description of Dry-Year Water Transfer Assumptions Analyzed in the PEIR
14.3.3 CEQA Review of the Proposed Dry-Year Transfer

Commenters also raised questions about proposed Mitigation Measure 5.3.6-4a, Avoidance of Flow Changes by Reducing Demand for Don Pedro Reservoir Water, which would lessen the environmental impacts of the dry-weather transfer on the lower Tuolumne River, downstream of La Grange Dam. Comments on Mitigation Measure 5.3.6-4a are addressed in **Section 14.7, Master Response on Lower Tuolumne River Issues**, and comments on the water transfer of conserved water included as part of the Modified WSIP Alternative are addressed in **Section 14.10, Master Response on Modified WSIP Alternative** (Vol. 7, Chapter 14).

Commenters

Commenters that addressed this topic include:

Federal Agencies

- None

State Agencies

- None

Local and Regional Agencies

- Bay Area Water Supply and Conservation Agency – L_BAWSCA1
- City of Palo Alto – L_PaloAlto
- Modesto Irrigation District – L_MID
- Modesto Irrigation District and Turlock Irrigation District – L_MIDTID1
- Tuolumne Utilities District – L_TUD1 and L_TUD3

Groups

- Citizens Advisory Committee to SFPUC – SI_CAC2
- California Native Plant Society, East Bay Chapter _ SI_CNPS-EB2
- Restore Hetch Hetchy – SI_RHH1
- Tuolumne River Trust/Clean Water Action/Sierra Club, San Francisco Bay Chapter – SI_TRT-CWA-SierraC
- Tuolumne River Trust –SI_TRT8, SI_TRT10

Citizens

- Clark, Anne & Katherine Howard – C_Clark1
- Day, Joseph – C_DayJ

PEIR Section Reference

The Draft PEIR describes the dry-year water transfer in Vol. 1, Chapter 3, Section 3.6.2, pp. 3-36 to 3-39. Because the dry-year transfer is an integral part of the proposed WSIP water supply and system operations, it was included in the modeling for the future with-WSIP condition. The impacts of the WSIP water supply and system operations on water resources in the Tuolumne River watershed are described in Vol. 3, Chapter 5, Section 5.3.1, pp. 5.3.1-1 to 5.3.1-39, and the impact analysis includes the effects of the dry-year water transfer. Modeling data for the future with-WSIP condition used in the Draft PEIR are presented in Vol. 5, Appendices H1 and H2, and results of the updated modeling conducted after publication of the Draft PEIR and used in the refined analyses provided in the Comments and Responses document are presented in Vol. 8, Appendix O. All model results include the effects of the dry-year transfer as part of the proposed program.

14.3.2 Description of Dry-Year Water Transfer Assumptions Analyzed in the PEIR

Comment Summary

This section of this master response responds to all or part of the following comments:

L_BAWSCA1-44	L_MIDTID1-23	SI_RHH1-07
L_BAWSCA1-46	L_TUD1-09	SI_TRT8-07
L_BAWSCA1-47	L_TUD3-03	SI_TRT10-02
L_PaloAlto-07	SI_CAC2-01	SI_TRT-CWA-SierraC-68
L_MIDTID1-05	SI_CAC2-04	SI_TRT-CWA-SierraC-178
L_MIDTID1-06	SI_CAC2-08	C_Clark1-05
L_MIDTID1-15	SI_CNPS-EB2-05	C_DayJ-01

Summary of Issues Raised by Commenters

- There is no formal agreement on a dry-year transfer with TID and/or MID.

- The dry-year transfer may not be feasible because no agreement for such a transfer has been executed.
- The details of the proposed dry-year transfer should be fully described.

Response

The City and County of San Francisco (CCSF), TID, and MID hold rights to Tuolumne River water. TID and MID are senior to the CCSF for some of their direct and storage water rights. The Raker Act granted rights-of-way to the CCSF to construct the Hetch Hetchy Project on federal lands provided certain conditions were met, including recognition of TID's and MID's senior water rights (Vol. 1, Chapter 2, pp. 2-33 and 2-34). To meet these conditions, the CCSF is required at certain times to release certain flows from its reservoirs in the upper Tuolumne River watershed for use by TID and MID.

The CCSF's reservoirs in the upper Tuolumne River watersheds are not sized to capture the CCSF's full entitlement of Tuolumne River water. When the Don Pedro Project was built in the early 1970s, the CCSF contributed to the project's cost to receive the right to "prepay" TID and MID for water the CCSF would otherwise have to release from its upstream reservoirs to meet its Raker Act obligations. The water bank acts as "virtual storage" that allows the CCSF to use a greater portion of the Tuolumne River water to which it is entitled. All water stored in Don Pedro Reservoir belongs to TID and MID, and the CCSF cannot divert water directly from the reservoir. The Don Pedro Reservoir water bank is described further in the Draft PEIR (Vol. 1, Chapter 2, pp. 2-37 to 2-39).

When inflow to Don Pedro Reservoir exceeds the TID's and MID's Raker Act entitlements and there is space available in the water bank, the excess water is credited to the CCSF's water bank account. When the CCSF would otherwise have to release water from its reservoirs in the upper Tuolumne River watershed to fulfill its Raker Act obligations to TID and MID, the CCSF's water bank account in Don Pedro Reservoir is debited so that TID and MID receive their full entitlement of Tuolumne River water. This water banking arrangement enables the CCSF to divert and store more water in Hetch Hetchy Reservoir than it otherwise would, preserving the water for use in the Bay Area.

As described in the Draft PEIR (Vol. 1, Chapter 3, pp. 3-33 to 3-39), the SFPUC's existing water supply sources are insufficient to satisfy the WSIP water supply goal of no greater than 20 percent systemwide rationing during droughts under current (2005) demand (purchase requests). This shortage will become more severe by 2030 with the projected increase in purchase requests. Under the WSIP, the SFPUC would establish supplemental dry-year water sources, one of which would be a transfer of water from TID and MID. Although the SFPUC would only need the dry-year transfer fairly infrequently, the transfer would need to occur administratively every year because at the beginning of a year it would not be possible to know when hydrologic circumstances would make a transfer necessary. The proposed dry-year water transfer under the WSIP would occur as follows. Each year TID and MID would transfer ownership of a block of water in Don Pedro Reservoir to the SFPUC. In many years, the SFPUC would be able to meet its customers' needs without using the transferred water, and ownership of the water would likely revert to TID and MID. Occasionally, the SFPUC would need the transferred water, which it would secure by decreasing releases from its reservoirs in the upper Tuolumne River watershed and using the block of water in Don Pedro Reservoir to meet its Raker Act obligations to TID and MID. This would enable the SFPUC to increase its diversions from Hetch Hetchy Reservoir during droughts, and, in combination with the Westside Basin conjunctive-use program, to meet customer purchase requests while limiting rationing to 20 percent systemwide, thereby achieving the WSIP level of service objective for deliveries during droughts.

The Hetch Hetchy/Local Simulation Model was used to estimate the size of the transfer needed to limit rationing to 20 percent systemwide during droughts. In the Draft PEIR, the size of the necessary transfer was estimated to be 25,765 acre-feet per year (23 million gallons per day) averaged over the 8.5-year design drought (Vol. 1, Chapter 3, p. 3-36). As described in Section 13.3 (Vol. 7, Chapter 13), the input assumptions for the model were improved and updated after publication of the Draft PEIR. Using the improved and updated input assumptions, the size of the necessary transfer was estimated to be 29,350 acre-feet per year (26 million gallons per day) averaged over the 8.5-year design drought. Due to the combination of updated input assumptions to the model, the overall level of diversions from the Tuolumne River remained unchanged, even with the revised size of the dry-year transfer. As discussed in Section 13.3, review of the updated model results confirmed that the change in the size of the transfer would not have any direct effect in terms of the environmental consequences of the WSIP. The original modeling for the Draft PEIR and the updated modeling produced similar results, and the PEIR conclusions with respect to the significance of the WSIP's environmental impacts remain valid.

Although the dry-year transfer described above is proposed as part of the WSIP, no agreement to make such a transfer has been executed among the CCSF, TID, and MID. In fact, as explained below in Section 14.3.3, it would be improper to enter into such an agreement in the absence of completed CEQA review.

The CCSF has cooperatively worked with TID and MID for many years in analyzing water supply availability from the Tuolumne River watershed, and the SFPUC's studies indicate that there could be water available for a dry-year transfer without a loss of water to these agencies. The CCSF understands that neither TID nor MID have confirmed the availability of water for this transfer or made any commitments to the CCSF for such a transfer. If the San Francisco Planning Commission certifies the Final PEIR and the SFPUC adopts the WSIP, CCSF staff will pursue a formal agreement with TID and MID for the proposed dry-year transfer. Nonetheless, agreements or approvals from TID or MID regarding the proposed water transfer are not required, nor could final agreements be executed, prior to certification of the PEIR and adoption of the WSIP (or any alternative or variation of it). The absence of such agreements does not affect the validity of the environmental analysis presented in the Draft PEIR. Reasonable assumptions were made in the Draft PEIR with respect to the SFPUC's ability to secure a dry-year water transfer from TID and MID, and they provided sufficient information to perform the environmental analysis.

14.3.3 CEQA Review of the Proposed Dry-Year Transfer

Comment Summary

This section of this master response responds to all or part of the following comments:

L_MID-02	L_MIDTID1-28	C_Clark1-05
L_MIDTID1-05	L_TUD1-09	
L_MIDTID1-23	SI_TRT-CWA-SierraC-58	

Summary of Issues Raised by Commenters

- The dry-year transfer is insufficiently defined for CEQA purposes.
- The PEIR develops and supports alternatives and mitigation measures that are based on the assumed success of these transfer agreements.
- The proposed dry-year transfer would result in an additional drawdown of water from the Tuolumne River.

Response

As described in the Draft PEIR (Vol. 1, Chapter 3, p. 3-36), the dry-year transfer as proposed would be made from TID and MID to the SFPUC. In the Draft PEIR analysis, it was assumed that water owned by TID and MID and stored in Don Pedro Reservoir would be the source of the dry-year transfer. This assumption resulted in the greatest reduction in storage in Don Pedro Reservoir and the greatest impacts on the Tuolumne River, thereby depicting a worst-case scenario for CEQA purposes. As such, the impact analysis of the dry-year transfer presented in the Draft PEIR is conservative and adequate for CEQA review of the WSIP.

It is possible that TID and MID would provide some or all of the water for the dry-year transfer by conserving water or otherwise changing water management practices within their service areas. If this were the case, the environmental impacts on the Tuolumne River would be less than those described in the Draft PEIR. (The conserved water transfer is included in Mitigation Measure 5.3.6-4a and the Modified WSIP Alternative; for more information, refer to **Section 14.7, Master Response on Lower Tuolumne River Issues**, and **Section 14.10, Master Response on Modified WSIP Alternative**, respectively.)

The CCSF acknowledges that no agreement is in place for a dry-year transfer of water from TID and MID. For further information, please refer to Section 14.3.2, above.

It is appropriate to analyze the environmental effects of the proposed dry-year transfer before a formal agreement is made because neither TID and MID nor the CCSF can enter into or approve such an agreement before CEQA review is completed. Because the details of the dry-year water transfer were not known, the Draft PEIR evaluated a worst-case scenario of water supply and system operations impacts on the lower Tuolumne River, as noted above.

If an agreement for a dry-year water transfer was to be made among TID and MID and the SFPUC, as described in the Draft PEIR, additional project-level CEQA review would not be required. The transferring agencies, TID and MID, would serve as responsible agencies for CEQA compliance and could use the PEIR to make their own findings as required by CEQA Guidelines Section 15096. If the characteristics of the dry-year transfer were not as described and analyzed in the Draft PEIR, then additional CEQA review would likely be required. TID and/or MID would be the lead agency for the subsequent, project-specific CEQA review. However, the environmental impacts on the Tuolumne River and associated resources of any dry-year transfer considered as an alternative to the transfer described in the Draft PEIR would likely be less than those of the transfer included in the WSIP and analyzed in the Draft PEIR.

14.4 Master Response on PEIR Appropriate Level of Analysis

14.4.1 Introduction

Overview

This master response addresses the issues commenters raised about the impact analysis and implementation of mitigation measures related to individual facility improvement projects versus the overall program under the WSIP. In particular, numerous comments questioned the level and basis of analysis used for potential impacts on biological resources. Commenters also specifically requested changes to the project descriptions of facility improvement projects and coordination with the SFPUC during project planning and development of mitigation measures. This master response is organized by the following subtopics:

14.4.2 Intent of Programmatic Impact Analysis
14.4.3 SFPUC Coordination with Other Agencies
14.4.4 Biological Resources Level of Analysis

Commenters

Commenters that addressed this topic include:

Federal Agencies

- U.S. Fish and Wildlife Service, San Francisco Bay National Wildlife Refuge Complex – F_USFWS
- U.S. Department of the Interior, National Park Service, Golden Gate National Recreation Area – F_NPS-GGNRA

State Agencies

- Department of Transportation – S_Caltrans
- Coastal Conservancy – S_CC
- California Department of Fish and Game – S_CDFG2
- Department of Water Resources – S_DWR

Local and Regional Agencies

- Alameda County Community Development Agency – L_ACCDA
- Alameda County Flood Control and Water Conservation District – L_ACFCWCD
- Alameda County Water District – L_ACWD
- Bay Area Water Supply and Conservation Agency – L_BAWSCA1
- Bay Conservation and Development Commission – L_BCDC
- East Bay Regional Park District – L_EPRPD
- City of Fremont – L_Fremont
- City of Menlo Park – L_Menlo1

- City of Newark – L_Newark
- City of Palo Alto – L_PaloAlto
- San Francisco Bay Trail Project, Association of Bay Area Governments – L_SFBayTrl
- San Francisco City Planning Commission – L_SFCPC5
- San Francisco Landmarks Preservation Advisory Board – L_SFLandmarks
- Tuolumne County – L_Tuol2

Groups

- Alameda Creek Alliance – SI_ACA1
- California Trout – SI_Caltrout
- Center for Resource Solutions – SI_CRS
- Citizens Advisory Committee to SFPUC – SI_CAC2
- California Native Plant Society, East Bay Chapter – SI_CNPS-EB1
- California Native Pant Society, Santa Clara Valley Chapter – SI_CNPS-SCV1, SI_CNPS-SCV2
- Ecology Center – SI_EcoCtr
- Greenpeace – SI_GreenP
- Klamath-Siskyou Wildlands Center – SI_KSWC
- Menlo Business Park LLC – SI_MenloBP
- Republicans for Environmental Protection – SI_CAREP
- Santa Clara County Creeks Coalition – SI_SCCCC
- Sierra Club – SI_SierraC1, SI_SierraC6, SI_SierraC7
- Tuolumne River Trust – SI_TRT2, SI_TRT3, SI-TRT6, SI_TRT7, SI_TRT8, SI_TRT10

Citizens

- Berkowitz, Allan – C_Berko
- Bresolin, Mark – C_Breso
- Clark, Ann & Katherine Howard – C_Clark1
- Coleman, Caroline – C_Colem2
- Elbizri, Elanie – C_Elbiz
- Garbarino, Caroline – C_Garba
- Genovese, Marilyn – C_Genov
- Goldfein, Kathleen – C_Goldf
- Graves, Ben – C_Grave
- Joyce, Lindsay and Ken – C_Joye
- Martin, Michael – C_MartiM
- McCollom – C_McCol
- Mijac, Ivo – C_Mijac
- Noren, William – C_Noren1
- Okuzumi, Margaret – C_Okuzu
- Parkes, Doug – C_Parke
- Raffaeli, Paul – C_Raffa
- Ross, Jim – C_Ross
- Spring, Cindy – C_Spri
- Steinhart, Peter – C_Stein
- Sugars, Marc – C_Sugar
- Urdan, Matthew – C_Urdan
- Vermeys, Jim – C_VermeJ
- Weiss, Richard – C_Weiss
- Williams, Doris – C_Willi

PEIR Section Reference

The Draft PEIR addresses this topic area in the following locations: Vol. 1, Summary, Section S.2, pp. S-10 to S-47; Vol. 1, Chapter 3, Sections 3.8 through 3.13, pp. 3-48 to 3-88; Vol. 2, Chapter 4 (entire chapter); and Vol. 4, Chapter 6, Sections 6.2 and 6.3, pp. 6-4 to 6-47 and pp. 6-65 to 6-170.

14.4.2 Intent of Programmatic Impact Analysis

Comment Summary

This section of this master response responds to all or part of the following comments:

F_NPS-GGNRA-03	L_ACWD-06	L_Fremont-04	SI_CNPS-EB1-09
F_USFWS-01	L_BCDC-01	L_Fremont-05	SI_CNPS-SCV1-01
F_USFWS-02	L_BCDC-02	L_Menlo1-02	SI_CNPS-SCV1-06
F_USFWS-03	L_EBRPD-03	L_Menlo1-06	SI_CNPS-SCV1-07
F_USFWS-04	L_EBRPD-04	L_Menlo1-07	SI_CNPS-SCV2-01
F_USFWS-05	L_EBRPD-05	L_Newark-01	SI_MenloBP-02
S_CC-02	L_EBRPD-08	L_PaloAlto-12	SI_MenloBP-03
S_CC-03	L_EBRPD-09	L_PaloAlto-13	SI_MenloBP-04
S_CC-04	L_EBRPD-11	L_SFBayTrl-05	SI_MenloBP-05
S_CDFG2-01	L_EBRPD-21	L_SFLandmarks-02	SI_MenloBP-07
S_DWR-01	L_EBRPD-22	L_SFLandmarks-07	SI_TRT-CWA-SierraC-30
L_ACCDA-03	L_EBRPD-24	SI_ACA1-23	
L_ACWD-05	L_Fremont-01	SI_CAC2-05	

Summary of Issues Raised by Commenters

- More detailed design information needed on specific WSIP projects along with more detailed project locations in order to better determine jurisdiction, encroachments, etc.
- More detailed impact assessment needed under certain environmental resource areas for specific projects.
- The adequacy of program mitigation measures for specific projects and specific situations as well as for the WSIP as a whole is questionable.

Response

Section 15168 of the CEQA Guidelines allows a Program EIR to be prepared on a series of actions that can be characterized as one project for the purpose of analysis under CEQA. A Program EIR enables a lead agency to examine the overall effects of a proposed course of action and take steps to avoid unnecessary adverse environmental effects by considering the series of actions, or project, as a whole. Chapter 4 (Vol. 2) of the Draft PEIR considers the WSIP facility improvement projects as series of related actions and identifies general, program-level types of impacts that could occur under the individual projects; in addition, Section 4.16 in Chapter 4 considers all of the WSIP projects as a whole and evaluates the overall impacts that could result from construction of all projects combined. Several discussions presented in the Draft PEIR explain the role of this PEIR as it relates to the individual WSIP facility projects; these discussions are summarized below:

- Section 1.2 (Vol. 1, Chapter 1, pp. 1-1 to 1-3) states that the PEIR provides a foundation for any necessary future environmental review documents that focus on the individual WSIP projects. As this section indicates, Chapter 4 of the Draft PEIR evaluates the major environmental effects of implementing the proposed facility improvement projects from a broad, *program-level* perspective, framing the nature and magnitude of the expected environmental impacts and identifying *program-level* mitigation measures to address these impacts. While the PEIR provides *project-level* CEQA analysis of certain combined program impacts that apply to all projects proposed under the WSIP (e.g., facility-related collective/cumulative impacts, water supply effects, regional influences, secondary effects of growth, and other factors that apply to the program as a whole), Section 1.2 indicates that *project-level* CEQA review will be conducted separately for the individual WSIP facility improvement projects when more detailed design, construction, and operation details become available for each project. In general, project-specific EIRs or negative declarations for site-specific activities will be completed after the Final PEIR is certified, as the act of certification carries with it the lead agency decision-making body's conclusion that the document fully satisfies the requirements of CEQA.

- Section 3.8 (Vol. 1, Chapter 3, pp. 3-48 to 3-73, including Tables 3.10, 3.11, and 3.12) and Appendix C (Vol. 5, pp. C-1 to C-26) present the facility descriptions, locations, and schedules that served as the basis for the program-level impact evaluation contained in Chapter 4 of the Draft PEIR (Vol. 2). Section 3.8 states that the purpose of the Chapter 4 analysis is to provide a comprehensive environmental review of the overall range of effects resulting from the WSIP facility improvement projects as a whole as well as to identify programmatic mitigation measures. As Section 3.8 indicates, once additional project details and site-specific information have been developed, it is possible that the individual project effects identified in the PEIR might not occur or that additional project effects not identified in the PEIR could in fact occur. Such changes in project details would be addressed during the project-specific environmental reviews.

- Section 4.1 (Vol. 2, Chapter 4, p. 4.1-1) notes that the Chapter 4 impact analysis is based on preliminary information about the individual projects that would be implemented following approval of the WSIP, and that the level of detail of the information presented is appropriate for the programmatic analysis of these projects. The Draft PEIR (p. 4.1-2) notes that many of the WSIP projects have been developed at the conceptual level only, and that only some projects have more detailed siting and design information. Accordingly, the Chapter 4 program-level evaluation addresses all projects from a broad, overview perspective. Section 4.1 states that all of the WSIP projects will be examined in more detail at the project level, and that if individual WSIP projects have additional significant impacts that were not addressed in the PEIR, the San Francisco Planning Department will prepare EIRs or negative declarations to examine the site-specific and project-specific effects of the individual projects. More detailed information about the individual projects (i.e., construction plans as well as siting and operational details) will be considered in the project-level environmental documents.

- Section 4.1 (p. 4.1-2) also states that Chapter 6 (Vol. 4) of the Draft PEIR identifies the appropriate program-level mitigation measures in general terms, and that these measures will be refined to specifically apply to each project as the projects are further refined.

Commenters requested more detailed information about specific WSIP project locations, boundaries, and design in order to define agency jurisdiction, determine ordinance compliance and general plan conformity, identify encroachments on other agencies' properties or facilities, or determine effects on existing infrastructure that crosses project facilities. Commenters also requested clarification regarding the disposition of certain existing facilities to be decommissioned after project completion, as well as more detailed impact assessment of specific projects on topics such as: effects on downstream water users in the Alameda Creek watershed due to construction-related dewatering and discharges in the Sunol Valley; site-specific flooding where construction could induce settlement of levees along the San Francisco Bay shoreline; specific historical resources that could be affected by the WSIP; construction-related traffic, access, and parking impacts on specific uses (including those with easements on SFPUC land); construction work hours, haul truck restrictions, and vibration monitoring; potential disruption of service during relocation of utilities that cross project facilities; and compliance with local noise ordinances.

However, as indicated in the above-listed sections of the Draft PEIR, such detailed project information was not available for all WSIP projects during preparation of the Draft PEIR, nor was this detailed information necessary to define the overall programmatic effects of the individual facility improvement projects. Therefore, a detailed impact analysis is more appropriately presented in the project-level CEQA documentation for each WSIP facility project when such information becomes available. The primary purpose of the PEIR is to evaluate the combined or collective impacts resulting from all of the WSIP projects—that is, the impacts of the WSIP as a whole (Vol. 2, Chapter 4, p. 4.16-1)—which will allow decision-makers to make an informed decision on the proposed program based its overall environmental effects. The PEIR also helps to define the scope of project-level impact evaluations by providing an overview of the broad impact categories that could be associated with implementation of the WSIP, by identifying the impact categories that could apply to each WSIP facility project, and by formulating program-level mitigation measures that could be translated into more specific measures as individual projects are proposed and analyzed. As part of the project-level CEQA review for each project, the impact significance determinations identified in the PEIR will be reevaluated. The programmatic mitigation measures will also be reevaluated and, if applicable, will be confirmed, refined, or replaced with an equivalent measure.

It should be noted that the PEIR significance determinations err on the conservative side, since the impact analyses at the program level must generalize the types and classes of impacts as well as the feasibility of mitigation measures to reduce impacts to a less-than-significant level. Some commenters recommended additional mitigation measures or clarification of program measures to: reduce impacts identified by the commenter; include a specific jurisdiction’s standard conditions for construction; provide more protection from construction noise and vibration; minimize public inconvenience and ensure public safety; and ensure traffic and emergency access and parking are maintained for businesses affected by project facility construction. However, it would be premature to provide more detailed mitigation measures for project-specific impacts without more detailed impact analyses to justify the added requirements. These commenters’ concerns will be addressed when project-level environmental documents are prepared for individual projects, at which time the project-level reviews may find that the commenters’ recommended measures are appropriate mitigation.

As suggested above, program-level mitigation measures included in the PEIR are intended to be general in nature, commensurate with the program-level impact analysis. The SFPUC standard construction measures that will be applied to all proposed WSIP facility projects are listed in Section 6.2 of the Draft PEIR (Vol. 4, Chapter 6, pp. 6-4 to 6-6), and these measures will reduce some identified program-level impacts. Program-level mitigation measures are listed in Section 6.3 (Vol. 4, Chapter 6, pp. 6-7 to 6-47), and these measures will reduce many of the program-level impacts identified in Chapter 4 to a less-than-significant level. Additional program-level mitigation measures that address the WSIP's combined or collective impacts are also included in Section 6.3 (i.e., the measures numbered 4.16-x). The summary tables in Section 6.6 (Vol. 4, Chapter 6, Tables 6.3 to 6.9, pp. 6-64 to 6-170) list all of the program-level impacts and mitigation measures that would apply to each WSIP facility project.

14.4.3 SFPUC Coordination with Other Agencies

Comment Summary

This section of this master response responds to all or part of the following comments:

F_NPS-GGNRA-02	L_ACFCWCD-10	L_EBRPD-04	L_Menlo1-02
F_USFWS-03	L_ACWD-07	L_EBRPD-15	L_Menlo1-06
F_USFWS-05	L_ACWD-08	L_EBRPD-20	L_PaloAlto-12
S_Caltrans-01	L_ACWD-12	L_EBRPD-23	L_SFBayTrl-05
S_CC-01	L_ACWD-21	L_Fremont-01	SI_MenloBP-04
S_CC-03	L_ACWD-22	L_Fremont-03	SI_TRT-CWA-SierraC-172
S_CC-04	L_ACWD-25	L_Fremont-04	
S_CDFG2-01	L_CoastsideCWD-05	L_Fremont-05	

Summary of Issues Raised by Commenters

- Numerous agencies requested that the SFPUC coordinate with them during project planning and development of mitigation measures.

Response

As noted in Draft PEIR Section 3.13 (Vol. 1, Chapter 3, p. 3-86), each of the individual WSIP facility improvement projects will undergo project-level CEQA review, and each project's environmental documentation will provide more detailed and up-to-date information on needed approvals by local, state, and federal agencies. Section 3.13 also references Table C.6 (Vol. 5, Appendix C, p. C-26), which lists specific permits and approvals that could be required for individual projects. As shown below, this table is revised and expanded to include the commenting agencies that have requested consultation during the planning and design phases of certain WSIP projects. These agencies are listed below, along with a summary of the requested consultation or other information that these agencies indicate should be considered as part of project-level review.

- *U.S. Department of the Interior, National Park Service, Golden Gate National Recreation Area*. This agency requests consultation during project development and advance notification of meetings and would like to assist in creating mitigations for potential impacts for the following projects: Crystal Springs/San Andreas Transmission Upgrade (PN-2), HTWTP Long-Term Improvements (PN-3), Lower Crystal Springs Dam Improvements (PN-4), and Pulgas Balancing Reservoir Rehabilitation (PN-5).

- *U.S. Department of the Interior, Fish and Wildlife Service (USFWS) and Coastal Conservancy*. The USFWS and the Coastal Conservancy are interested in acquiring clean dredge material generated by the Bay Division Pipeline Reliability Upgrade project (BD-1) for use in wetland

TABLE 14.4-1
(REVISED DRAFT PEIR TABLE C.6)
PERMITS, APPROVALS, AND EARLY COORDINATION WITH OTHER AGENCIES THAT MAY BE REQUIRED[a]

Project Number	Project Name	ACOE Section 10	Individual or ACOE NWP Section 404	National Wildlife Refuge	SHPO Section 106	NMFS Section 7 / USFWS Section 7	USFWS FWCA	National Park Service, GGNRA[b]	State Lands Commission Lease/ Permit[c]	Caltrans[d]	DWR, Central Valley Flood Protection Board	DWR, Division of Safety of Dams	CDFG 1602, 2080.1, 2081, or MOA	DHS (Public Water System)	SWRCB (SWPPP)	RWQCB 401	RWQCB Discharge/ Dewatering	BAAQMD	BCDC	Local CUPA/ HazMat Business Plan
SJ-1	Advanced Disinfection		Possible		Possible	Possible							X	X	X	Possible		~~AQMD permit~~ TBD		
SJ-2	Lawrence Livermore Supply Improvements		X (TS site only)		Possible	X (TS site only)							X (TS site only)	X	X	X (TS site only)				X
SJ-3	San Joaquin Pipeline System		X	Possible	X	X			X	Possible	Possible		X		X	X				X
SJ-4	Rehabilitation of Existing San Joaquin Pipelines	Possible	Possible	Possible	Possible	Possible				Possible			Possible							
SJ-5	Tesla Portal Disinfection Station												X	X	X					X
SV-1	Alameda Creek Fishery Enhancement		TBD		TBD	TBD				Possible			X			TBD				
SV-2	Calaveras Dam Replacement		X		X	X	X					X	X		X	X	X			X
SV-3	Additional 40-mgd Treated Water Supply													X	X					X
SV-4	New Irvington Tunnel		X		X	X				Possible			X		X	X	X			X
SV-5	SVWTP – Treated Water Reservoirs													X	X					X
SV-6	San Antonio Backup Pipeline																			
BD-1	Bay Division Pipeline Reliability Upgrade	Possible	X	Possible	X	X	X[e]		X	Possible			X		X	X	X		Possible	X
BD-2	BDPL Nos. 3 and 4 Crossovers		X			X	X			Possible			X		X	X	X			
BD-3	Seismic Upgrade of BDPLs Nos. 3 and 4 at Hayward Fault	TBD	TBD		TBD	TBD	TBD		TBD	Possible			TBD	TBD	TBD	TBD	TBD	TBD		
PN-1	Baden and San Pedro Valve Lot Improvements									Possible				X			X			
PN-2	Crystal Springs/San Andreas Transmission Upgrade	X	X		X	X		EC[b]		Possible			X	X	X	X	X			X
PN-3	HTWTP Long-Term Improvements							EC[b]		Possible				X	X					
PN-4	Lower Crystal Springs Dam Improvements	X	X		X	X	X	EC[b]		Possible		X	X		X	X	X			X
PN-5	Pulgas Balancing Reservoir Rehabilitation							EC[b]					X							
SF-1	San Andreas Pipeline No. 3 Installation									Possible					X	X	X			
SF-2	Groundwater Projects (Local and Regional)									Possible				X				X		
SF-3	Recycled Water Projects									Possible				X		X				

NOTES: ACOE = U.S. Army Corps of Engineers; BAAQMD = Bay Area Air Quality Management District; BCDC = San Francisco Bay Conservation and Development Commission; Caltrans = California Department of Fish and Game Transportation; CDFG = California Department of Fish and Game; CUPA = Certified Unified Program Agency; DHS = California Department of Health Services; DWR = California Department of Water Resources; EC = Early Coordination Requested; (FWCA = Fish and Wildlife Coordination Act); GGNRA = Golden Gate National Recreation Area; MOA = Memorandum of Agreement; NMFS = U.S. National Marine Fisheries Service; (NWP = National Permit for Stream and Wetland Restoration Activities); RWQCB = Regional Water Quality Control Board; SHPO = State Historic Preservation Office; SWPPP = stormwater pollution prevention plan; SWRCB = State Water Resources Control Board; TBD = To Be Determined; TS = Thomas Shaft; USFWS = U.S. Fish and Wildlife Service.

a Additional approvals may be identified for WSIP facility projects when separate, project-level CEQA analysis is completed.

b The GGNRA requests consultation during project development and advance notification of meetings and would like to assist in creating mitigations for potential impacts from these projects.

c Section 6327 of the Public Resources Code provides that if a facility is for the "procurement of fresh-water from and construction of drainage facilities into navigable rivers, streams, lakes and bays," and if the applicant obtains a permit from the local reclamation district, State Reclamation Board, the U.S. Army Corps of Engineers, or the Department of Water Resources, then an application shall not be required by the State Lands Commission. Since the proposed program appears to fall within this section, a lease from the Commission would not be required, provided one of the above-listed permits is obtained.

d As part of project-level CEQA review, Caltrans requests that each facility improvement project be reviewed to determine if it encroaches on any state facilities. Any encroachment on Caltrans right-of-way would require an encroachment permit, and CEQA-related environmental studies may be necessary (including studies related to biological resources, cultural resources, and hazardous materials). A qualified professional must conduct these studies to satisfy Caltrans's environmental review policies. Ground-disturbing activities on the site prior to completing and/or approving the required environmental documents could affect Caltrans' ability to issue a permit for the project.

e The USFWS and the Coastal Conservancy are interested in acquiring clean dredge material generated by this project for use in wetland restoration associated with the South Bay Salt Pond Restoration Project, particularly within the Don Edwards San Francisco Bay National Wildlife Refuge (contact Clyde Morris, Manager, 510-792-0222, ext. 25). The USFWS recommends that the SFPUC coordinate with the USFWS's Division of Endangered Species at the Sacramento Fish and Wildlife Office (916-414-6600).

**TABLE 14.4-1 (Continued)
(REVISED DRAFT PEIR TABLE C.6)
PERMITS, APPROVALS, AND EARLY COORDINATION WITH OTHER AGENCIES THAT MAY BE REQUIRED**

Project Number	Project Name	San Mateo County Transit District	Coastal Conservancy[e]	Association of Bay Area Governments	Local Flood Control Districts[f]	Alameda County Flood Control and Water Conservation District	Alameda County Water District[g]	East Bay Regional Park District[h]	City of Fremont[i]	City of Menlo Park	City of Palo Alto	Coastside County Water District
SJ-1	Advanced Disinfection											
SJ-2	Lawrence Livermore Supply Improvements											
SJ-3	San Joaquin Pipeline System				Possible							
SJ-4	Rehabilitation of Existing San Joaquin Pipelines				Possible							
SJ-5	Tesla Portal Disinfection Station											
SV-1	Alameda Creek Fishery Enhancement				Possible		EC	EC				
SV-2	Calaveras Dam Replacement					EC[j]	EC	EC	EC			
SV-3	Additional 40-mgd Treated Water Supply						EC	EC				
SV-4	New Irvington Tunnel				Possible		EC	EC				
SV-5	SVWTP – Treated Water Reservoirs						EC	EC				
SV-6	San Antonio Backup Pipeline				Possible		EC	EC				
BD-1	Bay Division Pipeline Reliability Upgrade	EC[k]	EC[l]	EC[l]	Possible		EC	EC	EC	EC[m]		
BD-2	BDPL Nos. 3 and 4 Crossovers				Possible						EC[n]	
BD-3	Seismic Upgrade of BDPLs Nos. 3 and 4 at Hayward Fault				Possible				EC			
PN-1	Baden and San Pedro Valve Lot Improvements											
PN-2	Crystal Springs/San Andreas Transmission Upgrade				Possible							
PN-3	HTWTP Long-Term Improvements											
PN-4	Lower Crystal Springs Dam Improvements											EC[o]
PN-5	Pulgas Balancing Reservoir Rehabilitation											
SF-1	San Andreas Pipeline No. 3 Installation				Possible							
SF-2	Groundwater Projects (Local and Regional)				Possible							
SF-3	Recycled Water Projects				Possible							

NOTE: EC = Early Coordination Requested

[f] As part of project-level CEQA review, the Alameda County Flood Control and Water Conservation District requests that each facility improvement project that includes pipelines be reviewed to determine if an encroachment permit is required where the pipelines cross the District's channels and creek inverts.

[g] The ACWD requests that the BD-1 project be coordinated with the ACWD earlier (during project planning and design phases, rather than during the construction phase) to minimize impacts associated with conflicting water facilities and potential impacts on the ACWD's ability to meet customer demands and fire flow requirements. In addition, all Sunol Valley projects (SV-1 through SV-6) will need to take into account potential effects of facility construction on downstream water intakes at ACWD's facilities in the flood control channel. The project-level CEQA review for the SV-2 project will need to consider coordination and notification related to Calaveras Reservoir release protocols that could affect downstream groundwater recharge and the potential for flooding.

[h] As part of project-level CEQA review, each facility improvement project in the Sunol Valley region should be reviewed to determine if it encroaches on EBRPD property. The EBRPD requests coordination of construction mitigation measures for certain WSIP projects in the Sunol Valley to minimize construction impacts on recreational uses and allow coordination of fire suppression planning and response (including review of traffic control plans). As part of the project-level EIR for SV-2, the EBRPD states that the SFPUC needs to coordinate the timing of water releases from Calaveras Dam to maximize benefits to amphibians and anadromous fish species.

[i] The City of Fremont requests consultation (regarding the applicability of encroachment permits, and development and review of traffic control plans) during the planning and design phases of the SV-2, BD-1, and BD-3 projects as well as any other WSIP project that could affect the Fremont transportation network.

[j] As part of the project-level CEQA review, mitigation measures should be developed to establish coordination and notification protocols between the SFPUC and the ACFCWCD regarding Calaveras Reservoir releases that could affect the potential for downstream flooding.

[k] The USFWS requests that the BD-1 project be coordinated with the Transit District's Dumbarton Rail Project to minimize habitat impacts for both projects.

[l] The Coastal Conservancy requests that the SFPUC coordinate with the Coastal Conservancy and Association of Bay Area Government's Bay Trail project (regarding completion of the Bay Trail gap through SFPUC lands).

[m] The City of Menlo Park requests coordination of construction mitigation measures for the BD-1 project to minimize construction impacts (e.g., access and parking) on local residents and businesses, including the Menlo Business Park.

[n] The City of Palo Alto requests early consultation on the BD-2 project.

[o] The Coastside CWD requests consultation during development of the adaptive management program for Crystal Springs Reservoir as part of the operations phase of the PN-4 project.

restoration associated with the South Bay Salt Pond Restoration Project, particularly within the Don Edwards San Francisco Bay National Wildlife Refuge.

The USFWS also recommends that the SFPUC coordinate with the USFWS's Division of Endangered Species at the Sacramento Fish and Wildlife Office.

- *San Mateo County Transit District*. The USFWS requests that the Bay Division Pipeline Reliability Upgrade project (BD-1) be coordinated with the Transit District's Dumbarton Rail Project to minimize habitat impacts for both projects.

- *Coastal Conservancy and Association of Bay Area Governments (ABAG)*. The Coastal Conservancy requests that the SFPUC coordinate with the Conservancy and ABAG's Bay Trail project (regarding completion of the Bay Trail gap through SFPUC lands).

- *California Department of Water Resources (DWR)*. The DWR requests that the San Joaquin Pipeline System project (SJ-3) be reviewed as part of the project-level CEQA review to determine if it encroaches on the State Plan of Flood Control for the Central Valley (Designated Floodway maps at http://recbd.ca.gov).

- *California Department of Transportation (Caltrans)*. Caltrans requests that each facility improvement project be reviewed as part of the project-level CEQA review to determine if it encroaches on any state facilities. It also states that any encroachment on Caltrans right-of-way would require an encroachment permit, and that CEQA-related environmental studies may be necessary (such as studies related to biological resources, cultural resources, and hazardous materials). The agency indicates that a qualified professional must conduct these studies to satisfy Caltrans' environmental review policies, and that ground-disturbing activities on the site prior to completion and/or approval of the required environmental documents could affect Caltrans' ability to issue a permit for the project.

- *Alameda County Flood Control and Water Conservation District (ACFCWCD)*. The ACFCWCD requests that each facility improvement project that includes pipelines be reviewed as part of the project-level CEQA review to determine if an encroachment permit is required where the pipelines cross the District's channels and creek inverts. The ACFCWCD also states that the project-level CEQA review for the Calaveras Dam Replacement project (SV-2) should include mitigation measures establishing coordination and notification protocols between the SFPUC and the ACFCWCD regarding Calaveras Reservoir releases that could affect the potential for downstream flooding.

- *Alameda County Water District (ACWD)*. The ACWD requests that the Bay Division Pipeline Reliability Upgrade project (BD-1) be coordinated with the ACWD earlier (during the project planning and design phases, rather than during the construction phase) to minimize impacts associated with conflicting water facilities and potential impacts on the ACWD's ability to meet customer demand and fire flow requirements. In addition, the ACWD indicates that all Sunol Valley projects (Alameda Creek Fishery Enhancement, SV-1; Calaveras Dam Replacement, SV-2; Additional 40-mgd Treated Water Supply, SV-3; New Irvington Tunnel, SV-4; SVWTP – Treated Water Reservoirs, SV-5; San Antonio Backup Pipeline, SV-6) need to take into account the potential effects of facility construction on downstream water intakes at ACWD facilities in the flood control channel. The ACWD also states that the project-level CEQA review for the Calaveras Dam Replacement project needs to consider coordination and notification protocols related to Calaveras Reservoir releases that could affect downstream groundwater recharge and the potential for flooding.

- *East Bay Regional Park District (EBRPD)*. The EBRPD requests that each facility improvement project in the Sunol Valley Region be reviewed as part of the project-level CEQA review to determine if it encroaches on EBRPD property. The EBRPD also requests coordination of construction mitigation measures for certain WSIP projects in the Sunol Valley to minimize construction impacts on recreational uses and allow coordination of fire suppression planning and response (including review of traffic control plans). The EBRPD states that the SFPUC needs to coordinate the timing of water releases from Calaveras Dam to maximize benefits to amphibians and anadromous fish species. This issue will be addressed further in the project-level EIR for the Calaveras Dam Replacement project (SV-2).

- *City of Fremont*. The City requests consultation (regarding the applicability of encroachment permits, and development and review of traffic control plans) during the planning and design phases of the Bay Division Pipeline Reliability Upgrade (BD-1), New Irvington Tunnel (SV-4), Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault (BD-3), and any other WSIP projects that could affect the Fremont transportation network.

- *City of Menlo Park*. The City requests coordination of construction mitigation measures for the Bay Division Pipeline Reliability Upgrade project (BD-1) to minimize construction impacts (e.g., access and parking) on local residents and businesses, including the Menlo Business Park.

- *City of Palo Alto*. The City requests early consultation on the BDPL Nos. 3 and 4 Crossovers project (BD-2).

- *Coastside County Water District (CWD)*. Coastside CWD requests consultation during development of the adaptive management program for Crystal Springs Reservoir as part of the operations phase of the Lower Crystal Springs Dam Improvements project (PN-4).

The PEIR serves as a guidance document for all subsequent, project-level CEQA review. The Draft PEIR (Vol. 1, Chapter 3, p. 3-86) indicates that each of the individual WSIP facility improvement projects will undergo project-level CEQA review, and that the environmental documents developed through those reviews will identify needed approvals by local, state, and federal agencies for the individual projects. The SFPUC and the San Francisco Planning Department, Major Environmental Analysis Division will review the agencies identified in updated Table C.6 for applicability and will update the list of agencies as necessary at the time of each project-level review.

In response to comments by numerous agencies requesting early consultation, early coordination, or other information, the Draft PEIR (Vol. 1, Chapter 3, p. 3-86, fourth full paragraph) is revised as follows:

> Each of the individual WSIP facility improvement projects will undergo project-level CEQA review, and CEQA documents developed through those reviews will identify needed approvals by local, state, and federal agencies for individual projects. Table C.6 of Appendix C presents the specific permits and approvals that could be required for individual projects as well as the interested agencies that have requested early consultation and coordination with the SFPUC. Several projects are expected to require U.S. Department of the Army permits to comply with the Clean Water Act, which, in turn, will require compliance with the Federal Endangered Species Act, the Clean Water Act Section 401, and the National Historic Preservation Act. Several projects are expected to require Streambed Alteration Agreements from the California Department of Fish and Game and compliance with the California Endangered Species Act. When individual projects undergo CEQA review, the project's environmental documentation will provide more detailed and up-to-date information on the

required approvals <u>and need for consultation with interested agencies</u>. The approval and adoption of the overall WSIP as a program and policy are distinct actions from the approvals for individual facility improvement projects.

14.4.4 Biological Resources Level of Analysis

Comment Summary

This section of this master response responds to all or part of the following comments:

S_CDFG2-01	SI_SierraC1-01	C_Garba-02
L_ACFCWCD-11	SI_SierraC6-03	C_Genov-01
L_EBRPD-05	SI_SierraC7-04	C_Goldf-02
L_Tuol2-03	SI_TRT2-01	C_Grave-01
SI_ACA1-18	SI_TRT3-03	C_Joye-01
SI_Caltrout-01	SI_TRT6-03	C_MartiM-06
SI_CAREP-01	SI_TRT7-07	C_McCol-01
SI_CNPS-EB1-08	SI_TRT8-04	C_Mijac-01
SI_CNPS-EB1-18	SI_TRT10-03	C_Noren1-01
SI_CNPS-EB1-24	SI_TRT-CWA-SierraC-06	C_Okuzu-01
SI_CNPS-EB1-25	SI_TRT-CWA-SierraC-13	C_Parke-04
SI_CNPS-EB1-27	SI_TRT-CWA-SierraC-14	C_Raffa-05
SI_CNPS-SCV1-04	SI_TRT-CWA-SierraC-85	C_Ross-03
SI_CNPS-SCV1-06	SI_TRT-CWA-SierraC-119	C_Stein-04
SI_CNPS-SCV1-07	SI_TRT-CWA-SierraC-150	C_Sugar-01
SI_CRS-01	C_Berko-04	C_Urdan-01
SI_EcoCtr-01	C_Breso-01	C_VermeJ-01
SI_GreenP-03	C_Clark1-13	C_Weiss-01
SI_KSWC-01	C_Colem2-01	C_Willi-03
SI_SCCCC-03	C_Elbiz-04	

Summary of Issues Raised by Commenters

- The level of detail of biological information presented in the Draft PEIR was not sufficient to support the analysis of impacts, both for the program-level and project-level analyses.

- The baseline (or existing) condition did not take into account the already altered conditions in the Tuolumne River as a result of decades of Hetch Hetchy system operations.

- Using the brief time period when Calaveras Reservoir has been at less than full capacity minimizes the finding of impact.

- Mitigation for the WSIP projects cannot be determined at the current level of program description, so it is not clear how any mitigation (such as the Habitat Reserve Program) can be considered sufficient.

Response

Level of Detail of Data and Analysis for the PEIR

Commenters challenged the adequacy of the PEIR analysis as data-deficient in several ways. Comment SI_CNPS-EB1-18 states that biological surveys must be performed at all sites as part of impact evaluation; Comment SI_CNPS-SCV1-05 specifies the need for a comprehensive study of the Tuolumne River watershed, and Comment SI_CNPS-SCV1-07 specifies the need for quantitative impact assessments before suitable mitigation can be proposed. However, CEQA Guidelines Section 15151 imposes a standard of adequacy that is "reasonably feasible" and sufficient to allow decision-makers to make a decision that takes account of environmental consequences. Data gathering need not be "exhaustive." In cases where the Draft PEIR is a precursor to project-level CEQA analysis (see Section 14.4.2, above), only reasonably expected project impacts and widely applicable mitigations are discussed. It would be unwieldy and inappropriate to evaluate all of the special-status species for the entire program region, and many aspects of the proposed facility improvement projects are so undefined that impacts would be difficult to assess for most individual species. Therefore, where a project-level analysis will be performed in the future, the PEIR preparers concentrated on listed species and sensitive natural communities as representative of the habitat needs of other special-status species, many of which occur in the identified sensitive natural communities. The Draft PEIR's program-level evaluation of the regional WSIP facility projects presented in Chapter 4 defers to the subsequent, project-specific CEQA review of each facility improvement project, at which time impacts and impact receptors will be better defined based on more detailed and site-specific project information. To present more specific findings at the PEIR stage would be speculative, which is discouraged by CEQA Guidelines Section 15145.

Chapter 5 (Vol. 3) of the Draft PEIR addresses the impacts of WSIP water supply and system operations at the project level. Some reviewers commented that the level of detail for these components was insufficient; however, the PEIR impact analysis meets the "reasonably feasible" standard. The analysis of terrestrial biological resources presented in Chapter 5 focused on the current composition and condition of the riparian and wetland systems of the Tuolumne River, Alameda Creek, and Peninsula watersheds, then considered the interactive responses of plant and animal species to hydrologic changes resulting from the WSIP. In the face of this complexity, the PEIR preparers relied on ecological principles, scientific literature, existing data, and site visits to assess potential impacts and develop appropriate mitigation measures. The Draft PEIR analysis was conservative in finding that an impact could be potentially significant if there was any possibility of impacts resulting from predicted hydrologic changes under the proposed WSIP water supply and system operations.

CEQA Baseline

Some commenters (e.g., SI_CNPS-EB1-08) found that baseline conditions for biological resources were not clearly explained. CEQA Guidelines Section 15125 acknowledges the importance of identifying a baseline that best ensures meaningful environmental review. As described above, Chapter 4 of the Draft PEIR provides a programmatic analysis of the facility improvement projects and includes a program-level description of existing conditions for biological resources. More detailed, site-specific baseline conditions will be included in the subsequent, project-specific CEQA review for the individual projects as appropriate.

For the analysis of WSIP water supply and system operations impacts, the Draft PEIR (Vol. 3, Chapter 5) provides a description of baseline conditions tailored appropriately for the type and nature of each impact. Historical and ongoing operation of the Hetch Hetchy system is part of the baseline for the proposed program; however, the ecological impacts of ongoing operations are not relevant to the impact analysis of the WSIP, although they are considered in the cumulative analysis. Nonetheless, in making significance determinations, the PEIR authors did consider the possibility that existing conditions have increased the sensitivity or vulnerability of biological receptors to additional impacts. Riparian ecosystems on the Tuolumne River that are already stressed by water withdrawals could be more vulnerable or sensitive to even small, incremental changes. For example, in the Poopenaut Valley, located in the upper Tuolumne River immediately below O'Shaughnessy Dam, past and ongoing operations have reduced seasonal groundwater recharge below natural levels, with the result that shallow-rooted native meadow vegetation is already stressed and thus vulnerable to any future reduction in seasonal meadow groundwater recharge. Over the long term, water stress and prevailing dry conditions would allow upland species to invade the meadow, reducing the extent and quality of meadow vegetation. This in turn would reduce the meadow's ability to retain water in the root zone of wetland plants, accelerating the meadow degradation. As wetland and riparian habitats in the Poopenaut Valley are considered to be sensitive and are already degraded by ongoing operations, the Draft PEIR determined that any changes in the quantity and timing of releases from O'Shaughnessy Dam under the WSIP would be potentially significant. The analysis also determined that this impact could be mitigated to a less-than-significant level with implementation of Measure 5.3.7-2 (Vol. 4, Chapter 6, pp. 6-49 and 6-50).

In the lower Tuolumne River, the chief habitat effect of WSIP water supply and system operations would be on extant riparian vegetation, which is already greatly reduced and likely stressed. Its maintenance is dependent on the very modest discharges that fill the streams at least occasionally from bank to bank. Thus, the Draft PEIR determined that even an incremental reduction in "bankfull" events due to delayed or absent spring flows under the WSIP would put this vegetation at increased risk. This impact was determined to be potentially significant, but could be mitigated to a less-than-significant level with implementation of Measure 5.3.6-4a (Vol. 4, Chapter 6, p. 6-48) or Measure 5.3.7-6 (pp. 6-50 and 6-51).

With regard to the comment that use of the existing "Calaveras Down" baseline conditions could camouflage the effects of the WSIP on Alameda watershed riparian systems, the Draft PEIR discloses that the current riparian habitat reflects longer-term conditions, and analyzes the potential impacts of the WSIP with this fact in mind(Vol. 3, Chapter 5, p. 5.4.6-18). The Draft PEIR discussion of impacts on riparian vegetation along Alameda Creek, which compares existing "Calaveras Down" conditions to pre-2002 "Calaveras Up" conditions, addresses only willow and mixed riparian habitat along the creek channel (not sycamore alluvial woodland, which is formed and sustained only under very high periodic flows such as those found in unimpeded streams). The distribution of willow and mixed riparian habitats is primarily the result of prevailing flows over several decades: in other words, the operational conditions described as Calaveras Up, which maximized the diversions at the Alameda Creek Diversion Dam prior to the 2001 Division of Safety of Dams (DSOD) restrictions on Calaveras Reservoir and represents the operating conditions for over 70 years prior to the DSOD restriction. The CEQA baseline for the WSIP hydrologic modeling (i.e., Calaveras Down) reflects reduced diversions and therefore increased flows in Alameda Creek below the diversion dam. Although substantially lower than existing flows under the Calaveras Down scenario, the proposed WSIP flows would resemble prior Calaveras Up conditions (i.e., historical operating conditions). As a result, the PEIR concluded that the impact on these riparian habitats would be less than significant.

Consistent with CEQA guidelines, the Draft PEIR uses the conditions present in 2005 as the baseline condition for the analysis of impacts of WSIP water supply and system operations on Alameda Creek (Vol. 3, Chapter 5, p. 5.1-13). This baseline condition (referred to as Calaveras Down due to the DSOD restrictions on Calaveras Dam) provides for a worst-case environmental analysis for hydrological effects since it represents the greatest change in stream flow conditions from those proposed under the WSIP. As described in the Draft PEIR (Vol. 3, Chapter 5, Section 5.1), the impacts of WSIP water supply and system operations were analyzed using the Hetch Hetchy/Local Simulation Model, which uses the existing conditions (i.e., the SFPUC operating conditions and facilities restrictions in 2005) and predicts the reservoir spills and releases (i.e., stream flow conditions downstream from SFPUC reservoirs) over an 82-year period of historical hydrology, and not the actual "brief" period of time during which Calaveras Reservoir has been operated under restricted conditions (i.e., 2002 to the present).

Mitigation for Biological Impacts

Several points were raised (in Comments SI_CNPS-SCV1-04, SI_CNPS-SCV1-07, and others) regarding the adequacy of mitigation for WSIP impacts on biological resources. As described above, the site-specific type and extent of biological resource impacts resulting from the WSIP facility improvement projects can be analyzed only at the project level once the project descriptions have been fully developed. As a result, the type and extent of mitigation for those impacts must also be determined on a project-specific basis at the project EIR stage. As described above, the Draft PEIR provides programmatic mitigation measures for impacts associated with the facility improvement projects, and these measures will be reevaluated and, if applicable, will be confirmed, refined, or replaced with an equivalent measure as part of the subsequent, project-level CEQA review for the individual WSIP projects.

As part of the project-level review, consultation with resource agencies will ultimately determine the type and extent of appropriate mitigation measures. The SFPUC's proposed Habitat Reserve Program (HRP) does not purport to provide compensation for all WSIP impacts, regardless of type or quantity. Rather, the HRP proposes steps to restore, create, or enhance a variety of habitats in several geographic areas in advance of specific project impacts, and the resulting habitat values may be applied to the WSIP projects if deemed appropriate during project-specific agency consultation (see Draft PEIR, Vol. 1, Chapter 3, pp. 3-84 to 3-86). The policies of the California Department of Fish and Game and the USFWS place a priority on implementing mitigation *before* project impacts have occurred in order to reduce the temporal extent and quantity of lost habitat. To accomplish this goal, the HRP proposes to begin habitat improvements before WSIP project implementation.

The WSIP and the HRP are separate but parallel projects, each with its own objectives and environmental analysis. The HRP will receive CEQA analysis through an EIR as a project that is distinct from the WSIP. All HRP actions will be designed to be consistent with the Alameda and Peninsula Watershed Management Plans, Habitat Conservation Plans, and the Watershed and Environmental Improvement Program, but would not overlap with other habitat improvements. Thus, any habitat improvement or enhancement would not be credited twice. In addition, if mitigation opportunities provided by the HRP are not of the type or quantity required for mitigation of the biological resources impacts of a specific WSIP project or any portion of a WSIP project, then other means will be developed and employed to mitigate those impacts.

14.5 Master Response on Water Resources Modeling

14.5.1 Introduction

Overview

This master response addresses questions about the water resources model used for the impact analysis of proposed WSIP water supply and system operations. Commenters raised questions about the model itself, the appropriateness of its use for the Draft PEIR, the assumptions used in the modeling analysis, and the model output. This master response is organized by the following subtopics:

14.5.2 Model Availability
14.5.3 Model Time Interval
14.5.4 Use of Year Type Averages
14.5.5 Model Validation
14.5.6 Modeling Assumptions
14.5.7 Model Limitations for Pilarcitos Creek Watershed
14.5.8 Units of Measure
14.5.9 Model Results for Tuolumne River Diversions

Commenters

Commenters that addressed this topic include:

Federal Agencies

- None

State Agencies

- None

Local and Regional Agencies

- Modesto Irrigation District and Turlock Irrigation District – L_MIDTID
- Alameda County Water District – L_ACWD

Groups

- Republicans for Environmental Protection, Protection Commissioner – SI_CAREP
- California Native Plant Society – SI_CNPS
- California Native Plant Society, Santa Clara Valley Chapter – SI_CNPS-SCV1
- California Native Plant Society, Willis L. Jepson Chapter – SI_CNPS-WLJ
- Center for Resource Solutions – SI_CRS
- Environmental Defense – SI_EnvDef
- Northern California/Nevada Council of the Federation of Fly Fishers Steelhead Committee – SI_NCFFSC

- Pacific Institute – SI_PacInst
- Coalition for San Francisco Neighborhoods – SI_SFNeigh
- Sierra Club – SI_SierraC6, SI_SierraC7
- Tuolumne River Trust – SI_TRT3, SI_TRT6, SI_TRT7, SI_TRT8, SI_TRT9, SI_TRT10
- Tuolumne River Trust/Clean Water Action/Sierra Club, San Francisco Bay Chapter – SI_TRT-CWA-SierraC

Citizens

- Allison, Rita – C_Allis
- Berkowitz, Allan – C_Berko
- Beviacqua, John – C_Bevia
- Bourke, Sean – C_Bourk
- Boutin, Dolores – C_BoutiD
- Chiapella, Lynn – C_Chiap
- Collin, Robert – C_Colli
- Davey, Mary – C_Davey
- Duperrault, Fred – C_Duper
- Gelman, Robert – C_Gelma
- Hamilton-Lam, Kimberly – C_Hamil
- Hoffman, Jeff – C_Hoffm
- Kim, Michelle – C_Kim
- Lee, Aldora – C_Lee
- Maddock, Tyana – C_Maddo
- Madou, Ramses – C_Madou
- Mindelzun, Naomi – C_MindeN
- Mindelzun, Robert – C_MindeR
- Okuzumi, Margaret – C_Okuzu
- Raffaeli, Paul – C_Raffa
- Schmidt, Ron – C_SchmiR
- Schriebman, Judy – C_Schri
- Symons, Barbara – C_Symon
- Thollaugh, Julia – C_Tholl
- Unreadable commenter name – C_Unreadable4

The PEIR addresses this topic area in Vol. 3, Chapter 5, Section 5.1.4, pp. 5.1-7 to 5.1-18. Additional information on the model and the detailed modeling results are contained in Vol. 5, Appendices H1 and H2, with further updated model information in Vol. 8, Appendix O.

14.5.2 Model Availability

Comment Summary

This section of this master response responds to all or part of the following comments:

L_MIDTID-01

Summary of Issues Raised by Commenters

- TID and MID requested that the model used in the analysis be made available to them so they could check the assumptions, and requested a 60-day comment period after receipt of the model.

Response

In response to the request by TID and MID, on October 4, 2007 the San Francisco Planning Department sent both agencies a CD containing hydrologic model output as well as related files to help them understand the data. In addition, a meeting was held on November 28, 2007 to discuss the Hetch Hetchy/Local Simulation Model (HH/LSM) and its use for the Draft PEIR;

representatives from TID, MID, the SFPUC, and the PEIR consultant team (representing the San Francisco Planning Department) attended the meeting. The SFPUC representative described how the HH/LSM was used to analyze the WSIP water supply and system operations and to estimate its effects on Tuolumne River flows, and identified the assumptions used in the analysis. A slide presentation was made and hard copy of the presentation provided to meeting attendees (included as an attachment to **Response L_MID-TID1**). The meeting was conducted informally, and the TID and MID attendees asked questions throughout the presentation.

The SFPUC representative noted that the assumptions and modeling approach used in the HH/LSM for TID and MID are consistent with the assumptions and approach used by the California Department of Water Resources (DWR) and the U.S. Bureau of Reclamation (USBR) in their modeling of the San Joaquin River using CalSim II, the statewide model developed by these agencies for planning purposes. The assumptions and approach used in the HH/LSM are also consistent with those used in modeling for MID's municipal water treatment plant.

At the end of the meeting, the TID and MID representatives indicated that the SFPUC representative had satisfactorily answered all of their questions with respect to the HH/LSM. The SFPUC transmitted an executable copy of the model to the Districts on December 21, 2007.

The San Francisco Planning Department declined to extend the comment period on the Draft PEIR as requested by the Districts.

14.5.3 Model Time Interval

Comment Summary

This section of this master response responds to all or part of the following comments:

L_ACWD-11	SI_TRT-CWA-SierraC-83	SI_TRT-CWA-SierraC-175
SI_TRT-CWA-SierraC-46	SI_TRT-CWA-SierraC-101	SI_TRT-CWA-SierraC-110
SI_TRT-CWA-SierraC-48	SI_TRT-CWA-SierraC-105	SI_TRT8-05
SI_TRT-CWA-SierraC-49	SI_TRT-CWA-SierraC-107	C_Hughe1-01
SI_TRT-CWA-SierraC-50	SI_TRT-CWA-SierraC-141	C_Hughe2-02
SI_TRT-CWA-SierraC-53	SI_TRT-CWA-SierraC-158	
SI_TRT-CWA-SierraC-82	SI_TRT-CWA-SierraC-167	

Summary of Issues Raised by Commenters

- The HH/LSM predicts monthly average values of river flow, which are inappropriate for analyzing environmental elements that may be affected by hourly, weekly, or daily flows (biological resources) or peak flows (geomorphology) that occur rarely.

Response

The impact analysis in the Draft PEIR used a combination of approaches as deemed appropriate for the specific impact and resource being analyzed. The analysis of WSIP water supply and system operations (Vol. 3, Chapter 5) was based on modeled monthly flow data using the

HH/LSM and supplemented with data derived from operational records and stream flow gages as needed. As described in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.1-7 to 5.1-18), the HH/LSM is a state-of-the-art model of the regional water system developed by the SFPUC for water supply planning and is the best available tool for predicting reservoir releases/spills under various operating scenarios. It was used in the Draft PEIR to estimate the effects of the WSIP water supply and system operations on river and creek flows downstream of SFPUC reservoirs compared to the existing condition. The SFPUC has been improving and refining the model during more than 10 years of use (see Section 14.5.5, Model Validation, below), but like all models that simulate complex systems, it involves various simplifying assumptions, including the use of a monthly time-step.

As described below, monthly flow estimates derived from the HH/LSM output provide an accurate depiction of conditions in most cases and are appropriate for use in assessing impacts. During many months of the year, large portions of the regional system operations often do not vary on a daily or weekly basis. For those time periods, the HH/LSM results were useful and appropriate in assessing impacts on fish, wildlife, and riparian vegetation. However, for other times of the year, reservoir operations require adjustments more frequently than once per month due to circumstances such as changing hydrological and meteorological conditions. For the impact analysis during those periods, the HH/LSM data were supplemented with operational and daily flow records to estimate flow changes and to assess impacts. A more detailed description of how HH/LSM data were used in combination with other data in the impact analysis is presented below.

For the impact analysis of resources in the Tuolumne River between Hetch Hetchy and Don Pedro Reservoirs, monthly flow estimates derived from the HH/LSM provide an accurate depiction of actual conditions for most months of the year. Flow in this reach of the river consists entirely of releases from Hetch Hetchy Reservoir. During the late summer, fall, winter, and early spring, dam operators typically release only the required minimum instream flow. Currently, this condition exists about 84 percent of the time; with the WSIP, it would occur about 85 percent of the time. During periods when only minimum releases are being made, the release rate does not vary on a day-to-day or week-to-week basis. The SFPUC operators adjust the release rate monthly as necessary to comply with the minimum release schedule, which is specified in terms of monthly releases. Consequently, the monthly flows estimated using the HH/LSM and presented in the Draft PEIR provide an accurate characterization of flow in the Tuolumne River below O'Shaughnessy Dam more than 80 percent of the time. During such times, flow in the river below the dam varies very little, and the daily, weekly, and monthly average flow rates are essentially the same; as a result, the flow estimates from the HH/LSM are useful in assessing impacts on fish and riparian vegetation and wildlife.

The HH/LSM results for monthly reservoir releases during the snowmelt period do not provide a complete characterization of river flow because dam operators may adjust releases to the river more frequently than once per month. At the beginning of the snowmelt period, when storage in Hetch Hetchy Reservoir is at its seasonal minimum, operators typically use most of the inflowing snowmelt to fill the reservoir, releasing only the minimum required to the river below O'Shaughnessy Dam. Once the reservoir has filled, or it becomes apparent that the reservoir will fill based on projections of inflow, operators begin to release more than the minimum required to the river below the dam. The release rate may be adjusted every few days based on the volume of water flowing into the reservoir and the volume of water exiting the reservoir via the Canyon Tunnel. Consequently, monthly averages alone do not provide a good characterization of river flow during the snowmelt period. Therefore, the HH/LSM analysis for the snowmelt period was supplemented by performing a second analysis based on operational records of representative years, which enabled daily flows to be estimated. The estimates of daily flows in the Tuolumne River below O'Shaughnessy Dam in 1999 are shown in Draft PEIR Figure 5.3.1-10 (Vol. 3, Chapter 5, p. 5.3.1-28). For the snowmelt period, daily flow information was used in assessing impacts on fish and riparian vegetation and wildlife.

Circumstances in the Tuolumne River below La Grange Dam are similar to those in the river below O'Shaughnessy Dam. Flow in this reach of the river consists entirely of releases from La Grange Dam. During the late summer, fall, winter, and early spring, dam operators typically release only the required minimum instream flow. Currently, this condition occurs about 73 percent of the time; with the WSIP, it is estimated to occur about 74 percent of the time. Releases in excess of the minimum required occur primarily during the late spring snowmelt period, but may also occur in the late fall and winter as operators adjust storage in Don Pedro Reservoir in response to rainfall and to maintain compliance with flood storage requirements. When releases in excess of the minimum required are necessary, operators may adjust releases daily, and so the average monthly flow estimates from the HH/LSM do not by themselves provide a good characterization of flow in the river. Consequently, the analysis using the HH/LSM was supplemented by performing a second analysis based on TID's operational records, which enabled daily flows to be estimated (TID operates Don Pedro Reservoir and La Grange Dam). The estimates of daily flows in the Tuolumne River below La Grange Dam in 2000 are shown in Draft PEIR Figure 5.3.1-13 (Vol. 3, Chapter 5, p. 5.3.1-37). Again, for the snowmelt period, daily flow information was used in assessing impacts on fish and riparian vegetation and wildlife.

The HH/LSM was also used in the Draft PEIR to analyze the effects of the WSIP on local watersheds in the Bay Area, including watersheds of Alameda, San Mateo, and Pilarcitos Creeks. In each case, the average monthly flow estimates derived using the monthly time-step model were supplemented by performing additional analysis based on U.S. Geological Survey (USGS) gage data and/or operational records that provide insight into daily flows. Section 5.4.1 (Vol. 3, Chapter 5, pp. 5.4.1-10 to 5.4.1-33) relies on HH/LSM results in combination with daily flow gage data from the USGS, including instantaneous data (15-minute readings) from 1997 to 2007, to fully and appropriately analyze the effects of the WSIP on flows in Alameda Creek; this overall data, in turn, is used to analyze effects on downstream fish and riparian resources.

Estimates of monthly river flows derived from the HH/LSM output are only marginally useful for the assessment of impacts on geomorphology. Channel form and sediment transport are most influenced by peak flows, which the HH/LSM does not estimate. When estimates of peak flows were needed, they were derived through a statistical analysis of long-term flow gaging records.

It should be noted that the SFPUC's use of a monthly time-step model such as the HH/LSM is typical of many water systems. Water managers conventionally use monthly time-step models to simulate water system operations for planning purposes. For example, the CalSim II model used by the DWR and USBR for statewide water planning is a monthly time-step model. If monthly time-step model output does not reflect a water manager's experience or expectations, the manager may use professional judgment in refining and extrapolating from model results to provide insight into weekly or daily operations. Models with a shorter time interval than monthly typically tier off the results of a monthly time-step model. Models with a shorter time-step are not widely developed or used because monthly time-step models are sufficient for most planning purposes.

Monthly time-step models are also often used in CEQA documents. Two examples of CEQA documents that used CalSim II are the Draft EIR on the Monterey Amendment to the State Water Project Contracts (DWR, 2007) and the Environmental Water Account EIS/EIR (DWR and USBR, 2003).

14.5.4 Use of Year Type Averages

Comment Summary

This section of this master response responds to all or part of the following comments:

SI_SierraC6-03	SI_TRT-CWA-SierraC-102	C_Hughe2-02
SI_TRT-CWA-SierraC-47	SI_TRT-CWA-SierraC-110	
SI_TRT-CWA-SierraC-82	SI_TRT-CWA-SierraC-141	

Summary of Issues Raised by Commenters

- River flow data from the model are sorted into year types and presented as averages within year types; the use of averages within year types is inappropriate for the purpose of for environmental analysis because it conceals extreme values and understates impacts.

Response

The HH/LSM estimates reservoir releases in every month of the 82-year hydrologic record, which enables estimates to be made of river flow in 984 individual months. There is no single perfect way to examine and present data of this type. The data are voluminous and difficult to interpret without simplification, and describe highly variable phenomena—that is, river flow, reservoir storage, and other hydrologic information. Data from each month can be averaged, and the result provides a piece of information that helps to roughly characterize the phenomena. At the other end of the scale, each individual monthly flow estimate can be examined to provide a more refined characterization, but one that is limited to a single month in an 82-year period. According to the technical specialists who run the model, the most practical approach is to use some combination of averaging data and examining data from individual months. This was the approach used for the Draft PEIR, as described below. It was also used for the Monterey Amendment EIR and the Environmental Water Account EIS/EIR referred to above in Section 14.5.3.

Averaging data within year types often provides insight into how a water system operates under different hydrologic conditions. For example, Draft PEIR Table 5.3.1-5 shows estimated monthly flows in the Tuolumne River below O'Shaughnessy Dam (Vol. 3, Chapter 5, p. 5.3.1-26). The table indicates that flow in the river in October, November, and December of all hydrologic year types is about the same, but that average monthly flow in June of wet years may be as high as 4,500 cubic feet per second (cfs)—about 20 times greater than in dry years. Although this information helps to characterize the pattern of river flows, it is recognized that conditions in any one wet or dry year may deviate considerably from the average. Draft PEIR Figure 5.3.1-9 shows reservoir releases in each month in the 984-month hydrologic record (Vol. 3, Chapter 5, p. 5.3.1-23). As the figure shows, although the average monthly flow in June of wet years averages 4,500 cfs, it can be as great as 7,500 cfs on rare occasions.

The monthly data used to create Table 5.3.1-5 and Figure 5.3.1-9 (Vol. 3, Chapter 5, pp. 5.3.1-5 and 5.3.1-23) are provided in the Draft PEIR (Vol. 5, Appendix H2-1). Monthly flow data derived from the HH/LSM were supplemented by information on daily flows shown in Figures 5.3.1-10 and 5.3.1-13 of the Draft PEIR (Vol. 3, Chapter 5, pp. 5.3.1-28 and 5.3.1-37). The monthly and daily flow data were used in combination to determine environmental impacts.

14.5.5 Model Validation

Comment Summary

This section of this master response responds to all or part of the following comments:

SI_TRT-CWA-SierraC-47	SI_TRT-CWA-SierraC-100	SI_TRT-CWA-SierraC-102
SI_TRT-CWA-SierraC-52	SI_TRT-CWA-SierraC-101	SI_TRT-CWA-SierraC-158

Summary of Issues Raised by Commenters

- The model's error and accuracy should be specified.

Response

The evaluation of physics-based hydrologic models such as the HH/LSM (i.e., models relying on the physics of water movement) is generally based on three different measures: calibration, verification, and validation. Calibration of a model is needed when the hydrologic parameters required to simulate the water movement are not available, and the model must use those parameters during simulations; however, because historical stream flow and water demand data are explicitly incorporated in and formulated as part of the HH/LSM, separate calibration (as is typically required for a numerical model) was not required for the HH/LSM.

Verification refers to the accuracy of computations in a model; however, because the HH/LSM is not a numerical model based on complex equations, verification related to numerical stability is not an issue. The HH/LSM is a simple mass-balance model designed with checks and balances to ensure that the basic principle of "conservation of mass" is maintained (i.e., that all water is accounted for in the system at all times, and that inflow balances with outflow and storage). The

HH/LSM is a linked-node model wherein an input of water to one part of the system—such as inflow to a reservoir—must balance with the output/storage from that same part of the system—such as the combination of releases from the reservoir, evaporation or losses from the reservoir, and a change in storage in that same reservoir. Similarly, water diverted into a pipeline must be accounted for through releases from that same pipeline. This system of checks and balances provides a built-in verification of the underlying mass-balance principle that forms the basis for the HH/LSM.

Validation refers to how well the output of the model matches the experimental or observed data. The HH/LSM is a long-term planning model that provides a simulation of water system operations over a range of hydrologic conditions. It is based on a consistent set of physical and institutional constraints (e.g., reservoir and pipeline capacities, flow requirements below reservoirs, and unimpaired runoff) and a systematic set of operational protocols that direct the operation of the water system. The model was designed to inform and direct the *long-term planning* of the system and not its *short-term operations*. Consequently, comparing absolute values of simulated operations with actual reservoir storage at the end or beginning of every hydrologic year has not been the objective of the HH/LSM.

Therefore, validation of the accuracy of the HH/LSM relates to how well the model portrays SFPUC water system operations within the context of the model's purpose. The complex operational rules incorporated into the model are based on historical data and the experience of operators, and thus achieve the best possible representation of the system for reliable and efficient system planning. In other words, the operational rules incorporated into the model are not hypothetical. The HH/LSM has been continuously refined for more than 10 years based on the modelers' expert knowledge as well as SFPUC system operators' periodical review of the model output. The model has produced reasonable and consistent results that have been confirmed by system operators and validate not only the results of the model but also the representation of the system. This continuous refinement of the HH/LSM, based on periodic review of the accuracy of the model by system modelers and operators, encompasses the generally expected validation requirements for this type of mass-balance model. For example, as described in Section 13.3 (Vol. 7, Chapter 13), the SFPUC conducted updated model runs in 2008 following publication of the Draft PEIR using more recent input assumptions for several model parameters as part of its ongoing system planning and management. And, as discussed in that section, the resulting output data were generally consistent with the 2007 data used in the Draft PEIR. The refined HH/LSM results were incorporated as appropriate into the Comments and Responses document.

In addition, the HH/LSM has been externally verified and validated on a number of occasions. The model was used in support of an application to amend the license for the Don Pedro Project, which was submitted to the Federal Energy Regulatory Commission (FERC) in 1993 and 1994. FERC approved the use and results of the model. The model was reviewed again in 2005, as part of the *Water Supply Improvement Program Assessment* (Parsons-CH2MHILL, 2005). The model review focused on each element of the HH/LSM to determine if the model input data, assumptions, operational criteria, and results were within the expected range of practice for this type of model application. The review included verification and validation of input hydrology, system demands, reservoir target, storage levels and capacities, transmission system flow capacities, general operations criteria, and simulation procedure logic. The reviews concluded that the comparison of HH/LSM results with historical operations provides a reasonable simulation of system deliveries and reservoir storage values for the existing SFPUC regional water system. Similarly, as applied to the long-term planning purposes for which the model was designed, the reviews also concluded that the representation of the existing SFPUC system is reasonably incorporated by procedural simulation logic. Such external reviews have additionally and independently validated the HH/LSM.

In conclusion, use of a model to simulate actions in a water system is a valid and widely used practice employed by many water agencies in the United States, including the DWR, and model results can provide adequate and acceptable data for both system planning purposes as well as for environmental analysis. The SFPUC considers the HH/LSM results to reasonably portray the current and anticipated operation of the regional water system under the scenarios developed in the PEIR, and the San Francisco Planning Department has determined that the HH/LSM is a reasonable and appropriate tool to use in assessing environmental impacts of the proposed WSIP water supply and system operations on resources in the Tuolumne River, Alameda Creek, and Peninsula watersheds.

14.5.6 Model Assumptions

Comment Summary

This section of this master response responds to all or part of the following comments:

SI-TRT-CWA-SierraC-10	SI-TRT-CWA-SierraC-69	SI_TRT-CWA-SierraC-177
SI_TRT-CWA-SierraC-30	SI_TRT-CWA-SierraC-70	SI_TRT-CWA-SierraC-188
SI_TRT-CWA-SierraC-55	SI-TRT-CWA-SierraC-76	
SI-TRT-CWA-SierraC-68	SI-TRT-CWA-SierraC-79	

Summary of Issues Raised by Commenters

Questions regarding the model assumptions for:

- Future water demand and water conservation/recycling
- Future hydrology
- Future TID/MID diversions from the Tuolumne River
- Future instream flow releases at La Grange Dam

Response

Future Water Demand and Water Conservation/Recycling

For discussion of assumptions related to water demand and future water conservation and recycling, please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14). Those assumptions were incorporated into the HH/LSM input as part of the system customer purchase request/demand.

Future Hydrology

In the modeling performed for the Draft PEIR, future hydrology was assumed to be a recurrence of the historical hydrology. Although there is inherent uncertainty regarding whether historical hydrology will be repeated in the future—especially given the evolving information on the potential effects of global climate change—the use of historical data over 82 years provides a wide enough range of interannual variation to address the future hydrology with climate change effects expected by 2030 for the purposes of the PEIR. Use of historical hydrologic data is still the conventional practice in water supply system modeling, although many water agencies are examining potential climate change effects on future hydrology as well as on future water supply planning and management. Please refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14) for more information on the effects of global climate change as it relates to the Draft PEIR impact analysis.

Although the modeling for the WSIP relied on historical hydrologic data, the SFPUC's water supply planning does assume that future droughts could be more severe than historical droughts. The SFPUC chose a design drought more severe than any drought in the hydrologic record because of San Francisco's unusual vulnerability in droughts and its experiences during earlier droughts. Most agricultural water agencies and many municipal water agencies have both surface and groundwater supply sources. During droughts, these agencies can increase pumping from their groundwater sources to make up for any shortfall in surface water supplies. When planning for the future, these agencies typically establish their design drought based on the historical record. If the historical record proves to be unreliable, and droughts more severe than those in the historical record occur, these agencies can turn to their groundwater supplies or, in the case of the agricultural water agencies, fallow some land. In this way, these agencies can avoid severe economic losses.

Unlike these agencies, however, the SFPUC depends almost exclusively on surface water supplies, and its water rights are restricted in a manner that means little or no water is available to the SFPUC from its primary source, the Tuolumne River, in very dry years. As a result, the risk of a severe water shortage, with the attendant economic losses, is much greater for the SFPUC's retail and wholesale customers who rely solely on the regional system for their water than for most other urban or agricultural communities. Because of these circumstances, the SFPUC must take a more conservative posture than many water agencies when it chooses a design drought. Although the SFPUC's design drought was not selected with climate change in mind, it does provide the SFPUC with a margin of safety in water supply planning if the climate becomes drier.

Future TID/MID Diversions from the Tuolumne River

The assumptions regarding water diversions by the SFPUC, TID, and MID used in the Draft PEIR analysis of the WSIP are consistent with the assumptions used by the DWR in developing the *California Water Plan*; these data were used as input to the HH/LSM studies used in the Draft PEIR analysis. TID and MID's water use rates were based on a DWR model which, for a given crop pattern, estimates the amount of water farmers will need to grow crops in a given month, taking account of precipitation and evapotranspiration. Part of the farmers' water needs in the TID and MID service areas is met with groundwater and the remainder is supplied from the

Tuolumne River. Depending on conditions in Don Pedro Reservoir, TID and MID may not be able to supply all of the surface water that farmers need every year. Under existing conditions, the model estimates that TID and MID need to divert an average of 867,000 acre-feet per year at La Grange Dam for crop irrigation and delivery system operation.

With respect to future diversions of Tuolumne River water by TID and MID at La Grange, the analysis in the Draft PEIR assumed that the future (2030) need for water for agricultural irrigation would be the same as the present need. This assumption was based on the projection that agricultural lands in the TID and MID service areas are already fully developed, and so agricultural water use would not be expected to increase. Municipal use of Tuolumne River water in the TID and MID service areas is expected to increase considerably by 2030, but the increase would be offset by a reduction in agricultural use of Tuolumne River water.

Until recently, TID and MID provided surface water exclusively to agricultural users, and the municipalities in the TID and MID service areas obtained their water from groundwater wells. Farmers in the service areas obtained surface water from TID and MID and groundwater from wells. Because some of the wells in the TID and MID service areas are contaminated with small amounts of agricultural chemicals, they are more suitable for agricultural use than municipal use. The municipalities, together with TID and MID, have developed plans for regional surface water systems that would supply high-quality Tuolumne River water to municipal water users and reduce the municipal use of wells. Tuolumne River water flowing in the Turlock and Modesto Canals would be diverted to water treatment plants and, after treatment, delivered to municipal water users.

As described in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.7-10 and 5.7-11), MID's municipal water treatment plant, which has a capacity of 30 million gallons per day (mgd) and serves the city of Modesto, was put in service in 1994. Its capacity is currently being expanded to 60 mgd, and the expanded plant will be in service in 2009. TID's water treatment plant is under construction and will have a capacity of 42.5 mgd. The plant will serve the city of Turlock and several other communities and will be operational in 2010. As municipalities increase their use of surface water and decrease their use of groundwater, more groundwater would become available for agricultural use. Agricultural users would increase their use of groundwater and decrease their use of Tuolumne River water.

Some reduction in agricultural water use and an increase in municipal water use is also expected as agricultural lands are converted to residential and commercial areas. But agricultural land and housing subdivisions use roughly equivalent amounts of water, so the land use change would not have much effect on overall water use.

A commenter notes that MID's urban water management plan indicates the District's demand for municipal water will increase by 70 percent by 2030, and that this figure seems inconsistent with the assumption of no increase in diversions by MID and TID at La Grange Dam. However, any projected increased use of Tuolumne River water to serve projected urban growth in the MID service area or to serve customers switching from groundwater to Tuolumne River water would be offset by a corresponding reduction in agricultural use of Tuolumne River water, as described above.

Although global climate change could cause an increase in future agricultural water use in the TID and MID service areas, other factors such as land use conversion and agricultural market forces make it too speculative at this time to quantify potential changes in agricultural water demand. Please refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14) for further discussion.

Future Instream Flow Releases at La Grange Dam

The SFPUC assumed that the required instream releases at La Grange Dam in support of fisheries would remain the same as the current releases. Continuation of the current releases is a reasonable future scenario, and any other assumption would be speculative. For further discussion of instream releases, please refer to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.4).

14.5.7 Model Limitations for Pilarcitos Creek Watershed

Comment Summary

This section of this master response responds to all or part of the following comments:

SI_TRT-CWA-SierraC-79

Summary of Issues Raised by Commenters

- The model limitations for the Pilarcitos Creek watershed should be explained.

Response

Model limitations for the Pilarcitos Creek watershed are described briefly in the Draft PEIR (Vol. 3, Chapter 5, p. 5.1-14). The analysis in the Draft PEIR used the best available information from the 2007 HH/LSM model runs, even though it did not fully represent operations at Pilarcitos Reservoir. This element of the HH/LSM has been modified, and updated model runs have been conducted that provide an improved representation of that system, as described in Chapter 13, Section 13.3 of this document. The updated model runs did not identify any environmental impacts that were not reported in the Draft PEIR, but they did enable the impacts to be better described. Some text changes have been made in the sections of the Draft PEIR that describe the impacts of the WSIP in the Pilarcitos Creek watershed (see the staff-initiated text changes for Section 5.5 in Vol. 7, Chapter 16).

Although the modifications to the model improved the HH/LSM's ability to simulate storage in Pilarcitos Reservoir and flows in Pilarcitos Creek, the changes to the model assumptions in the Pilarcitos system have a negligible effect on other elements of the SFPUC water system. This is because storage in Pilarcitos Reservoir represents only about 0.5 percent of the SFPUC's total water storage capacity, and water production from its watershed represents only about 1.2 percent of the deliveries under the WSIP.

14.5.8 Units of Measure

Comment Summary

This section of this master response responds to all or part of the following comments:

L_MID-TID1-04
SI_TRT-CWA-SierraC-81

Summary of Issues Raised by Commenters

- Requests for the use of consistent units of measure in the Draft PEIR.

Response

No single unit of flow is the best descriptor of a hydrologic element in all cases. In describing their overall operations, agricultural water agencies typically use acre-feet per year as their primary unit, whereas municipal water agencies use million gallons per day (expressed as an average of all days in the year). Flow in rivers, on the other hand, is usually expressed in cubic feet per second. The Draft PEIR uses the units that were appropriate for the particular circumstances. However, it is recognized that readers may want to convert one unit to another for comparison purposes. Conversion factors are included in the Draft PEIR at the end of the glossary and acronyms (Vol. 1, p. xxxviii) and are as follows:

1 million gallons per day = 1,120 acre-feet per year = 1.55 cubic feet per second

14.5.9 Model Results for Tuolumne River Diversions

Comment Summary

This section of this master response responds to all or part of the following comments:

SI_CAC2-06
SI_CAREP-01
SI_CNPS-01
SI_CNPS-SCV1-05
SI_CNPS-WLJ-01
SI_CRS-02
SI_EnvDef-03
SI_PacInst-84
SI_NCFFSC-01
SI_SFNeigh-02
SI_SierraC6-01
SI_SierraC7-01
SI_TRT3-01
SI_TRT6-01
SI_TRT7-01
SI_TRT8-01
SI_TRT8-07
SI_TRT9-01
SI_TRT10-01
SI_TRT-CWA-SierraC-81
C_Allis-01
C_Berko-01
C_Bevia-01
C_Bourk-01
C_BoutiD-01
C_BramlD2-01
C_Chiap-03
C_Colli-03
C_Davey-01
C_Duper-01
C_Gelma-01
C_Hamil-01
C_Hoffm-01
C_Kim-01
C_Lee-02
C_Maddo-01
C_Madou-01
C_MindeN-01
C_MindeR-01
C_Okuzu-01
C_Okuzu-02
C_Raffa-03
C_SchmiR-01
C_Schri-01
C_Symon-01
C_Tholl-01
C_Unreadable4-01

Summary of Issues Raised by Commenters

- Confusion regarding the magnitude of increased diversions from the Tuolumne River compared to the increase in purchase requests in 2030.

Response

Many comments indicated confusion about the estimates provided in the Draft PEIR for the increase in customer purchase requests by 2030 compared to the increase in Tuolumne River diversions under the WSIP. The confusion derives from PEIR statements regarding a *25 mgd increase in purchase requests* and a *27 mgd increase in diversions from the Tuolumne River*. As explained below, these two estimates are different, since they represent distinct, though related, system parameters. For clarification, these system parameters are defined as follows:

- *Purchase requests* represent the customer demand for water from the SFPUC regional system; this term is used interchangeably with *demand on the regional system*. This concept differs from simple “demand,” since demand for some customers is served by sources other than the SFPUC regional system.
- *Diversions* represent water from the supply sources (such as the Tuolumne River or Alameda Creek) that is transferred either to customers or to storage.
- *Deliveries* represent the portion of diversions that is transmitted to customers.

Purchase Requests

On an average annual basis, customer purchase requests from the regional water system are currently 265 mgd and, by 2030, are projected to be 300 mgd—an increase of 35 mgd over the existing condition (Vol. 1, Chapter 3, p. 3-33). Under the WSIP, 10 mgd of this increase in purchase requests would be met by recycled water, groundwater, and conservation in San Francisco, and the adjusted purchase requests under the WSIP would be 290 mgd. The SFPUC proposes to serve the remaining 25 mgd of increased purchase requests from a combination of increased diversions from the Tuolumne River and improvements to the local watershed system (primarily attributable to the restoration of full capacity at Calaveras and Crystal Springs Reservoirs). In summary, the estimates for determining the average annual increase in customer purchase requests are shown in **Table 14.5-1**, below.

Deliveries

Under the existing condition, the regional system does not have sufficient water supply, stored water, or supplemental water sources to fully meet customer purchase requests during extended dry periods, at which time the SFPUC must impose rationing. Therefore, during these periods, deliveries from the regional system are less than the customer purchase requests. The HH/LSM results indicate that over the 82-year historical hydrology, the SFPUC’s average annual system deliveries to customers are approximately 258 mgd of the 265 mgd in purchase requests (approximately 97 percent) due to the shortfall in deliveries when rationing is imposed during droughts. The analysis in the Draft PEIR indicated that the source of the 258 mgd in system

TABLE 14.5-1
AVERAGE ANNUAL CUSTOMER PURCHASE REQUESTS FROM THE REGIONAL SYSTEM
(average annual, mgd)

Scenario	Customer Purchase Requests
WSIP, 2030	300
Amount of purchase requests to be met with recycled water/groundwater/conservation in San Francisco	10
Adjusted purchase requests, 2030	290
Existing condition, 2005	265
Total increase in purchase requests under the WSIP to be met by Tuolumne River and local watershed supplies	25

NOTE: Data shown from Draft PEIR, Vol. 1, Chapter 3.

deliveries consists of an average annual amount of 218 mgd from the Tuolumne River and 40 mgd from the local watersheds.

Under the WSIP by 2030, the SFPUC would substantially improve overall delivery reliability and would be able to meet customer purchase requests more consistently than it currently does. However, during extended droughts, the system would still be unable to fully meet customer purchase requests, even though it would implement supplemental dry-year water sources, including water transfers from TID and MID and a conjunctive-use program in the Westside Groundwater Basin. The SFPUC would still need to impose rationing, but it would be limited to 20 percent systemwide. The HH/LSM results indicate that over the 82-year historical hydrology, the average annual system deliveries to customers under the WSIP would be approximately 287 mgd of the 290 mgd in purchase requests (approximately 99 percent), indicating improved delivery reliability over existing conditions. The Draft PEIR analysis showed that on an average annual basis, the 287 mgd would consist of 245 mgd in deliveries from the Tuolumne River and 42 mgd in deliveries from the local watersheds. The estimates for determining the average annual system deliveries from the SFPUC's water sources under existing and proposed conditions are shown in **Table 14.5-2**.

TABLE 14.5-2
SOURCE OF CUSTOMER DELIVERIES FROM THE REGIONAL SYSTEM
(average annual, mgd)

Scenario	Total System Customer Deliveries	Tuolumne River Diversions for Customer Deliveries	Local Watershed Diversions for Customer Deliveries[a]
WSIP, 2030	287	245	42
Existing Condition, 2005	258	218	40
Increase under the WSIP	29	27	2

[a] The increase in local watershed diversions under the WSIP is due to the restored capacity in Calaveras and Crystal Springs Reservoirs.

NOTE: Data shown based on 2007 HH/LSM studies; refer to Appendix H (Vol. 5).

Diversions

As indicated in Table 14.5-2, the SFPUC currently diverts an estimated annual average of 218 mgd from the Tuolumne River, and, under the WSIP, this amount would increase to 245 mgd. Thus, as stated in the Draft PEIR (Vol. 4, Chapter 9, p. 9-13), the estimated increase in diversions from the Tuolumne River for customer deliveries would be 27 mgd.

14.6 Master Response on Upper Tuolumne River Issues

14.6.1 Introduction

Overview

This master response addresses questions and comments about the impact analysis for the upper Tuolumne River; that is, the river between O'Shaughnessy Dam and Don Pedro Reservoir. This master response is organized by the following subtopics:

14.6.2 Minimum Required Instream Flows
14.6.3 Adequacy of Data on Streamside Meadows
14.6.4 Mitigation Measure 5.3.7-2
14.6.5 Impacts on Flow/Hydrology
14.6.6 Impacts on Geomorphology
14.6.7 Impacts on Water Quality

Commenters

Commenters that addressed this topic include:

Federal Agencies

- None

State Agencies

- California State Assembly – S_CSA

Local and Regional Agencies

- Tuolumne County – L_Tuol2

Groups

- California Trout – SI_Caltrout
- Center for Resource Solutions – SI_CRS
- Ecology Center – SI_EcoCtr
- Greenpeace – SI_GreenP
- Klamath-Siskiyou Wildlands Center – SI_KSWC
- Republicans for Environmental Protection – SI_CAREP
- Santa Clara County Creeks Coalition – SI_SCCCC
- Sierra Club – SI_SierraC1, SI_SierraC6, SI_SierraC7
- San Francisco Planning and Urban Research Association – SI_SPUR
- Tuolumne River Trust – SI_TRT2, SI_TRT3, SI_TRT6, SI_TRT7, SI_TRT8, SI_TRT10
- Tuolumne River Trust/Clean Water Action/Sierra Club, San Francisco Bay Chapter – SI_TRT-CWA-SierraC

Citizens

- Alter, Grudy – C_Alter
- Bail, Christopher – C_Bail
- Berkowitz, Allan – C_Berko
- Beviacqua, John – C_Bevia
- Bramlette, Darryl – C_BramlD1
- Bresolin, Mark – C_Breso
- Chiapella, Lynn – C_Chiap
- Clark, Ann & Katherine Howard – C_Clark1
- Coleman, Caroline – C_Colem2
- Dulmage, Diana – C_Dulma
- Elbizri, Elanie – C_Elbiz
- Garbarino, Caroline – C_Garba
- Genovese, Marilyn – C_Genov
- Goitein, Ernest – C_Goite
- Goldfein, Kathleen – C_Goldf
- Goodman, Rebecca – C_Goodm
- Graves, Ben – C_Grave
- Hankermeyer, Carol – C_Hanke
- Hasson, Tomer – C_Hasso
- Hoffman, Jeff – C_Hoffm
- Joyce, Lindsay and Ken – C_Joye
- Martin, Michael – C_MartiM
- McCollom – C_McCol
- Means, Robert – C_Means2
- Mijac, Ivo – C_Mijac
- Noren, William – C_Noren1
- Okuzumi, Margaret – C_Okuzu
- Parkes, Doug – C_Parke
- Pickup, Ron – C_Picku
- Raffaeli, Paul – C_Raffa
- Ross, Jim – C_Ross
- Spring, Cindy – C_Sprin
- Steinhart, Peter – C_Stein
- Sugars, Marc – C_Sugar
- Urdan, Matthew – C_Urdan
- Vermeys, Jim – C_VermeJ
- Weiss, Richard – C_Weiss
- Williams, Doris – C_Willi
- Zimmerman, Benita – C_Zimme

PEIR Section Reference

The Draft PEIR addresses this topic area in Vol. 3, Chapter 5, Section 5.3, pp. 5.3.1-1 to 5.3.9-3.

14.6.2 Minimum Required Instream Flows

Comment Summary

This section of this master response responds to all or part of the following comments:

S_CSA-02
L_Tuol2-03
SI_Caltrout-01
SI_CAREP-01
SI_CRS-07
SI_EcoCtr-01
SI_GreenP-03
SI_KSWC-01
SI_SCCCC-03
SI_SierraC1-01
SI_SierraC6-03
SI_SierraC7-04
SI_SPUR-07
SI_TRT2-01
SI_TRT3-03
SI_TRT6-03
SI_TRT7-07
SI_TRT8-04
SI_TRT10-03
SI_TRT-CWA-SierraC-06
SI_TRT-CWA-SierraC-08
SI_TRT-CWA-SierraC-14
SI_TRT-CWA-SierraC-66
SI_TRT-CWA-SierraC-85
SI_TRT-CWA-SierraC-86
SI_TRT-CWA-SierraC-87
SI_TRT-CWA-SierraC-146
SI_TRT-CWA-SierraC-148
SI_TRT-CWA-SierraC-157
SI_TRT-CWA-SierraC-191
C_Berko-04
C_Breso-01
C_Bryan-01
C_Clark1-13
C_Colem2-01
C_Dulma-01
C_Elbiz-04
C_Garba-02
C_Genov-01
C_Goldf-02
C_Grave-01
C_Joye-01
C_MartiM-06
C_McCol-01
C_Mijac-01
C_Noren1-01
C_Okuzu-01
C_Parke-04
C_Raffa-05
C_Raffa-13
C_Ross-03
C_Stein-04
C_Sugar-01
C_Urdan-01
C_VermeJ-01
C_Weiss-01
C_Willi-03

Summary of Issues Raised by Commenters

- The Draft PEIR lacks sufficient data to determine whether current flows support public trust values.
- The Draft PEIR lacks sufficient data to reach conclusions on the WSIP's impacts.

Response

The purpose of the Draft PEIR is to describe the consequences of the proposed WSIP relative to the existing condition. CEQA requires that an EIR contain a description of the existing "without project" condition, but does not require that an EIR determine whether the existing condition complies with current regulations or supports public trust values. The U.S. Geological Survey operates a stream gage below O'Shaughnessy Dam, which provided ample data to characterize the existing condition with respect to river flow.

The current minimum required releases from O'Shaughnessy Dam to support fisheries are shown in Table 5.3.1-2 of the Draft PEIR (Vol. 3, Chapter 5, p. 5.3.1-12). The releases are made in accordance with an agreement between the City and County of San Francisco (CCSF) and the U.S. Department of the Interior (DOI), which determined the minimum flow schedules for resident trout. Anglers continue to catch trout in the reach of the river below the dam, but no detailed information on fish populations has been gathered since the U.S. Fish and Wildlife Service (USFWS) studies in the early 1990s. Obtaining new information on fish populations was determined to be unnecessary for the purpose of the PEIR based on the projected nature, frequency, and magnitude of flow changes attributable to the WSIP.

The SFPUC will adhere to the minimum release schedule whether or not the WSIP is implemented. As indicated in the Draft PEIR (Vol. 3, Chapter 5, p. 5.3.1-25), implementation of the WSIP would not reduce river flow during those times when minimum releases are being made under the existing condition. It would increase the number of months during which only minimum releases are made, from 837 months in the 984-month hydrologic record to 843 months. The fisheries impact analysis in the Draft PEIR, which was performed by an expert fisheries biologist, was based on the hydrological changes that would occur under the WSIP and an understanding of species habitat requirements. The expert concluded that the small increase in the number of months when minimum releases are being made would not have a significant adverse effect on resident fisheries.

A draft report prepared by the USFWS in 1992 recommended an increase in minimum releases from O'Shaughnessy Dam, based on an Instream Flow Incremental Methodology (IFIM) study. The draft report concluded that resident trout populations could be increased if releases from O'Shaughnessy Dam were increased. As described in the Draft PEIR (Vol. 3, Chapter 5, p. 5.7-7), the CCSF provided comments on the draft study questioning the basis for some of the recommendations, but the matter was left unresolved. Beginning in 2005, the SFPUC began working with the USFWS to resolve issues regarding the recommended releases. Cooperative field studies are in progress, and the CCSF and USFWS expect to reach agreement on the releases in 2009. The new studies will include the use of IFIM or an alternative flow and habitat assessment methodology.

The 1987 CCSF and DOI agreement provided for supplemental releases of 4,400 to 15,000 acre-feet per year from O'Shaughnessy Dam, depending on hydrologic year type. The supplemental releases are shown in Draft PEIR Table 5.7-4 (Vol. 3, Chapter 5, p. 5.7-30). The supplemental releases have not been made since 1992 because the USFWS has yet to make a determination about the schedule needed for supplemental releases. Supplemental releases were made between 1989 and 1992 in support of the studies that resulted in the USFWS's 1992 draft report. Because these releases (or some other schedule of releases derived from the ongoing studies) will occur in the future, they were included in the cumulative impact analysis contained in the Draft PEIR (Vol. 3, Chapter 5, Section 5.7).

The analysis indicated that any increase in minimum releases for the benefit of resident trout during the minimum release period (more than 80 percent of the time) could have adverse biological effects. The release of more water from Hetch Hetchy Reservoir during the minimum release period would cause the reservoir to be drawn down farther just prior to the snowmelt than it would with the current schedule of minimum releases. Because more water would be needed to refill the reservoir, the total volume of water released in the spring snowmelt period would be reduced and the release would be delayed by a few days. The reduction and delay in the spring release could have an adverse effect on riparian and meadow vegetation in the Poopenaut Valley, as described in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.3.7-21 and 5.3.7-22). Before recommending changes to the current release schedule, the SFPUC and USFWS will consider both the benefits and adverse effects of additional releases on fisheries and other biological resources during the spring, summer, fall, and winter.

14.6.3 Adequacy of Data on Streamside Meadows

Comment Summary

This section of this master response responds to all or part of the following comments:

SI_SPUR-07	SI_TRT-CWA-SierraC-15	C_Dulma-01
SI_TRT-CWA-SierraC-04	SI_TRT-CWA-SierraC-16	
SI_TRT-CWA-SierraC-14	SI_TRT-CWA-SierraC-18	

Summary of Issues Raised by Commenters

- The Draft PEIR lacks sufficient data to characterize impacts on streamside meadows.

Response

The San Francisco Planning Department (as the CEQA lead agency) and the SFPUC (as the project sponsor) both acknowledge that little published information is currently available on the flora and fauna of streamside meadows in the Poopenaut Valley, and that acquisition of comprehensive data would take several years. However, in the course of preparing the PEIR, the consulting biologists conducted a reconnaissance survey of the meadow and discussed conditions in the meadow with National Park Service biologists, who are beginning surveys of the Poopenaut Valley in coordination with the SFPUC. As described in **Section 14.4, Master**

Response on PEIR Appropriate Level of Analysis (Vol. 7, Chapter 14, Section 14.4.4), CEQA Guidelines Section 15151 imposes a standard of adequacy that is "reasonably feasible" and sufficient to allow decision-makers to make a decision that takes account of environmental consequences. Data gathering need not be "exhaustive." The Draft PEIR analysis of the WSIP water supply and system operations on biological resources in the Poopenaut Valley was based on current knowledge regarding the composition and condition of the riparian system, and a consideration of the interactive responses of plant and animal species to hydrologic changes resulting from the WSIP. The analysis relied on ecological principles, scientific literature, existing data, and site visits. The Draft PEIR analysis was conservative in finding that an impact could be potentially significant if there was a possibility of impacts from the WSIP water supply and system operations.

In general, it is known that the ecological health of mountain meadows depends on periodic recharge of the underlying groundwater, which supports vegetation through the dry summer months. In the Poopenaut Valley, groundwater recharge occurs as a result of runoff from the canyon sides into the valley, and when high flows in the Tuolumne River flood the meadow or otherwise raise groundwater levels. Little is known about the condition of the Poopenaut Valley before the construction of Hetch Hetchy Reservoir in the 1920s. The meadow itself, and its flora and fauna, have adapted to changes in the magnitude and seasonal pattern of river flow since the reservoir was built. From the 1920s to the late 1960s, Hetch Hetchy Reservoir affected the seasonal pattern but not the magnitude of flow in the river within the Poopenaut Valley. Water was diverted for municipal supply at Early Intake, several miles downstream of the Poopenaut Valley. In 1967, the completion of Canyon Tunnel enabled the diversion of water at Hetch Hetchy Reservoir for municipal water supply and hydropower generation several miles upstream of the Poopenaut Valley. Beginning in 1967, average annual flow in the Tuolumne River through the Poopenaut Valley was reduced by about 50 to 60 percent compared to pre-1967 flows.

Compared to the existing condition, the WSIP would reduce the total volume of flow in the Tuolumne River through the snowmelt period and delay releases from Hetch Hetchy Reservoir by a few days. With the WSIP, the average annual diversion from the river at Hetch Hetchy Reservoir would increase from the current 469,000 acre-feet to 478,500 acre-feet, an increase of about 2 percent. The increased average annual diversion would produce a corresponding reduction in average annual releases to and flow in the river. Because the change in flow and the delay in the initial release of snowmelt have the potential to reduce groundwater recharge and thus affect the flora and fauna of the meadow, the effect of the WSIP on biological resources in the Poopenaut Valley was determined to be potentially significant. Detailed knowledge of the meadow's flora and fauna was not necessary to reach this conclusion.

Mitigation Measure 5.3.7-2 (Vol. 4, Chapter 6, pp. 6-49 and 6-50) identified an approach to reduce the potential impacts of WSIP-induced flow changes in the Poopenaut Valley to a less-than-significant level. Currently, the operators of Hetch Hetchy Reservoir do not actively shape the late spring/early summer release from the reservoir to achieve any particular environmental goal. With Mitigation Measure 5.3.7-2 in place, operators would shape the release to recharge groundwater in the valley in a manner that approximates conditions characteristic of typical Sierra Nevada meadows. The performance standard to be achieved by this measure is no net loss of the extent, diversity, and condition of the existing meadow and wetland vegetation types in the Poopenaut Valley. The mitigation measure includes a monitoring and baseline data collection component.

The National Park Service, in coordination with the SFPUC, is currently conducting studies in the Poopenaut Valley that include vegetation surveys, rare species surveys, and groundwater level monitoring. The results of the studies will be available during the course of WSIP implementation and will enable monitoring of the WSIP's effects as well as refinement of how the proposed mitigation measure (Measure 5.3.7-2) would be implemented. Once the WSIP is adopted, the monitoring component of Measure 5.3.7-2 would provide the information necessary to determine if the performance goal is being met and if the release pattern needs to be modified.

14.6.4 Mitigation Measure 5.3.7-2

Comment Summary

This section of this master response responds to all or part of the following comments:

SI_SPUR-07	SI_TRT-CWA-SierraC-17	C_Dulma-01
SI_TRT5-03	SI_TRT-CWA-SierraC-18	

Summary of Issues Raised by Commenters

- The Draft PEIR does not specify the timing or magnitude of releases.

Response

Mitigation Measure 5.3.7-2 (Vol. 4, Chapter 6, pp. 6-49 and 6-50) would impose a specific release strategy on the reservoir operators and require releases sufficient to maintain the existing meadow communities.

It is not possible to specify exactly the timing and magnitude of controlled releases because they would vary from year to year. Under the existing condition, the SFPUC releases only the required minimum flows from Hetch Hetchy Reservoir for most of the time (837 months in the 984-month hydrologic record). During the spring snowmelt period, the SFPUC attempts to refill Hetch Hetchy Reservoir, and in most years (74 years in the 82-year hydrologic record) the reservoir fills completely. Once the reservoir is full, or it is apparent to the reservoir operators that it will fill, releases in excess of the minimum required release begin. The magnitude of the total release above the minimum required depends on the volume of runoff entering the reservoir from its watershed and the rate of diversion to Canyon Tunnel. The release pattern is not currently designed or deliberately shaped, but is simply a consequence of the operators' response to upstream hydrology and choices with respect to reservoir management and the consequent opening and closing of gates and valves.

With implementation of Measure 5.3.7-2, the water available for release would be released in a pattern that increases the chance of inundating the meadow in the Poopenaut Valley. Examination of the soil types in the valley indicate that the underlying groundwater in the meadow can probably be recharged in a matter of a few hours or a day, and that extended inundation would not increase recharge substantially. As an example, operators may currently choose to release water from Hetch Hetchy Reservoir during the snowmelt period at a rate of 1,000 cubic feet per second (cfs) for 10 days. With Mitigation Measure 5.3.7-2 in place, the reservoir operators could choose to release the same amount of water in the following pattern: 1,000 cfs for the first day, 2,000 cfs for the second day, 3,000 cfs for the third day, 2,000 cfs for the fourth day, and 1,000 cfs for the fifth and sixth days. The modified release pattern would increase the chance that the meadow would be inundated.

The most effective release pattern would be determined by monitoring the effect of releases and refined as information becomes available from the ongoing National Park Service/SFPUC studies in the Poopenaut Valley and baseline studies associated with Measure 5.3.7-2. An experimental release of 3,000 cfs made by the SFPUC in 2007 raised the river level in the Poopenaut Valley by 11 feet, sufficient to flood the meadow. The SFPUC operators made additional experimental releases in the spring of 2008 that showed similar results.

The third full paragraph of Mitigation Measure 5.3.7-2, Controlled Releases to Recharge Groundwater in Streamside Meadows and Other Alluvial Deposits (Vol. 4, Chapter 6, p. 6-50, first full paragraph) is revised as follows for clarification. There are no revisions to the footnote in this paragraph, so it is not included here but should be retained as part of the text.

> As part of this measure the SFPUC will gather baseline data regarding the extent, species composition and condition of the existing meadow vegetation within the Poopenaut Valley. Some of these environmental baseline data may be available as a result of current study efforts in the Poopenaut Valley. As needed, the SFPUC will augment this information by carrying out vegetation composition surveys in the meadow before implementing the WSIP and at 5 year intervals after WSIP implementation to assess the efficacy of mitigation releases in maintaining or improving the percentage cover of meadow species as described by Ratliff (1985). The basic methodology for baseline vegetation survey and subsequent mitigation monitoring will be generally accepted quantitative vegetation sampling methods to permit statistical comparison of vegetation composition over time, as well as mapping the meadow vegetation in the Poopenaut Valley. The SFPUC will consult with a qualified biologist to assist in shaping the releases from Hetch Hetchy Reservoir in consideration of baseline and future meadow vegetation data. If a significant decline in the extent or diversity of native meadow vegetation occurs, releases will be modified as needed to achieve the mitigating effect of sustaining the existing meadow communities.

14.6.5 Impacts on Flow/Hydrology

Comment Summary

This section of this master response responds to all or part of the following comments:

L_BAWSCA2-04	SI_TRT-CWA-SierraC-103	C_BramlD1-01	C_Hoffm-01
SI_GreenP-01	SI_TRT-CWA-SierraC-104	C_Chiap-01	C_MartiM-06
SI_GWWF2-01	SI_TRT-CWA-SierraC-105	C_Dulma-01	C_Means2-
SI_SPUR-07	SI_TRT-CWA-SierraC-106	C_Elbiz-01	01C_Picku-01

SI_TRT7-01	SI_TRT-CWA-SierraC-122	C_Goite-01	C_Raffa-03
SI_TRT-CWA-SierraC-42	SI_TRT-CWA-SierraC-123	C_Goodm-	C_Sprin-01
SI_TRT-CWA-SierraC-45	C_Alter-01	02C_Hanke-01	C_Zimme-01
SI_TRT-CWA-SierraC-97	C_Bail-02	C_Hasso-02	

Summary of Issues Raised by Commenters

- Numerous comments expressed confusion about the existing and proposed levels of diversions by the SFPUC from the Tuolumne River.
- The Draft PEIR's conclusions regarding the flow impacts and significance of hydrology impacts are questionable.

Response

Level of Diversions

The average annual unimpaired flow in the Tuolumne River at Hetch Hetchy Reservoir is estimated to be 749,600 acre-feet. Currently, the SFPUC diverts about 63 percent of the average annual unimpaired flow into Canyon Tunnel at Hetch Hetchy Reservoir. Thus, flow in the Tuolumne River immediately below O'Shaughnessy Dam is about 37 percent of its average annual unimpaired value. Water flows through Canyon Tunnel to the Kirkwood Powerhouse. After passing through the turbines at the powerhouse, about two-thirds of the flow enters Mountain Tunnel for conveyance to the Bay Area; the other third is returned to the river at Early Intake. Flow in the Tuolumne River below Early Intake is at least 50 percent of its average annual unimpaired value.

With the WSIP in place, the SFPUC would divert about 64 percent of the average annual unimpaired flow in the Tuolumne River into Canyon Tunnel at Hetch Hetchy Reservoir. Thus, flow in the Tuolumne River immediately below O'Shaughnessy Dam would be about 36 percent of its average annual unimpaired value. Flow in the Tuolumne River below Early Intake would be at least 49 percent of its average annual unimpaired value.

Note that the values presented in the two paragraphs above are slightly different from those provided in the Draft PEIR. After completion of the Draft PEIR, some improvements were made to the Hetch Hetchy/Local Simulation Model, and the values in the preceding paragraphs were obtained using the update model, as described in Section 13.3 (Vol. 7, Chapter 13) of the Comments and Responses document.

Flow Impacts and Significance of Hydrology Impacts

Under the existing condition, flow in the Tuolumne River between O'Shaughnessy Dam and Early Intake consists almost entirely of releases from the dam. Minimum releases from the dam and minimum flows in the river are specified in an agreement between the CCSF and DOI, as shown in Draft PEIR Table 5.3.1-1 (Vol. 3, Chapter 5, p. 5.3.1-12). The minimum releases represent the low end of the range of flows in this reach of the river. The minimum flow is 35 cfs under the schedule for critically dry years (8 percent of all years). The minimum flow occurs in most months of years when precipitation at Hetch Hetchy Reservoir is less than certain values specified in the CCSF/DOI agreement. If the WSIP is implemented, the SFPUC would still have to adhere to the minimum release schedules specified in the agreement; therefore, the WSIP would not affect the low end of the range of flows in this reach of the river.

Typically, flows in the Tuolumne River below O'Shaughnessy Dam are at their seasonal maximum in the late spring and early summer when the snowpack melts. One of the dam operators' goals is to fill Hetch Hetchy Reservoir by the end of the snowmelt period. Another goal is keep flow in the river below the dam to no more than 8,000 cfs to prevent flooding at the Kirkwood Powerhouse. The dam operators monitor the depth of the snowpack, measure inflow to the reservoir, and adjust releases from the dam as necessary to meet these goals. Water can be diverted from the reservoir to the Canyon Tunnel at a maximum rate of about 1,400 cfs, and released to the river via eight valves at a maximum rate of about 9,000 cfs. Above these values, water passes over the spillway to the river in an uncontrolled manner. This is a rare occurrence, and dam operators are usually able to manage the reservoir without uncontrolled releases.

Maximum flows in the river below O'Shaughnessy Dam typically occur in the spring of years when the snowpack in the Sierra Nevada is heavy and melts rapidly. Modeled average monthly flows in the river below O'Shaughnessy Dam under the existing condition and with the WSIP are shown in Figure 5.3.1-9 (Vol. 3, Chapter 5, p. 5.3.1-23). The figure shows that average monthly flows under the existing condition and with the WSIP would exceed 5,000 cfs eight times in the 82-year hydrologic record.

A red line on Figure 5.3.1-9 shows the average monthly release from Hetch Hetchy Reservoir to the river with the WSIP. A blue line shows the average monthly release from Hetch Hetchy Reservoir to the river under the existing condition. Where the red and blue lines occupy the same space, the red line overwrites the blue line. Examination of the figure for the years in which average monthly flow exceeded 5,000 cfs (1922, 1938, 1956, 1969, 1978, 1983, 1995, and 1998) indicates that the red line overwrites the blue line in all eight years. This shows that in very high flow years, the WSIP would have no effect on the peak average monthly flow.

The reason the WSIP would have no effect on the highest average monthly peak flows is that the capacity of Hetch Hetchy Reservoir is small relative the amount of runoff produced in its watershed in very high runoff years. In years when the snowpack is deep, the reservoir fills rapidly at the beginning of the snowmelt period, after which operators must release any additional runoff to the river below the dam. The peak release to the river usually occurs after the reservoir is full or is close to full.

Average daily flows in the river below O'Shaughnessy Dam typically exceed average monthly flows because, in the snowmelt period, reservoir operators may adjust releases to the river every few days. U.S. Geological Survey gaging records show that average daily flows in the river below the dam equaled or exceeded 10,000 cfs on at least one day in 1929, 1933, 1935, 1938, 1943, 1950, 1951, 1983, 1995, and 1997, usually in May or June. A maximum average daily flow of 16,400 cfs occurred in 1997 in an unusual storm that caused rain to fall on the snowpack in January. Operators of the dam estimate that the instantaneous peak release on January 3, 2007 was probably about 20,000 cfs. It is unlikely that the WSIP would have any effect on the highest average daily peak or instantaneous peak flows for the same reason that it would not have any effect on average monthly peak flows.

In summary, the WSIP would have no effect on either the low or high ends of the range of current flows in the Tuolumne River below O'Shaughnessy Dam. The WSIP would not "substantially alter stream flows such that they are outside the range of pre-project conditions," and its impact on flows was therefore judged to be less than significant.

Although the WSIP would not affect the magnitude of relatively rare, very large peak flows, it would affect the magnitude of the smaller average monthly peak flows that occur more frequently than once every 10 years. The modeled flows shown in Figure 5.3.1-9 of the Draft PEIR indicate that the WSIP would not have any effect on average monthly peak flows during the large runoff events that occur about once every 10 years (eight times in the 82-year hydrologic record); this would be the case under conditions that occurred in 1922, 1938, 1956, 1969, 1978, 1983, 1995, and 1998. Average monthly peak flows during runoff events with a frequency of more than once in 10 years may be affected at times. For example, as shown in Figure 5.3.1-9, average monthly peak flows with the WSIP under conditions that occurred in 1989, 1991, 2001, and 2002 would be lower than under the existing condition.

Except on rare occasions, daily and instantaneous peak flows are a result of management decisions by dam operators. If there were no change in current reservoir management practices with the WSIP, average daily and instantaneous peak flows during runoff events with a higher frequency than once in 10 years would be reduced. However, Mitigation Measure 5.3.7-2 calls for a change in reservoir management practices; that is, the shaping of releases from O'Shaughnessy Dam to increase the chance of recharging groundwater in the Poopenaut Valley. Implementation of this measure would also reduce or eliminate the effects of the WSIP on daily or instantaneous peak flows during runoff events with a higher frequency than once in 10 years.

14.6.6 Impacts on Geomorphology

Comment Summary

This section of this master response responds to all or part of the following comments:

SI_SPUR-07	SI_TRT-CWA-SierraC-119	C_Goite-01
SI_TRT-CWA-SierraC-42	SI_TRT-CWS-SierraC-122	C_Goodm-02
SI_TRT-CWA-SierraC-48	SI_TRT-CWA-SierraC-123	C_Noren-01
SI_TRT-CWA-SierraC-49	C_BramlD1-01	C_Sprin-01
SI_TRT-CWA-SierraC-99	C_Dulma-01	
SI_TRT-CWA-SierraC-110	C_Elbiz-01	

Summary of Issues Raised by Commenters

- The PEIR should not reference average flow data.
- The Draft PEIR's conclusions regarding sediment transport are speculative.

Response

The average monthly flow data provided in Table 5.3.1-5 of the Draft PEIR (Vol. 3, Chapter 5, p. 5.3.1-26) played only a minor role in the assessment of the WSIP's effects on the geomorphology of the Tuolumne River below O'Shaughnessy Dam. Changes in peak flows attributable to the WSIP provided the primary informational basis for reaching conclusions regarding impacts on geomorphology. The WSIP would have little effect on the range of flows experienced in the Tuolumne River below O'Shaughnessy Dam. It would have no effect on the magnitude of infrequent, very large flows because Hetch Hetchy Reservoir is small relative to the volume of runoff produced in its watershed. However, the WSIP could have an effect on the frequency of smaller peak flows. Please see Section 14.6.5, above, for more information.

A commenter opines that the analysis of sediment transport and gravel bed conditions in the Draft PEIR is qualitative and largely speculative. The San Francisco Planning Department acknowledges that the analysis is qualitative but disagrees that it is speculative. Although little data are available on substrate conditions in the upper Tuolumne River between Hetch Hetchy and Don Pedro Reservoirs, it is the San Francisco Planning Department's view that the data are sufficient to make a reasonable analysis, without excessive speculation, of the WSIP's impacts on sediment movement.

The information on existing sediment conditions in the Tuolumne River between Hetch Hetchy and Don Pedro Reservoirs provided in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.3.2-1 to 5.3.2-3) was obtained from reports prepared for the SFPUC by McBain and Trush and RMC. The most recent in a series of reports summarized available data on the ecosystem in the upper Tuolumne River and provided recommendations for monitoring (McBain and Trush and RMC, 2007). The report confirmed the general description contained in the Draft PEIR of channel and sediment characteristics in this reach of the river.

Much of the upper Tuolumne River flows in a bedrock channel in a deep canyon. Alluvial deposits and riparian vegetation are limited along most of this river reach, but generally increase somewhat in a downstream direction. The only location where the floodplain broadens is in the Poopenaut Valley where an extensive streamside meadow has developed. For about 80 years, O'Shaughnessy, Cherry, and Eleanor Dams have prevented the downstream movement of bedload from the watersheds upstream of Hetch Hetchy Reservoir, Lake Lloyd, and Lake Eleanor. The reservoirs have also reduced peak daily flows in the river in all but the very largest floods.

Little information is available on the relationship between peak flows and the movement of sediment, gravel, and boulders in this reach of the Tuolumne River. As noted in the Draft PEIR, limited studies of the Clavey River, a Tuolumne River tributary, provide some information on the relationship between peak flows and bedload transport in the Clavey River. Because the Clavey River and the Tuolumne River share some characteristics (they both have a relatively steep bedrock channel confined within a canyon), the Clavey River data provide some insight into the geomorphology of the Tuolumne River.

As indicated in the Draft PEIR (Vol. 3, Chapter 5, p. 5.3.2-3), the Clavey River data suggest that:

- Common small floods that occur every one to three years scour and deposit sand in pools and bars.
- Moderate-sized floods that occur every 12 to 17 years move gravel and cobbles, reshape side channels, and move large woody debris.
- Very large floods that occur every 70 to 100 years erode large bars, remove and create side channels, and move large boulders over short distances.

As described in Section 14.6.5, above, the WSIP would have no effect on infrequent, large peak flows in the Tuolumne River below O'Shaughnessy Dam, but it would have some effect on smaller and more frequent peak flows. The WSIP would have no effect on moderate-sized or very large floods and would therefore have no impact on the transport of gravel, cobbles, and boulders. It could reduce the transport of sand somewhat relative to existing conditions. However, despite this minor effect on sediment movement, the Draft PEIR concludes that the WSIP would not result in substantial changes in erosion or siltation rates, and this impact was determined to be less than significant.

14.6.7 Impacts on Water Quality

Comment Summary

This section of this master response responds to all or part of the following comments:

SI_SPUR-07	SI_TRT-CWA-SierraC-160	C_Goite-01
SI_TRT-CWA-SierraC-131	C_BramlD1-01	C_Goodm-02
SI_TRT-CWA-SierraC-132	C_Dulma-01	C_Noren-01
SI_TRT-CWA-SierraC-159	C_Elbiz-01	C_Sprin-01

Summary of Issues Raised by Commenters

- The Draft PEIR's conclusions regarding water temperature are questionable.
- The WSIP would violate water quality objectives.

Response

As described in the Draft PEIR, Hetch Hetchy Reservoir is typically filled in the late spring and early summer and is drawn down during the rest of the year. Under ordinary conditions, the required releases to support coldwater fish in the Tuolumne River below the reservoir during the warm summer and early fall months are drawn from the pool of cool water, deep within the reservoir. During droughts, the reservoir is drawn down farther than in more typical conditions. Under existing conditions and with the WSIP, the pool of cool water in the reservoir is great enough to enable releases of cool water throughout the summer and early fall in all but one drought, the 1976–1977 drought. In a drought like the 1976–1977 drought, the reservoir would probably destratify in September, and warmer water would be released to the river from the reservoir. Both under the existing condition and with the WSIP, water temperature in the river below O'Shaughnessy Dam would increase by more than the water quality objective of 5 degrees Fahrenheit. With the WSIP, elevated water temperatures could persist for several days or weeks longer than under the existing condition.

The conclusion in the Draft PEIR that the WSIP would have a less-than-significant impact on water quality was based on an assessment of whether the beneficial use that the objective is intended to protect—coldwater fish—would be significantly harmed. Both the severity and the frequency of exceedances entered into the assessment. Under typical conditions, water released from the bottom of Hetch Hetchy Reservoir in the summer is quite cool, about 8 degrees Celsius (ºC). This is probably considerably cooler than the summer water temperature in the river under natural (i.e., pre-O'Shaughnessy Dam) conditions. While this water temperature is suitable for resident trout, it is below the optimum for rearing juvenile trout, which is 13 to 21 ºC. In a severe drought, the temperature of water released from O'Shaughnessy Dam would be 10 to 12 ºC warmer and would raise water temperature in the river to 18 to 20 ºC, toward the upper end of the acceptable range for resident trout. It is not expected that the temperature increase, which would occur over a week or two, would harm resident trout, because water temperatures would remain within the acceptable range. Even if the temperature rise increased stress on resident trout, the rise would occur very infrequently, about one fall in every 82 years. Because the risk to resident trout when water temperatures rise is small, and because WSIP-caused temperature increases would be very infrequent, it was concluded that the WSIP's impact on water quality in the Tuolumne River between Hetch Hetchy and Don Pedro Reservoirs would be less than significant.

14.7 Master Response on Lower Tuolumne River Issues

14.7.1 Introduction

Overview

This master response addresses questions and comments about the impact analysis for the lower Tuolumne River; that is, the river between La Grange Dam and the San Joaquin River. This master response is organized by the following subtopics:

14.7.2 Chinook Salmon in the Lower Tuolumne River
14.7.3 Steelhead in the Lower Tuolumne River
14.7.4 FERC-Required Minimum Flows
14.7.5 Impacts on Water Quality
14.7.6 Impacts on Flow/Hydrology
14.7.7 Impacts on Geomorphology
14.7.8 Mitigation Measure 5.3.6-4a
14.7.9 Mitigation Measure 5.3.6-4b

Commenters

Commenters that addressed this topic include:

Federal Agencies

- None

State Agencies

- California Department of Fish and Game – S_CDFG2

Local and Regional Agencies

- Modesto Irrigation District and Turlock Irrigation District – L_MIDTID
- Tuolumne County – L_Tuol2

Groups

- California Trout – SI_Caltrout
- Center for Resource Solutions – SI_CRS
- Ecology Center – SI_EcoCtr
- Environmental Defense – SI_EnvDef
- Golden West Women Flyfishers – SI_GWWF1, SI_GWWF2
- Klamath-Siskiyou Wildlands Center – SI_KSWC
- Northern California/Nevada Council of the Federation of Fly Fishers Steelhead Committee – SI_NCFFSC
- Republicans for Environmental Protection – SI_CAREP
- Santa Clara County Creeks Coalition – SI_SCCCC
- Sierra Club – SI_SierraC1, SI_SierraC6, SI_SierraC7

- Tuolumne River Trust – SI_TRT2, SI_TRT3, SI_TRT5, SI_TRT6, SI_TRT7, SI_TRT8, SI_TRT10
- Tuolumne River Trust/Clean Water Action/Sierra Club, San Francisco Bay Chapter – SI_TRT-CWA-SierraC

Citizens

- Alter, Grudy – C_Alter
- Bail, Christopher – C_Bail
- Berkowitz, Allan – C_Berko
- Beviacqua, John – C_Bevia
- Bramlette, Darryl – C_BramlD1
- Bresolin, Mark – C_Breso
- Chiapella, Lynn – C_Chiap
- Clark, Ann & Katherine Howard – C_Clark1
- Coleman, Caroline – C_Colem2
- Dulmage, Diana – C_Dulma
- Elbizri, Elanie – C_Elbiz
- Garbarino, Caroline – C_Garba
- Genovese, Marilyn – C_Genov
- Goitein, Ernest – C_Goite
- Goldfein, Kathleen – C_Goldf
- Goodman, Rebecca – C_Goodm
- Graves, Ben – C_Grave
- Hankermeyer, Carol – C_Hanke
- Hasson, Tomer – C_Hasso
- Hoffman, Jeff – C_Hoffm
- Joyce, Lindsay and Ken – C_Joye
- Martin, Michael – C_MartiM
- McCollom – C_McCol
- Means, Robert – C_Means2
- Mijac, Ivo – C_Mijac
- Noren, William – C_Noren1
- Okuzumi, Margaret – C_Okuzu
- Parkes, Doug – C_Parke
- Pickup, Ron – C_Picku
- Raffaeli, Paul – C_Raffa
- Ross, Jim – C_Ross
- Spring, Cindy – C_Sprin
- Steinhart, Peter – C_Stein
- Sugars, Marc – C_Sugar
- Urdan, Matthew – C_Urdan
- Vermeys, Jim – C_VermeJ
- Weiss, Richard – C_Weiss
- Williams, Doris – C_Willi
- Zimmerman, Benita – C_Zimme

PEIR Section Reference

The Draft PEIR addresses this topic area in Vol. 3, Chapter 5, Section 5.3, pp. 5.3.1-1 to 5.3.9-3.

14.7.2 Chinook Salmon in the Lower Tuolumne River

Comment Summary

This section of this master response responds to all or part of the following comments:

S_CDFG2_05	SI_TRT7-07	C_MartiM
L_Tuol2-03	SI_TRT8-04	C_McCol
SI_Caltrout-01	SI_TRT10-03	C_Mijac
SI_CAREP-01	SI_TRT-CWA-SierraC-149	C_Noren1
SI_CRS-01	SI_TRT-CWA-SierraC-09	C_Okuzu
SI_EcoCtr-01	C_Berko	C_Parke
SI_GWWF1-02	C_Breso	C_Raffa
SI_KSWC-01	C_Bryan	C_Raffa
SI_SCCCC-03	C_Clark1	C_Ross
SI_SierraC1-01	C_Colem2	C_Stein
SI_SierraC6-03	C_Dulma	C_Sugar
SI_SierraC7-04	C_Elbiz	C_Urdan
SI_TRT2-01	C_Garba	C_VermeJ

SI_TRT3-03	C_Genov	C_Weiss
SI_TRT5-01	C_Goldf	C_Willi
SI_TRT5-02	C_Grave	
SI_TRT6-03	C_Joye	

Summary of Issues Raised by Commenters

- More up-to-date information on salmon needs to be presented.
- More complete data on the historical occurrence of salmon need to be presented.
- The WSIP has the potential to harm already declining anadromous fish populations.

Response

The Draft PEIR provides information on Chinook salmon populations in the Tuolumne River (Vol. 3, Chapter 5, pp. 5.3.6-13 to 5.3.6-17). Table 5.3.6-2 shows the results of spawning surveys for the period 1971 to 2004, which show a declining trend in Chinook salmon production. A commenter provided similar information that also shows a declining trend; the receipt of this information is acknowledged (see **Response SI_TRT-CWA-SierraC-194**).

The information on Chinook salmon provided in the Draft PEIR was sufficient to reach the conclusion that the WSIP could have a potentially significant adverse impact on salmonids in the Tuolumne River below La Grange Dam. As stated in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.3.6-28 to 5.3.6-32), overall flow reductions coupled with the projected infrequent water temperature increases that could result from the WSIP would have an adverse impact on habitat conditions for juvenile salmonids. The *Habitat Restoration Plan for the Lower Tuolumne River Corridor* (McBain and Trush, 2000) establishes goals for fishery habitat restoration, and the National Marine Fisheries Service (NMFS) and others have identified goals for fishery enhancement in this reach of the river. The WSIP's small but incremental contribution to adverse effects on the lower river would make planned restoration of habitat and fishery resources more difficult. Thus, the Draft PEIR reflects the view of a commenter that the WSIP has the potential to cause a significant adverse effect on anadromous fish in the Tuolumne River below La Grange Dam.

Although the information in the Draft PEIR was sufficient to reach the conclusion referred to above, the following supplementary information is provided to augment and clarify the discussion in the Draft PEIR in response to the comments.

The San Joaquin River and its major tributaries historically supported large populations of both spring-run and fall-run Chinook salmon. During the late 1800s and early 1900s, construction of a number of dams and impoundments within the watershed to provide hydroelectric power generation as well as water supplies for agricultural and municipal usage substantially altered the hydrologic regime of the rivers in terms of the seasonal timing and magnitude of instream flows. The dams also created complete impassable barriers to the upstream migration of adult salmonids, thereby precluding access to otherwise suitable spawning and juvenile rearing habitat located farther upstream within the watershed. The construction of various dams and impoundments coupled with land use changes within the watershed cumulatively contributed to the declining abundance of Chinook salmon, ultimately leading to the extirpation of both spring-run and fall-run Chinook salmon on the mainstem San Joaquin River downstream of Friant Dam. Fall-run Chinook salmon continued to persist within the three major tributaries to the San Joaquin River, including the Stanislaus, Merced, and Tuolumne Rivers, within habitat reaches located downstream of major dams on each of these three tributaries. In addition to naturally spawning, self-sustaining populations of Chinook salmon within the three tributaries, a mitigation hatchery was constructed on the Merced River for the production of Chinook salmon, which has also contributed to the population abundance and dynamics of Chinook salmon within the lower watershed.

Since completion of the major dams in the San Joaquin River watershed during the late 1940s, the Chinook salmon population inhabiting the Tuolumne, Merced, and Stanislaus Rivers has been characterized by highly variable and fluctuating numbers of adult salmon returning to the tributaries each year to spawn. Adult Chinook salmon population abundance within the three tributaries over the past six decades has fluctuated from a low of several hundred fish to a high of over 40,000 adult salmon. Recent fall-run Chinook salmon escapement averages from 1992 through 2006 were 3,700 adults for the Stanislaus River, 4,600 for the Tuolumne River, and 3,800 for the Merced River. Maximum fall-run escapement over the period from 1967 to 2006 was between 10,000 and 14,000 adults for the Stanislaus River, between 10,000 and 20,000 for the Tuolumne River, and between 10,000 and 15,000 for the Merced River. The fluctuations in adult abundance appear to follow a long-term cyclical pattern, which has been hypothesized to be related to a variety of environmental factors. During the two most recent years, 2006 and 2007, adult Chinook salmon returns to the three tributaries have declined substantially to near-record lows.

There is a high degree of uncertainty and disagreement on the causal mechanisms that have contributed to the high fluctuations in adult returns to the Tuolumne River and other San Joaquin River tributaries. Research on the Tuolumne River suggests that numerous in-river mortality factors may be affecting the abundance and survival of Chinook salmon within the Tuolumne River and other tributaries, including the following: predation by piscivorous fish such as largemouth and smallmouth bass, striped bass, and Sacramento pikeminnow, both within the river and associated with gravel pits; exposure to seasonally elevated water temperatures, particularly during drier water years; low water velocities; habitat degradation within the tributaries; reduced instream flows supporting spawning, egg incubation, juvenile rearing, and adult and juvenile migration; redd superimposition; lack of turbidity during smolt outmigration; and limitations on available juvenile rearing habitat.

It appears that much of the fry and smolt mortality takes place after the juvenile Chinook salmon emigrate from the tributary rivers to the mainstem San Joaquin River, the Delta, or the ocean where there are a number of adverse conditions. Potential sources of mortality within the mainstem San Joaquin River and Delta include exposure to seasonally elevated water temperatures; exposure to potential entrainment risk at unscreened water diversions; entrainment and salvage risk as a result of operation of the State Water Project (SWP) and Central Valley Project (CVP) water export facilities; exposure to contaminants and toxics; vulnerability to predation mortality by striped bass, largemouth bass, Sacramento pikeminnow, and other predatory fish and birds; and delays in adult and juvenile migration as a result of changes in Delta hydrologic conditions associated with water export operations. In addition, the availability of suitable food supplies may be reduced for emigrating juvenile salmon within the lower San Joaquin River and the Delta. Furthermore, the results of correlation analyses between hydrologic conditions within the San Joaquin River basin during the spring period of juvenile emigration and the subsequent number of adult Chinook salmon returning to the tributaries two and one-half years later suggest the importance of river flow as a factor affecting the survival of juvenile Chinook salmon as they migrate downstream from the San Joaquin River tributaries through the lower mainstem and Delta.

There is growing scientific evidence that coastal oceanographic conditions, such as changes in water currents, changes in ocean water temperatures, and changes in ocean upwelling, are important influences on coastal productivity. They affect the species composition and abundance of zooplankton, macroinvertebrates, and fish inhabiting coastal marine waters. Changes in oceanographic conditions and coastal productivity have been related to salmon survival and ultimately the population abundance of adults. Within Pacific coastal waters, changes in oceanographic conditions associated with the Pacific decadal oscillation have been used to predict the abundance of returning adult Chinook salmon to inland tributaries to spawn. Ocean commercial and recreational harvesting of adult Chinook salmon has also been identified as a factor affecting the population dynamics and abundance of Central Valley Chinook salmon stocks.

Concern has been expressed that the hatchery production of Chinook salmon in the Merced River and other Central Valley hatcheries could affect the genetic integrity and population dynamics of Chinook salmon stocks within the San Joaquin River watershed and throughout the Central Valley. The NMFS and California Department of Fish and Game (CDFG) are working cooperatively to identify hatchery management practices that will reduce the potential effects of hatchery production on the genetic integrity of Central Valley Chinook salmon populations, as well as the effects of hatchery planting practices and the ocean harvesting of hatchery-produced salmon on the health and abundance of wild in-river Chinook salmon produced within the Central Valley tributaries.

A variety of scientific investigations and management programs have been implemented recently in an effort to better understand the factors affecting the survival and population dynamics of Chinook salmon within San Joaquin River tributaries, including the Tuolumne River, as well as programs designed to protect and enhance habitat conditions for Chinook salmon spawning, egg incubation, juvenile rearing, and adult and juvenile migration. For example, the Vernalis Adaptive Management Program (VAMP, described in Vol. 3, Chapter 5, pp. 5.2-17 and 5.2-18) was specifically designed to: (1) provide improved protection and survival of juvenile Chinook salmon emigrating from the San Joaquin River tributaries through the Delta during the spring months, and (2) provide a scientific framework for testing and evaluating the potential relationship between changes in stream flows within the San Joaquin River at Vernalis, installation of the Head of Old River barrier, and reductions in SWP and CVP export rates during the spring months on juvenile Chinook salmon survival. The VAMP investigations are ongoing.

Investigations have also been conducted to monitor the seasonal loading and concentrations of various toxics and potential pollutants within the mainstem San Joaquin River and its tributaries. Land use within the San Joaquin River watershed includes both urban populations as well as extensive agricultural production. Runoff within the watershed may include a variety of water quality contaminants, including pesticides and herbicides, petroleum products, selenium, and salts. Scientific investigations in combination with various regulatory programs have been designed to characterize the potential effects of these water quality constituents on the health and survival of aquatic resources, including San Joaquin River basin Chinook salmon, as well as to identify management actions to reduce or avoid the potential risk of exposure to these water quality constituents.

Large-scale management and habitat restoration programs, such as the CALFED Bay-Delta Program, have invested substantial staff and financial resources in conducting scientific investigations and in supporting habitat enhancement and improvement projects designed to benefit Chinook salmon and other aquatic resources in the lower Tuolumne River and other Central Valley rivers. In addition, the Anadromous Fish Restoration Program under the Central Valley Project Improvement Act has invested substantial time and financial resources to improve the scientific understanding of various factors affecting Chinook salmon in the San Joaquin River tributaries as well as to implement various management actions and habitat restoration and enhancement programs designed to improve the quality and availability of suitable habitat for Chinook salmon and other fish species.

One of the significant environmental factors that affects habitat quality and availability within the Tuolumne River and other San Joaquin River tributaries for Chinook salmon spawning, egg incubation, juvenile rearing, and adult and juvenile migration is exposure to seasonally elevated water temperatures. A variety of scientific programs designed to develop simulation and predictive models have been implemented in recent years; these models can be used to assess the effects of various reservoir operating strategies, stream flow schedules, coldwater pool management strategies, and other factors influencing the seasonal and longitudinal gradients of water temperatures within the tributaries that potentially affect the health and survival of Chinook salmon in the watershed.

As part of previous State Water Resources Control Board Bay-Delta water quality and water-right proceedings as well as the Federal Energy Regulatory Commission (FERC) hydroelectric project relicensing, considerable emphasis has been placed on evaluating and potentially modifying instream flow schedules for the Tuolumne River and other San Joaquin River tributaries. These management changes to instream flows were intended to improve the physical habitat for various life-history stages of Chinook salmon and other fishery resources as well as to provide more suitable seasonal water temperature conditions in an effort to improve the overall health and survival of Chinook salmon. Investigations into the relationship between instream flows and the hatching success, abundance of fry, abundance of smolts, juvenile emigration survival, and ultimately the abundance of adult Chinook salmon returning to the tributaries to spawn are continuing.

Ongoing investigations are also being performed by the CDFG, NMFS, and the Pacific Fishery Management Council to better identify the effects of recreational and commercial harvesting of Chinook salmon from various river systems, including the Tuolumne River, on population dynamics and adult escapement. Since the Central Valley Chinook salmon populations are comprised of both naturally spawning, in-river-produced salmon as well as fish produced within the Central Valley hatcheries, including the Merced River Fish Hatchery, regulation of commercial and recreational harvesting is an important factor in protecting weaker stocks, such as the wild, in-river Chinook salmon produced in the Tuolumne River. Since 2007, a large-scale constant fractional marking program has been implemented at Central Valley hatcheries to provide additional information on the contribution of various hatcheries to adult salmon populations in the ocean, the effects of harvest on various salmon stocks, adult straying among Central Valley rivers, and the relationship between various environmental factors within the rivers, the Delta, and ocean environments that ultimately affect the health and survival of Central Valley populations.

In recent years, a settlement was reached in federal court that is intended to restore instream flows and self-sustaining populations of spring-run and fall-run Chinook salmon to the mainstem San Joaquin River downstream of Friant Dam. The San Joaquin River Restoration Program is in its early stages, but has identified a number of physical features within the mainstem San Joaquin River that need to be modified or altered in order to reestablish Chinook salmon populations. The restoration program is seeking funding to implement the various restoration elements of the program, which are ultimately expected to support long-term fishery restoration within the river. There are, however, a number of uncertainties regarding the performance and effectiveness of the proposed restoration actions as well as the relationship between Chinook salmon populations and physical habitat within the mainstem and the survival of fall-run Chinook salmon inhabiting the lower tributaries. Full implementation of the San Joaquin River Restoration Program is expected to take a decade or longer.

Currently, the California Department of Water Resources and U.S. Bureau of Reclamation are engaged in a formal Section 7 consultation with the U.S. Fish and Wildlife Service regarding the potential effects of SWP and CVP export operations on the health and survival of delta smelt. The NMFS is responsible for issuing biological opinions under the Federal Endangered Species Act regarding the coordinated operations of the SWP and CVP for the protection of listed stocks of Chinook salmon, steelhead, and green sturgeon. The current Section 7 re-consultation process is expected to result in modifications to SWP and CVP export operations and other facilities within the Delta estuary, such as installation of the Head of Old River barrier and the south Delta barrier project, which may also have direct and indirect effects on the survival of juvenile Chinook salmon emigrating from the San Joaquin River tributaries downstream through the Delta.

The environmental and biological factors affecting the abundance of adult Chinook salmon returning to spawn in the Tuolumne River and other San Joaquin tributaries are dynamic and vary within and among years. An understanding of these various factors and their associated level of uncertainty provides, in part, the framework used in the Draft PEIR to assess potential impacts of the WSIP operations on habitat quality and availability for various life-history stages of Chinook salmon inhabiting the lower Tuolumne River.

14.7.3 Steelhead in the Lower Tuolumne River

Comment Summary

This section of this master response responds to all or part of the following comments:

SI_GWWF1-02	SI_TRT-CWA-SierraC-12	SI_TRT-CWA-SierraC-172
SI_NCFFSC-01	SI_TRT-CWA-SierraC-150	SI_TRT5-02
SI_SierraC7-10	SI_TRT-CWA-SierraC-151	SI_TRT8-04
SI_TRT-CWA-SierraC-11	SI_TRT-CWA-SierraC-152	

Summary of Issues Raised by Commenters

- No data on steelhead trout are included in the Draft PEIR.
- Recent studies indicate that some steelhead are present in the Tuolumne River.

Response

A comment on the Draft PEIR refers to the lack of data on steelhead trout and cites McEwan (2001) as a source of information on current steelhead presence and population in the Tuolumne River. The comment notes that the McEwan study provides more recent information on steelhead presence in the Tuolumne River than the data included in the Draft PEIR from the FERC study (1996).

Section 5.3.6.1 of the Draft PEIR (Vol. 3, Chapter 5, pp. 5.3.6-1 to 5.3.6-24) provides setting information and discussion on the presence of steelhead trout in the Tuolumne River. The data presented in the Draft PEIR on habitat conditions in the lower Tuolumne River indicate that this reach of the river is unsuitable for significant populations of steelhead trout due to high temperatures over summer months. The studies by FERC (1996) concluded that no significant populations of steelhead or rainbow trout are present within the lower Tuolumne River system.

The McEwan study includes a discussion on the historical distribution of steelhead and documents historical evidence of steelhead in the lower Tuolumne River. The study also estimates the present range of likely steelhead occurrence, including in the Tuolumne River. Consistent with the Draft PEIR, the McEwan study states that high water temperatures are a primary stressor for juvenile steelhead through the summer months. Dam construction over the last century has made coldwater spawning and rearing habitat at mid-range and high elevations in the Tuolumne River watershed inaccessible to steelhead. Steelhead are now confined to the lower elevation reaches, where high summer water temperatures are a major stressor (McEwan, 2001).

Additionally, consistent with the Draft PEIR, McEwan found that no significant populations of steelhead/rainbow trout are present in the lower Tuolumne River system. Section 5.3.6.1 of the Draft PEIR presents the findings of rainbow trout surveys conducted between 1982 and 2004. These findings concluded that, while rainbow trout are present and their range has been moderately extended downstream as a result of FERC Settlement Agreement flows, large anadromous steelhead occur in the system very infrequently. Also consistent with the Draft PEIR, McEwan presents data from surveys on the Tuolumne River that established the presence of rainbow trout. However, the surveys (conducted by a CDFG biologist in 2001) documented only a single rainbow trout of 28 inches and a single steelhead smolt of 11 inches, captured in the same location within a few days of each other. These findings by McEwan (2001) on steelhead presence in the lower Tuolumne River are consistent with those provided in the Draft PEIR in showing that no significant populations of steelhead are present within the lower Tuolumne River system.

14.7.4 FERC-Required Minimum Flows

Comment Summary

This section of this master response responds to all or part of the following comments:

S_CDFG2-05	SI_TRT-CWA-SierraC-172	SI_TRT6-04
L_MIDTID-08	SI_TRT-SWA-SierraC-64	C_Sprin-01

Summary of Issues Raised by Commenters

- The FERC-imposed minimum instream flows will probably increase when Don Pedro Reservoir is relicensed.
- The analysis in the Draft PEIR should assume greater FERC-imposed minimum flows.

Response

Table 5.3.1-3 in the Draft PEIR shows current minimum stream flow requirements for the Tuolumne River below La Grange Dam (Vol. 3, Chapter 5, p. 5.3.1-12). The minimum flows are a condition of the license issued by the FERC in 1996 for the Don Pedro Project. Various other conditions are contained in the settlement agreement that led to issuance of the license, including a requirement that water quality and fish populations be monitored and certain fish habitat restoration projects completed. The Don Pedro Project is scheduled for relicensing in 2016, at which time the FERC will review the results of the monitoring program and the minimum instream flow requirements.

Several commenters indicated that because fall-run Chinook salmon populations in the Tuolumne River below La Grange Dam have declined in the last 10 years, it is likely that the FERC will increase the minimum instream flow requirements. Therefore, the commenters stated that the analysis of the WSIP in the Draft PEIR should have allowed for an increase in minimum flows.

The Draft PEIR did not incorporate a possible increase in the future minimum flow requirement in its primary analysis of the WSIP (Vol. 3, Chapter 5, Section 5.3.6), although it did consider the possibility of an increase in the future minimum flow requirement in the cumulative impact analysis (Vol. 3, Chapter 5, Section 5.7). The PEIR did not include an increase in the future minimum instream flow in its primary analysis of the WSIP for two reasons. First, it is impossible to predict what the future minimum instream flow requirements might be, and to assume flow requirements other than the current minimum flows would be speculative. Secondly, an increase in the minimum instream flows would likely have both beneficial and adverse effects on salmonids. Increased stream flow would likely benefit salmonids at times, such as providing increased quality and quantity of spawning and rearing habitat, but would also cause Don Pedro Reservoir to be drawn down farther than it is under the current minimum flow regime. This would reduce the magnitude of pulse flows in excess of the minimum required during the winter months and delay the typical large spring release during the snowmelt period. The changes in pulse flows and the delay in spring release could harm salmonids. The delay in spring release due to an increase in the minimum flow requirement would be additive to the delay in spring release caused by the WSIP, producing a longer delay than the WSIP alone. The combined delay would have a more severe adverse effect on salmonids in the river below La Grange Dam than the WSIP alone. Therefore, while the Draft PEIR acknowledges that the FERC relicensing process will likely result in minimum flow requirements remaining the same or increasing, the San Francisco Planning Department determined that, in the absence of any information, the most reliable (and least speculative) assumption to use in the impact analysis was the existing, known minimum instream flow requirements.

A commenter notes that the SFPUC currently pays the Turlock Irrigation District (TID) and Modesto Irrigation District (MID) to make minimum instream release below La Grange Dam; this is consistent with information presented in the Draft PEIR (Vol. 1, Chapter 2, p. 2-42). The commenter further notes that this arrangement may not be acceptable to the Districts in the future if minimum instream flow requirements are increased. As the terms of any future agreements with the Districts are unknown, it would be speculative for the Draft PEIR to assume anything other than a continuation of the existing arrangements. Currently, the need to make releases for minimum instream flows causes Don Pedro Reservoir to be drawn down farther than it would without the releases. However, if TID and MID declined to make releases from Don Pedro Reservoir on the SFPUC's behalf in the future, then the SFPUC's water bank account could be reduced to provide a portion of the releases, if the Districts demonstrated that their water entitlements would be adversely affected by making the releases without an adjustment in the SFPUC's water bank account. This would likely require the SFPUC to draw down Hetch Hetchy Reservoir farther than it does currently. The result would be to transfer some of the environmental consequences of delayed spring releases from the lower to the upper Tuolumne River. The SFPUC's obligation with respect to FERC minimum required flows is described in the Draft PEIR (Vol. 1, Chapter 2, p. 2-42).

14.7.5 Impacts on Water Quality

Comment Summary

This section of this master response responds to all or part of the following comments:

SI_TRT-CWA-SierraC-128	C_BramlD1-01	C_Goodm-02
SI_TRT-CWA-SierraC-129	C_Dulma-01	C_Sprin-01
SI_TRT-CWA-SierraC-130	C_Elbiz-01	
SI_TRT-CWA-SierraC-167	C_Goite-01	

Summary of Issues Raised by Commenters

- The analysis of the WSIP on water temperature is inadequate.
- The occasional increases in water temperature could still have significant effects.

Response

A comment states that the information contained in Table 5.3.3-2 (Vol. 3, Chapter 5, p. 5.3.3-3) is not comprehensive or well explained. The table shows maximum summer and fall water temperatures in the Tuolumne River at five locations between La Grange Dam and Modesto for the period 1996 through 2004. The data summarized in Table 5.3.3-2 were obtained in the course of studies conducted by TID and MID pursuant to the 1995 FERC Settlement Agreement with respect to licensing for the Don Pedro Project. The water temperature data were obtained from thermographs installed in the river. Thermographs are typically set to record water temperature every few minutes. The table shows the maximum temperatures recorded at five stations from 1996 to 2004. The values are not instantaneous maxima but are close to them. For graphs showing daily maximum, minimum, and average water temperatures, please see *2005 Ten Year Summary Report*, FERC Project No. 2299-024, TID/MID, 2005.

The temperatures shown in Table 5.3.3-2 are not cut off at 20 degrees Celsius (ºC). The footnote on the table simply indicates that maximum temperatures equal to or greater than 20 ºC are shown in bold print.

A comment notes that Table 5.3.3-2 contains information on summer maximum water temperatures, and that water temperatures in the winter and spring are also important for the development and out-migration of juvenile salmon. Under the existing condition, the operators of Don Pedro Reservoir sometimes release pulses of water to the lower Tuolumne River in the winter months as they seek to preserve the flood control reservation in the face of winter storms. The pulse releases are in addition to the minimum required releases. Because Don Pedro Reservoir would be drawn down somewhat farther with the WSIP than under the existing condition, the winter pulse releases with the WSIP would be smaller than under the existing condition. Water released from the reservoir in the winter is cool, typically between 9 and 11 ºC. It is not expected that the WSIP would have any effect on the temperature of these winter releases.

As noted above, Don Pedro Reservoir would be drawn down farther with the WSIP than under the existing condition, resulting in a delay in the release of water in excess of the minimum required in the spring as snowmelt runoff reaches the reservoir. The delay could cause water temperatures below the reservoir in the spring to rise above the values that occur under the current condition. Water temperatures in the river with and without the WSIP were modeled and are shown in Figures 5.3.3-3 and 5.3.3-4 (Vol. 3, Chapter 5, pp. 5.3.3-18 and 5.3.3-19). In most years, the WSIP would have little effect on water temperature below La Grange Dam. Sometimes (in 12 months in the 82-year hydrologic record) the WSIP could cause average daily water temperatures to rise by 1 or 2 ºC. Very rarely (in one month in the 82-year hydrologic record), the WSIP could cause average daily water temperatures to rise by 10 ºC. In terms of a water quality impact (Vol. 3, Chapter 5, pp. 5.3.3-17 to 5.3.3-19), the Draft PEIR concluded that the rare exceedances of the water temperature objective would not impair the river's ability to support the designated beneficial uses that the objective is designed to protect, including coldwater fisheries. However, the occasional increases in water temperature in the Tuolumne River below La Grange Dam, together with other factors, contributed to the conclusion that the WSIP could have a significant adverse effect on salmonids in this reach of the river (Vol. 3, Chapter 5, pp. 5.3.6-28 to 5.3.6-32).

14.7.6 Impacts on Flow/Hydrology

Comment Summary

This section of this master response responds to all or part of the following comments:

L_BAWSCA2-04	SI_TRT7-01	C_Hasso-02
SI_GreenP-01	C_Alter-01	C_Hoffm-01
SI_GWWF2-01	C_Bail-02	C_MartiM-06
SI_TRT-CWA-SierraC-45	C_BramlD1-01	C_Means2-01
SI_TRT-CWA-SierraC-113	C_Chiap-01	C_Picku-01
SI_TRT-CWA-SierraC-114	C_Dulma-01	C_Raffa-03
SI_TRT-CWA-SierraC-115	C_Elbiz-01	C_Sprin-01
SI_TRT-CWA-SierraC-118	C_Goite-01	C_Zimme-01
SI_TRT-CWA-SierraC-163	C_Goodm-02	
SI_TRT-CWA-SierraC-188	C_Hanke-01	

Summary of Issues Raised by Commenters

- Numerous comments were raised about the existing and proposed levels of diversions by the SFPUC from the Tuolumne River.
- Objection to the rationale for the Draft PEIR's significance determination for hydrology impacts (the "within current range" argument).

Response

Level of Diversions

The average annual unimpaired flow in the Tuolumne River at La Grange Dam is estimated to be 1,850,000 acre-feet. Currently, TID and MID divert about 47 percent of the average annual unimpaired flow into the Turlock and Modesto Canals at La Grange Dam. The SFPUC's current diversion of water from its reservoirs in the upper Tuolumne River watershed represents about 13 percent of the average annual unimpaired flow at La Grange Dam. Together, current diversions by the SFPUC, TID, and MID represent about 60 percent of the average annual unimpaired flow. Thus, flow in the Tuolumne River immediately below La Grange Dam is about 40 percent of its average annual unimpaired value.

With the WSIP in place, it is assumed that diversions by TID and MID at La Grange Dam would be unchanged, while diversions by the SFPUC in the upper Tuolumne River watershed would increase. With the WSIP, the SFPUC's diversion of water from its reservoirs in the upper Tuolumne River watershed would represent about 15 percent of the average annual unimpaired flow at La Grange Dam. Together, diversions by the SFPUC, TID, and MID would represent about 62 percent of the average annual unimpaired flow. Thus, flow in the Tuolumne River immediately below La Grange Dam would be about 38 percent of its average annual unimpaired value.

Note that the values presented in the two paragraphs above are slightly different from those provided in the Draft PEIR. After completion of the Draft PEIR, some improvements were made to the Hetch Hetchy/Local Simulation Model, and the values in the preceding paragraphs were obtained using the updated model as described in Section 13.3 (Vol. 7, Chapter 13) of the Comments and Responses document.

Range of Flows

Several comments challenged the conclusion in the Draft PEIR that river flows with the WSIP would remain within the range experienced under the existing condition, and therefore that the impacts on hydrology would be less than significant.

Flow in the Tuolumne River below La Grange Dam consists entirely of releases from the dam. Minimum releases from the dam and minimum flows in the river are specified in an agreement among TID, MID, and FERC, and are shown in Draft PEIR Table 5.3.1-2 (Vol. 3, Chapter 5, p. 5.3.1-13). The minimum releases represent the low end of the range of flows in this reach of the river. The minimum flow is 50 cubic feet per second (cfs), which occurs between June 1 and September 30 in the driest years. TID, the operator of La Grange Dam, would continue to adhere to the minimum releases specified in the agreement whether or not the WSIP is implemented. Therefore, the WSIP would not affect the low end of the range of flows in this reach of the river.

Typically, flows in the Tuolumne River below La Grange Dam are at their seasonal maximum in the winter and spring. One of the goals of dam operators is to fill Don Pedro Reservoir by the end of the snowmelt period if possible. The operators' ability to meet this goal is constrained by the requirement that space be retained in Don Pedro Reservoir to reduce possible flooding downstream of La Grange Dam. The flood control reservation requirement increases from zero on September 8 to 340,000 acre-feet on October 7, and is again reduced to zero between April 27 and June 3. Another goal is to keep flow in the river below La Grange Dam to no more than 9,000 cfs to prevent flooding in the Modesto area. The dam operators monitor the depth of the snowpack in the upper watershed, measure inflow to Don Pedro Reservoir, and adjust releases from Don Pedro Reservoir as necessary to meet the operating goals. At times when inflow to the reservoir is high, the capacity of the gates and valves at Don Pedro Dam can be exceeded, causing water to flow over the dam spillway. Water released from Don Pedro Reservoir flows two miles to La Grange Dam. Water can be diverted at La Grange Dam into the Turlock and Modesto Canals and released to the river through a number of valves. If very large releases from Don Pedro Reservoir are made, water can pass over La Grange Dam to the river in an uncontrolled manner. Uncontrolled releases over the spillways at Don Pedro and La Grange Dams are rare and are usually avoided by the dam operators.

Maximum flows in the river below La Grange Dam typically occur in the winter or spring of years when the snowpack in the Sierra Nevada is heavy and it melts rapidly or is subject to rainfall. Modeled average monthly flows in the river below La Grange Dam under the existing condition and with the WSIP are shown in Draft PEIR Figure 5.3.1-12 (Vol. 3, Chapter 5, p. 5.3.1-33). The figure shows that average monthly flows under both the existing condition and with the WSIP would exceed 6,000 cfs in 14 years in the 82-year hydrologic record.

A red line on Figure 5.3.1-12 shows the average monthly release from La Grange Dam to the river under the WSIP. A blue line shows the average monthly release from La Grange Dam under the existing condition. Where the red and blue lines occupy the same space, the red line overwrites the blue line. Examination of the figure for the years in which average monthly flow exceeded 6,000 cfs (1922, 1938, 1956, 1967, 1969, 1970, 1980, 1982, 1983, 1984, 1986, 1995, 1997, and 1998) indicates that the red line overwrites or almost overwrites the blue line in all 14 years. This shows that in very high flow years, the WSIP would have little or no effect on the peak average monthly flow.

The reason the WSIP would have little or no effect on the highest average monthly peak flows is that the operators of Don Pedro Reservoir must limit the capture of runoff during the winter and spring in order to maintain the required flood control reservation. In years when rainfall is abundant, the reservoir fills rapidly and reaches the maximum storage permitted consistent with the flood control requirements. Operators must release any additional inflow to the reservoir to the river below La Grange Dam. The peak release to the river usually occurs after the reservoir is at the maximum storage permitted consistent with flood control requirements.

Average daily flows in the river below La Grange Dam typically exceed average monthly flows because, in the winter and spring, reservoir operators may adjust releases to the river every few days to maintain the flood storage reservation. U.S. Geological Survey gaging records show that average daily flows in the river below the dam equaled or exceeded 10,000 cfs on at least one day in 1983 and 1997. A maximum average daily flow of 58,900 cfs occurred in 1997 in an unusual storm that caused rain to fall on the snowpack in January. It is unlikely that the WSIP would have any effect on the highest average daily peak or instantaneous peak flows for the same reason that it would not have any effect on average monthly peak flows.

In summary, the WSIP would have little or no effect on either the low or high ends of the range of current flows in the Tuolumne River below La Grange Dam. The WSIP would not "substantially alter stream flows such that they are outside the range of pre-project conditions," and its impact on flows was therefore judged to be less than significant.

Although the WSIP would not affect the magnitude of relatively rare, very large peak flows, it would affect the magnitude of the smaller average monthly peak flows that occur more frequently than once every 10 years. The modeled flows shown in Figure 5.3.1-12 of the Draft PEIR (Vol. 3, Chapter 5, p. 5.3.1-33) indicate that the WSIP would not have any effect on average monthly peak flows in large runoff events that occur about once every six years (14 times in the 82-year hydrologic record). This would be the case during conditions that occurred in 1922, 1938, 1956, 1967, 1969, 1970, 1980, 1982, 1983, 1984, 1986, 1995, 1997, and 1998. Average monthly peak flows in runoff events with a higher frequency than once in six years may be affected at times. For example, as shown in Figure 5.3.1-12, average monthly peak flows with the WSIP under conditions that occurred in 1936, 1950, 1965, 1978, and 1993 would be lower than under the existing condition.

14.7.7 Impacts on Geomorphology

Comment Summary

This section of this master response responds to all or part of the following comments:

SI_TRT-CWA-SierraC-119	C_BramdlD1-01	C_Goodm-02
SI_TRT-CWA-SierraC-125	C_Dulma-01	C_Hoffm-01
SI_TRT-CWA-SierraC-126	C_Elbiz-01	C_Sprin-01
SI_TRT-CWA-SierraC-164	C_Goite-01	

Summary of Issues Raised by Commenters

- Objection to the rationale for the Draft PEIR's significance determination for geomorphology impacts (the "within current range" argument).
- The sediment transport analysis is not quantitative and is speculative.

Response

The average monthly flow data provided in Table 5.3.1-6 of the Draft PEIR (Vol. 3, Chapter 5, p. 5.3.1-35) played only a minor role in the assessment of the WSIP's effects on the geomorphology of the Tuolumne River below La Grange Dam. Changes in peak flow attributable to the WSIP provided the primary informational basis for reaching conclusions regarding impacts on geomorphology. The WSIP would have little effect on the range of flows experienced in the Tuolumne River below La Grange Dam. It would have no effect on the magnitude of infrequent, very large flows for the reasons described in Section 14.7.6, above.

A commenter opines that the analysis of sediment transport and gravel bed conditions in the Draft PEIR is qualitative and largely speculative. The San Francisco Planning Department acknowledges that the analysis is qualitative but disagrees that it is speculative. Although limited data are available on substrate conditions in the lower Tuolumne River below La Grange Dam, it is the San Francisco Planning Department's view that the data are sufficient to make a reasonable analysis, without excessive speculation, of the WSIP's impact on sediment movement.

The information on existing sediment conditions in the lower Tuolumne River provided in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.3.2-3 and 5.3.2-4) was obtained from reports prepared by McBain and Trush (McBain and Trush, 2000; McBain and Trush and J. Vick, 2004). The lower Tuolumne River extends from La Grange Dam to the confluence with the San Joaquin River. The uppermost half of the reach, between La Grange Dam and the community of Hughson, has a gravel bed and banks. From Hughson to the confluence with the San Joaquin River, the river has a sand bed and banks. The broad riparian forest that once existed has been largely removed, and levees and agricultural encroachment confine much of the river corridor. The channel itself has been reshaped by gold mining in the 19th century and by gravel mining in the 20th century. For more than 130 years, the La Grange, Don Pedro, and New Don Pedro Dams have prevented the downstream movement of bedload from the upper Tuolumne River watershed. Abandoned gold and gravel mining pits within the river corridor below La Grange Dam also impede the movement of bedload. The pits trap gravel and prevent its downstream migration. Don Pedro Reservoir has also reduced peak flows in the river below La Grange Dam, which reduces the rate of downstream movement of bedload in this reach of the river.

As noted in the Draft PEIR, the WSIP would have very little effect on large infrequent floods, such as the flood that occurred in 1997. It would reduce the magnitude of the smaller bankfull peak flows that occur every one to three years and are the primary channel-forming events. This reduction would slow the rate of downstream fine sediment movement and affect channel formation, but the scale of the changes would be small relative to the changes wrought by past water management and mining activities and the clearing of the riparian forest. Therefore, the San Francisco Planning Department concluded that the impacts of the WSIP on the geomorphology of the lower Tuolumne River would be less than significant.

The quality of salmonid spawning gravels in the Tuolumne River below La Grange Dam has been greatly degraded by the past practices referred to above. Conditions suitable for salmonid spawning occur in a 25-mile-long gravel-bedded river reach between La Grange Dam and the community of Hughson, but most salmon spawn in the five-mile reach immediately below La Grange Dam. Salmonid spawning is most successful in gravel-bedded rivers with relatively small amounts of fine silt and sand. The quality of salmon-spawning habitat in the gravel-bedded reach of the river is impaired by a lack of coarse sediment from the watershed above and by an excess of fine sediment. More than 130 years ago, the construction of the first dam on the Tuolumne River, near the site of La Grange Dam, halted the downstream transport of coarse sediment from the upper watershed. Fine sediment enters the Tuolumne River below La Grange Dam from Gasburg Creek and Peaslee Creek, both of which drain agricultural areas. The WSIP-induced reduction in the magnitude of the bankfull peak flows that occur every one to three years may reduce the rate at which fine sediments are washed out of the gravel-bedded reach of the river.

In terms of a geomorphology impact (Vol. 3, Chapter 5, p. 5.3.2-7), the Draft PEIR concluded that the WSIP would not result in substantial changes in erosion or siltation rates or channel form, and this impact was determined to be less than significant. However, the WSIP-caused reduction in the rate of fine sediment movement in the Tuolumne River below La Grange Dam, together with other factors, contributed to the conclusion that the WSIP could have a significant adverse effect on salmonids in this reach of the river (Vol. 3, Chapter 5, pp. 5.3.6-28 to 5.3.6-32).

14.7.8 Mitigation Measure 5.3.6-4a

Comment Summary

This section of this master response responds to all or part of the following comments:

S_CDFG2-07	SI_TRT2-03	SI_TRT-CWA-SierraC-170
SI_CRS-07	SI_TRT5-03	SI_TRT-CWA-SierraC-155
SI_EnvDef-04	SI_TRT-CWA-SierraC-58	SI_TRT-CWA-SierraC-188

Summary of Issues Raised by Commenters

- Expression of uncertainty related to the feasibility of Mitigation Measure 5.3.6-4a.

Response

As stated in the Draft PEIR, the WSIP-caused reductions in flow and increases in water temperature in the reach of the Tuolumne River below La Grange Dam would have a potentially significant adverse effect on salmonids (Vol. 3, Chapter 5, p. 5.3.6-28 to 5.3.6-32). The Draft PEIR identified Mitigation Measure 5.3.6-4a as the preferred approach to reduce the impacts on salmonids to a less-than-significant level (Vol. 4, Chapter 6, p. 6-48). Several comments noted that, as acknowledged in the Draft PEIR, there is uncertainty regarding the feasibility of Mitigation Measure 5.3.6-4a. Because of this uncertainty, the Draft PEIR also identified an alternative mitigation measure, Measure 5.3.6-4b (see Section 14.7.9, below).

In order for Measure 5.3.6-4a to be effective, water levels in Don Pedro Reservoir with the WSIP would have to be essentially the same as they are under the existing condition. This could only be accomplished by reducing TID's and MID's use of water from Don Pedro Reservoir by an amount equal to the SFPUC's increased diversion from the Tuolumne River under the WSIP. Surface water use in the TID and MID service areas could be reduced through conservation efforts, such as installing more efficient irrigation systems, lining irrigation canals, recycling irrigation tailwater, improving conjunctive use of surface and groundwaters, planting crops that need less water, permanently or temporarily fallowing land, and by water savings in urban areas. The SFPUC could pay for these measures, and TID and MID could transfer the water saved to the SFPUC. Projects of this type are difficult but not impossible to implement; an example of such a project is an agreement between the Imperial Irrigation District and San Diego County Water Authority, whereby the Authority financed agricultural water conservation measures within the Imperial Irrigation District in order to secure the conserved water for its customers.

Another possible approach would be for the SFPUC to obtain water from a water agency other than TID and MID. The water acquired by the SFPUC would be conveyed to TID and MID so that the Districts would be able to reduce their use of Don Pedro Reservoir water. As indicated in the Draft PEIR, additional CEQA compliance might be required on a specific proposal to develop and transfer conserved water; it is expected that the transferring agency would serve as the CEQA lead agency for project-level review if required.

Mitigation Measure 5.3.6-4a is the San Francisco Planning Department's preferred measure to lessen the impacts of the WSIP on salmonids and riparian resources. Accordingly, the City and County of San Francisco has begun discussions with TID, MID, and other water agencies' staff in an initial effort to obtain commitments and reduce uncertainty with respect to Measure 5.3.6-4a. **Section 14.10, Master Response on Modified WSIP Alternative** (Vol. 7, Chapter 14) provides more information on the conserved water transfer under Measure 5.3.6-4a.

14.7.9 Mitigation Measure 5.3.6-4b

Comment Summary

This section of this master response responds to all or part of the following comments:

S_CDFG2-08	SI_TRT5-04	SI_TRT-CWA-SierraC-171
S_CDFG2-10	SI_TRT-CWA-SierraC-59	SI_TRT-CWA-SierraC-189
SI_EnvDef-04	SI_TRT-CWA-SierraC-60	SI_TRT-CWA-SierraC-190
SI_NCFFSC-01	SI_TRT-CWA-SierraC-62	
SI_TRT2-03	SI_TRT-CWA-SierraC-170	

Summary of Issues Raised by Commenters

- Mitigation Measure 5.3.6-4b does not reflect the latest knowledge on fish predation.
- Mitigation Measure 5.3.6-4b is inadequate because it is not similar in kind to the impact.

Response

As stated in the Draft PEIR, the WSIP-caused reductions in flow and increases in water temperature in the reach of the Tuolumne River below La Grange Dam would have a potentially significant adverse effect on salmonids (Vol. 3, Chapter 5, p. 5.3.6-28 to 5.3.6-32). The Draft PEIR identified Mitigation Measure 5.3.6-4a as the preferred approach to reduce the impacts on salmonids to a less-than-significant level (Vol. 4, Chapter 6, p. 6-48). However, there is some uncertainty associated with this measure because it cannot be implemented by the SFPUC alone, but requires the cooperation of another water agency (see Section 14.7.8, above). Although Measure 5.3.6-4a is the preferred measure, the Draft PEIR also identified an alternative measure (Mitigation Measure 5.3.6-4b) in the event that Measure 5.3.6-4a cannot be implemented. Measure 5.3.6-4b would reduce the impacts of the WSIP on salmonids by making habitat improvements in the reach of the river below La Grange Dam that would offset the potential habitat degradation attributable to the WSIP-induced flow reductions (Vol. 4, Chapter 6, pp. 6-48 and 6-49).

Mitigation Measure 5.3.6-4b, as described in the Draft PEIR, would either implement a spawning gravel augmentation project or eliminate one of the former gravel pits harboring fish that prey on juvenile salmonids. Several comments received on the Draft PEIR were critical of Measure 5.3.6-4b. These comments stated that the mitigation measure poorly matches the impact it is designed to mitigate and questioned the effectiveness of quarry pit removal from the river in benefiting salmonids. As indicated in the Draft PEIR and this response, Measure 5.3.6-4a is the preferred mitigation and would most directly addresses the nature of the WSIP impact on the lower river fisheries (i.e., an incremental flow reduction that would infrequently result in elevated water temperatures that could adversely affect salmonids). However, as discussed in the Draft PEIR analysis, since the flow reductions coupled with the projected infrequent water temperature increases that could occur under the WSIP would have an adverse impact on habitat conditions for juvenile salmonids, mitigation that improves habitat for juvenile salmonids is appropriate under CEQA.

Measure 5.3.6-4b would provide for implementation of an action that would improve habitat for juvenile salmonids. The measure calls for the SFPUC to implement one of two specific actions: gravel augmentation or gravel pit removal from the river. These actions, which were designed to either increase habitat quality and availability or reduce the vulnerability of juvenile salmonids to potential predation mortality, were selected in part based on (1) a review of the *Habitat Restoration Plan for the Lower Tuolumne River*, (2) information provided by Mesick et al. (2007), (3) discussions with the Anadromous Fish Restoration Program and resource agencies, and (4) a review of existing physical habitat conditions in the lower river and the ability of mitigation measures to reduce the effects of various potentially limiting factors related to the successful production of juvenile salmonids in the lower river. The two alternative actions described in Measure 5.3.6-4b would offer important long-term benefits to salmonid production that would enhance habitat conditions in the lower river in every year. Implementation of this measure would provide an incremental benefit in every year as a tradeoff for a potentially adverse periodic impact with a low frequency of occurrence.

A commenter observed that restoring spawning gravel would not mitigate impacts on later salmonid life stages and could harm later life stages by causing overcrowding of rearing habitat. The WSIP would reduce flow and increase water temperatures in May and June of some years, which could have adverse effects on juvenile Chinook salmon that are rearing in the stream and have yet to migrate downstream. There is no reason to believe that a gravel augmentation project that resulted in the production of larger numbers of juvenile salmon would have an adverse effect on later life stages; on the contrary, increased production of juvenile salmon could increase the chance of more salmon surviving to return to spawn.

The intent of the gravel augmentation action is to directly contribute to an increase in the availability and quality of habitat for various life-history stages of salmonids, which would result in increased reproductive success, better health and survival of rearing juveniles, and increased overall productivity in the lower river. The benefits of a multifaceted habitat enhancement action involving gravel augmentation are as follows: it would contribute to the improved quality and availability of spawning gravels for adult Chinook salmon and steelhead, increase suitable substrate available for macroinvertebrate production as a food resource for juvenile rearing salmonids, improve habitat quality and availability for juvenile salmonid rearing, increase instream cover and velocity refuges for rearing juveniles, and provide an overall increase in the habitat carrying capacity of the lower river for juvenile salmonid rearing. Observations of similar multifaceted habitat enhancement projects in the lower Mokelumne River have demonstrated benefits to both spawning and juvenile rearing for salmonids as well as increased macroinvertebrate production (Merz, 2004).

It has been hypothesized that the availability and quality of juvenile rearing habitat may be a factor limiting the production of salmonids in the lower Tuolumne River. Gravel augmentation and associated habitat enhancement would help directly address the carrying capacity for juvenile rearing by providing increased habitat quality and availability, increased habitat complexity and diversity, and increased instream cover for juvenile rearing, and would be expected to contribute to an increase in the health, growth rates, and survival of juvenile salmonids produced in the lower river. The benefits of such a physical habitat enhancement project would be present within the lower river year-round under all hydrologic-year type conditions and would provide long-term habitat benefits to salmonids spawning and rearing in the lower river.

Implementation of the gravel pit removal action would directly contribute to a reduction in predation mortality for those juvenile salmonids rearing in the lower Tuolumne River or emigrating downstream and could result in cooler water and greater food production as a result of improved riparian habitat. Comments on this measure raised questions about the effectiveness of this measure in benefiting salmonids. Although pilot studies conducted by TID on a similar action have shown disappointing results, the concept remains promising, and further study may prove to be more successful. Results of screw trap monitoring and other investigations in the lower Tuolumne River have identified predation mortality by a variety of piscivorous fish, including largemouth and smallmouth bass, striped bass, and Sacramento pikeminnow, in addition to avian predation as a factor contributing to the high mortality rates for juvenile salmonids rearing and emigrating from the lower river. Juvenile salmonids experience an increased vulnerability to predation associated with certain physical habitat structures, including captured gravel pits and incised pool habitat, where turbulent flow can cause disorientation of juvenile salmonids and increase their vulnerability to predation mortality. Physical structures such as gravel pits provide suitable habitat for many of the predatory fish as well as areas where prey can accumulate and concentrate, thereby increasing their vulnerability to predation mortality.

As part of the quarry pit removal action identified in this mitigation measure, physical modifications would be made to one or more existing structures within the lower Tuolumne River. These modifications, which could include gravel pit isolation, removal of physical structures that provide habitat for predatory fish, modifications to existing scour pools that provide holding habitat and ambush points for predators, or other physical and structural modifications to existing habitat conditions within the lower river, would be aimed specifically at reducing predation mortality for juvenile salmonids, thereby increasing their survival and potential contribution to the adult population. Modifications to decrease predation vulnerability within the lower river would benefit juvenile salmonids year-round in all hydrologic-year types, thus resulting in a long-term benefit by increasing the survival of salmonid fry and smolts produced in the lower river.

In response to comments on Mitigation Measure 5.3.6-4b (Vol. 4, Chapter 4, pp. 6-48 and 6-49), the following text revisions are made to clarify the method of implementation:

Fishery Habitat Enhancement

Measure 5.3.6-4b: If Measure 5.3.6-4a is not implemented, then the SFPUC will mitigate potential fishery effects on the lower Tuolumne River by implementing (or funding) one of the following two habitat enhancement actions ~~directed at fish habitat improvements~~ that are designed to sustain fishery resources under the river's flow regime, which are consistent with the Habitat Restoration Plan for the Lower Tuolumne River Corridor: gravel augmentation<u>/habitat enhancement</u> <u>to provide salmonid spawning and rearing habitat</u>, or isolating or filling a captured former gravel quarry pit along the river <u>that provides habitat for salmonid predators</u>.

The gravel augmentation/habitat enhancement project ~~Spawning gravel enhancement~~ will be implemented to increase salmonid spawning success and to improve the survival of rearing salmonids in the reach of the river downstream of La Grange Dam. Spawning success will be improved by the addition of suitable gravel to the stream channel. Other habitat features will be created to provide cover for juvenile salmonids and to increase the availability of substrate for macroinvertebrates ~~production~~ that would be used as ~~an enhanced~~ food ~~supply~~ by rearing juvenile salmon and steelhead~~and other species~~. The ~~spawning~~ gravel augmentation/habitat enhancement project will involve the planning, design, permitting, purchase, placement, and monitoring of suitable gravel and associated habitat enhancements ~~to be placed~~ at three riffle locations within the spawning reach between Basso Bridge and La Grange Dam. The three locations will meet ~~that meets~~ the criteria for suitable habitat as described in the Habitat Restoration Plan for the Lower Tuolumne River Corridor ~~at each location~~. The gravel will preferentially be rounded river rock of native origin that would be sized and pre-washed before placement into the river. The gravel augmentation/habitat enhancement project will also involve the addition of large woody debris and boulders to create increased habitat complexity and diversity at each of the three enhancement sites. After construction of the gravel augmentation/habitat enhancement project, it will be surveyed to establish its baseline condition. A survey of the three sites will be made at a minimum of five-year intervals by a qualified fisheries biologist. The fisheries biologist will determine whether the three sites continue to meet established criteria for salmonid spawning and rearing habitat. If the sites do not meet the criteria, as part of its long-term operations, the SFPUC will make the improvements necessary to return it to baseline conditions. ~~The depth and quality (e.g., percentage fines and cementation) of gravel will be monitored at five-year intervals and if the gravel deposits do not meet the criteria for suitable habitat SFPUC will be obligated to further augment or enhance the gravel deposits. The SFPUC will continue this gravel augmentation project and periodic monitoring as part of long-term system operations.~~

~~Alternately~~As an alternative to the gravel augmentation project, the SFPUC will remove from the lower river channel one of the former gravel quarry pits that has been "captured" by the river and acts as predator zones for fish such as largemouth and striped bass to prey on rearing and emigrating juvenile salmonids. ~~This~~Removal could be accomplished by filling the pit or installing a levee berm around the pit to isolate it permanently from the river channel. The SFPUC could implement this action directly or fund implementation by another entity involved in river restoration.

The performance standard for gravel pit removal would be an established permanent reduction in area of salmonid predator habitat. The SFPUC will monitor the pit removal project at five-year intervals. If floods have eroded the fil1 or damaged the levees in a manner that restores salmonid predator habitat, the SFPUC will make the necessary repairs. The SFPUC will continue periodic monitoring and repair as part of long-term system operations.

14.8 Master Response on Delta and San Joaquin River Issues

14.8.1 Introduction

Overview

This master response addresses issues raised by commenters regarding the WSIP's effects on the San Joaquin River and Sacramento–San Joaquin River Delta, and, as a consequence, on the State Water Project (SWP) operated by the California Department of Water Resources (DWR) and Central Valley Project (CVP) operated by the U.S. Bureau of Reclamation (USBR), both of which convey water through the Delta to customers south of the Delta. This master response is organized by the following subtopics:

14.8.2 Review of WSIP Effects on the San Joaquin River and Delta
14.8.3 Potential Effects on CVP and SWP Operations and Related Indirect Effects

Commenters

Commenters that addressed this topic include:

Federal Agencies

- U.S. Bureau of Reclamation – F_USBR

State Agencies

- None

Local and Regional Agencies

- San Francisco Bay Conservation and Development Commission – L_BCDC
- Contra Costa Water District – L_CCWD
- Santa Clara Valley Water District – L_SCVWD
- San Luis and Delta-Mendota Water Authority, Westlands Water District, and Kern County Water Agency – L_SLDWWKC
- Tuolumne Utilities District – L_TUD2
- Alameda County Flood Control and Water Conservation District, Zone 7 – L_Zone7

Groups

- Environmental Defense – SI_EnvDef
- Northern California / Nevada Council of the Federation of Fly Fishers Steelhead Committee – SI_NCFFSC
- Sierra Club – SI_SierraC2, SI_SierraC7
- State Water Contractors – SI_SWC
- Tuolumne River Trust – SI_TRT3, and SI_TRT6

- Tuolumne River Trust, Clean Water Action, and Sierra Club, SF Bay Chapter – SI_TRT-CWA-SierraC

Citizens

- Collin, Robert – C_Colli
- Dulmage, Diane – C_Dulma
- Hankemeyer, Carol – C_Hanke
- Martin, Michael – C_MartiM
- Toth, Tibor – C_Toth

PEIR Section Reference

The Draft PEIR addresses this topic area in the following locations: Vol. 1, Summary, pp. S-47 to S-62; Vol. 3, Chapter 5, pp. 5.3.1-38 and 5-3.1-39 (hydrology/flow), pp. 5.3.3-19 and 5.3.3-20 (water quality), pp. 5.3.4-5 to 5.3.4-9 (water supply), pp. 5.3.6-32 and 5.3.6-33 (fisheries), and pp. 5.7-45 to 5.7-52 (cumulative effects).

14.8.2 Review of WSIP Effects on the San Joaquin River and Delta

Comment Summary

This section of this master response responds to all or part of the following comments:

F_USBR-01	L_Zone7-02	SI_TRT-CWA-SierraC-138
F_USBR-06	SI_CNPS-01	SI_TRT-CWA-SierraC-139
L_BCDC-04	SI_NCFFSC-02	SI_TRT-CWA-SierraC-145
L_CCWD-01	SI_SierraC7-08	C_Colli-03
L_CCWD-02	SI_TRT3-05	C_Dulma-02
L_SLDWWKC-01	SI_TRT6-05	C_Hanke-03
L_SLDWWKC-04	SI_TRT-CWA-SierraC-65	C_MartiM-04
L_SLDWWKC-05	SI_TRT-CWA-SierraC-66	C_Toth-01
L_SLDWWKC-06	SI_TRT-CWA-SierraC-67	
L_SLDWWKC-07	SI_TRT-CWA-SierraC-137	

Summary of Issues Raised by Commenters

- The Draft PEIR analysis of impacts on the San Joaquin River and Delta is inadequate; it does not provide enough information.
- The Draft PEIR does not identify significant impacts on flow or water quality in the San Joaquin River and/or Delta because it assumes that the CVP and/or SWP operations will be modified to maintain compliance with regulatory flow and quality standards.
- The Draft PEIR baseline of 2005 is inadequate because of changes that have occurred since that time.
- The PEIR has significance criteria for impacts on water supplies but does not apply these criteria to impacts on the San Joaquin River or Delta.

Response

Draft PEIR Impact Assessment for the San Joaquin River and Delta

The effects of the WSIP on the San Joaquin River and Delta are addressed in several sections of the Draft PEIR, as listed above under the heading PEIR Section Reference. The analysis of effects on flows in the San Joaquin River and Delta is based on the detailed modeling and assessment of the WSIP's effects on Tuolumne River flows presented in the Draft PEIR (Vol. 3, Chapter 5, Section 5.3, with additional detail provided in Vol. 5, Appendix H).[1]

As described in Impact 5.3.1-4 (Vol. 3, Chapter 5, p. 5.3.1-30), the WSIP would indirectly result in flow changes in the lower Tuolumne River. Increased diversions under the WSIP would not directly result in reduced flow downstream in the lower Tuolumne River; rather, under the WSIP the increased water diversion at Hetch Hetchy Reservoir upstream of Don Pedro Reservoir to meet 2030 SFPUC customer purchase requests would cause a reduction in inflow to Don Pedro Reservoir thus leading to a reduction in reservoir storage at Don Pedro Reservoir. The way in which the WSIP would result in indirect effects on flow in the lower Tuolumne River is described below.

Don Pedro Reservoir, which is owned and operated by the Modesto Irrigation District (MID) and Turlock Irrigation District (TID) (together, "the Districts"), stores water from the upper Tuolumne River. In most below-normal or drier years, all of the runoff from the watershed upstream of Don Pedro Reservoir is captured and stored in the reservoir. The Districts make releases from the reservoir to the Modesto and Turlock Canals to make deliveries to their agricultural customers and also to the lower Tuolumne River in accordance with FERC requirements. In some years, usually wet or above normal years, the runoff volume is too great to either be used by the Districts or stored in the reservoir. In these years, water in excess of the FERC requirements is released to the lower Tuolumne River below La Grange Dam. As a result, in the future with the WSIP, the Districts would draw Don Pedro Reservoir down farther in many years than it would have been drawn down under the existing condition. Consequently, the Districts would have to capture a greater proportion of spring runoff to refill the reservoir, and the volume of excess water released to the lower Tuolumne River would be reduced compared to the existing condition. The SFPUC does not have any authority over the operation of Don Pedro Reservoir. The PEIR impact analysis assumes that, in the future, the Districts would continue to divert water from the reservoir into the canals that serve their agricultural customers as they do now, without adjustment; thus, the reduction in reservoir storage resulting from the WSIP would in turn cause a reduction, in some months and years, in the amount of excess water released by TID from the reservoir to the lower Tuolumne River. In this way, the WSIP would indirectly result in flow reductions in the lower Tuolumne River. The following discussion uses the term "WSIP-induced" flow reductions to refer to fact that the WSIP would not directly reduce flow in

[1] The Draft PEIR analysis was performed using the Hetch Hetchy/Local Simulation Model (HH/LSM), a state-of-the-art model of the regional water system developed by the SFPUC for water supply planning. The model provides information on reservoir releases, and this information was used in the Draft PEIR to estimate the effects of the WSIP on stream flows downstream of SFPUC reservoirs. The SFPUC has been improving and refining the model during more than 10 years of use.

the lower Tuolumne River or farther downstream in the San Joaquin River and into the Delta, but would do so indirectly.

As discussed in Impact 5.3.1-5 (Vol. 3, Chapter 5, p. 5.3.1-38), the WSIP-induced flow reductions described in detail for the lower Tuolumne River would also occur downstream in the San Joaquin River in the reach between the confluence with the Tuolumne River and the confluence with the Stanislaus River. Downstream of the confluence with the Stanislaus River, flow conditions in the San Joaquin River would reflect a combination of effects resulting from both the WSIP and the USBR's water releases from New Melones Reservoir. In the Delta, hydrologic conditions would reflect the combined effects of the WSIP and the actions taken by the USBR and/or DWR in accordance with their regulatory obligations for the CVP and SWP, respectively (along with actions by many others that affect the Delta).[2]

As described in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.3.4-1 and 5.3.4-2), the USBR and DWR hold post-1914 appropriative water rights, subject to the continuing jurisdiction of the State Water Resources Control Board (SWRCB), under which these agencies divert water into CVP and SWP reservoirs and canals upstream of the Delta and from the Delta itself. Because of the size of the diversions made by the CVP and SWP, the nature of their authorizing legislation, and the priority level of their water rights, the SWRCB has assigned unique responsibilities to the USBR and DWR for compliance with Delta water quality and flow objectives. Under preceding SWRCB water-rights decisions and current Water Right Decision 1641, the CVP and SWP must be operated in a manner that maintains compliance with Delta water quality and flow objectives. The USBR's and DWR's water rights are conditioned such that they can not be exercised in a manner that would cause a violation of the Delta objectives. These regulatory requirements are not mitigation measures, as suggested by some commenters, but rather regulatory obligations established in existing decisions and orders.[3] The water rights for the CVP and SWP are junior to the City and County of San Francisco's (CCSF's) Tuolumne River water rights. For this reason, too, the USBR and DWR must accommodate their operations to the lawful exercise by CCSF of its more senior water rights.

Draft PEIR Table 5.3.1-6 (Vol. 3, Chapter 5, p. 5.3.1-35) and Figure 5.3.1-12 (p. 5.3.1-33) present detailed information on the projected timing, frequency, and magnitude of the WSIP-induced flow reductions that could affect the San Joaquin River and Delta. As discussed in the Draft PEIR (p. 5.3.1-38), the WSIP-induced flow reductions affecting the San Joaquin River and Delta would primarily occur from January through June in wet or above-normal years, and during the season when flow in the San Joaquin River is at its annual maximum. As stated in the

[2] Regulatory flow and water quality objectives established by the SWRCB for the San Joaquin River and Delta are described in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.3.1-18 to 5.3.1-19, pp. 5.3.4-3 to 5.3.4-4, and pp. 5.3.3-9 to 5.3.3-12)

[3] In the early and late 1990s, the SWRCB considered alternatives to requiring the CVP and SWP to maintain water quality objectives in the Bay-Delta, including allocation of responsibility on a watershed-by-watershed basis, a strict water-rights priority basis, and equitable apportionment based on diversions. Any SWRCB initiative to implement Bay-Delta water quality objectives by assigning responsibilities to senior water-rights holders would require lengthy regulatory proceedings and even longer litigation. As a practical matter, the CVP and SWP are the only projects large enough to control water quality conditions in the Delta; therefore, it would be speculative to assume regulatory conditions for the WSIP other than the current regulatory regime.

Draft PEIR (p. 5.3.1-38), in most cases (except in three months over the 82-year [984-month] historical record), the WSIP-induced flow reductions would not result in conditions in the San Joaquin River upstream of the Delta that would affect the achievement of regulatory objectives established to maintain flow levels and water quality parameters protective of beneficial uses. In these few such instances, the USBR would act to ensure compliance with the regulatory objectives. The WSIP-induced flow reductions during these periods would have a less-than-significant effect on hydrology and the related areas of water quality, water supply, and fisheries.

Concerning the Delta, WSIP-induced flow changes within the San Joaquin River could affect the operation of the CVP and SWP if operational adjustments are needed to comply with regulatory obligations. The effect on operations could be a change in releases from upstream reservoirs, a change in the level of CVP or SWP Delta diversions, or a combination of both. As discussed in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.3.1-38 and 5.3.1-39), the USBR and DWR, as operators of the CVP and SWP, would be required to take action to maintain compliance with flow and water quality objectives in accordance with their regulatory obligations by either increasing releases from upstream reservoirs or reducing the level of Delta diversions. The PEIR assumes that these agencies would continue to meet the applicable regulatory requirements for the San Joaquin River and Delta following WSIP implementation, and concludes that the WSIP-induced flow reductions would result in a less-than-significant impact on these downstream water bodies and the environmental resources they support. Further discussion of the potential WSIP effects on CVP and SWP operations and related indirect effects is presented below in Section 14.8.3.

Some commenters questioned whether "frequency of occurrence" should be considered in determining impact significance and suggested that only "severity" or magnitude should be considered. Evaluating environmental impacts and determining their significance involves consideration of several factors, including the nature of the impact, the sensitivity of the affected resources, the local and regional environmental context, as well as impact magnitude, frequency, and duration. Other factors may be important in determining impact significance, depending on the environmental resource or issue under review. In general, the impact significance criteria used in the Draft PEIR provide guidance on what could constitute a significant impact and, where appropriate, identify the specific metrics for evaluation. For each project, the impact analysis provides a project-specific discussion of relevant information to substantiate whether or not a potential effect would be significant. The frequency of impact, along with other factors, was relevant to the analysis of WSIP effects on flows to the San Joaquin River and Delta and on the related issues of water quality, fisheries and aquatic resources, and water supply. Section 14.8.3, below, provides further discussion of potential WSIP effects on CVP and SWP operations and on water contractors that receive supply deliveries for agricultural, municipal, and industrial uses.

An example of how frequency of effect can be relevant to determining impact significance arises in the analysis of a project's effect on water supply to other users. A substantial reduction in supply delivery to a customer that occurs infrequently and lasts for a short period (such as a single year) has different consequences than a substantial frequent or chronic reduction in supply that reduces the overall long-term supply reliability. The customer can often make short-term arrangements to address an infrequent, short-term supply reduction (e.g., using conservation and/or other supply reserves such as groundwater) without experiencing lasting land use or environmental changes or damage, while a chronic reduction in previously available supply could result in more permanent effects. In the first scenario, an infrequent, short-term supply reduction would not constitute a significant impact on water deliveries, while the second scenario—a recurring supply reduction of sufficient frequency to appreciably reduce the long-term supply reliability—could represent a significant impact. In this and many other examples, frequency of impact is an important and relevant factor for determining impact significance. The following review of the potential WSIP effects clarifies when and why frequency of effect is relevant in determining impact significance.

Baseline for Impact Assessment

In accordance with CEQA guidance regarding the selection of an appropriate baseline for analysis, the year 2005 is used in the assessment of potential WSIP effects. The CEQA Guidelines indicate that, in most cases, the potential environmental impacts of a project should be determined relative to the existing conditions that exist at the time the environmental process is initiated. This baseline year was selected because the Notice of Preparation for the PEIR was published in 2005, and because it represented the most current, complete year for which information about water resource conditions was available for use in the Draft PEIR impact analysis (which was conducted primarily in 2006 and early 2007 prior to release of the Draft PEIR in June 2007).

In addition, model information for CalSim II, which was relevant to portions of the PEIR analysis, was updated in 2005. CalSim II, a model developed jointly by the USBR and DWR to assess CVP and SWP operations and resulting conditions in the Delta, is the central tool and source of comprehensive information used for water resources planning and impact assessment related to the Sacramento and San Joaquin Rivers and the Delta. While the PEIR analysis did not employ the CalSim II model—which does not address the Tuolumne River system or overall SFPUC water system operations in detail the way the Hetch Hetchy/Local Simulation Model [HH/LSM][4] does—the analysis makes use of information compiled for the 2005 update of the CalSim II model.

Comment SI_SLDWWKC-06 suggests that the 2005 baseline is inadequate because of changes that have occurred since then, but does not identify any specific changes of concern for consideration. Numerous ongoing activities and proposed actions are affecting the San Joaquin River and Delta, as summarized in the Draft PEIR cumulative impact analysis (Vol. 3, Chapter 5, pp. 5.7-5 to 5.7-52). Key events or activities that have occurred or are now in progress since Draft PEIR publication in mid-2007 include: (1) the Judge Wanger decision in late 2007 regarding delta smelt, which imposed interim export pumping restrictions tied to flow conditions on Old and Middle Rivers in the Delta; (2) the Endangered Species Act reconsultation now in progress for

[4] The Draft PEIR analysis was performed using the HH/LSM, a state-of-the-art model of the regional water system developed by the SFPUC for water supply planning. The model provides information on reservoir releases, which was used in the Draft PEIR to estimate the effects of the WSIP on stream flows downstream of SFPUC reservoirs.

the coordinated operations of the CVP and SWP (known as the "OCAP" [Operations Criteria & Plan] reconsultation), which will establish revised, long-term operating requirements for the CVP and SWP operations to protect endangered species (replacing Judge Wanger's interim measures for delta smelt and establishing other operational constraints for the protection of additional endangered species, including salmon); (3) the Judge Wanger decision to invalidate the OCAP Biological Opinion for anadromous salmonids, including steelhead, and winter-run and spring-run salmon[5]; and (4) the proposed Bay Delta Conservation Plan (BDCP), for which the state and federal environmental review processes have recently been initiated (spring 2008) with release of a Notice of Preparation for an Environmental Impact Report and a Notice of Intent for an Environmental Impact Statement, respectively.

Among these four recent developments, only the Judge Wanger decision provides adequate information for use in reevaluating potential WSIP effects. The SFPUC has prepared a supplemental modeling assessment of potential WSIP effects on the San Joaquin River and Delta for this master response that addresses the interim export pumping restrictions imposed by the 2007 Judge Wanger decision (see Section 14.8.3, below, for a discussion of the supplemental analysis). As described in detail below, the supplemental analysis using this updated information corroborates the Draft PEIR findings regarding the WSIP's effects on the San Joaquin River and Delta. Based on this supplemental modeling assessment, the baseline information used in the Draft PEIR analysis of the WSIP effectively addresses current 2008 baseline conditions; the PEIR baseline is adequate and supports a meaningful assessment of the potential effects of WSIP implementation on the San Joaquin River and Delta.

There is insufficient information regarding either the description or the consequences of the other three activities listed above for use in evaluating potential WSIP effects. It would be speculative to describe how these other potential actions might affect the Delta and/or tributary rivers or to assess potential effects related to these activities. For the OCAP reconsultation process now in progress, there are no specific results or decisions regarding modified CVP and SWP operations that could be effectively incorporated into the WSIP impact analysis. The interim export pumping restrictions represent the best available information regarding potential changes in CVP and SWP Delta operations as they relate to the WSIP. For the BDCP, this program proposes substantial modification of the existing water supply conveyance through the Delta, including consideration of both through-Delta conveyance as well as isolated-conveyance and dual-conveyance system alternatives. However, at this time, there is insufficient information about the proposed BDCP alternatives to incorporate into a meaningful impact analysis of the WSIP. As noted, the environmental review process for the BDCP alternatives was initiated this spring (2008), and a draft environmental analysis is not expected until 2009. In the review presented below of potential WSIP effects on the Delta, CVP and SWP operations, and water contractors, there are references made, where appropriate, to how the OCAP reconsultation, the Wanger decision on salmonids, and the BDCP might influence WSIP effects or the response to WSIP effects;

5 Judge Wanger has yet to issue a remedy in the salmonid case, and any interim remedy will be superceded by the Endangered Species Act reconsultation now in progress for the OCAP, which will establish revised, long-term operating requirements for the CVP and SWP operations to protect endangered species. It would be speculative to posit Judge Wanger's remedy in the salmonid case or what conditions may be imposed under the OCAP Biological Opinion.

however, technical analysis of such effects is not possible given the lack of current information on these activities.

Similarly, while the PEIR addresses the issue of climate change and potential effects on water resources and water supply (see Vol. 3, Chapter 5, pp. 5.7-92 to 5.7-96, and Vol. 7, Chapter 14, Section 14.11, Master Response on Climate Change), it does not include a detailed technical analysis of the potential effects of climate change on the San Joaquin River or the Delta because there is insufficient information to do so. The USBR and DWR are currently updating the modeling tools used to evaluate water resources and impacts on the Delta in order to incorporate potential climate change scenarios (as required in part by the Judge Wanger decisions on OCAP Biological Opinions addressing delta smelt and salmonid species). This process involves development and peer review of appropriate assumptions about climate change with respect to the Delta and tributary river system and of the modeling approach, which will begin to provide the analytical tools necessary to evaluate potential climate change scenarios. In the absence of these analytical tools and information, the PEIR provides a qualitative assessment of WSIP impacts with consideration of climate change effects and determines that near-term climate change effects (through 2030) would not change the conclusions of the impact analysis presented in the Draft PEIR on the lower Tuolumne River as well as on downstream effects on the San Joaquin River and Delta (see Vol. 7, Section 14.11.4).

Effects on Delta Water Users

Comments related to the WSIP's effects on Delta surface water supplies delivered to water users for agricultural and municipal/industrial use purposes were received from water agencies that are "in-Delta" diverters, such as the Contra Costa Water District (CCWD); from the USBR, which operates the CVP; and from agencies that receive water from the CVP and/or SWP water systems that export water from the Delta, including the San Luis & Delta-Mendota Water Authority, Westlands Water District, Kern County Water Agency, Santa Clara Valley Water District, Zone 7, and the State Water Contractors (representing all SWP contractors). The following discussion responds to comments from the CCWD, which diverts water directly from the Delta into its system. Section 14.8.3, below, addresses comments about the WSIP's effects on the CVP and SWP and associated water contractors.

Comments L_CCWD-01 and L_CCWD-02 stated that the PEIR does not adequately analyze changes in Delta water quality, and that changes in Delta water quality could affect its water supply operations and, in turn, its supply reliability. The Draft PEIR discusses WSIP effects on Delta water quality in Section 5.3.3, Surface Water Quality (Vol. 3, Chapter 5, pp. 5.3.3-19 and 5.3.3-20) as well as in Section 5.3.4, Surface Water Supplies (Vol. 3, Chapter 5, pp. 5.3.4-9 to 5.3.4-11). Based on the detailed analysis of WSIP-induced flow effects, the PEIR concludes that the potential effects on Delta water quality would be less than significant for several reasons.

First, WSIP-induced flow reductions affecting the Delta would occur primarily in wet and above-normal year types, and in the winter and spring periods, in the season when flows are at their annual maximum. Given the magnitude of flow through the Delta during these periods, WSIP-related flow reductions would not appreciably affect Delta water quality. The impact analysis presented in the Draft PEIR (p. 5.3.4-11) indicates that WSIP-induced flow reductions affecting the Delta would be minimal, typically on the order of 500 cubic feet per second (cfs) as compared to a Delta outflow that is greater that 10,000 cfs. On rare occasions, the WSIP-induced flow reductions could range from 1,000 cfs to 4,000 cfs. Detailed modeling of the WSIP indicated that this type of flow reduction could occur in seven months out of the 984-month hydrologic record. Additional modeling (including use of the DSM2 model) was not considered necessary because information available from the HH/LSM modeling effort provided evidence that impacts on Delta water quality would be less than significant.

The CCWD operates its Delta intakes to meet both water supply and water quality criteria. In addition to the SWRCB's water quality objectives for the Delta, the CCWD has established a delivered water quality goal for its customers and manages its water supply diversions to help achieve this goal. The CCWD uses the Los Vaqueros Reservoir project to help manage the quality of its delivered water. The CCWD diverts high-quality Delta water to storage in the first months of each year and uses this stored water to blend with lower quality supply being diverted from the Delta later in the year; in this way, CCWD compensates for periods of lower Delta water quality and maintains delivered water quality to meets its standards. CCWD adjusts Delta diversions, storage, and the timing and extent of supply blending each year to manage for variations in Delta water quality and maintain a consistent delivered water quality to its customers. Under the WSIP, it is assumed the CCWD would continue this same type of water supply diversion, storage, blending, and delivery operation. In most years, the WSIP would not affect CCWD water diversion operations; very infrequently (less than 1 percent of the time), WSIP effects on the Delta might affect water quality such that the CCWD would make some adjustment in Delta pumping and/or blending, as it does now to address the constant variations in Delta water quality. Based on the impact significance presented in the Draft PEIR (Vol. 3, Chapter 5, p. 5.3.4-4), this very infrequent potential effect on Delta water quality would not represent a substantial change in water quality that would result in a substantial adverse change in CCWD water diversion operations or decreases in water deliveries for its customers.

14.8.3 Potential Effects on CVP and SWP Operations and Related Indirect Environmental Effects

Comment Summary

This section of this master response responds to all or part of the following comments:

F_USBR-01	L_SLDWWKC-04	SI_SWC-01
F_USBR-02	L_SLDWWKC-05	SI_SWC-03
F_USBR-03	L_SLDWWKC-06	SI_TRT3-05
F_USBR-04	L_SLDWWKC-07	SI_TRT6-05
F_USBR-05	L_TUD2-01	SI_TRT-CWA-SierraC-65
F_USBR-06	L_Zone7-02	SI_TRT-CWA-SierraC-67
L_CCWD-01	SI_EnvDef-05	SI_TRT-CWA-SierraC-91
L_CCWD-02	SI_SierraC2-02	SI_TRT-CWA-SierraC-137
L_SLDWWKC-01	SI_SierraC7-08	

Summary of Issues Raised by Commenters

- The Draft PEIR does not address WSIP effects on CVP and SWP operations, which might have environmental effects.
- The Draft PEIR does not address WSIP effects on CVP and SWP operations, which might affect water supply deliveries. The Draft PEIR does not properly apply impact significance criteria related to surface water supplies to the San Joaquin River or Delta (i.e., to the CVP and SWP).

Response

Introduction

The Draft PEIR analyzes effects on the San Joaquin River and the Delta and, as discussed above in Section 14.8.2, indicates that WSIP-induced flow reductions to these water bodies could in some cases require the USBR and/or DWR to adjust CVP and/or SWP operations in order to meet their obligations to maintain compliance with regulatory flow and water quality objectives. Adjustments to CVP or SWP operations could include increasing water releases from system reservoirs and/or reducing export pumping of supply from the Delta. The Draft PEIR analysis indicates that WSIP-induced flow reductions could require adjustment of CVP or SWP operations. In response to comments received on this topic, the SFPUC conducted a supplemental modeling assessment to help the San Francisco Planning Department further examine the potential WSIP-induced effects on the San Joaquin River and the Delta and, in turn, on CVP and SWP operations (Vol. 8, Appendix O4). This supplemental modeling assessment is presented in Appendix O (Vol. 8) of the PEIR. This supplemental assessment uses information on the WSIP derived from the HH/LSM in combination with information from the 2005 CalSim II model.

Focused primarily on operations of the CVP and SWP, CalSim II incorporates the simulated operations of non-CVP/SWP water projects that exist on tributaries to the San Joaquin and Sacramento Rivers. Development of the CalSim II model during 2005 included a refinement of the depiction of San Joaquin River basin operations and hydrology. On the Tuolumne River, CalSim II models operation of the Don Pedro Project (including releases below Don Pedro Reservoir at La Grange Dam that affect Tuolumne River flow contributions to the San Joaquin River and Delta). Although the HH/LSM and CalSim II are different models, the underlying logic of operations for the Don Pedro Project in each of the models was developed coincidentally and the models produce similar results. For this supplemental analysis, the CalSim II model was used to further evaluate the effect that WSIP-induced flow reductions in the lower Tuolumne River would have on the San Joaquin River and Delta. The findings of this supplemental modeling assessment, described here, corroborate the impact findings of the Draft PEIR.

Effects on the San Joaquin River and on CVP Operations at New Melones Reservoir

The supplemental modeling analysis corroborates the findings that WSIP-induced flow reductions affecting the San Joaquin River would typically occur during wetter years, and that the more sizeable changes in flow would occur during years when the flows in the river are relatively large.

To further assess potential WSIP effects on the USBR's CVP operations at New Melones Reservoir due to flow reductions in the San Joaquin River, modeling results indicating when and to what extent the WSIP would result in flow reductions in the San Joaquin River were compared to modeling results for the "base case" (without WSIP implementation) that estimates periods over the 82-year (984-month) historical hydrologic record when the USBR would have to make releases from New Melones Reservoir on the Stanislaus River to maintain either flow or water quality objectives for the San Joaquin River. This comparison identified those instances when WSIP effects would "trigger" a response from the CVP system and require the USBR to make a release from New Melones Reservoir that it otherwise would not have been required to make.

This analysis identifies three monthly instances (over the 984-month record) when the WSIP would trigger the need for a release from New Melones Reservoir; in two instances, the WSIP-induced flow reductions occurred during a period when flow objectives were a controlling condition of the USBR's operations, and in one instance the reductions occurred when water quality objectives were the controlling condition. This finding corroborates the analysis presented in the PEIR that only very infrequently would reductions in San Joaquin River flow attributable to the WSIP be sufficient to cause flow in the San Joaquin River to fall below the established objectives and trigger a compensatory reaction from the USBR's CVP New Melones Reservoir. In most months modeled over the 82-year period of hydrologic record, the WSIP's effect on flow in the San Joaquin River would not require any changes in CVP operations at New Melones Reservoir. The supplemental modeling reaffirms the result that the WSIP could affect CVP operations on the San Joaquin River upstream of the Delta only rarely—less than 1 percent of the time.

Based on the PEIR impact significance criteria regarding potential effects on surface water supplies and water users (Vol. 3, Chapter 5, p. 5.3.4-4), the WSIP's effects on USBR CVP operations at New Melones Reservoir would not result in substantial adverse changes in operations or substantial decreases in water supply deliveries for water users. The WSIP's effects would be very infrequent and of a limited magnitude and duration. The WSIP would not result in the need for a frequent or sustained schedule of release from New Melones Reservoir that would chronically reduce the available supply for CVP contractors. Rather, the WSIP would very rarely require a release of water from New Melones Reservoir, and the resulting reduction in stored water might or might not affect supply deliveries to CVP contractors the following year. Depending on the timing of the required reservoir release and the climate and hydrology of that year and the following year, the reservoir could refill and restore storage levels without any reduction in deliveries to CVP contractors. If the reservoir did not refill and restore the amount of water released, then some CVP contractors could experience a reduction in supply delivery in the following year due to the WSIP-induced flow changes downstream in the San Joaquin River.

The eastside CVP contractors that receive water from New Melones Reservoir include Stockton East Water District and Central San Joaquin Water District. At present, the supply delivered to these contractors from the CVP system varies from year to year. Very infrequently, the WSIP could contribute to a short-term reduction in deliveries to these contractors. As they do now to address year-to-year variations in supply from the CVP New Melones system, these contractors would implement various actions, including the use of other supplies (groundwater and other surface water supplies); short-term reductions in crop acreage, the number of crop rotations, or crop type; and increased conservation (irrigation improvements). These contractors are already actively pursuing the development and acquisition of supplemental water supply sources and are engaged in ongoing conservation efforts to address several factors, including the following: the need to remedy existing groundwater overdraft in the San Joaquin Valley region and develop an effective regional conjunctive-use program; the growing long-term CVP system water delivery reliability issues due to regulatory requirements for addressing special-status fishery resources in the Delta (delta smelt) and its tributary rivers (salmonid species); and overall surface water reliability issues such as the potential future effects of climate change on water supply availability. These contractors have identified the need to pursue multiple conservation and supplemental water supply strategies regardless of WSIP implementation. While the potential effects of the WSIP would contribute to possible supply delivery reductions to CVP contractors, the WSIP contribution is not considered to be cumulatively considerable, given how infrequently the reductions would occur coupled with their limited magnitude and duration.

Effects on the Delta and on the CVP and SWP Systems

With respect to WSIP-induced effects on the Delta, a supplemental analysis was conducted using CalSim II modeling information to identify periods when the Delta is in “excess condition” versus “balanced condition” (see Vol. 8, Appendix O). The term “excess condition” is used to describe those periods when there is more water flowing through the Delta than is needed to meet Delta environmental standards (for flow and water quality) and the needs of water diverters. The term “balanced condition” is used to describe periods when there is not enough water flow through the Delta, and the USBR and DWR have to actively operate the CVP and SWP to balance reservoir releases with export operations in order to provide specific Delta outflow to meet either the flow or water quality objectives. A WSIP-induced flow reduction that affected Delta inflow during excess conditions would possibly require the USBR or DWR to alter its CVP or SWP export operations but would not necessarily require a change in upstream reservoir releases. During these excess conditions, a WSIP-induced flow reduction could affect Delta outflow. A WSIP-induced flow reduction that affected Delta inflow during balanced conditions could require the USBR and DWR to make either upstream reservoir releases or adjustments to CVP and SWP export operations.

Modeling analysis indicates that WSIP-caused flow reductions would affect Delta inflow about 15 percent of the time, or in 145 months in the 984-month hydrologic record (see Vol. 8, Appendix O for more information). Most of the WSIP-caused reductions in Delta inflow would occur during excess conditions (118 months in the 984-month hydrologic record, or about 12 percent of the time) and thus would result in reductions in Delta outflow and could but would not necessarily affect CVP or SWP export operations. These reductions in Delta outflow would occur during periods of relatively high flow through the Delta and would not result in significant adverse effects on Delta environmental resources, as illustrated by the location of the freshwater/brackish water interface (referred to as “X2,” an important indicator of the health of aquatic life in the Delta). When Delta outflow is large, X2 moves downstream deep into Suisun

Bay; when outflow is small, X2 moves into the western Delta. The Delta environmental standards include a provision specifying that X2 should not be located upstream of certain locations between February and June to protect aquatic life. In effect, the standard requires that the SWP and CVP operate their facilities in a manner that causes Delta outflow to be great enough to maintain X2 in a downstream location between February and June.

When the Delta is in an excess condition, more water is flowing through the Delta than is needed to meet Delta standards and, consequently, X2 is located downstream of the specified locations. In 127 months out of the 145 months in the 984-month hydrological record, when modeling indicates that the WSIP would affect Delta inflow, the WSIP-caused reductions in monthly Delta outflow would be less than 20,000 acre-feet, insufficient to have much effect on Delta outflow or the position of X2. Occasionally (occurring in 4 months out of the 984 months modeled), relatively large WSIP-caused reductions in monthly Delta outflow of more than 100,000 acre-feet would occur. However, since monthly Delta outflow during excess conditions typically exceeds 1,000,000 acre-feet, the outflow reductions would likely cause X2 to move upstream, but it would still remain downstream of the locations specified in the Delta standards. Because of this, the impacts of WSIP-caused reductions in Delta outflow on biological resources would be less than significant.

Although during excess conditions a change in Delta inflow due to WSIP-induced flow changes in the San Joaquin River may not affect CVP and SWP upstream release operations, CVP and SWP export operations may be affected. This effect is described later below.

Concerning WSIP-induced effects on the Delta that could affect CVP and SWP operations during balanced conditions, the supplemental analysis used CalSim II modeling information to identify periods when the Delta is in a balanced condition, which could require the USBR and DWR to make adjustments in CVP and SWP operations to address the flow or water quality effects of the WSIP. The supplemental modeling analysis identified 26 months out of the 984-month (82-year) record in which WSIP-induced flow reductions would occur during Delta balanced conditions (less than 3 percent of the time). The average annual reduction in inflow during these balanced conditions would be 7,000 acre-feet. When these flow reductions occur, the USBR and DWR might elect to increase reservoir releases, decrease Delta exports, or a combination of both to maintain the required Delta outflow and achieve required flow and water quality objectives.

The CVP and SWP systems include multiple reservoirs upstream of the Delta and two major export pumping facilities in the Delta (Jones Pumping Plant and Banks Pumping Plant, respectively), which the USBR and DWR use in a coordinated manner to meet their environmental obligations as well as contract delivery responsibilities. The CVP and SWP together deliver an annual average of about 5 million acre-feet of water to users south of the Delta, about 3 million acre-feet to farmers, and the rest to urban areas. The two projects pump water from the south Delta and convey it directly to users or (when water availability exceeds users' needs) into storage at their jointly owned south-of-the-Delta reservoir, San Luis Reservoir, near Los Banos. Because of the size and complexity of these two federal and state water systems, it is not possible to determine exactly how the USBR and DWR would adjust system operations to respond to a WSIP-induced flow change in the Delta. The analysis of potential WSIP effects on the San Joaquin River, summarized above, is able to consider specific effects on the New Melones Reservoir, since it is the only CVP facility that would respond to flow changes in the San Joaquin River. By contrast, this discussion of possible effects on the CVP and SWP systems, the Delta, and south-of-Delta contractors in response to a WSIP-induced flow change in the Delta must address various possible impact scenarios rather than a specific impact on a particular facility or user(s). Under existing conditions, it is expected that the USBR and DWR would primarily increase reservoir releases rather than reduce exports to achieve Delta standards; however, in the future, it is possible that the CVP and SWP operational changes necessary to address the pending requirements of the Judge Wanger decision on salmonid species protection could limit the ability of the USBR and DWR to use reservoir releases to meet Delta standards, thus leading to a greater reliance on export reductions.

Whether the USBR and DWR choose to increase reservoir releases or reduce export pumping, the WSIP-induced Delta inflow reductions that occur during balanced conditions in the Delta would not necessarily reduce the amount of water available in the short term for delivery to CVP and SWP contractors. Whether actual deliveries to contractors would be reduced would depend on hydrological and year-to-year system operation objectives. For example, a release of water from a CVP and/or SWP reservoir upstream of the Delta would reduce the amount of water in storage that year. However, that reduction in storage might not immediately lead to a reduction in contractor deliveries and the reservoir might refill the following year, in which case storage levels would be restored with no resulting shortage in actual water deliveries to contractors. Releases from upstream reservoirs to address WSIP-induced effects would increase the risk of a supply delivery reduction by reducing the amount of water in storage, but would not necessarily result in an actual delivery reduction.

While the USBR and DWR could decide to restrict Delta export pumping to address flow and water quality objectives in those occasional instances when WSIP-induced flow reductions occur during Delta balanced conditions, there are also other constraints on the CVP and SWP systems that limit water exports from the Delta based on hydraulic conditions in the south Delta whether the Delta is in an excess or balanced condition. In particular, the emergency remedy measures to protect delta smelt imposed by Judge Wanger establish allowable reverse flows in Old and Middle Rivers between January and June. These flows are dependent on the hydraulics of the south Delta, including the amount of water that enters the Delta from the San Joaquin River. A general rule-of-thumb is that approximately 50 percent of the flow at Vernalis in the San Joaquin River (downstream of the confluence with the Tuolumne River) affects the flow in Old and Middle Rivers, and exports have an almost direct (1:1) effect on flow in Old and Middle Rivers. As a result, about one-half of the change in flow in the San Joaquin River will affect the amount of allowed water export.

A conservative assessment was undertaken of the average effect per year of WSIP-induced flow reductions in the San Joaquin River. The assessment is conservative in that it includes WSIP-induced flow reductions in years with extremely high flow when the WSIP reductions might not constrain Delta exports, and no adjustment is made for the fact that in some wet years a reduction in allowable Delta water export might not affect south of Delta deliveries. Using this conservative assessment, the average annual effect of the WSIP on CVP and SWP exports amounts to approximately 10,000 acre-feet per year. This is the amount of water that, on an average annual basis, the CVP and SWP would not have available to export to contractors south of the Delta with the implementation of the WSIP. The amount of water exported from the Delta by the CVP and SWP varies annually. Between 1995 and 2004, the SWP diverted an average of 2.4 million acre-feet per year from the Delta; the CVP diverts an average of 1.7 million acre-feet per year. Based on the impact significance criteria presented in the Draft PEIR (Vol. 3, Chapter 5, p. 5.3.4-4), this potential indirect WSIP effect on the CVP and SWP water supply deliveries does not represent a substantial change in CVP and SWP operations or a substantial decrease in water deliveries for water users.

On the occasions when WSIP-caused reductions in Delta inflow could affect deliveries to SWP and CVP water users, adverse environmental impacts could occur if the users were forced by this loss of water supply to substantially alter their water management practices. For example, if the WSIP effects resulted in a sustained, long-term reduction in supply availability, then agricultural users might take land permanently out of production, which could then cause dust emissions, at least in the few years before native vegetation became established. Agricultural and municipal water users might replace the lost SWP or CVP water with water from other sources, and the use of the other sources could itself have environmental impacts. However, for the reasons described below, SWP and CVP water users would not be likely to substantially alter their water management practices as a result of the WSIP.

WSIP-induced reductions in CVP and SWP deliveries would be small in magnitude compared to the differences in year-to-year deliveries that result due to hydrological factors. SWP and CVP deliveries often vary widely from year to year. For example, in 1991, a very dry year, the SWP delivered about 550,000 acre-feet of water to users; in 2000, a wet year, it delivered about 3,500,000 acre-feet of water to users. Because water users are subject to such variability in SWP and CVP deliveries, they have developed their long-term water management strategies accordingly. Most users of SWP and CVP water do not rely solely on the projects, but have other water sources that can be used when SWP and CVP water is in short supply. Many users of SWP and CVP water have the ability to store water available in wet years in surface reservoirs or groundwater banks for later use in dry years.

SWP and CVP water users are also able to adapt to short-tem changes in water availability. Each fall, the operators of the SWP and CVP make an initial estimate of the amount of water they expect to be available to users in the coming spring and summer, and then periodically update the estimate as hydrological information accumulates. The estimates are based on weather forecasts and the amounts of water in storage in reservoirs in the Central Valley, including Don Pedro Reservoir, and in storage as mountain snow. SWP and CVP water users are able to respond to rapidly developing shortages or surpluses. Agricultural users may increase or decrease their planting of annual crops. Municipal users may impose water rationing or place surplus water in storage. The infrequent changes in SWP and CVP water availability attributable to the WSIP would be accommodated within the water users' existing short-term water management strategies. The minor changes in availability of SWP and CVP water attributable to the WSIP are unlikely to cause SWP and CVP water users to substantially alter either their long-term or short-term water management strategies. Therefore, the environmental impacts of WSIP-caused delivery reductions (should such impacts occur) would be less than significant.

This supplemental analysis supports the Draft PEIR conclusions that WSIP effects on flow, water quality, as well as beneficial uses (i.e., fish/aquatic resources and water supply) would be less than significant. It should also be noted that while the PEIR determines the WSIP effects on the San Joaquin River and Delta to be less than significant and requiring no mitigation, the PEIR does identify a mitigation measure to address the WSIP-induced flow effects in the lower Tuolumne River on fisheries and riparian habitat that would also essentially avoid WSIP-induced effects downstream in the San Joaquin River and the Delta. Mitigation Measure 5.3.6-4a, Avoidance of Flow Changes by Reducing Demand for Don Pedro Reservoir Water, calls for the SFPUC to secure a water transfer from MID/TID and/or other water agency such that the water acquired is developed through actions that result in a reduction of demand on Don Pedro Reservoir as a result of conservation, improved delivery efficiency, interagency water transfer of conserved water, or use of an alternative supply such as groundwater. Consequently, MID/TID would deliver less water from Don Pedro Reservoir, and the resulting increase in water storage in the reservoir would offset the reduction in reservoir inflow attributable to the WSIP. Thus, the WSIP would not trigger a change in downstream reservoir releases to the lower Tuolumne River. While this measure is not fully in the SFPUC's control to implement and requires agreements and actions by other entities, the SFPUC intends to adopt and pursue this measure as part of WSIP implementation. This measure would further reduce, if not fully eliminate, the downstream effects of the WSIP on the San Joaquin River and the Delta as well as on the CVP and SWP and their water contractors.

14.9 Master Response on Alameda Creek Fishery Issues

14.9.1 Introduction

This master response addresses comments on the adequacy of the impact analysis and mitigations with respect to the WSIP's effects on the steelhead fishery in Alameda Creek, as well as other comments on Alameda Creek fishery resources, including fish-related stream flows and water quality. Comments concerning fisheries in the context of climate change are addressed in part in this master response, but refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14) for detailed discussion of climate change effects. Comments concerning riparian corridors and related aspects of terrestrial biology are addressed in part in this master response and also in the responses to individual comments (see Vol. 7, Chapter 15) pertaining to terrestrial biology.

Updated Assumptions Used in this Master Response

Since publication of the Draft PEIR, a number of changes have occurred with respect to the Draft PEIR's discussion of the potential for steelhead reestablishment in the upper Alameda Creek watershed. These changes include updated status of fish passage improvement projects, modifications to the descriptions of the Alameda Creek Fishery Enhancement (SV-1) and Calaveras Dam Replacement (SV-2) projects, and updated Alameda Creek flow modeling. This master response incorporates these changes and updated assumptions as part of the comprehensive response to the numerous comments on the Draft PEIR related to steelhead fisheries in Alameda Creek.

Changes in Steelhead Conditions

Although the presence of steelhead in Alameda Creek above the Bay Area Rapid Transit District (BART) weir is not an "existing condition" as defined by CEQA and as described in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.4.5-4 to 5.4.5-11), it is a possible future condition that could occur as the result of the cumulative implementation of many planned and proposed projects and actions designed to restore steelhead in Alameda Creek. As a result of information provided by commenters regarding future projects influencing the future habitat conditions for steelhead in the Alameda Creek watershed, the Draft PEIR analysis of cumulative effects (Vol. 3, Chapter 5, pp. 5.7-52 to 5.7-67) has been updated to incorporate a discussion of cumulative impacts of the WSIP on future-occurring steelhead. This master response provides an expanded discussion of the "future cumulative scenario" in which it is assumed that the steelhead fishery has been restored above the BART weir, and then discusses the potential effects of the WSIP on potential future-occurring steelhead. Following this expanded discussion, specific text revisions to the Draft PEIR are identified.

Changes to the Calaveras Dam Replacement and Alameda Creek Fishery Enhancement Projects

Sections 13.2 and 16.2 (Vol. 7, Chapters 13 and 16, respectively) present the revised project descriptions for WSIP components affecting system operations, including changes to the Alameda Creek Fishery Enhancement (SV-1) and Calaveras Dam Replacement (SV-2) projects. Since publication of the Draft PEIR, the SFPUC has incorporated both project revisions and protective measures into these two projects to reduce the WSIP's potential to affect habitat conditions for potential future-occurring steelhead in the upper watershed (SFPUC, 2008). The project revisions would occur regardless of steelhead presence or absence upstream of the BART weir and are as follows:

- The Calaveras Dam Replacement project would include facility modifications at the Alameda Creek Diversion Dam (ACDD) to construct a new bypass structure needed to implement bypass stream flows.
- If a structural alternative involving construction of a recapture facility is selected under the Alameda Creek Fishery Enhancement project, the recapture facility would be located at the downstream end of the reach of Alameda Creek between the lower Sunol Valley and the confluence with Arroyo de la Laguna. As an alternative to the recapture facility, the SFPUC may coordinate with other water agencies to develop and implement other means of recapturing fishery enhancement flows consistent with the 1997 California Department of Fish and Game Memorandum of Understanding (CDFG MOU).

The project description modifications also include protective measures that were designed in the event that man-made barriers in Alameda Creek are removed and steelhead gain access to Alameda Creek above the BART weir. These protective measures would provide both a long-term strategy of working with federal and state agencies, as well as interim protection in the event that: (1) the National Marine Fisheries Service (NMFS) and/or the CDFG have determined steelhead to be present in Alameda Creek above the BART weir; (2) construction of the Calaveras Dam Replacement project is complete; and (3) the Alameda Watershed Habitat Conservation Plan (HCP) has yet to be finalized. The project components designed to provide protective measures for future-occurring steelhead would include the following:

- An operational plan to provide minimum stream flows to support steelhead spawning below the ACDD to the confluence with Calaveras Creek when precipitation naturally generates runoff and flow in the creek, including the site-specific studies needed to determine the specific minimum stream flow requirements to support steelhead spawning in this reach of the creek.
- A detailed monitoring plan to survey and document steelhead spawning, subject to review and comment by the appropriate resource agencies. Monitoring would occur for a minimum of five years and a maximum of 10 years following implementation of the bypass flows for steelhead. At the completion of the monitoring period, the SFPUC would provide a report describing the methods, data collected, and results used to assess the performance of the minimum stream flow in providing suitable habitat for steelhead spawning.
- Interim minimum flows would be implemented if the NMFS and/or CDFG have determined that steelhead are present in Alameda Creek above the BART weir, construction of the Calaveras Dam project is complete, and the Alameda Watershed HCP

has yet to be finalized. The interim bypass flow releases would be consistent with the 1997 CDFG MOU, with the additional requirement that these flows would be achieved through bypass flows at the ACDD at all times when flows are available in upper Alameda Creek, rather than through releases at Calaveras Dam. Any changes in bypass flows provided for in this measure would be limited by the SFPUC's ability to achieve the bypass flow schedule, taking into consideration such factors as natural annual and interannual (i.e., seasonal) variations in flow in Alameda Creek immediately above the ACDD, and the SFPUC's ability to maintain all appropriated water rights in Alameda Creek. If supplemental releases need to be made for 1997 CDFG MOU compliance due to naturally low stream flows in upper Alameda Creek, releases would be made from Calaveras Dam. Based on flow studies conducted by Hagar and Payne (ETJV, 2008), it has been determined that the performance criteria, monitoring requirements, and other specifications included in the 1997 CDFG MOU could be readily adapted to benefit steelhead as well as sensitive amphibians. The MOU flow schedule provides the following instream flows:

  - 5 cubic feet per second (cfs) between November 1 and January 14
  - 20 cfs between January 15 and March 15
  - 7 cfs between March 16 and October 31 (reduced on ramping schedule to avoid settling of fines)

- Until the studies needed to resolve the physical and institutional requirements for future steelhead migration in Alameda Creek have been completed, the following interim measure would be implemented, but only after the following conditions are met: construction of the Calaveras Dam Replacement project (SV-2) is completed; existing barriers to passage are remedied; and the NMFS and/or CDFG have determined that steelhead can migrate above the BART weir of their own volition:

  - The SFPUC would provide seasonal flow bypasses at the ACDD and/or flow releases from Calaveras Dam, either (1) without recapture or (2) with recapture at a point approximately at the downstream end of the reach of Alameda Creek between the lower Sunol Valley and the confluence with Arroyo de la Laguna, below critical riffle locations or lower in the creek, between December 1 and June 30 (combined adult and juvenile migration period) in an amount equivalent to the flow release schedule provided in the 1997 CDFG MOU.

  - As an alternative to the recapture facility, the SFPUC would coordinate with other water agencies to develop and implement other means of recapturing enhancement flows consistent with the 1997 CDFG MOU at a location downstream of the reach of Alameda Creek between the lower Sunol Valley and the confluence with Arroyo de la Laguna.

Draft PEIR Mitigation Measure 5.4.5-3a

In order to reflect the incorporation of the project revisions and additional protective measures into the Calaveras Dam Replacement project (SV-2) component of the WSIP, Draft PEIR Mitigation Measure 5.4.5-3a, Minimum Flows for Resident Trout on Alameda Creek (Vol. 4, Chapter 6, pp. 6-52 and 6-53), has been modified to be implemented in conjunction with the bypass flows at the diversion dam proposed as part of the Calaveras Dam Replacement project (and described above) to meet the 1997 CDFG MOU flow requirements (see Vol. 7, Chapter 16 for specific text changes).

Updated Flow Modeling

Subsequent to publication of the Draft PEIR, the SFPUC conducted updated model runs with the Hetch Hetchy/Local Simulation Model (HH/LSM)[1] to reflect more recent input assumptions for several model parameters as part of its ongoing system planning and management. Revised model assumptions and data are discussed in Section 13.3 (Vol. 7, Chapter 13), and new model output is shown in Appendix O (Vol. 8) of this PEIR. With respect to Alameda Creek, the updated model runs resulted in generally minor changes in flows and reservoir operations compared to the data presented in the Draft PEIR. The results of the updated model runs are integrated into the responses to comments, updated analyses, and protective measures.

Master Response Organization

This master response is organized by the following subtopics:

- 14.9.2 Steelhead Fishery – Existing Conditions in Alameda Creek
- 14.9.3 Impacts on Steelhead in Lower Alameda Creek below the BART Weir
- 14.9.4 Steelhead – Future Fishery Scenario and Potential Cumulative Effects
- 14.9.5 Other Fish Species and Aquatic Habitat in Alameda Creek
- 14.9.6 Climate Change and Cumulative Effects on Future Fish Passage and Fish Habitat

Comments on Alameda Creek fishery issues were received from the following entities:

Federal Agencies

- None

State Agencies

- California Department of Fish and Game – S_CDFG2

Local and Regional Agencies

- Alameda County Flood Control and Water Conservation District – L_ACFCWCD
- Alameda County Water District – L_ACWD
- East Bay Regional Park District – L_EBRPD
- Zone 7 Water Agency – L_Zone7

Groups

- Alameda Creek Alliance – SI_ACA1, SI_ACA2
- California Native Plant Society, East Bay Chapter – SI_CNPS-EB2
- Environmental Defense – SI_EnvDef
- Golden West Women Flyfishers – SI_GWWF2
- Northern California/Nevada Council of the Federation of Fly Fishers Steelhead Committee – SI_NCFFSC

[1] The Draft PEIR (Vol. 3, Chapter 5, pp. 5.1-9 to 5.1-17) analyzed the WSIP's impacts on river and steam flow using a computerized mathematical simulation model developed by the SFPUC. This model, the HH/LSM, simulates the operations of the regional water system using a monthly time-step.

Citizens

- None

PEIR Section Reference

The Draft PEIR evaluates impacts on fisheries and habitat in Alameda Creek, presents mitigation measures to reduce or eliminate impacts, and discusses future fishery habitat enhancement projects in the following locations: Vol. 1, Summary, Table S.6, p. S-53; and Vol. 3, Chapter 5, Section 5.4.1 (stream flow), Section 5.4.3 (water quality), Section 5.4.5 (fisheries), and Section 5.7.3 (cumulative impacts).

The Draft PEIR addresses issues concerning Alameda Creek fisheries-related legal issues and water rights in the following locations: Vol. 1, Chapter 2, Section 2.4.2 (regulatory requirements); Section 2.5.1 (institutional considerations); Table 2.3 (SFPUC water resources policies); Vol. 2, Chapter 4, Section 4.6 (biological resources); Vol. 3, Chapter 5, Section 5.2 (plans and policies) and Section 5.4.5 (fisheries).

14.9.2 Steelhead Fishery – Existing Conditions in Alameda Creek

Introduction

This section of the master response addresses comments concerning the existing conditions in Alameda Creek for steelhead and rainbow trout, including their regulatory status and the SFPUC's current and ongoing stewardship and management efforts towards steelhead restoration. It also discusses flow requirements for steelhead with consideration of other native stream-dependent species. This section is organized by the following subtopics:

- Biological Distinctions and Regulatory Status for Steelhead and Rainbow Trout
- Anadromous Steelhead in Lower Alameda Creek
- Consideration of Fish Passage at the Niles Gaging Station
- SFPUC Environmental Stewardship and Alameda Creek Fishery Restoration Projects
- Consideration of Steelhead at the Alameda Creek Diversion Dam
- Other Native Stream-Dependent Species
- SFPUC's Ongoing Management and Stewardship of the Alameda Watershed

Comment Summary

This section of this master response responds to all or part of the following comments:

L_ACFCWCD-02	L_ACFCWCD-13	SI_ACA1-11
L_ACFCWCD-03	L_ACFCWCD-15	

Summary of Issues Raised by Commenters

- An arbitrary distinction is drawn between steelhead and rainbow trout.

- Clarification is needed regarding the regulatory status of steelhead and rainbow trout in Alameda Creek above the BART weir.
- Issues regarding fish passage above the BART weir, including:
  - The consideration of steelhead currently passing upstream over the BART weir is inadequate.
  - The distinction between naturally migrating fish past the BART weir and fish transported past the weir is arbitrary.
  - The effects of reduced peak winter flows on fish passage over the BART weir and middle inflatable dam are not adequately addressed.
  - Mitigation for effects of reduced peak winter flows on fish passage over the BART weir and middle inflatable dam needs to be included.
- The discussion of Niles gaging station with respect to fish passage is inadequate.
- SFPUC involvement in fishery enhancement projects is inconsistent with the position that steelhead are not present upstream of the BART weir.

Biological Distinctions and Regulatory Status for Steelhead and Rainbow Trout

Comments received on the Draft PEIR requested further validation of the biological distinctions made between anadromous steelhead and resident rainbow trout within the Alameda Creek watershed in determining WSIP-related impacts on steelhead populations. The Draft PEIR addresses the regulatory status, life history, and distinctions between resident and migratory populations, as well as flows needed to support populations, in Section 5.4.5 (Vol. 3, Chapter 5, pp. 5.4.5-4 to 5.4.5-11).

The life-history discussion presented in Section 5.4.5 is summarized here to facilitate an understanding of how the biological distinction was drawn between steelhead and rainbow trout in the Draft PEIR. Steelhead and rainbow trout are both genetically identified as the species *Oncorhynchus mykiss* (*O. mykiss*), but are distinguished by their different regulatory status and life-history strategies, as summarized here. Both steelhead and rainbow trout have a flexible life history and adopt varying life-cycle strategies. All *O. mykiss* hatch in the gravel substrate of coldwater streams (Gunther et al., 2000). During spawning, the female steelhead and rainbow trout clears and cleans a depression in the gravel (redd) where eggs are deposited, fertilized, and incubate until hatching. After the eggs hatch, fry emerge from the gravel and disperse through the stream, typically occupying low-velocity areas along stream margins (Reiser and Bjornn, 1979). Juvenile steelhead and rainbow trout often move to deeper pools and higher velocity areas as they grow, and remain in freshwater for at least one year.

Following this rearing period of at least one year, juveniles (parr) may follow a variety of life-history patterns, which include residents (non-migratory) at one extreme and individuals that migrate to the open ocean (anadromous) at the other extreme. Intermediate life-history patterns include fish that migrate within the stream (potamodromous), fish that migrate only as far as estuarine habitat, and fish that migrate to near-shore ocean areas.

Juveniles that become migratory typically do so after one or two years of rearing, but sometimes longer. Physiological changes (smoltification) in these fish (smolts) ultimately allow them to make a transition from freshwater to seawater. Smolts migrate to the ocean, spend a variable amount of time there (typically one to two years), grow rapidly and return to spawn, generally in the stream where they hatched. This is an anadromous life history, typical of many salmon and trout as well as other fish species, and anadromous *O. mykiss* are commonly known as steelhead. Within a given stream, some *O. mykiss* do not migrate to the sea, and the proportion may vary considerably depending on local circumstances. These resident fish are often known as resident or stream rainbow trout. While resident rainbow trout share many of the same life-history characteristics and environmental requirements as anadromous steelhead, unlike steelhead—which migrate to the ocean for a portion of their life cycle—resident rainbow trout complete their entire life cycle within the freshwater environments of streams and lakes.

In the past, the Alameda Creek watershed supported anadromous steelhead (Gunther et al., 2000). Scientists have determined that resident rainbow trout and anadromous steelhead are genetically the same species that exhibits two different life-history strategies. Specifically, these different life-history strategies do not appear to be genetically distinct, and steelhead and rainbow trout have been observed interbreeding. Tissue samples have been collected from steelhead and rainbow trout in the Alameda Creek watershed and from other streams in the area for genetic analyses (Gunther et al., 2000). These analyses concluded with a high level of confidence that the Alameda Creek samples are not of hatchery origin and are genetically part of the Central California Coast (CCC) Distinct Population Segment (DPS) (formerly Evolutionarily Significant Unit, ESU) (Nielsen, 2003). Trout populations isolated above dams in the Alameda Creek watershed have been observed adopting an adfluvial life history, spending most of their lives in the reservoirs and migrating to tributary streams to spawn.

As described in the Draft PEIR (Vol. 3, Chapter 5, p. 5.4.5-4), while steelhead and resident rainbow trout are genetically identical, a distinction is made for steelhead based on the successful life-history strategy displayed. Although rainbow trout and steelhead are identified in the Draft PEIR as the same species, the two life-history strategies are not used interchangeably when discussing impacts on the listed special-status species of CCC steelhead. Steelhead are distinguished biologically as the anadromous life-history strategy. Anadromous steelhead have the ability to migrate to the sea and return to freshwater spawning areas in natal streams. Resident rainbow trout in upper Alameda Creek can migrate to coastal marine waters, but cannot return to spawning or rearing habitat upstream of the BART weir.

In January 2006, pursuant to the Federal Endangered Species Act (FESA), the NMFS listed as threatened the CCC steelhead DPS, including all naturally spawned anadromous steelhead populations below natural and manmade impassable barriers (71 Federal Register 834). The listing of the Alameda Creek CCC steelhead DPS as threatened applies only to the anadromous form of *O. mykiss* and is therefore limited to populations downstream of the BART weir. Specifically, the final listing determination stated, “Under our final approach of delineating steelhead-only DPSs of *O. mykiss*, the resident populations, including those in upper Alameda Creek and the Livermore-Amador Valley, are not considered part of the listed DPSs” (71 Federal

Register 841). Further discussion of the regulatory status of steelhead in Alameda Creek is presented in the Draft PEIR (Vol. 3, Chapter 5, p. 5.4.5-4).

As discussed in the Draft PEIR, a National Marine Fisheries Service (NMFS) ruling determined that steelhead and rainbow trout inhabiting a river or stream that allows the possibility of successful migration to and from coastal marine waters will, by definition, be classified as steelhead. Thus, the resident rainbow trout that occur in Alameda Creek upstream of the BART weir (a complete barrier to adult migration) are not designated as a listed species due to their inability to complete an entire life cycle involving adult upstream migration to the upper watershed with subsequent spawning. Therefore, a regulatory distinction currently exists that defines *O. mykiss* upstream of the BART weir as resident rainbow trout.

The NMFS has not designated the Alameda Creek watershed as critical habitat for steelhead, and has listed as threatened only those steelhead that currently exist below the lowest impassible barriers in the Alameda Creek watershed (i.e., the BART weir). Thus, the resident rainbow trout that occur in the creek above the BART weir are not designated as a listed species and are not proposed for listing. However, the NMFS has advised that the designation of critical habitat would be open to further evaluation if anadromous steelhead do obtain passage to upper Alameda Creek.

Anadromous Steelhead in Lower Alameda Creek

Many comments were received regarding fish passage in the lower portion of Alameda Creek and past the BART weir. Comments on this issue sought clarification on the extent to which the BART weir currently blocks upstream passage by anadromous CCC steelhead. Section 5.4.5 of the Draft PEIR (Vol. 3, Chapter 5, pp. 5.4.5-4 to 5.4.5-11) discusses steelhead populations in Alameda Creek, current barriers to fish passage, the regulatory status of steelhead in Alameda Creek, and the activities of the SFPUC, other agencies, and workgroups in passage improvement programs. Further discussion of this issue is provided in Section 14.9.3, below.

Alameda Creek historically hosted a steelhead run that spawned in the upper reaches of the watershed. That steelhead run was eliminated by the placement of several obstructions to migration within the Alameda Creek channel over the past century. These obstructions include the Alameda County Flood Control and Water Conservation District's (ACFCWCD) BART weir, located about 9.5 miles upstream from the creek's confluence with San Francisco Bay.

In February 2000, the Center for Ecosystem Management and Restoration published a report entitled *An Assessment of the Potential for Restoring a Viable Steelhead Trout Population in the Alameda Creek Watershed* (Gunther et al., 2000). The assessment found that suitable habitat exists in the watershed to support steelhead spawning and rearing, but that upstream adult migration was completely prevented by the presence of several barriers in the lower portion of the watershed. The assessment concluded that the BART weir presents a complete barrier to all migrating anadromous fish species under all flow conditions, with the possible exception of Pacific lamprey. Therefore, steelhead can currently migrate upstream within Alameda Creek only as far as the BART weir. The comment's assertion that the BART weir barrier is temporal (i.e., flow-dependent) is unsupported by either current literature (Gunther et al., 2000) or regulatory distinction.

Comments received on the Draft PEIR noted that individual steelhead fish have been transported upstream of the BART weir through citizen-group catch-and-release programs coordinated by the Alameda Creek Alliance. Concern was raised regarding impacts on these individual fish due to WSIP implementation. A discussion of steelhead in the Alameda Creek watershed is presented in Draft PEIR Section 5.4.5 (Vol. 3, Chapter 5), and a discussion of cumulative impacts on steelhead is presented in Section 14.9.4, below.

Steelhead that are artificially transported upstream of total passage barriers do not represent a naturally occurring, self-sustaining population, and, as such, impacts on these few individual fish are not evaluated in the Draft PEIR. These individuals are not considered part of the CCC steelhead DPS under FESA because these fish and their offspring, if successful in spawning, cannot return to the watershed upstream of the BART weir to complete a full life cycle. The Alameda Creek Alliance has been involved in transporting adult migrant fish past barriers in lower Alameda Creek. The Alameda Creek Alliance describes this transport operation on its website, which discusses the fact that the transport of a few individuals does not effectively move a sufficient number of fish upstream to create a viable spawning population (Alameda Creek Alliance, 2002).

Consideration of Fish Passage at the Niles Gaging Station

Comments raised concern that the Draft PEIR discussion of the U.S. Geological Survey (USGS) Niles gaging station (located upstream of the BART weir) was inadequate with respect to fish passage. Section 5.4.5 of the Draft PEIR (Vol. 3, Chapter 5, p. 5.4.5-9) discusses the Niles gaging station with respect to fish passage, as well as future habitat and passage improvement projects currently under study and planning. The Niles gaging station has been described as a potential impediment to fish passage (Gunther et al., 2000), although it remains passable during higher flow events. The downstream pool temperatures are characterized by stressful to highly unsuitable conditions in summer months, and improvements are required for both upstream and downstream passage (Hanson, 2008). The Northern California Council Federation of Fly Fishers has developed a preliminary study of fish passage by the Niles gage, and fish passage criteria and studies at the gaging station are ongoing. Because steelhead are unable to migrate upstream of the BART weir under existing conditions, impacts on steelhead passage at the Niles gaging station were not evaluated in the Draft PEIR. However, these impacts are considered in the cumulative impact analysis presented below in Section 14.9.4, which discusses future passage improvements and instream flow strategies as part of the SFPUC’s involvement in steelhead population recovery within the Alameda Creek watershed.

SFPUC Environmental Stewardship and Alameda Creek Fishery Restoration Projects

As part of the continuing effort to address steelhead restoration in Alameda Creek, the SFPUC has entered into an agreement with 17 public agencies and organizations as part of the Alameda Creek Fisheries Restoration Workgroup (ACFRW) to provide funding and collaborate on flow studies focused on steelhead restoration. To date, these studies have not developed instream flow recommendations, but an initial workplan—the *Alameda Creek Population Recovery Strategies and Instream Flow Assessment for Steelhead Trout*—has been developed to achieve this goal (McBain and Trush, 2007). Collaborative data collection is scheduled for the near future, and a joint process among the agencies has begun to recommend a range of flows to support steelhead restoration objectives. The referenced report details this effort to establish instream flow targets and outlines specific studies intended to result in a flow strategy for restoring and maintaining native fishes (McBain and Trush, 2007). Due to the many variables involved, these studies need to be completed before it is possible to develop a specific, scientifically based flow schedule for steelhead. Further detailed discussion on specific flow release volumes and schedules is provided in Section 14.9.4, below.

Comments raised concern that the Draft PEIR failed to mitigate or analyze impacts on fish passage within the context of proposed future projects designed to increase habitat quality and connectivity within Alameda Creek for steelhead. A detailed discussion of future cumulative scenario conditions and cumulative impacts associated with WSIP implementation is presented in Section 14.9.4. As previously described, various watershed and habitat studies have established that steelhead do not migrate above the BART weir (Gunther et al., 2000).

Regardless of the timing of the BART weir fish passage project and other planned habitat enhancement/restoration actions, the SFPUC will continue to participate in steelhead restoration efforts. Ongoing studies will recommend flows to support steelhead restoration (as detailed in Section 14.9.4), and the SFPUC will continue to work with the NMFS, CDFG, and other stakeholders on these studies. Section 14.9.4 provides a detailed discussion of the WSIP's potential contribution to cumulative impacts on future-occurring steelhead in Alameda Creek with the consideration of the revisions to the Calaveras Dam Replacement project (SV-2) and Draft PEIR mitigation measures summarized above in Section 14.9.1. The SFPUC plans to incorporate steelhead recovery strategies developed through the ACFRW process into its Alameda Watershed HCP or other regulatory mechanism, which will provide coverage under FESA for regional water system operations at the time steelhead return to the upper Alameda Creek watershed. The SFPUC will comply with FESA requirements for steelhead protection through the Alameda Watershed HCP, or other agreement/authorization acceptable to the permitting agencies, as described in Section 14.9.4.

Consideration of Steelhead at the Alameda Creek Diversion Dam

Comments on the Draft PEIR identified the desire to remove the ACDD as a barrier to fish passage in order to support restoration of the historical range of steelhead within Alameda Creek. The SFPUC has no plans to remove the ACDD, and its removal is not required to mitigate significant impacts of the WSIP. However, to address the potential for steelhead reestablishment in the upper Alameda Creek watershed, the SFPUC proposes to develop and implement an operational plan to provide minimum stream flows below the ACDD that will support steelhead spawning as part of the Calaveras Dam Replacement project (SFPUC, 2008). This operations plan will be developed in coordination with the ACFRW, CDFG, and NMFS. Other SFPUC actions proposed to address potential future-occurring steelhead in the upper watershed are discussed in Section 14.9.1, above. Additionally, as stated in Mitigation Measure 5.4.5-3a, Minimum Flows for Resident Trout on Alameda Creek, and Mitigation Measure 5.4.5-3b, Alameda Diversion Dam Diversion Restrictions or Fish Screens (Vol. 4, Chapter 6, pp. 6-52 to 6-54), the SFPUC would complete site-specific studies to determine appropriate bypass flows to address impacts on the resident trout fishery in Alameda Creek below the diversion dam. As stated in Measure 5.4.5-3a, providing minimum flows below the dam would support resident trout spawning and egg incubation; it is also expected that this measure would be sufficient to sustain the resident trout population in this reach of the creek, which is limited due to natural drying of the stream channel in alluvial sections during the summer months (Sak, 2007). As stated above and further discussed in Section 14.9.4, the SFPUC is committed to the ongoing management and stewardship of the Alameda Creek watershed, including fishery enhancement projects and measures to provide flows for native stream-dependent species, as detailed in Section 14.9.1, above.

Other Native Stream-Dependent Species

Comments received from the CDFG noted that Mitigation Measure 5.4.5-3a, Minimum Flows for Resident Trout on Alameda Creek, may not provide adequate protective flows for steelhead and native stream-dependent species. In response to the comment recommending further study to determine whether sufficient water will be available for different life stages of fish and native stream-dependent species, the Draft PEIR mitigation measure incorporates site-specific studies and coordination with the ACFRW to determine the appropriate minimum stream flow. Section 14.9.4 presents a detailed analysis of current habitat conditions for different life stages of steelhead and rainbow trout, the potential impacts of WSIP implementation on these various life stages, and the status of studies on instream flow requirements to protect fishery resources. Please refer to Section 14.9.4, below, as well as **Response S_CDFG2-15** and **Response L_ACWD-22** (Vol. 6, Chapter 15, Sections 15.2 and 15.3, respectively) for more discussion of bypass flows in Alameda Creek.

In response to comments regarding the ACDD bypass flows and reevaluation of Mitigation Measure 5.4.5-3a, the measure has been expanded to address other species and life stages. The following three excerpts from the Draft PEIR are revised as follows:

Vol. 3, Chapter 5, p. 5.4.6-19, third full paragraph:

> Overall, implementation of the proposed WSIP water supply and system operations would result in *potentially significant* impacts on terrestrial biological resources due to a potential reduction in aquatic breeding habitat for key special-status species. Measure 5.4.1-2, Diversion Tunnel Operation, calls for operation of the diversion tunnel in a manner that ensures that flows not required to maintain storage in Calaveras Reservoir are passed down Alameda Creek at the diversion dam. Measure 5.4.5-3a, Minimum Flows for Resident Trout on Alameda Creek, calls for <u>developing and implementing an operational plan to provide</u> minimum <u>bypass</u> flows below the diversion dam <u>to support habitat for rainbow trout and other native stream-dependent species</u> from December through April. Implementation of these measures would ensure that minimum flows in Alameda Creek are allowed to pass by the diversion dam. Taken together, these measures would reduce adverse impacts on key special-status species to a less-than-significant level.

Vol. 4, Chapter 6, p. 6-52, first paragraph under Fisheries, first sentence:

> **Measure 5.4.5-3a:** The SFPUC shall develop and carry out as part of the implementation of the Calaveras Dam Replacement (SV-2) project, an operational plan to implement minimum ~~stream~~ bypass flows when precipitation generates runoff into the creek below the diversion dam to the Calaveras Creek confluence from December 1 through April 30 to support ~~resident trout~~ spawning and egg incubation for resident trout as well as breeding habitat for other native stream-dependent amphibians.

Vol. 4, Chapter 6, p. 6-53, first paragraph, last sentence:

> The operational plan will allow for adapting minimum flow amounts to support resident trout spawning and egg incubation and other native stream-dependent species based on the monitoring results and best available scientific information.

Section 14.9.4, below, provides a detailed discussion of planned steelhead restoration within the Alameda Creek watershed and assesses potential cumulative effects on steelhead that could result from WSIP implementation. As described in Section 14.9.4, successful implementation of planned and proposed fishery enhancement projects would result in the removal of many barriers to passage for anadromous steelhead within Alameda Creek. As described in Section 14.9.1 above, when steelhead passage is restored to the upper watershed, the SFPUC will work with the CDFG and NMFS to comply with the applicable FESA requirements for steelhead through the Alameda Watershed HCP or other regulatory mechanism. Currently, the SFPUC is developing the Alameda Watershed HCP in compliance with FESA, which will addresses operation (but not construction) of the Calaveras Dam Replacement project (SV-2), and steelhead is a covered species in the HCP. The HCP is a long-term mechanism in which the SFPUC and regulatory agencies are assessing the requirements for steelhead restoration and other native fish and aquatic species in the watershed affected by SFPUC water system operations.

SFPUC's Ongoing Management and Stewardship of the Alameda Watershed

Comments also requested clarification of the SFPUC's position regarding the presence of steelhead in the upper watershed, and the reasons for SFPUC involvement in fishery enhancement projects upstream of the BART weir if the current understanding is that steelhead are not present in the upper watershed. Sections 5.4.5 and 5.7.3 of the Draft PEIR (Vol. 3, Chapter 5) discuss the SFPUC's involvement in habitat improvement programs planned for the Alameda Creek watershed.

The SFPUC manages its Alameda watershed lands to benefit a wide range of species, habitat, and natural resources in addition to specific efforts to restore steelhead to Alameda Creek. The SFPUC's watershed management and stewardship policies are detailed in the *Alameda Watershed Management Plan* (SFPUC, 2001) and the Water Enterprise Environmental Stewardship Policy (SFPUC, 2006). The SFPUC has dedicated much time and funding toward numerous long-term efforts to improve steelhead habitat and passage within the watershed, such as the recent removal of the Sunol and Niles Dams; it is also a major participant in the ACFRW, which is focusing on the restoration of steelhead to Alameda Creek. The SFPUC's work with the ACFRW includes developing a long-term strategy that encompasses a range of watershed management goals.

Additionally, independent of involvement in the ACFRW's fishery enhancement projects, the SFPUC has funded studies to better understand the biological characteristics required for successful steelhead restoration. It is the policy of the SFPUC to operate the SFPUC water system in a manner that protects and restores native fish and wildlife downstream of SFPUC dams and water diversions, within SFPUC reservoirs, and on SFPUC watershed lands.

14.9.3 Impacts on Steelhead in Lower Alameda Creek below the BART Weir

Introduction

This section of the master response addresses comments concerning the analysis of the WSIP's potential effects on steelhead and flows in lower Alameda Creek downstream of the BART weir. This section is organized by the following subtopics:

- Lower Alameda Creek as a Migration Corridor and a Transition Zone for Steelhead Smolts
- Impacts on Stream Flow and Fisheries Downstream of the BART Weir

Comment Summary

This section of this master response responds to all or part of the following comments:

L_ACFCWCD-04	L_ACWD-09	L_ACWD-19
L_ACFCWCD-14	L_ACWD-12	L_Zone7-01
L_ACWD-07	L_ACWD-17	SI_ACA1-02

Summary of Issues Raised by Commenters

- The discussion of lower Alameda Creek as a transition zone for steelhead is inadequate.
- Inadequate discussion of project impacts on steelhead below the middle inflatable dam.
- Lower Alameda Creek flow diversions would affect fisheries and habitat in the flood control channel.
- The WSIP would reduce winter and spring flows by 50 percent in normal years and could adversely affect steelhead passage below the BART weir.
- Flows below the recapture facility should be addressed; flows should be allowed to pass downstream.

Response

Lower Alameda Creek as a Migration Corridor and a Transition Zone for Steelhead Smolts

Comments on the Draft PEIR raised concern that reduced flows below the BART weir resulting from the WSIP would affect the estuarine zone of Alameda Creek and reduce the potential for steelhead smolt development within this possible zone of transition to marine waters.

The flood control channel represents the 12-mile reach of Alameda Creek from the confluence with San Francisco Bay to the mouth of Niles Canyon. It is an artificially managed and modified environment with a heavily sedimented, sandy bottom and riprap sides. The low riparian cover and high summer water temperatures in this creek section (Hanson, 2002a, 2002b) are not suitable for summer rearing by coldwater fish species. Gunther et al. (2000) classify the geographic range of the flood control channel as non-viable habitat for steelhead spawning or rearing.

Tidal influence in the flood control reach of lower Alameda Creek falls short of Alameda County Water District's (ACWD) lowermost inflatable dam (Gunther et al., 2000); unless flows overtop or bypass the inflatable dam, the channel below the inflatable dams can become dry, further reducing the potential under current conditions for the flood control channel to provide viable smolt transition habitat. Under typical operating conditions, ACWD's inflatable dams are raised to facilitate the diversion of flows into off-channel recharge areas, except during peak storm events.

Currently, no summer rearing habitat exists in this reach of lower Alameda Creek that could be considered suitable for either steelhead or rainbow trout. The 12-mile reach of the flood control channel, extending upstream to Niles Canyon, is a simplified system without natural features (such as pool/riffle sequences) and, even after the implementation of future restoration projects, it would primarily offer only migratory habitat (see Section 14.9.4, below). Implementation of the WSIP, as outlined in the Draft PEIR, would not affect smolt development in this section of the creek, as no suitable habitat exists within this reach for smolt development due to the physical characteristics of the engineered flood control channel. Additionally, implementation of the WSIP would not significantly affect the potential for steelhead to continue using this stretch as a migratory corridor. The response presented below addresses the potential impacts on migrating salmonids due to changes in seasonal flow under the WSIP, including the continued use of this creek reach as a migratory corridor.

Impacts on Stream Flow and Fisheries Downstream of the BART Weir

Comments raised concern that increased diversions under the WSIP would adversely affect steelhead passage in the 9.5 miles of channel from San Francisco Bay to the BART weir, and that the Draft PEIR did not contain sufficient analysis of impacts on stream flow and fisheries in the lower section of Alameda Creek.

The Draft PEIR (Vol. 3, Chapter 5, pp. 5.4.1-16 to 5.4.1-43) describes the changes in stream flow and reservoir water levels that would result from the WSIP. Impact 5.4.1-4 (pp. 5.4.1-39 to 5.4.1-43) discusses the analyses conducted on stream flow changes that would occur under the WSIP, and the potential impact of WSIP implementation on flow along Alameda Creek below the confluence with San Antonio Creek. The Draft PEIR analysis concluded that average monthly flows in Alameda Creek below the confluence with San Antonio Creek would be lowered due to the WSIP in winter months of normal or wetter years. It was also determined that changes in flow would be substantially dampened by inflows from other tributaries in the Sunol Valley; therefore, no adverse hydrological effects would result, and no mitigation measures would be required. Additionally, in considering the WSIP-related effects on flow in Alameda Creek, along with fishery flow releases (under the Calaveras Dam Replacement project, SV-2) being recaptured (under the Alameda Creek Fishery Enhancement project, SV-1), the Draft PEIR analysis found there would be no change in average monthly flows in most months of normal and wetter years, and no change in those flows in all months of drier years.

Section 5.4.5 of the Draft PEIR (Vol. 3, Chapter 5) describes fishery resources in Alameda Creek and the potential impacts that would result from the WSIP. Impact 5.4.5-6 (Vol. 3, Chapter 5, pp. 5.4.5-21 and 5.4.5-22) describes the WSIP's effects on fishery resources along Alameda Creek below the confluence with San Antonio Creek. The analysis concluded that potential impacts on fishery resources and habitat along Alameda Creek downstream of the confluence with San Antonio Creek would be less then significant, and no mitigation measures would be required.

In order to address comments regarding the WSIP's impacts on steelhead passage and fishery habitat in lower Alameda Creek downstream of the BART weir (to the confluence with San Francisco Bay), additional stream flow analysis was conducted (see Vol. 8, **Appendix N**); this analytical effort is summarized in the paragraphs that follow.

Downstream of the confluence of Alameda and San Antonio Creeks, Alameda Creek joins with the other major tributary in the Alameda Creek watershed, Arroyo de la Laguna. Below this confluence Alameda Creek enters Niles Canyon and flows for approximately 3.5 miles before exiting the canyon. Lower Alameda Creek, which begins downstream of the Niles Canyon reach, is a low-gradient creek characterized by flood control channels and several instream structures, including the BART weir and ACWD inflatable dams used for water diversion. The ACWD utilizes the lower creek for water supply via diversions and groundwater recharge. Lower Alameda Creek ultimately discharges to San Francisco Bay approximately 12 miles downstream of Niles Canyon.

Recent USGS flow records from three gaging stations on Alameda Creek (upstream of the San Antonio Creek confluence, near the downstream end of Niles Canyon, and from Arroyo de la Laguna) were reviewed to estimate the proportion of flow that upper Alameda Creek and Arroyo de la Laguna contribute to the lower reaches of Alameda Creek. The flow proportions were used to estimate the changes in flow that would occur in lower Alameda Creek as a result of the WSIP for hydrologic years 2000 to 2007.[2] **Figure 14.9-1** presents the locations of the three USGS gaging stations (labeled AC Welch, ADLL, and AC Niles) from which data were analyzed, and the contributing watersheds for each of the gages.

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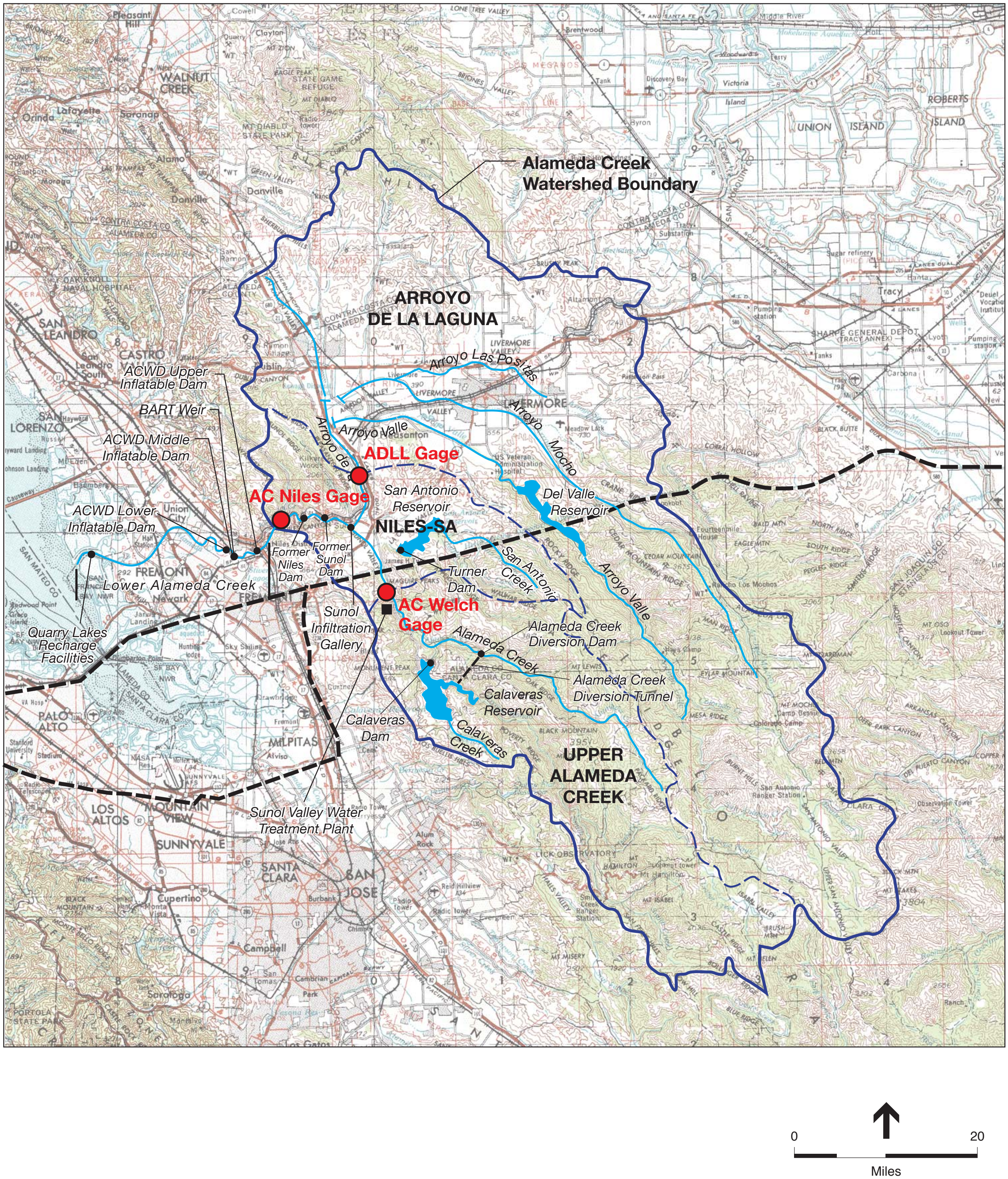
2 This analysis takes into account both the "Calaveras Up" and "Calaveras Down" base-case HH/LSM results because historical gage data were used in the analysis, and the Division of Safety of Dams (DSOD) restriction on Calaveras Dam operations was implemented during the period of analysis (in 2002). Therefore, the analysis uses model data from the Calaveras Up condition (prior to the DSOD restriction) for hydrologic years 2000 to 2001, and model data from the Calaveras Down condition (after the DSOD restriction and the base-case used for the Draft PEIR impact analysis) for the remainder of the years.



SFPUC Water System Improvement Program . 203287

SOURCE: ESA + Orion; USGS 1969

Figure 14.9-1
Location of 3 USGS Gages and
Contributing Watersheds for Lower Alameda Creek

Data from the three USGS gages were reviewed on an average monthly flow basis for overlapping periods of record (hydrologic years 2000 to 2007). Diversions from upper Alameda Creek to Calaveras Reservoir were substantially curtailed starting in 2002 due to the operating restrictions imposed on Calaveras Reservoir by the California Department of Water Resources, Division of Safety of Dams (DSOD). **Figure 14.9-2** presents average monthly flows over the eight-year period for the three gages. Review of the flow data reveals that flow measured at the Arroyo de la Laguna gage (shown as a blue shaded area) generally contributes a higher percentage of the flow measured at the Niles gage (shown as a black line) compared to that measured at the Welch gage (shown as a green shaded area). The discrepancy between the summation of the Arroyo de la Laguna and Welch gage flows and flow at the Niles gage (the white space below the black line) is assumed to be inflow from the watershed between the two upper gages and the Niles gage (labeled “Niles–SA watershed” on Figure 14.9-1).

Included in the Niles–San Antonio Creek watershed are releases made from the State Water Project, flow from San Antonio Creek, and contributions/losses from the watershed that occur downstream of the two upper gages.

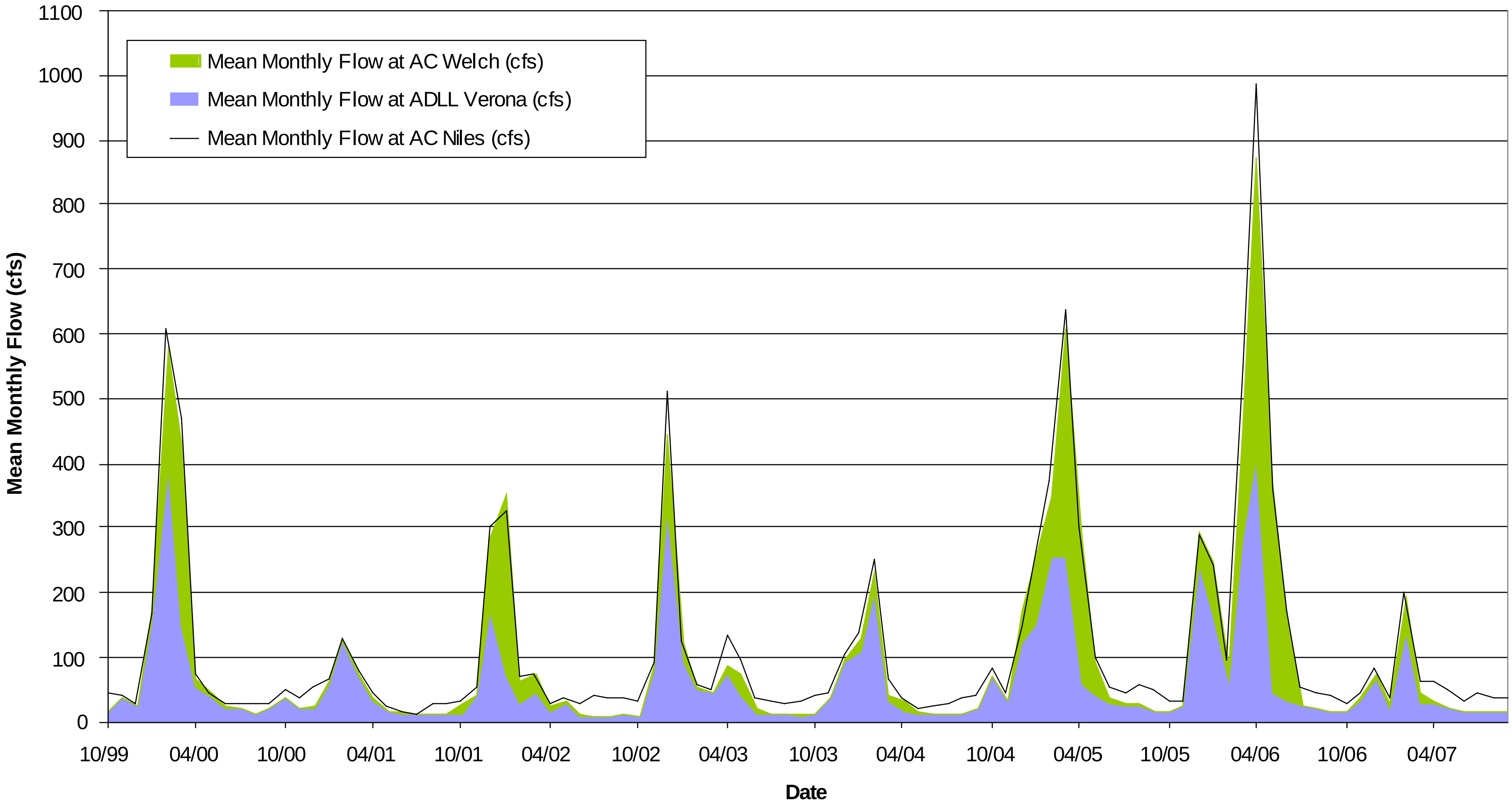
Releases or spills from San Antonio Reservoir rarely occur. Most flows in San Antonio Creek result from groundwater seepage or runoff from the watershed downstream of Turner Dam. The Niles–San Antonio Creek watershed contribution noted in summer months (as a gap between the green and blue areas and the black line) is assumed primarily to be releases from the State Water Project and contribution from groundwater in Niles Canyon. Also notable in the chart are the spikes in flow from upper Alameda Creek in the winter and spring of the hydrologic years 2005 and 2006. These spikes are a result of above-normal runoff in the watershed combined with the restricted Calaveras Reservoir storage and required releases from the reservoir to maintain the DSOD-restricted level.

The data presented in Figure 14.9-2 were analyzed to determine the percentage of flow contributed by each of the watersheds tributary to the Niles gage (identified in Figure 14.9-1). **Tables 14.9-1** and **14.9-2** present the relative contribution of the upstream watersheds to flow at the Niles gage over the past eight hydrologic years, from 2000 to 2007.

TABLE 14.9-1
AVERAGE MONTHLY PERCENTAGE OF WATERSHED CONTRIBUTIONS AT THE NILES GAGE
HYDROLOGIC YEARS 2000–2007

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	WY Total
ADLL	58%	81%	71%	61%	70%	46%	42%	34%	40%	47%	41%	43%	55%
AC Welch	6%	3%	23%	40%	24%	44%	45%	59%	39%	3%	1%	1%	33%
Niles-SA	36%	16%	6%	-1%	5%	10%	13%	7%	20%	50%	58%	57%	13%

SOURCE: Hydroconsult Engineers Inc., 2008 (see Appendix N)



SOURCE: SFPUC Water System Improvement Program

SFPUC Water System Improvement Program . 203287

Figure 14.9-2
Comparison of Mean Monthly Flow Contribution from ADLL and Upper Alameda Creek at Niles, WY 2000-2007

TABLE 14.9-2
SUMMARY OF FLOW CONTRIBUTIONS AT THE NILES GAGE
HYDROLOGIC YEARS 2000–2007

Watershed	Eight-Year Average Contribution	Eight-Year Range of Contribution
Arroyo de la Laguna	55%	43% – 71%
Upper Alameda Creek	33%	5% – 46%
Niles–San Antonio Creek	13%	8% – 27%

SOURCE: Hydroconsult Engineers Inc., 2008 (see Appendix N)

This analysis reveals that on average, approximately one-third of the flow at the Niles gage results from the upper Alameda Creek watershed. Since all SFPUC operations occur within the upper Alameda Creek watershed, implementation of the WSIP would only affect approximately one-third of the upstream flow that contributes to flow at the Niles gage. As such, flow changes in upper Alameda Creek as a result of the WSIP would be dampened in lower Alameda Creek by inflow from the other sub-watersheds. For instance, a flow of 100 cfs for Alameda Creek could hypothetically be reduced by 25 percent in a given month under the WSIP, resulting in a flow of 75 cfs for Alameda Creek. The same hypothetical flow at the Niles gage would be 300 cfs without the WSIP and 275 cfs with the WSIP, corresponding to an 8 percent reduction.

The results from the HH/LSM showing the percentage reductions in monthly flow for Alameda Creek below the San Antonio Creek confluence (see the Draft PEIR, Vol. 3, Chapter 5, Table 5.4.1-11, p. 5.4.1-42) were applied to monthly gage flow data from the Welch gage. Although the Welch gage and the HH/LSM analysis location of Alameda Creek below the San Antonio Creek confluence are not the same, this difference is not considered significant for this analysis. The San Antonio Creek confluence is approximately 2.7 miles downstream of the Welch gage, and the analysis presented in this section applies the percentage change in flow from the HH/LSM analysis, not actual flow data, to the Welch gage. Therefore, any difference in flows at the two locations would not affect this analysis, since the percentage reduction in flow was considered applicable to flow in Alameda Creek in the vicinity of the Welch gage.

Table 14.9-3 presents the flow changes estimated using the HH/LSM. The resulting changes in flow at the Welch and Niles gages are shown in **Tables 14.9-4** and **14.9-5** and **Figure 14.9-3**. Table 14.9-4 presents the results of applying the HH/LSM flow reductions to records from the Welch gage for the hydrologic years 2000–2007. Figure 14.9-3 and Table 14.9-5 detail the predicted changes in flow in Alameda Creek at the Niles gage over the eight-year period (2000–2007) with implementation of the WSIP. The solid blue area in Figure 14.9-3 represents average monthly flow at Niles, and the black line indicates calculated flow with implementation of the WSIP. The discrepancy between the two lines represents a change between gage records and calculated flow under the WSIP.

TABLE 14.9-3
HH/LSM CALCULATED FLOW REDUCTIONS IN ALAMEDA CREEK BELOW THE SAN ANTONIO CREEK CONFLUENCE

Percent Change, Revised Base (Calaveras Down) vs Revised WSIP (Proposed Program)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep
All	0%	0%	-28%	-32%	-21%	-15%	-4%	9%	0%	0%	0%	0%
Wet	0%	0%	-23%	-26%	-9%	-9%	-7%	16%	0%	0%	0%	0%
Above Normal	0%	0%	-38%	-43%	-35%	-21%	17%	1%	0%	0%	0%	0%
Normal	0%	0%	-34%	-47%	-56%	-45%	-12%	0%	0%	0%	0%	0%
Below Normal	0%	0%	0%	0%	-6%	0%	3%	0%	0%	0%	0%	0%
Dry	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Percent Change, Base (Calaveras Up) vs WSIP Proposed Program (Not Revised)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep
All	0%	0%	32%	19%	22%	2%	-3%	12%	0%	0%	0%	0%
Wet	0%	0%	49%	14%	13%	-3%	-7%	8%	0%	0%	0%	0%
Above Normal	0%	0%	26%	38%	67%	15%	18%	38%	0%	0%	0%	0%
Normal	0%	0%	5%	14%	17%	18%	16%	0%	0%	0%	0%	0%
Below Normal	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Dry	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Increase of greater than 1%
Decrease of greater than 1%
Decrease of greater than 5%

SOURCE: Hydroconsult Engineers Inc., 2008 (see Appendix N)

TABLE 14.9-4
COMPARISON OF RECORDED AND CALCULATED FLOWS IN ALAMEDA CREEK AT WELCH GAGE

Recorded Flow in Alameda Creek at Welch Gage (cfs, avg. monthly)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Year Type
2000	0	1	2	17	183	287	13	8	3	2	1	1	AN
2001	1	1	1	3	7	8	3	2	1	0	0	0	BN
2002	17	1	112	282	37	28	8	4	2	1	0	0	BN
2003	0	5	117	26	5	3	11	34	5	1	0	0	N
2004	0	0	2	24	26	5	14	1	0	0	0	0	N
2005	0	1	53	106	95	351	227	53	7	3	1	0	AN
2006	0	1	51	84	27	177	466	325	133	2	1	0	AN
2007	1	2	10	5	56	16	4	2	1	0	0	0	D

Calculated Flow at Welch for Revised WSIP Proposed Program (cfs, avg. monthly)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Year Type
2000	0	1	2	23	305	331	16	10	3	2	1	1	AN
2001	1	1	1	3	7	8	3	2	1	0	0	0	BN
2002	17	1	112	282	35	28	8	4	2	1	0	0	BN
2003	0	5	78	14	2	1	10	34	5	1	0	0	N
2004	0	0	1	12	11	3	12	1	0	0	0	0	N
2005	0	1	33	60	62	276	267	53	7	3	1	0	AN
2006	0	1	31	47	18	139	547	328	133	2	1	0	AN
2007	1	2	10	5	56	16	4	2	1	0	0	0	D

Difference Between Recorded and Calculated Flow for Revised WSIP Proposed Program at Welch (cfs, avg. monthly)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Year Type
2000	0 [0%]	0 [0%]	0 [26%]	6 [38%]	122 [67%]	44 [15%]	2 [18%]	3 [38%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	AN
2001	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	BN
2002	0 [0%]	0 [0%]	0 [0%]	0 [0%]	-2 -[6%]	0 [0%]	0 [3%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	BN
2003	0 [0%]	0 [0%]	-40 -[34%]	-12 -[47%]	-3 -[56%]	-1 -[45%]	-1 -[12%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	N
2004	0 [0%]	0 [0%]	-1 -[34%]	-11 -[47%]	-14 -[56%]	-2 -[45%]	-2 -[12%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	N
2005	0 [0%]	0 [0%]	-20 -[38%]	-46 -[43%]	-33 -[35%]	-76 -[21%]	39 [17%]	1 [1%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	AN
2006	0 [0%]	0 [0%]	-19 -[38%]	-36 -[43%]	-9 -[35%]	-38 -[21%]	81 [17%]	4 [1%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	AN
2007	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	D

Increase of greater than 1%
Decrease of greater than 1%
Decrease of greater than 5%

NOTE: The portion of the table titled "Calculated Flow at Welch for Revised WSIP" represents the future condition with implementation of the WSIP. "Revised" WSIP refers to the 2008 updated modeling results, as discussed in Section 13.3 (Vol. 7).

SOURCE: Hydroconsult Engineers Inc., 2008 (see Appendix N)

TABLE 14.9-5
COMPARISON OF AVERAGE MONTHLY FLOW AT THE NILES GAGE, RECORDED FLOW VERSUS CALCULATED FLOW UNDER THE WSIP

Recorded Flow in Alameda Creek at Niles (cfs, avg. monthly)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Year Type
2000	44	41	28	165	606	469	74	46	26	27	29	29	AN
2001	50	35	55	65	128	79	44	22	14	10	27	27	BN
2002	33	53	302	329	71	76	27	34	30	39	38	36	BN
2003	34	91	513	126	56	50	131	97	35	33	30	33	N
2004	39	45	104	138	251	65	36	21	23	27	35	41	N
2005	83	45	148	262	374	638	300	98	55	46	57	51	AN
2006	30	32	287	242	94	551	986	361	172	53	44	39	AN
2007	28	45	82	38	202	61	61	47	32	43	35	37	D

Calculated Flow at Niles for Revised WSIP Proposed Program (cfs, avg. monthly)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Year Type
2000	44	41	28	171	728	513	76	49	26	27	29	29	AN
2001	50	35	55	65	128	79	44	22	14	10	27	27	BN
2002	33	53	302	329	68	76	27	34	30	39	38	36	BN
2003	34	91	474	114	53	48	130	97	35	33	30	33	N
2004	39	45	103	127	237	62	34	21	23	27	35	41	N
2005	83	45	127	216	341	562	340	99	55	46	57	51	AN
2006	30	32	267	205	85	513	1067	365	172	53	44	39	AN
2007	28	45	82	38	202	61	61	47	32	43	35	37	D

Difference Between Recorded and Calculated Flow for Revised WSIP Proposed Program at Niles (cfs, avg. monthly)

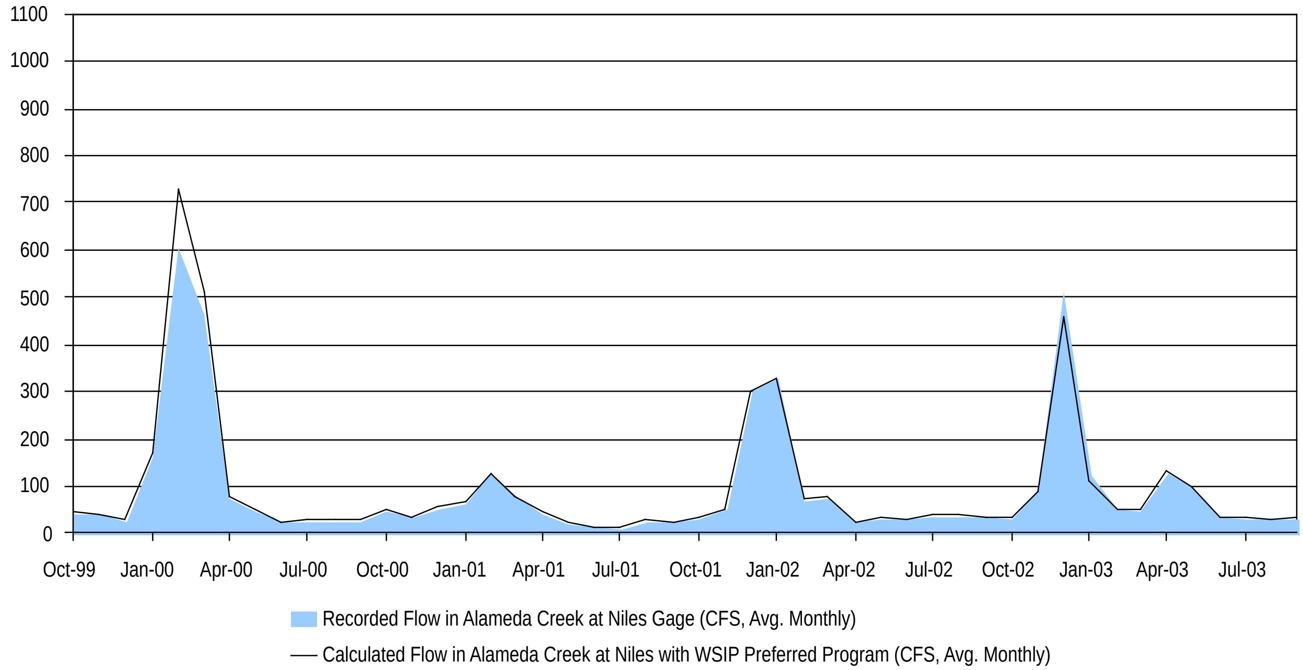
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Year Type
2000	0 [0%]	0 [0%]	0 [1%]	6 [4%]	122 [20%]	44 [9%]	2 [3%]	3 [6%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	AN
2001	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	BN
2002	0 [0%]	0 [0%]	0 [0%]	0 [0%]	-2 -[3%]	0 [0%]	0 [1%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	BN
2003	0 [0%]	0 [0%]	-40 -[8%]	-12 -[10%]	-3 -[5%]	-1 -[2%]	-1 -[1%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	N
2004	0 [0%]	0 [0%]	-1 -[1%]	-11 -[8%]	-14 -[6%]	-2 -[4%]	-2 -[5%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	N
2005	0 [0%]	0 [0%]	-20 -[14%]	-46 -[18%]	-33 -[9%]	-76 -[12%]	39 [13%]	1 [1%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	AN
2006	0 [0%]	0 [0%]	-19 -[7%]	-36 -[15%]	-9 -[10%]	-38 -[7%]	81 [8%]	4 [1%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	AN
2007	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	D

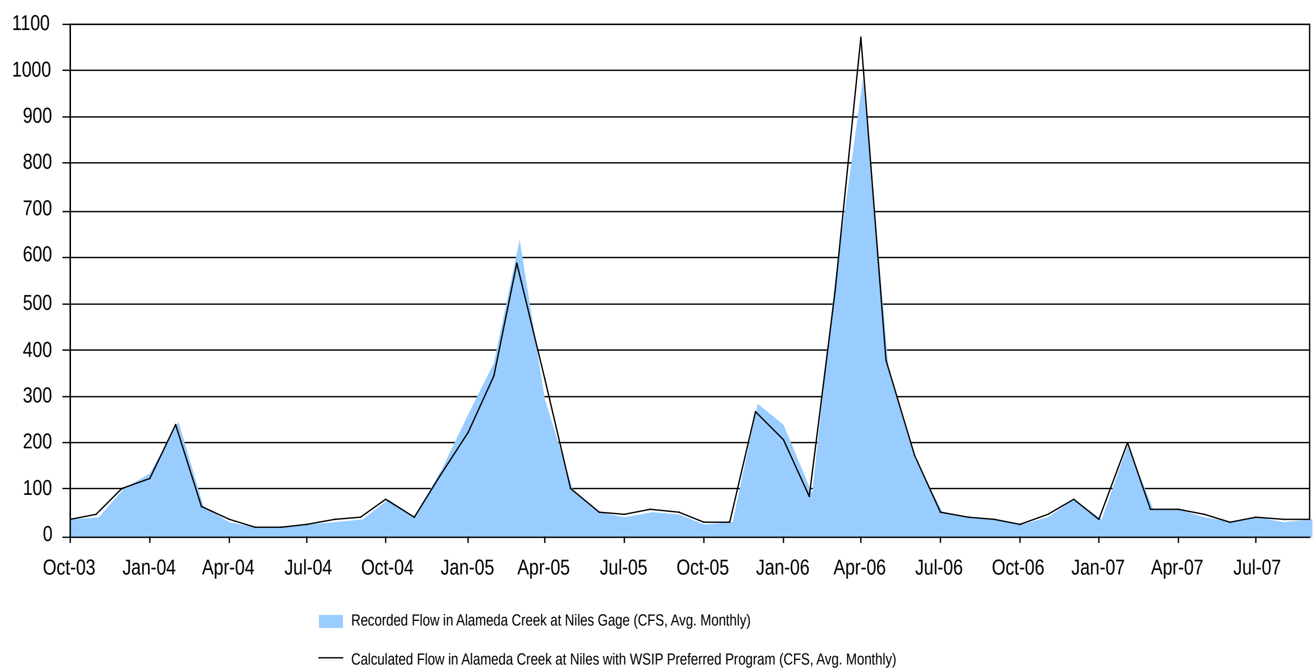
Increase of greater than 1%
Decrease of greater than 1%
Decrease of greater than 5%

NOTE: The portion of the table titled “Calculated Flow at Niles for Revised WSIP” represents the future condition with implementation of the WSIP. “Revised” WSIP refers to the 2008 updated modeling results, as discussed in Section 13.3 (Vol. 7).

SOURCE: Hydroconsult Engineers Inc., 2008 (see Appendix N)

The analysis shows that based on the historical hydrology from 2000 to 2007, reductions in flow in Alameda Creek at Niles Canyon would occasionally occur under the WSIP. Reductions of up to 18 percent in average monthly flow could occur in years similar to the past eight years of record. The maximum flow reduction would occur during January of an above-normal year, but a flow increase of 13 percent would occur in April of that same hydrologic year type. No changes in flow would occur in dry years, and minimal changes (up to 3 percent reductions) would occur in February of below-normal years. It should be noted that in 2000—an above-normal year—there would be an increase in flow of up to 20 percent under the WSIP; this year represents historical operating conditions prior to the DSOD operating restrictions placed on Calaveras Dam. The past eight years include four of the five hydrologic year types (only a wet year is absent). However, as shown in Table 14.9-5, the greatest flow changes under the WSIP would occur during normal and above-normal years, which are represented in the 2000–2007 data and are therefore included in this analysis.





Notes:
- WSIP conditions includes recapture of MOU flows released from Calaveras Dam.
- Years 2000 and 2001analysis includes a comparison of Base with Calaveras Up vs WSIP Proposed Program. DSOD restriction was implemented in
- Analysis for WSIP only, no other cumulative projects analyzed.

SOURCE: SFPUC Water System Improvement Program

Figure 14.9-3
Comparison of Average Monthly Flow at the Niles Gage, Recorded Flow versus WSIP Proposed Program

The impact conclusion for Impact 5.4.1-4 (Vol. 3, Chapter 5, p. 5.4.1-43) states: "Flow in Alameda Creek below the confluence of San Antonio Creek would be altered as a result of the WSIP in winter months of normal or wetter years; however, the change in flows would be substantially dampened by inflows from other tributaries in the Sunol Valley and would not result in adverse hydrologic effects." The analysis presented in this section corroborates and provides further supporting detail for this impact conclusion, and also estimates the dampening effect. The largest calculated decrease in flow in lower Alameda Creek would occur during January 2005, with a reduction in average monthly flow of 46 cfs, or 18 percent, of the average monthly flow recorded in January 2005. This corresponds to a reduction in upper Alameda Creek flow of 39 percent. Further review of the data reveals that flow reductions are predicted to occur in December through March of normal to wet years and in April of wet years, and to a small degree in February of below-normal years. In all other months, including winter months of below-normal years (with the exception of a slight decrease in February) and dry years, flow in upper Alameda Creek and at the Niles gage would either remain the same or would increase with implementation of the WSIP.

The calculated flows for lower Alameda Creek under the WSIP are within the range of current flows in this segment of the creek. Further, the flood control infrastructure and water supply facilities in lower Alameda Creek were constructed and operational well before the current DSOD restriction on Calaveras Reservoir required the SFPUC to reduce its diversions at the ACDD. The HH/LSM results indicate that, compared to the flow conditions in existence prior to the DSOD restriction on Calaveras Reservoir, flows in lower Alameda Creek under the WSIP would increase in winter months of normal to wet years (with the exception of slight decreases in March and April of wet years) and would remain the same in all other months of other year types. Therefore, implementation of the WSIP would not affect the operation of flood control infrastructure and water supply facilities in lower Alameda Creek.

The stream flow analysis for the lower 12-mile reach of Alameda Creek from downstream of Niles Canyon to the confluence with San Francisco Bay demonstrates that the WSIP would not affect steelhead passage, fisheries, or fish habitat during any month of a below-normal or drier year (see Table 14.9-5). The analysis also demonstrates that no WSIP-related impacts on steelhead passage, fisheries, or fish habitat would occur between April and November for normal or wetter years (Table 14.9-5). As the table shows, the maximum calculated reduction in flow would occur during the winter months of normal and wetter years (from 262 to 216 cfs), and these flows are within the range of recorded flows typical for this segment of Alameda Creek (from 28 to 638 cfs). The WSIP is therefore unlikely to affect steelhead passage, fisheries, or fish habitat in this reach. Draft PEIR Section 5.4.5.1 (Vol. 5, Chapter 5, pp. 5.4.5-9) discusses steelhead passage improvement projects for the flood control channel of Alameda Creek at the BART weir. Studies conducted on these potential improvement projects estimate that the minimum level of flow needed to ensure adult steelhead passage could range from 10 to 50 cfs for projects that involve total removal of the structure and restoration of a "roughened channel" as well as for projects that involve three ladder and screen options.

Therefore, the impact conclusion for Impact 5.4.5-6 (Draft PEIR, Vol. 3, Chapter 5, pp. 5.4.5-21 and 5.4.5-22) that "impacts on Alameda Creek below the confluence of San Antonio Creek would be less than significant, and no mitigation measures would be required" is supported by the additional analysis performed.

14.9.4 Steelhead – Future Fishery Scenario and Potential Cumulative Effects

Introduction

Several comments expressed concern that the Draft PEIR did not identify potential WSIP impacts under a future scenario in which steelhead have been restored to the reaches of Alameda Creek above the BART weir, as is expected to occur following the implementation of several proposed projects to remove current fish passage barriers. As discussed in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.4.5-1 to 5.4.5-15) and in Section 14.9.2 of this master response, steelhead are precluded from naturally migrating to spawning habitat upstream of the BART weir under existing baseline conditions. In accordance with CEQA Guidelines Section 15125, the Draft PEIR assessed the WSIP's effects with respect to existing conditions in the program area, and therefore did not address potential effects on steelhead (or steelhead habitat) above the BART weir.

The Draft PEIR provides a full discussion of proposed plans to restore anadromous steelhead to Alameda Creek above the BART weir, including the many steps required, parties involved, and agreements in place to accomplish this goal (Vol. 3, Chapter 5, Section 5.4.5.1). The Draft PEIR discusses the planned restoration of steelhead above the BART weir and describes the SFPUC's active participation with other agencies to achieve steelhead restoration; as the PEIR states, once such restoration occurs, the SFPUC will comply with all applicable environmental regulations (FESA foremost among them) to ensure that its water system operations and watershed management practices incorporate conservation measures to protect steelhead. The SFPUC is engaged in consultation with the USFWS, NMFS, and CDFG to prepare a plan for FESA and California Endangered Species Act (CESA) compliance. This plan, called the Alameda Watershed HCP, will address the potential effects of SFPUC water system operations and watershed management activities on several listed species within the SFPUC's Alameda watershed lands, including steelhead. Thus, the SFPUC is actively engaged with the resource agencies in developing appropriate measures to protect this species once steelhead have been restored to this reach of the creek.

Although the presence of steelhead in Alameda Creek above the BART weir is not an "existing condition" as defined by CEQA, it is a possible future condition that could occur through the cumulative implementation of the many proposed projects and actions designed to restore steelhead in Alameda Creek. In response to the comments received on this issue, the Draft PEIR analysis of cumulative effects (Vol. 3, Chapter 5, pp. 5.7-52 to 5.7-67) has been revised to incorporate a discussion of potential WSIP impacts on future-occurring steelhead. This section of this master response provides an expanded discussion of the "future cumulative scenario" (which assumes that the steelhead fishery has been restored above the BART weir) and then discusses the potential effects of the WSIP on potential future-occurring steelhead. Following this expanded discussion, specific text revisions to the Draft PEIR are identified.

The analysis of the WSIP's contribution to potential, cumulative effects (both positive and negative) on future-occurring steelhead is general because many uncertainties remain regarding how and when steelhead will be restored as well as the future environmental conditions that will be present in Alameda Creek at that time. Uncertainties regarding steelhead restoration include, but are not limited to the following: the way in which existing barriers to passage would be remedied in the future; the extent to which natural features act as barriers; and the extent to which the varying water resource operations of the water agencies in the overall Alameda Creek basin influence flows. Protective measures to address and minimize the WSIP's contribution to future cumulative effects on steelhead are included as part of the WSIP program description (incorporated as changes to the project descriptions of the Alameda Creek Fishery Enhancement, SV-1, and Calaveras Dam Replacement, SV-2, projects). As described in Section 14.9.1, above, such protective measures would include: SFPUC reservoir releases and bypass flows to support minimum instream flow requirements, operational modifications (reservoir diversion and release protocols), and monitoring/studying/surveying steelhead habitat below the ACDD. These measures demonstrate the SFPUC's commitment described in the Draft PEIR and the Comments and Responses documents—that the SFPUC would implement the necessary protective measures for steelhead once they are restored, in compliance with applicable environmental regulations including FESA and CESA.

This section of the master response is organized by the following subtopics:

- Future Cumulative Scenario for Steelhead
  - Introduction
  - Regulations, Plans, and Programs Related to Steelhead Recovery in the Watershed
  - Steelhead Life Stages and Habitat Requirements
  - Past and Present Projects Affecting Steelhead
  - Future Projects Influencing Future Habitat Conditions for Steelhead
- Cumulative Impact Assessment for Potential Future-Occurring Steelhead
  - Changes in Habitat Conditions from Future Cumulative Projects
  - Potential Future Cumulative Impacts on Steelhead
    - Migration
    - Spawning
    - Rearing
- PEIR Text Revisions to Include Cumulative Impact on Future-Occurring Steelhead

Comment Summary

This section of this master response responds to all or part of the following comments:

L_ACFCWCD-06	L_ACWD-20	SI_ACA1-12	SI_ACA2-01
L_ACFCWCD-09	SI_ACA1-02	SI_ACA1-13	SI_GWWF2-02
L_ACFCWCD-13	SI_ACA1-03	SI_ACA1-16	SI_NCFFSC-03
L_ACFCWCD-15	SI_ACA1-04	SI_ACA1-19	
L_ACWD-18	SI_ACA1-05	SI_ACA1-20	
L_ACWD-19	SI_ACA1-08	SI_ACA1-25	

Summary of Issues Raised by Commenters

- The effects of the WSIP combined with proposed fish passage improvement projects and steelhead restoration to the upper watershed are not adequately addressed.
- Additional diversions under the WSIP would result in the "take" of listed species through reduced passage and increased temperatures.
- The Draft PEIR contains insufficient information to support the contention that mitigation measures would reduce impacts to a less-than-significant level.
- Specific flow information is required for adequate mitigation of impacts on steelhead passage, spawning, and juvenile rearing.
- Issues related to releases required under two memoranda of understanding: the 1997 CDFG MOU and 2006 ACFRW MOU.
- Relationship of the Draft PEIR assessments to the Calaveras Dam Replacement project-level assessments is unclear.
- The impacts of Calaveras Dam on steelhead/trout in 2010–2012 are not speculative.

Response

Future Cumulative Scenario for Steelhead

Introduction

As described briefly above, it is possible that steelhead could be restored to the Alameda Creek watershed reaches upstream of the BART weir by 2030, the WSIP planning horizon. More specifically, steelhead could be restored during construction or operation of the Calaveras Dam project. In response to this scenario, the SFPUC has modified the project descriptions for components of the proposed program—the Alameda Creek Fishery Enhancement (SV-1) and Calaveras Dam Replacement (SV-2) projects—to recognize this potential for future steelhead restoration, as summarized in Section 14.9.1, above. The modifications to these projects include project revisions that would be implemented regardless of the success of planned and proposed projects to restore steelhead to the upper Alameda Creek watershed, as well as protective measures that would be implemented in the event that the NMFS and/or CDFG have determined steelhead to be present in Alameda Creek above the BART weir, construction of the Calaveras Dam Replacement project is complete, and the Alameda Watershed HCP has yet to be finalized. As summarized in Section 14.9.1, the protective measures have been incorporated into the

Calaveras Dam Replacement project component of the WSIP to address potential effects on steelhead in the event that planned and proposed projects to remove man-made barriers in Alameda Creek are successfully implemented and anadromous steelhead gain access to the upper Alameda Creek watershed. The WSIP's potential contribution to future cumulative effects on steelhead is evaluated here with respect to steelhead life-stage and habitat requirements in the various reaches of Alameda Creek.

The future cumulative scenario for the steelhead fishery in Alameda Creek assumes implementation of all necessary proposed projects and actions to remove the existing fish passage and migration barriers for steelhead, from the BART weir up to spawning and rearing habitats in the upper reaches of Alameda Creek. Under this future cumulative scenario, steelhead are assumed to be present in Alameda Creek above the BART weir. A more detailed discussion of this potential future scenario follows, including: a summary of the regulations, plans, and programs related to steelhead recovery in the Alameda watershed; a review of steelhead life stages and habitat requirements; and the expected future habitat conditions for steelhead following the removal of passage barriers.

This assessment of future conditions does not describe: the specifics of any barrier removal/bypass projects (since no specific adopted designs/plans are available); what flow requirements for reservoir releases, bypass flows at the ACDD, or flows through fish ladders might be adopted; or when (and if) the projects would be undertaken. Thus, this future cumulative scenario is based on a fair degree of speculation, but the information available at this time allows for a general framing of potential future conditions and discussions of the potential WSIP contribution to future cumulative effects.

Regulations, Plans, and Programs Related to Steelhead Recovery in the Watershed

Draft PEIR Section 5.4.5 (Vol. 3, Chapter 5, p. 5.4.5-4) includes a discussion of the regulatory status of steelhead in the Alameda Creek watershed, and Section 5.2 (Vol. 3, Chapter 5, pp. 5.2-1 to 5.2-26) provides an overview of plans and policies relevant to the management of the SFPUC's water supply and system operations, including regulations, policies, plans, and programs related to steelhead recovery in the watershed. Comments on the Draft PEIR expressed concern regarding the take of listed species (defined below under Federal Endangered Species Act) as a result of WSIP implementation. The following information on regulations, plans, and programs related to steelhead recovery augments the information presented in the Draft PEIR.

Federal Endangered Species Act. Pursuant to FESA, the USFWS and NMFS have authority over projects that may result in the take of a federally listed species. Under FESA, "take" means to "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." The USFWS has also interpreted the definition of "harm" to include significant habitat loss or modification. If a project could affect a federally listed species, either an incidental take permit under FESA Section 10(a) or a federal interagency consultation under FESA Section 7 is required. The USFWS has regulatory jurisdiction over freshwater and estuarine fishes as well as all terrestrial vegetation and wildlife, while the NMFS has jurisdiction over anadromous and marine species, including steelhead.

The NMFS has not designated the Alameda Creek watershed as critical habitat for steelhead, and has listed as threatened only those steelhead that currently exist below the lowest impassable barriers in the Alameda Creek watershed (i.e., the BART weir). Thus, the resident rainbow trout that occur in the creek above the BART weir are not designated as a listed species and are not proposed for listing. However, the NMFS has advised that the designation of critical habitat would be open to further evaluation if and when anadromous steelhead obtain passage to upper Alameda Creek (as discussed in Section 14.9.2, above). As noted, this cumulative impact assessment is based on the assumption that steelhead will regain access to the Alameda Creek watershed in the future.

Alameda Creek Fisheries Restoration Workgroup. The ACFRW is a multi-agency stakeholder group formed in 1999 to pursue the restoration of steelhead to Alameda Creek. The ACFRW is composed of numerous community and citizens' groups, local water management and flood control agencies, and state and federal resource agencies, including the SFPUC.

With funding from the ACFCWCD and the California Coastal Conservancy, the ACFRW published a report entitled *An Assessment of the Potential for Restoring a Viable Steelhead Trout Population in the Alameda Creek Watershed* (Gunther et al., 2000). The report found that suitable habitat exists in the watershed to support steelhead spawning and rearing, but that several barriers in the lower portion of the watershed completely prevent adult migration upstream. It concluded that making these barriers passable was essential to steelhead restoration in Alameda Creek, and made recommendations to address migration and other steelhead restoration issues in the watershed.

The ACFRW has identified the need to implement passage barrier modification projects, install positive-barrier fish screens at water diversion points, modify instream flows within the four reaches of Alameda Creek, and implement proposed riparian corridor improvements and possibly a steelhead supplementation program. The Draft PEIR discusses the ACFRW's Memorandum of Understanding (2006 ACFRW MOU) to perform steelhead flow studies, the various phases and elements of the studies, and the development of the Alameda Watershed HCP (Vol. 3, Chapter 5, pp. 5.4.5-10 and 5.4.5-11).

SFPUC Alameda Watershed Habitat Conservation Plan. The SFPUC, working with the CDFG, USFWS, and NMFS, is in the process of developing an HCP for its portion of the Alameda Creek watershed in compliance with FESA and CESA. Steelhead is a covered species in the HCP, which is scheduled for public review in 2009. The plan will require preparation of a joint environmental impact report/environmental impact statement (EIR/EIS) before the SFPUC can consider adoption and begin implementation of the HCP conservation strategies. The HCP will be the primary plan in which the SFPUC and regulatory agencies lay out the program and requirements for the restoration of steelhead and other fish species in the watershed affected by SFPUC operations.

SFPUC Water Enterprise Environmental Stewardship Policy. As described in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.2-24 and 5.2-25), the Water Enterprise Environmental Stewardship Policy was adopted in June 2006 and established the long-term management direction for the City and County of San Francisco's lands and natural resources affected by operation of the SFPUC regional water system within the Tuolumne River, Alameda Creek, and Peninsula watersheds. The policy includes the following points specifically relevant to the fishery issues in the Alameda Creek watershed:

- It is the policy of the SFPUC to operate the SFPUC water system in a manner that protects and restores native fish and wildlife downstream of SFPUC dams and water diversions, within SFPUC reservoirs, and on SFPUC watershed lands.

- Releases from SFPUC reservoirs will (consistent with the SFPUC mission, existing agreements, and applicable state and federal laws) mimic the variation of the seasonal hydrology (e.g., magnitude, timing, duration, and frequency) of their corresponding watersheds in order to sustain the aquatic and riparian ecosystems upon which these native fish and wildlife species depend (consistent with the SFPUC mission, existing agreements, and applicable state and federal laws).

The Environmental Stewardship Policy calls for specific integration of this policy into the WSIP and individual infrastructure projects.

Steelhead Life Stages and Habitat Requirements

A summary of steelhead life stages (e.g., migration, spawning, rearing) and habitat requirements is provided in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.4.5-4 to 5.4.5-7). The following discussion augments the Draft PEIR discussion and focuses on different steelhead life-stage and habitat requirements in the Alameda Creek watershed. This information was derived from studies/ assessments of steelhead recovery in the Alameda Creek watershed, including the following:

- *Alameda Creek Population Recovery Strategies and Instream Flow Assessment for Steelhead Trout* (McBain and Trush, 2007)

- *An Assessment of the Potential for Restoring a Viable Steelhead Trout Population in the Alameda Creek Watershed* (Gunther et al., 2000)

As previously described, steelhead have a highly flexible and complex life history and may follow a variety of life-history patterns and strategies. Historical (pre-1900s) steelhead life-history strategies in the Alameda Creek watershed likely occurred within two broad categories: (1) fry were born in the upper tributaries and reared for one or two years, then migrated rapidly to San Francisco Bay, and (2) following emergence in the upper tributaries, the fry moved downstream and reared in the mainstem and/or Niles Canyon before entering the estuary and San Francisco Bay (McBain and Trush, 2007). The success of a given strategy likely varied from year to year and depended on several factors (e.g., precipitation, flow, temperature, food availability). Historically, headwater tributaries likely contributed large steelhead smolts to San Francisco Bay, especially during consecutive wet years, but many additional large smolts were likely produced by slower migrating juveniles that grew on their way downstream through the mainstem channels before smolting and entering the Alameda Creek estuary and then San Francisco Bay.

A critical period occurs during juvenile freshwater residency. Juvenile fish may remain in the watershed from less than a year to more than two years. Those residing in freshwater and/or an estuary for less than a full year from the time of egg deposition are called “0+ juveniles.”

Juveniles that spend one complete winter in freshwater and/or an estuary are termed "1+ juveniles," and those remaining for two complete winters in freshwater and/or an estuary are called "2+ juveniles." Prior to entering the Pacific Ocean, all juveniles physiologically transform into ocean salt-tolerant smolts. Smolts mature into adults and may remain in the Pacific Ocean from one to three years (or more) before returning to their natal streams to spawn. In California, most adult steelhead returning to spawn have spent at least one full winter rearing as juveniles (i.e., as 1+ juveniles) in their natal watershed (McBain and Trush, 2007).

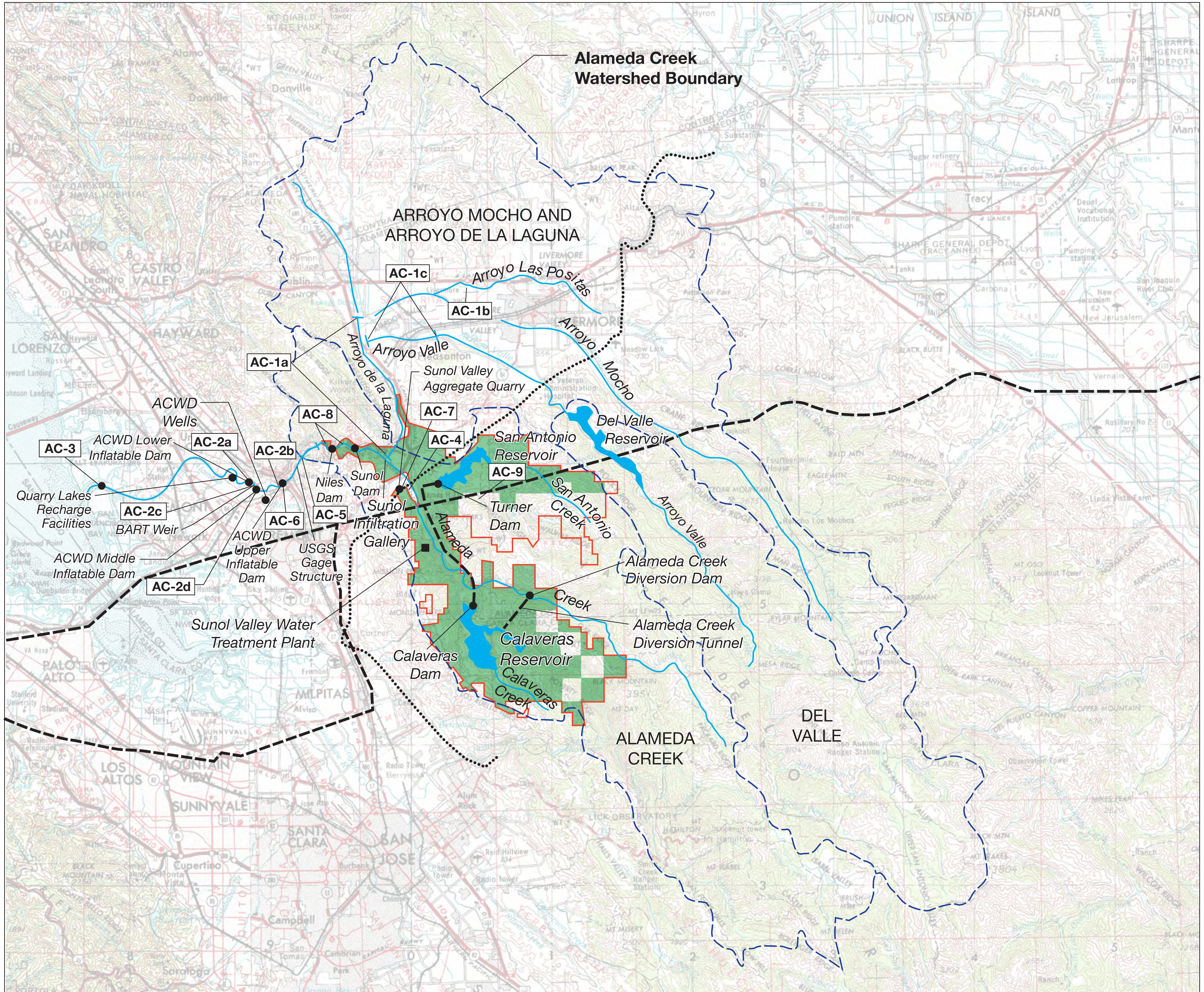
Often, each unique period of juvenile freshwater residency (i.e., staying less than a year, more than one full year, and slightly more than two full years in the watershed) is considered a separate life-history strategy. While these categories are helpful, they do not sufficiently differentiate patterns of watershed use. For example, a juvenile steelhead spending one winter in Alameda Creek (a 1+ juvenile) might reside high in the headwaters then migrate rapidly to San Francisco Bay, or it might move far downstream shortly following emergence to spend the entire winter in Niles Canyon (if suitable conditions exist) before migrating to San Francisco Bay in late spring. Both would enter San Francisco Bay as 1+ smolts, but their strategies for utilizing the watershed would have been fundamentally different (McBain and Trush, 2007).

A key factor in determining steelhead survival and recovery success is the growth of juveniles during freshwater residency and smolt transition. Fish size at smolting is important to steelhead survival, and big smolts are much more likely to return as spawning adults than small smolts (McBain and Trush, 2007). Growth rates during the juvenile rearing period are greatly influenced by both the availability (e.g., access and quantity) and quality (e.g., favorable water temperature and forage availability) of oversummer rearing habitat in the Alameda Creek watershed.

Past and Present Projects Affecting Steelhead

As presented in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.4.5-7 to 5.4.5-10 and pp. 5.7-52 to 5.7-53), a number of existing facilities (i.e., past and present projects) under the jurisdiction of the SFPUC, the ACWD, Zone 7 Water Agency, and the ACFCWCD, among others, affect hydrological and fishery habitat conditions in the Alameda Creek watershed. Many of these structures and facilities have been in existence for well over 80 years and have resulted in substantial changes to the natural conditions that existed prior to the original construction of Calaveras Dam in 1913, when a steelhead run is presumed to have been present throughout the basin. Although built in the past, these facilities (as well as other influences) continue to operate and affect both current habitat conditions and future cumulative scenario conditions for potential future-occurring steelhead in the Alameda Creek watershed. Some of these are direct barriers to fish migration, while others pose various degrees of control/influence over habitat conditions. As shown in Draft PEIR **Figure 5.7-3** (as revised below), the major facilities and other factors affecting fish passage (separated by watershed and/or reach) outlined by Gunther et al. (2000) include:

- *Upper Alameda Creek*:
  - Calaveras Dam and Reservoir
  - Alameda Creek Diversion Dam and Tunnel



- Watershed Boundary
- Existing SFPUC System Corridor
- AP-1 Other SFPUC Project
- AC-1 Non-SFPUC Project
- CCSF Ownership (also project boundary for AP-1, AP-2, AP-3)
- HCP Study Area (also project boundary for AP-1a)
- DWR South Bay Aqueduct

See Draft PEIR Table 5.7-13 for names and descriptions of projects

Cumulative Project No.	Plan/Project Name
OTHER SFPUC PROJECTS (not shown on figure as watershed wide)	
AP-1	Alameda Watershed Management Plan (WMP)
AP-1a	Alameda Watershed Habitat Conservation Plan (sub-project of Alameda WMP)
AP-2	Watershed and Environmental Improvement Program (WSIP-related activity)
AP-3	Habitat Reserve Program (WSIP-related activity)
NON-SFPUC PROJECTS	
AC-1	Zone 7 Stream Management Master Plan (SMMP)
AC-1a	Arroyo de la Laguna Reach 10 Improvements (sub-project of Zone 7 SMMP)
AC-1b	Chain of Lakes (sub-project of Zone 7 SMMP)
AC-1c	Lower Arroyo del Valle Restoration and Enhancement (sub-project of Zone 7 SMMP)
AC-2	Alameda Creek Steelhead Restoration
AC-2a	Rubber Dam 2 Decommissioning and Foundation Modification Project (sub-project of Alameda Creek Steelhead Restoration)
AC-2b	Alameda Creek Pipeline No. 1 Fish Screen (sub-project of Alameda Creek Steelhead Restoration)
AC-2c	BART Weir (sub-project of Alameda Creek Steelhead Restoration Efforts)
AC-2d	Middle Inflatable Dam Modification
AC-3	Alameda Creek – Levee Reconfiguration
AC-4	PG&E Gas Line Crossing
AC-5	Stonybrook Creek Culvert Removal
AC-6	Upper Inflatable Dam Fish Passage Project
AC-7	Sunol Valley Aggregate Quarry – SMP 30
AC-8	Section 1135 Alameda Creek Flood Control Project Fish Passage Modifications
AC-9	Apperson Ridge Quarry

0 — 20 Miles

SOURCE: ESA + Orion

SFPUC Water System Improvement Program . 203287

Figure 5.7-3 (Revised)
Future Projects in the Alameda Creek Watershed Considered in the Cumulative Analysis

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  - Sunol Valley aggregate quarries and the associated relocation and channelization of Alameda Creek
  - PG&E gas line crossing
  - Turner Dam and San Antonio Reservoir
  - Sunol infiltration galleries

- *Niles Canyon*:
  - USGS gage structure

- *Arroyo de la Laguna watershed*:
  - Del Valle Reservoir/South Bay Aqueduct, including State Water Project releases
  - Livermore/Amador Valley/Quarry Lakes recharge facilities
  - Various channelized and culverted stream segments
  - Expansion of urban development of the Tri-Valley Area

- *Lower Alameda Creek*:
  - ACWD's upper, middle, and lower inflatable dams
  - BART weir
  - Alameda Creek levee reconfiguration

All of these facilities, combined with urbanization and other land use activities, have resulted in substantial alteration of habitat conditions for potential future-occurring steelhead in the watershed. In 2006, the SFPUC removed two historic structures—the Niles and Sunol Dams, both located on Alameda Creek below the Sunol quarries. While some influence on the creek channel due to these dams may remain, they have been removed entirely as barriers to fish migration.

Future Projects Influencing Future Habitat Conditions for Steelhead

The reasonably foreseeable future projects that could affect conditions for potential future-occurring steelhead in the Alameda Creek watershed are presented in Draft PEIR Section 5.7.3 and are summarized in Table 5.7-13 and Figure 5.7-3 (Vol. 3, Chapter 5, pp. 5.7-53 to 5.7-60). These projects include removing/modifying dams, weirs, culverts, and pipelines that block fish passage; installing positive-barrier fish screens at water diversions; constructing slurry cutoff walls in quarry pits to reduce losses to groundwater; and restoring and protecting habitat and instream flows. While these identified future projects are considered reasonably foreseeable for the purposes of this analysis, there remains uncertainty regarding their implementation due to unknowns such as funding or permitting issues. Of particular importance to this analysis are proposals to remove or bypass several fish migration barriers in the watershed. The future projects included in this analysis and their planning status are described in Draft PEIR Section 5.7.3. In response to comments, several revisions and updates have been made to the future projects that would influence habitat conditions for steelhead in the Alameda Creek watershed. These revisions to future projects are presented here and were used in establishing the future baseline condition for assessing the effects of the WSIP on future-occurring steelhead upstream of the BART weir.

A comment received on the Draft PEIR regarding future fish passage improvement projects indicated that, subsequent to publication of the Draft PEIR, the ACFCWCD and ACWD entered into an agreement (on July 31, 2007) to design a fish passage facility over the BART weir and the middle inflatable dam in the Alameda County Flood Control Channel. In response to this comment, the Draft PEIR (Vol. 3, Chapter 5, p. 5.4.5-9, first bullet) is amended as follows:

- Alameda County Flood Control and Water Conservation District's BART Weir – several studies have been conducted regarding potential designs to provide passage at this location. The most recent effort is a report (Wood Rogers, 2006) that outlines options ranging from total removal of the structure ("roughened channel") to three ladder and screen alternatives. The range of low flows estimated to allow suitable passage for adult steelhead among these four options is 10–50 cfs. However, other barriers (e.g., ACWD middle and upper rubber dams, PG&E Drop Structure – see below) within Alameda Creek may be impassable at these low flows. ~~There is currently no schedule or budget for this project, and environmental review has yet to begin.~~ On July 31, 2007, the Alameda County Flood Control and Water Conservation District and the Alameda County Water District entered into an agreement to design a fish passage facility over the BART weir and the middle inflatable dam in the Alameda County Flood Control Channel to improve steelhead passage within the Alameda Creek watershed.

Cumulative Impact Assessment for Potential Future-Occurring Steelhead

The following analysis evaluates the WSIP's potential contribution to effects on future-occurring steelhead in combination with past, present, and probable future projects, including other SFPUC and non-SFPUC projects or activities under the jurisdiction of various federal, state, and local agencies that have the potential to affect steelhead recovery in the watershed. The project description changes summarized above include protective measures for future-occurring steelhead in Alameda Creek above the BART weir that are proposed as part of the Calaveras Dam Replacement project, as well as Mitigation Measures 5.4.1-2 and 5.4.5-3a identified in the Draft PEIR. These protective measures and mitigation measures are summarized in Section 14.9.1, above.

Changes in Habitat Conditions from Future Cumulative Projects

A characterization of habitat conditions for steelhead under existing conditions and the projected future cumulative scenario, based on an analysis of past, present, and probable future projects, is provided below. Alameda Creek has historically been divided into three distinct reaches: lower Alameda Creek, Niles Canyon, and upper Alameda Creek. This section provides a description of habitat conditions within each of these three reaches.

Table 14.9-6 presents a summary of existing conditions along Alameda Creek with the current fish passage barriers in place and with Calaveras Reservoir and the ACDD operating under DSOD-restricted conditions, and summarizes the stream and habitat conditions for three different steelhead life stages under two scenarios:

1. A future scenario *without* implementation of the WSIP (i.e., specifically the Calaveras Dam Replacement and Alameda Creek Fishery Enhancement [recapture facility] projects). This scenario assumes that all planned and proposed projects to improve fish passage in the

TABLE 14.9-6
SUMMARY OF ALAMEDA CREEK STEELHEAD HABITAT USE AND CONDITION
UNDER FUTURE CUMULATIVE WITHOUT WSIP AND FUTURE CUMULATIVE WITH WSIP SCENARIOS

	Existing Condition	Assumed Future Condition without WSIP[a]				Assumed Future Condition with WSIP and Measures to Address Potential Impacts[b]			
			Life Stage Habitat Use and Condition[b]				Life Stage Habitat Use and Condition[c]		
Alameda Creek Reach (moving upstream)	**Stream Condition (Steelhead do not have access to Alameda Creek above the BART weir under the Existing Condition)**	**Stream Condition**	**Migration**	**Spawning**	**Rearing**	**Stream Condition**	**Migration**	**Spawning**	**Rearing**
Lower Alameda Creek (Flood Control Channel) – from San Francisco Bay to mouth of Niles Canyon	• Concrete-lined flood control channel • BART weir acts as complete barrier to migration; ACWD dams are also major migration obstacles • High summer temperatures • Substrate has high silt component • Intermittent flow in summer • High winter flows with limited diversion in normal/wet and wet years	• Fish passage restored upstream of BART weir and ACWD inflatable dams • No change to habitat conditions in this reach • Possible increased surface flow from upstream improvements at Sunol quarries	PRESENT	ABSENT	ABSENT/ LIMITED	• Fish passage restored upstream of BART weir and ACWD inflatable dams • No change to habitat conditions in this reach • Calaveras Dam Replacement project / WSIP would increase diversions to Calaveras Reservoir, implement releases from ACDD or Calaveras Dam consistent with the 1997 MOU, and recapture releases also consistent with the 1997 MOU. It would result in reduced stream flow in lower Alameda Creek in winter months of normal/wet and wet years (up to 18%); minimal change during below-normal and dry years.	PRESENT	ABSENT	ABSENT/ LIMITED
Niles Canyon – from mouth of Niles Canyon to confluence with Arroyo de la Laguna	• Confined channel with steep canyon walls • Well-developed riparian zone • Low-gradient perennial stream • Large deep pools, connected by run and riffle habitat • High summer temperatures • Serves as conveyance for water supply from South Bay Aqueduct • USGS gage acts as obstacle to migration under moderate to low flow conditions	• Fish passage restored at USGS gage for all flow conditions • Possible increased surface flow from upstream improvements at Sunol quarries • Improved rearing habitat through cool-water thermal buffering	PRESENT	PRESENT/ LIMITED	LIMITED	• Fish passage restored at USGS gage for all flow conditions • Calaveras Dam Replacement project / WSIP would increase diversions to Calaveras Reservoir, implement releases from ACDD or Calaveras Dam consistent with the 1997 MOU, and recapture releases also consistent with the 1997 MOU. It would result in reduced stream flow in lower Alameda Creek in winter months of normal/wet and wet years (up to 18%); minimal change during below-normal and dry years. • Improved rearing habitat through cool-water thermal buffering	PRESENT	PRESENT/ LIMITED	LIMITED
Upper Alameda Creek (General) – from confluence with Arroyo de la Laguna and upstream	• Fish passage limited by Turner Dam, Little Yosemite, Alameda Creek Diversion Dam, Calaveras Dam • Spawning and rearing habitat influenced by SFPUC dam operations and releases	• Downstream passage improvements increase potential for migration to upper reaches • Fish passage limited by Turner Dam, Little Yosemite, Alameda Creek Diversion Dam, Calaveras Dam • Spawning and rearing habitat influenced by SFPUC dam operations and releases	(see reach-by-reach below)	(see reach-by-reach below)	(see reach-by-reach below)	• Downstream passage improvements increase potential for migration to upper reaches • Calaveras Dam Replacement project / WSIP would increase diversions to Calaveras Reservoir and implement fish releases consistent with 1997 MOU. WSIP would include downstream recapture of those releases at downstream end of Reach A-1. • Fish passage limited by Turner Dam, Little Yosemite, Alameda Creek Diversion Dam, Calaveras Dam • Spawning and rearing habitat influenced by SFPUC dam operations and releases	(see reach-by-reach below)	(see reach-by-reach below)	(see reach-by-reach below)
A-1 – from confluence with Arroyo de la Laguna to lower Sunol Valley (near Sunol WTP)	• Wide, low-gradient, alluvial valley • Intermittent flows • Natural channel relocated due to gravel mining operations • "Losing" reach – up to 36% seepage of surface water from Alameda Creek to gravel mining pits, infiltration galleries, etc. • Warmwater fish habitat • Trout likely not present in reach • PG&E pipeline crossing acts as obstacle to migration • Migration impeded at several locations (critical riffles) at low flows	• Downstream passage barriers removed and fish passage restored • Historical channel realigned • Improved stream flow conditions due to reduced surface and groundwater losses with construction of slurry cutoff walls (but would remain a naturally "losing" reach) • Fish passage provided at the PG&E pipeline crossing • Critical riffles present within the segment of Alameda Creek adjacent to the Sunol quarry (SMP 30) would be enhanced through restoration of the stream channel associated with Sunol quarry permit renewal	PRESENT	LIMITED	ABSENT/ LIMITED	• Downstream passage barriers removed and fish passage restored • Historical channel realigned • Improved stream flow and habitat conditions due to reduced surface and groundwater losses with construction of slurry cutoff walls (but would remain "losing" reach) and stream habitat restoration • Intermittent stream flow • Warmwater fish habitat • Calaveras Dam Replacement project / WSIP would increase diversions to Calaveras Reservoir and implement fish releases consistent with 1997 MOU. WSIP would include downstream recapture of those releases at downstream end of Reach A-1. This would result in substantially reduced normal/wet and wet year winter stream flows in this reach (up to 45%), which would adversely affect migration.	PRESENT	LIMITED/ PRESENT	ABSENT/ LIMITED

TABLE 14.9-6 (continued)
SUMMARY OF ALAMEDA CREEK STEELHEAD HABITAT USE AND CONDITION
UNDER FUTURE CUMULATIVE WITHOUT WSIP AND FUTURE CUMULATIVE WITH WSIP SCENARIOS

Alameda Creek Reach (moving upstream)	Existing Condition	Assumed Future Condition without WSIP[a]				Assumed Future Condition with WSIP and Measures to Address Potential Impacts[b]			
	Stream Condition (Steelhead do not have access to Alameda Creek above the BART weir under the Existing Condition)	Stream Condition	Life Stage Habitat Use and Condition[b]			Stream Condition	Life Stage Habitat Use and Condition[c]		
			Migration	Spawning	Rearing		Migration	Spawning	Rearing
A-1 (cont.)		• Intermittent stream flow • Warmwater fish habitat				• Calaveras Dam Replacement project / WSIP would provide for releases to augment flows to support fisheries consistent with the 1997 MOU, and releases would improve habitat conditions upstream of recapture			
A-2 – from lower Sunol Valley to confluence with Calaveras Creek	• Confined stream channel • Well-developed riparian zone • Pool, run, and riffle habitat present • Intermittent stream flow in dry years • High summer temperatures favor warmwater fish • Flows influenced by Calaveras Dam and Alameda Creek Diversion Dam operations under DSOD-restricted conditions • Rearing habitat influenced by operation of Calaveras Dam and Alameda Creek Diversion Dam	• No projects planned in this reach • Downstream passage barriers removed and fish passage restored	PRESENT	PRESENT	ABSENT/ LIMITED	• Downstream passage barriers removed and fish passage restored • Calaveras Dam Replacement project / WSIP implementation would: – Restore historical flow diversions at diversion dam to Calaveras Reservoir and storage in Calaveras Reservoir – Reduce high winter stream flows in normal/wet and wet years (up to 45%); remaining relatively moderate to high flows would enable migration – Provide for releases to augment flows at upstream end of this reach to support fisheries consistent with 1997 MOU – WSIP would include downstream recapture of 1997 MOU releases at downstream end of Reach A-1 – Improve habitat conditions upstream of recapture • Summer coldwater habitat conditions improved in Alameda Creek from the Calaveras Creek confluence to approximately 2 miles downstream	PRESENT	PRESENT (improved due to 1997 MOU releases)	PRESENT (improved due to 1997 MOU releases)
A-3 – from confluence with Calaveras Creek to point upstream of Little Yosemite	• Steep, confined stream channel • Warmwater and coldwater fish habitat present • Steep bedrock/falls/gradient limit fish passage • Passage impeded by steep bedrock falls at Little Yosemite • Diversion dam operations affect winter and spring stream flow, which has substantially increased since DSOD restriction on Calaveras Reservoir	• No projects planned in this reach • Downstream passage barriers removed • Passage impeded by steep bedrock falls at Little Yosemite	LIMITED, only during specific flows (natural barriers)	PRESENT	PRESENT	• No projects planned in this reach • Downstream passage barriers removed • Passage impeded by steep bedrock falls at Little Yosemite • Calaveras Dam Replacement project / WSIP implementation would restore historical flow diversions to Calaveras Reservoir and would reduce magnitude and frequency of flows • PEIR mitigation for bypass flows at diversion dam would provide minimum flows for resident trout	LIMITED, only during specific flows (natural barriers)	PRESENT	PRESENT
A-4 – from Little Yosemite to Alameda Creek Diversion Dam	• Steep gradient channel sections impede passage • Fragmented habitat under low flow conditions • Dry stream sections in summer • Alameda Creek Diversion Dam and Tunnel operations heavily influence flows and habitat conditions	• No projects planned in this reach • Downstream passage barriers removed	LIMITED, only during specific flows (natural barriers)	PRESENT	LIMITED	• No projects planned in this reach • No change to future scenario habitat conditions other than downstream passage barriers removed and WSIP • Calaveras Dam Replacement project / WSIP implementation would restore historical flow diversions to Calaveras Reservoir but mitigation for bypass flows at diversion dam would provide minimum flows for resident trout	LIMITED, only during specific flows (natural barriers)	PRESENT with mitigation for trout minimum flows (PEIR Measure 5.4.5-3a)	LIMITED
A-5 – from Alameda Creek Diversion Dam to Camp Ohlone	• Steep gradient sections impede passage • Fragmented habitat • Dry stream sections in summer • Steelhead access excluded by Alameda Creek Diversion Dam	• No projects planned in this reach • Downstream passage barriers removed • Migration, spawning, and rearing habitat conditions would remain unchanged	N/A (barrier at ACDD would remain)	N/A (barrier at ACDD would remain)	N/A (barrier at ACDD would remain)	• No projects planned in this reach • Migration, spawning, and rearing habitat conditions would remain unchanged • Calaveras Dam Replacement project / WSIP implementation would not affect this reach • Steelhead access still precluded by ACDD	N/A (barrier at ACDD would remain)	N/A (barrier at ACDD would remain)	N/A (barrier at ACDD would remain)

TABLE 14.9-6 (continued)
SUMMARY OF ALAMEDA CREEK STEELHEAD HABITAT USE AND CONDITION
UNDER FUTURE CUMULATIVE WITHOUT WSIP AND FUTURE CUMULATIVE WITH WSIP SCENARIOS

Alameda Creek Reach (moving upstream)	Existing Condition	Assumed Future Condition without WSIP[a]				Assumed Future Condition with WSIP and Measures to Address Potential Impacts[b]			
	Stream Condition (Steelhead do not have access to Alameda Creek above the BART weir under the Existing Condition)	Stream Condition	Life Stage Habitat Use and Condition[b]			Stream Condition	Life Stage Habitat Use and Condition[c]		
			Migration	Spawning	Rearing		Migration	Spawning	Rearing
C-1 – Calaveras Creek from confluence with Alameda Creek to Calaveras Dam	• Deep pool, run, and riffle habitat present • Stream flow heavily influenced by Calaveras Dam operations • Water temperature influenced by temperatures of reservoir releases • Habitat values marginal for steelhead due to steep topography, isolated pools, altered stream hydrology • Rainbow trout not present	• No projects planned in this reach • No change to future scenario habitat conditions other than WSIP / Calaveras Dam Replacement project	LIMITED (barrier at dam)	LIMITED	LIMITED/ ABSENT	• Calaveras Dam Replacement project / WSIP implementation would restore operations of Calaveras Dam and include fish releases to achieve flow conditions at confluence consistent with 1997 MOU	LIMITED (barrier at replacement dam)	LIMITED	PRESENT
C-2, AH-1 – Calaveras Creek and Arroyo Hondo upstream of Calaveras Reservoir	• Calaveras Creek lacks hydrologic connection with Calaveras Reservoir at lowermost segment of creek • Calaveras Reservoir provides habitat for trout and warmwater fishes • Arroyo Hondo has good habitat/connectivity for 1.8 miles upstream of the reservoir • Steelhead access precluded by Calaveras Dam	• No projects planned in this reach	N/A (barrier at Calaveras Dam would remain)	N/A (barrier at Calaveras Dam would remain)	N/A (barrier at Calaveras Dam would remain)	• Calaveras Dam Replacement project / WSIP would restore historical operating levels and improve coldwater pool in Calaveras Reservoir • Improved connectivity of Arroyo Hondo and Calaveras Creek with Calaveras Reservoir • Steelhead access still precluded by dam	N/A (barrier at replacement dam)	N/A (barrier at replacement dam)	N/A (barrier at replacement dam)

NOTES: See Figure 14.9-4 for the location of reaches.

[a] Future cumulative condition assumes that planned and proposed projects to improve fish passage in the Alameda Creek watershed would be successfully implemented such that anadromous steelhead have access to the upper Alameda Creek watershed, but flow conditions would be the same as under existing conditions (Alameda Creek Diversion Dam and Calaveras Reservoir operations with DSOD restrictions).

[b] Future cumulative condition assumes that planned and proposed projects to improve fish passage in the Alameda Creek watershed would be successfully implemented such that anadromous steelhead have access to the upper Alameda Creek watershed. In addition, it assumes that the proposed WSIP water supply and system operations modifications would be implemented, including construction and operation of the Calaveras Dam Replacement and Alameda Creek Fishery Enhancement projects. Further, it assumes that identified direct impacts of the WSIP would be mitigated and assumes implementation of Draft PEIR Mitigation Measures 5.4.1-2 (Diversion Tunnel Operation) and 5.4.5-3a (Minimum Flows for Resident Trout on Alameda Creek) and 5.4.5-3b (Alameda Creek Diversion Dam Restrictions or Fish Screens).

[c] ABSENT denotes habitat not present in reach to support life stage. LIMITED denotes habitat present to support life stage during periods of the year, but limited by seasonal low flows and/or high summer temperatures; marginally suitable. PRESENT denotes habitat present to support life stage. N/A = Not Applicable, i.e., not affected by Calaveras Dam Replacement project or WSIP because existing barriers (Calaveras Dam and Alameda Creek Diversion Dam) would remain.

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Alameda Creek watershed have been successfully implemented and anadromous steelhead have access to the upper Alameda Creek watershed, and that stream flow conditions attributable to SFPUC water system operations would be the same as under the existing condition.

2. A future scenario *with* implementation of the WSIP, including the Calaveras Dam Replacement and Alameda Creek Fishery Enhancement projects and associated protective measures. This scenario assumes the same conditions as Scenario 1, except it includes full implementation of the WSIP, which would modify stream flow conditions. Under Scenario 2, full implementation of the WSIP would include increasing diversions at the ACDD to restore historical storage levels in Calaveras Reservoir, providing bypass flows at the ACDD as well as releases from Calaveras Reservoir to augment stream flow to support fisheries consistent with the 1997 CDFG MOU, and, if recaptured, recapturing those releases at a downstream location consistent with the 1997 CDFG MOU.

Table 14.9-6 describes the stream and habitat conditions along the various reaches of Alameda Creek that could be affected by the WSIP, including the Calaveras Dam project, beginning at the downstream end of the watershed in lower Alameda Creek and Niles Canyon, and moving upstream to individual reaches in upper Alameda Creek. **Figure 14.9-4** shows the location of the reaches described in Table 14.9-6.

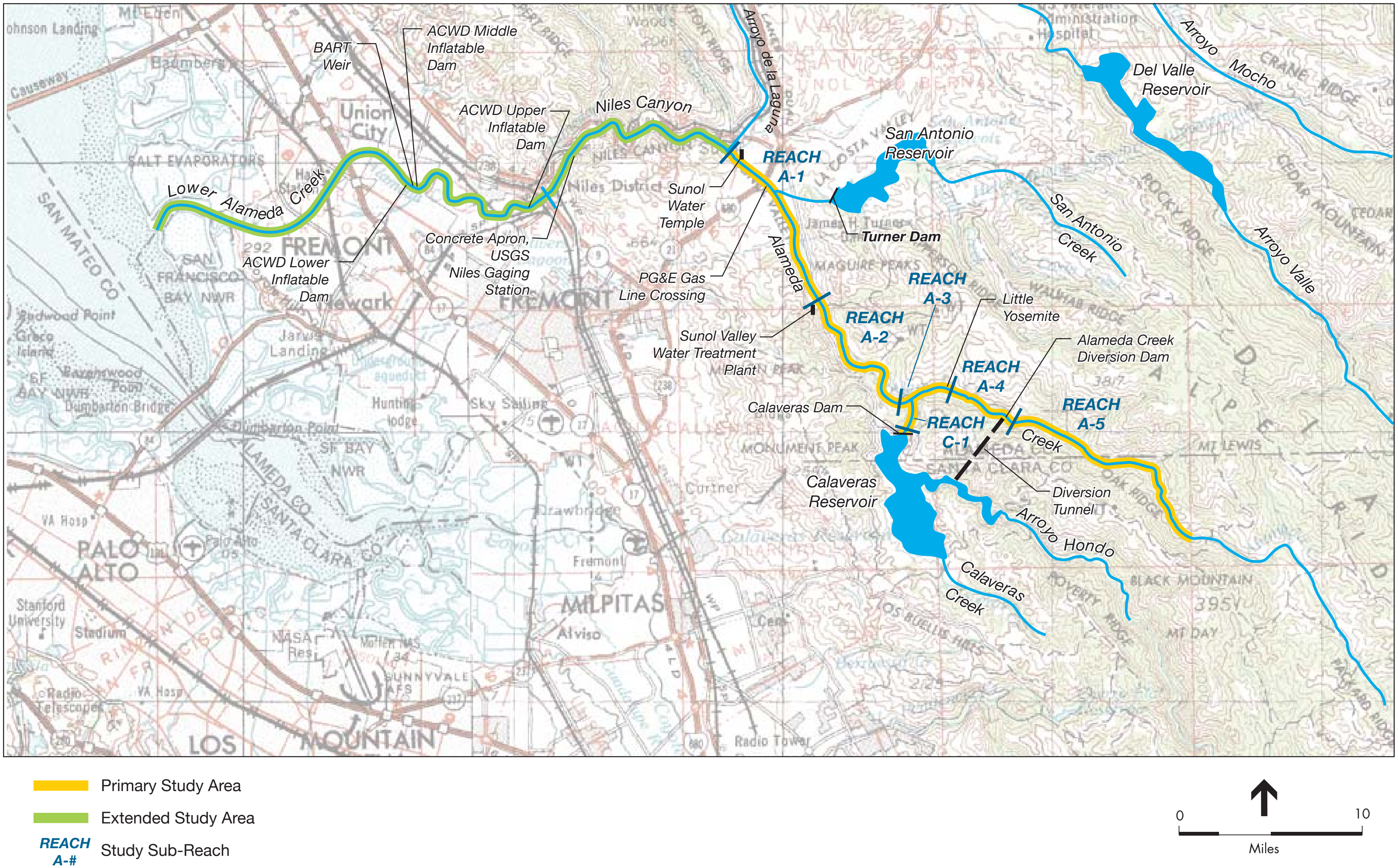
It should be noted that the WSIP's effect on habitat conditions for steelhead in the reaches downstream of Arroyo de la Laguna (i.e., lower Alameda Creek and Niles Canyon) are linked to a number of uncertainties regarding:

- The way in which existing barriers to passage would be remedied in the future (the design of passage facilities and the timing and amount of flow that would be required to achieve suitable passage conditions at those locations) as well as the effectiveness of the proposed slurry cutoff wall on the perimeter of the quarry on the right bank (looking downstream) of Alameda Creek above the San Antonio Creek confluence to reduce seepage losses from Alameda Creek in the Sunol Valley

- The extent to which natural features act as barriers (e.g., wide/braided channel locations, falls, sediment wedges) under various flow regimes and associated water temperature conditions

- The extent to which varying water resource operations of all water agencies in the overall Alameda Creek basin influence flows needed to establish and sustain appropriate flow and temperature conditions for steelhead and the subsequent effects of the WSIP on these downstream conditions (the contributions of flow from Arroyo del Valle and Arroyo de la Laguna complicate the hydrology further and add to uncertainties)

Understanding and resolving the approach to steelhead habitat restoration in the watershed, including addressing uncertainties regarding habitat requirements in Niles Canyon and lower Alameda Creek, requires a comprehensive, coordinated, basinwide effort and is currently being addressed through the ACFRW, of which the SFPUC is a participant.



SOURCE: ESA + Orion; USGS 1969

SFPUC Water System Improvement Program . 203287

Figure 14.9-4
Existing and Future Habitat Conditions for Steelhead on Alameda Creek

Potential Future Cumulative Impacts on Steelhead

The following discussion provides a reach-by-reach analysis of the WSIP's impacts on steelhead in Alameda Creek based on the changes in steelhead life-stage functions: migration (adult and juvenile), spawning, and rearing. The analysis incorporates the project revisions, protective measures, and mitigation measures described in Section 14.9.1, above. The protective measures added to the Calaveras Dam Replacement project description (SFPUC, 2008) include specific operational protocols, seasonal bypass flows at the ACDD and Calaveras Dam, and performance criteria to meet the habitat requirements of steelhead (if present) and other native aquatic species (fish and sensitive amphibians) in upper Alameda Creek in the event that the NMFS and/or CDFG determine that steelhead are present in Alameda Creek above the BART weir, construction of the Calaveras Dam project is complete, and the Alameda Watershed HCP is yet to be finalized. The protective measures also include an interim bypass flow release schedule that would consist of the implementation of flows consistent with the 1997 CDFG MOU, with the additional requirement that these flows be achieved through bypass flows at the ACDD at all times when flows are available, rather than through releases at Calaveras Dam. This interim flow schedule would meet the requirements of the 1997 CDFG MOU point of compliance below the confluence of Alameda and Calaveras Creeks as well as provide additional benefit in the reach between the ACDD and Calaveras Creek. The SFPUC would implement this interim measure until such time that the resource agencies (USFWS, NMFS, and CDFG) develop alternative requirements (i.e., operational protocols, seasonal bypass flows, and performance criteria) through the Alameda Watershed HCP process or other regulatory mechanism to ensure the habitat requirements of steelhead and other native aquatic species are provided at a level that is equal to or better than that provided by this interim measure. Following the development of these protocols, the SFPUC would implement these actions either through the Alameda Watershed HCP or other mechanism developed in consultation with the USFWS, NMFS, and CDFG.

The project revisions and protective measures for steelhead proposed as part of the Calaveras Dam Replacement project (SFPUC, 2008), along with the mitigation measures detailed in the Draft PEIR, have been analyzed by ESA+Orion and EDAW-Turnstone JV (2008) to determine the WSIP's contribution to cumulative effects (both positive and negative) on potential future-occurring steelhead, as discussed below. Implementation of the project revisions, protective measures, and mitigation measures (summarized in the Section 14.9.1, above) would reduce adverse effects of the WSIP on steelhead life stages and habitat in Alameda Creek to a less-than-significant level.

Migration

Upper Alameda Creek (Reaches A-1 through A-5). Implementation of the WSIP would influence stream flow and water temperature in Alameda Creek during steelhead migration periods. Under the WSIP, proposed operation of the ACDD would increase diversions from upper Alameda Creek to Calaveras Reservoir as well as implement protective measures to address steelhead migration downstream of the recapture facility. The protective measures incorporated into the WSIP as part of the Calaveras Dam Replacement and Alameda Fishery Enhancement projects include: (1) in the long term, operational protocols, seasonal bypass flows at the ACDD and Calaveras Dam, and performance criteria to ensure the habitat requirements of steelhead (if present) as implemented through the Alameda Watershed HCP or other regulatory mechanism ensuring compliance with FESA and CESA, and (2) in the short-term until issues associated with the long-term measures are resolved, seasonal flow bypasses at the ACDD and/or Calaveras Dam consistent with the 1997 CDFG MOU but without recapture or with recapture at a point at the downstream end of Reach A-1 below critical riffle locations or lower in the creek. Under this cumulative analysis, it is assumed that Mitigation Measure 5.4.5-3a would be implemented in conjunction with the protective measures

As a result, flows in Alameda Creek downstream of the diversion dam would be substantially reduced from those under existing conditions. Flows passing the diversion dam would include flows above 650 cfs (capacity of the diversion), downstream tributary inflow, and bypass flows when upstream flows are available (from December 1 to April 30) implemented as part of the protective measures and Measure 5.4.5-3a. Natural summer low-flow limitations would not be affected by the bypass flow protective measures, since the bypass flows only address the period from December 1 to April 30, and there is typically no diversion during the summer months.

Because the bypass flows outlined in the 1997 CDFG MOU and Mitigation Measure 5.4.5-3a were developed to meet life-stage habitat suitability requirements for resident rainbow trout, conditions may only be marginally suitable for steelhead migration. As shown in Table 14.9-6, steelhead passage under the existing condition is impeded by natural rock barriers in the steep sections of Alameda Creek within Little Yosemite (Reach A-3, upstream from the Calaveras Creek confluence) under most flow conditions, based on recently completed studies (URS/SWRI, unpublished data). Thus, the effect of the proposed increased diversions on steelhead migration in the reach from the base of the diversion dam to the downstream end of Little Yosemite would only occur during times when flow conditions would have otherwise been adequate for steelhead migration, or if that natural barrier (i.e., falls at Little Yosemite) were to be removed. Removal of the natural Little Yosemite rock barrier is not proposed at this time.

Under the WSIP, flows in the segment of the creek downstream from the confluence of Alameda and Calaveras Creeks would be managed in accordance with the 1997 CDFG MOU through naturally occurring flows, releases from Calaveras Dam, and/or bypass flows at the diversion dam. The resulting stream flows would contribute to potentially suitable migratory conditions at certain times of the year within the reach of Alameda Creek that extends from the Calaveras Creek confluence with Alameda Creek downstream to the water recapture facility. When the bypass flows are released from the diversion dam to meet the terms of the MOU as part of the protective measures incorporated in the Calaveras Dam Replacement project, then the beneficial effects of these flows would also be achieved in Reaches A-3 and A-4, upstream from the Calaveras Creek confluence to the diversion dam.

In the Sunol Valley (Reaches A-1 and A-2), some wide channel areas may limit steelhead passage at lower flows (also known as areas of critical riffles) under existing conditions. In general concept, higher flows would enable upstream migrating adults and downstream migrating adult and juvenile steelhead to pass these areas and the remaining “natural” migration obstacles (following removal of the human-made barriers) in the Sunol Valley and farther downstream.

Stream flow and fish migration assessments conducted in Reach A-1, the stream reach with primary critical riffles adjacent to the Sunol quarry (SMP 30) (ENTRIX, 2006; URS/SWRI, unpublished data), have determined that a total of seven critical riffles are present that could potentially limit fish passage. The assessments determined that a wide range of low to moderate flows would be required to enable fish passage at the individual critical riffle locations. These flow requirements, in order of magnitude, are: 74, 17, 6, 5, 4, 2, and 1 cfs. The flow assessment results indicate that fish passage could be enabled through the provision of minimum flows equal to the highest flow requirement (i.e., 74 cfs) or through physical modification of the creek channel at the critical riffle locations to improve the specific conditions (e.g., wide channel, shallow depths, high velocities, steep gradient, etc.) that impede fish passage, and which, in general, would reduce the flow requirements for suitable fish passage.

While WSIP implementation would result in increased diversions in upper Alameda Creek at the diversion dam, the implementation of releases and/or bypass flows at Calaveras Dam and the ACDD, consistent with the 1997 CDFG MOU (per protective measures incorporated into the Calaveras Dam Replacement project) and Mitigation Measure 5.4.5-3a, would augment migration flows and assure project impacts on fishery habitat as far downstream as the proposed recapture facility are reduced to a less-than-significant level. As part of the project revisions incorporated into the Alameda Fishery Enhancement project, the SFPUC would either not implement recapture until the long-term regulatory mechanism for steelhead protection is resolved, or would locate the recapture facility at a point approximately at the downstream end of Reach A-1 below the areas of critical riffles. Thus, implementation of the 1997 MOU flows would enhance migratory conditions in this area.

Under the assumed future conditions with construction of a slurry cutoff wall and stream habitat restoration at the Sunol quarry pit (i.e., SMP 30 in Reach A-1),[3] downstream losses in stream flow from percolation into these pits in the Sunol area would be reduced; physical conditions at critical riffles is assumed to be improved; and there would be a resulting beneficial effect on steelhead migration in this area. While the remaining stream flow losses due to infiltration and the actual stream flow increase resulting from a future cutoff wall at the Sunol quarry are unknown at this time, it is assumed that increases in stream flows would be achieved and stream habitat restoration would improve physical conditions at critical riffles. Previous assessments of the critical riffles (ENTRIX, 2006; URS/SWRI, unpublished data) determined that passage is enabled at five of the seven critical riffles at relatively low flows (i.e., 1 to 6 cfs). Based on these results, it

[3] The SFPUC's Sunol Valley Sand and Aggregate Quarry Operations (SMP 30) includes projects to be undertaken by the quarry operator to correct losses of water into quarry pits and to enhance riparian vegetation. There is limited fish passage and degraded habitat value in this reach due to past mining-related realignment of the creek channel (noted above), which results in mining pit capture of a significant amount of Alameda Creek flows at the head of the realigned creek. The SFPUC proposes to coordinate planning for an Alameda Creek channel restoration project at this location as part of its negotiation with the selected operator of its Sunol quarry and to include aspects of the restoration project as part of the lease conditions. The SFPUC desires the operator to construct a slurry cutoff wall to reduce inflow to the pit as well as provide restoration of riparian habitat on the right bank of Alameda Creek and the left bank of San Antonio Creek (looking downstream). A plan for these actions has not yet been developed. The selected entity will be required to provide funds towards these efforts. CEQA/NEPA environmental review has yet to begin, but will include planning information for fish passage at the PG&E pipeline drop structure.

is assumed that physical conditions (e.g., channel width and form, gradient) would be improved at the critical riffles that require the highest flows (i.e., 74 and 17 cfs) and these improvements would enable fish passage at low flows, similar to the other critical riffle locations (1 to 6 cfs). These actions combined with minimum flow releases/bypasses consistent with the 1997 CDFG MOU (range of flows between 5 and 20 cfs during migration periods) would achieve suitable steelhead migration conditions in the Sunol Valley downstream to the recapture facility.

In summary, under the future conditions with the WSIP, the total combined stream flow from both regulated and unregulated sources, coupled with the assumed stream flow and habitat improvements at the Sunol Quarry, would sustain some winter flows in Alameda Creek that could facilitate fish migration. Location of the recapture facility downstream of critical riffles (Reach A-1) would assure suitable steelhead migration conditions. With the proposed program modifications described above, the WSIP would have a *less-than-significant* impact on steelhead migration in upper Alameda Creek (ESA+Orion and EDAW-Turnstone JV, 2008).

Lower Alameda Creek and Niles Canyon. At present, steelhead have access only to the segment of lower Alameda Creek below the BART weir because the BART weir acts as a complete barrier to steelhead migration under all flow conditions. In combination with other projects that could provide steelhead access through lower Alameda Creek and Niles Canyon to upper Alameda Creek in the future (including the provision of a fish bypass at the BART weir), the WSIP could result in a cumulative effect on steelhead migration.

Additional stream flow analysis was conducted subsequent to publication of the Draft PEIR (summarized above in Section 14.9.3 and included in Vol. 8, **Appendix N**) in order to address comments regarding the WSIP's impacts on steelhead passage and fishery habitat in lower Alameda Creek and Niles Canyon. This analysis determined that, based on the historical hydrology from 2000 to 2007, flows in Alameda Creek in Niles Canyon and downstream, on average, would occasionally be reduced under the WSIP. Reductions of up to 18 percent in average monthly flow could occur in winter months of years similar to the past eight years of record. The maximum flow reduction would occur during January of an above-normal year; however, the average calculated flow during this period remains relatively high (171 to 216 cfs). A flow increase of up to 13 percent would occur in April of that same hydrologic year type. The average monthly reduction that would occur from December through March of these year types is approximately 20 cfs, with a remaining calculated average flow of 313 cfs (range of 28 to 562 cfs). No changes in flow would occur in below-normal and dry years, when naturally low flow conditions would potentially result in the most substantial passage impediments.

Because the WSIP's effect on flows would only occur during above-normal hydrologic year types when flow conditions are predicted to remain relatively high (ESA+Orion and EDAW-Turnstone JV, 2008), operation of the WSIP is expected to have a negligible cumulative effect on future (anticipated) habitat conditions for steelhead migration. Therefore, this impact would be *less than significant*.

Spawning

Upper Alameda Creek (Reaches A-1 through A-5). Studies recently completed by Hagar and Payne (ETJV, 2008) identified suitable habitat for steelhead spawning in the reach of Alameda Creek immediately downstream of the Calaveras Creek confluence (Reach A-2) and between the Calaveras Creek confluence and the ACDD (Reaches A-3 and A-4). Implementation of the Calaveras Dam Replacement project (SV-2) component of the WSIP would alter stream flow in Alameda Creek during steelhead spawning periods. At present, steelhead do not have access to upper Alameda Creek. However, in combination with other projects that would provide steelhead access to upper Alameda Creek in the future, operation of the Calaveras Dam project could affect steelhead spawning.

Upstream of the Calaveras Creek confluence, Alameda Creek flows are predominantly influenced by operation of the diversion dam and tunnel. At present, Alameda Creek between the diversion dam and the confluence with Calaveras Creek provides habitat for spawning resident rainbow trout as well as other native species. As discussed above, passage conditions are extremely limited under most flow conditions at Little Yosemite and likely impede steelhead access to the majority of this reach, and therefore the effects of the Calaveras Dam project on steelhead spawning may only practically be realized in Alameda Creek downstream of Little Yosemite. Implementation of the WSIP would substantially reduce flows in Alameda Creek compared to existing conditions; however, implementation of PEIR Mitigation Measure 5.4.5-3a would address spawning and egg incubation habitat needs for resident rainbow trout as well as breeding habitat for other native stream-dependent amphibian species present in the creek and would require the SFPUC to monitor fish and sensitive amphibian populations and aquatic habitats. With the addition of the protective measures incorporated into the Calaveras Dam Replacement project, the implementation of the 1997 CDFG MOU flow releases from the ACDD when flow is available in upper Alameda Creek would reduce the WSIP's effect on steelhead spawning in this reach.

While steelhead generally require increased flow (compared to rainbow trout) to meet spawning habitat suitability requirements (e.g., water depth and flow velocity conditions), the bypass flows developed for rainbow trout spawning have been modeled so they would also be adequate for anadromous steelhead spawning. Preliminary studies by Hagar and Payne (ETJV, 2008) to assess flow requirements for steelhead spawning indicate that flows in Alameda Creek between the diversion dam and the Calaveras Creek confluence in the range of 18 to 60 cfs provide the *most* suitable[4] quantity and quality of steelhead spawning habitat. For Alameda Creek downstream of the Calaveras Creek confluence, the studies indicate that flows in the range of 21 to 80 cfs provide the *most* suitable quantity and quality of steelhead spawning habitat. Bypass flows to support spawning in Alameda Creek would be most effective if implemented from approximately January through March, and based on different hydrologic year types and aligned with the timing of precipitation in the upper watershed. It is noted that the 1997 CDFG MOU flows range up to 20 cfs and thus are at or near the lower ranges noted above for the most suitable habitat quantity and quality for steelhead.

4 80 percent or greater of maximum usable area based on the relationship between stream flow and spawning habitat requirements (i.e., water depth, flow velocity, and substrate type and size).

Under the WSIP, water releases from Calaveras Dam and/or bypasses from the ACDD consistent with the 1997 CDFG MOU would contribute to enhancing steelhead spawning habitat conditions at certain times (18 to 20 cfs from January to March) within the reach of Alameda Creek that extends from the Calaveras Creek confluence downstream through Reach A-2 (extent of suitable spawning habitat). The MOU was developed to address habitat needs for rainbow trout only, but would also be expected, based on the Hagar and Payne study (ETJV, 2008, Appendix A), to provide spawning habitat functions for steelhead (ESA+Orion and EDAW-Turnstone JV, 2008). Incorporation of the protective measures (steelhead bypass flows) into the WSIP program description, as summarized above, would reduce these impacts to a *less-than-significant* level.

As a separate issue related to spawning, the increased diversion of higher flows (up to about 650 cfs at the diversion dam as part of the Calaveras Dam Replacement project) could provide a benefit in above-normal and wet years by reducing the likelihood that steelhead eggs incubating in redds downstream of Little Yosemite would be vulnerable to scour and erosion. As such, in some years the increased diversions occurring with the WSIP would be expected to contribute to improved reproductive success of any steelhead spawning within the reach, provided that a suitable base level of flow (through bypass flow mitigation) would be available for spawning and egg incubation (ETJV, 2008).

Lower Alameda Creek and Niles Canyon. Steelhead spawning habitat in lower Alameda Creek is either absent or very limited, and there are no proposed spawning habitat restoration projects in this reach of Alameda Creek. Therefore, the WSIP would not affect steelhead spawning in lower Alameda Creek.

Potential spawning habitat is present in Niles Canyon; however, the future production of individuals spawned in this reach would be restricted by several factors related to subsequent rearing requirements and existing and future habitat limitations (see discussion below). As described above under the heading Migration, stream flow modeling indicated that the WSIP could result in reductions of up to 18 percent in average monthly flow in winter months of above-normal/wet years. The maximum flow reduction would occur during January of an above-normal year; however, the average calculated flow during this period remains relatively high (171 to 216 cfs). A flow increase of up to 13 percent would occur in April of that same hydrologic year type. The average monthly reduction that would occur from December through March of these year types is approximately 20 cfs, with a remaining calculated average flow of 313 cfs (range of 28 to 562 cfs). No changes in flow would occur in below-normal and dry years, when naturally low flow conditions would potentially result in the most limited habitat conditions for spawning.

Because the WSIP's effect on potential steelhead spawning habitat would only occur during above-normal hydrologic year types (when remaining flow conditions are predicted to still be relatively high), the WSIP is expected to have a negligible effect on future (anticipated) habitat conditions for steelhead spawning (ESA+Orion and EDAW-Turnstone JV, 2008). Therefore, this impact would be *less than significant*.

Rearing

Upper Alameda Creek (Reaches A-1 through A-5). At present, steelhead do not have access to upper Alameda Creek. However, in combination with planned projects that would provide steelhead access to upper Alameda Creek in the future, operation of the proposed program could affect steelhead rearing. Implementation of the WSIP could influence stream flow and water temperatures in Alameda Creek during steelhead rearing periods.

Although no published studies have been conducted that specifically address flow needs for rearing steelhead in reaches of Alameda Creek downstream of Calaveras Dam or the diversion dam, the 1997 CDFG MOU was developed to provide an increase in the amount of coldwater habitat in lower Alameda Creek for the benefit of resident trout. This is especially important in the summer and fall periods, at which times the MOU releases would provide sufficiently cool water to support fish survival through the hot, dry summer period. Resident trout and juvenile steelhead have essentially the same requirements for rearing habitat (e.g., flow, water temperature, physical habitat components). Therefore, under the WSIP, releases from Calaveras Dam and/or bypasses from the diversion dam that meet flow and temperature objectives consistent with the 1997 CDFG MOU would be expected to provide habitat conditions suitable for rearing steelhead in Alameda Creek from the confluence with Calaveras Creek downstream, and, with bypasses made from the diversion dam under the Calaveras Dam Replacement project, upstream in Alameda Creek as well. Releases consistent with the MOU are proposed as part of the WSIP, including summer releases that do not occur under existing conditions. Thus, the WSIP would have a *beneficial* effect on potential steelhead summer rearing habitat in the approximate two-mile segment of Alameda Creek between the Calaveras Creek confluence and the boundary of the Sunol Regional Park (i.e., the creek segment where sufficiently cool water temperatures could be maintained before warming [CDFG, 1997]) (see Figure 14.9-4).

There is the potential for adverse effects on steelhead rearing habitat during the rainy season (i.e., approximately November through March) in the reach of Alameda Creek between the diversion dam and the Calaveras Creek confluence (Reaches A-3 and A-4). However, proposed bypass releases from the ACDD under Measure Mitigation 5.4.5-3a would reduce the WSIP’s contribution to this effect. During the dry season when there is minimal naturally occurring flow in Alameda Creek (i.e., April through November), minimal diversions would be made under the WSIP, similar to the existing condition. Furthermore, Draft PEIR Mitigation Measure 5.4.1-2 (Vol. 4, Chapter 6, pp. 6-51 and 6-52) would formalize a commitment for the SFPUC operators to close the gates to the diversion tunnel once reservoir storage levels are met to provide the maximum possible days of winter and spring flows in Alameda Creek below the diversion dam.

Downstream of the bridge at the Sunol Valley Water Treatment Plant (Reach A-1), habitat conditions in the Sunol Valley do not appear to be suitable for steelhead rearing. Annual fish monitoring from 1998 to present (conducted by the SFPUC and summarized in ETJV, 2008) resulted in no rainbow trout being sampled or observed at locations immediately above this reach. With construction of a slurry cutoff wall at the Sunol quarry pit (SMP 30), downstream losses in stream flow resulting from the percolation of groundwater may be substantially reduced, resulting in a beneficial effect. However, remaining losses in stream flow and the capture efficiency of a future cutoff wall at the Sunol quarry (SMP 30) are unknown. Therefore, while the future viability of reestablished steelhead rearing habitat in the Sunol Valley is still uncertain, releases/bypasses included under the WSIP as part of the 1997 CDFG MOU requirements or as part of the PEIR mitigation requirements for resident trout could result in the limited seasonal enhancement of rearing habitat conditions for steelhead (i.e., late spring and late fall, when water temperatures remain sufficiently cool) compared to the existing condition (ESA+Orion and EDAW-Turnstone JV, 2008). Therefore, the WSIP is unlikely to have an adverse effect on steelhead rearing habitat in Reach A-1. In summary, implementation of the WSIP, including project description changes that provide protective measures, in conjunction with the mitigation measures, would result in a *less-than-significant impact* on steelhead rearing.

Lower Alameda Creek and Niles Canyon. There are several key uncertainties regarding the availability and quality of rearing habitat in lower Alameda Creek and Niles Canyon (McBain and Trush, 2007). The Niles Canyon reach may have historically provided important rearing habitat for juvenile steelhead. Currently, rearing habitat in this reach for steelhead is limited by altered flows and warm water temperatures (ETJV, 2008; McBain and Trush, 2007; Hanson, 2002b). As previously noted, the proposed slurry cutoff wall at the Sunol quarry pits could improve the contributions to stream flow and underflow of shallow groundwater into Niles Canyon.

As described above under the heading Migration, additional stream flow analysis indicated that the WSIP could result in reductions of up to 18 percent in average monthly flow in winter months of above-normal/wet years. The maximum flow reduction would occur during January of an above-normal year; however, the average calculated flow during this period remains relatively high (171 to 216 cfs). A flow increase of up to 13 percent would occur in April of that same hydrologic year type. The average monthly reduction that would occur from December through March of these year types is approximately 20 cfs, with a remaining calculated average flow of 313 cfs (range of 28 to 562 cfs). No changes in flow would occur in below-normal and dry years, when naturally low flow conditions would potentially result in the most limited habitat conditions for rearing.

Because habitat functions for rearing have been greatly diminished in lower Alameda Creek and the WSIP's predicted effect on rearing habitat would only occur during above-normal year types (when remaining flow conditions are predicted to still be relatively high), the WSIP is expected to have a negligible effect on future (anticipated) habitat conditions for steelhead rearing (ESA+Orion and EDAW-Turnstone JV, 2008). Therefore, this impact would be *less than significant.*

PEIR Text Revisions to Include Cumulative Impact on Future-Occurring Steelhead

Based on the analysis of the WSIP's contribution to future cumulative effects on potential future-occurring steelhead presented above, the assessment presented in the Draft PEIR of the WSIP's cumulative impacts in the Alameda Creek watershed has been revised. The Draft PEIR text is revised as follows (Vol. 3, Chapter 5, p. 5.4.5-11, fifth full paragraph):

Potential Steelhead Restoration

For the purposes of full disclosure, the PEIR provides this discussion of steelhead in lower Alameda Creek, and the potential for steelhead to be restored to the upper reaches of Alameda Creek (above the BART weir). However, because this steelhead access does not currently exist and there is no current steelhead migration above the BART weir, ~~there would be no~~ the potential impact on steelhead migration, spawning, or juvenile rearing upstream of the BART weir as a result of WSIP implementation is not analyzed in this section, which addresses WSIP impacts relative to existing conditions, but instead is analyzed as a future, cumulative impact in Section 5.7.3. ~~Further, as described in the preceding discussion, since a number of steps are required before steelhead migration further upstream can occur, it is speculative to assess the specific impacts that system operation under the WSIP might have on the potential future restoration of steelhead. Thus, no impact analysis or conclusion is developed in this PEIR. If and when steelhead are restored, the SFPUC will be required to conform its system operations to comply with the applicable Endangered Species Act requirements.~~

In addition, the Draft PEIR text is revised as follows (Vol. 3, Chapter 5, p. 5.7-65, second paragraph):

Cumulative Effects and WSIP Contribution

Table 5.7-15 summarizes the effects of past and present projects, the impacts of the WSIP, the effects of probable future projects, and the combined impacts of the WSIP plus probable future projects on the Alameda Creek watershed. Past and present projects have substantially altered the hydrology, geomorphology, surface water quality, groundwater, fisheries, and terrestrial biology of this portion of the Alameda Creek watershed compared to pre-Euro-American settlement conditions. Visual and recreational resources have been moderately altered. The existing condition, which serves as the baseline for the analysis of the WSIP, reflects the substantial environmental changes that have occurred as a result of the past projects. Because past and present actions have drastically altered ~~this portion of~~ the Alameda Creek watershed, some of the environmental resources are more sensitive to small adverse changes than they would be if the ~~reach~~ watershed had remained relatively unaltered from pre-Euro-American settlement conditions.

In addition, the Draft PEIR text is revised as follows (Vol. 3, Chapter 5, p. 5.7-66, third paragraph):

Implementation of the WSIP would substantially reduce flows in the reach of Alameda Creek from the diversion dam to below its confluence with Calaveras Creek compared to existing conditions (Impact 5.4.1-2). This impact was determined to be significant and unavoidable, even with implementation of Measure 5.4.1-2 (Diversion Tunnel Operation) and bypass flows included as part of the protective measures in the Calaveras Dam Replacement project (SV-2). However, no other past, present, or future projects were identified that would further reduce the stream flow in this reach of Alameda Creek, and some of the projects listed in Table 5.7-13 could enhance the flow. Thus, there would be no adverse cumulative impact on hydrology associated with past, present, and future projects, and the WSIP's contribution to the cumulative impact on hydrology is not applicable.

Due to agreements and ongoing actions regarding the implementation of fish passage improvement projects in lower Alameda Creek (as described in Section 5.4.5 of the Draft

PEIR), it is possible that steelhead will be restored to the Alameda Creek watershed reaches upstream of the BART weir by 2030. More specifically, steelhead may be restored during construction or operation of the Calaveras Dam Replacement project (SV-2) under the WSIP. In response to this scenario, the SFPUC has modified the WSIP program description—mainly that of the Alameda Creek Fishery Enhancement (SV-1) and Calaveras Dam Replacement (SV-2) projects—to incorporate protective measures for steelhead in the event that man-made barriers in Alameda Creek have been successfully removed and that steelhead migration, spawning, and rearing have been restored in Alameda Creek above the BART weir. The protective measures incorporated into the operations of the Calaveras Dam Replacement project would address future-occurring steelhead and would provide for a range of minimum bypass flows and releases at the Alameda Creek Diversion Dam and Calaveras Dam to support steelhead migration, spawning, and rearing. The program as revised, and with implementation of mitigation measures identified in the Draft PEIR, which together include minimum bypass flows to support the various life stages and habitat requirements for steelhead, would have a less-than-significant contribution to cumulative impacts on fishery resources in the Alameda Creek watershed. Please refer to Chapter 14, Section 14.9, of the Final PEIR for further discussion.

14.9.5 Other Fish Species and Aquatic Habitat in Alameda Creek

Introduction

This section of the master response addresses comments concerning the impact analysis and mitigation for the WSIP's potential effects on fishery resources in Alameda Creek upstream of the BART weir. This section of the master response is organized by the following subtopics:

- Analysis of Chinook Salmon, Coho Salmon, and Pacific Lamprey
- Warmwater Fish Species and their Habitats in Alameda Creek

Comment Summary

This section of this master response responds to all or part of the following comments:

L_ACFCWCD-14	SI_ACA1-08	SI_ACA1-19
L_ACWD-19	SI_ACA1-09	SI_ACA1-20
SI_ACA1-05	SI_ACA1-10	SI_GWWF2-02

Summary of Issues Raised by Commenters

- Need to acknowledge the historical range of Chinook salmon, coho salmon, and Pacific lamprey.
- Need to perform analyses to determine mitigation for impacts of flow diversions on Chinook salmon and Pacific lamprey.
- The mitigation measures target rainbow trout and may not mitigate impacts on steelhead, Pacific lamprey, and Chinook salmon.

- Inadequate discussion of warmwater and coldwater fish species and their habitats in the lower Alameda Creek reach.
- Lower Alameda Creek flow diversions would affect fisheries and habitat in the flood control channel.

Chinook Salmon, Coho Salmon, and Pacific Lamprey

Chinook Salmon

Chinook salmon are addressed in the Draft PEIR as part of the environmental setting for Alameda Creek fisheries (Vol. 3, Chapter 5, pp. 5.4.5-11 and 5.4.5-12). While small runs of Chinook salmon may have historically occurred within Alameda Creek, in recent years only a small number of individual Chinook salmon adults have been recovered in the flood control channel downstream of the BART weir. As presented in the Draft PEIR, it is believed that hatchery-produced salmon have strayed into streams that did not traditionally (and do not currently) support them (Gunther et al., 2000).

Although Chinook salmon are occasionally observed and documented below the BART weir, these few individuals are not currently able to migrate upstream of this barrier. If the migration barriers were absent, as discussed above in Section 14.9.3, seasonal high temperatures and low stream flow conditions during both the adult and juvenile migration and rearing periods would likely limit successful Chinook salmon production in most years.

As described above, the discussion of existing conditions presented in the Draft PEIR does not include Chinook salmon as a species of concern in the program area upstream of the BART weir. Impacts on Chinook salmon due to reduced flows below the BART weir have not been determined to be significant based on hydrological modeling of flow changes in the lower portion of Alameda Creek. Further discussion of WSIP-related flow impacts in the flood control channel is provided above in Section 14.9.3, under the heading Impacts on Stream Flow and Fisheries Downstream of the BART Weir. It should be noted, however, that Chinook salmon will be included in the SFPUC's Alameda Watershed HCP.

Coho Salmon

The geographic range for the CCC coho salmon DPS extends from Punta Gorda in northern California south to and including the San Lorenzo River in central California (NMFS, 2006). Evidence presented by Leidy (2007) shows the Alameda Creek watershed historically supported a run of coho salmon. Although there is evidence to support the historical presence of coho salmon in tributaries and coastal streams in and around San Francisco Bay, current findings on the geographic distribution of coho salmon conclude the species is absent from San Francisco Bay and its tributaries and is limited locally to a small number of tributaries in Marin County (NMFS, 2005).

A report by the NMFS (2005) on the status of federally listed DPS of west coast salmon and steelhead summarized a range of surveys and reports on the occurrence of coho salmon in tributaries and coastal streams in and around San Francisco Bay. In assessing historical data and discussing decreasing population numbers for coho salmon in this region, the report identified extremely low contemporary abundance compared to historical abundance, widespread local extinctions, clear downward trends in abundance, extensive habitat degradation, and associated decreases in the carrying capacity of Alameda Creek. The NMFS (2005) presented findings that salmon stocks in small coastal streams north of San Francisco were at moderate risk of extinction, and those in coastal streams south of San Francisco Bay were at high risk of extinction. The report indicated that coho salmon were not present in San Francisco Bay and its tributaries. The results of presence-absence analyses for the CCC coho salmon ESU as a whole estimated that coho salmon were present in only 42 percent of streams historically known to contain coho salmon (NMFS, 2005). Data presented as part of these analyses (CDFG findings, as presented in NMFS, 2005) estimated occupancy was highest in Mendocino County (62 percent), followed by Marin County (40 percent), Sonoma County (4 percent), and San Francisco Bay tributaries (0 percent).

In summary, there is no documentation indicating the presence of coho salmon within Alameda Creek. Therefore, the Draft PEIR does not include an analysis of impacts on coho salmon as a species of concern in the program area.

Pacific Lamprey

Pacific lamprey is addressed in the Draft PEIR as part of the environmental setting for Alameda Creek fisheries (Vol. 3, Chapter 5, p. 5.4.5-12). Additionally, Leidy (2007) presents records for the upper Alameda Creek watershed suggesting that lamprey are able to ascend some formidable migration barriers to reach spawning habitat in the upper Sunol Valley, including the BART weir and the PG&E gas line crossing, as well as more transitory obstacles such as the ACWD inflatable dams in the Alameda Creek flood control channel downstream of Niles Canyon.

Moyle (2002) suggests the possibility that some upstream populations of Pacific lamprey may contain individuals that remain resident, rather than migrating to sea (much like rainbow trout), and it is therefore possible that the sampled population in the program area is resident. There are no known observations of either Pacific lamprey or river lamprey spawning in Alameda Creek, and no recorded observations of lamprey attached to other fish or of scars on fish from lamprey attacks. If adult Pacific lamprey can ascend barriers in the lower creek and reach Sunol Park, it is unclear how often they are successful at doing so.

The Draft PEIR identified sensitive habitat and listed species in the program area. The PEIR description of existing conditions does not include anadromous Pacific lamprey as a species of concern in the program area due to the lack of conclusive data indicating that this form of Pacific lamprey occurs within the upper Alameda Creek watershed. Impacts on Pacific lamprey due to reduced flows below the BART weir (where individual lamprey have recently been netted in the flood control channel section) have not been determined to be significant based on hydrological modeling of flow changes in the lower portion of Alameda Creek. Further discussion of WSIP-related flow impacts in the flood control channel is provided above in Section 14.9.3 under the heading “Impacts on Stream Flow and Fisheries Downstream of the BART Weir.” It should be noted, however, that Pacific lamprey will be included in the SFPUC’s Alameda Watershed HCP.

Warmwater Fish Species and their Habitats in Alameda Creek

Comments on the Draft PEIR requested consideration of warmwater fish habitat in the lower portion of Alameda Creek. A discussion of species present within Alameda Creek, including warmwater species, is presented in Section 5.4.5 of the Draft PEIR (Vol. 3, Chapter 5, p. 5.4.5-12) and summarized in Table 5.4.5-1 (Vol. 3, Chapter 5, pp. 5.4.5-13 to 5.4.5-15).

The CDFG has outlined recreational fishing resources in the San Francisco Bay Area and classifies Alameda Creek as habitat for federally listed steelhead as well as for many native non-game warmwater fish and native and introduced game fish species (CDFG, 2008). According to Skinner (1962), while Alameda Creek may not be a typical warmwater stream, it does support a number of warmwater fish species, including largemouth bass, small-mouth black bass, crappie, catfish, panfish, and roughfish.

The impacts of the WSIP on all fishery resources, including the warmwater species discussed in Table 5.4.5-1, are presented in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.4.5-16 to 5.4.5-22). These impacts were determined to be either beneficial or less than significant in all cases (except for Impact 5.4.5-3, which would be potentially significant, but could be mitigated to a less-than-significant level with implementation of Mitigation Measures 5.4.5-3a and 5.4.5-3b).

14.9.6 Climate Change and Cumulative Effects on Future Fish Passage and Fish Habitat

Introduction

This section of the master response addresses comments concerning the WSIP's potential effects on fish passage and fishery resources in the Alameda Creek watershed when the effects of climate change are taken into consideration.

Comment Summary

This section of this master response responds to all or part of the following comments:

L_ACFCWCD-05

Summary of Issues Raised by Commenters

- The combined effects of the WSIP and climate change on flows and fish passage over the BART weir and middle inflatable dam are not adequately addressed.

Response

Comments received on the Draft EIR included concern regarding climate change effects on flows as they relate to fish passage over the BART weir. A number of habitat studies identify the BART weir as a total barrier to anadromous fish passage (Gunther et al., 2000). As described above in Section 14.9.4, passage improvement projects in Alameda Creek must be successfully completed for fish passage to be possible at the BART weir, and other barriers to passage will need to be removed as well for steelhead to become restored to the upper watershed. For this reason, impacts related to fish passage at the BART weir within the context of climate change were not analyzed in the Draft PEIR. Potential cumulative impacts on fish passage are discussed in Section 14.9.4, which describes the impacts of the WSIP on potential future-occurring anadromous fish under the future cumulative scenario, which assumes the implementation of passage improvement projects and minimum flow releases for the protection of listed species. Impacts on anadromous salmonid migration and fishery habitat in lower Alameda Creek below the recapture facility due to implementation of the WSIP are presented above in Section 14.9.3.

Additional concern was raised that climate change could affect flows in the upper watershed and thus affect future fish passage and habitat connectivity. Potential impacts of climate change on the regional water system, precipitation patterns, and local hydrology are discussed in **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14, Section 14.11.4); this master response provides a qualitative assessment of WSIP impacts in the Alameda Creek watershed with consideration of climate change effects, and therefore addresses effects of climate change on Alameda Creek flows.

Potential impacts on habitat and habitat connectivity from climate-change-induced temperature effects are discussed here. The results of temperature monitoring in Alameda Creek conducted as part of habitat survey work (Hanson, 2002a, 2002b; McBain and Trush, 2007) demonstrate that current habitat conditions in Alameda Creek are on the threshold for steelhead suitability. Temperatures in mid-April already exceeded the smoltification success threshold, and by mid-June had exceeded the assumed juvenile growth threshold in Niles Canyon and farther downstream. Summer water temperatures within the lower reaches of the tributaries and mainstem Alameda Creek were characterized as stressful and/or unsuitable for juvenile steelhead rearing under the environmental conditions monitored during 2001 and 2002 (Hanson, 2002a, 2002b).

Under future climate change scenarios, increased summer temperatures could cause Alameda Creek to exceed the range for viable steelhead summer rearing habitat, particularly in the middle and lower reaches of the creek. Cooler waters are also more likely to favor high juvenile growth rates. Instream flow releases can generate physical juvenile rearing habitat, but abundant habitat that is too warm is not viable for steelhead. However, greater stream flow generally produces cooler water temperatures, especially instream flows released from the hypolimnion[5] of reservoirs (McBain and Trush, 2007). Instream flow releases will be an important management tool for extending favorable water temperatures into spring and summer. In addition, as discussed above in Section 14.9.4, under the future cumulative scenario, the proposed improvements at the Sunol quarry pits could improve the contributions to stream flow and underflow of shallow groundwater into Niles Canyon, improving rearing habitat through cool-water thermal buffering.

5 The bottom portion of a thermally stratified lake or reservoir; water in the hypolimnion is generally cool and has a low oxygen concentration.

Under proposed WSIP operations, peak winter flows of up to 650 cfs would be diverted from Alameda Creek to Calaveras Reservoir through the diversion tunnel. These proposed diversions would not adversely affect summer temperatures or rearing habitat, as no diversions occur during the summer (dry) months. The project revisions described in Section 14.9.1, above, provide detailed discussion of the various strategies for instream flow releases, designed as protective measures for fishery and native stream-dependent biological resources in Alameda Creek. The protective measures include ongoing monitoring and adaptive management of bypass flows such that the SFPUC would modify and adjust flows as needed to address steelhead habitat and life-stage requirements. The ongoing monitoring and adaptation would include operational and flow modifications to address possible climate change effects.

14.10 Master Response on Modified WSIP Alternative

14.10.1 Introduction

Overview

This master response addresses the issues commenters raised on the Modified WSIP Alternative, which was identified in the Draft PEIR as the environmentally superior alternative. Several commenters requested that the Final PEIR further describe and analyze the Draft PEIR's Modified WSIP Alternative. Commenters expressed support for the Modified WSIP Alternative because it would result in fewer impacts on natural resources than the proposed program. This master response is organized by the following subtopics:

14.10.2 Modified WSIP Alternative – Additional Details
14.10.3 Additional Water Conservation/Recycling and the Modified WSIP Alternative
14.10.4 Modified WSIP Alternative – Additional Information on Environmental Impacts

It was apparent from the comments that the Modified WSIP Alternative concept needed clarification. This alternative was devised to avoid the significant adverse impacts on fisheries and terrestrial biological resources in the reach of the Tuolumne River below La Grange Dam that were identified to occur with the WSIP. It incorporates some, but not all, of the mitigation measures that were designed to lessen or eliminate the significant impacts of the WSIP (see Draft PEIR, Vol. 4, Chapter 6). If the Modified WSIP Alternative were to be implemented, mitigation measures would still be needed to avoid significant adverse impacts, as described below in Section 14.10.4.

Commenters

Commenters that addressed this topic include:

Federal Agencies

- None

State Agencies

- California Department of Fish and Game – S_CDFG2
- California State Assembly – S_CSA

Local and Regional Agencies

- Alameda County Water District – L_ACWD
- Bay Area Water Supply and Conservation Agency – L_BAWSCA1, L_BAWSCA2, L_BAWSCA6
- City of Daly City – L_DalyCty
- City of Hillsborough – L_Hillsb
- City of Millbrae – L_Millbr
- City of Palo Alto – L_PaloAlto
- City of Sunnyvale – L_Snnyvl
- Stanford University (BAWSCA member) – L_Stanford

- Tuolumne Utilities District – L_TUD1
- Tuolumne County Board of Supervisors – L_Tuol1
- Alameda County Flood Control and Water Conservation District, Zone 7 – L_Zone7

Groups

- Citizens Advisory Committee to PUC – SI_CAC2
- California Native Plant Society, East Bay Chapter – SI_CNPS-EB1
- Environmental Defense – SI_EnvDef
- Pacific Institute – SI_PacInst
- Restore Hetch Hetchy – SI_RHH1
- San Francisco Planning and Urban Research Association – SI_SPUR
- State Water Contractors – SI_SWC
- Tuolumne River Trust – SI_TRT3

Citizens

- Okuzumi, Margaret – C_Okuzu

PEIR Section Reference

The Draft PEIR addresses this topic area in the following locations: Vol. 1, Summary, Section S.7, pp. S-75, S-77, and S-78; and Vol. 4, Chapter 9, Section 9.2.8, pp. 9-78 to 9-84.

14.10.2 Modified WSIP Alternative – Additional Details

Comment Summary

This section of this master response responds to all or part of the following comments:

S_CDFG2-06	L_BAWSCA6-03	L_Zone7-02
S_CDFG2-07	L_DalyCty-22	SI_EnvDef-03
S_CSA-02	L_Hillsb-04	SI_EnvDef-17
S_CSA-04	L_Millbr-03	SI_PacInst-22
L_BAWSCA1-46	L_PaloAlto-05	SI_PacInst-83
L_BAWSCA1-47	L_Snnyvl-10	SI_SPUR-03
L_BAWSCA1-49	L_Stanford-01	
L_BAWSCA6-02	L_TUD1-04	

Summary of Issues Raised by Commenters

- The PEIR should provide a more detailed description of the Modified WSIP Alternative.

Response

As described in the Draft PEIR (Vol. 4, Chapter 9, pp. 9-78 to 9-82), the Modified WSIP Alternative incorporates changes into the proposed WSIP primarily to modify the proposed water supply and system operations so as to minimize environmental effects on resources in the

Tuolumne River, Alameda Creek, San Mateo Creek, and Pilarcitos Creek watersheds. This alternative incorporates many (but not all) of the mitigation measures identified in the Draft PEIR to reduce potentially significant or significant impacts. It consists of the same facility improvement projects and water supply sources as the WSIP, but would also include additional conservation, water recycling, and local groundwater development and certain system operation modifications that would reduce environmental impacts. The Modified WSIP Alternative would meet 2030 customer purchase requests and achieve all of the WSIP goals and level of service objectives, and its performance would be essentially identical to that of the WSIP based on the drought-year shortages and the amount of rationing that would be required during the design drought (see Table 14.10-3, below).

The Modified WSIP Alternative is similar to the proposed WSIP and would consist of the following elements:

- Water supply sources during all years (nondrought and drought periods):
  - Local supplies from the Peninsula and Alameda Creek watersheds (similar to the WSIP)
  - Tuolumne River (similar to existing conditions)
  - Transfer of water conserved in the TID and MID service areas and/or in the service area of another water agency (not part of the WSIP)
  - Recycled water/groundwater/increased conservation in San Francisco (same as the WSIP)
  - Increased recycled water/conservation/local groundwater in the regional wholesale customer service area (not part of the WSIP)

- Supplemental dry-year water supply sources:
  - Westside Groundwater Basin conjunctive use (same as the WSIP)
  - Dry-year water transfer of conserved water from TID and MID (similar to the WSIP, but with transfer made from conserved water)

- System operations under the Modified WSIP Alternative would be the same as with the WSIP, except for the following additional measures designed to minimize environmental effects:
  - Alameda Creek bypass flows between the Alameda Creek Diversion Dam and the confluence with Calaveras Creek to provide minimum flows for resident trout
  - Modified operations of Pilarcitos facilities to reduce effects on water quality, biological resources, and fisheries
  - Modified operations of Crystal Springs Reservoir to reduce effects on biological resources

Table 14.10-1 presents a comparison of the Modified WSIP Alternative and the proposed program, and updates information on the Modified WSIP Alternative shown in Table 9.5 of the Draft PEIR (Vol. 4, Chapter 9, p. 9-11). As shown in the table, the Modified WSIP Alternative would have essentially the same water supply sources as the proposed program, with the notable

TABLE 14.10-1
(SIMILAR TO DRAFT PEIR TABLE 9.4)
COMPARISON OF PROPOSED PROGRAM AND MODIFIED WSIP ALTERNATIVE

Program Element	Existing Condition	Proposed Program	Modified WSIP Alternative
Planning Year	2005	2030	2030
Target Delivery Level (annual average)	265 mgd	300 mgd	300 mgd
Water Supply Sources (during nondrought and drought periods)	▪ Local watersheds (with Calaveras and Lower Crystal Springs Reservoirs operating at reduced levels based on Division of Safety of Dams restrictions) ▪ Tuolumne River	▪ Local watersheds (with Calaveras and Lower Crystal Springs Reservoirs restored) ▪ Tuolumne River, with increased average annual diversions ▪ Recycled water/groundwater/additional conservation in San Francisco, 10 mgd	▪ Local watersheds (with Calaveras and Lower Crystal Springs Reservoirs restored, but with reduced maximum operating levels for Crystal Springs Reservoir) ▪ Tuolumne River, with increased average annual diversions between Hetch Hetchy and Don Pedro Reservoirs but with no increase in diversions below La Grange Dam ▪ Recycled water/groundwater/additional conservation in San Francisco, 10 mgd ▪ Regional recycled water/groundwater/additional conservation in wholesale service area, 10 mgd ▪ Transfer of conserved water in the TID and MID service area and/or in the service area of another water agency
Supplemental Dry-Year Water Supply Sources (for implementation during drought periods only)	None	▪ Additional Tuolumne River diversions from Turlock and Modesto Irrigation District (TID and MID) transfers of 25 mgd (average over design drought) ▪ Westside Basin conjunctive use, 6 mgd (average over design drought)	▪ Transfer of conserved water from TID and MID (17.5 mgd average over design drought) ▪ Westside Basin conjunctive use, (6 mgd average over design drought)
Maximum Drought Rationing Policy	No defined limit, but assumed incidental rationing of up to 25%	20%	20%
System Firm Yield	219 mgd	256 mgd	248 mgd
WSIP PEIR Facility Improvement Projects	None	All projects	All projects
Other Facility Improvements	None	None	▪ Low-head pumping station and permanent aeration system at Pilarcitos Reservoir ▪ Facilities associated with water conservation project(s) in TID, MID, and/or other water agency service area ▪ Facilities associated with additional water conservation, recycling, and groundwater projects in the wholesale service area
Delivery, Operations, and Maintenance	As described in Chapter 2, Section 2.3 (Vol. 1)	Improved to meet WSIP goals and objectives (as described in Vol. 1, Chapter 3, Section 3.8)	Similar to proposed program but with: bypass flows for resident trout at Alameda Creek Diversion Dam; revised operations at Pilarcitos Reservoir; reduced maximum operating levels in Crystal Springs Reservoir; habitat monitoring and compensation at Pilarcitos Reservoir; and establishing flow criteria, monitoring, and augmenting flows below Stone Dam

TABLE 14.10-1 (Continued)
COMPARISON OF PROPOSED PROGRAM AND MODIFIED WSIP ALTERNATIVE

Program Element	Existing Condition	Proposed Program	Modified WSIP Alternative
Permits, Approvals, and other Decisions/Actions	As described in Chapter 2, Sections 2.4 and 2.5 (Vol. 1)	▪ San Francisco Planning Commission certifies Final PEIR ▪ SFPUC adopts CEQA findings/mitigation monitoring and reporting program and approves and adopts the WSIP ▪ Water transfer agreements with TID and MID ▪ Operating agreements with Daly City, San Bruno, and California Water Service Company for Westside Basin conjunctive-use program ▪ Water sales agreements with retail and wholesale customers (see Vol. 1, Chapter 3, Section 3.13)	Same as proposed program except: ▪ Transfer agreements with TID and MID and/or other water agency for conserved water ▪ Agreements for participation in regional recycled water/ conservation/local groundwater projects that could offset SFPUC supply
Mitigation Measures needed to reduce significant and potentially significant impacts	N/A	▪ All programmatic mitigation measures identified for impacts associated with facility improvement projects (Measures 4.3-2 to 4.17-8) ▪ All mitigation measures identified for water supply and system operations impacts (Measures 5.3.6-4 to 5.6-5)	▪ All programmatic mitigation measures for facility improvement projects (Measures 4.3-2 to 4.17-8) ▪ All mitigation measures identified for water supply and system operations impacts (Measures 5.3.6-4 to 5.6-5), except for the following, which would be incorporated into this alternative: - Measure 5.3.6-4a, Avoidance of Flow Changes by Reducing Demand for Don Pedro Reservoir Water - Measure 5.3.6-4b, Fishery Habitat Enhancement - Measure 5.3.7-6, Lower Tuolumne River Riparian Habitat Enhancement - Measure 5.4.5-3a, Minimum Flows for Resident Trout on Alameda Creek - Measure 5.4.5-3b, Alameda Diversion Dam Diversion Restrictions or Fish Screens - Measure 5.5.3-2a, Low-Head Pumping Station at Pilarcitos Reservoir - Measure 5.5.3-2b, Aeration System at Pilarcitos Reservoir - Measure 5.5.3-2c, Habitat Monitoring and Compensation at Pilarcitos Reservoir - Measure 5.5.5-5, Establish Flow Criteria, Monitor and Augment Flow below Stone Dam

difference that the alternative would implement increased levels of conservation and water recycling. Section 14.10.3, below, presents a detailed description of the water conservation and recycling proposed under the Modified WSIP Alternative to supplement water supply sources, including agricultural conservation in the San Joaquin Valley and increased conservation/water recycling/local groundwater projects in the wholesale service area. The additional water conservation and recycling efforts incorporated into the Modified WSIP Alternative would enable the SFPUC to reduce diversions from the Tuolumne River compared to the levels proposed under the WSIP while still achieving all of the WSIP's level of service objectives, including serving customer purchase requests to 2030. As indicated in the table, the Modified WSIP Alternative would incorporate some, but not all, of the mitigation measures identified for the WSIP in the Draft PEIR. This alternative is designed to reduce the water-supply-related impacts of the WSIP, but would still require implementation of many of the same mitigation measures as the proposed program to reduce other identified impacts to a less-than-significant level. As described below in Section 14.10.4, the Modified WSIP Alternative was determined to be the environmentally superior alternative.

The Draft PEIR (Vol. 1, Chapter 3) provides detailed descriptions of the proposed facility improvement projects (pp. 3-48 to 3-72) that would be implemented under both the WSIP and the Modified WSIP Alternative. However, since publication of the Draft PEIR in June 2007, the SFPUC has conducted additional studies that would result in slight modifications to the facility improvement projects and system operations under the Modified WSIP Alternative. These changes would affect Alameda Creek bypass flows, Pilarcitos facilities operations, and Crystal Springs Reservoir operations, as described below.

Facility Improvement Project Updates and Alameda Creek Fishery Releases

As described in Section 13.2, Program Description Changes Affecting System Operations (Vol. 7, Chapter 13), as well as in **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14), the SFPUC modified the project descriptions of the Alameda Creek Fishery Enhancement (SV-1) and Calaveras Dam Replacement (SV-2) projects after publication of the Draft PEIR. These modifications would reduce the environmental impacts on fishery, recreational, and visual resources in the Alameda Creek watershed and would also affect regional system operations. The modifications to the Calaveras Dam project include construction of a new bypass structure at the Alameda Creek Diversion Dam and implementation of releases from this structure to meet the requirements of the 1997 California Department of Fish and Game Memorandum of Understanding when flow is available in Alameda Creek. This proposed measure to implement flow releases at the Alameda Creek Diversion Dam would reduce the effects of the WSIP on resident trout between the diversion dam and the confluence with Calaveras Creek and on recreational and visual resources in the Sunol Regional Wilderness. It would also serve as an interim measure to reduce potential impacts on future-occurring steelhead in Alameda Creek to a less-than-significant level, until such time that the Alameda Watershed Habitat Conservation Plan is completed.

Under both the WSIP and the Modified WSIP Alternative, the SFPUC would incorporate these modifications and implement them as part of the Calaveras Dam Replacement project (SV-2).

The Modified WSIP Alternative would also incorporate the specific requirements included in Mitigation Measure 5.4.5-3a (see Vol. 7, Chapter 16, Section 16.2, Measure 5.4.5-3a, as revised), which call for the SFPUC to conduct the necessary site-specific studies to determine the minimum flow requirements needed to support resident trout spawning and egg incubation, and to implement an operations plan that provides for adaptation of the minimum flows based on the monitoring results and best available scientific information.

Modified Pilarcitos Facilities Operations and Related Measures

As described in the Draft PEIR (Vol. 4, Chapter 9, p. 9-79), the Modified WSIP Alternative incorporates Mitigation Measure 5.5.3-2, Revised Operations Plan for Pilarcitos Watershed Facilities, to avoid impacts on multiple Pilarcitos watershed resources, including water quality, terrestrial biological resources, and fisheries. However, as described in Section 13.3 (Vol. 7, Chapter 13), the SFPUC conducted further analysis and modeling of Pilarcitos facilities subsequent to Draft PEIR publication and determined that this proposed mitigation measure would be technically challenging and that other more practical solutions are available. As a result, multiple substitute mitigation measures have been developed to replace Measure 5.5.3-2 that would reduce the impacts of the WSIP on all resources in the Pilarcitos Creek watershed to a less-than-significant level. The replacement measures are described in Section 13.3 (Vol. 7, Chapter 13) and are presented as revised text in Section 16.2 (Vol. 7, Chapter 16). The replacement/substitute measures for the Pilarcitos watershed consist of the following: Measure 5.5.3-2a, Low-Head Pumping Station at Pilarcitos Reservoir; Measure 5.5.3-2b, Aeration System at Pilarcitos Reservoir; Measure 5.5.3-2c, Habitat Monitoring and Compensation; and Measure 5.5.5-5, Establish Flow Criteria, Monitor and Augment Flow.

Therefore, the Modified WSIP Alternative as currently proposed incorporates these replacement mitigation measures. Under the Modified WSIP Alternative, the SFPUC would:

- Install a permanent low-head pumping station at Pilarcitos Reservoir, which would enable the SFPUC to augment flow in Pilarcitos Creek with water from the reservoir when the WSIP would cause releases from Pilarcitos Reservoir to Pilarcitos Creek to be reduced to reservoir inflow earlier in the summer than would occur under the existing condition—about 25 percent of years in the hydrologic record (see Measure 5.5.3-2a)

- Install a permanent aeration system at Pilarcitos Reservoir, which the SFPUC would operate as necessary to avoid anoxic conditions and maintain good water quality conditions at the reservoir (see Measure 5.5.3-2b)

- Develop and implement an adaptive management plan for managing and maintaining freshwater marsh and other wetlands around the periphery of Pilarcitos Reservoir, and compensate for the reduced productivity and diversity of San Francisco garter snake and California red-legged frog wetland habitat that could occur as a result of the greater variability, extent, and duration of drawdowns at Pilarcitos Reservoir associated with operation of the proposed low-head pumping station (see Measure 5.5.3-2c)

- Develop and implement a monitoring and operations plan for Stone Dam to ensure WSIP-related flow reductions downstream of Stone Dam do not impair steelhead passage and spawning during the winter months of normal and wetter hydrologic years and, if needed, release bypass flows from Stone Dam when flow is available to meet the minimum stream flow for steelhead passage in Pilarcitos Creek in the reach between Stone Dam and Albert Canyon (see Measure 5.5.5-5)

Modified Crystal Springs Reservoir Operations

Since publication of the Draft PEIR, the SFPUC has completed studies on Crystal Springs Reservoir as part of the development of the Lower Crystal Springs Dam Improvements project (PN-4). These studies included topographic LiDAR surveys, detailed review of historical water surface elevations and operating procedures, mapping of existing habitat, and analysis of future conditions under the WSIP and the Modified WSIP Alternative using the Hetch Hetchy/Local Simulation Model (HH/LSM) (SFPUC, 2008; Entrix, 2008). The studies identified the maximum operating water surface elevation and corresponding maximum storage capacity in Crystal Springs Reservoir under various conditions, as shown in **Table 14.10-2**, below:

TABLE 14.10-2
CRYSTAL SPRINGS RESERVOIR WATER SURFACE ELEVATION AND STORAGE CAPACITY

Condition	Maximum Water Surface Elevation (feet, NGVD)	Maximum Storage Capacity (billion gallons)
Existing Condition, with DSOD restrictions imposed since 1982	283.8	18.5
WSIP, proposed program analyzed in the Draft PEIR	291.8	22.2
Modified WSIP Alternative	287.8	20.3

NGVD = National Geodetic Vertical Datum of 1929; DSOD = California Department of Water Resources, Division of Safety of Dams.

SOURCE: SFPUC, 2008.

In determining the maximum operating water surface elevation and corresponding storage capacity under the Modified WSIP Alternative, the SFPUC considered numerous factors that would reduce impacts on biological resources, including existing vegetation, the potential for areas to revegetate with other vegetation/habitat if operating water elevations are raised, and the estimated frequency and duration of various inundation conditions, among others. This revised definition of operating parameters for Crystal Springs Reservoir under the Modified WSIP Alternative would set a maximum water surface elevation for most of the year, below the maximum capacity of the future reservoir, to reduce impacts on various habitats and related biological resources while still allowing the SFPUC to achieve the WSIP level of service objectives. It assumes that proposed system operations would not affect the daily rates of change in water surface elevation (which are based on storms and customer demand) or minimum elevations during drought periods (which are based on supply limitations). The major change in operating assumptions under the WSIP and the Modified WSIP Alternative compared to the existing condition is that Crystal Springs Reservoir would be fuller longer, subject to the maximum water surface elevation and corresponding storage level specified above.

The above assumptions constitute a refinement and improvement of the proposed Crystal Springs Reservoir operations under the Modified WSIP Alternative described in the Draft PEIR, which suggested that the SFPUC could regulate seasonal fluctuations within the maximum reservoir capacity rather than restricting the maximum storage level (Vol. 4, Chapter 9, p. 9-9). The refined operating assumptions for the Modified WSIP Alternative would reduce the magnitude of impacts on biological resources compared to the WSIP, but would not eliminate the impacts, which would remain potentially significant under the Modified WSIP Alternative. Therefore, implementation of the following mitigation measures would still be required to reduce impacts to a less-than-significant level: Measure 5.5.6-1a, Adaptive Management of Freshwater Marsh and Wetlands; Measure 5.5.6-1b, Compensation for Impacts on Terrestrial Biological Resources; and Measure 5.5.6-1c, Compensation for Serpentine Seep-Related Special-Status Plants (Vol. 4, Chapter 6, pp. 6-57 and 6-58). However, these impacts and mitigation measures will be reevaluated in detail at a project level and refined as part of the environmental review of the Lower Crystal Springs Dam Improvements project (PN-4).

14.10.3 Additional Water Conservation/Recycling and the Modified WSIP Alternative

Comment Summary

This section of this master response responds to all or part of the following comments:

S_CDFG2-06	L_Hillsb-04	SI_EnvDef-16
S_CDFG2-07	L_Millbr-03	SI_EnvDef-17
S_CSA-02	L_PaloAlto-05	SI_PacInst-22
S_CSA-04	L_Snnyvl-10	SI_PacInst-83
L_ACWD-03	L_Stanford-01	SI_RHH1-03
L_BAWSCA1-46	L_TUD1-04	SI_SPUR-03
L_BAWSCA1-47	L_Tuol1-01	SI_SWC-02
L_BAWSCA1-49	L_Zone7-02	SI_TRT3-04
L_BAWSCA2-04	SI_CAC2-03	SI_TRT10-02
L_BAWSCA6-02	SI_CNPS-EB1-15	C_Okuzu-03
L_BAWSCA6-03	SI_EnvDef-07	
L_DalyCty-22	SI_EnvDef-10	

Summary of Issues Raised by Commenters

- The PEIR should provide a more detailed description of how the proposed conserved water transfer from the Turlock Irrigation District (TID) and the Modesto Irrigation District (MID) (i.e., reduction in demand for water from Don Pedro Reservoir) is to be achieved.

- The PEIR should explore the feasibility of increasing agricultural conservation beyond that proposed to develop the conserved water dry-year water transfer element of the WSIP, with the goal of no net decrease in flows released to the lower Tuolumne River or even an increase; this could result in *more* water (a net increase) remaining in Don Pedro Reservoir (and released to the lower Tuolumne) than is currently the case, even after taking the proposed increased diversions for the SFPUC regional system into account. Possible mechanisms to increase agricultural water conservation to be explored include: Bay Area water agencies provide economic incentives and/or financial support to encourage and fund agricultural conservation.

- The PEIR should provide more detail on future water recycling efforts by the wholesale customers.
- The preferred alternative identified in the Draft PEIR (the proposed program) does not maximize water conservation and recycling in lieu of additional water diversions from the Tuolumne River.
- The SFPUC and Bay Area Water Supply and Conservation Agency (BAWSCA) should work together to establish more effective regional conservation and recycling programs.

Response

Proposed Transfer of Conserved Water Included in Modified WSIP Alternative

Under the WSIP, the SFPUC would increase the amount of water it would divert from the Tuolumne River at Hetch Hetchy Reservoir. The increased diversion of water at Hetch Hetchy Reservoir needed to serve increased purchase requests by 2030 would be partially facilitated by a proposed dry-year water transfer from TID and MID to the SFPUC. The dry-year water transfer is included in the WSIP in order to avoid water rationing of more than 20 percent systemwide during a prolonged drought. For more information on the proposed dry-year water transfer, see **Section 14.3, Master Response on Proposed Dry-Year Water Transfer** (Vol. 7, Chapter 14).

Because more water would be diverted at Hetch Hetchy Reservoir with the WSIP (including the dry-year transfer), less water would flow down the river between O'Shaughnessy Dam and Don Pedro Reservoir, and inflow to Don Pedro Reservoir would be reduced. Decreased inflow would reduce storage in Don Pedro Reservoir compared to the existing condition. Because storage in Don Pedro Reservoir with the WSIP would be reduced, more of the late spring/early summer snowmelt runoff would be needed to refill the reservoir. As a result, less water would be released to the Tuolumne River below La Grange Dam than is released under the existing condition. Releases would still be in compliance with the Federal Energy Regulatory Commission's minimum required releases, but the HH/LSM results indicate that minimum releases would be made in 734 months of the 984-month hydrologic record with the WSIP compared to 717 months under the existing condition. The reduction in late spring/early summer releases attributable to the WSIP would have significant adverse impacts on fisheries and terrestrial biological resources in the reach of the river below La Grange Dam, as described in the Draft PEIR (Vol. 3, Chapter 5, Sections 5.3.6 and 5.3.7).

Draft PEIR Mitigation Measure 5.3.6-4a describes a "conserved water transfer" (Vol. 4, Chapter 6, p. 6-48) to reduce the impacts of the WSIP on fisheries and terrestrial biological resources in the Tuolumne River below La Grange Dam to a less-than-significant level. Measure 5.3.6-4a would involve a water transfer from TID/MID and/or another water agency to the SFPUC, in a manner similar to the dry-year water transfer that is already part of the WSIP. The water for Measure 5.3.6-4a would be developed through conservation in the service areas of TID, MID, and/or another water agency. In this context, conservation could include water savings achieved through altered irrigation methods or planting of less water-intensive crops; improved delivery efficiency; an interagency transfer of conserved water; or use of an alternative supply such as groundwater. Measure 5.3.6-4a was incorporated into the Modified WSIP Alternative, as described in Chapter 9 of the Draft PEIR (Vol. 4, pp. 9-78 to 9-81), but with the condition that the water for the mitigation measure would be developed through conservation only. Unlike Measure 5.3.6-4a, this alternative would not include as an option the use of alternative water sources.

As described in the Draft PEIR (Vol. 1, Chapter 3, pp. 3-36 to 3-39), and expanded upon in **Section 14.3, Master Response on Proposed Dry-Year Water Transfer** (Vol. 7, Chapter 14), the dry-year transfer would be made between TID/MID and the SFPUC. The conserved water transfer included in Measure 5.3.6-4a and the Modified WSIP Alternative differs from the dry-year transfer in that it could be made between TID/MID and the SFPUC or between another water agency and the SFPUC. From a practical standpoint, only a water agency in reasonable proximity to the TID and MID service areas could serve as the source of the conserved water transfer to the SFPUC. The Modified WSIP Alternative, incorporating Measure 5.3.6-4a with water developed through conservation only, would result in less-than-significant adverse impacts on fisheries and terrestrial biological resources in the Tuolumne River below La Grange Dam because it would have little effect on storage in Don Pedro Reservoir compared to the existing condition. Storage in Don Pedro Reservoir with the Modified WSIP Alternative would be similar to storage under the existing condition, and, consequently, releases to the river from La Grange Dam with the Modified WSIP Alternative would be similar to those under the existing condition. Under the Modified WSIP Alternative, the WSIP-caused reduction in inflow to Don Pedro Reservoir would be offset by a reduction in Don Pedro Reservoir outflow, thus maintaining storage in the reservoir at close to the existing condition. Outflow from the reservoir (i.e., water diverted to the Modesto and Turlock Canals) would be reduced through conservation in the TID and MID service areas, or in the service areas of neighboring irrigation districts. The conserved water would be transferred to the SFPUC.

If the source of the conserved water transfer were to be TID and MID, those agencies would conserve water in their service areas and transfer the conserved water directly to the SFPUC. If the source of the conserved water transfer were to be an agency other than TID and MID, the transfer would still involve TID and MID and would occur as follows. The transferring agency would reduce water use in its service area by implementing conservation measures and would transfer the conserved water to TID and MID. TID and MID would use the conserved water in their service areas, thereby reducing the need to divert water from the Tuolumne River. The reduction in diversions of Tuolumne River water by TID and MID, and the consequent reduction in outflow from Don Pedro Reservoir, would offset the reduction in inflow to the reservoir produced by the SFPUC's increased diversions from the Tuolumne River at Hetch Hetchy Reservoir. As noted in the Draft PEIR, the details of the proposed water transfers have not been developed, and no agreements have been made with MID/TID or another water agency with respect to the transfers. The proposed water transfers could themselves have environmental impacts and may need additional environmental review, as described in the Draft PEIR (Vol. 4, Chapter 6, p. 6-63) and Section 14.10.4 of this master response, once the details of such transfers are known.

A commenter on the Draft PEIR, BAWSCA, supports the conserved water transfer concept but notes that decisions regarding crop choice and irrigation water pricing are the responsibility of the irrigation districts and their members. Furthermore, BAWSCA states that it does not support the fallowing of land as a means of water conservation. The San Francisco Planning Department acknowledges the views expressed by BAWSCA. The SFPUC intends to work with TID, MID, and/or other water agencies to develop a transfer of conserved water that is acceptable to all parties to the transfer. Any conserved water transfer agreement is likely to involve the implementation of water conservation measures selected and implemented by the transferring agency and paid for by the SFPUC and the wholesale customers. BAWSCA has expressed its willingness to contribute to the cost of agricultural water conservation measures that reduce environmental impacts on the Tuolumne River.

Many experts believe that water could be used more efficiently in California's cities and agricultural areas, and that it would be if appropriate financial incentives were provided. (See the comment letter from BAWSCA dated February 21, 2008 and the attached materials authored by Professor Brent Haddad, Director of the Center for Integrated Water Research at the University of California, and Peter Gleick, President of the Pacific Institute [Vol. 8, **Appendix M**].) Even without financial incentives, farmers in California are slowly but consistently moving toward more efficient irrigation methods. For example, data from surveys conducted by the California Department of Water Resources indicate that the percentage of land in California irrigated by the more efficient methods—sprinkler and drip/micro irrigation—increased from about 20 percent in the early 1970s to 50 percent in 2000.

The adoption of more efficient irrigation methods could be accelerated through the provision of appropriate financial incentives. Currently, TID and MID divert an average of 867,000 acre-feet of water annually from the Tuolumne River at La Grange Dam. If the SFPUC and TID/MID agreed to a conserved water transfer, TID and MID would only have to increase their water use efficiency slightly to offset the effects of the Modified WSIP Alternative. With appropriate financial incentives, it is assumed that additional agricultural water conservation and improvements in water use efficiency on this scale in the service areas of TID, MID, and/or other water agencies would be feasible.

It should be noted that the Modified WSIP Alternative would lessen but not entirely eliminate the impacts of the WSIP on flow, fisheries, and terrestrial biological resources in the Tuolumne River below La Grange Dam. With the conserved water transfer, average annual releases to the river below La Grange Dam would increase slightly with the Modified WSIP Alternative compared to the existing condition, which would be marginally beneficial for fisheries and terrestrial biological resources. With the Modified WSIP Alternative, there would still be occasional delays in the late spring/early summer releases from La Grange Dam (those releases in excess of minimum requirements), but the magnitude and frequency of the delays would be much less than with the WSIP. The delays would not be completely eliminated under the Modified WSIP Alternative because the timing of changes in Don Pedro Reservoir inflow attributable to increased water demand could not be perfectly matched with the timing of changes in reservoir outflow attributable to the conserved water transfer. Nevertheless, the impacts of the occasional delays in spring releases on fisheries and terrestrial biological resources that would occur under the

Modified WSIP Alternative would be reduced to a less-than-significant level with implementation of the conserved water transfer.

The conserved water transfer that is a part of the Modified WSIP Alternative could have an indirect effect on surface and groundwater resources in the lower Tuolumne River watershed and neighboring watersheds, as noted in the Draft PEIR (Vol. 4, Chapter 6, p. 6-64). Conservation measures and measures to improve the efficiency of agricultural water use could reduce groundwater recharge and the volume of irrigation tailwater discharges to surface streams. The environmental effects of the measures would depend on their nature and location, but would be expected to be relatively minor because any reductions in groundwater recharge or tailwater discharge would be small compared to total groundwater storage capacity or river flow.

Water Conservation in Agricultural Areas Beyond that Included in the Modified WSIP Alternative

BAWSCA and some of its member agencies have proposed the implementation of additional agricultural water conservation beyond that included in the Modified WSIP Alternative. According to these proposals, the water saved would accumulate in Don Pedro Reservoir and could be used to increase flows in the Tuolumne River below La Grange Dam or could be conveyed to water users in the Bay Area via a water exchange agreement with TID and MID. The SFPUC regards any project intended to increase agricultural water conservation beyond the level needed to reduce the impacts of the WSIP to a less-than-significant level to be separate from the WSIP. If the Modified WSIP Alternative is selected as the preferred course of action, the SFPUC would work with TID, MID, or another water agency to develop the transfer of conserved water that is included in the Modified WSIP Alternative. BAWSCA could choose to pursue a separate agricultural water conservation project to augment this transfer, but if the SFPUC were to participate in the project, it would be considered a distinct action from the WSIP or any alternative/variant of the WSIP.

Increased Conservation, Water Recycling, and Local Groundwater Use by Wholesale Customers Included in the Modified WSIP Alternative

The WSIP would increase the average annual diversion of water from the Tuolumne River by 24 million gallons per day (mgd) compared to the existing condition, based on updated HH/LSM results (see **Table 14.10-3**). The Modified WSIP Alternative includes features that would both increase and decrease average annual diversions of water from the Tuolumne River compared to the WSIP, but would result in a net reduced level of Tuolumne River diversions compared to the proposed program. The components of the Modified WSIP Alternative that would increase average annual diversions include the measures to lessen the impacts of the WSIP on natural resources in the Alameda Creek and Peninsula watersheds. They include the release of water from the diversion dam on Alameda Creek to support resident trout, modified operations in the Pilarcitos Creek watershed, and restrictions on the use of storage in Crystal Springs Reservoir. Implementation of these measures would reduce the amount of water available to the regional system from the Alameda Creek and Peninsula watersheds by an annual average of 1 mgd. In order to meet its level of service goals under the Modified WSIP Alternative, the SFPUC would have to increase diversions from the Tuolumne River by an annual average of about 1 mgd compared to the WSIP to compensate for the loss of water from the local watersheds.

TABLE 14.10-3
(SIMILAR TO DRAFT PEIR TABLE 9.5)
AVERAGE ANNUAL TUOLUMNE RIVER DIVERSIONS AND DROUGHT-YEAR SHORTAGES FOR THE MODIFIED WSIP ALTERNATIVE[a]

Scenario	Estimated Tuolumne River Diversions Over the 82-Year Period of Hydrologic Record[b]		Drought-Year Shortages Based on 82-Year Period of Hydrologic Record				Drought-Year Shortages During Design Drought (8.5 years)		
	Average Annual Increase by the SFPUC (mgd)	Average Annual Diversions by the SFPUC (mgd)	Years of Shortages (10% Shortage)	Years of Shortages (20% Shortage)	Years of Shortages >20% Shortage)	No. of Years Drought-Year Supplies Triggered	Years of Shortages (10% Shortage)	Years of Shortages (20% Shortage)	Years of Shortages (25% to 30% Shortage)
Existing Conditions	N/A	221	6 out of 82 (1 in 14 years)	8 out of 82 (1 in 10 years)	None	N/A	1	5	1.5
Proposed Program (WSIP)	24	245	6 out of 82 (1 in 14 years)	2 out of 82 (1 in 41 years)	None	24	3	3.5	None
Modified WSIP Alternative, between Hetch Hetchy and Don Pedro Reservoirs	15	236	6 out of 82 (1 in 14 years)	2 out of 82 (1 in 41 years)	None	23	3	3.5	None
Modified WSIP Alternative, below La Grange Dam	0	221[c]	6 out of 82 (1 in 14 years)	2 out of 82 (1 in 41 years)	None	23	3	3.5	None

a Results from the 2008 HH/LSM analysis using updated and refined model input assumptions. The numbers are not directly comparable to those in Draft PEIR Table 9.5, which are based on the 2007 HH/LSM analysis.
b Diversion levels represent the average annual amount modeled over the 82-year historical hydrology, but do not represent year-to-year variation in diversions. Thus, even with a zero average annual increase in diversions, there would still be year-to-year variations in diversions compared to the existing condition, due primarily to modified system operations for maintenance and implementation of the conjunctive-use program.
c This represents the net effect of SFPUC diversions below La Grange Dam with conserved water transfers implemented.

The components of the Modified WSIP Alternative that would decrease average annual diversions include increased local water conservation, recycling, and groundwater use within the wholesale customer service area of 5 to 10 mgd compared to the WSIP (see Draft PEIR, Vol. 4, Chapter 9, p. 9-80). Studies completed by BAWSCA and the SFPUC indicate that opportunities exist to develop more water conservation, recycling, and groundwater projects within the wholesale customers' service areas than were reflected in the purchase request estimates for the WSIP (Vol. 4, Chapter 9, pp. 9-47 to 9-59). These projects alone would not meet the full projected wholesale customer need for additional water delivery in 2030, but they could meet more of the demand than was assumed in the Draft PEIR.

Increasing local conservation, water recycling, and groundwater use within the wholesale customer service area by 5 to 10 mgd under the Modified WSIP Alternative would decrease the SFPUC's diversion of water from the Tuolumne River by an annual average of 5 to 10 mgd compared to the WSIP. As noted above, the mitigation measures in the Alameda and Peninsula watersheds that are part of the Modified WSIP Alternative would increase the SFPUC's diversion of water from the Tuolumne River by an annual average of 1 mgd compared to the WSIP. Thus, the reduction in diversions associated with additional local conservation, water recycling, and groundwater use would more than offset the increase in diversions attributable to the mitigation measures in the Alameda and Peninsula watersheds.

Modeling performed for the Modified WSIP Alternative—assuming an additional 10 mgd of regional water conservation, recycling, and groundwater use—indicates that the SFPUC's diversion of water from the Tuolumne River at Hetch Hetchy Reservoir would be reduced by an annual average of 9 mgd compared to the WSIP. As shown in Table 14.10-3, the SFPUC's annual average diversion of water from the Tuolumne River at Hetch Hetchy Reservoir under the existing condition is 221 mgd. Annual diversions would average 245 mgd with the WSIP and 236 mgd with the Modified WSIP Alternative. Flow in the Tuolumne River below O'Shaughnessy Dam would be reduced under the Modified WSIP Alternative, but to a lesser extent than under the WSIP.

As described above, the Modified WSIP Alternative includes a transfer of conserved water, which on balance would offset the effects of the SFPUC's increased diversion of water from the Tuolumne River at Hetch Hetchy Reservoir in the reach of the river below La Grange Dam. With the Modified WSIP Alternative, annual average releases from La Grange Dam would be greater than under the WSIP and similar to those made under the existing condition. The environmental effects of the Modified WSIP Alternative on fisheries and terrestrial biological resources in the reach of the river below La Grange Dam would be much less than those of the WSIP.

BAWSCA supports additional conservation, water recycling, and groundwater use within the wholesale customer service area as part of the Modified WSIP Alternative (see Comment L_BAWSCA1-51, Vol. 6, Chapter 12, Section 12.3). In March 2008, the BAWSCA Board of Directors authorized a study of additional water conservation, recycling, and groundwater use opportunities within its service area, and in July 2008, BAWSCA released a Request for Proposals for preparation of a water conservation/recycling implementation plan. Building on the work presented in the *Investigation of Regional Water Supply Option No. 4 Technical*

Memorandum (SFPUC, 2007, Appendix D), this current effort is expected to provide more detailed information about specific near-term projects that BAWSCA and its member agencies can pursue to develop additional local supplies and/or offset demand with conservation and/or water recycling.

14.10.4 Modified WSIP Alternative – Additional Information on Environmental Impacts

Comment Summary

This section of this master response responds to all or part of the following comments:

S_CDFG2-06	L_BAWSCA6-02	L_Stanford-01
S_CDFG2-07	L_BAWSCA6-03	L_TUD1-04
S_CSA-02	L_DalyCty-22	L_Zone7-02
S_CSA-04	L_Hillsb-04	SI_EnvDef-17
L_BAWSCA1-46	L_Millbr-03	SI_PacInst-22
L_BAWSCA1-47	L_PaloAlto-05	SI_PacInst-83
L_BAWSCA1-49	L_Snnyvl-10	SI_SPUR-03

Summary of Issues Raised by Commenters

- The PEIR should further analyze the Modified WSIP Alternative.
- The PEIR should more fully explore the environmentally superior alternative.

Response

The Draft PEIR includes a qualitative/comparative assessment of the environmental impacts of the Modified WSIP Alternative compared to those of the WSIP (Vol. 4, Chapter 9, pp. 9-82 to 9-84). Since publication of the Draft PEIR, the SFPUC has conducted a review of the Modified WSIP Alternative and has refined the assumptions for measures included in it, as described above in Sections 14.10.2 and 14.10.3. This section provides further discussion and analysis of the environmental impacts of the Modified WSIP Alternative, including the results of additional HH/LSM modeling. The impacts of this alternative on resources in the Tuolumne River, Alameda Creek, and Peninsula watersheds are summarized in **Tables 14.10-4**, **14.10-5,** and **14.10-6**; the tables include only those impacts that were determined to be significant or potentially significant under the WSIP, and present a comparison of those impacts between the WSIP and the Modified WSIP Alternative. The impacts of the Modified WSIP Alternative are discussed below under three categories: facility impacts, supply and system operations impacts, and growth-inducement impacts.

Facility Impacts

The environmental impacts of the facility improvement projects proposed under the Modified WSIP Alternative would be the same as those of the WSIP, as described in the Draft PEIR (Vol. 2, Chapter 4), and the same mitigation measures identified for the WSIP's impacts would also apply

TABLE 14.10-4
SUMMARY OF SIGNIFICANT WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR THE WSIP AND MODIFIED WSIP ALTERNATIVE
TUOLUMNE RIVER WATERSHED

Impact	Impact Description	Proposed Program	Modified WSIP Alternative
Section 5.3.6, Fisheries			
Impact 5.3.6-4: Effects on fishery resources along the Tuolumne River below La Grange Dam.			
	In wet or above-normal years when Don Pedro Reservoir is being filled, changes in the timing and duration of releases from the reservoir would decrease average monthly flows along the lower Tuolumne River beneath La Grange Dam. The greatest average flow reductions would occur during June and could result in elevated water temperatures. Changes in stream flow and water temperature would result in a reduction in the linear extent of suitable habitat for rearing Chinook salmon and oversummering steelhead/rainbow trout, potentially causing adverse affects on these fish populations in the lower Tuolumne River.	PSM	Similar to but much less than proposed program (LS) due to conserved water transfer
Section 5.3.7, Terrestrial Biological Resources			
Impact 5.3.7-2: Impacts on meadow/alluvial features along the Tuolumne River below O'Shaughnessy Dam.			
▪ Sensitive habitats	Delayed snowmelt releases, reductions in flow, and the resulting reduction in groundwater recharge would result in an incremental reduction in the extent and diversity of wetland and riparian habitats, including sensitive wetland and riparian habitats in the Poopenaut Valley.	PSM	Similar to but slightly less than proposed program (PSM)
▪ Key special-status species	A reduction in wetland and riparian habitat would reduce suitable breeding habitat for key special-status species potentially occurring along this reach (e.g., foothill yellow-legged frog, California red-legged frog, and willow flycatcher), the populations of which are already critically reduced in the Sierra Nevada.	PSM	Similar to but slightly less than proposed program (PSM)
▪ Other species of concern	A reduction in the extent and diversity of wetland and riparian habitats would reduce habitat quality and extent for animal and plant species of concern.	PSM	Similar to but slightly less than proposed program (PSM)
▪ Common habitats and species	All habitats affected by the WSIP are considered sensitive. The WSIP could affect a large number of common animal species that depend on sensitive meadows and larger riparian areas for food and cover.	PSM	Similar to but slightly less than proposed program (PSM)
Impact 5.3.7-6: Impacts on biological resources along the Tuolumne River below La Grange Dam.			
▪ Sensitive habitats	Delayed spring releases and reductions in average and total flow (particularly during and following an extended drought) below La Grange Dam would reduce or eliminate suitable conditions for the recruitment of some riparian species along the river.	PSM	Similar to but much less than proposed program (LS) due to conserved water transfer

TABLE 14.10-4 (Continued)
SUMMARY OF SIGNIFICANT WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR THE WSIP AND MODIFIED WSIP ALTERNATIVE
TUOLUMNE RIVER WATERSHED

Impact	Impact Description	Proposed Program	Modified WSIP Alternative
Section 5.3.7, Terrestrial Biological Resources (cont.)			
▪ Key special-status species	Because of the known presence of key special-status species and the very limited amount of remaining suitable habitat along this reach of the Tuolumne River, this incremental impact would be potentially significant.	PSM	Similar to but much less than proposed program (LS) due to conserved water transfer
▪ Other species of concern	Species of concern that would be adversely affected by changes in the extent and quality of suitable riparian habitat include western pond turtle, several bat species, and a wide variety of riparian- and marsh-associated bird species.	PSM	Similar to but much less than proposed program (LS) due to conserved water transfer
▪ Common habitats and species	The populations of common species that depend on riparian habitat could be adversely affected by the alteration of habitat.	PSM	Similar to but much less than proposed program (LS) due to conserved water transfer

LS = Less than Significant, no mitigation required
SM or PSM = Significant or Potentially Significant, can be Mitigated to less than significant
SU or PSU = Significant Unavoidable or Potentially Significant Unavoidable, cannot be mitigated to less than significant

TABLE 14.10-5
SUMMARY OF SIGNIFICANT WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR THE WSIP AND MODIFIED WSIP ALTERNATIVE
ALAMEDA CREEK WATERSHED

Impact	Impact Description	WSIP	Modified WSIP Alternative
Section 5.4.1, Stream Flow and Reservoir Water Levels			
Impact 5.4.1-2: Effects on flow along Alameda Creek below the diversion dam.			
	In all year types, system operations under the WSIP would increase diversions from Alameda Creek to Calaveras Reservoir between the months of December and May, nearly eliminating low and moderate (1 to 650 cubic feet per second) flows in Alameda Creek downstream of the diversion dam and substantially reducing many higher (greater than 650 cubic feet per second) flows that have occurred since 2002. The resultant reduction in stream flows and alteration of the stream hydrograph is considered an adverse effect.	SU	Similar to proposed program (SU)
Section 5.4.5, Fisheries			
Impact 5.4.5-3: Effects on fishery resources.			
	Following implementation of the Calaveras Dam Replacement project (SV-2), operation of Calaveras Reservoir and the Alameda Creek Diversion Dam would be restored to pre-2002 conditions. A substantial increase in diversions from Alameda Creek to Calaveras Reservoir would reduce flows in this stretch of the creek, despite proposed bypass flows at the diversion dam. Diversion of most or all flows during late winter and spring months would reduce the ability of resident rainbow trout to spawn and for eggs to incubate; additional monitoring would be needed to determine the effectiveness of proposed bypass flows. In addition, the increased diversion of flows to the reservoir would divert fish from Alameda Creek to the reservoir, prevent fish passage to downstream reaches of the creek, and increase the potential for fish entrainment since there are currently no screens on the diversion.	PSM	Much less than proposed program (LS) due to bypass flows for resident trout from Alameda Creek Diversion Dam
Section 5.4.6, Terrestrial Biological Resources			
Impact 5.4.6-1: Impacts on riparian habitat and related biological resources in Calaveras Reservoir.			
▪ Sensitive habitats	Increased reservoir storage elevations would result in inundation and permanent loss of seasonal wetlands, seeps, perennial freshwater marsh, and riparian habitat that have established since 2002.	PSM	Same as proposed program (PSM)
▪ Key special-status species	Since 2002, foothill yellow-legged frogs have occupied approximately 10,000 linear feet of stream channel along Arroyo Hondo between the maximum reservoir elevation mandated by the Division of Safety of Dams and the spillway elevation. Higher maintained reservoir levels would reduce the length of this high-quality habitat along the creek and adversely affect existing populations of foothill yellow-legged frog.	PSM	Same as proposed program (PSM)
Impact 5.4.6-2: Effects on riparian habitat and related biological resources along Alameda Creek from below the diversion dam to the confluence with Calaveras Creek.			
▪ Key special-status species	A reduction in the frequency, duration, and magnitude of flows below the diversion dam would reduce the total available aquatic breeding habitat and food sources for California red-legged frog and foothill yellow-legged frog populations that currently occupy this reach of Alameda Creek.	PSM	Much less than proposed program (LS) due to bypass flows for resident trout from Alameda Creek Diversion Dam

TABLE 14.10-5 (Continued)
SUMMARY OF SIGNIFICANT WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR THE WSIP AND MODIFIED WSIP ALTERNATIVE
ALAMEDA CREEK WATERSHED

Impact	Impact Description	WSIP	Modified WSIP Alternative
Section 5.4.6, Terrestrial Biological Resources (cont.)			
Impact 5.4.6-3: Effects on riparian habitat and related biological resources along Calaveras Creek from Calaveras Reservoir to the confluence with Alameda Creek.			
▪ Key special-status species	Future outlet works at Calaveras Dam would have the capacity to make higher volume releases than under existing conditions. Depending on the timing and volume of operational releases, they could adversely affect the reproductive success of special-status amphibian species along this reach (e.g., California red-legged frog and foothill yellow-legged frog).	PSM	Similar to proposed program (PSM)
Impact 5.4.6-4: Effects on riparian habitat and related biological resources along Alameda Creek from Calaveras Creek to San Antonio Creek.			
▪ Key special-status species	Depending on annual rainfall and localized site conditions along this creek segment, changes in winter and summer flows along this reach could result in both beneficial and adverse impacts on habitat for California red-legged frog and foothill yellow-legged frog populations.	PSM	Similar to proposed program (PSM)
Section 5.4.7, Recreational and Visual Resources			
Impact 5.4.7-1: Effects on recreation.			
	Operations under the WSIP would substantially reduce flows along Alameda Creek in the Sunol Regional Wilderness during winter and early spring months and adversely affect the recreational experience for hikers. *(Note: The Draft PEIR determined this impact to be PSM, but due to the change in the project description of the Calaveras Dam Replacement project (SV-2), this impact determination is revised to LS.)*	LS	Same as proposed program (LS)
Impact 5.4.7-2: Visual effects.			
	WSIP-induced reductions in stream flows along Alameda Creek would substantially change the quality of visual resources in the Sunol Regional Wilderness. *(Note: The Draft PEIR determined this impact to be PSM, but due to the change in the project description of the Calaveras Dam Replacement project (SV-2), this impact determination is revised to LS.)*	LS	Same as proposed program (LS)

LS = Less than Significant, no mitigation required
SM or PSM = Significant or Potentially Significant, can be Mitigated to less than significant
SU or PSU = Significant Unavoidable or Potentially Significant Unavoidable, cannot be mitigated to less than significant

TABLE 14.10-6
SUMMARY OF SIGNIFICANT WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR THE WSIP AND MODIFIED WSIP ALTERNATIVE
PENINSULA WATERSHED

Impact	Impact Description	WSIP	Modified WSIP Alternative
Section 5.5.3, Surface Water Quality			
Impact 5.5.3-2: Water quality in Pilarcitos Reservoir and along Pilarcitos Creek.			
	Proposed operations would generally be within the same range as existing conditions, although replacement Measure 5.5.3-2a would cause Pilarcitos Reservoir to be drawn down earlier in the summer compared to existing conditions. Water temperature could increase and dissolved oxygen could be reduced. *(Note: The Draft PEIR determined this impact to be PSM, and with the refined impact analysis for the Pilarcitos Creek watershed, implementation of a replacement mitigation measure would result in this impact determination remaining PSM.)*	PSM	Effects offset by aeration system (LS)
	During dry years, summertime releases from Pilarcitos Reservoir to Pilarcitos Creek would be reduced to reservoir inflow at an earlier date than they are under the existing condition. This would increase the temperature of instream flows between Pilarcitos Creek and Stone Dam and reduce the creek's ability to support designated cold freshwater habitat along this reach.	PSM	Similar to existing condition (LS) due to releases from low-head pump station
	During wet and above-normal years, the volume of spills over Stone Dam would be reduced compared to the existing condition.	LS	Similar to proposed program (LS)
Section 5.5.5, Fisheries			
Impact 5.5.5-1: Effects on fishery resources in Crystal Springs Reservoir.			
	Elevated water levels in Crystal Springs Reservoir would inundate approximately 1,500 linear feet of trout spawning habitat upstream of the reservoir along Laguna and San Mateo Creeks.	PSU	Similar to but less than proposed program (PSU)
Impact 5.5.5-4: Effects on fisheries resources in Pilarcitos Reservoir.			
	Proposed operations would be within the same range as existing conditions, although replacement Measure 5.5.3-2a would cause Pilarcitos Reservoir to be drawn down earlier in the summer compared to existing conditions. This would reduce the volume and quality of coldwater habitat available for resident fish species. *(Note: The Draft PEIR determined this impact to be PSM, and with the refined impact analysis for the Pilarcitos Creek watershed, implementation of a replacement mitigation measure would result in this impact determination remaining PSM.)*	PSM	Effects offset by aeration system (LS)
Impact 5.5.5-5: Effects on fisheries resources along Pilarcitos Creek below Pilarcitos Reservoir.			
	Under the WSIP, the extended period of no or very little flow in Pilarcitos Creek below Pilarcitos Reservoir during summer months of dry years would result in significant impacts on resident trout, other resident fish species and aquatic resources, and habitat quality and availability for anadromous steelhead. Increased drawdown of Pilarcitos Reservoir would increase the temperature of releases in summer and fall and reduce the quality and availability of habitat for coldwater fish species.	PSM	Similar to existing condition (LS) due to releases from low-head pump station
	A reduction in the frequency and magnitude of spills over Stone Dam would reduce flows along the lower reach. Reduced instream flows during winter months would adversely affect migratory fish habitat.	PSM	Similar to proposed program (PSM)

TABLE 14.10-6 (Continued)
SUMMARY OF SIGNIFICANT WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR THE WSIP AND MODIFIED WSIP ALTERNATIVE
PENINSULA WATERSHED

Impact	Impact Description	WSIP	Modified WSIP Alternative
Section 5.5.6, Terrestrial Biological Resources			
Impact 5.5.6-1: Impacts on biological resources in Upper and Lower Crystal Springs Reservoirs.			
▪ Sensitive Habitats	Implementation of the Lower Crystal Springs Dam Improvements project (PN-4) would raise average monthly water levels in Crystal Springs Reservoir and result in a short-term reduction in the overall extent of freshwater marsh as the reservoir fills. Proposed changes in operations would maintain maximum reservoir levels during summer for longer periods than under existing conditions, which could affect the composition and structure of riparian habitats. In addition, sensitive upland habitats that are unable to tolerate these longer periods of inundation would be lost.	PSM	Similar to but less than proposed program (PSM)
▪ Key special-status species	Elevated reservoir levels would inundate existing populations of special-status plant species, including serpentine-associated fountain thistle and Marin western flax, and their habitat could be permanently lost. The extent of available habitat for San Francisco garter snake and California red-legged frog would be temporarily reduced during reservoir refill, but wetland habitat that would establish at higher elevations could be more extensive. Raised reservoir levels would provide greater opportunities for largemouth bass and other predators to access frogs and snakes. Periodic drawdown during planned maintenance could adversely affect San Francisco garter snake foraging habitat.	PSM	Similar to but less than proposed program (PSM)
▪ Other species of concern	Changes in wetland habitat due to reservoir refill and proposed operations would adversely affect reptile and bird species of concern, particularly if permanent changes in the composition of wetland vegetation occur. Permanent loss of upland habitat, including upland trees, grassland, and coastal scrub, would result in significant impacts on several bird and mammal species of concern. Serpentine- and grassland-associated plant species unable to tolerate extended periods of inundation would be lost.	PSM	Similar to but less than proposed program (PSM)
▪ Common Habitats and species	Due to the extent of area involved, impacts on common habitats and species would be significant.	PSM	Similar to but less than proposed program (PSM)
Impact 5.5.6-4: Impacts on biological resources in Pilarcitos Reservoir.			
▪ Key special-status species	Proposed operations would be within the same range as existing conditions, although replacement Measure 5.5.3-2a would cause Pilarcitos Reservoir to be drawn down earlier in the summer compared to existing conditions. This would affect the extent of suitable habitat for California red-legged frog and San Francisco garter snake. Special-status species that utilize adjacent upland vegetation would not be affected. *(Note: The Draft PEIR determined this impact to be PSM, and with the refined impact analysis for the Pilarcitos Creek watershed, implementation of a replacement mitigation measure would result in this impact determination remaining PSM.)*	PSM	Effects offset by monitoring and compensation program (LS)
Impact 5.5.6-5: Impacts on biological resources along Pilarcitos Creek.			
▪ Sensitive habitats	In summer months of dry years, an extended period of no or little flow in Pilarcitos Creek between Pilarcitos Reservoir and Stone Dam could stress riparian vegetation, but existing vegetation appears to be adapted to periods of dryness. *(Note: The Draft PEIR determined this impact to be PSM, but due to the refined impact analysis for the Pilarcitos Creek watershed, this impact determination is revised to LS.)*	LS	Similar to existing condition (LS)

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SM or PSM = Significant or Potentially Significant, can be Mitigated to less than significant
SU or PSU = Significant Unavoidable or Potentially Significant Unavoidable, cannot be mitigated to less than significant

to the Modified WSIP Alternative. However, the Modified WSIP Alternative would include some additional facilities that could have environmental impacts in addition to those identified for the WSIP, as shown in Table 14.10-1, above. New or modified water management facilities in the service areas of TID, MID, or another water agency would likely be needed to enable the conserved water transfer that is part of the Modified WSIP Alternative. New or modified facilities might include sprinkler and drip irrigation systems, tailwater recycling systems, and lined canals. Under the Modified WSIP Alternative, the increased conservation, water recycling, and groundwater use in the wholesale customer service area could require the construction of new facilities such as wastewater reclamation plants and groundwater wells and associated pipelines and transmission facilities (Vol. 4, Chapter 9, pp. 9-35 and 9-93). These facilities would be subject to separate CEQA review; however, in general, it is expected that these facilities would be constructed in previously disturbed areas (within either agricultural or urban lands) and that all construction and operational impacts could be mitigated to a less-than-significant level.

Supply and System Operations Impacts

After publication of the Draft PEIR, the SFPUC conducted updated and refined water supply modeling using the HH/LSM, and quantitative data became available to allow a more detailed analysis of the potential impacts of the Modified WSIP Alternative than the qualitative assessment presented in the Draft PEIR. As described in Section 13.3 (Vol. 7, Chapter 13), the updated HH/LSM results included refinements in the input assumptions, so data from the updated analyses are not always directly comparable to the HH/LSM results presented in the Draft PEIR. However, the updated model results enable a direct comparison of the effects of the WSIP and the Modified WSIP Alternative to those under the existing condition. **Appendix O** (Vol. 8) provides supporting information on the updated HH/LSM assumptions and results for the WSIP and Modified WSIP Alternative.

Tuolumne Watershed Impacts

As shown in Table 14.10-3, diversions from the Tuolumne River at Hetch Hetchy Reservoir under the Modified WSIP Alternative would increase by an annual average of 15 mgd compared to the existing condition. This amount is 9 mgd less than would occur with the WSIP. The reduction in flow in the upper Tuolumne River below Hetch Hetchy Reservoir as a result of increased diversions by the SFPUC would manifest itself as a delay in the spring releases from Hetch Hetchy Reservoir. As described in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.3.7-21 and 5.3.7-22), the delay in the spring releases from Hetch Hetchy Reservoir attributable to the WSIP would have a significant adverse impact on terrestrial biological resources in the streamside meadows and riparian corridor downstream of O'Shaughnessy Dam. Although the delay would be less with the Modified WSIP Alternative than with the WSIP, it would still have a potentially significant adverse effect on terrestrial biological resources in the Poopenaut Valley downstream of the dam; the same mitigation measure, Measure 5.3.7-2, Controlled Releases to Recharge Groundwater in Streamside Meadows, would reduce this impact to a less-than-significant level.

As described in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.3.1-21 to 5.3.1-37), the SFPUC's increased diversions of water from the Tuolumne River would result in a decrease in flow in the river below

La Grange Dam. Again, the decrease would manifest itself as a delay in the late spring/early summer releases from La Grange Dam, together with a reduction in episodic releases from the dam in the fall and winter. As described in Sections 5.3.3, 5.3.6, and 5.3.7 of the Draft PEIR (Vol. 3, Chapter 5), increased water temperature, the delay in late spring/early summer releases, and the reduction in average flow attributable to the WSIP would have a significant adverse impact on fisheries and terrestrial biological resources in the Tuolumne River downstream of La Grange Dam. However, the Modified WSIP Alternative includes a transfer of conserved water from TID, MID, or another water agency (as described in Section 14.10.2, above) that would offset the effects of the SFPUC's increased diversions of water from the Tuolumne River. As a result, the Modified WSIP Alternative would have a less-than-significant impact on fisheries and terrestrial biological resources in the Tuolumne River below La Grange Dam.

The conserved water transfer that is a part of the Modified WSIP Alternative could result in impacts on local groundwater or surface water resources, but conservation projects typically have minor environmental impacts with some tradeoffs in environmental effects. However, those impacts cannot be fully assessed until the characteristics of the projects needed to enable the conserved water transfer are defined. If an agreement for the conserved water transfer were to be made between TID/MID and the SFPUC, additional project-level CEQA review may not be required. The transferring agencies, TID and MID, would serve as the responsible agencies for CEQA compliance and could use the PEIR to make their own findings, as required by CEQA Guidelines Section 15096. If it became apparent that the projects needed to enable the conserved water transfer could have environmental impacts that were not described and analyzed in the Draft PEIR, then additional CEQA review would likely be required. TID and/or MID would be the lead agency for the subsequent, project-specific CEQA review.

If the agreement for a conserved water transfer were to be made between another water agency and the SFPUC, it is expected that the impacts on the Tuolumne River would be less than those described in the Draft PEIR, although impacts could occur in neighboring watersheds. In this case, either the SFPUC or the transferring agency would serve as lead agency for CEQA compliance, and impacts on neighboring watersheds would be evaluated in a project-level CEQA document prior to any discretionary action required for the transfer. Whether the PEIR could be used to provide general background information would be determined at that time and in light of contemporaneous facts and circumstances.

Alameda Watershed Impacts

With the exception of the reach of Alameda Creek between the diversion dam and the confluence with Calavaras Creek, the impacts of the Modified WSIP Alternative in the Alameda Creek watershed would be essentially the same as those of the WSIP, as described in the Draft PEIR (Vol. 3, Chapter 5, Section 5.4). Under the Modified WSIP Alternative, the only difference in system operations in the Alameda Creek watershed would be the incorporation of Mitigation Measure 5.4.5-3a, Minimum Flows for Resident Trout on Alameda Creek (as revised due to changes in the project description of the Calaveras Dam Replacement project [SV-2], Vol. 7, Chapter 13, Section 13.2); this measure requires a monitoring program and site-specific studies to determine if proposed bypass flows would be adequate to support trout spawning and egg incubation, as well as an operations plan that would ensure the bypass flows are adapted as needed based on monitoring results and best available scientific information. For both the WSIP and the Modified WSIP Alternative, incorporation of this measure would reduce potentially significant impacts on fishery and biological resources (key special-status species) along Alameda Creek below the diversion dam (Impacts 5.4.5-3 and 5.4.6-2, respectively, Vol. 3, Chapter 5, pp. 5.4.5-18 to 5.4.5-20 and 5.4.6-18 to 5.4.6-19) to a less-than-significant level.

The impact on flow along Alameda Creek below the diversion would be similar for the Modified WSIP Alternative and the WSIP, and for both would be significant and unavoidable. Other potentially significant impacts on biological resources identified in the Draft PEIR for the WSIP (Impacts 5.4.6-1, 5.4.6-3, and 5.4.6-4 [Vol. 3, Chapter 5, pp. 5.4.6-14 to 5.4.6-23] related to biological resources in Calaveras Reservoir, Calaveras Creek, and Alameda Creek between Calaveras and San Antonio Creeks, respectively) would be the same for the Modified WSIP Alternative, and implementation of Draft PEIR Measure 5.4.6-1, Compensation for Impacts on Terrestrial Biological Resources, and Measure 5.4.6-3, Operational Procedures for Calaveras Dam Releases (Vol. 4, Chapter 6, pp. 6-54 and 6-55) would reduce these impacts to a less-than-significant level.

Peninsula Watershed Impacts

Crystal Springs Reservoir. As described above in Section 14.10.2, the Modified WSIP Alternative would alter the proposed operations of Crystal Springs Reservoir compared to the proposed operations under the WSIP. The Modified WSIP Alternative would impose a maximum water surface elevation for most of the year that is 4 feet lower than the maximum elevation under the WSIP, thus reducing the area of inundation and reducing the magnitude of impacts on habitat and related biological resources around the periphery of the reservoir. However, the operating assumptions for the Modified WSIP Alternative would not eliminate the impacts on biological resources, and the potentially significant impact identified in the Draft PEIR (Impact 5.5.6-1, Vol. 3, Chapter 5, pp. 5.5.6-14 to 5.5.6-17) would also be potentially significant under the Modified WSIP Alternative. Implementation of Measure 5.5.6-1a, Adaptive Management of Freshwater Marsh and Wetlands at Upper and Lower Crystal Springs Reservoir, and Measure 5.5.6-1b, Compensation for Impacts on Terrestrial Biological Resources, would still be required, though to lesser degree, to reduce this impact to a less-than-significant level.

Similarly, the Draft PEIR identified a potentially significant, unavoidable impact on fishery resources in Crystal Springs Reservoir (Impact 5.5.5-1, Vol. 3, Chapter 5, pp. 5.5.5-6 and 5.5.5-7) due to elevated water levels, which would inundate trout spawning habitat upstream of the reservoir along Laguna and San Mateo Creeks. While the Modified WSIP Alternative would reduce the maximum water surface elevation in the reservoir and reduce the magnitude of the impact compared to the WSIP, this impact would remain potentially significant and unavoidable.

These impacts will be evaluated in detail at a project-level as part of the environmental review of the Lower Crystal Springs Dam Improvements project (PN-4).

Pilarcitos Watershed. The WSIP would result in significant adverse effects on water quality, fisheries, and terrestrial biological resources in the Pilarcitos Creek watershed, as described in

Sections 5.5.3, 5.5.5, and 5.5.6 of the Draft PEIR (Vol. 3, Chapter 5), and recommended mitigation measures would reduce all impacts to a less-than-significant level. As described above in Section 14.10.3, the Modified WSIP Alternative would incorporate Measure 5.5.3-2a, Low-Head Pumping Station at Pilarcitos Reservoir; Measure 5.5.3-2b, Aeration System at Pilarcitos Reservoir; Measure 5.5.3-2c, Habitat Monitoring and Compensation; and Measure 5.5.5-5, Establish Flow Criteria, Monitor and Augment Flow. Thus, the impacts of the Modified WSIP Alternative in the Pilarcitos Creek watershed would be the same as those of the WSIP after the inclusion of the mitigation measures.

Growth-Inducement Impacts

The growth-inducement impacts of the Modified WSIP Alternative would be the same as those of the WSIP.

Environmentally Superior Alternative

As described in the Draft PEIR (Vol. 4, Chapter 9, pp. 9-95 and 9-96), the Modified WSIP Alternative is considered the environmentally superior alternative. This conclusion is further supported by the detailed analysis presented above. The Modified WSIP Alternative would reduce key impacts of the WSIP on natural resources along the lower Tuolumne River, along Alameda Creek below the diversion dam, at Pilarcitos Reservoir and along Pilarcitos Creek, and in Crystal Springs Reservoir. Importantly, it would also achieve the WSIP's goals and level of service objectives.

As stated above, compared to the proposed program, the Modified WSIP Alternative could result in additional facilities-related impacts associated with increased conservation, water recycling, and local groundwater projects, including conservation projects within agricultural areas. However, while the construction of new facilities would cause temporary disruption and related environmental impacts, the long-term implementation of these conservation, water recycling, and local groundwater projects would substantially reduce long-term impacts on the Tuolumne River. The impacts associated with these projects would occur in previously disturbed areas in either agricultural or urban use, and could likely be mitigated with standard mitigation measures.

Depending on the extent to which increased conservation, water recycling, and local groundwater projects could be implemented in the wholesale customers' service areas, the SFPUC's need to divert water from the Tuolumne River would be reduced. The Modified WSIP Alternative includes 5 to 10 mgd of regional conservation, water recycling, and local groundwater projects in the wholesale customers' service areas. Assuming that projects resulting in 10 mgd are implemented by 2030, the SFPUC's diversion of water from the Tuolumne River at Hetch Hetchy Reservoir would be reduced by an annual average of 9 mgd compared to the WSIP. In addition, by implementing a transfer of conserved water under the Modified WSIP Alternative, the SFPUC would be able to offset the WSIP's increased diversions from the upper reaches of Tuolumne River such that the average annual releases below La Grange Dam would be similar to those under existing conditions.

14.11 Master Response on Climate Change

14.11.1 Introduction

Overview

This master response addresses issues raised by commenters concerning the discussion on climate change and global warming presented in the Draft PEIR. Commenters primarily raised questions about how the PEIR addresses the effects of climate change on the SFPUC's water supply sources and how those effects would combine with WSIP-related impacts; some commenters also referred to the WSIP's potential to increase greenhouse gas emissions and contribute to global climate change. This master response is organized by the following subtopics:

14.11.2 Update of Climate Change Studies on Water Resources in California and Climate Change Regulatory Framework

14.11.3 Review of Water Agencies' Water Supply Management Approach to Climate Change

14.11.4 Climate Change and the SFPUC Regional Water System

14.11.5 SFPUC's Actions to Address Climate Change

Commenters

Comments on climate change/global warming were received from the following entities:

Federal Agencies

- National Park Service, Yosemite National Park – F_NPS-YOS

State Agencies

- Regional Water Quality Control Board, San Francisco Bay Region – S_RWQCBSF

Local/Regional Agencies

- Alameda County Flood Control and Water Conservation District – L_ACFCWD
- Modesto Irrigation District and Turlock Irrigation District – L_MID-TID
- Tuolumne County – L_Tuol1

Groups

- Acterra – SI_ACT
- Citizens Advisory Committee to PUC – SI_CAC1, SI_CAC2
- California Native Plant Society, East Bay Chapter – SI_CNPS-EB1
- Center for Resource Solutions – SI_CRS
- Clean Water Action – SI_CWA2
- Greenpeace – SI_GreenP
- Pacific Institute – SI_PacInst

- Sierra Club – SI_SierraC2, SI_SierraC3, SI_SierraC7
- San Francisco Planning and Urban Research Association – SI_SPUR
- Tuolumne River Trust – SI_TRT7, SI_TRT8
- Tuolumne River Trust/Clean Water Action/Sierra Club, San Francisco Bay Chapter – SI_TRT-CWA-SierraC

Citizens

- Bail, Christopher – C_Bail
- Chodeu, Bernie – C_Chode
- Clark, Ann – C_Clark1, C_Clark2
- Collin, Robert – C_Colli
- Garbarino, Caroline – C_Garba
- Gelman, Robert – C_Gelma
- Genovese, Marylyn – C_Genov-02
- Greene, David – C_GreenD
- Hasson, Tomer – C_Hasso
- Kaliner-MacKellen, Gwynn – C_Kalin
- Lee, Aldora – C_Lee
- Martin, Michael – C_MartiM-01
- Materman, Len – C_Mater
- Mijac, Ivo – C_Mijac
- Owen, Ellie – C_Owen
- Raffaeli, Paul – C_Raffa
- Steinhart, Peter – C_Stein
- Sugars, Marc – C_Sugar
- Tubman, Marianna – C_Tubma
- Walker, Patricia – C_Walke
- Williams, Doris – C_Willi

PEIR Section Reference

The Draft PEIR (Vol. 2, Chapter 4, Section 4.9, pp. 4.9-14 to 4.9-20 and pp. 4.9-42 to 4.9-47) addresses the potential impacts of the WSIP facility improvement projects relative to greenhouse gas (GHG) emissions and presents a program-level analysis of GHG emissions. This information is also discussed in the following sections: Vol. 1, Summary, Section S.3, pp. S-28 and S-63; and Vol. 1, Chapter 3, Section 3.10, p. 3-82. The analysis concluded that construction and operation of the facility improvement projects would not conflict with the state's goal of reducing GHG emissions to 1990 levels by 2020 because WSIP-related GHG emissions would not result in a substantial contribution to a global climate change. This determination was based on the ongoing implementation of GHG reduction actions by the City and County of San Francisco (CCSF) and the SFPUC and additional GHG reduction actions that the SFPUC would implement as part of the WSIP (see the Draft PEIR, Vol. 1, Chapter 3, p. 3-82). Furthermore, implementation of mitigation measures related to exhaust controls, criteria pollutant emissions, waste reduction, and energy efficiency would further reduce GHG emissions associated with construction and operation of the facility improvement projects.

The Draft PEIR (Vol. 4, Chapter 7, pp. 7-60, 7-61, and 7-76) addresses the potential impacts of the WSIP-related growth inducement, which could indirectly result in increases in GHG emissions. No comments were received regarding the adequacy of the GHG emissions analysis in Draft PEIR Chapters 4 and 7, and commenters did not identify any other significant issues related to GHG emissions associated with facility construction and operations. Therefore, this master response does not provide any further discussion of WSIP-generated GHG emissions beyond that provided in Chapters 4 and 7.

The Draft PEIR addresses the potential effects of global climate change on the SFPUC's water resources in the following location: Vol. 3, Chapter 5, Section 5.7.6, pp. 5.7-92 to 5.7-96.

Comments received on the Draft PEIR related to climate change were focused almost exclusively on issues addressed in Chapter 5 of the Draft PEIR; therefore, this master response provides further discussion to update and augment the analysis of climate change issues presented in Chapter 5.

14.11.2 Update of Climate Change Studies on Water Resources in California and Climate Change Regulatory Framework

Comment Summary

This section of this master response responds to all or part of the following comments:

F_NPS-YOS-01	SI_PacInst-18	SI_TRTCWA-SierraC-78
S_RWQCBSF-16	SI_SierraC2-03	SI_TRTCWA-SierraC-130
L_ACFCWCD-05	SI_SierraC3-03	SI_TRTCWA-SierraC-133
L_MID-TID1-11	SI_SierraC7-06	SI_TRTCWA-SierraC-135
L_MID-TID1-26	SI_SPUR-04	SI_TRTCWA-SierraC-159
SI_ACT-04	SI_SPUR-05	SI_TRTCWA-SierraC-168
SI_ACT-05	SI_TRT8-06	C_Gelma-02
SI_CAC2-04	SI_TRTCWA-SierraC-20	C_Hasso-04
SI_CNPS-EB1-06	SI_TRTCWA-SierraC-22	C_Lee-04
SI_CRS-04	SI_TRTCWA-SierraC-34	C_Mater-01
SI_CWA-01	SI_TRTCWA-SierraC-70	C_Owen-01
SI_GreenP-04	SI_TRTCWA-SierraC-77	C_Unreadable1-01

Summary of Issues Raised by Commenters

- The PEIR lacks up-to-date research.
- The California Department of Water Resources (DWR) has made predictions related to climate change effects on state water resources that should be included in the impact analysis.
- Projections by the Intergovernmental Panel on Climate Change (IPCC) should be addressed.
- The PEIR only addresses one of many possible patterns of global climate change.
- The PEIR does not consider climate science in the impact analysis.
- The PEIR impact analysis does not consider that studies indicate global warming will reduce the Sierra snowpack by 5 percent by 2030 and 33 percent by 2060.

Response

Climate Change Literature Review

The following review of climate change literature relevant to the WSIP and the Draft PEIR was prepared by CH2M HILL (2007) and the SFPUC (2008) to augment and update the annotated bibliography presented in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.7-93 and 5.7-94). The literature review focuses on information related to climate change effects on California water supplies and water management, including many of the references cited in comments received on the Draft PEIR. The key findings of this literature review are briefly summarized below, followed by an annotated review of relevant climate change science and policy/guidance literature in Tables 14.11-1 and 14.11-2. The findings from this literature review are then used in Section 14.11.4, below, to assess the effects of climate change on the impact analysis of water resources presented in the Draft PEIR.

Summary of Literature Review

In California and throughout the West the signs of climate change are evident. During the last 50 years, trends have shown a slight increase in winter and spring temperatures, snow levels in the Sierra Nevada mountains have moved to a higher average elevation, and snowmelt has been occurring earlier in the season. Observed temperature increases in California are higher than the global average. The causes of these recent climate changes are complex and are in part due to the levels of GHG emissions throughout the globe. Climate scientists are studying possible future conditions under a range of future GHG emissions. Under all future emission scenarios, the level of warming is expected to increase and would significantly accelerate under higher emission scenarios. Temperature increases in the range of 1.7 to 5.8 degrees Celsius (°C) are possible by 2100 with a mid-range estimate of 3.1 to 4.3 °C. However, despite the general consensus on future warming for California (and the globe), the scientific studies show no clearly discernible trend in precipitation changes in California over the next century. There is a wide range of differences in model projections for precipitation changes due to global warming, with some models projecting increases in precipitation and others predicting no increase or decreases over the century; still other studies indicate that even with no change in annual precipitation, the number of days with precipitation could decline, resulting in more intense precipitation on those fewer days with precipitation.

A number of analyses have been performed over the past 5 to 10 years to assess the hydrologic impacts of climate change on California's water resources. Some of the more robust findings among the studies listed in Table 14.11-1 are presented below:

- The Sierra Nevada spring snowpack is expected to continue to decrease due to an increase in the elevation of the freezing line, more precipitation falling as rain rather than snow, and an earlier snowmelt (DWR, 2006; California Climate Change Center, 2006; Mote et al., 2005; Roos, 2005).
- Rivers and streams fed by mountain watersheds are expected to exhibit an increase in stream flow in winter and early spring and a decrease in late spring and summer (Hamlet et al., 2005; Maurer and Duffey, 2005; Hayhoe et al., 2004).
- Greater conflicts among water supply, hydropower, and flood control in reservoir operations are anticipated (DWR, 2006).
- Warmer temperatures are expected to reduce some reservoir coldwater pools, which could affect the temperature of reservoir releases and increase stream temperatures, potentially disrupting aquatic species (DWR, 2006).

- Warmer temperatures could cause increases in water demand in both agricultural and municipal regions (DWR, 2006; Kiparsky and Gleick, 2003).
- Sea level rise will affect coastal areas and estuaries and could threaten levees (IPCC, 2007; DWR, 2006).

These six major findings are further discussed below in Section 14.11.4 (see Table 14.11-3) with respect to how climate change may be expected to affect the SFPUC regional water system and how climate change considerations would affect the WSIP impacts presented in the Draft PEIR.

In summary, the literature review (Table 14.11-1) indicated that quantitative assessments of potential climate change effects have been developed for the major watersheds in the Central Valley, and these studies have provided information useful to the SFPUC regional water system. These studies indicate a potential loss in Sierra spring snowpack of 12 to 50 percent by mid-century, depending on the degree of warming. The DWR's most recent climate change study (DWR, 2006) evaluated a range of future climate conditions on water resources in the Central Valley using output from two climate models and four climate change scenarios selected from the IPCC studies; DWR found that under three of the four climate change scenarios (those assuming a modest decline in total precipitation), water deliveries to State Water Project (SWP) and Central Valley Project (CVP) contractors would significantly decrease by 2050. The water resources in lower to mid-elevation basins, such as the upper Sacramento River and Feather River basins, would be substantially affected due to a reduction in snowpack and changes in runoff. Higher elevation basins, such as those providing inflow to Hetch Hetchy Reservoir, would be less sensitive to warming and would not lose as much winter-season snowpack as those with average elevations near the freezing line. The DWR reported that when these climate change scenarios are applied to Don Pedro Reservoir, there would be a reduction in Tuolumne River annual inflow to the reservoir as well as a shift in the timing of inflow by 2050. No focused studies of the upper Tuolumne River basin were identified in this literature review (outside of the initial modeling efforts performed by the SFPUC of the Hetch Hetchy system, as summarized in the Draft PEIR and described further below), although many researchers have analyzed the broad effects of climate change on the Sierra drainages, including the Tuolumne River watershed.

Various researchers and agencies have used different approaches and applied different climate change scenarios to assess the impacts and vulnerabilities of water resource systems to future climate change. One approach used by the DWR and the California Climate Change Center applies a range of future emission scenarios coupled with two general circulation models to quantify possible impacts. The quantitative assessments performed using this approach have utilized results from the research community as inputs to existing operational models. The applications of this approach vary from the use of specific scenarios to multi-model ensemble scenarios to perform the assessments. Another approach recently used by the U.S. Bureau of Reclamation in the Colorado River basin relies on paleoclimatological (tree ring) data over several centuries to characterize hydrologic variability and to predict future climate trends. A third approach used by several entities including the East Bay Municipal Utility District (EBMUD) evaluates system vulnerability to climate change and rates future management options based on flexibility to adapt to a changed climate. The approach being used by the SFPUC to address climate change is described in Sections 14.11.4 and 14.11.5 of this master response.

Tables 14.11-1 and **14.11-2** summarize the recent literature on climate change science and policy relevant to California water supplies and water management that was reviewed for this PEIR.

Regulatory Framework – Climate Change

This section summarizes recent California statues and executive orders that specifically pertain to global climate change, and augments the regulatory framework included in the Draft PEIR (Vol. 2, Chapter 4, pp. 4.9-14 and 4.9-15). The additional regulatory framework information provides a more comprehensive basis for evaluating climate change policy issues related to the SFPUC regional water system, but does not change the analysis in the Draft PEIR. It should be noted that all regulatory policy and guidance related to climate change pertain to GHG emissions.

Assembly Bill 1493

Approved in 2002, Assembly Bill 1493 addresses GHG emissions from motor vehicles. It requires that the California Air Resources Board (CARB) develop and adopt, by January 1, 2005, regulations that achieve "the maximum feasible reduction of GHGs emitted by passenger vehicles and light-duty truck and other vehicles determined by the CARB to be vehicles whose primary use is noncommercial personal transportation in the state."

Executive Order S-3-05

Approved on June 1, 2005 by Governor Schwarzenegger, Executive Order S-3-05 formally recognizes California's vulnerability to the impacts of climate change, including the fact that increased temperatures threaten to reduce snowpack in the Sierra Nevada, which serves as one of the state's primary sources of water. Additionally, the order notes that climate change could influence human health, coastal habitats, microclimates, and agricultural yield. To address these potential impacts, the order mandates the following GHG emission reduction targets: by 2010, reduce GHG emissions to 2000 levels; by 2020, reduce GHG emissions to 1990 levels, and by 2050, reduce GHG emissions to 80 percent below 1990 levels. In addition, the order requires biannual reports starting in January 2006 describing: progress made toward meeting GHG emission targets; global warming impacts in California on water supply, public health, agriculture, the coastline, and forestry; and mitigation and adaptation plans to combat these impacts.

Assembly Bill 32 – California Global Warming Solutions Act

Approved in 2006, the California Global Warming Solutions Act (Assembly Bill 32) establishes a timetable for the CARB to adopt emission limits, rules, and regulations designed to achieve, among other objectives, a statewide GHG emissions cap for 2020 that is equivalent to the 1990 emissions levels. The act requires the CARB to adopt regulations to require the reporting and verification of statewide GHG emissions as well as regulations to achieve the maximum technologically feasible and cost-effective reductions in GHGs. Refer to the Draft PEIR (Vol. 2, Chapter 4, pp. 4.9-14 and 4.9-15) for further description of this act.

TABLE 14.11-1
CLIMATE CHANGE SCIENCE REFERENCES

Reference	Summary
Barnett, T.P., D.W. Pierce, H.G. Hidalgo, C. Bonfils, B.D. Santer, T. Das, G. Bala, A.W. Wood, T. Nozawa, A.A. Mirin, D.R. Cayan, and M.D. Dettinger, Human-Induced Changes in the Hydrology of the Western United States, in: *Science* 319:1080-1082, 2008.	This study provides statistical validation that observed changes in the hydrological cycle in the western United States from 1950 to 1999 are due to human-caused climate changes related to GHGs and aerosols. The authors conducted a regional, multivariable climate change detection and attribution study using a high-resolution hydrologic model combined with global climate models and sophisticated data analysis. The results show that up to 60 percent of the climate-related trends of river flow, winter air temperature, and snow-pack between 1950 and 1999 are human-induced.
Intergovernmental Panel on Climate Change (IPCC), *Climate Change 2007: The Physical Science Basis, Summary for Policymakers,* 2007.	This brief report provides a summary of the IPPC Working Group I findings in its Fourth Assessment Report (AR4). The report summarizes the most current scientific consensus-based findings regarding recent observations of climate change, a paleoclimate perspective, and projections of future climate change.
Christensen, J.H., B. Hewitson, A. Busuioc, A. Chen, X. Gao, I. Held, R. Jones, R.K. Kolli, W.T. Kwon, R. Laprise, V. Magaña Rueda, L. Mearns, C.G. Menéndez, J. Räisänen, A. Rinke, A. Sarr, and P. Whetton, *Regional Climate Projections*, in: *Climate Change 2007: The Physical Science Basis, Contribution of Working Group I to the Fourth Assessment Report of the Intergovern-mental Panel on Climate Change,* 2007.	This chapter of the IPCC Assessment Report 4 provides a summary of the most recent regional climate projections and attempts to synthesize the most overarching issues. North America is considered as one region, although some greater geographical detail is provided. An assessment is provided regarding the general skill (capability of simulating observed climate) of the current suite of AOGCMs. General conclusions regarding temperature increases, precipitation changes, extreme events, atmospheric circulation, and snowpack-snowmelt-runoff are provided. In addition to the findings reported elsewhere of temperature increases and precipitation uncertainty, the report indicates greater climate variability during the 21st century. It indicates both a greater frequency in extreme temperature events and diurnal range, as well as greater frequency of extreme precipitation events (both wet and dry).
California Department of Water Resources (DWR), *Progress on Incorporating Climate Change into Planning and Management of California's Water Resources,* Technical Memorandum Report, July 2006.	This report is DWR's response to the governor's 2005 order establishing targets for GHG emissions and requiring biennial reporting by state agencies. This report describes the progress made to incorporate climate change into water resources planning and management. The report describes potential changes in precipitation and runoff, sea level, water demand, and fisheries. Based on research by Knowles and Cayan (2002) and the 2001 IPCC findings, the report projects the following loss of April snowpack averaged across the entire Sierra in snow-water-equivalent. Snow-water-equivalent is a measure of the volume of water that would be produced by melting snow and is used to translate snowpack to water volume. • 0.6 °C rise, ~5 percent loss • 1.6 °C rise, ~33 percent loss • 2.1 °C rise, ~50 percent loss These three levels of average temperature rise were projected by Knowles and Cayan to occur by 2030, 2060, and 2090, respectively. The water supply analyses included in this report utilized the results from four climate change scenarios described below in CalEPA (2006): PCM A2, GFDL A2, PCM B1, and GFDL B1. All four of these scenarios show a warming trend by the end of the 21st century; three of the four scenarios show a modest drying trend in precipitation with the fourth scenario showing a weak precipitation increase. There was no consistent trend for precipitation. Due to the coarse scale of the AOGCMs, the results from these climate change scenarios were "downscaled," a process of translating AOGCM output to a smaller regional or watershed scale (such as the major watersheds of the Central Valley) using the statistical methods described by Wood et al (2002, 2004) and Maurer et al. (2007). After downscaling, hydrological analyses were performed using the macro-scale Variable Infiltration Capacity model for each major watershed. The effects on runoff were analyzed for a historical period centered around 1976 (1961–1990) and for a climate change future period centered around 2050 (2035–2064). The fractional changes in runoff from historical gage measurements and future scenarios were then applied as monthly perturbation ratios to adjust the inflows to the CALSIM II Hydrology and Operations model to reflect

TABLE 14.11-1 (Continued)
CLIMATE CHANGE SCIENCE REFERENCES

Reference	Summary
	the climate change future. The perturbation ratios are simply multipliers applied to historical inflows to reflect the effects of climate change. For example, the historical inflow to Oroville Reservoir for July 1985 was approximately 2,189 cubic feet per second (cfs), and the perturbation ratio for July under the GFDL A2 scenario is 0.68. The inflow to Oroville for this simulated month under the GFDL A2 climate change scenario would then be 1,489 cfs (2,189 cfs multiplied by 0.68). For the major watersheds contributing stream flow to the Central Valley (including Tuolumne River inflow to Don Pedro Reservoir), the DWR found there was generally an increase in runoff from December through April and a decrease in May through November due to: more precipitation falling as rain rather than snow and, a reduced snowpack in the warmer climate. This shift occurred regardless of whether the climate change scenario was considered wetter or drier than historical records due to the temperature effect on the snowpack. The long-term average annual inflows to Shasta, Oroville, and Folsom Reservoirs were found to be decreased in three of the four scenarios (those assuming a decline in total precipitation). Only the PCM B1 scenario, the less-sensitive AOGCM combined with the lower emissions, produced increased annual inflows to these reservoirs. The DWR performed model simulations to analyze the long-term potential impacts on State Water Project (SWP) and Central Valley Project (CVP) delivery capability and found that total project impacts ranged from virtually no change to up to 10 percent, depending on the climate change scenario. The DWR also reported potential changes in monthly patterns of Tuolumne River inflow to Don Pedro Reservoir. The shift in the *fraction* of monthly inflows ranged from an increase of 6 to 25 percent for the December through April period and a decrease of 4 to 29 percent for the May through November period. Note that these percentages are an average of the fractional changes and are not equivalent to volumetric shifts in inflow. Volumetric changes in inflow were not documented in the DWR report. However, using the perturbation factors presented in this report and historical inflows to Don Pedro Reservoir, average annual inflow would also decrease for three of the four climate change scenarios (those assuming a decline in total precipitation). Only the wetter PCM B1 scenario produces increased average annual inflow. The report, however, did not specifically analyze climate change effects on the Hetch Hetchy system.
California Environmental Protection Agency (CalEPA), *Climate Action Team Report to Governor Schwarzenegger and the Legislature,* March 2006.	This report provides a general overview of climate processes and summarizes a broad range of climate change impacts on various resources in California. Strategies for controlling GHG emissions and potential adaptation measures are provided. Importantly, the report summarizes climate change scenarios used in the analysis of each of the resource areas. The report uses the results from three emission scenarios developed by the IPCC: a higher emission scenario (A1Fi), a medium-high emission scenario (A2), and a lower emission scenario (B1). To capture the range of uncertainty among climate models, the report relies on projections of the climate changes under these emission scenarios from three atmosphere-ocean general circulation models (AOGCM): the low-sensitivity Parallel Climate Model (PCM) from the National Center for Atmospheric Research (NCAR) and Department of Energy (DOE), the medium-sensitivity Geophysical Fluids Dynamic Laboratory (GFDL) CM2.1 model from the National Oceanic and Atmospheric Administration (NOAA), and the slightly higher-sensitivity Hadley Centre Climate Model, Version 2 (HadCM3) from the U.K. Met Office Hadley Center. The range of scenarios considered in this report exhibits projected temperature increases for the period of 2000 to 2100 of 1.7 to 3.0 °C for the lower range, 3.1 to 4.3 °C in the medium range, and 4.4 to 5.8 °C in the higher range. Despite the consensus among scenarios in projecting warming for California (and the globe), there is no clear trend for overall precipitation results for California over the next century. Only one scenario (PCM B1) projected an increase in precipitation, while all others indicated no change or a decrease.
California Climate Change Center, *Scenarios of Climate Change in California: An Overview,* February 2006.	This white paper was largely incorporated into the March 2006 CalEPA report to Governor Schwarzenegger. It describes the basis of climate change scenarios and gives an overview of the potential impacts on various resources in California. The impacts on water resources are briefly summarized. Hydrologic modeling performed for California was used to estimate changes in snowpack throughout the century. These studies projected reductions in Sierra snowpack with increased temperature and showed large snowpack losses associated with the higher ranges of temperature increases. The paper indicates that in the Sierra Nevada, by the 2035–2064 period, snowpack could be reduced by 12 to 47 percent from historical levels under the lower range of warming and 26 to 40 percent under the higher range of warming. By the end of the century, snowpack may be reduced by as much as 90 percent at the higher end of warming.

TABLE 14.11-1 (Continued)
CLIMATE CHANGE SCIENCE REFERENCES

Reference	Summary
	Two modeling approaches were applied to evaluate the effects on water supply in the Central Valley. The first approach is that described in DWR (2006) using the CALSIM model with climate change "perturbed" inflows. The second approach uses the Water Evaluation and Planning (WEAP) model with direct temperature and precipitation inputs. Both methods indicate a likely decrease in stream flows by mid-century, with more dramatic changes by the end of the century. In addition, the analyses indicate a greater propensity for "critically dry" year classification (using unadjusted indices) than the historical hydrology. Analyses using the CALSIM model indicated that by the end of the century deliveries to the SWP and CVP could be reduced by 15 to 30 percent under the lower warming scenarios and by as much as 40 to 50 percent under the medium and higher warming scenarios. These studies did not include the effects of increased agricultural or outdoor urban demands, but suggested that these could increase by 2 to 13 percent by the end of the century.
California Climate Change Center, *Our Changing Climate, Assessing the Risks to California*, A Summary Report from the California Climate Change Center, 2006.	This brief report is a summary of the "Climate Scenarios" project, which analyzed a range of impacts that would likely result with rising temperatures in California. It is largely a summary of other work. In summarizing the potential effects on the Sierra snowpack, the reports states that "if heat-trapping emissions continue unabated, more precipitation will fall as rain instead of snow, and the snow that does fall will melt earlier, reducing the Sierra Nevada spring snowpack by as much as 70 to 90 percent." The report also indicates there is continued uncertainty regarding the future changes in precipitation, which would affect the magnitude of the snowpack loss. It indicates that if emissions are significantly curbed and temperatures remain in the lower range of projections, the loss of snowpack will likely be half that expected if temperatures reach the higher range of projections.
Sansone, Amy and Pascal Storck, *The Implications of Climate Change on a Snow Melt Dominated Watershed in Western Washington,* 3TIER Environmental Forecast Group Inc., HydroVision, 2006.	The goal of this paper was to evaluate the effect of global warming by 2025 and 2045 on the snowpack in the watershed that supplies a portion of the city of Seattle's water supply. The results from eight global climate simulations were evaluated, and the analysis showed a 1.5 °C change over a 30-year period from 1995 to 2025. The study also showed a shift in runoff from the months of April, May, and June to the months of January, February, and March.
Maurer, E., *Uncertainty in Hydrologic Impacts of Climate Change in the Sierra Nevada Mountains, California under Two Emissions Scenarios,* April 2005.	This manuscript reports on an evaluation of hydrologic impacts in the Sierra Nevada with climate projected by 11 different AOGCMs under two emission scenarios. The intent of the study was to identify the projected hydrologic changes that have high statistical confidence for the period of 2071–2100. High statistical confidence was found under the projections for increasing winter stream flow and decreasing late spring and summer flow. Less snow at the end of winter and earlier arrival of the annual flow volume were identified as confident projections. The two emission pathways investigated, SRES A2 and B1, showed differing impacts with high confidence, leading to the author's conclusion that future emission scenarios play a significant role in the degree of impacts on water resources in California.
Dettinger, Michael D., *From Climate-Change Spaghetti to Climate-Change Distributions for 21st Century California,* San Francisco Estuary and Watershed Science, U.S. Geological Survey, March 2005.	The goal of this paper was to derive a statistically based conclusion from the variable results from runs of many differing Global Circulation Models (GCMs). The paper uses the same figure (temperature change over time from a variety of GCMs) that is used in the Cayan 2004 Ground Water Conference presentation, but it explores a statistical resampling technique to construct projection distribution functions to reduce the variance in the results. When North American GCM results are emphasized in the resampling process, an increase of 3 °C by 2050 and 6 °C by 2100 temperature change is found.
Mote, P.W., A.F. Hamlet, M.P. Clark, and D.P. Lettenmaier, *Declining Mountain Snowpack in Western North America*. Bulletin of the American Meteorological Society, January 2005.	This article presented the results of research utilizing 824 snow stations from the Natural Resources Conservation Service, DWR, and Ministry of Sustainable Resource Management for British Columbia. The authors found decreases in April 1 snow water equivalent between 1950 and 1977 at the majority of the sites, with the largest decreases found in western Oregon and Washington and northern California. Some upward trends in snow water equivalent were found for the Southwest, including the southern Sierra. Some of the increasing trend was attributed to long-term climatic signals such as the Pacific Decadal Oscillation and the El Niño Southern Oscillation.

TABLE 14.11-1 (Continued)
CLIMATE CHANGE SCIENCE REFERENCES

Reference	Summary
Maurer, E and P.B. Duffy, *Uncertainty in Projections of Streamflow Changes due to Climate Change in California,* Geophysical Research Letters, Vol. 32, L03704, 2005.	This paper examines the effects of stream flow under a range of climate projections with the goal of analyzing uncertainty between models and confidence in hydrologic impacts. The effects of climate change on stream flow at three northern Sacramento Valley rivers (Sacramento River at Shasta Dam, Feather River at Oroville, American River at Folsom) and four San Joaquin Valley rivers (Stanislaus River at New Melones, Tuolumne River at New Don Pedro, and Merced River at Lake McClure) were examined under a range of carbon dioxide increase scenarios. The AOGCMs applied were those available for the Coupled Model Intercomparison Project, but are not comparable to those used by Maurer to support the DWR (2006) analyses. This paper confirmed the robust result of increases in stream flow in December through March and decreases in June through October. In addition, the authors found that the March–April flows in the higher elevation south basins were more highly influenced by projected temperature changes than in the lower elevation north basins. This appears to contradict findings by Hamlet et al. (2005), who found that trends in snow water equivalent at high-elevation basins were less affected by warming than lower basins; however, Hamlet's study covered the entire western United States, whereas this study focuses on California. The perturbed climate scenarios utilized in this study indicated a shift in stream flow timing for the Tuolumne River at New Don Pedro, but also indicated an increase in overall annual runoff due to increased precipitation projections.
Roos, M., *Accounting for Climate Change,* California Water Plan Update 2005, Vol. 4, 2005.	This report by Maurice Roos, State Hydrologist for California, examines the broad implications of climate change on California water resources. It provides a good narrative of historical trends in temperature, sea level rise, and water resource systems. The report states that the "most important parameter in determining runoff and therefore water supply is precipitation" and that "regional precipitation predictions in the huge general circulation models of the atmosphere have not been reliable, and vary greatly among the different models." Roos states that on a global scale, warming would increase evaporation, and thus increase overall precipitation, but highlights that "where and when the precipitation falls is all-important." The report discusses initial efforts by the DWR that indicated a much greater trend for warming impacts on northern Sierra snowpack and runoff decreases compared to southern Sierra snowpack and runoff, due to the elevation of these watersheds. Roos reports that with recent models it is possible to project increases in southern Sierra snowmelt runoff under wetter climate scenarios (although from less area), while this phenomenon is not shown for the northern Sierra. Roos also discusses implications for water resources in the state and concludes that not all basins would be equally affected. The report references the differences in the ratio of storage to average annual inflow in watersheds as an indicator of the level of impact. Due to a greater capacity to store runoff, the Stanislaus River with a ratio of 2.5 (storage to inflow) would be expected to have a smaller impact than the American River, where the ratio is about 0.64. Roos also analyzed the past hydrologic record for the Sacramento River and identified declining trends in April–July runoff. The trend was found to exist for most major drainages to the Central Valley, with smaller declines in the southern Sierra. This report also mentions work by researchers that has shown an increased risk for large storms and flood events for several AOGCM scenarios. An increase in flood control space would conflict with operations for water supply, power, and recreation for many of the reservoirs in California. Roos suggests that if increased winter flood control capacity were required, then one would expect greater difficulty in filling reservoirs in the spring. Finally, Roos discusses potential changes (increases) in agricultural water use with increasing temperature and difficulties in managing cold–water pools for anadromous fish. Cold-water pools in reservoirs, and within the watershed, would be expected to decrease, and river water temperatures could warm beyond the tolerable limits for salmon and steelhead in the summer. Roos suggests that multi-level outlets in reservoirs should be considered for more effective cold-water release management.
Hamlet, A., P.W. Mote, M.P. Clark, and D.P. Lettenmaier, *Effects of Temperature and Precipitation Variability on Snowpack Trends in the Western United States,* Journal of Climate, 2005.	This paper summarizes hydrologic simulation studies that were used to examine trends in snow water equivalent for the western U.S. The authors found that widespread warming occurred during 1916–2003, resulting in downward trends in April 1 snow water equivalent for large areas of the western U.S. However, as in previous work, the authors indicate upward trends in snow water equivalent in the Southwest and southern Sierra. Importantly, the paper finds that almost all upward trends in snow water equivalent are due to modest upward trends in precipitation, while all downward trends are associated with widespread warming. Decadal variability (such as the Pacific Decadal Oscillation) is reported to account for the winter trends of precipitation. Trends for stations at high elevations are less affected by warming than those at lower elevations.

TABLE 14.11-1 (Continued)
CLIMATE CHANGE SCIENCE REFERENCES

Reference	Summary
Hayhoe, K., D. Cayan, C.B. Field, P.C. Frumhoff, E.P. Maurer, N.L. Miller, S.C. Moser, S.H. Schneider, K.N. Cahill, E.E. Cleland, L. Dale, R. Drapek, R.M. Hanemann, L.S. Kalkstein, J. Lenihan, C.K. Lunch, R.P. Neilson, S.C. Sheridan, and J.H. Verville, *Emissions Pathways, Climate Change, and Impacts on California*, 2004.	This study represents one of the earlier versions of the “scenarios” project for California, in which a broad range of climate impacts were analyzed under various emission pathways. The study found that California temperature increases nearly double from the lower to the higher emission scenarios and three of four simulations showed greater summer increases than winter increases. By the end of the century, Sierra snowpack was projected to decrease by 30 to 70 percent under the lower emission scenario and up to 90 percent under the higher emission scenario. The study found that the main differences between scenarios were apparent in the second half of the century, but were strongly dependent on emissions from the preceding decades.
Cayan, Dan, *Climate Change: A Challenge Looming for California*, 2004.	This reference is for a presentation given at the Ground Water Conference, Sacramento, California on October 26, 2004 by Dan Cayan, Scripps Institution of Oceanography, Climate Research Division and the U.S. Geological Survey with input from Mike Dettinger, Iris Stewart, and Noah Knowles, sponsored by the NOAA OGP RISA element, California Energy Commission PIER program. The presentation showed modeled temperature changes for Northern California that range from 1.5 to 4.5 °C by 2050 and from 2 to 10 °C by 2100. A midpoint in these ranges was selected for each date: 3 °C by 2050 and 6 °C by 2100. The presentation concluded that: • Humans have altered the atmospheric composition and thus are altering the earth’s climate; greenhouse gases have long lifetimes, so choices made now and in the future will determine future climate. Warming is already underway and coming fast. • California temperature projections are broadly in consensus (increases from 2 to 6 °C by 2100). • Warming would produce more rain, less snow, earlier flows, more floods, higher sea level, and drier summers. • California precipitation projections are scattered, with most projections showing small changes. • “Shoulders” of watershed elevations at 6,000–8,000 feet would generate more immediate runoff. • Better monitoring and modeling is crucially needed.
Kiparsky, M. and P.H. Gleick, *Climate Change and California Water Resources: A Survey and Summary of Literature*, California Water Plan, Vol. 4, Reference Guide, 2003.	This report summarizes the research and studies (as of 2003) of climate change effects on various California resources. It also highlights areas of greater uncertainty and provides recommendations for further research. The report concludes with suggested strategies for adapting to potential climate change impacts. This report provides a good summary of research, but is somewhat outdated with the rapid advance of climate change analyses in recent years.
Miller, N.L. and K.E. Bashford, *Climate Change Sensitivity Study of California Hydrology: A Report to the California Energy Commission*, Lawrence Berkeley National Labs Technical Report No. 49110, 2001.	This report describes the methodology and results of a study to analyze the effects of climate change on the major drainages of the Central Valley. The study utilized two AOGCM projections from the IPCC Third Assessment Report to analyze temperature and precipitation changes, and eventually snowpack, snowmelt, and runoff. Of particular note in this study, the authors utilized a range of temperature shifts and precipitation ratios to the Sacramento Soil Moisture Accounting Model and Anderson Snow Model in order to determine hydrologic sensitivities. Climate temperature shifts and precipitation ratios were utilized to constrain the changes from the historical climate in order to use existing operational models and “increase credibility and public acceptance” of hydrologic response. Such an approach was deemed valid, although it removed the variance in the time-series that may indicate extreme events. Results indicated that a larger proportion of the streamflow volume will occur earlier in the year and that the amount and timing is dependent on the characteristics of each basin, particularly the elevation of the freezing line. In general, higher elevation basins are less sensitive and do not lose as much winter season snowpack as those with centroid elevations near the freezing line. The paper also reported that there would likely be an increase in high flow days under the scenarios analyzed.

SOURCES: CH2M HILL, 2007; SFPUC, 2008.

TABLE 14.11-2
SELECTED CLIMATE CHANGE POLICY AND GUIDANCE REFERENCES

Reference	Summary
Natural Resources Defense Council (NRDC), *In Hot Water: Water Management Strategies to Weather the Effects of Global Warming,* 2007.	This recent report highlights the potential effects of climate change on water resources and ecosystems and suggests approaches for future water management. Potential impacts on water supply, flood management, aquatic ecosystems, water quality, and hydropower are summarized largely through reference to other studies. The foundation of the report, however, is in identifying approaches for incorporating climate change into water planning and management. The report suggests the following strategies for water managers: (1) evaluate the vulnerability of water systems to global warming impacts, (2) develop response strategies to reduce future impacts of global warming, (3) prevent future impacts by reducing greenhouse gas emissions, and (4) increase awareness of global warming and water impacts. The report also provides an assessment of the performance of various water management strategies after considering global warming effects. This report is included here as it was referenced by a commenter on the Draft PEIR.
California Department of Water Resources (DWR), *State Water Project Delivery Reliability Report-2005,* April 2006.	The 2005 State Water Project (SWP) Delivery Reliability Report addressed the need to incorporate some of the uncertainties of global warming with regard to planning and operation of the SWP. “Until the impacts of climate change on precipitation and runoff patterns in California are better quantified, future weather patterns are usually assumed to be similar to those of the past, especially where there is a significant historical rainfall record. The State Water Project analyses contained in this report are based upon 73 years of historical records (1922 to1994) for rainfall and runoff that have been adjusted to reflect the current and future levels of development in the source areas by analyzing land use patterns and projecting future land and water use. These series of data are then used to forecast the amount of water available to the SWP under current and future conditions. The assumption that past rainfall-runoff patterns will be repeated in the future has an inherent uncertainty, especially given the evolving information on the potential effects of global climate change.” Note: This report has been updated in 2007 to incorporate recent interim changes in fishery protection actions required by court decisions. The report also presents SWP reliability information with consideration given to the climate change scenarios described in DWR July 2006 above.
Gleick, P.H., H. Cooley, and D. Groves, *California Water 2030: An Efficient Future*. Pacific Institute, September 2005.	This report is not specifically on climate change, but investigates the water “scenarios” approach to decision-making as applied to the California Water Plan. The report argues that the scenarios approach allows for robust decision-making without explicitly quantifying all ranges of uncertainty. This report is included here as it was referenced by a commenter on the Draft PEIR.

SOURCE: CH2M HILL, 2007.

Senate Bill 1368

Approved in 2006 as the companion bill of Assembly Bill 32, Senate Bill 1368 requires the California Energy Commission, in consultation with the California Public Utilities Commission and the CARB, to establish and adopt by June 2007 a GHG emission performance standard and implementing regulations for all long-term baseload generation commitments made by electric utilities. The legislation requires the California Energy Commission to reevaluate and continue, modify, or replace the GHG emission performance standard when an enforceable GHG emissions limit is established and in operation.

Executive Order S-1-07

Executive Order S-1-07, the Low Carbon Fuel Standard, was issued on January 18, 2007 and calls for a reduction of at least 10 percent in the carbon intensity of California's transportation fuels by 2020. The order instructs the California Environmental Protection Agency to coordinate activities among the University of California, the California Energy Commission, and other state agencies to develop and propose a draft compliance schedule to meet the 2020 target. Furthermore, the order directs the CARB to consider initiating regulatory proceedings to establish and implement the Low Carbon Fuel Standard. In response, the CARB identified the Low Carbon Fuel Standard as an early action item with a regulation to be adopted and implemented by 2010.

Senate Bill 97

Senate Bill 97 was signed into law in August 2007. This bill requires the Office of Planning and Research to prepare, develop, and transmit to the State of California Resources Agency guidelines for the feasible mitigation of GHG emissions or the effects of GHG emissions by July 1, 2009. The Resources Agency would be required to certify and adopt those guidelines by January 10, 2010. The Office of Planning and Research is required to periodically update the guidelines to incorporate new information or criteria established by the CARB pursuant to the California Global Warming Solutions Act of 2006 (described above). The Office of Planning and Research recently released a technical advisory on CEQA and climate change. The technical advisory offers "informal guidance regarding the steps lead agencies should take to address climate change in their CEQA documents" (OPR, 2008).

14.11.3 Review of Water Agencies' Water Supply Management Approach to Climate Change

Comment Summary

This section of this master response responds to all or part of the following comments, which reference actions by other water agencies to address climate change:

F_NPS-YOS-01
S_RWQCBSF-16
L_ACFCWCD-05
L_MID-TID1-11
L_MID-TID1-26
SI_ACT-04
SI_ACT-05
SI_CAC2-04
SI_CNPS-EB1-06
SI_CRS-04
SI_CWA-01
SI_GreenP-04
SI_SPUR-04
SI_SPUR-05
SI_TRT8-06
SI_TRTCWA-SierraC-20
SI_TRTCWA-SierraC-22
SI_TRTCWA-SierraC-34
SI_TRTCWA-SierraC-70
SI_TRTCWA-SierraC-77
SI_TRTCWA-SierraC-78
SI_TRTCWA-SierraC-130
SI_TRTCWA-SierraC-133
SI_TRTCWA-SierraC-135
SI_TRTCWA-SierraC-159
SI_TRTCWA-SierraC-168
C_Gelma-02
C_Hasso-04
C_Lee-04
C_Mater-02
C_Owen-01
C_Unreadable1-01

Summary of Issues Raised by Commenters

- The PEIR should follow an approach to climate change similar to that used by EBMUD, which has quantified possible climate change impacts and developed operation models.

- Turlock Irrigation District (TID) staff conducted preliminary modeling of global warming effects on the Tuolumne River and the PEIR needs to address the impacts of global warming on this river system.

Response

East Bay Municipal Utility District

EBMUD has been actively monitoring the progress of climate change research to understand and predict potential future impacts on its water supply and operations and has used the results from climate change studies to analyze these impacts (Sykes, 2006). In general, the results have indicated only a modest impact on the utility's water supply reliability. EBMUD used its water supply model to simulate the 80-year historical hydrologic record under a changed climate scenario to analyze the potential effects on water supply reliability at a 2020 level of development. These simulations assumed no change in total annual precipitation, but assumed that a warmer climate (3 °C increase in temperature) would cause 28 percent of the historical runoff to occur earlier in the year. The results of the study indicated that an earlier runoff would have little impact on EBMUD's water deliveries for four main reasons: the large percentage of spring runoff in the system's water supply watershed, the steepness of the area-elevation curve (see Figure 14.11-2), the timing and amount of demands, and the reservoir storage-to-runoff ratio. The climate change scenario used in their model resulted in fewer flood control releases due to decreased spring runoff and no significant effect on carryover storage. In addition, the amount of demand under this scenario is less than the average annual runoff, and the storage volume is greater than the average annual runoff. Nonetheless, EBMUD has taken actions to prepare for climate change, including diversifying its water supply portfolio to reduce vulnerability to geographical variation in precipitation and reinforcing its system to prepare for the effects of a 3-foot sea level rise on its Delta facilities. It is also promoting water conservation and water reclamation and a reduction in emissions of GHGs.

EBMUD has embarked on an evaluation of water supply management options through the year 2040. The focus of EBMUD's initial climate change plan is on the vulnerability of its system to climate change. As part of this effort, the district will conduct sensitivity analyses to evaluate and score the flexibility of each water supply portfolio considered in the Water Supply Management Plan 2040 to respond to climate change. The district will also consider secondary (or backup) elements for use under the predicted worsening climate conditions. This proposed approach represents a "bottom-up" methodology that would initially be limited to climate change scenarios and would not rely on the results of the "downscaled" atmosphere-ocean general circulation models (AOGCM) being used by the DWR (see the description in Table 14.11-1, above, under DWR's *Progress on Incorporating Climate Change into Planning and Management of California's Water Resources*, 2006).

As described in more detail below, many of EBMUD's strategies to address climate change are similar to those being implemented by the SFPUC. The SFPUC used one of the same key assumptions as EBMUD in its near-term planning for climate change (i.e., no change in the total annual precipitation but a shift in runoff patterns to earlier in the year that would be expected to result from warmer climate). However, unique aspects of the EBMUD and SFPUC systems necessitated some differences in the analyses of climate change effects on the systems' water resources and deliveries as well as in the long-term planning approaches. For example, the SFPUC conducted preliminary modeling of near-term climate change effects (to 2030) using temperature projections that were consistent with those of the IPCC, while EBMUD's period of analysis was to 2020 and used different temperature figures. As described below in Section 14.11.4, the SFPUC analysis used a potential mean annual temperature increase of 1.5 °C by 2025–2030, based on climate change studies that forecast a mean annual temperature increase of 3 °C by 2050 (Dettinger, 2005; Sansone and Storck, 2006). EBMUD's use of a 3 °C temperature increase by 2020 accelerates the projected temperature increase compared to the findings of current climate change studies and thus represents a very conservative assumption. The SFPUC's long-term water supply planning to prepare for the effects of climate change (as described in Section 14.11.5, below) has some of the same elements as EBMUD's program, including diversifying its water supply portfolio.

Turlock Irrigation District

TID has conducted some preliminary analyses of the possible impacts of global warming on Tuolumne River watershed runoff. The ongoing study, performed in collaboration with the SFPUC, uses a physical process model—the Hydrologic Forecasting Analysis Model—calibrated to the Tuolumne River basin for the period 1931 to 2000. The model is designed to explicitly analyze evapotranspiration,[1] snowpack, precipitation as rain or snow, and heat budget to determine effects on runoff timing and volume. This initial work compares the existing temperature (base case) with increasing temperature inputs of 0.6 and 1.7 °C (1 and 3 °F). The SFPUC is currently working with TID in reviewing the model assumptions and preliminary results. However, the work is still in progress, and no conclusions have been reached to date. As described in Section 14.11.5 below, the SFPUC is working with TID to further develop this model for use in long-term planning for climate change effects.

California Department of Water Resources

The DWR's climate change planning efforts are described above in Table 14.11-1. The SFPUC is using information provided by the DWR as general guidance in addressing climate change effects on its water system, although the results of specific DWR modeling do not address the Hetch Hetchy system and therefore are not directly applicable. (Please refer to Table 14.11-1 for descriptions of DWR's climate change planning documents.)

Sacramento Municipal Utility District

Because the Sacramento Municipal Utility District (SMUD) system includes reservoirs in the Sierra Nevada at elevations similar to those in the Hetch Hetchy system, the SFPUC contacted SMUD regarding its ongoing actions related to climate change. SMUD is following the scientific literature and DWR's analyses on climate change, particularly with respect to potential effects on the runoff patterns and quantities that could affect its system. Although SMUD does not provide water supply services, it operates and maintains hydroelectric facilities that are dependent on

1 The return of water from the soil and from plants to the atmosphere by evaporation and transpiration.

runoff patterns that could be altered by climate change. SMUD's hydroelectric project in the upper American River watershed includes three major reservoirs, at elevations of approximately 4,500, 5,500, and 6,300 feet. Because the drainage basin includes areas at 9,000-foot elevations, climate change effects associated with rising snowlines would not be expected to affect SMUD's system in the near future. SMUD has not conducted modeling or other analyses to determine any special issues for its reservoirs and watershed (McFadden, 2008).

14.11.4 Climate Change and the SFPUC Regional Water System

Comment Summary

This section of this master response responds to all or part of the following comments:

F_NPS-YOS-01
S_RWQCBSF-16
L_ACFCWCD-05
L_MID-TID1-11
L_MID-TID1-26
SI_ACT-04
SI_ACT-05
SI_CAC2-04
SI_CNPS-EB1-06
SI_CRS-04
SI_CWA-01
SI_GreenP-04
SI_PacInst-18
SI_SierraC2-03
SI_SierraC3-03
SI_SierraC7-06
SI_SPUR-04
SI_SPUR-05
SI_TRT7-09
SI_TRT8-06
SI_TRT-CWA-SierraC-20
SI_TRT-CWA-SierraC-22
SI_TRT-CWA-SierraC-34
SI_TRT-CWA-SierraC-70
SI_TRT-CWA-SierraC-77
SI_TRT-CWA-SierraC-78
SI_TRT-CWA-SierraC-130
SI_TRT-CWA-SierraC-133
SI_TRT-CWA-SierraC-135
SI_TRT-CWA-SierraC-159
SI_TRT-CWA-SierraC-168
SI_TRT7-09
SI_TRT8-06
SI_TRT-CWA-SierraC-20
SI_TRT-CWA-SierraC-22
C_Chode-01
C_Clark1-04
C_Clark1-07
C_Clark1-08
C_Clark1-12
C_Clark2-03
C_Colli-02
C_Garba-03
C_Gelma-02
C_Genov-02
C_Colli-02
C_Garba-03
C_Genov-02
C_GreenD-03
C_GreenD-03
C_Hasso-04
C_Kallin-01
C_Lee-04
C_MartiM-04
C_Mater-02
C_Mijac-01
C_Owen-01
C_Raffa-06
C_Stein-03
C_Stein-04
C_Sugar-02
C_Tubma-02
C_Unreadable1-01
C_Walke-02

Summary of Issues Raised by Commenters

- The PEIR should analyze the effects of increased diversions coupled with the effects stemming from climate change and global warming, including impacts on biological resources.
- The PEIR should analyze the effects on the Tuolumne River watershed, including the SFPUC's Tuolumne River system firm yield, due to climate change and associated effects on the SFPUC's system operations and water yield.
- The PEIR should analyze the effects of climate change on demand, water use patterns, and the frequency of future rationing.

- Use of historical hydrology in the impact analysis overestimates water availability and underestimates the impacts of removing water from the Tuolumne River. Changes within the historical range are not the same as no impact, and modeling shown in the PEIR does not capture the range of impacts.
- The analysis should be expanded to include the effects resulting from changes in the frequency and duration of extreme climatic events.
- The water system needs to be robust enough to withstand any future climate scenario.

Response

Chapter 5 of the Draft PEIR (Vol.3, pp. 5.7-92 to 5.7-96) describes the SFPUC's initial modeling of potential climate change effects, which indicated that warming of 1.5 °C would effectively raise the snowline by 500 feet and transfer a portion of each year's runoff from spring/summer to fall/winter. This initial modeling of the SFPUC's regional water system indicates that, by 2025, about 7 percent of the current runoff to Hetch Hetchy Reservoir would occur earlier in the year. The Draft PEIR indicates that this degree of change is within the interannual variation in runoff, and that the potential impacts of global warming on the SFPUC's regional system would not affect the proposed WSIP operations through 2030. Consistent with the approach presented in the Draft PEIR, the analysis presented in this master response relies on the best available scientific information to provide further discussion and assessment of potential climate change effects on water resources and the SFPUC regional water system in the context of the environmental impacts of the WSIP.

SFPUC's Current Studies of Climate Change Effects

Background

The SFPUC manages three reservoirs in the Sierra Nevada mountains and five local reservoirs in the Bay Area to provide water supplies for customers in the Bay Area. The mountain watersheds typically have substantial snowmelt runoff from about March through June, filling the three Sierra reservoirs by late in the spring season. The supply from the Sierra reservoirs supplements the water supply provided by the local reservoirs, and in most years it is adequate to meet customer demand through the summer as well as to provide longer term reservoir storage in case subsequent years are dry.

The historical variability of hydrologic year types includes a broad range of annual runoff volumes in the mountain watersheds, ranging from at least 40 to 200 percent of the average annual runoff, and each winter's pattern of storms is different. The SFPUC operates the Hetch Hetchy system based on the "water first" protocol (see the Draft PEIR, Vol. 1, Chapter 2, p. 2-18), and discretionary drafts of the reservoir do not occur until forecasting tools confirm that snowmelt runoff will fill the reservoirs. This policy is designed to protect against water supply shortages in the foreseeable future.

The Hetch Hetchy basin above O'Shaughnessy Dam covers 459 square miles. About 87 percent of the area is above 6,000 feet in elevation, and about 76 percent is above 7,000 feet. The Cherry

Creek drainage basin above Lake Lloyd is 116 square miles; about 76 percent is above 6,000 feet, and about 52 percent is above 7,000 feet. The Eleanor Creek drainage basin above Lake Eleanor is 79 square miles, and about 60 percent is above 6,000 feet and 26 percent is above 7,000 feet.

Based on preliminary modeling of global warming effects, the SFPUC has estimated that the elevation of the snowline in the Sierra watersheds will increase from 6,000 to about 6,500 feet by 2025 (see the Draft PEIR, Vol. 3, Chapter 5, p. 5.7-94). This change means that in the future with climate change more of the precipitation in the SFPUC's Sierra watersheds will fall as rain than as snow due to the increased occurrence of warmer storms compared to historical conditions. It also means that the snowpack, on average, will contain less water and produce less snowmelt runoff. While the total runoff volume is likely to stay about the same, the pattern of the runoff will change. The November-through-March fraction of the runoff is expected to increase, and the April-through-July fraction of the runoff is expected to decrease.

Preliminary Modeling of Near-Term Climate Change Effects

The Draft PEIR (Vol. 3, Chapter 5, pp. 5.7-94 to 5.7-96) summarizes the SFPUC's initial evaluation of climate change effects on the regional system, and a more detailed description of that study is presented in this master response. The SFPUC conducted a preliminary analysis of global warming effects using the Water Supply Forecast Model (WSFM), a statistical model based on a 48-year record of daily temperature and precipitation (Hannaford, 1997). The SFPUC currently uses the WSFM as a tool to assist in the planning and operation of the Hetch Hetchy system to predict unimpaired stream flow conditions, and adapted this model to estimate stream flow effects of near-term temperature increases in the Tuolumne River watershed that appear likely in the next few decades based on the climate change literature. However, because the WSFM is a statistical model based on historical data, the SFPUC is working with TID to develop a different model—a physical process model—for studying long-term climate change effects (see Section 14.11.5, below).

The WSFM makes forecasts using prior precipitation and runoff, the water stored as snowpack in the basin, and future precipitation. The basin's snowpack is quantified by 35 snow courses (snow measuring stations) located throughout the Merced, Tuolumne, and Stanislaus River basins. Historical precipitation is used to estimate the likely range of future precipitation, and historical temperature is used to estimate future snow melt quantity and timing. An advanced statistical procedure is employed to develop equations that are then used, together with current conditions and 48 years of historical temperature and precipitation data, to make monthly forecasts of future runoff volumes.[2]

The database used in the model includes public data collected by state, federal, and cooperating organizations and individuals. Snow course data are coordinated by the California Cooperative Snow Survey Program based in Sacramento. Precipitation and temperature data originate from a variety of sources, including the Snow Survey, the National Weather Service and their

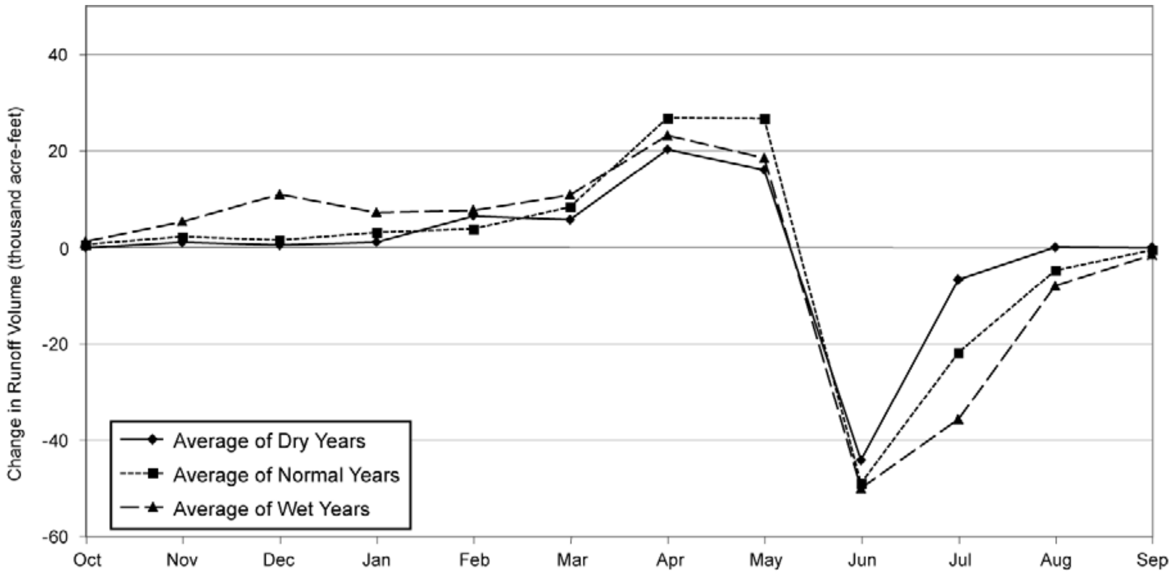
[2] Based on standard errors, the accuracy of the WSFM in predicting total annual runoff is within approximately 5 percent.

cooperators, and irrigation and water supply districts. Runoff data for the model originate from sources such as the U.S. Geological Survey, TID, and MID.

Climate change studies indicate that there will be an increase of 3 °C mean annual temperature from 2000 to 2050 (Dettinger, 2005; Sansone and Storck, 2006). Because the PEIR period of analysis is through 2030, a projected temperature increase of 1.5 °C (about 3 °F) by 2025 was selected for analysis, which is assumed to approximate the 2030 condition. Thus, a 1.5 °C warming factor was added to historical temperatures, and the SFPUC calculated runoff volumes by month for the 1948–1995 period using the WSFM to depict a climate change scenario. Differences in the monthly volumes between the historical and climate change scenarios were analyzed for the entire analysis period, and the years were also sorted into wet, normal, and dry categories to determine if differences were evident for the various wetness regimes. This analysis assumed that no changes in annual precipitation would occur, even though the scientific literature has reported a range of differences in various model projections for precipitation changes due to global warming. Since the scientific literature indicates no clear trend for precipitation changes in California over the next century (see the description in Table 14.11-1, above, under CalEPA's *Climate Action Team Report to Governor Schwarznegger and the Legislature*, 2006), it was determined that no change in annual precipitation from historical/existing conditions was a reasonable assumption for the purposes of this near-term analysis (i.e., use of this assumption would be sufficient to characterize the general nature of effects that may be expected through 2030 due to climate change). The analysis is not intended to provide the full range of possible outcomes that could occur under the various climate change scenarios, but rather to encompass a reasonable range of effects. In the absence of scientific consensus on a quantifiable change in precipitation, the assumption of no change avoids speculation as to whether precipitation would decrease, increase, or occur at the same level, or whether it would occur on fewer days but at more intense levels.

Preliminary results from the WSFM confirmed that a shift in the timing of runoff from late winter months to early winter months could occur between 2000 and 2025, and inflow to all three of the SFPUC's Sierra reservoirs shows an average shift in runoff of about 7 percent. For the 48-year period, about 7 percent of the runoff shifted from the April–July period to the November–March period. In dry years, the runoff volume is smaller, and 8.5 percent shifted, corresponding to a volume of about 35,000 acre-feet out of 410,000 acre-feet as an average runoff volume for that year type. For normal years, 7 percent shifted, corresponding to a volume of about 50,000 acre-feet out of 677,000 acre-feet as an average runoff volume. For wet years, 6 percent shifted, corresponding to a volume of about 70,000 acre-feet out of 1,410,000 acre-feet. **Figure 14.11-1** graphically depicts the shift in the volume and timing of runoff that would be expected to occur by 2025 compared to historical conditions based on a 1.5 °C increase in temperature.

The capacity of Hetch Hetchy Reservoir is 360,000 acre-feet, and in normal and wet years over 700,000 acre-feet of water flows into the reservoir, resulting in large spills/releases to the Tuolumne River. Modest amounts of spill occur even in dry years. The WSFM results indicate that a shift in the timing of runoff volumes ranging from 35,000 to 70,000 acre-feet could occur by 2025 due to global warming. These predicted changes are well within the range of current and



Note: Zero represents average historical conditions from 1948 to 1995.

SFPUC Water System Improvement Program ▪ 203287

SOURCE: SFPUC, 2008.

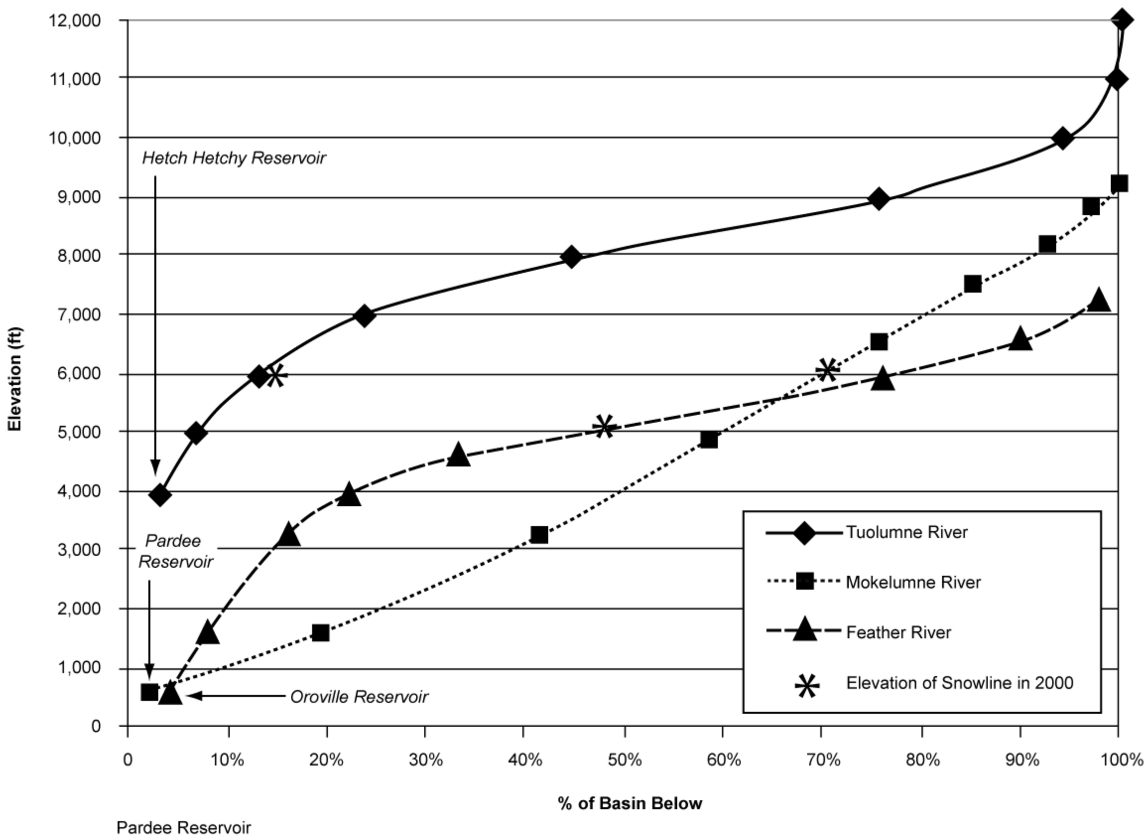
Figure 14.11-1
Modeled Shift in Runoff to Hetch Hetchy Reservoir
Comparing Historical Patterns with a Global Warming Scenario
of 1.5 °C Increase in Temperature

historical variability in annual runoff patterns. Year-to-year historical variability has shown much larger shifts between early and late winter runoff than the 2025–2030 global warming effect projected by the WSFM. Therefore, while global warming is projected to result in changes in runoff patterns in the Hetch Hetchy watershed, the SFPUC operators have determined that the magnitude of the predicted near-term changes is within the range of current/historical runoff patterns, and therefore it is not expected that substantial changes in SFPUC management practices or operations would be required through 2030. In dry years, if runoff ends earlier than in normal or wet years, the SFPUC has established operational procedures to minimize spills or discretionary power releases. A shift in the timing of runoff volumes (ranging from 35,000 to 70,000 acre-feet) to earlier in the season could cause releases/spills from the reservoir to cease a few days earlier each year. For current Hetch Hetchy Reservoir operations, the period when spills cease typically ranges from June 1 to August 15 depending on the hydrologic conditions of any given year. Under global warming conditions in the 2025–2030 timeframe, any change in the timing of when spills from Hetch Hetchy Reservoir cease would be minor compared to current/historical year-to-year variability. For these reasons, the SFPUC operators have determined that the change in runoff timing due to near-term global warming is not expected to cause substantial operational changes in the SFPUC's water supply system or its reliability.

The critical factor behind the relatively small shift in runoff timing and volume due to the predicted 1.5 °C warming at Hetch Hetchy Reservoir is the high elevation of the Hetch Hetchy watershed. The higher the elevation of a snow-covered basin, the greater the warming needed to change a large fraction of the snow-covered area and alter runoff patterns significantly.

Figure 5.7-5 in the Draft PEIR (Vol. 3, Chapter 5, p. 5.7-95) depicts the estimated decrease in snowpack in the Hetch Hetchy watershed due to predicted temperature increases by 2030 associated with global climate change.

Thus, the expected near-term climate change effects on the SFPUC regional system are different from those predicted for other California water supply and hydroelectric systems with reservoirs at much lower elevations. For example, EBMUD's Mokelumne River watershed and the SWP's Feather River watershed contain much lower proportions of their overall drainage basin as high-elevation snowpack compared to the Tuolumne River watershed. As shown in **Figure 14.11-2**, the overall basin elevation and the shape (steepness) of the area-elevation curve are indicative of a system's sensitivity to temperature change. The Feather River basin, for example, is sensitive to temperature change because its area-elevation curve is very flat, and for modest temperature changes, large areas of the basin could shift from snow-covered to rain-influenced lands.



SFPUC Water System Improvement Program ▪ 203287

SOURCE: SFPUC, 2008.

Figure 14.11-2
Relationship between Area and Elevation for the Tuolumne, Mokelumne, and Feather River Basins

Reservoirs at higher elevations, such as Hetch Hetchy, are less likely to be affected by increased air temperatures from global warming in the next 25 to 30 years than those at lower elevations in terms of reservoir water temperatures and stream flow releases. A shift in the timing of runoff would not likely cause a substantial change in the magnitude or schedule of the minimum stream flow releases from reservoirs at higher elevations, since these releases are routinely made from the bottom of the reservoir (i.e., below the upper layer of water in the reservoir that is affected by air temperature). If summer air temperatures become significantly higher with global warming, streams may warm more rapidly than under historical conditions; however, air temperature is dynamic and highly variable, and thermal refuges such as cool, deep pools exist in most stream reaches.

In conclusion, the preliminary WSFM results indicate that the near-term effects of climate change through 2030 are not expected to affect the current water supply planning or operations of the SFPUC regional water system.

Since the planning horizon for the WSIP is 2030, the results of the preliminary WSFM modeling are adequate for the purposes of the PEIR environmental analysis. A description of the SFPUC's long-term planning with respect to climate change is provided in Section 14.11.5, below, for informational purposes. Further detail on the effects of climate change as they relate to the proposed WSIP is presented below using the results of the WSFM modeling.

It should be noted that the current state of atmospheric science and global circulation models is not yet advanced enough to provide specific information on phenomena such as changes in total precipitation, seasonal precipitation allocation, or the more frequent or more intense droughts or larger storm events that some scientists believe may occur. Thus, at this time, it would be speculative to predict the magnitude and characteristics such events and attempt to analyze them with operational planning models. The SFPUC now uses a design drought in its operational planning models that is longer and more intense than any drought on record, and is thereby planning for the more intense droughts predicted to occur under some climate change scenarios using prudent judgment and the best available scientific information.

Qualitative Assessment of WSIP Impacts with Consideration of Climate Change Effects

In response to the numerous comments on the Draft PEIR related to climate change, this master response presents a qualitative assessment of potential WSIP impacts in the context of potential climate change effects in order to confirm the impact analysis of proposed WSIP water supply and system operations presented in the Draft PEIR (Vol. 3, Chapter 5).

In the 2005 *State Water Project Delivery Reliability Report*, the DWR stated:

> Until the impacts of climate change on precipitation and runoff patterns in California are better quantified, future weather patterns are usually assumed to be similar to those of the past, especially where there is a significant historical rainfall record.

Consistent with this statement, the impact analysis of the WSIP water supply and system operations presented in Chapter 5 of the Draft PEIR is largely based on results obtained from the Hetch Hetchy/Local Simulation Model (HH/LSM), which simulates system operations over an 82-year period of historical hydrology (from 1920 to 2002). Although there is inherent uncertainty regarding whether historical hydrology will be repeated in the future—especially given the evolving information on the potential effects of global climate change—the use of historical data over 82 years provides a wide enough range of inter-annual variation to address the climate change effects expected by 2030. The HH/LSM represents the best available tool for depicting overall regional system operations and predicting potential future effects on resources downstream of SFPUC water system facilities. The validity of this methodology to account for the future effects of climate change through 2030 was corroborated by the results of the WSFM modeling described above, which indicated that, independent of WSIP implementation, the existing SFPUC system operations and management practices provide adequate flexibility to accommodate the projected effects of climate change through the WSIP planning year of 2030.

Nevertheless, in response to comments received on the Draft PEIR, a qualitative analysis was conducted to determine how climate change might affect the environmental impacts of the WSIP identified in the Draft PEIR. The qualitative assessment was conducted by first reviewing the key findings from the scientific literature (summarized in Section 14.11.2, above) and assessing the applicability of each finding to the SFPUC regional water system. The qualitative analysis then reexamined the impacts of the WSIP assuming that a certain climate change scenario would occur between now and 2030 using the findings from the WSFM modeling described above. The qualitative analysis was based on an understanding of regional system operations and operating constraints combined with an understanding of the changes in system operations that would result from WSIP implementation as identified through the HH/LSM.

Table 14.11-3 lists the key findings from the literature review on climate change variables and describes how each variable relates to the HH/LSM assumptions and how those assumptions could be adjusted to account for climate change. The table indicates that, with the exception of the shift in the seasonal timing of runoff to the Hetch Hetchy system reservoirs and Don Pedro Reservoir, no other adjustments to the assumptions used in the HH/LSM or the Draft PEIR impact analysis would be required, either because any revised assumption would be too speculative at this time or because the existing operational protocols and planning process include adequate flexibility to account for expected climate change effects through 2030.

Methods and Assumptions for Qualitative Assessment

This qualitative analysis was based on a reasonable prediction of climate change effects in the next few decades as they pertain to the SFPUC regional water system. Although it does not encompass the wide range of climate change projections and variability described in the scientific literature, this approach provides a reasonable basis for the purposes of the PEIR for estimating the nature and magnitude of the environmental impacts of the WSIP while accounting for climate change through 2030. This qualitative assessment assumed global climate change would increase air temperatures in California by an average of 1.5 °C by 2030, but that no change in average annual precipitation would occur. These assumptions are generally consistent with the results of

TABLE 14.11-3
CLIMATE CHANGE VARIABLES AND THE SFPUC REGIONAL WATER SYSTEM

Climate Change Variable	Existing HH/LSM Modeling Assumptions That Could Be Affected	Adjusted Assumptions to Account for Climate Change Variable for the Qualitative Assessment
1. Sierra snowpack will likely decrease due to an increase in snowline elevation, resulting in increased amount of precipitation falling as rain rather than snow and an earlier snowmelt. Since there is no clear trend for precipitation changes in California, this variable assumes no change in total average annual precipitation.	• Unimpaired runoff to Hetch Hetchy system reservoirs and to Don Pedro Reservoir • Tuolumne River entitlements among CCSF, TID, and MID • Forecasted runoff procedures and operation protocols	Shift in monthly distribution of inflow within a year: • Increased inflow to reservoirs in fall, winter, and spring (approximately October to May) • Decreased inflow to reservoirs in late spring and summer (approximately June to September)
2. Rivers and streams fed by mountain watersheds are expected to exhibit an increase in stream flow in fall, winter, and spring, and a decrease in late spring and summer.	Instream flow requirements are based on hydrology and fishery needs that establish releases from: • Lake Lloyd (Cherry Reservoir) • Lake Eleanor • Hetch Hetchy Reservoir • Don Pedro Reservoir	No change in current mandated minimum releases for fisheries from affected reservoirs. At this time, it would be speculative to assume that future resource objectives and flow requirements would be different from the existing condition.
3. Warmer air temperatures are expected to increase water temperature in reservoirs, potentially increasing temperature of releases to streams; instream water temperatures may increase.	Instream flow requirements are based on hydrology and fishery needs that establish releases from: • Lake Lloyd (Cherry Reservoir) • Lake Eleanor • Hetch Hetchy Reservoir • Don Pedro Reservoir	No change in current mandated minimum releases for fisheries from affected reservoirs (see above). There would be negligible changes in SFPUC reservoirs during all but the most extreme droughts due to the size of the coldwater pool in the reservoirs and minimal changes in reservoir operations.
4. Conflicts among water supply, hydropower, and flood control in reservoir operations are expected.	Reservoir operations	No change in protocols for SFPUC reservoir operations. Protocols would continue to prioritize water supply. No change in protocols for Don Pedro Reservoir operations by TID and MID.
5. Warmer temperatures could cause increases in water demand in both agricultural and municipal regions.	• 300 mgd, 2030 purchase request • Availability of water in Don Pedro Reservoir	No change in delivery assumptions for the SFPUC. While demand of SFPUC customers may increase, delivery is limited to the contractual amount. Agricultural demand of TID and MID may evolve, since warmer conditions could lead to increased demand for irrigation. However, other factors such as land use conversion and agricultural market forces may have a larger effect on demand for irrigation than climate change, making alternative demands too speculative to predict.
6. Sea level rise will affect coastal areas and estuaries.	Not applicable	Not applicable
7. Increased risk for more extreme weather and climate events (i.e., more intense precipitation and drought events) is likely.	• Historical and design drought sequences included in the HH/LSM to establish system firm yield and rationing needs • Flood control studies have been performed for regulatory requirements	No change in existing SFPUC operation protocols, which were developed to address a wide range of conditions, including extreme weather events. The SFPUC planning process already incorporates a more extreme drought scenario than any from historical hydrology (i.e., the design drought). No change in SFPUC operations related to flooding because the SFPUC facilities have no flood control functions. Assume no change for TID and MID flood control operations for Don Pedro Reservoir.

the literature review presented above in Section 14.11.2, with the understanding that an increase of 1.5 °C by 2030 may be on the high side (and is therefore a conservative assumption with respect to determining potential impacts). The following analysis considers the effects of this temperature increase on hydrology within the SFPUC regional water system based on the WSFM results, and compares the environmental effects that would stem from this hydrologic change with the impact analysis presented in the Draft PEIR.

The WSFM, described above, was used to estimate inflow into reservoirs on the Tuolumne River under this climate change scenario (an average of 1.5 °C warming by 2030). As noted earlier, the primary effect of the climate-change-induced temperature rise would be to increase precipitation falling as rain, decrease precipitation falling as snow, and cause snowmelt to occur earlier in the season. Using the numerical reservoir inflow estimates provided by the WSFM, the qualitative analysis was performed by tracking the movement of water through the SFPUC regional water system, noting where reservoir storage and releases to rivers would increase or decrease due to climate change effects compared to the analysis presented in Chapter 5 of the Draft PEIR. The general scale of increases and decreases was also noted. However, due to the broad assumptions used in the analysis regarding climate change effects, no numerical values for increases or decreases of reservoir storage and releases are presented, since they would give a misleading impression of the precision of this assessment.

The following assessment is organized by watersheds and reflects a three-step process. First, it summarizes the environmental impacts of the WSIP compared to existing conditions as presented in Chapter 5 of the Draft PEIR. It then describes how climate change could affect reservoir storage and releases by 2030. Finally, the impacts of the WSIP presented in the Draft PEIR are discussed in light of possible climate change effects.

Upper Tuolumne River Watershed

Under the existing condition, only the required minimum stream flow releases are made to the Tuolumne River from Hetch Hetchy Reservoir for most months of the year. In the late spring, snowmelt runoff fills the reservoir and releases in excess of the minimum required are made to the river (typically in May and June). With the WSIP in 2030, the SFPUC would draw down Hetch Hetchy Reservoir farther prior to the snowmelt period than it does under the existing condition in order to serve the increased purchase requests, thus lowering the water level in the reservoir. As a result, a greater proportion of the snowmelt runoff would be needed to refill the reservoir, and spring stream flow releases in excess of the minimum required would be delayed by a few to several days, and the total volume of releases over that time period would be reduced. Terrestrial biological resources in the Poopenaut Valley would be adversely affected by the delay and reduced volume of the spring release (see Draft PEIR, Impact 5.3.7-2, Vol. 3, Chapter 5, pp. 5.3.7-21 and 5.3.7-22).

With climate change effects in 2030, snowmelt is expected to occur earlier in the year. Assuming no change in annual precipitation, the total volume of the spring release would not be altered but its seasonal timing would be. Hetch Hetchy Reservoir would have lower water levels due to serving the increased purchase requests under the WSIP, and it would fill with snowmelt runoff earlier in the year due to climate change; thus, releases to the river in excess of the minimum would begin earlier. Thus, it is possible that the delay in spring releases to the river (by a few to several days) that was identified as a consequence of the WSIP might not occur when the combined effects of climate change and the WSIP are considered together. If this were to happen, terrestrial biological resources in the Poopenaut Valley would not be subjected to a delay in spring releases, and the Poopenaut Valley would probably experience the greatest release several weeks earlier than under the existing condition. When climate change is considered, the effect on biological resources in the Poopenaut Valley would be the same as, or possibly less than, that described in Draft PEIR Impact 5.3.7-2.

The WSIP and climate change combined could still adversely affect terrestrial biological resources if peak flows were reduced compared to the existing condition and opportunities for groundwater recharge in the Poopenaut Valley were reduced. However, as identified in the Draft PEIR for the impacts of the WSIP, the combined effects of the WSIP and climate change on these resources could be reduced through the operational strategies described in Mitigation Measure 5.3.7-2 (Vol. 4, Chapter 6, pp. 6-49 and 6-50). These strategies involve shaping the releases from Hetch Hetchy Reservoir to maximize opportunities for inundation of the valley in an effort to achieve the necessary groundwater recharge, and, as specified in the measure, can be modified as needed to achieve the mitigating effect of sustaining the existing meadow communities.

The Draft PEIR determined that the WSIP would have a less-than-significant effect on whitewater river recreation in the upper Tuolumne River watershed (Impact 5.3.8-2, Vol. 3, Chapter 5, pp. 5.3.8-27 to 5.3.8-32). With the WSIP in 2030, the delay in spring releases could slightly reduce the number of days when flow in the river is suitable for rafting in some years; however, when climate change effects are also considered, the earlier snowmelt could cause releases to the river to begin earlier, possibly offsetting the effects of the WSIP. When climate change is considered, the effect on whitewater river recreation would be the same as, or possibly less than, that described in Draft PEIR Impact 5.3.8-2.

Lower Tuolumne River Watershed

Under the existing condition, only the minimum required stream flow releases are made to the Tuolumne River from La Grange Dam in most months. During the summer and fall, Don Pedro Reservoir is drawn down to meet water supply needs. One of the goals of dam operators is to fill the reservoir in the following winter and spring with rainfall and snowmelt runoff by the end of the snowmelt period. The operators' ability to meet this goal is constrained by the requirement that space must be retained in Don Pedro Reservoir to accommodate flood flows and reduce the risk of downstream flooding. Water in excess of the minimum required is typically released from La Grange Dam to the Tuolumne River in a number of pulses. During large winter storms, operators may have to release water to maintain the flood reservation in the reservoir, creating a pulse release of a few days to a few weeks. The need to maintain the flood reservation declines in the late spring, and the operators use snowmelt runoff to fill Don Pedro Reservoir. If more water is available than is needed to fill the reservoir, releases in excess of the minimum required are made to the Tuolumne River below La Grange Dam. In many years, the release from the reservoir during the snowmelt period is the largest of the pulse releases.

With the WSIP in 2030, increased purchase requests in the SFPUC service area would cause Don Pedro Reservoir to be drawn down farther prior to the snowmelt period than it is under the existing condition. As a result, a greater proportion of reservoir inflow from winter rainfall and snowmelt runoff would be needed to fill the reservoir. Because the reservoir would be drawn down farther than under the existing condition, runoff from winter storms could be more easily contained in the reservoir without encroaching on the flood reservation. As a result, some of the wintertime pulse releases to the Tuolumne River from La Grange Dam that occur under the existing condition would be eliminated or reduced in volume with the WSIP. The increased reservoir drawdown with the WSIP would also delay (by several days or weeks) the larger pulse release in the snowmelt period and reduce its total volume. The delay and reduction in the spring pulse release would have adverse effects on anadromous fish in the Tuolumne River and biological resources along the river below La Grange Dam (see Draft PEIR, Impacts 5.3.6-4 and 5.3.7-6, Vol. 3, Chapter 5, pp. 5.3.6-28 to 5.3.6-32 and pp. 5.3.7-25 to 5.3.7-26).

With climate change effects in 2030, rainfall and snowmelt runoff would enter Don Pedro Reservoir earlier in the season than it does under the existing condition. As the dam operators would be unable to accommodate the earlier wintertime runoff in the reservoir because of the flood control reservation, they would have to release water in excess of the minimum required to the Tuolumne River. The earlier runoff could offset the effects of the WSIP on reservoir water levels. When the effects of WSIP and climate change are considered together, the wintertime pulse releases could occur much as they do under the existing condition.

Based on the assumptions and results from the WSFM analysis, climate change is not expected to have much effect on the total average annual volume of water released from La Grange Dam by 2030.[3] As noted above, the WSIP would delay the spring pulse release by several days or weeks compared to the existing condition. The WSIP and climate change together would delay the spring release and also reduce its volume because a higher proportion of inflow to the reservoir would be in the winter and be released to the stream at that time.

The adverse effects of the WSIP on anadromous fish would be attributable to the delay and reduction in volume of the spring release from La Grange Dam and would not be much affected by the WSIP-caused reductions in wintertime pulse releases. When the WSIP and climate change are considered together, the reduction in spring release would be greater than with the WSIP alone, and therefore the effects on anadromous fish could be greater. If increases in spring water temperatures due to climate change are also considered, the effects on anadromous fish could be even more severe. Implementation of Mitigation Measure 5.3.6-4a, Avoidance of Flow Changes by Reducing Demand for Don Pedro Reservoir Water, or Mitigation Measure 5.3.6-4b, Fishery Habitat Enhancement (Vol. 4, Chapter 6, pp. 6-48 and 6-49), would avoid the impacts attributable

[3] As described in Section 14.11.2, above, the DWR reported that when some climate change scenarios are applied to Don Pedro Reservoir, there would be a reduction in Tuolumne River annual inflow to the reservoir as well as a shift in the timing of the inflow by 2050. The results of this qualitative assessment corroborate the DWR prediction that climate change will cause a shift in the timing of runoff; however, unlike the DWR results, due to differences in the assumptions used in the climate change scenarios, this qualitative assessment assumes the total annual inflow to Don Pedro Reservoir would remain the same.

to the WSIP. Since implementation of this measure would fully mitigate the adverse effects of the WSIP, the effects of climate change on anadromous fish would be independent of the WSIP.

The identified adverse effects of the WSIP on terrestrial biological resources along the Tuolumne River below La Grange Dam are primarily attributable to the reduction in average peak flows and total flows in the river. Thus, the effects on biological resources due to the WSIP and climate change combined could be essentially the same as those due to the WSIP alone (as described in Draft PEIR Impact 5.3.7-6), since climate change effects are not expected to result in much change in the total volume of winter and spring releases from La Grange Dam based on the assumptions used in the WSFM. Implementation of Mitigation Measure 5.3.6-4a (Vol. 4, Chapter 6, p. 6-48) would avoid the impacts attributable to the WSIP.

The shift in the timing of snowmelt and runoff in the Tuolumne River watershed due to climate change is not expected to affect SFPUC system deliveries to the San Joaquin Pipelines and Bay Area customers.

Alameda Creek Watershed

Climate change effects by 2030 are not expected to change the total volume of water the SFPUC diverts from the Tuolumne River. Since this analysis assumed no change in total annual precipitation, and since the Alameda Creek watershed is at a much lower elevation than the Sierra watersheds and is not affected by snowmelt, there would be no change in local hydrology and runoff patterns due to increasing snowline elevations. While some studies indicate that climate change could result in more extreme weather or climate events, there are insufficient data to make any assumptions regarding how these extreme weather events might affect a specific watershed or operation of local SFPUC facilities. None of the SFPUC reservoirs in the Alameda Creek watershed currently provide or are proposed to provide flood control functions under the WSIP, so any operational changes attributable to extreme flooding events due to climate change would occur independent of the WSIP. Similarly, SFPUC operational practices during drought events would remain the same, regardless of whether the WSIP is implemented, and the SFPUC would continue to meet all legal requirements for the protection of fish and other wildlife habitat. Consequently, the 2030 operations of water supply facilities in the Alameda Creek watershed with the WSIP and with the WSIP and climate change considered together would likely be the same. Therefore, the environmental effects of SFPUC water system operations in the Alameda Creek watershed with the WSIP and with the WSIP and climate change combined would also likely be the same, as described in the Draft PEIR (Vol. 3, Chapter 5, Section 5.4).

Peninsula Watershed

As stated above, climate change would not affect the total volume of water the SFPUC would divert from the Tuolumne River by 2030. Since this analysis assumed no change in total annual precipitation, and since the San Mateo Creek and Pilarcitos Creek watersheds are at much lower elevations than the Sierra watersheds and are not affected by snowmelt, there would be no change in local hydrology and runoff patterns due to increasing snowline elevations. While some studies indicate that climate change could result in more extreme weather or climate events, there are insufficient data to make any assumptions regarding how these extreme weather events might affect a specific watershed or operation of local SFPUC facilities. None of the SFPUC reservoirs in the Peninsula watershed currently provide or are proposed to provide flood control functions under the WSIP,[4] so any operational changes attributable to extreme flooding events due to climate change would occur independent of the WSIP. Similarly, SFPUC operational practices during drought events would remain the same, regardless of whether the WSIP is implemented, and the SFPUC would continue to meet all legal requirements for the protection of fish and other wildlife habitat. Consequently, the 2030 operations of water supply facilities in the Peninsula watershed with the WSIP and with the WSIP and climate change considered together would likely be the same. Therefore, the environmental effects of SFPUC water system operations in the Peninsula watershed with the WSIP and with the WSIP and climate change combined would also likely be the same, as described in the Draft PEIR (Vol. 3, Chapter 5, Section 5.5).

Summary of Qualitative Assessment of WSIP Impacts and Climate Change

The assessment demonstrates that, in all cases, the impacts of the WSIP through 2030 on resources in the Tuolumne River, Alameda Creek, and Peninsula watersheds identified in the Draft PEIR remain valid when climate change effects are also considered. In most cases, when WSIP effects are considered in combination with a climate change scenario, the resulting impacts are either comparable to those described in the Draft PEIR or possibly less severe due to an offsetting effect of the timing of snowmelt compared to the WSIP-induced changes in reservoir storage or releases. In all cases, mitigation measures identified in the Draft PEIR would apply whether or not climate change is considered. Thus, the impact analysis of WSIP water supply and system operations presented in Chapter 5 of the Draft PEIR provides a reasonable, and sometimes conservative, assessment of environmental effects that accounts for potential climate change through the SFPUC planning horizon of 2030.

14.11.5 SFPUC's Actions to Address Climate Change

Comment Summary

This section of this master response responds to all or part of the following comments:

F_NPS-YOS-01
S_RWQCBSF-16
L_ACFCWCD-05
L_MID-TID1-11
L_MID-TID1-26
L_Tuol1-07
SI_ACT-04
SI_ACT-05
SI_CAC2-04
SI_CNPS-EB1-06
SI_CRS-04
SI_SPUR-04
SI_SPUR-05
SI_SPUR-07
SI_TRT7-09
SI_TRT8-06
SI_TRT-CWA-SierraC-20
SI_TRT-CWA-SierraC-22
SI_TRT-CWA-SierraC-34
SI_TRT-CWA-SierraC-70
SI_TRT-CWA-SierraC-77
SI_TRT-CWA-SierraC-78
C_Chode-01
C_Clark1-04
C_Clark1-07
C_Clark1-08
C_Clark2-03
C_Gelma-02
C_Hasso-04
C_Lee-04
C_MartiM-04
C_Mater-01
C_Mijac-01

[4] The Lower Crystal Springs Dam Improvements project (PN-4) would include improvements to protect downstream areas from the probable maximum flood; however, the Lower Crystal Springs Dam is generally not operated as a flood control facility. Crystal Springs Reservoir reduces peak flow in San Mateo Creek most of the time, and the SFPUC operates the reservoir to allow space for floodwaters when major storms are expected.

SI_CWA-01	SI_TRT-CWA-SierraC-130	C_Owen-01
SI_GreenP-04	SI_TRT-CWA-SierraC-133	C_Raffa-08
SI_PacInst-18	SI_TRT-CWA-SierraC-135	C_Unreadable1-01
SI_SierraC2-03	SI_TRT-CWA-SierraC-159	C_Willi-04
SI_SierraC3-03	SI_TRT-CWA-SierraC-168	
SI_SierraC7-06	C_Bail-02	

Summary of Issues Raised by Commenters

- Proactive climate change management strategies should be the first priority.

Response

SFPUC Water Supply Management Approach to Climate Change

As part of its ongoing operations and management of the regional water system, the SFPUC is addressing climate change with respect to both the near-term and long-term implications for the system. While some short-term trends over the next 20 to 25 years are discernible to a degree, the uncertainty associated with the range of climate conditions that could develop late in the 21st century from the continued accumulation of greenhouse gases in the atmosphere presents a greater challenge to water supply management.

The SFPUC is now taking steps to evaluate its water supply planning with respect to climate change effects. In addition, the SFPUC is working at a broader level to organize the utility community around climate change issues, to advocate for improved climate science, and to help develop better decision support tools that can address uncertainties related to long-term climate change effects.

Planning for Long-Term Climate Change Effects

The SFPUC is investigating the effects of global warming on the Tuolumne River basin water supply at time scales that extend well beyond the planning horizon for the WSIP and the PEIR. At these longer time scales (such as by 2100), a potential 6 °C change would have a range of effects that are more significant than the effects estimated to occur by 2025 or 2030. Physical processes subject to long-term climate change effects, such as evapotranspiration (ET), the lack of permanent snow cover, and midwinter melting, could change runoff timing in a significant way and even alter runoff volumes due to increased ET losses.

The SFPUC has begun collaborative research with TID (as described above in Section 14.11.3) and plans to assess the longer time-scale changes with a physical process model that TID has had calibrated to the Tuolumne River basin. The TID model is an explicit physics-based simulation model that incorporates the physical processes that occur during the accumulation and ablation (loss) of a watershed’s snowpack and that produce runoff, and is thus better suited to examining the large changes in temperature and other variables that could occur between 2025 and 2100. The TID model analyzes ET and snowpack accumulation by allocating precipitation (as rain or snow) on 800 sub-watersheds based on elevation and other factors, and then performs heat budget calculations for the snowpack. It is expected that the model will depict representative effects of long-term climate change on runoff timing and volume. The TID model output can then be used as the input to an operations or planning model to investigate changes in operations, firm yield, and other issues of interest for the period from 2050 to 2100 and beyond. Operations models using these new inflow time series can be changed to assess ways of adapting current project operations to compensate for the expected larger changes in runoff timing and volume in this longer timeframe. As regional downscaling of global circulation models begins to provide better projections of climate change effects in the Tuolumne River basin, the TID model will be used to refine the analysis of changes in temperature and precipitation on runoff timing and quantity.

SFPUC Climate Change Activities

In August 2006, the SFPUC Commission held a special public hearing to begin outlining the local and regional steps needed to prepare the utility and its customers for the expected impacts of global climate change on the SFPUC's water, wastewater, and power services. In January and February 2007, the SFPUC convened the Water Utility Climate Change Summit, which was attended by managers and board members from 30 water utilities from eight states; representatives from 17 regional, state, and federal agencies; leaders from non-governmental organizations and business communities; and members of the public. The summit was designed for the utility community with a focus on adaptation to climate change ("adaptation" is the term used to describe efforts to respond to the effects of climate change rather than to address the causes). For two days, top experts from around the country discussed the implications of climate change with respect to water supply, operations, and sea level rise, as well as the state of climate science in determining the nature of climate change impacts. The second day was focused on brainstorming action items, such as enhancing technical tools to help better predict climate change impacts, increasing funding for data gathering related to snowpack, streamflow, and related issues, and developing a collective voice for the water utility community.

Eight of the attending utilities have since formed a coalition, called the Water Utility Climate Alliance, to build on the recommendations that emerged from the summit. Chaired by the SFPUC, the alliance also includes Seattle Public Utilities, Metropolitan Water District of Southern California, New York City Department of Environmental Protection, San Diego County Water Authority, Southern Nevada Water Authority, Portland Water Bureau, and Denver Water. Combined, these utilities deliver water to over 36 million Americans. Thus far, the focus has been on addressing adaptation concerns while also enhancing mitigation programs. The group has identified the following two priorities: (1) lobbying for more funding for climate research, and greater focus on regional climate forecasting, in order to improve the ability to predict the effects of climate change on water supply and infrastructure; and (2) adapting decision support tools that might assist utilities in developing frameworks for long-term planning in the face of the extensive uncertainties regarding the scope of climate change effects. Utilities in the alliance are also learning from one another in developing adaptation programs, gathering information on federal initiatives such as the Climate Change Science Program (and commenting in an integrated fashion on that program), educating each other about efforts to downscale global circulation models to improve forecasting at a regional level, and tracking federal legislation. Guest speakers representing the Western Water Assessment in Colorado, National Center for Atmospheric Research, Association of Metropolitan Water Agencies, American Water Works Association

Research Foundation, and U.S. Environmental Protection Agency have participated in the activities of the Water Utility Climate Alliance.

In addition to these efforts, the SFPUC participated in the American Water Works Association Research Foundation (AwwaRF) Climate Change Research Needs Workshop on January 8 and 9, 2008. The SFPUC's water quality manager, Andrew DeGraca, served as chair of the workshop and is chairing a new strategic initiative at AwwaRF focused on improving climate change research to assist water utility planning efforts.

Other activities at the SFPUC include: (1) in May 2007, SFPUC General Manager Susan Leal represented Mayor Gavin Newsom at the international C40 Large Cities Climate Summit hosted by Mayor Michael Bloomberg in New York; and (2) during 2007, SFPUC staff presented their climate change-related work on panels at the Association of Metropolitan Water Agencies fall conference, the Colorado Water Congress annual meeting, the annual California Water Policy Conference of Public Officials for Water and Environmental Reform (POWER), and at a workshop on Climate Change, Urban Drainage, and Adaptation sponsored by Seattle Public Utilities.

Reducing the SFPUC's Carbon Footprint

In addition to the steps the CCSF and the SFPUC are taking to reduce GHG emissions described in the Draft PEIR (Vol. 2, Chapter 4, pp. 4.9-16 to 4.9-20), the SFPUC is taking other actions as well. The SFPUC is developing a comprehensive Sustainability Plan, which will incorporate consideration of the agency's carbon footprint and adaptation of system operations to adjust for climate change effects.

As a clean power generator whose water supply is largely gravity fed, the SFPUC currently has a small carbon footprint compared to that of most utility districts. Nonetheless, the SFPUC Power Enterprise manages a number of programs that develop renewable energy facilities and energy efficiency programs for the CCSF.

Two key programs managed by the Power Enterprise—renewable energy generation and energy efficiency—are helping the SFPUC contribute to San Francisco's effort to reduce its carbon footprint. By the end of 2007, a total of 2 megawatts of peak solar capacity had been installed on city facilities (including Moscone Center, San Francisco International Airport, the SFPUC's City Distribution Division, and other locations), generating an estimated 2.5 million kilowatt-hours of electricity per year, or approximately 1,000 tons of carbon-dioxide-equivalent[5] per year.

On the energy efficiency front, the SFPUC has an aggressive program in several city departments; projects include lighting and HVAC (heating, ventilation, and air conditioning) upgrades at San Francisco General Hospital, and conversion of the city's traffic signals to LED technology. The resulting energy savings of these projects is an estimated 24 million kilowatt-

5 Carbon dioxide equivalency is a quantity that describes, for a given mixture and amount of greenhouse gas, the amount of carbon dioxide that would have the same global warming potential when measured over a specified timescale (generally 100 years).

hours of electricity and 300,000 therms of natural gas per year, a GHG emissions reduction of approximately 11,000 tons of carbon-dioxide-equivalent per year.

The SFPUC recycles a substantial amount of potential GHG at its wastewater treatment plants. Methane gas produced in the anaerobic digesters at both wastewater treatment plants (Southeast and Oceanside) is used to fuel the engine generators and boilers, which in turn produce the energy used in plant operations. The engine generators produce electrical power, and the engine generators and boilers both produce hot water to heat the digesters and run the plant's HVAC system. Without this system, this methane gas—a more damaging GHG than carbon dioxide—would be released into the atmosphere.

The CCSF's newly adopted Green Building Ordinance (Chapter 7 of the Environment Code) requires city construction projects over 5,000 square feet in size to be built to Leadership in Energy and Environmental Design (LEED) Silver standards and to be certified by the U.S. Green Building Council. The San Francisco Municipal Green Building Program is mandatory for most aboveground buildings, including those proposed under the WSIP, regardless of whether or not they are used to house facilities or people. The San Francisco Department of the Environment has also been working with the SFPUC and other CCSF departments on certain municipal projects that are not required to obtain LEED Silver Certification (such as pipelines) to try to ensure these projects are constructed with recycled, environmentally friendly building materials that are sourced locally to minimize transportation fuel. City officials estimate this ordinance could reduce carbon dioxide emissions in the city by 60,000 tons and save 220,000 megawatt-hours of power by 2012.

Finally, the CCSF is a member of the California Climate Action Registry and became the first city to certify its emissions with the Registry in 2006. The SFPUC's emissions were certified as part of the overall city/county certification process using the Registry's Power Utility Protocol.

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15 Responses to Individual Comments

15.1 Federal Agencies

FEDERAL AGENCIES

FEDERAL AGENCIES THAT SUBMITTED COMMENTS ON THE DRAFT PEIR

Comment Letter Format	Comment Letter ID	Name of Commenter	Title	Organization/ Affiliation	Page
Email	F_NPS-GGNRA	Brian O'Neill	General Superintendent	National Park Service, Golden Gate National Recreation Area	15.1-1
Email	F_NPS-Yos	Michael Tollefson	Superintendent	National Park Service, Yosemite National Park	15.1-4
Mail	F_USBR	Richard J. Woodley	Regional Resources Manager	U.S. Department of the Interior, Bureau of Reclamation	15.1-6
Mail	F_USDAFS	Tom Quinn	Forest Supervisor	U.S. Department of Agriculture, Forest Service	15.1-8
Email	F_USFWS	G. Mendel Stewart	Manager	U.S. Department of the Interior, Fish and Wildlife Service, San Francisco Bay National Wildlife Refuge Complex	15.1-11

National Park Service, Golden Gate National Recreation Area, Brian O'Neill, General Superintendent, 11/06/07

F_NPS-GGNRA-01 The commenter requests that the reference to Cañada Road be deleted. In response to this comment, the Draft PEIR is revised as follows (Vol. 2, Chapter 4, p. 4.2-7, first paragraph):

> In 1969, the CCSF granted two easements over the vast majority of the Peninsula watershed to the Department of the Interior. The easements were granted to the federal government in order to obtain a change in the route of Interstate 280 (I-280) (and an increase in the federal share of costs) to a less environmentally damaging location further east of Crystal Springs Reservoir. The approximately 19,000-acre Scenic Easement covers the lands west of Crystal Springs and San Andreas Reservoirs. The approximately 4,000-acre Scenic and Recreation Easement applies to lands in the vicinity of I-280. ~~Cañada Road demarcates these easements: t~~The CS/SA Transmission project (PN-2), Lower Crystal Springs Dam project (PN-4), and the Pulgas Channel and sediment catch basin components of the Pulgas Balancing Reservoir project (PN-5) are within the Scenic Easement, while the Pulgas Balancing Reservoir itself is within the Scenic and Recreation Easement. The easements cover nearly all of the CCSF-owned Peninsula watershed lands and place restrictive covenants on use of the lands that are unrelated to the SFPUC's overall management of the land for utility purposes. The provisions of the easement include:

F_NPS-GGNRA-02 Due to an agreement established between the SFPUC and the GGNRA, the commenter requests that the GGNRA be considered a stakeholder agency during the planning phases for the subsequent WSIP projects. Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.3) for detailed discussion of the issues raised by this comment. The GGNRA's request to be consulted and notified has been added to Draft PEIR Table C.6 (Vol. 5, Appendix C, p. C-26) for consideration during the project-level CEQA review for the following projects: Crystal Springs/San Andreas Transmission Upgrade (PN-2), HTWTP Long-Term Improvements (PN-3), Lower Crystal Springs Dam Improvements (PN-4), and Pulgas Balancing Reservoir Rehabilitation (PN-5).

F_NPS-GGNRA-03 The commenter expresses concern regarding the potentially significant but mitigable impacts related to existing land uses, visitor access and experience, visual character, wetland and aquatic resources, historic resources, and traffic safety hazards, as well as the unavoidable significant impacts on sensitive biological and historic resources. Please refer to

Section 14.4, Master Response on PEIR Appropriate Level of Analysis (Vol. 7, Chapter 14, Section 14.4.2) for detailed discussion of the issues raised by this comment. This master response provides information on the appropriate level of detail of an impact analysis at the program level versus the project level. The Draft PEIR generally addresses the potential types of land use, visual/aesthetic, biological resource, historic resource, and recreation impacts identified by the commenter, and they are discussed on the following pages of the Draft PEIR:

Land Use: Impact 4.3-2 (Vol. 2, Chapter 4, p. 4.3-26) indicates that permanent displacement or long-term disruption of existing land uses would not be expected under any of the Peninsula projects, because these projects would not involve the acquisition of additional land, with the possible exception of the Crystal Springs/San Andreas Transmission Upgrade project (PN-2). In general, the lands that would be affected by WSIP projects are already owned by the City and County of San Francisco (CCSF) and are currently used for or designated for use as water infrastructure. Only those projects requiring the acquisition of non-CCSF-owned land would have the potential to cause permanent land use changes. The programmatic impact analysis in the Draft PEIR determined that a potentially significant land use impact could result from the Crystal Springs/San Andreas Transmission Upgrade project, but identifies this impact as potentially significant and unavoidable since facility locations have not yet been determined. As noted in the impact discussion, if it is determined during subsequent project development and project-level environmental review that land acquisition is required, this impact could be mitigated to a less-than-significant level by implementing facility siting studies (Mitigation Measure 4.3-2; Vol. 4, Chapter 6, p. 6-7), which may identify alternative sites and designs to avoid land use impacts.

Visual/Aesthetics: Impact 4.3-4 (Vol. 2, Chapter 4, p. 4.3-41 and Table 4.3-4, p. 4.3-34) identifies potentially significant permanent impacts on scenic vistas or visual character under all projects of concern to the commenter: Crystal Springs/San Andreas Transmission Upgrade (PN-2), HTWTP Long-Term Improvements (PN-3), Lower Crystal Springs Dam Improvements (PN-4), and Pulgas Balancing Reservoir Rehabilitation (PN-5). The Draft PEIR indicates that all of these projects, except for the HTWTP Long-Term Improvements, are located in the Peninsula Watershed Management Plan (WMP) boundary and therefore will be subject to WMP design guidelines. In addition, all four projects will be required to implement Draft PEIR mitigation measures addressing architectural design, landscaping plans, landscape screens, and tree removal (Measures 4.3-4a through 4.3-4d; Vol. 4, Chapter 6, p. 6-7) to reduce potential visual impacts to a less-than-significant level.

Biological Resources: Impact 4.6-1 (Vol. 2, Chapter 4, p. 4.6-50) identifies potentially significant impacts on wetlands and aquatic resources for three projects of concern to the commenter: Crystal Springs/San Andreas Transmission Upgrade (PN-2), Lower Crystal Springs Dam Improvements (PN-4), and Pulgas Balancing Reservoir Rehabilitation (PN-5). Implementation of SFPUC Construction Measure #8, which requires performance of a biological screening survey, will determine if sensitive wetland and aquatic resources are present; if such resources are present, Mitigation Measures 4.6-1a and 4.6-1b (Vol. 4, Chapter 6, p. 6-11) will be implemented as necessary to reduce identified impacts to a less-than-significant level.

Historic Resources: Impact 4.7-3 (Vol. 2, Chapter 4, p. 4.7-74) identifies potentially significant impacts on historic resources for two projects of concern to the commenter: Crystal Springs/San Andreas Transmission Upgrade (PN-2) and Lower Crystal Springs Dam Improvements (PN-4). Implementation of Mitigation Measures 4.7-3 and 4.7-4a through 4.7-4f (Vol. 2, Chapter 6, p. 6-26) could reduce potential impacts on historic resources to a less-than-significant level, but impacts associated with the Crystal Springs/San Andreas Transmission Upgrade project could remain significant after mitigation.

Recreation: Impact 4.12-1 (Vol. 2, Chapter 4, p. 4.12-25) identifies potentially significant temporary conflicts with established recreational uses during construction of the Crystal Springs/San Andreas Transmission Upgrade project (PN-2); however, implementation of SFPUC Construction Measures #1, #3, #5, and #6 (Neighborhood Notice, Air Quality, Traffic, and Noise) and Mitigation Measure 4.12-1 (Vol. 2, Chapter 4, p. 6-44; Coordination with Facility Managers) would reduce identified temporary conflicts to a less-than-significant level. SFPUC Construction Measures would also reduce potential impacts on recreational uses to a less-than-significant level for the Lower Crystal Springs Dam Improvements (PN-4) and Pulgas Balancing Reservoir Rehabilitation (PN-5) projects.

National Park Service, Yosemite National Park, Michael Tollefson, Superintendent, 10/15/07

F_NPS-YOS-01 The Draft PEIR (Vol. 3, Chapter 5, pp. 5.3.1-1 to 5.3.1-40) provides a comprehensive analysis of the WSIP's impacts on stream flow in the Tuolumne River and water levels in the SFPUC's reservoirs. The impacts of WSIP-induced changes in stream flow and reservoir water levels on the riverine ecosystem are described in Section 5.3.2 (Geomorphology), Section 5.3.3 (Water Quality), Section 5.3.6 (Fisheries), and Section 5.3.7 (Terrestrial Biological Resources). The analysis of WSIP impacts on stream flow was conducted using the SFPUC's Hetch Hetchy/Local Simulation Model (HH/LSM). The HH/LSM uses monthly stream flow monitoring data for the 82-year period from 1920 to 2002, which includes several multiple-year droughts and extremely dry years.

Please refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14) for detailed discussion of climate change effects, including a literature review on climate change effects on California water supplies and water management and a qualitative assessment of WSIP impacts with consideration of climate change effects.. Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14) for more information on the SFPUC's use of a design drought that is more severe than any droughts in the historical record.

F_NPS-YOS-02 The commenter expresses concern that the WSIP could make archaeological resources within Yosemite Park boundaries vulnerable to damage by "pot hunters." The WSIP does not include the construction of facilities within park boundaries and consequently would not result in damage to archaeological resources related to construction activities. The WSIP could make archaeological resources within the inundation areas of the SFPUC's reservoirs more vulnerable to damage by pot hunters if the WSIP resulted in reservoir drawdowns greater than those that occur under the existing condition, in which case portions of the inundation areas that are currently inaccessible could become accessible to pot hunters.

Two of the SFPUC's reservoirs, Lake Eleanor and Hetch Hetchy Reservoir, lie within Yosemite National Park. As noted in the Draft PEIR (Vol. 3, Chapter 5, p. 5.3.1-30), the WSIP would have essentially no effect on storage and water levels in Lake Eleanor. Consequently, archaeological resources in the Lake Eleanor inundation area would be no more vulnerable to damage under the WSIP than they are under the existing condition.

The Draft PEIR (Vol. 3, Chapter 5, pp. 5.3.1-21 to 5.3.1-24) describes the existing and with-WSIP operations of Hetch Hetchy Reservoir. As shown in Figure 5.3.1-9 (p. 5.3.1-23), storage and water levels in Hetch Hetchy Reservoir fluctuate annually under the existing condition. Storage is typically at its maximum of 360,400 acre-feet in late June or early July, when Hetch Hetchy Reservoir is usually full. The maximum storage level corresponds with a water surface elevation of 3,806 feet above mean sea level. Storage and water levels drop gradually until snowmelt begins in the following April or May. Under most conditions, storage in the reservoir does not fall below 150,000 acre-feet, which corresponds with a water surface elevation of 3,684 feet above mean sea level. The same pattern of filling in the snowmelt period and drawdown for the rest of the year would continue with the WSIP. As under existing conditions, the water level in the reservoir with the WSIP would rarely fall below the elevation of 3,684 feet above mean sea level. Thus, under most conditions, archaeological resources in the Hetch Hetchy Reservoir inundation area would be no more vulnerable to damage with the WSIP than they are under the existing condition. Annual reservoir drawdown would be greater with the WSIP than under the existing condition because of the expected increase in water demand by 2030, but the annual drawdown would not typically expose areas otherwise inaccessible to pot hunters.

As noted in the Draft PEIR (Vol. 3, Chapter 5, p. 5.3.1-24), Hetch Hetchy Reservoir is drawn down to a very low level occasionally under the existing condition. Occasional drawdowns could be even greater with the WSIP. Under the existing condition, the water level could be drawn down to an elevation of 3,573 feet above sea level once in the 82-year hydrologic record. With the WSIP, it could be drawn down to an elevation of 3,562 feet above sea level. Thus, on rare occasions, a portion of the inundation area not accessible to pot hunters under the existing condition would be available to them with the WSIP.

The SFPUC and Yosemite National Park have for many years cooperated to protect water quality and other natural resources in the Hetch Hetchy watershed. Cooperative actions are defined in the Hetch Hetchy Watershed Protection Agreement signed by both parties in 2005. Under the terms of the agreement, NPS staff from the Hetch Hetchy Entrance Station patrol the reservoir perimeter and tributaries within one mile of the reservoir to prevent activities that might contaminate the reservoir water as well as other unauthorized or illegal activities, which would include prevention of pot hunting.

The Hetch Hetchy Watershed Protection Agreement expires in June 2010, and a new five-year agreement would likely be negotiated. The SFPUC and the NPS may choose to specifically mention patrolling to prevent pot hunting in the new agreement.

U.S. Bureau of Reclamation, Richard J. Woodley, Regional Resources Manager, 1106/07

F_USBR-01 This comment addresses concerns that the Draft PEIR does not adequately address the potential indirect effects of the WSIP on the Central Valley Project (CVP) operated by the U.S. Bureau of Reclamation and the State Water Project (SWP) operated by the Department of Water Resources (DWR) or, in turn, the indirect effects on fisheries, water quality, and/or water users served by the CVP and SWP. Please refer to **Section 14.8, Master Response on Delta and San Joaquin River Issues** (Vol. 7, Chapter 14) for additional discussion of the WSIP's effects on the San Joaquin River and the Delta analyzed in the PEIR.

WSIP impacts on flow along the San Joaquin River and Delta region are analyzed in the Draft PEIR under Impact 5.3.1-5: Effects on Flow along the San Joaquin River and the Sacramento–San Joaquin Delta (Vol. 3, Chapter 5, pp. 5.3.1-38 and 5.3.3-39). Related effects on water quality are analyzed under Impact 5.3.3-2: Effects on Water Quality along the San Joaquin River and Sacramento–San Joaquin Delta (Vol. 3, Chapter 5, pp. 5.3.3-19 and 5.3.1-20). Indirect impacts on fisheries and aquatic resources are analyzed under Impact 5.3.6-5: Effects on Fishery Resources along the San Joaquin River (Vol. 3, Chapter 5, pp. 5.3.6-32 to 5.3.6-37). With respect to adverse effects on San Joaquin River and Delta water users, including impacts on SWP and CVP operations, see the discussion under Impact 5.3.4-1: Effects on Tuolumne River, San Joaquin River, and Stanislaus River Water Users, and Impact 5.3.4-2: Effects on Delta Water Users (Vol. 3, Chapter 5, pp. 5.3.4-5 to 5.3.4-11).

F_USBR-02 Refer to **Section 14.8, Master Response on Delta and San Joaquin River Issues** (Vol. 7, Chapter 14, Section 14.8.3) for additional discussion of potential effects on CVP and SWP operations.

F_USBR-03 Refer to Draft PEIR Impact 5.3.4-2 (Vol. 3, Chapter 5, pp. 5.3.4-9 to 5.3.4-11), and **Section 14.8, Master Response on Delta and San Joaquin River Issues** (Vol. 7, Chapter 14, Section 14.8.3), for discussions of potential effects on SWP and CVP operations.

F_USBR-04 This comment states that the Draft PEIR does not apply the informal significance standards for impacts related to water supplies to WSIP-related impacts on the San Joaquin River and the Delta. Please refer to **Section 14.8, Master Response on Delta and San Joaquin River Issues** (Vol. 7, Chapter 14, Section 14.8.3) for pertinent response to this comment.

F_USBR-05 This comment restates the previous comment. Refer to **Section 14.8, Master Response on Delta and San Joaquin River Issues** (Vol. 7, Chapter 14, Section 14.8.3).

F_USBR-06 Refer to **Section 14.8, Master Response on Delta and San Joaquin River Issues** (Vol. 7, Chapter 14).

U.S. Department of Agriculture, Tom Quinn, Forest Supervisor, 10/03/07

F_USDAFS-01 The Draft PEIR (Vol. 1, Chapter 3, Section 3.6, pp. 3-33 to 3-39) describes the increased diversion of water from the Tuolumne River that would occur with the WSIP. The Draft PEIR (Vol. 3, Chapter 5, pp. 5.3.1-1 to 5.3.1-40) provides a comprehensive analysis of the impacts of the WSIP on stream flow in the Tuolumne River and water levels in the SFPUC's reservoirs.

F_USDAFS-02 The impacts of WSIP-induced changes in stream flow and reservoir water levels on biological resources are described in the Draft PEIR in Section 5.3.6 (Fisheries) and Section 5.3.7 (Terrestrial Biological Resources).

F_USDAFS-03 As noted in the Draft PEIR (Vol. 3, Chapter 5, p. 5.3.1-29), the WSIP would have almost no effect on water levels in Lake Lloyd and flows in Cherry Creek below Lake Lloyd. Consequently, it would have no effect on recreational users of Lake Lloyd and Cherry Creek. (Please also see Vol. 3, Chapter 5, pp. 5.3.8-23 and 5.3.8-24.)

The commenter notes that, "Effects are projected on recreation due to a decrease in rafting flows." The effects of the WSIP on rafting flows are described in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.3.8-27 to 5.3.8-32). The effects of the WSIP on the availability of water for river rafting would be minor and were determined to be less than significant.

F_USDAFS-04 The Draft PEIR used available data to characterize the baseline or existing condition. The San Francisco Planning Department has concluded that the existing data are sufficient to make a reasonable assessment of environmental consequences. CEQA Guidelines Section 15151 notes that an "evaluation of environmental effects of a proposed project need not be exhaustive."

The program effects on the Tuolumne River ecosystem would be the consequence of changes in flow attributable to the WSIP. As indicated in the Draft PEIR (Vol. 3, Chapter 5, p. 5.3.1-25), under the existing condition only the minimum required releases are made from O'Shaughnessy Dam in 837 months of the 987-month hydrologic record, or in about 84 percent of the total months. The WSIP would have no effect on river flow in these months and thus would have no effect on the river ecosystem. The primary effect of the WSIP would be to shorten (for a few days) the period during which flows in excess of the minimum required are released from O'Shaughnessy Dam. The analysis in the Draft PEIR concluded that existing data on the river below O'Shaughnessy Dam were sufficient to determine that WSIP-induced flow changes would have a less-than-significant effect on resident fish and a potentially significant effect on biological resources in the streamside meadow in the Poopenaut Valley. The flow changes might also affect riparian vegetation elsewhere in the reach of the river between Hetch Hetchy and Don Pedro Reservoirs, but any effects would diminish in a downstream direction as tributaries enter the main stem of the river and flow is returned to the river at Early Intake. A proposed mitigation measure calling for managed releases (Measure 5.3.7-2) would reduce the impacts on biological resources in the Poopenaut Valley meadow to a less-than-significant level (Chapter 6, pp. 6-49 and 6-50). The mitigation measure would also lessen the effects on riparian vegetation elsewhere in the reach of the river between Hetch Hetchy and Don Pedro Reservoirs. For additional information regarding potential impacts along the upper Tuolumne River, please refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14).

F_USDAFS-05 The San Francisco Planning Department invited comments from the Stanislaus National Forest on the Draft PEIR through direct mailings of notices and CEQA documentation, including the Notice of Preparation in September 2005 and the Draft PEIR in June 2007. In addition to notifications directly associated with the WSIP, in August 2005 the SFPUC established the Tuolumne River Stakeholders Group, which includes the U.S. Forest Service, to coordinate SFPUC efforts within the Tuolumne River watershed. The SFPUC met with this group in October and December 2005, April and October 2006, March and November 2007, and March 2008.

In addition, the Planning Department's Major Environmental Analysis Division and the SFPUC held several public outreach efforts to inform the general public, regulatory agencies, and special interest groups in all counties potentially affected by the proposed program. Public outreach efforts included four informational meetings during the earlier part of the environmental review process; notification of the public hearings in local newspapers; five public scoping meetings following release of the Notice of Preparation; and six public hearings following the release of the Draft PEIR. Public comments on the Draft PEIR were accepted from June 29, 2007 through October 15, 2007. However, public comments on the Draft PEIR received through December 31, 2007 were addressed in the Comments and Responses document; comments received after December 31, 2007 were included in Appendix M (Vol.8). Further, the SFPUC has dedicated a webpage to the WSIP PEIR that has been continually updated to inform the public of progress and upcoming hearings.

The Draft PEIR describes the resources within the Stanislaus National Forest between Hetch Hetchy and Don Pedro Reservoirs that could be affected by the WSIP in Vol. 3, Chapter 5, Section 5.3. The locations of Stanislaus National Forest resources are shown in the Draft PEIR on Figure 5.2-1 (Vol. 3, Chapter 5, p. 5.2-9) and Figure 5.3.1-1a (Vol. 3, Chapter 5, p. 5.3.1-3). The

Draft PEIR also includes a summary of the Raker Act requirements in Vol. 1, Chapter 2, pp. 2-33 and 2-34, and it is acknowledged that the Raker Act provides regulatory authority to the U.S. Department of Agriculture for the protection of lands in the Stanislaus National Forest. The SFPUC would welcome an opportunity to meet with the Stanislaus National Forest to discuss concerns regarding the WSIP.

F_USDAFS-06 The public comment period on the Draft PEIR lasted for 108 days, from June 29, 2007 through October 15, 2007. In addition, six public hearings were held during this period to receive oral comments on the Draft PEIR, including a meeting in Sonora on September 5, 2007. The San Francisco Planning Department has determined that this extended public review provided ample time for agencies and the public to review and comment on the Draft PEIR. As stated in **Response F_USDAFS-05**, the SFPUC would welcome an opportunity to meet with the Stanislaus National Forest to discuss concerns regarding the WSIP.

The Stanislaus National Forest will be included on the mailing list for the Comments and Responses document.

F_USDAFS-07 The comment expressing the opinion of the Stanislaus National Forest is acknowledged. The commenter expressed support of an alternative “which does not divert additional water which would affect the Stanislaus National Forest.” As described in Vol. 3, Chapter 5, Section 5.3, the Draft PEIR determined that impacts of the proposed program on resources along the Tuolumne River within the Stanislaus National Forest would be less than significant. For information on alternatives that do not include additional diversions from the Tuolumne River, refer to the descriptions of the Year-round Desalination at Oceanside Alternative (Vol. 4, Chapter 9, Section 9.2.4), and Aggressive Conservation/Water Recycling and Local Groundwater Alternative (Without Tuolumne River Supplement) (Vol. 4, Chapter 9, Section 9.2.6). The SFPUC will consider the Final PEIR before making a decision on the proposed program.

U.S. Fish and Wildlife Service, San Francisco Bay National Wildlife Refuge Complex, G. Mendel Stewart, Manager, 09/26/07

F_USFWS-01 This comment introduces concerns with the Bay Division Pipeline Reliability Upgrade project (BD-1) that are more specifically stated in Comments F_USFWS-02 through F_USFWS-04; please refer to **Response F_USFWS-02** regarding issues related to Bay Division Pipelines (BDPL) Nos. 1 and 2. The commenter's specific concerns with the BDPL Reliability Upgrade project will be addressed in the project-level CEQA analysis for that project. The Draft PEIR includes program mitigation measures that have been identified to minimize program-level, construction-related impacts on biological resources. During the project-level CEQA analysis, the programmatic mitigation measures will be reevaluated, and if applicable, will be either confirmed, refined, or replaced with an equivalent measure. In addition, SFPUC Construction Measure #8 (Vol. 4, Chapter 6, p. 6-5) and Mitigation Measure 4.6-3a (Vol. 4, Chapter 6, p. 6-12) require site-specific biological surveys to identify areas of potential impact on wildlife and habitat. Also refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.2) for additional discussion of the issues raised by this comment. This master response provides a discussion of the appropriate level of detail of an impact analysis at the program level versus the project level.

F_USFWS-02 The commenter is concerned that noise, vibration, and human disturbance during construction and operation would have an adverse impact on wildlife. Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.2) for detailed discussion of the issues raised by this comment. This master response provides information on the appropriate level of detail of an impact analysis at the program level versus the project level. The commenter's specific concerns with the BDPL Reliability Upgrade project (BD-1) will be addressed in the project-level CEQA analysis for that project. Table 6.1 (Vol. 4, Chapter 6, p. 6-14) lists programmatic mitigation measures for special-status species that will be applied to the BDPL Reliability Upgrade project as appropriate, including measures for raptors, California clapper rail, snowy plover, salt marsh harvest mouse, vernal pool invertebrates, California red-legged frog, California tiger salamander, and western burrowing owl. These measures will ensure that construction does not result in significant impacts on special-status species, even though construction may occur during sensitive breeding and nesting periods; as part of the project-level environmental review, these programmatic mitigation measures will be reevaluated and refined as necessary to address site-specific project details to further ensure that potential construction impacts on special-status species would be reduced to less-than–

significant levels. Surveys required under Mitigation Measure 4.6-3a (Vol. 4, Chapter 6, p. 6-12) will refine the list of species that could be affected by each WSIP project, and additional protection, avoidance, minimization, and compensation measures could be added.

It should be noted that the segments of BDPL Nos. 1 and 2 traversing the wildlife refuge would remain in place under the WSIP, since the BDPL Reliability Upgrade project (BD-1) would involve construction of an underground tunnel in this area. BDPL Nos. 1 and 2 may be decommissioned and abandoned in-place, but this determination would be made only after the BD-1 tunnel has been inspected and the warranty has expired (the warranty period could be one to five years). Alternatively, the SFPUC is considering maintaining the transbay sections of BDPL Nos. 1 and 2 (i.e., between Newark and Ravenswood) and associated facilities for potential future use in emergencies or during maintenance of the new tunnel proposed under the BDPL Reliability Upgrade project. Potential impacts on sensitive biological resources in the vicinity of tunnel portals and aboveground segments of BDPL Nos. 1 and 2 across the bay will be evaluated in the project-level EIR.

F_USFWS-03 The commenter is concerned about access issues during the construction and operation phase and consequent impacts on wetlands in the Don Edwards San Francisco Bay National Wildlife Refuge. Please refer to **Response F_USFWS-02** regarding SFPUC plans for the segments of BDPL Nos. 1 and 2 that traverse the wildlife refuge. Since this section of the BDPL Reliability Upgrade project (BD-1) would be an underground tunnel, potential impacts on wetlands would be limited to the tunnel shaft vicinities. As indicated in Draft PEIR Impact 4.6-1 (Vol. 2, Chapter 4, p. 4.6-48), the BD-1 pipeline could affect degraded saline emergent wetland habitat near the valve lots at the edge of San Francisco Bay, especially at the Newark Valve Lot where the staging area would be located for the tunnel segment of the pipeline. The tunnel shaft area would be accessed via a new roadway (about one-quarter mile long) that would extend between the shaft site and Willow Drive to the east. The tunnel shaft site would be located about 500 feet east of the point where BDPL Nos. 1 and 2 emerge and would extend westward above ground. With respect to the Ravenswood tunnel shaft, there is already an access road to the Ravenswood Valve Lot that connects with University Avenue in East Palo Alto. Paved parking areas could be added in this area to accommodate tunnel-related construction equipment.

The BDPL Reliability Upgrade project's potential impacts on wetlands are identified as potentially significant, but the Draft PEIR concludes that these impacts could be mitigated to a less-than-significant level with implementation of several mitigation measures. Please also refer to SFPUC Construction Measure #3 (Vol. 4, Chapter 6, p. 6-4), which calls for preservation of existing vegetation, use of wind erosion control measures, stabilization of site ingress and egress locations to minimize erosion, and measures to minimize fugitive dust emissions. SFPUC Construction Measure #8 and Mitigation Measure 4.6-3a (Vol. 4, Chapter 6, pp. 6-7 and 6-12) also call for surveys, documentation, protection, avoidance, minimization, restoration, and compensation for impacts on sensitive habitats and those that support special-status species. Mitigation Measures 4.6-1a and 4.6-1b (Vol. 4, Chapter 6, pp. 6-11 and 6-12) identify further specific measures to avoid, minimize, and compensate for impacts on wetlands. The potential impacts on special-status species during construction and maintenance activities would be avoided or minimized through implementation of the programmatic biological resource mitigation measures outlined in Table 6.2 (Vol. 4, Chapter 6, p. 6-16), and through consultation with the CDFG and USFWS in accordance with permit requirements. Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Sections 14.4.2 and 14.4.3) for additional discussion of the issues raised by this comment.

F_USFWS-04 Refer to **Response F_USFWS-02** regarding SFPUC plans for the segments of BDPL Nos. 1 and 2 that traverse the wildlife refuge. The commenter's request to remove the existing BDPL Nos. 1 and 2 to avoid potential impacts associated with leaving these pipelines in place is acknowledged.

F_USFWS-05 Table 4.17-3 (Vol. 2, Chapter 4, p. 4.17-16) lists the Dumbarton Rail Corridor Project as a cumulative project that would be built during the same time period as construction of the BDPL Reliability Upgrade project (BD-1) (approximately between 2008 and 2010). Potential cumulative impacts cited in Table 4.17-3 include impacts on sensitive habitats and species. Section 4.17 (Vol. 2, Chapter 4, pp. 4.17-51 and 4.17-52) also identifies cumulative bioregional impacts related to the loss of sensitive biological resources that could result from the WSIP in conjunction with other proposed projects. Mitigation Measure 4.6-2 (Vol. 4, Chapter 6, p. 6-12) requires that staging areas for the WSIP projects be coordinated where possible to minimize habitat loss by making repeated use of staging/construction areas and access roads. The project-level EIR for the BDPL Reliability Upgrade project will also include a project-specific cumulative impact analysis and evaluate whether additional mitigation measures are required.

Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Sections 14.4.2 and 14.4.3) for additional discussion of the issues raised by this comment. This master response provides information on the appropriate level of detail of an impact analysis at the program level versus the project level. Requested coordination of the BDPL Reliability Upgrade project (BD-1) with the San Mateo County Transit District's Dumbarton Rail Corridor Project to minimize the habitat impacts of both projects has been added to Table C.6 (Vol. 5, Appendix C, p. C-26) for consideration in the project-level EIR for the BDPL Reliability Upgrade project.

F_USFWS-06 The USFWS's interest in acquiring clean dredge material generated by the BDPL Reliability Upgrade project (BD-1) for use in the South Bay Salt Pond Restoration Project has been noted in Table C.6 (Vol. 5, Appendix C, p. C-26) for consideration in the project-level EIR for the BDPL Reliability Upgrade project. Please note that Impact 4.6-1 (Vol. 2, Chapter 4, pp. 4.6-48 and 4.6-49) also identifies the potential for temporary impacts on wetlands associated with the placement of spoils, but indicates that potential use of these spoils as part of the restoration effort could result in a long-term beneficial impact.

F_USFWS-07 As discussed in **Response F_USFWS-03**, the SFPUC will coordinate with the USFWS on any project that has the potential to affect listed species, including informal or formal consultation and development of a Biological Opinion, as appropriate, for each WSIP project. The USFWS's recommendation to coordinate with the Sacramento Fish and Wildlife Office for endangered species and to contact the wildlife refuge has been added to Table C.6 (Vol. 5, Appendix C, p. C-26) for consideration in the project-level EIR for the BDPL Reliability Upgrade project (BD-1).

15.2 State Agencies

STATE AGENCIES

STATE AGENCIES THAT SUBMITTED COMMENTS ON THE DRAFT PEIR

Comment Letter Format	Comment Letter ID	Name of Commenter	Title	Organization/ Affiliation	Page
Mail	S_Caltrans	Tom Dumas	Chief of Office for Metropolitan Planning	California Department of Transportation	15.2-1
Mail	S_CC	Sam Schuchat	Executive Officer	Coastal Conservancy	15.2-2
Mail	S_CDFG1	W.E. Loudermilk	Regional Manager	California Department of Fish and Game	15.2-3
Mail	S_CDFG2	Charles Armor	Regional Manager, Bay Delta Region	California Department of Fish and Game	15.2-4
Mail	S_CSA	Sally Lieber	Assemblywoman, 22nd District	California State Assembly	15.2-18
Mail	S_DWR	Christopher Huitt	Staff Environmental Scientist	California Department of Water Resources, Floodway Protection Section	15.2-19
Mail	S_RWQCBCV	Greg Vaughn	Senior Engineer	Regional Water Quality Control Board, Central Valley Region	15.2-20
Mail	S_RWQCBSF	Keith H. Lichten	Senior Engineer	Regional Water Quality Control Board, San Francisco Bay Region	15.2-25

California Department of Transportation, Tom Dumas, Chief of Office for Metropolitan Planning, 07/23/07

S_Caltrans-01 Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.3) for detailed discussion of the issues raised by this comment. Caltrans's interest in determining which WSIP facility projects would encroach on state facilities and in coordinating required environmental studies for any encroachment permits has been noted in Table C.6 of the Draft PEIR (Vol. 5, Appendix C, p. C-26) for consideration in all project-level CEQA review.

Coastal Conservancy, Sam Schuchat, Executive Officer, 10/01/07

S_CC-01 The information regarding the Coastal Conservancy's role in the South Bay Salt Pond Restoration Project and the availability of the Final EIR/EIS for that project is acknowledged. This information, however, does not pertain to the adequacy or accuracy of the Draft PEIR. Also, please refer to **Response S_CC-03** and to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.3) for detailed discussion regarding the SFPUC's coordination efforts with other agencies during project planning.

S_CC-02 The commenter raises concerns similar to those expressed by the U.S. Fish and Wildlife Service regarding the plan to decommission/abandon-in-place the existing Bay Division Pipelines (BDPL) Nos. 1 and 2. Please refer to **Response F_USFWS-02** and **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.2).

S_CC-03 The commenter requests that the SFPUC coordinate with the Don Edwards San Francisco Bay National Wildlife Refuge on the South Bay Salt Pond Restoration Project as the BDPL Reliability Upgrade project (BD-1) proceeds. Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Sections 14.4.2 and 14.4.3) for detailed discussion of the issues raised by this comment. The Coastal Conservancy's interest in acquiring clean dredge material generated by the BDPL Reliability Upgrade project for use in the South Bay Salt Pond Restoration Project, particularly within the Don Edwards San Francisco Bay National Wildlife Refuge, has been noted in Draft PEIR Table C.6 (Vol. 5, Appendix C, p. C-26) for consideration in the project-level EIR for the BDPL Reliability Upgrade project.

S_CC-04 This comment summarizes the Coastal Conservancy's plans to complete a gap in the San Francisco Bay Trail, which encircles San Francisco Bay and San Pablo Bay. Since BDPL Nos. 1 and 2 would be constructed in the vicinity of the Association of Bay Area Government's (ABAG) Bay Trail project, the commenter requests coordination with the SFPUC as the BDPL Reliability Upgrade project (BD-1) proceeds. Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Sections 14.4.2 and 14.4.3) for detailed discussion of the issues raised by this comment. The Coastal Conservancy's request for coordination has been noted in Draft PEIR Table C.6 (Vol. 5, Appendix C, p. C-26) for consideration in the project-level EIR for the BDPL Reliability Upgrade project.

California Department of Fish and Game, W.E. Loudermilk, Regional Manager, 10/01/07

S_CDFG1-01 The Draft PEIR describes the existing institutional agreement associated with releases for the Moccasin Fish Hatchery (Vol. 1, Chapter 2, p. 2-41). Under the agreement between the SFPUC and the California Department of Fish and Game (CDFG), the SFPUC can interrupt water supply to the Moccasin Fish Hatchery at any time to undertake maintenance. The WSIP would not affect or change any terms of this agreement. With implementation of the WSIP, the SFPUC would meet, at a minimum, all current and anticipated legal requirements for the protection of fish and other wildlife habitat, consistent with the WSIP sustainability goal and system performance objectives indicated in Draft PEIR Table 3.2 (Vol. 1, Chapter 3, p. 3-9).

S_CDFG1-02 Implementation of the maintenance program under the WSIP is not projected to result in impacts on the Moccasin Fish Hatchery, as described in **Response S_CDFG-01**. As described in the Draft PEIR (Vol. 4, Chapter 9), alternatives to the WSIP were identified based on their potential to avoid or reduce the identified impacts of the WSIP while attaining most of the program's basic objectives. Since no impact was identified on the Moccasin Fish Hatchery, CEQA does not require the development of an alternative to provide bypass pipelines or other features that would modify the hatchery operations. Neither the proposed WSIP nor any of the identified alternatives would include any structural changes to facilities east of the Oakdale Portal.

California Department of Fish and Game, Charles Armor, Regional Manager, Bay Delta Region, 10/01/07

S_CDFG2-01 The Draft PEIR (Vol. 2, Chapter 4, p. 4.6-32) describes the authority of the California Department of Fish and Game (CDFG) under Fish and Game Code Sections 1600–1607 to develop mitigation measures and enter into streambed alteration agreements (SAAs) with applicants. During project-level planning, environmental review, and implementation of the various WSIP facility improvement projects, the SFPUC will consult with the CDFG, as appropriate, regarding the need for SAAs. The WSIP would include construction of numerous facility improvement projects and would also alter operations of its regional water system to meet the WSIP goals and objectives (Vol. 1, Chapter 3, p. 3-9). The Draft PEIR includes a program-level impact analysis of the facility improvement projects (Vol. 2, Chapter 4, Sections 4.1 through 4.17, pp. 4.1-1 to 4.17-67). The program-level analysis determined that at least 12, and probably more, of the facility improvement projects would require SAAs (Vol. 5, Appendix C, Table C.6, p. C-26). Final identification of the need for SAAs would occur during project-level CEQA analysis. Please also refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14).

The Draft PEIR (Vol. 3, Chapter 5) describes potential impacts on water resources in the Tuolumne River, Alameda Creek, San Mateo Creek, and Pilarcitos Creek watersheds associated with the proposed modifications to water system operations to meet the WSIP goals and objectives. Under the WSIP, the SFPUC would continue operation of water diversions from streams and rivers at the same locations as under existing conditions, and the diversions would occur in accordance with agreements for minimum instream flows where such agreements exist. The SFPUC has reviewed Section 1600 of the Fish and Game Code and has made a preliminary determination that the altered operation of its existing diversions as proposed under the WSIP would not require SAAs for operations associated with Stone Dam and Early Intake Diversion Dam. As part of WSIP implementation, the SFPUC will coordinate with the CDFG to determine appropriate permit requirements for facilities that could affect stream flows or streambeds within the SFPUC's water supply watersheds, including proposed modifications to the Alameda Creek Diversion Dam (ACDD), which will be assessed as part of the Calaveras Dam Replacement project (SV-2) EIR.

S_CDFG2-02 The WSIP would not cause the SFPUC to re-evaluate or revise the 1987 instream flow agreement. However, as described in the Draft PEIR (Vol. 1, Chapter 3, p. 3-83), the SFPUC is currently conducting studies of the Tuolumne River between O'Shaughnessy Dam and Early Intake that may lead to revision of the 1987 agreement. The flows specified in the 1987 instream flow agreement are shown in Table 5.3.1-2 of the Draft PEIR (Vol. 3, Chapter 5, p. 5.3.1-13); the SFPUC currently releases a minimum stream flow from Hetch Hetchy Reservoir in accordance with the 1987 agreement and would continue to do so under the WSIP. At the time of the 1987 agreement, the SFPUC and the U.S. Fish and Wildlife Service (USFWS) agreed that certain supplemental flows might be provided if determined necessary by a subsequent study to enhance conditions for resident trout, but the SFPUC disagreed with the results of the study at that time; the USFWS has not yet made the determination whether and when such flows might be required.

Plans for the SFPUC's current studies were reviewed by the Tuolumne River Stakeholder Group, which includes the CDFG, USFWS, National Park Service, U.S. Forest Service, Tuolumne County, Groveland Community Services District, Bay Area Water Supply and Conservation Agency, Tuolumne River Trust, and recreation and whitewater rafting interests. Studies of stream hydrology and geomorphology are in progress, and two preliminary reports have been published. A study of fish habitat is planned and will include the use of the USFWS's Instream Flow Incremental Methodology or similar method for relating flow and the extent and value of fish habitat.

When the 1987 agreement was executed, the focus of concern was the maintenance of minimum instream flows in the summer for the benefit of resident trout. The agreement did not address streamside meadows, the ecological health of which is probably more influenced by seasonal high flows than seasonal minimum flows. As discussed in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.7-28 to 5.7-31), the summertime release of more water for resident trout would reduce the total amount of water available for release from Hetch Hetchy Reservoir during the spring high-flow period, which could adversely affect streamside meadows.

S_CDFG2-03 The studies described in **Response S_CDFG2-02** will consider the life histories of native resident fish and include an analysis using the Instream Flow Incremental Methodology or similar method for relating flow and the extent and value of fish habitat. The studies will take some years to complete, and limited information (on geomorphology) was available for use in the Draft PEIR. Please refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14) for more information on the adequacy of existing data to analyze the impacts of the WSIP on fisheries and other biological resources.

The National Park Service is currently carrying out studies of the streamside meadows in the Poopenaut Valley, which will provide better information on special-status species. As described in the Draft PEIR, once data from the studies are available, the information could be used to refine the implementation of Mitigation Measure 5.3.7-2, Controlled Releases to Recharge Groundwater in Streamside Meadows; this biological resources measure calls for monitoring groundwater and vegetation as a means of mitigating potential impacts on riparian resources in the upper Tuolumne River (see Vol. 4, Chapter 6, pp. 6-49 and 6-50). Although the commenter suggests a more robust and comprehensive protocol, the Draft PEIR analysts concluded that groundwater recharge and the resulting vegetation response will be the fundamental metrics for measuring meadow and riparian health, which in turn determines habitat for other elements of the ecosystem. The SFPUC will continue to work with the CDFG, USFWS, National Park Service, and U.S. Forest Service on upper Tuolumne River ecosystem studies.

S_CDFG2-04 Implementation of system operations to meet 2030 purchase requests under the WSIP would result in a reduction in the average total volume of water released from O'Shaughnessy Dam during the spring snowmelt period and a delay of a few days in the initial release. The Draft PEIR concluded that this change in flow pattern could have a significant adverse effect on terrestrial biological resources of the Poopenaut Valley, but that it would have a less-than-significant adverse effect on resident native trout below Hetch Hetchy Reservoir (Vol. 3, Chapter 5, Impact 5.3.7-2, pp. 5.3.7-21 and 5.3.7-22, and Impact 5.3.6-2, pp. 5.3.6-26 to 5.3.6-28). Accordingly, Mitigation Measure 5.3.7-2 (Vol. 4, Chapter 6, pp. 6-49 and 6-50) was specifically designed to lessen or eliminate the potential significant adverse effects of the WSIP on terrestrial biological resources in the Poopenaut Valley. Because the effects of the WSIP on resident native fish were determined to be less than significant, no mitigation measures are proposed to reduce impacts on fish.

The San Francisco Planning Department is required by statute to monitor, or delegate an agency to monitor, any mitigation measures to which the SFPUC commits pursuant to the Planning Department's responsibilities as a lead agency for CEQA compliance (Section 21081.6 of the California Public Resources Code). The primary purpose of CEQA mitigation monitoring is to ensure that mitigation measures are in fact implemented; however, the state's guidelines for tracking CEQA mitigation measures notes that the information gathered in the course of monitoring may help refine or make mitigation measures more effective. Following certification of the Final PEIR, the SFPUC will be required to adopt a mitigation monitoring and reporting program (MMRP) at the same time as it adopts the CEQA findings, prior to approving and adopting the WSIP. The MMRP will have dual purposes: to track mitigation measures in accordance with statutory requirements, and to gather the information necessary to evaluate the effectiveness of Mitigation Measure 5.3.7-2 and refine its implementation if needed.

As noted in **Responses S_CDFG2-02** and **S_CDFG2-03**, the SFPUC has begun a program of study intended to improve understanding of the relationship between flow in the Tuolumne River below O'Shaughnessy Dam and the riverine ecosystem. The studies will include an Instream Flow Incremental Methodology analysis or similar analysis that will determine the availability and quality of native fish habitat under different flow conditions. In planning the fish habitat studies, the SFPUC will continue to work with the Tuolumne River Stakeholder Group, which includes the CDFG. The fish habitat studies will provide information that will enable an assessment of the effects on native fish resulting from the flow shaping and pulse releases that constitute Mitigation Measure 5.3.7-2. Also, data from the studies will be used to determine whether the 1987 instream flow agreement needs to be modified.

In addition to the SFPUC's studies, the National Park Service is conducting groundwater-level and special-status species studies in the Poopenaut Valley. Data from these studies will provide baseline information on ecological conditions in the Poopenaut Valley. As noted in Measure 5.3.7-2, the data from these ongoing studies could be useful in augmenting the baseline data and in refining the implementation of the measure.

The commenter makes reference to Fish and Game Code Section 5937 and the California Endangered Species Act. Operations at Hetch Hetchy Reservoir are currently in compliance with these statutes and would continue to be in compliance under the WSIP.

S_CDFG2-05 Please refer to Section **14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Sections 14.7.3 and 14.7.4) for a discussion of Federal Energy Regulatory Commission (FERC) flow requirements. This comment, which notes that evidence suggests current FERC flow requirements may not be sufficient to protect the Chinook salmon run, is acknowledged. The fact that the CDFG has written to FERC requesting additional flows is also acknowledged.

The commenter opines that the effects of the WSIP and other past, present, and possible future actions on the anadromous fish populations of the Tuolumne River below La Grange Dam are cumulatively significant. The analysis in the Draft PEIR concluded that long-term WSIP-induced flow changes in the Tuolumne River below La Grange Dam could have a significant adverse effect on anadromous fish in that reach of river, and concluded that implementation of Mitigation Measures 5.3.6-4a and 5.3.6-4b would reduce these impacts to a less-than-significant level (Vol. 4, Chapter 6, pp. 6-48 and 6-49). The cumulative analysis in the Draft PEIR assumes that Mitigation Measures 5.3.6-4a and 5.3.6-4b would be effective and would reduce the impacts of the WSIP on anadromous fish to a less-than-significant level. The cumulative analysis in the

Draft PEIR also includes a discussion of the New Don Pedro Project, the 1995 FERC Settlement Agreement (as stated in the comment), and the FERC relicensing scheduled for 2016. With this assumption and in consideration of the FERC agreement, the WSIP's contribution to cumulative impacts would not be cumulatively considerable, as explained in more detail in the Draft PEIR (Vol. 3, Chapter 5, Impact 5.7.2-2, pp. 5.7-33 to 5.7-44).

The commenter provides technical information on the decline of Chinook salmon populations in the Tuolumne River and makes the case that the decline is attributable to limiting factors associated with the Tuolumne River rather than other limiting factors such as ocean harvests and water diversions in the Delta. Information is presented on the relationship between spring flow below La Grange Dam and salmon escapement 2.5 years later. The San Francisco Planning Department acknowledges receipt of the technical information. Please refer to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.2) for further discussion of the decline of Chinook salmon.

This same comment also provides technical information on the relationship between water temperature and adult salmon brood year production. The commenter points out that water temperature depends on the temperature and magnitude of releases from La Grange Dam, and that lower water temperatures result in higher salmon production.

The commenter's assertion that the WSIP could cause anadromous fish populations of the Tuolumne River to drop below self-sustaining levels and further reduce the range of the federal threatened Central Valley steelhead is acknowledged. As noted above, the Draft PEIR concluded that long-term WSIP-induced flow changes in the Tuolumne River below La Grange Dam could have a significant adverse effect on anadromous fish in that reach of river if left unmitigated. The analysis in the Draft PEIR indicates that implementation of Mitigation Measures 5.3.6-4a and 5.3.6-4b would reduce these impacts to a less-than-significant level (Vol. 4, Chapter 6, pp. 6-48 and 6-49).

S_CDFG2-06 For the reasons discussed in **Response S_CDFG2-05**, the commenter expressed the preference that the SFPUC obtain additional water from sources other than the Tuolumne River. The comment is acknowledged. It should be noted that the Draft PEIR analyzes impacts based on increased Tuolumne River diversions under 2030 purchase request conditions, and that lower purchase requests (i.e., water demand), smaller increases in diversions, and therefore less severe impacts would be expected in the interim. Refer to Section 13.4, Phased WSIP Variant (Vol. 7, Chapter 13) for additional discussion on this issue. In 2014, when FERC reconsiders the requirements for Project 2299, the SFPUC may need to revise its operations and/or its operational agreements with the licensees in order for

Project 2299 to meet all FERC-ordered requirements. At the same time, if the SFPUC approves the WSIP or any portion/modification of it analyzed in the PEIR, the SFPUC would continue to implement mitigation measures identified in the PEIR, consistent with the CEQA findings and the MMRP.

In addition, as required by CEQA, the Draft PEIR (Vol. 4, Chapter 9) analyzes alternatives that would avoid or substantially lessen the significant adverse effects of the WSIP. The analysis includes two alternatives that would not increase average annual diversions from the Tuolumne River—the Aggressive Conservation/Water Recycling and Local Groundwater Alternative (no supplemental Tuolumne River water) and the Year-round Desalination at Oceanside Alternative—as well as three alternatives that would substantially reduce future increases in diversions from the Tuolumne River—the No Program Alternative, No Purchase Request Increase Alternative, and Aggressive Conservation/Water Recycling and Local Groundwater Alternative (with supplemental Tuolumne River water). Please also refer to **Section 14.10, Master Response on Modified WSIP Alternative** (Vol. 7, Chapter 14), which describes how this alternative would reduce future increases in Tuolumne River diversions compared to the WSIP. As described in Section 11.2 of the Comments and Responses document (Vol. 6, Chapter 11, p. 11-2), the ultimate decision on whether to approve and implement the WSIP or any alternative, portion, or modification of the WSIP will be made by the SFPUC. Also refer to Section 13.4 of this document for additional discussion regarding the Phased WSIP Variant.

S_CDFG2-07 The commenter's reference to the mitigation measure to reduce impacts on fisheries below La Grange Dam is incorrect; the correct reference should be Measure 5.3.6-4a, not Measure 5.4-3a. Please refer to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.8) and **Section 14.10, Master Response on Modified WSIP Alternative** (Vol. 7, Chapter 14) for further discussion of Mitigation Measure 5.3.6-4a regarding the avoidance of flow changes below Don Pedro Reservoir through the pursuit of a water transfer agreement that is based on conserved water.

The commenter indicates concern that this mitigation measure could potentially be transferring WSIP impacts to another watershed; however, this is a misinterpretation of the measure. Based on this comment, the text of Mitigation Measure 5.3.6-4a (Vol. 5, Chapter 6, p. 6-48, first sentence) is clarified as follows:

> **Measure 5.3.6-4a:** The SFPUC will pursue a water transfer arrangement with MID/TID and/or other water agencies such that the water acquired is developed through actions that result in reduction of demand on Don Pedro Reservoir as a result of conservation, improved delivery efficiency, inter-agency water transfer <u>of conserved water,</u> or use of an alternative supply such as groundwater.

The SFPUC acknowledges the commenter's request "to implement and mandate enforceable water recycling/conservation strategies or upgrades for its wholesale customers and their constituents who elect not to use feasible water recycling/conservation strategies or upgrades." As described in the Draft PEIR (Vol. 1, Chapter 2, p. 2-43), the SFPUC currently holds individual agreements with its wholesale customers; these agreements provide terms for the rate schedule, operating costs, and supply assurance and also require wholesale customers to employ best efforts to use all sources of water owned or controlled by them. Regarding the SFPUC's authority to require or impose mandatory conservation, the SFPUC does have the regulatory authority to implement conservation programs in the retail customer service area; however the SFPUC's ability to influence the wholesale customers is limited to its contractual agreements with them. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for detailed discussion of this issue. The Modified WSIP Alternative would include increased conservation, recycling, and groundwater use in the wholesale customer service areas. Please refer to **Section 14.10, Master Response on Modified WSIP Alternative** (Vol. 7, Chapter 14) for more information.

S_CDFG2-08 The commenter's reference to the mitigation measure to reduce impacts on fisheries below La Grange Dam is incorrect; the correct reference should be Measure 5.3.6-4b, not Measure 5.4-3b. Please refer to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.9) for further discussion of Mitigation Measure 5.3.6-4b regarding fishery habitat enhancement.

S_CDFG2-09 Refer to **Response S_CDFG2-07**, above.

S_CDFG2-10 Refer to **Response S_CDFG2-08** and **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.9) for further discussion of Mitigation Measure 5.3.6-4b regarding the proposed lower Tuolumne River fishery mitigation conclusion.

The San Francisco Planning Department acknowledges the recommendation that the SFPUC coordinate with the National Marine Fisheries Service, USFWS, and CDFG to develop mitigation measures for the lower Tuolumne River fishery.

S_CDFG2-11 The commenter correctly summarizes the Division of Safety of Dams (DSOD) restriction on Calaveras Reservoir in terms of restricted capacity. The commenter also correctly summarizes the proposal under the WSIP to restore the reservoir to its historical operating level prior to DSOD restrictions to enable the SFPUC to meet the WSIP goals and objectives. The commenter then describes the flow releases under the 1997 Memorandum of Understanding to provide habitat for resident trout and other native fish species, and states that current plans regarding fish migration barrier improvements at the BART weir would mean these flows would need to be re-assessed for anadromous steelhead and other stream-dependent native species. Please refer to **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14) for a detailed discussion of potential future-occurring anadromous steelhead in the Alameda Creek watershed and the release/bypass flows designed to provide sufficient habitat for steelhead life stages. Additionally, refer to the **Response S_CDFG2-15**, below, regarding the revision of mitigation measures to provide habitat for other native stream-dependent species in addition to resident rainbow trout.

The commenter proposes mitigating the effects of the future flow releases by instituting a program of screening as well as bullfrog and non-native centrarchids control to protect California red-legged frog, California tiger salamander, and foothill yellow-legged frog. The San Francisco Planning Department acknowledges this comment. The Draft PEIR (Vol. 2, Chapter 4, p. 4.6-1), however, describes the program-level impacts of the Calaveras Dam Replacement project operations specific to that project in order to explain the nature and magnitude of potential WSIP effects on species and habitats and to frame appropriate broad mitigation strategies where necessary. A more detailed, site-specific impact analysis will be conducted as part of the project-level EIR for the Calaveras Dam Replacement project (SV-2), which will more fully address this concern.

The commenter also suggests that the environmental review for the Calaveras Dam Replacement project (SV-2) should include an assessment of operations to ensure water elevations are sufficient for passage of rainbow trout between Calaveras Reservoir and Arroyo Hondo during critical upstream and downstream migration periods. Under the WSIP, Calaveras Reservoir would be restored to pre-DSOD storage levels and water elevations would typically be increased. This is unlikely to present a passage impediment to migrating resident rainbow trout (adult and juvenile). A more detailed, site-specific impact analysis will be conducted as part of the project-level EIR for the Calaveras Dam Replacement project, which will more fully address this concern.

S_CDFG2-12 This comment consists of a summary of Draft PEIR Mitigation Measures 5.4.5-3a and 5.4.1-2 (Vol. 4, Chapter 6, pp. 6-51 to 6-53). The commenter provides an accurate summary of these measures. As described in Section 13.2 of the Comments and Responses document (Vol. 7, Chapter13, p. 13-3), subsequent to the publication of the Draft PEIR, the SFPUC has modified the project description of the Calaveras Dam Replacement project to include construction of bypass facilities at the ACDD; this has resulted in minor changes to the text of this mitigation measure to acknowledge these proposed project revisions. Please refer to Chapter 16 of the Comments and Responses document (Vol. 7) for the specific changes.

S_CDFG2-13 The commenter's reference to the mitigation measure to reduce impacts on fisheries below the ACDD is incorrect. The correct reference should be Measure 5.4.5-3a, not Measure 5.4.3-3a. This biological resources measure (Vol. 4, Chapter 6, Measure 5.4.5-3a, pp. 6-52 and 6-53) calls for the SFPUC to develop and implement an operational plan to sustain minimum flows in Alameda Creek below the diversion dam. These minimum flows would be established to benefit resident trout. The commenter notes that steelhead could be restored to the watershed above the BART weir in the future, and that the mitigation flows outlined in Measure 5.4.5-3a would need to be reassessed to provide adequate protection for anadromous steelhead and to comply with Fish and Game Code Section 5937. Mitigation Measure 5.4.5-3a would reduce impacts related to resident trout spawning and egg incubation to a less-than-significant level, but is not designed to protect anadromous steelhead or habitat. For a detailed discussion of potential future-occurring steelhead in the upper watershed and protective measures designed to support anadromous steelhead life stages and habitat, please refer to **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14).

The commenter also states that an objective of Mitigation Measure 5.4.5-3a should include providing sufficient bypass flows to support populations of California red-legged frog and foothill yellow-legged frog. In response to this comment, Measure 5.4.5-3a (Vol. 4, Chapter 6, p. 6-52, next to last paragraph, first sentence) is revised as follows:

> **Measure 5.4.5-3a:** The SFPUC shall develop and carry out as part of the implementation of the Calaveras Dam Replacement (SV-2) project, an operational plan to implement minimum ~~stream~~ bypass flows when precipitation generates runoff into the creek below the diversion dam to the Calaveras Creek confluence from December 1 through April 30 to support ~~resident trout~~ spawning and egg incubation for resident trout as well as breeding habitat for other native stream-dependent amphibians.

S_CDFG2-14 This comment accurately summarizes Draft PEIR Mitigation Measure 5.4.5-3b (Vol. 4, Chapter 6, p. 6-54). The commenter goes on to suggest additional measures to be incorporated into Measure 5.4.5-3b, including decommissioning and removal of the ACDD, retrofitting the ACDD for fish passage, and adaptation of the measure, if necessary, in response to results of analysis and monitoring.

Measures 5.4.5-3a and 5.4.5-3b are designed to mitigate potential impacts on resident trout due to implementation of the WSIP. Measure 5.4.5-3a includes a detailed monitoring plan and is thus designed to adapt to changing conditions. Measure 5.4.5-3b, which includes modification of ACDD operations, would be implemented if Measure 5.4.5-3a fails to sustain the resident trout population in Alameda Creek below the ACDD. Decommissioning and removal of the ACDD, however, is not proposed as part of either of these mitigation measures because the analysis in the Draft PEIR did not conclude that this would be necessary to mitigate the impacts of the WSIP. The ACDD is an existing structure and part of the existing conditions; as such, it is considered part of the environmental baseline for the WSIP, and mitigation of impacts associated with existing conditions is not required under CEQA. However, as described in Section 13.2 (Vol. 7, Chapter 13), subsequent to publication of the Draft PEIR, the SFPUC has proposed to incorporate modification of the ACDD to provide a new bypass structure needed to implement bypass stream flows as part of the Calaveras Dam Replacement (SV-2) project. For a detailed discussion on proposed project revisions to the Calaveras Dam project, adaptive management, and monitoring and protective measures for fisheries in Alameda Creek, please refer to **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14).

The commenter also states that the 10-year monitoring period is too long a time before screening of the diversion tunnels at the ACDD is implemented, and that screening should take place concurrently with the Calaveras Dam Replacement project (SV-2). Comment acknowledged. This impact and the mitigation measure will be reevaluated and refined at a project level of detail as part of the EIR for the Calaveras Dam Replacement project

S_CDFG2-15 Mitigation Measure 5.4.1-2, Diversion Tunnel Operations (Vol. 4, Chapter 6, pp. 6-51 and 6-52) is included in the Draft PEIR as a feasible approach to reducing flow impacts in Alameda Creek below the diversion dam; however, as explained in the Draft PEIR (Vol. 3, Chapter 5, p. 5.4.1-35), this measure could help reduce the impact but would not fully mitigate it. The reestablishment of the diversions from Alameda Creek to Calaveras Reservoir that would occur under the WSIP is necessary to achieve the SFPUC water supply objective, and full mitigation could not be accomplished without foregoing the needed diversions. Therefore, Impact 5.4.1-2 would remain significant and unavoidable even with implementation of Measure 5.4.1-2.

The commenter notes that Mitigation Measure 5.4.5-3a (Vol. 4, Chapter 6, p. 6-52) commits to bypass flows only after December 1, and expresses concern that the release schedule for bypass flows described in Measure 5.4.5-3a will not sufficiently augment surface flows in Alameda Creek due to increased infiltration from depleted groundwater caused by the increased diversions. The commenter recommends further study to determine whether sufficient water will be available for different life stages of fish and aquatic wildlife. As described in the Draft PEIR, Measure 5.4.5-3a includes the requirement for the SFPUC to complete site specific studies to determine flow requirements to support spawning and egg incubation for resident. However, as described above in Response S_CDFG2-13, measure has been revised to address breeding habitat for other native stream-dependent species. In addition, this impact and associated mitigation measure will be reevaluated at a project level of detail during environmental review of the Calaveras Dam Replacement project (SV-2), which may include more detailed mitigation requirements. Please refer to **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14) for more discussion of adaptive measures regarding bypass flows for fishery resources as well as studies being conducted in Alameda Creek to determine bypass and release flows to support steelhead and resident trout.

In response to this comment, Mitigation Measure 5.4.5-3a has been expanded to address other wildlife species in addition to fish, and the following excerpts from the Draft PEIR are revised as follows:

(Vol. 3, Chapter 5, p. 5.4.6-19, third full paragraph, third sentence):

> Measure 5.4.5-3a, Minimum Flows for Resident Trout on Alameda Creek, calls for developing and implementing an operational plan to provide minimum bypass flows below the diversion dam to support habitat for rainbow trout and other native stream-dependent species from December through April.

(Vol. 4, Chapter 6, p. 6-52, next to last paragraph, first sentence):

> **Measure 5.4.5-3a:** The SFPUC shall develop and carry out as part of the implementation of the Calaveras Dam Replacement (SV-2) project, an operational plan to implement minimum ~~stream~~ bypass flows when precipitation generates runoff into the creek below the diversion dam to the Calaveras Creek confluence from December 1 through April 30 to support ~~resident trout~~ spawning and egg incubation for resident trout as well as breeding habitat for other native stream-dependent amphibians.

(Vol. 4, Chapter 6, p. 6-53, first paragraph, last sentence):

> The operational plan will allow for adapting minimum flow amounts to support resident trout spawning and egg incubation and other native stream-dependent species based on the monitoring results and best available scientific information.

S_CDFG2-16 The commenter accurately notes that under existing conditions, the SFPUC attempts to capture all runoff from the upper San Mateo Creek watershed, and only rarely releases water to the lower San Mateo Creek from Lower Crystal Springs Dam. As noted in the Draft PEIR, releases under the WSIP would continue to be infrequent and would be of about the same magnitude as those occurring under existing conditions (Vol. 3, Chapter 5, p. 5.5.1-14). Because the WSIP would have little or no effect on existing releases to lower San Mateo Creek, it would also have a less-than-significant impact on fisheries and streamside terrestrial biological resources. For this reason, no mitigation measures are proposed in the Draft PEIR to address biological conditions in the lower creek.

The proposed improvements to Lower Crystal Springs Dam are included as one of the WSIP facility improvement projects, and its potential environmental effects are addressed at the program level in the Draft PEIR (Vol. 2, Chapter 4). A project-level CEQA analysis of the Lower Crystal Springs Dam Improvements project (PN-4) is in progress, and potential impacts on San Mateo Creek will be evaluated in more detail as site-specific project information is developed. In addition, various permits from the CDFG and other agencies will be needed before construction can proceed. The CDFG may choose to raise the issue of additional releases of water from Lower Crystal Springs Reservoir in the context of project-level CEQA compliance and permit applications.

The commenter's opinion with respect to the need to protect fish in San Mateo and Pilarcitos Creeks, as well as in Alameda Creek, is acknowledged.

S_CDFG2-17 The commenter requests clarification of fisheries impacts from the Lower Crystal Springs Dam Improvements project (PN-4) through potential hydrological disconnects between habitat units. The comment states that the project could result in passage impediments for *O. mykiss* migrating between the reservoir and tributaries to spawn as well as for out-migrating smolts due to the lack of a defined active channel.

Draft PEIR Section 5.5.5 (Vol. 3, Chapter 5, pp. 5.5.5-1 to 5.5.5-9) and Impact 5.5.5-1 (pp. 5.5.5-6 and 5.5.5-7) discuss impacts on fishery resources due to implementation of WSIP water supply and system operations, and more specifically, the Crystal Springs Dam Improvements project. Based on the hydrologic modeling results presented in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.5.1-14 to 5.5.1-16), it is unlikely that implementation of the WSIP, including the Crystal Springs Dam Improvements project, would result in hydrological disconnects that would impede passage for *O. mykiss* migrating between the reservoir and upstream habitat. In addition, the hydrologic modeling indicated that the average monthly storage in Crystal Springs Reservoir would be greater under proposed WSIP operations than under existing conditions. Increased reservoir storage would provide an increase in the volume of habitat available for resident fish species inhabiting the reservoir, including both warmwater and coldwater fish species. The increase in storage elevation under the WSIP could also provide greater opportunities for connectivity and migration of fish between the reservoir and upstream tributary habitat. As a result of these factors, increased reservoir storage under proposed operations is considered a beneficial impact on fishery resources.

However, model projections show that restoring water storage levels in Crystal Springs Reservoir could cause a potential loss of stream channel and potential spawning area in San Mateo Creek. The Draft PEIR indicates that upstream areas may provide suitable replacement habitat, and this prospect is being evaluated in the project-level CEQA review for the Lower Crystal Springs Dam Improvements project. However, in the absence of site-specific information on the availability and feasibility of replacement habitat, this impact is considered potentially significant and unavoidable at the program level of analysis as a conservative determination in the Draft PEIR.

The Draft PEIR identifies Mitigation Measure 5.5.5-1, Create New Spawning Habitat Above Crystal Springs Reservoir (Vol. 4, Chapter 6, p. 6-62), as a strategy for surveying and creating suitable spawning habitat, but at a programmatic level of analysis, the feasibility of this measure remains unknown and thus the impact is considered potentially significant and unavoidable. This impact and mitigation measure will be evaluated in more detail during the project-level CEQA review for the Lower Crystal Springs Dam Improvements project (PN-4) when more site-specific information and project details are available to identify the nature and magnitude of the impact and to reevaluate the appropriateness and effectiveness of the mitigation measure. Project-level analysis may determine that this impact can be reduced to a less-than-significant level. Refer to Section 14.4, Master Response on PEIR Appropriate Level of Analysis (Vol. 7, Chapter 14, Section 14.4.2) for a discussion regarding the difference between project-level and program-level analysis.

S_CDFG2-18 The WSIP would include the diversion of additional water from Pilarcitos Creek to meet increased water demand in the Coastside County Water District service area. As the commenter correctly notes, the Draft PEIR indicates that the WSIP would have significant adverse impacts on surface water quality, fisheries, and terrestrial biological resources in Pilarcitos Reservoir and along Pilarcitos Creek as a result of increased diversions. To reduce these impacts to a less-than-significant level, the Draft PEIR identified Mitigation Measure 5.5.3-2 (Vol. 4, Chapter 6, p. 6-56). Under Measure 5.5.3-2, the SFPUC would develop an operations plan for the Pilarcitos watershed facilities that would closely resemble operations under existing operations. After completion of the Draft PEIR, the SFPUC attempted to develop the protocols necessary to implement Measure 5.5.3-2, but it became apparent that more practical measures would be preferred and replacement mitigation measures were identified; please refer to Vol. 7, Chapter 13, Section 13.3 for a discussion of the updated and refined analysis of resources in the Pilarcitos watershed and a description of the replacement mitigation measures. The replacement mitigation measures would reduce the impacts of the WSIP in the Pilarcitos Creek watershed to a less-than-significant level, including impacts on San Francisco garter snake and California red-legged frog.

The commenter's opinion with respect to the need for removal or modification of Stone Dam and the restoration of Pilarcitos Creek is acknowledged. However, the purpose of the replacement mitigation measures is to prevent degradation of Pilarcitos Creek and associated resources attributable to the WSIP relative to the existing condition, not to improve the creek relative to the existing condition. The SFPUC is currently participating in the Pilarcitos Creek Restoration Workgroup with the CDFG and other stakeholders to assess existing conditions and develop a strategy for creek restoration (see Vol. 3, Chapter 5, p. 5.2-21), but these activities are independent of the WSIP CEQA process. The CDFG's concurrence with the NMFS recommendations for steelhead restoration in Pilarcitos Creek is acknowledged.

S_CDFG2-19 The San Francisco Planning Department acknowledges receipt of the technical information contained in the appendix to the CDFG letter. The information provides further support of the conclusion in the Draft PEIR that long-term WSIP-induced flow reductions in the Tuolumne River below La Grange Dam could have a significant adverse (but mitigable) impact on anadromous fish. Please refer to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14) for discussion of fishery impacts in the lower Tuolumne River.

California State Assembly, Sally Lieber, Assemblywoman, 22nd District, 10/01/07

S_CSA-01 This comment, which expresses an opinion regarding the importance and urgency to rebuild the regional water system's infrastructure, is acknowledged. Please see **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Sections 14.1.2, 14.1.3, and 14.1.4) for an expanded discussion on the overall need for the WSIP and of the potential consequences of not implementing the proposed program.

S_CSA-02 This comment, which expresses concern regarding additional Tuolumne River diversions and requests that additional studies of alternatives that minimize diversions from the Tuolumne River be conducted, is acknowledged. Please refer to **Section 14.10, Master Response on Modified WSIP Alternative** (Vol. 7, Chapter 14) for more discussion and analysis of the environmentally superior alternative. Please also see **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.2) for more information regarding the SFPUC's adherence to the minimum required flows with or without the WSIP.

S_CSA-03 This comment opposing additional diversions from the Tuolumne River and supporting additional conservation is acknowledged. The comment praising BAWSCA and its member agencies for reducing residential usage is also acknowledged. Refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) regarding water conservation and recycling projects proposed by the SFPUC in San Francisco and by the SFPUC's wholesale customers in their respective service areas.

S_CSA-04 This comment, which expresses support for agricultural conservation to reduce diversions from the Tuolumne River, is acknowledged. Please refer to **Section 14.10, Master Response on Modified WSIP Alternative** (Vol. 7, Chapter 14) for more discussion of a water transfer agreement based on conserved water to avoid flow changes below Don Pedro Reservoir.

S_CSA-05 This comment, which stresses the immediate need for infrastructure repair of the system, is acknowledged. Please refer to **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Sections 14.1.2 and 14.1.3) for more discussion.

S_CSA-06 This comment expresses support for the environmentally superior alternative and for implementation of the WSIP; comment acknowledged.

California Department of Water Resources, Floodway Protection Section, Christopher Huitt, Staff Environmental Scientist, 07/23/07

S_DWR-01 Based on the information available during preparation of the Draft PEIR, it is uncertain, at a programmatic level of analysis, whether the San Joaquin Pipeline System project (SJ-3) would encroach on a designated floodway for the San Joaquin River or its tributaries, as identified in the State Adopted Plan of Flood Control. However, the Draft PEIR (Vol. 2, Chapter 4, p. 4.5-25) acknowledges that pipeline projects, including the San Joaquin Pipeline System project, would be subject to encroachment permits from the local flood control district or other appropriate local agency. The potential for encroachment of a designated floodway will be analyzed as part of project-level CEQA review for each WSIP project, including a discussion of the encroachment permitting requirements of the Reclamation Board if appropriate. Please refer to **Section 14.4**, **Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Sections 14.4.2 and 14.4.3) for information on the appropriate level of detail of an impact analysis at the program level versus the project level and for information regarding the SFPUC's coordination efforts with other agencies.

Regional Water Quality Control Board, Central Valley Region, Greg Vaughn, Senior Engineer, 10/17/07

S_RWQCBCV-01 This comment requests that the discussion of beneficial uses of surface waters be expanded to indicate that beneficial uses are designated in the State's Water Quality Control Plans for surface waters and ground water basins. In response to this comment, the Draft PEIR is revised as follows:

(Vol. 2, Chapter 4, p. 4.5-9, end of first full paragraph)

> These agencies also implement the Waste Discharge Requirements (WDR) Program, which regulates discharges of waste to land under the California Water Code as well as discharges of waste into waters of the state that are outside federal jurisdiction, as defined under the Clean Water Act.

(Vol. 2., Chapter 4, p. 4.5-9, end of second full paragraph)

> The San Francisco Bay RWQCB adopted its Basin Plan in 1995, and most recently revised the plan in December 2006. ~~November 2004. A general update to the plan was approved by the San Francisco Bay RWQCB in 2005 and by the SWRCB in April 2006. The update is undergoing review by the Office of Administrative Law.~~ The Central Valley RWQCB adopted its Basin Plan in 1998, and most recently revised the plan in October 2007~~September 2004~~.

S_RWQCBCV-02 In response to this comment, the Draft PEIR (Vol. 2, Chapter 4, p. 4.5-9, third paragraph) is revised as follows:

> Beneficial uses ~~of surface waters~~ serve as a basis for establishing water quality objectives and discharge prohibitions to attain ~~beneficial use goals~~ the goal of achieving the highest water quality consistent with the maximum benefit to the people of the state. Beneficial uses are designated in Basin Plans for surface waters and groundwater basins, and in the case of the San Francisco Bay Basin, wetlands. **Table 4.5-1** lists the designated beneficial uses for those water bodies that could be affected by the WSIP. ~~project activities, as defined in the Basin Plans.~~

The Draft PEIR is organized as follows: Vol. 2, Chapter 4 pertains to the environmental setting and impacts associated with the WSIP facility improvement projects, and Vol. 3, Chapter 5 pertains to the environmental setting and impacts associated with the WSIP water supply and system operations. Since the issues related to the Tuolumne River are addressed in Chapter 5, the requested supplemental information on the Tuolumne River and groundwater basin has been added to Vol. 3, Chapter 5. Therefore, in response to this comment, the Draft PEIR (Vol. 3, Chapter 5, p. 5.3.3-1, second full paragraph) is revised as follows:

> The Tuolumne River flows from the crest of the Sierra Nevada westward to its confluence with the San Joaquin River. The San Joaquin River flows north to the Sacramento–San Joaquin Delta. Water from the Delta discharges to the San Francisco Bay Estuary and the Pacific Ocean. The Tuolumne River system and downstream water bodies are shown in Figure 5.1-1. Beneficial uses of the Tuolumne River, as designated in the *Water Quality Control Plan for the Sacramento and San Joaquin River Basins*, include the following:
>
> - Source to (New) Don Pedro Reservoir: Municipal and Domestic Supply (MUN); Agricultural Supply (AGR); Hydropower Generation (POW); Water Contact Recreation (REC-1); Non-water Contact Recreation (REC-2); Warm Freshwater Habitat (WARM); Cold Freshwater Habitat (COLD); and Wildlife Habitat (WILD)
>
> - New Don Pedro Reservoir: MUN (Potential); POW; REC-1; REC-2; WARM; COLD; and WILD
>
> - New Don Pedro Dam to San Joaquin River: MUN (Potential); AGR; REC-1; REC-2; WARM; COLD; Migration of Aquatic Organisms (MIGR); Spawning, Reproduction, and/or Early Development (SPWN); and WILD

The following reference is added to the end of Section 5.3.3 (Vol. 3, Chapter 5, p. 5.3.3-21):

State Water Resources Control Board (SWRCB), California Regional Water Quality Control Board, Central Valley Region, *Water Quality Control Plan (Basin Plan) for the Sacramento and San Joaquin River Basins*, Fourth Edition, Revised October 2007 with approved amendments.

In addition, the following text is added to the Draft PEIR (Vol. 3, Chapter 5, p. 5.3.5-1, end of the second full paragraph):

> The Tuolumne River flows from the crest of the Sierra Nevada westward to its confluence with the San Joaquin River. The San Joaquin River flows north to the Sacramento–San Joaquin Delta. The Tuolumne River system and downstream water bodies are shown in Figure 5.3.1-1. Unless otherwise designated by the California Regional Water Quality Control Board, all groundwaters in the Central Valley region are considered to be suitable or potentially suitable, at a minimum, for municipal and domestic supply, agricultural supply, industrial service supply, and industrial process supply.

S_RWQCBCV-03 In response to this comment regarding state regulation of activities in wetlands, the Draft PEIR is revised as follows:

(Vol. 2, Chapter 4, p. 4.5-12, insert new first paragraph under the heading Construction in Waters of the State and of the United States)

> The Regional Water Quality Control Board (RWQCB) has regulatory authority over construction in waters of the United States and waters of the state, including activities in wetlands, under both the Clean Water Act and the State of California's Porter-Cologne Water Quality Control Act (California Water Code, Division 7). Under the Clean Water Act, the RWQCB has regulatory authority over actions in waters of the United States through the issuance of water quality certifications under Section 401 of the Clean Water Act, which are issued in conjunction with permits issued by the Army Corps of Engineers (Corps) under Section 404 of the Clean Water Act. When the RWQCB issues a Section 401 certification for a project, the project is also regulated under State Water Resources Control Board Order No. 2003-0017-DWQ, "General Waste Discharge Requirements for Dredge and Fill Discharges That Have Received State Water Quality Certification," which requires compliance with all conditions of the water quality certification. Activities in areas that are outside the jurisdiction of the Corps (e.g., isolated wetlands, vernal pools, or stream banks above the ordinary high water mark) are regulated by the RWQCB under the authority of the Porter-Cologne Act. Activities that lie outside of Corps jurisdiction may require the issuance of either individual or general waste discharge permits.

(Vol. 2, Chapter 4, p. 4.6-32, fourth full paragraph)

> The state's authority to regulate activities in wetlands and water at the project sites resides primarily with the ~~State Water Resources Control Board (SWRCB)~~ California Regional Water Quality Control Board (RWQCB), which regulates construction in waters of the United States and waters of the state, including activities in wetlands, under both the Clean Water Act and the State of California's Porter-Cologne Water Quality Control Act. .... The RWQCB ~~SWRCB, acting through the nine Regional Water Quality Control Boards,~~ must certify that a Corps permit action meets state water quality objectives (Section 401, Clean Water Act).

S_RWQCBCV-04 The commenter correctly summarizes the general analysis presented in Impact 4.5-1 (Vol. 2, Chapter 4, pp. 4.5-21 to 4.5-28) regarding water quality degradation due to erosion and sedimentation.

SFPUC Construction Measure #3, described in the Draft PEIR (Vol. 1, Chapter 3, p. 3-80) identifies the *minimum* measures that would be taken to reduce adverse effects related to sedimentation and erosion. The

San Francisco Planning Department and SFPUC acknowledge the recommendation of the commenter to consider scheduling and phasing of construction activities as a feasible and effective best management practice to limit areas and periods of disturbance to the maximum extent practicable and to minimize the area of disturbed soil during the wet season.

S_RWQCBCV-05 The biological impact analysis in the Draft PEIR considers the requirements of the Porter-Cologne Water Quality Control Act. In response to this comment, the Draft PEIR (Vol. 2, Chapter 4, p. 4.6-37, third significance criterion) is revised as follows:

- Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act and as protected under the Porter-Cologne Water Quality Control Act (including but not limited to marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means (Evaluated in this section)

S_RWQCBCV-06 As noted in **Response S_RWQCBCV-03**, the Draft PEIR has been revised to indicate that the RWQCB's authority over wetlands of any type, including areas that are outside of Corps jurisdiction under the Clean Water Act.

In response to this comment, the mitigation measure for wetland impacts is revised as follows:

(Vol. 4, Chapter 6, p. 6-11, Measure 4.6-1b, first paragraph)

> **Measure 4.6-1b:** If the wetland delineation indicates that the WSIP project will affect jurisdictional wetlands or aquatic resources, then, in accordance with state and federal permit requirements, the SFPUC will avoid and minimize direct and indirect impacts such as erosion and sedimentation, alteration of hydrology, and degradation of water quality. As a first priority, the SFPUC will implement (1) avoidance measures. For unavoidable impacts, the SFPUC will implement (2) minimization of unavoidable impacts, (3) restoration procedures, and (4) compensatory creation or enhancement to ensure no net loss of wetland extent or function.

The San Francisco Planning Department and the SFPUC acknowledge that for all impacts on wetlands, the SFPUC will be required to demonstrate to the RWQCB that they have avoided and minimized impacts to the maximum extent practicable before considering compensation measures.

S_RWQCBCV-07 This comment corroborates information presented in a footnote in the Draft PEIR (Vol. 2, Chapter 4, p. 4.6-31), where the current regulatory environment regarding wetlands is discussed.

S_RWQCBCV-08 Section 5.2 of the Draft PEIR (Vol. 3, Chapter 5, p. 5.2-6) includes a brief summary of the Clean Water Act, with the intent of providing an overview of the regulations generally governing the SFPUC's water supply and system operations as they would be affected by the WSIP. Additional description of sections of the Clean Water Act relevant to the construction and operation of the facility improvement projects under the WSIP are provided in the Draft PEIR (Vol. 2, Chapter 4, pp. 4.5-9 to 4.5-17 and pp. 4.6-31 to 4.6-32), including mention of Section 401 of the Clean Water Act.

The following text is added to the Draft PEIR (Vol. 3, Chapter 5, p. 5.2-6, end of the fourth full paragraph) to augment the description of the Clean Water Act:

> Under Section 401 of the Clean Water Act, every applicant for a federal permit for any activity that may affect waters of the state must obtain a water quality certification that the proposed activity will comply with state water quality standards.

S_RWQCBCV-09 The commenter accurately summarizes the analysis presented in Impact 5.3.7-2 (Vol. 3, Chapter 5, pp. 5.3.7-15 to 5.3.7-22) regarding impacts on alluvial features that support meadow and riparian habitat along the Tuolumne River below Hetch Hetchy Reservoir. The commenter also notes the importance of baseline studies to assess the effectiveness of pulse flows per Mitigation Measure 5.3.7-2 (Vol. 4, Chapter 6, p. 6-50). This corroborates the requirements of the mitigation measure, which states that the SFPUC will gather "baseline data regarding the extent, species composition and condition of the existing meadow vegetation…"

S_RWQCBCV-10 Please refer to **Section 4.11, Master Response on Climate Change** (Vol. 7, Chapter 14) for additional discussion of climate change to augment the discussion presented in Section 5.7.6 of the Draft PEIR (Vol. 3, Chapter 5, pp. 5.7-92 to 5.7-96). Section 4.11 provides more detailed and up-to-date information on climate change as it relates to the SFPUC regional water supply and the proposed WSIP.

Regional Water Quality Control Board, San Francisco Bay Region, Keith H. Lichten, Senior Engineer, 10/03/07

S_RWQCBSF-01 Please refer to **Response S_RWQCBCV-01**.

S_RWQCBSF-02 Refer to **Response S_RWQCBCV-02** for a description of Draft PEIR text revisions related to beneficial uses. In addition, in response to this comment, additional information is added to Table 4.5-1 (Vol. 2, Chapter 4, p. 4.5-10) as follows:

TABLE 4.5-1
DESIGNATED BENEFICIAL USES

Water Body	Designated Beneficial Uses
San Joaquin Region	
San Joaquin River	MUN (potential), AGR, IND, MIGR, REC-1, REC-2, WARM, SPWN, WILD
California Aqueduct	MUN, AGR, IND, REC-1, REC-2, WILD
Delta-Mendota Canal	MUN, AGR, REC-1, REC-2, WARM, WILD
Sunol Valley Region	
Alameda Creek	AGR, COLD, GWR, MIGR, REC-1, REC-2, SPWN, WARM, WILD
Arroyo Hondo	COLD, FRSH, MUN, REC-1, REC-2, SPWN, WARM, WILD
Calaveras Reservoir	COLD, MUN, REC-1 (limited), REC-2, SPWN, WARM, WILD
San Antonio Reservoir	COLD, MUN, REC-1 (limited), REC-2, SPWN, WARM, WILD
Niles Cone Groundwater	MUN, PROC, IND, AGR
Bay Division Region	
Guadalupe River	COLD, MIGR (potential), REC-1 (potential), REC-2, SPWN (potential), WARM, WILD
Santa Clara Valley Groundwater	MUN, PROC, IND, AGR (potential)
Peninsula Region	
San Mateo Creek	COLD (potential), FRSH, RARE, REC-1 (potential), REC-2 (potential), SPWN, WILD
Crystal Springs Reservoir	COLD, MUN, RARE, REC-2, SPWN, WARM, WILD
San Andreas Reservoir	COLD, MUN, RARE, REC-1 (limited), REC-2, SPWN, WARM, WILD
San Mateo Plain Groundwater	MUN, PROC, IND, AGR (potential)
San Francisco Region	
Lake Merced	COLD, MUN (potential), REC-1, REC-2, SPWN, WARM, WILD
Westside Groundwater	MUN, PROC (potential), IND (potential), AGR
San Francisco Bay	
San Francisco Bay, Lower	COMM, EST, IND, MIGR, NAV, RARE, REC-1, REC-2, SHELL, SPWN (potential), WILD
San Francisco Bay, South	COMM, EST, IND, MIGR, NAV, RARE, REC-1, REC-2, SHELL, SPWN (potential), WILD

Beneficial Uses Key:

MUN (Municipal and Domestic Supply); AGR (Agriculture); REC-1 (Body Contact Recreation); REC-2 (Noncontact Recreation); WARM (Warm Freshwater Habitat); COLD (Cold Freshwater Habitat); MIGR (Fish Migration); SPWN (Fish Spawning); WILD (Wildlife Habitat); NAV (Navigation); GWR (Groundwater Recharge); FRSH (Freshwater Replenishment); RARE (Preservation of Rare and Endangered Species); SHELL (Shellfish Harvesting); COMM (Ocean, Commercial, and Sport Fishing); EST (Estuarine Habitat); IND (Industrial Service Supply); PROC (Industrial Process).

Note: Beneficial uses for specific wetland sites affected by the WSIP facility improvement projects in the San Francisco Bay region will be determined as needed based on the process described in the San Francisco Bay Basin Plan.

S_RWQCBSF-03 Refer to **Response S_RWQCBCV-03**.

S_RWQCBSF-04 The information regarding the RWQCB's ongoing development of a Municipal Regional Urban Runoff Phase I NPDES Stormwater Permit that will replace the municipal stormwater permits in Alameda, Santa Clara, and San Mateo Counties is acknowledged.

In response to this comment, the Draft PEIR (Vol. 2, Chapter 4, p. 4.5-13, second full paragraph) is revised as follows:

> The C.3 requirements are similar for all counties. However, local municipalities are phasing in these requirements, and specific procedures and application requirements may differ from one municipality to another. Reconstruction projects located within ~~Projects completed in~~ a public street or road right-of-way, such as some pipeline projects proposed as part of the WSIP, are exempt from the C.3 requirements where ~~when~~ both sides of the right-of-way are developed.

S_RWQCBSF-05 Refer to **Response S_RWQCBCV-04**.

S_RWQCBSF-06 The commenter correctly summarizes the analysis in Impact 4.5-2 (Vol. 2, Chapter 4, p. 4.5-29) and the associated Mitigation Measure 4.5-2 (Vol. 4, Chapter 6, pp. 6-9 and 6-10) regarding the depletion of groundwater resources. The commenter also notes the potential relationship between Impact 4.5-2 and wetland habitat.

The commenter states that Mitigation Measure 4.6-1a (Vol. 4, Chapter 6, p. 6-11) should be expanded to include an evaluation of indirect effects on aquatic and riparian habitat for the New Irvington Tunnel project (SV-4). During preparation of the project-level EIR, baseline surveys will be identified and carried out based on the defined footprint, the project description and construction methods, and more complete and current ecological information that would better identify indirect impacts. The "three step review process" cited by the commenter and recommended for inclusion is explicitly required by CEQA Guidelines Section 15370 and does not need to be restated in the text. To clarify, however, the Draft PEIR (Vol. 4, Chapter 6, p. 6-11, second full paragraph) is revised as follows:

> **Measure 4.6-1b:** If the wetland delineation indicates that the WSIP project will affect jurisdictional wetlands or aquatic resources, then, in accordance with state and federal permit requirements, the SFPUC will avoid and minimize direct and indirect impacts such as erosion and sedimentation, alteration of hydrology, and degradation of water quality. As a first priority, the SFPUC will implement (1) avoidance measures. For unavoidable impacts, the SFPUC will implement (2) minimization of unavoidable impacts, (3) restoration procedures, and

> (4) compensatory creation or enhancement to ensure no net loss of wetland extent or function.

S_RWQCBSF-07 The commenter correctly summarizes the analysis in Impact 4.5-3 (Vol. 2, Chapter 4, pp. 4.5-31 to 4.5-33) regarding construction dewatering discharges.

In response to this comment, the Draft PEIR (Vol. 2, Chapter 4, p. 4.5-31, last paragraph) is revised as follows:

> For projects that are subject to the Construction General Permit (described in Impact 4.5-1, above), the discharges could possibly be made in accordance with this permit, provided it could be demonstrated that the water is uncontaminated. … Discharge to a local sanitary sewer system would comply with the requirement of the local permitting agency. Other General Permits in the San Francisco Region under which dewatered groundwater may be discharged include the following General NPDES Permits:
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> - General NPDES Permit for VOC Cleanups (Order No. R2-2004-0055)
> - General NPDES Permit for Fuel Cleanups (Order No. R2-2006-0075)
> - General NPDES Permit for Groundwater Dewatering (Order No. R2-2006-0075)
>
> Before discharging under any general permit, the SFPUC must submit a completed Notice of Intent that includes a dewatering plan with appropriate treatment and monitoring specifications. The SFPUC should also allow at least 60 days for the RWQCB review and acceptance of the Notice of Intent and dewatering plans.

S_RWQCBSF-08 The San Francisco Planning Department acknowledges the RWQCB's recommendation that the SFPUC evaluate the potential to plumb blowoff valves, crossover facilities, and other potable water discharge locations to treatment plants and sanitary sewers, where feasible, rather than draining to a surface water body. During project-level environmental review of the individual WSIP facility improvement projects, more detailed and site-specific analysis of this impact will be conducted to determine the applicability and feasibility of these measures on a project-by-project basis.

S_RWQCBSF-09 The commenter summarizes the analysis in Impact 4.5-6 (Vol. 2, Chapter 4, pp. 4.5-49 to 4.5-54) regarding the degradation of water quality due to altered drainage patterns or an increase in impervious surfaces. In response to the clarification indicated by the commenter, the Draft PEIR (Vol. 2, Chapter 4,

p. 4.5-50, first and second full paragraphs under "Other Projects") is revised as follows:

> With the exception of San Francisco and San Joaquin County, the municipal stormwater permits for the counties within the WSIP study area require new development and redevelopment projects that involve the creation or replacement of impervious surfaces to incorporate treatment measures and other appropriate source control and site design features to reduce the pollutant load in stormwater discharges and to manage runoff flows; the applicability of countywide MS4 stormwater management controls to the WSIP will be determined on a project-by-project basis as part of project-level review of individual WSIP projects. In each county, projects subject to these controls that involve the creation or replacement of one or more acres of impervious surfaces were required to comply with the new development and redevelopment requirements as of February 15, 2005. Projects subject to countywide MS4 stormwater management controls that involve the creation or replacement of 10,000 square feet or more of impervious surfaces were required to comply with the requirements by August 15, 2006. These thresholds apply to individual projects and are not applied to a cumulative set of projects if the locations of the cumulative set of projects under a single program are noncontiguous and/or are not part of a single common plan of development. To the extent that projects subject to countywide MS4 stormwater management controls are part of a single common plan of development that cumulatively exceeds 10,000 square feet of new or replaced impervious surface, the smaller amount of impervious surface from each sub-project would require appropriately sized stormwater treatment BMPs. ~~such as the WSIP. The applicability of the municipal stormwater permit requirements to specific projects would depend on the amount of impervious surface that would be created or replaced.~~
>
> In addition, projects subject to countywide MS4 stormwater management controls that involve land disturbance of more than one acre would be required to include post-construction erosion and sediment control BMPs in the SWPPP prepared for the project (Described in the Setting and in Impact 4.5-1). For projects subject to countywide MS4 stormwater management controls, the post-construction erosion and sediment control BMPs for projects located in Alameda, Santa Clara, and San Mateo Counties and creating or replacing more than one acre of impervious surface must also comply with requirements in the Hydrograph Modification Management Plans for those counties. Post-construction BMPs could include minimizing land disturbance or the amount of impervious surfaces; treating stormwater runoff using infiltration, detention/retention, or biofilters; using efficient irrigation systems; ensuring that interior drains are not connected to a storm sewer system; and using appropriately designed and constructed energy dissipation devices. These measures would be designed to ensure that drainage patterns are not changed in a way that results in offsite erosion or flooding, and must be consistent with all

local post-construction stormwater management requirements, policies, and guidelines. Coverage under the General Construction Permit cannot be terminated until the site is in compliance with all local stormwater management requirements and a post-construction stormwater management plan is in place, as described in the SWPPP.

The commenter's concern that watershed management actions pertaining to onsite stormwater collection and drainage systems be continued for the life of the system/facility at all SFPUC facilities is acknowledged.

S_RWQCBSF-10 Please refer to **Response S_RWQCBCV-05**.

S_RWQCBSF-11 Refer to **Responses S_RWQCBCV-03, S_RWQCBCV-06,** and **S_RWQCBSF-07**.

S_RWQCBSF-12 Refer to **Responses S_RWQCBCV-03** and **S_RWQCBCV-07**.

S_RWQCBSF-13 Refer to **Response S_RWQCBCV-08**.

S_RWQCBSF-14 The comment requests that: (1) the Alameda Creek sediment transport setting discussion in the Draft PEIR include discussion of Leopold's "effective work concept," which concludes that a change in discharge or sediment load may initiate changes in channel morphology; (2) potential changes in both the timing of sediment input and water flows along Alameda Creek downstream of the diversion dam be assessed, since they have the potential to affect channel shape and sediment transport; and (3) continuous modeling over the period of record be used for the assessment in the PEIR.

The Draft PEIR includes an assessment of impacts on geomorphology in Alameda Creek (Vol. 3, Chapter 5, pp. 5.4.2-1 to 5.4.2-4), which includes projected changes in sediment transport and channel formation resulting from stream flow changes associated with WSIP implementation. The assessment is based on generalized channel bed/bedrock characteristics and historical operations and stream flow. Based on the qualitative analysis presented in the Draft PEIR and discussed further below, the geomorphic impacts would be less than significant, and therefore the requested additional detailed quantitative analysis is not necessary for CEQA purposes.

Current geomorphic surfaces within the creek downstream of the Alameda Creek Diversion Dam (ACDD) have been heavily influenced by the construction of the dam in 1932. Since that time, flow in Alameda Creek downstream of the diversion dam has been regulated by diversions through the Alameda Diversion Tunnel to Calaveras Reservoir. Operational records for the ACDD are not readily available, except for recent (post-2002) operations, as shown in Section 5.4.1 of the Draft PEIR (Vol. 3, Chapter 5, pp. 5.4.1-7 to

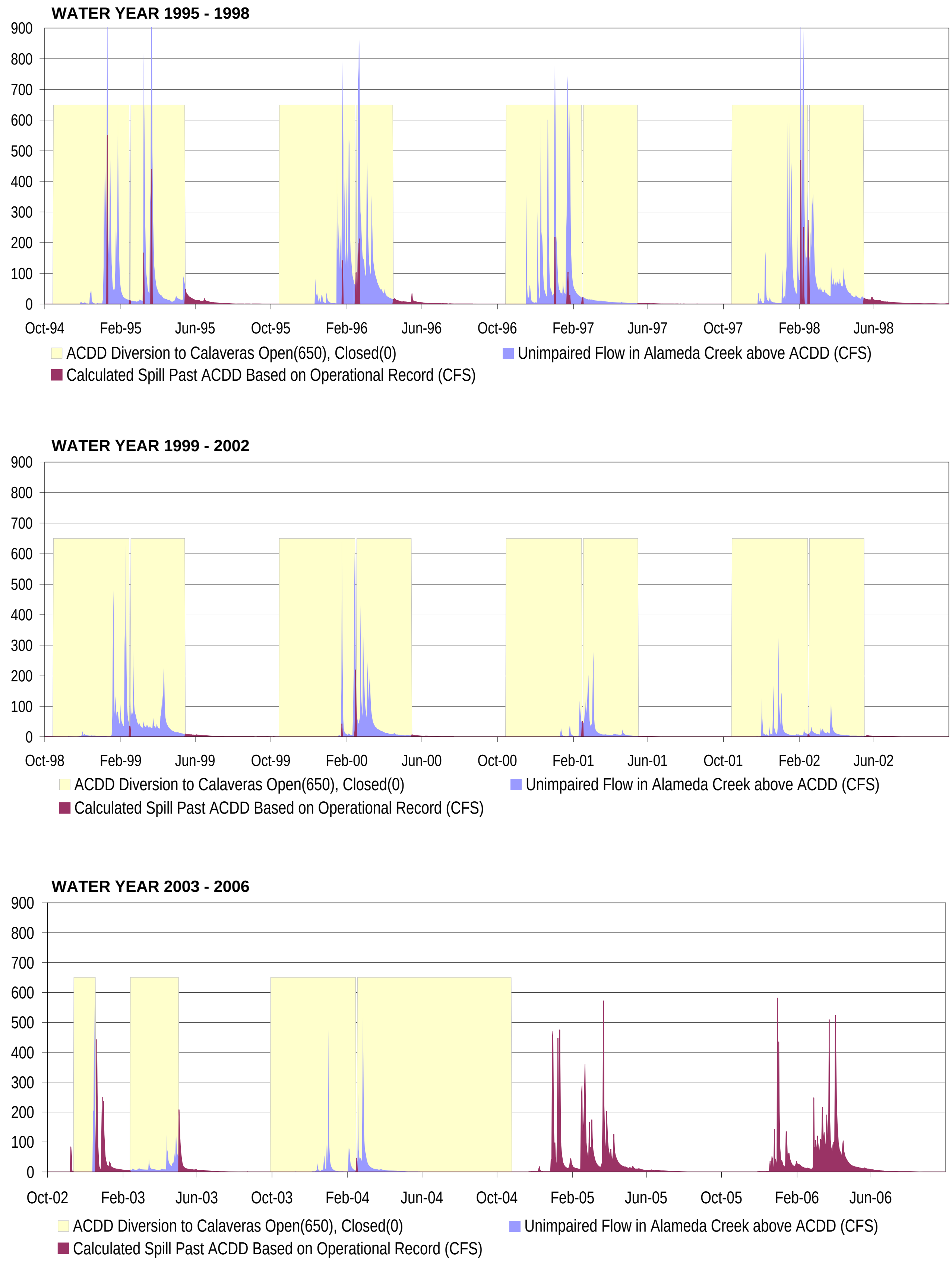
5.4.1-13). As noted in this section, prior to the Division of Safety of Dams (DSOD) restrictions on operation of Calaveras Reservoir (pre-2002), the SFPUC operational procedure was to divert flows of up to 650 cubic feet per second (cfs) from Alameda Creek above the diversion dam to Calaveras Reservoir for the majority of the wet season, and annually to sluice/flush sediment from behind the dam into the downstream reach of Alameda Creek. Since implementation of the DSOD-restricted operating condition in Calaveras Reservoir, diversions to Calaveras Reservoir have continued during drier years; however, the frequency of diversion as well as the quantities of water diverted have been substantially reduced due to the reduced capacity of the reservoir. Accordingly, more flow currently bypasses the dam and sediment loading/transport downstream of the dam has increased from pre-2002 operations.

Figure 15.2-1 shows changes in flow conditions at the ACDD over the period of available gage record, incorporating operational variations that have occurred pre- and post-DSOD restrictions. The blue area of the figure represents inflow from upper Alameda Creek to the diversion dam; the maroon area represents the calculated flow below the diversion dam; and the yellow area indicates when the diversion gates were open to allow flows to be diverted to Calaveras Reservoir.

The SFPUC began implementing the DSOD restriction in water year 2002, which means that it discontinued operating Calaveras Reservoir at its full historical capacity in the autumn of 2001. However, due to hydrological/ meteorological conditions, diversions from Alameda Creek to Calaveras Reservoir continued in 2002, partially in 2003, and again in 2004. Diversions did not occur in 2005 or 2006, both above-normal hydrologic years when Calaveras fill limits were met entirely from reservoir watershed flows; diversions were initiated again in 2007, a dry year, and early in 2008 (not shown on the chart).

Since implementation of the DSOD restriction, the frequency and magnitude of diversions have become more variable, with reduced overall diversions to Calaveras Reservoir, particularly during wetter years; this has resulted in more flow in Alameda Creek downstream of the diversion dam as compared to the unrestricted pre-DSOD condition.

As noted by the commenter, these more frequent moderate flows occurring during the current operating condition have likely mobilized and transported sediment in Alameda Creek downstream of the diversion dam that would not have been mobilized by the lesser flows under the unrestricted pre-2002 condition. However, it should be noted that implementation of the DSOD restriction has not resulted in a cessation of all diversions; under the



SOURCE: SFPUC Water System Improvement Program

Notes:
- Assumes that under pre-DSOD restriction conditions, diversion gates were opened on 10/15 and closed on 4/15 each year
- Assumes a two day sluice in February of each year except in 2002

SFPUC Water System Improvement Program . 203287

Figure 15.2-1
Flow Conditions at Diversion Dam under Various Operational Scenarios– pre- vs. post-DSOD Restrictions

DSOD-restricted condition, winter flow conditions in Alameda Creek below the ACDD are similar to pre-DSOD operations in lower-flow years. Therefore, sediment supply and movement characteristics similar to those under historical (pre-2002) conditions continue to occur in lesser rainfall years.

As stated above, the creek channel, in its current form, is largely a result of ACDD operations since the dam was built in 1932. Operational records for the diversion dam are not available for that entire period. However, it may be assumed that SFPUC management practices and policies, water demands, hydrology, and maintenance activities have resulted in a range of operating conditions over that time period.

Implementation of the WSIP would result in changes in flow and sediment delivery below the ACDD. However, with respect to diversion dam operations, with the exception of the bypass flows included as protective measures under the Calaveras Dam Replacement project (SV-2) as described in Section 13.2 (Vol. 7, Chapter 13), the WSIP would represent a return to historical operations. Channel form and sediment characteristics found downstream in Alameda Creek are largely a result of the historical operation of the diversion dam, not of the current, temporarily restricted operating condition. Current operations of the diversion dam, while different from pre-2002 operations, are likely within the range of operations performed over the last 76 years. Similarly, the current range of flows and sediment delivery to Alameda Creek below the dam are likely within the historical range that has resulted in the creek channel in its present form. Therefore, a return to near-historical operations is not expected to significantly alter the geomorphology below the ACDD, since these conditions have formed over several decades under variable hydrologic and operating conditions that have not differed significantly from those currently occurring.

Thus, operational variability, the continued diversions above the ACDD (albeit at a reduced rate), and the fact that current geomorphology downstream of the diversion dam is a result of over 70 years of managed flows have all contributed to the widely varying patterns of sediment transport and geomorphic processes. The sediment supply and flow rates that would occur under the WSIP would likely be within the historical range. The proposed return to historical diversion patterns would change the timing of sediment load to Alameda Creek below the diversion dam compared to the existing condition. However, due to the sluicing/flushing procedure, the quantity and particle-size distribution of sediments would not be altered considerably.

It should be noted that in and below the Sunol Valley, sand/gravel extraction activities and the recent removal of the Niles and Sunol Dams have had, and would continue to have, a larger effect on sediment transport and stream geomorphology than any changes in flows and sediment transport from the upper Alameda Creek watershed. Mining activities in the Sunol Valley have altered both the groundwater table and creek form in the vicinity of the quarries. The drawn down groundwater table in the quarry reach currently reduces flow in Alameda Creek by increasing surface water loss to groundwater, reducing the capacity of the creek to transport sediment, particularly at lower to moderate flows. The channelization of the creek has likely increased the velocity of higher flows through the reach, altering the timing and character of sediment deposited and transported in the quarry reach. Farther downstream, within Niles Canyon, the Sunol and Niles Dams have recently been removed, exposing sediments deposited in the former backwaters of the dams. Studies performed for the removal of the dams estimated that the sediment stored in the former backwaters would migrate downstream over the course of several decades, redistributing throughout Niles Canyon and eventually farther downstream.

In addition to these factors, implementation of Mitigation Measures 5.4.1-2 and 5.4.5-3 (Vol. 4, Chapter 6, pp. 6-51 to 6-53) and bypass flows included as protective measures under the Calaveras Dam Replacement Project would act to dampen the change in flow regime from current intermittent diversion characteristics to the future condition with much more sustained diversion. Mitigation Measure 5.4.1-2 would require that the SFPUC not divert excess flow, that is, diversion would be limited only to the water necessary to fill Calaveras Reservoir. Once the reservoir is full, diversion gates would be closed and flow during the remainder of the season would continue over the dam, carrying suspended sediments with it. Once the diversion gates are closed, the full flow in Alameda Creek would continue past the diversion dam. The magnitude of these flows, if any, would depend on year-to-year hydrological and meteorological conditions.

In summary, channel shape and sediment characteristics in Alameda Creek below the diversion dam have been significantly influenced by the historical operation of the dam. The current operating condition of the diversion dam, which continues to divert flow to Calaveras Reservoir in a reduced capacity and to annually sluice/flush sediments, is expected to be within the range of operating conditions that have occurred since construction of the dam. While the current, restricted operating condition may provide a steadier supply of sediment and higher flow rates in Alameda Creek below the diversion dam than historical operating conditions, it is not expected to have significantly altered Alameda Creek geomorphology over the short timeframe and variable operating conditions that have occurred since the 2001 DSOD restriction was implemented. Based on the above analysis, continuous modeling over the period of record is not necessary to identify this programmatic impact.

Please refer to **Response L_ACWD-13** (Vol. 7, Chapter 12, Section 12.3) for further discussion of geomorphology in Alameda Creek.

S_RWQCBSF-15 The commenter states that the Draft PEIR does not include an evaluation of potential water quality impacts associated with the sluicing of sediment from behind the ACDD. As explained below, such an analysis was not undertaken because the WSIP is expected to improve water quality below the ACDD compared with existing conditions.

The Draft PEIR (Vol. 3, Chapter 5, p. 5.4.2-2) states that the SFPUC uses the sluice gates to discharge approximately 900 cubic yards per year of accumulated sediment from behind the ACDD. This activity is largely sediment flushing to remove sand and gravel that has settled behind the diversion dam.

This SFPUC flushing operation is intended to remove accumulations of coarse sediment to protect the facility, maintain storage capacity (and thus diversion capacity) above the diversion dam, and support downstream geomorphic processes by passing the sediment. Sediment flushing of the diversion dam typically occurs in February, at which time the sluice gates are opened to flush coarse sediments from upstream of the dam. Operations normally occur over a 48-hour period during high-flow events (necessary to develop the velocity to mobilize coarse sediments behind the dam). Flushing operations occur whether or not any flows from the creek are being diverted to the diversion tunnel. The sluice gates remain closed except during the flushing procedure. In the infrequent event that creek flows exceed the tunnel capacity (650 cubic feet per second), excess creek waters flows over the top of the dam. As described in the Draft PEIR (Vol. 1, Chapter 2, p. 2-24), if water is not diverted via the diversion gates to the reservoir, the entire volume of the creek flows over the top of the dam. These SFPUC sediment flushing activities and sluice gate operations would continue, unchanged, under the WSIP.

It is likely that more sediment would be transported to Calaveras Reservoir with the WSIP than under current conditions because of the increased flows diverted to Calaveras Reservoir. Many of these sediments would settle out in the reservoir, reducing the overall quantity of sediments in the creek. Therefore, less sediment would be available for transport (either in flows over the dam or via sluicing/flushing operations) down both the upper and lower reaches of Alameda Creek. It is unclear whether this is the case in reality, because the sluice gates may have been left open for longer than 48 hours to allow flows to pass at those times when diversions were not occurring during post-2002-conditions.

Operation of the proposed bypass structure at the ACDD as part of the Calaveras Dam Replacement project (SV-2) would maintain the transport of sediment during periods of low-flow to some extent and would transport finer-grained material. This would act to reduce the amount of the slug passed during sluicing/flushing.

Thus, it is likely that downstream sediment transport, deposition, and turbidity associated with sluicing/flushing operations would decrease with the WSIP compared to existing conditions. The following water quality information is provided for informational purposes.

No water quality data are available for Alameda Creek immediately below the diversion dam for use in analyzing the direct water quality impacts associated with sediment flushing behind the dam. However, water quality data collected by the Alameda County Water District (ACWD) and analyzed for total dissolved solids (TDS) were examined to identify the general characteristics of TDS farther downstream in Alameda Creek (see Draft PEIR, Table 5.4.3-4, Vol. 3, Chapter 5, p. 5.4.3-6). Samples were collected at approximately five-day intervals near Sunol in Alameda Creek, above Arroyo de la Laguna, from 1997 through 2005, on a total of 270 days.[1] This sampling location is about 10 miles downstream from the ACDD, and the water quality of Alameda Creek at this location is affected by numerous upstream inflows and land uses, including the diversion dam, Calaveras Dam, Welch Creek, Turner Dam, and gravel mining operations and quarries.

Review of the ACWD data at Sunol indicate that high levels of TDS occurred on numerous occasions during this period. The TDS levels were largely independent of season and flow. Because high TDS levels were recorded throughout the year and under a wide range of flow conditions, it is not evident if the elevated TDS levels are related to natural watershed processes (e.g., erosion) and/or land use activities in the watershed. There is no correlation between the TDS levels and the SFPUC's annual 48-hour sediment flushing operation at the ACDD that typically occurs in February. Therefore, it is assumed that implementation of the WSIP would not affect TDS levels, and the water quality impact would be less than significant.

Settleable material may include fine alluvial sediments. The settling of fine material onto spawning gravels can cause decreased survival and emergence of

1 Note that there are several periods of data gaps. The ACWD has indicated that these data may not have been subject to the rigorous QA/QC procedures required for scientific studies, and therefore should not be used for purposes other than to indicate general conditions, unless otherwise specified by the ACWD (see **Response L_ACWD-14**).

salmonid eggs and alevin (newly hatched fish in larval stage not yet emerged from the nesting area). If the sluice gates are closed suddenly and not incrementally during sediment flushing operations, stream depth and flow velocity can change substantially over a short period of time. If this occurs during or after rainbow trout spawning, areas where fish have spawned may become dewatered or otherwise unsuitable for the development of embryos or fry through the settling of fines onto the spawning gravels. If releases are gradually reduced at a rate that does not exceed the typical flow reductions occurring under the natural hydrograph, these effects on spawning grounds would be substantially avoided. A more detailed analysis of this potential effect on fishery habitat below the ACDD will be conducted as part of the EIR for the Calaveras Dam Replacement project (SV-2). However, under the WSIP, increased diversions to Calaveras Reservoir would transport more settleable material to the reservoir than is currently carried with sediments transported to Alameda Creek. Therefore, the volume of materials to be sluiced/flushed from the ACDD under the WSIP is likely to be reduced compared with current conditions, which would result in a less-than-significant water quality impact with respect to settleable materials.

Suspended material would consist of the same material present in the channel, alluvial sediments, and waters of Alameda Creek. The 48-hour sediment flushing operation is assumed to have a less-than-significant water quality impact with respect to suspended material, because flushing operations occur during high-flow events when suspended material is typically elevated, and would therefore add minimally to the overall suspended sediment load and turbidity in the flows.

The ACWD turbidity data described above show that turbidity was below 50 NTU approximately 95 percent of the time. Turbidity exceeded 50 NTU on 14 days (see table below). Elevated turbidity was largely associated with elevated flow rates and occurred throughout the December through March period, and is an existing phenomenon within the watershed resulting from high wet-weather flows and erosion in the watershed. Furthermore, although the WSIP would increase the volume of sediment flushed and transported downstream, it would not create an additional sediment load in the Sunol Valley. These sediments would presumably have a similar fate once past the ACDD as under existing conditions, which is that the sediments would be transported downstream at a rate determined by the carrying capacity of the creek. The 48-hour sediment flushing operation is assumed to have a less than significant water quality impact with respect to turbidity because operations occur during high flow events when turbidity is typically well above 50 NTU.

TURBIDITY IN ALAMEDA CREEK NEAR SUNOL, ABOVE ARROYO DE LA LAGUNA (1997–2005)

Date	Turbidity (NTU)	Flow (cfs)	Date	Turbidity (NTU)	Flow (cfs)
12/2/1997	100	18	1/18/2000	141	80
12/12/1997	100	301	1/25/2000	93.4	250
12/15/1997	182	83	2/15/2000	81.5	30
1/12/1998	1,000	600	2/29/2000	65.7	650
2/16/1998	117	1,500	3/6/2000	56.8	730
2/24/1998	171	2,300	3/5/2002	112	10
2/9/1999	1,000	1,000	2/26/2004	347	350

These ACWD TDS data may not have been subject to the rigorous QA/QC procedures required for scientific studies, and therefore should not be used for purposes other than to indicate general conditions, unless otherwise specified by the ACWD.

SOURCE: ACWD, 2006.

As noted above, compared to the existing condition, more sediment would be directed toward Calaveras Reservoir with the increased diversions, and therefore the sluicing/flushing procedures under the WSIP would decrease potential water quality impacts with respect to settleable material, suspended material, and turbidity. The implementation of bypass flows included as protective measures under the Calaveras Dam Replacement project (SV-2), as well as Mitigation Measure 5.4.5-3a, Minimum Flows for Resident Trout on Alameda Creek (Vol. 4, Chapter 6, pp. 6-52 and 6-53), would result in the transport of fine sediments past the ACDD during those periods when flow is present in upper Alameda Creek.

In response to this comment, new text is added to the Draft PEIR (Vol. 3, Chapter 5, Impact 5.4.3-3, p. 5.4.3-11, following the third paragraph under "Reach 1") as follows:

> **Settleable Materials, Suspended Materials, and Turbidity.** Sections 5.4.1.1 and 5.4.2.1 describe the SFPUC flushing activities intended to remove accumulations of coarse sediment to protect the facility, maintain storage capacity (and thus diversion capacity) above the Alameda Creek Diversion Dam, and support downstream geomorphic processes by passing sediment. The flushing procedure involves opening the sluice gates to flush coarse sediments from upstream of the diversion dam. Sediment flushing discharges approximately 900 cubic yards of sediment from behind the diversion dam each year, and typically occurs in February. This sediment typically consists of sands and gravels. Operations normally occur over a 48-hour period during high-flow events to develop the necessary velocity to mobilize the coarse sediments behind the dam. Flushing operations occur whether or not flows from the creek are being diverted to the diversion tunnel. The sluice gates remain closed year-round, except during the sluicing procedure. If water is not diverted via the diversion gates to the reservoir, the entire volume of the creek flows through the sluice gates in

the dam or over the top of the dam. It is assumed that these SFPUC sediment flushing activities and sluice gate operations would continue under the WSIP.

Three water quality parameters—settleable materials, suspended materials, and turbidity—could be affected by changes in the Alameda Creek Diversion Dam operations and sediment flushing procedures. It is likely that more sediment would be transported to Calaveras Reservoir with the WSIP than under current conditions because of increased flows diverted to Calaveras Reservoir. Many of these sediments would settle out in the reservoir, reducing the overall quantity of sediments in the creek. Therefore, less sediment would be available for transport (either in flows over the dam or via sluicing/flushing operations) down Alameda Creek compared to the existing condition. Therefore, the sluicing/flushing procedures under the WSIP would have less-than-significant water quality impacts with respect to settleable materials, suspended materials, and turbidity.

S_RWQCBSF-16 Please refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14) for additional discussion of climate change to augment the discussion in Section 5.7.6 of the Draft PEIR (Vol. 3, Chapter 5, pp. 5.7-92 to 5.7-96). Section 14.11 provides more detailed and up-to-date information on climate change as it relates to the SFPUC regional water supply and the proposed WSIP.

15.3 Local and Regional Agencies

LOCAL AND REGIONAL AGENCIES

LOCAL AND REGIONAL AGENCIES THAT SUBMITTED COMMENTS ON THE DRAFT PEIR

Comment Letter Format	Comment Letter ID	Name of Commenter	Title	Organization/ Affiliation	Page
Mail	L_ACCDA	Bruce Jensen	Senior Planner	Alameda County Community Development Agency	15.3-1
Email	L_ACFCWCD	Kwablah Attiogbe	Environmental Services	Alameda County Flood Control and Water Conservation District	15.3-3
Mail	L_ACWD	Paul Piraino	General Manager	Alameda County Water District	15.3-8
Email	L_BAWSCA1	Arthur Jensen	General Manager	Bay Area Water Supply and Conservation Agency	15.3-23
Hand-delivered, PH	L_BAWSCA2	Arthur Jensen	General Manager	Bay Area Water Supply and Conservation Agency	15.3-47
PH Sonora	L_BAWSCA3	Nicole Sandkulla	Senior Water Resources Engineer	Bay Area Water Supply and Conservation Agency	15.3-48
PH Modesto	L_BAWSCA4	Nicole Sandkulla	Senior Water Resources Engineer	Bay Area Water Supply and Conservation Agency	15.3-49
PH SF1	L_BAWSCA5	Steven Miller	Lawyer	Bay Area Water Supply and Conservation Agency	15.3-50
PH SF2	L_BAWSCA6	Arthur Jensen	General Manager	Bay Area Water Supply and Conservation Agency	15.3-51
Mail	L_BCDC	Sara Polgar	Planner	San Francisco Bay Conservation and Development Commission	15.3-52
Mail	L_Brisbane	Randy Breault	Director of Public Works	City of Brisbane	15.3-60
Mail	L_Burlgme	Syed Murtuza	Director of Public Works	City of Burlingame Public Works Department	15.3-61

LOCAL AND REGIONAL AGENCIES THAT SUBMITTED COMMENTS ON THE DRAFT PEIR (Continued)

Comment Letter Format	Comment Letter ID	Name of Commenter	Title	Organization/ Affiliation	Page
Mail	L_CalWater	Thomas Salzano	Water Resources Planning Supervisor	California Water Service Company	15.3-62
Mail	L_CCWD	Leah Orloff	Senior Water Resources Specialist	Contra Costa Water District	15.3-63
Email	L_CoastsideCWD	Joe Guistino / Cathleen Brennan	Interim General Manager / Water Resources Analyst	Coastside County Water District	15.3-64
Mail	L_DalyCty	Patricia Martel	City Manager	City of Daly City	15.3-74
Mail	L_DSRSD	Bert Michalczyk	General Manager	Dublin San Ramon Services District	15.3-86
Mail	L_EBMUD	William Kirkpatrick	Manager of Water Distribution Planning	East Bay Municipal Utility District	15.3-87
Mail	L_EBRPD	Chris Barton	Senior Planner	East Bay Regional Park District	15.3-88
Mail	L_FosterCty	Ramon Towne	Director of Public Works	City of Foster City	15.3-104
Email	L_Fremont	Rene Dalton		City of Fremont, Transportation and Operations Department	15.3-106
Mail	L_Hayward	Robert Bauman	Director of Public Works	City of Hayward Department of Public Works	15.3-108
Mail	L_Hillsb	Cyrus Kianpour	City Engineer	Town of Hillsborough	15.3-109
Mail	L_LAHCFD	Dorothy Price	President	Los Altos Hills County Fire District	15.3-111
Mail	L_LosAltosH	Craig Jones	Mayor	Town of Los Altos Hills	15.3-112
Email	L_Menlo1	Kent Steffens	Director of Public Works	City of Menlo Park	15.3-113
PH Fremont	L_Menlo2	Kirsten Keith	Employee	Menlo Park Planning Commission	15.3-117
PH Palo Alto	L_Menlo3	Kelly Fergusson	Mayor	City of Menlo Park	15.3-118
PH Modesto	L_MID	Walt Ward	President of the Board of Directors	Modesto Irrigation District	15.3-119
Email	L_MID-TID1	Walter Ward / Robert Nees	Assistant General Manager / Assistant General Manager	Modesto Irrigation District / Turlock Irrigation District	15.3-120

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Mail	L_MID-TID2	Walter Ward / Robert Nees	Assistant General Manager / Assistant General Manager	Modesto Irrigation District / Turlock Irrigation District	15.3-130
Mail	L_Millbr	Ronald Popp	Director of Public Works	City of Millbrae	15.3-131
Mail	L_Milpts	Thomas Williams	City Manager	City of Milpitas	15.3-132
Mail	L_MtnVw	Cathy Lazarus	Public Works Director	City of Mountain View	15.3-142
Email	L_Newark	John Becker	City Manager	City of Newark	15.3-143
Mail	L_PaloAlto	Yoriko Kishimoto	Mayor	City of Palo Alto	15.3-144
Mail	L_PHWD1	Daniel Seidel	President	Purissima Hills Water District	15.3-149
PH Palo Alto	L_PHWD2	Daniel Seidel	President	Purissima Hills Water District	15.3-152
Mail	L_RdwdCty	Peter Ingram (sent by Chu Chang)	Community Development Services Director	Redwood City	15.3-153
Mail	L_SanJose	Mansour Nasser	Deputy Director, Water Resources Division	City of San Jose	15.3-162
Email	L_SBruno	Barbara A. Brenner	Stoel Rives, Attorney at Law	City of San Bruno	15.3-166
Email	L_SClara1	Gloria Sciara	Development Review Officer	City of Santa Clara Planning Division	15.3-174
Mail	L_SClara2	Robin Saunders	Director of Water and Sewer Utility	City of Santa Clara Water and Sewer Utilities	15.3-175
Mail	L_SCVWD1	Keith Whitman	Deputy Operation Officer	Santa Clara Valley Water District, Water Supply Management Division	15.3-176
PH Palo Alto	L_SCVWD2	Amy Fowler	Staff Member	Santa Clara Valley Water District	15.3-177
Mail	L_SFBayTrl	Laura Thompson	Project Manager	San Francisco Bay Trail	15.3-178
PH SF1	L_SFCPC1	Christina Olague	Commissioner	San Francisco City Planning Commission	15.3-181
PH SF1	L_SFCPC2	Michael Antonini	Commissioner	San Francisco City Planning Commission	15.3-183

LOCAL AND REGIONAL AGENCIES THAT SUBMITTED COMMENTS ON THE DRAFT PEIR (Continued)

Comment Letter Format	Comment Letter ID	Name of Commenter	Title	Organization/ Affiliation	Page
PH SF1	L_SFCPC3	Kathrin Moore	Commissioner	San Francisco City Planning Commission	15.3-184
PH SF2	L_SFCPC4	Kathrin Moore	Commissioner	San Francisco City Planning Commission	15.3-185
PH SF2	L_SFCPC5	Michael Antonini	Commissioner	San Francisco City Planning Commission	15.3-186
Email	L_SFLandmarks	Robert Cherny	Vice President	Landmarks Preservation Advisory Board	15.3-188
Mail	L_SJVAPCD	Arnaud Marjollet	Permit Services Manager	San Joaquin Valley Air Pollution Control District	15.3-195
Mail	L_SLDWWKC	Daniel Nelson, Thomas W. Birmingham, and James Beck	Executive Director, General Manager, and General Manager	San Luis & Delta-Mendota Water Authority, Westlands Water District, and Kern County Water Agency	15.3-196
Email	L_Snnyvl	Jamie McLeod / James Craig	Associate Planner / Superintendent of Field Services	City of Sunnyvale	15.3-199
Mail	L_StanCoERC	Raul Mendez	Senior Management Consultant	Stanislaus County Environmental Review Committee	15.3-201
Email	L_Stanford	Clifford (Mike) Goff	Director of Utilities	Stanford University	15.3-202
Email	L_TCCC	George Segarini	President & CEO	Tuolumne County Chamber of Commerce	15.3-204
Email	L_TUD1	Peter J. Kampa	General Manager	Tuolumne Utilities District	15.3-205
Mail	L_TUD2	Barbara Balen	Board President	Tuolumne Utilities District	15.3-214
PH Sonora	L_TUD3	Peter J. Kampa	General Manager	Tuolumne Utilities District	15.3-215
Mail	L_Tuol1	Mark Thornton	Chairman, Tuolumne County Board of Supervisors	Tuolumne County	15.3-216
Email	L_Tuol2	Mark Thornton	District 4 Supervisor, Tuolumne County	Tuolumne County	15.3-225
Mail	L_Zone7	G.F. Duerig	General Manager	Alameda County Flood Control and Water Conservation District, Zone 7	15.3-229

Alameda County Community Development Agency, Bruce Jensen, Senior Planner, 10/15/07

L_ACCDA-01 This comment identifies some of the topical areas where potential impacts could result from implementation of WSIP facility improvement projects; it acknowledges that mitigation is identified in the Draft PEIR to reduce the levels of impact significance, and that, in some cases, the Draft PEIR makes a conservative determination that these effects would be potentially significant and unavoidable. During subsequent project-level environmental review of the individual projects, it may be determined that these effects can be avoided or mitigated to a less-than-significant level; however, if during the project-level environmental review the impacts are determined to be significant and unavoidable, it will be necessary to adopt a Statement of Overriding Considerations.

L_ACCDA-02 Regarding Alameda County requiring the SFPUC to apply for a Finding of General Plan Conformance under California Government Code Section 65402, the Draft PEIR (Vol. 2, Chapter 4, p. 4.2-9) acknowledges that the SFPUC will notify local agencies of proposed plans and meet consistency determination requirements pursuant to Section 65402(b). It should be noted that these consistency determinations are advisory to the SFPUC rather than binding. As stated in the Draft PEIR (Vol. 2, Chapter 4, p. 4.2-9), approval of the WSIP would not trigger this requirement, but the requirement would be triggered by implementation of the individual WSIP projects. Therefore, these determinations would be made by the pertinent jurisdictions following preparation of project-specific CEQA documentation and notification by the SFPUC pursuant to state law (Vol. 2, Chapter 4, p. 4.2-16).

The commenter's topics of concern (land use, biology, visual resources, growth inducement, etc.) will be addressed as part of project-level CEQA review. The program-level impacts in Alameda County related to these topics are discussed in the Draft PEIR under the Sunol Valley and Bay Division Regions (Vol. 2, Chapter 4, pp. 4.3-7 to 4.4-50; pp. 4.6-37 to 4.6-74; pp. 4.16-8 and 4.16-16; and Vol. 4, Chapter 7, p. 7-1).

The Draft PEIR (Vol. 2, Chapter 4, p. 4.2-9) acknowledges that individual projects could, in select cases, require encroachment permits from local agencies. The need for local conditional use permits will be determined during project-level CEQA review.

L_ACCDA-03 Appendix B (Vol. 5, p. B-15) lists the significance criteria used in the Draft PEIR to determine the significance of impacts on mineral resources. They include whether the project would: (a) result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state; or (b) result in the loss of availability of a locally important mineral resource recovery site delineated in a local general plan, specific plan, or other land use plan. The Draft PEIR (Vol. 5, Appendix B, p. B-16) concludes that, at a program level, none of the WSIP projects would result in the loss of mineral resources or make them inaccessible. Furthermore, the construction of pipelines and other public engineering projects is excluded from Surface Mining and Reclamation Act regulation. Therefore, impacts related to the loss of mineral resources would not be applicable to the WSIP projects. However, the effects of each WSIP project on current mining patterns and access to mineral resources will be considered during project-level CEQA review, as acknowledged by the commenter. Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.2) for detailed information regarding the intent of the programmatic impact analysis.

Alameda County Flood Control and Water Conservation District, Kwablah Attiogbe, Environmental Services, 10/1/07

L_ACFCWCD-01 In response to this comment regarding conversion factors for degrees Celsius and Fahrenheit, the following is added to the list of conversion factors provided at the back of the glossary in the Draft PEIR (Vol. 1, Glossary, p. xxxviii):

Temperature

Degrees Celsius (°C) = 5/9 x (°F – 32)

Degrees Fahrenheit (°F) = 9/5 x (°C) + 32

L_ACFCWCD-02 Please refer to **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14, Section 14.9.2).

L_ACFCWCD-03 Please refer to **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14, Section 14.9.2).

L_ACFCWCD-04 Please refer to **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14, Section 14.9.3).

L_ACFCWCD-05 Please refer to **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14, Section 14.9.6). In addition, refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14) for additional discussion of climate change to augment the discussion presented in Section 5.7.6 of the Draft PEIR (Vol. 3, Chapter 5, pp. 5.7-92 to 5.7-96). Section 14.11 provides more detailed and up-to-date information on climate change as it relates to the SFPUC regional water supply and the proposed WSIP.

L_ACFCWCD-06 Please refer to **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14, Section 14.9.4). The general location of the Alameda Creek Fishery Enhancement project (SV-1) is described in Draft PEIR Table 3.10 (Vol. 1, Chapter 3, p. 3-50); however, because the precise location has not yet been identified, this project location is not shown in Figure 3.5a (Vol. 1, Chapter 3, p. 3-57).

L_ACFCWCD-07 While implementation of the WSIP would result in increased diversions from Alameda Creek compared to the existing condition, the proposed level of diversions would be similar to the historical level of diversions that occurred for about 70 years prior to the 2001 Division of Safety of Dams restriction on Calaveras Dam. As described in the Draft PEIR (Vol. 1, Chapter 2, p. 2-10), the SFPUC considers the current reduced storage level in Calaveras Dam and associated reduced diversion level as an impaired operating mode that puts the regional system at risk of being unable to adequately meet existing customer water demands in the event of an emergency or a prolonged drought. The restoration of storage capacity in Calaveras Reservoir and associated increased diversions from Alameda Creek are needed to meet existing customer water demand during drought or other emergency conditions and to provide both delivery and seismic reliability; it is also needed to maximize the use of local water supplies. This component of the WSIP is not driven by the need to meet the projected increase in purchase requests.

This comment incorrectly implies that 2000 Association of Bay Area Governments (ABAG) data (probably referring to *Projections 2000*) were used to develop the demand projections. ABAG's *Projections 2002* was used as the source of many of the population projections and most of the employment projections used in the demand model. The use of *Projections 2002* was appropriate as it was the current projections series at the time. The Draft PEIR (Vol. 4, Chapter 7, sidebar on p. 7-22, and pp. 7-22 through 7-26, and Vol. 5, Appendix E.3) reviews changes in the ABAG projections series since *Projections 2002* was issued and compares the later projections to the assumptions used in projecting 2030 water demand. Also refer to **Responses SI_PacInst-76** and **SI_PacInst-77**.

L_ACFCWCD-08 This comment incorrectly implies that water use and water efficiency were not reviewed and analyzed. The SFPUC, in conjunction with its wholesale customers, conducted extensive studies as part of the WSIP planning effort, including technical studies on conservation and recycled water use potential and water demand studies that included a detailed evaluation of existing water use in order to establish base-year conditions. These studies are described in the Draft PEIR (Vol. 1, Chapter 3, pp. 3.16 to 3-22, and Vol. 5, Appendix E.2); in addition, **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) presents an expanded discussion of existing and planned conservation.

As described above in **Response L_ACFCWCD-07**, the need for additional water diversions from Alameda Creek and the associated restoration of storage in Calaveras Reservoir is driven primarily by the need to meet existing customer demand during drought or other emergency conditions and to increase both delivery and seismic reliability. Nevertheless, the Draft PEIR (Vol. 4, Chapter 9) provides a detailed evaluation of aggressive conservation and water recycling as part of the alternatives analysis. However, all alternatives analyzed in the Draft PEIR, including the aggressive conservation and recycling alternatives, rely on the restoration of Calaveras Reservoir to its historical capacity and associated increased diversions from Alameda Creek.

L_ACFCWCD-09 Please refer to **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14, Section 14.9.4).

L_ACFCWCD-10 The Draft PEIR (Vol. 2, Chapter 4, p. 4.5-25) acknowledges that pipeline projects may be subject to encroachment permits from the local flood control district or other appropriate local agency. The ACFCWCD's request that pipeline crossings conform to specific design requirements is acknowledged. In addition, the need for any encroachment permits is noted in **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.3) and added to Table C.6 (Vol. 5, Appendix C, p. C-26) for consideration during the project-level CEQA review for individual WSIP projects. As described in Section 14.4.3, identification of specific local agency requirements is not needed to determine a level of impact significance for this programmatic analysis; this issue will be addressed in the project-level environmental documentation for each WSIP project as appropriate.

L_ACFCWCD-11 Implementation of the WSIP would include releases from Calaveras Dam and/or bypasses at the Alameda Creek Diversion Dam in order to comply with the 1997 California Department of Fish and Game Memorandum of Understanding. The releases would be designed and implemented to provide a beneficial impact on downstream fisheries. Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.3) for discussion of notification and coordination with the ACFCWCD.

L_ACFCWCD-12 The commenter requests that the significance determinations in the Initial Study checklist for the following topic areas be changed from "Less than Significant" to "Potentially Significant": Transportation and Circulation (5a), Biological Resources (12a, 12b, 12c, 12d), and Hydrology and Water Quality (14b, 14c). However, the Initial Study checklist (Draft PEIR, Vol. 5, Appendix B) classifies all but one of these items as "Less than Significant with Mitigation Incorporated," while 14c is classified as "Less than Significant." Item 14c is classified as "Less than Significant" because it assumes implementation of SFPUC Construction Measure #3 (Onsite air and water quality measures) as well as compliance with applicable stormwater control regulations; this impact is discussed in the Draft PEIR as Impact 4.5-1 (Vol. 2, Chapter 4, pp. 4.5-21 to 4.5-28. The significance determinations for the other items in this checklist identified by the commenter were classified assuming the mitigation measures will be applied and therefore already acknowledge that the impact is potentially significant. The mitigation measures will be incorporated into the Mitigation Monitoring and Reporting Program, which the SFPUC will be required to adopt as part of the CEQA findings from the certified Final PEIR; thus, in effect, the final decision-makers will not have the option of rejecting the measures as infeasible, as is the case with mitigation measures identified in the PEIR text. The "Less than Significant with Mitigation Incorporated" determination indicates that the impact is potentially significant but would be reduced to a less-than-significant level when mitigation measures contained in the Draft PEIR are implemented. The checklist's "Less than Significant" determination can indicate that the impact is potentially significant but would be less than significant with implementation of SFPUC Standard Construction Measures and applicable regulations. These determinations correspond to the Draft PEIR's "Potentially Significant, Mitigatable" (PSM) and "Less than Significant" (LS) significance determinations. These determinations are defined in Sections 4.1 and 5.1 of the Draft PEIR (Vol. 2, p. 4.1-5, and Vol. 3, p. 5.1-18).

L_ACFCWCD-13 Please refer to **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14, Sections 14.9.2 and 14.9.4).

In response to this comment, the following text from the Draft PEIR (Vol. 3, Chapter 5, p. 5.4.1-4, third full paragraph, last sentence) is revised as follows:

> A flow control structure known as the BART weir (owned by the ACFCWCD and located where the BART and railroad tracks cross Alameda Creek in Fremont) provides ~~grade control~~ structural protection of the footings of the BART and railroad bridge crossing and is a barrier to fish passage along this reach.

L_ACFCWCD-14 Please refer to **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14, Section 14.9.3, under the heading Impacts on Stream Flow and Fisheries Downstream of the BART Weir, and Section 14.9.5, under the heading Warmwater Fish Species and their Habitats in Alameda Creek).

L_ACFCWCD-15 Please refer to **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14, Section 14.9.2, under the headings Biological Distinctions and Regulatory Status for Steelhead and Rainbow Trout, Anadromous Steelhead in Lower Alameda Creek, and Consideration of Fish Passage at the Niles Gaging Station; and Section 14.9.4).

L_ACFCWCD-16 Prior to the certification hearing on the PEIR, the San Francisco Planning Department will distribute the Comments and Responses document for review to the public and affected agencies, including the commenter and all other individuals and organizations that submitted comment letters on the Draft PEIR. In accordance with CEQA Guidelines Section 15088.5(b), recirculation is not required "where the new information added to the EIR merely clarifies or amplifies or makes insignificant modifications" to the EIR. The additional information provided in this Comments and Responses documents falls in that category, and recirculation of the PEIR is not warranted.

Alameda County Water District, Paul Piraino, General Manager, 9/26/07

L_ACWD-01 This comment corroborates information presented in the Draft PEIR—that the ACWD's 2030 estimated purchase request from the SFPUC of 13.76 million gallons per day (mgd), as shown in Draft PEIR Table 3.3 (Vol. 1. Chapter 3, p. 3-18) and others, is the same as its existing contractual entitlement, or supply assurance, of 13.76 mgd (Vol. 5, Appendix E.1, Table E.1.1). As shown in Table 3.4 (Vol. 1, Chapter 3, p. 3-19) and Table 7.3 (Vol. 4, Chapter 7, p. 7-18), the ACWD's 2030 purchase estimate represents an increase of approximately 15 percent over its purchases in the 2001 base year of 11.99 mgd. A review of the current Bay Area Water Supply and Conservation Agency's Annual Survey (BAWSCA, 2007; p. 76) indicates that the ACWD purchased between 511,590,900 and 607,476,100 cubic feet per year (equal to 10.48 to 12.45 mgd) for BAWSCA fiscal years 2002/2003 through 2005/2006.

L_ACWD-02 This comment, which expresses the ACWD's support for a high-quality water supply and a reliable storage and conveyance system for the San Francisco Bay Area at a reasonable cost, is acknowledged.

L_ACWD-03 The commenter's support of BAWSCA's proposal regarding the Modified WSIP Alternative, which involves exploring the feasibility of increased agricultural water conservation in the lower Tuolumne River watershed, is acknowledged. Please refer to **Section 14.10, Master Response on Modified WSIP Alternative** (Vol. 7, Chapter 14, Section 14.10.3) for further discussion.

L_ACWD-04 This comment provides background information related to the Alameda Creek watershed that is generally consistent with the description provided in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.4.1-1 to 5.4.1-4). The Draft PEIR focuses on impacts in the southern Alameda Creek watershed, which is the portion of the overall watershed that would be affected by the proposed program. This comment summarizes the more detailed comments presented in Comments L_ACWD-05 through L_ACWD-25; refer to **Responses L_ACWD-05** through **L_ACWD-25** for the specific responses, which address downstream impacts on the ACWD's water supplies and potential impacts on steelhead.

L_ACWD-05 The commenter requests clarification on whether the Alameda Creek Fishery Enhancement project (SV-1) would recapture more water than is being released upstream, resulting in downstream flow impacts (ACWD Comment No. 1). Under the WSIP, the SFPUC would release flows upstream from the confluence of Alameda and Calaveras Creeks (i.e., releases from Calaveras Dam and/or bypasses at the Alameda Creek Diversion Dam) in accordance with the 1997 California Department of Fish and Game (CDFG) Memorandum of

Understanding (MOU), and the Alameda Creek Fishery Enhancement project would recapture those flows at a downstream location, also in accordance with the 1997 CDFG MOU. The Alameda Creek Fishery project includes structural and nonstructural alternatives to recapture only those flows released to meet the requirements of the MOU. It could include a water recapture facility downstream of the Sunol Valley Water Treatment Plant (WTP), or could involve SFPUC coordination with other water agencies to develop and implement other means of recapturing MOU flows. The hydrological modeling used in the impact analysis of proposed water supply and system operations in the Draft PEIR assumed only recapture of flow from the creek consistent with the 1997 CDFG MOU. Therefore, all downstream flow impact analyses in the Draft PEIR considered implementation of the recapture component of the Alameda Creek Fishery Enhancement project (SV-1).As described in Section 13.2 (Vol. 7, Chapter 13), the SFPUC has incorporated project revisions and protective measures for steelhead into the project descriptions of the Alameda Creek Fishery Enhancement (SV-1) and Calaveras Dam Replacement (SV-2) projects which would modify implementation of the 1997 CDFG MOU. Please also refer to **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14, Section 14.9.1) for a description of protective measures that the SFPUC has incorporated into the Alameda Creek Fishery project.

As noted by the commenter (ACWD Comment No. 2), the BDPL Nos. 3 and 4 Crossovers (BD-2) and Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault (BD-3) projects and part of the Bay Division Pipeline Reliability Upgrade project (BD-1) are located on lands that overlie the Niles Cone Groundwater Basin. The commenter requests an impact analysis for this basin. The Draft PEIR (Vol. 2, Chapter 4, p. 4.5-30) concluded that potential impacts on groundwater resources in this groundwater basin associated with construction of these projects would be less than significant because the projects would not include long-term dewatering (which could deplete groundwater supplies) or interfere substantially with groundwater recharge. In addition, to avoid cross-contamination of aquifers, groundwater dewatering would not be conducted at the Newark Tunnel Shaft to be constructed under the BDPL Reliability Upgrade project (BD-1). Furthermore, temporary dewatering during construction would not be expected to substantially deplete shallow groundwater resources, and impacts related to the depletion of shallow groundwater due to construction dewatering are considered less than significant for all WSIP projects (Vol. 2, Chapter 4, p. 4.5-28).

The commenter is concerned that construction-related discharges to creeks and waterways in the Alameda Creek watershed could affect downstream ACWD water intakes and requests analysis of impacts on these intakes (ACWD Comment No. 3). Impact 4.5-1 in the Draft PEIR (Vol. 2, Chapter 4, p. 4.5-26) identifies potential construction-related water quality impacts due to erosion, sedimentation, or hazardous materials releases, and indicates that projects in the

Sunol Valley would be subject to the National Pollutant Discharge Elimination System (NPDES) permitting requirements of the Regional Water Quality Control Board (RWQCB) and SFPUC Construction Measure #3 (Onsite Air and Water Quality Measures During Construction) (Vol. 2, Chapter 4, p. 4.5-32). The stormwater pollution prevention plan (SWPPP) required under the NPDES permit would specify erosion control measures as well as requirements for providing secondary containment and berming of the diesel or other chemical storage areas to prevent any potential release from reaching an adjacent waterway or stormwater collection system (Vol. 2, Chapter 4, p. 4.5-23). For WSIP facility projects in the Sunol Valley Region, these plans would take into account potential effects on downstream water intakes at ACWD facilities in the flood control channel. Additionally, the ACWD has requested to be notified in the event of a spill or release to any waterway in the Alameda Creek system that could affect water quality. This request is acknowledged. Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.3) for a discussion of SFPUC coordination with other agencies as part of project-level CEQA review.

The commenter is concerned that dewatering and construction-related discharges could adversely affect downstream water users in the Alameda Creek watershed if control measures fail, and requests more evaluation as well as development of a notification plan as mitigation (ACWD Comment No. 4). Impact 4.5-3 in the Draft PEIR (Vol. 2, Chapter 4, pp. 4.5-31 to 4.5-35) addresses potential degradation of water quality due to construction dewatering discharges and states that contractor(s) would be required to obtain necessary permits from the local flood control district or any appropriate local agencies for construction-related dewatering discharges and treated-water discharges.

All of the above potential impacts will be addressed in the project-level CEQA documentation for each WSIP project in the Sunol Valley Region. Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.2) for additional discussion of the issues raised by this comment. This master response provides a more detailed discussion of the appropriate level of detail of an impact analysis at the program level versus the project level.

L_ACWD-06 The commenter is concerned that flooding and associated sediment and contaminant releases could affect downstream water users (ACWD Comment No. 5), and requests an evaluation of impacts on the ACWD’s diversion and groundwater recharge facilities. Draft PEIR Impact 4.5-4 (Vol. 2, Chapter 4, pp. 4.5-37 and 4.5-38) identifies potentially significant flooding impacts for the Alameda Creek Fishery Enhancement (SV-1), New Irvington Tunnel (SV-4), and San Antonio Backup Pipeline (SV-6) projects because, based on the preliminary project description information available during preparation of the Draft PEIR, these projects could potentially contribute sediments or contaminants to flood flows. Subsequent project-level CEQA review of these three projects will reevaluate the significance of this impact. At a program level of analysis, the Draft PEIR determined that potential impacts due to these projects (if any) on the ACWD's diversion and recharge facilities would be mitigated through implementation of Measure 4.5-4a (flood protection measures incorporated into SWPPPs) and Measure 4.5-4b (site-specific flooding analysis). During project-level CEQA review, these programmatic mitigation measures would be reevaluated to determine if they are still applicable and if so, then either confirmed, refined or replaced with an equivalent measure.

As stated above, operation of the WSIP facility improvement projects is not expected to exacerbate flooding or generate contaminants that would affect the ACWD's diversion or recharge facilities. A more detailed analysis of potential impacts on these facilities will be provided in the project-level CEQA review for each project. Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.2) for additional discussion of the issues raised by this comment. This master response provides more information on the appropriate level of detail of an impact analysis at the program level versus the project level. Also refer to Section 14.4.3 of the master response for discussion of notification and coordination with the ACWD.

L_ACWD-07 The commenter requests discussion of the possible impacts of discharges on Alameda Creek flow conditions and the ACWD's downstream inflatable dam and diversion operations due to operation of the WSIP facility improvement projects. Draft PEIR Impact 4.5-5 (Vol. 2, Chapter 4, pp. 4.5-45 and 4.5-46) addresses potential discharges to surface water during operation of WSIP projects in the Sunol Valley Region and potential water quality degradation effects. This impact states that the Additional 40-mgd Treated Water Supply (SV-3) and SVWTP – Treated Water Reservoirs (SV-5) projects would require only occasional maintenance-related discharges of treated water, and these discharges would be regulated by the RWQCB under the Regionwide General NPDES Permit for Discharges from Surface Water Treatment Facilities for Potable Supply. Under the San Antonio Backup Pipeline project (SV-6), discharges to San Antonio Creek and Alameda Creek would be dechlorinated, dissipated, and discharged in accordance with NPDES permit requirements and the requirements of other regulatory agencies. Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.3) for discussion of notification and coordination with the ACWD.

The Draft PEIR (Vol. 3, Chapter 5, Section 5.4.1) describes potential impacts on Alameda Creek stream flow due to WSIP water supply and system operations; the PEIR analysis of downstream flow conditions and the ACWD's inflatable dam and diversion operations is augmented in **Section 14.9, Master Response**

on Alameda Creek Fishery Issues (Vol. 7, Chapter 14, Section 14.9.3), which includes a discussion of impacts related to flow changes downstream of Niles Canyon. Please also refer to **Response L_ACWD-12**, below, for a discussion of the effects of the WSIP water supply and system operations on downstream flows in Alameda Creek.

L_ACWD-08 The commenter states that the SFPUC should coordinate with the ACWD earlier (during the planning and design phases of facility projects) rather than during the construction phase, as specified in Draft PEIR Mitigation Measure 4.11-1h (Vol. 2, Chapter 6, p. 6-44). Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.3) for a discussion of coordination with the ACWD. In response to this comment, the ACWD's request for early coordination has been noted in Table C.6 as revised (Vol. 7, Chapter 16) for consideration in the project-level EIR for several facility improvement projects, including the Bay Division Pipeline Reliability Upgrade (BD-1) and Calaveras Dam Replacement (SV-2) projects. Issues such as early coordination with the ACWD, presence of an onsite ACWD inspector, and need for ACWD approval will be considered during the implementation phase for applicable WSIP facility improvement projects as appropriate. This level of detail is not required for a Program EIR or program-level mitigation measures.

L_ACWD-09 The commenter states that the description of the watershed boundary in the Draft PEIR is incomplete and that the PEIR should be revised to include the downstream section of the watershed to San Francisco Bay, including the underlying Niles Cone Groundwater Basin. Figure 5.4.1-1 in the Draft PEIR (Vol. 3, Chapter 5, p. 5.4.1-2) depicts the Alameda Creek watershed boundary based on the delineation performed by CalWater, an Interagency Watershed Mapping Committee, working through the California Resources Agency and California Environmental Protection Agency. By definition, the boundaries of the drainage area as a hydrologic area are defined by hydrographic and topographic criteria that delineate an area of land upstream from a specific point on a river, stream, or similar surface waters. Figure 5.4.1-1 shows the correct Alameda Creek watershed boundary, which, according to this system of delineation, extends downstream only as far as Niles Canyon. In the lower 12 miles of the creek, there is no defined watershed other than a very large urban watershed that covers most of the developed cities along that portion of San Francisco Bay.

It should be noted, however, that the Draft PEIR describes the watershed as extending to the bay (Vol. 3, Chapter 5, pp. 5.4.1-1 to 5.4.1-4). In addition, the Draft PEIR addresses the Niles Cone Groundwater Basin in Section 5.4.4 (Vol. 3, Chapter 5, p. 5.4.4-1). The Draft PEIR provides detailed descriptions of existing conditions and impacts on resources potentially affected by the WSIP, including resources in the downstream section of the watershed as appropriate. Consistent with CEQA guidelines, impacts are addressed at a level of detail commensurate with the effects that could be attributable to the WSIP. Please refer to **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14, Section 14.9.3) for further discussion of downstream effects on the Alameda Creek watershed.

L_ACWD-10 This comment, which supports the use of baseline conditions under the operating restrictions for Calaveras Reservoir imposed by the Division of Safety of Dams (DSOD), is acknowledged.

L_ACWD-11 As noted by the commenter, the Draft PEIR uses data from a monthly time-step model—the Hetch Hetchy/Local Simulation Model—to estimate changes in stream flow and reservoir storage levels attributable to the WSIP. While these monthly data may have limitations with respect to identifying day-to-day effects, they were used in the Draft PEIR to provide an overview of the anticipated range of impacts, which were then categorized by hydrologic year types. However, as stated in the Draft PEIR (Vol. 3, Chapter 5, p. 5.4.1-18), patterns from actual flow data were used to supplement the model results in order to provide additional detail and context for assessing potential impacts. Daily data from U.S. Geological Survey gages along Alameda Creek were used to provide a better understanding of stream flow characteristics, as shown in Tables 5.4.1-4 and 5.4.1-5 (pp. 5.4.1-12 and 5.4.1-13) and Figures 5.4.1-9 through 5.4.1-12 (pp. 5.4.1-28 to 5.4.1-31), and these data were used together with the monthly model results to determine impacts on water resources within the Alameda Creek watershed.

For additional information on this issue, please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.3).

L_ACWD-12 This comment questions the adequacy of the Draft PEIR's analysis of downstream impacts on Alameda Creek flows. This response focuses on impacts related to the WSIP water supply and system operations; please refer to **Response L_ACWD-07** for a discussion of impacts related to WSIP facility improvement projects.

In response to this comment, supplemental analysis of WSIP stream flow effects in lower Alameda Creek was conducted to augment the stream flow analysis presented in the Draft PEIR (Vol. 3, Chapter 5, Section 5.4.1). This supplemental analysis is included in **Appendix N** of this Comments and Responses document (Vol. 8) and summarized in **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14, Section 14.9.3). The commenter correctly summarizes information in the Draft PEIR regarding WSIP-induced flow reductions of approximately 50 percent during normal years and approximately 30 percent during above-normal and wet years (Vol. 3, Chapter 5, Table 5.4.1-11, p. 5.4.1-42); however, it should be noted that these estimates refer to Alameda

Creek below the San Antonio Creek confluence and not to lower Alameda Creek. The supplemental analysis presented in Appendix N provides quantitative estimates of the WSIP's effects in lower Alameda Creek, specifically at the Niles gage; unlike the analysis in the Draft PEIR, this analysis accounts for tributaries downstream of San Antonio Creek as well as other effects contributing to flow conditions at the Niles gage.

Similar to the analysis conducted for the Draft PEIR, the supplemental effort analyzed monthly mean data, which were adequate to determine the general magnitude and timing of potential effects; monthly data were also adequate to determine those instances when no change (no impact) would occur. Model applicability and the use of monthly time-step data for this analysis are further discussed in the **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14, Section 14.9.3).

As quantified in the supplemental flow analysis provided in Appendix N, implementation of the WSIP is estimated to result in flow changes in lower Alameda Creek in wet months (December to May) of normal to wet year types, and these flow changes would range from a -18 percent decrease to a +13 percent increase in flow. Flow in lower Alameda Creek would remain unchanged in the remainder of months (June to November) in normal to wet year types and in all months of below-normal (except for a slight decrease in February) and dry year types. This analysis corroborates the conclusion in Draft PEIR Impact 5.4.1-4 (Vol. 3, Chapter 5, pp. 5.4.1-39 to 5.4.1-43) that flow impacts in lower Alameda Creek would be less than significant because downstream tributaries (such as Arroyo de la Laguna) would substantially dampen the impacts resulting from WSIP-related flow changes in the upper Alameda Creek watershed.

The supplemental analysis indicated that lower Alameda Creek would experience lower average monthly flows in most winter months (December to March) of normal to wet years, ranging from a 2 to 18 percent reduction, with implementation of the WSIP. These months are generally the highest flow months of the year at Niles Canyon. The analysis also indicated that the WSIP would increase flow in lower Alameda Creek during April and May of normal to wet years, ranging from 2 to 13 percent. April and May are generally not the highest flow months of the year, and this increase in flow is therefore not expected to exceed the capacity of existing flood control infrastructure. As a result, the WSIP would generally be beneficial to flood control objectives in lower Alameda Creek.

The ACWD relies on water from the Alameda Creek watershed for approximately 15 percent of its water supply (ACWD, 2008). Flow in the creek is augmented with water from the State Water Project discharged to Vallecitos Creek, which flows into Arroyo de la Laguna near its confluence with Alameda

Creek, and the ACWD then recovers the water in lower Alameda Creek. The ACWD captures water from the creek behind three large, inflatable rubber dams that divert water to recharge ponds, where the water percolates to recharge the underlying Niles Cone Groundwater Basin, and subsequently pumps groundwater from the Niles Cone basin and to provide water supply to its customers.

As noted above, flow rates in lower Alameda Creek under the WSIP are estimated to decrease in most winter months of normal to wet years compared to current flows with Calaveras Reservoir operating under DSOD-restricted conditions. Flow rates would, however, increase in comparison to those under pre-DSOD-restricted conditions. This comparison to the pre-2002 operation of Calaveras Reservoir is relevant because the ACWD management and use of the Niles Cone Groundwater Basin predates the DSOD-restricted operating condition. Therefore, although implementation of the WSIP would alter flows in lower Alameda Creek in winter months of normal to wet years, the projected flows would be greater than the historical conditions in existence when the ACWD recharge facilities were constructed in 1972 to 1989.

The ACWD has operated facilities and made use of groundwater in the Niles Cone Groundwater Basin under historical lower-flow conditions (pre-2002) and under the recent higher-flow condition (post-2002). Flows in lower Alameda Creek under the WSIP would be bracketed within this range of flows. Therefore, the WSIP would have a less-than-significant impact on water supply operations in lower Alameda Creek.

Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.3) for a discussion of coordination with the ACWD.

L_ACWD-13 The commenter states that the Draft PEIR should evaluate the significance of potential geomorphology impacts relative to the existing condition. The Draft PEIR determined that the long-term historical condition of the Alameda Creek watershed was relevant to the analysis of geomorphology impacts because the current form of Calaveras, Alameda, and San Antonio Creeks has developed over many years. The geomorphology and sediment transport systems have been substantially altered by dams, weirs, channelization, aggregate mining, induced erosion, vegetation changes, land development, and structures in the channels. These influences have controlled the geomorphologic systems for more than 100 years. The result has been a long period of regulated stream flow, trapping of sediment behind the dams, and changes in channel erosion and aggradation below the dams. In sum, the existing stream geomorphology is the product of substantial, long-term, direct and indirect manipulation of the fluvial system.

The commenter states that the Draft PEIR should include an evaluation of downstream impacts on geomorphology and sediment transport in Niles Canyon. An average of approximately 270,000 tons (160,000 cubic yards) of sediment is transported by Alameda Creek annually (Weiss Associates, 2004a). At the Sunol Dam site, these sediments are about one-quarter to one-third sand and two-thirds to three-quarters gravel. These sediments are transported by high winter flows in the creek; for example, the estimated 3.5-year stream flow of Alameda Creek at the Sunol Dam site (approximately 7,000 cubic feet per second [cfs]) transports a volume of sediment equal to about 25 percent of the average annual sediment load in the creek (Weiss Associates, 2004a). Sediment transport curves developed by Weiss Associates for Alameda Creek near Niles indicate minimal sediment transport with flows of less than 20 cfs; thus, little sediment transport occurs during summer periods. During historical dam operations, summer flows in Alameda Creek were cut off and no sediment transport occurred. Sediment transport increases from 10 to 1,000 tons per day when stream flows increase from 100 to 1,000 cfs. At a flow of 2,000 cfs, estimated sediment loads approach 10,000 tons per day, which include both suspended sediment and bedload transport. At Niles Canyon, there is virtually no bedload transport with stream flows under 1,000 cfs, and 2,500 to 6,000 tons per day with flows of 10,000 cfs (Weiss Associates, 2004a).

In response to this comment, the Draft PEIR Impact 5.4.2-2 (Vol. 3, Chapter 5, p. 5.4.2-3, last paragraph) is revised as follows:

> **Impact 5.4.2-2: Effects on channel formation and sediment transport along Alameda Creek downstream of the diversion dam <u>and downstream of the San Antonio Creek confluence.</u>**

In addition, the following text is added to the description of Impact 5.4.2-2 (Vol. 3, Chapter 5, p. 5.4.2-4, after the first partial paragraph):

> <u>Implementation of the WSIP would reduce flow in Alameda Creek downstream of the San Antonio Creek confluence in winter months of normal to wet years, ranging from a -18 percent decrease to a +13 percent increase in flow at the USGS Niles gage station. In the majority of winter months (December to March), flows at this location would decrease, but in April and May the flows would exhibit small to moderate increases. Although implementation of the WSIP would result in additional flow in Alameda Creek in summer months as part of the 1997 CDFG MOU releases, these additional flows would not mobilize significant amounts of sediment and could be recaptured at a location downstream of the Sunol Valley WTP. This net decrease in flow in Alameda Creek below the San Antonio Creek confluence when compared to the existing condition would likely result in a slight decrease in the amount of sediment transported in Niles Canyon and lower Alameda Creek and would therefore decrease sediment and debris loading on lower Alameda Creek facilities.</u>

As noted in Impacts 5.4.2-1 and 5.4.2-3, flows and the resulting impacts on geomorphology upstream of the San Antonio Creek confluence are expected to be within the range of conditions that have been experienced since development of water supply and flood control facilities in the upper and lower Alameda Creek watershed. Therefore, implementation of the WSIP would not significantly alter bed or channel form or introduce substantial new sources of sediment.

As a result of this net decrease in sediment transport in Niles Canyon and the less-than-significant impacts in upper Alameda Creek, the impact related to geomorphologic characteristics and sediment transport along Alameda Creek downstream of the San Antonio Creek confluence would be *less than significant*. It should also be noted that the Arroyo de la Laguna watershed is the major contributor to sediment supply in Niles Canyon and lower Alameda Creek.

L_ACWD-14 The commenter cites three concerns regarding the Alameda Creek water quality information presented in Section 5.4.3.1 of the Draft PEIR (Vol. 3, Chapter 5): (1) the reference to field temperature data is incorrect; (2) water quality data may not have been subject to quality assurance/quality control (QA/QC) procedures; and (3) the location of monitoring stations is unclear.

In response to these comments, the following text from the Draft PEIR (Vol. 3, Chapter 5, p. 5.4.3-4, second full paragraph) is revised to avoid confusion about the monitoring location:

> Water quality in Alameda Creek is generally good and is protective of beneficial uses. In terms of aquatic life, the key water quality parameter is temperature, which is directly related to hydrologic flow conditions. **Table 5.4.3-3** summarizes weekly water temperature data collected by the ACWD near Sunol, above Arroyo de la Laguna, from 1997 through 2005. ~~The ACWD continuously samples, analyzes, and monitors the quality of water in Alameda Creek at a special monitoring facility located at the mouth of Niles Canyon near Mission Boulevard and at other key locations throughout the watershed (ACWD, 2007).~~ Average monthly water temperatures show an expected seasonal trend (i.e., cooler during the winter and warmer during the summer).

The footnote in Table 5.4.3-3 (Vol. 3, Chapter 5, p. 5.4.3-5) is revised as follows to identify the source of the field temperature data:

> SOURCES: ACWD (raw data provided by Laura Hidas); Merritt Smith Consulting (data reduction). Note that ACWD temperature data may not have been subject to the rigorous QA/QC procedures required for scientific studies, and therefore should be used only to indicate general conditions (unless otherwise specified by the ACWD).

The footnote in Table 5.4.3-4 (Vol. 3, Chapter 5, p. 5.4.3-6) is revised as follows to identify the source of the field temperature data:

> SOURCES: ACWD (raw data provided Laura Hidas); Merritt Smith Consulting (data reduction). Note that ACWD TDS data may not have been subject to the rigorous QA/QC procedures required for scientific studies, and therefore should be used only to indicate general conditions (unless otherwise specified by the ACWD).

L_ACWD-15 The commenter correctly quotes the Draft PEIR, which states: "…most of the summer and fall flows in Alameda Creek below its confluence with Arroyo de la Laguna originate from the South Bay Aqueduct" (Vol. 3, Chapter 5, p. 5.4.3-5). Flows in Alameda Creek below the confluence with Arroyo de la Laguna tend to be warm, because coldwater sources are largely unavailable in these reaches and base flows are low during this time of year, allowing waters to warm towards their natural temperature in equilibrium with meteorological conditions. Further, Arroyo de la Laguna appears to be a source of elevated total dissolved solids (TDS) and chloride, as noted in RWQCB (2008):

> Arroyo de la Laguna has an average TDS concentration of 630 mg/L, and an average chloride concentration of 117 mg/L. Above the confluence, Alameda Creek has a much lower average TDS concentration of 280 mg/L and an average chloride concentration of 28 mg/L. Below the confluence, both TDS and chloride in Alameda Creek increase significantly. The average TDS concentration is 437 mg/L and the average chloride concentration is 71 mg/L. (RWQCB, 2008, p. 13/17 Fact Sheet Appendix F-1)

These findings indicate that Arroyo de la Laguna is a considerable source of TDS (and chloride) in Alameda Creek.

In response to this comment, the Draft PEIR (Vol. 3, Chapter 5, p. 5.4.3-5, end of first full paragraph) is revised as follows:

> ~~In addition, most of the summer and fall flows in Alameda Creek below its confluence with Arroyo de la Laguna originate from the South Bay Aqueduct. This South Bay Aqueduct water may be warmer and is higher in total dissolved solids (TDS) than the flows in Alameda Creek originating from the Sunol Valley watershed.~~ Summer and fall flows in Alameda Creek and its tributaries are at their seasonal low. Thus, flows in Alameda Creek below its confluence with Arroyo de la Laguna tend to be warmer during these periods, because coldwater sources are largely unavailable in these reaches and base flows are low during this time of year, allowing waters to warm towards their natural temperature in equilibrium with meteorological conditions. In addition, flows in Arroyo de la Laguna appears to be higher in total dissolved solids (TDS) than the flows in Alameda Creek originating from the watershed upstream of Arroyo de la Laguna (RWQCB, 2008).

The following reference is added to the end of Section 5.4.3 (Vol. 3, Chapter 5, p. 5.4.3-12):

Regional Water Quality Control Board - San Francisco Bay (RWQCB). 2008. Final Order No. R2-2008-0011, NPDES Permit No. CAG982001 General Permit for Discharges from Aggregate Mining, Sand Washing, and Sand Offloading Facilities to Surface Waters. February 15. http://www.waterboards.ca.gov/sanfranciscobay/board_decisions/adopted_orders/2008/february/r2-2008-0011final.pdf

L_ACWD-16 Please refer to **Response S_RWQCBSF-15.**

L_ACWD-17 The commenter expresses concern that the potential effects on the Niles Cone Groundwater Basin due to reductions in flow in Alameda Creek are not adequately addressed, since the Niles Cone relies on flows in Alameda Creek to replenish the groundwater basin. Please refer to **Response L_ACWD-12,** above, **Appendix N** (Vol. 8), and **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14, Section 14.9.3) for discussions of the WSIP's impacts on flow in lower Alameda Creek.

In response to this comment, the discussion of Draft PEIR Impact 5.4.4-1 (Vol. 3, Chapter 5, p. 5.4.4-6) is revised as follows:

Impact 5.4.4-1: Changes in groundwater levels, flows, quality, and supplies.

Compared to current conditions, increased diversions and storage under the WSIP would reduce peak flows in Alameda Creek between the diversion dam and the confluence with San Antonio Creek. Seasonally, the WSIP would reduce flows in the high-flow months and increase flows in the low-flow months due to fishery releases. It would also increase storage in Calaveras Reservoir. The overall effect of these changes in groundwater supplies downstream in the Sunol aquifer areas is expected to be minor (either slightly positive or slightly negative), depending on the year's rainfall and seasonal conditions. The WSIP would reduce potential infiltration in the Sunol groundwater basin by reducing peak flows in wet years. ~~However, impacts on groundwater in the Niles Cone would be dampened by inflow from non-SFPUC watershed streams and aquifers, removal of the Sunol and Niles Dams, and ongoing withdrawals at the infiltration galleries above the water temple; as a result, impacts are expected to be minimal.~~ Impacts on groundwater in the Niles Cone would be less than significant because flows in Alameda Creek downstream of Niles Canyon would be maintained within the range of flows experienced since the Niles Cone began to be managed and utilized as a water supply resource. The program's minor changes in groundwater levels would not affect groundwater quality. This impact would be *less than significant*, and no mitigation measures would be required.

L_ACWD-18 Please refer to **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14, Section 14.9.4) for a discussion of the future cumulative scenario for steelhead.

L_ACWD-19 Please refer to **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14, Sections 14.9.3, 14.9.4, and 14.9.5) for discussion of fishery issues in lower Alameda Creek.

L_ACWD-20 The referenced Draft PEIR figure (Figure 5.7-3 in Vol. 3, Chapter 5, p. 5.7-55) has been revised and is included in **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14, Section 14.9.4) as well as in Chapter 16, Staff-Initiated Text Changes.

L_ACWD-21 As acknowledged in the Draft PEIR (Vol. 2, Chapter 4, p. 4.5-25), construction activities that could cause erosion, sedimentation, or hazardous materials releases would be subject to permits from the local flood control district or other appropriate local agency, the NPDES permitting requirements of the RWQCB, as well as SFPUC Construction Measure #3 (Onsite Air and Water Quality Measures During Construction). The SWPPP required under the NPDES permit would specify erosion control measures as well as requirements for providing secondary containment and berming of the diesel or other chemical storage areas to prevent any potential release from reaching an adjacent waterway or stormwater collection system.

The need for encroachment permits is discussed in **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.3) and noted in Table C.6 (Vol. 5, Appendix C, p. C-26) for consideration during all project-level CEQA reviews. As summarized in Section 14.4, identification of specific local agency requirements is not needed to determine the level of impact significance for this programmatic analysis, but will be addressed in the project-level environmental documentation for each WSIP project. The project-level CEQA review of all Sunol Valley projects will take into account the potential effects on downstream water intakes at the ACWD's facilities in the flood control channel.

L_ACWD-22 Please refer to **Response L_ACWD-12** regarding effects on ACWD operations and facilities. Refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.3) for a discussion of notification and coordination with the ACWD.

L_ACWD-23 The commenter states that the proposed flow releases under Draft PEIR Mitigation Measure 5.4.5-3a are contingent on future studies, and that the Draft PEIR should commit to a minimum level of flow releases to support fisheries. Consistent with CEQA Guidelines Section 15126.4(a) (1) (B), this mitigation measure, assuming it is adopted as part of the Mitigation Monitoring and

Reporting Program, would commit the SFPUC to minimum stream flow releases, and specifies performance standards to mitigate the significant effects of the WSIP (i.e., the flows must meet the minimum flow requirements to support resident trout spawning and egg incubation based on monitoring results and best available scientific information). Subsequent to publication of the Draft PEIR, the SFPUC modified the project description of the Calaveras Dam Replacement project (SV-2), as described in Sections 13.2 and 14.9.1 of this Comments and Responses document (Vol. 7, Chapters 13 and 14, respectively). These modifications address fishery resources in Alameda Creek and minimum flow requirements. Please refer to **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14) for further discussion.

L_ACWD-24 Regarding the first point in this comment, Draft PEIR Table 7.2 (Vol. 4, Chapter 7, p. 7-15) shows the percentage of the ACWD's total 2030 demand met by SFPUC purchases; Table 7.3 (p. 7-18) shows the percentage of the ACWD's base-year 2001 demand met by SFPUC purchases; and the customer-specific summary for the ACWD (pp. 7-35 and 7-36) also indicates the percentage of its total water demand that would be met by SFPUC purchases in 2030. The purpose of Table 7.10 (the subject of this part of the comment) is to show how the total projected change in water demand for each customer, as developed by the Demand Side Management Least-Cost Planning Decision Support System model, compares with the projected change in overall employment and population for each customer's service area, irrespective of the source(s) of water supply used by customers to meet their total demand. The column referenced in this comment shows the percentage of total demand (not the percentage of total SFPUC purchases), and provides the reader with a sense of each customer's overall size for context in reviewing the demographic and demand comparisons presented in the table. Given that every table cannot show all attributes of each water customer's water supply, and that information on the percentage of the ACWD's demand met by SFPUC purchases is presented elsewhere in the chapter, no change is needed to Table 7.10.

Regarding the second point in this comment, each customer's current supply assurance is indicated in the customer-specific summaries presented in the Draft PEIR (Vol. 4, Chapter 7, pp. 7-35 to 7-58) and shown in Table E.1.1 (Vol. 5, Appendix E.1, p. E.1-2). As discussed in **Response L_ACWD-01**, the ACWD's recent purchases indicated by the current BAWSCA Annual Survey (for BAWSCA fiscal year 2002/2003 through 2005/2006), and its purchases in the 2001 base year used in the water demand study were somewhat lower than ACWD's contractual supply assurance. The statement in this comment—that in fiscal year 2006/2007 (for which published data are not available) the ACWD purchased its full contractual quantity—is acknowledged. Existing actual use, rather than a contractual maximum, is the appropriate baseline for evaluating the actual change in demand for 2030, and is what the Draft PEIR uses.

The third point in this comment correctly notes that the horizon years of the adopted general plans in the service area do not extend to 2030, the planning horizon for the WSIP. As discussed in Chapter 7, it is the purview of land use agencies and the elected representatives of a jurisdiction to make decisions about land use and the appropriate levels of growth in the jurisdiction. The level of growth approved in *currently adopted* general plans or plan elements, as represented by the population and employment projections in those plans, is shown in Tables 7.8 and 7.9 (Vol. 4, Chapter 7, pp. 7-28 and 7-30). The Draft PEIR acknowledges (p. 7-7) that water agencies' planning horizons are, of necessity, sometimes longer than those of land use planning agencies and the jurisdictions served by the water agencies.[1] Because some of the adopted general plans have a shorter planning horizon than the WSIP, whereas those of ABAG go to 2030, ABAG projections are also included as another point of comparison. Using 2030 instead of 2020 (as suggested in the comment) is preferred because it is the WSIP horizon year.

L_ACWD-25 Refer to **Response L_ACWD-08** regarding early coordination with the ACWD and **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.3) for a discussion of notification and coordination with the ACWD.

[1] Urban water management plans require a minimum 20-year planning horizon (Water Code, Section 10631, subdivision [a]).

Bay Area Water Supply and Conservation Agency, Arthur Jensen, General Manager, 10/1/07

L_BAWSCA1-01 This comment summarizes more detailed comments presented in Comments L-BAWSCA1-02 through L-BAWSCA1-53; refer to **Responses L-BAWSCA1-02** through **L-BAWSCA1-53**.

L_BAWSCA1-02 This comment regarding the fundamental need for the WSIP due to the regional system's vulnerability to seismic hazards is acknowledged. The Draft PEIR (Vol. 2, Chapter 4, pp. 4.4-4 to 4.4-13) describes the regional faulting and seismic hazards along the SFPUC regional water system and includes a map of major faults in the vicinity of the system (Figure 4.4-1, Vol. 2, Chapter 4, pp. 4.4-7 to 4.4-8). Please refer to **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Sections 14.1.2, 14.1.3, and 14.1.4) for more discussion.

L_BAWSCA1-03 This information provided by the commenter regarding seismic hazards is acknowledged. Please refer to **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Sections 14.1.3 and 14.1.4) for pertinent discussion.

L_BAWSCA1-04 The information provided by the commenter regarding potential impacts of earthquakes on BAWSCA customers is acknowledged. Please refer to **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Sections 14.1.2, 14.1.3, and 14.1.4) for pertinent discussion.

L_BAWSCA1-05 The information provided by the commenter, which pertains to the potential economic consequences associated with SFPUC facility failures due to an extended loss of water, is acknowledged. This comment, which does not address the adequacy or accuracy of the PEIR, was submitted by multiple commenters; refer to **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Section 14.1.6) for additional information.

L_BAWSCA1-06 This information regarding Assembly Bill 1823, the Wholesale Regional Water System Security and Reliability Act, is acknowledged, and corroborates information presented in the Draft PEIR (Vol. 1, Chapter 2, pp. 2-34 and 2-35).

L_BAWSCA1-07 This information regarding the passage of Measures A and E in the San Francisco November 2002 local election is acknowledged, and corroborates information presented in the Draft PEIR (Vol. 1, Chapter 3, p. 3-10).

L_BAWSCA1-08 This comment expresses an opinion on the PEIR alternatives that is based on more detailed comments; refer to **Responses L_BAWSCA-09** through **L_BAWSCA-39**.

L_BAWSCA1-09 The Draft PEIR analyzes the No Program Alternative (Vol. 4, Chapter 9, pp. 9-23 to 9-40) as required by CEQA Guidelines Section 15126.6(e). As described in the Draft PEIR, Section 9.3.1, Comparison of Alternatives (Vol. 4, Chapter 9, pp. 9-84 to 9-95), the No Program Alternative would leave the SFPUC and its customers at significant risk of supply reduction or disruption during an earthquake or other emergency or during a drought, and the Draft PEIR concluded that this is not a feasible or acceptable alternative. The Draft PEIR also demonstrates that the No Program Alternative would not be the environmentally superior alternative, since it could ultimately result in greater environmental effects than the proposed program.

L_BAWSCA1-10 This comment expresses agreement with the Draft PEIR discussion of the feasibility issues associated with the No Program Alternative. Comment acknowledged.

L_BAWSCA1-11 This comment describing potential disaster scenarios in the Bay Area is acknowledged. This comment neither relates to any section in the Draft PEIR nor addresses the adequacy or accuracy of the PEIR. However, because this comment was submitted by multiple commenters, a discussion is provided in **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Section 14.1.4).

L_BAWSCA1-12 This comment regarding the consequences of adoption of the No Program Alternative is acknowledged. The Draft PEIR states that the No Program Alternative is not a feasible or acceptable alternative (Vol. 4, Chapter 9, p. 9-85).

L_BAWSCA1-13 This comment implies that the No Purchase Request Increase Alternative does not meet its stated purpose. The purpose of including the No Purchase Request Increase Alternative in the PEIR alternatives analysis was "to evaluate the consequences of the SFPUC not meeting the future increase requested by its customers in an effort to avoid or minimize the potential growth-inducing effects and secondary effects of growth" (Draft PEIR Vol. 4, Chapter 9, p. 9-41). The Draft PEIR states that this alternative "would have less growth-inducement potential than the WSIP" because the SFPUC would provide less water to the wholesale customers (p. 9-46). The Draft PEIR also acknowledges the possibility that the alternative's growth-inducement potential could be similar to that of the proposed program (as cited in this comment) because growth can occur without a corresponding increase in water supply, and states that if growth were to decrease in the

Bay Area it would likely increase elsewhere. The PEIR analysis achieved the goal of evaluating the consequences of the SFPUC not meeting the requested increase and, with respect to future growth, acknowledges uncertainties. It was appropriate to include this alternative in the range of alternatives evaluated in the PEIR in order to provide agencies and others with this information and thus to foster informed decision-making and public participation. Moreover, this alternative would meet most of the program objectives (see Table 9.6, beginning on p. 9-14) and would reduce numerous impacts associated with fisheries, terrestrial biology, and stream flow in the Tuolumne River watershed (refer to Table 9.7, beginning on p. 9-17).

L_BAWSCA1-14 This comment correctly summarizes information presented on the No Purchase Request Increase Alternative. The Draft PEIR summarizes the adverse impacts associated with developing alternative sources of water supply in Table 9.10 (Vol. 4, Chapter 9, p. 9-35); the level of detail with which these impacts are described is consistent with CEQA requirements (CEQA Guidelines Section 15126.6[d]). As indicated in the Draft PEIR (Vol. 4, Chapter 9, p. 9-26), an assessment of the specific projects that each wholesale customer would pursue, and the likelihood that they could successfully implement the projects, would be speculative.

L_BAWSCA1-15 Regarding characterization of the impacts of "displaced" growth (whereby growth potential reduced in the Bay Area under the No Purchase Request Increase Alternative would cause increased growth pressure elsewhere), the Draft PEIR (Vol. 4, Chapter 9, p. 9-47) states that "growth in these outlying areas would have similar types of environmental impacts [as growth in communities served by the regional system] but of potentially greater magnitude and consequences due to the effects of new development or 'sprawl' versus the infill that would occur in the existing Bay Area communities served by the SFPUC's regional system."

L_BAWSCA1-16 This comment, which cites studies that indicate the advantages of "smart growth," is acknowledged. As it does not address the adequacy or accuracy of the PEIR, no response is provided.

L_BAWSCA1-17 This comment regarding the advantages of smart growth is acknowledged, but as it does not address the adequacy or accuracy of the PEIR, no response is provided.

L_BAWSCA1-18 This comment, which expresses the commenter's opinion that planned growth in San Francisco's neighboring communities is consistent with smart growth principles, is acknowledged. As it does not address the adequacy or accuracy of the PEIR, no response is provided.

L_BAWSCA1-19 This comment on the No Purchase Request Increase Alternative asserts that, “If growth does not occur in the SFPUC service area, it is likely to occur instead on the eastern and southern fringes of the Bay Area, as well as in the communities on the western borders of the San Joaquin Valley,” and requests that the PEIR present additional information on the impacts caused by displaced growth and compare the impacts of such growth to the impacts of “the growth the WSIP will accommodate in San Francisco and its immediately adjacent neighboring communities.”

Information from the Draft PEIR on growth patterns identified under the No Purchase Request Increase Alternative, and the environmental impacts of growth under this alternative, is provided in the Draft PEIR (Vol. 4, Chapter 9, pp. 9-46 and 9-47) and is summarized below.

Growth Patterns Under the No Purchase Request Increase Alternative

The Draft PEIR states that this alternative “would have less growth-inducement potential than the WSIP” because the SFPUC would provide less water to the wholesale customers (p. 9-46). The Draft PEIR also acknowledges the possibility that the alternative’s growth-inducement potential could be similar to that of the proposed program because growth can occur without a corresponding increase in water supply and “it is not expected that [implementation of this alternative] would deter communities from taking actions to support planned growth” (p. 9-47). Some of that growth could occur elsewhere in the form of displaced growth (defined in **Response L_BAWSCA1-15**). The Draft PEIR (p. 9-47) identifies the following areas where such displaced growth could manifest: eastern Contra Costa County, Solano and Sonoma Counties, and parts of the Central Valley.

Indirect Effects of Growth for the No Purchase Request Increase Alternative

To the extent that growth under this alternative still occurred in the wholesale customers’ service areas, the impacts would be as described in the Draft PEIR (Vol. 4, Chapter 7, pp. 7-60 to 7-78).

Regarding displaced growth, the Draft PEIR (Vol. 4, Chapter 9, p. 9-47) states that “growth in these outlying areas would have similar types of environmental impacts [as growth in communities served by the regional system] but of potentially greater magnitude and consequences due to the effects of new development or ‘sprawl’ versus the infill that would occur in the existing Bay Area communities served by the SFPUC’s regional system.”

The implied opinion of the commenter—that the WSIP would result in smart growth (in San Francisco and the Bay Plain) and that the No Purchase Request Increase (or No Program) Alternatives would result in sprawl (in the "outer" Bay Area and the western Central Valley)—is acknowledged.

L_BAWSCA1-20 Refer to **Response L_BAWSCA-19**.

L_BAWSCA1-21 Refer to **Response L_BAWSCA-19**.

L_BAWSCA1-22 Refer to **Response L_BAWSCA-19**.

L_BAWSCA1-23 Refer to **Response L_BAWSCA-19**.

L_BAWSCA1-24 Refer to **Response L_BAWSCA-19**.

L_BAWSCA1-25 The Draft PEIR includes a brief description of San Francisco's water rights (Vol. 1, Chapter 2, pp. 2-36 and 2-37), a summary of provisions of the Raker Act (Vol. 1, Chapter 2, pp. 2-33 and 2-34), and a description of SFPUC Resolution 93-0084, Defense of Water Rights (Vol. 1, Chapter 2, p. 2-45) to provide background information on the existing conditions and to provide context for understanding the WSIP. The planning horizon for the WSIP is 2030, and none of the WSIP alternatives analyzed in the Draft PEIR contemplate or require San Francisco to abandon its water rights as a condition of implementation within the planning horizon. However, the Draft PEIR analyzes impacts that could result from the adoption of alternatives that limit sales to the wholesale customers, including the possibility that wholesale customers would be expected to pursue supplemental supplies to make up for the 2030 shortfall (Vol. 4, Chapter 9, Section 9.2, pp. 9-4 to 9-84).

L_BAWSCA1-26 This comment summarizes and draws conclusions based on the more detailed comments L_BAWSCA-13 through L_BAWSCA-25, which argue that the No Purchase Request Increase Alternative is misguided and infeasible. Please refer **Responses L_BAWSCA-13** through **L_BAWSCA-25**.

L_BAWSCA1-27 This comment, which expresses agreement with statements in the Draft PEIR (Vol. 4, Chapter 9, p. 9-53) regarding the feasibility of the Aggressive Conservation/Water Recycling and Local Groundwater Alternative, is acknowledged. While the PEIR identifies technical, institutional, financial, and public acceptance challenges that would need to be overcome in order to implement this alternative, it was nonetheless included in the PEIR because of substantial public and agency interest in exploring ways to maximize conservation and recycling in place of increasing surface water diversions.

L_BAWSCA1-28 This comment characterizing per-capita water use and conservation levels in the Bay Area is acknowledged.

L_BAWSCA1-29 This comment presents the following information for the wholesale customers: water savings associated with existing plumbing codes and conservation programs; how conservation savings are accounted for in the demand projections; conservation measures considered in development of the 2030 purchase estimates; and conservation measures currently being implemented and planned for implementation. This information is acknowledged and is generally consistent with information presented in the Draft PEIR. **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) presents an expanded discussion of existing and planned conservation and recycling for the wholesale (and retail) customers to address misconceptions reflected in comments on the Draft PEIR.

L_BAWSCA1-30 This comment characterizing the existing diversified water supply portfolios of BAWSCA member agencies is acknowledged.

L_BAWSCA1-31 This comment characterizing the existing and projected diversified water supply portfolios of BAWSCA member agencies is acknowledged.

L_BAWSCA1-32 This comment characterizing San Francisco's existing water supplies is acknowledged.

L_BAWSCA1-33 The commenter is correct in the assertion that the Aggressive Conservation/Water Recycling and Local Groundwater Alternative was designed to address the impacts on the Tuolumne River, Alameda Creek, and Peninsula watersheds. Furthermore, the commenter's assertion that the Modified WSIP Alternative does a "better job at reducing overall identified impacts" is also consistent with the Draft PEIR, since the PEIR identified the Modified WSIP Alternative as the environmentally superior alternative. However, it should be noted that the Draft PEIR provides an analysis of the environmental effects of the Aggressive Conservation/Water Recycling and Local Groundwater Alternative compared to the WSIP (Vol. 4, Chapter 9, pp. 9-55 to 9-59) as required by CEQA; it does not present a direct comparison of impacts with the Modified WSIP Alternative, although it does include a general comparison of alternatives in Section 9.3.1 (pp. 9-84 to 9-95).

L_BAWSCA1-34 Assuming mitigation measures are implemented, the impacts on fisheries would be the same under the Aggressive Conservation/Water Recycling and Local Groundwater Alternative and the Modified WSIP Alternative.

L_BAWSCA1-35 The commenter's assertion is correct regarding the recreational experience of hikers along Alameda Creek in the Sunol Regional Wilderness, although the basis of the comparison depends on several assumptions, including whether or not mitigation is applied to reduce impacts to less-than-significant levels. Please refer to **Response L_BAWSCA-34**.

L_BAWSCA1-36 The commenter's assertion is correct regarding the visual effects along Alameda Creek in the Sunol Regional Wilderness, although the basis of the comparison depends on several assumptions, including whether or not mitigation is applied to reduce impacts to less-than-significant levels. Please refer to **Response L_BAWSCA-34**.

L_BAWSCA1-37 The information regarding demand hardening is acknowledged, and as indicated by the commenter, it corroborates the description of demand hardening presented in the Draft PEIR. In addition, the commenter states in footnote 5 that the Draft PEIR does not consider the environmental impacts of increased storage as a means "to bolster the drought reliability of the system." The concept of increased storage is discussed in the Draft PEIR as part of the alternatives identification and screening process (Vol. 4, Chapter 9, Table 9.14, pp. 9-106 to 9-110), and concepts involving increased storage, such as enlarging Calaveras Reservoir, were eliminated from further analysis because they did not satisfy the screening criteria sufficiently to warrant additional study (see Vol. 4, Chapter 9, pp. 9-97 to 9-128).

L_BAWSCA1-38 The information regarding the benefits of greenscapes is acknowledged, as is the assertion that aggressive conservation measures could negatively affect greenscapes. This corroborates information presented in the Draft PEIR as part of the description of demand hardening (Vol. 4, Chapter 9, p. 9-28).

L_BAWSCA1-39 The commenter's explanation of reasons for increased water use during summer and fall is acknowledged. Since this information does not affect the analysis in the Draft PEIR, no further response is provided.

L_BAWSCA1-40 The commenter's opinion that the WSIP Variant 3 – 10% Rationing is environmentally and economically superior is acknowledged. The Draft PEIR concludes that the Modified WSIP Alternative would be the environmentally superior alternative. As provided by CEQA Guidelines Section 15064, economic changes resulting from a project are not to be treated as significant effects on the environment, and therefore economic changes were not considered in the determination of the environmentally superior alternative. Moreover, WSIP Variant 3 – 10% Rationing does not reduce the significant environmental impacts of the proposed WSIP. Please refer to **Response L_BAWSCA-45**, below.

L_BAWSCA1-41 The commenter correctly describes the WSIP level of service objective of limiting rationing to a maximum of 20 percent systemwide during extended droughts. The commenter is correct in stating that such a 20 percent systemwide reduction in water service could result in some customers being required to reduce water service by less than 20 percent and others by more than 20 percent. The Draft PEIR (Vol. 1, Chapter 3, p. 3-14) states that "this systemwide level of 20 percent rationing translates into different percentages of allocation adjustments for each individual SFPUC customer. These percentages are dependent on the allocation plans … as well as further agreements among the wholesale customers. SFPUC wholesale customer allocation adjustments for a 20 percent systemwide rationing scenario could range from 12 to 40 percent for individual customers."

L_BAWSCA1-42 The comment regarding the environmental and economic consequences of a 25 percent year-round reduction in water use in the wholesale service area is acknowledged. Both the San Francisco Planning Department and the SFPUC acknowledge that the consequences of a severe water shortage would be substantial. However, as stated in the Draft PEIR, water shortages do not necessarily result in physical changes in the environment (Vol. 4, Chapter 9, p. 9-31). In accordance with CEQA Guidelines Section 15064, "the economic and social changes resulting from a project shall not be treated as significant effects on the environment." Therefore, the Draft PEIR does not analyze the economic impacts of rationing.

Nonetheless, as requested in comments submitted by BAWSCA on the Notice of Preparation (NOP) for the Draft PEIR, the PEIR (Vol. 4, Chapter 9, pp. 9-28 to 9-31) presented information on the effects of droughts and rationing on customers. The discussion draws from several published sources, including the William Wade report cited in this comment, and the California Department of Water Resources' *California Water Plan Update 2005* and *Preparing for California's Next Drought, Changes Since 1987–92*. As described on Draft PEIR p. 9-29 (under the discussion of the No Program Alternative), the experiences among water suppliers and their customers during the 1987–1992 drought varied considerably, as will likely be the case for future droughts. Relative to existing conditions, or future conditions expected to occur if the WSIP is not implemented, the WSIP would lessen the severity of economic effects, as well as environmental effects, associated with rationing. As described in the Draft PEIR (Vol. 4, Chapter 9, p. 9-13), the need for 20 percent systemwide rationing under the proposed program is projected to occur in 2 years out of the 82-year period of hydrologic record. This compares with 8 years under the existing condition and 10 years under the No Program Alternative. Therefore, implementation of the WSIP would result in fewer years of rationing, relative to the existing condition, and no further analysis or mitigation is required.

L_BAWSCA1-43 As described in the Draft PEIR (Vol. 1, Chapter 2, pp. 2-18, 2-30, and 2-34), the SFPUC currently operates the regional water system consistent with the Water First Policy, which gives priority to the production and protection of water supply over the production of hydropower generation in the operation of the Hetch Hetchy system. This existing operating strategy would continue under the WSIP (Vol. 1, Chapter 3, p. 3-39, third bullet) and is also assumed to be incorporated into all variants and alternatives analyzed in the PEIR.

L_BAWSCA1-44 The commenter correctly describes the component of the WSIP's dry-year operations strategy to secure water transfer agreements with the Turlock Irrigation District (TID) and/or the Modesto Irrigation District (MID). The opinion of the commenter regarding the source of the water transfer (i.e., conjunctive use in the Central Valley) is acknowledged. The Draft PEIR (Vol. 4, Chapter 6, p. 6-48) indicates that under Mitigation Measure 5.3.6-4a, conjunctive use of groundwater is a possible supplemental source for the water transfer agreement. Please refer to **Section 14.3, Master Response on Proposed Dry-Year Water transfer** (Vol. 7, Chapter 14, Section 14.3.2) for additional information.

L_BAWSCA1-45 The commenter correctly cites Table 8.2, footnote a, of the Draft PEIR (Vol. 4, Chapter 8, p. 8-6) regarding WSIP Variant 3 – 10% Rationing. The description and analysis of the variants are included in the PEIR at the request of the project sponsor and are not part of the CEQA requirements. As stated in the Draft PEIR, "the variants are designed to meet or exceed all WSIP goals and objectives but differ with respect to water supply source or drought-year level of service. The variants are not intended to be alternatives to the proposed program that would lessen or avoid environmental impacts as required by the California Environmental Quality Act (CEQA)" (Vol. 4, Chapter 8, p. 8-1). The WSIP Variant 3 – 10% Rationing would not reduce the significant effects of the proposed program. No additional information on the variants is needed for the Final PEIR.

L_BAWSCA1-46 Please see Section **14.10, Master Response on Modified WSIP Alternative** (Vol. 7, Chapter 14) for additional discussion and analysis of this alternative. Please also refer to **Section 14.3, Master Response on Proposed Dry-Year Water Transfer** (Vol. 7, Chapter 14, Section 14.3.2) for a detailed description of the dry-year water transfer assumptions analyzed in the PEIR.

L_BAWSCA1-47 The information provided in the commenter's Figure 17 regarding the distribution of Tuolumne River runoff is reasonably consistent with similar information presented in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.7-33 and 5.7-34). The commenter is correct in stating that it is currently unknown what sources of water would be involved in a water transfer agreement between the SFPUC and TID/MID and if those sources of water could be conserved water. Therefore, in the absence of this information, the analysis and modeling conducted for the Draft PEIR used reasonable worst-case assumptions that the water would be taken out of TID/MID storage in Don Pedro Reservoir in order to provide a conservative analysis of potential impacts. Please refer to **Section 14.10, Master Response on Modified WSIP Alternative** (Vol. 7, Chapter 14) for additional discussion and analysis of the proposed water transfer of conserved water. Please also refer to **Section 14.3, Master Response on Proposed Dry-Year Water Transfer** (Vol. 7, Chapter 14, Section 14.3.2) for additional details.

The commenter's opinions on the following topics are acknowledged: (1) the commenter's support for meeting Coastside County Water District's increased demand by pumping from Crystal Springs Reservoir is conditioned on the economic impact of that approach; (2) the commenter's support for increased stream flow in a particular reach of Alameda Creek is not meant to suggest that the commenter disagrees with Alameda County Water District comments; (3) the commenter does not support the notion of permanently fallowing agricultural lands as an ongoing source of water for the Bay Area; (4) the commenter does not believe that greater urbanization of the Central Valley is likely to result in less water use on a per-acre basis; (5) the commenter corroborates the feasibility of the concept in the Modified WSIP Alternative that the dry-year water transfer should involve conserved rather than stored water; and (6) the commenter believes that the use of conserved water can provide benefits to agriculture, the urban Bay Area, and the lower Tuolumne River. Regarding the fifth comment listed above, please see **Section 14.10, Master Response on Modified WSIP Alternative** (Vol. 7, Chapter 14) for discussion and analysis of the proposed water transfer of conserved water.

L_BAWSCA1-48 This comment regarding water rights is acknowledged.

L_BAWSCA1-49 This comment expressing the recommendation of the BAWSCA board of directors is acknowledged. The Final PEIR includes additional discussion and analysis of the Modified WSIP Alternative, including the recommended water transfer based on conserved water. Please refer to **Section 14.10, Master Response on Modified WSIP Alternative** (Vol. 7, Chapter 14) for additional discussion and analysis of this alternative. However, because CEQA does not require that the PEIR evaluate the financial aspects of the alternatives, the Final PEIR does not address the feasibility of Bay Area water customers financially supporting water efficiencies in the TID and MID; that issue can be considered in the findings prepared as part of the WSIP approval process.

L_BAWSCA1-50 This comment describes opportunities for partnerships with agricultural interests to allow more water to flow through the Tuolumne River while still providing water to accommodate San Francisco and its neighboring communities. Comment acknowledged.

L_BAWSCA1-51 This comment, which expresses BAWSCA's support for the component of the Modified WSIP Alternative that calls for additional water conservation, recycling, and local groundwater in the BAWSCA service area, is acknowledged. The comment indicating BAWSCA's interest in being responsible for this component is also acknowledged.

L_BAWSCA1-52 This comment, which provides excerpts from the California Water Code related to the SFPUC regional water system and to BAWSCA's statutory authority, is acknowledged.

L_BAWSCA1-53 The commenter's preference—that BAWSCA coordinate the development of 5 to 10 mgd through regional conservation, local groundwater, or recycled water projects—is acknowledged. The SFPUC will continue to work cooperatively with BAWSCA and the individual wholesale customers to provide reliable water to meet customer's needs, regardless of whether the WSIP or an alternative is ultimately adopted.

The comment recommending a potential funding mechanism for the regional conservation, local groundwater, or recycled water projects is acknowledged.

L_BAWSCA1-54 The summary section of the Draft PEIR addresses the issue of aging water system infrastructure (Vol. 1, Summary, p. S-2), and Chapter 2 provides additional details and some examples of historical facility failures (Vol. 1, pp. 2-27 and 2-28). This information is included in the Draft PEIR to provide the reader with sufficient background and context regarding the existing system and problems to understand the purpose and need for the

WSIP; it is not intended to serve as a detailed listing of system failures. Additional discussion of system failures is presented in **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Section 14.1.2). The examples of regional system failures provided by the commenter are acknowledged, but have not been confirmed.

L_BAWSCA1-55 The summary section of the Draft PEIR provides the basic information relevant to the program description. Additional details regarding the water service area and customers served by the regional water system are included in Chapter 3 (Vol. 1, pp. 3-5 to 3-7), where it states that the "SFPUC serves about one-third of its water supplies directly to retail customers in San Francisco." Table 3.1 (p. 3-7) lists the major customers and indicates that the City and County of San Francisco does not receive water supplies from sources other than the SFPUC. No text changes to the Draft PEIR are warranted.

L_BAWSCA1-56 This comment on the Draft PEIR Summary (Vol. 1, p. S-2) is acknowledged; refer to **Responses L_BAWSCA-30** and **L_BAWSCA-31**.

L_BAWSCA1-57 In response to this comment, Figure S.3 (Vol. 1, Summary, p. S-5) and Figure 5.1-2 (Vol. 3, Chapter 5, p. 5.1-6) are revised as follows. The label on the right-hand side of the figure should say:

Annual Average Forecasted ~~Demands~~ <u>Deliveries</u>

L_BAWSCA1-58 The preliminary schedule for implementation of the WSIP projects is presented in Figure 3.6 of the Draft PEIR (Vol. 1, Chapter 3, p. 3-62). The SFPUC developed this schedule based on priorities related to the vulnerability of a facility to seismic damage, a facility's importance to system operations, system operational requirements, and projected funding. As discussed in the Draft PEIR (p. 3-61), the project schedule is considered preliminary and was the best available at the time of Draft PEIR preparation. The SFPUC will refine the schedule as the WSIP and related projects are further developed. Project-level CEQA documentation prepared for each WSIP project will address the updated schedule and will include an appropriate analysis of potential cumulative impacts based on the updated schedule. The dates shown on the preliminary schedule reflect construction periods, not project closeout dates.

L_BAWSCA1-59 The information requested in the comment regarding the presence of historic resources is presented in Draft PEIR Table 4.7-4 (Vol. 2, Chapter 4, beginning on p. 4.7-64).

L_BAWSCA1-60 The information and concern regarding water quality and public health issues associated with drinking water is acknowledged. As stated in the

Draft PEIR (Vol. 1, Chapter 3, pp. 3-5, 3-8, and 3-9), the fundamental mission and one of the primary goals of the WSIP is to maintain high-quality water.

L_BAWSCA1-61 The San Antonio Pump Station is located in the Sunol Valley (see Figure 2.2 in Vol. 1, Chapter 2, p. 2-9) adjacent to the Alameda Siphons. Constructed in 1968 and modified in 1992, its purpose is to pump Hetch Hetchy water to the Sunol Valley Water Treatment Plant (WTP), San Antonio Reservoir, or San Antonio Creek. Pumping Hetch Hetchy water to the Sunol Valley WTP, San Antonio Reservoir, or San Antonio Creek is necessary when the water does not meet water quality standards for delivery to customers (SFPUC, 2004). Since this information is not fundamental to the adequacy or accuracy of the Draft PEIR, no changes in the PEIR text are required.

L_BAWSCA1-62 The Draft PEIR (Vol. 1, Chapter 2, p. 2-12) states that the SFPUC's intertie with the Santa Clara Valley Water District (SCVWD) "serves as a means to transfer water between the SCVWD during an emergency or during periods of planned maintenance work on critical facilities." Thus, the water exchange between the SCVWD and SFPUC described in the next paragraph on that same page is a short-term activity.

L_BAWSCA1-63 The Draft PEIR (Vol. 1, Chapter 3, p. 3-7) describes aging infrastructure as one of the key reasons the WSIP is needed. The WSIP facility improvement projects (listed in Vol. 1, Chapter 3, pp. 3-23 to 3-25) were selected and designed to address the "operational areas and issues which act as drivers for the WSIP," or, in other words, the facilities that the SFPUC has identified as most critical and in need of major repair. It would be speculative to describe what could happen during a major seismic event, other than as already described in the Draft PEIR (Vol. 1, Chapter 3, pp. 3-15 and 3-16) based on the system performance studies conducted in support of the WSIP. Moreover, the additional information requested by the commenter is not needed to evaluate the impacts of implementing the WSIP. The description of existing system maintenance (Vol. 1, Chapter 2, pp. 2-27 and 2-28) includes examples of how existing operations and maintenance are affected by the aging infrastructure, including reasons why the Irvington, Pulgas, Crystal Springs Bypass, and Stanford Tunnels are difficult to shut down for inspection and maintenance. Additional discussion is provided in **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Section 14.1.2). Also refer to **Response L_BAWSCA1-54** for examples of recent outages provided by the commenter.

L_BAWSCA1-64 The commenter is correct in noting the change in the basic service level used to define the WSIP's seismic reliability system performance objective that occurred between issuance of the NOP and the Draft PEIR. The NOP stated a 215 mgd basic service level and the Draft PEIR stated 229 mgd. The originally estimated basic service level of 215 mgd was based on information developed in the SFPUC *Water Supply Master Plan* (April 2000), but these estimates were updated prior to publication of the Draft PEIR for use in determining the WSIP level of service objectives by applying winter reduction factors to average-day demands. The updated basic service level was developed using customer billing data for winter months in the 1992 to 2005 period (SFPUC, 2006a).

L_BAWSCA1-65 The WSIP level of service objective of limiting rationing to a maximum of 20 percent systemwide during an extended drought is part of the proposed program as defined by the project sponsor. CEQA does not require the sponsor to justify its selection of project components, only to describe the project's objectives. The Draft PEIR (Vol. 1, Chapter 3, p. 3-42) describes the SFPUC's management of water supplies during drought years. Note that modeling performed for the Draft PEIR analysis indicates that drought-year shortages of 20 percent would occur in only 2 years out of the 82-year hydrologic cycle (Vol. 4, Chapter 9, p. 9-13). Also refer to **Response L_BAWSCA1-42** regarding analysis of the impacts of rationing.

L_BAWSCA1-66 The Draft PEIR (Vol. 1, Chapter 3, p. 3-14, last sentence of last paragraph) states: "SFPUC *wholesale* [emphasis added] customer allocation adjustments for a 20 percent systemwide rationing scenario could range from 12 to 40 percent for individual customers." No further clarification is needed.

L_BAWSCA1-67 The statement that the SFPUC "has not committed to any level of increased water conservation or recycling in 2030, and have treated water conservation and recycling in San Francisco as a component of the WSIP" requires clarification. The SFPUC has proposed the WSIP, which includes conservation and recycling in San Francisco. Like the wholesale customers, the SFPUC already implements conservation programs. Refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional discussion of conservation in San Francisco.

L_BAWSCA1-68 This comment stating that Menlo Park Water District receives 100 percent of its water supply from the SFPUC is correct. Refer to **Response L_Menlo1-08** for further discussion.

L_BAWSCA1-69 Refer to Section **14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14).

L_BAWSCA1-70 In response to this comment, the text in Item E (Vol. 1, Chapter 3, p. 3-25) of the Draft PEIR is revised as follows:

E. **Regional Recycled Water Projects** (note that these are different than the project #22, Recycled Water Projects, listed above under A). The SFPUC expects <u>that</u> ~~to consider and develop~~ some recycled water projects that would be located outside of San Francisco <u>will be developed</u> in coordination with other jurisdictions. As these projects are developed and designed, they will be reviewed to determine the appropriate <u>lead agency and</u> level of environmental review.

L_BAWSCA1-71 In response to this comment, the text in the Draft PEIR (Vol. 1, Chapter 3, p. 3-27) is revised by adding the following as the last paragraph of Section 3.5.1:

<u>Other water quality regulations of significance to the SFPUC could include the Stage 2 Disinfectants and Disinfection Byproducts Rule, Candidate Contaminant List, California Action Levels, and California Public Health Goals. The SFPUC will address these regulations as appropriate as part of its ongoing operations as well as to ensure consistency with the WSIP water quality levels of service.</u>

L_BAWSCA1-72 The commenter is correct in noting that if a facility is sized to meet one of several objectives, the facility may be able to operate beyond other minimum levels of performance. As described in the Draft PEIR (Vol. 1, Chapter 3, pp. 3-10 and 3-11), the SFPUC has conducted numerous planning and engineering studies of the regional system with respect to its vulnerability, reliability, and performance, and the Draft PEIR presents only a brief summary of the key studies and relevant results needed to demonstrate that the proposed improvements could meet or exceed the WSIP level of service objectives. More detail regarding the studies, assumptions, and analytical methods used in determining the system performance is not required under CEQA. However, it should be noted that design of the WSIP project facilities is driven by all of the program objectives in combination—seismic reliability, delivery reliability, water quality, and water supply. All four of these goals are factored into the decision on how to size the WSIP's individual facilities. The commenter is referred to the document *WSIP System Assessment for Levels of Service Objectives* (SFPUC, 2006a) and to the SFPUC memorandum *Water System Improvement Program Facilities Capacity* (SFPUC, 2008b).

L_BAWSCA1-73 The Draft PEIR (Vol. 1, Chapter 3, p. 3-30, first bullet) provides a definition and description of "Delivery During a Hetch Hetchy Water Quality Event." On rare occasions, meteorological or other conditions affect the quality of water in the Hetch Hetchy system, and the water does not meet drinking water standards and cannot be delivered to customers without filtration. During such a Hetch Hetchy water quality event, the normal system operations are constrained. The system assessment indicated that while some water could be served to customers (see the "Existing System Performance" column in Table 3.7, p. 3-31), the SFPUC would be unable to deliver the average annual demand.

L_BAWSCA1-74 The guiding principles for implementing the WSIP's sustainability and cost-effectiveness goals are listed as system performance objectives in the Draft PEIR, Table 3.2 (Vol. 1, Chapter 3, p. 3-9).

L_BAWSCA1-75 The commenter's opinion expressing agreement with the proposed system operations strategy is acknowledged.

L_BAWSCA1-76 This comment providing additional operating objectives for the SFPUC is acknowledged. The objectives for the proposed program were provided by the SFPUC to the San Francisco Planning Department. Should the SFPUC wish to change or add to the objectives of the program, it will notify the San Francisco Planning Department.

L_BAWSCA1-77 Please refer to **Response L_BAWSCA-76**. A programmatic analysis of flood-related issues is provided in the Draft PEIR (Vol. 2, Chapter 4, Impact 4.5-4, pp. 4.5-37 to 4.5-41).

L_BAWSCA1-78 The information regarding the current *Interim Water Shortage Allocation Plan* is acknowledged.

L_BAWSCA1-79 As stated in the Draft PEIR (Vol. 1, Chapter 3, p. 3-43), the SFPUC will meet, at a minimum, all current and anticipated legal requirements for the protection of fish and other wildlife habitat. The chapter further states: "Although the fishery release requirements that FERC [Federal Energy Regulatory Commission] may impose in 2016 cannot be anticipated at this time, the SFPUC assumes, for purposes of the WSIP, that it will be able to continue its current agreement with TID and MID to pay them to provide all of the additional water, if any, required for the fishery releases." It would be speculative at this time to provide any further information on anticipated future fishery release requirements.

L_BAWSCA1-80 The Draft PEIR describes the proposed water delivery operations strategy (Vol. 1, Chapter 3, pp. 3-45 and 3-46), including a strategy to optimize local water storage. The strategy integrates replenishment of local reservoirs with the need to meet increased purchase requests through 2030 and to institutionalize a planned maintenance program for the regional system facilities. With the increased conveyance capacity and addition of redundant facilities under the WSIP, the SFPUC would meet or exceed the system performance objectives delineated in Draft PEIR Table 3.2 (Vol. 1, Chapter 3, p. 3-9). This includes providing operational flexibility and system capacity to replenish local reservoirs as needed to meet the seismic reliability, delivery reliability, and water supply goals of the WSIP. Under existing conditions, the SFPUC operates the system to replenish local reservoirs to the extent possible, but it currently performs this function to meet a lower demand level and without a regular, planned maintenance program. The facilities sizing proposed under the WSIP is needed to achieve all of the program objectives in combination—seismic reliability, delivery reliability, water quality, and water supply. All four of these goals are factored into the decision on how to size the WSIP's individual facilities; the replenishment rate of local reservoirs is only one factor and cannot be separated from the other factors.

L_BAWSCA1-81 The commenter's opinion expressing agreement with the proposed system operations strategy is acknowledged.

L_BAWSCA1-82 Regarding existing system maintenance, Section 2.3.6 of the Draft PEIR (Vol. 1, Chapter 2, p. 2-27), states: "Many of the tunnels in the system are important for water delivery to customers and lack redundancy, so it is difficult to shut them down for inspections. These include the Irvington, Pulgas, Crystal Springs Bypass, and Stanford Tunnels. Some of these tunnels have not been inspected for 20 to 30 years." Additional discussion is provided in **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Section 14.1.2).

L_BAWSCA1-83 This comment, which expresses a preference for the components to be included in the San Joaquin Pipeline System project (SJ-3), is acknowledged. More detailed project description information will be developed and identified in the project-level environmental documentation.

L_BAWSCA1-84 Please refer to **Response L_BAWSCA1-82**. Additional discussion regarding maintenance needs and redundancy is provided in **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Section 14.1.2).

L_BAWSCA1-85 Staffing issues are not considered physical environmental effects, and therefore are not analyzed in the Draft PEIR.

L_BAWSCA1-86 In response to this comment, the Draft PEIR (Vol. 1, Chapter 3, p. 3-82, last paragraph) is revised as follows:

> As the preliminary schedule indicates, construction of projects is expected ~~to begin in 2008 and~~ to be completed by the end of 2014; there would be an intense period of construction from 2009 to 2010, when 18 of the 22 projects would be under construction ~~constructed~~ concurrently.

L_BAWSCA1-87 Permits, approvals, and other decisions associated with alternatives to the WSIP are listed in Draft PEIR Table 9.4 (Vol. 4, Chapter 9, pp. 9-11 and 9-12), and the table includes the information provided by the commenter.

L_BAWSCA1-88 The commenter requests that the PEIR present the beneficial seismic safety effects of the WSIP in graphic and tabular format; however, the Draft PEIR already presents this information. Sections 3.4.2 and 3.5.2 (Vol. 1, Chapter 3, pp. 3-15 and 3-27) summarize findings of the seismic vulnerability studies and present the WSIP's seismic reliability goals. Table 3.10 (Vol. 1, Chapter 3, p. 3-49) identifies which WSIP projects address seismic reliability (see Column 3 of this table), while Figure 4.4 (Vol. 2, Chapter 4, p. 4.4-7) graphically depicts the locations of all WSIP projects listed in Table 3.10 in relation to the major faults.

L_BAWSCA1-89 See **Response L_BAWSCA1-42**.

L_BAWSCA1-90 The proposed system operations strategy under the WSIP is presented in the Draft PEIR, Section 3.7 (Vol. 1, Chapter 3, pp. 3-39 and 48), which includes a description of proposed reservoir storage levels and operational flexibility needed for the proposed level of system maintenance.

L_BAWSCA1-91 This comment refers to a statement in the Draft PEIR regarding spills or releases from local reservoirs (Vol., 3, Chapter 5, p. 5.1-17, first paragraph). This statement is part of a discussion on model limitations, and it is presented in the context of explaining how model output of monthly data was used to explain phenomena that may last only a few days. However, the commenter uses this statement out of context to inquire about reservoir operations and downstream flooding.

Existing operations for system reservoirs are described in Draft PEIR Section 2.3 (Vol. 1, Chapter 2, pp. 2-16 to 2-28), which states that the local reservoirs are managed to maintain sufficient available storage and to minimize uncontrolled spills. While none of the SFPUC reservoirs have specific flood control requirements, the SFPUC operates all dams and reservoirs to avoid downstream flooding. Refer also to **Response BAWSCA1-77**.

L_BAWSCA1-92 The referenced mitigation tables (Draft PEIR, Vol. 4, Chapter 4, pp. 6-65 to 6-189) are intended to provide a quick reference guide for the reader to understand the significance determination for each project under each impact and the level of mitigation required to support this determination. For example, a determination of "less than significant" may mean that the impact is potentially significant but would be reduced to a less-than-significant level with implementation of mitigation measures and/or SFPUC standard construction measures that would ensure compliance with regulations or policies. In other cases, the impact may simply be less than significant without the need to implement mitigation measures. These tables are not intended to document the level of detail requested by the commenter. The mitigation tables are already over 100 pages long, and the addition of more detailed information would make them even more lengthy and cumbersome. As noted by the commenter, the full citations are included in Chapters 4 and 5 of the Draft PEIR.

L_BAWSCA1-93 This comment, which states that the potentially unanalyzed impacts of growth are either the same as those analyzed in the Draft PEIR or are so small as to be insignificant, and that over 90 percent of the WSIP's indirect growth impacts has already been analyzed in the CEQA documents for local jurisdictions' general plans, is noted. The potential impacts of growth that could occur beyond the projections indicated in local general plans and related land use plans are discussed in the Draft PEIR (Vol. 4, Chapter 7, pp. 7-70 and 7-71).

L_BAWSCA1-94 As stated in the Draft PEIR (Vol. 4, Chapter 8, p. 8-1), the description and analysis of variants were included in the PEIR at the request of the SFPUC and not to fulfill any CEQA requirement. Because one of the variants was identified as being able to reduce the impacts associated with increased diversions from the Tuolumne River, it was included in the CEQA alternatives analysis in Chapter 9 of the Draft PEIR.

L_BAWSCA1-95 The commenter cites summary statements in the Draft PEIR regarding the comparison of all the major impacts (significant unavoidable or potentially significant unavoidable) of the variants with those of the proposed program. However, the commenter omits a key phrase from the statement in the Draft PEIR. The complete statement from the Draft PEIR (Vol. 4, Chapter 8, p. 8-77) is as follows: "With the exception of the BARDP [Bay Area Regional Desalination Project] component of Variant 2, all three variants would have the same significant unavoidable or potentially significant unavoidable impacts as the proposed program, *although in some cases, there would be slight differences in severity of the impact.*" The Draft PEIR further states that the greatest differences among the proposed program and the variants are associated with facilities-related impacts of the BARDP and other facilities-related impacts are minor. It should be noted that the two conclusions stated by the commenter reflect the opinion of the commenter and not the conclusions of the Draft PEIR.

L_BAWSCA1-96 The information presented in Draft PEIR Table 9.2 (Vol. 4, Chapter 9, p. 9-4) is identical to that in Table 3.5 (Vol. 1, Chapter 3, p. 3-26) and compares existing and proposed regional system levels of service. It does not present a comparison of system performance. Therefore, the descriptor “not defined” is an appropriate depiction of the existing system’s level of service for seismic response. Table 3.6 (Vol. 1, Chapter 3, p. 3-29) provides a comparison of existing and future system performance for seismic response.

L_BAWSCA1-97 This comment regarding the absence of actual total cost information on the alternatives is acknowledged. The SFPUC has no additional information to provide on total costs at this time; cost is one of the factors that the SFPUC can consider in evaluating the feasibility of alternatives at the time of program approval.

L_BAWSCA1-98 See **Response L_BAWSCA1-60**.

L_BAWSCA1-99 Draft PEIR Table 9.7 (Vol. 4, Chapter 9, p. 9-17) includes a column entitled “Proposed Program” that summarizes the impact analysis for the WSIP as presented in Vol. 3, Chapter 5. The three bullet-point summary comparisons presented by the commenter are correct, although the actual number of individual impacts does not necessarily relate to the magnitude or severity of individual impacts.

L_BAWSCA1-100 The Draft PEIR (Vol. 4, Chapter 9, p. 9-26) states that “the ability of the wholesale customers to develop additional water supplies is uncertain, and further studies would be required to evaluate technical and institutional feasibility.” Part of these further studies would include determining whether and how the SFPUC system infrastructure could be used in concert with alternative supplies, and analysis of the constraints on the regional system for these purposes is beyond the scope of this PEIR. The Draft PEIR provides a thorough analysis of the environmental impacts of the proposed water supply under the WSIP, and, consistent with CEQA Guidelines Section 15126.6, the environmental impacts of the alternative supplies are evaluated at sufficient detail to allow meaningful comparison with the proposed program. With regard to the example provided by the commenter, Draft PEIR Table 9.10 (Vol. 4, Chapter 9, pp. 9-35 and 9-36) summarizes the types of projects and range of environmental impacts that could occur if the wholesale customers were to develop alternative water supplies.

L_BAWSCA1-101 This comment, which states that some urban water customers are contracting to buy conserved water from agricultural water users, is acknowledged.

L_BAWSCA1-102 This comment, stating that the wholesale customers expect to provide 13 mgd from conservation and 9 mgd from recycled water and desalination projects by 2030, is acknowledged. These water savings are factored into the 2030 water demand projections and are presented in the Draft PEIR (Vol. 1, Chapter 3, p. 3-18).

L_BAWSCA1-103 This comment states that the analysis of the Aggressive Conservation/ Water Recycling and Local Groundwater Alternative must consider the existing water demand and supply sources as well as projections for future water demand and water supply diversity. This comment provides comparisons of current and future water supply sources for the San Francisco retail area and the BAWSCA member agencies in the form of pie charts.

The intent of the word “consider” in this comment (i.e., the additional analysis being requested) is unclear. The analysis of the Aggressive Conservation/Water Recycling and Local Groundwater Alternative assumes this water supply diversity will continue, that the wholesale customers—in partnership with the SFPUC and BAWSCA—will actively participate in developing additional recycled water/groundwater/ conservation projects, and that the wholesale customers would pursue additional supplemental supply. BAWSCA’s objections to and criticisms of this alternative are raised elsewhere in this submittal (and addressed in other responses). In any case, the assertions regarding water supply diversity do not affect the adequacy of the PEIR.

(Note that the data presented for the BAWSCA agencies’ existing water use by source of supply are for fiscal year 2005/2006, which is not the base year used for the water demand projections. The data presented for the BAWSCA agencies’ 2030 water sources are somewhat inconsistent with the data in the Draft PEIR, indicating that the BAWSCA agencies’ 2030 water supply will total 320.61 mgd, rather than 323 to 325 mgd, as estimated in the demand projections; however, BAWSCA’s purchases from the SFPUC and supply diversity remain the same as presented in the Draft PEIR.)

L_BAWSCA1-104 This comment, which refers to a critical statement made by other organizations concerning single-family residential per-capita outdoor water use, is acknowledged. The SFPUC estimates of single-family residential per-capita demand for 2030 compiled for the 2006 Sustainable Water

Supply Briefing (SFPUC, 2006b)[1] differ somewhat from those cited in this comment; for additional information on this topic, please refer to **Response SI_PacInst-68** as well as **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2, under the heading Outdoor Water Use, and Section 14.2.3, Table 14.2-12).

L_BAWSCA1-105 This comment refers to a statement by other organizations that the proposed WSIP ignores conservation, efficiency, and recycling measures. Comment acknowledged. The WSIP includes implementation of 22 to 25 mgd of conservation and recycling in the wholesale area and an additional 8 mgd in the San Francisco retail service area.

L_BAWSCA1-106 This comment refers to a recommendation by other organizations that the SFPUC conduct a study about maximum potential for conservation and efficiency savings. This comment and the BAWSCA response are acknowledged. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information on this topic.

L_BAWSCA1-107 According to the SFPUC, the nonresidential sector is responsible for over 80 percent of the projected 2030 demand increase; refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2, under the heading Outdoor Water Use).

L_BAWSCA1-108 This comment refers to a statement by other organizations that outdoor water use represents over 40 percent of the increase in nonresidential demand. This comment and the BAWSCA response are acknowledged. According to the SFPUC, about 35 percent of the increase in nonresidential demand is due to outdoor water use. Refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2, under the heading Outdoor Water Use).

L_BAWSCA1-109 This comment, which rebuts a critical statement regarding the demand studies' purported failure to account for the impact of rising prices on water consumption, is acknowledged. For additional information on this topic, please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2, under the heading Consideration of Water Price in WSIP

[1] For more information on this briefing, refer to the introduction to the responses to comments received from the Pacific Institute **(SI_PacInst)**.

Background Studies) and **Response SI_PacInst-62** (Vol. 7, Chapter 15, Section 15.4).

L_BAWSCA1-110 This comment, which consists of BAWSCA's response to statements regarding evapotranspiration controllers to reduce outdoor water use, states that BAWSCA is currently awaiting the results of a multiyear study on the effectiveness of weather-based evapotranspiration controllers in the Bay Area. Comment acknowledged. For additional information on the Irvine Ranch Water District study, please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3, under the heading Frequently Submitted Comments Addressing Conservation and Recycling).

L_BAWSCA1-111 This comment, which consists of BAWSCA's response to statements regarding conservation technologies that can reduce residential water demand, is acknowledged. The Draft PEIR acknowledges that additional water savings become more difficult to achieve as more conservation measures are implemented. For additional information on this topic, please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3, under the heading Frequently Submitted Comments Addressing Conservation and Recycling). With respect to the change in single-family residential per-capita demand stated in a previous L_BAWSCA1 comment, refer to **Response L_BAWSCA1-104**.

L_BAWSCA1-112 Please refer to **Response L_BAWSCA1-04** as well as **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Sections 14.1.2, 14.1.3, and 14.1.4) for pertinent discussion of this issue.

L_BAWSCA1-113 This comment, submitted in support of Comment L_BAWSCA1-23, is an excerpt from a report by the Greenbelt Alliance that provides information about actions taken in Alameda, San Mateo, and Santa Clara Counties to preserve the Bay Area Greenbelt, and estimates the acreage of greenbelt land in each county at high, medium, and low risk of conversion to urban use. This information is acknowledged; as it does not address the adequacy or accuracy of the PEIR, no response is provided.

L_BAWSCA1-114 This comment consists of BAWSCA's *Water Conservation Program's Annual Report FY 2006/7*. Refer to **Response L_BAWSCA1-23**.

L_BAWSCA1-115 The contents of the report entitled *An Economic Evaluation of the Water Supply Reliability Goal in the SFPUC Water System Improvement Plan* are acknowledged. BAWSCA commissioned this report with the purpose of reviewing the WSIP water supply level of service objective, which would limit rationing to a maximum of 20 percent systemwide during extended droughts. The report includes recommendations to the SFPUC to review and revise its water supply planning goals, and states the opinion that the SFPUC should consider the economic costs of mandatory rationing. The report does not address the adequacy or accuracy of the Draft PEIR, and therefore no response from the San Francisco Planning Department is required. It can be noted, however, that hydrologic modeling conducted for the Draft PEIR environmental analysis indicates that 20 percent systemwide rationing would only be required for 2 years out of the 82-year period of hydrologic record (or 1 in 41 years) if the WSIP were implemented. **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Section 14.1.6) provides additional discussion of the obligation under CEQA to evaluate the economic impacts of mandatory rationing.

L_BAWSCA1-116 This comment, which consists of the affidavit of Anson B. Moran, former general manager of the SFPUC, regarding the planning and operation of the SFPUC water facilities during a drought, is acknowledged. The affidavit does not address the adequacy or accuracy of the PEIR, and no response from the San Francisco Planning Department is required.

Bay Area Water Supply and Conservation Agency, Arthur Jensen, General Manager, 9/20/07

L_BAWSCA2-01 This comment suggests that the PEIR more clearly emphasize the importance of completing the WSIP in order to protect the public health and safety of the Bay Area's residents. For a response to this comment, please refer to **Response L_BAWSCA1-02**. For additional discussion of this topic, also refer to **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Sections 14.1.2 and 14.1.3).

L_BAWSCA2-02 This comment lists the following points in support of the WSIP: (1) several of the SFPUC regional water system's tunnels, reservoirs, and pipelines are located on or cross one or more active fault(s); (2) there is a greater than 60 percent chance of a major earthquake before 2032; and (3) subsequent to a major earthquake, the flow of water to communities could be disrupted for 30 to 60 days. Please refer to **Response L_BAWSCA1-02** for a response to this issue. For additional discussion of this topic, also refer to **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Section 14.1.3).

L_BAWSCA2-03 This comment, which characterizes water use and existing and future conservation among BAWSCA member agencies, is acknowledged. Please refer to **Responses BAWSCA1-28** and **BAWSCA1-29** as well as **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14).

L_BAWSCA2-04 Please refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.5) and **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.6) for clarification regarding current and estimated future municipal and agricultural diversions from the Tuolumne River.

This comment expresses support for the Modified WSIP Alternative, and for opportunities for agricultural conservation along the lower Tuolumne River as a way to offset incremental increases in Tuolumne River diversions while providing water supplies for the Bay Area. Comment acknowledged. Please refer to **Section 14.10, Master Response on Modified WSIP Alternative** (Vol. 7, Chapter 14, Section 14.10.3) for a discussion of agricultural water conservation in the services areas of TID, MID, and/or another water agency as a means of securing water for the conserved water transfer to the SFPUC. Please also refer to **Responses L_BAWSCA1-47, L_BAWSCA1-49, and L_BAWSCA1-50**.

Bay Area Water Supply and Conservation Agency, Nicole Sandkulla, Senior Water Resources Engineer, 9/5/07

[See Public Hearing Transcript, Sonora, pp. 17–20]

L_BAWSCA3-01 Please see **Response L_BAWSCA1-02**. Also see **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Sections 14.1.2 and 14.1.3) for relevant response.

L_BAWSCA3-02 The issues presented in this comment were also raised throughout the BAWSCA1 letter; refer to the responses to that letter (specifically, regarding an expected decline in residential per-capita water use, see **Response BAWSCA1-28**; regarding the need for the WSIP with respect to earthquake hazards, see **Response BAWSCA1-02**). Please also see **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Section 14.1.3) for additional discussion of earthquake hazards.

Bay Area Water Supply and Conservation Agency, Nicole Sandkulla, Senior Water Resources Engineer, 9/6/07

[See Public Hearing Transcript, Modesto, pp. 12-14]

L_BAWSCA4-01 Please refer to **Response L_BAWSCA1-02** for a response to this comment. For additional discussion of this topic, also refer to **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Sections 14.1.2 and 14.1.3).

L_BAWSCA4-02 Statements presented in this comment were also raised throughout the BAWSCA1 letter; refer to the responses to that letter (in particular, regarding an expected decline in residential per-capita water use, see **Response BAWSCA1-28**).

Bay Area Water Supply and Conservation Agency, Steven Miller, Lawyer, 9/20/07

[See Public Hearing, San Francisco City Hall, September 20, 2007, pp. 9–11]

L_BAWSCA5-01 Issues presented in this comment were also raised in the L_BAWSCA1, L_BAWSCA2, L_BAWSCA3, and L_BAWSCA4 comment letters. Please refer to **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Sections 14.1.2, 14.1.3, and 14.1.4) for response.

L_BAWSCA5-02 Statements presented in this comment were also made throughout the BAWSCA1 letter; refer to the responses to that letter (in particular, regarding an expected decline in residential per-capita water use, see **Response BAWSCA1-28**).

L_BAWSCA5-03 Like Comment L_BAWSCA5-02, statements presented in this comment were also made throughout the BAWSCA1 comment letter and in BAWSCA2-04. Please refer to **Responses L_BAWSCA1-47, L_BAWSCA1-49,** and **L_BAWSCA1-50** for responses to these issues.

Bay Area Water Supply and Conservation Agency, Arthur Jensen, General Manager, 10/11/07

[See Public Hearing Transcript, San Francisco City Hall, October 11, 2007, pp. 39–42]

L_BAWSCA6-01 Issues presented in this comment were also raised in the L_BAWSCA1, L_BAWSCA2, L_BAWSCA3, L_BAWSCA4, and L_BAWSCA5 comment letters. Please refer to **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Sections 14.1.2, 14.1.3, and 14.1.4) for response.

L_BAWSCA6-02 This comment states that the Draft PEIR does not adequately describe or analyze the Modified WSIP Alternative. Please refer to **Section 14.10, Master Response on Modified WSIP Alternative** (Vol. 7, Chapter 14) in response to this comment.

L_BAWSCA6-03 This comment summarizes BAWSCA's commitment to meeting a portion of it demand through conservation and recycling measures. The comment also expresses support for the environmentally superior alternative, the Modified WSIP Alternative. Please refer to **Response L_BAWSCA1-47** in response to this comment. Also refer to **Section 14.10, Master Response on Modified WSIP Alternative** (Vol. 7, Chapter 14) for additional details.

L_BAWSCA6-04 Statements raised in this comment are similar to those made in **L_BAWSCA1-49.** Please refer to **Responses L_BAWSCA1-49** and **L_BAWSCA1-50** in response to this comment.

San Francisco Bay Conservation and Development Commission, Sara Polgar, Planner, 9/6/07

L_BCDC-01 The commenter's summary of the project description for the proposed Bay Division Pipeline (BDPL) Reliability Upgrade project (BD-1), as described in Draft PEIR Table 3.10 (Vol. 1, Chapter 3, p. 3-52) and Table C.1 (Vol. 5, Appendix C, p. C-4), is correct.

The description of the BDPL Reliability Upgrade project (BD-1) is based on the most accurate information available at the time the Draft PEIR was prepared, and the fixed locations of valve lots and construction activities were not known. Therefore, these items are not described in detail or shown precisely on figures in the Draft PEIR. Section 15142 (b) and (h) (3) and Section 15168 of the CEQA Guidelines do not require that a Program EIR provide a level of detail greater than that of the known program being analyzed (in this case the WSIP). The locations of the valve lots and construction activities for the BDPL Reliability Upgrade project will be identified and analyzed in the project-level EIR.

Draft PEIR Table C.1 (Vol. 5, Appendix C, p. C-4) and the description in the Land Use and Visual Quality section (Vol. 2, Chapter 4, p. 4.3-5, third full paragraph) may be misleading in that they suggest that the locations of the project components are known more accurately than as analyzed in the Draft PEIR, because most of the pipeline alignment for the BDPL Reliability Upgrade project (BD-1) is located adjacent to the existing SFPUC right-of-way for BDPL Nos. 1 and 2. Accordingly, in Table C.1, the project description and the description of existing land uses, facility locations, and land acquisitions are generally known because the BDPL Reliability Upgrade project is proposed to be constructed adjacent to the existing BDPL Nos. 1 and 2. Similarly, the referenced paragraph (Vol. 2, Chapter 4, p. 4.3-5) identifying aboveground facilities refers to the existing setting and aboveground structures associated with the existing BDPL Nos. 1 and 2, not the future BDPL Reliability Upgrade project.

The Draft PEIR (Vol. 2, Chapter 4, p. 4.2-8) states that the bay tunnel portion of the BDPL Reliability Upgrade project (BD-1) would be buried 100 to 150 feet below mean seal level and result in approximately 355,000 cubic yards of bay mud excavation/spoils, and acknowledges that this project could be subject to certain provisions of the SF Bay Plan.

Based on this program-level of information, the Draft PEIR did not determine the extent of BCDC's jurisdictional and permitting authority over the BDPL Reliability Upgrade project (BD-1). BCDC will have the opportunity to review detailed project information and determine jurisdiction during preparation of the project-level EIR for this project. At this stage of project planning, it is reasonable for the commenter to assume that this project falls under BCDC jurisdiction (worst-case conditions); however, this determination will be made as part of project-level CEQA review. Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vo1. 7, Chapter 15, Section 14.4.2) for detailed information on the issues raised by this comment.

L_BCDC-02 The commenter's description of BCDC's authority to issue permits and to enforce policies within its area of jurisdiction is consistent with that presented in the Draft PEIR (Vol. 2, Chapter 4, p. 4.2-8). Because detailed information about filling or dredging associated with this project was not available during preparation of the Draft PEIR, the PEIR provided a broad overview of land use plans and policies applicable to the WSIP rather than listing individual policies of each plan and evaluating each WSIP project's consistency with these policies. As the commenter notes, SF Bay Plan policies concerning filling, dredging, and public access could be applicable to the BDPL Reliability Upgrade project (BD-1); however, depending on final project plans for the BD-1 tunnel segment and associated shaft structures, other BCDC policies (pertaining to such topics as fish, other aquatic organisms, and wildlife; water quality; and appearance, design, and scenic views) could also be applicable. Since project components had not yet been developed beyond a program level of detail, it was not possible for the Draft PEIR to determine the applicability of these policies.

As stated in the Draft PEIR (Vol. 2, Chapter 4, p. 4.2-10), because the policy language found in a land use plan is susceptible to varying interpretations, it is often difficult to determine whether a proposed project is consistent or inconsistent with such policies. Further, because land use plans often contain numerous policies emphasizing differing legislative goals, the BDPL Reliability Upgrade project (BD-1) may be consistent with the SF Bay Plan, taken as a whole, even though it may appear to be inconsistent with specific policies within the plan. BCDC would typically determine a project's consistency at the project (rather than program) level.

Potential BCDC jurisdiction over the BDPL Reliability Upgrade project (BD-1) is already identified in Draft PEIR Table C.6 (Vol. 5, Appendix C, p. C-26) for consideration during project-level CEQA review. Based on project-specific information regarding the siting, design, construction, and operation of the BD-1 bay tunnel segment, the project-level EIR for this project will evaluate BCDC's jurisdictional authority and summarize the applicable policies of the SF Bay Plan. Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.2), for more information on the issues raised by this comment.

As requested by the commenter, the text of the Draft PEIR has been augmented to further describe BCDC's jurisdictional authority and the types of Bay Plan policies that could be applicable to the BDPL Reliability Upgrade project (BD-1). The Draft PEIR (Vol. 2, Chapter 4, p. 4.2-8, last sentence of the second paragraph) is revised as follows:

San Francisco Bay Conservation and Development Commission, San Francisco Bay Plan

The San Francisco Bay Plan (SF Bay Plan), prepared by the San Francisco Bay Conservation and Development Commission (BCDC) in 1968 in accordance with the McAteer-Petris Act of 1965, is an enforceable plan that guides the protection and use of San Francisco Bay and its shoreline (BCDC, 2005). Under the McAteer-Petris Act, BCDC has the authority to issue or deny permit applications for placing fill, extracting materials, or changing the use of any land, water, or structure within the area of its jurisdiction and to enforce policies aimed at protecting the bay and its shoreline.[3a] The SF Bay Plan designates shoreline areas that should be reserved for water-related purposes like ports, industry, public recreation, airports, and wildlife refugees. Since its adoption by BCDC in 1968, the SF Bay Plan has been amended periodically to keep pace with changing conditions and to incorporate new information concerning the bay. The new Bay Division Pipeline Tunnel No. 5 proposed under the BDPL Reliability Upgrade project (BD-1) includes approximately five miles of tunnel under the Don Edwards San Francisco Bay Wildlife Refuge, Newark Slough, and San Francisco Bay. The pipeline would be buried between 100 and 150 feet below mean sea level and result in approximately 355,000 cubic yards of bay mud excavation/spoils. As a result, this project could be subject to ~~certain provisions~~ SF Bay Plan policies concerning the placement of fill in the bay, dredging, public access, and other policies and provisions contained in the SF Bay Plan (BCDC, 2005), depending on the final siting, construction, and operation of the BDPL Reliability Upgrade project.

[3a] BCDC has jurisdiction over all of San Francisco Bay up to mean high tide, areas of marsh up to 5 feet above mean sea level, a shoreline band lying 100 feet inland from the bay, as well as salt ponds, managed wetlands, and certain waterways.

In addition, the following text is added to the Draft PEIR (Vol. 2, p. 4.2-16, fourth full paragraph):

San Francisco Bay Plan

Implementation of the Bay Division Pipeline Reliability Upgrade project (BD-1) includes construction of a tunnel to replace aboveground pipelines located in San Francisco Bay. Depending on the final scope of work undertaken with respect to this project, SF Bay Plan policies could be relevant to the project. The proposed five-mile tunnel under Don Edwards San Francisco Bay Wildlife Refuge, Newark Slough, and San Francisco Bay is generally straight, which provides for ease in constructability, but is also designed to minimize environmental disruption, particularly with respect to protected species. Programmatic

> mitigation measures described in Chapter 6, if determined to be applicable, identify measures to protect and restore natural resources and habitats, including special-status species. Compliance with BCDC permitting requirements and consideration of applicable SF Bay Plan policies would also ensure that relevant policies of the SF Bay Plan are addressed and carried out to minimize environmental effects on the bay. The WSIP would, on the whole, be consistent with policies contained in the SF Bay Plan.

L_BCDC-03 As indicated in **Response L_BCDC-02**, the Draft PEIR impact analysis of the WSIP facility improvement projects does not discuss the individual policies of local and regional plans because their applicability cannot be determined until more detailed information on siting, design, construction, and operation is available for each project. Instead, the Draft PEIR seeks to provide the reader and decision-makers with an overview of the jurisdictional purview and permitting authority of federal, state, regional, and local agencies (Vol. 1, Chapter 3, p. 3-86; Vol. 5, Appendix C, p. C-26), and an overview of policies that could be applicable to the program (Vol. 2, Chapter 4, p. 4.2-1).

The Regulatory and Conservation Planning Framework section in the Draft PEIR (Vol. 2, Chapter 4, pp. 4.6-23 to 4.6-25) describes the federal and state laws pertaining to the protection of endangered species, as defined by the Federal Endangered Species Act, California state law (Fish and Game Code Sections 3511, 4700, 5050, and 5515), and the California Native Plant Protection Act, and other statutes, codes, and policies affording limited species protection under federal and state laws. Whereas BCDC relies on its policies related to fish, other aquatic organisms, and wildlife; tidal marshes and tidal flats; and salt ponds in reviewing permit applications for bay lands within its jurisdiction, the statutes and government codes described in the Draft PEIR identify specific endangered species and set forth legal requirements for the preservation and protection of these species. The BCDC policies cited by the commenter provide guidance for the protection of fish and wildlife and their habitats that are generally consistent with the legal statutory requirements for the protection and preservation of rare or endangered biological resources. However, since these BCDC policies are not laws or statutes, they are not included in the Draft PEIR regulatory discussion.

Potential BCDC jurisdiction over the BDPL Reliability Upgrade project (BD-1) is already identified in Draft PEIR Table C.6 (Vol. 5, Appendix C, p. C-26) for consideration in the project-level EIR for this project. Although it is premature to list pertinent BCDC plans and policies for the above reasons, the following discussion of BCDC jurisdiction and policies is added to the PEIR (Vol. 2, Chapter 4, p. 4.6-33, before the second full paragraph):

Local Laws, Regulations, and Policies Applying to Natural Resource Protection

The San Francisco Bay Conservation and Development Commission (BCDC) was formed in 1969 under the McAteer-Petris Act to regulate development in and around San Francisco Bay. BCDC developed the San Francisco Bay Plan to guide the wise use of the bay's water and shorelines. In reviewing permit applications for projects within its jurisdiction, BCDC relies on its Bay Plan policies to ensure the protection of habitats and biological resources, including fish, other aquatic organisms, and wildlife, and water quality; as well as policies on uses of the bay and shoreline.

L_BCDC-04 The commenter requests that the PEIR address whether the additional Tuolumne River diversions under the proposed program would conflict with the freshwater inflow policies in the Bay Plan. Any indirect effects of the WSIP on salinity in San Francisco Bay would be contingent on any WSIP-related changes in salinity due to reduced Delta inflow. The Draft PEIR analysis of impacts on flow and water quality along the Delta region first evaluated the changes in flow that would occur with the WSIP, and then estimated changes in water quality and temperature. The WSIP's impacts on flow in the Delta region are analyzed under Impact 5.3.1-5: Effects on flow along the San Joaquin River and the Sacramento–San Joaquin Delta (Vol. 3, Chapter 5, pp. 5.3.1-38 and 5.3.1-39), and the related effects on water quality are analyzed under Impact 5.3.3-2: Effects on water quality along the San Joaquin River and Sacramento–San Joaquin Delta (Vol. 3, Chapter 5, pp. 5.3.3-19 and 5.3.3-20). Based on the Draft PEIR finding that the WSIP's effects on flow and water quality in the Delta would be less than significant, the WSIP would not result in significant effects on flow farther downstream into San Francisco Bay. In response to this comment, several revisions have been made to Section 5.2 of the PEIR to clarify WSIP consistency with BCDC's freshwater inflow policies.

The following row is added to Table 5.2-1 (Vol. 3, Chapter 5, pp. 5.2-3 to 5.2-5, under the State of California heading):

The following paragraph is added to the Draft PEIR (Vol. 3, Chapter 5, p. 5.2-12, under the State Statutes and Agreements heading, above Porter-Cologne Water Quality Control Act):

McAteer-Petris Act

The McAteer-Petris Act was passed by the state legislature in 1965 to promote responsible planning and regulation of San Francisco Bay. The act designates the San Francisco Bay Conservation and Development Commission (BCDC) as the agency responsible for maintaining and carrying out the provisions of the act and the SF Bay Plan (for additional information on the act, see Chapter 4, Section 4.2, p. 4.2-8).

TABLE 5.2-1
APPLICABLE FEDERAL, STATE, AND LOCAL STATUTES AND AGREEMENTS

Statute or Agreement / Responsible Agency[a]	Summary Description	Associated Statutes and Plans	Applicability to WSIP Water Supply and System Operations Issues
State of California			
McAteer-Petris Act / BCDC	Promotes responsible planning and regulation of San Francisco Bay. Establishes BCDC as the agency responsible for carrying out the provisions of the act and of the SF Bay Plan.	San Francisco Bay Plan	Described in Section 5.2.3 and evaluated in Section 5.2.4 for consistency. Analyzed in Section 5.3.3.

The following paragraph is added to the Draft PEIR (Vol. 3, Chapter 5, p. 5.2-12, under the Local and Regional Agencies heading, above City and County of San Francisco):

San Francisco Bay Conservation and Development Commission

The San Francisco Bay Conservation and Development Commission (BCDC) is the agency responsible for maintaining and carrying out the provisions of the McAteer-Petris Act and the SF Bay Plan. In the public interest, BCDC is authorized to control bay filling and dredging and bay-related shoreline development. Due to the regulatory authority of the State Water Resources Control Board (SWRCB), San Francisco Bay Regional Water Quality Control Board, U.S. Environmental Protection Agency, and the U.S. Army Corps of Engineers, BCDC's scope of authority over water quality issues is limited. (For additional information on BCDC's regulatory authority, see Chapter 4, Section 4.2, p. 4.2-8.)

The following paragraph is added to the Draft PEIR (Vol. 3, Chapter 5, p. 5.2-20, above Regional Habitat Conservation Plans):

San Francisco Bay Plan

The SF Bay Plan, completed and adopted by BCDC in 1968, is an enforceable plan that guides the protection and use of San Francisco Bay and its shoreline. For a discussion of the SF Bay Plan's applicability to individual WSIP facility projects, see Section 4.2 (Vol. 2, Chapter 4, p. 4.2-16).

The SF Bay Plan is founded on the belief that water quality in San Francisco Bay will be maintained at levels sufficiently high to protect the beneficial uses of the bay. The SF Bay Plan includes findings and policies related to freshwater inflow and changes in salinity. The freshwater inflow findings contained in the SF Bay Plan stress the importance of maintaining a balance between fresh and saltwater. The related policies assert that the impact of freshwater diversions should be monitored by the SWRCB to ensure compliance with water quality standards.

The second paragraph in Section 5.2.4 of the Draft PEIR (Vol. 3, Chapter 5, p. 5.2-27, under the heading Consistency with Regional Natural Resource Protection Plans) is revised as follows:

Consistency with Regional Natural Resource Protection Plans

WQCPs [water quality control plans] identify water quality issues and prescribe enforceable water quality objectives/criteria for specific water bodies and their tributaries. Because these standards are based on designated beneficial uses of the respective waterways, violation of the water quality objectives/criteria can adversely affect fish, wildlife, and other protected resources. SFPUC operations currently comply with water quality standards contained in the WQCPs, and the WSIP goals and objectives would be consistent with the applicable WQCPs. <u>Further, as future SFPUC operations would be consistent with the water quality standards contained in the WQCPs, SFPUC operations would also be consistent with the SF Bay Plan freshwater inflow policies.</u> The potential impacts of WSIP implementation on water quality in the Tuolumne River watershed <u>and Sacramento–San Joaquin Delta</u>, Alameda Creek watershed, Peninsula watershed, and Westside Groundwater Basin are analyzed in Sections 5.3.3, 5.4.3, 5.5.3, and 5.6, respectively.

L_BCDC-05 All pertinent BCDC plans and policies, including policies related to the safety of fill materials and sea level rise, will be evaluated as part of the project-level CEQA review for each WSIP facility project, including the BDPL Reliability Upgrade project (BD-1).

The Draft PEIR's Regulatory Framework discussion in Section 4.5, Hydrology and Water Quality (Vol. 2, Chapter 4, p. 4.5-9) addresses federal laws under the Clean Water Act and the California Water Code. Additionally, the Regional Water Quality Control Board regulates water under the federal Porter-Cologne Water Quality Control Act. The policies of local agencies are not discussed in this section because it addresses the statutory requirements and regulations pertaining to water quality. With respect to listing individual BCDC policies in the text of the Draft PEIR, please refer to **Response L_BCDC-02**.

City of Brisbane, Randy Breault, Director of Public Works, 9/27/07

L_Brisbane-01 This comment, which supports the need of the SFPUC to meet the seismic and reliability goals of the WSIP in a timely manner, is acknowledged.

L_Brisbane-02 The opinion of the commenter in support of the Modified WSIP Alternative as the preferred alternative is acknowledged.

L_Brisbane-03 In response to this comment, the City of Brisbane has been removed entirely from Draft PEIR Table 3.11, WSIP Improvement Projects – Affected Jurisdictions (Vol. 1, Chapter 3, p. 3-60). The table is revised as follows:

Affected County and City Jurisdictions	SF-2, Groundwater Projects
~~Brisbane~~	~~X~~

L_Brisbane-04 This comment correctly summarizes information presented in Draft PEIR Chapter 7 and Appendix E and supplements information on the demographic projections used to develop Brisbane and Guadalupe Valley Municipal Improvement District's 2030 water demand; it also provides additional information regarding the City's water conservation and smart growth efforts for future development. This comment is acknowledged.

L_Brisbane-05 This comment is not inconsistent with, and expands on, demand information for Brisbane and Guadalupe Valley Municipal Improvement District presented in the Draft PEIR (Vol. 5, Appendix E, pp. E.2-5 to E.2-19).

L_Brisbane-06 This comment provides information on Brisbane's involvement in the South San Francisco–San Bruno Recycled Water Feasibility Study since the *Wholesale Customer Recycled Water Potential Technical Memorandum* was prepared. This comment is acknowledged.

City of Burlingame Public Works Department, Syed Murtuza, Director of Public Works, 9/20/07

L_Burlgme-01 The 2030 purchase estimate of 4.70 mgd (not 4.68 as stated in this comment) shown in the Draft PEIR (Vol. 1, Table 3.3, p. 3-18 and Vol. 4, Tables 7.2 and 7.3, pp. 7-15 and 7-18) is based on the "Wholesale Customer Best Estimate of Water Purchases from the SFPUC" form submitted by the City of Burlingame (dated November 8, 2004) to the SFPUC, and is also reflected in the *SFPUC 2030 Purchase Estimate Technical Memorandum* (URS, 2004b). This comment indicates that the City of Burlingame has updated its 2030 demand projection since the WSIP planning effort, and that its purchase estimate has increased by approximately 0.35 mgd (to 5.03 mgd). Comment noted. This updated projection does not alter the analysis or conclusions presented in the Draft PEIR. The demand projections and associated purchase estimates will evolve somewhat over time; the City's change is reflective of this fact.

L_Burlgme-02 The opinion of the commenter supporting WSIP Variant 3 – 10% Rationing is acknowledged. However, the commenter should note that Draft PEIR Table 8.2 (Vol. 4, Chapter 8, p. 8-5) compares the frequency of rationing that would occur under the proposed program and Variant 3 based on the hydrologic modeling over the 82-year hydrologic record, and the results indicate that the difference between the proposed program and Variant 3 would be slight. As shown on the table, there would be 8 out of the 82 years that systemwide rationing would be required under the WSIP, with 2 years of 20 percent rationing and 6 years of 10 percent rationing. Variant 3 would also require systemwide rationing for 8 of the 82 years, although rationing would be at 10 percent for all 8 years. Thus, the only difference between the proposed program and Variant 3 would be that for 2 years out of 82, the proposed program would required 20 percent systemwide rationing instead of 10 percent.

The commenter's statement that Variant 2 would require 20 percent rationing in 5.5 years of an 8-year drought is in error; Variant 2 – Regional Desalination for Drought would have the same frequency of 20 percent rationing as the proposed program, or 3.5 years of an 8-year drought. Variant 1 – All Tuolumne would require 20 percent rationing in 5.5 years of an 8-year drought.

The Draft PEIR (Vol. 4, Chapter 9, p. 9-27) discusses feasibility issues related to demand hardening and the increasing difficulty of achieving rationing goals as more and more long-term conservation measures are implemented.

California Water Service Company, Thomas Salzano, Water Resources Planning Supervisor, 9/28/07

L_CalWater-01 This comment, which expresses Cal Water's support of the WSIP goals and objectives, is acknowledged.

L_CalWater-02 This comment, which expresses support for the WSIP's conjunctive-use program in the Westside Groundwater Basin, is acknowledged.

L_CalWater-03 This comment, which notes that the projected growth presented in the Draft PEIR is consistent with current projections, that future growth will be redevelopment in existing neighborhoods, and that per-capita water demand has remained constant, is acknowledged. As it does not address the adequacy or accuracy of the PEIR, no response is provided.

L_CalWater-04 This comment, which expresses support for increasing the reliability and availability of locally produced water and for implementation of the Calaveras Dam Replacement project (SV-2), is acknowledged.

L_CalWater-05 This comment, which describes Cal Water's support for increasing the use of recycled water and its efforts in this regard, is noted.

Contra Costa Water District, Leah Orloff, Senior Water Resources Specialist, 10/1/07

L_CCWD-01 This comment requests additional information on Delta water quality effects. Please refer to **Section 14.8, Master Response on Delta and San Joaquin River Issues** (Vol. 7, Chapter 14) for additional discussion of the WSIP's effects on Delta water quality analyzed in the PEIR.

L_CCWD-02 This comment also requests additional information on Delta water quality effects and potential effects on the CCWD. Please refer to **Section 14.8, Master Response on Delta and San Joaquin River Issues** (Vol. 7, Chapter 14) for additional discussion of the WSIP's effects on Delta water quality analyzed in the PEIR.

Coastside County Water District, Joe Guistino / Cathleen Brennan, Interim General Manager / Water Resources Analyst, 9/24/07

L_CoastsideCWD-01 This comment expressing Coastside County Water District's (Coastside CWD) support of the WSIP's goals and objectives is acknowledged.

L_CoastsideCWD-02 The comment regarding the status of the noncontiguous areas of the Coastside CWD is acknowledged. In response to this comment, revisions have been made to the three identical figures, Figure S.2 (Vol. 1, Summary, p. S-4), Figure 3.2 (Vol. 1, Chapter 3, p. 3-6), and Figure 7.1 (Vol. 4, Chapter 7, p. 7-20); an asterisk has been placed next to the labels to these noncontiguous areas, and the following footnote added:

- Portions of Coastside County Water District not served by the SFPUC regional water system.

The revised figures can be found in Volume 7, Chapter 16, Staff-Initiated Text Changes.

L_CoastsideCWD-03 This comment expressing Coastside CWD's support of the WSIP's goals and objectives is acknowledged.

L_CoastsideCWD-04 The commenter notes that proposed Mitigation Measure 5.5.3-2 would involve the development of a revised operations plan for the SFPUC's facilities in the Pilarcitos Creek watershed (Vol. 4, Chapter 6, p. 6-56). With Measure 5.5.3-2 in place, the SFPUC would operate its Pilarcitos Creek facilities much as it does under existing conditions. After publication of the Draft PEIR, the SFPUC determined that Measure 5.5.3-2 would be technically challenging to implement, and that more practical solutions were available. As described in Vol. 7, Chapter 13, Section 13.3, replacement mitigation measures were developed that would reduce the impacts of the WSIP in the Pilarcitos Creek watershed to a less-than-significant level. The request that the SFPUC coordinate development of revised operations plans in the Pilarcitos Creek watershed with Coastside CWD is acknowledged.

L_CoastsideCWD-05 Coastside CWD's request to be involved in the development of the adaptive management program for Crystal Springs Reservoir, which will be developed as part of the operations phase of the Lower Crystal Springs Dam Improvements (WSIP facility improvement project PN-4), is acknowledged. The purpose of the adaptive management program is to protect biological resources in and around the reservoir. With the WSIP, the storage capacity and maximum water surface elevation in Crystal Springs Reservoir would increase compared to the existing condition. The Draft PEIR concludes that biological resources in the zone between the existing maximum water level and the future (with-WSIP) maximum water level could potentially be harmed by inundation (Vol. 3, Chapter 5, Sections 5.5.5 and 5.5.6). The adaptive management program would involve the development of reservoir management practices that take advantage of the increase in reservoir capacity but also protect biological resources around the existing reservoir perimeter (Mitigation Measures 5.5.6-1a and 5.5.6-1b). It is not expected that the portion of the adaptive management program that deals with maximum water surface elevations would have any effect on Coastside CWD's water supply from Crystal Springs Reservoir.

Biological resources around the perimeter of the reservoir could also be harmed during the periodic drawdown of the reservoir during maintenance of the transmission system from the Tuolumne River; therefore, the adaptive management program would address effects on biological resources due to low as well as high water levels. During maintenance of the transmission system, which would typically occur about every five years in November and December, the water needs of San Francisco and its suburban customers would be met from the local reservoirs. Coastside CWD has two water intakes at Crystal Springs Reservoir at elevations of 245 feet and 265 feet above sea level. With the WSIP and during maintenance of the transmission system, the water level in the reservoir could occasionally fall to about the elevation of the higher intake. During such times, Coastside CWD would be able to obtain water from the reservoir using the lower intake.

In response to this comment, Coastside CWD has been added to Draft PEIR Table C.6 (Vol. 5, Appendix C, p. C-26) as an agency that has requested consultation during the planning and design phases of certain WSIP projects. Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.3) for a discussion of coordination with Coastside CWD.

L_CoastsideCWD-06 Please refer to **Response L_CoastsideCWD-20**, below.

L_CoastsideCWD-07 The commenter notes that infrastructure limitations prevent Coastside CWD from taking water from Pilarcitos Creek and Crystal Springs Reservoir simultaneously. Accordingly, in response to this comment, the Draft PEIR (Vol. 1, Chapter 2, p. 2-24, last paragraph, next to last sentence) is revised as follows:

> …. In the summer months, when Coastside CWD's water demand is at its seasonal maximum, its water supply from Pilarcitos Creek ~~is supplemented by water pumped from Crystal Springs Reservoir.~~ becomes insufficient to meet its needs. At that point, Coastside CWD ceases diversions from Pilarcitos Creek and obtains its water by pumping from Crystal Springs Reservoir.

L_CoastsideCWD-08 As noted by the commenter, the Draft PEIR describes current actions by the SFPUC in making experimental releases in Pilarcitos Creek below Stone Dam (Vol. 1, Chapter 2, p. 2-24, and Chapter 3, p. 3-43). The Draft PEIR also includes a description of the SFPUC's current participation with the Pilaracitos Creek Restoration Workgroup, of which Coastside CWD is a member (Vol. 3, Chapter 5, p. 5.2-21). Coastside CWD's request to be involved with the SFPUC's decisions regarding changes to its physical system and operations in the Pilarcitos Creek watershed is acknowledged.

L_CoastsideCWD-09 This comment expressing Coastside CWD's support for optimizing water storage in the Peninsula watershed is acknowledged.

L_CoastsideCWD-10 This comment stating Coastside CWD's participation in the Pilaracitos Creek Restoration Workgroup, which is preparing the Pilarcitos Creek Integrated Watershed Management Plan, is noted. This information is included in the Draft PEIR under the description of the Pilarcitos Creek Integrated Watershed Management Plan (Vol. 3, Chapter 5, p. 5.2-21).

L_CoastsideCWD-11 As part of its current operations, the SFPUC attempts to limit releases to Pilarcitos Creek after Pilarcitos Reservoir has filled to the amount of water needed by Coastside CWD. This is because the SFPUC prefers to divert water from Pilarcitos Creek to the San Mateo Creek watershed from Pilarcitos Reservoir rather than from Stone Dam. Water diverted at Pilarcitos Reservoir flows by gravity to San Andreas Reservoir, but water diverted at Stone Dam flows to the lower elevation Crystal Springs Reservoir. Ultimately, water in Crystal Springs Reservoir must be pumped to San Andreas Reservoir for treatment and distribution to customers. Energy costs are minimized if the SFPUC's Pilarcitos Creek water is diverted directly to San Andreas Reservoir.

Although it is the SFPUC's goal to limit releases to Pilarcitos Creek after Pilarcitos Reservoir has filled to the amount of water needed by Coastside CWD, this goal may not always be achieved because the two diversions cannot be operated to precisely correspond to runoff resulting from changing hydrologic conditions. Also, during periods when the SFPUC is making experimental releases of water below Stone Dam, the source of the releases is Pilarcitos Reservoir. At such times, releases from Pilarcitos Reservoir would be at least the sum of Coastside CWD's water needs and the experimental releases.

In response to this comment, the Draft PEIR (Vol. 3, Chapter 5, p. 5.5.1-9, third full paragraph, last sentence) is revised as follows:

> … After the reservoir has filled, the ~~only water~~ SFPUC <u>attempts to limit</u> releases from Pilarcitos Reservoir ~~is~~ <u>to</u> that amount requested by Coastside CWD to meet its water needs. <u>However, at times, additional water may be released from Pilarcitos Reservoir and diverted to Crystal Springs Reservoir at Stone Dam or released from Stone Dam (see discussion below regarding experimental releases from Stone Dam to Pilarcitos Creek).</u>

L_CoastsideCWD-12 Please refer to **Response L_CoastsideCWD-07**.

L_CoastsideCWD-13 With the WSIP as originally proposed, the SFPUC planned to serve a portion of Coastside CWD's increased water demand with water from Pilarcitos Creek. However, as described in Section 13.3 (Vol. 7, Chapter 13), subsequent to the publication of the Draft PEIR, the SFPUC refined its assumptions for the Pilarcitos facilities operations. Under the WSIP, the SFPUC now plans to supply most of Coastside CWD's increased demand with water from Crystal Springs Reservoir.

L_CoastsideCWD-14 The commenter notes that, under existing conditions, Coastside CWD already maximizes its use of water from Pilarcitos Creek. During the rainy season, natural runoff in Pilarcitos Creek provides sufficient water to meet Coastside CWD's needs. As runoff decreases in the late spring and early summer, water is released from Pilarcitos Reservoir to supplement natural runoff and to meet Coastside CWD's needs. At some time during some summers, storage in Pilarcitos Reservoir becomes depleted, reservoir releases are curtailed, and insufficient water reaches Stone Dam to meet Coastside CWD's needs. At that time, Coastside CWD ceases diversions from Pilarcitos Creek and is served water from Crystal Springs Reservoir.

As one of the replacement mitigation measures for potential impacts on Pilarcitos watershed resources (see Vol. 7, Chapter 16), the SFPUC would install a pumping station at Pilarcitos Reservoir, which would enable it to access additional storage in the reservoir and to maintain flow in Pilarcitos Creek during the summer of dry years. The purpose of the pumping station would be to maintain sufficient flow in the creek to protect biological resources. It would not likely affect the proposed system operations under the WSIP, including the date on which the

SFPUC would begin supplying Coastside CWD from Crystal Springs Reservoir rather than from Pilarcitos Creek.

As described in the Draft PEIR (Vol. 3, Chapter 5, p. 5.2-21), the SFPUC is a participant in the Pilarcitos Creek Restoration Workgroup, which is developing the Pilarcitos Creek Integrated Watershed Management Plan. Consideration of this plan is included in the determination that the cumulative effects of the WSIP water supply and system operations on the Pilarcitos Creek watershed would be less than significant (Vol. 3, Chapter 5, pp. 5.7-80 to 5.7-84). Also refer to **Responses L_CoastsideCWD-08** and **L_CoastsideCWD-13**.

L_CoastsideCWD-15 The Draft PEIR considers the possibility that the increase in maximum storage capacity of Crystal Springs Reservoir and the altered operations to take advantage of the increased storage capacity (both of which are part of the WSIP) could adversely affect water quality (Vol. 3, Chapter 5, pp. 5.5.3-5 and 5.5.3-6). However, this is a possible effect rather than a certain consequence of the WSIP. The possible effect was identified in two studies conducted for the SFPUC by Merritt-Smith Consulting and other consultants in 2002 and 2006 (see Vol. 3, Chapter 5, Section 5.5.3 for the complete references).

The Draft PEIR describes a chain of events that could increase algae concentrations in Crystal Springs Reservoir. For algae concentrations to increase, two phenomena—neither of them certain—would have to occur. The proportion of Hetch Hetchy water in Crystal Springs Reservoir would have to increase compared to the existing condition, and phosphorous concentrations would also have to increase.

If the proportion of Hetch Hetchy water in Crystal Springs Reservoir increased compared to the existing condition, nitrogen concentrations in the reservoir water could increase. Hetch Hetchy water contains more nitrogen (a plant nutrient) than local runoff because Hetch Hetchy water has been disinfected with chloramine (which contains nitrogen) prior to discharge into Crystal Springs Reservoir. With the WSIP, it is expected that the proportion of Hetch Hetchy water in the reservoir would be about the same as it is under the existing condition most of the time, but it is possible that it could increase at times.

Algae growth in Crystal Springs Reservoir has historically been limited by both nitrogen and phosphorous concentrations. After the SFPUC began disinfecting Hetch Hetchy water with chloramine, and thereby adding nitrogen, phosphorous became the limiting nutrient. Without a change in phosphorous concentrations, a WSIP-induced increase in nitrogen concentrations would have no effect on algae growth. A WSIP-induced increase in phosphorous concentrations could occur if the increase in water depth attributable to the WSIP resulted in more stable thermal stratification, oxygen depletion in deeper waters, and a consequent release of phosphorous from sediments. If an increase in phosphorous concentration occurred at the same time the amount of Hetch Hetchy water with higher nitrogen concentrations increased, then the WSIP could increase the growth of algae. However, it should be noted that the relationship between nutrient levels and algae growth is extremely difficult to predict, so it is uncertain that the chain of events described above would in fact result in increased algae growth.

If the WSIP is implemented, it would likely be many years, if ever, before it could be determined whether WSIP-induced changes had affected algae concentrations in the reservoir. The SFPUC routinely monitors water quality in its reservoir, but any changes in reservoir water quality attributable to the WSIP are likely to be small and difficult to distinguish from changes attributable to other factors (weather, conditions in the watersheds, etc.). As described in the Draft PEIR (Vol. 2, Chapter 4, p. 4.2-5), the SFPUC's *Peninsula Watershed Management Plan* provides a policy framework for decisions regarding activities that are appropriate on watershed lands. The primary goal of the plan is to maintain and improve source water quality to protect public health and safety, and, as Policy WQ3 specifically states, to minimize nutrient loading to the water supply. Thus, management of nutrient loading and water quality in Crystal Springs Reservoir is part of the SFPUC's ongoing operations and maintenance practices.

The SFPUC shares Coastside CWD's concerns with respect to algae concentrations and, should they become problematic for whatever reason, would take appropriate corrective action in order to maintain high water quality for all of its customers.

L_CoastsideCWD-16 The Draft PEIR describes current actions by the SFPUC in making experimental releases in Pilarcitos Creek below Stone Dam (Vol. 1, Chapter 3, p. 3-43), due in part to the concerns of the National Marine Fisheries Service. Please refer to **Response L_CoastsideCWD-08**. The SFPUC acknowledges Coastside CWD's request to be involved in any activities that affect Pilarcitos Creek. The SFPUC currently has no plans to modify Stone Dam.

L_CoastsideCWD-17 This comment correctly points out that the Pilarcitos Creek watershed and Pilarcitos Creek, as delineated in Draft PEIR Figure 5.5.1-1 (Vol. 3, Chapter 5, p. 5.5.1-2), are not within the boundaries of the Golden Gate National Recreation Area. However, while it is true that no recreational activities are allowed in Pilarcitos Reservoir or in the Pilarcitos Creek watershed, recreational uses are present along Pilarcitos Creek in the vicinity of Half Moon Bay State Beach. The following text changes are made to the Draft PEIR (Vol. 3, Section 5.5.7, p. 5.5.7-3, first full paragraph):

> Pilarcitos Creek starts at Pilarcitos Reservoir within the SFPUC Peninsula watershed. No water recreation or access to this reservoir is allowed. The creek runs south until it reaches Highway 92, then runs west ~~through portions of the Golden Gate National Recreation Area (GGNRA) and Rancho Corral de Tierra~~ to its mouth on the Pacific Ocean within Half Moon Bay State Beach. ~~Numerous public trails throughout the GGNRA and Rancho Corral del Tierra provide access to Pilarcitos Creek.~~ No organized recreational activities are established within or adjacent to the creek in the upper watershed. However, ~~T~~trails within Half Moon Bay State Beach run adjacent to and across Pilarcitos Creek, and the public is allowed access to portions of ~~the~~ this stretch of the creek (Bay Area Hiker, 2007).

L_CoastsideCWD-18 The San Francisco Planning Department acknowledges Coastside CWD’s request for involvement in developing the revised operations plans for Pilarcitos watershed facilities, as described in Mitigation Measure 5.5.3-2 (Vol., 4, Chapter 6, p. 6-56). As described in the response to L_CoastsideCWD-04 above, Measure 5.5.3-2 has been replaced by several other mitigation measures (see Vol. 7, Chapter 13, Section 13.3 for more information).

L_CoastsideCWD-19 This comment, which describes growth management provisions in the Coastside CWD service area, the challenges of projecting population growth, the limitations on use of local water supply sources, and the agency’s increased reliance on the SFPUC to meet future water demand, expands on the information presented in the Draft PEIR and is acknowledged.

L_CoastsideCWD-20 The determination that the WSIP would support a degree of growth above that planned for in the Half Moon Bay 1993 *Local Coastal Program Land Use Plan* (the adopted general plan for the city) is based on a comparison of the 2030 population assumed for the Coastside CWD service area in the demand study with the buildout population presented in the *Local Coastal Program Land Use Plan* (shown in Draft PEIR Table 7.8, Vol. 4, Chapter 7, p. 7-28). This comment regarding growth control and limits on service connections in the Coastside CWD service area is consistent with, and expands on, the information presented in the Draft PEIR (Vol. 4, Chapter 7, pp. 7-40 and 7-41).

L_CoastsideCWD-21 Please refer to **Response L_CoastsideCWD-07**.

L_CoastsideCWD-22 As noted in **Response L_CoastsideCWD-05**, Coastside CWD has two water intakes at Crystal Springs Reservoir at elevations of 245 feet and 265 feet above sea level. During maintenance of the transmission system from the Tuolumne River, the water level in the reservoir could occasionally fall to about midway between the two intakes. During such times, Coastside CWD would be able to obtain water from the reservoir using the lower intake.

L_CoastsideCWD-23 This comment expressing concern about alternatives requiring greater than 20 percent rationing is acknowledged. The commenter is correct in noting that two alternatives analyzed in the Draft PEIR—the No Program Alternative and the Aggressive Conservation/Water Recycling and Local Groundwater Alternative with no supplemental Tuolumne River water—would result in water shortages requiring systemwide rationing greater than 20 percent, as shown in Table 9.5 (Vol. 4, Chapter 9, p. 9-13). The No Program Alternative is included in the PEIR analysis because it is required by CEQA; however, as described in Table 9.6 (p. 9-15), it would not meet most of the WSIP objectives. The Aggressive Conservation/Water Recycling and Local Groundwater Alternative is included in the PEIR because it would avoid the potentially significant impacts associated with the WSIP's increased diversions from the Tuolumne River. However, this alternative to the WSIP would have feasibility issues associated with demand hardening and would fail to accomplish many of the WSIP objectives, as described in the Draft PEIR (Vol. 4, Chapter 9, p. 9-53 to 9-55).

L_CoastsideCWD-24 The commenter's concern about alternatives that would fail or partially fail the seismic reliability objective is acknowledged. These alternatives, as identified in Table 9.6 (Vol. 4, Chapter 9, p. 9-14), include the No Program, No Purchase Request Increase, Aggressive Conservation/Water Recycling and Local Groundwater, and Lower Tuolumne River Diversion Alternatives; none of these alternatives were identified as the environmentally superior alternative.

L_CoastsideCWD-25 Please refer to **Responses L_CoastsideCWD-13** and **L_CoastsideCWD-14**. As the commenter notes, it is expected that with the WSIP, and on average, Coastside CWD would have to switch from its Pilarcitos Creek water source to its Crystal Springs Reservoir water source at an earlier date than it does under the existing condition.

L_CoastsideCWD-26 The San Francisco Planning Department acknowledges Coastside CWD's request for the SFPUC to consider making improvements to both the Pilarcitos facilities and Coastside CWD's Crystal Springs facilities. At this time, the WSIP does not include any facility improvement projects related to the Pilaracitos facilities or to Coastside CWD's facilities at Crystal Springs Reservoir. However, as noted in Table 4.17-4 (Vol. 2, Chapter 4, p. 4.17-23), the Draft PEIR's cumulative impact analysis identifies two planned non-WSIP SFPUC projects related to Pilarcitos facilities that address improvement issues and increased reliability: the Pilarcitos Pipeline Inspection, and the Pilarcitos Pipeline Replacement.

L_CoastsideCWD-27 The Draft PEIR provides supporting information on Coastside CWD's water sources (Vol. 5, Appendix H2-3, pp. 1 to 16). The information was compiled from various sources, including the water delivery records maintained by SFPUC operators. References for the sources can be found in Appendix H2-3 (Vol. 5, Appendix H).

Coastside CWD's proportional use of its water sources depends on hydrologic conditions in any particular year. In the five-year period from 2001 through 2005, Coastside CWD obtained an annual average of 0.76 million gallons per day (mgd) from its wells and 1.78 mgd from the SFPUC. Of the water supplied by the SFPUC, an annual average of 0.92 mgd was obtained through diversions from Pilarcitos Creek at Stone Dam, and 0.86 mgd was pumped from Crystal Springs Reservoir. The statement in the Draft PEIR that the commenter refers to, "The SFPUC currently serves Coastside CWD primarily from the Pilarcitos Reservoir" is misleading, because in a recent five-year period the SFPUC has supplied Coastside CWD with almost equal amounts of water from Pilarcitos Creek and Crystal Springs Reservoir.

In response to this comment, the Draft PEIR (Vol. 4, Chapter 9, p. 9-90, second full paragraph, third sentence) is revised as follows:

> … The SFPUC currently serves Coastside CWD ~~primarily~~ with about equal quantities of water from ~~the~~ Pilarcitos ~~Reservoir~~ Creek and Crystal Springs Reservoir.

As the commenter notes, Coastside CWD already maximizes its use of Pilarcitos Creek water given its current level of demand (about 1.8 mgd from the SFPUC between 2001 and 2005). Under the WSIP, the SFPUC would supply water to meet Coastside CWD's 2030 estimated purchase request, and some of the additional water would be diverted from Pilarcitos Creek. As a result of the increased diversion, Pilarcitos Creek would be subject to certain environmental impacts. The impacts were described in the Draft PEIR; additional information on the impacts is provided in Vol. 7, Chapter 13, Section 13.3. Under the No Purchase Request Increase Alternative, the SFPUC would not attempt to meet Coastside CWD's full 2030 purchase request. It would divert slightly more water from Pilarcitos Creek than under the existing condition to meet Coastside CWD’s demand but less than it would under the WSIP. Consequently, hydrologic changes, and the environmental impacts that stem from the hydrologic changes, in the Pilarcitos Creek watershed under the No Purchase Request Increase Alternative would be less than those that would occur under the WSIP.

City of Daly City, Patricia Martel, City Manager, 10/1/07

L_DalyCty-01 This comment is an opening statement regarding the City of Daly City's detailed comments presented in Comments L_DalyCty-03 through L_DalyCty-53; refer to **Responses L_DalyCty-03** through **L_DalyCty-53** for the specific responses.

L_DalyCty-02 This background information on Daly City is acknowledged, and provides additional setting information insofar as it relates to how Daly City could be affected by the WSIP as a wholesale customer as well as by the WSIP facility improvement projects shown in Draft PEIR Table 3.11 (Vol. 1, Chapter 3, p. 3-60).

L_DalyCty-03 This information regarding Daly City's unmetered pipeline connections to the SFPUC regional system and protection of Daly City's municipal wells from contamination is acknowledged. The Draft PEIR includes a program-level analysis of the contamination of drinking water due to groundwater pumping in the Westside Groundwater Basin (Impact 5.6-5, Vol. 3, Chapter 5, pp. 5.6-31 and 5.6-32). The PEIR states that the SFPUC would develop a drinking water source assessment for each of the conjunctive-use wells, and that impacts related to the potential for contamination of one of these wells would be reduced to a less-than-significant level with implementation of Mitigation Measure 5.6-5, Drinking Water Source Assessments for Groundwater Wells (Vol. 4, Chapter 6, p. 6-59). This measure would require development and implementation of a source water protection program for wells that are considered vulnerable to contamination. The project-level CEQA review of the Regional Groundwater Projects (SF-2) will include a more detailed analysis of this impact and will address site-specific information such as that provided by the commenter.

L_DalyCty-04 This comment describing Daly City's water pricing structure, per-capita demand, and conservation practices is noted. This information is consistent with, and expands on, information in the Draft PEIR and in this Comments and Responses document (see **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** [Vol. 7, Chapter 14] and **Response L_BAWSCA1-28**).

L_DalyCty-05 This information regarding Daly City's participation in the conjunctive-use and recycled water programs with the SFPUC is acknowledged. The Draft PEIR includes a program-level description of the In-Lieu Recharge Demonstration Study through 2005 (Vol. 3, Chapter 5, p. 5.6-17). The commenter provides updated information regarding the In-Lieu Recharge Demonstration Study through 2007. This updated information corroborates the information used to assess impacts in the Draft PEIR's program-level analysis of groundwater impacts in the South Westside Groundwater Basin (Impacts 5.6-1, 5.6-3, 5.6-4, 5.6-5, and 5.6-6, Vol. 3, Chapter 5, pp. 5.6-23 to 5.6-32). The project-level CEQA review of the Regional Groundwater Projects (SF-2) will include a more detailed analysis of the conjunctive-use program and will address the information provided by the commenter.

L_DalyCty-06 This comment, which provides information on Daly City's Tertiary Recycled Water Facility and the provision of recycled water to the Olympic Club, Lake Merced, Daly City's Westlake Park, and San Francisco Golf Club, is acknowledged. The Draft PEIR includes a program-level description of the replacement of irrigation pumping with recycled water (Vol. 3, Chapter 5, p. 5.6-8). This supplemental information corroborates the information used to assess impacts in the Draft PEIR's program-level analysis of groundwater impacts in the South Westside Groundwater Basin (Impacts 5.6-1, 5.6-3, 5.6-4, 5.6-5, and 5.6-6, Vol. 3, Chapter 5, pp. 5.6-23 to 5.6-32). The project-level CEQA review of the Regional Groundwater Projects (SF-2) will include a more detailed analysis of the replacement of irrigation pumping with recycled water produced by the North San Mateo County Sanitation District (a subsidiary to Daly City) and will address the information provided by the commenter.

L_DalyCty-07 This comment summarizes more detailed comments related to seismic risk, conservation, and 10 percent rationing presented in Comments L_DalyCty-08 through L_DalyCty-10; refer to **Responses L_DalyCty-08** through **L_DalyCty-10** for the specific responses.

L_DalyCty-08 See **Response L_BAWSCA1-02.**

L_DalyCty-09 This comment on Daly City's projected conservation savings and implementation of Program B is noted. A minor clarification is that the *SFPUC Wholesale Customer Water Conservation Potential Technical Report* (Table 5-1, p. 5-2 in URS, 2004a) indicates a savings of 0.448 million gallons per day (mgd) under Program B for Daly City.

L_DalyCty-10 During development of the WSIP, the SFPUC Commission considered both 10 percent and 20 percent rationing scenarios, and, as a policy decision, selected the 20 percent maximum systemwide reduction in water service during drought periods for further study (Draft PEIR Vol. 1, Chapter 3, p. 3-14). Thus, under the WSIP, the SFPUC would establish a level of service of up to 20 percent systemwide rationing during extended droughts. The analysis conducted for the Draft PEIR (Vol. 4, Chapter 8, p. 8-5) determined that the frequency of 20 percent rationing under the proposed program over the 82-year hydrologic record would be approximately once in 41 years. The Draft PEIR (Vol. 4, Chapter 9, p. 9-27) discusses feasibility issues related to demand hardening and the increasing difficulty of achieving rationing goals as more and more long-term conservation measures are implemented.

The information regarding Daly City's water consumption rates is acknowledged.

The opinion of the commenter supporting WSIP Variant 3 – 10% Rationing is acknowledged. See **Response L_Burlgme-02** for clarification of the difference between the proposed program and Variant 3.

L_DalyCty-11 The commenter's interpretation of Figure S.3 (Vol. 1, Summary, p. S-5) is consistent with that used in the Draft PEIR.

L_DalyCty-12 This comment, which expresses support for the proposed water supply approach to meet the projected 35-mgd increase in average annual purchase requests, is acknowledged.

L_DalyCty-13 See **Response L_DalyCty-10**.

L_DalyCty-14 This comment, which expresses Daly City's expectation that it will continue working with the SFPUC toward implementing the conjunctive-use program under the Regional Groundwater Projects (SF-2), is acknowledged.

L_DalyCty-15 As discussed in the Draft PEIR (Vol. 1, Chapter 3, pp. 3-23 to 3-25), the SFPUC has identified numerous projects for funding through the WSIP bond measure. In addition to the recycled water projects included as part of the WSIP facility improvement project SF-3, there are regional recycled water projects that the SFPUC expects to consider and develop; these projects would be located outside of San Francisco in coordination with other jurisdictions.

L_DalyCty-16 This suggestion to use stormwater data developed under the joint Daly City/SFPUC Lake Merced Pilot Stormwater Enhancement Project as a baseline if treated stormwater is used for restoration of Lake Merced water levels under the Local Groundwater Projects (a component of WSIP facility project SF-2) is acknowledged, as is the suggestion to use groundwater sampling data around Lake Merced and in Daly City. The Draft PEIR includes a program-level analysis of water quality impacts related to restoration of Lake Merced water levels (Impact 4.5-5, Vol. 2, Chapter 4, pp. 4.5-47 to 4.5-49); the PEIR analysis concludes that water quality impacts related to the addition of treated stormwater to Lake Merced would be potentially significant for the Groundwater Projects (SF-2), but would be reduced to a less-than-significant level with treatment to remove nutrients from stormwater and implementation of groundwater monitoring in the vicinity of Lake Merced (as specified in Mitigation Measure 4.5-5). The suggested stormwater and groundwater data would support the implementation of Measure 4.5-5, and the project-level CEQA review of the Local Groundwater Projects will include a more detailed analysis of baseline stormwater and groundwater quality that addresses the information provided by the commenter.

L_DalyCty-17 The commenter expresses concurrence with the Draft PEIR significance determinations for impacts related to basin overdraft, potential effects on surface water, and seawater intrusion in the South Westside Groundwater Basin (Vol. 3, Chapter 5, pp. 5.6-23 to 5.6-29). As noted in the comment, the potential for seawater intrusion into the Westside Groundwater Basin would occur in the North Westside Groundwater Basin, north of Lake Merced, as described on p. 5.6-28 of the Draft PEIR.

L_DalyCty-18 This comment notes that future growth will mainly be infill lots aimed at mixed-use developments, and provides an exhibit showing examples of Smart Growth in Daly City to which this comment refers. Comment acknowledged.

L_DalyCty-19 This comment regards concerns raised during the scoping process about the development of demand projections, and expresses the commenter's opinion that the appropriate issue is the consistency of the methodology used rather than the availability of newer information. Comment noted. As a point of clarification, in the process of developing future water demand estimates each wholesale customer was asked to select the published population projection source to be used for its service area, as described in the Draft PEIR (Vol. 1, Chapter 3, p. 3-21 and Vol. 4, Chapter 7, p. 7-14). About two-thirds of the wholesale customers selected *Projections 2002*, the Association of Bay Area Governments' (ABAG) current projections series at the time, for their population projections. *Projections 2002* was used as the source of employment projections for all but two of the wholesale customers. For a more detailed discussion of the use of *Projections 2002* and updated forecasts presented in subsequent ABAG projections series, refer to **Responses SI_PacInst-76** and **SI_PacInst-77**.

L_DalyCty-20 The opinion of the commenter, expressing support for Variant 3 – 10% Rationing and opposition to the No Program and No Purchase Request Increase Alternatives, is acknowledged.

L_DalyCty-21 This comment, which expresses concern about the Aggressive Conservation/ Water Recycling and Local Groundwater Alternative and describes Daly City's water conservation and recycling projects and efforts related to conjunctive use, is acknowledged.

L_DalyCty-22 Please refer to **Section 14.10, Master Response on Modified WSIP Alternative** (Vol. 7, Chapter 14) for additional discussion and analysis of this alternative, as well as to **Response L_BAWSCA1-47**.

L_DalyCty-23 This comment, which addresses consistency in the application of demand projection methodology and the existence of new information or different criteria, is acknowledged. Please refer to **Response L_DalyCty-19**, above.

L_DalyCty-24 This comment concurring with and expanding on the information presented in the Draft PEIR is noted. Regarding the second paragraph in this comment, Daly City's conservation savings of 0.44 mgd is shown in the referenced table (Table 3.3, Vol. 1, Chapter 3, p. 3-18). As the table shows, conservation savings and the use of groundwater (also shown) are integral elements of the assumed supply mix, along with purchases from the SFPUC, to meet Daly City's projected demand.

L_DalyCty-25 As discussed in **Response L_DalyCty-24**, conservation and the use of other water supply sources were factored into the purchase estimates.

L_DalyCty-26 Draft PEIR Table 3.3 (Vol. 1, Chapter 3, p. 3-18), which is referenced in the section cited in this comment, includes a footnote explaining the purchase estimate range submitted by Daly City. This comment does not question the accuracy of the information presented, and the suggested revision would not alter the analysis or conclusions of the PEIR; therefore, no text change is needed.

L_DalyCty-27 The information regarding the potential for the SFPUC to work with other local agencies to provide recycled water to San Francisco is acknowledged.

L_DalyCty-28 The referenced description of Package C is the way Package C is defined in *City and County of San Francisco Retail Water Demands and Conservation Potential* (Hannaford and Hydroconsult, 2004, p. 39, second paragraph). The analogous Program C developed in the Draft PEIR for each of the wholesale customers is similarly described in the *SFPUC Wholesale Customer Water Conservation Potential Technical Report*: "Wholesale customers selected measures for Program C based on the full extent of what appeared cost-effective and implementable" (URS, 2004a, p. 4-3, last paragraph). Neither Program C nor Package C consists of any and all conservation measures considered in the respective studies, but rather resulted from a screening process that started with a larger number of potential measures. The process is summarized in the Draft PEIR (Vol. 1, Chapter 3 and Vol. 4, Chapter 7) and described in more detail in Appendix E.2 (Vol. 5, pp. E.2-12 to E.2-15).

L_DalyCty-29 The commenter states that the use of the term "additional" is an important consideration that distinguishes conjunctive-use pumping under the Regional Groundwater Projects (a component of WSIP facility improvement project SF-2) and normal historical (i.e., municipal) groundwater pumping. This comment is acknowledged and is consistent with the interpretation used in the Draft PEIR. Groundwater pumping under the Regional Groundwater Projects is described in Chapter 3 (Vol. 1, pp. 3-36 to 3-38 and 3-56). The impacts of this proposed conjunctive-use pumping are evaluated in Section 5.6 (Impacts 5.6-1 through 5.6-6, Vol. 3, Chapter 5, pp. 5.6-21 to 5.6-31), while the cumulative impacts of drought-year groundwater pumping under the WSIP combined with municipal groundwater pumping from the South Westside Groundwater Basin are addressed in Impact 5.7.5-2 (Vol. 3, Chapter 5, pp. 5.7-90 and 5.7-91).

L_DalyCty-30 See **Response L_DalyCty-29**.

L_DalyCty-31 The commenter notes that increased pumping by the participating pumpers during a drought year will make more water available to users who do not have alternate water supplies. In response to this comment, the following text from the Draft PEIR (Vol. 1, Chapter 3, p. 3-42, first full paragraph, last sentence) is revised as follows:

> In exchange, those customers would increase groundwater pumping during drought periods, thereby reducing the amount of their purchase requests during a drought and ~~creating a temporary reduction system demand~~ making more water available for serving regional water system demand.

L_DalyCty-32 The commenter expresses an expectation that any use of groundwater within San Francisco would remain consistent with Daly City's effort to preserve the Westside Groundwater Basin for municipal purposes—the best and highest use. Table 3.10 of the Draft PEIR, referred to by the commenter, addresses components of each WSIP facility project (Vol. 1, Chapter 3, p. 3-55). Water quality objectives for the Groundwater Projects (SF-2) are addressed at a program level in Section 5.6 of the Draft PEIR and are based on maintaining beneficial uses of the groundwater basin established by the Regional Water Quality Control Board in the Basin Plan (Vol. 3, Chapter 5, p. 5.6-22).

L_DalyCty-33 In response to this comment, the City of Daly City has been added to Table 3.11, WSIP Improvement Projects – Affected Jurisdictions, under SF-3, Recycled Water Projects (Vol. 1, Chapter 3, p. 3-60). The table is revised as follows:

Affected County and City Jurisdictions	**SF-3, Recycled Water Projects**
Daly City	X

L_DalyCty-34 The comment is correct about the square mileage of the North and South Westside Groundwater Basins, and these areas are provided in the discussion of the Westside Groundwater Basin aquifer system (Vol. 3, Chapter 5, pp. 5.6-4 and 5.6-5).

L_DalyCty-35 This comment, which indicates that the In-Lieu Recharge Demonstration Study is also referred to as the Aquifer Recharge Study, is acknowledged. The name of this study used in the Draft PEIR is consistent with the name used in the Luhdorff and Scalmanini report documenting the results of the study (Luhdorff and Scalmanini, 2005).

L_DalyCty-36 The commenter states that in 2005, the North San Mateo County Sanitation District (a subsidiary of the City of Daly City) delivered a total of 155.24 million gallons of recycled water to golf clubs. This supplemental information supports the program-level description of the replacement of irrigation pumping with recycled water (Vol. 3, Chapter 5, p. 5.6-8). The project-level CEQA review of the Regional Groundwater Projects (SF-2) will include a more detailed analysis of the replacement of irrigation pumping with recycled water produced by North San Mateo County Sanitation District and will address the information provided by the commenter.

L_DalyCty-37 The commenter indicates that Daly City records of historical pumping rates show a range of 278 to 305 acre-feet per year (afy), as opposed to the 120 to 150 afy stated in the Draft PEIR. The City and County of San Francisco acknowledges the information provided by the commenter and will use this and other updated data to refine the ongoing modeling being conducted to identify the potential for adverse conditions in the South Westside Groundwater Basin. The commenter correctly quotes the estimated historical pumping rates by the California Golf Club presented in the Draft PEIR (Vol. 3, Chapter 5, p. 5.6-8, footnote 8); this range is based on studies performed on behalf of the SFPUC (Luhdorff and Scalmanini, 2006). While historical groundwater pumping rates and uses were considered to determine the effects of groundwater pumping under WSIP's proposed conjunctive use program (part of the Regional Groundwater Projects, a component of SF-2), this updated information does not affect the impact analysis presented in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.6-23 to 5.6-31) because the proposed groundwater pumping would be conducted consistent with operating agreements between the SFPUC and participating pumpers. The operating agreements would specify that an operating committee be established to develop annual operating and maintenance plans, and monitoring and modeling would be conducted to assess the conjunctive use program's performance and to identify and avoid potential problems. Updated information, such as that provided by the commenter, would be used to inform decisions to modify the recharge or pumping strategy as necessary (Vol. 3, Chapter 5, p. 5.6-26). The project-level CEQA review of the Regional Groundwater Projects will include an updated and more detailed review and analysis of historical pumping in the South Westside Groundwater Basin.

L_DalyCty-38 The commenter suggests identifying the beneficial uses of Lake Merced to provide a better understanding of the intent of the Local Groundwater Projects (a component of SF-2) and also describes the rapid rise in lake levels beginning in the 1930s and the original operation of Lake Merced as a systemwide balancing reservoir. In addition, this comment describes the previous misperception of Lake Merced as a surface expression of groundwater and the current understanding of the interrelationship of Lake Merced and the groundwater system, which indicates that the lake levels are only indirectly connected to the primary production aquifer and can be separately and distinctly managed. This comment is acknowledged.

The Draft PEIR (Vol. 3, Chapter 5, pp. 5.6-13 to 5.6-15) provides background information on Lake Merced as part of the description of existing conditions, and includes a discussion of the historical fluctuation of the lake and the relationship between Lake Merced and the underlying groundwater system. The beneficial uses of Lake Merced are identified in Table 4.5-1 of the Draft PEIR (Vol. 2, Chapter 4, p. 4.5-10). In response to this comment, the following text from the Draft PEIR (Vol. 3, Chapter 5, p. 5.6-13, end of third full paragraph) is revised as follows:

> However, Lake Merced has not been used as a potable water supply since the 1930s. <u>Refer to Table 4.5-1 for a description of the existing beneficial uses of Lake Merced.</u>

L_DalyCty-39 This comment, which expresses concern that the Draft PEIR discussion may create a misperception that groundwater levels in the Daly City area continue to decline, rather than having reached a stabilized level, is acknowledged. However, the Draft PEIR (Vol. 3, Chapter 5, pp. 5.6-16 and 5.6-17) includes text that should avoid this misperception; it states that: "Along the coastline to the south of Lake Merced, including Fort Funston and Thornton Beach, it appears that faulting and steeply dipping beds of the Merced Formation provide a physical barrier between the South Westside Groundwater Basin aquifer system and the Pacific Ocean; this barrier has prevented seawater intrusion, despite the fact that groundwater levels in Daly City were lowered to over 120 feet below msl prior to implementation of the In-Lieu Recharge Demonstration Study (described in Section 5.6.1.9)."

This statement does not address whether or not groundwater levels had stabilized beneath Daly City, but is intended to demonstrate the effectiveness of the barrier in preventing seawater intrusion, even though groundwater levels were 120 feet below sea level.

The commenter also states that the Draft PEIR should include additional information regarding the physical barrier that prevents seawater intrusion west of the Daly City pumping area, and that seawater intrusion is more likely to the north in San Francisco's Sunset District, where the physical barrier is thinned out. The presence of the barrier to the west of the Daly City pumping area is discussed at a program level in the Draft PEIR (Vol. 3, Chapter 5, p. 5.6-16) and is one basis for the determination that potential impacts related to seawater intrusion would be less than significant for the Regional Groundwater Projects (SF-2) in the South Westside Groundwater Basin (Impact 5.6-3, Vol. 3, Chapter 5, p. 5.6-29).

The absence of the barrier to the north of Lake Merced is described in the Draft PEIR (Vol. 3, Chapter 5, p. 5.6-16) as follows: "Even though the shallow aquifer in the North Westside Groundwater Basin is in direct connection with the ocean near the coastline, limited development of this portion of the groundwater basin and a groundwater gradient towards the ocean have prevented seawater intrusion in this area, with the exception of temporary effects on the shallow aquifer that occurred during dewatering for construction of the Oceanside Water Pollution Control Plant in the mid-1990s."

The lack of the barrier in this portion of the groundwater basin is one basis for the determination that potential impacts related to seawater intrusion would be potentially significant for the Local Groundwater Projects (SF-2) in the North Westside Groundwater Basin (Impact 5.6-3, Vol. 3, Chapter 5, pp. 5.6-28 and 5.6-29).

L_DalyCty-40 This comment, which indicates that the In-Lieu Recharge Demonstration Study is also referred to as the Aquifer Recharge Study, is acknowledged. The name of this study used in the Draft PEIR is consistent with the name used in the Luhdorff and Scalmanini report documenting the results of the study (Luhdorff and Scalmanini, 2005), and reflects the fact that the groundwater basin would be recharged because the SFPUC would provide system water to the participating pumpers in-lieu of the municipal pumping that would otherwise occur.

The commenter also provides additional and updated information regarding Daly City's participation in the study from October 2002 to May 2007. The Draft PEIR description of the In-Lieu Recharge Demonstration Study is based on the October 2005 Luhdorff and Scalmanini report (Vol. 3, Chapter 5, p. 5.6-17). The project-level CEQA analysis of the Regional Groundwater Projects (SF-2) will address this updated information provided by the commenter.

L_DalyCty-41 The commenter suggests revisions to the Draft PEIR description of Daly City's well permitting requirements specified in Chapter 13.20 of the Daly City Municipal Code. In response to this comment, the following text from the Draft PEIR (Vol. 3, Chapter 5, p. 5.6-21, last sentence of third full paragraph) is revised as follows:

> Chapter 13.20 of the Daly City Municipal Code specifies well permitting requirements for Daly City. ~~, but~~ Although this code does not include provisions related to overdraft of the Westside Groundwater Basin, Section 13.20.070 allows for denial of a permit when the request is judged not to be in the public interest.

L_DalyCty-42 The commenter suggests clarification to the Draft PEIR description of the delivery of system water during drought conditions. In response to this comment, the following text from the Draft PEIR (Vol. 3, Chapter 5, p. 5.6-25, last sentence of third full paragraph) is revised as follows:

> During drought conditions, the SFPUC would be able to reduce the quantity of SFPUC system water delivered to the participating pumpers, and the stored groundwater, or banked water, would be available for local use to supplement supplies from the regional water system.

The commenter suggests that to help distinguish conjunctive-use pumping under the Regional Groundwater Projects (SF-2) from historical pumping within the South Westside Groundwater Basin, a clarification should be added to the top of

p. 5.6-26 stating that the conjunctive-use program pumping would be restricted to the amount of banked groundwater. The Draft PEIR already includes this statement in the following description of groundwater withdrawals (Vol. 3, Chapter 5, p. 5.6-26): "*Because groundwater withdrawals would be restricted to the amount of water banked under the Regional Groundwater Projects* [emphasis added], groundwater levels as a result of implementation of the proposed conjunctive-use program would be expected to be consistently in a range higher than those that have resulted from long-term historical groundwater pumping." A similar statement is included on p. 5.6-29 of the Draft PEIR.

Additionally, the potential cumulative impacts of drought-year groundwater pumping under the WSIP combined with municipal groundwater pumping from the South Westside Groundwater Basin are addressed in Impact 5.7.5-2 (Chapter 5, pp. 5.7-90 and 5.7-91). No further clarification is required to distinguish conjunctive-use pumping from historical pumping within the South Westside Groundwater Basin.

The commenter suggests revisions to footnote 15 on p. 5.6-26 of the Draft PEIR to clarify that conjunctive-use pumping would be conducted in combination with municipal pumping by the participating pumpers. See **Response L_DalyCty-29**. No change to footnote 15 is needed because this footnote addresses only pumping under the proposed Regional Groundwater Projects (SF-2).

L_DalyCty-43 This comment, which states that recycled water was made available from the North San Mateo County Sanitation District, a subsidiary to the City of Daly City, as a substitute irrigation supply, is acknowledged. The Draft PEIR (Vol. 3, Chapter 5, p. 5.7-86) includes a program-level description of the replacement of irrigation pumping with recycled water based on the best information available at the time of preparation of the Draft PEIR. This supplemental information provided by the commenter supports the program-level analysis related to groundwater impacts in the South Westside Groundwater Basin. The project-level CEQA review of the Regional Groundwater Projects (SF-2) will include a more detailed analysis of the replacement of irrigation pumping with recycled water produced by the North San Mateo County Sanitation District and will address the information provided by the commenter

L_DalyCty-44 This comment, which provides clarification that the municipal groundwater pumping during a drought year would be equivalent to Daly City's historical 3.75 mgd pumping established for the Aquifer Recharge Study from October 2002 to May 2007, is acknowledged. The Draft PEIR includes a program-level description of historical municipal pumping in the South Westside Groundwater Basin (Vol. 3, Chapter 5, p. 5.7-86) based on studies performed on behalf of the SFPUC (Luhdorff and Scalmanini, 2006). This supplemental, updated information provided by the commenter supports the program-level analysis of groundwater impacts in the South Westside Groundwater Basin. The project-level CEQA review of the Regional Groundwater Projects (SF-2) will include a more detailed analysis of historical pumping from the South Westside Groundwater Basin and will address the updated information provided by the commenter.

The commenter also requests that a reference to Table 4-4 of the Daly City Urban Water Management Plan (UWMP) be included in the Draft PEIR. In response to this comment, the following text from the Draft PEIR (Vol. 3, Chapter 5, p. 5.7-87, first bullet) is revised as follows:

- In its 2005 UWMP, the City of Daly City estimates that future municipal groundwater pumping under the WSIP conjunctive-use program (Regional Groundwater Projects, SF-2) would range from 1.34 mgd (1,501 afy) during a nondrought year when surface water is supplied by the SFPUC to 3.76 mgd (4,212 afy) during a drought year when the city is also allowed to pump its banked groundwater (City of Daly City, 2005). These projected pumping volumes are presented in Table 4-4 of the 2005 UWMP.

L_DalyCty-45 The commenter suggests adding clarification to the second bullet point at the top of p. 5.7-91 of the Draft PEIR to refer to the "program" as the "conjunctive use program." In response to this comment, the following text from the Draft PEIR (Vol. 3, Chapter 5, p. 5.7-91, second bullet) is revised as follows:

- Under the proposed conjunctive-use program, the participating pumpers collectively would not be allowed to pump more than the quantity of banked groundwater resulting from the in-lieu delivery of SFPUC system water.

L_DalyCty-46 This comment, which is similar to Comment L_DalyCty-24 and states the City's concurrence with the Daly City data presented in Draft PEIR Table 7.2, is noted.

L_DalyCty-47 This comment concurring with and expanding on the information presented in Draft PEIR Table 7.3 is noted.

L_DalyCty-48 This comment correctly states that conservation savings (0.44 mgd) are not included in the demand estimate for Daly City shown in Table 7.10. Conservation savings are reflected in the City's 2030 purchase estimate, which is not shown in this table. Please also refer to **Response L_DalyCty-24**.

L_DalyCty-49 Refer to previous responses in this letter and to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14).

L_DalyCty-50 See **Response L_DalyCty-10**.

L_DalyCty-51 This comment, which states Daly City's concurrence with and expands on information presented in the Draft PEIR (Vol. 5, Appendix E.1, Table E.1.1,

p. E.1-2, and Table E.2.1, p. E.2-2) and provides similar information to that in Comment L_DalyCty-24, is noted. Information on Daly City's expected groundwater use, and its effects on Daly City's expected purchases, is included in Draft PEIR Table E.2.6 (Appendix E.2, p. E.2-18) as well as in Table 7.2 (Vol. 4, Chapter 7, p. 7-15).

L_DalyCty-52 This comment, which supplements information on adjustments to the Demand Side Management Least-Cost Planning Decision Support System model for Daly City (described in Draft PEIR Vol. 5, Appendix E.2, p. E.2-7) and describes Daly City's review of local planning efforts in determining future demand estimates, is acknowledged.

L_DalyCty-53 Daly City's concurrence with the information shown for conservation savings in Draft PEIR Table E.2.4 (Vol. 5, Appendix E.2), and with the explanation for the purchase estimate range in Table E.2.6, is noted. The information presented in Table E.2.5 is based on the *SFPUC Wholesale Customer Recycled Water Potential Technical Memorandum* (RMC, 2004). Demand projections, the use of other sources (including recycled water), and associated purchase estimates will evolve somewhat over time, and the City's update of information on the yield of current and planned recycled water projects is reflective of this fact. The comment correctly notes that the WSIP demand studies considered water supply sources that would offset demand for potable supplies and did not include demand that is exclusively for nonpotable supplies in the baseline and projected future demands. Similarly, the recycled water potential studies distinguished between total recycled water projects and those that would replace potable supplies; only recycled water that would replace potable supplies is shown in the Draft PEIR tables. The information presented in this comment regarding Daly City's other recycled water projects is acknowledged.

L_DalyCty-54 This comment indicates that the starting point and endpoint values in Draft PEIR Tables E.3.4, E.3.5, and E.3.6 (Vol. 5, Appendix E.3, pp. E.3-6 to E.3-8) are correct, that Daly City records have slight differences in the numbers presented between the period 2005–2025 and 2005–2030, and that the differences are not significant. Comment noted. As it does not address the adequacy or accuracy of the PEIR, no response is provided.

L_DalyCty-55 This comment concurs with numbers presented in Draft PEIR Table E.3.37 (Vol. 5, Appendix E.3, p. E.3-43) but cautions that the water demand estimate for 2030 does not include water conservation potential consistent with Program B. Comment acknowledged. As it does not address the adequacy or accuracy of the PEIR, no response is provided.

Dublin San Ramon Services District, Bert Michalczyk, General Manager, 9/28/07

L_DSRSD-01 The information presented in Draft PEIR Section 3.4.6 (Vol. 1, Chapter 3, pp. 3-23 to 3-25), consists of the projects that the SFPUC had identified for funding through the WSIP bond measure as of the publication of the Draft PEIR in June 2007. As stated in that section, the SFPUC is continuing to develop and refine the WSIP projects. The information provided by the commenter regarding regional interconnecting projects is acknowledged for future consideration by the SFPUC. The SFPUC currently has a number of interties with other Bay Area water agencies, including the Santa Clara Valley Water District and East Bay Municipal Utility District, for use during emergencies or planned maintenance on critical facilities (Vol. 1, Chapter 2, p. 2-12) as part of its overall water supply reliability of existing operations. As described in the Draft PEIR (Vol. 4, Chapter 9, Tables 9.13 and 9.14, pp. 9-104 to 9-110), numerous alternative strategies and concepts were identified, including consideration of regional groundwater and recycling projects and additional interties, many of which were incorporated into the CEQA alternatives analysis in Chapter 9.

East Bay Municipal Utility District, William Kirkpatrick, Manager of Water Distribution Planning, 8/27/07

L_EBMUD-01 This comment, which expresses appreciation for the opportunity to comment on the Draft PEIR and requests that the East Bay Municipal Utility District remain on the project mailing list, is acknowledged.

East Bay Regional Park District, Chris Barton, Senior Planner, 10/1/07

L_EBRPD-01 The commenter is concerned that the WSIP could affect the park user's experience. The significance criteria applied in the Recreational Resources section (Draft PEIR, Vol. 2, Chapter 4, p. 4.12-17) relate to projects that develop recreational facilities and projects that would result in an increase in demand for recreational activities. The City and County San Francisco (CCSF) CEQA Checklist includes an additional significance criterion related to projects that could adversely affect existing recreational resources. Under this third criterion, the Draft PEIR impact analysis considered whether the project would result in: (1) direct removal of or damage to existing recreational resources; (2) indirect impacts such as air quality and noise effects that degrade the quality of the recreational experience; and (3) disruption of access to existing recreation facilities. These topics are typically covered under the Land Use, Aesthetics, Traffic, Air Quality, and Noise sections. The impact analysis in the Draft PEIR takes into account the types of activities described by the commenter that provide park users with recreational experiences at East Bay Regional Park District (EBRPD) facilities as well as recreational facilities throughout the WSIP study area.

Further, Section 15382 of the CEQA Guidelines emphasizes that a significant effect on the environment is a substantial adverse change in the physical condition of the project area. Impacts on the subjective experiences of nature appreciation, hiking, and photography could occur as a result of physical environmental impacts (such as traffic, air quality, noise, park access, biological resources, and visual impacts). Thus, the above-added criteria are intended to tie physical environmental impacts to effects on the recreational experience. The recreational impact analysis in the Draft PEIR (Vol. 2, Chapter 4, pp. 4.12-18 to 4.12-28) considered physical impacts such as siting, construction, and operation of WSIP facilities in the evaluation of impacts on the quality of the recreational experience. One example is the evaluation of the Calaveras Dam Replacement project (SV-2), which considered potential temporary and long-term impacts on visual resources at borrow sites and spoils areas as seen from the Sunol Wilderness Area. The analysis determined this impact to be significant and unavoidable due to the loss of oak woodland and changes in views of affected hillsides from across the reservoir. Thus, this physical impact is identified as significant because it could diminish the recreational experience of hikers and photographers, even though this adverse visual impact would not constitute a physical impact on recreational facilities.

Air quality and noise impacts were noted parenthetically as examples of the types of physical impacts that could adversely affect the recreational experience. Citing air quality and noise as examples did not preclude or dismiss other types of physical impacts that could disrupt or deteriorate the quality of the park users' experience, such as traffic, land use access, biological resource, and visual resource impacts.

Please refer also to **Response L_EBRPD-02** for further discussion of these issues.

L_EBRPD-02 As discussed in **Response L_EBRPD-01**, under Section 15382 of the CEQA Guidelines, impacts on recreational resources would occur if there were physical effects on recreational facilities, such as physical deterioration or adverse impacts related to the construction or expansion of recreational facilities. The recreational impact analysis (Vol. 2, Chapter 4, pp. 4.12-18 to 4.12-28) considers physical environmental impacts on the recreational experience.

In response to this comment, the following text is added to the Approach to Analysis discussion in Section 4.12, Recreational Resources (Vol. 2, Chapter 4, p. 4.12-18, second full paragraph):

> To determine potential direct effects of WSIP projects construction activities and/or land acquisition, project areas were compared with the locations of identified recreational resources. Potential indirect effects on recreational resources were identified through the same means, as well as by reviewing the impact findings from Section 4.3, Land Use and Visual Quality; Section 4.5, Hydrology and Water Quality; Section 4.9, Air Quality; and Section 4.10, Noise and Vibration. Indirect impacts that would typically result from other physical impacts and could adversely affect the recreational experience include the following: removal of vegetation that could alter views (Section 4.3, Land Use and Visual Quality); construction-related noise that could affect hiking or nature appreciation (Section 4.10, Noise); or impeded access to hiking trails (Section 4.8, Traffic, Transportation, and Circulation).

Also refer to **Responses L_EBRPD-03, L_EBRPD-06, L_EBRPD-09, and L_EBRPD-10** for additional discussion of visual, traffic, air quality, and noise impacts on recreational resources.

L_EBRPD-03 The commenter expresses concern regarding the potential impacts of temporarily closing Calaveras Road during construction of the Calaveras Dam Replacement project (SV-2). The Draft PEIR (Vol. 2, Chapter 4, p. 4.12-23) presents a programmatic discussion of the recreational impacts associated with temporary closure of Calaveras Road during the construction period based on a preliminary project description. Because this disruption to recreational access would be temporary and an alternate route into the wilderness area would be available, this impact was determined to be less than significant. This impact determination assumes that the SFPUC would implement the Standard Construction Measures, including Measure #6 requiring that the contractors prepare a traffic control plan. Programmatic construction-related traffic impacts resulting from implementation of the WSIP as well as other projects in the region are evaluated in Section 4.8, Traffic, Transportation, and Circulation; Section 4.16, Collective Impacts Related to WSIP Facilities; and Section 4.17, Cumulative Effects (Vol. 2, pp. 4.8-10 to 4.8-22; pp. 4.16-33 and 4.16-34; and p. 4.17-61). The PEIR analysis determined that the WSIP projects in the Sunol Valley, either individually or collectively, would have potentially significant impacts on traffic during construction. The Draft PEIR includes Mitigation Measures 4.8-1 and 4.16-6c, requiring coordinated and combined Sunol Valley traffic control plans (Vol. 4, Chapter 6, pp. 6-30 to 6-33), which would further serve to reduce the impacts of the temporary road closure on recreational users.

However, the project-level EIR for the Calaveras Dam Replacement project (SV-2) will analyze access issues and impacts on recreational resources in more detail based on the most up-to-date construction plans and schedule, and will identify additional and/or more specific traffic mitigation measures as appropriate. Please also refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.2) for discussion of the appropriate level of detail of an impact analysis at the program level versus the project level.

L_EBRPD-04 The Draft PEIR (Vol. 2, Chapter 4, p. 4.12-23) concludes that at a programmatic level of analysis, implementation of SFPUC Standard Construction Measures #1, #3, #5, and #6 (neighborhood notice, air quality, traffic, and noise) would reduce impacts on recreational resources. In addition, Mitigation Measure 4.8-1a (Vol. 4, Chapter 6, pp. 6-30 and 6-31) and Mitigation Measure 4.16-6c (p. 6-33) provide a programmatic approach to mitigating potential traffic impacts and specify 22 measures that could be included in traffic control plans that will be required to mitigate the impacts of construction vehicle traffic. However, in response to this comment, the EBRPD has been added to Table C.6 (Vol. 5, Appendix C, p. C-26) as an agency that has requested consultation during the planning and design phases of certain WSIP projects in the Sunol Valley.

The project-level EIR for the Calaveras Dam Replacement project (SV-2) will analyze the project in more detail based on the most up-to-date construction plans and schedule, and will provide more detailed traffic mitigation measures (including consideration of the commenter's suggested measures to mitigate impacts associated with the temporary closure of Calaveras Road between Geary Road and Felter Road). Please also refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.2) for discussion of the appropriate level of detail of an impact analysis at the program level versus the project level.

L_EBRPD-05 The construction schedule information used in the Draft PEIR impact assessment is presented in Table C.4 (Vol. 5, Appendix C, p. C-21), which indicates that construction of the Calaveras Dam Replacement project (SV-2) would occur over a two- to three-year period. Since details regarding the duration of the temporary closure of Calaveras Road between Geary Road and Felter Road were not available at the time of Draft PEIR preparation, the assessment assumed that Calaveras Road would be closed for the duration of the construction period of two to three years as a worst-case scenario. The text in Section 4.3, Land Use and Visual Quality, and Section 4.8, Traffic, Transportation, and Circulation (Vol. 2, Chapter 4, pp. 4.3-15 and 4.8-12) correctly refers to the two- to three-year construction duration. Although this is consistently evaluated in the Draft PEIR, the text describing the construction duration in the Traffic section (Vol. 2, Chapter 4, p. 4.8-22, third full paragraph) has been revised to indicate the "two-to three-year construction duration." Text changes to this paragraph are indicated under **Response L_EBRPD-06** below.

Please also refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.2) for discussion of the appropriate level of detail of an impact analysis at the program level versus the project level. The project-level EIR for the Calaveras Dam Replacement project (SV-2) will analyze the project in more detail based on the most up-to-date construction plans and schedule, and will identify additional and/or more specific mitigation measures for significant impacts. Additional details related to the duration of the temporary closure of Calaveras Road between Geary Road and Felter Road and associated impacts will be included in the project-level EIR.

L_EBRPD-06 The programmatic traffic analysis (Vol. 2, Chapter 4, p. 4.8-22) indicates that construction of the Calaveras Dam Replacement project (SV-2) would require closure of Calaveras Road between Geary Road and Felter Road to through-traffic during the two- to three-year construction period. Based on information on the Calaveras Dam Replacement project available at the time the Draft PEIR was prepared, it was not possible to determine the extent to which direct access to EBRPD trails could be restricted during closure of Calaveras Road. The Ohlone Wilderness Trail, located north of Geary Road, could be directly affected, and the Bay Area Ridge Trail connection from the west could be indirectly affected. The Bay Area Ridge Trail connects to the Ohlone Wilderness Trail from the Mission Peak Regional Preserve. At the programmatic level, the Draft PEIR (Vol. 2, Chapter 4, p. 4.8-22) states that implementation of SFPUC Standard Construction Measure #5 (traffic control plan) and additional traffic control measures identified in Mitigation Measure 4.8-1a (Vol. 4, Chapter 6, p. 6-30) would mitigate this potential impact to a less-than-significant level. This programmatic mitigation measure specifies detailed elements of the traffic control plan and requires coordination with local jurisdictions for affected roadways and intersections.

The project-level EIR for the Calaveras Dam Replacement project (SV-2) will provide the site-specific analysis of the potential impacts on EBRPD trails based on more detailed and up-to-date project information.

Based on clarifications provided in this comment and the previous comment (**L_EBRPD-05**), the Draft PEIR (Vol. 2, Chapter 4, p. 4.8-22, third full paragraph) is revised as follows:

> Construction of Calaveras Dam (SV-2) would require temporary closure of Calaveras Road between Geary Road and Felter Road to through-traffic during the two- to three-year construction period. Through-traffic using Calaveras Road would be required to find an alternate route for the duration of the construction period and would likely use I-680. Access to the East Bay Regional Park District's (EBRPD) Sunol Regional Wilderness would still be provided via Calaveras Road and Geary Road from the north, and emergency vehicles would continue to have access to temporarily closed roads. Direct access to ~~some~~ the EBRPD Ohlone Wilderness Regional Trail may be restricted, including access to the Bay Area Ridge Trail connection from the west. There are no private residences or commercial uses on this segment of Calaveras Road. This project would be evaluated as part of separate, project-level CEQA review. Implementation of SFPUC Construction Measure #5 (traffic control plan) and additional traffic control measures identified in Measure 4.8-1a would be adequate to ensure acceptable levels of traffic, pedestrian, and bicycle flow and to reduce any *potentially significant* circulation and access impacts to a less-than-significant level.

L_EBRPD-07 As stated in Mitigation Measure 4.8-1a (Vol. 4, Chapter 6, p. 6-31), the traffic control measures require that roadway rights-of-way be repaired or returned to their original condition or better upon the completion of construction. This measure typically includes inspection of roadways prior to and after completion of the project, and if project-related roadway damage were detected, the SFPUC would be required to enter into an agreement with local jurisdictions for implementing a post-construction repair/rehabilitation program. This measure would also typically address the condition of roadways during project construction. Mitigation Measures 4.8-1a and 4.16-6c (Vol. 4, Chapter 6, pp. 6-30 and 6-33) require coordination with local jurisdictions, which will include Alameda County, in developing these measures.

L_EBRPD-08 The commenter raises concerns regarding the effectiveness of traffic-related Mitigation Measure 4.16-6c (Vol. 4, Chapter 6, p. 6-33) to mitigate potentially significant impacts associated with overlapping schedules for projects in the Sunol Valley Region. Given the programmatic nature of the impact assessment and mitigation measures, the use of the word "could" rather than "shall" is appropriate for this mitigation measure, because this programmatic measure specifies various measures that *could* be included in the Sunol Valley Traffic Control Plan, and this plan *shall* be required to mitigate the collective or combined impacts of construction vehicle traffic. Project-level CEQA review for WSIP facility projects in the Sunol Valley Region will identify mitigation measures that respond to the specific requirements of each project's construction and identified significant impacts. The project-level CEQA documents will include mitigation measures that utilize the words "should" or "shall," as suggested by the commenter. Please also refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.2) for discussion of the appropriate level of detail of an impact analysis at the program level versus the project level.

L_EBRPD-09 Draft PEIR Sections 4.9, Air Quality, and 4.16, Collective Impacts Related to WSIP Facilities (Vol. 2, Chapter 4, pp. 4.9-20 and 4.16-29) present a programmatic impact assessment of the air quality impacts. Table 4.9-4 (Vol. 2, Chapter 4, p. 4.9-24) presents average daily total construction-related emissions that would be generated in each region during construction of all WSIP projects. The Draft PEIR (Vol. 2, Chapter 4, p. 4.9-23) acknowledges that most of the estimated emissions are attributable to the three largest WSIP projects: San Joaquin Pipeline System (SJ-3), Calaveras Dam Replacement (SV-2), and Bay Division Pipeline Reliability Upgrade (BD-1). Therefore, air quality in the Sunol Valley Region would be primarily affected by the Calaveras Dam Replacement project.

The Draft PEIR (Vol. 2, Chapter 4, p. 4.9-25) classifies construction emissions associated with the WSIP projects in the Sunol Valley Region to be potentially significant, requiring implementation of the dust and exhaust control measures recommended by the Bay Area Air Quality Management District (BAAQMD) for all of these projects, even if the project by itself would not exceed BAAQMD operational significance thresholds. Dust control measures typically reduce PM_{10} emissions by 50 percent. As indicated in Table 4.9-5 (Vol. 2, Chapter 4, p. 4.9-24), the combined average PM_{10} emissions in the Sunol Valley Region (52 pounds per day) would not exceed the BAAQMD operational significance threshold of 80 pounds per day, and implementation of dust control measures could reduce project emissions to 25 pounds per day—well below the threshold. Pollutant emissions associated with equipment exhaust would exceed BAAQMD thresholds and would significantly contribute to the degradation of regional air quality. The Draft PEIR (Vol. 2, Chapter 4, p. 4.16-29) classifies these regional contributions as potentially significant and unavoidable, given the San Francisco Bay Area Air Basin's nonattainment status for ozone and particulate matter.

When evaluating the effects of short-term construction emissions, the Draft PEIR focuses on sensitive receptors that cannot relocate during project construction and that, therefore, cannot avoid exposure to pollutant emissions. While it is acknowledged that recreationists are also sensitive receptors, they are mobile (not stationary) receptors and can choose to use other regional parks (or other trails within the park) on a short-term basis to avoid emissions, if air quality is a concern. It should also be noted that recreationists would be exposed to project-related construction emissions for short periods of time. Nevertheless, impacts on recreational resources will be specifically evaluated as part of project-level CEQA review for all WSIP projects in the Sunol Valley Region. Please also refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.2) for discussion of the appropriate level of detail of an impact analysis at the program level versus the project level.

L_EBRPD-10 The commenter's statement pertaining to the significant impact on recreational resources is addressed in **Response L_EBRPD-01**. The commenter correctly summarizes the Draft PEIR statement (Vol. 2, Chapter 4, p. 4.3-2) that views of WSIP facilities may be available from public trails in the Sunol Regional Wilderness. The Sunol Regional Wilderness is not specifically called out as a visual resource on the page referenced by the commenter (p. 4.3-8) because that discussion is an overview of the approach to the visual quality impact analysis in its entirety, and does not identify individual visual resources.

"Visual Resources" is the subheading for the last paragraph on p. 4.3-2 (Draft PEIR, Vol. 2). Each of the visual features discussed in the paragraph under this subheading is recognized in the Draft PEIR as a visual resource, including available views of the Calaveras Dam Replacement project (SV-2) from the Sunol Regional Wilderness. The visual assessment conducted for the Draft PEIR determined that Calaveras Dam is not visible from the Ohlone Regional Wilderness; however, any potential for visibility from the Ohlone Regional Wilderness or any other EBRPD facilities will be assessed in greater detail as part of project-level CEQA review for the Calaveras Dam Replacement project.

Potential impacts on views from the Sunol Regional Wilderness due to the Calaveras Dam Replacement project (SV-2) are identified in Draft PEIR Table 4.3-4 (Vol. 2, Chapter 4, p. 4.3-21) and described under Impact 4.3-4 (p. 4.3-38). Excavation and grading activities associated with dam construction would remove vegetation and create visual discontinuity that would affect views from surrounding areas, including the Sunol Regional Wilderness. Mitigation Measures 4.3-4a through 4.3-4d (Vol. 4, Chapter 6, pp. 6-7 and 6-8) would minimize these visual impacts; however, even with mitigation, visual impacts resulting from tree removal and grading in the vicinity of Calaveras Dam were determined to be significant and unavoidable. The project-level EIR for the dam project will further analyze the visual impacts on Sunol Regional Wilderness and other EBRPD facilities, if applicable, and identify site-specific mitigation measures to help reduce these impacts.

L_EBRPD-11 The Draft PEIR (Vol. 2, Chapter 4, p. 4.2-5) states that the purpose of the *Alameda Watershed Management Plan* (Alameda WMP) is to provide a policy framework for the SFPUC to make decisions about the activities on watershed lands, and to provide watershed management implementation guidelines. While Alameda WMP policies must be implemented for all SFPUC projects located within Alameda WMP boundaries, Alameda WMP goals and policies are not intended to provide project-specific requirements for preserving and protecting visual resources. In addition, the Alameda WMP does not address protection or preservation of visual resources that are not located on CCSF-owned property.

The Alameda WMP recognizes that the CCSF-owned watershed lands are endowed with visual features; however, the Alameda WMP also states its primary goal is to "Maintain and protect water quality for public health and safety." Because the SFPUC water distribution, storage, and maintenance facilities are already located and built within CCSF-owned watershed lands (such as with the Calaveras Dam Replacement project, SV-2), the SFPUC does not have the flexibility to site or designate locations for major facilities and construction staging areas that entirely avoid onsite and offsite visual impacts. Instead, the Alameda WMP policies require viewshed studies and implementation of design guidelines to avoid and minimize visual impacts to the extent feasible. Two design guidelines from the Alameda WMP that are included in the Draft PEIR (Vol. 2, Chapter 4, pp. 4.3-37 and 4.3-38) refer to protecting existing visual resources within the watershed lands by contouring slopes and landforms for compatibility with the surrounding environment, and by minimizing grading and the visibility of cut banks. In addition, SFPUC Standard Construction Measure #10 (construction site maintenance/restoration) will require sites to be returned to the general condition that existed before construction, including regrading of the site and revegetation of disturbed areas. Implementation of both of these guidelines and Measure #10 would minimize the visual impacts of WSIP facilities within SFPUC Alameda watershed lands.

In addition to identified Alameda WMP design guidelines (Vol. 2, Chapter 4, pp. 4.3-37 and 4.3-38), the Draft PEIR requires implementation of Mitigation Measure 4.3-2, Facility Siting Studies (Vol. 4, Chapter 6, p. 6-7) for the Additional 40-mgd Treated Water Supply (SV-3) and San Antonio Backup Pipeline (SV-6) projects, which includes consideration of alternative site locations. Siting and viewshed studies will be completed as necessary as part of project-level CEQA review for all WSIP projects (including ancillary project features such as haul roads or borrow sites) in visually sensitive areas, including the Sunol Valley.

Please also refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.2) for discussion of the appropriate level of detail of an impact analysis at the program level versus the project level.

L_EBRPD-12 With respect to the need for viewshed studies for the Calaveras Dam Replacement project (SV-2), the commenter references the impact discussion in Chapter 5 (Vol. 3, p. 5.4.7-4). This chapter (which begins on p. 5.1-1) evaluates potential environmental impacts of the proposed water supply and system operations, which are distinct from the impacts of constructing WSIP facility improvement projects (such as the Calaveras Dam Replacement), which are described and analyzed in Chapter 4 of the Draft PEIR. Therefore, the conclusion of the Draft PEIR (Vol. 3, Chapter 5, p. 5.4.7-4) that Policy WA-9 viewshed studies would not be required is appropriate, as it applies to changes in views as a result of proposed changes in water supply and system operations. The Draft PEIR (Vol. 3, Chapter 5, pp. 5.4.7-5 and 5.4.7-6) states that potential recreational and visual impacts attributable to changes in WSIP water supply or regional system operations would more likely involve changes in water flows in Alameda Creek, which could in turn affect the visual experience of EBRPD visitors.

As noted in the Draft PEIR (Vol. 2, Chapter 4, p. 4.2-9), the SFPUC seeks to work cooperatively with local jurisdictions to avoid land use conflicts. The project-level EIR for the Calaveras Dam Replacement project (SV-2) will determine the need for a viewshed study for this project, as specified in Policy WA-9 of the Alameda WMP.

L_EBRPD-13 The commenter expresses concern that the WSIP could result in reduced flows in Alameda Creek, with a resulting decrease in the recreational experience for EBRPD users and a reduction in the fish and wildlife habitat in several parks that feature Alameda Creek as a recreational feature. The commenter's concerns with reduced flows in Alameda Creek, the need to manage flows to maximize benefits for amphibians and fish, and the recreational experience for EBRPD users are addressed in the Draft PEIR as follows: stream flow—Impact 5.4.1-2 (Vol. 3, Chapter 5, pp. 5.4.1-25 to 5.4.1-35); fisheries—Impact 5.4.5-3 (Vol. 3, Chapter 5, pp. 5.4.5-18 to 5.4.5-20); terrestrial biological resources—Impact 5.4.6-2 (Vol. 3, Chapter 5, pp. 5.4.6-18 and 5.4.6-19); and recreational and visual resources—Impact 5.4.7-1 (Vol. 3, Chapter 5, pp. 5.4.7-5). Mitigation Measure 5.4.5-3a (Vol. 4, Chapter 6, p. 6-52) calls for biological studies as well as an operational plan to manage minimum flows for resident trout; this measure has been expanded to address other aquatic-dependent species, including amphibians. Subsequent to publication of the Draft PEIR, the SFPUC modified the project description of the Calaveras Dam Replacement project (SV-2), as described in Vol. 7, Chapter 13, Section 13.2 of this Comments and Responses document, which has resulted in a reduction in severity of Impact 5.4.7-1 from potentially significant to less than significant. Please also refer to **Response S_CDFG2-15** and **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14) for additional discussion of the issues raised by this comment, including a discussion of steelhead fisheries in Alameda Creek.

L_EBRPD-14 The commenter refers to a provision in the land use plan for the EBRPD's Sunol and Ohlone Wilderness Regional Preserves "to coordinate the timing of water for the Calaveras Dam with the SFPUC to maximize the benefits to these [amphibians and anadromous fish] species." The SFPUC is solely responsible for all operations related to Calaveras Dam, including the timing of releases from the dam. As discussed in the Draft PEIR (Vol. 3, Chapter 5, p. 5.2-20), the SFPUC is currently participating in the Alameda Creek Fisheries Restoration Workgroup, of which the EBRPD is also a member, to manage the Alameda Creek watershed and to plan for restoration of steelhead in Alameda Creek. The SFPUC's participation in the Workgroup will continue independent of the WSIP. Please refer to **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14) for discussion of steelhead (anadromous fish species) issues. Also refer to **Response L_EBRPD-19** regarding the status of the land use plan for the Sunol and Ohlone Wilderness Regional Preserves and to **Response S_CDFG2-15** regarding mitigation measures to address other stream-dependent species (amphibians).

L_EBRPD-15 This comment, which suggests that the SFPUC consider giving the EBRPD the opportunity to review and comment on the operation plan for establishing minimum flows in Alameda Creek for resident trout, is acknowledged. As indicated by the commenter, Mitigation Measure 5.4.5-3a (Vol. 4, Chapter 6, pp. 6-52 and 6-53) incorporates coordination with the Alameda Creek Fisheries Restoration Workgroup, of which the EBRPD is a member. In addition, the EBRPD's interest in coordinating their resource management efforts with those of the SFPUC has been noted in Draft PEIR Table C.6 (Vol. 5, Appendix C, p. C-26) for consideration in the project-level EIR for the Calaveras Dam Replacement project (SV-2). Please also refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.3) for additional information about the SFPUC's coordination efforts with other agencies. The commenter is also referred to **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14) for a description of changes in the Calaveras Dam Replacement project to include protective measures for fisheries.

L_EBRPD-16 The commenter states concerns over the use of land already managed for watershed protection that might be used as mitigation for new projects (Draft PEIR, Vol. 4, Chapter 6, pp. 6-11 and 6-12). However, watershed land already owned by the CCSF is not necessarily precluded from development. For example, extensive areas of CCSF-owned land in the Sunol Valley are in use for viticulture, golf courses, commercial nurseries, and gravel mining, and therefore are not conserved as natural habitat. Placing a conservation easement over natural habitat on SFPUC land could provide an added degree of protection, if such land could be used for other purposes without compromising its function in watershed protection.

In addition, some CCSF-owned land may be deemed extraneous for watershed protection purposes and could be sold. The Sheep Ranch is one such example; this area, which comprises about 400 acres, is under CCSF ownership but is situated in the Arroyo de la Laguna watershed, not the Alameda Creek watershed in the Sunol Valley. A conservation easement over the Sheep Ranch could ensure that this land would not be sold and subsequently developed.

Some of the land owned by the CCSF in the Sunol Valley has been highly disturbed, and restoration or enhancement could considerably increase habitat values. Some examples are abandoned commercial nurseries, stock ponds with eroded outlets, and former oak woodlands that were cut down for timber and firewood many decades ago. Watershed and water quality management objectives do not necessarily require that such lands be restored to full ecological function and productivity. Thus, ecological restoration would not necessarily take place unless it was part of a mitigation program for capital projects. If such lands were placed under a conservation easement and restored under WSIP mitigation and Habitat Reserve Program management, such improvements would be both mandated and funded.

L_EBRPD-17 The Draft PEIR (Vol. 2, Chapter 4, pp. 4.6-55 and 4.6-56) indicates that Mitigation Measure 4.6-1b, implementation of the Habitat Reserve Program or a similar habitat compensation program, would provide a mechanism for offsite identification, protection, restoration and management of compensation land.

The commenter's concern regarding the long-term effectiveness of conservation easements over private lands is acknowledged. In fact, any lands set aside for long-term mitigation and conservation can be compromised by unforeseen management problems. However, conservation easements, besides being routinely accepted as CEQA mitigation, often have the advantage of remaining in the private sector, thus providing economic incentives for the landowner to maintain the property. In addition, use of conservation easements could enable the SFPUC to protect more land than could be protected under a fee purchase program, since easements are typically less expensive than fee purchases.

L_EBRPD-18 The commenter requests application of a 5 dB CNEL increase as a significance criterion for impacts on park users. As defined in the Draft PEIR, CNEL is a 24-hour noise level that includes a 10-dB penalty for nighttime noise (Vol. 2, Chapter 4, p. 4.10-1). This threshold is typically used to evaluate the impact of noise sources associated with project operations, such as operation of facility equipment or permanent increases in traffic. Construction-related noise is more sporadic and can vary from hour to hour and day to day. In addition, most construction activities occur during the day, so it is inappropriate to evaluate changes in the ambient noise environment over a 24-hour period. For projects where only daytime construction would occur, the use of CNEL would underestimate the noise impact. Therefore, the Draft PEIR defines as significant any noise increase that interferes with activities during the day and/or night (speech and sleep interference), whichever is applicable (Vol. 2, Chapter 4, pp. 4.10-12 and 4.10-13). These thresholds are based on Leq rather than CNEL and are more rigorous for construction noise since they account for hourly variations in noise increases.

While passive recreational areas can be sensitive to noise, the significance of construction-related noise impacts are determined, in part, by the nature of the recreational use (trail versus picnic area) in areas where recreationists using the facilities cannot avoid construction noise. Although there are trails in the Sunol Regional Wilderness, potential noise increases were not identified as significant since hikers could choose to use other parts of the park located away from facility construction areas. Hikers using trails near construction areas would be exposed to short-term noise increases, but only when hiking on the trail section located near the construction area. The hilly topography in the Sunol Valley would help limit the extent of area affected by construction noise, since hills would block the construction noise. Nevertheless, the site-specific impacts on recreational resources will be evaluated as part of project-level CEQA review for all WSIP projects in the Sunol Valley Region.

L_EBRPD-19 The EBRPD has adopted over 40 land use plans for its regional parks and preserves. Land use plans evaluate park resources, document and recommend programs for managing and conserving park resources, discuss key planning issues and relevant policies, and offer proposals for future recreational and service facilities (EBRPD, 2007e). Not all EBRPD parklands have adopted land use plans, although it is the District's long-term goal to create such a plan for every park. According to the EBRPD, the land use plan for the Sunol and Ohlone Regional Wilderness Preserves has not been adopted, but a draft plan was completed in 2003 (Still, 2008).

In response to this comment, the Draft PEIR (Vol. 2, Chapter 4, p. 4.12-2, last paragraph) is revised as follows:

> **East Bay Regional Parks.** The EBRPD has jurisdiction over numerous regional parks located in Alameda and Contra Costa Counties. Several major EBRPD facilities encompassing thousands of acres of parks and open space are clustered in the East County/Sunol Valley area, including Del Valle Regional Park, Ohlone Regional Wilderness, Sunol Regional Wilderness, Vargas Plateau Regional Preserve, and Mission Peak Regional Park. <u>The long-term goal of the EBRPD is to adopt land use plans to guide the management and use of all of its facilities. The EBRPD has adopted a land use plan for Del Valle Regional Park; other land use plans are in draft form at various stages of planning.</u>

L_EBRPD-20 In the event that construction of the WSIP facilities requires the SFPUC to access or cross EBRPD trails or parklands, trail or encroachment permits would be required from the EBRPD if the SFPUC does not have a property interest that provides access without a permit. Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.3) for detailed discussion of the issues raised by this comment. The EBRPD's interest in determining which WSIP facility projects would encroach on District property has been noted in Draft PEIR Table C.6 (Vol. 5, Appendix C, p. C-26) for consideration in all project-level CEQA review of WSIP projects in the Sunol Valley Region.

L_EBRPD-21 At the time the Draft PEIR was prepared, there were alternative tunnel alignments under consideration for the New Irvington Tunnel project (SV-1), as indicated in Table C.3 (Vol. 5, Appendix C, p. C-17). The Draft PEIR impact assessment encompassed the range of possible impacts that could result from proposed and alternative tunnel alignments. Potential impacts on EBRPD facilities will be evaluated in greater detail as part of project-level CEQA review for the New Irvington Tunnel project based on the most up-to-date and detailed project plans regarding the tunnel location. Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.2) for discussion of the appropriate level of detail of an impact analysis at the program level versus the project level.

L_EBRPD-22 The commenter's concerns with flooding impacts as a result of the Alameda Creek Fishery Enhancement project (SV-1) are addressed in the Draft PEIR (Vol. 2, Chapter 4, p. 4.5-38); the PEIR analysis determined that potential flooding impacts under this project would be potentially significant because the construction of dams in Alameda Creek could impede flood flows or exacerbate flooding issues. Implementation of the site-specific flooding analysis specified in Mitigation Measure 4.5-4b (Vol. 4, Chapter 6, p. 6-10) would be required to reduce this impact to a less-than-significant level. Such analysis will be required as part of project-level CEQA review for this project. Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.2) for discussion of the appropriate level of detail of an impact analysis at the program level versus the project level.

L_EBRPD-23 The EBRPD Public Safety Division provides law enforcement and fire protection services for 65 park facilities in Alameda and Contra Costa Counties. In response to this comment, the EBRPD has been added to the list of agencies that provide fire protection and law enforcement services in the Sunol Valley Region.
Table 4.11-2 of the Draft PEIR (Vol. 1, Chapter 4, p. 4.11-4) is revised as follows:

TABLE 4.11-2
LAW ENFORCEMENT AND FIRE PROTECTION SERVICE PROVIDERS WITHIN THE WSIP STUDY AREA

Jurisdiction	Law Enforcement Agencies	Fire Protection Service Agencies
Alameda County		
Unincorporated areas including, San Lorenzo and Castro Valley	Alameda County Sheriff's Department East Bay Regional Park District Police Department	Alameda County Fire Department East Bay Regional Park District Fire Department

As indicated in **Response L_EBRPD-04**, the EBRPD has been added to Draft PEIR Table C.6 (Vol. 5, Appendix C, p. C-26) as an agency that has requested consultation during the planning and design phases of certain WSIP projects in the Sunol Valley. At that time, the EBRPD will have the opportunity to coordinate fire suppression planning and response (including review of traffic control plans). Please also refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.3) for additional information about the SFPUC's planned coordination efforts with other agencies.

L_EBRPD-24 The locations of the Calaveras Dam Replacement (SV-2) borrow and spoil areas are based on the preliminary project information available at the time the Draft PEIR was prepared. The Draft PEIR discloses programmatic temporary and long-term impacts on visual and biological resources that could occur at the borrow sites and spoils areas. The Draft PEIR (Vol. 2, pp. 4.3-38 and 4.6-55) identifies potentially significant visual and biological impacts due to the extensive grading proposed in borrow areas on slopes east of the reservoir and the resulting removal of riparian communities (such as coast live oak riparian forest, etc.). Mitigation measures are identified to reduce these impacts, but visual impacts would not be reduced to a less-than-significant level and would be unavoidable. The addition of impacts associated with the borrow area at the south end would not alter these significance determinations. Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.2) for discussion of the appropriate level of detail of an impact analysis at the program level versus the project level. The project-level EIR for the Calaveras Dam Replacement project will describe and map the geographic limits of the borrow and spoils areas, and will assess site specific visual and biological impacts associated with this project.

L_EBRPD-25 In response to this comment, the Draft PEIR reference to the Habitat Preserve Program (Vol. 4, Chapter 6, p. 6-55, third sentence of the second full paragraph) is corrected as follows:

One alternative for implementing such habitat compensation is the Habitat Reserve Program (HRP) currently being developed by the SFPUC. The purpose of the HRP is to provide a comprehensive, coordinated approach to mitigation and related regulatory compliance for WSIP projects and operations. This related SFPUC project is described further in Chapter 3, Section ~~3.11~~ 3.12.3.

L_EBRPD-26 The Quarry Lakes Regional Recreation Area and the Coyote Hill Regional Park, and their locations with respect to Alameda Creek and the Alameda Creek Trail, are described in the Draft PEIR (Vol. 3, Chapter 5, p. 5.4.7-3). These facilities were not specifically called out in the setting overview referenced by the commenter on Draft PEIR p. 5.4.7-1. Even with the addition of new information on these existing parks, the impact discussion of recreational facilities and/or activities and visual effects on scenic resources remain the same as described in the Draft PEIR for these recreational facilities (Vol. 3, Chapter 5, pp. 5.4.7-5 and 5.4.7-6, respectively). Potential recreational and visual effects were identified only for the Sunol Regional Wilderness. No impacts were identified in the Draft PEIR for the other EBRPD parklands described on pp. 5.4.7-2 and 5.4.7-3.

In response to this comment, the Vargas Plateau Regional Preserve has been added to the inventory of EBRPD parks described in Section 5.4.7.1 of the Draft PEIR (Vol. 3, Chapter 5, pp. 5.4.7-2 and 5.4.7-3), and potential recreational and visual impacts were also added. No significant visual or recreational impacts would occur at the Vargas Plateau Regional Preserve as a result of program-related changes in water supply and regional system operations. Views of Alameda Creek from the Vargas Plateau Regional Preserve would be minimally affected by program-related changes in flows, because any changes in flows would be substantially moderated by inflow from Arroyo de la Laguna and Arroyo Mocho, which are not controlled by the SFPUC. In addition, the WSIP would result in increased low-flow releases in the summer, which would add to the visual amenities afforded by the creek during those times. The WSIP would not affect the visual or recreational amenities of Alameda Creek in the Coyote Hills Regional Park because of the intervening flows and the tidal nature of that reach of the creek.

In response to this comment, the Draft PEIR (Vol. 3, Chapter 5, p. 5.4.7-1, third full paragraph) is revised as follows:

Alameda Creek Recreation and Visual Quality

Alameda Creek runs through several local parks, ~~and~~ municipalities (including ~~Sunol Regional Wilderness,~~ Alameda County), and the cities of Fremont and Union City. Alameda Creek also runs through the Sunol Regional Wilderness and is adjacent to the Vargas Plateau Regional Preserve, Quarry Lakes Regional Recreation Area, and Coyote Hills

> Regional Park, all of which are operated by the EBRPD. The recreational uses of the creek are described below.

The following paragraph is added to the Draft PEIR just before the paragraph on the Quarry Lakes Regional Recreation Area (Vol. 3, Chapter 5, p. 5.4.7-3, first full paragraph):

> **Vargas Plateau Regional Preserve**
>
> The Vargas Plateau Regional Preserve, managed by the EBRPD, is located adjacent to the SFPUC Alameda watershed along a common boundary line on the east side of the preserve. Its northern boundary touches Alameda Creek for a distance of about 2,500 feet. A portion of the decommissioned Sunol Aqueduct crosses the park within a utility easement. Currently, the preserve is not suitable for active public use due to the lack of public road access, the need to protect natural or man-made resources, and other factors related to public safety and access. The EBRPD is currently in the process of adopting the *Vargas Plateau Regional Park Land Use Plan*, which would create a regional park that provides trails, outdoor recreation, campgrounds, and nature appreciation areas (EBRPD, 2007e).

The following reference is added to the Draft PEIR (Vol. 3, Chapter 5, p. 5.4.7-6):

East Bay Regional Park District (EBRPD), *Draft Vargas Plateau Regional Park Land Use Plan*, October 2007e, available online at http://www.ebparks.org/planning/lup, accessed January 25, 2008.

City of Foster City, Ramon Towne, Director of Public Works, 10/1/07

L_FosterCty-01 This comment, which states Estero Municipal Improvement District's goal to "Pursue Reliable and Uninterruptible Alternative Sources of Water Supply" and encourages that seismic retrofits to the regional water system be implemented expeditiously, is acknowledged.

L_FosterCty-02 Table 3.3, Table 7.2, Table 7.3, Table E.2.1, and Table E.2.6 in the Draft PEIR show that projected 2030 demand for Estero Municipal Improvement District is 6.8 mgd, consistent with this comment. Tables 3.4 and E.1.1 referenced in this comment show only the 2030 purchase estimates, not projected demand. The source of the range shown for the 2030 purchase estimate is the *SFPUC 2030 Purchase Estimates Technical Memorandum* (Table 3, p. 1-5 of that report; URS, 2004a), which is based on information submitted by the wholesale customers. The source for the estimated range of 0.0 to 0.6 mgd in conservation savings (which accounts for the difference between the projected demand and the purchase estimate) was the form entitled "Wholesale Customer Best Estimate of Water Purchases from the SFPUC" (dated November 17, 2004), which Estero Municipal Improvement District submitted to the SFPUC. The submitted form states:

> The Estero Municipal Improvement District (EMID) projects that it will purchase 100% of its estimated total water demand from the SFPUC in 2030. Based on the information collected and analyses conducted in developing overall Demand Projections this total demand equates to 6.8 mgd (annual average). Based on the same information collected and analyses conducted, EMID projects that this total demand may be reduced by as much as 0.6 MGD if the equivalent of all "Category A" and "Category B" conservation measures as analyzed for EMID were adopted and achieve their maximum potential savings. It is understood that this estimate will be used by the SFPUC for purposes of planning and environmental review and is subject to change based on changed conditions, such as the future cost of water, new pricing structures, and new developments in the area of conservation Best Management Practices.

Based on this comment, the SFPUC assumes that Estero Municipal Improvement District will not realize any conservation savings in 2030 and plans to purchase 6.8 mgd from the regional water system (SFPUC, 2008a); this would correspond to the high end of the purchase estimate range and the low end of the conservation estimate range shown in the Draft PEIR tables. The SFPUC selected the high range purchase estimate totaling 300 mgd as the target goal for the average annual water delivery, as stated in the Draft PEIR (Vol. 4, Chapter 7, p. 7-16). The demand projections and/or associated purchase estimates are expected to evolve somewhat over time (including the eventual emergence of a single figure in the cases where a range had been assumed), and the clarification of Estero Municipal Improvement District's estimate of 2030 purchases and conservation savings is an example of this; no change to the referenced tables is needed.

L_FosterCty-03 This comment, which concurs with and expands on information about Estero Municipal Improvement District's service area presented in the Draft PEIR, is noted. As discussed in the Draft PEIR (Vol. 4, Chapter 7, p. 7-14), the source of population projections used to develop water demand projections was selected by the wholesale customers. As discussed in the more detailed description of demand projection development (see Appendix E.2, pp. E.2-6 et seq.), a "blend" of ABAG cities was created in order to reconcile ABAG projections with those for the wholesale customers' service areas. The percentage of wholesale customer service area within jurisdictional boundaries is shown in Chapter 7, Table 7.1 (p. 7-12).

L_FosterCty-04 This comment, which expresses support for the Modified WSIP Alternative and for the adoption of the 10 percent rationing goal during drought periods, is acknowledged. The support of the commenter for WSIP Variant 3 – 10% Rationing is acknowledged. See **Response L_Burlgme-02** for clarification of the difference between the proposed program and Variant 3.

L_FosterCty-05 This information related to Estero Municipal Improvement District's development of an Emergency Sanitation Annex Plan and the importance of the complete rehabilitation of the Hetch Hetchy system is noted.

City of Fremont, Transportation and Operations Department, Rene Dalton, 10/9/07

L_Fremont-01 Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Sections 14.4.2 and 14.4.3) for detailed discussion of the issues raised by this comment. The City of Fremont has been added to Draft PEIR Table C.6 (Vol. 5, Appendix C, p. C-26) as an agency that has requested consultation during the planning and design phases of the following projects: Bay Division Pipeline (BDPL) Reliability Upgrade (BD-1), New Irvington Tunnel (SV-4), and Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault (BD-3).

While the City has requested the use of jack-and-bore construction for the pipeline crossings of arterial streets in Fremont, it should be noted that the Draft PEIR (Vol. 2, Chapter 4, p. 4.8-13) indicates the cut-and-cover construction method would be used to cross Mission Boulevard, Paseo Padre Parkway, and Fremont Boulevard, which was based on preliminary information available at the time the Draft PEIR was prepared. The project-level EIR for the BDPL Reliability Upgrade project (BD-1) will analyze the project in more detail, including the up-to-date design details for construction across roadways, and will identify additional mitigation measures for significant impacts associated with cut-and-cover construction across multiple-lane arterials, including coordination with the City of Fremont.

L_Fremont-02 The last bullet item under Mitigation Measure 4.8-1a (Vol. 4, Chapter 6, p. 6-31) refers to the state's *Manual of Traffic Controls for Construction and Maintenance Work Areas*. In late 2006, the *California Manual on Uniform Traffic Control Devices* replaced the 1996 version of the *Manual of Traffic Control for Construction and Maintenance Work Areas*. In response to this comment, the text of the Draft PEIR has been revised to update this reference and to include Caltrans' *2006 Standard Plans*. The Draft PEIR (Vol. 4, Chapter 6, p. 6-31, last bullet item under Measure 4.8-1a) is revised as follows:

> To the extent applicable, the traffic control plan will conform to the ~~state's *Manual of Traffic Controls for Construction and Maintenance Work Areas*~~ *California Manual on Uniform Traffic Control Devices for Streets and Highways: Part 6 Temporary Traffic Control* and Caltrans' *2006 Standard Plans*.

L_Fremont-03 The commenter states that applications for encroachment permits and traffic control plan reviews must be submitted to the City of Fremont two months in advance of construction, and provides information on the application process. The SFPUC will obtain encroachment permits when access is needed to public rights-of-way where the SFPUC has no property interest that provides access without a permit.

Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.3) for more discussion of the issues raised by this comment. The City of Fremont has been added to Draft PEIR Table C.6 (Vol. 5, Appendix C, p. C-26) as an agency that has requested consultation (including the need for encroachment permits and development and review of traffic control plans) during the planning and design phases of the following projects: the BDPL Reliability Upgrade (BD-1), New Irvington Tunnel (SV-4), and Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault (BD-3).

L_Fremont-04 The commenter requests coordination with City of Fremont staff regarding the need to close bicycle trails and maintenance access roads during construction near Paseo Padre Parkway. Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Sections 14.4.2 and 14.4.3) for more discussion of the issues raised by this comment. The City of Fremont has been added to Draft PEIR Table C.6 (Vol. 5, Appendix C, p. C-26) as an agency that has requested consultation during the planning and design phases of the following projects: BDPL Reliability Upgrade (BD-1), New Irvington Tunnel (SV-4), and Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault (BD-3).

L_Fremont-05 The commenter states that the City of Fremont requires submittal of site-specific plans for all work within city limits that could affect Fremont's transportation network. Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Sections 14.4.2 and 14.4.3) for more discussion of the issues raised by this comment. The City of Fremont has been added to Draft PEIR Table C.6 (Vol. 5, Appendix C, p. C-26) as an agency that has requested consultation during the planning and design phases of any WSIP project that could affect the Fremont transportation network.

City of Hayward Department of Public Works, Robert Bauman, Director of Public Works, 9/17/07

L_Hayward-01 The commenter correctly describes the purpose of the CEQA EIR process. The comments describing the urgent need for the WSIP facility improvement projects for water quality, seismic, and delivery reliability are acknowledged. Please see **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Section 14.1.2) for more discussion.

L_Hayward-02 This comment advocating a two-tiered approach that separates the proposed seismic improvements from the proposed changes in water supply (i.e. additional Tuolumne River diversions) is acknowledged. Please see the discussion in **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Section 14.1.5).

L_Hayward-03 This comment, which provides considerable background on future planned growth in Hayward and the basis for its projected 2030 water demand, as well as information regarding the City's commitment to smart growth and water conservation, is acknowledged.

Town of Hillsborough, Cyrus Kianpour, City Engineer, 9/27/07

L_Hillsb-01 This comment expressing support for the WSIP goals and objectives and the Draft PEIR is acknowledged.

L_Hillsb-02 This comment addresses the need and urgency to repair the regional system to avoid failure in a significant seismic event. Section 3.3 of the Draft PEIR (Vol. 1, Chapter 3, pp. 3-5 to 3-8) describes the need for and objectives of the WSIP. In addition, the PEIR describes the regional faulting and seismic hazards along the SFPUC regional water system (Vol. 2, Chapter 4, pp. 4.4-4 to 4.4-13) and includes a map of major faults in the vicinity of the system (Figure 4.4-1, Vol. 2, Chapter 4, pp. 4.4-7 and 4.4-8). The No Program Alternative (Vol. 4, Chapter 9, pp. 9-23 to 9-40) describes the consequences and environmental effects of not improving SFPUC system facilities, which include increasing the risk of prolonged water outages (see in particular p. 9-32). The purpose of the PEIR is to evaluate the environmental effects of implementing the WSIP as well as several alternatives to the WSIP identified in the PEIR. The requested economic evaluation is outside the scope and purview of this PEIR (see CEQA Guidelines Section 15064). In its comments on the Draft PEIR, the Bay Area Water Supply and Conservation Agency (BAWSCA) provided information regarding potential the economic consequences associated with SFPUC facility failures due to an extended loss of water (refer to Comment L_BAWSCA1-05). The information in L_BAWSCA1-05 is based on a 2002 report by the Bay Area Economic Forum. Please refer to **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Sections 14.1.2 and 14.1.3) for more discussion.

L_Hillsb-03 This comment expressing support for the Modified WSIP Alternative is acknowledged.

L_Hillsb-04 This comment expressing the Town of Hillsborough's support for the Modified WSIP Alternative is acknowledged. Please refer to **Section 14.10, Master Response on Modified WSIP Alternative** (Vol. 7, Chapter 14) for additional discussion and analysis of this alternative, and **Response L-BAWSCA1-47**.

L_Hillsb-05 The first sentence of this comment, which recommends that the Draft PEIR discuss the possibility of the SFPUC and its wholesale customers entering into a new contract that would maintain established entitlements, is acknowledged. The Draft PEIR (Vol. 1, Chapter 2, pp. 2-43 and 2-44) describes the customer agreements between the SFPUC and its wholesale customers; the analysis in the Draft PEIR is based on the existing terms of the agreement. The second sentence in this comment, which supports BAWSCA taking the lead on regionally funded conservation through increased water rates, is also acknowledged.

L_Hillsb-06 This comment emphasizes the need to implement the proposed WSIP facility projects to improve the regional water system's performance and reliability, and expresses concern that the proposed changes in water supply sources could delay implementation of these facility improvements. Comment acknowledged.

L_Hillsb-07 This comment expressing support for the 10 percent rationing goal during prolonged drought periods is acknowledged. See **Response L_Burlgme-02** for clarification of the difference between the proposed program and Variant 3 – 10% Rationing.

L_Hillsb-08 The commenter indicates that the WSIP would result in the construction of facilities within Hillsborough's boundaries. However, Table 3.11 (Vol. 1, Chapter 3, p. 3-60) indicates that no WSIP facility projects evaluated in the Draft PEIR would be located within the town boundaries. This table indicates that the Crystal Springs/San Andreas Transmission Upgrade project (PN-2) would be located in San Mateo County, and that several cities (including Hillsborough) are close to that project site. The project-level CEQA analysis for this project will identify any offsite impacts that would affect the town.

L_Hillsb-09 This comment describing the Town of Hillsborough's conservation program efforts is noted.

Los Altos Hills County Fire District, Dorothy Price, President, 9/21/07

L_LAHCFD-01 This comment regarding the critical need for water reliability for the purposes of firefighting is acknowledged. Please refer to **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Section 14.1.4) for more discussion.

L_LAHCFD-02 This comment, which supports conservation measures and additional restrictions on water use to the extent feasible, and describes the Fire District's water conservation measures, is noted. For information on alternatives evaluated in the Draft PEIR that do not include additional diversions from the Tuolumne River, refer to the descriptions of the Year-round Desalination at Oceanside Alternative (Vol. 4, Chapter 9, Section 9.2.6) and the Aggressive Conservation/Water Recycling and Local Groundwater Alternative (Without Tuolumne River Supplement) (Vol. 4, Chapter 9, Section 9.2.4, p. 9-47). Refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional response regarding conservation programs and recycling projects proposed by the SFPUC and its wholesale customers.

L_LAHCFD-03 This comment urging rapid completion of the environmental review process and implementation of the WSIP is acknowledged.

Town of Los Altos Hills, Craig Jones, Mayor, 9/14/07

L_LosAltosH-01 This comment regarding the critical need for water reliability for the purposes of firefighting is acknowledged. Please refer to **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Section 14.1.4) for more discussion.

L_LosAltosH-02 This comment reiterates projected future water demand in the SFPUC service area through 2030 as presented in the Draft PEIR. To clarify the information related to water supplies presented in this comment, water supply sources during nondrought and drought periods under the proposed program would consist of runoff from local watersheds (with Calaveras and Lower Crystal Springs Reservoirs restored), increased average annual diversions from the Tuolumne River, and recycled water/groundwater/additional conservation in San Francisco. During drought sequences, this supply would be augmented first through implementation of a conjunctive-use program in the Westside Groundwater Basin, and then by additional Tuolumne River diversions through a water transfer with Turlock Irrigation District and Modesto Irrigation District. Information related to future conservation measures and recycled water projects proposed by the SFPUC wholesale customers is provided in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3).

L_LosAltosH-03 This comment, which asserts that the Town of Los Altos Hills has implemented Smart Growth principles by requiring a minimum lot size of one acre, is acknowledged. More typically, the concept of “smart growth” refers to more intensive development at densities that encourage the use of public transit and reduce the overall footprint of the built environment. The Los Altos Hills approach does result in the use of less water per acre relative to denser housing, but does so by limiting the number of households and population that can be accommodated within the city limits.

L_LosAltosH-04 This comment describing the town’s conservation efforts is noted.

L_LosAltosH-05 This comment urging rapid certification of the Draft PEIR and expeditious implementation of the WSIP is acknowledged.

City of Menlo Park, Kent Steffens, Director of Public Works, 10/1/07

L_Menlo1-01 This comment regarding the vulnerability of the regional system to seismic hazards and the need to proceed expeditiously with the WSIP is acknowledged. Please refer to **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 4, Chapter 14, Section 14.1.3) for more discussion.

L_Menlo1-02 Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Sections 14.4.2, and 14.4.3) for detailed discussion of the issues raised by this comment. The City's request for coordination of reasonable construction mitigation measures has been noted in Draft PEIR Table C.6 (Vol. 5, Appendix C, p. C-26) for consideration in the project-level EIR for the Bay Division Pipeline Reliability Upgrade project (BD-1).

L_Menlo1-03 Noise limits specified in Section 8.06.030 and time limits specified in Section 8.06.040 of the Menlo Park Noise Ordinance are summarized in Draft PEIR Table 4.10-2 (Vol. 2, Chapter 4, p. 4.10-7), and these limits are consistent with the noise ordinance sections attached to the commenter's letter. Draft PEIR Impact 4.10-1 (Vol. 2, Chapter 4, p. 4.10-19) acknowledges that temporary construction-related noise impacts associated with the Bay Division Pipeline Reliability Upgrade project (BD-1) would be potentially significant at some locations due to the proximity of sensitive noise receptors to the pipeline alignment. The Draft PEIR's potentially significant and unavoidable (PSU) significance determination for this impact acknowledges that the language "to the extent feasible" contained in SFPUC Construction Measure #6 (Vol. 1, Chapter 3, p. 3-80) and Draft PEIR Mitigation Measure 4.10-1a (Vol. 4, Chapter 6, p. 6-39) may not reduce impacts to a less-than-significant level, since these measures do not guarantee compliance with local noise ordinances. Measure 4.10-1a indicates that for some WSIP projects, nighttime construction cannot be avoided (e.g., tunnel construction must occur 24 hours per day), and in these situations, construction noise would be required to comply with applicable noise ordinance nighttime limits or not exceed the 50-dBA sleep interference criterion to the extent feasible. The City's concerns with construction noise and compliance with the City's Noise Ordinance will be addressed in detail as part of project-level CEQA review for the Bay Division Pipeline Reliability Upgrade project.

L_Menlo1-04 The City's comment identifying the need for settlement monitoring where the proposed Bay Tunnel crosses under existing levees in Menlo Park is addressed under Draft PEIR Impact 4.4-4 (Vol. 2, Chapter 4, p. 4.4-31) for the Bay Division Pipeline Reliability Upgrade project (BD-1). The impact discussion identifies this impact as potentially significant but mitigated to a less-than-significant level with implementation of a subsidence monitoring program (Measure 4.4-4) to detect potential ground movement well before major subsidence occurs. Corrective action, such as increased tunnel support, would be implemented if measured displacement reached a designated minimum trigger amount. This impact would be evaluated in more detail as part of project-level CEQA review for this project.

L_Menlo1-05 Trucks operating onsite within the pipeline right-of-way are considered part of the onsite construction activities described under Draft PEIR Impact 4.10-1 (Vol. 2, Chapter 4, p. 4.10-19) and would be subject to ordinance time limits as specified in SFPUC Construction Measure #6. However, the impacts associated with trucks operating offsite along construction haul routes (mostly public streets for this project) are described under Draft PEIR Impact 4.10-2 (Vol. 2, Chapter 4, p. 4.10-25), and these trucks would be subject to restrictions such as avoiding local residential streets, using designated truck routes, and avoiding nighttime hours (10 p.m. to 7 a.m.) depending on the proximity of residential uses to haul routes (Vol. 4, Chapter 6, Mitigation Measures 4.10-2a and 4.10-2b, p. 6-41). The City's concerns with truck noise along haul routes will be addressed in detail as part of project-level CEQA review for the Bay Division Pipeline Reliability Upgrade project.

L_Menlo1-06 The commenter raises concerns regarding the effectiveness of the traffic mitigation measures (Vol. 4, Chapter 6, p. 6-30, Measures 4.8-1a and 4.8-1b) to mitigate potentially significant traffic impacts when the Bay Division Pipeline Reliability Upgrade project (BD-1) is being constructed through Menlo Park, and the need to develop the traffic control plan in consultation with the City of Menlo Park prior to submitting this project to bid. As indicated in Draft PEIR Mitigation Measure 4.8-1a (Vol. 4, Chapter 6, p. 6-30), the SFPUC and its contractors will prepare the traffic control plan in coordination with Caltrans and local jurisdictions. The project-level EIR for the Bay Division Pipeline Reliability Upgrade project will analyze traffic impacts in more detail based on the most up-to-date design details, and will identify additional mitigation measures for significant impacts.

Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.2, Intent of Programmatic Impact Analysis, and Section 14.4.3) for detailed discussion of the issues raised by this comment. The City's request for coordination of construction traffic routing and appropriate mitigation measures has been noted in Draft PEIR Table C.6 (Vol. 5, Appendix C, p. C-26) for consideration in the project-level EIR for the Bay Division Pipeline Reliability Upgrade project (BD-1).

L_Menlo1-07 Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.2) for detailed discussion of the issues raised by this comment. This master response provides information on the appropriate level of detail of an impact analysis at the program level versus the project level. The project-level EIR for the Bay Division Pipeline Reliability Upgrade project (BD-1) will analyze vibration impacts in more detail and, if warranted, identify additional mitigation measures for significant impacts, such as preparation of a mitigation monitoring program that includes vibration monitoring.

L_Menlo1-08 This comment correctly states that Menlo Park (i.e., the Menlo Park Water District) receives 100 percent of its water supply from the SFPUC. Ninety-six percent of Menlo Park's existing demand is met through SFPUC purchases (as shown in Draft PEIR Table 7.3, Vol. 4, Chapter 7, p. 7-18); however, because Menlo Park purchases the balance of its supply from East Palo Alto (according to the BAWSCA Annual Survey [BAWSCA, 2006]), all of its supply is ultimately provided by the SFPUC. In response to this comment, and to clarify and avoid double counting of existing supply, Table 3.1 (Vol. 1, Chapter 3, p. 3-7) has been revised as follows:

TABLE 3.1
SFPUC REGIONAL WATER SYSTEM CUSTOMERS

Wholesale Regional Customers[a] (BAWSCA Members)		
Peninsula	**South Bay**	**Other Major Customers**
	City of Menlo Park*b	

* Indicates customers that currently receive additional water supplies from sources other than the SFPUC.

a Not shown on the table because they are not a BAWSCA member, the Cordilleras Mutual Water Association is also a wholesale customer receiving water from the SFPUC. It is a small water association serving 18 single-family homes located in San Mateo County.

b Menlo Park receives all of its water supply from the SFPUC; however, a portion of the supply is obtained indirectly from the SFPUC through purchases from East Palo Alto (BAWSCA, 2006).

SOURCES: CDM, 2005; URS, 2004a.

The following has been added to the Chapter 3 references (p. 3-88):

Bay Area Water Supply and Conservation Agency (BAWSCA), *Bay Area Water Supply and Conservation Agency Annual Survey FY2004-05*, April 2006.

Although the comment does not raise this issue with respect to Table 3.4 (Vol. 1, Chapter 3, p. 3-19), for consistency with the revised Table 3.1, Table 3.4 has also been revised, as follows:

TABLE 3.4
SUMMARY OF SFPUC 2030 PURCHASE ESTIMATES

SFPUC Customer	Fiscal Year 2001/2002 Purchases from the SFPUC (mgd)	2030 Purchase Estimates (mgd)	Change in Water Purchases from the SFPUC (mgd)
Wholesale Customers			
City of Menlo Park[a,c] [g]	3.57	4.54	0.97

[a] Wholesale customer that currently receives water supplies from sources other than the SFPUC, including local groundwater, local surface water, recycled water, and other sources of supply.
[c] Wholesale customer that currently receive water supplies from other sources but projects receiving only SFPUC water by 2030
[g] Menlo Park purchased 96 percent of its 2001/2002 supply directly from the SFPUC; the balance of its 2001/2002 purchases also came from the SFPUC regional system, but was purchased from East Palo Alto. Menlo Park projects that it will purchase all of its 2030 supply directly from the SFPUC.

SOURCES: URS, 2004c; City of Redwood City, 2005; Westborough Water District, 2007.

Please also refer to the description of Menlo Park in Chapter 7 (Vol. 4, pp. 7-47 and 7-48), which identifies Menlo Park's other sources of supply.

Menlo Park Planning Commission, Kirsten Keith, Employee, 9/18/07

[See Public Hearing Transcript, Fremont, pp. 24–25]

L_Menlo2-01 This recommendation to read the book *Cadillac Desert* is acknowledged, but as it does not address the adequacy or accuracy of the Draft PEIR, no response is provided.

City of Menlo Park, Kelly Fergusson, Mayor, 9/19/07

[See Public Hearing Transcript, Palo Alto, pp. 43–44]

L_Menlo3-01 This comment states that the Mayor of Menlo Park and the City of Menlo Park's Public Works Director were present at the September 19, 2007 public hearing on the Draft PEIR held in the city of Palo Alto. No response is necessary.

Modesto Irrigation District, Walt Ward, President of the Board of Directors, 9/6/07

[See Public Hearing Transcript, Modesto, pp. 25–26]

L_MID-01 This comment requests an extension of the public review period for the WSIP Draft PEIR by 30 days or longer. The public review period on the Draft PEIR was initially scheduled for 90 days, from June 29, 2007 through October 1, 2007, but was extended by an additional 15 days, to October 15, 2007. Further, comments received after the October 15, 2007 deadline were accepted and are responded to in this Comments and Responses document. In accordance with CEQA Guidelines Section 15105, the public review period for draft EIRs that require review by state agencies must not be less than 45 days, unless a shorter period, not less than 30 days, is approved by the State Clearinghouse. Thus, the public review period provided for the Draft PEIR meets and exceeds the public review requirements under CEQA.

L_MID-02 Please refer to **Section 14.3, Master Response on Proposed Dry-Year Water Transfer** (Vol. 7, Chapter 14, Section 14.3.3) for detailed discussion of this issue.

Modesto Irrigation District / Turlock Irrigation District, Walter Ward / Robert Nees, Assistant General Manager / Assistant General Manager, 10/1/07

L_MID-TID1-01 In response to the request of the commenter, on October 4, 2007, the San Francisco Planning Department sent the Turlock Irrigation District (TID) and Modesto Irrigation District (MID) a CD containing hydrologic model output as well as related files to help TID and MID to understand the data. In addition, a meeting was held on November 28, 2007 to discuss the Hetch Hetchy/Local Simulation Model (HH/LSM) and its use in support of the Draft PEIR, and included representatives from TID, MID, the SFPUC, and the PEIR consultant team (representing the San Francisco Planning Department). The SFPUC representative described how the HH/LSM was used to analyze the WSIP and estimate its effects on Tuolumne River flows, and identified assumptions made in the analysis. A slide presentation was made and hard copy of the presentation was provided to meeting attendees (see Attachment L_MID-TID1-1). The meeting was conducted informally, and the SFPUC answered questions raised by TID and MID attendees.

At the November 28, 2007 meeting, the SFPUC noted that the assumptions and modeling approach used for the TID and MID in the HH/LSM are consistent with the assumptions and approach used in the modeling of the San Joaquin River and modeling for MID's recent water treatment plant project. TID and MID are using CalSim II, the statewide model developed by the Department of Water Resources and the U.S. Bureau of Reclamation, to model the San Joaquin River.

At the end of the meeting, the TID and MID representatives indicated that the SFPUC representative had answered all of their questions with respect to the HH/LSM, and that an executable copy of the model would be sent to TID and MID. The model was transmitted to the Districts on December 21, 2007.

With regard to the request to extend the comment period on the Draft PEIR, please refer to **Response L_MID-01**. In addition, because the SFPUC planned to refine the HH/LSM runs used in the Draft PEIR in 2008 in support of the Final PEIR, the Districts were invited to submit comments on the modeling in advance of preparation of this Response to Comments document. The comments would be considered if submitted to the SFPUC in a timely manner.

For further information on the HH/LSM, please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14).

L_MID-TID1-02 The Draft PEIR (Vol. 1, Chapter 2, pp. 2-35 to 2-37) provides a summary description of the City and County of San Francisco's (CCSF) rights to Tuolumne River water. The SFPUC believes that the diversion of water from the Tuolumne River as proposed in the WSIP is consistent with the CCSF's water rights.

L_MID-TID1-03 The commenter's summary of the two fundamental principles pertaining to the existing system is consistent with the description in the Draft PEIR (Vol. 1, Chapter 3, p. 3-8). These principles are used as the basis for the WSIP goals and objectives. Chapter 9 of the Draft PEIR (Vol. 4) identifies and analyzes alternatives to the proposed program that would meet most of the basic program goals and objectives while at the same time avoiding or substantially lessening significant environmental effects of the WSIP. The PEIR analyzes one alternative that would involve treatment and pumping of Tuolumne River water—the Lower Tuolumne River Diversion Alternative (Vol. 4, Chapter 9, pp. 9-59 to 9-66). In addition, the Draft PEIR provides further discussion of the reasons for rejecting filtration of Sierra source water as an alternative strategy (Vol., 4, Chapter 9, pp. 9-119 and 9-120).

However, as noted in Section 11.2 (Vol. 6, Chapter 11, p. 11-2), following certification of the Final PEIR, decision-makers have the discretion to approve the WSIP or any portion/modification/alternative of the WSIP analyzed in the PEIR.

L_MID-TID1-04 The flows expressed as million gallons per day (mgd) do not express an instantaneous rate of flow. When used in the text of the Draft PEIR, the flow expressed in mgd is typically qualified as an average annual, monthly, or daily flow. (For an example, see the first full paragraph of Vol. 1, Chapter 2, p. 2-37 of the Draft PEIR.) Annual flows are expressed in mgd in the Draft PEIR, rather than in acre-feet per year (afy), because municipal water supply agencies typically use mgd (and not afy) as their primary units of flow.

Projected purchase requests (water demand) for the SFPUC in 2030 is 300 mgd (336,066 afy), an increase of 35 mgd (39,207 afy) compared to the 2005 condition.

With respect to the units of flow used in the Draft PEIR, please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.8). With respect to the request for a copy of the water supply model, refer to **Response L_MID-TID1-01**.

L_MID-TID1-05 Please refer to **Section 14.3, Master Response on Proposed Dry-Year Water Transfer** (Vol. 7, Chapter 14) for more detail on the proposed water transfer from TID/MID to the SFPUC. Also refer to **Response L_TUD1-09**.

The SFPUC has determined that the proposed water transfers from TID and MID would be feasible technically, based on HH/LSM model runs that use 82 years of historical hydrology as well as assumptions that are consistent with those used in the modeling of the San Joaquin River for the Department of Water Resources and in the modeling for MID's recent water treatment plant project (see **Response L_MID-TID1-01**). This 82-year hydrologic record includes several extended drought sequences, and the modeling conducted for the Draft PEIR analysis using the HH/LSM indicated that the WSIP water supply level of service could be achieved during drought periods with the combination of water transfer, a conjunctive-use program in the Westside Basin, and a maximum systemwide rationing of 20 percent.

The analysis in the Draft PEIR is based on the worst-case assumption (in terms of environmental consequences) that the proposed water transfer from TID and MID would originate from stored water in Don Pedro Reservoir. Consequently, the river flow estimates and the reservoir storage estimates for the with-WSIP scenario shown in the Draft PEIR include the effects of the proposed transfer (Vol. 3, Chapter 5, pp. 5.3.1-1 to 5.3.1-40). Most of the environmental effects of the WSIP on the Tuolumne River would stem from WSIP-induced changes in reservoir storage and river flow. The effects of WSIP-induced reservoir storage and river flow changes on other environmental elements, including water quality, groundwater, fisheries, terrestrial biological resources, recreation/visual resources, and energy, are described in Vol. 3, Chapter 5, Sections 5.3.2 through 5.3.9 of the Draft PEIR. These PEIR sections provide a project-level analysis of the effects of the proposed water transfer on the Tuolumne River and its natural resources, as required by CEQA. However, additional CEQA documentation could be required once any facilities needed to execute the transfer have been designed.

L_MID-TID1-06 In its planning, the SFPUC determined that a dry-year water transfer from TID/MID would be needed if the SFPUC is to deliver water to customers during the design drought without requiring rationing of greater than 20 percent systemwide. An approximately 26,000-acre-foot transfer from TID and MID, averaged over the 8.5-year design drought, was analyzed using the HH/LSM, and the environmental impacts of such a transfer are characterized in the Draft PEIR. After publication of the Draft PEIR, updated and refined modeling using the HH/LSM indicated that a dry-year transfer of approximately 29,000 acre-feet would be needed. The increase in the size of the dry-year transfer would have a negligible effect with respect to the environmental impacts of the WSIP described in the Draft PEIR, because the full 29,000-acre-foot transfer would be needed so rarely. The SFPUC is not considering transfers substantially greater than 29,000 acre-feet, so the Draft PEIR does not analyze larger transfers. Please also refer to **Section 14.3,**

Master Response on Proposed Dry-Year Water Transfer (Vol. 7, Chapter 14, Section 14.3.2) for additional information.

L_MID-TID1-07 Neither the Tuolumne River nor the San Joaquin River is currently listed for water temperature in the State Water Resources Control Board's Clean Water Act Section 303(d) list.

The WSIP would have no effect on water temperature in the Tuolumne River below La Grange Dam in most months, because flow in this reach of river equals the minimum required flow in most months. Flow in the river would be the same with the WSIP as under the existing condition in 717 months of the 984-month (82-year) hydrologic record. As stated in the Draft PEIR, on infrequent occasions (12 months in the 984-month hydrologic record), WSIP-induced flow reductions would cause mean daily temperature increases of 1 or 2 degrees Celsius (see Draft PEIR Vol. 3, Chapter 5, p. 5.3.3-19). The statement in the comment letter that an increase of 1 to 2 degrees would occur in 15 percent of the months modeled—157 months in the 984-month record—is incorrect.

The Draft PEIR also notes that the WSIP could cause an exceedance of the water quality objective (i.e., the objective prohibiting an increase of more than 5 degrees Fahrenheit, or 2.8 degrees Celsius) in three or four months of the 984-month hydrologic record (Vol. 3, Chapter 5, p. 5.3.3-19). Because exceedances would be so infrequent that they would not impair the river's ability to support its designated beneficial uses, it was concluded that the WSIP would have a less-than-significant impact on water temperature.

The primary purpose of the water temperature objective is to protect aquatic life, and particularly cold-water fish. As indicated in the Draft PEIR, the reductions in flow combined with the increases in water temperature attributable to the WSIP would have a potentially significant adverse impact on fishery resources in the lower Tuolumne River (Vol. 3, Chapter 5, pp. 5.3.6-29 to 5.3.6-32). A proposed mitigation measure, Measure 5.3.6-4a (Vol. 4, Chapter 6, p. 6-48), would essentially eliminate the effects of the WSIP on flow and water temperature in the lower Tuolumne River and the San Joaquin River.

L_MID-TID1-08 Please refer to **Sections 14.6 and 14.7, Master Responses on the Upper and Lower Tuolumne River Issues** (Vol. 7, Chapter 14), respectively, regarding additional instream flow requirements.

L_MID-TID1-09 As stated in the Draft PEIR, the CCSF must adhere to the Raker Act (Vol. 1, Chapter 2, pp. 2-33 and 2-34). The WSIP is consistent with Raker Act requirements, including Section 9(h), with respect to the export of additional water from the Tuolumne River watershed, since the additional diversions under the WSIP would be for municipal and domestic purposes. Also refer to **Response L_TUD1-05**.

The WSIP does not seek to meet the entire increase in purchase requests (water demand) projected to occur between 2005 and 2030 by diverting more water from the Tuolumne River. The projected purchase request in 2030 is 300 mgd (336,066 afy), an increase of 35 mgd (39,207 afy) compared to the 2005 condition. Local demand would be reduced by about 4 mgd (4,481 afy) through water conservation measures over and above those already planned. Approximately 6 mgd (6,721 afy) of the additional demand would be met from local sources to be developed under the WSIP—2 mgd from groundwater wells in San Francisco (WSIP facility improvement project SF-2), and 4 mgd from reclamation and recycling of San Francisco's wastewater (WSIP facility improvement project SF-3).

The SFPUC is not planning to add new wholesale customers and is considering several options that would limit the use of Tuolumne River water to meet the wholesale customers' needs. An alternative, the No Purchase Request Increase Alternative, which would limit deliveries to the wholesale customers' current purchase requests, is evaluated in Chapter 9 of the Draft PEIR (Vol. 4). The Modified WSIP Alternative, which is also discussed in Chapter 9, would include an additional 5 to 10 mgd of water conservation, recycling, and groundwater use in the wholesale customers' service areas.

L_MID-TID1-10 The WSIP would result in an overall increase in average annual hydropower generation, but a decrease in average annual hydropower generation at TID/MID facilities, as noted in the Draft PEIR (Vol. 3, Chapter 5, p. 5.3.9-3). If TID/MID replaced the hydropower lost with power produced at a fossil-fuel plant, then the replacement would cause the emission of additional air pollutants and greenhouse gases. However, any emissions would be more than offset by the emission reductions resulting from the SFPUC's increase in hydropower generation, which would replace power produced through the combustion of fossil fuels. Please refer to the Draft PEIR (Vol. 2, Chapter 4, Section 4.9) for a description of the WSIP's effects related to greenhouse gas emissions.

L_MID-TID1-11 Please refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14) for a discussion of climate change that augments the discussion presented in Section 5.7.6 of the Draft PEIR (Vol. 3, Chapter 5, pp. 5.7-92 to 5.7-96). Section 14.11 provides more detailed and up-to-date information on climate change as it relates to the SFPUC regional water supply and the proposed WSIP.

L_MID-TID1-12 The comment expressing an opinion on the appropriateness of additional diversions from the Tuolumne River is acknowledged.

The opinion of the commenter that greater consideration should be given to the Lower Tuolumne River Diversion Alternative and the two desalination alternatives is acknowledged. The San Francisco Planning Department disagrees that the Lower Tuolumne River Diversion, Year-round Desalination at Oceanside, and Regional Desalination for Drought Alternatives would have fewer environmental impacts than the WSIP or Modified WSIP Alternative. As described in the Draft PEIR (Vol. 4, Chapter 9, p. 9-93 and 9-94), although these alternatives would have lesser effects on the Tuolumne River than the WSIP and the Modified WSIP Alternative, they would result in substantially greater construction and operations impacts associated with a treatment plant, intake structures, transmission and distribution pipelines, and possibly a storage facility. In addition to the likelihood of substantially greater impacts on land use, traffic, air quality, noise, biological resources, and energy, these alternatives would also result in indirect effects associated with greater energy use. Obtaining the additional energy would have its own environmental impacts, which would likely include the emission of air pollutants and greenhouse gases.

As noted above in **Response L_MID-TID1-03** and in Section 11.2 (Vol. 6, Chapter 11, p. 11-2), following certification of the Final PEIR, decision-makers have the discretion to approve the WSIP or any portion/modification/alternative of the WSIP analyzed in the PEIR.

L_MID-TID1-13 If the proposed and preferred Mitigation Measure 5.3.6-4a (Vol. 4, Chapter 6, p. 6-48) proves to be feasible and is implemented, then the WSIP would have minimal effects on the Tuolumne River below La Grange Dam. If Measure 5.3.6-4a proves to be infeasible, then the SFPUC would implement Mitigation Measure 5.3.6-4b (Vol. 4, Chapter 6, pp. 6-48 and 6-49). Please refer to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14) for detailed discussion of these measures.

The Draft PEIR does not provide a mitigation measure for TID/MID's loss of hydropower identified under Impact 5.3.9-1 (Vol. 3, Chapter 5, pp. 5.3.9-2 and 5.3.9-3) because this impact is economic rather than environmental and consequently does not need to be addressed in a CEQA document. Depending on how TID/MID replaced the lost power, greenhouse gases could be emitted. However, as noted **Response L_MID-TID-10**, any increased emissions would be more than offset, because the WSIP would produce a net increase in hydropower. Refer to the Draft PEIR for information on greenhouse gas emissions under the WSIP (Vol. 2, Chapter 4, Section 4.9).

L_MID-TID1-14 This comment requesting special attention is acknowledged.

L_MID-TID1-15 This comment, which expresses TID's opinion regarding prior discussion of the water transfers, is acknowledged. Please refer to **Section 14.3, Master Response on Proposed Dry-Year Water Transfer** (Vol. 7, Chapter 14, Section 14.3.2) for additional information.

L_MID-TID1-16 This comment, which expresses TID's concurrence with the removal of the fourth pipeline from the WSIP, is acknowledged. The WSIP facility improvement projects (Vol. 1, Chapter 3, Table 3.10, p. 3-49) include the San Joaquin Pipeline System project (SJ-3), which would consist of partial segments of a fourth San Joaquin Pipeline and additional crossover facilities.

L_MID-TID1-17 This comment regarding the agreements between the CCSF and the Districts (TID and MID) is acknowledged. The Draft PEIR (Vol. 1, Chapter 2, pp. 2-42 and 2-43) includes a summary description of the Fourth Agreement among the CCSF, TID, and MID regarding the New Don Pedro Project.

L_MID-TID1-18 The SFPUC chose a design drought more severe than any drought in the hydrologic record because of San Francisco's unusual vulnerability to droughts and its experiences during earlier droughts. Most agricultural water agencies and many municipal water agencies have both surface water and groundwater supply sources. During droughts, these agencies can increase pumping from their groundwater sources to make up for any shortfall in surface water supplies. When planning for the future, these agencies typically establish their design drought based on the historical record. If the historical record proves to be unreliable and droughts more severe than those in the historical record occur, the agencies can always turn to their groundwater supplies or, in the case of the agricultural agencies, fallow some land. In this way, they can avoid severe economic losses. Unlike these agencies, San Francisco depends almost exclusively on surface water supplies, and its water rights are restricted in a manner that means little or no water is available to the SFPUC from its primary source, the Tuolumne River, in very dry years. As a result, the risk of a severe water shortage, with attendant economic losses, is much greater for San Francisco than for most other urban or agricultural communities. Because of these circumstances, the SFPUC determined that it would take a more conservative posture than many water agencies in choosing a design drought.

The disadvantages for the SFPUC of choosing a design drought based on the historical record were illustrated during the 1987–1992 drought. Toward the end of this extended drought, San Francisco's water supplies were almost exhausted, and the SFPUC was initiating programs to achieve a 45 percent reduction in system wide water deliveries (described in Vol. 1, Chapter 2,

p. 2-26). Absent an unseasonably large spring storm (the “March miracle”), severe rationing would have been imposed and economic losses incurred.

For the reasons noted above, the SFPUC concluded that it would be imprudent to base its design drought entirely on historical hydrology. Consequently, it does not see the need for a parallel analysis of the WSIP using a design drought based on historical hydrology. If such an analysis were performed, it would likely reduce the size of the transfer needed to meet the SFPUC’s water needs during droughts. Although the design drought is an extreme event without precedent in the historical record, dry-year transfers, when needed, would typically be smaller than the estimated maximum.

L_MID-TID1-19 Please refer to **Response L_MID-TID1-01**.

L_MID-TID1-20 The SFPUC has conducted sufficient background studies, which have identified the feasibility of developing approximately 10 mgd of additional water from conservation, recycling, and groundwater development in San Francisco. If the SFPUC were unable to meet the demand of retail customers through conservation, recycling, and groundwater use, more water would have to be diverted from the Tuolumne River to meet the WSIP goals and objectives. This possibility was examined as Variant 1 in Vol. 4, Chapter 8, pp. 8-7 to 8-10 of the Draft PEIR. The environmental consequences of Variant 1 are described in Vol. 4, Chapter 8, pp. 8-70 to 8-72 of the Draft PEIR.

L_MID-TID1-21 The WSIP does not include plans to fully treat the SFPUC’s entire water supply. The federal Safe Drinking Water Act generally requires filtration of drinking water supplies; however, the U.S. Environmental Protection Agency and California Department of Health Services have approved the use of unfiltered water from the Hetch Hetchy watershed because Hetch Hetchy water is of such high quality. These agencies and the SFPUC concluded that watershed protection and disinfection are sufficient to produce a safe water supply. The SFPUC does not expect to be required to filter Hetch Hetchy water by 2030, and so full treatment was not included in the WSIP. The improvements contained in the WSIP are compatible with the addition of filtration, if filtration ever becomes necessary in the future.

L_MID-TID1-22 Refer to **Response L_MID-TID1-02**.

L_MID-TID1-23 Refer to **Response L_MID-TID-05** and **Section 14.3, Master Response on Proposed Dry-Year Water Transfer** (Vol. 7, Chapter 14) for more detail on the proposed water transfer from TID/MID to the SFPUC.

L_MID-TID1-24 Refer to **Response L_MID-TID-14**.

L_MID-TID1-25 Some of the information requested in this comment is available and pertinent to the PEIR. As noted in the Draft PEIR, the 2005 regional system firm yield is estimated to be 219 mgd (Vol. 1, Chapter 3, Table 3.5, p 3-26). This is lower than the normal regional system firm yield of 226 mgd because of current restrictions on storage in Calaveras Reservoir. The expected 2030 regional system firm yield with the WSIP is estimated to be 256 mgd. However, the requested information on the Tuolumne River and local system firm yield is not relevant (or available), since the WSIP was designed with consideration of the regional system as a whole. The average annual delivery via the San Joaquin Pipeline under 2005 conditions is about 247,700 acre-feet. The corresponding value under 2030 conditions with the WSIP would be about 274,500 acre-feet. Other project-specific data on the San Joaquin Pipeline system is relevant to the programmatic impact analysis in the PEIR and would be considered as necessary during project-level environmental review of the San Joaquin Pipeline System project (SJ-3).

With respect to units of flow, please refer to **Response L_MID-TID1-04**. With respect to the assumptions used in WSIP water supply planning and modeling, refer to **Response L_MID-TID1-01**, which addressed the commenter's request for flow assumptions.

L_MID-TID1-26 Please refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14) for a discussion of climate change that augments the discussion presented in Section 5.7.6 of the Draft PEIR (Vol. 3, Chapter 5, pp. 5.7-92 to 5.7-96). Section 14.11 provides more detailed and up-to-date information on climate change as it relates to the SFPUC regional water supply and the proposed WSIP.

L_MID-TID1-27 Comment noted with respect to TID's opinion that any additional diversions from the Tuolumne River should be made from the lower reaches of the river.

The Draft PEIR analyzes an alternative under which the SFPUC would divert water from the Tuolumne River just upstream of the river's confluence with the San Joaquin River. It is referred to as the Lower Tuolumne River Diversion Alternative and is described in Vol. 4, Chapter 9, pp. 9-59 to 9-66 together with its potential environmental consequences.

The Draft PEIR did not evaluate a lower Tuolumne River alternative involving diversion at about River Mile 25, close to the existing diversion for TID's future Regional Water Supply Project. Such an alternative would be more costly than the Lower Tuolumne River Diversion Alternative examined in the Draft PEIR and, as noted in the comment letter, would have fewer environmental benefits.

L_MID-TID1-28 Please refer to the Draft PEIR (Vol. 1, Chapter 3, pp. 3-86 to 3-88) for a description of the required actions and approvals applicable to the overall WSIP. This discussion identifies TID and MID as responsible for review and approval of water transfer agreements with the SFPUC and/or for amendments to the SFPUC's water bank account in Don Pedro Reservoir. Please also refer to **Section 14.3, Master Response on Proposed Dry-Year Water Transfer** (Vol. 7, Chapter 14, Section 14.3.3) for additional information.

L_MID-TID1-29 The Draft PEIR provides a description of the purpose of the program environmental impact report (Vol. 1, Chapter 1, pp. 1-1 to 1-4), as well as a description of WSIP project refinements and other WSIP components that had been developed since the SFPUC's issuance of the preliminary WSIP program description in January 2006 (Vol. 1, Chapter 3, pp. 3-23 to 3-25). The San Francisco Planning Department is responsible for preparation of the PEIR and the environmental review of individual WSIP projects. The Planning Department maintains a mailing list for the WSIP PEIR and also uses this list for the project-level CEQA documents for individual WSIP projects to inform all potentially affected agencies, organizations, and individuals.

The commenter's impression (gained at the scoping meeting) that the PEIR would be the overarching document for all projects funded through the WSIP bond measure is incorrect (see Draft PEIR Vol. 1, Chapter 3, pp. 3-23 and 3-24). Some water system improvements funded through the WSIP bond measure are treated as independent projects, are not addressed in the PEIR, and would be subject to separate CEQA compliance processes.

The Lower Tuolumne Diversion Alternative is evaluated in Chapter 9 of the Draft PEIR (Vol. 4, pp. 9-59 to 9-66). The SFPUC recognizes that if it chose to proceed with this alternative, or any course of action described in the PEIR, it would have to coordinate with TID and MID, and that regional and specific projects would need to be closely coordinated. TID's Regional Surface Water Supply Project is described in the Draft PEIR cumulative impact analysis (Vol. 3, Chapter 5, Section 5.7).

Modesto Irrigation District / Turlock Irrigation District, Walter Ward / Robert Nees, Assistant General Manager / Assistant General Manager, 10/29/07

L_MID-TID2-01 See **Response L_MID-TID1-01**.

L_MID-TID2-02 See **Response L_MIDTID1-01**.

City of Millbrae, Ronald Popp, Director of Public Works, 9/28/07

L_Millbr-01 This comment, which describes the City of Millbrae's evaluation of groundwater and recycled water projects, its pursuit of conservation practices, and its reliance on the SFPUC for water supplies, is noted.

L_Millbr-02 This comment regarding the urgency and critical nature of the WSIP and the need to proceed expeditiously with the WSIP is acknowledged. Please refer to **Section 14.1**, **Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Section 14.1.2) for more discussion.

L_Millbr-03 This comment expressing the City of Millbrae's support for the Modified WSIP Alternative is acknowledged. Please refer to **Section 14.10, Master Response on Modified WSIP Alternative** (Vol. 7, Chapter 14) for additional discussion and analysis of this alternative.

L_Millbr-04 Please refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.5) and **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.6) for clarification regarding current and estimated future municipal and agricultural diversions from the Tuolumne River.

L_Millbr-05 The Draft PEIR analyzes the environmental impacts of the proposed program, which includes a level of service objective to limit rationing during an extended drought to a maximum of 20 percent systemwide. Chapter 8 of the Draft PEIR analyzes a WSIP variant in which rationing during an extended drought would be limited to a maximum of 10 percent systemwide (Vol. 4, Chapter 8, pp. 8-33 to 8-35). The PEIR does not include a variant with 30 percent systemwide rationing, although the No Program Alternative and Aggressive Conservation/Water Recycling and Local Groundwater Alternative would result in rationing greater than 20 percent systemwide during drought periods. With respect to CEQA requirements related to economic evaluations, please refer to **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 7, Section 14.1.6).

City of Milpitas, Thomas Williams, City Manager, 9/27/07

L_Milpts-01 This comment regarding the urgency to rehabilitate the SFPUC water delivery system to help the system withstand a major earthquake is acknowledged. Please see **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Section 14.1.4) for more details related to this issue.

L_Milpts-02 This comment emphasizing the City of Milpitas' reliance on SFPUC water supplies and urging rapid implementation of the WSIP is acknowledged.

L_Milpts-03 This comment, which contains information on the current percentage of Milpitas' supply provided by the SFPUC and additional information on Milpitas' other sources of supply, is noted. The percentages of supply provided by the SFPUC, as shown in Draft PEIR Table 7.3 (Vol. 4, Chapter 7, p. 7-18), are from the 2001 base year used in the wholesale customer demand study, and the percentage shown in Table 3.3 (Vol. 1, Chapter 3, p. 3-18) and Table 7.2 (Vol. 4, Chapter 7, p. 7-15) and the customer summary referenced in this comment is the projected percentage for 2030. For wholesale customers with multiple sources of supply, such as Milpitas, the percentage of water supplied by the SFPUC would be expected to vary from year to year, as this comment illustrates. This change does not alter the analysis or conclusions presented in the Draft PEIR. By virtue of the City's making this comment, this information is included as part of the Final PEIR.

L_Milpts-04 This comment on Milpitas' maintenance of separate potable distribution systems is noted. By virtue of the City's making this comment, this information is included in the Final PEIR.

L_Milpts-05 As shown in Table 7.3 (Vol. 4, Chapter 7, p. 7-18), the City of Milpitas' 2001 to 2030 projected demand increase is 48 percent, while its change in purchases from the SFPUC is only 20 percent; this substantial difference between demand and purchases noted in the Draft PEIR is consistent with information provided in this comment (i.e., that a larger portion of the City's future demand increase is expected in areas served by the Santa Clara Valley Water District). The customer-specific summary (Chapter 7, p. 7-49) notes that Milpitas' 2030 purchase estimate of 8.2 million gallons per day (mgd) is below its current water supply assurance of 9.23 mgd. By virtue of the City's making this comment, this information is included in the Final PEIR.

L_Milpts-06 This comment describing Milpitas' recycled water use is noted. Draft PEIR Table 3.3 (Vol. 1, Chapter 3, p. 3-18) and Table 7.2 (Vol. 4, Chapter 7, p. 7-15) show the City's 2030 projected use of 1.77 mgd of recycled water which, as this comment notes, represents approximately 10 percent of its total 2030 water supply.

L_Milpts-07 The introduction to Section 7.3.6, Customer-Specific Summaries, of the Draft PEIR (Vol. 4, Chapter 7, p. 7-34) indicates that the discussions in this section refer to Table 7.2.

L_Milpts-08 This comment providing additional information regarding the City's water conservation programs is acknowledged.

L_Milpts-09 Draft PEIR Tables C.4 and C.5 (Vol. 5, Appendix C, pp. C-21 and C-24) indicate that the SFPUC proposes to utilize Calaveras Road for the Calaveras Dam Replacement (SV-2) construction access route for workers, equipment, and haul/delivery trucks. The City's concerns with potential construction-related traffic impacts on Milpitas streets will be addressed in detail as part of project-level CEQA review for the Calaveras Dam Replacement project.

L_Milpts-10 Draft PEIR Table C.3 (Vol. 5, Appendix C, p. C-16) indicates there are no alternative locations under consideration in Milpitas. In response to this comment, the City of Milpitas has been added to Table 3.11, WSIP Improvement Projects – Affected Jurisdictions, under SV-2, Calaveras Dam Replacement project (Vol. 1, Chapter 3, p. 3-60). The table is revised as follows:

Affected County and City Jurisdictions	SV-2, Calaveras Dam Replacement
Milpitas	A

L_Milpts-11 The commenter requests that the Midtown and Transit Area Specific Plans for Milpitas be added to Draft PEIR Table 4.17-3 (Vol. 2, Chapter 4, p. 4.17-14) in Section 4.17, Cumulative Effects. Since the Draft PEIR cumulative analysis did not include specific plans, these plans have not been included. In general, many factors determine how and when growth will occur in a specific plan area, and it is therefore too speculative to assume that all or some portion of the expected growth in a specific plan area would coincide with the construction of WSIP facility projects. As stated in note "b" of Table 4.17-3 (Vol. 2, Chapter 4, p. 4.17-20), the schedules of projects included in the cumulative projects list were based on the most current information available during preparation of the Draft PEIR, as of July 2006.

The Draft PEIR (Vol. 2, Chapter 4, p. 4.17-2) states that the project information listed in Tables 4.17-1 through 4.17-5 (Vol. 2, Chapter 4, pp. 4.17-3 to 4.17-35) was compiled based on consultations with local jurisdictions within the San Joaquin, Sunol Valley, Bay Division, Peninsula, and San Francisco Regions (the local planning, community development, and public works/engineering departments of these agencies) as well as review of EIRs and information posted on agency websites. Specific development projects are listed in Tables 4.17-1 through 4.17-5, and they include projects located within specific plan areas. Several development projects in the Midtown Specific Plan area could be included in

Table 4.17-3: the North Main Street utilities and streetscape improvements, Milpitas Public Library, Devries Place senior housing, and the Santa Clara Valley Health Center Milpitas and Parking Structure. These projects are already under construction along the Main Street corridor. Since none of them are adjacent to any proposed WSIP facility projects, the cumulative impacts resulting from these projects in combination with the WSIP projects and other projects listed in the Draft PEIR would be limited to cumulative construction-related traffic impacts on I-880 and Highway 237 as well as associated regional air quality and noise impacts. The Draft PEIR identifies cumulative traffic, air quality, and noise impacts as potentially significant and unavoidable. The significance of these impacts would remain unchanged when these projects are added.

L_Milpts-12 The bullet characterizing growth in Milpitas and East Palo Alto as more recent is in reference to the preceding bullet, which indicates that the highest rates of growth within most cities in the wholesale customer service area occurred in the decades following World War II (i.e., the 1950s through the 1970s). By contrast, according to the Milpitas General Plan (p. 1-1), "with the exception of the Great Mall…and some scattered subdivisions and buildings along Main Street, virtually the entire City has been built over the last 30 years" (City of Milpitas, 2002a). Additional information on growth trends in select jurisdictions in the service area, including Milpitas, is presented in Draft PEIR Appendix E.4. The additional information on growth over the past decade provided in this comment supplements, and is not inconsistent with, the information presented in the Draft PEIR on the longer-term development trends in the area.

L_Milpts-13 This comment states that the Draft PEIR characterization of growth for the city (Vol. 4, Chapter 7, pp. 7-49 and 7-50) is incorrect and cites examples of smart growth planning. The City's commitment to smart growth described in this comment is acknowledged. The PEIR text referenced in this comment accurately describes adjustments that were made to the Demand Side Management Least-Cost Planning Decision Support System (DSS) model, which reflected assumptions about future growth in the city at the time. Model assumptions and adjustments were made in close consultation with city staff, and the City submitted a form concurring with the projected demands. While the City of Milpitas faults the characterization of future growth within the city and suggests that adjustments be made to the demand model, Comment L_Milpts-05 shows that the City's purchase request is consistent with that presented in the Draft PEIR. Therefore, no change to the PEIR text or to the description of account categories in the demand model is warranted.

L_Milpts-14 The "Water Customer – Selected Population Projection for 2030" column in Draft PEIR Table 7.8 (Vol. 4, Chapter 7, p. 7-28) refers to population projections used in the DSS demand model, based on the projection source selected by each wholesale customer. The information presented in this column (including a 2030 population of 88,841 for Milpitas) is based on the *SFPUC Wholesale Customer Demand*

Technical Memorandum (URS, 2004b, Table 4-1, p. 4-5 of the memorandum), which also indicates that the Association of Bay Area Governments' (ABAG) *Projections 2002* subregional series was Milpitas' choice of projections source. This is consistent with the "Wholesale Customer Population Projection Selection Form" submitted by Milpitas (dated February 6, 2004), which indicated the City selected ABAG as the projections source, and that this selection was a revision of an earlier projections source selection.

With respect to the general plan projection, contrary to the information in the Draft PEIR (and consistent with information presented in this comment), the Midtown Milpitas Specific Plan is included in the current general plan projection of 77,100.[1] Therefore, in response to this comment, the Draft PEIR has been revised as shown below. However, the suggested revision (of taking the additional population expected to result from the proposed Transit Area Specific Plan project and adding it to the general plan projection) has not been made, because the comparison of general plan and water demand study projections presented in Table 7.8 and discussed in the individual customer summaries is between the demand study projections and those in *adopted* general plans; the Transit Area Specific Plan has not yet been adopted.

The entry for Milpitas in Table 7.8 (Vol. 4, Chapter 7, p. 7-28) has been revised as shown on the following page.

The customer-specific summary (Vol. 4, Chapter 7, p. 7-50, first full paragraph) for Milpitas is revised as follows:

> The customer-selected population projection used for Milpitas in the demand study is ~~generally consistent with~~ approximately 15 percent greater than the growth identified in the city's general plan and is generally consistent with (about 3 percent less than) the growth projected by ABAG. ~~The 2030 Milpitas population presented in the demand study is approximately 6 percent less than that cited in the city's general plan, as amended by the Midtown Milpitas Specific Plan, and projected by ABAG.~~ The City of Milpitas is currently preparing a Transit Area Specific Plan that is expected, upon adoption, to result in a buildout population of 95,014, somewhat greater than the population projection used in the demand study (Williams, 2007).

[1] This is at variance with the *Midtown Milpitas Specific Plan Draft Environmental Impact Report* (DEIR) analysis (Chapter 5 of that report, p. 5-1), which states that ABAG projected a 2020 population of 77,100 for Milpitas based on the land use regulations and land availability in effect prior to the adoption of the specific plan. (*Projections 2000*, published in 1999, shows this projection of 77,100 in 2020 and is assumed to be the projection series cited in the specific plan DEIR.)

TABLE 7.8
COMPARISON OF WATER DEMAND POPULATION ESTIMATES AND GENERAL PLAN POPULATION ESTIMATES

Customer	UWMP Population in 2030	*Projections 2005* Population in 2030	Water Customer-Selected Population Projection for 2030	General Plan Population Projection for General Plan Projection Year[a]	General Plan Projection Year[a]	Difference: Water Customer Population and General Plan Population	% Difference (Water Customer Population and General Plan Population)
Customer-selected projection less than or equal to general plan projection							
City of East Palo Alto	32,712	43,600	32,712	34,600	2020	-1,888	-5.5%
~~City of Milpitas~~[b]	~~91,400~~	~~91,400~~	~~88,841~~	~~94,400~~	~~2020~~	~~5,559~~	~~-5.9%~~
City of Sunnyvale[c]	159,100	159,100	151,610	154,600	2020	-2,990	-1.9%
Customer-selected projection 1–10% greater than general plan projection							
Alameda County Water District	405,900	404,700	379,931	359,113		20,818	5.8%
Fremont	*257,100*	*257,200*		*229,213*	2020		
Newark	*53,500*	*53,400*		*49,800*	2020		
Union City	*95,300*	*94,100*		*80,100*	2020		
CWS–South San Francisco District and Westborough Water District[d,e]	83,450	73,660	73,884	68,685	2020	5,199	7.6%
City of Daly City	115,651	127,200	115,651	113,000	2020	2,651	2.3%
City of Hayward	162,800	171,500	162,757	160,300	2025	2,457	1.5%
Town of Hillsborough		11,800	12,708	11,800	2025	908	7.7%
Mid-Peninsula Water District[f]	28,930	28,800	27,997	27,800	2010	197	0.7%
City of Millbrae	24,200	24,500	25,174	24,860	2015	314	1.3%
City of Mountain View	81,700	89,600	81,670	75,200	2010	6,470	8.6%
City of Palo Alto	69,199	92,200	69,199	62,880	2010	6,319	10.0%
City of Redwood City	93,329	122,300	93,535	87,100	2020	6,435	7.4%
City of San Bruno	See note g	50,700	48,229	46,400	2020	1829	3.9%
City and County of San Francisco[h]	849,942	903,300	849,942	811,100	2020	38,842	4.8%
City of Santa Clara	140,698	142,100	140,698	129,900	2010	10,798	8.3%
Customer-selected projection more than 10% greater than general plan projection							
City of Burlingame[h,i]	31,900	31,900	34,967	31,500	2010	3,467	11.0%
City of Milpitas[b]	91,400	91,400	88,841	94,400	2020	5,559	-5.9%
Coastside County Water District[j]	24,973	27,100	24,973	21,065	2020	3,908	18.6%
Estero Municipal Improvement District (MID)[j,k]	40,866	32,500	40,096	30,803	2010	9,293	30.2%

NOTE: Most wholesale customer service areas are not contiguous with city limits (or with the city and its planning area), and therefore the population projections from the jurisdictions' general plans and ABAG should be considered as general comparisons only. The following are not included, because the water service area and jurisdictional boundaries are not comparable or the general plan of the corresponding jurisdiction does not provide a comparable population projection: Brisbane, CWS–Bear Gulch, CWS–Mid-Peninsula, Menlo Park, North Coast County Water District, Purissima Hills Water District, San Jose North, Skyline County Water District, and Stanford University.

a The general plan population projection and projection year are the most distant population projection and the year of the most distant population projection available in the general plan or general plan element.
b The general plan population is based on the 2002 Milpitas General Plan. ~~population shown in the general plan (77,100) plus the additional population accommodated by the Milpitas Midtown Specific Plan, as advised by Milpitas Planning Department staff (Carrington, 2006), to account for 5,000 additional units with an assumed density of 3.46 persons per unit (i.e., an added population of 17,300). The City has amended to general plan to incorporate the specific plan.~~
c The service area of Sunnyvale's water district is contiguous with the city limits; however, another water utility (CWS) serves several small areas within the city.
d CWS = California Water Service Company.
e CWS–South San Francisco serves South San Francisco, Colma, a small portion of Daly City, and the unincorporated area of Broadmoor. The water customer estimate for the Westborough Water District is from the district's Urban Water Management Plan. The general plan figure is the combined total projected population in the South San Francisco and Colma general plans (67,400 and 1,285 respectively); the general plan projection year shown (2020) is for South San Francisco, the projection year for Colma is 2005. The *Projections 2005* figure is for South San Francisco and Colma (71,800 and 1,860, respectively).
f The Mid-Peninsula Water District serves Belmont, portions of San Carlos, and unincorporated areas of San Mateo County. The general plan figure is for the city of Belmont, from the 2002 housing element.
g The San Bruno UWMP (City of San Bruno, 2007) shows two population projections for 2030: 50,700, based on ABAG's *Projections 2005*, and 48,229, based on the City's Adjusted Draft General Plan.
h UWMP and *Projections 2005* figures are for household population, since the customer-selected figure is for household population.
i Burlingame's water system also serves portions of unincorporated Burlingame and a few properties in the city of San Mateo and town of Hillsborough.
j The general plan figure is for the city of Half Moon Bay only, from the 1993 Half Moon Bay Local Coastal Program Land Use Plan (Table 9.3, Chapter 9, page 189). In addition to incorporated Half Moon Bay, the Coastside County Water District serves unincorporated areas of Half Moon Bay and the unincorporated communities of El Granada, Miramar, and Princeton by the Sea.
k Estero MID serves Foster City and a portion of the city of San Mateo. The general plan figure is for Foster City.

SOURCES: ABAG, 2004; ACWD, 2005; CWS-South San Francisco, 2006; ~~Carrington, 2006;~~ City and County of San Francisco, 2004; City of Belmont, 2002a; City of Burlingame, 2002a; City of Burlingame, 2005; City of Daly City, 2004a; City of Daly City, 2005; City of East Palo Alto, 1999a; City of East Palo Alto, 2006; City of Foster City, 2001a; City of Fremont, 2003a; City of Half Moon Bay, 1993; City of Hayward, 2002a; City of Hayward, 2005; City of Millbrae, 1998a; City of Millbrae, 2005; City of Milpitas, 2002a; City of Milpitas, 2005; City of Mountain View, 2002a; City of Mountain View, 2005; City of Newark, 2002a; City of Palo Alto, 1998a; City of Palo Alto, 2005b; City of Redwood City, 2005b; City of Redwood City, 2007a; City of San Bruno, 2003a; City of San Bruno, 2007; City of Santa Clara, 2002a; City of Santa Clara, 2005; City of South San Francisco, 2002a; City of Sunnyvale, 2002a; City of Sunnyvale, 2005; City of Union City, 2002a; Coastside County Water District, 2005; Estero MID, 2005; Hannaford and Hydroconsult, 2004; Mid-Peninsula Water District, 2006; SFPUC, 2005; Town of Colma, 1999a; Town of Hillsborough, 2002a; URS, 2004a, Westborough Water District, 2005.

The first bullet on p. 7-27, Section 7.3.3, General Plan Projections, is revised as follows:

> The population projections used for ~~three~~ <u>two</u> of the wholesale customers (East Palo Alto~~, Milpitas,~~ and Sunnyvale) in the water demand studies are less than (from 2 to 6 percent less) the projections assumed in the general plans of the jurisdictions served by them.

The first two bullets on p. 7-29 are revised as follows:

> The population projections assumed by ~~three~~<u>four</u> of the water customers (Burlingame, Coastside County Water District, ~~and~~ Estero Municipal Improvement District<u>, and Milpitas)</u> appear to be more than 10 percent greater than the projections assumed in the respective general plans. The difference in these projections results from the longer 2030 planning horizon used for water planning and differences in the geographic area covered by the two sets of projections. Based on the difference in projections, however, the growth assumed in the demand models of these wholesale customers does not appear to be fully addressed in the general plans of the cities served by these customers.
>
> Two of the ~~three~~<u>four</u> customers assuming greater population growth than is reflected in the respective general plan also show somewhat greater growth than is forecasted in *Projections 2005*. Both of these customers (Burlingame and Estero MID) serve unincorporated areas outside the city's jurisdictional boundaries and ABAG subregional areas. In addition, Estero MID serves a non-segregable part of the city of San Mateo that is not included with the *Projections 2005* forecast for Foster City used in this comparison. The other customer (Coastside County Water District) assumes less growth than is forecasted in *Projections 2005* for 2030.

In response to this comment and comment L_RdwdCty-08, the last complete bullet on p. 7-7, Section 7.1.2, Summary of Conclusions, is revised as follows:

> The population growth assumed in the demand projections for most (~~17~~<u>15</u> of ~~20~~19) of the water customers for which comparable general plan projections are available is similar to the growth anticipated in the general plans of the cities served by them.

In Vol. 1, Summary, p. S-62, the last full paragraph, second from the last sentence, is revised as follows:

> In some jurisdictions (Foster City, Half Moon Bay<u>, Milpitas,</u> and Burlingame), the WSIP could support more population growth than is forecasted in adopted general plans.

In Vol. 5, Appendix E.3, the entries for Milpitas in Tables E.3.34 and E.3.36 (pp. E.3-38 and E.3-40) are revised as shown on the following pages.

TABLE E.3.34
COMPARISON OF GENERAL PLAN POPULATION PROJECTIONS TO ABAG PROJECTIONS 2005, UWMPS, AND WATER CUSTOMER DEMAND PROJECTIONS FOR GENERAL PLAN PROJECTION YEAR

	Population in General Plan Population Year[a] Shown in:			
	General Plan[b]	**UWMP**	**SFPUC Water Customer Projection[c]**	***Projections 2005***
Cities with GP Population Projections for 2005				
Colma	1,285	see note d	see note d	1,350
Cities with GP Population Projections for 2010				
Belmont	27,800	see note f	see note f	26,000
Burlingame	31,500	30,200	31,648	30,200
Foster City	30,803	37,424[e]	36,284[e]	29,800
Menlo Park	35,285	10,344[g]	12,619[g]	35,600
Mountain View	75,200	75,200	74,422	76,000
Palo Alto	62,880	64,168	62,823	78,300
San Mateo	100,700	see note h	see note h	102,500
Santa Clara	129,900	116,527	115,630	117,400
Cities with GP Population Projections for 2015				
Millbrae	24,860	23,055	23,253	22,800
Cities with GP Population Projections for 2020				
Atherton	8,400	see note i	see note i	7,900
Daly City	113,000	114,291[j]	112,363[j]	120,200
East Palo Alto	34,600	29,612	29,844	39,600
Fremont	229,213	236,700	see note k	236,900
Half Moon Bay (incl. unincorporated area)	21,065	23,262	22,679	26,400
Milpitas	77,100~~94,400~~[l]	82,400	79,846	82,400
Newark	49,800	50,000	see note k	49,000
Redwood City	87,100	89,492 [m]	89,519[m]	114,200
San Bruno	46,400	n.a.	45,642	47,700
San Francisco	811,100	840,000	818,954[n]	859,200
South San Francisco+Westborough Water District[d]	67,400	78,200	70,156	68,700
Sunnyvale	154,600	146,900	144,629	146,900
Union City	80,100	86,000	see note k	82,600
Cities with GP Population Projections for 2025				
Hayward	160,300	160,300	158,909	165,900
Hillsborough	11,800	n.a	12,520	11,600
Cities with GP Population Projections for Years Prior to 2005 or No Applicable GP: Projections for 2030				
Brisbane + Guadalupe Valley MID		n.a.	6,164	5,240
Los Altos Hills		n.a.	see note o	10,700
Los Trancos County Water District[p]		see note q	1,094	n.a.
Pacifica		42,100	47,829	42,200
Portola Valley		see note q	see note q	7,800
San Carlos		see note h	see note h	35,200
Stanford University		n.a.	27,924	n.a.
Woodside		see note q	see note q	7,300

n.a. = Not available.

[a] Population shown is for the year of the most distant population projection available in the general plan, housing element, or other relevant local document (see note b). For example, populations in all columns for cities in the group titled “Cities with GP Population Projections for 2005” are populations projected for or estimated in 2005.
[b] Population estimates are from each city’s general plan (GP) or the general plan’s EIR.
[c] Estimates for years between 2001 and 2030 are derived by Mundie & Associates, based on linear interpolations of water customer projections, except for the 2020 San Francisco projection, which is included in the Retail Demand Study (Hannaford and Hydroconsult, 2004).
[d] CWS – South San Francisco District (Colma, parts of Daly City and South San Francisco, plus unincorporated areas) UWMP projection for 2020 is 64,050, and Westborough Water District (which serves part of South San Francisco) UWMP projection for 2020 is 14,150; the CWS-South San Francisco water customer projection for 2020 is 56,006 and the Westborough Water District water customer projection is the same as its UWMP projection (14,150).

TABLE E.3.36
COMPARISON OF GENERAL PLAN POPULATION PROJECTIONS TO ABAG *PROJECTIONS 2005*, UWMPS, AND WATER CUSTOMER DEMAND PROJECTIONS FOR 2030

	General Plan Population Projection	UWMP Population in 2030	SFPUC Water Customer Population Projection for 2030	*Projections 2005* Population in 2030
Cities with GP Population Projections for 2005				
Colma	1,285	see note a	see note a	1,860
Cities with GP Population Projections for 2010				
Belmont	27,800	see note c	see note c	28,800
Burlingame	31,500	31,900	34,967[d]	31,900
Foster City	30,803	40,866	40,096[b]	32,500
Menlo Park	35,285	11,218[e,f]	13,655[e,f]	41,100
Mountain View	75,200	81,700[g]	81,670[g]	89,600
Palo Alto	62,880	69,199	69,199	92,200
San Mateo	100,700	see note h	see note b,h	119,800
Santa Clara	129,900	140,698	140,698	142,100
Cities with GP Population Projections for 2015				
Millbrae	24,860	24,200	25,174	24,500
Cities with GP Population Projections for 2020				
Atherton	8,400	see note f	see note f	8,200
Daly City	113,000[i]	115,651 [j,k]	115,651[j,k]	127,200
East Palo Alto	34,600	32,712	32,712	43,600
Fremont	229,213	257,100	see note l	257,200
Half Moon Bay (incl. uninc. area)	21,065	24,973[m]	24,973[m]	27,100
Milpitas	77,100~~94,400~~[n]	91,400	88,841	91,400
Newark	49,800	53,500	see note l	53,400
Redwood City	87,100	93,329 [o]	93,535 [o]	122,300
San Bruno	46,400	see note p	48,229[q]	50,700
San Francisco	811,100	871,000	849,942	924,600
South San Francisco+Westborough Water District	67,400	83,450[r]	73,884[r]	71,800
Sunnyvale	154,600	159,100	151,610	159,100
Union City	80,100	95,300	see note l	94,100
Cities with GP Population Projections for 2025				
Hayward	160,300	162,800	162,757	171,500
Hillsborough	11,800		12,708[s]	11,800
Cities with GP Population Projections for Years Prior to 2005 or No Applicable GP Population Projection				
Brisbane + Guadalupe Valley MID		n.a.	6,164	5,240
Los Altos Hills		n.a.	see note t	10,700
Los Trancos Valley Water Dist.[u]		n.a.	1,094[v]	
Pacifica		42,100	47,829	42,200
Portola Valley		n.a.	see notes f,w	7,800
San Carlos		see note h	see note h	35,200
Stanford University			27,924	n.a.
Woodside			see note f	7,300

a CWS – South San Francisco District (Colma, parts of Daly City and South San Francisco, plus unincorporated areas) UWMP projection for 2030 is 60,150; water customer projection for 2030 is 59,584.
b Estero MID (Foster City and part of San Mateo) projection for 2030 is 40,096.
c Mid-Peninsula Water District (Belmont, part of San Carlos, and portions of unincorporated San Mateo County) UWMP projection for 2030 is 28,930; water customer projection is 27,997.
d Figure shown is for the City of Burlingame Water Agency, which also serves some unincorporated area.
e Figure shown is for the portion of Menlo Park (less than half of the city's population) served by the City of Menlo Park Water Agency.
f CWS – Bear Gulch District (Atherton, parts of Menlo Park, Portola Valley, and Woodside, plus unincorporated areas) projection for 2030 is 73,719; UWMP population projection is 59,220 in 2030.
g Figure shown is for the City of Mountain View Water Agency, which serves most of Mountain View.
h CWS – Mid-Peninsula District (parts of the cities of San Mateo and San Carlos plus unincorporated areas) water customer population projection for 2030 is 139,834; UWMP population projection for 2030 is 134,010.
i The Housing Element of the Daly City General Plan projects this population within the city limits and a population of 120,000 within the (planning) area that corresponds to the ABAG subregional study area.
j Figure shown is for the portion of Daly City served by the City of Daly City Water Agency.
k Parts of Daly City and South San Francisco are served by CWS – South San Francisco District.
l Alameda County Water District (cities of Fremont, Newark, and Union City) projection for 2030 is 379,931.
m Figure shown is for the Coastside County Water District, which also serves unincorporated Half Moon Bay.
n Based on Milpitas General Plan~~ adjusted to include 5,000 housing units added by the Midtown Milpitas Specific Plan (Carrington, 2006)~~.
o Figure shown is for City of Redwood City Water Agency, which also serves part of the City of San Carlos, part of the Town of Woodside, and portions of unincorporated San Mateo County.
p San Bruno UWMP (City of San Bruno,2007) shows two population projections for 2030: 50,700, based on ABAG's *Projections 2005*, and 48,229, based on the City's Adjusted Draft General Plan.
q Figure shown is for the City of San Bruno Water Agency, which also serves some unincorporated areas.
r Figures shown are for the CWS – South San Francisco District plus Westborough Water District. For the Westborough Water District, the water customer projection is the same as the UWMP projection.
s Figure shown is for the Town of Hillsborough Water Agency, which also serves some unincorporated area.
t Purissima Hills Water District, (part of Los Altos Hills and some unincorporated area) projection is 6,763.
u Los Trancos County Water District was acquired by CWS in 2006, and is now part of the CWS – Bear Gulch District. Because it was a separate entity when these projections were prepared, it is presented separately in this analysis.
v Includes a portion of Portola Valley.
w Portola Valley is served by CWS – Bear Gulch District; a portion of the city was previously served by the Los Trancos County Water District, which is now part of CWS – Bear Gulch.

SOURCE: See sources for Table E.3.34.

In Vol. 5, Appendix E.3, the footnote and source information for Milpitas in Table E.3.34 (p. E.3-39) is revised as follows:

l Based on Milpitas General Plan ~~adjusted to include 5,000 housing units added by the Midtown Milpitas Specific Plan~~.

SOURCES: ABAG, 2004; ACWD, 2005; CWS-Mid-Peninsula, 2005 ;CWS-South San Francisco, 2006; ~~Carrington, 2006;~~ City and County of San Francisco, 2004; City of Belmont, 2002; City of Burlingame, 2002a; City of Burlingame, 2005; City of Daly City, 2004; City of Daly City, 2005; City of East Palo Alto, 1999; City of East Palo Alto, 2006; City of Foster City, 2001; City of Fremont, 2003; City of Half Moon Bay, 1993; City of Hayward, 2002; City of Hayward, 2005; City of Menlo Park, 1994; City of Menlo Park, 2006; City of Millbrae, 1998; City of Millbrae, 2005; City of Milpitas, 2002b; City of Milpitas, 2005; City of Mountain View, 2002; City of Mountain View, 2005; City of Newark, 2002; City of Palo Alto, 1998; City of Palo Alto, 2005; City of Redwood City, 2005; City of Redwood City, 2007; City of San Bruno, 2003; City of San Bruno, 2007; City of San Mateo, 2001; City of Santa Clara, 2002; City of Santa Clara, 2005; City of South San Francisco, 2002; City of Sunnyvale, 2002; City of Sunnyvale, 2005; City of Union City, 2002; Coastside County Water District, 2005; Estero MID, 2005; Hannaford and Hydroconsult, 2004; Mid-Peninsula Water District, 2006; SFPUC, 2005; Town of Atherton, 2002; Town of Colma, 1999; Town of Hillsborough, 2002; URS, 2004, Westborough Water District, 2005.

Vol. 5, Appendix E.4 (p. E.4-8, second paragraph) is revised as shown:

> …With the Midtown Milpitas Specific Plan, the city's general plan population at buildout is projected to be 77,100 ~~94,400~~ (City of Milpitas, 2002a; City of Milpitas, 2002c~~; Carrington, 2006~~).

In addition, the entry for Milpitas in Table E.4.1 (p. E.4-3) is revised as shown on p. 5.3-141.

L_Milpts-15 This comment stating that the Elmwood development receives water from sources other than the SFPUC is noted. Draft PEIR Appendix E.6 presents a review of select EIRs on major projects within wholesale customer service areas. The purpose of the review was to see whether mitigation measures identified in a given jurisdiction's general plan EIR were being applied (if appropriate) at the project level within the jurisdiction. The summary regarding Elmwood does not address the source of water for this development, which, as indicated, is not germane to this program-level review. Therefore, the text revision suggested in this comment is not necessary.

L_Milpts-16 This comment, which expands on and is not inconsistent with the summary of information on the Midtown Milpitas Specific Plan presented in Draft PEIR Appendix E.4.2, is noted. This information does not alter the analysis or conclusions of the Draft PEIR. By virtue of the City's making this comment, this additional information is included in the Final PEIR, and no change to the Draft PEIR text is required.

TABLE E.4.1
CURRENT POPULATION ESTIMATES AND FORECASTS OF SELECT JURISDICTIONS

	Actual Population	Current Population Estimates			Forecasts				
City	**U.S. Census 2000 Population**	**U.S. Census Estimated 2005 Population**	**ABAG *Projections 2005* Estimated 2005 Population**	**Department of Finance Estimated 2006 Population**	**General Plan Buildout (Year) and Population**	**ABAG *Projections 2005 Population* Projection for General Plan Buildout Year**	**Customer-Selected Population Projection for 2030**	**ABAG *Projections 2005 Population* Projection for 2030**	**Percent of Supply (after Conservation) from SFPUC**
Alameda County									
ACWD[a]	312,753	311,600	326,900	325,396	(2020) 359,113	368,500	379,931	404,700	25%
Fremont	*203,413*	*200,468*	*211,100*	*210,158*	*(2020) 229,213*	*236,900*		*257,200*	
Newark[b]	*42,471*	*41,956*	*44,400*	*43,486*	*(2020) 49,800*	*49,000*		*53,400*	
Union City	*66,869*	*69,176*	*71,400*	*71,752*	*(2020) 80,100*	*82,600*		*94,100*	
Hayward	140,030	140,293	146,300	146,398	(2025) 160,300	165,900	162,757	171,500	100%
Santa Clara County									
Milpitas[c]	62,698	63,383	65,400	65,276	(2020) 77,100~~94,400~~	82,400	88,841	91,400	48%
Santa Clara[d]	102,361	105,402	108,700	110,771	(2010) 129,900	117,400	140,698	142,100	15%
Sunnyvale	131,760	128,902	131,700	133,544	(2025) 154,600	146,900	151,610	159,100	46%
San Mateo County									
East Palo Alto	29,506	32,242	32,700	32,083	(2020) 34,600	39,600	32,712	43,600	100%
Redwood City[e]	75,402	73,114	77,300	76,087	(2020) 87,100	87,100	93,535	122,300	92%
San Mateo[f]	92,482	91,081	94,900	94,315	(2010) 100,700	98,000	See note f	119,800	100%
South San Francisco[g]	60,552	60,735	61,000	61,824	(2020) 67,400	68,500	73,884	71,800	See note g
City and County of San Francisco	776,733	739,426	798,000	798,680	(2020) 811,100	859,200	849,942	924,600	97%

[a] ACWD = Alameda County Water District; U.S. Census, ABAG, Department of Finance (DOF), and general plan figures are the combined estimates for Fremont, Newark and Union City.
[b] The Newark general plan projection shown is from the 2002 housing element. The general plan (adopted in 1992) projected a buildout population of 51,942 by the year 2007.
[c] The general plan population is based on the population shown in the general plan~~ (77,100) plus the additional population accommodated by the Milpitas Midtown Specific Plan, as advised by Milpitas Planning Department staff (Carrington, 2006), to account for 5,000 additional units with an assumed density of 3.46 persons per unit (i.e., an added population of 17,300). The City has amended to general plan to incorporate the specific plan~~.
[d] The general plan figure for Santa Clara is the average of the range projected in the general plan at buildout of 124,800 to 135,000.
[e] The SFPUC provides 100 percent of Redwood City's potable water. The remaining 8 percent of demand indicated here is met by recycled water.
[f] The city of San Mateo is served by the CWS–Mid-Peninsula District and Estero MID, both of which serve other jurisdictions as well; therefore, the 2030 population assumed by the wholesale customers is not comparable to projections for the city. The SFPUC supplies all of the CWS–Mid Peninsula District's and Estero MID's water.
[g] The customer-selected projection is the combined 2030 estimates for the CWS–South San Francisco District (which also serves Colma and a small portion of unincorporated San Mateo County), based on the 2004 demand study, and the Westborough Water District, based on the district's 2005 UWMP. The SFPUC would supply approximately 85 percent of the CWS–South San Francisco District's water supply in 2030 and 100 percent of Westborough Water District's. The other figures are for South San Francisco only.

SOURCES: ABAG, 2004; California Department of Finance, 2006; ~~Carrington, 2006;~~ City of East Palo Alto, 1999a; City of Fremont, 2003a; City of Hayward, 2002a; City of Milpitas, 2002a; City of Newark, 2002; City of Redwood City, 2007c; City of San Mateo, 2001; City of Santa Clara, 2002; City of Sunnyvale, 2002; City of Union City, 2002a; U.S. Census Bureau, 2000; U.S. Census Bureau, 2006; URS, 2004, Westborough Water District, 2005.

City of Mountain View, Cathy Lazarus, Public Works Director, 9/28/07

L_MtnVw-01 This comment regarding the urgent need to implement the WSIP improvements to protect public health, safety, and the economic well-being of Bay Area residents is acknowledged. Please see **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Sections 14.1.2 to 14.1.4) for more discussion.

L_MtnVw-02 This comment, which requests acknowledgement for water agencies' efforts to manage water demand and provides additional information on the City of Mountain View's water conservation programs, is acknowledged. The Draft PEIR (Chapter 3, Table 3.3, p. 3-18 and Chapter 7, Table 7.2, p. 7-15) indicates the projected savings from conservation in 2030 for each wholesale customer. The additional information provided in Attachment 1 of the comment letter is included in the administrative record for the Draft PEIR.

L_MtnVw-03 This comment, which clarifies that water service within Mountain View's jurisdictional boundaries is provided by a City-owned and -operated water utility, is noted.

City of Newark, John Becker, City Manager, 10/1/07

L_Newark-01 The commenter indicates that the City of Newark will be directly affected by the Bay Division Pipeline Reliability Upgrade project (BD-1) and identifies the need for mitigation to address public inconvenience, public safety (traffic controls and emergency access), and construction-related disruption. Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.2) for detailed discussion of the issues raised by this comment. This master response provides information on the appropriate level of detail of an impact analysis at the program level versus the project level. The project-level EIR for Bay Division Pipeline Reliability Upgrade project will present more detailed information and provide additional analysis of impacts in Newark, including more detailed mitigation measures.

L_Newark-02 This comment is acknowledged. Please refer to **Response L_Newark-01**.

City of Palo Alto, Yoriko Kishimoto, Mayor, 9/25/07

L_PaloAlto-01 This comment expresses support for the WSIP and the adequacy of the Draft PEIR in satisfying CEQA requirements. It summarizes the more detailed comments presented in Comments L_PaloAlto-04 through L_PaloAlto-06; refer to **Responses L_PaloAlto-04** through **L_PaloAlto-06** for the specific responses.

L_PaloAlto-02 This comment requests clarification on the development of the water demand projections. The Draft PEIR (Vol. 1, Chapter 3, pp. 3-16 to 3-22) describes the methodology used to develop the 2030 water demand projections; more detailed information is provided in Draft PEIR Appendix E.2 (Vol. 5). As described on p. 3-21, each wholesale customer selected the source of the demographic projections to be used in the development of the water demand projections for its service area. According to the *SFPUC Wholesale Customer Water Demand Projections Technical Memorandum* (Table 4-1 of that report, p. 4-5; URS, 2004a), the Association of Bay Area Governments' (ABAG) *Projections 2002* was used to develop water demand for Palo Alto, not the comprehensive plan (as implied in this comment). The "Wholesale Customer Population Selection Form" submitted by the City of Palo Alto to the SFPUC also indicates that *Projections 2002* was the City's choice of projections for use in the demand model. The inconsistency between ABAG's 2030 projections and the population forecast used is discussed in the customer summary presented in Draft PEIR Chapter 7 (Vol. 4, pp. 7-51 and 7-52). The comment that the Draft PEIR demand estimates for Palo Alto are realistic is acknowledged.

L_PaloAlto-03 The commenter's request for coordination of the construction schedule for the BDPL Nos. 3 and 4 Crossovers project (BD-2) with Palo Alto's Gunn High School is addressed by SFPUC Construction Measure #1, Neighborhood Notice (Draft PEIR, Vol. 4, Chapter 6, p. 6-4), which states, "Where schools would be affected, the SFPUC will coordinate with school facility managers to schedule construction for time periods with the least impact on school activities to ensure student safety and to minimize disruption to educational and recreational uses of the school property."

L_PaloAlto-04 The comment stressing support for the timely completion the seismic improvement projects contained in the WSIP is acknowledged. The information related to Palo Alto City Council Resolution #7986 is also noted. Please refer to **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Section 14.1.2) for more discussion.

L_PaloAlto-05 This comment expressing Palo Alto's support for the Modified WSIP Alternative is acknowledged. Please see **Section 14.10, Master Response on Modified WSIP Alternative** (Vol. 7, Chapter 14) for additional discussion and analysis of this alternative. In addition, this comment noting the critical need for completing the seismic upgrades and repairs of the regional system is also acknowledged. Please see **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Sections 14.1.2 and 14.1.3) for further discussion.

L_PaloAlto-06 This comment expressing Palo Alto's support for the transfers of conserved water as a component of the Modified WSIP Alternative is acknowledged. The commenter also expresses support for the following: wholesale customers paying for the best conservation measures; aggressive pursuit of conservation opportunities in the Modesto and Turlock Irrigation District service areas; and creating a net increase in flows in the lower Tuolumne River to improve environmental conditions. These comments are acknowledged. See **Response L-BAWSCA1-47**.

L_PaloAlto-07 This information related to the City of Palo Alto's support for the efficient use of natural resources, including water supplies, is noted. Please see **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14), for more discussion on assumptions regarding conservation and recycling used in the development of the WSIP. Please also refer to **Section 14.3, Master Response on Proposed Dry-Year Water Transfer** (Vol. 7, Chapter 14, Section 14.3.2) for additional discussion regarding the proposed dry-year transfer under the WSIP.

L_PaloAlto-08 This comment, which describes Palo Alto's commitment to stewardship of the natural environment and smart growth practices, is acknowledged. As it does not address the adequacy or accuracy of the PEIR, no response is provided.

L_PaloAlto-09 This comment, which describes Palo Alto's energy and water conservation programs, water consumption patterns, and water rates, is acknowledged. This information is conceptually included in the PEIR by virtue of its inclusion in this comment letter.

L_PaloAlto-10 The opinion of the commenter supporting WSIP Variant 3 – 10% Rationing is acknowledged. See **Response L_Burlgme-02** for clarification of the difference between the proposed program and Variant 3.

L_PaloAlto-11 As described in the Draft PEIR (Vol. 4, Chapter 9, pp. 9-116 and 9-122 to 9-123), the SFPUC investigated several alternatives for an exchange or transfer with the Santa Clara Valley Water District (SCVWD) as part of the WSIP background studies exploring regional water supply opportunities. The SFPUC and SCVWD explored options using the existing intertie or a new intertie, as well as exchanges through delivery to the eight customers in common to both the SCVWD and SFPUC. In general, an exchange would involve the SFPUC advancing water in wet years to the SCVWD in exchange for supplies from the SCVWD in dry years. However, the SCVWD does not have the capacity or need for additional water supplies during wet years. At times when the SFPUC has additional supplies available for delivery to the SCVWD, the SCVWD cannot use the water directly or store it. Additionally, the SCVWD does not have excess water to transfer to the SFPUC in normal or dry years. Therefore, this concept was eliminated from further consideration because it would not provide a dependable future water source for the SFPUC regional system.

L_PaloAlto-12 The commenter requests that the PEIR include an elevation/schematic of the control building and/or vault associated with the BDPL Nos. 3 and 4 Crossovers project (BD-2). Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.2) for detailed discussion of the issues raised by this comment. This master response provides information on the appropriate level of detail of an impact analysis at the program level versus the project level. At the programmatic level, design details for individual WSIP projects are not presented or evaluated in the Draft PEIR. The City will have the opportunity to review and comment on the design details of this project during project-level CEQA review.

The commenter states that the mitigation measures should not allow WSIP projects to violate city ordinances (including but not limited to noise and nuisance ordinances), and that the City should be consulted at an early stage in this project. The Draft PEIR (Vol. 2, Chapter 4, p. 4.2-9) states that the SFPUC is exempt from complying with the building and zoning ordinances of other cities. However, project consistency with the provisions of other local ordinances (including noise and tree ordinances) will be determined during the preparation of project-level CEQA documentation. The Palo Alto tree, vegetation, and noise ordinances are identified in Tables 4.6-1 and 4.10-2 (Vol. 2, Chapter 4, pp. 4.6-34 and 4.10-7). As stated in the Draft PEIR (Vol. 2, Chapter 4, p. 4.10-6), time and noise limits prescribed in local noise ordinances were used in the PEIR as criteria to determine the significance of project impacts under CEQA. Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.3) regarding the City's request for early consultation. This request for early consultation has been noted in Draft PEIR Table C.6 (Vol. 5, Appendix C, p. C-26).

L_PaloAlto-13 The commenter requests substitution of SFPUC Construction Measure #1 with specific language requiring coordination with Gunn High School, but such coordination is already required, as described in **Response L_PaloAlto-03**.

The commenter also mentions that additional right-of-way/easement could be needed for the BDPL Nos. 3 and 4 Crossovers project (BD-2), and also questions the visibility of the control building/vault from Foothill Boulevard. Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.2) for information on the appropriate level of detail of an impact analysis at the program level versus the project level. As a program-level document, the Draft PEIR does not present or evaluate the design details for the individual WSIP projects. The City will have the opportunity to review and comment on the design details of this project during project-level CEQA review.

L_PaloAlto-14 The commenter requests that information on the city's parks and open space be updated. The number of parks and total urban park acreage presented in the Draft PEIR (Vol. 2, Chapter 4, p. 4.12-10) are based on information cited in the *City of Palo Alto Comprehensive Plan* (1998) and subsequent revisions to the plan made in July 2007. In response to this comment, the Draft PEIR (Vol. 2, Chapter 4, p. 4.12-10, fourth full paragraph) has been revised as follows:

City of Palo Alto

According to the City of Palo Alto, the city has a total of 4,358 acres of parkland and open space areas, including 32 urban parks encompassing approximately 200 acres and several large open-space and nature preserves. Foothill Park is approximately 1,400 acres and the Arastradero Preserve is approximately 610 acres (City of Palo Alto, 2007). ~~Palo Alto operates 29 parks encompassing approximately 190 acres. Palo Alto Baylands Nature Preserve, a popular hiking and bird-watching area on San Francisco Bay, encompasses 1,940 acres and contains 15 miles of multi-use trails, a segment of the Bay Trail, an athletic center, picnic facilities, an art park, and the Baylands Nature Interpretive Center.~~ The City of Palo Alto owns the wetlands south of Cooley Landing (in East Palo Alto) in the vicinity of the BDPL Reliability Upgrade (BD-1) pipeline alignment (City of Palo Alto, 1998). A BDPL Nos. 3 and 4 Crossovers (BD-2) crossover facility would be adjacent to the sports fields at Gunn High School.

The following reference has been added to the Draft PEIR (Vol. 2, Chapter 4, p. 4.12-29):

City of Palo Alto, Yoriko Kishimoto, Mayor, letter communication, September 25, 2007.

L_PaloAlto-15 The commenter's recommendation to correct the last paragraph under the Cultural Resources section (Vol. 4, Chapter 6, p. 6-6) is not necessary. The Environmental Review Officer represents the Planning Department.

L_PaloAlto-16 This comment repeats points made in Comment L_Palo Alto-02 about the projections source used in the demand model and differences between ABAG projections and those used in the demand model. Please refer to **Response L_PaloAlto-02**. The Draft PEIR (Vol. 4, Chapter 7, p. 7-52) indicates that the population and employment projections used for Palo Alto in the demand study are about 10 percent and 16 percent higher, respectively, than those shown for 2010 in the comprehensive plan (referred to as the general plan), consistent with this comment's request. The comment that the City considers the forecast shown in the PEIR to be reasonable is acknowledged.

Purissima Hills Water District, Daniel Seidel, President, 9/28/07

L_PHWD1-01 This comment regarding the critical need for a reliable water supply and fire safety in Los Altos Hills is acknowledged. Please refer to **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Section 14.1.4) for more discussion.

L_PHWD1-02 The commenter correctly indicates that Foothill Community College is within the Purissima Hills Water District, although the data presented in the comment (number of students and ratio of students to residents) were not specific factors in the SFPUC's demand model. As described in the Draft PEIR (Vol. 1, Chapter 3, pp. 3-20 and 3-21), base-year water usage was established using actual account data, and the growth rates reflected in the selected source of population and employment projections were used to project future water demand. According to the *SFPUC Wholesale Customer Water Demand Projections Technical Report*, Foothill College is the District's largest water customer (URS, 2004a, Appendix A, p. A-5). The comment comparing the District's per-acre water consumption with more densely developed communities is acknowledged. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2) for further discussion of per-capita demand.

L_PHWD1-03 This comment regarding the urgency for the seismic improvements contained in the WSIP is acknowledged. Please refer to **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Section 14.1.3) for more discussion.

L_PHWD1-04 Please refer to **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Section 14.1.2) for an expanded discussion of the overall need for the WSIP and of the potential consequences of not implementing the proposed program.

L_PHWD1-05 This comment expressing an opinion related to growth inducement is acknowledged. The growth-inducement potential associated with the WSIP is analyzed in Chapter 7 of the Draft PEIR (Vol. 4).

L_PHWD1-06 This comment, which states that water conservation measures are included in projected demand estimates and that, as these measures are implemented, further improvements in water conservation will be more difficult to achieve, is acknowledged. As a point of clarification, the column showing "2030 Demand (with Plumbing Code Savings)" in Table 3.3 (Vol. 1, Chapter 3, p. 3-18), Table 7.2 (Vol. 4, Chapter 7, p. 7-15), and Table 7.3 (Vol. 4, Chapter 7,

p. 7-18) does not include conservation measures but only savings that would result from plumbing codes and natural fixture replacement. Projected savings from conservation measures are shown in a separate column in Tables 3.3 and 7.2, and are reflected in the estimates of 2030 purchases from the SFPUC regional system shown in all three tables.

L_PHWD1-07 The opinion of the commenter regarding the reliability and impacts of desalination is acknowledged. This is consistent with information presented in the Draft PEIR regarding Variant 2 – Regional Desalination for Drought (Vol. 4, Chapter 8, pp. 8-24 to 8-32).

L_PHWD1-08 This comment urging rapid certification of the WSIP PEIR and expeditious implementation of the WSIP is acknowledged.

L_PHWD1-09 In response to this comment, the typographical error in the Draft PEIR (Vol. 4, Chapter 7, p. 7-52, fourth paragraph, third sentence) is revised as follows:

> In 2001, the Purissima Hills Water District served 6,032—or 64 percent—of the approximately ~~94,555~~ 9,455 residences estimated for the town and its sphere of influence in 2000.

L_PHWD1-10 This comment questions the Draft PEIR's inclusion of employment estimates for Los Altos Hills, stating "There are no commercial enterprises in Los Altos Hills" and estimating institutional employment in Los Altos Hills "in the 450–470 range."

The employment estimates presented in the Draft PEIR (Vol. 5, Appendix E.3, Tables E.3.12, E.3.24, and E.3.35, pp. E.3-16, E.3-17, and E.3-40) are from the Association of Bay Area Governments' (ABAG) *Projections 2002*, *Projections 2003*, and *Projections 2005* and include public employees (for example, city and school district jobs). These projections furnish the following detail for the estimates of existing employment in 2000 for Los Altos Hills:

	Projections 2002 and Projections 2003	**Projections 2005**
Agriculture & Mining	30	80
Manufacturing & Wholesale	60	190[a]
Retail	50	60
Service	2,290	1,560
Financial & Professional		440
Health, Educational, & Recreational		1,120
Other	290	490
Total	2,720	2,380

[a] Manufacturing, wholesale, and transportation

SOURCES: ABAG, *Projections 2002*, *Projections 2003*, and *Projections 2005.*

According to ABAG staff, the *Projections* employment estimates are based on information from the Census Transportation Planning Package, adjusted to include self-employed workers as well as those who might have been on vacation or otherwise absent from work during the census week (Wong, 2008). This information is assembled by census place (not census tract): for example, Los Altos Hills (Los Altos would be a separate and distinct census place). ABAG staff also note that Foothill College is located in Los Altos Hills (as indicated in Comment L_PHWD-02). The Foothill–De Anza Community College District employs 1,185 workers (604 full-time and 577 part-time) in Los Altos Hills at the college and the district's central offices (Parisi, 2008).

L_PHWD1-11 Information on the town's website (http://www.losaltoshills.ca.gov/government/general planupdate.html) indicates that the revision of the Land Use Element has not yet been initiated. The Open Space and Recreation Element adopted in April 2007 and currently posted on the town's website was reviewed to ensure there were no differences between it and the version cited in the Draft PEIR relevant to the PEIR's growth-inducement analysis or conclusions. The following text from the Draft PEIR (Vol. 4, Chapter 7, p. 7-62 and p. 7-90) is revised as follows:

> Land Use Element (n.d.) and Open Space~~,~~ and Recreation Element~~s~~ ~~(n.d.)~~ (2007).

The following reference on page 7-90 of the Draft PEIR is revised as follows to reflect the above text revision:

> Town of Los Altos Hills Land Use, Open Space, and Recreation Elements, http://www.losaltoshills.ca.gov/government/town-documents.html (website accessed March 15, 2006), 2007.

Purissima Hills Water District, Daniel Seidel, President, 9/19/07

[See Public Hearing Transcript, Palo Alto, pp. 23–27]

L_PHWD2-01 This comment raises a similar issue to that raised in Comment PHWD1-02 (concerning the influence of the community college on water demand). Please refer to **Response L_PHWD1-02**.

L_PHWD2-02 This comment expresses concern related to the vulnerability of the regional water system to seismic hazards and urges rapid completion of the CEQA process so that seismic improvements can be made. Comment noted. Please see **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Sections 14.1.2 to 14.1.4) for more discussion of the numerous reasons the program is need.

Redwood City, Peter Ingram (sent by Chu Chang), Community Development Services Director, 9/27/07

L_RdwdCty-01 This comment, which provides background information related to Redwood City's water service area and expresses support for the WSIP, is acknowledged.

L_RdwdCty-02 This comment regarding the overall urgency of program implementation is acknowledged. Please see **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Section 14.1.2) for more discussion.

L_RdwdCty-03 This comment expressing support for the programmatic approach to the environmental review of the WSIP is acknowledged.

L_RdwdCty-04 The commenter's description of the City of Redwood City's current involvement with SFPUC engineering staff on the design drawings for the Bay Division Pipeline (BDPL) Reliability Upgrade project (BD-1) is acknowledged. The City indicates that its involvement with the SFPUC on this project will continue through the project-level CEQA process, which is the appropriate process for addressing concerns specific to that project.

L_RdwdCty-05 This comment, which states concurrence with the demand methodology and the water demand estimates for Redwood City presented in the Draft PEIR, is acknowledged.

L_RdwdCty-06 The commenter provides minor corrections for the acreages of some city parks described in the Draft PEIR. The acreages for Fleishman Park, Hawes Park, and Red Morton Parks presented in the Draft PEIR (Vol. 2, Chapter 4, p. 4.12-11) were the acreages listed on Redwood City's website for the Recreation and Community Department. The acreage provided by the commenter for Hawes Park (1.59 acres) is the same acreage presented in the Draft PEIR.

In response to this comment, the Draft PEIR text (Vol. 2, Chapter 4, p. 4.12-11, first full paragraph) is revised as follows:

> **City of Redwood City**
>
> Redwood City owns and operates 30 parks, including small neighborhood parks, larger multi-use parks, a dog park, a skate park, and two outdoor pools (City of Redwood City, 2007c). The BDPL Reliability Upgrade project (BD-1) is in the vicinity of Fleishman Park, Hawes Park, and Red Morton Park. The 0.64~~0.63~~-acre Fleishman Park has play equipment, a play area, picnic area, barbeque pits, and restrooms (City of Redwood City, 2007a). Hawes Park contains ball fields and restroom facilities on ~~covering~~ 1.59 acres (City of Redwood City, 2007a~~b~~). Red

> Morton Park encompasses 30.89 ~~31.74~~ acres and has pools, ball fields, play areas and equipment, picnic areas, barbeque pits, tennis courts, basketball courts, and restroom facilities (City of Redwood City, 2007a~~d~~). An alternative site for the BDPL 3 and 4 Crossovers project (BD-2) could also be located in Redwood City (City of Redwood City, 1991).

The corresponding references are revised as follows (Vol. 2, Chapter 4, p. 4.12-29):

> City of Redwood City, Peter Ingram, Community Services Director, letter communication, September 27, 2007a.
>
> ~~City of Redwood City, Parks, Recreation and Community Services, Fleishman Park, available online at www.redwoodcity.org/parks/parksandpools/parks/parks_fleishman.html, accessed May 17, 2007a.~~
>
> ~~City of Redwood City, Parks, Recreation and Community Services, Hawes Park, available online at www.redwoodcity.org/parks/parksandpools/parks/parks_hawes.html, accessed May 17, 2007b.~~
>
> City of Redwood City, Parks, Recreation and Community Services, Parks and Pools, available online at www.redwoodcity.org/parks/parksandpools/index.html, accessed May 17, 2007b~~c~~.
>
> ~~City of Redwood City, Parks, Recreation and Community Services, Red Morton Park, available online at www.redwoodcity.org/parks/parksandpools/parks/parks_red.html, accessed May 17, 2007d.~~"

L_RdwdCty-07 The commenter requests to know the cutoff date used for project selection in Section 4.17.2, Projects Considered in Cumulative Analysis. As stated in note "b" of Table 4.17-3 (Vol. 2, Chapter 4, p. 4.17-20), the schedules of projects included in the cumulative projects list were based on the most current information available during preparation of the Draft PEIR as of July 2006.

L_RdwdCty-08 The explanation for using the urban water management plan (UWMP) as the source for the population projection in the demand model is noted. A comparison of jurisdictions' general plans is presented in the growth-inducement analysis because, unlike UWMPs, general plans (and general plan elements) reflect the land uses and level of growth planned for a jurisdiction by the land use planning agency; general plans also receive environmental review under CEQA prior to adoption, and are formally adopted or approved by the local decision-making body (i.e., city council or county board of supervisors).

Contrary to the information presented in the Draft PEIR, the recent Downtown Precise Plan was not adopted as an amendment to Redwood City's general plan, and therefore the 1990 general plan stands as the currently adopted plan. The 1990 general plan states that: "… Redwood City can be expected to experience a brisk housing market and a steady population increase through the next decade, reaching 70,000 by the year 2000" but that this estimate may need to be raised or lowered, depending on various contingencies (Redwood City Strategic General Plan, Population Characteristics, Chapter 4, p. 4-1). This population projection provides a sense, within the adopted general plan, of the City's expectations regarding future growth, which is what the "General Plan Projection" column of Draft PEIR Table 7.8 (Vol. 4, Chapter 7, p. 7-28) and the reference to general plan projections in the customer summaries is meant to convey. However, as stated in the Draft PEIR (p. 7-27, footnote 19; p. 7-28, table note; and p. 7-29, footnote 21), general plans with projection years earlier than 2005 were not considered comparable to the 2030 population and employment projections used in the water demand studies and consequently were not included in Tables 7.8 or 7.9 (and tables comparing WSIP projections with general plan projections in Appendix E.3). Since the buildout year for Redwood City's 1990 Strategic General Plan is 2000, as noted in this comment, the general plan projection should not be included in the table.

Therefore, in response to this comment, the Draft PEIR is revised as follows:

> In Chapter 7, p. 7-27, the first paragraph, second sentence, of Section 7.3.3, and footnotes 19 and 20, are revised as follows:
>
> > The general plans of ~~22~~21 cities that are served in whole or part by SFPUC and its wholesale customers have population projections that are generally comparable to the water customer-selected population projections.[19, 20]
> >
> > [19] ….The ~~22~~21 cities, served by ~~20~~19 water customers, represent approximately two-thirds of 32 cities served by the SFPUC regional system.
> >
> > [20] The ~~22~~21 cities are served by ~~19~~18 wholesale customers and the SFPUC (for the retail service area), referred to collectively here as ~~20~~19 water customers.
>
> In Chapter 7, p. 7-27, the second from the last bullet is revised as follows:
>
> > The population projections assumed for ~~14~~13 of the water customers (ACWD, CWS-South San Francisco in combination with Westborough Water District, Daly City, Hayward, Hillsborough, Mid-Peninsula Water District, Millbrae, Mountain View, Palo Alto, ~~Redwood City,~~ San Bruno, San Francisco, and Santa Clara) are

> higher but within 1 to 10 percent of the projections presented in the respective general plans.

In response to this comment and comment L_Milpts-14, the last complete bullet on p. 7-7, Section 7.1.2, Summary of Conclusions, is revised as follows:

> The population growth assumed in the demand projections for most (~~17~~15 of ~~20~~19) of the water customers for which comparable general plan projections are available is similar to the growth anticipated in the general plans of the cities served by them.

The entry for Redwood City in Table 7.8 (p. 7-28) is revised as shown on the following page.

The customer-specific summary (Chapter 7, Section 7.3.6, p. 7-53, third full paragraph) for Redwood City is revised as follows:

> The customer-selected population projection used for Redwood City in the demand study is ~~generally consistent with the buildout population identified in the city's general plan (which has a 2020 planning horizon), and~~ 24 percent lower than ABAG's 2030 population projection of 122,300 for the city and its sphere of influence. The 2030 Redwood City population used in the demand study is approximately 7 percent more than the 2020 projection shown in the city's Downtown Precise Plan ~~(a recent amendment of the general plan)~~, which cites ABAG's *Projections 2005* forecast for 2020 for the city within its jurisdictional boundary. The city's water service area includes only a portion of the city's sphere of influence (Bonte, 2006), which probably accounts for the difference between the ABAG projection for the city and its sphere of influence and that assumed in the demand study. ABAG's 2030 projection of 94,300 for Redwood City within the city limits only is within 1 percent of the demand study projection. Because the population projection included in the city's 1990 general plan is for 2000 (earlier than 2005), it is not considered comparable to the 2030 WSIP population projection for this analysis. According to the city, the 2003 UWMP was selected for use in the demand study because the UWMP contained the most current population and employment projections at the time.

In response to this comment and Comment L_Milpts-14, the last complete bullet on p. 7-7 in Chapter 7, Section 7.1.2, Summary of Conclusions, is revised as shown in **Response L_Milpts-14**.

In Vol. 5, Appendix E.3, the entries for Redwood City have been deleted from Tables E.3.34 and E.3.36 (pp. E.3-38 and E.3-40), as shown on pp. 15.3-158 to 15.3-159.

TABLE 7.8
COMPARISON OF WATER DEMAND POPULATION ESTIMATES AND GENERAL PLAN POPULATION ESTIMATES

Customer	UWMP Population in 2030	*Projections 2005* Population in 2030	Water Customer-Selected Population Projection for 2030	General Plan Population Projection for General Plan Projection Year[a]	General Plan Projection Year[a]	Difference: Water Customer Population and General Plan Population	% Difference (Water Customer Population and General Plan Population)
Customer-selected projection less than or equal to general plan projection							
City of East Palo Alto	32,712	43,600	32,712	34,600	2020	-1,888	-5.5%
City of Milpitas[b]	91,400	91,400	88,841	94,400	2020	5,559	-5.9%
City of Sunnyvale[c]	159,100	159,100	151,610	154,600	2020	-2,990	-1.9%
Customer-selected projection 1–10% greater than general plan projection							
Alameda County Water District	405,900	404,700	379,931	359,113		20,818	5.8%
Fremont	*257,100*	*257,200*		*229,213*	2020		
Newark	*53,500*	*53,400*		*49,800*	2020		
Union City	*95,300*	*94,100*		*80,100*	2020		
CWS–South San Francisco District and Westborough Water District[d,e]	83,450	73,660	73,884	68,685	2020	5,199	7.6%
City of Daly City	115,651	127,200	115,651	113,000	2020	2,651	2.3%
City of Hayward	162,800	171,500	162,757	160,300	2025	2,457	1.5%
Town of Hillsborough		11,800	12,708	11,800	2025	908	7.7%
Mid-Peninsula Water District[f]	28,930	28,800	27,997	27,800	2010	197	0.7%
City of Millbrae	24,200	24,500	25,174	24,860	2015	314	1.3%
City of Mountain View	81,700	89,600	81,670	75,200	2010	6,470	8.6%
City of Palo Alto	69,199	92,200	69,199	62,880	2010	6,319	10.0%
~~City of Redwood City~~	~~93,329~~	~~122,300~~	~~93,535~~	~~87,100~~	~~2020~~	~~6,435~~	~~7.4%~~
City of San Bruno	See note g	50,700	48,229	46,400	2020	1829	3.9%
City and County of San Francisco[h]	849,942	903,300	849,942	811,100	2020	38,842	4.8%
City of Santa Clara	140,698	142,100	140,698	129,900	2010	10,798	8.3%
Customer-selected projection more than 10% greater than general plan projection							
City of Burlingame[h,i]	31,900	31,900	34,967	31,500	2010	3,467	11.0%
Coastside County Water District[j]	24,973	27,100	24,973	21,065	2020	3,908	18.6%
Estero Municipal Improvement District (MID)[j,k]	40,866	32,500	40,096	30,803	2010	9,293	30.2%

NOTE: Most wholesale customer service areas are not contiguous with city limits (or with the city and its planning area), and therefore the population projections from the jurisdictions' general plans and ABAG should be considered as general comparisons only. The following are not included, because the water service area and jurisdictional boundaries are not comparable or the general plan of the corresponding jurisdiction does not provide a comparable population projection: Brisbane, CWS–Bear Gulch, CWS–Mid-Peninsula, Menlo Park, North Coast County Water District, Purissima Hills Water District, Redwood City, San Jose North, Skyline County Water District, and Stanford University.

a The general plan population projection and projection year are the most distant population projection and the year of the most distant population projection available in the general plan or general plan element.
b The general plan population is based on the population shown in the general plan (77,100) plus the additional population accommodated by the Milpitas Midtown Specific Plan, as advised by Milpitas Planning Department staff (Carrington, 2006), to account for 5,000 additional units with an assumed density of 3.46 persons per unit (i.e., an added population of 17,300). The City has amended to general plan to incorporate the specific plan.
c The service area of Sunnyvale's water district is contiguous with the city limits; however, another water utility (CWS) serves several small areas within the city.
d CWS = California Water Service Company.
e CWS–South San Francisco serves South San Francisco, Colma, a small portion of Daly City, and the unincorporated area of Broadmoor. The water customer estimate for the Westborough Water District is from the district's Urban Water Management Plan. The general plan figure is the combined total projected population in the South San Francisco and Colma general plans (67,400 and 1,285 respectively); the general plan projection year shown (2020) is for South San Francisco, the projection year for Colma is 2005. The *Projections 2005* figure is for South San Francisco and Colma (71,800 and 1,860, respectively).
f The Mid-Peninsula Water District serves Belmont, portions of San Carlos, and unincorporated areas of San Mateo County. The general plan figure is for the city of Belmont, from the 2002 housing element.
g The San Bruno UWMP (City of San Bruno,2007) shows two population projections for 2030: 50,700, based on ABAG's *Projections 2005*, and 48,229, based on the City's Adjusted Draft General Plan.
h UWMP and *Projections 2005* figures are for household population, since the customer-selected figure is for household population.
i Burlingame's water system also serves portions of unincorporated Burlingame and a few properties in the city of San Mateo and town of Hillsborough.
j The general plan figure is for the city of Half Moon Bay only, from the 1993 Half Moon Bay Local Coastal Program Land Use Plan (Table 9.3, Chapter 9, page 189). In addition to incorporated Half Moon Bay, the Coastside County Water District serves unincorporated areas of Half Moon Bay and the unincorporated communities of El Granada, Miramar, and Princeton by the Sea.
k Estero MID serves Foster City and a portion of the city of San Mateo. The general plan figure is for Foster City.

SOURCES: ABAG, 2004; ACWD, 2005; CWS-South San Francisco, 2006; Carrington, 2006; City and County of San Francisco, 2004; City of Belmont, 2002a; City of Burlingame, 2002a; City of Burlingame, 2005; City of Daly City, 2004a; City of Daly City, 2005; City of East Palo Alto, 1999a; City of East Palo Alto, 2006; City of Foster City, 2001a; City of Fremont, 2003a; City of Half Moon Bay, 1993; City of Hayward, 2002a; City of Hayward, 2005; City of Millbrae, 1998a; City of Millbrae, 2005; City of Milpitas, 2002a, City of Milpitas, 2005; City of Mountain View, 2002a; City of Mountain View, 2005; City of Newark, 2002a; City of Palo Alto, 1998a; City of Palo Alto, 2005b; ~~City of Redwood City, 2005b; City of Redwood City, 2007a;~~ City of San Bruno, 2003a; City of San Bruno, 2007; City of Santa Clara, 2002a; City of Santa Clara, 2005; City of South San Francisco, 2002a; City of Sunnyvale, 2002a; City of Sunnyvale, 2005; City of Union City, 2002a; Coastside County Water District, 2005; Estero MID, 2005; Hannaford and Hydroconsult, 2004; Mid-Peninsula Water District, 2006; SFPUC, 2005; Town of Colma, 1999a; Town of Hillsborough, 2002a; URS, 2004a, Westborough Water District, 2005.

TABLE E.3.34
COMPARISON OF GENERAL PLAN POPULATION PROJECTIONS TO ABAG PROJECTIONS 2005, UWMPs, AND WATER CUSTOMER DEMAND PROJECTIONS FOR GENERAL PLAN PROJECTION YEAR

	Population in General Plan Population Year[a] Shown in:			
	General Plan[b]	UWMP	SFPUC Water Customer Projection[c]	*Projections 2005*
Cities with GP Population Projections for 2005				
Colma	1,285	see note d	see note d	1,350
Cities with GP Population Projections for 2010				
Belmont	27,800	see note f	see note f	26,000
Burlingame	31,500	30,200	31,648	30,200
Foster City	30,803	37,424[e]	36,284[e]	29,800
Menlo Park	35,285	10,344[g]	12,619[g]	35,600
Mountain View	75,200	75,200	74,422	76,000
Palo Alto	62,880	64,168	62,823	78,300
San Mateo	100,700	see note h	see note h	102,500
Santa Clara	129,900	116,527	115,630	117,400
Cities with GP Population Projections for 2015				
Millbrae	24,860	23,055	23,253	22,800
Cities with GP Population Projections for 2020				
Atherton	8,400	see note i	see note i	7,900
Daly City	113,000	114,291[j]	112,363[j]	120,200
East Palo Alto	34,600	29,612	29,844	39,600
Fremont	229,213	236,700	see note k	236,900
Half Moon Bay (incl. unincorporated area)	21,065	23,262	22,679	26,400
Milpitas	94,400[l]	82,400	79,846	82,400
Newark	49,800	50,000	see note k	49,000
~~Redwood City~~	~~87,100~~	~~89,492[m]~~	~~89,519[m]~~	~~114,200~~
San Bruno	46,400	n.a.	45,642	47,700
San Francisco	811,100	840,000	818,954[n]	859,200
South San Francisco+Westborough Water District[d]	67,400	78,200	70,156	68,700
Sunnyvale	154,600	146,900	144,629	146,900
Union City	80,100	86,000	see note k	82,600
Cities with GP Population Projections for 2025				
Hayward	160,300	160,300	158,909	165,900
Hillsborough	11,800	n.a	12,520	11,600
Cities with GP Population Projections for Years Prior to 2005 or No Applicable GP: Projections for 2030				
Brisbane + Guadalupe Valley MID		n.a.	6,164	5,240
Los Altos Hills		n.a.	see note o	10,700
Los Trancos County Water District[p]		see note q	1,094	n.a.
Pacifica		42,100	47,829	42,200
Portola Valley		see note q	see note q	7,800
San Carlos		see note h	see note h	35,200
Stanford University		n.a.	27,924	n.a.
Woodside		see note q	see note q	7,300

n.a. = Not available.

a Population shown is for the year of the most distant population projection available in the general plan, housing element, or other relevant local document (see note b). For example, populations in all columns for cities in the group titled “Cities with GP Population Projections for 2005” are populations projected for or estimated in 2005.

b Population estimates are from each city’s general plan (GP) or the general plan’s EIR.

c Estimates for years between 2001 and 2030 are derived by Mundie & Associates, based on linear interpolations of water customer projections, except for the 2020 San Francisco projection, which is included in the Retail Demand Study (Hannaford and Hydroconsult, 2004).

d CWS – South San Francisco District (Colma, parts of Daly City and South San Francisco, plus unincorporated areas) UWMP projection for 2020 is 64,050, and Westborough Water District (which serves part of South San Francisco) UWMP projection for 2020 is 14,150; the CWS-South San Francisco water customer projection for 2020 is 56,006 and the Westborough Water District water customer projection is the same as its UWMP projection (14,150).

TABLE E.3.36
COMPARISON OF GENERAL PLAN POPULATION PROJECTIONS TO ABAG *PROJECTIONS 2005*, UWMPs, AND WATER CUSTOMER DEMAND PROJECTIONS FOR 2030

	General Plan Population Projection	UWMP Population in 2030	SFPUC Water Customer Population Projection for 2030	*Projections 2005* Population in 2030
Cities with GP Population Projections for 2005				
Colma	1,285	see note a	see note a	1,860
Cities with GP Population Projections for 2010				
Belmont	27,800	see note c	see note c	28,800
Burlingame	31,500	31,900	34,967[d]	31,900
Foster City	30,803	40,866	40,096[b]	32,500
Menlo Park	35,285	11,218[e,f]	13,655[e,f]	41,100
Mountain View	75,200	81,700[g]	81,670[g]	89,600
Palo Alto	62,880	69,199	69,199	92,200
San Mateo	100,700	see note h	see note b,h	119,800
Santa Clara	129,900	140,698	140,698	142,100
Cities with GP Population Projections for 2015				
Millbrae	24,860	24,200	25,174	24,500
Cities with GP Population Projections for 2020				
Atherton	8,400	see note f	see note f	8,200
Daly City	113,000[i]	115,651 [j,k]	115,651[j,k]	127,200
East Palo Alto	34,600	32,712	32,712	43,600
Fremont	229,213	257,100	see note l	257,200
Half Moon Bay (incl. uninc. area)	21,065	24,973[m]	24,973[m]	27,100
Milpitas	94,400[n]	91,400	88,841	91,400
Newark	49,800	53,500	see note l	53,400
~~Redwood City~~	~~87,100~~	~~93,329 [o]~~	~~93,535 [o]~~	~~122,300~~
San Bruno	46,400	see note p	48,229[q]	50,700
San Francisco	811,100	871,000	849,942	924,600
South San Francisco+Westborough Water District	67,400	83,450[r]	73,884[r]	71,800
Sunnyvale	154,600	159,100	151,610	159,100
Union City	80,100	95,300	see note l	94,100
Cities with GP Population Projections for 2025				
Hayward	160,300	162,800	162,757	171,500
Hillsborough	11,800		12,708[s]	11,800
Cities with GP Population Projections for Years Prior to 2005 or No Applicable GP Population Projection				
Brisbane + Guadalupe Valley MID		n.a.	6,164	5,240
Los Altos Hills		n.a.	see note t	10,700
Los Trancos Valley Water Dist.[u]		n.a.	1,094[v]	
Pacifica		42,100	47,829	42,200
Portola Valley		n.a.	see notes f,w	7,800
San Carlos		see note h	see note h	35,200
Stanford University			27,924	n.a.
Woodside			see note f	7,300

a CWS – South San Francisco District (Colma, parts of Daly City and South San Francisco, plus unincorporated areas) UWMP projection for 2030 is 60,150; water customer projection for 2030 is 59,584.
b Estero MID (Foster City and part of San Mateo) projection for 2030 is 40,096.
c Mid-Peninsula Water District (Belmont, part of San Carlos, and portions of unincorporated San Mateo County) UWMP projection for 2030 is 28,930; water customer projection is 27,997.
d Figure shown is for the City of Burlingame Water Agency, which also serves some unincorporated area.
e Figure shown is for the portion of Menlo Park (less than half of the city's population) served by the City of Menlo Park Water Agency.
f CWS – Bear Gulch District (Atherton, parts of Menlo Park, Portola Valley, and Woodside, plus unincorporated areas) projection for 2030 is 73,719; UWMP population projection is 59,220 in 2030.
g Figure shown is for the City of Mountain View Water Agency, which serves most of Mountain View.
h CWS – Mid-Peninsula District (parts of the cities of San Mateo and San Carlos plus unincorporated areas) water customer population projection for 2030 is 139,834; UWMP population projection for 2030 is 134,010.
i The Housing Element of the Daly City General Plan projects this population within the city limits and a population of 120,000 within the (planning) area that corresponds to the ABAG subregional study area.
j Figure shown is for the portion of Daly City served by the City of Daly City Water Agency.
k Parts of Daly City and South San Francisco are served by CWS – South San Francisco District.
l Alameda County Water District (cities of Fremont, Newark, and Union City) projection for 2030 is 379,931.
m Figure shown is for the Coastside County Water District, which also serves unincorporated Half Moon Bay.
n Based on Milpitas General Plan adjusted to include 5,000 housing units added by the Midtown Milpitas Specific Plan (Carrington, 2006).
~~o Figure shown is for City of Redwood City Water Agency, which also serves part of the City of San Carlos, part of the Town of Woodside, and portions of unincorporated San Mateo County.~~
p San Bruno UWMP (City of San Bruno,2007) shows two population projections for 2030: 50,700, based on ABAG's *Projections 2005*, and 48,229, based on the City's Adjusted Draft General Plan.
q Figure shown is for the City of San Bruno Water Agency, which also serves some unincorporated areas.
r Figures shown are for the CWS – South San Francisco District plus Westborough Water District. For the Westborough Water District, the water customer projection is the same as the UWMP projection.
s Figure shown is for the Town of Hillsborough Water Agency, which also serves some unincorporated area.
t Purissima Hills Water District, (part of Los Altos Hills and some unincorporated area) projection is 6,763.
u Los Trancos County Water District was acquired by CWS in 2006, and is now part of the CWS – Bear Gulch District. Because it was a separate entity when these projections were prepared, it is presented separately in this analysis.
v Includes a portion of Portola Valley.
w Portola Valley is served by CWS – Bear Gulch District; a portion of the city was previously served by the Los Trancos County Water District, which is now part of CWS – Bear Gulch.

SOURCE: See sources for Table E.3.34.

In Vol. 5, Appendix E.3, the footnote and source information for Redwood City in Table E.3.34 (p. E.3-39) are deleted as follows:

~~m Figure shown is for City of Redwood City water agency, which also serves part of the City of San Carlos, part of the Town of Woodside, and portions of unincorporated San Mateo County.~~

SOURCES: ABAG, 2004; ACWD, 2005; CWS-Mid-Peninsula, 2005 ;CWS-South San Francisco, 2006; Carrington, 2006; City and County of San Francisco, 2004; City of Belmont, 2002; City of Burlingame, 2002a; City of Burlingame, 2005; City of Daly City, 2004; City of Daly City, 2005; City of East Palo Alto, 1999; City of East Palo Alto, 2006; City of Foster City, 2001; City of Fremont, 2003; City of Half Moon Bay, 1993; City of Hayward, 2002; City of Hayward, 2005; City of Menlo Park, 1994; City of Menlo Park, 2006; City of Millbrae, 1998; City of Millbrae, 2005; City of Milpitas, 2002b, City of Milpitas, 2005; City of Mountain View, 2002; City of Mountain View, 2005; City of Newark, 2002; City of Palo Alto, 1998; City of Palo Alto, 2005; ~~City of Redwood City, 2005; City of Redwood City, 2007;~~ City of San Bruno, 2003; City of San Bruno, 2007; City of San Mateo, 2001; City of Santa Clara, 2002; City of Santa Clara, 2005; City of South San Francisco, 2002; City of Sunnyvale, 2002; City of Sunnyvale, 2005; City of Union City, 2002; Coastside County Water District, 2005; Estero MID, 2005; Hannaford and Hydroconsult, 2004; Mid-Peninsula Water District, 2006; SFPUC, 2005; Town of Atherton, 2002; Town of Colma, 1999; Town of Hillsborough, 2002; URS, 2004, Westborough Water District, 2005.

In Vol. 5, Appendix E.3, References – Appendix E.3 (p. E.3-51), the entry for the Downtown Precise Plan is deleted as follows:

~~City of Redwood City, *Downtown Precise Plan Draft Environmental Impact Report* (October 2006) and *Final Environmental Impact Report*, State Clearinghouse #2005052027, certified March 2007.~~

In Vol. 5, Appendix E.4 (p. E.4-14, first full paragraph), the fourth and fifth sentences are revised as follows:

> During the 1970s and 1980s, changes in industry and housing occurred, with the craft industries of the city's early years giving way to high-technology and information-age industries (City of Redwood City, 1990). <u>The 1990 Redwood City General Plan indicated that the city was expected to reach a population of 70,000 by the year 2000 (Redwood City, 1990, Chapter 4, p. 4-1).</u> The EIR for the Downtown Precise Plan~~, a recent amendment of the general plan,~~ cites ABAG's *Projections 2005* forecasts for the city (not including its sphere of influence) of 87,100 in 2020.

In Vol. 5, the entry for Redwood City in Table E.4.1 (p. E.4-3) is revised as shown on the following page.

L_RdwdCty-09 This comment, which accurately characterizes the description of the Aggressive Conservation/Water Recycling and Local Groundwater Alternative, is acknowledged.

TABLE E.4.1
CURRENT POPULATION ESTIMATES AND FORECASTS OF SELECT JURISDICTIONS

	Actual Population	Current Population Estimates			Forecasts				
City	**U.S. Census 2000 Population**	**U.S. Census Estimated 2005 Population**	**ABAG *Projections 2005* Estimated 2005 Population**	**Department of Finance Estimated 2006 Population**	**General Plan Buildout (Year) and Population**	**ABAG *Projections 2005 Population* Projection for General Plan Buildout Year**	**Customer-Selected Population Projection for 2030**	**ABAG *Projections 2005 Population* Projection for 2030**	**Percent of Supply (after Conservation) from SFPUC**
Alameda County									
ACWD[a]	312,753	311,600	326,900	325,396	(2020) 359,113	368,500	379,931	404,700	25%
Fremont	*203,413*	*200,468*	*211,100*	*210,158*	*(2020) 229,213*	*236,900*		*257,200*	
Newark[b]	*42,471*	*41,956*	*44,400*	*43,486*	*(2020) 49,800*	*49,000*		*53,400*	
Union City	*66,869*	*69,176*	*71,400*	*71,752*	*(2020) 80,100*	*82,600*		*94,100*	
Hayward	140,030	140,293	146,300	146,398	(2025) 160,300	165,900	162,757	171,500	100%
Santa Clara County									
Milpitas[c]	62,698	63,383	65,400	65,276	(2020) 94,400	82,400	88,841	91,400	48%
Santa Clara[d]	102,361	105,402	108,700	110,771	(2010) 129,900	117,400	140,698	142,100	15%
Sunnyvale	131,760	128,902	131,700	133,544	(2025) 154,600	146,900	151,610	159,100	46%
San Mateo County									
East Palo Alto	29,506	32,242	32,700	32,083	(2020) 34,600	39,600	32,712	43,600	100%
Redwood City[e]	75,402	73,114	77,300	76,087	(2000~~2020~~) 70,000~~87,100~~	87,100	93,535	122,300	92%
San Mateo[f]	92,482	91,081	94,900	94,315	(2010) 100,700	98,000	See note f	119,800	100%
South San Francisco[g]	60,552	60,735	61,000	61,824	(2020) 67,400	68,500	73,884	71,800	See note g
City and County of San Francisco	776,733	739,426	798,000	798,680	(2020) 811,100	859,200	849,942	924,600	97%

a ACWD = Alameda County Water District; U.S. Census, ABAG, Department of Finance (DOF), and general plan figures are the combined estimates for Fremont, Newark and Union City.
b The Newark general plan projection shown is from the 2002 housing element. The general plan (adopted in 1992) projected a buildout population of 51,942 by the year 2007.
c The general plan population is based on the population shown in the general plan (77,100) plus the additional population accommodated by the Milpitas Midtown Specific Plan, as advised by Milpitas Planning Department staff (Carrington, 2006), to account for 5,000 additional units with an assumed density of 3.46 persons per unit (i.e., an added population of 17,300). The City has amended to general plan to incorporate the specific plan.
d The general plan figure for Santa Clara is the average of the range projected in the general plan at buildout of 124,800 to 135,000.
e The SFPUC provides 100 percent of Redwood City's potable water. The remaining 8 percent of demand indicated here is met by recycled water.
f The city of San Mateo is served by the CWS–Mid-Peninsula District and Estero MID, both of which serve other jurisdictions as well; therefore, the 2030 population assumed by the wholesale customers is not comparable to projections for the city. The SFPUC supplies all of the CWS–Mid Peninsula District's and Estero MID's water.
g The customer-selected projection is the combined 2030 estimates for the CWS–South San Francisco District (which also serves Colma and a small portion of unincorporated San Mateo County), based on the 2004 demand study, and the Westborough Water District, based on the district's 2005 UWMP. The SFPUC would supply approximately 85 percent of the CWS–South San Francisco District's water supply in 2030 and 100 percent of Westborough Water District's. The other figures are for South San Francisco only.

SOURCES: ABAG, 2004; California Department of Finance, 2006; Carrington, 2006; City of East Palo Alto, 1999a; City of Fremont, 2003a; City of Hayward, 2002a; City of Milpitas, 2002a; City of Newark, 2002; City of Redwood City, 1990~~2007c~~; City of San Mateo, 2001; City of Santa Clara, 2002; City of Sunnyvale, 2002; City of Union City, 2002a; U.S. Census Bureau, 2000; U.S. Census Bureau, 2006; URS, 2004, Westborough Water District, 2005.

City of San Jose, Mansour Nasser, Deputy Director, Water Resources Division, 9/27/07

L_SanJose-01 This comment expressing support for the Modified WSIP Alternative is acknowledged.

L_SanJose-02 This comment summarizes more detailed comments presented in Comments L_SanJose-03 through L_SanJose-07; refer to **Responses L_SanJose-03** through **L_SanJose-07** for the specific responses.

L_SanJose-03 This comment, which provides additional information regarding the water conservation programs of the San Jose Municipal Water System, is noted.

L_SanJose-04 This comment provides information about growth permitted under San Jose's North San Jose Area Development Policy ("Policy"), including information on current and future population in the area generally within the North San Jose/Alviso service area of the San Jose Municipal Water System that is served by the SFPUC (San Jose North). San Jose North provides service to only a small portion of San Jose and only a small portion of the area governed by the Policy. As shown in the Draft PEIR (Vol. 5, Appendix E.3, p. E.3-36), the agency's urban water management plan anticipates employment of 3,353 in 2030, an increase from the estimate of 2,500 jobs in 2001. Similarly, the *Wholesale Customer Water Demand Projections Technical Report* (URS, 2004a) estimates a 2001 population of 11,098 in the area served, increasing to 13,686 in 2030.

This information about additional growth (outside the area served by an SFPUC wholesale customer) does not address the adequacy or accuracy of the PEIR; therefore, no response is provided.

L_SanJose-05 This comment does not state the location of the alleged Draft PEIR quotation, which is in fact inconsistent with information presented in the Draft PEIR. Table 7.3 (Vol. 4, Chapter 7, p. 7-18) indicates that 96 percent (not 100 percent) of San Jose North's demand was met by SFPUC purchases in 2001. According to the *SFPUC Wholesale Customer Water Demand Projections Technical Report* (URS, 2004a, p. A-5), recycled water supplied the remaining 4 percent. The Draft PEIR customer summary (Vol. 4, Chapter 7, pp. 7-54 and 7-55) states that while the SFPUC would be San Jose North's only source of potable supply *in 2030*, the City has used other sources of water supply. The information on other sources of supply presented in Table 3.3 (Vol. 1, Chapter 3, p. 3-18) and Table 7.2 (Vol. 4, Chapter 7, p. 7-15) is for 2030—the WSIP planning horizon—and does not purport to represent any interim years.

Information on 2030 purchases and conservation is based on the *SFPUC Wholesale Customer 2030 Purchase Estimates Technical Memorandum* (URS, 2004b, Table 9, p. 5-1) and the "Wholesale Customer Best Estimate of Water Purchases from the SFPUC" form submitted by the City of San Jose to the SFPUC (dated November 16, 2004). The purchase estimate technical memorandum indicates that San Jose would receive 97.6 percent of total demand in 2030; conservation savings (shown in Draft PEIR Table 7.2) would meet the remaining demand. The Wholesale Customer Best Estimate of Water Purchases from the SFPUC form submitted by San Jose to the SFPUC states:

> Based on the information collected and analyses conducted in developing overall Demand Projections, City of San Jose estimates that it will purchase 6.343 mgd (annual average) from the SFPUC in 2030. It is understood that this estimate will be used by the SFPUC for purposes of planning and environmental review and conforms to the 2030 Water Demand Projection of 6.5 mgd, and the Conservation Savings Range of 0.157 mgd. The estimate is subject to change based on changed conditions, such as the future cost of water, new pricing structures, and other modified contract arrangements.

Thus, according to the submitted form, the SFPUC supply plus conservation would meet the projected demand, as indicated in the Draft PEIR Chapter 7 summary and reflected in Tables 7.2 and 7.3.

With respect to recycled water use discussed in this and the following comment, it is important to note that the focus of the WSIP demand studies was on demand for potable supplies. Existing demand currently met by recycled water that would not be met in the future by potable supplies was not included in the demand baseline. Similarly, the *Wholesale Customer Recycled Water Potential Technical Memorandum* (RMC, 2004) distinguishes between recycled water projects that would replace potable water supply and those that would not. The recycled water shown in Tables 3.3 and 7.2 offset demand for potable water supplies. It appears that at least a portion of the recycled water use described in this comment refers to recycled water that does not replace potable supplies.

San Jose North is one of three wholesale customers served by the South Bay Water Recycling Project, which currently provides 3.1 mgd of recycled water that offsets potable demand (see Draft PEIR Table E.2.5, Vol. 5, Appendix E.2, p. E.2-17). Information on the allocation of this supply among the three participating jurisdictions is not provided in the technical memorandum (and may change from year to year), but San Jose North's participation in this project is consistent with the City of San Jose's use of recycled water to meet 4 percent of its 2001 demand. However, as discussed above, the projected use of recycled water is not assumed to offset the 2030 demand according to the purchase estimate form submitted by the City.

L_SanJose-06 The Draft PEIR (Vol. 1, Chapter 3, pp. 3-16 to 3-22, and Vol. 5, Appendix E, pp. E.2-1 to E.2-20) contains a discussion of the demand projection methodology. As part of this effort, each wholesale customer, including San Jose North, provided an estimate of 2030 purchases from the SFPUC taking into account water savings from conservation and other water supply sources (refer to **Response L_SanJose-05**). This comment states that recycled water accounts for 9 to 11 percent of the San Jose North water supply; however, this information was not indicated as part of the purchase estimate submitted by the City. Based on Figure 2 of this comment, it appears that the use of recycled water and groundwater would not alter the SFPUC purchase estimate of 6.34 mgd, but would alter the City's overall demand projections, which would be approximately 10 mgd (compared to 6.5 mgd shown in the Draft PEIR) in 2030. As discussed in **Response L_SanJose-05**, the difference between the total demand indicated in Figure 2 of this comment and that identified in the WSIP demand studies and the Draft PEIR apparently stems from the inclusion in Figure 2 of all expected recycled water use within San Jose North, whereas the WSIP demand studies considered only water supply sources that would offset demand for potable supplies; this would include some but not all of the recycled water projects in the service area.

L_SanJose-07 This comment regarding the essential need for a reliable supply from the SFPUC system is acknowledged. Please refer to **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Section 14.1.2) for more discussion.

L_SanJose-08 This comment, an attachment referenced in Comment L_SanJose-05, contains a list of San Jose North demand projection citations that the commenter asserts are incorrect. However, the numbers mentioned in Tables 3.3 (Vol. 4, Chapter 7, p. 7-18), 7.2 (Vol. 4, Chapter 7, p. 7-15), 7.3 (Vol. 4, Chapter 7, p. 7-18), Section 7.3.6 (Vol. Chapter 7, pp. 7-54 to 7-55), and Tables E.2.1 (Vol. 5, Appendix E, p. E.2-2) and E.2.6 (Vol. 5, Appendix E, p. E.2-18) in the Draft PEIR are consistent with information presented in SFPUC background documents and submitted to the SFPUC by the City of San Jose, as stated in **Response L_SanJose-05**; therefore, no text revisions are necessary. Regarding the commenter's suggested deletion of footnote "c" in Table 3.4 (Vol. 1, Chapter 3, p. 3-19), the "Wholesale Customer Best Estimate of Water Purchases from the SFPUC" form, submitted by the City of San Jose to the SFPUC, indicates that San Jose North would purchase all of its projected 2030 demand, except the portion offset by conservation savings, from the SFPUC (refer to **Response L_SanJose-05**). Thus, this suggested text change is unnecessary. As for the commenter's suggested text change to Table E.2.5 (Vol. 5, Appendix E, p. E-2-17), no text revision is necessary because information obtained from the technical memorandum, *Wholesale Customer Recycled Water Potential Technical Memorandum* (RMC, 2004) is correctly cited and is consistent with the purchase estimate form submitted by San Jose. Please refer to **Response L_SanJose-05** for additional information regarding these citations in the Draft PEIR.

City of San Bruno, Barbara A. Brenner, Stoel Rives, Attorneys at Law, 10/1/07

L_SBruno-01 The commenter correctly summarizes the Draft PEIR description of the regional conjunctive-use project. The commenter notes that the Regional Groundwater Projects (a component of WSIP facility improvement project SF-2) has been updated to include development of 15 wells instead of the 10 wells described in Chapter 3 of the Draft PEIR, and notes that the planned groundwater extraction using these 15 wells would be 8,100 acre-feet per year (afy). The Draft PEIR notes that the project descriptions presented in Table 3.10 and Appendix C are based on the best available information at the time the Draft PEIR was prepared and are appropriate for the evaluation of the overall magnitude of effects expected from implementation of the WSIP as a whole (Vol. 1, Chapter 3, p. 3-48). The Draft PEIR also notes that any changes in project details would be addressed during subsequent, project-specific environmental review (Vol. 1, Chapter 3, p. 3-61).

As indicated by the commenter, analysis conducted subsequent to preparation of the Draft PEIR has demonstrated that more than 10 wells will be required to achieve a pumping capacity of 8,100 afy. However, the planned pumping capacity of the Regional Groundwater Projects (SF-2) has not changed (see Vol. 1, Chapter 3, p. 3-39). Therefore, Section 5.6 of the Draft PEIR adequately addresses impacts on the South Westside Groundwater Basin at a program level. Consistent with the approach described in the Draft PEIR, the project-level CEQA analysis of the Regional Groundwater Projects will analyze the effects of the preferred alternative for the conjunctive-use program at a more detailed level, and will address any changes in the planned number and location of wells to be installed in the South Westside Groundwater Basin.

The commenter also questions the references to a pumping capacity of 6 mgd (equivalent to approximately 6,700 afy) on pp. S-18 and 3-56 of the Draft PEIR. While the proposed pumping capacity under the conjunctive-use program of 8,100 afy is approximately equivalent to 7 mgd, the actual pumping rate under the WSIP would be different because of the way that the extraction component of the conjunctive-use program would occur. This is described in the Draft PEIR as follows (Vol. 1, Chapter 3, p. 3-39, footnote 23):

> The conjunctive-use program has been designed to provide an extraction capacity of approximately 8,100 acre-feet during a dry year, equivalent to about 7 mgd, over 7.5 years. While the initiation of the extraction component of the conjunctive use program would occur as the first response to anticipated drought, the realization of a drought does not typically occur until the second year of a dry sequence. Thus, in the 8.5-year design drought, the extraction component of the conjunctive-use

program would only occur for 7.5 years. Groundwater pumping of about 7 mgd over 7.5 years is approximately equivalent in volume to 6 mgd over 8.5 years.

A similar footnote is included in Section 5.6 (Vol. 3, Chapter 5, p. 5.6-26, footnote 15). Note that, as discussed in the Draft PEIR, the amount of water withdrawn under the Regional Groundwater Projects (SF-2) would be limited to the amount of groundwater banked through in-lieu delivery of SFPUC system water to participating pumpers, and the participating pumpers would enter into an operating agreement(s) specifying the terms and conditions of groundwater storage and withdrawals to ensure that adverse conditions do not occur (Vol. 3, Chapter 5, pp. 5.6-25 and 5.6-26). These restrictions on groundwater withdrawals and the formation of operating agreement(s) would ensure that impacts related to basin overdraft are less than significant in the South Westside Groundwater Basin.

L_SBruno-02 The commenter states that San Bruno's projected cessation of groundwater pumping (cited on many pages of the Draft PEIR) is based on a worst-case scenario, and that San Bruno plans on maintaining its groundwater production capacity and utilizing groundwater resources in the future. This comment about potential future use of groundwater by San Bruno is noted. The "worst case scenario" described by the commenter is from the point of view of water supply planning, not from the point of view of potential environmental impacts. As required by CEQA, the Draft PEIR analyzes the potential impacts from the point of view of worst-case environmental impacts, which would be if San Bruno were to pump groundwater for municipal purposes in combination with drought-year pumping under the proposed conjunctive-use program (Impact 5.7.5-2, Vol. 3, Chapter 5, pp. 5.7-90 and 5.7-91).

As summarized in this impact analysis, the combined conjunctive-use and municipal pumping could temporarily exceed historical high groundwater withdrawal rates, but impacts related to this increased pumping rate would be less than significant with implementation of the proposed operating agreement(s) to be executed between the SFPUC and the participating pumpers. The agreement(s) would outline allowable operating parameters for pumping during drought years to avoid adverse long-term conditions. In addition, an operating committee would be formed to develop annual operating maintenance plans as well as an annual operating schedule, and groundwater monitoring and modeling would also be conducted to identify the potential for adverse conditions and inform decisions to modify the recharge or pumping strategy in response to changing conditions over time. These measures would ensure that future municipal groundwater pumping by San Bruno, should it be necessary, would not cause adverse effects in the South Westside Groundwater Basin.

L_SBruno-03 The commenter notes that the proposed conjunctive-use program in the South Westside Groundwater Basin (to be implemented under the Regional Groundwater Projects, SF-2) should be referred to as “proposed” since the local agencies have not agreed to the terms. The Draft PEIR identifies implementation of an operating agreement(s) between the SFPUC and the participating pumpers as a required action that would need approval for the Regional Groundwater Projects (Vol. 1, Chapter 3, p. 3-88; Vol. 2, Chapter 5, pp. 5.6-25, 5.6-26, 5.7-90, and 5.7-91).

L_SBruno-04 The commenter notes that the Regional Groundwater Projects (SF-2) currently include installation of 15 wells in the South Westside Groundwater Basin, instead of the 10 wells described in the Draft PEIR. As described in **Response L_SBruno-01**, project analysis conducted subsequent to preparation of the Draft PEIR has demonstrated that more than 10 wells will be required to achieve a pumping capacity of 8,100 afy. However, the planned pumping capacity of the Regional Groundwater Projects has not changed. Therefore, Section 5.6 of the Draft PEIR adequately addresses impacts on the South Westside Groundwater Basin at a program level. Consistent with the approach described in the Draft PEIR, the project-level CEQA analysis of the Regional Groundwater Projects will analyze the effects of the preferred alternative for the conjunctive-use program at a more detailed level, and will address any changes in the planned number and location of wells to be installed in the South Westside Groundwater Basin.

The commenter also indicates that the Draft PEIR reference to an estimated 14 wells in San Francisco, Daly City, San Bruno, and South San Francisco (Vol. 1, Chapter 3, p. 3-72) is inconsistent with the description of the Regional Groundwater Projects (SF-2) which, in the Draft PEIR, includes development of 10 wells in the South Westside Groundwater Basin. However, the 14 new groundwater wells referenced on p. 3-72 of the Draft PEIR includes four wells proposed in the North Westside Groundwater Basin under the Local Groundwater Projects (also part of SF-2) and 10 wells proposed in the South Westside Groundwater Basin under the Regional Groundwater Projects (see Table 3-12, Vol. 1, Chapter 3, p. 3-67).

L_SBruno-05 This comment stating that San Bruno’s groundwater production in 2006 was 1,955 afy is acknowledged. The Draft PEIR (Vol. 3, Chapter 5, p. 5.7-86) cites a figure of approximately 1,700 afy for San Bruno’s 2006 pumping rate. The groundwater production rate provided in the Draft PEIR is based on studies performed on behalf of the SFPUC and the best available information at that time. This updated information will be incorporated into modeling to be conducted to identify the potential for adverse conditions in the South Westside Groundwater Basin and inform decisions to modify the recharge or pumping strategy (Vol. 3, Chapter 5, p. 5.6-26), and will be addressed as part of the project-level CEQA analysis of the Regional Groundwater Projects (SF-2) with respect to groundwater pumping impacts on the South Westside Groundwater Basin.

L_SBruno-06 This comment provides clarification of the Draft PEIR text regarding groundwater monitoring by San Bruno in order to clarify that the wells described as proposed in the Draft PEIR have already been installed. In response to this comment, the following text from the Draft PEIR (Vol. 3, Chapter 5, p. 5.6-17, last sentence of first full paragraph) has been revised as follows:

> The City of San Bruno ~~is~~ construct<u>ed</u>~~ing~~ two monitoring well~~s~~ <u>clusters in 2006</u> along the bay side that ~~should~~ <u>have</u> provide<u>d</u> additional <u>geologic information and allow for monitoring of groundwater levels and groundwater quality at different depths along the bay margin.</u> ~~insight into the mechanisms preventing seawater intrusion.~~

L_SBruno-07 This comment provides clarification of the Draft PEIR text regarding the statement that, in the South Westside Groundwater Basin, manganese has exceeded the secondary drinking water standard in San Bruno and Daly City. In response to this comment, the following text from the Draft PEIR (Vol. 3, Chapter 5, p. 5.6-17, third full paragraph, last sentence) has been revised as follows:

> In the South Westside Groundwater Basin, manganese has exceeded the secondary drinking water standard in San Bruno and Daly City <u>in the untreated groundwater, but the</u> water <u>is treated to meet secondary standards prior to use in the water supply.</u>

L_SBruno-08 The commenter suggests that the Draft PEIR should include the basis for the estimated 13,000 afy of groundwater storage in the South Westside Groundwater Basin. The Draft PEIR (Vol. 3., Chapter 5, pp. 5.6-17 and 5.7-86) presents this information as part of the results of the In-Lieu Recharge Demonstration Study through 2005. The estimated 13,000 afy included 6,300 afy in the Daly City area, 3,600 afy in the South San Francisco area, and 3,000 afy in the San Bruno area. The project-level CEQA analysis of the Regional Groundwater Projects (SF-2) will include a more detailed and up-to-date analysis of the conjunctive-use program and will address the information provided by the commenter.

L_SBruno-09 The commenter provides clarification regarding what types of wells Section 4.68.225 of the San Mateo County Code applies to. In response to this comment, the following text from the Draft PEIR (Vol. 3, Chapter 5, last paragraph on p. 5.6-21 and ending on p. 5.6-22) has been revised as follows:

> In accordance with Section 4.68.225 of the San Mateo County Code, the San Mateo County Environmental Health Division would not grant a well permit for a large well[12] ~~in a public park, cemetery, or golf course~~ that could potentially cause overdraft of the South Westside Groundwater

> Basin or be located in an area subject to a specific and localized groundwater problem. The Environmental Health Division could also deny, revoke, or suspend a permit for a large well to avoid pollution or contamination of water resources.

In addition, the following text from the Draft PEIR (Vol. 3, Chapter 5, p. 5.7-91, last paragraph) has been revised as follows:

> Furthermore, as discussed in Section 5.6, the San Mateo County Environmental Health Division would not grant a well permit for a large well ~~in a public park, cemetery, or golf course~~ that could potentially cause overdraft of the South Westside Groundwater Basin or be located in an area subject to a specific and localized groundwater problem…..

L_SBruno-10 The commenter suggests that the text on p. 5.6-25 (in Chapter 5 of the Draft PEIR) should be clarified to state that a portion of the banked groundwater would be introduced into the regional water system under specified conditions. The commenter is correct in noting that some of the banked groundwater could be introduced into the regional system. Impacts related to the introduction of treated groundwater into the distribution system are addressed in Impact 5.6-6 (Vol. 3, Chapter 5, p. 5.6-32), where it is acknowledged that the SFPUC would continue to meet all drinking water standards in the use of groundwater to supplement its current supply during both nondrought and drought periods. The text on p. 5.6-25 referenced by the commenter addresses potential impacts related to basin overdraft due to pumping from the South Westside Groundwater Basin (Impact 5.6-1), and the suggested text changes do not apply to this impact.

L_SBruno-11 This comment provides updated information that the Regional Groundwater Projects (SF-2) would develop 15 wells instead of the 10 wells described in the Chapter 3 of the Draft PEIR, and that the supplemental supply of groundwater would be for the participating pumpers and for the regional system. See **Response L_SBruno-01**.

The text referred to by the commenter (Vol. 3, Chapter 5, p. 5.6-26) addresses potential impacts related to basin overdraft due to pumping from the South Westside Groundwater Basin (Impact 5.6-1). Drought-year system operations are discussed in Section 3.7.1 of the Draft PEIR (Vol. 1, Chapter 3, pp. 3-42 and 3-43), and this section acknowledges that groundwater will be available to the regional system in a drought year.

The commenter also states that the proposed Regional Groundwater Projects (SF-2) does not restrict municipal pumping to previously pumped quantities. The Draft PEIR evaluates the cumulative effects of municipal pumping in combination with drought-year pumping under the Regional Groundwater Projects in Impact 5.7.5-2 (Vol. 3, Chapter 5, pp. 5.7-90 and 5.7-91). This impact analysis does not state that the amount of groundwater pumped would be restricted to the amount of groundwater previously pumped as well as the amount of banked water resulting from the project. Rather, the analysis concludes that the combined conjunctive-use and municipal pumping could temporarily exceed historical high groundwater withdrawal rates, but that impacts related to this increased pumping rate would be less than significant with implementation of the proposed operating agreement(s) to be executed between the SFPUC and the participating pumpers. The agreement(s) would outline allowable operating parameters for pumping during drought years to avoid adverse long-term conditions. In addition, an operating committee would be formed to develop annual operating maintenance plans as well as an annual operating schedule, and groundwater monitoring and modeling would also be conducted to identify the potential for adverse conditions and inform decisions to modify the recharge or pumping strategy in response to changing conditions over time. These measures would ensure that future groundwater pumping by San Bruno, should it be necessary, would not cause adverse effects in the South Westside Groundwater Basin.

L_SBruno-12 The commenter requests edits to p. 5.7-87 of the Draft PEIR to reflect revisions to San Bruno's urban water management plan (UWMP) that would be needed if the Regional Groundwater Projects (SF-2) is approved. In response to this comment, the following text from the Draft PEIR (Vol. 3, Chapter 5, p. 5.7-87, first sentence of the third bullet) has been revised as follows:

> The 2006 UWMP for the San Bruno does not yet reflect long-term participation in the SFPUC's proposed conjunctive-use program, but, <u>if approved,</u> participation in this program is expected to be included in the next revision of its UWMP.

L_SBruno-13 The commenter states that the text on p. 5.7-90 of the Draft PEIR should mention municipal pumping in future pumping estimates. In response to this comment, the following text from the Draft PEIR (Vol. 3, Chapter 5, p. 5.7-90, the first sentence of Impact 5.7.5-2) has been revised as follows:

> Future <u>and continuing</u> projects identified in the northern portion of the South Westside Groundwater Basin include the WSIP conjunctive-use program (the regional component of SF-2)<u>, municipal pumping by the participating pumpers,</u> and continued irrigation pumping at 2,600 afy.

L_SBruno-14 The commenter states that on p. 5.7-91 of the Draft PEIR, it would be more accurate to say that the combined conjunctive-use and municipal pumping "is anticipated to significantly exceed" historical high groundwater withdrawal rates, rather than "could temporarily exceed" these rates. The commenter also notes that the proposed operational agreement(s) do not alter existing pumpers' rights regarding their use of groundwater. These comments are acknowledged.

As discussed in **Response L_SBruno-11**, the Draft PEIR evaluates the cumulative effects of municipal pumping in combination with conjunctive-use pumping under the Regional Groundwater Projects (SF-2) in Impact 5.7.5-2 (Vol. 3, Chapter 5, pp. 5.7-90 and 5.7-91). This impact analysis concludes that the combined conjunctive-use and municipal pumping could temporarily exceed historical high groundwater withdrawal rates, but that impacts related to this increased pumping rate would be less than significant with implementation of the proposed operating agreement(s) to be executed between the SFPUC and the participating pumpers. The agreement(s) would outline allowable operating parameters for pumping during drought years to avoid adverse long-term conditions. In addition, an operating committee would be formed to develop annual operating maintenance plans as well as an annual operating schedule, and groundwater monitoring and modeling would also be conducted to identify the potential for adverse conditions and inform decisions to modify the recharge or pumping strategy in response to changing conditions over time. These measures would ensure that future groundwater pumping would not cause adverse effects in the South Westside Groundwater Basin, even if groundwater withdrawal rates were to "significantly exceed" historically high withdrawal rates.

L_SBruno-15 This comment suggests adding text to Chapter 5, p. 5.7-91 of the Draft PEIR stating that one method of controlling adverse effects on the South Westside Groundwater Basin under the operating agreement(s) would be to restrict pumping from the conjunctive-use wells if groundwater levels were to fall below historical lows. Comment acknowledged. A number of options could be appropriate for avoiding potentially adverse effects on the South Westside Groundwater Basin during a drought year, and, as discussed in Impact 5.7.5-2 (Vol. 3, Chapter 5, pp. 5.7-90 and 5.7-91), operating agreement(s) between the SFPUC and participating pumpers would outline allowable operating parameters for pumping during drought years to avoid adverse long-term conditions. In addition, an operating committee would be formed to develop annual operating maintenance plans as well as an annual operating schedule, and groundwater monitoring and modeling would also be conducted to identify the potential for adverse conditions and inform decisions to modify the recharge or pumping strategy in response to changing conditions over time. Specific options for avoiding adverse conditions in the South Westside Groundwater Basin are not addressed in the program-level discussion provided in the Draft PEIR, but would be identified on the basis of groundwater monitoring and modeling conducted in accordance with the operating agreement(s). The project-level CEQA analysis of the Regional Groundwater Projects (SF-2) will include a more detailed analysis of options for avoiding adverse conditions in the groundwater basin and will address the information provided by the commenter.

L_SBruno-16 See **Response L_SBruno-11**.

L_SBruno-17 The commenter requests that the discussion on p. 5.7-100 of the Draft PEIR utilize the final UWMP dated January 2007. In response to this comment, the following text from the Draft PEIR (Vol. 3, Chapter 5, p. 5.7-87, third bullet) has been revised as follows (edits shown include edits in **Response L-SBruno-12**):

> The 200~~6~~7 UWMP for the San Bruno does not yet reflect long-term participation in the SFPUC's proposed conjunctive-use program, but, if approved, participation in this program is expected to be included in the next revision of its UWMP. In its 200~~6~~7 UWMP, the City of San Bruno estimates that overall, groundwater usage will decrease from 2.5 mgd (2,800 afy) in 2010 to zero in 2030 through implementation of conservation measures and increased purchases from the SFPUC. In a drought year, groundwater use between 2010 and 2030 is projected to range from 0.80 mgd (896 afy) to a maximum of 2.5 mgd (2,800 afy) (City of San Bruno, 200~~6~~7).

In addition, the following text from the Draft PEIR (Vol. 3, Chapter 5, p. 5.7-100, sixth reference under Westside Groundwater Basin Resources) has been revised as follows:

> City of San Bruno, ~~*Public Draft*~~ *Final Urban Water Management Plan*. ~~December 2006~~ January 2007.

L_SBruno-18 This comment refers to Draft PEIR Table E.3.34 (Vol. 5, Appendix E, p. E.3-38), noting that population projections are available in San Bruno's UWMP (adopted January 2007), contrary to the indication in the table that population projections were not available. Table E.3.34 presents a comparison of projections in the general plan projection year; therefore, the appropriate year for reporting the San Bruno UWMP population estimate is 2020, as this is the year for which a projection is available in the City's adopted general plan housing element.

In response to this comment, Table E.3.34 (Vol. 5, Appendix E.3, p. E.3-38) has been revised as follows:

(City)	General Plan	UWMP	SFPUC Water Customer Projection	***Projections 2005***
San Bruno	46,400	~~n.a.~~see note r	45,642	47,700

r The UWMP (Table 2) reports three population projections: the draft general plan (2006), ABAG subregional (2005), and adjusted draft general plan (2001), although the draft general plan (2006) does not include a projection for 2020. The projections for 2020 are, respectively, 43,400 (based on a straight-line interpolation from projections shown for 2005 and 2025), 47,700, and 43,400.

City of Santa Clara Planning Division, Gloria Sciara, Development Review Officer, 8/28/07

L_SClara1-01 This comment states that the City of Santa Clara must review the PEIR if any work associated with the BDPL Nos. 3 and 4 Crossovers project (BD-2) would occur in Santa Clara. The San Francisco Planning Department responded by email on September 18, 2007, indicating that this project would require work in Santa Clara, and a CD of the full Draft PEIR was mailed to the City of Santa Clara on the same day.

City of Santa Clara Water and Sewer Utilities, Robin Saunders, Director of Water and Sewer Utility, 8/23/07

L_SClara2-01 This comment, which expresses the City of Santa Clara's concern regarding potential service interruptions caused by earthquake damage to the SFPUC system or failure of critical infrastructure as a result of deferred maintenance, is acknowledged. Please see **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14) for more discussion.

L_SClara2-02 This comment stating the City of Santa Clara's commitment to the efficient use and sustainability of regional water supplies is acknowledged.

L_SClara2-03 This comment describing water conservation and recycling programs in Santa Clara is acknowledged.

L_SClara2-04 This comment, which cites the Santa Clara's smart growth planning policies, is acknowledged. As it does not address the adequacy or accuracy of the PEIR, no further response is provided.

L_SClara2-05 This comment illustrating a decrease in per-capita water use over the past 20 years is noted.

L_SClara2-06 This comment expressing concern about the reliability and sustainability of the regional water system and urging the SFPUC to proceed with the preferred alternative WSIP is acknowledged.

Santa Clara Valley Water District, Water Supply Management Division, Keith Whitman, Deputy Operation Officer, 9/26/07

L_SCVWD1-01 This comment urging the SFPUC to adopt the WSIP and meet all program goals and objectives is acknowledged.

L_SCVWD1-02 The commenter states concern with any potential for re-directed impacts on the Santa Clara Valley groundwater basin and local or imported surface water resources due to SFPUC's reduction in supplies or level of service provided to Santa Clara County. The historical information on land subsidence in the Santa Clara Valley due to groundwater pumping provided by the commenter is acknowledged. Under the proposed program, the SFPUC would fully achieve the WSIP goals and objectives and serve wholesale customers' purchase requests during nondrought and drought periods through 2030. The PEIR also includes environmental analysis of a number of alternatives and variants that, while reducing impacts on the Tuolumne River, would reduce the reliability and/or the water supply delivery to customers. These include the No Program Alternative, the No Purchase Request Alternative, Aggressive Conservation/ Water Recycling/Local Groundwater Alternative, and the Phased WSIP Variant (see Vol. 4, Chapter 9 for the first three alternatives and Vol. 7, Chapter 13 for the variant). As part of the environmental analyses of these alternatives/variant, the PEIR identifies potential impacts associated with possible water supply acquisition projects that wholesale customers could pursue, including groundwater pumping (see Vol. 4, Chapter 9, Table 9.10, p. 9-35). In addition, please see Section 13.4, Phased WSIP Variant, for a discussion of how a water delivery shortfall could affect the wholesale customers.

Regarding the commenter's request that the SFPUC address potential impacts on water supplies for the State Water Project and the Central Valley Project users, please refer to **Section 14.8, Master Response on Delta and San Joaquin River Issues** (Vol. 7, Chapter 14).

L_SCVWD1-03 This comment, which expresses support for the SFPUC's goal to maximize water conservation, recycling, and desalination, is acknowledged. In addition, the comment regarding the practical limits in "implementability" of water-use efficiency programs is also acknowledged. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects proposed by SFPUC and its wholesale customers.

Santa Clara Valley Water District, Amy Fowler, Staff Member, 9/19/07

[See Public Hearing Transcript, Palo Alto, pp. 29–32]

L_SCVWD2-01 This information related to Santa Clara Valley Water District's (SCVWD) service area and water supplies is acknowledged, but as this comment does not address the adequacy or accuracy of the PEIR, no additional response is provided.

L_SCVWD2-02 This comment expresses support for the WSIP goals and objectives and expresses concern regarding the potential for secondary impacts on the SCVWD's water supplies in the event that the water supplies or level of service provided by the SFPUC to Santa Clara County is reduced. This comment also expresses support for maximizing water conservation, recycling, and desalination and urges the expedient adoption of the PEIR. In addition, the comment regarding the practical limits in "implementability" of water-use efficiency programs is also acknowledged. For additional information related to conservation and recycling measures, please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3).

San Francisco Bay Trail, Laura Thompson, Project Manager, 9/24/07

L_SFBayTrl-01 This comment, which expresses support for the new underground "Bay Tunnel" segment of the Bay Division Pipeline (BDPL) No. 5 under the BDPL Reliability Upgrade project (BD-1), is acknowledged.

L_SFBayTrl-02 The commenter requests a correction in the length of the Bay Trail (from 400 to 500 miles) and in the number of miles that have been completed (from 280 to 290 miles). However, the referenced statement cannot be changed since it refers to the proposed length specified in the adopted *Bay Trail Plan.* Instead, the following text change updates information on the Bay Trail (Vol. 2, Chapter 4, p. 4.12-7, fourth and fifth full paragraphs):

> **The Bay Trail.** Senate Bill 100, passed in 1987, directed the Association of Bay Area Governments (ABAG) to identify an alignment and develop a plan to create a public trail system encircling San Francisco Bay. The *Bay Trail Plan*, adopted by ABAG in 1989, proposed a continuous 400-mile corridor that would eventually link the shorelines of all nine Bay Area counties and 47 cities around San Francisco and San Pablo Bays. Since its adoption, the *Bay Trail Plan* has received widespread public support as a means of preserving and enhancing public access to the San Francisco Bay waterfront. Most of the jurisdictions along the proposed trail alignment have adopted the plan and incorporated the appropriate Bay Trail segments into their local plans and policies. <u>When complete, the Bay Trail corridor will be 500 miles long.</u>
>
> Development of the Bay Trail is overseen by the Bay Trail Project, a nonprofit organization established in 1990. The Bay Trail Project does not own land or easements; instead, it encourages local jurisdictions to construct and maintain segments of the Bay Trail, often in partnership with other local nonprofit groups. ~~As of 2005, a~~Approximately ~~280~~<u>290</u> miles, or just over half of the envisioned trail, ~~had~~<u>has</u> been completed. Some portions of the Bay Trail are paved pathways, while others consist of dirt trails or sidewalks. The main trail, referred to as the "spine trail," follows the San Francisco Bay shoreline to the extent possible. Where it is not able to follow the shoreline, "spur trails" provide access from the spine trail to points of interest along the waterfront. In addition, "connector trails" provide links to other nearby recreational facilities, residential neighborhoods and employment centers (Association of Bay Area Governments Bay Trail Project, 2005). Segments of the Bay Trail exist near the proposed pipeline alignments for the BDPL Reliability Upgrade (BD-1) project.

L_SFBayTrl-03 The commenter strongly recommends that BDPL Nos. 1 and 2 be decommissioned and physically removed to reduce impacts on habitat and allow for closure of the Bay Trail gap in this area. Please refer to **Response F_USFWS-02** for discussion of issues related to BDPL Nos. 1 and 2.

L_SFBayTrl-04 The commenter requests that the Ravenswood Open Space Preserve and San Francisco Bay Trail be added to the recreational resources located in the vicinity of the BDPL Reliability Upgrade project (BD-1). The requested text additions to Impact 4.12-1 would not alter the significance determination (PSM) identified for this project in the Draft PEIR (Vol. 2, Chapter 4, p. 4.12-24). In response to this comment, the following text changes are made to update information in Table 4.12-2 (Vol. 2, Chapter 4, p. 4.12-22, under BD-1):

TABLE 4.12-2
PUBLIC PARKS AND RECREATIONAL FACILITIES IN THE PROJECT VICINITY

Projects	Potentially Affected Recreational Resources
BD-1: Bay Division Pipeline Reliability Upgrade	Don Edwards San Francisco Bay Regional Wildlife Refuge; Ravenswood Open Space Preserve; San Francisco Bay Trail; local parks in Fremont, Newark, San Mateo County, and Redwood City; numerous school properties in East Palo Alto, Fremont, Menlo Park, Newark, and Redwood City

These resources are also added to the impact discussion under Impact 4.12-1, Bay Division Region (Vol. 2, Chapter 4, p. 4.12-24, first full paragraph):

> Of the WSIP projects proposed for construction in the Bay Division Region, the BDPL Reliability Upgrade project (BD-1) would have the greatest potential impact on recreational facilities in the area. The preferred pipeline alignment for the new Bay Division Pipeline (No. 5) would pass beneath the Don Edwards San Francisco Bay Regional Wildlife Refuge, with an approximately five-mile tunnel segment installed beneath marshlands and San Francisco Bay. The two cut-and-cover sections of pipeline (approximately seven miles from the Irvington Tunnel Portal to the Newark Valve House and nine miles from the Ravenswood Valve House to the Pulgas Tunnel Portal) would be located within the existing SFPUC right-of-way. The Ravenswood Open Space Preserve and San Francisco Bay Trail are also located in the vicinity of the Ravenswood Valve House.

L_SFBayTrl-05 The commenter requests that the SFPUC coordinate with the Bay Trail Project, Coastal Conservancy, and Midpeninsula Open Space District to complete this Bay Trail gap. Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Sections 14.4.2 and 14.4.3) for detailed discussion of the issues raised by this comment. The Coastal Conservancy's request for coordination with the SFPUC regarding completion of the Bay Trail gap through SFPUC lands has been noted in Table C.6 (Vol. 5, Appendix C, p. C-26) for consideration in the project-level EIR for the BDPL Reliability Upgrade project (BD-1).

San Francisco City Planning Commission, Christina Olague, Vice President, 9/20/07

[See Public Hearing Transcript, San Francisco City Hall, September 20, 2007, pp. 39–41]

L_SFCPC1-01 This comment expresses an opinion that the public hearing on the Draft PEIR should have been held earlier in the public comment period and recommends that the comment period be extended.

On June 29, 2007, printed copies of the Draft PEIR or CDs of the draft document were distributed to 70 state and local agencies and 365 additional organizations and individuals. The San Francisco Planning Department notified agencies and the public in writing and via email regarding the availability of the Draft PEIR and the public hearing dates and locations. On June 29, 2007, a Notice of Availability (NOA) of the draft document was sent by first class mail to over 1,627 entities (individuals or organizations). On August 27, 2007, a follow-up notice of the public hearings and comment period was distributed to an expanded list of approximately 1,751 entities. Legal notices and display ads of the public hearings and information on how to obtain a copy of the Draft PEIR and provide comments were placed in the legal classified section of local newspapers in Tuolumne, Stanislaus, San Joaquin, San Mateo, and San Francisco Counties. The NOA and notice of public hearings were posted on the SFPUC and San Francisco Planning Department websites. Printed copies of the Draft PEIR and associated reference materials, as well as the NOA and notice of the public hearings were posted in public libraries in Tuolumne, Stanislaus, San Joaquin, Alameda, San Mateo, and San Francisco Counties.

In accordance with CEQA Guidelines Section 15105, when a draft EIR is submitted to the State Clearinghouse for review by state agencies, the public review period must not be less than 45 days, unless the State Clearinghouse approves a shorter period (but not less than 30 days). CEQA does not require formal hearings at any stage of the environmental review process and allows public comments to be restricted to written communication (CEQA Guidelines Section 15202). However, as stated in CEQA Guidelines Section 15202, “A draft EIR or Negative Declaration should be used as a basis for discussion at a public hearing. The hearing may be held at a place where public hearings are regularly conducted by the Lead Agency or at another location expected to be convenient to the public.”

The public review period on the Draft PEIR, initially scheduled for 90 days (from June 29, 2007 through October 1, 2007), was extended by an additional 15 days, to October 15, 2007. All comments received through December 31, 2007 were accepted by the San Francisco Planning Department and are responded to in this Comments and Responses document. The San Francisco Planning Department initially scheduled five public hearings on the Draft PEIR at: Sonora on September 5, 2007; Modesto on September 6, 2007; Fremont on September 18, 2007; Palo Alto on September 19, 2007; and San Francisco on September 20, 2007. Following recommendations by the San Francisco City Planning Commission, a sixth public hearing was held in San Francisco, on October 11, 2007. Thus, the public review period provided for the Draft PEIR meets and exceeds all public review requirements under CEQA. Please refer to **Response F_USDAFS-05** and **Appendix J1** (Vol. 8) of this Comments and Responses document for more information on public outreach efforts conducted by the Planning Department's Major Environmental Analysis Division and the SFPUC.

L_SFCPC1-02 While it is true that the SFPUC and not the San Francisco City Planning Commission will ultimately have the authority to approve the program, the Planning Commission is responsible for certifying the Final PEIR on the WSIP.

L_SFCPC1-03 In this comment, Commissioner Christina Olague requested that an informational presentation of the WSIP be held at a subsequent public hearing for the purpose of briefing the Planning Commission on the WSIP and the program elements.

In response to Commissioner Olague's request, a sixth public hearing was held before the San Francisco City Planning Commission on October 11, 2007, and the public review period for the Draft PEIR was extended to October 15, 2007. Prior to opening up the October 11, 2007 hearing for public comment, Tony Irons, SFPUC Deputy General Manager, gave a presentation on the history and current condition of the regional water system, and the facility improvements, water supplies, and operational changes proposed under the WSIP. Diana Sokolove, Senior Environmental Planner with the San Francisco Planning Department, Major Environmental Analysis Division, provided an overview of the organization of the Draft PEIR and of the impacts and mitigation measures identified therein.

San Francisco City Planning Commission, Michael Antonini, Commissioner, 9/20/07

[See Public Hearing Transcript, San Francisco City Hall, September 20, 2007, pp. 42–43]

L_SFCPC2-01 This comment by Commissioner Michael Antonini, which expresses the fiduciary responsibility of the City and County of San Francisco due to the size of the regional system, is acknowledged. Commissioner Antonini's comment indicating that the seismic upgrades should move forward is also acknowledged.

L_SFCPC2-02 This comment regarding per-capita water consumption is noted. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2) for information on per-capita water use in the wholesale customer service area (which, as the commenter surmises, is higher than usage within San Francisco).

San Francisco City Planning Commission, Kathrin Moore, Commissioner, 9/20/07

[See Public Hearing Transcript, San Francisco City Hall, September 20, 2007, pp. 43–44]

L_SFCPC3-01 This comment, which expresses Commissioner Kathrin Moore's opinion that the Draft PEIR lacks sufficient measures aimed at environmental sustainability, is acknowledged. However, it should be noted that the WSIP includes a program goal to enhance sustainability in all system activities (see Vol. 1, Chapter 3, Table 3.2, p. 3-9). The system performance objectives include: manage natural resources and physical systems to protect watershed ecosystems; meet, at a minimum, all current and anticipated legal requirements for protection of fish and other wildlife habitat; and manage natural resources and physical systems to protect public health and safety. Furthermore, as described on p. 3-82, the SFPUC has committed to specific greenhouse gas reduction actions as part of the WSIP. As described in the Draft PEIR (Vol. 1, Chapter 3, Section 3.6.1), the proposed program also includes implementation of local groundwater projects in the North Westside Groundwater Basin, recycled water projects on the west side of San Francisco, and additional conservation programs within the San Francisco retail service area. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information regarding conservation programs and recycling projects proposed by the SFPUC and its wholesale customers.

L_SFCPC3-02 The indirect effects of growth that would be supported by the WSIP are discussed on pp. 7-59 to 7-78 of the Draft PEIR (Vol. 4, Chapter 7); more detailed information on the impacts of growth identified in the EIRs prepared for the general plans that guide development within service area jurisdictions is presented in Draft PEIR Appendix E.5 (Vol. 5). Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2) for a discussion of the methodologies used by the SFPUC and the Bay Area Water Supply and Conservation Agency to project future water demand.

Impacts on scenic resources are analyzed in Section 4.3, Land Use and Visual Quality, of the Draft PEIR (Vol. 2, Chapter 4). Most of the proposed upgrades would occur at existing SFPUC facilities and along existing pipeline alignments. As discussed in the Draft PEIR (Vol. 4, Chapter 6, p. 6-7), implementation of Mitigation Measure 4.3-2, Facility Siting Studies, would ensure that the SFPUC identifies and evaluates alternative site locations, access roads, building configurations, and facility operations to minimize or avoid land use impacts.

San Francisco City Planning Commission, Kathrin Moore, Commissioner, 10/11/07

[See Public Hearing Transcript, San Francisco City Hall, October 11, 2007, pp. 31–32]

L_SFCPC4-01 This comment expressing Commissioner Kathrin Moore's approval of working with local people and not outsourcing this project is acknowledged.

L_SFCPC4-02 The commenter asked why there are no WSIP facility improvement projects in the Hetch Hetchy Region. As explained by Tony Irons (the SFPUC's Deputy General Manager) at the public hearing, improvements needed in the Hetch Hetchy region are limited to periodic maintenance of the granite tunnels; no capital improvements are needed. Therefore, there are no WSIP facility improvement projects in the Hetch Hetchy region.

L_SFCPC4-03 This comment expresses concern with respect to seismic hazards at the Priest and Moccasin Reservoirs. The Priest and Moccasin Reservoirs are in the Sierra Nevada foothills, near Groveland. The nearest active faults to these reservoirs are the Great Valley 7 and Great Valley 8 blind-thrust faults, which are more than 50 miles to the west. These reservoirs lie within the Foothills Fault System, which, as described in the Draft PEIR (Vol. 2, Chapter 4, p. 4.4-5), is considered potentially active. However, the potential for rupture along one of the faults in this system is low, and no known fault traces cross the reservoirs.

As described in the Draft PEIR (Vol. 1, Chapter 3, pp. 3-15 and 3-16), the SFPUC conducted an extensive series of facility reliability and system performance studies to identify critical projects for achieving seismic reliability of the regional water system, as well as achieving the other goals of the WSIP. These studies identified no reservoirs, other than the Calaveras and Lower Crystal Springs Reservoirs, as critical facilities needing upgrade to current seismic standards to reduce the overall vulnerability of the regional water system to earthquake damage.

San Francisco City Planning Commission, Michael Antonini, Commissioner, 10/11/07

L_SFCPC5-01 The commenter questions whether extending an alternative pipeline at a distance away from the pipelines in the San Joaquin Pipeline System could ensure that a seismic event would not take the whole system out of operation. Surface fault rupture presents the greatest potential for seismic damage to pipelines where they cross a fault. The San Joaquin Pipeline System traverses the Great Valley 7 blind-thrust fault at its west end, just east of Tesla Portal, as described in the Draft PEIR (Vol. 2, Chapter 4, Figure 4.4-1b, p. 4.4-8). Thrust faults have no surface expression, and movement along these faults occurs on subsurface planes (see p. 4.4-5 in the Draft PEIR). Therefore, the potential for surface fault rupture associated with this fault is low, and as stated in the Draft PEIR (p. 4.4-32), impacts related to fault rupture would be less than significant for the San Joaquin Pipeline System project (SJ-3). Therefore, constructing an alternative pipeline at a distance away from the San Joaquin system would not provide additional protection from seismic hazards.

Instead, as summarized in Table 3.10 of the Draft PEIR (Vol. 1, Chapter 3, p. 3-49), the San Joaquin Pipeline System project (SJ-3) includes additional facilities to upgrade the hydraulic capacity of the San Joaquin Pipeline System and to provide redundancy to the existing pipeline, and the Rehabilitation of Existing San Joaquin Pipelines project (SJ-4) includes rehabilitation and reconditioning of the existing pipelines. The goal of both of these projects is to increase the reliability of the water system. Although the San Joaquin Pipeline System could be subjected to strong groundshaking in the event of an earthquake on the Great Valley 7 fault, or one of the other regional faults, the proposed improvements would be designed to withstand seismic hazards and maintain water service in accordance with the SFPUC's *General Seismic Design Requirements* (Vol. 2, Chapter 4, p. 4.4-32), which would reduce the potential for damage to the system in the event of an earthquake.

L_SFCPC5-02 The commenter asks whether the new pipes for the San Joaquin Pipeline System project (SJ-3) would be constructed of non-concrete or a material with greater tensile strength. The proposed new pipeline would be a welded-steel pipe lined with cement-mortar or low-profile material, with a dielectric coating. The final design will not be available until the SFPUC has completed value engineering and detailed cost estimating.

L_SFCPC5-03 The commenter asks whether the portions of the Bay Division Pipelines Nos. 1 and 2 that are aboveground and traverse the bay would remain or be removed. Please refer to **Response F_USFWS-02** for a discussion of issues related to these two pipelines. Please also refer to **Section 14.4, Master Response on**

PEIR Appropriate Level of Analysis (Vol. 7, Chapter 14, Section 14.4.2) for discussion regarding the intent of the programmatic impact analysis.

L_SFCPC5-04 The commenter's suggestion that the Bay Division Pipelines Nos. 1 and 2 pipelines serve as an alternative line if needed in an emergency is acknowledged. Please refer to **Response F_USFWS-02** for discussion of this issue. Please also see **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.2) for additional discussion regarding the intent of the programmatic impact analysis.

Landmarks Preservation Advisory Board, Robert Cherny, Vice President, 9/27/07

L_SFLandmarks-01 The commenter's suggestion to include historic trees, gardens, and landscaping in project-level evaluations is acknowledged. The San Francisco Planning Department, Major Environmental Analysis Division staff will ensure that, where appropriate, evaluations of historic cultural and designed landscapes are performed during project-level CEQA review for each WSIP facility improvement project.

L_SFLandmarks-02 The Draft PEIR (Vol. 4, Chapter 9, pp. 9-98 and 9-99) identifies impacts and potential strategies to avoid or lessen significant effects as part of the alternatives identification and screening process. As noted on p. 9-99, the Draft PEIR identified potentially significant impacts on cultural and historic resources associated with facility siting and design issues. These include potentially significant and unavoidable (PSU) impacts for the Calaveras Dam Replacement (SV-2), New Irvington Tunnel (SV-4), Crystal Springs/San Andreas Transmission Upgrade (PN-2), and Lower Crystal Springs Dam Improvements (PN-4) projects. However, in some cases, the PSU impacts were identified as such because there was not enough site-specific information at the program level of analysis to determine whether the impact would be less than significant, or whether the identified mitigation measures could reduce the severity of the impact to a less-than-significant level. The programmatic strategies identified to avoid or minimize impacts on cultural resources include refinement of project site selections and/or facility layout designs. However, as discussed on p. 9-112, this approach to reducing impacts on cultural and historic resources is more appropriately considered during the project-level environmental review of individual WSIP projects, at which time more detailed and site-specific project and siting information will be available. Please note that the CEQA alternatives section in the Draft PEIR (Vol. 4, Chapter 9, pp. 9-4 to 9-21) focuses on water supply alternatives that would meet most of the project's basic objectives and avoid or lessen the significant environmental impacts of the proposed program. Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.2), and **Response L_SFLandmarks-08** for additional response.

L_SFLandmarks-03 The commenter recommends that mitigation measures include provisions to salvage examples of historic materials and equipment. In response to this comment, the following text is added to the end of Mitigation Measure 4.7-4a (Vol. 2, Chapter 6, p. 6-27):

> Representative features such as aqueduct/pipe sections, valves subject to replacement, decorative elements, or plaques/inscriptions from buildings or other portions of structures demolished as a part of the WSIP projects could be preserved and displayed. Most of these types of structures are of sufficient size that they would form "monumental" commemorative structures. For example, an original pipeline valve replaced by modern equipment might be mounted and displayed on publicly accessible SFPUC property with informative placards. Such displays, if located in other jurisdictions, might be subject to those jurisdiction's requirements related to public art, safety, and liability considerations.

L_SFLandmarks-04 The commenter suggests including in the historical context information regarding the opposition to building the system from various interests. In response to this comment, the following text is added to the Draft PEIR context statement (Vol. 2, Chapter 4, p. 4.7-24, after the first partial paragraph):

> Opposition to construction of the Hetch Hetchy project came from a variety of interests. Understandably, the Spring Valley Water Company opposed this project, which effectively ended the company's role as the utility company supplying San Francisco with its municipal and domestic water.[21a] The Hetch Hetchy project was designed to transmit electrical power to San Francisco from a power plant at Moccasin. A politically charged conflict over this electric power and associated revenue pitted public power advocates against the privately financed electric power industry. Opposition came from electrical power-generating companies like Pacific Gas and Electric Company (PG&E) and Great Western Power Company (GWP), two utilities that served San Francisco and the Bay Area. These private power companies opposed the competing generation and sale of electricity by public agencies, which was a provision of the Raker Act. The CCSF planned to acquire PG&E's and GWP's distribution systems within its service area, but between 1927 and 1941 the public consistently rejected bond issues required to fund their acquisition; allegedly, this opposition to the bond measures was largely funded by PG&E.[21b] The CCSF's agreements to have PG&E (which had acquired GWP in the 1930s) wheel its power through the company's existing transmission and distribution systems for delivery to San Francisco agencies, and its purchase of city power for resale, caused a longstanding controversy between the federal government, public power advocates, and the CCSF.[21c]

The corresponding references are added to the Draft PEIR (Vol. 2, Section 4.7):

> [21a] Elmo R. Richardson, "The Struggle for the Valley: California's Hetch Hetchy Controversy, 1905–1913," *California Historical Society Quarterly*, Vol. 38, 1959.

[21b] Norris Hundley, *The Great Thirst: Californians and Water, 1770s–1990s*. University of California Press, pp. 187–189, 1992; Stephen P. Sayles, "Hetch Hetchy Reversed: A Rural Urban Struggle for Power." *California History*, 64:4, p. 256, Fall 1985.

[21c] San Francisco Public Utilities Commission (SFPUC), *San Francisco Water and Power*, pp. 57–61, June 1949.

The commenter also recommends adding a discussion of the federal government's role in funding O'Shaughnessy Dam improvements in the 1930s. In response to this comment, the following text is added to the Draft PEIR (Vol. 2, Chapter 4, p. 4.7-25, after the third full paragraph):

O'Shaughnessy Dam was designed and built in a manner that would allow it to be raised. In the 1930s, President Franklin D. Roosevelt sought to provide America with a New Deal, a government-sponsored socioeconomic initiative that among its most prominent programs included dam construction projects as massive public works. Not long after Roosevelt's election (November 1932) and the start of the New Deal (after his inauguration in March 1933), the CCSF received a grant from the federal government covering 30 percent of the cost of labor and materials for raising O'Shaughnessy Dam. The money came from the National Recovery Administration, which was formed by the National Industrial Recovery Act of June 1933. The SFPUC reported that on November 7, 1933, the citizens of San Francisco passed a bond measure for $3.5 million to cover the city's portion of the cost of enlarging O'Shaughnessy Dam. The federal grant also stipulated that all available unemployed workers in Tuolumne County had to be put to work before unemployed people from San Francisco could be used. Soon thereafter, the state requested that the CCSF use 500 to 600 unemployed laborers it had available for "maintenance of municipal property" under the State Emergency Relief Act (SERA). By March 1934, the CCSF had erected seven SERA work camps capable of housing and feeding nearly 700 workers. Later, the state's SERA program for unemployment relief was absorbed into the federal Works Progress Administration. The CCSF issued the contract for the Hetch Hetchy Dam enlargement project on April 8, 1935 to the Transbay Construction Company, and the dam's raising was completed more than three years later, on July 1, 1938.[22a]

The corresponding references are added to the Draft PEIR (Vol. 2, Section 4.7):

[22a] San Francisco Public Utilities Commission (SFPUC), *San Francisco Water and Power*, pp. 59–60, June 1949; Ted Wurm, *Hetch Hetchy and its Dam Railroad*, Trans-Anglo Books, Glendale, CA, p. 251, 1973.

L_SFLandmarks-05 The commenter requests clarification in the historical property list and confirmation that the eligibility information came from state and federal agencies. In response to this comment, the following footnote is added to the Regulatory Framework section of the Draft PEIR (Vol. 2, Chapter 4, p. 4.7-37, end of second full paragraph, before bullet list):

> [29a] These properties have been determined eligible for listing in the National Register through consensus between a federal agency and the State Historic Preservation Officer. Information regarding National Register eligibility was acquired through a records search conducted at the Northwest Information Center at Sonoma State University, which is one of regional offices of the California Historical Resources Information System established by the California Office of Historic Preservation.

L_SFLandmarks-06 The commenter suggests that the historical context statement in the Draft PEIR examine the labor history and significance of the Hetch Hetchy project with respect to the population groups that worked on it. In response to this comment, the following text is added to the Draft PEIR (Vol. 2, Chapter 4, p. 4.7-24, after the third full paragraph):

> Multi-purpose dam and water conveyance projects proliferated within river basins throughout America in the early decades of the 20th century. The projects were built for a variety of purposes: municipal water supplies, federal land reclamation, irrigation, and electric power generation. Thousands of workers contributed to this construction work, often under tight schedules and difficult, even dangerous, conditions. Hetch Hetchy water project contract workers and wage laborers consisted of a varied group of individuals stratified by skill, race, and ethnicity. The largest proportion was low-paid, unskilled laborers, both native-born and immigrants. Above them were the better-paid skilled workers and craftsmen, and at the top was a smaller group consisting of managers, supervisors, administrative personnel, and skilled professionals such as civil and electrical engineers, hydrographers, and surveyors. Over more than 25 years of construction activity, the Hetch Hetchy project provided employment to many thousands of workers in many fields of industrial labor; these workers built everything from mountain roads, railroads, labor camps, buildings, bridges, and trestles that served as project infrastructure, to dams, tunnels, pipelines, siphons, and penstocks that stored and conveyed municipal water. Many of the lesser-skilled construction laborers were highly migratory, non-unionized workers whose employment was seasonal, with peak employment coming during the summer and autumn and minimal opportunities in winter and spring.

> While some workers were more sedentary and lived in towns or work camps with their families, the majority of the workers—who

were predominantly unmarried, mobile, and male—resided in boardinghouses or labor camps near their work sites. The ethnic makeup of the workingmen's boarding houses was often quite diverse, according to 1920 census records. For example, one lumber camp near Groveland was operated by an American civil engineer whose wife kept house with the assistance of one cook. Twenty-five boarders lived there, including painters, carpenters, contractors, lumberjacks, millwrights, and the lumberyard foreman. While the nationality of the boarders was predominately native-born, there were also Hungarians, Poles, Swedes, Germans, and Italians represented among the lodgers. Similarly, a tunnel camp in Groveland Precinct in 1920 contained boarding houses operated by a Swedish immigrant and a Canadian-born mine superintendent. While the Swedish-run operation catered mostly to about 20 Swedish, Norwegian, and native-born tunnel workers, the Canadian establishment lodged a diverse clientele of 22 workers, including tunnel miners and laborers, blacksmiths, foremen, and electricians. They were a diverse lot by nationality, including Canadians, native-born Americans, Spanish, German, Swedish, Italian, Irish, and Austrian workers. This pattern of boarding house occupation by workers of various nationalities was borne out at other tunnel camps and dam construction camps located outside the town of Groveland and at Lake Eleanor.[21d]

Unsafe working conditions and inadequate wages were issues that periodically contributed to labor strife and fostered efforts to unionize the rural industrial labor force assembled to construct the Hetch Hetchy project. During August of 1920, workers at some of the city's construction camps, particularly in the Mountain Tunnel Division, staged a general strike that lasted until May 1921. City officials, particularly O'Shaughnessy, had expressed general support for trade or craft unionism, but objected to "radicals" who organized the day laborers/construction workers hired by the CCSF and advocated worker solidarity, class conflict, and direct action (strikes) at the point of production. These radical labor leaders included representatives of the Industrial Workers of the World (I.W.W., or "Wobblies"), which variously functioned as an umbrella labor organization and revolutionary social movement, and the International Union of Mine, Mill & Smelter Workers, a labor union with militant roots in the copper, nickel, lead, and gold mines of the American West and British Columbia. During the 1920s and 1930s, Mine and Mill, as the union was known, made concerted efforts to organize unskilled national minorities such as Mexican-Americans and African-Americans in the American Southwest. City records indicated that Swedish/Finnish tunnel crews and Mexican laborers were among the more ardent supporters of the radical unionization effort.[21e]

Construction of Hetch Hetchy Dam, ancillary water storage structures, the city's extensive water conveyance system, and its power plant at Moccasin proceeded over several decades, from 1913 into the late 1930s. In 1925, in his report to the CCSF on Hetch Hetchy's progress, O'Shaughnessy made little mention of labor problems or strife over organizing, and no comments related to national groups and/or the ethnic composition of the workforce. He reported that the total number of men productively employed on the project ranged widely between 1914 and mid-1925: there were over 500 at the end of 1914 and less than a hundred at the beginning of 1915, with a gradual increase (with ebbs and flows) to about 750 in 1919. Thereafter the numbers increased quickly, reaching over 2,000 in 1922 before dropping off again to less than 400 by mid-1925.[21f] After 1925, the bulk of the construction effort shifted to the Foothill and Coast Range Tunnels and installation of the San Joaquin Pipeline, leading eventually to the delivery of Hetch Hetchy water into the city in October 1934.[21g]

The corresponding references are added to the Draft PEIR (Vol. 2, Section 4.7):

[21d] U.S. Census Bureau, MSS Population, Groveland Precinct, Tuolumne County, CA, 1920.

[21e] Ted Wurm, *Hetch Hetchy and its Dam Railroad*, Trans-Anglo Books, Glendale, CA, pp. 121–122, 1973; Melvyn Dubofsky, *We Shall Be All: A History of the Industrial Workers of the World*, Urbana: University of Illinois Press, 1988; Mario T. Garcia, *Mexican Americans: Leadership, Ideology and Identity, 1930–1960*, Urbana: Yale University Press, pp. 175–198, 1989; City and County of San Francisco (CCSF), Moccasin Archives, n.d.

[21f] M.M. O'Shaughnessy, *Hetch Hetchy Water Supply*, Bureau of Engineering of the Department of Public Works, report prepared for the City and County of San Francisco, p. 42, October 1925.

[21g] Warren D. Hanson, *San Francisco Water and Power: A History of the Municipal Water Department and Hetch Hetchy System*, City and County of San Francisco, pp. 55–56, 1994.

L_SFLandmarks-07 The commenter requests clarification regarding project-level impacts and coordination under the National Historic Preservation Act (i.e., whether there should be any federal involvement). The Draft PEIR identifies potential cultural resources impacts at a program level of detail. The project-level CEQA review will identify and evaluate impacts associated with each facility improvement project based on more detailed project information. Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.2) for additional discussion regarding this issue.

Several WSIP facility improvement projects will require review and approval by the U.S. Army Corps of Engineers and other federal agencies. If a project is considered a federal undertaking, appropriate Section 106 studies will be completed.

L_SFLandmarks-08 The commenter states an interest in ensuring that the historical value of the water system as a whole is evaluated during individual project-level environmental review, and that this historical value is not lost during project implementation. The overview presented in the Draft PEIR regarding the nature and historical development of the SFPUC's water facilities addresses this issue (Vol. 2, Chapter 4, pp. 4.7-11 to 4.7-27). Also, Impact 4.7-3 (Vol. 2, Chapter 4, pp. 4.7-69 to 4.7-75) addresses this issue by identifying impacts on the historical significance of a historic district or a contributor to a historic district. This analysis assesses impacts on potentially interrelated groups of facilities and resources (united by historical plan and function) that could be considered discrete historic districts. The WSIP would have an effect on potential historic districts within the water system if it were to remove or alter individual resources within a district in a manner that would diminish the district's historical integrity. Mitigation Measure 4.7-3 requires evaluation, by a qualified historian, of all water system facilities affected by the WSIP facility projects to determine whether they contribute to a historic district. The CCSF is currently undertaking supplemental studies to assess potential historic districts containing water system facilities that could be affected by one or more WSIP project(s). The results of those supplemental studies will be presented in project-specific CEQA documentation as appropriate.

San Joaquin Valley Air Pollution Control District, Arnaud Marjollet, Permit Services Manager, 10/1/07

L_SJVAPCD-01 The commenter’s contact information and concurrence with the air quality analysis in the Draft PEIR (Vol. 2, Chapter 4, pp. 4.9-1 to 4.9-48) are acknowledged.

San Luis & Delta-Mendota Water Authority, Westlands Water District, and Kern County Water Agency, Daniel Nelson, Executive Director; Thomas W. Birmingham, General Manager; and James Beck, General Manager, 10/1/07

L_SLDWWKC-01 This comment raises concerns that the Draft PEIR does not adequately address the WSIP's effects on the San Joaquin River or the Delta. Please refer to **Section 14.8, Master Response on Delta and San Joaquin River Issues** (Vol. 7, Chapter 14) for a review of the PEIR analysis and additional discussion of the WSIP's effects on the San Joaquin River and the Delta.

L_SLDWWKC-02 The SFPUC Water Enterprise Environmental Stewardship Policy is discussed in the Draft PEIR in the section on plans and polices relevant to the WSIP water supply option and system operations (Vol. 3, Chapter 5, pp. 5.2-24 to 5.2-25 and 5.2-29). As described in the Draft PEIR, the WSIP would be consistent with the *underlying* [emphasis added] goals of this policy, particularly with respect to the WSIP sustainability goal and the WSIP system performance objective to "manage natural resources and physical systems to protect watershed ecosystems." The Draft PEIR acknowledges and analyzes the potential effects on stream flow and downstream habitats that would occur under the WSIP in the Tuolumne River, Alameda Creek, and Peninsula watersheds (Chapter 5, Sections 5.3, 5.4, and 5.5, respectively). Mitigation measures described in Chapter 6 identify measures to reduce potential impacts on fisheries and other biological resources, including operational approaches to managing releases from SFPUC reservoirs.

As a measure of its commitment to the stewardship policy, the SFPUC is coordinating with a wide range of stakeholders in each of the watersheds as part of its overall stewardship policy implementation efforts. These include the Tuolumne River Stakeholder Group, the Alameda Creek Fisheries Restoration Workgroup, and Pilarcitos Creek Restoration Workgroup. These activities are being conducted in conjunction with, but independent of, the PEIR.

The Draft PEIR evaluates eight CEQA alternatives in detail, as listed in Table 9.3 (Vol. 4, Chapter 9, pp. 9-7 and 9-8). Two of the alternatives would not involve increased diversions from the Tuolumne River—the Aggressive Conservation/Water Recycling and Local Groundwater Alternative with no supplemental Tuolumne River supply, and the

Year-round Desalination at Oceanside Alternative. Both of these alternatives meet the requirements of the San Francisco Board of Supervisors Resolution No. 321-07.

L_SLDWWKC-03 This comment, which provides general comments on the role of CEQA in an EIR, is acknowledged.

L_SLDWWKC-04 This comment provides a summary of three key issues raised by the commenter regarding the adequacy of the Draft PEIR. These three issues are presented in detail in the following three comments. Please refer to **Reponses L_SLDWWKC-05**, **L_SLDWWKC-06**, and **L_SLDWWKC-07**. Also refer to **Section 14.8, Master Response on Delta and San Joaquin River Issues** (Vol. 7, Chapter 14) for additional information.

L_SLDWWKC-05 This comments states that the Draft PEIR does not adequately address potential impacts on the Delta and does not analyze the potential indirect effects of the WSIP on Central Valley Project (CVP) and State Water Project (SWP) operations. Please refer to **Section 14.8, Master Response on Delta and San Joaquin River Issues** (Vol. 7, Chapter 14) for further discussion of the WSIP's effects on the Delta and on CVP and SWP operations and users.

L_SLDWWKC-06 This comment states that the baseline used in the Draft PEIR to describe existing conditions is inaccurate and irrelevant. Please refer to **Section 14.8, Master Response on Delta and San Joaquin River Issues** (Vol. 7, Chapter 14) for a discussion of the baseline used in the PEIR impact analysis.

L_SLDWWKC-07 This comment raises concerns about the Draft PEIR analysis of alternatives. One concern is that the PEIR does not adequately analyze impacts on the San Joaquin River or the Delta and therefore does not appropriately identify an alternative(s) to address impacts on the San Joaquin River and the Delta. However, the PEIR does analyze the WSIP's impacts on the San Joaquin River and the Delta (Vol. 3, Chapter 5, Section 5.3). Please refer to **Section 14.8, Master Response on Delta and San Joaquin River Issues** (Vol. 7, Chapter 14) for a review of the PEIR analysis of these issues and for further discussion of WSIP effects. The Draft PEIR analysis and the supplemental analysis conducted for this Comments and Responses effort concluded that the WSIP's effects on the San Joaquin River and the Delta, as well as indirect effects on the CVP and SWP systems and uses supported by these systems, would be less than significant. While mitigation is not required to address these less-than-significant effects, Mitigation Measure 5.3.6-4a, Avoidance of Flow Changes by Reducing Demand for Don Pedro Reservoir Water, proposed to address the WSIP's effects on fisheries and riparian habitat in the lower Tuolumne River; this measure, which calls for the SFPUC to acquire conserved water for the proposed water transfer element of the WSIP, would also further reduce WSIP effects on the San Joaquin River and the Delta. Further, the Draft PEIR does analyze alternatives that would reduce or avoid additional diversions from the Tuolumne River compared to those under the WSIP and therefore would also reduce or avoid effects on the San Joaquin River and the Delta. The Draft PEIR evaluates eight CEQA alternatives in detail, as listed in Table 9.3 (Vol. 4, Chapter 9, pp. 9-7 and 9-8). Two of the alternatives would involve no increased diversions from the Tuolumne River—the Aggressive Conservation/Water Recycling and Local Groundwater Alternative with no supplemental Tuolumne River supply, and the Year-round Desalination at Oceanside Alternative. Other alternatives would reduce Tuolumne River diversions. The Draft PEIR provides a thorough review of potential alternatives to the proposed program. Furthermore, Section 13.4 (Vol. 7, Chapter 13) of this Comments and Reponses document contains additional discussion regarding the Phased WSIP Variant.

The comment raises concerns about the analysis of the No Program Alternative, stating that the scenario described and analyzed in the PEIR may not come to pass. The Draft PEIR evaluates eight CEQA alternatives in detail (Vol. 4, Chapter 9) and provides a reasoned discussion of likely actions expected to occur under the No Program Alternative. If the WSIP were not implemented, it is assumed that the SFPUC would continue to make water deliveries to its customers through the regional system. Deliveries could increase as customer purchase requests increase over time and would be met by the SFPUC to the extent possible under its existing water rights on the Tuolumne River. As described, the SFPUC has sufficient existing water rights to continue to meet projected customer demands through 2030 in normal and above-normal hydrologic years. In dry years and drought periods, customers would experience increasing delivery shortages. Further, under the No Program Alternative, the SFPUC would not implement the proposed comprehensive program of system facility upgrades and improvements. The regional system facilities would continue to age and would have to be repaired and replaced on a piecemeal basis over time as they deteriorate and/or fail. The system would remain vulnerable to substantial risk of seismic damage and deteriorating reliability. As described accurately in the Draft PEIR, the No Program Alternative is not a scenario under which the SFPUC limits diversions from the Tuolumne River to existing levels. The PEIR accurately describes and adequately discusses the potential effects of the No Program Alternative.

City of Sunnyvale, Jamie McLeod, Associate Planner, and James Craig, Superintendent of Field Services, 9/28/07

L_Snnyvl-01 The Draft PEIR (Vol. 4, Chapter 7, Table 7.2, p. 7-15) states that the City of Sunnyvale's projected use of recycled water for 2030 is 1.5 mgd, consistent with the information provided in this comment. This comment, which states that Sunnyvale is seeking to build more housing units to accommodate existing demand as well as future growth in the South Bay, is acknowledged. As it does not address the adequacy or accuracy of the PEIR, no response is provided.

L_Snnyvl-02 The preliminary schedule for implementation of the WSIP projects is presented in Figure 3.6 of the Draft PEIR (Vol. 1, Chapter 3, p. 3-62). This schedule is based on the priority of each project with respect to its vulnerability to seismic damage, importance to system operations, system operational requirements, and projected funding. As discussed on p. 3-61 of the Draft PEIR, the project schedule is considered preliminary and will be subject to further refinement as the SFPUC proceeds with development of the WSIP. The Calaveras Dam Replacement project (SV-2) is a high-priority project that is scheduled to start in 2009, and the Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault (BD-3) is scheduled to start in 2010.

L_Snnyvl-03 The commenter's recommendation that the conveyance system be designed to provide the full amount of the future projected need for the Bay Area, and that the volume of water flowing through the system be based on policy and programs, not limited by capacity, is acknowledged. As stated in the Draft PEIR (Vol. 1, Chapter 3, p. 3-25), the WSIP proposes levels of service for the regional water system that are intended to meet system performance objectives through 2030 and to provide design criteria for the facility improvement projects. The SFPUC designed the WSIP to provide comprehensive improvements in the overall system reliability for its customers, including the need to serve future water demands. Designing for system reliability improvements is integrated with designing for increased capacity and involves a host of interrelated system parameters that affect water deliveries, including factors related to physical facilities and water supply sources. The WSIP as designed would meet the system reliability and future (2030) capacity needs of the customers as defined by the goals and objectives in Table 3.2 (Vol. 1, Chapter 3, p. 3-9).

L_Snnyvl-04 This comment, which expresses the City of Sunnyvale's recommendation for an overall plan to maximize the utility of the water used while maintaining basic water levels in the streams to address environmental concerns, is acknowledged. The Draft PEIR (Vol. 1, Chapter 3) presents the WSIP goals and objectives for water supply and delivery reliability as well as sustainability and watershed ecosystem protection, and describes the facility improvement projects needed to implement the WSIP.

L_Snnyvl-05 This comment expressing the City of Sunnyvale's support of solutions that minimize negative impacts on the environment is acknowledged. The commenter's reference to "hydrogenation" may be misdirected ("hydrogenation" refers to a class of chemical reactions). Assuming the commenter is referring to the WSIP's impact on hydropower generation, the Draft EIR addresses this issue in Impact 5.3.9-1 (Vol. 3, Chapter 5, pp. 5.3.9-2 and 5.3.9-3), which describes how the proposed changes in water supply and system operations would result in a net increase in hydropower generation compared to the existing conditions.

L_Snnyvl-06 This comment advocating a system maintenance fund for the ongoing maintenance of the system is noted.

L_Snnyvl-07 This comment, which states that Sunnyvale is seeking to build more housing units to accommodate existing demand as well as future growth in the South Bay, is acknowledged. As it does not address the adequacy or accuracy of the PEIR, no response is provided.

L_Snnyvl-08 This comment describing the City's water conservation programs is acknowledged.

L_Snnyvl-09 This comment expressing the City of Sunnyvale's support of the WSIP is acknowledged.

L_Snnyvl-10 Please refer to **Section 14.10, Master Response on Modified WSIP Alternative** (Vol. 7, Chapter 14), as well as **Response L_BAWSCA1-47** for additional discussion and analysis of this alternative.

Stanislaus County Environmental Review Committee, Raul Mendez, Senior Management Consultant, 8/27/07

L_StanCoERC-01 The commenter is concerned that any site containing an existing or former residence or farm be fully investigated (i.e., that Phase I and II studies be completed as necessary) prior to issuing a grading permit. SFPUC Construction Measure #7 (see Draft PEIR, Chapter 6, Vol. 4, p. 6-7) will be applied to all WSIP projects, and requires completion of a site assessment to evaluate the potential for soil or groundwater contamination at each site prior to construction. This assessment is intended to ensure that contaminated materials are handled in accordance with applicable laws and regulations, and that a contingency plan is prepared that specifies measures to be taken should unanticipated contamination be identified during construction. If a site assessment performed during project-level CEQA review of any WSIP facility project identifies a potentially significant impact, implementation of Mitigation Measures 4.14-1a and 4.14-1b (preparation of a site health and safety plan and materials disposal plan) (Vol. 4, Chapter 6, pp. 6-45 and 6-46) will be required to control exposure to contaminants and ensure proper handling of contaminated soil. Such measures would reduce this impact to a less-than-significant level.

The Draft PEIR (Vol. 2, Chapter 4, pp. 4.3-21 and 4.3-22) indicates that additional right-of-way/easement could be required for associated power requirements and access roads for the San Joaquin Pipeline System project (SJ-3). The Draft PEIR (Vol. 2, Chapter 4, p. 4.2-9) also indicates that the SFPUC is exempt from complying with local building and zoning ordinances when locating or constructing facilities for the production, generation, storage, treatment, or transmission of water. Therefore, the rezoning requirements (evaluation of pesticide levels) specified by the commenter may not apply.

Stanford University, Clifford (Mike) Goff, Director of Utilities, 10/1/07

L_Stanford-01 This comment expressing Stanford University's support for the WSIP goals and objectives is acknowledged. Please refer to **Section 14.10, Master Response on Modified WSIP Alternative** (Vol. 7, Chapter 14) for more discussion and analysis of this alternative and the potential for coordination efforts between SFPUC and BAWSCA in support of water conservation of agricultural uses on the lower Tuolumne River.

L_Stanford-02 This comment regarding Stanford University and associated hospitals' reliance on a high-quality water supply is acknowledged. Please refer to **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Section 14.1.2) for relevant discussion.

L_Stanford-03 This comment regarding the critical importance of completing the WSIP and improving the system with respect to seismic hazards is acknowledged. Please refer to **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Section 14.1.3) for more discussion.

L_Stanford-04 This comment describes reductions in water use at Stanford and expresses concern about the need to make further reductions during a drought. The Draft PEIR acknowledges the difficulties of implementing water cutbacks in the future due to demand hardening, and characterizes in general terms the socioeconomic, environmental, and health effects based on data from the 1987–1992 drought (Vol. 4, Chapter 9, pp. 9-29 to 9-31).

L_Stanford-05 This comment, which provides additional information on water use, conservation programs, use of recycled water, campus growth, and Stanford's water consumption, is acknowledged.

L_Stanford-06 The commenter correctly notes that the WSIP proposes a level of service for drought-year rationing of up to 20 percent systemwide. However, the WSIP does not provide details regarding the allocation of rationing requirements among customers in the event of an extended drought. The proposed drought-year system operations (see Draft PEIR Vol. 1, Chapter 3, pp. 3-42 and 3-43) would consist of a four-stage response program to ensure that water is delivered to customers continuously through the duration of a drought. The first stage of response would be to initiate dry-year water supplies and would not affect customer deliveries. Stages 2 and 3 of the response program would include up to 10 and 20 percent systemwide rationing, respectively. The procedures would include customer notification, customer allocation if necessary, and evaluation of customer performance.

The SFPUC would implement the drought response program in close coordination with all retail and wholesale customers and the Bay Area Water Supply and Conservation Agency (BAWSCA). As described in the Draft PEIR (Vol. 1, Chapter 2, p. 2-26), in 2000 the SFPUC adopted the *Interim Water Shortage Allocation Plan* in collaboration with BAWSCA; the plan identifies a water allocation method to be used to determine the share of water for wholesale customers during shortages caused by drought, and the WSIP would not affect any aspect of this plan.

The comment, which describes Stanford University's current efforts to implement conservation and water saving programs and the associated difficulties in implementing further reductions due to rationing, is acknowledged. Please refer to **Response L_Stanford-04**, above, regarding demand hardening issues.

It should be noted that hydrologic modeling conducted for the environmental analysis in the Draft PEIR indicates that the frequency of the need to implement 20 percent rationing would be very low. Based on the 82-year hydrologic record, there would be only 2 out of the 82 years (or 1 in 41 years) that 20 percent systemwide rationing would be required if the WSIP is implemented.

Tuolumne County Chamber of Commerce, George Segarini, President & CEO, 10/1/07

L_TCCC-01 The opinion of the Tuolumne County Chamber of Commerce opposing any additional diversions from the Tuolumne River is acknowledged.

L_TCCC-02 This information (related to the policy statement on water adopted by the Tuolumne County Chamber of Commerce) stating the importance of protecting existing water sources in the county is noted; however, as it does not address the adequacy or accuracy of the PEIR, no additional response is provided.

L_TCCC-03 The opinion of the Tuolumne County Chamber of Commerce supporting the alternatives that protect the Tuolumne River from new diversions is acknowledged. The comment indicating that requiring more water conservation, efficiency, and recycling is the best way to lessen impacts on the Tuolumne River is acknowledged. The Draft PEIR identifies two alternatives that would not increase diversions from the Tuolumne River: the Aggressive Conservation/Water Recycling and Local Groundwater Alternative (with no supplemental Tuolumne River supply), and the Year-round Desalination at Oceanside Alternative.

L_TCCC-04 The opinion of the Tuolumne County Chamber of Commerce expressing that the SFPUC should adopt a policy of reducing diversions from the Tuolumne River is noted. Regarding the request for additional watershed studies to assess the environmental impacts of the WSIP, the San Francisco Planning Department has determined that the currently available information is sufficient for conducting the environmental review of potential impacts. CEQA Guidelines Section 15151 states that an EIR should be prepared with a sufficient degree of analysis to provide decision-makers with information enabling them to make a decision that intelligently takes account of environmental consequences. An evaluation of the environmental effects of a proposed project need not be exhaustive, but the sufficiency of an EIR is to be reviewed in light of what is reasonably feasible.

Tuolumne Utilities District, Peter J. Kampa, General Manager, 9/28/07

L_TUD1-01 The Draft PEIR (Vol. 4, Chapter 9, pp. 9-1 to 9-128) evaluates eight alternatives at a comparative level detail to the evaluation of the WSIP, as required by CEQA Guidelines Section 15126.6. The eight alternatives represent a broad range of options in terms of how to implement key aspects of the proposed program while at the same time avoiding or substantially lessening the potentially significant or significant adverse impacts identified for the WSIP. Six of the eight alternatives include a variation on the water supply sources—either for nondrought years, drought years, or both—compared to that proposed for the WSIP. Draft PEIR Table 9.4 (p. 9-11) describes the differences in water supply sources among the eight alternatives. The water supply sources evaluated under these six alternatives encompass a diverse range of sources other than Tuolumne River water and include the following: (1) varying levels of regional recycled water/conservation/groundwater in the wholesale service area; (2) diversion of Tuolumne River water near the confluence with the San Joaquin River instead of at Hetch Hetchy Reservoir; (3) year-round desalination of seawater; and (4) regional desalination of brackish water. The various water sources under each alternative are used in combinations that would attain *most* of the WSIP's basic objectives, including the water supply objectives for nondrought and drought periods where feasible. Similar to the example provided by the commenter, the Year-round Desalination at Oceanside Alternative would include a small desalination plant on the west side of San Francisco as well as recycled water projects in San Francisco (WSIP facility improvement project SF-3) that would provide irrigation water for parks, the San Francisco Zoo, and median strips.

L_TUD1-02 The No Purchase Request Increase Alternative analyzed in the Draft PEIR (Vol. 4, Chapter 9, pp. 9-40 to 9-47) is based on the assumption that the SFPUC would limit the wholesale customers' future purchases to the terms of the existing Master Water Sales Agreement instead of providing them the full amount of their 2030 purchase request. In accordance with CEQA, the Draft PEIR discusses the SFPUC actions, wholesale customer actions, feasibility issues, and ability to meet the WSIP objectives associated with this alternative as well as its environmental impacts compared to those of the WSIP. The Draft PEIR does not, as the commenter asserts, address the political and economic impacts of the alternative (which is not required under CEQA), although it does discuss institutional and legal issues associated with this alternative.

The commenter's suggestion that a wholesale customer's new purchase requests could be limited based on its performance level with regard to conservation and recycling efforts is acknowledged. The statement that limiting new purchase requests would result in increased public acceptance of recycled water and enhanced tolerance of aggressive conservation measures is also acknowledged. As described in the Draft PEIR (Vol. 1, Chapter 2, pp. 2-43 and 2-44), the SFPUC currently holds individual agreements with its wholesale customers based on the Master Water Sales Agreement, which requires that wholesale customers employ best efforts to use all sources of water owned or controlled by them. In addition, some of the wholesale customers are solely dependent on the SFPUC for their water supply, while others have other sources of water available to them (see Vol. 1, Chapter 3, Table 3.1, p. 3-7). The 27 wholesale customers vary widely in their population and land use characteristics, including their abilities to implement recycled water and conservation programs. Refer to **Response S_CDFG2-07** and **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for further discussion on this issue.

L_TUD1-03 This comment, which expresses the Tuolumne Utilities District's support of the comments and concerns submitted by Tuolumne County on October 18, 2005 during the public scoping period and on September 25, 2007 during public review of the Draft PEIR, is acknowledged. Both letters are on file with the San Francisco Planning Department as part of the WSIP PEIR environmental review record. The comment letter from Tuolumne County dated September 25, 2007 included its October 18, 2005 letter as an attachment; therefore, both letters referenced by the commenter are included in this Comments and Responses document (coded as L-Tuol1), and the responses to the 20 comments are provided herein.

L_TUD1-04 The first paragraph in this comment asserts that the Draft PEIR estimated that requests to wholesale customer agencies to implement conservation measures at 20 percent during drought would result in a commensurate 20 percent reduction in supply needs, and that (according to the commenter) conservation measures would need to be set at a higher percentage in order to achieve 20 percent reduction in usage. While it is correct that the SFPUC could impose systemwide rationing of up to 20 percent in any one year of a drought as part of the drought supply planning under the WSIP, the statement that the PEIR estimated that requests to implement conservation measures at 20 percent would result in a commensurate 20 percent reduction in use is incorrect. The Draft PEIR describes the rationale for adopting the 20 percent rationing policy (Vol. 1, Chapter 3, p. 3-32 and pp. 3-36 to 3-39). As described, the SFPUC's drought response is a multi-step program to achieve the targeted system firm yield through: (1) existing local watersheds and Tuolumne River resources; (2) conservation, water recycling, and groundwater supply programs (implemented in all years); (3) water transfers; (4) groundwater conjunctive-use programs; and (5) restoration of storage in Crystal Springs and Calaveras Reservoirs. As stated in the Draft PEIR, the SFPUC would first pursue other strategies (e.g., groundwater pumping) before resorting to implementation of up to 20 percent systemwide rationing. The 20 percent systemwide rationing would not be implemented uniformly among all of the customers (because of differences among the customers with respect to their reliance on the regional system, ability to access alternative supply sources, etc.). The specific policies that the wholesale and retail customers would adopt to meet mandatory cutbacks would differ somewhat, in part based on different water use patterns within their respective service areas. Differences between actual and planned cutbacks can be expected and have been documented in previous droughts; as with previous droughts, water agencies can adapt drought rationing policies to make them more effective. There is sufficient discretionary water use on a systemwide basis to accommodate 20 percent cutbacks. (For information on the experiences of water agencies and their customers during the 1987–1992 drought, refer to Draft PEIR Vol. 4, Chapter 9, p. 9-29.)

The comment regarding demand hardening requires clarification. As stated in the Draft PEIR (Vol. 4, Chapter 9, p. 9-28), demand hardening refers to the increasing difficulty and expense of achieving short-term water conservation levels during droughts as more long-term conservation measures are implemented and water use efficiency increases. The *California Water Plan Update 2005* (DWR, 2005) acknowledges that demand hardening is a concern for California water agencies (see quoted text from the *California Water Plan Update 2005* in the Draft PEIR, Vol. 4, Chapter 9, p. 9-28). Where long-term conservation measures save water that would have been saved through short-term, drought-year measures (e.g., replacement of turf with water-efficient landscaping), then the latter will be less effective. Nonetheless, water agencies will adopt the measures needed to achieve the requisite cutbacks.

Contrary to this comment, the Draft PEIR does not attempt to validate "the level at which [the] wholesale agencies are currently enforcing conservation." Rather, the PEIR documents existing and planned levels of long-term conservation in the retail and wholesale customer service areas based on data used in, and generated by, modeling for the demand projections. **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) provides additional information on existing and planned levels of conservation. Regarding the "level of customer performance during previous years," in the 1976–1977 and 1986–1992 droughts, Bay Area water agencies used a variety of short-term conservation measures (steeply inclining block rate pricing, public education campaigns, water restrictions, and ordinances, some of which threatened to shut off water to non-responsive customers) to reduce water use temporarily from about 20 to over 50 percent (Association of California Water Agencies, 1991).

The third paragraph in this comment asserts that the statement in the PEIR—that water conservation and recycling can partially, but not fully, meet the WSIP delivery reliability and water supply performance objectives—is based on cursory input from the wholesale customers rather than research, analysis, and factual data. This assertion, which apparently refers to the analysis of the Aggressive Conservation/Water Recycling and Local Groundwater Alternative, is incorrect. As part of the planning effort for the proposed program, the SFPUC, in conjunction with its wholesale customers, conducted extensive studies—including technical studies on conservation and recycled water use potential and water demand studies that involved detailed evaluation of existing water use—in order to establish base-year conditions. These studies are described in the Draft PEIR (Vol. 1, Chapter 3, pp. 3.16 to 3-22, and Vol. 5, Appendix E.2); Section 14.2.3 (Vol. 7, Chapter 14) presents an expanded discussion of existing and planned conservation.

The *SFPUC Wholesale Customer Recycled Water Potential Technical Memorandum* (RMC, 2004) entailed a review of existing documents on water recycling in the area, including the only comprehensive study on recycled water potential in the Bay Area, the *1999 Bay Area Regional Water Recycling Program Master Plan*; technical memoranda from the Draft Bay Area Water Quality and Water Supply Reliability Program, a CALFED-supported program that includes water recycling as one of the elements being examined; and recycled water planning studies completed by agencies in the wholesale service area. This information was updated as needed through contacts with the wholesale customers. The recycled water use potential in the retail service area was identified in the *City and County of San Francisco Recycled Water Master Plan* (RMC, 2006).

In addition to the technical studies prepared for the proposed program, the SFPUC, in cooperation with its wholesale customers and the Bay Area Water Supply and Conservation Agency (BAWSCA), undertook a study to assess the potential for additional conservation and recycled water projects, including potential regional projects, that were not already considered to be implemented locally by 2030 as part of the WSIP purchase estimates, as described in the Draft PEIR (Vol. 4, Chapter 9, pp. 9-47 to 9-51). The results of this study, *Investigation of Regional Water Supply Option No. 4 Technical Memorandum* (SFPUC, 2007) provided the basis for the Aggressive Conservation/Water Recycling and Local Groundwater Alternative evaluated in the Draft PEIR (Vol. 4, Chapter 9, pp. 9-47 to 9-59) as well as an element of the Modified WSIP Alternative (Vol. 4, Chapter 9, pp. 9-78 to 9-84). The PEIR assessment of this alternative is based on these extensive background studies, contrary to the assertion in this comment. In addition, although the Draft PEIR concludes that the feasibility of the Aggressive Conservation/Water Recycling and Local Groundwater Alternative (Vol. 4, pp. 9-47 to 9-59) depends on numerous technical, institutional, financial, and public acceptance issues that would need to be overcome prior to implementation, the Modified WSIP Alternative recognizes that the analysis conducted by the SFPUC and BAWSCA of additional conservation and recycled water projects, including potential regional projects, indicates there is more potential for both additional conservation and water recycling than is currently included in the WSIP. The Draft PEIR identified this alternative as the environmentally superior alternative. For more information on this alternative, please refer to **Section 14.10, Master Response on Modified WSIP Alternative** (Vol. 7, Chapter 14).

Regarding the list of data items this comment states is missing from the PEIR, note that CEQA does not require that alternatives be evaluated at the same level of detail as a proposed project. Consistent with CEQA Guidelines Section 15126.6(d), the Draft PEIR includes sufficient information about and analysis of the Aggressive Conservation/Water Recycling and Local Groundwater Alternative, the Modified WSIP Alternative, and each of the other program alternatives considered in the Draft PEIR (Vol. 4, Chapter 9) to afford decision-makers and the public a meaningful comparison with the proposed program.[1] Also consistent with Section 15126.6(d), the Draft PEIR discusses the significant effects of each alternative.

L_TUD1-05 The commenter states that the Raker Act requires San Francisco to utilize local water sources before increasing Tuolumne River diversions. This is a misinterpretation of Raker Act Section 9(h). The Raker Act does not require the City and County of San Francisco (CCSF) to develop and use local water sources before it diverts out of the Tuolumne River watershed.

As described in the Draft PEIR (Vol. 1, Chapter 2, pp. 2-33 and 2-34), the Raker Act of 1913 granted to the CCSF rights-of-way and use of public lands in Yosemite National Park and Stanislaus National Forest to develop and use water and power. The act imposed many conditions and obligations on the CCSF, including the requirement that Tuolumne River water could be used in the Bay Area for municipal and domestic purposes, but not for agricultural irrigation. Specifically, Section 9(h) of the Raker Act provides that San Francisco:

> … shall not divert beyond the limits of the San Joaquin Valley any more of the water from the Tuolumne watershed than, together with the water which it now has or may hereafter acquire, shall be necessary for its beneficial use for domestic and other municipal purposes.

The commenter also asserts that the PEIR does not adequately evaluate the impacts of reduced wastewater discharges into receiving waters throughout the Bay Area. Changes in wastewater discharges into receiving waters in the SFPUC

[1] While the data items listed in this comment are not needed to provide sufficient evaluation and analysis of the program alternatives, note that the information requested as item (a) in the comment is included in the Draft PEIR (Vol. 1, Chapter 3); aggregated information on existing levels of conservation is presented on p. 3-16 (footnote 16) and disaggregated information on planned conservation is presented on p. 3-18.

service area would be an indirect effect associated with implementation of the WSIP. Insofar as the WSIP would result in changes in municipal and domestic water use patterns, there would also be associated changes in wastewater discharge patterns for municipal and industrial uses, with much of the change attributed to population growth. The Draft PEIR addresses the indirect effects of growth in Chapter 7 (Vol. 4, pp. 7-60 to 7-78); as this chapter indicates, these indirect effects, including impacts on wastewater treatment facilities and wastewater treatment capacities, were identified as significant but mitigable in the environmental impact reports for the general and specific plans in the service area. In the cases where the WSIP would result in increased use of recycled water, the associated effects on wastewater discharges will be addressed in the project-level environmental documentation for the recycled water projects.

L_TUD1-06 As part of the feasibility issues associated with the Aggressive Conservation/ Water Recycling and Local Groundwater Alternative, the Draft PEIR notes that public acceptance issues exist in some communities with regard to recycled water use (Vol. 4, Chapter 9, p. 9-53). However, this discussion is separate and distinct from the analysis of the environmental impacts of the alternative, and this information is not relied upon in the Draft PEIR to determine the environmentally superior alternative.

L_TUD1-07 As part of the feasibility issues associated with the Year-round Desalination at Oceanside Alternative, the Draft PEIR notes that there could be public acceptance issues from residents on the west side of San Francisco as well as from recreational users in the area with regard to desalination and the associated facilities (Vol. 4, Chapter 9, p. 9-69). However, this discussion is separate and distinct from the analysis of the environmental impacts of the alternative, and this information is not relied upon in the Draft PEIR to determine the environmentally superior alternative. Preliminary studies for both the regional desalination plant and the Oceanside desalination plant provided adequate information for the comparative analysis of the environmental impacts of the WSIP alternatives, as provided for in CEQA Guidelines Section 15126.6. Thus, the impacts described are general in nature based on preliminary studies and analysis of similar projects, and as stated by the commenter, not based on detailed study or data. With only preliminary information available, the discussion of environmental impacts is necessarily conservative, rather than "overstated" as asserted by the commenter.

L_TUD1-08 The commenter correctly describes the alternative strategy presented in the Draft PEIR, which involves an intertie with the Santa Clara Valley Water District (SCVWD), and correctly identifies the reason for rejecting this strategy (i.e., that the SCVWD does not have the capacity or need for additional water supplies during wet years) (Vol. 4, Chapter 9. pp. 9-122 and 9-123).

The conjunctive-use program included as part of the proposed WSIP dry-year supply (described in Vol. 3, Chapter 5, pp. 5.6-25 and 5.6-26) does not include active recharge of the groundwater basin during wet years; rather, the participating pumpers would receive potable water from the regional system during wet years, and the groundwater basin would recharge naturally. The PEIR does not evaluate the option of recharging the groundwater basin with water from the SCVWD during wet years because the SCVWD uses its excess supply in wet years to bank in their groundwater storage systems and has no excess supplies available to the SFPUC.

L_TUD1-09 This comment addresses the proposed dry-year water transfer included in the WSIP. The SFPUC proposes to secure a water transfer to help meet its dry-year water supply needs and identified the Turlock and Modesto Irrigation Districts (TID and MID) as the first agencies it would pursue for such an arrangement. The SFPUC has conducted a preliminary assessment of such a water transfer with TID and MID and determined it would be technically feasible and cost-effective because the existing infrastructure is adequate to implement this transfer and no additional facilities would be required. The existing agreements among the SFPUC, TID, and MID regarding storage space in Don Pedro Reservoir (see Draft PEIR, Vol. 1, Chapter 2, pp. 2-37 to 2-39) allow for the exchange of water among these agencies, and the proposed water transfers under the WSIP would be implemented through supplemental agreements with TID and MID. Please refer to **Section 14.3, Master Response on Proposed Dry-Year Water Transfer** (Vol. 7, Chapter 14, Section 14.3.2) for further discussion on this issue.

The analysis in the Draft PEIR is based on the worst-case assumption (in terms of environmental consequences) that the proposed water transfer from TID and MID would originate from water stored in Don Pedro Reservoir; TID and MID would presumably have the legal authority to approve such transfers based on their water rights and as owners and operators of the reservoir. The analysis of the impacts of this water transfer on the Tuolumne River, described in Impact 5.3.1-4 (Vol. 3, Chapter 5, pp. 5.3.1-30 to 5.3.1-38), examined the potential effects of the WSIP based on 82 years of historical hydrology and on assumptions that are consistent with those used in the modeling of the San Joaquin River for the Department of Water Resources and in the modeling for MID's recent water treatment plant project. This 82-year hydrologic record includes several extended drought sequences, and the modeling conducted for the PEIR analysis using the Hetch Hetchy/Local Simulation Model indicated that the WSIP water supply level of service could be achieved during drought periods with the combination of the proposed water transfer, a conjunctive-use program in the Westside Groundwater Basin, and a maximum systemwide rationing of 20 percent. While SFPUC staff has had some preliminary discussion with TID and MID, there has been no formal transfer request or negotiations.

As indicated in the Draft PEIR, the proposed WSIP would result in potentially significant impacts on fisheries and on riparian habitat along the Tuolumne River below La Grange Dam. Implementation of Mitigation Measure 5.3.6-4a (Vol. 4, Chapter 6, p. 6-48) would avoid these impacts by reducing the demand for Don Pedro Reservoir water. This measure states, "The SFPUC will pursue a water transfer arrangement with MID/TID and/or other water agencies such that the water acquired is developed through actions that result in reduction of demand on Don Pedro Reservoir as a result of conservation, improved delivery efficiency, interagency water transfer, or use of an alternative supply such as groundwater." The Draft PEIR acknowledges that MID/TID and/or other agency might be involved in the proposed transfer, but does not imply one way or the other that the water transfer would be from the Oakdale Irrigation District. However, as mentioned in the Draft PEIR (Vol. 4, Chapter 6, p. 6-60), regardless of the source of the water transfer, there would be additional CEQA environmental review of potential effects for any source other than stored water in Don Pedro Reservoir (which was already analyzed in the Draft PEIR). Consistent with CEQA Guidelines Section 15126.4(a)(1)(D), the Draft PEIR includes a section describing the potential impacts of mitigation measures (Vol. 4, Chapter 6, pp. 6-60 to 6-64), including the potential impacts of measures that affect other water sources. Thus, the Draft PEIR reviews the potential effects of implementing a water transfer that involves conserved water rather than stored water. It is expected that the appropriate transferring agency (TID, MID, or other agency) would conduct additional CEQA review if needed to address any aspects of the water transfer proposal not already analyzed in the PEIR. Nonetheless, agreements or approvals from MID, TID, or any other water agencies regarding the proposed water transfer are not required prior to certification of the PEIR and adoption of the WSIP, and the absence of such agreements does not affect the validity of the environmental analysis presented in the Draft PEIR.

Please refer to **Section 14.3, Master Response on Proposed Dry-Year Water Transfer** (Vol. 7, Chapter 14) for more detail on the proposed water transfer from MID/TID to the SFPUC. See also **Response L_MID-TID1-05 and L_MID-TID-06**.

L_TUD1-10 See **Response L_TUD1-05** regarding interpretation of the Raker Act. The commenter is correct in noting that the SFPUC has available options for increasing its water supply. One of the objectives of the WSIP is for the SFPUC to diversify its water supply options during drought and nondrought periods, and the proposed WSIP water supply includes the following new sources: recycled water/groundwater/conservation in San Francisco, a conjunctive-use program in the Westside Groundwater Basin, and dry-year water transfers.

L_TUD1-11 The position of the Tuolumne Utilities District vigorously opposing additional diversions from either the Tuolumne or Stanislaus Rivers is acknowledged. The analyses of the WSIP and alternatives contained in the Draft PEIR are based on extensive studies, as evidenced by the numerous and lengthy lists of references cited in each chapter of the PEIR. All information and supporting data used in the Draft PEIR are available for review at the San Francisco Planning Department. See **Response L_Tuol1-04** regarding Tuolumne County's County of Origin water rights.

Tuolumne Utilities District, Barbara Balen, Board President, 9/10/07

L_TUD2-01 This comment, which expresses support for aggressive recycling and reuse as well as the need to protect the Tuolumne River's environment, is acknowledged. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for further discussion of the conservation and recycling practices within the SFPUC service area.

Tuolumne Utilities District, Peter J. Kampa, General Manager, 9/5/07

[See Public Hearing Transcript, Sonora, pp. 34–36]

L_TUD3-01 Please refer to **Response L_SFCPC1-01** for information regarding extension of the public review period.

L_TUD3-02 Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for further discussion of the conservation and recycling practices within the SFPUC service area.

L_TUD3-03 Refer to **Response L_TUD1-09** for a response to this comment.

L_TUD3-04 The opinion of the Tuolumne Utilities District that 20 percent rationing is below the industry standard is acknowledged. In conducting the drought planning and water supply studies in support of the WSIP, the SFPUC addressed the problems and issues that occurred from the drought periods in the last 30 years, notably the 1976–1977 and 1987–1992 droughts, as described in the Draft PEIR (Vol. 1, Chapter 2, pp. 2-25 to 2-27). These studies were used in the development of the WSIP proposed rationing scenario (the level of service objective of limiting rationing to a maximum of 20 percent systemwide), which was ultimately selected by the SFPUC commissioners (see Vol. 1, Chapter 3, p. 3-14).

L_TUD3-05 Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for further discussion of the conservation and recycling practices within the SFPUC service area.

Tuolumne County, Mark Thornton, Chairman, Tuolumne County Board of Supervisors, 9/25/07

L_Tuol1-01 The Draft PEIR analyzes two alternatives to the proposed program that would include increased levels of water conservation compared to the WSIP (Vol. 4, Chapter 9), and the Comments and Responses describes and analyzes the Phased WSIP Variant which also addresses increased levels of water conservation (Vol. 7, Chapter 13). The alternatives with increased levels of conservation are the Aggressive Conservation/Water Recycling and Local Groundwater Alternative and the Modified WSIP Alternative. The Aggressive Conservation/Water Recycling and Local Groundwater Alternative focuses on *maximizing* water conservation/water recycling and local groundwater in the wholesale customer service area (up to 19 mgd) with the objective of avoiding or minimizing increased diversions from the Tuolumne River (see Vol. 4, Chapter 9, pp. 9-47 to 9-59). The Modified WSIP Alternative would include increased levels of water conservation/ water recycling/local groundwater (up to 10 mgd) as well as implementing agricultural conservation in the San Joaquin Valley (see Vol. 7, **Section 14.10, Master Response on Modified WSIP Alternative**). The Phased WSIP Variant would defer a long term decision on additional diversions from the Tuolumne River until additional effort is made towards implementing additional local recycled water, groundwater, and demand management actions (see Vol. 7, Section 13.4, Phased WSIP Variant).

In addition the Draft PEIR identifies four additional alternatives that would divert less water from the Tuolumne River than would be diverted under the WSIP. These alternatives are shown in Table 9-5 (Vol. 4, Chapter 9, p. 9-13) and are as follows: No Program Alternative; No Purchase Request Increase Alternative;; Year-round Desalination at Oceanside Alternative; and Regional Desalination for Drought Alternative. These alternatives represent a range of reduced diversions from the Tuolumne River (i.e., the increase in average annual diversions under these alternatives would range from 0 to 20 million gallons per day (mgd), compared to the 27 mgd average annual increase that would occur under the WSIP).

L_Tuol1-02 The first part of this comment addresses the effects of reduced stream flows under the WSIP and the related effects on fisheries and recreation. The Draft PEIR analyzes the potential effects of the WSIP on the trout, salmon, and steelhead fisheries in the Tuolumne River (Vol. 3, Chapter 5, pp. 5.3.6-1 to 5.3.6-35). This analysis examined the fishery impacts along two reaches of the Tuolumne River below O'Shaughnessy Dam. Although the WSIP would result in changes in the existing flow and water temperature patterns in the reach between Hetch Hetchy and Don Pedro Reservoirs, the PEIR analysis demonstrated that the extent and frequency of the changes would not result in adverse effects on the resident fisheries, including rainbow trout; therefore, this impact (Impact 5.3.6-2) was determined to be less than significant, and no mitigation would be required. However, for the impact on the fishery resources along the Tuolumne River below La Grange Dam (Impact 5.3.6-4), the Draft PEIR concluded that the WSIP's effects on flow and temperature would infrequently contribute to potentially significant effects on fishery resources, but that implementation of Mitigation Measure 5.3.6-4a (Vol. 4, Chapter 6, p. 6-48) would ensure flow changes are avoided by reducing demand for Don Pedro Reservoir water, which would reduce this impact to a less-than-significant level. Due to the uncertainty in implementing this measure or in the event this measure proves to be infeasible, the Draft PEIR also includes Mitigation Measure 5.3.6-4b (Vol. 4, Chapter 6, pp. 6-48 and 6-49); this measure, which requires fishery habitat enhancement, would reduce these adverse impacts to a less-than-significant level.

With regard to the effect on whitewater recreation, Impact 5.3.8-2 in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.3.8-27 to 5.3.8-34) analyzed the effects of the WSIP on whitewater rafting in the Tuolumne River between Cherry Creek and Don Pedro Reservoir, and in Cherry Creek between Holm Powerhouse and the Tuolumne River. In both cases, the PEIR concluded that the effects on whitewater rafting would be less than significant, since the difference between the WSIP and existing conditions would typically be limited to a few days in May or June. Thus, this small change from existing conditions would not be expected to result in noticeable effects for the Sierra communities associated with seasonal recreation.

The Draft PEIR also considers other past, present, and future projects or activities and analyzes cumulative impacts on resources in the Tuolumne River watershed, including fisheries and recreation (Vol. 3, Chapter 5, pp. 5.7-5 to 5.7-52). The PEIR analysis demonstrated that cumulative impacts on fisheries and recreation would be less than significant (Impacts 5.7.2-1 and 5.7.2-2 for the Tuolumne River from Hetch Hetchy to Don Pedro Reservoir, and from Don Pedro Reservoir to the San Joaquin River, respectively), and no additional mitigation beyond those measures described above would be required.

The San Francisco Planning Department, as the CEQA lead agency, acknowledges receipt of Resolution 40-07 by the Board of Supervisors of the County of Tuolumne; this resolution formalizes the County's opposition to the SFPUC's proposed diversion of additional water from the Tuolumne River and indicates its intent to seek legal remedies to see that no further water diversions occur from the Tuolumne River. Note that the San Francisco Planning Department is responsible for the preparation of the PEIR in compliance with CEQA, but it is the responsibility of the SFPUC, the project sponsor, to select and adopt the WSIP or an alternative to the WSIP based on review and consideration of the certified PEIR. Please see the Draft PEIR (Vol. 1, Chapter 3, pp. 3-86 to 3-88) for a description of the required actions and approvals. The underlying substantive County of Origin water rights issue is addressed in **Response L_Tuol1-04**, below.

The descriptions of 13 conditions (prefaced by the term "whereas") listed in Resolution 40-07 by the Board of Supervisors of the County of Tuolumne are acknowledged. The following discussion provides a response to the listed conditions where corrections or clarification is warranted:

- The ninth condition in the resolution contains misinformation. The 265 mgd described in the Draft PEIR represents the average annual *purchase requests* currently served by the SFPUC. It does not represent the current level of *diversions* from the Tuolumne River. Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.9) for a description of the difference between the increase in purchase requests and the increase in diversions from the Tuolumne River.

- The tenth condition in the resolution contains misinformation. Consistent with CEQA guidelines, the Draft PEIR addresses and identifies the impacts of the WSIP that could affect Tuolumne County, as presented in both Chapter 4 (Vol. 2) and Chapter 5 (Vol. 3). Chapter 4 (pp. 4.3-1 to 4.17-64) includes the programmatic analysis of all environmental impacts of the proposed construction and operation of the portions of the San Joaquin Pipeline System (SJ-3) and Rehabilitation of Existing San Joaquin Pipelines (SJ-4) located in Tuolumne County, including activities in the vicinity of the Oakdale Portal. It identifies environmental impacts related to rural and urban land uses (Section 4.3), recreational resources (Section 4.12), and agricultural resources (Section 4.13), as well as impacts on visual resources (Section 4.3), geology (Section 4.4), hydrology (Section 4.5), biological resources (Section 4.6), cultural resources (4.7), traffic and transportation (Section 4.8), air quality (Section 4.9), noise (Section 4.10), services and utilities (Section 4.11), hazards (Section 4.14), and energy (Section 4.15).

  Chapter 5 (pp. 5.3.1-1 to 5.3.9-3) provides the analysis of water supply and system operations impacts on the Tuolumne River watershed and downstream water bodies. The analysis in Chapter 5 includes environmental impacts on environmental resources in Tuolumne County related to stream flow and reservoir water levels (Section 5.3.1), geomorphology (Section 5.3.2), surface water quality (Section 5.3.3), surface water supplies (Section 5.3.4), groundwater (Section 5.3.5), fisheries (Section 5.3.6), terrestrial biological resources (Section 5.3.7), recreational and visual resources (Section 5.3.8), and energy (Section 5.3.9). The proposed water supply option under the WSIP would not affect the Stanislaus River or related resources, and therefore the Draft PEIR does not discuss impacts on the Stanislaus River.

For a response to the last three conditions, please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14) for a detailed discussion of those issues.

L_Tuol1-03 In response to items 1 and 2 regarding conservation and recycling, the Draft PEIR (Vol. 1, Chapter 3, pp. 3-16 to 3-22) discusses assumptions used in determining the existing and future water demands, including conservation and recycled water potential; in addition, please refer to **Section 14.2, Master Response on Demand**

Projections, Conservation, and Recycling (Vol. 7, Chapter 14) for a detailed discussion of those issues. The Draft PEIR also analyzes more aggressive conservation and water recycling strategies as part of the alternatives analysis in Chapter 9.

In response to item 3 regarding stormwater, Table 9.14 in the Draft PEIR identifies this as an alternative concept raised during the PEIR scoping process (Vol. 4, Chapter 9, p. 9-109). The concept of capturing and storing stormwater runoff was determined not to meet any of the basic program objectives for delivery reliability or water supply. However, the concept is considered under a component of one of the WSIP facility improvement projects, Groundwater Projects (SF-2), in which treated urban stormwater could be used to maintain water levels in Lake Merced.

In response to item 4 regarding desalination, the Draft PEIR considers and analyzes two possible approaches to supplementing the SFPUC water supply with desalination. The Draft PEIR analyzes the SFPUC's participation in a regional desalination program as a supplemental drought supply both as a variant to the WSIP (Vol. 4, Chapter 8, pp. 8-10 to 8-33) and as a CEQA alternative (Vol. 4, Chapter 9, pp. 9-74 to 9-78). The PEIR also analyzes year-round desalination at the Oceanside plant in San Francisco to avoid additional diversions from the Tuolumne River as a CEQA alternative (Vol. 4, Chapter 9, pp. 9-66 to 9-74).

In response to item 5, studies conducted to evaluate options for reducing the need for diversions from the Tuolumne River yielded six alternatives (including the No Program Alternative), which are described and evaluated in Draft PEIR Chapter 9 (Vol. 4). All six alternatives would divert less water from the Tuolumne River than would be diverted under the WSIP, but none of the alternatives would divert less than under existing (2005) conditions. The Aggressive Conservation/Water Recycling and Local Groundwater Alternative specifically considered the potential for these water demand and supply options to completely offset proposed diversions from the Tuolumne River (refer to Draft PEIR Vol. 4, Chapter 9, pp. 9-47 to 9-59).

L_Tuol1-04 The commenter asserts that the PEIR must analyze the impacts of the WSIP on Tuolumne County's County of Origin water rights. The California Water Code contains three provisions that are known as the area of origin rights. The County of Origin statute (Water Code Section 10505) only applies to water rights held by the Department of Water Resources for the State Water Project. The Watershed of Origin statute (Water Code Sections 11460 et seq.) only applies to water rights held by the Department of Water Resources and the U.S. Bureau of Reclamation for the State Water Project and the Central Valley Project. Finally, the Area of Origin statute (Water Code Sections 1215 et seq.) only applies to appropriative surface water rights initiated after January 1, 1985; the City and County of San Francisco's (CCSF) Tuolumne water rights are not subject to the statute, as its Tuolumne River water rights were filed before 1914. Any attempt to analyze impacts on Tuolumne County's inchoate County of Origin water rights, if any, to the Tuolumne River would be speculative. The CCSF notes that the Tuolumne Utilities District has determined it has the water resources to meet Tuolumne County's needs through the year 2035, and that it intends to seek its next increments of water supply from New Melones Reservoir and water rights filings on the South Fork Stanislaus River, as described in the *Tuolumne Utilities District Urban Water Management Plan, 2005 Update* (pp. 14 and 15).

L_Tuol1-05 This comment states that an economic analysis must be completed to determine the environmental effects on Tuolumne County residents, businesses, and tourism prior to approval of additional diversions of water from the Tuolumne River. Please refer to **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Section 14.1.6) for a response to this comment.

L_Tuol1-06 The WSIP as designed would meet the system reliability and capacity needs of SFPUC customers, as defined by the goals and objectives shown in Draft PEIR Table 3.2 (Vol. 1, Chapter 3, p. 3-9). The need for increased capacity of specific transmission components and treatment plants is largely created by two independent functions: (1) the SFPUC must retain the ability to provide capacity to replenish local storage following a drought, seismic event, unplanned shutdown, or maintenance shutdown period (ensuring that the local system has enough stored water to meet three months of demand strictly from the local system); and (2) the SFPUC must retain the ability to meet demand while performing maintenance or in the event of a seismic outage.

Thus, system reliability addresses a host of interrelated parameters affecting water deliveries, such as seismic reliability, delivery reliability, and the ability to maintain water quality standards. These same factors are also considered in planning efforts to provide capacity to serve planned growth, so it is difficult to make a clear distinction between system reliability and capacity for additional customers. The SFPUC has determined that the design capacity of the WSIP project facilities would be the same regardless of whether the WSIP were implemented as proposed or whether average annual diversions from the Tuolumne River were to remain within the current historical record (SFPUC, 2008b). Nevertheless, the Draft PEIR (Vol. 4, Chapter 7, Impact 7-1, pp. 7-60 to 7-78) recognizes that the WSIP would support planned growth in the SFPUC service area and considers this indirect growth-inducement impact to be significant and unavoidable.

L_Tuol1-07 In general, the SFPUC uses the historical hydrology specific to the regional system for future water supply planning. The historical records for the Hetch Hetchy system date back to 1920, with even earlier records for parts of the Peninsula watershed, and these records encompass a wide range of hydrologic conditions.

However, the SFPUC also keeps abreast of statewide water planning efforts, including the Department of Water Resources' *California Water Plan Update*. Please refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14, Section 14.11.5) for further discussion of the SFPUC's actions to address climate change.

L_Tuol1-08 The Draft PEIR (Vol. 3, Chapter 5, pp. 5.7-2 to 5.7-51) provides an assessment of cumulative effects on the Tuolumne River system and downstream water bodies consistent with the CEQA Guidelines, Sections 15065(a) and 15130. This analysis considers the effects of past, present, and reasonably foreseeable future projects and evaluates the WSIP's contribution to cumulative impacts. In addition to SFPUC projects, the analysis considers projects by other agencies or jurisdictions, including the Turlock Irrigation District, Modesto Irrigation District, National Park Service (NPS), and a host of project sponsors involved in projects that could contribute to cumulative effects on the San Joaquin River and/or Delta (see Table 5.7-1, pp. 5.7-14 to 5.7-21).

L_Tuol1-09 The Draft PEIR (Vol. 4, Chapter 5, pp. 5.2-1 to 5.2-29) includes a discussion of how the WSIP relates to applicable land use and resource plans and policies. Under the Wild and Scenic Rivers Act, the NPS administers the designated wild and scenic rivers or reaches of rivers located within the national park system; the U.S. Forest Service administers the designated wild and scenic rivers located within national forests. The NPS is currently preparing the *Tuolumne Wild and Scenic River Comprehensive Management Plan* (Wild and Scenic Plan) for the 54 miles of designated wild and scenic reaches of the Tuolumne River within Yosemite National Park, but the plan has not been adopted. A discussion of the plan and related reports prepared by NPS is provided in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.2-16 and 5.2-17). As the Wild and Scenic Plan is still under development and is not yet adopted, no determination regarding the consistency of the WSIP with its provisions is made in the PEIR.

The Draft PEIR (Vol. 3, Chapter 5, pp. 5.2-15 and 5.2-16) provides a description of the Wild and Scenic Plan as it applies to the 29 miles of the Tuolumne Wild and Scenic River located outside of Yosemite National Park. As stated in the Wild and Scenic Rivers Act (Section 3[a] [53]), the Wild and Scenic Plan does not apply to the exercise of the CCSF's water rights under the Raker Act. However, overall WSIP consistency with the management objectives, standards, and guidelines contained in the Wild and Scenic Plan related to biological resources planning and recreational/visual resources is discussed in the Draft PEIR in Sections 5.3.7 and 5.3.8, respectively. As indicated in the discussion of Impact 5.3.7-7 (Vol. 3, Chapter 5, pp. 5.3.7-26 and 5.3.7-27), potential conflicts with the provisions of the Wild and Scenic Plan with respect to biological resources planning would be less than significant. The effects of the WSIP on recreational resources along the Tuolumne River are discussed under Impact 5.3.8-2 (Vol. 3, Chapter 5, pp. 5.3.8-27 to 5.3.8-34) and would also be less than significant. With respect to the aesthetic values of the Tuolumne Wild and Scenic River, no significant effects are expected, as discussed under Impact 5.3.8-3 (Vol. 3, Chapter 5, pp. 5.3.8-34 and 5.3.8-35).

L_Tuol1-10 The Draft PEIR (Vol. 3, Chapter 5) analyzes potential impacts downstream of the confluence of the Tuolumne and San Joaquin Rivers with respect to stream flow changes (Impact 5.3.1-5, pp. 5.3.1-38 and 5.3.1-39), water quality (Impact 5.3.3-3, pp. 5.3.3-19 and 5.3.3-20), surface water supplies (Impacts 5.3.4-1 and 5.3.4-2, pp. 5.3.4-5 to 5.3.4-11), fisheries (Impact 5.3.6-5, pp. 5.3.6-32 and 5.3.6-33), and recreation (Impact 5.3.8-2, pp. 5.3.8-27 to 5.3.7-34). All of the listed impacts were determined to be less than significant. As described in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.3.1-38 and 5.3.1-39), the WSIP would not alter flow in the San Joaquin River below its confluence with the Tuolumne River such that flow would be substantially outside the range experienced under existing conditions.

L_Tuol1-11 The Draft PEIR addresses the concept of an alternative that would require filtration of the Sierra source water as part of the overall alternatives analysis (Vol. 4, Chapter 9). As indicated by the commenter, the concept of filtering the Sierra source water was raised during the scoping period, and it is discussed in the Draft PEIR (Vol. 4, Chapter 9, pp. 9-119 and 9-120). As a stand-alone alternative, this concept would not meet any of the basic program objectives, would not avoid or lessen any of the impacts of the WSIP, and would result in additional construction and operational impacts associated with a new treatment facility. However, one of the alternatives analyzed in the Draft PEIR, the Lower Tuolumne River Diversion Alternative (Vol. 4, Chapter 9, pp. 9-59 to 9-66), would include construction of conveyance and treatment facilities for diversions from the lower Tuolumne River near the confluence with the San Joaquin River rather than increasing diversions from Hetch Hetchy Reservoir. One of the overall goals of the WSIP is to maintain high-quality water for the regional water system, and one of the performance objectives is to meet current and future federal and state water quality regulations. The WSIP facility improvements include the Advanced Disinfection project (SJ-1), which would be designed to provide treatment for *Cryptosporidium*.

L_Tuol1-12 This comment regarding the devastating effects of a catastrophic fire in the Groveland Community Services District (GCSD) is acknowledged. In the event of a water shortage, the SFPUC would work with the GCSD to determine appropriate rationing levels, regardless of whether or not the WSIP is implemented. The rationing levels described in the Draft PEIR are in terms of systemwide rationing, and the appropriate level for individual customers would be determined as necessary on a case-by-case basis.

L_Tuol1-13 The proposed program includes a groundwater conjunctive-use program as part of its proposal for water supply during drought (see Draft PEIR Vol. 1, Chapter 3, p. 3-37).

L_Tuol1-14 This comment regarding groundwater infiltration to Mountain Tunnel and the GCSD's payment of a surcharge for lost power revenue is acknowledged. The issue of GCSD's water payments is outside the scope of the PEIR, since it is not related to potential physical environmental effects.

Infiltration to Mountain Tunnel and accretions and depletions within the regional water system are accounted for within the hydrology incorporated into the SFPUC's modeling. The SFPUC model accounts for flows under the Hetch Hetchy Water and Power project in the water balance for the basin upstream of La Grange Dam.

If infiltration to Mountain Tunnel is considered to be groundwater, this phenomenon has been occurring for years, and its use by the SFPUC would therefore be in compliance with Tuolumne County Ordinance Code Section 13.20 pertaining to groundwater.

The comment requesting assistance for the GCSD in finding an alternative water supply during times of tunnel maintenance is acknowledged.

L_Tuol1-15 This comment regarding the GCSD's role in paying for the proposed system improvements is acknowledged; since this comment does not address the adequacy of the environmental analysis in the PEIR, no response is required.

L_Tuol1-16 The Draft PEIR (Vol. 1, Chapter 3, pp. 3-86 to 3-88) describes the required actions and approvals necessary for overall adoption of the WSIP and subsequent implementation of the proposed program. As indicated in the PEIR, no federal approvals are required for the overall WSIP as a program, and therefore the overall program is not subject to the National Environmental Policy Act (NEPA). However, individual facility improvement projects under the WSIP might require federal permits and approvals and associated NEPA compliance; this determination will be made as part of the project-level environmental review of each project.

L_Tuol1-17 This question regarding the merging of Hetch Hetchy water and hydroelectric systems is acknowledged; since this comment does not address the adequacy of the environmental analysis in the PEIR, no response is required.

L_Tuol1-18 Please refer to **Response L_Tuol1-02**. In addition, the Draft PEIR (Vol. 4, Chapter 6, pp. 6-60 to 6-64) acknowledges that some of the mitigation measures could result in significant effects separate from the identified WSIP impacts, and it includes a section that describes the impacts of mitigation measures.

L_Tuol1-19 This comment regarding local Tuolumne County contractors is noted; since this comment does not address the adequacy of the environmental analysis in the PEIR, no response is required.

L_Tuol1-20 The Draft PEIR (Vol. 4, Chapter 9, pp. 9-1 to 9-128) evaluates eight alternatives at a comparative level detail to that provided for the WSIP, as required by CEQA Guidelines Section 15126.6. The eight alternatives represent a broad range of options in terms of how to implement key aspects of the proposed program while at the same avoiding or substantially lessening potentially significant or significant adverse impacts identified for the WSIP. The alternatives analysis focuses on the comparative merits of the alternatives with respect to physical environmental effects, although it includes a discussion of feasibility issues associated with each alternative. In some cases, the alternatives have feasibility issues that could have economic implications (pp. 9-27 to 9-31), but there is no clear relationship between any economic effects and direct physical effects on the environment. Further, as provided by CEQA Guidelines Section 15064, economic changes resulting from a project are not to be treated as significant effects on the environment. Therefore, the PEIR does not include an economic analysis of alternatives.

The concept of restoring the Hetch Hetchy Valley is discussed in the Draft PEIR as an alternative concept that was raised during the scoping period (Vol. 4, Chapter 9, pp. 9-127 and 9-128).

Tuolumne County, Mark Thornton, District 4 Supervisor, Tuolumne County, 10/15/07

L_Tuol2-01 The effects of the WSIP on rafting flows in the Tuolumne River and Cherry Creek are described in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.3.8-27 to 5.3.8-32). The effects of the WSIP on the availability of water for river rafting are minor and are judged to be less than significant. CEQA does not require an analysis of economic effects unless they would result in indirect physical environmental effect (CEQA Guidelines Section 15131). Please refer to **Response L_Tuol1-05**.

L_Tuol2-02 The City and County of San Francisco (CCSF) is unaware of any water-right permits or licenses held by Tuolumne County, Tuolumne Utilities District (TUD), or TUD's predecessor, the Tuolumne County Water District No. 2, on the Middle or South Forks of the Tuolumne River. In the past, Tuolumne County agencies filed or joined filings for water-rights applications on several projects within the Tuolumne River watershed, but all applications were dismissed by the State Water Resources Control Board after the agencies terminated the projects. Please refer to **Response L_Tuol1-04** regarding Tuolumne County water-right issues.

L_Tuol2-03 This comment states that there is a lack of adequate baseline data for the Tuolumne River, and that without such data it is not impossible to properly analyze the environmental consequences of additional diversions. As described in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.1-7 to 5.1-18), the basic approach to the analysis of impacts on water and related resources was to first evaluate the changes in the river flow and reservoir levels that would occur with the WSIP, then to estimate changes in water quality and temperature, and finally to combine this information to determine potential impacts on fisheries and other biological resources. The analysis used the existing 82-year historical hydrologic record, coupled with the Hetch Hetchy/Local Simulation Model to depict the overall regional water system operations and to project the extent of changes in flow that could occur in the future. These results were used for the PEIR water supply and system operations impact analysis.

As described in **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.4), the CEQA Guidelines (Section 15151) impose a standard of adequacy that is "reasonably feasible" and sufficient to allow decision-makers to make a decision that takes account of environmental consequences. Data gathering need not be "exhaustive." The Draft PEIR analysis of the WSIP water supply and system operations with respect to fisheries and biological resources along the Tuolumne River was based on current knowledge of the composition and condition of the resources and in consideration of the potential interactive responses of plant and animal species to the hydrologic changes resulting from the WSIP as indicated by the model results. The analysis relied on ecological principles, scientific literature, existing data, and site visits. The Draft PEIR analysis was conservative in finding that an impact could be potentially significant if there was a possibility of impacts from the WSIP water supply and system operations.

The San Francisco Planning Department believes these data are sufficient to reasonably assess the general magnitude, frequency, and extent of the WSIP's environmental consequences, and to identify appropriate mitigation measures to offset potentially significant impacts on the Tuolumne River watershed and related resources. The mitigation measures were developed to include performance standards based on ecological principles, with the understanding that data from ongoing and future studies could be useful in augmenting the baseline data and in refining the implementation of each measure. As described in Draft PEIR Mitigation Measure 5.3.7-2 (Vol. 4, Chapter 6, pp. 6-49 and 6-50), **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.2), and **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.2), several studies of the Tuolumne River are in progress by the SFPUC, National Park Service, U.S. Fish and Wildlife Service, National Marine Fisheries Service, California Department of Fish and Game, and other agencies. Data from these studies would be used to augment the existing data and allow for refinement of the implementation of the mitigation measure to better achieve the identified performance standards.

L_Tuol2-04 Please refer to **Response L_Tuol1-01** and **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14) for a detailed discussion of these issues.

L_Tuol2-05 The Draft PEIR provides background information on the existing regional water supply, including a description of the agreements between the SFPUC and the Turlock and Modesto Irrigation Districts regarding the New Don Pedro Project (Vol. 1, Chapter 2, pp. 2-37 to 2-39). One of the agreements allocates storage space in Don Pedro Reservoir for a specified volume of Tuolumne River water within the CCSF's entitlement under the Raker Act.

L_Tuol2-06 This comment states that the Draft PEIR is deficient in addressing WSIP consistency with the Sierra Nevada Framework and CALFED; in this response, "CALFED" is interpreted to mean the Bay Delta Conservation Plan. In response to this comment, the Draft PEIR is revised to include the following discussion under the heading Federal Statutes and Agreements (Vol. 3, Chapter 5, p. 5.2-6).

<u>*National Forest Management Act*</u>

<u>The National Forest Management Act, enacted by Congress in 1976, is the primary statute governing the administration of national forests. The act requires the Secretary of Agriculture to assess forest lands, and to develop</u>

and implement a resource management plan for each unit of the National Forest System. The management plans must: ensure consideration of both economic and environmental factors; provide for wildlife and fish; provide for the diversity of plant and animal communities; ensure timber harvesting will occur only where water quality and fish habitat are adequately protected from serious detriment; and ensure clearcutting and other harvesting will occur only where it may be done in a manner consistent with the protection of soil, watersheds, fish, wildlife, recreation, aesthetic resources, and regeneration of the timber resource. The management plans must be updated at least once every 15 years. In the overall WSIP region, the Sierra Nevada Framework is the management plan governing Stanislaus National Forest. The provisions of the Sierra Nevada Framework are implemented by the U.S. Forest Service.

The Draft PEIR is revised to include the following discussion under the heading Relevant Plans, Policies, and Planning Actions (Vol. 3, Chapter 5, p. 5.2-14).

U.S. Forest Service, Sierra Nevada Framework

In January 2001, the U.S. Forest Service adopted the Sierra Nevada Forest Plan Amendment (SNFPA or Sierra Nevada Framework), a plan for the management of 11 national forests and 11.5 million acres of national forest land in the Sierra Nevada mountain range, including Stanislaus National Forest. In January 2004, in response to concerns about the flexibility and compatibility of the SNFPA with other programs related to wildland fire management, the U.S. Forest Service amended the Sierra Nevada Framework to provide additional provisions for fire and fuels treatments. The amended Framework outlines procedures used to manage and protect forests, wildlife habitats, and communities from a variety of threats, including catastrophic fires, and provides a programmatic framework within which project-level decisions are designed and implemented. Key aspects of the SNFPA include: a commitment to restoration and protection of old-growth forest habitat; protection of all trees greater than 30 inches on 11 million of the 11.5 million acres of public land managed by the U.S. Forest Service; designation of riparian conservation areas; improvement and protection of suitable habitat for California spotted owl (*Strix occidentalis occidentalis*), northern goshawk (*Accipiter gentiles*), and willow flycatcher (*Empidonax traillii*); adoption of an integrated vegetation management strategy with the primary objective of protecting communities and modifying landscape-scale fire behavior to reduce the size and severity of fires; and provisions for increased land use management, including grazing, timber production, road construction, and recreation activities. The SNFPA is administered by the U.S. Forest Service (USDA Forest Service, 2004). As no WSIP facility improvement projects are proposed within Stanislaus National Forest, and the resources protected by the SNFPA would not be affected by the WSIP water supply and system operations, the WSIP would be consistent with the provisions of the SNFPA.

Bay Delta Conservation Plan

The Bay Delta Conservation Plan (BDCP) is an effort driven by Delta water users to provide for the conservation and management of certain aquatic species, both listed and non-listed, and their habitats, while providing for regulatory assurances related to water supply reliability and water quality for the Sacramento–San Joaquin River Delta. Activities that would be covered under the BDCP include water supply operations related to the State Water Project and the Central Valley Project, and the power plant operations of the Mirant Corporation. Under the BDCP, water users would pay for new infrastructure, wetlands restoration, and other related projects in return for guaranteed stable water supplies. As the BDCP is still under development and is not yet adopted, no determination regarding potential conflicts of the WSIP with its provisions has been made.

The following reference is added to the Draft PEIR (Vol. 2, Chapter 4, Section 4.2, p. 4.2-19):

USDA Forest Service, *Sierra Nevada Forest Plan Amendment Final Supplemental Environmental Impact Statement*, January 2004.

Alameda County Flood Control and Water Conservation District, Zone 7, G.F. Duerig, General Manager, 10/1/07

L_Zone7-01 Please refer to **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14, Section 14.9.3).

L_Zone7-02 Zone 7's support for the Modified WSIP Alternative is acknowledged. Please refer to **Section 14.8**, **Master Response on Delta and San Joaquin River Issues** (Vol. 7, Chapter 14) for further discussion of the WSIP's effect on the San Joaquin River and the Delta, including potential effects on State Water Project operations and resulting indirect effects. Please refer to **Section 14.10**, **Master Response on Modified WSIP Alternative** (Vol. 7, Chapter 14) for further discussion and analysis of the Modified WSIP Alternative.

L_Zone7-03 This comment, which expresses Zone 7's support for the exploration of interconnections and water exchanges among the SFPUC and other jurisdictions, such as the Dublin San Ramon Services District, is acknowledged. As discussed in Draft PEIR Section 9.4.4 (Vol. 4, Chapter 9, p. 9-116), the SFPUC explored some options for interconnections and water exchanges during development of the WSIP, but the SFPUC eliminated this concept from further consideration because it would not provide a reliable future water source consistent with the WSIP goals and objectives. However, as part of its overall water supply planning (irrespective of the WSIP), the SFPUC will continue to work with other Bay Area water agencies.

October 30, 2008

Final
Program Environmental Impact Report
Volume 7b of 8

For the
San Francisco Public Utilities Commission's

WATER SYSTEM IMPROVEMENT PROGRAM

Responses to Comments

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15.4 Groups

GROUPS

GROUPS THAT SUBMITTED COMMENTS ON THE DRAFT PEIR

Comment Letter Format	Comment Letter ID	Name of Commenter	Title	Organization/ Affiliation	Page
Email	SI_ACA1	Jeff Miller	Director	Alameda Creek Alliance	15.4-1
PH Fremont	SI_ACA2	Jeff Miller	Director	Alameda Creek Alliance	15.4-19
Email	SI_ACT	David T. Smernoff, Ph.D.	Board Vice President	Acterra: Action for a Sustainable Earth	15.4-20
Email	SI_CAC1	Steve Lawrence	Vice Chair	Citizens Advisory Committee to the SFPUC	15.4-22
Email	SI_CAC2	Steve Lawrence	Vice Chair	Citizens Advisory Committee to the SFPUC	15.4-25
Mail	SI_Caltrout	Brian Stranko	Chief Executive Officer	California Trout	15.4-29
Email	SI_CAREP	Buddy Burke / Virginia Chang Kiraly	CA REP President & CA REP Vice President	Republicans for Environmental Protection, Protection Commissioner, California Commission for Economic Development	15.4-31
PH Palo Alto	SI_CI	Katherine Forrest	Member	Commonwealth Institute	15.4-33
Mail	SI_CNPS	Amanda Jorgenson	Executive Director	California Native Plant Society	15.4-34
Email	SI_CNPS-EB1	Laura Baker	Conservation Committee Chair	California Native Plant Society, East Bay Chapter	15.4-35
PH Fremont	SI_CNPS-EB2	Lech Naumovich		California Native Plant Society, East Bay Chapter	15.4-55
Email	SI_CNPS-SCV1	Kevin Bryant	President, Santa Clara Valley Chapter	California Native Plant Society, Santa Clara Valley Chapter	15.4-54
Mail	SI_CNPS-SCV2	Libby Lucas	Conservation	California Native Plant Society, Santa Clara Valley Chapter	15.4-61

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Email	SI_CNPS-WLJ	Tedmund Swiecki	Conservation Committee Co-Chair	California Native Plant Society, Willis Jepson Chapter	15.4-67
Email	SI_CRS	Meredith Wingate / Brad Drda	Director Clean Energy Policy Design and Implementation Program	Center for Resource Solutions	15.4-68
Email	SI_CSERC	Brenda Whited	Staff Biology	Central Sierra Environmental Resource Center	15.4-70
Email	SI_CWA1	Jennifer Clary	Water Policy Analyst	Clean Water Action	15.4-71
PH SF1	SI_CWA2	Jennifer Clary	Water Policy Analyst	Clean Water Action	15.4-72
Mail	SI_D3Dem1	Tony Gantner	President	District 3 Democratic Club	15.4-73
PH SF1	SI_D3Dem2	Tony Gantner	President	District 3 Democratic Club	15.4-74
Mail	SI_EcoCtr	Martin Bourque	Executive Director	Ecology Center	15.4-75
Email	SI_EnvDef	Spreck Rosekrans	Senior Analyst	Environmental Defense	15.4-76
Mail	SI_Greenp	Krikor Didonian		Greenpeace	15.4-80
Email	SI_GWWF1	Cindy Charles	Conservation Chair	Golden West Women Flyfishers	15.4-81
PH SF1	SI_GWWF2	Cindy Charles	Chairperson	Golden West Women Flyfishers	15.4-82
Email	SI_KSWC	Joseph Vaile	Campaign Director	Klamath-Siskiyou Wildlands Center	15.4-83
Mail	SI_MenloBP	J. Wesley Skow	Attorney	Menlo Business Park LLC (on behalf of by DLA Piper US LLP)	15.4-84
Email	SI_NCFFSC	Dougald Scott	Chair	NCCFFF Steelhead Committee	15.4-87
Email	SI_PacInst	Peter Gleick	President	Pacific Institute	15.4-90
Email	SI_PilarCrk	Tim Frahm	Chair	Pilarcitos Creek Advisory Committee	15.4-118
Email	SI_RHH1	Jerry Cadagan	Board Member/Founder	Restore Hetch Hetchy; Committee to Save Lake Merced	15.4-120

GROUPS THAT SUBMITTED COMMENTS ON THE DRAFT PEIR (Continued)

Comment Letter Format	Comment Letter ID	Name of Commenter	Title	Organization/ Affiliation	Page
Hand-delivered, PH	SI_RHH2	Bob Hackamack	Tech/Engineering Chair	Restore Hetch Hetchy	15.4-123
PH Sonora	SI_RHH3	Bob Hackamack	Tech/Engineering Chair	Restore Hetch Hetchy	15.4-126
PH Sonora	SI_RHH4	Jerry Cadagan	Board Member/Founder	Restore Hetch Hetchy; Committee to Save Lake Merced	15.4-127
Email	SI_SCCCC	Mondy Lariz		Santa Clara County Creeks Coalition	15.4-128
PH SF1	SI_SFNeigh	Joan Girardot		Coalition for San Francisco Neighborhoods	15.4-129
Mail	SI_SierraC1	Blaine Rogers		Sierra Club, Tuolumne Group	15.4-131
PH Modesto	SI_SierraC2	Sandra Wilson	Chair	Sierra Club	15.4-132
PH Palo Alto	SI_SierraC3	Bill Young	Member	Sierra Club	15.4-133
PH Palo Alto	SI_SierraC4	Richard Zimmerman	Member	Sierra Club	15.4-135
PH SF1	SI_SierraC5	Gwynn MacKellen	Member	Sierra Club	15.4-137
PH SF1	SI_SierraC6	John Rizzo	Executive Committee Member	Sierra Club, San Francisco Bay Chapter	15.4-138
PH SF2	SI_SierraC7	John Rizzo	Executive Committee Member	Sierra Club, San Francisco Bay Chapter	15.4-139
Mail	SI_SPUR	Laura Tam	Sustainable Development Policy Director	San Francisco Planning and Urban Research Association	15.4-142
Mail	SI_SWC	Terry Erlewine	General Manager	State Water Contractors	15.4-145
PH Sonora	SI_TCFB	Stan Kellogg	President	Tuolumne County Farm Bureau	15.4-146
Email	SI_TROA	Stephen Welch	President	Tuolumne River Outfitters Association	15.4-147
Email	SI_TRT1	Amy Meyer	Founding Member	Tuolumne River Trust	15.4-148
PH Sonora	SI_TRT2	Cynthia King	Sierra Nevada Program Director	Tuolumne River Trust	15.4-149
PH Sonora	SI_TRT3	Galen Weston	Part-time Employee	Tuolumne River Trust	15.4-150

GROUPS THAT SUBMITTED COMMENTS ON THE DRAFT PEIR (Continued)

Comment Letter Format	Comment Letter ID	Name of Commenter	Title	Organization/ Affiliation	Page
PH Modesto	SI_TRT4	Meg Gonzalez	Director of Community Outreach and Education	Tuolumne River Trust	15.4-152
PH Modesto	SI_TRT5	Patrick Koepele	Central Valley Program Director	Tuolumne River Trust	15.4-153
PH Modesto	SI_TRT6	Eric Wesselman	Executive Director	Tuolumne River Trust	15.4-155
PH Fremont	SI_TRT7	Eric Wesselman	Executive Director	Tuolumne River Trust	15.4-156
PH Palo Alto	SI_TRT8	Peter Drekmeier	Bay Area Program Director	Tuolumne River Trust	15.4-159
PH SF1	SI_TRT9	Eric Wesselman	Executive Director	Tuolumne River Trust	15.4-161
PH SF2	SI_TRT10	Peter Drekmeier	Bay Area Program Director	Tuolumne River Trust	15.4-163
Mail	SI_TRT-CWA-SierraC	Peter Drekmeier, Jennifer Clary, John Rizzo		Tuolumne River Trust, Clean Water Action, Sierra Club	15.4-165

Alameda Creek Alliance, Jeff Miller, Director, 10/01/07

SI_ACA1-01 This comment states that the Draft PEIR fails to address impacts on anadromous fish in Alameda Creek. This comment also states that the Draft PEIR's mitigation measures for special-status species are inadequate and jeopardize the SFPUC's schedule for implementation of the WSIP facility improvement projects. Please refer to **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14) for an expanded discussion of existing fishery resources in Alameda Creek, potential WSIP impacts on steelhead in lower Alameda Creek below the Bay Area Rapid Transit District (BART) weir, and potential WSIP impacts under a future scenario in which steelhead have been restored to the reaches of Alameda Creek above the BART weir. Section 14.9 also includes a discussion of new protective measures that have been incorporated into the WSIP program description for the Calaveras Dam Replacement (SV-2) and the Alameda Creek Fishery Enhancement (SV-1) projects to address future-occurring steelhead in Alameda Creek above the BART weir, and text revisions to Mitigation Measure 5.4.5-3a (Vol. 3, Chapter 6, p. 6-52 and 6-53) that further define the fishery protection measures addressed in the PEIR.

SI_ACA1-02 Under the WSIP (through implementation of the Calaveras Dam Replacement project, SV-2), the SFPUC would reestablish historical diversions from upper Alameda Creek to Calaveras Reservoir such that diversions would be similar to those occurring prior to the 2001 Division of Safety of Dams (DSOD) restriction on Calaveras Reservoir. The Draft PEIR (Vol. 3, Chapter 5, Sections 5.4.5 and 5.4.6) describes potential impacts on fisheries and other biological resources due to the proposed changes in system operations. Please refer to **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14, Sections 14.9.3 and 14.9.4) for discussions addressing the commenter's concerns that implementation of the Calaveras Dam Replacement (SV-2) and the Alameda Creek Fishery Enhancement (SV-1) projects would divert additional stream flow from Alameda Creek and adversely affect native fish and other aquatic wildlife.

The commenter states that the SFPUC already diverts 86 percent of the stream flows tributary to the Sunol Valley from Alameda, Calaveras, and San Antonio Creeks. This statement is not derived from information contained in the Draft PEIR. Information on the current percentage of stream flow diverted by the SFPUC is not necessary for the impact analysis in the PEIR. Please refer to Draft PEIR, Vol. 3, Chapter 5, Section 5.4.1 for information used in the PEIR to analyze stream flows in the Alameda Creek watershed.

SI_ACA1-03 This comment states that the SFPUC's current operation of Calaveras and San Antonio Reservoirs does not include minimum bypass flows to keep native fish downstream in good condition. The commenter also questions the SFPUC's legal water right to divert Alameda Creek stream flow at the diversion dam. The SFPUC's existing water rights and entitlements for the Alameda watershed water supplies are described in the Draft PEIR (Vol. 1, Chapter 2, pp. 2-35 to 2-37). The SFPUC is currently operating Calaveras and San Antonio Reservoirs in compliance with applicable regulations and institutional considerations, which are described in the Draft PEIR (Vol. 1, Chapter 2, Sections 2.4 and 2.5, respectively). In addition, the existing and proposed diversion of water from the Alameda Creek watershed is consistent with the City and County of San Francisco's (CCSF) water rights (Vol. 1, Chapter 2, Section 2.5.1).

Implementation of the WSIP would result in increased diversions from Alameda Creek compared to the existing condition, but the proposed level of diversions would be similar to the historical level of diversions that occurred for about 70 years prior to the 2001 DSOD restriction on Calaveras Dam. Under the WSIP, the SFPUC would continue to operate the regional water system in compliance with applicable regulations.

Impact 5.4.5-3 in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.4.5-18 to 5.4.5-20) analyzes effects on fishery resources along Alameda Creek downstream of the Alameda Creek Diversion Dam. Mitigation Measure 5.4.5-3a in the Draft PEIR (Vol. 4, Chapter 6, pp. 6-52 and 6-53) outlines minimum flows in Alameda Creek for maintaining habitat suitable for resident trout downstream of the diversion dam. **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14, Section 14.9.4) discusses in detail the impact of the WSIP on habitat and fishery resources in Alameda Creek, including impacts on potential future-occurring steelhead, and describes minimum bypass flows (included as part of the Calaveras Dam Replacement project description) for protecting future-occurring steelhead. Please refer to **Response S_CDFG2-11** for additional information related to the future operation of Calaveras Dam and Reservoir under the WSIP; refer to **Response S_CDFG2-14** for additional information on Draft PEIR Measure 5.4.5-3b.

SI_ACA1-04 Please refer to **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14, Section 14.9.4) for discussion of minimum flows for anadromous fish.

SI_ACA1-05 Please refer to **Section 13.2, Program Description Changes Affecting System Operations** (Vol. 7, Chapter 13) and to **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14, Sections 14.9.4 and 14.9.5) for discussion of protective measures for steelhead in Alameda Creek.

SI_ACA1-06 This comment regarding the Alameda Creek Alliance's efforts to communicate its concerns and suggestions to the SFPUC regarding projects in the Sunol Valley is acknowledged.

SI_ACA1-07 As described in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.2-24 and 5.2-25), the SFPUC's adopted Water Enterprise Environmental Stewardship Policy establishes a long-term management direction for CCSF-owned lands and natural resources affected by operation of the SFPUC regional water system, including lands within the Alameda Creek watershed. In addition, the WSIP's goals and objectives shown in Table 3.2 of the Draft PEIR (Vol. 1, Chapter 3, p. 3-9) include a system performance objective to "manage natural resources and physical systems to protect watershed ecosystems."

The Draft PEIR addresses impacts on biological resources, including special-status species and rare habitats, and mitigations for significant impacts in the following sections: Vol. 2—Section 4.5, Section 4.16 (pp. 4.16-16 to 4.16-19), and Section 4.17 (pp. 4.17-51 and 4.17-52); Vol. 3—Sections 5.3.6, 5.3.7, 5.4.5, 5.4.6, 5.5.5, 5.5.6, and 5.7 (pp. 5.7-31, 5.7-32, 5.7-41, 5.7-42, 5.7-63, 5.7-64, 5.7-77, 5.7-81, 5.7-82); Vol. 4—Sections 6.3.5, 6.4.2, 6.4.3, and 6.4.4; and Vol. 5—Appendix D.

SI_ACA1-08 Please refer to **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14, Sections 14.9.4 and 14.9.5) for discussion of steelhead and other fish species in Alameda Creek.

SI_ACA1-09 Please refer to **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14, Section 14.9.5) for discussion Chinook salmon, coho salmon, Pacific lamprey, and other fish species in Alameda Creek.

SI_ACA1-10 Please refer to **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14, Section 14.9.5). The comment stating that there is historical evidence of steelhead trout in Arroyo de la Laguna, Arroyo Mocho, and Arroyo Valle is acknowledged. The existing setting related to fisheries in Arroyo de la Laguna, Arroyo Mocho, and Arroyo Valle, including a description of the historical setting, is discussed in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.4.5-2 and 5.4.5-3).

SI_ACA1-11 The regulatory status, life history, and distinctions between resident and migratory populations of steelhead and rainbow trout, as well as flows needed to support populations of these fish, are discussed in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.4.5-4 to 5.4.5-11). Please refer to **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14, Section 14.9.2) for additional discussion of the regulatory status of steelhead and rainbow trout. The information provided by the commenter regarding background studies leading to the designation of steelhead as a federally listed threatened species is acknowledged.

SI_ACA1-12 The commenter's assertion that SFPUC currently operates Calaveras and San Antonio Reservoirs in violation of California Fish and Game Code is noted. California Fish and Game Codes relevant to the WSIP are discussed in **Response SI-TRT-CWA-SierraC-84**; please refer to that response for details. Whether or not the SFPUC is currently operating the regional water system in compliance with the California Fish and Game Code, including Section 5937, is not a CEQA issue. As described in the Draft PEIR (Vol. 1, Chapter 2, p. 2-41), Calaveras Dam and Reservoir is the only SFPUC facility in the Alameda Creek watershed operating under an agreement to make releases in support of fisheries, although due to the current DSOD restrictions on Calaveras Dam, the CDFG has agreed that implementation of the flow releases can be suspended until the Calaveras Dam Replacement project is completed. Operation of Turner Dam on San Antonio Reservoir is not currently subject to a release agreement to support fisheries.

The commenter states that the current operations and implementation of the WSIP, specifically the operation of the Alameda Creek Diversion Dam (ACDD), would violate California Fish and Game Code Sections 5901 and 5937. As described in Section 13.2 of this Comments and Responses document (Vol. 7, Chapter 13), the SFPUC has modified the project description of the Calaveras Dam Replacement project (SV-2) to include construction of a new bypass structure at the diversion dam and protective measures for fishery resources, including releases at the ACDD consistent with flows required under the 1997 CDFG MOU. The proposed modifications and protective measures included in the Calaveras Dam Replacement project are designed to minimize impacts on potential future-occurring steelhead in the upper Alameda Creek watershed in the event that man-made barriers in Alameda Creek are successfully removed and steelhead migration, spawning, and rearing have been restored in Alameda Creek above the BART weir. In addition, the Draft PEIR has identified Measure 5.4.5-3a, Minimum Flows for Resident Trout in Alameda Creek, to reduce potential impacts of the WSIP on fisheries.

For a discussion of WSIP impacts on potential future-occurring steelhead in Alameda Creek and a description of protective flow measures included as part of the WSIP program description (part of Calaveras Dam Replacement and Alameda Creek Fishery Enhancement projects) to minimize impacts on steelhead life stages and habitat requirements, including minimum bypass flows and releases at the Alameda Creek Diversion and Calaveras Dams, please refer to **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14, Section 14.9.4). Additionally, refer to **Response SI_ACA1-03**, above, as well as **Responses S_CDFG2-11** and **S_CDFG2-14** for further discussion of minimum bypass flows for resident fish.

The San Francisco Planning Department received comments from the CDFG on the PEIR Notice of Preparation (NOP) in a letter dated January 19, 2007. The CDFG letter dated November 22, 2005 referred to by the commenter was in regard to the NOP for the Calaveras Dam Replacement project (SV-2). The information quoted from the CDFG letter regarding flows for anadromous steelhead and use of storage facilities to meet minimum bypass flows is noted.

Implementation of the WSIP would result in increased diversions from Alameda Creek compared to the existing condition, but the proposed level of diversions would be similar to the historical level of diversions that occurred for about 70 years prior to the 2001 DSOD restriction on Calaveras Dam. The Draft PEIR (Vol. 3, Section 5.4.5) addresses impacts on fisheries in the Alameda Creek watershed that would result from the WSIP. Draft PEIR Impact 5.4.5-3 (Vol. 3, Chapter 5, pp. 5.4.5-18 to 5.4.5-20) analyzes effects on fishery resources along Alameda Creek downstream of the ACDD. Impacts on fishery resources below Calaveras Dam and Turner (San Antonio) Dam are discussed in Impacts 5.4.5-2 and 5.4.5-5 (Vol. 3, Chapter 5, pp. 5.4.5-17 and 5.4.5-21), respectively. The Draft PEIR concluded that impacts on fishery resources below Calaveras Dam would be beneficial due to the instream flow releases that would be implemented as part of the WSIP, and that impacts on fishery resources below San Antonio Reservoir would be less than significant because the seasonal patterns of instream flow releases to San Antonio Creek would be similar under the existing condition and with the WSIP. The fact that Calaveras and Turner Dams currently act as a complete barrier to fish migration would be unchanged under the WSIP and are, therefore, not subject to review under CEQA.

SI_ACA1-13 The description and implementation status of the 1997 CDFG MOU provided by the commenter corroborates the information presented in the Draft PEIR (Vol. 1, Chapter 2, p. 2-41 and Vol. 3, Chapter 5, p. 5.4.1-9). The commenter also provides an interpretation of the DSOD restrictions on Calaveras Dam and discusses the SFPUC fishery release flows from Calaveras Reservoir; those comments confuse regional water system firm yield and Calaveras yield (a subset of the regional water system), and a correction is provided here. Currently, due to the DSOD operating restrictions on Calaveras Dam, the system firm yield of the regional water system was reduced to 219 million gallons per day (mgd), a 7 mgd reduction from the normal system firm yield (i.e., prior to the 2001 DSOD restrictions) of 226 mgd (not 223 mgd as stated by the commenter). The DSOD restrictions reduced the total storage capacity of Calaveras Reservoir by about 60 percent, and the total working storage capacity of the SFPUC's local reservoirs by over 30 percent (see Draft PEIR, Vol. 1, Chapter 2, p. 2-10). Although the SFPUC is currently not releasing water from Calaveras Reservoir to meet the requirements of the 1997 CDFG MOU, the SFPUC reduced diversions from Alameda Creek above the diversion dam when the DSOD imposed the restrictions on Calaveras Dam in 2001, thereby increasing natural flow in Alameda

Creek downstream of the diversion dam. The Draft PEIR provides a detailed discussion of flows below the Alameda Creek Diversion and Calaveras Dams following the DSOD restrictions (Vol. 3, Chapter 5.4, pp. 5.4.1-9 to 5.4.1-13).

The commenter states that the resident trout population below Calaveras Dam is not in good condition, and that the Draft PEIR fails to adequately discuss minimum flows for anadromous steelhead and resident trout life stages and habitat requirements. **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14, Section 14.9.4) provides a detailed discussion of minimum bypass flows to protect fishery resources on Alameda Creek. The information provided by the commenter from the CDFG letter dated November 22, 2005 was in regard to the NOP for the Calaveras Dam Replacement project (not the WSIP PEIR); please refer to **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14, Section 14.9.4) for discussion of the issues identified by the CDFG in this letter. For further information related to the CDFG review of WSIP impacts on Alameda Creek fishery resources, please refer to **Responses S_CDFG2-01** and **S_CDFG2-11** to **S_CDFG2-15**.

SI_ACA1-14 Under the WSIP, the SFPUC does not propose to increase diversions in excess of the water rights the CCSF now holds in the Alameda Creek watershed, and, consequently, the CCSF does not require new water rights from the State Water Resources Control Board. The diversion of water in and from the Alameda Creek watershed is consistent with the CCSF's water rights. The CCSF holds a water right to divert from Alameda Creek into Calaveras Reservoir along with the rights it holds to divert and store water in Calaveras Reservoir from Arroyo Hondo and Calaveras Creek (see Vol. 1, Chapter 2, Section 2.5.1).

The comment regarding the State Water Resources Control Board's estimate of impairment in the Alameda Creek watershed is acknowledged. This statement is not derived from information contained in the Draft PEIR, and this information on the current percentage of impairment in Alameda Creek is not necessary for the impact analysis in the PEIR. Please refer to Draft PEIR, Vol. 3, Chapter 5, Section 5.4.1 for information used in the PEIR to analyze stream flows in the Alameda Creek watershed. The comment stating that the Department of Water Resources considers the Alameda Creek watershed "fully appropriated' is also acknowledged.

SI_ACA1-15 The Raker Act does not require San Francisco to develop and use local water sources before it can divert out of the Tuolumne River watershed. Rather, the Raker Act restricts San Francisco's use of Tuolumne River water in the Bay Area to municipal and domestic purposes only. Under the WSIP, the SFPUC would continue to maximize its use of local resources and develop those local resource projects and programs that are feasible, reasonable, and cost-effective consistent with responsible stewardship of Tuolumne River resources.

As stated in the Draft PEIR, the CCSF must adhere to the Raker Act (Vol. 1, Chapter 2, pp. 2-33 and 2-34). The WSIP is consistent with Raker Act requirements, including Section 9(h), with respect to the export of additional water from the Tuolumne River watershed, since the additional diversions under the WSIP would be for municipal and domestic purposes. Also refer to **Responses L_TUD1-05** and **L_MID-TID-09**.

Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for a discussion of conservation and water recycling in San Francisco.

SI_ACA1-16 Please refer to **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14, Section 14.9.4) with regard to the effects of the WSIP on steelhead and SFPUC plans to consult with the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service, and CDFG for compliance with the Federal and California Endangered Species Acts.

The commenter correctly quotes the Draft PEIR regulatory status description relevant to steelhead (Vol. 3, Chapter 5, pp. 5.4.5-4 and 5.4.5-11); this description remains valid, although updated information on the SFPUC's proposed protective measures for steelhead is provided in **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14). The opinion of the commenter that steelhead trout could have access to Alameda Creek stream reaches affected by the SFPUC dams by 2010 is acknowledged, and Section 14.9 also addresses this potential future scenario.

With regard to the comment regarding consultation with federal wildlife agencies on listed species, the subsequent environmental review of individual WSIP project will include consultation with resource agencies as determined appropriate based on the project-level, site specific analysis. Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14).

The Draft PEIR (Vol. 2, Chapter 4, pp. 4.6-33 to 4.6-37) describes habitat conservation plans for species listed as threatened or endangered under the Federal and California Endangered Species Acts that could potentially be affected by the WSIP. These include the San Joaquin County Multi-Species Habitat Conservation and Open Space Plan, the Draft Santa Clara Valley Habitat Conservation Plan/Natural Communities Conservation Plan, the SFPUC Alameda and Peninsula Watershed Habitat Conservation Plans, and the San Joaquin River National Wildlife Refuge Comprehensive Conservation Plan. Impact 4.6-5 (Vol. 2, Chapter 4, pp. 4.6-73 and 4.6-74) describes the potential for conflict with the provisions of applicable plans; it was concluded that impacts from the WSIP projects would be less than significant or could be reduced to a less-than-significant level through the implementation of identified mitigation measures.

SI_ACA1-17 The commenter correctly states that one of the goals of the WSIP is to enhance sustainability in all system activities (Draft PEIR, Table 3.2, Vol. 1, Chapter 3, p. 3-9). The commenter's description of the SFPUC Water Enterprise Environmental Stewardship Policy corroborates the description presented in the Draft PEIR (Vol. 3, Chapter 5, p. 5.2-25). It should be noted that this policy is subsidiary to the overall mission of the SFPUC, which, as described in the Draft PEIR (Vol. 1, Chapter 3, p. 3-5), is "to serve San Francisco and its Bay Area customers with reliable, high-quality and affordable water, while maximizing benefits from power operations and responsibly managing the resources entrusted to its care." The consistency of the WSIP with the stewardship policy is described in the Draft PEIR (Vol. 3, Chapter 5, p. 5.2-29).

In response to this comment, Table 2.3 (Vol. 1, Chapter 2, p. 2-45) is revised to include the Water Enterprise Environmental Stewardship Policy as the last row in the table:

TABLE 2.3
SFPUC WATER RESOURCES POLICIES RELATED TO THE WSIP

Date	Resolution Number	Description
June 2006	06-0105	*Water Enterprise Environmental Stewardship Policy* The Environmental Stewardship Policy will be integrated into SFPUC Water Enterprise planning and decision-making processes and also directly implemented through a number of efforts, including: • Implementation and updating of the existing Alameda and Peninsula Watershed Management Plans • Development of Habitat Conservation Plans for the Alameda and Peninsula Watersheds • Development and implementation of the Watershed and Environmental Improvement Program, which will cover the Tuolumne River, Alameda Creek, and Peninsula watersheds • Development of the Lake Merced Watershed Plan • Active participation in local forums, including coordination with Yosemite National Park Service and Stanislaus National Forest in the Tuolumne River watershed, the Tuolumne River Technical Advisory Committee, the Alameda Creek Fisheries Restoration Workgroup, the Pilarcitos Creek Restoration Workgroup, and the Lake Merced Task Force • Integration of the policy into the WSIP and individual infrastructure projects (i.e., repair and replacement programs) • Reliance on the policy to guide the development of project descriptions, alternatives and mitigation for all SFPUC projects during the environmental review process under CEQA and/or NEPA • Providing support for and encouragement to all employees to integrate environmental stewardship into daily operations through communication and training

SI_ACA1-18 The commenter makes reference to several cited technical reports (Vol. 3, Chapter 5, pp. 5.4.6-6 and 5.4.6-11), which are part of the administrative record for the PEIR, and therefore are available to the public on request from the San Francisco Planning Department. It should be noted, however, that CEQA does not require that an agency perform all research or study recommended by commenters, as long as a good faith effort at full disclosure is made in the EIR (CEQA Guidelines Section 15204[a]).

The commenter states that the Draft PEIR omits consideration of impacts on several special-status species. For a discussion of the issues raised by this comment, please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.4). This master response describes the appropriate level of detail of a biological resources impact analysis at the program level versus the project level. As discussed in Draft PEIR Section 5.4.6, WSIP water supply and system operations in the Alameda watershed would not affect species dependent on upland habitats, such as the Callippe silverspot butterfly, San Joaquin kit fox, or Berkeley kangaroo rat. Impacts on upland-dependent special-status species as a result of WSIP projects, such as construction of the Calaveras Dam Replacement project (SV-2), are analyzed at a program level in the PEIR and will be analyzed in more detail in project-specific CEQA documents. Responses to species-specific comments are provided below.

Bay checkerspot butterfly and San Joaquin kit fox. At the programmatic level and using the best available data, the Draft PEIR analysis determined that Bay checkerspot butterfly and San Joaquin kit fox are not present in the Sunol Valley Region (Vol. 2, Chapter 4, pp. 4.6-18 and 4.6-22). However, the project-specific EIRs prepared for the individual WSIP projects will not be constrained by the species occurrence data presented in the PEIR, and must reevaluate all species identified in the PEIR as potentially affected by program elements. If new or additional data are available at the time the project-specific EIRs are prepared, or if the legal or identified status of species changes in the interim, potential impacts would be evaluated at that time and appropriate mitigations would be identified. If the determination is made that impacts on these species could occur, the standard mitigation measures presented in the Draft PEIR (Vol. 4, Chapter 6, Tables 6.1 and 6.2, pp. 6-14 through 6-20) would apply to Bay checkerspot butterfly (Measure I.3) and San Joaquin kit fox (Measure M.2). In addition, standard construction measures to reduce project footprints as well as construction monitoring would minimize potential impacts on all special-status species.

Berkeley kangaroo rat. The commenter notes that impacts on Berkeley kangaroo rat are not analyzed in the Draft PEIR. Please refer to the Draft PEIR discussion of the programmatic impact methodology (Vol. 2, Chapter 4, p. 4.6-1). The PEIR focuses on those special-status species and key sensitive habitats that are formally listed or designated under the California and Federal Endangered Species Acts, as these species/habitats are considered to have the highest degree of ecological sensitivity and legal protection. Berkeley kangaroo rat has no formal status with either the CDFG or USFWS. Separate, project-level CEQA review will be conducted as appropriate for the WSIP projects; this review will describe project impacts on the full range of biological resources more precisely and, where necessary, tailor the mitigation measures presented in the PEIR. As noted above, no upland-dependent special-status species were found to be affected by WSIP operations.

Calaveras Reservoir Species. Although the commenter states that potential impacts on California red-legged frog, California tiger salamander, and Alameda whipsnake are not analyzed, Table 4.6-3 in the Draft PEIR (Vol. 2, Chapter 4, p. 4.6-41) and Table 5.4.6-3 (Vol. 3, Chapter 5, p. 5.4.6-8) list each of these species as present in program area, including Calaveras Reservoir, and the programmatic impact assessment for the Calaveras Dam Replacement project (SV-2) identifies impacts on these species as potentially significant (Vol. 2, Chapter 4, p. 4.6-63). Table 6.1 in the Draft PEIR (Vol. 4, Chapter 6, p. 6-14) identifies programmatic mitigation measures for these species that would apply to the Calaveras Dam Replacement project and other projects in the Sunol Valley Region.

SI_ACA1-19 The opinion of the commenter regarding the WSIP's effects on stream flow below the ACDD (Impact 5.4.1-2, Vol. 3, Chapter 5, p. 5.4.1-25) is noted. The PEIR concludes that this impact would be significant and unavoidable because the WSIP would substantially reduce stream flows and alter the stream hydrograph of Alameda Creek below the diversion dam compared to the existing condition with the DSOS restrictions on Calaveras Dam. As part of the WSIP water supply option, the proposed program would reestablish the historical level of diversions from Alameda Creek to Calaveras Reservoir (Vol. 3, Chapter 5, pp. 5.4.1-33 to 5.4.1-35).

The commenter correctly quotes Mitigation Measure 5.4.1-2, Diversion Tunnel Operation (Vol. 4, Chapter 6, p. 6-51), and the commenter's opinion of this measure is noted. The commenter states that Measure 5.4.1-2 is not adequate to protect fish and wildlife resources on Alameda Creek downstream of the diversion dam. However, Measure 5.4.1-2 was designed to mitigate impacts on creek hydrology below the diversion dam resulting from the reduction in peak flows (due to the resumption of historical diversions to Calaveras Reservoir)—not specifically to mitigate impacts on fish and wildlife due to WSIP flow reductions (see Mitigation Measures 5.4.5-3a and 5.4.5-3b, Vol. 4, Chapter 6, pp. 6-52 to 6-54). As stated, Measure 5.4.1-2 is intended to reduce the impacts of reduced stream flow below the diversion dam, but would not reduce the impact to a less-than-significant level.

Draft PEIR Impact 5.4.5-3 analyzes the effects of the WSIP on fisheries due to changes in stream flow below the diversion dam (Vol. 3, Chapter 5, pp. 5.4.5-18 to 5.4.5-20). Although the commenter correctly quotes excerpts from this impact analysis, the indented quotation is not accurate since it does not indicate that some intervening sentences are missing. The analysis in Impact 5.4.5-3 concluded that the WSIP would result in potentially significant but mitigable impacts on resident rainbow trout habitat along Alameda Creek immediately downstream of the diversion dam.

The commenter correctly quotes the first two paragraphs of Draft PEIR Mitigation Measure 5.4.5-3a; please refer to **Chapter 16, Staff-Initiated Text Revisions** (Vol. 7) for revisions made to this measure since PEIR publication to reflect changes in the project description of the Calaveras Dam Replacement project (SV-2). This measure includes performance criteria and would reduce Impact 5.4.5-3 to a less-than-significant level; in addition to providing for minimum flows in support of resident trout, it includes monitoring, adaptive management, and coordination with resource agencies as well as other agencies/organizations involved in fishery studies on Alameda Creek. The commenter is correct in noting that the PEIR does not contain detailed information to determine whether 10 cubic feet per second is sufficient to support trout spawning and egg incubation; however, Mitigation Measure 5.4.5-3a provides for site-specific studies to identify and implement the appropriate minimum stream flow. The measure specifies that minimum stream flows would be required when precipitation would naturally generate runoff in the creek below the diversion dam under unimpaired conditions between December 1 and April 30.

To ensure the adequacy and effectiveness of the mitigation, the Draft PEIR also includes Mitigation Measure 5.4.5-3b, which provides a timeline tied to a performance measure along with supplemental actions that would reduce the impact to a less-than-significant level. The commenter correctly quotes the first paragraph of Measure 5.4.5-3b.

The commenter raises the issue that the diversion tunnel may currently be injuring or harming fish; however, CEQA does not require that projects provide mitigation for existing conditions.

For impacts related to steelhead migration, please refer to **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14, Section 14.9.4). For impacts on Pacific lamprey and Chinook salmon, refer to Section 14.9.5 of this master response. The information provided by the commenter on recent fishery monitoring results in Alameda Creek is acknowledged.

The commenter correctly quotes the provisions of Mitigation Measure 5.4.6-3, Operational Procedures for Calaveras Dam Releases (Vol. 4, Chapter 6, p. 6-55); however, the commenter incorrectly links this measure with impacts on resident rainbow trout below the diversion dam and incorrectly states that it would begin no earlier than 10 years after the construction of Calaveras Dam. Measure 5.4.6-3 was developed to reduce potentially significant impacts associated with Impact 5.4.6-3 (effects on riparian habitat and related biological resources along Calaveras Creek, from Calaveras Reservoir to the confluence with Alameda Creek) and would be implemented prior to the completion of Calaveras Dam.

The objectives of the flows specified in the 1997 CDFG MOU were developed prior to and independent of the WSIP and therefore are not a CEQA issue subject to evaluation in the PEIR. The Draft PEIR does not rely on the MOU flows to mitigate the WSIP's impacts on species, but rather evaluates the effects of implementation of the MOU as part of the WSIP. Please refer to **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14) for a discussion of proposed changes related to the MOU releases and other bypass flows proposed as part of the Calaveras Dam Replacement project (SV-2). In addition, Section 14.9.4 of this master response presents a detailed analysis of WSIP impacts on steelhead as well as protective measures designed to provide minimum flows for potential future-occurring steelhead.

SI_ACA1-20 The commenter states that the Draft PEIR contains inadequate mitigations for significant WSIP impacts on steelhead, Chinook salmon, and Pacific lamprey. Please refer to **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14, Sections 14.9.4 and 14.9.5).

The commenter refers to standard mitigation measure F1 listed in Table 6.2 in the Draft PEIR (Vol. 4, Chapter 6, p. 6-16). As indicated in the Draft PEIR, the measures listed in this table are generic measures and will be modified based on site-specific conditions and applied to each WSIP project as appropriate. These measures are intended to be the minimum necessary actions, and the project-specific CEQA analyses may identify additional measures for key special-status species once more site-specific information is available. Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14).

The commenter suggests mitigation measures for the protection of aquatic wildlife, including fencing out cattle from streams to protect spawning habitat and riparian vegetation, eradicating bass from Calaveras and San Antonio Reservoirs, and increasing dissolved oxygen (DO) in reservoirs to provide habitat for reservoir-residing trout. As described below, these measures are either already being implemented by the SFPUC or have been determined to be unnecessary as programmatic mitigation for the WSIP.

Livestock Grazing. Livestock grazing on the Alameda watershed has been a standard practice for more than a century and is a crucial management tool for wildfire protection. The SFPUC has taken measures to reduce the potential impacts of erosion, native plant displacement, and water quality degradation often associated with grazing. Grazing management practices, including fencing creeks to keep out livestock and limiting the number of animals allowed in the watershed, have helped to maintain high water quality and reduce the threat of wildfire while also providing protection to aquatic wildlife. Grazing is an important tool in managing fire by reducing the amount of grass and other vegetation that presents a fire hazard if left unmanaged during the hot, dry summers typical of the region. The *Alameda Watershed Management Plan* (SFPUC, 2001) outlines management actions for periodically and systematically inspecting watershed perimeter fencing, access gates, and locks and for repairing/replacing them as required to minimize trespassing, straying cattle, and illegal dumping.

Specific grazing management actions listed in the *Alameda Watershed Management Plan* detail methods the SFPUC follows to effectively manage and contain grazing activities so that the beneficial aspects related to fire management can be realized without jeopardizing water quality/quantity and biological resources. These management actions specify the implementation of structural protection measures to reduce the risk of viable pathogen discharges into watershed streams and reservoirs, as well as the strategic placement of fencing around reservoirs and streams to restrict cattle access and around riparian pastures to restrict access by calves. The fencing prevents cattle from entering these areas while at the same time providing for adequate wildlife access.

Dissolved Oxygen Management. Currently, the SFPUC manages DO levels in Calaveras Reservoir through liquid oxygen supply based on a feasibility study conducted in 2003. As described in the Draft PEIR, levels of DO are managed to provide for and protect fish habitat and drinking water quality (Vol. 3, Chapter 5, p. 5.4.3-2). The oxygenation management system has the capability to provide this same protection in a larger reservoir and would continue to be operated once the dam is replaced and storage levels are restored to the historical levels in place prior to the 2001 DSOD operating restriction. Dissolved oxygen levels in Calaveras Reservoir would remain equal to or would possibly improve over those under the existing condition. Under existing conditions, the reduced water pool in the lowered reservoir has constrained reservoir habitat for trout, since the water column that provides suitable temperatures and oxygenation for trout survival has severely decreased. Higher water elevations with implementation of the WSIP would provide increased habitat for aquatic species and an increase in coldwater pool storage. Dissolved oxygen levels in San Antonio Reservoir are not expected to change significantly as a result of WSIP implementation. However, the SFPUC is investigating an oxygenation system for San Antonio Reservoir.

<u>Predator Control</u>. Draft PEIR Section 5.4.5 and Impacts 5.4.5-1 and 5.4.5-4 (Vol. 3, Chapter 5) discuss fishery resources and the impacts of WSIP implementation. For the Calaveras and San Antonio Reservoirs, the WSIP would increase the storage volume from that under current conditions. In assessing the fishery-related impacts due to this change, it was concluded that the increase would offer the potential for increased coldwater pool storage and would also benefit coldwater fish species downstream of Calaveras Reservoir. Additionally, this increased coldwater pool volume within the reservoirs would increase the volume of habitat available for resident fish species, including both warmwater and coldwater species. While this increase in habitat could increase the abundance of non-native predators, the overall impact on fishery resources is deemed beneficial due to the improved habitat conditions, along with greater connectivity and migration of fish between the reservoir and upstream tributaries; therefore, no mitigation measures are necessary.

SI_ACA1-21 The comments regarding the Draft PEIR's programmatic mitigation measures for potential impacts on special-status butterflies, burrowing owl, and San Joaquin kit fox are noted. As stated above in **Response SI_ACA1-20**, these standard programmatic measures for biological resources are generic measures and will be modified based on site-specific conditions and applied to each WSIP project as appropriate. The measures are intended to be the minimum necessary actions and are consistent with mitigations currently accepted by the resource agencies. As more site-specific information becomes available, the project-specific CEQA analyses for the WSIP projects may identify additional measures for key special-status species. Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.4).

<u>Butterflies</u>. The location, quality, and extent of suitable habitat for special-status invertebrate species will be identified at the project-specific EIR level, and Mitigation Measure I.3 would be implemented (Vol. 4, Chapter 6, Tables 6.1 and 6.2, pp. 6-14 to 6-20). Fugitive dust can be a problem for the host plants of these butterflies; however, this type of impact is normally addressed at the project level when project footprints and construction methods have been better defined.

<u>Burrowing owl</u>. The commenter is correct in that passive relocation of burrowing owls does not ensure their survival, only that mortality is avoided. Passive relocation of owls as proposed is consistent with current CDFG guidance (*Staff Report on Burrowing Owl Mitigation*, memorandum dated October 17, 1995, signed by C.F. Raysbrook, CDFG Interim Director). However, PEIR mitigations do include habitat replacement, such as those under the Habitat Reserve Program. While long-term monitoring of the fate of relocated burrowing owls is an excellent conservation practice, it is not required under CEQA for owls or any other species.

San Joaquin kit fox. The commenter states that there should be no destruction of potential San Joaquin kit fox dens in the Sunol Valley. Potentially suitable dens (excavations with a minimum 4-inch aperture) are plentiful due to the presence of resident California ground squirrels and other fossorial (digging) animals; the availability of dens is not a limiting factor for kit fox. By contrast, active dens with known kit fox use are protected as endangered species habitat. Please refer to Mitigation Measure M.2 (Vol. 4, Chapter 6, Table 6.2, p. 6-19 and 6-20) for standard programmatic measures for the protection of San Joaquin kit fox and its habitat.

Mitigation ratios. This comment stating that mitigation ratios for impacts on wetlands and critical habitat for a listed species should be higher than 1:1 is acknowledged. The actual mitigation ratios for wetlands, sensitive habitats, key special-status species, and other species of concern affected by the individual WSIP projects will be developed at the project level when the extent, location, and quality of affected habitat are known. Mitigation Measure 4.6-1b states that, "SFPUC will develop and implement compensation plans that meet the appropriate regulatory requirements and permit conditions with respect to compensation ratios…." (Vol. 4, Chapter 6, p. 6-11).

In response to this comment, the Draft PEIR (Vol. 4, Chapter 6, p. 6-11, third paragraph) is revised as follows:

> For each WSIP project, a qualified biologist will quantify the magnitude and extent of impacts to wetlands, sensitive habitats, and key special-status species and other species of concern, and the SFPUC will develop and implement restoration and/or compensation plans that meet the appropriate regulatory requirements and permit conditions with respect to restoration and/or compensation ratios. Compensation ratios typically range from a minimum of 1:1 for common habitats to 2:1 or higher for rare and sensitive habitats. If individual project requirements of the RWQCB, CDFG, or USFWS differ somewhat from these ratios, they are still intended to achieve the same purpose of full restoration and/or compensation, ~~other conservation measures and management requirements~~ to mitigate project impacts to less-than-significant levels, and to ensure no net reduction in the populations of any species listed as threatened or endangered by the state or federal resource agencies.

SI_ACA1-22 This comment refers to and consists of comments from the Alameda Creek Alliance letter to the San Francisco Planning Department (dated August 28, 2007), which provides scoping comments on the Habitat Reserve Program. As described in the Draft PEIR (Vol. 1, Chapter 3, pp. 3-84 and Vol. 4, Chapter 6, p. 6-11), the Habitat Reserve Program is being designed as a comprehensive, coordinated approach to implementing mitigation measures for impacts on biological resources and related regulatory compliance for the WSIP projects. In most cases, the Habitat Reserve Program would augment the project-specific mitigation measures, focusing on habitat compensation requirements. However, it should be noted that the Habitat Reserve Program is presented as one alternative for implementing offsite habitat compensation. Please refer also to **Response L_EBRPD-16** regarding the Habitat Reserve Program.

SI_ACA1-23 This comment refers to and consists of comments from the CDFG letter to the San Francisco Planning Department (dated November 22, 2005) responding to the NOP on the Calaveras Dam Replacement project (SV-2).

As stated in **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.2), the PEIR provides a foundation for any necessary future environmental review documents that focus on individual WSIP projects and presents a general, program-level analysis of the types of impacts that could occur under the individual WSIP facility improvement projects (see Vol. 2, Chapter 4). Thus, the requested site-specific analysis of construction and operation of the Calaveras Dam Replacement project (SV-2) is more appropriately addressed in the CEQA document for that project.

However, the PEIR does provide a project-level analysis of impacts related to the WSIP water supply and system operations, relevant in part to the operational component of the Calaveras Dam Replacement project (SV-2). The issues listed in this comment regarding the WSIP water supply and system operations include: flow issues related to steelhead (see Vol. 7, Chapter 14, **Section 14.9, Master Response on Alameda Creek Fishery Issues**); minimum bypass flows for fisheries at Calaveras Dam and ACDD (see Vol. 3, Chapter 5, Section 5.4.5); and impacts on fisheries upstream and downstream of San Antonio Reservoir (see Vol. 3, Chapter 5, Impacts 5.4.5-4 and 5.4.5-5, p. 5.4.5-21). The remaining issues listed in this comment are more appropriately addressed in the EIR for the Calaveras Dam Replacement project, especially in light of the fact that the intent of the CDFG letter was to provide guidance in the development of the scope of that EIR.

SI_ACA1-24 Please refer to **Response SI_ACA1-22**, above.

SI_ACA1-25 Please refer to **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14, Section 14.9.4).

SI_ACA1-26 The SFPUC wholesale customers are represented by the Bay Area Water Supply and Conservation Agency (BAWSCA), which was created by the California legislature in 2002 with adoption of Assembly Bill 2058; BAWSCA, which was formerly known as the Bay Area Water Users Association (BAWUA), was founded in 1958 to oversee administration of the Master Water Sales Agreement. As part of the WSIP planning process, the SFPUC, in cooperation with its wholesale customers and BAWSCA, undertook a study to assess the potential for additional conservation and recycled water projects, including potential regional projects that were not identified in the previous studies and already considered to be implemented locally by 2030. The study considered projects that would be feasible if implemented regionally, including projects that may have been found to be infeasible for individual customers. This study, the *Investigation of Regional Water Supply Option No. 4 Technical Memorandum* (URS, 2006), provided the basis for the Aggressive Conservation/Water Recycling and Local Groundwater Alternative discussed in Draft PEIR Chapter 9 (Vol. 4, pp. 9-47 to 9-59). As indicated on p. 9-49, this alternative could meet about 75 percent of the additional projected 2030 average annual water supply need; however, at least 6 mgd of the 2030 purchase requests would be unmet.

Regarding the statement that the Draft PEIR underestimates the potential for water conservation and recycling, please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3). Regarding the comparison of SFPUC service area conservation to that in other metropolitan areas, refer to Section 14.2.3 under the heading Frequently Submitted Comments Addressing Conservation and Recycling. The commenter's opinion that recycled water use in the SFPUC service area is comparatively low is acknowledged.

Draft PEIR Table 3.3 (Vol. 1, Chapter 3, p. 3-18) and Table 7.2 (Vol. 4, Chapter 7, p. 7-15) show the estimated levels of water conservation and recycling assumed in the purchase estimates submitted by each water customer. The averages of the estimated ranges of conservation (13 to 19 mgd) and recycling (9 to 14 mgd) represent about 4 percent and 3 percent, respectively, of the total 2030 demand (417 mgd) for the service area, as this comment states. The commenter's opinion that these levels are unreasonably low is acknowledged. Note, however, that a comparison of per-capita water consumption in each hydrologic region of the state, as shown in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3), indicates that per-capita consumption in the Bay Area is low compared to other parts of the state.

The commenter's opinion that there is a discrepancy between the conservation and recycling goals set by the SFPUC and those of its wholesale customers is acknowledged. This comment refers to BAWSCA's 2000 Water Supply Master Plan; this document was primarily authored by SFPUC, in conjunction with BAWSCA. The requirement in the master plan (according to this comment) that wholesale customers employ their best efforts to use all sources of water owned or controlled by them, including groundwater, is consistent with the Master Water Sales Agreement requirements discussed in the Draft PEIR (Vol. 1, Chapter 2, p. 2-44 and Vol. 4, Chapter 7, p. 7-13). Tables 14.2-6 and 14.2-7 in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) show the conservation measures currently being implemented or planned for implementation under the WSIP by each wholesale customer and by the SFPUC for the retail service area.

The commenter incorrectly states that the Draft PEIR does not adequately analyze alternatives that include the potential for conservation, recycling, and groundwater by the wholesale customers. The Draft PEIR included multiple alternatives involving higher levels of conservation and recycling than were proposed under the WSIP, including the Aggressive Conservation/Water Recycling and Local Groundwater Alternative and the Modified WSIP Alternative, which are fully analyzed in the Draft PEIR (Vol. 4, Chapter 9, pp. 9-47 to 9-59 and pp. 9-78 to 9-84, respectively). Also refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3, under the heading Additional Conservation and Water Recycling Potential), **Section 14.10, Master Response on Modified WSIP Alternative**, and **Section 13.4, Phased WSIP Variant,** for more detailed discussion and analysis of additional conservation, water recycling, and groundwater projects in the wholesale customer service area.

Alameda Creek Alliance, Jeff Miller, Director, 09/18/07

[See Public Hearing Transcript, Fremont, pp. 17–20]

SI_ACA2-01 Please refer to **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14, Section 14.9.4).

The commenter is correct in noting that compliance with the law is not necessarily the same as mitigation for impacts under CEQA. As discussed in the Draft PEIR (Vol. 2, Chapter 4, pp. 4.1-6 and 4.1-7), there are some cases where compliance with regulations could avoid or minimize a significant impact; in other cases, there may be no applicable regulations or the regulations by themselves would not be sufficient to avoid or minimize a significant impact. In the latter case, the PEIR identifies whether feasible measures are available that could reduce significant impacts to a less-than-significant level.

The SFPUC is currently operating the Alameda Creek Diversion Dam in compliance with all applicable regulations and would continue to do so under the WSIP. The commenter's statement that this organization is calling on the SFPUC to remove the diversion dam is noted.

The Draft PEIR identifies programmatic impacts and mitigation related to construction and operation of the Calaveras Dam Replacement (SV-2) and Alameda Fishery Enhancement (SV-1) projects in Vol. 2, Chapter 4. Impacts of the proposed WSIP water supply and system operations as they relate to these two WSIP projects are analyzed in Vol. 3, Chapter 5, Section 5.4.

SI_ACA2-02 This comment expressing support for conservation, water recycling, and efficiency and opposition to additional diversions from Alameda Creek or the Tuolumne River is acknowledged. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects proposed by the SFPUC and its wholesale customers.

Acterra Action for a Sustainable Earth, David T. Smernoff, Ph.D., Board Vice-President, 09/28/07

SI_ACT-01 This comment expresses support for the seismic improvements proposed under the WSIP, but states that the commenter found the PEIR to be flawed. This is an opening statement, and the specific comments follow in Comments SI_ACT-02 through SI_ACT-05; please refer to **Responses SI_ACT-02** through **SI_ACT-05** for the specific responses.

SI_ACT-02 This comment advocates for a two-tiered approach that separates the proposed seismic improvements from the proposed changes in water supply (i.e. additional Tuolumne River diversions). Comment acknowledged. Please refer to the discussion in **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Section 14.1.5) for more information on this topic.

Refer to **Response L_Tuol1-09** regarding the applicability of the federal Wild and Scenic Rivers Act to the Tuolumne River and the overall consistency of the WSIP with the act.

The opinion stating that public policy decisions should be based on the merits of the proposal is acknowledged. Extensive public comments, including several comment sets from the Bay Area Water Supply and Conservation Agency, were received on the Draft PEIR; these comments, representing a wide range of opinions, are reproduced in Volume 6 of the PEIR, and responses to all comments received on the Draft PEIR are included in Volume 7 of the PEIR.

SI_ACT-03 This comment, which expresses support for alternatives identified in the Draft PEIR that protect the Tuolumne River from new diversions, is acknowledged. The comment stating that additional water conservation, efficiency, and recycling is the best way to lessen impacts on the Tuolumne River is also acknowledged. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to demand projections and to conservation programs and recycling projects proposed by the SFPUC and its wholesale customers.

SI_ACT-04 This comment asserting that the demand projections are flawed is addressed in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2). The impacts of water diversions on the Tuolumne River are addressed in the Draft PEIR (Vol. 3, Chapter 5, Section 5.3).

The Draft PEIR provides a discussion of impacts related to climate change on the Tuolumne River watershed (Vol. 3, Chapter 5, pp 5.7-92 to 5.7-96). Please refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14) for additional discussion of this issue. Section 14.11 provides detailed and up-to-date information on climate change as it relates to the SFPUC regional water supply and the proposed WSIP. The discussion includes a qualitative assessment of WSIP impacts with consideration of climate change effects and corroborates the conclusion that the Draft PEIR provides a reasonable assessment of environmental effects that accounts for potential climate change effects through the SFPUC planning horizon of 2030.

SI_ACT-05 The SFPUC conducted thorough studies of water demand before estimating the total water demand (purchase request) that the regional water system must satisfy in 2030 (Vol. 1, Chapter 3, pp. 3-16 to 3-22). The estimate of SFPUC system demand assumed continued implementation of current water conservation programs as well as the implementation of a number of local water recycling projects and additional conservation programs. The 2030 SFPUC system purchase request was estimated to be 300 million gallons per day (mgd). Under the WSIP, about 8 mgd of the estimated 2030 SFPUC system demand would be satisfied through additional conservation and recycled water programs in San Francisco (that is, in addition to those already accounted for prior to estimating the 300 mgd purchase request). Another 2 mgd would be satisfied through the development of groundwater resources on the San Francisco Peninsula. For more information on this topic, please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14).

The effects of climate change are described in the Draft EIR (Vol. 3, Chapter 5, Section 5.7.6). For more information on this topic, please refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14).

SI_ACT-06 This comment, which encourages the SFPUC to drop Tuolumne River diversions from the seismic upgrade projects and to revisit water demand issues at a later date, is acknowledged. Please refer to **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Section 14.1.5) for relevant response related to the integration of the seismic improvements and water supply option to meet program objectives. Refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2) for a detailed discussion of the demand projections.

Citizens Advisory Committee to PUC, Steve Lawrence, Vice Chair, 08/17/07

SI_CAC1-01 The commenter states that the project schedule included in Figure 3.6 of the Draft PEIR (Vol. 1, Chapter 3, p. 3-62) is out of date, is "fanciful," and does not accurately list the WSIP projects. As discussed in the Draft PEIR (Vol. 2, Chapter 3, p. 3-2 and pp. 3-23 to 3-25), the SFPUC classifies as part of the WSIP all capital improvements and projects that received financing from the 2002 voter-approved bond measure, which fall into six categories: key regional projects, regional projects, local projects, WSIP-related activities, regional recycled water projects, and Bay Division Pipeline No. 4 condition assessment. The Draft PEIR analyzes only the *key regional WSIP projects* (in addition to the WSIP water supply and system operations) as the proposed program for CEQA purposes (see Vol. 1, Chapter 3, pp. 3-23 to 3-25). Other WSIP-funded activities in the remaining five categories that are not evaluated as part of the proposed program are undergoing CEQA review independent of the PEIR and are therefore not included in Figure 3.6.

Figure 3.6 shows the preliminary construction schedule for each of the key regional WSIP projects described in Section 3.4.6 of the Draft PEIR. This schedule was provided by the SFPUC at the time of Draft PEIR preparation and was based on the priority of the project in terms of vulnerability to seismic damage, importance to system operations, system operational requirements, and projected funding. Figure 3.6 is presented in the Draft PEIR to provide general information on the construction timeframe of each project as well as to demonstrate which projects' construction schedules might have a potential to overlap, which could exacerbate environmental effects due to construction activities. The collective effects of the WSIP projects analyzed in the Draft PEIR are addressed in Vol. 3, Chapter 4, Section 4.16. The cumulative effects of these WSIP projects, other SFPUC projects (including other WSIP projects deemed to have independent utility), and projects of other jurisdictions are addressed in Section 4.17 of the Draft PEIR.

As discussed in the Draft PEIR (Vol. 1, Chapter 3, p. 3-61), the preliminary schedule is subject to further refinement during the ongoing planning and development of each project. The project-level CEQA documentation prepared for each WSIP project will address changes in the schedule and will include an appropriate analysis of potential cumulative impacts based on the updated schedule.

SI_CAC1-02 The Draft PEIR (Vol. 3, Chapter 8, Section 8.3) analyzes a variant to the WSIP that would provide supplemental dry-year water through the Bay Area Regional Desalination Project (BARDP). As indicated in the Draft PEIR (pp. 8-18 to

8-21), a pre-feasibility study has been completed for the BARDP, and the commenter is referred to the references cited in the Draft PEIR for the assumptions used in developing this project (URS Corporation, *Bay Area Regional Desalination Project Pre-feasibility Final Report*, 2003). The Draft PEIR analysis was based on this preliminary information and, as the PEIR states, is a conceptual-level, generalized impact analysis that is intended to provide sufficient information to allow decision-makers to consider this variant to the WSIP, not to provide a site-specific environmental analysis. The level of detail of information requested by the commenter is not required for the purposes of this impact analysis in the PEIR.

SI_CAC1-03 As indicated by the commenter, refer to **Response SI_CAC2-04**.

SI_CAC1-04 The specific emergencies identified in this comment (e.g., epidemics) were not a factor in WSIP planning efforts, although water supply planning includes a margin of safety to address atypical conditions such as epidemics.

SI_CAC1-05 Cost estimates for the Lower Tuolumne River Alternative are included in the Water Supply Options Report (SFPUC 2007). The alternative would require the construction of several new facilities that are not included in the WSIP, as described in the Draft PEIR (Vol. 4, Chapter 9, p. 9-60). The major new facilities would include an intake and pumping plant on the lower Tuolumne River, a 15-mile-long, 48-inch-diameter pipeline from the intake to near Tesla Portal, a 55-million-gallon-per-day water treatment plant, and a pumping plant to convey treated water to Tesla Portal. The capital cost of the new facilities, not including lifecycle costs, could be upwards of $354 million; this cost estimate, provided in response to this comment, is not relevant under CEQA, which requires only consideration of the comparative environmental impacts of alternatives.

The elevation of the intake on the Tuolumne River would depend on the exact site chosen. The elevation of the land surface in the vicinity of the confluence of the Tuolumne River and the San Joaquin River is about 30 feet above sea level. Ideally, the intake would take the form of an infiltration gallery under the bed of the Tuolumne River. The San Joaquin River at its confluence with the Tuolumne River is not tidal, and saltwater from the Delta does not penetrate this far upstream.

Large-scale flooding in the Delta could occur if a major earthquake caused many of the levees to fail. However, it is expected that if this alternative is selected for further consideration and design, the intake and other facilities needed for the Lower Tuolumne River Alternative would be designed to comply with applicable standards for water supply facilities, including provisions for adequate flood protection. As described in the Draft PEIR (Vol. 4, Chapter 9, p. 9-65), this alternative would result in increased annual energy demand compared to the proposed program, which in turn could result in secondary impacts from air pollution and greenhouse gas emissions, depending on the source of power.

SI_CAC1-06 The Draft PEIR presents the information in a way intended to be both comprehensive and understandable to decision-makers, regulatory and local agencies, and the public. The authors acknowledge that some of the topics covered in the Draft PEIR are technical, but a discussion of these topics is important for full disclosure of the changes proposed under the WSIP and its potential environmental impacts. A glossary of technical terms is included in Volume 1 to assist the reader in understanding the document. Further, the San Francisco Planning Department scheduled a 108-day public review period, rather than the 45-day public review period required under CEQA, to allow additional time for agencies and the public to review and evaluate the adequacy and accuracy of the Draft PEIR.

Citizens Advisory Committee to PUC, Steve Lawrence, Vice Chair, 10/15/07

SI_CAC2-01 The opinions of the commenter regarding the merits of the proposed dry-year water transfer are noted. Please refer to **Section 14.3, Master Response on Proposed Dry-Year Water Transfer** (Vol. 7, Chapter 14, Section 14.3.2) for further discussion of this component of the proposed program. Under CEQA, the purpose of the PEIR is to disclose the environmental effects of the proposed program to decision-makers, not to determine or judge its merits.

SI_CAC2-02 The commenter is correct in noting that the regional water system is highly dependent on storage, since the majority of the water for the regional system is located about 150 miles from customers, and nearly all precipitation occurs in the winter months. Background studies conducted for the WSIP determined that the proposed seismic, delivery, and water reliability levels of service could be achieved by restoring the historical capacities of Calaveras and Crystal Springs Reservoirs (Vol. 1, Chapter 3, pp. 3-25 to 3-39). Information regarding storage capacities of the major facilities in the existing system is presented in Table 2.2 (Vol. 1, Chapter 2, p. 2-6), which shows both the existing (restricted) capacities of the Calaveras and Crystal Springs Reservoirs and the historical capacities. The reasons for rejecting an enlarged Calaveras Reservoir include uncertainties regarding water rights and environmental permits (see Draft PEIR Vol. 4, Chapter 9, pp. 9-118 and 9-119).

SI_CAC2-03 This comment addresses future conservation in San Francisco. Under the proposed WSIP, up to 4 million gallons per day (mgd) of conservation savings[1] would offset total demand in the retail service area (including San Francisco), as shown in Draft PEIR Table 3.3 (Vol. 1, Chapter 3, p. 3-18). The conservation measures included in Packages A, B, and C for the retail customer service area are shown in Table 19, Selection of Conservation Measures by Package, which is included as an attachment at the end of Draft PEIR Appendix E.2 (Vol. 5): Tables 14.2-7 and 14.2-8 of **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) identify current and proposed conservation measures for the retail service area. As the discussion in this master response indicates, Package C is not the same as the “Aggressive Conservation” referred to in the Aggressive Conservation/Water Recycling and Local Groundwater Alternative evaluated in the Draft PEIR

[1] This is part of the 10 mgd from conservation, recycled water, and groundwater projects planned to offset retail service area demand under the WSIP.

(Vol. 4, Chapter 9, pp. 9-47 to 9-59). Rather, Package C was one of three suites of measures[2] considered for implementation by the individual water customers.

As described in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14), the SFPUC also conducted a study to identify additional water conservation, recycling, and groundwater projects that could be feasible if implemented regionally, including some projects that were determined to be infeasible when considered by the individual water customers. This study provided the basis for the Aggressive Conservation/Water Recycling and Local Groundwater Alternative. The additional projects considered in this alternative are shown in Table 9.11 (Vol. 4, Chapter 9, pp. 9-50 and 9-51).

Under the Modified WSIP Alternative (Vol. 4, Chapter 9, pp. 9-78 to 9-84), the SFPUC would institute a program to work with the wholesale customers to develop an additional supply contribution of approximately 5 to 10 mgd from conservation, recycled water, and local groundwater projects in the wholesale service area, as identified in Table 9.11. This additional amount of water from conservation, recycled water, and groundwater projects is in addition to the amount from conservation, recycled water, and groundwater projects accounted for in the 2030 purchase request assumed under the WSIP. Because the specific projects have not been identified, the Modified WSIP Alternative provides a reasonable range of supply contribution that could feasibly be implemented. Please refer to **Section 14.10, Master Response on Modified WSIP Alternative** (Vol. 7, Chapter 14, Section 14.10.3) for further discussion.

SI_CAC2-04 The comment is correct in noting that the Draft PEIR analysis of impacts related to the WSIP water supply and system operations (Vol. 3, Chapter 5) is based on the 82-year period of hydrologic record, from 1920 to 2002. The Draft PEIR (Vol. 3, Chapter 5, Section 5.7.6) discusses the general types of climate change impacts that could affect water resources in California and presents the SFPUC's initial modeling of climate change effects on the regional system. Please refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14) for additional discussion of climate change effects on the regional system and how the analysis presented in the Draft PEIR remains valid when climate change effects are considered.

Table 9.5 in the Draft PEIR (Vol. 4, Chapter 9, p. 9-13) presents the anticipated frequency of rationing under the WSIP and the alternatives based on the 82-year hydrologic record. The commenter correctly states that rationing would be required about 10 percent of the time, corroborating the information shown in the

[2] These suites of conservation measures are referred to as Packages A, B, and C in the retail customer service area conservation potential study and as Programs A, B, and C in the wholesale customer service area study.

table—that under the WSIP, rationing would be required in 8 out of 82 years (6 years at 10 percent rationing and 2 years at 20 percent).

As indicated by the commenter, the proposed dry-year supplies would be required under the WSIP in 24 out of the 82-year hydrological record (about 29 percent of the time). Please refer to **Section 14.3, Master Response on Proposed Dry-Year Water Transfer** (Vol. 7, Chapter 14, Section 14.3.2) for information on how and when the SFPUC would obtain water from the Turlock and Modesto Irrigation Districts (TID and MID).

SI_CAC2-05 This comment presents a series of questions related to the recycled water component of the WSIP. As described in the Draft PEIR (Vol. 1, Chapter 3, p. 3-34), the proposed water supply option under the WSIP includes 10 mgd from a combination of conservation, recycled water, groundwater projects in San Francisco. The recycled water projects would be implemented through the WSIP facility improvement project, Recycled Water Projects (SF-3), and the preliminary project description for this project is presented in Table 3.10 (Vol. 1, Chapter 3, p. 3-56). However, since preparation of the Draft PEIR, the SFPUC has continued studies in support of planning and development of the Recycled Water Projects, and these studies have shown that the existing North San Mateo County Sanitation District recycled water treatment facility in Daly City has sufficient capacity to provide recycled water for irrigation of the Harding Park Golf Course. The necessary infrastructure to serve Daly City's recycled water to Harding Park under this project may be constructed and implemented in partnership between the SFPUC and Daly City. Although the Harding Park project is part of the Recycled Water Projects (SF-3), it will likely be implemented separately from SF-3; however, the amount of recycled water supplied to Harding Park would count towards the WSIP's goal to obtain 10 mgd from conservation, recycled water, and groundwater projects in San Francisco. The preliminary WSIP project descriptions provided in the PEIR will be updated and refined as part of the project-level environmental analyses, as described in **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.2). Thus, additional details regarding the Recycled Water Projects are currently under development.

And, as noted in the Draft PEIR (Vol. 1, Chapter 3, p. 3-25), in addition to the recycled water projects under SF-3, the SFPUC expects to consider and develop recycled water projects that would be located outside of San Francisco in coordination with other jurisdictions.

SI_CAC2-06 Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.9) for an explanation of the relationship between the average annual increase in purchase requests and the average annual increase in Tuolumne River diversions.

SI_CAC2-07 The Draft PEIR (Vol. 3, Chapter 8, Section 8.3) analyzes a variant to the WSIP that would provide supplemental dry-year water through the Bay Area Regional Desalination Project (BARDP). As indicated in the Draft PEIR (pp. 8-18 to 8-21), a pre-feasibility study has been completed for the BARDP, and the commenter is referred to the references cited in the Draft PEIR for the assumptions used in developing this project (URS Corporation, *Bay Area Regional Desalination Project Pre-feasibility Final Report*, 2003). Please also refer to **Response SI_CAC1-02**.

SI_CAC2-08 Table 9.5 of the Draft PEIR (Vol. 4, Chapter 9, p. 9-13) shows the SFPUC's estimated average annual Tuolumne River diversions, as determined by modeling results using the Hetch Hetchy/Local Simulation Model, which is based on the 82-year period of hydrologic record from 1920 to 2002. Under the proposed program, the SFPUC's average annual diversions would be 245 mgd. This volume of water is within the City and County of San Francisco's (CCSF) existing water rights and entitlements as provided for under the Raker Act (see Vol. 1, Chapter 2, pp. 2-36 and 2-37); in most years (nondrought), no compensation is required to TID and MID for this volume of water, other than the SFPUC's recognition and assurance of the senior water rights of these two districts. However, as described in the Draft PEIR (Vol. 1, Chapter 2, pp. 2-37 to 2-39 and 2-42), the CCSF has entered into several agreements with TID and MID that allow for bypass flows for downstream uses and may include appropriate compensation to the districts. Please also refer to **Section 14.3, Master Response of Proposed Dry-Year Water Transfer** (Vol. 7, Chapter 14, Section 14.3.2) for additional information.

California Trout, Brian Stranko, Chief Executive Officer, 09/28/07

SI_Caltrout-01 This comment expresses opposition to additional Tuolumne River diversions and requests that additional studies be conducted before the PEIR is finalized. As described in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.1-7 to 5.1-18), the basic approach to the analysis of impacts on water and related resources was to first evaluate the changes in the river flow and reservoir levels that would occur with the WSIP, then to estimate changes in water quality and temperature, and finally to combine this information to determine potential impacts on fisheries and other biological resources. The analysis used the existing 82-year historical hydrologic record, coupled with the Hetch Hetchy/Local Simulation Model (HH/LSM), to depict the overall regional water system operations and to project the extent of changes in flow that could occur in the future. These results were used for the PEIR water supply and system operations impact analysis.

As described in **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.4), the CEQA Guidelines (Section 15151) impose a standard of adequacy that is "reasonably feasible" and sufficient to allow decision-makers to make a decision that takes account of environmental consequences. Data gathering need not be "exhaustive." The Draft PEIR analysis of the WSIP water supply and system operations with respect to fisheries and biological resources along the Tuolumne River was based on current knowledge of the composition and condition of the resources and in consideration of the potential interactive responses of plant and animal species to the hydrologic changes resulting from the WSIP as indicated by the model results. The analysis relied on ecological principles, scientific literature, existing data, and site visits. The Draft PEIR analysis was conservative in finding that an impact could be potentially significant if there was a possibility of impacts from the WSIP water supply and system operations.

The San Francisco Planning Department believes these data are sufficient to reasonably assess the general magnitude, frequency, and extent of the WSIP's environmental consequences, and to identify appropriate mitigation measures to offset potentially significant impacts on the Tuolumne River watershed and related resources. The mitigation measures were developed to include performance standards based on ecological principles, with the understanding that data from ongoing and future studies could be useful in augmenting the baseline data and in refining the implementation of each measure. As described in Draft PEIR Measure 5.3.7-2 (Vol. 4, Chapter 6, pp. 6-49 and 6-50), **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.2), and **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.2), several studies of the Tuolumne River are in progress by the SFPUC, National Park Service, USFWS, NMFS, CDFG, and other agencies. Data from these studies would be used to augment the existing data and allow for refinement of the implementation of the mitigation measure to meet the performance standards.

SI_Caltrout-02 This comment, which expresses support for alternatives identified in the Draft PEIR that protect the Tuolumne River from new diversions, and for additional water conservation, efficiency, and recycling, is acknowledged. Please see **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14), for additional information related to demand projections as well as conservation programs and recycling programs proposed by the SFPUC and its wholesale customers.

Republicans for Environmental Protection, Protection Commissioner, California Commission for Economic Development, Buddy Burke, CA REP President, and Virginia Chang Kiraly, CA REP Vice President, 10/14/07

SI_CAREP-01 This comment, which requests that additional studies of the Tuolumne River be conducted before the PEIR is finalized, is acknowledged. Please refer to **Response SI_Caltrout-01** for a response to this comment. Also refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.9) for an explanation of the relationship between the average annual increase in purchase requests and the average annual increase in Tuolumne River diversions.

SI_CAREP-02 The commenter expresses concern that flow reductions would degrade the Tuolumne River's "world-class recreation opportunities," which would also reduce visitors and tourism to Yosemite National Park and the surrounding region.

Section 5.3.8.1 of the Draft PEIR (Vol. 3, Chapter 5) describes current water and off-water recreational visitor use of the upper Tuolumne River corridor and evaluates the region's recreational resources. A particularly extensive analysis of whitewater recreation was performed to assess both the current use levels and the potential for WSIP-related changes to reduce future recreational use. The analysis of the timing and magnitude of the WSIP-related changes in water releases within the upper Tuolumne River concluded that effects on recreation would be less than significant, predominantly because shifts in water releases would reduce upper Tuolumne flows during the river's high-flow months (April through June) or during the low recreation season (November to March), which would not significantly impair use of the river for whitewater rafters or other recreationists. In addition, during the peak visitor months of July and August, SFPUC releases for whitewater rafting would continue to be provided when operationally practical. Furthermore, the flow reductions would only occur during drier-than-normal hydrologic years and would be relatively limited (i.e., 3 percent or less reductions in average monthly flows); such a reduction in flows would be imperceptible to most recreationists.

SI_CAREP-03 This comment expresses concern that the proposed WSIP water supply would delay implementation of the seismic facility improvements, increase water rates, and result in burdensome costs to business, which in turn would have a trickle-down effect with transaction costs being passed to consumers and taxpayers. Comment acknowledged. The commenter urges the SFPUC to be mindful of these fiscal impacts by not moving forward to divert water from the Tuolumne

River. Please refer to **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Section 14.1.5) for a discussion of this topic.

SI_CAREP-04 The commenter’s support for water conservation, efficiency, and recycling measures and for alternatives that would eliminate increased diversions from the Tuolumne River is acknowledged. The commenter’s suggestion that the SFPUC undertake additional studies is also acknowledged. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for a discussion of this topic.

Commonwealth Institute, Katherine Forrest, Member, 09/19/07

[See Public Hearing Transcript, Palo Alto, pp. 38–39]

SI_CI-01 This comment, which expresses an opinion on the role that state and local governments could play in providing incentives for water conservation and penalties for excessive use (such as permitting gray water systems for individual homes and limiting large irrigation systems), is acknowledged. Note that the California Department of Water Resources, Office of Water Use Efficiency and Transfers, is in the process of updating the existing Model Water Efficient Landscape Ordinance. The update must be completed by January 1, 2009, and local agencies must adopt the model ordinance, or one that is at least as effective as the updated model ordinance, by January 1, 2010.

The Draft PEIR describes local groundwater projects, recycled water projects, and additional conservation measures that would be implemented under the WSIP as part of the nondrought water supply (Vol. 1, Chapter 3, p. 3-34). Table 9.11 of the Draft PEIR (Vol. 4, Chapter 9, p. 9-50) identified additional conservation, recycled water, and groundwater projects that could be implemented by the wholesale customers to reduce demand and supplement supplies to meet future delivery requests, assuming the projects are feasible and implementable (refer to Vol. 7, Chapter 13, Section 13.4 for further discussion of the information presented in Table 9.11). For additional information regarding existing and proposed conservation measures by the SFPUC wholesale and retail customers, please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3).

California Native Plant Society, Amanda Jorgenson, Executive Director, 09/25/07

SI_CNPS-01 This comment, which opposes additional Tuolumne River diversions and encourages additional efforts to conserve the equivalent of the projected customer purchase requests through 2030, is acknowledged. See **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3), for additional information regarding the conservation and recycling programs proposed by the SFPUC and its wholesale customers. Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.9), for an explanation of the relationship between the average annual increase in purchase requests and the average annual increase in Tuolumne River diversions. Also note that the projected increase in average annual purchase requests is 35 mgd, not 38 mgd. Please refer also to **Section 14.8, Master Response on Delta and San Joaquin River Issues** (Vol. 7, Chapter 14, Section 14.8.2), for relevant response regarding the WSIP's impacts on the San Joaquin River and Delta.

California Native Plant Society, East Bay Chapter, Laura Baker, Conservation Committee Chair, 10/01/07

SI_CNPS-EB1-01 Comment noted regarding potential impacts on native flora in the East Bay.

SI_CNPS-EB1-02 This comment expressing support for the WSIP goals and objectives is acknowledged.

SI_CNPS-EB1-03 This comment expresses the opinion that the WSIP overestimates the need for additional water supplies from rivers and creeks and underestimates the capacity of the SFPUC and its customers to conserve water. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Sections 14.2.2 and 14.2.3) for additional information related to demand projections as well as conservation programs and recycling projects proposed by the SFPUC and its wholesale customers.

SI_CNPS-EB1-04 Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3, under the heading Frequently Submitted Comments Addressing Conservation and Recycling) regarding the Pacific Institute's comparisons of SFPUC conservation efforts to those of other water districts referenced in this comment. The information regarding the Helix Water District provided in this comment is acknowledged. In the SFPUC service area, population and employment are projected to increase (refer to Table 7.4 in Vol. 4, Chapter 7, p. 7-21) while per-capita demand is projected to decrease (refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling**, Section 14.2.2, under the heading Per-Capita Demand). The basis for the statement that "retail customers in San Francisco show a decline in demand of 4.7 mgd" is unclear. As shown in Table 7.3 (Vol. 4, Chapter 7, p. 7-18), demand in the retail service area is projected to decline by 0.2 mgd in 2030 (despite increases in population and employment). Refer to **Section 14.2** (Vol. 7, Chapter 14, Section 14.2.3) for detailed information on existing and proposed conservation by the wholesale and retail customers; Tables 14.2-7 and 14.2-8 in the master response show the California Urban Water Conservation Council's best management practices that the retail and wholesale customers are implementing or have committed to implement.

SI_CNPS-EB1-05 The comment expresses the general opinion that certain methodologies and models used in the Draft PEIR were either flawed or the wrong tool. For each environmental issue, the PEIR includes a section entitled "Approach to Analysis" to describe and explain the methodologies and models used to assess and identify potential impacts. The methodologies and models used in the Draft PEIR are standard, professionally accepted approaches employed in the respective fields of study, with the exception of the water resources model—the Hetch Hetchy/Local Simulation Model (HH/LSM)—which is unique to the regional system and is the best available tool (see Vol. 3, Chapter 5, pp. 5.1-9 to 5.1-17). Refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14) for additional information on the model itself and the appropriateness of its use for the PEIR. This comment summarizes the specific comments that follow in Comments SI_CNPS-EB1-06 through SI_CNPS-EB1-10; refer to **Responses SI_CNPS-EB1-06** through **SI_CNPS-EB1-10** for the specific responses.

SI_CNPS-EB1-06 Draft PEIR Impact 4.9-7 addresses the potential effects of the WSIP facility improvement projects with regard to greenhouse gas emissions (Vol. 2, Chapter 4, pp. 4.9-42 to 4.9-47). In addition, the Draft PEIR discusses the potential effects of climate change on water resources in Section 5.7.6 (Vol. 3, Chapter 5, pp. 5.7-92 to 5.7-96). Draft PEIR Table 5.7-21 (p. 5.7-93) describes the report by Maurice Roos cited by the commenter. The reference to the article on conservation and innovative approaches to efficiency is acknowledged.

Please refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14) for additional discussion of climate change to augment the discussion presented in Section 5.7.6 of the Draft PEIR (Vol. 3, Chapter 5, pp. 5.7-92 to 5.7-96). Section 14.11 provides more detailed and up-to-date information on climate change as it relates to the SFPUC regional water supply and the proposed WSIP.

SI_CNPS-EB1-07 The commenter states that Figure 4.6-1a (Vol. 2, Chapter 4, pp. 4.6-3 to 4.6-5) is inadequate. In any CEQA analysis, a wide range of natural resource classification types is available to the analyst. Gap Analysis Project (GAP) mapping provides a good compromise between systems. The commenter observes that the GAP analysis is a "coarse filter" overview of the natural communities at this scale, but the text identifies a "fine filter" description of the presence of sensitive natural communities within the GAP analysis polygons potentially affected by WSIP operations. In addition, the sensitive natural communities identified in the California Natural Diversity Database are described for each region in Vol. 2, Chapter 4, pp. 4.6-9 and 4.6-17 for the program-level analysis; and in Vol. 3, Chapter 5, pp. 5.3.7-4 and 5.3.7-5, pp. 5.4.6-3 to 5.4.6-7, and pp. 5.5.6-3 and 5.5.6-4 for the project-level analysis of WSIP water operations.

SI_CNPS-EB1-08 With regard to the timescale used in the impact analyses, the hydrology section follows the CEQA-mandated requirement that impacts be analyzed relative to current prevailing conditions appropriate to the resource and the nature of the impact. The Draft PEIR (Vol. 3, Chapter 5, p. 5.4.6-14) acknowledges that the existing structure and composition of natural communities are products of conditions that prevailed for decades prior to the current hydrologic regime. For this reason, the Draft PEIR impact analysis of terrestrial biological resources includes a discussion of historical surface water flows where appropriate because of their role in shaping existing conditions, such as the structure and composition of riparian vegetation. This broader view of relevant timescales is the context for the conclusion reached in the Draft PEIR (Vol. 3, Chapter 5, p. 5.4.6-22). Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.4) for further discussion of the rationale for considering the effects of hydrologic flow regimes on riparian resources.

Although historical conditions are important for understanding ecological dynamics, analyses under CEQA must concentrate on changes relative to current conditions (see CEQA Guidelines Section 15125). Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.4) for additional details regarding this issue.

SI_CNPS-EB1-09 The Draft PEIR provides a project-level analysis of the potential environmental impacts of the proposed changes in water supply sources and system operations under the WSIP. The Draft PEIR presents a summary of the significant water supply and system operations impacts within the Alameda Creek watershed that would occur under each of the CEQA alternatives (see Vol. 4, Chapter 9, Table 9.8, pp. 9-18 and 9-19). As indicated in the table, impacts on fisheries in the Alameda Creek watershed would be similar to those under the proposed program for all of the CEQA alternatives except for the Modified WSIP Alternative, which would result in fewer impacts than the proposed program. With respect to riparian habitat, impacts under all of the CEQA alternatives would be the same as those under the proposed program.

The Draft PEIR provides a program-level evaluation of the potential environmental impacts of constructing and operating each of the regional WSIP facility improvement projects (Vol. 2, Chapter 4) and describes the key regional projects proposed under the WSIP (see Vol. 1, Chapter 3, Table 3.10, pp. 3-39 to 3-56). The more detailed information regarding project facilities, locations, and permits provided in Vol. 5, Appendix C is based on the best information available when the Draft PEIR was prepared, at which time the exact location and alignment of the facility improvements may not have been known. The project description information is presented at a level of detail appropriate to identify the overall magnitude of effects expected from WSIP implementation. Once additional project details and site-specific information are developed for the individual projects, the project-level environmental review will provide further evaluation of project-specific impacts. Refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.2) for additional discussion regarding the level of detail at which the program-level impacts were evaluated for the individual WSIP facility improvement projects.

SI_CNPS-EB1-10 Comment noted. The preparers of the Draft PEIR concur with the commenter's observation about the benefits of coordination and of sharing biological information across various SFPUC activities and projects. The attached 2004 CNPS letter is not directed toward the proposed WSIP or PEIR, but its contents are noted.

SI_CNPS-EB1-11 Consistent with the CEQA definition of growth-inducement impacts and as discussed in the Draft PEIR (Vol. 4, Chapter 7, pp. 7-2 and 7-4), water supply projects are inherently growth inducing. The Draft PEIR compares the wholesale and retail customer-selected projections for 2030 with general plan projections because general plans present the level of growth adopted by the land use planning agencies in the areas receiving SFPUC water and, when considered in context with other local planning efforts (e.g., growth ordinances and amendments adopted subsequent to general plan approval), characterize potential buildout within these jurisdictions.

The commenter's statement that "…together the increase in purchase requests from these four cities [Hayward, Newark, Union City, and Fremont] accounts for a fifth of the total purchase estimates of the SFPUC's Wholesale Service Area" is correct if edited as follows:

> …together the ~~increase in~~ total 2030 purchase requests from these four cities account for a fifth of the total purchase estimates of the SFPUC's wholesale service area.

The last two sentences in this comment do not correctly interpret the approach and intent of the PEIR's growth-inducement analysis. While the analysis does compare wholesale and retail customer-selected projections for 2030 with general plan projections (as described in the first paragraph of this response), and with the Association of Bay Area Governments' projections, these comparisons did not involve a formal statistical analysis as may be implied by the term "goodness of fit," and the aim of the analysis was not "to rectify the overall purchase requests from each wholesale customer." The approach to the analysis of growth inducement and secondary effects of growth is summarized in the Draft PEIR (Vol. 4, Chapter 7, pp. 7-4 and 7-5) and presented in more detail in Section 7.3 (Vol. 4, Chapter 7, pp. 7-19 to 7-59).

SI_CNPS-EB1-12 None of the four cities discussed in this comment letter (Hayward, Newark, Union City, and Fremont) currently has a growth ordinance, as this comment suggests.[1] According to city planners who were contacted during preparation of the Draft PEIR (three of the four cities cited in this comment), policies in the respective general plans are intended, in part, to guide and manage growth (Slafter, 2005; Leonard, 2005; Rizk, 2005). This comment correctly states that Hayward has the largest increase in 2030 estimated purchases, in absolute terms. (It is surpassed in terms of percentage increase in purchases by two small water customers; refer to Draft PEIR Table 7.3 in Vol. 4, Chapter 7, p. 7-18.) The Draft PEIR (Vol. 4, Chapter 7, pp. 7-45 to 7-47) explains why the increase in water demand projected for Hayward is considerably greater than the projected growth in population and employment used in the demand model. Part of the increase in demand is associated with Hayward's expectation that new housing developed in the city will have comparatively larger lots than former development and will have more landscaping. (The City of Hayward has indicated that former development was poorly designed, without adequate open space and residential landscaping, and the City is encouraging renovation efforts that include landscaping assistances for homeowners and landscaping in common areas within neighborhoods to improve the overall appearance of the city and the quality of life of its residents.) Some of this new housing may be in hillside areas, as suggested by the commenter; however, the specific examples of recent and planned development provided by the City of Hayward (see the attachment following Comment L_Hayward-03) are multifamily, mixed-use, transit-oriented developments that are not in hillside areas. Other factors contributing to the projected increase in demand include renovation efforts for existing residential accounts (including landscaping in common areas), new industrial uses (Hayward expects to attract high-technology manufacturing industries that would have higher water usage than the current warehousing operations in the city), and an adjustment in unaccounted-for water. For additional information, please refer to Comment L_Hayward-03.

The comment's suggestions for the City of Hayward to reduce future demand (capping or limiting irrigation water use, imposing a strict tier system for water rates, requiring fire-safe landscaping) are acknowledged. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for information on existing and planned conservation in Hayward (and other wholesale and retail customers). In Comment L_Hayward-03, the City states that it

[1] The comment states that none of the four cities has passed a growth ordinance. The City of Union City formerly had a growth management ordinance, which was revoked about 10 years ago (Leonard, 2005). Thus, none currently has a growth ordinance in place, as suggested by this comment.

envisions contemporary residential landscaping based on typically low-water-use plants and shrubs, consistent with its Water Efficient Landscaping Ordinance adopted 15 years ago, which will be updated in accordance with the provisions of Assembly Bill 1881.

SI_CNPS-EB1-13 This comment states that the Alameda County Water District (ACWD) is in a good position, with assistance from the SFPUC, to institute a coordinated plan for recycling water in the three cities it serves and thus to reduce its dependence on Delta water sources that may be uncertain in the future. As described in the Draft PEIR (Vol. 1, Chapter 3, p. 3-22 and Vol. 5, Appendix E.2, pp. E.2-16 and E.2-17), the SFPUC undertook technical studies to identify recycled water potential in the wholesale and retail service areas. The ACWD currently uses 3.5 mgd of recycled water (refer to Table E.2.5, p. E.2-17), although this recycled water is used for marsh restoration and does not replace potable supplies (RMC, 2004). The ACWD plans to use an additional 1.4 mgd of recycled water in the future (for two future golf courses and some existing end-users), which will offset potable supplies (refer to Table 3.3 or Table 7.2 [Vol. 1, Chapter 3, p. 3-18 or Vol. 4, Chapter 7, p. 7-15]). The SFPUC also undertook a regional study (SFPUC, 2007, Appendix D) to identify any additional recycled water and conservation projects that would be feasible if implemented regionally, including projects that may have been found to be infeasible for individual customers. The results of this study provided the basis for the Aggressive Conservation/Water Recycling and Local Groundwater Alternative (Vol. 4. Chapter 9, pp. 9-47 to 9-59). As indicated in Table 9.11 (p. 9-50), no additional potentially feasible recycled water projects were identified in the ACWD service area. (Approval of the WSIP would not preclude the ACWD from pursuing recycled water projects in the future; adoption of the Modified WSIP Alternative would establish and fund a program to provide 5 to 10 mgd from recycled water, conservation, and local groundwater projects within the regional wholesale service area.)

Refer also to Comment L_ACWD-01, in which the ACWD describes its water supply management strategies.

SI_CNPS-EB1-14 The illustration presented in this comment (of an apparent gap between the City of Fremont’s general plan and adoption of the Ahwahnee Principles for Resource-Efficient Communities on the one hand, and the City’s pursuit of a baseball stadium and development on lands designated and zoned as open space on the other), is acknowledged.

As noted in the Draft PEIR (Vol. 4, Chapter 7, p. 7-2), the SFPUC does not have authority to make land use decisions in its service area or to approve or disapprove development proposals; this is the responsibility of the cities and counties to which the SFPUC and its wholesale customers provide water. Although general plans may be amended and typically receive periodic updates to reflect new information and revised circumstances within the given jurisdiction, such changes involve a public process, including CEQA review, and are subject to approval by the local body responsible for making land use decisions. Substantial changes can occur to a project—either a development proposal or a general plan revision—from the initial proposal phase to the final project or plan that is approved or adopted, and proposed (unapproved) projects do not necessarily reflect the view of the decision-making body. Therefore, the Draft PEIR growth analysis appropriately references the adopted general plans for information on the *general* land use goals, plans, and policies of the jurisdictions in the service area, as well as the Association of Bay Area Governments' projections.

SI_CNPS-EB1-15 This comment states that it is impossible to assess the wholesale customers' individual commitment to water conservation without knowing the rationale for the particular composition of the programs (A, B, or C) or the specific reasons why certain customers chose to embrace or reject any of these programs. The Draft PEIR summarizes the process by which wholesale customers evaluated prospective conservation measures as follows (from Vol. 5, Appendix E.2, p. 12):

> The DSS end-use model was used to estimate water savings and evaluate the cost-effectiveness of implementing the 32 measures. Taking into account the cost-benefit analysis and estimated water savings for each measure, as well as service area water characteristics, retail customer behavior patterns, budgetary considerations, and relative ease of implementation, each wholesale customer compiled three packages of conservation measures, referred to as Programs A, B, and C. Water savings resulting from the natural replacement of fixtures under current plumbing codes was assumed to occur with or without any of the three programs. In general, Program A consists of measures that are currently being implemented; Program B consists of the measures in Program A plus additional measures that were considered to be the most readily implemented; and Program C includes the measures in Programs A and B plus all other measures that appeared to be both feasible and cost-effective to implement.

More information can be found in the *SFPUC Wholesale Customer Water Conservation Potential Technical Report* (URS, 2004b); Appendix D of that report (entitled SFPUC Wholesale Customer Conservation Information) presents the results of the conservation measure evaluation for each wholesale customer. Also refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3).

The commenter's opinion (that all Bay Area Water Supply and Conservation Agency members should be required to endorse the Ahwahnee Water Principles of 2005, and that the SFPUC is in a prime position to encourage a more systematic approach to conservation on the part of its customers) is acknowledged.

Note that the Modified WSIP Alternative (Vol. 4, Chapter 9, pp. 9-78 to 9-84) identifies several approaches to expanding conservation, water recycling, and groundwater projects that may not be cost-effective at the local level, but may be more economically viable if developed and funded as regional projects contributing to the overall regional water system. Refer to **Section 14.10, Master Response on Modified WSIP Alternative** (Vol. 7, Chapter 14, Section 14.10.3).

SI_CNPS-EB1-16 This comment contains several incorrect statements about the growth-inducement analysis presented in the Draft PEIR (Vol. 4, Chapter 7). The second sentence in the comment states that "…the PEIR uses locally derived information to buttress its position that the project itself is not growth inducing, that local governments are in good control of their own growth, and that they are appropriately mitigating for the impacts of development." Consistent with the CEQA definition of growth inducement, and as stated in the Draft PEIR (Vol. 4, Chapter 7, pp. 7-2 and 7-4 et seq.), the WSIP and other water supply projects that remove a potential obstacle to growth (lack of a reliable water supply) *are inherently growth inducing*. Regarding local government control of growth, cities and counties have the authority and obligation to conditionally approve or deny development proposals in a manner consistent with their general plans. Pursuant to CEQA Guidelines Section 15126.2(d), the Draft PEIR does not assume that growth is beneficial or detrimental (p. 7-2), but instead focuses on the secondary effects of growth.

The Draft PEIR uses "locally derived information" (180 general plans, general plan revisions, general plan amendments, specific plans, precise plans, updated land use and housing elements, and related CEQA documents (see Vol. 4, Chapter 7, pp. 7-78 to 7-91) and five project-specific EIRs (see Vol. 5, Appendix E.6, p. E.6-4) in several ways: (a) to determine whether the WSIP would support growth levels consistent with, or exceeding, levels identified by local land use planning agencies (i.e., planned versus unplanned growth); (b) to identify the environmental impacts associated with planned growth; (c) to identify mitigation commitments made by local agencies to reduce the environmental impacts of planned growth; and (d) to assess the efficacy of local agency implementation of mitigation strategies adopted for planned growth at the project-specific level.

The majority of growth that the WSIP would support is consistent with growth anticipated in the adopted general plans within the service area; consequently, the EIRs prepared for those general plans provide the appropriate analyses of impacts associated with that growth. The Draft PEIR reviewed those general plan EIRs that could be obtained and summarized the impacts and mitigation measures contained therein in Chapter 7 (Vol. 4, pp. 7-60 to 7-69) and Appendix E.5. The Draft PEIR also reviewed a selection of EIRs of major projects currently being undertaken in the SFPUC service area. The purpose of the review was to assess whether, at least for the small selection of EIRs reviewed, the mitigation measures identified in general plan EIRs were being implemented at the project level, and the Draft PEIR states the limited nature of the review (Vol. 4, Chapter 7, p. 7-71 and Vol. 5, Appendix E.6). As stated in the Draft PEIR, the review indicated that in these instances mitigation measures are being identified to reduce the impacts of growth consistent with measures identified in the general plan EIRs. To the extent that the WSIP would support a level of growth beyond that reflected in the adopted general plans, there could be additional or more severe impacts than those identified in the general plan EIRs. These impacts are discussed in the Draft PEIR (Chapter 7, pp. 7-69 to 7-71).

The comment questions the selection of the One Quarry Road project (one of five projects reviewed to determine whether project-specific EIRs were implementing the mitigation measures identified in the general plan EIRs) as an example because, since voters defeated that development, the commenter assumes the project was not environmentally suitable. The point of the exercise in the Draft PEIR was to compare the project-level impact assessment and mitigation with the city’s general plan EIR; the PEIR analysis accomplished this irrespective of the ultimate disposition of the project. Reviewing the number of times that amendments and zoning changes have been made to accommodate development, as suggested in this comment, would not answer the question the PEIR analysis was, in essence, asking: Are the land use planning agencies requiring project-specific mitigation consistent with the mitigation measures adopted as conditions of approving their general plans?

SI_CNPS-EB1-17 This comment, which endorses the findings and recommendations of the Pacific Institute report, is acknowledged. The Pacific Institute’s report recommendations are presented as Comments SI_PacInst-12 to SI_PacInst-24 and repeated in Comments SI_PacInst-85 to SI_PacInst-97. The six recommendations included in this comment do not exactly correspond to Pacific Institute recommendations, but verbatim copies of recommendations #1 through #3 were presented in numerous comment letters and are addressed in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14). Regarding recommendation #4, refer to Section 14.2.2 of that master response, under the heading Outdoor Water Use; regarding recommendation #5, refer to **Response SI_PacInst-24**; regarding recommendation #6, refer to **Response C_Raffa-12**.

SI_CNPS-EB1-18 The commenter requests that biological surveys be conducted at each WSIP project site as part of the PEIR process, not just during preparation of the subsequent project-level EIRs. The Draft PEIR text excerpt cited by the commenter (Vol. 1, Chapter 3, p. 3-81) refers to SFPUC Construction Measure #8, which will be implemented as part of all SFPUC projects, including the WSIP projects identified in the Draft PEIR. The biological screening surveys required by Measure #8 were not performed as part of the PEIR process because project locations (construction footprints) and designs for most of the WSIP projects had not yet been precisely defined; these surveys will be carried out during project-level CEQA review, as appropriate.

SFPUC Construction Measure #8 was developed to ensure that some level of biological resource assessment is carried out, even though it is expected that many of the WSIP facility projects would be sited in previously developed areas that are largely devoid of natural habitats. The initial surveys required under this measure do not represent the full biological resource assessment, but rather a screening step designed to confirm the presence or absence of sensitive resources, even in areas where they may not be expected. This requirement is amplified in Draft PEIR Mitigation Measure 4.6-1a, Wetlands Assessment (Vol. 4, Chapter 6, p. 6-11), which states that a qualified wetland scientist will conduct a site visit to determine whether wetlands are present and could be affected by a project, and, if wetlands could be affected, that a wetland delineation will be carried out. The biological screening survey required by SFPUC Construction Measure #8 will identify any sensitive habitats and heritage trees and will determine the potential for key special-status species or other species of concern to be present at the site. Mitigation Measures 4.6-2, Habitat Restoration/Tree Replacement, and 4.6-3a, Protection Measures During Construction for Key Special-Status Species and Other Species of Concern (Vol. 4, Chapter 6, pp. 6-12 and 6-13) call for avoidance, protection, minimization, restoration, and compensation with respect to impacts on these resources, including preconstruction surveys at an appropriate time of year as well as implementation of the applicable standard mitigation measures listed in Mitigation Measure 4.6-3b, Standard Mitigation Measures for Specific Plants and Animals (Vol. 4, Chapter 6, p. 6-13).

The commenter advises better coordination of mitigation efforts as well incorporation of mitigation measures into the design of the WSIP as a whole. This comment identifies the additive effect of multiple projects in the same area or on species affected by several projects. These effects are identified as the "Multi-regional Collective Impacts" and the "Localized Collective Impacts" of the WSIP, and are discussed under Impact 4.16-4 (Vol. 2, Chapter 4, pp. 4.16-16 to 4.16-19). Implementation of Mitigation Measures 4.16-4a, Bioregional Habitat Restoration Measures, and 4.16-4b, Coordination of Construction Staging and Access (Vol. 4, Chapter 6, pp. 6-13 to 6-21), would reduce identified multi-regional and localized collective impacts to a less-than-significant level, except in the Sunol Valley Region. The Draft PEIR (Vol. 2, Chapter 4, p. 4.16-18) identifies the collective impact of multiple WSIP project construction activities on sensitive biological resources in the Sunol Valley as potentially significant and unavoidable because of the number of WSIP projects to be implemented in this region, and the extent of overlap in terms of construction activity and timing. It is possible, however, that the project-level CEQA review for each project in this region will determine that this potentially significant collective impact can be mitigated to a less-than-significant level based on more detailed information about the project site locations, schedules, and construction methods. Refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.4) for additional discussion regarding the level of detail of biological information presented in the PEIR.

SI_CNPS-EB1-19 The commenter requests that focused floristic surveys be conducted several times during the growing season, preferably over several years, to reliably determine the presence of special-status plants. The screening survey required at all WSIP project sites under SFPUC Construction Measure #8 will determine the potential for special-status species to be present based on the presence of suitable habitats. Due to the project schedules, the initial assessments might not be carried out at an optimum time of year for all biological resources. However, a qualified biologist who is familiar with the habitat requirements of special-status plants known to occur in the region would be able to determine whether further floristic surveys at appropriate times of the year should be carried out as part of the project-level CEQA review. Also refer to **Response SI_CNPS-EB1-18** for discussion of required project-level biological surveys.

SI_CNPS-EB1-20 Special-status plants with the potential to occur in the WSIP area are discussed at a program level for individual WSIP facility improvement projects, and at a project level for the proposed changes in water supply sources and regional water system operations. As discussed in the Draft PEIR (Vol. 2, Chapter 4, p. 4.6-1), "key special-status species" were analyzed at the program level only; these were defined as species listed under either the Federal Endangered Species Act or the California Endangered Species Act. Sensitive habitats were also discussed on the basis that most other plant species of concern are found in sensitive habitats, such as vernal pools, seeps and springs, serpentine grasslands, and so forth. It was not practical to analyze the full suite of species in the Draft PEIR because of the large number of species involved throughout the program area and the lack of project definition at this time. When each WSIP project is analyzed at the project level (including those within the Alameda Creek watershed and the Bay Division Region), the evaluation will include a detailed review of all species relevant to specific project locations, which could include *all* CNPS List 1A and 1B species as well as CNPS List 2 plants (Vol. 3, Chapter 5, Section 5.4.6).

Although Dianne Lake's database of locally rare, significant, and unusual plant species in the East Bay was not cited, all of the CEQA-required plants appearing on her database were considered in the PEIR analysis. The commenter is correct that CEQA allows for the lead agency to recognize species of local concern, and impacts on unusual and significant plants of the East Bay may be discussed, if applicable, in the project-level EIRs for the individual WSIP projects.

With respect to the Alameda County moratorium on development along creeks in unincorporated areas of the county, all WSIP projects would be designed to avoid and minimize development on and near creeks to the extent feasible; however, Alameda County restrictions do not apply to the SFPUC.

SI_CNPS-EB1-21 For the program-level analysis, the extent of affected sensitive natural communities could not be determined because individual project descriptions and construction footprints had not been defined. However, for all WSIP projects located near sensitive natural communities and that could cause impacts on these communities, the Draft PEIR determined that such impacts would be potentially significant (Vol. 2, Chapter 4, pp. 4.6-43 to 4.6-59). Once the project descriptions and construction footprints have been defined during the project-level analysis, the significance determination could change.

SI_CNPS-EB1-22 The commenter is correct that impacts on special-status plants are not fully analyzed at the program level. Because the project descriptions and construction footprints are still in the development stage for most of the WSIP projects, the impacts could not be fully analyzed, even if protocol-level survey data were available. However, the Draft PEIR is conservative in its determination that impacts on special-status plants would be potentially significant for all WSIP projects, except for the HTWTP Long-Term Improvements at the Harry Tracy Water Treatment Plant (PN-3), which would be located entirely on graded surfaces that are maintained free of vegetation, and three projects in the San Francisco Region (San Andreas Pipeline No. 3 Installation, SF-1; Groundwater Projects, SF-2; and Recycled Water Projects, SF-3), which would be located entirely in urbanized areas. In any event, the SFPUC would carry out reconnaissance-level surveys for all WSIP projects, and protocol-level botanical surveys for those projects where impacts on any natural habitat or potential habitat for special-status species could occur.

SI_CNPS-EB1-23 The significance criteria adopted for the Draft PEIR biological resources analysis (Vol. 2, Chapter 4, pp. 4.6-37 and 4.6-38) are fully described and consistent with CEQA guidelines and precedent. It is true that many of these rely on professional judgment by qualified biologists. The three components of determining the extent of impact (duration, sensitivity, and susceptibility) are cited by the commenter accurately, and form the basis of a defensible significance determination. However, to clarify an error in the comment letter, the San Francisco Planning Department is responsible for CEQA compliance for the City and County of San Francisco (not the SFPUC) and is responsible for determining appropriate significance criteria.

SI_CNPS-EB1-24 Quantified baseline data, detailed mapping of sensitive natural communities, and floristic surveys at appropriate times of the year will be carried out as deemed appropriate during the project-level analyses for all WSIP projects. All plant species that must be addressed under CEQA (CNPS List 1 and 2) will be surveyed and mapped according to standard CNPS protocols. Developing this level of information at the program level is infeasible for the WSIP facility improvement projects because many details of the project description have not been defined, such as the location of accessways, borrow and fill disposal sites, and staging areas. As a result, detailed surveys of the project footprints cannot be carried out or impacts assessed. Please also refer to **Section 14.4, Master Response** (Vol. 7, Chapter 14, Section 14.4.4).

For analysis of WSIP water supply and system operations, the Draft PEIR provided appropriate level of detail of analysis of biological resources based on modeled estimates of changes in hydrological conditions. Please also refer to **Section 14.4, Master Response** (Vol. 7, Chapter 14, Section 14.4.4) and **Response SI_Caltrout-01** for additional response.

SI_CNPS-EB1-25 As noted by the commenter, the CEQA Guidelines require an analysis of impacts based on existing conditions. However, as stated in the Draft PEIR (Vol. 3, Chapter 5, p. 5.4.6-14), "…riparian structure today is the result of physical responses that have prevailed over the lifetime of the plants…. Therefore, the condition, distribution, and abundance of short-lived or young plants in the Alameda Creek watershed reflect existing stream flow conditions, and those of moderately aged trees and shrubs reflect a combination of both older (pre-2002) and existing flow conditions. The impact analysis uses the existing conditions baseline, but the history of flows in Alameda Creek is discussed in the impact analysis where appropriate because of the role of historical flow in shaping existing resources such as the riparian vegetation." In this way, the Draft PEIR preparers endeavored to represent impacts more realistically rather than minimizing them by comparing them *only* with existing conditions. Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.4) for additional discussion.

The Draft PEIR discussion of impacts on riparian vegetation along Alameda Creek comparing existing "Calaveras Down" conditions versus pre-2002 "Calaveras Up" conditions addresses only willow and mixed riparian habitat along the creek channel (not sycamore alluvial woodland, which is formed and sustained only under very high periodic flows such as those found in unimpeded streams). The distribution of willow and mixed riparian habitats is primarily the result of prevailing flows over several decades; in other words, the operational conditions described as "Calaveras Up," which maximized diversions at the Alameda Creek Diversion Dam prior to the 2001 Division of Safety of Dams (DSOD) restriction on Calaveras Reservoir operations. The CEQA baseline for the WSIP (i.e., Calaveras Down) reflects reduced diversions and therefore increased flows in Alameda Creek below the diversion dam. Although substantially lower than existing flows under the Calaveras Down scenario, the proposed WSIP flows would resemble prior Calaveras Up conditions. As a result, the PEIR concluded that the impact on these riparian habitats would be less than significant.

Consistent with the CEQA Guidelines, the Draft PEIR uses the conditions in 2005 to represent the baseline conditions for the analysis of impacts of WSIP water supply and system operations on Alameda Creek. This baseline condition, referred to as Calaveras Down due to the DSOD restriction on Calaveras Dam, provides for a worst-case environmental analysis since it represents the greatest change in stream flow conditions from those that would occur under the WSIP. As described in the Draft PEIR (Vol. 3, Chapter 5, Section 5.1), the impacts of water supply and system operations are analyzed using the Hetch Hetchy/Local Simulation Model, which uses the existing conditions (i.e., the SFPUC operating conditions and facilities restrictions in 2005) and predicts the reservoir spills and releases (i.e., stream flow conditions downstream from SFPUC reservoirs) over an 82-year record of historical hydrology, and not the actual "brief" period of time during which the Calaveras Reservoir has been operated under restricted conditions.

SI_CNPS-EB1-26 With regard to the Draft PEIR conclusion that the impact on sycamore woodlands would be less than significant, the flow regime in the Alameda watershed under the WSIP would provide higher year-round flows in Alameda Creek because of fishery releases. It could thus facilitate the development of a different natural riparian community in a narrow band along the low-flow channel. Any of the other natural riparian communities that could form, such as willow scrub or mixed riparian scrub or forest, are also considered sensitive natural communities by the California Natural Diversity Database. Thus, one sensitive natural community could be replaced by another sensitive natural community. More importantly, in this instance the extent of such replacement would be limited to the edge of the low-flow channel and would most likely be very narrow. Although the sycamore alluvial woodland in this section of Alameda Creek is extensive, the sycamore trees themselves are very widely spaced. As a result, the number of existing individual sycamores experiencing any change in available groundwater would be low, and the increase in available water would be tolerated by them. Moreover, established, mature sycamores are expected to compete successfully with other riparian species that would grow as a result of increased flows. It is likely that few or no sycamore trees would be lost as a result of the modified flow regime proposed under the WSIP, and therefore the change in the structure and effective extent of sycamore alluvial woodland would be very slight. As a result, the Draft PEIR (Vol. 3, Chapter 5, p. 5.4.8-22) concluded that this potential impact would be less than significant. It is likely that this subject will be revisited, with more quantitative data, in the EIR for the Calaveras Dam Replacement project (SV-2).

SI_CNPS-EB1-27 The commenter is correct that the adequacy of the mitigation, such as the Habitat Reserve Program (HRP), for the WSIP projects cannot be assessed in advance of a more detailed description of the exact nature of the biological resources and the presumed impacts upon them. The Draft PEIR does not attempt to propose the amount of mitigation required for the WSIP projects, since details on the magnitude, location, and type of impacts cannot be defined at the program level. Instead, the type and extent of adequate and appropriate mitigation would be determined at the project EIR stage. The HRP would not provide all mitigation for project impacts; avoidance, minimization, and restoration would also take place on the project site. Offsite compensatory mitigation could be provided by a program such as the HRP, and the type and amount of such mitigation would be determined by the resource agencies. If the HRP does not provide sufficient or appropriate mitigation, then other mitigations would be required. Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.4).

SI_CNPS-EB1-28 This comment, which states that the East Bay Chapter of the CNPS does not endorse any of the CEQA alternatives, is acknowledged. It is also acknowledged that this statement contradicts Comment SI_CNPS-EB2-01 by representatives of the same organization. This comment (SI_CNPS-EB1-28) states the opinion that the analysis of water supply and demand is flawed. Please refer to **Responses SI_CNPS-EB1-11** through **SI_CNPS-EB1-14** and **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14) for a detailed discussion of why the water supply and demand analysis used in the Draft PEIR is appropriate and adequate for this planning level of study.

SI_CNPS-EB1-29 The comment is noted. The San Francisco Planning Department has determined that recirculation of the Draft PEIR is not warranted, consistent with CEQA guidelines.

SI_CNPS-EB1-30 This comment is comprised of a CNPS letter addressed to the SFPUC, dated July 19, 2004, which comments on the special-status species proposed for coverage in the Alameda Watershed Habitat Conservation Plan. The PEIR preparers appreciate the submittal, but the Habitat Conservation Plan process operates under different guidelines and for different purposes than the WSIP PEIR, focusing on species currently or anticipated to be protected under the Federal Endangered Species Act. The letter restates many of the points made in the body of the CNPS letter; see **Responses SI_CNPS-EB1-05**, **SI_CNPS-EB1-08**, and **SI_CNPS-EB1-18** through **SI_CNPS-EB1-27** for the specific responses.

This letter notes the recent observation of several CNPS List 1B plants from the Alameda Creek watershed, mostly on East Bay Regional Park District lands. It also notes the existence of 162 unusual and significant plant species in the Alameda Creek watershed. As noted in the Draft PEIR (Vol. 2, Chapter 4, p. 4.6-1), the impact analysis addresses, at a programmatic level of detail, sensitive natural communities and “key” special-status species listed by the U.S. Fish and Wildlife Service or California Department of Fish and Game. The operational analysis presented in Chapter 5 in the Draft PEIR addresses, at a project level of detail, species recognized as rare and endangered (CNPS List 1B or 2), as required under CEQA. The project-specific analyses of the individual WSIP projects may present more detailed information, as deemed appropriate, on unusual and significant plants in the East Bay.

SI_CNPS-EB1-31 This comment is comprised of a CNPS letter addressed to the Alameda County Board of Supervisors, dated May 4, 2006. In this letter, the East Bay Chapter of the CNPS commented on the proposed moratorium on creek development in the unincorporated areas of Alameda County. The letter notes the high ecological value of Alameda Creek, especially upstream of the gravel quarries near Interstate 680, and a list of rare and unusual plants of Alameda Creek is attached. Receipt of the letter and attachment is acknowledged. The actions of Alameda County are not necessarily applicable to the PEIR analysis, but please note that the rare and endangered (CNPS List 1 and 2) plants and sensitive natural communities referenced in the letter are discussed in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.4.6-1 to 5.4.6-12).

California Native Plant Society, East Bay Chapter, Lech Naumovich, 09/18/07

[See Public Hearing Transcript, Fremont, pp. 25–28]

SI_CNPS-EB2-01 This comment, which expresses the support of the California Native Plant Society, East Bay Chapter, for the Aggressive Conservation/Water Recycling and Local Groundwater Alternative, is acknowledged. Note that this contradicts Comment SI_CNPS-EB1-28 by representatives of the same organization, who indicated that the California Native Plant Society, East Bay Chapter does not endorse any of the alternatives in the Draft PEIR.

SI_CNPS-EB2-02 This comment, which expresses an opinion in favor of the seismic improvements but against any additional Tuolumne River diversions, is acknowledged.

SI_CNPS-EB2-03 This commenter does not think it necessary to divert any water from Alameda Creek, and that WSIP implementation will undermine species and habitat restoration efforts by other organizations.

The Draft PEIR (Vol. 1, Sections 3.3 and 3.6, and Vol. 3, Section 5.4) discusses the purpose of and need for WSIP implementation and the need for diversions from Alameda Creek to meet current and future water supply and system reliability objectives. As shown in Figure 2.4 of the Draft PEIR (Vol. 1, Chapter 2, p. 2-18), the Alameda Creek watershed currently provides about 13 percent of the water supply to the regional system and, importantly, is the major source of local water supplies to the regional system. Implementation of the WSIP would result in increased diversions from Alameda Creek compared to the existing condition, but the proposed level of diversions would be similar to the historical level of diversions that took place for about 70 years prior to the Division of Safety of Dams operating restriction placed on Calaveras Dam in 2001. As described in the Draft PEIR (Vol. 1, Chapter 2, p. 2-10), the SFPUC considers the current reduced storage level in Calaveras Dam and the associated reduced diversion level to be an impaired operating mode that puts the regional system at risk of being unable to adequately meet existing customer water demand in the event of an emergency or a prolonged drought. The restoration of storage capacity in Calaveras Reservoir and the associated increased diversions from Alameda Creek are needed to meet existing customer demand during a drought or other emergency condition and to provide both delivery and seismic reliability; it is also needed to maximize use of local water supplies.

As described in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.2-24 and 5.2-25), the SFPUC's adopted Water Enterprise Environmental Stewardship Policy establishes a long-term management direction for CCSF-owned lands and natural resources affected by operation of the SFPUC regional water system, including lands within the Alameda Creek watershed. It states "It is the policy of the SFPUC to operate the regional water system in a manner that protects and restores native fish and wildlife downstream of SFPUC dams and water diversions, within SFPUC reservoirs, and on SFPUC watershed lands." The SFPUC actively monitors the health of the terrestrial and aquatic habitats under CCSF ownership or otherwise affected by SFPUC operations in order to continually improve ecosystem health.

In addition, the SFPUC has entered into partnerships with various organizations (see Draft PEIR, Vol. 3, Chapter 5, p. 5.2-20). One of these partnerships, the Alameda Creek Fisheries Restoration Workgroup (ACFRW), is a multi-agency stakeholder group formed to pursue the restoration of steelhead to Alameda Creek. The ACFRW is composed of numerous community and citizens' groups, state and federal resource agencies, and local water management and flood control agencies, including the SFPUC. The SFPUC is also working with the U.S. Fish and Wildlife Service and National Marine Fisheries Service and is in the process of developing a Habitat Conservation Plan for the Alameda Creek watershed. Further discussion of these partnerships and restoration efforts is presented in **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14), which includes a description of proposed modifications to the Calaveras Dam Replacement project (SV-2) to include protective measures for steelhead.

SI_CNPS-EB2-04 The information provided by the commenter (regarding water recycling practices in other parts of the world) is acknowledged. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2), for a detailed discussion of the water recycling assumptions used in developing the demand projections.

SI_CNPS-EB2-05 Please refer to **Section 14.3, Master Response on Proposed Dry-Year Water Transfer** (Vol. 7, Chapter 14, Section 14.3.2), regarding future water transfer agreements with the Turlock Irrigation District and the Modesto Irrigation District for supplemental Tuolumne River water as part of the proposed program.

SI_CNPS-EB2-06 Please see **Response SI_CNPS-EB1-18**.

California Native Plant Society, Kevin Bryant, President, Santa Clara Valley Chapter, 10/01/07

SI_CNPS-SCV1-01 The commenter indicates that the public cannot determine the validity of the impact analysis and mitigation measures due to the Draft PEIR's lack of detail as well as reliance on project EIRs that are currently unavailable to the public. For discussion of the issues raised by this comment, please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.2). This master response provides information on the appropriate level of detail of an impact analysis at the program level versus the project level. The Draft PEIR (Vol. 2, Chapter 4, pp. 4.16-1 to 4.16-38) also evaluates the multi-regional and localized combined or collective impacts associated with implementation of the WSIP (all WSIP facility projects combined), and provides mitigation measures (all those numbered 4.16-x) that address collective impacts (Vol. 4, Chapter 6, pp. 6-8, 6-13, 6-32, 6-38, and 6-42), including those impacts that cannot be effectively analyzed or mitigated through the CEQA process for projects individually.

This comment also expresses that the PEIR does not provide sufficient detail and analysis to support its conclusions regarding the future needs of the regional water system. For a discussion of this issue, please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2).

This comment also notes that of the 22 WSIP facility improvement projects, the SFPUC has published Notices of Preparation and EIRs for nine projects, and that considerable information is therefore unavailable to the public regarding impact and mitigation. The commenter requests that the SFPUC publish environmental documents for all 22 projects in a timely fashion so that they can be analyzed together in a coherent manner. As shown in Chapter 4 of the Draft PEIR, these projects are analyzed at a programmatic level of detail. Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.2) for discussion regarding the intent of the programmatic analysis versus the project-level analysis. The commenter also requests that the SFPUC provide local work sessions in the geographical areas affected by each project. Once the WSIP facility improvement projects begin, public scoping meetings and informational meetings will be held as necessary.

SI_CNPS-SCV1-02 This comment expressing concern about "water supply needs and measures to meet them" is acknowledged. Comment SI_CNPS-SCV1-03 details these concerns; refer to **Response SI_CNPS-SCV1-03**.

SI_CNPS-SCV1-03 Regarding the assertions that adequate consideration has not been given to conservation measures, and that the Draft PEIR substantially overestimates water demand in Santa Clara County because of faulty assumptions and flawed data sources, refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14).

The basis for the assertion regarding invalid sampling methods is not specified and is thus unclear. The methodology used to develop the demand estimates and to identify conservation and water recycling potential is described in Draft PEIR Chapter 3 (Vol. 1, pp. 3-16 to 3-22) and in more detail in Appendix E.2 (Vol. 5); as the descriptions indicate, sampling was not an integral part of the process, but actual consumption among all billing categories was (see the paragraph below).

The "total population of users," which the comment states is biased, apparently refers to the residential and nonresidential users within the service area. The comment provides no evidence to support or explain this general assertion, and no evidence of bias is apparent to the PEIR authors. As described in the Draft PEIR (Vol. 1, Chapter 3, p. 3-20), actual billing data along with published information on demographics and housing stocks, from such sources as the California Department of Finance and U.S. Census Bureau, were used to develop base-year water usage by end-use. Once base-year usage was established, future water demand was projected by using published population and employment projections to develop growth rates for residential and nonresidential water accounts, respectively. Each wholesale customer selected the published population projection source to be used for its service area; since the Association of Bay Area Governments (ABAG) *Projections 2002* was the current source of employment projections, it was used to develop the nonresidential demand estimates. Assuming the assertion of bias refers to the use of ABAG's *Projections 2002*, please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14).

The Pacific Institute's evaluation of the demand estimates prepared for the WSIP, which this comment endorses, was submitted as Comment Letter SI_PacInst; please refer to the responses to that submittal. The commenter's approval of the Loma Prieta chapter analysis is acknowledged.

The comment provides no evidence to support the assertion that implementation of the WSIP would have substantial growth-inducing effects on Santa Clara County that are “in no way covered by the proposed mitigations.” As explained in the Draft PEIR (Vol. 4, Chapter 7, pp. 7-59 to 7-77), measures to mitigate the indirect effects of planned growth have been identified in the EIRs prepared for the adopted plans of the jurisdictions in the areas served, including those in Santa Clara County. In approving a plan that could cause environmental impacts determined to be unavoidable, the decision-making body must indicate the reasons for approving the plan despite unavoidable impacts in a “statement of overriding considerations.” Draft PEIR Table 7.12 (Vol. 4, Chapter 7, p. 7-68) presents a summary of overriding considerations frequently cited by agencies. As shown in Draft PEIR Table E.5.1 (Vol. 5, Appendix E.5, pp. E.5-3 to E.5-18), the EIRs for the general or specific plans of several jurisdictions within Santa Clara County identified impacts on open space and public services, as this comment indicates, and provided measures to reduce those impacts.

SI_CNPS-SCV1-04 The commenter is concerned that the mitigations to compensate for biological resources impacts through the Habitat Reserve Program (HRP) would be implemented in advance of actual project-level impact analyses, and that there is insufficient site-specific data from which sound decisions can be made. Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.4, under the heading Habitat Reserve Program).

The commenter is correct that the quantity and type of compensatory action cannot be determined until the impacts of a proposed project have been analyzed at a project level of detail, as will occur in the project-specific CEQA documents prepared for the individual WSIP projects. The HRP is being designed to create habitat enhancements that would be applied as appropriate to WSIP project impacts, and while this is the preferred mitigation approach for impacts on biological resources associated with the WSIP projects, it is not the only option. As described in the Draft PEIR (Vol. 4, Chapter 6, p. 6-11), the HRP is presented as one option for implementing offsite habitat compensation for the WSIP projects; the SFPUC will compensate for affected sensitive habitats and will comply with applicable environmental regulations addressing sensitive habitats and species for each WSIP project, either on a project-by-project basis or through the HRP. Therefore, at a programmatic level of analysis, the Draft PEIR mitigation measures provide adequate guidance for the project-level impact analyses and mitigation development. Site-specific information on habitat compensation will be addressed as appropriate during project-level CEQA review. The level of detail at which the impacts of the WSIP facility projects are evaluated and mitigation specified in the Draft PEIR is consistent with CEQA Guidelines Section 15168.

The project description for the HRP states that no habitat enhancements applicable to WSIP project impacts have been or would be applied as mitigation for other SFPUC projects, and that these enhancements would be separate from any compensation developed for the watershed's habitat conservation plans, the Watershed and Environmental Improvement Program, or other regulatory or permitting purposes. The commenter's description of the HRP is noted, and, as stated above, the application of the HRP as mitigation to individual WSIP projects will be determined as part of project-level CEQA review. Also, please refer to **Response SI_CNPS-EB1-18** for discussion of required project-level biological surveys, impact analyses, and mitigation requirements. Refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.2) for discussion regarding the intent of the programmatic impact analysis.

SI_CNPS-SCV1-05 This comment opposes additional Tuolumne River diversions and states that the impacts of the WSIP on the Tuolumne River cannot be adequately evaluated without additional data collection and analysis and the preparation of a comprehensive study of the watershed. Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.9) for an explanation of the relationship between the average annual increase in purchase requests and the average annual increase in Tuolumne River diversions. Regarding the commenter's statement that additional studies are needed to evaluate the impacts of the WSIP on the Tuolumne River, refer to **Response SI_CRS-07**.

SI_CNPS-SCV1-06 This comment summarizes more detailed comments presented in Comments SI_CNPS-SCV1-01 through SI_CNPS-SCV1-05 and in Comments SI_CNPS-SCV-07 through SI_CNPS-SCV-16; refer to **Responses SI_CNPS-SCV1-01** through **SI_CNPS-SCV1-05** and **Responses SI_CNPS-SCV-07** through **SI_CNPS-SCV-16**. Also refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Sections 14.4.2 and 14.4.4) for additional discussion regarding the intent of the programmatic impact analysis and the level of detail of biological information presented in the PEIR.

SI_CNPS-SCV1-07 The commenter identifies specific examples of concern, including the Calaveras Dam Replacement project (SV-2); the comment states that this project is included in the PEIR and HRP, but that without specifics on the extensive excavation related to this project, its proposed advance mitigation will compound cumulative impacts on vegetative habitat. Please refer to **Responses SI_CNPS-SCV1-01** and **SI_CNPS-SCV1-04** and to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Sections 14.4.2 and 14.4.4),regarding program-level versus project-level analyses, the Draft PEIR's consideration of collective impacts from all WSIP projects, and concerns regarding advance mitigation through the HRP. Also refer to **Response SI_CNPS-EB1-18** for discussion of required project-level biological surveys, impact analyses, and mitigation requirements. In addition, the Draft PEIR (Vol. 2, Chapter 4, pp. 4.17-1 to 4.17-64) identifies cumulative impacts associated with the WSIP in combination with other approved and proposed development in the region.

SI_CNPS-SCV1-08 In regard to potential effects of the WSIP on federal-threatened marbled murrelet, nesting habitat for this species consists of old-growth conifer forest (such as Douglas-fir forest), which is not considered riparian vegetation and is unaffected by stream flows in Pilarcitos Creek.

SI_CNPS-SCV1-09 This comment points out a typographical error in the legend for Figure 5.7-4 (Vol. 3, Chapter 5, p. 5.7-71). The legend is revised as follows:

> PP-1a Peninsula Watershed Habitat Conservation Plan (sub-project of ~~Alameda~~ Peninsula WMP)

SI_CNPS-SCV1-10 This comment, which states that the water demand projections used biased data sources and an invalid sampling of the total population of users and overstated future water needs, restates comments made in Comment SI_CNPS-SCV-03; please refer to **Response SI_CNPS-SCV1-03**.

SI_CNPS-SCV1-11 This comment, which states that Draft PEIR Figure S.3 (Vol. 1, Summary, p. S-5) illustrates the difference in water usage by the SFPUC retail and wholesale customers, is acknowledged. Please refer to **Responses SI_PacInst-54** through **SI_PacInst-56** and to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2, under the heading Per-Capita Demand).

SI_CNPS-SCV1-12 This comment states that the need for additional water is not substantiated by the requests of several wholesale customers that are located in areas where recycled water is readily available for anticipated shoreline development. As described in the Draft PEIR, the SFPUC conducted a study to identify the potential for using recycled water within the wholesale service area (RMC, 2004). Table E.2.5 in the Draft PEIR (Vol. 5, Appendix E.2, p. E.2-17) shows the potential recycled water projects at various stages of planning, and with various degrees of certainty, in the service area. Some of the projects would serve jurisdictions cited in this comment, although not all of the recycled water produced would replace potable supplies. In addition, as described in the Draft PEIR (Vol. 4, Chapter 9, pp. 9-47 to 9-51), the SFPUC, in cooperation with its wholesale customers and the Bay Area Water Supply and Conservation Agency, undertook a study to assess the potential for additional conservation and recycled water projects, including potential regional projects, that were not already considered to be implemented locally by 2030 as part of the WSIP purchase estimates. The results of this study provided the basis for the Aggressive Conservation/Water Recycling and Local Groundwater Alternative evaluated in the Draft PEIR (Vol. 4, Chapter 9, pp. 9-47 to 9-59) as well as an element of the Modified WSIP Alternative (Vol. 4, Chapter 9, pp. 9-78 to 9-84). However, the study identified no additional opportunities for recycled water use in the jurisdictions cited in this comment.

Regarding substantiation of the projected increases in demand, refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14).

SI_CNPS-SCV1-13 This comment, which states that conservation capabilities exist for two wholesale customers requesting large increases (Stanford University and Purissima Hills Water District), is acknowledged. Tables 3.3 and 7.2 of the Draft PEIR (Vol. 1, Chapter 3, p. 3-18 and Vol. 4, Chapter 7, p. 7-15, respectively) show the projected conservation savings from measures to which these customers have committed. These measures are shown in Table 14.2-4 of **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14).

Please refer to **Response L_PHWD1-09** for a correction of the town’s population.

SI_CNPS-SCV1-14 Consistent with CEQA Guidelines Section 15126, the Draft PEIR presents an analysis of all phases of the WSIP. Chapter 4 (Vol. 2) includes a program-level analysis of the construction and operational phases of the proposed facility improvement projects, and Chapter 5 (Vol. 3) includes a project-level analysis of the proposed water supply and system operations. Chapter 6 (Vol. 4) describes the mitigation measures identified in Chapters 4 and 5 that would (in most cases) reduce the potentially significant impacts to a less-than-significant level; however, in a few cases, impacts were identified as significant and unavoidable even with the implementation of mitigation measures.

SI_CNPS-SCV1-15 Consistent with CEQA Guidelines Section 15130, the Draft PEIR analyzed the cumulative impacts of the WSIP (see Vol. 2, Chapter 4, Section 4.17 and Vol. 3, Chapter 5, Section 5.7).

The CEQA process consists of issuing a draft EIR and final EIR for public review, followed by certification of the final EIR by the CEQA lead agency. If a public agency, such as the SFPUC, decides to approve a project for which an EIR has been certified and which identifies one or more significant environmental effects, it must make "findings" for each of those significant effects, accompanied by a brief explanation of the rationale for each finding (CEQA Guidelines Section 15091). For the WSIP PEIR, the SFPUC will issue findings following certification of the Final PEIR and if/when it decides to approve or modify the proposed program.

According to CEQA Guidelines Section 15152, tiering refers to applying the general analysis contained in a broader EIR to subsequent EIRs and negative declarations on narrower projects. In the context of the WSIP PEIR, tiering refers to use of the analysis presented in the PEIR in subsequent project-level environmental review of the individual WSIP projects.

SI_CNPS-SCV1-16 As described in the Draft PEIR (Vol. 1, Chapter 2, p. 2-36), the City and County of San Francisco has sufficient water rights for existing operations and facilities as well as for proposed operations and facilities under the WSIP. Proposed diversions, it should be noted, would be 27 mgd, not 25 mgd. Section 5.2 of the Draft PEIR (Vol. 3, Chapter 5, pp. 5.2-1 to 5.2-29) presents plans and policies relevant to the SFPUC regional water system and describes program consistency with the applicable, adopted land use and resource plans and policies; this section also includes plans relevant to the Tuolumne and San Joaquin Rivers. The Draft PEIR analyzes the potential effects of the WSIP on fishery and other biological resources associated with the Tuolumne River, including wildlife species and resident and migratory fish, in Sections 5.3.6 and 5.3.7 (Vol. 3, Chapter 5).

California Native Plant Society, Santa Clara Valley Chapter, Libby Lucas, Conservation, 10/15/07

SI_CNPS-SCV2-01 In 2002, the California Department of Water Resources, Division of Safety of Dams (DSOD) imposed interim restrictions on Calaveras Dam operations with the caveat that the SFPUC continue to pursue an aggressive schedule for the remediation of Calaveras Dam. The SFPUC has rejected the concept of an enlarged Calaveras Reservoir because of uncertainty about the ability to obtain the necessary water rights and environmental permits within the timeframe needed to satisfy DSOD requirements. As stated in the Draft PEIR (Vol. 4, Chapter 9, p. 9-118), the Calaveras Dam Replacement project (SV-2) includes a base design that would technically allow the dam to be raised in the future, but the currently proposed height of the reservoir would not accommodate reservoir storage beyond its historical capacity. In the future, any discretionary action by the SFPUC to raise the height of the dam and increase storage capacity would be subject to CEQA review requirements (including public disclosure), and water rights and environmental issues would need to be resolved at that time. The comment also asks why there are no sediment basins at Calaveras Reservoir. The reservoir is not expected to have the kind of sediment issues that warrant sediment basins, which are not usually suitable as mitigation due to the periodic maintenance requirements.

The commenter requests clarification on the design capacity of the Calaveras Dam Replacement project (SV-2) and mitigation related to wetlands, streams, and habitat. The project-level EIR for this project will present detailed project design information, provide a more detailed impact assessment, and refine PEIR mitigation measures to specifically address this project. Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.2) for detailed discussion of the issues raised by this comment.

SI_CNPS-SCV2-02 Please refer to **Response SI_CNPS-SCV1-08**. Within the Pilarcitos Creek watershed, suitable nesting habitat for the marbled murrelet is located within upland forest habitats that are unaffected by flows in Pilarcitos Creek.

The Draft PEIR (Vol. 3, Chapter 5, pp. 5.5.1-5 to 5.5.1-12) describes the SFPUC's operations in Pilarcitos Reservoir and along Pilarcitos Creek. Impact 5.5.1-2 (Vol. 3, Chapter 5, pp. 5.5.1-19 to 5.5.1-22) describes the effects of WSIP implementation on flow along Pilarcitos Creek based on a review of historical data and SFPUC reservoir operating practices (see the discussion of model limitations in Section 5.1, pp. 5.1-14 to 5.1-17); the impact was determined to be less than significant with respect to stream flow changes in Pilarcitos Creek below both Pilarcitos and Stone Dams. Impact 5.5.4-1 (Vol. 3, Chapter 5, p. 5.5.4-3) describes the effects of changes in stream flow in Pilarcitos Creek on groundwater levels and water quality, which were determined to be less than significant because the WSIP would have very little effect on flow in Pilarcitos Creek below Stone Dam. Because inflow to Pilarcitos Creek below Stone Dam is the primary source of groundwater recharge, minor changes in upstream flow associated with the WSIP would not be expected to affect the groundwater and would not cause seawater intrusion during droughts.

The last part of this comment, asking whether the transfer of water from Crystal Springs Reservoir to Pilarcitos Reservoir would affect critical habitat, native grasslands, wetlands, or special-status species, is discussed in Impact 5.5.6-1 (Vol. 3, Chapter 5, p. 5.5.6-14 to 5.5.6-17). Impacts on these resources were found to be potentially significant, but implementation of Mitigation Measure 5.5.6-1a, Adaptive Management of Freshwater Marsh and Wetlands, Mitigation Measure 5.5.6-1b, Compensation for Impacts on Terrestrial Biological Resources, and Mitigation Measure 5.5.6-1c, Compensation for Serpentine Seep-Related Special-Status Plants (Vol. 4, Chapter 6, pp. 6-57 and 6-58), would reduce these impacts to less-than-significant levels.

SI_CNPS-SCV2-03 Please refer to **Response SI_CNPS-SCV1-09**.

SI_CNPS-SCV2-04 This comment regarding the salvage of *Lessingia arachnoidea* is noted. With the appropriate permits and approvals, this and other listed plants could be salvaged from areas where the populations would otherwise be lost. The commenter correctly states that much of the Peninsula is a state game refuge, and although this designation does not directly equate with an assessment of its biological value, the PEIR acknowledges the importance of its biodiversity and many unique natural features. Regarding the mitigation land for serpentine grassland, the SFPUC will work with county and non-governmental organizations to identify and protect high-quality serpentine grassland in San Mateo County, or will include such areas within the Habitat Reserve Program once specific impacts have been identified in project-specific EIRs. Lastly, the commenter appears to suggest either joining (combining) the Peninsula and Alameda Watershed Habitat Conservation Plans (HCPs) or perhaps avoiding the HCPs in some way. Regardless of the intent and meaning of the comment, the HCP process is consistent with the Draft PEIR, but is a separate process conducted under the Endangered Species Act rather than CEQA.

SI_CNPS-SCV2-05 Please refer to **Responses SI_CNPS-EB1-18, SI_CNPS-EB1-19**, and **SI_CNPS-EB1-20**. SFPUC Construction Measure #8, which requires the performance of screening surveys, is not offered as an adequate inventory but rather the start of the process for any construction action. For example, see Draft PEIR Mitigation Measure 4.6-3a (Vol. 4, Chapter 6, p. 6-12), which describes the role of detailed preconstruction surveys.

Regarding best management practices for invasive species, the SFPUC—like all land stewards in the Bay Area—is aware of the problems related to the introduction of non-native plant species. The commenter is referred to Draft PEIR Mitigation Measure 4.6-3a (Vol. 4, Chapter 6, pp. 6-12 and 6-13), which mandates a weed control plan for all WSIP projects.

SI_CNPS-SCV2-06 The commenter has asked whether oak mitigation would be compensated at a ratio of 1:1 and where such mitigation land would be reserved. The California Department of Fish and Game generally establishes mitigation ratios for the replacement of habitats such as oak woodland, but often at a ratio higher than 1:1 if the affected habitat is of good quality. The location of compensation land has not been determined, but would be located within the program region. Such compensation land may or may not be located within lands already managed by the SFPUC, but a higher compensation would apply if the land is already under some degree of protection and a lower compensation would apply if protection under a conservation easement were established on land not otherwise designated as such.

The commenter also asked what effect raising the water levels in Crystal Springs Reservoir would have on sediment basins sited around the reservoirs. Some of the sediment basins are within the proposed operational elevation range for the reservoir itself. If the reservoir were maintained at these higher levels during the rainfall season, the sediment basins would not function as designed; most likely, sediment would accumulate upstream where the flowing water slows as it encounters still water. More importantly for biological resources, some of the sediment catchment basins have been designed to function in an ecologically similar manner to sag ponds, with periods of inundation and seasonal drying. Operation of the reservoir at higher levels could alter the ecological function of these basins, changing the habitat quality for species such as California red-legged frog and San Francisco garter snake. This impact will be analyzed in detail in the EIR for the Lower Crystal Springs Dam Improvements project (PN-4).

SI_CNPS-SCV2-07 There are three issues discussed in this comment. Regarding the comment that the demand analysis is flawed and conservation measures are underestimated, please refer to **Section 14.2, Master Response on**

Demand Projections, Conservation, and Recycling (Vol. 7, Chapter 14, Section 14.2.3). Regarding Assembly Bills 1881 and 2717, refer to **Response SI_PacInst-73**. The comment regarding Assembly Bill 325, which was adopted in 1990 and requires jurisdictions to either adopt a landscape ordinance or issue findings that no ordinance is necessary, is acknowledged. Regarding the second part of this comment, stating that communities requesting sizable water supply increases should be required to substantiate the need for water and to document water conservation efforts, refer to **Section 14.2, Master Response on Demand Projections**, **Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2, under the heading Substantiation of the Need for Sizable Water Supply Increases and Documentation of Water Conservation Efforts). The third part of this comment, in which the commenter asks whether customers and water retail contractors should not also incorporate backup supply capabilities (in addition to SFPUC facilities) into their community water plans, is acknowledged.

SI_CNPS-SCV2-08 The commenter indicates that the analysis of cumulative impacts in the Draft PEIR should include San Francisco Bay saltmarsh conversion from increased sewage plant outflow. The commenter is correct in noting that changes in wastewater discharges into receiving waters in the SFPUC service area would be an indirect effect associated with implementation of the WSIP, since increases in water use directly correlate to increases in wastewater discharges. Insofar as the WSIP would result in changes to municipal and industrial water use patterns, there could be associated changes in wastewater discharge patterns for municipal and industrial uses. The Draft PEIR addresses the indirect effects of growth in Chapter 7 (Vol. 4, pp. 7-60 to 7-78), and it indicates that these effects, including impacts on wastewater treatment facilities and wastewater treatment capacities, have been identified as significant but mitigable in the environmental impact reports of the general and specific plans in the service area. Any incremental increases in sewage treatment plant discharges would not likely result in saltmarsh conversion, since the National Pollutant Discharge Elimination System permitting requirements associated with sewage treatment plant discharges are designed to protect the beneficial uses of San Francisco Bay, including saltmarsh habitat, where appropriate.

The potential impacts associated with flooding and increases in impervious surfaces are evaluated in the Draft PEIR under Impacts 4.5-4 and 4.5-6 (Vol. 2, Chapter 4, pp. 4.5-37 to 4.5-54). Growth-inducement impacts associated with the WSIP are analyzed in Chapter 7 (Vol. 4). The effects of global climate change on water resources are discussed in Section 5.7.6 (Vol. 3, Chapter 5, pp. 5.7-92 to 5.7-96), although the WSIP is not expected to increase water levels in the bay. Table C.6 (Vol. 5, Appendix C, p. C-26) shows the agency permits and approvals that may be required for the WSIP facility improvement projects, including possible review and approvals by the Department of Water Resources. Also refer to **Response S_DWR-01**.

SI_CNPS-SCV2-09 This comment, stating that recycled water use is behind projections in North San Jose and East Palo Alto, and that recycled water should be used before groundwater, is acknowledged. While it is unclear to what projections the comment is referring, note that the City of San Jose participates, along with the Cities of Milpitas and Santa Clara, in the South Bay Water Recycling Project. As shown in Table E.2.5 (Vol. 5, Appendix E.2, p. E.2-17), this project currently produces 3.1 million gallons per day (mgd) of recycled water and is projected to potentially provide an additional 2.1 mgd in the future. According to the *SFPUC Wholesale Customers Recycled Water Potential Study*, all of the current and projected recycled water from this project replaces potable supplies (RMC, 2004, Table 5). As discussed in **Response SI_CNPS-SCV1-12** and described in the Draft PEIR (Vol. 4, Chapter 9, pp. 9-47 to 9-51), the SFPUC, in cooperation with its wholesale customers and the Bay Area Water Supply and Conservation Agency, also undertook a study (SFPUC, 2007) to assess the potential for additional conservation and recycled water projects, including potential regional projects, that were not already considered to be implemented locally by 2030 as part of the WSIP purchase estimates. The results of this study provided the basis for the Aggressive Conservation/Water Recycling and Local Groundwater Alternative evaluated in the Draft PEIR (Vol. 4, Chapter 9, pp. 9-47 to 9-59) as well as an element of the Modified WSIP Alternative (Vol. 4, Chapter 9, pp. 9-78 to 9-84). This study revised the 2004 study's estimates of recycled water potential for Milpitas and Santa Clara and provided the basis for the estimates shown for these cities (1.77 mgd and 4.0 mgd, respectively) in Draft PEIR Tables 3.3 and 7.2 (Vol. 1, Chapter 3, p. 3-18, and Vol., 4, Chapter 7, p. 7-15). North San Jose currently uses 0.59 mgd of recycled water; however, this amount was deducted from North San Jose's baseline and projected demand and therefore is not shown as a component of supply in the Draft PEIR tables. The 2004 RMC study estimated that future projects could provide an additional 1.91 mgd to North San Jose (revised to 2.07 mgd in the 2007 study). However, this recycled water from future projects for North San Jose is expected to serve users that are not part of the projected 2030 demand and therefore is also not shown in the Draft PEIR tables. The study identified no other opportunities for recycled water use in the jurisdictions cited in this comment.

SI_CNPS-SCV2-10 Comment noted regarding an economic analysis of water rates, which is not within the scope of the PEIR.

SI_CNPS-SCV2-11 This comment regarding City Charter mandate (4) is acknowledged.

SI_CNPS-SCV2-12 This comment, requesting that the City and County of San Francisco avail itself "of all possible private volunteer assistance" in preserving natural habitat on SFPUC lands, is acknowledged.

California Native Plant Society, Willis Jepson Chapter, Tedmund Swiecki, Conservation Committee Co-Chair, 10/01/07

SI_CNPS-WLJ-01 This comment opposes the WSIP due to the additional withdrawal of 25 mgd from the Tuolumne River. Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.9) for an explanation of the relationship between the average annual increase in purchase requests and the average annual increase in Tuolumne River diversions.

The potential environmental impacts of the proposed changes in water supply sources and regional water system operations are evaluated at a project level and organized by watershed in the Draft PEIR (Vol. 3, Chapter 5, Sections 5.3 through 5.5). The potential impacts on biological resources related to individual WSIP facility improvement projects are evaluated at a programmatic level in Section 4.6 (Vol. 2, Chapter 4, pp. 4.6-37 to 4.6-74). As this comment does not address the adequacy or accuracy of the PEIR, no additional response is provided.

SI_CNPS-WLJ-02 This comment opposes additional Tuolumne River diversions and promotes additional water conservation to meet future water demand in the SFPUC service area. It should be noted that the projected increase in customer purchase requests through 2030 is 35 mgd, and not 38 mgd as implied by this commenter. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects proposed by the SFPUC and its wholesale customers.

Center for Resource Solutions, Meredith Wingate, Brad Drda, Director Clean Energy Policy Design and Implementation Program, 09/26/07

SI_CRS-01 This comment expresses opposition to additional Tuolumne River diversions and requests that additional studies be conducted before the PEIR is finalized. Please refer to **Response SI_Caltrout-01** for response.

SI_CRS-02 The background information related to the Tuolumne River provided by the commenter is acknowledged; however, as it does not address the adequacy or accuracy of the PEIR, no additional response is provided. Please refer to **Section 14.5**, **Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.9) for an explanation of the relationship between the average annual increase in purchase requests and the average annual increase in Tuolumne River diversions.

SI_CRS-03 This comment incorrectly states that the WSIP ignores conservation, efficiency, and recycling measures. Please refer to the Draft PEIR, Section 3.6.1, Proposed Nondrought Water Supply (Vol. 1, Chapter 3, pp. 3-34 to 3-36) and the last three projects listed in Table 3.10, WSIP Facility Improvement Projects (Vol. 1, Chapter 3, pp. 3-49 to 3-56) for information regarding the conservation measures, recycled water projects, and groundwater projects that would be implemented under the WSIP. The topics raised in this comment have also been submitted by numerous commenters; please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) under the heading Frequently Submitted Comments Addressing Conservation and Recycling, for additional information.

SI_CRS-04 This comment, which expresses concern that the SFPUC risks delaying its capital improvement program, causing cost overruns, and failing to increase the reliability of the water supply, is acknowledged. The Draft PEIR evaluated the potential impacts of climate change/global warming on the implementation of the WSIP (Vol. 3, Chapter 5, pp. 5.7-92 through 5.7-96). Please also refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14) for additional information on climate change as it relates to the SFPUC regional water supply and the proposed WSIP.

SI_CRS-05 The recommendations included in this comment—that the SFPUC reevaluate water demand projections; that a study be conducted to determine maximum potential conservation and efficiency; and that any additional demand be met through increased investment in conservation, efficiency, and recycling—have been submitted by numerous commenters; please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14). The Draft PEIR evaluated a No Purchase Request Increase Alternative (Vol. 4, Chapter 9, pp. 9-40 to 9-47) and an Aggressive Conservation/Water Recycling and Local Groundwater Alternative, one variation of which involved no supplemental water from the Tuolumne River (Vol. 4, Chapter 9, pp. 9-47 to 9-59). Neither of these was identified as the environmentally superior program alternative (refer to Vol. 4, Chapter 9, pp. 9-95 and 9-96). Regarding the suggestion to invest in conservation, refer to Tables 14.2-2, 14.2-3, and 14.2-4 (Vol. 7, Chapter 14, Section 14.2), which identify the measures the SFPUC is currently implementing and planning to implement under the WSIP. As the comment does not specify the particular issue(s) for which the commenter believes the demand and conservation studies are flawed or inaccurate, no additional response is provided.

SI_CRS-06 The recommendation from the Center for Resource Solutions—that the SFPUC adopt a policy of reducing diversions from the Tuolumne River over time—is acknowledged. The Draft PEIR describes existing SFPUC water resources policies related to the WSIP in Table 2.3 (Vol. 1, Chapter 2, pp. 2-45 to 2-46).

SI_CRS-07 This comment requests that a comprehensive watershed study be conducted to adequately assess the environmental impacts of the WSIP. Please refer to **Response SI_Caltrout-01** for response.

SI_CRS-08 This comment, which expresses support for the Aggressive Conservation/Water Recycling and Local Groundwater Alternative (No Supplemental Tuolumne River Water) and the Year-round Desalination at Oceanside Alternative, is acknowledged.

Central Sierra Environmental Resource Center, Brenda Whited, Staff Biology, 09/10/07

SI_CSERC-01 This comment, which supports the views of the Tuolumne River Trust regarding the WSIP, is noted.

SI_CSERC-02 This comment, which expresses support for the Aggressive Conservation/Water Recycling and Local Groundwater Alternative and for the implementation of additional conservation measures to offset the need for additional Tuolumne River diversions, is noted. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional response related to conservation programs and recycling projects proposed by the SFPUC and its wholesale customers.

Clean Water Action, Jennifer Clary, Water Policy Analyst, 10/01/07

SI_CWA1-01 The commenter states, albeit incorrectly, that the Stage 2 Disinfectants and Disinfection Byproducts Rule (DBP Rule) is neither mentioned nor analyzed in the Draft PEIR, and indicates that a justification for not including it should be provided. Chapter 2 of the Draft PEIR (Vol. 1, p. 2-32) lists the Stage 2 DBP Rule as one of the major federal drinking water regulations that would apply to the WSIP. As described in the Draft PEIR (Vol. 1, Chapter 3, pp. 3-26 and 3-27), the WSIP proposes a change in treatment processes so that the Hetch Hetchy water supply will meet the *Cryptosporidium* inactivation requirement stipulated in the U.S. EPA's Long Term 2 Enhanced Surface Water Treatment Rule. However, because the SFPUC implements chloramination of its water supply, no treatment changes would be required to achieve compliance with the U.S. EPA's Stage 2 DBP Rule. Since chloramination of the regional water supply began in February 2004, the average levels of the regulated total trihalomethanes and five haloacetic acids (as measured at compliance monitoring locations in San Francisco and throughout the transmission system) have been less than 50 percent of the corresponding maximum contaminant levels. The existing and ongoing chloramination treatment has substantially improved the SFPUC's ability to comply with the Stage 2 DBP Rule; therefore, the WSIP does not propose any further treatment processes or facilities to comply with this rule.

SI_CWA1-02 The commenter is correct in noting that the increased water demand by 2030 associated with the WSIP would result in increased water usage, which would in turn likely result in increased wastewater discharges. Changes in wastewater discharges into receiving waters in the SFPUC service area would be an indirect effect associated with implementation of the WSIP, since increases in water supply usage are directly correlated to increases in wastewater discharges. Insofar as the WSIP would result in changes in municipal and domestic water use patterns, there could be associated changes in wastewater discharge patterns for municipal and industrial uses. The Draft PEIR addresses the indirect effects of growth in Chapter 7 (Vol. 4, pp. 7-60 to 7-78); as the analysis indicates, these effects—including impacts on wastewater treatment facilities and wastewater treatment capacities—have been identified as significant but mitigable in the environmental impact reports prepared on the general and specific plans within the SFPUC service area. The analysis of impacts associated with increased wastewater discharges, if any, including potential increases in pollutant loading to San Francisco Bay, would be covered as part of the CEQA review of any changes to individual wastewater treatment and disposal facilities in the regional service area, if needed, although it is likely that minor, incremental increases in wastewater discharges may already be covered by existing environmental documentation.

Clean Water Action, Jennifer Clary, Water Policy Analyst, 09/20/07

[See Public Hearing Transcript, San Francisco City Hall, September 20, 2007, pp. 20–23]

SI_CWA2-01 This comment requests that the PEIR evaluate the impacts of climate change as a result of the WSIP in greater detail. Please refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14) for additional discussion of climate change to augment the discussion presented in Section 5.7.6 of the Draft PEIR (Vol. 3, Chapter 5, pp. 5.7-92 to 5.7-96). Section 4.11 provides more detailed and up-to-date information on climate change as it relates to the SFPUC regional water supply and the proposed WSIP.

District 3 Democratic Club, Tony Gantner, President, 09/20/07

SI_D3Dem1-01 The potential environmental impacts of the additional diversions from the Tuolumne River proposed under the WSIP are presented in the Draft PEIR in Vol. 3, Chapter 5, Sections 5.1 through 5.5. As this comment does not specify the particular issue(s) for which the commenter believes the Draft PEIR analysis is inadequate, no additional response is provided.

SI_D3Dem1-02 This comment expresses the opinion that increases in future water demand due to population growth could be offset by additional conservation and recycling. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional response related to conservation programs and recycling projects proposed by the SFPUC and its wholesale customers.

District 3 Democratic Club, Tony Ganter, President, 09/20/07

[See Public Hearing Transcript, San Francisco City Hall, September 20, 2007, pp. 12–13]

SI_D3Dem2-01 This comment opposing additional Tuolumne River diversions is noted.

SI_D3Dem2-02 The comment expresses the opinion that the Draft PEIR does not properly identify or address the impacts of taking more water from the Tuolumne River. The Draft PEIR identifies and addresses the impacts of taking more water from the Tuolumne River as required by CEQA (Vol. 3, Chapter 5, Sections 5.3.1 through 5.3.9). The projections of future water demand that would be satisfied by increased water diversions from the Tuolumne River, increased water conservation and recycling, and increased use of local groundwater are provided in the Draft PEIR (Vol. 1, Chapter 3, pp. 3-16 to 3-21). As the commenter accurately notes, the increased water demand is due to customers outside of the city of San Francisco.

SI_D3Dem2-03 This comment expresses the opinion that increases in future water demand due to population growth could be offset by additional conservation and recycling. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional response related to conservation programs and recycling projects proposed by the SFPUC and its wholesale customers.

Ecology Center,
Martin Bourque, Executive Director, 10/03/07

SI_EcoCtr-01 This comment requesting that the SFPUC undertake additional studies prior to finalizing the PEIR is acknowledged. Please refer to **Response SI_Caltrout-01** for response.

SI_EcoCtr-02 This comment expresses support for the Aggressive Conservation/Water Recycling and Local Groundwater Alternative (No Supplemental Tuolumne River Water) and the Year-round Desalination at Oceanside Alternative, and promotes greater conservation, efficiency, and recycling to prevent additional Tuolumne River diversions. Comment noted. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional response related to conservation programs and recycling projects proposed by the SFPUC and its wholesale customers.

Environmental Defense,
Spreck Rosekrans, Senior Analyst, 10/01/07

SI_EnvDef-01 This comment, which summarizes the WSIP goals and expresses support for the facility improvement projects necessary to repair existing infrastructure and protect the regional water system from seismic events and other disasters, is acknowledged.

SI_EnvDef-02 This recommendation to pursue a two-tiered approach that separates the seismic improvements from the proposed changes in water supply sources is acknowledged. Please refer to **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Section 14.1.5) regarding the integration of the seismic improvements and water supply options to meet program objectives and for a discussion of the advantages of using a program EIR to evaluate the proposed program as a whole.

SI_EnvDef-03 This comment incorrectly states that the alternatives considered in the Draft PEIR include up to 35 million gallons per day (mgd) in increased diversions from the lower Tuolumne River. Under the proposed program, 35 mgd represents the increase in purchase requests from the SFPUC regional system that are projected to occur by 2030 compared to the purchase requests under existing conditions (2005). Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.9) for an explanation of the difference between the average annual increase in purchase requests and the average annual increase in Tuolumne River diversions. Table 9.5 (Vol. 4, Chapter 9, p. 9-13) presents the average annual increase in Tuolumne River diversions under each of the CEQA alternatives evaluated in the Draft PEIR, and an updated table showing average annual Tuolumne River diversions under the Modified WSIP Alternative is included in **Section 14.10, Master Response on Modified WSIP Alternative** (Vol. 7, Chapter 14, Table 14.10-1). The commenter's opinion that it is time to put water back into California's rivers rather than take more water out is acknowledged.

The commenter notes that the proportion of unimpaired flow diverted collectively by the SFPUC, Turlock Irrigation District (TID), and Modesto Irrigation District (MID) in dry and critically dry years is greater than it is in average years. The information cited by the commenter is generally consistent with assumptions used in the preparation of the Draft PEIR.

SI_EnvDef-04 This comment indicates that the commenter agrees with the conclusions in the Draft PEIR—that the environmental effects of the WSIP on Chinook salmon in the lower Tuolumne River are potentially significant. However, as indicated in the Draft PEIR (Volume 3, Chapter 5, Sections 5.1 through 5.5), all potentially significant impacts on resources in the lower Tuolumne River could be reduced to a less-than-significant level with implementation of mitigation measures prescribed in the PEIR. Mitigation measures developed for the purpose of offsetting the effects of the WSIP on the lower Tuolumne River include either Measure 5.3.6-4a (Vol. 4, Chapter 6, p. 6-48) or Measure 5.3.6-4b (pp. 6-48 and 6-49) for impacts on fisheries, and either Measure 5.3.6-4a or Measure 5.3.7-6 (pp. 6-50 and 6-51) for impacts on biological resources. Please refer to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Sections 4.7.8 and 4.7.9) for supplementary information on Chinook salmon along this reach of the river, and for additional discussion of Measures 5.3.6-4a and 5.3.6-4b, including text revisions to Measure 5.3.6-4b that add further definition to the habitat enhancement effort.

SI_EnvDef-05 This comment, which expresses concern about impacts on the San Joaquin River and the Bay-Delta estuary due to the WSIP, is acknowledged. Please refer to **Section 14.8, Master Response on Delta and San Joaquin River Issues** (Vol. 7, Chapter 14, Section 14.8.3) for a review and update of the Draft PEIR analysis of these issues.

SI_EnvDef-06 This comment, which expresses the opinion that it is time to reverse the trend of increased development of water supplies in the Bay-Delta and Central Valley watersheds and leave more water in these rivers, is acknowledged. Since this comment does not address the adequacy or accuracy of the Draft PEIR, no further response is necessary.

SI_EnvDef-07 This comment, which supports opportunities for agricultural conservation along the lower Tuolumne River as a way to offset incremental increases in Tuolumne River diversions while providing water supplies for the Bay Area, is acknowledged. Please refer to **Section 14.10, Master Response on Modified WSIP Alternative** (Vol. 7, Chapter 14, Section 14.10.3) for a discussion of agricultural water conservation in the services areas of TID, MID, and/or another water agency as a means of securing water for the conserved water transfer to the SFPUC.

SI_EnvDef-08 This comment expressing support for the Lower Tuolumne River Diversion Alternative is acknowledged. As indicated in the Draft PEIR (Vol. 4, Chapter 9, Table 9.5, p. 9-13), the average annual increase in Tuolumne River diversions under this alternative would be the same as under the proposed program.

SI_EnvDef-09 This comment, which suggests that the SFPUC install the physical capacity and secure the appropriate institutional agreements to access Delta supplies as backup in case Tuolumne supplies are not available, is acknowledged. The alternatives analysis section of the Draft PEIR provides a discussion of Delta diversions, including a potential connection to the California Aqueduct or Delta-Mendota Canal, as part of rejected strategies/concepts that affect water supply sources (Vol. 4, Chapter 9, pp. 9-125 and 9-126). This concept was eliminated from further consideration due to uncertainties regarding the availability of water supplies and pumping capacities.

SI_EnvDef-10 This comment expresses support for aggressive urban water conservation programs and recommends that the discussion of urban conservation potential be continued throughout the development of future water supplies. Refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) and **Section 14.10, Master Response on Modified WSIP Alternative** (Vol. 7, Chapter 14, Section 14.10.3) for additional response related to conservation programs and recycling projects proposed by the SFPUC and its wholesale customers.

SI_EnvDef-11 This comment supporting the use of groundwater as supplemental drought-year supplies is noted.

SI_EnvDef-12 This comment supports the continued consideration of the Year-round Desalination at Oceanside Alternative and Regional Desalination for Drought Alternative (same as WSIP Variant 2), but cautions that a desalination project must address entrainment issues and must either include a plan to provide energy through renewable resources or implement full mitigation for emissions incurred by its energy use. These issues are addressed in the environmental analysis of these alternatives in Draft PEIR Sections 9.2.6 and 9.2.7 (Vol. 4, Chapter 4, pp. 9-66 to 9-78).

SI_EnvDef-13 This comment, which supports implementation of the Calaveras Dam Replacement project (SV-2) to restore the design capacity of Calaveras Reservoir (96,800 acre-feet), is acknowledged.

SI_EnvDef-14 The commenter's support of steelhead restoration in Alameda Creek and removal of the Alameda Creek Diversion Dam is acknowledged. Please refer to **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14) for further discussion of steelhead in Alameda Creek.

SI_EnvDef-15 Please refer to **Response SI_EnvDef-07**, above.

SI_EnvDef-16 This comment supports opportunities for both agricultural and urban conservation and expresses Environmental Defense's interest in the restoration of Hetch Hetchy Valley and the protection of the Tuolumne River between Hetch Hetchy and Don Pedro Reservoirs. This comment is acknowledged. Refer to **Section 14.10, Master Response on Modified WSIP Alternative** (Vol. 7, Chapter 14, Section 14.10.3) for additional information related to agricultural conservation along the lower Tuolumne River. Refer to

Section 14.6, Master Response on Upper Tuolumne River Issues (Vol. 7, Chapter 14) for further discussion of the Tuolumne River between Hetch Hetchy and Don Pedro Reservoirs.

SI_EnvDef-17 In this comment, Environmental Defense expands on one of the themes contained in the Bay Area Water Supply and Conservation Agency's (BAWSCA) comments on the Draft PEIR related to the Modified WSIP Alternative, and expresses support for opportunities for BAWSCA member agencies to invest in water efficiency initiatives in the agricultural areas adjacent to the Tuolumne River itself. Please refer to **Section 14.10, Master Response on Modified WSIP Alternative** (Vol. 7, Chapter 14) for relevant discussion.

Greenpeace, Krikor Didonian, 09/22/07

SI_GreenP-01 Please refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.5) and **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.6) for clarification regarding current and estimated future municipal and agricultural diversions from the Tuolumne River. The commenter's opinion with respect to increased diversions is noted. Also refer to **Section 14.8, Master Response on Delta and San Joaquin River Issues** (Vol. 7, Chapter 14) for additional information.

SI_GreenP-02 This comment, which states that the demand modeling in the Draft PEIR is flawed and inflates projected future needs, has been submitted by numerous commenters; please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2).

SI_GreenP-03 This comment asserts that the PEIR fails to properly identify and address all of the impacts of taking more water from the Tuolumne River due to lack of adequate baseline data. Please refer to **Response SI_Caltrout-01** for a response to this comment.

SI_GreenP-04 Please refer to the discussion presented in Section 5.7.6 of the Draft PEIR (Vol. 3, Chapter 5, pp. 5.7-92 to 5.7-96) and **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14) for additional discussion of climate change effects on the regional water system. Section 14.11 provides detailed and up-to-date information on climate change as it relates to the SFPUC regional water supply and the proposed WSIP.

SI_GreenP-05 This comment promotes conservation, efficiency, and recycling as the best way to provide for the water needs of the Bay Area in a sustainable manner. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling water projects proposed by the SFPUC and its wholesale customers.

Golden West Women Flyfishers, Cindy Charles, Conservation Chair, 09/29/07

SI_GWWF1-01 This comment opposing any additional Tuolumne River diversions is acknowledged.

SI_GWWF1-02 This comment expresses concerns related to the effects of additional Tuolumne River diversions on restoration efforts aimed at protecting fall-run Chinook salmon and Central Valley steelhead below La Grange Dam. As described in the Draft PEIR, the San Francisco Planning Department determined that long-term WSIP-induced flow changes in the Tuolumne River below La Grange Dam could have a significant adverse effect on anadromous fish, including fall-run Chinook salmon, along this reach of river (Vol. 3, Chapter 5, pp. 5.3.6-28 to 5.3.6-32). Regarding potential impacts on steelhead below La Grange Dam, the Draft PEIR provides setting information and a discussion on the presence of steelhead within the Tuolumne River (Vol. 3, Chapter 5, pp. 5.3.6-1 to 5.3.6-24). However, the data on habitat conditions within the lower Tuolumne River indicate that this reach of the river is unsuitable for significant populations of steelhead due to high temperatures during the summer months. Please refer to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.3) for additional information.

The Draft PEIR acknowledged that the WSIP's small but incremental contribution to adverse effects on the lower river would make planned restoration of habitat and fishery resources more difficult. As a result, the impact of the WSIP on these fishery resources in the lower Tuolumne River was determined to be potentially significant. Implementation of Mitigation Measures 5.3.6-4a, Avoidance of Flow Changes by Reducing Demand for Don Pedro Reservoir Water, or 5.3.6-4b, Fishery Habitat Enhancement, would reduce these impacts to a less-than-significant level (Vol. 4, Chapter 6, pp. 6-48 and 6-49). Please refer to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Sections 14.7.2, 14.7.8, and 14.7.9) for supplementary information on the presence of Chinook salmon along this reach of the lower river, and additional discussion on Mitigation Measures 5.3.6-4a and 5.3.6-4b, including text revisions to Measure 5.3.6-4b that add further definition to the habitat enhancement effort.

Golden West Women Flyfishers, Cindy Charles, Chairperson, 09/20/07

[See Public Hearing Transcript, San Francisco City Hall, September 20, 2007, pp. 14–15]

SI_GWWF2-01 The range of current urban and rural diversions from the Tuolumne River presented in this comment is inaccurate. Please refer to **Section 14.6, Master Response on Upper Tuolumne Issues** (Vol. 7, Chapter 14, Section 14.6.5) and **Section 4.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.6) for clarification regarding current and estimated future municipal and agricultural diversions from the Tuolumne River.

SI_GWWF2-02 This comment expresses concerns related to the effects of the WSIP facility improvement projects and changes in water supply and system operations on restoration efforts aimed at improving steelhead passage in the Alameda Creek watershed. Please refer to **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14, Section 14.9.4 and 14.9.5), for discussion of protective measures for steelhead in Alameda Creek.

Klamath-Siskiyou Wildlands Center, Joseph Vaile, Campaign Director, 09/27/07

SI_KSWC-01 This comment requesting that additional studies of the Tuolumne River be conducted before the PEIR is finalized, is acknowledged. Please refer to **Response SI_Caltrout-01** for a response to this comment.

SI_KSWC-02 This comment expresses support for the CEQA alternatives that do not include additional Tuolumne River diversions and promotes additional conservation, efficiency, and recycling to prevent the need for additional Tuolumne River diversions. Comment noted. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects proposed by the SFPUC and its wholesale customers.

Menlo Business Park LLC (on behalf of DLA Piper US LLP), J. Wesley Skow, Attorney, 12/12/2007

SI_MenloBP-01 This is an opening statement regarding the detailed comments submitted by DLA Piper on behalf of Menlo Business Park LLC presented in Comments SI_MenloBP-02 through SI_MenloBP-09; refer to **Responses SI_MenloBP-02** through **SI_MenloBP-09** for the specific responses.

SI_MenloBP-02 The commenter notes that easements located adjacent to the Menlo Business Park were purchased from the City and County of San Francisco (CCSF). The commenter is concerned with parking, access, and landscaping within the easements during construction of the Bay Division Pipeline (BDPL) Reliability Upgrade project (BD-1). Please refer to **Section 14.4**, **Master Response on PEIR Appropriate Level of Analysis** (Vo1. 7, Chapter 14, Section 14.4.2) for detailed discussion of the issues raised by this comment. The master response provides information on the appropriate level of detail of an impact analysis at the program level versus the project level. The project-level EIR for this project will analyze the impacts of construction in more detail based on the most up-to-date design details and will identify additional mitigation measures for significant impacts if needed.

SI_MenloBP-03 The commenter summarizes more detailed comments presented under Comments SI_MenloBP-04 through SI_MenloBP-08; refer to **Responses SI_MenloBP-04** though **SI_MenloBP-08** for the specific responses. Please also refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.2) for information on the appropriate level of detail of an impact analysis at the program level versus the project level.

SI_MenloBP-04 The commenter acknowledges that the Draft PEIR appropriately considers impacts associated with construction under the BDPL Reliability Upgrade project (BD-1). However, the commenter raises concerns regarding the impacts of open-trench construction on access to driveways and streets as well as to buildings within the Menlo Business Park. In the Draft PEIR, Impact 4.8-3 (Vol. 2, Chapter 4, p. 4.8-23) acknowledges that access to local businesses could be disrupted during construction of this project. As part of the project's traffic control plan, Mitigation Measure 4.8-1a (Vol. 4, Chapter 6, p. 6-31) will require coordination with facility owners or administrators of sensitive land uses such as police, fire, etc. (see bullet item #14) and will require that pedestrian access be maintained during project construction where it is safe to do so (see bullet item #9). As indicated in **Response SI_MenloBP-02**, the project-level EIR for this project will analyze these construction-related access impacts in more detail based on the most up-to-date design details and will identify additional mitigation measures for significant impacts. Please also refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.2) for information on the appropriate level of detail of an impact analysis at the program level versus the project level.

SI_MenloBP-05 The commenter requests that the project-level EIR for the BDPL Reliability Upgrade project (BD-1) include an assessment of construction impacts at the Menlo Business Park, which utilizes easements on SFPUC land for parking and for ingress and egress to the business park. The commenter is correct in stating that the localized impacts of project construction are more appropriately addressed in the project-level EIR. As indicated in **Response SI_MenloBP-02**, the project-level EIR for this project will analyze the localized impacts of construction in more detail. Please also refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.2) for information on the appropriate level of detail of an impact analysis at the program level versus the project level.

SI_MenloBP-06 The commenter raises concerns regarding construction impacts within portions of the SFPUC right-of-way currently used for parking by Menlo Business Park tenants and customers. Draft PEIR Impact 4.8-4 (Vol. 2, Chapter 4, p. 4.8-26) acknowledges that on-street parking would be temporarily displaced at some locations during construction of the BDPL Reliability Upgrade project (BD-1). The Draft PEIR indicates that temporary parking impacts would be mitigated to a less-than-significant level through implementation of SFPUC Construction Measure #5 (Vol. 4, Chapter 6, p. 6-5), which requires preparation of a traffic control plan, and through the additional traffic control measures identified in Mitigation Measure 4.8-1a (Vol. 4, Chapter 6, p. 6-30). The project-level EIR for the BDPL Reliability Upgrade project will analyze the localized construction-related impacts in more detail, including temporary effects on parking capacity and access to adjacent land uses, and will identify additional mitigation measures for significant impacts.

SI_MenloBP-07 The commenter identifies concerns related to the displacement of parking within the SFPUC right-of-way currently used by tenants and customers of the Menlo Business Park, and requests that the project-level EIR for the BDPL Reliability Upgrade project (BD-1) include coordination with the Menlo Business Park and individual business owners. Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.3) for additional discussion of the issues raised by this comment. Requested coordination of the BDPL Reliability Upgrade project with the Menlo Business Park to minimize parking impacts has been added to Table C.6 (Vol. 5, Appendix C, p. C-26) for consideration in the project-level EIR for this project.

SI_MenloBP-08 The commenter is concerned with the timeline of post-construction restoration along CCSF easements in the vicinity of the Menlo Business Park following implementation of the BDPL Reliability Upgrade project (BD-1). As required by SFPUC Construction Measure #10 (Project Site), in cases where construction easements or staging areas are located on non-SFPUC land, the SFPUC will restore these areas to their prior condition so that the owner may return them to their previous use, unless otherwise arranged with the property owner. At the time of Draft PEIR preparation, detailed information related to the construction of individual facility projects was not available. The project-level CEQA document for the BDPL Reliability Upgrade project will provide a more detailed analysis of the potential impacts of construction activities on surrounding land uses.

SI_MenloBP-09 This is a closing statement. No response is needed.

Northern California/Nevada Council of the Federation of Fly Fishers Steelhead Committee, Dougald Scott, Chair, 09/23/07

SI_NCFFSC-01 The commenter states that under the WSIP the SFPUC would divert an additional 25 million gallons per day (mgd) from the Tuolumne River. The Draft PEIR indicates that the WSIP proposes to meet an increase in average annual purchase requests of 25 mgd and to divert an additional annual average of 27 mgd from the Tuolumne River to meet the requests. For clarification, please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.9).

The Draft PEIR describes the decline of the Chinook salmon population in the Tuolumne River (Vol. 3, Chapter 5, pp. 5.3.6-13 to 5.3.5-17). The most recent data (not included in the Draft PEIR) show the decline continuing, with very low numbers of salmon returning to spawn in the Tuolumne River in 2005 and 2006.

As the commenter notes, the San Francisco Planning Department concluded that WSIP-caused changes in river flow would have a potentially significant adverse effect on anadromous fish in the Tuolumne River below La Grange Dam (Vol. 3, Chapter 5, pp. 5.3.6-28 to 5.3.6-32). In reaching this conclusion, the Planning Department considered both Chinook salmon and steelhead. However, implementation of Mitigation Measure 5.3.6-4a, Avoidance of Flow Changes by Reducing Demand for Don Pedro Reservoir Water, or Mitigation Measure 5.3.6-4b, Fishery Habitat Enhancement (Vol. 4, Chapter 6, pp. 6-48 and 6-49) would reduce these impacts to a less-than-significant level. One of the mitigation measures, Measure 5.3.6-4a, would greatly reduce the effects of the WSIP on flow in the Tuolumne River below La Grange Dam.

SI_NCFFSC-02 As the commenter notes, the WSIP would reduce flow in the San Joaquin River and the Delta. The San Francisco Planning Department concluded that the WSIP could potentially affect fish and fish habitat in the San Joaquin River, but that the impact would be less than significant (Vol. 3, Chapter 5, pp. 5.3.6-32 and 5.3.6-33). This determination was made because WSIP-caused flow reductions and increased water temperatures would only be of sufficient magnitude to adversely affect fish habitat conditions in the San Joaquin River very infrequently. Because the Planning Department concluded that WSIP-caused changes in river flow would have a potentially significant adverse effect on anadromous fish in the Tuolumne River below La Grange Dam, the Draft PEIR includes mitigation measures that would reduce the impacts a less-than-significant level (Measures 5.3.6-4a and 5.3.6-4b, Vol. 4, Chapter 6, pp. 6-48 and 6-49). Measure 5.3.6-4a, which was designed to reduce the effects of the WSIP on flow in the Tuolumne River below La Grange Dam, would also reduce the effects of the WSIP on flow in the San Joaquin River and the Delta.

The State Water Resources Control Board has promulgated water quality and flow objectives for the Delta designed to protect anadromous fish. The California Department of Water Resources (DWR) and the U.S. Bureau of Reclamation (USBR), the largest water diverters from the Delta, are responsible for maintaining compliance with the objectives for the Delta. Most of the time the changes in flow resulting from the WSIP would be too small to have any effect on the ability of the DWR and USBR to meet the Delta objectives. Occasionally, after a long sequence of dry years, the WSIP could change flows in the San Joaquin River at Vernalis and in the Delta by an amount that could affect the two agencies' ability to meet Delta objectives. During such times, the DWR and USBR would have to curtail diversions or release water from their reservoirs to meet the Delta objectives. For this reason, it was concluded that the flow changes associated with WSIP would have no effect on Delta fisheries. For additional information on the DWR and USBR obligations with respect to Delta standards, please refer to the Draft PEIR (Vol. 3, Chapter 5, Section 5.3.4) and **Section 14.8, Master Response on Delta and San Joaquin River Issues** (Vol. 7, Chapter 14, Section 14.8.2).

In recent years, it has become apparent that the water quality and flow objectives for the Delta are insufficient to protect all fish species. Delta smelt, an endangered species, has been in decline for many years. Many biologists attribute its decline to the large-scale diversion of water from the Delta by the State Water Project and Central Valley Project. A 2000 Record of Decision for the CALFED EIR/EIS established an Environmental Water Account that enables pumping curtailments at times when delta smelt are present in the vicinity of the pumps without a loss of water to the DWR's and USBR's contractors. Despite the creation and operation of the Environmental Water Account, the decline of delta smelt has continued. In December 2007, the Wanger Decision rejected a federal biological opinion with respect to delta smelt, a judgement that led to further curtailments of pumping by the State Water Project and Central Valley Project.

The Wanger Decision has accelerated efforts to find ways to better balance the need for water supply, flood reduction, and environmental protection in the Delta. The next decade is likely to see changes in physical facilities in the Delta, water management system operations, and environmental regulations. Whatever the future changes in facilities, operations, and regulations, it is not expected that the WSIP would have a substantial effect on environmental quality in the Delta. This is because the increment in diversion of water associated with the WSIP represents a small proportion of all water diverted upstream of the Delta.

SI_NCFFSC-03 This commenter's suggestion (to modify the minimum flow schedule set forth in the 1997 California Department of Fish and Game Memorandum of Understanding for Alameda Creek below the confluence of Alameda and Calaveras Creeks) is acknowledged. The commenter's support for minimum flows for Alameda Creek below the diversion dam is acknowledged.

Please refer to **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14, Section 14.9.4) for more information on this topic.

SI_NCFFSC-04 The commenter states that the WSIP and Draft PEIR do not adequately address strategies and conservation measures to replace increased diversions from the Tuolumne River. The Draft PEIR examined several WSIP variants and CEQA alternatives that would reduce diversions from the Tuolumne River compared to the WSIP (Vol. 4, Chapters 9 and 10). Several of the CEQA alternatives propose conservation measures that go beyond those included in the WSIP. The WSIP variants and CEQA alternatives include Variant 2, Regional Desalination for Drought, the No Program Alternative, the No Purchase Request Increase Alternative, the Aggressive Conservation/Water Recycling and Local Groundwater Alternative, the Year-round Desalination at Oceanside Alternative, and the Modified WSIP Alternative. Also, please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter14, Section 14.2). In addition, see **Section 13.4, Phased WSIP Variant**, for updated strategies to augment conservation and water recycling and to reduce effects on the Tuolumne River.

The commenter's reference to a 25-mgd increase in diversions from the Tuolumne River is incorrect. Please refer to **Response SI_NCFFSC-01**, above.

Pacific Institute
Dr. Peter H. Gleick, President, 10/1/2007

Introduction

The report presented as part of this submittal (beginning at Comment SI_PaciInst-25) was prepared in August 2006, before the WSIP Draft PEIR was published. References to information on the SFPUC service area apparently are largely based on material provided as background information for the Sustainable Water Supply Briefing held on September 28, 2006. The Sustainable Water Supply Briefing document (SFPUC, 2006a) is on file and available for review at the offices of the San Francisco Planning Department, Major Environmental Analysis Division. At the request of the participating groups, the SFPUC provided technical background information using its demand models. That information is not derived from the Draft PEIR but is consistent with it (and the underlying data used in the demand models is the same).

The responses presented below include information provided by the SFPUC's technical consultant Mr. Bill Maddaus. Mr. Maddaus has expertise in the development and evaluation of water demand projections and conservation programs; he assisted the SFPUC and Bay Area Water Supply and Conservation Agency (BAWSCA) in the development of the wholesale customer demand projections and conservation assessment conducted as part of the planning effort used to develop the WSIP.[1] Mr. Maddaus reviewed the Pacific Institute comment letter and provided information to assist in addressing questions about how water conservation potential in the SFPUC service area was evaluated and incorporated into the WSIP (Maddaus, 2008). Maddaus Water Management modeled demand and conservation potential in the wholesale customer service area using the Demand Side Management Least-Cost Planning Decision Support System (DSS) end-use model. In the following responses, Mr. Maddaus is referred to as the SFPUC's DSS technical consultant.

Many of the comments in this submittal were also submitted by other commenters and are addressed in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14); more detailed and specific comments that concern the same issues but are unique to this submittal are addressed in the individual responses below. The comments addressed herein largely critique the SFPUC's demand projections as too high and the conclusions regarding conservation and recycled water potential as too low. As discussed in the responses below, and in Section 14.2, the SFPUC and its technical consultants relied on reasonable assumptions and used accepted methodologies to forecast demand as well as conservation and recycled water potential within the service area, and the Draft PEIR reflects the City and County of San Francisco's (CCSF) best efforts at analysis and disclosure. Even if the SFPUC overestimated demand and underestimated conservation and recycled water potential, the likely effect would be a reduction in the use of water from the Tuolumne River and local

1 The *SFPUC Wholesale Customer Water Demand Projections Technical Report* prepared by URS Corporation and Maddaus Water Management, 2004 (URS, 2004a) and the *SFPUC Wholesale Customer Water Conservation Potential Technical Report* prepared by URS Corporation, Maddaus Water Management, and Jordan Jones and Goulding, 2004 (URS, 2004b).

watersheds, which could result in a reduction in impacts on those watersheds. Also, to the extent that the SFPUC has overestimated demand based on growth projections, the PEIR may overestimate the impacts associated with induced growth. The comments regarding the accuracy of conservation and recycled water potential may be taken into account by decision-makers in evaluating the feasibility of alternatives, but do not indicate that the PEIR underestimated the impacts of the WSIP.

SI_PacInst-01 This comment questioning the need for additional water supplies is prefatory to more detailed comments that follow; please refer to **Responses SI_PacInst-03** through **SI_PacInst-97** and to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14) and other master responses as indicated. In addition, the Draft PEIR (Vol. 1, Chapter 3, pp. 3-16 to 3-22, and Vol. 5, Appendix E.2) describes the methodology used to develop demand projections and determine the portion of that demand that would be offset by conservation savings and the use of recycled water, groundwater, and other surface supplies. The demand projections and estimates of 2030 purchases necessarily entail the use of assumptions about factors that cannot be known or predicted with absolute certainty. With respect to forecasting, CEQA Guidelines Section 15144 states the following:

> Drafting an EIR or preparing a Negative Declaration necessarily involves some degree of forecasting. While foreseeing the unforeseeable is not possible, an agency must use its best efforts to find out and disclose all that it reasonably can.

The analysis in the Draft PEIR is consistent with CEQA Guidelines Section 15144. In addition to describing in detail the demand methodology (Vol. 5, Appendix E.2), the Draft PEIR presents a detailed review and comparison of the demographic projections used in the demand models with more recent projections (Vol. 4, Chapter 7, p. 7-22 and Vol. 5, Appendix E.3) and represents the CCSF's best efforts at disclosure. The PEIR does not need to accurately predict future growth and demand but rather to inform the public and decision-makers about how the alternative programs would perform in the future under consistent reasonable growth and demand assumptions in order to allow for an informed choice of program and implementation of mitigation measures. The evaluation of demand model forecasts contained in the PEIR represents the CCSF's best efforts and allows for informed consideration of the program, alternatives, and impacts.

Note also that the Draft PEIR includes an alternative that evaluates the implementation of aggressive conservation and recycling to enable the public and decision-makers to weigh the relative merits of such an alternative and the proposed program with respect to their feasibility in meeting program objectives and minimizing environmental impacts. (Refer to Draft PEIR Vol. 5, Chapter 9, pp. 9-47 to 9-59.)

SI_PacInst-02 This comment summarizes Pacific Institute's conclusions regarding its review of the SFPUC's demand projections and is a preamble to the comments that follow. Please refer to **Responses SI_PacInst-03** through **SI_PacInst-97**, **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14), and other master responses as indicated.

SI_PacInst-03 This comment incorrectly states that per-capita demand for the wholesale customers is projected to increase over current (2001) per-capita demand. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2, under the heading Per-Capita Demand).

SI_PacInst-04 This comment states that SFPUC retail and wholesale demand does not include price-driven efficiency improvements despite an estimated quadrupling of the price of water from the SFPUC by 2015. By efficiency improvements the commenter presumably refers to implementation of conservation measures that allow the achievement of given purposes using less water. Such measures may be technological, such as replacement of water-using appliances and fixtures with ones that use less water, or behavioral, such as changing a watering schedule to minimize water losses due to evaporation and transpiration.[2] In fact, contrary to this comment, the conservation potential studies for both the wholesale and retail service areas considered the future price of water. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2, under the heading Effects of Future Price on Water Demand). With respect to other comments on the use of water rates to encourage conservation and comparisons with studies on the effectiveness of conservation pricing raised in Comments SI_PacInst-46 and SI_PacInst-47, see **Responses SI_PacInst-46** and **SI_PacInst-47**, below.

SI_PacInst-05 This comment states that increased residential demand is largely due to outdoor water use and that the projected increase in per-capita outdoor use indicates that conservation does not adequately address outdoor residential use. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling**, (Vol. 7, Chapter 14, Section 14.2.2, under the heading Outdoor Water Use).

SI_PacInst-06 This comment, which correctly states that the nonresidential sector is responsible for over 80 percent of the projected 2030 demand increase and that 35 percent of that increase is due to outdoor use, is noted. Also refer to **Section 14.2, Master**

[2] This description of the term is consistent with the discussion of conservation and efficiency in the Pacific Institute's *Waste Not, Want Not: The Potential for Urban Water Conservation in California*, cited frequently in the SI_PacInst comments.

Response on Demand Projections, Conservation, and Recycling (Vol. 7, Chapter 14, Section 14.2.2, under the heading Outdoor Water Use) for additional information on this topic.

SI_PacInst-07 This comment, which summarizes more detailed comments made in Comment SI_PacInst-79, is addressed in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2, under the heading Use of Total Jobs Projections for the Wholesale Customer Service Area).

SI_PacInst-08 This comment, which summarizes more detailed comments made in Comments SI_PacInst-76 and SI_PacInst-77, is addressed in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2, under the heading Employment Projections – Use of ABAG's *Projections 2002*).

SI_PacInst-09 This comment correctly states that conservation measures (not including plumbing code savings) reduce 2030 demand by 4 percent. Refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3, under the heading Frequently Submitted Comments Regarding Conservation and Recycling) regarding the studies that were undertaken to identify conservation potential, the conservation measures the SFPUC and wholesale customers are implementing or have committed to implement under the WSIP, and response regarding comparisons to other areas. Also refer to the comparison of hydrologic regions within the state in Section 14.2.3 (also under the heading Frequently Submitted Comments), which indicates that the San Francisco Bay hydrologic region has low per-capita water usage compared to other regions in the state.

SI_PacInst-10 This comment summarizes more detailed comments presented in Comments SI_PacInst-81 and SI_PacInst-82; refer to **Responses SI_PacInst-81** and **SI_PacInst-82**.

SI_PacInst-11 This comment is a preamble to recommendations made in Comments SI_PacInst-12 through SI_PacInst-24; refer to **Response SI_ PacInst-12** through **Response SI_PacInst-24**.

SI_PacInst-12 This comment states that the SFPUC should reevaluate nonresidential demand for its wholesale customers using industry-specific growth projections, water use, and conservation potential; that the initial reevaluation efforts should be regional in scope or focused on the agencies with high non-residential use; and that if the results of this effort differ from the DSS demand study, new detailed analyses should be conducted for each wholesale customer. The DSS technical consultant retained by the SFPUC to model future demand in the wholesale customer service area indicates that, in his professional judgment, it is unlikely that regional nonresidential water demand factors that would improve on the individual agency approach used in the wholesale customer demand study could be developed from available data, given that such water use factors are not available at the local level (Maddaus, 2008). Refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2, under the heading Use of Total Jobs Projections for the Wholesale Service Area). Regarding conservation, the SFPUC conducted studies, in consultation with each wholesale customer, to identify the potential for conservation measures to offset demand in the wholesale customer service area (refer to **Section 14.2,** Section 14.2.3). Note that those agencies with high nonresidential water use do not necessarily have high nonresidential water conservation potential, since conservation potential depends on how the water is being used and the current level of efficiency.

SI_PacInst-13 This comment summarizes more detailed comments made in Comment SI_PacInst-62 and is addressed in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2, under the heading Effects of the Future Price of Water on Projected Demand).

SI_PacInst-14 This comment states that the assessment of the cost-effectiveness of conservation measures should include benefits to consumers and quantification of the value of maintaining ecosystem flows in the Tuolumne River. A community perspective benefit-cost analysis, reflecting consumer benefits, was presented to the wholesale customers (refer to **Response SI_PacInst-52** below for more information). Neither the background reports on conservation and recycled water potential nor the Draft PEIR quantify benefits to the ecosystem of the Tuolumne River in the manner suggested in this comment. The intended focus of CEQA is on potential physical environmental effects rather than social or economic effects. Therefore, the Draft PEIR includes multiple alternatives that involve a reduction in diversions from the Tuolumne River to reduce attendant environmental impacts; several of these alternatives would involve increased levels of conservation and recycling (Vol. 4, Chapter 9, beginning on p. 9-4). The evaluation of alternatives will enable decision-makers to weigh the environmental tradeoffs associated with these various approaches.

SI_PacInst-15 The statements in this comment regarding nonresidential account data and standardized reporting methods summarize more detailed comments made in Comment SI_PacInst-79, and are addressed in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2, under the heading Use of Total Job Projections for the Wholesale Customer Service Area). The statement regarding a focus on outdoor water use apparently refers to more specific comments on nonresidential and outdoor use and conservation potential provided in Comments SI_PacInst-62, SI_PacInst-63, and SI_PacInst-80, and may also refer to more detailed comments on residential outdoor use in Comments SI_PacInst-05, SI_PacInst-71, and SI_PacInst-72. Refer to **Responses SI _PacInst-62** and **SI_PacInst-63**, below, and to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2, under the heading Outdoor Water Use, and Section 14.2.3, under the heading Frequently Submitted Comments Addressing Conservation and Recycling). Table 14.2-8 in Section 14.2.3 shows existing and proposed conservation measures for nonresidential accounts in the wholesale customers' service areas.

SI_PacInst-16 This comment states that multiple scenarios should be included in order to determine a range of future demand. This comment is premised on the assumption that the projections method used is faulty and, as a result, demand is overstated. Comments SI_PacInst-75 through SI_PacInst-79 present the commenter's criticisms of the demand projection methodology. As indicated in **Responses SI_PacInst-75** through **SI_PacInst-79** and in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2, under the headings Employment Projections – Use of ABAG's Projections 2002 and Use of Total Jobs for the Wholesale Customer Service Area), these criticisms do not warrant the requested changes to the demand projections methodology. In addition, given the length of time required to implement water system improvements, the advantage of multiple scenarios over the approach taken is unclear, since a decision about future demand would still, ultimately, be required based on incomplete information.

SI_PacInst-17 This comment regarding recycled water potential summarizes a conclusion from more detailed comments SI_PacInst-81 and SI_PacInst-82. Please refer to **Responses SI_PacInst-81** and **SI_PacInst-82**.

SI_PacInst-18 This comment recommending that the impact of climate change be the subject of future studies is noted. Also refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14).

SI_PacInst-19 This comment, which recommends that each agency assess the factors that drive demand and take a proactive role in identifying ways to reduce demand, is addressed in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3, under the heading Conservation Measures Suggested by Commenters).

SI_PacInst-20 This comment, which recommends that the SFPUC and its wholesale customers implement water and wastewater rate structures that encourage water conservation and fund conservation programs, is addressed in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling**

(Vol. 7, Chapter 14, Section 14.2.3, under the heading Conservation Measures Suggested by Commenters).

SI_PacInst-21 This comment expressing the opinion that all agencies should sign the CUWCC's Memorandum of Understanding (MOU) and work to implement the CUWCC's BMPs is noted; please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3, under the heading Conservation Measures Suggested by Commenters).

SI_PacInst-22 This comment recommending that the SFPUC and BAWSCA work together to implement regional conservation and recycling programs is noted. As described in the Draft PEIR (Vol. 4, Chapter 9, pp. 9-47 to 9-51), the SFPUC, in cooperation with its wholesale customers and BAWSCA, undertook a study to assess the potential for additional conservation and recycled water projects, including potential regional projects, that were not already considered to be implemented locally by 2030 as part of the WSIP purchase estimates. The results of this study provided the basis for the Aggressive Conservation/Water Recycling and Local Groundwater Alternative evaluated in the Draft PEIR (Vol. 4, Chapter 9, pp. 9-47 to 9-59) as well as an element of the Modified WSIP Alternative (Vol. 4, Chapter 9, pp. 9-78 to 9-84). Under the Modified WSIP Alternative, the SFPUC and/or BAWSCA would pursue additional efforts to generate supplemental supply and/or demand offset equivalents in the range of 5 to 10 million gallons per day (mgd). Please also refer to **Section 14.10, Master Response on Modified WSIP Alternative** (Vol. 7, Chapter 14).

SI_PacInst-23 BAWSCA performs many of the functions listed in this comment: encouraging implementation of water conservation measures, information sharing, program evaluations, and conservation data collection and reporting. Please refer to Appendix K of this Comments and Responses document (Vol. 8), which consists of a listing of the attachments provided by all commenters; it includes numerous examples and descriptions of wholesale customers' conservation and efficiency measures. Regarding economic incentives for demand reductions and conservation pricing for wholesale customers, refer to **Responses SI_PacInst-47** and **SI_PacInst-62**.

SI_PacInst-24 This comment recommends that purchases from the SFPUC be capped at current levels and that financial incentives/disincentives be instituted to encourage conservation and discourage growth in demand. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3, under the heading Conservation Measures Suggested by Commenters).

SI_PacInst-25 This comment is a preamble to more specific comments and conclusions that follow in Comments SI_PacInst-26 through SI-PacInst-84. Please refer to **Responses SI_PacInst-26** through **SI-PacInst-84**.

SI_PacInst-26 This comment provides an overview of the SFPUC system and WSIP planning that contains several minor factual errors as well as terminology that may be misleading if not clarified, as follows:

- The SFPUC now delivers water to 27 wholesale customers (not 28) (Draft PEIR, Vol. 1, Chapter 3, p. 3-5).

- The SFPUC's study of a regional supply option to offset the projected 35 mgd increase in purchases from the SFPUC system using only groundwater, recycled water, and conservation measures, entitled *Investigation of Regional Water Supply Option No. 4 Technical Memorandum* (SFPUC, 2007, Appendix D), identified projects that could potentially offset 28.5 mgd (not 28 mgd) of the projected 35 mgd increase in purchases (Draft PEIR, Vol. 4, pp. 9-47 to 9-49).

- With respect to the terminology used in this comment, the projected increase of 38 mgd for wholesale customers referenced in this comment refers to the increase in *purchases* from the SFPUC system, not the projected increase in demand (with plumbing codes) for the wholesale customers determined by the end-use demand models. While the projected purchases may be characterized as demand *specifically on the SFPUC system*, use of the term "demand" in this context could be misleading. The projected increase in demand for the wholesales customers is 52 mgd (Draft PEIR, Vol. 4, Chapter 7, Table 7.3, p. 7-18). Implementation of conservation measures and the use of other water sources (recycled water, groundwater, and other surface water) accounts for the difference between the wholesale customers' projected increase in demand and their projected increase in purchases from the SFPUC system.

This comment correctly states that a series of comprehensive studies were prepared to determine the estimated increase in purchases from the SFPUC system of 35 mgd, and that the SFPUC expects to satisfy this increase in the estimated purchases by relying on increased diversions from the Tuolumne River and offsetting 10 mgd through conservation, water recycling, and groundwater supply within the retail service area. Note that the estimated 35 mgd increase in purchases from the SFPUC system already factors in expected conservation savings, water recycling, and use of other potable supplies for the wholesale service area, as noted above in this response, but not for the retail service area. Therefore, as indicated here and in the Draft PEIR, the 35 mgd purchase estimate would be offset by the 10 mgd of conservation, water recycling, and groundwater in the retail service area.

SI_PacInst-27 This comment, which states that the wholesale and retail demand studies may overestimate future demand and underestimate demand management and the use of recycled water, is a preamble to the more specific Comments SI_PacInst-28 through SI_PacInst-35, which repeat Comments SI_PacInst-03 through SI_PacInst-10. Refer to **Responses SI_PacInst-28** through **SI_PacInst-35** for the appropriate response referrals. As the responses indicate, the commenter does not, in fact, make the case that either demand is overestimated or that conservation and recycled water use is underestimated.

Note that in this and all other comments addressing the perceived shortfall in conservation potential presented in this submittal, the comment does not address the fact that the WSIP as proposed anticipates that even with the increases in water supplies, the system will experience water shortages and that rationing will be required during extended droughts, possibly because the report presented in this submittal was prepared prior to publication of the Draft PEIR. As described in the Draft PEIR (Vol. 1, Chapter 3, pp. 3-32 et seq.), the WSIP-proposed level of service is to limit rationing (required reductions is water use) during drought periods to a maximum of 20 percent systemwide. Put another way, during an extended sequence of dry years, the wholesale and retail customers might be required to reduce water use by up to 20 percent on a systemwide basis. These cutbacks would be in addition to reductions in potable water use achieved through existing and planned conservation and recycling. As indicated in the Draft PEIR (Vol. 4, Chapter 9, p. 9-28), "To the extent that water conservation is already being practiced and will increase in the future, the more difficult it will be to implement adequate cutbacks in water use in the future to achieve the rationing that may be required during a drought period. Demand hardening refers to the increasing difficulty and expense of achieving short-term water conservation levels during shortages as more long-term conservation measures are implemented and water-use efficiency maximized." Refer to the Draft PEIR discussion related to the effects of droughts and rationing on customers (Vol. 4, Chapter 9, pp. 9-28 to 9-31).

SI_PacInst-28 This comment repeats Comment SI_PacInst-03 and is addressed in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2, under the heading Per-Capita Demand).

SI_PacInst-29 This comment repeats Comment SI_PacInst-04; refer to **Response SI_PacInst-04**.

SI_PacInst-30 This comment repeats Comment SI_PacInst-05 and is addressed in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2, under the heading Outdoor Water Use).

SI_PacInst-31 This comment repeats Comment SI_PacInst-06; refer to **Response SI_PacInst-06**.

SI_PacInst-32 This comment, which repeats Comment SI_PacInst-07 and summarizes more detailed comments made in Comment SI_PacInst-79, is addressed in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2, under the heading Use of Total Jobs Projections for the Wholesale Customer Service Area).

SI_PacInst-33 This comment, which repeats Comment SI_PacInst-08 and summarizes more detailed comments presented in Comments SI_PacInst-76 and SI_PacInst-77, is addressed in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2, under the heading Employment Projections – Use of ABAG's Projections 2002).

SI_PacInst-34 This comment repeats Comment SI_PacInst-09; refer to **Response SI_PacInst-09**.

SI_PacInst-35 This comment repeats Comment SI_PacInst-10, which in turn summarizes more detailed comments presented in Comments SI_PacInst-81 and SI_PacInst-82; refer to **Responses SI_PacInst-81** and **SI_PacInst-82**.

SI_PacInst-36 This comment stating the commenter's conclusion that demand and conservation studies are inadequate and fail to realize efficiency levels achieved elsewhere summarizes the commenter's conclusion of more specific Comments SI_PacInst-28 through SI_PacInst-35, which repeat Comments SI_PacInst-03 through SI_PacInst-10. Refer to **Responses SI_PacInst-28** through **SI_PacInst-35** for the appropriate response referrals. Also refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3, under the heading Frequently Submitted Comments Addressing Conservation and Recycling) for a discussion of comparisons to other areas. As the responses demonstrate, the "achievements elsewhere" turn out not to be valid comparisons to the SFPUC service area, and these comparisons and other related comments do not in fact support the contention that the demand and conservation studies are flawed. The comment correctly states that it is critical that water demand forecasts be based on good data and appropriate assumptions. As the referenced responses indicate, the demand and conservation studies are based on appropriate assumptions and good data. The SFPUC's water contracts with wholesale customers (see Draft PEIR, Vol. 1, Chapter 2, pp. 2-43 to 2-44) currently include provisions that wholesale customers employ best efforts to use all sources of water owned or controlled by them, including groundwater. The recommendation that the contracts be written to encourage conservation and efficiency improvements is noted.

SI_PacInst-37 This comment correctly summarizes information on the SFPUC and its service area, except that the SFPUC now delivers water to 27 wholesale customers, not 28 (Draft PEIR, Vol. 1, Chapter 3, p. 3-5). Given this change, 25—not 26—of its customers are public entities, and two are private water utilities.

SI_PacInst-38 This comment correctly summarizes information on BAWSCA and the coordination of the SFPUC and BAWSCA on a pre-rinse spray valve program, except that BAWSCA now represents 27—not 28—wholesale customers. According to Comment SI_PacInst-80 (Vol. 6, Chapter 12, Section 12.4), pre-rinse spray valves is one of the "most promising technologies" for the nonresidential sector identified in a Pacific Institute report.

SI_PacInst-39 This comment correctly states that the SFPUC and the wholesale customers depend on a variety of water sources to meet their water needs; however, to clarify, groundwater is currently the only other water source used by the SFPUC for the retail service area (although the CCSF currently uses a limited amount of recycled water (less than 1 mgd) for wastewater treatment plant process water and washdown operations; recycled water is also used in San Francisco for soil compaction and dust control during construction). That there is considerable variation in the supply mix used to meet demand for the wholesale customers is true, but certainly not "hidden," as implied by this comment. Refer to Table 3.3 (Vol. 1, Chapter 3, p. 3-18) and Table 7.2 (Vol. 4, Chapter 7, p. 7-15) and the individual customer summaries (Vol. 4, Chapter 7, pp. 7-35 to 7-59); as stated in the Draft PEIR, "the water customers vary in size, their overall projected demand for 2030, the change the 2030 demand represents in absolute terms (i.e., in mgd) and as a percentage of 2001 demand, and the degree to which they depend on the SFPUC for their water supply" (Vol. 4, Chapter 7, p. 7-34). Regarding the sources of supply used to meet 2001–2002 demand, see *SFPUC Wholesale Customer Demand Technical Report* (URS, 2004a, p. 1-3, Table 1-2) and BAWSCA Annual Surveys.

SI_PacInst-40 This comment correctly states that the SFPUC and the wholesale customers participate in a range of ongoing conservation programs; the information on signatories of the CUWCC MOU is updated as follows: the SFPUC and 14 of 27 wholesale customers are signatories of the CUWCC MOU (CUWCC, 2008), and 3 additional wholesale customers that are not signatories participate through the Santa Clara Valley Water District (SCVWD), which is a CUWCC signatory (BAWSCA, 2008, p. 75).

SI_PacInst-41 This comment and the table to which it refers correctly show the CUWCC BMPs to which the SFPUC and wholesale customers have committed to implement (SFPUC, 2006a, p. 23). The comment correctly notes that BMPs 5 and 9, which target commercial, industrial, and institutional water uses, show the lowest participation, and that BMPs 4, 6, and 11 show the highest participation. However, several measures show higher participation than BMP 8; BMP 7, Public Information, with all but two agencies participating, is among the four BMPs with the highest participation.

SI_PacInst-42 This comment, which states that although agencies may be implementing a BMP, they "may not meet the full coverage requirements of that BMP and thus may not be in compliance with the MOU," may be based on a note in the table of "Conservation Best Management Practices Implemented by BAWSCA Members - FY 2004-05" in BAWSCA's FY 2004-05 annual survey (the source cited for

Table 1 of Comment SI_PacInst-41). This comment is acknowledged. While the CUWCC does not monitor compliance with BMP requirements, agencies report annually on BMP implementation. The estimates of conservation savings submitted by the wholesale customers and assumed for WSIP planning were based on customer-specific evaluations of conservation potential in each wholesale customer service area.

SI_PacInst-43 This comment, which expresses the commenter's opinion regarding the CUWCC BMPs, and the opinion that these BMPs are a minimum level of conservation that agencies should be implementing, is noted. Refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) regarding conservation measures the SFPUC and its wholesale customers are implementing or have committed to implement under the WSIP.

SI_PacInst-44 This comment correctly states that BAWSCA and the SCVWD are signatories to the CUWCC MOU and that the SCVWD implements the CUWCC BMPs among the jurisdictions its serves, including eight SFPUC wholesale customers. The information presented in the comment on BAWSCA conservation programs, citing BAWSCA's *2006 Water Conservation Programs Annual Report*, is noted. BAWSCA's *2007 Water Conservation Programs Annual Report* is included in Comment Letter L_BAWSCA1 (Vol. 6, Chapter 12, Section 12.3); see **Comment L_BAWSCA-114** for the 2007 report.

SI_PacInst-45 This comment correctly states that the SFPUC implements conservation programs among its retail customers, implements all of the CUWCC BMPs in the retail service area, coordinates with BAWSCA on a pre-rinse spray valve program, and participates in a number of regional programs, including a regional water rebate program. These are described in more detail in the Sustainable Water Supply Briefing document (SFPUC, 2006a, pp. 6 to 7).

SI_PacInst-46 This comment correctly states that conservation pricing is BMP 11 of the CUWCC's BMPs. As shown in Table 1 of this comment letter (referenced in Comment SI_PacInst-45 [Vol. 6, Chapter 12, Section 12.4]) and Tables 14.2-7 and 14.2-8 in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3), all the wholesale customers and the SFPUC (for the retail customers) implement BMP 11. The comment correctly states that the SFPUC implements increasing block rates for most of its retail customers and for wastewater for its residential customers. Note that the water rates for the SFPUC's wholesale customers are set in contractual agreements with the wholesale customers. The rate for wholesale water service is set pursuant to the Master Sales Agreement between the CCSF and the SFPUC wholesale customers.

SI_PacInst-47 This comment states that increasing block rate pricing is effective in encouraging water conservation, citing a study in the Southwest that found that per-capita water use is typically lower in cities with dramatically increasing block rates, and recommends that the SFPUC and its wholesale customers evaluate and implement water and wastewater rate structures that encourage water conservation.

As discussed in **Response SI_PacInst-62**, below, water pricing, which has been used in conjunction with other measures during drought emergencies, is recognized as an important tool that water managers have employed to reduce discretionary use. However, as discussed in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2, under the heading Effects of Future Price of Water on Projected Demand), studies have been unable to distinguish between the effects of conservation pricing and other conservation programs when more than conservation pricing is implemented. The limitations of a tiered rate structure for effecting substantial reductions during nonemergency (normal rainfall) periods are discussed below.

All of the wholesale customers and the SFPUC (for the retail customers) implement conservation pricing (CUWCC's BMP 11), as indicated in the previous comment (Vol. 6, Chapter 12, Section 12.4) and response, and 17 of 27 wholesale customers currently have increasing block rates (SFPUC, 2006a, pp. 99 to 100). However, these customers (and others) have found that it is not possible to generate significant water savings from such rates (Maddaus, 2008). The SFPUC's DSS technical consultant has considered the feasibility and potential water savings from conservation-oriented rate structures, particularly three or more tiered rate structures (as cited in this comment) as discussed below.

A three or more tiered tariff structure provides the opportunity to address the very high water users directly. The higher blocks (third and fourth tiers, or blocks) are usually set at the levels of water use related to certain percentages of the total accounts (e.g., the top 20 percent or the top 10 percent of all accounts), with a view toward discouraging discretionary usage at these levels. According to its proponents, this type of rate structure promotes economic efficiency by charging rates that more closely reflect the costs of meeting peak demand to those who cause the need for peak capacity and this approach discourages wasteful water practices and promotes conservation through the direct message of higher prices in the realm of discretionary water use (Maddaus, 2008).

The third and fourth tiers are generally set at 15 to 20 percent above the prior tier. Sometimes the top tier is set very high to discourage peak water use if peaking is a particular problem. The reason for the nominal rate difference is that, the larger the rates are in the higher (e.g., third and fourth) tiers, the lower the first-and/or second-tier rates must be to maintain revenue neutrality. California law prohibits utilities from collecting revenues in significant excess of costs. (Note that the study cited in this comment addressed urban water use efficiency “across the southwest.”) Very large differences force the first tier rate to be so low that it becomes an affordability rate (i.e., a “lifeline” rate for low-income households) and the second block is, for all practical purposes, a single rate applied to 80 percent or more of total volume. Thus, for almost all customers (except for the relatively few that fall into the top blocks), this type of rate structure would offer no effective price-related conservation incentive (Maddaus, 2008).

Note also that this comment does not address rationing that would be imposed during drought periods and attendant demand hardening that could occur. Regarding the relationship between the implementation of long-term conservation measures and the imposition of short-term cutbacks in water use during drought periods, refer to **Response SI_PacInst-27**.

SI_PacInst-48 This comment describing the demand studies conducted in the retail and wholesale service areas is acknowledged.

SI_PacInst-49 This comment, which correctly summarizes the initial screening of conservation measures, is acknowledged.

SI_PacInst-50 This comment describes steps taken in the retail service area to model conservation potential and summarizes the commenter’s more detailed comments on the evaluation of nonresidential conservation potential presented in Comments SI_PacInst-76 through SI_PacInst-79. Refer to **Response SI_PacInst-78** and to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2, under the headings Employment Projections – Use of ABAG’s Projections 2002 and Use of Total Jobs Projections for the Wholesale Customer Service Area).

SI_PacInst-51 The commenter’s statement regarding differing levels of commitment to conservation is noted. The description of the conservation potential studies presented in this comment is somewhat at variance with the process described in the conservation potential technical reports (URS, 2004b; Hannaford and Hydroconsult, 2004). Refer to the summary description of the screening process employed in the conservation potential studies presented in the Draft PEIR (Vol. 5, Appendix E.2, pp. E.2-11 to E.2-15). Also refer to Tables 14.2-6, 14.2-7, and 14.2-8 in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for a description of existing and planned conservation measures for the retail and wholesale customers.

Note that this comment does not address rationing that would be imposed during drought periods and attendant demand hardening that could occur. Regarding the relationship between the implementation of long-term conservation measures and the imposition of short-term cutbacks in water use during drought periods, refer to **Response SI_PacInst-27**.

SI_PacInst-52 This comment states that both the DSS and Hannaford models[3] assess the economics of the conservation measures and programs from the "utility perspective" and that community costs and benefits, although discussed secondarily, were not used to evaluate the measures.

This statement is incorrect. The *Wholesale Customer Water Conservation Potential Technical Report* (URS, 2004b, Table 3-3, p. 3-18) presents the "Utility-Customer" Benefit-Cost Ratio for conservation measures for an example customer, and Appendix D presents them by customer for each of the 32 measures. Each measure includes costs and benefits to the customer as defined in the report (p. 3-17): "Utility-Customer benefits and costs: utility customer benefits equal utility benefits plus retail customer energy benefits (cost to heat water). Utility-customer costs include the sum of utility and retail customer costs." Wholesale customers were provided with this information when they selected measures for their alternative programs.

SI_PacInst-53 This comment cites high-efficiency clothes washer promotion programs as an example of a measure that could be overlooked as a result of only considering the utility perspective.

As discussed in **Response SI_PacInst-52**, the community perspective was considered in the cost-benefit analyses. With respect to clothes washer promotion programs, this was evaluated (as measure 5) in the wholesale conservation report (URS, 2004b); utility and community benefit-cost ratios (as defined above) were published. In addition, clothes washer rebate programs are included as CUWCC BMP 6. As shown in Tables 14.2-7 and 14.2-8 in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3), and in Table 1 of Comment SI_PacInst-45 (Vol. 6, Chapter 12, Section 12.4), the SFPUC (for the retail service area) and all of the wholesale customers have adopted this measure.

SI_PacInst-54 This comment, which includes a figure showing historical and projected water demand for the wholesale and retail customer service areas, states that conservation and efficiency offset increases in water use due to population and employment growth in the retail customer service area but not in the wholesale customer service area. Regarding historical trends, refer to **Figure 14.2-2** in

[3] Referring to the end-use demand and conservation potential models used in the wholesale customer service area and retail customer service area, respectively.

Section 14.2, Master Response on Demand Projections, Conservation, and Recycling (Vol. 7, Chapter 14, Section 14.2.2, under the heading Per-Capita Demand), which shows that on a per-capita basis, the wholesale and retail service areas had similar historical water demand trends. Regarding water demand, the comment correctly states that population and economic growth in the wholesale service area is expected to increase water demand. The growth in water demand will be offset to some extent by implementation of conservation measures, as indicated in the aforementioned discussion of per-capita demand.

SI_PacInst-55 This comment introduces the commenter's Table 3, which includes information on base-year demand, 2030 demand with plumbing codes, and 2030 demand with plumbing codes and conservation; this information essentially corresponds to the information presented in Tables 7.2 and 7.3 of the Draft PEIR (Vol. 4, Chapter 7, pp. 7-15 and 7-18). Minor differences are assumed to be due to rounding and some updated information in the Draft PEIR tables. Table 3 also includes information on the change in demand with conservation that is consistent with the information presented in the other columns. The text of this comment correctly summarizes information on projected increases in population and employment, changes in demand (in mgd and percent), and changes in demand after conservation savings are factored in.

The figures in Table 3 are consistent with information in the demand model and in Tables 7.2, 7.3, and 7.4 of the Draft PEIR (Vol. 4, Chapter 7, pp. 7-15, 7-18, and 7-20), except for rounding, some updated information reflected in the Draft PEIR tables, and the fact that, for those customers that submitted a range of conservation savings, the PEIR tables reflect the range rather than a single number.

SI_PacInst-56 This comment, which correctly states that there is variation in the changes in water demand among the wholesale and retail service area customers and that four wholesale customers account for nearly 80 percent of the increase in demand projected for 2030, and expresses the commenter's opinion that four wholesale customers are "responsible for a disproportionate amount of 2030 demand growth," is acknowledged.

SI_PacInst-57 This comment characterizes past per-capita demand and projected 2030 per-capita demand in the wholesale customer service area. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2, under the heading Per-Capita Demand).

SI_PacInst-58 This comment characterizes past gross per-capita demand and projected 2030 per-capita demand in the retail customer service area. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and**

Recycling (Vol. 7, Chapter 14, Section 14.2.2, under the heading Per-Capita Demand).

SI_PacInst-59 This comment characterizes trends over time in the retail and wholesale customer service areas (similar to Comments SI_PacInst-57 and SI_PacInst-58), stating that the comparison indicates that water-use efficiency improvements are not being implemented effectively for the wholesale customers and citing improvements that have been achieved in other water districts. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2, under the heading Per-Capita Demand) for a discussion of past per-capita demand trends and projected demand in the retail and wholesale customer service areas. Regarding the comparisons to other areas, refer to **Section 14.2** (Vol. 7, Chapter 14, Section 14.2.3, under the heading Frequently Submitted Comments Addressing Conservation and Recycling).

SI_PacInst-60 This comment correctly notes (in footnote 32) that water use trends for the retail and wholesale service areas are similar, but that retail area trends are less variable because the retail service area has less outdoor water use, which is sensitive to climate variations. While climate unquestionably affects outdoor water use, shorter term variations in weather (as opposed to climate) can cause variations in outdoor water use from year to year. This comment also states (in footnote 33) that for Tables 5 and 6 (cited in Comment SI_PacInst-68), “current” is defined as 2001 for the wholesale customers and as 2005 for the retail customers. While this comment is acknowledged, note that, as described in the Draft PEIR (Vol. 1, Chapter 3, p. 3-20), 2000 was used as the base year for the retail service area conservation and demand studies. The year 2001 was used as the base year for wholesale service area studies, consistent with the approach described in footnote 33.

SI_PacInst-61 This comment (in footnote 42) states that the commenter’s conclusion regarding the percentage savings that would result from the proposed change in plumbing requirements described in Comment SI_PacInst-74 (Vol. 6, Chapter 12, Section 12.4) is based on the assumption that all toilets currently have a flush volume of 1.6 gallons per flush and all urinals have a flush volume of 1.0 gallon per flush. For the purposes of calculating projected savings, this would be a conservative estimate, as this comment states, since the current average volume of gallons per flush for toilets and urinals is somewhat higher. The average flush volume in 2001 in the wholesale customer service area was determined by SFPUC studies to be 3.0 gallons per flush (Maddaus, 2008).

SI_PacInst-62 This comment focuses on issues related to the price of water and the consideration of price-driven efficiency improvements in the demand studies. Some price-related topics raised in this comment were also raised by other commenters and are addressed, as noted in this response, in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2). Regarding the level of conservation savings identified in the SFPUC service area and the alleged failure of conservation programs to adequately capture potential savings as compared to savings achieved in other assessments, refer to the discussion of comparisons to other areas in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3, under the heading Frequently Submitted Comments Addressing Conservation and Recycling).

Price elasticity of water demand. The comment discusses the price elasticity of water demand and cites the results of a survey of price elasticities conducted by the Pacific Institute, which found that typical California price elasticity of water demand is about -0.20 for single-family homes, -0.10 for multifamily homes, and -0.25 for the nonresidential sector. Price elasticity of demand is an economic term that refers to the sensitivity of consumers to the price of a given product (i.e., how much demand rises or falls in response to the fall or rise in price). The price elasticity of water demand, or elasticity factor, is defined as the ratio of the percentage change in the quantity of water used to the percentage change in the price of water (DWR, 1998). In general, demand for a good is considered elastic if the percentage change in price results in an equivalent (or greater) percentage change in demand (the absolute value of the calculated elasticity factor is 1 or greater). Demand is inelastic (that is, the consumer is relatively insensitive to changes in price) if the percentage change in price results in a smaller percentage change in demand (the absolute value of the calculated elasticity factor is less than 1).

The elasticity factors cited in this comment (which have absolute values of 0.2, 0.1, and 0.25) indicate that water demand in the studies surveyed is relatively inelastic. A Department of Water Resources (DWR) survey of elasticity studies and an evaluation of the effects of water pricing and non-pricing demand reduction actions commissioned by the DWR for the 1998 *California Water Plan* similarly found that “residential water demand is usually inelastic, i.e., water users were relatively insensitive to price for the price ranges evaluated.” The DWR study covered single-family residential use in eight cities and water districts (four in the Bay Area and four in southern California) and identified an elasticity factor of -0.16. The urban water demand forecast used for the 1998 *California Water Plan* assumed single-family residential price elasticity factors of -0.1 for winter months and -0.2 for summer months.

Another example of the variation in elasticity of water demand that exists, cited by the SFPUC’s DSS technical consultant (Maddaus, 2008), is a recent (2007) pricing study in the Bay Area city of Sonoma, which derived much lower elasticity factors: -0.028 for indoor use (December through February) and -0.061 for outdoor use (June through September). This study, which normalized water use to account for weather, compared water use and prices in 1999 and 2000 (similar use years) with 2005 and 2006 (similar use years). The indoor price increased 90 percent over that span and usage decreased by 2.5 percent in gallons per day per account; the outdoor water price increased 85.9 percent and usage decreased 5.3 percent. Changes in water price had statistically insignificant impacts on other account groups (City of Sonoma, 2007). During the time this study was being conducted, in addition to the effect of the plumbing codes on new homes and natural fixture replacements, the local water agency was implementing conservation programs that offered single-family residential customers ultra low-flush toilet rebates, home water audits, and free water-saving fixtures and devices (Pollard, 2007). Thus, this elasticity study showed that the price elasticity factors were low even when other conservation programs were being implemented and all savings were attributed to the price increases. Had the researchers been able to separate out the influence of price and the non-price conservation programs, the price elasticity may have been even lower (Maddaus, 2008).

A range of factors can affect the price elasticity of water demand, including climate, housing type, income, the percentage of the water user's budget represented by the water bill, the water rate structure, water conservation measures and education, and user preferences regarding water use. Because of these variables, the DWR discussion of elasticities cautions that "elasticity factors derived in one geographic area are not necessarily representative of another area" (DWR, 1998, p. 4A-3), a point the commenter also makes. Similarly, the SFPUC's DSS technical consultant has found that price elasticities are "rarely directly transportable from one utility to another" (Maddaus, 2008).

<u>Effect of future price on demand</u>. Regarding the statements that demand projections for the SFPUC retail and wholesale customers "do not include price-driven efficiency improvements" and that "[n]either the SFPUC retail nor wholesale customer demand analyses… consider price-driven efficiency," please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2, under the heading Effects of Future Price on Projected Demand).

<u>Water pricing as a water agency tool</u>. Even though studies have shown that water demand is relatively inelastic, water pricing is recognized as an important tool that allows water managers to reduce discretionary water use, as this comment indicates. In times of water shortage emergency, most water agencies have used water pricing as part of an overall strategy to reduce water use. In the 1976–1977 and 1986–1992 droughts, Bay Area water agencies used steeply inclining block rate pricing, public education campaigns, water restrictions, and ordinances,

some of which contained threats to shut off water to non-responsive customers, to reduce water use temporarily from about 20 to over 50 percent (Association of California Water Agencies, 1991). During such drought emergencies most of the reductions have come from drastically reduced discretionary use, which landscape irrigation is often considered to be. Such reductions have not come without impacts on water customers who have lost landscaping, on individuals and companies that depend on the landscaping and gardening industries for a livelihood, and on manufacturing companies that have had to cut back production and lay off workers due to water rationing programs (Barakat and Chamberlin, Inc., 1991).

Conservation pricing, CUWCC BMP 11, has been adopted by the SFPUC for the retail service area and by all the wholesale customers for ongoing, nonemergency conditions (refer to **Response SI_PacInst-46)**. Regarding the potential for tiered pricing to affect substantial conservation savings, refer to **Response SI_PacInst-47**.

Regarding the statement that "per capita water use remains high, particularly for the wholesale customers," the total gross per-capita average water use for the wholesale customers appears to be relatively low, not high, compared to per-capita demand in other parts of the state. Refer to the discussion of per-capita demand and to Tables 14.2-10 and 14.2-11 in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3, under the heading Frequently Submitted Comments Addressing Conservation and Recycling).

Note also that this comment does not address rationing that would be imposed during drought periods and attendant demand hardening that could occur. Regarding the relationship between the implementation of long-term conservation measures and the imposition of short-term cutbacks in water use during drought periods, refer to **Response SI_PacInst-27**.

SI_PacInst-63 This comment addresses projected water use by residential and nonresidential sectors in the wholesale customer service area. First it should be noted that "demand" as used in this comment takes into account plumbing code savings and active conservation programs, in contrast to use of the term in the Draft PEIR.[4] As shown in Table 7-3 of the Draft PEIR (Vol. 4, Chapter 7, p. 7-18), the total increase in demand in the wholesale service area from 2001, taking into account plumbing code savings, is 52 mgd. The comment does not indicate the source of Figures 3 and 4 (two bar charts) included with the comment, nor is the source

4 As used in the Draft PEIR discussion of demand projections and methodology (Vol. 1, Chapter 3, Section 3.4.4, pp. 3-16 to 3-21; Vol. 4, Chapter 7, Section 7.2.2, pp. 7-14 to 7-18; and Vol. 5, Appendix E.3) demand includes plumbing code savings but not savings from active conservation unless otherwise noted; conservation savings are presented separately and included in the 2030 purchase estimates.

apparent. The SFPUC used the demand models to calculate the information shown in the bar charts; the results, shown below, differ slightly with those in the bar charts. (The differences may be due to rounding.)

SFPUC calculation of data shown in Figure 3 of the comment (wholesale customer demand change, 2001–2030, with plumbing codes and proposed conservation):

- Wholesale Nonresidential = 23.6 mgd
- Residential = 9.5 mgd
- Unaccounted-for Water = 3.8 mgd
- Total = 36.8 mgd

SFPUC calculation of data shown in Figure 4 of the comment (retail customer demand change, 2000–2030, with plumbing codes and proposed conservation):

- Retail Nonresidential = 2.9 mgd
- Residential = -6.5 mgd
- Unaccounted-for Water = -1.0 mgd
- Total = -4.6 mgd

Regarding the statement that the nonresidential sector accounts for about two-thirds of the increase, or 24.1 mgd, the SFPUC calculated a slightly different result, perhaps due to rounding: the increase from 2001 to 2030 was calculated to be 23.6 mgd (from 97.0 to 120.6 mgd), which is about 64 percent of the total demand increase for that same period for the wholesale customer service area.

Regarding the statement that over 40 percent of the increase in nonresidential demand is due to outdoor use, the SFPUC calculates that 39 percent of the increase is from outdoor use.

SI_PacInst-64 This comment correctly states that in the retail customer service area conservation and efficiency improvements reduce total demand (as they do in the wholesale service area).

The comment also states that nonresidential demand increases by 3.1 mgd, all of which is for indoor use, and that residential demand and unaccounted-for water decrease by 6.5 mgd and 1 mgd, respectively, so that total demand decreases by 4.7 mgd. Refer to **Response SI_PacInst-63,** above, regarding the figures the SFPUC calculated, based on the demand models, for the sectors referenced in this comment. As shown, the SFPUC calculations are slightly different from the figures stated in this comment. The statement that for the retail service area "[a]ll of the projected increase in non-residential demand is due to indoor use" is incorrect. Data on the split between indoor and outdoor water use were not available for retail service area nonresidential demand, and therefore were not included in the Sustainable Water Supply Briefing materials. The commenter may have therefore assumed that there is no outdoor use, which may be the basis for this statement. However, assuming that the ratio of indoor/outdoor use for nonresidential demand in the retail service area in 2000 can be applied to 2030, the SFPUC calculates that nonresidential outdoor use would increase from 1.66 mgd in 2000 to 1.83 mgd in 2030. This change in nonresidential outdoor use, 0.17 mgd, is 5.9 percent of the total increase in nonresidential demand for the retail service area.

SI_PacInst-65 This comment, which includes a figure correctly showing residential per-capita water use in the wholesale and retail service areas and states in the comment text that data were not available to allow the commenter to distinguish single-family and multifamily water use and indoor and outdoor water use, is noted.

SI_PacInst-66 This comment characterizes water use data over the past 15 years, stating that residential per-capita water use has been constant, that indoor per-capita use has likely declined, and that indoor efficiency improvements have been offset over this period by increases in outdoor use.

The term "constant" may overstate the consistency of demand shown in Figure 5 of this comment. Because demand was not static, but instead shows variation for the years presented, "relatively" constant or stable may better characterize demand over the past 10 to 15 years, with the wholesales service area showing more variation than the retail service area. Figure 5 shows historical per-capita water use that is consistent with information provided in Sustainable Water Supply Briefing materials to the years 2001–2002 (SFPUC, 2006a) and (for the wholesale service area only) is consistent with information in the BAWSCA annual survey for the years 2002 to 2005. As noted in Comment SI_PacInst-65, the historical data on which this and related comments are based did not include a breakdown of water use for single- and multifamily residences, and the assumptions and conclusions drawn in the comment are therefore speculative. Data from the demand models for 2001 indicate a substantially higher percentage of single-family housing in the wholesale service area than is shown in the Table 4 of this comment: the model input data indicate that single-family housing made up approximately 93 percent of the residential housing in 2001, compared to 63 and 62 percent shown for 2000 and 2005, respectively, in this comment.

SI_PacInst-67 This comment, which correctly states that residential per-capita water demand is higher in the wholesale service area than in the retail service area, and that the higher percentage of multifamily housing units and fewer outdoor uses in the retail service area relative to wholesale service area tend to lower average residential per-capita water use, is acknowledged.

The comment also states that although differences in water use efficiency cannot be determined they will be discussed (in comments that follow). As noted in

Response SI_PacInst-66, the commenter's table showing percentages of single- and multifamily housing, to which this comment also refers, is not consistent with base-year data for the wholesale service area, which has a much higher proportion of single-family housing than the table shows. With respect to comparisons between retail and wholesale service areas, refer to **Response SI_PacInst-54** and **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2, under the heading Per-Capita Demand). The last statement of this comment introduces the discussion to follow; refer to the responses that follow.

SI_PacInst-68 This comment refers to two tables that correctly show baseline and projected single-family and multifamily total, indoor, and outdoor per-capita water use for the SFPUC wholesale customers and retail service area. The comment correctly states that single-family residential outdoor water use in Hayward and the Purissima Hills Water District is projected to increase substantially. The comment also states that in areas where 2001 per-capita demand was 300 gallons per capita per day (gpcd), demand was largely due to high outdoor water use; and that savings from conservation between 2001 and 2030 are due to reductions in indoor water use.

The statement that savings from conservation between 2001 and 2030 are due to reductions in indoor use is a generalization, apparently based on average usage, which overlooks the 18 wholesale customers that show reductions in single-family residential per-capita outdoor water use between 2001 and 2030. The use of "only" to characterize the reduction in per-capita use suggests the commenter's opinion about the magnitude of the reductions, which is stated more explicitly in Comments SI_PacInst-71 and SI_PacInst-72. These comments are addressed in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3, under the heading Frequently Submitted Comments Addressing Conservation and Recycling).

SI_PacInst-69 This comment states that projected water demand reductions for multifamily residential customers are larger than for single-family customers, and that the savings are due to efficiency improvements in indoor use because outdoor use is projected to remain constant. More accurately stated, the savings are *mainly* due to efficiency improvements in indoor use. (Although the comment is correct that average water use for multifamily customers does not change [as shown in Table 6 of this comment], this generalization overlooks variations among the wholesale customers. For most customers, per-capita outdoor use does not change; however, for four customers—East Palo Alto, Hayward, Millbrae, and Stanford—it decreases, although these declines are offset by increases for one customer—Redwood City.)

SI_PacInst-70 This comment states that demand reductions for single-family and multifamily residential use are more substantial in the retail service area than in the wholesale service area, and correctly states that a reduction of 10 gpcd, or 16 percent, is projected for total single-family use in the retail service area and a reduction of 11 gpcd, or 19 percent, is projected for total multifamily use in the retail service area. This statement characterizes the comparison of the retail service area with the average of the wholesale service area, although individual wholesale customers projected more or less than the average, and some show greater reductions than does the retail service area. Regarding comparisons between the retail customer and wholesale customer service areas, refer to **Response SI_PacInst-54** and **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2, under the heading Per-Capita Demand).

SI_PacInst-71 This comment refers to several studies as evidence that the wholesale and retail customers can do more to reduce indoor and outdoor demand. Please refer to the discussion of comparisons to other areas in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3, under the heading Frequently Submitted Comments Addressing Conservation and Recycling).

SI_PacInst-72 This comment states that additional attention and effort must be focused on reducing outdoor water use and cites studies documenting improvements in outdoor water-use efficiency in the Southwest and southern California. Please refer to the discussion of comparisons to other areas in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3, under the heading Frequently Submitted Comments Addressing Conservation and Recycling).

SI_PacInst-73 This comment, which describes recently adopted legislation that may encourage additional improvements in indoor and outdoor water use efficiency is acknowledged. The landscape ordinances described in this comment had not been adopted when the wholesale conservation potential study was conducted in 2003–2004. Changes in available technology and/or legal requirements will inevitably arise and will inform future conservation efforts by the SFPUC, BAWSCA, and the wholesale customers.

SI_PacInst-74 This comment describing provisions of an Assembly Bill 2496, which would have updated 1991 plumbing code standards for toilets and urinals had it not been vetoed, is noted.

SI_PacInst-75 This comment repeats the point made in Comment SI_PacInst-06 and summarizes more detailed comments made in SI_PacInst-79; refer to **Response SI_PacInst-06** and **Section 14.2, Master Response on Demand**

Projections, Conservation, and Recycling (Vol. 7, Chapter 14, Section 14.2.2, under the heading Use of Total Job Projections for the Wholesale Customer Service Area), which provides a response to Comment SI_PacInst-79. The statement that wholesale customers account for 90 percent of the projected growth in nonresidential demand is acknowledged.

SI_PacInst-76 This comment states that the Association of Bay Area Governments (ABAG) has issued more recent demographic projections than were used to project nonresidential water demand and that the water demand projections based on *Projections 2002* may be overstated and need to be revised. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2, under the heading Employment Projections – Use of ABAG's Projections 2002).

SI_PacInst-77 This comment states that the 2030 employment levels assumed in the demand model are unlikely and should be adjusted using more realistic employment projections. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2, under the heading Employment Projections – Use of ABAG's Projections 2002).

SI_PacInst-78 This comment, which correctly summarizes steps taken in the DSS demand modeling process to establish base-year conditions and forecast future demand, is acknowledged.

SI_PacInst-79 This comment states that the methodology used to forecast nonresidential demand in the wholesale customer service area contains errors that could lead to large inaccuracies in forecasted demand. Regarding the nonresidential growth rates assumed in the DSS demand models and variability among water users, please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2, under the heading Use of Total Job Projections for the Wholesale Customer Service Area). Regarding the list of water use coefficients presented in Table 8 of this comment, note that with the exception of golf courses, the last six entries in the table (which have the highest water use values) are absent from the wholesale customer service area (Maddaus, 2008).

SI_PacInst-80 This comment, which states that the conservation potential identified for the SFPUC wholesale and retail customers is weak and misses important efficiency opportunities, cites other conservation assessments that have found substantially higher conservation potential in the nonresidential sector. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3, under the heading Frequently Submitted Comments Addressing Conservation and Recycling) for a discussion of comparisons to other areas. Regarding the relationship between the implementation of long-term conservation measures and the imposition of short-term cutbacks in water use during drought periods, refer to **Response SI_PacInst-27**.

SI_PacInst-81 This comment, which describes recycled water and its use to supplement potable water supplies and correctly summarizes information presented in the *Wholesale Customer Recycled Water Potential Technical Memorandum* (RMC, 2004), is acknowledged. Specific information on recycled water is presented in the Draft PEIR (Vol. 5, Appendix E.2) and **Section 4.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3).

SI_PacInst-82 This comment summarizes current recycled water use within the SFPUC retail service area and findings of the *City and County of San Francisco Recycled Water Use Master Plan Update*, including that 11 mgd of recycled water could be provided in the retail service area by feasible recycled water projects by 2030. It is correct that under the WSIP in 2030, 9 mgd of recycled water would be used in the wholesale customer service area and 4 mgd would be used in the retail service area to offset demand for potable supplies from the SFPUC regional system. As shown in Table 3.3 (Vol. 1, Chapter 3, p. 3-18) and Table 7.2 (Vol. 4, Chapter 7, p. 7-15) of the Draft PEIR, a range of 9–10 mgd of recycled water is projected for the wholesale service area. This comment includes a figure that indicates the currently projected breakdown of water supplies to meet 2030 supplies under the WSIP. This figure appears to be based on the breakdown of supplies shown in Figure 2 of the *Investigation of Regional Water Supply Option No. 4 Technical Memorandum* (SFPUC, 2007, Appendix D, p. 1-4), adjusted to reflect an additional 2 mgd of groundwater, 4 mgd of conservation, and 4 mgd of recycled water (consistent with SFPUC plans to use groundwater, conservation, and recycled water to offset 10 mgd of demand in the retail service area). This comment is acknowledged.

SI_PacInst-83 This comment states that implementation of recycled water projects involves challenges, but that use of recycled water is increasing, and that examples of recycled water use in southern Florida and a new community in southern California indicate that opportunities exist to increase water recycling in the SFPUC service area to reduce the need for new potable water supplies.

Factors affecting the feasibility of implementing recycled water projects in another state or a new southern California community may be fundamentally different from those in long-established communities, such as those within the SFPUC's service area. The proposed use of recycled water to offset potable demand in 2030 is reflected in 2030 purchase estimates. The *Investigation of Regional Water Supply Option No. 4 Technical Memorandum* (SFPUC, 2007, Appendix D) investigated additional opportunities to implement programs that could potentially be implemented on a regional level. The findings of that report were used to develop the Aggressive Conservation/Water Recycling and Local

Groundwater Alternative evaluated in the Draft PEIR (Vol. 4, Chapter 9, pp. 9-47 to 9-59) as well as an element of the Modified WSIP Alternative (Vol. 4, Chapter 9, pp. 9-78 to 9-84). Also refer to **Section 14.10, Master Response on Modified WSIP Alternative** (Vol. 7, Chapter 14).

SI_PacInst-84 This comment correctly states that water purchases from the SFPUC regional water supply system are projected to increase by 35 mgd. To meet the projected increase, the preferred water supply option under the WSIP includes increased diversions from the Tuolumne River and 10 mgd of recycled water/ groundwater/conservation projects in San Francisco; during dry years, the regional supply would be supplemented by water transfers from the Modesto and Turlock Irrigation Districts and/or other water agency, a conjunctive-use program in the Westside Groundwater Basin, and the restored capacities of Calaveras and Crystal Springs Reservoirs (Vol. 1, Chapter 3, pp. 3-33 to 3-39). Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.9) for an explanation of the relationship between the average annual increase in purchase requests and the average annual increase in Tuolumne River diversions.

The second paragraph states that the commenter's foregoing analysis indicates that future demand may be significantly overestimated and demand management opportunities underestimated, and reiterates other statements made in the preceding SI_PacInst comments. With respect to the reiteration and summary of the commenter's previous comments, please refer to the previous responses.

SI_PacInst-85 This comment repeats Comment SI_PacInst-12; refer to **Response SI_PacInst-12**.

SI_PacInst-86 This comment repeats Comment SI_PacInst-13; refer to **Response SI_PacInst-13**.

SI_PacInst-87 This comment repeats Comment SI_PacInst-14; refer to **Response SI_PacInst-14**.

SI_PacInst-88 This comment repeats Comment SI_PacInst-15; refer to **Response SI_PacInst-15**.

SI_PacInst-89 This comment repeats Comment SI_PacInst-16; refer to **Response SI_PacInst-16**.

SI_PacInst-90 This comment repeats Comment SI_PacInst-17; refer to **Response SI_PacInst-17**.

SI_PacInst-91 This comment repeats Comment SI_PacInst-18; refer to **Response SI_PacInst-18**.

SI_PacInst-92 This comment repeats Comment SI_PacInst-19; refer to **Response SI_PacInst-19**.

SI_PacInst-93 This comment repeats Comment SI_PacInst-20; refer to **Response SI_PacInst-20**.

SI_PacInst-94 This comment repeats Comment SI_PacInst-21; refer to **Response SI_PacInst-21**.

SI_PacInst-95 This comment repeats Comment SI_PacInst-22; refer to **Response SI_PacInst-22**.

SI_PacInst-96 This comment repeats Comment SI_PacInst-23; refer to **Response SI_PacInst-23**.

SI_PacInst-97 This comment repeats Comment SI_PacInst-24; refer to **Response SI_PacInst-24**.

Pilarcitos Creek Advisory Committee, Tim Frahm, Chair, 9/28/2007

SI_PilarCrk-01 This comment states the position held by the Pilarcitos Creek Advisory Committee that current SFPUC facilities and operations in the upper Pilarcitos Creek watershed have reduced opportunities to accomplish the goals of "restoration and balance" in the Pilarcitos Creek watershed. Comment noted.

SI_PilarCrk-02 The purpose of the Draft PEIR is to describe the consequences of the proposed WSIP relative to the existing condition (CEQA Guidelines Section 15125[a]). CEQA does not require an EIR to evaluate whether the existing condition is satisfactory.

The commenter correctly notes that the cross-basin transfer of water from Pilarcitos Creek to the San Mateo Creek watershed causes dewatering within a reach of Pilarcitos Creek immediately below Stone Dam most of the time. This situation occurs under existing conditions. The purpose of the analysis in the Draft PEIR was to determine whether the WSIP would alter the existing condition and, if so, whether the alteration would represent a significant adverse environmental impact.

Under the WSIP, the SFPUC would serve a portion of Coastside County Water District's increased water demand with water from Pilarcitos Creek, which would affect flow in the creek below Stone Dam, as discussed in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.5.1-19 to 5.5.1-22). However, Draft PEIR Mitigation Measure 5.5.3-2 (Vol. 4, Chapter 6, p. 6-26) would require the SFPUC to modify the operation of its Pilarcitos Creek facilities so that flow in Pilarcitos Creek with the WSIP would be very similar to flow under existing conditions. Therefore, with implementation of Measure 5.5.3-2, the SFPUC would supply Coastside County Water District's increased water demand with water from Crystal Springs Reservoir, and there would no change from existing conditions with respect to flows in Pilarcitos Creek.

SI_PilarCrk-03 As noted above, the purpose of the Draft PEIR is to describe the consequences of the WSIP relative to the existing condition. CEQA does not require an EIR to evaluate whether the existing condition is compliant with environmental laws and policies. See also **Response S_CDFG2-18**.

SI_PilarCrk-04 Stone Dam and Pilarcitos Dam are existing structures that must comply with applicable regulations for dam safety. No modifications to either structure are proposed as part of the WSIP. For this reason, the Draft PEIR did not and does not need to include an analysis of dam failure. As indicated in the Draft PEIR (Vol. 1, Chapter 2, p. 2-35), Pilarcitos Dam and Reservoir are under the jurisdiction of the California Department of Water Resources, Division of Safety of Dams (DSOD). A dam safety inspection is conducted regularly. Permanent piezometers are read once per month for groundwater levels and surveys of dam monuments are conducted twice per year. If the surveyor determines that maintenance is required, a maintenance work order is prepared. Maintenance work typically consists of clearing vegetation on the face of the dam and cleaning out the spillway. Unlike Pilarcitos Dam, Stone Dam is not an earthen dam and therefore is not under DSOD jurisdiction. However, Stone Dam is visually inspected many times per month (almost daily). Engineering inspections, which are conducted annually or more frequently as needed, include inspection of the pipeline and tunnel leaving the reservoir. The screens on Stone Dam are cleaned and the facility's meter is read on a weekly basis. Additional maintenance, such as cleaning the spillway, is performed as needed.

SI_PilarCrk-05 As noted above, the purpose of the Draft PEIR is to describe the consequences of the WSIP relative to the existing condition. CEQA does not require an EIR to evaluate whether the existing condition is satisfactory. However, the SFPUC recognizes that the existing or baseline condition restricts upstream migration of native steelhead and limits the biological productivity of Pilarcitos Creek, particularly in the reach of the creek immediately below Stone Dam. As described in the Draft PEIR (Vol. 1, Chapter 2, p. 2-24), the SFPUC is currently conducting an experimental release of several cubic feet per second at Stone Dam to determine whether such a release would improve conditions for steelhead and other plant and animal species. See also **Response S_CDFG2-18**.

SI_PilarCrk-06 The baseline condition for an EIR is the condition that existed at the time the Notice of Preparation for the EIR was published. The Notice of Preparation for the WSIP Draft PEIR was published in September 2005, and the baseline conditions represent SFPUC operations at that time. Experimental releases from Stone Dam were initiated in October 2006 and therefore are not included as part of the baseline condition.

SI_PilarCrk-07 This comment is a closing statement summarizing the more detailed comments presented in Comments SI_PilarCrk-02 through SI_PilarCrk-06; refer to **Responses SI_PilarCrk-02** through **SI_PilarCrk-06** for the specific responses.

Restore Hetch Hetchy; Committee to Save Lake Merced, Jerry Cadagan, Board Member/Founder, 09/30/07

SI_RHH1-01 This comment summarizes the standards for determining the legal sufficiency of an EIR under CEQA. More detailed comments related to the specific issues in which the commenter believes the Draft PEIR is inadequate are presented in Comments SI_RHH1-02 through SI_RHH1-07; refer to **Responses SI_RHH1-02** through **SI_RHH1-07** for the specific responses.

SI_RHH1-02 The commenter refers to Section 3.6.1 of the Draft PEIR (Vol. 1, Chapter 3, pp. 3-34 and 3-35), which states that under the WSIP during nondrought conditions, the SFPUC proposes to meet the increased 35 million gallons per day (mgd) in purchase requests through a combination of conservation, water recycling, and groundwater supply programs in San Francisco and increased diversions from the Tuolumne River. The commenter correctly notes that 10 mgd of this increase in purchase requests would be served through conservation, water recycling, and groundwater supply programs in San Francisco.

The comment is also correct in noting that the *Recycled Water Master Plan for the City and County of San Francisco* (RMC, 2006) identified a total annual average of 11.8 mgd in potentially feasible recycled water *demand*; however, the report does not describe 11.8 mgd of specific recycled water *projects* in sufficient detail for near-term implementation. Consistent with the CEQA Guidelines, the Draft PEIR summarizes the relevant information from this report (Vol. 1, Chapter 3, p. 3-22); the commenter is referred to the referenced report for a more detailed analysis of the potential for water recycling in San Francisco.

The report indicated that serving the identified recycled water demand requires consideration of user water quality needs and other implementation constraints, such as onsite retrofits, extent of the distribution system, acceptance by customers and regulatory agencies, and public perception. It identified a long-term alternative for distributing recycled water throughout San Francisco, but due to uncertainties associated with the SFPUC’s Sewer System Master Plan (still under development), particularly with regard to facilities and users in the northeast and southeast portions of the city, the report identified the most feasible, short-term projects as Phase 1 projects. Under the WSIP, the SFPUC would develop about 4 mgd of recycled water projects (through implementation of facility improvement project SF-3), which were identified as Phase 1 uses in the Recycled Water Master Plan. The report indicates that the remaining portions of the SFPUC’s preferred long-term alternative for recycled water may need to be adjusted in the future based on the outcomes of the Sewer System Master Plan and the maintenance and improvement of the Auxiliary Water Supply System

Bond Measure. Therefore, it would be speculative to assume any additional recycled water use in San Francisco as part of the WSIP until the SFPUC has identified, confirmed, and developed additional specific recycled water projects.

The information provided by the commenter regarding the status of San Francisco's water recycling record is acknowledged. The City and County of San Francisco currently uses a limited amount of recycled water (less than 1 mgd) for wastewater treatment plant process water and washdown operations; recycled water is also used in San Francisco for soil compaction and dust control during construction. Historically (from 1932 to 1981), San Francisco used recycled water for nonpotable uses; the McQueen Treatment Plant in Golden Gate Park supplied recycled water for irrigation and flow augmentation of the park's streams and lakes until the plant was shut down in 1981 (when it could not meet the current health standards), and groundwater generally replaced recycled water as the source for the park's irrigation water uses.

The comments regarding the adequacy of references used in the background report, *Recycled Water Master Plan for the City and County of San Francisco* (RMC, 2006), are noted.

SI_RHH1-03 The projected use of recycled water assumed under the WSIP for wholesale customers and the SFPUC (for the retail service area) is shown in Draft PEIR Table 3.3 (Vol. 1, Chapter 3, p. 3-18). (Note that the quantities shown reflect the amounts that would offset potable water supplies; additional recycled water projects that do not replace potable supplies, such as recycled water used for marsh or wetland restoration projects, are not shown in Table 3.3.) Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for more information on existing and planned recycled water projects, the recycled water studies undertaken as part of WSIP planning, and information in the Draft PEIR on this topic. Draft PEIR Table 9.11 (Vol. 4, Chapter 9, pp. 9-50 and 9-51) referenced by the commenter provides information about potential additional supplies from regional recycled water, groundwater, and conservation projects that were included as part of the Aggressive Conservation/Recycled Water and Local Groundwater Alternative, one of the WSIP alternatives evaluated in Draft PEIR Chapter 9. Also refer to **Section 14.10, Master Response on Modified WSIP Alternative** (Vol. 7, Chapter 14, Section 14.10.3) regarding the potential for additional recycling efforts by the SFPUC's wholesale customers included in this alternative beyond the amount assumed in the proposed program.

SI_RHH1-04 The alternatives analysis in the Draft PEIR includes a detailed evaluation of the Aggressive Conservation/Water Recycling and Local Groundwater Alternative (Vol. 4, Chapter 9, pp. 9-47 to 9-59). The water supply source for this alternative would include up to an additional 19 mgd of recycled water, groundwater, and conservation in the wholesale service area in addition to the 10 mgd of recycled water, groundwater, and conservation in San Francisco included under the proposed program. The level of detail presented in the PEIR is consistent with CEQA requirements and provides sufficient information to enable the public and decision-makers to weigh the relative merits of the alternatives and the proposed program. Refer to **Response L_TUD1-05** for discussion of Raker Act, Section 9(h).

SI_RHH1-05 The commenter correctly notes that Chapter 10 of the Draft PEIR lists 20 significant and unavoidable impacts that could result from implementation of the WSIP. Eighteen of the impacts are associated with the program-level analysis of the facility improvement projects, which was based on worst-case assumptions derived from preliminary project information. Therefore, the significance determinations made in the Draft PEIR are conservative for these impacts, and the project-level and site-specific environmental review of these projects may be determine that these effects can be avoided or mitigated to a less-than-significant level.

The other two impacts identified in the Draft PEIR as significant and unavoidable are related to the proposed WSIP water supply and system operations (one in the Alameda Creek watershed and the other in the Peninsula watershed). The SFPUC is currently investigating potential methods to reduce the severity of these impacts; however, as of the publication of the Draft PEIR, it was uncertain whether proposed mitigation could reduce the impacts to a less-than-significant level, so a conservative determination was made that the impacts would be significant and unavoidable. These two significant, unavoidable impacts related to water supply and system operations will be reevaluated as part of the project-level CEQA review of the WSIP facility improvement projects, or specifically, the Calaveras Dam Replacement (SV-2) and Lower Crystal Springs Dam Improvements (PN-4) projects.

SI_RHH1-06 The opinion of the commenter regarding his desire for the SFPUC or the San Francisco Board of Supervisors to cooperate in the removal of O'Shaughnessey Dam is acknowledged. The Draft PEIR (Vol. 4, Chapter 9, pp. 9-127 and 9-128) describes why the removal of O'Shaughnessy Dam is not considered an alternative to the WSIP and why it is not evaluated in detail in the Draft PEIR. Also refer to **Response SI_RHH4-01**.

SI_RHH1-07 Please refer to **Section 14.3, Master Response on Proposed Dry-Year Water Transfer** (Vol. 7, Chapter 14, Section 14.3.2) for detailed discussion related to this element of the proposed water supply option.

Restore Hetch Hetchy,
Bob Hackamack, Tech/Engineering Chair, 09/05/07

SI_RHH2-01 The Draft PEIR (Vol. 1, Chapter 2) presents a description and overview of the existing regional water system to provide context for understanding the WSIP and its potential environmental effects. The description refers to the 1912 Freeman Report (p. 2-36) only with respect to its implication regarding San Francisco's water rights, and does not include unnecessary explanation of the history of the regional system.

The opinion of the commenter that the system was built for "maximum hydroelectric profit" is acknowledged. The calculations of firm yield provided by the commenter are also acknowledged, but, as discussed below, the statement about hydroelectric profit is not consistent with the SFPUC's Water First Policy, and the commenter's calculations are not consistent with its firm yield calculations and rationing estimates.

The Draft PEIR describes the system firm yield under existing conditions as well as the design drought that the SFPUC uses for regional water system planning (Vol. 1, Chapter 2, p. 2-25). The design drought is a planning and operation tool that the SFPUC has defined as a reasonable worst-case drought scenario based on historical hydrology; employing a conservative approach to regional water system planning, the SFPUC uses a design drought based on the hydrology of the six years of the worst historical drought (1987–1992) coupled with the 2.5 years of the 1976–1977 drought, for a combined total of an 8.5-year design drought sequence. The design drought represents a drought sequence that is more severe than any on record, but the SFPUC considers it prudent to use such a scenario for planning purposes. The SFPUC designed the WSIP to achieve the level of service objectives for drought-year rationing (Vol. 1, Chapter 3, Table 3.5, p. 3-26) such that the regional water system could accommodate customer deliveries under hydrologic conditions equivalent to the design drought with a maximum of 20 percent systemwide rationing. This table shows that the system firm yield is 219 million gallons per day (mgd) under existing conditions and would be 256 mgd under the WSIP.

During a hypothetical design drought sequence, the SFPUC anticipates utilizing its entire portfolio of resources, including the use of stored groundwater and water purchases during the second year of drought. During the remainder of the drought, the SFPUC would continue to use these resources in combination with staged delivery reductions, but would not impose rationing of greater than 20 percent systemwide. The SFPUC considers this planning approach as a prudent method by which to plan for uncertainty in future hydrologic events.

Based on modeling conducted for the Draft PEIR using 82 years of historical hydrology, the SFPUC determined that there would be drought-year shortages in approximately 24 out of 82 years under the WSIP, but that 10 percent systemwide rationing would only be required in 6 out of 82 years, and 20 percent systemwide rationing in 2 out of 82 years (Vol. 4, Chapter 9, Table 9.5, p. 9-13). The regional water system would not experience any years with shortages greater than 20 percent over the 82-year hydrologic record. Note that Figure 2.5 in the Draft PEIR (Vol. 1, Chapter 2, p. 2-19) refers to *existing* conditions, and the commenter is referred to Figure 3.4 (Vol. 1, Chapter 3, p. 3-37) for *future* conditions with implementation of the WSIP.

SI_RHH2-02 Please refer to **Response SI_RHH2-01**.

SI_RHH2-03 The commenter's suggestions regarding capping diversions from the Tuolumne River and employing water efficiency, recycled water, groundwater banking, water purchases, and desalination of brackish water are acknowledged. As described in the Draft PEIR (Vol. 1, Chapter 3, pp. 3-33 to 3-39), the proposed program would expand the SFPUC's existing water supply portfolio to include recycled water, conservation, and groundwater projects in San Francisco, water transfers, and groundwater conjunctive use. The desalination of brackish water and seawater is evaluated under alternatives to the proposed program (Vol. 4, Chapter 9).

SI_RHH2-04 This comment, which supports the Aggressive Conservation/Water Recycling and Local Groundwater Alternative and alternatives that include groundwater banking and conjunctive use, desalination, and a lower Tuolumne River diversion, is acknowledged.

SI_RHH2-05 The commenter's suggestion regarding capping diversions from the Tuolumne River is acknowledged. Please refer to **Section 13.4, Phased WSIP Variant**, for a discussion of SFPUC's current planning approach to use of Tuolumne River water. As noted by the commenter, the WSIP includes a facility improvement project, San Joaquin Pipeline System project (SJ-3), that would construct portions of a fourth San Joaquin Pipeline to improve the reliability of the system, but the proposed improvement would limit the hydraulic capacity of the San Joaquin Pipeline System to 314 mgd (Vol. 1, Chapter 3, Table 3.10, p. 3-49). This is a minor increase compared to the capacity of the existing three San Joaquin Pipelines of 290 to 300 mgd (Vol. 1, Chapter 2, Table 2.2, p. 2-6).

SI_RHH2-06 The water supply objective presented at the scoping meeting remains the same as the one included in the Draft PEIR (Vol. 1, Chapter 3, Table 3.2, p. 3-9). This WSIP objective is to "improve use of new water sources and drought management, including use of groundwater, recycled water, conservation, and transfers." The WSIP would achieve this objective under the proposed program by expanding the SFPUC's existing water supply portfolio to include recycled water, conservation, and groundwater projects in San Francisco, water transfers, and groundwater conjunctive use (Vol. 1, Chapter 3, pp. 3-33 to 3-39).

Refer to **Response L_TUD1-05** for discussion of Raker Act Section 9(h).

Restore Hetch Hetchy, Bob Hackamack, Tech/Engineering Chair, 09/05/07

[See Public Hearing Transcript, Sonora, pp. 21–22]

SI_RHH3-01 This comment, which expresses the opinion that the SFPUC regional water system was built for "maximum hydroelectric profit" and not according to John Freeman's vision, is acknowledged. Please refer to **Response SI_RHH2-01** for response.

SI_RHH3-02 This comment opposing any additional Tuolumne River diversions is acknowledged.

SI_RHH3-03 The commenter states that the Raker Act requires San Francisco to utilize local water sources before increasing Tuolumne River diversions. Please refer to **Response L_TUD1-05** for a discussion of Raker Act Section 9(h).

Restore Hetch Hetchy; Committee to Save Lake Merced, Jerry Cadagan, Board Member/Founder, 09/05/07

[See Public Hearing Transcript, Sonora, pp. 23–25]

SI_RHH4-01 The commenter's suggestion that the PEIR include a mitigation measure in which the SFPUC would agree to cooperate in the restoration of Hetch Hetchy Valley is acknowledged. CEQA Guidelines Section 15126.4 states that "an EIR shall describe feasible measures which could minimize significant adverse impacts, including where relevant, inefficient and unnecessary consumption of energy." An agreement to cooperate in the restoration of Hetch Hetchy Valley would not provide any physical measures that would address significant adverse impacts identified in the Draft PEIR. The concept of removing O'Shaughnessy Dam and restoring Hetch Hetchy Valley is not reasonably related to a reduction or elimination of the significant impacts of the WSIP, but such a concept suggests far greater changes than those necessary to address any impacts the WSIP would cause on the Tuolumne River and related resources. The concept of restoring Hetch Hetchy Valley—while at the same time providing equivalent water and power to the SFPUC in an alternative manner—would likely in itself result in numerous, significant environmental impacts associated with construction and operation of unknown new storage, conveyance, and treatment facilities at unknown locations, and it would likely require increased long-term energy requirements compared to the existing regional system.

SI_RHH4-02 The commenter requests clarification regarding the 10 mgd of water that would be provided by the WSIP through recycling, conservation, and groundwater extraction. The commenter requests that the PEIR address this issue relative to the 11.8 mgd of recycled water that the City and County of San Francisco's *Recycled Water Master Plan* indicates could be generated. Please refer to Section 3.6.1 of the Draft PEIR (Vol. 1, Chapter 3, pp. 3-34 and 3-35), which states that the WSIP would provide about 2 mgd through local groundwater development, 4 mgd through recycled water projects, and 4 mgd through additional water conservation measures.

Also, please refer to **Response SI_RHH1-02** regarding the 11.8 mgd of recycled water proposed in the *Recycled Water Master Plan* and the relationship of this plan to the WSIP and Draft PEIR.

Santa Clara County Creeks Coalition, Mondy Lariz, 09/28/07

SI_SCCCC-01 This comment opposing any additional Tuolumne River diversions is acknowledged.

SI_SCCCC-02 This comment, which states that the demand modeling in the Draft PEIR is flawed and inflates projected future needs, was submitted by numerous commenters; please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2).

SI_SCCCC-03 This comment requests that additional studies of the Tuolumne River be conducted before the PEIR is finalized is acknowledged. Please refer to **Response SI_Caltrout-01** for response.

SI_SCCCC-04 This comment expresses support for the Aggressive Conservation/Water Recycling and Local Groundwater Alternative (No Supplemental Tuolumne River Water) and the Year-round Desalination at Oceanside Alternative, and promotes additional conservation, efficiency, and recycling to prevent additional Tuolumne River diversions. Comment noted.

Coalition for San Francisco Neighborhoods, Joan Girardot, 09/20/07

[See Public Hearing Transcript, San Francisco City Hall, pp. 27–29]

SI_SFNeigh-01 The commenter states that the historical tables indicate that the average delivery from the regional system is about 240 million gallons per day (mgd) rather than 261 mgd for the 2001 baseline water demand, and that the increase to 300 mgd by 2030 is a much larger increase if the starting point is 240 mgd. The commenter requests that the historical table be included in the PEIR.

Consistent with the information provided by the commenter, the Draft PEIR (Vol. 1, Chapter 2, p. 2-37) states that, from fiscal year 1968 to 2004, annual deliveries to SFPUC customers averaged about 248 mgd. This amount represents an average of deliveries over 36 years, a period that resulted in increased population growth as well as changes in water use patterns in the Bay Area; this period includes two severe droughts, the 1976–1977 and 1987–1992 droughts, during which time deliveries were reduced due to supply shortages, and rationing was imposed. The information on historical deliveries is presented graphically in the Draft PEIR in Figure 7.3 (Vol. 4, Chapter 7, p. 7-17), which the San Francisco Planning Department has determined to be a sufficient level of detail for the PEIR.

Also consistent with the information provided by the commenter, the Draft PEIR (Vol. 1, Chapter 3, p. 3-17) states that in fiscal year 2000/2001 about 261 mgd was purchased from the SFPUC regional system. The 2000/2001 period was selected as the base year for the demand projections because it represented a typical year in terms of both rainfall and economic conditions (Vol. 1, Chapter 3, p. 3-20).

SI_SFNeigh-02 This comment corroborates information presented in the Draft PEIR that the projected increase in demand (as well as the increase in water purchases) will occur in the wholesale service area rather than San Francisco (the retail service area), as shown in Draft PEIR Table 7.3 (Vol. 4, Chapter 7, p. 7-18).

Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.9) for an explanation of the relationship between the average annual increase in purchase requests and the average annual increase in Tuolumne River diversions.

The commenter's reference to average residential water use within San Francisco is consistent with historical per-capita consumption information prepared by the SFPUC.[1] This information shows that 61 gallons per capita per day (gpcd) was the median total residential consumption in the retail service area for the years 1988/1989 to 2003/2004 (SFPUC, 2006, p. 128). The SFPUC also prepared historical per-capita information for the wholesale service area, which provides weighted average per-capita consumption for fiscal years 1985/1986 to 2001/2002. The median of the weighted average residential per-capita consumption over this period was 92 gpcd (SFPUC, 2006, p. 144). The commenter's assertion that 61.19 gpcd is 12 percent below what the Environmental Protection Agency recommends for indoor usage is noted. The comment also states that outdoor use in San Francisco is negligible. According to information prepared by the SFPUC (SFPUC, 2006, p. 106), external water use for single-family residences in the retail service area is projected to account for approximately 1 percent of consumption in 2030 (1.5 gallons per day per account [gpda] of a total of 132.8 gpda), and external water use for multifamily residences is expected to be negligible. This comment suggests that a table comparing the per-capita water use of the wholesale customers be included in the PEIR. Please refer to Table 5 and Table 6 in Comment SI_PacInst-68. Table 5 shows base-year 2001 ("current") and projected 2030 single-family residential per-capita consumption, and Table 6 shows 2001 and 2030 multifamily residential per-capita consumption. The SFPUC has verified the information in these tables, which appear to be based on information prepared by the SFPUC (SFPUC, 2006a, pp. 150 and 156). By virtue of being included in the Pacific Institute comment on the Draft PEIR, this information is included in the PEIR.

SI_SFNeigh-03 Historical information from the SFPUC confirms that 61 gpcd was the median total residential consumption for the years 1988/1989 to 2003/2004 (see **Response SI_SFNeigh-02**), and the SFPUC projects that residential per-capita consumption in 2030 will be 52 gpcd with implementation of plumbing codes, without additional conservation, and will be 50 gpcd with plumbing codes, with additional planned conservation (SFPUC, 2006, pp. 129 and 130). As shown in **Table 14.2-5** in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3), the projected estimated 2030 water savings from conservation and recycling would be shared among the wholesale and retail customers. The table indicates that wholesale customers would contribute about 47 to 50 mgd in water savings from conservation and recycling by 2030, while the retail customers would contribute about 11 to 20 mgd.

[1] The SFPUC prepared per-capita information in response to specific requests by participants at the September 2006 Sustainable Water Supply Briefing; for more information, refer to the introduction to the responses to comments submitted by the Pacific Institute (SI_PacInst).

Sierra Club, Tuolumne Group, Blaine Rogers, 09/24/07

SI_SierraC1-01 This comment discusses the uses of Tuolumne River water by natural systems and by rural and urban users, and promotes increased conservation, recycling, and efficiency to prevent the need for additional Tuolumne River diversions. Comment noted. This comment requests that additional studies of the Tuolumne River be conducted before the PEIR is finalized is acknowledged. Please refer to **Response SI_Caltrout-01** for response.

Sierra Club, Sandra Wilson, Chair, 09/06/07

[See Public Hearing Transcript, Modesto, pp. 27–29]

SI_SierraC2-01 The commenter states concerns about salmon and wildlife habitat on the lower Tuolumne River below La Grange Dam, including the Tuolumne River Regional Park and the marsh habitat at the San Joaquin Wildlife Refuge for wintering Aleutian Canada geese. The commenter is correct that under the WSIP flows in the Tuolumne River would be reduced by an average of less than 10 percent during the winter months (Draft PEIR, Vol. 3, Chapter 5, p. 5.3.1-34), although reductions could be as much as 25 percent. Reductions would occur primarily in wet and above-normal rainfall years and would not affect releases in critically dry years when minimum releases are mandated. Under the WSIP, delayed spring releases and reductions in average peak flows and total flow would incrementally affect riparian communities and could also reduce stand diversity and incrementally reduce suitable conditions for the recruitment of some riparian species (Vol. 3, Chapter 5, p. 5.3.7-25). Because these impacts would take place incrementally in an already stressed system, they were determined to be potentially significant. Several mitigation measures were proposed to offset these impacts. Mitigation Measure 5.3.6-4a (Vol. 4, Chapter 6, p. 6-48) would avoid changes in flow by reducing demand for Don Pedro Reservoir water, thus offsetting the anticipated impacts due to increased diversions. If this measure is not feasible, Mitigation Measure 5.3.7-6 (Vol. 4, Chapter 6, p. 6-50) would provide for riparian habitat enhancement on the lower Tuolumne River.

SI_SierraC2-02 This comment expresses concern for potential effects on the San Joaquin Wildlife Refuge as a result of reduced flows. Please refer to **Section 14.8, Master Response on Delta and San Joaquin River Issues** (Vol. 7, Chapter 14, Section 14.8.3) for a relevant response to the effects of the WSIP on to the San Joaquin River and Delta.

SI_SierraC2-03 Please see **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14) for additional discussion of climate change to augment the discussion presented in Section 5.7.6 of the Draft PEIR (Vol. 3, Chapter 5, pp. 5.7-92 to 5.7-96). Section 14.11 provides more detailed and up-to-date information on climate change as it relates to the SFPUC regional water supply and the proposed WSIP.

Sierra Club, Bill Young, Member, 09/19/07

[See Public Hearing Transcript, Palo Alto, pp. 18–20]

SI_SierraC3-01 This comment is an opening statement regarding the Sierra Club's detailed comments presented in Comments SI_SierraC3-02 through SI_SierraC3-04; refer to **Responses SI_SierraC3-02** through **SI_SierraC3-04** for the specific responses.

SI_SierraC3-02 The commenter's opinion with respect to the need for decreasing reliance on the Tuolumne River and local creeks, such as Pilarcitos Creek, and the need for comprehensive watershed studies is acknowledged. The San Francisco Planning Department believes that comprehensive watershed studies, while desirable, are not needed to make an adequate analysis of the environmental impacts of the WSIP. Although comprehensive data on all of the SFPUC water supply watersheds may not be available at this time, sufficient information is available to evaluate the potential for the WSIP to result in significant effects on rivers and creeks and their related resources located downstream of the SFPUC reservoirs. As described in the Draft PEIR (Vol. 3, Chapter 5, Section 5.1.4), the approach to analyzing potential impacts on these resources is based first on the analysis of changes in stream flow and reservoir water levels that would occur under the WSIP compared to the existing condition. This analysis, combined with basic information on the watersheds and scientific understanding of the resources, was sufficient to make an adequate evaluation of the environmental impacts of the WSIP. Refer also to **Response SI_Caltrout-01** for further discussion.

SI_SierraC3-03 Please refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14), which provides detailed and up-to-date information on climate change as it relates to the SFPUC regional water supply and the proposed WSIP. Also refer to the discussion presented in Section 5.7.6 of the Draft PEIR (Vol. 3, Chapter 5, pp. 5.7-92 to 5.7-96).

SI_SierraC3-04 The proposed program would expand the SFPUC's current water supply portfolio and includes groundwater projects, recycled water projects, additional conservation measures, water transfers, and conjunctive water use (see Draft PEIR Vol. 1, Chapter 3, pp. 3-33 to 3-39). The commenter is correct in noting that the proposed program would increase diversions from the Tuolumne River.

This comment, which states that the Sierra Club believes there are more cost-effective and less environmentally harmful ways to secure and maintain a clean, reliable water supply, is acknowledged. The comment expressing support for increased water efficiency in urban and agricultural sectors, use of groundwater storage, and safe expansion of water reclamation and water recycling is also noted. The commenter's suggestion that the SFPUC invest in the most efficient water resources, a more diverse mix of water supplies, and reduce consumption is noted as well.

Sierra Club, Richard Zimmerman, Member, 09/19/07

[See Public Hearing Transcript, Palo Alto, pp. 20–23]

SI_SierraC4-01 This comment expressing support for seismic improvements to the regional water system is acknowledged.

SI_SierraC4-02 The comment that water conservation is the cheapest, easiest, and least destructive way to meet future demand was submitted by numerous commenters; for a discussion of this topic, please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) under the heading Frequently Submitted Comments Addressing Conservation and Recycling. Numerous commenters also asserted that the Bay Area lags behind other areas in terms of reducing water consumption; for a response to this comment, refer to the discussion of wholesale customers' per-capita water use under Frequently Submitted Comments Addressing Conservation and Recycling in Section 14.2.3.

The opinion expressed in this comment that the SFPUC must provide strong leadership to make water conservation a fact in the Bay Area is acknowledged. Refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects proposed by SFPUC and its wholesale customers.

SI_SierraC4-03 This comment correctly states that the SFPUC projects a 19 percent increase in water demand in the wholesale customer service area, as shown in Draft PEIR Table 7.3 (Vol. 4, Chapter 7, p. 7-18). With implementation of planned conservation measures, projected 2030 demand would be 308 to 311 million gallons per day (as shown in Table 7.2 in Vol. 4, Chapter 7, p. 7-15), representing a 14 percent increase over 2001 base-year demand. In addition to the 19 percent increase in population forecasted for the wholesale customer service area mentioned in this comment, employment is projected to increase by 31 percent (refer to Table 7.4 in Vol. 4, Chapter 7, p. 7-20). The comment correctly states that a decrease in demand is projected in the retail service area (as shown in Table 7.3).

Regarding the comment about projected outdoor water use, please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2) under the heading Outdoor Water Use.

Numerous comments were submitted regarding the level of conservation achieved in other areas; for a discussion of this topic, please refer to

Section 14.2, Master Response on Demand Projections, Conservation, and Recycling (Vol. 7, Chapter 14, Section 14.2.3) under the heading Frequently Submitted Comments Addressing Conservation and Recycling. Also refer to **Response SI_PacInst-72** regarding comparisons to Las Vegas, Nevada and Austin, Texas.

Sierra Club, Gwynn MacKellen, Member, 09/20/07

[See Public Hearing Transcript, San Francisco City Hall, September 20, 2007, pp. 11–12]

SI_SierraC5-01 This comment expresses the Sierra Club's opposition to any additional Tuolumne River diversions and states that Sierra Club members and other members of the public submitted 800 comment cards expressing opposition to such diversions. See Comment Letter C_Form2 for a sample of the comment cards submitted by the Sierra Club at the September 20, 2007 public hearing in San Francisco on behalf of Sierra Club members and other members of the public. Please refer to **Response C_Form2-01** for the specific response.

Sierra Club, San Francisco Bay Chapter, John Rizzo, Executive Committee Member, 09/20/07

[See Public Hearing Transcript, San Francisco City Hall, September 20, 2007, pp. 25–27]

SI_SierraC6-01 This comment opposes any additional Tuolumne River diversions and states that the Sierra Club would submit formal comments on the Draft PEIR in conjunction with other environmental groups. Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.9) for an explanation of the relationship between the average annual increase in purchase requests and the average annual increase in Tuolumne River diversions. Refer to Comment Letter SI_TRT-CWA-SierraC for comments on the Draft PEIR submitted by the Tuolumne River Trust, Clean Water Action, and the Sierra Club; see **Responses SI_TRT-CWA-SierraC-01** through **SI_TRT-CWA-SierraC-199** for the specific responses.

SI_SierraC6-02 This comment states that additional review is necessary "to bring the impacts of the growth number up to 2030 and also to review the impacts of the ABAG [projections] which only go to 2025." Please refer to **Section 14.2, Master Response on Demand Projections, Conservation and Recycling**, under the heading Employment Projections – Use of ABAG's Projections 2002 (Vol. 7, Chapter 14, Section 14.2.2).

SI_SierraC6-03 This comment states that there is a lack of adequate baseline data for the Tuolumne River to properly analyze the environmental consequences of additional diversions on river flows and fisheries. Please refer to **Response SI_Caltrout-01** for response.

Sierra Club-San Francisco Bay Chapter, John Rizzo, Executive Committee Member, 10/11/07

[See Public Hearing Transcript, San Francisco City Hall, October 11, 2007, pp. 42–44]

SI_SierraC7-01 This comment expresses support for seismic improvements to the regional water system and states that the comments that follow (SI_SierraC7-02 through SI_SierraC7-13) focus on impacts related to increased Tuolumne River diversions. Refer to **Responses SI_SierraC7-02** through **SI_SierraC7-13** for the specific responses.

Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.9) for an explanation of the relationship between the average annual increase in purchase requests and the average annual increase in Tuolumne River diversions.

The designation of the Tuolumne River as a wild and scenic river is discussed in Draft PEIR Section 5.2 (Vol. 3, Chapter 5, p. 5.2-8).

SI_SierraC7-02 This comment states that the analysis of impacts on the Tuolumne River inside Yosemite National Park as a result of changes in releases from O'Shaughnessy Dam is inadequate. As described in the Draft PEIR (Vol. 1, Chapter 2, pp. 2-33 and 2-34), the Raker Act granted to the City and County of San Francisco rights-of-way and use of public lands in the affected areas to construct, operate, and maintain facilities for developing and using water and power; these public lands include lands within Yosemite National Park. The Draft PEIR analyzes the potential impacts on environmental resources within Yosemite National Park associated with changes in Hetch Hetchy Reservoir levels and changes in releases from O'Shaughnessy Dam (see Vol. 3, Section 5.3). The analysis includes impacts on stream flow, geomorphology, water quality, groundwater, fisheries, terrestrial biological resources, recreation, and visual resources. Refer also to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14) for additional information regarding the impact analysis for the upper Tuolumne River.

SI_SierraC7-03 The comment that "growth statements" rely on published studies that don't cover the time period up to 2030 and have not undergone environmental review apparently refers to the use of ABAG's *Projections 2002* in the water demand models, and repeats issues raised in Comment SI_SierraC6-02. Please refer to **Response SI_SierraC6-02**.

SI_SierraC7-04 This comment states that there is a lack of adequate baseline data for the Tuolumne River to properly analyze the environmental consequences of additional diversions on river flows and fisheries. Please refer to **Response SI_Caltrout-01** for response.

SI_SierraC7-05 As indicated in the Draft PEIR, the analysis determined that impacts of the WSIP on stream flow in the Tuolumne River would be less than significant (Vol. 3, Chapter 5, Impacts 5.3.1-1 [pp. 5.3.1-21 to 5.3.1-28] and 5.3.1-4 [pp. 5.3.1-30 to 5.3.1-38]), and no mitigation measures are required. In addition, the analysis determined that impacts of the WSIP on fishery resources would be less than significant in the Tuolumne River between Hetch Hetchy and Don Pedro Reservoirs (Vol. 3, Chapter 5, Impact 5.3.6-2, pp. 5.3.6-26 to 5.3.6-28), and no mitigation measures are required. However, the analysis determined that impacts of the WSIP on fishery resources would be potentially significant in the Tuolumne River below La Grange Dam (Vol. 3, Chapter 5, Impact 5.3.6-4, pp. 5.3.6-28 to 5.3.6-33), but implementation of Mitigation Measures 5.3.6-4a or 5.3.6-4b (Vol. 4, Chapter 6, pp. 6-48 to 6-49) would reduce this impact to a less-than-significant level. Please also refer to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14) for further discussion of mitigation for potential impacts on fisheries, and additional discussion of Measures 5.3.6-4a and 5.3.6-4b, including text revisions to Measure 5.3.6-4b that add further definition to the habitat enhancement effort.

SI_SierraC7-06 Please refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14) for additional discussion of climate change to augment the discussion presented in Section 5.7.6 of the Draft PEIR (Vol. 3, Chapter 5, pp. 5.7-92 to 5.7-96). **Section 14.11** of this document provides more detailed and up-to-date information on climate change as it relates to the SFPUC regional water supply and the proposed WSIP.

SI_SierraC7-07 This comment asserting that demand projections are faulty has been submitted by numerous commenters; please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2).

SI_SierraC7-08 Refer to **Section 14.8, Master Response on Delta and San Joaquin River Issues** (Vol. 7, Chapter 14).

SI_SierraC7-09 The reference to the San Francisco Board of Supervisors resolution is acknowledged. It is assumed that the commenter is referring to Resolution No. 321-07 dated June 12, 2007, which urges environmental analysis of water supply alternatives that will not increase diversions of freshwater from the Tuolumne River as well as active implementation of conservation and recycled water programs. The PEIR is consistent with this resolution in that it evaluates two alternatives that would not increase diversions from the Tuolumne River: the Aggressive Conservation/Water Recycling and Local Groundwater

Alternative (see Vol. 4, Chapter 9, Section 9.2.4, pp. 9-47 to 9-59), No Supplemental Tuolumne River Water; and the Year-round Desalination at Oceanside Alternative (see Vol. 4, Chapter 9, Section 9.2.6, pp. 9-66 to 9-74). In addition, the WSIP includes 10 million gallons per day of recycled water, conservation, and groundwater projects as part of the proposed water supply option.

SI_SierraC7-10 This comment references Comment Letter S_CDFG2, dated October 1, 2007. Please refer to **Responses S_CDFG2-05** and **S_CDFG2-06** for specific responses.

SI_SierraC7-11 This comment references Comment Letter S_CDFG2, dated October 1, 2007. Please refer to **Response S_CDFG2-02** for response.

SI_SierraC7-12 Please refer to **Response L_Tuol1-02** regarding the Tuolumne County Board of Supervisors' resolution formalizing the Board's opposition to the increased diversions from the Tuolumne River.

SI_SierraC7-13 This comment, which recommends dropping the proposed increased diversions of Tuolumne River water from the WSIP, is acknowledged.

San Francisco Planning and Urban Research Association, Laura Tam, Sustainable Development Policy Director, 10/01/07

SI_SPUR-01 This comment is an overview statement of the comments submitted by the San Francisco Planning and Urban Research Association (SPUR). The specific comments are presented in Comments SI_SPUR-02 through SI_SPUR-07; refer to **Responses SI_SPUR-02** through **SI_SPUR-07** for the specific responses.

SI_SPUR-02 This comment expressing SPUR's support of the seismic improvements to the regional water system is acknowledged. Please refer to **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Section 14.1.2) for a more detailed discussion of the overall need for the WSIP and of the potential consequences of not implementing the seismic facility improvements.

SI_SPUR-03 This comment, which recommends more robust implementation of conservation and efficiency measures by the SFPUC's retail and wholesale customers, is acknowledged. Some of the information presented in the comment regarding projected changes in water demand, population, and employment requires clarification. As shown in Draft PEIR Table 7.4 and Table 7.10 (Vol. 4, Chapter 7, p. 7-20 and p. 7-33, respectively), population in the wholesale customer service area is expected to increase by 19 percent by 2030 (as the comment states) and employment is expected to increase by 31 percent (not 30 percent). As the comment states, water demand in the wholesale service area is projected to increase by 19 percent (refer to Draft PEIR Table 7.3 and Table 7.10, Vol. 4, Chapter 7, p. 7-18 and p. 7-33, respectively). Both population and employment growth were factored into the demand model; the suggestion that growth in demand is driven exclusively by increased employment does not appear to be based on information in the Draft PEIR, except insofar as more employment than population growth is expected. Regarding the employment projections assumed in the demand models, as well as expectations regarding per-capita demand, refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2).

The comment correctly notes that water savings are projected to result from active and passive conservation and from planned recycled water projects; expected savings from these components are shown Tables 14.2-5 and 14.2-9 of **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2). The 2030 purchase estimates submitted by the SFPUC and its wholesale customers do not assume any water savings from desalination projects (refer to Draft PEIR Table 7.2, Vol. 4, Chapter 7, p. 7-18), although the Draft PEIR analyzes the use of desalination technologies as a supplemental water supply in the discussions for the

Year-round Desalination at Oceanside Alternative (Vol. 4, Chapter 9, Section 9.2.6) and Variant 2 – Regional Desalination for Drought (Vol. 4, Chapter 9, Section 9.2.7).

Both population and employment in San Francisco are projected to increase, as this comment notes. As shown in Draft PEIR Table 7.10 (Vol. 4, Chapter 7, p. 7-33), population is projected to increase by 12 percent, employment is projected to increase by 25 percent, and water demand is projected to decrease very slightly (0.2 percent). The 11 percent decline referenced in this comment refers to the change in water "purchases" (that is, surface water supplies from the SFPUC regional system), as shown in Draft PEIR Table 7.3 (Vol. 4, Chapter 7, p. 7-18). The SFPUC retail demand will be met through regional water system supplies that include surface water, recycled water, and groundwater, as well as conservation.

The commenter's opinion—that the "environmentally superior alternative" identified in the Draft PEIR represents a better approach, that the WSIP should exceed or meet the California Urban Water Conservation Council (CUWCC) Best Management Practices (BMPs) for water conservation, and that all agencies should continuously be improving their conservation practices—is acknowledged. Please refer to Tables 14.2-3 and 14.2-4 in **Section 14.2, Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2) regarding the CUWCC BMPs and other conservation measures that are being implemented or planned by the SFPUC and its wholesale customers. Regarding the recommendation that the environmentally superior alternative be more fully described and evaluated, refer to **Section 14.10, Master Response on Modified WSIP Alternative** (Vol. 7, Chapter 14).

SI_SPUR-04 Please refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14) for additional discussion of climate change to augment the discussion presented in Section 5.7.6 of the Draft PEIR (Vol. 3, Chapter 5, pp. 5.7-92 to 5.7-96). Section 4.11 provides information on climate change as it relates to the SFPUC regional water supply and the proposed WSIP.

SI_SPUR-05 SPUR's request that climate change be examined, but not at the expense of the seismic improvements to the regional water system, is acknowledged. Please refer to Section 5.7.6 of the Draft PEIR (Vol. 3, Chapter 5, pp. 5.7-92 to 5.7-96) and **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14). Section 14.11 provides more detailed and up-to-date information on climate change as it relates to the SFPUC regional water supply and the proposed WSIP.

SI_SPUR-06 This comment expressing support for the Modified WSIP Alternative is acknowledged.

SI_SPUR-07 Please refer to **Section 14.6, Master Response on Upper Tuolumne River Issues,** and **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14) for relevant response related to the WSIP's impacts on Tuolumne River flows, including the effects of the proposed program on biological and fishery resources.

This comment stating the need for the regional water system to be as robust as possible for any future climate scenario is acknowledged. Refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14, Section 14.11.5) for a discussion of SFPUC actions to evaluate its water supply planning with respect to climate change effects.

State Water Contractors, Terry Erlewine, General Manager, 09/25/07

SI_SWC-01 This comment addresses concerns that the Draft PEIR does not adequately address the potential indirect effects of the WSIP on the State Water Project (SWP) operated by the Department of Water Resources (DWR) or the indirect effects on Delta water quality and SWP supply. Please refer to **Section 14.8, Master Response on San Joaquin River and Delta Issues** (Vol. 7, Chapter 14, Section 14.8.3) for a review of the PEIR analysis of these issues and additional information about the potential effects on Central Valley Project (CVP) and SWP operations and related indirect environmental effects.

SI_SWC-02 This comment supporting the environmentally superior alternative and encouraging additional environmental analysis due to the likely significant impacts associated with implementation of the WSIP is acknowledged. Please refer to **Section 14.10, Master Response on Modified WSIP Alternative** (Vol. 7, Chapter 14, Section 14.10.3) for additional information regarding updated model results for the proposed WSIP and Modified WSIP Alternative.

SI_SWC-03 This comment recommends two options: (1) that the SFPUC adopt the Modified WSIP Alternative as the preferred alternative, or (2) that the SFPUC provide an updated analysis of the proposed WSIP that would include adjusting the timing of Don Pedro Reservoir refill in order to reduce the scale of monthly flow reductions in the Tuolumne River below La Grange Dam and to coincide with periods of excess conditions in the Delta. Please refer to **Section 14.8, Master Response on San Joaquin River and Delta Issues** (Vol. 7, Chapter 14, Section 14.8.3) for further discuss on WSIP effects on CVP and SWP operations. The PEIR determined that WSIP effects on the CVP and SWP operations would be less than significant and no mitigation is required. However, Mitigation Measure 5.3.6-4a (Avoidance of Flow Changes By Reducing Demand for Don Pedro Reservoir Water) proposed to address WSIP effects on fisheries and riparian habitat in the Lower Tuolumne River (which calls for the SFPUC to acquire conserved water for the proposed water transfer element of the WSIP), would also further reduce WSIP effects on the San Joaquin River and the Delta.

Tuolumne County Farm Bureau, Stan Kellogg, President, 09/05/07

[See Public Hearing Transcript, Sonora, pp. 10–11]

SI_TCFB-01 This comment opposing any additional Tuolumne River diversions is acknowledged.

Tuolumne River Outfitters Association, Stephen Welch, President, 10/01/07

SI_TROA-01 This comment, which opposes any changes to the SFPUC regional water system that could potentially degrade the quality of the Tuolumne River Outfitters Association's (TROA) trips, is acknowledged. The commenter notes that the proposed withdrawals from the Tuolumne River could be detrimental to TROA's business while also recognizing that the SFPUC and TROA have worked together successfully to develop an understanding of each entity's needs and constraints. The San Francisco Planning Department and the SFPUC recognize the importance of reliable and adequate river flows to the commercial outfitters. In the Draft PEIR, the San Francisco Planning Department concluded that the WSIP would have a less-than-significant impact on whitewater rafting (Vol. 3, Chapter 5, pp. 5.3.8-27 to 5.3.8-32). The SFPUC would continue to work cooperatively with the commercial outfitters, as it does currently, whether or not the WSIP is implemented.

SI_TROA-02 The commenter notes that the Draft PEIR accurately describes the situation with respect to rafting flows and the working relationship between the SFPUC and the commercial rafting outfitters (Vol. 3, Chapter 5, pp. 5.3.8-9 and 5.3.8-10). The San Francisco Planning Department and the SFPUC acknowledge that the flows referred to as "minimum" and "adequate" are less than those preferred by the rafting outfitters and have noted the information provided by the commenter regarding TROA's opinion on optimal flow conditions.

SI_TROA-03 The commenter, who represents expert opinion with respect to commercial rafting on the Tuolumne River, offers the following correction, which the San Francisco Planning Department accepts. In response to this comment, the following text from the Draft PEIR (Vol. 3, Chapter 5, p. 5.3.8-10, third full paragraph) is revised as follows:

> ~~A 900-cfs~~ A 1,100-cfs flow at Lumsden Campground is the minimum required for whitewater paddle boats and oar boats; a ~~600-cfs~~ 900-cfs flow is the minimum required for kayaks~~ and oar boats~~, and a ~~1,200-cfs~~ 1,500- to 2,000-cfs flow is considered optimal. The commercial outfitters prefer ~~a six-hour~~ an eight-hour release, but a ~~three-hour~~ four-hour release allows them to launch one-, two- and three-day trips.

SI_TROA-04 The commenter expresses hope that the current "minimum" flows and the potential for future "optimal" flows would not be jeopardized by the WSIP. As noted in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.3.8-27 to 5.3.8-32), the WSIP would have a less-than-significant impact on whitewater rafting. The potential for future optimal flows would be the same with or without the WSIP.

Tuolumne River Trust, Amy Meyer, Founding Member, 09/28/07

SI_TRT1-01 This comment opposes any additional Tuolumne River diversions and promotes additional conservation and water recycling. Comment noted. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for information related to conservation programs and recycling projects proposed by the SFPUC and its wholesale customers.

SI_TRT1-02 This comment, which states that the SFPUC's pricing structure does not encourage enough conservation and recycling, is acknowledged. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) under the heading Conservation Measures Suggested by Commenters for a discussion of conservation pricing.

Tuolumne River Trust, Cynthia King, Sierra Nevada Program Director, 09/05/07

[See Public Hearing Transcript, Sonora, pp. 14–16]

SI_TRT2-01 This comment states that there is a lack of adequate baseline data for the Tuolumne River to properly analyze the environmental consequences of additional diversions on river flows, fisheries, riparian habitat, and associated species. Please refer to **Response SI_Caltrout-01** for a response to this comment.

SI_TRT2-02 This comment states that the demand projections are flawed because they use outdated employment projections and ignore the effect of price increases on future demand. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2) for additional information.

SI_TRT2-03 Please refer to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Sections 14.7.8 and 14.7.9) for an expanded discussion of Mitigation Measures 5.3.6-4a and 5.3.6-4b, including text revisions to Measure 5.3.6-4b that add further definition to the habitat enhancement effort.

Tuolumne River Trust, Galen Weston, Part-time Employee, 09/05/07

[See Public Hearing Transcript, Sonora, pp. 25–29]

SI_TRT3-01 Please refer to **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Section 14.1.5) for relevant response related to the integration of the seismic improvements and water supply option to meet program objectives. Also refer to **Section 14.5**, **Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.9) for an explanation of the relationship between the average annual increase in purchase requests and the average annual increase in Tuolumne River diversions. This comment also refers to the San Francisco Board of Supervisor's Resolution No. 321-07, dated June 12, 2007, in which the Board urges the SFPUC to fully analyze water supply alternatives that would not result in increased Tuolumne River diversions. The Draft PEIR evaluated alternatives that do not propose additional diversions from the Tuolumne River, including the Year-round Desalination at Oceanside Alternative (Vol. 4, Chapter 9, Section 9.2.4) and the Aggressive Conservation/ Water Recycling and Local Groundwater Alternative (With No Supplemental Tuolumne River Water) (Vol. 4, Chapter 9, Section 9.2.6). Also refer to **Section 13.4, Phased WSIP Variant** (Vol. 7, Chapter 13) for new information related to a variation of the program, called the Phased WSIP Variant, in which the SFPUC would meet only the current Master Sales Agreement commitment of serving the SFPUC wholesale customers up to 184 million gallons per day (mgd) through 2018, at which time the SFPUC would reevaluate the wholesale customer supply delivery and future water supplies.

SI_TRT3-02 Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2) for pertinent responses related to future demand projections and to conservation programs and recycling projects proposed by the SFPUC and its wholesale customers. The commenter expresses concern regarding the WSIP's compliance with the Raker Act of 1913. However, the City and County of San Francisco believes that the WSIP is consistent with the Raker Act, including Section 9(h), with respect to the export of additional water from the Tuolumne River watershed, since the additional diversions under the WSIP would be for municipal and domestic purposes. Please also refer to **Response L_TUD1-05** for additional information.

SI_TRT3-03 This comment states that the baseline data used in the Draft PEIR to analyze impacts on the Tuolumne River related to proposed changes in water supply sources and regional water system operations is inadequate. Please refer to **Response SI_Caltrout-01** for a response to this comment.

SI_TRT3-04 Mitigation Measure 5.3.6-4a, Avoidance of Flow Changes by Reducing Demand for Don Pedro Reservoir Water, is proposed to lessen the impacts of the WSIP on fishery and biological resources in the lower Tuolumne River below La Grange Dam (Vol. 4, Chapter 6, p. 6-48). The measure would involve actions that prevent the WSIP from causing water levels in Don Pedro Reservoir to be drawn down any farther than they are under the existing condition, which would require a reduction in water use by the Turlock Irrigation District, Modesto Irrigation District, or another water agency. Please refer to **Section 14.10, Master Response on Modified WSIP Alternative** (Vol. 7, Chapter 14, Section 14.10.3) for additional information regarding additional water conservation/recycling under the Modified WSIP Alternative.

SI_TRT3-05 Please refer to **Section 14.8, Master Response on Delta and San Joaquin River Issues** (Vol. 7, Chapter 14, Sections 14.8.2 and 14.8.3) for discussion of the responsibilities of the U.S. Bureau of Reclamation and California Department of Water Resources regarding compliance with Delta water quality and flow objectives.

SI_TRT3-06 The Draft PEIR evaluated the Aggressive Conservation/Water Recycling and Local Groundwater Alternative (With No Supplemental Tuolumne River Water), which relies on conservation and recycling to meet future water demand needs (Vol. 4, Chapter 9, Section 9.2.6). The Draft PEIR also evaluated the Year-round Desalination at Oceanside Alternative, which includes a 25-mgd desalination plant in San Francisco to serve the full projected increase in customer purchase requests through 2030 without additional Tuolumne River diversions (Vol. 4, Chapter 9, Section 9.2.4). As summarized in Table 9.6 (Vol. 4, Chapter 9, pp. 9-14 to 9-16), the Aggressive Conservation/Water Recycling and Local Groundwater Alternative (With No Supplemental Tuolumne River Water) would not be capable of meeting WSIP objectives related to water supply, and it is uncertain whether or not this alternative would meet all WSIP objectives related to seismic reliability, delivery reliability, and cost-effectiveness. The Year-round Desalination at Oceanside Alternative would only partially meet the WSIP objectives related to delivery reliability and cost-effectiveness, and it is uncertain whether or not this alternative would meet all WSIP objectives related to sustainability.

Tuolumne River Trust, Meg Gonzalez, Director of Community Outreach and Education, 09/06/07

[See Public Hearing Transcript, Modesto, p. 10]

SI_TRT4-01 The commenter states concern that efforts to restore the ecological integrity of the lower Tuolumne River would be undermined by the WSIP. Please refer to **Response SI_SierraC2-01**.

Tuolumne River Trust, Patrick Koepele, Central Valley Program Director, 09/06/07

[See Public Hearing Transcript, Modesto, pp. 18–21]

SI_TRT5-01 This comment expresses concerns related to the effects of additional Tuolumne River diversions on restoration efforts aimed at protecting fall-run Chinook salmon and Central Valley steelhead below La Grange Dam. As described in the Draft PEIR, the San Francisco Planning Department determined that long-term WSIP-induced flow changes in the Tuolumne River below La Grange Dam could have a significant adverse effect on fishery resources along this reach of river (Vol. 3, Chapter 5, pp. 5.3.6-28 to 5.3.6-32). The Draft PEIR acknowledged that the WSIP's small but incremental contribution to adverse effects on the lower river would make planned restoration of habitat and fishery resources more difficult. As a result, the impact of the WSIP on fishery resources in the lower Tuolumne River was determined to be potentially significant. Implementation of Mitigation Measure 5.3.6-4a, Avoidance of Flow Changes by Reducing Demand for Don Pedro Reservoir Water, or 5.3.6-4b, Fishery Habitat Enhancement, would reduce this impact to a less-than-significant level (Vol. 4, Chapter 6, pp. 6-48 and 6-49). Please refer to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Sections 14.7.2, 14.7.8, and 14.7.9) for supplementary information on the presence of steelhead and Chinook salmon along this reach of the lower river, and additional discussion on Measures 5.3.6-4a and 5.3.6-4b, including text revisions to Measure 5.3.6-4b that add further definition to the habitat enhancement effort.

SI_TRT5-02 The commenter notes that additional diversions of water from the Tuolumne River could harm steelhead that use the reach of the river below La Grange Dam. The focus of the Draft PEIR analysis was on Chinook salmon rather than steelhead, because conditions in this reach of river are generally considered to be unsuitable for steelhead under the existing condition. Please refer to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Sections 14.7.2, 14.7.3, 14.7.8, and 14.7.9) for information on the presence of steelhead and Chinook salmon along this reach of the lower river, and for additional discussion on Mitigation Measures 5.3.6-4a and 5.3.6-4b, including text revisions to Measure 5.3.6-4b that add further definition to the habitat enhancement effort.

SI_TRT5-03 The San Francisco Planning Department agrees with the commenter that the WSIP-caused flow reductions could have a potentially significant adverse effect on the riparian forest along the lower Tuolumne River (Vol. 3, Chapter 5, p. 5.3.7-25). Mitigation Measure 5.3.7-2, Controlled Releases to Recharge Groundwater in Streamside Meadows and Other Alluvial Deposits, would require that the SFPUC manage releases from Hetch Hetchy Reservoir during the spring in order to recharge groundwater, which supports meadow and riparian habitat in the upper Tuolumne River. Implementation of Measure 5.3.6-4a, Avoidance of Flow Changes by Reducing Demand for Don Pedro Reservoir Water, or, if Measure 5.3.6-4a is not feasible, implementation of Measure 5.3.7-6, Lower Tuolumne River Riparian Enhancement, would address impacts on riparian habitat below La Grange Dam. Please refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.4) and **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.8) for additional discussion of impacts on riparian habitat along the Tuolumne River, including text revisions to Measures 5.3.7-2 and 5.3.6-4a that further specify the mitigation requirements.

SI_TRT5-04 The commenter indicates that the proposed mitigation for the impact on fishery resources in the lower Tuolumne River is inadequate. Please refer to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.9) for an expanded discussion of the impact analysis for the lower Tuolumne River, including revisions to Measures 5.3.6-4a and 5.3.6-4b that further define the mitigation requirements.

SI_TRT5-05 This comment opposing additional Tuolumne River diversions and encouraging additional conservation efforts is acknowledged. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for pertinent response related to conservation programs and recycling projects proposed by the SFPUC in San Francisco and by the wholesale customers in their respective service areas.

Tuolumne River Trust,
Eric Wesselman, Executive Director, 09/06/07

[See Public Hearing Transcript, Modesto, pp. 21–25]

SI_TRT6-01 This comment stresses the need for seismic improvements to the regional water system but expresses concerns that the proposed WSIP water supply option and changes in system operations may delay the seismic improvements. Please refer to **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Section 14.1.5) regarding the integration of the seismic improvements and water supply options to meet program objectives, and for a discussion of the advantages of using a program EIR to evaluate the proposed program as a whole. Also refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.9) for an explanation of the relationship between the average annual increase in purchase requests and the average annual increase in Tuolumne River diversions.

SI_TRT6-02 The statements made in this comment regarding demand projections have been submitted by numerous commenters. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2) for additional information.

SI_TRT6-03 This comment states that there is a lack of adequate baseline data for the Tuolumne River to properly analyze the environmental consequences of additional diversions. Please refer to **Response SI_Caltrout-01** for a response to this comment.

SI_TRT6-04 The commenter accurately notes that the SFPUC currently pays the Turlock and Modesto Irrigation Districts to release fish flows at La Grange Dam on its behalf. Please refer to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.4) for a response to this comment.

SI_TRT6-05 This comment asserts that the PEIR does not adequately analyze the WSIP's impacts on the Delta. Please refer to **Section 14.8, Master Response on Delta and San Joaquin River Issues** (Vol. 7, Chapter 14, Sections 14.8.2 and 14.8.3) for a discussion of the WSIP's effects on the San Joaquin River and Delta, and of the responsibilities of the U.S. Bureau of Reclamation and California Department of Water Resources regarding compliance with Delta water quality and flow objectives.

Tuolumne River Trust, Eric Wesselman, Executive Director, 09/18/07

[See Public Hearing Transcript, Fremont, pp. 12–17]

SI_TRT7-01 This comment opposing additional Tuolumne River diversions is acknowledged. Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.9) for an explanation of the relationship between the average annual increase in purchase requests and the average annual increase in Tuolumne River diversions. Please refer to **Section 14.6, Master Response on Upper Tuolumne Issues** (Vol. 7, Chapter 14, Section 14.6.5) and **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.6) for clarification regarding current and estimated future municipal and agricultural diversions from the Tuolumne River.

SI_TRT7-02 This commenter's support for more conservation and recycling to meet water demand and opposition to additional diversions from the Tuolumne River is acknowledged. As described in the Draft PEIR, the WSIP includes 22 to 34 million gallons per day (mgd) of projected water conservation and recycling savings in addition to 36 mgd of passive conservation savings due to the implementation of plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives that would reduce diversions from the Tuolumne River, please refer to the following sections of the Draft PEIR: Sections 9.2.2 through 9.2.4, and Sections 9.2.6 and 9.2.7. For additional information, refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3).

SI_TRT7-03 This comment regarding the effect of price on demand was submitted by numerous commenters; please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2).

SI_TRT7-04 It is assumed that this comment refers to the *Investigation of Regional Water Supply Option No. 4 Technical Memorandum* (SFPUC, 2007, Appendix D). This study was used in the development of the Aggressive Conservation/Water Recycling and Local Groundwater Alternative analyzed in the Draft PEIR (Vol. 4, Chapter 9). In response to the commenter's reference to "the reformulation of new demand projections," please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3, under the heading Maximum Conservation and Water Recycling Potential).

SI_TRT7-05 This comment regarding the employment projections used in the demand study was submitted by numerous commenters; please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2).

SI_TRT7-06 This comment regarding per-capita demand increase was submitted by numerous commenters; please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14).

SI_TRT7-07 This comment states that there is a lack of adequate baseline data for the Tuolumne River to properly analyze the environmental consequences of additional diversions. Please refer to **Response SI_Caltrout-01** for a response to this comment.

SI_TRT7-08 CEQA defines a significant effect on the environment as a substantial, or potentially substantial, adverse change in the environment (Public Resources Code Section 21068). When determining whether a project may have a significant effect on the environment, CEQA calls for careful judgment on behalf of the lead agency based upon scientific and factual data to the extent possible. However, CEQA does not set quantifiable criteria because the significance of an activity may vary with the setting (CEQA Guidelines Section 15604). Appendix B of the Draft PEIR (SFPUC WSIP Initial Study Checklist) lists the significance criteria used to determine the significance of potential impacts. As stated in the Draft PEIR (Vol. 2, Chapter 4, p. 4.1-5), the impact significance criteria are based on San Francisco Planning Department, Major Environmental Analysis Division (MEA) standard guidance regarding the environmental effects to be considered significant. Note that the Draft PEIR includes additional significance criteria in cases where potential environmental issues associated with the WSIP are identified but are not clearly addressed by MEA's standard guidance.

The Draft PEIR (Vol. 2, Chapter 4, pp. 4.1-5 to 4.1-7) identifies the significance determination categories (e.g., not applicable, less than significant, or potentially significant but mitigable) and describes the significance determination process. The impact analyses evaluate whether compliance with applicable regulations would reduce a potentially significant impact to a less-than-significant level. If so, compliance with the regulation is assumed, and the impact is considered to be less than significant. In addition, the impact analyses determine whether the WSIP projects would be subject to the policies set forth in the SFPUC Alameda or Peninsula Watershed Management Plans. The analyses also consider whether implementation of the SFPUC's Standard Construction Measures (described in Chapter 3, Section 3.11 of the Draft PEIR) could reduce impacts to a less-than-significant level. An impact is considered potentially significant in cases where there are no applicable regulations or SFPUC Standard Construction Measures, or where such regulations and measures exist but by themselves would not reduce the impact to a less-than-significant level. If there are feasible measures available that would reduce a potentially significant impact to a less-than-significant level, then the impact is considered potentially significant but mitigable, and the PEIR identifies mitigation measure(s) to address the potentially significant impact.

SI_TRT7-09 Please refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14, Sections 14.11.4 and 14.11.5) for a response related to the SFPUC's approach to addressing climate change in its water supply planning.
Section 14.11 augments the discussion presented in Section 5.7.6 of the Draft PEIR (Vol. 3, Chapter 5, pp. 5.7-92 to 5.7-96). Section 14.11 provides more detailed and up-to-date information on climate change as it relates to the SFPUC regional water supply and the proposed WSIP.

Tuolumne River Trust, Peter Drekmeier, Bay Area Program Director, 09/19/07

[See Public Hearing Transcript, Palo Alto, pp. 12–16]

SI_TRT8-01 This comment opposing additional Tuolumne River diversions is acknowledged. Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.9) for an explanation of the relationship between the average annual increase in purchase requests and the average annual increase in Tuolumne River diversions.

SI_TRT8-02 These comments, which assert that demand is inflated, that demand projections do not account for increases in the price of water, and that per-capita consumption is expected to increase, have been submitted by many commenters; please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2). The comment does not indicate the basis for the assertion that "we are shifting from manufacturing to service and information, which use considerably less water" or sufficiently specify information to allow for a specific response. However, the comment apparently refers to use in the demand model of employment projections that are not industry-specific. For additional information related to conservation programs and recycling projects proposed by the SFPUC and its wholesale customers, refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3).

SI_TRT8-03 Regarding the assertion that the full potential for water recycling and conservation has not been examined, refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3). The basis for the statement that the proposed WSIP includes only a 3 percent increase in water recycling is unclear. The recycled water potential studies distinguish between total recycled water projects and those that would replace potable supplies; only recycled water that would replace potable supplies is shown in Draft PEIR Table 3.3 (Vol. 1, Chapter 3, p. 3-18). According to the *SFPUC Wholesale Customer Recycled Water Potential Technical Memorandum* (RMC, 2004), existing (2004) recycled water projects replace 4.3 million gallons per day (mgd) of potable water supply. Therefore, the estimated 10.4 mgd of recycled water for the wholesale service area shown in Draft PEIR Table 3.3 represents a 243 percent increase in recycled water use. For the service area as a whole, the estimated 12.4 mgd of recycled water (assuming 2 mgd for the SFPUC retail service area, the average of the range shown in Table 3.3) represents a 288 percent increase in the use of recycled water that replaces potable supplies. It is the case, based on the projected 2030 recycled water use and 2030 demand shown in Table 3.3, that recycled water represents about 3 percent of total 2030 demand, which may have been the commenter's point. This estimate is acknowledged.

Regarding the statement that 60 percent of 2030 water demand is for outdoor irrigation, refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2) for a discussion of water use for different sectors.

SI_TRT8-04 This comment states that there is a lack of adequate baseline data for the Tuolumne River to properly analyze the environmental consequences of additional diversions on river flows, fisheries, riparian habitat, and associated species. Please refer to **Response SI_Caltrout-01** for a response to this comment.

SI_TRT8-05 With respect to the use of monthly average and daily flows in the analysis of impacts on biological resources, please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.3).

SI_TRT8-06 Please refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14) for additional discussion of climate change to augment the discussion presented in Section 5.7.6 of the Draft PEIR (Vol. 3, Chapter 5, pp. 5.7-92 to 5.7-96). Section 14.11 provides more detailed and up-to-date information on climate change as it relates to the SFPUC regional water supply and the proposed WSIP.

SI_TRT8-07 With respect to the dry-year transfer, please refer to **Section 14.3, Master Response on Proposed Dry-Year Water Transfer** (Vol. 7, Chapter 14) for a discussion of feasibility and implementation issues and the requirement for subsequent project-level CEQA review of the transfer prior to ratification of such an agreement.

Also refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.9) for an explanation of the relationship between the average annual increase in purchase requests and the average annual increase in Tuolumne River diversions.

Tuolumne River Trust, Eric Wesselman, Executive Director, 09/20/07

[See Public Hearing Transcript, San Francisco City Hall, pp. 18–20]

SI_TRT9-01 This comment opposing additional Tuolumne River diversions is acknowledged. Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.9) for an explanation of the relationship between the average annual increase in purchase requests and the average annual increase in Tuolumne River diversions. Please refer to the Draft PEIR (Vol. 3, Chapter 5, pp. 5.2-7 to 5.2-9) regarding the Tuolumne River's designation as a wild and scenic river.

SI_TRT9-02 The purpose of the Draft PEIR is not to "justify or define" the need for more water. Consistent with CEQA, the PEIR evaluates the environmental impacts of the proposed program as defined by the project sponsor (in this case, the SFPUC) and identifies and analyzes alternatives that would reduce or eliminate those impacts. Regarding the comment that the price elasticity of water demand was not considered in the demand analysis, please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2).

SI_TRT9-03 It is assumed that this comment refers to the *Investigation of Regional Water Supply Option No. 4 Technical Memorandum* (SFPUC, 2007, Appendix D). This study was used in the development of the Aggressive Conservation/Water Recycling and Local Groundwater Alternative analyzed in the Draft PEIR (Vol. 4, Chapter 9, Section 9.2.4). Please also refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3, under the heading Additional Conservation and Water Recycling Potential).

SI_TRT9-04 This comment regarding the use of the Association of Bay Area Governments' *Projections 2002* in the demand analyses was submitted by numerous commenters; refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2).

SI_TRT9-05 This comment regarding per-capita demand was submitted by numerous commenters; please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2).

SI_TRT9-06 This comment, which stresses the need for seismic improvements to the regional water system while expressing concern that the proposed WSIP water supply option and changes in system operations could delay the seismic improvements, is acknowledged. Please refer to **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Section 14.1.5) regarding the integration of the seismic improvements and water supply options to meet program objectives, and for a discussion of the advantages of using a program EIR to evaluate the proposed program as a whole.

Tuolumne River Trust, Peter Drekmeier, Bay Area Program Director, 10/11/07

[See Public Hearing Transcript #2, San Francisco City Hall, pp. 37–39]

SI_TRT10-01 This comment expressing support for seismic improvements to the regional water system but opposing additional Tuolumne River diversions is acknowledged. Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.9) for an explanation of the relationship between the average annual increase in purchase requests and the average annual increase in Tuolumne River diversions.

SI_TRT10-02 With respect to the dry-year transfer included as part of the proposed program, please refer to **Section 14.3, Master Response on Proposed Dry-Year Water Transfer** (Vol. 7, Chapter 14). With respect to the agricultural conservation that would occur as part of a water transfer under the Modified WSIP Alternative, refer to Section 14.10, Master Response on Modified WSIP Alternative (Vol. 7, Chapter 14, Section 14.10 This section discusses feasibility and implementation issues as well as the requirement for subsequent project-level CEQA review of the transfer prior to ratification of such an agreement. With respect to the potential effects of the WSIP on the Tuolumne River between O'Shaughnessy Dam and La Grange Dam, the Draft PEIR (Vol. 3, Chapter 5, Sections 5.3.1 through 5.3.9) included a project-level analysis of impacts on fisheries and terrestrial biological resources that would result from the proposed water supply option and changes in system operations. The results of the analysis indicated potentially significant adverse impacts on alluvial features that support meadow and riparian habitat (Impact 5.3.7-2, Vol. 5, Chapter 5, pp. 5.3.7-21 and 5.3.7-22) along this reach of the Tuolumne River. However, implementation of Mitigation Measure 5.3.7-2, Controlled Releases to Recharge Groundwater in Streamside Meadows and Other Alluvial Deposits (Vol. 4, Chapter 6, pp. 6-49 and 6-50) was prescribed to reduce these impacts to a less-than-significant level. Refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14) for further discussion of the analysis of the effects of the WSIP on the upper Tuolumne River, and additional discussion of Mitigation Measure 5.3.7-2, including text revisions to Measure 5.3.7-2 that further define the mitigation requirements.

SI_TRT10-03 This comment states that there is a lack of adequate baseline data for the Tuolumne River to properly analyze the environmental consequences of additional diversions on river flows, fisheries, riparian habitat, and associated species. Please refer to **Response SI_Caltrout-01** for a response to this comment.

SI_TRT10-04 With respect to the dry-year transfer included as part of the proposed program, please refer to **Response SI_TRT10-02**, above. The commenter is correct that the California Department of Fish and Game has asked the Federal Energy Regulatory Commission to consider requiring greater releases of water from La Grange Dam to support anadramous fish. The commenter's opinion with respect to certification of the PEIR is noted.

Tuolumne River Trust, Clean Water Action, Sierra Club, Peter Drekmeier, Jennifer Clary, John Rizzo, 10/01/07

SI_TRT-CWA-SierraC-01 This comment consists of a summary of detailed comments contained in this comment letter. Responses to these comments are provided below in **Responses SI_TRT-CWA-SierraC-02** through **SI_TRT-CWA-SierraC-199**. In addition, many of these comments are addressed in **Sections 14.5, 14.6,** and **14.7, Master Responses on Water Resources Modeling, Upper Tuolumne River Issues,** and **Lower Tuolumne River Issues** (Vol. 7, Chapter 14), respectively.

SI_TRT-CWA-SierraC-02 The commenter correctly quotes the SFPUC's Water Enterprise Environmental Stewardship Policy. The Draft PEIR describes and evaluates the consistency of the WSIP with the Water Enterprise Environmental Stewardship Policy in two places: in Section 4.2 (Vol. 2, Chapter 4, p. 4.2-6 and pp. 4.2-15 and 4.2-16) with respect to the proposed facility improvement projects, and in Section 5.2 (Vol. 3, Chapter 5, pp. 5.2-24, 5.2-25, and 5.2-29) with respect to the proposed water supply and system operations. As described in these sections, the WSIP would be consistent with the underlying goals of the Water Enterprise Environmental Stewardship Policy, particularly with respect to the WSIP sustainability goal and the WSIP objective to manage natural resources and physical systems to protect watershed ecosystems (refer to Table 3.2, Vol. 1, Chapter 3, p. 3-9).

Impacts of the WSIP on downstream native fish and wildlife populations are analyzed in the Draft PEIR in Sections 5.3.6, 5.4.5, and 5.5.5 for the Tuolumne River system, Alameda Creek system, and Peninsula watershed, respectively. The following impacts on downstream fishery resources were found to be less than significant: along the Tuolumne River between Hetch Hetchy Reservoir and Don Pedro Reservoir (Impact 5.3.6-2); along the San Joaquin River (Impact 5.3.6-5); along Calaveras Creek below Calaveras Dam and along Alameda Creek below the confluence with Calaveras Creek (Impact 5.4.5-2); along San Antonio Creek below San Antonio Reservoir (Impact 5.4.5-5); along Alameda Creek below the confluence with San Antonio Creek (Impact 5.4.5-6); and along San Mateo Creek below Crystal Springs Reservoir (Impact 5.5.5-3). The following impacts on downstream fishery resources were found to be potentially significant but mitigable: along the Tuolumne River below Don Pedro Reservoir (Impact 5.3.6-4); along Alameda Creek below the Alameda Creek Diversion Dam (Impact 5.4.5-3); and along Pilarcitos Creek below Pilarcitos Reservoir (Impact 5.5.5-5). Implementation of identified mitigation measures for downstream fishery resources would reduce the impacts associated with the WSIP to a less-than-significant level.

SI_TRT-CWA-SierraC-03 The Draft PEIR used available data to characterize the baseline or existing condition. The San Francisco Planning Department believes that the data are sufficient to make a reasonable assessment of environmental consequences associated with implementation of the WSIP. The CEQA Guidelines (Section 15151) note that an "evaluation of environmental effects of a proposed project need not be exhaustive." For more information, please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol.7, Chapter 14, Section 14.4.4).

SI_TRT-CWA-SierraC-04 This comment expresses the opinion that biological baseline data are inadequate to assess the impacts of the WSIP. For information on this topic, please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol.7, Chapter 14, Section 14.4.4).

With respect to data on streamside meadows, please refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.3).

CEQA does not require that an EIR evaluate whether the existing condition is compliant with environmental laws and policies. The purpose of the Draft PEIR is to describe the consequences of the proposed WSIP relative to the existing condition (CEQA Guidelines Section 15125[a]).

With respect to the frequency and severity of impacts, refer to **Response SI_TRT-CWA-SierraC-44**.

SI_TRT-CWA-SierraC-05 This comment consists of a summary of comments on specific baseline data. Responses to detailed comments are provided in **Responses SI_TRT-CWA-SierraC-06** through **SI_TRT-CWA-SierraC-29**.

SI_TRT-CWA-SierraC-06 Please refer to **Response SI_TRT-CWA-SierraC-84** regarding Fish and Game Code Section 5937. In addition, as stated in **Response SI_TRT-CWA-SierraC-04**, CEQA does not require that an EIR evaluate whether the existing condition is compliant with environmental laws and policies. The purpose of the Draft PEIR is to describe the consequences of the proposed WSIP relative to the existing condition (CEQA Guidelines 15125[a]). As indicated in **Response SI_TRT-CWA-SierraC-03**, the San Francisco Planning Department believes that the data available from existing studies are sufficient to make a reasonable assessment of the environmental consequences of the WSIP for CEQA purposes. Also, please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol.7, Chapter 14, Section 14.4.4).

The commenter correctly notes that a draft report prepared by the U.S. Fish and Wildlife Service (USFWS) in 1992 recommended an increase in minimum releases from O'Shaughnessy Dam, based on an Instream Flow Incremental Methodology study. As described in the Draft PEIR (Vol. 3, Chapter 5, p. 5.7-7), the SFPUC provided comments on the draft study questioning the basis for some of the recommendations, but the matter was left unresolved. Beginning in 2005, the SFPUC began working with the USFWS to resolve issues regarding additional releases. Cooperative field studies are in progress, and the SFPUC and the USFWS expect to reach agreement on the releases in 2009. Please also refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.2).

The supplemental releases referred to in the comment of 4,400 to 15,000 acre-feet per year (afy) were included in the analysis of cumulative impacts. As described in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.7-28 to 5.7-32), the increase in minimum flows would benefit resident trout but could also have adverse effects on spawning trout and on the flora and fauna of streamside meadows. Release of the additional water from Hetch Hetchy Reservoir in most months would increase drawdown of the reservoir, which would reduce the total volume of water released in the spring and delay the release by a few days. The reduction in volume and delay in the release could have adverse impacts on spawning trout and on the flora and fauna of streamside meadows.

SI_TRT-CWA-SierraC-07 The Draft PEIR (Vol. 1, Chapter 2, pp. 2-35 to 2-37) provides a summary description of the City and County of San Francisco's (CCSF) water rights. These water rights are adequate for the proposed water supply option proposed under the WSIP; consequently, the CCSF will not seek new appropriative water rights.

The region identified by the National Marine Fisheries Service (NMFS) and California Department of Fish and Game (CDFG) in the 2002 draft guidelines referred to by the commenter does not include watersheds affected by SFPUC facilities; further, the NMFS and CDFG explicitly state that the draft guidelines "are not developed for use in areas outside of the identified mid-coastal range" (NMFS and CDFG, 2002).

SI_TRT-CWA-SierraC-08 The commenter accurately notes that a flow/habitat assessment methodology was not used in the Draft PEIR analysis of the WSIP. A study that relates flow to trout habitat value will be part of the SFPUC's and USFWS's ongoing cooperative studies, as described in **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.2).

With respect to compliance with existing environmental laws and policies, please refer to **Response SI_TRT-CWA-SierraC-04**.

SI_TRT-CWA-SierraC-09 Please refer to **Section 14.7, Master Response on the Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.2).

SI_TRT-CWA-SierraC-10 The commenter notes that the Modesto Irrigation District (MID) and Turlock Irrigation District (TID) routinely divert less water than allowed under their water rights. Although it would be theoretically possible for MID and TID to divert more water from the Tuolumne River than they have done historically, their current average diversion of about 867,000 afy is close to the practical maximum, taking account of available storage in Don Pedro Reservoir, flood control requirements, and requirements for minimum releases to the river. The assumed value for future diversions by TID and MID used in the Draft PEIR is consistent with the value that TID and MID provided to the Department of Water Resources for California Water Plan purposes. The SFPUC has no reason to believe that TID's and MID's diversions will increase in the future. For additional information on the assumed future diversions by MID and TID used in the Hetch Hetchy/Local Simulation Model (HH/LSM), refer to the discussion in **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.6).

SI_TRT-CWA-SierraC-11 Please refer to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.3).

SI_TRT-CWA-SierraC-12 The commenter notes that the lack of an established monitoring program to assess the status of steelhead (*O. mykiss*) in the Tuolumne River makes it impossible to evaluate impacts on this species due to the proposed flow changes. On the contrary, the San Francisco Planning Department believes that sufficient information is available to reach a conclusion with respect to the potential impact of the WSIP on steelhead for the reasons noted below.

As described in the Draft PEIR, the San Francisco Planning Department determined that long-term WSIP-induced flow changes in the Tuolumne River below La Grange Dam could have a significant adverse effect on anadromous fish (Vol. 3, Chapter 5, pp. 5.3.6-28 to 5.3.6-32). Although no significant populations of steelhead are known to exist in this reach of the river, individual steelhead could be adversely affected by WSIP-induced flow changes **(**for more information, please refer to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.3).

The Draft PEIR lists the possible mechanisms for harm to anadromous fish (Vol. 3, Chapter 5, p. 5.3.6-29). Although the WSIP would have little or no effect on average monthly flow in the lower river in most summer, fall, and winter months in all hydrologic year types, it would reduce flows in many spring and early summer months. As indicated in the Draft PEIR, the largest percentage reductions in Tuolumne River stream flow downstream of La Grange Dam due to the WSIP would occur in June. Flow reductions in May and June would likely result in seasonally elevated water temperatures and a corresponding reduction in the linear extent of suitable habitat for Chinook salmon and steelhead/rainbow trout rearing. Juvenile Chinook salmon typically migrate downstream in May, but could be adversely affected by the reduction in suitable habitat. Steelhead/rainbow trout rear within the river system throughout the year and would be adversely affected by seasonally elevated water temperatures during summer months.

Although steelhead are not abundant in the Tuolumne River (refer to Vol. 7, Chapter 14, **Section 14.7, Master Response on Lower Tuolumne River Issues**, Section 14.7.3), these changes in stream flow and water temperature could reduce habitat quality and availability for summer rearing. The more abundant juvenile Chinook salmon could also be adversely affected by WSIP-induced changes in flow and water temperature. As a result, the impact of the WSIP on these fishery resources in the lower Tuolumne River was determined to be potentially significant. Implementation of Mitigation Measures 5.3.6-4a or 5.3.6-4b would reduce these impacts to a less-than-significant level (Vol. 4, Chapter 6, pp. 6-48 and 6-49).

Additionally, the commenter notes that it is possible that current water storage and diversion operations on the Tuolumne River have led to unacceptable conditions in the river for steelhead. Furthermore, the fact that steelhead were once abundant and now are rare emphasizes the need to re-operate the water system in a manner that increases steelhead populations.

The purpose of the Draft PEIR is to describe the consequences of the proposed WSIP relative to the existing condition. CEQA does not require that an EIR evaluate whether the existing condition is compliant with all environmental laws and policies. The Draft PEIR does include an assessment of the effects of the WSIP on fisheries in the context of all past, present, and expected future actions that have or will affect this resource (Vol. 3, Chapter 5, Section 5.7). In this section, it is acknowledged that past and present water management practices and other past and present human activities, such as gravel and gold mining, have substantially altered habitat for anadromous fish in the lower Tuolumne River. The already degraded condition of the anadromous fish population in this reach of the river contributed to the conclusion that WSIP-induced flow reductions would have a significant adverse effect in the absence of appropriate mitigation measures. Please also refer to **Response S_CDFG2-05**.

SI_TRT-CWA-SierraC-13 This comment on the need for monitoring is acknowledged. With respect to the ability to reach impact conclusions for CEQA purposes using available data and to devise appropriate mitigation measures to reduce impacts on fisheries in the lower Tuolumne River, please refer to **Responses SI_TRT-CWA_SierraC-03** and **SI_TRT-CWA-SierraC-12** and **to Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.4).

SI_TRT-CWA-SierraC-14 The commenter accurately notes that there has been no recent comprehensive study of the upper Tuolumne River. As indicated in **Response SI_TRT-CWA-SierraC-03**, the San Francisco Planning Department believes that the data available from existing studies are sufficient to make a reasonable assessment of the environmental consequences of the WSIP for CEQA purposes. Also, please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.4).

For discussion of data on streamside meadows, please refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.3).

Several studies are in progress that will improve knowledge of the upper Tuolumne River and its natural resources. The SFPUC began studies of river hydrology and geomorphology in 2006, and the early results of the studies were available to the authors of the Draft PEIR. The SFPUC has already begun cooperative studies with the USFWS that may lead to a revision of instream flow requirements below O'Shaughnessy Dam. Please refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.2). The National Park Service has conducted studies as part of the development of its *Tuolumne Wild and Scenic River Comprehensive Management Plan* and continues to conduct groundwater, rare species, and vegetation studies in the Poopenaut Valley.

Although the SFPUC expects to approve the WSIP in 2008, implementation will take many years. The results of many of the studies identified above will become available during implementation of all of the elements of the WSIP. The results of these studies, together with the results of the monitoring component of Mitigation Measure 5.3.7-2, would provide data for the adaptive management component of Measure 5.3.7-2.

The SFPUC cannot currently meet its level of service goals without an increase in water supplies, and its ability to meet the level of service goals will further deteriorate as water demand in the suburban customers' service areas increases. If the source of water is the Tuolumne River, as envisaged under the WSIP, some increase in diversions from the river are needed immediately, although the full 27 million gallons per day (mgd) would not be needed until 2030.

SI_TRT-CWA-SierraC-15 Please refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.3). The National Park Service is collecting data on rare species, vegetation, and groundwater in the Poopenaut Valley.

SI_TRT-CWA-SierraC-16 Please refer to **Section 4.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.3) and **Response SI_TRT-CWA-SierraC-14**, above.

SI_TRT-CWA-SierraC-17 Please refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.4).

SI_TRT-CWA-SierraC-18 Please refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Sections 14.6.3 and 14.6.4).

SI_TRT-CWA-SierraC-19 No mitigation measures are proposed to lessen impacts of the WSIP on visual and recreational resources in the Tuolumne River corridor because the impacts of the WSIP on these resources were determined to be less than significant (Vol. 3, Chapter 5, pp. 5.3.8-20 to 5.3.8-35).

A steep trail descends about 1,400 feet from the north side of Hetch Hetchy Road and provides access to the Poopenaut Valley. Access to the south bank of the Tuolumne River within the valley is provided by the trail, but the river must be forded to reach the north bank of the river. The WSIP would have no effect on access to the Poopenaut Valley.

SI_TRT-CWA-SierraC-20 Please refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14).

SI_TRT-CWA-SierraC-21 The California Global Warming Solutions Act of 2006 (Assembly Bill No. 32), described in Draft PEIR Section 4.9, Air Quality (Vol. 2, Chapter 4, pp. 4.9-12 to 4.9-15), establishes a statewide greenhouse gas (GHG) emissions cap for 2020 that is equivalent to the 1990 emissions levels. Impacts associated with WSIP-related GHG emissions are analyzed in Impact 4.9-7 (Vol. 2, Chapter 4, pp. 4.9-42 to 4.9-47). Due to actions being actively taken by the CCSF and SFPUC to reduce GHG emissions, the PEIR analysis concludes that implementation of the WSIP would not conflict with the state's goal of reducing GHG emissions to 1990 levels by 2020. The CCSF and SFPUC actions to reduce GHG emissions are described in the Draft PEIR (Vol. 2, Chapter 4, pp. 4.9-17 to 4.9-19).

Refer to **Response SI_PacInst-03** regarding per-capita water use; this response describes why per-capita water demand in all sectors is projected to *decrease* between 2001 and 2030.

Since the proposed program was determined to have a less-than-significant impact related to GHG emissions, the alternatives analyzed in the Draft PEIR do not address GHG emissions, consistent with CEQA Guidelines Section 15126.6(a).

SI_TRT-CWA-SierraC-22 Please refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14).

SI_TRT-CWA-SierraC-23 As the commenter accurately notes, the Draft PEIR concluded that the WSIP would have a less-than-significant impact on groundwater in the Tuolumne River corridor (Vol. 3, Chapter 5, pp. 5.3.5-4 and 5.3.5-5). The reasons for the conclusion are described below. The only way that the WSIP could affect groundwater in the Tuolumne River corridor is if WSIP-induced changes in river flow altered groundwater recharge or discharge rates.

The Tuolumne River between Hetch Hetchy and Don Pedro Reservoirs flows in a deep canyon and is largely confined within a bedrock channel. Most of the alluvial deposits in the river corridor are limited in size, with the exception of the meadow in the Poopenaut Valley (Vol. 3, Chapter 5, pp. 5.3.2-1 and 5.3.2-2). There are no large groundwater bodies associated with this reach of the river, and no municipal water agencies, homeowners, or irrigators obtain their water supplies from groundwater in this portion of the Tuolumne River corridor. The rocks underlying the river are impermeable, so little or no water would be expected to percolate from the river into the ground. Groundwater probably enters the river from springs and seeps in the canyon walls.

WSIP-induced changes in flow in this reach of the river would manifest themselves as a reduction in the volume of water in the spring snowmelt period and a delay of a few days in the initial release of the snowmelt. This could result in a reduction in groundwater recharge in streamside alluvial deposits, particularly in the Poopenaut Valley, which could have a significant adverse impact on terrestrial biological resources (Vol. 3, Chapter 5, pp. 5.3.7-21 and 5.3.7-22). The significant impact on terrestrial biological resources would be reduced to a less-than-significant level by shaped releases of water from O'Shaughnessy Dam (see Mitigation Measure 5.3.7-2). WSIP-induced river flow changes would have no other effects on groundwater in the Tuolumne River corridor between Hetch Hetchy and Don Pedro Reservoirs.

The Tuolumne River between La Grange Dam and the San Joaquin River flows though alluvial deposits, as described in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.3.2-3 and 5.3.2-4). For most of this reach, the river gains water from the groundwater because the groundwater table in the lands surrounding the river is at a higher elevation than the river. Because a pumping depression has developed in central Modesto, a five-mile reach of the river in Modesto loses water to the groundwater.

WSIP-induced changes in flow in the river between La Grange Dam and the San Joaquin River would manifest themselves as a reduction in the volume of water in the winter and spring and an altered pattern of releases in that period. During the winter and spring, flow in the

Tuolumne River below La Grange Dam would be less at times with the WSIP than under the existing condition. Because water levels in the river would be lower, the gradient between the elevation of the groundwater table in the surrounding lands and the river water surface elevation would increase slightly, and groundwater discharge to the river could increase slightly in most of the river reach. In the Modesto area, the loss of water from the river to the groundwater could decrease slightly as a result of the WSIP-induced reduction in flow.

The groundwater hydrology of the lands on both banks of the Tuolumne River between La Grange Dam and the San Joaquin River is quite complex. Groundwater occurs both in shallow, unconfined water bodies and in deep, confined aquifers. The deep aquifers, which are the primary source of groundwater for irrigation and municipal supply, are not directly connected to the Tuolumne River and are thus unaffected by the WSIP. The shallow groundwaters are connected to the Tuolumne River, but the river's influence on groundwater levels is small compared to the influence of precipitation and applied irrigation water. Some farmers and homeowners in the river corridor may use wells extending into shallow groundwater for irrigation or domestic water supplies. However, because groundwater flow is generally toward the river from the surrounding land rather than away from it, the Draft PEIR concludes that the WSIP would not have a significant affect on groundwater levels and agricultural and domestic wells.

SI_TRT-CWA-SierraC-24 The commenter expresses concern that the yield of the Westside Groundwater Basin is underestimated because of the lack of historical data and because the yield estimate did not consider the potential for using local stormwater to enhance local aquifer recharge.

As discussed in the Draft PEIR (Vol. 3, Chapter 5, p. 5.6-24), estimates of recharge to the North Westside Groundwater Basin are being refined as part of ongoing groundwater modeling efforts on behalf of the SFPUC, and this analysis indicates that recharge to the basin could range from about 4,850 afy to 6,950 afy (Luhdroff and Scalmanini, 2007). While accurately estimating recharge to the North Westside Groundwater Basin is difficult because of the lack of reliable historical data regarding groundwater use, the SFPUC started metering the use of water for irrigation at Golden Gate Park and the San Francisco Zoo, the major uses of the groundwater basin in 2005. This more accurate information will be used to develop a better estimate of the safe yield of the groundwater basin, as required by Mitigation Measure 5.6-1 of the Draft PEIR (Vol. 4, Chapter 6, pp. 6-58 and 6-59). This measure requires that the basin's yield be determined on both a regular (average annual) and an intermittent (dry-year or emergency) basis, in accordance with Element 3 of the SFPUC's *Final Draft North Westside Groundwater Basin Management Plan* (SFPUC, 2005). A project-specific CEQA document will address the Westside Groundwater Project (part of the WSIP Regional Groundwater Projects, SF-2) in more detail.

The commenter also states that the groundwater yield estimate did not consider the potential for using local stormwater to enhance local aquifer recharge. In San Francisco, the SFPUC is examining options for recharging the Westside Groundwater Basin with stormwater, including restoration of Lake Merced water levels with stormwater. As discussed in the Draft PEIR (Table 3.10, Vol. 1, Chapter 3, p. 3-55), treated stormwater is one water supply under consideration for restoring Lake Merced water levels under the Local Groundwater Projects (SF-2). Under this project, treatment wetlands would be constructed to supply approximately 360 afy, or 0.32 mgd, of treated stormwater to Lake Merced. Because Lake Merced indirectly recharges the Westside Groundwater Basin, this project would result in a very small increase in the groundwater basin yield. However, the incremental increase in yield would be very small compared to the average annual increase in purchase requests of 35 mgd by 2030. Furthermore, the estimated range of recharge to the basin identified in the Draft PEIR (Vol. 3, Chapter 5, p. 5.6-24) includes recharge from Lake Merced.

In addition, the SFPUC evaluated recharge of the Westside Groundwater Basin with stormwater as part of the *Vista Grande Watershed Study* (RMC Water and Environment, 2006). This study demonstrated that construction of stormwater detention basins with a combined capacity of 54.4 million gallons would provide only approximately 694 afy (0.62 mgd) of recharge to the Westside Groundwater Basin. Aquifer recharge with stormwater would therefore require large amounts of land to achieve a substantial recharge benefit, and this land is not available in San Francisco and San Mateo County, which are mostly built out. The estimated cost would be $22,000 to $42,000 per acre-foot of water recharged. This is many times the cost of desalinated seawater, itself one of the more costly water sources potentially available to the SFPUC. Therefore, active recharge of the Westside Groundwater Basin with stormwater is not considered a feasible or cost-effective alternative to increase the yield of the groundwater basin because of high cost and the large amount of land that would be needed to achieve a substantial aquifer recharge benefit.

SI_TRT-CWA-SierraC-25 The commenter states that the Draft PEIR should confirm at the beginning of Section 5.6 that both the Local and Regional Groundwater Projects (SF-2) are subject to project-level CEQA review. Impacts of the proposed Local and Regional Groundwater Projects are addressed in Section 5.6 of the Draft PEIR (Vol. 3, Chapter 5). The analysis in this section demonstrates at a program level that identified impacts can be mitigated to a less-than-significant level. As stated in each impact analysis, the impacts and proposed mitigation would be subject to more detailed analysis as part of the project-level CEQA documentation for both projects, as determined by the San Francisco Planning Department.

SI_TRT-CWA-SierraC-26 The commenter expresses confusion regarding Figures 5.6-3 and 5.6-4, and states that the figures should reflect total pumping volumes. Figures 5.6-3 and 5.6-4 in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.6-7 and 5.6-9, respectively) are included for different purposes. The purpose of Figure 5.6-3 is to illustrate total historical pumping from the Westside Groundwater Basin, including pumping for municipal water supply, cemetery irrigation, and golf course irrigation. As described in the Draft PEIR (Vol. 3, Chapter 5, p. 5.6-6), groundwater usage for municipal purposes is metered, while usage for irrigation of cemeteries and golf courses has not historically been metered. Therefore, it is impossible to include a continual record of groundwater usage for irrigation of golf courses and cemeteries in this figure, and only one dot representing historically high pumping rates is included. This figure illustrates historically high pumping rates compared to 2005 groundwater pumping rates once much of the pumping for golf course irrigation was replaced with recycled water and municipal groundwater pumping was reduced during the In-Lieu Recharge Demonstration Study. The purpose of Figure 5.6-4 is to provide more detail regarding municipal groundwater pumping during the In-Lieu Recharge Demonstration Study.

SI_TRT-CWA-SierraC-27 The commenter asks why groundwater use at the Golden Gate Cemetery is not metered and what the plans are for measuring this groundwater use. Subsequent to preparation of the Draft PEIR, the SFPUC contacted the U.S. Department of Veterans Affairs and found that they no longer irrigate the Golden Gate Cemetery with groundwater. In response to this updated information, the text of the

Draft PEIR (Vol. 3, Chapter 5, p. 5.6-8, last paragraph) is revised as follows:

> Other continued uses of irrigation pumping in the South Westside Groundwater Basin in 2005 were consistent with historical pumping rates and are estimated at up to 2.1 mgd (2,400 afy) of irrigation pumping for cemeteries in Colma, and 0.1 mgd (120 to 150 afy) of irrigation pumping for the California Golf Club[8] in South San Francisco~~, and an undetermined amount of groundwater pumping for irrigation of the Golden Gate National Cemetery in San Bruno~~ (Luhdorff and Scalmanini, 2006). The Golden Gate National Cemetery in San Bruno has historically used groundwater for irrigation, but the cemetery has not been irrigated using groundwater for over 20 years (Schem, 2007).

The following reference is added to the Draft PEIR (Vol. 3, Chapter 5, p. 5.6-33).

> Schem, Clifford, U.S. Department of Veterans Affairs, National Cemetery Administration, personal communication with Greg Bartow, San Francisco Public Utilities Commission, September 7, 2007.

SI_TRT-CWA-SierraC-28 The commenter states that the available aquifer storage in the South Westside Groundwater Basin is greater than the capacity of Crystal Springs Reservoir, and that the Draft PEIR should evaluate the potential for proactive recharge of the groundwater basin with stormwater.

The Draft PEIR (Vol. 3, Chapter 5, p. 5.6-13) states that, based on the 2005 study by Luhdorff and Scalmanini, there is approximately 75,000 acre-feet of vacated aquifer storage in the South Westside Groundwater Basin in the Daly City, South San Francisco, and northern San Bruno areas. The proposed Regional Groundwater Projects (SF-2) are intended to take advantage of this vacated aquifer storage and to increase groundwater levels in the South Westside Groundwater Basin through in-lieu deliveries of potable water from the SFPUC regional system to the participating pumpers. While the vacated aquifer storage is greater than the historical capacity of the Crystal Springs Reservoir (69,300 acre-feet, Vol. 1, Chapter 2, Table 2.2, p. 2-6), the SFPUC studied recharge of the South Westside Groundwater Basin by stormwater, but found it to be infeasible.

The SFPUC investigated the potential for recharging the South Westside Groundwater Basin with stormwater in the *Vista Grande*

Watershed Study. The goal of the study was to identify potential solutions to flooding problems at the Vista Grande canal and in the Vista Grande drainage basin (RMC, 2006). This study evaluated the detention of stormwater to reduce both regional flooding as well as local flooding of the Vista Grande canal and tunnel.

As stated in **Response SI_TRT_CWA-SierraC-24**, the *Vista Grande Watershed Study* demonstrated that construction of stormwater detention basins with a combined capacity of 54.4 million gallons would provide only approximately 694 afy (0.62 mgd) of recharge to the Westside Groundwater Basin. Aquifer recharge with stormwater would therefore require huge amounts of land to achieve a substantial recharge benefit, and this land is not available in San Francisco and San Mateo County, which are largely built out. The estimated cost would be $22,000 to $42,000 per acre-foot of water recharged. Therefore, active recharge of the Westside Groundwater Basin with stormwater is not considered a feasible or cost-effective alternative to increase the yield of the groundwater basin because of the high cost to construct the basins and the large amount of land that would be needed to achieve a substantial aquifer recharge benefit.

SI_TRT-CWA-SierraC-29 The commenter states that a source water assessment should be part of the Draft PEIR, along with potential actions to address contamination of a water supply well. As stated in the Draft PEIR (Vol. 3, Chapter 5, p. 5.6-31), the SFPUC would develop a drinking water source assessment for each well constructed under the Local and Regional Groundwater Projects (SF-2). At a minimum, the assessment would include a delineation of the area around the well(s) through which contaminants might move and reach the well(s), referred to as the groundwater protection zone; an inventory of possible contaminating activities that could lead to a release of microbiological or chemical contaminants within the delineated area; and a determination of the potentially contaminating activities to which the well(s) are most vulnerable. Until production well locations are selected and a drinking water source assessment performed, the potential for contamination of a drinking water well cannot be fully evaluated. Therefore, impacts related to potential contamination of each well are conservatively considered potentially significant for the Local and Regional Groundwater Projects (SF-2) at the program level, but would be reduced to a less-than-significant level with implementation of Mitigation Measure 5.6-5, Drinking Water Source Assessments for Groundwater Wells (Vol. 4, Chapter 6, p. 6-59). This measure would require development and implementation of a source water protection program for wells that are considered vulnerable to contamination. The drinking water source assessment would be conducted as part of the project-level analysis and would identify actions to address potential contamination.

SI_TRT-CWA-SierraC-30 The model used in the analysis for the Draft PEIR (the HH/LSM) is a state-of-the-art water system model comparable with those used by other California state and local water agencies for planning purposes. Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.6).

The second part of this comment consists of a summary of comments on modeling and data analysis. Responses to these detailed comments are provided in **Responses SI_TRT-CWA-SierraC-31** through **SI_TRT-CWA-SierraC-54**.

SI_TRT-CWA-SierraC-31 This comment restates the comments submitted by the Pacific Institute (Comments SI_PacInst-03, SI_PacInst-04, SI_PacInst-05, SI_PacInst-07, SI_PacInst-08) and numerous other commenters; please refer to responses to the Pacific Institute letter and **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14).

SI_TRT-CWA-SierraC-32 Regarding the assertion that the demand projections used to develop the WSIP are inflated, refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14).

Regarding the comparison between percent difference in jobs and population between growth rates used to develop the demand projections and general plans, the commenter may be mistakenly referencing the comparison between Association of Bay Area Governments (ABAG) 2002 and 2005 projections. Table 7.8 in the Draft PEIR (Vol. 4, Chapter 7, p. 7-28) presents comparisons between water customer-selected population projections for 2030 and general plan population projections on a customer-by-customer basis; Table 7.9 (p. 7-30) presents the same information for employment projections. The percentages vary among the wholesale customers; as noted in the table, most wholesale customers service areas are not contiguous with city limits (or with the city and its planning area); therefore, the population projections from the jurisdictions' general plans and ABAG should be considered as general comparisons only.

The CCSF disagrees with the assertion that "it is speculative to make conclusions about consistency" between projections used to estimate future water demand and those contained in general plans. The Draft PEIR provides these comparisons because general plans present the level of growth adopted by the land use planning agencies in the areas receiving SFPUC water and, when considered in context with other local planning efforts (e.g., growth ordinances and amendments adopted subsequent to general plan approval), characterize potential buildout within these jurisdictions. The Draft PEIR identifies important issues salient to comparisons between the projections, noting the differences between planning-year horizons (Vol. 4, Chapter 7, pp. 7-7 et seq.), differences between service area boundaries and city boundaries (see preceding paragraph), and the age of some of the general plans and infrequency of general plan updates (p. 7-8). Partly because of these issues, the PEIR also compares the water-customer-selected population projections with those of the ABAG *Projections* series, since (a) ABAG is the official regional planning agency of the San Francisco Bay region; (b) the projections have a longer planning horizon than all of the general plans; and (c) the projections are updated (within information provided by Bay Area cities and counties) every two years.

Contrary to the comment, the PEIR does not assume nor speculate that "the local jurisdictions would plan for a continuing rate of growth beyond their [the general plans'] horizon years"; refer to note (a) in Tables 7.8 and 7.9 (Vol. 4, Chapter 7, pp. 7-28 and 7-30).

The comment also states that the general plan EIRs do not adequately cover the growth allowed by the increased water supply. As stated in the Draft PEIR (Vol. 4, Chapter 7, p. 7-70), "Given that the WSIP projections extend beyond the projections of many adopted general plans, especially in terms of expected employment growth, this analysis also considers the potential impacts of growth that could occur beyond the projections indicated in local general plans and related land use plans." The referenced analysis of growth beyond the previously evaluated growth (e.g., growth evaluated in general plan EIRs) is presented on Draft PEIR pp. 7-70 and 7-71.

Lastly, the comment correctly states that ABAG projections are not subject to environmental review; Bay Area cities and counties (not ABAG) are responsible for evaluating and approving future development. The CCSF believes that the Draft PEIR approach to evaluating growth, which is based not only on comparisons with ABAG projections but also on review of 180 general plans, general plan revisions, general plan amendments, specific plans, precise plans, updated land use and housing elements, and related CEQA documents (see Vol. 4, Chapter 7, pp. 7-78 to 7-91), is appropriate and consistent with CEQA requirements for a growth-inducement analysis.

SI_TRT-CWA-SierraC-33 This comment, which states that the Draft PEIR looks at the indirect effects of growth on air quality, traffic, and water quality but not on the other factors mandated by CEQA, is incorrect. Refer to Draft PEIR Section 7.4.1 (Vol. 4, Chapter 7, pp. 7-60 to 7-78). Table 7.11 (pp. 7-65 and 7-66) summarizes the significant impacts of planned growth, including impacts in the areas listed in this comment, and Table E.5.1 (Vol. 5, Appendix E.5, pp. E.5-3 to E.5-18) presents a more detailed summary of impacts and the measures that were identified to mitigate them in the EIRs prepared for the general plans of jurisdictions in the service area. In addition to these impacts on service area jurisdictions, the Draft PEIR identifies effects related to traffic, air quality, and hydrology/water quality as the key *regional* impacts of growth (i.e., in addition to these impacts within individual jurisdictions), which may be the basis for the comment's mischaracterization of the impact analysis.

SI_TRT-CWA-SierraC-34 Please refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14).

SI_TRT-CWA-SierraC-35 This comment regarding the Draft PEIR review of the project-level impacts on growth requires clarification. In addition to reviewing those general plan EIRs that could be obtained and summarizing the impacts and mitigation measures contained therein (Vol. 4, Chapter 7, pp. 7-60 to 7-69, and Vol. 5, Appendix E.5), the Draft PEIR preparers also reviewed a selection of EIRs for major projects currently being undertaken in the SFPUC service area (Vol. 4, Chapter 7, p. 7-71, and Vol. 5, Appendix E.6), to which this comment refers. The purpose of this project-level review was to assess whether, at least for the selection of EIRs reviewed, the mitigation measures identified in general plan EIRs were being implemented at the project level, and the Draft PEIR states the limited nature of the review (p. 7-71 and Appendix E.6).

The Draft PEIR review of general plan documents and related CEQA documents (Vol. 4, Chapter 7, pp. 7-78 to 7-91) indicated that the majority of growth the WSIP would support is consistent with the growth anticipated in the adopted general plans within the service area. To the extent that the WSIP would support a level of growth beyond that reflected in the adopted general plans, there could be additional or more severe impacts than those identified in the general plan EIRs. These impacts are discussed on pp. 7-69 to 7-71 of the Draft PEIR.

SI_TRT-CWA-SierraC-36 As described in Draft PEIR program description (Vol. 1, Chapter 3, pp. 3-28 to 3-30), the existing system could not meet average daily demand if any one of the five critical facilities were shut down for maintenance. SFPUC studies indicate that adequate redundancy for these critical facilities, including the Irvington Tunnel, is necessary to meet day-to-day customer water supply needs and allow sufficient operational flexibility to meet water delivery reliability goals. Without adequate redundancy of critical facilities, the SFPUC has limited operational flexibility in the event of an emergency or a system failure, as well as constraints on conducting adequate system inspection and maintenance. Consequently, the WSIP proposes to provide redundancy of some critical facilities in order to meet system reliability goals. The redundancy of individual facilities does not necessarily result in an overall increase in system capacity because of constraints in other parts of the system; therefore, the projected levels of water demand and related assumptions used in the Draft PEIR to estimate demand (Vol. 4, Chapter 7, pp. 7-9 to 7-18) provide the appropriate basis to assess expectations of future growth that would be served, in part, by the proposed program. Note also that the capacity of the existing Irvington Tunnel is not a constraint to growth, and the SFPUC is not proposing to use the second (new) tunnel and existing tunnel simultaneously.

SI_TRT-CWA-SierraC-37 This comment correctly states a requirement of the Master Water Sales Agreement that wholesale customers employ their best efforts to use all sources of water owned or controlled by them (Draft PEIR, Vol. 1, Chapter 2, p. 2-44 and Vol. 4, Chapter 7, p. 7-13).

The assertion that the analysis of the Aggressive Conservation/ Water Recycling and Local Groundwater Alternative was based on the additional conservation and recycling potential identified in the SFPUC's *Investigation of Regional Water Supply Option No. 4 Technical Memorandum* (SFPUC, 2007, Appendix D), as this comment suggests, is correct. The analysis of this and other alternatives presented in the Draft PEIR (Vol. 4, Chapter 9) evaluated the comparative merits of the alternatives and included sufficient information about each alternative to allow meaningful evaluation, analysis, and comparison with the proposed program, consistent with CEQA Guidelines Section 15126.6.

The statement that gross per-capita demand is projected to increase is incorrect; refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2, under the heading Per-Capita Demand).

Regarding the wholesale customers' planned conservation measures, refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3). The statement referring to "foreseeable changes" apparently refers to legislation mentioned in Comment SI_PacInst-72; refer to **Response SI_PacInst-72**.

The statement that 60 percent of the planned increase in demand is projected to arise from outdoor water use does not appear to be based on Pacific Institute comments submitted on the Draft PEIR, but may be based on information provided at the Sustainable Water Supply Briefing; refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3, under the heading Outdoor Water Use).

SI_TRT-CWA-SierraC-38 The commenter's opinion that the recycled water potential for the wholesale agencies falls below the recycling goals of the state and certain water agencies is acknowledged. Note that the 3 percent cited in this comment apparently refers to the 9 to 10 mgd of recycled water that has been identified as a component of the wholesale customers' 2030 water supply, shown in Draft PEIR Table 3.3 (Vol. 1, Chapter 3, p. 3-18). Note that this estimate of recycled water use is assumed in the customer's 2030 purchase estimates. The *SFPUC Wholesale Customer Recycled Water Potential Technical Memorandum* (RMC, 2004) identifies the *potential* for additional recycled water projects to be developed at some point in the future (refer to Draft PEIR Vol. 5, Appendix E.2, Table E.2.5, p. E.2-17).

SI_TRT-CWA-SierraC-39 As the comment correctly states, the additional potential for conservation measures and the use of recycled water and groundwater to offset demand on the SFPUC regional water system, as identified in the *Investigation of Regional Water Supply Option No. 4 Technical Memorandum* (SFPUC, 2007, Appendix D), was not incorporated into the proposed WSIP, and the SFPUC has committed to implementing identified measures in the retail customer service area that would offset 10 mgd of demand on the regional system. However, the findings of this study were used to inform the Aggressive Conservation/Water Recycling and Local Groundwater Alternative analyzed in the Draft PEIR (Vol. 4, Chapter 9, pp. 9-47 to 9-59). Refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for more information on this alternative. The reference to "6 mgd of savings" in this comment apparently refers to the difference between the maximum conservation savings considered to be feasible and cost-effective ("Program C") in the *SFPUC Wholesale Customer Water Conservation Technical Report* (URS, 2004b). Regarding the conservation measures to which the wholesale customers have committed, refer to Section 14.2.3 of the above-referenced master response.

SI_TRT-CWA-SierraC-40 This summary of the conservation potential studies conducted by the SFPUC in the retail customer and wholesale customer service areas requires clarification on several points. As the commenter states, the retail service area conservation potential study initially considered 48 conservation measures, of which 38 were selected for further consideration. Ultimately the SFPUC committed to implementing all 38 (Program C) as part of the WSIP (refer to Draft PEIR, Vol. 5, Appendix E.2, p. E.2-15); the wholesale customers' conservation potential study initially considered 75 measures, of which 32 were selected for further consideration by the wholesale customers. The commenter's estimate that an average of fewer than 10 measures was selected in the wholesale service area is noted. Draft PEIR Table 3.3 (Vol. 1, Chapter 3, p. 3-18) shows the projected conservation savings for each wholesale customer and for the retail service area, and Table E.2.4 (Vol. 5, Appendix E.2) shows the estimated conservation savings in relation to the three theoretical programs of measures (Programs A, B, and C) that were considered in the conservation potential assessments. Tables 14.2-7 and 14.2-8 in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14) show the measures being implemented or planned in the retail and wholesale customer service areas.

The commenter correctly states that the 32 measures selected for consideration by the wholesale customers were in general found to be cost-effective.[1] However, the incremental cost of adopting additional conservation measures is not as important as concerns about the feasibility of implementing additional measures in an agency's decision not to adopt additional measures, as discussed in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2,

1 Most of the 32 measures were cost-effective for most customers, although there were some exceptions; not all measures were cost-effective for all customers.

under the heading Effects of Future Price of Water on Projected Demand).

This comment also asserts that the wholesale customer conservation potential study failed to determine the total cost-effective conservation potential of the region. Since cost/benefit analyses of the programs of compiled measures (Programs A, B, and C) prepared for each customer found the programs to be cost-effective, the cumulative total conservation potential of Program C (shown in Table E.2.4, Vol. 5, Appendix E.2, p. E.2-14) could be considered a regional total for the individual wholesale customers. In addition, as part of the WSIP planning process, the SFPUC, in cooperation with its wholesale customers and the Bay Area Water Supply and Conservation Agency, undertook a study to assess the potential for additional conservation and recycled water projects, including projects that could be feasible if implemented regionally but that may have been found to be infeasible for individual customers. This study, *Investigation of Regional Water Supply Option No. 4 Technical Memorandum* (SFPUC, 2007, Appendix D), provided the basis for the Aggressive Conservation/Water Recycling and Local Groundwater Alternative analyzed in the Draft PEIR (Vol. 4, Chapter 9, pp. 9-47 to 9-59).

SI_TRT-CWA-SierraC-41 This comment seeks a response to two attachments regarding water pricing and the potential for water conservation and recycling: Attachments I and J. These attachments are shown as Comments SI_TRT-CWA-SierraC-196 through SI_TRT-CWA-SierraC-199 (refer to those responses).

SI_TRT-CWA-SierraC-42 The Draft PEIR provides a detailed analysis of the stream flow, geomorphology, groundwater, and fishery issues referred to in this comment (Vol. 3, Chapter 5, Sections 5.3.1, 5.3.2, 5.3.5, and 5.3.6). The analysis of potential WSIP impacts on these environmental elements extends along the length of the Tuolumne River, from Hetch Hetchy Reservoir to the river’s confluence with the San Joaquin River and then along the San Joaquin River to the Delta. For additional discussion of changes in flow and the rationale for considering flows under the WSIP to be within the range of existing flows, please refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Sections 14.6.5 and 14.6.6).

SI_TRT-CWA-SierraC-43 CEQA Section 21068 defines a significant effect on the environment as “a substantial, or potentially substantial, adverse change in the environment.” While CEQA requires that an EIR determine the significance of the environmental effects caused by a project, CEQA Guidelines Section 15064(b) states that “an ironclad definition of significant effect is not always possible because the significance of an activity may vary with the setting.” CEQA Guidelines Section 15064(d) provides further guidance, stating “in evaluating the significance of the environmental effect of a project, the Lead Agency shall consider direct physical changes in the environment which may be caused by the project and reasonably foreseeable indirect physical changes in the environment which may be caused by the project.” In terms of establishing significance criteria, CEQA Guidelines Section 15064.7 states “a threshold of significance is an identifiable quantitative, qualitative or performance level of a particular environmental effect.”

The CCSF has not formally adopted significance standards for analysis of environmental impacts, but as the CEQA lead agency for the CCSF, the San Francisco Planning Department generally applies the standards contained in Appendix G of the CEQA Guidelines, supplemented by additional topics specific to San Francisco.

In the Draft PEIR, the San Francisco Planning Department employs significance criteria appropriate to the range of the WSIP’s environmental effects, drawing from the significance standards contained in Appendix G of the CEQA Guidelines where applicable and augmenting them where needed to address topics that could be affected by the WSIP but are not addressed in Appendix G, such as stream flow or greenhouse gas emissions. The Draft PEIR evaluates impacts associated with the WSIP in accordance with the CEQA Guidelines described above, identifying the applicable significance criteria and using quantitative, qualitative, or performance levels where appropriate to determine impact significance. Often, the significance criteria are based on standards set pursuant to state or federal law, which may be numerical or non-numerical. Each section in the Draft EIR describing the WSIP’s impacts on a particular environmental element begins with a subsection entitled “Approach to Analysis” that describes how the numerical and non-numerical standards are used in the analysis of impacts.

As an example of a quantitative analysis, Impact 4.9-1 (Vol. 2, Chapter 4, pp. 4.9-21 to 4.9-27) provides a quantitative estimate of WSIP construction-related air pollutant emissions and compares them to quantitative significance criteria established by the air district to determine the impact significance. Impact 4.5-1 (Vol. 2, Chapter 4, p. 4.5-21) is an example of a qualitative impact analysis in which the potential for erosion and sedimentation during construction is identified but not quantified, and the impact significance is based on the effectiveness of known erosion and sedimentation control measures. Impact 4.10-4 (Vol. 2, Chapter 4, p. 4.10-33) is an example of a performance-level analysis in which disturbance due to long-term noise increases is identified, and the impact significance is based on the ability to comply with local noise ordinances. For some impacts in the Draft PEIR, the assessment of impact significance requires analysis of both the severity and frequency of an impact relative to a quantitative threshold; an example of this is Impact 5.3.3-2 (Vol. 3, Chapter 5, p. 5.3.3-17), which analyzes effects on water quality along the Tuolumne River below La Grange Dam and determines impact significance by considering both the magnitude of changes in water temperature relative to water quality objectives and the frequency of changes exceeding the objectives.

With respect to the need to consider both the frequency and severity of an impact, refer to **Response SI_TRT-CWA-SierraC-44**. With respect to the comment on cumulative impacts, refer to **Response SI_TRT-CWA-SierraC-45**. Also, see **Response SI_CNPS-EB1-23** for addition discussion of this topic.

SI_TRT-CWA-SierraC-44 The San Francisco Planning Department considered both severity and frequency of an impact when determining whether it was significant. Many of the potential impacts of the WSIP would stem from WSIP-caused changes in river flow, as depicted in Figure 5.1-3 (Vol. 3, Chapter 5, p. 5.1-8). However, river flow in watersheds fed by surface runoff is an inherently variable phenomenon, and the frequency of occurrence of noticeable flow changes from the existing condition is an important descriptor in understanding the effects of the WSIP on river flow. In most cases where the terms “occasional” or “rare” are used, they follow a more precise descriptor such as “x months in the 82-year hydrologic record.”

The rationale behind the impact significance determinations can best be illustrated by examples. In very dry periods under the current condition, the pool of cool water in Hetch Hetchy Reservoir becomes depleted and warmer water is released to the Tuolumne River below O’Shaughnessy Dam. This is a rare occurrence—once or twice in the 82-year period of hydrologic record. The WSIP would make this situation slightly worse; it would still be rare (occurring once or twice in the 82-year hydrologic record) but it might persist for two or three weeks rather than a few days or a week. The release of warm water from the reservoir would increase water temperatures in the river toward the upper end of the optimal range for rainbow trout. Because the event would be rare and the consequences of limited severity to the affected resource, the conclusion was reached that the WSIP would have a less-than-significant adverse impact on fisheries in the Tuolumne River below O'Shaughnessy Dam.

Another example is that the WSIP would delay the start of the release of water from La Grange Dam in the late winter and early spring in excess of the minimum required instream flow. In most cases the delay would be a matter of a few days. Infrequently, the delay could be several weeks, during which time flows in the river below the dam would remain at the minimum required instream flow and water temperatures would be higher than under the existing condition. As indicated in the Draft PEIR, Chinook salmon populations in the lower Tuolumne River are much below historical levels. Although WSIP-caused substantial reductions in flow and increases in water temperature would be rare, it was concluded that the impact of the changes could be severe, bearing in mind the fragility of the Chinook salmon population. The impact of the WSIP on fisheries in this reach of the river was accordingly determined to be potentially significant, and appropriate mitigation measures are proposed (Measures 5.3.6-4a and 5.3.6-4b).

SI_TRT-CWA-SierraC-45 The San Francisco Planning Department identified the criterion indicating whether an impact would be "substantially … outside of the range of pre-project conditions" as appropriate to determine the significance of changes in stream flow associated with the WSIP, and applied this criterion on an impact-by-impact basis. Please refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.5), and **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.6), for a description of how the criterion was applied to determine that stream flow impacts on the Tuolumne River would be less than significant. However, this same criterion, when applied to the effect of WSIP on stream flow in Alameda Creek (Impact 5.4.1-2, Vol. 3, Chapter 5, p. 5.4.1-25), resulted in the conclusion that the impact would be significant and unavoidable.

The Draft PEIR discusses the possibility that impacts determined to be less than significant could combine with other less-than-significant impacts from a future project to create a significant impact (Vol. 3, Chapter 5, Section 5.7, Cumulative Projects and Impacts Related to WSIP Water Supply and System Operations).

SI_TRT-CWA-SierraC-46 Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.3) for a discussion of the model time interval. The conclusions with respect to impacts on fisheries and riparian habitat were determined after consideration of both monthly and daily flows.

SI_TRT-CWA-SierraC-47 Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.4) for a discussion of the use of averages within hydrologic year types.

SI_TRT-CWA-SierraC-48 Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Sections 14.5.3 and 14.5.4) for discussions of the model time interval and the use of averages within hydrologic year types. Also, refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.6) and **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.7) for discussions of the use of flow data in the analysis of impacts on geomorphology.

SI_TRT-CWA-SierraC-49 As the commenter notes, stream ecology may respond to a finer timescale than monthly flows, and stream geomorphology may respond to peak flows that occur rarely. These concepts are reflected in the Draft PEIR impact analyses. For more information on the statistical analysis of flow data, please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Sections 14.5.3 and 14.5.4). For more information on the use of peak flow data in the analysis of geomorphology, refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.6) and **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.7). Estimates of monthly and daily flows were used in evaluating the effects of the WSIP on stream ecology. Daily flow information was estimated as described in the Draft PEIR (Vol. 3, Chapter 5, Section 5.3.1) and then used in the analysis of fisheries and terrestrial biology (Vol. 3, Chapter 5, Sections 5.3.6 and 5.3.7).

SI_TRT-CWA-SierraC-50 Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.3).

SI_TRT-CWA-SierraC-51 The commenter states that the Draft PEIR should set measurable criteria for the evaluation of groundwater impacts. The San Francisco Planning Department identified the following significance criteria for evaluating groundwater impacts in the Draft PEIR (Vol. 3, Chapter 5, p. 5.6-22). An impact is considered significant if it would:

- Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of preexisting nearby wells would drop to a level that would not support existing land uses or planned uses for which permits have been granted)
- Potentially result in onsite or offsite land subsidence that would cause substantial structural damage, increased flooding, or altered drainage patterns
- Violate any water quality standards or waste discharge requirements
- Otherwise substantially degrade water quality

As stated in the Draft PEIR (Vol. 3, Chapter 5, p. 5.6-22), criteria for evaluating the depletion of groundwater resources are based on whether groundwater pumping would reduce groundwater levels to a degree that adverse effects would occur, including saltwater intrusion, effects on surface water resources, or land subsidence. Criteria for evaluating groundwater quality are based on beneficial uses and water quality objectives established by the San Francisco Bay Regional Water Quality Control Board in the *Water Quality Control Plan for the San Francisco Bay Basin*, as authorized under the Porter-Cologne Water Quality Control Act and Clean Water Act. In addition, for groundwater to be used as a public water supply, it must meet groundwater quality evaluation criteria based on the California Drinking Water Standards, as established by the state and federal Safe Drinking Water Acts.

Support of beneficial uses, recommended as a criterion by the commenter, is addressed in evaluating impacts related to the depletion of groundwater resources, the violation of water quality standards, and other degradation of water quality.

The Draft PEIR analyzes the impacts of the proposed Local and Regional Groundwater Projects (WSIP facility improvement project

SF-2) (Vol. 3, Chapter 5, Section 5.6) and demonstrates at a program level that identified impacts can be mitigated to a less-than-significant level. As stated in each impact analysis, the impacts and proposed mitigation would be subject to more detailed, site-specific analysis as part of the project-level CEQA review for both projects.

For additional information on significance criteria and thresholds, please refer to **Response SI_TRT-CWA-SierraC-43**.

SI_TRT-CWA-SierraC-52 Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.5).

SI_TRT-CWA-SierraC-53 Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.3). The conclusions with respect to environmental impacts were arrived at after consideration of monthly, daily, and peak flows.

SI_TRT-CWA-SierraC-54 The sentence referred to on Draft PEIR p. 9-89 (Vol. 4, Chapter 9) is accurate and consistent with information presented in Table 9.7 (Vol. 4, Chapter 9, p. 9-17). The four alternatives mentioned would avoid the *significant* impacts on fishery resources below La Grange Dam, but would not necessarily avoid all impacts on this reach of the river. The Aggressive Conservation/Water Recycling and Local Groundwater Alternative (with No Supplemental Tuolumne River Water) and the Year-round Desalination for Drought Alternative would essentially avoid all impacts on the Tuolumne River below La Grange Dam. The Modified WSIP Alternative would also avoid all impacts on the Tuolumne River below La Grange Dam, provided Mitigation Measure 5.3.6-4a is implemented. The No Purchase Request Increase Alternative would have impacts similar to (but much less severe than) those of the WSIP. Its impacts on the reach of the river below La Grange Dam were judged to be less than significant.

SI_TRT-CWA-SierraC-55 This comment consists of a summary of comments on assumptions used in the Draft PEIR. Responses to detailed comments are provided below in **Responses SI_TRT-CWA-SierraC-55** through **SI_TRT-CWA-SierraC-73**. With regard to assumptions used in the HH/LSM, please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.6).

SI_TRT-CWA-SierraC-56 The Draft PEIR (Vol. 1, Chapter 2, pp. 2-35 to 2-37) provides a summary description of the CCSF's water rights. These water rights are adequate for the water supply option proposed under the WSIP;

consequently, the CCSF will not seek new appropriative water rights. No further information is provided because the validity or otherwise of water rights is not a CEQA issue.

The Raker Act does not require San Francisco to develop and use local water sources before it can divert out of the Tuolumne River watershed. Rather, the Raker Act restricts San Francisco's use of Tuolumne River water in the Bay Area to municipal and domestic purposes only. The SFPUC will continue to maximize its use of local resources and develop those local resource projects and programs that are feasible, reasonable, and cost-effective, consistent with responsible stewardship of Tuolumne River resources. For further information on this issue, please refer to **Response L_TUD1-05**.

SI_TRT-CWA-SierraC-57 Please refer to **Response SI_TRT-CWA-SierraC-56**, above.

SI_TRT-CWA-SierraC-58 Please refer to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.8).

The SFPUC does not know if TID and MID are willing to consider an arrangement like that described in Mitigation Measure 5.3.6-4a and elaborated upon in **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14). That is why the Draft PEIR acknowledges the uncertainty associated with the measure. For more information on the transfer, please refer to **Section 14.3, Master Response on Proposed Dry-Year Water Transfer** (Vol. 7, Chapter 14, Section 14.3.3).

SI_TRT-CWA-SierraC-59 The commenter's opinion with respect to gravel augmentation under Mitigation Measure 5.3.6-4b as poorly matched for the identified impact is acknowledged. Please refer to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.9).

SI_TRT-CWA-SierraC-60 The commenter's opinion with respect to pond removal as part of Mitigation Measure 5.3.6-4b is acknowledged. Please refer to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.9).

SI_TRT-CWA-SierraC-61 The potential effects of the WSIP on steelhead are described in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.3.6-28 to 5.3.6-32). Please also refer to **Response SI_TRT-CWA-SierraC-12**, above.

SI_TRT-CWA-SierraC-62 The commenter's opinion with respect to Mitigation Measure 5.3.6-4b is acknowledged. Please refer to **Section 14.7, Master**

Response on Lower Tuolumne River Issues (Vol. 7, Chapter 14, Section 14.7.9). Various measures are being taken to improve habitat for salmonids in the lower Tuolumne River. It will take some time to determine the effectiveness of the measures. The types of measures included in Measure 5.3.6-4b were devised based on factors known to be adversely affecting salmonid habitat. As described in Section 14.7.9, Measure 5.3.6-4b has been clarified to include surveys and actions to meet performance standards.

SI_TRT-CWA-SierraC-63 The analysis in the Draft PEIR compares conditions with the WSIP to those under the existing condition. The WSIP includes a transfer of water from TID and MID to the SFPUC that would enable the SFPUC to meet customer demand in dry years without greater than 20 percent systemwide rationing. The transfer was included in the Hetch Hetchy/Local Simulation Model (HH/LSM) and is reflected in the flow estimates provided in the Draft PEIR (Vol. 3, Chapter 5, Section 5.3.1). Furthermore, the transfer is reflected in the assessment of WSIP impacts on the Tuolumne River between Hetch Hetchy and Don Pedro Reservoirs and below La Grange Dam (Vol. 3, Chapter 5, Sections 5.3.2 through 5.3.9).

SI_TRT-CWA-SierraC-64 Please refer to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.4).

SI_TRT-CWA-SierraC-65 Please refer to **Section 14.8, Master Response on Delta and San Joaquin River Issues** (Vol. 7, Chapter 14, Sections 4.8.2 and 4.8.3).

SI_TRT-CWA-SierraC-66 Please refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.2).

SI_TRT-CWA-SierraC-67 Please refer to **Section 14.8, Master Response on Delta and San Joaquin River Issues** (Vol. 7, Chapter 14, Sections 4.8.2 and 4.8.3).

SI_TRT-CWA-SierraC-68 With regard to the assumptions made in the HH/LSM, please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.6).

The commenter correctly notes that an agreement has not yet been reached on a transfer of water from TID and MID to the SFPUC. Such agreements with TID and MID cannot be formalized until the PEIR is certified and the WSIP is approved and adopted by the SFPUC. Please refer to **Section 14.3, Master Response on**

Proposed Dry-Year Water Transfer (Vol. 7, Chapter 14, Section 14.3.2) for more information on the transfer.

The commenter correctly notes that the WSIP would reduce inflow to Don Pedro Reservoir compared to the existing condition. This would occur in all but very dry years because water demand is greater with the WSIP than under the existing condition, and much of the increased demand would be met through diversions from the Tuolumne River at Hetch Hetchy Reservoir. Consequently, the water that TID and MID would capture for their own diversion and use (an average of 867,000 afy) would represent a higher proportion of reservoir inflow with the WSIP than under the existing condition, as described in the Draft PEIR (Vol. 3, Chapter 5, Section 5.3.1).

SI_TRT-CWA-SierraC-69 Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.6) for information on expected future diversions by TID and MID. Expected future diversions are much less than TID's and MID's full water rights.

The conversion of agricultural lands to urban uses has occurred rapidly in the TID and MID service areas in the last 30 years and can be expected to continue once the effects of the sub-prime mortgage crisis passes. Increases in urban water use would be almost exactly offset by reductions in agricultural water use. Typical urban neighborhoods use about the same amount of water per acre each year as typical irrigated agricultural land.

SI_TRT-CWA-SierraC-70 With regard to the hydrologic assumptions used in the analysis, please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.6). With respect to the effects of climate change, refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14).

SI_TRT-CWA-SierraC-71 It is conventional practice in water supply system planning to estimate future demand by assuming a continuation of whatever water conservation and recycling practices are already in place or can reasonably be predicted. This practice produced the total water demand for the SFPUC service area of 417 mgd in 2030. Further consideration by the SFPUC's wholesale customers of additional feasible conservation programs and alternative local water supplies resulted in the 2030 purchase estimates for the regional water system of 300 mgd shown in Table 9.4 (Vol. 4, Chapter 9, p. 9-11). One of the proposed alternatives (the Aggressive Conservation/Water Recycling and Local Groundwater Alternative) includes more aggressive conservation measures and recycling practices. The water saved or used twice as a result of these practices can be treated as a new source of water or as a reduction in demand; how this saved water is viewed makes little practical difference in the planning process or impact analysis under CEQA.

The SFPUC chose to treat the 10 mgd of proposed groundwater/ recycled water/conservation projects in San Francisco (one component of the WSIP water supply option) as a reduction in water demand for the regional system. Consequently, 290 mgd would have to be delivered from the regional system's other water sources. Modeling of the system assumed that 290 mgd would be provided from the system's other sources, and that shortages and rationing in droughts would be estimated based on a demand of 290 mgd rather than a demand of 300 mgd. Because of this, and contrary to the comment, the estimated total demand of 300 mgd in 2030 does not skew the modeling of drought-year shortages.

SI_TRT-CWA-SierraC-72 This comment refers to the demand hardening discussion in the Draft PEIR, which is included in the analysis of the Aggressive Conservation/Water Recycling and Local Groundwater Alternative's ability to meet the program objectives (Vol. 4, Chapter 9, p. 9-54). As indicated on Table 9.6 (Vol. 4, Chapter 9, p. 9-15), this alternative would have a limited ability to meet the WSIP's level of service objectives for water supply. For the scenario in which no supplemental Tuolumne River water would be provided to customers, this alternative would neither meet the average annual 2030 purchase request of 300 mgd during nondrought years nor meet the 20 percent systemwide rationing limit during droughts; this means that shortages would occur in all years, and, as shown in Table 9.5 (Vol. 4, Chapter 9, p. 9-13), there would be 15 years out of the 82-year period of hydrologic record that shortages would reach 25 percent. For the scenario in which supplemental Tuolumne River water would be provided to serve the 2030 purchase request of 300 mgd during nondrought years, this alternative would meet the WSIP water supply level of service objective during nondrought years; during drought years (Table 9.5, p. 9-13), there would be 7 out of 82 years with 10 percent shortages and 8 out of 82 years with 20 percent shortages. However, under both scenarios, the demand hardening would occur as a result of the increased water-use efficiency, and customers would have limited options for accommodating water shortages during drought periods.

With regard to the comment asserting that 60 percent of the increased 2030 water demand is for outdoor use, refer to

Response SI_PacInst-63 as well as **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14) for a detailed discussion of assumptions used in determining water demand.

SI_TRT-CWA-SierraC-73 Conjunctive use typically means the coordinated use of groundwater and surface water sources to avoid shortages in years when surface waters are in short supply. Because no additional surface water is available under the “no additional diversions” alternative, conjunctive use in the Westside Groundwater Basin is not feasible.

It is not clear how the Aggressive Conservation/Water Recycling and Local Groundwater Alternative would affect water levels in the Westside Groundwater Basin. The use of recycled wastewater to satisfy some irrigation demand that is now met with well water could potentially raise groundwater levels. On the other hand, aggressive conservation measures that reduce the use of water outside homes could reduce recharge and lower groundwater levels. These issues will be examined in detail in the project-level CEQA document for the Westside Groundwater Project (part of the WSIP Regional Groundwater Projects, SF-2).

SI_TRT-CWA-SierraC-74 No federal permits or approvals are needed for the SFPUC to approve, adopt, or implement the overall WSIP as a program and policy; therefore, compliance with the National Environmental Policy Act is not needed. As described in the Draft PEIR (Vol. 1, Chapter 2, p. 2.-33), the Raker Act granted the CCSF the rights-of-way and use of public lands in the affected areas to construct, operate, and maintain reservoirs, dams, conduits, and other structures necessary or incidental to developing and using water and power. Consequently, there is no federal nexus requiring compliance with the National Environmental Policy Act. However, as described in the Draft PEIR (Vol. 1, Chapter 3, p. 3-86), some of the individual WSIP facility improvement project may require federal approvals, but those actions would be distinct from the approval of the WSIP as a whole.

SI_TRT-CWA-SierraC-75 This comment expresses an opinion that there was inadequate noticing of the Draft PEIR public hearing dates. Please refer to **Responses F_USDAFS-05** and **L_SFCPC1-01** (Vol. 7) and **Appendix J1** (Vol. 8) of this Comments and Responses document for detailed information on the public outreach efforts conducted by the San Francisco Planning Department’s Major Environmental Analysis Division and the SFPUC.

SI_TRT-CWA-SierraC-76 Draft PEIR Section 5.1 (Vol. 3, Chapter 5) is entitled "Overview" and is intended to provide the reader with an overall understanding of the HH/LSM and its use in the Draft PEIR analysis of the WSIP. Table 5.1-1 (Vol. 3, Chapter 5, p. 5.1-12) lists key differences between the existing condition and the WSIP scenarios. The assumption with respect to the diversion of water by TID and MID was not included because it was the same in the two scenarios. Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.6) for more information on the basis for the TID and MID diversion assumption.

SI_TRT-CWA-SierraC-77 The commenter questions the use of data from the 82-year period of record to model future hydrologic conditions in the Draft PEIR. The use of historical hydrologic data is conventional practice in water supply system modeling and has been for many years, although recently many water agencies have begun to examine the possibility that climate change could alter future hydrology. The climate change analysis in the Draft PEIR used a similar assumptions as those used in other recent EIRs on water projects (e.g. *DEIR on the Monterey Amendment to the State Water Project Contracts*, California Department of Water Resources, October 2007).

Refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14) for more information on the effects of climate change on the SFPUC regional water system.

SI_TRT-CWA-SierraC-78 The commenter notes that temporal availability of water is likely to change, and that the model underestimates hydrology impacts as well as the biological and geomophological impacts that result from hydrologic changes. The current understanding of climate change science and how it applies to California's water resources and the SFPUC regional system is discussed in detail in **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14).

SI_TRT-CWA-SierraC-79 The HH/LSM in the form used in the Draft PEIR did not accurately simulate water system operations in the Pilarcitos Creek watershed for two reasons. The model did not accurately represent limitations in the capacity of the conveyance system from Stone Dam to the Coastside County Water District (Coastside CWD) treatment plant, and it assumed that water would be pumped from Pilarcitos Reservoir to Pilarcitos Creek when the water level in Pilarcitos Reservoir fell below its outlet elevation. Because of these deficiencies, information from operational records rather than the HH/LSM was used to analyze potential WSIP effects on Pilarcitos

Creek. The San Francisco Planning Department believes that the operational data are sufficient to make a reasonable environmental assessment.

Since publication of the Draft PEIR, the model deficiencies have been corrected and the HH/LSM was used to estimate the effects of the WSIP on reservoir levels and stream flow in the Pilarcitos Creek watershed (see Vol. 7, Chapter 13, Section 13.3). The results of modeling, together with the results of biological field reconnaissance, enabled a more precise identification of the potential impacts of the WSIP in the Pilarcitos Creek watershed. No new impacts were identified that were not documented in the Draft PEIR, but several impacts identified as potentially significant in the Draft PEIR were reclassified as less than significant. The revised impacts are shown in **Chapter 16, Staff-Initiated Text Changes** (Vol. 7). The modeling results are included in Appendix O1 (Vol. 8).

The Draft PEIR indicated that the significant adverse effects of the WSIP in the Pilarcitos Creek watershed would be avoided with the implementation of Mitigation Measure 5.5.3-2. Under Measure 5.5.3-2, the SFPUC would modify operation of its Pilarcitos Creek facilities so that flow in Pilarcitos Creek with the WSIP would be very similar to flow under existing conditions. After publication of the Draft PEIR, the SFPUC concluded that implementation of Measure 5.5.3-2 would be technically challenging and less practical than other available measures. Replacement mitigation measures were developed and are described in **Chapter 16, Staff-Initiated Text Changes**. The replacement mitigation measures would reduce the impacts of the WSIP in the Pilarcitos Creek watershed to a less-than-significant level.

With the WSIP, the SFPUC had planned to serve a portion of Coastside CWD's increased water demand from Pilarcitos Creek. However, this would not be possible because of conveyance system capacity limits, and so almost all of Coastside's increased demand would be met from Crystal Springs Reservoir. This would slightly increase the amount of water diverted from the Tuolumne River under the Modified WSIP Alternative.

With respect to the accuracy of the model, please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.5).

SI_TRT-CWA-SierraC-80 Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.8).

SI_TRT-CWA-SierraC-81 Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.8).

SI_TRT-CWA-SierraC-82 Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.3). Information on daily flows in the Tuolumne River and Alameda Creek are provided in the Draft PEIR (Vol. 3, Chapter 5, Sections 5.3.1 and 5.4.1).

SI_TRT-CWA-SierraC-83 Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.3). Information on daily flows in the Tuolumne River and Alameda Creek are provided in the Draft PEIR (Vol. 3, Chapter 5, Sections 5.3.1 and 5.4.1).

SI_TRT-CWA-SierraC-84 This comment refers to Table 5.2-1, Applicable Federal, State, and Local Statues and Agreements, in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.2-3 to 5.2-5) and states that there is no mention of Fish and Game Code 5937, which requires: "The owner of any dam shall allow sufficient water at all times to pass through a fishway, or in the absence of a fishway, allow sufficient water to pass over, around or through the dam, to keep in good condition any fish that may be planted or exist below the dam."

In response to this comment, Draft PEIR Table 5.2-1 is revised to include the following text under the State Agencies heading (Vol. 3, Chapter 5, p. 5.2-4):

Statute or Agreement/Responsible Agency

California Fish and Game Code / Fish and Game Commission and CDFG

Summary Description

Provides a system for the restoration and preservation of California's fish and wildlife resources

Associated Statutes and Plans

California Endangered Species Act (CESA), California Environmental Quality Act (CEQA), Lake and Streambed Alterations

Applicability to WSIP Water Supply and System Operations Issues

CEQA review of the proposed water supply and system operations aspects of the WSIP is presented in Chapter 5, including the impacts of the WSIP on species listed under CESA, as discussed in Sections 5.3.7, 5.4.6, and 5.5.6.

In response to this comment, the Draft PEIR is revised to include the following text (Vol. 3, Chapter 5, p. 5.2-10) under the State Agencies heading:

California Fish and Game Commission

The California Fish and Game Commission (Commission) has the statutory authority to formulate guidance policies for the California Department of Fish and Game (CDFG). The Commission has over 200 powers and duties listed in the statutes of the Fish and Game Code. Principal among these are legislatively granted powers for the regulation of the sport take and possession of birds, mammals, fish, amphibians, and reptiles. The Commission oversees the establishment of wildlife areas and ecological reserves and regulates their use, and prescribes the terms and conditions under which permits or licenses may be issued by the CDFG. A primary responsibility of the Commission is to afford an opportunity for full public input and participation in the decision- and policy-making process of adopting regulations or taking other actions related to the well-being of California's fish and wildlife resources.

The Commission sets policy for the CDFG, while the CDFG is the lead state agency charged with implementing, safeguarding, and regulating the uses of fish and wildlife.

California Department of Fish and Game

The mission of the CDFG is to manage California's diverse fish, wildlife, and plant resources, and the habitats upon which they depend, for their ecological values and for their use and enjoyment by the public. The CDFG enforces multiple programs dedicated to the conservation and preservation of habitats and species in California, including the California Endangered Species Act (CESA), California Environmental Quality Act (CEQA), and California Fish and Game Code. Under CESA, the CDFG is responsible for consulting with state lead agencies to determine if their actions would affect a state-listed threatened or endangered species. Under CEQA, the CDFG is responsible for consulting with lead and responsible agencies and providing the requisite biological expertise to review and comment upon environmental documents and impacts arising from project activities. The CDFG is also responsible for enforcing the provisions of the California Fish and Came Code.

In response to this comment, the Draft PEIR is revised to include the following text (Vol. 3, Chapter 5, p. 5.2-11) under the State Statutes and Agreements heading:

California Fish and Game Code

The Fish and Game Code provides a system for the protection of California's fish and wildlife resources and includes:

provisions related to fish and wildlife protection and conservation; fish and game management; wetlands mitigation banking; endangered species; and operation of dams, conduits, and screens.

SI_TRT-CWA-SierraC-85 Please refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.2). With respect to compliance with the Fish and Game Code, CEQA does not require that an EIR evaluate whether the existing condition is compliant with all environmental laws and policies. The adequacy of baseline data is addressed in **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol.7, Chapter 14, Section 14.4.4).

SI_TRT-CWA-SierraC-86 Please refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.2).

SI_TRT-CWA-SierraC-87 The Draft EIR states that the SFPUC and the U.S. Department of the Interior agreed to the minimum release schedule from O'Shaughnessy Dam shown in Table 5.3.1-2 (Vol. 3, Chapter 5, p. 5.3.1-13), and that the SFPUC has made and continues to make releases in accordance with the minimum schedule. Furthermore, the Draft PEIR notes that field studies undertaken between 1989 and 1992 of the river reach between O'Shaughnessy Dam and Early Intake confirmed successful reproduction, rearing, and maintenance of adult populations of rainbow and brown trout (Vol. 3, Chapter 5, p. 5.3.6-2). Contrary to the statement in this comment, the Draft PEIR does not venture an opinion on whether the releases and the trout populations they support are sufficient (see **Response S_CDFG2-02**). The Draft PEIR confines itself to assessing the effects of WSIP-induced flow changes on resident trout. For more information, please refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.2).

SI_TRT-CWA-SierraC-88 The information provided in Figures 5.3.1-8 and 5.3.1-9 and the accompanying narrative provide a comprehensive summary description of the effects of the WSIP on storage in Hetch Hetchy Reservoir (Vol. 3, Chapter 5, pp. 5.3.1-21 to 5.3.1-24).
Figure 5.3.1-8 shows that average monthly storage in Hetch Hetchy Reservoir over the 82-year period of record would be less with the WSIP than under the existing condition by a small amount in every month. For example, in October average monthly storage under the existing condition would be about 270,000 acre-feet; with the WSIP it would be about 255,000 acre-feet. The highest storage in October under the existing condition and with the WSIP would be

325,000 acre-feet. The lowest storage in October under the existing condition would be about 90,000 acre-feet; with the WSIP it would be about 40,000 acre-feet.

Figure 5.3.1-8 does not provide information on the differences between storage in Hetch Hetchy Reservoir under the existing condition and with the WSIP in any month in the 82-year period of hydrologic record. This information is provided graphically in Figure 5.3.1-9 and in tabular form in Appendix H2-1 (Vol. 5, Tables 2.3-1, 2.3-2, and 2.3-3 on pp. 17, 18, and 19). Storage in Hetch Hetchy Reservoir under the existing condition and with the WSIP in any given month would be different depending on hydrologic circumstances and reservoir management practices. The differences between monthly storage with and without the WSIP would be greatest under conditions similar to those that occurred in 1976 and 1977. As noted in the Draft PEIR, water levels in Hetch Hetchy Reservoir during extreme droughts could be as much as 64 feet lower than under the existing condition (Vol. 3, Chapter 5, p. 5.3.1-24).

The description of the effects of the WSIP on storage in Hetch Hetchy Reservoir contained in the Draft PEIR is accurate (Vol. 3, Chapter 5, pp. 5.3.1-21 to 5.3.1-24). Storage and water levels in Hetch Hetchy Reservoir fluctuate within a wide range under the existing condition. Although water levels in the reservoir would often be lower with the WSIP than under the existing condition, most of the time they would remain in the same range as they do under the existing condition, and few if any environmental impacts would result. Occasionally, in extreme droughts, the water level with the WSIP would fall below levels experienced under the existing condition. During these conditions, the WSIP could have adverse impacts on water quality, as described in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.3.3-14 to 5.3.3-16).

SI_TRT-CWA-SierraC-89 Under the existing condition, average monthly storage in Hetch Hetchy Reservoir ranges from a maximum of 360,400 acre-feet to a minimum of about 34,000 acre-feet. As shown in Appendix H2-1, monthly storage with the WSIP would fall below 34,000 acre-feet in only 2 months of the 984-month hydrologic record (Vol. 5, Appendix H2-1, Tables 2.3-1, 2.3-2, and 2.3-3 on pp. 17, 18, and 19). This is the basis for stating that the water levels in Hetch Hetchy Reservoir with the WSIP would remain within the range currently experienced most of the time.

SI_TRT-CWA-SierraC-90 Please refer to **Responses SI_TRT-CWA-SierraC-88** and **SI_TRT-CWA-SierraC-89**.

SI_TRT-CWA-SierraC-91 The commenter restates information contained in the Draft PEIR; namely, that the issue of the degree to which parties that divert water upstream of the Delta, including the SFPUC, are responsible for meeting Delta objectives remains unresolved (Vol. 3, Chapter 5, p. 5.3.1-18). The commenter's opinion—that the SFPUC should not consider providing additional water to its suburban customers until the SFPUC's role in meeting Delta objectives is clarified—is acknowledged. For more information, please refer to **Section 14.8, Master Response on Delta and San Joaquin River Issues** (Vol. 7, Chapter 14).

SI_TRT-CWA-SierraC-92 It is possible that the Vernalis Adaptive Management Program (VAMP) may demonstrate the value of increased releases from reservoirs on the San Joaquin River and its tributaries during the spring to protect migratory fish. If increased releases from Don Pedro Reservoir are necessary in a VAMP-like program after 2011, or as a result of Don Pedro Project relicensing in 2016, the SFPUC's customers would be subject to more frequent and severe water shortages than currently planned with the WSIP; however, the analysis in the Draft PEIR is based on the currently known operations of Don Pedro Reservoir and it would be speculative to assume anything other than a continuation of the existing conditions.

The WSIP does not foreclose options for releasing more water in a VAMP-like program should such a release be determined to be necessary to protect migratory fish. The additional quantity of water that would be diverted from the Tuolumne River under the WSIP is small compared to the total amount of water currently diverted from the river for municipal and agricultural purposes. The additional diversion would have little effect on the ability of the SFPUC, TID, and MID to manage reservoir storage and provide a VAMP-like release.

SI_TRT-CWA-SierraC-93 "Pre-project" in this context means the condition without the WSIP.

CEQA does not require that an EIR evaluate whether the existing or pre-project condition is compliant with environmental laws and policies. The purpose of the Draft PEIR is to describe the environmental consequences of the proposed WSIP relative to the existing or pre-project condition (CEQA Guidelines

Section 15125[a]). Cumulative impacts are addressed in the Draft PEIR (Vol. 3, Chapter 5, Section 5.7).

SI_TRT-CWA-SierraC-94 The commenter's opinion with respect to Figure 5.3.1-9 is acknowledged. The figure provides a useful graphical overview of the effects of the WSIP on reservoir storage and releases to the Tuolumne River. The data used to construct the figure are available in Appendix H2-1 (Vol. 5, Appendix H2-1, Tables 2.3-1 through Table 2.3-6, pp. 17 to 23).

As the commenter notes, HH/LSM results indicates that storage in Hetch Hetchy Reservoir in the winters of 1987, 1988, and 1989 would be 10 to 25 percent lower with the WSIP compared to the existing condition. This change would be attributable to the WSIP, but the change would not translate directly into an environmental impact. The water levels with the WSIP would remain in the range experienced under the current condition, and no environmental resources would be adversely affected by WSIP-induced water level changes in these years.

SI_TRT-CWA-SierraC-95 The fourth full paragraph on p. 5.3.1-25 of the Draft PEIR (Vol. 3, Chapter 5, Section 5.3.1) is accurate and does not contradict information provided elsewhere in the PEIR. As stated in the third full paragraph on the same page, the model indicates that under the existing condition, the minimum required release would be made in 837 months of the 82-year hydrologic record. The WSIP would have no effect on flow in these months, and thus would have no effect on river flow 84.2 percent of the time.

As described in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.3.1-24 to 5.3.1-28), the WSIP would primarily affect releases from Hetch Hetchy Reservoir, and flow in the Tuolumne River below O'Shaughnessy Dam in the spring snowmelt period, which typically occurs in late April, May, and early June. Because water demand with the WSIP would be greater than current demand, Hetch Hetchy Reservoir would be drawn down farther just before snowmelt with the WSIP than it is under the existing condition. A higher proportion of snowmelt runoff from the watershed would be needed every year to refill the reservoir with the WSIP than under the existing condition; consequently, a smaller volume of water would be released from the reservoir to the river compared to the existing condition. The reductions in flow are reflected in Table 5.3.1-4 as reductions in average monthly flows in the months of April, May, and June in all hydrologic year types. As stated in the fourth full paragraph of p. 5.3.1-25, the effects of the WSIP are greatest in normal, below-normal, and dry years because a greater proportion of total snowmelt runoff would be needed in these year types to refill the reservoir. In wet years, total runoff would be much greater, and a smaller proportion of total runoff would be needed to refill the reservoir.

SI_TRT-CWA-SierraC-96 In very dry years, when the volume of inflow to Hetch Hetchy Reservoir is small, all the snowmelt runoff could be needed to refill the reservoir. Under these conditions, releases to the Tuolumne River below O'Shaughnessy Dam are limited to the minimum required. As indicated in the fourth paragraph on p. 5.3.1-27 of the Draft PEIR (Vol. 3, Chapter 5), under the existing condition, no releases in excess of the minimum required would occur in 15 years of the 82-year hydrologic record. With the WSIP, no releases in excess of the minimum required would occur in 18 years of the hydrologic record.

SI_TRT-CWA-SierraC-97 As indicated in **Response SI_TRT-CWA-SierraC-96** above, flows in the Tuolumne River below O'Shaughnessy Dam would be the same with the WSIP as under the existing condition in most months of most years, but the WSIP would reduce flow in the snowmelt period. As stated in the Draft PEIR (Vol. 3, Chapter 5, p. 5.3.1-27), the WSIP would reduce the total volume of water released from Hetch Hetchy Reservoir during the snowmelt period and delay the start of snowmelt releases. It would also likely reduce the length of the period during which flows in the river are in excess of the minimum required. The length of the period during which flows in the river are in excess of the minimum required would depend on both the volume of water available for release and the choices made by the operators of the reservoir. The operators could choose to release a modest volume for weeks or a large volume of water for a few days.

The WSIP would have a negligible effect on large, infrequent peak flows. For more information, refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.5).

SI_TRT-CWA-SierraC-98 Table 5.3.1-5 of the Draft PEIR (Vol. 3, Chapter 5, p. 5.3.1-26) contains information on monthly flows averaged for individual months within five different hydrologic year types. It is accurately titled "Estimated Average Monthly Flows for the Tuolumne River Below O'Shaughnessy Dam under Various Conditions." It correctly indicates that the greatest average reduction in monthly flow attributable to the WSIP would be 30 percent and would occur in May of dry years.

The information contained in the table is correct. It is recognized by the authors of the Draft PEIR that changes in average monthly flow within year types do not provide a complete picture of the consequences of the WSIP. This is why the fifth full paragraph on p. 5.3.1-25 notes that considerably greater percentage reductions in monthly flows would occur in some years. Estimated flows in the Tuolumne River below O'Shaughnessy Dam in each month in each year of the hydrologic record with and without the WSIP can be found in Appendix H2-1 (Vol. 5, pp. 21 to 23).

SI_TRT-CWA-SierraC-99 For discussion of the use of flow data in the geomorphology analysis, please refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.6).

SI_TRT-CWA-SierraC-100 The average monthly flows shown in Table 5.3.1-6 for the existing condition and the "future with WSIP" were all estimated using HH/LSM, the SFPUC's water supply planning model. For the existing condition, the model simulates the regional water system as it existed in 2005 and calculates the reservoir storage levels and releases that would occur over the 82-year period of hydrologic record, assuming the 2005 water demand of 265 mgd. For the "future with WSIP" condition, the model simulates the regional water system as it would be in 2030 after the improvements that are part of the WSIP are completed. It then calculates the reservoir storage levels and releases that would occur over the 82-year period of hydrologic record assuming the 2030 water demand of 300 mgd.

For a discussion of model accuracy, please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.5).

SI_TRT-CWA-SierraC-101 Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Sections 14.5.3 and 14.5.5).

SI_TRT-CWA-SierraC-102 Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Sections 14.5.3 and 14.5.5).

SI_TRT-CWA-SierraC-103 For discussion of whether the WSIP would cause flows in the Tuolumne River below O'Shaughnessy Dam to fall outside the existing range of flows, please refer to **Section 14.6, Master**

Response on Upper Tuolumne River Issues (Vol. 7, Chapter 14, Section 14.6.5).

SI_TRT-CWA-SierraC-104 Please refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Sections 14.6.5) for a description of the basis for the conclusion that the WSIP would not cause flows in the Tuolumne River below O'Shaughnessy Dam to fall outside the existing range of flows.

SI_TRT-CWA-SierraC-105 Please refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.5) for a discussion of the WSIP's effects on the range of flows experienced in the Tuolumne River below O'Shaughnessy Dam. Please refer to **Section 14.5, Master Response on Water Resources Modeling (**Vol. 7, Chapter 14, Section 14.5.3) for a discussion of the use of monthly and daily flow data in the Draft PEIR.

SI_TRT-CWA-SierraC-106 Contrary to this comment, Hetch Hetchy Reservoir fills in 74 years of the 82-year hydrologic period, or about 90 percent of the years. Also, please refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.5).

SI_TRT-CWA-SierraC-107 The opinion expressed with respect to the significance of impacts is acknowledged. Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.3) for a discussion of the use of monthly and daily flow data in the Draft PEIR.

SI_TRT-CWA-SierraC-108 A figure similar to Figure 5.3.1-8 for Lake Lloyd was not included in the Draft PEIR because storage in Lake Lloyd is the same under the existing condition and with the WSIP in almost all instances. Figure 2.4-1 in Appendix H2-1 is a plot of storage in Lake Lloyd with and without the WSIP over the 82-year period of hydrologic record. A green line shows storage with the WSIP; a red line shows storage under the existing condition. Most of the time, the green line overlays the red line, indicating that storage is the same under the two conditions. With the WSIP, Lake Lloyd would be drawn down farther in 1992, at the end of a long dry period, than it would under the existing condition. This is because Hetch Hetchy Reservoir would be drawn down farther with the WSIP than under the existing condition, reducing the amount of water that the SFPUC could release from that reservoir to meet TID's and MID's water-right entitlements. In this circumstance, the SFPUC would release water from Lake Lloyd to fulfill the entitlements.

Once in the 82-year hydrologic record, Lake Lloyd would be drawn down considerably farther with the WSIP than it would under the existing condition. It is not expected that this would result in adverse environmental effects.

SI_TRT-CWA-SierraC-109 The title of Draft PEIR Table 5.3.1-6 (Vol. 3, Chapter 5, p. 5.3.1-35) accurately describes its contents. It does not purport to contain extreme values of monthly flow differences between the existing and with-WSIP conditions. As the commenter notes, the extreme values are identified in the text.

SI_TRT-CWA-SierraC-110 For a discussion related to the use of average monthly flows and to averaging flow within water-year types, please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Sections 14.5.3 and 14.5.4). For a discussion of the use of flow data in determining the WSIP's impacts on geomorphology, refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 4.6.6) and **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 4.7.7). Monthly, daily, and peak flows were all used in the analysis of biological impacts.

SI_TRT-CWA-SierraC-111 Table 5.3.1-6 (Vol. 3, Chapter 5, p. 5.3.1-35) indicates that 13 of the 60 month by year type combinations indicate a reduction in flow of 5 percent or more. This represents 22 percent of the month by year type combinations rather than 33 percent, as stated by the commenter. The effects of the reductions in flow shown in Table 5.3.1-6 on geomorphology, water quality, fisheries, and terrestrial biological resources are described in the Draft PEIR (Vol. 3, Chapter 5, Sections 5.3.2, 5.3.3, 5.3.6, and 5.3.7). The impact analyses do not rely exclusively on the WSIP-induced changes in average monthly flows shown in Table 5.3.1-6. As explained in the text of the sections, peak and daily flow were also considered in reaching conclusions with respect to the impacts of WSIP-induced flow changes on stream geomorphology and biological resources.

SI_TRT-CWA-SierraC-112 The statement in the Draft PEIR was not derived from model output. It was based on operating practices at Don Pedro Reservoir and experience with historical peak flows.

As described in the Draft PEIR, the WSIP would result in reductions in releases from La Grange Dam in winter and spring in certain years. This is because with the WSIP the SFPUC would divert more water from the Tuolumne River at Hetch Hetchy Reservoir. As a result, inflow to and storage in Don Pedro Reservoir would be reduced and a greater proportion of winter and spring flows would be needed to refill the reservoir.

The conclusions in the Draft PEIR with respect to peak flows in the Tuolumne River below La Grange Dam were arrived at as follows. Don Pedro Reservoir is a large multi-purpose reservoir. Water is released from the reservoir and diverted into the Turlock and Modesto Canals at La Grange Dam, approximately two miles downstream of Don Pedro Reservoir. Flow in the Tuolumne River below La Grange Dam consists entirely of releases from the dam.

In many months of above-normal, below-normal, and dry years, and in all months of critically dry years, only the minimum required releases are made from La Grange Dam. Releases in excess of the minimum required are made when they are necessary to preserve the flood storage reservation in the reservoir, which is in effect from early September to early June, or when the reservoir is full or is expected to fill. Operators attempt to limit releases to 10,000 cubic feet per second (cfs) because flows greater than this can cause flooding in the Modesto area.

Extreme peak flows in the Tuolumne River below La Grange typically occur when rain falls on accumulated snow in the watershed above Don Pedro Reservoir. Runoff into the reservoir increases rapidly, and operators must make releases to maintain the flood storage reservation. Such an event occurred in January 1997, when the water level in Don Pedro Reservoir was at its maximum consistent with the flood storage reservation. Operators had to release water in an amount approximately equal to reservoir inflow to maintain the flood storage reservation. Daily flow in the Tuolumne River below La Grange Dam peaked at 58,000 cfs.

Figure 5.3.1-12 shows storage in Don Pedro Reservoir under the existing condition and with the WSIP for the 82-year period of hydrologic record (Vol. 3, Chapter 5, p. 5.3.1-33). As shown in the figure, in January 1997 storage in Don Pedro Reservoir with the WSIP would be the same as it was under the existing condition. Therefore, the release and peak flow with the WSIP would be virtually the same as it was under the existing condition.

SI_TRT-CWA-SierraC-113 Please refer to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.6).

SI_TRT-CWA-SierraC-114 With respect to whether flows in the Tuolumne River below La Grange Dam with the WSIP would remain within the current range, please refer to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.6).

The question of whether flows in a water body with the WSIP would remain within the current range was considered only to determine the significance of hydrological impacts. Separate and independent significance determinations were made with respect to environmental elements affected by WSIP-induced flow changes, such as biological resources and geomorphology. Because the effects of the WSIP on the hydrology of the Tuolumne River below La Grange Dam were determined to be less than significant does not mean that the effects of WSIP-induced flow changes on biological resources or geomorphology would also be less than significant. In fact, the impacts of the WSIP on both fisheries and terrestrial biological resources were determined to be potentially significant.

With respect to the analysis of current operating practices, CEQA does not require that an EIR evaluate whether the existing condition is environmentally desirable or compliant with existing laws and regulations.

SI_TRT-CWA-SierraC-115 With respect to whether flows in the Tuolumne River below La Grange Dam with the WSIP would remain within the current range, please refer to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.6). Because flows in the river with the WSIP would remain in the current range, the character of the river—that is, its channel cross-section, sinuosity, and appearance—would remain unaltered or would be altered very little. If a project altered the range of current flows by, for example, reducing peak flows to one-third of their pre-project value, then the character of the river would likely change; the cross-section would diminish and vegetation would encroach into the former stream channel.

SI_TRT-CWA-SierraC-116 The commenter opines that the use of the term “rare” is subjective and that it is not defined. In most instances in the Draft PEIR, where the terms “rare” or “infrequent” are used to describe an event, their use is followed by a reference to the number of times the event would be expected to occur in the 82-year period of hydrologic record. The sentence from the Draft PEIR quoted by the commenter (“Flow reductions of these magnitudes would be rare events occurring four or five times in the period of hydrologic record") provides an example.

The San Francisco Planning Department considered both the severity and frequency of an impact when determining its significance. Please also refer to **Response SI_TRT-CWA-SierraC-44**.

SI_TRT-CWA-SierraC-117 The flow reductions in the San Joaquin River referred to in the Draft PEIR occur in wet or above-normal years after a series of dry years (Vol. 3, Chapter 5, p. 5.3.1-38). A wet or above-normal spring enables operators to refill Don Pedro Reservoir after it has been drawn down in the dry years. Large flow reductions are unlikely to occur in successive years, but may persist for more than one month in the year that they occur.

The effects of the flow reductions on water quality are described in the Draft PEIR (Vol. 3, Chapter 5, Section 5.3.3).

SI_TRT-CWA-SierraC-118 Please refer to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.6) for a description of how the significance conclusion was reached. Although it was concluded that the effects of the WSIP on the hydrology of the Tuolumne River below La Grange Dam would be less than significant, the effects of WSIP-induced flow reductions on fisheries and terrestrial biology in this reach of the river were determined to be potentially significant (Vol. 3, Chapter 5, Sections 5.3.6 and 5.3.7).

SI_TRT-CWA-SierraC-119 For general aspects related to the approach to analysis and a discussion of the baseline condition, please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.4).

The commenter's opinion that the analysis of sediment transport and gravel bed conditions is qualitative and largely speculative is noted. The San Francisco Planning Department acknowledges that the analysis is qualitative but disagrees that it is largely speculative. Please refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.6) and **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.7).

SI_TRT-CWA-SierraC-120 For a discussion of the baseline condition, please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14).

The commenter notes that bed armoring is a major factor driving the loss of salmonid spawning habitat in the Central Valley. In the upper Tuolumne River, bed armoring probably occurred in the first few decades after construction of Hetch Hetchy Reservoir, Lake Lloyd, and Lake Eleanor when the bedload supply to the river reaches below the dams was eliminated. The trout that populate the upper Tuolumne River are adapted to the current channel bed conditions and the lack of gravel supply from upstream. The WSIP would have little or no effect on bedload movement from the watersheds above the reservoirs to the upper Tuolumne River and thus would neither decrease nor increase channel bed armoring.

Bed armoring is probably only one of a number of factors limiting the availability of salmonid spawning habitat in the lower Tuolumne River. The loss of bedload from above La Grange Dam, channel reshaping as a result of past mining, and the discharge of fine sediment in runoff from agricultural and urban lands are also important factors in limiting the availability of suitable spawning gravel. The WSIP would have little or no effect on bedload movement from the watershed above La Grange Dam to the lower Tuolumne River and thus would neither decrease nor increase channel bed armoring or otherwise affect the availability of salmonid spawning habitat. The WSIP would affect the bankfull peak flows in the river below La Grange Dam that occur every one to three years and could reduce the rate of downstream movement of artificially placed or other gravel in the lower Tuolumne River (refer to Vol. 7, Chapter 14, **Section 14.7, Master Response on Lower Tuolumne River Issues**, Section 14.7.7).

SI_TRT-CWA-SierraC-121 The SFPUC's geomorphology studies, conducted by McBain and Trush, indicate that the similarities between the upper Tuolumne River and the Clavey River are sufficient for data from the latter to be useful in analyzing the former (McBain and Trush and RMC, 2007). The Clavey River and the reach of the Tuolumne River between Hetch Hetchy Reservoir and the confluence with the Clavey River are at about the same elevation, and both rivers flow in a bedrock channel.

SI_TRT-CWA-SierraC-122 Please refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.5) for a discussion of the WSIP's effects on the magnitude, frequency, and duration of river flows, and to Section 14.6.6 of that master response for a discussion of WSIP-induced flow changes on channel form and sediment.

SI_TRT-CWA-SierraC-123 The WSIP would have very little effect on sediment transport in the upper Tuolumne River because most downstream migrating sediment was interrupted when Hetch Hetchy Reservoir and Lakes Lloyd and Eleanor were built. The armoring of sediments below O'Shaughnessy Dam likely occurred many years ago and results primarily from the elimination of sediment transport from the watershed above Hetch Hetchy Reservoir. The reduction in frequency of moderate-sized to small floods that occur more than once in 10 years as a result of the WSIP would not be expected to have much effect on the armoring phenomenon.

The reduction in frequency of moderate-sized to small floods that remove sediment from interstitial spaces in spawning gravels could have some adverse effect on the quality of spawning and rearing habitat for resident trout. However, the SFPUC proposes Mitigation Measure 5.3.7-2 (Vol. 4, Chapter 6, pp. 6-49 and 6-50), which would involve shaping releases of water from Hetch Hetchy Reservoir to increase the frequency of groundwater recharge in the Poopenaut Valley. The same measure would also wash sediment from spawning gravel.

Also, please refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.5) for a discussion of the WSIP's effects on the magnitude, frequency, and duration of river flows, and to Section 14.6.6 of that master response for a discussion of WSIP-induced flow changes on channel form and sediment.

SI_TRT-CWA-SierraC-124 The authors of the Draft PEIR did not refer to the USFWS's 1992 draft Instream Flow Incremental Methodology report because the information in it is out-of-date. As the commenter notes, the report would enable an assessment of the changes that may have occurred in sediment conditions between 1992 and the present once the current SFPUC studies are completed.

SI_TRT-CWA-SierraC-125 Please refer to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.7).

SI_TRT-CWA-SierraC-126 The WSIP would have little effect on the magnitude of large flood flows, such as the flood that occurred in 1997, which radically reshaped the channel. However, in this reach of the river, the primary channel-forming events are peak flows that occur every one to three years, which would be affected by the WSIP. Please refer to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.7) for more information.

For a discussion of the WSIP's effects on bedload armoring, please refer to **Response SI_TRT-CWA-SierraC-120**, above.

SI_TRT-CWA-SierraC-127 There are many reasons for the decline of the salmonid populations in the Tuolumne River, including past water system development, gravel and gold mining in the river channel, the clearing of the riparian forest, channel encroachment by agriculture and urban development, and ocean harvesting and conditions. Past water development created barriers to fish passage and sediment movement, depleted flow, and altered seasonal flow patterns. The cumulative effects of past and present activities on the lower Tuolumne River and its fishery resources are described in the Draft PEIR (Vol. 3, Chapter 5, Section 5.7). Compared to the effects of past actions, the WSIP would have only minor effects on sediment transport in the reach of the river below La Grange Dam.

The degraded condition of the river ecology below La Grange Dam as a result of these past activities is acknowledged in the Draft PEIR (Vol. 3, Chapter 5, Section 5.7). Although the WSIP-related adverse changes in the condition of this reach of the river are relatively minor, including somewhat reduced sediment transport, the San Francisco Planning Department concluded that WSIP-caused incremental impacts on fisheries and terrestrial biological resources would be significant. The conclusion was reached because biological resources in this reach of the river are in a stressed and vulnerable condition.

SI_TRT-CWA-SierraC-128 With respect to the information in Table 5.3.3-2 (Vol. 3, Chapter 5, p. 5.3.3-3), please refer to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.5, under the heading Impacts on Water Quality).

The commenter accurately notes that the table does not include any critically dry years. None occurred between 1996 and 2004. Maximum water temperatures in critically dry years could be greater than the values shown in the table.

SI_TRT-CWA-SierraC-129 Please refer to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.5).

SI_TRT-CWA-SierraC-130 Please refer to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.5). For more information on recorded temperatures in the Tuolumne River below La Grange Dam, see *2005 Ten Year Summary Report*, FERC Project No. 2299-024, Turlock Irrigation District/Modesto Irrigation District, 2005. For a discussion of the potential effects of global warming, please refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14).

SI_TRT-CWA-SierraC-131 Please refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.7).

SI_TRT-CWA-SierraC-132 Please refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.7). For a discussion of the frequency and severity of impacts, refer to **Response SI_TRT-CWA-SierraC-44**.

SI_TRT-CWA-SierraC-133 For a discussion of the potential effects of global warming, please refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14).

SI_TRT-CWA-SierraC-134 The Draft PEIR states that the optimum temperatures for Chinook spawning are 8 to 16 degrees Celsius (ºC) and optimum temperatures for juvenile rearing are 12 to 18 ºC (Vol. 3, Chapter 5, p. 5.3.6-16). Optimum temperatures for steelhead in California are considered to be in the range of 10 to 15 ºC, but water temperatures up to 20 ºC are considered suitable for juvenile summer rearing.

The commenter uses the information in Figures 5.3.3-3 and 5.3.3-4 to estimate the length of the river below La Grange Dam that would be suitable for steelhead rearing with and without the WSIP under conditions prevailing in 1993 and 1999. There is no disagreement with the commenter's estimates. It is acknowledged in the Draft PEIR that the length of the river reach suitable for juvenile salmonids would be truncated at times as a result of WSIP-caused elevated water temperatures (Vol. 3, Chapter 5, p. 5.3.6-32).

The occasional substantial increases in water temperature in the Tuolumne River below La Grange Dam, together with other factors, contributed to the conclusion that the WSIP could have a significant adverse effect on salmonids in this reach of the river (Vol. 3, Chapter 5, pp. 5.3.6-28 to 5.3.6-32).

SI_TRT-CWA-SierraC-135 For a discussion of the potential effects of global warming, please refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14).

SI_TRT-CWA-SierraC-136 As stated in the Draft PEIR, the WSIP would cause water temperatures in the reach of the river between La Grange Dam and the San Joaquin River to exceed the water quality objective of 5-degree-Fahrenheit increase in three or four months of the 82-year hydrologic record (Vol. 3, Chapter 5, p. 5.3.3-19). The San Francisco Planning Department concluded that the impacts of the WSIP on water quality would be less than significant because the exceedences would be rare and because they would not impair the river's ability to support its designated beneficial uses. However, as noted above, the occasional increases in water temperature in the Tuolumne River below La Grange Dam, together with other factors, contributed to the conclusion that the WSIP could have a significant adverse effect on salmonids (Vol. 3, Chapter 5, pp. 5.3.6-28 to 5.3.6-32).

SI_TRT-CWA-SierraC-137 The WSIP would not cause exceedences of water quality objectives at Vernalis or in the Delta. Responsibility for compliance with the water quality objectives belongs to two of the junior water-rights holders, the California Department of Water Resources (DWR) and U.S. Bureau of Reclamation (USBR). During the infrequent periods when flow in the San Joaquin River would be substantially reduced under the WSIP, the DWR and USBR would reduce diversions from their facilities to meet flow and water quality objectives at Vernalis and in the Delta as necessary (Vol. 3, Chapter 5, p. 5.3.1-39). Please refer to **Section 14.8, Master Response on Delta and San Joaquin River Issues** (Vol. 7, Chapter 14, Section 14.8).

For a discussion of how the frequency and severity of impacts were accounted for in the analysis, please refer to **Response SI_TRT-CWA-SierraC-44**, above.

SI_TRT-CWA-SierraC-138 Table 5.3.3-6 (Vol. 3, Chapter 5, p. 5.3.3-10) shows water quality objectives for the San Joaquin River basin. The water quality objective for dissolved oxygen in the San Joaquin River between Turner Cut and Stockton shown in the table is revised as follows:

> 6.0 mg/L (September 1 to November 30) <u>and 5.0 mg/L (December 1 to August 30)</u>

As shown in Table 5.3.4-4 (Vol. 3, Chapter 5, p. 5.3.4-7), the WSIP would rarely affect flow in the San Joaquin River by more than 100 cfs in September, October, and November (8 months out of 246 months). During those months, if the flow reductions attributable to the WSIP could cause exceedences of water quality or flow objectives for the San Joaquin River at Vernalis, the USBR would have to make releases from its facilities to ensure that the objectives were met. This would lessen any adverse effects of the WSIP on dissolved oxygen levels in the lower San Joaquin River. Please refer to **Section 14.8, Master Response on Delta and San Joaquin River Issues** (Vol. 7, Chapter 14, Section 14.8.2) for additional discussion of the effects of the WSIP on the San Joaquin River and Delta, including potential effects on Central Valley Project and State Water Project operations.

SI_TRT-CWA-SierraC-139 With respect to dissolved oxygen concentrations in the lower San Joaquin River, please refer to **Response SI_TRT-CWA-SierraC-138**. The commenter accurately notes that exceedences of the dissolved oxygen objective in the Stockton area are already common. The causes for the condition are many and include municipal wastewater discharges, agricultural tailwater discharges, and depleted flow due to diversions for agricultural and municipal purposes. The San Francisco Planning Department concluded that the WSIP's contribution to low dissolved oxygen conditions near Stockton was small compared to the effects of the other factors, and that the impact of the WSIP would be less than significant.

SI_TRT-CWA-SierraC-140 The Draft PEIR text referred to by the commenter (Vol. 3, Chapter 5, p. 5.3.4-5, third paragraph) is accurate but could be clarified. The text in this paragraph is revised as follows:

> As described in Section 5.3.1, under existing conditions in the majority of years classified as below-normal or drier, almost all of the winter and spring runoff from the watershed upstream of Don Pedro Reservoir on the Tuolumne River is captured in the reservoir. Only the minimum required releases to the Tuolumne River below La Grange Dam are made. The WSIP would have no effect on flow in the Tuolumne River below La Grange Dam or the San Joaquin River ~~under these conditions~~ <u>in months when only the minimum flows are currently released.</u> In years when the reservoir fills, usually wet or above-normal years, excess water is released in some months to the Tuolumne River. In the future with the WSIP, TID and MID would draw Don Pedro Reservoir down farther in most years than they would under the existing condition, and consequently a greater proportion of spring runoff would

be needed to refill the reservoir. As a result, the volume of excess water released to the Tuolumne River would be reduced in ~~some normal, above normal and wet years compared to the existing condition~~ all wet years, most above-normal years, and occasional below-normal and dry years.

SI_TRT-CWA-SierraC-141 For a discussion of how the frequency and severity of impacts were accounted for in the analysis, please refer to **Response SI_TRT-CWA-SierraC-44**, above.

The commenter combines long-term monthly flow data averaged over several years, and shown in Table 5.3.1-1 (Vol. 3, Chapter 5, p. 5.3.1-12), with modeled flow data from a single month referred to in the text and shown in Table 5.3.4-4 (Vol. 3, Chapter 5, p. 5.3.4-7). This approach produces misleading information.

Table 5.3.1-1 shows gaging data for the Tuolumne River below La Grange Dam, and as the commenter notes, average monthly flow in the river in February is 1,884 cfs. This is the measured flow in February averaged over a 30-year period. Table 5.3.1-6 (Vol. 3, Chapter 5, p. 5.3.1-35) shows average monthly flows for the Tuolumne River below La Grange for an 82-year period of hydrologic record estimated using the HH/LSM. The table shows that average monthly flow in the river in February over the 82-year period would be 1,723 cfs under the existing condition and 1,638 cfs with the WSIP, a reduction of about 5 percent.

As noted by several commenters, and concurred with by the authors of the Draft PEIR, average values alone do not provide a basis for reaching conclusions with respect to environmental impacts. Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Sections 14.5.3 and 14.5.4) for more information on this topic.

Because average values alone do not provide a basis for assessing environmental impacts, the average monthly data within hydrologic year types that are shown in Table 5.3.1-6 are supplemented by data on average flows for each month in the 82-year hydrologic record in Table 5.3.4-4. As shown in Table 5.3.4-4, the WSIP would have no effect on flows in the Tuolumne River below La Grange in critically dry years and little effect in dry and below-normal years. In seven months in the 82-year hydrologic record, the WSIP would reduce flows in the Tuolumne River below La Grange Dam by more than 1,000 cfs. The San Francisco Planning Department concluded that these flow reductions represent a less-than-significant impact on hydrology because they would not cause flows in the river to be outside the range experienced under the existing conditions. Even though WSIP-induced substantial reductions in flow would occur infrequently, it was concluded that the effects of the flow reductions on fisheries and terrestrial biology in this reach of the river would be potentially significant (Vol. 3, Chapter 5, Sections 5.3.6 and 5.3.7). The Draft PEIR includes mitigation measures designed to reduce the impacts of flow reductions on biological resources to a less-than-significant level (Measures 5.3.6-4a and 5.3.6-4b, Vol. 4, Chapter 6, pp. 6-48 and 6-49).

SI_TRT-CWA-SierraC-142 The commenter combines long-term monthly flow data averaged over several years (shown in Table 5.3.1-1) with flow data from a single month (shown in Table 5.3.4-4). This approach produces misleading information.

The commenter notes that the WSIP would reduce flows in the Tuolumne River below La Grange in the fall and winter under conditions that prevailed in 1964. This is one of 2 years in the 82-year hydrologic record when the WSIP would have an effect on flow in this reach of the river in a dry or critically dry year. The flow reduction probably results from the fact that, under the conditions prevailing in the fall and winter of 1964, Don Pedro Reservoir would be at its maximum water level consistent with the flood storage reservation. Any rainstorms over the watershed would cause reservoir operators to release water to the river. With the WSIP, the water level in the reservoir in the fall and winter of 1964 would be slightly lower than under the existing condition, and the reservoir operators would be able to capture some of the runoff from the rainstorms without encroaching on the flood storage reservation. Less water would be released to the river, but the minimum required flows in the river below La Grange Dam would have to be maintained.

SI_TRT-CWA-SierraC-143 The comment with respect to the readability and utility of Table 5.3.4-4 (Vol. 3, Chapter 5, p. 5.3.4-7) is acknowledged. The San Francisco Planning Department respectfully disagrees with the comment. The estimated changes in flow attributable to the WSIP for each month in the 82-year period are a necessary supplement to the average monthly flow data provided elsewhere in Chapter 5 of the Draft PEIR.

SI_TRT-CWA-SierraC-144 Please refer to **Response SI_TRT-CWA-SierraC-141**, above.

SI_TRT-CWA-SierraC-145 As stated in the Draft PEIR, substantial WSIP-induced flow reductions in the San Joaquin River between its confluence with the Tuolumne River and its confluence with the Stanislaus River would occur four or five times in the 82-year period of hydrologic record (Vol. 3, Chapter 5, p. 5.3.1-38). As the commenter notes, the Tuolumne River provides a substantial fraction of the flow in the San Joaquin River. However, the WSIP-induced reductions in flow in the San Joaquin River would not have any effect on compliance with State Water Resources Control Board–imposed flow and water quality objectives at Vernalis or in the Delta. Responsibility for compliance with the objectives belongs to two of the junior water-rights holders, the DWR and USBR. During the infrequent periods when flow in the San Joaquin River would be substantially reduced by the WSIP, the DWR and USBR would reduce diversions from their facilities to meet flow and water quality objectives at Vernalis and in the Delta as necessary (Vol. 3, Chapter 5, p. 5.3.1-39). Also, please refer to **Section 14.8, Master Response on Delta and San Joaquin River Issues** (Vol. 7, Chapter 14).

SI_TRT-CWA-SierraC-146 For a brief description of the monitoring program referred to by the commenter, please refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.2). The San Francisco Planning Department concluded that sufficient information is available to reach conclusions with respect to the impacts of the WSIP on fishery resources in the Tuolumne River below O’Shaughnessy Dam. Please refer to **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.4).

SI_TRT-CWA-SierraC-147 Please refer to **Response SI_TRT-CWA-SierraC-14**, above.

SI_TRT-CWA-SierraC-148 Please refer to **Response SI_TRT-CWA-SierraC-14**, above, and to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.2).

SI_TRT-CWA-SierraC-149 Please refer to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.2).

SI_TRT-CWA-SierraC-150 Please refer to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.3) and **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.4).

SI_TRT-CWA-SierraC-151 Please refer to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.3).

SI_TRT-CWA-SierraC-152 The comment raises concern over the biological distinctions made between steelhead and rainbow trout in describing steelhead presence and abundance within the lower Tuolumne River. The comment references the polymorphic nature of the species within the context that any *O. mykiss* surveyed within this area could potentially adopt an anadromous life-history strategy and are therefore subject to protection under the Federal Endangered Species Act.

Section 5.3.6 (Vol. 3, Chapter 5) of the Draft PEIR discusses steelhead presence and abundance within the lower Tuolumne River. This section discusses rainbow trout/steelhead presence and abundance based on biological surveys conducted between 1982 and 2004 (p. 5.3.6-18). Impact 5.3.6-4 (p. 5.3.6-28 to 5.3.6-32) discusses potential impacts on anadromous salmonids within the lower Tuolumne River and provides specific discussion of the impacts on steelhead within the affected reach. Implementation of Mitigation Measures 5.3.6-4a and 5.3.6-4b (Vol. 4, Chapter 6, pp. 6-48 and 6-49) would reduce these potentially significant impacts to a less-then-significant level. The legal status of steelhead, including details regarding steelhead protection under the Federal Endangered Species Act, is described in the (Vol. 3, Chapter 5, p. 5.3.6-23, under the heading Regulatory Setting). Further discussion of steelhead presence and abundance in the lower Tuolumne River is provided in **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.3) and in **Response SI_TRT-CWA-SierraC-12**, above.

Studies by the Federal Energy Regulatory Commission (FERC, 1996) present findings indicating that, although there are steelhead in the lower Tuolumne River, no significant populations are present. Data presented in the Draft PEIR show water temperatures in the lower Tuolumne River to be in the 25 to 30 ºC range for extended periods during the summer in many locations. Water temperature data presented in Draft PEIR Table 5.3.3-2 (Vol. 3, Chapter 5, p. 5.3.3-18 and 5.3.3-19) demonstrate that only the reach immediately downstream of La Grange Reservoir is characterized by water temperatures suitable for steelhead rearing. The increased temperatures in reaches farther downstream and in the San Joaquin River during spring and summer may preclude successful out-migration of juveniles. Trout surveys conducted between 1982 and 2004 (see Vol. 3, Chapter 5, p. 5.3.6-18) found that the geographic range of *O. mykiss* reflected this thermal regime, and that the species was found with greatest frequency above River Mile 45 and not below River Mile 38.

Impact 5.3.6-4 (Vol. 3, Chapter 5, pp 5.3.6-28 to 5.3.6-32) discusses steelhead along the Tuolumne River below La Grange Dam as a federally listed threatened species that inhabits this portion of the river in low abundance. As presented under Impact 5.3.6-4, the largest percentage reductions in Tuolumne River stream flow downstream of La Grange Dam under WSIP operations are expected to occur in June. These summer flow reductions would likely elevate water temperatures and reduce the linear extent of suitable rearing habitat for steelhead/rainbow trout, which are acknowledged as rearing within the river system throughout the year.

As stated on p. 5.3.6-32, the flow reductions coupled with the projected infrequent water temperature increases that could result under the WSIP would have an adverse impact on habitat conditions for juvenile steelhead/rainbow trout. The flow reductions would reduce available habitat in the entire reach of the river used by juvenile steelhead/rainbow trout below La Grange Dam. The elevated temperatures, although infrequent, would truncate the length of the river reach suitable for juvenile steelhead/rainbow trout. These adverse effects on flow and temperature in the river under the WSIP would not substantially alter or degrade fishery habitat or jeopardize the continuation of the fishery populations in the lower Tuolumne River in most years. However, the WSIP's effects on flow and temperature would infrequently contribute to potentially significant effects on fishery resources. The *Habitat Restoration Plan for the Lower Tuolumne River Corridor* (McBain and Trush, 2000) establishes goals for fishery habitat restoration, and the NMFS and others have identified goals for fishery enhancement on the lower river. The WSIP's small but incremental contribution to adverse effects on the lower river would make planned restoration of habitat and fishery resources more difficult. As a result, the impact of the WSIP on these fishery resources in the lower Tuolumne River would be potentially significant. Implementation of Mitigation Measure 5.3.6-4a, Avoidance of Flow Changes by Reducing Demand for Don Pedro Reservoir Water, would reduce this impact to a less-than-significant level. This measure involves some uncertainty because its implementation depends on the SFPUC reaching agreement with MID and TID and possibly other water agencies. If this measure proves to be infeasible, the SFPUC will implement Mitigation Measure 5.3.6-4b, Fishery Habitat Enhancement, to enhance fishery habitat in the lower Tuolumne River. Implementation of Measure 5.3.6-4a or 5.3.6-4b would reduce these adverse impacts on steelhead/rainbow trout to a less-than-significant level.

SI_TRT-CWA-SierraC-153 Please refer to **Response SI_TRT-CWA-SierraC-152**.

SI_TRT-CWA-SierraC-154 The commenter concurs with the text of the Draft PEIR stating that low flow and high water temperatures in this reach stress juvenile salmon and enhance predation by bass (Vol. 3, Chapter 5, p. 5.3.6-20). Further, the commenter notes that WSIP-induced flow reductions and increased water temperatures would increase the loss of salmonids to non-native predators. The authors of the Draft PEIR agree with the commenter; this is one of the reasons why it was determined that the WSIP would have a potentially significant adverse effect on salmonids in this reach of the river (Vol. 3, Chapter 5, pp. 5.3.6-28 to 5.3.6-32). The proposed mitigation measures (Measures 5.3.6-4a and 5.3.6-4b) would reduce the impacts to a less-than-significant level.

SI_TRT-CWA-SierraC-155 The commenter's opinion regarding the desirability of increasing flows in the Tuolumne River below La Grange Dam to decrease suitable habitat for non-native predators is acknowledged. Please also refer to **Response SI_TRT-CWA-SierraC-154** and **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.8).

SI_TRT-CWA-SierraC-156 Refer to **Response SI_TRT-CWA-SierraC-43** regarding how the San Francisco Planning Department identifies significance criteria.

The comment describing the goal of doubling anadromous fish populations above their baseline averages in the Anadromous Fish Restoration Program is acknowledged.

The Draft PEIR (Vol. 2, Chapter 4, p. 4.6-23 and 4.6-24) summarizes the Federal Endangered Species Act as it applies to the WSIP and describes how provisions under this act are incorporated into the PEIR impact analysis on biological resources. This section of the Draft PEIR includes a description of the situations in which the act permits the "taking" of federally listed species.

SI_TRT-CWA-SierraC-157 Please refer to **Response SI_TRT-CWA-SierraC-14**, above, and **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.2).

SI_TRT-CWA-SierraC-158 Please refer to n **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Sections 14.5.3 and 14.5.4). The flow reductions in the reach of the river below O'Shaughnessy Dam that would be attributable to the WSIP would manifest themselves as a delay in the initial release of water in excess of the minimum required releases in the spring snowmelt period. It was determined that the delay in the release would not be expected to have a significant adverse effect on rainbow trout or other resident fish (Vol. 3, Chapter 5, p. 5.3.6-27).

SI_TRT-CWA-SierraC-159 With regard to water quality objectives, please refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.7). With regard to climate change, please refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14).

SI_TRT-CWA-SierraC-160 Please refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.7).

SI_TRT-CWA-SierraC-161 The analysis of fishery impacts in the Tuolumne River below La Grange Dam focused on Chinook salmon because this species was once abundant in this reach of the river and has been the subject of considerable management efforts in the last decade. The analysis in the Draft PEIR considered steelhead, but acknowledged that surveys conducted between 1982 and 2004 suggested that large anadromous steelhead occur in the river very infrequently (Vol. 3, Chapter 5, p. 5.3.6-18).

The San Francisco Planning Department concluded that the occasional flow reductions and increases in water temperature attributable to the WSIP would have a significant adverse impact on anadromous fish in the Tuolumne River below La Grange Dam. Although the focus of the analysis was Chinook salmon, it was acknowledged that the changes would affect habitat for summer rearing of steelhead (Vol. 3, Chapter 5, p. 5.3.6-31).

The purpose of the Draft PEIR is to describe the environmental consequences of the proposed WSIP relative to the existing condition. CEQA does not require that an EIR evaluate whether the existing condition is satisfactory for steelhead and compliant with all environmental laws and policies. The Draft PEIR does include an assessment of the effects of the WSIP on fisheries in the context of all past, present, and expected future actions that have or will affect the resource (Vol. 3, Chapter 5, Section 5.7). In this section, it is acknowledged that past and present water management practices and other past and present human activities, such as gravel and gold mining, have substantially altered habitat for anadromous fish in the lower Tuolumne River. The degraded condition of anadromous fish in this reach of the river contributed to the conclusion that WSIP-induced flow reductions would have a significant adverse impact in the absence of appropriate mitigation measures.

SI_TRT-CWA-SierraC-162 Please refer to **Response SI_TRT-CWA-SierraC-161**, above.

SI_TRT-CWA-SierraC-163 Please refer to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.6).

SI_TRT-CWA-SierraC-164 As indicated in **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.7), the WSIP would have little effect on large infrequent peak flows in the reach of the river below La Grange Dam, and therefore would have little or no effect on the movement of coarse sediments in this reach of the river. The WSIP would not affect the recruitment of coarse sediment in this reach of the river because La Grange and Don Pedro Dams prevent the downstream movement and recruitment of coarse sediment. For a discussion of the effects of the WSIP on the movement of fine sediment, please refer to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.7).

SI_TRT-CWA-SierraC-165 Please refer to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.2).

SI_TRT-CWA-SierraC-166 Please refer to **Response SI_TRT-CWA-SierraC-134**, above.

SI_TRT-CWA-SierraC-167 Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.3) for more information on the use of monthly and daily data in the environmental analysis. Refer to **Response SI_TRT-CWA-SierraC-44** for more information on the frequency and severity of impacts.

Most flow reductions below La Grange Dam attributable to the WSIP would manifest themselves as a delay in late winter or early spring releases. On some days in the winter or spring, flow in the Tuolumne River with the WSIP would be the minimum required. On those same days under the existing condition, flow in the river would be greater because the spring release would have begun.

The releases to the river under the existing condition in 2000 are shown in Figure 5.3.1-13 (Vol. 3, Chapter 5, p. 5.3.1-37). Reservoir operators in 2000 were releasing the minimum required, 300 cfs, in January and the early part of February. In mid-February, reservoir operators began to release water in excess of the minimum required, raising flow in the river to about 3,000 cfs over about one week.

With the WSIP, the release would have been delayed by a few days and thus flow in the river would have remained at 300 cfs for a few days longer. In those few days, flow with the WSIP would be 90 percent less than under the existing condition.

The temperature model was used to simulate two scenarios: one where the WSIP would cause a 90 percent reduction in flow in the lower Tuolumne River, and one where it would cause a 50 percent reduction in flow. The results are shown in Figures 5.3.3-3 and 5.3.3-4 (Vol. 3, Chapter 5, pp. 5.3.3-18 and 5.3.3-19). In most years, flow reductions of this magnitude would last only a few days.

The San Francisco Planning Department concluded that the flow reductions attributable to the WSIP, and the consequent increase in water temperatures, would not represent a significant adverse effect on water quality in the Tuolumne River below La Grange Dam. However, the increase in water temperatures, together with other factors, contributed to the conclusion that the WSIP could have a significant adverse effect on salmonids in this reach of the river (Vol. 3, Chapter 5, p. 5.3.6-28 to 5.3.6-32).

SI_TRT-CWA-SierraC-168 For a discussion of the potential effects of global warming, please refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14). Refer to **Response SI_TRT-CWA-SierraC-44** for more information on the frequency and severity of impacts. The commenter's statement that even small changes in water temperature can have a dramatic effect on salmon survival is acknowledged

SI_TRT-CWA-SierraC-169 The commenter concurs with the statement in the Draft PEIR (Vol. 3, Chapter 5, p. 5.3.6-32) that the WSIP's incremental contribution to adverse effects on the reach of the river below La Grange Dam would make the planned restoration of habitat and fishery resources more difficult.

The sentence referred to by the commenter is awkwardly stated. The intent was to indicate that, although the WSIP would have a substantial adverse effect on salmonid habitat in some years, it would not jeopardize the existence of salmonid populations because there would always be a reach of the river immediately below La Grange Dam where conditions would be suitable for salmonids.

In response to this comment, the Draft PEIR is revised as follows (Vol. 3, Chapter 5, p. 5.3.6-32, fourth sentence in the first partial paragraph):

> These adverse effects on flows and temperature in the river under the WSIP would not substantially alter or degrade ~~fishery habitat~~ salmonid habitat in most years or jeopardize the continuation of the ~~fishery~~ salmonid populations in the lower Tuolumne River ~~in most years~~.

SI_TRT-CWA-SierraC-170 With respect to Mitigation Measure 5.3.6-4a, please refer to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.8). With respect to Mitigation Measure 5.3.6-4b, refer to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.9).

SI_TRT-CWA-SierraC-171 The commenter's agreement with the quoted text on Draft PEIR p. 5.3.6-36 (Vol. 3, Chapter 5) is acknowledged.

SI_TRT-CWA-SierraC-172 Please refer to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.4) for a discussion of FERC-required minimum flows in the lower Tuolumne River. As the commenter notes, the minimum flows were developed to facilitate Chinook salmon recovery, and little or no consideration was given to steelhead because the available evidence suggested that steelhead either no longer exist in the river or exist in very small numbers. Refer to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.3) with respect to data on steelhead in the lower Tuolumne River.

The minimum required instream flows will be reviewed in the future when the Don Pedro Project's FERC relicensing process begins, or perhaps earlier. Based on the poor returns of Chinook salmon in recent years, the CDFG has requested that FERC require the operators of the Don Pedro Project to increase releases to the river for salmonids. The CDFG's request focuses on recovery of Chinook salmon rather than steelhead.

The sentence quoted by the commenter states that during dry periods the WSIP would have no effect on flow in the San Joaquin River. This is because in dry periods the minimum required release would be made from La Grange Dam with or without the WSIP.

SI_TRT-CWA-SierraC-173 For information on significance criteria, please refer to **Response SI_TRT-CWA-SierraC-43**. Refer to **Response SI_TRT-CWA-SierraC-44** for more information on the frequency and severity of impacts. Flow in the San Joaquin River does not depend solely on water from the Tuolumne River. As a result, the WSIP-caused changes in flow in the San Joaquin River are less pronounced than in the lower Tuolumne River. Because of this, and because substantial WSIP-caused changes in flow in the San Joaquin River would be infrequent, the San Francisco Planning Department concluded that the impacts of the WSIP on fisheries in the San Joaquin River would be less than significant.

However, it should be noted that the preferred mitigation measure (Measure 5.3.6-4a) proposed to reduce the impacts of the WSIP on salmonid fisheries in the lower Tuolumne River would also reduce or eliminate the effects of the WSIP on fisheries in the San Joaquin River.

SI_TRT-CWA-SierraC-174 In response to this comment, Draft PEIR, Vol. 5, Appendix H1, p. H1-10, third full paragraph, seventh sentence is revised as follows:

> Studies suggest that there is a 30 percent chance that the SFPUC system will experience a drought in the next 75 years equal to or more severe than the 1987–1992 drought (Beck, 1994).

In addition, Draft PEIR, Vol.5, Appendix H1, p. H1-39, the following text is added as the first reference:

> Beck, R.W. *Design Drought Analysis*. Prepared for Modesto Irrigation District and Turlock Irrigation District, August 1994.

SI_TRT-CWA-SierraC-175 Refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.3) for a description of how monthly flows produced by the HH/LSM were supplemented by daily flow estimates derived from operational records.

SI_TRT-CWA-SierraC-176 Lake Eleanor and Lake Lloyd are located on Cherry Creek and do not contribute inflow to Hetch Hetchy Reservoir.

SI_TRT-CWA-SierraC-177 Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter1 4, Section 14.5.6).

SI_TRT-CWA-SierraC-178 The SFPUC has not reached agreement with TID and MID with respect to the dry-year water transfer. Please refer to **Section 14.3, Master Response on Proposed Dry-Year Water Transfer** (Vol. 7, Chapter 14, Section 14.3.2) for more information. The commenter's observation with respect to the uncertainty associated with the transfer is acknowledged. The CCSF has worked with TID and MID for many years in analyzing water supply availability from the Tuolumne River, and the HH/LSM modeling indicates that there could be water available for a dry-year transfer without a loss of water to TID and MID.

SI_TRT-CWA-SierraC-179 The commenter opines that the data contained in Draft PEIR Appendix H2-1 (Vol. 5, Table 2.1-1, p. 11) is difficult to review in the tabular format and that it should be displayed in a graphical form. Much of the data used in the impact analysis are displayed graphically, either in the appendix or in the body of the Draft PEIR. For example, the data shown in Table 2.2-1 are shown graphically in Figure 2.2-1. The data contained in Tables 2.3-1, 2.3-2, and 2.3-3 on storage in Hetch Hetchy Reservoir are plotted in Figures 2.3-1, 2.3-2, 2.3-3, and 2.3-4 in Appendix H2-1. Figure 2.3-1 is included in the main body of the PEIR as Figure 5.3.1-9 (Vol. 3, Chapter 5, p. 5.3.1-23).

SI_TRT-CWA-SierraC-180 The comment misstates the content of Table 2.3-3 (Vol. 5, Appendix H2-1, p. 19), which shows differences in Hetch Hetchy Reservoir storage with and without the WSIP. The data contained in Table 2.3-3 are plotted in Figure 2.3-3 (Vol. 5, Appendix H2-1, p. 20).

SI_TRT-CWA-SierraC-181 Please refer to **Response SI_TRT-CWA-SierraC-180**, above.

SI_TRT-CWA-SierraC-182 Please refer to **Response SI_TRT-CWA-SierraC-180**, above.

SI_TRT-CWA-SierraC-183 The comment misstates the content of Table 2.3-4 (Vol. 5, Appendix H2-1, p. 21), which shows releases from Hetch Hetchy Reservoir to the Tuolumne River with the WSIP. The data contained in Table 2.3-4 are plotted in Figure 2.3-1 (Vol. 5, Appendix H2-1, p. 16).

SI_TRT-CWA-SierraC-184 The comment misstates the content of Table 2.3-5 (Vol. 5, Appendix H2-1, p. 22), which shows releases from Hetch Hetchy Reservoir to the Tuolumne River under the existing condition. The data contained in Table 2.3-5 are plotted in Figure 2.3-1 (Vol. 5, Appendix H2-1, p. 16).

SI_TRT-CWA-SierraC-185 The comment misstates the content of Table 2.3-6 (Vol. 5, Appendix H2-1, p. 22), which shows differences in releases from Hetch Hetchy Reservoir to the Tuolumne River under the existing condition and with the WSIP. The data contained in Table 2.3-6 are not directly plotted, but can be seen by observing the differences between the with- and without-WSIP releases plotted in Figure 2.3-1 (Vol. 5, Appendix H2-1, p. 16).

SI_TRT-CWA-SierraC-186 The data contained in Table 2.4-1 (Vol. 5, Appendix H2-1, p. 27) are not directly plotted, but can be seen by observing the differences between the with- and without-WSIP releases plotted in Figure 2.4-1 (Vol. 5, Appendix H2-1, p. 25).

SI_TRT-CWA-SierraC-187 The comment misstates the content of Appendix H2-1 Tables 2.6-1 through 2.6-8. Tables 2.6-1 and 2.6-2 show storage in Don Pedro Reservoir with and without the WSIP, and Table 2.6-3 shows the differences in storage between the two scenarios. Table 2.6-4 shows differences in reservoir inflow between the two scenarios. Tables 2.6-5 and 2.6-6 show releases from Don Pedro Reservoir to the Tuolumne River with and without the WSIP, and Table 2.6-7 shows the differences in releases between the two scenarios. Table 2.6-8 shows the same information as Table 2.6-7, but the information is ranked in descending order of wetness, based on the San Joaquin River index. The data in Tables 2.6-1, 2.6-2, 2.6-5, and 2.6-6 are plotted in Figure 2.6-1 (Vol. 5, Appendix H2-1, p. 30). The data contained in Table 2.6-3, Table 2.6-7, and 2.6-8 are not directly plotted, but can be seen by observing the differences between the with- and without-WSIP storage and releases plotted in Figure 2.6-1.

SI_TRT-CWA-SierraC-188 Please refer to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 4.7.8) regarding Mitigation Measure 5.3.6-4a, as well as to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.6). Because of uncertainties regarding Measure 5.3.6-4a, an alternative mitigation measure, Measure 5.3.6-4b, is identified in the Draft PEIR (Vol. 4, Chapter 6, pp. 6-48 and 6-49).

SI_TRT-CWA-SierraC-189 Please refer to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.9). It is recognized that the current understanding of the factors influencing salmonid productivity in the Tuolumne River below La Grange Dam is incomplete. Mitigation Measure 5.3.6-4b has been clarified to include surveys and actions to meet performance standards (refer to Vol. 7, **Chapter 16, Staff-Initiated Text Changes**). The comment regarding the possibility that providing additional spawning habitat for salmonids could cause crowding of rearing habitat is acknowledged.

SI_TRT-CWA-SierraC-190 Please refer to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.9). A part of Mitigation Measure 5.3.6-4 is based on the belief of some fisheries experts that the gravel pits provide habitat for salmonid predators, and that elevated numbers of predators reduce salmon survival. The comment questioning the evidence that predators are a problem is acknowledged. Also refer to **Response SI_TRT-CWA-SierraC-189**. The commenter's opinion that Measure 5.3.6-4b would not provide benefits to terrestrial biological resources is acknowledged. As noted in the Draft PEIR (Vol. 4, Chapter 6, p. 6-50), if Measure 5.3.6-4a proves to be infeasible and Measure 5.3.6-4b is implemented, an additional mitigation measure (Measure 5.3.7-6) would be implemented to reduce the impacts of the WSIP on terrestrial biological resources in the Tuolumne River below La Grange Dam to a less-than-significant level.

SI_TRT-CWA-SierraC-191 It is acknowledged in the Draft PEIR that past and current actions have harmed salmon habitat in the Tuolumne River (Vol. 3, Chapter 5, Section 5.7).

Studies of rainbow trout and salmon habitat in the Tuolumne River are in progress. Please refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.2) for a description of studies the SFPUC is conducting, in consultation with the USFWS, in the Tuolumne River below O'Shaughnessy Dam. TID and MID are currently conducting studies of the lower Tuolumne River pursuant to their license to operate the Don Pedro Project granted by FERC in 1996. If the WSIP is implemented, the results of these studies, together with the results of monitoring that is a part of several mitigation measures, would provide information for the adaptive management program associated with the WSIP's mitigation measures.

SI_TRT-CWA-SierraC-192 Please refer to **Response SI_TRT-CWA-SierraC-191**, above.

SI_TRT-CWA-SierraC-193 Receipt of the information provided by the commenter is acknowledged. The table labeled "Table 1" is included in the Draft PEIR (Vol. 3, Chapter 5, p. 5.3.1-12). The Draft PEIR includes a table of additional releases for trout in the Tuolumne River below O'Shaughnessy Dam (Vol. 3, Chapter 5, p. 5.7-30), but it is not the same as the table labeled "rough draft" and provided by the commenter. The information provided does not raise any new issues that have not been addressed in the Draft PEIR.

SI_TRT-CWA-SierraC-194 Receipt of the information provided by the commenter on Chinook salmon production in the Tuolumne River is acknowledged. It is similar to but more detailed than information presented in the Draft

PEIR in Table 5.3.6-2 (Vol. 3, Chapter 5, p. 5.3.6-15). The information provided does not raise any new issues that have not been addressed in the Draft PEIR.

SI_TRT-CWA-SierraC-195 Receipt of the information provided by the commenter on water demand is acknowledged. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14) and the responses to comments from the Pacific Institute (**SI_PacInst**).

SI_TRT-CWA-SierraC-196 Receipt of the information provided by the commenter on water conservation is acknowledged. The comment (Attachment I), entitled Studies on Water Conservation, is a list of studies primarily on conservation in Seattle and southern California intended to support the assertion that the Bay Area is not doing enough in these areas. Refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3, under the heading Frequently Submitted Comments Addressing Conservation and Recycling); **Responses SI_PacInst-59** and **SI_PacInst-71** regarding specific assertions based on Seattle studies; and **Reponses SI_PacInst-72** and **SI_PacInst-80** regarding studies on urban water conservation potential in southern California.

SI_TRT-CWA-SierraC-197 Receipt of the information provided by the commenter on water demand and conservation is acknowledged. Regarding issues raised in the presentations refer to responses to the Pacific Institute letter (**SI_PacInst**).

SI_TRT-CWA-SierraC-198 Receipt of the information provided by the commenter on water demand and conservation is acknowledged. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3). In particular, refer to the discussion under the heading Effects of the Future Cost of Water on Projected Demand.

SI_TRT-CWA-SierraC-199 Receipt of the information provided by the commenter on water pricing and demand is acknowledged. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3). In particular, refer to the discussion under the heading Effects of the Future Cost of Water on Projected Demand.

15.5 Citizens

CITIZENS

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Mail	C_AllenT	Thomas Allen	15.5-2
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Email	C_Arons	Eric Arons	15.5-3
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Hand-delivered, PH	C_Blake	Martin Blake	15.5-9
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PH Sonora	C_BoutiD	Dolores Boutin	15.5-10
PH Sonora	C_BoutiF	Fred Boutin	15.5-10
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PH Sonora	C_BramlD3	Darryl Bramlette	15.5-13
PH Modesto	C_BramlD4	Darryl Bramlette	15.5-14
Email	C_Brand	Jobst Brandt	15.5-14
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PH	C_Britt	Beverly Britts	15.5-16
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PH SF1	C_Bug	June Bug	15.5-17
Email	C_Byron	Juan Byron	15.5-17
PH Fremont	C_Cant	John Cant	15.5-20
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Email	C_Chiap	Lynn Chiapella	15.5-21
PH SF1	C_Chode	Bernie Chodeu	15.5-23
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PH Palo Alto	C_Dippe	Dan Dippery	15.5-35
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PH SF1	C_Kalma	Emeric Kalman	15.5-65
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PH Sonora	C_Sturt	Jon Sturtevant	15.5-101
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Mail	C_Unreadable2	Unreadable commenter name	15.5-107
Mail	C_Unreadable3	Unreadable commenter name	15.5-107
Mail	C_Unreadable4	Unreadable commenter name	15.5-107
Mail	C_Unreadable5	Unreadable commenter name	15.5-108
Email	C_Urdan	Matthew Urdan	15.5-108
Email	C_Vadop	Paul Vadopalas	15.5-108
Email	C_VermeJ	Jim Vermeys	15.5-108
Email	C_VermeK	Karen Vermeys	15.5-109
Mail	C_Voyik	Ashleigh Voyikes	15.5-109
Mail	C_Vrana	Leo Vrana	15.5-109
Email	C_Walke	Patricia Walker	15.5-110
Email	C_Walls	Pete Wallstrom	15.5-111
Email	C_Weiss	Richard Weiss	15.5-111
Mail	C_Westc	Bart Westcott	15.5-112
Email	C_Willi	Doris Williams	15.5-112
Email	C_Wingf	Polly P. Wingfield	15.5-113
Email	C_Wolf	Elizabeth Wolf	15.5-113
Mail	C_Zimme	Benita Zimmerman	15.5-113

Amy Adams, 09/19/07

[See Public Hearing Transcript, Palo Alto, pp. 32–35]

C_AdamsA-01 This comment expresses the opinion that the SFPUC should pursue a two-tiered approach that separates the seismic improvements from the proposed water supply option. Please refer to **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Section 14.1.5) regarding the integration of the seismic improvements and water supply option to meet program objectives, and for a discussion of the advantages of using a program EIR to evaluate the proposed program as a whole.

C_AdamsA-02 This comment in support of conservation and efficiency is acknowledged. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects proposed by SFPUC and its wholesale customers.

Sambhu Agarwala, 09/20/07

C_Agarw-01 This comment opposing additional Tuolumne River diversions and encouraging additional conservation and recycling efforts to conserve the projected increase in water demand through 2030 is acknowledged. The commenter incorrectly infers that SFPUC wholesale customers in the East Bay account for 60 percent of the proposed increase in diversions from the Tuolumne River. Alameda County Water District and the City of Hayward, the two SFPUC wholesale customers in the East Bay, together account for 35 percent of the purchase request increase (approximately 12.1 mgd of the projected 35 mgd increase in purchase requests) relative to 2001/2002 purchases. Refer to Draft PEIR Table 7.2 and Table 7.3 (Vol. 4, Chapter 7, pp. 7-15 and 7-18) regarding expected future demand and purchases and the change in demand and purchases from 2001. Please also refer to the discussion in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2, under the heading Outdoor Water Use), for more information on outdoor demand, and to Section 14.2 (Vol. 7, Chapter 14, Section 14.2.3) for more information regarding conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers.

Casey Allen, 09/20/07

C_AllenC-01 This comment opposing additional Tuolumne River diversions is acknowledged.

C_AllenC-02 This comment expresses concern for impacts to wildlife and biodiversity that could result from the proposed increase in Tuolumne River diversions. The Draft PEIR (Vol. 3, Chapter 5, Sections 5.3.6 and 5.3.7) included a project-level analysis of impacts on fisheries and terrestrial biological resources that would result from the proposed water supply option and changes in system operations. As described, implementation of the WSIP would result in several potentially significant adverse impacts on the Tuolumne River and its resources; the Draft PEIR identified mitigation measures to reduce these impacts to less-than-significant levels.

C_AllenC-03 Regarding the commenter's concerns about impacts to local businesses, please refer to **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 4, Section 14.1.6) regarding CEQA requirements related to economic evaluations, and the environmental effects that some commenters perceive could cause economic impacts for Tuolumne County residents, businesses, and tourism.

Thomas Allen, 09/22/07

C_AllenT-01 This comment expressing an opinion on the WSIP is acknowledged.

Rita Allison, 08/28/07

C_Allis-01 This comment expressing opposition to additional diversions from the Tuolumne River and support for additional conservation is acknowledged. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for discussion of conservation programs and recycling projects proposed by the SFPUC and its wholesale customers. Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.9) for an explanation of the relationship between the average annual increase in purchase requests and the average annual increase in Tuolumne River diversions.

Grudy Alter, 09/20/07

C_Alter-01 This comment opposing additional diversions from the Tuolumne River and in support of additional conservation and recycling is acknowledged. Refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for information on the conservation programs and recycling projects being implemented or planned by the SFPUC and its wholesale customers. Please refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.5) and to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.6), for clarification regarding current and estimated future municipal and agricultural diversions from the Tuolumne River.

Eric Arons, 09/14/07

C_Arons-01 This comment opposing additional diversions from the Tuolumne River and urging the protection of river habitat and recreational boating is acknowledged. The Draft PEIR (Vol. 3, Chapter 5, Sections 5.3.1 through 5.3.8) analyzed the effects of the WSIP on the hydrology, geomorphology, water quality, groundwater, terrestrial biology, fisheries, recreation, and visual quality of the Tuolumne River corridor. As described, implementation of the WSIP would result in several potentially significant adverse impacts on the Tuolumne River and its resources; the Draft PEIR identified mitigation measures to reduce these impacts to less-than-significant levels.

Christopher Bail, 09/28/07

C_Bail-01 This comment opposing additional Tuolumne River diversions is acknowledged. The Draft PEIR (Vol. 3, Chapter 5, Sections 5.3.1 through 5.3.8) analyzed the effects of the WSIP on the hydrology, geomorphology, water quality, groundwater, terrestrial biology, fisheries, recreation, and visual quality of the Tuolumne River corridor. As described, implementation of the WSIP would result in several potentially significant adverse impacts on the Tuolumne River and its resources; the Draft PEIR identified mitigation measures to reduce these impacts to less-than-significant levels.

C_Bail-02 Please refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.5) and to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7. Chapter 14, Section 14.7.6), for clarification regarding current and estimated future municipal and agricultural diversions from the Tuolumne River. Regarding the effects of global warming on the Tuolumne River, refer to **Section 14.11**, **Master Response on Climate Change** (Vol. 7, Chapter 14, Section 14.11.5) for information on current studies and models that are being used to forecast the effects of climate change on the SFPUC's regional water system. This comment incorrectly implies that the purchase estimates prepared for the WSIP do not include increased conservation and recycling efforts to mitigate demand. For additional information on the methodologies used by SFPUC in collaboration with its wholesale customers and the Bay Area Water Supply and Conservation Agency (BAWSCA) to assess future water demand, and on the conservation programs and recycling projects proposed by the SFPUC and its wholesale customers, please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14).

C_Bail-03 This comment opposing additional Tuolumne River diversions and recommending that the SFPUC consider the possibility of reducing diversions from the river is acknowledged.

John Barbey, 10/01/07

C_Barbe1-01 This comment states that the supply capacity of the Hetch Hetchy Water System is reaching its limitations. While the SFPUC is currently able to serve customer demands during certain hydrologic and operating conditions and has the "capacity" to continue to do so through 2030, the existing system is currently unable to meet WSIP level of service objectives for reliably serving customers needs over a range of operating conditions and these deficiencies will become more severe in the future. As shown in the Draft PEIR, Table 3.5 (Vol. 1, Chapter 3, p. 3-26), the WSIP would improve overall system reliability with respect to water quality, seismic response after a major earthquake, customer deliveries during system maintenance, and water supply during drought periods. All of these factors influence the understanding of "capacity limitations" for the regional system.

C_Barbe1-02 This comment expresses support for additional water storage in the form of dams and water impoundments, and for implementation of desalination projects to meet future water demand in the SFPUC service area. The WSIP includes implementation of two facility improvement projects that would increase water storage in existing Bay Area reservoirs: the Calaveras Dam Replacement (SV-2) and Lower Crystal Springs Dam Improvements (PN-4) projects.

The PEIR analyzes the use of desalination technologies as a supplemental water supply in the Regional Desalination for Drought Alternative – Variant 2 (Vol. 4, Chapter 9, Section 9.2.7) and the Year-round Desalination at

Oceanside Alternative (Vol. 4, Chapter 9, Section 9.2.6). As indicated in Table 9.6 (pp. 9-14 to 9-16), it is uncertain whether these two alternatives are capable of meeting all WSIP goals and objectives related to sustainability and the cost-effective use of funds, and these alternatives would only partially meet the WSIP objective of maintaining a gravity-driven system. Also, the Year-round Desalination at Oceanside Alternative would only partially meet WSIP objectives related to delivery reliability during planned maintenance.

C_Barbe1-03 The comment asserts that San Francisco water customers are conserving so that suburban customers can squander the “saved” water. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) regarding conservation programs and water recycling projects being implemented or planned in the retail and wholesale customer service areas.

C_Barbe1-04 The Draft PEIR, (Vol. 1, Chapter 3, pp. 3-16 to 3-22) describes the demand projection methodology. As described, projections for both retail and wholesale customers were developed using end-use demand models that break down total water use by customer type to specific end uses, such as toilets, faucets and irrigation. To project future demand, account growth rates were developed for residential and nonresidential accounts using published population and employment projections, respectively. For a more detailed discussion of the demand forecasting methodology, refer to Draft PEIR Appendix E2 (Vol. 5). The comment implies that the demand projections were prepared as part of the Draft PEIR. The demand projections were prepared by the SFPUC and its technical consultants, along with the SFPUC’s wholesale customers, as a component of WSIP planning. For additional information on the methodologies used by the SFPUC in collaboration with its wholesale customers and BAWSCA to assess future water demand, please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2).

John Barbey, 09/20/07

[See Public Hearing Transcript, San Francisco City Hall, September 20, 2007, pp. 7-8]

C_Barbe2-01 This comment expresses an opinion that there was inadequate noticing of the Draft PEIR public hearing dates. Please see **Responses F_USDAFS-05** and **L_SFCPC1-01**, and **Appendix J1** (Vol. 8) of this Comments and Responses document for detailed information on the public outreach efforts conducted by the San Francisco Planning Department’s Major Environmental Analysis Division and the SFPUC.

C_Barbe2-02 This comment expressing an opinion that San Francisco's water supplies should be safeguarded and that additional conservation is not capable of meeting future water demand is acknowledged.

Cris Barsanti, 09/10/07

C_Barsa-01 The commenter expresses the concern that WSIP-related changes in Tuolumne River flow due to additional Tuolumne River diversions and changes in water system operations would reduce opportunities for whitewater recreation.

The Draft PEIR (Vol. 3, Section 5.3.8) provides an extensive discussion of existing whitewater recreational resources in the Tuolumne River watershed and evaluates the potential magnitude of impacts on future whitewater recreation under the WSIP. The detailed analysis of the timing and magnitude of the WSIP-related changes in water releases within the upper Tuolumne River watershed (see Impact 5.3.8-2: Effects on river recreation due to changes in water system operations, pp. 5.3.8-27 through 5.3.8-34) conclude that the effects on whitewater recreation would be less than significant since shifts in water releases and associated reductions in flow along the upper Tuolumne River would generally be limited to high flow months (April through June) or the low recreation season (November to March) and thus, would not significantly impair whitewater recreation. In addition, during other peak visitor months of July and August, SFPUC releases for whitewater rafting would continue to be provided when operationally practical. Furthermore, flow reductions during these months are projected to only occur during drier than normal hydrologic years and be relatively limited (i.e. 3 percent or less reductions in average monthly flows) so as to be imperceptible to most recreationists.

C_Barsa-02 This comment in support of additional conservation and recycling to serve future water demand and against additional diversions from the Tuolumne River is acknowledged. For descriptions of alternatives evaluated in the Draft PEIR that do not include additional diversions from the Tuolumne River, refer to the descriptions of the Year-round Desalination at Oceanside Alternative (Vol. 4, Chapter 9, Section 9.2.4), and Aggressive Conservation/Water Recycling and Local Groundwater Alternative (Without Tuolumne River Supplement) (Vol. 4, Chapter 9, Section 9.2.6). Refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers.

Cedric De La Beaujardiere and Susan Stansbury, 09/19/07

[See Public Hearing Transcript, Palo Alto, pp. 36-38]

C_Beauj-01 This comment expressing support of more conservation and recycling is acknowledged. Refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for information on conservation programs and recycling projects being implemented or planned by the SFPUC and its wholesale customers.

C_Beauj-02 This comment expressing support for the proposed seismic upgrades, opposition to additional diversions from the Tuolumne River, and support for future decreases in diversions from the river is acknowledged.

Bonnie Berg, 09/11/07

C_Berg-01 This comment opposing additional Tuolumne River diversions is acknowledged. This commenter requests that water demand projections in the SFPUC service area be reevaluated and urges more conservation and recycling. The 2030 purchase estimates prepared for the WSIP include 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, Section 3.4.4, pp. 3-16 to 3-22). For additional information on the methodologies used by the SFPUC in collaboration with its wholesale customers and BAWSCA to assess future water demand, and on the conservation programs and recycling projects proposed by the SFPUC and its wholesale customers, please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14). For descriptions of alternatives that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78).

Allan Berkowitz, 09/07/07

C_Berko-01 This comment opposing additional Tuolumne River diversions is acknowledged. Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.9), for an explanation of the relationship between the average annual increase in purchase requests and the average annual increase in Tuolumne River diversions.

C_Berko-02 This comment questions the demand and conservation projections and suggests that the SFPUC determine the maximum potential for conservation and efficiency savings, and that additional demand be met through increased investment in conservation, efficiency, and recycling. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14) for additional information on the methodologies used by SFPUC in collaboration with its wholesale customers and the Bay Area Water Supply and Conservation Agency (BAWSCA) to assess future water demand, and on the conservation programs and recycling projects proposed by the SFPUC and its wholesale customers.

C_Berko-03 This comment expressing an opinion that the SFPUC should adopt a policy of reducing additional Tuolumne River diversions over time is acknowledged.

C_Berko-04 This comment was submitted by multiple commenters; refer to **Response C_Breso-01**.

Gabie Berliner, 09/20/07

C_Berli-01 This comment opposing additional Tuolumne River diversions is noted. Please refer to **Response L_Tuol1-09** regarding the potential effects of the WSIP on those reaches of the Tuolumne River designated as wild and scenic.

John Beviacqua, 09/19/07

C_Bevia-01 This comment, which expresses support for more conservation and recycling to meet water demand and opposing additional diversions from the Tuolumne River, is acknowledged. The 2030 purchase estimates prepared for the WSIP include 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Draft PEIR, Vol. 1, Chapter 3, pp. 3-16 to 3-22). Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3), for additional information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers. Refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.9), for an explanation of the relationship between the average annual increase in purchase requests and the average annual increase in Tuolumne River diversions. For more information regarding impacts on Chinook salmon, refer to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.2).

Marty Bigos, 10/01/07

C_Bigos-01 This comment opposing urban sprawl development in the Bay Area is acknowledged.

C_Bigos-02 This comment expressing support for the CEQA alternatives that would not include additional Tuolumne River diversions and that would promote additional conservation, efficiency, and recycling to prevent the need for additional Tuolumne River diversions is acknowledged. For a discussion of the alternatives evaluated in the Draft PEIR that do not include additional diversions from the Tuolumne River, refer to the descriptions of the Year-round Desalination at Oceanside Alternative (see Draft PEIR Vol. 4, Chapter 9, Section 9.2.6, p. 9-66) and Aggressive Conservation/Water Recycling and Local Groundwater Alternative (Without Tuolumne River Supplement) (see Section 9.2.4, p. 9-47). Refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for a discussion of the conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers.

Martin Blake, 09/05/07

C_Blake-01 This comment opposing additional diversions from the Tuolumne River and supporting additional conservation is acknowledged. Refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3), for additional information related to the conservation programs and recycling projects being implemented or planned by the SFPUC and its wholesale customers.

Sean Bourke, MD, 09/11/07

C_Bourk-01 This comment opposing additional diversions from the Tuolumne River is acknowledged. Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.9) for an explanation of the relationship between the average annual increase in purchase requests and the average annual increase in Tuolumne River diversions.

Dolores Boutin, 09/05/07

[See Public Hearing Transcript, Sonora, pp. 11-13]

C_BoutiD-01 This comment opposing additional Tuolumne River diversions is acknowledged. Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.9), for an explanation of the relationship between the average annual increase in purchase requests and the average annual increase in Tuolumne River diversions.

Fred Boutin, 09/05/07

[See Public Hearing Transcript, Sonora, p. 17]

C_BoutiF-01 This comment expresses an opinion that the Water System Improvement Program (WSIP) is not an improvement program, but rather an expansion program, and should be renamed accordingly. This comment is acknowledged.

C_BoutiF-02 The request for studies evaluating the maximum potential for water conservation has been submitted by numerous commenters; please refer to the discussion in **Section 14.2, Master Response on Demand Projections, Conservation and Recycling** (Vol. 7, Chapter 14, Section 14.2.3), under the heading Frequently Submitted Comments Addressing Conservation and Recycling. Refer to Table 7.3 in the Draft PEIR (Vol. 4, Chapter 7, p. 7-18) regarding where the increase in water demand and increase in water purchases from the SFPUC regional system is projected to occur.

Darryl Bramlette, 09/06/07

C_BramlD1-01 The Draft PEIR (Vol. 3, Chapter 5, Sections 5.3.1 through 5.3.8) analyzed the effects of the WSIP on the hydrology, geomorphology, water quality, groundwater, terrestrial biology, fisheries, recreation, and visual quality of the Tuolumne River corridor. As described, implementation of the WSIP would result in several potentially significant adverse impacts on the Tuolumne River and its resources; the Draft PEIR identified mitigation measures to reduce these impacts to less-than-significant levels. Refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14) and **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14) for additional information related to the impact analysis for the Tuolumne River. (Regarding the use of desalination technologies to supplement water supplies, refer to **Response C_BramlD1-02**.)

C_BramlD1-02 This comment questions why the SFPUC has not considered using desalination technologies to achieve "all of the key elements" of the WSIP and then provides information on desalination. The Draft PEIR analyzed the use of desalination technologies as a supplemental water supply as part of the Regional Desalination for Drought Alternative – Variant 2 (Vol. 4, Chapter 9, Section 9.2.7) and the Year-round Desalination at Oceanside Alternative (Vol. 4, Chapter 9, Section 9.2.6). As indicated in Table 9.6 (pp. 9-14 to 9-16), it is uncertain whether these two alternatives are capable of meeting all WSIP goals and objectives related to sustainability and the cost-effective use of funds, and these alternatives would only partially meet the WSIP objective of maintaining a gravity-driven system. Also, the Year-round Desalination at Oceanside Alternative would only partially meet WSIP objectives related to delivery reliability during planned maintenance.

C_BramlD1-03 The commenter suggests several ways to control seawater intrusion. The suggested methods for control of seawater intrusion mentioned in this comment are acknowledged and recognized as feasible. Management of groundwater withdrawals and positioning of wells is incorporated into the project design for both the Local and Regional Groundwater Projects (SF-2) (Draft PEIR, Vol. 3, pp. 5.6-24 and 5.6-25). Other methods of control that are mentioned in the comment (recharge with basins or wells to maintain freshwater pressure, interception with a line of pumping wells, and placement of a subsurface groundwater barrier) involve remediation for seawater intrusion and would not be needed because the Local and Regional Groundwater Projects would be conducted in a manner to avoid seawater intrusion as discussed below.

The potential for seawater intrusion to the North and South Westside Groundwater Basins is evaluated in Impact 5.6-3 of the Draft PEIR (Vol. 3, pp. 5.6-28 and 5.6-29). Potential impacts related to seawater intrusion are considered potentially significant for the North Westside Groundwater Basin because the shallow aquifer is in direct connection with the ocean from approximately Lake Merced to the north. However, determination of the basin safe yield in accordance with Measure 5.6-1 (Vol. 4, Chapter 6, pp. 6-58 and 6-59) would reduce impacts related to basin overdraft and potential seawater intrusion to a less-than-significant level. This measure requires determination of the basin's yield on both a regular (average annual) and an intermittent (dry-year or emergency) basis, in accordance with Element 3 of SFPUC's *Final Draft North Westside Groundwater Basin Management Plan* (SFPUC, 2005), as well as implementation of groundwater level and quality monitoring in accordance with Element 1 of the Groundwater Management Plan. The monitoring data would be used to inform decisions regarding appropriate pumping patterns to avoid overdraft and the undesirable effects associated with overdraft.

In the South Westside Groundwater Basin potential impacts related to seawater intrusion are less than significant because faulting and folding of the Merced Formation along the western border with the Pacific Ocean and the presence of bedrock and bay mud along the eastern border with the bay block seawater intrusion, as discussed in the Draft PEIR (Vol. 3, p. 5.6-29). Furthermore, monitoring and modeling would also be conducted to assess the conjunctive-use program's performance and to identify and avoid potential problems (Draft PEIR, Vol. 3, p. 5.6-26). Based on monitoring data and modeling results, conjunctive-use management strategies would be adjusted and implemented as necessary to avoid adverse conditions.

C_BramlD1-04 The commenter states that the environmental impacts of the increased delivery demands on the Tuolumne River were not addressed in the Draft PEIR. The Draft PEIR (Vol. 3, Chapter 5, Sections 5.3.1 through 5.3.8) analyzed the effects of the WSIP on the hydrology, geomorphology, water quality, groundwater, terrestrial biology, fisheries, recreation, and visual quality of the Tuolumne River corridor. As described, implementation of the WSIP would result in several potentially significant adverse impacts on the Tuolumne River and its resources; the Draft PEIR identified mitigation measures to reduce these impacts to less-than-significant levels. Refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14) and **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14) for additional information related to the impact analysis for the Tuolumne River.

Darryl Bramlette, 09/27/07

C_BramlD2-01 This comment characterizes oral comments presented at a public meeting on the Draft PEIR ("The number one problem: San Francisco needs more water!"; "The number two problem: the increasing diversion will do further harm to the Tuolumne River"). Please refer to **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Section 14.1.5) regarding the integration of the seismic improvements and water supply option to meet program objectives, and for a discussion of the advantages of using a program EIR to evaluate the proposed program as a whole. Please refer also to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.9) for an explanation of the relationship between the average annual increase in purchase requests and the average annual increase in Tuolumne River diversions.

C_BramlD2-02 This comment expressing support for more conservation and recycling to meet water demand, and opposition to additional diversions from the Tuolumne River is acknowledged. The 2030 purchase estimates prepared for the WSIP include 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, Section 3.4.4, pp. 3-16 to 3-22). For descriptions of alternatives that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). This comment also expresses doubt that projected water demand for San Francisco and its wholesale customers can be met by Tuolumne River diversions, conservation, efficiency, and recycling. As discussed in the Draft PEIR (Vol. 4, Chapter 7, p. 7-9) and shown in Table 3.3 and Table 7.2 (Vol. 1, Chapter 3, p. 3-18 and Vol. 4, Chapter 7, p. 7-15, respectively), for about half the wholesale customers, the SFPUC is one of several sources of supply. For additional information on the methodologies used by SFPUC in collaboration with its wholesale customers and BAWSCA to assess future water demand, and on the conservation programs and recycling projects proposed by the SFPUC and its wholesale customers, please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14).

C_BramlD2-03 This comment expresses the opinion that the SFPUC should write an EIR on the development of alternative water supply sources. The Draft PEIR (Vol. 4, Chapter 9) evaluates various supplemental water supply alternatives involving more conservation and water recycling (see the Aggressive Conservation/Water Recycling and Local Groundwater Alternative, Sections 9.2.4 and 9.2.5); alternative locations for Tuolumne River diversion (see the Lower Tuolumne River Diversion Alternative, Section 9.2.5): desalination technologies (see the Regional Desalination for Drought [Variant 2], Section 9.2.7, and the Year-round Desalination at Oceanside Alternative, Section 9.2.6); and an alternative involving a modification of system operations (see Modified WSIP Alternative, Section 9.2.8).

Darryl Bramlette, 09/05/07

[See Public Hearing Transcript, Sonora, pp. 29-30]

C_BramlD3-01 This comment opposes additional Tuolumne River diversions and supports the use of desalination as a source of supplemental water supplies. Please refer to **Response C_BramlD1-02** for response.

C_BramlD3-02 This comment supporting additional conservation among SFPUC customers to meet future water demands is acknowledged. Refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to the conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers.

C_BramlD3-03 This comment implies that the SFPUC illegally sells Tuolumne River water to other communities for profit. The Raker Act imposed many conditions and obligations on the City and County of San Francisco (CCSF), including the requirement that Tuolumne River water could be used in the Bay Area for municipal and domestic purposes, but not for agricultural irrigation. See **Response L_TUD1-05** regarding CCSF's water rights and the Raker Act.

Darryl Bramlette, 09/06/07

[See Public Hearing Transcript, Modesto, pp. 15-16]

C_BramlD4-01 See **Response C_BramlD1-02**.

Jobst Brandt, 09/24/07

C_Brand-01 This comment opposing additional Tuolumne River diversions but in support of seismic improvements to the regional water system is acknowledged. Please refer to **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Section 14.1.5) for a discussion related to the integration of the seismic improvements and water supply options to meet program objectives, and for a discussion of the advantages of using a program EIR to evaluate the proposed program as a whole.

Mark Bresolin, 10/11/07

C_Breso-01 This comment expresses opposition to additional Tuolumne River diversions and requests that additional studies be conducted before the PEIR is finalized. As described in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.1-7 to 5.1-18), the basic approach to the analysis of impacts on water and related resources was to first evaluate the changes in the river flow and reservoir levels that would occur with the WSIP, then to estimate changes in water quality and temperature, and finally to combine this information to determine potential impacts on fisheries and other biological resources. The analysis used the existing 82-year historical hydrologic record, coupled with the Hetch Hetchy/Local Simulation Model (HH/LSM), to depict the overall regional water system operations and to project the extent of changes in flow that could occur in the future. These results were used for the PEIR water supply and system operations impact analysis.

As described in **Section 14.4, Master Response on PEIR Appropriate Level of Analysis** (Vol. 7, Chapter 14, Section 14.4.4), the CEQA Guidelines (Section 15151) impose a standard of adequacy that is "reasonably feasible" and sufficient to allow decision-makers to make a decision that takes account of environmental consequences. Data gathering need not be "exhaustive." The Draft PEIR analysis of the WSIP water supply and system operations with respect to fisheries and biological resources along the Tuolumne River was based on current knowledge of the composition and condition of the resources and in consideration of the potential interactive responses of plant and animal species to the hydrologic changes resulting from the WSIP as indicated by the model results. The analysis relied on ecological principles, scientific literature, existing data, and site visits. The Draft PEIR analysis was conservative in finding that an impact could be potentially significant if there was a possibility of impacts from the WSIP water supply and system operations.

The San Francisco Planning Department believes these data are sufficient to reasonably assess the general magnitude, frequency, and extent of the WSIP's environmental consequences, and to identify appropriate mitigation measures to offset potentially significant impacts on the Tuolumne River watershed and related resources. The mitigation measures were developed to include performance standards based on ecological principles, with the understanding that data from ongoing and future studies could be useful in augmenting the baseline data and in refining the implementation of each measure. As described in Draft PEIR Measure 5.3.7-2 (Vol. 4, Chapter 6, pp. 6-49 and 6-50), **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.2), and **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.2), several studies of the Tuolumne River are in progress by the SFPUC, National Park Service, USFWS, NMFS, CDFG, and other agencies. Data from these studies would be used to augment the existing data and allow for refinement of the implementation of the mitigation measure to meet the performance standards.

C_Breso-02 This comment incorrectly states that the preferred alternative ignores conservation, efficiency, and recycling. The statements in this comment were submitted by numerous commenters and are responded to in **Section 14.2, Master Response on Demand Projections, Conservation and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) under the heading Frequently Submitted Comments Addressing Conservation and Recycling. The commenter's support for alternatives that protect the Tuolumne River from new diversions is acknowledged. For descriptions of alternatives evaluated in the Draft PEIR that do not include additional diversions from the Tuolumne River, refer to the descriptions of the Year-round Desalination at Oceanside Alternative (Vol. 4, Chapter 9, Section 9.2.4), and Aggressive Conservation/Water Recycling and Local Groundwater Alternative (Without Tuolumne River Supplement) (Vol. 4, Chapter 9, Section 9.2.6).

Beverly Britts, 09/05/07

C_Britt-01 This comment advocating greater public awareness of the environmental impacts of additional Tuolumne River diversions and of the need for increased conservation, is acknowledged. Please refer to **Section 14.2, Master Response Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for information regarding conservation programs and recycling projects being implemented and planned by the SFPUC and its wholesale customers. As shown in Tables 14.2-6, 14.2-7, and 14.2-8, public information programs are being implemented throughout the SFPUC service area.

Liz Brooking, 09/11/07

C_BrookL-01 This comment, which advocates educating the public as to the value of conservation and reductions in water consumption, expresses support for more conservation and recycling to meet water demand, and opposes additional diversions from the Tuolumne River, is acknowledged. The 2030 purchase estimates prepared for the WSIP include 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Draft PEIR, Vol. 1, Chapter 3, pp. 3-16 to 3-22). Please refer to **Section 14.2, Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for information regarding conservation programs and recycling projects being implemented or planned by the SFPUC and its wholesale customers. As shown in Tables 14.2-6, 14.2-7, and 14.2-8 of Section 14.2, public information programs are being implemented throughout the SFPUC service area.

Louis Bryan, 10/01/07

C_Bryan-01 This comment expresses opposition to additional Tuolumne River diversions and requests that additional studies be conducted before the PEIR is finalized. Please see **Response C_Breso-01**.

Keith Buckingham, 09/20/07

C_Bucki-01 This comment states that growth projections seem to be excessive. This comment was submitted by numerous commenters and is responded to in **Section 14.2, Master Response on Demand Projections, Conservation and Recycling** (Vol. 7, Chapter 14, Section 14.2.2).

C_Bucki-02 This comment, advocating more water conservation, is acknowledged. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) regarding conservation programs and recycling projects being implemented or planned in the SFPUC service area. Regarding comparisons to other areas refer to the discussion in Section 14.2.3 under the heading Frequently Submitted Comments Addressing Conservation and Recycling.

June Bug, 09/20/07

[See Public Hearing Transcript, San Francisco City Hall, September 20, 2007, pp. 33-37]

C_Bug-01 This comment opposing additional Tuolumne River diversions is acknowledged.

Juan Byron, 09/19/07

C_Byron-01 This comment in support of tiered water rates as a conservation incentive is acknowledged. Please refer to **Responses SI_PacInst-46** and **SI_PacInst-47** for relevant discussions of conservation pricing. Please refer also to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) regarding conservation programs and recycling projects being implemented or planned by the SFPUC and its wholesale customers.

C_Byron-02 This comment stating that the 82-year hydrologic record, which is used as the baseline for hydrologic modeling in the Draft PEIR, lacks consideration of "earlier historical, geological, and anthropological evidence that pre-modern and modern societies thrived in the [SFPUC] service area for hundreds of years with almost no water storage or distribution" is acknowledged. The water supplies of historical societies in the SFPUC service area are not relevant to the CEQA review process. As this comment does not address the adequacy or accuracy of the Draft PEIR, no additional response is provided.

C_Byron-03 This comment expressing an opinion that the significance determinations "identified for the Tuolumne, Alameda, and Peninsula watersheds are unacceptable because water conservation is more economical for the consumer and the utility" is acknowledged. Refer to **Section 14.2 Master Response on Demand Projections, Conservation and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for information on conservation programs and water recycling projects proposed by SFPUC and its wholesale customers. The commenter also expressed the opinion that "engineering best practices will allow seismic upgrade of the water distribution system without the above impacts because of the vastly redundant nature of the nine major reservoirs and multiple parallel pipelines that characterize this system." This comment does not accurately characterize the regional water system. The Draft PEIR provides a program-level evaluation of the potential environmental impacts of constructing and operating the 22 regional WSIP facility projects (Vol. 2, Chapter 4). The analysis, which is based on preliminary information about the projects and their general site locations, presents a reasonable worst-case scenario regarding the potential environmental impacts that could occur. Project-level CEQA review will be conducted for each facility project, as appropriate, and will confirm the degree of impact.

C_Byron-04 The commenter states that potential impacts to groundwater resources are unacceptable given that voluntary conservation measures would meet realistic water supply objectives for the WSIP. As described in Draft PEIR (Vol. 1, Chapter 3, Section 3.4.1), the SFPUC conducted several planning efforts and studies to address future water supply needs for the SFPUC service area, and these efforts concluded that use of groundwater resources would diversify the regional system's water supply portfolio during both drought and nondrought periods. Under WSIP, the proposed Local and Regional Groundwater Projects (SF-2) would include measures as part of the project or as mitigation of potential impacts to ensure that adverse groundwater effects do not occur.

Potential impacts of the Local and Regional Groundwater projects on groundwater and surface water resources are addressed in Section 5.6 of the Draft PEIR (Vol. 3, Chapter 5, pp. 5.6-1 to 5.6-33). In the North Westside Groundwater Basin, potentially significant impacts related to potential basin overdraft and seawater intrusion would be reduced to less than significant with implementation of Measure 5.6-1 (Vol. 4, Chapter 6, pp. 6-58 and 6-59) requiring determination of the basin's yield on both a regular (average annual) and an intermittent (dry-year or emergency) basis, in accordance with Element 3 of the Groundwater Management Plan, as well as with implementation of groundwater level and quality monitoring in accordance with Element 1 of the Groundwater Management Plan (Draft PEIR, Vol. 3, pp. 5.6-24 and 5.6-25). The monitoring data would be used to inform decisions regarding appropriate pumping patterns to avoid overdraft and the undesirable effects associated with overdraft.

Potentially significant impacts related to effects on water levels in Lake Merced and other surface water features would be reduced to less than significant with implementation of Measure 5.6-1 (Vol. 4, Chapter 6, pp. 6-58 and 6-59), and Measure 5.6-2 (p. 6-59). (See Draft PEIR, Vol. 3, pp. 5.6-27 and 5.6-28 for the impact analysis.) Measure 5.6-1 includes groundwater and surface water monitoring as specified in Elements 1 and 2 of the Groundwater Management Plan to monitor the effects of groundwater pumping on surface water features. The monitoring data would be used to inform decisions regarding the alteration of pumping patterns to avoid undesirable effects on surface water features. Measure 5.6-2 includes development and implementation of a lake level management plan identifying strategies for altering pumping patterns or lake augmentation to maintain Lake Merced water levels within the desired long-term range, should monitoring conducted under Measure 5.6-1 indicate the potential for adverse effects on lake levels due to groundwater pumping. The SFPUC would coordinate the implementation of both measures.

Following CEQA environmental review, implementation of the Regional Groundwater Projects in the South Westside Groundwater Basin would be subject to approval of an operating agreement(s) between the SFPUC and the participating pumpers as described in Section 3.14, Required Actions and Approvals and on pp. 5.6-25 and 5.6-26 of the Draft PEIR. The proposed operating agreement(s) would outline allowable operating parameters for pumping during drought years to avoid adverse long-term conditions. In addition, an operating committee would be formed to develop annual operating maintenance plans as well as an annual operating schedule, and groundwater monitoring and modeling would be conducted to identify the potential for adverse conditions and inform decisions to modify the recharge or pumping strategy in response to changing conditions over time.

Potentially significant effects related to groundwater contamination from pumping would be less than significant with development of a drinking water source assessment in accordance with applicable regulations (Draft PEIR, Vol. 3, p. 5.6-31), and preparation of a drinking water source assessments for each well in accordance with Measure 5.6-5 (Vol. 4, Chapter 6, p. 6-59).

Prudent management of groundwater resources in the North and South Westside Groundwater Basins as described above and in the Draft PEIR (Vol. 3, Sections 5.6 and 5.7.5) would ensure that groundwater resources are not depleted, and that use of the groundwater would be consistent with beneficial uses identified by the RWQCB without leaving the SFPUC exposed to catastrophic risk. Furthermore, there would be a larger quantity of groundwater in the South Westside Groundwater Basin during nondrought years due to the in-lieu recharge resulting from deliveries of SFPUC system water and correspondingly reduced groundwater pumping (Draft PEIR, Vol. 3, p. 5.6-25). Subsequent to the PEIR, project-level environmental review will be conducted on the local and regional groundwater projects.

The opinion of the commenter regarding the Wetlands Water District is noted.

C_Byron-05 This comment expressing an opinion that an alternative similar to the Modified WSIP combined with the “no purchase request increase” alternative should be implemented is acknowledged. Please refer to Sections 9.3 (Vol. 4, Chapter 9, pp. 9-84 through 9-96) and Table 9-7 (Vol. 4, Chapter 9, pp. 9-17 through 9-21) for a comparison of impacts among the evaluated alternatives. The PEIR provides the environmental analysis of the proposed program as well as detailed analysis of a wide range of alternatives. Thus, consistent with CEQA, the PEIR, if certified, will enable the SFPUC to make an informed decision regarding program approval on a wide range of alternatives that may include a combination of the alternatives analyzed in the PEIR.

C_Byron-06 This comment states that the use of groundwater to augment supplies would exacerbate groundwater overdraft problems. See **Response C_Byron-04**.

C_Byron-07 This comment opposing the Year-round Desalination at Oceanside Alternative is acknowledged.

C_Byron-08 This comment expressing support for further evaluation of the Regional Desalination for Drought Alternative – Variant 2 acknowledged.

C_Byron-09 This comment essentially restates Comment C_Byron-01; please refer to **Response C_Byron-01**.

C_Byron-10 This comment expressing support for restoration of Hetch Hetchy Valley is acknowledged. This concept was considered during the preliminary screening phase but because it did not meet any of the basic program goals or objectives, the concept was eliminated from further consideration. Please refer to the O'Shaughnessy Dam removal alternative concept in Section 9.5 (Vol. 4, Chapter 9, pp. 9-127 to 9-128) for further discussion.

C_Byron-11 This comment is a closing statement expressing opinions regarding the history of water development in the Bay Area and water resource management in general. As the comment contains no specific comment on the adequacy or accuracy of the PEIR, no response is provided.

John Cant, 09/18/07

[See Public Hearing Transcript, Fremont, pp. 8-10]

C_Cant-01 This comment addressing levels of conservation and recycling in the SFPUC service area was submitted by numerous commenters and is responded to in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3); regarding comparisons to other areas, refer to the discussion under the heading Frequently Submitted Comments Addressing Conservation and Recycling. As noted in the Draft PEIR (Vol. 4, Chapter 7, p. 7-35), the Alameda County Water District (ACWD) (which provides water to Fremont) currently purchases about

25 percent of its supply, and in 2030 would purchase approximately 23 percent of its supply, from the SFPUC after conservation has been implemented.

C_Cant-02 The commenter states concerns that the acreage of mitigation proposed by the Habitat Reserve Program (HRP) is insufficient to compensate for impacts from the WSIP. The HRP is intended to provide a "reserve" of mitigation values that can be applied to mitigation needs for each WSIP project as needed. Since mitigation requirements for each WSIP project will be determined as part of the project-level studies, all mitigation values developed under the HRP may or may not be sufficient to compensate for each project. If the HRP mitigation values are not sufficient or are not of the kind required for in-kind mitigation, additional mitigation will be developed as needed as part of project-level studies. All mitigation values developed by the HRP, the impacts of which would be analyzed in a project-level EIR, would be available for WSIP projects and would not be applied to other SFPUC mitigation needs unless they were deemed excess.

C_Cant-03 This comment restates issues raised in Comments C_Cant-01 and C_Cant-02 and advocates the SFPUC "pushing "our more recalcitrant neighbors" into doing more conservation. Refer to **Responses C_Cant-01** and **C_Cant-02**, and to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3).

Robert Caughlan, 09/24/07

C_Caugh-01 This comment regarding population and family planning is acknowledged. As this comment does not address the adequacy or accuracy of the Draft PEIR, no response is provided.

Birgit Chase, 09/20/07

C_Chase-01 This comment opposing additional diversions from the Tuolumne River and supporting additional conservation is acknowledged. Refer to the discussion in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) regarding water conservation and recycling projects proposed by SFPUC in San Francisco and its wholesale customers in their respective service areas.

Lynn Chiapella, 09/30/07

C_Chiap-01 The percentage of diversions from the Tuolumne River attributed to the SFPUC presented in this comment is inaccurate. Please refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.5) and to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7. Chapter 14, Section 14.7.6), for clarification regarding current and estimated future municipal and agricultural diversions from the Tuolumne River. The Draft PEIR (Vol. 1, Chapter 2, pp. 2-35 to 2-37) provides a summary description of the CCSF's water rights. Please refer to **Response L_TUD1-05** for additional discussion of CCSF's water rights and the Raker Act.

This comment also incorrectly implies that a profit motive is driving the WSIP. The WSIP would improve the reliability of the existing regional water system that provides water to people in San Francisco, San Mateo, Santa Clara, Alameda, and Tuolumne Counties. The program is not driven by profit but is needed due to public health and safety and water reliability reasons. Refer also to **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Section 14.1.2) for information regarding the purpose of the program. For additional information related to future conservation measures being implemented or planned by the SFPUC and its wholesale customers refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3).

C_Chiap-02 This comment in support of tiered water rates as a conservation incentive is acknowledged. Please refer to **Responses SI_PacInst-46** and **SI_PacInst-47** for further discussion of conservation pricing. Please also refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for information regarding conservation programs being implemented or planned by the SFPUC and its wholesale customers.

C_Chiap-03 This comment criticizes excessive outdoor water use and supports additional conservation and recycling. Please refer **Section 14.2, Master Response on Demand Projections, Conservation and Recycling** (Vol. 7, Chapter 14) for information on outdoor water use within the SFPUC service area, existing and proposed recycled water programs, and alternatives involving higher levels of conservation and recycling than the preferred WSIP. Please refer also to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.9) for an explanation of the relationship between the average annual increase in purchase requests and the average annual increase in Tuolumne River diversions.

Bernie Chodeu, 09/20/07

[See Public Hearing Transcript, San Francisco City Hall, September 20, 2007, pp. 29-30]

C_Chode-01 For a discussion of the effects of climate change on the SFPUC regional water system and related SFPUC actions, please refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14, Sections 14.11.4 and 14.11.5). Also see the discussion presented in Section 5.7.6 of the Draft PEIR (Vol. 3, Chapter 5, pp. 5.7-92 to 5.7-96). Section 14.11 of this document provides more detailed and up-to-date information on climate change as it relates to the SFPUC regional water supply and the proposed WSIP.

Ann Clark, Katherine Howard, 09/20/07

C_Clark1-01 This comment summarizes the more detailed comments presented in Comments C_Clark1-02 through C_Clark1-16; refer to **Responses C_Clark1-02** through **C_Clark1-16** for the specific responses.

C_Clark1-02 The PEIR describes general funding of the WSIP for informational purposes (Vol. 1, Chapter 3, p. 3-10), and as provided under CEQA, the PEIR addresses the environmental consequences, not the specific funding and financing, of the proposed program. However, it should be noted that following certification of the PEIR, if the SFPUC adopts the WSIP (or an alternative to it that is covered in the PEIR), the SFPUC would also be required to adopt a Mitigation Monitoring and Reporting Program that will commit the SFPUC to implement mitigation measures identified in the PEIR as appropriate to the program adopted. The commenters concerns regarding cost and funding of the WSIP and associated mitigation measures are acknowledged.

C_Clark1-03 This comment requests that both a detailed cost analysis and the specific contract conditions for wholesale customers be included with the final PEIR. CEQA does not require inclusion of detailed costs and funding as part of the environmental document, and therefore this information is not provided in the PEIR.

The comment also states that the 2009 contract between the SFPUC and its wholesale customers will have an environmental impact on the WSIP and that environmental analysis of the 2009 contract needs to be included in the final PEIR. As described in the Draft PEIR (Vol. 1, Chapter 2, pp. 2-43 and 2-44), the SFPUC and each of its wholesale customers currently have agreements specifying the terms and conditions for purchasing water from the regional system. The individual agreements include terms set forth in the 1984 Master

Water Sales Agreement, which includes a supply assurance. Even though the current master contract expires in June 2009, the contract specifies that the supply assurance remains effective following termination of the Master Water Sales Agreement. The WSIP was developed to address anticipated customer demand on the regional system through 2030. To the extent that the individual agreements and/or the Master Water Sales Agreement may affect water supply (through 2030) and related environmental resources, the PEIR addresses those environmental issues (see Vol. 3, Chapter 5). Prior to approving a water sales agreement, the SFPUC will adopt CEQA findings documenting that the contract is consistent with the scope of the analysis contained in the PEIR.

The commenter also states that the PEIR need to include specific 2009 contract conditions for rates and charges for water use, including wholesale and retail incentives for water conservation requirements. As discussed above, CEQA does not require inclusion of detailed costs and funding as part of the environmental document, and therefore this information is not provided in the PEIR. For information regarding wholesale and retail conservation efforts and requirements, please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14).

C_Clark1-04 This comment requests additional analysis of impacts to the Tuolumne River brought about by the cumulative effects of drought cycles, climate change, and global warming. Please refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14, Sections 14.11.4 and 14.11.5) for a discussion of the effects of climate change on the SFPUC regional water system and related SFPUC actions.

C_Clark1-05 This comment questions the feasibility of the dry-year transfers from the Modesto Irrigation District (MID) and Turlock Irrigation District (TID). The analysis of the proposed program in the Draft PEIR incorporates the dry-year transfer as one component of the program and assumes a worst-case scenario that water would be from water stored in Don Pedro Reservoir. See **Section 14.3, Master Response on Proposed Dry-Year Water Transfer** (Vol. 7, Chapter 14) for a description of the assumptions used in the Draft PEIR to evaluate the dry-year water transfer and a discussion of the feasibility of the proposed transfer.

C_Clark1-06 Please refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14, Section 14.11.5) for response.

C_Clark1-07 Regarding the effects of climate change on the SFPUC regional water system and related SFPUC actions, refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14, Sections 14.11.4 and 14.11.5). The description of actions taken by the East Bay Municipal Utility District is noted. Regarding demand management strategies being implemented or proposed for implementation by SFPUC retail and wholesale customers (e.g., existing and proposed levels of conservation, conservation best management practices adopted by the SFPUC and wholesale customers), refer to **Section 14.2, Master Response on Demand Management, Conservation and Recycling** (Vol. 7, Chapter 14, Section 14.2.3).

C_Clark1-08 This comment requests additional research and analysis to address the effects of climate change, global warming, and drought cycles and to protect the Tuolumne River from significant environmental impacts. Please see **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14, Section 14.11.5) for information regarding SFPUC's current efforts to evaluate their water supply planning with respect to climate change. This comment also requests that the PEIR focus on conservation, recycling, and re-use alternatives. Refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for information on the conservation programs and recycling projects being implemented or proposed by SFPUC and its wholesale customers.

C_Clark1-09 This comment, which states that there are "major discrepancies in the assumptions, research models, and recommendations" applied to the wholesale customers and the retail customers that result in "diametrically opposed policies for water use and active conservation," reflects some basic misconceptions about the methodology used by the SFPUC in consultation with its wholesale customers to evaluate 2030 water demand and conservation potential.

The Draft PEIR (Vol. 1, Chapter 3, p. 3-16 to 3-17 and Vol. 5. Appendix E.2) describes the methodology used to forecast demand and evaluate conservation and recycled water potential. As described therein, similar, although not identical, approaches were taken to model demand in the retail customer and wholesale customer service areas. To evaluate demand in each wholesale customer service area, the SFPUC employed an end-use model (the Decision Support System, or DSS, model) that breaks down existing water use by customer type into detailed water end uses, and then uses population and employment projections to develop residential and nonresidential account growth rates, to project future water demand by end use. Demand projections for the SFPUC retail customer service area were developed using a similar end-use model, although nonresidential demand was evaluated using composite employee water use rates with Association of Bay Area Governments (ABAG) industry-specific employment projections (rather than using employment forecasts to develop nonresidential account growth rates). Regarding the reasons this approach was not taken in the wholesale customer service area, refer to the discussion in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2), under the heading Use of Total Jobs Projections for the Wholesale Customer Service Area.

As part of the modeling effort the SFPUC also used the end-use models to evaluate conservation potential in the wholesale and retail service areas. As with the demand modeling, wholesale customer conservation potential modeling was conducted in close consultation with the wholesale customers. Three suites of theoretically feasible and cost-effective conservation programs (Programs A, B, and C) were identified for each wholesale customer and for the retail customer service area. The SFPUC also conducted studies to evaluate the potential for recycled water projects to offset demand for potable water in the retail and wholesale service areas. Based on the information generated by these studies and modeling efforts, the wholesale customers and the SFPUC (for the retail service area) submitted their best estimates of 2030 water purchases from the SFPUC. Each customer's estimates of conservation savings and the use of recycled water, groundwater, and other supply sources as well as its 2030 purchase estimate is shown in Draft PEIR Table 3.3 (Vol. 1, Chapter 3, p. 3-18).

As part of the WSIP planning process, the SFPUC in cooperation with its wholesale customers and BAWSCA also undertook a study to assess the potential for additional conservation and recycled water projects, including potential regional projects that were not identified in the previous studies or already considered to be implemented locally by 2030. This study, *Investigation of Regional Water Supply Option No. 4 Technical Memorandum* (SFPUC, 2007, Appendix D), provided the basis for the Aggressive Conservation/Water Recycling and Local Groundwater Alternative analyzed in the Draft PEIR (Vol. 4, Chapter 9, pp. 9-47 to 9-59). The SFPUC subsequently incorporated into the WSIP the San Francisco local projects categorized in the Regional Water Supply Option No, 4 study as likely to be implemented.

Draft PEIR Table 3.3 (Vol. 1, Chapter 3, p. 3-18) summarizes the water supply assumptions used in developing the 2030 demand projections. The table indicates that in the retail service area projected conservation savings range from 0 to 4 mgd, projected use of groundwater ranges from 3 to 5 mgd, and projected use of recycled water ranges from 0 to 4 mgd, for a total of 3 to 13 mgd that could offset demand. In the wholesale service area, the table indicates projected conservation savings range from 13 to 15 mgd, projected use of groundwater ranges from 39 to 42 mgd, and projected use of recycled water ranges from 9 to 10 mgd, for a total of an estimated 61 to 67 mgd of groundwater, recycled water, and conservation savings that would offset wholesale customer demand for water from the SFPUC regional system. An additional 53 mgd would be provided by other surface water sources in the wholesale service area.

Tables 14.2-6, 14.2-7, and 14.2-8, in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) describe existing and planned conservation measures, including measures incorporating incentives and disincentives for water uses for wholesale and retail customers. As shown in these tables, many of the conservation measures that the SFPUC plans to implement in the retail service area also are planned for the wholesale customer service areas.

Policies related to conservation inevitably will change over time; for example, programs that may not have been considered feasible for an individual wholesale customer to implement may prove more economical and feasible – and therefore will be pursued – on a regional basis. Also, technological developments likely will create new demand management strategies over the project performance period (to year 2030). Nothing in the WSIP precludes that process from occurring.

The statement in the comment that wholesale conservation goals are left to suggested methods and parameters in respective urban water management plans apparently refers to text in the Draft PEIR evaluation of WSIP alternatives (Vol. 4, Chapter 9, pp. 9-23 to 9-96). As described therein, the evaluation of alternatives includes a discussion of the actions by the SFPUC as well as possible wholesale customer actions that each alternative would entail. The alternatives analysis reasonably points out differences in supply assumptions and wholesale customer actions that the alternatives would entail and the sources of supply, conservation, and related wholesale customer activities that are reflected in current urban water management plans. As discussed above, extensive background studies in the wholesale and retail service areas – not urban water management plans – provided the basis for the estimates of conservation and use of recycled water assumed for the WSIP proposed by the SFPUC. However, it is assumed that the WSIP planning studies informed the urban water management plans, which for most customers were finalized in 2005, after the 2004 WSIP planning studies.

The statement in the comment that the wholesale model “does not penalize additional water usage” requires clarification. The model does not make policy. As described above, conservation potential was evaluated in the modeling undertaken as part of WSIP planning. However, it was up to each wholesale customer to determine which measures were feasible and cost effective to implement in its service area. Some wholesale customers have adopted water pricing strategies, during normal years and/or during dry years, that penalize individual customer accounts for higher rates of consumption. Refer to **Responses SI_PacInst-46** and **SI_PacInst-47** (Vol. 7, Chapter 15, Section 15.4) for more information on tiered pricing.

The statement in the comment that "additional mandatory conservation will not be required for wholesalers" requires clarification. The wholesale customers have committed to implementing conservation and recycling at levels shown in Table 3.3 (Draft PEIR Vol. 1, Chapter 3, p.3-18). The Draft PEIR evaluates two alternatives that would involve higher levels of conservation and recycling by wholesale customers: the Aggressive Conservation/Water Recycling and Local Groundwater Alternative, and the Modified WSIP Alternative. Approval of either alternative would require higher levels of conservation and/or recycling by the wholesale customers; BAWSCA (which represents the wholesale customers) has expressed opposition to the Aggressive Conservation/Water Recycling and Local Groundwater Alternative and support for the Modified WSIP Alternative (refer to various comments in the submittal L_BAWSCA1). Regarding the authority of the SFPUC to condition future water purchase agreements on demand management measures, refer to the discussion in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3), under the heading Frequently Submitted Comments Addressing Conservation and Recycling.

. The statements in the comment that the Draft PEIR recommends that additional water be diverted from the Tuolumne River also require clarification. The WSIP PEIR (Draft PEIR Chapter 3) characterizes the WSIP as proposed by SFPUC and analyses the environmental impacts of the proposed program (Vol. 2, Chapter 4, Vol. 3, Chapter 5, and Vol. 4, Chapters 6 and 7); in the alternatives analysis (Vol. 4, Chapter 9, p. 9-96), the Draft PEIR identifies as the environmentally superior alternative the Modified WSIP Alternative. The California Environmental Quality Act (CEQA) requires that agencies consider the environmental consequences of projects as part of their decision-making process; the WSIP PEIR provides that information for the WSIP and alternatives to the WSIP. Individuals with approval authority[1] over the WSIP and the PEIR will consider information in the PEIR, including input received during the public review process, in deciding whether to approve the preferred WSIP or an alternative to it.

C_Clark1-10 Regarding comparisons with water use patterns in other jurisdictions and existing and planned conservation, refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) under the heading Frequently Submitted Comments Addressing Conservation and Recycling.

[1] The San Francisco Planning Commission, SFPUC, and San Francisco Board of Supervisors; see Draft PEIR pp. 3-86 and 3-87 (Vol. 1, Chapter 3) for a complete list.

C_Clark1-11 Regarding comparisons with water use patterns in other jurisdictions and existing and planned conservation, refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) under the heading Frequently Submitted Comments Addressing Conservation and Recycling. Regarding the commenter's request for a regional analysis of specific projects in the wholesale customer service areas that affect water use, Chapter 7 of the PEIR contains an extensive analysis of growth associated with implementation of the WSIP, and the environmental impacts associated with that growth. See Tables 14.2-6, 14.2-7, and 14.2-8 regarding conservation programs proposed as part of the WSIP or otherwise planned by wholesale customers

C_Clark1-12 This comment states that additional research be conducted to evaluate the combined long-term effects of additional diversions from the Tuolumne River and climate change on the health and welfare of the river, endangered species and habitats, and Delta ecosystems. Please refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14, Section 14.11.4) for response.

C_Clark1-13 This comment requests that mitigation measures in the Draft PEIR be revised when the additional research and analysis requested by the commenter in Comments C_Clark1-08, -11, and -12 is completed. The Final PEIR includes staff-initiated text revisions to the Draft PEIR, including modifications and refinement of some of the mitigation measures in the Draft PEIR. These revisions are explained and documented in Chapter 16 of this Comment and Responses document, including any appropriate revisions to mitigation measures.

The Draft PEIR provides a program-level evaluation of the potential environmental impacts of constructing and operating the 22 regional WSIP facility projects (Vol. 2, Chapter 4). The analysis, which is based on preliminary information about the projects and their general site locations, presents a reasonable worst-case scenario regarding the potential environmental impacts that could occur and provides programmatic mitigation measures for all potentially significant impacts. Project-level CEQA review will be conducted for each facility project, as appropriate, and will confirm the degree of impact and the applicability of the mitigation measures presented in the WSIP PEIR. As necessary, these mitigation measures will be re-evaluated to be confirmed, refined or replaced with an equivalent measure to better address the project-specific impacts.

The Draft PEIR provides a project-level evaluation of the potential environmental impacts of the proposed changes in water supply sources and regional water system operations organized by watershed in the Draft PEIR

(Vol. 3, Chapter 5) and identifies mitigations for significant and potentially significant impacts. As discussed in **Response C_Breso-01**, above, the San Francisco Planning Department believes the data used to analyze project-level impacts on water and related resources are sufficient to reasonably assess the general magnitude, frequency, and extent of the WSIP's environmental consequences, and to identify appropriate mitigation measures to offset potentially significant impacts on the Tuolumne River, Alameda Creek, and Peninsula watersheds and related resources. The mitigation measures were developed to include performance standards based on ecological principles, with the understanding that data from ongoing and future studies could be useful in augmenting the baseline data and in refining the implementation of each measure.

C_Clark1-14 This comment opposing Tuolumne River diversions and in support of "equitable conservation requirements" is acknowledged. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for discussion on conservation program and recycling projects proposed by SFPUC and its wholesale customers.

C_Clark1-15 This comment supporting the Aggressive Conservation/Water Recycling and Local Groundwater Alternative (No Supplemental Tuolumne River Supply) is acknowledged.

C_Clark1-16 This comment expresses an opinion regarding the responsibility of San Francisco in environmental leadership. The WSIP includes a program goal to enhance sustainability in all system activities (see Vol. 1, Chapter 3, Table 3.2, p. 3-9). The system performance objectives include: manage natural resources and physical systems to protect watershed ecosystems; meet, at a minimum, all current and anticipated legal requirements for protection of fish and other wildlife habitat; and manage natural resources and physical systems to protect public health and safety. Furthermore, as described on p. 3-82, the SFPUC has committed to specific greenhouse gas reduction actions as part of the WSIP. As described in the Draft PEIR (Vol. 1, Chapter 3, Section 3.6.1), the proposed program also includes implementation of local groundwater projects in the North Westside Groundwater Basin, recycled water projects on the west side of San Francisco, and additional conservation programs within the San Francisco retail service area. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information regarding conservation programs and recycling projects proposed by the SFPUC and its wholesale customers.

Ann Clark, 09/20/07

[See Public Hearing Transcript, San Francisco City Hall, September 20, 2007, pp. 31-33]

C_Clark2-01 See **Response C_Clark1-02**.

C_Clark2-02 This comment states that the 2009 water contracts with the wholesale agencies are directly connected to the WSIP and that environmental review of the contract is needed. Please refer to **Response C_Clark1-03**, above.

The commenter further states that any promises to do more conservation with agricultural users should be expressly stated in the contractual terms. Conservation by agricultural users is not included in the proposed program, although it was identified as a mitigation measure for the potential impacts on the lower Tuolumne River and also as a component of the Modified WSIP Alternative. Please refer to **Sections 14.7 and 14.10, Master Responses on Lower Tuolumne River Issues and Modified WSIP Alternative**, respectively, for further discussion.

C_Clark2-03 This comment states that the Draft PEIR does not adequately address the combined effects of climate change, global warming, and drought. Please refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14, Sections 14.11.4 and 14.11.5) for a discussion of the effects of climate change on the SFPUC's system operations and water yield, and related SFPUC actions.

Gary Clossman, 09/18/07

C_Closs-01 This comment expressing support for more conservation and recycling to meet water demand and opposing additional diversions from the Tuolumne River is acknowledged. The 2030 purchase estimates prepared for the WSIP include 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). For additional information, please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3).

Caroline Coleman, no date

C_Colem1-01 This comment opposing additional Tuolumne River diversions, expressing concern regarding the reliability of Tuolumne River water supplies, and in support of conservation and recycling to serve future water demand, is acknowledged. However, this comment does not address the content or adequacy of the Draft PEIR; therefore, no response is needed.

Caroline Coleman, 09/21/07

C_Colem2-01 This comment opposes additional Tuolumne River diversions and requests that additional studies be conducted to evaluate the WSIP-related effects on fish and wildlife in the Tuolumne River watershed. Please refer to **Response C_Breso-01**.

With respect to conservation and recycling efforts, the 2030 purchase estimates prepared for the WSIP include 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). For additional information, refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3).

Robert Collin, 09/27/07

C_Colli-01 This comment opposing additional Tuolumne River diversions is acknowledged.

C_Colli-02 Please see **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14, Section 14.11.4) for additional discussion of climate change to augment the discussion presented in Section 5.7.6 of the Draft PEIR (Vol. 3, Chapter 5, pp. 5.7-92 to 5.7-96). Section 14.11 of this document provides more detailed and up-to-date information on climate change as it relates to the SFPUC regional water supply and the proposed WSIP.

C_Colli-03 Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.9) for an explanation of the relationship between the average annual increase in purchase requests and the average annual increase in Tuolumne River diversions. Regarding potential impacts on downstream waterbodies from increased diversions from the Tuolumne River, refer to **Section 14.8, Master Response on Delta and San Joaquin Issues** (Vol. 7, Chapter 14, Section 14.8.2). As stated in that section, impacts on the Delta attributable to the WSIP were determined to be less than significant; therefore, any impacts on resources downstream of the Delta, such as those associated with San Francisco Bay, would be less than significant. This comment expressing support of more conservation and recycling to meet water demand and against additional diversions from the Tuolumne River is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, Section 3.4.4, pp. 3-16 to 3-22). For descriptions of alternatives that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). For additional information, please refer to the discussion in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3).

Leland & Shirley Dahlin, 09/08/07

C_Dahli-01 This comment, which expresses support for more conservation and recycling to meet water demand and opposition to additional diversions from the Tuolumne River, is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). For additional information, please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3).

Mary Davey, 09/09/07

C_Davey-01 This comment, which expresses support for more conservation and recycling to meet water demand and opposition to additional diversions from the Tuolumne River, is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Draft PEIR, Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections of the Draft PEIR (Sections 9.2.2 through 9.2.4 and Sections 9.2.6 and 9.2.7). For additional information, refer to **Section 14.2, Master Response on Demand Projections, Conservation and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for discussion of conservation programs and recycling projects proposed by the SFPUC and its wholesale customers. Please also refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.9) for an explanation of the relationship between the average annual increase in purchase requests and the average annual increase in Tuolumne River diversions.

Joel Davidson, 10/01/07

C_David-01 This comment, which expresses support for more conservation and recycling to meet water demand and opposition to additional diversions from the Tuolumne River, is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). For additional information, please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3).

Joseph Day, 09/05/07

[See Public Hearing Transcript, Sonora, pp. 44-45]

C_DayJ-01 This comment, opposing additional Tuolumne River diversions and water transfers from TID/MID as supplemental dry-year supplies, is acknowledged. For pertinent response regarding the proposed dry-year water transfers, refer to **Section 14.3, Master Response on Dry Year Water Transfer** (Vol. 7, Chapter 14).

C_DayJ-02 This comment expresses support for the use of desalination technologies for supplemental water supplies. Please refer to **Response C_BramlD1-02**.

Lisa Day, 09/20/07

C_DayL-01 This comment, which expresses support for more conservation and recycling to meet water demand and opposition to additional diversions from the Tuolumne River, is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). For additional information, please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3). Regarding the Draft PEIR's consideration of the Tuolumne River's status as a federally designated Wild and Scenic River and potential impacts relevant to that designation, please refer to **Response L_Tuol1-09**.

Dan Dippery, 09/19/07

[See Public Hearing Transcript, Palo Alto, pp. 17-18]

C_Dippe-01 This comment, which refers to the report *Investigation of Regional Water Supply Option No. 4 Technical Memorandum*, was submitted by numerous commenters and is responded to in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3); refer to the discussion under the heading Frequently Submitted Comments Addressing Conservation and Recycling.

C_Dippe-02 This comment requesting a study on the maximum technical potential for conservation and efficiency savings has also been submitted by numerous commenters and is also responded to in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3); refer to the discussion under the heading Frequently Submitted Comments Addressing Conservation and Recycling.

Denise Dougherty, 09/20/07

[See Public Hearing Transcript, San Francisco City Hall, September 20, 2007, p. 38]

C_Dough-01 This comment, which expresses support for more conservation and recycling to meet water demand and opposition to additional diversions from the Tuolumne

River, is acknowledged. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3).

Diane Dulmage, 09/18/07

C_Dulma-01 The Draft PEIR (Vol. 3, Chapter 5, Sections 5.3.6 and 5.3.7) included a project-level analysis of impacts on fisheries and terrestrial biological resources that would result from the proposed water supply option and changes in system operations. As described, implementation of the WSIP would result in several potentially significant adverse impacts on the Tuolumne River and its resources; the Draft PEIR identified mitigation measures to reduce these impacts to less-than-significant levels. Refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14) and **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14) for additional information related to the impact analysis for the Tuolumne River. A discussion on the occurrence of Chinook salmon in the Tuolumne River watershed is presented in Section 14.7.2.

C_Dulma-02 This comment expresses concern regarding the effects of additional Tuolumne River diversions on the salinity of the San Francisco Bay-Delta Estuary. Please see Draft PEIR, Section 5.3.3 (Vol. 3, Chapter 5, pp. 5.3.3-19 and 5.3.3-20), which explains why the effect of the WSIP would be too small to substantially affect salinity in the Delta, and refer to **Section 14.8, Master Response on Delta and San Joaquin River Issues** (Vol. 7, Chapter 14, Section 14.8.2) for additional discussion.

C_Dulma-03 This comment expressing support for more conservation and recycling is acknowledged. For a discussion of the alternatives evaluated in the Draft PEIR that do not include additional diversions from the Tuolumne River, refer to the descriptions of the Year-round Desalination at Oceanside Alternative (see Draft PEIR Vol. 4, Chapter 9, Section 9.2.6, p. 9-66) and Aggressive Conservation/ Water Recycling and Local Groundwater Alternative (Without Tuolumne River Supplement) (see Section 9.2.4, p. 9-47). Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for discussion of conservation programs and recycling projects being implemented or proposed by SFPUC and its wholesale customers. The statement regarding the findings of a Pacific Institute study is acknowledged. For specific responses to the Pacific Institute submittal on the Draft PEIR refer to **Responses SI_PacInst-01** through **SI_PacInst-97** (Vol. 7, Chapter 15, Section 15.4).

C_Dulma-04 This comment supports desalination of brackish water as an alternative source of water supply. Please refer to **Response C_BramlD1-02**.

C_Dulma-05 This comment is a closing statement that summarizes Comments C_Dulma-01 through C_Dulma-04; refer to **Responses C_Dulma-01** through **C_Dulma-04**, above.

Fred Duperrault, 09/25/07

C_Duper-01 This comment expressing support for more conservation and recycling to meet water demand and opposition to additional diversions from the Tuolumne River is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, Section 3.4.4, pp. 3-16 to 3-22). For descriptions of alternatives that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). For additional information, please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3). Please also refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.9) for an explanation of the relationship between the average annual increase in purchase requests and the average annual increase in Tuolumne River diversions.

Jeb Eddy, 09/30/07

C_Eddy1-01 The Draft PEIR (Vol. 1, Chapter 3, pp. 3-17 to 3-21 and Vol. 5, Appendix E.2) summarizes the steps involved in establishing base year water usage and projecting future demands. Projections were not based solely on population growth, as the comment suggests, but also considered future employment, customer-specific information on usage; levels of conservation, recycling and use other water sources that would offset demand for water from the SFPUC regional system, and other factors. As described in Draft PEIR Appendix E.2 (p. E.2-6) the selected sources used for population and employment provided forecasts in five- or ten-year increments (as opposed to a linear projection to the horizon year as suggested by this comment). ABAG, for example, provides projections in five-year increments. To develop yearly projections to 2030 for each source, the population and employment increase for each five- or ten-year increment was divided evenly and applied yearly throughout the five- or ten-year period (depending on the increment used in the particular projection) to form a linear yearly projection *between increments.* For additional discussion of the methodology used by SFPUC in collaboration with its wholesale customers and BAWSCA to project future demand, refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2).

C_Eddy1-02 This comment supporting seismic improvements to the regional water system is acknowledged.

C_Eddy1-03 Refer to **Response C_Eddy1-01**. This comment expressing support of more conservation and recycling to meet water demand and against additional diversions from the Tuolumne River is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, Section 3.4.4, pp. 3-16 to 3-22). For descriptions of alternatives that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Note also that the water demand models used in the wholesale and retail service areas are not based on per-capita consumption, as this comment suggests, but rather are end-use models. Refer to Draft PEIR Appendix E.2 (Vol. 5) for a detailed description of demand methodology. Refer also to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3).

Jeb Eddy, 09/19/07

[See Public Hearing Transcript, Palo Alto, pp. 40-43]

C_Eddy2-01 This comment advocating the use of markets/pricing to decrease demand is acknowledged. Please refer to **Response SI_PacInst-62** and also to **Section 14.2, Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2) for information pertinent to this comment.

C_Eddy2-02 This comment questions the demand forecasting and suggests that market influences could create different kinds of water supply for different kinds of users and needs, thus changing market structures (and, therefore, demand). The comment appears to suggest that separate markets for recycled water or conserved water may decrease future demand for Tuolumne River water. While market structures may change in the future, as new technologies become available, it would be speculative for the PEIR to evaluate water demand based upon markets that have not been established. The implication in this comment that the demand projections are based on per-capita estimates is incorrect. Demand projection methodology is described in Draft PEIR Chapter 3 (Vol. 1, pp. 3-16 to 3-22) and in more detail in AppendixE.2 (Vol. 5). As the Draft PEIR discussion indicates, the models used to develop water demand are end-use models and not based on per-capita consumption. The demand projections include savings from “passive conservation” resulting from plumbing codes, and the 2030 purchase estimates reflect savings from active conservation programs and recycling projects, as well as the use of other water sources. Please also refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2) for additional information pertinent to this comment.

Elanie Elbizri, 09/24/07

C_Elbiz-01 The Draft PEIR (Vol. 3, Chapter 5, Sections 5.3.1 through 5.3.8) analyzed the effects of the WSIP on the hydrology, geomorphology, water quality, groundwater, terrestrial biology, fisheries, recreation, and visual quality of the Tuolumne River corridor. As described, implementation of the WSIP would result in several potentially significant adverse impacts on the Tuolumne River and its resources; the Draft PEIR identified mitigation measures to reduce these impacts to less-than-significant levels. Refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14), and **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14), for additional information related to the impact analysis for the Tuolumne River. As this comment does not specify the particular issue(s) in which the commenter believes the analysis presented in the Draft PEIR is inadequate, no specific response is provided.

C_Elbiz-02 This comment, which cites reductions in demand growth achieved in other areas, was submitted by numerous commenters and is responded to in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7. Chapter 14, Section 14.2.3) under the heading Frequently Submitted Comments Addressing Conservation and Recycling.

C_Elbiz-03 This comment supporting the Aggressive Conservation/Water Recycling and Local Groundwater Alternative (No Supplemental Tuolumne River Water) and the Year-round Desalination at Oceanside Alternative is acknowledged.

C_Elbiz-04 This comment, requesting additional studies on the Tuolumne River, was submitted by numerous commenters; see **Response C_Breso-01** for response.

Claire Elliott, 09/19/07

[See Public Hearing Transcript, Palo Alto, pp. 27-29]

C_EllioC-01 This comment expresses the opinion that the SFPUC should pursue a two-tiered approach that separates the seismic improvements from the proposed water supply option. Please refer to **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Section 14.1.5) regarding the integration of the seismic improvements and water supply options to meet program objectives, and for a discussion of the advantages of using a program EIR to evaluate the proposed program as a whole.

C_EllioC-02 The commenter's opinion on the diversion from the Tuolumne River is acknowledged. The commenter also asserts that the PEIR does not adequately evaluate the impacts on salt marshes of increased wastewater discharges into the San Francisco Bay receiving waters throughout the Bay Area. Changes in wastewater discharges into receiving waters in the SFPUC service area would be an indirect effect associated with implementation of the WSIP. Insofar as the WSIP would result in changes in municipal and domestic water use patterns, there would also be associated changes in wastewater discharge patterns for municipal and industrial uses, with much of the changes attributed to population growth. The Draft PEIR addresses the indirect effects of growth in Chapter 7 (Vol. 4, pp. 7-60 to 7-78); as this chapter indicates, these indirect effects, including impacts on wastewater treatment facilities and wastewater treatment capacities, were identified as significant but mitigable in the environmental impact reports for the general and specific plans in the service area. In the cases where the WSIP would result in increased use of recycled water, the associated effects on wastewater discharges would be or have been addressed in the project-level environmental documents for the recycled water projects.

C_EllioC-03 This comment encouraging additional water recycling is acknowledged. Refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for information on current and planned recycling projects in the SFPUC retail and wholesale customer service areas.

Patricia Elliott, 09/05/07

[See Public Hearing Transcript, Sonora, pp. 31-33]

C_EllioP-01 This comment expresses concern regarding the effects of additional Tuolumne River diversions on the towns of Groveland and Big Oak Flat. Please refer to

Section 14.1, Master Response on WSIP Purpose and Need (Vol. 7, Chapter 14, Section 14.1.6) regarding the scope of the PEIR with respect to economic evaluations.

Dave Ellison, 09/18/07

[See Public Hearing Transcript, Fremont, pp. 11-12]

C_Ellis-01 This comment advocating more conservation and public education regarding water efficiency is acknowledged. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for discussion of conservation measures being implemented and planned by the SFPUC and SFPUC wholesale customers. As shown in Tables 14.2-6, 14.2-7, and 14.2-8 of Section 14.2, public information programs are being implemented throughout the SFPUC service area.

Benjamin L. Farnum, 10/01/07

C_Farnu-01 This comment, which expresses support for more conservation and recycling to meet water demand and opposition to additional diversions from the Tuolumne River, is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). For additional information on conservation programs and recycling projects being implemented or planned by the SFPUC and its wholesale customers, please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3).

Jan Fenwick, 09/30/07

C_Fenwi-01 This comment refutes statements made by the Tuolumne River Trust and does not address the content or adequacy of the Draft PEIR; no response is needed.

David Fielding, 10/01/07

C_Field-01 This comment, which expresses support for more conservation to meet water demand and opposition to additional diversions from the Tuolumne River, is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). For additional information on conservation programs and recycling projects being implemented or planned by the SFPUC and its wholesale customers, please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3).

John and Janet Fiore, 10/01/07

C_Fiore-01 This comment, expressing the commenter's opinion on water sales by the CCSF, does not address the content or adequacy about the Draft PEIR; no response is necessary.

M. Flanigan, 09/20/07

C_Flani-01 This comment, which expresses opposition to additional diversions from the Tuolumne River and support for more conservation and recycling to meet additional water demand is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22), which offset a portion of the projected demand. For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). For additional information on the conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customer, please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3).

E. Fleming-Hasegaue, 09/20/07

C_Flemi-01 This comment opposing additional Tuolumne River diversions is acknowledged.

Kirsten Flynn, 09/27/07

C_Flynn-01 This comment opposing additional Tuolumne River diversions is acknowledged.

C_Flynn-02 This comment expressing support for more conservation and recycling is acknowledged. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3).

Peter Fox, 09/25/07

C_Fox-01 This comment provides a personal perspective on the Tuolumne River and does not address the content or adequacy of the Draft PEIR. No response is provided.

Jimmy Gado, 09/05/07

[See Public Hearing Transcript, Sonora, pp. 33-34]

C_Gado-01 This comment expresses concern regarding the use of monthly average values of river flow to evaluate the WSIP's impacts on recreational uses along the Tuolumne River. The Draft PEIR (Vol. 3, Section 5.3.8) provides an extensive discussion of existing whitewater recreational resources in the Tuolumne River watershed and evaluates the potential magnitude of impacts on future whitewater recreation under the WSIP. The detailed analysis of the timing and magnitude of the WSIP-related changes in water releases within the upper Tuolumne River watershed as related to whitewater rafting was based on review of daily flow and operations information, in addition to monthly average river flow (see Impact 5.3.8-2: Effects on river recreation due to changes in water system operations, pp. 5.3.8-27 through 5.3.8-34).

C_Gado-02 This comment, which expresses opposition to additional diversions from the Tuolumne River and support for additional conservation and recycling programs, is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by SFPUC and its wholesale customers.

Caroline Garbarino, 09/22/07

C_Garba-01 This comment, which states that flawed demand modeling inflates future demand and that other metropolitan areas have reduced demand despite growth, was submitted by numerous commenters and is responded to in **Section 14.2, Master Response on Demand Projections, Conservation and Recycling** (Vol. 7, Chapter 14, Section 14.2.2).

C_Garba-02 This comment, requesting that SFPUC conduct additional studies on the Tuolumne River, was submitted by numerous commenters; see **Response C_Breso-01** for response.

C_Garba-03 This comment states that the Draft PEIR does not take into consideration the impact of climate change on precipitation in the Tuolumne River watershed. Please refer to **Section, 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14, Section 14.11.4).

Ruben Garcia, 09/20/07

C_Garci-01 This comment opposing additional diversions from the Tuolumne River is acknowledged. The Draft PEIR includes multiple alternatives to the WSIP that would reduce diversions from the Tuolumne River; refer to the following sections in Chapter 9 (Vol. 4): Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for discussion of conservation programs and recycling projects being implemented or proposed by SFPUC and its wholesale customers.

Robert Gelman, 09/05/07

[See Public Hearing Transcript, Sonora, pp. 43-44]

C_Gelma-01 This comment questions the volume of water to be diverted from the Tuolumne River. Please refer to the Draft PEIR Chapter 3 (pp. 3-16 to 3-22) for information regarding development of demand projections and purchase estimates. Demand projections are described in more detail in Draft PEIR Appendix E.2 (Vol. 4). For additional information, refer to **Section 14.2, Master Response on Demand Projections, Conservation and Recycling** (Vol. 7, Chapter 14, Section 14.2.2). Please also refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.9) for an explanation of the relationship between the average annual increase in purchase requests and the average annual increase in Tuolumne River diversions.

C_Gelma-02 Please see **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14) for additional discussion of climate change to augment the discussion presented in Section 5.7.6 of the Draft PEIR (Vol. 3, Chapter 5, pp. 5.7-92 to 5.7-96). Section 14.11 of this document provides more detailed and up-to-date information on climate change as it relates to the SFPUC regional water supply and the proposed WSIP.

Marylyn Genovese, 09/29/07

C_Genov-01 This comment states that the impact analysis presented in the Draft PEIR did not adequately address the environmental impacts to the Tuolumne River. Please refer to **Response C_Breso-01** for response.

The commenter also requests that the SFPUC re-evaluate the projections for future water demand and conservation potential. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14) for a discussion of the methodology used by SFPUC in collaboration with its wholesale customers and BAWSCA to project future demand, and for additional information related to conservation programs and recycling projects proposed by the SFPUC and its wholesale customers.

C_Genov-02 This comment, which supports reducing reliance on the Tuolumne River due to the uncertainty of climate change effects, implementation of more conservation and recycling to meet water demand, and alternatives that protect the Tuolumne River from additional diversions, is acknowledged. Regarding the effects of climate change on the Tuolumne River, refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14, Section 14.11.4).

The commenter's support for conservation and recycling and opposition to additional diversions from the Tuolumne River is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, Section 3.4.4, pp. 3-16 to 3-22). For descriptions of alternatives that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Please also refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers.

Ernest Goitein, 10/14/07

C_Goite-01 This comment states that there will be impacts on the Tuolumne River. The Draft PEIR (Vol. 3, Chapter 5, Sections 5.3.1 through 5.3.8) analyzed the effects of the WSIP on the hydrology, geomorphology, water quality, groundwater, terrestrial biology, fisheries, recreation, and visual quality of the Tuolumne River corridor. As described, implementation of the WSIP would result in several potentially significant adverse impacts on the Tuolumne River and its resources; the Draft PEIR identified mitigation measures to reduce these impacts to less-than-significant levels. Refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14) and **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14) for additional information related to the impact analysis for the Tuolumne River.

C_Goite-02 This comment expressing opposition to additional diversions from the Tuolumne River and support for more water conservation, including pricing incentives, and water recycling, is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, Section 3.4.4, pp. 3-16 to 3-22). For descriptions of alternatives that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by SFPUC and its wholesale customers.

Shawna Gokener, 09/20/07

[See Public Hearing Transcript, San Francisco City Hall, September 20, 2007, p. 33]

C_Goken-01 This comment expresses a general concern about water supply management and does not address the content or adequacy of the Draft PEIR; no response is needed.

Kathleen Goldfein, 09/25/07

C_Goldf-01 This comment in support for alternatives that reduce diversions from the Tuolumne River is acknowledged. The second part of this comment presents observations on personal conservation practices and demand hardening. Refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) regarding the specific conservation measures currently being implemented and those to which the SFPUC and SFPUC wholesale customers have committed under the WSIP.

C_Goldf-02 Please refer to **Response C_Breso-01**.

Rebecca Goodman, 09/26/07

C_Goodm-01 This comment summarizes more specific issues discussed in Comment C_Goodm-02; refer to **Response C_Goodm-02**.

C_Goodm-02 This comment encourages consideration of biological resources along the Tuolumne River, and encourages additional conservation and recycling in lieu of additional diversions. The Draft PEIR (Vol. 3, Chapter 5, Sections 5.3.1 through 5.3.8) analyzed the effects of the WSIP on the hydrology, geomorphology, water quality, groundwater, terrestrial biology, fisheries, recreation, and visual quality of the Tuolumne River corridor. As described, implementation of the WSIP would result in several potentially significant adverse impacts on the Tuolumne River and its resources; the Draft PEIR identified mitigation measures to reduce these impacts to less-than-significant levels. Refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14), and **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14), for additional information related to the impact analysis for the Tuolumne River.

For descriptions of alternatives that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the

Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Please refer also to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for information related to conservation programs and recycling projects being implemented or proposed by SFPUC and its wholesale customers.

Ben Graves, 09/27/07

C_Grave-01 This comment has been submitted by numerous commenters; please refer to **Response C_Breso-01**.

C_Grave-02 This comment expressing support for more conservation and recycling to meet water demand and for alternatives that protect the Tuolumne River from additional diversions is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, Section 3.4.4, pp. 3-16 to 3-22). For descriptions of alternatives that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented of proposed by the SFPUC and its wholesale customers.

David Greene, 09/11/07

C_GreenD-01 This comment, expressing support for more conservation and recycling rather than additional diversions from the Tuolumne River to meet additional demand and requesting that the SFPUC re-evaluate its studies, is acknowledged. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation and Recycling** (Vol. 7, Chapter 14) regarding the studies conducted to project water demand and conservation and recycled water potential and for information on the conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers.

C_GreenD-02 This comment stating that SFPUC adopt a policy of reducing diversions from the Tuolumne River is noted.

C_GreenD-03 This comment requests that the Draft PEIR take into account the impact of climate change on precipitation in the Tuolumne River watershed. Please refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14, Section 14.11.4).

C_GreenD-04 This comment expressing support for more conservation and recycling is acknowledged. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for discussion of conservation programs and recycling projects proposed by SFPUC and its wholesale customers.

Katherine Greene, 09/21/07

C_GreenK-01 This comment, which expresses support for more conservation and recycling to meet water demand and opposition to additional diversions from the Tuolumne River, is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Please also refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects proposed by SFPUC and its wholesale customers.

Doris Grinn, 09/20/07

[See Public Hearing Transcript, Sonora, pp. 38-40]

C_GrinnD-01 This comment does not address the accuracy or adequacy of the Draft PEIR; no response is provided.

Jim Grinnell, 09/20/07

[See Public Hearing Transcript, Sonora, pp. 40-41]

C_GrinnJ-01 This comment, which expresses support for more conservation and less development in the Bay Area if needed to protect resources, is acknowledged. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for pertinent response on the conservation programs and recycling projects proposed by SFPUC and its wholesale customers.

Andrew Gross, 09/20/07

C_Gross-01 See **Response C_Agarw-01**.

Bob Hackamack, 10/01/07

C_Hacka1-01 This comment expressing an opinion that SFPUC adopt a policy of reducing diversions from the Tuolumne River is noted. This comment also requests that the impact discussion presented in the Draft PEIR be expanded to include a discussion of San Francisco's water rights on the Tuolumne River. A brief discussion of existing water rights and entitlements is included in the Draft PEIR, Section 2.5.1 (Vol. 1, Chapter 2, pp. 2-35 to 2-37) for informational purposes. Issues related to the validity or otherwise of CCSF's water rights is not a CEQA issue and therefore not addressed in the PEIR.

C_Hacka1-02 This comment requests additional discussion regarding three items: (1) the impact of export reduction from the Tuolumne River on the operation under the Raker Act; (2) the impact of the Lower Tuolumne River Diversion Alternative on San Francisco's water rights; and (3) the impact of the Lower Tuolumne Diversion Alternative on the operation of the Raker Act. See **Response L_TUD1-05** regarding CCSF's water rights and the Raker Act.

C_Hacka1-03 This comment requests additional discussion regarding the impact of the Lower Tuolumne Diversion Alternative on the operation of the four agreements among San Francisco, Tuolumne Irrigation District (TID), and Modesto Irrigation District (MID). The descriptions of the CEQA alternatives presented in the Draft PEIR are conceptual, and the evaluation of the alternatives is based on the available information and reasonable assumptions about how each alternative would be implemented. Uncertainties regarding the feasibility of each alternative are discussed in the Draft PEIR and were taken into consideration during the screening process. As discussed in the Draft PEIR (Vol. 4, Chapter 9, pp 9-62), the Lower Tuolumne River Diversion Alternative would pose a number of institutional challenges including agreements with TID/MID for making the necessary releases from Don Pedro Reservoir, and approval by the State Water Resources Control Board (SWRCB) for a change in the point of diversion and possibly additional appropriation license to recover the water. See also **Response L_TUD1-05**.

C_Hacka1-04 The Draft PEIR analyzed impacts on water and off-water recreational uses in the lower Tuolumne River (see Vol. 3, Section 5.3.8), including boating, fishing, swimming, camping, day-use, and picnicking at the principal public park and river access sites in Stanislaus County (La Grange Regional Park, Turlock Lake State Recreation Area, Fox Grove Regional Park, and Tuolumne River Regional Park). Impacts on reservoir recreation due to changes in water system operations were found to be less than significant (Impact 5.3.8-1, pp. 5.3.8-23 through 5.3.8-27). Impacts on river recreation due to changes in water system operations were also found to be less than significant (Impact 5.3.8.2, pp. 5.3.8-27 through 5.3.8-34).

C_Hacka1-05 This comment states that "improving and enlarging of the Lower Cherry Aqueduct may not be provided for in Raker Act documents and a full EIR is requested." The relevant past and future SFPUC projects presented in the cumulative impact analysis are summarized solely for the purpose of evaluating the WSIP's contribution to cumulative impacts and are not proposed as part of the WSIP. Improving and enlarging Lower Cherry Aqueduct is a component of the Hetch Hetchy Repair and Rehabilitation Program (see Vol. 3, Chapter 5, pp. 5.7-6 and 5.7-7). Project-level CEQA review will be conducted as appropriate to provide additional information and analyses. However, as stated above, issues related to the validity or otherwise of CCSF's water rights is not a CEQA issue.

Bob Hackamack, 10/15/07

C_Hacka2-01 This comment requests the SFPUC to discuss plans for compliance with Section 9(h) of the Raker Act. See **Response L_TUD1-05**.

Diana Hall, 10/15/07

C_Hall-01 This comment opposing additional Tuolumne River diversions and supporting a program emphasizing conservation and recycling is noted. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for information related to conservation programs and recycling projects proposed by SFPUC and its wholesale customers.

C_Hall-02 This comment stating that water efficiency measures and implementation of diverse water supplies would help reduce the impacts associated with climate change is noted. Refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for response.

Kimberly Hamilton-Lam, 09/20/07

C_Hamil-01 This comment opposes additional Tuolumne River diversions and promotes water conservation as the key to satisfying future water demand and protecting the river. The following comments in this submittal were submitted by numerous commenters:

> " . . outdoor water use drives 60% of the anticipated increase in demand"
>
> "Water conservation is cheap, relatively easy and much less destructive to the environment."
>
> "The Bay Area lags behind other metropolitan areas when it comes to water conservation."

Please see **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14). Refer to the discussion in Section 14.2.2, under the heading Outdoor Water Use, regarding estimates of outdoor water demand, and to the discussion in Section 14.2.3, under the heading Frequently Submitted Comments Addressing Conservation and Recycling, regarding comparisons to other areas. Refer also to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.9) for an explanation of the relationship between the average annual increase in purchase requests and the average annual increase in Tuolumne River diversions.

Carol Hankermeyer, 09/25/07

C_Hanke-01 This comment opposing additional diversions from the Tuolumne River is acknowledged. Please refer to **Response L_Tuol1-09** regarding the potential effects of the WSIP on those reaches of the Tuolumne River designated as wild and scenic. Please refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.5) and to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7. Chapter 14, Section 14.7.6) for clarification regarding current and estimated future municipal and agricultural diversions from the Tuolumne River.

C_Hanke-02 This comment stating that 60 percent of the proposed increase in Tuolumne River diversions is due to outdoor water use and that the Bay Area falls behind other California metropolitan areas in conservation is acknowledged. These comments were submitted by numerous commenters and are responded to in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14); refer to Section 14.2.2, under the heading

Outdoor Water Use, regarding estimates of outdoor water demand, and to the discussion in Section 14.2.3, under the heading Frequently Submitted Comments Addressing Conservation and Recycling, regarding comparisons to other areas and the need for conservation and efficiency to meet increases in outdoor water demand.

C_Hanke-03 This comment expresses concern regarding impacts to the San Francisco Bay-Delta's estuarine ecosystem as a result of additional Tuolumne River diversions. Please refer to **Section 14.8, Master Response on Delta and San Joaquin River Issues** (Vol. 7, Chapter 14, Section 14.8.2).

C_Hanke-04 This comment opposing additional Tuolumne River diversions is acknowledged.

Tomer Hasson, 09/20/07

[See Public Hearing Transcript, San Francisco City Hall, September 20, 2007, pp. 15-18]

C_Hasso-01 This comment supporting seismic improvements to the regional water system is acknowledged.

C_Hasso-02 This comment opposing additional Tuolumne River diversions and encouraging increased conservation and water efficiency is acknowledged. Please refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.5), and to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.6) for clarification regarding current and estimated future municipal and agricultural diversions from the Tuolumne River. Please refer to the discussion in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2) under the heading Outdoor Water Use, regarding estimates of outdoor water demand. The characterization of the methodology used to project water demand is incorrect; see Section 14.2.2. Regarding the comparison to other metropolitan areas, see Section 14.2.3 under the heading Frequently Submitted Comments Addressing Conservation and Recycling.

C_Hasso-03 This comment, regarding demand modeling, per-capita demand, the SFPUC's studies on conservation and recycling, and comparisons to other areas, was submitted by numerous commenters and is responded to in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14).

C_Hasso-04 This comment requests that the Draft PEIR address the concept of global warming. Please refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14).

Alex Helldoevker, 08/15/07

C_Helld-01 This comment, which expresses support for more conservation and recycling to meet water demand and opposition to additional diversions from the Tuolumne River, especially for outdoor use, is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). For additional information, including information on projected outdoor use as well as conservation programs and recycling projects in the SFPUC service area, please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3).

Leah Henry, 09/20/07

C_Henry-01 This comment opposing additional Tuolumne River diversions is acknowledged.

Kristin Herron, 09/25/07

C_HerroK-01 This comment, which expresses the commenter's opinion that the environmental impacts of increased water diversions outweigh the need for lawns and sprawl in the East Bay, support for more conservation and recycling to meet water demand, is acknowledged. The California Environmental Quality Act (CEQA) requires a public agency with approval authority over a project to balance a project's benefits (economic, legal, social, technological, or other) against any unavoidable environmental risks (the "costs" implied in this comment) when determining whether to approve the project.[2] When an agency approves a project that will result in the occurrence of significant effects that are not avoided or substantially lessened through adopted mitigation measures, the agency must state in writing the specific reasons to support its action. Alternatively, the agency can adopt measures to mitigate significant

2 CEQA Guidelines Sections 15043 and 15093.

environmental effects or adopt an alternative to the project that lessens the project's effects.

As stated in Draft PEIR (Vol. 1, Chapter 1, p. 1-1 and p. 1-9), the San Francisco Planning Department prepared the Draft PEIR to provide the public and responsible and trustee agencies with information about the potentially significant environmental effects of the proposed program, to identify possible ways to minimize the potentially significant effects, and to describe and evaluate feasible alternatives to the proposed program. Upon certification of the PEIR, the SFPUC may proceed to take action on program approval.

Regarding conservation and recycling in the SFPUC service area, the 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects proposed by SFPUC and its wholesale customers.

The statement that 60 percent of proposed increase in diversions would go to the East Bay is incorrect; please refer to **Response C_Agarw-01**, above.

Christopher Hest, 10/16/07

C_Hest-01 This comment opposing additional Tuolumne River diversions is acknowledged.

Sidney Higgins, 09/20/07

C_Higgi-01 This comment does not address the content or adequacy of the Draft PEIR; no response is needed.

Jeff Hoel, 10/01/07

C_Hoel-01 The purpose and objectives of the WSIP are described in the Draft PEIR (Vol. 1, Chapter 3, pp. 3-5 to 3-10), and the components of the WSIP addressed in the Draft PEIR are described in Sections 3.6 to 3.8 (pp. 3-33 to

3-73). The use of chlorine and chloramines for disinfection of the SFPUC's water supply is part of the ongoing system operations and maintenance and not directly related to implementation of the WSIP. The SFPUC acknowledges that both chlorine and chloramine are considered for planning, operational flexibility, and emergency purposes. As part of ongoing system operations, discharges containing residual disinfectants—chlorine or chloramines—are dechlorinated to address environmental concerns per RWQCB requirements. Chloramine is used to ensure compliance with the federal drinking water regulations (Stage 1 and 2 Disinfectants and Disinfection Byproducts Rule, as discussed in Draft PEIR, Vol. 1, Chapter 2, 2-32). Therefore, consistent with the WSIP water quality objectives; use of chloramine cannot be discontinued for the duration of the WSIP construction projects.

Both chlorine and chloramines are toxic to aquatic species, and would need to be removed from any discharges to surface waters. Because the chlorine or chloramine would be removed from the water prior to discharge, the impacts of discharge of water containing either disinfectant would be the same as described in the Draft PEIR (Vol. 2, Chapter 4, pp. 4.5-35 to 4.5-49; and Vol. 3, Chapter 5, p. 5.5.3-3). Dechlorination removes the toxic chlorine from both waters containing free chlorine and those containing chloramines. The SFPUC does not propose to switch to free chlorine during construction as it would jeopardize the reliability of complying with public health and water quality regulations.

C_Hoel-02 The commenter asks why there would be increased need for chloramination or chlorination supplies in a drought year. There would be no increase in *total systemwide* volume of chloramination or chlorination supplies in a drought year based on the fact that overall system deliveries would be the same or less than a typical year. However, under the WSIP, during drought years the first stage of response would be to implement the supplemental dry-year water supplies, namely the conjunctive-use program within the Westside Groundwater Basin and the TID and MID water transfer (Vol. 1, Chapter 3, pp. 3-42 and 3-43). If supplemental dry-year water supplies are needed from the conjunctive-use program in the Westside Groundwater Basin, chlorination or chloramination of supplies may be required for groundwater sources used during drought years depending on water quality and water demand conditions. This would result in a *localized* increase in chlorination or chloramination supplies to disinfect this water source to meet public health requirements. Groundwater pumped from the Westside Groundwater Basin under the Local and Regional Groundwater Projects (SF-2) will require disinfection prior to being used in the regional water supply system. As discussed in the Draft PEIR (Vol. 1, p. 3-71), this would require approximately 14 new well stations (one for each groundwater production well). Since disinfection would be accomplished with either chlorination or chloramination, the operational change described in

Table 3-12 reflects the materials needed for disinfection of the groundwater during a drought year when groundwater resources would be used.

C_Hoel-03 The comment regarding the State Water Resources Control Board's statement on chloramines is acknowledged.

Construction-related pollutants are listed in the Draft PEIR in Table 4.5-3 (Vol. 2, Chapter 4, p. 4.5-22). The Draft PEIR states "Through compliance with existing regulations and established project procedures as well as implementation of mitigation measures specified in this section, these impacts would be less than significant" (Vol. 2, Chapter 4, p. 4.5-21). With regard to "potential" impacts, impacts are a function of time of year, receiving water volume and water quality, as well as discharge volume and water quality. For construction projects, the SFPUC obtains construction permits and implements Storm Water Pollution Prevention Plans (SWPPP) as required by regulations to minimize erosion and turbid water runoff. In addition, the SFPUC follows sanitary work practices and emergency response plans for these projects. Disinfectants in discharged water are dechlorinated per RWQCB requirements.

The Draft PEIR further states "The San Francisco Bay Basin Plan standard for residual chlorine is 0.0 milligrams per liter and the Central Valley Region General Order for Dewatering and Other Low Threat Discharges to Surface Waters standard for residual chlorine is 0.02 milligrams per liter; thus, dechlorination of any discharges would be required in order to remove all residual chlorine prior to discharge to surface waters, and to assure compliance with RWQCB requirements" (Vol. 2, Chapter 4, p. 4.5-42).

With regards to impacts of environmental effects of chloraminated water, see **Response C_Hoel-01**.

Both chlorine and chloramine dissipate in the water over time. The rate of dissipation depends on many factors such as pH, temperature, disinfectant concentration, dilution, exposure to sunlight etc. Chloramine takes longer to dissipate, but it is not a persistent disinfectant. Discharges containing residual disinfectants chlorine or chloramine are dechlorinated to address environmental concerns per RWQCB requirements. Dechlorination removes the toxic chlorine from both waters containing free chlorine and those containing chloramines. Residual disinfectant chloramine is dechlorinated per RWQCB requirements.

The comment expressing an opinion on the Draft PEIR concerning the efficacy of treatment of chlorine and chloramines is acknowledged. Free chlorine (sodium hypochlorite) is used at the treatment plant to address pathogens (e.g., giardia, viruses). Prior to leaving the treatment plant free chlorine levels are increased and ammonia added to form chloramines. The use of chloramines serves the dual purpose of persistent residual disinfection in the distribution system and reduces the formation of disinfection byproducts. This process meets the Department of Public Health total coliform rule and disinfection byproduct rule. http://www.cdph.ca.gov/certlic/drinkingwater/Pages/default.aspx

The comment stating that "chloramine are more persistent than chlorine" is acknowledged.

The U.S. Environmental Protection Agency provides a comprehensive treatment of chlorine, chloramines, and ammonia in the documents listed below. Toxicity impacts on aquatic organisms for chlorine and chloramines are similar. There is widely available literature on these subjects as well. Presentation of organism-specific effects are discussed to some extent in the following documents, but are not exhaustive.

U.S. Environmental Protection Agency. 1996. Quality Criteria for Water. Office of Water, Regulations and Standards Agency. Washington, DC, EPA 440/5-86-001. May 1. http://www.epa.gov/waterscience/criteria/goldbook.pdf

U.S. Environmental Protection Agency. 1985. *Ambient Water Quality Criteria for Chlorine - 1984*. Office of Water, Regulations and Standards Criteria and Standards Divisions, Washington, D.C. EPA-440/5-84-030. January. http://www.epa.gov/waterscience/criteria/library/ambientwqc/chlorine1984.pdf

U.S. Environmental Protection Agency. 1999. Alternative Disinfectants and Oxidants Guidance Manual. Office of Water. EPA-440/5-84-030. April. http://www.epa.gov/safewater/mdbp/alternative_disinfectants_guidance.pdf

U.S. Environmental Protection Agency. 1999. *1999 Update of Ambient Water Quality Criteria for Ammonia*. Office of Water, Office of Science and Technology, Washington, D.C. EPA-822-R-99-014. December. http://www.epa.gov/waterscience/standards/ammonia/99update.pdf

Humans are not considered aquatic organisms, and use of chlorine, ammonia, and chloramines as disinfection agents is consistent with U.S. EPA drinking water regulations designed for protection of public health.

The comment is acknowledged that the San Francisco Bay Basin Plan standard for residual chlorine is 0.0 milligrams per liter (Vol. 2, Chapter 4, p. 4.5-42; Vol. 3, Chapter 5, p. 5.5.3-3), and that the Draft PEIR identifies four limits, all less than 0.02 mg/L, but not equal to zero. The Central Valley Region General Order for Dewatering and Other Low Threat Discharges to Surface Water standards for residual chlorine is 0.02 mg/l (Vol. 2, Chapter 4, p. 4.5-42). The

Draft PEIR states that “dechlorination of any discharges would be required in order to remove all residual chlorine prior to discharge to surface waters, and to assure compliance with RWQCB requirements” (Vol. 2, Chapter 4, p. 4.5-42). Note that many instruments cannot accurately measure residual chlorine below 0.02 mg/L thus this value was used in the report.

Before SFPUC discharges system water into Crystal Springs Reservoir, the treated water is dechlorinated per RWQCB requirements and ammonia is removed to limit the potential for eutrophication in the reservoir and for operational reasons.

C_Hoel-04 The commenter indicates concern regarding the amount of ammonia removed from system water prior to discharge to Crystal Springs Reservoir. The removal of ammonia is based on flow rate (and thus mass). The Pulgas Dechloramination Facility was designed to remove 90 percent of ammonia for all flows between 10 million gallons per day and 100 million gallons per day.

Ammonia in chloramine that is not removed when water is discharged to Crystal Springs Reservoir, will convert to nitrate via nitrification, as described in the Draft PEIR (Vol. 3, Chapter 5, p. 5.5.3-4) and will not have to be removed prior to treatment.

The Draft PEIR, Section 5.5.3, has been revised to correct the spelling of “phosphorus.” Please see Chapter 16 of this Comments and Responses document.

C_Hoel-05 Reference material cited in the Draft PEIR is available for review by contacting the San Francisco Planning Department at 1650 Mission Street, Suite 400, San Francisco, CA 94103.

The comment on pipe material and the effects of chloramines on pipe materials is acknowledged. The American Water Works Association (http://www.awwa.org/) (AWWA) has published guidelines for chemical compatibility of different materials commonly used in drinking water facilities with chloramine at residual disinfectant concentrations (<4 mg/L). These guidelines are being used during final design for all materials selection decisions. Where new pipe welded steel pipe with cement mortar lining will be employed. Other pipeline materials may be considered on a case by case basis, but consistent with AWWA guidelines.

Jeff Hoffman, 09/20/07

C_Hoffm-01 This comment opposing additional Tuolumne River diversions is acknowledged. The Draft PEIR (Vol. 3, Chapter 5, Sections 5.3.1 through 5.3.8) analyzed the effects of the WSIP on the hydrology, geomorphology, water quality, groundwater, terrestrial biology, fisheries, recreation, and visual quality of the Tuolumne River corridor. As described, implementation of the WSIP would result in several potentially significant adverse impacts on the Tuolumne River and its resources; the Draft PEIR identified mitigation measures to reduce these impacts to less-than-significant levels. Please refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.5) and to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.6) for clarification regarding current and estimated future municipal and agricultural diversions from the Tuolumne River. Refer also to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.9) for an explanation of the relationship between the average annual increase in purchase requests and the average annual increase in Tuolumne River diversions.

C_Hoffm-02 The opinion of the commenter regarding the San Francisco ballot initiative authorizing the WSIP is acknowledged.

C_Hoffm-03 This comment states that the actions of the SFPUC outside of San Francisco are in direct opposition to the will of San Francisco residents. Extensive public comments were received on the Draft PEIR; these comments, representing a wide range of opinions, are included in Vol. 1 of this Comments and Responses document. A programmatic analysis of the environmental impacts of the facility improvement projects located outside of San Francisco is included in the Draft PEIR (Vol. 2, Chapter 4).

Pei-Lin Hsiung, 10/12/07

C_Hsiun-01 The Draft PEIR analyzed the effects of the WSIP on the hydrology, geomorphology, water quality, groundwater, terrestrial biology, fisheries, and recreation and visual quality of the Tuolumne River corridor in Vol. 3, Chapter 5, Sections 5.3.1 through 5.3.8. Several potentially significant adverse impacts of the WSIP on the Tuolumne River and its resources were identified and mitigation measures developed to reduce the impacts to a less-than-significant level. As this comment does not specify the particular issue(s) in which the commenter believes the analysis presented in the Draft PEIR is inadequate, no specific response is provided. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects proposed by SFPUC and its wholesale customers.

C_Hsiun-02 These comments were submitted by numerous commenters and are responded to in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3).

Noah Hughes, 09/05/07

[See Public Hearing Transcript, Sonora, pp. 41-43]

C_Hughe1-01 This comment states that the use of monthly average values of river flow are inappropriate for analysis of environmental elements that may be affected by hourly, weekly, or daily flows. Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.3).

C_Hughe1-02 The opinion of the commenter expressing the Board of Supervisors' position on the preferred alternative is acknowledged.

C_Hughe1-03 This comment expressing the commenter's understanding of fiscal management of the regional system in the 1990s is acknowledged. This comment does not address the accuracy or adequacy of the Draft PEIR; no response is provided.

Noah Hughes, 09/06/07

[See Public Hearing Transcript, Modesto, pp. 16-18]

C_Hughe2-01 This comment opposing additional Tuolumne River diversions is acknowledged. Regarding environmental sustainability, see **Response C_Clark1-16**.

C_Hughe2-02 This comment states that the use of monthly average values of river flow are inappropriate because it conceals extreme values and understates impacts. Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Sections 14.5.3 and 14.5.4).

Kile Ikemoto, 08/15/07

C_Ikemo-01 This comment opposing additional Tuolumne River diversions and in support of conservation and recycling is acknowledged. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) regarding conservation to address outdoor water demand in the SFPUC service area and for information related to other conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers.

Marian Isaac, 09/28/07

C_Issac-01 This comment, which expresses support for more conservation, recycling, and desalination to meet water demand and opposition to additional diversions from the Tuolumne River, is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Draft PEIR, Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following. For additional information related to conservation programs and recycling projects being implemented or proposed by SFPUC and its wholesale customers, please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3). Regarding the use of desalination technologies as a supplemental water supply, refer to **Response C_BramlD1-02**.

Richard Izmirian, 10/01/07

C_Izmir-01 This comment requests for clarification as to why SFPUC is exempt from Section 5937 of the State Fish and Game Code, NOAA requirements, and the Federal Endangered Species Act (FESA). The Draft PEIR describes all of the relevant state and federal regulatory requirements that are applicable to the SFPUC regional water system (see Vol. 1, Chapter 2, Section 2.4, pp. 2-31 thru 2-35). As this comment does not relate to the adequacy of the Draft PEIR, no additional response is provided.

C_Izmir-02 This comment requests that the analysis be revised to include SFPUC's responsibility to release adequate flows downstream of its dams. The Draft PEIR (Vol. 1, Chapter 2, pp. 2-39 to 2-43) describes the SFPUC's obligations for instream flow releases.

Mitchell Johnson, 09/13/07

C_JohnsM-01 This comment, which expresses opposition to additional diversions from the Tuolumne River and support for more conservation to meet water demand, is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for a discussion of conservation programs and recycling projects being implemented or proposed by SFPUC and its wholesale customers.

Sieglinde Johnson, 09/20/07

C_JohnSie-01 This comment, which expresses support for more conservation and recycling to meet water demand and opposition to additional diversions from the Tuolumne River, is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Draft PEIR, Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives evaluated in the Draft PEIR that do not include additional diversions from the Tuolumne River, refer to the descriptions of the Year-round Desalination at Oceanside Alternative (Vol. 4, Chapter 9, Section 9.2.4), and Aggressive Conservation/Water Recycling and Local Groundwater Alternative (Without Tuolumne River Supplement) (Vol. 4, Chapter 9, Section 9.2.6). Please also refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by SFPUC and its wholesale customers.

Silvia Johnson, 09/20/07

[See Public Hearing Transcript, San Francisco City Hall, September 20, 2007, pp. 35-36]

C_JohnsSil-01 This comment does not address the content or the adequacy of the Draft PEIR; no response is needed.

Lindsay and Ken Joye, 09/11/07

C_Joye-01 This comment, requesting that SFPUC consider the conservation programs of other progressive water agencies, and consider incentive programs and landscape standards, is acknowledged. The reference to the efforts by other water agencies is similar to comments submitted by numerous commenters which are responded to in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) under the heading Frequently Submitted Comments Addressing Conservation and Recycling. Please also refer to Tables 14.2-6, 14.2-7, 14.2-8 regarding the conservation programs, including programs to reduce outdoor water use, being implemented or proposed by the SFPUC and its wholesale customers. Regarding the statement that a comprehensive watershed study should be completed, please refer to **Response C_Breso-01**.

Mike Kahn, 09/17/07

C_Kahn-01 This comment, which expresses support for more conservation and recycling to meet water demand and opposition to additional diversions from the Tuolumne River or any other water source, is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Draft PEIR, Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives evaluated in the Draft PEIR that do not include additional diversions from the Tuolumne River, refer to the descriptions of the Year-round Desalination at Oceanside Alternative (Vol. 4, Chapter 9, Section 9.2.4), and Aggressive Conservation/Water Recycling and Local Groundwater Alternative (Without Tuolumne River Supplement) (Vol. 4, Chapter 9, Section 9.2.6). Please also refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by SFPUC and its wholesale customers.

Gwynn Kaliner-MacKellen, 09/20/07

C_Kalin-01 This comment, which expresses support for more conservation and recycling to meet water demand and opposition to additional diversions from the Tuolumne River, is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects proposed by SFPUC and its wholesale customers. Regarding graywater systems, refer to the discussion in Section 14.2.3 under the heading Conservation Measures Suggested by Commenters. Regarding the effects of climate change on the Tuolumne River, refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14, Section 14.11.4).

Emeric Kalman, 09/20/07

[See Public Hearing Transcript, San Francisco City Hall, September 20, 2007, pp. 33-35]

C_Kalma-01 This comment expresses an opinion that there was inadequate noticing of the Draft PEIR public hearing dates. Please see **Responses F_USDAFS-05** and **L_SFCPC1-01**, and **Appendix J1** (Vol. 8) of this Comments and Responses document for detailed information on the public outreach efforts conducted by the San Francisco Planning Department's Major Environmental Analysis Division.

Suzanne Keebra, 10/01/07

C_Keebr-01 The comment expresses support for retrofitting the Hetch Hetchy system, and (with Comment C_Keebr-02) asserts that the SFPUC should separate the seismic improvements from the proposed water supply option. Please refer to **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Section 14.1.5) regarding the integration of the seismic improvements and water supply option to meet program objectives, and for a discussion of the advantages of using a program EIR to evaluate the proposed program as a whole.

C_Keebr-02 This comment expressing support of more conservation and recycling to meet water demand and against additional diversions from the Tuolumne River is acknowledged. Refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for discussion of conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers. Regarding graywater systems, refer to the discussion in Section 14.2.3 under the heading Conservation Measures Suggested by Commenters.

Michael Kelleher, 10/01/07

C_Kelle-01 This comment expresses an opinion about the value of natural resources and requests that CCSF "give careful consideration to the recommendations you get from all sides and make a decision that will benefit California in perpetuity." This comment is acknowledged.

Michelle Kim, 09/20/07

C_Kim-01 This comment, which expresses support for more conservation and recycling to meet water demand and opposition to additional diversions from the Tuolumne River, is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers. Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.9) for an explanation of the relationship between the average annual increase in purchase requests and the average annual increase in Tuolumne River diversions.

The comment also requests that the economic consequences of the proposed program be evaluated. Refer to **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Section 14.1.6) regarding the scope of the PEIR with respect to economic evaluations.

Carl King, 10/01/07

C_KingC-01 This comment expressing support of more conservation and recycling to meet water demand and opposing additional diversions from the Tuolumne River is acknowledged. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for a discussion of conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers. The comment also states that the plan to increase diversions does not adequately consider the recreational benefits of the wild and scenic Tuolumne River. Please refer to **Response C_Barsa-01** for a discussion of potential impacts on future whitewater recreation under the WSIP. Please refer also to **Response L_Tuol1-09** regarding the potential effects of the WSIP on those reaches of the Tuolumne River designated as wild and scenic.

David King, 10/01/07

C_KingD-01 This comment opposing urban sprawl is acknowledged.

Kenneth King, 10/15/07

C_KingK-01 This comment opposing additional Tuolumne River diversions and expressing support for sustainable alternatives is acknowledged. For descriptions of alternatives evaluated in the Draft PEIR that do not include additional diversions from the Tuolumne River, refer to the descriptions of the Year-round Desalination at Oceanside Alternative (Vol. 4, Chapter 9, Section 9.2.4), and Aggressive Conservation/Water Recycling and Local Groundwater Alternative (Without Tuolumne River Supplement) (Vol. 4, Chapter 9, Section 9.2.6). Please also refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers.

John Kramer, 09/05/07

C_Krame1-01 This comment questions how the WSIP would address counties of origin water rights. Please refer to **Response L_Tuol1-04**.

C_Krame1-02 Please refer to **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Section 14.1.5) regarding the integration of the seismic improvements and water supply option to meet program objectives, and for a discussion of the advantages of using a program EIR to evaluate the proposed program as a whole.

John Kramer, 10/11/07

C_Krame2-01 The Draft PEIR (Vol. 3, Chapter 5, Sections 5.3.1 through 5.3.8) analyzed the effects of the WSIP on the hydrology, geomorphology, water quality, groundwater, terrestrial biology, fisheries, recreation, and visual quality of the

Tuolumne River corridor. As described, implementation of the WSIP would result in several potentially significant adverse impacts on the Tuolumne River and its resources; the Draft PEIR identified mitigation measures to reduce these impacts to less-than-significant levels. Please refer to **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Section 14.1.6) for pertinent response regarding the scope of the PEIR with respect to economic evaluations.

C_Krame2-02 See **Response C_Krame1-02**.

Aldora Lee, 09/25/07

C_Lee-01 This comment stressing the importance of seismic improvements to the regional water system is acknowledged.

C_Lee-02 This comment opposing additional Tuolumne River diversions is acknowledged. Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.9) for an explanation of the relationship between the average annual increase in purchase requests and the average annual increase in Tuolumne River diversions.

C_Lee-03 This comment states that demand analyses do not sufficiently take into consideration conservation and recycling. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Draft PEIR, Vol. 1, Chapter 3, pp. 3-16 to 3-22). Please refer also to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2) regarding the methodology used by the SFPUC in collaboration with its wholesale customers and BAWSCA to project demand and to Section 14.2.3 (Vol. 7, Chapter 14, Section 14.2) for additional information related to conservation programs and recycling projects being implemented or proposed by SFPUC and its wholesale customers.

C_Lee-04 Please refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14) for additional discussion of climate change to augment the discussion presented in Section 5.7.6 of the Draft PEIR (Vol. 3, Chapter 5, pp. 5.7-92 to 5.7-96). Section 14.11 of this document provides more detailed and up-to-date information on climate change as it relates to the SFPUC regional water supply and the proposed WSIP.

Ben Leet, 08/16/07

C_Leet-01 This comment expressing support for conservation is acknowledged. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects proposed by SFPUC and its wholesale customers.

Linda Lewin, 09/20/07

C_Lewin-01 See **Response C_HerroK-01**.

C_Lewin-02 This comment expressing support for more conservation and recycling to meet water demand and against additional diversions from the Tuolumne River is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, Section 3.4.4, pp. 3-16 to 3-22). For descriptions of alternatives that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers.

Sidney Liebes, 09/19/07

[See Public Hearing Transcript, Palo Alto, p. 23]

C_Liebe-01 This comment endorses the remarks of Peter Drekmeier (Bay Area Program Director at the Tuolumne River Trust) regarding the WSIP. This comment is acknowledged. Regarding environmental sustainability, refer to **Response C_Clark1-16**.

Kingman Lim, 09/11/07

C_Lim-01 This comment, which expresses support for more conservation to meet water demand and opposition to additional diversions from the Tuolumne River, is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Draft PEIR, Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives evaluated in the Draft PEIR that do not include additional diversions from the Tuolumne River, refer to the descriptions of the Year-round Desalination at Oceanside Alternative (Vol. 4, Chapter 9, Section 9.2.4), and Aggressive Conservation/Water Recycling and Local Groundwater Alternative (Without Tuolumne River Supplement) (Vol. 4, Chapter 9, Section 9.2.6). Please also refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers.

Carissa Look, 09/20/07

C_Look-01 This comment, which expresses support for more conservation and recycling to meet water demand and opposition to additional diversions from the Tuolumne River, is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers; regarding comparisons to the achievements in other areas in reducing demand, refer to the discussion under Frequently Submitted Comments Addressing Conservation and Recycling.

Regarding the location of the SFPUC service area, refer to Draft PEIR Figure 3.2 (Vol. 1, Chapter 3, p. 3-6); as shown, the service area includes portions of the South Bay and San Francisco Peninsula in addition to portions of the East Bay and San Francisco. Regarding specific projections of future demand and purchases from the SFPUC regional system, refer to Table 3.3 or Table 7.2 (Vol. 1, Chapter 3, p. 3-18 and Vol.4, Chapter 7, p. 7-15, respectively). Table 3.4 and Table 7.3 (Vol. 1, Chapter 3, p. 3-19 and Vol. 4, Chapter 7, p. 7-18, respectively) include information on projected increases in demand and purchases from the 2001 base year used in the demand projections.

Judith LoVuolo-Bhushan, 09/24/07

C_LoVuo-01 This comment expressing concern about increased diversions and support for more conservation to meet water demand, and suggesting that the SFPUC work with Acterra on a conservation plan, is acknowledged. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects proposed by SFPUC and its wholesale customers.

Janet Lowry, 10/01/07

C_Lowry-01 This comment, which expresses support for more conservation and recycling to meet water demand and for alternatives that protect the Tuolumne River from additional diversions, is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers.

Sheri Lubin, 09/19/07

C_Lubin-01 The commenter’s support for conservation, conservation outreach, recycling, and replacement of lawns with low/no-water-use landscaping is acknowledged. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) regarding the specific conservation measures currently being implemented and those to which the SFPUC and its wholesale customers have committed under the WSIP.

Erik Lundberg, 09/19/07

C_Lundb-01 This comment opposing additional Tuolumne River diversions is acknowledged.

Tyana Maddock, 09/18/07

C_Maddo-01 This comment opposing additional Tuolumne River diversions is acknowledged. Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.9) for an explanation of the relationship between the average annual increase in purchase requests and the average annual increase in Tuolumne River diversions.

Ramses Madou, 09/19/07

[See Public Hearing Transcript, Palo Alto, p. 17]

C_Madou-01 This comment opposing additional Tuolumne River diversions, urging additional conservation to reduce future water demand, and expressing concern for biological resources in the Tuolumne River watershed, is acknowledged**.** Impacts of the proposed diversions on biological and fisheries resources of the Tuolumne River corridor were analyzed in the Draft PEIR (Vol. 3, Chapter 5, Sections 5.3.6 and 5.3.7). As described, implementation of the WSIP would result in several potentially significant adverse impacts on the Tuolumne River and its resources; the Draft PEIR identified mitigation measures to reduce these impacts to less-than-significant levels. Refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.9) for an explanation of the relationship between the average annual increase in purchase requests and the average annual increase in Tuolumne River diversions.

The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers.

Nick Magol, 09/20/07

C_Magol-01 This comment opposing additional Tuolumne River diversions and expressing support for additional water conservation is acknowledged. Refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers.

Mary Jane Marcus, 09/19/07

[See Public Hearing Transcript, Palo Alto, pp. 10-12]

C_Marcu-01 This comment, which advocates more conservation through public awareness, education, and involvement in determining conservation potential, and expresses opposition to additional diversions from the Tuolumne River, is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers.

Elliot Margolies, 09/19/07

[See Public Hearing Transcript, Palo Alto, pp. 35-36]

C_Margo-01 This comment encouraging additional water conservation and recycling is acknowledged. Refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for pertinent response related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers.

James Marshall, 09/09/07

C_Marsh-01 This comment, which expresses support for more conservation and recycling to meet water demand and opposition to additional diversions from the Tuolumne River, is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers.

Michael Martin, 09/26/07

C_MartiM-01 This comment expresses concerns related to the effects of additional Tuolumne River diversions on spring-run Chinook salmon, fall-run Chinook salmon, and Central Valley steelhead below La Grange Dam. As described in the Draft PEIR, the San Francisco Planning Department determined that long-term WSIP-induced flow changes in the Tuolumne River below La Grange Dam could have a significant adverse effect on anadromous fish, including steelhead and fall-run Chinook salmon, along this reach of river (Vol. 3, Chapter 5, pp. 5.3.6-28 to 5.3.6-32). No spring-run Chinook salmon currently exist in the Tuolumne River. Spring-run Chinook typically spawn in the upper reaches of watersheds, which have been inaccessible to migratory fish in the Tuolumne River for more than 100 years.

The Draft PEIR determined that WSIP effects on flow and temperature would infrequently contribute to potentially significant effects on these fishery resources. As a result, the impact of the WSIP on these fishery resources in the lower Tuolumne River was determined to be potentially significant. Implementation of Mitigation Measures 5.3.6-4a (Avoidance of Flow Changes By Reducing Demand for Don Pedro Reservoir Water), or 5.3.6-4b (Fishery Habitat Enhancement) would reduce these impacts to a less-than-significant level (Vol. 4, Chapter 6, pp. 6-48 and 6-49). Please see **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Sections 14.7.2 and 14.7.3) for supplementary information on the presence of steelhead and Chinook salmon along this reach of the lower river, and additional discussion on Mitigation Measures 5.3.6-4a and 5.3.6-4b, including text revisions to Measure 5.3.6-4b that add further definition to the habitat enhancement effort.

C_MartiM-02 This comment correctly states that the majority of the future demand resides outside of San Francisco, as shown in Draft PEIR Table 3.3 (Vol.1, Chapter 3, p. 3-18). The comments on outdoor use and demand projections were submitted by numerous commenters and are responded to in **Section 14.2, Master Response on Demand Projections, Conservation and Recycling** (Vol. 7, Chapter 14, Section 14.2.2). Regarding the statement in support of conservation and recycling to meet future increases in demand, the 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78).

C_MartiM-03 This comment expresses concern regarding the effects of additional Tuolumne River diversions on property values, tourism, and recreation resources in the upper Tuolumne River watershed. For a discussion of CEQA requirements with respect to economic effects on Tuolumne County residents, businesses, and tourism prior, please refer to **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Section 14.1.6).

C_MartiM-04 This comment expresses concern regarding the potential effects of climate change and how it will affect water supply. More specifically, the commenter requests that the PEIR include an analysis of the effects of drought and water shortage and provide a discussion regarding how the SFPUC would meet demand during those critical times. Refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14, Section 14.11.4) for information regarding effects of climate change on the Tuolumne River watershed and associated effects on SFPUC's system operations and water yield. Please also refer to Section 14.11.5 under the heading SFPUC's Actions to Address Climate Change for information regarding SFPUC's current efforts to evaluate their water supply planning with respect to climate change.

This comment also states that reduced flows in the San Joaquin River basin has resulted in low recruitment of anadromous salmonid populations. See **Section 14.8, Master Response on Delta and San Joaquin River Issues** (Vol. 7, Chapter 14, Section 14.8.2) for a discussion of WSIP effects on the San Joaquin River and Delta.

C_MartiM-05 This comment expressing support for alternatives that would avoid increases in diversions from the Tuolumne River is acknowledged. These alternatives include the Year-round Desalination at Oceanside Alternative (see Draft PEIR Vol. 4, Chapter 9, Section 9.2.6, p. 9-66) and Aggressive Conservation/Water Recycling and Local Groundwater Alternative (Without Tuolumne River Supplement) (see Section 9.2.4, p. 9-47). Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers.

C_MartiM-06 This comment states that the Draft PEIR lacks sufficient description of the potential impacts of the WSIP on the Lower Tuolumne River, particularly with respect to anadromous fish populations. See **Response C_MartiM-01**. This comment also states that the WSIP fails to address consistency with on-going State and Federal resource agency activities, studies, and actions that may be compromised by additional Tuolumne River Diversions. Refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.5) and **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.6) for clarification regarding current and estimated future municipal and agricultural diversions from the Tuolumne River. With respect to the commenter's request for additional studies, please refer to **Response C_Breso-01**.

Sofia Martinez, 08/15/07

C_MartiS-01 This comment, which expresses support for using recycled water for outdoor water use and opposition to additional diversions from the Tuolumne River, is acknowledged. The proposed WSIP includes recycled water projects in the SFPUC service area totaling 9 to 14 mgd by 2030 (Vol. 1, Chapter 3, pp. 3-18 and 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Please also refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers; regarding conservation and recycling to meet outdoor water demand refer to the discussion under the heading Frequently Submitted Comments on Conservation and Recycling.

Len Materman, 09/19/07

[See Public Hearing Transcript, Palo Alto, pp. 44-45]

C_Mater-01 This comment states that the Draft PEIR inadequately and inconsistently addresses the topic of climate change and global warming. Please see **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14) for additional discussion of climate change to augment the discussion presented in Section 5.7.6 of the Draft PEIR (Vol. 3, Chapter 5, pp. 5.7-92 to 5.7-96). Section 14.11 of this document provides more detailed and up-to-date information on climate change as it relates to the SFPUC regional water supply and the proposed WSIP.

C_Mater-02 The commenter states that although impacts to special-status species were discussed, ecosystems were not adequately addressed. In both Chapter 4 (Vol. 2, Chapter 4, Section 4.6) and in Chapter 5 (Vol. 3, Chapter 5, Sections 5.3.7, 5.4.6 and 5.5.6), impacts on both special-status species and sensitive natural communities are analyzed.

Jonathan McClelland, 09/26/07

C_McCle-01 This comment, which expresses support for more conservation to meet water demand and opposition to additional diversions from the Tuolumne River, is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers. Tables 14.2-6, 14.2-7, and 14.2-8 in Section 14.2 show the specific conservation measures currently being implemented and those to which the SFPUC and SFPUC wholesale customers have committed under the WSIP.

Karl McCollom, 11/07/07

C_McCol-01 Please refer to **Response C_Breso-01**.

C_McCol-02 This comment expressing support for more conservation and recycling to meet water demand and for alternatives that protect the Tuolumne River from additional diversions is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, Section 3.4.4, pp. 3-16 to 3-22). Alternatives that would reduce diversions from the Tuolumne River are described in the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers.

Mike McConnell, 09/07/07

C_McCon-01 This comment, which expresses support for more conservation and recycling to meet water demand and opposition to additional diversions from the Tuolumne River, is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers.

Keith & Luella McFarland, 09/13/07

C_McFar-01 This comment opposing additional Tuolumne River diversions is acknowledged.

Julie McKee, 09/29/07

C_McKee-01 This comment, which expresses support for more conservation to meet water demand and opposition to additional diversions from the Tuolumne River, is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect

22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects proposed by SFPUC and its wholesale customers.

Robert Means, 09/18/07

C_Means1-01 This comment states that water needs are best addressed through conservation. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers.

Robert Means, 09/18/07

[See Public Hearing Transcript, Fremont, pp. 20-22]

C_Means2-01 This comment, which expresses support for more conservation and recycling to meet water demand and opposition to additional diversions from the Tuolumne River, is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78).

Please refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.5), and to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7., Chapter 14, Section 14.7.6) for clarification regarding current and estimated future municipal and agricultural diversions from the Tuolumne River.

Regarding the assertion that demand projections are faulty, and for a discussion of current and planned conservation and recycling in the SFPUC service area, please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14).

C_Means2-02 The methodology used to develop demand projections is described in Draft PEIR Chapter 3 and in more detail in Appendix E.2 (Vol. 5). Refer also to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2). This part of Section 14.2 also addresses the commenter's assertion regarding per capita demand, which was submitted by many commenters. Regarding the commenter's support for more conservation and efficiency to meet future demand, the 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). Alternatives to the WSIP that would reduce diversions from the Tuolumne River, are described in the following sections of Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers.

Christina and Chet Melnarik, 09/18/07

C_Melna-01 This comment expressing the commenter's opinion that the environmental impacts of water diversions from the Tuolumne River outweigh the benefit and that Bay Area water districts should be leaders in conservation and recycling is acknowledged. The California Environmental Quality Act (CEQA) requires a public agency with approval authority over a project to balance a project's benefits (economic, legal, social, technological, or other) against any unavoidable environmental risks (the "costs" implied in this comment) when determining whether to approve the project.[3] When an agency approves a project that will result in the occurrence of significant effects that are not avoided or substantially lessened through adopted mitigation measures, the

[3] CEQA Guidelines Sections 15043 and 15093.

agency must state in writing the specific reasons to support its action. Alternatively, the agency can adopt measures to mitigate significant environmental effects or adopt an alternative to the project that lessens the project's effects.

As stated in Draft PEIR (Vol. 1, Chapter 1, p. 1-1 and p. 1-9), the San Francisco Planning Department prepared the Draft PEIR to provide the public and responsible and trustee agencies with information about the potentially significant environmental effects of the proposed program, to identify possible ways to minimize the potentially significant effects, and to describe and evaluate feasible alternatives to the proposed program. Upon certification of the PEIR, the SFPUC may proceed to take action on program approval.

Regarding conservation and recycling in the SFPUC service area, the 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers. Regarding the use of graywater, refer to the discussion in Section 14.2.3 under the heading Conservation Measures Suggested by Commenters.

Bill Mensing, 09/06/07

C_Mensi-01 This comment opposing additional Tuolumne River diversions is acknowledged.

Karen Menuz, 09/09/07

C_Menuz-01 This comment, which expresses support for more conservation and recycling to meet water demand and opposition to additional diversions from the Tuolumne River, is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers.

Steven Merlo, 09/20/07

C_Merlo-01 This comment opposing additional Tuolumne River diversions and supporting more efficiency is acknowledged. For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers.

Ivo Mijac, 10/01/07

C_Mijac-01 This comment supporting adoption of landscaping policies, more conservation and recycling to meet water demand, and opposition to additional diversions from the Tuolumne River, is acknowledged. Refer to **Tables 14.2.2**, **14.2.3**, and **14.2.4** of **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) regarding the specific conservation measures currently being implemented and those to which SFPUC and its wholesale customers have committed under the WSIP. As shown, measures include landscape audits and, in the wholesale customer service area, xeriscape education.

With respect to conservation and recycling, the 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers. Regarding the commenter's request for additional studies to adequately identify and address impacts on the Tuolumne River, please refer to **Response C_Breso-01**. Regarding the effects of climate change on the river, please refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14, Section 14.11.4).

Eric Millette, 10/01/07

C_Mille-01 This comment, which expresses support for more conservation to meet water demand and opposition to additional diversions from the Tuolumne River, is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers.

Naomi Mindelzun, 09/20/07

C_MindeN-01 This comment, which expresses support for more conservation and efficiency measures to meet water demand and opposition to additional diversions from the Tuolumne River, is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). For information on the demand projections prepared for the WSIP and additional information on conservation and recycling, please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14). Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7. Chapter 14, Section 14.5.9) for an explanation of the relationship between the average annual increase in purchase requests and the average annual increase in Tuolumne River diversions.

Robert E. Mindelzun, 09/23/07

C_MindeR-01 This comment, which expresses support for more conservation and efficiency measures to meet water demand and opposition to additional diversions from the Tuolumne River, is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers. Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7. Chapter 14, Section 14.5.9) for an explanation of the relationship between the average annual increase in purchase requests and the average annual increase in Tuolumne River diversions.

Peter Neal, 09/21/07

C_Neal-01 This comment stresses the need for seismic improvements to the regional water system but opposes additional Tuolumne River diversions. The commenter also states that the Draft PEIR does not adequately address the impacts of additional Tuolumne River diversions and recommends that the SFPUC use a two-tiered approach that separates the seismic improvements from the proposed water supply option.

The Draft PEIR (Vol. 3, Chapter 5, Sections 5.3.1 through 5.3.8) analyzed the effects of the WSIP on the hydrology, geomorphology, water quality, groundwater, terrestrial biology, fisheries, recreation, and visual quality of the Tuolumne River corridor. As described, implementation of the WSIP would result in several potentially significant adverse impacts on the Tuolumne River and its resources; the Draft PEIR identified mitigation measures to reduce these impacts to less-than-significant levels. Please refer to **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Section 14.1.5) regarding the integration of the seismic improvements and water supply option to meet program objectives, and for a discussion of the advantages of using a program EIR to evaluate the proposed program as a whole.

Erna Nore, 09/26/07

C_Nore-01 This comment, which expresses support for more conservation and recycling to meet water demand and opposition to additional diversions from the Tuolumne River, is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7. Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers.

William Noren, 10/10/07

C_Noren1-01 This comment expresses opposition to additional Tuolumne River diversions and requests that additional studies be conducted before the PEIR is finalized. Please see **Response C_Breso-01**.

C_Noren1-02 This comment expressing support for alternatives that would avoid increases in diversions from the Tuolumne River is acknowledged. These alternatives include the Year-round Desalination at Oceanside Alternative (see Draft PEIR Vol. 4, Chapter 9, Section 9.2.6, p. 9-66) and the Aggressive Conservation/Water Recycling and Local Groundwater Alternative (Without Tuolumne River Supplement) (see Section 9.2.4, p. 9-47).

C_Noren1-03 This comment, which expresses support for more conservation and recycling as a means to meet water demand while minimizing impacts on the Tuolumne River, is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7. Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers.

C_Noren1-04 This comment, which expresses the commenter's opinion that agribusiness wastes more water than cities do, but that use and disposal of water by residences and businesses in cities requires more energy, and that water use must be addressed on both fronts, is acknowledged. Refer also to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7. Chapter 14, Section 14.2.3) for information on the specific conservation measures currently being implemented and those to which the SFPUC and its wholesale customers have committed under the WSIP. Regarding water use by the agricultural sector, the commenter may be interested to note that a component of the Modified WSIP Alternative involves the yearly transfer of *conserved* agricultural water from the Modesto and Turlock irrigation districts to the SFPUC (Vol. 4, Chapter 9, p 9-79).

C_Noren1-05 This comment expressing support for implementation of water saving technology and reducing water waste by agribusiness is noted. Regarding conservation under the WSIP, please refer to **Response C_Noren1-03**.

William Noren, 09/18/07

[See Public Hearing Transcript, Fremont, pp. 22-24]

C_Noren2-01 This comment expressing an opinion regarding sustainable resource management is acknowledged; as it does not address the adequacy or accuracy of the PEIR, no response is provided.

Margaret Okuzumi, 10/12/07

C_Okuzu-01 The comment states that a comprehensive study of baseline conditions must be conducted in order to properly analyze the impacts of the project on the upper Tuolumne River. Please refer to **Response C_Breso-01**. Please also refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7. Chapter 14, Section 14.5.9) for an explanation of the relationship between the average annual increase in purchase requests and the average annual increase in Tuolumne River diversions.

C_Okuzu-02 This comment opposes additional Tuolumne River diversions. The Draft PEIR includes a detailed analysis of the potential impacts of the proposed WSIP water supply and system operations on the Tuolumne River (Vol. 3, Chapter 5, Section 5.3). Section 5.3 addresses environmental resources that could be affected by the proposed water supply option and system operations: surface water hydrology, geomorphology, water quality, groundwater, fisheries and aquatic resources, riparian resources, recreational and visual resources, Delta water supplies, and energy. As indicated in Section 5.3.6 (beginning on p. 5.3.6-25), impacts to fishery resources in Hetch Hetchy Reservoir and Don Pedro Reservoir, and along the Tuolumne River between Hetch Hetchy Reservoir and Don Pedro Reservoir would be less than significant. Impacts to fishery resources along the Tuolumne River below La Grange Dam would be potentially significant, but would be reduced to less-than-significant levels with implementation of either Measure 5.3.6-4a (Vol. 4, Chapter 6, p. 6-48), or (if Measure 5.3.6a proves to be infeasible) Measure 5.3.6b (pp. 6-48 and 6-49). As indicated in Section 5.3.3 (beginning on p. 5.3-13), the effects of the WSIP on water quality along the San Joaquin River and the Sacramento-San Joaquin Delta would be less than significant. Further, as discussed in Section 5.3.8 (p. 5.3.8-23), the effects of the WSIP on recreational uses along the Tuolumne River would also be less than significant. Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7. Chapter 14, Section 14.5.9) for an explanation of the relationship between the average annual increase in purchase requests and the average annual increase in Tuolumne River diversions.

C_Okuzu-03 This comment, which expresses the commenter's opinion that the environmentally superior alternative is one that requires more conservation and recycling, rather than additional diversions from the Tuolumne River, and that the PEIR should reach this conclusion, is acknowledged. Alternatives that would reduce diversions from the Tuolumne River are described in the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). The Draft PEIR (Vol. 4, Chapter 9, p. 9-95 to 9-96) identified the Modified WSIP Alternative, which includes more conservation, water recycling and local groundwater projects than does the WSIP, as the environmentally superior alternative. Refer to pp. 9-95 to 9-96 for more information on the basis for identifying the Modified WSIP Alternative as the environmentally superior alternative. Please also refer to **Section 14.10, Master Response on Modified WSIP Alternative** (Vol. 7, Chapter 14, Section 14.10.3) for additional information.

The statement that the employment projections used to develop future demand estimates are inflated was submitted by numerous commenters and is responded to in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7. Chapter 14, Section 14.2.2). For information regarding the conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers please also refer to **Section 14.2** (Vol. 7. Chapter 14, Section 14.2.3).

Jenna Olsen, 09/20/07

[See Public Hearing Transcript, San Francisco City Hall, September 20, 2007, pp. 23-25]

C_Olsen-01 This comment expresses an opinion that San Francisco should strive to be a leading city in sustainable water management and encourages increased water efficiency and conservation. Please refer to **Response C_Clark1-16**.

Kay O'Neill, 09/19/07

C_ONeil-01 This comment, which expresses support for more conservation and recycling to meet water demand and opposition to additional diversions from the Tuolumne River, is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7. Chapter 14, Section 14.2.3), for information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers.

The commenter's opinion that agricultural and industrial water use needs to be reviewed and not subsidized is acknowledged. The proposed WSIP would involve neither agricultural subsidy nor use of water for agriculture. Regarding the implication that industrial water use is subsidized, note that the SFPUC and all but one of the wholesale customers implement California Urban Water Conservation Council Best Management Practice No. 4, Metering with Commodity Pricing, as shown in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7. Chapter 14, Section 14.2.3). For additional discussion of projected nonresidential water use refer to Section 14.2.2).

Ellie Owen, 09/05/07

[See Public Hearing Transcript, Sonora, p. 31]

C_Owen-01 This comment questions how the yield of water is calculated from a glacier and requests additional information regarding the coupled effect of drought and global warming. Please see **Section 14.11, Master Response on Climate Change** (Vol. 7. Chapter 14) for additional discussion of climate change to augment the discussion presented in Section 5.7.6 of the Draft PEIR (Vol. 3, Chapter 5, pp. 5.7-92 to 5.7-96).

Anne Pagliarulo, 09/20/07

C_Pagli-01 This comment, which expresses support for more conservation and recycling to meet water demand and opposition to additional diversions from the Tuolumne River, is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7. Chapter 14, Section 14.2.3) for information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers.

Doug Parkes, 09/29/07

C_Parke-01 This comment recommends that the SFPUC pursue a two-tiered approach that separates the seismic improvements from the proposed changes in water supply sources. Please refer to **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Section 14.1.5) regarding the integration of the seismic improvements and water supply option to meet program objectives, and for a discussion of the advantages of using a program EIR to evaluate the proposed program as a whole. (Note that the correct name of the proposed program is the Water System Improvement Program [WSIP], and not the Water Improvement Program ([WIP].)

C_Parke-02 This comment that the demand forecasts pay little attention to conservation or changes in the price of water requires clarification and is essentially incorrect. The estimated water *purchases* from the SFPUC (that is, the demand on the SFPUC regional system) consider conservation and the future price of water; refer to **Section 14.2, Master Response on Demand Projections, Conservation and Recycling** (Vol. 7. Chapter 14, Section 14.2.2). This comment correctly states that 4 percent of demand is expected to be met by conservation; this level refers to savings from active conservation programs to which the SFPUC and wholesale customers have committed. Draft PEIR

Table 3.3 (Vol. 1, p. 3-18) and Table 7.2 (Vol. 4, p. 7-15) show the estimated level of water conservation assumed in the purchase estimates submitted by each water customer. The average of the estimated range of conservation (13-19 mgd) represent about 4 percent of the total 2030 demand (417 mgd) for the service area. Note that an additional 36 mgd is expected to result from implementation of plumbing code requirements (or "passive conservation"). As part of the planning effort for the proposed program, the SFPUC, in conjunction with its wholesale customers and BAWSCA, conducted extensive studies—including technical studies on conservation and recycled water use potential. These studies are described in the Draft PEIR (Vol. 1, Chapter 3, pp. 3.16 to 3-22, and Vol. 5, Appendix E.2) and in **Section 14.2, Master Response on Demand Projections, Conservation and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) under the heading Background.

Regarding the statements in this comment about per-capita and outdoor water use; please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7. Chapter 14, Section 14.2.2), under the headings Per-Capita Demand and Outdoor Water Use, respectively.

C_Parke-03 This comment expressing support for more conservation and recycling to meet water demand and opposition to additional diversions from the Tuolumne River is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, Section 3.4.4, pp. 3-16 to 3-22). For descriptions of alternatives that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7. Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects proposed by SFPUC and its wholesale customers. Regarding the specific conservation measures currently being implemented and those to which the SFPUC and its wholesale customers have committed under the WSIP, refer to Section 14.2.

C_Parke-04 This comment, requesting that additional studies on the Tuolumne River, was submitted by numerous commenters; see **Response C_Breso-01** for response.

Kathy Perl, 09/20/07

C_Perl-01 This comment expressing support for more conservation, recycling, and desalination to meet water demand and opposition to additional diversions from the Tuolumne River is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7. Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers.

The Draft PEIR analyzes the use of desalination technologies as a supplemental water supply in the discussions for the Year-round Desalination at Oceanside Alternative (Vol. 4, Chapter 9, Section 9.2.6) and Variant 2 – Regional Desalination for Drought (Vol. 4, Chapter 9, Section 9.2.7). As indicated in Table 9-6 (pp. 9-14 thru 9-16), it is uncertain whether these two alternatives are capable of meeting all WSIP goals and objectives related to sustainability and the cost-effective use of funds, and these alternatives would only partially meet the WSIP objective of maintaining a gravity-driven system. Also, the Year-round Desalination at Oceanside Alternative would only partially meet WSIP objectives related to delivery reliability during planned maintenance. The commenter’s opinion that the planet is endangered by overpopulation is acknowledged.

Ron Pickup, 09/05/07

[See Public Hearing Transcript, Sonora, pp. 37-38]

C_Picku-01 This comment, which expresses support for more conservation and recycling to develop a more sustainable water supply, as many other cities have accomplished, and opposition to additional diversions from the Tuolumne River, is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7. Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers.

The statement that the “county of origin … has already provided you 20 million gallons per day [mgd] from our river” is incorrect. Please refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.5) and to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.6) for clarification regarding current and estimated future municipal and agricultural diversions from the Tuolumne River.

J. Poulton, 09/26/07

C_Poult-01 This comment incorrectly states that the proposed WSIP does not include conservation, and expresses support for alternatives that reduce Tuolumne River diversions. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). Alternatives to the WSIP that would reduce diversions from the Tuolumne River are described in the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7. Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects proposed by SFPUC and its wholesale customers.

Regarding the Draft PEIR consideration of impacts on the river or people living near it, the Draft PEIR (Vol. 3, Chapter 5, Sections 5.3.1 through 5.3.8) analyzed the effects of the WSIP on the hydrology, geomorphology, water quality, groundwater, terrestrial biology, fisheries, recreation, and visual quality of the Tuolumne River corridor. As described, implementation of the WSIP would result in several potentially significant adverse impacts on the Tuolumne River and its resources; the Draft PEIR identified mitigation measures to reduce these impacts to less-than-significant levels. Assuming this comment also refers to potential economic impacts, please refer **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 4, Section 14.1.6) regarding CEQA requirements related to economic evaluations, and the environmental effects that some commenters perceive could cause economic impacts for Tuolumne County residents, businesses, and tourism.

Paul Raffaeli, 10/01/07

C_Raffa-01 This comment opposing additional Tuolumne River diversions is acknowledged.

C_Raffa-02 This comment opposes additional Tuolumne River diversions and refers to the specific comments presented in Comments C_Raffa-03 through C_Raffa-12; refer to **Responses C_Raffa-03** through **C_Raffa-12** for the specific responses.

C_Raffa-03 The background information related to the Tuolumne River watershed corroborates information presented in the Draft PEIR (Vol. 3, Chapter 5, Sections 5.2 and 5.3). The range of current SFPUC diversions from the Tuolumne River presented in this comment is inaccurate. Please refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.5) and to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.6) for clarification regarding current and estimated future municipal and agricultural diversions from the Tuolumne River. Please also refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.9) for an explanation of the relationship between the average annual increase in purchase requests and the average annual increase in Tuolumne River diversions.

Regarding the statement that outdoor water use is driving 60 percent of the anticipated increase in water demand, refer to **Section 14.2, Master Response on Demand Projections, Conservation and Recycling** (Vol. 7, Chapter 14, Section 14.2.2), under the heading Outdoor Water Use.

C_Raffa-04 The comment that the Draft PEIR used flawed modeling to determine the anticipated increase in water demand, thus inflating future needs was submitted by numerous commenters and is responded to in **Section 14.2, Master Response on Demand Projections, Conservation and Recycling** (Vol. 7, Chapter 14, Section 14.2.2). The statement that the anticipated increase in demand projected by the SFPUC is “large and out of step” compared to other metropolitan areas also was submitted by numerous commenters and is responded to in **Section 14.2** (Vol. 7, Chapter 14, Section 14.2.3) under the heading Frequently Submitted Comments Addressing Conservation and Recycling.

C_Raffa-05 This comment states that there is a lack of adequate baseline data for the Tuolumne River to properly analyze the environmental consequences of additional diversions. Please refer to **Response C_Breso-01** for response.

C_Raffa-06 This comment states that the Draft PEIR does not take into consideration the impact of climate change on precipitation in the Tuolumne River watershed. Please refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14, Section 14.11.4) for information regarding current studies and models that are being used to forecast the effects of climate change on the SFPUC’s regional water system.

C_Raffa-07 These comments were submitted by numerous commenters and are responded to in **Section 14.2, Master Response on Demand Projections, Conservation and Recycling** (Vol. 7, Chapter 14, Section 14.2.3).

C_Raffa-08 This comment encourages the SFPUC to reduce its reliance on the Tuolumne River to protect the ecosystems and functions of the river and to prepare for uncertainties regarding climate change. Refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14, Section 14.11.5) for information regarding the effects of climate change on Tuolumne River water supplies.

C_Raffa-09 This comment states that "by pursuing a plan to divert additional water from the Tuolumne River, the SFPUC risks delaying their capital improvement program" among other things. Please refer to **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Section 14.1.5) regarding the integration of the seismic improvements and water supply option to meet program objectives, and for a discussion of the advantages of using a program EIR to evaluate the proposed program as a whole.

C_Raffa-10 This comment, stating that the SFPUC should re-evaluate their projections in light of flaws and inaccuracies, was submitted by numerous commenters. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation and Recycling** (Vol. 7, Chapter 14, Section 14.2.2) for response.

C_Raffa-11 These comments were submitted by numerous commenters; please refer to **Section 14.2, Master Response on Demand Projections, Conservation and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) regarding conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers and the study requested in this comment.

C_Raffa-12 This comment suggesting that the SFPUC adopt a policy of reducing diversions from the Tuolumne River is acknowledged.

C_Raffa-13 This comment requests that a comprehensive watershed study be completed in order to adequately assess the environmental impacts of the WSIP. Refer to **Response C_Breso-01,** above.

David Raube, 10/01/07

C_Raube-01 This comment, which expresses support for more conservation, recycling, and desalination to meet water demand and opposition to additional diversions from the Tuolumne River, is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers. The Draft PEIR analyzes the use of desalination technologies as a supplemental water supply in the discussions for the Year-round Desalination at Oceanside Alternative (Vol. 4, Chapter 9, Section 9.2.6) and Variant 2 – Regional Desalination for Drought (Vol. 4, Chapter 9, Section 9.2.7). As indicated in Table 9-6 (pp. 9-14 thru 9-16), it is uncertain whether these two alternatives are capable of meeting all WSIP goals and objectives related to sustainability and the cost-effective use of funds, and these alternatives would only partially meet the WSIP objective of maintaining a gravity-driven system. Also, the Year-round Desalination at Oceanside Alternative would only partially meet WSIP objectives related to delivery reliability during planned maintenance.

Mark Reedy, 09/19/07

C_Reedy-01 This comment, which expresses support for more conservation and recycling to meet water demand and opposition to additional diversions from the Tuolumne River, is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers. Regarding environmental sustainability, refer to **Response C_Clark1-16**.

Stefani Reichle, 09/05/07

C_Reich-01 This comment, which suggests that the Bay Area lags behind other metropolitan areas in terms of conservation and could instead be a leader in this area was submitted by numerous commenters and is responded to in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) under the heading Frequently Submitted Comments Addressing Conservation and Recycling.

Matthew Richardson, 09/06/07

C_Richa-01 This comment opposing additional Tuolumne River diversions is acknowledged.

C_Richa-02 This comment recommending additional public awareness programs to promote conservation is acknowledged. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) regarding the specific conservation measures currently being implemented and those to which SFPUC and its wholesale customers have committed under the WSIP.

C_Richa-03 This comment encouraging additional water conservation and recycling is acknowledged. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information on the recycled water potential studies that were conducted and recycling projects being implemented or proposed by the SFPUC and its wholesale customers.

C_Richa-04 This comment opposing the construction of new dams is acknowledged. The proposed program does not include the construction of new dams. The WSIP proposes implementation of two facility improvement projects that would retrofit two existing dams at Bay Area water supply reservoirs in order to meet seismic standards, protect public safety, and restore full, historical water storage capacity: the Calaveras Dam Replacement (SV-2) and Lower Crystal Springs Dam Improvements (PN-4) projects.

C_Richa-05 This comment expressing support for desalination technologies is acknowledged. Please refer to **Response C_BramlD1-02**.

Leah Rogers, 09/19/07

[See Public Hearing Transcript, Palo Alto, pp. 39-40]

C_Roger-01 This comment expresses an opinion about water consumption by industrial and agricultural uses. As this comment does not address the adequacy or accuracy of the PEIR, no response is needed.

Jim Ross, 10/03/07

C_Ross-01 See **Response C_Raffa-03**.

C_Ross-02 These comments have been submitted by numerous commenters and are responded to in **Section 14.2, Master Response on Demand Projections, Conservation and Recycling** (Vol. 7, Chapter 14, Section 14.2.3).

C_Ross-03 See **Response C_Breso-01**.

C_Ross-04 See **Response C_Raffa-06**.

C_Ross-05 These comments have been submitted by numerous commenters and are responded to in **Section 14.2, Master Response on Demand Projections, Conservation and Recycling** (Vol. 7, Chapter 14, Section 14.2.3).

C_Ross-06 See **Response C_Raffa-08**.

C_Ross-07 See **Response C_Raffa-09**.

C_Ross-08 The concerns reflected in this comment regarding demand projections and the level of proposed conservation were submitted by numerous commenters and are responded to in **Section 14.2, Master Response on Demand Projections, Conservation and Recycling** (Vol. 7, Chapter 14).

C_Ross-09 These comments were submitted by numerous commenters and are responded to in **Section 14.2, Master Response on Demand Projections, Conservation and Recycling** (Vol. 7, Chapter 14, Section 14.2.3).

C_Ross-10 See **Response C_Raffa-12**.

C_Ross-11 See **Response C_Raffa-13**.

Trish Rowe, 10/11/07

C_Rowe-01 This comment expressing an opinion regarding water usage and management is acknowledged. This comment also endorses a statement made by California Department of Fish and Game (CDFG) that is presented in Comment C_Rowe-02; refer to **Response C_Rowe-02** below.

C_Rowe-02 This comment is an excerpt from the comment letter submitted by CDFG on the Draft PEIR dated October 1, 2007. The full text of this letter can be found in Comment Letter S_CDFG2. This excerpt is contained within Comment S_CDFG2-05; refer to **Response S_CDFG2-05** for the specific response.

Ron Schmidt, 09/11/07

C_SchmiR-01 This comment opposing additional Tuolumne River diversions is acknowledged. Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.9) for an explanation of the relationship between the average annual increase in purchase requests and the average annual increase in Tuolumne River diversions.

Judy Schriebman, 09/25/07

C_Schri-01 This comment questioning the methodology used to project future water demand was submitted by numerous commenters and is responded to in **Section 14.2, Master Response on Demand Projections, Conservation and Recycling** (Vol. 7, Chapter 14, Section 14.2.2). Refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.9) for an explanation of the relationship between the average annual increase in purchase requests and the average annual increase in Tuolumne River diversions.

C_Schri-02 This comment opposing additional Tuolumne River diversions and supporting conservation and recycling is acknowledged. For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers. Regarding the Draft PEIR's consideration of the Tuolumne River's status as a federally designated Wild and Scenic River and potential impacts relevant to that designation, please refer to **Response L_Tuol1-09**.

Urs Schuler, 09/17/07

C_Schul-01 This comment, which expresses support for more conservation and recycling to meet water demand and opposition to additional diversions from the Tuolumne River, is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers.

Kelly Shea, 09/20/07

C_Shea-01 This comment which expresses concern about the environmental effects of the WSIP, opposition to additional diversions from the Tuolumne, and support for more conservation and recycling to meet water demand, and suggests that the Bay Area emulate conservation efforts in Seattle and Los Angeles, is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers.

John Simpkin, 09/14/07

C_Simpk-01 This comment expressing opposition to additional Tuolumne River diversions is acknowledged.

Ann Sloan, 09/06/07

C_Sloan-01 This comment expressing opposition to additional Tuolumne River diversions is acknowledged.

Evan Winslow Smith, 09/26/07

C_SmithE-01 This comment expressing support for seismic improvements to the regional water system but urging additional recycling and conservation is acknowledged. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for information on conservation programs and recycling projects proposed by SFPUC and its wholesale customers.

Paul Smith, 09/30/07

C_SmithP-01 This comment expressing an opinion regarding agricultural water use is acknowledged.

Cindy Spring, 09/25/07

C_Sprin-01 The commenter's opinion expressing concern regarding environmental impacts to the Tuolumne River and the associated habitat for fish and wildlife is acknowledged. Please refer to **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14) and **Section 14.7, Master Response on Lower Tuolumne Issues** (Vol. 7, Chapter 14) for additional discussion on WSIP-induced flow changes and their effects on public trust values.

C_Sprin-02 This comment on water conservation is acknowledged. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects proposed by SFPUC and its wholesale customers.

Peter Steinhart, 09/26/07

C_Stein-01 This comment criticizes evaluation of seismic improvements and the proposed water supply option as part of the same program. Please refer to **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Section 14.1.5) regarding the integration of the seismic improvements and water supply option to meet program objectives, and for a discussion of the advantages of using a program EIR to evaluate the proposed program as a whole.

C_Stein-02 These comments were submitted by numerous commenters and are responded to in **Section 14.2, Master Response on Demand Projections, Conservation and Recycling** (Vol. 7, Chapter 14).

C_Stein-03 This comment states that the discussion of potential impacts of global warming on the Tuolumne's future flows is inadequate and that the discussion shrugs off impacts as being similar under both the existing conditions and with the proposed program. Please refer to **Section 14.11**, **Master Response on Climate Change** (Vol. 7, Chapter 14, Section 14.11.4) for information on current studies and models that are being used to forecast the effects of climate change on the SFPUC's regional water system.

C_Stein-04 This comment requests for additional studies on the upper Tuolumne River and states that climate change coupled with increased diversions from the Tuolumne could result in significant impacts on the health of the Sacramento Delta and San Francisco Bay. Please refer to **Response C_Breso-01** for response related to the need for additional studies to analyze impacts. Please refer to **Section 14.11**, **Master Response on Climate Change** (Vol. 7, Chapter 14, Section 14.11.4) for a qualitative assessment of effects of the WSIP with consideration of climate change.

Jon Sturtevant, 09/05/07

[See Public Hearing Transcript, Sonora, pp. 36-37]

C_Sturt-01 This comment opposing additional Tuolumne River diversions and encouraging additional conservation and recycling efforts to serve future water demand is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2

through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Please also refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers and discussion regarding comparisons to other areas, which were submitted by numerous commenters.

Marc Sugars, 09/26/07

C_Sugar-01 This comment has been submitted by numerous commenters. Please refer to **Response C_Breso-01**.

C_Sugar-02 This comment, which expresses support for more conservation to meet water demand and opposition to additional diversions from the Tuolumne River, is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers and discussion regarding comparisons to other areas, which were submitted by numerous commenters. Regarding the effects of global warming on the Tuolumne River, refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14, Section 14.11.4).

Karen Sundback, 10/01/07

C_Sundb-01 This comment regarding Governor Schwarzenegger's support for the peripheral canal and questioning how water rights along the Tuolumne River would be affected if the peripheral canal were implemented is noted. This comment does not address the accuracy or adequacy of the Draft PEIR; no response is provided.

Barbara Symons, 09/20/07

C_Symon-01 This comment recommending that the SFPUC use a two-tiered approach that separates the seismic improvements from the proposed water supply option is acknowledged. Please refer to **Section 14.1, Master Response on WSIP Purpose and Need** (Vol. 7, Chapter 14, Section 14.1.5) regarding the integration of the seismic improvements and water supply option to meet program objectives, and for a discussion of the advantages of using a program EIR to evaluate the proposed program as a whole. Refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.9) for an explanation of the relationship between the average annual increase in purchase requests and the average annual increase in Tuolumne River diversions.

Jean Taylor, 09/06/07

[See Public Hearing Transcript, Modesto, pp. 26-27]

C_TayloJ-01 This comment opposing additional Tuolumne River diversions and expressing concern for the current condition of the Tuolumne River is acknowledged. Because this comment does not address the accuracy or adequacy of the Draft PEIR, no response is needed.

Scott Taylor, 10/01/07

C_TayloS-01 This comment opposing additional Tuolumne River diversions and supporting conservation and recycling is acknowledged. Refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers.

M. Teves, 09/19/07

C_Teves-01 This comment supporting conservation is acknowledged. The suggestion that conservation is not included in WSIP planning is incorrect. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in

Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information on the conservation and recycled water potential studies that were conducted and the conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers.

Betsy Thagard, 09/25/07

C_Thaga-01 This comment expressing an opinion that the SFPUC should adopt a policy to reduce diversions from the Tuolumne River is acknowledged.

C_Thaga-02 These comments were submitted by numerous commenters. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation and Recycling** (Vol. 7, Chapter 14, Section 14.2.3). The commenter's suggestion to reduce withdrawals from the Tuolumne River over time is acknowledged.

Julia Thollaug, 09/11/07

C_Tholl-01 This comment opposing additional Tuolumne River diversions and expressing concern for the Tuolumne River is acknowledged. Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.9) for an explanation of the relationship between the average annual increase in purchase requests and the average annual increase in Tuolumne River diversions.

Dennis Thomas, 05/02/07

C_Thoma-01 Regarding the Draft PEIR's consideration of the Tuolumne River's status as a federally designated Wild and Scenic River and potential impacts relevant to that designation, please refer to **Response L_Tuol1-09**. The comments in support of meeting additional water demands through conservation and recycling and drawing comparisons to other areas were submitted by numerous commenters and are addressed in **Section 14.2, Master Response on Demand Projections, Conservation and Recycling** (Vol. 7, Chapter 14, Section 14.2.3).

Tibor Toth, 09/04/07

C_Toth-01 Regarding potential impacts to the Delta from increased diversions from the Tuolumne River, refer to **Section 14.8, Master Response on Delta and**

San Joaquin Issues (Vol. 7, Chapter 14, Section 14.8.2). As stated in that section, impacts on the Delta attributable to the WSIP were determined to be less than significant.

C_Toth-02 This comment opposing additional Tuolumne River diversions and supporting desalination technologies is acknowledged. Please refer to **Response C_BramlD1-02**.

Marianna Tubman, 09/26/07

C_Tubma-01 This comment stating that the future demand estimates used in the WSIP PEIR are based on inflated projections was submitted by numerous commenters and is responded to in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.2). This comment also states that the WSIP does not do enough to protect the Tuolumne River and other watersheds. The Draft PEIR includes a programmatic evaluation of the environmental impacts of the proposed facility improvement projects by topical area (Vol. 2, Chapter 4). A project-level evaluation of the potential environmental impacts of the proposed additional Tuolumne River diversions and changes in regional water system operations are organized by watershed in the Draft PEIR (Vol. 3, Chapter 5). Several potentially significant impacts were identified and mitigation measures developed to reduce the impacts to a less-than-significant level.

C_Tubma-02 This comment, which expresses support for more conservation to meet water demand, opposition to additional diversions from the Tuolumne River, and the opinion that fish and plant life need the water more than people, is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers. Regarding the effects of climate change on the Tuolumne River, refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14, Section 14.11.4). Regarding the effects of the WSIP on fish and plant life, the Draft PEIR (Vol. 3, Chapter 5, Sections 5.3.1 through 5.3.8) analyzed the effects of the WSIP on the hydrology, geomorphology, water quality, groundwater, terrestrial biology, fisheries, recreation, and visual quality of the Tuolumne River corridor. As described, implementation of the WSIP would result in several potentially significant adverse impacts on the Tuolumne River and its resources; the Draft PEIR identified mitigation measures to reduce these impacts to less-than-significant levels.

C_Tubma-03 This comment, expressing the commenter's belief that population in the area will not increase significantly due to housing prices is acknowledged. The methodology used to project future demand, which involved selection of a published population projection source, is described in Draft PEIR Chapter 3 (Vol. 1, pp. 3-16 to 3-21) and described in more detail in Appendix E.2 (Vol. 5). As described in Draft PEIR Chapter 7 (Vol. 4, p. 7-34), growth in many of the jurisdictions served by the SFPUC is expected to be accommodated by infill development, redevelopment, and increasing densities, as this comment suggests. There are some exceptions to this; some new housing in several areas[4] is expected to be on comparatively large lots with more landscaping and higher water use (refer to Vol.5, Appendix E.2, pp E.2-7 to E.2-9).

C_Tubma-04 This comment, which urges promotion of aggressive conservation measures and watershed protection, is acknowledged. The Draft PEIR (Vol. 4, Chapter 9) evaluates various supplemental water supply alternatives involving more conservation and water recycling (see the Aggressive Conservation/Water Recycling and Local Groundwater Alternative, Sections 9.2.4 and 9.2.5). Please also refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers.

Kristen Tucker, 09/11/07

C_Tucke-01 This comment opposing additional Tuolumne River diversions and supporting conservation and recycling is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR:

[4] For example, the demand model was adjusted for Estero Municipal Improvement District, Hayward, and Milpitas to include new account categories for new residences on larger lots with higher water use levels than current residences, and model adjustments were made for Purissima Hills Water District and Santa Clara to reflect observed higher water use rates for newer single family residences. (Refer also to Comment L_Milpitas-13 and **Response L_Milpitas-13** regarding the city's commitment to smart growth and the Draft PEIR information on model adjustments.)

Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers.

Unreadable commenter name, 09/20/07

C_Unreadable1-01 The comment regarding the need for more conservation to meet water demand and conservation achievements in other urban areas was submitted by numerous commenters; please refer to **Section 14.2, Master Response on Demand Projections, Conservation and Recycling** (Vol. 7, Chapter 14, Section 14.2.3)**.** Regarding the location of the SFPUC service area, refer to Draft PEIR Figure 3.2 (Vol. 1, Chapter 3, p. 3-6); as shown, the service area includes portions of the South Bay and San Francisco Peninsula in addition to portions of the East Bay and San Francisco. Regarding specific projections of future demand and purchases from the SFPUC regional system, refer to Table 3.3 or Table 7.2 (Vol. 1, Chapter 3, p. 3-18 and Vol.4, Chapter 7, p. 7-15, respectively). Table 7.3 (Vol. 4, Chapter 7, p. 7-18) includes information on projected increases in demand and purchases from the 2001 base year used in the demand projections. Regarding the effects of climate change on the Tuolumne River, refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14).

Unreadable commenter name, 08/15/07

C_Unreadable2-01 This comment opposing additional Tuolumne River diversions is acknowledged.

Unreadable commenter name, 09/20/07

C_Unreadable3-01 This comment, which expresses support for conservation and opposition to additional diversions from the Tuolumne River, especially for outdoor use, is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to

9-78). Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for more information regarding conservation to address outdoor water demand and conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers.

Unreadable commenter name, 08/15/07

C_Unreadable4-01 This comment expressing opposition to additional diversions from the Tuolumne River and support for conservation and recycling to meet demand is acknowledged. The statement that the increased diversion under the WSIP would be used only to water lawns is incorrect. Refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14) regarding the percentage of additional demand that would be for outdoor use, as well as information on conservation and recycling measure being implemented or planned in the SFPUC service area. Please refer to **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14, Section 14.5.9) for an explanation of the relationship between the average annual increase in purchase requests and the average annual increase in Tuolumne River diversions.

Unreadable commenter name, 08/15/07

C_Unreadable5-01 This comment opposing additional Tuolumne River diversions is acknowledged.

Matthew Urdan, 09/27/07

C_Urdan-01 This comment has been submitted by numerous commenters. Please refer to **Response C_Breso-01**.

C_Urdan-02 This comment expressing support for more conservation and recycling to meet water demand and for alternatives that protect the Tuolumne River from additional diversions is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, Section 3.4.4, pp. 3-16 to 3-22). For descriptions of alternatives that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Please refer to **Section 14.2, Master Response on Demand**

Projections, Conservation, and Recycling (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers.

Paul Vadopalas, 10/01/07

C_Vadop-01 This comment opposing additional Tuolumne River diversions and supporting desalination technologies is acknowledged. Please refer to **Response C_BramlD1-02**.

Jim Vermeys, 09/30/07

C_VermeJ-01 This comment, which expresses support for more conservation and recycling to meet water demand and opposition to additional diversions from the Tuolumne River, is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers. Regarding the request to “take a better look” at environmental impacts, please refer to **Response C_Breso-01**.

Karen Vermeys, 09/24/07

C_VermeK-01 This comment opposing additional Tuolumne River diversions is acknowledged.

Ashleigh Voyikes, 08/15/07

C_Voyik-01 This comment opposing additional Tuolumne River diversions is acknowledged.

Leo Vrana, 09/20/07

C_Vrana-01 This comment expressing support for more conservation and recycling to meet water demand and opposition to additional diversions from the Tuolumne River, is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers and discussion regarding comparisons to other areas, which were submitted by numerous commenters.

C_Vrana-02 This comment requesting that CCSF take the proper steps to make the Bay Area a leader in water conservation is noted; please refer to **Response C_Vrana-01**.

Patricia Walker, 10/13/07

C_Walke-01 This comment expresses concern that the proposed water supply option may delay implementation of seismic improvements to the regional water system. Please refer to **Section 14.1, Master Response on WSIP Purpose and Need**, (Vol. 7, Chapter 14, Section 14.1.5) regarding the integration of the seismic improvements and water supply option to meet program objectives, and for a discussion of the advantages of using a program EIR to evaluate the proposed program as a whole.

C_Walke-02 The first part of the comment stating that the SFPUC should take the lead in reducing water demand by implementing more stringent water conservation measures is acknowledged. Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information on conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers. The second part of the comment states that the Draft PEIR fails to address the environmental impacts associated with the increased diversion of water from the Tuolumne River, including the projected reduction in flows due to reduced snowpack. The Draft PEIR (Vol. 3, Chapter 5, Sections 5.3.1 through 5.3.8) analyzed the effects of the WSIP on the hydrology, geomorphology, water quality, groundwater, terrestrial biology, fisheries, recreation, and visual quality of the Tuolumne River corridor. As described, implementation of the WSIP would result in several potentially significant adverse impacts on the Tuolumne River and its resources; the Draft PEIR identified mitigation measures to reduce these impacts to less-than-significant levels. Refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14, Section 14.11.4) for information regarding current studies and models that are being used to forecast the effects of climate change on the SFPUC's regional water system.

C_Walke-03 This first part of this comment was submitted by numerous commenters and is responded to in **Section 14.2, Master Response on Demand Projections, Conservation and Recycling, of this Comments and Responses Document** (Vol. 7, Chapter 14, Section 14.2.3) under the heading Frequently Submitted Comments Addressing Conservation and Recycling. The second part of this comment, which states that the PEIR does not address the potential to increase water supplies by water recycling, is incorrect. As shown in Draft PEIR Table 3.3 (Vol. 1, Chapter 3, p. 3-18), the 2030 purchase estimates prepared for the WSIP reflect 9-14 mgd in recycled water supply.

Pete Wallstrom, 09/27/07

C_Walls-01 This comment opposing additional Tuolumne River diversions is acknowledged.

C_Walls-02 This comment expresses support for the CEQA alternatives that would not include additional Tuolumne River diversions and that would promote additional conservation, efficiency, and recycling to prevent the need for additional Tuolumne River diversions. For a discussion of the alternatives evaluated in the Draft PEIR that do not include additional diversions from the Tuolumne River, refer to the descriptions of the Year-round Desalination at Oceanside Alternative (Vol. 4, Chapter 9, Section 9.2.4), and Aggressive Conservation/Water Recycling and Local Groundwater Alternative (Without Tuolumne River Supplement) (Vol. 4, Chapter 9, Section 9.2.6). Refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information regarding conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers.

Richard Weiss, 09/26/07

C_Weiss-01 This comment asserts that the Draft PEIR fails to adequately address environmental impacts to the Tuolumne River and urges SFPUC to conduct additional studies of the Tuolumne River before finishing environmental review of the WSIP. See **Response C_Breso-01**.

C_Weiss-02 This comment expressing support for the CEQA alternatives that would not include additional Tuolumne River diversions and that would promote additional conservation, efficiency, and recycling to prevent the need for additional Tuolumne River diversions is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For a discussion of the alternatives evaluated in the Draft PEIR that do not include additional diversions from the Tuolumne River, refer to the descriptions of the Year-round Desalination at Oceanside Alternative (Vol. 4, Chapter 9, Section 9.2.6, p. 9-66) and Aggressive Conservation/Water Recycling and Local Groundwater Alternative (Without Tuolumne River Supplement) (see Section 9.2.4, p. 9-47). Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers.

Bart Westcott, 09/12/07

C_Westc-01 This comment opposing additional Tuolumne River diversions is acknowledged.

Doris Williams, 09/25/07

C_Willi-01 This comment, which expresses support for more conservation and recycling to meet water demand and opposition to additional diversions from the Tuolumne River, is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to

9-78). Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects proposed by SFPUC and its wholesale customers.

C_Willi-02 The statement that the demand modeling was flawed was submitted by numerous commenters and is responded to in **Section 14.2, Master Response on Demand Projections, Conservation and Recycling** (Vol. 7, Chapter 14, Section 14.2.2). Please also refer to the discussion of comparisons to other areas in Section 14.2 (Vol. 7, Chapter 14, Section 14.2.3), under the heading Frequently Submitted Comments Addressing Conservation and Recycling.

C_Willi-03 This comment has been submitted by numerous commenters; please refer to **Response C_Breso-01**.

C_Willi-04 This comment states that the Draft PEIR does not take into consideration the impact of climate change on precipitation in the Tuolumne River Watershed and recommends decreasing reliance on the Tuolumne River. Please refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14, Section 14.11.5) for information regarding current studies and models that are being used to forecast the effects of climate change on the SFPUC's regional water system.

C_Willi-05 This comment has been submitted by numerous commenters and is responded to in **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) under the heading Frequently Submitted Comments Addressing Conservation and Recycling.

Polly P. Wingfield, 09/11/07

C_Wingf-01 This comment opposing additional Tuolumne River diversions is acknowledged.

Elizabeth Wolf, 09/24/07

C_Wolf-01 This comment requests that more research be done before the PEIR is finalized. As this comment does not specify the particular issue(s) in which the commenter believes the analysis presented in the Draft PEIR is inadequate, no specific response is provided.

Benita Zimmerman, 09/28/07

C_Zimme-01 This comment, which expresses support for more conservation and recycling to meet water demand, opposition to additional diversions from the Tuolumne River, and support for a sustainable water plan, is acknowledged. The 2030 purchase estimates prepared for the WSIP reflect 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Vol. 1, Chapter 3, pp. 3-16 to 3-22). For descriptions of alternatives to the WSIP that would reduce diversions from the Tuolumne River, refer to the following sections in Chapter 9 (Vol. 4) of the Draft PEIR: Sections 9.2.2 through 9.2.4 (pp. 9-23 to 9-59), and Sections 9.2.6 and 9.2.7 (pp. 9-66 to 9-78). Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3) for additional information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers.

This comment also expresses concern that any more water diversions would threaten the entire ecosystem in the Bay Area The Draft PEIR (Vol. 3, Chapter 5, Sections 5.3.1 through 5.3.8) analyzed the effects of the WSIP on the hydrology, geomorphology, water quality, groundwater, terrestrial biology, fisheries, recreation, and visual quality of the Tuolumne River corridor. As described, implementation of the WSIP would result in several potentially significant adverse impacts on the Tuolumne River and its resources; the Draft PEIR identified mitigation measures to reduce these impacts to less-than-significant levels. Please see **Section 14.6, Master Response on Upper Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.6.5) and to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.6) for clarification regarding current and estimated future municipal and agricultural diversions from the Tuolumne River.

15.6 Form Letters

FORM LETTERS

CITIZENS WHO SUBMITTED FORM LETTER COMMENTS ON THE DRAFT PEIR

Form 1

Keren Abra
Tom Adams
Karen Boudreaux
Katie Bramlett
Eric Brooks
Susan Burgenbauch
Leslie Chew
Nick Colin
John Cordes
Colette Crutcher
Michael/Tom Duncan/Richard
Don Ehrlich
Don Eichelberger
Ruben Garcia
Peter Gass
Julian Giardinelli
Richard and Valerie Girling
Sami Goski
Barry Hermanson
Carole Herron
Lia Hillman
Mark Jones
Cassandra Kyle
Gary Laufman
Joseph and Vicki/John
Leidner/Radogno
Victoria Lewis
Kirk Lumpkin
Michele Luncy
Laurie McCann
Mary L. McDonnell
Sara Meghrouni
Gale Melton
Mariella Mey
Mark Mills-Thysen
Elan Minvielle
Denis Mosgofian
Kevin Neeson
Chad Nichols
Lauren Nickell
Erica Pederson
Ed Pike
Kevin Rayhill
Dorothy Reinhardt
Janine Richman
Mija Riedel
Hedi Saraf
Patrick Schmitz
Kent Schneeveis
Tara Schubert
Peter, Bonnie, Benard Seidman
Kate Stepan
Maury and Susan Stern
Olav Strawe
Megan Sullivan
Allen Todd
Terry A. Trumbull
Catherine Vowles
Tes Welborn
J. Wong
Ebbe Roe Yovino-Smith

Form 2

Alice Abbott
Bashir Abdullah
Trip Adler
Monika Aeschbacher
Joshua Agan
Bunardi Aiechlanski
Robert Alna
Trudy Alter
Lydia Alva
Bylgia Amadour
Susan Amden
Anna Andersen
Sara Anderson
B.J. Anderson
Kyle Anderson
Theresa Andrews
Max Andrews
Mitchell Aourls
Gary Apter
Lisa Arena
Joe Aristo
Marilyn Arnest
David Artis
Elizabeth Ashcroft
Lani Asher
Nicola Atkins
Laura Atkins
Sarikka Attoe
Sylvia Augustiniok
N. Ausschnitt
Vai Aven
Phyllis Ayer
Richard Babb
J. Bacani
Samuel Bagdorf
Shaun Bailey
Marilyn Bair
John Baker
Yvonne Baker
William Baker
Marilyn Bancel
Teresa Baom
Linda Barnett
Randall Barry
Dirk Bartels
Gail Bartlett
Jason Baum
Nikki Beach
Bruce Beal
Devena Beal
Blanche Bebb
Jessica Bell
Nikki Bengal
Lawrence Bernard
Nellie Bertucci
Max Betkouski
James Biggs
Jon Birnbaum
Sandra Bishop
Gillian Blair
Alex Blanchad
Dian Blomquist
Phil Bloomfield
Ron Boeck
Jordan Bogash
Raymond Bohn
Mitchell Bonner
Sherry Boschert
Sherry Boschert
Alex Boyd
John Boyes
Ava Breembaum
William Breen
Kristina Brennan
Janet Brewer
Simone Brille
Carlos Brito
Ralph Brott

CITIZENS WHO SUBMITTED FORM LETTER COMMENTS ON THE DRAFT PEIR (Continued)

Form 2 (cont.)

Bruce Brown
Maureen Brown
Geoffrey Brown
Tom Browne
Mary Browne
Kent & Jennifer Brownlow
Jordan Brownwood
William Bryant
William Bryant
Lynne Buchholz
Flavia Buda
Michael Buel
Brad Buethe
Ann Burke
Jean Burkhead
Adam Burnett
Jacklyn Button
Davis C
Paul Cahill
Benjamin Caldwell
Susan Calender
Robert Campbell
Matt Campbell
Isaac Campbell
Amy Canalino
Robert Cangelosi
Alma Canindin
Elizabeth Carbajal
Marion Cardinal
Arthur Carey
Caitlin Carini
Rebecca Carino
Hugnette Carleton
Lance Carnes
Kathleen Casey
Gloria Catricala
Leslie Cele
Andria Cercio
Arthur Cerf
Lauren Cha
Lyzanan Chaires
Chan
Kelly Chang
Anne Chang
Loretta Chardin
Elvina Charley
Pearl Chen
Eric Chesmar
May Chin
Karen Christenson
Jonah Christian
Winston Christian
Pelletier Christiane
Kerry Chung
Jesse Church
Mike Burbank Cindy Roberts
Scott Clark
Jackson Clawson
Judy Clayton
Laurence Clement
Nancy Coe
Steven Cohen
Kimberly Cohen
K. Colburn
Dan Coleman
Caroline Coleman
Christopher Concolino
John Conley
Jean Conner
J. Maureen Cook
Gibbons Cooney
Alison Corson
James Corwin
Scott Corwin
Jesse Costello-Good
Curtis & Debi Cournale
John Cowan
Carolyn Crampton
Mr. & Mrs. William Crowe
Elizabeth Curda
John Curran
Tonette Cyprien
Chris Czerkies
Maria Dais
Peter Dalton
Micheal Daly
Tina Dang
Denise D'Anne
Clayton Dart
Michelle Davidson
Sierra Davidson
Ludmilla Davis
George Davis
Claude Davis
Ian Dedrick
Carole Deeb
Matthew Denckla
Martin Denefeld
Sherley Denney
Gertrude Denney
Ernest Dernburg
Ray & Helen Desai
Peter Desmond
Madeline Dessat
Deirdre Devine
Maria Dichov
Matt Dietz
Mark Dillan
Jacqueline Dion
Sofia DiPadova
Ralph DiPadova
Okori Dixon
Fumiko Docker
Claudia Doerr
Janelle Dong
E. Donnelly
Justin Dorsey
Robert Dower
Annie Du
Maria Ducey
Larey Dunn
S. J. Dunne
Mary Dunning
Natalia Dusov
Betty Cornell Eberhardt
Harvey Eckmann
Tom Eckstrom
Scott Edwards
David Egert
Lynne Eggeri
Charlie Scott Elaine Michaud
Gretchen Elliott
Scott Ellis
Jessica Ellis
Ernest Ely
John Emami
Jeri Engstrand
Aviva Enoch
Julie Enright
Jack Ermen
John Erskine
John & Leigh Escobedo
J. Esfacio
Jonathen Esillies
Chris Esparcia
Douglas Estes
Mark Evans
Debra & Brad Evans
Maxamilienne Ewalt
David Fairley
Deborah Farkas
Carol Farley
Geoff Farrell
Alice Farrelly
Michael Fay
Marla Feher
Gavin Feiger
Mike Fernandez
Ron Ferrato
Kristina Fialova
David & Audrey Fielding
June Finis
Raul Fion
Eve Fisher
E. Fleming
Paul Flores
Stephen Follansbee
Susan Ford
Muriel Forlerer
Michael Fornalski
Chiara Fox
Elizabeth Franczak
Ellen Frank
Martina Frank
Deborah Frankel
Mark Freeman
Elena Freiwald
Yee-chung Fu
Genevieve Fujimoto
Ryan Gamlin
Andrea Gara
Albert Garcia
Tamayer Garcia
Kevin Garden
Michele Garside
Claudia Gaytan
Anne-Marie Gearhart
Arlene Getz
Sean Gibson
Rose Gillen
Judy Ginsburg
Justin Glosvenor

CITIZENS WHO SUBMITTED FORM LETTER COMMENTS ON THE DRAFT PEIR (Continued)

Form 2 (cont.)

Randall Goetsl
Kristina Goldberg
Jim Goldstein
David Gonzalez
Chris Goodfellow
Deborah Goodson
Jazmin Gorge
Kevin Gottesman
Erica Gould
Robbie Gould
L. Gourley
Don Graham
T.J. Grasshoff
David Gray
Debra Green
Pamela Green
D. Green
Lyn Grigonis
Bill Grindell
L. Grithner
Paul Groose
M.Bruce Grosjean
Lee Grygo
Daniel Guaraldi
Maijala Guerr
Judith Guerriero
George Guie
Pearl Gunsell
Morgan Gwynn
Ursula Haas
Lucile Hackett
Jessica Hahn
Robert Hall
Thomas Hall
Samuel Hall
Brittany Hall
Dean Halpern
F. Hammer
Nedzada Handukic
Jim Hannah
Kristin Hansen
Aimee Harcos
Gabriel Harlow
Craig Harmer
Lisa Harms
Tom Harold
Richard Harrigan
Richard Harrigan
Jill Harris
Tina Harris
Janet Harrison
R. Hayden
Elizabeth Haylock
Loie Hayward
Craig Hecker
Michelle Hecnt
Tim Heiman
Bob Henderson
Corey Hennessy
Ann Henry
Karen Herman
Gustavo Hernandez
Donald Heyneman
John Hicks
Maggie Hill
Mary Hill
Frederick Hirth
Frederick Hirth
Nan Ho
Phillip Hoehn
Mr. & Mrs. William Hogan
Bettie Holaday
Edward Holden
Donald Holley
Jan & Maurice Holloway
Thelma Holmer
Arune Hoover
Cornelia Hoppe
Inge Horton
Carmen Horton
Julia Horvath
Leonard Horwitz
Mark Hotsenpiller
Deborah Howard-Page
Edward Howden
Julianne Howe
Keith Howell
Ying Hsiao
Vicky Huang
Sarah Hudson
Ellen Hughes
Joan & Jack Hughes
Sarah Hummingbird
Karyn Hunt
David Hunter
Lisa Hunter
Carolyn Hutchinson
Lois Hyatt
Jennifer Hymp
Mara Iaconi
Sacha Ielmorini
Eva Ihle
Monica Incerti
Al Inddicato
Hretna Ingadottir
Ernesto Inuro
Rosa Iversen
Zach Ives
Gwendolyn Jacobsen
John Jameson
Denise Jameson
Roy Jarl
Patty Jaundzems
Yari Jeada
Gerald Griffin Jean Clements
Sara Jobin
Diana Scott Joel Schechter
Barbara Johnson
Beverly Johnson
Wiebke Johnson
Linda Jolie
Lori Jones
Jerone Jones
Robin Jones
Myra Jones-Taylor
S. Jordan
Richard Jorgensen
Derek Jostad
Barbara Jue
Marlena Jury
Lisa Kadyk
Eve Kamakea
Elizabeth Kaplan
Jane Kastner
Paula Katz
Fran Kearney
James Keeffe
Audra Kefe
Larry Kelleher
Erwin Kelly
Joan Kelly
Kerri Kelting-Leslie
Wilbert Kemp
Nancy Kenyon
Sabrina Kesler
Sanjay Kewlani
David Keyes
Daniel Kim
Jana King
James Kinsinger
John Kliment
Joseph Knight
Eni Knight
Barbara Kockerols-Alvarez
Carolyn Koester
Blanche Korfmacher
Ana Kreo
Brooke Krohn
Godelieve Kuppens
Amy Kyle
Alex Labanda
Matt Lafferty
Tomi Lahdesneki
Heather Laing-Obstbaum
Theresa Lamb
Theresa Lamb
Barbara Lane
Patricia Langdell
Nechama Langer
Lanoir
Steven Lanum
Melissa Laulle
Curt Lawson
Gary Lea
Alice Leach
Elizaberth Leaf
Joan Leaf
Joan & Elizabeth Leaf
Kelly Leber
Gloria Lee
Preey Lehartowicz
Troy Leone
Salvatore Lesata
David Lesseps
Linda Lewin
Deborah Lewis
Erin Li
Alan Li
Eric Liaw
Harry Lieberman
Lori Liederman
Clifford Liehe

CITIZENS WHO SUBMITTED FORM LETTER COMMENTS ON THE DRAFT PEIR (Continued)

Form 2 (cont.)

Ho Lin
Irving Lind
Sara Lind
Inavk Linenthal
Lawrence Lipkind
Kelly Liu
Alyss Lochen
Brice Lockord
Esther Lomeli
Jean Long
Jacques Longval
Gary Lopez
James Lovette-Black
Patrisha Lowder
Molley & Rich Lowry
Marshall Luck
Nancy Ludcke
Patricia Luddington
Oscar Luna
Torborg Lundell
T.J. Lupis
Kim Lynn
Barbara Lyon
Xiue Ma
Regina Macias
Gwynn MacKellen
Mary Mackin
Miles Madison
Paul Malhin
Karen Malm
Maria Mansi
Ron Mantingh
Bruce Marcucci
Barbara Margolis
Eli Marias
Maria Markoff
Ziliana Martinez
Marcello Martinez
Joseph Martinez
Eric Wells Maryanne Razzo
Caryn Mason
David Massen
Elisabeth Matkin-Sullins
Mary Matrux
Erna Matula
Kelly Maughan
Seth Mausner
Lawrence Maxwell
Alan McAllister
Scarlett McCahill
Michelle McCarron
K. McClune
Alexandra McCormack
Tracey McCormick
Brian McCracken
Norine McCulley
Mary McDonnell
Allison McDonough
R. McEachern
Doyle McGolden
K. McKenna
John McKenna
Bill McLaughlin
Judith McManigal
Joseph Meant
Guadolupe Mecron
Dorothy Medlin
Sue Mehrings
Karen Menuz
Carmen Meraza
John Merchant
Michael Merk
Fred Merrick
Barbara Messmore
Brad Meyers
Chad Michel
Chad Michel
Nica Michoch
Florence Miller
Christine Mills
David Milne
Kala Milosevich
David & Nancy Milton
Buffy Mitchell
Miryum Mochkin
Julian Montellanos
Montez
E. Mooney
Jubilith Moore
Alberto Moran
Joe Moriarty
Colin Morris
Richard Morris
John Morris
Richard Morris
Dennis Mosgofian
Karen Mount
Klaus Muehlmann
Gloria Mundt
Geraldine Murphy
Joanna Murphy
Elizabeth Murrens
Chloe Lewis Myles Conley
Robert Myska
Louise Nakamura
Katrina & Peter Nardini
Julia Nash
Bill Nasser
Jonas Nattoom
Lawrence Nelson
Suzanne Nelson
Vanessa Nelson
Fiya Nelson
Troy Nergaard
Denny Ng
El Ng
Lan Ngo
Marilyn Nichols
Noreen Nieden
Stephanie Niemann
Caitlin No Name Entered
Willard Norley
David Nuegowski
Zilma Nuns
Jessica Nusbaum
Eric Nyman
William O Arge
Patricia O' Neill
Vera Obermeyer
Melody O'Donnell
Claudine Offer
O'Finnegan
Austin Okane
Megan O'Leary
Andrea O'Leary
Pamela Olson
Maureen O'Neal
Eing Ong
Gene O'Ovidio
Trudy Opitz
John O'Reilly
Nicole Osborn
Chris Oshaben
Duke Otoshi
Carolyn Ozarchuk
Paula Page
M. Pains
Jean Palmeter
Sophia Papageorgiou
Holly Pataki-Bettin
Ruth Patschhkowski
Jay Patton
Jon Gatto Paul Colfer
Eli Payton
Sebastian Peck
John Pendleton
Anita Pereira
Tina Perez
Adele Perez
Marco Antonio Perez
Jack Perkins
Dana Perrigan
Jeffrey Perrone
Chris Petaja
Stefanie Peter
Faith Petric
Beth Pewther
Andrea Pfaff
Greta Phillips
Tim Phillips
Susannah Phillips
Nora Phillips
Maryte Piazza
Marianna Pieck
Patricia Pierce
Ed Pike
Alex Pineda
Nancy Piotrowski
John Piva
Wendy Poinsor
Benito Polo
P.D. Poole
Luke Powell
Laurle Prescott
Mariah Price
Louis Prisco
Lisa Prochello
Megan Pruiett
T. Przybeck
Judith Pynn
Brad Quarstrom
Carlos Quintanilla

CITIZENS WHO SUBMITTED FORM LETTER COMMENTS ON THE DRAFT PEIR (Continued)

Form 2 (cont.)

Gina Quintinilla
JC Rafferty
Lynn Ragghianti
Gaylin Raisler
Lord Ramsey
Sanjay Ranchod
Stephen Randall
Rebecca Rankin
Martin Ratcliff
Charles Rathbone
Patricia Reid
Dale Reihart
D.J. Reilly
M. Reynolds
Judy Reynolds
Jeanne Rice
Gary Richmond
Samantha Rieter
Lillyane Rietmann
Jose Rios
Olga Rios
Michael Ritter
Micca Rivera
Deborah Robbins
Rachel Galsoul Robert Halsy
Lois Roberts
Robin Roberts
Betty Roi
David Romaro
Eddy Rose
Eunice Rosenberg
Isadore Rosenthal
Mitzi Ross
Janet Rossi
Antonio Rossi
Bruce Rueppel
Olivia Ruiz
Kris Spangler Ruth Schlesinger
Patricia Rutherford
Michael Ryan
Frank Ryan
M. Ryan
Carina Ryan Wechsler
Rob Rynski
Mitchell Sacks
Jason Salfi
Kadie Salfi
Canyon Sam
Oscar Samarran
Manuel Sanchez
Xenia Sanders
Luis Santiago
Melissa Sarenae
Lauren & Matt Satlak
Giancarlo Scalise
Joel & Laine Schipper
Susan Schneider
Michele Schoal
David Schott
David Schott
Brigitte Schulz
Edward Schuster
David Scortpimo
Jeanie Scott
Pamela Scrutton
Kinney Shah
Louis Bennett Shauna Sadowski
Cynthia Shaw
Daniel & Helen Sheehan
Kenneth Sherey
Brian Sherry
Tina Shih
Mary Lynn Shimek
Suzanne Shinkle
Esther Shon
Steve Shovelind
Brad Shutzberg
Dano & Elizabeth Silva
Kenneth Silveria
Robert Simac
Case Simmons
Adam Simonoff
Michael Simpson
Marcia Sitaske
Dorothy Skylok
Suellen Sleamaker
Ray Sloan
Susan Smith
Kris Smith
G. Austin Smith
J. Smith
Emily Smith
Aura Smithers
Regina Sneed
Chris Sommerfield
L.E. Sorenson
Carol Soto
Geraldine Souzis
Kathryn Spence
Michelle Spicher
Jim Sprague
Laura Sriclesky
Sridlaran Srivatsan
Fred Stabell
L. Stansfield
Loriel Starr
Kim Steele
Steenbogen
Christina Stephens
Heather Sterner
Leta Sternes
Marilyn Stettler
Jesse Stevens
Claudia Stillwell
Joel Streicker
Adam Strom
Kina Sullivan
Ben Sun
Sara Sunderek
Karin Surber
David McIlhenny
Susan Burkhardt
Katherine Swan
Walter Swan
Walter Swan
Joshua Switzky
Edda Sydow
Paula Symonds
Benilda Taft-Kiewek
Blodwen Tarter
Alicia Tavlen
Ian Tawes
Anna Taylor
LeeAnn Taylor
Jennifer Templin
Rose Terrell
Rakia Thabet
Valentine Thaler
Carol Thenot
Kat They
Nanci Thibs
Callie Thomas
Andrea Hacher Thompson
James Thompson
Benjamin Thompson
Richard Thompson
Pete Thompson
Charles Thornburgh
Thea Miller Thornton Smith
Joelle Tirindelli
Nelson Tobar
Zac Tobias
Alex Tokar
Adrienne Toomey
Flora Torres
Andrew Tosiello
Mary Tovar
Kavita Trivedi
Arthur James Ulam
Karen Ulring
Pat Umhinger
Dan Unger
Harrison Unreadable
Lilly Urbach
George Ushanoff
Elise Vaccarest
Geraldine Vahey
Sylvia Valdez
Paget Valentzas
Barbara Valverde
Edward Van Eqri
M. Van Gils
Paul Van Houten
Laurens Vaneveld
Sally Vangundy
Stephanie Vasilev
Susan Vaughan
Candace Vee
David Velasquez
Randol Venderford
Matthew Vespa
Joe Viallcrino
John Victorino
Villarroel
Martine Vincent
Jane Vincent Corlett
Claire Visconti
Eleanor Visser
Charles Wagner
Johanna Wald
Pamela Wallach
Charles Ward

CITIZENS WHO SUBMITTED FORM LETTER COMMENTS ON THE DRAFT PEIR (Continued)

Form 2 (cont.)

Paul Washington
Bruce Watts
Lyn Watts
Robert Watts
Catherine Wayland
Marilyn Webb
John Webster
Stefani Wedl
Catherine Wehrmeister
Abby Weidner
Linda Weiner
Tes Welborn
Ann Wellington
Doug Wentworth
Andrea Werplman
Debbie West
N. West
Ruth Wetherford
Jeanne Wetzel Chinn
Patty Wheeler
Kathleen White
Mani White
Douglas White
Monroe Whitley
David Willey
Roger Williams
Cynthia Wilsey
Heather Wilson
William Wilson
Elizabeth Wilson
Recha Winkelman
Grace Wi-Santiago
Carl Wolf
Jonathan Wolfe
Carol Wong
F. Wong
Donald Woods
Danny Wright
Huang Xinhng
Karyn Yandar
Henry Yang
Alice Yavorsky
Larry Yavorsky
Leslie Yip
Jeff Younker
Chris Yu
Diane Zacher
Noe Zamoro Flores
Turek Zarzycki
Julian Zepeda
Eric Zivian
Marya Zlatnik
Mike Zucksworth
Lonn
Unreadable Name #1
Unreadable Name #2
Unreadable Name #3
Unreadable Name #4
Unreadable Name #5
Unreadable Name #6
Unreadable Name #7
Unreadable Name #8
Unreadable Name #9
Unreadable Name #10
Unreadable Name #11
Unreadable Name #12
Unreadable Name #13
Unreadable Name #14
Unreadable Name #15
Unreadable Name #16
Unreadable Name #17
Unreadable Name #18
Unreadable Name #19

15.6 Form Letters

Form Letter 1

C_FORM1-01 This comment states that the Draft PEIR inadequately addresses all of the environmental impacts that would result from increased Tuolumne River diversions and requests additional studies before finalization of the PEIR. Please refer to **Response C_Breso-01** for response.

C_FORM1-02 This comment, which expresses support for more conservation and recycling to meet water demand and opposing additional diversions from the Tuolumne River, is acknowledged. The 2030 purchase estimates prepared for the WSIP include 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Draft PEIR, Vol. 1, Chapter 3, pp. 3-16 to 3-22). Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3), for additional information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers.

Form Letter 2

C_FORM2-01 This comment, which expresses support for more conservation and recycling to meet water demand and opposing additional diversions from the Tuolumne River, is acknowledged. The 2030 purchase estimates prepared for the WSIP include 22 to 34 mgd of projected water conservation and recycling savings, in addition to 36 mgd of passive conservation savings due to plumbing codes (Draft PEIR, Vol. 1, Chapter 3, pp. 3-16 to 3-22). Please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14, Section 14.2.3), for additional information related to conservation programs and recycling projects being implemented or proposed by the SFPUC and its wholesale customers.

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No references.

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16. Staff-Initiated Text Changes

CHAPTER 16
Staff-Initiated Text Changes

16.1 Introduction

This chapter presents changes to the text of the Draft PEIR made in response to comments (as presented in Chapters 14 and 15) or to clarify and provide applicable updates of the text in the Draft PEIR. The text revisions in this chapter represent four main categories of changes: (1) clarifications/refinements made in response to comments; (2) updated information due to WSIP revisions; (3) clarification/refinement due to updated information; and (4) clarifications/corrections made due to editorial errors. Text changes are prefaced by a brief explanation, including where appropriate, reference to the master response in Chapter 14 or comment number in Chapter 15. In each change, new language is underlined, while deleted text is shown in ~~strikethrough~~, except where the text is indicated as entirely new, in which case no underlining is used for easier reading.

16.2 Text Revisions

Volume 1, Glossary

Conversion Factors section, Page xxxviii: The following conversion factor is added to the list of conversion factors in response to a comment (see **Response L_ACFCWCD-01**).

Temperature

Degrees Celsius (°C) = 5/9 x (°F – 32)

Degrees Fahrenheit (°F) = 9/5 x (°C) + 32

Volume 1, Summary

Section S.2, page S-4, Figure S.2: This revision is the same as that described below under Volume 1, Chapter 3, Section 3.3, page 3-6, Figure 3.2.

Section S.2, page S-5, Figure S.3: This revision is the same as that described below under Volume 3, Chapter 5, Section 5.1.3, page 5.1-6, Figure 5.1-2.

Section S.2, page S-12, Table S.2: The revisions to projects SV-1 and SV-2 are the same as that described below under Volume 1, Chapter 3, Section 3.8, page 3-50, Table 3.10.

Section S.2, page S-16, Table S.2: This revision to project PN-4 is the same as that described below under Volume 1, Chapter 3, Section 3.8, page 3-54, Table 3.10.

Section S.3, page S-37, Table S.4: Measure 4.8-1a in this table is revised as follows in response to a comment (see **Response L_Fremont-02**).

TABLE S.4
SUMMARY OF FACILITY MITIGATION MEASURES BY IMPACT

Impact	Mitigation Measure(s)
Impact 4.8-1: Temporary reduction in roadway capacity and increased traffic delays.	**Measure 4.8-1a, Traffic Control Plan Measures:** Elements of the traffic control plan could include: circulation and detour plans, designated truck routes, sufficient staging area, access to driveways, use of standard construction specifications for controlling construction vehicle movements, restrictions on truck trips during peak morning and evening commute hours, lane closure restrictions, maintenance of alternate one-way traffic flow, detour signing, pedestrian and bicycle access and circulation, equipment and materials storage, construction worker parking, roadside safety protocols, considerations for sensitive land uses, coordination with local transit service providers, roadway repair, conformance with the ~~state's *Manual of Traffic Controls for Construction and Maintenance Work Areas*~~ *California Manual on Uniform Traffic Control Devices for Streets and Highways: Part 6 Temporary Traffic Control* and *Caltrans' 2006 Standard Plans*.
	Measure 4.8-1b, Coordination of Individual Traffic Control Plans: In the event that more than one construction contract is issued for work along existing or new pipelines, and where construction could occur within and/or across multiple streets in the same vicinity, coordinate the traffic control plans in order to mitigate the impact of traffic disruption by including measures that address overlapping construction schedules and activities, truck arrivals and departures, lane closures and detours, and the adequacy of on-street staging requirements.

Section S.3, pages S-48 through S-60, Tables S.5, S.6, S.7, and S.8: The following footnote is added below each of these tables.

[a] Mitigation measure text is summarized; please see Chapter 6 for details.

Section S.3, page S-50, Table S.5: Measure 5.3.6-4b is revised as shown on the following page to correct an editorial error.

Section S.3, page S-52, Table S.6, Impact 5.4.2-2: This impact is revised as follows in response to a comment (see **Response L_ACWD-13**).

Impact 5.4.2-2: Effect on channel formation and sediment transport along Alameda Creek downstream of the diversion dam and downstream of the San Antonio Creek confluence.

TABLE S.5
SUMMARY OF WATER SUPPLY IMPACTS AND MITIGATION MEASURES – TUOLUMNE RIVER SYSTEM AND DOWNSTREAM WATER BODIES

Impact	Significance Determination						Mitigation Measures
		Biological Resource Impacts					
	All Impacts (except Biological Resources)	Sensitive Habitats	Key Special-Status Species	Other Species of Concern	Common Habitats and Species		
FISHERIES (cont.)							
Impact 5.3.6-4 (cont.)							**Measure 5.3.6-4b, Fishery Habitat Enhancement:** The SFPUC will implement or fund one of two fishery habitat enhancement projects that are consistent with the Lower Tuolumne River Restoration Plan; augmentation of spawning gravel at ~~five~~ three selected sites or the filling or isolation from the river of one of the existing inactive quarry pits.

Section S.3, page S-55, Table S.6, Impact 5.4.7-1 and Impact 5.4.7-2: These impacts are revised as shown on the following page to reflect the change in project description of the Calaveras Dam (SV-2) project.

Section S.3, pages S-56 and S-57, Table S.7: Mitigation measures for Impacts 5.5.3-2, 5.5.5-4, and 5.5.5-5 are revised as shown on pages 16-6 through 16-8 to refine the fishery analysis in the Pilarcitos watershed as determined from the updated modeling results conducted in 2008, as discussed in Chapter 13, Section 13.3.

Section S.3, page S-58, Table S.7: Mitigation measures for Impacts 5.5.6-4 and 5.5.6-5, and the impact conclusion for Impact 5.5.6-5 are revised as shown on page 16-9 to refine the fishery analysis in the Pilarcitos watershed as determined from the updated modeling results conducted in 2008, as discussed in Chapter 13, Section 13.3.

Section S.3, page S-62: The second to last sentence of the last full paragraph is revised as follows in response to a comment (see **Response L_Milpts-14**).

> In some jurisdictions (Foster City, Half Moon Bay, Milpitas, and Burlingame), the WSIP could support more population growth than is forecasted in adopted general plans.

Section S.3, page S-63: In first paragraph, under Indirect Effects of Growth Supported by the WSIP, the first sentence is revised as follows to clarify the potential growth inducing impact identified for the WSIP.

> As identified in Impact 7-1, ~~T~~the WSIP would indirectly contribute to environmental impacts caused by growth; some of these impacts would be unavoidable.

Section S.4, page S-67: The last paragraph is revised as follows to reflect augmented impact discussions based on updated information and revisions to WSIP project descriptions.

> While this restoration planning is in progress, because steelhead access does not currently exist and there is no current steelhead migration above the BART weir, there would be no impact on steelhead migration, spawning, or juvenile rearing upstream of the BART weir as a direct result of WSIP implementation compared to the existing condition~~. Further, since a number of steps are required before steelhead migration further upstream can occur, it is speculative to assess the specific impacts that system operation under the WSIP might have on the potential future restoration of steelhead. Thus, no impact analysis or conclusion is developed in this PEIR. If and when steelhead are restored, the SFPUC will be required to conform its system operations to comply with the applicable Endangered Species Act requirements.~~ However, to address the potential that steelhead could regain access to the upper Alameda Creek watershed in the event that planned and proposed projects and actions designed to restore steelhead in Alameda Creek are successfully implemented, a cumulative impact assessment for potential future-occurring steelhead was conducted.

TABLE S.6
SUMMARY OF WATER SUPPLY IMPACTS AND MITIGATION MEASURES – ALAMEDA CREEK WATERSHED

Impact	Significance Determination					Mitigation Measures
	All Impacts (except Biological Resources)	Biological Resource Impacts				
		Sensitive Habitats	Key Special Status-Species	Other Species of Concern	Common Habitats and Species	
RECREATION AND VISUAL						
Impact 5.4.7-1: Effects on recreational facilities and/or activities.	~~PSM~~ LS					~~**Measure 5.4.1-2, Diversion Tunnel Operation** – see description above.~~ None required.
Impact 5.4.7-2: Visual effects on scenic resources or visual character of the water bodies.	~~PSM~~ LS					~~**Measure 5.4.1-2, Diversion Tunnel Operation** – see description above.~~ None required.

TABLE S.7
SUMMARY OF WATER SUPPLY IMPACTS AND MITIGATION MEASURES – PENINSULA WATERSHEDS

Impact	Significance Determination					Mitigation Measures
		Biological Resource Impacts				
	All Impacts (except Biological Resources)	Sensitive Habitats	Key Special-Status Species	Other Species of Concern	Common Habitats and Species	
STREAM FLOW						
Impact 5.5.1-1: Effects on flow along San Mateo Creek.	LS					None required.
Impact 5.5.1-2: Effects on flow along Pilarcitos Creek.	LS					None required.
GEOMORPHOLOGY						
Impact 5.5.2-1: Changes in sediment transport and channel morphology in the Peninsula watershed.	LS					None required.
WATER QUALITY						
Impact 5.5.3-1: Effects on water quality in Crystal Springs Reservoir, San Andreas Reservoir, and San Mateo Creek.	LS					None required.
Impact 5.5.3-2: Effects on water quality in Pilarcitos Reservoir and along Pilarcitos Creek.	PSM					~~**Measure 5.5.3-2, Revised Operations Plan for Pilarcitos Watershed Facilities:** The SFPUC will develop and implement an operations plan for Pilarcitos Reservoir, Stone Dam, and associated diversions that will mimic current operations and will result in reservoir water levels, stream flows, water quality, and conditions for fisheries and terrestrial biological resources that are similar to the current condition.~~ **Measure 5.5.3-2a, Low-head Pumping Station at Pilarcitos Reservoir:** The SFPUC will install a permanent low-head pumping station at Pilarcitos Reservoir which would enable the SFPUC to access and use an additional 350 acre-feet of water from Pilarcitos Reservoir. In years when the WSIP would cause releases from Pilarcitos Reservoir to Pilarcitos Creek to be reduced to reservoir inflow earlier in the summer than under the existing condition (about 25 percent of years in the hydrologic record), the SFPUC will use the pumping station to augment flow in Pilarcitos Creek with water from the reservoir. The pumping station will draw water from the cool pool of water below the thermocline during times when the reservoir is stratified. The pumping station outlet will be designed to ensure that water discharged to the creek is adequately aerated. **Measure 5.5.3-2b, Aeration System at Pilarcitos Reservoir:** The SFPUC will install a permanent aeration system at Pilarcitos Reservoir. The SFPUC will operate the aeration system as necessary to avoid anoxic conditions and maintain good water quality conditions at the reservoir.

TABLE S.7 (Continued)
SUMMARY OF WATER SUPPLY IMPACTS AND MITIGATION MEASURES – PENINSULA WATERSHEDS

Impact	Significance Determination					Mitigation Measures
	All Impacts (except Biological Resources)	Biological Resource Impacts				
		Sensitive Habitats	Key Special -Status Species	Other Species of Concern	Common Habitats and Species	
GROUNDWATER						
Impact 5.5.4-1: Alteration of stream flows along Pilarcitos Creek, which could affect groundwater levels and water quality.	LS					None required.
FISHERIES						
Impact 5.5.5-1: Effects on fishery resources in Crystal Springs Reservoir (Upper and Lower).	PSU					**Measure 5.5.5-1, Create New Spawning Habitat Above Crystal Springs Reservoir:** The SFPUC will survey the extent and quality of fish spawning habitat lost due to inundation and, if feasible, create new spawning habitat at a higher elevation. The specifics of this mitigation measure will be determined as part of project-level CEQA review.
Impact 5.5.5-2: Effects on fishery resources in San Andreas Reservoir.	LS					None required.
Impact 5.5.5-3: Effects on fishery resources along San Mateo Creek.	LS					None required.
Impact 5.5.5-4: Effects on fishery resources in Pilarcitos Reservoir.	PSM					~~**Measure 5.5.3-2, Revised Operations Plan for Pilarcitos Watershed Facilities**~~ **Measure 5.5.3-2b, Aeration System at Pilarcitos Reservoir –** see description above.
Impact 5.5.5-5: Effects on fishery resources along Pilarcitos Creek below Pilarcitos Reservoir.	PSM					~~**Measure 5.5.3-2, Revised Operations Plan for Pilarcitos Watershed Facilities**~~ **Measure 5.5.3-2a, Low-head Pumping Station at Pilarcitos Reservoir** – see description above. **Measure 5.5.5-5 Establish Flow Criteria, Monitor and Augment Flow –** The SFPUC will develop a monitoring and operations plan for Stone Dam to ensure WSIP-related flow reductions downstream of Stone Dam do not impair steelhead passage and spawning during the winter months of normal and wetter hydrologic years.

TABLE S.7 (Continued)
SUMMARY OF WATER SUPPLY IMPACTS AND MITIGATION MEASURES – PENINSULA WATERSHEDS

Impact	Significance Determination					Mitigation Measures
	All Impacts (except Biological Resources)	Biological Resource Impacts				
		Sensitive Habitats	Key Special -Status Species	Other Species of Concern	Common Habitats and Species	
TERRESTRIAL BIOLOGY						
Impact 5.5.6-1: Impacts on biological resources in Upper and Lower Crystal Springs Reservoirs.		PSM	PSM	PSM	PSM	The SFPUC will implement Measures 5.5.6-1a and 5.5.6-1b to reduce adverse impacts on sensitive habitats, key special-status species, other species of concern, and common habitats and species to a less-than-significant level. In addition, the SFPUC will implement Measure 5.5.6-1c to mitigate adverse impacts to key special-status plant species (i.e., fountain thistle) adapted to serpentine seeps. **Measure 5.5.6-1a, Adaptive Management of Freshwater Marsh and Wetlands at Upper and Lower Crystal Springs Reservoirs:** The SFPUC will develop an adaptive management plan to minimize adverse effects of the WSIP-induced rise in average water levels, and periodic drawdown of reservoir water levels for maintenance, on San Francisco garter snakes and red-legged frogs. **Measure 5.5.6-1b, Compensation for Impacts on Terrestrial Biological Resources:** The SFPUC will protect, restore, and enhance existing wetland and upland habitat and/or create new habitat that compensates for WSIP-induced habitat losses at Crystal Springs Reservoir. Compensatory habitat may be provided as part of the SFPUC's Habitat Reserve Program. **Measure 5.5.6-1c, Compensation for Serpentine Seep-Related Special-Status Plants:** The SFPUC will protect, restore, and enhance existing habitat and/or create new habitat that compensates for WSIP-induced habitat losses for plant species adapted to serpentine seeps.

TABLE S.7 (Continued)
SUMMARY OF WATER SUPPLY IMPACTS AND MITIGATION MEASURES – PENINSULA WATERSHEDS

Impact	Significance Determination					Mitigation Measures
	All Impacts (except Biological Resources)	Biological Resource Impacts				
		Sensitive Habitats	Key Special -Status Species	Other Species of Concern	Common Habitats and Species	
TERRESTRIAL BIOLOGY (Cont.)						
Impact 5.5.6-4: Impacts on biological resources in Pilarcitos Reservoir.		LS	PSM	LS	LS	~~The SFPUC will implement Measure 5.5.3-2 to reduce adverse impacts on key special-status species to a less-than-significant level.~~ ~~**Measure 5.5.3-2, Revised Operations Plan for Pilarcitos Watershed Facilities** – see description above.~~ **Measure 5.5.3-2c, Habitat monitoring and Compensation -** The SFPUC will protect, restore, and enhance existing habitat and/or create new habitat that compensates for WSIP-induced habitat losses at Pilarcitos Reservoir. Compensatory habitat may be provided as part of the SFPUC's Habitat Reserve Program.
Impact 5.5.6-5: Impacts on biological resources along Pilarcitos Creek below Pilarcitos Reservoir.		~~PSM~~ LS	LS	LS	LS	~~The SFPUC will implement Measure 5.5.3-2 to reduce adverse impacts on sensitive habitats to a less-than-significant level.~~ ~~**Measure 5.5.3-2, Revised Operations Plan for Pilarcitos Watershed Facilities** – see description above.~~ None required.

Section S.6,page S-71: The first sentence of the last paragraph is revised as follows to reflect an updated request from the SFPUC.

> The SFPUC requested that the PEIR also include environmental assessment of ~~three~~ four variants to the WSIP.

Section S.6, page S-73: The following text is inserted after the first partial paragraph on page S-73 to reflect an updated request from the SFPUC.

Variant 4 – Phased WSIP

> Variant 4 – Phased WSIP would generally be the same as the WSIP, except that an interim mid-term planning horizon of 2018 would be used instead of the WSIP 2030 planning horizon. Under this variant, all facility improvement projects would be implemented, and the SFPUC would make a decision about future water supply to its customers through 2018 only and defer a decision regarding long-term water supply until after 2018. Variant 4 would limit deliveries from SFPUC watersheds to an annual average of 265 mgd through 2018 and would promote development and implementation of 10 to 20 mgd of additional local conservation, water recycling, and groundwater projects. The environmental impacts of Variant 4 would be essentially the same as those for the WSIP or Modified WSIP Alternative, except for a reduction in impacts on Tuolumne River resources. However, it would result in additional impacts associated with construction and operation of recycled water and groundwater facilities similar to those of the Modified WSIP Alternative.

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Section 1.3.5, page 1-8: The second to last bullet is revised as follows to correct an editorial error.

- City of Redwood City, *Downtown Precise Plan Draft Environmental Impact Report* (October 2006) and *Final Environmental Impact Report*, State Clearinghouse #2006~~5~~052027 certified March 2007a.

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Section 2.2.1, page 2-6, Table 2.2: On row 6, under "Major Storage Facilities," the capacity of Crystal Springs Reservoir is revised to reflect updated information from recent SFPUC studies.

TABLE 2.2
EXISTING CAPACITY OF MAJOR FACILITIES IN THE REGIONAL WATER SYSTEM

Facility	Capacity	Notes
Crystal Springs Reservoir[b]	~~58,400~~ 56,800 acre-feet (interim conditions as required by the Division of Safety of Dams) ~~69,300~~ 68,000 acre-feet (normal conditions)	~~19.0~~ 18.5 billion gallons ~~22.6~~ 22.2 billion gallons

Section 2.3.4, page 2-24: The second to last sentence of the fourth paragraph is revised as follows in response to a comment (see **Response L_CoastsideCWD-07**).

> In the summer months, when Coastside CWD's water demand is at its seasonal maximum, its water supply from Pilarcitos Creek ~~is supplemented by water pumped from Crystal Springs Reservoir.~~ becomes insufficient to meet its needs. At that point, Coastside CWD ceases diversions from Pilarcitos Creek and obtains its water by pumping from Crystal Springs Reservoir.

Section 2.5.6, page 2-46, Table 2.3: The following row is added at the end of Table 2.3 in response to a comment (see **Response SI_ACA1-17**).

TABLE 2.3
SFPUC WATER RESOURCES POLICIES RELATED TO THE WSIP

Date	Resolution Number	Description
June 2006	06-0105	*Water Enterprise Environmental Stewardship Policy* The Environmental Stewardship Policy will be integrated into SFPUC Water Enterprise planning and decision-making processes and also directly implemented through a number of efforts, including: • Implementation and updating of the existing Alameda and Peninsula Watershed Management Plans • Development of Habitat Conservation Plans for the Alameda and Peninsula Watersheds • Development and implementation of the Watershed and Environmental Improvement Program, which will cover the Tuolumne River, Alameda Creek, and Peninsula watersheds • Development of the Lake Merced Watershed Plan • Active participation in local forums, including coordination with Yosemite National Park Service and Stanislaus National Forest in the Tuolumne River watershed, the Tuolumne River Technical Advisory Committee, the Alameda Creek Fisheries Restoration Workgroup, the Pilarcitos Creek Restoration Workgroup, and the Lake Merced Task Force • Integration of the policy into the WSIP and individual infrastructure projects (i.e., repair and replacement programs) • Reliance on the policy to guide the development of project descriptions, alternatives and mitigation for all SFPUC projects during the environmental review process under CEQA and/or NEPA • Providing support for and encouragement to all employees to integrate environmental stewardship into daily operations through communication and training

SOURCES: SFPUC, 1993a to 1993f; 2000c; 2000d; 2006b.

Section 2.6, page 2-49: The following reference is added after (SFPUC, 2006a) in response to a comment (see **Response SI_ACA1-17**).

> San Francisco Public Utilities Commission (SFPUC), Water Enterprise Environmental Stewardship Policy, June 27, 2006b.

Volume 1, Chapter 3

Section 3.3, page 3-6, Figure 3.2: An asterisk is placed next to the labels to these noncontinguous areas and the following footnote is added in response to a comment (see **Response L_CoastsideCWD-02**). The revised figure is shown on the following page.

> * Portions of Coastside County Water District not served by the SFPUC regional water system.

Section 3.3, page 3-7: Table 3.1 is revised as shown below in response to a comment (see **Response L_Menlo1-08**).

TABLE 3.1
SFPUC REGIONAL WATER SYSTEM CUSTOMERS

Wholesale Regional Customers[a] (BAWSCA Members)		
Peninsula	**South Bay**	**Other Major Customers**
	City of Menlo Park*[b]	

* Indicates customers that currently receive additional water supplies from sources other than the SFPUC.

[a] Not shown on the table because they are not a BAWSCA member, the Cordilleras Mutual Water Association is also a wholesale customer receiving water from the SFPUC. It is a small water association serving 18 single-family homes located in San Mateo County.

[b] Menlo Park receives all of its water supply from the SFPUC; however, a portion of the supply is obtained indirectly from the SFPUC through purchases from East Palo Alto (BAWSCA, 2006).

SOURCES: CDM, 2005; URS, 2004a.

Section 3.4.4, page 3-19: Table 3.4 is revised as shown below in response to a comment (see **Response L_Menlo1-08**).

TABLE 3.4
SUMMARY OF SFPUC 2030 PURCHASE ESTIMATES

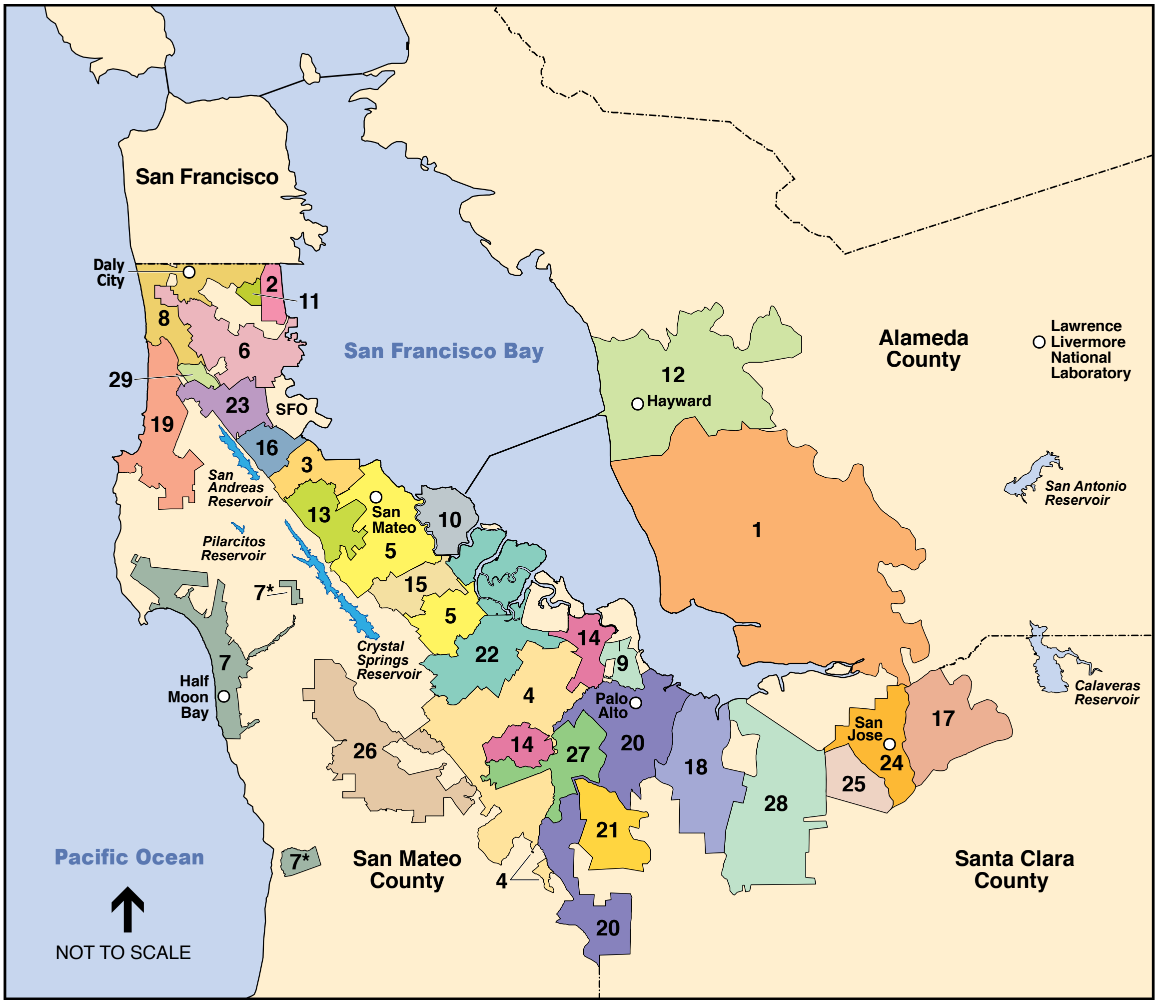
SFPUC Customer	Fiscal Year 2001/2002 Purchases from the SFPUC (mgd)	2030 Purchase Estimates (mgd)	Change in Water Purchases from the SFPUC (mgd)
Wholesale Customers			
City of Menlo Park[~~a,c~~ g]	3.57	4.54	0.97

[a] Wholesale customer that currently receives water supplies from sources other than the SFPUC, including local groundwater, local surface water, recycled water, and other sources of supply.

[c] Wholesale customer that currently receive water supplies from other sources but projects receiving only SFPUC water by 2030

[g] Menlo Park purchased 96 percent of its 2001/2002 supply directly from the SFPUC; the balance of its 2001/2002 purchases also came from the SFPUC regional system, but was purchased from East Palo Alto. Menlo Park projects that it will purchase all of its 2030 supply directly from the SFPUC.

SOURCES: URS, 2004c; City of Redwood City, 2005; Westborough Water District, 2007.



Legend

(Wholesale customers and members of Bay Area Water Supply and Conservation Agency)

1 Alameda County Water District
2 City of Brisbane
3 City of Burlingame
4 CWS – Bear Gulch
5 CWS – Mid-Peninsula
6 CWS – South San Francisco
7 Coastside County Water District
8 City of Daly City
9 City of East Palo Alto
10 Estero Municipal Improvement District
11 Guadalupe Valley Municipal Improvement District
12 City of Hayward
13 Town of Hillsborough
14 City of Menlo Park
15 Mid-Peninsula Water District
16 City of Millbrae
17 City of Milpitas
18 City of Mountain View
19 North Coast County Water District
20 City of Palo Alto
21 Purissima Hills Water District
22 City of Redwood City
23 City of San Bruno
24 City of San Jose (North)
25 City of Santa Clara
26 Skyline County Water District
27 Stanford University
28 City of Sunnyvale
29 Westborough Water District

* Portions of Coastside County Water District not served by the SFPUC regional water system.

NOTE: For the purposes of this PEIR, the California Water Service (CWS) Company is a single wholesale customer with three different water service districts.

SOURCE: BAWSCA, 2006a

SFPUC Water System Improvement Program . 203287

Figure 3.2 (Revised)
SFPUC Water Service Area - San Francisco and SFPUC Wholesale Customers

Section 3.4.4, page 3-22: The first paragraph is revised as follows to incorporate information from recent planning efforts.

Recycled Water Potential

The SFPUC evaluated recycled water potential by considering existing recycled water programs, plans to expand uses in the future, and the amount of potable water that could potentially be offset by future recycled water uses. The studies indicated that there is a range of about 47 to 53 mgd in potential for recycled water use in the wholesale and retail service areas, including current plus additional uses through 2020 (RMC, 2004). The *Recycled Water Master Plan* (RMC, 2006) assesses the technical feasibility of recycled water projects in the westside area of San Francisco; it identifies projects with the potential to provide approximately 6.2 mgd of recycled water to irrigate Golden Gate Park, Lincoln Park, Harding Park, the San Francisco Zoo, San Francisco State University, and other locations, as well as provide a supplemental water supply for Lake Merced. The first phase of projects identified in the report would provide 4.1 mgd of recycled water to this area (RMC, 2006). These San Francisco projects are included in the total SFPUC service area recycled water potential of 47 to 53 mgd in 2020 (RMC, 2004). It should be noted, however, that during the project planning and design phase of recycled water projects, the recycled water potential of specific users will be refined and could potentially be reduced. As such, it is assumed that 100 percent of these specific users' demand represents an offset in potable surface water supplies and that could be met by other appropriate sources of alternative water supply such as groundwater and/or stormwater if recycled water is deemed inappropriate for the specified use (SFPUC, 2008a).

Section 3.4.6, page 3-24: The text following the list under the heading "B. Regional Projects" is revised as follows to reflect the determination made by the San Francisco Planning Department in March 2008 regarding the independent utility of certain WSIP projects.

In September 2005, the Notice of Preparation (NOP) on the WSIP PEIR identified most of the projects listed above as projects that might undergo environmental review independent of and possibly in advance of the PEIR (refer to the NOP in Appendix A of this PEIR for brief descriptions of these projects). As a result of reclassification of projects and program refinement since the issuance of the NOP, the San Francisco Planning Department has determined that three other projects not listed in the NOP as such are appropriate for environmental review separate from the PEIR: Alameda Siphons (previously classified as part of the Irvington Tunnel project), San Antonio Pump Station Upgrade and Capuchino Valve Lot Improvements. The Planning Department is preparing or has completed environmental review for all of the projects listed above separate from the PEIR, and the SFPUC has already implemented some of the projects. The Planning Department has determined that these projects may appropriately proceed with environmental review in advance of completion of the WSIP PEIR for several reasons: (1) these projects are necessary irrespective of whether the SFPUC approves the overall WSIP goals and objectives or any other WSIP facility project; (2) construction of the particular project will not increase the normal operating or delivery capacity of the SFPUC's regional system, change the manner in which water is dispersed, increase the storage capacity of the system, or increase or alter the nature of any treatment capacity of the system; (3) these projects do not commit the SFPUC to any other WSIP project; and (4) any cumulative impacts associated with the individual project can be and are adequately addressed by the analysis in the individual environmental review documents. Although the independent utility projects may contribute to the overall reliability of the regional water system, the primary purpose of these projects is to rehabilitate existing facilities and provide flexibility for maintenance and emergency response.

Subsequent to Draft PEIR publication in June 2007 and based on more detailed project information, the San Francisco Planning Department determined that five additional regional WSIP projects, previously identified as Key Regional Projects in category A above, could appropriately proceed with environmental review independent of the WSIP PEIR: Rehabilitation of Existing San Joaquin Pipelines, BDPL Nos. 3 and 4 Crossovers, Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault, Baden and San Pedro Valve Lots Improvements, and Pulgas Balancing Reservoir Rehabilitation (all phases). Thus, these five additional projects have been determined to have independent utility from the overall program analyzed in the WSIP PEIR (SFPUC, 2008b) and can undergo environmental review independent of and possibly in advance of the PEIR.

Section 3.4.6, page 3-25: Item E is revised as follows in response to a comment (see **Response L_BAWSCA1-70**).

E. **Regional Recycled Water Projects** (note that these are different than the project #22, Recycled Water Projects, listed above under A). The SFPUC expects ~~to consider and develop~~ that some recycled water projects that would be located outside of San Francisco will be developed in coordination with other jurisdictions. As these projects are developed and designed, they will be reviewed to determine the appropriate lead agency and level of environmental review.

Section 3.5.1, page 3-27: The following text is inserted as the new last paragraph of Section 3.5.1 in response to a comment (see **Response L_BAWSCA1-71**).

Other water quality regulations of significance to the SFPUC could include the Stage 2 Disinfectants and Disinfection Byproducts Rule, Candidate Contaminant List, California Action Levels, and California Public Health Goals. The SFPUC will address these regulations as appropriate as part of its ongoing operations as well as to ensure consistency with the WSIP water quality levels of service.

Section 3.6.1, page 3-34: The second bullet under the second full paragraph is revised as follows to incorporate information from recent planning efforts.

- *Recycled Water Projects*. One of the WSIP facility improvement projects described in Section 3.8 includes treatment, storage, and distribution facilities to provide about 4 mgd of recycled water to irrigation users on the west side of San Francisco based on preliminary estimates of recycled water demand. However, due to ongoing planning efforts and demand projection refinements, the project sizes may be reduced to match the refined demands (SFPUC, 2008a).

Section 3.6.2, page 3-36: The first bullet under the first paragraph in this section is revised as follows to incorporate information from updated modeling efforts. As described in Section 13.3 of this document, this revision does not result in any increase of average annual diversions from the Tuolumne River or in any change in the impact analysis presented in Volume 3, Chapter 5 of the Draft PEIR. The increase in magnitude of dry-year water transfers is a reflection of updated modeling input to assumptions for both the existing condition and WSIP and better reflects the modeled estimate for dry-year water transfers needed to achieve the WSIP level of service objectives over the design drought.

- *Water transfers*. Utilize up to an equivalent of ~~23~~ 26 mgd (annual average over 8.5-year design drought) of supplemental Tuolumne River water through water transfer agreements with TID and MID.

Section 3.7.1, page 3-42: The last sentence of the first full paragraph is revised as follows in response to a comment (see **Response L_DalyCty-31**).

> In exchange, those customers would increase groundwater pumping during drought periods, thereby reducing the amount of their purchase requests during a drought and ~~creating a temporary reduction system demand~~ making more water available for serving regional water system demand.

Section 3.8, pages 3-50 and 3-54, Table 3.10: The following text in the fourth and fifth columns in **Table 3.10** is revised as shown on the following page to reflect the change in project description of the Calaveras Dam (SV-2) and Alameda Creek Fishery (SV-1) projects and to reflect updated information from SFPUC studies.

Section 3.8, page 3-60, Table 3.11: The entry located in the third to last row, second to last column in Table 3.11 is deleted as shown on page 16-19 in response to a comment (see **Response L_Brisbane-03**).

Section 3.8, page 3-60, Table 3.11: The entry located in the second to last row, last column to the right in Table 3.11 is revised as shown on page 16-19 in response to a comment (see **Response L_DalyCty-33**).

Section 3.8, page 3-60, Table 3.11: The entry located in the 15th row, 8th column of Table 3.11 is revised as shown on page 16-19 in response to a comment (see **Response L_Milpts-10**).

Section 3.8, page 3-63, Table 3.12: The first region listed in the first row of Table 3.12 is revised as follows to correct an editorial error.

> ~~Sunol~~ San Joaquin Region

Section 3.10, page 3-82: The third paragraph is revised as follows to correct an editorial error.

> In addition, the SFPUC is committed to the following GHG reduction actions as part of the WSIP program. The SFPUC will include the first two ~~following~~ measures in all WSIP contractor specifications and implement the third measure during project planning and

TABLE 3.10 (same as **TABLE S.2)**
WSIP FACILITY IMPROVEMENT PROJECTS

No.	Project Title	Principal Type of Facility/ Objectives[b]	Location of Preferred Project[c]	Project Description
SV-1	Alameda Creek Fishery Enhancement	Other / Water Supply, Sustainability	Structural Alternatives: Alameda Creek in Sunol Valley, downstream of Calaveras Dam	This project would recapture the water released as part of the Calaveras Dam project (SV-2) and return it back to the regional system for use. A number of structural and non-structural recovery alternatives are under consideration for this project, including: a water recapture facility downstream of the Sunol Valley WTP, conjunctive groundwater use, horizontal collector wells, or other groundwater recovery systems yet to be defined. Other alternative designs for this project could be developed. If a structural alternative involving construction of a recapture facility is selected, the recapture facility would be located at the downstream end of the reach of Alameda Creek between the lower Sunol Valley and the confluence with Arroyo de la Laguna. As an alternative to the recapture facility, the SFPUC may coordinate with other water agencies to develop and implement other means of recapturing fishery enhancement flows consistent with the 1997 CDFG MOU.
SV-2	Calaveras Dam Replacement	Storage / Water Supply, Delivery and Seismic Reliability	Sunol Valley, immediately downstream of existing dam and at the Alameda Creek Diversion Dam	This project would provide for the planning, design, and construction of a replacement dam at Calaveras Reservoir to meet seismic safety requirements. The new dam would provide for a reservoir with the same storage capacity as the original reservoir (96,800 acre-feet), but the replacement dam would be designed to accommodate enlargement of the dam in the future. The preferred project would include construction of: • New earthfill dam • New intake tower and new outlet valve for water releases for instream flow requirements • New or rehabilitated outlet works for seismic safety and improved operations and maintenance • New bypass structure at the Alameda Creek Diversion Dam As part of this project, Calaveras Reservoir and the proposed bypass structure at the diversion dam would be operated to release up to 6,300 acre-feet per year (5.5 mgd) of water to Alameda Creek in support of fisheries in compliance with the 1997 CDFG MOU. When flow is available in Alameda Creek, releases would be made through the proposed bypass structure at the Alameda Creek Diversion Dam and would be supplemented as necessary with releases from Calaveras Dam.
PN-4	Lower Crystal Springs Dam Improvements	Storage / Water Supply and Delivery Reliability	Lower Crystal Springs Dam	This project would consist of major repairs and improvements to Lower Crystal Springs Dam to provide adequate protection of the dam and downstream areas from the probable maximum flood, as defined by the DSOD. DSOD has placed operational restrictions on the dam, and the capacity of the reservoir is limited to ~~58,400~~ 56,800 acre-feet. The project would restore the historical reservoir capacity of ~~69,300~~ 68,000 acre-feet. The project would be coordinated with San Mateo County, which is concurrently planning the replacement of the existing county bridge built above the crest of the dam. Project elements would include: • Lowering the existing parapet wall on either side of the existing spillway to lengthen the overflow weir (central spillway) from the reservoir • Raising the remaining parapet walls and adding two new spillway bays, one on each side of the existing central spillway • Enlarging the spillway stilling basin to accommodated the probable maximum flood • Installing four gates (with control building) or installing a fixed weir within the spillway to restore the historical storage capacity

design, which in addition to having other environmental benefits, would also help reduce GHG emissions.

Section 3.11, page 3-82: The third sentence of the last paragraph is revised as follows in response to a comment (see **Response L_BAWSCA1-86**).

> As the preliminary schedule indicates, construction of projects is expected ~~to begin in 2008 and~~ to be completed by the end of 2014; there would be an intense period of construction from 2009 to 2010, when 18 of the 22 projects would be under construction ~~constructed~~ concurrently.

Section 3.13, page 3-86: The fourth full paragraph on the page is revised as follows in response to comments described in **Section 14.4, Master Response on Appropriate Level of Analysis**.

> Each of the individual WSIP facility improvement projects will undergo project-level CEQA review, and CEQA documents developed through those reviews will identify needed approvals by local, state, and federal agencies for individual projects. Table C.6 of Appendix C presents the specific permits and approvals that could be required for individual projects as well as interested agencies that have requested early consultation and coordination with the SFPUC. Several projects are expected to require U.S. Department of the Army permits to comply with the Clean Water Act, which, in turn, will require compliance with the Federal Endangered Species Act, the Clean Water Act Section 401, and the National Historic Preservation Act. Several projects are expected to require Streambed Alteration Agreements from the California Department of Fish and Game and compliance with the California Endangered Species Act. When individual projects undergo CEQA review, the project's environmental documentation will provide more detailed and up-to-date information on the required approvals and need for consultation with interested agencies. The approval and adoption of the overall WSIP as a program and policy are distinct actions from the approvals for individual facility improvement projects.

Section 3.14, page 3-88: The following reference is added before (CDFG, 1997) in response to a comment (see **Response L_Menlo1-08**).

> Bay Area Water Supply and Conservation Agency (BAWSCA), *Bay Area Water Supply and Conservation Agency Annual Survey FY2004-05*, April 2006.

Section 3.14, page 3-90: The following references are added after (SFPUC, 2007b) to support updated information.

> SFPUC, *Demand Estimates for Recycled Water and Water Conservation Application*, addressed to Kelley Capone, Bureau of Environmental Management, from Ellen Levin, Water Enterprise. February 27, 2008a.

> SFPUC, *Memo Supporting Project Independent Utility*, submitted by Irina Torrey, March 20, 2008b.

TABLE 3.11
WSIP IMPROVEMENT PROJECTS – AFFECTED JURISDICTIONS

Affected County and City Jurisdictions	Advanced Disinfection SJ-1	Lawrence Livermore Supply Improvements SJ-2	San Joaquin Pipeline System SJ-3	Rehabilitation of Existing San Joaquin Pipelines SJ-4	Tesla Portal Disinfection Station SJ-5	Alameda Creek Fishery Enhancement SV-1	Calaveras Dam Replacement SV-2	Additional 40-mgd Treated Water Supply SV-3	New Irvington Tunnel SV-4	SVWTP – Treated Water Reservoirs SV-5	San Antonio Backup Pipeline SV-6	Bay Division Pipeline Reliability Upgrade BD-1	BDPL Nos. 3 and 4 Crossovers BD-2	Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault BD-3	Baden and San Pedro Valve Lots Improvements PN-1	Crystal Springs/San Andreas Transmission Upgrade PN-2	HTWTP Long-Term Improvements PN-3	Lower Crystal Springs Dam Improvements PN-4	Pulgas Balancing Reservoir Rehabilitation PN-5	San Andreas Pipeline No. 3 Installation SF-1	Groundwater Projects SF-2	Recycled Water Projects SF-3
Tuolumne County																						
Unincorporated Areas			X	X																		
Stanislaus County																						
Unincorporated Areas			X	X																		
Riverbank				X																		
Modesto				X																		
San Joaquin County																						
Unincorporated Areas	X	X	X	X	X																	
Alameda County																						
Unincorporated Areas (including Sunol and Castro Valley)						X	X	X	X	X	X											
Newark												X										
Fremont									X			X		X								
Santa Clara County																						
Unincorporated Areas							X															
Milpitas							A						A									
San Jose													X									
Santa Clara													X									
Sunnyvale													A									
Mountain View													A									
Los Altos													A									
Palo Alto													X									
San Mateo County																						
Unincorporated Areas												X				X	X	X	X		X	
East Palo Alto												X										
Menlo Park												X										
Atherton													X									
Redwood City												X	A									
Woodside													A									
San Mateo																						
Hillsborough																C						
Burlingame																C					X	
Millbrae																C	C				X	
San Bruno																C	C				X	
South San Francisco															X						X	
Colma																					X	
Brisbane																					~~X~~	
Daly City															X					X	X	X
City and County San Francisco																				X	X	X

NOTES: X = Indicates a preferred project location, but an alternative site may also be present in this jurisdiction.
A = Alternative sites under consideration.
C = Not located in the city, but very close to the city limits.

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Volume 2, Chapter 4

4.2 Plans and Policies

Section 4.2.2, page 4.2-4: The following text is added after the discussion of the San Francisco Sustainability Plan to incorporate recent planning efforts applicable to the WSIP.

> ***San Francisco Municipal Green Building Program***
>
> San Francisco's Green Building Program was founded in 1999 when the CCSF adopted the Resource Efficient Building Ordinance, which established green building standards for municipal buildings to increase energy efficiency, conserve CCSF finances, reduce the environmental impacts of demolition, construction, and operation of buildings, and create safe workplaces for CCSF employees and visitors. The ordinance created the inter-departmental Resource Efficient Building (REB) Task Force and charged the San Francisco Department of Environment with implementing the ordinance in partnership with the Department of Public Works and other REB Task Force departments. In 2004, amendments to Chapter 7 of the Environment Code set LEED (Leadership in Energy and Environmental Design) Silver Certification by the U.S. Building Council as the minimum environmental performance requirement for all municipal projects over 5,000 square feet. The REB Task Force assists City departments in compliance with the LEED Silver Certification requirement and helps to determine which projects are applicable for LEED ratings. For all municipal construction projects, including those projects that do not involve buildings and are not required to obtain LEED Silver Certification, the REB Task Force provides recommended best practices and sample specifications for building materials (e.g. recycled content of steel and concrete) (SF Dept of Environment, 2004-2007).

Section 4.2.2, page 4.2-7: The first paragraph is revised as follows in response to a comment (see **Response F_NPS-GGNRA-01**).

> In 1969, the CCSF granted two easements over the vast majority of the Peninsula watershed to the Department of the Interior. The easements were granted to the federal government in order to obtain a change in the route of Interstate 280 (I-280) (and an increase in the federal share of costs) to a less environmentally damaging location further east of Crystal Springs Reservoir. The approximately 19,000-acre Scenic Easement covers the lands west of Crystal Springs and San Andreas Reservoirs. The approximately 4,000-acre Scenic and Recreation Easement applies to lands in the vicinity of I-280. ~~Cañada Road demarcates these easements: t~~The CS/SA Transmission project (PN-2), Lower Crystal Springs Dam project (PN-4), and the Pulgas Channel and sediment catch basin components of the Pulgas Balancing Reservoir project (PN-5) are within the Scenic Easement, while the Pulgas Balancing Reservoir itself is within the Scenic and Recreation Easement. The easements cover nearly all of the CCSF-owned Peninsula watershed lands and place restrictive covenants on use of the lands that are unrelated to the SFPUC's overall management of the land for utility purposes. The provisions of the easement include:

Section 4.2.2, page 4.2-8: The second paragraph is revised as follows in response to a comment (see **Response L_BCDC-02**).

San Francisco Bay Conservation and Development Commission, San Francisco Bay Plan

The San Francisco Bay Plan (SF Bay Plan), prepared by the San Francisco Bay Conservation and Development Commission (BCDC) in 1968 in accordance with the McAteer-Petris Act of 1965, is an enforceable plan that guides the protection and use of San Francisco Bay and its shoreline (BCDC, 2005). Under the McAteer-Petris Act, BCDC has the authority to issue or deny permit applications for placing fill, extracting materials, or changing the use of any land, water, or structure within the area of its jurisdiction and to enforce policies aimed at protecting the bay and its shoreline.[3a] The SF Bay Plan designates shoreline areas that should be reserved for water-related purposes like ports, industry, public recreation, airports, and wildlife refugees. Since its adoption by BCDC in 1968, the SF Bay Plan has been amended periodically to keep pace with changing conditions and to incorporate new information concerning the bay. The new Bay Division Pipeline Tunnel No. 5 proposed under the BDPL Reliability Upgrade project (BD-1) includes approximately five miles of tunnel under the Don Edwards San Francisco Bay Wildlife Refuge, Newark Slough, and San Francisco Bay. The pipeline would be buried between 100 and 150 feet below mean sea level and result in approximately 355,000 cubic yards of bay mud excavation/spoils. As a result, this project could be subject to ~~certain provisions~~ SF Bay Plan policies concerning the placement of fill in the bay, dredging, public access, and other policies and provisions contained in the SF Bay Plan (BCDC, 2005), depending on the final siting, construction, and operation of the BDPL Reliability Upgrade project.

[3a] BCDC has jurisdiction over all of San Francisco Bay up to mean high tide, areas of marsh up to 5 feet above mean sea level, a shoreline band lying 100 feet inland from the bay, as well as salt ponds, managed wetlands, and certain waterways.

Section 4.2.3, page 4.2-15: The following text is added after the discussion of WSIP consistency with the San Francisco Sustainability Plan, the first full paragraph on the page, to address recent planning efforts applicable to the WSIP.

San Francisco Municipal Green Building Program

The San Francisco Municipal Green Building Program was developed for the purpose of improving the environmental performance of municipal buildings. The WSIP facility improvement projects would be consistent with the San Francisco Municipal Green Building Program, since all applicable facility improvement projects constructed under the WSIP would be designed, constructed, and operated in accordance with the City's Green Building requirements. The SFPUC would complete and submit LEED checklists to the REB Task Force on all applicable WSIP projects.

Section 4.2.3, page 4.2-16: The fourth full paragraph is revised as follows in response to a comment (see **Response L_BCDC-02**).

San Francisco Bay Plan

Implementation of the Bay Division Pipeline Reliability Upgrade project (BD-1) includes construction of a tunnel to replace aboveground pipelines located in San Francisco Bay. Depending on the final scope of work undertaken with respect to this project, SF Bay Plan policies could be relevant to the project. The proposed five-mile tunnel under Don Edwards San Francisco Bay Wildlife Refuge, Newark Slough, and San Francisco Bay is generally straight, which provides for ease in constructability, but is also designed to minimize environmental disruption, particularly with respect to protected species. Programmatic mitigation measures described in Chapter 6, if determined to be applicable, identify measures to protect and restore natural resources and habitats, including special-status species. Compliance with BCDC permitting requirements and consideration of applicable SF Bay Plan policies would also ensure that relevant policies of the SF Bay Plan are addressed and carried out to minimize environmental effects on the bay. The WSIP would, on the whole, be consistent with policies contained in the SF Bay Plan.

Section 4.2.5, page 4.2-18: The following reference is added after (BCDC, 2005) to support updated information.

San Francisco Department of Environment, *San Francisco Municipal Green Building Report 2004-2007*.

Section 4.2, page 4.2-19: The following reference is added after (Tuolumne County, 1996) in response to a comment (see **Response L_Tuol2-06**).

USDA Forest Service, *Sierra Nevada Forest Plan Amendment Final Supplemental Environmental Impact Statement*, January 2004.

4.5 Hydrology and Water Quality

Section 4.5.1, page 4.5-9: The last sentence of the first paragraph is revised as follows in response to a comment (see **Response S_RWQCBCV-01**).

These agencies also implement the Waste Discharge Requirements (WDR) Program, which regulates discharges of waste to land under the California Water Code as well as discharges of waste into waters of the state that are outside federal jurisdiction, as defined under the Clean Water Act.

Section 4.5.1, page 4.5-9: The end of the second full paragraph is revised as follows in response to a comment (see **Response S_RWQCBCV-01**).

The San Francisco Bay RWQCB adopted its Basin Plan in 1995, and most recently revised the plan in December 2006. ~~November 2004. A general update to the plan was approved by the San Francisco Bay RWQCB in 2005 and by the SWRCB in April 2006. The update is undergoing review by the Office of Administrative Law.~~ The Central Valley RWQCB (Region#5) has regulatory authority over water bodies in the San Joaquin Region. The Central Valley RWQCB adopted its Basin Plan in 1998, and most recently revised the plan in October 2007~~September 2004~~.

Section 4.5.1, page 4.5-9: The third full paragraph is revised as follows in response to a comment (see **Response S_RWQCBCV_02**).

> Beneficial uses ~~of surface waters~~ serve as a basis for establishing water quality objectives and discharge prohibitions to attain ~~beneficial use goals~~ the goal of achieving the highest water quality consistent with the maximum benefit to the people of the state. Beneficial uses are designated in Basin Plans for surface waters and groundwater basins, and in the case of the San Francisco Bay Basin, wetlands. **Table 4.5-1** lists the designated beneficial uses for those water bodies that could be affected by the WSIP. ~~project activities, as defined in the Basin Plans.~~ The beneficial uses of the water bodies generally apply to all tributaries.

Section 4.5.1, page 4.5-10: Table 4.5-1 is revised as follows in response to a comment (see **Response S_RWQCBSF-02**).

TABLE 4.5-1
DESIGNATED BENEFICIAL USES

Water Body	Designated Beneficial Uses
San Joaquin Region	
San Joaquin River	MUN (potential), AGR, IND, MIGR, REC-1, REC-2, WARM, SPWN, WILD
California Aqueduct	MUN, AGR, IND, REC-1, REC-2, WILD
Delta-Mendota Canal	MUN, AGR, REC-1, REC-2, WARM, WILD
Sunol Valley Region	
Alameda Creek	AGR, COLD, GWR, MIGR, REC-1, REC-2, SPWN, WARM, WILD
Arroyo Hondo	COLD, FRSH, MUN, REC-1, REC-2, SPWN, WARM, WILD
Calaveras Reservoir	COLD, MUN, REC-1 (limited), REC-2, SPWN, WARM, WILD
San Antonio Reservoir	COLD, MUN, REC-1 (limited), REC-2, SPWN, WARM, WILD
Niles Cone Groundwater	MUN, PROC, IND, AGR
Bay Division Region	
Guadalupe River	COLD, MIGR (potential), REC-1 (potential), REC-2, SPWN (potential), WARM, WILD
Santa Clara Valley Groundwater	MUN, PROC, IND, AGR (potential)
Peninsula Region	
San Mateo Creek	COLD (potential), FRSH, RARE, REC-1 (potential), REC-2 (potential), SPWN, WILD
Crystal Springs Reservoir	COLD, MUN, RARE, REC-2, SPWN, WARM, WILD
San Andreas Reservoir	COLD, MUN, RARE, REC-1 (limited), REC-2, SPWN, WARM, WILD
San Mateo Plain Groundwater	MUN, PROC, IND, AGR (potential)
San Francisco Region	
Lake Merced	COLD, MUN (potential), REC-1, REC-2, SPWN, WARM, WILD
Westside Groundwater	MUN, PROC (potential), IND (potential), AGR
San Francisco Bay	
San Francisco Bay, Lower	COMM, EST, IND, MIGR, NAV, RARE, REC-1, REC-2, SHELL, SPWN (potential), WILD
San Francisco Bay, South	COMM, EST, IND, MIGR, NAV, RARE, REC-1, REC-2, SHELL, SPWN (potential), WILD

Beneficial Uses Key:

MUN (Municipal and Domestic Supply); AGR (Agriculture); REC-1 (Body Contact Recreation); REC-2 (Noncontact Recreation); WARM (Warm Freshwater Habitat); COLD (Cold Freshwater Habitat); MIGR (Fish Migration); SPWN (Fish Spawning); WILD (Wildlife Habitat); NAV (Navigation); GWR (Groundwater Recharge); FRSH (Freshwater Replenishment); RARE (Preservation of Rare and Endangered Species); SHELL (Shellfish Harvesting); COMM (Ocean, Commercial, and Sport Fishing); EST (Estuarine Habitat); IND (Industrial Service Supply); PROC (Industrial Process).

Note: Beneficial uses for specific wetland sites affected by the WSIP facility improvement projects in the San Francisco Bay region will be determined as needed based on the process described in the San Francisco Bay Basin Plan.

Section 4.5.1, page 4.5-12: The following paragraph is inserted as the first paragraph under the heading “Construction in Waters of the State and of the United States” in response to a comment (see **Response S_RWQCBCV-03**).

> The Regional Water Quality Control Board (RWQCB) has regulatory authority over construction in waters of the United States and waters of the state, including activities in wetlands, under both the Clean Water Act and the State of California’s Porter-Cologne Water Quality Control Act (California Water Code, Division 7). Under the Clean Water Act, the RWQCB has regulatory authority over actions in waters of the United States through the issuance of water quality certifications under Section 401 of the Clean Water Act, which are issued in conjunction with permits issued by the Army Corps of Engineers (Corps) under Section 404 of the Clean Water Act. When the RWQCB issues a Section 401 certification for a project, the project is also regulated under State Water Resources Control Board Order No. 2003-0017-DWQ, “General Waste Discharge Requirements for Dredge and Fill Discharges That Have Received State Water Quality Certification,” which requires compliance with all conditions of the water quality certification. Activities in areas that are outside the jurisdiction of the Corps (e.g., isolated wetlands, vernal pools, or stream banks above the ordinary high water mark) are regulated by the RWQCB under the authority of the Porter-Cologne Act. Activities that lie outside of Corps jurisdiction may require the issuance of either individual or general waste discharge permits.

Section 4.5.1, page 4.5-13: The second full paragraph is revised as follows in response to a comment (see **Response S_RWQCBSF-04**).

> The C.3 requirements are similar for all counties. However, local municipalities are phasing in these requirements, and specific procedures and application requirements may differ from one municipality to another. Reconstruction projects located within ~~Projects completed in~~ a public street or road right-of-way, such as some pipeline projects proposed as part of the WSIP, are exempt from the C.3 requirements where ~~when~~ both sides of the right-of-way are developed.

Section 4.5.2, page 4.5-31: The last paragraph is revised as follows in response to a comment (see **Response S_RWQCBSF-07**).

> For projects that are subject to the Construction General Permit (described in Impact 4.5-1, above), the discharges could possibly be made in accordance with this permit, provided it could be demonstrated that the water is uncontaminated. … Discharges to a local sanitary sewer system would comply with the requirement of the local permitting agency. Other General Permits in the San Francisco Region under which dewatered groundwater may be discharged include the following General NPDES Permits:
>
> - General NPDES Permit for VOC Cleanups (Order No. R2-2004-0055)
> - General NPDES Permit for Fuel Cleanups (Order No. R2-2006-0075)
> - General NPDES Permit for Groundwater Dewatering (Order No. R2-2006-0075)

Before discharging under any general permit, the SFPUC must submit a completed Notice of Intent that includes a dewatering plan with appropriate treatment and monitoring specifications. The SFPUC should also allow at least 60 days for the RWQCB review and acceptance of the Notice of Intent and dewatering plans.

Section 4.5.2, page 4.5-39: The third full paragraph is revised as follows to correct an editorial error.

The Calaveras Dam (SV-2), 40-mgd Treated Water (SV-3), and Treated Water Reservoirs (SV-5) projects would not be located within a mapped 100-year floodplain. Therefore, flooding impacts would *not apply* to these projects.

Section 4.5.2, page 4.5-50: The first and second full paragraphs are revised as follows in response to a comment (see **Response S_RWQCBSF-09**).

With the exception of San Francisco and San Joaquin County, the municipal stormwater permits for the counties within the WSIP study area require new development and redevelopment projects that involve the creation or replacement of impervious surfaces to incorporate treatment measures and other appropriate source control and site design features to reduce the pollutant load in stormwater discharges and to manage runoff flows; the applicability of countywide MS4 stormwater management controls to the WSIP will be determined on a project-by-project basis as part of project-level review of individual WSIP projects. In each county, projects subject to these controls that involve the creation or replacement of one or more acres of impervious surfaces were required to comply with the new development and redevelopment requirements as of February 15, 2005. Projects subject to countywide MS4 stormwater management controls that involve the creation or replacement of 10,000 square feet or more of impervious surfaces were required to comply with the requirements by August 15, 2006. These thresholds apply to individual projects and are not applied to a cumulative set of projects if the locations of the cumulative set of projects under a single program are noncontiguous and/or are not part of a single common plan of development. To the extent that projects subject to countywide MS4 stormwater management controls are part of a single common plan of development that cumulatively exceeds 10,000 square feet of new or replaced impervious surface, the smaller amount of impervious surface from each sub-project would require appropriately sized stormwater treatment BMPs. ~~such as the WSIP. The applicability of the municipal stormwater permit requirements to specific projects would depend on the amount of impervious surface that would be created or replaced.~~

In addition, projects subject to countywide MS4 stormwater management controls that involve land disturbance of more than one acre would be required to include post-construction erosion and sediment control BMPs in the SWPPP prepared for the project (Described in the Setting and in Impact 4.5-1). For projects subject to countywide MS4 stormwater management controls, the post-construction erosion and sediment control BMPs for projects located in Alameda, Santa Clara, and San Mateo Counties and creating or replacing more than one acre of impervious surface must also comply with requirements in the Hydrograph Modification Management Plans for those counties. Post-construction BMPs could include minimizing land disturbance or the amount of impervious surfaces; treating stormwater runoff using infiltration, detention/retention, or biofilters; using efficient irrigation systems; ensuring that interior drains are not connected to a storm sewer system; and using appropriately designed and constructed energy dissipation devices. These measures would be designed to ensure that drainage patterns are not changed in a way that results in offsite erosion or flooding, and must be consistent with all local post-construction stormwater management requirements, policies, and guidelines. Coverage under the General Construction Permit cannot be terminated until the site is in compliance with all local stormwater management requirements and a post-construction stormwater management plan is in place, as described in the SWPPP.

4.6 Biological Resources

Section 4.6.1, page 4.6-22: The third full paragraph is revised as follows to correct an editorial error. The footnote in this paragraph remains unchanged and is not shown below.

Program Area Occurrence. ~~A~~ Two adult San Joaquin kit fox were~~was~~ sighted recently on another SFPUC project site in the Sunol Valley. Despite this sighting of ~~Since this was a single sighting,~~ apparently ~~of~~ a pair of ~~single~~ transient animals, this species is not otherwise considered present in the Sunol Region. Salt marsh harvest mouse occurs most frequently in suitable habitat that lies generally south of a line between Redwood City and Hayward (Goals Project, 2000).

Section 4.6.1, page 4.6-32: The fourth full paragraph is revised as follows in response to a comment (see **Response S_RWQCBCV-03**).

The state's authority to regulate activities in wetlands and water at the project sites resides primarily with the ~~State Water Resources Control Board (SWRCB)~~ California Regional Water Quality Control Board (RWQCB), which regulates construction in waters of the United States and waters of the state, including activities in wetlands, under both the Clean Water Act and the State of California's Porter-Cologne Water Quality Control Act. .... The RWQCB ~~SWRCB, acting through the nine Regional Water Quality Control Boards,~~ must certify that a Corps permit action meets state water quality objectives (Section 401, Clean Water Act).

Section 4.6.1, page 4.6-33: The following text is added before the second full paragraph on the page in response to a comment (see **Response L_BCDC-03**).

Local Laws, Regulations, and Policies Applying to Natural Resource Protection

The San Francisco Bay Conservation and Development Commission (BCDC) was formed in 1969 under the McAteer-Petris Act to regulate development in and around San Francisco Bay. BCDC developed the San Francisco Bay Plan to guide the wise use of the bay's water and shorelines. In reviewing permit applications for projects within its jurisdiction, BCDC relies on its Bay Plan policies to ensure the protection of habitats and biological resources, including fish, other aquatic organisms, and wildlife, and water quality; as well as policies on uses of the bay and shoreline.

Section 4.6.2, page 4.6-37: The third bullet is revised as follows in response to a comment (see **Response S_RWQCBCV-05**).

- Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act and as protected under the Porter-Cologne Water Quality Control Act (including but not limited to marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means (Evaluated in this section)

Section 4.6.2, page 4.6-47: The first sentence in the first full paragraph is revised as follows to be consistent with the updated project description of the Calaveras Dam Replacement project (SV-2).

The Calaveras Dam project (SV-2) would affect about 100 acres of habitat in the ~~dam~~ construction area, including portions of Calaveras Creek downstream from the existing dam and portions of Alameda Creek in the vicinity of the Alameda Creek Diversion Dam.

Section 4.6.2, page 4.6-55: The sixth sentence in the third full paragraph (starting on line 13 of this paragraph) is revised as follows to be consistent with the updated project description of the Calaveras Dam Replacement project (SV-2).

Established critical habitat in the Sunol Valley includes the area between Arroyo Hondo and Calaveras Reservoir (for California tiger salamander) and the area between the Alameda Creek Diversion Dam, Calaveras Reservoir and San Antonio Reservoir (for Alameda whipsnake).

4.7 Cultural Resources

Section 4.7.1, page 4.7-24: The following text is added after the first partial paragraph on the page in response to a comment (see **Response L_SFLandmarks-04**).

Opposition to construction of the Hetch Hetchy project came from a variety of interests. Understandably, the Spring Valley Water Company opposed this project, which effectively ended the company's role as the utility company supplying San Francisco with its municipal and domestic water.[21a] The Hetch Hetchy project was designed to transmit electrical power to San Francisco from a power plant at Moccasin. A politically charged conflict over this electric power and associated revenue pitted public power advocates against the privately financed electric power industry. Opposition came from electrical power generating companies like Pacific Gas and Electric Company (PG&E) and Great Western Power Company (GWP), two utilities that served San Francisco and the Bay Area. These private power companies opposed the competing generation and sale of electricity by public agencies, which was a provision of the Raker Act. The CCSF planned to acquire PG&E and GWP's distribution systems within its service area, but between 1927 and 1941 the public consistently rejected bond issues required to fund their acquisition; allegedly, this opposition to the bond measures was largely funded by PG&E.[21b] The CCSF's agreements to have PG&E (which had acquired GWP in the 1930s) wheel its power through the company's existing transmission and distribution systems for delivery to San Francisco agencies, and its purchase of city power for resale, caused a longstanding controversy between the federal government, public power advocates, and the CCSF.[21c]

Section 4.7.1, page 4.7-24: The following text is added after the third full paragraph in response to a comment (see **Response L_SFLandmarks-06**).

Multi-purpose dam and water conveyance projects proliferated within river basins throughout America in the early decades of the 20th century. The projects were built for a variety of purposes: municipal water supplies, federal land reclamation, irrigation, and electric power generation. Thousands of workers contributed to this construction work, often under tight schedules and difficult, even dangerous, conditions. Hetch Hetchy water project contract workers and wage laborers consisted of a varied group of individuals stratified by skill, race, and ethnicity. The largest proportion was low-paid, unskilled laborers, both native-born and immigrants. Above them were the better-paid skilled workers and craftsmen, and at the top was a smaller group consisting of managers, supervisors, administrative personnel, and skilled professionals such as civil and electrical engineers, hydrographers, and surveyors. Over more than 25 years of construction activity, the Hetch Hetchy project provided employment to many thousands of workers in many fields of industrial labor; these workers built everything from mountain roads, railroads, labor camps, buildings, bridges, and trestles that served as project infrastructure, to dams, tunnels, pipelines, siphons, and penstocks that stored and conveyed municipal water. Many of the lesser-skilled construction laborers were highly migratory, non-unionized workers whose employment was seasonal, with peak employment coming during the summer and autumn and minimal opportunities in winter and spring.

While some workers were more sedentary and lived in towns or work camps with their families, the majority of the workers—who were predominantly unmarried, mobile, and male—resided in boardinghouses or labor camps near their work sites. The ethnic makeup of the workingmen's boarding houses was often quite diverse, according to 1920 census records. For example, one lumber camp near Groveland was operated by an American civil engineer whose wife kept house with the assistance of one cook. Twenty-five boarders lived there, including painters, carpenters, contractors, lumberjacks, millwrights, and the lumberyard foreman. While the nationality of the boarders was predominately native-born, there were also Hungarians, Poles, Swedes, Germans, and Italians represented among the lodgers. Similarly, a tunnel camp in Groveland Precinct in 1920 contained boarding houses operated by a Swedish immigrant and a Canadian-born mine superintendent. While the Swedish-run operation catered mostly to about 20 Swedish, Norwegian, and native-born tunnel workers, the Canadian establishment lodged a diverse clientele of 22 workers, including tunnel miners and laborers, blacksmiths, foremen, and electricians. They were a diverse lot by nationality, including Canadians, native-born Americans, Spanish, German, Swedish, Italian, Irish, and Austrian workers. This pattern of boarding house occupation by workers of various nationalities was borne out at other tunnel camps and dam construction camps located outside the town of Groveland and at Lake Eleanor.[21d]

Unsafe working conditions and inadequate wages were issues that periodically contributed to labor strife and fostered efforts to unionize the rural industrial labor force assembled to construct the Hetch Hetchy project. During August of 1920, workers at some of the city's construction camps, particularly in the Mountain Tunnel Division, staged a general strike that lasted until May 1921. City officials, particularly O'Shaughnessy, had expressed general support for trade or craft unionism, but objected to "radicals" who organized the day laborers/construction workers hired by the CCSF and advocated worker solidarity, class conflict, and direct action (strikes) at the point of production. These radical labor leaders included representatives of the Industrial Workers of the World (I.W.W., or "Wobblies"), which variously functioned as an umbrella labor organization and revolutionary social movement, and the International Union of Mine, Mill & Smelter Workers, a labor union with militant roots in the copper, nickel, lead, and gold mines of the American West and British Columbia. During the 1920s and 1930s, Mine and Mill, as the union was known, made concerted efforts to organize unskilled national minorities such as Mexican-Americans and African-Americans in the American Southwest. City records indicated that Swedish/Finnish tunnel crews and Mexican laborers were among the more ardent supporters of the radical unionization effort.[21e]

Construction of Hetch Hetchy Dam, ancillary water storage structures, the city's extensive water conveyance system, and its power plant at Moccasin proceeded over several decades, from 1913 into the late 1930s. In 1925, in his report to the CCSF on Hetch Hetchy's progress, O'Shaughnessy made little mention of labor problems or strife over organizing, and no comments related to national groups and/or the ethnic composition of the workforce. He reported that the total number of "men" productively employed on the project between 1914 and mid-1925 ranged from over 500 at the end of 1914, less than a hundred at the beginning of 1915, and then a gradual increase (with ebbs and flows) to about 750 in 1919. Thereafter the numbers increased quickly, reaching over 2,000 in 1922, before dropping off again to less than 400 by mid-1925.[21f] After 1925, the bulk of the construction effort shifted to the Foothill and Coast Range Tunnels and installation of the San Joaquin Pipeline, leading eventually to the delivery of Hetch Hetchy water into the city in October 1934.[21g]

Section 4.7.1, page 4.7-24: The following footnotes are added in response to two comments (see **Responses L_SFLandmarks-04** and **L_SFLandmarks-06**):

[21a] Elmo R. Richardson, "The Struggle for the Valley: California's Hetch Hetchy Controversy, 1905–1913," *California Historical Society Quarterly*, Vol. 38, 1959.

[21b] Norris Hundley, *The Great Thirst: Californians and Water, 1770s–1990s.* University of California Press, pp. 187–189, 1992; and Stephen P. Sayles, "Hetch Hetchy Reversed: A Rural Urban Struggle for Power." *California History*, 64:4, p. 256, Fall 1985.

[21c] San Francisco Public Utilities Commission (SFPUC), *San Francisco Water and Power*, pp. 57–61, June 1949.

[21d] U.S. Census Bureau, MSS Population, Groveland Precinct, Tuolumne County, CA, 1920.

[21e] Ted Wurm, *Hetch Hetchy and its Dam Railroad*, Trans-Anglo Books, Glendale, CA, pp. 121–122, 1973; Melvyn Dubofsky, *We Shall Be All: A History of the Industrial Workers of the World*, Urbana: University of Illinois Press, 1988; Mario T. Garcia, *Mexican Americans: Leadership, Ideology and Identity, 1930–1960*, Urbana: Yale University Press, pp. 175–198, 1989; City and County of San Francisco (CCSF), Moccasin Archives, n.d.

[21f] M.M. O'Shaughnessy, *Hetch Hetchy Water Supply*, Bureau of Engineering of the Department of Public Works, report prepared for the City and County of San Francisco, p. 42, October 1925.

[21g] Hanson, Warren D., *San Francisco Water and Power: A History of the Municipal Water Department and Hetch Hetchy System*, City and County of San Francisco, pp. 55–56, 1994.

Section 4.7.1, page 4.7-25: The following text is added after the third full paragraph in response to a comment (see **Response L_SFLandmarks-04**):

O'Shaughnessy Dam was designed and built in a manner that would allow it to be raised. In the 1930s, President Franklin D. Roosevelt sought to provide America with a New Deal, a government-sponsored socioeconomic initiative that among its most prominent programs included dam construction projects as massive public works. Not long after Roosevelt's election (November 1932) and the start of the New Deal (after his inauguration in March 1933), the CCSF received a grant from the federal government covering 30 percent of the cost of labor and materials for raising O'Shaughnessy Dam. The money came from the National Recovery Administration, which was formed by the National Industrial Recovery Act of June 1933. The SFPUC reported that on November 7, 1933, the citizens of San Francisco passed a bond measure for $3.5 million to cover the city's portion of the cost of enlarging O'Shaughnessy Dam. The federal grant also stipulated that all available unemployed workers in Tuolumne County had to be put to work before unemployed people from San Francisco could be used. Soon thereafter, the state requested that the CCSF use 500 to 600 unemployed laborers it had available for "maintenance of municipal property" under the State Emergency Relief Act (SERA). By March 1934, the CCSF had erected seven SERA work camps capable of housing and feeding nearly 700 workers. Later, the state's SERA program for unemployment relief was absorbed into the federal Works Progress Administration. The CCSF issued the contract for the Hetch Hetchy Dam enlargement project on April 8, 1935 to the Transbay Construction Company, and the dam's raising was completed more than three years later, on July 1, 1938.[22a]

Section 4.7.1, page 4.7-25: The following footnote is added in response to a comment (see **Response L_SFLandmarks-04**):

[22a] San Francisco Public Utilities Commission (SFPUC), *San Francisco Water and Power,* pp. 59–60, June 1949; Ted Wurm, *Hetch Hetchy and its Dam Railroad*, Trans-Anglo Books, Glendale, CA, p. 251, 1973.

Section 4.7.2, page 4.7-37: The following footnote is added at the end of second full paragraph in response to a comment (see **Response L_SFLandmarks-05**):

> [29a] These properties have been determined eligible for listing in the National Register through consensus between a federal agency and the State Historic Preservation Officer. Information regarding National Register eligibility was acquired through a records search conducted at the Northwest Information Center at Sonoma State University, which is one of regional offices of the California Historical Resources Information System established by the California Office of Historic Preservation.

Section 4.7.2, page 4.7-39: The fourth bullet at the bottom of the page is revised as follows to clarify the current understanding of the historical status of the Coast Range Tunnel.

- *Hetch Hetchy Coast Range Tunnel*. This facility is listed as a California Historic Civil Engineering Landmark and appears to meet the criteria ~~is eligible~~ for listing in the National and California Register.

Section 4.7.3, page 4.7-51, Table 4.7-2: The text for the Baden and San Pedro Valve Lots project (row 19 below the table header) is revised as follows to correct an editorial oversight.

TABLE 4.7-2
POTENTIAL FOR PALEONTOLOGICAL IMPACTS

Project No.	Project Name	Would the WSIP project be located in an area of geologic formations where there is a high likelihood of paleontological impact?[a]	Have fossil localities been identified at other locations within the geologic formation?[a]	What is the potential for impacts on paleontological resources?	Impact significance
PN-1	Baden and San Pedro Valve Lots Improvements	Yes, ~~marine deposits, possible Merced Formation~~ Butano Sandstone/Whiskey Hill Formation	Yes	High	PSM

Section 4.7.3, page 4.7-54: The first paragraph under the subheading "Peninsula Region" is revised as follows, including a new footnote shown below, to correct an editorial oversight.

> Paleontological resources could be encountered during construction work for the Baden and San Pedro Valve Lots (PN-1), HTWTP Long-Term (PN-3), and Pulgas Balancing Reservoir (PN-5) projects. These project areas overlie marine sedimentary geologic units that have recorded fossil localities. The ~~Baden and San Pedro Valve Lots and~~ HTWTP Long-Term project~~s~~ overlies the Merced Formation, a marine sandstone, siltstone, claystone, and conglomerate deposit that contains numerous invertebrate fossil localities throughout the San Francisco Peninsula. The Pulgas Balancing Reservoir and Baden and San Pedro Valve Lots Improvements projects include construction ~~is~~ at the southern end of Crystal Springs Reservoir, in ~~an~~ areas underlain by Butano Formation sandstone/Whiskey Hill Formation[32a] and other fossil-bearing marine sandstones and shales. The Butano Formation/Whiskey Hill Formation contains numerous fossil localities throughout

San Mateo County (UCMP, 2006). Given the high likelihood that these projects could affect paleontological resources, this impact would be *potentially significant*, but could be reduced to a less-than-significant level by suspending work if a paleontological resource is identified and having the site inspected by a qualified paleontologist (Measure 4.7-1).

(Footnote to be added as part of the above new text):

[32a] The Whiskey Hill Formation was previously mapped as the Butano sandstone. However, in 1993 the USGS determined that the Butano sandstone was actually composed of two similar sandstones indistinguishable in lithology and age but separated by the San Andreas-Pilarcitos fault system and having different stratigraphic relations to other geologic units. As a result of this determination, the geologic unit in the vicinity of the southern end of Crystal Springs Reservoir is now identified as the Whiskey Hill Formation, but references prepared prior to 1993 (including the University of California Museum of Paleontology Collections Database) refer to the Butano sandstone instead of the Whiskey Hill Formation. For this reason, the formation is referred to as the Butano sandstone/Whiskey Hill Formation in this analysis.

Section 4.7.3, pages 4.7-64 and 4.7-65, Table 4.7-4: The third and ninth rows, excluding headers, of Table 4.7-4 are revised as follows to correct inadvertent omissions of potentially affected facilities.

TABLE 4.7-4
HISTORIC ARCHITECTURAL RESOURCES IMPACT POTENTIAL ON REGIONAL WATER SYSTEM FACILITIES

WSIP Facility Improvement Project	Construction Date of Potentially Affected Facilities	Would the project affect a potential historic district?	Significance determination for impacts on the historical significance of a potential historic district	Would the project demolish or alter the historic fabric or function of a specific existing facility?	Significance determination for impacts on the historical significance of the individual facility
SV-4: New Irvington Tunnel	Irvington Tunnel: 1934 Irvington Portal: 1934 Alameda West Portal: 1934 Coast Range Tunnel: 1934	Yes, the existing Irvington Tunnel and the Irvington and Alameda West Portals could be contributors to a potential historic district related to the implementation of John R. Freeman's plan for the development of the Hetch Hetchy system. Because the existing Irvington Tunnel and Alameda West Portal would continue as originally designed, and the project would create a new component of the system (a new, redundant tunnel) rather than eliminate the existing tunnel, the impact on such a potential historic district would be less than significant. However, the existing Irvington Portal would be demolished as part of this project, which would result in a potentially significant impact on the potential historic district. This impact could likely be reduced to a less-than-significant level.	PSM	Yes, the project would demolish the unique spherical Irvington Portal (in Fremont) that was built in the 1930s. Since retaining the portal is not feasible due to safety concerns, the impact on the historic facility would be potentially significant and unavoidable, if the portal were determined to be a historical resource for the purposes of CEQA compliance.	PSU

4.8 Traffic, Transportation, and Circulation

Section 4.8.2, page 4.8-22: The third full paragraph is revised as follows in response to a comment (see **Response L_EBRPD-06**):

> Construction of Calaveras Dam (SV-2) would require temporary closure of Calaveras Road between Geary Road and Felter Road to through-traffic during the two- to three-year construction period. Through-traffic using Calaveras Road would be required to find an alternate route for the duration of the construction period and would likely use I-680. Access to the East Bay Regional Park District's (EBRPD) Sunol Regional Wilderness would still be provided via Calaveras Road and Geary Road from the north, and emergency vehicles would continue to have access to temporarily closed roads. Direct access to ~~some~~ the EBRPD Ohlone Wilderness Regional Trail may be restricted, including access to the Bay Area Ridge Trail connection from the west. There are no private residences or commercial uses on this segment of Calaveras Road. This project would be evaluated as part of separate, project-level CEQA review. Implementation of SFPUC Construction Measure #5 (traffic control plan) and additional traffic control measures identified in Measure 4.8-1a would be adequate to ensure acceptable levels of traffic, pedestrian, and bicycle flow and to reduce any *potentially significant* circulation and access impacts to a less-than-significant level.

4.9 Air Quality

Section 4.9.2, page 4.9-17: The following text is added after the first paragraph to reflect updated information implemented by the city and county of San Francisco. This change does not affect the GHG impact analysis in the Draft PEIR.

Greenhouse Gas Reduction Ordinance

In May 2008, San Francisco adopted an ordinance amending its Environment Code to establish greenhouse gas emission targets and action plans, to authorize the Department of the Environment to coordinate efforts to meet these targets, and to make environmental findings (CCSF, 2008). The ordinance establishes the following greenhouse gas emission reduction limits for San Francisco and the target dates to achieve them:

- Determine 1990 City greenhouse gas emissions by 2008, the baseline level with reference to which target reductions are set;
- Reduce greenhouse gas emissions by 25 percent below 1990 levels by 2017;
- Reduce greenhouse gas emissions by 40 percent below 1990 levels by 2025; and
- Reduce greenhouse gas emissions by 80 percent below 1990 levels by 2050.

The ordinance also specifies requirements for City departments to prepare Climate Action Plans that assess and report GHG emissions and prepare recommendations to reduce emissions. As part of this, the San Francisco Planning Department is required to: (1) update and amend the City's applicable General Plan elements to include the emissions reduction limits set forth in this ordinance and policies to achieve those targets; (2) consider a project's impact on the City's GHG reduction limits specified in this ordinance as part of its review under CEQA; and (3) work with other City departments to enhance the "transit first" policy to encourage a shift to sustainable modes of transportation thereby reducing emissions and helping to achieve the targets set forth by this ordinance.

Section 4.9.2, page 4.9-19: The text following the heading "SFPUC GHG Reduction Actions as Part of the WSIP" is revised as follows to correct an editorial error.

A. The SFPUC will include the first two ~~following~~ measures in all WSIP contractor specifications and will implement the third during project planning and design, which in addition to having other environmental benefits, would also help reduce GHG emissions.

Section 4.9.3, page 4.9-20: The third bullet under Significance Criteria is revised as follows to reflect the updated criterion used by the San Francisco Planning Department and to clarify the intent of the greenhouse gases (GHGs) analysis in the Draft PEIR. This change does not affect the GHG impact analysis in the Draft PEIR.

- Conflict with the state goal of reducing GHG emissions in California to 1990 levels by 2020, as set forth by the timetable established in AB 32, California Global Warming Solutions Act of 2006, such that the project's GHG emissions would result in a substantial contribution to global climate change (Evaluated in this section).

Section 4.9.4, page 4.9-48: The following reference is added after (Cal-EPA, 2005) to reflect updated information implemented by the City and County of San Francisco.

City and County of San Francisco (CCSF), Environment Code, Chapter 9: Greenhouse Gas Emissions Targets and Departmental Actions, (Ordinance 81-08, File No. 071294), May 13, 2008.

4.11 Public Services and Utilities

Section 4.11.1, page 4.11-4, Table 4.11-2: Table 4.11-2 is revised as shown on the following page in response to a comment (see **Response L_EBRPD-23**).

TABLE 4.11-2
LAW ENFORCEMENT AND FIRE PROTECTION SERVICE PROVIDERS WITHIN THE WSIP STUDY AREA

Jurisdiction	Law Enforcement Agencies	Fire Protection Service Agencies
Alameda County		
Unincorporated areas including, San Lorenzo and Castro Valley	Alameda County Sheriff's Department East Bay Regional Park District Police Department	Alameda County Fire Department East Bay Regional Park District Fire Department

Section 4.11.1, page 4.11-8: The first sentence in the first paragraph is revised as follows to correct an editorial error.

California Integrated Waste Management Act of 1989

The California Integrated Waste Management Act of 1989 (Public Resources Code [PRC], Division 30), enacted through Assembly Bill (AB) 939 and modified by subsequent legislation, requires all California cities and counties to implement programs to reduce, recycle, and compost at least 50 percent of wastes by the year 2000~~, and to divert at least 75 percent by 2010~~ (PRC Section 41780).

4.12 Recreational Resources

Section 4.12.1, page 4.12-2: The last paragraph is revised as follows in response to a comment (see **Response L_EBRPD-19**).

East Bay Regional Parks. The EBRPD has jurisdiction over numerous regional parks located in Alameda and Contra Costa Counties. Several major EBRPD facilities encompassing thousands of acres of parks and open space are clustered in the East County/Sunol Valley area, including Del Valle Regional Park, Ohlone Regional Wilderness, Sunol Regional Wilderness, Vargas Plateau Regional Preserve, and Mission Peak Regional Park. The long-term goal of the EBRPD is to adopt land use plans to guide the management and use of all of its facilities. The EBRPD has adopted a land use plan for Del Valle Regional Park; other land use plans are in draft form at various stages of planning.

Section 4.12.1, page 4.12-7: The last two paragraphs are revised as follows in response to a comment (see **Response L_SFBayTrl-02**).

The Bay Trail. Senate Bill 100, passed in 1987, directed the Association of Bay Area Governments (ABAG) to identify an alignment and develop a plan to create a public trail system encircling San Francisco Bay. The *Bay Trail Plan*, adopted by ABAG in 1989, proposed a continuous 400-mile corridor that would eventually link the shorelines of all nine Bay Area counties and 47 cities around San Francisco and San Pablo Bays. Since its adoption, the *Bay Trail Plan* has received widespread public support as a means of preserving and enhancing public access to the San Francisco Bay waterfront. Most of the jurisdictions along the proposed trail alignment have adopted the plan and incorporated the appropriate Bay Trail segments into their local plans and policies. When complete, the Bay Trail corridor will be 500 miles long.

Development of the Bay Trail is overseen by the Bay Trail Project, a nonprofit organization established in 1990. The Bay Trail Project does not own land or easements; instead, it encourages local jurisdictions to construct and maintain segments of the Bay Trail, often in partnership with other local nonprofit groups. ~~As of 2005, a~~Approximately ~~280~~290 miles, or just over half of the envisioned trail, ~~had~~has been completed. Some portions of the Bay Trail are paved pathways, while others consist of dirt trails or sidewalks. The main trail, referred to as the "spine trail," follows the San Francisco Bay shoreline to the extent possible. Where it is not able to follow the shoreline, “spur trails” provide access from the spine trail to points of interest along the waterfront. In addition, “connector trails” provide links to other nearby recreational facilities, residential neighborhoods and employment centers (Association of Bay Area Governments Bay Trail Project, 2005). Segments of the Bay Trail exist near the proposed pipeline alignments for the BDPL Reliability Upgrade (BD-1) project.

Section 4.12.1, page 4.12-10: The fourth paragraph is revised as follows in response to a comment (see **Response L_PaloAlto-14**).

City of Palo Alto

According to the City of Palo Alto, the city has a total of 4,358 acres of parkland and open space areas, including 32 urban parks encompassing approximately 200 acres and several large open-space and nature preserves. Foothill Park is approximately 1,400 acres and the Arastradero Preserve is approximately 610 acres (City of Palo Alto, 2007). ~~Palo Alto operates 29 parks encompassing approximately 190 acres. Palo Alto Baylands Nature Preserve, a popular hiking and bird-watching area on San Francisco Bay, encompasses 1,940 acres and contains 15 miles of multi-use trails, a segment of the Bay Trail, an athletic center, picnic facilities, an art park, and the Baylands Nature Interpretive Center.~~ The City of Palo Alto owns the wetlands south of Cooley Landing (in East Palo Alto) in the vicinity of the BDPL Reliability Upgrade (BD-1) pipeline alignment (City of Palo Alto, 1998). A BDPL Nos. 3 and 4 Crossovers (BD-2) crossover facility would be adjacent to the sports fields at Gunn High School.

Section 4.12.1, page 4.12-11: The first full paragraph is revised as follows in response to a comment (see **Response L_RdwdCty-06**).

City of Redwood City

Redwood City owns and operates 30 parks, including small neighborhood parks, larger multi-use parks, a dog park, a skate park, and two outdoor pools (City of Redwood City, 2007~~c~~a). The BDPL Reliability Upgrade project (BD-1) is in the vicinity of Fleishman Park, Hawes Park, and Red Morton Park. The 0.64~~0.63-~~acre Fleishman Park has play equipment, a play area, picnic area, barbeque pits, and restrooms (City of Redwood City, 2007~~a~~b). Hawes Park contains ball fields and restroom facilities on ~~covering~~ 1.59 acres (City of Redwood City, 2007b). Red Morton Park encompasses 30.89 ~~31.74~~ acres and has pools, ball fields, play areas and equipment, picnic areas, barbeque pits, tennis courts, basketball courts, and restroom facilities (City of Redwood City, 2007b~~d~~). An alternative site for the BDPL 3 and 4 Crossovers project (BD-2) could also be located in Redwood City (City of Redwood City, 1991).

Section 4.12.2, page 4.12-18: The second paragraph is revised as follows in response to a comment (see **Response L_EBRPD-02**).

To determine potential direct effects of WSIP projects construction activities and/or land acquisition, project areas were compared with the locations of identified recreational

> resources. Potential indirect effects on recreational resources were identified through the same means, as well as by reviewing the impact findings from Section 4.3, Land Use and Visual Quality; Section 4.5, Hydrology and Water Quality; Section 4.9, Air Quality; and Section 4.10, Noise and Vibration. Indirect impacts that would typically result from other physical impacts and could adversely affect the recreational experience include the following: removal of vegetation that could alter views (Section 4.3, Land Use and Visual Quality); construction-related noise that could affect hiking or nature appreciation (Section 4.10, Noise); or impeded access to hiking trails (Section 4.8, Traffic, Transportation, and Circulation).

Section 4.12.2, page 4.12-22, Table 4.12-2: Table 4.12-2 is revised as follows in response to a comment (see **Response L_SFBayTrl-04**).

TABLE 4.12-2
PUBLIC PARKS AND RECREATIONAL FACILITIES IN THE PROJECT VICINITY

Projects	Potentially Affected Recreational Resources
BD-1: Bay Division Pipeline Reliability Upgrade	Don Edwards San Francisco Bay Regional Wildlife Refuge; Ravenswood Open Space Preserve; San Francisco Bay Trail; local parks in Fremont, Newark, San Mateo County, and Redwood City; numerous school properties in East Palo Alto, Fremont, Menlo Park, Newark, and Redwood City

Section 4.12.2, page 4.12-24: The first full paragraph is revised as follows in response to a comment (see **Response L_SFBayTrl-04**).

> Of the WSIP projects proposed for construction in the Bay Division Region, the BDPL Reliability Upgrade project (BD-1) would have the greatest potential impact on recreational facilities in the area. The preferred pipeline alignment for the new Bay Division Pipeline (No. 5) would pass beneath the Don Edwards San Francisco Bay Regional Wildlife Refuge, with an approximately five-mile tunnel segment installed beneath marshlands and San Francisco Bay. The two cut-and-cover sections of pipeline (approximately seven miles from the Irvington Tunnel Portal to the Newark Valve House and nine miles from the Ravenswood Valve House to the Pulgas Tunnel Portal) would be located within the existing SFPUC right-of-way. The Ravenswood Open Space Preserve and San Francisco Bay Trail are also located in the vicinity of the Ravenswood Valve House.

Section 4.12.3, page 4.12-29: The following reference is added after (City of Palo Alto, 1998) in response to a comment (see **Response L_PaloAlto-14**).

> City of Palo Alto, Yoriko Kishimoto, Mayor, letter communication, September 25, 2007.

Section 4.12.3, page 4.12-29: The following references are revised as follows in response to a comment (see **Response L_RdwdCty-06**).

City of Redwood City, Parks, Recreation and Community Services, Parks and Pools, available online at www.redwoodcity.org/parks/parksandpools/index.html, accessed May 17, 2007ae.

City of Redwood City, Peter Ingram, Community Services Director, letter communication, September 27, 2007b.

City of Redwood City, Parks, Recreation and Community Services, Fleishman Park, available online at www.redwoodcity.org/parks/parksandpools/parks/parks_fleishman.html, accessed May 17, 2007a.

City of Redwood City, Parks, Recreation and Community Services, Hawes Park, available online at www.redwoodcity.org/parks/parksandpools/parks/parks_hawes.html, accessed May 17, 2007b.

City of Redwood City, Parks, Recreation and Community Services, Red Morton Park, available online at www.redwoodcity.org/parks/parksandpools/parks/parks_red.html, accessed May 17, 2007d."

Attachment 4-A (End of Chapter 4)

Attachment 4-A, pages 8 and 9, Measure 4.6-1b: This is the same revision to Measure 4.6-1b as described below under Volume 4, Chapter 6, Section 6.3.5, page 6-11.

Attachment 4-A, pages 11 and 12: This is the same deletion to Table 6-1 as described below under Volume 4, Chapter 6, Section 6.3.5, page 6-14. In addition, the revision to the footnote on this table on page 12 is the same as described below under Volume 4, Chapter 6, Section 6.3.6, page 6-15.

Attachment 4-A, page 17: This is the same revision to Table 6-2 (Measure 4.6-3b) as described below under Volume 4, Chapter 6, Section 6.3.5, page 6-20, regarding the San Mateo woolly sunflower.

Attachment 4-A, page 24, Measure 4.7-4a: This is the same revision to Measure 4.7-4a as described below under Volume 4, Chapter 6, Section 6.3.6, page 6-27.

Attachment 4-A, page 28, Measure 4.8-1a: This is the same revision to Measure 4.8-1a as described below under Volume 4, Chapter 6, Section 6.3.7, page 6-31.

Attachment 4-A, page 30: The impact number for Measure 4.16-6c (Combined Sunol Valley Traffic Control Plan) is revised as follows to correct an editorial error.

Combined Sunol Valley Traffic Control Plan

Measure 4.16-76c: Due to the potential for overlapping project schedules in the Sunol Valley Region as well as for construction traffic….

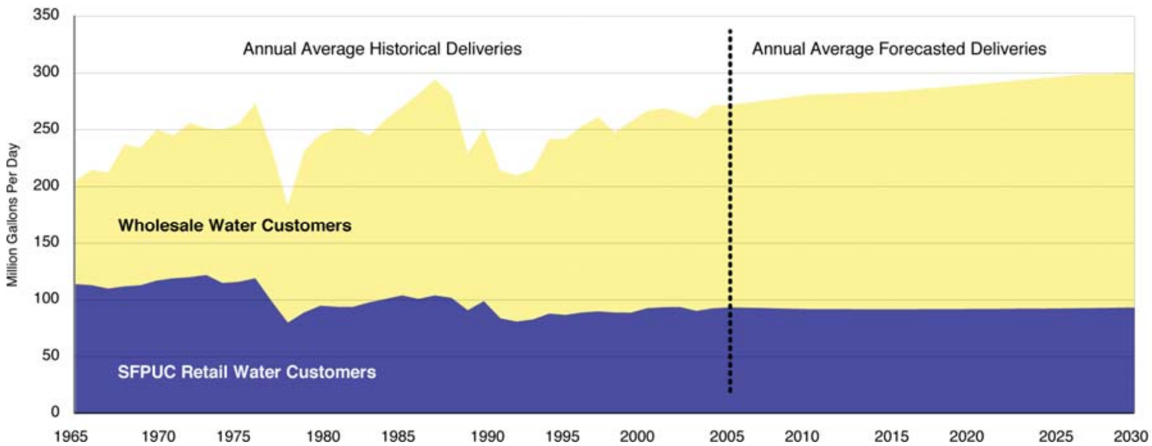
Attachment 4-A, page 36: This is the same revision to Measure 4.16-7b as described below under Volume 4, Chapter 6, Section 6.3.8, page 6-39.

Volume 3, Chapter 5

5.1 Overview

Section 5.1.3, page 5.1-5. This is the same revision as described above for Section 3.6.2, page 3-36, in the first bullet under the first paragraph under the heading "Proposed Drought-Year Water Supplies."

Section 5.1.3, page 5.1-6, Figure 5.1-2: The label on the right-hand side of the figure is revised as shown on the following page in response to a comment (see **Response L_BAWSCA1-57**).



SFPUC Water System Improvement Program ▪ 203287

SOURCE: SFPUC, 2007b

Figure 5.1-2 (Revised)
Annual Average Historical and
Projected Future Customer Purchase Requests

Section 5.1.4, page 5.1-9. The second paragraph under the heading "Hetch Hetchy/Local Simulation Model" is revised as follows and text is added to provide information regarding the updated modeling results conducted in 2008, as discussed in Chapter 13, Section 13.3.

> A general overview of this modeling tool and the basic assumptions about the system included in the model are described in this section. **Appendix H1** provides a more detailed description of the model and how it was used for the PEIR water supply and system operations impact analysis; **Appendix H2** provides supporting details and an explanation of the 2007 raw data output from the model.
>
> Following publication of the Draft PEIR, the SFPUC conducted updated model runs in 2008 using more recent input assumptions for several model parameters as part of its ongoing system planning and management. The revised input assumptions included: adjusted capacity for Crystal Springs Reservoir from recent survey data; more accurate assumptions for Pilarcitos facilities operations; improved data regarding the historical hydrology in the Alameda Creek watershed; updated agricultural demands in the Modesto and Turlock Irrigation Districts service area to be consistent with data used in recent

> statewide planning documents; and a refinement of water release protocols at Don Pedro Reservoir. Review of the 2008 model output indicated that the results are generally consistent with the 2007 results used in the Draft PEIR analysis, and that the analyses and impact determinations presented in the Draft PEIR remain valid. With one exception, no changes in the impact approach, analysis or conclusions presented in the Draft PEIR are necessary for the water supply and system operations impact assessments that were based on the 2007 results. The sole exception is the approach to the impact analysis of Pilarcitos watershed resources, for which only semi-quantitative data were previously available. Therefore, the 2008 data were used to conduct a refined impact analysis of the Pilarcitos watershed resources; no new impacts were identified. The results of the refined impact analysis for the Pilarcitos watershed are summarized in Chapter 13 (Section 13.3, pp. 13-6 to 13-7).

Section 5.1.4, page 5.1-14: The last paragraph is deleted as follows to reflect the updated modeling results conducted in 2008, as discussed in Chapter 13, Section 13.3.

> ~~For example, the HH/LSM was used to estimate baseline and with-WSIP water levels in all SFPUC reservoirs except for Pilarcitos Reservoir. Model results for the Pilarcitos watershed were not directly used to analyze existing and projected water levels in Pilarcitos Reservoir or flows in Pilarcitos Creek. The model does not currently reflect a complete contemporary depiction of the physical operation of the Pilarcitos watershed's facilities. Although adequate for SFPUC's systemwide water supply planning purposes, HH/LSM results for the Pilarcitos watershed at times required supplemental refinement and analysis to accurately reflect the physical infrastructure in place in the watershed.~~

Section 5.1.4, page 5.1-17: The first sentence of the first paragraph is revised as follows to reflect the updated modeling results conducted in 2008, as discussed in Chapter 13, Section 13.3.

> The HH/LSM was ~~also~~ used to estimate baseline and with-WSIP flows in the Tuolumne River, ~~and~~ Alameda Creek, and Pilarcitos Creek.

Section 5.1.4, page 5.1-17. The third paragraph is revised as follows to provide information regarding the updated modeling results conducted in 2008, as discussed in Chapter 13, Section 13.3.

> For the reasons noted above, HH/LSM results were not used to predict ~~water levels in Pilarcitos Reservoir, flows in Pilarcitos Creek, or~~ the magnitude and timing of spills or releases from Crystal Springs and San Antonio Reservoirs. In addition, HH/LSM results were not used to predict the magnitude and timing of spills or releases from Crystal Springs Reservoir. In these cases, the likely effects of the WSIP were determined through a review of historical data and consultation with individuals knowledgeable about the past and predicted future reservoir operating practices as well as output from the updated 2008 HH/LSM results.

5.2 Plans and Policies

Section 5.2.2, page 5.2-4, Table 5.2-1: The following rows are added under the heading State of California in response to two comments as shown on the following page (see **Response L_BCDC-04** and **Response SI_TRT-CWA-SierraC-84**).

Section 5.2.2, page 5.2-6: The following text is added at the end of the fourth full paragraph in response to a comment (see **Response S_RWQCBCV-08**).

> Under Section 401 of the Clean Water Act, every applicant for a federal permit for any activity that may affect waters of the state must obtain a water quality certification that the proposed activity will comply with state water quality standards.

Section 5.2.2, page 5.2-6: The following text is added under the heading Federal Statutes and Agreements in response to a comment (see **Response L_Tuol2-06**).

National Forest Management Act

> The National Forest Management Act, enacted by Congress in 1976, is the primary statute governing the administration of national forests. The act requires the Secretary of Agriculture to assess forest lands, and to develop and implement a resource management plan for each unit of the National Forest System. The management plans must: ensure consideration of both economic and environmental factors; provide for wildlife and fish; provide for the diversity of plant and animal communities; ensure timber harvesting will occur only where water quality and fish habitat are adequately protected from serious detriment; and ensure clearcutting and other harvesting will occur only where it may be done in a manner consistent with the protection of soil, watersheds, fish, wildlife, recreation, aesthetic resources, and regeneration of the timber resource. The management plans must be updated at least once every 15 years. In the overall WSIP region, the Sierra Nevada Framework is the management plan governing Stanislaus National Forest. The provisions of the Sierra Nevada Framework are implemented by the U.S. Forest Service.

Section 5.2.2, page 5.2-10: The following text is added under the State Agencies heading in response to a comment (see **Response SI_TRT-CWA-SierraC-84**).

California Fish and Game Commission

> The California Fish and Game Commission (Commission) has the statutory authority to formulate guidance policies for the California Department of Fish and Game (CDFG). The Commission has over 200 powers and duties listed in the statutes of the Fish and Game Code. Principal among these are legislatively granted powers for the regulation of the sport take and possession of birds, mammals, fish, amphibians, and reptiles. The Commission oversees the establishment of wildlife areas and ecological reserves and regulates their use, and prescribes the terms and conditions under which permits or licenses may be issued by the CDFG. A primary responsibility of the Commission is to afford an opportunity for full public input and participation in the decision- and policy-making process of adopting regulations or taking other actions related to the well-being of California's fish and wildlife resources.

TABLE 5.2-1
APPLICABLE FEDERAL, STATE, AND LOCAL STATUTES AND AGREEMENTS

Statute or Agreement / Responsible Agency[a]	Summary Description	Associated Statutes and Plans	Applicability to WSIP Water Supply and System Operations Issues
State of California			
McAteer-Petris Act / BCDC	Promotes responsible planning and regulation of San Francisco Bay. Establishes BCDC as the agency responsible for carrying out the provisions of the act and of the SF Bay Plan.	San Francisco Bay Plan	Described in Section 5.2.3 and evaluated in Section 5.2.4 for consistency. Analyzed in Section 5.3.3.
California Fish and Game Code / Fish and Game Commission and CDFG	Provides a system for the restoration and preservation of California's fish and wildlife resources	California Endangered Species Act (CESA), California Environmental Quality Act (CEQA), Lake and Streambed Alterations	CEQA review of the proposed water supply and system operations aspects of the WSIP is presented in Chapter 5, including the impacts of the WSIP on species listed under CESA, as discussed in Sections 5.3.7, 5.4.6, and 5.5.6.

The Commission sets policy for the CDFG, while the CDFG is the lead state agency charged with implementing, safeguarding, and regulating the uses of fish and wildlife.

California Department of Fish and Game

The mission of the CDFG is to manage California's diverse fish, wildlife, and plant resources, and the habitats upon which they depend, for their ecological values and for their use and enjoyment by the public. The CDFG enforces multiple programs dedicated to the conservation and preservation of habitats and species in California, including the California Endangered Species Act (CESA), California Environmental Quality Act (CEQA), and California Fish and Game Code. Under CESA, the CDFG is responsible for consulting with state lead agencies to determine if their actions would affect a state-listed threatened or endangered species. Under CEQA, the CDFG is responsible for consulting with lead and responsible agencies and providing the requisite biological expertise to review and comment upon environmental documents and impacts arising from project activities. The CDFG is also responsible for enforcing the provisions of the California Fish and Came Code.

Section 5.2.2, page 5.2-11: The following text is added under the State Statutes and Agreements heading in response to a comment (see **Response SI_TRT-CWA-SierraC-84**).

California Fish and Game Code

The Fish and Game Code provides a system for the protection of California's fish and wildlife resources and includes: provisions related to fish and wildlife protection and conservation; fish and game management; wetlands mitigation banking; endangered species; and operation of dams, conduits, and screens.

Section 5.2.2, page 5.2-12: The following paragraph is added above the heading Porter-Cologne Water Quality Control Act in response to a comment (see **Response L_BCDC-04**).

McAteer-Petris Act

The McAteer-Petris Act was passed by the state legislature in 1965 to promote responsible planning and regulation of San Francisco Bay. The act designates the San Francisco Bay Conservation and Development Commission (BCDC) as the agency responsible for maintaining and carrying out the provisions of the act and the SF Bay Plan (for additional information on the act, see Chapter 4, Section 4.2, p. 4.2-8).

Section 5.2.2, page 5.2-12: The following paragraph is added under the heading Local and Regional Agencies heading, below City and County of San Francisco, in response to a comment (see **Response L_BCDC-04**).

San Francisco Bay Conservation and Development Commission

The San Francisco Bay Conservation and Development Commission (BCDC) is the agency responsible for maintaining and carrying out the provisions of the McAteer-Petris Act and the SF Bay Plan. In the public interest, BCDC is authorized to control bay filling and dredging and bay-related shoreline development. Due to the regulatory authority of the State Water Resources Control Board (SWRCB), San Francisco Bay Regional Water Quality Control Board, U.S. Environmental Protection Agency, and the U.S. Army Corps of Engineers, BCDC's scope of authority over water quality issues is limited. (For additional information on BCDC's regulatory authority, see Chapter 4, Section 4.2, p. 4.2-8.)

Section 5.2.3, page 5.2-14: The following text is added under the heading Relevant Plans, Policies, and Planning Actions in response to a comment (see Response **Response L_Tuol2-06**).

U.S. Forest Service, Sierra Nevada Framework

In January 2001, the U.S. Forest Service adopted the Sierra Nevada Forest Plan Amendment (SNFPA or Sierra Nevada Framework), a plan for the management of 11 national forests and 11.5 million acres of national forest land in the Sierra Nevada mountain range, including Stanislaus National Forest. In January 2004, in response to concerns about the flexibility and compatibility of the SNFPA with other programs related to wildland fire management, the U.S. Forest Service amended the Sierra Nevada Framework to provide additional provisions for fire and fuels treatments. The amended Framework outlines procedures used to manage and protect forests, wildlife habitats, and communities from a variety of threats, including catastrophic fires, and provides a programmatic framework within which project-level decisions are designed and implemented. Key aspects of the SNFPA include: a commitment to restoration and protection of old-growth forest habitat; protection of all trees greater than 30 inches on 11 million of the 11.5 million acres of public land managed by the U.S. Forest Service; designation of riparian conservation areas; improvement and protection of suitable habitat for California spotted owl (*Strix occidentalis occidentalis*), northern goshawk (*Accipiter gentiles*), and willow flycatcher (*Empidonax traillii*); adoption of an integrated vegetation management strategy with the primary objective of protecting communities and modifying landscape-scale fire behavior to reduce the size and severity of fires; and provisions for increased land use management, including grazing, timber production, road construction, and recreation activities. The SNFPA is administered by the U.S. Forest Service (USDA Forest Service, 2004). As no WSIP facility improvement projects are proposed within Stanislaus National Forest, and the resources protected by the SNFPA would not be affected by the WSIP water supply and system operations, the WSIP would be consistent with the provisions of the SNFPA.

Section 5.2.3, page 5.2-15: The following text is added under the heading Regional Natural Resource Protection Plans in response to a comment (see **Response L_Tuol2-06)**.

Bay Delta Conservation Plan

The Bay Delta Conservation Plan (BDCP) is an effort driven by Delta water users to provide for the conservation and management of certain aquatic species, both listed and non-listed, and their habitats, while providing for regulatory assurances related to water supply reliability and water quality for the Sacramento–San Joaquin River Delta. Activities that would be covered under the BDCP include water supply operations related to the State Water Project and the Central Valley Project, and the power plant operations of the Mirant Corporation. Under the BDCP, water users would pay for new infrastructure, wetlands restoration, and other related projects in return for guaranteed stable water supplies. As the BDCP is still under development and is not yet adopted, no determination regarding potential conflicts of the WSIP with its provisions has been made.

Section 5.2.3, page 5.2-20: The following paragraph is added above the Regional Habitat Conservation Plans heading in response to a comment (see **Response L_BCDC-04**).

San Francisco Bay Plan

The SF Bay Plan, completed and adopted by BCDC in 1968, is an enforceable plan that guides the protection and use of San Francisco Bay and its shoreline. For a discussion of the SF Bay Plan's applicability to individual WSIP facility projects, see Section 4.2 (Vol. 2, Chapter 4, p. 4.2-16).

The SF Bay Plan is founded on the belief that water quality in San Francisco Bay will be maintained at levels sufficiently high to protect the beneficial uses of the bay. The SF Bay Plan includes findings and policies related to freshwater inflow and changes in salinity. The freshwater inflow findings contained in the SF Bay Plan stress the importance of maintaining a balance between fresh and saltwater. The related policies assert that the impact of freshwater diversions should be monitored by the SWRCB to ensure compliance with water quality standards.

Section 5.2.4, page 5.2-27: The second full paragraph is revised as follows in response to a comment (see **Response L_BCDC-04**).

Consistency with Regional Natural Resource Protection Plans

WQCPs [water quality control plans] identify water quality issues and prescribe enforceable water quality objectives/criteria for specific water bodies and their tributaries. Because these standards are based on designated beneficial uses of the respective waterways, violation of the water quality objectives/criteria can adversely affect fish, wildlife, and other protected resources. SFPUC operations currently comply with water quality standards contained in the WQCPs, and the WSIP goals and objectives would be consistent with the applicable WQCPs. Further, as future SFPUC operations would be consistent with the water quality standards contained in the WQCPs, SFPUC operations would also be consistent with the SF Bay Plan freshwater inflow policies. The potential impacts of WSIP implementation on water quality in the Tuolumne River watershed and Sacramento–San Joaquin Delta, Alameda Creek watershed, Peninsula watershed, and Westside Groundwater Basin are analyzed in Sections 5.3.3, 5.4.3, 5.5.3, and 5.6, respectively.

Section 5.2.4, page 5.2-30: The following reference is added after (Pilarcitos Creek Restoration Workgroup, 2007) in response to a comment (see **Response L_BCDC-04)**.

San Francisco Bay Conservation and Development Commission, *San Francisco Bay Plan*, 1968, reprinted in January 2008.

5.3 Tuolumne River System and Downstream Water Bodies

Section 5.3.1.1, page 5.3.1-8: The fourth sentence of the second full paragraph is revised as follows to correct an editorial error.

> TID and MID ~~typically~~ divert ~~800,000 to 900,000 afy~~ an annual average of about 867,000 acre-feet from the Tuolumne River.

Section 5.3.1.2, page 5.3.1-25: Third full paragraph, last sentence is revised as follows to correct an editorial error.

> Under the existing condition, the model indicates that the minimum release would be made ~~84.2~~ 85.1 percent of the time (837 months in the ~~987~~984-month hydrologic record); with the WSIP the minimum release would be made ~~85.4~~ 85.7 percent of the time (843 months in the ~~987~~984-month hydrologic record).

Section 5.3.1.2, page 5.3.1-34: Third full paragraph, last sentence is revised as follows to correct an editorial error.

> Under the existing condition, the model indicates that the minimum release would be made ~~72.6~~ 72.9 percent of the time (717 months in the ~~987~~984-month hydrologic record); with the WSIP the minimum release would be made ~~74.4~~ 74.6 percent of the time (734 months in the ~~987~~984-month hydrologic record).

Section 5.3.3.1, page 5.3.3-1: The following text is inserted at the end of the second full paragraph in response to a comment (see **Response S_RWQCBCV-02**).

> The Tuolumne River flows from the crest of the Sierra Nevada westward to its confluence with the San Joaquin River. The San Joaquin River flows north to the Sacramento–San Joaquin Delta. Water from the Delta discharges to the San Francisco Bay Estuary and the Pacific Ocean. The Tuolumne River system and downstream water bodies are shown in Figure 5.1-1. Beneficial uses of the Tuolumne River, as designated in the *Water Quality Control Plan for the Sacramento and San Joaquin River Basins*, include the following:
>
> - Source to (New) Don Pedro Reservoir: Municipal and Domestic Supply (MUN); Agricultural Supply (AGR); Hydropower Generation (POW); Water Contact Recreation (REC-1); Non-water Contact Recreation (REC-2); Warm Freshwater Habitat (WARM); Cold Freshwater Habitat (COLD); and Wildlife Habitat (WILD)
> - New Don Pedro Reservoir: MUN (Potential); POW; REC-1; REC-2; WARM; COLD; and WILD
> - New Don Pedro Dam to San Joaquin River: MUN (Potential); AGR; REC-1; REC-2; WARM; COLD; Migration of Aquatic Organisms (MIGR); Spawning, Reproduction, and/or Early Development (SPWN); and WILD

Section 5.3.3.1, page 5.3.3-10, Table 5.3.3-6: The text in the first row, fourth column of Table 5.3.3-6 is revised as follows in response to a comment (see **Response SI_TRT-CWA-SierraC-138**):

> 6.0 mg/L (September 1 to November 30) and 5.0 mg/L (December 1 to August 30)

Section 5.3.3, page 5.3.3-21: The following reference is added to the end of Section 5.3.3 in response to a comment (see **Response S_RWQCBCV-02**).

> State Water Resources Control Board (SWRCB), California Regional Water Quality Control Board, Central Valley Region, *Water Quality Control Plan (Basin Plan) for the Sacramento and San Joaquin River Basins*, Fourth Edition, Revised October 2007 with approved amendments.

Section 5.3.4.2, pages 5.3.4-5 and 5.3.4-6: The last paragraph on page 5.3.4-5 is revised as follows in response to a comment (see **Response SI_TRT-CWA-SierraC-140**).

> As described in Section 5.3.1, under existing conditions in the majority of years classified as below-normal or drier, almost all of the winter and spring runoff from the watershed upstream of Don Pedro Reservoir on the Tuolumne River is captured in the reservoir. Only the minimum required releases to the Tuolumne River below La Grange Dam are made. The WSIP would have no effect on flow in the Tuolumne River below La Grange Dam or the San Joaquin River ~~under these conditions~~ in months when only the minimum flows are currently released. In years when the reservoir fills, usually wet or above-normal years, excess water is released in some months to the Tuolumne River. In the future with the WSIP, TID and MID would draw Don Pedro Reservoir down farther in most years than they would under the existing condition, and consequently a greater proportion of spring runoff would be needed to refill the reservoir. As a result, the volume of excess water released to the Tuolumne River would be reduced in ~~some normal, above normal and wet years compared to the existing condition~~ all wet years, most above-normal years, and occasional below-normal and dry years.

Section 5.3.5.1, page 5.3.5-1: The following text is added at the end of the second full paragraph in response to a comment (see **Response S_RWQCBCBV-02**).

> The Tuolumne River flows from the crest of the Sierra Nevada westward to its confluence with the San Joaquin River. The San Joaquin River flows north to the Sacramento–San Joaquin Delta. The Tuolumne River system and downstream water bodies are shown in Figure 5.3.1-1. Unless otherwise designated by the California Regional Water Quality Control Board, all groundwaters in the Central Valley region are considered to be suitable or potentially suitable, at a minimum, for municipal and domestic supply, agricultural supply, industrial service supply, and industrial process supply.

Section 5.3.6.2, page 5.3.6-26: Second paragraph under Impact 5.3.6-2, the third to last sentence is revised as follows to correct an editorial error.

> The modeling analysis indicates that, under the existing condition, the minimum flow release would be made ~~84.2~~ 85.1 percent of the time (837 months in the ~~987~~984-month hydrologic record), while under the WSIP the minimum flow release would be made 85.4 percent of the time (in 6 more months, or 843 months in the ~~987~~984-month hydrologic record).

Section 5.3.6.2, page 5.3.6-32: The fourth sentence of the first paragraph is revised as follows in response to a comment (see **Response SI_TRT-CWA-SierraC-169**).

> These adverse effects on flows and temperature in the river under the WSIP would not substantially alter or degrade ~~fishery habitat~~ salmonid habitat in most years or jeopardize the continuation of the ~~fishery~~ salmonid populations in the lower Tuolumne River ~~in most years~~.

Section 5.3.8.1, page 5.3.8-10: The first and second sentence of the third paragraph is revised as follows in response to a comment (see **Response SI_TROA-03**).

> ~~A 900-cfs~~ A 1,100-cfs flow at Lumsden Campground is the minimum required for whitewater paddle boats and oar boats; a ~~600-cfs~~ 900-cfs flow is the minimum required for kayaks ~~and oar boats~~, and a ~~1,200-cfs~~ 1,500- to 2,000-cfs flow is considered optimal. The commercial outfitters prefer ~~a six-hour~~ an eight-hour release, but a ~~three-hour~~ four-hour release allows them to launch one-, two- and three-day trips.

Section 5.3.8.2, page 5.3.8-33: The first sentence of the first paragraph under River Recreation Below La Grange Dam is revised as follows to correct an editorial error.

> Under existing conditions, most of the time (717 months in the ~~987~~984-month hydrologic record) flow in the Tuolumne River below La Grange Dam consists of the minimum required instream flows.

5.4 Alameda Creek Watershed Streams and Reservoirs

Section 5.4.1.1, page 5.4.1-4: The last sentence of the third full paragraph is revised as follows in response to a comment (see **Response L_ACFCWCD-13**).

> A flow control structure known as the BART weir (owned by the ACFCWCD and located where the BART and railroad tracks cross Alameda Creek in Fremont) provides ~~grade control~~ structural protection of the footings of the BART and railroad bridge crossing and is a barrier to fish passage along this reach.

Section 5.4.1.1, page 5.4.1-9: The fourth paragraph, second sentence is revised as follows to better describe existing conditions as determined from the updated modeling results conducted in 2008, as discussed in Chapter 13, Section 13.3.

> Average monthly storage in Calaveras Reservoir under restricted operations ranges from about ~~31,000~~ 28,000 to 38,000 acre-feet in all conditions and months.

Section 5.4.1.1, page 5.4.1-13: The first paragraph, first sentence is revised as follows to better describe existing conditions as determined from the updated modeling results conducted in 2008, as discussed in Chapter 13, Section 13.3.

> The SFPUC estimates that, prior to lowering Calaveras Reservoir water levels (pre-2002 conditions), about ~~6,000~~ 8,000 afy had been diverted from Alameda Creek to Calaveras Reservoir in years with normal rainfall, with lesser diversions in dry and below-normal years.

Section 5.4.1.1, page 5.4.1-16: In the paragraph under the heading "San Antonio Creek Below San Antonio Reservoir," the first sentence is revised as follows to better describe existing conditions as determined from the updated modeling results conducted in 2008, as discussed in Chapter 13, Section 13.3.

> Modeled uncontrolled releases from San Antonio Reservoir to San Antonio Creek average about ~~1,700~~ 1,000 afy, ranging from no releases in below-normal and dry years to about ~~8,500~~ 3,200 acre-feet in very wet years.

Section 5.4.1.2, page 5.4.1-19: The second paragraph is revised as follows to reflect the change in project descriptions of the Calaveras Dam (SV-2) and Alameda Creek Fishery (SV-1) projects.

> Reservoir storage is constrained to approximately 37,800 acre-feet (except on a temporary basis), about 40 percent of its design capacity. Under the WSIP, Calaveras Reservoir would be restored to its full design capacity (approximately 96,800 acre-feet), which would allow the SFPUC to maximize the use of local watershed supplies. Furthermore, fishery releases from the proposed bypass flow structure at the Alameda Creek Diversion Dam and/or from the reservoir ~~(measured below the confluence of Alameda and Calaveras Creeks)~~ and flow recapture would be implemented under the WSIP in accordance with the 1997 MOU (compliance with the 1997 MOU is measured below the confluence of Alameda and Calaveras Creeks). The fishery releases from the diversion dam bypass flow structure to Alameda Creek and from Calaveras Reservoir to Calaveras Creek would be recaptured downstream and returned to the SFPUC water supply in compliance with the 1997 MOU.

Section 5.4.1.2, page 5.4.1-19: The fourth paragraph is revised as follows to reflect the change in project description of the Calaveras Dam (SV-2) related to the proposed release of bypass flows at the diversion dam.

> **Figure 5.4.1-5** illustrates the modeled chronological storage and stream releases from Calaveras Reservoir for both the existing condition and the WSIP using hydrologic data from the period 1920 to 2002. Releases to Calaveras Creek from Calaveras Reservoir represent both controlled releases through the cone valve and uncontrolled releases over the spillway. The graphs also show how peak flows in Calaveras Creek downstream of the dam tend to correspond to periods when Calaveras Reservoir is operating at or near capacity. This figure assumes the SFPUC would make fishery releases in compliance with the 1997 MOU from Calaveras Reservoir only and does not account for the proposed bypass flows

from the diversion dam; this represents a worst-case condition for the range of fluctuation in Calaveras Reservoir water levels.

Section 5.4.1.2, page 5.4.1-22: The first, second, third and fourth full paragraphs are revised as follows to reflect the change in project description of the Calaveras Dam (SV-2) project and to refine and update the impact discussion based on the modeling results conducted in 2008, as discussed in Chapter 13, Section 13.3.

Figure 5.4.1-6 presents the estimated change in average monthly reservoir water surface elevation under existing conditions and after implementation of the WSIP. This figure assumes the SFPUC would make fishery releases in compliance with the 1997 MOU from Calaveras Reservoir only and does not account for the proposed bypass flows from the diversion dam; this represents a worst-case condition for the range of fluctuation in Calaveras Reservoir water levels. The water level in Calaveras Reservoir would be higher year-round with the WSIP; the increase in average monthly storage would be mostly attributable to completion of the Calaveras Dam project (SV-2) and the removal of the DSOD storage limitations. During rainy months, the reservoir water level would be kept near the wintertime storage objective, or roughly 20 to 30 feet higher than under existing conditions. The average water surface elevation would be substantially greater than under current conditions, but only 6 to 12 feet higher than pre-2002 conditions (prior to the DSOD restrictions).

With implementation of the WSIP, the change in operation of Calaveras Reservoir storage would affect hydrologic conditions elsewhere in the watershed. As described below, the restored capacity of Calaveras Reservoir would affect the operation of the Alameda Creek Diversion Dam and Tunnel, and thus the inflow to Calaveras Reservoir and flow to Alameda Creek below the diversion dam. The proposed bypass structure at the Alameda Creek Diversion Dam and the ~~The~~ restored storage capacity would also allow for implementation of the 1997 MOU-required releases from either the new bypass structure or Calaveras Reservoir in support of fisheries.

Compared to existing conditions, the WSIP would change the nature of releases from Calaveras Reservoir to Calaveras Creek. With implementation of the fishery releases from the new bypass flow structure at the diversion dam and from Calaveras Reservoir (up to 6,300 afy), there would at times be releases from the reservoir under the WSIP that are not made under existing conditions. These flows would be gaged and maintained below the confluence of Alameda and Calaveras Creeks. Contributing to these flows would be: (1) flows that spill past the Alameda Creek Diversion Dam, (2) unregulated runoff from accretions (inflow) between the diversion dam and the Calaveras Creek confluence, (3) unregulated runoff between Calaveras Dam and the confluence, ~~and~~ (4) operational releases from Calaveras Reservoir for reservoir regulation purposes, and (5) operational releases from the Alameda Creek Diversion Dam to support fishery releases when there is available flow in Alameda Creek.

Figure 5.4.1-7 illustrates the modeled chronological releases of water below Calaveras Dam to Calaveras Creek for both existing conditions and with the WSIP; this figure assumes the

> SFPUC would make fishery releases in compliance with the 1997 MOU from Calaveras Reservoir only and does not account for the proposed bypass flows from the diversion dam. Operational releases from Calaveras Reservoir occur in about ~~40~~ 50 percent of the years under the modeled existing condition and ~~slightly less frequently~~ in about 35 percent of the years under the WSIP (with the exception of 1997 MOU releases, which would occur in all years), with most of these years being classified as above-normal or wet. **Table 5.4.1-7** shows the releases from the reservoir for various representative hydrologic year types and assumes the SFPUC would make fishery releases in compliance with the 1997 MOU from Calaveras Reservoir only and does not account for the proposed bypass flows from the diversion dam. As shown in the table, releases with the WSIP would be substantially diminished in the winter months of normal, above-normal, and wet years, with up to a 70 percent reduction. This reduction in the frequency and magnitude of releases would primarily result from removal of the DSOD storage constraint following construction of the Calaveras Dam project (SV-2). With greater operational capacity, more local runoff would be stored and used for water supply. During all months of below-normal and dry years and the majority of months in normal, above-normal, and wet years, the volume of releases would remain nearly the same or would be slightly diminished with the WSIP compared to existing conditions. However, in several scenarios, releases would be eliminated under WSIP operations.

Section 5.4.1.2, page 5.4.1-25: In the first paragraph, the last sentence is revised as follows to reflect the change in project description of the Calaveras Dam (SV-2) project.

> With implementation of the WSIP, summer base flows (flows that occur in the absence of any recent rainfall) in Calaveras Creek below the dam would increase due to the required fishery releases below Calaveras Dam (shown in Table 5.4.1-5). The maximum supplemental release of 6,300 afy might not be needed in every year due to other flows reaching the confluence, including bypass flows at the Alameda Creek Diversion Dam~~; therefore, supplemental instream flow releases would range from about 2,250 afy to the full 6,300 afy~~.

Section 5.4.1.2, page 5.4.1-27: In the partial paragraph at the top of the page, the first full sentence is revised as follows to refine and update the impact discussion based on the modeling results conducted in 2008, as discussed in Chapter 13, Section 13.3, as well as to reflect the change in project description of the Calaveras Dam (SV-2) project.

> Flows past the diversion dam would be reduced in ~~all hydrologic year types, and nearly eliminated in below-normal and dry years~~ wet, above normal, and normal year types, although when flow is available, the SFPUC would allow for minimum bypass flows consistent with the requirements of the 1997 CDFG MOU.

Section 5.4.1.2, page. 5.4.1-27: In the first full paragraph, the last sentence is revised as follows to reflect the change in project description of the Calaveras Dam (SV-2) project.

> ~~Because the~~ The existing diversion dam facilities seep, and therefore, summer and fall base flows of less than about 1 cfs ~~would~~ continue down the creek and these flows would be

> expected to continue down the creek under the WSIP via the new bypass facilities ~~would not be affected by WSIP operations~~.

Section 5.4.1.2, pages 5.4.1-27 and 5.4.1-33: The last paragraph on page 5.4.1-27 and ending on page 5.4.1-33 is revised as follows to refine and update the impact discussion based on the modeling results conducted in 2008, as discussed in Chapter 13, Section 13.3.

> **Table 5.4.1-8** presents modeled flow data for the Calaveras confluence in terms of the monthly average flow within year type. As shown in the table, there would be a substantial reduction (up to 44 percent) in wintertime flow at the confluence during normal, above-normal and wet years. As with the upstream reach, peak flows would also be substantially reduced ~~in drier years~~, primarily as a result of renewed upstream diversions. However, overall flows would be increased due to fishery releases.

Section 5.4.1.2, page 5.4.1-32, Table 5.4.1-8: The data in Table 5.4.1-8 showing flow in Alameda Creek below the Calaveras Creek confluence in the units of acre-feet per month are replaced with the same data in the units of cubic feet per second to be consistent with the format of similar tables in the PEIR. Due to rounding, the numbers and percentages representing the difference between existing conditions and the proposed WSIP have slightly changed. The replacement table is shown on the following page and for ease of reading, revised data are not shown in underlined format.

Section 5.4.1.2, page 5.4.1-33: In the second full paragraph, the first sentence is revised as follows to reflect the change in project description of the Calaveras Dam (SV-2) project and to refine and update the impact discussion based on the modeling results conducted in 2008, as discussed in Chapter 13, Section 13.3.

> Under the WSIP, the SFPUC would augment flow below the confluence of Calaveras and Alameda Creeks by bypassing/releasing water from the Alameda Creek Diversion Dam and Calaveras Reservoir; as a result, there would be an increase in flow at the confluence in ~~almost all other months~~ April to November of wet and above-normal rainfall years and in all instances of other years.

Section 5.4.1.2, page 5.4.1-36: The first and second full paragraphs are revised as follows and Figure 5.4.1-14 (shown on page 16-55) is revised to reflect the updated impact discussion based on the modeling results conducted in 2008, as discussed in Chapter 13, Section 13.3.

> **Figure 5.4.1-14** illustrates the modeled chronological operation of San Antonio Reservoir for both the existing condition and with the WSIP. The figure shows the reservoir's storage, inflow from the Hetch Hetchy system, and releases to San Antonio Creek for each condition. ~~As illustrated in the figure, San Antonio Reservoir storage operations are typically cyclical: the reservoir fills in the late winter/early spring and is depleted during the summer. During a drought, reservoir storage would be additionally depleted by the slow, successive drawdown due to drafting to the Sunol Valley WTP in excess of watershed runoff and replenishment by Hetch Hetchy flows.~~

TABLE 5.4.1-8
ESTIMATED AVERAGE MONTHLY FLOW IN
ALAMEDA CREEK BELOW THE CALAVERAS CREEK CONFLUENCE
(cubic feet per second)

	Wet		Above Normal		Normal		Below Normal		Dry		All	
Existing Condition (2005)												
Oct	0		0		0		0		0		0	
Nov	1		1		0		0		0		1	
Dec	56		26		22		1		1		21	
Jan	280		114		24		3		1		84	
Feb	463		214		55		6		4		147	
Mar	272		110		26		7		1		82	
Apr	144		25		5		1		1		35	
May	5		2		1		1		0		2	
Jun	1		0		0		0		0		0	
Jul	0		0		0		0		0		0	
Aug	0		0		0		0		0		0	
Sep	0		0		0		0		0		0	
WSIP (2030)												
Oct	7		7		7		7		7		7	
Nov	5		5		5		5		5		5	
Dec	45		18		13		5		5		17	
Jan	199		64		18		14		13		61	
Feb	434		151		36		22		23		132	
Mar	272		106		22		16		13		85	
Apr	145		32		9		7		7		40	
May	9		7		7		7		7		7	
Jun	7		7		7		7		7		7	
Jul	7		7		7		7		7		7	
Aug	7		7		7		7		7		7	
Sep	7		7		7		7		7		7	
Difference and Percent Change, Existing Condition (2005) vs WSIP (2030)												
Oct	7	*	7	*	7	*	7	*	7	*	7	*
Nov	4	[400%]	4	[400%]	5	*	5	*	5	*	4	[400%]
Dec	-11	-[20%]	-8	-[31%]	-9	-[41%]	4	[400%]	4	[400%]	-4	-[19%]
Jan	-81	-[29%]	-50	-[44%]	-6	-[25%]	11	[367%]	12	[1,200%]	-23	-[27%]
Feb	-29	-[6%]	-63	-[29%]	-19	-[35%]	16	[267%]	19	[475%]	-15	-[10%]
Mar	0	[0%]	-4	-[4%]	-4	-[15%]	9	[129%]	12	[1,200%]	3	[4%]
Apr	1	[1%]	7	[28%]	4	[80%]	6	[600%]	6	[600%]	5	[14%]
May	4	[80%]	5	[250%]	6	[600%]	6	[600%]	7	*	5	[250%]
June	6	[600%]	7	*	7	*	7	*	7	*	7	*
July	7	*	7	*	7	*	7	*	7	*	7	*
Aug	7	*	7	*	7	*	7	*	7	*	7	*
Sept	7	*	7	*	7	*	7	*	7	*	7	*

NOTE: "Existing Condition (2005)" is based on model run MEA3CHR. "WSIP (2030)" is based on model run MEA5HIN. An overview of the model runs is presented in Section 5.1. Detailed information on the models and underlying assumptions is provided in Appendix H.

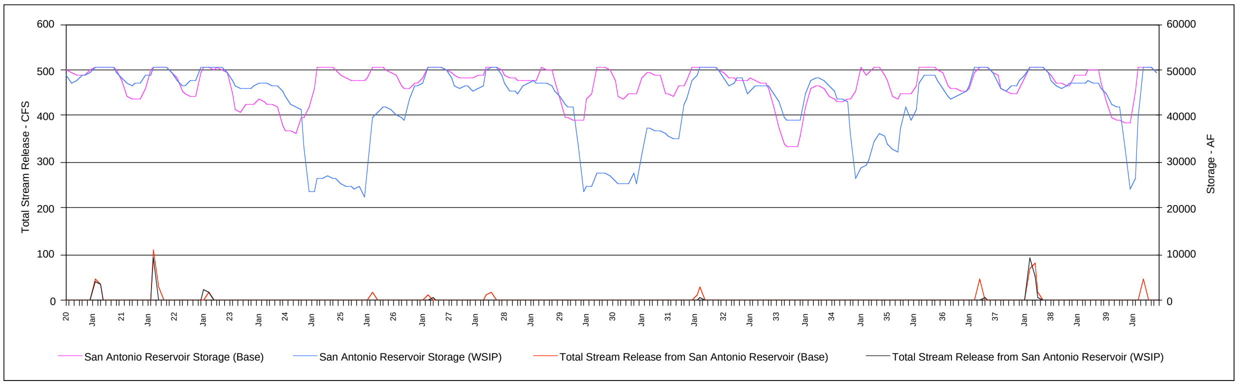
Key:

* Indicates a release under the "WSIP (2030)" condition where no release under "Current Condition (2005) currently exists.

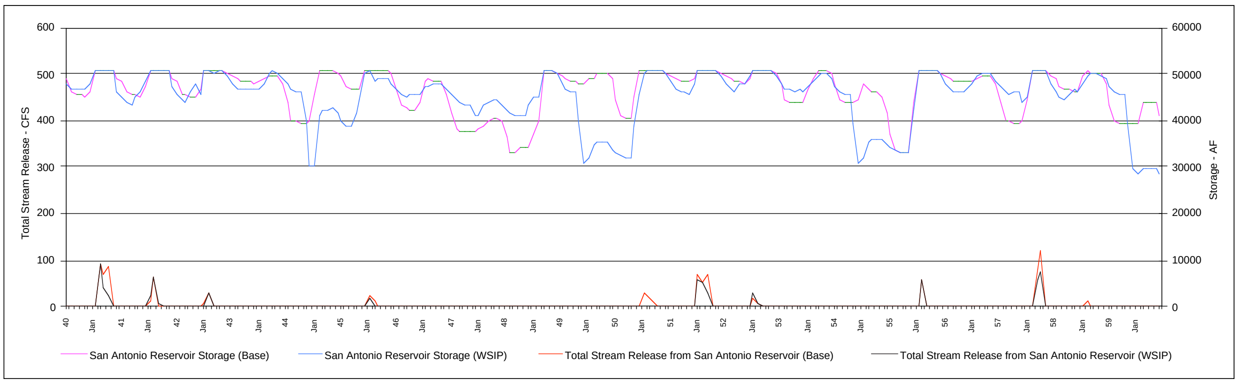
Color	Meaning
(light blue)	> 0%
(yellow)	< 0 to -5%
(orange)	< -5%

SOURCE: SFPUC, HH/LSM (See Appendix H)

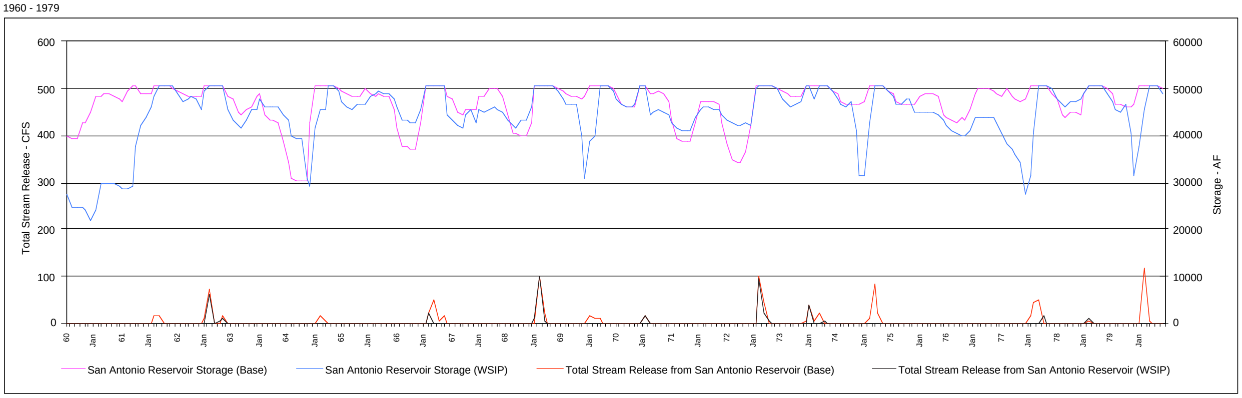
1920 - 1939



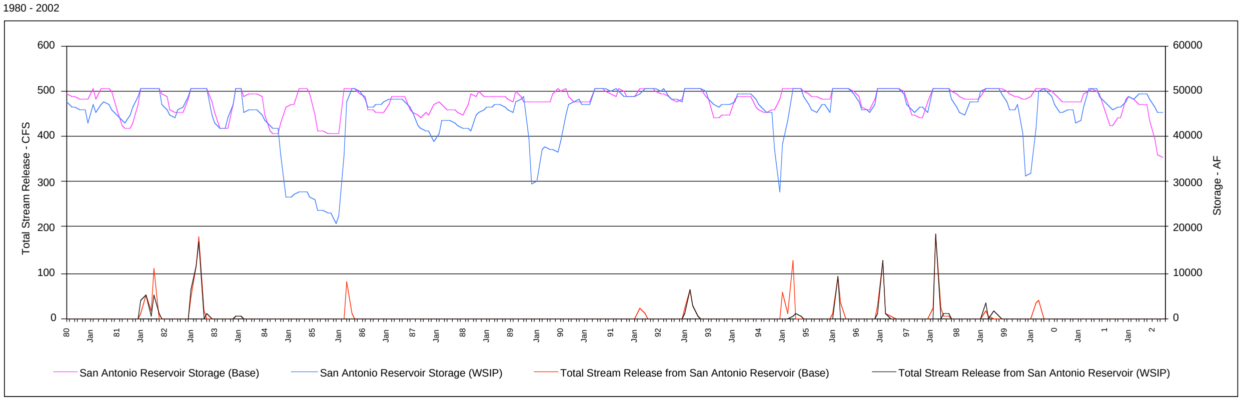
1940 - 1959



1960 - 1979



1980 - 2002



Note: This figure is revised to reflect updated HH/LSM modeling (see Appendix O).

SOURCE: SFPUC, HH/LSM

SFPUC Water System Improvement Program . 203287

Figure 5.4.1-14 (Revised)
Chronological Operation of San Antonio Reservoir

> ~~Typically, San Antonio Reservoir would remain slightly fuller under the WSIP than under modeled existing conditions because the restored capacity of Calaveras Reservoir would provide additional local water supply to serve customer demand, reducing the need to use water from San Antonio Reservoir.~~ WSIP operations involve keeping local reservoirs higher for delivery reliability and system maintenance purposes. This supply would be used to maintain the Sunol Valley WTP's minimum throughput of 20 mgd and to satisfy water demand in excess of Hetch Hetchy flows. ~~The exception to this higher storage would occur e~~Every fifth year storage levels would drop when planned maintenance for the Mountain Tunnel would reduce Hetch Hetchy flows to the Bay Area during the winter. During this period, San Antonio Reservoir would be drawn to replace the flows not provided from the Hetch Hetchy system. The reservoir would refill to typical operating levels within one to two years after the maintenance period.

Section 5.4.1.2, page 5.4.1-36: The fourth full paragraph on page 5.4.1-36 and the fifth partial paragraph starting on page 5.4.1-36 and ending on page 5.4.1-39 are revised as follows to refine and update the impact discussion based on the modeling results conducted in 2008, as discussed in Chapter 13, Section 13.3.

> As indicated in the table, the WSIP would have ~~no~~ a minimal effect on flow in San Antonio Creek ~~in dry, below-normal, and normal years~~. The proposed program would result in minor increases and decreases in winter and spring flows in some above-normal years. Occasionally, the WSIP could result in spills to San Antonio Creek that would not occur under existing conditions. ~~These occasional spills would occur because the reservoir would be drawn down less often due to the restoration of Calaveras Reservoir storage capacity, the fishery releases that would be recaptured, and local reservoirs that would be kept slightly fuller for delivery reliability and system maintenance purposes.~~

> **Figure 5.4.1-15** illustrates the modeled chronological release of water below Turner Dam under the existing condition and with the WSIP. Releases from San Antonio Reservoir to San Antonio Creek have historically been rare and would continue to be rare with the WSIP. Releases past the dam are modeled to occur ~~in about 20 percent of the years under the existing condition and~~ at about the same frequency with the WSIP—mostly in above-normal or wet years. ~~The change in releases would occur primarily during January, February, and March of these years, with increases in average monthly flows of up to 15 cfs in some months countered by decreases of up to 15 cfs in some months countered by decreases of up to 16 cfs in others.~~ It should be noted that under actual operations, these changes in modeled average monthly flows could take the form of a few days of larger releases.

Section 5.4.1.2, page 5.4.1-39: The last full paragraph is revised as follows to refine and update the impact discussion based on the modeling results conducted in 2008, as discussed in Chapter 13, Section 13.3.

> **Figure 5.4.1-16** illustrates the modeled flow at the confluence during the various rainfall scenarios for the existing condition and with the WSIP. **Table 5.4.1-11** presents modeled flows at the confluence in terms of the average monthly flow within hydrologic year type.

As shown in the figure and table, there would be a substantial (8 to 52 percent) reduction in flow volumes at the confluence during January, February, and March of normal or wetter years, depending on the rainfall distribution. The majority of this effect would occur due to the reduction in spills from Calaveras Reservoir and~~, to a lesser degree,~~ increased diversions from the Alameda Creek Diversion Dam during these periods. However, in April of normal years, the modeled data indicate a moderate increase in total flow volumes (about 14 percent), again due to the change in operation of Calaveras Reservoir, as described above.

Section 5.4.2.2, page 5.4.2-3, Table 5.4.2-1: Impact 5.4.2-2 is revised as follows in response to a comment (see **Response L_ACWD-13**).

TABLE 5.4.2-1
SUMMARY OF IMPACTS – GEOMORPHOLOGY OF THE ALAMEDA CREEK WATERSHED

Impact	Significance Determination
Impact 5.4.2-1: Effects on channel formation and sediment transport along Calaveras Creek	LS
Impact 5.4.2-2: Effects on channel formation and sediment transport along Alameda Creek downstream of the diversion dam and downstream of the San Antonio Creek confluence.	LS
Impact 5.4.2-3: Effects on channel formation and sediment transport along San Antonio Creek downstream of San Antonio Reservoir	LS

LS = Less than Significant impact, no mitigation required

Section 5.4.2.2, page 5.4.2-3: Impact 5.4.2-2 is revised as follows in response to a comment (see **Response L_ACWD-13**).

Impact 5.4.2-2: Effect on channel formation and sediment transport along Alameda Creek downstream of the diversion dam and downstream of the San Antonio Creek confluence.

Section 5.4.2.2, page 5.4.2-4: The following text is added after the first partial paragraph in response to a comment (see **Response L_ACWD-13**).

Implementation of the WSIP would reduce flow in Alameda Creek downstream of the San Antonio Creek confluence in winter months of normal to wet years, ranging from a -18 percent decrease to a +13 percent increase in flow at the USGS Niles gage station. In the majority of winter months (December to March), flows at this location would decrease, but in April and May the flows would exhibit small to moderate increases. Although implementation of the WSIP would result in additional flow in Alameda Creek in summer months as part of the 1997 CDFG MOU releases, these additional flows would not mobilize significant amounts of sediment and could be recaptured at a location downstream of the Sunol Valley WTP. This net decrease in flow in Alameda Creek below the San Antonio

Creek confluence when compared to the existing condition would likely result in a slight decrease in the amount of sediment transported in Niles Canyon and lower Alameda Creek and would therefore decrease sediment and debris loading on lower Alameda Creek facilities.

As noted in Impacts 5.4.2-1 and 5.4.2-3, flows and the resulting impacts on geomorphology upstream of the San Antonio Creek confluence are expected to be within the range of conditions that have been experienced since development of water supply and flood control facilities in the upper and lower Alameda Creek watershed. Therefore, implementation of the WSIP would not significantly alter bed or channel form or introduce substantial new sources of sediment.

As a result of this net decrease in sediment transport in Niles Canyon and the less-than-significant impacts in upper Alameda Creek, the impact related to geomorphologic characteristics and sediment transport along Alameda Creek downstream of the San Antonio Creek confluence would be *less than significant*. It should also be noted that the Arroyo de la Laguna watershed is the major contributor to sediment supply in Niles Canyon and lower Alameda Creek.

Section 5.4.3.1, page 5.4.3-4: The first paragraph under the heading “Alameda Creek Below the Diversion Dam” is revised as follows in response to a comment (see **Response L_ACWD-14**).

Water quality in Alameda Creek is generally good and is protective of beneficial uses. In terms of aquatic life, the key water quality parameter is temperature, which is directly related to hydrologic flow conditions. **Table 5.4.3-3** summarizes weekly water temperature data collected by the ACWD near Sunol, above Arroyo de la Laguna, from 1997 through 2005. ~~The ACWD continuously samples, analyzes, and monitors the quality of water in Alameda Creek at a special monitoring facility located at the mouth of Niles Canyon near Mission Boulevard and at other key locations throughout the watershed (ACWD, 2007).~~ Average monthly water temperatures show an expected seasonal trend (i.e., cooler during the winter and warmer during the summer).

Section 5.4.3.1, page 5.4.3-5: The source footnote in Table 5.4.3-3 is revised as follows in response to a comment (see **Response L_ACWD-14**).

SOURCES: ACWD (raw data provided by Laura Hidas); Merritt Smith Consulting (data reduction). Note that ACWD temperature data may not have been subject to the rigorous QA/QC procedures required for scientific studies, and therefore should be used only to indicate general conditions (unless otherwise specified by the ACWD).

Section 5.4.3.1, page 5.4.3-5: The last two sentences of the first full paragraph are revised as follows in response to a comment (see **Response L_ACWD-15**).

~~In addition, most of the summer and fall flows in Alameda Creek below its confluence with Arroyo de la Laguna originate from the South Bay Aqueduct. This South Bay Aqueduct water may be warmer and is higher in total dissolved solids (TDS) than the flows in Alameda Creek originating from the Sunol Valley watershed.~~ Summer and fall flows in

Alameda Creek and its tributaries are at their seasonal low. Thus, flows in Alameda Creek below its confluence with Arroyo de la Laguna tend to be warm during these periods, because coldwater sources are largely unavailable in these reaches and base flows are low during this time of year, allowing waters to warm towards their natural temperature in equilibrium with meteorological conditions. In addition, flows in Arroyo de la Laguna appears to be higher in total dissolved solids (TDS) than the flows in Alameda Creek originating from the watershed upstream of Arroyo de la Laguna (RWQCB, 2008).

Section 5.4.3.1, page 5.4.3-6: The source footnote in Table 5.4.3-4 is revised as follows in response to a comment (see **Response L_ACWD-14**).

SOURCES: ACWD (raw data provided Laura Hidas); Merritt Smith Consulting (data reduction). Note that ACWD TDS data may not have been subject to the rigorous QA/QC procedures required for scientific studies, and therefore should be used only to indicate general conditions (unless otherwise specified by the ACWD).

Section 5.4.3.2, page 5.4.3-10: The third paragraph is revised as follows to reflect the change in project description of the Calaveras Dam (SV-2) project.

Studies conducted for the 1997 MOU between the CDFG and CCSF contemplated that a 7-cfs release from Calaveras Reservoir would result in cooler temperatures for the upper half of the stream reach between the Alameda/Calaveras ~~River~~ Creek confluence and the Sunol Valley WTP. Furthermore, the existing oxygenation system, which is also planned to be used in future operations, would maintain desired DO conditions in reservoir waters, which would further enhance DO conditions in the downstream reach. If MOU releases are from Alameda Creek upstream of Calaveras Creek, then Calaveras Creek would not receive the temperature benefits of these releases, and temperatures would remain as in the base case.

Section 5.4.3.2, page 5.4.3-11: The following text is added after the third paragraph under the heading “Reach 1” in response to a comment (see **Response S_RWQCBSF-15**).

Settleable Materials, Suspended Materials, and Turbidity. Sections 5.4.1.1 and 5.4.2.1 describes the SFPUC flushing activities intended to remove accumulations of coarse sediment to protect the facility, maintain storage capacity (and thus diversion capacity) above the Alameda Creek Diversion Dam, and support downstream geomorphic processes by passing sediment. The flushing procedure involves opening the sluice gates to flush coarse sediments from upstream of the diversion dam. Sediment flushing discharges approximately 900 cubic yards of sediment from behind the diversion dam each year, and typically occurs in February. This sediment typically consists of sands and gravels. Operations normally occur over a 48-hour period during high-flow events to develop the necessary velocity to mobilize the coarse sediments behind the dam. Flushing operations occur whether or not flows from the creek are being diverted to the diversion tunnel. The sluice gates remain closed year-round, except during the sluicing procedure. If water is not diverted via the diversion gates to the reservoir, the entire volume of the creek flows through the sluice gates in the dam or over the top of the dam. It is assumed that these SFPUC sediment flushing activities and sluice gate operations would continue under the WSIP.

Three water quality parameters—settleable materials, suspended materials, and turbidity—could be affected by changes in the Alameda Creek Diversion Dam operations and sediment flushing procedures. It is likely that more sediment would be transported to Calaveras Reservoir with the WSIP than under current conditions because of increased flows diverted to Calaveras Reservoir. Many of these sediments would settle out in the reservoir, reducing the overall quantity of sediments in the creek. Therefore, less sediment would be available for transport (either in flows over the dam or via sluicing/flushing operations) down Alameda Creek compared to the existing condition. Therefore, the sluicing/flushing procedures under the WSIP would have less-than-significant water quality impacts with respect to settleable materials, suspended materials, and turbidity.

Section 5.4.3, page 5.4.3-12: The following reference is added after "Merrit-Smith Consultants" in response to a comment (see **Response L_ACWD-15**).

Regional Water Quality Control Board - San Francisco Bay (RWQCB). 2008. Final Order No. R2-2008-0011, NPDES Permit No. CAG982001 General Permit for Discharges from Aggregate Mining, Sand Washing, and Sand Offloading Facilities to Surface Waters. February 15. http://www.waterboards.ca.gov/sanfranciscobay/board_decisions/adopted_orders/2008/february/r2-2008-0011final.pdf

Section 5.4.4.2, pages 5.4.4-6 and 5.4.4-7: The last partial paragraph that begins on page 5.4.4-6 and ends on page 5.4.4-7 is revised as follows in response to a comment (see **Response L_ACWD-17**).

Impact 5.4.4-1: Changes in groundwater levels, flows, quality, and supplies.

Compared to current conditions, increased diversions and storage under the WSIP would reduce peak flows in Alameda Creek between the diversion dam and the confluence with San Antonio Creek. Seasonally, the WSIP would reduce flows in the high-flow months and increase flows in the low-flow months due to fishery releases. It would also increase storage in Calaveras Reservoir. The overall effect of these changes in groundwater supplies downstream in the Sunol aquifer areas is expected to be minor (either slightly positive or slightly negative), depending on the year's rainfall and seasonal conditions. The WSIP would reduce potential infiltration in the Sunol groundwater basin by reducing peak flows in wet years. ~~However, impacts on groundwater in the Niles Cone would be dampened by inflow from non-SFPUC watershed streams and aquifers, removal of the Sunol and Niles Dams, and ongoing withdrawals at the infiltration galleries above the water temple; as a result, impacts are expected to be minimal.~~ Impacts on groundwater in the Niles Cone would be less than significant because flows in Alameda Creek downstream of Niles Canyon would be maintained within the range of flows experienced since the Niles Cone began to be managed and utilized as a water supply resource. The program's minor changes in groundwater levels would not affect groundwater quality. This impact would be *less than significant*, and no mitigation measures would be required.

Section 5.4.5.1, page 5.4.5-9: The first bulleted paragraph is revised as follows in response to comments described in **Section 14.9, Master Response on Alameda Creek Fishery Issues**.

- Alameda County Flood Control and Water Conservation District's BART Weir – several studies have been conducted regarding potential designs to provide passage at this location. The most recent effort is a report (Wood Rogers, 2006) that outlines options ranging from total removal of the structure ("roughened channel") to three ladder and screen alternatives. The range of low flows estimated to allow suitable passage for adult steelhead among these four options is 10–50 cfs. However, other barriers (e.g., ACWD middle and upper rubber dams, PG&E Drop Structure – see below) within Alameda Creek may be impassable at these low flows. ~~There is currently no schedule or budget for this project, and environmental review has yet to begin.~~ On July 31, 2007, the Alameda County Flood Control and Water Conservation District and the ACWD entered into an agreement to design a fish passage facility over the BART weir and the middle inflatable dam in the Alameda County Flood Control Channel to improve steelhead passage within the Alameda Creek watershed.

Section 5.4.5.1, page 5.4.5-11: The first paragraph under the heading "Potential Steelhead Restoration" is revised as follows in response to comments described in **Section 14.9, Master Response on Alameda Creek Fishery Issues**.

Potential Steelhead Restoration

For the purposes of full disclosure, the PEIR provides this discussion of steelhead in lower Alameda Creek, and the potential for steelhead to be restored to the upper reaches of Alameda Creek (above the BART weir). However, because this steelhead access does not currently exist and there is no current steelhead migration above the BART weir, ~~there would be no~~ the potential impact on steelhead migration, spawning, or juvenile rearing upstream of the BART weir as a result of WSIP implementation is not analyzed in this section, which addresses WSIP impacts relative to existing conditions, but instead is analyzed as a future, cumulative impact in Section 5.7.3. ~~Further, as described in the preceding discussion, since a number of steps are required before steelhead migration further upstream can occur, it is speculative to assess the specific impacts that system operation under the WSIP might have on the potential future restoration of steelhead. Thus, no impact analysis or conclusion is developed in this PEIR. If and when steelhead are restored, the SFPUC will be required to conform its system operations to comply with the applicable Endangered Species Act requirements.~~

Section 5.4.5.2, page 5.4.5-19: The first full paragraph is revised as follows to reflect the change in project description of the Calaveras Dam (SV-2) project.

As described in Section 5.4.1, under the WSIP, reservoir operations would be restored, and the diversion dam would be operated to divert most flows that currently flow down upper Alameda Creek (up to a maximum diversion of approximately 650 cfs) through the diversion tunnel and into the reservoir. Under the proposed program, the SFPUC would construct a bypass flow structure at the Alameda Creek Diversion Dam and would implement bypass flows consistent with the 1997 CDFG MOU when flows are available

> ~~there is no requirement for maintaining minimum instream flows within Alameda Creek~~ to support fishery habitat downstream of the dam. The proposed diversion of most Alameda Creek flows below 650 cfs would result in a significant change in hydrologic conditions in Alameda Creek downstream of the diversion dam when compared to existing conditions. Diversion of most or all flows during the late winter and spring months could adversely affect the ability of resident rainbow trout to spawn and for eggs to successfully incubate in this reach, although the proposed bypass flows at the diversion dam would reduce the severity of this effect. In the future, with Calaveras Reservoir storage operating at higher levels for longer periods under the WSIP, diversions to storage are expected to be reduced and the frequency and magnitude of spills from the reservoir increased.

Section 5.4.5.2, page 5.4.5-20: The last paragraph is revised as follows to reflect the change in the description of the Calaveras Dam (SV-2) project.

> Overall, WSIP-related impacts on fishery habitat along Alameda Creek immediately downstream of the diversion dam would be *potentially significant*, despite proposed implementation of bypass flows at the diversion dam. Implementation of Measure 5.4.5-3a: Minimum Flows for Resident Trout on Alameda Creek, which would require the SFPUC to develop operational guidelines and implement minimum instream flow requirements for Alameda Creek downstream of the diversion dam from December through April to support resident trout spawning and egg incubation, would reduce this impact to a less-than-significant level. Measure 5.4.5-3a in conjunction with the proposed bypass flows at the diversion dam may be sufficient to fully mitigate WSIP effects on resident trout in Alameda Creek, including the effects of entrainment through the diversion tunnel. If, after monitoring of this measure and adaptive management of the minimum flow requirements, the monitoring indicates that WSIP effects are not fully mitigated, then the SFPUC also will implement Measure 5.4.5-3b: Alameda Diversion Dam Diversion Restrictions or Fish Screens, to either modify seasonal diversions schedules to minimize impacts on fish or screen its diversion facilities. This measure may be refined as it would be developed in more detail and implemented as part of the Calaveras Dam (SV-2) project.

Section 5.4.6.2, page 5.4.6-19: The third full paragraph is revised as follows in response to comments (see **Response S_CDFG2-15** and **Section 14.9)**.

> Overall, implementation of the proposed WSIP water supply and system operations would result in *potentially significant* impacts on terrestrial biological resources due to a potential reduction in aquatic breeding habitat for key special-status species. Measure 5.4.1-2, Diversion Tunnel Operation, calls for operation of the diversion tunnel in a manner that ensures that flows not required to maintain storage in Calaveras Reservoir are passed down Alameda Creek at the diversion dam. Measure 5.4.5-3a, Minimum Flows for Resident Trout on Alameda Creek, calls for developing and implementing an operational plan to provide minimum bypass flows below the diversion dam to support habitat for rainbow trout and other native stream-dependent species from December through April. Implementation of these measures would ensure that minimum flows in Alameda Creek are

allowed to pass by the diversion dam. Taken together, these measures would reduce adverse impacts on key special-status species to a less-than-significant level.

Section 5.4.6.2, page 5.4.6-20: The third and fourth paragraphs are revised as follows to reflect the change in project description of the Calaveras Dam (SV-2) project.

Flows in Calaveras Creek below Calaveras Dam would be altered in two ways during the two- to five-year period when the reservoir is being refilled. First, there would be no cone valve releases into Calaveras Creek below the dam. Second, the SFPUC would initiate required minimum instream flow releases (see Table 5.4.1-9) when construction of the new Calaveras Dam is completed. When flows at the confluence of Alameda and Calaveras Creeks fall below the minimum required flow, generally during protracted dry periods, releases would be made from Calaveras Dam or upstream on Alameda Creek. These releases would ensure that existing riparian habitat would be sustained; therefore, impacts on riparian habitats related to filling the reservoir would be *less than significant*, and no mitigation measures would be required.

Impacts from Minimum Flows. Under the WSIP, minimum flows ~~would~~ may be maintained year-round, ~~an increase over both existing conditions and pre-2002 conditions~~ depending if flow releases are from Calaveras Reservoir or from upstream on Alameda Creek. Sustained minimum flows during the dry season could slightly increase groundwater recharge. It could also facilitate the conversion from riparian habitats that require only seasonally flowing water to those that require permanent flowing water, such as alder riparian forest. This potential replacement of one sensitive riparian habitat with another one (with no change in the total extent of riparian habitat) would be *less than significant*.

Section 5.4.6.2, pages 5.4.6-23 and 5.4.6-24: The last partial paragraph on page 5.4.6-23 continuing to the first paragraph on page 5.4.6-24 and the first full paragraph on page 5.4.6-24 are revised as follows to refine and update the impact discussion based on the modeling results conducted in 2008, as discussed in Chapter 13, Section 13.3.

Sensitive Habitats

Sensitive habitats that could be affected by operations of San Antonio Reservoir include small areas of freshwater marsh and riparian scrub on gently sloping reservoir margins. ~~The average reservoir levels would be higher with the WSIP than under existing conditions, but t~~The maximum reservoir levels would not change. No upland habitats would be affected. ~~The average range of reservoir elevations under the WSIP would be slightly less than under existing conditions. Little perennial freshwater marsh or riparian scrub would be inundated to the extent that it would be permanently lost. Any loss of such habitat would be balanced by development of similar habitat at higher elevations.~~ As discussed in Section 5.4.1, storage levels at San Antonio Reservoir would drop every fifth year for planned system maintenance. The reservoir would be refilled to typical operating levels within one to two years after the maintenance period. The depth and duration of drawdown would be within the range of historic operating conditions. Thus, WSIP impacts on riparian and freshwater

> marsh habitat along the margins of San Antonio Reservoir would be *less than significant*, and no mitigation measures would be required.
>
> ~~Drawdown once every five years during late fall or early winter would have a less-than-significant impact on habitat, since reservoir levels would be restored within a few months after system maintenance is completed.~~

Section 5.4.6.2, page 5.4.6-24: The second full paragraph, last sentence is revised as follows to refine and update the impact discussion based on the modeling results conducted in 2008 as discussed in Chapter 13, Section 13.3.

> However, impacts ~~related to the negligible changes in the extent of~~ on riparian scrub and freshwater marsh habitat would be less than significant, and therefore impacts on the habitat of California red-legged frog and California tiger salamander would be *less than significant*, and no mitigation measures would be required.

Section 5.4.6.2, page 5.4.6-24: The third full paragraph, first sentence is revised as follows to refine and update the impact discussion based on the modeling results conducted in 2008, as discussed in Chapter 13, Section 13.3.

Other Species of Concern

> San Antonio Reservoir ~~would be kept near maximum levels for longer periods, the~~ maximum water surface elevation would not change, and ~~only minor~~ fluctuations in water level that would occur ~~(apart from maintenance drawdown)~~ would be within the historic operating range.

Section 5.4.7.1, page 5.4.7-1: The third paragraph is revised as follows in response to a comment (see **Response L_EBRPD-26**).

Alameda Creek Recreation and Visual Quality

> Alameda Creek runs through several local parks, ~~and~~ municipalities (including ~~Sunol Regional Wilderness,~~ Alameda County), and the cities of Fremont and Union City. Alameda Creek also runs through the Sunol Regional Wilderness and is adjacent to the Vargas Plateau Regional Preserve, Quarry Lakes Regional Recreation Area, and Coyote Hills Regional Park, all of which are operated by the EBRPD. The recreational uses of the creek are described below.

Section 5.4.7.1, page 5.4.7-3, the following text is added after the first partial paragraph in response to a comment (see **Response L_EBRPD-26**).

Vargas Plateau Regional Preserve

> The Vargas Plateau Regional Preserve, managed by the EBRPD, is located adjacent to the SFPUC Alameda watershed along a common boundary line on the east side of the preserve. Its northern boundary touches Alameda Creek for a distance of about 2,500 feet. A portion

> of the decommissioned Sunol Aqueduct crosses the park within a utility easement. Currently, the preserve is not suitable for active public use due to the lack of public road access, the need to protect natural or man-made resources, and other factors related to public safety and access. The EBRPD is currently in the process of adopting the *Vargas Plateau Regional Park Land Use Plan*, which would create a regional park that provides trails, outdoor recreation, campgrounds, and nature appreciation areas (EBRPD, 2007e).

Section 5.4.7.2, page 5.4.7-5, Table 5.4.7-1: Table 5.4.7-1 is revised as follows to reflect the change in project description of the Calaveras Dam (SV-2) project.

TABLE 5.4.7-1
SUMMARY OF IMPACTS –
RECREATIONAL AND VISUAL RESOURCES IN THE ALAMEDA CREEK WATERSHED

Impact	Significance Determination
Impact 5.4.7-1: Effects on recreational facilities and/or activities	~~PSM~~LS
Impact 5.4.7-2: Visual effects on scenic resources or the visual character of water bodies	~~PSM~~LS

~~PSM = Potentially Significant impact, can be mitigated to less than significant~~ LS = Less than Significant impact, no mitigation required

Section 5.4.7.2, page 5.4.7-5: The last paragraph is revised as follows to reflect the change in project description of the Calaveras Dam (SV-2) project.

> The WSIP would not affect water-related recreational facilities or activities in the Alameda Creek watershed. As described above in Section 5.4.7.1, Setting, water recreation is not allowed on the SFPUC reservoirs; because there would be no change to this policy under the WSIP, impacts on recreation would not occur as a result of water level changes in the reservoir. With respect to recreation in and along the creeks in the watershed~~, for most portions of the watershed,~~ there is either: (1) no or only very limited water recreation occurring at present, and/or (2) the WSIP-related flow changes described in Section 5.4.1 would not change creek flows to an extent that existing recreational use would be affected. ~~However, the~~ The proposed program would ~~substantially~~ reduce peak flows along Alameda Creek in the Sunol Regional Wilderness in the winter and early spring months. The reduced flows would somewhat degrade the recreational experience for hikers on the trails near (or with views of) Alameda Creek, ~~resulting in a *potentially*~~ however, with the proposed minimum flows for resident trout on Alameda Creek to be released from the Alameda Creek Diversion Dam when such flows are present, this would be a *less-than-significant* impact. ~~Implementation of Measure 5.4.1-2, Diversion Tunnel Operation, and Measure 5.4.5-3a, Minimum Flows for Resident Trout on Alameda Creek, would reduce this impact to a less-than-significant level.~~

Section 5.4.7.2, page 5.4.7-6: The first and second paragraphs are revised as follows to reflect the change in project description of the Calaveras Dam project (SV-2).

> As described in Section 5.4.1, changes in stream flow and reservoir water levels under the WSIP are not beyond the range of flow and water level variation that occurs now. The reductions in peak flows in average, above-average, and wet years under the proposed program would not be visually apparent to most recreational users and others viewing the creeks and reservoirs. The main exception would be the ~~substantial~~ reductions in <u>peak</u> flows in Alameda Creek in the Sunol Regional Wilderness, including the scenic Little Yosemite area, during winter and spring months. Reduced <u>peak</u> flows in Alameda Creek in the Little Yosemite area would ~~result in a *potentially significant* impact on scenic resources. Implementation of Measure 5.4.1-2, Diversion Tunnel Operation, and Measure 5.4.5-3a, Minimum Flows for Resident Trout on Alameda Creek, would reduce potential impacts on scenic resources along Alameda Creek in the Sunol Regional Wilderness to a less-than-significant level.~~ <u>somewhat degrade the visual character Alameda Creek, however, with the proposed minimum flows for resident trout on Alameda Creek to be released from the Alameda Creek Diversion Dam when such flows are present, this would be a *less-than-significant* impact.</u>
>
> Proposed <u>summer</u> releases to support fisheries would increase flows in Calaveras Creek and downstream in Alameda Creek and would have a beneficial visual effect, because the releases would enhance the creek's appearance in the summer months when recreational use is highest. Therefore, no significant adverse visual impacts would occur, and no mitigation is required.

Section 5.4.7.2, page 5.4.7-6: The following reference is added after (EBRPD, 2007d) in response to a comment (see Response **Response L_EBRPD-26**).

> <u>East Bay Regional Park District (EBRPD), *Draft Vargas Plateau Regional Park Land Use Plan*, October 2007e, available online at http://www.ebparks.org/planning/lup, accessed January 25, 2008.</u>

5.5 San Francisco Peninsula Streams and Reservoirs

Section 5.5.1.1, page 5.5.1-5: The second paragraph, sixth sentence is revised as follows to reflect updated information on the Crystal Springs Reservoir capacity from recent SFPUC studies.

> The current maximum capacities of San Andreas~~, Upper Crystal Springs,~~ and ~~Lower~~ Crystal Springs Reservoirs are 19,000~~, 23,360,~~ and ~~35,040~~ <u>56,800</u> acre-feet, respectively.

Section 5.5.1.1, page 5.5.1-9: The last sentence of the third full paragraph is revised as follows in response to a comment (see **Response L_CoastsideCWD-11**).

> After the reservoir has filled, the ~~only water~~ SFPUC <u>attempts to limit</u> releases from Pilarcitos Reservoir ~~is~~ <u>to</u> that amount requested by Coastside CWD to meet its water needs. <u>However, at times, additional water may be released from Pilarcitos Reservoir and diverted</u>

to Crystal Springs Reservoir at Stone Dam or released from Stone Dam (see discussion below regarding experimental releases from Stone Dam to Pilarcitos Creek).

Section 5.5.1.2, page 5.5.1-13: The first paragraph under “Approach to Analysis” is revised as follows to better describe the refined analysis of impacts on resources in the Pilarcitos watershed as determined from the updated modeling results conducted in 2008, as discussed in Chapter 13, Section 13.3.

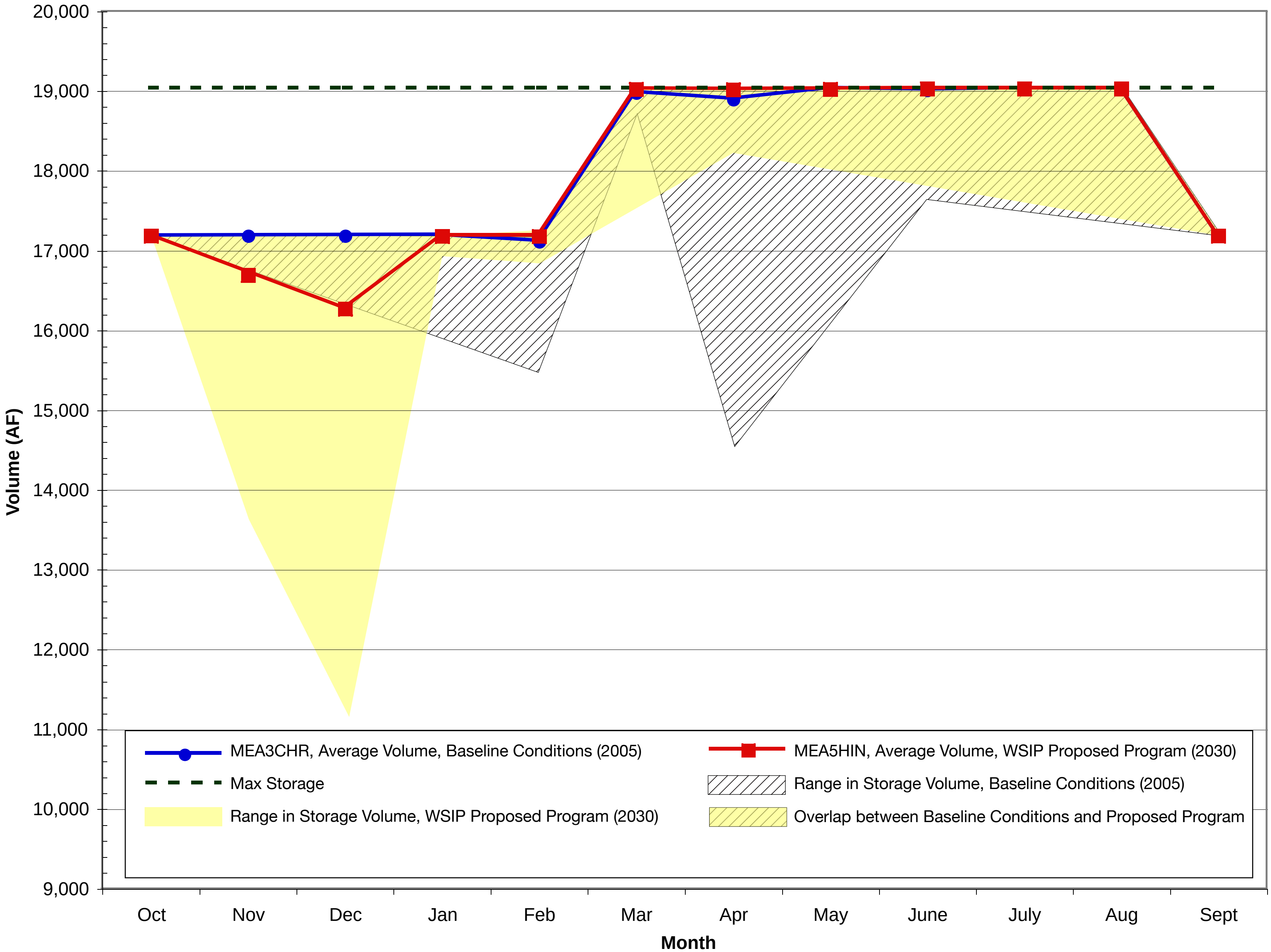
Approach to Analysis

Changes in reservoir storage and water levels attributable to the WSIP in the San Mateo Creek watershed and changes in reservoir storage, water levels and stream flows in the Pilarcitos Creek watershed attributable to the WSIP were estimated using the Hetch Hetchy/Local Simulation Model (HH/LSM). An overview of the model is provided in Section 5.1. Detailed information on the model and the assumptions that underlie it ~~is~~ are provided in Appendix H. Stream flows in San Mateo Creek and stream flows and changes in reservoir storage and water levels for the Pilarcitos Creek watershed were estimated semi-quantitatively based on results from the model in addition to interviews with individuals knowledgeable about historical, current and expected future (with-WSIP) water system operations. Information on the limitations of the HH/LSM and reasons for using supplemental information are provided in Section 5.1. Information on current and expected future operations in the Pilarcitos Creek watershed is provided in Appendix H2-3 and H2-7.

Section 5.5.1.2, page 5.5.1-14: The second paragraph is revised as follows to reflect updated information on the Crystal Springs Reservoir capacity from recent SFPUC studies.

The proposed program would increase average monthly storage in Crystal Springs Reservoir year-round compared to the existing condition. **Figure 5.5.1-7** shows average monthly storage in the reservoir. The increase in average monthly storage would mostly be attributable to the Lower Crystal Springs Dam project (PN-4), but also to improvements to the SFPUC regional water system as a whole. The improvements to Crystal Springs Dam are part of the WSIP and would allow the reservoir to be operated at its full capacity of ~~69,300~~ 68,000 acre-feet, or ~~22.6~~ 22.2 billion gallons. The Division of Safety of Dams currently limits the maximum storage capacity in Crystal Springs Reservoir to ~~58,400~~ 56,800 acre-feet (~~19~~ 18.5 billion gallons) due to concerns regarding the ability of the dam spillway to safely pass the largest floods that could occur in the watershed. …

Section 5.5.1.2, page 5.5.1-18: The legend in **Figure 5.5.1-9** is revised to show the correct range in storage volume of the San Andreas Reservoir. The Draft PEIR incorrectly labeled the yellow area as “Range in Storage Volume, Baseline Conditions (2005)” and the hatched area as “Range in Storage Volume, WSIP Proposed Program (2030).” Figure 5.5.1-9 is revised as shown on the following page.



SOURCE: SFPUC, HH/LSM (see Appendix H)

SFPUC Water System Improvement Program . 203287

Figure 5.5.1-9 (Revised)
Average Monthly Storage Volume,
San Andreas Reservoir

Section 5.5.1.2, page 5.5.1-20: The two paragraphs under "Water Storage and Water Levels in Pilarcitos Reservoir" are revised as follows, including insertion of a new figure, Figure 5.5.1-10, to refine the flow analysis in the Pilarcitos watershed as determined from the updated modeling results conducted in 2008, as discussed in Chapter 13, Section 13.3.

Water Storage and Water Levels in Pilarcitos Reservoir

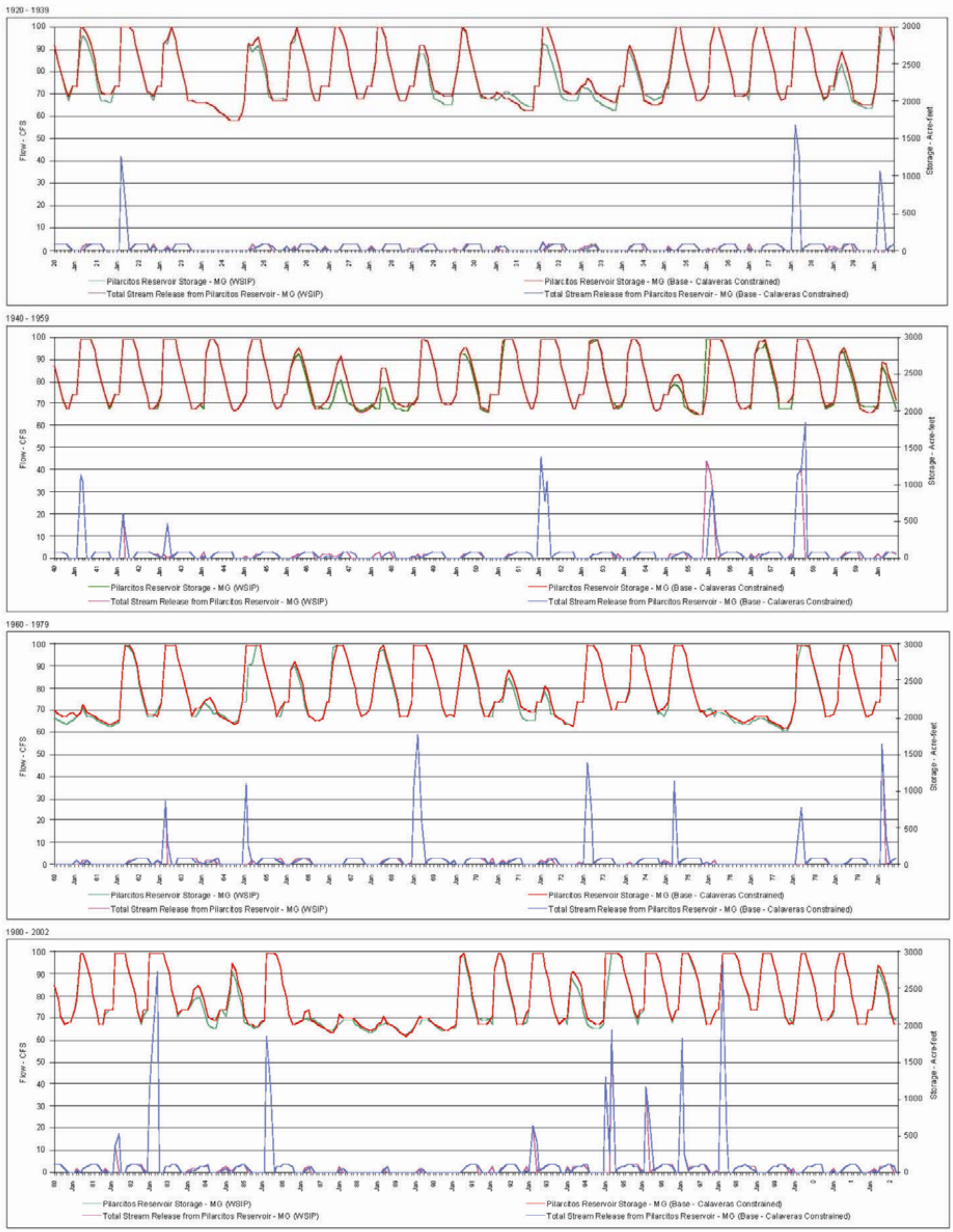
Seasonal changes in storage and water surface elevation in Pilarcitos Reservoir under the existing condition are shown in Figure 5.5.1-6. **Figure 5.5.1-10** shows chronological modeled storage in Pilarcitos Reservoir using hydrology data from the period 1920 to 2002. The figure compares the WSIP to the existing condition. With the WSIP, storage in the reservoir would follow a similar seasonal pattern as under the existing condition, but would average somewhat less than under the existing condition and would be drawn down more rapidly in some years in the late spring and summer. The increased rate of drawdown is primarily attributable to increased water demand in the Coastside CWD service area, which is served by releases from the reservoir, and increased transfers of water to the San Mateo Creek watershed. As water demand increases in the Coastside CWD service area, additional water would be drawn from Pilarcitos Reservoir to meet demand, although diversion of water from Pilarcitos Creek to Coastside CWD is currently limited to a maximum of 2 mgd because of pipeline capacity. The HH/LSM assumes that when Coastside CWD's monthly demand from Pilarcitos Creek exceeds 2 mgd the SFPUC serves Coastside CWD from Crystal Springs Reservoir. Additional water would also be transferred from the Pilarcitos Creek watershed to the SFPUC's reservoirs in the San Mateo Creek watershed with the WSIP than under the existing condition. This is because with the WSIP more reservoir capacity in the San Mateo Creek watershed would be available at times when water is available from Pilarcitos Creek.

~~Storage in Pilarcitos Reservoir with the WSIP would be reduced much of the time, except when the reservoir is full and spilling, or at its minimum elevation and no further diversions can be made.~~ Under existing conditions and in most years ~~dry periods~~, storage in ~~the~~ Pilarcitos ~~r~~Reservoir becomes depleted by the late summer, and the only releases made to Pilarcitos Creek are the consequence of inflow from groundwater and tributary streams. Depletion of the reservoir in dry periods would occur earlier in the year with the WSIP.

Section 5.5.1.2, page 5.5.1-20: A new table, **Table 5.5.1-2**, and the following new paragraph are inserted immediately under the heading "Flow in Pilarcitos Creek between Pilarcitos Reservoir and Stone Dam" to refine the flow analysis in the Pilarcitos watershed as determined from the updated modeling results conducted in 2008, as discussed in Chapter 13, Section 13.3.

Flow in Pilarcitos Creek between Pilarcitos Reservoir and Stone Dam

Releases to Pilarcitos Creek from Pilarcitos Reservoir under the existing condition and with the WSIP are shown in Figure 5.5.1-10. In normal, below normal, and dry years, the WSIP would have little or no effect on releases to Pilarcitos Creek from the reservoir. In average wet years and with the WSIP, releases would be reduced by about 6 percent. In average



SOURCE: SFPUC, HH/LSM (see Appendix H)

SFPUC Water System Improvement Program . 203287

Figure 5.5.1-10 (New)
Pilarcitos Reservoir Storage and Stream Release

TABLE 5.5.1-2 (New)
AVERAGE MONTHLY CHANGES IN PILARCITOS CREEK FLOW BELOW PILARCITOS RESERVOIR ATTRIBUTABLE TO THE WSIP (CUBIC FEET PER SECOND)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year Type
1983	6	4	0	74	131	182	0	0	5	5	6	6	Wet
1998	0	0	2	0	192	37	0	0	3	5	5	6	Wet
1958	0	0	5	0	74	81	-62	0	5	6	6	6	Wet
1941	4	0	0	0	76	69	0	0	5	6	6	6	Wet
1982	0	4	0	0	23	-17	0	0	5	6	6	6	Wet
1995	0	0	0	-43	-8	118	0	2	4	5	6	6	Wet
1956	0	0	131	90	62	-10	3	4	5	6	6	6	Wet
1952	4	0	0	92	51	70	0	4	5	6	6	6	Wet
1938	4	0	0	0	112	84	0	3	5	6	6	6	Wet
1997	6	0	0	122	16	4	5	5	6	6	6	3	Wet
1969	0	0	3	70	119	37	1	4	5	6	6	6	Wet
1973	0	0	3	0	92	51	2	4	5	5	6	6	Wet
1986	0	0	0	0	123	79	0	4	5	6	6	6	Wet
1980	0	0	2	0	109	-13	2	4	5	6	6	6	Wet
1942	6	0	0	0	41	-12	0	0	5	6	6	6	Wet
1967	0	0	0	0	0	0	0	0	5	6	6	6	Wet
1963	0	0	-2	0	57	-10	0	0	5	6	6	6	AN
1940	0	0	0	0	-36	-27	0	4	5	6	6	6	AN
1965	0	0	0	-37	-9	5	0	4	5	6	6	6	AN
1996	6	7	4	0	77	-22	3	4	5	6	6	6	AN
1922	0	0	0	0	83	46	0	4	6	6	6	6	AN
1975	6	0	6	4	0	-38	0	3	5	6	6	6	AN
1974	0	2	0	0	4	0	0	3	5	6	6	6	AN
1978	0	0	0	0	-9	-26	0	4	5	6	6	6	AN
1993	0	0	7	0	43	-13	3	4	6	6	6	6	AN
1951	0	0	0	0	0	0	4	4	5	6	6	6	AN
1943	5	4	5	0	3	-16	1	4	5	6	6	6	AN
1927	0	0	4	0	0	0	0	5	6	6	6	6	AN
1937	0	0	0	8	0	0	0	4	6	6	6	6	AN
2000	6	-2	5	0	0	0	4	5	6	6	6	6	AN
1921	7	4	0	0	0	4	5	5	6	6	5	0	AN
1999	6	7	5	0	0	0	0	3	5	6	6	6	AN
1923	0	6	0	0	0	5	0	5	6	6	6	5	AN
1953	6	0	0	0	1	0	4	4	6	6	6	6	NORMAL
1928	0	0	1	4	1	0	0	5	6	6	6	5	NORMAL
1970	4	0	4	0	0	0	4	5	6	6	6	4	NORMAL
1984	6	0	0	2	4	4	4	4	6	4	0	0	NORMAL
1946	3	0	0	0	0	4	4	4	6	6	6	-2	NORMAL
1926	0	0	0	5	0	5	0	5	6	6	6	4	NORMAL
1936	3	0	0	2	0	2	2	4	6	6	6	6	NORMAL
1945	0	0	0	4	0	0	3	4	6	6	6	6	NORMAL
1971	0	7	0	0	5	2	4	5	6	6	0	0	NORMAL
1935	0	0	0	0	5	0	0	3	6	6	6	6	NORMAL
1932	0	0	0	0	-4	5	6	6	6	6	-3	0	NORMAL
1979	5	0	0	0	0	0	3	5	6	6	6	5	NORMAL
1962	0	0	0	0	0	0	5	5	6	6	6	5	NORMAL
1949	0	0	0	-1	4	0	3	4	6	6	6	6	NORMAL
1992	0	0	0	7	0	0	5	6	6	6	6	4	NORMAL
1981	3	0	0	0	4	0	4	5	6	6	6	4	NORMAL
2001	0	0	0	4	0	0	4	5	6	6	6	4	BN
1930	0	0	0	2	1	0	5	5	6	6	6	0	BN
1954	-2	6	0	0	0	0	3	5	6	6	6	6	BN
1968	5	0	0	0	0	2	4	5	6	6	6	4	BN
1959	6	0	0	0	0	5	5	5	6	6	-2	0	BN
1925	0	0	0	0	0	6	4	3	6	6	6	-2	BN
1944	4	0	0	6	0	0	4	5	6	6	6	6	BN
2002	0	0	0	0	4	0	5	5	6	6	-3	0	BN
1950	0	0	0	0	0	5	4	5	6	6	3	0	BN
1966	4	7	0	1	0	5	6	6	6	2	0	0	BN
1955	0	0	0	0	4	4	4	5	6	-2	0	0	BN
1957	4	0	0	5	0	4	4	3	6	6	6	6	BN
1934	0	0	1	0	0	5	6	6	6	-3	0	0	BN
1985	0	2	4	6	1	1	6	5	6	6	-2	0	BN
1991	0	0	0	0	0	0	5	6	6	6	6	-2	BN
1929	0	0	2	3	3	2	4	6	6	6	0	0	BN
1964	5	7	-1	0	5	6	5	-3	0	0	0	0	BN

TABLE 5.5.1-2 (New) (Continued)
AVERAGE MONTHLY CHANGES IN PILARCITOS CREEK FLOW BELOW PILARCITOS RESERVOIR ATTRIBUTABLE TO THE WSIP
(cubic feet per second)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year Type
1947	0	6	4	4	4	3	4	5	6	-3	-2	0	DRY
1994	4	0	0	6	0	6	5	5	6	2	0	0	DRY
1939	6	0	4	5	2	4	5	6	6	-2	0	0	DRY
1948	0	0	0	0	6	9	1	4	6	-3	0	0	DRY
1960	0	0	0	6	0	6	6	6	4	0	0	0	DRY
1972	0	0	1	5	3	7	6	-3	0	0	0	0	DRY
1933	0	0	0	2	5	5	5	3	0	0	0	0	DRY
1961	0	0	0	-2	0	5	3	0	0	0	0	0	DRY
1990	0	0	0	0	5	-1	0	0	0	0	0	0	DRY
1987	4	0	0	0	5	5	-2	0	0	0	0	0	DRY
1988	0	0	0	7	-1	0	0	0	0	0	0	0	DRY
1989	0	0	0	0	0	5	-2	0	0	0	0	0	DRY
1931	0	0	0	6	-1	-1	0	0	0	0	0	0	DRY
1976	6	0	-2	0	6	0	0	0	0	0	0	0	DRY
1977	0	0	0	0	0	0	0	0	0	0	0	0	DRY
1924	0	0	0	0	0	0	0	0	0	0	0	0	DRY

NOTES: Hydrologic year types were determined by rank ordering of total SFPUC Bay Area reservoir inflow.
Year Types: Wet, AN -- Above Normal, Normal, BN -- Below Normal, and Dry

SOURCE: SFPUC, HH/LSM (see Appendix H)

above normal years and with the WSIP, releases would be reduced by about 34 percent. The differences between releases under the existing condition and with the WSIP are shown in Table 5.5.1-2 in every month for the period 1921 through 2002. Negative values indicate the months in which releases to the creek with the WSIP would be less than under the existing condition.

Section 5.5.1.2, pages 5.5.1-20 and 5.5.1-21: The last partial paragraph on page 5.5.1-20 continuing to page 5.5.1-21 and the first full paragraph on page 5.5.1-21 are revised as follows to refine the flow analysis in the Pilarcitos watershed as determined from the updated modeling results conducted in 2008, as discussed in Chapter 13, Section 13.3.

Most runoff into Pilarcitos Reservoir occurs between November and April. In normal, above-normal, and wet years, when the reservoir is full and runoff exceeds the capacity of the diversion tunnels to San Andreas and Crystal Springs Reservoirs, or those reservoirs are full, the reservoir spills to Pilarcitos Creek. ~~Because Pilarcitos Reservoir is drawn down to its minimum elevation in late summer in all but the wettest years, the WSIP would have a negligible effect on wintertime spills to Pilarcitos Creek in most years.~~ ~~Some reduction in spills could occur in wet years~~. As shown in Figure 5.5.1-10, the WSIP would not affect wintertime spills in most years, but it would reduce spills in some wet and above normal years. Occasionally (for example, under 1940, 1943, 1965 and 1976 hydrologic conditions), wintertime spills that occur under the existing condition would be completely or almost completely eliminated with the WSIP.

The WSIP would increase flow in Pilarcitos Creek immediately below Pilarcitos Reservoir in some late spring and summer months of most hydrologic year types as a result of increased releases from the reservoir to meet Coastside CWD's needs. <u>The increases are shown as positive values in April, May, June and July in Table 5.5.1-2.</u> In the summer months of ~~dry~~ <u>some</u> years, Pilarcitos Reservoir would become depleted earlier in the year with the WSIP than it does under the existing condition. Coastside CWD would activate its pumps and draw water from Crystal Springs Reservoir earlier in the year than it does under the existing condition. At such times, there would be no releases from Pilarcitos Reservoir to the creek except for dry season inflow to the reservoir. Flow in the creek below the reservoir would be the same as under the existing condition, consisting of inflow releases, seepage from the dam, infiltration from groundwater, and tributary flow. The period of minimal flow below Pilarcitos Reservoir would be extended with the WSIP, because the reservoir would be drawn down to its minimum elevation earlier in the year. <u>Table 5.5.1-2 shows negative values in some years between May and September. These are months in which releases from Pilarcitos Reservoir occur under the existing condition but which would be reduced or eliminated under the WSIP.</u>

Section 5.5.1.2, page 5.5.1-21: The first and second paragraphs under "Flow in Pilarcitos Creek below Stone Dam" are revised as follows to refine the flow analysis in the Pilarcitos watershed as determined from the updated modeling results conducted in 2008, as discussed in Chapter 13, Section 13.3.

Flow in Pilarcitos Creek Below Stone Dam

Under the existing condition, water occasionally spills over Stone Dam to Pilarcitos Creek. There is little flow in Pilarcitos Creek immediately below Stone Dam most of the time, and no flow in dry periods. Spills over Stone Dam occur when releases from Pilarcitos Reservoir and runoff into Pilarcitos Creek between the reservoir and Stone Dam exceed the capacity of the diversion at Stone Dam. Occasional spills over Stone Dam would continue under the WSIP. The volume of spills would be reduced by the additional amount of Pilarcitos Creek water the SFPUC supplies to Coastside CWD <u>or diverts to its reservoirs in the San Mateo Creek watershed.</u>

~~In most months of wet years, spills over Stone Dam with the WSIP and under the existing condition would be the same. In some winter and early spring months, spills with the WSIP would probably be less than under the existing condition.~~ Spills at Stone Dam typically occur ~~in wet years~~ when Pilarcitos Reservoir is full, Coastside CWD's demand is met, and the SFPUC cannot transfer water to the San Mateo Creek watershed, either because available water in the Pilarcitos Creek watershed exceeds the capacity of the SFPUC's tunnels to San Andreas and Crystal Springs Reservoir<u>s,</u> or those reservoirs are already full. <u>Spills very rarely occur in dry and below normal years under the existing condition and would very rarely occur with the WSIP. With the WSIP, average annual spills in wet, above normal and normal years would be reduced by about 11, 60, and 25 percent, respectively, compared to the existing condition.</u>

Section 5.5.3.1, page 5.5.3-1: The last full sentence on the page is revised as follows to correct the spelling of "phosphorus" and in response to a comment (see **Response C_Hoel-04**).

> Past studies have shown that the growth of algae in Crystal Springs Reservoir is limited by a lack of nitrogen and phosphor~~o~~us, both of which are plant nutrients; therefore, an increase in the concentration of either could increase the growth of algae.

Section 5.5.3.2, page 5.5.3-4: The first paragraph under "Approach to Analysis" is revised as follows to better describe the refined analysis of impacts on resources in the Pilarcitos watershed as determined from the updated modeling results conducted in 2008, as discussed in Chapter 13, Section 13.3.

Approach to Analysis

> Changes in reservoir storage and water levels in the San Mateo Creek watershed and changes in reservoir storage, water levels and stream flows in the Pilarcitos Creek watershed attributable to the WSIP were estimated using the HH/LSM. An overview of the model is presented in Section 5.1. Detailed information on the model and the assumptions that underlie it ~~is~~ are provided in Appendix H. Changes in stream flows in ~~both~~ the San Mateo Creek ~~and Pilarcitos watersheds and changes in reservoir storage and water levels for the Pilarcitos Creek~~ watershed attributable to the WSIP were estimated semi-quantitatively in consultation with individuals knowledgeable about historical, current, and expected future (with-WSIP) water system operations.

Section 5.5.3.2, page 5.5.3-6: The first partial paragraph and the first full paragraph on page 5.5.3-6 are revised as follows to correct the spelling of "phosphorus" and in response to a comment (see **Response C_Hoel-04**).

> …bottom of the reservoir. If the proposed program increased the volume of oxygen-depleted water at the bottom of the reservoir, it could increase the release of phosphor~~o~~us. Increased release of phosphor~~o~~us and increased phosphor~~o~~us concentrations in reservoir water would have the potential to increase the growth of algae.
>
> Studies completed over the last several years indicate that the growth of algae in Crystal Springs Reservoir has historically been limited by both nitrogen and phosphor~~o~~us concentrations. After the SFPUC began disinfecting Hetch Hetchy water with chloramine, the nitrogen concentration in the reservoir increased, and the concentration of phosphor~~o~~us in reservoir water became the factor limiting the growth of algae. Thus, the addition of more nitrogen as a result of a WSIP-induced increase in the proportion of Hetch Hetchy water in Crystal Springs Reservoir would not alone increase the growth of algae. Increased phosphor~~o~~us concentrations in the reservoir as a result of the more stable thermal stratification induced by the WSIP would increase the growth of algae.

Section 5.5.3.2, page 5.5.3-7: The first paragraph under the heading "Pilarcitos Reservoir" is revised as follows to refine the water quality analysis in the Pilarcitos watershed as determined from the updated modeling results conducted in 2008, as discussed in Chapter 13, Section 13.3.

Pilarcitos Reservoir

Figure 5.5.1-6 shows recent past storage levels in Pilarcitos Reservoir from 1998 to 2006. Under the existing condition, the reservoir is drawn down through the summer, reaching minimum storage in October and November, just before the rainy season begins. With the WSIP, drawdown would occur more rapidly in ~~many~~ some years. The ~~increased~~ more rapid drawdown attributable to the proposed program could cause the reservoir to destratify earlier than under existing conditions. This would not adversely affect water quality; in fact, mechanical destratification in the fall has been recommended to the SFPUC as a means of improving water quality (SFPUC, 2002).

Section 5.5.3.2, page 5.5.3-7: The first paragraph under the heading "Pilarcitos Creek between Pilarcitos Reservoir and Stone Dam" is revised as follows to refine the water quality analysis in the Pilarcitos watershed as determined from the updated modeling results conducted in 2008, as discussed in Chapter 13, Section 13.3.

Pilarcitos Creek Between Pilarcitos Reservoir and Stone Dam

The WSIP could affect water quality in Pilarcitos Creek between Pilarcitos Reservoir and Stone Dam in two ways – by altering the quality of water released from Pilarcitos Reservoir to the creek and by altering flow in the creek. As discussed above, with the WSIP in place, the volume of the pool of cool water in Pilarcitos Reservoir below the thermocline would be reduced earlier in the year in some years compared to the existing condition, but the quality of water released to Pilarcitos Creek from the reservoir would change little.

Section 5.5.3.2, page 5.5.3-8: The first full paragraph is revised as follows to refine the water quality analysis in the Pilarcitos watershed as determined from the updated modeling results conducted in 2008, as discussed in Chapter 13, Section 13.3.

The proposed program would also reduce flow in Pilarcitos Creek between Pilarcitos Reservoir and Stone Dam in wet months of some wet years. It is not expected that the wet-year flow reductions would have an adverse effect on water quality in the stream because, during the winter, water in the creek would be cool and well oxygenated.

Section 5.5.3.2, page 5.5.3-8: The second paragraph under the heading "Pilarcitos Creek Below Stone Dam" is revised as follows to refine the water quality analysis in the Pilarcitos watershed as determined from the updated modeling results conducted in 2008, as discussed in Chapter 13, Section 13.3.

With the WSIP, less water would pass over Stone Dam in ~~wet~~ winters of wet, above normal, and normal years than it does under the existing condition. It is unlikely that the reductions in spill over Stone Dam would have much effect on water quality in Pilarcitos Creek below Stone Dam. The reductions in spills would occur in months of wet, above normal, and normal years when runoff from the Pilarcitos Creek watershed below Stone Dam would be high. For this reason, the effect of the flow reductions on water quality in the creek below Stone Dam would be minor.

Section 5.5.3.2, page 5.5.3-9: The text under the heading "Impact Summary" is revised as follows to refine the water quality analysis in the Pilarcitos watershed as determined from the updated modeling results conducted in 2008, as discussed in Chapter 13, Section 13.3.

Impact Summary

The ~~Overall~~ adverse impacts of the WSIP on water quality ~~in Pilarcitos Reservoir and~~ along Pilarcitos Creek between Pilarcitos Reservoir and Stone Dam would be *potentially significant*; however implementation of Measure 5.5.3-2a~~, Revised Operations Plan for Pilarcitos Watershed Facilities~~ Low-head Pumping Station at Pilarcitos Reservoir, would restore flow to this reach of Pilarcitos Creek in the late summer ~~maintain the current storage levels in the reservoir~~ and reduce the impact to a less than significant level.

The adverse impacts of the WSIP on water quality in Pilarcitos Reservoir would also be potentially significant. Furthermore, Measure 5.5.3-2a, Low-head Pumping Station at Pilarcitos Reservoir, would exacerbate adverse impacts on water quality at the reservoir by lowering the water level in some summers. Implementation of Measure 5.5.3-2b, Aeration System at Pilarcitos Reservoir, would improve water quality and reduce impacts in the reservoir to a less than significant level.

Section 5.5.5.2, page 5.5.5-5: The text under "Approach to Analysis" is revised as follows to better describe the refined analysis of impacts on resources in the Pilarcitos watershed as determined from the updated modeling results conducted in 2008, as discussed in Chapter 13, Section 13.3.

Approach to Analysis

Changes in reservoir storage and water levels in the San Mateo Creek watershed and changes in reservoir storage, water levels and stream flows in the Pilarcitos Creek watershed attributable to the WSIP were estimated using the HH/LSM. An overview of the model is presented in Section 5.1. Detailed information on the model and the assumptions that underlie it ~~is~~ are provided in Appendix H. Changes in flow in streams in the San Mateo Creek ~~and Pilarcitos watersheds and changes in reservoir storage and water levels in the Pilarcitos~~ watershed attributable to the WSIP were estimated semi-quantitatively based on interviews with individuals knowledgeable about the historical, current, and expected future (with-WSIP) water system operations.

Section 5.5.5.2, page 5.5.5-6, Table 5.5.5-1: Table 5.5.5-1 is revised as follows to reflect the updated modeling results conducted in 2008, as discussed in Chapter 13, Section 13.3.

TABLE 5.5.5-1
SUMMARY OF IMPACTS – FISHERIES
IN SAN FRANCISCO PENINSULA STREAMS AND RESERVOIRS

Impact	Significance Determination
Impact 5.5.5-1: Effects on fishery resources in Crystal Springs Reservoir (Upper and Lower)	PSU
Impact 5.5.5-2: Effects on fishery resources in San Andreas Reservoir	LS
Impact 5.5.5-3: Effects on fishery resources along San Mateo Creek	LS
Impact 5.5.5-4: Effects on fishery resources in Pilarcitos Reservoir	PSM*
Impact 5.5.5-5: Effects on fishery resources along Pilarcitos Creek below Pilarcitos Reservoir	PSM

LS = Less than Significant impact, no mitigation required
PSM = Potentially Significant impact, can be mitigated to less than significant
PSU = Potentially Significant impact, unavoidable

* Based on the refined Pilarcitos watershed impact analysis (see Section 13.3), this impact is PSM due to adverse effects that would result from implementing replacement Measure 5.5.3-2a.

Section 5.5.5.2, pages 5.5.5-7 and 5.5.5-8: The text under Impact 5.5.5-4, Effects on fishery resources in Pilarcitos Reservoir, is revised as follows to refine the fishery analysis in the Pilarcitos watershed as determined from the updated modeling results conducted in 2008, as discussed in Chapter 13, Section 13.3.

> Storage in Pilarcitos Reservoir varies seasonally. The reservoir typically fills in the winter and is drawn down in the late spring and summer. By late summer, releases from the reservoir are typically limited to reservoir inflow. The volume of habitat available for resident aquatic species varies seasonally from about 3,000 acre-feet in the winter and spring to 1,600 acre-feet in the late summer or fall.
>
> With the WSIP, the reservoir would be drawn down more rapidly and earlier in the season than under the existing condition. The period in which the reservoir would be at its minimum elevation would be extended by days or weeks. ~~The reduction in summer storage would reduce the~~The volume of habitat ~~potentially~~ available for resident aquatic species would be at its minimum. ~~This impact would be *potentially significant*.~~ Because the WSIP would cause ~~Reductions in~~ the volume of water stored within Pilarcitos Reservoir to reach its seasonal minimum several days or weeks earlier in the year than under the existing condition, it ~~under proposed operations~~ would also be expected to reduce the coldwater pool volume within the reservoir hypolimnion to its seasonal minimum earlier in the year. This ~~which~~ could in turn have an adverse effect on resident coldwater species in the reservoir. However, because water is released from close to the surface of the reservoir, a cool water pool is usually retained below the level of the outlet. ~~Still, WSIP-induced water quality impacts on fishery habitat in the reservoir would be potentially significant.~~ Overall, the impacts of the proposed program on ~~related to a reduction in the volume and suitability of habitat potentially available for~~ resident aquatic species in Pilarcitos Reservoir would be *less than* ~~*potentially*~~ *significant.*

Implementation of Measure 5.5.3-2a, ~~Revised Operations Plan for Pilarcitos Watershed Facilities~~ Low-head Pumping Station at Pilarcitos Reservoir, would ~~maintain the current storage levels in the reservoir and reduce these impacts to a less-than-significant level~~ reduce the storage volume in Pilarcitos Reservoir by about 350 acre-feet in the late summer and fall of about one in four years. In these years, the seasonal minimum storage volume in Pilarcitos Reservoir would be 1,600 to 1,700 acre-feet. However, implementation of Measure 5.5.3-2b, Aeration System at Pilarcitos Reservoir, would improve water quality at such times as the reservoir was drawn down. The periodic reduction in volume of water available to aquatic species, attributable to Measure 5.5.3-2a, coupled with the improvement in water quality attributable to Measure 5.5.3-2b would have a *less-than-significant* impact on resident aquatic species.

Section 5.5.5.2, page 5.5.5-8: The text under the heading “Pilarcitos Creek Below Pilarcitos Reservoir” is revised as follows to refine the fishery analysis in the Pilarcitos watershed as determined from the updated modeling results conducted in 2008, as discussed in Chapter 13, Section 13.3.

Pilarcitos Creek Below Pilarcitos Reservoir

Flow in Pilarcitos Creek would increase during many spring and early summer months as a result of the WSIP; however, flow reductions would occur during the summer of dry years. Under the WSIP ~~proposed operations~~, instream flow releases (other than dam seepage and reservoir inflow) would cease in Pilarcitos Creek downstream of Pilarcitos Reservoir during summer months of dry years at an earlier date ~~with the WSIP~~ than under the existing condition. Flow reductions in Pilarcitos Creek downstream of Pilarcitos Reservoir under the WSIP ~~proposed operations~~ would result in potentially significant impacts on resident trout, other resident fish species and aquatic resources.~~ and habitat quality and availability for anadromous steelhead.~~

In addition, as described above, releases from Pilarcitos Reservoir to Pilarcitos Creek are made from close to the surface of the reservoir, so summer and fall releases under existing conditions are warm. With the proposed program in place, summer and fall releases would also be warm (possibly warmer at times ~~in the fall~~), because Pilarcitos Reservoir would be drawn down several days or weeks earlier ~~farther~~ than under the existing condition. Exposure to higher water temperatures in the late summer and fall could significantly affect habitat quality and availability for coldwater fish species inhabiting Pilarcitos Creek below Pilarcitos Reservoir, including ~~both~~ resident trout ~~and anadromous steelhead~~. This would be a potentially significant impact.

Section 5.5.5.2, page 5.5.5-8 and 5.5.5-9. The text under the heading “Pilarcitos Creek Below Stone Dam” is revised as follows to refine the fishery analysis in the Pilarcitos watershed as determined from the updated modeling results conducted in 2008, as discussed in Chapter 13, Section 13.3.

Pilarcitos Creek Below Stone Dam

~~Pilarcitos Creek below Stone Dam provides potential habitat for anadromous salmonids.~~ Pilarcitos Creek supports a population of anadromous steelhead. The creek channel is used as a migration corridor for upstream migration of adults and downstream migration of both adults and juvenile steelhead between approximately December 1 and May 31. Under the proposed WSIP, winter flows within the creek below Stone Dam, during normal or wetter hydrologic years, would be reduced. Although no specific barriers to passage have been identified downstream of Stone Dam, this reduction in peak winter flows could potentially adversely impact steelhead migratory passage and spawning at critical riffles and gravel bars due to the shallow nature of these habitat types.

Currently, there are occasional spills over Stone Dam when releases from Pilarcitos Reservoir and runoff into Pilarcitos Creek above Stone Dam exceed the capacity of the diversion at the dam. The spills occur in the winter months of wet, above normal and normal years. With implementation of the proposed program, occasional spills over Stone Dam would continue but with ~~somewhat~~ reduced frequency and magnitude. The volume of spills in average wet, above normal, and normal years would be reduced by 11, 60, and 25 percent, respectively.

Approximately, one-third of the Pilarcitos Creek watershed lies upstream of Stone Dam, and most of the runoff from the watershed is used for municipal water supply by the SFPUC and Coastside CWD. Spills over Stone Dam currently provide up to ~~one third~~ 15 percent of the flow in the ~~this~~ lower reach of Pilarcitos Creek in Half Moon Bay, based on data from gages just downstream of Stone Dam and in Half Moon Bay.

With the WSIP, spills would be reduced and flow in Pilarcitos Creek would be reduced in the winter months, when occasional large flows are important to migratory fish. The effects of the reduced spills would be primarily felt in the reach of Pilarcitos Creek from Stone Dam to the first major downstream tributary at Albert Canyon. ~~Consequently, t~~The reduction in flows due to the WSIP ~~operations~~ and related impacts on fish habitat would be potentially significant. In addition, the National Marine Fisheries Service has raised concerns regarding stream flows in Pilarcitos Creek below Stone Dam, and the SFPUC is currently making experimental summer releases and undertaking studies in an effort to address these concerns.

Section 5.5.5.2, page 5.5.5-9: The text under the heading “Impact Conclusions” is revised as follows to refine the fishery analysis in the Pilarcitos watershed as determined from the updated modeling results conducted in 2008, as discussed in Chapter 13, Section 13.3.

Impact Conclusions

Overall, impacts on fishery resources along Pilarcitos Creek between ~~below~~ Pilarcitos Reservoir and Stone Dam related to reduced flows, degraded water quality and elevated temperatures in the late summer and fall ~~and reduced flows in the winter months~~ would be *potentially significant*. Implementation of Measures 5.5.3-2a, Low-head Pumping Station at Pilarcitos Reservoir, and Measure 5.5.3-2b, Aeration System at Pilarcitos Reservoir, ~~Revised Operations Plan for Pilarcitos Watershed Facilities~~ would reduce this potential impact to a less-than-significant level.

Impacts on fishery resources in Pilarcitos Creek below Stone Dam related to reduced wintertime flows would be *potentially significant*. Implementation of Measure 5.5.5-5, Establish Flow Criteria, Monitor and Augment Flow, would reduce this potential impact to a *less-than-significant* level.

Section 5.5.6.2, page 5.5.6-14, Table 5.5.6-4: Table 5.5.6-4 is revised as follows to reflect the updated modeling results conducted in 2008, as discussed in Chapter 13, Section 13.3.

TABLE 5.5.6-4
SUMMARY OF IMPACTS –
TERRESTRIAL BIOLOGICAL RESOURCES IN THE PENINSULA WATERSHED

Impacts	Sensitive Habitats	Key Special-Status Species	Other Species of Concern	Common Habitats and Species
Impact 5.5.6-1: Impacts on biological resources in Upper and Lower Crystal Springs Reservoirs	PSM	PSM	PSM	PSM
Impact 5.5.6-2: Impacts on biological resources in San Andreas Reservoir	LS	LS	LS	LS
Impact 5.5.6-3: Impacts on biological resources along San Mateo Creek below Lower Crystal Springs Dam	LS	LS	LS	LS
Impact 5.5.6-4: Impacts on biological resources in Pilarcitos Reservoir	LS	PSM*	LS	LS
Impact 5.5.6-5: Impacts on biological resources along Pilarcitos Creek below Pilarcitos Reservoir	~~PSM~~LS	LS	LS	LS
Impact 5.5.6-6: Impacts on biological resources along Pilarcitos Creek below Stone Dam	LS	LS	LS	LS
Impact 5.5.6-7: Conflicts with the provisions of adopted conservation plans or other approved biological resource plans	LS			

LS = Less than Significant impact, no mitigation required
PSM= Potentially Significant impact, can be mitigated to less than significant

* Based on the refined Pilarcitos watershed impact analysis (see Section 13.3), this impact is PSM due to adverse effects that would result from implementing replacement Measure 5.5.3-2a.

Section 5.5.6.2, page 5.5.6-19: The first two paragraphs in Impact 5.5.6-4 are revised as follows to refine the biological resources analysis in the Pilarcitos watershed as determined from the updated modeling results conducted in 2008, as discussed in Chapter 13, Section 13.3.

Sensitive Habitats

~~Greater~~ The earlier drawdown of the reservoir under the WSIP would not increase the extent of unvegetated, weedy, or seasonal wetland areas below the maximum water levels, although these areas would be exposed several days or weeks earlier than under the existing condition in some years. ~~Existing freshwater emergent vegetation is already limited to areas that receive groundwater seepage or year-round surface water flow at the mouths of the tributary streams. Although the greater drawdown could slightly reduce the extent of areas supporting sensitive freshwater marsh habitat, t~~This impact would be less-than-significant.

Key Special-Status Species

Proposed operations with the WSIP at Pilarcitos Reservoir would have no effect on ~~slightly reduce~~ the extent of suitable habitat at the ~~Pilarcitos~~ ~~R~~reservoir for California red-legged frog and San Francisco garter snake. ~~, a *potentially significant* impact.~~ ~~However,~~ Similarly, the extent and condition of adjacent upland vegetation would not be affected by the proposed reservoir operations. As a result, the WSIP would have no effect on species such as the marbled murrelet that ~~this impact would not apply to~~ nest~~ing~~ or forage~~ing~~ in upland habitats adjacent to the reservoir.~~for species such as the marbled murrelet.~~

Section 5.5.6.2, page 5.5.6-20: The second paragraph on this page is revised as follows to refine the biological resources analysis in the Pilarcitos watershed as determined from the updated modeling results conducted in 2008, as discussed in Chapter 13, Section 13.3.

Impact Conclusions

Impacts of the WSIP on sensitive habitats, key special-status species, other species of concern, and common habitats and species at Pilarcitos Reservoir would be *less than* ~~*potentially*~~ *significant.* However, ~~I~~implementation of Measure 5.5.3-2a, Low-head Pumping Station at Pilarcitos Reservoir, ~~Revised Operations Plan for Pilarcitos Watershed Facilities, would maintain storage levels similar to existing conditions and~~ would lower the water level in the reservoir by 3 or 4 feet in some summers. This could have a potentially significant impact on the extent of suitable habitat at the reservoir for California red-legged frog and the San Francisco garter snake. Implementation of Measure 5.5.3-2c, Habitat Monitoring and Compensation, would reduce this impact to a less-than-significant level.

Section 5.5.6.2, page 5.5.6-20: The text under Impact 5.5.6-5 under the heading "Sensitive Habitats" is revised as follows to refine the biological resources analysis in the Pilarcitos watershed as determined from the updated modeling results conducted in 2008, as discussed in Chapter 13, Section 13.3.

Sensitive Habitats

Under the WSIP, flow in Pilarcitos Creek between Pilarcitos Reservoir and Stone Dam would increase in some spring months ~~during normal and better~~ ~~rainfall years~~, a beneficial impact. In the summer months of some drier ~~dry~~ years, the period during which releases from Pilarcitos Reservoir would be limited to reservoir inflow ~~cease~~ would be extended, potentially for up to three months. Because willows exist ~~White alder, the dominant species~~ in the riparian forest in this section, ~~requires~~ it is apparent that the riparian forest is adapted to periods without flowing water ~~and without it could become stressed or could die~~. ~~Although there is some seepage from Pilarcitos Dam as well as flow from lateral tributaries, this seepage would decrease during an extended drought.~~ The channel-forming processes in Pilarcitos Creek would be reduced insignificantly under the WSIP. Thus, some changes in flow would be beneficial and some adverse. ~~Conservatively, t~~The overall impact on sensitive riparian habitat is considered *less than* ~~*potentially*~~ *significant.*

Section 5.5.6.2, page 5.5.6-21: The text under the heading "Impact Conclusions" is revised as follows to refine the biological resources analysis in the Pilarcitos watershed as determined from the updated modeling results conducted in 2008, as discussed in Chapter 13, Section 13.3.

Impact Conclusions

Impacts on sensitive riparian habitat at Pilarcitos Creek ~~below~~ between Pilarcitos Reservoir and Stone Dam would be *less than* ~~*potentially*~~ *significant*. ~~Implementation of Implementation of Measure 5.5.3-2, Revised Operations Plan for Pilarcitos Watershed Facilities, would maintain reservoir storage levels similar to existing conditions and would reduce this impact to a less-than-significant level.~~

Section 5.5.7.1, p. 5.5.7-3: The first and second paragraphs are revised as follows in response to a comment (see **Response L_CoastsideCWD-17**).

Pilarcitos Creek starts at Pilarcitos Reservoir within the SFPUC Peninsula watershed. No water recreation or access to this reservoir is allowed. The creek runs south until it reaches Highway 92, then runs west ~~through portions of the Golden Gate National Recreation Area (GGNRA) and Rancho Corral de Tierra~~ to its mouth on the Pacific Ocean within Half Moon Bay State Beach. ~~Numerous public trails throughout the GGNRA and Rancho Corral del Tierra provide access to Pilarcitos Creek.~~ No organized recreational activities are established within or adjacent to the creek in the upper watershed. However, ~~T~~trails within Half Moon Bay State Beach run adjacent to and across Pilarcitos Creek, and the public is allowed access to portions of ~~the~~ this stretch of the creek (Bay Area Hiker, 2007).

5.6 Westside Groundwater Basin Resources

Section 5.6.1.3, page 5.6-8: The last paragraph is revised as follows in response to a comment (see **Response SI_TRT-CWA-SierraC-27**).

Other continued uses of irrigation pumping in the South Westside Groundwater Basin in 2005 were consistent with historical pumping rates and are estimated at up to 2.1 mgd (2,400 afy) of irrigation pumping for cemeteries in Colma, and 0.1 mgd (120 to 150 afy) of irrigation pumping for the California Golf Club[8] in South San Francisco~~, and an undetermined amount of groundwater pumping for irrigation of the Golden Gate National Cemetery in San Bruno~~ (Luhdorff and Scalmanini, 2006). The Golden Gate National Cemetery in San Bruno has historically used groundwater for irrigation, but the cemetery has not been irrigated using groundwater for over 20 years (Schem, 2007).

Section 5.6.1.5, page 5.6-13: The text as follows is added at the end of the third paragraph in response to a comment (see **Response L_DalyCty-38**).

However, Lake Merced has not been used as a potable water supply since the 1930s. Refer to Table 4.5-1 for a description of the existing beneficial uses of Lake Merced.

Section 5.6.1.7, page 5.6-17: The last sentence of the first full paragraph is revised as follows in response to a comment (see **Response L_SBruno-06**).

> The City of San Bruno ~~is~~ constructed~~ing~~ two monitoring well~~s~~ clusters in 2006 along the bay side that ~~should~~ have provided additional geologic information and allow for monitoring of groundwater levels and groundwater quality at different depths along the bay margin. ~~insight into the mechanisms preventing seawater intrusion.~~

Section 5.6.1.8, page 5.6-17: The last sentence of the third full paragraph is revised as follows in response to a comment (see **Response L_SBruno-07**).

> In the South Westside Groundwater Basin, manganese has exceeded the secondary drinking water standard in San Bruno and Daly City in the untreated groundwater, but the water is treated to meet secondary standards prior to use in the water supply.

Section 5.6.1.11, page 5.6-21: The last sentence of the third paragraph is revised as follows in response to a comment (see **Response L_DalyCty-41**):

> Chapter 13.20 of the Daly City Municipal Code specifies well permitting requirements for Daly City. ~~, but~~ Although this code does not include provisions related to overdraft of the Westside Groundwater Basin, Section 13.20.070 allows for denial of a permit when the request is judged not to be in the public interest.

Section 5.6.1.11, pages 5.6-21 to 5.6-22: The last partial paragraph that begins on page 5.6-21 and ends on page 5.6-22 is revised as follows in response to a comment (see **Response L_SBruno-09**):

> In accordance with Section 4.68.225 of the San Mateo County Code, the San Mateo County Environmental Health Division would not grant a well permit for a large well[12] ~~in a public park, cemetery, or golf course~~ that could potentially cause overdraft of the South Westside Groundwater Basin or be located in an area subject to a specific and localized groundwater problem. The Environmental Health Division could also deny, revoke, or suspend a permit for a large well to avoid pollution or contamination of water resources.

Section 5.6.2.2, page 5.6-25: The last sentence of the third full paragraph is revised as follows in response to a comment (see **Response L_DalyCty-42**).

> During drought conditions, the SFPUC would be able to reduce the quantity of SFPUC system water delivered to the participating pumpers, and the stored groundwater, or banked water, would be available for local use to supplement supplies from the regional water system.

Section 5.6.2.2, page 5.6-33: The following reference is added after (SFPUC, 2007) in response to a comment (see **Response SI_TRT-CWA-SierraC-27**).

> Schem, Clifford, U.S. Department of Veterans Affairs, National Cemetery Administration, personal communication with Greg Bartow, San Francisco Public Utilities Commission, September 7, 2007.

5.7 Cumulative Projects and Impacts Related to WSIP Water Supply and System Operations

Section 5.7.2.1, page 5.7-11: The first sentence of the third full paragraph under the heading "Expansion of MID Municipal Treatment Plant" is revised as follows to correct an editorial error:

> MID owns and operates a ~~30~~ 40-mgd municipal water treatment plant that obtains water from Modesto Reservoir.

Section 5.7.3.2, page 5.7-55, Figure 5.7-3: This figure is revised as shown on the following page in response to comments described in **Section 14.9, Master Response on Alameda Creek and Fishery Issues**.

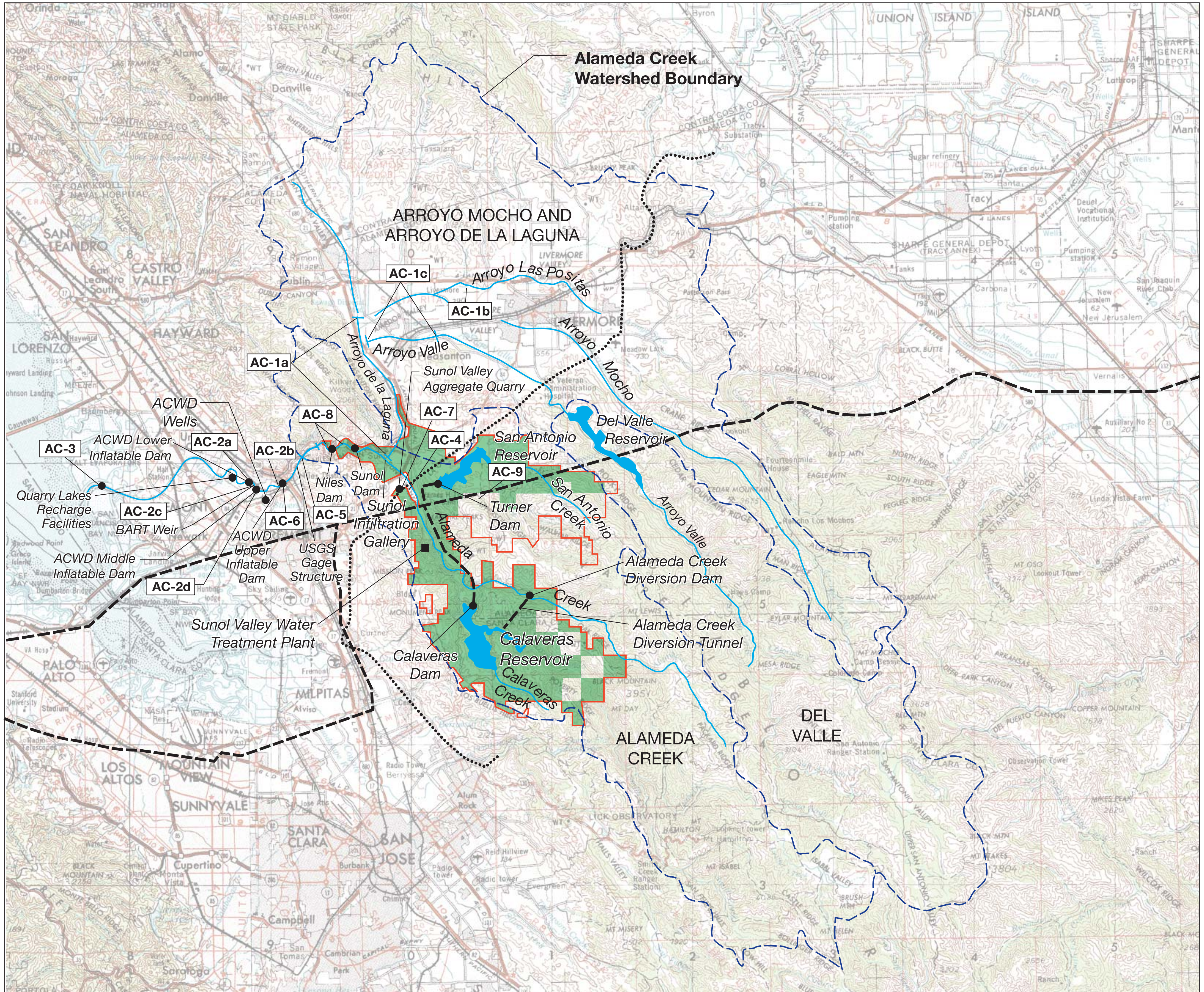
Section 5.7.3.2, page 5.7-65: The first full paragraph is revised as follows in response to comments described in **Section 14.9, Master Response on Alameda Creek and Fishery Issues**.

> **Cumulative Effects and WSIP Contribution**
>
> **Table 5.7-15** summarizes the effects of past and present projects, the impacts of the WSIP, the effects of probable future projects, and the combined impacts of the WSIP plus probable future projects on the Alameda Creek watershed. Past and present projects have substantially altered the hydrology, geomorphology, surface water quality, groundwater, fisheries, and terrestrial biology of this portion of the Alameda Creek watershed compared to pre-Euro-American settlement conditions. Visual and recreational resources have been moderately altered. The existing condition, which serves as the baseline for the analysis of the WSIP, reflects the substantial environmental changes that have occurred as a result of the past projects. Because past and present actions have drastically altered ~~this portion of~~ the Alameda Creek watershed, some of the environmental resources are more sensitive to small adverse changes than they would be if the ~~reach~~ watershed had remained relatively unaltered from pre-Euro-American settlement conditions.

Section 5.7.3.2, page 5.7-65, Table 5.7-15: The last row of Table 5.7-15 is revised as follows to reflect the change in project description of the Calaveras Dam (SV-2) project.

TABLE 5.7-15
CUMULATIVE EFFECTS ON THE ALAMEDA CREEK WATERSHED

Resource	Effects of Past and Present Projects	Impacts of WSIP (prior to mitigation/ after mitigation)	Effects of Other Future Projects	Cumulative Impact (WSIP after mitigation + Future Projects)	WSIP Contribution Cumulatively Considerable?
Hydrology	SA	SU/SU[a]	N/A	N/A	No
Geomorphology	SA	LS	LS	LS	No
Surface Water Quality	SA	LS	LSM	LS	No
Groundwater	SA	LS	LS	LS	No
Fisheries	SA	PSM/LS[a]	B	LS	No
Terrestrial Biology	SA	PSM/LS[a]	B	LS	No
Recreational/Visual Quality	MA	~~PSM/~~LS[a]	LS	LS	No



Watershed Boundary

Existing SFPUC System Corridor

AP-1 Other SFPUC Project

AC-1 Non-SFPUC Project

CCSF Ownership (also project boundary for AP-1, AP-2, AP-3)

HCP Study Area (also project boundary for AP-1a)

DWR South Bay Aqueduct

See Table 5.7-13 for names and descriptions of projects

Cumulative Project No.	Plan/Project Name
OTHER SFPUC PROJECTS (not shown on figure as watershed wide)	
AP-1	Alameda Watershed Management Plan (WMP)
AP-1a	Alameda Watershed Habitat Conservation Plan (sub-project of Alameda WMP)
AP-2	Watershed and Environmental Improvement Program (WSIP-related activity)
AP-3	Habitat Reserve Program (WSIP-related activity)
NON-SFPUC PROJECTS	
AC-1	Zone 7 Stream Management Master Plan (SMMP)
AC-1a	Arroyo de la Laguna Reach 10 Improvements (sub-project of Zone 7 SMMP)
AC-1b	Chain of Lakes (sub-project of Zone 7 SMMP)
AC-1c	Lower Arroyo del Valle Restoration and Enhancement (sub-project of Zone 7 SMMP)
AC-2	Alameda Creek Steelhead Restoration
AC-2a	Rubber Dam 2 Decommissioning and Foundation Modification Project (sub-project of Alameda Creek Steelhead Restoration)
AC-2b	Alameda Creek Pipeline No. 1 Fish Screen (sub-project of Alameda Creek Steelhead Restoration)
AC-2c	BART Weir (sub-project of Alameda Creek Steelhead Restoration Efforts)
AC-2d	Middle Inflatable Dam Modification
AC-3	Alameda Creek – Levee Reconfiguration
AC-4	PG&E Gas Line Crossing
AC-5	Stonybrook Creek Culvert Removal
AC-6	Upper Inflatable Dam Fish Passage Project
AC-7	Sunol Valley Aggregate Quarry – SMP 30
AC-8	Section 1135 Alameda Creek Flood Control Project Fish Passage Modifications
AC-9	Apperson Ridge Quarry

0 — 20 Miles

SOURCE: ESA + Orion

SFPUC Water System Improvement Program . 203287

Figure 5.7-3 (Revised)
Future Projects in the Alameda Creek Watershed Considered in the Cumulative Analysis

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Section 5.7.3.2, page 5.7-66: The third full paragraph on page 5.7-66 is revised as follows and the following paragraph is inserted after the third full paragraph on this page in response to comments described in **Section 14.9, Master Response on Alameda Creek Fishery Issues**.

> Implementation of the WSIP would substantially reduce flows in the reach of Alameda Creek from the diversion dam to below its confluence with Calaveras Creek compared to existing conditions (Impact 5.4.1-2). This impact was determined to be significant and unavoidable, even with implementation of Measure 5.4.1-2 (Diversion Tunnel Operation) and bypass flows included as part of the protective measures in the Calaveras Dam Replacement project (SV-2). However, no other past, present, or future projects were identified that would further reduce the stream flow in this reach of Alameda Creek, and some of the projects listed in Table 5.7-13 could enhance the flow. Thus, there would be no adverse cumulative impact on hydrology associated with past, present, and future projects, and the WSIP's contribution to the cumulative impact on hydrology is not applicable.
>
> Due to agreements and ongoing actions regarding the implementation of fish passage improvement projects in lower Alameda Creek (as described in Section 5.4.5 of the Draft PEIR), it is possible that steelhead will be restored to the Alameda Creek watershed reaches upstream of the BART weir by 2030. More specifically, steelhead may be restored during construction or operation of the Calaveras Dam Replacement project (SV-2) under the WSIP. In response to this scenario, the SFPUC has modified the WSIP program description—mainly that of the Alameda Creek Fishery Enhancement (SV-1) and Calaveras Dam Replacement (SV-2) projects—to incorporate protective measures for steelhead in the event that man-made barriers in Alameda Creek have been successfully removed and that steelhead migration, spawning, and rearing have been restored in Alameda Creek above the BART weir. The protective measures incorporated into the operations of the Calaveras Dam Replacement project would address future-occurring steelhead and would provide for a range of minimum bypass flows and releases at the Alameda Creek Diversion Dam and Calaveras Dam to support steelhead migration, spawning, and rearing. The program as revised, and with implementation of mitigation measures identified in the Draft PEIR, which together include minimum bypass flows to support the various life stages and habitat requirements for steelhead, would have a less-than-significant contribution to cumulative impacts on fishery resources in the Alameda Creek watershed. Please refer to Chapter 14, Section 14.9, of the Final PEIR for further discussion.

Section 5.7.4.1, page 5.7-71: The legend for Figure 5.7-4 is revised as follows in response to a comment (see **Response SI_CNPS-SCV1-09**) and to correct an editorial error. The revised figure is shown on page 16-89.

> PP-1a Peninsula Watershed Habitat Conservation Plan (sub-project of ~~Alameda~~ Peninsula WMP)

Section 5.7.5.1, page 5.7-87: The first bullet under the heading "Municipal Pumping" is revised as follows in response to a comment (see **Response L_DalyCty-44**).

- In its 2005 UWMP, the City of Daly City estimates that future municipal groundwater pumping under the WSIP conjunctive-use program (Regional Groundwater Projects, SF-2) would range from 1.34 mgd (1,501 afy) during a nondrought year when surface water is supplied by the SFPUC to 3.76 mgd (4,212 afy) during a drought year when the city is also allowed to pump its banked groundwater (City of Daly City, 2005). These projected pumping volumes are presented in Table 4-4 of the 2005 UWMP.

Section 5.7.5.1, page 5.7-87: The third bullet is revised as follows in response to two comments (see **Responses L_SBruno-12 and L_SBruno-17**).

- The 20067 UWMP for the San Bruno does not yet reflect long-term participation in the SFPUC's proposed conjunctive-use program, but, if approved, participation in this program is expected to be included in the next revision of its UWMP. In its 20067 UWMP, the City of San Bruno estimates that overall, groundwater usage will decrease from 2.5 mgd (2,800 afy) in 2010 to zero in 2030 through implementation of conservation measures and increased purchases from the SFPUC. In a drought year, groundwater use between 2010 and 2030 is projected to range from 0.80 mgd (896 afy) to a maximum of 2.5 mgd (2,800 afy) (City of San Bruno, 20067).

Section 5.7.5.2, page 5.7-90: The first sentence of under Impact 5.7.5-2 is revised as follows in response to a comment (see **Response L_SBruno-13**).

Future and continuing projects identified in the northern portion of the South Westside Groundwater Basin include the WSIP conjunctive-use program (the regional component of SF-2), municipal pumping by the participating pumpers, and continued irrigation pumping at 2,600 afy.

Section 5.7.5.2, page 5.7-91: The second bullet is revised as follows in response to a comment (see **Response L_DalyCty-45**).

- Under the proposed conjunctive-use program, the participating pumpers collectively would not be allowed to pump more than the quantity of banked groundwater resulting from the in-lieu delivery of SFPUC system water.

Section 5.7.5.2, page 5.7-91: The first sentence of the last paragraph is revised as follows in response to a comment (see **Response L_SBruno-09**).

Furthermore, as discussed in Section 5.6, the San Mateo County Environmental Health Division would not grant a well permit for a large well[1] in a public park, cemetery, or golf

[1] A large well means any individual well that pumps an amount equal to or greater than 50 gallons per minute or 1,000 gallons per day, or multiple small wells on the same land use parcel which cumulatively pump an amount equal to or greater the 50 gallons per minute or 1,000 gallons per day.

PP-1 Other SFPUC Project

PC-1 Non-SFPUC Project

CCSF Ownership (also project boundary for PP-1, PP-2, PP-3)

Pilarcitos Creek Watershed Boundary (also project boundary for PC-2)

See Table 5.7-16 for names and descriptions of projects

Cumulative Project No.	Plan/Project Name
OTHER SFPUC PROJECTS	
PP-1	Peninsula Watershed Management Plan (WMP)
PP-1a	Peninsula Watershed Habitat Conservation Plan (sub-project of Peninsula WMP)
PP-2	Watershed and Environmental Improvement Program (WSIP-related activity)
PP-3	Habitat Reserve Program (WSIP-related activity)
NON-SFPUC PROJECTS	
PC-3	Lower Crystal Springs Dam Road Reconstruction
PC-2	Pilarcitos Creek Integrated Watershed Management Plan
PC-3	San Mateo Creek Mouth Improvements

0 2
Miles

SOURCE: ESA + Orion

SFPUC Water System Improvement Program . 203287

Figure 5.7-4 (Revised)
Future Projects in the Peninsula Watershed Considered in the Cumulative Analysis

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~~course~~ that could potentially cause overdraft of the South Westside Groundwater Basin or be located in an area subject to a specific and localized groundwater problem.

Section 5.7, page 5.7-100: The sixth reference under Westside Groundwater Basin Resources is revised as follows in response to a comment (see **Response L_SBruno-17**).

City of San Bruno, ~~*Public Draft*~~ *Final Urban Water Management Plan*. ~~December 2006~~ January 2007.

Attachment 5-A (End of Chapter 5)

Attachment 5-A, page 5-A-2, The revision is the same as that described below under Section 6.4, page 6-48.

Attachment 5-A, pages 5-A-2 and 5-A-3. Same revision as Section 6.4.2, pages 6-48 and 6-49.

Attachment 5-A, page 5-A-4. Same revision as Section 6.5.2, page 6-50.

Attachment 5-A, pages 5-A-6 and 5-A-7. Same revision as Section 6.4.3, pages 6-52 and 6-53 below.

Attachment 5-A, page 5-A-9. Same revision as Section 6.4.3, page 6-55.

Attachment 5-A, pages 5-A-10 and 5-A-11. Same as the multiple revisions to Section 6.4.4, pages 6-56 and 6-57 below.

Volume 4, Chapter 6

6.3 Mitigation Measures to Minimize Facilities Impacts

Section 6.3.5, page 6-11: The first paragraph of Measure 4.6-1b is revised as follows in response to comments (see **Responses S_RWQCBCV-06** and **S_RWQCBSF-06**).

Measure 4.6-1b: If the wetland delineation indicates that the WSIP project will affect jurisdictional wetlands or aquatic resources, then, in accordance with state and federal permit requirements, the SFPUC will avoid and minimize direct and indirect impacts such as erosion and sedimentation, alteration of hydrology, and degradation of water quality. As a first priority, the SFPUC will implement (1) avoidance measures. For unavoidable impacts, the SFPUC will implement (2) minimization of unavoidable impacts, (3) restoration procedures, and (4) compensatory creation or enhancement to ensure no net loss of wetland extent or function.

Section 6.3.5, page 6-11: The third sentence of the second paragraph of Measure 4.6-1b is revised as follows in response to a comment (see **Response SI_ACA1-21**).

For each WSIP project, a qualified biologist will quantify the magnitude and extent of impacts to wetlands, sensitive habitats, and key special-status species and other species of concern, and the SFPUC will develop and implement <u>restoration and/or </u>compensation plans that meet the appropriate regulatory requirements and permit conditions with respect to <u>restoration and/or </u>compensation ratios<u>. Compensation ratios typically range from a minimum of 1:1 for common habitats to 2:1 or higher for rare and sensitive habitats. If individual project requirements of the RWQCB, CDFG, or USFWS differ somewhat from these ratios, they are still intended to achieve the same purpose of full restoration and/or compensation</u>, <s>other conservation measures and management requirements </s>to mitigate project impacts to less-than-significant levels<u>, and to ensure no net reduction in the populations of any species listed as threatened or endangered by the state or federal resource agencies</u>.

Section 6.3.5, page 6-14, Table 6-1: The revision in the sixth column of Table 6-1 (Measure 4.6-3b) is made to correct an editorial error.

TABLE 6.1 (SEE MEASURE 4.6-3b)
MITIGATION MEASURES FOR KEY SPECIAL-STATUS SPECIES

No.	**Project Name** **Notes:** **1. This table is for guidance only and is not intended as a complete list of mitigations for all projects, which must be assessed individually at the project-specific level.** **2. Standard measure B.4 (general surveys for raptors and protection of raptor nests) apply to all projects.**	**Suites of Key Special-Status Species**					
		Vernal Pool Invertebrates	Vernal Pool Plants	Riparian and Reservoir Species	Native Grassland Species	Salt Marsh Species	Fishes
SV-2	Calaveras Dam Replacement			B.5	I.3<s>, M.4</s>		F.1
SV-3	Additional 40-mgd Treated Water Supply			B.5	<s>M.4</s>		
SV-4	New Irvington Tunnel			B.5	<s>M.4</s>		F.1
SV-5	SVWTP – New Treated Water Reservoirs			B.5	<s>M.4</s>		F.1
SV-6	San Antonio Backup Pipeline			B.5	<s>M.4</s>		F.1

Section 6.3.5, page 6-20, Table 6-2: The following text in the last row of Table 6-2 (Measure 4.6-3b) is revised as follows to correct an editorial error.

TABLE 6.2 (MEASURE 4.6-3b)
STANDARD PROGRAMMATIC BIOLOGICAL RESOURCES MITIGATION MEASURES

Biological Resource Species and Status	Standard Mitigation Measures for Specific Plants and Animals
San ~~Francisco~~ Mateo Woolly Sunflower (FE/CE), Marin Western Flax (FT/CT) Fountain thistle (FE/CE)	**P.4:** Surveys for San ~~Francisco~~ Mateo woolly sunflower, fountain thistle and Marin western flax will be carried out at an appropriate time of year for projects located within the known range of the species. Any populations found will be avoided. An approved biological monitor will be present during all construction activities. A plan will be developed to protect populations located along Crystal Springs and Polhemus Roads where project-related construction vehicle traffic will occur. Where populations cannot be avoided, salvage of plants or seed will be implemented, along with a program to compensate for losses.

Section 6.3.6, page 6-27: The following text is added to the end of Mitigation Measure 4.7-4a in response to a comment (see **Response L_SFLandmarks-03**).

> Representative features such as aqueduct/pipe sections, valves subject to replacement, decorative elements, or plaques/inscriptions from buildings or other portions of structures demolished as a part of the WSIP projects could be preserved and displayed. Most of these types of structures are of sufficient size that they would form "monumental" commemorative structures. For example, an original pipeline valve replaced by modern equipment might be mounted and displayed on publicly accessible SFPUC property with informative placards. Such displays, if located in other jurisdictions, might be subject to those jurisdiction's requirements related to public art, safety, and liability considerations.

Section 6.3.7, page 6-31: The last bullet item under Measure 4.8-1a is revised as follows in response to a comment (see **Response L_Fremont-02**).

- To the extent applicable, the traffic control plan will conform to the ~~state's~~ ~~*Manual of Traffic Controls for Construction and Maintenance Work Areas*~~ *California Manual on Uniform Traffic Control Devices for Streets and Highways: Part 6 Temporary Traffic Control* and *Caltrans' 2006 Standard Plans*.

Section 6.3.8, pages 6-38 and 6-39: Measure 4.16-7b is revised as follows to clarify appropriate application of this measure in the Sunol Valley Region.

Health Risk Screening or use of Soot Filters for All Projects in the San Joaquin and Sunol Valley Regions

Measure 4.16-7b: Measure 4.9-2a requires specific projects to either conduct a health risk assessment or use soot filters to reduce DPM emissions associated with haul trucks. To address collective DPM impacts, this measure will be required for all WSIP projects in the San Joaquin and Sunol Valley Regions. This measure would only apply in the Sunol Valley Region if, under Measure 4.9-2b, the SFPUC elects not to vacate the two SFPUC Land Managers' residences in the Sunol Valley. ~~When~~ If this requirement is applied to the New Irvington Tunnel project (SV-4), it shall be applied to both the Sunol Valley and Fremont tunnel portals, taking into account truck traffic from other WSIP projects in the vicinity of both portals.

6.4 Mitigation Measures to Minimize Water Supply and System Operations Impacts

Section 6.4.2, page 6-48: The first sentence of Mitigation Measure 5.3.6-4a, Avoidance of Flow Changes by Reducing Demand for Don Pedro Reservoir Water, is clarified as follows in response to comments received on the Draft PEIR (see **Response S_CDFG2-07** and **Section 14.10, Master Response on Modified WSIP Alternative**).

> **Measure 5.3.6-4a:** The SFPUC will pursue a water transfer arrangement with MID/TID and/or other water agencies such that the water acquired is developed through actions that result in reduction of demand on Don Pedro Reservoir as a result of conservation, improved delivery efficiency, inter-agency ~~water~~ transfer of conserved water, or use of an alternative supply such as groundwater.

Section 6.4.2, pages 6-48 and 6-49: Measure 5.3.6-4b is revised as follows in response to several comments described in **Section 14.7, Master Response on Lower Tuolumne River Issues**.

> **Fishery Habitat Enhancement**
>
> **Measure 5.3.6-4b:** If Measure 5.3.6-4a is not implemented, then the SFPUC will mitigate potential fishery effects on the lower Tuolumne River by implementing (or funding) one of the following two habitat enhancement actions ~~directed at fish habitat improvements~~ that are designed to sustain fishery resources under the river's flow regime, which are consistent with the Habitat Restoration Plan for the Lower Tuolumne River Corridor: gravel augmentation/habitat enhancement to provide salmonid spawning and rearing habitat, or isolating or filling a captured former gravel quarry pit along the river that provides habitat for salmonid predators.
>
> The gravel augmentation/habitat enhancement project ~~Spawning gravel enhancement~~ will be implemented to increase salmonid spawning success and to improve the survival of rearing salmonids in the reach of the river downstream of La Grange Dam. Spawning success will be improved by the addition of suitable gravel to the stream channel. Other habitat features will be created to provide cover for juvenile salmonids and to increase the availability of substrate for macroinvertebrates ~~production~~ that would be used as ~~an enhanced~~ food ~~supply~~ by rearing juvenile salmon and steelhead~~and other species~~. The ~~spawning~~ gravel augmentation/habitat enhancement project will involve the planning, design, permitting, purchase, placement, and monitoring of suitable gravel and associated habitat enhancements~~to be placed~~ at three riffle locations within the spawning reach between Basso Bridge and La Grange Dam. The three locations will meet ~~that meets~~ the criteria for suitable habitat as described in the Habitat Restoration Plan for the Lower Tuolumne River Corridor~~ at each location~~. The gravel will preferentially be rounded river rock of native origin that would be sized and pre-washed before placement into the river. The gravel augmentation/habitat enhancement project will also involve the addition of large woody debris and boulders to create increased habitat complexity and diversity at each of the three enhancement sites. After construction of the gravel augmentation/habitat enhancement project, it will be surveyed to establish its baseline condition. A survey of the three sites will be made at a minimum of five-year intervals by a qualified fisheries biologist. The fisheries biologist will determine whether the three sites continue to meet established criteria for salmonid spawning and rearing habitat. If the sites do not meet the criteria, as part of its long-term operations, the SFPUC will make the

> improvements necessary to return it to the baseline conditions. ~~The depth and quality (e.g., percentage fines and cementation) of gravel will be monitored at five-year intervals and if the gravel deposits do not meet the criteria for suitable habitat SFPUC will be obligated to further augment or enhance the gravel deposits. The SFPUC will continue this gravel augmentation project and periodic monitoring as part of long-term system operations.~~
>
> ~~Alternately~~As an alternative to the gravel augmentation project, the SFPUC will remove from the lower river channel one of the former gravel quarry pits that has been "captured" by the river and acts as predator zones for fish such as largemouth and striped bass to prey on rearing and emigrating juvenile salmonids. ~~This~~Removal could be accomplished by filling the pit or installing a levee berm around the pit to isolate it permanently from the river channel. The SFPUC could implement this action directly or fund implementation by another entity involved in river restoration.
>
> The performance standard for gravel pit removal would be an established permanent reduction in area of salmonid predator habitat. The SFPUC will monitor the pit removal project at five-year intervals. If floods have eroded the fill or damaged the levees in a manner that restores salmonid predator habitat, the SFPUC will make the necessary repairs. The SFPUC will continue periodic monitoring and repair as part of long-term system operations.

Section 6.4.2, page 6-50: The first full paragraph (last paragraph of Measure 5.3.7-2 (Controlled Releases to Recharge Groundwater in Streamside Meadows and Other Alluvial Deposits) is revised as follows for clarification. There are no revisions to the footnote in this paragraph, so it is not included here but it should be retained as part of the text.

> As part of this measure the SFPUC will gather baseline data regarding the extent, species composition and condition of the existing meadow vegetation within the Poopenaut Valley. Some of these environmental baseline data may be available as a result of current study efforts in the Poopenaut Valley. As needed, the SFPUC will augment this information by carrying out vegetation composition surveys in the meadow before implementing the WSIP and at 5 year intervals after WSIP implementation to assess the efficacy of mitigation releases in maintaining or improving the percentage cover of meadow species as described by Ratliff (1985). The basic methodology for baseline vegetation survey and subsequent mitigation monitoring will be generally accepted quantitative vegetation sampling methods to permit statistical comparison of vegetation composition over time, as well as mapping the meadow vegetation in the Poopenaut Valley. The SFPUC will retain the services of a qualified biologist to assist in shaping the releases from Hetch Hetchy Reservoir in consideration of baseline and future meadow vegetation data. If a significant decline in the extent or diversity of native meadow vegetation occurs, releases will be modified as needed to achieve the mitigating effect of sustaining the existing meadow communities.

Section 6.4.3, pages 6-52 and 6-53: Measure 5.4.5-3a is revised as follows to reflect the change in project description of the Calaveras Dam (SV-2) project. The first sentence of the first paragraph as well as the last sentence of the fourth paragraph is revised as follows in response to comments (see **Response S_CDFG2-13, Response CDFG2-15** and **Section 14.9, Master response on Alameda Creek Fishery Issues**).

Minimum Flows for Resident Trout on Alameda Creek

Measure 5.4.5-3a: The SFPUC shall develop and carry out as part of the implementation of the Calaveras Dam Replacement (SV-2) project, an operational plan to implement minimum ~~stream~~ bypass flows when precipitation generates runoff into the creek below the diversion dam to the Calaveras Creek confluence from December 1 through April 30 to support ~~resident trout~~ spawning and egg incubation for resident trout as well as breeding habitat for other native stream-dependent amphibians. This is the period when winter precipitation typically would produce flows for spawning and egg incubation and breeding habitat for other native stream-dependent species. The operational plan will identify the specific minimum flow requirements to support resident trout spawning and egg incubation, and a detailed monitoring plan to survey and document trout spawning and egg incubation and any diversion facility modifications that are needed to implement the minimum stream flows. This measure will be implemented in conjunction with the proposed bypass flows at the diversion dam to meet the 1997 CDFG MOU flow requirements.

Minimum flow requirements to support resident trout spawning and egg incubation vary depending on stream reach conditions. Although site-specific studies are needed to determine an appropriate minimum flow requirement for each specific creek reach, based on the general size and characteristics of the Alameda Creek channel immediately downstream of the diversion structure it has been suggested that a minimum flow on the order of 10 cfs may be needed to support trout spawning and egg incubation. The SFPUC's Natural Resources Division will complete the site-specific studies needed to determine the appropriate minimum stream flow for this reach of the creek; studies may show that the minimum flow requirement is more or less than 10 cfs. This minimum flow requirement would be met when precipitation would naturally generate runoff in the creek (below the diversion dam) under unimpaired conditions between December 1 and April 30. When precipitation generates runoff in the creek, the SFPUC shall provide for bypass of flow up to the required minimum flow amount. The operational plan will allow for adapting minimum flow amounts to support resident trout spawning and egg incubation and other native stream-dependent species based on the monitoring results and best available scientific information.

The monitoring plan will be provided to appropriate resource agencies for review and comment and will subsequently be implemented by the SFPUC's Natural Resources Division staff. Monitoring results shall be provided to the resource agencies as requested. Monitoring shall occur for a minimum of five years and a maximum of ten years following completion of the Calaveras Dam Replacement project. At the completion of the monitoring period the SFPUC shall produce a draft comprehensive report describing the methods, data collected, and results used to assess the performance of the minimum streamflow in providing suitable habitat for resident trout spawning and egg incubation.

The Alameda Creek Fisheries Restoration Workgroup is currently overseeing collaborative studies to better characterize the flow-habitat relationships for trout spawning within Alameda Creek, and the SFPUC is providing staff and funding to support this effort. Information from these studies will also be used in developing the specific range of minimum stream flows needed to support suitable habitat within the reach below the diversion dam to the Calaveras Creek confluence. ~~Identification of any SFPUC facilities modifications needed to allow the designated minimum flow to pass downstream of the diversion dam will be described and evaluated as necessary in the project-level EIR for the Calaveras Dam Replacement project (SV-2).~~

This measure addresses two areas of impact to the resident trout fishery in Alameda Creek below the diversion dam. First, it addresses the decrease in flow below the diversion dam that would occur under the WSIP as a result of re-instituting flow diversions to Calaveras Reservoir once the dam is replaced (WSIP Project SV-2) and current DSOD storage capacity restrictions are removed. Second, it addresses the loss of fish from the lower creek system that would result from fish entrainment through the unscreened diversion tunnel to Calaveras Reservoir. Providing for minimum stream flows in Alameda Creek below the diversion dam, as required by the mitigation measure, would support resident trout spawning and egg incubation and it is expected that this measure would be sufficient to sustain the trout population in this reach of the creek. This would fully address/mitigate for both areas of WSIP impact to the resident trout fishery below the diversion dam. If monitoring indicates that this measure is adequate to sustain the resident trout population below the diversion dam, then no additional mitigation action would be required. If monitoring indicates that this measure does not sustain the resident trout fishery in this reach, then the SFPUC shall either modify the minimum stream flow to enhance downstream habitat conditions to fully meet the mitigation requirement or also implement Measure 5.4.5-3b Diversion Restrictions or Fish Screens.

Section 6.4.3, page 6-55: The first sentence of the second full paragraph is revised as follows in response to a comment (see **Response L_EBRPD-25**).

One alternative for implementing such habitat compensation is the Habitat Reserve Program (HRP) currently being developed by the SFPUC. The purpose of the HRP is to provide a comprehensive, coordinated approach to mitigation and related regulatory compliance for WSIP projects and operations. This related SFPUC project is described further in Chapter 3.0, Section ~~3.11~~ 3.12.3.

Section 6.4.4, page 6-56: Under the heading "Surface Water Quality," Measure 5.5.3-2 is replaced with Measure 5.5.3-2a and Measure 5.5.3-2b below as substitute mitigation for the Revised Operations Plan for Pilarcitos Watershed Facilities, which, upon subsequent analysis, was determined to be technically challenging and was replaced with more practical measures.

~~Revised Operations Plan for Pilarcitos Watershed Facilities~~

~~**Measure 5.5.3-2:** The SFPUC will develop an operations plan for Pilarcitos Reservoir, Stone Dam, and associated diversions that would manage storage in Pilarcitos Reservoir and releases to Pilarcitos Creek so that flows in Pilarcitos Creek between Pilarcitos Reservoir and Stone Dam would be similar to those that occur under the existing condition. This could be achieved by supplying Coastside CWD's increased future purchase request from Crystal Springs Reservoir in a pattern of diversion that would allow Pilarcitos Reservoir to be operated in a manner that approximates historical operations. Because, with this mitigation measure in place, storage in Pilarcitos Reservoir would be similar with the~~

~~WSIP and under existing conditions, spills at Stone Dam with the WSIP and under existing conditions would also be similar.~~

Low-head Pumping Station at Pilarcitos Reservoir

Measure 5.5.3-2a: The SFPUC shall install a permanent low-head pumping station at Pilarcitos Reservoir which would enable the SFPUC to access and use an additional 350 acre-feet of water from Pilarcitos Reservoir. In years when the WSIP would cause releases from Pilarcitos Reservoir to Pilarcitos Creek to be reduced to reservoir inflow earlier in the summer than under the existing condition (about 25 percent of years in the hydrologic record), the SFPUC will use the pumping station to augment flow in Pilarcitos Creek with water from the reservoir. The pumping station will draw water from the cool pool of water below the thermocline during times when the reservoir is stratified. The pumping station outlet will be designed to ensure that water discharged to the creek is adequately aerated.

Aeration System at Pilarcitos Reservoir

Measure 5.5.3-2b: The SFPUC shall install a permanent aeration system at Pilarcitos Reservoir. The SFPUC will operate the aeration system as necessary to avoid anoxic conditions and maintain good water quality conditions at the reservoir.

Section 6.4.4, page 6-56: Under the heading "Fisheries," Measure 5.5.5-5 is inserted as substitute mitigation for Measure 5.5.3-2, Revised Operations Plan for Pilarcitos Watershed Facilities, which was previously intended to provide mitigation for Impact 5.5.5-5, but, upon subsequent analysis, was determined to be technically challenging and was replaced with more practical measures.

Establish Flow Criteria, Monitor and Augment Flow

Measure 5.5.5-5: The SFPUC shall develop a monitoring and operations plan for Stone Dam to ensure WSIP-related flow reductions downstream of Stone Dam do not impair steelhead passage and spawning during the winter months of normal and wetter hydrologic years. This operational plan will provide for minimum stream flows to support existing adult steelhead passage and spawning downstream of Stone Dam, in the reach between Stone Dam and the confluence with the tributary at Albert Canyon, approximately 3.5 miles downstream. Downstream of Albert Canyon, WSIP flow reductions are unlikely to cause a significant impact to steelhead migration and spawning due to contributing flows from numerous downstream tributaries being sufficient to maintain adult upstream passage and spawning conditions within the creek. Monitoring and implementation of the operational plan will occur when precipitation generates runoff into Pilarcitos Creek below Stone Dam from December 1 through April 30 of normal and wetter years. This monitoring and operations plan will be established within five years of the approval of the PEIR.

Specific instream flows needed to support anadromous steelhead downstream of Stone Dam have not yet been identified. Suitable instream flows for steelhead passage on Pilarcitos Creek may be defined as providing a water depth of at least 0.6 feet over 25 percent of the total wetted channel cross-sectional area with 10 percent being contiguous. In cooperation with CDFG and NMFS, the SFPUC will identify up to five critical riffles, downstream of Stone Dam and upstream of Albert Canyon that may cause a passage impediment/barrier to steelhead migration at reduced flows as defined by the water depth criterion above. Such habitat types will be selected for survey because they represent the shallowest habitat type and thus would most likely represent low flow passage barriers under WSIP-related reduced flow scenarios. This monitoring plan will survey and document the critical riffles identified to determine physical conditions (e.g., depth, velocity, and top width of the channel) present at various flow levels. The SFPUC will measure the stage-discharge relationship at each of the five critical riffles and identify the minimum stream flow that meets the steelhead passage criterion at the most restrictive of the five riffle locations.

The SFPUC will calibrate and validate the flow measurements made at the existing flow monitoring gage (USGS Gage 11162620) located immediately downstream of Stone Dam. The SFPUC will then develop a statistical relationship between the flow measurements at the existing gage and the flow at the most restrictive critical riffle downstream of Stone Dam to establish minimum average daily flows necessary to meet steelhead passage criterion. The SFPUC will monitor average daily flows at the stream flow gage during the period from December 1 through April 30 each year. If average daily flow, as measured at the gage, indicates that the minimum stream flow at the downstream critical riffle is not met, the SFPUC will release bypass flows from Stone Dam at a rate sufficient to meet the minimum stream flow for steelhead passage at a release rate up to, but not exceeding, the average daily inflow into Pilarcitos Reservoir as determined by SFPUC operators.

The SFPUC's Natural Resources Division will complete the site-specific studies needed to determine the appropriate minimum stream flow for the most restrictive critical riffle identified during monitoring. This minimum flow criterion will be met when WSIP diversions occur between December 1 and April 30 of normal and wetter hydrologic years. The operational plan will allow for adapting minimum flow amounts to support steelhead migration based on the monitoring results and best available scientific information. Monitoring and flow management will be continued for a minimum period of five years and a maximum period of ten years, at which time the SFPUC will prepare a technical report describing results of the stream flow monitoring, identifying whether or not operation of Stone Dam reduced passage flows below the minimum criteria, and identifying, if needed, an appropriate bypass flow for future operations at Stone Dam (a minimum flow below which water could not be diverted to storage between December and April 30). The technical report will be provided to CDFG and NMFS.

Section 6.4.4, page 6-57: Under the heading "Terrestrial Biological Resources," Measure 5.5.3-2c is inserted to mitigate impacts on terrestrial biological resources associated with implementation of the replacement Measure 5.5.3-2a, Low-head Pumping Station at Pilarcitos Reservoir.

Habitat Monitoring and Compensation

Measure 5.5.3-2c The SFPUC shall compensate for reduced productivity and diversity of San Francisco garter snake (SFGS) and California red-legged frog (CRLF) wetland habitat which could occur as a result of greater variability, extent and duration in drawdowns at Pilarcitos Reservoir as a result of implementation of Revised Measure 5.5.3-2a (Low-head Pumping Station at Pilarcitos Reservoir). To offset the potential loss of habitat quality, the SFPUC will develop an adaptive management plan for managing and maintaining freshwater marsh and other wetlands around the periphery of Pilarcitos Reservoir. This adaptive management plan would include pre- implementation monitoring and post-implementation monitoring for up to 10 years to ensure that habitat is sustained at Pilarcitos Reservoir, to achieve no net loss of habitat and value for SFGS and CRLF habitat and document changes (if any) in extent or quality of the habitat attributable to operation of the low-head pumping station.

In the event that habitat is reduced, one alternative for implementing such habitat compensation is the Habitat Reserve Program (HRP) currently being developed by the SFPUC. The purpose of the HRP is to provide a comprehensive, coordinated approach to mitigation and related regulatory compliance for WSIP projects and operations. The HRP is described further in the Draft PEIR, Chapter 3.0, Section 3.12.3. Under the proposed HRP, the SFPUC would proceed as soon as possible with identifying, securing (through designation, management agreement, conservation easement, or acquisition of fee title) and improving lands to be used for habitat compensation so that mitigation is underway concurrent with habitat loss related to WSIP program activities, further ensuring no net loss of resources. The proposed HRP is undergoing CEQA environmental review in 2008 and 2009 and is targeted for implementation as soon as possible thereafter. Once the HRP is approved and implemented, the SFPUC will use this as one vehicle or method for implementing the mitigation requirements for WSIP-related activities. Otherwise, where appropriate and necessary, the SFPUC will develop and implement appropriate habitat compensation mitigation for WSIP system operational effects on Pilarcitos Reservoir, independent of the HRP.

6.6 Summary Tables of All Impacts and Mitigation Measures

Section 6.6, page 6-85, Table 6.4: The third and fourth rows of Table 6.4 are revised as follows to correct an editorial error.

IMPACT	Alameda Creek Fishery Enhancement SV-1	Calaveras Dam Replacement SV-2	Additional 40-mgd Treated Water Supply SV-3	New Irvington Tunnel SV-4	SVWTP – Treated Water Reservoirs SV-5	San Antonia Backup Pipeline SV-6
Impact 4.3-4: Permanent adverse impacts on scenic vistas or visual character	PSM	PSU	LS	PSM	LS	PSM
Regulations						
~~None applicable.~~ Watershed Management Plans and Actions						
Des5: Design Guidelines	X	X	X	X	X	X
SFPUC Construction Measures						
None applicable.						

Section 6.6, page 6-127, Table 6.6: The third row in Table 6.6 is revised as follows to correct an editorial error.

IMPACT	Baden and San Pedro Valve Lots Improvements PN-1	Crystal Springs / San Andreas Transmission Upgrade PN-2	HTWTP Long-Term Improvements PN-3	Lower Crystal Springs Dam Improvements PN-4	Pulgas Balancing Reservoir Rehabilitation PN-5
Impact 4.3-4: Permanent adverse impacts on scenic vistas or visual character	LS	PSM	PSM	PSM	PSM
Regulations					
~~None applicable.~~ Watershed Management Plans and Actions		X		X	X

Section 6.6, page 6-180, Table 6.11: The text under the heading "5.4.7 Recreational and Visual Resources" in Table 6.11 is revised as shown on the following page to reflect the change in project description of the Calaveras Dam (SV-2) project.

TABLE 6.11 (continued)
IMPACT AND MITIGATION SUMMARY FOR ALAMEDA CREEK WATERSHED STREAMS AND RESERVOIRS RELATED TO WATER SUPPLY AND SYSTEM OPERATIONS

IMPACT	Significance Determination	Mitigation Measure Required
Impact 5.4.6-8: Conflicts with the provisions of adopted conservation plans or other approved biological resource plans	LS	
PEIR Mitigation Measures		
None required.		
5.4.7 Recreational and Visual Resources		
Impact 5.4.7-1: Effects on recreational facilities and/or activities	~~PSM~~ LS	~~5.4.1-2 and 5.4.5-3a~~
PEIR Mitigation Measures		
~~Measure 5.4.1-2: Diversion Tunnel Operation~~ None required.		~~X~~
~~Measure 5.4.5-3a: Minimum Flows for Resident Trout on Alameda Creek~~		~~X~~
Impact 5.4.7-2: Visual effects on scenic resources or visual character of the water bodies	~~PSM~~ LS	~~5.4.1-2 and 5.4.5-3a~~
PEIR Mitigation Measures		
~~Measure 5.4.1-2: Diversion Tunnel Operation~~ None required.		~~X~~
~~Measure 5.4.5-3a: Minimum Flows for Resident Trout on Alameda Creek~~		~~X~~

LS = Less than Significant impact, no mitigation required
PSM= Potentially Significant impact, can be mitigated to less than significant
PSU = Potentially Significant Unavoidable impact
X = Applicable
N/A = Not Applicable

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Section 7.1.2, page 7-7: The last complete dash is revised in response to two comments (see **Response L_Milpts-14** and **Response L_RdwdCty-08**).

– The population growth assumed in the demand projections for most (~~17~~15 of ~~20~~19) of the water customers for which comparable general plan projections are available is similar to the growth anticipated in the general plans of the cities served by them.

Section 7.2.1, page 7-10, Figure 7.1: This revision is the same as that described above under Vol. 1, Chapter 3, Section 3.3, page 3-6, Figure 3.2.

Section 7.3.1, page 7-21, Table 7.5: Table 7.5 is revised as shown below to correct an editorial error.

TABLE 7.5
EMPLOYMENT AND POPULATION PROJECTIONS USED FOR WATER DEMAND ESTIMATES: SUMMARY BY COUNTY[a]

	Employment			Population		
	2001	2030	% change	2001	2030	% change
Wholesale Customers						
Alameda County	238,565	335,701	41%	456,962	542,688	19%
Santa Clara County	501,186	635,809	27%	466,452	580,391	24%
San Mateo County[b]	394,346	517,056	31%	703,185	814,904	16%
Total Wholesale Customers	1,134,097	1,488,566	31~~21~~%	1,626,599	1,937,983	19%
Retail Customers						
San Francisco (City and County)[c]	638,840	795,400	25%	760,075	849,942	12%
Total	1,772,937	2,283,966	29%	2,386,674	2,787,925	17%

Section 7.3.3, page 7-27: The second sentence of the first paragraph and the footnotes for that sentence are revised as follows in response to a comment (see **Response L_RdwdCty-08**).

The general plans of ~~22~~21 cities that are served in whole or part by SFPUC and its wholesale customers have population projections that are generally comparable to the water customer-selected population projections.[19, 20]

[19] ….The ~~22~~21 cities, served by ~~20~~19 water customers, represent approximately two-thirds of 32 cities served by the SFPUC regional system.

[20] The ~~22~~21 cities are served by ~~19~~18 wholesale customers and the SFPUC (for the retail service area), referred to collectively here as ~~20~~19 water customers.

Section 7.3.3, page 7-27: The first bullet item is revised as follows in response to a comment (see **Response L_Milpts-14**).

- The population projections used for ~~three~~ two of the wholesale customers (East Palo Alto~~,~~ ~~Milpitas,~~ and Sunnyvale) in the water demand studies are less than (from 2 to 6 percent less) the projections assumed in the general plans of the jurisdictions served by them.

Section 7.3.3, page 7-27: The second bullet item is revised as follows in response to a comment (see **Response L_RdwdCty-08**).

- The population projections assumed for ~~14~~13 of the water customers (ACWD, CWS-South San Francisco in combination with Westborough Water District, Daly City, Hayward, Hillsborough, Mid-Peninsula Water District, Millbrae, Mountain View, Palo Alto, ~~Redwood City,~~ San Bruno, San Francisco, and Santa Clara) are higher but within 1 to 10 percent of the projections presented in the respective general plans.

Section 7.3.3, page 7-28, Table 7.8: Table 7.8 is revised on the following page in response to two comments (see **Response L_Milpts-14** and **Response L_RdwdCty-08**). In addition, the table heading is revised to correct an editorial error.

Section 7.3.3, page 7-29: The first two bulleted items are revised in response to a comment (see **Response L_Milpts-14**).

- The population projections assumed by ~~three~~four of the water customers (Burlingame, Coastside County Water District, ~~and~~ Estero Municipal Improvement District, and Milpitas) appear to be more than 10 percent greater than the projections assumed in the respective general plans. The difference in these projections results from the longer 2030 planning horizon used for water planning and differences in the geographic area covered by the two sets of projections. Based on the difference in projections, however, the growth assumed in the demand models of these wholesale customers does not appear to be fully addressed in the general plans of the cities served by these customers.

- Two of the ~~three~~four customers assuming greater population growth than is reflected in the respective general plan also show somewhat greater growth than is forecasted in *Projections 2005*. Both of these customers (Burlingame and Estero MID) serve unincorporated areas outside the city's jurisdictional boundaries and ABAG subregional areas. In addition, Estero MID serves a non-segrable part of the city of San Mateo that is not included with the *Projections 2005* forecast for Foster City used in this comparison. The other customer (Coastside County Water District) assumes less growth than is forecasted in *Projections 2005* for 2030.

Section 7.3.6, page 7-50: The first full paragraph is revised as follows in response to a comment (see **Response L_Milpts-14**).

The customer-selected population projection used for Milpitas in the demand study is ~~generally consistent with~~ approximately 15 percent greater than the growth identified in the city's general plan and is generally consistent with (about 3 percent less than) the growth projected by ABAG. ~~The 2030 Milpitas population presented in the demand study is~~

TABLE 7.8
COMPARISION OF WATER DEMAND POPULATION ESTIMATES AND GENERAL PLAN POPULATION ESTIMATES

Customer	UWMP Population in 2030	*Projections 2005* Population in 2030	Water Customer-Selected Population Projection for 2030	General Plan Population Projection for General Plan Projection Year[a]	General Plan Projection Year[a]	Difference: Water Customer Population and General Plan Population	% Difference (Water Customer Population and General Plan Population)
Customer-selected projection less than or equal to general plan projection							
City of East Palo Alto	32,712	43,600	32,712	34,600	2020	-1,888	-5.5%
~~City of Milpitas[b]~~	~~91,400~~	~~91,400~~	~~88,841~~	~~94,400~~	~~2020~~	~~5,559~~	~~-5.9%~~
City of Sunnyvale[~~c~~b]	159,100	159,100	151,610	154,600	2020	-2,990	-1.9%
Customer-selected projection 1–10% greater than general plan projection							
Alameda County Water District	405,900	404,700	379,931	359,113		20,818	5.8%
Fremont	*257,100*	*257,200*		*229,213*	2020		
Newark	*53,500*	*53,400*		*49,800*	2020		
Union City	*95,300*	*94,100*		*80,100*	2020		
CWS–South San Francisco District and Westborough Water District[~~d,e~~ c,d]	83,450	73,660	73,884	68,685	2020	5,199	7.6%
City of Daly City	115,651	127,200	115,651	113,000	2020	2,651	2.3%
City of Hayward	162,800	171,500	162,757	160,300	2025	2,457	1.5%
Town of Hillsborough		11,800	12,708	11,800	2025	908	7.7%
Mid-Peninsula Water District[~~f~~e]	28,930	28,800	27,997	27,800	2010	197	0.7%
City of Millbrae	24,200	24,500	25,174	24,860	2015	314	1.3%
City of Mountain View	81,700	89,600	81,670	75,200	2010	6,470	8.6%
City of Palo Alto	69,199	92,200	69,199	62,880	2010	6,319	10.0%
~~City of Redwood City~~	~~93,329~~	~~122,300~~	~~93,535~~	~~87,100~~	~~2020~~	~~6,435~~	~~7.4%~~
City of San Bruno	See note ~~g~~f	50,700	48,229	46,400	2020	1829	3.9%
City and County of San Francisco[~~h~~g]	849,942	903,300	849,942	811,100	2020	38,842	4.8%
City of Santa Clara	140,698	142,100	140,698	129,900	2010	10,798	8.3%
Customer-selected projection more than 10% greater than general plan projection							
City of Burlingame[~~h,i~~ g,h]	31,900	31,900	34,967	31,500	2010	3,467	11.0%
City of Milpitas[~~b~~ i]	91,400	91,400	88,841	94,400	2020	5,559	-5.9%
Coastside County Water District[j]	24,973	27,100	24,973	21,065	2020	3,908	18.6%
Estero Municipal Improvement District (MID)[j,k]	40,866	32,500	40,096	30,803	2010	9,293	30.2%

NOTE: Most wholesale customer service areas are not contiguous with city limits (or with the city and its planning area), and therefore the population projections from the jurisdictions' general plans and ABAG should be considered as general comparisons only. The following are not included, because the water service area and jurisdictional boundaries are not comparable or the general plan of the corresponding jurisdiction does not provide a comparable population projection: Brisbane, CWS–Bear Gulch, CWS–Mid-Peninsula, Menlo Park, North Coast County Water District, Purissima Hills Water District, Redwood City, San Jose North, Skyline County Water District, and Stanford University.

a The general plan population projection and projection year are the most distant population projection and the year of the most distant population projection available in the general plan or general plan element.

~~b The general plan population is based on the population shown in the general plan (77,100) plus the additional population accommodated by the Milpitas Midtown Specific Plan, as advised by Milpitas Planning Department staff (Carrington, 2006), to account for 5,000 additional units with an assumed density of 3.46 persons per unit (i.e., an added population of 17,300). The City has amended to general plan to incorporate the specific plan.~~

b~~c~~ The service area of Sunnyvale's water district is contiguous with the city limits; however, another water utility (CWS) serves several small areas within the city.

c~~d~~ CWS = California Water Service Company.

d~~e~~ CWS–South San Francisco serves South San Francisco, Colma, a small portion of Daly City, and the unincorporated area of Broadmoor. The water customer estimate for the Westborough Water District is from the district's Urban Water Management Plan. The general plan figure is the combined total projected population in the South San Francisco and Colma general plans (67,400 and 1,285 respectively); the general plan projection year shown (2020) is for South San Francisco, the projection year for Colma is 2005. The *Projections 2005* figure is for South San Francisco and Colma (71,800 and 1,860, respectively).

e~~f~~ The Mid-Peninsula Water District serves Belmont, portions of San Carlos, and unincorporated areas of San Mateo County. The general plan figure is for the city of Belmont, from the 2002 housing element.

f~~g~~ The San Bruno UWMP (City of San Bruno, 2007) shows two population projections for 2030: 50,700, based on ABAG's *Projections 2005*, and 48,229, based on the City's Adjusted Draft General Plan.

g~~h~~ UWMP and *Projections 2005* figures are for household population, since the customer-selected figure is for household population.

h~~i~~ Burlingame's water system also serves portions of unincorporated Burlingame and a few properties in the city of San Mateo and town of Hillsborough.

i The general plan population is based on the 2002 Milpitas general Plan.

j The general plan figure is for the city of Half Moon Bay only, from the 1993 Half Moon Bay Local Coastal Program Land Use Plan (Table 9.3, Chapter 9, page 189). In addition to incorporated Half Moon Bay, the Coastside County Water District serves unincorporated areas of Half Moon Bay and the unincorporated communities of El Granada, Miramar, and Princeton by the Sea.

k Estero MID serves Foster City and a portion of the city of San Mateo. The general plan figure is for Foster City.

SOURCES: ABAG, 2004; ACWD, 2005; CWS-South San Francisco, 2006; ~~Carrington, 2006;~~ City and County of San Francisco, 2004; City of Belmont, 2002a; City of Burlingame, 2002a; City of Burlingame, 2005; City of Daly City, 2004a; City of Daly City, 2005; City of East Palo Alto, 1999a; City of East Palo Alto, 2006; City of Foster City, 2001a; City of Fremont, 2003a; City of Half Moon Bay, 1993; City of Hayward, 2002a; City of Hayward, 2005; City of Millbrae, 1998a; City of Millbrae, 2005; City of Milpitas, 2002a; City of Milpitas, 2005; City of Mountain View, 2002a; City of Mountain View, 2005; City of Newark, 2002a; City of Palo Alto, 1998a; City of Palo Alto, 2005b; ~~City of Redwood City, 2005b; City of Redwood City, 2007a~~; City of San Bruno, 2003a; City of San Bruno, 2007; City of Santa Clara, 2002a; City of Santa Clara, 2005; City of South San Francisco, 2002a; City of Sunnyvale, 2002a; City of Sunnyvale, 2005; City of Union City, 2002a; Coastside County Water District, 2005; Estero MID, 2005; Hannaford and Hydroconsult, 2004; Mid-Peninsula Water District, 2006; SFPUC, 2005; Town of Colma, 1999a; Town of Hillsborough, 2002a; URS, 2004a, Westborough Water District, 2005.

> ~~approximately 6 percent less than that cited in the city's general plan, as amended by the Midtown Milpitas Specific Plan, and projected by ABAG.~~ <u>The City of Milpitas is currently preparing a Transit Area Specific Plan that is expected, upon adoption, to result in a buildout population of 95,014, somewhat greater than the population projection used in the demand study (Williams, 2007).</u>

Section 7.3.6, page 7-52: The third sentence of the fourth paragraph is revised as follows in response to a comment (see **Response L_PHWD1-09**).

> In 2001, the Purissima Hills Water District served 6,032—or 64 percent—of the approximately ~~94,555~~ <u>9,455</u> residences estimated for the town and its sphere of influence in 2000.

Section 7.3.6, p. 7-53: The third full paragraph is revised as follows in response to a comment (see **Response L_RdwdCty-08**).

> The customer-selected population projection used for Redwood City in the demand study is ~~generally consistent with the buildout population identified in the city's general plan (which has a 2020 planning horizon), and~~ 24 percent lower than ABAG's 2030 population projection of 122,300 for the city and its sphere of influence. The 2030 Redwood City population used in the demand study is approximately 7 percent more than the 2020 projection shown in the city's Downtown Precise Plan ~~(a recent amendment of the general plan)~~, which cites ABAG's *Projections 2005* forecast for 2020 for the city within its jurisdictional boundary. The city's water service area includes only a portion of the city's sphere of influence (Bonte, 2006), which probably accounts for the difference between the ABAG projection for the city and its sphere of influence and that assumed in the demand study. ABAG's 2030 projection of 94,300 for Redwood City within the city limits only is within 1 percent of the demand study projection. <u>Because the population projection included in the city's 1990 general plan is for 2000 (earlier than 2005), it is not considered comparable to the 2030 WSIP population projection for this analysis. According to the city, the 2003 UWMP was selected for use in the demand study because the UWMP contained the most current population and employment projections at the time.</u>

Section 7.4.1, page 7-62: The second to the last bullet is revised as follows in response to a comment (see **Response L_PHWD1-11**).

- Town of Los Altos Hills General Plan (1975), General Plan Path Element (1996), 2002 Housing Element (2002), Circulation Element (1999), Land Use <u>Element (n.d.) and</u> Open Space~~,~~ and Recreation Element~~s~~ ~~(n.d.)~~ <u>(2007).</u>

Section 7.4, page 7-90: The fourth to the last reference is revised as follows in response to a comment (see **Response L_PHWD1-11**).

> Town of Los Altos Hills Land Use, Open Space, and Recreation Elements, http://www.osaltoshills.ca.gov/government/town-documents.html (website accessed March 15, 2006), <u>2007</u>.

Section 7.4, page 7-91: The following reference is added after (URS, 2006) in response to a comment (see **Response L_Milpts-14**).

Williams, Thomas, Comment letter from the City Manager of Milpitas to the SFPUC on the Draft PEIR for the SFPUC's Water System Improvement Program, September 27, 2007.

Chapter 7 references, pages 7-85, 7-89 and 7-90: The following corrections are made:

Popp, Ron, Director of Public Works, City of Millbrae, email communication, June 4, 2007.

San Francisco Public Utilities Commission (SFPUC), SFPUC Capital Improvement Program Wholesale Customer Best Estimate of Water Purchases from the SFPUC [submitted by the SFPUC and each wholesale customer], November 2004.

City of Redwood City, *Downtown Precise Plan Draft Environmental Impact Report* (October 2006) and *Final Environmental Impact Report*, State Clearinghouse #2006~~5~~052027, certified March 2007a.

Town of Colma, Ordinance No. 557 of the City Council of the Town of Colma: An Ordinance Amending the Colma Municipal Code To Provide for Amendments to the "Town of Colma Zoning Map," July 14, 1999d.

Town of Hillsborough, *Town of Hillsborough Housing Element, 1999-2006*, adopted July 8, 2002a.

Volume 4, Chapter 8

Section 8.1, pages 8-1 and 8-2: The first and second paragraphs are revised as follows to reflect project sponsor requested revisions subsequent to the publication of the Draft PEIR.

The San Francisco Public Utilities Commission (SFPUC) has requested that this Program Environmental Impact Report (PEIR) include environmental analysis of three variants to the Water System Improvement Program (WSIP or proposed program). The WSIP variants are variations of the proposed program which are designed to meet or exceed all WSIP goals and objectives but differ with respect to water supply source or drought-year level of service. The variants are not necessarily intended to be alternatives to the proposed program that would lessen or avoid environmental impacts as required by the California Environmental Quality Act (CEQA); the CEQA alternatives are described and analyzed in Chapter 9.

Subsequent to the publication of the Draft PEIR, the SFPUC requested that the PEIR address a fourth variant. Please refer to Chapter 13 (Vol. 7) of the PEIR, Section 13.4 for a description and analysis of the fourth variant, the *Phased WSIP Variant.*

This chapter describes and analyzes the potential environmental effects of three WSIP variants: *WSIP Variant 1 – All Tuolumne*; *WSIP Variant 2 – Regional Desalination for*

> *Drought*; and *WSIP Variant 3 – 10% Rationing*. The variants include the same fundamental facility components and operation/maintenance plan as the proposed WSIP. The major difference between the variants and the proposed program is either in the proposed source(s) of water supply or in the drought-year rationing level of service.

Section 8.5, page 8-59, Table 8.6: The last two rows in Table 8.6 are revised as shown on the following page to reflect the change in project description of the Calaveras Dam (SV-2) project.

Section 8.5, pages 8-61, 8-62, and 8-65, Table 8.7: The impact descriptions for Impacts 5.5.3-2, 5.5.5-4, and 5.5.6-4 as well as the impact conclusion for Impact 5.5.6-5 are revised as shown on pages 16-109 to 16-110 to refine the surface water quality and biological resources analyses in the Pilarcitos Watershed as determined from the updated modeling results conducted in 2008, as discussed in Chapter 13, Section 13.3.

Volume 4, Chapter 9

Section 9.2.1, page 9-19: Table 9.8 is revised as shown on page 16-111 to reflect the change in project description of the Calaveras Dam (SV-2) project.

Section 9.2.1, pages 9-20 and 9-21, Table 9.9: The impact descriptions for Impacts 5.5.3-2, 5.5.5-4, and 5.5.6-4 as well as the impact conclusions for Impact 5.5.6-5, Sensitive habitats, are revised as shown on page 16-112 to refine the biological resources analysis in the Pilarcitos Watershed as determined from the updated modeling results conducted in 2008, as discussed in Chapter 13, Section 13.3.

Section 9.2.8, page 9-78: The following footnote is added to the first sentence of the first paragraph under the heading "9.2.8 Modified WSIP Alternative" in response to comments described in **Section 14.10, Master Response on Modified WSIP Alternative.**

> The Modified WSIP Alternative incorporates changes in the proposed WSIP primarily to modify the proposed water supply and system operations so as to minimize environmental effects.[11]
>
> [11] The description and analysis of the Modified WSIP Alternative has been updated in the Comment and Responses document. Please see Section **14.10, Master Response on the Modified WSIP Alternative** (Vol. 7, Chapter 14) for detailed information.

Section 9.3.1, page 9-90: The fourth sentence of the second paragraph is revised as follows in response to a comment (see **Response L_CoastsideCWD-27**).

> The SFPUC currently serves Coastside CWD ~~primarily~~ with about equal quantities of water from ~~the~~ Pilarcitos ~~Reservoir~~ Creek and Crystal Springs Reservoir.

TABLE 8.6 (Continued)
SUMMARY OF WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR THE WSIP VARIANTS COMPARED TO EXISTING CONDITIONS – ALAMEDA WATERSHED

Impact	Proposed Program	Variant 1 – All Tuolumne	Variant 2 – Regional Desal for Drought	Variant 3 – 10% Rationing
Impact 5.4.7-1: Effects on recreation facilities and/or activities	Under both existing and future conditions, water recreation is prohibited in SFPUC reservoirs. Thus, changes in reservoir water levels would not adversely affect recreation. Operations under the WSIP would substantially reduced flows along Alameda Creek in the Sunol Regional Wilderness during winter and early spring months and adversely affect the recreational experience of hikers; however, with the changes in project description for the Calaveras Dam Replacement (SV-2) project, bypass flows would be reduced from the diversion dam when flows are present. (~~PSM~~ LS)	Same as proposed program (~~PSM~~ LS)	Same as proposed program (~~PSM~~ LS)	Same as proposed program (~~PSM~~ LS)
Impact 5.4.7-2: Visual effects on scenic resources or visual character of water bodies	Apart from raised water levels in Calaveras Reservoir and substantial reductions in flows along Alameda Creek in the Sunol Regional Wilderness area during winter and spring months, changes in stream flow and reservoir elevations in the Alameda watershed would not be apparent to most recreational users. WSIP-induced reductions in stream flows along Alameda Creek would substantially change quality of visual resources in the Sunol Regional Wilderness area; however, with the changes in project description for the Calaveras Dam Replacement (SV-2) project, bypass flows would be reduced from the diversion dam when flows are present. (~~PSM~~ LS)	Same as proposed program (~~PSM~~ LS)	Same as proposed program (~~PSM~~ LS)	Same as proposed program (~~PSM~~ LS)

TABLE 8.7
SUMMARY OF WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR THE WSIP VARIANTS COMPARED TO EXISTING CONDITION – PENINSULA WATERSHED

Impact	Proposed Program	Variant 1 – All Tuolumne	Variant 2 – Regional Desalination for Drought	Variant 3 – 10% Rationing
Impact 5.5.3-2: Effects on water quality in Pilarcitos Reservoir and along Pilarcitos Creek	~~Operations under the WSIP would increase summer drawdown of Pilarcitos Reservoir and could cause the reservoir to destratify earlier in the season, which may improve water quality. However, the ability of the reservoir to support cold freshwater habitat could be reduced due to a reduced volume of cool water below thermocline.~~ Proposed operations would generally be within the same range as existing conditions although replacement Measure 5.5.3-2a would cause Pilarcitos Reservoir to be drawn down earlier in the summer compared to existing conditions. Water temperature could increase and dissolved oxygen content could be reduced. During dry years summertime releases from Pilarcitos Reservoir to Pilarcitos Creek would be eliminated or reduced to a low level for a longer period of time with the WSIP, which would increase the temperature of instream flows between Pilarcitos Creek and Stone Dam and reduce the creek's ability to support designated cold freshwater habitat along this reach. Slight reductions in spill over Stone Dam would be minor and would not adversely affect water quality along Pilarcitos Creek. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)
Impact 5.5.5-4: Effects on fisheries resources in Pilarcitos Reservoir	~~Reduction in average monthly storage~~ Proposed operations would be within the same range as existing conditions although replacement Measure 5.5.3-2a would cause Pilarcitos Reservoir to be drawn down earlier in the summer compared to existing conditions. This would reduce the volume and quality of coldwater habitat available for resident fish species. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)
Impact 5.5.6-4: Impacts on biological resources in Pilarcitos Reservoir				
• Sensitive Habitats	Reduced water elevations could slightly reduce the extent of areas supporting sensitive freshwater marsh habitat. (LS)	Similar to proposed program (LS)	Same as proposed program (LS)	Similar to proposed program (LS)

TABLE 8.7 (Continued)
SUMMARY OF WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR THE WSIP VARIANTS COMPARED TO EXISTING CONDITION – PENINSULA WATERSHED

Impact	Proposed Program	Variant 1 – All Tuolumne	Variant 2 – Regional Desalination for Drought	Variant 3 – 10% Rationing
• Key Special Status Species	Proposed operations would be within the same range as existing conditions, although replacement Measure 5.5.3-2a would cause Pilarcitos Reservoir to be drawn down earlier in the summer compared to existing conditions. This cwould reduce the extent of suitable habitat for California red-legged frog and San Francisco garter snake. Special status species that utilize adjacent upland vegetation would not be affected. (PSM)	Similar to proposed program (PSM)	Similar to proposed program (PSM)	Similar to proposed program (PSM)
Impact 5.5.6-5: Impacts on biological resources along Pilarcitos Creek below Pilarcitos Reservoir				
• Sensitive Habitats	In summer months of dry years, an extended period of no or little flow would stress or kill riparian vegetation. Proposed operations would result in flows within the range of historical conditions, to which sensitive habitats have adapted. (PSM LS)	Similar to proposed program (PSM LS)	Similar to proposed program (PSM LS)	Similar to proposed program (PSM LS)

TABLE 9.8
SUMMARY OF SIGNIFICANT WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR CEQA ALTERNATIVES – ALAMEDA WATERSHED

Impact	Proposed Program	No Program Alternative	No Purchase Request Increase Alternative	Aggressive Conservation/Water Recycling and Local Groundwater Alternative		Lower Tuolumne River Diversion Alternative	Year-round Desalination at Oceanside Alternative	Regional Desalination for Drought Alternative	Modified WSIP Alternative
				No Supplemental Tuolumne River Water	With Supplemental Tuolumne River Water				
Section 5.4.7, Recreational and Visual Resources									
Impact 5.4.7-1: Effects on recreation									
	Operations under the WSIP would substantially reduce flows along Alameda Creek in the Sunol Regional Wilderness during winter and early spring months and adversely affect the recreational experience of hikers; however, with the changes in project description for the Calaveras Dam Replacement (SV-2) project, bypass flows would be reduced from the diversion dam when flows are present. (~~PSM~~ LS)	Same as proposed program. (~~PSM~~ LS)	Same as proposed program. (~~PSM~~ LS)	Same as proposed program. (~~PSM~~ LS	Same as proposed program. (~~PSM~~ LS)	Same as proposed program. (~~PSM~~ LS)	Same as proposed program. (~~PSM~~ LS)	Same as proposed program (~~PSM~~ LS)	~~Much less than~~ Same as proposed program (LS)
Impact 5.4.7-2: Visual effects									
	WSIP-induced reductions in stream flows along Alameda Creek would substantially change the quality of visual resources in the Sunol Regional Wilderness; however, with the changes in project description for the Calaveras Dam Replacement (SV-2) project, bypass flows would be reduced from the diversion dam when flows are present. (~~PSM~~ LS)	Same as proposed program. (~~PSM~~ LS)	Same as proposed program. (~~PSM~~ LS)	Same as proposed program. (~~PSM~~ LS)	Same as proposed program. (~~PSM~~ LS)	Same as proposed program. (~~PSM~~ LS)	Same as proposed program. (~~PSM~~ LS)	Same as proposed program (~~PSM~~ LS)	~~Much less than~~ Same as proposed program (LS)

LS = Less than Significant, no mitigation required
SM or PSM = Significant or Potentially Significant, can be Mitigated to less than significant
SU or PSU = Significant Unavoidable or Potentially Significant Unavoidable, cannot be mitigated to less than significant

TABLE 9.9
SUMMARY OF SIGNIFICANT WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR CEQA ALTERNATIVES – PENINSULA WATERSHED

Impact	Proposed Program	No Program Alternative	No Purchase Request Increase Alternative	Aggressive Conservation/Water Recycling and Local Groundwater Alternative		Lower Tuolumne River Diversion Alternative	Year-round Desalination at Oceanside Alternative	Regional Desalination for Drought Alternative	Modified WSIP Alternative
				No Supplemental Tuolumne River Water	With Supplemental Tuolumne River Water				
Section 5.5.3, Surface Water Quality									
Impact 5.5.3-2: Water quality in Pilarcitos Reservoir									
	~~Operations under the WSIP would increase summer drawdown of Pilarcitos Reservoir and could cause the reservoir to destratify earlier in the season, which may improve water quality. However, the ability of the reservoir to support cold freshwater habitat could be reduced due to a reduced volume of cool water below thermocline.~~ Proposed operations would generally be within the same range as existing conditions although replacement Measure 5.5.3-2a would cause Pilarcitos Reservoir to be drawn down earlier in the summer compared to existing conditions. Water temperature could increase and dissolved oxygen content could be reduced. During dry years, summertime releases from Pilarcitos Reservoir to Pilarcitos Creek would be eliminated or reduced to a low level for a longer period of time with the WSIP, which would increase the temperature of instream flows between Pilarcitos Creek and Stone Dam and reduce the creek's ability to support designated cold freshwater habitat along this reach. (PSM)	Similar to proposed program. (PSM)	Similar to but much less than proposed program. (LS)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program (PSM)	Similar to ~~existing condition~~ but much less than proposed program (LS)
Impact 5.5.5-4: Effects on fisheries resources in Pilarcitos Reservoir									
	~~Reduction in average monthly storage in Pilarcitos Reservoir~~ Proposed operations would be within the same range as existing conditions although replacement Measure 5.5.3-2a would cause Pilarcitos Reservoir to be drawn down earlier in the summer compared to existing conditions. This would reduce the volume and quality of coldwater habitat available for resident fish species. (PSM)	Similar to proposed program. (PSM)	Similar to but much less than proposed program. (LS)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program (PSM)	Similar to existing condition (LS)
Impact 5.5.6-4: Impacts on biological resources in Pilarcitos Reservoir									
▪ Key special status species	Proposed operations would be within the same range as existing conditions, although replacement Measure 5.5.3-2a would cause Pilarcitos Reservoir to be drawn down earlier in the summer compared to existing conditions. This ~~c~~would reduce the extent of suitable habitat for California red-legged frog and San Francisco garter snake. Special-status species that utilize adjacent upland vegetation would not be affected. (PSM)	Similar to proposed program. (PSM)	Similar to but much less than proposed program. (LS)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program. (PSM)	Similar to proposed program (PSM)	Similar to existing condition (LS)
Impact 5.5.6-5: Impacts on biological resources along Pilarcitos Creek									
▪ Sensitive habitats	~~In summer months of dry years, an extended period of no or little flow would stress or kill riparian vegetation.~~ Proposed operations would result in flows within the range of historical conditions, to which sensitive habitats have adapted. (~~PSM~~ LS)	Similar to proposed program. (~~PSM~~ LS)	Similar to ~~but much less than~~ proposed program. (LS)	Similar to proposed program. (~~PSM~~ LS)	Similar to proposed program. (~~PSM~~ LS)	Similar to proposed program. (~~PSM~~ LS)	Similar to proposed program. (~~PSM~~ LS)	Similar to proposed program (~~PSM~~ LS)	Similar to ~~existing condition~~ proposed program (LS)

Volume 5, Appendices

Appendix C

Appendix C.6

Appendix C, pages C-2, C-6, and C-7, Table C-1: The revisions to the project descriptions for the Alameda Creek Fishery Enhancement (SV-1), Calaveras Dam Replacement (SV-2), and Lower Crystal Springs Dam Improvement (PN-4) are the same as those described above under Volume 1, Chapter 3, Section 3.8, pages 3-50 and 3-54, Table 3.10.

Appendix C.6, page C-26: Table C.6 is revised as shown on pages 16-115 and 16-116 in response to comments described in **Section 14.4, Master Response on PEIR Appropriate Level of Analysis**.

Appendix E

Appendix E.3 Population, Employment, and Water Demand Projections

Appendix E.3, page E.3-38: The entries for Milpitas, Redwood City, and San Bruno in Table E.3.34 are revised as shown on page 16-117 in response to a few comments (see **Responses L_Milpts-14, L_RdwdCty-08, and L_SBruno-18**).

Appendix E.3, page E.3-39: The footnote and source information for Milpitas and Redwood City in Table E.3.34 are revised as shown on the page 16-118 in response to two comments (see **Responses Response L_Milpts-14** and **L_RdwdCty-08**).

Appendix E.3, page E.3-40: The entries for Milpitas and Redwood City in Table E.3.36 is revised as shown on page 16-119 in response to two comments (see **Responses L_Milpts-14** and **L_SBruno-18**).

Appendix E.3, page E.3-51: The following reference is deleted in response to a comment (see **Response L_RdwdCty-08**).

> ~~City of Redwood City, *Downtown Precise Plan Draft Environmental Impact Report* (October 2006) and *Final Environmental Impact Report*, State Clearinghouse #2005052027, certified March 2007.~~

Appendix E.4 Growth Trends

Appendix E.4, page E.4-3, Table E.4.1: Table E.4.1 is revised in response to two comments as shown on page 16-120 (see **Responses L_Milpts-14** and **L_RdwdCty-08**).

Appendix E.4, p. E.4-8: The last sentence of the second paragraph is revised as follows in response to a comment (see **Response L_Milpts-14**):

> With the Midtown Milpitas Specific Plan, the city's general plan population at buildout is projected to be 77,100 ~~94,400~~ (City of Milpitas, 2002a; City of Milpitas, 2002c~~; Carrington, 2006~~).

Appendix E.4, page E.4-14: The fourth and fifth sentences of the first full paragraph on this page are revised as follows in response to a comment (see **Response L_RdwdCty-08**).

> During the 1970s and 1980s, changes in industry and housing occurred, with the craft industries of the city's early years giving way to high-technology and information-age industries (City of Redwood City, 1990). The 1990 Redwood City General Plan indicated that the city was expected to reach a population of 70,000 by the year 2000 (Redwood City, 1990, Chapter 4, p. 4-1). The EIR for the Downtown Precise Plan~~, a recent amendment of the general plan,~~ cites ABAG's *Projections 2005* forecasts for the city (not including its sphere of influence) of 87,100 in 2020.

The following corrections are made:

References

City of Redwood City, *Downtown Precise Plan Draft Environmental Impact Report* (October 2006) and *Final Environmental Impact Report*, State Clearinghouse #2006~~5~~052027 certified March 2007c.

Appendix E.5 Impacts

The following corrections are made:

Page 2:

- City of Redwood City Downtown Precise Plan EIR, State Clearinghouse #2006~~5~~052027 (2007)

Table E.5.1 footnote

[m] City of Redwood City, Downtown Precise Plan Environmental Impact Report, State Clearinghouse #2006~~5~~052027, certified March 2007a; Resolution No. 14769 of the City Council of City of Redwood City Making Certain Findings Concerning Mitigation Measures, Adopting a Mitigation Monitoring and Reporting Program, Making Findings Concerning Alternatives, and Adopting a Statement of Overriding Considerations in Accordance with the California Environmental Quality Act for the Redwood City Downtown Precise Plan, adopted March 26, 2007b; Ordinance No. 2308 of the City Council of the City of Redwood City Adopting the Redwood City Downtown Precise Plan and the Moderate Intensity Alternative as the Most Appropriate Maximum Alternative Development Limitation for the Downtown Precise Plan, approved April 24, 2007c.

References

City of Redwood City, *Downtown Precise Plan Draft Environmental Impact Report* (October 2006) and *Final Environmental Impact Report*, State Clearinghouse #2006~~5~~052027 certified March 2007a.

TABLE C.6
PERMITS, APPROVALS, AND EARLY COORDINATION WITH OTHER AGENCIES THAT MAY BE REQUIRED[a]

Project Number	Project Name	ACOE Section 10	Individual or ACOE NWP Section 404	National Wildlife Refuge	SHPO Section 106	NMFS Section 7 / USFWS Section 7	USFWS FWCA	National Park Service, GGNRA[b]	State Lands Commission Lease/ Permit[c]	Caltrans[d]	DWR, Central Valley Flood Protection Board	DWR, Division of Safety of Dams	CDFG 1602, 2080.1, 2081, or MOA	DHS (Public Water System)	SWRCB (SWPPP)	RWQCB 401	RWQCB Discharge/ Dewatering	BAAQMD	BCDC	Local CUPA/ HazMat Business Plan
SJ-1	Advanced Disinfection		Possible		Possible	Possible							X	X	X	Possible		~~AQMD permit~~ TBD		
SJ-2	Lawrence Livermore Supply Improvements		X (TS site only)		Possible	X (TS site only)							X (TS site only)	X	X	X (TS site only)				X
SJ-3	San Joaquin Pipeline System		X	Possible	X	X			X	Possible	Possible		X		X	X				X
SJ-4	Rehabilitation of Existing San Joaquin Pipelines	Possible	Possible	Possible	Possible	Possible				Possible			Possible							
SJ-5	Tesla Portal Disinfection Station												X	X	X					X
SV-1	Alameda Creek Fishery Enhancement		TBD		TBD	TBD				Possible			X			TBD				
SV-2	Calaveras Dam Replacement		X		X	X	X					X	X		X	X	X			X
SV-3	Additional 40-mgd Treated Water Supply													X	X					X
SV-4	New Irvington Tunnel		X		X	X				Possible			X		X	X	X			X
SV-5	SVWTP – Treated Water Reservoirs													X	X					X
SV-6	San Antonio Backup Pipeline																			
BD-1	Bay Division Pipeline Reliability Upgrade	Possible	X	Possible	X	X	X[e]		X	Possible			X		X	X	X		Possible	X
BD-2	BDPL Nos. 3 and 4 Crossovers		X			X	X			Possible			X		X	X	X			
BD-3	Seismic Upgrade of BDPLs Nos. 3 and 4 at Hayward Fault	TBD	TBD		TBD	TBD	TBD		TBD	Possible			TBD	TBD	TBD	TBD	TBD	TBD		
PN-1	Baden and San Pedro Valve Lot Improvements									Possible				X			X			
PN-2	Crystal Springs/San Andreas Transmission Upgrade	X	X		X	X		EC[b]		Possible			X	X	X	X	X			X
PN-3	HTWTP Long-Term Improvements							EC[b]		Possible				X	X					
PN-4	Lower Crystal Springs Dam Improvements	X	X		X	X	X	EC[b]		Possible		X	X		X	X	X			X
PN-5	Pulgas Balancing Reservoir Rehabilitation							EC[b]					X							
SF-1	San Andreas Pipeline No. 3 Installation									Possible					X	X	X			
SF-2	Groundwater Projects (Local and Regional)									Possible				X				X		
SF-3	Recycled Water Projects									Possible				X		X				

NOTES: ACOE = U.S. Army Corps of Engineers; BAAQMD = Bay Area Air Quality Management District; BCDC = San Francisco Bay Conservation and Development Commission; Caltrans = California Department of Fish and GameTransportation; CDFG = California Department of Fish and Game; CUPA = Certified Unified Program Agency; DHS = California Department of Health Services; DWR = California Department of Water Resources; EC = Early Coordination Requested; (FWCA = Fish and Wildlife Coordination Act); GGNRA = Golden Gate National Recreation Area; MOA = Memorandum of Agreement; NMFS = U.S. National Marine Fisheries Service; (NWP = National Permit for Stream and Wetland Restoration Activities); RWQCB = Regional Water Quality Control Board; SHPO = State Historic Preservation Office; SWPPP = stormwater pollution prevention plan; SWRCB = State Water Resources Control Board; TBD = To Be Determined; TS = Thomas Shaft; USFWS = U.S. Fish and Wildlife Service.

[a] Additional approvals may be identified for WSIP facility projects when separate, project-level CEQA analysis is completed.

[b] The GGNRA requests consultation during project development and advance notification of meetings and would like to assist in creating mitigations for potential impacts from these projects.

[c] Section 6327 of the Public Resources Code provides that if a facility is for the "procurement of fresh-water from and construction of drainage facilities into navigable rivers, streams, lakes and bays," and if the applicant obtains a permit from the local reclamation district, State Reclamation Board, the U.S. Army Corps of Engineers, or the Department of Water Resources, then an application shall not be required by the State Lands Commission. Since the proposed program appears to fall within this section, a lease from the Commission would not be required, provided one of the above-listed permits is obtained.

[d] As part of project-level CEQA review, Caltrans requests that each facility improvement project be reviewed to determine if it encroaches on any state facilities. Any encroachment on Caltrans right-of-way would require an encroachment permit, and CEQA-related environmental studies may be necessary (including studies related to biological resources, cultural resources, and hazardous materials). A qualified professional must conduct these studies to satisfy Caltrans's environmental review policies. Ground-disturbing activities on the site prior to completing and/or approving the required environmental documents could affect Caltrans' ability to issue a permit for the project.

[e] The USFWS and the Coastal Conservancy are interested in acquiring clean dredge material generated by this project for use in wetland restoration associated with the South Bay Salt Pond Restoration Project, particularly within the Don Edwards San Francisco Bay National Wildlife Refuge (contact Clyde Morris, Manager, 510-792-0222, ext. 25). The USFWS recommends that the SFPUC coordinate with the USFWS's Division of Endangered Species at the Sacramento Fish and Wildlife Office (916-414-6600).

TABLE C.6
PERMITS, APPROVALS, AND EARLY COORDINATION WITH OTHER AGENCIES THAT MAY BE REQUIRED (CONT'D)

Project Number	Project Name	San Mateo County Transit District	Coastal Conservancy	Association of Bay Area Governments	Local Flood Control Districts[f]	Alameda County Flood Control and Water Conservation District	Alameda County Water District[g]	East Bay Regional Park District[h]	City of Fremont[i]	City of Menlo Park	City of Palo Alto	Coastside County Water District
SJ-1	Advanced Disinfection											
SJ-2	Lawrence Livermore Supply Improvements											
SJ-3	San Joaquin Pipeline System				Possible							
SJ-4	Rehabilitation of Existing San Joaquin Pipelines				Possible							
SJ-5	Tesla Portal Disinfection Station											
SV-1	Alameda Creek Fishery Enhancement				Possible		EC	EC				
SV-2	Calaveras Dam Replacement					EC[j]	EC	EC	EC			
SV-3	Additional 40-mgd Treated Water Supply						EC	EC				
SV-4	New Irvington Tunnel				Possible		EC	EC				
SV-5	SVWTP – Treated Water Reservoirs						EC	EC				
SV-6	San Antonio Backup Pipeline				Possible		EC	EC				
BD-1	Bay Division Pipeline Reliability Upgrade	EC[k]	EC[l]	EC[l]	Possible		EC	EC	EC	EC[m]		
BD-2	BDPL Nos. 3 and 4 Crossovers				Possible						EC[n]	
BD-3	Seismic Upgrade of BDPLs Nos. 3 and 4 at Hayward Fault				Possible				EC			
PN-1	Baden and San Pedro Valve Lot Improvements											
PN-2	Crystal Springs/San Andreas Transmission Upgrade				Possible							
PN-3	HTWTP Long-Term Improvements											
PN-4	Lower Crystal Springs Dam Improvements											EC[o]
PN-5	Pulgas Balancing Reservoir Rehabilitation											
SF-1	San Andreas Pipeline No. 3 Installation				Possible							
SF-2	Groundwater Projects (Local and Regional)				Possible							
SF-3	Recycled Water Projects				Possible							

NOTE: EC = Early Coordination Requested

[f] As part of project-level CEQA review, the Alameda County Flood Control and Water Conservation District requests that each facility improvement project that includes pipelines be reviewed to determine if an encroachment permit is required where the pipelines cross the District's channels and creek inverts.

[g] The ACWD requests that the BD-1 project be coordinated with the ACWD earlier (during project planning and design phases, rather than during the construction phase) to minimize impacts associated with conflicting water facilities and potential impacts on the ACWD's ability to meet customer demands and fire flow requirements. In addition, all Sunol Valley projects (SV-1 through SV-6) will need to take into account potential effects of facility construction on downstream water intakes at ACWD's facilities in the flood control channel. The project-level CEQA review for the SV-2 project will need to consider coordination and notification related to Calaveras Reservoir release protocols that could affect downstream groundwater recharge and the potential for flooding.

[h] As part of project-level CEQA review, each facility improvement project in the Sunol Valley region should be reviewed to determine if it encroaches on EBRPD property. The EBRPD requests coordination of construction mitigation measures for certain WSIP projects in the Sunol Valley to minimize construction impacts on recreational uses and allow coordination of fire suppression planning and response (including review of traffic control plans). As part of the project-level EIR for SV-2, the EBRPD states that the SFPUC needs to coordinate the timing of water releases from Calaveras Dam to maximize benefits to amphibians and anadromous fish species.

[i] The City of Fremont requests consultation (regarding the applicability of encroachment permits, and development and review of traffic control plans) during the planning and design phases of the SV-2, BD-1, and BD-3 projects as well as any other WSIP project that could affect the Fremont transportation network.

[j] As part of the project-level CEQA review, mitigation measures should be developed to establish coordination and notification protocols between the SFPUC and the ACFCWCD regarding Calaveras Reservoir releases that could affect the potential for downstream flooding.

[k] The USFWS requests that the BD-1 project be coordinated with the Transit District's Dumbarton Rail Project to minimize habitat impacts for both projects.

[l] The Coastal Conservancy requests that the SFPUC coordinate with the Coastal Conservancy and Association of Bay Area Government's Bay Trail project (regarding completion of the Bay Trail gap through SFPUC lands).

[m] The City of Menlo Park requests coordination of construction mitigation measures for the BD-1 project to minimize construction impacts (e.g., access and parking) on local residents and businesses, including the Menlo Business Park.

[n] The City of Palo Alto requests early consultation on the BD-2 project.

[o] The Coastside CWD requests consultation during development of the adaptive management program for Crystal Springs Reservoir as part of the operations phase of the PN-4 project.

TABLE E.3.34
COMPARISON OF GENERAL PLAN POPULATION PROJECTIONS TO ABAG PROJECTIONS 2005, UWMPS, AND WATER CUSTOMER DEMAND PROJECTIONS FOR GENERAL PLAN PROJECTION YEAR

	Population in General Plan Population Year[a] Shown in:			
	General Plan[b]	UWMP	SFPUC Water Customer Projection[c]	*Projections 2005*
Cities with GP Population Projections for 2005				
Colma	1,285	see note d	see note d	1,350
Cities with GP Population Projections for 2010				
Belmont	27,800	see note f	see note f	26,000
Burlingame	31,500	30,200	31,648	30,200
Foster City	30,803	37,424[e]	36,284[e]	29,800
Menlo Park	35,285	10,344[g]	12,619[g]	35,600
Mountain View	75,200	75,200	74,422	76,000
Palo Alto	62,880	64,168	62,823	78,300
San Mateo	100,700	see note h	see note h	102,500
Santa Clara	129,900	116,527	115,630	117,400
Cities with GP Population Projections for 2015				
Millbrae	24,860	23,055	23,253	22,800
Cities with GP Population Projections for 2020				
Atherton	8,400	see note i	see note i	7,900
Daly City	113,000	114,291[j]	112,363[j]	120,200
East Palo Alto	34,600	29,612	29,844	39,600
Fremont	229,213	236,700	see note k	236,900
Half Moon Bay (incl. unincorporated area)	21,065	23,262	22,679	26,400
Milpitas	77,100~~94,400~~[l]	82,400	79,846	82,400
Newark	49,800	50,000	see note k	49,000
~~Redwood City~~	~~87,100~~	~~89,492 [m]~~	~~89,519[m]~~	~~114,200~~
San Bruno	46,400	~~n.a.~~see note m	45,642	47,700
San Francisco	811,100	840,000	818,954[n]	859,200
South San Francisco+Westborough Water District[d]	67,400	78,200	70,156	68,700
Sunnyvale	154,600	146,900	144,629	146,900
Union City	80,100	86,000	see note k	82,600
Cities with GP Population Projections for 2025				
Hayward	160,300	160,300	158,909	165,900
Hillsborough	11,800	n.a	12,520	11,600
Cities with GP Population Projections for Years Prior to 2005 or No Applicable GP: Projections for 2030				
Brisbane + Guadalupe Valley MID		n.a.	6,164	5,240
Los Altos Hills		n.a.	see note o	10,700
Los Trancos County Water District[p]		see note q	1,094	n.a.
Pacifica		42,100	47,829	42,200
Portola Valley		see note q	see note q	7,800
San Carlos		see note h	see note h	35,200
Stanford University		n.a.	27,924	n.a.
Woodside		see note q	see note q	7,300

n.a. = Not available.

[a] Population shown is for the year of the most distant population projection available in the general plan, housing element, or other relevant local document (see note b). For example, populations in all columns for cities in the group titled “Cities with GP Population Projections for 2005” are populations projected for or estimated in 2005.

[b] Population estimates are from each city’s general plan (GP) or the general plan’s EIR.

[c] Estimates for years between 2001 and 2030 are derived by Mundie & Associates, based on linear interpolations of water customer projections, except for the 2020 San Francisco projection, which is included in the Retail Demand Study (Hannaford and Hydroconsult, 2004).

[d] CWS – South San Francisco District (Colma, parts of Daly City and South San Francisco, plus unincorporated areas) UWMP projection for 2020 is 64,050, and Westborough Water District (which serves part of South San Francisco) UWMP projection for 2020 is 14,150; the CWS-South San Francisco water customer projection for 2020 is 56,006 and the Westborough Water District water customer projection is the same as its UWMP projection (14,150).

TABLE E.3.34 (Continued)
COMPARISON OF GENERAL PLAN POPULATION PROJECTIONS TO ABAG PROJECTIONS 2005, UWMPS, AND WATER CUSTOMER DEMAND PROJECTIONS FOR GENERAL PLAN PROJECTION YEAR

Figures shown are for Estero MID (Foster City and part of San Mateo).

f Mid-Peninsula Water District (Belmont, part of San Carlos, and portions of unincorporated San Mateo County) UWMP projection for 2010 is 26,130; water customer projection is 26,925.

g Figures shown are for the City of Menlo Park water agency, which serves part of Menlo Park (less than half of the city's population).

h CWS – Mid-Peninsula District (parts of the cities of San Mateo and San Carlos plus unincorporated areas) UWMP projection for 2010 is 129,070; water customer projection is 126,746. Part of San Mateo is served by Estero MID.

i CWS – Bear Gulch District (Atherton, parts of Menlo Park, Portola Valley, and Woodside, plus unincorporated areas) UWMP projection for 2020 is 57,730; water customer projection for 2020 is 71,125.

j Figures shown are for City of Daly City water agency, which serves part of Daly City.

k Alameda County Water District (cities of Fremont, Newark, and Union City) projection is 358,066 in 2020.

l Based on Milpitas General Plan ~~adjusted to include 5,000 housing units added by the Midtown Milpitas Specific Plan~~.

m ~~Figure shown is for City of Redwood City water agency, which also serves part of the City of San Carlos, part of the Town of Woodside, and portions of unincorporated San Mateo County.~~ The UWMP (Table 2) reports three population projections: the draft general plan (2006), ABAG subregional (2005), and adjusted draft general plan (2001), although the draft general plan (2006) does not include a projection for 2020. The projections for 2020 are, respectively, 43,400 (based on a straight-line interpolation from projections shown for 2005 and 2025), 47,700, and 43,400.

n Figure is for Household Population in 2020 as shown in the Retail Demand Study (Hannaford and Hydroconsult, 2004)

o Purissima Water District (part of Los Altos Hills and some unincorporated areas) water customer projection is 6,763.

p Los Trancos County Water District was acquired by CWS in 2006, and is now part of the CWS – Bear Gulch District. Because it was a separate entity when these projections were prepared, it is presented separately in this analysis.

q CWS – Bear Gulch District (Atherton, parts of Menlo Park, Portola Valley, and Woodside, plus unincorporated areas) UWMP projection for 2030 is 59,220; water customer projection is 73,719 (excluding Los Trancos).

SOURCES: ABAG, 2004; ACWD, 2005; CWS-Mid-Peninsula, 2005 ;CWS-South San Francisco, 2006; ~~Carrington, 2006;~~ City and County of San Francisco, 2004; City of Belmont, 2002; City of Burlingame, 2002a; City of Burlingame, 2005; City of Daly City, 2004; City of Daly City, 2005; City of East Palo Alto, 1999; City of East Palo Alto, 2006; City of Foster City, 2001; City of Fremont, 2003; City of Half Moon Bay, 1993; City of Hayward, 2002; City of Hayward, 2005; City of Menlo Park, 1994; City of Menlo Park, 2006; City of Millbrae, 1998; City of Millbrae, 2005; City of Milpitas, 2002b; City of Milpitas, 2005; City of Mountain View, 2002; City of Mountain View, 2005; City of Newark, 2002; City of Palo Alto, 1998; City of Palo Alto, 2005; ~~City of Redwood City, 2005; City of Redwood City, 2007;~~ City of San Bruno, 2003; City of San Bruno, 2007; City of San Mateo, 2001; City of Santa Clara, 2002; City of Santa Clara, 2005; City of South San Francisco, 2002; City of Sunnyvale, 2002; City of Sunnyvale, 2005; City of Union City, 2002; Coastside County Water District, 2005; Estero MID, 2005; Hannaford and Hydroconsult, 2004; Mid-Peninsula Water District, 2006; SFPUC, 2005; Town of Atherton, 2002; Town of Colma, 1999; Town of Hillsborough, 2002; URS, 2004, Westborough Water District, 2005.

TABLE E.3.36
COMPARISON OF GENERAL PLAN POPULATION PROJECTIONS TO ABAG *PROJECTIONS 2005*, UWMPS, AND WATER CUSTOMER DEMAND PROJECTIONS FOR 2030

	General Plan Population Projection	UWMP Population in 2030	SFPUC Water Customer Population Projection for 2030	*Projections 2005* Population in 2030
Cities with GP Population Projections for 2005				
Colma	1,285	see note a	see note a	1,860
Cities with GP Population Projections for 2010				
Belmont	27,800	see note c	see note c	28,800
Burlingame	31,500	31,900	34,967[d]	31,900
Foster City	30,803	40,866	40,096[b]	32,500
Menlo Park	35,285	11,218[e,f]	13,655[e,f]	41,100
Mountain View	75,200	81,700[g]	81,670[g]	89,600
Palo Alto	62,880	69,199	69,199	92,200
San Mateo	100,700	see note h	see note b,h	119,800
Santa Clara	129,900	140,698	140,698	142,100
Cities with GP Population Projections for 2015				
Millbrae	24,860	24,200	25,174	24,500
Cities with GP Population Projections for 2020				
Atherton	8,400	see note f	see note f	8,200
Daly City	113,000[i]	115,651 [j,k]	115,651[j,k]	127,200
East Palo Alto	34,600	32,712	32,712	43,600
Fremont	229,213	257,100	see note l	257,200
Half Moon Bay (incl. uninc. area)	21,065	24,973[m]	24,973[m]	27,100
Milpitas	77,100~~94,400~~[n]	91,400	88,841	91,400
Newark	49,800	53,500	see note l	53,400
~~Redwood City~~	~~87,100~~	~~93,329~~ ~~[o]~~	~~93,535~~ ~~[o]~~	~~122,300~~
San Bruno	46,400	see note ~~p~~o	48,229[~~q~~p]	50,700
San Francisco	811,100	871,000	849,942	924,600
South San Francisco+Westborough Water District	67,400	83,450[r]	73,884[~~r~~q]	71,800
Sunnyvale	154,600	159,100	151,610	159,100
Union City	80,100	95,300	see note l	94,100
Cities with GP Population Projections for 2025				
Hayward	160,300	162,800	162,757	171,500
Hillsborough	11,800		12,708[~~s~~r]	11,800
Cities with GP Population Projections for Years Prior to 2005 or No Applicable GP Population Projection				
Brisbane + Guadalupe Valley MID		n.a.	6,164	5,240
Los Altos Hills		n.a.	see note t	10,700
Los Trancos Valley Water Dist.[~~u~~t]		n.a.	1,094[v]	
Pacifica		42,100	47,829	42,200
Portola Valley		n.a.	see notes f,~~w~~v	7,800
San Carlos		see note h	see note h	35,200
Stanford University			27,924	n.a.
Woodside			see note f	7,300

a CWS – South San Francisco District (Colma, parts of Daly City and South San Francisco, plus unincorporated areas) UWMP projection for 2030 is 60,150; water customer projection for 2030 is 59,584.
b Estero MID (Foster City and part of San Mateo) projection for 2030 is 40,096.
c Mid-Peninsula Water District (Belmont, part of San Carlos, and portions of unincorporated San Mateo County) UWMP projection for 2030 is 28,930; water customer projection is 27,997.
d Figure shown is for the City of Burlingame Water Agency, which also serves some unincorporated area.
e Figure shown is for the portion of Menlo Park (less than half of the city's population) served by the City of Menlo Park Water Agency.
f CWS – Bear Gulch District (Atherton, parts of Menlo Park, Portola Valley, and Woodside, plus unincorporated areas) projection for 2030 is 73,719; UWMP population projection is 59,220 in 2030.
g Figure shown is for the City of Mountain View Water Agency, which serves most of Mountain View.
h CWS – Mid-Peninsula District (parts of the cities of San Mateo and San Carlos plus unincorporated areas) water customer population projection for 2030 is 139,834; UWMP population projection for 2030 is 134,010.
i The Housing Element of the Daly City General Plan projects this population within the city limits and a population of 120,000 within the (planning) area that corresponds to the ABAG subregional study area.
j Figure shown is for the portion of Daly City served by the City of Daly City Water Agency.
k Parts of Daly City and South San Francisco are served by CWS – South San Francisco District.
l Alameda County Water District (cities of Fremont, Newark, and Union City) projection for 2030 is 379,931.
m Figure shown is for the Coastside County Water District, which also serves unincorporated Half Moon Bay.
n Based on Milpitas General Plan~~ adjusted to include 5,000 housing units added by the Midtown Milpitas Specific Plan (Carrington, 2006)~~.
~~o~~ ~~Figure shown is for City of Redwood City Water Agency, which also serves part of the City of San Carlos, part of the Town of Woodside, and portions of unincorporated San Mateo County.~~
~~p~~o San Bruno UWMP (City of San Bruno,2007) shows two population projections for 2030: 50,700, based on ABAG's *Projections 2005*, and 48,229, based on the City's Adjusted Draft General Plan.
~~q~~p Figure shown is for the City of San Bruno Water Agency, which also serves some unincorporated areas.
~~r~~q Figures shown are for the CWS – South San Francisco District plus Westborough Water District. For the Westborough Water District, the water customer projection is the same as the UWMP projection.
~~s~~r Figure shown is for the Town of Hillsborough Water Agency, which also serves some unincorporated area.
~~t~~s Purissima Hills Water District, (part of Los Altos Hills and some unincorporated area) projection is 6,763.
~~u~~t Los Trancos County Water District was acquired by CWS in 2006, and is now part of the CWS – Bear Gulch District. Because it was a separate entity when these projections were prepared, it is presented separately in this analysis.
~~v~~u Includes a portion of Portola Valley.
~~w~~v Portola Valley is served by CWS – Bear Gulch District; a portion of the city was previously served by the Los Trancos County Water District, which is now part of CWS – Bear Gulch.

SOURCE: See sources for Table E.3.34.

TABLE E.4.1
CURRENT POPULATION ESTIMATES AND FORECASTS OF SELECT JURISDICTIONS

City	Actual Population: U.S. Census 2000 Population	Current Population Estimates: U.S. Census Estimated 2005 Population	Current Population Estimates: ABAG *Projections 2005* Estimated 2005 Population	Current Population Estimates: Department of Finance Estimated 2006 Population	Forecasts: General Plan Buildout (Year) and Population	Forecasts: ABAG *Projections 2005 Population* Projection for General Plan Buildout Year	Forecasts: Customer-Selected Population Projection for 2030	Forecasts: ABAG *Projections 2005 Population* Projection for 2030	Forecasts: Percent of Supply (after Conservation) from SFPUC
Alameda County									
ACWD[a]	312,753	311,600	326,900	325,396	(2020) 359,113	368,500	379,931	404,700	25%
Fremont	*203,413*	*200,468*	*211,100*	*210,158*	*(2020) 229,213*	*236,900*		*257,200*	
Newark[b]	*42,471*	*41,956*	*44,400*	*43,486*	*(2020) 49,800*	*49,000*		*53,400*	
Union City	*66,869*	*69,176*	*71,400*	*71,752*	*(2020) 80,100*	*82,600*		*94,100*	
Hayward	140,030	140,293	146,300	146,398	(2025) 160,300	165,900	162,757	171,500	100%
Santa Clara County									
Milpitas[c]	62,698	63,383	65,400	65,276	(2020) 77,100~~94,400~~	82,400	88,841	91,400	48%
Santa Clara[d]	102,361	105,402	108,700	110,771	(2010) 129,900	117,400	140,698	142,100	15%
Sunnyvale	131,760	128,902	131,700	133,544	(2025) 154,600	146,900	151,610	159,100	46%
San Mateo County									
East Palo Alto	29,506	32,242	32,700	32,083	(2020) 34,600	39,600	32,712	43,600	100%
Redwood City[e]	75,402	73,114	77,300	76,087	(2000~~2020~~) 70,000~~87,100~~	87,100	93,535	122,300	92%
San Mateo[f]	92,482	91,081	94,900	94,315	(2010) 100,700	98,000	See note f	119,800	100%
South San Francisco[g]	60,552	60,735	61,000	61,824	(2020) 67,400	68,500	73,884	71,800	See note g
City and County of San Francisco	776,733	739,426	798,000	798,680	(2020) 811,100	859,200	849,942	924,600	97%

[a] ACWD = Alameda County Water District; U.S. Census, ABAG, Department of Finance (DOF), and general plan figures are the combined estimates for Fremont, Newark and Union City.
[b] The Newark general plan projection shown is from the 2002 housing element. The general plan (adopted in 1992) projected a buildout population of 51,942 by the year 2007.
[c] The general plan population is based on the population shown in the general plan~~ (77,100) plus the additional population accommodated by the Milpitas Midtown Specific Plan, as advised by Milpitas Planning Department staff (Carrington, 2006), to account for 5,000 additional units with an assumed density of 3.46 persons per unit (i.e., an added population of 17,300). The City has amended to general plan to incorporate the specific plan~~.
[d] The general plan figure for Santa Clara is the average of the range projected in the general plan at buildout of 124,800 to 135,000.
[e] The SFPUC provides 100 percent of Redwood City's potable water. The remaining 8 percent of demand indicated here is met by recycled water.
[f] The city of San Mateo is served by the CWS–Mid-Peninsula District and Estero MID, both of which serve other jurisdictions as well; therefore, the 2030 population assumed by the wholesale customers is not comparable to projections for the city. The SFPUC supplies all of the CWS–Mid Peninsula District's and Estero MID's water.
[g] The customer-selected projection is the combined 2030 estimates for the CWS–South San Francisco District (which also serves Colma and a small portion of unincorporated San Mateo County), based on the 2004 demand study, and the Westborough Water District, based on the district's 2005 UWMP. The SFPUC would supply approximately 85 percent of the CWS–South San Francisco District's water supply in 2030 and 100 percent of Westborough Water District's. The other figures are for South San Francisco only.

SOURCES: ABAG, 2004; California Department of Finance, 2006; ~~Carrington, 2006;~~ City of East Palo Alto, 1999a; City of Fremont, 2003a; City of Hayward, 2002a; City of Milpitas, 2002a; City of Newark, 2002; City of Redwood City, 1990~~2007c~~; City of San Mateo, 2001; City of Santa Clara, 2002; City of Sunnyvale, 2002; City of Union City, 2002a; U.S. Census Bureau, 2000; U.S. Census Bureau, 2006; URS, 2004, Westborough Water District, 2005.

Appendix H

Appendix H1, page H1-10: The seventh sentence of the third full paragraph on the page is revised in response to a comment (see **Response SI_TRT-CWA-SierraC-174**).

> Studies suggest that there is a 30 percent chance that the SFPUC system will experience a drought in the next 75 years equal to or more severe than the 1987–1992 drought (Beck, 1994).

Appendix H1, page H1-39: The following text is added as the first reference in response to a comment (see **Response SI_TRT-CWA-SierraC-174**).

> Beck,R.W. *Design Drought Analysis*. Prepared for Modesto Irrigation District and Turlock Irrigation District, August 1994.

Appendix I

Appendix I, page I-3: The following consultant is added after "JRP Historical Consulting (Cultural Resources)" to reflect this consultant's contributions to the Comments and Reponses document.

Stratus Consulting (Climate Change, third party review)

P.O. Box 4059
Boulder, CO 80306-4059

- Joel B. Smith

October 30, 2008

Final
Program Environmental Impact Report
Volume 8 of 8

For the San Francisco Public Utilities Commission's
WATER SYSTEM IMPROVEMENT PROGRAM

Appendices J - O

San Francisco Planning Department File No. 2005.0159E
State Clearinghouse No. 2005092026

Draft PEIR Publication Date: June 29, 2007

Draft PEIR Public Hearing Dates:
September 5, 2007 in Sonora
September 6, 2007 in Modesto
September 18, 2007 in Fremont
September 19, 2007 in Palo Alto
September 20, 2007 in San Francisco
October 11, 2007 in San Francisco

Draft PEIR Public Comment Period: June 29, 2007 through October 15, 2007
Comments and Responses Publication Date: September 30, 2008
Final PEIR Certification Date: October 30, 2008

City and County of San Francisco
San Francisco Planning Department

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City and County of San Francisco
San Francisco Planning Department

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J. Draft PEIR Notification and Public Hearing Materials

APPENDIX J

Draft PEIR Notification and Public Hearing Materials

APPENDIX J1

Public Hearing Summary

Summary of WSIP Draft PEIR Notification and Public Hearings

The San Francisco Planning Department published the Draft Program Environmental Impact Report (PEIR) on the San Francisco Public Utilities Commission's Water System Improvement Program (WSIP) on June 29, 2007. The public comment period to review the Draft PEIR began on Friday, June 29, 2007 with submittal of the Draft PEIR to the State Clearinghouse and the issuance of the Notice of Availability (NOA). The Draft PEIR and NOA included notification of the public comment period and public hearings, and announced that public meetings were to be held on September 5, 6, 18, 19, and 20 and written comments were to be accepted to be through October 1, 2007. After the public hearing on September 20, the San Francisco Planning Department scheduled an additional public hearing for October 11 and extended the official public comment period to October 15, 2007.

Notification of Release of Draft PEIR

The San Francisco Planning Department notified agencies and the public in writing regarding about the availability of the Draft PEIR and the public hearing dates and locations. The notification provided details on the comment process. The following methods of notification were used:

Mailing List. A mailing list was compiled, including over 1600 contacts for direct mail and 300 for e-mail, representing affected federal, state, regional, and local agencies; federal, state, regional, and local elected officials; regional and local interest groups; member agencies of the Bay Area Water Supply and Conservation Agency (BAWSCA); other potentially affected water and irrigation districts; SFPUC Community Advisory Committee members; information repositories; media contacts; and individuals who attended the scoping and other past meetings on the WSIP PEIR.

Draft PEIR and NOA. On June 29th, printed copies of the Draft PEIR were distributed to 70 state and local agencies, and 15 hardcopies of the Draft PEIR Summary, 15 CDs containing the full Draft PEIR, and one hardcopy of the Notice of Completion were delivered to the State Clearinghouse. Copies of the Draft PEIR or CDs of the draft document were also sent to 365 additional organizations and individuals. In addition, a Notice of Availability (NOA) of the draft document was distributed via first-class mail to the entire mailing list.

Meeting Notification. Notice of the initial five public hearings was provided to individuals and the general public through the following means:

Direct mail of the NOA and notice of public hearings

- On 6/29/07 the NOA, including notice of public hearings, was sent by first class mail to a contact list of approximately 1,627 entities (individuals or organizations).
- On 8/27/07 a post card follow up notice of the public hearings and comment period was sent by first class mail to an expanded contact list of approximately 1,751 entities.

E-mail notice of NOA

- On 6/29-30/07 an electronic NOA and notice of public hearings was emailed to a list of 818 e-mails.
- On 8/24/07 a follow-up email notice of the public hearings and public comment period was sent to an expanded e-mail list of 1,124.
- On 10/8-9/07 an additional follow-up email notice of the public hearings and public comment period was sent to the e-mail list of 1,124 noticing the extended comment period and additional public hearing.

Legal Notices

Notices of the public hearings and information on how to obtain a copy of the Draft PEIR and provide public comment were placed and run in the legal classified section of the following newspapers on the following dates:

- Modesto Bee, 6/29/07 and 7/13/07
- Sonora Union Democrat, 7/2/07
- Stockton Record, 7/3/07
- San Francisco Chronicle, 6/29/07
- San Mateo County Times 6/29/07

Display Ads

Display ads with information about the public meetings and information on how to obtain a copy of the Draft PEIR and provide public comment were placed and run in the following newspapers on the following dates:

- Modesto Bee, 8/27/07
- Sonoma Union Democrat, 8/27/07
- Stockton Record, 9/10/07
- San Mateo County Times, 9/7/07
- SF Examiner, 9/10/07

Website

The SFPUC updated the WSIP PEIR webpage on sfwater.org (http://PEIR.sfwater.org) to include the NOA and notice of public hearings, and similar information was posted on the Planning Department’s website at www.sfgov.org/site/planning/mea.

Information Repositories

Printed copies of the Draft PEIR and associated reference materials (in some cases as noted below), as well as the NOA and notice of the public hearings were posted in the following locations:

- Alameda County/City of Fremont Library (copy of Draft PEIR and associated reference materials)
- San Francisco Main Library (copy of Draft PEIR and associated reference materials)
- Stockton – San Joaquin County Public Library (copy of Draft PEIR and associated reference materials)
- City of San Mateo Main Library (copy of Draft PEIR and associated reference materials)
- San Jose – Dr. Martin Luther King, Jr. Library (copy of Draft PEIR and associated reference materials)
- Modesto Library (copy of Draft PEIR and associated reference materials)
- San Francisco Planning Department (copy of Draft PEIR only is available)
- San Francisco Public Utilities Commission, by appointment (copy of Draft PEIR and associated reference materials)
- Tuolumne County Library (copy of Draft PEIR and associated reference materials)

In addition, a copy of the Draft PEIR was posted to www.sfgov.org/planning/mea on June 29th and a link on the http:PEIR.sfwater.org Web site directed viewers to the www.sfgov.org Web site for document review. Table J-1 presents a breakdown of the categories of recipients who were on the mailing list:

TABLE J-1
NUMBER OF RECIPIENTS ON MAILING LIST FOR DRAFT PEIR AND NOA

Category	Number of Recipients of Draft PEIR	Number of Recipients of Public Hearing Notices (NOA, E-notice and/or Postcard notice)	Number of Recipients of Public Hearing Notices and Draft PEIR
Federal Agencies/Elected Officials	25	70	95
State and Regional Agencies/Elected Officials	42	118	160
Local Agencies/Elected Officials	66	566	632
Water Agencies/Irrigation Districts	85	238	323
Special Interest and Environmental Groups	79	256	335
Businesses or other Organizations	64	83	147
Media, Libraries, and Individuals	76	166	242
TOTAL	**437**[a]	**1,497**[b]	**1,934**

[a] Received either printed copy or CD
[b] Received at least one notice (printed copy NOA, email notice, or postcard notice)

Public Hearings on Draft PEIR

The San Francisco Planning Department held public hearings at five locations along or near the SFPUC's regional water system during September 2007 and one public hearing in San Francisco in October 2007. The locations and dates of the meetings, and approximate number of attendees, are noted below.

1. Sonora: Wednesday, September 5, 2007 (Sonora Opera House)

Approximately 92 attendees based on sign-in sheets, including:

- Government agencies: Tuolumne County CAO's Office, Office of Congressman George Radanovich, Tuolumne County Board of Supervisors, Tuolumne Utilities District,
- Water agencies: Turlock Irrigation District, Bay Area Water Supply and Conservation Agency (BAWSCA)
- Environmental interests: Restore Hetch Hetchy, Tuolumne River Trust, Sierra Club, Stanislaus National Forest, California Native Plant Society, Review Trust, Land Trust, Audubon, Central Sierra Environmental Resource Center
- Commercial interests: Condor Earth Tech., Arta River Trips,
- Other interests: Bramlette Consulting, RHN, CSCN, Tuolumne County Farm Bureau
- Media: Clarke Broadcasting, KVMV, Star 92.7, 93.5 KKBN
- Public Citizens

25 total speakers (21 unique speakers since some speakers spoke more than once):

- Stan Kellog, Tuolumne County Farm Bureau
- Dolores Boutin, Tuolumne River Trust, Sierra Club, Save the Bay
- Cynthia King, Tuolumne River Trust
- Fred Boutin
- Nicole Sandkulla, Bay Area Water Supply and Conservation Agency
- Bob Hackamack, Restore Hetch Hetchy
- Jerry Cadagan
- Galen Weston, Tuolumne River Trust
- Darryl Bramlette, Bramlette Consulting
- Ellie Owen
- Patricia Elliott
- Jimmy Gado
- Pete Kampa, Tuolumne Utilities District
- Jon Sturtevant
- Ron Pickup
- Doris Grinn
- Jim Grinnell
- Noah Hughes
- Robert Gelman
- Joseph Day, Tuolumne Utilities District

2. Modesto: Thursday, September 6, 2007 (Thomas Downey High School Cafeteria)

Approximately 54 attendees based on sign-in sheet, including:

- Government agencies: Tuolumne River Regional Park, Stanislaus County, Stanislaus County Department of Environmental Resources, Waterford River Park, National Resource Conservation Service (NRCS),
- Water agencies: Turlock Irrigation District, Bay Area Water Supply and Conservation Agency (BAWSCA), California Department of Water Resources, Oakdale Irrigation District, Modesto Irrigation District
- Environmental interests: Tuolumne River Trust, Sierra Club
- Commercial interests:
- Other interests: Bramlette Consulting, GUM, Kronick Moskovitz Tiedemann & Girard, the Great Valley Museum
- Media: Modesto Bee, Capitol Press, Modesto Irrigation District
- Public Citizens

9 total speakers:

- Meg Gonzalez, Tuolumne River Trust
- Nicole Sandkulla, Bay Area Water Supply and Conservation Agency
- Darryl Bramlette, Bramlette Consulting
- Noah Hughes
- Patrick Koepele, Tuolumne River Trust
- Eric Wesselman, Tuolumne River Trust
- Walt Ward, Modesto Irrigation District
- Jean Taylor
- Sandra Wilson, Sierra Club

3. Fremont: Tuesday, September 18, 2007 (Fremont Main Library)

Approximately 36 attendees based on sign-in sheet, including:

- Government agencies: Office of Assembly Member Gene Mullin, Menlo Park Planning Commission, City of Fremont Planning, City of Daly City, City of Newark
- Water agencies: Alameda County Water District
- Environmental interests: Tuolumne River Trust, Sierra Club, Alameda Creek Alliance
- Commercial interests: The Shaw Group
- Other interests: League of Women Voters, Northern California Council-Federation of Fly Fishers
- Media: No members of the media were present
- Public Citizens

8 total speakers:

- John Cant
- Dave Ellison
- Eric Wesselman, Tuolumne River Trust
- Jeff Miller, Alameda Creek Alliance
- Robert Means
- William Noren
- Kirsten Keith, Menlo Park Planning Commission
- Lech Naumovich, California Native Plant Society

4. Palo Alto: Wednesday, September 19, 2007 (Avenidas Senior Center)

Approximately 87 attendees based on sign-in sheet, including:

- Government agencies: City of Sunnyvale, City of Menlo Park, City of Palo Alto, City of Brisbane, City of Mountain View
- Water agencies: Purissima Hills Water District, Stanford Utilities, Santa Clara Valley Water District, Coastside County Water District
- Environmental interests: Tuolumne River Trust, Sierra Club, Conexions.org, Valley of Hearts Delight, Acterra, California Native Plant Society
- Commercial interests:
- Other interests: Avenidas Senior Center, Somatic Recovery, League of Women Voters
- Media: Sonora Cable Access, The Almanac
- Officials: Kelly Fergusson
- Public Citizens

18 total speakers:

- Mary Jane Marcus
- Peter Drekmeier, Tuolumne River Trust
- Ramses Madou
- Dan Dippery
- Bill Young, Sierra Club
- Richard Zimmerman, Sierra Club
- Sidney Liebes
- Daniel Seidel, Purissima Hills Water District
- Claire Elliott
- Amy Fowler, Santa Clara Valley Water District
- Amy Adams
- Elliot Margolies
- Cedric de la Beavjardiere, Valley of Hearts Delight Conexions.org
- Katherine Forrest, Commonweal Institute
- Leah Rogers
- Jeb Eddy
- Kelly Fergusson, Menlo Park
- Len Materman

5. San Francisco: Thursday, September 20, 2007 (San Francisco Planning Commission)

San Francisco Public Hearings were held as part of the San Francisco Planning Commissions regularly scheduled meetings. Therefore, attendance tracking was not available.

18 total speakers:

- John Barbey
- Steven Miller, BAWSCA
- Gwynn MacKellen, Sierra Club
- Tony Ganter, District 3 Democratic Club
- Cindy Charles , Golden West Women Fly Fishers
- Tomer Hasson
- Eric Wesselman, Tuolumne River Trust
- Jennifer Clary, Clean Water Action
- Jenna Olsen
- Johnn Rizzo, Sierra Club-San Francisco Bay Chapter
- Joan Girardot, Coalition for San Francisco Neighborhoods
- Bernie Chodeu
- Ann Clark
- Shawna Gokener
- Emeric Kalman
- Silvia Johnson
- June Bug
- Denise Dougherty

6. San Francisco: Thursday, October 11, 2007 (San Francisco Planning Commission)

San Francisco Public Hearings were held as part of the San Francisco Planning Commissions regularly scheduled meetings. Therefore, attendance tracking was not available.

3 total speakers:

- Peter Drekmeier, Tuolumne River Trust
- Art Jensen, Bay Area Water Supply and Conservation Agency
- John Rizzo, Sierra Club

APPENDIX J2

Mailing List

TABLE J-2
WSIP DRAFT PEIR MAILING LIST

#	Last Name	First Name	Title	Affiliation	City	State	Copies
1.				Act Now Productions	San Francisco	CA	NOA
2.	Closson	Michael	Executive Director	Acterra	Palo Alto	CA	NOA
3.	Marr	Melody	Chief Executive Officer	Alameda Chamber of Commerce	Alameda	CA	NOA
4.	De Costa	Manny		Alameda County Flood Control & Water Conservation District	Hayward	CA	DPEIR CD
5.	Gill	Elisa		Alameda County Flood Control & Water Conservation District	Hayward	CA	NOA
6.	Johnson	Ralph		Alameda County Flood Control & Water Conservation District	Hayward	CA	NOA
7.	Kidd	Laura		Alameda County Flood Control & Water Conservation District	Hayward	CA	NOA
8.	Schultheis	Carla		Alameda County Flood Control & Water Conservation District	Hayward	CA	NOA
9.	Sweet	Karen	Executive Officer	Alameda County Resource Conservation District	Livermore	CA	NOA
10.	Cartwright	Eric		Alameda County Water District	Fremont	CA	NOA
11.	Chun	Doug		Alameda County Water District	Fremont	CA	NOA DPEIR
12.	Hidas	Laura		Alameda County Water District	Fremont	CA	NOA
13.	Niesar	Thomas		Alameda County Water District	Fremont	CA	NOA
14.	Piraino	Paul	General Manager	Alameda County Water District	Fremont	CA	NOA CD
15.	Piraino	Paul	Operations Manager	Alameda County Water District	Fremont	CA	NOA CD
16.	Shaver	Robert		Alameda County Water District	Fremont	CA	NOA
17.	Stinson	Karl	Operations Manager	Alameda County Water District	Freemont	CA	CD
18.	Weed	John	Director	Alameda County Water District	Fremont	CA	NOA
19.	Cant	John		Alameda Creek Alliance	Fremont	CA	NOA CD
20.	Chaiken	Alison		Alameda Creek Alliance	Fremont	CA	NOA CD
21.	Cimino	Rich		Alameda Creek Alliance	Pleasanton	CA	NOA CD
22.	Kanz	Ralph		Alameda Creek Alliance	Oakland	CA	NOA
23.	Lorelli	Jeff		Alameda Creek Alliance	Fremont	CA	NOA CD
24.	Miller	Jeff	Director	Alameda Creek Alliance	Canyon	CA	NOA DPEIR
25.	Gunther	Andrew		Alameda Creek Alliance Fisheries Restoration Workgroup, CEMAR	Oakland	CA	NOA DPEIR
26.	B.	J.		Alameda-Contra Costa Transit District (AC Transit)	Fremont	CA	NOA
27.	Williams	Al		Alfred Williams Consultancy, LLC	San Francisco	CA	NOA
28.	Clary	Jennifer	Chair	Alliance for a Clean Waterfront	San Francisco	CA	NOA DPEIR

NOA = Notice of Availability
DPEIR = hard copy of the Draft PEIR
CD = Draft PEIR CD
Summary = Summary of Draft PEIR

TABLE J-2 (Continued)
WSIP PEIR MAILING LIST

#	Last Name	First Name	Title	Affiliation	City	State	Copies
29.				Alliance of California Tribes			NOA
30.	Grich	Wynn		Alternative Technology of Water Nationally (ATOWN)	Fremont	CA	NOA DPEIR CD
31.				Amador Livermore Valley Historical Society	Pleasanton	CA	NOA
32.	Samarzes	Louis		American Association of Retired Persons	San Francisco	CA	NOA
33.	O'Driscoll	Margie	Executive Director	American Institute of Architects	San Francisco	CA	NOA
34.	Maclin	Elizabeth		American Rivers	Washington	DC	NOA
35.	Rothert	Steve	Director	American Rivers	Fairfax	CA	NOA
36.				Aquatic Outreach Institute	Richmond	CA	NOA
37.	Collup	Steven	General Manager	Arvin-Edison Water Storage District	Arvin	CA	CD
38.	Lo	Lily		Asian and Pacific Islander Biz and Info Services	San Francisco	CA	NOA
39.	Chen H.	Basilio	Chairman/CEO	Asian Business Association	San Francisco	CA	NOA
40.	So	Kitty	Executive Director	Asian Business League	San Francisco	CA	NOA
41.	Gaffney	Maureen	Planner	Association of Bay Area Governments	Oakland	CA	NOA
42.	Gardner	Henry J.	Executive Director	Association of Bay Area Governments	Oakland	CA	NOA
43.	Perry	Patricia	Senior Regional Planner	Association of Bay Area Governments	Oakland	CA	NOA
44.	Ryder	Suzan		Association of Bay Area Governments	Oakland	CA	NOA
45.	Scandone	Ceil	Senior Regional Planner	Association of Bay Area Governments	Oakland	CA	NOA
46.	Thompson	Laura	Project Manager	Association of Bay Area Governments	Oakland	CA	NOA
47.	Hall	Steve	Executive Director	Association of California Water Agencies	Sacramento	CA	NOA
48.	Olson	Glenn	Sr. Vice President, Executive Director	Audubon California	Sacramento	CA	NOA
49.			President	Audubon Society	Hayward	CA	NOA
50.			President	Audubon Society	Cupertino	CA	NOA
51.	Williams	Mike	President	Audubon Society	Walnut Creek	CA	NOA
52.	Murphy	Janet	President	Audubon Society, Central Sierra	Sonora	CA	NOA
53.	Murdock	Elizabeth	Executive Director	Audubon Society, Golden Gate	Berkeley	CA	NOA
54.	Saddler	Eli		Audubon Society, Golden Gate	Berkeley	CA	NOA CD
55.				Audubon Society, Mt. Diablo	Walnut Creek	CA	NOA
56.			Executive Director	Audubon Society, Ohlone	Hayward	CA	NOA
57.	Gordon	Pat		Audubon Society, Ohlone	Hayward	CA	NOA

NOA = Notice of Availability
DPEIR = hard copy of the Draft PEIR
CD = Draft PEIR CD
Summary = Summary of Draft PEIR

TABLE J-2 (Continued)
WSIP PEIR MAILING LIST

#	Last Name	First Name	Title	Affiliation	City	State	Copies
58.	Cariss	Scott Bryon		Audubon Society, Redwood City	Bayside	CA	NOA CD
59.	Breon	Craig		Audubon Society, Santa Clara Valley	Cupertino	CA	NOA
60.	Torres-Barreto	Brenda	Executive Director	Audubon Society, Santa Clara Valley	Cupertino	CA	NOA
61.			Executive Director	Audubon Society, Sequoia	Woodside	CA	NOA
62.	Smith	Robin		Audubon Society, Sequoia	Atherton	CA	NOA
63.	Froba	Dave	President	Audubon Society, Stanislaus	Modesto	CA	NOA
64.				Baker, Manock & Jensen	Fresno	CA	NOA
65.	Bartkiewicz	Paul M.		Bartkiewicz, Kronick & Shanahan	Sacramento	CA	CD
66.	Lee	Robert		Battle Creek Watershed Conservancy	Manton	CA	CD
67.				Bay Area Air Quality Management District	San Francisco	CA	NOA
68.	Broadbent	Jack	Executive Officer	Bay Area Air Quality Management District	San Francisco	CA	NOA DPEIR
69.	Romaidis	Mary	Clerk of the Board	Bay Area Air Quality Management District	San Francisco	CA	NOA CD
70.	Steinberger	Joseph		Bay Area Air Quality Management District	San Francisco	CA	NOA
71.	Pickett	Karen		Bay Area Coalition for Headwaters	Berkeley	CA	NOA
72.				Bay Area Council	San Francisco	CA	NOA
73.	Wunderman	Jim	President & CEO	Bay Area Council	San Francisco	CA	NOA
74.	Mendonca	Lenny	Chairman	Bay Area Economic Forum	San Francisco	CA	NOA
75.	Randolph	R. Sean	President & CEO	Bay Area Economic Forum	San Francisco	CA	NOA
76.			President	Bay Area Inter-League Organization	Oakland	CA	NOA
77.	Capps	BC		Bay Area Open Space Council	Santa Rosa	CA	NOA
78.	Woodbury	John	Director	Bay Area Open Space Council	San Francisco	CA	NOA
79.			Attn: Board of Directors	Bay Area Rapid Transit District	Oakland	CA	NOA
80.	Cohen	Stuart	Executive Director	Bay Area Transportation and Land Use Coalition	Oakland	CA	NOA
81.	Bornstein	Michael		Bay Area Water Stewards	Berkeley	CA	NOA DPEIR
82.	Jensen	Arthur	General Manager	Bay Area Water Supply & Conservation Agency	San Mateo	CA	NOA DPEIR
83.	Pink	Benjamin		Bay Area Water Supply & Conservation Agency	San Mateo	CA	NOA
84.	Sandkulla	Nicole	Senior Water Resource Engineer	Bay Area Water Supply & Conservation Agency	San Mateo	CA	NOA DPEIR CD
85.	Ummel	John		Bay Area Water Supply & Conservation Agency	San Mateo	CA	NOA CD

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WSIP PEIR MAILING LIST**

#	Last Name	First Name	Title	Affiliation	City	State	Copies
86.	Travis	Will	Executive Director	Bay Conservation & Development Commission	San Francisco	CA	NOA
87.				Baykeeper San Francisco	San Francisco	CA	NOA
88.	Coxey	David	General Manager	Bella Vista Water District	Redding	CA	NOA CD
89.	Wilkinson	Gregory		Best, Best & Kreiger LLP	Riverside	CA	NOA CD
90.	Johnson	Erik	President	Bicycle Trails Council of the East Bay	Berkeley	CA	NOA
91.	Corlett	Adrian		BKF Engineers	Redwood City	CA	NOA
92.	Maddow	Robert B.		Bold, Polisner, Maddow, Nelson & Judson	Walnut Creek	CA	NOA CD
93.	Bramlette	Darryl		Bramlette Consulting	Jamestown	CA	NOA DPEIR
94.	Kerwin	Brad	President	Brisbane Chamber of Commerce	Brisbane	CA	NOA
95.	Webb	Dick	General Menager	Broadview Water District	Oakhurst	CA	NOA CD
96.	Maylor	Georgette	President & CEO	Burlingame Chamber of Commerce	Burlingame	CA	NOA
97.				CA Air Resources Board	Sacramento	CA	NOA DPEIR CD
98.	Nielson	Julie		CA Assemblymember Alberto Torrico	Fremont	CA	NOA
99.	Fuchs	Ben		CA Assemblymember Gene Mullin	San Mateo	CA	NOA
100.				CA Bay Delta Authority	Sacramento	CA	NOA
101.				CA Bay Delta Authority	Sacramento	CA	NOA CD
102.	Grindstaff	Joe	Acting Director	CA Bay-Delta Authority, CALFED Bay-Delta Program	Sacramento	CA	NOA
103.	Winternitz	Leo		CA Bay-Delta Authority, CALFED Bay-Delta Program	Sacramento	CA	NOA CD
104.	Bowen	Michael	Coastal Project Manager	CA Coastal Conservancy	Oakland	CA	NOA
105.	Buxton	Brenda		CA Coastal Conservancy	Oakland	CA	NOA
106.	Hutzel	Amy		CA Coastal Conservancy	Oakland	CA	NOA
107.	Fiack	Linda	Executive Director	CA Delta Protection Commission	Walnut Grove	CA	NOA
108.	Tsuneyoshi	Raynor T.	Director	CA Dept. of Boating & Waterways	Sacramento	CA	NOA
109.	Sareeram	Debbie	Deputy Director	CA Dept. of Conservation	Sacramento	CA	NOA CD
110.	Atkinson	Kristine		CA Dept. of Fish & Game	Santa Cruz	CA	NOA
111.	Broddrick	Ryan	Director	CA Dept. of Fish & Game	Sacramento	CA	NOA CD
112.	Jacobs	Diana F.	Deputy Director	CA Dept. of Fish & Game	Sacramento	CA	NOA
113.	Loudermilk	Bill	Regional Manager	CA Dept. of Fish & Game	Fresno	CA	CD
114.	Martinelli	Greg		CA Dept. of Fish & Game	Yountville	CA	DPEIR

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#	Last Name	First Name	Title	Affiliation	City	State	Copies
115.	Mitchell	Dale		CA Dept. of Fish & Game	Fresno	CA	NOA
116.	Smith	Kent	Acting Assistant Regional Manager	CA Dept. of Fish & Game	Rancho Cordova	CA	NOA
117.	Vouchilas	Cathie		CA Dept. of Fish & Game	Sacramento	CA	CD
118.	Wilcox	Carl		CA Dept. of Fish & Game	Napa	CA	NOA CD
119.	Herrgesell	Perry L.		CA Dept. of Fish & Game, Central Valley Bay-Delta Branch	Stockton	CA	NOA CD
120.	Murray	Nancee M.		CA Dept. of Fish & Game, Legal Affairs Div.	Modesto	CA	CD
121.	Wilson	Dan		CA Dept. of Fish and Game	Napa	CA	NOA DPEIR
122.	Kawamura	A.G.	Secretary	CA Dept. of Food & Agriculture	Sacramento	CA	NOA
123.	Ferreira	John	Unit Chief	CA Dept. of Forestry & Fire Protection	Felton	CA	NOA
124.	Geldert	Dale	Director	CA Dept. of Forestry & Fire Protection	Sacramento	CA	NOA
125.	Hoehman	Bill	Northern Region Chief	CA Dept. of Forestry & Fire Protection	Santa Rosa	CA	NOA
126.	McVay	Fred	Unit Chief	CA Dept. of Forestry & Fire Protection	San Andrea	CA	NOA
127.	Turner	Tim	Southern Region Chief	CA Dept. of Forestry & Fire Protection	Fresno	CA	NOA
128.	Woodill	Steve	Unit Chief	CA Dept. of Forestry & Fire Protection	Morgan Hill	CA	NOA
129.			Regional Director	CA Dept. of Health & Human Services	San Francisco	CA	NOA CD
130.				CA Dept. of Health Services	Sacramento	CA	NOA
131.	Forbes	Cindy	Southern California Field Operations Branch Chief	CA Dept. of Health Services	Fresno	CA	NOA CD
132.	Graham	Betty	District Engineer	CA Dept. of Health Services	Richmond	CA	NOA DPEIR
133.	Holtquist	Robert	Northern California Field Operations Branch Chief	CA Dept. of Health Services	Sacramento	CA	NOA CD
134.	Shewry	Sandra	Director	CA Dept. of Health Services	Sacramento	CA	NOA
135.	Coleman	Ruth	Director	CA Dept. of Parks & Recreation	Sacramento	CA	NOA
136.	Rayburn	Richard	Chief	CA Dept. of Parks & Recreation	Sacramento	CA	NOA
137.	Willard	Charlie	Statewide Trails Coordinator	CA Dept. of Parks & Recreation	Sacramento	CA	NOA
138.	Robinson	Leonard	Director	CA Dept. of Toxic Substances Control	Sacramento	CA	NOA
139.	Sable	Tim		CA Dept. of Transportation	Oakland	CA	NOA
140.	Sable	Timothy	District 4 Branch Chief	CA Dept. of Transportation	Oakland	CA	NOA DPEIR CD
141.	Sanatkar	Amir H.		CA Dept. of Transportation	Oakland	CA	NOA

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#	Last Name	First Name	Title	Affiliation	City	State	Copies
142.	Shridhar	Nandini N.		CA Dept. of Transportation	Oakland	CA	NOA CD
143.	Treulufian	Helen		CA Dept. of Transportation - Planning	Sacramento	CA	NOA
144.	Ajise	Kome	District Director	CA Dept. of Transportation, District 10	Stockton	CA	NOA
145.	Browne	Joe	District Director	CA Dept. of Transportation, District 4	Oakland	CA	NOA
146.	Colarusso	Al	Assoc. Transportation Engineer	CA Dept. of Transportation, District 4	Oakland	CA	NOA
147.	Mehta	Tim	Sr. Transportation Engineer	CA Dept. of Transportation, District 4	Oakland	CA	NOA
148.	Bardini	Gary		CA Dept. of Water Resources	Sacramento	CA	NOA
149.	Crothers	Cathy		CA Dept. of Water Resources	Sacramento	CA	CD
150.	Johns	Jerry	Deputy Director Water Resource Planning and Management	CA Dept. of Water Resources	Sacramento	CA	NOA
151.	Rangchi	Amir H.		CA Dept. of Water Resources	Sacramento	CA	CD
152.	Snow	Lester	Director	CA Dept. of Water Resources	Sacramento	CA	CD
153.	Spence	Jim		CA Dept. of Water Resources	Sacramento	CA	NOA
154.	Torres	Ralph		CA Dept. of Water Resources	Sacramento	CA	CD
155.	Torgersen	Carl		CA Dept. of Water Resources, SWP Operations Control Office	Sacramento	CA	CD
156.	Hart	Earl	Sr. Geologist	CA Division of Mines & Geology	Sacramento	CA	NOA
157.	Therkelsen	Robert L.	Executive Director	CA Energy Commission	Sacramento	CA	NOA
158.	Walsh	Sean	Director	CA Governor's Office of Planning & Research	Sacramento	CA	NOA
159.	Howlwein	Reinhard		CA Integrated Waste Management Board	Sacramento	CA	NOA
160.	Hohlwein	Reinhard		CA Integrated Waste Mgt Board	Sacramento	CA	NOA
161.	O'Leary	Sue		CA Integrated Waste Mgt Board	Sacramento	CA	NOA
162.	Jordan	Jerry	Executive Director	CA Municipal Utilities Association	Sacramento	CA	NOA
163.				CA Native American Heritage Commission	Sacramento	CA	NOA DPEIR
164.	Cahill	Virginia A.		CA Office of Attorney General	Sacramento	CA	CD
165.	Mellon, SHPO	Knox		CA Office of Historic Preservation	Sacramento	CA	NOA
166.	Donaldson	Milford Wayne	FAIA, SHPO	CA Office of Historic Preservation - Department of Parks and Recreation	Sacramento	CA	NOA
167.	Chu	Kristina		CA Office of Senator Leland Yee	San Francisco	CA	NOA
168.	Campbell	Matthew R.		CA Office of the Attorney General	Sacramento	CA	CD
169.				CA Parks and Recreation, Diablo Valley District	Petaluma	CA	NOA DPEIR CD
170.	Brown	Geoffrey F.	Commissioner	CA Public Utilities Commission	San Francisco	CA	NOA

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#	Last Name	First Name	Title	Affiliation	City	State	Copies
171.	Grueneich	Dian M.	Commissioner	CA Public Utilities Commission	San Francisco	CA	NOA
172.	Kennedy	Susan P.	Commissioner	CA Public Utilities Commission	San Francisco	CA	NOA
173.	Peevey	Michael R.	Commissioner	CA Public Utilities Commission	San Francisco	CA	NOA
174.	Gowdy	Mark		CA Regional Water Quality Control Board	Rancho Cordova	CA	CD
175.	Wolfe	Bruce H.	Executive Officer	CA Regional Water Quality Control Board	Oakland	CA	NOA
176.	Pinkos	Thomas R.	Executive Officer	CA Regional Water Quality Control Board, Central Valley Region	Rancho Cordova	CA	CD
177.				CA Regional Water Quality Control Board, San Francisco Bay Region	Oakland	CA	NOA
178.	Elias	Dave		CA Regional Water Quality Control Board, San Francisco Bay Region	Oakland	CA	NOA DPEIR
179.	Fernandez	Xavier		CA Regional Water Quality Control Board, San Francisco Bay Region	Oakland	CA	NOA DPEIR
180.	Kolb	Larry	Assistant Executive Officer	CA Regional Water Quality Control Board, San Francisco Bay Region	Oakland	CA	NOA
181.	Lee	Shin-Roei	South Bay Watershed Management Division Chief	CA Regional Water Quality Control Board, San Francisco Bay Region	Oakland	CA	NOA
182.	Lundgren	Anders	Senior WRCE - San Mateo/Santa Clara Counties	CA Regional Water Quality Control Board, San Francisco Bay Region	Oakland	CA	NOA
183.	Mumley	Tom	TMDL & Planning Division Chief	CA Regional Water Quality Control Board, San Francisco Bay Region	Oakland	CA	NOA
184.	Wines	Brian		CA Regional Water Quality Control Board, San Francisco Bay Region	Oakland	CA	NOA CD
185.	Wolfenden	John	Senior WRCE - Alameda/Santa Clara Counties	CA Regional Water Quality Control Board, San Francisco Bay Region	Oakland	CA	NOA
186.	Elias	Dave		CA Regional Water Quality Control, Central Valley Region	Sacramento	CA	NOA DPEIR
187.	Fernandez	Xavier		CA Regional Water Quality Control, Central Valley Region	Sacramento	CA	NOA DPEIR
188.	Lichten	Keith		CA Regional Water Quality Control, Central Valley Region	Sacramento	CA	NOA DPEIR
189.	Muhl	Rich	Storm Water Unit	CA Regional Water Quality Control, Central Valley Region	Rancho Cordova	CA	NOA CD
190.	Vaghn	Greg		CA Regional Water Quality Control, Central Valley Region	Fresno	CA	CD
191.	Amodio	John	Assistant Secretary of Ecological Management	CA Resources Agency	Sacramento	CA	NOA
192.	Chrisman	Mike	Secretary for Resources	CA Resources Agency	Sacramento	CA	NOA
193.	Jones	Lucile	Chairperson	CA Seismic Safety Commission	Sacramento	CA	NOA
194.	Ma	Fiona	Assemblywoman, Majority Whip	CA State Assembly , District 12	Sacramento	CA	NOA
195.	Wolk	Lois	Chair	CA State Assembly Standing Committee	Sacramento	CA	NOA

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#	Last Name	First Name	Title	Affiliation	City	State	Copies
196.	Leno	Mark	Assembly Member	CA State Assembly, District #13	San Francisco	CA	NOA
197.	Houston	Guy	Assembly Member	CA State Assembly, District #15	Sacramento	CA	NOA
198.	Villines	Michael N.	Assembly Republican Leader	CA State Assembly, District #29	Sacramento	CA	NOA
199.	DeSaulnier	Mark	Assemblyman	CA State Assembly, District 11	Sacramento	CA	NOA
200.	Saulnier	Mark	Assemblyman	CA State Assembly, District 11	Sacramento	CA	NOA
201.	Leno	Mark	Assemblyman	CA State Assembly, District 13	Sacramento	CA	NOA
202.	Leno	Mark	Assemblyman	CA State Assembly, District 13	Sacramento	CA	NOA
203.	Swanson	Sandra	Assemblyman	CA State Assembly, District 16	Sacramento	CA	NOA
204.	Hayashi	Mary	Assemblywoman, Assistant Majority Whip	CA State Assembly, District 18	Sacramento	CA	NOA
205.	Mullin	Gene	Assemblyman	CA State Assembly, District 19	San Mateo	CA	NOA
206.	Mullin	Gene	Assemblyman	CA State Assembly, District 19	Sacramento	CA	NOA
207.	Torrico	Alberto	Assemblyman	CA State Assembly, District 20	Fremont	CA	NOA
208.	Torrico	Alberto	Assemblyman	CA State Assembly, District 20	Sacramento	CA	NOA
209.	Ruskin	Ira	Assemblyman	CA State Assembly, District 21	Los Altos	CA	NOA
210.	Ruskin	Ira	Assemblyman	CA State Assembly, District 21	Sacramento	CA	NOA
211.	Lieber	Sally	Assemblywoman	CA State Assembly, District 22	Mountain View	CA	NOA
212.	Lieber	Sally	Assemblywoman	CA State Assembly, District 22	Sacramento	CA	NOA
213.	Coto	Joe	Assemblyman	CA State Assembly, District 23	San Jose	CA	NOA
214.	Coto	Joe	Assemblyman	CA State Assembly, District 23	Sacramento	CA	NOA
215.	Beall	Jim	Assemblyman	CA State Assembly, District 24	Sacramento	CA	NOA
216.	Berryhill	Tom	Assemblyman	CA State Assembly, District 25	Modesto	CA	NOA
217.	Berryhill	Tom	Assemblyman	CA State Assembly, District 25	Sacramento	CA	NOA
218.	Caballero	Anne M.	Assemblywoman	CA State Assembly, District 28	Sacramento	CA	NOA
219.	Gaines	Ted	Assemblyman	CA State Assembly, District 4	Sacramento	CA	NOA
220.	Evans	Noreen	Assemblywoman, Democratic Caucus Chair	CA State Assembly, District 7	Santa Rosa	CA	NOA
221.	Evans	Noreen	Assemblywoman, Democratic Caucus Chair	CA State Assembly, District 7	Sacramento	CA	NOA
222.	Hancock	Loni	Assembly Member	CA State Assembly, District #14	El Cerrito	CA	NOA
223.	Wolk	Lois	Assemblywoman	CA State Assembly, District 8	Vacaville	CA	NOA
224.	Wolk	Lois	Assemblywoman	CA State Assembly, District 8	Sacramento	CA	NOA
225.				CA State Clearinghouse	Sacramento	CA	NOA DPEIR CD
226.				CA State Lands Commission	Sacramento	CA	NOA DPEIR CD
227.	Jenkins	Stephen L.	Assistant Chief, Division of Planning	CA State Lands Commission	Sacramento	CA	NOA DPEIR CD

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228.	Thayer	Paul	Executive Director	CA State Lands Commission	Sacramento	CA	NOA CD
229.	Corbett	Ellen	State Senator	CA State Senate, District #10	Sacramento	CA	NOA
230.	Simitian	Joe	State Senator	CA State Senate, District #11	Sacramento	CA	NOA
231.	Denham	Jeff	State Senator	CA State Senate, District #12	Sacramento	CA	NOA
232.	Alquist	Elaine	State Senator	CA State Senate, District #13	San Jose	CA	NOA
233.	Alquist	Elaine	State Senator	CA State Senate, District #13	Sacramento	CA	NOA
234.	Cogdill	Dave	State Senator	CA State Senate, District #14	Sacramento	CA	NOA
235.	Kuehl	Sheila	State Senator	CA State Senate, District #23	Sacramento	CA	NOA
236.	Migden	Carole	State Senator	CA State Senate, District #3	San Francisco	CA	NOA
237.	Migden	Carole	State Senator	CA State Senate, District #3	Sacramento	CA	NOA
238.	Machado	Michael	State Senator	CA State Senate, District #5	Sacramento	CA	NOA
239.	Torlakson	Tom	State Senator	CA State Senate, District #7	Concord	CA	NOA
240.	Yee Ph.d.	Leland	State Senator	CA State Senate, District #8	San Francisco	CA	NOA
241.	Perata	Don	State Senator	CA State Senate, District #9	Sacramento	CA	NOA
242.	Cantu	Celeste	Executive Director	CA State Water Resources Control Board	Sacramento	CA	NOA CD
243.	Herrera	Steve	Chief, Environmental Section	CA State Water Resources Control Board	Sacramento	CA	NOA DPEIR
244.	Jackson	Donielle		CA State Water Resources Control Board	Sacramento	CA	DPEIR
245.	Martinson	Stan	Division Chief	CA State Water Resources Control Board	Sacramento	CA	NOA
246.	Mrowka	Katherine	Chief, Watershed Unit 3	CA State Water Resources Control Board	Sacramento	CA	NOA CD
247.	Dickinson	Mary Ann	Executive Director	CA Urban Water Conservation Council	Sacramento	CA	NOA CD
248.	Wright	Al	Executive Director	CA Wildlife Conservation Board	Sacramento	CA	NOA
249.	Gray	Diane	Executive Director	Calaveras County Chamber	Angels Camp	CA	NOA
250.	Turner	L. Alan	General Manager	Calaveras County Water District	San Andreas	CA	NOA
251.	Granville	Simon		Calaveras County Water District Green	San Andreas	CA	NOA CD
252.	Goffe	Gary L.	Manager	Calaveras Public Utility District	San Andrea	CA	NOA
253.	Van de Brooke	Tomi	Director, Land Use and Water Policy	California Alliance for Jobs	Emeryville	CA	NOA
254.	Miller	Keith	Owner	California Canoe & Kayak, Inc.	Oakland	CA	NOA CD
255.	Nelson	Mark	President	California Cattleman's Association	Sacramento	CA	NOA
256.	Zaremberg	Allan	President & CEO	California Chamber of Commerce	Sacramento	CA	CD
257.	Francois	Anthony L.	Director, Water Resources	California Farm Bureau Federation	Sacramento	CA	CD
258.	Southwick	Brenda Jahns		California Farm Bureau Federation, Natural Resources & Envior Div.	Sacramento	CA	NOA CD

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259.	Johnson	Doug		California Invasive Plant Council	Berkeley	CA	NOA
260.	Duncan	Jeanne	Executive Director	California Irrigation Institute	Sacramento	CA	NOA
261.	Smartt	Susan	Executive Director	California League of Conservation Voters	Oakland	CA	NOA
262.	Middlebrook	Alrie		California Native Garden Foundation	San Jose	CA	NOA
263.				California Native Plant Society	San Francisco	CA	NOA
264.	Fenerty	Judy	President	California Native Plant Society	Palo Alto	CA	NOA
265.	Jackson	Elaine P.	President	California Native Plant Society	Martinez	CA	NOA
266.	Lucas	Libby		California Native Plant Society	Los Altos	CA	NOA DPEIR
267.	Muick	Pam	Executive Director	California Native Plant Society	Sacramento	CA	NOA
268.	Olson	Jessica		California Native Plant Society	Woodacre	CA	NOA
269.	Olson	Jessica Jean	East Bay Conservation Analyst	California Native Plant Society	Sacramento	CA	NOA
270.				California Native Plant Society, East Bay Chapter	Berkeley	CA	NOA
271.	Boutin	Dolores		California Native Plant Society, Tulolume River Trust, Sierra Club	Tuoulmne	CA	NOA CD
272.	Boutin	Fred		California Native Plant Society, Tulolume River Trust, Sierra Club	Tulomne	CA	NOA CD
273.	Cobb	Janet		California Oak Foundation	Oakland	CA	NOA
274.	Beuttler	John		California Sportfishing Protection Alliance	Berkeley	CA	NOA
275.	Crenshaw	Jim		California Sportfishing Protection Alliance	Woodland	CA	NOA CD
276.	Real	Jim	President	California State Horseman's Association	Riverside	CA	NOA
277.	Quesenberry	David	President	California Striped Bass Association	Modesto	CA	NOA
278.	Sorenson	Jay	Director	California Striped Bass Association	Stockton	CA	NOA
279.				California Trout	San Francisco	CA	NOA
280.	Stranko	Brian	Executive Director	California Trout	San Francisco	CA	NOA
281.	Macaulay	Steve	Executive Director	California Urban Water Agencies	Sacramento	CA	NOA CD
282.	Pettit	Walt		California Urban Water Agencies	Sacramento	CA	NOA
283.				California Water Association	San Francisco	CA	NOA CD
284.	Guzzetta	Rob	Vice-President, Operations	California Water Service Co.	San Jose	CA	NOA
285.	Duncan	Darin		California Water Service Company	Atherton	CA	NOA
286.	Nelson	Peter	President & CEO	California Water Service Company	San Jose	CA	NOA
287.	Weber	Jeanette		California Water Service Company	Atherton	CA	NOA
288.				California Wildlife Federation	Sacramento	CA	NOA

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289.	Murphy	John		Cal-Trout	Riverbank	CA	NOA
290.	Davis	Matt		Cary and Company	San Francisco	CA	NOA
291.	Sugaya	Hisashi		Cary and Company	San Francisco	CA	NOA
292.				Castro Valley Forum		CA	NOA
293.	Aldenhuysen	Rob		CEMEX	Pleasanton	CA	NOA
294.	Schipper	Louis B.		CEMEX	Pleasanton	CA	NOA
295.	Finkelstein	Michael	Executive Director	Center for Biological Diversity	San Francisco	CA	NOA
296.	Galvin	Peter	Conservation Director	Center For Biological Diversity	San Francisco	CA	NOA
297.	Selkirk	Mary		Center for Collaborative Policy	Berkeley	CA	NOA
298.	Becker	Gordon		Center for Ecosystem Management and Restoration	Oakland	CA	NOA
299.				Centerville Business Association	Fremont	CA	NOA
300.	Schuler	Kathleen		Centerville Business Association	Fremont	CA	NOA
301.	Greathouse	Elizabeth A.	Coordinator	Central California Information Center - Department of Anthropology, California State University Stanislaus	Turlock	CA	NOA DPEIR
302.	Roberts	Reid W.		Central San Joaquin Water Cons. Dist.	Stockton	CA	NOA CD
303.	Buckley	John	Executive Director	Central Sierra Environmental Resource Center	Twain Harte	CA	NOA DPEIR
304.	Whited	Brenda	Staff Biology	Central Sierra Resource Center	Twain Harte	CA	NOA
305.	Tellefson	Warren P.		Central Valley Clean Water Association	Auburn	CA	NOA CD
306.			Director	Central Valley Project Water Association	Sacramento	CA	NOA
307.	Tillman	Terri	CEO	Ceres Chamber of Commerce	Ceres	CA	NOA
308.	Chi	Peter		Chinese American Association of Commerce	San Francisco	CA	NOA
309.	Pak	Rose	General Consultant	Chinese Chamber of Commerce	San Francisco	CA	NOA
310.	Welsh	Douglas	General Menager	Chowchilla Water District	Chowchilla	CA	CD
311.	Nocito	Andrea	Project Associate	CirclePoint	San Francisco	CA	NOA
312.	Ortiz	Julie	Senior Project Manager	CirclePoint	San Francisco	CA	NOA
313.	Strumwasser	Ben	Principal	CirclePoint	San Francisco	CA	NOA
314.	Allen	Charles		Citizen	Belmont	CA	NOA
315.	Altamirano	Gino		Citizen	San Francisco	CA	DPEIR CD
316.	Appel	Deirdre		Citizen	San Francisco	CA	NOA
317.	Armstrong	Beth		Citizen	Fremont	CA	NOA
318.	Baiocchi	Robert J.	Consultant	Citizen	Graeagle	CA	CD
319.	Baker	R. Inez		Citizen	Palo Alto	CA	NOA DPEIR

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320.	Bauer	Jonathan		Citizen	San Francisco	CA	NOA
321.	Belton	Bruce L.	Attorney at Law	Citizen	Redding	CA	CD
322.	Birenbaum	Ann		Citizen	San Francisco	CA	NOA
323.	Blume	Scott		Citizen			NOA DPEIR
324.	Bonte	Gary		Citizen	Redwood City	CA	NOA
325.	Bossak	Patrycja	Bay Trail Planner	Citizen	Oakland	CA	DPEIR
326.	Bowman	Lora		Citizen	San Francisco	CA	NOA
327.	Breeze-Martin	Rick		Citizen	Sonora	CA	NOA CD
328.	Britts	Bev		Citizen	Columbia	CA	CD
329.	Bueb	Allen		Citizen	Sonora	CA	NOA DPEIR
330.	Burt	Justine		Citizen	Fremont	CA	NOA CD
331.	Campagna	Tonya Catherine		Citizen	S. San Francisco	CA	NOA
332.	Carrozzi	Craig		Citizen	San Francisco	CA	NOA CD
333.	Cauthen	Sue		Citizen	San Francisco	CA	NOA
334.	Chenault	Sally		Citizen	Modesto	CA	NOA CD
335.	Coleman	Jennifer		Citizen			NOA
336.	Collins	Carl		Citizen	Modesto	CA	NOA CD
337.	Cordes	John		Citizen	Sunnyvale	CA	NOA CD
338.	Cossins	Mr. & Mrs. Robert		Citizen	Burlingame	CA	NOA
339.	Cusewza	Dr. A.J.		Citizen	Turlock	CA	NOA
340.	Cutshall	Matthew		Citizen	Sacramento	CA	NOA CD
341.	D'Anne	Denise		Citizen	San Francisco	CA	NOA CD
342.	Dennis	Dusten		Citizen	Sonora	CA	NOA CD
343.	Denton	Richard		Citizen	Oakland	CA	CD
344.	Dickerman	Tom		Citizen			NOA DPEIR
345.	Dolrenry	Stephanie		Citizen			NOA DPEIR
346.	Earhart	Linda		Citizen	Groveland	CA	NOA CD
347.	Engle	Stephen		Citizen	San Francisco	CA	NOA
348.	Engrg	Jacobs		Citizen	Walnut Creek	CA	CD

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WSIP PEIR MAILING LIST

#	Last Name	First Name	Title	Affiliation	City	State	Copies
349.	Etheridge	J.C.		Citizen	Sunol	CA	NOA DPEIR
350.	Figueiredo	Pete		Citizen	Burlingame	CA	NOA
351.	Fisher	Olivia		Citizen			NOA DPEIR
352.	Fornalski	Michael		Citizen	Fremont	CA	NOA
353.	Gaarde	Ralph E.		Citizen	Oakdale	CA	NOA CD
354.	Gado	Jimmy		Citizen	Columbia	CA	NOA CD
355.	Gaguine	Alexander		Citizen			NOA DPEIR
356.	Gearhart	Susan & James		Citizen	Fremont	CA	NOA CD
357.	Gokener	Shawna		Citizen	San Francisco	CA	NOA
358.	Gravanis	Ruth		Citizen	San Francisco	CA	NOA
359.	Grinn	Doris		Citizen	Sonora	CA	NOA CD
360.	Gruch	Wynn		Citizen	Fremont	CA	NOA
361.	Guy	Kevin		Citizen	Colma	CA	NOA
362.	Haimowitz	Carla		Citizen	Oakland	CA	NOA
363.	Hanspeter	Walter		Citizen			NOA
364.	Harrington	R.L.		Citizen	San Francisco	CA	NOA
365.	Hecker	Craig		Citizen			NOA
366.	Hecux	Susan		Citizen	San Mateo	CA	NOA
367.	Heiser	Shawn		Citizen	Daly City	CA	NOA
368.	Hildebrand	Alex		Citizen	Manteca	CA	CD
369.	Hollingsworth	Gordon	Attourney at Law	Citizen	Modesto	CA	NOA DPEIR
370.	Holubar	Michael		Citizen	Redwood City	CA	CD
371.	Hughes	Noah		Citizen	Sonora	CA	NOA CD
372.	Ishi	Jeanine		Citizen			NOA DPEIR
373.	Izmirian	Richard		Citizen	San Carlos	CA	NOA
374.	Jackson	Michael B.		Citizen	Quincy	CA	NOA
375.	Johnson, M.D.	Everett		Citizen	Turlock	CA	NOA
376.	Jue	Barbara		Citizen	San Francisco	CA	NOA
377.	Kalman	Emeric		Citizen	San Francisco	CA	NOA
378.	Kellogg	Mike		Citizen			NOA DPEIR
379.	Kopf	Patricia		Citizen	Modesto	CA	NOA CD

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#	Last Name	First Name	Title	Affiliation	City	State	Copies
380.	Kramer	John		Citizen	Vallecito	CA	CD
381.	Kuhn	Tom		Citizen	San Francisco	CA	NOA DPEIR
382.	Kunzler	Robert		Citizen	Cupertino	CA	NOA
383.	Lewis	Scott		Citizen	Fremont	CA	NOA CD
384.	Lilly	Alan B.		Citizen	Sacramento	CA	CD
385.	Lin	Sueann		Citizen	Fremont	CA	NOA
386.	LoCoco	Joseph		Citizen	Redwood City	CA	NOA
387.	Marlin	Daniel		Citizen	San Mateo	CA	NOA
388.	Mason	Edward		Citizen	San Francisco	CA	NOA
389.	McCauley	Paul		Citizen	San Francisco	CA	NOA
390.	McGolden	Doyle		Citizen	San Francisco	CA	NOA
391.	McGowan	Cathy		Citizen	Mountain View	CA	NOA CD
392.	Mills	John		Citizen	Columbia	CA	CD
393.	Monaghan	Phil		Citizen	Burlingame	CA	NOA
394.	Moran	Jessica		Citizen			NOA
395.	Morison	Denise		Citizen			NOA
396.	Munakata	Don		Citizen	San Mateo	CA	NOA
397.	Murphy	Christina		Citizen			NOA DPEIR
398.	Neuer	Bob		Citizen	Portola Valley	CA	NOA CD
399.	Nordstrom	Michael H.		Citizen	Corcoran	CA	CD
400.	Nunez-Borja	Zelma		Citizen	Fremont	CA	NOA
401.	Nuss	Frances		Citizen	San Carlos	CA	NOA
402.	O'Heffernan	Patrick		Citizen	San Anselmo	CA	NOA CD
403.	Owen	Ellie		Citizen	Groveland	CA	NOA CD
404.	Owen	Wllie		Citizen	Groveland	CA	NOA CD
405.	Palley	Mark		Citizen	Kensington	CA	NOA CD
406.	Passalaqua	Mike		Citizen	Modesto	CA	NOA CD
407.	Pickup	Ron		Citizen	Soulsbyville	CA	NOA CD
408.	Platt	G. Bland		Citizen	San Francisco	CA	NOA
409.	Pollock	Lynnel		Citizen	Woodland	CA	CD
410.	Prevesca	Aldo		Citizen	Belmont	CA	NOA

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411.	Ramirez	Nestor		Citizen	Groveland	CA	NOA CD
412.	Rathmann	Diane		Citizen	Dos Palos	CA	CD
413.	Redmond	Debbie		Citizen			NOA DPEIR
414.	Reichle	Susan S.		Citizen	Jamestown	CA	NOA CD
415.	Reynolds	Glynn		Citizen			NOA DPEIR
416.	Richardson	Matthew J.		Citizen	San Francisco	CA	NOA CD
417.	Roberts	Sam	and Karen Fisher	Citizen	Millbrae	CA	NOA
418.	Rush	Fred & Virginia		Citizen	Twain Harte	CA	NOA CD
419.	Saponara	Vincent		Citizen	Fremont	CA	NOA
420.	Saxe	JoAnne		Citizen	San Francisco	CA	NOA
421.	Schlater	Nelson		Citizen	San Francisco	CA	NOA
422.	Schmitte	Allison		Citizen	San Francisco	CA	NOA
423.	Scott	Greg		Citizen	Newark	CA	NOA CD
424.	Shaw	Cynthia		Citizen	San Francisco	CA	NOA
425.	Shumway	Peter		Citizen	Sonora	CA	NOA CD
426.	Sigg	Jake		Citizen	San Francisco	CA	NOA CD
427.	Skrabak	Darryl		Citizen	San Francisco	CA	NOA
428.	Smith	Felix E.		Citizen	Carmichael	CA	CD
429.	Snetsinger	K.G.		Citizen	Sunol	CA	NOA DPEIR
430.	Sokale	Jana		Citizen	Newark	CA	NOA CD
431.	Sonne	Robert		Citizen	San Francisco	CA	NOA
432.	Steffani	Edward		Citizen	Lodi	CA	CD
433.	Sturtevant	Jon		Citizen	Tuolumne	CA	CD
434.	Swanson	Jeffery J.		Citizen	Redding	CA	CD
435.	Tegarden	Benjamin		Citizen	Belmont	CA	NOA
436.	Trabold	Vicki		Citizen			NOA DPEIR
437.	Unlimited	Trout		Citizen	Berkeley	CA	NOA
438.	Volker	Stephen C.		Citizen	Oakland	CA	CD
439.	Ward	Andra		Citizen	Berkeley	CA	NOA
440.	Weakley	Clint		Citizen	Groveland	CA	NOA CD

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#	Last Name	First Name	Title	Affiliation	City	State	Copies
441.	Wong	Noel		Citizen	San Francisco	CA	NOA
442.	Wood	Don		Citizen	La Mesa	CA	NOA DPEIR
443.	Worg	Nogu		Citizen	San Francisco	CA	NOA
444.	Lieberman	Lillian		Citizens Concerned About Chloramine	Palo Alto	CA	NOA CD
445.	LaRiviere	Florence		Citizens' Committee to Complete the Refuge	Palo Alto	CA	NOA
446.			Public Works Director	City & County of San Francisco	San Francisco	CA	NOA
447.	Agunbiade	Yomi	Acting General Manager	City & County of San Francisco	San Francisco	CA	NOA
448.	Alioto-Pier	Michela	District 2 Supervisor	City & County of San Francisco	San Francisco	CA	NOA Summary
449.	Ammiano	Tom	District 9 Supervisor	City & County of San Francisco	San Francisco	CA	NOA Summary
450.	Asay	Greg	Aide to Supervisor Maxwell	City & County of San Francisco	San Francisco	CA	NOA
451.	Avalos	John	Aide to Supervisor Daly	City & County of San Francisco	San Francisco	CA	NOA
452.	Bhatia	Rajiv	Medical Director	City & County of San Francisco	San Francisco	CA	NOA
453.	Black	Rob	Aide to Supervisor Alioto-Pier	City & County of San Francisco	San Francisco	CA	NOA
454.	Bonilla	Gloria	President	City & County of San Francisco	San Francisco	CA	NOA DPEIR
455.	Calvillo	Angela	Clerk of the Board of Supervisors	City & County of San Francisco	San Francisco	CA	NOA
456.	Chan	Betty	Aide to Supervisor McGoldrick	City & County of San Francisco	San Francisco	CA	NOA
457.	Chan	Jason	District 6 Liaison	City & County of San Francisco	San Francisco	CA	NOA
458.	Chin	Gordon		City & County of San Francisco	San Francisco	CA	NOA
459.	Chung	Rose	Aide to Supervisor Peskin	City & County of San Francisco	San Francisco	CA	NOA
460.	Costello	Cassandra	Aide to Supervisor McGoldrick	City & County of San Francisco	San Francisco	CA	NOA
461.	Daly	Chris	District 6 Supervisor	City & County of San Francisco	San Francisco	CA	NOA Summary
462.	Delepine	Boris E.	Aide to Supervisor Mirkarimi	City & County of San Francisco	San Francisco	CA	NOA
463.	Dufty	Bevan	District 8 Supervisor	City & County of San Francisco	San Francisco	CA	NOA Summary
464.	Elsbernd	Sean	District 7 Supervisor	City & County of San Francisco	San Francisco	CA	NOA Summary
465.	Fong	Heather	Police Chief	City & County of San Francisco	San Francisco	CA	NOA
466.	Gavin	John	Aide to Supervisor Elsbernd	City & County of San Francisco	San Francisco	CA	NOA
467.	Green	Andrea	Executive/Recording Secretary	City & County of San Francisco	San Francisco	CA	NOA
468.	Harrison	Tom		City & County of San Francisco	San Francisco	CA	NOA

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469.	Hayward	Boe	Aide to Supervisor Dufty	City & County of San Francisco	San Francisco	CA	NOA
470.	He	Sarah	Aide to Supervisor Maxwell	City & County of San Francisco	San Francisco	CA	NOA
471.	Herrera	Dennis	City Attorney	City & County of San Francisco	San Francisco	CA	NOA
472.	Homsey	Daniel	Director	City & County of San Francisco	San Francisco	CA	NOA
473.	Kahn	Amanda	Aide to Supervisor Dufty	City & County of San Francisco	San Francisco	CA	NOA
474.	Katz	Dr. Mitch	Public Health Director	City & County of San Francisco	San Francisco	CA	NOA
475.	Kennedy	Susan	Public Information Officer	City & County of San Francisco	South San Francisco	CA	NOA
476.	Lazarus	Jim		City & County of San Francisco	San Francisco	CA	NOA
477.	Leal	Susan	General Manager	City & County of San Francisco	San Francisco	CA	NOA
478.	Lee	Edwin M.	County Clerk	City & County of San Francisco	San Francisco	CA	NOA
479.	Lee	Tomas	Aide to Supervisor Ammiano	City & County of San Francisco	San Francisco	CA	NOA
480.	Lee	William	Chief Administrator	City & County of San Francisco	San Francisco	CA	NOA
481.	Levitan	Meagan		City & County of San Francisco	San Francisco	CA	NOA
482.	Lim	Bernadine	District Liaison - Districts 3 & 4	City & County of San Francisco	San Francisco	CA	NOA
483.	Louie	Wendell	Director	City & County of San Francisco	San Francisco	CA	NOA
484.	Macris	Dean	Planning Director	City & County of San Francisco	San Francisco	CA	NOA Summary
485.	Martin	Lawrence	Vice President	City & County of San Francisco	San Francisco	CA	NOA
486.	Maxwell	Sophie	District 10 Supervisor	City & County of San Francisco	San Francisco	CA	NOA Summary
487.	McArthur	Margaret	Commission Liaison	City & County of San Francisco	San Francisco	CA	NOA
488.	McGoldrick	Jake	District 1 Supervisor	City & County of San Francisco	San Francisco	CA	NOA Summary
489.	Mirkarimi	Ross	District 5 Supervisor	City & County of San Francisco	San Francisco	CA	NOA Summary
490.	Murray	John W.		City & County of San Francisco	San Francisco	CA	NOA
491.	Newsom	Gavin	Mayor	City & County of San Francisco	San Francisco	CA	NOA Summary
492.	O'Leary	Denis	Southern Police Station	City & County of San Francisco	San Francisco	CA	NOA
493.	Ortega	Robert	District 9 Liaison	City & County of San Francisco	San Francisco	CA	NOA
494.	Owen	David	Aide to Supervisor Peskin	City & County of San Francisco	San Francisco	CA	NOA
495.	Palone	Kriztina	District Liaison - Districts 10 & 11	City & County of San Francisco	San Francisco	CA	NOA
496.	Peskin	Aaron	District 3 Supervisor	City & County of San Francisco	San Francisco	CA	NOA Summary
497.	Redondiez	Rachel	Aide to Supervisor Daly	City & County of San Francisco	San Francisco	CA	NOA
498.	Sandoval	Gerardo	District 11 Supervisor	City & County of San Francisco	San Francisco	CA	NOA Summary

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499.	Scanlon	Olivia	Aide to Supervisor Elsbernd	City & County of San Francisco	San Francisco	CA	NOA
500.	Stacy	Kate	Deputy City Attorney	City & County of San Francisco	San Francisco	CA	NOA
501.	Tom	Tina	Aide to Supervisor Sandoval	City & County of San Francisco	San Francisco	CA	NOA
502.	True	Judson	Aide to Supervisor Sandoval	City & County of San Francisco	San Francisco	CA	NOA
503.	Warren	Elaine	Deputy City Attorney	City & County of San Francisco	San Francisco	CA	NOA DPEIR
504.	Younge	Gloria	County Clerk	City & County of San Francisco	San Francisco	CA	NOA
505.	Legnitto	Steve	Director of Property	City & County of San Francisco, San Francisco Real Estate Department	San Francisco	CA	NOA
506.	Chin	Paul	Assistant Deputy Chief - Fire Marshall	City and County of San Francisco, Fire Dept.	San Francisco	CA	NOA
507.	Schultheis	Barbara	Fire Marshall	City and County of San Francisco, Fire Dept.	San Francisco	CA	NOA
508.	Furman	Donn W.	Deputy City Attorney	City and County of San Francisco, Office of the City Attorney	San Francisco	CA	NOA DPEIR CD
509.				City and County of San Francisco, Office of the City Attorney, City Hall	San Francisco	CA	NOA
510.	LaForte	Daniel		City and County of San Francisco, Parks & Recreation Department	San Francisco	CA	NOA
511.	Maltzer	Paul	Environmental Review Officer	City and County of San Francisco, Planning Department	San Francisco	CA	NOA
512.	Olafsson	Erik		City and County of San Francisco, Planning Department	San Francisco	CA	NOA
513.	Shambray	Janice	Planning Information Counter	City and County of San Francisco, Planning Department	San Francisco	CA	DPEIR CD
514.	Byrd	Virna		City and County of San Francisco, Planning Department. Major Environmental Analysis	San Francisco	CA	NOA DPEIR
515.	Sokolove	Diana	Environmental Planner, EIR Coordinator	City and County of San Francisco, Planning Department. Major Environmental Analysis	San Francisco	CA	NOA DPEIR CD
516.	Pardini	Capt. Albert		City and County of San Francisco, Police Department	San Francisco	CA	CD
517.	Karasyova	Svetlana	Park Planner	City and County of San Francisco, Recreation and Park Department	San Francisco	CA	NOA
518.	Jakel	Jake	City Manager	City of Antioch	Antioch	CA	CD
519.	Cook	Terri	City Clerk	City of Belmont	Belmont	CA	NOA
520.	Davis	Raymond	Public Works Director	City of Belmont	Belmont	CA	NOA
521.	Ewing	Craig	Planning Director	City of Belmont	Belmont	CA	NOA
522.	Feierbach	Coralin	Mayor	City of Belmont	Belmont	CA	NOA
523.	Lieberman	Warren	Vice Mayor	City of Belmont	Belmont	CA	NOA
524.	Matthewson	Phyllis	Councilmember	City of Belmont	Belmont	CA	NOA

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525.	Warden	Dave	Councilmember	City of Belmont	Belmont	CA	NOA
526.			Planning Director	City of Brisbane	Brisbane	CA	NOA
527.	Barnes	Michael	Mayor Pro Tem	City of Brisbane	Brisbane	CA	NOA
528.	Bologoff	Cyril	Councilmember	City of Brisbane	Brisbane	CA	NOA
529.	Breault	Ray	Public Works Director/ Engineer	City of Brisbane	Brisbane	CA	NOA
530.	Conway	Clarke	Councilmember	City of Brisbane	Brisbane	CA	NOA
531.	Flanagan	Jerry		City of Brisbane	Brisbane	CA	NOA
532.	Holstine	Clayton	City Manager	City of Brisbane	Brisbane	CA	NOA
533.	Panza	Lee	Councilmember	City of Brisbane	Brisbane	CA	NOA
534.	Prince	Bill	Planning Director	City of Brisbane	Brisbane	CA	NOA
535.	Richardson	A. Sepi	Councilmember	City of Brisbane	Brisbane	CA	NOA
536.	Schroeder	Sheri	City Clerk	City of Brisbane	Brisbane	CA	NOA
537.	Waldo	Steven W.	Mayor	City of Brisbane	Brisbane	CA	NOA
538.	Bagdon	George J.	Public Works Director	City of Burlingame	Burlingame	CA	NOA DPEIR
539.	Baylock	Cathy	Councilmember	City of Burlingame	Burlingame	CA	NOA
540.	Keighran	Ann	Councilmember	City of Burlingame	Burlingame	CA	CD
541.	Monroe	Margaret	City Planner	City of Burlingame	Burlingame	CA	NOA
542.	Mortensen	Doris	City Clerk	City of Burlingame	Burlingame	CA	NOA
543.	Murtuza	Syed		City of Burlingame	Burlingame	CA	NOA
544.	Nagel	Terry	Mayor	City of Burlingame	Burlingame	CA	NOA
545.	Nantell	Jim	City Manager	City of Burlingame	Burlingame	CA	NOA
546.	O’Mahony	Rosalie	Vice Mayor	City of Burlingame	Burlingame	CA	NOA
547.	O'Mahony	Rosalie	Councilmember	City of Burlingame	Burlingame	CA	NOA
548.			Economic & Community Development	City of Daly City	Daly City	CA	NOA
549.	Christensen	Judith A.	Councilmember	City of Daly City	Daly City	CA	NOA
550.	Cortes	Maria E.	City Clerk	City of Daly City	Daly City	CA	NOA DPEIR
551.	Gleichenhaus	D. Peter	Public Works Director	City of Daly City	Daly City	CA	NOA
552.	Gomez	Maggie	Mayor	City of Daly City	Daly City	CA	NOA
553.	Guingona	Michael P.	Councilmember	City of Daly City	Daly City	CA	NOA
554.	Klatt	Carol L.	Councilmember	City of Daly City	Daly City	CA	NOA
555.	Martel	Patricia	City Manager	City of Daly City	Daly City	CA	NOA
556.	Rover	Cynthia		City of Daly City	Daly City	CA	NOA
557.	Stallings	Michael	Parks & Recreation Director	City of Daly City	Daly City	CA	NOA
558.	Sweetland	Patrick	Director, Water & Wastewater Resources Dept.	City of Daly City	Daly City	CA	NOA

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559.	Sweetland	Patrick	Water & Wastewater Dept. Director	City of Daly City	Daly City	CA	NOA
560.	Tissier	Adrienne		City of Daly City	Daly City	CA	NOA
561.	Torres	Sal	Vice Mayor	City of Daly City	Daly City	CA	NOA
562.	Abrica	Ruben	Councilmember	City of East Palo Alto	East Palo Alto	CA	NOA
563.	Banico	Maria	Planning Division	City of East Palo Alto	East Palo Alto	CA	NOA DPEIR
564.	Bravo	Fernando	Interim Director of Public Works	City of East Palo Alto	East Palo Alto	CA	NOA
565.	Evans	A. Peter	Councilmember	City of East Palo Alto	East Palo Alto	CA	NOA
566.	Foster	Patricia	Vice Mayor	City of East Palo Alto	East Palo Alto	CA	NOA
567.	James	Alvin D.	City Manager	City of East Palo Alto	East Palo Alto	CA	NOA
568.	Meda	Okelo	Community Services Director	City of East Palo Alto	East Palo Alto	CA	NOA DPEIR
569.	Rutherford	Donna	Councilmember	City of East Palo Alto	East Palo Alto	CA	NOA
570.	Schechter	Debbie	Environmental Protection Agency	City of East Palo Alto	East Palo Alto	CA	NOA
571.	Woods	David E.	Mayor	City of East Palo Alto	East Palo Alto	CA	NOA
572.	Chappelle	Kristi	Public Information Officer	City of Foster City	Foster City	CA	NOA
573.	Cox	Ron	Mayor	City of Foster City	Foster City	CA	NOA
574.	Frisella	Pam	Vice Mayor	City of Foster City	Foster City	CA	NOA
575.	Hardy	James C.	City Manager	City of Foster City	Foster City	CA	NOA
576.	Kiramis	John	Councilmember	City of Foster City	Foster City	CA	NOA
577.	Koelling	Linda	Councilmember	City of Foster City	Foster City	CA	NOA
578.	Lisenko	John	Public Works Director	City of Foster City	Foster City	CA	NOA
579.	Marks	Richard B.	Community Development Director	City of Foster City	Foster City	CA	NOA
580.	Miller	Kevin	Parks & Recreation Director	City of Foster City	Foster City	CA	NOA
581.	Tesene	Therese	City Clerk	City of Foster City	Foster City	CA	NOA
582.	Toler	Steve	Administrative Services Director	City of Foster City	Foster City	CA	NOA
583.	Wykoff	Rick	Councilmember	City of Foster City	Foster City	CA	NOA
584.	Towne	Ray	Public Works Director	City of Foster City, Estero Mun. Improvement District	Foster City	CA	NOA
585.			Public Works Director	City of Fremont	Fremont	CA	NOA
586.	Cho	Steve	Councilmember	City of Fremont	Fremont	CA	NOA
587.	Daniel	Christine	Deputy City Manager	City of Fremont	Fremont	CA	NOA
588.	Diaz	Fred	City Manager	City of Fremont	Fremont	CA	NOA
589.	Hughes	Norm	City Engineer	City of Fremont	Fremont	CA	NOA
590.	Levine	Harvey	City Attorney	City of Fremont	Fremont	CA	NOA

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591.	Macy	Lynn	Assistant City Manager/City Clerk	City of Fremont	Fremont	CA	NOA DPEIR CD
592.	Natarajan	Anu	Councilmember	City of Fremont	Fremont	CA	NOA
593.	Pierson	Jim	Assistant City Engineer	City of Fremont	Fremont	CA	NOA
594.	Schwob	Jeff	Planning Director	City of Fremont	Fremont	CA	NOA
595.	Wasserman	Bob	Mayor	City of Fremont	Fremont	CA	NOA
596.	Wieckowski	Bob	Vice Mayor	City of Fremont	Fremont	CA	NOA
597.	Flint	Steve	Planning Director	City of Half Moon Bay	Half Moon Bay	CA	NOA
598.	Ameri	Alex	Deputy Director of Public Works	City of Hayward	Hayward	CA	NOA
599.	Armas	Jesus	City Manager	City of Hayward	Hayward	CA	NOA
600.	Bauman	Robert	Public Works Director	City of Hayward	Hayward	CA	NOA
601.	Cooper	Roberta	Mayor	City of Hayward	Hayward	CA	NOA
602.	Dowling	Kevin	Councilmember	City of Hayward	Hayward	CA	NOA
603.	Ehrenthal	Sylvia	Community & Economic Development Director	City of Hayward	Hayward	CA	NOA
604.	Halliday	Barbara	Mayor Pro Tem	City of Hayward	Hayward	CA	NOA
605.	Henson	Olden	Councilmember	City of Hayward	Hayward	CA	NOA
606.	Mosher	Marilyn		City of Hayward	Hayward	CA	NOA
607.	Reyes	Angelina	City Clerk	City of Hayward	Hayward	CA	CD
608.	Sweeney	Michael	Mayor	City of Hayward	Hayward	CA	NOA
609.	Ward	William H. (Bill)	Councilmember	City of Hayward	Hayward	CA	NOA
610.	Armas	Jesus	City Manager	City of Livermore	Hayward	CA	NOA
611.	Calvert	Alice	City Clerk	City of Livermore	Livermore	CA	NOA
612.	Dietrich	Lorraine	Councilmember	City of Livermore	Livermore	CA	NOA
613.	Kamena	Marshall H.	Mayor	City of Livermore	Livermore	CA	NOA
614.	Leider	Margorie	Councilmember	City of Livermore	Livermore	CA	NOA
615.	Marchand	John	Councilmember	City of Livermore	Livermore	CA	NOA
616.	McIntyre	Dan	Public Services Director	City of Livermore	Livermore	CA	NOA
617.	Reitter	Tom	Councilmember	City of Livermore	Livermore	CA	NOA
618.	Roberts	Marc	Community Development Director	City of Livermore	Livermore	CA	NOA
619.	Brees	Dave	Recreation Director	City of Los Altos	Los Altos	CA	NOA
620.	Casas	David	Councilmember	City of Los Altos	Los Altos	CA	NOA
621.	Cole	Curtis	Mayor	City of Los Altos	Los Altos	CA	NOA
622.	Houston	Jolie	City Attorney	City of Los Altos	San Jose	CA	NOA
623.	James	Walgren	Community Development Director	City of Los Altos	Los Altos	CA	NOA
624.	Kitchens	Susan	City Clerk	City of Los Altos	Los Altos	CA	NOA

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**TABLE J-2 (Continued)
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#	Last Name	First Name	Title	Affiliation	City	State	Copies
625.	Packard	Ron	Councilmember	City of Los Altos	Los Altos	CA	NOA
626.	Porter	Jim	Public Works Director	City of Los Altos	Los Altos	CA	NOA
627.	Rose	Philip J., Jr.	City Manager	City of Los Altos	Los Altos	CA	NOA
628.	Walgren	James	Community Development Director	City of Los Altos	Los Altos	CA	NOA
629.	Arlinda	Heineck	Community Development Director (Acting)	City of Menlo Park	Menlo Park	CA	NOA
630.	Boesch	David	City Manager	City of Menlo Park	Menlo Park	CA	NOA
631.	Boyle	John C.	Councilmember	City of Menlo Park	Menlo Park	CA	NOA
632.	Cohen	Andrew	Mayor Pro Tem	City of Menlo Park	Menlo Park	CA	NOA
633.	Fergusson	Kelly J.	Mayor	City of Menlo Park	Menlo Park	CA	NOA DPEIR
634.	Heineck	Arlinda	Community Development Director (Acting)	City of Menlo Park	Menlo Park	CA	NOA
635.	Nino	Ruben	Director of Engineering Services	City of Menlo Park	Menlo Park	CA	NOA
636.	Steffens	Kent	Public Works Director	City of Menlo Park	Menlo Park	CA	NOA
637.	Vonderlinden	Silvia M.	City Clerk	City of Menlo Park	Menlo Park	CA	NOA DPEIR
638.	Gottschalk	Robert G.	Councilmember	City of Millbrae	Millbrae	CA	NOA
639.	Hershman	Marc	Mayor	City of Millbrae	Millbrae	CA	NOA
640.	Holober	Nadia V.	Vice Mayor	City of Millbrae	Millbrae	CA	NOA
641.	Jaeck	Ralph	City Manager	City of Millbrae	Millbrae	CA	NOA
642.	Killian	Jeffrey W.	Assistant City Manager/Director of General Services	City of Millbrae	Millbrae	CA	NOA
643.	Konkol	Deborah	City Clerk	City of Millbrae	Millbrae	CA	NOA
644.	Larson	Linda T.	Councilmember	City of Millbrae	Millbrae	CA	NOA
645.	Petty	Ralph	Community Development/ Parks Director [Planning]	City of Millbrae	Millbrae	CA	NOA
646.	Popp	Ron	Public Works Director	City of Millbrae	Millbrae	CA	NOA
647.	Ralph	Phil	Community Development Director [Planning]	City of Millbrae	Millbrae	CA	NOA
648.	Schwartz	Randy	Parks & Recreation Director (Interim)	City of Millbrae	Millbrae	CA	NOA
649.			Community Services Director	City of Milpitas	Milpitas	CA	NOA
650.	Armedariz	Greg	Public Works Director	City of Milpitas	Milpitas	CA	NOA
651.	Blalock	Gail	City Clerk	City of Milpitas	Milpitas	CA	NOA
652.	Esteves	Jose (Joe)	Mayor	City of Milpitas	Milpitas	CA	NOA
653.	Giordano	Debbie	Councilmember	City of Milpitas	Milpitas	CA	NOA
654.	Gomez Jr.	Armando	Councilmember	City of Milpitas	Milpitas	CA	NOA
655.	Heyden	Tambri	Planning Manager	City of Milpitas	Milpitas	CA	NOA

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#	Last Name	First Name	Title	Affiliation	City	State	Copies
656.	Livengood	Robert	Vice Mayor	City of Milpitas	Milpitas	CA	NOA
657.	Polanski	Althea	Councilmember	City of Milpitas	Milpitas	CA	NOA
658.	Williams	Thomas C.	City Manager	City of Milpitas	Milpitas	CA	NOA
659.	Wong	Darryl		City of Milpitas	Milpitas	CA	NOA
660.	Britton	George	Acting City Manager	City of Modesto	Modesto	CA	NOA
661.	Cowles	Peter	Director of Public Works	City of Modesto	Modesto	CA	NOA
662.	Dunbar	Bob	Councilmember	City of Modesto	Modesto	CA	NOAA
663.	Ford	Bob	Project Coordinator	City of Modesto	Modesto	CA	NOA
664.	Hawn	Brad	Vice Mayor	City of Modesto	Modesto	CA	NOA
665.	Houx	Nathan G.	Project Coordinator	City of Modesto	Modesto	CA	NOA
666.	Keating	Janice	Councilmember	City of Modesto	Modesto	CA	NOA
667.	Kilger	Brad	Community and Economic Development Director	City of Modesto	Modesto	CA	NOA
668.	Lagarbo	Allen		City of Modesto	Modesto	CA	NOA CD
669.	Marsh	Garrad	Councilmember	City of Modesto	Modesto	CA	NOA
670.	Niskanen	Jim	Director, Parks and Recreation	City of Modesto	Modesto	CA	NOA
671.	O'Bryant	Will	Councilmember	City of Modesto	Modesto	CA	NOA
672.	Pinhey	Nick	Director of Public Works	City of Modesto	Modesto	CA	NOA
673.	Ridenour	Jim	Mayor	City of Modesto	Modesto	CA	NOA
674.	Zahr	Jean	City Clerk	City of Modesto	Modesto	CA	NOA
675.	Costello	Elaine	Community Development Director	City of Mountain View	Mountain View	CA	NOA
676.	Duggan	Kevin	City Manager	City of Mountain View	Mountain View	CA	NOA
677.	Elaine	Costello	Community Development Director	City of Mountain View	Mountain View	CA	NOA
678.	Galiotto	Nick	Councilmember	City of Mountain View	Mountain View	CA	NOA
679.	Kasperzak, Jr.	R. Michael	Mayor	City of Mountain View	Mountain View	CA	NOA
680.	Lazarus	Cathy	Public Works Director	City of Mountain View	Mountain View	CA	NOA
681.	Lin	Jean		City of Mountain View	Mountain View	CA	NOA
682.	Locke	Robert	Finance and Administrative Services Director	City of Mountain View	Mountain View	CA	NOA
683.	Macias	Laura	Mayor	City of Mountain View	Mountain View	CA	NOA
684.	Means	Tom	Vice Mayor	City of Mountain View	Mountain View	CA	NOA
685.	Pear	Matt	Councilmember	City of Mountain View	Mountain View	CA	NOA
686.	Salvador	Angelita	City Clerk	City of Mountain View	Mountain View	CA	CD
687.	Skinner	Peter		City of Mountain View	Mountain View	CA	NOA
688.	Becker	John	City Manager	City of Newark	Newark	CA	NOA

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#	Last Name	First Name	Title	Affiliation	City	State	Copies
689.	Carmen	Michael		City of Newark	Newark	CA	NOA
690.	Claassen	Pete	Public Works Director	City of Newark	Newark	CA	NOA
691.	Collier	Ray	Building Official	City of Newark	Newark	CA	NOA
692.	Freitas	Luis L.	Councilmember	City of Newark	Newark	CA	NOA
693.	Galliano	Gary T.	City Attorney	City of Newark	Newark	CA	NOA
694.	Huezo	Albert T.	City Manager	City of Newark	Newark	CA	NOA
695.	Johnson	Susan	Vice Mayor	City of Newark	Newark	CA	NOA
696.	Jones	Dennis	Assistant City Manager/Finance Director	City of Newark	Newark	CA	NOA
697.	Jones	Paul H. B.	Treasurer	City of Newark	Newark	CA	NOA
698.	Miller-Rogers	Frances	City Clerk	City of Newark	Newark	CA	NOA
699.	Nagy	Alan L.	Vice Mayor	City of Newark	Newark	CA	NOA
700.	Smith	David W.	Mayor	City of Newark	Newark	CA	NOA
701.			City Clerk	City of Oakdale	Oakdale	CA	NOA
702.	Baker	Steven W.	City Administrator	City of Oakdale	Oakdale	CA	NOA
703.	Dunlop	Tom	Councilmember	City of Oakdale	Oakdale	CA	NOA
704.	Hallam	Steven	Community Development Director	City of Oakdale	Oakdale	CA	NOA
705.	Jackson	Farrell	Mayor	City of Oakdale	Oakdale	CA	NOA
706.	Morgan	Katherine	Mayor Pro Tem	City of Oakdale	Oakdale	CA	NOA
707.	Word	John	Director	City of Oakdale	Oakdale	CA	NOA
708.	Balachandran	Girish		City of Palo Alto	Palo Alto	CA	NOA
709.	Beecham	Bern	Councilmember	City of Palo Alto	Palo Alto	CA	NOA
710.	Beecham	Bern	Councilmember	City of Palo Alto	Palo Alto	CA	NOA DPEIR
711.	Benest	Frank	City Manager	City of Palo Alto	Palo Alto	CA	NOA
712.	Cordell	LaDoris	Councilmember	City of Palo Alto	Stanford	CA	NOA
713.	Emslie	Steve	Planning Director	City of Palo Alto	Palo Alto	CA	NOA
714.	Kishimoto	Yoriko	Mayor	City of Palo Alto	Palo Alto	CA	NOA
715.	Kleinberg	Judy	Councilmember	City of Palo Alto	Palo Alto	CA	NOA
716.	Morton	Jack	Councilmember	City of Palo Alto	Palo Alto	CA	NOA
717.	Mossar	Dena	Councilmember	City of Palo Alto	Palo Alto	CA	NOA
718.	Ratchye	Jane	Senior Resource Planner	City of Palo Alto	Palo Alto	CA	NOA CD
719.	Roberts	Glenn	Public Works Director	City of Palo Alto	Palo Alto	CA	NOA
720.	Rogers	Donna	City Clerk	City of Palo Alto	Palo Alto	CA	NOA
721.	Yeats	Carl	Administrative Services Director	City of Palo Alto	Palo Alto	CA	NOA
722.	Bachman	Steve	Associate Park & Recreation Specialist	City of Petaluma, Dept. of Parks & Recreation	Petaluma	CA	NOA CD

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723.	Grisham	Marc	City Manager	City of Pittsburg	Pittsburg	CA	CD
724.	Fialho	Nelson	City Manager	City of Pleasanton	Pleasanton	CA	NOA
725.	Hosterman	Jennifer	Mayor	City of Pleasanton	Pleasanton	CA	NOA
726.	Iserson	Jerry	Planning Director	City of Pleasanton	Pleasanton	CA	NOA
727.	McGovern	Cindy	Vice Mayor	City of Pleasanton	Pleasanton	CA	NOA
728.	Sullivan	Matt	Councilmember	City of Pleasanton	Pleasanton	CA	NOA
729.	Wilson	Robert	Public Works/Utilities Director	City of Pleasanton	Pleasanton	CA	NOA
730.	Aguirre	Alicia	Councilmember	City of Redwood City	Redwood City	CA	NOA
731.	Bain	Ian	Councilmember	City of Redwood City	Redwood City	CA	NOA
732.	Chang	Chu		City of Redwood City	Redwood City	CA	NOA
733.	Church	Michael	Planning Manager	City of Redwood City	Redwood City	CA	NOA
734.	Claire	Richard	BAWSCA Representative	City of Redwood City	Redwood City	CA	NOA
735.	Everett	Edward	City Manager	City of Redwood City	Redwood City	CA	NOA
736.	Foust	Rosanne	Vice Mayor	City of Redwood City	Redwood City	CA	NOA
737.	Hartnett	Jim	Councilmember	City of Redwood City	Redwood City	CA	NOA
738.	Howard	Diane	Councilmember	City of Redwood City	Redwood City	CA	NOA
739.	Howe	Patricia	City Clerk	City of Redwood City	Redwood City	CA	NOA
740.	Ingram	Peter	Public Works Director	City of Redwood City	Redwood City	CA	NOA
741.	Ira	Jeff	Councilmember	City of Redwood City	Redwood City	CA	NOA
742.	Joel	Patterson	Community Development Director	City of Redwood City	Redwood City	CA	NOA
743.	Patterson	Joel	Community Development Director	City of Redwood City	Redwood City	CA	NOA
744.	Pierce	Barbara	Mayor	City of Redwood City	Redwood City	CA	NOA
745.	Abid-Cummings	Linda	City Clerk	City of Riverbank	Riverbank	CA	NOA
746.	Anaya	Kathy	Councilmember	City of Riverbank	Riverbank	CA	NOA
747.	Barton	Laurie	Director of Public Works	City of Riverbank	Riverbank	CA	NOA
748.	Benitez	Sandra	Councilmember	City of Riverbank	Riverbank	CA	NOA
749.	Crifasi	Chris	Mayor	City of Riverbank	Riverbank	CA	NOA
750.	Fitzpatrick	Sue	Director of Parks and Recreation	City of Riverbank	Riverbank	CA	NOA
751.	Hightower	J.D.	Director of Community Development	City of Riverbank	Riverbank	CA	NOA
752.	Holmer	Richard P.	City Manager	City of Riverbank	Riverbank	CA	NOA
753.	Madueño	Virginia	Vice Mayor	City of Riverbank	Riverbank	CA	NOA
754.	Kerridge	Ray	General Manager	City of Sacramento	Sacramento	CA	CD
755.	Robinson	Joe		City of Sacramento	Sacramento	CA	CD
756.	Chambers	Jane	Interim Public Works Director	City of San Bruno	San Bruno	CA	NOA

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757.	Franzella	Larry	Mayor	City of San Bruno	San Bruno	CA	NOA
758.	Howard	Robert		City of San Bruno	San Bruno	CA	NOA
759.	Ibarra	Ken	Councilmember	City of San Bruno	San Bruno	CA	NOA
760.	Jackson	Connie	City Manager	City of San Bruno	San Bruno	CA	NOA DPEIR
761.	Munns	Scott	Public Works Director	City of San Bruno	San Bruno	CA	NOA
762.	O'Connell	Irene	Councilmember	City of San Bruno	San Bruno	CA	NOA
763.	O'Connell	Irene	Councilmember	City of San Bruno	San Bruno	CA	NOA
764.	Ruane	Jim	Councilmember	City of San Bruno	San Bruno	CA	NOA
765.	Simon	Ed	City Clerk	City of San Bruno	San Bruno	CA	NOA
766.	Thompson	Pamela	City Attorney	City of San Bruno	San Bruno	CA	NOA
767.	Williams	Tom	Community & Economic Development Director	City of San Bruno	San Bruno	CA	NOA
768.	Boland	Christine	City Clerk	City of San Carlos	San Carlos	CA	NOA
769.	Cullinan	Elizabeth	Planning Director	City of San Carlos	San Carlos	CA	NOA
770.	Davids	Thomas	Mayor	City of San Carlos	San Carlos	CA	NOA
771.	Garvey	Michael P.	City Manager	City of San Carlos	San Carlos	CA	NOA
772.	Grocott	Matt	Councilmember	City of San Carlos	San Carlos	CA	NOA
773.	Mokhtari	Parviz	Public Works Director	City of San Carlos	San Carlos	CA	NOA
774.	Parks	Leslie	Director of Community Development	City of San Carlos	San Carlos	CA	NOA
775.	Tiegel Doherty	Inge	Councilmember	City of San Carlos	San Carlos	CA	NOA
776.	Moy	Barbara		City of San Francisco, Department of Public Works	San Francisco	CA	NOA
777.	Hasenin	Isam	Director	City of San Francisco, Dept. of Building Inspection	San Francisco	CA	NOA
778.	Yee	Bond M.		City of San Francisco, Dept. of Parking & Traffic	San Francisco	CA	NOA
779.	Buker	Jim		City of San Francisco, Dept. of Public Works	San Francisco	CA	NOA
780.	Foley	Barbara	Fire Marshall	City of San Francisco, Fire Department	San Francisco	CA	NOA
781.	Mitchell	Bill	Captain	City of San Francisco, Fire Dept., Bureau of Fire Prevention & Investigation	San Francisco	CA	NOA
782.	Allen	Katy	Public Works Director	City of San Jose	San Jose	CA	NOA
783.	Campos	Nora	Councilmember, District 5	City of San Jose	San Jose	CA	NOA
784.	Chirco	Judy	Councilmember, District 9	City of San Jose	San Jose	CA	NOA
785.	Cortese	David D.	District 8 Vice Mayor	City of San Jose	San Jose	CA	NOA
786.	Haase	Stephen	Director of Planning/Building & Code Enforcement	City of San Jose	San Jose	CA	NOA
787.	Nasser	Mansour	Water Utility Manager	City of San Jose	San Jose	CA	NOA

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788.	Price	Lee	City Clerk	City of San Jose	San Jose	CA	NOA
789.	Pyle	Nancy	District 10 Councilmember	City of San Jose	San Jose	CA	NOA
790.	Reed	Chuck	Mayor	City of San Jose	San Jose	CA	NOA
791.	White	Les	City Manager	City of San Jose	San Jose	CA	NOA
792.	Williams	Forrest	Councilmember	City of San Jose	San Jose	CA	NOA
793.	Wilson	Bob		City of San Jose	San Jose	CA	NOA
794.	Beyer	Robert	Community Development Director	City of San Mateo	San Mateo	CA	NOA
795.	Canzian	Sheila	Parks & Recreation Director	City of San Mateo	San Mateo	CA	NOA
796.	Croce	Arne	City Manager	City of San Mateo	San Mateo	CA	NOA
797.	Epstein	Jan	Councilmember	City of San Mateo	San Mateo	CA	NOA
798.	Gomez	Norma	City Clerk	City of San Mateo	San Mateo	CA	NOA
799.	Groom	Carole	Deputy Mayor	City of San Mateo	San Mateo	CA	NOA
800.	Lee	John	Council Member	City of San Mateo	San Mateo	CA	NOA
801.	Matthews	Jack	Mayor	City of San Mateo	San Mateo	CA	NOA
802.	Patterson	Larry A.	Public Works Director	City of San Mateo	San Mateo	CA	NOA
803.	Robert	Beyer	Community Development Director	City of San Mateo	San Mateo	CA	NOA
804.	McNamara	Karen	Public Services Director	City of San Ramon	San Ramon	CA	NOA
805.	Caserta	Dominic	Councilmember	City of Santa Clara	Santa Clara	CA	NOA
806.	Diridon	Rod, Jr.	City Clerk	City of Santa Clara	Santa Clara	CA	NOA
807.	Goodfellow	Geoffrey (Geof)	Planning Director	City of Santa Clara	Santa Clara	CA	NOA
808.	Kennedy	Will	Councilmember	City of Santa Clara	Santa Clara	CA	NOA
809.	Kolstad	Patrick	Councilmember	City of Santa Clara	Santa Clara	CA	NOA
810.	Ma	Dennis		City of Santa Clara	Santa Clara	CA	NOA
811.	Mahan	Patricia	Mayor	City of Santa Clara	Santa Clara	CA	NOA
812.	McLeod	Jamie	Vice Mayor	City of Santa Clara	Santa Clara	CA	NOA
813.	Moore	Kevin	Councilmember	City of Santa Clara	Santa Clara	CA	NOA
814.	Saunders	Robin	Public Works Director	City of Santa Clara	Santa Clara	CA	NOA
815.	Sciara	Gloria	Development Review Officer	City of Santa Clara	Santa Clara	CA	CD
816.	Sparacino	Jennifer	City Manager	City of Santa Clara	Santa Clara	CA	NOA
817.	Harvey	Alan N.		City of Shasta Lake	Shasta Lake	CA	CD
818.	Powell	Marlee	Councilmember	City of Sonora	Sonora	CA	NOA DPEIR
819.	Anderson	Gary	Councilmember	City of Sonora, Administrative Offices	Sonora	CA	NOA
820.	Applegate	Greg	City Administrator	City of Sonora, Administrative Offices	Sonora	CA	NOA

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821.	Canning	Bill	Councilmember	City of Sonora, Administrative Offices	Sonora	CA	NOA
822.	Cassinetto	Marijane	City Clerk	City of Sonora, Administrative Offices	Sonora	CA	NOA
823.	Russell	Hank	Mayor	City of Sonora, Administrative Offices	Sonora	CA	NOA
824.	Sheppard	David A.	Councilmember	City of Sonora, Administrative Offices	Sonora	CA	NOA
825.	Stearn	Ron	Mayor Pro-Tem	City of Sonora, Administrative Offices	Sonora	CA	NOA
826.	Wyllie	Ed	Community Development Director	City of Sonora, Administrative Offices	Sonora	CA	NOA
827.	Fernekes	Joseph A.	Councilmember	City of South San Francisco	South San Francisco	CA	NOA
828.	Garbarino Sr.	Richard	Mayor	City of South San Francisco	South San Francisco	CA	NOA
829.	Gonzalez	Pedro	Vice Mayor	City of South San Francisco	South San Francisco	CA	NOA
830.	Matsumoto	Karyl	Councilmember	City of South San Francisco	South San Francisco	CA	NOA
831.	Nagel	Barry M.	City Manager	City of South San Francisco	South San Francisco	CA	NOA
832.	Payne	Sylvia M.	City Clerk	City of South San Francisco	South San Francisco	CA	NOA
833.	Van Duyn	Marty	Economic Development Director	City of South San Francisco	South San Francisco	CA	NOA
834.	White	Terry	Public Works Director	City of South San Francisco	South San Francisco	CA	NOA
835.	Witman	Kathy		City of Stockton	Stockton	CA	CD
836.	Chan	Amy	City Manager	City of Sunnyvale	Sunnyvale	CA	NOA
837.	Chu	Dean	Councilmember	City of Sunnyvale	Sunnyvale	CA	NOA
838.	Craig	James		City of Sunnyvale	Sunnyvale	CA	NOA
839.	Hamilton	Melinda	Councilmember	City of Sunnyvale	Sunnyvale	CA	NOA
840.	Howe	John	Councilmember	City of Sunnyvale	Sunnyvale	CA	NOA
841.	Kirby	Tim		City of Sunnyvale	Sunnyvale	CA	NOA
842.	Lee	Otto	Mayor	City of Sunnyvale	Sunnyvale	CA	NOA
843.	Paternoster	Robert	Community Development Director [Planning]	City of Sunnyvale	Sunnyvale	CA	NOA
844.	Ramos	Susan	City Clerk	City of Sunnyvale	Sunnyvale	CA	NOA
845.	Risch	Tim	BAWSCA Representative	City of Sunnyvale	Sunnyvale	CA	NOA
846.	Robert	Paternoster	Community Development Director [Planning]	City of Sunnyvale	Sunnyvale	CA	NOA
847.	Rose	Marvin	Public Works Director	City of Sunnyvale	Sunnyvale	CA	NOA
848.	Swegles	Ron	Councilmember	City of Sunnyvale	Sunnyvale	CA	NOA

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849.	Walker	Robert	Parks & Recreation Director	City of Sunnyvale	Sunnyvale	CA	NOA
850.	Conzet	Val	Public Works Supervisor	City of Sunnyvale, Public Works Deparment	Sunnyvale	CA	NOA
851.	Edwards	Sandra	City Clerk	City of Tracy	Tracy	CA	NOA
852.	Hobbs	Daniel	City Manager	City of Tracy	Tracy	CA	NOA
853.	Ives	Brent	Mayor	City of Tracy	Tracy	CA	NOA
854.	Sundberg	Irene	Councilmember	City of Tracy	Tracy	CA	NOA
855.	Tolbert	Evelyn	Councilmember	City of Tracy	Tracy	CA	NOA
856.	Tucker	Suzanne	Mayor Pro Tem	City of Tracy	Tracy	CA	NOA
857.	Digre	Rich	Administrative Services Director	City of Union City	Union City	CA	NOA
858.	Elliott	Renee	City Clerk	City of Union City	Union City	CA	NOA
859.	Fernandez	Manuel (Manny)	Councilmember	City of Union City	Union City	CA	NOA
860.	Green	Mark	Mayor	City of Union City	Union City	CA	NOA
861.	Last name	Larry	City Manager	City of Union City	Union City	CA	NOA
862.	Leonard	Mark	Community Development Director [Planning]	City of Union City	Union City	CA	NOA
863.	Navarro	Jim	Vice Mayor	City of Union City	Union City	CA	NOA
864.	Valle	Richard	Councilmember	City of Union City	Union City	CA	NOA
865.	Ganding	Exequiel G.		City of Vallejo, Dept. of Public Works	Vallejo	CA	CD
866.	Lewis	William P.		City of Yuba City	Yuba City	CA	CD
867.	Clary	Jennifer		Clean Water Action	San Francisco	CA	NOA DPEIR
868.	Pfuehler	Erich	California Director	Clean Water Action	San Francisco	CA	NOA
869.	Berkowitz	Judith	President	Coalition for San Francisco Neighborhoods	San Francisco	CA	NOA
870.	Girardot	Joan	Chair, Water Task Force	Coalition for San Francisco Neighborhoods	San Francisco	CA	NOA
871.	Greul	Steve	1st Vice President	Coalition for San Francisco Neighborhoods	San Francisco	CA	NOA
872.				Coastal Watershed Council	Santa Cruz	CA	NOA
873.	Brennan	Cathleen		Coastside County Water District	Sunnyvale	CA	CD
874.	Brennan	Cathleen		Coastside County Water District	Halfmoon Bay	CA	CD
875.	Flanagan	Amanda		Coastside County Water District	Half Moon Bay	CA	NOA
876.	Mickelsen	Chris	President	Coastside County Water District	Half Moon Bay	CA	NOA
877.	Schmidt	Ed	General Manager	Coastside County Water District	Half Moon Bay	CA	NOA
878.				Coastside Fishing Club	Pacifica	CA	NOA
879.				Coastside Habitat Coalition	San Gregorio	CA	NOA
880.	Roberts	Lennie	Legislative Analyst	Committee for Green Foothills	Palo Alto	CA	NOA
881.	Bishop	Walter	General Manager	Contra Costa Water District	Concord	CA	CD

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#	Last Name	First Name	Title	Affiliation	City	State	Copies
882.	Briggs	David A.		Contra Costa Water District	Concord	CA	CD
883.	Gartrell	Gregory	Assistant General Manager	Contra Costa Water District	Concord	CA	CD
884.	Naillon	Marguerite	Senior Water Resources Specialist	Contra Costa Water District	Concord	CA	NOA CD
885.	Orloff	Leah	Senior Water Resources Specialist	Contra Costa Water District	Concord	CA	NOA CD
886.	Hokholt	Ms. Lisa	Project Coordinator	Council of Resource Conservation Districts	Concord	CA	NOA
887.	Bazar	Chris	Planning Director	County of Alameda	Oakland	CA	NOA
888.	Hishida Graff	Crystal	Clerk of the Board of Supervisors	County of Alameda	Oakland	CA	NOA
889.	James	Sorensen	Community Development Agency Director	County of Alameda	Hayward	CA	NOA
890.	Linton	Donna	Assistant County Administrator	County of Alameda	Oakland	CA	NOA
891.	Muranishi	Susan S.	County Administrator	County of Alameda	Oakland	CA	CD
892.	Sorensen	James	Community Development Agency Director	County of Alameda	Hayward	CA	NOA
893.	Woldesenbet	Daniel	Public Works Director	County of Alameda	Hayward	CA	NOA
894.	Carson	Keith	District 5 Supervisor	County of Alameda, Board of Supervisors	Oakland	CA	NOA
895.	Haggerty	Scott	District 1 Supervisor, Board President	County of Alameda, Board of Supervisors	Oakland	CA	NOA
896.	Lai-Bitker	Alice	District 3 Supervisor, Board Vice President	County of Alameda, Board of Supervisors	Oakland	CA	NOS
897.	Miley	Nathan	District 4 Supervisor	County of Alameda, Board of Supervisors	Oakland	CA	NOA
898.	Steele	Gail	District 2 Supervisor	County of Alameda, Board of Supervisors	Oakland	CA	NOA
899.	Chapman	Nicholas J.	Alameda County Fire Commissioner	County of Alameda, Fire Commission	Sunol	CA	NOA CD
900.	MacKenzie	Robert W.		County of Butte, Office of County Counsel	Oroville	CA	CD
901.	Callaway	Merita	District 3 Supervisor, Board Vice Chair	County of Calaveras, Board of Supervisors	Avery	CA	NOA
902.	Claudino	Bill	District 1 Supervisor	County of Calaveras, Board of Supervisors	San Andreas	CA	NOA
903.	Gates	Carol	Supervising Board Clerk	County of Calaveras, Board of Supervisors	San Andreas	CA	NOA
904.	Thomas	Russ	District 5 Supervisor, Board Chair	County of Calaveras, Board of Supervisors	San Andreas	CA	NOA
905.	Tryon	Thomas R.	District 4 Supervisor	County of Calaveras, Board of Supervisors	San Andreas	CA	NOA
906.	Varni	Karen	County Clerk/Ex-Oficio Clerk to the Board	County of Calaveras, Board of Supervisors	San Andreas	CA	NOA

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907.	Wilensky	Steve	District 2 Supervisor	County of Calaveras, Board of Supervisors	San Andreas	CA	NOA
908.	Stanton	Donald F.		County of Colusa	Colusa	CA	CD
909.	Herring	Norman Y.		County of Glenn	Willows	CA	CD
910.			Community Development Agency Director	County of Mariposa	Mariposa	CA	NOA
911.			County Clerk	County of Mariposa	Mariposa	CA	NOA
912.	Hertfelder	Dana S.	Public Works Director	County of Mariposa	Mariposa	CA	NOA
913.	Inman	Rich	County Administrator	County of Mariposa	Mariposa	CA	NOA
914.	Schenk	Kris	Planning Director	County of Mariposa	Mariposa	CA	NOA
915.	Turpin	Lyle	District 2 Supervisor	County of Mariposa	Mariposa	CA	NOA
916.	Williams	Margie	Clerk of the Board of Supervisors	County of Mariposa	Mariposa	CA	NOA
917.	Aborn	Brad	District 1 Supervisor	County of Mariposa, Board of Supervisors	Mariposa	CA	NOA
918.	Bibby	Janet	District 3 Supervisor	County of Mariposa, Board of Supervisors	Mariposa	CA	NOA
919.	Fritz	Dianne	District 4 Supervisor	County of Mariposa, Board of Supervisors	Mariposa	CA	NOA
920.	Pickard	Bob	District 5 Supervisor	County of Mariposa, Board of Supervisors	Mariposa	CA	NOA
921.				County of Merced, Board of Supervisors	Merced	CA	CD
922.	Flinn	Thomas	Director of Public Works	County of San Joaquin	Stockton	CA	NOA
923.	Freeman	Gary W.	County Clerk	County of San Joaquin	Stockton	CA	NOA
924.	Hulse	Jeff (Ben)	Community Development Director	County of San Joaquin	Stockton	CA	NOA
925.	Lopez	Manuel	County Administrator	County of San Joaquin	Stockton	CA	NOA
926.	Sahyoun	Lois M.	Clerk of the Board	County of San Joaquin	Stockton	CA	NOA
927.	Gutierrez	Steven	District 1 Supervisor	County of San Joaquin, Board of Supervisors	Stockton	CA	NOA
928.	Mow	Victor	District 3 Supervisor, Chairman	County of San Joaquin, Board of Supervisors	Stockton	CA	NOA
929.	Ornellas	Leroy	District 5 Supervisor	County of San Joaquin, Board of Supervisors	Stockton	CA	NOA
930.	Ruhstaller	Larry	District 2 Supervisor	County of San Joaquin, Board of Supervisors	Stockton	CA	NOA
931.	Vogel	Ken	District 4 Supervisor, Vice Chairman	County of San Joaquin, Board of Supervisors	Stockton	CA	NOA
932.	Cullen	Neil R.	Public Works Director	County of San Mateo	Redwood City	CA	NOA
933.	Ferrari	Jeani	Chief Fire Officer	County of San Mateo	Redwood City	CA	NOA CD
934.	Holland	David	Director of Parks and Recreation	County of San Mateo	Redwood City	CA	NOA

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#	Last Name	First Name	Title	Affiliation	City	State	Copies
935.	Maltbie	John L.	County Manager/Clerk of the Board	County of San Mateo	Redwood City	CA	NOA
936.	Slocum	Warren	County Clerk	County of San Mateo	Redwood City	CA	NOA
937.	Church	Mark	District 1 Supervisor	County of San Mateo, Board of Supervisors	Redwood City	CA	NOA
938.	Gordon	Richard S.	District 3 Supervisor	County of San Mateo, Board of Supervisors	Redwood City	CA	NOA
939.	Hill	Jerry	District 2 Supervisor, Board Vice President	County of San Mateo, Board of Supervisors	Redwood City	CA	NOA
940.	Jacobs Gibson	Rose	District 4 Supervisor, President	County of San Mateo, Board of Supervisors	Redwood City	CA	NOA
941.	Tissier	Adrienne	District 5 Supervisor	County of San Mateo, Board of Supervisors	Redwood City	CA	NOA
942.	Alcomendras	Gina	County Clerk/Recorder	County of Santa Clara	San Jose	CA	NOA
943.	Graves	Gary	Chief Deputy County Executive	County of Santa Clara	San Jose	CA	NOA
944.	Perez		Clerk to the Board of Supervisors	County of Santa Clara	San Jose	CA	NOA
945.	Yeager	Ken	Supervisor, District 4	County of Santa Clara	San Jose	CA	NOA
946.	Alvarado	Blanca	District 2 Supervisor, Board Vice Chair	County of Santa Clara, Board of Supervisors	San Jose	CA	NOA
947.	Gage	Donald F.	District 1 Supervisor, Board Chair	County of Santa Clara, Board of Supervisors	San Jose	CA	NOA
948.	Kniss	Liz	Board Chair, District 5	County of Santa Clara, Board of Supervisors	San Jose	CA	NOA
949.	McHugh	Pete	District 3 Supervisor	County of Santa Clara, Board of Supervisors	San Jose	CA	NOA
950.	Freitas	Ron	Planning & Community Development Director	County of Stanislaus	Modesto	CA	NOA
951.	Harrigfeld	Sonya		County of Stanislaus	Modesto	CA	NOA
952.	Lundergin	Lee	County Clerk	County of Stanislaus	Modesto	CA	NOA
953.	Patterson	Kenneth	Director of Community Services	County of Stanislaus	Modesto	CA	NOA
954.	Robinson	Richard		County of Stanislaus	Modesto	CA	CD
955.	Tallman	Christine Ferraro	Clerk to the Board	County of Stanislaus	Modesto	CA	NOA
956.	DeMartini	Jim	District 5 Supervisor	County of Stanislaus, Board of Supervisors	Modesto	CA	NOA DPEIR
957.	Grover	Jeff	District 3 Supervisor	County of Stanislaus, Board of Supervisors	Modesto	CA	NOA
958.	Mayfield	Thomas W.	District 2 Supervisor	County of Stanislaus, Board of Supervisors	Modesto	CA	NOA
959.	Monteith	Dick	District 4 Supervisor	County of Stanislaus, Board of Supervisors	Modesto	CA	NOA
960.	O'Brien	William	District 1 Supervisor	County of Stanislaus, Board of Supervisors	Modesto	CA	NOA

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961.	Mendez	Raul		County of Stanislaus, Chief Executive Office	Modesto	CA	NOA
962.	Ford	Kirk		County of Stanislaus, Planning Department	Modesto	CA	NOA
963.	Willard	Charles H.		County of Tehama Board of Supervisors	Red Bluff	CA	NOA CD
964.	Stokely	Tom		County of Trinity -Natural Resources Dept.	Hayfork	CA	CD
965.	Jamar	Alicia L.	Clerk of the Board of Supervisors	County of Tuolumne	Sonora	CA	NOA
966.	Pedro	Craig	Assistant County Administrator	County of Tuolumne	Sonora	CA	NOA
967.	Rei	Petty	Public Works Director	County of Tuolumne	Sonora	CA	NOA
968.	Shane	Beverly	Community Development Director	County of Tuolumne	Sonora	CA	NOA
969.	Wallace	C. Brent	County Administrator	County of Tuolumne	Sonora	CA	CD
970.	Bass	Liz	District 1 Supervisor, Chair	County of Tuolumne, Board of Supervisors	Sonora	CA	NOA DPEIR
971.	Maffei	Paolo	District 2 Supervisor	County of Tuolumne, Board of Supervisors	Sonora	CA	NOA CD
972.	Murrison	Terri	District 3 Supervisor	County of Tuolumne, Board of Supervisors	Sonora	CA	NOA
973.	Pland	Dick	District 5 Supervisor	County of Tuolumne, Board of Supervisors	Sonora	CA	NOA
974.	Thornton	Mark	District 4 Supervisor	County of Tuolumne, Board of Supervisors	Sonora	CA	NOA DPEIR
975.	Carr	Colleen		County of Tuolumne, Planning Commission	Big Oak Flat	CA	NOA CD
976.				Coyote Creek Alliance	San Jose	CA	NOA
977.	Kidder	Norm	Supervising Naturalist	Coyote Hills Regional Park	Fremont	CA	NOA
978.	Panoringan	Mario	Executive Director	Daly City - Colma Chamber of Commerce	Daly City	CA	NOA
979.	Davis	Darilyn		Davis & Associates	San Francisco	CA	NOA
980.	Kelly	Julie		Deer Creek Watershed Conservancy	Vina	CA	CD
981.				Defense of Place	San Francisco	CA	NOA
982.	Brogan	Bill	General Manager	Delano-Earlimart Irrigation District	Delano	CA	CD
983.				Diablo Valley Fly Fisherman	Walnut Creek	CA	NOA
984.	Nilson	David		Diablo Valley Fly Fishers	Walnut Creek	CA	NOA
985.	Rabinowe	Ed		Diablo Valley Fly Fishers	Walnut Creek	CA	NOA
986.	Onishi	Josie	Secretary to Jon D. Rubin,	Diepenbrock Harrison	Sacramento	CA	CD
987.	Rubin	Jon		Diepenbrock Harrison	Sacramento	CA	CD
988.	Peltzer	Alex		Dooley Herr & Peltzer	Visalia	CA	CD
989.	Dooley	Daniel M.		Dooley Herr, LLP	Visalia	CA	CD

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990.	O'Brien	Kevin M.		Downey Brand LLP	Sacramento	CA	CD
991.	Froman	Loralie		Eagle Eye Editing	San Francisco	CA	NOA
992.				Earth Neighborhood	Union City	CA	NOA
993.	Raburn	Rovert	Executive Director	East Bay Bicycle Coalition	Oakland	CA	NOA
994.				East Bay Express			NOA
995.	Coleman	John A	Director, Ward #2	East Bay Municipal Utility District	Oakland	CA	NOA
996.	Diemer	Dennis	General Manager	East Bay Municipal Utility District	Oakland	CA	NOA
997.	Foulkes	Katy	Director, Ward #3	East Bay Municipal Utility District	Oakland	CA	NOA
998.	Linney	Doug	Director, Ward #5	East Bay Municipal Utility District	Oakland	CA	NOA
999.	McIntosh	Lesa R.	Director, Ward #1	East Bay Municipal Utility District	Oakland	CA	NOA
1000.	Mellon	Frank	Director, Ward #7	East Bay Municipal Utility District	Oakland	CA	NOA
1001.	Patterson	William B.	Director, Ward #6	East Bay Municipal Utility District	Oakland	CA	NOA
1002.	Richardson	David	Director, Ward #4	East Bay Municipal Utility District	Oakland	CA	NOA
1003.	Whitty	Eileen		East Bay Municipal Utility District		CA	CD
1004.	Etheridge	Fred S.		East Bay Municipal Utility District, Office of General Counsel	Oakland	CA	NOA
1005.	Alexander	Pete		East Bay Regional Park District	Oakland	CA	NOA
1006.	Anderson	Mike		East Bay Regional Park District	Oakland	CA	NOA
1007.	Budzinski	Ray	Range Management Specialist	East Bay Regional Park District	Oakland	CA	NOA
1008.	Cameron	Rosemary	Assistant General Manager	East Bay Regional Park District	Oakland	CA	NOA
1009.	Di Donato	Joe	Chief, Natural Resources Mgmt.	East Bay Regional Park District	Oakland	CA	NOA
1010.	Escobar	John	Asst. GM-Operations/Interpr.	East Bay Regional Park District	Oakland	CA	NOA
1011.	Fiala	Steve	Trail Specialist - Land Acquisition	East Bay Regional Park District	Oakland	CA	NOA
1012.	Lewis	Shelly		East Bay Regional Park District	Oakland	CA	NOA
1013.	O'Brien	Pat	General Manager	East Bay Regional Park District	Oakland	CA	NOA CD
1014.	Olson	Brad	Environmental Programs Manager	East Bay Regional Park District	Oakland	CA	NOA DPEIR CD
1015.	Weninger	Nancy	Chief, Land Acquisition	East Bay Regional Park District	Oakland	CA	NOA
1016.	Wiese	Brian	Chief of Planning	East Bay Regional Park District	Oakland	CA	NOA
1017.	Preston	Mary	General Manager	East Contra Costa Irrigation District	Brentwood	CA	CD
1018.	Docto	David	Public Works Director	East Palo Alto Water District	East Palo Alto	CA	NOA
1019.				East Stanislaus County Resource Conservation District	Modesto	CA	NOA
1020.				Echo Wilderness Company	Oakland	CA	NOA DPEIR

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1021.	Karpowicz	Ron	Project Manager	Ecology & Environment, Inc.	San Francisco	CA	DPEIR
1022.	Winsor	Mark	Project Manager	EDAW, Inc.	San Francisco	CA	DPEIR
1023.	Schneider	Anne J.		Ellison, Schneider & Harris L.L.P.	Sacramento	CA	CD
1024.	Boucher	Peter	Project Manager	ENTRIX, Inc.	Walnut Creek	CA	DPEIR
1025.	Lowe	Tim		Environmental Awareness Club	Castro Valley	CA	NOA
1026.	Graff	Tom	California Regional Director	Environmental Defense	Oakland	CA	NOA CD
1027.	Hayden	Ann		Environmental Defense	Oakland	CA	NOA DPEIR
1028.	Rosekrans	Sprek	Senior Analyst	Environmental Defense	Oakland	CA	NOA DPEIR
1029.	Young	Terry	Scientist	Environmental Defense Fund	Oakland	CA	NOA
1030.	Deen	Alisha	Legislative Analyst	Environmental Justice Coalition for Water	Oakland	CA	NOA
1031.	Freeman	Robin		Environmental Program	Oakland	CA	NOA
1032.				Environmental Water Caucus	San Francisco	CA	NOA
1033.	Nesmith	David		Environmental Water Caucus		CA	NOA CD
1034.	Davis	John A.	Team Leader, Water Supply	ESA + Orion	San Francisco	CA	NOA
1035.	Geier	Valerie C.	Team Leader, Facilities Impacts	ESA + Orion	San Francisco	CA	NOA
1036.	Hsiao	Joyce	Principal	ESA + Orion	San Francisco	CA	NOA
1037.	Moulton	Leslie	Director - Water/Wastewater Services	ESA + Orion	San Francisco	CA	NOA DPEIR
1038.	Oates	Gary W.	Principal in Charge	ESA + Orion	San Francisco	CA	NOA
1039.	Hardy	Jim	City Manager	Estero Mun. Improvement Distict	Foster City	CA	NOA
1040.	Towne	Jim	Public Works Director	Estero Mun. Improvement Distict	Foster City	CA	NOA
1041.	Dally	Dale	General Manager	Exeter Irrigation District	Exeter	CA	CD
1042.				Fair Oaks Beautification Association, Inc.	Menlo Park	CA	NOA
1043.	McClish	Art		Fair Oaks Beautification Association, Inc.	Menlo Park	CA	NOA CD
1044.	James	Bill	Editor/Assistant Publisher	Fairfield Daily Republic	Fairfield	CA	NOA
1045.	Dwyer	Patrick	Program Manager	Farmington Groundwater Recharge Program	Sacramento	CA	NOA
1046.	Rockwell, D.C.	C.Mark		Federation of Fly Fishers	Penn Valley	CA	CD
1047.	Felger	Warren P.		Felger & Associates	Fresno	CA	CD
1048.	Robbins	Kenneth M.		Flanagan, Mason, Robbins & Gnass	Merced	CA	CD
1049.	Mason	Michael		Flannigan, Mason, Robbins & Gnass	Merced	CA	CD
1050.	Lariz	Mondy		Flycasters, Inc. San Jose	San Jose	CA	NOA

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1051.	Seldon	Marty		Flycasters, Inc. San Jose	Sunnyvale	CA	NOA
1052.				Foster City Chamber of Commerce	Foster City	CA	NOA
1053.	Bonior	Cindy	President & CEO	Fremont Chamber of Commerce	Fremont	CA	NOA
1054.	Jacobsma	Ronald	General Manager	Friant Water Users Authority	Lindsay	CA	CD
1055.	Skaredoff	Igor		Friends of Alhambra Creek	Martinez	CA	NOA
1056.				Friends of Baxter Creek	El Cerrito	CA	NOA
1057.	Szostak	Apple		Friends of Baxter Creek	Richmond	CA	NOA
1058.				Friends of Corte Madera Creek Watershed	Larkspur	CA	NOA
1059.	Smith	Susan		Friends of Coyote Hills & Fremont	Fremont	CA	NOA
1060.	Pietrzyk	John & Patricia		Friends of Coyote Hills Fremont	Union City	CA	NOA
1061.	Nanga	Daphne		Friends of Crow Creek	Castro Valley	CA	NOA
1062.	Schwartz	Susan		Friends of Five Creeks	Berkeley	CA	NOA
1063.	Puls	Cheri		Friends of Kottinger Creek	Pleasanton	CA	NOA
1064.				Friends of Lobos Creek c/o Golden Gate NRA	San Francisco	CA	NOA
1065.	Malko	Mary		Friends of Mount Diablo Creek	Berkeley	CA	NOA
1066.				Friends of San Leandro Creek	San Leandro	CA	NOA
1067.				Friends of Stevens Creek Trail - McClellan Ranch Park	Cupertino	CA	NOA
1068.	Rothenberg	Ken		Friends of Sycamore Grove Park	Livermore	CA	NOA
1069.	Douglas	Bruce		Friends of Temescal Creek	Oakland	CA	NOA
1070.	Tung	Dave & Louann		Friends of The Arroyos	Livermore	CA	NOA
1071.	Romo	Pam		Friends of the Creeks	Walnut Creek	CA	NOA
1072.	Cochrane	Steve		Friends of the Estuary	Oakland	CA	NOA
1073.				Friends of the River	Sacramento	CA	NOA
1074.	Evans	Steve	Conservation Director	Friends of the River	Sacramento	CA	NOA
1075.	Boucher	Allison	Project Manager	Friends of the Tuolumne, Inc.	Bend	OR	NOA CD
1076.	Atlas	J. Mark		Frost, Krup & Atlas	Willows	CA	CD
1077.	Mora	Steve		Glenn County Farm Bureau	Orland	CA	CD
1078.	Hernandez	Dan	Green Festival Volunteer Coordinator	Global Exchange/ Coop America	San Francisco	CA	NOA DPEIR
1079.	MacWilliams	Michael		Golden Gate Angling & Casting	San Francisco	CA	NOA
1080.			President of the Board	Golden Gate Bridge, Highway, & Transportation District	San Francisco	CA	NOA
1081.	Zahradnik	Alan	Director of Planning & Policy Analysis	Golden Gate Bridge, Highway, & Transportation District	San Rafael	CA	NOA
1082.				Golden West Women Flyfishers	San Francisco	CA	NOA
1083.	Heffren	Frank		Gorrill Land Company	Durham	CA	CD

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1084.	Renteria	Henry	Executive Director	Governor's Office of Emergency Services	Mather	CA	NOA
1085.	Widell	David	General Manager	Grassland Water District	Los Banos	CA	CD
1086.	Gardner	Alan		Great Oaks Water Company	San Jose	CA	NOA
1087.	Green	Denslow		Green, Green & Rigby	Madera	CA	CD
1088.	Stivers	Evelyn		Greenbelt Alliance	Walnut Creek	CA	NOA
1089.				Grizzly Peak Flyfishers	El Cerrito	CA	NOA
1090.	Goodrich	Jim	General Manager	Groveland Community Services District	Groveland	CA	NOA CD
1091.	Brown	Maria	Superintendent	Gulf of the Farallones National Marine Sanctuary	San Francisco	CA	NOA
1092.				Half Moon Bay Fisherman's Market Association	El Granada	CA	NOA
1093.	Miller	Steven		Hanson Bridgett Marcus Vlahos & Rudy, LLP	San Francisco	CA	NOA
1094.	Schutte	Allison		Hanson, Bridgett, Marcus, Vlahos & Rudy, LLP	San Francisco	CA	NOA DPEIR
1095.	Willyerd	Eric	General Manager	Hayward Area Recreation & Park District	Hayward	CA	NOA
1096.	Raty	Scott	President & CEO	Hayward Chamber of Commerce	Hayward	CA	NOA
1097.	Olson	David		HDR\SWRI	Sacramento	CA	NOA
1098.	Harrigfeld	Karna		Herum, Crabtree, Dyer, Zolezzi, & Terpstra	Stockton	CA	CD
1099.	Zolezzi	Jeanne M.		Herum, Crabtree, Dyer, Zolezzi, & Terpstra	Stockton	CA	CD
1100.	McRorie	Ken & Glenda		Hetch Hetchy Water and Power	Modesto	CA	NOA
1101.	Brown	Malcolm		Highway 120 Chamber	Groveland	CA	NOA
1102.	Ventura	Richard		Hispanic Chamber of Commerce	San Francisco	CA	NOA
1103.	Goldstein	Beth		Hydroconsult Engineers	San Francisco	CA	NOA
1104.	Janow	Roger J.	Investment Professional	ING Financial Partners	Aptos	CA	NOA CD
1105.	Lambert	Steve	Editor	Inland Valley Daily Bulletin (Ontario)	Ontario	CA	NOA
1106.	Hurst	Mark		Irvington Business Association	Fremont	CA	NOA
1107.	Hurlbutt	Thomas R.		J G Boswell, Company	Pasadena	CA	NOA
1108.	Willy	Henry		Jackson Valley Irrigation Distric	Ione	CA	CD
1109.	Arbabian	Mendi		Jacobs Energy Group	Walnut Creek	CA	CD
1110.	Sugiura	Kaz		Japanese Chamber of Commerce	San Mateo	CA	NOA
1111.	Walters	Rich	Project Manager	Jones & Stokes, Inc	Oakland	CA	DPEIR CD
1112.	McMorris	Chris		JRP Historical Consulting	San Francisco	CA	NOA
1113.	Beck	James	General Mgr.	Kern County Water Agency	Bakersfield	CA	CD

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#	Last Name	First Name	Title	Affiliation	City	State	Copies
1114.				Kilkare Woods Homeowners Association	Sunol	CA	NOA
1115.	Tharpe	D. Tyler		Kimble, MacMichael & Upton	Fresno	CA	CD
1116.		Mr. Sang On Kim		Korean American Chamber of Commerce	San Francisco	CA	NOA
1117.	Goldsmith	Janet K.		Kronick, Moskovitz, Tiedemann & Girard	Sacramento	CA	CD
1118.	O'Hanlon	Daniel J.		Kronick, Moskovitz, Tiedemann & Girard	Sacramento	CA	CD
1119.				Kronick, Moskovitz, Tiedemann, & Girard	Sacramento	CA	CD
1120.	Schulz	Cliff W.		Kronick, Moskovitz, Tiedemann, & Girard	Sacramento	CA	CD
1121.	Colen	Tim		Lake Merced Task Force	San Francisco	CA	NOA
1122.	Morten	Dick		Lake Merced Task Force	San Francisco	CA	NOA
1123.	Bailey	Richard		Lake Merritt Institute	Oakland	CA	NOA
1124.	Foster, Esq.	Christopher G.		Law Offices of Smil& & Khachigian	Los Angeles	CA	CD
1125.	Wyznyckyj	Luba		LCW	San Francisco	CA	NOA
1126.	Baldisseri	Marie	President	League of Women Voters	South San Francisco	CA	NOA
1127.	Borgonovo	Roberta		League of Women Voters	San Francisco	CA	NOA CD
1128.	Keller	Miriam		League of Women Voters	Fremont	CA	NOA
1129.			President	League of Women Voters of Alameda	Alameda	CA	NOA
1130.				League of Women Voters of California	Sacramento	CA	NOA
1131.			President	League of Women Voters of Central San Mateo County	San Mateo	CA	NOA
1132.			President	League of Women Voters of Fremont, Newark, & Union City	Fremont	CA	NOA
1133.			President	League of Women Voters of Livermore-Amador Valley	Livermore	CA	NOA
1134.	Tincher	Veronica	President	League of Women Voters of Palo Alto	Palo Alto	CA	NOA
1135.	Waggoner	Jennifer	President	League of Women Voters of San Francisco	San Francisco	CA	NOA
1136.	Fischler	Bobbie	President	League of Women Voters of San Jose/Santa Clara	San Jose	CA	NOA
1137.			President	League of Women Voters of South San Mateo County	Menlo Park	CA	NOA
1138.	Lennihan	Martha H.		Lennihan Law	Sacramento	CA	CD
1139.				Library - Alameda County/ City of Fremont	Fremont	CA	NOA DPEIR CD

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#	Last Name	First Name	Title	Affiliation	City	State	Copies
1140.				Library - Belmont City	Belmont	CA	NOA DPEIR
1141.				Library - East Palo Alto	East Palo Alto	CA	NOA DPEIR
1142.				Library - Foster City	Foster City	CA	NOA DPEIR
1143.	Yang	Angela	Library Manager	Library - Fremont Main	Fremont	CA	NOA DPEIR
1144.				Library - Hastings College of Law	San Francisco	CA	DPEIR
1145.				Library - Millbrae	Millbrae	CA	NOA DPEIR
1146.				Library - Modesto	Modesto	CA	NOA DPEIR CD
1147.				Library - Oakdale	Oakdale	CA	NOA DPEIR
1148.				Library - San Carlos	San Carlos	CA	NOA DPEIR
1149.				Library - San Francisco Main, Government Information Services	San Francisco	CA	DPEIR
1150.	Owens	Wendy		Library - San Francisco Public	San Francisco	CA	NOA DPEIR CD
1151.				Library - San Jose-Dr. Martin Luther King, Jr.	San Jose	CA	NOA DPEIR CD
1152.	Johnson	Victoria	Director of Library Services	Library - San Mateo County	San Mateo	CA	DPEIR CD
1153.	Cervantes	Melinda	County Librarian	Library - Santa Clara County	los gatos	CA	NOA DPEIR
1154.				Library - Stanford University, Jonsson Library of Government Documents	Stanford	CA	DPEIR
1155.				Library - Stockton-San Joaquin County Public Library	Stockton	CA	NOA DPEIR CD
1156.				Library - Tuolumne County	Tuolumne	CA	NOA DPEIR CD
1157.	Corcoran	Constance J.	County Librarian	Library - Tuolumne County	Sonora	CA	DPEIR CD
1158.				Library - Turlock	Turlock	CA	NOA DPEIR
1159.	Hagman	Mike	General Manager	Lindmore Irrigation District	Lindsay	CA	CD
1160.	Edwards	Scott	General Manager	Lindsay-Strathmore Irrigation District	Lindsay	CA	CD
1161.				Lions Club--Centerville	Newark	CA	NOA
1162.	Coffing	David G.		Lions Club--Fremont Industrial	Fremont	CA	NOA

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#	Last Name	First Name	Title	Affiliation	City	State	Copies
1163.	Housen	Vivian	General Manager	Livermore Amador Wastewater Management Authority (LAVWMA)	Dublin	CA	NOA
1164.	Barry	Timothy J.	General Manager	Livermore Area Recreation & Park District	Livermore	CA	NOA
1165.	Kaye	Dale	President & CEO	Livermore Chamber of Commerce	Livermore	CA	NOA
1166.	Gage	Stanley	Director	Los Trancos County Water District	Portola Valley	CA	NOA
1167.	Turner	Alan	General Manager	Madera Irrigation District	Madera	CA	CD
1168.	Helliker	Paul	General Manager	Marin Municipal Water District	Corte Madera	CA	NOA
1169.	McGuire	Eric	Environmental Services Coordinator	Marin Municipal Water District	Corte Madera	CA	NOA
1170.				Mariposa County Resource Conservation District	Mariposa	CA	NOA
1171.	Godwin	Arthur F.		Mason, Robbins, Gnass & Browning	Merced	CA	CD
1172.	Blueford	Joyce		Math/Science Nucleus	Fremont	CA	NOA
1173.	Blackwell	Fred	Director	Mayor's Office of Community Development	San Francisco	CA	NOA
1174.	Blout	Jesse		Mayor's Office of Economic Development	San Francisco	CA	NOA
1175.				Media - Alameda Journal		CA	NOA
1176.				Media - Alameda Publishing Corp.		CA	NOA
1177.	Dianda	Mario	Editor	Media - ANG Newspapers	Oakland	CA	NOA
1178.				Media - Asian Week		CA	NOA
1179.			Editor	Media - Associated Press	San Francisco	CA	NOA
1180.	Chea	Tarence	Staff Writer	Media - Associated Press	San Francisco	CA	NOA
1181.	Shiffman	Bill		Media - Associated Press	San Francisco	CA	NOA
1182.				Media - Bay Area Reporter		CA	NOA
1183.				Media - Bay City News Service		CA	NOA
1184.				Media - Bay Nature Magazine	Berkeley	CA	NOA
1185.	King	Michelle	News Editor	Media - Chico Enterprise-Record	Chico	CA	NOA
1186.				Media - China Press			NOA
1187.				Media - Chinese Radio			NOA
1188.				Media - Chinese Times			NOA
1189.				Media - CNN			NOA
1190.				Media - Contra Costa Times			NOA
1191.				Media - Contra Costa Weekly Papers			NOA
1192.				Media - Daily Review			NOA
1193.				Media - El Bohemia News			NOA
1194.				Media - El Latino			NOA
1195.				Media - El Mensajero			NOA

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1196.				Media - El Tecolote			NOA
1197.				Media - Foster City Islander		CA	NOA
1198.	Grossi	Mark	Staff Writer	Media - Fresno Bee	Fresno	CA	NOA
1199.	Provost	Steve	Assistant News Editor	Media - Fresno Bee	Fresno	CA	NOA
1200.				Media - Half Moon Bay Review			NOA
1201.				Media - Hokubei Mainichi			NOA
1202.				Media - India Currents			NOA
1203.				Media - India West			NOA
1204.				Media - KABL AMFM			NOA
1205.				Media - KALW FM			NOA
1206.				Media - KAZA AM			NOA
1207.				Media - KBAY FM			NOA
1208.				Media - KBBF FM			NOA
1209.				Media - KBLX			NOA
1210.				Media - KBWB TV Channel 20			NOA
1211.				Media - KCBS AM			NOA
1212.				Media - KCBS AM (City Hall)			NOA
1213.				Media - KCRH FM			NOA
1214.				Media - KCSM FM			NOA
1215.				Media - KDFC FM			NOA
1216.				Media - KDTV TV Channel 14 (Univision)			NOA
1217.				Media - KEAR FM			NOA
1218.				Media - KEST AM			NOA
1219.				Media - KFAX AM			NOA
1220.				Media - KFRC FM			NOA
1221.				Media - KFSF TV Channel 66			NOA
1222.				Media - KFTY TV Channel 50			NOA
1223.				Media - KGO AM			NOA
1224.				Media - KGO TV Channel 7			NOA
1225.				Media - KIQI FM (Radio Unica)			NOA
1226.				Media - KITS FM			NOA
1227.				Media - KKIQ FM			NOA
1228.				Media - KKSF / KDFC			NOA
1229.				Media - KLIV AM			NOA
1230.				Media - KLLC FM			NOA
1231.				Media - KMEL FM			NOA
1232.	Walter	Hanspeter		Media - KMTG	Sacramento	CA	DPEIR CD

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1233.				Media - KMTP TV Channel 32			NOA
1234.				Media - KNBR AM			NOA
1235.				Media - KNEW AM			NOA
1236.				Media - KNTV TV Channel 11			NOA
1237.				Media - KOIT AMFM			NOA
1238.				Media - KPFA AM			NOA
1239.				Media - KPIX Channel 5			NOA
1240.				Media - KPOO FM			NOA
1241.				Media - KQED FM			NOA
1242.				Media - KQED TV Channel 9			NOA
1243.				Media - KRON TV Channel 4			NOA
1244.				Media - KSAN FM			NOA
1245.				Media - KSFO AM			NOA
1246.				Media - KSOL FM			NOA
1247.				Media - KSTS TV Channel 48			NOA
1248.				Media - KTCT AM			NOA
1249.				Media - KTSF TV Channel 26			NOA
1250.				Media - KTVU Channel 2			NOA
1251.				Media - KZQZ FM			NOA
1252.			Editor	Media - Lodi News Sentinel	Lodi	CA	NOA
1253.	Romney	Lee	Staff Writer	Media - Los Angeles Times	Los Angeles	CA	NOA
1254.				Media - Marina Times		CA	NOA
1255.				Media - Ming Pao Daily			NOA
1256.	Dunlsa	Mike		Media - Modesto Bee	Modesto	CA	NOA
1257.	Stern	Eric	Staff Writer	Media - Modesto Bee	Modesto	CA	NOA
1258.				Media - Mountain View Voice		CA	NOA
1259.				Media - New Mission News			NOA
1260.	Richard	Chris		Media - Oakland Museum	Oakland	CA	NOA
1261.				Media - Oakland Tribune		CA	NOA
1262.				Media - Pacifica Tribune		CA	NOA
1263.				Media - Palo Alto Daily News		CA	NOA
1264.				Media - Palo Alto Weekly		CA	NOA
1265.				Media - Philippine News			NOA
1266.				Media - Pleasanton Weekly		CA	NOA
1267.				Media - Post Newspapers, Inc.			NOA
1268.				Media - Reuters			NOA
1269.				Media - Richmond Review		CA	NOA
1270.				Media - Russian Life			NOA

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1271.	Leavenworth	Stuart	Associate Editor	Media - Sacramento Bee	Sacramento	CA	NOA
1272.	Philp	Tom	Associate Editor	Media - Sacramento Bee	Sacramento	CA	NOA
1273.	Sample	Herbert A.	Staff Writer	Media - Sacramento Bee	Sacramento	CA	NOA
1274.	Welsh	Melinda		Media - Sacramento News & Review	Sacramento	CA	NOA
1275.	Roth	Gabe	City Editor	Media - San Francisco Bay Guardian	San Francisco	CA	NOA
1276.				Media - San Francisco Bay View		CA	NOA
1277.			Editor	Media - San Francisco Business Times	San Francisco	CA	NOA
1278.			Copy Editor	Media - San Francisco Chronicle	San Francisco	CA	NOA
1279.	Adams	Gerald		Media - San Francisco Chronicle	San Francisco	CA	NOA
1280.	Garcia	Ken	Staff Columnist	Media - San Francisco Chronicle	San Francisco	CA	NOA
1281.	Goben	Jan	Copy Editor	Media - San Francisco Chronicle	San Francisco	CA	NOA
1282.	Goodyear	Charlie	Reporter, Contra Costa Crime & Courts	Media - San Francisco Chronicle	Concord	CA	NOA
1283.	Hall	Carl T.	Reporter, Science, Medical	Media - San Francisco Chronicle	San Francisco	CA	NOA
1284.	Holt	Tim		Media - San Francisco Chronicle	San Francisco	CA	NOA
1285.	Lelchuk	Ilene	Staff Writer	Media - San Francisco Chronicle	San Francisco	CA	NOA
1286.	Martin	Glen	Reporter, North Coast & Sierra Nevada	Media - San Francisco Chronicle	San Francisco	CA	NOA
1287.				Media - San Francisco Chronicle (Peninsula Edition)		CA	NOA
1288.				Media - San Francisco Daily Journal		CA	NOA
1289.				Media - San Francisco Downtown		CA	NOA
1290.				Media - San Francisco Examiner		CA	NOA
1291.	Fancher	Emily		Media - San Francisco Examiner	San Francisco	CA	NOA
1292.				Media - San Francisco Examiner (Peninsula Edition)		CA	NOA
1293.				Media - San Francisco Observer		CA	NOA
1294.				Media - San Francisco Weekly		CA	NOA
1295.	Caraccio	David	News Desk Editor	Media - San Joaquin Record	Stockton	CA	NOA
1296.	Bell	Norman	Editor	Media - San Jose Business Journal	San Jose	CA	NOA
1297.	Carroll	Chuck	General Assignment Reporter	Media - San Jose Mercury News	Palo Alto	CA	NOA
1298.	Yarnold	David	Editor	Media - San Jose Mercury News	San Jose	CA	NOA
1299.				Media - San Mateo County Times		CA	NOA
1300.	Simmers	Tim	Staff Writer	Media - San Mateo County Times	San Mateo	CA	NOA
1301.	Mays	Jon	Staff Writer	Media - San Mateo Daily Journal	San Mateo	CA	NOA
1302.	Carson	Sara		Media - San Mateo Daily News	San Mateo	CA	NOA

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1303.	Smith	Matt	Columnist	Media - SF Weekly	San Francisco	CA	NOA
1304.				Media - Sing Tao Daily			NOA
1305.				Media - Sunset Beacon			NOA
1306.	Softky	Marion		Media - The Almanac	Portola Valley	CA	NOA
1307.				Media - The Argus			NOA
1308.	Daly	Maria	Reporter	Media - The Epoch Times			NOA
1309.				Media - The Herald	Pleasanton	CA	NOA
1310.			Editor	Media - The Modesto Bee	Modesto	CA	NOA
1311.				Media - The Modesto Bee			NOA
1312.				Media - The New Fillmore			NOA
1313.				Media - The New York Times			NOA
1314.				Media - The Noe Valley Voice			NOA
1315.				Media - The Potrero View			NOA
1316.				Media - The Recorder			NOA
1317.				Media - The Sun Reporter	San Francisco	CA	NOA
1318.			Editor	Media - The Union Democrat	Sonora	CA	NOA
1319.				Media - The Wall Street Journal			NOA
1320.				Media - Tri-Valley Herald			NOA
1321.				Media - Valley Times			NOA
1322.				Media - Valley Wilds	Livermore	CA	NOA
1323.	Krist	John	Senior Reporter/Opinion Page Columnist	Media - Ventura County Star	Ventura	CA	NOA
1324.				Media - West County Times			NOA
1325.				Media - West of Twin Peaks Observer			NOA
1326.				Media - West Portal Monthly			NOA
1327.				Media - World Journal			NOA
1328.	Dehn	Fran	President & CEO	Menlo Park Chamber of Commerce	Menlo Park	CA	NOA
1329.				Merced Irrigation District	Merced	CA	CD
1330.	Krause	Garith	General Manager	Merced Irrigation District	Merced	CA	CD
1331.	Goldblatt	Craig		Metropolitan Transportation Commission	Oakland	CA	NOA
1332.	Heminger	Steve	Executive Director	Metropolitan Transportation Commission	Oakland	CA	NOA
1333.	Kightlinger	Jeff	General Manager	Metropolitan Water District of Southern CA	Los Angeles	CA	CD
1334.	Quinn	Timothy H.		Metropolitan Water District of Southern CA	Los Angeles	CA	CD
1335.	Roberts	James F.		Metropolitan Water District of Southern CA	Los Angeles	CA	CD
1336.	Regan	Paul	General Manager	Mid Peninsula Water District	Belmont	CA	NOA

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1337.				Midpeninsula Regional Open Space District	Los Altos	CA	NOA
1338.	Vella	Louis	Director	Mid-Peninsula Water District	Belmont	CA	NOA
1339.	Ford	John	President & CEO	Millbrae Chamber of Commerce	Millbrae	CA	NOA
1340.	McDonough	Diane	President	Milpitas Chamber of Commerce	Milpitas	CA	NOA
1341.	Baber III	William H.		Minasian, Spruance, Baber, Meith, Soares & Sexton	Oroville	CA	CD
1342.	Meith	Jeffrey A.		Minasian, Spruance, Baber, Meith, Soares & Sexton	Oroville	CA	CD
1343.	Minasian	Paul R.		Minasian, Spruance, Baber, Meith, Soares & Sexton	Oroville	CA	CD
1344.	Sexton	Michael V.		Minasian, Spruance, Baber, Meith, Soares & Sexton	Oroville	CA	CD
1345.	Soares	M. Anthony		Minasian, Spruance, Baber, Meith, Soares & Sexton	Oroville	CA	CD
1346.	Spruance	William H.		Minasian, Spruance, Baber, Meith, Soares & Sexton	Oroville	CA	CD
1347.	Levine	Toby		Mission Creek Conservancy	San Francisco	CA	NOA
1348.	Granados	Luis	Executive Director	Mission Economic Development Association	San Francisco	CA	NOA
1349.				Mission Peak Fly Anglers	Fremont	CA	NOA
1350.				Mission San Jose Chamber of Commerce	Fremont	CA	NOA
1351.	Hodges	Stan	President & CEO	Modesto Chamber of Commerce	Modesto		NOA
1352.	Ketscher	Bill		Modesto Irrigation District	Modesto	CA	NOA
1353.	Mayer	Chris		Modesto Irrigation District	Modesto	CA	NOA
1354.	Moskowitz	Joel		Modesto Irrigation District	Modesto	CA	CD
1355.	Serpa	Mike	Director	Modesto Irrigation District	Modesto	CA	NOA
1356.	Short	Allen	General Manager	Modesto Irrigation District	Modesto	CA	CD
1357.	Ward	Walt		Modesto Irrigation District	Modesto	CA	NOA
1358.	Warda	Paul		Modesto Irrigation District	Modesto	CA	NOA
1359.				Modesto Irrigation District, Legal Dept.	Merced	CA	CD
1360.	Walters	Christian		Monterey Bay National Marine Sanctuary	Monterey	CA	NOA
1361.				Monterey Bay Salmon and Trout Project	Davenport	CA	NOA
1362.	Chatigny	Jim	Exec. Director	Mountain Counties Water Resources Association	Grass Valley	CA	CD
1363.	Williams	Christopher D.		Mountain County Water Resources Assoc.	San Andreas	CA	CD
1364.	Villa	Debbie	Chief Operating Officer	Mountain View Chamber of Commerce	Mountain View	CA	NOA
1365.	Van Blarcom	Ronald A.		Municipal Water District of Orange County	Fountain Valley	CA	CD

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1366.	Cambra	Rosemary	Chairwoman	Muwekma Ohlone Tribe of the San Francisco Bay Area	San Jose	CA	NOA
1367.	Aceituno	Michael		National Oceanic and Atmospheric Administration (NOAA) Fishieries	Sacramento	CA	NOA CD
1368.				National Parks Conservation Association	Washington	DC	NOA
1369.	Pilas-Treadway	Debbie	Environmental Specialist 3	Native American Heritage Commission	Sacramento	CA	NOA
1370.				Native Here Nursery	Berkeley	CA	NOA
1371.	Gantenbein	Julie		Natural Heritage Institute	San Francisco	CA	NOA
1372.	Roo-Collins	Richard	Richard Roos-Collins	Natural Heritage Institute	San Francisco	CA	CD
1373.	Thomas	Gregory A.		Natural Heritage Institute	San Francisco	CA	CD
1374.	Nelson	Barry		Natural Resources Defense Council	San Francisco	CA	NOA
1375.	Schmitt	Monty		Natural Resources Defense Council	San Francisco	CA	NOA
1376.	Shephard, Sr	Thomas J.		Neumiller & Beardslee	Stockton	CA	CD
1377.	McKenzie	Kelley	General Counsel	New United Motor Manufacturing, Inc. (NUMMI)	Fremont		NOA CD
1378.	Ashley	Linda	President & CEO	Newark Chamber of Commerce	Newark	CA	NOA
1379.				Niles Main Street Association	Fremont	CA	NOA
1380.				Niles Merchant Association	Fremont	CA	NOA
1381.	Nomellini	Dante John		Nomellini, Grilli & McDaniel	Stockton	CA	CD
1382.	Rose	Dan		NorCal Skipper's Club	Union City	CA	NOA
1383.	Garland	Marsha		North Beach Chamber of Commerce	San Francisco	CA	NOA
1384.	O'Connell	Kevin	General Manager	North Coast County Water District	Pacifica	CA	NOA DPEIR
1385.	Piccolotti	Thomas J.	Director	North Coast County Water District	Pacifica	CA	NOA
1386.	Rogers	Dave		North Coast County Water District	Pacifica	CA	NOA
1387.				North Fair Oaks Beautification Association			NOA
1388.	Steffani	Ed	General Manager	North San Joaquin Water Conservation District	Clements	CA	CD
1389.	Steffani	Ed	President	North San Joaquin Water Conservation District	Clement	CA	NOA
1390.	Laing	Michael W.		Northern California Council--Federation of Flyfishers	Carmichael	CA	CD
1391.	Pope	James H.	General Manager	Northern California Power Agency	Roseville	CA	NOA
1392.				Northern California Water Association	Sacramento	CA	NOA
1393.	Guy	David	General Manager	Northern California Water Association	Sacramento	CA	NOA CD

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1394.	Jordan	Leigh	Coordinator	Northwest Information Center, Sonoma State University	Rohnert Park	CA	NOA DPEIR CD
1395.	Guardiola	Mary	CEO	Oakdale Chamber of Commerce	Oakdale	CA	NOA
1396.	Knell	Steve	General Manager	Oakdale Irrigation District	Oakdale	CA	CD
1397.	Haraburda	Joe	President & CEO	Oakland Metropolitan Chamber	Oakland	CA	NOA
1398.	Milstein	Josh	Deputy City Attorney	Office of the City Attorney, City Hall	San Francisco	CA	NOA
1399.	O'Laughlin	Tim		O'Laughlin & Paris, LLP	Chico	CA	CD
1400.	Roldan	John	General Manager	Orange Cove Irrigation District	Orange Cove	CA	CD
1401.	Grader	Zeke		Pacific Coast Federation of Fishermen's Association	San Francisco	CA	NOA
1402.	Morrow	Bill	General Manager	Pacific Gas & Electric	San Francisco	CA	NOA CD
1403.	Moss	Richard H.		Pacific Gas & Electric	San Francisco	CA	CD
1404.	Ross-Leach	Diane	Manager of Environmental Support and Services	Pacific Gas & Electric	San Francisco	CA	NOA
1405.	Steitz	Curtis		Pacific Gas & Electric	San Ramon	CA	NOA
1406.	Bowman	Dick		Pacific Locomotive Association	Fremont	CA	NOA
1407.	Lonnquist	Sandra	Executive Director	Palo Alto Chamber of Commerce	Palo Alto	CA	NOA DPEIR
1408.	Porgans	Patrick		Patrick Porgans & Associates	Sacramento	CA	CD
1409.	Kruss	Dave		Peninsula Fly Fishers	San Mateo	CA	NOA
1410.	Patterson	Harold		Peninsula Fly Fishers	Foster City	CA	NOA
1411.				Peninsula Open Space Trust	Palo Alto	CA	NOA
1412.	Frahm	Tim		Pilarcitos Creek Advisory Committee	Half Moon Bay	CA	NOA CD
1413.	Mangold	Keith		Pilarcitos Creek Advisory Committee	El Granada	CA	NOA
1414.				Pilarcitos Creek Advisory Council			NOA
1415.	Arnold	Carol		Pinole Creek Watershed Coordinator	Hercules	CA	NOA
1416.			Executive Director	Planning & Conservation League/ PCL Foundation	Sacramento	CA	NOA
1417.	Bouchard	David	President & CEO	Pleasanton Chamber of Commerce	Pleasanton	CA	NOA
1418.	Lewis	Sherman		Preserve Area Ridgelands	Hayward	CA	NOA
1419.				Preserve Area Ridgelands Committee	Livermore	CA	NOA
1420.	Burke	Steve		Protect Our Water	Modesto	CA	NOA
1421.	Warburton	Michael		Public Trust Alliance, Resource Renewal Institute	San Francisco	CA	CD
1422.	Seidel	Daniel F.	Board Member	Purissima Hills Water District	Los Altos Hills,	CA	NOA
1423.	Walter	Patrick	General Manager	Purissima Hills Water District	Los Altos Hills	CA	NOA

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#	Last Name	First Name	Title	Affiliation	City	State	Copies
1424.	Witt	Phil		Purissima Hills Water District	Los Altos Hills	CA	NOA
1425.	Buckmaster	Laurence	President & CEO	Redwood City/San Mateo Chamber	Redwood City	CA	NOA
1426.	Cadagan	Jerry		Restore Hetch Hetchy	Sonora	CA	NOA CD
1427.	Good	Ron	Executive Director	Restore Hetch Hetchy	Sonora	CA	NOA DPEIR
1428.	Hackamack	Bob		Restore Hetch Hetchy	Twain Harte	CA	NOA CD
1429.	Rypinski	Richard		Restore Hetch Hetchy	San Francisco	CA	NOA CD
1430.	Dunsworth	Leslie A.		Sacramento Municipal Utility District	Sacramento	CA	CD
1431.	Costa	Harry	Chief Executive Officer	San Bruno Chamber of Commerce	San Bruno	CA	NOA
1432.	Pomerenk	Sheryl	Chief Executive Officer	San Carlos Chamber of Commerce	San Carlos	CA	NOA
1433.				San Franciscans for Reasonable Growth	San Francisco	CA	NOA
1434.	Chase	Charles	Executive Director	San Francisco Architectural Heritage	San Francisco	CA	NOA
1435.	Gonchar	Nancy	Deputy Director	San Francisco Arts Commission	San Francisco	CA	NOA
1436.	Bradley	John		San Francisco Bay National Wildlife Refuge	Newark	CA	NOA
1437.				San Francisco BayKeeper	San Francisco	CA	NOA
1438.	Workman	Dee Dee	Executive Director	San Francisco Beautiful	San Francisco	CA	NOA
1439.	Penn	Michael		San Francisco Black Chamber of Commerce	San Francisco	CA	NOA
1440.	Washington	Mel		San Francisco Black Chamber of Commerce	San Francisco	CA	NOA
1441.	Mazzola	Larry	President	San Francisco Building & Construction Trades Council	San Francisco	CA	NOA
1442.				San Francisco Chamber of Commerce	San Francisco	CA	NOA
1443.	Blitch	A. Lee	President & CEO	San Francisco Chamber of Commerce	San Francisco	CA	NOA
1444.	Serpan	G.		San Francisco Chamber of Commerce	San Francisco	CA	NOA
1445.	Waldeck	Cliff		San Francisco Chamber of Commerce	San Francisco	CA	NOA
1446.	Maxwell	Jim	President	San Francisco Council of District Merchants Association	San Francisco	CA	NOA
1447.	Brockbank	Marcia	Director	San Francisco Estuary Project	Oakland	CA	NOA DPEIR
1448.	Paulson	Tim	Executive Director	San Francisco Labor Council	San Francisco	CA	NOA
1449.	Chan	Lily	Board Member	San Francisco Landmarks Preservation Advisory Board	San Francisco	CA	NOA DPEIR
1450.	Cherny	Robert W.	Board Member	San Francisco Landmarks Preservation Advisory Board	San Francisco	CA	NOA DPEIR

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1451.	Damkroger	Courtney	Board Member	San Francisco Landmarks Preservation Advisory Board	San Francisco	CA	NOA DPEIR
1452.	Dearman	Ina	Board Member	San Francisco Landmarks Preservation Advisory Board	San Francisco	CA	NOA DPEIR
1453.	Hasz	Karl	Board Member	San Francisco Landmarks Preservation Advisory Board	San Francisco	CA	NOA DPEIR
1454.	Maley	M. Bridget	Board Member	San Francisco Landmarks Preservation Advisory Board	San Francisco	CA	NOA DPEIR
1455.	Martinez	Alan	Board Member	San Francisco Landmarks Preservation Advisory Board	San Francisco	CA	NOA DPEIR
1456.	Samaha	Jean-Paul	Board Member	San Francisco Landmarks Preservation Advisory Board	San Francisco	CA	NOA DPEIR
1457.	Street	Johanna	Board Member	San Francisco Landmarks Preservation Advisory Board	San Francisco	CA	NOA DPEIR
1458.	Jawa	Amandeep	President	San Francisco League of Conservation Voters	San Francisco	CA	NOA DPEIR
1459.	Krefting	Steve		San Francisco League of Conservation Voters	San Francisco	CA	NOA CD
1460.	Nickerson	Steve	Principal Administrative Analyst	San Francisco MUNI	San Francisco	CA	NOA
1461.	Straus	Peter		San Francisco MUNI	San Francisco	CA	NOA
1462.	Chappell	James	President	San Francisco Planning & Urban Research Association	San Francisco	CA	NOA
1463.	Alexander	Dwight	Commissioner	San Francisco Planning Commission	San Francisco	CA	NOA DPEIR
1464.	Olague	Christina	Commissioner	San Francisco Planning Commission	San Francisco	CA	NOA DPEIR
1465.	Sugaya	Hisashi	Commissioner	San Francisco Planning Commission	San Francisco	CA	NOA DPEIR
1466.	Lee	William L.	Commissioner	San Francisco Planning Commission	San Francisco	CA	NOA DPEIR
1467.	Lee	Sue	Commissioner	San Francisco Planning Commission	San Francisco	CA	NOA DPEIR
1468.	Moore	Kathrin	Commissioner	San Francisco Planning Commission	San Francisco	CA	NOA DPEIR
1469.	Antonini	Michael J.	Commissioner	San Francisco Planning Commission	San Francisco	CA	NOA DPEIR
1470.				San Francisco Public Utilities Commission	San Francisco	CA	DPEIR
1471.	Apperson	Steve		San Francisco Public Utilities Commission	San Francisco	CA	NOA DPEIR
1472.	Brooks	Ryan L.		San Francisco Public Utilities Commission	San Francisco	CA	NOA DPEIR
1473.	Capone	Kelley	Environmental Project Manager	San Francisco Public Utilities Commission	San Francisco	CA	NOA DPEIR CD

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1474.	Carlin	Michael	Assistant General Manager, Water Enterprise	San Francisco Public Utilities Commission	San Francisco	CA	NOA DPEIR CD
1475.	Chan	Ben		San Francisco Public Utilities Commission	San Francisco	CA	NOA
1476.	Chenue	Scott		San Francisco Public Utilities Commission	San Francisco	CA	NOA
1477.	Freeman	Craig		San Francisco Public Utilities Commission	San Francisco	CA	NOA DPEIR
1478.	Hale	Barbara	Assistant General Manager	San Francisco Public Utilities Commission	San Francisco	CA	NOA DPEIR CD
1479.	How	Kathy		San Francisco Public Utilities Commission	San Francisco	CA	NOA DPEIR CD
1480.	Hutton	Janice	Environmental Planner	San Francisco Public Utilities Commission	San Francisco	CA	NOA DPEIR CD
1481.	Irons	Tony	Deputy General Manager	San Francisco Public Utilities Commission	San Francisco	CA	NOA DPEIR CD
1482.	Lavelle	Jane		San Francisco Public Utilities Commission	San Francisco	CA	NOA
1483.	Lopez	Robert		San Francisco Public Utilities Commission	San Francisco	CA	NOA
1484.	Malone	Jerry		San Francisco Public Utilities Commission	Sonora	CA	NOA DPEIR
1485.	Moller Caen	Ann	Vice President	San Francisco Public Utilities Commission	San Francisco	CA	CD DPEIR
1486.	Normandy	E. Dennis	Commissioner	San Francisco Public Utilities Commission	San Francisco	CA	NOA DPEIR
1487.	Ramirez	Tim		San Francisco Public Utilities Commission	San Francisco	CA	NOA DPEIR
1488.	Sak	Brian		San Francisco Public Utilities Commission	San Francisco	CA	NOA
1489.	Salerno	Jim		San Francisco Public Utilities Commission	San Francisco	CA	NOA
1490.	Saslafsky	Sharyn		San Francisco Public Utilities Commission	San Francisco	CA	NOA
1491.	Sklar	Richard	Commissioner	San Francisco Public Utilities Commission	San Francisco	CA	NOA DPEIR
1492.	Spanjian	Laura	Assistant GM for External Affairs	San Francisco Public Utilities Commission	San Francisco	CA	NOA
1493.	Wade	Susan		San Francisco Public Utilities Commission	San Francisco	CA	NOA DPEIR
1494.	Werbach	Adam	Commissioner	San Francisco Public Utilities Commission	San Francisco	CA	NOA DPEIR
1495.	Winnicker	Tony	Director of Communictions	San Francisco Public Utilities Commission	San Francisco	CA	NOA

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1496.				San Francisco Public Utilities Commission - WSIP Info counter	San Francisco	CA	DPEIR CD
1497.	Chiang	Robin		San Francisco Public Utilities Commission Citizens Advisory Committee	San Francisco	CA	NOA
1498.	Cleaveland	Ken		San Francisco Public Utilities Commission Citizens Advisory Committee	San Francisco	CA	NOA
1499.	Dawdy	David		San Francisco Public Utilities Commission Citizens Advisory Committee	San Francisco	CA	NOA
1500.	Hansen	Richard		San Francisco Public Utilities Commission Citizens Advisory Committee	San Francisco	CA	NOA
1501.	Hochshild	David	Secretary	San Francisco Public Utilities Commission Citizens Advisory Committee	San Francisco	CA	NOA
1502.	Hunter	Linda	Vice Chair & Water Subcommittee Chair	San Francisco Public Utilities Commission Citizens Advisory Committee	San Francisco	CA	NOA
1503.	Jung	Robert		San Francisco Public Utilities Commission Citizens Advisory Committee	San Francisco	CA	NOA
1504.	Lantsberg	Alex	Energy Subcommittee Chair	San Francisco Public Utilities Commission Citizens Advisory Committee	San Francisco	CA	NOA
1505.	Lawrence	Steve		San Francisco Public Utilities Commission Citizens Advisory Committee	San Francisco	CA	NOA CD
1506.	Lendvay	John “Jack”		San Francisco Public Utilities Commission Citizens Advisory Committee	San Francisco	CA	NOA
1507.	Mizany	Kimia		San Francisco Public Utilities Commission Citizens Advisory Committee	San Francisco	CA	NOA
1508.	Monteiro	Ken		San Francisco Public Utilities Commission Citizens Advisory Committee	San Francisco	CA	NOA
1509.	Pascal	David	Chair	San Francisco Public Utilities Commission Citizens Advisory Committee	San Francisco	CA	NOA
1510.	Hannaford	Margaret A.	Manager, Hetch Hetchy Water and Power	San Francisco Public Utilities Commission, Bureau of Environmental Management	San Francisco	CA	NOA DPEIR CD
1511.	Labonte	Julie	WSIP Director	San Francisco Public Utilities Commission, Bureau of Environmental Management	San Francisco	CA	NOA DPEIR CD
1512.	Levin	Ellen	Director of Water Resources Water Enterprise	San Francisco Public Utilities Commission, Bureau of Environmental Management	San Francisco	CA	NOA DPEIR CD
1513.	McGurk,Ph.D.	Bruce	Hetch Hetchy Water and Power	San Francisco Public Utilities Commission, Bureau of Environmental Management	San Francisco	CA	NOA DPEIR CD

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1514.	Palacios	Barbara	WSIP Project Manager	San Francisco Public Utilities Commission, Bureau of Environmental Management	San Francisco	CA	NOA DPEIR CD
1515.	Pohl	Heather	Water Enterprise	San Francisco Public Utilities Commission, Bureau of Environmental Management	San Francisco	CA	NOA DPEIR CD
1516.	Steiner	Daniel B.	Consulting Engineer	San Francisco Public Utilities Commission, Bureau of Environmental Management	San Francisco	CA	NOA DPEIR CD
1517.	Torrey	Irina P.	Manager of Bureau of Environmental Management	San Francisco Public Utilities Commission, Bureau of Environmental Management	San Francisco	CA	NOA DPEIR CD
1518.	Marks	Jim	Coordinator of Citizen Involvement	San Francisco Public Utilities Commission, Communication Division	San Francisco	CA	NOA DPEIR CD
1519.				San Francisco State University - Government Publications Department	San Francisco	CA	DPEIR
1520.				San Francisquito Watershed Council	Palo Alto	CA	NOA
1521.	Simpson	Dave	District Conservationist	San Joaquin County Resource Conservation District	Stockton	CA	NOA
1522.	Ploss	Lowell		San Joaquin River Group Authority	Roseville	CA	NOA CD
1523.	Chedester	Steve		San Joaquin River Water Authority Exchange Contractors	Los Banos	CA	NOA CD
1524.	Cadrett	John		San Joaquin Valley Air Pollution Control District	Modesto	CA	NOA DPEIR CD
1525.	Guerra	Hector R.	Senior Air Quality Planner	San Joaquin Valley Air Pollution Control District	Modesto	CA	NOA CD
1526.	Cunneen	Jim	President & CEO	San Jose Silicon Valley Chamber	San Jose	CA	NOA
1527.	Balocco	Richard		San Jose Water Company	San Jose	CA	NOA
1528.	Lorance	Shauna	General Manager	San Juan Water District	Granite Bay	CA	CD
1529.	Heckmann	Gretchen		San Lorenzo Creek Watershed Coordinator	Livermore	CA	NOA
1530.	Staker	James	General Manager	San Luis Canal Company	Dos Palos	CA	CD
1531.	Nelson	Dan	Exec. Director	San Luis Delta-Mendota Water Authority	Los Banos	CA	NOA CD
1532.	Asbury	Linda	President & CEO	San Mateo Area Chamber	San Mateo	CA	NOA
1533.				San Mateo County Farm Bureau	Half Moon Bay	CA	NOA
1534.	Ednoff	Mike	Executive Director	San Mateo County Resource Conservation District	Half Moon Bay	CA	NOA
1535.	Nelson	Kellyx	Executive Director	San Mateo County Resource Conservation District	Half Moon Bay	CA	NOA
1536.	Matuk	Vivian		San Pedro Creek Watershed Association	Pacifica	CA	NOA

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1538.	Molle	Gary	President	Santa Clara County - Guadalupe Coyote Resource Conservation District	San Jose	CA	NOA
1539.				Santa Clara County - Loma Prieta Resource Conservation District	Gilroy	CA	NOA
1540.	Duffy	Mike	General Manager	Santa Clara Valley Water District	San Jose	CA	CD
1541.	Fowler	Amy		Santa Clara Valley Water District	San Jose	CA	NOA DPEIR
1542.	Stevens	Phyllis		Santa Clara Valley Water District	Pleasant Hill	CA	NOA DPEIR
1543.	Wadlow	Walter	Chief Operating Office	Santa Clara Valley Water District	San Jose	CA	CD
1544.	Whitman	Keith	Water Utilities Unit	Santa Clara Valley Water District	San Jose	CA	NOA DPEIR
1545.	Williams	Stanley M.	CEO	Santa Clara Valley Water District	San Jose	CA	NOA
1546.	Yep	Raymond L.	Water Utilities Unit	Santa Clara Valley Water District	San Jose	CA	NOA
1547.	Davis	Kristin	Executive Director	Saratoga Chamber of Commerce	Saratoga	CA	NOA
1548.	Adams	Seth		Save Mount Diablo	Walnut Creek	CA	NOA
1549.				Save Open Space - Gateway Valley	Orinda	CA	NOA
1550.	Siu	Howard & Lettie		Save Our Danville Creeks	Danville	CA	NOA
1551.	Stillman	Pat	President	Save our Sunol	Sunol	CA	NOA
1552.	Lewis	David	Executive Director	Save San Francisco Bay Association	Oakland	CA	NOA
1553.	Revier	Paul		Save San Francisco Bay Association	Oakland	CA	NOA
1554.	Nogue	John		Save Suisun Creek Alliance	Suisun	CA	NOA
1555.	Koehler	Cynthia L.		Save the Bay	Oakland	CA	CD
1556.	Latta	Marilyn		Save the Bay	Oakland	CA	NOA
1557.	Nisbet	Briggs		Save the Bay	Oakland	CA	NOA
1558.	Patton	Cynthia		Save the Bay	Oakland	CA	NOA
1559.				SCORE	Sunol	CA	NOA
1560.	Craven	Bill	Chief Consultant	Senate Standing Committee on Natural Resources and Water	Sacramento	CA	NOA
1561.	Margett	Senator Bob	Vice-Chair	Senate Standing Committee on Natural Resources and Water	Sacramento	CA	NOA
1562.	Staus	Peter		Service Planning Department San Francisco MUNI	San Francisco	CA	NOA
1563.				Sewer Authority Mid-Coastside	Half Moon Bay	CA	NOA
1564.	Foley	John	Manager	Sewer Authority Mid-Coastside	Half Moon Bay	CA	NOA
1565.			Chapter Director	Sierra Club	Sacramento	CA	NOA
1566.	Allen	Mary		Sierra Club	San Francisco	CA	NOA CD

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1567.	Atmore	Barbara		Sierra Club	Palo Alto	CA	NOA
1568.	Boock	Lisa		Sierra Club			NOA
1569.	Edmark	Kristin		Sierra Club	Fremont	CA	NOA
1570.	Edwards	Burke		Sierra Club	San Francisco	CA	NOA
1571.	Gorman	Elaine		Sierra Club	Modesto	CA	NOA CD
1572.	Halepota	Tabbi		Sierra Club			NOA
1573.	Hippard	Melissa L.	Chapter Director	Sierra Club	Palo Alto	CA	NOA
1574.	Hoffman	Jeff		Sierra Club	San Francisco	CA	NOA CD
1575.	Hoover	Victoria		Sierra Club	San Francisco	CA	NOA CD
1576.	Krefting	Steven		Sierra Club	San Francisco	CA	CD DPEIR
1577.	Mann	Rex		Sierra Club	Fremont	CA	NOA
1578.	Mitton	Caroline		Sierra Club	Modesto	CA	NOA
1579.	Olsen	Jenna		Sierra Club	San Francisco	CA	NOA CD
1580.	Peterson	George F.		Sierra Club	Fremont	CA	NOA DPEIR
1581.	Petritsah	Sandi		Sierra Club	Union City	CA	NOA
1582.	Rizzo	John	Chapter Director	Sierra Club	Berkeley	CA	NOA
1583.	Saddik	Eric		Sierra Club	Berkeley	CA	NOA
1584.	Sullivan	Dan		Sierra Club	Berkeley	CA	NO CD
1585.	Sullivan	Cathleen		Sierra Club	Berkeley	CA	NOA DPEIR
1586.	Weaver	Alan		Sierra Club	San Francisco	CA	NOA
1587.	Lamont	Juliet	Vice Chair, Executive Committee	Sierra Club Bay Chapter	Berkeley	CA	NOA DPEIR
1588.	Young	Bill		Sierra Club Loma Prieta Chapter	Palo Alto	CA	NOA CD
1589.	Zimmerman	Richard		Sierra Club Loma Prieta Chapter	San Francisco	CA	NOA CD
1590.	Condon	Chris		Sierra Club Mac River Trips	Columbia	CA	NOA CD
1591.	Forman	Don		Sierra Club Yodeler	Berkeley	CA	NOA
1592.	Witherspoon	Jennifer		Sierra Club, Field Office	San Francisco	CA	NOA
1593.	Blickenstaff	Jim		Sierra Club, Mt. Diablo	San Ramon	CA	NOA
1594.	Koellner	Werner		Sierra Club, Mt. Diablo	Walnut Creek	CA	NOA
1595.	Beach	Doug		Sierra Club, SF Bay Chapter	Berkeley	CA	NOA
1596.	Daly	Mike		Sierra Club, SF Bay Chapter	Berkeley	CA	NOA
1597.	Evans	Becky		Sierra Club, SF Bay Chapter	Berkeley	CA	NOA

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1599.	Guardino	Carl	President & CEO	Silicon Valley Manufacturers Group	San Jose	CA	NOA
1600.	Hannon	Tammy	General Manager	Skyline County Water District	Woodside	CA	NOA
1601.	Reynolds	Chris	Vice President	Skyline County Water District	Woodside	CA	NOA
1602.	Dixon	Al		Small Business Development Center	San Francisco	CA	NOA
1603.	Seed	Syndi		Small Business Network	San Francisco	CA	NOA
1604.	Waldeck	Cliff		Small Business Network	San Francisco	CA	NOA
1605.	Bentley	Suan		Somach, Simmons & Dunn	Sacramento	CA	CD
1606.	Dunn	Sandra		Somach, Simmons & Dunn	Sacramento	CA	CD
1607.	Jacobs	Nicholas A.		Somach, Simmons & Dunn	Sacramento	CA	NOA
1608.	Simmons	Paul S.		Somach, Simmons & Dunn	Sacramento	CA	CD
1609.	Somach	Stuart L.		Somach, Simmons & Dunn	Sacramento	CA	CD
1610.	Herrick	John	General Manager	South Delta Water Agency	Stockton	CA	CD
1611.	Huntley	Lance	Interim Executive Director	South San Francisco Chamber	South San Francisco	CA	NOA
1612.	Emrick	Steven P.	General Counsel	South San Joaquin Irrigation District	Manteca	CA	CD
1613.	Stroud	Stevan	General Manager	South San Joaquin Irrigation District	Ripon	CA	CD
1614.	Steiner	Todd		SPAWN	Forest Knolls	CA	NOA
1615.	Haroff	Kevin T.		Squire, Sanders and Dempsey L.L.P.	San Francisco	CA	NOA CD
1616.	Yurovsky	Tanya	Project Manager	SRT Consultants	San Francisco	CA	DPEIR
1617.	Pidot	Justin		Stanford Environmental Law Clinic	Palo Alto	CA	NOA CD
1618.	Gordon	Holly		Stanford Legal Clinics - Environmental Law Clinics	Stanford	CA	NOA CD
1619.	Christensen	Jon	Research Fellow	Stanford University	Stanford	CA	NOA
1620.	Goff	Mike	Utilties Director	Stanford University	Stanford	CA	NOA CD
1621.	Kincade	Lee Ann		Stanford University	Stanford	CA	NOA
1622.	Laporte	Marty	Environmental Quality Manager	Stanford University	Stanford	CA	NOA CD
1623.	Frazier	Jim		Stanislaus National Forest	Sonora	CA	CD
1624.	Gottlieb	Danny		Stanislaus Taxpayers Assocation	Modesto	CA	NOA CD
1625.	Daly	Joe	Legislative Aide	State Capitol	Sacramento	CA	NOA DPEIR
1626.				State Office of Intergovernmental Management	Sacramento	CA	NOA
1627.	Cobrun	John		State Water Contractors	Sacramento	CA	NOA CD

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1628.	Flory	Dan	Chief	State Water Project Analysis Office, CA Dept. of Water Resources	Sacramento	CA	CD
1629.	Wilhoit	Douglass	Chief Executive Officer	Stockton Chamber	Stockton	CA	NOA
1630.	Kauffman	Kevin	General Manager	Stockton East Water District	Stockton	CA	CD
1631.	Brenner	Barbara A.		Stoel Rives LLP	Sacramento,	CA	NOA CD
1632.	Peters	Gil		Stop the Dump in Sunol	Sunol	CA	NOA
1633.	Joseph	Mark	District Manager	Strawberry Recreation & Park District	Mill Valley	CA	NOA
1634.	Chappell	Steven		Suisun Resource Conservation District	Suisun	CA	CD
1635.	Blackman	Suzi	President & CEO	Sunnyvale Chamber of Commerce	Sunnyvale	CA	NOA
1636.	Kasterotis	Demetri		Sunol Business Guild	Sunol	CA	NOA
1637.	Hall	Joan		Sunol Citizen Advisory Committee	Sunol	CA	NOA
1638.	Smith	Conover		Sunol Citizen Advisory Committee	Sunol	CA	NOA
1639.	Zimmermann	Edward		Sunol Citizen Advisory Committee	San Francisco	CA	NOA
1640.				Sunol Citizens Advisory Committee	Sunol	CA	NOA
1641.	Fries	Frank		Sunol Citizens Advisory Committee	Sunol	CA	NOA
1642.	Sawrey-Kubicek	Phil		Sunol Citizens Advisory Committee	Hayward	CA	NOA
1643.				Sunol Citizens Organized Regarding the Environment – SCORE	Sunol	CA	NOA
1644.	Bettencourt	Judy		Sunol Glen Community Club	Sunol	CA	NOA
1645.	Pilpel	David	Member	Sunshine Ordinance Task Force	San Francisco	CA	NOA
1646.	Larenas	Edmundo	Chairman	Surfrider San Mateo Chapter	EL GRANADA	CA	NOA
1647.	Neale	Bob		Sustainable Conservation	San Francisco	CA	NOA
1648.	White	Ernest E.		Tehama County Resource Cons. Dist.	Red Bluff	CA	CD
1649.	Harrison	Christy		Terrain - Berkeley Ecology Center	Berkeley	CA	NOA
1650.	Li	Margaret P.		Tetra Tech EM Inc.	San Francisco	CA	NOA
1651.	Grassetti	Richard	Project Manager	Tetra Tech, Inc	San Francisco	CA	DPEIR
1652.				The Bay Institute	Novato	CA	NOA
1653.	Bobker	Gary		The Bay Institute of San Francisco	Novato	CA	CD
1654.	Lamus	Carla	Office Manager	The Bay Institute of San Francisco	Novato	CA	CD
1655.	Swanson	Christina		The Bay Institute of San Francisco	Novato	CA	CD
1656.				The Bay Model Association	Sausalito	CA	NOA
1657.	Nelson	Melissa	Director	The Cultural Conservancy	San Francisco	CA	NOA
1658.	Chisholm	Graham	Regional Director	The Nature Conservancy	San Francisco	CA	NOA
1659.	Drake	Debbie	Director, Agency Relations	The Nature Conservancy	San Francisco	CA	NOA

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1660.	Olstein	Daniel	Mt. Hamilton Project Manager	The Nature Conservancy	San Francisco	CA	NOA
1661.	Saracino	Anthony	Director of Water Policy	The Nature Conservancy	Sacramento	CA	NOA
1662.	Wagstaff	Lloyd	Regional Director	The Nature Conservancy	San Francisco	CA	NOA
1663.	Burget	Mark	Executive Director	The Nature Conservancy California Program	Sacramento	CA	NOA
1664.	Serpa	Larry		The Nature Conservancy of California	San Francisco	CA	NOA
1665.	Schoenbren	Deborah		The Trust For Public L&	San Francisco	CA	NOA
1666.	Carlson	Alan B.	Mayor	Town of Atherton	Atherton	CA	NOA
1667.	Costa Sanders	Lisa	Deputy Town Planner	Town of Atherton	Atherton	CA	NOA
1668.	Janz	James R.	Vice Mayor	Town of Atherton	Atherton	CA	NOA
1669.	Jones	Duncan	Public Works Director/Engineer	Town of Atherton	Atherton	CA	NOA
1670.	Marsala	Charles E.	Council Member	Town of Atherton	Atherton	CA	NOA
1671.	McKeithen	Kathleen	Council Member	Town of Atherton	Atherton	CA	NOA
1672.	Robinson	Jim	City Manager	Town of Atherton	Atherton	CA	NOA
1673.	Dossey	Brian	Recreation & Community Services Director	Town of Colma	Colma	CA	NOA
1674.	Fisicaro	Helen	Council Member	Town of Colma	Colma	CA	NOA
1675.	Formalejo	Claro (Larry)	Vice Mayor	Town of Colma	Colma	CA	NOA
1676.	Mao	Richard	Public Works Director/City Engineer	Town of Colma	Colma	CA	NOA
1677.	McGrath	Diane	City Manager & City Clerk	Town of Colma	Colma	CA	NOA
1678.	Ouse	Andrea	City Planner	Town of Colma	Colma	CA	NOA
1679.	Silva	Joseph	Vice Mayor	Town of Colma	Colma	CA	NOA
1680.	Vallerga	Frossanna	Mayor	Town of Colma	Colma	CA	NOA
1681.			Planning & Building Director	Town of Hillsborough	Hillsborough	CA	NOA
1682.	Constantouros	Anthony	City Manager	Town of Hillsborough	Hillsborough	CA	NOA
1683.	DeBry	Martha	Public Works Director	Town of Hillsborough	Hillsborough	CA	NOA
1684.	Fannon	John J.	Councilmember, BAWSCA Representative	Town of Hillsborough	Hillsborough	CA	NOA
1685.	Kasten	Thomas M.	Councilmember	Town of Hillsborough	Hillsborough	CA	NOA
1686.	Kianpour	Cyrus	City Engineer	Town of Hillsborough	Hillsborough	CA	NOA
1687.	Krolik	Christine M.	Vice Mayor	Town of Hillsborough	Hillsborough	CA	NOA
1688.	Morton	Maureen	City Planner	Town of Hillsborough	Hillsborough	CA	NOA
1689.	Mullooly	Catherine U.	Mayor	Town of Hillsborough	Hillsborough	CA	NOA
1690.	Regan	D. Paul	Councilmember	Town of Hillsborough	Hillsborough	CA	NOA
1691.	Ungaretti	Rachelle	Deputy City Clerk	Town of Hillsborough	Hillsborough	CA	NOA
1692.	Boynton	Susan	Mayor	Town of Woodside	Woodside	CA	NOA

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TABLE J-2 (Continued)
WSIP PEIR MAILING LIST

#	Last Name	First Name	Title	Affiliation	City	State	Copies
1693.	Boynton	Susan	Mayor	Town of Woodside	Woodside	CA	NOA
1694.	Dewell	Kent	Public Works/Engineer	Town of Woodside	Woodside	CA	NOA
1695.	George	Susan	Town Manager	Town of Woodside	Woodside	CA	NOA
1696.	Gordon	Val	Councilmember	Town of Woodside	Woodside	CA	NOA
1697.	Hodges	Carroll Ann	Councilmember	Town of Woodside	Woodside	CA	NOA
1698.	Koelsch	Janet	Town Clerk	Town of Woodside	Woodside	CA	NOA
1699.	Romines	Ron	Mayor Pro Tem	Town of Woodside	Woodside	CA	NOA
1700.	Sinclair	Peter	Councilmember	Town of Woodside	Woodside	CA	NOA
1701.	Sullivan	Hope	Planning Director	Town of Woodside	Woodside	CA	NOA
1702.	Tanner	David	Councilmember	Town of Woodside	Woodside	CA	NOA
1703.	Leo	Sandy		Tracy Fly Fishers	Tracy	CA	NOA
1704.				Tracy Flyfishers	Tracy	CA	NOA
1705.	Radulovich	Tom		Transportation for a Livable City	San Francisco	CA	NOA CD
1706.				Tri City Ecology Center	Fremont	CA	NOA
1707.				Tri-City Anglers	Newark	CA	NOA
1708.				Tri-City Ecology Center	Fremont	CA	NOA
1709.	Olson	Inga		Tri-Valley CARES	Livermore	CA	NOA
1710.				Tri-Valley Fly Fishers	Livermore	CA	NOA
1711.	Bridgman	Derrel		Tri-Valley Fly Fishers	Pleasanton	CA	NOA
1712.	Ploss	Norm		Tri-Valley Fly Fishers		CA	NOA
1713.				Trout Unlimited	Berkeley	CA	CD
1714.	Cronin	Mike		Trout Unlimited	Fairfax	CA	NOA
1715.	Watt	Gary		Trout Unlimited	Richmond	CA	NOA
1716.	Katz	David	California Director	Trout Unlimited of California	Santa Rosa	CA	NOA
1717.	Graham	Brent	General Manager	Tulare Lake Basin Water Storage Unit	Corcoran	CA	CD
1718.	Hendricks	Sunny		Tuolumne Band of Mc-Wuk Indians	Tuolumne	CA	NOA CD
1719.	Segarini	George	President & CEO	Tuolumne County, Chamber of Commerce	Sonora	CA	NOA
1720.	Daly	Joe		Tuolumne River Outfitters	Oakland	CA	NOA CD
1721.	Welch	Steve	President	Tuolumne River Outfitters Association	Groveland	CA	NOA CD
1722.	Goodwin	Christina	General Manager	Tuolumne River Preservation Trust	San Francisco	CA	CD
1723.	Bargmann	Kay		Tuolumne River Trust	Sonora	CA	NOA DPEIR
1724.	Coffin	Philip		Tuolumne River Trust	New York	NY	NOA DPEIR

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TABLE J-2 (Continued)
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#	Last Name	First Name	Title	Affiliation	City	State	Copies
1725.	Dempsey	Heather	Bay Area Program Director	Tuolumne River Trust	San Francisco	CA	NOA DPEIR CD
1726.	Meral	Gerald H. (AKA. Jerry)		Tuolumne River Trust	Inverness	CA	NOA CD
1727.	Welles	Holly	Board Member	Tuolumne River Trust	Mill Valley	CA	NOA CD
1728.	Wesselman	Eric	Executive Director	Tuolumne River Trust	San Francisco	CA	NOA DPEIR
1729.	Koepele	Patrick		Tuolumne Trust	Modesto	CA	NOA DPEIR
1730.			District Manager	Tuolumne Utilities District	Sonora	CA	NOA
1731.	Kampa	Pete	General Manager	Tuolumne Utilities District	Sonora	CA	CD
1732.	McCullough	Tim		Tuolumne Utilities District	Sonora	CA	CD
1733.				Turlock & Modesto Irrigation District	Turlock	CA	CD
1734.	Silva	Sharon	President & CEO	Turlock Chamber of Commerce	Turlock	CA	NOA
1735.	Masuda	Roger K.	General Coucil	Turlock Irrigation District	Turlock	CA	NOA DPEIR
1736.	Monier	Wes		Turlock Irrigation District	Turlock	CA	NOA DPEIR
1737.	Nees	Robert		Turlock Irrigation District	Turlock	CA	NOA
1738.	Weis	Larry	General Manager	Turlock Irrigation District	Turlock	CA	CD
1739.	Weis	Larry W.	General Manager	Turlock Irrigation District	Turlock	CA	CD
1740.	Guinee	Roger	Chief of Water Operations	U.S Fish & Wildlife Service	Sacramento	CA	NOA
1741.	Eshoo	Anna	Congresswoman	U.S. House of Representatives, District #14	Washington	DC	NOA
1742.	Radanovich	George	Congressman	U.S. House of Representatives, District #19	Washington	DC	NOA
1743.	Feir	Col. Philip	District Engineer	U.S. Army Corp of Engineers	San Francisco	CA	NOA
1744.	Jewell	Mike		U.S. Army Corp of Engineers	Sacramento	CA	NOA
1745.	LaCivita	Peter	Chief of Environmental	U.S. Army Corp of Engineers	San Francisco	CA	NOA
1746.	Su	S.T.	Chief of Water Resources Center	U.S. Army Corp of Engineers	San Francisco	CA	NOA
1747.	D'Avignon	Mark	Environmental Protection Specialist	U.S. Army Corps of Engineers	San Francisco	CA	NOA
1748.	Finan	Mike	Chief	U.S. Army Corps of Engineers	Sacramento	CA	NOA
1749.	Grass	Col. Peter		U.S. Army Corps of Engineers	San Francisco	CA	NOA
1750.	Headlee	John		U.S. Army Corps of Engineers	Sacramento	CA	NOA
1751.	Martindale	Molly	Environmental Protection Specialist	U.S. Army Corps of Engineers	San Francisco	CA	NOA
1752.	Smith	Bob		U.S. Army Corps of Engineers	San Francisco	CA	NOAA DPEIR
1753.	Wylie	Ed	Section Chief South, Regulatory Branch	U.S. Army Corps Of Engineers	San Francisco	CA	NOA

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TABLE J-2 (Continued)
WSIP PEIR MAILING LIST

#	Last Name	First Name	Title	Affiliation	City	State	Copies
1754.	Candlish	Al		U.S. Bureau of Reclamation Mid-Pacific Region	Sacramento	CA	NOA CD
1755.	Milligan	Ronald		U.S. Bureau of Reclamation, Central Valley Operations Office	Sacramento	CA	CD
1756.	Noell	Ivana		U.S. Department of Agriculture, Natural Resources Conservation Service and Alameda County Resource Conservation District	Livermore	CA	NOA
1757.			Office of the Secretary	U.S. Department of the Interior	Washington	CA	CD
1758.	Shillito	Daniel	Regional Solicitor	U.S. Department of the Interior	Sacramento	CA	CD
1759.				U.S. Dept. of Agriculture, Natural Resources Conservation Service	Davis	CA	NOA
1760.			Regional Director	U.S. Dept. of Agriculture, Natural Resources Conservation Service	San Francisco	CA	NOA
1761.	Calderon	Angela	Office Adm.	U.S. Dept. of Agriculture, Natural Resources Conservation Service	San Francisco	CA	CD
1762.	Candee	Hamilton		U.S. Dept. of Agriculture, Natural Resources Conservation Service	San Francisco	CA	CD
1763.	Cerna, Jr.	Albert	District Conservationist	U.S. Dept. of Agriculture, Natural Resources Conservation Service	Washington	DC	NOA
1764.	Huff	Terence	District Conservationist	U.S. Dept. of Agriculture, Natural Resources Conservation Service	Concord	CA	NOA
1765.	Huff	Terry		U.S. Dept. of Agriculture, Natural Resources Conservation Service and Alameda County Resource Conservation District	Livermore	CA	NOA
1766.	Aufdemberge	Amy		U.S. Dept. of Interior, Office of the Solicitor	Sacramento	CA	CD
1767.	Rodgers	Kirk C.	Regional Director	U.S. Dept. of the Interior - Bureau of Reclamation	Sacramento	CA	CD
1768.	Ryan	Michael J.	Area Manager	U.S. Dept. of the Interior - Bureau of Reclamation	Shasta Lake	CA	NOA
1769.	Jarvis	Jon	Regional Director	U.S. Dept. of the Interior, National Park Service	Oakland	CA	NOA
1770.	Nadeau	Doug	Chief of Resources Management	U.S. Dept. of the Interior, National Park Service	San Francisco	CA	NOA
1771.	Stone	Nancy	Branch Chief, Rivers, Trails & Conservation	U.S. Dept. of the Interior, National Park Service	Oakland	CA	NOA
1772.	O'Neill	Brian	General Superintendent	U.S. Dept. of the Interior, National Park Service, Golden Gate National Recreation Area	San Francisco	CA	NOA CD
1773.	Monroe	Michael		U.S. Environmental Protection Agency	San Francisco	CA	NOA DPEIR
1774.	Strauss	Alexis	Director, Water Management Division	U.S. Environmental Protection Agency	San Francisco	CA	NOA
1775.	Vendlinski	Tim		U.S. Environmental Protection Agency	San Francisco	CA	NOA
1776.	Herbold	Bruce		U.S. Environmental Protection Agency, Region 9	San Francisco	CA	CD

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TABLE J-2 (Continued)
WSIP PEIR MAILING LIST

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1777.	Schwinn	Karen		U.S. Environmental Protection Agency, Region 9	San Francisco	CA	CD
1778.	Adhya	Ron	Dam Safety Engineer	U.S. Federal Energy Regulatory Commission	San Francisco	CA	NOA
1779.	Scott	John H.	Deputy Regional Engineer	U.S. Federal Energy Regulatory Commission	San Francisco	CA	NOA
1780.	Yamashita	Takeshi	Regional Engineer	U.S. Federal Energy Regulatory Commission	San Francisco	CA	NOA
1781.	Brown	Cecelia		U.S. Fish & Wildlife Service	Sacramento	CA	NOA
1782.	Hoover	Mike		U.S. Fish & Wildlife Service	Sacramento	CA	NOA
1783.	Hoover	Michael		U.S. Fish & Wildlife Service	Sacramento	CA	NOA DPEIR
1784.	Littlefield	Mark	Chief	U.S. Fish & Wildlife Service	Sacramento	CA	NOA
1785.	Olah	Ryan	Chief	U.S. Fish & Wildlife Service	Sacramento	CA	NOA DPEIR
1786.	Weinrich	Doug		U.S. Fish & Wildlife Service	Sacramento	CA	NOA DPEIR
1787.	White	Wayne		U.S. Fish & Wildlife Service	Sacramento	CA	NOA CD
1788.	Boston	Christian	Lead USFS Contact/Project Coorinator	U.S. Forest Service	Groveland	CA	NOA
1789.	Dettman	Julie		U.S. Forest Service	Groveland	CA	NOA CD
1790.	Gibbons	Dave	Director, Ecosystem Conservation Group	U.S. Forest Service	Vallejo	CA	NOA
1791.				U.S. Geological Survey	Menlo Park	CA	NOA CD
1792.			District Chief, Water Resources Division	U.S. Geological Survey	Sacramento	CA	NOA CD
1793.	Tauscher	Ellen	Congresswoman	U.S. House of Representatives, District #10	Walnut Creek	CA	NOA
1794.	McNerney	Jerry	Congressman	U.S. House of Representatives, District #11	Stockton	CA	NOA
1795.	McNerney	Jerry	Congressman	U.S. House of Representatives, District #11	Washington	DC	NOA
1796.	McNerney	Jerry	Congressman	U.S. House of Representatives, District #11	Pleasanton	CA	NOA
1797.	Lantos	Hon. Tom	Congressman	U.S. House of Representatives, District #12	San Mateo	CA	NOA
1798.	Stark	Peter	Congressman	U.S. House of Representatives, District #13	Washington	DC	NOA
1799.	Stark	Peter	Congressman	U.S. House of Representatives, District #13	Fremont	CA	NOA
1800.	Eshoo	Anna	Congresswoman	U.S. House of Representatives, District #14	Palo Alto	CA	NOA
1801.	Honda	Mike	Congressman	U.S. House of Representatives, District #15	Washington	DC	NOA

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TABLE J-2 (Continued)
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1802.	Honda	Mike	Congressman	U.S. House of Representatives, District #15	Campbell	CA	NOA
1803.	Lofgren	Zoe	Congresswoman	U.S. House of Representatives, District #16	San Jose	CA	NOA
1804.	Cardoza	Dennis	Congressman	U.S. House of Representatives, District #18	Modesto	CA	NOA
1805.	Cardoza	Dennis	Congressman	U.S. House of Representatives, District #18	Washington	DC	NOA
1806.	Radanovich	George	Congressman	U.S. House of Representatives, District #19	Fresno	CA	NOA
1807.	Radanovich	George	Congressman	U.S. House of Representatives, District #19	Modesto	CA	NOA
1808.	Costa	Jim	Congressman	U.S. House of Representatives, District #20	Washington	DC	NOA
1809.	Costa	Jim	Congressman	U.S. House of Representatives, District #20	Bakersfield	CA	NOA
1810.	Costa	Jim	Congressman	U.S. House of Representatives, District #20	Fresno	CA	NOA
1811.	Miller	George	Congressman	U.S. House of Representatives, District #7	Concord	CA	NOA
1812.	Miller	George	Congressman	U.S. House of Representatives, District #7	Richmond	CA	NOA
1813.	Miller	George	Congressman	U.S. House of Representatives, District #7	Vallejo	CA	NOA
1814.	Miller	George	Congressman	U.S. House of Representatives, District #7	Washington	DC	NOA
1815.	Pelosi	Nancy	Speaker of the House	U.S. House of Representatives, District #8	Washington	DC	NOA
1816.	Pelosi	Nancy	Speaker of the House	U.S. House of Representatives, District #8	San Francisco	CA	NOA
1817.	Lee	Barbara	Congresswoman	U.S. House of Representatives, District #9	Oakland	CA	NOA
1818.	McLain	Jeff		U.S. National Marine Fisheries Service	Sacramento	CA	NOA
1819.	Moody	Maura Eagan		U.S. National Marine Fisheries Service	Santa Rosa	CA	NOA
1820.	Rutten	Patrick		U.S. National Marine Fisheries Service	Santa Rosa	CA	NOA
1821.	Stern	Gary		U.S. National Marine Fisheries Service	Santa Rosa	CA	NOA DPEIR
1822.	Boxer	Barbara	United States Senator	U.S. Senate	Washington DC		NOA
1823.	Boxer	Barbara	United States Senator	U.S. Senate	San Francisco	CA	NOA
1824.	Feinstein	Dianne	United States Senator	U.S. Senate	Washington DC		NOA
1825.	Feinstein	Dianne	United States Senator	U.S. Senate	San Francisco	CA	NOA
1826.	Feltman-Strider	Michelle	Library Assistant	UC Berkeley	Berkeley	CA	NOA DPEIR

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**TABLE J-2 (Continued)
WSIP PEIR MAILING LIST**

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1827.				UC Berkeley - Institute of Government Studies	Berkeley	CA	DPEIR
1828.			General Manager	Union Sanitary District	Union City	CA	NOA DPEIR
1829.	Chau	Raymond Clark	Senior Engineer	Union Sanitary District	Union City	CA	NOA CD
1830.				Urban Creeks Council	Berkeley	CA	NOA
1831.				Urban Creeks Council - Santa Clara Chapter	Alviso	CA	NOA
1832.	Heick	Denise	Project Manager	URS Corporation	San Francisco	CA	DPEIR
1833.	Leach	Steve	Tech Consultant	URS Corporation			NOA
1834.	Eckblom	Frank	Executive Director	Valley Springs Chamber	Valley Springs	CA	NOA
1835.	Bonnot	Dave		Voters Choice Tuolumne County	Sonora	CA	NOA CD
1836.	Preston	Terry		Ward Creek Alliance	Hayward	CA	NOA
1837.	McClurg	Sue	Executive Director	Water Education Foundation	Sacramento	CA	NOA
1838.	Sudman	Rita Schmidt	Program Director	Water Education Foundation	Sacramento	CA	NOA
1839.	Miller	G. Wade	Executive Director	WateReuse Association	Alexandria	CA	NOA
1840.	Collins	Laurel		Watershed Sciences		CA	NOA
1841.	Riley	Ann		Waterways Restoration Institute	Berkeley	CA	CD
1842.			District Manager	West Stanislaus County Resource Conservation District	Modesto	CA	NOA
1843.	Barrow	Darryl	General Manager	Westborough Water District	South San Francisco	CA	NOA
1844.	Craig, EdD, LLD	Robert C.	Vice President of the Board	Westborough Water District	South San Francisco	CA	NOA
1845.	Kennedy	John		Westborough Water District	South San Francisco	CA	NOA
1846.	Orth	Dave	General Manager	Westlands Water District	Fresno	CA	CD
1847.	McGinnis	William		Whitewater Voyages	El Sobrante	CA	NOA CD
1848.	Barth	Sara	Regional Director	Wilderness Society	San Francisco	CA	NOA
1849.	George	Barbara		Women's Energy Matters	Fairfax	CA	NOA
1850.	Christensen	Anders		Woodbridge Irrigation District	Woodbridge	CA	CD
1851.	Seratt	Carl J.		Working Assets	Sacramento	CA	NOA DPEIR
1852.	Stoecker	Matt		Worldwaters	Portola Valley	CA	NOA
1853.	Arboleda	Gustavo	Project Manager	WRE	San Francisco	CA	DPEIR
1854.	Taghavi	Ali		WRIME, Inc.	Sacramento	CA	NOA
1855.	Mayer	Elexis	Compliance Specialist	Yosemite National Park	Yosemite	CA	NOA
1856.	Treutelaar	Jennifer	Hetch Hetchy Program Manager	Yosemite National Park, Office of the Superintendent	Yosemite	CA	NOA CD
1857.	Conant	Ernest A.		Young Woolridge	Bakersfield	CA	CD

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WSIP PEIR MAILING LIST

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1858.	Aikens	Curt	General Manager	Yuba County Water Agency	Marysville, CA	CA	CD
1859.	Ferguson	Bob		Zephyr Whitewater	Columbia	CA	NOA DPEIR CD
1860.	Houts	David		Zone 7 Water Agency	Livermore	CA	NOA DPEIR
1861.	Lim	Mary	Environmental Services Program Manager	Zone 7 Water Agency	Livermore	CA	NOA CD
1862.	Myers	Dale	General Manager	Zone 7 Water Agency	Livermore	CA	NOA
1863.	Naamani	Amy	General Council	Zone 7 Water Agency	Livermore	CA	CD
1864.	Nemeth	Karla		Zone 7 Water Agency	Livermore	CA	NOA
1865.	Wong	Vince	Assistant General Manager	Zone 7 Water Agency	Livermore	CA	NOA

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TABLE J-3
ERRATA – MAIL RETURNED – NO FORWARDING ADDRESS

#	Last Name	First Name	Title	Affiliation	City	State
1	Cartwright	Eric		Alameda County Water District	Fremont	CA
2	Atkinson	Kristine		CA Dept. of Fish & Game	Yountville	CA
3	Shewry	Sandra	Director	CA Dept. of Health Services	Sacramento	CA
4	Leslie	Tim	District 4	CA State Assembly	Sacramento	CA
5	Speier	Jackie	State Senator	CA State Senate, District #8	San Francisco	CA
6	Barsanti	Cris		Citizen	Columbia	CA
7	Hsieh	Frances	Aide to Supervisor Ma	City & County of San Francisco	San Francisco	CA
9	Jew	Ed	Supervisor, District 4	City & County of San Francisco	San Francisco	CA
8	Mak	Jaynry	Aide to Supervisor Ma	City & County of San Francisco	San Francisco	CA
10	Arnold	Carol	District Manager	Contra Costa County Resource Conservation District	Concord	CA
11	McNeil	Carrie	Director	CSM-CSPA -- Delta Keeper	Stockton	CA
12	Wallace	Doug	Community Affairs Representative	East Bay Municipal Utility District	Oakland	CA
13	Barton	Christ	Senior Planner	East Bay Regional Park District	Oakland	CA
14	Plummer	John		Friends of Lake Merced	Daly City	CA
15	Heaton	Michael G.		Law Office of Michael G. Heaton	Sacramento	CA
16	Baxter	Stephen	Staff Writer	Media - San Mateo Daily Journal	San Mateo	CA
17	Levey	Dhyana		Media - Union Democrat	Sonora	CA
18	Mendoza	Edgar		Office of Senator Liz Figueroa	Fremont	CA
19	Ringer	Alice		Sierra Club, Loma Prieta Chapter	Santa Clara	CA
20	Mc Comas	R.W.		Stony Creek Business and Landowners Coalition	Orland	CA
21	Regan	John		Trout Unlimited	San Francisco	CA
22	Weakley	Monica		Tuolumne River Trust	Groveland	CA
23	Pombo	Richard W.		U.S. House of Representatives, District #11	Washington	DC
24	Williams	Diana M.	Executive Director	Urban Ecology	Oakland	CA
25	Williams	Diana M.	Executive Director	Urban Ecology	San Francisco	CA

APPENDIX J3

Draft PEIR Notice of Availability and Meeting Notification

SAN FRANCISCO
PLANNING DEPARTMENT

June 29, 2007

1650 Mission St.
Suite 400
San Francisco,
CA 94103-2479

Reception:
415.558.6378

Fax:
415.558.6409

Planning
Information:
415.558.6377

PUBLIC NOTICE

AVAILABILITY OF DRAFT PROGRAM ENVIRONMENTAL IMPACT REPORT for the SAN FRANCISCO PUBLIC UTILITIES COMMISSION'S WATER SYSTEM IMPROVEMENT PROGRAM

PLANNING DEPARTMENT CASE NO. 2005.0159E
STATE CLEARINGHOUSE NO. 2005092026

A Draft Program Environmental Impact Report (Draft PEIR) has been prepared by the City and County of San Francisco Planning Department in connection with this program. Beginning June 29, 2007, the Draft PEIR for the SFPUC's Water System Improvement Program can be viewed at the following locations:

Online at:
www.sfgov.org/site/planning/mea
(or by linking to this site from *http://PEIR.sfwater.org*)

In print at:

- San Francisco Planning Department, 1660 Mission Street, 1st Floor, Planning Information Counter (copy of Draft PEIR only is available).
- By appointment at the San Francisco Public Utilities Commission by calling 1-866-231-1337 or e-mailing *PEIRappointments@sfwater.org* (copy of Draft PEIR and associated reference materials are available).
- Any of the libraries listed below (copy of Draft PEIR and associated reference materials are available).

Alameda County
Alameda County/City of Fremont Library:
2400 Stevenson Blvd., Fremont

San Francisco County
San Francisco Main Library:
100 Larkin St., San Francisco

San Joaquin County
Stockton-San Joaquin County Public Library:
605 N. El Dorado St., Stockton

San Mateo County
City of San Mateo Main Library
55 West 3rd Avenue, San Mateo

Santa Clara County
San Jose-Dr. Martin Luther King, Jr. Library: 150 E. San Fernando, San Jose

Stanislaus County
Modesto Library:
1500 I St., Modesto

Tuolumne County
Tuolumne County Library:
480 Greenley Rd., Sonora

PROGRAM DESCRIPTION

The San Francisco Public Utilities Commission (SFPUC) proposes to adopt and implement the Water System Improvement Program (WSIP) to increase the reliability of the regional water system, which provides drinking water to 2.4 million people in San Francisco, San Mateo, Santa Clara, Alameda, and Tuolumne Counties. WSIP implementation would involve using additional water supplies to serve customer needs through 2030 as well as constructing repairs and improvements to many facilities within the existing system located in Tuolumne, Stanislaus, San Joaquin, Alameda, Santa Clara, San Mateo, and San Francisco Counties.

SUMMARY OF IMPACT ANALYSIS

The Draft PEIR evaluates the environmental effects of the proposed changes in water supply, including growth-inducing impacts, as well as the general environmental effects of implementing 22 facility projects. The analysis in the Draft PEIR finds that the WSIP would support planned growth in the existing SFPUC service area and indirect effects of growth are significant and unavoidable. All other impacts resulting from water supply changes could be mitigated to a less-than-significant level, with the exception of an unavoidable impact on streamflow for about two miles in Alameda Creek and a potentially significant and unavoidable fisheries impact in Crystal Springs Reservoir. Other potentially significant but mitigable impacts as a result of water supply changes include: impacts on water quality, fishery resources, terrestrial biological resources, recreation and visual resources in the watersheds of either the Tuolumne River, Alameda Creek, San Mateo Creek, or Pilarcitos Creek; and impacts on groundwater and related resources in the Westside Groundwater Basin.

The environmental analysis also determined that most of the impacts associated with implementing facility projects could be mitigated to a less-than-significant level, although some impacts in the areas of land use, visual resources, cultural resources, biological resources, noise, vibration, air quality, and traffic were conservatively identified as potentially significant and unavoidable at the programmatic level. These impact determinations may be revised during subsequent environmental review of individual facility improvement projects. The Draft PEIR identifies potentially significant, but mitigable impacts from construction and operation of 22 facility projects in the areas of land use, visual quality, geology, hydrology/water quality, biological resources, cultural resources, traffic, air quality, noise, vibration, public services, utilities, recreational resources, agricultural resources, hazards, and energy.

The Draft PEIR also evaluates the environmental effects of variations of and alternatives to the WSIP.

PUBLIC HEARINGS

The San Francisco Planning Department will hold five public hearings on this Draft PEIR at the locations listed below. The same information and opportunity to comment will be provided at each meeting. See the maps on the reverse side of this notice for directions to meeting locations.

Sonora	Modesto	Fremont	Palo Alto	San Francisco
September 5, 2007	September 6, 2007	September 18, 2007	September 19, 2007	September 20, 2007
6:30 pm	6:30 pm	6:30 pm	6:30 pm	1:30 pm or later*
Sonora Opera House 250 S. Washington St.	Thomas Downey High School Cafeteria 1000 Coffee Rd.	Fremont Main Library Fukaya Room 2400 Stevenson Blvd.	Avenidas Senior Center 450 Bryant St.	San Francisco Planning Commission City Hall, Room 400 1 Dr. Carlton B Goodlett Place

**Call (415) 558-6422 the week of the hearing for a recorded message giving a more specific time.*

PUBLIC COMMENTS

Public comments on the Draft PEIR will be accepted by the San Francisco Planning Department from Friday, June 29, 2007 through 5:00 pm on Monday, October 1, 2007. You may submit comments to the Planning Department using any of the following means:

- Provide oral or written comment at any of the five public hearings
- Mail written comments to the San Francisco Planning Department, Attention: Paul Maltzer, Environmental Review Officer, WSIP PEIR, 1650 Mission Street, Suite 400, San Francisco, CA 94103
- E-mail written comments to: *wsip.peir.comments@gmail.com*

The San Francisco Planning Department will prepare written responses to comments received during the public review period in a Comments and Responses document. If you have any questions about the environmental review of the WSIP, please leave a message for the Planning Department at **1-866-231-1337**.

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PLANNING DEPARTMENT

Paul Maltzer
Environmental Review Officer
WSIP PEIR
1650 Mission Street, Suite 400
San Francisco, CA 94103

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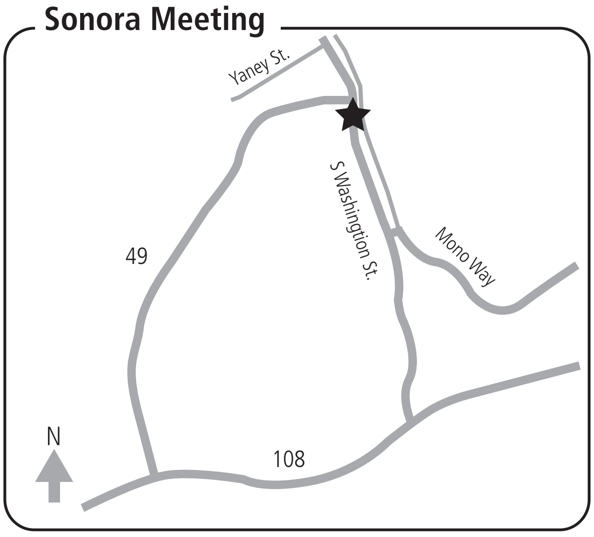
NOW AVAILABLE FOR PUBLIC REVIEW
Draft Program Environmental Impact Report
San Francisco Public Utilities Commission's Water System Improvement Program

Sonora Meeting



★ **Sonora Meeting** – Wednesday, September 5, 2007
Sonora Opera House, 250 South Washington Street

★ **Modesto Meeting** – Thursday, September 6, 2007
Thomas Downey High School Cafeteria, 1000 Coffee Road

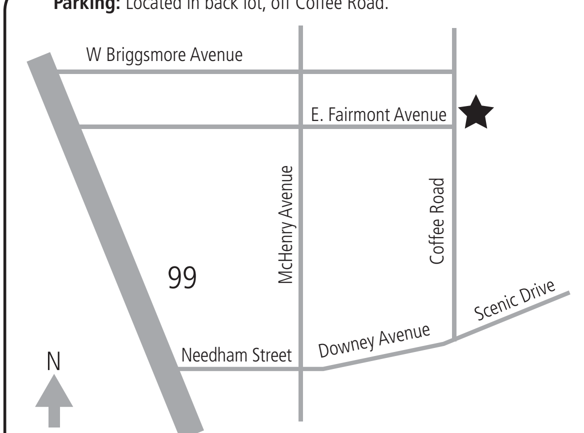
★ **Fremont Meeting** – Tuesday, September 18, 2007
Main Library, Fukaya Room, 2400 Stevenson Boulevard

★ **Palo Alto** – Wednesday, September 19, 2007
Avenidas Senior Center, 450 Bryant Street

★ **San Francisco Meeting** – Thursday, September 20, 2007
City Hall, Room 400, 1 Dr. Carlton B, Goodlett Place

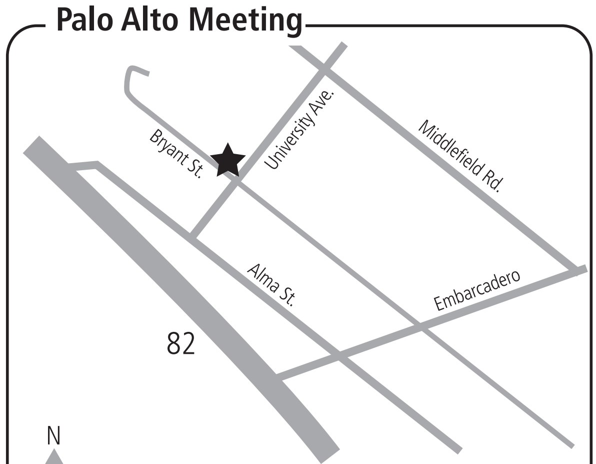
Modesto Meeting

Parking: Located in back lot, off Coffee Road.



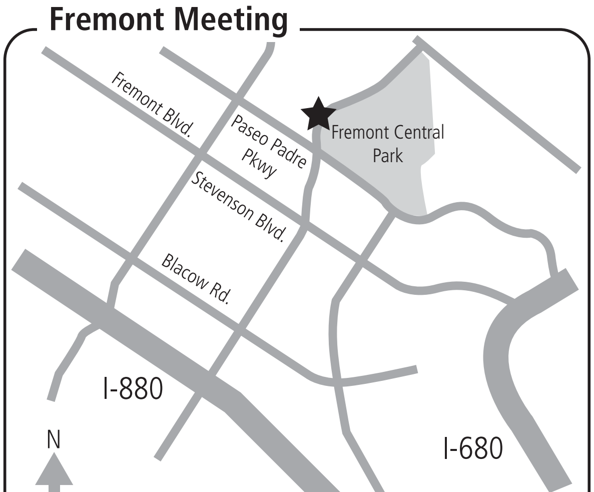
Exit Briggsmore Ave. from 99

Palo Alto Meeting



By public transit: Take Caltrain to Palo Alto station or Santa Clara VTA Bus 22 or 35 to Caltrain Palo Alto station. Cross to University Ave.; turn left on Bryant.

Fremont Meeting



By public transit: Take BART to Fremont station. Walk to end of BART Way; turn left at Civic Center Dr; walk two blocks to Stevenson.

San Francisco Meeting

By public transit: Take BART/MUNI to Civic Center station. Walk west two blocks on Grove; turn right at Polk for three blocks; turn left on Turk. Or, exit MUNI Van Ness station; walk north on Van Ness; right on Turk.

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Public Hearings in September on

The Environmental Review of the SFPUC's Water System Improvement Program

PROGRAM DESCRIPTION

The San Francisco Public Utilities Commission (SFPUC) proposes to adopt and implement the Water System Improvement Program (WSIP) to increase the reliability of the regional water system, which provides drinking water to 2.4 million people in San Francisco, San Mateo, Santa Clara, Alameda, and Tuolumne Counties. WSIP implementation would involve using additional water supplies to serve customer needs through 2030, as well as constructing repairs and seismic improvements to many facilities within the existing system located in Tuolumne, Stanislaus, San Joaquin, Alameda, Santa Clara, San Mateo, and San Francisco Counties.

A Draft Program Environmental Impact Report (Draft PEIR) has been prepared by the City and County of San Francisco Planning Department in connection with this program. Beginning June 29, 2007, the Draft PEIR for the SFPUC's Water System Improvement Program is available for review and public comments (see reverse side for more details on how to view and comment on the Draft PEIR). Look for a summary presentation of the Draft PEIR's contents online in early September at www.sfgov.org/site/planning/mea.

Share your comments on the Draft PEIR on the SFPUC's Water System Improvement Program at one of the following public hearings:

Sonora	Modesto	Fremont	Palo Alto	San Francisco
September 5, 2007	September 6, 2007	September 18, 2007	September 19, 2007	September 20, 2007
6:30 pm	6:30 pm	6:30 pm	6:30 pm	1:30 pm or later*
Sonora Opera House 250 S. Washington St.	Thomas Downey High School Cafeteria 1000 Coffee Rd.	Fremont Main Library Fukaya Room 2400 Stevenson Blvd.	Avenidas Senior Center 450 Bryant St.	San Francisco Planning Commission City Hall, Room 400 1 Dr. Carlton B. Goodlett Place

**Call (415) 558-6422 the week of the hearing for a recorded message giving a more specific time.*

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Paul Maltzer, Environmental Review Officer WSIP PEIR
1650 Mission St., Suite 400, San Francisco, CA 94103

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How to View the Draft PEIR on the SFPUC's Water System Improvement Program

Online at: www.sfgov.org/site/planning/mea

In Print at:

San Francisco Planning Department Planning Information Counter 1660 Mission St., 1st Floor, San Francisco	San Jose – Dr. Martin Luther King, Jr. Library 150 E. San Fernando, San Jose
San Francisco – Main Library 100 Larkin St., San Francisco	Modesto Library 1500 I. St., Modesto
City of Fremont – Main Library 2400 Stevenson Blvd., Fremont	Sonora – Tuolumne County Library 480 Greenley Rd., Sonora
Stockton – San Joaquin County Public Library 605 N. El Dorado St., Stockton	San Mateo Library 55 West 3rd Ave., San Mateo

or by appointment at the San Francisco Public Utilities Commission by calling 1-866-231-1337 or e-mailing PEIRappointments@sfwater.org.

Public Comments

Public Comments will be accepted through close of business on Monday October 1, 2007.
You can submit comments on the Draft PEIR by:

- Providing oral or written comments at a public hearing
- Mailing written comments to: Paul Maltzer, Environmental Review Officer, WSIP PEIR, 1650 Mission St., Suite 400, San Francisco, CA 94103
- E-mailing written comments to: wsip.peir.comments@gmail.com

Attend an upcoming public hearing!

See details on reverse side.

APPENDIX J4

Draft PEIR Legal Notices and Display Ads

PUBLIC NOTICE

NO. 07-277

NOTICE OF HEARING ON DRAFT PROGRAM ENVIRONMENTAL IMPACT REPORT FOR THE FOLLOWING

2005.0159E- WATER SYSTEM IMPROVEMENT PROGRAM (WSIP). The San Francisco Public Utilities Commission (SFPUC) proposes to adopt and implement the WSIP to increase the reliability of the regional water system, which provides drinking water to 2.4 million people in San Francisco, San Mateo, Santa Clara, Alameda, and Tuolumne Counties. WSIP implementation would involve using additional water supplies to serve customer needs through 2030 as well as construction of repairs and/or improvements to many facilities within the existing system located in Tuolumne, Stanislaus, San Joaquin, Alameda, Santa Clara, San Mateo, and San Francisco Counties.

Notice is hereby given to the general public as follows:

1) A Draft Program Environmental Impact Report (PEIR) on the WSIP has been prepared by the San Francisco Planning Department to identify potentially significant environmental effects of the proposed program, ways to minimize those effects, and feasible alternatives. The report can be viewed online at www.sfgov.org/site/planning/mea (or by linking to this site from http://PEIR.sfwater.org). A printed copy of the report is available for public review and comment at the Planning Department offices at 1660 Mission Street, 1st Floor, Planning Information Counter. A printed copy of the report and associated reference materials are available for review by appointment at the San Francisco Public Utilities Commission by calling 1-866-231-1337 or e-mailing PEIRappointments@sfwater.org. They also can be viewed at:

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2) The Draft PEIR evaluates the environmental effects of the proposed changes in water supply, including growth-inducing impacts, as well as the general environmental effects of implementing 22 facility projects. The analysis in the Draft PEIR finds that the WSIP would support planned growth in the existing SFPUC service area and indirect effects of growth are significant and unavoidable. All other impacts resulting from water supply changes could be mitigated to a less-than-significant level, with the exception of an unavoidable impact on streamflow for about two miles in Alameda Creek and a potentially significant and unavoidable fisheries impact in Crystal Springs Reservoir. The environmental analysis also determined that most of the impacts associated with implementing facility projects could be mitigated to a less-than-significant level, although some impacts in the areas of land use, visual resources, cultural resources, biological resources, noise, vibration, air quality, and traffic were conservatively identified as potentially significant and unavoidable at the programmatic level. These impact determinations may be revised during subsequent environmental review of individual facility improvement projects.

3) Public hearings on this Draft PEIR have been scheduled as follows:

- Sept. 5 6:30 p.m.: Sonora Opera House, 250 S. Washington Street, Sonora
- Sept. 6 6:30 p.m.: Thomas Downey High School Cafeteria, 1000 Coffee Rd, Modesto
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Publish Date: July 2, 2007

The Union Democrat, Sonora, CA 95370

DECLARATION OF PUBLICATION
(C.C.P. S2015.5)

COUNTY OF STANISLAUS
STATE OF CALIFORNIA

I am a citizen of the United States and a resident Of the County aforesaid; I am over the age of Eighteen years, and not a party to or interested In the above entitle matter. I am a printer and Principal clerk of the publisher of **THE MODESTO BEE,** printed in the City of **MODESTO,** County of **STANISLAUS,** State of California, daily, for which said newspaper has been adjudged a newspaper of general circulation by the Superior Court of the County of **STANISLAUS,** State of California, Under the date of **February 25, 1951, Action No. 46453;** that the notice of which the annexed is a printed copy, has been published in each issue there of on the following dates, to wit:

JULY 13, 2007

I certify (or declare) under penalty of perjury That the foregoing is true and correct and that This declaration was executed at **MODESTO, California** on

JULY 13, 2007

Esther Jimenez

(Signature)

NOTICE OF HEARING ON DRAFT PROGRAM ENVIRONMENTAL IMPACT REPORT FOR THE FOLLOWING

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JULY 13, 2007

PROOF OF PUBLICATION NOTICE

STATE OF CALIFORNIA
COUNTY OF SAN JOAQUIN

THE UNDERSIGNED SAYS:

I am a citizen of the United States and a resident of San Joaquin County; I am over the age of 18 years and not a part to or interested in the above-entitled matter. I am the principal clerk of the printer of THE RECORD, a newspaper of general publication, printed and published daily in the City of Stockton, County of San Joaquin and which newspaper has been adjudged a newspaper of general circulation in the City of Stockton and the County of San Joaquin by the Superior Court of the County of San Joaquin, State of California, under the date of February 26, 1952, File No. 52857, San Joaquin County Records; that the notice of which the annexed is a printed copy (set in type not smaller than nonpareil), has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following dates,

To wit, July 3
All in the year, 2007

I declare under penalty of perjury that the foregoing is true and correct.
Executed on July 3rd, 2007
In Stockton, California.

Laurie Costello

Laurie Costello

NOTICE OF HEARING ON DRAFT PROGRAM ENVIRONMENTAL IMPACT REPORT FOR THE FOLLOWING

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DECLARATION OF PUBLICATION OF
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PUBLIC NOTICES CITY

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2005.0159E- WATER SYSTEM IMPROVEMENT PROGRAM (WSIP). The San Francisco Public Utilities Commission (SFPUC) proposes to adopt and implement the WSIP to increase the reliability of the regional water system, which provides drinking water to 2.4 million people in San Francisco, San Mateo, Santa Clara, Alameda, and Tuolumne Counties. WSIP implementation would involve using additional water supplies to serve customer needs through 2030 as well as construction of repairs and/or improvements to many facilities within the existing system located in Tuolumne, Stanislaus, San Joaquin, Alameda, Santa Clara, San Mateo, and San Francisco Counties.

Notice is hereby given to the general public as follows:

1) A Draft Program Environmental Impact Report (PEIR) on the WSIP has been prepared by the San Francisco Planning Department to identify potentially significant environmental effects of the proposed program, ways to minimize those effects, and feasible alternatives. The report can be viewed online at www.sfgov.org/site/planning/mea (or by linking to this site from http://PEIR.sfwater.org). A printed copy of the report is available for public review and comment at the Planning Department offices at 1660 Mission Street, 1st Floor, Planning Information Counter. A printed copy of the report and associated reference materials are available for review by appointment at the San Francisco Public Utilities Commission by calling 1-866-231-1337 or e-mailing PEIRappointments@sfwater.org.

They also can be viewed at:

- Alameda County/City of Fremont Library: 2400 Stevenson Boulevard, Fremont
- San Francisco Main Library: 100 Larkin Street San Francisco
- Stockton-San Joaquin County Public Library: 605 N. El Dorado St, Stockton
- San Mateo

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PUBLIC NOTICES CITY

County/Belmont Library: 25 Tower Road, San Mateo

- San Jose-Dr. Martin Luther King, Jr. Library; 150 East San Fernando, San Jose
- Tuolumne County Library: 480 Greenley Road, Sonora

2) The Draft PEIR evaluates the environmental effects of the proposed changes in water supply, including growth-inducing impacts, as well as the general environmental effects of implementing 22 facility projects. The analysis in the Draft PEIR finds that the WSIP would support planned growth in the existing SFPUC service area and indirect effects of growth are significant and unavoidable. All other impacts resulting from water supply changes could be mitigated to a less-than-significant level, with the exception of an unavoidable impact on streamflow for about two miles in Alameda Creek and a potentially significant and unavoidable fisheries impact in Crystal Springs Reservoir. The environmental analysis also determined that most of the impacts associated with implementing facility projects could be mitigated to a less-than-significant level, although some impacts in the areas of land use, visual resources, cultural resources, biological resources, noise, vibration, air quality, and traffic were conservatively identified as potentially significant and unavoidable at the programmatic level. These impact determinations may be revised during subsequent environmental review of individual facility improvement projects.

3) Public hearings on this Draft PEIR have been scheduled as follows:

- Sept. 5 6:30 p.m.: Sonora Opera House, 250 S. Washington Street, Sonora
- Sept. 6 6:30 p.m.: Thomas Downey High School Cafeteria, 1000 Coffee Rd, Modesto
- Sept. 18 6:30 p.m.: Fremont Main Library, Fukaya Room, 2400 Stevenson Blvd, Fremont
- Sept. 19 6:30 p.m.:

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PUBLIC NOTICES CITY

Avenidas Senior Center, 450 Bryant, Palo Alto

- Sept. 20 1:30 p.m. or later: San Francisco Planning Commission, City Hall, Rm 400, 1 Dr. Carlton B Goodlett Place, San Francisco (Call 558-6422 the week of the hearing for a recorded message giving a more specific time).

4) Public comments on the Draft PEIR will be accepted by the San Francisco Planning Department from Friday, June 29 through 5:00 p.m. on Monday, October 1, 2007. You may submit comments to the Planning Department using any of the following means: provide oral or written comments at a public hearing; mail comments to the San Francisco Planning Department, attention: Paul Maltzer, Environmental Review Officer, WSIP PEIR, 1650 Mission Street, Suite 400, San Francisco, CA 94103, or e-mail comments to wsip.peir.comments@gmail.com. The San Francisco Planning Department will prepare written responses to comments received during the public review period in a Comments and Responses document. If you have any questions about the environmental review of the WSIP, please leave a message for the Planning Department at 1-866-231-1337.

WESLEY MANALASTAS

declares that:

The annexed advertisement has been regularly published in the

SAN FRANCISCO CHRONICLE

which is and was at all times herein mentioned established as newspaper of general circulation in the City and County of San Francisco, State of California, as that term is defined by Section 6000 of the Government Code.

SAN FRANCISCO CHRONICLE
(Name of Newspaper)

901 Mission Street
San Francisco, CA 94103

From June 29, 2007
To June 29, 2007
Namely, on June 29, 2007

(Dates of Publication)

I declare under penalty of perjury that the foregoing is true and correct.

Executed on June 29, 2007

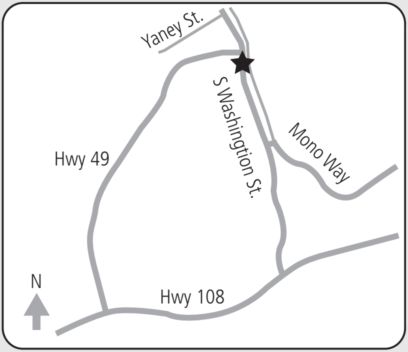
at San Francisco, California.

Wesley Manalastas

Wesley Manalastas

INTERESTED IN THE ENVIRONMENTAL REVIEW OF THE SFPUC WATER SYSTEM IMPROVEMENT PROGRAM?

The San Francisco Planning Department has issued for public review a Draft Program Environmental Impact Report (PEIR) on the San Francisco Public Utilities Commission's (SFPUC) Water System Improvement Program. Copies of the Draft PEIR are available for viewing at the Tuolumne County Library at 480 Greenley Road in Sonora and online at http://PEIR.sfwater.org or www.sfgov.org/site/planning/mea.

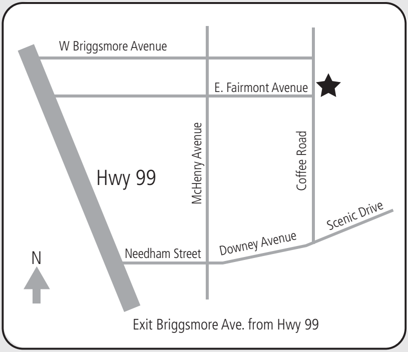


Share your comments about the Draft PEIR at a public hearing on **Wednesday, September 5th, 6:30 PM at the Sonora Opera House**: 250 S. Washington St, Sonora, CA, 95370.

Comments on the Draft PEIR are due by close of business on Monday, October 1, 2007. You may provide oral or written comments at a public meeting, mail comments to the San Francisco Planning Department, attention: Paul Maltzer, Environmental Review Officer, WSIP PEIR, 1650 Mission Street, Suite 400, San Francisco, CA 94103, or e-mail comments to wsip.peir.comments@gmail.com. For more information call 1-866-231-1337.

INTERESTED IN THE ENVIRONMENTAL REVIEW OF THE SFPUC WATER SYSTEM IMPROVEMENT PROGRAM?

The San Francisco Planning Department has issued for public review a Draft Program Environmental Impact Report (PEIR) on the San Francisco Public Utilities Commission's (SFPUC) Water System Improvement Program. Copies of the Draft PEIR are available for viewing at the Modesto Library at 1500 I. Street in Modesto and online at http://PEIR.sfwater.org or www.sfgov.org/site/planning/mea.

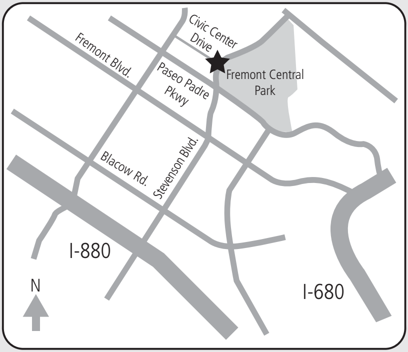


Share your comments about the Draft PEIR at a public hearing on **Thursday, September 6th, 6:30 PM at the Thomas Downey High School Cafeteria:** 1000 Coffee Rd., Modesto, CA, 95355

Comments on the Draft PEIR are due by close of business on Monday, October 1, 2007. You may provide oral or written comments at a public meeting, mail comments to the San Francisco Planning Department, attention: Paul Maltzer, Environmental Review Officer, WSIP PEIR, 1650 Mission Street, Suite 400, San Francisco, CA 94103, or e-mail comments to wsip.peir.comments@gmail.com. For more information call 1-866-231-1337.

INTERESTED IN THE ENVIRONMENTAL REVIEW OF THE SFPUC WATER SYSTEM IMPROVEMENT PROGRAM?

The San Francisco Planning Department has issued for public review a Draft Program Environmental Impact Report (PEIR) on the San Francisco Public Utilities Commission's (SFPUC) Water System Improvement Program. Copies of the Draft PEIR are available for viewing at the City of Fremont Main Library at 2400 Stevenson Boulevard in Fremont and online at http://PEIR.sfwater.org or www.sfgov.org/site/planning/mea.



Share your comments about the Draft PEIR at a public hearing on **Tuesday, September 18th, 6:30 PM at the Fremont Main Library, Fukaya Room:** 2400 Stevenson Blvd., Fremont, CA, 94538

SEAL OF THE CITY AND COUNTY OF SAN FRANCISCO

Comments on the Draft PEIR are due by close of business on Monday, October 1, 2007. You may provide oral or written comments at a public meeting, mail comments to the San Francisco Planning Department, attention: Paul Maltzer, Environmental Review Officer, WSIP PEIR, 1650 Mission Street, Suite 400, San Francisco, CA 94103, or e-mail comments to wsip.peir.comments@gmail.com. For more information call 1-866-231-1337.

K. Attachment Log

Attachment Log

This attachment log summarizes any attachments received with a particular letter, some of which are included in this Comments and Responses document and others that are available for review at the San Francisco Planning Department. If the attachments contain direct comments on the adequacy or accuracy of the Draft PEIR, they are included along with the comment letters in Chapter 12 and are treated as individual comments. However, in other instances the attachments provide generic information supporting some aspect of an agency or organization's mission (e.g., description of a city's conservation program and activities) and are not directly related to the adequacy or accuracy of the Draft PEIR; those materials are not produced in this document but are available for review at the San Francisco Planning Department.

Comment Letter ID	Organization/Affiliation	Date of Letter	Attachment	Location
F_USFWS	U.S. Fish and Wildlife Service	9/26/07	U.S. Fish and Wildlife Service, Don Edwards San Francisco Bay National Wildlife Refuge [Map]. Produced for the Division of Realty, Portland Oregon. Current to April 9, 2004.	Chapter 12 of this Comments and Responses document
S_CC	Coastal Conservancy	09/17/07	EDAW Inc., South Bay Salt Pond Restoration Project [Map]. Figure 2-5c. Alternative B: Managed Pond Emphasis Ravenswood, Year 50 Map Data by Siegel and Bashand, 2002. Current as of March 2007.	Chapter 12 of this Comments and Responses document
S_CC	Coastal Conservancy	09/17/07	EDAW Inc., South Bay Salt Pond Restoration Project [Map]. Figure 2-7c. Alternative C: Tidal Habitat Emphasis Ravenswood, Year 50 Map Data by Siegel and Bashand, 2002. Current as of March 2007.	Chapter 12 of this Comments and Responses document
S_CDFG2	California Department of Fish and Game	10/01/07	Mesick, C., McLain, J., Marston, D., and Heyne, T. Table 1. Tuolumne River Spring Flow Comparison (1997–2003). Limiting Fact Analyses and Recommended Studies for Fall-run Chinook Salmon and Rainbow Trout in the Tuolumne River. February 27, 2007.	Chapter 12 of this Comments and Responses document
S_CDFG2	California Department of Fish and Game	10/01/07	Mesick, C., McLain, J., Marston, D., and Heyne, T. Table 2. Tuolumne River Spring Flow and Water Temperature. Limiting Fact Analyses and Recommended Studies for Fall-run Chinook Salmon and Rainbow Trout in the Tuolumne River. February 27, 2007.	Chapter 12 of this Comments and Responses document
S_CDFG2	California Department of Fish and Game	10/01/07	Mesick, C., McLain, J., Marston, D., and Heyne, T. Table 3. Stanislaus River Spring Flow Comparison (1998–2004). Limiting Fact Analyses and Recommended Studies for Fall-run Chinook Salmon and Rainbow Trout in the Tuolumne River. February 27, 2007.	Chapter 12 of this Comments and Responses document
S_CDFG2	California Department of Fish and Game	10/01/07	Mesick, C., McLain, J., Marston, D., and Heyne, T. Merced River Spring Flow Comparison (1998–2004). Limiting Fact Analyses and Recommended Studies for Fall-run Chinook Salmon and Rainbow Trout in the Tuolumne River. February 27, 2007.	Chapter 12 of this Comments and Responses document

Comment Letter ID	Organization/Affiliation	Date of Letter	Attachment	Location
S_CDFG2	California Department of Fish and Game	10/01/07	Mesick, C., McLain, J., Marston, D., and Heyne, T. Table 2. EA Engineering, Science, and Technology. Predation Studies in the Lower Tuolumne River in 1989 and 1990.	Chapter 12 of this Comments and Responses document
S_CDFG2	California Department of Fish and Game	10/01/07	Mesick, C., McLain, J., Marston, D., and Heyne, T. Figure 1. San Joaquin River Salmon Escapement Trends (1977–2006). Limiting Fact Analyses and Recommended Studies for Fall-run Chinook Salmon and Rainbow Trout in the Tuolumne River. February 27, 2007.	Chapter 12 of this Comments and Responses document
S_CDFG2	California Department of Fish and Game	10/01/07	Mesick, C., McLain, J., Marston, D., and Heyne, T. Figure 2. Tuolumne River Fall Flows Since 1998. Limiting Fact Analyses and Recommended Studies for Fall-run Chinook Salmon and Rainbow Trout in the Tuolumne River. February 27, 2007.	Chapter 12 of this Comments and Responses document
S_CDFG2	California Department of Fish and Game	10/01/07	Mesick, C., McLain, J., Marston, D., and Heyne, T. Figure 3. Tuolumne River Spring Flows Since 1998. Limiting Fact Analyses and Recommended Studies for Fall-run Chinook Salmon and Rainbow Trout in the Tuolumne River. February 27, 2007.	Chapter 12 of this Comments and Responses document
S_CDFG2	California Department of Fish and Game	10/01/07	Mesick, C., McLain, J., Marston, D., and Heyne, T. Figure 4. Tuolumne Spring Flow and Escapement Trends. Limiting Fact Analyses and Recommended Studies for Fall-run Chinook Salmon and Rainbow Trout in the Tuolumne River. February 27, 2007.	Chapter 12 of this Comments and Responses document
S_CDFG2	California Department of Fish and Game	10/01/07	Mesick, C., McLain, J., Marston, D., and Heyne, T. Figure 5. Tuolumne Spring Flow and Brood Year Recruitment Production. Limiting Fact Analyses and Recommended Studies for Fall-run Chinook Salmon and Rainbow Trout in the Tuolumne River. February 27, 2007.	Chapter 12 of this Comments and Responses document
S_CDFG2	California Department of Fish and Game	10/01/07	Mesick, C., McLain, J., Marston, D., and Heyne, T. Figure 6. Tuolumne Spring Flow and Water Temperature. Limiting Fact Analyses and Recommended Studies for Fall-run Chinook Salmon and Rainbow Trout in the Tuolumne River. February 27, 2007.	Chapter 12 of this Comments and Responses document
S_CDFG2	California Department of Fish and Game	10/01/07	Mesick, C., McLain, J., Marston, D., and Heyne, T. Figure 7. Tuolumne River Spring Water Temperature and Adult Salmon Production. Limiting Fact Analyses and Recommended Studies for Fall-run Chinook Salmon and Rainbow Trout in the Tuolumne River. February 27, 2007.	Chapter 12 of this Comments and Responses document
S_CDFG2	California Department of Fish and Game	10/01/07	Mesick, C., McLain, J., Marston, D., and Heyne, T. Figure 8. Coordinated San Joaquin River East-side Tributary Flow and Release. Limiting Fact Analyses and Recommended Studies for Fall-run Chinook Salmon and Rainbow Trout in the Tuolumne River. February 27, 2007.	Chapter 12 of this Comments and Responses document

Comment Letter ID	Organization/Affiliation	Date of Letter	Attachment	Location
S_CDFG2	California Department of Fish and Game	10/01/07	Mesick, C., McLain, J., Marston, D., and Heyne, T. Figure 9. Merced Hatchery Release. Limiting Fact Analyses and Recommended Studies for Fall-run Chinook Salmon and Rainbow Trout in the Tuolumne River. February 27, 2007.	Chapter 12 of this Comments and Responses document
S_CDFG2	California Department of Fish and Game	10/15/07	Mesick, C., McLain, J., Marston, D., and Heyne, T. Figure 10. Merced River Hatchery (MRH) Release and Escapement. Limiting Fact Analyses and Recommended Studies for Fall-run Chinook Salmon and Rainbow Trout in the Tuolumne River. February 27, 2007.	Chapter 12 of this Comments and Responses document
S_CDFG2	California Department of Fish and Game	10/01/07	Mesick, C., McLain, J., Marston, D., and Heyne, T. Figure 11. Tuolumne River Escapement and Harvest Index. Limiting Fact Analyses and Recommended Studies for Fall-run Chinook Salmon and Rainbow Trout in the Tuolumne River. February 27, 2007.	Chapter 12 of this Comments and Responses document
S_CDFG2	California Department of Fish and Game	10/01/07	Mesick, C., McLain, J., Marston, D., and Heyne, T. Figure 12. Tuolumne River Escapement and South Delta Exports (minus 2.5 years). Limiting Fact Analyses and Recommended Studies for Fall-run Chinook Salmon and Rainbow Trout in the Tuolumne River. February 27, 2007.	Chapter 12 of this Comments and Responses document
S_CDFG2	California Department of Fish and Game	10/01/07	Mesick, C., McLain, J., Marston, D., and Heyne, T. Figure 13. Vernalis Spring Water Temperature and Tuolumne Salmon Production. Limiting Fact Analyses and Recommended Studies for Fall-run Chinook Salmon and Rainbow Trout in the Tuolumne River. February 27, 2007.	Chapter 12 of this Comments and Responses document
S_CDFG2	California Department of Fish and Game	10/01/07	Mesick, C., McLain, J., Marston, D., and Heyne, T. Figure 14. Vernalis Spring Flow and Water Temperature Relationship. Limiting Fact Analyses and Recommended Studies for Fall-run Chinook Salmon and Rainbow Trout in the Tuolumne River. February 27, 2007.	Chapter 12 of this Comments and Responses document
S_CDFG2	California Department of Fish and Game	10/01/07	Mesick, C., McLain, J., Marston, D., and Heyne, T. Figure 15. Juvenile Production and Smolt Outmigrants Relationship before 1999 and after 2000 Spawning Habitat Project in the Stanislaus River. Limiting Fact Analyses and Recommended Studies for Fall-run Chinook Salmon and Rainbow Trout in the Tuolumne River. February 27, 2007.	Chapter 12 of this Comments and Responses document
S_DWR	California Department of Water Resources	07/13/07	Encroachment Permits Fact Sheet	Chapter 12 of this Comments and Responses document
S_RWQCBSF	California Regional Water Quality Control Board, San Francisco Bay Region	09/26/07	Santa Clara Valley Urban Runoff Pollution Prevention Program; Hydromodification Management Plan Literature Review. GeoSyntec Consultants, Walnut Creek, CA 94596.	SF Planning Department

Comment Letter ID	Organization/Affiliation	Date of Letter	Attachment	Location
S_RWQCBSF	California Regional Water Quality Control Board, San Francisco Bay Region	09/26/07	Table 1. List of Articles Obtained and Reviewed for Inclusion in the Literature Review	SF Planning Department
S_RWQCBSF	California Regional Water Quality Control Board, San Francisco Bay Region	09/26/07	Interagency Permitting Task Force Contact List	Chapter 12 of this Comments and Responses document
L_ACWD	Alameda County Water District	9/26/07	Alameda County Water District Comments in Table Format	Chapter 12 of this Comments and Responses document
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Covers and Photos of Volumes 2 through 6, October 1, 2007	Chapter 12 of this Comments and Responses document
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 1: Attachment 1. Detailed Section-by-Section Comments on the PEIR for the WSIP.	Chapter 12 of this Comments and Responses document
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 1: Attachment 2. Impact of Earthquakes on BAWUA Customers Summery Report, prepared by G&E Engineering Systems Inc., November 23, 2001.	Chapter 12 of this Comments and Responses document
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 1: Attachment 3. Ballot Digest on Proposition A, Water Bonds.	Chapter 12 of this Comments and Responses document
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 1: Attachment 4. AT RISK: The Bay Area Greenbelt 2006 Edition, Greenbelt Alliance, 2006.	Chapter 12 of this Comments and Responses document
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 1: Attachment 5. Water Conservation Programs Annual Report FY 2006/2007, prepared by Nichole Sandkulla and Benjamin Pink, September 2006.	Chapter 12 of this Comments and Responses document
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 1: Attachment 6. Economic Evaluation of Water Supply Reliability Goal in SFPUC Water System Improvement Program, prepared by William W. Wade, May 2005.	Chapter 12 of this Comments and Responses document
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 1: Attachment 7. Federal Energy Regulatory Commission, Turlock Irrigation District and Modesto Irrigation District Affidavit of Anson B. Moran, January 26, 1994.	Chapter 12 of this Comments and Responses document
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 2: Alameda County Water District – Newark Desalination Facility Diagrams	SF Planning Department

Comment Letter ID	Organization/Affiliation	Date of Letter	Attachment	Location
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 2: Alameda County Water District – Water Conservation Program	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 2: Attachment: Alameda County Water District	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/1007	Volume 2: Attachment: California Water Service – Bear Gulch, Mid-Peninsula, South San Francisco	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 2: Attachment: City of Brisbane	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 2: Attachment: City of East Palo Alto	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 2: Attachment: City of Daly City	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 2: Attachment: City of Hayward	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 2: Attachment: Coastside County Water District	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/1007	Volume 2: Attachment: Conservation, Smart Growth and Local Supply Programs	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 2: Attachment: Estero Municipal Improvement District	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 2: Attachment: Town of Hillsborough	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 2: California Water Service, Bear Gulch–Mid-Peninsula–South San Francisco – CPUC PowerPoint	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 2: California Water Service, Bear Gulch–Mid-Peninsula–South San Francisco – Water Action Plan	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 2: CCWD – Letter to Nicole Sandkulla on Water Conservation Plan	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 2: CCWD – Ordinance 1997-01 Prohibiting Wasteful Water Use	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 2: CCWD – Rate and Fee Schedule 2007	SF Planning Department

Comment Letter ID	Organization/Affiliation	Date of Letter	Attachment	Location
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 2: CCWD – Water Shortage and Drought Contingency Plan	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 2: City of Burlingame – Draft Urban Water Management Plan 2005	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 2: City of Burlingame – Notice to Customers Concerning Potential Water Shortage	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 2: City of Daly City – Consumer Confidence Report on Water Quality 2006	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 2: City of Daly City – Title 17 Municipal Code, Landscaping	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 2: City of Daly City – Water Conservation Program 8-07	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 2: City of East Palo Alto – 2005 Urban Water Management Plan	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 2: Estero Municipal Improvement District – Conservation Communication Plan	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 2: Estero Municipal Improvement District – Foster City Actions and Policies	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 2: Estero Municipal Improvement District – General Plan Annual Report 2006	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 2: Estero Municipal Improvement District – Goals, Policies, and Programs for Land Use and Circulation	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 2: Estero Municipal Improvement District – Letter on Water Conservation Practices	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 2: Estero Municipal Improvement District – Letter to hme Owners Association to Reduce Water Usage	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 2: Estero Municipal Improvement District – Letter to Parks Superintendent on Water Conservation Policy	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 2: Estero Municipal Improvement District – Municipal Code Water Conservation and Rationing	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 2: Estero Municipal Improvement District – San Mateo County Actions and Policies	SF Planning Department

Comment Letter ID	Organization/Affiliation	Date of Letter	Attachment	Location
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 2: Town of Hillsborough – Letter on Voluntary Reduction Measures	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/1007	Volume 3: Attachment: Conservation, Smart Growth and Local Supply Programs	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 3: Attachment: Mid-Peninsula Water District	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 3: Attachment: North Coast County Water District	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 3: City of Millbrae – City Report Summer 2007	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 3: City of Millbrae – Toilet Rebate Program	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 3: City of Millbrae – Water Conservation Starts With You Conservation Program	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 3: City of Millbrae – Water Resources and Conservation Use Water Wisely Program	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 3: City of Millbrae – Water Resources and Conservation Program Community Information	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 3: City of Milpitas – Municipal Code Chapter 6, Water Conservation	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 3: City of Milpitas – Ordinance 238 Regulating Efficient Water Use for New, Existing, and Rehabilitated Landscapes	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 3: City of Milpitas – Ordinance 240 Requiring Water Conservation	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 3: City of Milpitas – Policy Planning Performance Indicators	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 3: City of Milpitas – Resolution 6796	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 3: City of Milpitas – Save Water Mailer June 2007	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 3: City of Milpitas – Water Supply and Conservation Programs August 27, 2007	SF Planning Department

Comment Letter ID	Organization/Affiliation	Date of Letter	Attachment	Location
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 3: City of Mountain View – Attachment 1, Code Section 35.17 Right to Limit	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 3: City of Mountain View – Attachment 2, Door hanger	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 3: City of Mountain View – Attachment 2, Water Conservation Division 3 Code	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 3: City of Mountain View – Attachment 3, Water Shortage Contingency Plan	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 3: City of Mountain View – Attachment 4, Residential and Commercial Water Rates	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 3: City of Mountain View – Attachment 6, Web Printouts of News and Events	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 3: City of Mountain View – Attachment 7, Water Quality 2006 Consumer Quality Report	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 3: City of Mountain View – Attachment 8, The View Newsletter	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 3: City of Mountain View – Jensen letter	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 3: City of Palo Alto – Adopted Awahnee Water Principles	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 3: Menlo Park – Chapter 12.44, Water Efficient Landscaping	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 3: Menlo Park – Appendix C, No-Waste Water Ordinance	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 3: Menlo Park – Appendix D, Water Efficient Landscape Ordinance	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 3: Menlo Park – City of Menlo Park Master Fee Schedule	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 3: Menlo Park – Conserve Water at Work Insert	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 3: Menlo Park – It has Been a Dry Year Please Help Conserve Water	SF Planning Department

Comment Letter ID	Organization/Affiliation	Date of Letter	Attachment	Location
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 3: Menlo Park – Letter to Lawn and Garden Maintenance Company	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 3: Menlo Park – Public Works Municipal Water District Forms and Publications	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 3: Menlo Park – Title 7, Health and Sanitation, Chapter 7.38, Water Conservation	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 3: Menlo Park – Washing Machine Rebate Insert	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 3: Menlo Park – Water Conservation Materials	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 3: Menlo Park – Water Conservation Tips	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 3: Mid-Peninsula Water District – Items Sent to Our Customers	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 3: Mid-Peninsula Water District – Newspaper Items	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 3: Mid-Peninsula Water District – Other Activities and Items	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 3: North Coast County Water District – Guide to Water Conservation Awareness	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 3: North Coast County Water District – NCCWD Consumer Confidence Report 2006	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 3: North Coast County water District – NCCWD Recycled Water Irrigation Project	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 3: North Coast County Water District – Public Outreach: Newspaper, TV	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 3: North Coast County Water District – Public Outreach: Web	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 3: North Coast County Water District – The Reservoir Newsletter	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 3: North Coast County Water District – Notice of intent on Water Recycling Storage Tank Location	SF Planning Department

Comment Letter ID	Organization/Affiliation	Date of Letter	Attachment	Location
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 3: North Coast County Water District – Memo to NCCWD, Response to Water Recycling Tank Location August 2007	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 4: Attachment: Conservation, Smart Growth and Local Supply Programs	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 5: Attachment: Conservation, Smart Growth and Local Supply Programs	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 5: City of Palo Alto – General Residential Water Service Utility Rate Schedule W-1	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 5: City of Palo Alto – Title 18 Zoning Code	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 5: City of Redwood City – Recycled Water Project	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 5: City of Redwood City – Water Conservation in Redwood City	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 5: Purissima Hills Water District – Los Altos letters	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 5: Purissima Hills Water District – Media Publications	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 5: Purissima Hills Water District – Orion Transmitters Technical Briefs	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 5: Purissima Hills Water District – Purissima Pipeline	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 5: Purissima Hills Water District – Purissima Pipeline 2	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 5: Purissima Hills Water District – Residential Water Rate Charges March 2004	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 5: Purissima Hills Water District – Santa Clara Valley Water District Rebate Charts	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 5: Purissima Hills Water District – Water Conservation Plan 2006	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 5: Purissima Hills Water District – Water Conservation Plan 2006, Table 3	SF Planning Department

Comment Letter ID	Organization/Affiliation	Date of Letter	Attachment	Location
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 5: Purissima Hills Water District – Water Conservation Plan 2006, Appendix A	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 5: Purissima Hills Water District – Water Conservation Plan 2006, Appendix B	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 5: Purissima Hills Water District – Water Conservation Plan 2006, Appendix C	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 5: Purissima Hills Water District – Water Conservation Plan 2006, Appendix E	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 5: Purissima Hills Water District – Water Conservation Plan 2006, Attachment 1	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 5: Purissima Hills Water District – Water Conservation Plan 2006, Attachment 2	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 5: Purissima Hills Water District – Water Conservation Plan 2006, Attachment 3	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 5: Purissima Hills Water District – Water Conservation Plan 2006, Attachment 4	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 5: Purissima Hills Water District – Water Conservation Plan 2006, Attachment 5	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 5: Purissima Hills Water District – Water Conservation Plan 2006, Attachment 6	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 5: Purissima Hills Water District – Water Conservation Plan 2006, Conservation Programs	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 5: Purissima Hills Water District – Water Conservation Plan 2006, Figures	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 5: Purissima Hills Water District – Water Conservation Plan 2006, Table 1	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 5: Purissima Hills Water District – Water Conservation Plan 2006, Table 2	SF Planning DepartmentO
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 5: Purissima Hills Water District – Water Conservation Plan 2006, Water Resources	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 5: Purissima Hills Water District – Landscape Guide for Los Altos	SF Planning Department

Comment Letter ID	Organization/Affiliation	Date of Letter	Attachment	Location
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 6: Attachment: Conservation, Smart Growth and Local Supply Programs	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 6: Attachment: Skyline County	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 6: City of San Bruno – Gross Water Consumption Per Capita FY 2005/2006	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 6: City of San Bruno – Letter to Nicole Sandkulla, City Efforts of Conservation	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 6: City of San Bruno – Transmittal Form	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 6: City of San Bruno – Utility Rate Increase Notice	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 6: City of San Bruno – Water Conservation Starts with You! Conservation Tips	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 6: City of San Bruno – Water Wise Program	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 6: City of San Jose North – 2005 Urban Water Management Plan	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 6: City of San Jose North – Chapter 15.10, Water Waste Prevention and Water Shortage Measures	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 6: City of San Jose North – Conservation Rebate Policy	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 6: City of San Jose North – Municipal Code 15.11, Water Efficient Landscape Standards	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 6: City of San Jose North – Municipal Water Retail Rates 2007	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 6: City of San Jose North – Water Supply Assessment Development Policies Update June 2005	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 6: City of San Jose North – Water Supply Projections 2002–2030	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 6: City of Sunnyvale – A Status Report on Recycled Water in Sunnyvale	SF Planning Department

Comment Letter ID	Organization/Affiliation	Date of Letter	Attachment	Location
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 6: City of Sunnyvale – Making Water Work Reclamation Program	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 6: City of Sunnyvale – Project Information Sheets Rebate and Leak Protection Projects	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 6: City of Sunnyvale – Quarterly Report Summer 2007 Water Conservation: Every Drop Counts!	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 6: City of Sunnyvale – Recycled Water Uses Allowed in California	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 6: City of Sunnyvale – Successful Landscapes Using Reclaimed Water	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 6: City of Sunnyvale – Water Conservation Including Recycled Water	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 6: Stanford University – Water Conservation Program January 2007	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 6: Westborough Water District – Water and Sewer Rates	SF Planning Department
L_BAWSCA1	Bay Area Water Supply and Conservation Agency	10/1/07	Volume 6: Westborough Water District – Water Conservation and Rebates	SF Planning Department
L_BAWSCA2	Bay Area Water Supply and Conservation Agency	9/20/07	Distribution of Tuolumne River Runoff (20 Year Averages) [Chart]	Chapter 12 of this Comments and Responses document
L_BAWSCA2	Bay Area Water Supply and Conservation Agency	9/20/07	Residential Water Use in Neighboring Communities Demonstrates Increasing Water Conservation [Graph], BAWSCA Annual Surveys Historical Data, Brown and Caldwell Projected Data, November 2006	Chapter 12 of this Comments and Responses document
L_BAWSCA2	Bay Area Water Supply and Conservation Agency	9/20/07	San Francisco Bay Region Earthquake Probability [Map]	Chapter 12 of this Comments and Responses document
L_BAWSCA2	Bay Area Water Supply and Conservation Agency	9/20/07	State-wide Per Capitia Residential Water Demand; San Francisco Wholesale Customers' Demand Lowest in the State [Table], DWR 2005 Water Plan	Chapter 12 of this Comments and Responses document
L_BAWSCA2	Bay Area Water Supply and Conservation Agency	9/20/07	Water Systems Facilities Cross Four Active Faults [Map], SFPUC Facilities Reliability Program, Figure 2, Overview of Subsystems	Chapter 12 of this Comments and Responses document

Comment Letter ID	Organization/Affiliation	Date of Letter	Attachment	Location
L_BRISBANE	City of Brisbane	9/27/07	Attachment A: Brisbane Smart Growth	SF Planning Department
L_BRISBANE	City of Brisbane	9/27/07	Attachment B: Brisbane and GVMID Water Conservation Practices	SF Planning Department
L_CalWater	California Water Service Company	9/28/07	Attachment A: Different Water Saving Devices Examples	SF Planning Department
L_CalWater	California Water Service Company	9/28/07	Attachment B: Cal Water Events	SF Planning Department
L_CalWater	California Water Service Company	9/28/07	Attachment C: Urban Water Management Plans for Bear Gulch, Mid-Peninsula, and South San Francisco Districts	SF Planning Department
L_CalWater	California Water Service Company	9/28/07	South San Francisco 2006 Urban Water Management Plan	SF Planning Department
L_CCWD	Contra Costa Water District	10/1/07	Attachment indicated in comment letter but none submitted	SF Planning Department
L_CoastsideCWD	Coastside County Water District	9/24/07	Coastside CWD's Comments on WSIP PEIR – Draft, chart by chapter, section, page, and comments	Chapter 12 of this Comments and Responses document
L_DalyCity	City of Daly City	10/1/07	Exhibit No. 1: Daly City Water Conservation Program	SF Planning Department
L_DalyCity	City of Daly City	10/1/07	Exhibit No. 2: Smart Growth	SF Planning Department
L_DalyCity	City of Daly City	10/1/07	Exhibit No. 3: Letter to BAWSCA	SF Planning Department
L_Fremont	City of Fremont Comments – Draft PEIR WSIP	10/9/07	Encroachment Permit [pdf]	SF Planning Department
L_Hayward	The City of Hayward Department of Public Works	9/17/07	Attachments: City of Hayward Smart Growth Development; and City of Hayward Water Conservation Program	Chapter 12 of this Comments and Responses document
L_Menlo1	City of Menlo Park	10/1/07	Menlo Park Municipal Code, Chapter 8.06, Noise	Chapter 12 of this Comments and Responses document
L_MID-TID1	Modesto Irrigation District / Turlock Irrigation District	10/1/07	Two letters referenced in the October 1, 2007 MID-TID letter; one dated October 2, 2007 and the other April 26, 2007	Chapter 12 of this Comments and Responses document

Comment Letter ID	Organization/Affiliation	Date of Letter	Attachment	Location
L_Milpts	City of Milpitas	9/27/07	Attachment 1: City of Milpitas, Ordinance 238, Water Efficient Landscape	SF Planning Department
L_Milpts	City of Milpitas	9/27/07	Attachment 2: City of Milpitas, Ordinance 240, Water Conservation	SF Planning Department
L_Milpts	City of Milpitas	9/27/07	Attachment 3: Water Supply and Conservation Programs, binder	SF Planning Department
L_Milpts	City of Milpitas	9/27/07	Attachment 4: City of Milpitas Truck Route Map	SF Planning Department
L_MtnVw	City of Mountain View	9/28/07	Attachment 1: September 27, 2007 Letter to BAWSCA	SF Planning Department
L_MtnVw	City of Mountain View	9/28/07	Attachment 5: Section 6, Water Conservation Demand Management Measure Implementation	SF Planning Department
L_MtnVw	City of Mountain View	9/28/07	Attachments 9 and 10: Public Outreach	SF Planning Department
L_MtnVw	City of Mountain View	9/28/07	Attachments 11 and 12: Transit-Oriented Development Wins Three Awards; Certificate of Award for Planning Implementation, Small Jurisdiction Rowhouse Guidelines, 2006	SF Planning Department
L_PaloAlto	City of Palo Alto	9/25/07	Attachment A: Resolution No. 7986 – Resolution of the Council of the City of Palo Alto Recommending SFPUC Take Prompt Action to Improve Regional Water Supply Reliability and Quality	SF Planning Department
L_PaloAlto	City of Palo Alto	9/25/07	Attachment B: Resolution No. 8135 – Resolution of the Council of the City of Palo Alto in Support of Legislation Allowing the Formation of a Regional Water Agency (Senate Bill 1870, the Bay Area Water Reliability Financing Authority Act)	SF Planning Department
L_PaloAlto	City of Palo Alto	9/25/07	Attachment C: Resolution No. 8136 – Resolution of the Council of the City of Palo Alto in the Support of Legislation Allowing the Formation of a Regional Water Agency (Assembly Bill 2058, the Bay Area Regional Water Supply and Conservation Agency Act)	SF Planning Department
L_PaloAlto	City of Palo Alto	9/25/07	Attachment D: Water Policies and Reports Regarding Water	SF Planning Department
L_PaloAlto	City of Palo Alto	9/25/07	Attachment E: City of Palo Alto Utilities Bill Inserts	SF Planning Department
L_PaloAlto	City of Palo Alto	9/25/07	Attachment F: City of Palo Alto Utilities Marketing Material	SF Planning Department

Comment Letter ID	Organization/Affiliation	Date of Letter	Attachment	Location
L_PaloAlto	City of Palo Alto	9/25/07	Attachment G: Advertisements and Articles Related to Water Efficiency	SF Planning Department
L_PaloAlto	City of Palo Alto	9/25/07	Attachment H: City of Palo Alto Utilities School Education Program Materials	SF Planning Department
L_PaloAlto	City of Palo Alto	9/25/07	Attachment I: City of Palo Alto Annual Water Supply Purchases Since 1965 and Long-Term Purchase Forecast	SF Planning Department
L_PaloAlto	City of Palo Alto	9/25/07	Attachment J: City of Palo Alto Utilities School Special Drought Materials	SF Planning Department
L_PaloAlto	City of Palo Alto	9/25/07	Attachment K: City of Palo Alto Utilities Residential Water Rate Schedules (since July 1976)	SF Planning Department
L_SanJose	City of San Jose	9/27/07	Attachment A: Conservation Website: Current Programs and Available Information; and Historical Programs and Available Information	SF Planning Department
L_SanJose	City of San Jose	9/27/07	Attachment B: City Water Codes, Ordinances and Policies; Tiered Water Rates	SF Planning Department
L_SanJose	City of San Jose	9/27/07	Attachment C: North San Jose Area Development Policy	SF Planning Department
L_SanJose	City of San Jose	9/27/07	Attachment D: Incorrect SJMWS Demand Projection Citations within the PEIR	Chapter 12 of this Comments and Responses document
L_SanJose	City of San Jose	9/27/07	Attachment E: Recycled Water Customers and New Development	SF Planning Department
L_SanJose	City of San Jose	9/27/07	Attachment F: Recycled Water Website: Historical and Future Use 2005 San Jose Urban Water Management Plan; Marketing Materials; Recycled water User Guidelines; Recycled Water Usage Success Stories	SF Planning Department
L_SanJose	City of San Jose	9/27/07	Part of Attachment A – Clean Bay Strategy; South Bay Watershed Activities Status Report July 2002	SF Planning Department
L_SanJose	City of San Jose	9/27/07	Part of Attachment A – Clean Bay Strategy; South Bay Watershed Activities Status Report June 2003	SF Planning Department
L_SanJose	City of San Jose	9/27/07	Part of Attachment A – Clean Bay Strategy; South Bay Watershed Activities Status Report June 2004	SF Planning Department
L_SanJose	City of San Jose	9/27/07	Part of Attachment A – Clean Bay Strategy; South Bay Watershed Activities Status Report June 2005	SF Planning Department

Comment Letter ID	Organization/Affiliation	Date of Letter	Attachment	Location
L_SanJose	City of San Jose	9/27/07	Part of Attachment A – San Jose NPDES Permit Management Team, Flow Reduction Issues and Recommendations for the San Jose/Santa Clara Water Pollution Control Plant's NPDES Permit, Final Report. January 16, 2003.	SF Planning Department
L_SanJose	City of San Jose	9/27/07	Part of Attachment B: City of San Jose Water Policy Framework	SF Planning Department
L_SanJose	City of San Jose	9/27/07	Part of Attachment B: Study Session on Water Issues	SF Planning Department
L_SanJose	City of San Jose	9/27/07	Part of Attachment C: Water Supply Assessment for North San Jose Development Policies Update, April 2005	SF Planning Department
L_SanJose	City of San Jose	9/27/07	Part of Attachment C: North San Jose Development Policy, Proposed General Plan Changes map	SF Planning Department
L_SanJose	City of San Jose	9/27/07	Part of Attachment F: 2005 Urban Water Management Plan for the City of San Jose Municipal Water System Environmental Services Department, December 2005	SF Planning Department
L_SClara2	City of Santa Clara Water and Sewer Utilities	8/23/07	Recycled Water Quality Information for the Santa Clara Water Pollution Control Plant	SF Planning Department
L_SFBayTrl	San Francisco Planning Departement	9/24/07	Exhibit A: San Francisco Bay Trail within the Vicinity of the San Francisco Public Utilities Commission's Water System Improvement Program	Chapter 12 of this Comments and Responses document
L_SLDWWKC	San Luis and Delta-Mendota Water Authority, Westlands Water District, and Kern County Water Agency	10/1/07	SFPUC Water Enterprise Environmental Stewardship Policy Final, July 27, 2006	Chapter 12 of this Comments and Responses document
L_SLDWWKC	San Luis and Delta-Mendota Water Authority, Westlands Water District, and Kern County Water Agency	10/1/07	Amendment of the Whole in the Board, File No. 070754, Resolution No. 321-07, June 12, 2007	Chapter 12 of this Comments and Responses document
L_SLDWWKC	San Luis and Delta-Mendota Water Authority, Westlands Water District, and Kern County Water Agency	10/1/07	City and County of San Francisco Tails Resolution, File No. 070754, Approved June 22, 2007	Chapter 12 of this Comments and Responses document
L_Snnyvl	City of Sunnyvale California	9/28/07	City of Sunnyvale Recycled Water Program Master Plan, December 2000	SF Planning Department

Comment Letter ID	Organization/Affiliation	Date of Letter	Attachment	Location
L_Tuol 1	Board of Supervisors County of Tuolumne	9/25/07	October 18, 2005 Letter to the San Francisco Planning Department regarding the WSIP	Chapter 12 of this Comments and Responses document
L_Tuol1	Board of Supervisors County of Tuolumne	9/25/07	Board of Supervisors of the County of Tuolumne Resolution No. 140-07	Chapter 12 of this Comments and Responses document
SI_ACA1	Alameda Creek Alliance	10/1/07	Comments on the Draft PEIR	Chapter 12 of this Comments and Responses document
SI_CNPS-EB1	California Native Plant Society, East Bay Chapter	10/1/07	CNPS comment letter on Alameda Watershed HCP submitted on July 19, 2004; CNPS comment letter on proposed moratorium on development in riparian areas submitted on May 4, 2006; Rare and Unusual Plants of Arroyo Mocho	Chapter 12 of this Comments and Responses document
SI-EnvDef	Environmental Defense	10/1/07	September 18, 2007 Letter to Ms. Rosalie O'Mahony, Chair, BAWSCA Board of Directors	Chapter 12 of this Comments and Responses document
SI-EnvDef	Environmental Defense	10/1/07	September 14, 2007 Letter to BAWSCA Board of Directors from Art Jensen, General Manager, and Ray McDevitt, Legal Counsel	Chapter 12 of this Comments and Responses document
SI_PacInst	Pacific Institute	10/1/07	A Review of the San Francisco Public Utilties Commission's Retail and Wholesale Customer Water Demand Projections, Released July 2007	Chapter 12 of this Comments and Responses document
SI_TRT-CWA-SierraC	Tuolumne River Trust, Clean Water Action, Sierra Club SF Bay Chapter	10/1/07	Attachment A: Table of Specific Comments on the Hydrologic, Geomorphic, and Fishery Impacts of the WSIP	Chapter 12 of this Comments and Responses document
SI_TRT-CWA-SierraC	Tuolumne River Trust, Clean Water Action, Sierra Club SF Bay Chapter	10/1/07	Attachment B: Instream Flow Requirements for Rainbow and Brown Trout in the Tuolumne River between O'Shaughnessy Dam and Early Intake	Chapter 12 of this Comments and Responses document
SI_TRT-CWA-SierraC	Tuolumne River Trust, Clean Water Action, Sierra Club SF Bay Chapter	10/1/07	Attachment C: Bar Chart Estimating Yearly Natural Production and In-River Escapements of Tuolumne River Adult Fall-run Chinook Salmon	Chapter 12 of this Comments and Responses document
SI_TRT-CWA-SierraC	Tuolumne River Trust, Clean Water Action, Sierra Club SF Bay Chapter	10/1/07	Attachment D: Central Valley Steelhead Report	SF Planning Department

Comment Letter ID	Organization/Affiliation	Date of Letter	Attachment	Location
SI_TRT-CWA-SierraC	Tuolumne River Trust, Clean Water Action, Sierra Club SF Bay Chapter	10/1/07	Attachment E: Natural Resource Defense Counsel, In Hot Water: Water Management Strategies to Weather the Effects of Global Warming. 2007.	SF Planning Department
SI_TRT-CWA-SierraC	Tuolumne River Trust, Clean Water Action, Sierra Club SF Bay Chapter	10/1/07	Attachment F: Water Management Strategies to Weather the Effects of Global Warming, NRDC, Barry Nelson, Monty Schmitt, Ronnie Cohen, Noushin Katabi, Theo Spencer, UCSB, Robert C. Wilkinson, Southern Nevada Water Authority, Patricia Mulroy	SF Planning Department
SI_TRT-CWA-SierraC	Tuolumne River Trust, Clean Water Action, Sierra Club SF Bay Chapter	10/1/07	Attachment G: The Union Democrat.com, Mike Morris, September 24, 2007	SF Planning Department
SI_TRT-CWA-SierraC	Tuolumne River Trust, Clean Water Action, Sierra Club SF Bay Chapter	10/1/07	Attachment H: Review of SFPUC Retail and Wholesale Customer Water Demand Projections, Heather Cooley, Pacific Institute for Studies in Development, Environment, and Security, July 2007	Same as SI_PacInst
SI_TRT-CWA-SierraC	Tuolumne River Trust, Clean Water Action, Sierra Club SF Bay Chapter	10/1/07	Attachment I: Studies on Water Conservation, URL links	Chapter 12 of this Comments and Responses document
SI_TRT-CWA-SierraC	Tuolumne River Trust, Clean Water Action, Sierra Club SF Bay Chapter	10/1/07	Attachment J: Review of SFPUC Retail and Wholesale Customer Demand Projections, Sustainable Water Supply Briefing, Heather Cooley, Peter Gleick, Pacific Institute, Oakland CA September 28, 2007, PowerPoint	Chapter 12 of this Comments and Responses document

L. Form Letter 1 Submittals

APPENDIX L
Form Letter 1 Submittals

Note: All Form Letter 1 submittals are presented in Appendix L to capture any slight variations to the form letter. All Form Letter 2 submittals were identical and are therefore not included in Appendix L. A list of all commenters who submitted Form Letter 1 and Form Letter 2 is shown in Chapter 11 in Table 11.7.

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

No More Diversions From The Tuolumne!

keren abra <abra2@mindspring.com> **Mon, Oct 1, 2007 at 1:55 PM**
To: wsip.peir.comments@gmail.com

To:

Paul Maltzer, Environmental Review Officer
Water System Improvement Program PEIR
San Francisco Planning Department

Dear Mr. Maltzer:

I had hoped to attend the hearing on the Tuolumne River plan at City Hall with the Sierra Club recently, and greatly regret that I couldn't do so. My presence may not have made a difference, but I'm expressing to you now my very strong opposition to further diversion of its waters.

Your environmental review of the SFPUC's plan to take more water from the river does not address all the environmental impacts that diversion would cause. I strongly urge you to do additional studies of the Tuolumne before finishing the report.

L-1 I support the alternatives in your draft document that protect the Tuolumne from any new diversions. More water conservation, efficiency, and recycling are the best ways to both protect the River, and provide permanently sustainable water for the San Francisco Bay Area.

Only by keeping a healthy water flow in the Tuolumne can we protect this beautiful river and the diverse watershed and wildlife which depend on it, while at the same time making sure that all future generations in the Bay Area will have access to clean water.

Sincerely,

Keren Abra

--
(415)587-5281 (home)
143 Judson Ave,
San Francisco, CA 94112
USA

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

Tuolomne water diversion

Thomas Adams <alfadams@earthlink.net> **Tue, Sep 25, 2007 at 4:30 AM**
To: wsip.peir.comments@gmail.com

Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Maltzer:

Your environmental review of the San Francisco Public Utilities Commission's plan to take more water from the Tuolumne River fails to adequately identify and address all of the environmental impacts to the River. I urge you to undertake additional studies before finalizing this document.

I support the alternatives identified in your draft document that protect the Tuolumne River from new diversions. Requiring more water conservation, efficiency, and recycling is the best way to lessen impacts on the Tuolumne River while promoting a sustainable water plan for the Bay Area.

Only by ensuring that healthy amounts of water continue to flow into the Tuolumne River can we protect this irreplaceable natural treasure.

Sincerely,

Tom Adams
2059 Golden Gate Avenue, No. 2
San Francisco, California 94115

Diana Sokolove <wsip.peir.comments@gmail.com>

(no subject)

Big City Business Forms <sales@bigcitybf.com> **Mon, Oct 1, 2007 at 12:55 PM**
To: wsip.peir.comments@gmail.com

Dear Mr. Maltzer:

Your environmental review of the SFPUC's plan to take more water from the Tuolumne River does not address all environmental impacts to the River. I strongly urge you to do additional studies of the Tuolumne before finishing the report.
I support the alternatives in your draft document that protect the Tuolumne from any new diversions. **More water conservation, efficiency, and recycling are the best ways to both protect the River, and provide permanently sustainable water for the San Francisco Bay Area.**

Only by keeping a healthy water flow in the Tuolumne, can we protect this beautiful river and the diverse watershed and wildlife which depend on it; while at the same time making sure that all future generations in the Bay Area will have access to clean water.
Sincerely,

Karen Boudreaux
333 Melrose Ave
San Francisco, CA 94127

--

L-2

Big City Business Forms, Inc. 5818 Mission Street
sales@bigcitybf.com San Francisco, CA 94112
http://www.bigcitybf.com 415-452-1000 tel / 415-452-1007 fax

RECEIVED
SEP 2 6 2007
CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
M E A

Katie Bramlett
1044 High Street
Palo Alto, CA 94301
650/566-1140

September 24, 2007

Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Maltzer:

Your environmental review of the San Francisco Public Utilities Commission's plan to take more water from the Tuolumne River fails to adequately identify and address all of the environmental impacts to the River. I urge you to undertake additional studies before finalizing this document.
I support the alternatives identified in your draft document that protect the Tuolumne River from new diversions. Requiring more water conservation, efficiency, and recycling is the best way to lessen impacts on the Tuolumne River while promoting a sustainable water plan for the Bay Area.

Only by ensuring that healthy amounts of water continue to flow into the Tuolumne River can we protect this irreplaceable natural treasure.

Sincerely,

Katie Bramlett
Katie Bramlett

Diana Sokolove <wsip.peir.comments@gmail.com>

No More Diversions From The Tuolumne!

Eric Brooks <brookse32@att.net> **Mon, Oct 1, 2007 at 12:15 PM**
To: wsip.peir.comments@gmail.com

To:

Paul Maltzer, Environmental Review Officer
Water System Improvement Program PEIR
San Francisco Planning Department

Dear Paul:

Your environmental review of the SFPUC's plan to take more water from the Tuolumne River does not address all environmental impacts to the River. I strongly urge you to do additional studies of the Tuolumne River before finishing the report.

I support the alternatives in your draft document that protect the Tuolumne from any new diversions. More water conservation, efficiency, and recycling are the best ways to both protect the River, and provide permanently sustainable water for the San Francisco Bay Area.

Only by keeping a healthy water flow in the Tuolumne, can we protect this beautiful river and the diverse watershed and wildlife which depend on it; while at the same time making sure that all future generations in the Bay Area will have access to clean water.

L-3

Sincerely,

Eric Brooks
SF, CA
94109

Diana Sokolove <wsip.peir.comments@gmail.com>

WSIP PEIR

Susan Burgenbauch <susanb@stanford.edu> **Mon, Sep 24, 2007 at 2:24 PM**
To: wsip.peir.comments@gmail.com

Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Maltzer:

Your environmental review of the San Francisco Public Utilities Commission's plan to take more water from the Tuolumne River fails to adequately identify and address all of the environmental impacts to the River. I urge you to undertake additional studies before finalizing this document.

I support the alternatives identified in your draft document that protect the Tuolumne River from new diversions. Requiring more water conservation, efficiency, and recycling is the best way to lessen impacts on the Tuolumne River while promoting a sustainable water plan for the Bay Area.

Only by ensuring that healthy amounts of water continue to flow into the Tuolumne River can we protect this irreplaceable natural treasure.

Sincerely,

Susan Burgenbauch
277 Andsbury Ave.
Mt. View, CA 94043

Diana Sokolove <wsip.peir.comments@gmail.com>

No More Diversions From The Tuolumne!

Leslie Chew <lesliejchew@yahoo.com> **Wed, Oct 3, 2007 at 12:13 AM**
To: wsip.peir.comments@gmail.com

Paul Maltzer, Environmental Review Officer
Water System Improvement Program PEIR
San Francisco Planning Department

Dear Mr. Maltzer:

Your environmental review of the SFPUC's plan to take more water from the Tuolumne River does not address all environmental impacts to the River. I strongly urge you to do additional studies of the Tuolumne before finishing the report.

I support the alternatives in your draft document that protect the Tuolumne from any new diversions. More water conservation, efficiency, and recycling are the best ways to both protect the River, and provide permanently sustainable water for the San Francisco Bay Area.

Only by keeping a healthy water flow in the Tuolumne, can we protect this beautiful river and the diverse watershed and wildlife which depend on it; while at the same time making sure that all future generations in the Bay Area will have access to clean water.

L-4

Sincerely,

Leslie Chew
1771 27th Avenue
San Francisco, CA 94122

Diana Sokolove <wsip.peir.comments@gmail.com>

No More Diversions From The Tuolumne!

Nick Colin <nickcolin@gmail.com> **Mon, Oct 1, 2007 at 2:06 PM**
To: wsip.peir.comments@gmail.com

To:

Paul Maltzer, Environmental Review Officer
Water System Improvement Program PEIR
San Francisco Planning Department

Dear Mr. Maltzer:

Your environmental review of the SFPUC's plan to take more water from the Tuolumne River does not address all environmental impacts to the River. I strongly urge you to do additional studies of the Tuolumne before finishing the report.

I support the alternatives in your draft document that protect the Tuolumne from any new diversions. More water conservation, efficiency, and recycling are the best ways to both protect the River, and provide permanently sustainable water for the San Francisco Bay Area.

Only by keeping a healthy water flow in the Tuolumne, can we protect this beautiful river and the diverse watershed and wildlife which depend on it; while at the same time making sure that all future generations in the Bay Area will have access to clean water.

Sincerely,

Nick Colin
122 Coleridge Street
San Francisco, CA 94110

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

Comments on WSIP

John Cordes <johncordes@yahoo.com> **Sat, Sep 29, 2007 at 4:14 PM**
To: wsip.peir.comments@gmail.com

To: Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Maltzer:

Your environmental review of the San Francisco Public Utilities Commission's plan to take more water from the Tuolumne River fails to adequately identify and address all of the environmental impacts to the River. I urge you to undertake additional studies before finalizing this document. I support the alternatives identified in your draft document that protect the Tuolumne River from new diversions. Requiring more water conservation, efficiency, and recycling is the best way to lessen impacts on the Tuolumne River while promoting a sustainable water plan for the Bay Area. Only by ensuring that healthy amounts of water continue to flow into the Tuolumne River can we protect this irreplaceable natural treasure.

Sincerely,

Sincerely,
Mr John G. Cordes
550 East Arbor Ave
Sunnyvale Ca. 94085
johncordes@yahoo.com

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

Tuolumne river

Colette Crutcher <kramm51@earthlink.net> **Tue, Sep 25, 2007 at 9:03 PM**
To: wsip.peir.comments@gmail.com

Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Maltzer:

I am concerned about the San Francisco Public Utilities Commission's plan to take more water from the Tuolumne River. It fails to adequately identify and address all of the environmental impacts to the River. I urge you to undertake additional studies before finalizing this document.

I support the alternatives identified in your draft document that protect the Tuolumne River from new diversions. Requiring more water conservation, efficiency, and recycling is the best way to lessen impacts on the Tuolumne River while promoting a sustainable water plan for the Bay Area.

We must protect this irreplaceable natural treasure.

Sincerely,

Colette Crutcher
316 Highland Ave
San Francisco, CA 94110

Diana Sokolove <wsip.peir.comments@gmail.com>

Leave Tuolumne Alone and Stop the Sprawl

1 message

Michael Duncan & Tom Richard <bernalites@comcast.net> **Mon, Oct 1, 2007 at 8:49 PM**
To: wsip.peir.comments@gmail.com

Subject: No More Diversions From The Tuolumne!

To:
Paul Maltzer, Environmental Review Officer
Water System Improvement Program PEIR
San Francisco Planning Department

Dear Mr. Maltzer:

Your environmental review of the SFPUC's plan to take more water from the Tuolumne River does not address all environmental impacts to the River. I strongly urge you to do additional studies of the Tuolumne before finishing the report.
I support the alternatives in your draft document that protect the Tuolumne from any new diversions. More water conservation, efficiency, and recycling are the best ways to both protect the River, and provide permanently sustainable water for the San Francisco Bay Area.

L-6

Only by keeping a healthy water flow in the Tuolumne, can we protect this beautiful river and the diverse watershed and wildlife which depend on it; while at the same time making sure that all future generations in the Bay Area will have access to clean water.

Sincerely,

Michael Duncan & Tom Richard
224 Elsie St
San Francisco, CA 94110
415 920-9211
bernalites@comcast.net

Diana Sokolove <wsip.peir.comments@gmail.com>

No More Diversions From The Tuolumne!

Don Ehrlich <violadon@earthlink.net> **Mon, Oct 1, 2007 at 4:11 PM**
To: wsip.peir.comments@gmail.com

To:
Paul Maltzer, Environmental Review Officer
Water System Improvement Program PEIR
San Francisco Planning Department

Dear Mr. Maltzer:

Your environmental review of the SFPUC's plan to take more water from the Tuolumne River does not address all environmental impacts to the River. I strongly urge you to do additional studies of the Tuolumne before finishing the report.
I support the alternatives in your draft document that protect the Tuolumne from any new diversions. More water conservation, efficiency, and recycling are the best ways to both protect the River, and provide permanently sustainable water for the San Francisco Bay Area.

Only by keeping a healthy water flow in the Tuolumne, can we protect this beautiful river and the diverse watershed and wildlife which depend on it; while at the same time making sure that all future generations in the Bay Area will have access to clean water.

Sincerely,

Dr Don A Ehrlich
806 Shrader Street
San Francisco, CA 94117

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

Comment on Tuolumne Diversion Plan

Don Eichelberger <done7777@sbcglobal.net>
To: wsip.peir.comments@gmail.com

Wed, Oct 3, 2007 at 3:15 PM

I realize this is late, but I hope you add my name in opposition to ANY diversions from the Tuolumne. Thank you.

Subject: No More Diversions From The Tuolumne!

To:

Paul Maltzer, Environmental Review Officer
Water System Improvement Program PEIR
San Francisco Planning Department

Dear Mr. Maltzer:

Your environmental review of the SFPUC's plan to take more water from the Tuolumne River does not address all environmental impacts to the River. I strongly urge you to do additional studies of the Tuolumne before finishing the report.

L-7 I support the alternatives in your draft document that protect the Tuolumne from any new diversions. More water conservation, efficiency, and recycling are the best ways to both protect the River, and provide permanently sustainable water for the San Francisco Bay Area.

Only by keeping a healthy water flow in the Tuolumne, can we protect this beautiful river and the diverse watershed and wildlife which depend on it; while at the same time making sure that all future generations in the Bay Area will have access to clean water.

Sincerely,

Don L. Eichelberger
628 Lyon St., #1
San Francisco, CA 94117

Don Eichelberger
DJ Fix Independent Productions

Green Uprising Blog
www.greenuprising.blogspot.com

My You Tube

http://www.youtube.com/watch?v=ctRp5rGJoUc
http://www.youtube.com/watch?v=iySwwyZfDgE
http://www.youtube.com/watch?v=8r9rK8nPREA
http://www.youtube.com/watch?v=u5UbnJ0kUqo
http://www.youtube.com/watch?v=4SktIYTyC1U

Donny Fix del.icio.us book marks
http://del.icio.us/donnyfix

The Hegelian/Marxist goal is emancipation. Marx said it best in 1843:

"Human emancipation wll only be complete when the real, individual man (sic) is absorbed into himself the abstract citizen; when as an individual man, in his every day life, in his work and in his relationships, he has become a species-being (politically accountabe to the whole); and when he recognizes and realizes his own power as social powers, so that he no longer separates this social power from himself as political power."

Diana Sokolove <wsip.peir.comments@gmail.com>

comments from Ruben Garcia

Ruben Garcia <ruben@globalexchange.org> **Mon, Oct 1, 2007 at 3:21 PM**
To: wsip.peir.comments@gmail.com

October 1, 2007

Subject: No More Diversions From The Tuolumne!

To:

Paul Maltzer, Environmental Review Officer

Water System Improvement Program PEIR

San Francisco Planning Department

Dear Mr. Maltzer:

L-8 Your environmental review of the SFPUC's plan to take more water from the Tuolumne River does not address all environmental impacts to the River. I strongly urge you to do additional studies of the Tuolumne before finishing the report.

I support the alternatives in your draft document that protect the Tuolumne from any new diversions. More water conservation, efficiency, and recycling are the best ways to both protect the River, and provide permanently sustainable water for the San Francisco Bay Area.

Only by keeping a healthy water flow in the Tuolumne, can we protect this beautiful river and the diverse watershed and wildlife which depend on it; while at the same time making sure that all future generations in the Bay Area will have access to clean water.

Sincerely,

Ruben Garcia

Global Exchange

Diana Sokolove <wsip.peir.comments@gmail.com>

No More Diversions From The Tuolumne!

Peter Gass <petergass@yahoo.com> **Mon, Oct 1, 2007 at 6:54 PM**
To: wsip.peir.comments@gmail.com

October 1 2007

Paul Maltzer, Environmental Review Officer
Water System Improvement Program PEIR
San Francisco Planning Department

Dear Mr. Maltzer:

Your environmental review of the SFPUC's plan to take more water from the Tuolumne River does not address all environmental impacts to the River. I strongly urge you to do additional studies of the Tuolumne before finishing the report.

I support the alternatives in your draft document that protect the Tuolumne from any new diversions. More water conservation, efficiency,

and recycling are the best ways to both protect the River, and provide permanently sustainable water for the San Francisco Bay Area.

Only by keeping a healthy water flow in the Tuolumne, can we protect this beautiful river and the diverse watershed and wildlife which depend on it; while at the same time making sure that all future generations in the Bay Area will have access to clean water.

Sincerely,

Peter R. Gass
381 Jersey Street
San Francisco, CA 94114

Diana Sokolove <wsip.peir.comments@gmail.com>

No More Diversions From The Tuolumne!

Julian Giardinelli <julian@pixelsplice.com> **Mon, Oct 1, 2007 at 2:39 PM**
To: wsip.peir.comments@gmail.com

To:
Paul Maltzer, Environmental Review Officer
Water System Improvement Program PEIR
San Francisco Planning Department

Dear Mr. Maltzer:

L-9

Your environmental review of the SFPUC's plan to take more water from the Tuolumne River does not address all environmental impacts to the River. I strongly urge you to do additional studies of the Tuolumne before finishing the report.
I support the alternatives in your draft document that protect the Tuolumne from any new diversions. More water conservation, efficiency, and recycling are the best ways to both protect the River, and provide permanently sustainable water for the San Francisco Bay Area.

Only by keeping a healthy water flow in the Tuolumne, can we protect this beautiful river and the diverse watershed and wildlife which depend on it; while at the same time making sure that all future generations in the Bay Area will have access to clean water.

Sincerely,
Julian Giardinelli
359 29TH ST.
San Francisco, CA 94131

Diana Sokolove <wsip.peir.comments@gmail.com>

(no subject)

Richard Girling <rzgirling@hotmail.com> **Tue, Oct 2, 2007 at 4:52 PM**
To: wsip.peir.comments@gmail.com

Dear Mr. Maltzer:

Your environmental review of the SFPUC's plan to take more water from the Tuolumne River does not address all environmental impacts to the River. I strongly urge you to do additional studies of the Tuolumne before finishing the report.

I support the alternatives in your draft document that protect the Tuolumne from any new diversions. More water conservation, efficiency, and recycling are the best ways to both protect the River, and provide permanently sustainable water for the San Francisco Bay Area.

Only by keeping a healthy water flow in the Tuolumne, can we protect this beautiful river and the diverse watershed and wildlife which depend on it; while at the same time making sure that all future generations in the Bay Area will have access to clean water.
LET's Learn to USE LESS and SAVE MORE of the environment!

Sincerely,
Richard and Valerie Girling

Gmail

Diana Sokolove <wsip.peir.comments@gmail.com>

Tuolumne River

Sami Goski <sgoski@gmail.com> **Mon, Sep 24, 2007 at 5:35 PM**
To: wsip.peir.comments@gmail.com

September 24, 2007

Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Maltzer:

Your environmental review of the San Francisco Public Utilities Commission's plan to take more water from the Tuolumne River fails to adequately identify and address all of the environmental impacts to the River. I urge you to undertake additional studies before finalizing this document.

I support the alternatives identified in your draft document that protect the Tuolumne River from new diversions. Requiring more water conservation, efficiency, and recycling is the best way to lessen impacts on the Tuolumne River while promoting a sustainable water plan for the Bay Area.

L-10

Only by ensuring that healthy amounts of water continue to flow into the Tuolumne River can we protect this irreplaceable natural treasure.

Sincerely,

Sami Goski
517 Ashbury Street
San Francisco, CA 94117

No More Diversions From The Tuolumne!

Inbox Turn off highlighting Print all

Barry Hermanson <barry@hermansons.com> to me show details Oct 1 Reply

Paul Maltzer, Environmental Review Officer
Water System Improvement Program PEIR
San Francisco Planning Department

Dear Mr. Maltzer:

Your environmental review of the SFPUC's plan to take more water from the Tuolumne River does not address all environmental impacts to the River. I strongly urge you to do additional studies of the Tuolumne before finishing the report.

I support the alternatives in your draft document that protect the Tuolumne from any new diversions. More water conservation, efficiency, and recycling are the best ways to both protect the River, and provide permanently sustainable water for the San Francisco Bay Area.

Only by keeping a healthy water flow in the Tuolumne, can we protect this beautiful river and the diverse watershed and wildlife which depend on it; while at the same time making sure that all future generations in the Bay Area will have access to clean water.

Sincerely,

Barry Hermanson
2467 28th Avenue
San Francisco, CA 94116

Reply Forward Invite Barry to Gmail

Diana Sokolove <wsip.peir.comments@gmail.com>

TUOLUMNE RIVER diversion project

Carole Herron (cherron) <cherron@cisco.com> **Mon, Oct 1, 2007 at 12:53 PM**
To: wsip.peir.comments@gmail.com

Paul Maltzer, Environmental Review Officer Water System Improvement Program PEIR San Francisco Planning Department

Dear Mr. Maltzer:

Your environmental review of the SFPUC's plan to take more water from the Tuolumne River does not address all environmental impacts to the River. I strongly urge you to do additional studies of the Tuolumne before finishing the report. To solve future water needs at the risk of degrading California's rivers is a mistake. Please reconsider your current plan.

I support the alternatives in your draft document that protect the Tuolumne from any new diversions. More water conservation, efficiency, and recycling are the best ways to both protect the River, and provide permanently sustainable water for the San Francisco Bay Area.

Only by keeping a healthy water flow in the Tuolumne, can we protect this beautiful river and the diverse watershed and wildlife which depend on it; while at the same time making sure that all future generations in the Bay Area will have access to clean water.

Sincerely,

Carole Herron
180 Bocana St.
San Francisco, CA 94110

Diana Sokolove <wsip.peir.comments@gmail.com>

Diverting Tuolumne River's water

Lia Hillman <lhillman@sfpl.org> **Mon, Oct 1, 2007 at 2:42 PM**
To: wsip.peir.comments@gmail.com

To:

Paul Maltzer, Environmental Review Officer
Water System Improvement Program PEIR
San Francisco Planning Department

Dear Mr. Maltzer:

Your environmental review of the SFPUC's plan to take more water from the Tuolumne River does not address all environmental impacts to the River. I strongly urge you to do additional studies of the Tuolumne before finishing the report.

I support the alternatives in your draft document that protect the Tuolumne from any new diversions. More water conservation, efficiency, and recycling are the best ways to both protect the River, and provide permanently sustainable water for the San Francisco Bay Area.

Only by keeping a healthy water flow in the Tuolumne, can we protect this beautiful river and the diverse watershed and wildlife which depend on it; while at the same time making sure that all future generations in the Bay Area will have access to clean water.

Sincerely,

Lia Hillman
3566A 22nd Street
San Francisco, CA 94114

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

No More Diversions From The Tuolumne!

Mark Jones <markjones23@gmail.com> **Mon, Oct 1, 2007 at 1:42 PM**
To: wsip.peir.comments@gmail.com

Paul Maltzer, Environmental Review Officer
Water System Improvement Program PEIR
San Francisco Planning Department

Dear Mr. Maltzer:

Your environmental review of the SFPUC's plan to take more water from the Tuolumne River does not address all environmental impacts to the River. I strongly urge you to do additional studies of the Tuolumne before finishing the report.

I support the alternatives in your draft document that protect the Tuolumne from any new diversions. More water conservation, efficiency, and recycling are the best ways to both protect the River, and provide permanently sustainable water for the San Francisco Bay Area.

Only by keeping a healthy water flow in the Tuolumne, can we protect this beautiful river and the diverse watershed and wildlife which depend on it; while at the same time making sure that all future generations in the Bay Area will have access to clean water.

Sincerely,
Mark Jones
Citizen of San Francisco

L-12

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

No More Diversions From The Tuolumne!

Cassandra Kyle <thegreekseeress@hotmail.com> **Mon, Oct 1, 2007 at 3:35 PM**
To: wsip.peir.comments@gmail.com

To:

Paul Maltzer, Environmental Review Officer
Water System Improvement Program PEIR
San Francisco Planning Department

Dear Mr. Maltzer:

Your environmental review of the SFPUC's plan to take more water from the Tuolumne River does not address all environmental impacts to the River. I strongly urge you to do additional studies of the Tuolumne before finishing the report.

I support the alternatives in your draft document that protect the Tuolumne from any new diversions. More water conservation, efficiency, and recycling are the best ways to both protect the River, and provide permanently sustainable water for the San Francisco Bay Area.

Only by keeping a healthy water flow in the Tuolumne, can we protect this beautiful river and the diverse watershed and wildlife which depend on it; while at the same time making sure that all future generations in the Bay Area will have access to clean water.

Sincerely,
Cassandra L Kyle
83 Parnassus Ave.
San Francisco, CA 94117

Diana Sokolove <wsip.peir.comments@gmail.com>

Tuolumne River

Gary Laufman <garyphoto@earthlink.net> **Mon, Oct 1, 2007 at 1:38 PM**
To: wsip.peir.comments@gmail.com

Paul Maltzer, Environmental Review Officer
Water System Improvement Program PEIR
San Francisco Planning Department

Dear Mr. Maltzer:

Your environmental review of the SFPUC's plan to take more water from the Tuolumne River does not address all environmental impacts to the River. I strongly urge you to do additional studies of the Tuolumne before finishing the report.
I support the alternatives in your draft document that protect the Tuolumne from any new diversions. More water conservation, efficiency, and recycling are the best ways to both protect the River, and provide permanently sustainable water for the San Francisco Bay Area.

Only by keeping a healthy water flow in the Tuolumne, can we protect this beautiful river and the diverse watershed and wildlife which depend on it; while at the same time making sure that all future generations in the Bay Area will have access to clean water.

L-13

Sincerely,

Gary Laufman
3251 Washington St. #301
San Francisco, Ca. 94115

Diana Sokolove <wsip.peir.comments@gmail.com>

No More Diversions From The Tuolumne!

joe l <tryingonchickens@hotmail.com> **Tue, Oct 2, 2007 at 5:03 PM**
To: wsip.peir.comments@gmail.com

To:

Paul Maltzer, Environmental Review Officer
Water System Improvement Program PEIR
San Francisco Planning Department

Dear Mr. Maltzer:

Your environmental review of the SFPUC's plan to take more water from the Tuolumne River does not address all environmental impacts to the River. I strongly urge you to do additional studies of the Tuolumne before finishing the report.

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Only by keeping a healthy water flow in the Tuolumne, can we protect this beautiful river and the diverse watershed and wildlife which depend on it; while at the same time making sure that all future generations in the Bay Area will have access to clean water.

Sincerely,
Joseph Leidner, Vicki Leidner & John Radogno
770 Shotwell St. San Francisco, C.A. 94110

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

No More Diversions From The Tuolumne!

Victoria Lewis <cymrufilms@mindspring.com> **Mon, Oct 1, 2007 at 3:29 PM**
To: wsip.peir.comments@gmail.com

Dear Mr. Maltzer:

Your environmental review of the SFPUC's plan to take more water from the Tuolumne River does not address all environmental impacts to the River. I strongly urge you to do additional studies of the Tuolumne before finishing the report.

I support the alternatives in your draft document that protect the Tuolumne from any new diversions. More water conservation, efficiency, and recycling are the best ways to both protect the River, and provide permanently sustainable water for the San Francisco Bay Area.

Only by keeping a healthy water flow in the Tuolumne, can we protect this beautiful river and the diverse watershed and wildlife which depend on it; while at the same time making sure that all future generations in the Bay Area will have access to clean water.

Sincerely,

Victoria Lewis
1370 Sanchez St.
san Francisco, CA 94131

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

Tuolumne River

Kirk Lumpkin <Kirk@twinberry.net> **Tue, Sep 25, 2007 at 10:27 AM**
To: wsip.peir.comments@gmail.com

Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Maltzer:

Your environmental review of the San Francisco Public Utilities Commission's plan to take more water from the Tuolumne River fails to adequately identify and address all of the environmental impacts to the River. I urge you to undertake additional studies before finalizing this document.

I support the alternatives identified in your draft document that protect the Tuolumne River from new diversions. Requiring more water conservation, efficiency, and recycling is the best way to lessen impacts on the Tuolumne River while promoting a sustainable water plan for the Bay Area.

Only by ensuring that healthy amounts of water continue to flow into the Tuolumne River can we protect this irreplaceable natural treasure.

Though I currently do not live in San Francisco I did live there for over 20 years, still own an apartment there, and will probably live there again in the future.

Sincerely,

Kirk Lumpkin
5505 Macdonald Ave.
El Cerrito, CA 94530

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

Tuolumne River

Michele B. Lundy <michelelundy@gmail.com> **Mon, Oct 1, 2007 at 11:42 PM**
To: wsip.peir.comments@gmail.com

Subject: No More Diversions From The Tuolumne!

Paul Maltzer, Environmental Review Officer
Water System Improvement Program PEIR
San Francisco Planning Department

Dear Mr. Maltzer:

Your environmental review of the SFPUC's plan to take more water from the Tuolumne River does not address all environmental impacts to the River. I strongly urge you to do additional studies of the Tuolumne before finishing the report.

I support the alternatives in your draft document that protect the Tuolumne from any new diversions. More water conservation, efficiency, and recycling are the best ways to both protect the River, and provide permanently sustainable water for the San Francisco Bay Area.

Only by keeping a healthy water flow in the Tuolumne, can we protect this beautiful river and the diverse watershed and wildlife which depend on it; while at the same time making sure that all future generations in the Bay Area will have access to clean water.

Sincerely,

Michele Lundy
90 Paradise Avenue
San Francisco, Ca 94131

September [illegible] 2007

RECEIVED
SEP 1 7 2007
CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
M E A

Paul Maltzer, Environmental Review Officer
Water System Improvement Program PEIR
San Francisco Planning Department

Dear Mr. Maltzer:

Your environmental review of the San Francisco Public Utilities Commission's plan to take more water from the Tuolumne River fails to adequately identify and address all of the environmental impacts to the River. I urge you to undertake additional studies of the Tuolumne River before finalizing this document.

I support the alternatives identified in your draft document that protect the Tuolumne River from new diversions. Requiring more water conservation, efficiency, and recycling is the best way to lessen impacts to the Tuolumne River while promoting a sustainable water solution for the San Francisco Bay Area.

Only by ensuring that healthy amounts of water continue to flow into the Tuolumne River can we protect this irreplaceable natural wonder.

Sincerely,

Laurie McCann

Laurie McCann
PO Box 1452
Santa Cruz CA 95061

L-16

Public Comments Needed by October 1st to PROTECT THE TUOLUMNE RIVER!

Take action to stop the San Francisco Public Utilities Commission (SFPUC) from harming the Tuolumne River by signing this comment letter. Please send it to the Tuolumne River Trust in the enclosed envelope so we can deliver it before the October 1st deadline. You can find more information and take action on our website: www.tuolumne.org Thank you for your support!

To: Paul Maltzer, Environmental Review Officer
Water System Improvement Program PEIR
San Francisco Planning Department

Dear Mr. Maltzer:

Your environmental review of the SFPUC's plan to take more water from the Tuolumne River fails to adequately identify and address all of the environmental impacts to the River. I urge you to undertake additional studies of the Tuolumne River before finalizing this document.

I support the alternatives identified in your draft document that protect the Tuolumne River from new diversions. Requiring more water conservation, efficiency, and recycling is the best way to lessen impacts to the Tuolumne River while promoting a sustainable water solution for the San Francisco Bay Area.

Only by ensuring that healthy amounts of water continue to flow into the Tuolumne River can we protect this irreplaceable natural wonder.

Sincerely,

Name: Mary Louise McDonnell
Address: 7 Aquavista Way
City, State, Zip: San Francisco, CA 94131

Gmail +talk BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

No More Diversions From The Tuolumne

2 messages

sara meghrouni <macondorelay@yahoo.com> **Mon, Oct 1, 2007 at 5:04 PM**
To: wsip.peir.comments@gmail.com

Paul Maltzer, Environmental Review Officer
Water System Improvement Program PEIR
San Francisco Planning Department

Dear Mr. Maltzer:

Your environmental review of the SFPUC's plan to take
more water from
the Tuolumne River does not address all environmental
impacts to the
River. I strongly urge you to do additional studies of
the Tuolumne
before finishing the report.

I support the alternatives in your draft document that
protect the
Tuolumne from any new diversions. More water
conservation, efficiency,

and recycling are the best ways to both protect the
River, and provide
permanently sustainable water for the San Francisco
Bay Area.

Only by keeping a healthy water flow in the Tuolumne,
can we protect
this beautiful river and the diverse watershed and
wildlife which
depend
on it; while at the same time making sure that all
future generations
in
the Bay Area will have access to clean water.

Sincerely,

Sara Meghrouni
1252 5th Avenue
SF CA 94122

---

sara meghrouni <macondorelay@yahoo.com> **Mon, Oct 1, 2007 at 5:07 PM**

To: wsip.peir.comments@gmail.com

[Quoted text hidden]

L-17

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

Stop SF Utilities Commission From Destroying The Tuolumne

galemelton@comcast.net <galemelton@comcast.net> **Mon, Oct 1, 2007 at 2:40 PM**
To: wsip.peir.comments@gmail.com

> Subject: No More Diversions From The Tuolumne!
>
> To: Paul Maltzer, Environmental Review Officer
> Water System Improvement Program PEIR
> San Francisco Planning Department
>
> Dear Mr. Maltzer:
>
> Your environmental review of the SFPUC's plan to take more water from
> the Tuolumne River does not address all environmental impacts to the
> River. I strongly urge you to do additional studies of the Tuolumne
> before finishing the report.
>
> I support the alternatives in your draft document that protect the
> Tuolumne from any new diversions. More water conservation, efficiency,
> and recycling are the best ways to both protect the River, and provide
> permanently sustainable water for the San Francisco Bay Area.
>
> Only by keeping a healthy water flow in the Tuolumne, can we protect
> this beautiful river and the diverse watershed and wildlife which depend
> on it; while at the same time making sure that all future generations in
> the Bay Area will have access to clean water.
>
> Sincerely,
>

Gale Melton
225 Andover St.
San Francisco, CA 94110

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

No More Diversions From The Tuolumne!

writehand@mac.com <writehand@mac.com> **Mon, Oct 1, 2007 at 4:20 PM**
To: wsip.peir.comments@gmail.com

To:
Paul Maltzer, Environmental Review Officer
Water System Improvement Program PEIR
San Francisco Planning Department

Dear Mr. Maltzer:

Your environmental review of the SFPUC's plan to take more water from the Tuolumne River does not address all environmental impacts to the River. I strongly urge you to do additional studies of the Tuolumne before finishing the report.
I support the alternatives in your draft document that protect the Tuolumne from any new diversions. More water conservation, efficiency, and recycling are the best ways to both protect the River, and provide permanently sustainable water for the San Francisco Bay Area.

Only by keeping a healthy water flow in the Tuolumne, can we protect this beautiful river and the diverse watershed and wildlife which depend on it; while at the same time making sure that all future generations in the Bay Area will have access to clean water.

Sincerely,
Mariella de Mey
319 Edna Street
San Francisco, CA 94112

Mark and Marghe Mills-Thysen
337 Neva Street, Sebastopol, California 95472
Telephone 707-823-1428

RECEIVED
SEP 17 2007
CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
M.E.A.

September 14, 2007

Paul Maltzer, Environmental Review Officer
Water System Improvement Program PEIR
San Francisco Planning Department
1650 Mission St #400
San Francisco CA 94103

Dear Mr. Maltzer:

Your environmental review of the San Francisco Public Utilities Commission's plan to take more water from the Tuolumne River fails to adequately identify and address all of the environmental impacts to the River. I urge you to undertake additional studies of the Tuolumne River before finalizing this document.

I support the alternatives identified in your draft document that protect the Tuolumne River from new diversions. Requiring more water conservation, efficiency, and recycling is the best way to lessen impacts to the Tuolumne River while promoting a sustainable water solution for the San Francisco Bay Area.

Only by ensuring that healthy amounts of water continue to flow into the Tuolumne River can we protect this irreplaceable natural wonder.

Sincerely,

Mark Mills-Thysen

Diana Sokolove <wsip.peir.comments@gmail.com>

Subject: No More Diversions From The Tuolumne!

Minvielle, Elan <Elan.Minvielle@ucsf.edu> **Mon, Oct 1, 2007 at 1:09 PM**
To: wsip.peir.comments@gmail.com

To:

Paul Maltzer, Environmental Review Officer
Water System Improvement Program PEIR
San Francisco Planning Department Dear Mr. Maltzer:

Your environmental review of the SFPUC's plan to take more water from the Tuolumne River does not address all environmental impacts to the River. I strongly urge you to do additional studies of the Tuolumne before finishing the report.

I support the alternatives in your draft document that protect the Tuolumne from any new diversions. More water conservation, efficiency, and recycling are the best ways to both protect the River, and provide permanently sustainable water for the San Francisco Bay Area.

Only by keeping a healthy water flow in the Tuolumne, can we protect this beautiful river and the diverse watershed and wildlife which depend on it; while at the same time making sure that all future generations in the Bay Area will have access to clean water.

Sincerely,
Elan Minvielle
504 2nd Ave
San Francisco, CA 94118

Diana Sokolove <wsip.peir.comments@gmail.com>

Don't drain the Tuolumne River

Denis Mosgofian <denism@earthlink.net> **Mon, Oct 1, 2007 at 4:12 PM**
To: wsip.peir.comments@gmail.com

Paul Maltzer, Environmental Review Officer
Water System Improvement Program PEIR
San Francisco Planning Department

Dear Mr. Maltzer:

Your environmental review of the SFPUC's plan to take more water from the Tuolumne River does not address all environmental impacts to the River. I strongly urge you to do additional studies of the Tuolumne before finishing the report.
I support the alternatives in your draft document that protect the Tuolumne from any new diversions. More water conservation, efficiency, and recycling are the best ways to both protect the River, and provide permanently sustainable water for the San Francisco Bay Area.

Only by keeping a healthy water flow in the Tuolumne, can we protect this beautiful river and the diverse watershed and wildlife which depend on it; while at the same time making sure that all future generations in the Bay Area will have access to clean water.

Sincerely,

Denis Mosgofian and family
1227 10th Avenue
San Francisco, CA 94122

Diana Sokolove <wsip.peir.comments@gmail.com>

Please stop diversions from the Tuolumne River!

Kevin Neeson <neeson@sbcglobal.net> **Mon, Oct 1, 2007 at 1:54 PM**
To: wsip.peir.comments@gmail.com

To: Paul Maltzer, Environmental Review Officer
Water System Improvement Program PEIR
San Francisco Planning Department

Dear Mr. Maltzer:

I understand from TheCity.org that your organization is responsible for reviewing and approving the diversion and sale of additional Sierra waters to east bay suburbs. I'm personally concerned that with changes to our environment, it's not clear that such supplies will be available in the future and thus there must be strict limitations put on water usage (not just for new developments, but current users--both residential and business/agriculture). Your environmental review of the SFPUC's plan to take more water from the Tuolumne River does not address all environmental impacts to the River. I strongly urge you to do additional studies of the Tuolumne before finishing the report.

I support the alternatives in your draft document that protect the Tuolumne from any new diversions. More water conservation, efficiency, and recycling are the best ways to both protect the River, and provide permanently sustainable water for the San Francisco Bay Area.

L-20

Only by keeping a healthy water flow in the Tuolumne, can we protect this beautiful river and the diverse watershed and wildlife which depend on it; while at the same time making sure that all future generations in the Bay Area will have access to clean water.

Sincerely,
Kevin Neeson

Diana Sokolove <wsip.peir.comments@gmail.com>

No More Diversions From The Tuolumne!

ISAchad@aol.com <ISAchad@aol.com> **Mon, Oct 1, 2007 at 12:39 PM**
To: wsip.peir.comments@gmail.com

To: Paul Maltzer, Environmental Review Officer
Water System Improvement Program PEIR
San Francisco Planning Department

Dear Mr. Maltzer:

Your environmental review of the SFPUC's plan to take more water from the Tuolumne River does not address all environmental impacts to the River. I strongly urge you to do additional studies of the Tuolumne before finishing the report. I use the Tolumne regularely and strongly oppose the potential water diversion.

I support the alternatives in your draft document that protect the Tuolumne from any new diversions. More water conservation, efficiency, and recycling are the best ways to both protect the River, and provide permanently sustainable water for the San Francisco Bay Area.

Only by keeping a healthy water flow in the Tuolumne, can we protect this beautiful river and the diverse watershed and wildlife which depend on it; while at the same time making sure that all future generations in the Bay Area will have access to clean water.

Sincerely,

Chad Nichols
901 Wisconsin Street
San Franicsco, CA 94107

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

Tuolumne River

sunsetinn <sunsetinn@mlode.com> **Thu, Sep 27, 2007 at 3:43 PM**
To: wsip.peir.comments@gmail.com

September 27, 2007

Paul Maltzer, Environmental Review Officer

San Francisco Planning Department

1650 Mission Street, Suite 400

San Francisco, CA 94103

Dear Mr. Maltzer:

L-21

Your environmental review of the San Francisco Public Utilities Commission's plan to take more water from the Tuolumne River fails to adequately identify and address all of the environmental impacts to the River. I urge you to undertake additional studies before finalizing this document.

I support the alternatives identified in your draft document that protect the Tuolumne River from new diversions. Requiring more water conservation, efficiency, and recycling is the best way to lessen impacts on the Tuolumne River while promoting a sustainable water plan for the Bay Area.

Only by ensuring that healthy amounts of water continue to flow into the Tuolumne River can we protect this irreplaceable natural treasure.

Sincerely,

Lauren Nickell

33569 Hardin Flat Road

Groveland, CA 95321

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

No More Diversions From The Tuolumne!

erica @ sanfrancisco. com <erica@sanfrancisco.com> **Mon, Oct 1, 2007 at 1:08 PM**
Reply-To: erica@sanfrancisco.com
To: wsip.peir.comments@gmail.com

To:

Paul Maltzer, Environmental Review Officer
Water System Improvement Program PEIR
San Francisco Planning Department

Dear Mr. Maltzer:

Your environmental review of the SFPUC's plan to take more water from the Tuolumne River does not address all environmental impacts to the River. I strongly urge you to do additional studies of the Tuolumne before finishing the report.

I support the alternatives in your draft document that protect the Tuolumne from any new diversions. More water conservation, efficiency, and recycling are the best ways to both protect the River, and provide permanently sustainable water for the San Francisco Bay Area.

Only by keeping a healthy water flow in the Tuolumne, can we protect this beautiful river and the diverse watershed and wildlife which depend on it; while at the same time making sure that all future generations in the Bay Area will have access to clean water.

Sincerely,

Erica Pedersen

Managing Editor
SanFrancisco.com
1475 Folsom St., Ste. 200
San Francisco, CA 94103
Tel. 415.552.5588 x209
Fax. 415.552.5587

Tuolumne River

EHPIII@aol.com <EHPIII@aol.com> **Wed, Sep 26, 2007 at 6:43 AM**
To: wsip.peir.comments@gmail.com

Paul Maltzer, Environmental Review Officer

San Francisco Planning Department

1650 Mission Street, Suite 400

San Francisco, CA 94103

Dear Mr. Maltzer:

L-22

The Tuolumne River is very important to myself and my family. Your environmental review of the San Francisco Public Utilities Commission's plan to take more water from the Tuolumne River fails to adequately identify and address all of the environmental impacts to the River. I urge you to undertake additional studies before finalizing this document.

I support the alternatives identified in your draft document that protect the Tuolumne River from new diversions. Requiring more water conservation, efficiency, and recycling is the best way to lessen impacts on the Tuolumne River while promoting a sustainable water plan for the Bay Area.

Only by ensuring that healthy amounts of water continue to flow into the Tuolumne River can we protect this irreplaceable natural treasure.

Sincerely,

Ed Pike
421 Congo St
San Francisco, CA 94131

Diana Sokolove <wsip.peir.comments@gmail.com>

Save the Tuolumne River

krayhill@rcn.com <krayhill@rcn.com> **Mon, Oct 1, 2007 at 1:00 PM**
To: wsip.peir.comments@gmail.com

Dear Mr. Maltzer:

Your environmental review of the SFPUC's plan to take more water from the Tuolumne River does not address all environmental impacts to the River. I strongly urge you to do additional studies of the Tuolumne before finishing the report.

I support the alternatives in your draft document that protect the Tuolumne from any new diversions. More water conservation, efficiency, and recycling are the best ways to both protect the River, and provide permanently sustainable water for the San Francisco Bay Area.

Only by keeping a healthy water flow in the Tuolumne, can we protect this beautiful river and the diverse watershed and wildlife which depend on it; while at the same time making sure that all future generations in the Bay Area will have access to clean water.

Sincerely,

Kevin Rayhill

No More Diversions From The Tuolumne!

Reinhardt2@aol.com <Reinhardt2@aol.com> **Mon, Oct 1, 2007 at 12:40 PM**
To: wsip.peir.comments@gmail.com

To:

Paul Maltzer, Environmental Review Officer
Water System Improvement Program PEIR
San Francisco Planning Department

Dear Mr. Maltzer:

Your environmental review of the SFPUC's plan to take more water from the Tuolumne River does not address all environmental impacts to the River. I strongly urge you to do additional studies of the Tuolumne before finishing the report.

I support the alternatives in your draft document that protect the Tuolumne from any new diversions. More water conservation, efficiency, and recycling are the best ways to both protect the River, and provide permanently sustainable water for the San Francisco Bay Area.

L-23

Only by keeping a healthy water flow in the Tuolumne, can we protect this beautiful river and the diverse watershed and wildlife which depend on it; while at the same time making sure that all future generations in the Bay Area will have access to clean water.

Sincerely,
Dorothy Reinhardt

Diana Sokolove <wsip.peir.comments@gmail.com>

No More Diversions From The Tuolumne!

jan richman <janrichman@hotmail.com> **Mon, Oct 1, 2007 at 5:10 PM**
To: wsip.peir.comments@gmail.com

To:

Paul Maltzer, Environmental Review Officer
Water System Improvement Program PEIR
San Francisco Planning Department

Dear Mr. Maltzer:

Your environmental review of the SFPUC's plan to take more water from the Tuolumne River does not address all environmental impacts to the River. I strongly urge you to do additional studies of the Tuolumne before finishing the report.

I support the alternatives in your draft document that protect the Tuolumne from any new diversions. More water conservation, efficiency, and recycling are the best ways to both protect the River, and provide permanently sustainable water for the San Francisco Bay Area.

Only by keeping a healthy water flow in the Tuolumne, can we protect this beautiful river and the diverse watershed and wildlife which depend on it; while at the same time making sure that all future generations in the Bay Area will have access to clean water.

Sincerely,

Janine Richman
133 Dolores Street #3
San Francisco, CA
94103

Please: no more diversions from the Tuolumne!

Mija Riedel <mijariedel@yahoo.com> **Mon, Oct 1, 2007 at 3:51 PM**
To: wsip.peir.comments@gmail.com

Dear Mr. Maltzer:

Your environmental review of the SFPUC's plan to take more water from the Tuolumne River does not address all environmental impacts to the River. I strongly urge you to do additional studies of the Tuolumne before finishing the report.

I support the alternatives in your draft document that protect the Tuolumne from any new diversions. More water conservation, efficiency, and recycling are the best ways to both protect the River, and provide permanently sustainable water for the San Francisco Bay Area.

L-24

Only by keeping a healthy water flow in the Tuolumne, can we protect this beautiful river and the diverse watershed and wildlife which depend on it; while at the same time making sure that all future generations in the Bay Area will have access to clean water.

Sincerely,
Mija Riedel
San Francisco, CA

Gmail by Google BETA Diana Sokolove <wsip.peir.comments@gmail.com>

(no subject)

Hedi Saraf <hedi@mcn.org> **Mon, Oct 1, 2007 at 7:12 PM**
To: wsip.peir.comments@gmail.com

To:
Paul Maltzer, Environmental Review Officer
Water System Improvement Program PEIR
San Francisco Planning Department

Dear Mr. Maltzer:

Your environmental review of the SFPUC's plan to take more water from the Tuolumne River does not address all environmental impacts to the River. I strongly urge you to do additional studies of the Tuolumne before finishing the report.
I support the alternatives in your draft document that protect the Tuolumne from any new diversions. More water conservation, efficiency, and recycling are the best ways to both protect the River, and provide permanently sustainable water for the San Francisco Bay Area.

Only by keeping a healthy water flow in the Tuolumne, can we protect this beautiful river and the diverse watershed and wildlife which depend on it; while at the same time making sure that all future generations in the Bay Area will have access to clean water.

Sincerely,

[Your Name and Address Here]
Hedi Saraf
3765 21st Street
San Francisco, CA
94114

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

Enough Diversions From The Tuolumne already.

Patrick Schmitz <cogit@ludicrum.org> **Mon, Oct 1, 2007 at 2:07 PM**
To: wsip.peir.comments@gmail.com

Paul Maltzer, Environmental Review Officer
Water System Improvement Program PEIR
San Francisco Planning Department

Dear Mr. Maltzer:

I am concerned that the environmental review of the SFPUC's plan to divert additional water from the Tuolumne River does not address all environmental impacts to the River. As a citizen of San Francisco and concerned citizen, I urge you to carry out additional studies of the Tuolumne before submitting your report.

I support the alternatives in your draft document that protect the Tuolumne from any new diversions. More water conservation, efficiency, and recycling are the best ways to both protect the River, and provide permanently sustainable water for the San Francisco Bay Area.

Only by keeping a healthy water flow in the Tuolumne, can we protect this beautiful river and the diverse watershed and wildlife which depend on it; while at the same time making sure that all future generations in the Bay Area will have access to clean water.

Sincerely,

Patrick L. Schmitz

409 Fair Oaks St.
San Francisco, CA 94110

L-25

RECEIVED
SEP 2 5 2007
CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
M E A

9/24/2007

Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Maltzer:

I am a fisherman and an outdoors man who values our rivers and I stand in solidarity with Palo Alto councilman Peter Drekmeier who is Program Director with the Tuolumne River Trust.

Your environmental review of the San Francisco Public Utilities Commission's plan to take more water from the Tuolumne River fails to adequately identify and address all of the environmental impacts to the River. I urge you to undertake additional studies before finalizing this document.

I support the alternatives identified in your draft document that protect the Tuolumne River from new diversions. Requiring more water conservation, efficiency, and recycling is the best way to lessen impacts on the Tuolumne River while promoting a sustainable water plan for the Bay Area.

Only by ensuring that healthy amounts of water continue to flow into the Tuolumne River can we protect this irreplaceable natural treasure.

Sincerely,

Kent J. Schneeveis
586 College Ave.
Palo Alto, CA 94306
(650) 857-9518

Diana Sokolove <wsip.peir.comments@gmail.com>

Please protect the Tuolumne River

Tara Schubert <tara@tschubert.net> **Mon, Oct 1, 2007 at 2:58 PM**
To: wsip.peir.comments@gmail.com

Dear Mr. Maltzer:

Your environmental review of the SFPUC's plan to take more water from the Tuolumne River does not address all environmental impacts to the River. I strongly urge you to do additional studies of the Tuolumne before finishing the report.

I support the alternatives in your draft document that protect the Tuolumne from any new diversions. More water conservation, efficiency, and recycling are the best ways to both protect the River, and provide permanently sustainable water for the San Francisco Bay Area.

Only by keeping a healthy water flow in the Tuolumne, can we protect this beautiful river and the diverse watershed and wildlife which depend on it; while at the same time making sure that all future generations in the Bay Area will have access to clean water.

Sincerely,

Tara Schubert

4 Downey St
San Francisco, CA 94117

L-26

Diana Sokolove <wsip.peir.comments@gmail.com>

RE. Program Environmental Impact Report for the Water System Improvement Program

Peter Seidman <petsei@earthlink.net> **Wed, Sep 26, 2007 at 11:21 AM**
To: wsip.peir.comments@gmail.com

Dear Mr. Maltzer:

Your environmental review of the San Francisco Public Utilities Commission's plan to take more water from the Tuolumne River fails to adequately identify and address all of the environmental impacts to the River. I urge you to undertake additional studies before finalizing this document.

I support the alternatives identified in your draft document that protect the Tuolumne River from new diversions. Requiring more water conservation, efficiency, and recycling is the best way to lessen impacts on the Tuolumne River while promoting a sustainable water plan for the Bay Area.

Only by ensuring that healthy amounts of water continue to flow into the Tuolumne River can we protect this irreplaceable natural treasure.

Sincerely,

Peter Seidman and Bonnie Benard

--
Peter Seidman and Bonnie Benard
1238 Josephine Street
Berkeley, CA 94703-1112
510-528-4344
petsei@earthlink.net

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

Tuolomne River diversion

2 messages

Kate Stepan <katestepan@yahoo.com> **Sat, Dec 29, 2007 at 1:54 PM**
To: wsip.peir.comments@gmail.com

12/29/07

Paul Maltzer, Environmental Review Officer

San Francisco Planning Department

1650 Mission Street, Suite 400

San Francisco, CA 94103

Dear Mr. Maltzer:

Your environmental review of the San Francisco Public Utilities Commission's plan to take more water from the Tuolumne River fails to adequately identify and address all of the environmental impacts to the River. I urge you to undertake additional studies before finalizing this document.

L-27

I support the alternatives identified in your draft document that protect the Tuolumne River from new diversions. Requiring more water conservation, efficiency, and recycling is the best way to lessen impacts on the Tuolumne River while promoting a sustainable water plan for the Bay Area.

Only by ensuring that healthy amounts of water continue to flow into the Tuolumne River can we protect this irreplaceable natural treasure.

Sincerely,

Kate Stepan
111 Ave. Del Reposo #2
San Clemente, CA 92672

Diana Sokolove <wsip.peir.comments@gmail.com> **Tue, Jan 15, 2008 at 2:42 PM**
To: kwhite@esassoc.com

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

Protect the Tuolumne River from new diversions

Susan Stern <bubbestern@yahoo.com> **Wed, Sep 26, 2007 at 5:00 PM**
To: wsip.peir.comments@gmail.com

September 26, 3007

Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Maltzer:

Your environmental review of the San Francisco Public Utilities Commission's plan to take more water from the Tuolumne River fails to adequately identify and address all of the environmental impacts to the River. We urge you to undertake additional studies before finalizing this document.

We support the alternatives identified in your draft document that protect the Tuolumne River from new diversions. Requiring more water conservation, efficiency, and recycling is the best way to lessen impacts on the Tuolumne River while promoting a sustainable water plan for the Bay Area.

Only by ensuring that healthy amounts of water continue to flow into the Tuolumne River can we protect this irreplaceable natural treasure.

Sincerely,

Dr. Maury and Susan Stern
939 Carol Lane
Lafayette, CA 94549

Diana Sokolove <wsip.peir.comments@gmail.com>

(no subject)

Olav V. Strawe <strawe@4tfy.com> **Wed, Sep 26, 2007 at 4:30 PM**
Reply-To: strawe@4tfy.com
To: wsip.peir.comments@gmail.com

Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Maltzer:

I am aware of the tight water situation in Californias Central Valley through a number of recent visits in the area.

So your environmental review of the San Francisco Public Utilities Commission's plan to take more water from the Tuolumne River is a surprising turn in the water policies for this region.
It fails to adequately identify and address all of the environmental impacts to the River.
I urge you to undertake additional studies before finalizing this document.

L-28

I support the alternatives identified in your draft document that protect the Tuolumne River from new diversions. Requiring more water conservation, efficiency, and recycling is the best way to lessen impacts on the Tuolumne River while promoting a sustainable water plan for the Bay Area.

Only by ensuring that healthy amounts of water continue to flow into the Tuolumne River can we protect this irreplaceable natural treasure.

Sincerely,

Olav Strawe

Fortify Communications, Inc.
367 9th St., Suite B
San Francisco, CA 94103-3831

P: +1 (415) 651-4186
F: +1 (415) 946-3540
C: +1 (650) 861-9151

Diana Sokolove <wsip.peir.comments@gmail.com>

NO MORE DIVERSIONS FROM THE TUOLUMNE!!

Megan Sullivan <sulliblums@earthlink.net> **Tue, Oct 2, 2007 at 12:58 PM**
To: wsip.peir.comments@gmail.com

To:
Paul Maltzer, Environmental Review Officer
Water System Improvement Program PEIR
San Francisco Planning Department

Dear Mr. Maltzer:

Your environmental review of the SFPUC's plan to take more water from the Tuolumne River does not address all environmental impacts to the River. I strongly urge you to do additional studies of the Tuolumne before finishing the report.
I support the alternatives in your draft document that protect the Tuolumne from any new diversions. More water conservation, efficiency, and recycling are the best ways to both protect the River, and provide permanently sustainable water for the San Francisco Bay Area.

Only by keeping a healthy water flow in the Tuolumne, can we protect this beautiful river and the diverse watershed and wildlife which depend on it; while at the same time making sure that all future generations in the Bay Area will have access to clean water.

Sincerely,

Megan M. Sullivan

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

(no subject)

lchiapella@juno.com <lchiapella@juno.com> **Sun, Sep 30, 2007 at 1:20 AM**
To: wsip.peir.comments@gmail.com

Allen Todd
631 Colorado Avenue
Palo Alto, CA 94306

Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Maltzer:

Your environmental review of the San Francisco Public Utilities Commission's plan to take more water from the Tuolumne River fails to adequately identify and address all of the environmental impacts to the River. I urge you to undertake additional studies before finalizing this document.

I support the alternatives identified in your draft document that protect the Tuolumne River from new diversions. Requiring more water conservation, efficiency, and recycling is the best way to lessen impacts on the Tuolumne River while promoting a sustainable water plan for the Bay Area.

L-29

Only by ensuring that healthy amounts of water continue to flow into the Tuolumne River can we protect this irreplaceable natural treasure.

Sincerely,

Allen Todd

Gmail by Google BETA

Diana Sokolove <wsip.peir.comments@gmail.com>

Increased Tuolumne River withdrawals

TerryT1011@aol.com <TerryT1011@aol.com> **Mon, Sep 24, 2007 at 12:23 PM**
To: wsip.peir.comments@gmail.com

Sept. 24, 2007

Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Maltzer:

Your environmental review of the San Francisco Public Utilities Commission's plan to take more water from the Tuolumne River fails to adequately identify and address all of the environmental impacts to the River. I urge you to undertake additional studies before finalizing this document.

I support the alternatives identified in your draft document that protect the Tuolumne River from new diversions. Requiring more water conservation, efficiency, and recycling is the best way to lessen impacts on the Tuolumne River while promoting a sustainable water plan for the Bay Area.

As a water consumer of Tuolumne River water in Palo Alto, I see every day that water conservation is not a priority for my city. As a member of an advisory committee to the Santa Clara Valley Water District, I can see that similar problems exist in every city using Tuolumne water. We have hardly been an attempt on water conservation and re-use.

Only by ensuring that healthy amounts of water continue to flow into the Tuolumne River can we protect this irreplaceable natural treasure.

Sincerely,
Terry A. Trumbull
Professor, Environmental Studies Dept.
San Jose State University

Diana Sokolove <wsip.peir.comments@gmail.com>

No More Diversions From The Tuolumne

Catherine.Vowles@kp.org <Catherine.Vowles@kp.org> **Mon, Oct 1, 2007 at 2:19 PM**
To: wsip.peir.comments@gmail.com

L-30

Dear Mr. Maltzer:

Your environmental review of the SFPUC's plan to take more water from the Tuolumne River does not address all environmental impacts to the River. I strongly urge you to do additional studies of the Tuolumne before finishing the report.

I support the alternatives in your draft document that protect the Tuolumne from any new diversions. More water conservation, efficiency, and recycling are the best ways to both protect the River, and provide permanently sustainable water for the San Francisco Bay Area.

Only by keeping a healthy water flow in the Tuolumne, can we protect this beautiful river and the diverse watershed and wildlife which depend on it; while at the same time making sure that all future generations in the Bay Area will have access to clean water.

Sincerely,

Catherine Vowles
2714 Fulton St
San Francisco, CA 94118

Diana Sokolove <wsip.peir.comments@gmail.com>

No More Diversions From The Tuolumne!

tesw@aol.com <tesw@aol.com> **Mon, Oct 1, 2007 at 2:01 PM**
To: wsip.peir.comments@gmail.com

To:
Paul Maltzer, Environmental Review Officer
Water System Improvement Program PEIR
San Francisco Planning Department

Dear Mr. Maltzer:

Your environmental review of the SFPUC's plan to take more water from the Tuolumne River does not address all environmental impacts to the River. I strongly urge you to do additional studies of the Tuolumne before finishing the report.
I support the alternatives in your draft document that protect the Tuolumne from any new diversions. More water conservation, efficiency, and recycling are the best ways to both protect the River, and provide permanently sustainable water for the San Francisco Bay Area.

Only by keeping a healthy water flow in the Tuolumne, can we protect this beautiful river and the diverse watershed and wildlife which depend on it; while at the same time making sure that all future generations in the Bay Area will have access to clean water.

Sincerely,
Tes Welborn
2001 Oak St.
SF 94117

Diana Sokolove <wsip.peir.comments@gmail.com>

Please protect the Tuolumne River

Judygardn@aol.com <Judygardn@aol.com> **Tue, Sep 25, 2007 at 8:56 PM**
To: wsip.peir.comments@gmail.com

September 26, 2007

Paul Maltzer, Environmental Review Officer

San Francisco Planning Department

1650 Mission Street, Suite 400

San Francisco, CA 94103

Dear Mr. Maltzer:

L-31

Your environmental review of the San Francisco Public Utilities Commission's plan to take more water from the Tuolumne River fails to adequately identify and address all of the environmental impacts to the River. I urge you to undertake additional studies before finalizing this document.

I support the alternatives identified in your draft document that protects the Tuolumne River from new diversions. Requiring more water conservation, efficiency, and recycling is the best way to lessen impacts on the Tuolumne River while promoting a sustainable water plan for the Bay Area.

Only by ensuring that healthy amounts of water continue to flow into the Tuolumne River can we protect this irreplaceable natural treasure.

Sincerely,

J. Wong

747 15th Ave.

Menlo Park, CA 94025

Diana Sokolove <wsip.peir.comments@gmail.com>

sfpuc

Ebbe Roe <ebhead1@gmail.com> **Mon, Oct 1, 2007 at 3:21 PM**
To: wsip.peir.comments@gmail.com

Paul Maltzer, Environmental Review Officer
Water System Improvement Program PEIR
San Francisco Planning Department

Dear Mr. Maltzer:

Your environmental review of the SFPUC's plan to take more water from the Tuolumne River does not address all environmental impacts to the River. I strongly urge you to do additional studies of the Tuolumne before finishing the report.

I support the alternatives in your draft document that protect the Tuolumne from any new diversions. More water conservation, efficiency, and recycling are the best ways to both protect the River, and provide permanently sustainable water for the San Francisco Bay Area.

Only by keeping a healthy water flow in the Tuolumne, can we protect this beautiful river and the diverse watershed and wildlife which depend on it; while at the same time making sure that all future generations in the Bay Area will have access to clean water.

L-32

Sincerely,
ebbe roe yovino-smith
227 montcalm st
sf ca
94110
415 846 8284

M. Comment Letters Received After December 31, 2007

APPENDIX M

Comment Letters Received After December 31, 2007

The public review period on the Draft PEIR, initially scheduled for 90 days (from June 29, 2007 through October 1, 2007), was extended by an additional 15 days, to October 15, 2007. All comments received through December 31, 2007 were accepted by the San Francisco Planning Department and are responded to in this Comments and Responses document. Comment letters received after December 31, 2007 are presented below; these comments are not responded to individually, but the issues have already been addressed. **Table M.1** includes a cross reference for each of these letters to either a master response or another response that includes a discussion of related issues.

TABLE M.1
COMMENT LETTERS SUBMITTED ON THE DRAFT PEIR AFTER DECEMBER 31, 2007

Comment Letter Format	Name of Commenter	Organization/ Affiliation	Date of Letter	Issues	Pertinent Response
Letter	Arthur R. Jensen, Ph.D.	Bay Area Water Supply & Conservation Agency	02/21/08	Modified WSIP; agricultural conservation	Section 4.10, Master Response on Modified WSIP Alternative
Letter	Arthur R. Jensen	Bay Area Water Supply & Conservation Agency	07/17/08	Phased WSIP Variant; economic impacts of service interruption	Section 13.4, Phased WSIP Variant; Section 14.1, Master Response on WSIP Purpose and Need (Section 14.1.6)
Letter	John Stufflebean	City of San Jose	06/27/08	Phased WSIP Variant; economic impacts of service interruption	Section 13.4, Phased WSIP Variant; Section 14.1, Master Response on WSIP Purpose and Need (Section 14.1.6)
Letter	Alan Kurotori	City of Santa Clara	06/27/08	Phased WSIP Variant; economic impacts of service interruption	Section 13.4, Phased WSIP Variant; Section 14.1, Master Response on WSIP Purpose and Need (Section 14.1.6)
Letter	Keith Whitman	Santa Clara Valley Water District	06/24/08	Phased WSIP Variant; economic impacts of service interruption	Section 13.4, Phased WSIP Variant; Section 14.1, Master Response on WSIP Purpose and Need (Section 14.1.6)
Letter	Emily McGinty	Citizen	02/22/08	No additional Tuolumne River diversions; more conservation and recycling; impacts on San Joaquin River and Delta	Responses C_Form1-01 and -02; Section 14.8, Master Response on Delta and San Joaquin River Issues

BAWSCA
Bay Area Water Supply & Conservation Agency

February 21, 2008

Mr. William Wycko
Acting Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Dear Mr. Wycko:

The Bay Area Water Supply and Conservation Agency ("BAWSCA") submitted extensive comments last fall on the draft PEIR on the Water System Improvement Program developed by the San Francisco Public Utilities Commission. Those comments expressed BAWSCA's support for the "Modified WSIP" which the draft PEIR identified as the "Environmentally Superior Alternative." We also recommend that the final PEIR evaluate it in more detail.

The Modified WSIP contemplates additional water conservation/recycling in communities in San Mateo, Santa Clara and Alameda counties that currently purchase water from the SFPUC. It also envisions that increased diversions from the Tuolumne River would be offset by water use efficiencies (funded by Bay Area water agencies) in the agricultural lands bordering the Tuolumne River. Our comments were intended to corroborate the feasibility of this concept. They also conveyed the recommendation of the BAWSCA Board of Directors that the final PEIR "explore the feasibility of Bay Area water customers financially supporting water efficiencies in the [Turlock Irrigation District/Modesto Irrigation District] that will result in more water remaining in New Don Pedro than is currently the case, even after taking increased diversions by San Francisco into account." (BAWSCA comments, p. 47)

As further evidence of the feasibility of this approach, I am enclosing the following materials:

- Letter dated February 15, 2008 from Professor Brent Haddad, Director of the Center for Integrated Water Research at the University of California at Santa Cruz, substantiating the feasibility of the agricultural conservation element of the modified WSIP.

- Declaration dated July 23, 2007 by Peter Gleick, President of the Pacific Institute, submitted to the U.S. Federal District Court for the Eastern District of California demonstrating the feasibility of agricultural water users in the San Joaquin hydrologic region implementing additional long-term water management and efficiency measures.

Professor Haddad's resume is attached to his letter. The declaration submitted by Dr. Gleick summarizes his qualifications and experience at paragraphs 1 through 3. A more extensive biographical review is enclosed with this letter.

I have also enclosed a copy of my own resume, which summarizes my academic training and my several decades of experience in planning and managing California water delivery systems, as support for my personal opinion that the agricultural water conservation element in the Modified WSIP is feasible.

I hope this information is helpful to the Planning Department as it prepares a Final PEIR. I trust, and request, that this letter and its accompany materials will be made part of the record prepared for review by the Planning Commission, and by the Board of Supervisors in the event of an appeal from the Planning Commission certification of the Final PEIR.

Sincerely,

Arthur R. Jensen, Ph.D.
Chief Executive Officer and General Manager

Enclosure (s)

1. February 15, 2008 letter from Prof. Brent Haddad, MA, MBA, Ph.D. regarding the feasibility of the agricultural conservation of the modified WSIP.
2. July 23, 2007 Declaration of Peter H. Gleick, Ph.D. to the U.S. Federal District Court of the Eastern District of California.
3. Resume of Arthur R. Jensen, Ph.D., BAWSCA Chief Executive Officer and General Manager.

cc: Ms. Susan Leal, General Manager, SFPUC
Ms. Irina Torrey, Director, Environmental and Regulatory Compliance Division
Ms. Diana Sokolove, Environmental Planner, San Francisco Planning Department

UNIVERSITY OF CALIFORNIA, SANTA CRUZ

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CENTER FOR INTEGRATED WATER RESEARCH
UNIVERSITY OF CALIFORNIA
SANTA CRUZ, CA 95064, U.S.A.

TEL: (831) 459-4149
FAX: (831) 459-4015
E-MAIL: bhaddad@ucsc.edu

BRENT M. HADDAD, M.A., MBA, Ph.D.
DIRECTOR, AND
PROFESSOR OF ENVIRONMENTAL STUDIES

February 15, 2008

Mr. Arthur R. Jensen
General Manager
Bay Area Water Supply and Conservation Agency
155 Bovet Road, Suite 302
San Mateo, California 94402

Dear Mr. Jensen:

As you requested, I have reviewed the Draft Program Environmental Impact Report (Draft PEIR) for the San Francisco Public Utilities Commission (SFPUC) Water System Improvement Plan (June 2007, http://www.sfgov.org/site/planning_index.asp?id=37672), as well as the comments on it submitted by the Bay Area Water Supply and Conservation Agency (BAWSCA). My particular focus has been the feasibility of the "Modified WSIP" alternative. Of the three aspects of the Modified WSIP proposal, I address the potential for water conservation and savings in the lower Tuolumne River watershed (LTRW), a region served by the Modesto Irrigation District (MID) and Turlock Irrigation District (TID). Based on my experience with the economics of both urban and agricultural water use in California, it is my opinion that this aspect of the Modified WSIP Alternative is definitely feasible.

The Modified WSIP is described as the "environmentally superior alternative" (p. 9-96). The Modified WSIP can be a source of environmental improvement by providing additional in-stream flows to the lower Tuolomne River while also providing additional water to the San Francisco Bay Area. The Draft PEIR anticipates joint projects involving BAWSCA and SFPUC in the LTRW (9-96), and correctly notes the value of collaboration in reducing overall environmental impacts on the Tuolumne River.

Below, I make the following points:

1. Water "conservation" as used in the Draft PEIR should be understood as water "savings" - the ultimate result of numerous water management strategies and technologies, not just reductions in quantities consumed by a particular end use of water.

2. Water conservation projects (broadly understood) could cost-effectively improve the long-term water supply reliability of the San Francisco Bay Area while simultaneously improving environmental conditions on the lower Tuolumne River through enhanced in-stream flows.

1. The Draft PEIR aims in the right direction by suggesting that water conservation projects yielding year-round supply enhancement can be pursued in the LTRW (Sec. 9-2-8 *Modified WSIP Alternative*; pp. 9-78 to 9-79). However, this categorization specifying conservation only (p. 9-81) is too narrow. Water conservation is typically understood to mean a reduction in end-use of water without loss of amenity or productivity. It is achieved by implementation of less-water-intensive technologies, economic incentives, or both. Narrowly understood, it is only one of numerous water-supply-enhancing strategies now available to water managers. More broadly, conservation simply means saving water: engaging in carefully-considered endeavors that help society achieve numerous goals with limited water supply. This latter understanding of conservation better serves state and regional interests in managing the Tuolumne River system since it provides a broader scope of action to meet the many demands on the system.

Other sections of the Draft PEIR list and comment on numerous water-management strategies proposed for implementation in the San Francisco Bay Area. The same list of management and new-technology alternatives proposed for the San Francisco Bay Area should also be available for consideration in the LTRW. These options include conservation (traditionally understood), water reclamation and reuse, desalination of inland brackish water, storm water management, improved management and retrofits of existing reservoirs and supply infrastructure, and groundwater-surface water management programs. As long as any of these approaches increases available water, improves environmental conditions, improves supply reliability, and is cost-effective, it doesn't matter where it occurs. If the conservation-only language appears in the Final PEIR, I hope it will be understood that conservation signifies a larger category of water-saving endeavors that includes at least the programs and technologies mentioned above.

2. Within the combined natural and engineered watershed of the Tuolumne River, it is possible to identify cost-effective water-saving projects that could provide both additional instream flows on the lower Tuolumne River and additional water to the San Francisco Bay Area. From an economic perspective, one should anticipate the potential for cost-effective agricultural and urban water savings in the LTRW. Water-conserving irrigation technologies have advanced in recent years, as have urban water reclamation and reuse technologies. Effective water-saving technologies such as drip irrigation are now in use in agricultural areas throughout California, on a variety of crops. Many end-users of water in the LTRW have not yet been offered strong financial incentives to implement them. One should anticipate that incentive programs similar to those implemented in Imperial Irrigation District would result in saved water in the LTRW.

The "Water Conservation and Transfer Program" involving Imperial Irrigation District (IID) and the Metropolitan Water District of Southern California (MWD), initiated in 1988, included 15 projects designed to conserve 105,000 acre-feet per year of water in IID's delivery system and on individual farms. District-level conservation projects included lining of earthen canals, constructing local reservoirs, installing spill-interceptor systems and non-leak gates, automating instrumentation and control systems, and altering water-delivery timetables. On-farm conservation measures included tailwater pumpback, drip irrigation, and linear-move irrigation systems. The program's EIR considered impacts on drainage, groundwater, native habitats, runoff, chemicals of concern, and eco-toxicological risks. The IID program, which provided direct economic benefits to farmers in IID, improved IID's infrastructure as well as water supply reliability in the MWD service territory.[i] A subsequent agreement between IID and the San Diego County Water Authority (1998) identified an additional 303,000 acre-feet of on-farm and distribution system conservation projects. These agreements serve as an example of what is possible when introducing positive economic incentives to manage water wisely.

Just as with IID, the LTRW has substantial water-savings capacity. The CALFED publication "Water Use Efficiency: Comprehensive Evaluation" supports the conclusion that efficiency improvements are available in the eastern San Joaquin Valley.[ii] CALFED's Agricultural Water Use Efficiency documentation also finds that potential savings exist in the larger CALFED region from reduced evapotranspiration and improved long-term diversion flexibility.[iii] The CALFED Efficiency Program analysis estimates 185-225 thousand af/year conservation potential for the larger region in which MID/TID is found (Table 5-8b), a region roughly four times larger than MID/TID.[iv] The bulk of the savings are in urban landscaping conservation measures. This suggests a roughly 50 thousand af/year (an average of 70 cfs) conservation potential in the MID/TID region. However, this estimation that does not take into account the range of targeted economic incentives and support for conservation that were successful in IID and are possible in the LTRW. The actual conservation potential in the LTRW is much higher, at least 100,000 acre-feet/year, depending upon the design of and commitment to conservation incentive programs.

MID's 1999 Water Management Plan identifies several potential efficiency activities (Table 43).[v] They include improving the efficiency of MID water supply operations, water reclamation and reuse, and others. Estimated water savings/production are not provided, but appear to be substantial. TID provides the same general information in Table II-1 of its Agricultural Water Management Plan Two-Year Progress Report.[vi]

In terms of urban Best Management Practice savings, the San Joaquin River region is one of the weakest performers in the CALFED territory (Fig 1.3, p. 16). Urban water is roughly 5% of overall water use, but the proportion is growing as urbanization continues.[vii] The 2000 regional population density was just under 200 persons per square mile, mostly concentrated in cities, less than one-tenth of the population densities of the urbanized BAWSCA territories. 1995 regional per capita water use was 301 gallons per day in the MID/TID region, nearly three times the per capita use in the BAWSCA territories. Urban landscape acreage in the MID/TID region is expected to nearly double between 2000 and 2020. Without a system of incentives or regulations to guide landscaping choices, this acreage could become a large water consumer in the coming decades. A lack of available funding for programs of this sort appears to be hindering implementation.

By way of categories, the following general approaches to water supply management should be considered in the LTRW:

1. Surface-water/groundwater Conjunctive Management. This approach could include efforts to improve groundwater quality, as well as desalinating the brackish groundwater in near-surface aquifers in the western portion of the LTRW.
2. Spill and Drainage Recovery and Reservoir Improvement. This approach involves investing in improvements in the MID and TID storage and delivery infrastructures to improve delivery efficiency.
3. Water Reclamation and Reuse. This approach could take the form of (1) improving urban wastewater through advanced treatment to make it available for urban and agricultural reuse in the LTRW, and/or (2) improving agricultural waters, including waters used by the dairy and livestock industries. Water end-use is not reduced, but demand for water taken directly from the Tuolumne River is.
4. Water-Smart Landscaping. This approach provides incentive for urban and residential low-water-use landscaping.
5. Drip Irrigation. This approach reduces demand by farmers for water deliveries.
6. Other Urban Incentives. These include technology retrofits, stormwater capture and use, and low-water-use urban growth planning.

All of these categories have the potential to cost-effectively reduce demand for Tuolumne River water in the LTRW. Water saved could then be used to improve environmental conditions along the Lower Tuolumne River (by providing additional in-stream flows), while also providing additional water supply to the San Francisco Bay Area. Carefully selected programs would not harm the traditional agricultural character of the LTRW, and could support it by providing an additional source of income to the region's agricultural sector.

Please contact me if you have further questions on this topic. A copy of my Curriculum Vitae is enclosed.

Sincerely,

Brent M. Haddad

---

[i] Metropolitan Water District, 1989. *Water Conservation Agreement Between the Metropolitan Water District of Southern California and the Imperial Irrigation District.* Los Angeles: MWD. Also Haddad, B. 2000. *Rivers of Gold: Designing Markets to Allocate Water in California.* Washington, D.C.: Island Press. Summaries also exist at:
http://www.mwdh2o.com/mwdh2o/pages/yourwater/supply/conservation/conserv02.html and http://www.iid.com/Water/WaterConservation. Also Appendix 2: Private Sector Water Resource Capabilities and Projects (US-China Water Resource Management Program Draft Framework July 27, 1998, http://www.lanl.gov/chinawater/main.html). Accessed February 10, 2008.

[ii] CALFED, "Water Use Efficiency Comprehensive Evaluation," April 2006 Public Review Draft.

[iii] CALFED, "Details of Water Use Efficiency: CALFED Agricultural Water Use Efficiency," 2000, Table 1.1. http://www.calwater.ca.gov/Archives/WaterUseEfficiency/adobe_pdf/qo_detail.pdf, Accessed March 27, 2007.

[iv] CALFED Bay-Delta Program Water Use Efficiency Program Plan, Final Programmatic EIS/EIR Technical Appendix, 2000.

[v] Modesto Irrigation District, Water Management Plan for the Modest Irrigation District, July 13, 1999 (revised March 3, 2000).

[vi] Turlock Irrigation District 2003. Agricultural Water Management Plan Two-Year Water Management Plan (December).

[vii] CALFED Bay-Delta Program Water Use Efficiency Program Plan, Final Programmatic EIS/EIR Technical Appendix, 2000, p. 4-41.

Brent M. Haddad, MA, MBA, Ph.D.

Professor of Environmental Studies
Director, Center for Integrated Water Research
University of California, Santa Cruz
1156 High Street, Santa Cruz, CA 95064
831-459-4149; (c) 831-331-0654; (f) 831-459-4015 bhaddad@ucsc.edu

EMPLOYMENT HISTORY

2007- Founder and Director, Center for Integrated Water Research, University of California, Santa Cruz

1997- University of California, Santa Cruz. Professor of Environmental Studies

1991- Consultant on energy, water, environmental regulation and policy, and market development.

EDUCATION

1996 University of California, Berkeley, Ph.D. in Energy and Resources

1991 University of California, Berkeley, Haas School of Business, MBA in Business and Public Policy

1985 Georgetown University, School of Foreign Service, Washington, D.C., M.A. in International Relations

1982 Stanford University, B.A. in International Relations

SELECTED AWARDS AND HONORS

2007 California Public Utilities Commission, Division of Ratepayer Advocates, research and administrative coordination of a process to identify a regional solution to Monterey County water supply needs, $326,000.

2007 Monterey Regional Water Pollution Control Agency, exploring the federal role in regional water treatment and supply projects. $42,000.

2006 California Public Utilities Commission, Division of Ratepayer Advocates, research support for analysis of the Central California Water Project, $100,000.

2005 California Department of Water Resources Proposition 50 grant competition. "Developing a Tool to Guide State and Local Desalination Planning," $2,597,149.

2003 WateReuse Foundation. Organized and held a research needs assessment workshop entitled, "Integrating Human Reactions to Water Reclamation and Reuse into Reuse Project Design." $30,000.

1998-99 *Excellence in Teaching Award,* University of California, Santa Cruz.

1999 *Educational Service Award,* University of California Educational Partnership Center.

1998-00 University of California Centers for Water and Wildland Resources. "An institutional analysis of the application of urban reclaimed water to agriculture in California." $50,500.

1997-98 University of California Fund for Toxics Research. "Assessing the Early Economic Impacts of the Salinas Valley Reclamation Project and the Castroville Seawater Intrusion Project." $30,000.

SELECTED PUBLICATIONS

2007 Haddad, B. "The Professional and Intellectual Challenges of Sustainable Water Management," Chapter in *Proceedings of the 3rd Dubrovnik Conference on Sustainable Development of Energy, Water and Environment Systems, 2005.* N. Afgan, Z. Bogdan, N. Duic, & Z. Guzovic, eds. Singapore: World Scientific Publishing.

2007 Haddad, B. *Introduction to Environmental Politics and Economics: Course Book.* Mason, OH: Thompson.

2006 Haddad, B. "Achieving Numerous Watershed-Management Goals in a Multi-Watershed System," extended abstract in *Proceedings,* International Conference on Forest and Water in a Changing Environment (Beijing, August 8-10).

2004 Huxman, T.E., M. Smith, P. Fay, A.K. Knapp, M.R. Shaw, M.E. Loik, S.D. Smith, D.T. Tissue, J.C. Zak, J.F. Weltzin, W.T. Pockman, O.E. Sala, B. Haddad, J. Harte, G.W. Koch, S. Schwinning, E.E. Small, D.G. Williams. "Convergence across biomes to a common rain-use efficiency," *Nature* 429: 651-654.

2004 Haddad, B. "New Ways to Understand Water Customers' 'Irrational' Behavior," *WateReuse Update* (June).

2004 Haddad, B. "Research Needs Assessment Workshop: Human Reactions to Water Reuse," Alexandria, VA: WateReuse Foundation.

2004 Haddad, B. "Water," in S. Krech III, J.R. McNeill, and C. Merchant, eds., *Encyclopedia of Environmental History.* Volume 3, 1299-1303.

2003 Loik, M.E. and Haddad B. "PrecipNet: An International Network for Precipitation and Ecosystem Change Interdisciplinary Research." Poster presented at the Biennial Meeting of the U.S. Society for Ecological Economics, Saratoga Springs, NY (May 24).

2003 Weltzin, J.F., M.E. Loik, S. Schwinning, D.G. Williams, P. Fay, B. Haddad *and in alphabetical order*: J. Harte, T.E. Huxman, A.K. Knapp, G. Lin, W.T. Pockman, M.R. Shaw, E.E. Small, M.D. Smith, D.T. Tissue, J.C. Zak. "Assessing the response of terrestrial ecosystems to potential changes in precipitation," *BioScience* 53(10):941-952.

2003 Haddad, B. "Property rights, ecosystem management, and John Locke's labor theory of ownership," *Ecological Economics* 46(1):19-31.

2003 Haddad, B., Sloan, L., Snyder, M., and Bell, J. "Regional climate change impacts and freshwater systems: focusing the adaptation research agenda," *International Journal of Sustainable Development* 6(3): 265-282.

2003 Haddad, B. and D. Kelso. "Understanding the Public Reaction to Indirect Potable Reuse Projects," Proceedings, U.S. Centers for Disease Control and Prevention Workshop on Water Reuse, Atlanta, GA.

2002 Haddad, B. "Monterey County Water Recycling Project: An Institutional Study," *Journal of Water Resources Planning and Management* 28(4): 280-287.

2002 Haddad, B. "The Role of the Private Sector in Fresh Water Supply: Contracting and Public Benefits Considerations." *Proceedings*, Institute of the Americas H_2O Conference, April 24, San Diego, CA.

2001 Ludwig, D., Mangel, M. and Haddad, B. "Ecology, Conservation, and Public Policy," *Annual Review of Ecology and Systematics* 32: 481-517.

2001 Haddad, B., L. Sloan, J. Bell, and M. Snyder. "Regional Climate Modeling and Water Forecasting at the District Level," *Proceedings*, Annual meeting of the American Water Resources Association, Albuquerque, NM.

2001 Haddad, B. "The Challenge of Large-Scale Water Reallocation: Lessons from the California Experience," *Proceedings*, International Conference on the Spanish Hydrological Plan and Sustainable Water Management, Zaragoza, Spain.

2001 Haddad, B., and Merritt, K. "Evaluating regional impacts and adaptations to climate change: the case of California water," in D. Hall and R.B. Howarth, eds. *The Long-Term Economics of Climate Change: Beyond a Doubling of Greenhouse Gas Concentrations*. New York: JAI Press.

2000 Haddad, B. "Reply to Discussion: Economic Incentives for Water Conservation on the Monterey Peninsula: The Market Proposal," *Journal of the American Water Resources Association*, August.

2000 Haddad, B. "Economic Incentives for Water Conservation on the Monterey Peninsula: the Market Proposal," *Journal of the American Water Resources Association* 36(1): 1-15.

2000 Haddad, B. *Rivers of Gold: Designing Markets to Allocate Water in California*. Washington, D.C.: Island Press.

PUBLIC LECTURE AND FORUM PARTICIPATION

2007 Legal Seminar on Water Recycling, "Future Potential for Recycled Water," Monterey, California, February 2.

2007 "Report on a Water Reclamation Survey," presented at a meeting jointly sponsored by the City of San Jose and the Government of Queensland, Australia, San Jose, CA, January 28.

2006 Interviewee, "Talk of the Nation Science Friday," NPR (Oct. 13).

2006 Member, Organizing Committee and Scientific Advisory Board, 2007 Dubrovnik Conference on Sustainable Development of Energy, Water, and Environmental Systems, sponsored by UNESCO.

2006 Interviewee, "World of Possibilities" syndicated radio program on the topic of desalination (August 15).

2006 Participant, "Recycled Water…changing public perception and addressing negative branding," hosted by US Bureau of Reclamation and Southern California Water Recycling Projects Initiative, Los Angeles (June 7)

2006 Interviewee, "Which Way L.A.," Los Angeles-based radio program on the topic of water reclamation and reuse (May 17).

2006 Panelist, "Water Reuse & Future Limitations – Pharmaceutical Effects on People and Fish Alike," Washington Association of Sewer and Water Districts (April 21).

2006	Participant, national Joint Water Reuse & Desalination Task Force meeting on institutional issues in desalination and water purification, San Antonio, Texas (April 17-18).
2006	Presenter, Administrative Law Judges Lunchtime Seminar Series, California Public Utilities Commission, "New Directions for California Water Governance," San Francisco (March 16).
2005	"California Water Policy: Planning for Climate Change, Growth, and Natural Heritage Preservation," 25th Biennial Groundwater Conference and 14th Annual Meeting of the Groundwater Resources Association of California, Sacramento (October 26).
2005	Moderator, Panel on Groundwater. California Water Law Symposium. University of San Francisco School of Law, San Francisco, CA. (January 22).
2004	Panelist, Fall Meeting of the Dissertation-Year Fellowship Program and the President's Postdoctoral Fellowship Program, Oakland, Ca. (October 1).
2004	"Global Warming and Environmental Justice," California League of Conservation Voters Environmental Justice Alliance. San Francisco, CA (May 20).
2004	Participant, Workshop on Developing a Water Reuse Economic Framework, sponsored by the National Water Research Institute and WateReuse Foundation. Pomona, CA (May 10-12).
2004	"Not an accident? Understanding Why One Billion People Worldwide Lack Reliable Drinking Water." Inaugural talk of the Synergy Lecture Series. U.C. Santa Cruz Science and Engineering Library (April 27).
2004	Participant, Water Reuse Research Needs Workshop. San Diego, CA (February 2-4).
2003	"Environmental Justice and Urban Water Management," Los Angeles Area Monthly Environmental Justice Luncheon Series, sponsored by The California League of Conservation Voters. Santa Monica, CA (October 30).
2003	PrecipNet research meeting, National Center for Ecological Analysis and Synthesis. Santa Barbara, CA (March 21-23).
2003	"Reporting on the Colorado River and the Salton Sea," U.C. Berkeley Center for Water Resources, sponsored symposium for journalists (March 15).
2003	"Innovations in State Environmental Policy," presented to State Senators and their staffs. U.C. Berkeley (January 23).
2002	Participant, California Water Law and Policy Conference, April 8-9, San Francisco.
2002	Invited speaker, Institute of the Americas H_2O Americas Conference, on the topic of challenges and benefits of water privatization, April 24, San Diego.
2002	"Property Rights, Ecosystem Services, and Climate Change in the Rural West," to the Analysis and Synthesis of Precipitation and Ecosystem Change Conference, National Center for Ecological Analysis and Synthesis (NCEAS), September 5-7.

2002 "Salton Sea: Historical Accident, Modern Enigma," Santa Cruz Museum of Natural History, February.

2001 "Regional Climate Modeling at the District Level," Annual Meeting of the American Water Resources Association, Albuquerque, NM, Nov. 13.

2000 Guest Speaker, "Community Forum" of *Action Pajaro Valley.* Topic: "Meeting the Challenge of Seawater Intrusion in the Pajaro Valley," Watsonville, CA, September 21.

2000 Presenter, "Water Reallocation in Theory and Practice," before the Berkeley Water Working Group. March 3. Presentation is available at: http://www.cnr.berkeley.edu/csrd/html/projects/0004/index.html

2000 "Evaluating Regional Impacts and Adaptations to Climate Change: The Case of California Water," (co-author K. Merritt) presented to the quarterly C-DELSI Meeting, Santa Cruz. May 19.

2000 Featured Guest, *Eco Review* television show, on the topic of watershed management, April 25.

2000 Lectured on *Rivers of Gold*, Capitola Book Café, Capitola, Ca., March 28.

2000 Featured Guest, KUSP Radio talk show, on water reallocation. March 27.

2000 Featured Guest, KSCO Radio "Saturday Morning Agricultural Hour," on water reallocation, February 26.

1998 3-day Workshop on International Water Policy for graduate students of the Monterey Institute of International Studies, October 16-18.

1998 "Water: A Precious Resource," panelist at a community forum on water issues along California's Central Coast," April 29.

1998 "Market-based Water Conservation on the Monterey Peninsula: The Fair-Use Management Proposal," Monterey Bay Regional Studies Seminar Series, April 24.

1998 "Water Marketing in California: an Update," International Water Issues Seminar, University of California, Santa Cruz, February 9.

1997 "Domestic and International Water Quality Issues," Monterey Institute of International Studies, Monterey CA. October 23.

1997 "The Economics of Fresh Water Policy," Natural Resource Economics Class, University of California, Santa Cruz, October 14.

1997 "California Water Marketing: An Alternative Route to Reform," Environmental Studies Board Seminar Series, University of California, Santa Cruz, January 29.

1996 "A New Approach to Reallocating California's Water Resources," Energy and Resources Group Spring Colloquium Series. April 3.

1995 "Links Between Water Science and Water Policy," presented to the course, "Scientific Foundations of International Environmental Policy," Monterey Institute of International Studies, Monterey CA. November 7.

MEMBERSHIPS AND ACTIVITIES IN PROFESSIONAL ORGANIZATIONS

2006- Member, Project Advisory Committee, WateReuse Foundation, Exploring the Value of Reliability Benefits for Reuse and Desalination Projects, WRF 06-002.

2005- Member, Research Advisory Committee, WateReuse Foundation, a national committee that provides long-term advising on the research direction of the Foundation. Reappointed 2007.

2001 Member, Proposal Advisory Committee, WateReuse Foundation Research Program. Attended workshop to making funding decisions for the 2001 Call for Proposals, San Diego, September 7.

1998 Participant, Water Education Foundation 1998 Update on Recent Water Law and Policy, San Diego, CA. July 9-10

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IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF CALIFORNIA

NATURAL RESOURCES DEFENSE COUNCIL, *et al.* Plaintiffs, v. DIRK KEMPTHORNE, Secretary, U.S. Department of the Interior, *et al.* Defendants. SAN LUIS & DELTA-MENDOTA WATER AUTHORITY and WESTLANDS WATER DISTRICT; CALIFORNIA FARM BUREAU FEDERATION; GLENN-COLUSA IRRIGATION DISTRICT, *et al.*; CALIFORNIA DEPARTMENT OF WATER RESOURCES, and STATE WATER CONTRACTORS, Defendant-Intervenors.	Case No. 05-CV-01207 OWW TAG DECLARATION OF PETER H. GLEICK, Ph.D. IN SUPPORT OF PLAINTIFFS' PROPOSED INTERIM REMEDIES Date: August 21, 2007 Time: 9:00 a.m. Courtroom: 3 Judge: Hon. Oliver W. Wanger

I, Peter H. Gleick, declare as follows:

1. I am a founding member, and current President, of the Pacific Institute for Studies in Development, Environment, and Security in Oakland, California, created in 1987. I have more than 20 years of professional experience analyzing, assessing, measuring, modeling, and reporting on freshwater issues, with a focus on water-use efficiency. I have a B.S. in Engineering and Applied Science (1978 cum laude and with distinction) from Yale University. I have an M.S. in Energy and Resources (1980) from the University of California, Berkeley. I have a Ph.D. in Energy and Resources (1986) from the University of California, Berkeley. Both of these graduate degrees were given for work on water resources in California. I am an elected member of the United States National Academy of Sciences. In 2001, I was appointed an Academician of the International Water Academy in Oslo, Norway. In 2003, I was awarded a MacArthur Foundation Fellowship for my work on water conservation science and policy. I have served on the California Department of Water Resources Public Advisory Committee for the California Water Plan.

2. The Pacific Institute is a non-profit corporation dedicated to finding solutions to the related problems of regional and global environmental degradation, unsustainable development, and political conflict through interdisciplinary research, policy analysis, and public outreach. We work collaboratively with water users, corporations, environmental and community groups, local, state, and national governments, and international organizations to address water issues.

3. As founding member and President, I have guided and participated in the Pacific Institute's work on California water issues since its inception in 1987. In 1993, the Institute began comprehensive water conservation and efficiency analysis for the State of California's urban and agricultural sector, including residential, commercial, industrial, and institutional water use, and we published an analysis of this in 1995.[1] I served as a Science Advisory Expert for the CALFED Independent Review Panel on Agricultural Water Conservation Potential in 1998. In 1998, we were contracted by the U.S. Department of the Interior to conduct an independent review of the water-use efficiency analyses of CALFED.[2] In 2003, the Institute published a report on the potential for urban water conservation and efficiency statewide.[3] The results of this work have been adopted in state water planning documents, including the 2005 California Water Plan, and the work of the Planning

and Conservation League. Local water agencies and organizations have requested that the Institute expand this work to address local water concerns. In September 2005, the Pacific Institute released a new study with an analysis of a "high efficiency" scenario for California urban and agricultural users to the year 2030.[4] I was the lead author of this study.

4. This declaration will address three main issues: the kinds of natural and human-caused variations in water supply that face California water users; the ways they have responded to those variations in the past; and the potential for future responses to changes in water availability. The conclusion of my analysis is that substantial reductions in water demands from the Delta are possible in both the short-term and long-term, and that these reductions can be made cost-effectively, with existing technologies and oft-used water strategies. In formulating this declaration, I have considered the materials specifically identified in the endnotes to this report.

5. Water users throughout the State of California are faced with natural wet and dry variations in water supply associated with the natural hydrologic cycle. Increasingly, human factors are playing a role in water supply reliability, including growing competition among users and efforts to restore natural ecosystems by returning water allocations to them, or altering the timing of existing withdrawals.

6. California water users have demonstrated the ability to develop and implement creative and collaborative responses to these variations, including especially a wide range of "conservation" and "efficiency" actions that permit both temporary and permanent reductions in water use. These include changes in technology and policy. Indeed, these actions are considered the foundation of future water policy for the State of California, as described in the most recent California Water Plan from the Department of Water Resources, which states:

> The water plan provides a Framework for Action, or roadmap, that lays out the role of State government and the water community to ensure that California has sustainable water uses and reliable water supplies in 2030 for all beneficial uses. *The framework identifies three foundational actions—use water efficiently, protect water quality, and support environmental stewardship—that will ensure sustainable water uses.* These foundational actions must be central to California water management.[5] (emphasis added)

7. Conservation and efficiency policies and technologies are not merely hypothetical approaches to increasing water savings; they are proven effective tools for reducing demand over time. For example, total water use in California was less in 2001 than it was in 1975 according to the U.S. Geological Survey national water use reports, yet population increased by nearly 60 percent and gross state product increased 2.5 times during this period. Forty years ago, we used nearly 2000 gallons for every person in the state every day. Today, we use half that amount.

7a. Although Californians have improved efficiency of our water use over the past 25 years, current water use is still wasteful. The research I have directed at the Pacific Institute for 20 years concludes that there is substantial untapped potential for both urban and agricultural water users that receive water from the Sacramento-San Joaquin river basins to permanently reduce wasteful uses of water and improve their water-use efficiency. There is also the potential for temporary, shorter-term conservation actions that can reduce water demands.

7b. The Pacific Institute's 2003 report ("Waste Not, Want Not"), funded by California foundations and state water agencies and extensively peer reviewed, provides a comprehensive statewide analysis of the conservation potential in California's urban sector. This study funds that existing, cost-effective technologies and policies can reduce current (year 2000) urban demand by more than 30 percent. The Institute's report "California Water 2030: An Efficient Future" found that similar, substantial savings are available from the agricultural sector as well. More than 65 percent of all crops in California are still grown with inefficient flood or sprinkler irrigation systems. Studies have shown, as cited in that report, that installing efficient irrigation technology such as drip systems can reduce water use and increase agricultural yields. Given that the agricultural sector is responsible for consuming around 80 percent of Californian's use of water, even small efficiency improvements can produce tremendous water savings. Additional water savings are possible if farmers continue to the trend of moving away from water-intensive crops like cotton, pasture, rice, and alfalfa in favor of more valuable, low-water crops like many vegetables, fruits, and nuts.

8. Research from the Pacific Institute and data available from the State of California and California water users also shows that water users in the San Joaquin and Sacramento hydrologic regions, or in regions that use water exported from these watersheds, have not fully implemented

long-term water management and efficiency measures used by similarly situated water users that also face potential water shortages. There is additional potential for both agricultural and urban water users to reduce demand on a temporary basis through short-term actions, some of which can be implemented at little or no cost.

Defining "Water-Use Efficiency" and "Water Conservation"

9. A wide range of water-management actions are available to lessen the effect of any reduction of water supply. Two broad management responses are the focus of this declaration: (1) "efficiency" responses focused on reducing demand by permanently improving the efficiency of existing agricultural and urban uses; and (2) "conservation" responses focused on reducing diversions and pumping requirements by temporarily changing uses or behavior.

10. There are many and varied definitions of "water-use efficiency." In this declaration, improving "water-use efficiency" refers to the potential to provide the same beneficial use to water users while utilizing less water, *i.e.*, to reduce the water needed to do a specific task or satisfy a specific need. Examples include crop shifting while producing the same or more income, replacement of inefficient irrigation methods to boost yields per unit water (or to boost income per acre, or income per gallon), replacement of inefficient water appliances, removal of outdoor water-intensive landscaping in commercial, residential, and institutional settings, and changes to industrial and commercial water processes. Efficiency improvements can be measured and evaluated at the field, crop, household, or business level, or at a larger "basin" level. The focus here is to reduce the use of water that is not used productively to produce a good or service.

11. In this declaration, water "conservation" refers to the additional potential to cut water use by changing benefits, goods, and services. Examples include single-season crop shifting, fallowing, and land retirement for agricultural users, and eliminating lawn watering, taking shorter showers, reducing car washing, and comparable urban actions commonly applied during severe droughts as voluntary responses.

12. Both approaches may be appropriate in certain circumstances, such as drought, temporary or intentional cutoffs of water supplies resulting from changes to operations of the Delta pumps, and changes in allocations.

Discussion and Analysis

13. Water availability naturally fluctuates with wet and dry extremes around the long-term average. Water districts and users may also experience significant short-term reductions in water allocations due to political, economic, or technical factors. Perhaps the most important function of water agencies and irrigation districts is to help water users manage these fluctuations through the development of water supply infrastructure and management practices.

14. These actions are also at the heart of official California water policy. As described in the latest California Water Plan, their official Framework for Action identifies "*three foundational actions—use water efficiently, protect water quality, and support environmental stewardship.* Describing "use water efficiently," DWR goes on to say:

> To minimize the impacts of water management on California's natural environment and ensure that our state continues to have the water supplies it needs, *Californians must use water efficiently to get maximum utility from existing supplies.* Californians are already leaders in water use efficiency measures such as conservation and recycling. Because competition for California's limited water resources is growing, we must continue these efforts and be innovative in our pursuit of efficiency.
>
> Water use efficiency will continue to be a primary way that we meet increased demand. In the future, we must broaden our definition of efficient water use to include other ways of getting the most utility out of our groundwater and surface water resources and water management systems: Increase levels of urban and agricultural water use efficiency...[6]

I. Agricultural Use

15. Growers understand their sensitivity to climatic variability and supply uncertainties, and they understand the value and potential of improving efficiency. A survey by the Center for Irrigation Technology at California State University, Fresno, asked growers "What contingency plans do you have in the event of a prolonged drought?" Growers responded with a wide variety of tools, but the answer chosen more often than any other was "improve system efficiency," showing that the potential to do so is not only there, but considered their first choice. The next two listed were "develop a deficit irrigation plan" and "modified cropping plan."[7]

16. A practical example of the historical capacity to act in the face of supply shortfalls is the Westlands Water District (the largest member of the San Luis and Delta-Mendota Water

Authority). Like other water agencies, Westlands experiences allocation reductions on a somewhat regular basis due to the natural variation in California's water supply and its position as a junior water right holder. During the severe 1987-1992 drought in California, reductions in the delivery of federal surface water from the Central Valley Project (CVP) to Westlands were as large as 70 percent. During this drought, growers within the Westlands Water District responded to water-supply changes by using both conservation and efficiency tools including:

A. Short-term replacement of lost surface supplies with other sources including water marketing, transfers, and increased groundwater pumping,

B. Short-term fallowing of lower valued crops.

C. Long-term permanent improvements in the efficiency of their water use.

D. Long-term changes in crop types.

These actions, described in detail below, are common to all water agencies or districts, including urban agencies, and help reduce the economic and employment impacts of those reductions.

Short-Term Changes in Water Supplies

17. As Figure 1 shows, Westlands relies on a mix of sources of water over time. While CVP water is the dominant source, the District also uses groundwater, transfers from other Districts and users, and other supplies. As the availability of federal surface supplies changes up and down, their reliance on other sources also changes up and down to compensate.

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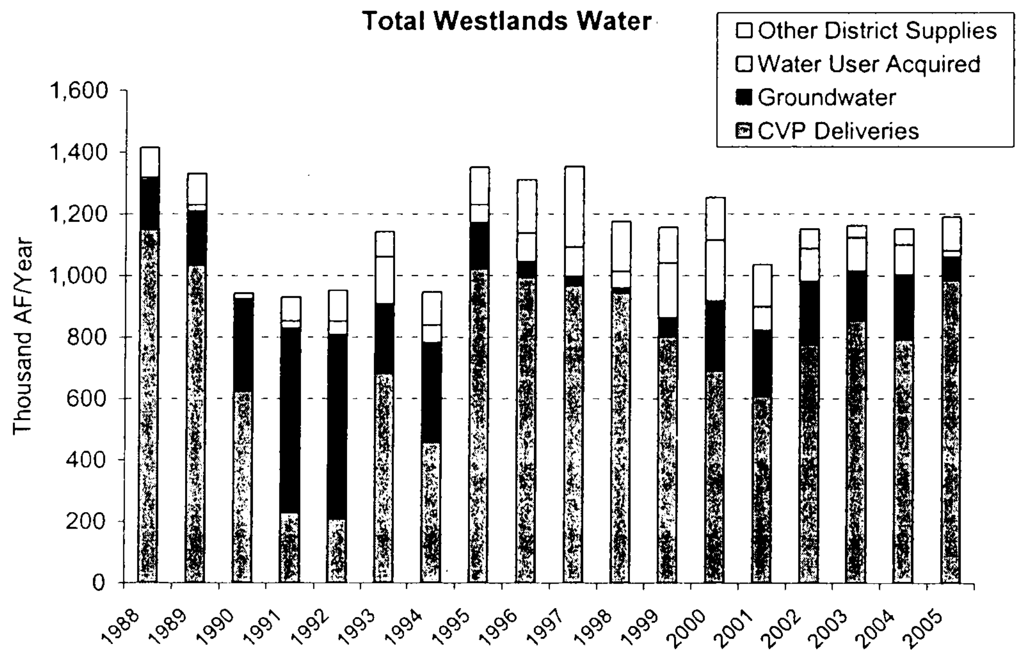

Figure 1. The use of water by the Westlands Water District from 1988 to 2005, showing the source of water. Data come from the Westlands Water District.[8]

18. The option of temporarily relying on increased groundwater pumping is a particularly important one: Central Valley growers regularly rely on short-term increases in groundwater pumping in dry years. Using Westland's data, Figure 2 shows that during the 1987-1992 drought period, CVP surface water deliveries to Westlands dropped approximately 70 percent, from an average of 1,150,000 acre-feet ("af") per year to nearly 300,000 af per year. To make up this shortfall, groundwater pumping increased from 160,000 af per year to 600,000 af per year and has now dropped again during the recent wet years. Particularly when groundwater levels are relatively high (as is currently the case), farmers can pump additional groundwater for very little cost. The current drought has increased groundwater withdrawals to make up for reduced surface supplies – precisely what managed groundwater is intended to do. Similarly, the expansion of groundwater recharge and innovative water banking arrangements made by water districts in Kern County with MWD and other Delta customers, were designed to help buffer drought impacts for both urban and agricultural users.

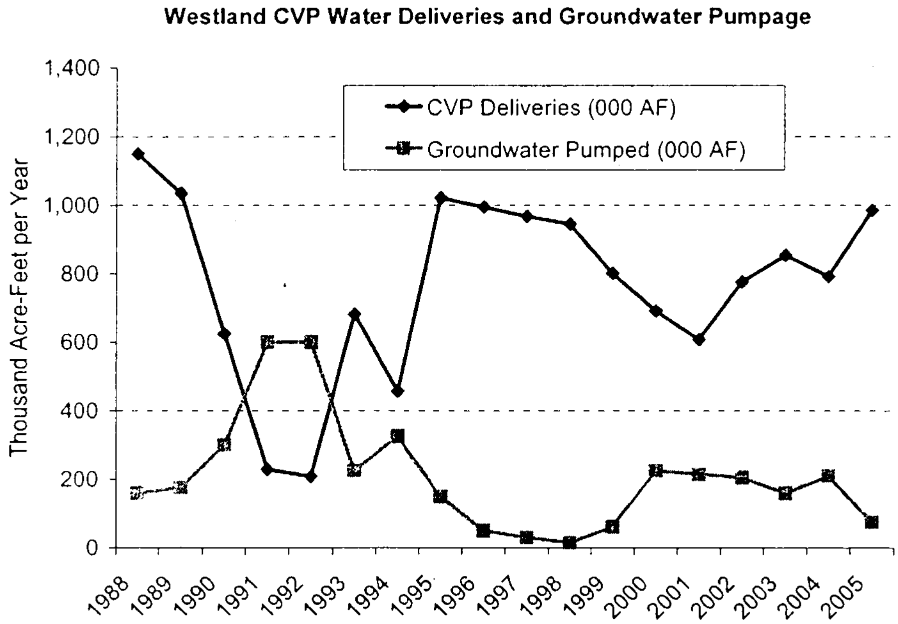

Figure 2. Groundwater and surface water use by Westlands Water District. During the drought of the late 1980s and early 1990s, surface water deliveries dropped and groundwater pumping increased substantially. Groundwater pumping in recent years has dropped back to around or below 200,000 acre-feet per year.[9]

19. There is the risk that increased pumping, even if temporary, could cause long-term environmental impacts, reduced groundwater storage capacity, and land subsidence in some regions, but in many basins in the Central Valley careful conjunctive use of surface and groundwater is common. As Figure 3 shows, high rates of groundwater pumping by Westlands lead to drops in groundwater levels, but groundwater levels recover when pumping declines. Indeed, at present, groundwater levels are relatively high, showing that groundwater is again readily available for use in an emergency drought, for emergency shutdown of surface deliveries, or for other needs. Water districts in Kern County, including KCWA, Semi-Tropic, and Arvin Edison have also developed large water banks to store surface supplies for later use in dry years. These districts have access to multiple supply sources, including local water, state water project supplies, and the San Joaquin River watershed, and have stored large amounts of water in the recent wetter years.

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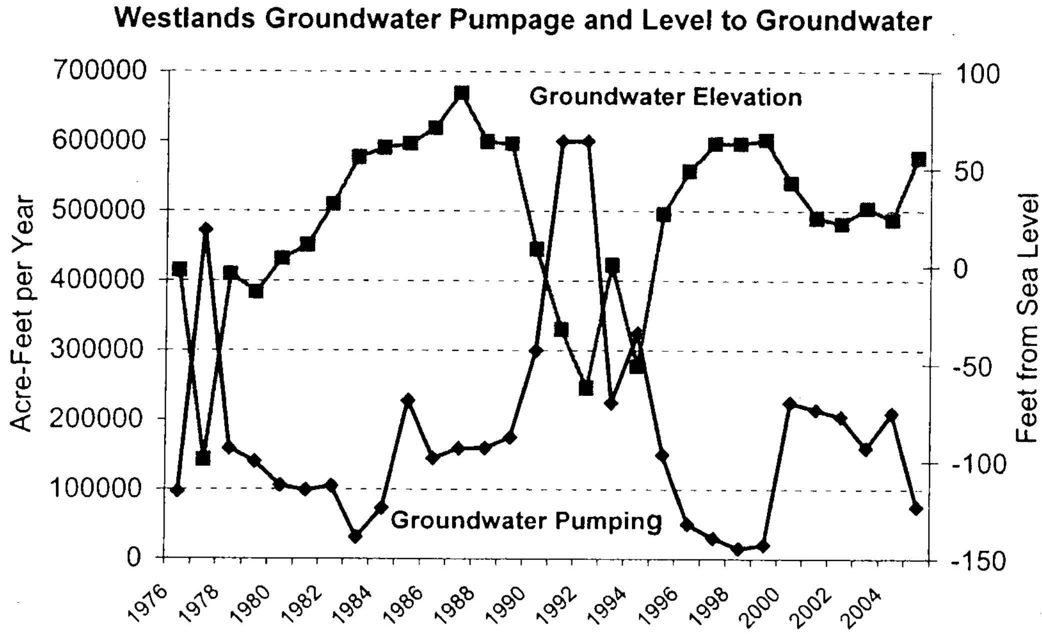

Figure 3: Groundwater pumping volumes (acre-feet per year) and groundwater levels (elevation in feet from sea level) over time for the Westlands Water District. Groundwater levels may drop during high pumping periods but recover during wetter periods. Current groundwater levels are high.[10]

Short-Term Fallowing of Lower-Valued Crops

20. In addition to longer term efficiency improvements, agricultural water users have the potential to implement shorter-term reductions in water use. For example, they can fallow land during severe droughts, reducing total agricultural water demand. All water districts typically fallow some land every year as part of regular rotations, but large amounts of fallowing are usually considered only as a last resort. Any policies encouraging such fallowing must also consider the economic impacts of such policies. This option is comparable to short-term cutbacks in urban water use that occur during extreme shortages.

21. Data from Westlands Water District show that some fallowing always occurs, even during wet years, and that farmers are unlikely to substantially fallow land even during very dry years – preferring instead to find other sources of water (see section A, above), change crop type, or improve efficiency. Figure 4 shows that Westlands growers may fallow as much as 125,000 acres during dry years, but even in the recent wet years over the past decade have typically fallowed between 50,000 and 100,000 acres.

21a. Other water districts have similar options. For example, the San Joaquin River Exchange Contractors currently make up to 150,000 acre-feet per year of their water supply available for sale or exchange with other users.[11] The NEPA/CEQA review of this program notes that the Exchange Contractors have developed this supply largely through conservation efforts (up to 100,000 acre-feet), with additional contributions through temporary land fallowing and idling crops.[12]

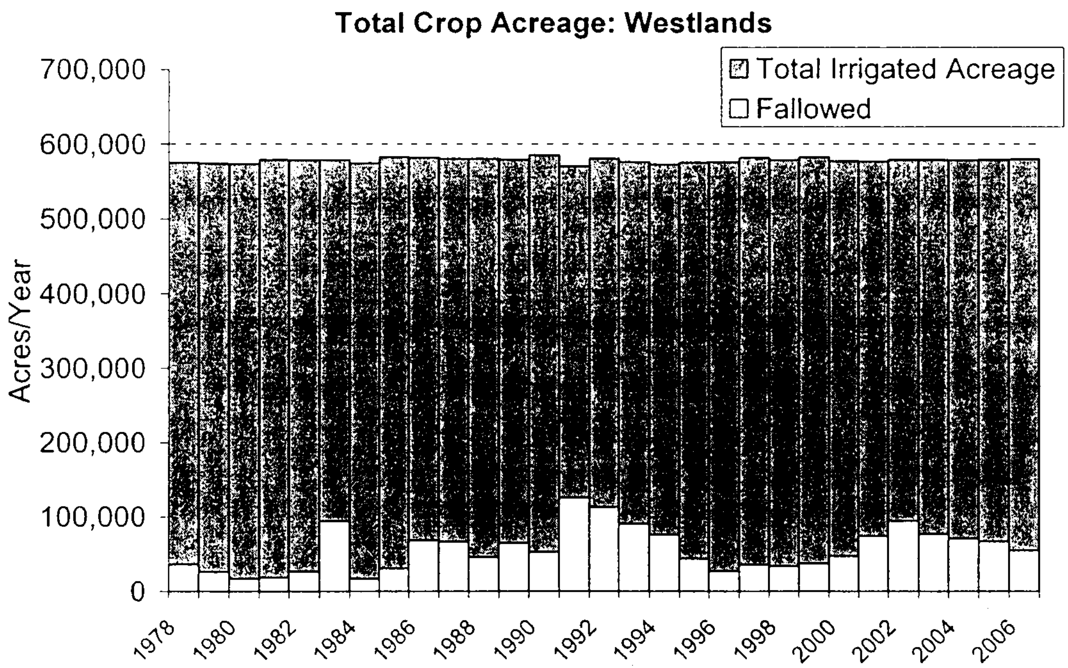

Figure 4: Total irrigated and fallowed acreage in the Westlands Water District from 1978 to present.[13]

Long-Term Improvements in Agricultural Water-Use Efficiency

22. Water is not used as efficiently as possible by Delta water users, even given current economics and technologies. This is one of the major conclusions of State of California analyses and the work of the Pacific Institute.[14] One of the most important arguments in support of the conclusion that improvements in the efficiency of water use are possible comes from growers themselves. A survey of more than 400 growers in the San Joaquin Valley, conducted by the Center for Irrigation Technology at California State University, Fresno, very clearly notes that farmers *themselves* understand that they can do more with the water they have, or even reduce current uses.

In some ways, this is the clearest evidence of the potential to use water more efficiently – academics can argue about data and methods, but farmers themselves have a strong sense of what is possible in their own fields. In this survey, 436 growers responded to the question, "do you irrigate as efficiently as you think you could." *Forty percent* of these growers responded "no" and indeed they offered a list of many dozens of different ways they felt they could improve irrigation efficiency.[15]

23. There has been a substantial change in irrigation type throughout California, permitting increased yields, increased water-use efficiency, and reduced water applied per acre for many crops. In particular, California growers are slowly but consistently moving toward more efficient irrigation methods. Figure 5 shows statewide changes in irrigation method applied to vegetable crops between 1972 and 2001, as reported by DWR surveys. These surveys show that drip irrigation overall has been increasing at a rapid rate, while less efficient gravity/surface irrigation has been declining.[16] Figure 6 shows the same trend statewide for all cropland in California. This trend is likely to continue and could be further accelerated by appropriate policies. Drip irrigation can boost crop yields and production while reducing overall water use. *See* Appendix.

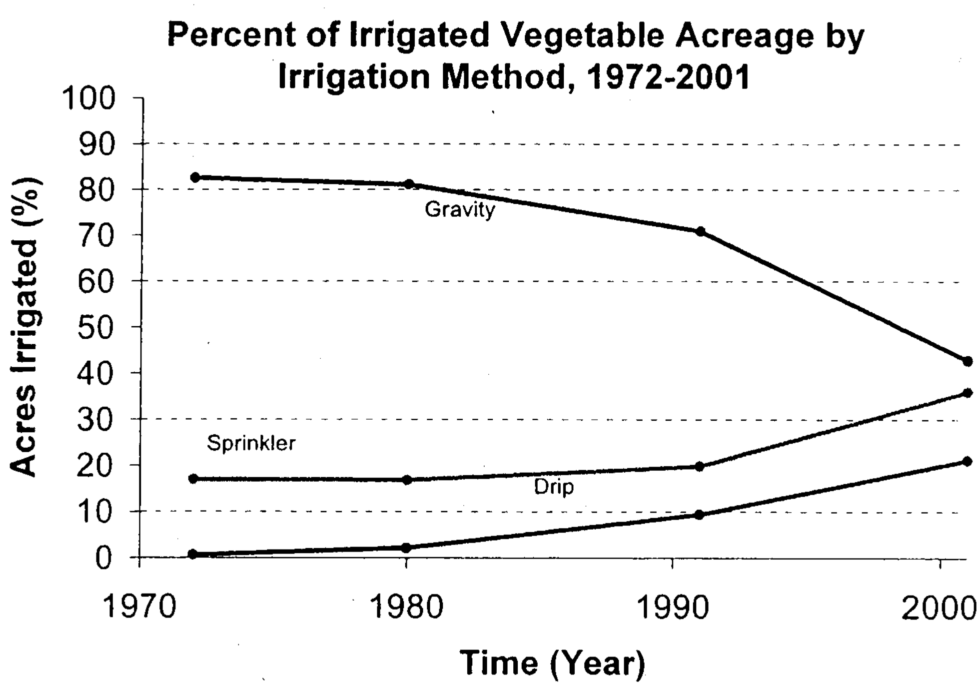

Figure 5: Percentage of vegetable crop area irrigated with gravity, sprinkler, and drip systems for 1971, 1980, 1992, and 2001 from the California Dept. of Water Resources, showing changes in irrigation method over time toward more water efficient systems. The 2001 survey is the most recent statewide.[17]

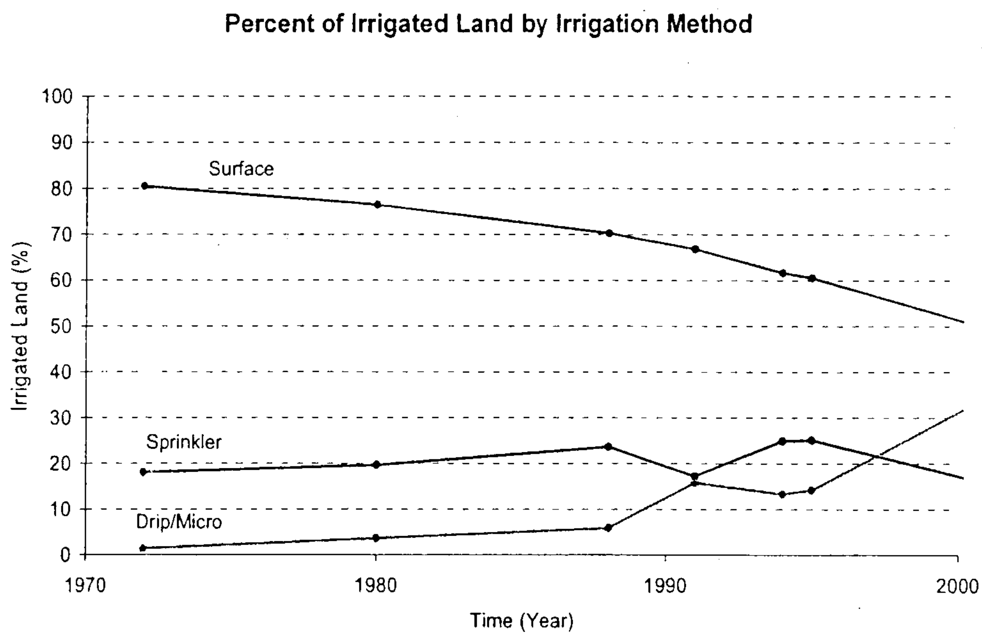

Figure 6: Historical data on the percent of irrigated land (all crops) under each irrigation method between 1972 and 2001. (Data from California DWR surveys and Orang et al. 2005.)[18]

24. The change toward more efficient irrigation methods has been slower in the San Joaquin and Sacramento Valleys than statewide. For example, Figure 7 shows the irrigation methods used on field crops statewide, and in the San Joaquin and Tulare hydrologic regions, according to the Department of Water Resources.[19] As this graph clearly shows, the San Joaquin and Tulare regions are still relying on more wasteful surface irrigation methods, and have shifted more slowly than other parts of the state to more efficient sprinkler systems.

25. At a hydrologic level, the Tulare Lake and San Joaquin regions apply water less efficiently than the state average for all crop types. Surface irrigation is used on 95 percent of field crops in the Tulare and San Joaquin hydrologic regions, compared to 87 percent in the State on average. For vineyards, the difference is even greater: 45 percent of vineyards in the Tulare Lake and San Joaquin hydrologic regions are irrigated with less-efficient surface methods, compared to only 21 percent in the State as a whole. For orchards and vegetables, the San Joaquin and Tulare Lake regions are slightly less efficient than the state average.

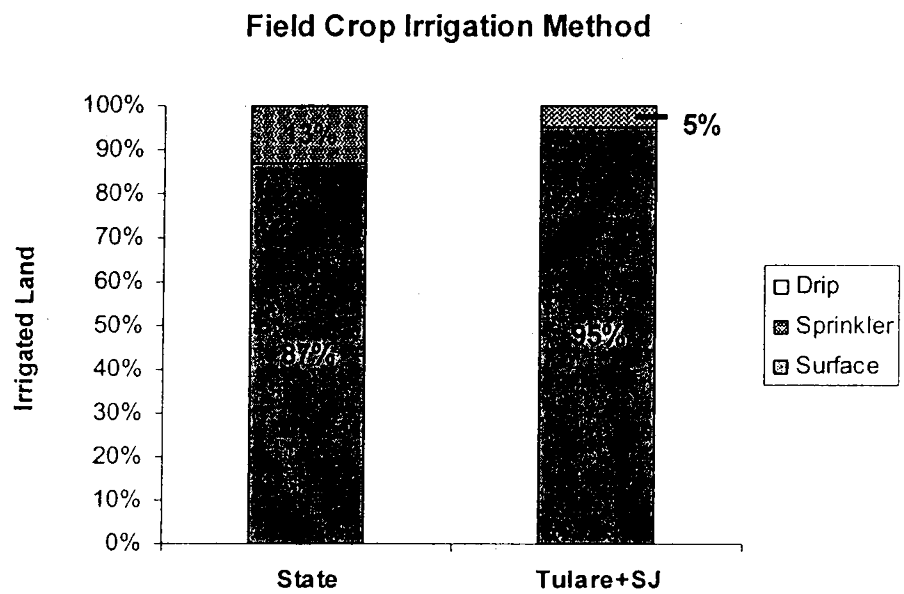

Figure 7. Percent of field crops statewide and in the Tulare and San Joaquin (SJ) hydrologic regions under drip, sprinkler, and surface irrigation, in 2001. Less efficient technologies are used more frequently on field crops in the Tulare and San Joaquin regions than statewide.[20]

26. While it is difficult to accurately measure unproductive evaporation, it is quite clear that such wasted water exists in all irrigation systems. For example, "most measurements have shown spray evaporation and drift to range from 5 to 20 percent of the water discharged."[21] In a series of field-level water balances, Molden found that evaporation losses accounted for 17 percent of total depletion in wheat crops and 30 percent in cotton crops.[22] Hillel estimates that, under surface flood irrigation, 20 to 30 percent of applied water is lost to evaporation from open water surfaces and transpiration by weeds.[23]

27. There are a number of different ways to reduce unproductive evaporation losses. It is widely understood that changing irrigation frequency, irrigation method, mulching, shading, and so forth can modify evaporation.[24] Unproductive evaporation can be reduced without adversely affecting crop production, soil quality, or yields. For example, some water is lost to winds immediately during and following field application. Changing irrigation technology has been shown to have a major effect on reducing evaporative wind losses while maintaining or improving crop yields. Efficient crop maintenance is also important: a well-watered crop with dry soil and plant

surfaces (full cover, no weeds) requires less water than a well-watered crop with wet soil and plant surfaces and weeds in between plants.

28. Irrigation methods that introduce water directly into the root zone, such as drip irrigation, without sprinkling the foliage or wetting the entire soil surface minimize deep percolation, surface runoff, and unproductive evaporative loss, while surface application induces depletion by evaporation. Drip irrigation offers the additional benefit of keeping the soil surface between the rows of crop plants dry, discouraging the growth of weeds that compete with the crops for nutrients and moisture.[25] Evaporation can also be reduced by improving irrigation timing and providing the crops with water when they need it most. For example, there is a greater potential to reduce ET during the midday when transpiration is reduced and evaporation is at its highest. Improvements in irrigation technology and irrigation management can both decrease evaporative losses.

29. According to Piper and Cappelluci, efficient irrigation systems tend to increase crop yield or decrease crop production inputs, an effect noted by many others as well.[26] Bernardo and Whittlesey reported that the potential for conserving water without greatly affecting producer income runs up to 35 percent for surface irrigation and up to 25 percent under center pivot irrigation.[27] Because a substantial amount of irrigated land in the Central Valley is still irrigated with surface or sprinkler methods, these results suggest that total crop yields can be maintained or improved with a smaller input of water; or conversely that crop yields can be significantly boosted with the water currently being used by the agricultural sector. Recent experience with precision irrigation systems in California supports this conclusion (see Appendix).

30. Reductions in evaporation can also be achieved by reducing surface water exposure, evaporation from soils, and mis-application of irrigation water. Indeed, the switch from surface flooding/gravity irrigation to sprinklers or precision drip systems is done in part to reduce this unproductive evaporative loss of water.

31. These data suggest that if growers in Central Valley districts improved irrigation technology even up to the current state average, water savings would result. Moreover, irrigation efficiency can be significantly improved beyond current state average levels.[28]

Long-Term Changes in Crop Type

32. A fourth option regularly employed by growers in response to the perception or imposition of long-term changes in water conditions is changing the type of crop grown. As water becomes more expensive or scarcer, farmers often switch to higher-valued, lower water-using crops.

33. In California agriculture, approximately half of all water used goes to grow rice, cotton, alfalfa, and irrigated pasture. Yet these four crops typically only produce 5 percent of total agricultural revenue, according to data from the California Department of Water Resources.[29] This vast mismatch in economic productivity of water use is driven by many factors, including water availability, pricing, federal subsidies, soil conditions, and the experience of growers with particular crops and equipment.

34. Discussions of crop switching (i.e., growing different kinds of crops on the same land) have traditionally been excluded from California water policy debates. Yet such changes in cropping patterns over time in California have probably had a greater impact on total agricultural water demand, water quality, and consumptive use than any other factor. Policies aimed at encouraging more water-efficient crops could have very large long-term benefits for the California water balance without adversely affecting farm income, and there is evidence that such changes can improve farm income.[30] For example, an analysis from the Pacific Institute shows that crop revenue could actually increase overall by switching a modest amount of acreage out of rice, cotton, alfalfa, and pasture to higher-valued crops, while saving as much as 1.5 million acre-feet of water.[31]

35. Figure 8 shows the shift in the Westlands District away from field crops toward less water-intensive vegetable crops over the past 35 years. As the figure shows, acreage planted in fruits and vegetables has tripled, while acreage planted in water-intensive cotton and other field and row crops has dropped enormously. Yet total agricultural income has more than tripled over the past 30 years to over $1 billion annually.[32]

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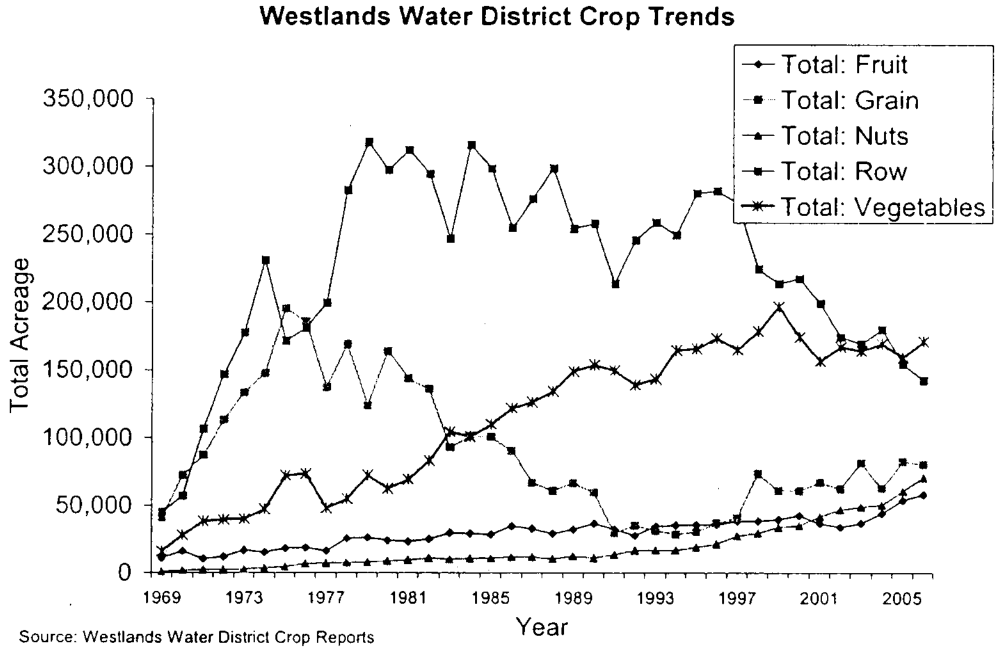

Figure 8: Trends in crop types grown in the Westlands Water District from 1969 to 2006. Total row and grain crops are slowly but consistently being replaced with higher valued, lower-water using fruit, nut, and vegetable crops.[33]

36. There has a similar trend over the past 20 years in the Friant Division away from grain and field crops toward more profitable vegetables, orchards, and vineyards. Figure 9 shows the historical trends in crops planted in the Friant Division between 1987 and 2004. While total crop area has not changed during this period, significant crop shifting has occurred; field crop acreage has declined by 20 percent, whereas vegetable and vineyard acreages have increased by 11 percent and orchard acreage has increased by 26 percent. Orchards and vineyards now account for over 60 percent of the crop area.

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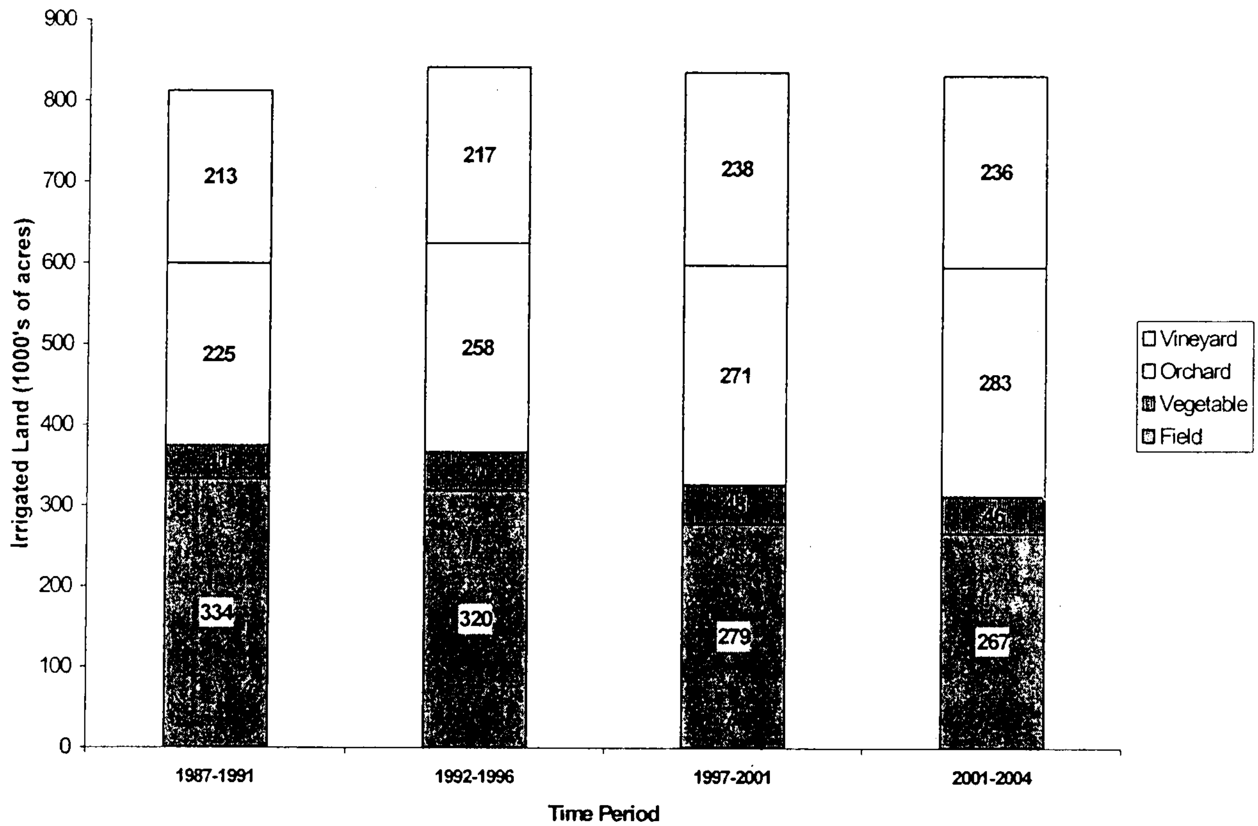

Figure 9: Irrigated acreage in the Friant Division by major crop type between 1987 and 2004.[34] Area devoted to orchards and vineyards is growing; field crop area is decreasing.

37. There is no reason to believe that this trend will stop, and many reasons to believe it will continue or even accelerate. These include:

- Growing pressures on water availability, which encourage growers to plant crops with lower water demands, or permanent crops likely to be given higher water priority during droughts;
- Higher profit for food crops, which can be grown productively on California farmland;
- The ability to better control evaporative losses using precision irrigation, which is more suited to orchards, vineyards, and row crops than low-valued field and grain crops.

38. Crop shifting trends suggest that the potential for water savings may be even greater in the future. Although studies have shown that drip systems apply water more efficiently than

surface irrigation for field crops, the adoption of this technology for field crops has been slower than for other crop types.[35] Over 50 percent of orchards and vineyards statewide are irrigated with drip, while less than one percent of field crops are irrigated with drip. Thus as agricultural land in the Friant Division is converted to higher-value orchards and vineyards, overall water needs will go down, and the ability to install even more efficient irrigation systems goes up.

39. Finally, even without changes in the actual crop types planted in California, we expect to see the introduction of new varieties of crops that are more water-efficient. Traditional crop genetics and efforts to develop new crop varieties with advanced genetic engineering are likely to permit increasing crop yields with either similar or lower water requirements in the future.

II. Urban Use

40. Urban water use in the some of the regions dependent on the Delta is also substantially higher than in other regions of California, largely because of wasteful outdoor landscape irrigation in the hotter climates of the Central Valley and inland areas of Southern California and the Bay Area. Similar to agriculture, urban water savings in areas outside of the Delta export regions can free up water that in many cases can be transferred to Delta users. These outdoor water uses are not critical for health and well-being, and could easily be reduced temporarily (during a short-term emergency) or permanently (through changes in garden irrigation methods, landscape design, and management). Table 1 shows the high average total urban water use per person for the Sacramento, San Joaquin, and Tulare hydrologic regions, compared to the State average. The Table also shows that residential water use in these regions is higher than the State average, including both indoor and outdoor use. A comprehensive assessment of the potential for improving urban water use in the state as a whole showed that total urban needs can be satisfied with about 30 percent less water, simply by applying existing cost-effective water-efficiency technologies.[36]

41. Urban users can also respond to shortages in the short-term through behavioral changes such as taking shorter showers, using dishwashers and washing machines only when full, reducing unnecessary water use when shaving or teeth cleaning, etc. Urban water users can respond quickly to supply shortages caused by drought and the need to provide additional water for the

environment. In the early 1990s, the City of Los Angeles reduced water usage over 100,000 acre-feet in a year (17 percent reduction) as the drought continued and legal efforts to reduce diversions from the Mono Lake Basin succeeded and users became aware of the need and ability to protect ecosystems.[37]

Table 1: Urban Water Use is High in Central Valley Regions

Region	Total Urban Water Use (Gallons per Person per Day)	Residential Water Use (Gallons Per Person Per Day)
Sacramento Region	296	177
San Joaquin Region	312	220
Tulare Region	310	242
State Average	**233**	**145**

Data from the California Department of Water Resources (DWR). 2005. The California Water Plan Update. Public Review Draft (May 2005). Bulletin 160-05. Sacramento, California. Volume 3.

42. Data on specific regional urban uses in the parts of the Central Valley such as the Friant Division service area support the conclusion that comparable, and even greater, water savings are possible here. While Friant service area users get little water from the Delta, it can be a source of water for Westlands and other water users who depend on Delta water. They are, therefore, a potential source of water transfers in any future water management arrangement.

43. According to the California Department of Water Resources California Water Plan, current urban use (per person) in the Tulare Lake hydrologic region is around 310 gallons per person per day. Similarly, regional average per capita urban use in the San Joaquin River hydrologic region is around 304 gallons per person per day.[38] These levels are substantially higher than average statewide use. In part, this higher use is the result of the failure of major cities in the region from Sacramento to Fresno to meter household water use. Such meters have been shown to reduce urban water use when combined with rate structures that charge based on the volume of use.

44. It can be argued that urban water use is higher in these regions because of the warmer, drier climate, and larger average garden and lawn size. This is partly true, but when I correct for this difference and simply look at average indoor residential water use alone, the urban areas in this region still use substantially more water per person than the statewide average. Table 2 shows this comparison. As this Table shows, the state average of indoor residential water use is

Page 21 is missing - did not receive from the commenter.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge. Executed in Oakland, California, on July 23, 2007.

Dr. Peter H. Gleick

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[1] Gleick, P., Loh, P., Gomez, S., and Morrison, J. 1995. California Water 2020: A Sustainable Vision. Pacific Institute Report, Pacific Institute for Studies in Development, Environment, and Security. Oakland, California.

[2] Gleick, P.H. and D. Haasz. 1998. "Review of the CALFED Water-Use Efficiency Component Technical Appendix." Report to the United States Department of the Interior, Bureau of Reclamation, Grant No. 8-FG-20-16250. Pacific Institute for Studies in Development, Environment, and Security, Oakland, California (June 1998).

[3] Gleick, P.H. et al. 2003. Waste Not, Want Not: The Potential for Urban Water Conservation in California Pacific Institute Report, Pacific Institute for Studies in Development, Environment, and Security. Oakland, California (hereafter "Waste Not, Want Not").

[4] Gleick, P.H., H. Cooley, D. Groves. 2005. California Water 2030: An Efficient Future. Pacific Institute Report, Pacific Institute for Studies in Development, Environment, and Security. Oakland, California.

[5] California Department of Water Resources. 2005. The California Water Plan Update. A Framework for Action. Sacramento, California, page 2-1.

[6] California Department of Water Resources. 2005. The California Water Plan Update. A Framework for Action. Sacramento, California, page 2-5.

[7] Zoldoske, D.F. 2002. "San Joaquin Valley Grower Irrigation Survey." CATI Pub. #021201. Center for Irrigation Technology, California State University, Fresno, California, pp.14-16.

[8] Data from Westlands Water District: http://www.westlandswater.org/resources/watersupply/supply.asp?title=Annual%20Water%20Use%20and%20Supply

[9] Data from Westlands Water District, "Deep Groundwater Conditions: December 2005," Westlands Water District publication March 2006.

[10] Data from Westlands Water District, "Deep Groundwater Conditions: December 2005," Westlands Water District publication March 2006.

[11] See Final EIS/EIR, Water Transfer Program for the San Joaquin River Exchange contractors, Water Authority 2005-1014 (Dec. 2004; Draft Environmental Assessment/Initial Study, Groundwater Pumping/Water Transfer Project for 25 Consecutive Years (July 3, 2007), available at http://www.usbr.gov/mp/nepa/nepa_base.cfm?location=all.)

[12] FEIS, 12/04, at ES-6; DEA/IS, 7/07 at 2-11 to 2-12.

[13] Data from Westlands District annual crop reports.

[14] See the CalFed Water Use Efficiency conclusions, the Dept. of Water Resources Bulletin 160-05 (California Water Plan Update), and Gleick, P.H., H. Cooley, D. Groves. 2005. California Water 2030: An Efficient Future. Pacific Institute Report, Pacific Institute for Studies in Development, Environment, and Security. Oakland, California.

[15] Zoldoske, D.F. 2002. "San Joaquin Valley Grower Irrigation Survey." CATI Pub. #021201. Center for Irrigation Technology, California State University, Fresno, California, pp.14-16.

[16] Orang, Morteza N., Richard L. Snyder, and J. Scott Matyac. 2005. "Survey of Irrigation Methods in California in 2001". In California Department of Water Resources (DWR). The California Water Plan Update. B160-05, Sacramento, California.

[17] Orang, M.N., R.L. Snyder, and J. S. Matyac. 2005. "Survey of irrigation methods in California in 2001." In California Department of Water Resources (DWR). The California Water Plan Update. Bulletin 160-05. Sacramento, California.

[18] Orang, M.N., R.L. Snyder, and J. S. Matyac. 2005. "Survey of irrigation methods in California in 2001." In California Department of Water Resources (DWR). The California Water Plan Update. Bulletin 160-05. Sacramento, California.

[19] Source: Orang, Morteza. Personal communication on 8/31/05. Data extracted from Orang, M.N., R.L. Snyder, and J. S. Matyac. 2005. "Survey of irrigation methods in California in 2001." In California Department of Water Resources (DWR). The California Water Plan Update. Bulletin 160-05. Sacramento, California.

[20] Orang, M.N., R.L. Snyder, and J. S. Matyac. 2005. "Survey of irrigation methods in California in 2001." In California Department of Water Resources (DWR). The California Water Plan Update. Bulletin 160-05. Sacramento, California.

[21] Council for Agricultural Science and Technology (CAST). 1988. "Effective Use of Water in Irrigated Agriculture." Task Force Report No. 113. (June). Ames, Iowa, pp. 32, and 49-51.

[22] Molden, M. 1997. . "Accounting for Water Use and Productivity." System-Wide Initiative for Water Management. International Irrigation Management Institute. Sri Lanka.

[23] Hillel, D. 1997. "Small-Scale Irrigation for Arid Zones; Principles and Options." FAO Development Series 2. Rome, Italy

[24] Burt, C.M., Clemmens, A.J., Strelkoff, K.H., Bliesner, R.D., Hardy, L.A., Howell, T.A., Members, ASCE, and D.E. Eisenhauer. 1997. "Irrigation Performance Measures: Efficiency and Uniformity." *Journal of Irrigation and Drainage Engineering*, 123(6):423-442.
Hillel, D. 1997. "Small-Scale Irrigation for Arid Zones; Principles and Options." FAO Development Series 2. Rome, Italy.
Molden, M. 1997. "Accounting for Water Use and Productivity." System-Wide Initiative for Water Management. International Irrigation Management Institute. Sri Lanka.
Gallardo, M., Snyder, R.L., Schulbach, K., and L.E. Jackson. 1996. "Crop Growth and Water Use Model for Lettuce." Journal of Irrigation and Drainage Engineering, 122(6).

[25] Hillel, D. 1997. "Small-Scale Irrigation for Arid Zones; Principles and Options." FAO Development Series 2. Rome, Italy.

[26] Piper, R.A. and A.J. Cappellucci. 1993. "Reductions of Deep Percolation and Drain Water." Journal of Irrigation and Drainage Engineering. Vol. 119, No. 3, pp. 568-576.

[27] Bernardo, D.J. and N.K. Whittlesey. 1989. "Factor Demand in Irrigated Agriculture Under Conditions of Restricted Water Supplies." Resources and Technology Division, Economic Research Service, U.S. Department of Agriculture, Technical Bulletin No. 1765. Washington, D.C.

[28] As noted earlier from Gleick, P.H., H. Cooley, D. Groves. 2005. California Water 2030: An Efficient Future. Pacific Institute Report, Pacific Institute for Studies in Development, Environment, and Security. Oakland, California.

[29] According to the US Department of Agriculture and the California Agricultural Statistics Service, in 2002, these four crops (rice, cotton, alfalfa, and irrigated pasture) generated about $1.5 billion in revenue to farmers, out of a total annual gross agricultural revenue of around $27.5 billion (http://www.cdfa.ca.gov/). During that same period, these four crops used about 15 million acre-feet of water out of the total agricultural use of about 30 million acre-feet (Personal communication,

Scott Matyac, Department of Water Resources, October 20, 2004, data from file CaLWU092404.mdb, qry_AW_State(TAF)).

[30] Gleick, P., Loh, P., Gomez, S., and Morrison, J. 1995. California Water 2020: A Sustainable Vision. Pacific Institute Report, Pacific Institute for Studies in Development, Environment, and Security. Oakland, California.

[31] See Table 20 of Gleick et al. 1995, California Water 2020: A Sustainable Vision. Pacific Institute Report, Pacific Institute for Studies in Development, Environment, and Security. Oakland, California.

[32] Westlands reported that in 1978 total crop value was $333 million. They have now stopped posting total crop values on their website, but the $1 billion figure comes from a 2001 San Francisco Chronicle article "Central Valley irrigation district fights to save arid farmland, despite cost to taxpayers" by Eric Brazil, January 28, 2001.

[33] Data from the Westlands Water District annual crop reports.

[34] Data from "Expert Report of Charles M. Burt on Friant Service Area" August 18, 2005, Irrigation Training and Research Center, San Luis Obispo, California.

[35] Colaizzi, P.D., A.D. Schneider, S.R. Evett, and T.A. Howell. 2004. Comparison of SDI, LEPA, and Spray Irrigation Performance for Grain Sorghum. Transactions of the ASAE, 47(5): 1477-1492.
Kamilov, B., N. Ibragimov, Y. Esanbekov, S. Evett, and L. Heng. 2003. Drip Irrigated Cotton: Irrigation Scheduling Study by Use of Soil Moisture Neutron Probe. International Water and Irrigation, 23(1): 38-41.
Ayars, J.E., C.J. Phene, R.B. Hutmacher, K.R. Davis, R.A. Schoneman, S.S. Vail, and R.M. Mead. 1999. Subsurface Drip Irrigation of Row Crops: A Review of 15 Years of Research at the Water Management Research Laboratory. Agricultural Water Management, 42: 1-27.

[36] Gleick, P.H. et al. 2003. Waste Not, Want Not: The Potential for Urban Water Conservation in California Pacific Institute Report, Pacific Institute for Studies in Development, Environment, and Security. Oakland, California (hereafter "Waste Not, Want Not").

[37] See Table and Figure on page 1-6 of The 2005 LADWP Urban Water Management Plan (available at http://www.ladwp.com/ladwp/cms/ladwp007157.pdf). This table shows a 110 TAF drop in demand from 1990 to 1991.

[38] California Department of Water Resources. 2005. Draft California Water Plan, Bulletin 160. Volume 3, Sacramento, CA.

[39] California Department of Water Resources. 2005. Draft California Water Plan, Bulletin 160. Volume 3. Sacramento, CA.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge. Executed in Oakland, California, on July 23, 2007.

Peter H. Gleick

Dr. Peter H. Gleick

Oakland 7-23-07

[1] Gleick, P., Loh, P., Gomez, S., and Morrison, J. 1995. California Water 2020: A Sustainable Vision. Pacific Institute Report, Pacific Institute for Studies in Development, Environment, and Security. Oakland, California.
[2] Gleick, P.H. and D. Haasz. 1998. "Review of the CALFED Water-Use Efficiency Component Technical Appendix." Report to the United States Department of the Interior, Bureau of Reclamation, Grant No. 8-FG-20-16250. Pacific Institute for Studies in Development, Environment, and Security, Oakland, California (June 1998).
[3] Gleick, P.H. et al. 2003. Waste Not, Want Not: The Potential for Urban Water Conservation in California. Pacific Institute Report, Pacific Institute for Studies in Development, Environment, and Security. Oakland, California (hereafter "Waste Not, Want Not").
[4] Gleick, P.H., H. Cooley, D. Groves. 2005. California Water 2030: An Efficient Future. Pacific Institute Report, Pacific Institute for Studies in Development, Environment, and Security. Oakland, California.
[5] California Department of Water Resources. 2005. The California Water Plan Update. A Framework for Action. Sacramento, California, page 2-1.
[6] California Department of Water Resources. 2005. The California Water Plan Update. A Framework for Action. Sacramento, California, page 2-5.
[7] Zoldoske, D.F. 2002. "San Joaquin Valley Grower Irrigation Survey." CATI Pub. #021201. Center for Irrigation Technology, California State University, Fresno, California, pp.14-16.
[8] Data from Westlands Water District: http://www.westlandswater.org/resources/watersupply/supply.asp?title=Annual%20Water%20Use%20and%20Supply
[9] Data from Westlands Water District, "Deep Groundwater Conditions: December 2005," Westlands Water District publication March 2006.
[10] Data from Westlands Water District, "Deep Groundwater Conditions: December 2005," Westlands Water District publication March 2006.
[11] See Final EIS/EIR, Water Transfer Program for the San Joaquin River Exchange contractors, Water Authority 2005-1014 (Dec. 2004; Draft Environmental Assessment/Initial Study, Groundwater Pumping/Water Transfer Project for 25 Consecutive Years (July 3, 2007), available at http://www.usbr.gov/mp/nepa/nepa_base.cfm?location=all.)
[12] FEIS, 12/04, at ES-6; DEA/IS, 7/07 at 2-11 to 2-12.
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[15] Zoldoske, D.F. 2002. "San Joaquin Valley Grower Irrigation Survey." CATI Pub. #021201. Center for Irrigation Technology, California State University, Fresno, California, pp.14-16.

Appendix to the Declaration of Peter H. Gleick

Drip Irrigation Water Savings: Selected Case Studies [1]

- In Los Banos in Fresno County in the late 1990s, Trecho Farms began using subsurface drip irrigation to grow fresh market and processing tomatoes. Trecho Farms reports that applied water use was reduced by as much as 50 percent from previous gravity/flood systems.

- At Hammond Ranch in Firebaugh, Fresno County, the owner established subsurface drip irrigation on 560 acres of cotton, tomatoes, and asparagus. Hammond Ranch reported improvements in yields and reduced water use. Cotton on drip requires 20 percent less water than the region's average (2.1 acre-feet of water per acre, instead of 2.7 acre-feet per acre) and has produced yields approximately 15 percent above the region's average. Yields on asparagus were 50 percent higher than those typical produced using furrow or sprinkler irrigation.

- Turlock Fruit Company, also in Firebaugh, started testing subsurface drip systems in the early 1990s on 300 acres of asparagus, 150 acres of melons, and 150 acres of cotton. The company reported that drip irrigation increased yields on these fields by 30 to 40 percent and reduced water use by 20 to 30 percent, as well as eliminating drainage problems. Soil salinity is monitored, and they have seen no increase in soil salinity on drip-irrigated fields.

- In the early 1990s, the California Energy Commission (CEC) granted low-interest loans to two California farmers to help cover the costs of converting bell pepper row crops to drip irrigation. In 1993, High Rise Farms near Gilroy installed buried drip irrigation equipment on forty acres, and Underwood Ranches near Oxnard installed buried drip irrigation on fifty acres. Technical assistance and monitoring were provided by the Irrigation Training and Research Center (ITRC) at Cal Poly San Luis Obispo. Both farms found that buried drip irrigation substantially increased pepper yields, decreased water consumption, and greatly improved profits. The average net revenue increase for High Rise Farms was $1,100 per acre per year; the average net revenue increase for Underwood Ranches was $1,900 per acre per year. Applied water use dropped between 16 and 25 percent at Underwood Ranches while yields went up between 10 and 50 percent. Applied water use at High Rise Farms dropped as much as 11 percent while yields went up as much as 56 percent. Initial installation and operation problems often experienced with new systems were successfully addressed and both farms subsequently expanded their drip irrigation systems with their own money. All these cases reported additional savings from reduced fertilizer and a pesticide application.

[1] These case studies come from M. Fidell, P.H. Gleick, A. Wong, 1998. "Converting to Drip Irrigation: Underwood Ranches and High Rise Farms," Sustainable Use of Water: California Success Stories. Pacific Institute for Studies in Development, Environment, and Security, Oakland (September 1998), pp. 164-178, and from Cohen R. and Curtis J. 1998. "Agricultural solutions: Improving Water Quality in California Through Water Conservation and Pesticide Reduction." Natural Resources Defense Council, New York

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EDUCATION

Doctorate (PhD)	**University of California, Berkeley, Energy and Resources, 1986.**
Master of Science (MS)	**University of California, Berkeley, Energy and Resources, 1980.**
Bachelor of Science (BS)	**Yale University, in Engineering and Applied Science, 1978. Cum laude, with distinction.**

PROFESSIONAL EMPLOYMENT

Pacific Institute for Studies in Development, Environment, and Security.
Co-Founder and President. 1987-present

MacArthur Foundation Research and Writing Fellowship.
Fellowship in International Peace and Security. 1988-1990.

MacArthur Foundation Fellow in International Security.
Social Science Research Council/MacArthur Foundation. Post-doctoral position at the Energy and Resources Group, University of California, Berkeley. 1986-1988.

University of California, Berkeley.
Research Associate in the Energy and Resources Group. 1983-1986.

Office of the Governor of California.
Deputy Assistant for Energy and Environment. 1980-1982.

University of California and Lawrence Berkeley Laboratory.
Energy and Resources Group, Research and Teaching Associate. 1980-1981. Ecology Research Group Assistant, Energy and Environment Division. 1978-1980.

HONORS, AWARDS, FELLOWSHIPS

- Named MacArthur Fellow. October 2003
- Elected to Phi Beta Delta: Honor Society for scholarly achievement in international education. April 2003.
- Appointed to Water Science and Technology Board, National Academy of Sciences, Washington. June 2001.
- Named by the BBC as a "visionary on the environment" in its Essential Guide to the 21st Century.
- Elected Academician of the International Water Academy, Oslo, Norway. October 1999.
- MacArthur Foundation Research and Writing Fellowship. 1988-1990.
- Social Science Research Council-MacArthur Foundation Post-Doctoral Fellow in International Peace and Security Studies, June 1986 to June 1988.
- San Francisco Chronicle, one of "90 People to Watch in the '90s."
- *Cum laude*, Yale University 1978; *Distinction*, Engineering and Applied Science

PUBLIC AND PROFESSIONAL SERVICE (Current)

- Water Science and Technology Board, National Academy of Sciences, 2001-present.
- Public Advisory Committee: California Water Plan 2003. Department of Water Resources, 2001-present
- Board of Directors: Pacific Institute for Studies in Development, Environment, and Security, 1988-present.
- Editorial Board, Annual Reviews of Energy and the Environment, 2001-2006
- Editorial Board, Climatic Change, 1990-present.
- Editorial Board, Water Policy, 1997-present
- Advisory Council, International Water Academy, Oslo,Norway, 2003-2005.
- Scientific Advisor: IMAX Film "The Water Planet," 2003-present

PUBLIC AND PROFESSIONAL SERVICE (Past)

- Co-Chair: Water Sector: National Assessment of the Potential Impacts of Climatic Variability and Change on the United States, 1998-2000.
- Board of Directors: International Water Resources Association, 1997-2000.
- Global Environmental Change Committee, American Geophysical Union, 1993-1998.
- Public Advisory Forum: American Water Works Association, 1993-1998.
- 1990 Water Task Group, Second World Climate Conference, Geneva, Switzerland.
- Advisor, Comprehensive Freshwater Assessment, Stockholm Environment Institute, 1996-1997.
- Advisory Board: documentary film *Cadillac Desert* 1995-1997
- Advisory Committee: Climate Institute's Environmental Refugee Program, 1993-1995.
- Board of Directors: Environmental Science and Policy Institute, 1991-1997.
- Climate and Water Panel, American Association for the Advancement of Science, 1986-1990.
- Co-Chair, Working Group 2, Advisory Group on Greenhouse Gases (AGGG), WMO/UNEP, 1989-91.
- Committee on Science & International Security, American Association for the Advancement of Science, 1993-95.
- Editorial Board, Environment and Security, 1993-2001.
- Editorial Board, Encyclopedia of Life Support Systems, 1997-2002.
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Arthur (Art) R. Jensen

Chief Executive Officer/General Manager
Bay Area Water Supply & Conservation Agency

1976: **Major Consulting firm in California – Principle Project Engineer**

Produced planning studies on San Francisco water system hydraulic upgrades, produced reports on water supply planning, wastewater outfall environmental impacts, reservoir yield analyses, wastewater and water system capital improvements.

1984: **San Francisco Water Department – Deputy General Manager and Acting General Manager**

Managed department response following the Loma Prieta earthquake. Initiated $104 million bond funded program for treatment and water system improvement. Provided analyses of water supplies and demand leading to water rationing and purchase of supplemental water supplies after the Hetch Hetchy water supply was impacted by drought and hydroelectric operations.

1990: **Contra Costa Water District: Assistant General Manager and Director of Planning**

Developed multi-agency agreement for water supply planning. Negotiated wastewater recycling agreement with local sanitation agency. Oversaw development of 10-year capital improvement program and subsequent updates. Managed development of water distribution plans, agency environmental documents and comments on environmental reports prepared by other entities.

1995-Current: **General Manager of the Bay Area Water Users Association (BAWUA), predecessor organization of the Bay Area Water Supply & Conservation Agency (BAWSCA)**

Currently Chief Executive Officer and General Manager of BAWSCA, comprising 27 cities, water districts and water companies that purchase water from the San Francisco Public Utilities Commission (SFPUC) for resale to their local service areas. The Agency represents its members' collective interests in their relationship with the SFPUC and on matters related to water conservation, water supply, facility reliability, operations, water quality and wholesale water rates. Manages development and implementation of regional water conservation programs. Worked on successful passage of the Wholesale Regional Water System Security Reliability Act.

Education: MS and Ph.D. in Environmental Engineering Science from California Institute of Technology.

BS in Engineering Physics from UC Berkeley.

Taught courses in water engineering and water resources management at both Stanford and UC Berkeley.

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BAWSCA

Bay Area Water Supply & Conservation Agency

July 17, 2008
Via e-mail and U.S.P.S

Mr. Bill Wycko
Acting Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Re: Analysis of New Variant to Water System Improvement Program Program Environmental Impact Report

Dear Mr. Wycko:

The Bay Area Water Supply & Conservation Agency (BAWSCA) represents the interests of 25 cities and water districts, an investor-owned utility, and Stanford University, who purchase water wholesale from the San Francisco Regional Water System. These agencies provide retail water service to 1.7 million people and over 30,000 businesses and community organizations in Santa Clara, San Mateo and Alameda counties.

The Limitation.
The San Francisco Public Utilities Commission (SFPUC) General Managers have sent two letters to the San Francisco Planning Department introducing the concept of using 2018 as an interim date for future water supply decisions in connection with the Program Environmental Impact Report (PEIR) and Water System Improvement Program (WSIP). The first letter was sent by Susan Leal on March 21 and the second was sent by Ed Harrington on May 2. The letters request that the Major Environmental Analysis (MEA) Division analyze a variant of the "No Purchase Request Alternative," examining the environmental impacts of limiting deliveries to the wholesale customers to 184 mgd through the year 2018.

The Demand.
This 184 mgd limitation is 10 mgd short of meeting the wholesale customers' projected 2018 demand of 194 mgd. The 194 mgd projected demand is based on the wholesale customers' extensive collaboration with the SFPUC which created reasonable and defensible demand projections of future water needs. In addition, the projected demand incorporates wholesale customer commitments to conservation, recycling and groundwater that will meet 19 percent of their total demands by 2030. However, if San Francisco honors its commitment to the 25 wholesale customers who have perpetual contracts and the customers' demand happens to be at least 184 mgd in 2018, then it is possible the SFPUC will, by necessity, choose to limit deliveries to the two interruptible wholesale customers, the cities of Santa Clara and San Jose.

Consequences of an Interruption of Supply.
If San Francisco interrupted or decreased supplies to these cities, the impacts would be severe. Families, businesses, hospitals and schools in San Jose and Santa Clara are dependent on the reliable high quality water that they have paid for year after year for almost 40 years. San Jose has 2332 customers with a residential population of 14,800 and 365 businesses of which 263 are industrial customers receiving this water. The portions of these cities served by the Regional Water System are isolated from the parts of the cities that are served by other water supplies.

Before the cities began purchasing water from the Regional Water System in the 1970's, both cities experienced over-draft of groundwater supplies and the resulting negative environmental impacts of land subsidence. San Francisco deliveries have been key to halting the over-drafting and associated subsidence and have allowed the Santa Clara Valley Water District to manage groundwater pumping. Despite these efforts, groundwater is not a sustainable substitution for water from the Regional Water System.

The Santa Clara Valley Water District, the primary water resources manager in Santa Clara County, states that any reduction in supplies to San Jose and Santa Clara would need to be addressed with an increase in development of and exportation of water from the already beleaguered Delta. Furthermore, additional infrastructure would be needed to treat and deliver the new supplies. The environmental impacts of the new water supply and infrastructure would be in addition to those already associated with the WSIP, could be significant, and have not yet been adequately analyzed as part of the WSIP PEIR.

The Cities are Maximizing Their Resources.
Both San Jose and Santa Clara have thriving recycled water programs and implement all the current Best Management Practices for water conservation. For example, in North San Jose, the area of that City that receives water from San Francisco, 13 percent of water needs are met with recycled water. This is projected to expand to 30 percent in the future, preserving high quality potable water for the most valuable uses, but will not eliminate the need for water from the Regional Water System. Santa Clara currently offsets 2.7 mgd of its needs with recycled water.

BAWSCA supports the idea of placing a realistic limit on increased deliveries from San Francisco's watersheds to the SFPUC service area until 2018 so that sustainable demand management and water supply alternatives can be examined and to the extent feasible, developed. BAWSCA opposes alternatives or variants that would ignore the needs of long-standing retail or wholesale customers of the system.

A Constructive Solution.
As noted by MEA in the draft PEIR, the impacts of increased diversions on the Lower Tuolumne River can be mitigated by investments in agricultural water conservation in the Tuolumne River basin. The MEA should evaluate the variant the SFPUC wants analyzed in conjunction with this mitigation measure. This approach could prevent an increase in net diversions from watersheds until the year 2018 while maintaining water deliveries to San Jose and Santa Clara. In our comments on the draft PEIR, BAWSCA proposed that the amount conserved should exceed the increase in diversions so the Lower Tuolumne River would experience a net increase in flow at times important to the endangered fish species present in that part of the river. As BAWSCA noted in its comments on the draft PEIR such a program should exclude land fallowing or other elements that might be detrimental to the farming community or cause third-party impacts.

This type of proposal has been supported by two environmental organizations. The Environmental Defense Fund has supported this specific proposal of investing in agricultural conservation, and the Pacific Institute has suggested that urban investment in agricultural conservation is a possible solution to future water management that should be explored.

Please ensure that the final PEIR fully examines and analyzes environmental and other consequences of cutting off deliveries to San Jose and Santa Clara as well as the opportunity to honor a limitation on net withdrawals from watersheds by implementing this mitigation measure.

Sincerely,

Arthur R. Jensen
Chief Executive Officer and General Manager

CC: Ed Harrington, General Manager, San Francisco Public Utilities Commission
Diana Sokolove, Environmental Planner, San Francisco Planning Department
Alan Kurotori, Director of Water and Sewer Utilities, City of Santa Clara
Mansour Nasser, Division Manager, Environmental Services Department, City of San Jose

CITY OF
SAN JOSE
CAPITAL OF SILICON VALLEY

June 27, 2008

Mr. Bill Wycko, Acting Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Re: Additional Information from City of San José as Part of WSIP PEIR Alternative Analysis

Dear Mr. Wycko:

The City of San José (City) is pleased to offer additional comments on the Program Environmental Impact Report (PEIR) for the San Francisco Public Utility Commission's (SFPUC) Water System Improvement Program (WSIP). San José previously commented on the PEIR (letter of September 27, 2007), generally supporting the PEIR as written and expressing support for the environmentally superior alternative (specifically, the Modified WSIP), which, along with the proposed program, includes the continued delivery of water from the San Francisco Regional Water System (RWS) to meet the projected water supply needs of San José. In addition, the City believes this alternative can be enhanced (as suggested by BAWSCA) to provide not only sufficient water supply for the projected water demand of all BAWSCA wholesale customers (including those for the Cities of San José and Santa Clara) but to also provide for greater flows in the lower Tuolumne River.

It has now come to our attention that the SFPUC has directed the San Francisco Planning Department to evaluate a variation of the "No Purchase Request Increase Alternative," a less desirable alternative, that may preclude a long-term assured supply of water to the City from the San Francisco RWS (letter of May 2, 2008, from Mr. Ed Harrington to SF Planning Dept).

Since 1969, the San José Municipal Water System has received water from the San Francisco RWS and distributed this water to customers in the North San José area. Under the current Master Water Sales Agreement, the cities of San José and Santa Clara receive water as "temporary and interruptible" customers. San José, with a population of nearly 990,000, is the largest city in the suburban service area, yet only accounted for 2.7% of the water purchased from SFPUC in 2006-07. The City desires to become a permanent customer of the SFPUC to ensure the continued delivery of water from the RWS to the North San José Area for the following reasons:

- The North San José area has no other viable alternative water supply available. San José firmly believes that continued delivery of this small amount of water supply to this area is the most environmentally responsible option for a long-term water supply to the North San José area.
- San José has a proven track record of aggressive water conservation and recycling to assure the most efficient use of water from the San Francisco RWS.
- There would be severe environmental and economic implications from San Francisco ceasing to provide water supply to San José.

San José has proven to be a cooperative customer and an asset to San Francisco and the Bay Area Water Supply and Conservation Agency (BAWSCA) in terms of supporting agency and state-wide water supply issues. Continuation of SFPUC supplies to North San José is the best and most environmentally responsible alternative for future water supply in this area.

No Viable Alternative Water Supply Available

San José relies on water from the San Francisco RWS to meet the water supply needs for the North San José area as no alternate potable water supply is available to accommodate normal deliveries. This area is hydraulically separate from the other water supplies that serve the City. Specifically, the Santa Clara Valley Water District has stated that it is not feasible for it to provide treated water to this area due to a lack of distribution system and treatment plant capacity. In addition, while this area does have access to local groundwater, this water supply is not a consistently dependable long-term source due to the known potential for groundwater overdraft and consequent land subsidence during times of increased use or drought. Prior to receiving water from the San Francisco RWS in the late 1960's, the North San José area was completely supplied by groundwater wells, resulting in land subsidence in the area.

San José Has a Proven Track Record of Aggressive Water Recycling and Conservation

San José has been implementing successful conservation and water recycling programs that have supported the efficient use of water from the San Francisco RWS since 1988 and 1998, respectively. San José and its tributary agencies have invested more than $250 million in a recycled water system. Recycled water has been supplied to North San José since 1998, and the system has continued to expand since that time. Recycled water is supplied to the area for a variety of uses, including irrigation, industrial processing, and dual plumbing. In 2006-07, recycled water accounted for approximately 13% of the water supplied to the North San José area. As of the end of 2007, recycled water has supplied a total of nearly 1.5 billion gallons to the North San José area. Ultimately, recycled water is projected to be used to meet almost 30% of the water demand in the North San José area, preserving high quality water from the San Francisco RWS for the highest value uses.

In 2006-2007, approximately 387,000 gallons per day of water savings was achieved in the greater San José/Santa Clara area through water conservation programs funded and implemented by the City. These programs include water use surveys, rebates for high efficiency clothes washers and toilets, and a comprehensive incentive program for commercial, industrial and institutional users to retrofit their facilities with water efficient technologies. As a signatory to the California Urban Water Conservation Council's Memorandum of Understanding for Urban Water Conservation, San José implements all fourteen of the conservation Best Management Practices.

Severe Economic and Environmental Implications from Curtailing This Water Supply

The delivery of water supply from the San Francisco RWS has been vital to the growth of the electronic industries in North San José and the entire Bay Area. In San José and Santa Clara, Hetch Hetchy water is provided mainly to industrial customers who rely on high purity water with low mineral content for their manufacturing. Without this pure water supply companies such as Cisco Systems, Cypress Semiconductor, Novellus Systems and others, would need to increase on-site treatment of water used for manufacturing, which in turn would increase operating costs. These industrial customers are essential to providing jobs and supporting the economic structure of the entire Bay Area region, not just San José. The manufacturing companies in this area continue to emphasize that it is essential to have water from the San Francisco RWS water as a reliable high quality source. The Santa Clara County Manufacturing Group in a letter to the City stated that "the high-tech electronics industry in Santa Clara County is heavily dependent on an adequate and predictable supply of water."

Obtaining water supplies from the SFPUC is the most environmentally responsible option for long-term water supply, as there is no other viable long term water supply to the North San José area at this time. A decision by San Francisco to curtail water supply to this area would require the identification and development of a new potable water supply as well as the design, construction, and implementation of a new water delivery system. As shown in San Francisco's draft Program EIR for the WSIP, obtaining water supplies from any other source would involve a greater cumulative environmental impact than would the continued delivery of water from the San Francisco RWS.

San José Supports the WSIP and Desires To Become A Permanent Customer

As a long term customer of the San Francisco RWS, the City has provided valuable support to the City of San Francisco and to the Bay Area in matters regarding state-wide water supply as well as state and national environmental issues. San Francisco and the greater Bay Area are facing several current and ongoing water supply challenges. Issues including climate change, the integrity of the Bay Delta and its habitat, implications of legal actions impacting Delta water supplies, seismic security, and upgrading of the San Francisco RWS all benefit from cooperative efforts, with water users throughout the Bay Area working together to provide a sufficient supply of quality water for the future. San José's support for these and other efforts will continue to be a great asset to the San Francisco.

The City desires to become a permanent customer of the SFPUC and to continue to pay for the benefits received from an assured water supply from the San Francisco RWS and for the environmental mitigation associated with the WSIP and the operations of the San Francisco RWS.

The City is concerned with maintaining the reliability and sustainability of its water supply and the water supplies of its neighboring cities. We have made investments and taken the steps available to us to ensure our ability to supply water to the residents and businesses in this portion of San José. We are concerned that the new alternative being examined by the San Francisco Planning Department at the direction of the SFPUC could result in significant environmental, operational and other impacts to the customers, businesses and residents. The City believes the PEIR will be inadequate unless it addresses these impacts satisfactorily.

In pursuing the environmentally superior alternative and ensuring that the San Francisco RWS is the long-term water supply source for the North San José area, San Francisco will be pursuing the best and most environmentally responsible approach towards the goal of providing a high quality, reliable water supply to the public.

If you have any questions regarding any of the information provided, please feel free to contact me at (408) 535-8560. We will contact your office in the first part of July to set up a meeting where the City can provide further details of the potential environmental and other impacts to the City and the region from the proposed variation of the "No Purchase Request Increase Alternative."

Sincerely,

John Stufflebean, Director
Director, Environmental Services

c: A. Jensen, General Manager, BAWSCA
C. Reed, Mayor and Member, BAWSCA Board of Directors
D. Figone, City Manager
E. Harrington, General Manager SFPUC
O. Martin-Steele, CEO SCVWD

SANTA CLARA CALIFORNIA

Santa Clara All-America City 2001

Water & Sewer Utilities

June 27, 2008

Bill Wycko, Acting Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Re: Additional Information as Part of WSIP PEIR Alternatives Analysis

Dear Mr. Wycko:

The City of Santa Clara is pleased to offer additional comments on the draft Water System Improvement Program (WSIP) Program Environmental Impact Report (PEIR). Specifically, this letter provides additional detail as to the potential environmental and economic impacts that would result from a decision by San Francisco to interrupt the delivery of water supply to the City of Santa Clara. As part of your analysis of alternatives that consider the restriction of water sales to San Francisco's existing wholesale customers, we believe that specific information is a critical element that must be addressed as part of the impact analysis for any such alternative.

The City of Santa Clara provided comments in a letter dated August 23, 2007 that included supporting the draft PEIR. The City of Santa Clara also supported the "Modified WSIP/Environmentally Superior Alternative" that was presented in the draft PEIR. In addition, the City believes this alternative could be enhanced (as suggested by BAWSCA) to provide not only sufficient water supply for the projected water demand of all BAWSCA wholesale customers including those for the Cities of Santa Clara and San Jose while still providing for greater flows in the (lower) Tuolumne River.

In our earlier letter dated August 23, 2007, we emphasized the need to proceed with the WSIP for regional water supply reliability. The San Francisco Public Utility Commission's (SFPUC) proposed program included treating the City of Santa Clara as a full partner in this endeavor along with all other BAWSCA agencies. We have been a steady wholesale customer from the San Francisco Regional Water Supply (RWS) since 1974 and we understand that the SFPUC has directed the San Francisco Planning Department to evaluate a variation of the "No Purchase Request Increase Alternative", a less desirable alternative, that may preclude a long-

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term assured supply of water to the City of Santa Clara from the San Francisco Regional Water Supply (RWS) (letter of May 2, 2008 from Mr. Ed Harrington to SF Planning Dept).

The City of Santa Clara is committed to the efficient use and sustainability of all of our regional water supplies. The City has demonstrated this commitment through the implementation of extensive water conservation, use of recycled water, and smart growth development. However, we are concerned that San Francisco may take unilateral action that would preclude providing the City of Santa Clara an assured long-term supply of water from the San Francisco RWS. In particular we would like to detail specific undesirable consequences that could or would occur as result of any termination or interruption of that supply.

1. Under our current contract this water supply is distributed within that part of Santa Clara north of US 101 (Bayshore Freeway). This service area is to a considerable degree hydraulically isolated from the rest of the City's water system. While San Francisco RWS water comprises about 17% of the whole City's water supply, it represents nearly 90% of the drinking water in the northerly portion of the City on an average day.

2. The City does not have good alternative treated water supply sources. Although the City has the ability to pump groundwater to help offset an interruption of San Francisco RWS supply, and has constructed two new wells in the north of US 101 service area to help improve our water system reliability, one of these wells require additional treatment to remove naturally occurring constituents in the groundwater.

3. Ultimately any attempt to offset the loss of San Francisco RWS supply would impact the regional groundwater supply of Santa Clara Valley. The groundwater basin is managed by the Santa Clara Valley Water District. They have provided separate comments on the PEIR. The District's (Mr. Whitman) letter to you, dated September 26, 2007, includes the following: "We urge San Francisco to adopt the proposed... WSIP and meet all the program goals and objectives. ***Any diminution in levels of service provided by SFPUC could result in significant impacts to water resources in Santa Clara County with associated environmental and socio-economic consequences.***" [emphasis added]. Mr. Whitman's letter dated June 24, 2008 also identifies certain impacts of over-pumping the groundwater basin. The greatest detrimental effect of excessive extraction of groundwater is land subsidence with the accompanying affects of collapse of existing water wells and the loss of flood flow carrying capacity of all creeks and rivers with levees. Santa Clara Valley has a history of land subsidence from over-drafting this valuable aquifer. Past land subsidence has also reduced the water storage capacity of the regional aquifers.

4. While not directly served by District's imported treated water, it could be possible to offset some of the loss of San Francisco RWS supply in the northerly portion of the City of Santa Clara by an increase in supply from the District's treated water. As was stated in Mr. Whitman's letters, this in turn would increase reliance on water supplies from the State Water Project and Central Valley Project; both sources are faced with restrictions on pumping from the Delta.

5. Although the City has 9.4 million gallons of storage located in the northerly service area, this storage is adjacent to and replenished by San Francisco RWS water supply. Any long-term interruption of San Francisco RWS supply would reduce our over-all system reliability for emergencies and peak demands.

6. Many Silicon Valley technology companies corporate headquarters are among the City's retail water customers in this northerly service area. Many of these use de-mineralized water in their manufacturing processes, and have come to depend on the low mineral content and high quality of San Francisco RWS water. Any interruption of this high-quality supply will force these industries to expend more energy treating the water they need and will increase their overall water demand due to reduced recovery ratios. The additional reject water and blow-down from cooling towers will also increase the flows to the regional wastewater treatment plant. Based on our experience of the past few interruptions of water supply from the San Francisco RWS, water demand increases from 10% to 20% when using groundwater and sanitary sewers increases up to 200%. This increase to sanitary sewer discharge will increase energy use at the wastewater treatment plant. Both results will increase the carbon footprint for these industries.

7. The resulting impact of higher operating costs as outlined in item 6, could suppress job creation within the City of Santa Clara and the region due to large companies relocating part of their business or smaller companies relocating altogether.

Even though over the last 20 years the City's populations has increased by 25%, the residential water demand has stayed relatively flat or decreased due to our local and regional water conservation programs, changes in the plumbing code and the use of recycled water. As was mentioned in our letter of August 23, 2007, the City of Santa Clara has managed to provide for all of the increased water demand for the past two decades in the North of Bayshore area by expanding our recycled water delivery system to serve irrigation, dual-plumbed buildings and industrial customers.

The City of Santa Clara is concerned with maintaining the reliability and sustainability of its water supply and the water supplies of its neighboring cities. We have made investments and taken the steps available to us to ensure our ability to supply water to the residents and

The City of Santa Clara desires to become a permanent customer of the SFPUC and to continue to pay for the benefits received from an assured water supply from the San Francisco RWS. We remain concerned about the known risks of failure of the San Francisco RWS following a major seismic event and therefore continue to urge the SFPUC to proceed with the implementation of the Environmentally Superior Alternative for the WSIP as expeditiously as possible.

If you have any questions regarding the information in these comments, please feel free to contact me at (408) 615-2010. We will contact your office in the next week to set up a meeting where the City of Santa Clara can provide further details of the potential impacts to the City of Santa Clara from the proposed variation of the "No Purchase Request Increase Alternative."

Sincerely,

Alan Kurotori
Director of Water & Sewer Utilities

ak

cc: Jennifer Sparacino, City Manager – City of Santa Clara
Mr. Pat Kolstad, City Council and Santa Clara Member BAWSCA Board of Directors
Mr. Arthur Jensen, General Manager BAWSCA
Mr. Kevin Riley, Director of Planning & Inspection – City of Santa Clara
Mr. Robin Saunders, Consultant – City of Santa Clara Water Utility
Mr. Ed Harrington, General Manager San Francisco Public Utilities Commission

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Santa Clara Valley Water District

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AN EQUAL OPPORTUNITY EMPLOYER

June 24, 2008

Mr. Bill Wycko
Acting Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Mr. Ed Harrington
General Manager
San Francisco Public Utilities Commission
1155 Market Street – 11th Floor
San Francisco, CA 94103

Re: March 21, 2008 and May 2, 2008 Letters Regarding Analysis of Variant to WSIP PEIR

Dear Mr. Wycko and Mr. Harrington:

I am writing to express our concerns regarding San Francisco Public Utilities Commission's (SFPUC) request to consider a variant to the proposed program in the final PEIR. Our specific concerns relate to SFPUC's desire to cap its water delivery service to the wholesale customers at 184 mgd until 2018 and uncertain amount of supply delivery beyond 2018.

As described in my September 26, 2007 comment letter on the draft PEIR (see attached), Santa Clara Valley Water District (District) is the primary water resources manager for Santa Clara County. SFPUC and the District share the responsibility of providing a clean, safe and reliable water supply to cities and entities in the northern portion of Santa Clara County. SFPUC supplies constitute 100% of some of these cities' water supply in those areas and there is very little or no alternative supply from the District or elsewhere.

In particular, we are very concerned with implications and potential consequences of the 184 mgd delivery cap on the cities of San Jose and Santa Clara since they both hold "interruptible" contracts with San Francisco. If SFPUC supplies to these two cities are not included in the 184 mgd cap or their future deliveries are dramatically diminished from their current and historical purchases, it will create immense impacts to health and safety of the communities, water and environmental resources in Santa Clara County, as well as economic viability of the region.

San Jose and Santa Clara are the historical "epicenters" of land subsidence due to overdraft of groundwater. If SFPUC supplies to the two cities are cut-off or reduced, the cities will have to use more groundwater as replacement since there is insufficient capacity in both the District's and the cities' treated water systems. This potential increase in groundwater extraction could lead to re-initiation of land subsidence and erase decades of conjunctive use management efforts undertaken by the District.

Furthermore, reduced SFPUC supplies to Santa Clara County could create a ripple effect to water and environmental resources in the Delta. More than half of the average year supplies in Santa Clara County is imported by the District from the Delta. Any reduction in SFPUC supplies would need to be mitigated with additional supply development and could lead to increased reliance on exportation of water from the Delta.

We are extremely concerned with the adequacy of analysis, disclosure, documentation and mitigation for this proposed variant to the WSIP PEIR, especially because it was proposed after the release of the draft PEIR and it was not widely publicized. The District welcomes any opportunity to work with San Francisco to understand the implications and impacts from this variant and to develop acceptable mitigation measures if it were to be incorporated into the final program alternative.

Sincerely,

Keith Whitman
Deputy Operating Officer
Water Supply Management Division

Attachment: September 26, 2007 District comments on the Draft PEIR

cc: Michael Carlin
Jim Fiedler
Art Jensen
Alan Kurotori
Olga Martin-Steele
Mansour Nasser
Robin Saunders
John Stufflebean

Santa Clara Valley
Water District

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September 26, 2007

Mr. Paul Maltzer
Environmental Review Officer
Water System Improvement Program PEIR
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Subject: Comments on the Draft PEIR

Dear Mr. Maltzer:

The Santa Clara Valley Water District (District) provides wholesale drinking water supply for 1.7 million residents and is the primary water resources manager for Santa Clara County. We manage the conjunctive use of surface and groundwater resources to ensure that water supply is reliable to meet current and future demands. We actively manage the groundwater basin to optimize beneficial uses and aggressively protect the groundwater basin from contamination and minimize inelastic land surface subsidence.

As you well know, San Francisco Public Utilities Commission (SFPUC) and the District share the responsibility of providing a clean, safe and reliable water supply to cities and entities in the northern portion of Santa Clara County. SFPUC supply comprises 15% of the overall water supply in Santa Clara County and constitutes 100% of the water supply to some cities.

We expect SFPUC to continue providing its water supply in Santa Clara County and meet the projected 2030 purchase requests submitted by the wholesale customers. This expectation is described and documented in the District's and the cities' 2005 Urban Water Management Plans. The cities collaborated with SFPUC on its demand projection and water use efficiency studies and arrived at reasonable and defensible projections on future water needs. These water supply and demand projections constitute the foundation of water resources planning for the next 30 years, for the cities, SFPUC and the District.

We urge San Francisco to adopt the proposed Water System Improvement Program (WSIP) and meet all the program goals and objectives. Any diminution in levels of service provided by SFPUC could result in significant impacts to water resources in Santa Clara County with associated environmental and socio-economic consequences.

Santa Clara Valley had a legacy of land subsidence in the 1920's and 1930's due to over-extraction of ground water. Through the District's water importation and conjunctive use management, land subsidence was halted by the late 1960's and the District has been vigilant in preventing its re-occurrence. Understandably, we are very concerned with any potential re-directed impacts on our groundwater basin and local or imported surface water resources due to SFPUC's reduction in supplies or level of service provided to Santa Clara County. We also urge San Francisco to fully address any potential impacts on water supplies for the State Water Project and Central Valley Project users.

We support SFPUC's goal to maximize water conservation, recycling and desalination. The District has been very aggressive in implementing programs to maximize water use efficiency and further diversify our sources of supply. We believe these program areas are ideal for SFPUC and the District to partner with local land-use entities in their implementation. However, there are practical limits in "implementability" of these programs and they cannot be used as "stand-alone" substitute alternatives or variants because they fail to meet the overall program goals.

We look forward to San Francisco addressing our concerns adequately and adopting the PEIR and WSIP expediently so that the critical work of securing the water supply for the Bay Area communities can begin.

Sincerely,

Keith Whitman

Keith Whitman
Deputy Operating Officer
Water Supply Management Division

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CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
M E A

February 22, 2008

Paul Maltzer, Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Fransisco, CA 94103

Dear Mr. Maltzer,

Your environmental review of the San Francisco Public Utilities Commission's plan to take more water from the Tuolumne River fails to adequately identify and address all of the environmental impacts to the River. I urge you to undertake additional studies before finalizing this document. I also urge you to view the water from the Tuolumne, as water being taken from the entire watershed, thus reducing the health of the Tuolumne itself, the San Juaquin and the San Francisco Bay Delta.

I support the alternatives identified in draft document that protect the Tuolumne River from new diversions. Requiring more water conservation, efficiency, and recycling is the best way to lessen impacts on the Tuolumne River while promoting a sustainable water plan for the Bay Area.

Only by ensuring that healthy amounts of water continue to flow into the Tuolumne River can we protect this irreplaceable treasure.

Sincerely,

Emily McGinty
24000 Casa Loma Road
Groveland, CA 95321

N. Technical Memorandum – Estimation of Flow Changes in Lower Alameda Creek with Implementation of the WSIP

APPENDIX N

Technical Memorandum – Estimation of Flow Changes in Lower Alameda Creek with Implementation of the WSIP

Introduction

To determine the effects of the WSIP, flow changes in lower Alameda Creek at the Niles Gage were estimated using the following methodology:

1. Available U.S. Geological Survey (USGS) gage records were reviewed on a monthly basis for upper Alameda Creek (Alameda C BL Welch C), Arroyo de la Laguna (Arroyo de la Laguna A Verona), and lower Alameda Creek (Alameda C Near Niles) for overlapping periods of gage record (Water Years [WY] 2000 to 2007).

2. Monthly relationships were developed between the three gages to determine flow proportions at the Niles Gage from each of the two major upstream watersheds, named Arroyo de la Laguna (ADLL) and upper Alameda Creek for this analysis to reflect the major tributaries draining each watershed.

3. Gage records from Arroyo Hondo (unimpaired inflow to Calaveras) were used to classify the years of available gage record into year types based on the index developed for the PEIR analysis. The PEIR analysis used aggregated annual inflow to local reservoirs to rank years for the 82-year period (from 1921 to 2002) into 20th percentiles. The five percentile groups were labeled: Wet, Above Normal, Normal, Below Normal, and Dry.

4. Analysis of the eight years of gage record was performed using the flow changes developed for the PEIR as input to the Hetch Hetchy/Local Simulation Model (HH/LSM). The analysis was performed based on hydrologic year types. Charts and tables tabulating the expected changes in flow for each of the eight actual years were developed to illustrate the potential effects of the WSIP on flow in lower Alameda Creek for the period of available gage record.

Analysis

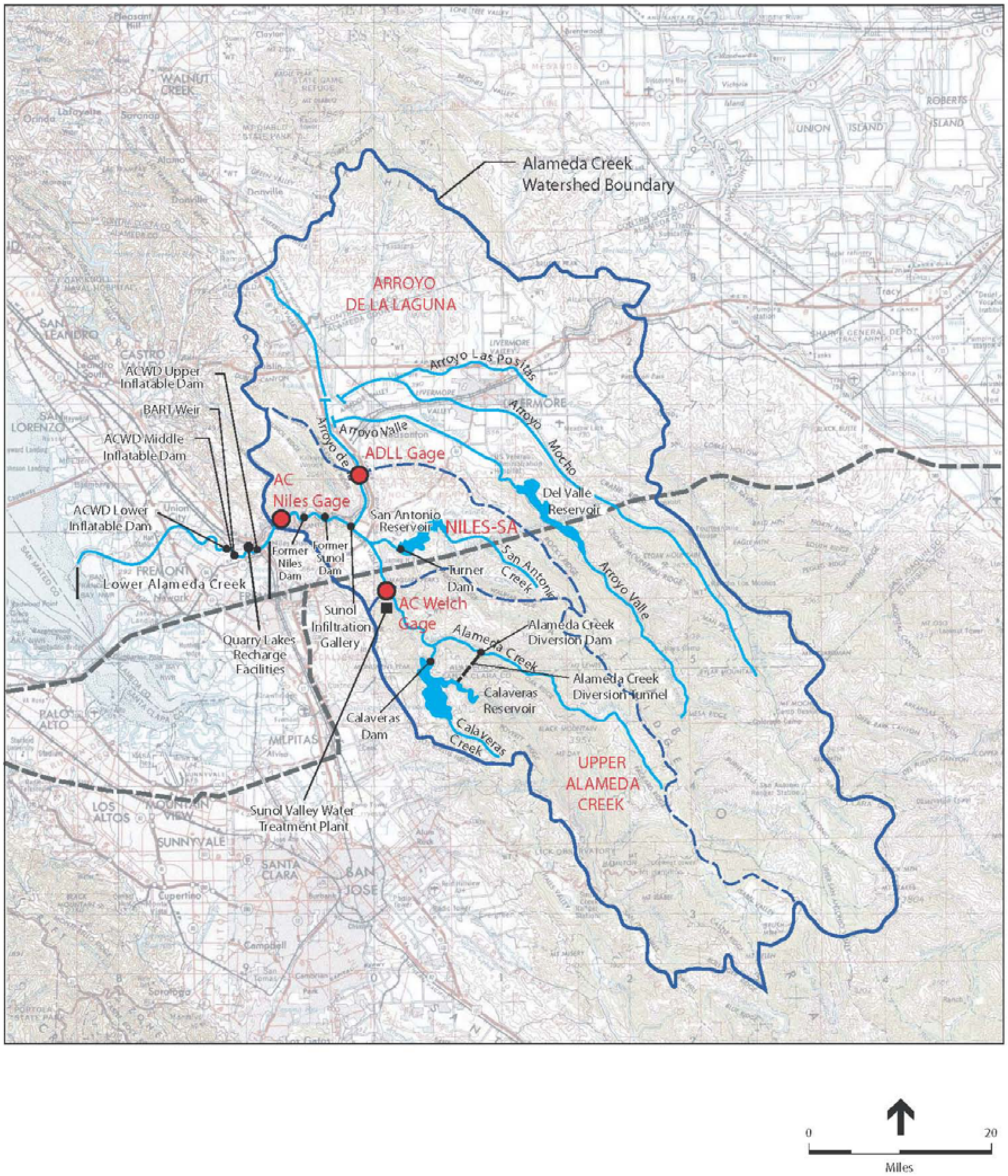
Gage Record Analysis

Flow records were reviewed on an average monthly flow basis at three USGS gages in the Alameda Creek watershed for periods of overlapping record (WY 2000-2007). The three gages were chosen to represent flow in the two major upstream basins of the Alameda Creek watershed (upper Alameda Creek and Arroyo de la Laguna) and flow in the lower reach of Alameda Creek. Upper Alameda Creek flow is recorded by the USGS “Alameda C BL Welch C” gage (AC Welch Gage), located in the Sunol Valley reach of Alameda Creek below the confluence at Welch Creek, near the Sunol Valley Water Treatment Plant. Arroyo de la Laguna flow is monitored by the USGS “Arroyo de la Laguna A Verona” gage (ADLL Gage) on ADLL approximately three miles upstream of the ADLL and Alameda Creek confluence. The USGS “Alameda C Near Niles” gage (AC Niles Gage) records a combination of these two flows as well as the contribution or loss of flow from the watershed between these gages and the Niles Gage, including flow from San Antonio Creek and State Water Project releases.

Figure N.1 shows the location of the three gages and the watersheds associated with each gage.

Figure N.2 presents the mean monthly flow over the eight-year period for the three gages. Review of the data reveals that flow measured at the ADLL Gage (shown as a blue shaded area) generally contributes a higher percentage of the flow measured at the Niles Gage (shown as a black line) compared to that measured at the Welch Gage (shown as a green shaded area). The discrepancy between the summation of the ADLL and AC Welch flows and the flow at the Niles Gage (the white space below the black line) is assumed to be other inflow from the watershed between the two upper gages and the Niles Gage (labeled Niles-SA watershed on Figure N.1). The Niles-SA watershed includes releases made from San Antonio Reservoir and the State Water Project, which occur downstream of the two upper gages.

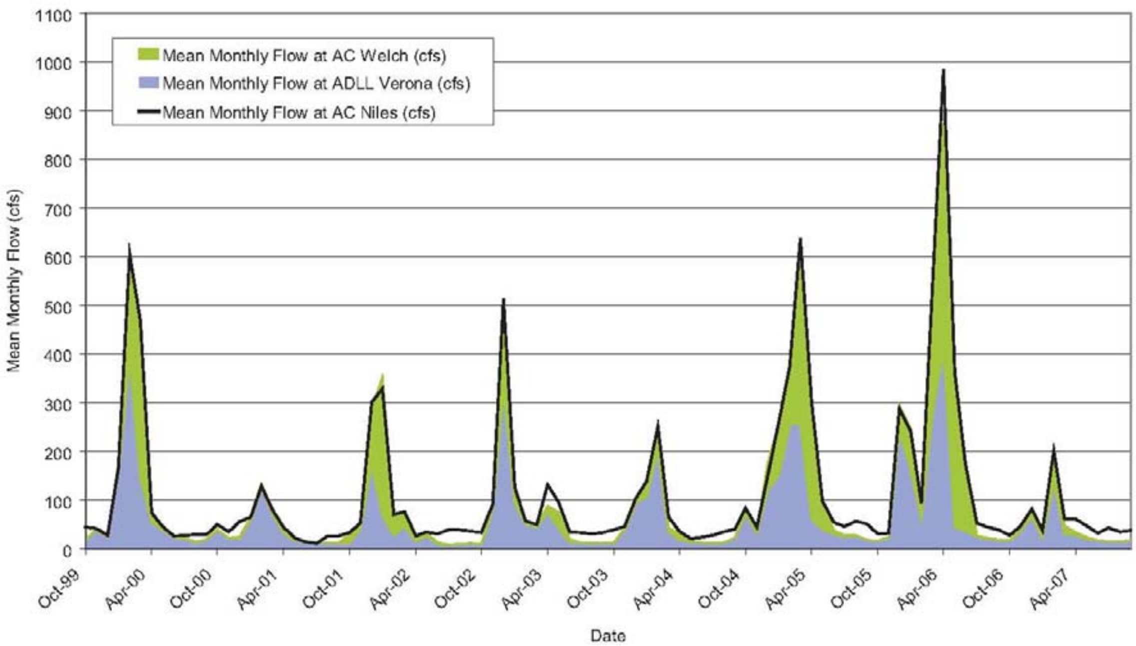
Releases or spills from San Antonio Reservoir rarely occur. The flow in San Antonio Creek is usually the result of groundwater seepage or runoff from the watershed downstream of Turner Dam. The Niles-SA watershed contribution noted during the summer months is assumed to be primarily releases from the State Water Project and contribution from groundwater in Niles Canyon. Also notable in the chart are the spikes in flow from upper Alameda Creek in the winter and spring of WY 2005 and 2006. These spikes are the result of above-normal runoff in the watershed as well as restricted storage at Calaveras Reservoir.



SOURCE: ESA+Orion; USGS, 1969.

SFPUC Water System Improvement Program ▪ 203287

Figure N.1
Location of USGS Gages and Contributing Watersheds for Lower Alameda Creek



SFPUC Water System Improvement Program ▪ 203287

SOURCE: ESA+Orion.

Figure N.2
Flow Contribution from ADLL and AC Welch Gages at the AC Niles Gage, WY 2000-2007

Monthly Relationships

Table N.1 provides a month-by-month review of the percent contribution from each of the watersheds contributing to flow in Alameda Creek, as measured at the Niles Gage.

TABLE N.1
PERCENT FLOW CONTRIBUTION AT THE AC NILES GAGE

ADLL

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	WY Total
2000	40%	96%	91%	95%	65%	32%	74%	83%	87%	75%	45%	67%	60%
2001	76%	62%	40%	92%	98%	88%	76%	74%	104%	119%	42%	41%	78%
2002	38%	79%	58%	21%	39%	61%	59%	82%	34%	21%	25%	30%	43%
2003	29%	89%	64%	75%	89%	90%	58%	43%	41%	37%	42%	32%	63%
2004	33%	86%	91%	78%	81%	55%	48%	68%	56%	43%	35%	54%	71%
2005	88%	73%	81%	58%	68%	40%	20%	41%	56%	55%	48%	35%	51%
2006	54%	72%	85%	68%	65%	52%	42%	12%	21%	46%	49%	44%	47%
2007	62%	79%	82%	61%	68%	50%	46%	44%	50%	36%	43%	46%	60%

AC Welch

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	WY Total
2000	1%	2%	6%	10%	30%	61%	18%	17%	13%	6%	2%	2%	33%
2001	2%	3%	2%	5%	6%	10%	8%	8%	7%	4%	1%	1%	5%
2002	52%	2%	37%	86%	52%	36%	29%	13%	6%	2%	0%	0%	46%
2003	0%	6%	23%	21%	9%	5%	8%	35%	14%	3%	1%	0%	17%
2004	1%	1%	2%	17%	10%	8%	39%	6%	1%	1%	0%	0%	9%
2005	0%	1%	36%	40%	25%	55%	76%	54%	12%	6%	1%	1%	42%
2006	1%	2%	18%	35%	29%	32%	47%	90%	77%	4%	2%	1%	44%
2007	2%	4%	12%	14%	28%	27%	7%	4%	3%	1%	0%	0%	14%

Niles-SA Wshed

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	WY Total
2000	59%	2%	4%	-5%	5%	7%	8%	0%	0%	19%	53%	30%	8%
2001	22%	35%	57%	3%	-3%	1%	16%	18%	-11%	-23%	57%	59%	17%
2002	10%	20%	5%	-7%	8%	3%	12%	6%	60%	77%	75%	70%	11%
2003	71%	5%	13%	5%	2%	4%	33%	22%	45%	60%	58%	68%	20%
2004	67%	13%	8%	5%	9%	37%	12%	26%	43%	57%	65%	46%	20%
2005	12%	25%	-17%	2%	6%	4%	4%	5%	32%	39%	51%	65%	8%
2006	45%	26%	-2%	-2%	6%	16%	11%	-2%	2%	49%	49%	55%	10%
2007	36%	17%	6%	25%	4%	23%	47%	51%	47%	64%	57%	54%	27%

Niles-SA watershed values, as mentioned previously, were calculated by subtracting ADLL and AC Welch flow rates from the flow gaged at Niles. Negative values for the Niles-SA watershed are assumed to be the result of loss to groundwater (particularly in the Sunol reach downstream of the Welch Gage), discrepancy introduced when converting daily flows to monthly average flows, or gage error.

Table N.2 provides a summary of the month-by-month analysis for WY 2000-2007.

TABLE N.2
MEAN MONTHLY PERCENTAGES OF WATERSHED CONTRIBUTIONS
AT THE AC NILES GAGE, WY 2000-2007

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	WY Total
ADLL	58%	81%	71%	61%	70%	46%	42%	34%	40%	47%	41%	43%	55%
AC Welch	6%	3%	23%	40%	24%	44%	45%	59%	39%	3%	1%	1%	33%
Niles-SA	36%	16%	6%	-1%	5%	10%	13%	7%	20%	50%	58%	57%	13%

Table N.3 shows the relative contribution of the upstream watersheds to flow at the Niles Gage over the past eight hydrologic years from WY 2000 to 2007. SFPUC operations would alter flow in the upper Alameda Creek watershed. Therefore, implementation of the WSIP would only affect approximately one-third of the flow that contributes to flow at the Niles Gage.

TABLE N.3
SUMMARY OF FLOW CONTRIBUTIONS AT THE AC NILES GAGE, WY 2000-2007

Watershed	Eight-Year Average Contribution	Eight-Year Range of Contribution
Arroyo de la Laguna	55%	43% – 71%
Upper Alameda Creek	33%	5% – 46%
Niles–San Antonio Creek	13%	8% – 27%

Classification of Year Types

The ranking system for the local watershed systems used for the PEIR (5 Reservoir Index) was developed for WY 1921 to 2002. Years were ranked into 20th percentiles and labeled Wet, Above Normal, Normal, Below Normal, and Dry based on inflow to local (non-Tuolumne) reservoirs. The ranking system developed for the PEIR covers WY 2000 to 2002. WY 2003 to 2007 were ranked according to the same index using unimpaired runoff at Arroyo Hondo. **Table N.4** summarizes the year types over the period analyzed.

TABLE N.4
YEAR TYPES FOR WY 2000-2007

2000	Above Normal
2001	Below Normal
2002	Below Normal
2003	Normal
2004	Normal
2005	Above Normal
2006	Above Normal
2007	Dry

Table N.4 shows that the past eight years provide a reasonable cross-section of water year types, with only wet years being absent.

Table N.5 presents a series of tables summarizing the monthly flow reductions predicted by the HH/LSM for Alameda Creek below the San Antonio Creek confluence. The first of the Table N.5 tables shows the existing condition (Calaveras Down) compared with the WSIP. The second table compares the Calaveras Up scenario (i.e., the pre-DSOD restricted condition at Calaveras Reservoir) with conditions under the WSIP. Note that the biggest impacts on flow in Alameda Creek with the WSIP would occur in Normal and Above Normal months, which are both represented in this analysis.

TABLE N.5
CALCULATED FLOW REDUCTIONS IN ALAMEDA CREEK BELOW THE SAN ANTONIO CREEK CONFLUENCE

Percent Change, Revised Base (Calaveras Down) vs Revised WSIP (Proposed Program)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep
All	0%	0%	-28%	-32%	-21%	-15%	-4%	9%	0%	0%	0%	0%
Wet	0%	0%	-23%	-26%	-9%	-9%	-7%	16%	0%	0%	0%	0%
Above Normal	0%	0%	-38%	-43%	-35%	-21%	17%	1%	0%	0%	0%	0%
Normal	0%	0%	-34%	-47%	-56%	-45%	-12%	0%	0%	0%	0%	0%
Below Normal	0%	0%	0%	0%	-6%	0%	3%	0%	0%	0%	0%	0%
Dry	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Percent Change, Base (Calaveras Up) vs WSIP Proposed Program (Not Revised)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep
All	0%	0%	32%	19%	22%	2%	-3%	12%	0%	0%	0%	0%
Wet	0%	0%	49%	14%	13%	-3%	-7%	8%	0%	0%	0%	0%
Above Normal	0%	0%	26%	38%	67%	15%	18%	38%	0%	0%	0%	0%
Normal	0%	0%	5%	14%	17%	18%	16%	0%	0%	0%	0%	0%
Below Normal	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Dry	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Increase of greater than 1%
Decrease of greater than 1%
Decrease of greater than 5%

The Base condition with Calaveras Up was included in the analysis because the DSOD restriction on Calaveras Reservoir was implemented in 2001. Review of Calaveras Reservoir water surface elevations reveals that the restricted operations were fully implemented in WY 2002. Therefore, this analysis uses the Base, Calaveras Up condition for WY 2000-2001 and the Base, Calaveras Down condition for the remainder of the years.

Revised model runs (April 2008) for the Base (Calaveras Down) and the WSIP were used for WY 2002-2007. Model runs performed in July 2006 for the Draft PEIR were used for Base (Calaveras Up) and the WSIP for WY 2000-2001. Model runs for the Base (Calaveras Up) scenario were not revised in 2008; therefore, the earlier model runs were used for the Calaveras Up condition in the first two years of the analysis.

The implementation of the WSIP assumes that there would be releases from either Calaveras Dam or the Alameda Creek Diversion Dam in accordance with the 1997 California Department of Fish and Game Memorandum of Understanding (MOU) as well as recapture of those flows upstream of the confluence with San Antonio Creek. Therefore, the flow in Alameda Creek below San Antonio Creek calculated for the WSIP does not include these MOU flows; the model assumes they have been recaptured and conveyed to the regional water system. The model does not account for groundwater loss in the Sunol Valley. Therefore, both the base case and the future scenario with implementation of the WSIP assume no change in groundwater losses.

This assumption is conservative for two reasons. First, the future condition will likely include the cumulative project to install slurry walls adjacent to the quarries in the Sunol Valley, reducing the loss to groundwater and increasing the amount of flow that reaches lower Alameda Creek from the Sunol Valley. Secondly, this analysis likely overestimates the contribution of upper Alameda Creek to flow at the AC Niles Gage, because no loss to groundwater is assumed in the Sunol reach of Alameda Creek below the AC Welch Gage. If groundwater losses were included in the model, the upper Alameda Creek watershed contribution would be reduced and the Niles-SA watershed contribution would be increased.

Analysis of the Eight Water Years of Record

The percent reductions in monthly flow estimated using the HH/LSM and presented above were applied to monthly gage flow at AC Welch. The resulting changes in flow at AC Welch and AC Niles are presented in the following charts and tables. Appendix N1 presents a year-by-year summary of monthly flow changes at AC Welch and AC Niles that would occur with the WSIP.

The AC Welch Gage and the HH/LSM analysis location of Alameda Creek below the San Antonio confluence are not the same. The San Antonio Creek confluence is approximately 2.7 miles downstream of the AC Welch Gage. This analysis applied the percent change in flow from the HH/LSM analysis, not actual flow numbers, to the Welch Gage. This difference in location was not considered significant for this level of analysis, and the percent reduction in flow was considered applicable for flow in Alameda Creek in the vicinity of the Welch Gage.

Table N.6 presents the results of applying the HH/LSM flow reductions to the gage record for AC Welch for WY 2000-2007. The second table represents the future condition with implementation of the WSIP.

TABLE N.6
COMPARISON OF RECORDED AND CALCULATED FLOW IN ALAMEDA CREEK AT THE AC WELCH GAGE

Recorded Flow in Alameda Creek at Welch Gage (cfs, avg. monthly)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Year Type
2000	0	1	2	17	183	287	13	8	3	2	1	1	AN
2001	1	1	1	3	7	8	3	2	1	0	0	0	BN
2002	17	1	112	282	37	28	8	4	2	1	0	0	BN
2003	0	5	117	26	5	3	11	34	5	1	0	0	N
2004	0	0	2	24	26	5	14	1	0	0	0	0	N
2005	0	1	53	106	95	351	227	53	7	3	1	0	AN
2006	0	1	51	84	27	177	466	325	133	2	1	0	AN
2007	1	2	10	5	56	16	4	2	1	0	0	0	D

Calculated Flow at Welch for Revised WSIP Proposed Program (cfs, avg. monthly)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Year Type
2000	0	1	2	23	305	331	16	10	3	2	1	1	AN
2001	1	1	1	3	7	8	3	2	1	0	0	0	BN
2002	17	1	112	282	35	28	8	4	2	1	0	0	BN
2003	0	5	78	14	2	1	10	34	5	1	0	0	N
2004	0	0	1	12	11	3	12	1	0	0	0	0	N
2005	0	1	33	60	62	276	267	53	7	3	1	0	AN
2006	0	1	31	47	18	139	547	328	133	2	1	0	AN
2007	1	2	10	5	56	16	4	2	1	0	0	0	D

Difference Between Recorded and Calculated Flow for Revised WSIP Proposed Program at Welch (cfs, avg. monthly)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Year Type
2000	0 [0%]	0 [0%]	0 [26%]	6 [38%]	122 [67%]	44 [15%]	2 [18%]	3 [38%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	AN
2001	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	BN
2002	0 [0%]	0 [0%]	0 [0%]	0 [0%]	-2 -[6%]	0 [0%]	0 [3%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	BN
2003	0 [0%]	0 [0%]	-40 -[34%]	-12 -[47%]	-3 -[56%]	-1 -[45%]	-1 -[12%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	N
2004	0 [0%]	0 [0%]	-1 -[34%]	-11 -[47%]	-14 -[56%]	-2 -[45%]	-2 -[12%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	N
2005	0 [0%]	0 [0%]	-20 -[38%]	-46 -[43%]	-33 -[35%]	-76 -[21%]	39 [17%]	1 [1%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	AN
2006	0 [0%]	0 [0%]	-19 -[38%]	-36 -[43%]	-9 -[35%]	-38 -[21%]	81 [17%]	4 [1%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	AN
2007	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	D

Increase of greater than 1%
Decrease of greater than 1%
Decrease of greater than 5%

Figure N.3 and **Table N.7** detail the predicted changes in flow that would occur in Alameda Creek at AC Niles over the eight-year period (WY 2000-2007) with implementation of the WSIP. On the chart, the solid blue area represents average monthly gage flow at AC Niles, and the black line is calculated flow under the WSIP. The discrepancy between the two lines represents the change between gage records and calculated flow under the proposed program.

The analysis shows that reductions in flow at the Niles Gage would occur with the WSIP when compared to the current DSOD-restricted operating condition, based on the historical hydrology from 2001 to 2007. Reductions of up to 18% in average monthly flow could occur in years similar to the past eight years of record. The maximum flow reduction would occur during January of 2005, an Above Normal year. However, there would be a flow increase of 13% in April of that same year type. No changes in flow would occur in Dry and Below Normal years, with the exception of a slight decrease in February of Below Normal years. It should be noted that in 2000, an Above Normal year, there would be up to a 20% increase in flow with implementation of the WSIP; this year represents historical operating conditions prior to the DSOD operating restrictions.

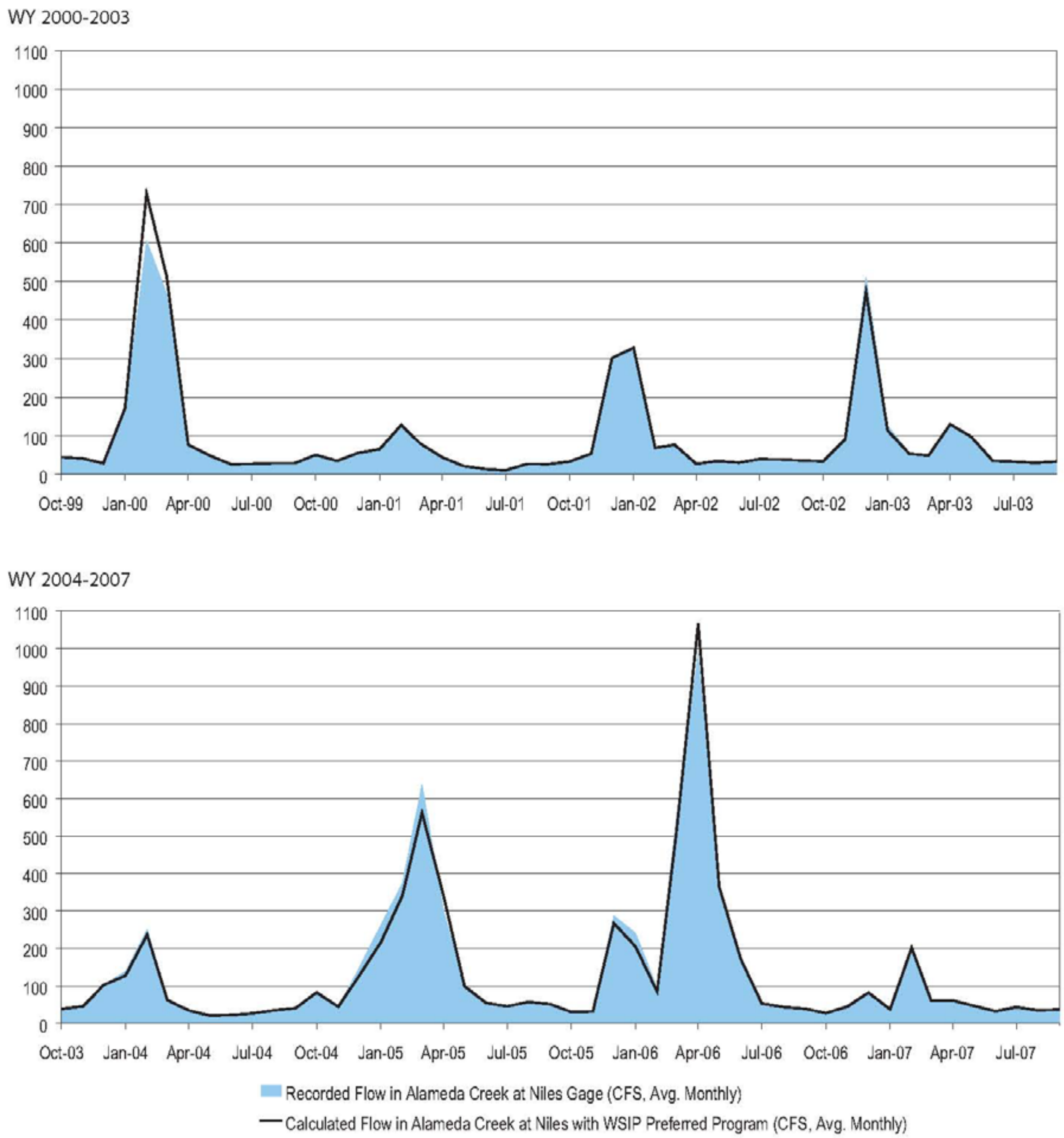
The past eight years include four of the five year types; note that a Wet year is absent. However, as shown in Table N.5, the largest reductions in flow with the WSIP would occur during Normal and Above Normal years, which are included in this analysis. Therefore, this analysis covers the flow reduction scenario with the greatest impacts expected under the WSIP.

The largest decrease in flow in lower Alameda Creek in the analysis would occur in a month similar to January of 2005, with a reduction in average monthly flow of 46 cubic feet per second, or 18%, of the average monthly flow recorded in January 2005. This corresponds to a reduction in upper Alameda Creek of 43%. Further review of the data reveals that flow reductions are calculated to occur in December through March of Normal to Wet years and in April of Wet years. In all other months, including winter months of Below Normal (with the exception of a slight decrease in February) and Dry years, flow in upper Alameda Creek and at Niles would either remain the same or increase under the WSIP.

Limitations of the Analytical Results

- The data are based on monthly flows and do not reflect the range of fluctuations that occur during shorter time intervals. However, the monthly data provide a sufficient level of detail to determine the general magnitude of the effects on flow in lower Alameda Creek, as well as the season and water year type in which the effects would occur. The monthly data also provide a definitive indication of when no changes would occur.

- The discrepancy between the model prediction for flow in Alameda Creek below the San Antonio Creek confluence and the application of these flow reductions to the AC Welch Gage may introduce some error. The model flow predictions include the flow contribution from the watershed between Welch Creek and the San Antonio Creek confluence, and the flow contribution from San Antonio Reservoir releases. However, releases from the reservoir are very infrequent, and the contribution from the watershed between Welch and San Antonio Creeks is minor.



Notes:
- WSIP conditions includes recapture of MOU flows released from Calaveras Dam.
- Years 2000 and 2001 analysis includes a comparison of Base with Calaveras Up vs WSIP Proposed Program. DSOD restriction was implemented in 2001, with Calaveras Reservoir level reduction beginning in WY 2002.
- Analysis for WSIP only, no other cumulative projects analyzed.

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SOURCE: ESA+Orion.

Figure N.3
Comparison of Average Monthly Flow at the AC Niles Gage, Recorded Flow versus Calculated Flow under the WSIP

TABLE N.7
COMPARISON OF AVERAGE MONTHLY FLOW AT THE AC NILES GAGE, RECORDED FLOW VERSUS CALCULATED FLOW UNDER THE WSIP

Recorded Flow in Alameda Creek at Niles (cfs, avg. monthly)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Year Type
2000	44	41	28	165	606	469	74	46	26	27	29	29	AN
2001	50	35	55	65	128	79	44	22	14	10	27	27	BN
2002	33	53	302	329	71	76	27	34	30	39	38	36	BN
2003	34	91	513	126	56	50	131	97	35	33	30	33	N
2004	39	45	104	138	251	65	36	21	23	27	35	41	N
2005	83	45	148	262	374	638	300	98	55	46	57	51	AN
2006	30	32	287	242	94	551	986	361	172	53	44	39	AN
2007	28	45	82	38	202	61	61	47	32	43	35	37	D

Calculated Flow at Niles for Revised WSIP Proposed Program (cfs, avg. monthly)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Year Type
2000	44	41	28	171	728	513	76	49	26	27	29	29	AN
2001	50	35	55	65	128	79	44	22	14	10	27	27	BN
2002	33	53	302	329	68	76	27	34	30	39	38	36	BN
2003	34	91	474	114	53	48	130	97	35	33	30	33	N
2004	39	45	103	127	237	62	34	21	23	27	35	41	N
2005	83	45	127	216	341	562	340	99	55	46	57	51	AN
2006	30	32	267	205	85	513	1067	365	172	53	44	39	AN
2007	28	45	82	38	202	61	61	47	32	43	35	37	D

Difference Between Recorded and Calculated Flow for Revised WSIP Proposed Program at Niles (cfs, avg. monthly)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Year Type
2000	0 [0%]	0 [0%]	0 [1%]	6 [4%]	122 [20%]	44 [9%]	2 [3%]	3 [6%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	AN
2001	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	BN
2002	0 [0%]	0 [0%]	0 [0%]	0 [0%]	-2 -[3%]	0 [0%]	0 [1%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	BN
2003	0 [0%]	0 [0%]	-40 -[8%]	-12 -[10%]	-3 -[5%]	-1 -[2%]	-1 -[1%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	N
2004	0 [0%]	0 [0%]	-1 -[1%]	-11 -[8%]	-14 -[6%]	-2 -[4%]	-2 -[5%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	N
2005	0 [0%]	0 [0%]	-20 -[14%]	-46 -[18%]	-33 -[9%]	-76 -[12%]	39 [13%]	1 [1%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	AN
2006	0 [0%]	0 [0%]	-19 -[7%]	-36 -[15%]	-9 -[10%]	-38 -[7%]	81 [8%]	4 [1%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	AN
2007	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	D

Increase of greater than 1%
Decrease of greater than 1%
Decrease of greater than 5%

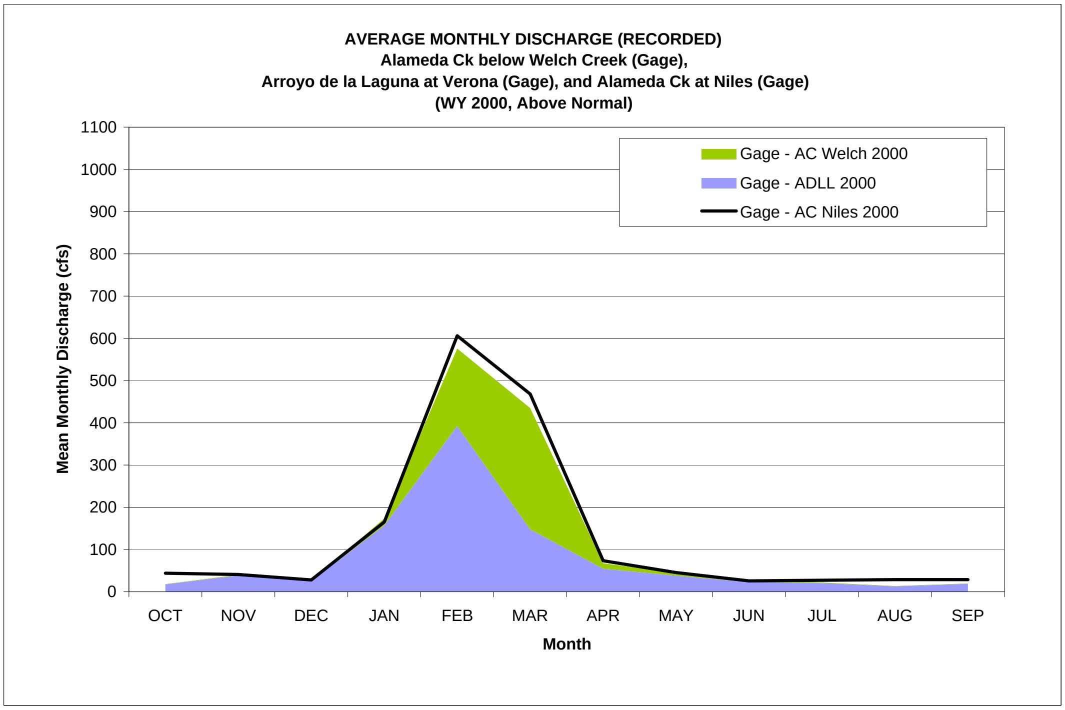
- As discussed previously, this analysis did not account for losses to groundwater in the Sunol Valley. Losses to groundwater can be significant, and inclusion of this assumption in the analysis would decrease the upper Alameda Creek contribution to flow at the AC Niles Gage and would mute the impacts of the WSIP, particularly if the future condition assumes less loss to groundwater with implementation of the slurry wall project adjacent to the Sunol Quarries. The current analysis is therefore conservative; however, including a quantified loss to groundwater in the Sunol reach was considered too speculative.

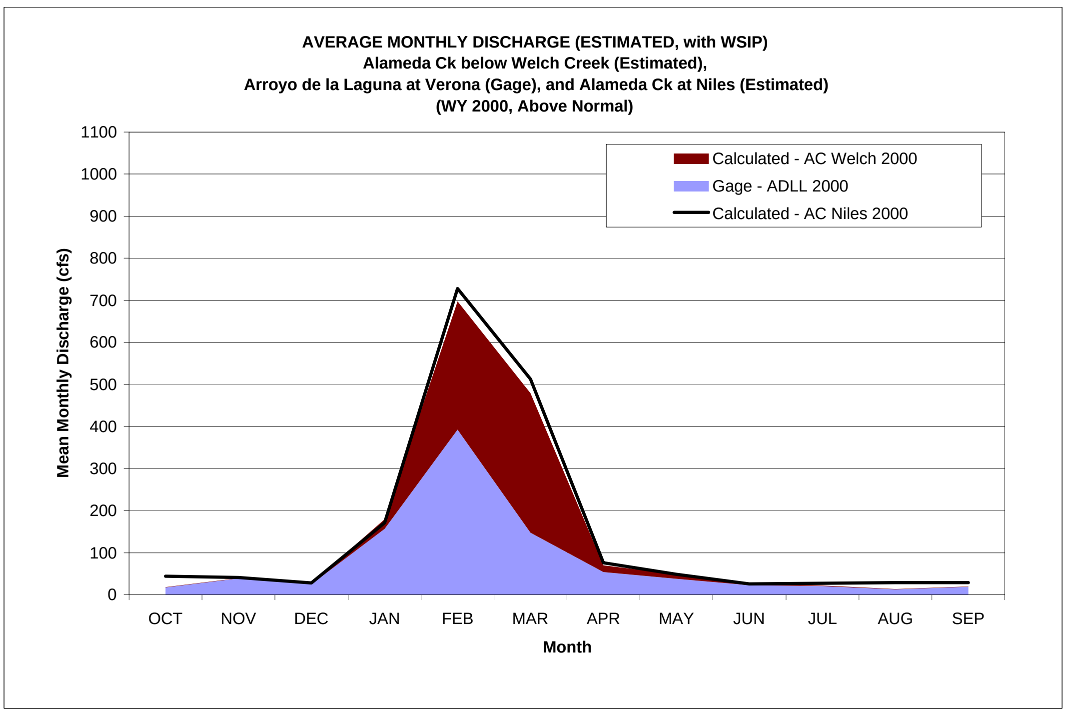
- A Wet year is not included in the analysis because one was not present in the available gage record. A Wet year could be synthesized; however, since the greatest effects of the WSIP are shown to occur in Above Normal and Normal years, the current analysis includes the year types with the greatest impact on flows.

- Actual upstream operations in the upper Alameda Creek and ADLL watersheds were not accounted for in the analysis. For instance, large spikes in flow in 2005 and 2006 are likely a result of DSOD-restricted operations as well as releases made from Calaveras Reservoir for the flow/infiltration studies in the Sunol Valley. The additional releases for these studies had the affect of increasing upper Alameda Creek's flow contribution at the Niles Gage. Similar operational anomalies could be reviewed for the ADLL watershed and used to refine the flow percentages from the upper watersheds, but such an effort exceeded the scope of this analysis.

APPENDIX N1

Annual Flow in Alameda Creek at the Niles Gage, Water Years 2000-2007 – Existing Condition and with Implementation of the WSIP





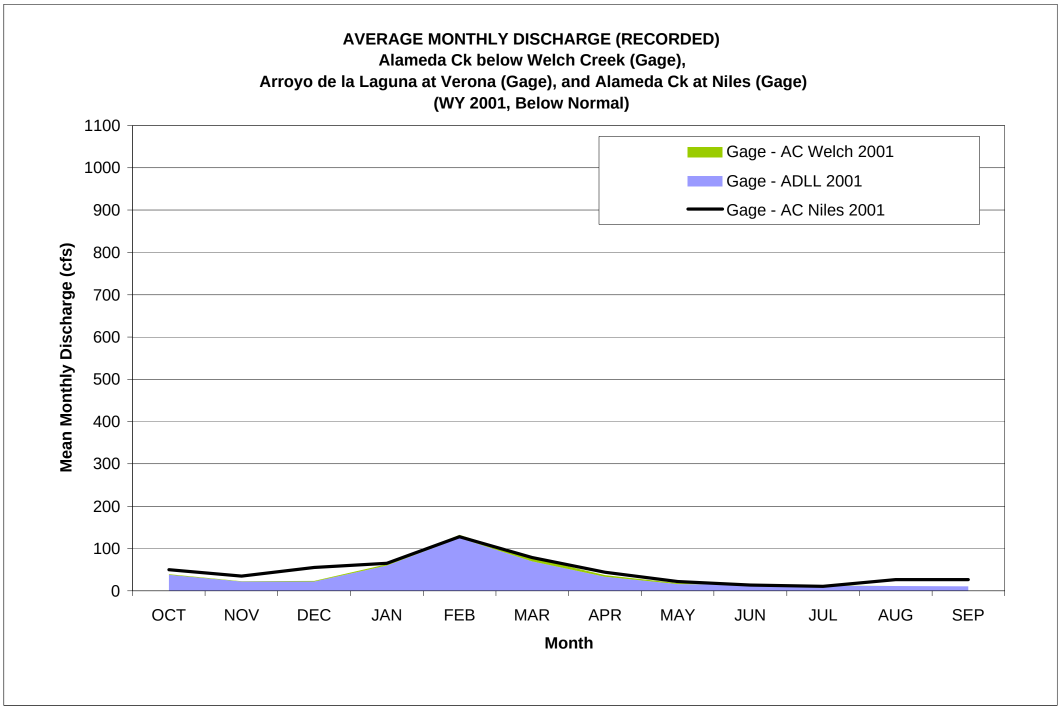
AC below Welch Ck, Gage versus Calculated w WSIP 2030

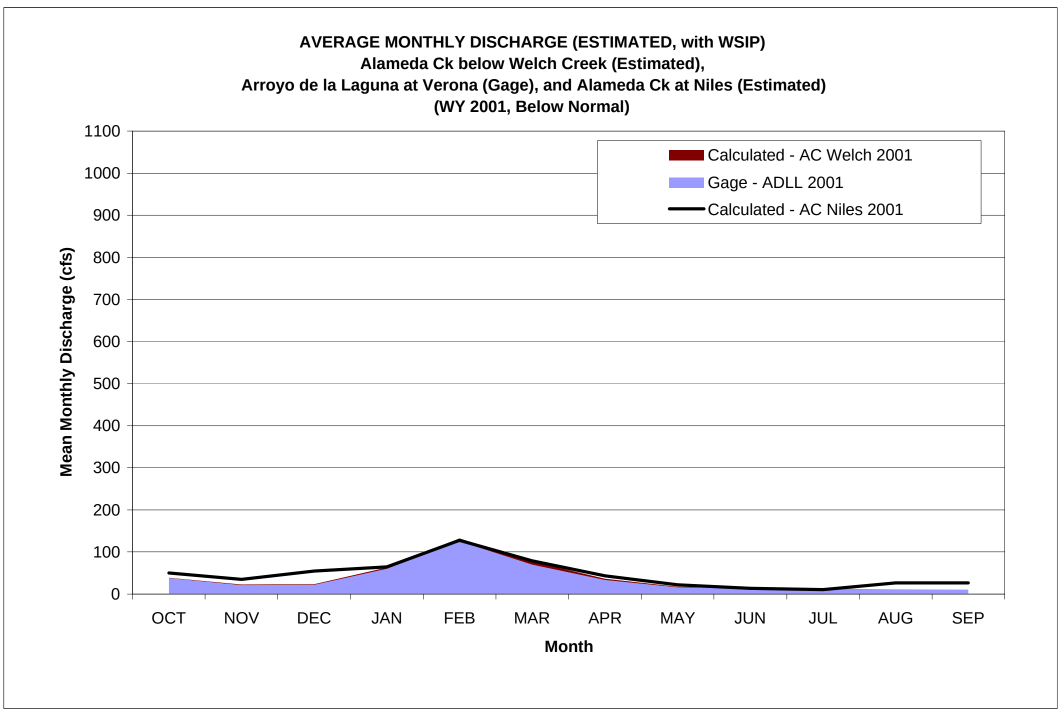
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
2000	0	1	2	17	183	287	13	8	3	2	1	1
2000	0	1	2	23	305	331	16	10	3	2	1	1
Delta	0	0	0	6	122	44	2	3	0	0	0	0
Delta %	0%	0%	26%	38%	67%	15%	18%	38%	0%	0%	0%	0%

AC at Niles, Gage versus Calculated w WSIP 2030

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
2000	44.3	40.8	27.9	164.9	606.3	468.5	73.5	45.8	26.1	27.1	28.8	28.6
2000	44.3	40.8	28.3	171.2	728.1	512.8	75.9	48.7	26.1	27.1	28.8	28.6
Delta	0	0	0	6	122	44	2	3	0	0	0	0
Delta %	0%	0%	1%	4%	20%	9%	3%	6%	0%	0%	0%	0%

Increase of greater than 1% | Decrease of greater than 1% | Decrease of greater than 5%





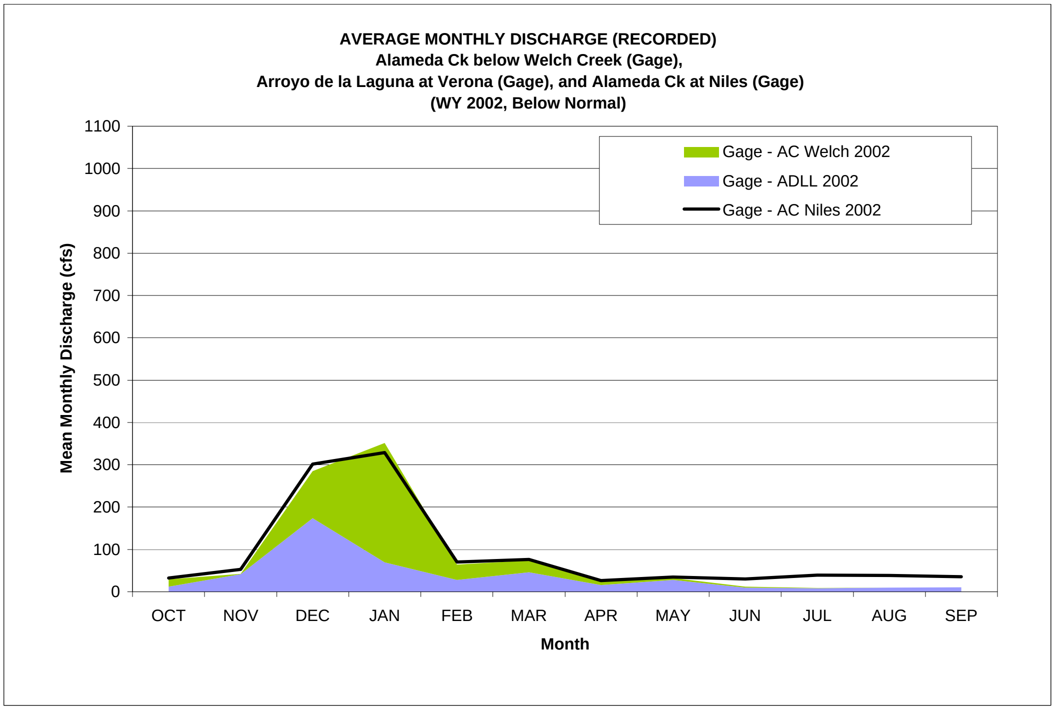
AC below Welch Ck, Gage versus Calculated w WSIP 2030

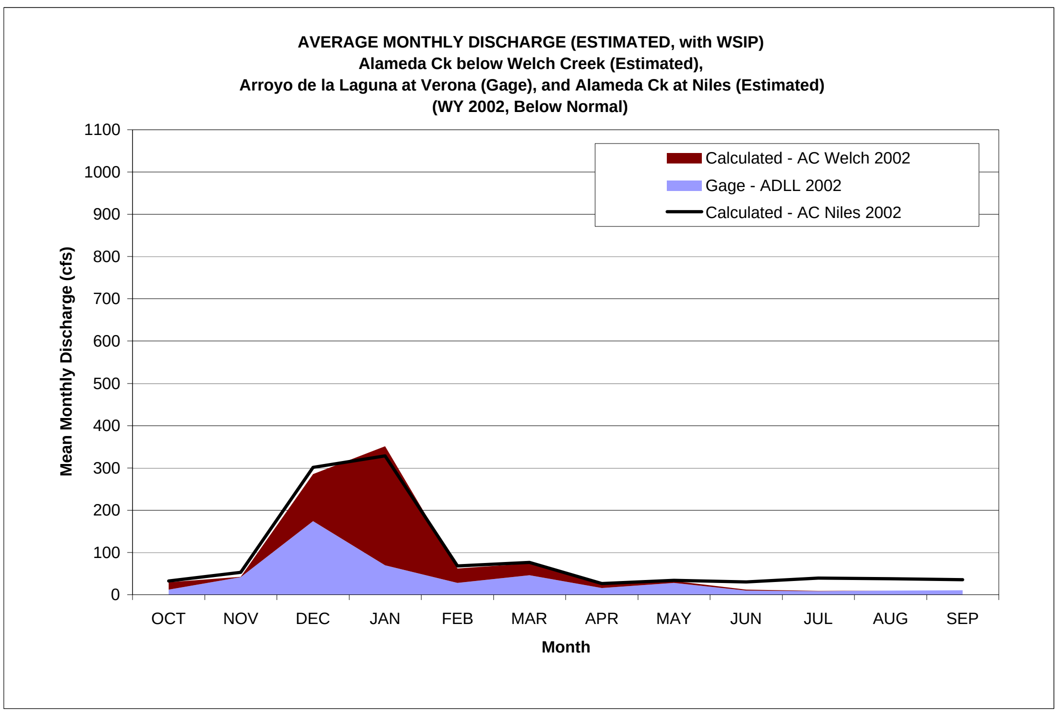
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
2001	0.9	1.0	1.1	2.9	7.1	8.0	3.5	1.7	0.9	0.4	0.3	0.1
2001	0.9	1.0	1.1	2.9	7.1	8.0	3.5	1.7	0.9	0.4	0.3	0.1
Delta	0	0	0	0	0	0	0	0	0	0	0	0
Delta %	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

AC at Niles, Gage versus Calculated w WSIP 2030

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
2001	50.2	34.8	55.1	64.8	127.8	78.9	43.7	21.8	13.6	10.4	26.7	26.6
2001	50.2	34.8	55.1	64.8	127.8	78.9	43.7	21.8	13.6	10.4	26.7	26.6
Delta	0	0	0	0	0	0	0	0	0	0	0	0
Delta %	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Increase of greater than 1% | Decrease of greater than 1% | Decrease of greater than 5%





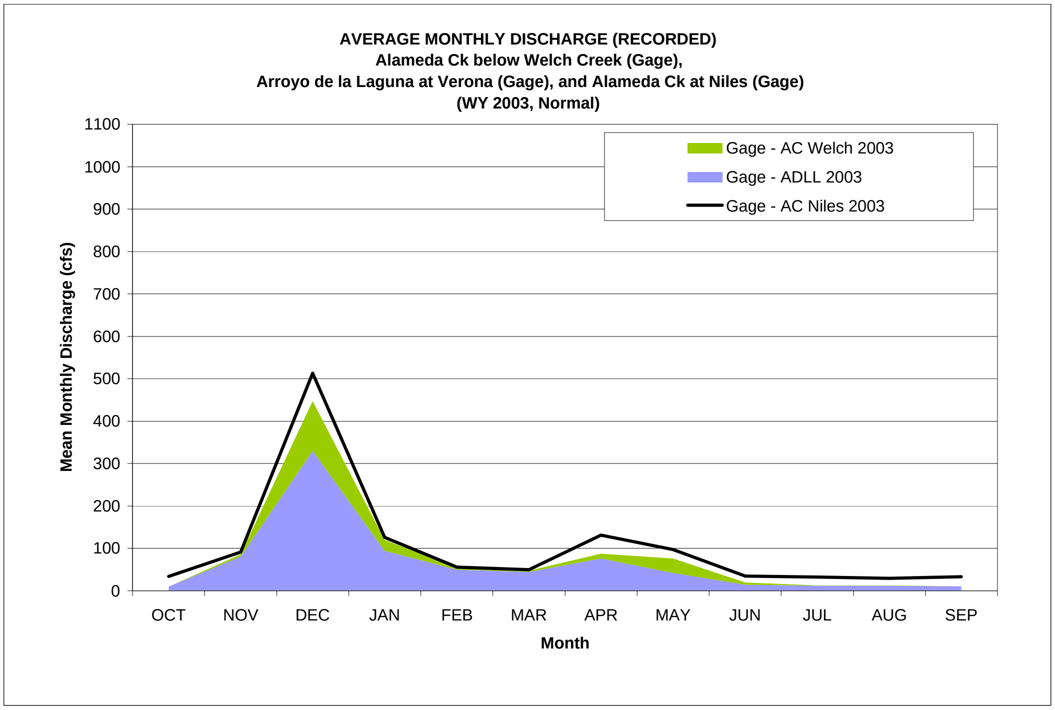
AC below Welch Ck, Gage versus Calculated w WSIP 2030

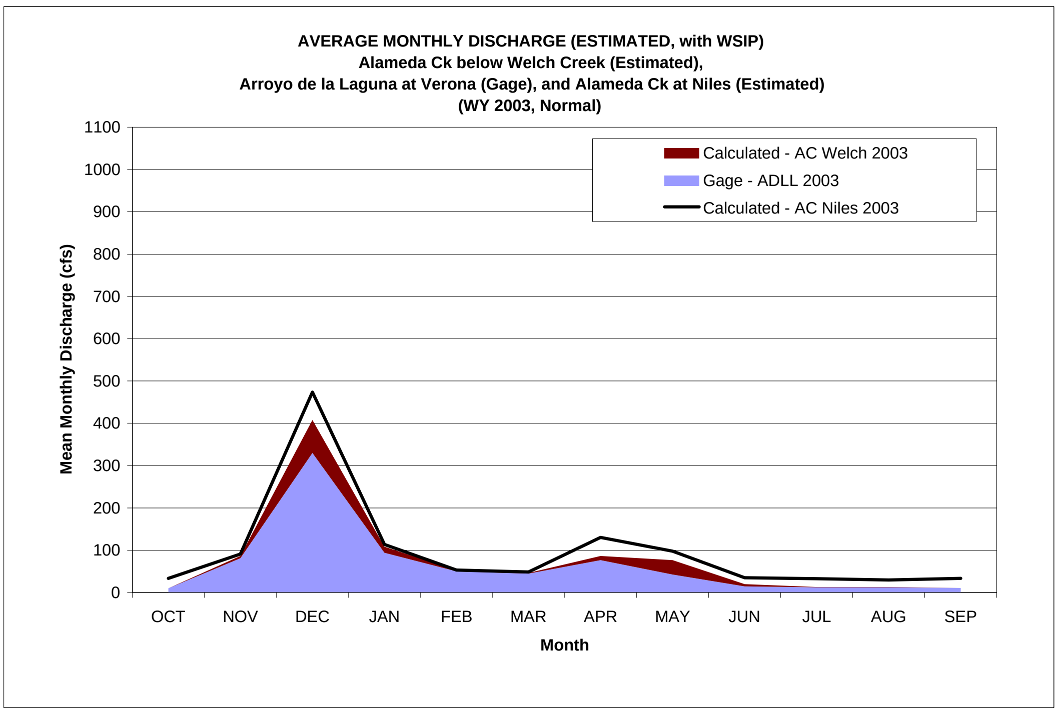
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
2002	17.2	0.9	111.5	281.9	36.9	27.8	7.7	4.3	1.9	0.7	0.1	0.0
2002	17.2	0.9	111.5	281.9	34.7	27.8	7.9	4.3	1.9	0.7	0.1	0.0
Delta	0	0	0	0	-2	0	0	0	0	0	0	0
Delta %	0%	0%	0%	0%	-6%	0%	3%	0%	0%	0%	0%	0%

AC at Niles, Gage versus Calculated w WSIP 2030

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
2002	32.8	53.1	301.5	328.5	70.6	76.2	26.6	34.4	30.1	39.1	38.2	35.7
2002	32.8	53.1	301.5	328.5	68.4	76.2	26.8	34.4	30.1	39.1	38.2	35.7
Delta	0	0	0	0	-2	0	0	0	0	0	0	0
Delta %	0%	0%	0%	0%	-3%	0%	1%	0%	0%	0%	0%	0%

Increase of greater than 1%   Decrease of greater than 1%   Decrease of greater than 5%





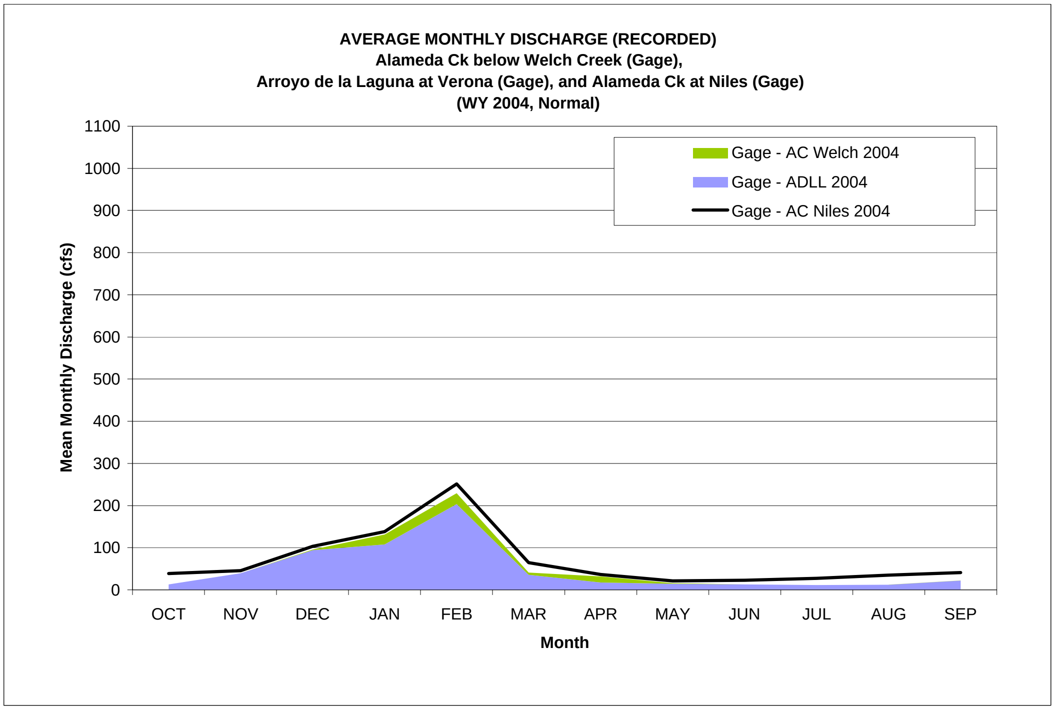
AC below Welch Ck, Gage versus Calculated w WSIP 2030

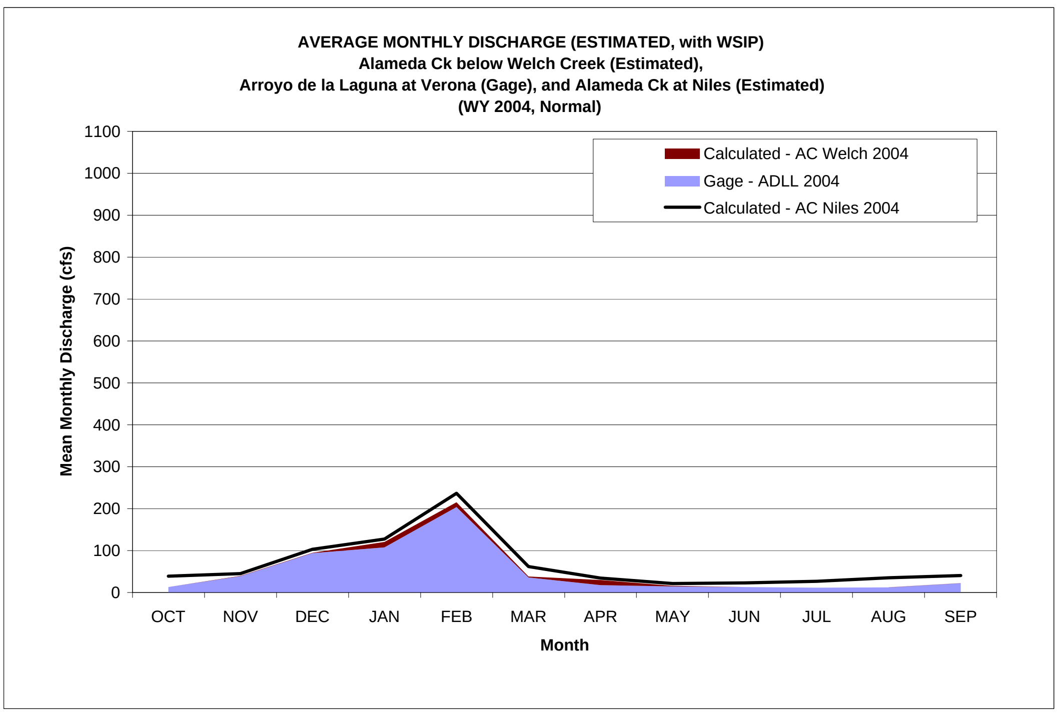
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
2003	0.1	5.4	117.4	26.0	5.0	2.7	11.1	33.8	4.9	0.8	0.2	0.1
2003	0.1	5.4	77.8	13.8	2.2	1.5	9.8	33.8	4.9	0.8	0.2	0.1
Delta	0	0	-40	-12	-3	-1	-1	0	0	0	0	0
Delta %	0%	0%	-34%	-47%	-56%	-45%	-12%	0%	0%	0%	0%	0%

AC at Niles, Gage versus Calculated w WSIP 2030

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
2003	33.6	91	513.3	126	56.1	49.7	131.1	97.3	34.9	32.7	29.7	33
2003	33.6	91.0	473.7	113.8	53.3	48.5	129.8	97.3	34.9	32.7	29.7	33.0
Delta	0	0	-40	-12	-3	-1	-1	0	0	0	0	0
Delta %	0%	0%	-8%	-10%	-5%	-2%	-1%	0%	0%	0%	0%	0%

Increase of greater than 1% | Decrease of greater than 1% | Decrease of greater than 5%





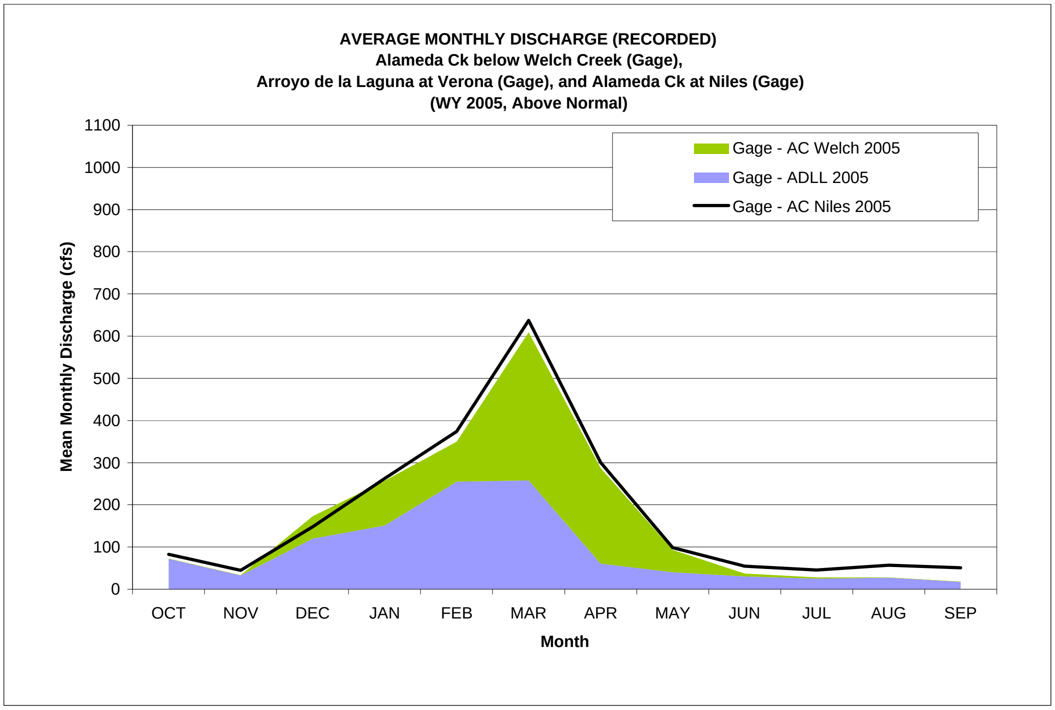
AC below Welch Ck, Gage versus Calculated w WSIP 2030

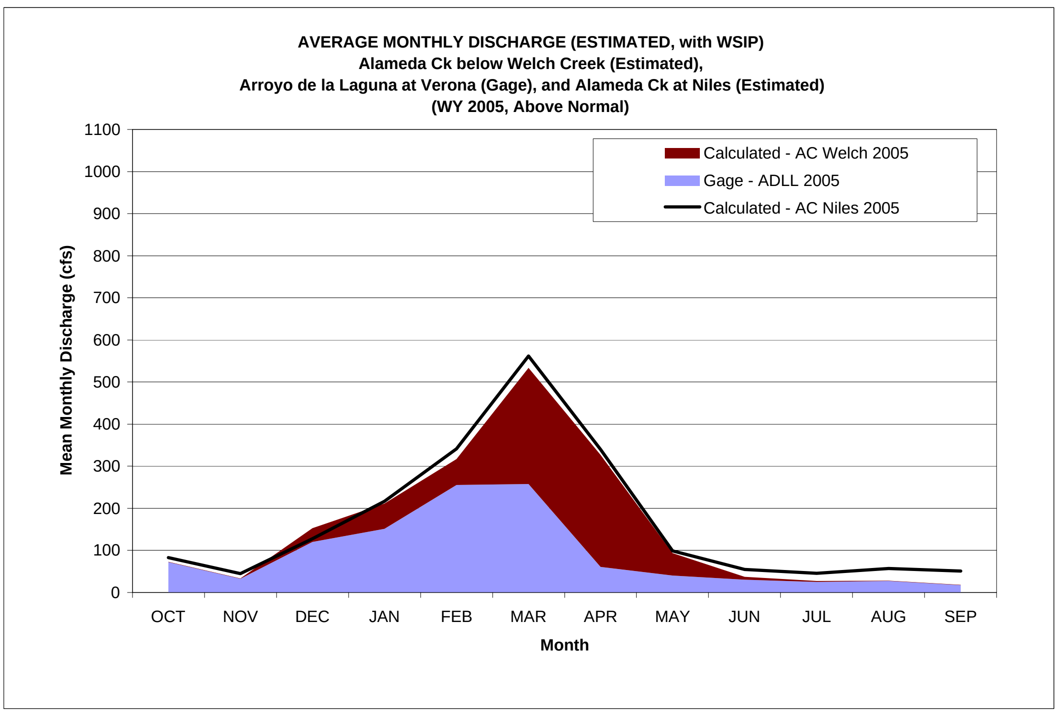
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
2004	0.2	0.4	1.8	23.5	25.6	5.2	14.2	1.3	0.3	0.2	0.0	0.0
2004	0.2	0.4	1.2	12.5	11.2	2.8	12.5	1.3	0.3	0.2	0.0	0.0
Delta	0	0	-1	-11	-14	-2	-2	0	0	0	0	0
Delta %	0%	0%	-34%	-47%	-56%	-45%	-12%	0%	0%	0%	0%	0%

AC at Niles, Gage versus Calculated w WSIP 2030

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
2004	39	45.4	103.5	138.4	251.1	64.5	36.1	21.1	22.8	27	34.9	40.7
2004	39.0	45.4	102.9	127.4	236.7	62.1	34.4	21.1	22.8	27.0	34.9	40.7
Delta	0	0	-1	-11	-14	-2	-2	0	0	0	0	0
Delta %	0%	0%	-1%	-8%	-6%	-4%	-5%	0%	0%	0%	0%	0%

Increase of greater than 1% | Decrease of greater than 1% | Decrease of greater than 5%





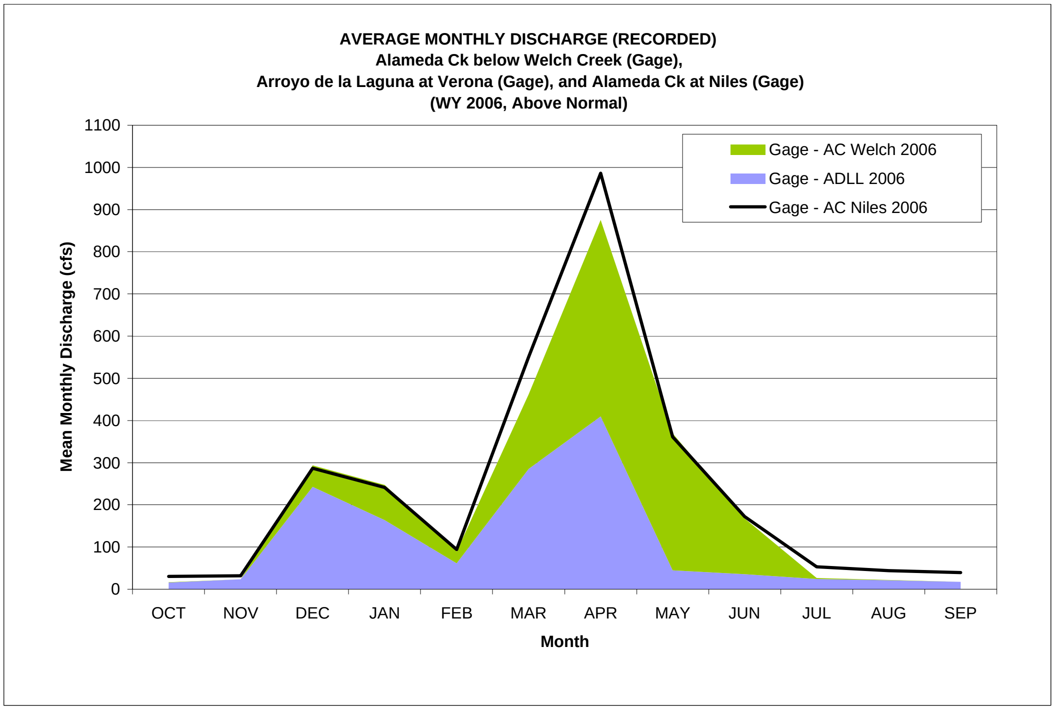
AC below Welch Ck, Gage versus Calculated w WSIP 2030

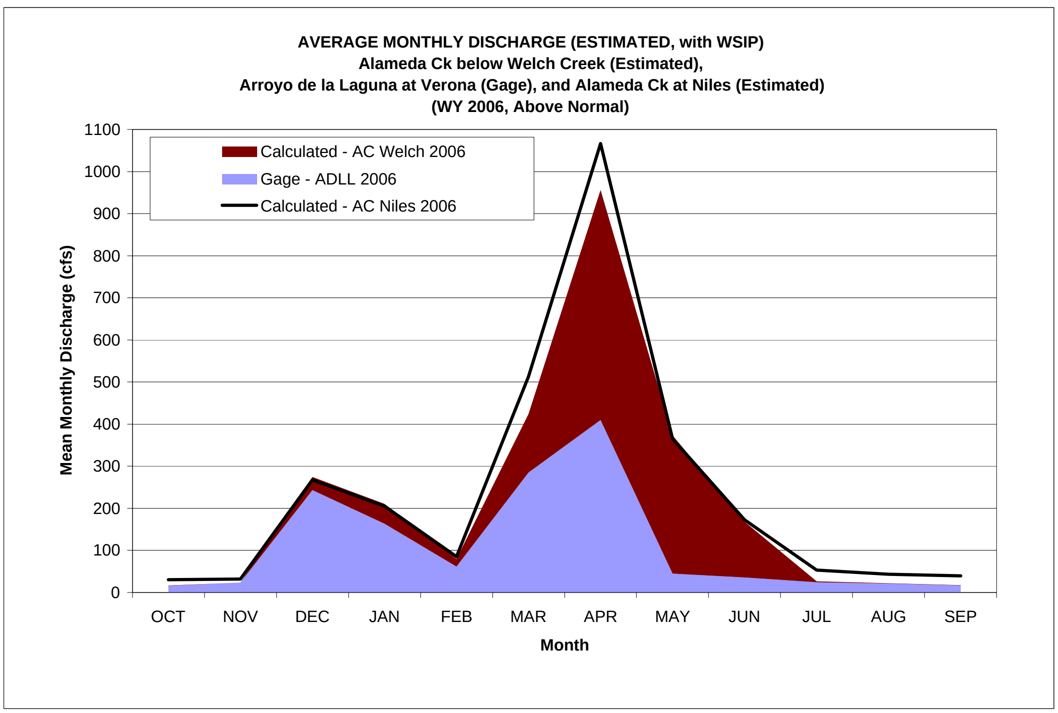
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
2005	0.3	0.6	53.4	106.1	94.9	351.4	227.1	52.8	6.7	2.5	0.6	0.4
2005	0.3	0.6	33.0	60.1	62.1	275.9	266.5	53.4	6.7	2.5	0.6	0.4
Delta	0	0	-20	-46	-33	-76	39	1	0	0	0	0
Delta %	0%	0%	-38%	-43%	-35%	-21%	17%	1%	0%	0%	0%	0%

AC at Niles, Gage versus Calculated w WSIP 2030

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
2005	82.5	44.5	147.8	262.4	373.8	637.6	300.1	98.3	54.5	45.5	57.2	51.1
2005	82.5	44.5	127.4	216.4	341.0	562.1	339.5	98.9	54.5	45.5	57.2	51.1
Delta	0	0	-20	-46	-33	-76	39	1	0	0	0	0
Delta %	0%	0%	-14%	-18%	-9%	-12%	13%	1%	0%	0%	0%	0%

Increase of greater than 1% | Decrease of greater than 1% | Decrease of greater than 5%





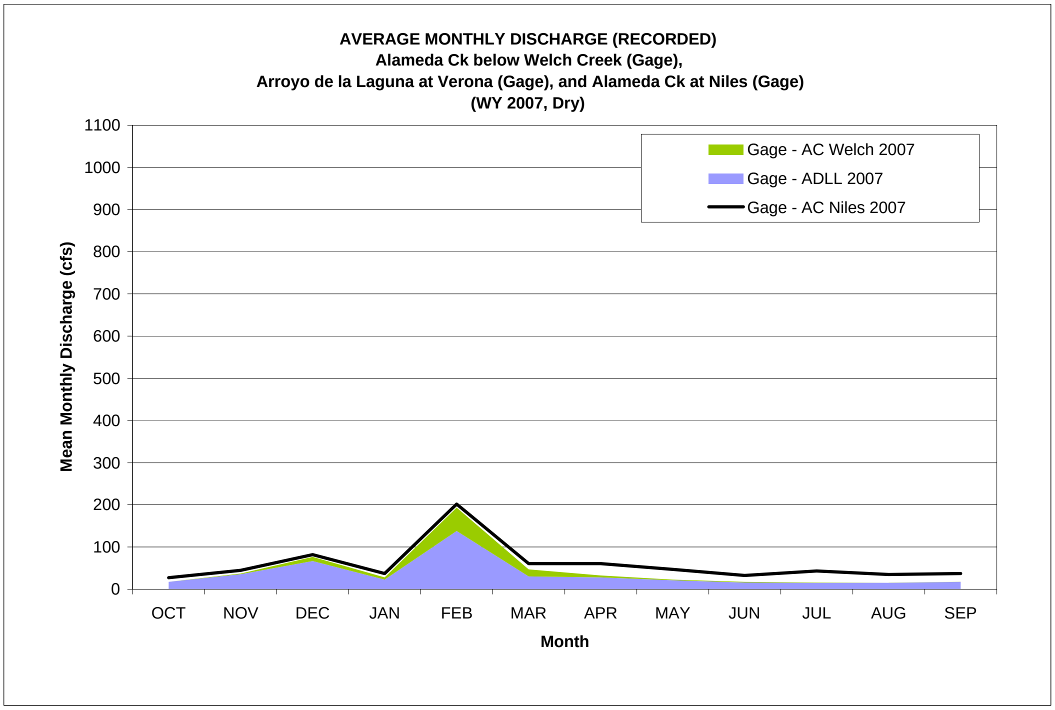
AC below Welch Ck, Gage versus Calculated w WSIP 2030

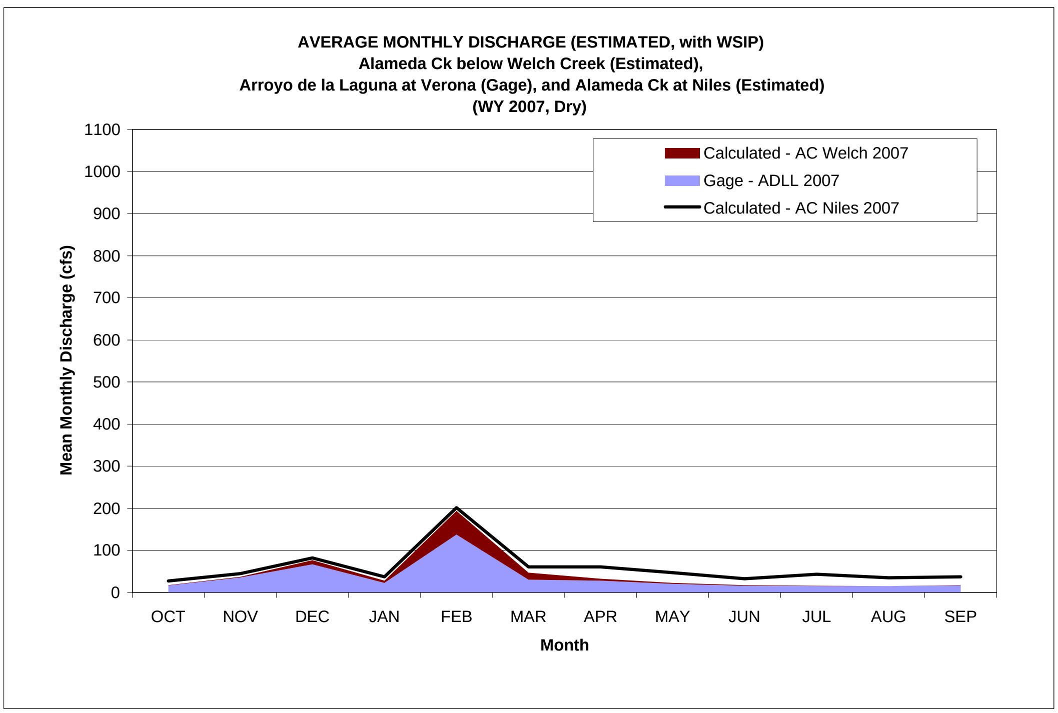
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
2006	0.3	0.6	50.7	83.5	27.4	177.0	465.9	324.9	132.5	2.2	1.0	0.4
2006	0.3	0.6	31.3	47.3	17.9	138.9	546.7	328.4	132.5	2.2	1.0	0.4
Delta	0	0	-19	-36	-9	-38	81	4	0	0	0	0
Delta %	0%	0%	-38%	-43%	-35%	-21%	17%	1%	0%	0%	0%	0%

AC at Niles, Gage versus Calculated w WSIP 2030

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
2006	30.3	32.2	286.8	241.5	94.4	551	985.9	361.1	172.3	53.1	43.7	39.3
2006	30.3	32.2	267.4	205.3	84.9	512.9	1066.7	364.6	172.3	53.1	43.7	39.3
Delta	0	0	-19	-36	-9	-38	81	4	0	0	0	0
Delta %	0%	0%	-7%	-15%	-10%	-7%	8%	1%	0%	0%	0%	0%

Increase of greater than 1% | Decrease of greater than 1% | Decrease of greater than 5%





AC below Welch Ck, Gage versus Calculated w WSIP 2030

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
2007	0.6	1.8	9.9	5.1	55.8	16.4	4.4	2.0	0.8	0.3	0.1	0.0
2007	0.6	1.8	9.9	5.1	55.8	16.4	4.4	2.0	0.8	0.3	0.1	0.0
Delta	0	0	0	0	0	0	0	0	0	0	0	0
Delta %	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

AC at Niles, Gage versus Calculated w WSIP 2030

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
2007	27.6	45.1	81.8	37.5	201.6	61	60.9	47	32.4	43.4	35.1	36.9
2007	27.6	45.1	81.8	37.5	201.6	61.0	60.9	47.0	32.4	43.4	35.1	36.9
Delta	0	0	0	0	0	0	0	0	0	0	0	0
Delta %	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Increase of greater than 1% | Decrease of greater than 1% | Decrease of greater than 5%

O. Hydrologic Modeling – Additional Supporting Information

APPENDIX O

Hydrologic Modeling – Additional Supporting Information

O1 – Updated HH/LSM Assumptions and Results—Proposed WSIP

O2 – Updated HH/LSM Assumptions and Results—Modified WSIP Alt.

O3 – Updated HH/LSM Assumptions and Results—Phased WSIP Variant

O4 – Analysis of WSIP upon the San Joaquin River and the Sacramento-San Joaquin Delta

APPENDIX O1

Memorandum

Subject: **Updated HH/LSM Assumptions and Results – Proposed WSIP**

From: **Daniel B. Steiner**

Date: **March 20, 2008**

1. Introduction

This memorandum summarizes assumptions for, and discusses the interpretation of, the Hetch Hetchy/Local Simulation Model (HH/LSM) results for the simulation of the Water System Improvement Program (WSIP or the proposed program). Table 1-1 and Table 1-2 summarize the program/setting characteristics and modeling assumptions, and the performance and hydrologic results, respectively, for the WSIP as they compare to the modeled existing setting (2005, with Calaveras Reservoir constrained by the California Division of Safety of Dams [DSOD] restrictions).

The hydrology under the proposed program is primarily discussed in terms of a comparison to the baseline condition presented in the Draft Program Environmental Impact Report, i.e., the simulated current (2005) operation of the San Francisco Public Utilities Commission (SFPUC) regional water system, assuming that the operation of Calaveras and Crystal Springs Reservoirs is constrained by DSOD restrictions. Primary hydrologic parameters such as projected water deliveries, reservoir storage, and stream flows are compared, and additional parameters that assist in identifying the causes of hydrologic changes are also described as needed.

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Table 1-1
Setting Characteristics and Modeling Assumptions (Part 1/3)

Assumptions and Characteristics of Setting and/or Program	Units	Baseline Baseline Conditions[1] - Calaveras Constrained	Proposed WSIP
Time Horizon for Setting of Analysis / Date[4]		2005	2030
HH/LSM Simulation Study Name[5]		Base1LT	WSIP1LT
System Wide Parameters			
Customer Purchase Request (Demand Level)[6]	MGD	265	300
Demand Level Supplied from Other Sources[7]			
Regional Recycled Water/Conservation/Groundwater in SF	MGD	0	10
Other Regional Recycled Water/Conservation/Groundwater	MGD	0	0
Demand Level Supplied from Tuolumne + Local Watersheds[8]	MGD	265	290
Average Annual Deliveries and Supplies[9]			
Deliveries from Tuolume + Local Watersheds (Average Annual)	MGD	258	287
Supply or Deliveries from Other Sources - Regional Recl/Cons/GW	MGD	0	10
Total Deliveries and Supply for Demand Level (Average Annual)	MGD	258	297
Features and Facilities[10]			
Regional Reclaimed Water/Conservation/Groundwater - SF			●
Regional Reclaimed Water/Conservation/Groundwater - Other			
Calaveras Reservoir - 12.4 BG (Constrained)		●	
Calaveras Reservoir - 31.6 BG (Restored/Unconstrained)			●
Calaveras Reseroivr Release for Fish			●
Calaveras Reservoir Release for Fish & Flow Recapture			●
Alameda Creek Diversion Dam Bypass Flow & Recapture			
Pilarcitos Reservoir Pump for Creek Summer Release			
Crystal Springs Reservoir - 18.52 BG (Constrained)		●	
Crystal Springs Reservoir - 20.28 BG (Restricted)			
Crystal Springs Reservoir - 22.15 BG (Restored/Unconstrained)			●
Sunol Valley Water Treatment Plant Expansion			●
Sunol Valley Water Treatment Plant Feed from SJPL			●
Harry Tracy Water Treatment Plant Expansion			●
Bay Division Pipeline Increased Conveyance			●
San Joaquin Pipeline Increased Conveyance			●
Desalination Project			
Westside Groundwater Project			●
Tuolumne River Transfer			**29,350 (From Storage)**
Water Supply Reliability[11]			
Action	Level	Rationing %	Rationing %
Implement Drought Water Supply Action (Westside GW or Desal)	1	NA	GW
Rationing (Level 1)	2	10	10
Rationing (Level 2)	3	20	20
Rationing (Level 3)	4	25	25
	Years	Action Level	Action Level
	1921		
	1924	2	1
	1925		1
	1926		1
	1929		1
	1930		1
	1931	3	2
	1932		
	1933		
	1934	2	1
	1935		
	1939		
	1944		
	1946		
	1947		
	1948		1
	1949		
	1950		1
	1953		
	1954		
	1955		1
	1957		
	1959		
	1960	2	1
	1961	3	2
	1962		
	1964		1
	1966		
	1968		
	1971		
	1972		1
	1976	2	1
	1977	3	2
	1979		
	1981		
	1984		
	1985		1
	1987	2	1
	1988	3	2
	1989	3	2
	1990	3	3
	1991	3	2
	1992	3	3
	1994	2	1
	DD1993	4	3
	DD1994	4	3
Max Drought Rationing - Policy Cap[12]	DD	Incidental 25%	20%
	Historical	Incidental 20%	20%

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Table 1-1
Setting Characteristics and Modeling Assumptions (Part 2/3)

Assumptions and Characteristics of Setting and/or Program	Units	Baseline: Baseline Conditions[1] - Calaveras Constrained	Proposed WSIP
System Wide Parameters			
Incremental Supply - Average[13]			
System Customer Purchase Request Level	MGD	265	300
Demand Level Supplied from Other Sources	MGD	0	10
Demand Level Supplied from Tuolumne + Local Watersheds	MGD	265	290
System Deliveries	MGD	258	287
Regional Desalination	MGD	0	0
San Joaquin Pipelines (Tuolumne Diversion)	MGD	221	245
Inferred Local Watershed Production	MGD	37	41
Addt'l Tuolumne Diversion (Compared to Calaveras Constrained)	MGD	*221*	24
Incremental Design Drought Supply[14]			
From Other Sources - Regional Recl/Cons/GW (Every Year)	MGD	0	10
Restoration of Calaveras Reservoir Capacity (w/ flow recapture)	MGD	0	7
Restoration of Crystal Springs Capacity		0	1
MID/TID Transfer to SFPUC (Results in additional diversion from TR)	MGD	0	25
Westside Basin Conjunctive Use (8,100 acre-feet Storage)	MGD	0	6
Regional Desalination (26 mgd)	MGD	0	0
Sum of Incremental Supplies	MGD	0	48
Yield - Without Other Sources Added (Compared to Calaveras Constrained)	MGD	219	257
Yield - With Other Sources Added (Compared to Calaveras Constrained)	MGD	219	267
Design Drought Delivery Calculator[15]		2	3
	MGD		
Average Annual Delivery During	Year 1	265	290
Average Annual Delivery During	Year 2	239	290
Average Annual Delivery During	Year 3	212	261
Average Annual Delivery During	Year 4	212	261
Average Annual Delivery During	Year 5	212	232
Average Annual Delivery During	Year 6	212	261
Average Annual Delivery During	Year 7	212	232
Average Annual Delivery During	Year 8	199	232
Average Annual Delivery During	Last 6 Mo	99	116
	DD Ave	219	256
Firm Yield (Nominal) Not Including Other Sources	MGD	219	256
Local System Operational Parmeters			
Crystal Springs Reservoir Operation			
Storage - Minimum/Maximum	BG	5.4 - 18.52	5.4 - 22.15
	TAF	16.6 - 56.8	16.6 - 68.0
Fall/Winter Operation Storage		16.52 BG (50.7 TAF)	18.55 BG (56.9 TAF)
Stream Release		Up to 250 cfs to not exceed 18.52 BG	Up to 250 cfs to not exceed 21 BG
Calaveras Reservoir Operation			
Storage - Minimum/Maximum	BG	8.4 - 12.4	8.4 - 31.5
	TAF	25.7 - 38.0	25.7 - 96.8
Fall/Winter Operation Storage		10.3 BG (31.6 TAF)	27.0 BG (82.9 TAF)
Alameda Creek Release/Recapture[16]	AFY	0	Up to 6,300
San Andreas Reservoir Operation			
Storage - Minimum/Maximum	BG	3.0 - 6.2	3.0 - 6.2
	TAF	9.2 - 19.0	9.2 - 19.0
Fall/Winter Operation Storage		5.6 BG (17.2 TAF)	5.6 BG (17.2 TAF)
San Antonio Reservoir Operation			
Storage - Minimum/Maximum	BG	1.0 - 16.5	1.0 - 16.5
	TAF	3.1 - 50.5	3.1 - 50.5
Fall/Winter Operation Storage		15.9 BG (48.8 TAF)	15.9 BG (48.8 TAF)
Pilarcitos Reservoir Operation			
Storage - Minimum/Maximum	BG	0.66 - 0.97	0.66 - 0.97
	TAF	2.0 - 3.0	2.0 - 3.0
Fall/Winter Operation Storage		0.72 BG (2.2 TAF)	0.72 BG (2.2 TAF)
Water Treatment Plants			
Sunol Valley Water Treatment Plant Maximum	MGD	120	160
		90 MGD from Calaveras	90 MGD from Calaveras + Recapture
Sunol Valley Water Treatment Plant Minimum	MGD	20	20
		From Calavers & San Antonio & SJPL	From Calavers & San Antonio & SJPL
Harry Tracy Water Treatment Plant Maximum	MGD	120	140
Harry Tracy Water Treatment Plant Minimum	MGD	20	20
Conveyance			
Bay Division Pipeline Maximum		340 MGD Jun - Sep 320 MGD Apr, May & Oct 290 MGD Nov - Mar	380 MGD Apr - Oct 320 MGD Nov - Mar
Bay Division Pipeline Maintenance		Cycle one pipeline out Nov - Mar each year (average remaining capacity rotation) maximum 230 MGD	Same as Baselines, except maximum 320 MGD

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Table 1-1
Setting Characteristics and Modeling Assumptions (Part 3/3)

Assumptions and Characteristics of Setting and/or Program	Units	Baseline Baseline Conditions[1] - Calaveras Constrained	Proposed WSIP
Tuolumne River System Operational Parameters			
Hetch Hetchy Reservoir Operation			
Storage - Minimum/Maximum	TAF	26.1 - 360.4	26.1 - 360.4
Fall/Winter Operation Storage		30 TAF winter buffer	30 TAF winter buffer
1987 Stipulation Minimum Release Flows		Yes	Yes
1987 Stipulation Supplemental Release Flows		No	No
Cherry Reservoir Operation			
Storage - Minimum/Maximum	TAF	1.0 - 273.3	1.0 - 273.3
Fall/Winter Operation Storage		25.3 TAF winter buffer	25.3 TAF winter buffer
Eleanor Reservoir Operation			
Storage - Minimum/Maximum	TAF	0.0 - 27.1	0.0 - 27.1
Fall/Winter Operation Storage		Required Minimum Storage	Reqrd Minimum Stor
New Don Pedro Water Bank Account			
Storage - Minimum/Maximum	TAF	0.0 - 570.0 Temporary storage up to 740 TAF during Apr - Sep	0.0 - 570.0 Temp stor up to 740 TAF during Apr - Sep
Conveyance			
San Joaquin Pipelines Maximum	MGD	290	313
San Joaquin Pipelines Minimum	MGD	70	70
San Joaquin Pipelines Flow Rate Changes		11 Stepwise Surrogate minimum changes by allowing only 7 changes in a year	17 Stepwise Allow up to 7 changes in a year (surrogate)
San Joaquin Pipelines Maintenance		Cycle one pipeline out Nov - Mar each year (average remaining capacity rotation) maximum 210 MGD	Cyclic 5-year mantenance (see note)
TID/MID Operational Parameters			Note: Cyclic 5-year maintenance, maximum 271 MGD available all other months exc and 135.5 MGD available
Districts' Tuolumne Diversion[17]		Varies annually based on land use and water availability Annual average 875 TAF	Set equal to baseline conditions. SFPUC effects measured by the result of reducing inflow to DP and its effect upon La Grange releases to the TR
Tuolumne River La Grange Flow Releases			
Don Pedro, 1996 FERC		X	X
VAMP - considered but not modeled[18]		X	X

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Table 1-2
Summary of Modeling Results (Part 1/2)

HH/LSM Simulation Results	Units	Baseline: Baseline Conditions[1] - Calaveras Constrained	Proposed WSIP
Design Drought Production & Disposition[19]			
San Joaquin Pipeline Diversion	MGD	208.7	235.0
Bay-Area Deliveries	MGD	218.3	248.9
Added Groveland & Coastside Delivery	MGD	2.6	3.6
Local Reservoir Evaporation	MGD	10.7	12.5
Inflow from ACDD	MGD	1.3	1.6
Flow Recapture	MGD	0	5.3
Local Reservoir Stream Release	MGD	0.6	5.4
Desalination	MGD	0	0
Westside Basin	MGD	0	5.6
District Transfer to NDP Water Bank	MGD	0	24.7
Local Storage - Begin	MG	53,854	77,310
Local Storage - End	MG	18,403	18,495
Study Average Production & Disposition (1921-02)[20]			
Tuolumne River System			
Reservoirs			
Hetch Hetchy			
Inflow	AF	749,605	749,605
River	AF	275,255	267,021
Stream Minimum Release	AF	65,728	65,593
Tunnel	AF	470,709	478,932
Evaporation	AF	3,893	3,869
Reservoir	AF	281,938	275,235
Cherry			
Inflow	AF	279,293	279,293
Eleanor Gravity	AF	289	289
Eleanor Pump	AF	118,251	118,274
River	AF	41,636	41,439
Stream Minimum Release	AF		
Tunnel	AF	352,692	352,915
Evaporation	AF	3,505	3,501
Reservoir	AF	239,971	239,309
Eleanor			
Inflow	AF	169,617	169,617
Eleanor Gravity	AF	289	289
Eleanor Pump	AF	118,251	118,274
River	AF	49,171	49,148
Stream Minimum Release	AF		
Evaporation	AF	1,906	1,906
Reservoir	AF	22,191	22,191
Don Pedro Reservoir			
Inflow	AF	1,587,517	1,560,828
MID Diversion	AF	302,054	302,055
TID Diversion	AF	573,164	573,168
LaGrange Total Stream	AF	668,876	644,009
LaGrange Minimum Stream Release	AF	221,477	221,477
Total Evaporation	AF	43,493	42,604
Reservoir	AF	1,472,337	1,434,872
Water Bank Account			
Balance	AF	514,299	516,733
Transfer	AF	0	29,350
San Joaquin Pipelines			
Volume (AF)	AF	247,763	274,450
Volume (MG)	MG	80,734	89,429
Rate (MGD)	MGD	221	245
Max Rate (MGD)	MGD	290	313
Min Rate (MGD)	MGD	70	0
East Bay System			
Reservoirs			
Calaveras			
Inflow	MG	12,368	12,368
From ACDD	MG	1,316	1,730
Stream	MG	3,660	4,167
Stream Flow Recapture	MG	0	1,538
To SVWTP	MG	9,013	8,244
To San Antonio	MG	0	0
Evaporation	MG	1,023	1,704
Resevoir	MG	10,969	28,170
San Antonio			
Inflow	MG	2,468	2,468
From Calaveras/SJPL	MG	1,173	1,734
Stream	MG	991	613
To SVWTP	MG	1,693	2,628
Evaporation	MG	1,012	973
Resevoir	MG	15,323	14,490
Alameda Creek Diversion Dam			
Inflow	MG	4,197	4,197
To Calaveras Reservoir	MG	1,316	1,730
Spill	MG	2,881	2,467
Alameda Creek Confluence			
Accretion	MG	625	625
From ACDD	MG	2,881	2,467
From Calaveras Dam	MG	3,660	4,167
At Confluence	MG	7,167	7,259
Treatment Plants			
SVWTP Total	MG	13,662	15,738
From Calaveras	MG	9,013	8,244
From San Antonio	MG	1,693	2,628
From SJPL	MG	2,956	3,329
From Recapture	MG	0	1,538
SVWTP Total MGD	MGD	37	43
SVWTP Max MGD	MGD	120	158
SVWTP Min MGD	MGD	20	20

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Table 1-2
Summary of Modeling Results (Part 2/2)

HH/LSM Simulation Results	Units	Baseline: Baseline Conditions[1] - Calaveras Constrained	Proposed WSIP
Peninsula System			
Reservoirs			
Crystal Springs			
Inflow	MG	3,722	3,722
From San Andreas	MG	0	0
From Pilarcitos and SJPL	MG	8,045	7,643
Stream	MG	773	325
Pump to San Andreas	MG	9,438	9,005
Pump to Coastside	MG	247	591
Evaporation	MG	1,323	1,490
Reservoir	MG	16,360	18,621
San Andreas			
Inflow	MG	1,428	1,428
From other Streams	MG	9,954	9,590
Stream	MG	0	0
To HTWTP	MG	10,851	10,487
Evaporation	MG	530	531
Reservoir	MG	5,892	5,882
Pilarcitos			
Inflow		1,297	1,297
To San Andreas	MG	516	584
For Stone Diversion	MG	262	280
Stream other than Diversion	MG	417	332
Evaporation	MG	103	102
Reservoir	MG	776	767
Stone Dam			
Accretion blw Pilarcitos	MG	167	211
Pilarcitos non-diversion Release	MG	417	332
Pilarcitos Release for Diversions	MG	584	543
Diversion to Coastside	MG	167	211
Diversion to Crystal Springs	MG	142	180
Spill past Stone	MG	860	695
Treatment Plants			
HTWTP Total	MG	10,851	10,487
HTWTP Total MGD	MGD	30	29
HTWTP Max MGD	MGD	149	106
HTWTP Min MGD	MGD	20	20
Other Facilites			
Westside Basin Net	MG	0	11
Desalination Input	MG	0	0
Additional Information			
Total Local Reservoir Stream Release	MG	5,842	5,437
Total Local Reservoir Stream Evaporation	MG	3,991	4,800
Deliveries			
In-City	MG	29,589	26,686
South Bay	MG	43,106	52,906
Crystal Springs	MG	15,120	16,931
San Andreas	MG	5,400	6,604
Coastside	MG	675	1,082
Groveland	MG	365	365
Total Deliveries	MG	94,255	104,574
Total Deliveries	MGD	258	287
Storage			
Total Local Storage Begin	MG	49,849	71,363
Total Local Storage End	MG	43,129	65,197
Residual Difference during 82-year Simulation	MGD	0.22	0.21
Westside Storage Begin	MG	0	23,474
Westside Storage End	MG	0	24,363
Residual Difference during 82-year Simulation	MGD	0.00	-0.03

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Notes for Table 1-1 and Table 1-2

1. Baseline condition represents the existing conditions at the time of Notice of Preparation publication in September 2006. This is the baseline used to assess WSIP program impacts and impact significance. This setting is indicative of DSOD restrictions on Calaveras and Crystal Springs Reservoirs.

2. N/A

3. N/A

4. The time horizon for the setting of the scenario. The baseline condition scenario is depicted for recent conditions, while the proposed WSIP, variants, and alternatives are depicted for the future at full buildout and implementation (i.e., conditions in the year 2030).

5. HH/LSM simulation study name.

6. The customer purchase request (demand) information is based on the demand and request studies prepared by the SFPUC in coordination with the wholesale customers. This demand on the regional water system includes both the SFPUC retail customers and wholesale customers. The current (2005) average annual demand is 265 mgd and the projected 2030 average annual demand is 300 mgd, assuming the SFPUC adopts the updated wholesale customer purchase requests as part of renewing the Master Sales Agreement with these customers (due in 2009).

7. Certain scenarios include development of additional water supply from a combination of recycled water projects, groundwater projects, and conservation, utilized every year and not subject to reduction during drought.

8. The average annual demand for supplies from the combination of SFPUC local watershed, Tuolumne River, and programs not included in the regional water conservation, recycling, and groundwater programs shown.

9. Modeled results for SFPUC deliveries, with supplies added for regional water conservation, recycling, and groundwater programs. Total deliveries and supply will be less than full customer purchase requests due to rationing in some years.

10. Shows only the features that affect hydrologic results of the system operation simulations. Additional projects are included in the WSIP.

11. Illustrates the frequency and severity of water supply action or the severity of systemwide rationing. Only years when a variable water supply component is implemented or rationing occurs are shown. "DD" illustrates the shortage results for years included in the prospective drought period of the SFPUC design drought. These years contribute to establishing system operation protocols but are not included in the hydrologic assessment analyses.

12. Rationing policy cap: The SFPUC WSIP level of service goal is to maintain rationing on the regional system at no more than 20% during any one year of the drought. Some alternatives do not achieve this level of service goal. Performance is indicated for the Design Drought ("DD") sequence and for the "Historical" hydrologic sequence.

13. Water supply elements develop water in different amounts from year-to-year, and in some instances only develop water during dry years. This information is provided to illustrate a comparison between local watershed supplies, Tuolumne River supplies, and other identifiable water supplies used to meet system purchase requests. Values are stated in units of average annual quantities during the simulated historical sequence.

14. Results from HH/LSM analysis of each scenario. Values represent the average annual production of each element of supply during the design drought period.

15. Simplified calculation of system deliveries during the SFPUC design drought. The value represents the application of systemwide shortages to the demand level being met with SFPUC local watershed, Tuolumne River, and other developed supplies, and does not include supplies from regional water conservation, recycled water, or groundwater projects. Average value may be slightly misstated (up to 3 mgd) due to metric of analysis that does not account for differences in residual storage between studies. "Nominal" Firm Yield represents the yield of each scenario after adjustment for minor residual storage differences.

16. Supplemental releases from Calaveras Reservoir for fisheries (1997 CDFG MOU) of up to 6,300 acre-feet per year and the Alameda Creek recapture facility project are tied to implementation of the Calaveras Dam Replacement project (SV-2). When the dam is replaced and capacity restored, the flow release and recapture will both occur. The release requirement is based on supplementing other occurring flows below Calaveras Reservoir, sometimes not requiring the full 6,300 acre-feet.

17. SFPUC actions are assumed to not change MID/TID diversions so as to isolate and possibly overstate the WSIP's effects on the Tuolumne River below La Grange Dam. The Districts' diversions are assumed to be constant among the scenarios to provide comparable results of WSIP-alone effects. The exception is for the Modified WSIP Alternative, in which the MID/TID diversion is reduced by the amount of SFPUC transfer.

18. Participation in the San Joaquin River Agreement is assumed. Although the agreement expires after 2010, it is assumed that a subsequent similar agreement or requirement of the Districts will occur. HH/LSM does not explicitly model the Districts' participation in the agreement; however, their participation if modeled would result in only minor differences in results and would not change impact conclusions.

19. From HH/LSM results for modeling the SFPUC design drought period.

20. From HH/LSM results for modeling the system operations for the historical hydrologic period 1921-2002. Values indicate average annual quantities during simulated historical period.

2. Proposed WSIP

The SFPUC proposes to adopt and implement the WSIP to increase the reliability of the regional water system. The WSIP is a program to implement the service goals and system performance objectives established by the SFPUC for the regional water system in the areas of water quality, seismic reliability, delivery reliability, and water supply through the year 2030.

The WSIP level of service objectives for water supply are to: (1) fully meet customer purchase requests in nondrought years through planning year 2030, estimated at 300 million gallons per day (mgd) average annual delivery; and (2) provide drought-year delivery with a maximum systemwide delivery reduction (rationing) of 20 percent in any one year of a drought. These objectives correspond to a required system firm yield of 256 mgd in 2030. System firm yield is defined as the average annual water delivery that can be sustained throughout an extended drought. The current firm yield of the system is 219 mgd under the current restricted operating conditions that limit storage levels in Calaveras and Crystal Springs Reservoirs.

During nondrought years, the SFPUC would serve the increased 35 mgd in purchase requests through a combination of conservation, water recycling, groundwater supply programs, increased diversions from the Tuolumne River, and greater utilization of Bay Area watershed supplies associated with the restoration of operational storage capacity (primarily in Calaveras Reservoir). The SFPUC would implement conservation, water recycling, and groundwater supply programs in the SFPUC retail service area to achieve the equivalent of 10 mgd of supply per year, in all years. These programs would be in addition to demand management and conservation measures already accounted for in the 2030 purchase requests for the retail service area.

In most years, the SFPUC could serve the projected 2030 water purchases of 300 mgd with its existing sources of water supply; however, these sources alone have not allowed for full water deliveries during past droughts, and they would be insufficient during future droughts as purchase requests increase. The SFPUC proposes to serve this 2030 need for increased system firm yield (i.e., water supply during a drought scenario) with a combination of conservation, water recycling, and groundwater programs in the SFPUC retail service area; water transfers (29,350 acre-feet per year) from the Turlock Irrigation District (TID) and Modesto Irrigation District (MID); a groundwater conjunctive-use program, incorporating the Westside Basin Groundwater Program; and restoration of reservoir operating capacity at Crystal Springs and Calaveras Reservoirs. Systemwide rationing is limited to no more than 20 percent in any year, with a firm yield of 256 mgd throughout an extended drought.

2.1 Water Deliveries and Drought Response Actions

With a current systemwide purchase request of approximately 265 mgd, the regional water system cannot provide full deliveries during all anticipated drought sequences. Drought response actions (delivery shortages) are necessary at the onset of a drought to provide a viable, albeit reduced, supply throughout the duration of a drought. Because the regional water system has limited current resources, rationing of the SFPUC supply by more than 20 percent may be required during an extended drought. With the proposed program, the purchase requests would increase from 265 mgd to 300 mgd, with 10 mgd of these requests satisfied by conservation, recycling, and groundwater programs in the city of San Francisco. In the future, the system would experience a net demand of 290 mgd. The additional net demand and increase in the water supply reliability of the regional water system would be served by the water supply programs described above. Table 1-1 compares the drought response actions for the proposed program and base (Calaveras constrained) settings. Figure 2.1-1 illustrates the drought response actions for the simulated 82-year historical period (1921-2002).

In Figure 2.1-1, years with bars showing a “1” or greater level of action indicate periods when a supplemental water supply action is initiated. In the WSIP setting, the action is the use of the Westside Basin Groundwater Program to supplement SFPUC water deliveries. The water transfer from MID/TID is also occurring during these periods. Action levels greater than “1” indicate the imposition of delivery shortages (rationing) to SFPUC customers.

Figure 2.1-1

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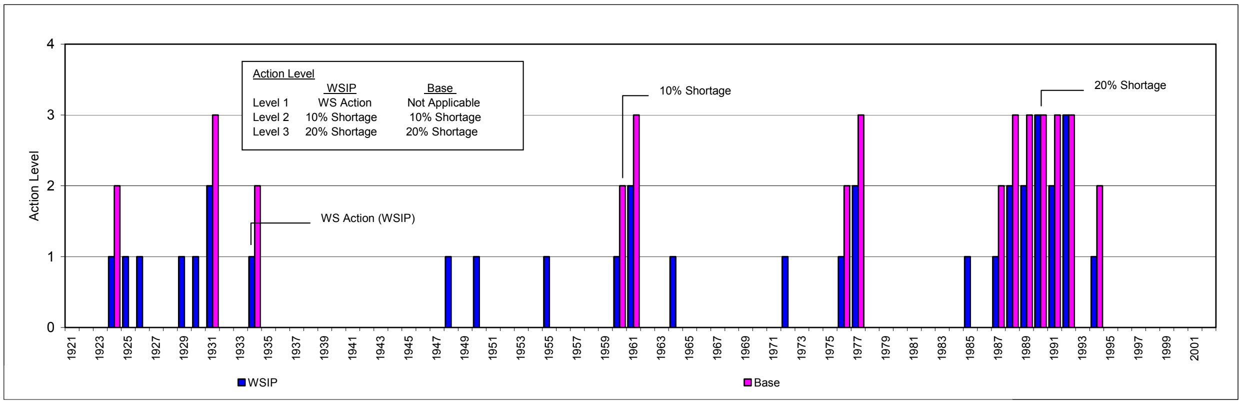
Drought Response Actions – WSIP and Base



In modeling parlance, there is no level 1 action in the base setting. Without supplemental resources, the existing system only has the delivery shortage measure available to cope with drought. This shortage measure is imposed during level 2 (10 percent) and level 3 (20 percent). These percentages of shortage are applied to both the WSIP and the base settings for these action levels. As evidenced in Figure 2.1-1, rationing would be required more frequently and with greater severity (level 2 and level 3 actions) in the base setting.

Figure 2.1-1 illustrates that, when compared to the base setting, the WSIP setting triggers the supplemental resource (Westside Basin Groundwater Program) at an early indication of drought, and during periods when in the base setting there were no supplemental resources available to the system. The utilization of the supplemental resource during these times results in the elimination or reduction, or at least a non-increase in the severity, of delivery shortage.

Although not illustrated in Figure 2.1-1, Table 1-1 shows the delivery shortages anticipated during the entire SFPUC design drought. Shortages during the design drought with the WSIP are maintained within the objective to limit the severity of shortage to no more than 20 percent. With the existing system (Calaveras and Crystal Springs Reservoirs constrained), the 20-percent-limitation (cap) objective cannot be achieved during the last 18 months of the design drought, and a 25-percent shortage is applied. The system's yield in the base setting is 219 mgd.

The difference in water deliveries between the proposed program and the base settings is shown chronologically for the 82-year simulation in Table 2.1-1. The differences all indicate an increase in deliveries due to an increase in the level of purchase requests, and an increase in the reliability of delivery. The annual (fiscal-year-based) increase of approximately 9.1 million gallons represents the basic increase in delivery associated with an increase in purchase requests from 265 mgd to 290 mgd. The years that show other levels of additional deliveries illustrate the increase in purchase requests and represent years when shortages are reduced in the WSIP setting compared to the base setting.

2.2 Diversions from Tuolumne River

The metric for illustrating the SFPUC diversions from the Tuolumne River Basin is the flow through the San Joaquin Pipeline (SJPL). Table 2.2-1 illustrates the difference in diversions to the SJPL between the proposed program and the base settings. Evident in the operation is the increase in summer diversions associated with an increase in the conveyance capacity of the SJPL. Regardless of an increase in purchase requests, the availability of increased conveyance capacity would increase diversions during the summer to retain storage in the Bay Area reservoirs, typically exercising the SJPL at its maximum capacity. The increase in purchase requests would require the utilization of the maximum capacity for a longer period into the fall. Generally, fewer diversions would occur during the late fall and early winter because of the lesser drawdown of the Bay Area reservoirs (requiring less replenishment), and because systematic maintenance within Hetch Hetchy facilities (lessening available conveyance capacity) would impair diversions in the WSIP setting. The increase in diversions during the winter and spring would

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Table 2.1-1

Difference in Total System-wide Delivery (MG)

WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
1921	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1922	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1923	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1924	810	611	461	374	437	609	727	907	1,008	2,347	2,262	1,909	12,462	9,124
1925	1,627	1,198	894	695	869	1,278	1,584	1,935	1,008	1,145	1,095	940	14,269	17,607
1926	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,125	9,125
1927	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,125
1928	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1929	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1930	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,125	9,125
1931	810	611	461	374	437	609	727	907	1,008	2,009	1,947	1,710	11,610	9,125
1932	1,547	1,259	1,075	947	1,006	1,309	1,479	1,721	1,847	1,145	1,095	940	15,370	17,856
1933	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1934	810	611	461	374	437	609	727	907	1,008	2,347	2,262	1,909	12,462	9,124
1935	1,627	1,198	894	695	869	1,278	1,584	1,935	1,008	1,145	1,095	940	14,268	17,607
1936	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1937	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1938	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1939	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1940	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1941	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1942	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1943	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1944	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1945	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1946	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1947	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1948	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1949	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,125
1950	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1951	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,125
1952	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1953	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1954	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1955	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1956	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,125
1957	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1958	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1959	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1960	810	611	461	374	437	609	727	907	1,008	2,347	2,262	1,909	12,462	9,124
1961	1,627	1,198	894	695	869	1,278	1,584	1,935	2,150	2,009	1,947	1,710	17,896	18,749
1962	1,547	1,259	1,075	947	1,006	1,309	1,479	1,721	1,847	1,145	1,095	940	15,370	17,856
1963	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1964	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1965	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,125
1966	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1967	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1968	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1969	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1970	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1971	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1972	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1973	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,125
1974	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1975	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1976	810	611	461	374	437	609	727	907	1,008	2,347	2,262	1,909	12,462	9,124
1977	1,627	1,198	894	695	869	1,278	1,584	1,935	2,150	2,009	1,947	1,710	17,896	18,749
1978	1,547	1,259	1,075	947	1,006	1,309	1,479	1,721	-263	1,145	1,095	940	13,260	15,746
1979	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1980	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1981	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1982	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1983	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1984	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1985	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1986	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,125
1987	810	611	461	374	437	609	727	907	1,008	2,347	2,262	1,909	12,462	9,124
1988	1,627	1,198	894	695	869	1,278	1,584	1,935	2,150	2,009	1,947	1,710	17,896	18,749
1989	1,547	1,259	1,075	947	1,006	1,309	1,479	1,721	1,847	2,009	1,947	1,710	17,856	17,856
1990	1,547	1,259	1,075	947	1,006	1,309	1,479	1,721	1,847	885	845	733	14,654	17,856
1991	646	509	403	337	381	503	586	709	775	2,009	1,947	1,710	10,513	7,311
1992	1,547	1,259	1,075	947	1,006	1,309	1,479	1,721	1,847	885	845	733	14,654	17,856
1993	646	509	403	337	381	503	586	709	-1,335	1,145	1,095	940	5,917	5,201
1994	810	611	461	374	437	609	727	907	1,008	2,347	2,262	1,909	12,462	9,124
1995	1,627	1,198	894	695	869	1,278	727	907	1,008	1,145	1,095	940	12,383	15,721
1996	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1997	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1998	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1999	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
2000	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
2001	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
2002	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
Avg (21-02)	920	699	536	439	509	707	831	1,024	1,054	1,290	1,237	1,062	10,307	10,307

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Table 2.2-1

Difference in Total San Joaquin Pipeline (Acre-feet) WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
1921	0	-921	0	0	0	12,368	2,118	2,189	2,118	2,189	2,189	2,118	24,368	27,130
1922	952	1,841	-1,902	952	0	0	7,365	5,043	4,880	2,189	2,189	2,118	25,627	25,627
1923	0	-2,762	0	0	0	15,317	2,118	2,189	2,118	2,189	2,189	2,118	25,476	25,476
1924	-951	0	1,902	-952	-859	5,803	2,118	2,189	2,118	2,189	2,189	2,118	17,864	17,864
1925	2,189	-19,334	-19,979	5,803	17,272	11,512	2,118	2,189	2,118	2,189	2,189	2,118	10,384	10,384
1926	5,043	5,616	-7,088	5,803	9,452	15,317	4,880	2,189	2,118	2,189	2,189	2,118	49,826	49,826
1927	1,903	-921	0	4,757	0	6,659	2,762	2,189	2,118	2,189	2,189	2,118	25,963	25,963
1928	2,949	0	-2,331	3,805	4,297	5,708	4,603	2,189	2,118	2,189	2,189	2,118	29,834	29,834
1929	4,756	1,841	1,902	1,902	1,718	5,803	2,118	2,189	2,118	2,189	2,189	2,118	30,843	30,843
1930	2,189	-19,334	-19,979	5,803	9,538	11,512	2,118	2,189	2,118	2,189	2,189	2,118	2,650	2,650
1931	2,189	5,616	-7,088	5,803	5,242	5,803	2,118	2,189	2,118	2,189	2,189	6,721	35,089	30,486
1932	8,562	2,762	5,708	5,708	0	15,412	4,880	6,945	6,721	2,189	2,189	2,118	63,194	67,797
1933	-951	0	-7,088	7,611	6,875	5,803	2,118	2,189	2,118	2,189	2,189	2,118	25,171	25,171
1934	2,189	5,616	5,803	6,659	6,015	5,803	2,118	2,189	2,118	2,189	2,189	2,118	45,006	45,006
1935	5,043	-19,334	-19,979	19,122	17,272	10,560	9,483	7,897	7,642	2,189	2,189	2,118	44,202	44,202
1936	2,189	4,603	-7,088	7,611	0	15,317	2,118	2,189	2,118	2,189	2,189	2,118	35,553	35,553
1937	3,806	1,841	1,902	3,805	0	951	6,445	5,043	4,880	2,189	2,189	2,118	35,169	35,169
1938	1,903	0	0	5,708	0	0	5,524	5,043	4,880	2,189	2,189	2,118	29,554	29,554
1939	-1,902	-921	-2,855	2,854	2,578	5,803	2,118	2,189	2,118	2,189	2,189	2,118	18,478	18,478
1940	2,189	-19,334	-19,979	15,317	7,734	13,319	8,286	5,043	4,880	2,189	2,189	2,118	23,951	23,951
1941	-1,902	-921	0	0	0	0	0	952	921	2,189	2,189	2,118	5,546	5,546
1942	2,379	0	-1,142	0	0	2,663	5,524	2,854	2,762	2,189	2,189	2,118	21,536	21,536
1943	1,903	-921	-7,088	0	0	3,805	6,721	2,189	2,118	2,189	2,189	2,118	15,223	15,223
1944	1,902	-921	0	1,902	7,046	15,317	2,118	2,189	2,118	2,189	2,189	2,118	38,167	38,167
1945	-475	-19,334	-19,979	5,803	13,749	15,317	2,118	2,189	2,118	2,189	2,189	2,118	8,002	8,002
1946	5,043	1,841	0	0	0	10,560	2,118	2,189	2,118	2,189	2,189	2,118	30,365	30,365
1947	952	1,841	0	-952	3,437	10,560	2,118	2,189	2,118	2,189	2,189	2,118	28,759	28,759
1948	2,189	5,616	-7,088	4,756	2,578	5,803	2,118	2,189	2,118	2,189	2,189	2,118	26,775	26,775
1949	2,189	5,616	2,854	-952	-859	1,902	2,118	2,189	2,118	2,189	2,189	2,118	23,671	23,671
1950	3,805	-19,334	-19,979	16,459	16,413	5,803	2,118	2,189	2,118	2,189	2,189	2,118	16,088	16,088
1951	2,189	7,365	0	0	0	8,562	2,118	2,189	2,118	2,189	2,189	2,118	31,037	31,037
1952	2,949	0	1,712	0	0	0	9,206	2,189	2,118	2,189	2,189	2,118	24,670	24,670
1953	1,902	-921	0	0	0	15,317	2,118	2,189	2,118	2,189	2,189	2,118	29,219	29,219
1954	-1,807	0	0	2,854	5,328	10,560	2,118	2,189	2,118	2,189	2,189	2,118	29,856	29,856
1955	-951	-19,334	-15,222	16,459	14,866	5,803	2,118	2,189	2,118	2,189	2,189	2,118	14,542	14,542
1956	2,189	5,616	0	0	0	2,663	2,118	2,189	2,118	2,189	2,189	2,118	23,389	23,389
1957	2,949	0	1,902	3,805	7,046	10,560	2,118	2,189	2,118	2,189	2,189	2,118	39,183	39,183
1958	952	2,762	-7,088	9,514	0	0	0	1,047	1,013	2,189	2,189	2,118	14,696	14,696
1959	0	0	0	2,854	0	15,317	2,118	2,189	2,118	2,189	2,189	2,118	31,092	31,092
1960	2,189	-19,334	-19,979	5,803	10,398	5,803	2,118	2,189	2,118	2,189	2,189	2,118	-2,199	-2,199
1961	2,189	5,616	-7,088	5,803	9,538	5,803	2,118	2,189	2,118	2,189	5,043	9,483	45,001	34,782
1962	9,799	10,219	4,757	3,805	3,437	18,075	7,642	7,897	7,642	2,189	2,189	2,118	79,769	89,988
1963	2,949	1,841	-7,088	0	0	7,610	5,524	1,902	1,841	2,189	2,189	2,118	21,075	21,075
1964	2,189	0	0	7,611	6,875	5,803	2,118	2,189	2,118	2,189	2,189	2,118	35,399	35,399
1965	2,189	-19,334	-14,270	5,708	5,156	11,512	12,889	952	921	2,189	2,189	2,118	12,219	12,219
1966	2,949	-2,762	-1,379	9,704	8,765	5,803	2,118	2,189	2,118	2,189	2,189	2,118	36,001	36,001
1967	2,189	5,616	-2,855	0	0	0	6,445	0	0	2,189	2,189	2,118	17,891	17,891
1968	2,189	0	-7,088	8,562	7,734	5,803	2,118	2,189	2,118	2,189	2,189	2,118	30,121	30,121
1969	2,189	4,603	-952	0	0	951	7,642	2,189	2,118	2,189	2,189	2,118	25,236	25,236
1970	0	-19,334	-19,979	12,367	11,171	19,122	2,118	2,189	2,118	2,189	2,189	2,118	16,268	16,268
1971	2,379	-921	0	0	0	10,560	2,118	2,189	2,118	2,189	2,189	2,118	24,939	24,939
1972	2,189	5,616	0	-952	3,437	5,803	2,118	2,189	2,118	2,189	2,189	2,118	29,014	29,014
1973	2,189	5,616	-7,088	0	0	0	6,721	2,189	2,118	2,189	2,189	2,118	18,241	18,241
1974	1,902	0	0	0	0	10,464	4,603	5,043	4,880	2,189	2,189	2,118	33,388	33,388
1975	-1,902	-19,334	-19,979	11,512	5,156	3,805	8,286	5,043	4,880	2,189	2,189	2,118	3,963	3,963
1976	-1,902	-921	-7,088	0	0	5,803	2,118	2,189	2,118	2,189	2,189	2,118	8,813	8,813
1977	5,043	5,616	4,756	0	0	5,803	2,118	2,189	2,118	-4,756	-1,902	7,365	28,350	34,139
1978	7,611	-921	-2,854	5,708	5,156	10,464	12,152	5,803	5,616	2,189	2,189	2,118	55,231	49,442
1979	-2,854	0	1,902	2,854	0	11,416	2,118	2,189	2,118	2,189	2,189	2,118	26,239	26,239
1980	5,043	-19,334	-15,222	13,319	0	7,610	4,880	2,189	2,118	2,189	2,189	2,118	7,099	7,099
1981	1,902	0	-7,088	7,610	6,874	11,512	2,118	2,189	2,118	2,189	2,189	2,118	33,731	33,731
1982	2,189	-921	0	0	0	0	0	1,902	1,841	2,189	2,189	2,118	11,507	11,507
1983	1,047	-2,762	951	0	0	0	4,787	4,757	4,603	2,189	2,189	2,118	19,879	19,879
1984	952	-4,603	0	0	0	5,803	2,118	2,189	2,118	2,189	2,189	2,118	15,073	15,073
1985	2,189	-19,334	-19,979	10,560	9,538	5,803	2,118	2,189	2,118	2,189	2,189	2,118	1,698	1,698
1986	2,189	5,616	-7,088	5,803	3,437	7,610	7,365	5,043	4,880	2,189	2,189	2,118	41,351	41,351
1987	0	0	1,902	-952	-859	5,803	2,118	2,189	2,118	2,189	2,189	2,118	18,815	18,815
1988	5,043	5,616	-7,088	10,465	7,734	5,803	2,118	2,189	2,118	2,189	2,189	9,483	47,859	40,494
1989	4,756	1,841	4,757	2,854	2,578	5,803	2,118	5,043	4,880	5,043	3,806	7,365	50,844	48,491
1990	6,659	-19,334	-15,222	10,560	9,538	5,803	2,118	2,189	2,118	5,043	4,756	6,444	20,672	20,643
1991	3,805	-921	-2,331	0	0	10,465	4,880	2,854	2,762	2,189	3,805	1,841	29,349	37,757
1992	0	4,603	3,805	952	2,406	18,075	6,721	6,945	6,721	1,047	-1,902	1,841	51,214	58,063
1993	1,902	-921	-1,379	0	0	0	4,603	2,854	2,762	2,189	2,189	2,118	16,317	10,807
1994	-2,854	0	0	-952	10,312	5,803	2,118	2,189	2,118	2,189	2,189	2,118	25,230	25,230
1995	5,043	-19,334	-19,979	7,610	6,874	0	9,206	1,903	1,842	2,189	2,189	2,118	-339	-339
1996	1,902	0	-2,331	0	0	0	4,880	5,043	4,880	2,189	2,189	2,118	20,870	20,870
1997	1,903	0	0	0	0	10,465	2,118	2,189	2,118	2,189	2,189	2,118	25,289	25,289
1998	2,189	2,762	-7,088	0	0	951	11,048	3,901	3,775	2,189	2,189	4,880	26,796	24,034
1999	1,902	-921	0	6,659	0	8,562	9,206	2,189	2,118	2,189	2,189	2,118	36,211	38,973
2000	1,902	-19,334	-19,979	15,317	7,734	16,173	2,118	2,189	2,118	2,189	2,189	2,118	14,734	14,734
2001	3,806	2,762	-7,088	7,611	8,593	15,317	2,118	2,189	2,118	2,189	2,189	2,118	43,922	43,922
2002	952	0	-1,902	6,659	6,015	10,560	2,118	2,189	2,118	2,189	2,189	2,118	35,205	35,205
Avg (21-02)	2,106	-2,522	-4,852	4,307	3,833	7,532	3,864	2,797	2,706	2,160	2,195	2,561	26,687	26,720

result from the need to replenish Bay Area reservoir storage after the maintenance period, serve increased purchase requests, and top off Bay Area reservoir storage prior to summer. The difference in SJPL diversions between the WSIP setting and the base setting is illustrated in Figure 2.2-1. The difference in average monthly diversions through the SJPL is shown by year type for the 82-year simulation period.

Table 2.2-2 illustrates the average monthly diversions through the SJPL, by year type, for the 82-year simulation period for the proposed program and the base settings. The table illustrates a trend of diverting less water from the Tuolumne River Basin in wetter years (as Bay Area reservoir watersheds provide more supply during those years) than in drier years.

Figure 2.2-1
SJPL Diversions – WSIP and Base-Calaveras Constrained

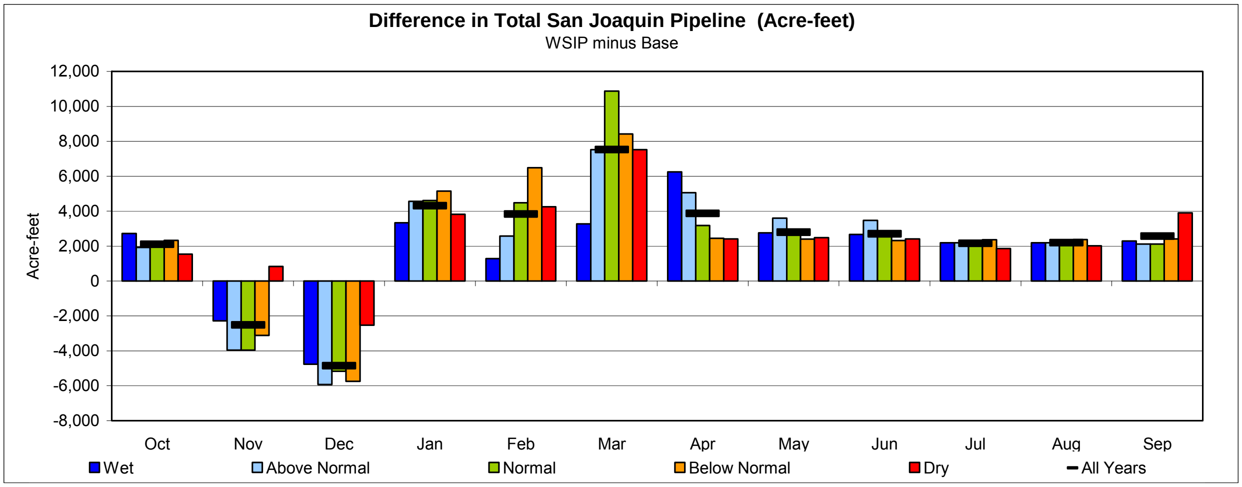


Table 2.2-2

Total San Joaquin Pipeline (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	27,584	16,762	9,692	11,066	7,304	10,875	21,647	26,722	25,859	29,778	29,778	28,817	245,884	243,146
Above Normal	26,935	14,568	8,898	13,901	8,598	16,352	24,176	28,608	27,685	29,778	29,778	28,817	258,095	258,095
Normal	26,632	15,087	9,698	15,299	11,343	21,935	28,322	29,778	28,817	29,778	29,778	28,817	275,285	275,285
Below Normal	27,567	16,214	13,000	21,070	18,065	25,211	28,817	29,481	28,530	29,778	29,521	27,972	295,227	295,751
Dry	26,210	19,881	16,554	19,818	16,869	25,717	28,817	29,778	28,817	29,094	28,773	27,154	297,481	299,662
All Years	26,992	16,475	11,553	16,261	12,458	20,037	26,359	28,878	27,946	29,645	29,529	28,317	274,450	274,450

Total San Joaquin Pipeline (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	24,854	19,046	14,449	7,730	6,015	7,611	15,398	23,962	23,189	27,589	27,589	26,526	223,960	222,101
Above Normal	25,015	18,522	14,830	9,346	6,015	8,831	19,117	25,015	24,208	27,589	27,589	26,699	232,776	232,343
Normal	24,616	19,046	14,865	10,691	6,864	11,060	25,145	27,054	26,181	27,589	27,589	26,699	247,400	246,589
Below Normal	25,239	19,334	18,748	15,927	11,585	16,789	26,374	27,085	26,212	27,421	27,141	25,562	267,417	267,585
Dry	24,676	19,046	19,087	15,995	12,621	18,195	26,411	27,292	26,411	27,232	26,757	23,247	266,970	269,749
All Years	24,886	18,997	16,405	11,955	8,624	12,505	22,496	26,081	25,239	27,485	27,334	25,756	247,763	247,729

Difference in Total San Joaquin Pipeline (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	2,730	-2,285	-4,757	3,336	1,289	3,264	6,249	2,759	2,670	2,189	2,189	2,291	21,924	21,045
Above Normal	1,920	-3,954	-5,932	4,555	2,583	7,521	5,058	3,593	3,477	2,189	2,189	2,118	25,318	25,752
Normal	2,016	-3,959	-5,167	4,608	4,479	10,875	3,177	2,724	2,636	2,189	2,189	2,118	27,885	28,696
Below Normal	2,328	-3,120	-5,748	5,143	6,480	8,422	2,443	2,396	2,318	2,357	2,379	2,410	27,810	28,166
Dry	1,534	834	-2,533	3,823	4,248	7,521	2,406	2,486	2,406	1,862	2,016	3,907	30,511	29,913
All Years	2,106	-2,522	-4,852	4,307	3,833	7,532	3,864	2,797	2,706	2,160	2,195	2,561	26,687	26,720

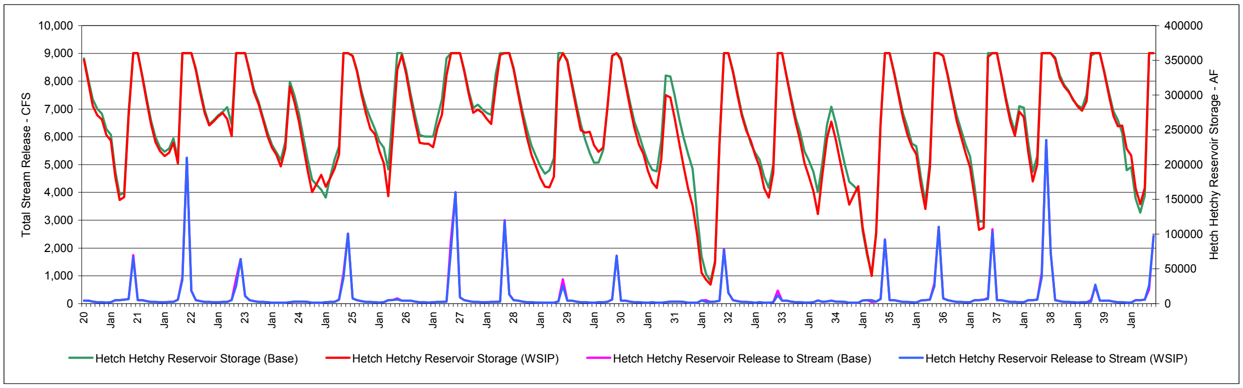
2.3 Hetch Hetchy Reservoir and Releases

The additional draw of water for the additional deliveries occurring under the WSIP would generally result in an increase in draw from Hetch Hetchy Reservoir. Figure 2.3-1 illustrates a chronological trace of the simulation of Hetch Hetchy Reservoir storage and stream releases. Shown in Figure 2.3-1 are the results for the WSIP and base settings. Supplementing the Figure 2.3-1 representation of Hetch Hetchy Reservoir storage are Table 2.3-1, Hetch Hetchy Reservoir Storage (WSIP); Table 2.3-2, Hetch Hetchy Reservoir Storage (Base); and Table 2.3-3, Difference in Hetch Hetchy Reservoir Storage (WSIP minus Base).

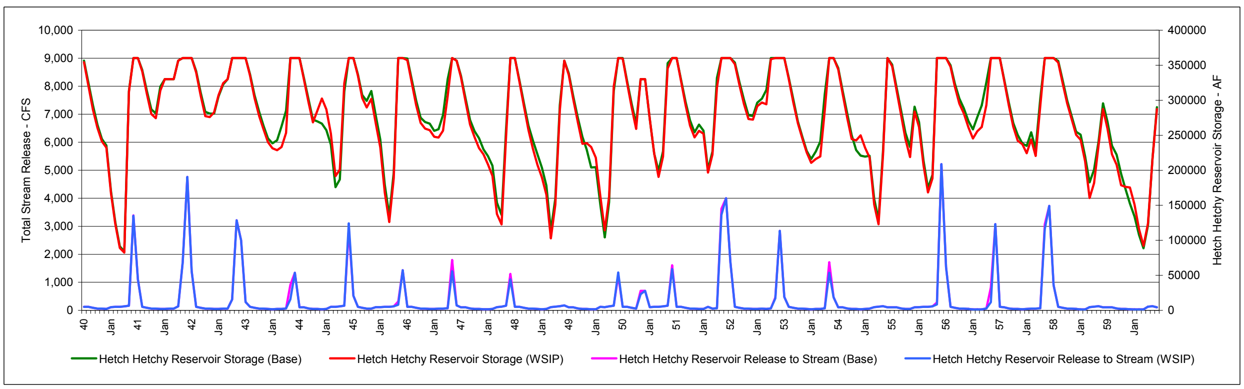
APPENDIX O1

Figure 2.3-1
Hetch Hetchy Reservoir Storage and Stream Release

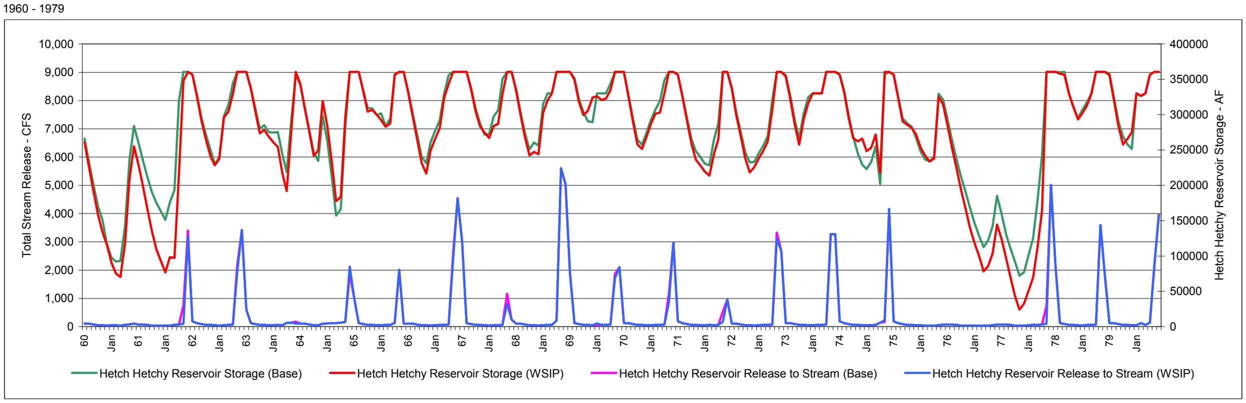
1920 - 1939



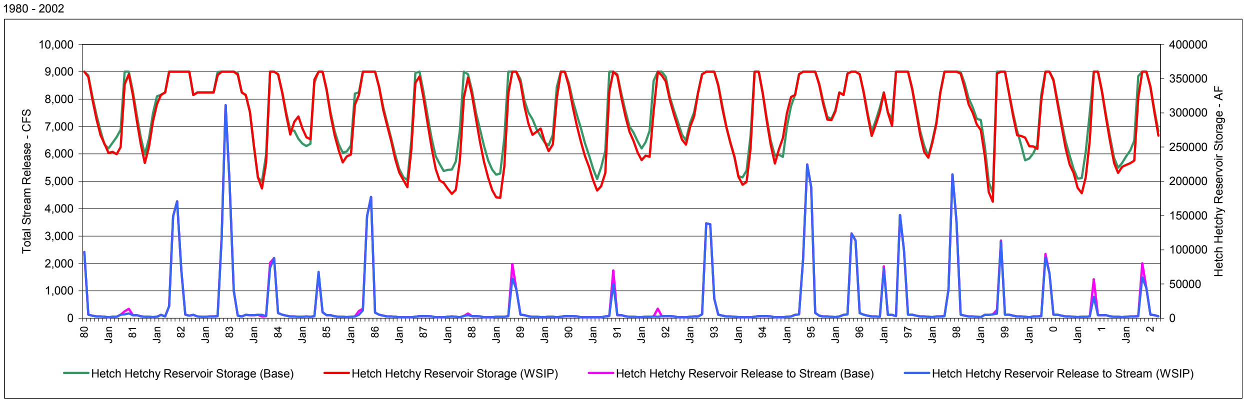
1940 - 1959



1960 - 1979



1980 - 2002



APPENDIX O1

Table 2.3-1

Hetch Hetchy Reservoir Storage (Acre-feet) WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	271,165	264,808	242,632	234,683	182,084	149,183	153,305	270,347	360,400	360,400	326,811	291,828
1922	258,301	232,379	219,552	212,511	216,970	231,546	201,859	360,400	360,400	360,400	336,082	302,853
1923	273,916	256,464	262,541	269,252	274,392	265,677	241,032	360,400	360,400	360,400	333,186	304,241
1924	287,239	264,605	241,219	224,237	213,989	197,420	222,900	312,177	290,436	262,497	227,241	191,379
1925	160,353	172,388	185,426	168,354	179,977	193,968	214,415	360,400	360,400	356,465	334,210	301,427
1926	274,085	251,427	243,883	219,916	201,778	154,687	243,705	336,096	357,554	330,389	294,965	261,018
1927	231,614	230,204	229,890	225,094	252,663	271,751	328,434	360,400	360,400	360,400	333,718	301,231
1928	274,488	279,141	274,500	265,521	258,520	310,981	357,818	360,400	360,400	337,096	302,689	269,444
1929	238,756	214,109	197,101	180,226	168,280	167,248	182,805	347,340	360,400	348,102	314,426	281,237
1930	249,493	245,923	247,253	227,747	218,315	224,793	286,156	356,465	360,400	350,768	316,726	283,424
1931	252,998	228,677	214,984	191,409	174,118	166,236	207,521	299,800	296,541	266,646	231,402	197,210
1932	165,286	141,000	99,154	44,357	34,477	27,305	58,254	229,673	360,400	360,400	333,089	299,918
1933	270,157	248,649	233,883	213,269	196,104	165,553	152,529	188,275	360,400	360,400	326,593	293,382
1934	260,961	234,344	202,598	182,895	161,604	129,002	185,456	237,968	261,776	235,550	203,546	172,300
1935	142,314	156,037	168,825	108,936	73,089	39,750	100,334	259,346	360,400	360,400	331,788	299,322
1936	267,086	242,699	226,345	214,884	170,029	136,212	195,836	360,400	360,400	356,465	327,853	294,110
1937	262,493	239,158	216,925	195,925	154,023	106,324	109,133	355,146	360,400	360,400	327,212	292,471
1938	261,919	241,518	276,115	268,301	217,388	175,924	200,166	360,400	360,400	360,400	352,029	324,714
1939	312,466	304,668	294,282	283,636	277,502	290,985	360,400	360,400	360,400	332,157	299,492	270,327
1940	255,209	256,245	222,760	213,012	165,616	143,200	166,203	360,400	360,400	354,451	320,313	286,310
1941	260,678	241,118	232,444	166,634	122,924	89,103	82,492	312,086	360,400	360,400	341,291	309,048
1942	280,245	274,466	313,690	330,000	330,000	330,000	356,592	360,400	360,400	360,400	339,529	306,962
1943	277,164	275,780	282,691	307,119	324,209	330,000	360,400	360,400	360,400	360,400	334,820	303,090
1944	277,241	258,445	240,206	231,387	228,604	233,279	253,354	360,400	360,400	360,400	329,290	297,445
1945	268,450	285,342	302,246	287,091	252,554	191,770	200,884	324,552	360,400	360,400	334,928	303,168
1946	289,579	302,009	266,576	232,638	168,168	125,876	188,823	360,400	360,400	357,267	325,581	293,235
1947	267,584	259,488	257,238	247,959	246,704	256,512	305,459	360,400	356,592	332,847	297,991	265,329
1948	247,258	231,519	222,630	208,209	191,894	137,570	122,657	247,597	360,400	360,400	325,774	291,062
1949	257,437	230,325	207,779	189,698	165,102	102,768	150,930	285,781	356,592	336,040	301,328	268,173
1950	237,728	238,697	233,120	217,888	163,294	114,244	162,551	319,659	360,400	359,600	323,849	289,929
1951	259,038	330,000	330,000	273,739	223,537	190,502	219,413	345,379	360,400	360,400	326,780	293,203
1952	263,719	247,031	256,244	252,090	196,649	222,356	318,163	360,400	360,400	360,400	351,651	322,211
1953	294,426	273,225	272,304	291,357	296,819	294,144	358,469	360,400	360,400	360,400	330,136	297,172
1954	267,018	245,088	225,346	210,648	216,124	219,810	285,610	360,400	360,400	343,956	308,827	274,943
1955	244,584	242,635	249,852	232,018	218,294	150,980	122,826	222,121	360,400	348,498	313,738	278,863
1956	244,816	218,801	283,964	261,892	207,063	168,360	188,550	360,400	360,400	360,400	347,791	319,290
1957	295,080	281,251	261,004	245,354	255,623	261,924	293,186	360,400	360,400	360,400	326,823	292,697
1958	262,298	242,214	237,194	224,344	243,852	220,345	292,148	360,400	360,400	360,400	353,900	323,910
1959	295,427	273,019	250,518	243,597	212,867	160,299	181,528	235,211	287,682	259,237	222,655	207,831
1960	178,623	176,466	175,310	150,905	115,966	92,114	123,900	215,531	287,296	261,055	225,853	191,635
1961	158,801	133,990	115,379	89,989	75,248	70,132	117,173	209,414	255,120	229,047	199,072	166,120
1962	135,106	109,472	92,419	76,863	98,093	97,377	215,903	347,784	360,400	356,465	326,379	292,131
1963	265,044	241,281	228,162	237,510	296,137	304,290	329,586	360,400	360,400	360,400	336,396	305,026
1964	273,668	278,495	268,855	260,703	254,291	217,069	191,863	276,888	360,400	343,750	309,409	275,896
1965	241,813	249,120	319,261	283,925	232,964	177,623	183,699	296,108	360,400	360,400	360,400	333,188
1966	304,353	306,716	299,942	292,395	282,814	287,628	356,592	360,400	360,400	331,450	297,972	265,321
1967	231,906	216,758	249,252	265,475	280,406	324,014	343,546	360,400	360,400	360,400	360,400	335,768
1968	304,053	283,496	274,527	266,857	283,817	286,873	329,080	360,400	360,400	334,325	299,837	267,451
1969	242,147	247,245	244,063	302,446	320,114	330,000	360,400	360,400	360,400	360,400	349,426	317,777
1970	299,296	305,659	324,435	326,065	320,846	322,797	334,670	360,400	360,400	360,400	326,016	290,760
1971	257,964	251,563	267,786	286,658	301,378	302,930	330,322	360,400	360,400	356,465	325,764	292,446
1972	258,839	236,370	228,162	219,353	213,819	244,031	265,495	360,400	360,400	336,426	299,001	267,965
1973	238,190	218,208	225,626	238,473	249,151	261,799	307,249	360,400	360,400	353,990	322,828	286,127
1974	257,794	293,500	316,503	330,000	330,000	330,000	360,400	360,400	360,400	356,465	331,550	295,187
1975	266,912	262,126	266,128	248,443	253,233	271,955	218,363	360,400	360,400	356,465	324,162	290,479
1976	285,385	281,517	272,478	253,215	242,054	233,754	238,104	324,938	314,385	284,316	252,614	222,717
1977	193,779	167,282	139,742	117,657	99,799	78,202	85,462	103,210	144,346	124,287	96,380	69,868
1978	43,507	24,382	32,503	50,915	68,975	112,212	164,152	360,400	360,400	360,400	357,869	356,406
1979	329,957	310,280	293,137	302,038	312,919	330,000	360,400	360,400	360,400	356,097	320,734	284,314
1980	257,725	265,877	274,536	330,000	326,446	330,000	356,592	360,400	360,400	360,400	352,729	320,413
1981	290,796	267,741	254,865	241,410	243,092	239,594	250,218	341,900	356,592	326,381	288,829	253,955
1982	226,746	250,781	287,735	312,861	326,446	330,000	360,400	360,400	360,400	360,400	360,400	360,400
1983	326,065	330,000	330,000	330,000	330,000	330,000	355,110	360,400	360,400	360,400	360,400	355,970
1984	330,000	326,192	301,515	251,330	205,725	189,676	227,004	360,400	360,400	356,465	328,962	296,457
1985	268,372	286,904	294,977	277,357	264,474	261,687	348,828	360,400	360,400	333,535	296,865	266,723
1986	245,402	227,652	236,474	239,341	311,791	326,065	360,400	360,400	360,400	360,400	337,490	304,597
1987	281,194	258,749	232,710	212,948	201,794	191,486	247,637	343,806	353,248	321,619	285,112	249,916
1988	218,130	201,193	197,937	189,208	181,835	187,927	230,788	322,288	351,731	325,880	291,107	257,476
1989	228,478	205,142	187,290	176,843	175,880	221,901	328,424	360,400	360,400	343,974	309,341	284,242
1990	267,935	272,656	277,435	258,063	244,079	253,888	321,588	360,400	360,400	339,162	307,130	280,640
1991	257,447	236,752	220,773	201,620	186,608	192,958	212,319	331,748	360,400	354,429	321,715	294,880
1992	272,636	259,154	242,411	230,916	237,549	235,995	302,519	360,400	355,022	346,244	319,447	297,703
1993	278,750	261,161	253,660	279,592	294,907	330,000	356,592	360,400	360,400	360,400	339,684	305,994
1994	278,714	255,699	235,580	206,856	194,993	199,287	248,143	360,400	360,400	328,106	288,504	253,299
1995	226,108	246,696	263,295	299,588	323,326	326,065	356,592	360,400	360,400	360,400	360,400	341,235
1996	313,102	290,180	289,399	302,383	330,000	326,065	357,776	360,400	360,400	356,465	329,269	295,808
1997	266,385	283,200	301,776	330,000	300,695	281,114	360,400	360,400	360,400	360,400	334,509	301,549
1998	267,747	243,111	234,508	256,700	283,939	330,000	360,400	360,400	360,400	360,400	357,575	336,363
1999	312,379	300,546	283,189	274,898	237,089	183,904	170,253	357,615	360,400	360,400	328,523	295,405
2000	267,514	266,427	263,903	251,200	251,088	247,384	318,690	360,400	360,400	347,257	314,429	280,432
2001	248,366	224,815	212,272	190,495	182,549	206,184	260,155	360,400	360,186	330,828	293,698	259,268
2002	226,907	212,332	221,154	223,929	226,634	230,337	322,554	360,400	360,400	337,536	300,566	266,784
Avg (21-02)	255,904	246,607	243,366	234,942	226,197	219,194	254,171	333,374	350,872	341,109	313,888	283,193

APPENDIX O1

Table 2.3-2

Hetch Hetchy Reservoir Storage (Acre-feet) Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	280,411	273,133	250,957	243,012	190,418	156,484	159,470	275,503	360,400	360,400	328,999	296,132
1922	263,554	239,474	224,744	218,657	223,120	237,696	208,009	360,400	360,400	360,400	338,270	307,157
1923	278,219	258,004	264,081	270,793	275,934	282,536	257,891	360,400	360,400	360,400	335,374	308,545
1924	290,590	267,956	246,473	228,542	217,437	206,672	232,567	319,193	299,564	273,802	240,713	206,954
1925	178,108	170,809	163,868	152,585	181,467	206,969	225,842	360,400	360,400	356,465	336,398	305,731
1926	283,429	266,388	251,261	233,101	224,226	193,028	276,699	360,400	360,400	335,420	302,178	270,343
1927	242,836	240,506	240,191	240,158	267,736	293,484	352,928	360,400	360,400	360,400	335,906	305,535
1928	281,739	286,393	279,420	274,249	271,550	329,719	360,400	360,400	360,400	339,284	307,062	275,931
1929	249,997	227,192	212,086	197,122	186,905	191,676	209,350	360,400	360,400	350,290	318,800	287,725
1930	258,166	235,262	216,614	202,893	202,985	220,974	284,455	356,465	360,400	352,956	321,099	289,912
1931	261,671	242,966	222,186	204,418	192,376	190,297	233,699	328,151	326,987	299,243	266,140	238,628
1932	215,243	193,719	128,322	67,999	42,831	32,420	61,085	231,720	360,400	360,400	335,277	304,222
1933	273,508	252,000	230,146	217,141	206,853	182,105	166,743	200,181	360,400	360,400	328,781	297,686
1934	267,451	246,451	218,992	205,761	189,607	160,228	202,741	257,431	283,334	259,261	229,404	200,246
1935	175,286	169,675	162,484	104,010	69,201	43,091	102,489	260,984	360,400	360,400	333,976	303,626
1936	273,576	253,792	230,244	226,479	181,301	145,902	204,009	360,400	360,400	356,465	330,041	298,414
1937	270,601	249,107	228,767	211,579	167,908	117,966	118,707	360,400	360,400	360,400	329,400	296,775
1938	268,124	247,723	284,031	281,929	231,023	189,521	212,145	360,400	360,400	360,400	354,217	329,018
1939	314,865	306,147	292,907	285,114	281,559	300,846	356,592	360,400	360,400	334,345	303,865	276,815
1940	263,881	245,583	192,045	196,568	151,034	130,959	155,867	360,400	360,400	356,639	324,687	292,798
1941	265,260	244,779	235,495	169,687	125,534	91,292	84,162	313,335	360,400	360,400	343,479	313,352
1942	286,926	281,147	319,229	330,000	330,000	330,000	356,592	360,400	360,400	360,400	341,717	311,266
1943	283,369	281,064	280,888	305,315	322,404	330,000	360,400	360,400	360,400	360,400	337,008	307,394
1944	283,446	263,729	245,490	238,577	242,844	262,836	285,029	360,400	360,400	360,400	331,478	301,749
1945	272,276	269,834	266,760	257,391	236,587	175,803	186,832	312,263	360,400	360,400	337,116	307,472
1946	298,923	313,194	277,762	243,830	179,367	135,427	196,880	360,400	360,400	359,455	329,955	299,722
1947	275,020	268,766	266,516	256,291	258,478	278,846	329,910	360,400	356,592	335,035	302,365	271,816
1948	255,930	245,807	229,831	220,170	206,440	153,592	136,183	258,923	360,400	360,400	327,962	295,366
1949	263,928	242,431	222,739	203,721	178,274	113,920	159,848	293,245	356,592	338,228	305,702	274,661
1950	248,017	229,653	203,967	204,416	151,359	104,230	154,484	312,900	360,400	360,400	326,837	295,032
1951	266,327	330,000	330,000	273,739	223,537	199,065	226,940	352,902	360,400	360,400	328,968	297,507
1952	270,971	254,282	265,208	256,577	201,139	226,846	331,859	360,400	360,400	360,400	353,839	326,515
1953	300,631	278,509	277,588	296,644	302,108	314,750	360,400	360,400	360,400	360,400	332,324	301,476
1954	269,513	247,582	227,840	215,998	226,805	241,051	308,969	360,400	360,400	346,144	313,200	281,430
1955	250,117	228,834	220,830	219,437	220,572	159,061	129,641	227,821	360,400	350,686	318,112	285,351
1956	253,489	233,090	290,850	268,782	213,957	174,362	193,602	360,400	360,400	360,400	349,979	323,594
1957	302,332	288,502	270,158	258,319	275,642	292,503	325,882	360,400	360,400	360,400	329,011	297,001
1958	267,551	250,230	238,122	234,786	254,300	230,793	302,596	360,400	360,400	360,400	356,088	328,214
1959	299,729	277,321	254,820	250,756	220,030	182,778	200,788	240,985	295,567	269,299	234,888	222,167
1960	195,138	173,648	152,513	133,893	107,807	88,465	121,115	216,331	290,212	266,155	233,132	201,024
1961	170,373	151,178	116,885	97,300	92,106	92,793	141,951	236,348	284,141	260,208	235,221	211,711
1962	190,469	175,055	162,758	151,091	175,846	193,205	319,373	360,400	360,400	356,465	328,567	296,435
1963	272,296	250,374	230,167	239,516	298,144	313,908	344,728	360,400	360,400	360,400	338,584	309,330
1964	280,158	284,985	275,345	274,808	275,278	243,860	218,576	293,373	356,592	342,134	309,983	278,588
1965	246,691	234,664	297,938	262,593	211,621	157,081	166,277	281,195	360,400	360,400	360,400	335,306
1966	309,419	309,020	299,715	301,871	283,891	294,508	356,592	360,400	360,400	333,638	302,345	271,809
1967	240,578	231,046	260,686	276,916	291,853	330,000	355,978	360,400	360,400	360,400	360,400	337,886
1968	308,358	287,801	271,744	272,635	297,331	306,191	350,516	360,400	360,400	336,513	304,211	273,939
1969	250,819	260,520	256,387	314,777	330,000	330,000	360,400	360,400	360,400	360,400	351,614	322,081
1970	303,598	290,627	289,425	330,000	330,000	330,000	343,990	360,400	360,400	360,400	328,204	295,064
1971	264,645	257,322	273,546	292,421	307,143	319,256	348,766	360,400	360,400	356,465	327,952	296,750
1972	265,329	248,476	240,268	230,515	228,425	264,440	288,021	360,400	360,400	338,614	303,374	274,452
1973	246,861	232,496	232,826	245,678	256,360	269,008	321,179	360,400	360,400	356,178	327,202	292,614
1974	266,182	301,887	324,891	330,000	330,000	330,000	360,400	360,400	360,400	356,465	333,738	299,491
1975	269,312	245,191	229,214	223,020	232,950	255,478	201,886	356,465	360,400	356,465	326,350	294,783
1976	287,784	282,995	266,869	247,602	236,438	233,942	240,409	329,430	320,991	293,102	263,576	235,784
1977	211,881	191,000	168,216	146,157	128,335	112,542	121,920	141,809	184,960	160,051	130,121	110,883
1978	92,092	72,046	77,314	101,462	124,716	178,418	242,510	360,400	360,400	360,400	360,057	360,400
1979	330,000	310,323	295,083	306,838	317,722	330,000	360,400	360,400	360,400	358,285	325,107	290,802
1980	269,252	258,070	251,507	330,000	326,446	330,000	356,592	360,400	360,400	360,400	354,917	324,717
1981	297,001	273,946	253,982	248,138	256,698	264,712	275,335	360,400	360,400	332,373	297,002	264,239
1982	239,211	262,326	299,280	324,411	326,446	330,000	360,400	360,400	360,400	360,400	360,400	360,400
1983	326,065	330,000	330,000	330,000	330,000	330,000	359,897	360,400	360,400	360,400	360,400	358,088
1984	330,000	326,192	301,515	251,330	205,725	199,414	238,663	360,400	360,400	356,465	331,150	300,761
1985	274,862	274,060	262,155	255,078	251,721	254,736	343,995	360,400	360,400	335,723	301,239	273,210
1986	254,074	241,940	243,674	252,349	328,243	330,000	360,400	360,400	360,400	360,400	339,678	308,901
1987	285,496	263,052	238,915	218,205	206,195	201,690	259,958	358,308	360,400	330,951	296,621	263,532
1988	236,781	225,459	215,116	216,862	217,237	229,133	274,112	360,400	356,592	332,923	300,330	276,174
1989	251,922	230,428	217,332	209,757	211,390	263,214	360,400	360,400	360,400	349,016	318,183	300,442
1990	290,787	276,174	265,731	256,913	252,466	268,079	337,897	360,400	360,400	344,204	316,923	296,870
1991	277,475	255,860	237,549	218,406	203,404	220,219	244,459	360,400	360,400	356,617	327,706	302,708
1992	280,460	271,581	258,644	248,110	257,159	273,680	346,925	360,400	360,400	352,662	323,955	304,049
1993	286,996	268,486	259,605	285,541	300,859	330,000	356,592	360,400	360,400	360,400	341,872	310,298
1994	280,162	257,147	237,028	207,354	205,802	215,899	266,874	360,400	360,400	330,294	292,878	259,786
1995	237,634	238,887	235,508	279,395	309,999	326,065	356,592	360,400	360,400	360,400	360,400	343,353
1996	317,122	294,200	291,087	304,073	330,000	326,065	357,776	360,400	360,400	356,465	331,457	300,112
1997	272,590	289,404	307,981	330,000	300,695	291,579	360,400	360,400	360,400	360,400	336,697	305,853
1998	274,237	252,363	236,673	258,866	286,106	330,000	360,400	360,400	360,400	360,400	359,763	343,429
1999	321,345	308,591	291,234	289,606	251,804	198,620	183,193	360,400	360,400	360,400	330,711	299,709
2000	273,719	253,298	230,795	233,390	241,001	253,471	326,894	360,400	360,400	349,445	318,802	286,920
2001	258,656	237,867	218,236	204,074	204,728	243,680	299,768	360,400	360,400	333,230	298,285	265,969
2002	234,555	219,980	226,900	236,337	245,064	259,327	353,663	360,400	360,400	339,724	304,940	273,272
Avg (21-02)	265,578	253,671	245,075	240,657	234,512	232,346	267,303	337,298	352,928	344,130	318,964	290,795

APPENDIX O1

Table 2.3-3

Difference in Hetch Hetchy Reservoir Storage (Acre-feet)

WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	-9,246	-8,325	-8,325	-8,329	-8,334	-7,301	-6,165	-5,156	0	0	-2,188	-4,304
1922	-5,253	-7,095	-5,192	-6,146	-6,150	-6,150	-6,150	0	0	0	-2,188	-4,304
1923	-4,303	-1,540	-1,540	-1,541	-1,542	-16,859	-16,859	0	0	0	-2,188	-4,304
1924	-3,351	-3,351	-5,254	-4,305	-3,448	-9,252	-9,667	-7,016	-9,128	-11,305	-13,472	-15,575
1925	-17,755	1,579	21,558	15,769	-1,490	-13,001	-11,427	0	0	0	-2,188	-4,304
1926	-9,344	-14,961	-7,378	-13,185	-22,448	-38,341	-32,994	-24,304	-2,846	-5,031	-7,213	-9,325
1927	-11,222	-10,302	-10,301	-15,064	-15,073	-21,733	-24,494	0	0	0	-2,188	-4,304
1928	-7,251	-7,252	-4,920	-8,728	-13,030	-18,738	-2,582	0	0	-2,188	-4,373	-6,487
1929	-11,241	-13,083	-14,985	-16,896	-18,625	-24,428	-26,545	-13,060	0	-2,188	-4,374	-6,488
1930	-8,673	10,661	30,639	24,854	15,330	3,819	1,701	0	0	-2,188	-4,373	-6,488
1931	-8,673	-14,289	-7,202	-13,009	-18,258	-24,061	-26,178	-28,351	-30,446	-32,597	-34,738	-41,418
1932	-49,957	-52,719	-29,168	-23,642	-8,354	-5,115	-2,831	-2,047	0	0	-2,188	-4,304
1933	-3,351	-3,351	3,737	-3,872	-10,749	-16,552	-14,214	-11,906	0	0	-2,188	-4,304
1934	-6,490	-12,107	-16,394	-22,866	-28,003	-31,226	-17,285	-19,463	-21,558	-23,711	-25,858	-27,946
1935	-32,972	-13,638	6,341	4,926	3,888	-3,341	-2,155	-1,638	0	0	-2,188	-4,304
1936	-6,490	-11,093	-3,899	-11,595	-11,272	-9,690	-8,173	0	0	0	-2,188	-4,304
1937	-8,108	-9,949	-11,842	-15,654	-13,885	-11,642	-9,574	-5,254	0	0	-2,188	-4,304
1938	-6,205	-6,205	-7,916	-13,628	-13,635	-13,597	-11,979	0	0	0	-2,188	-4,304
1939	-2,399	-1,479	1,375	-1,478	-4,057	-9,861	3,808	0	0	-2,188	-4,373	-6,488
1940	-8,672	10,662	30,715	16,444	14,582	12,241	10,336	0	0	-2,188	-4,374	-6,488
1941	-4,582	-3,661	-3,051	-3,053	-2,610	-2,189	-1,670	-1,249	0	0	-2,188	-4,304
1942	-6,681	-6,681	-5,539	0	0	0	0	0	0	0	-2,188	-4,304
1943	-6,205	-5,284	1,803	1,804	1,805	0	0	0	0	0	-2,188	-4,304
1944	-6,205	-5,284	-5,284	-7,190	-14,240	-29,557	-31,675	0	0	0	-2,188	-4,304
1945	-3,826	15,508	35,486	29,700	15,967	15,967	14,052	12,289	0	0	-2,188	-4,304
1946	-9,344	-11,185	-11,186	-11,192	-11,199	-9,551	-8,057	0	0	-2,188	-4,374	-6,487
1947	-7,436	-9,278	-9,278	-8,332	-11,774	-22,334	-24,451	0	0	-2,188	-4,374	-6,487
1948	-8,672	-14,288	-7,201	-11,961	-14,546	-16,022	-13,526	-11,326	0	0	-2,188	-4,304
1949	-6,491	-12,106	-14,960	-14,023	-13,172	-11,152	-8,918	-7,464	0	-2,188	-4,374	-6,488
1950	-10,289	9,044	29,153	13,472	11,935	10,014	8,067	6,759	0	-800	-2,988	-5,103
1951	-7,289	0	0	0	0	-8,563	-7,527	-7,523	0	0	-2,188	-4,304
1952	-7,252	-7,251	-8,964	-4,487	-4,490	-4,490	-13,696	0	0	0	-2,188	-4,304
1953	-6,205	-5,284	-5,284	-5,287	-5,289	-20,606	-1,931	0	0	0	-2,188	-4,304
1954	-2,495	-2,494	-2,494	-5,350	-10,681	-21,241	-23,359	0	0	-2,188	-4,373	-6,487
1955	-5,533	13,801	29,022	12,581	-2,278	-8,081	-6,815	-5,700	0	-2,188	-4,374	-6,488
1956	-8,673	-14,289	-6,886	-6,890	-6,894	-6,002	-5,052	0	0	0	-2,188	-4,304
1957	-7,252	-7,251	-9,154	-12,965	-20,019	-30,579	-32,696	0	0	0	-2,188	-4,304
1958	-5,253	-8,016	-928	-10,442	-10,448	-10,448	-10,448	0	0	0	-2,188	-4,304
1959	-4,302	-4,302	-4,302	-7,159	-7,163	-22,479	-19,260	-5,774	-7,885	-10,062	-12,233	-14,336
1960	-16,515	2,818	22,797	17,012	8,159	3,649	2,785	-800	-2,916	-5,100	-7,279	-9,389
1961	-11,572	-17,188	-1,506	-7,311	-16,858	-22,661	-24,778	-26,934	-29,021	-31,161	-36,149	-45,591
1962	-55,363	-65,583	-70,339	-74,228	-77,753	-95,828	-103,470	-12,616	0	0	-2,188	-4,304
1963	-7,252	-9,093	-2,005	-2,006	-2,007	-9,618	-15,142	0	0	0	-2,188	-4,304
1964	-6,490	-6,490	-6,490	-14,105	-20,987	-26,791	-26,713	-16,485	3,808	1,616	-574	-2,692
1965	-4,878	14,456	21,323	21,332	21,343	20,542	17,422	14,913	0	0	0	-2,118
1966	-5,066	-2,304	227	-9,476	-1,077	-6,880	0	0	0	-2,188	-4,373	-6,488
1967	-8,672	-14,288	-11,434	-11,441	-11,447	-5,986	-12,432	0	0	0	0	-2,118
1968	-4,305	-4,305	2,783	-5,778	-13,514	-19,318	-21,436	0	0	-2,188	-4,374	-6,488
1969	-8,672	-13,275	-12,324	-12,331	-9,886	0	0	0	0	0	-2,188	-4,304
1970	-4,302	15,032	35,010	-3,935	-9,154	-7,203	-9,320	0	0	0	-2,188	-4,304
1971	-6,681	-5,759	-5,760	-5,763	-5,765	-16,326	-18,444	0	0	0	-2,188	-4,304
1972	-6,490	-12,106	-12,106	-11,162	-14,606	-20,409	-22,526	0	0	-2,188	-4,373	-6,487
1973	-8,671	-14,288	-7,200	-7,205	-7,209	-7,209	-13,930	0	0	-2,188	-4,374	-6,487
1974	-8,388	-8,387	-8,388	0	0	0	0	0	0	0	-2,188	-4,304
1975	-2,400	16,935	36,914	25,423	20,283	16,477	16,477	3,935	0	0	-2,188	-4,304
1976	-2,399	-1,478	5,609	5,613	5,616	-188	-2,305	-4,492	-6,606	-8,786	-10,962	-13,067
1977	-18,102	-23,718	-28,474	-28,500	-28,536	-34,340	-36,458	-38,599	-40,614	-35,764	-33,741	-41,015
1978	-48,585	-47,664	-44,811	-50,547	-55,741	-66,206	-78,358	0	0	0	-2,188	-3,994
1979	-43	-43	-1,946	-4,800	-4,803	0	0	0	0	-2,188	-4,373	-6,488
1980	-11,527	7,807	23,029	0	0	0	0	0	0	0	-2,188	-4,304
1981	-6,205	-6,205	883	-6,728	-13,606	-25,118	-25,117	-18,500	-3,808	-5,992	-8,173	-10,284
1982	-12,465	-11,545	-11,545	-11,550	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	-4,787	0	0	0	0	-2,118
1984	0	0	0	0	0	-9,738	-11,659	0	0	0	-2,188	-4,304
1985	-6,490	12,844	32,822	22,279	12,753	6,951	4,833	0	0	-2,188	-4,374	-6,487
1986	-8,672	-14,288	-7,200	-13,008	-16,452	-3,935	0	0	0	0	-2,188	-4,304
1987	-4,302	-4,303	-6,205	-5,257	-4,401	-10,204	-12,321	-14,502	-7,152	-9,332	-11,509	-13,616
1988	-18,651	-24,266	-17,179	-27,654	-35,402	-41,206	-43,324	-38,112	-4,861	-7,043	-9,223	-18,698
1989	-23,444	-25,286	-30,042	-32,914	-35,510	-41,313	-31,976	0	0	-5,042	-8,842	-16,200
1990	-22,852	-3,518	11,704	1,150	-8,387	-14,191	-16,309	0	0	-5,042	-9,793	-16,230
1991	-20,028	-19,108	-16,776	-16,786	-16,796	-27,261	-32,140	-28,652	0	-2,188	-5,991	-7,828
1992	-7,824	-12,427	-16,233	-17,194	-19,610	-37,685	-44,406	0	-5,378	-6,418	-4,508	-6,346
1993	-8,246	-7,325	-5,945	-5,949	-5,952	0	0	0	0	0	-2,188	-4,304
1994	-1,448	-1,448	-1,448	-498	-10,809	-16,612	-18,731	0	0	-2,188	-4,374	-6,487
1995	-11,526	7,809	27,787	20,193	13,327	0	0	0	0	0	0	-2,118
1996	-4,020	-4,020	-1,688	-1,690	0	0	0	0	0	0	-2,188	-4,304
1997	-6,205	-6,204	-6,205	0	0	-10,465	0	0	0	0	-2,188	-4,304
1998	-6,490	-9,252	-2,165	-2,166	-2,167	0	0	0	0	0	-2,188	-7,066
1999	-8,966	-8,045	-8,045	-14,708	-14,715	-14,716	-12,940	-2,785	0	0	-2,188	-4,304
2000	-6,205	13,129	33,108	17,810	10,087	-6,087	-8,204	0	0	-2,188	-4,373	-6,488
2001	-10,290	-13,052	-5,964	-13,579	-22,179	-37,496	-39,613	0	-214	-2,402	-4,587	-6,701
2002	-7,648	-7,648	-5,746	-12,408	-18,430	-28,990	-31,109	0	0	-2,188	-4,374	-6,488
Avg (21-02)	-9,674	-7,064	-1,709	-5,714	-8,315	-13,152	-13,132	-3,925	-2,056	-3,021	-5,076	-7,602

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Table 2.3-3 illustrates the difference in Hetch Hetchy Reservoir storage between the WSIP and base settings. Immediately after Hetch Hetchy Reservoir is filled (May or June, and then continuing through July), occasional differences in storage would occur, typically during a multi-year drought sequence or during an occasional single year when the reservoir does not fill. No reduction in yearly storage during that period would indicate that the same amount of water is being passed through the reservoir, regardless of the size of the conveyance capacity of the SJPL or the purchase requests. Water not diverted to the SJPL would return to the Tuolumne River at Kirkwood Powerhouse or Moccasin Reservoir and flow to Don Pedro Reservoir. In the late summer and early fall, storage levels would consistently be slightly different (lower) between the two settings, as additional diversions to the SJPL would retain Bay Area reservoir storage. The additional storage depletion would be somewhat ameliorated later in the fall and into winter as SJPL diversions are reduced because of lower Bay Area reservoir replenishment needs and conveyance system maintenance. The storage difference would become almost neutral in December with the WSIP setting because of the additional conveyance maintenance that would occur under the WSIP (which does not occur in the base setting). The maintenance impairs diversions to the SJPL. After December, storage in the reservoir associated with the WSIP setting again would be affected as replenishment of Bay Area reservoir storage resumes following the maintenance period and because of increased purchase requests. During drier years, there is a difference in storage between the WSIP and base settings; the WSIP setting results in a lower amount of storage in the reservoir by the end of April. Figure 2.3-2 illustrates the reservoir storage, averaged by year type, for the WSIP setting. Figure 2.3-3 illustrates the average difference in storage, averaged by year type, for the two settings. Figure 2.3-4 illustrates the average monthly storage in Hetch Hetchy Reservoir for the 82-year simulation, and the range in storage for each month for the WSIP and base settings.

Figure 2.3-2

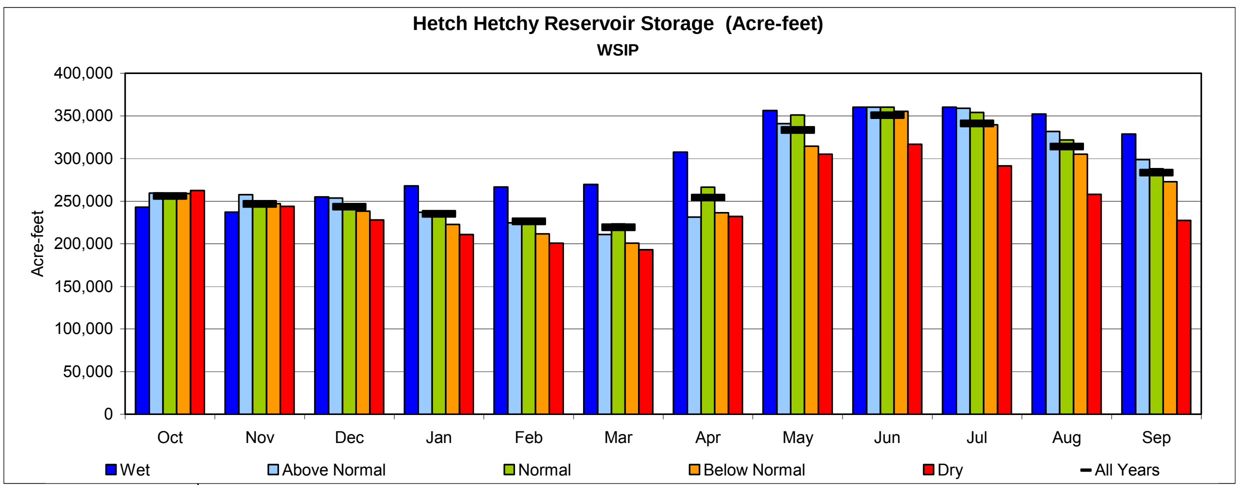


Figure 2.3-3

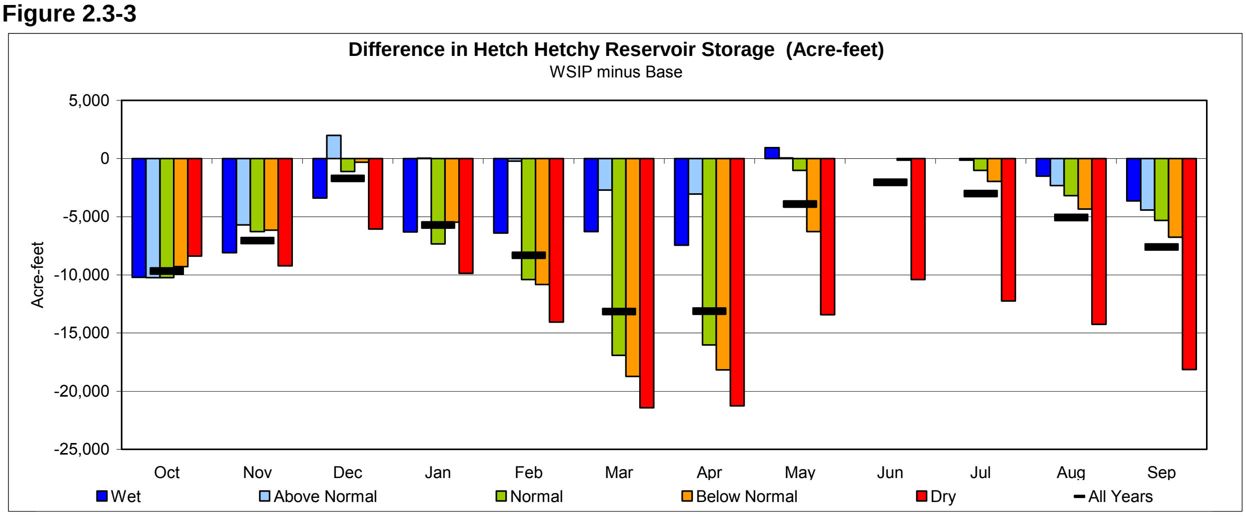
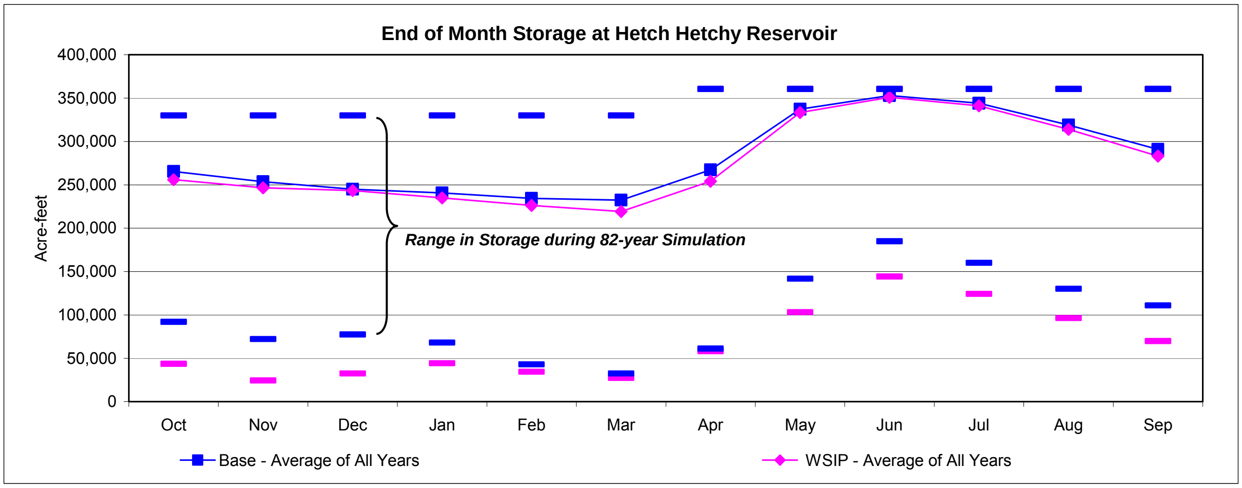


Figure 2.3-4



The difference in storage in Hetch Hetchy Reservoir attributed to the diversion effects of the WSIP would manifest in differences in releases from O'Shaughnessy Dam to the stream. A different amount of available reservoir space in the winter and spring due to the WSIP would lead to a different ability to regulate inflow, thus potentially changing the amount of water released to the stream (the amount which is above minimum release requirements). Figure 2.3-1 illustrates the stream releases from O'Shaughnessy Dam for the WSIP and base settings. Supplementing Figure 2.3-1 are Table 2.3-4 and Table 2.3-5, which show the stream releases from O'Shaughnessy Dam for the WSIP and base settings. Table 2.3-6 illustrates the difference in stream releases between the WSIP and base settings. Compared to the base setting, the WSIP setting typically results in a lesser stream release, predominantly during May or June, which reflects the months when releases to the stream above minimum release requirements are made in anticipation of the reservoir being filled. In a few exceptions to this circumstance, an increase in releases to the stream occurs. Several of these exceptions are considered anomalous within modeling, the result of only shifting releases from one month to another. The other exceptions occur due to the balancing of reservoir storage among the Hetch Hetchy system and the Bay Area reservoirs. The decrease in releases is the result of a more depleted reservoir, which is the result of greater demands between the settings.

Table 2.3-6 illustrates the difference in stream releases between the WSIP and base settings, expressed in terms of a monthly volume (acre-feet) of flow. The difference in monthly flow below O'Shaughnessy Dam indicates a potential change in releases between the WSIP and base settings, ranging from a decrease of approximately 40,000 acre-feet to an increase of approximately 14,900 acre-feet. Considering the manner in which releases are determined and made to the stream, quantifying the effect of these changes in terms of average monthly flow (in cubic feet per second [cfs]) is not always meaningful.[1] Assuming that a change in release volume equates to a delay or earlier initiation of releasing 6,000 acre-feet per day, the difference in stream releases from O'Shaughnessy Dam between the WSIP and base settings would range from delayed releases of up to 7 days to an addition of up to 2 days of release. Normally, the effect of a delay in release would not affect the year's peak stream release rate during a year.

1 See "Estimated Effect of WSIP on Daily Releases below Hetch Hetchy Reservoir," Memorandum by Daniel B. Steiner, December 31, 2006.

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Table 2.3-4

Hetch Hetchy Reservoir Release to Stream (Acre-feet) WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	3,074	2,975	2,460	3,074	6,916	7,624	8,271	10,084	98,913	7,686	7,686	5,316	164,079
1922	3,689	3,570	3,074	3,074	3,362	3,689	8,271	52,095	312,197	28,813	7,686	5,316	434,836
1923	3,689	3,570	3,074	3,074	3,362	3,689	7,676	39,054	95,231	16,928	7,686	5,316	192,349
1924	3,689	3,570	3,074	2,152	1,961	2,152	2,083	3,074	4,463	4,612	4,612	3,669	39,111
1925	2,152	2,083	2,152	3,074	3,362	3,689	8,271	56,758	149,864	11,621	7,686	5,316	256,028
1926	3,689	3,570	3,074	2,460	2,802	7,624	7,676	8,854	6,545	6,764	6,764	4,284	64,106
1927	3,074	2,975	2,460	3,074	3,362	3,689	4,463	118,928	238,640	13,543	7,686	5,316	407,210
1928	3,689	3,570	3,074	3,074	3,362	3,689	4,463	181,693	19,601	7,686	6,764	4,284	244,949
1929	3,074	2,975	2,460	2,460	1,961	2,152	2,083	4,919	38,258	6,764	6,764	4,284	78,154
1930	3,074	2,975	2,460	2,152	2,802	3,074	3,868	8,854	102,907	6,764	6,764	4,284	149,978
1931	3,074	2,975	2,460	2,152	2,802	2,152	2,083	3,074	4,463	4,612	4,612	3,669	38,128
1932	2,152	2,083	2,152	7,009	3,362	3,689	4,463	6,149	114,929	24,366	7,686	5,316	183,356
1933	3,689	3,570	3,074	2,152	2,802	2,152	2,083	3,074	17,729	6,764	6,764	4,284	58,137
1934	3,074	2,975	2,460	2,460	2,802	7,009	3,868	4,919	6,545	4,612	4,612	3,669	49,005
1935	2,152	2,083	2,152	7,009	6,916	7,624	4,463	10,084	136,065	7,686	7,686	5,316	199,236
1936	3,689	3,570	3,074	2,460	6,356	7,624	8,271	38,045	164,181	11,621	7,686	5,316	261,893
1937	3,689	3,570	3,074	3,074	6,916	7,624	8,271	10,084	154,062	7,686	7,686	5,316	221,052
1938	3,689	3,570	3,074	3,074	6,916	7,624	8,271	58,406	350,036	112,643	7,686	5,316	570,305
1939	3,689	3,570	3,074	2,460	2,802	3,074	3,868	41,832	6,545	6,764	6,764	4,284	88,726
1940	3,074	2,975	2,460	2,460	6,916	7,624	8,271	40,199	145,292	7,686	7,686	5,316	239,959
1941	3,689	3,570	3,074	7,009	6,916	7,624	8,271	10,084	200,571	67,763	7,686	5,316	331,573
1942	3,689	3,570	3,074	3,074	3,362	3,689	8,271	105,473	283,373	86,094	7,686	5,316	516,671
1943	3,689	3,570	3,074	3,074	3,362	3,689	23,247	197,709	148,920	18,174	7,686	5,316	421,510
1944	3,689	3,570	3,074	2,460	2,802	3,074	3,868	24,276	79,627	6,764	6,764	4,284	144,252
1945	3,074	2,975	2,460	3,074	6,916	7,624	8,271	10,084	184,630	31,926	7,686	5,316	274,036
1946	3,689	3,570	7,009	7,009	6,916	7,624	8,271	12,189	85,083	7,686	7,686	5,316	162,048
1947	3,689	3,570	3,074	3,074	3,362	3,689	4,463	86,043	10,353	6,764	6,764	4,284	139,129
1948	3,074	2,975	2,460	2,460	2,802	7,009	7,676	10,084	65,929	7,686	7,686	5,316	125,157
1949	3,689	3,570	3,074	2,460	2,802	7,009	7,676	8,854	10,353	6,764	6,764	4,284	67,299
1950	3,074	2,975	2,460	2,460	6,916	7,009	8,271	10,084	80,211	7,686	7,686	5,316	144,148
1951	3,689	34,010	42,960	7,009	6,916	7,624	8,271	10,084	87,710	7,686	7,686	5,316	228,961
1952	3,689	3,570	3,074	3,074	6,916	3,689	4,463	209,387	238,065	106,256	7,686	5,316	595,185
1953	3,689	3,570	3,074	3,074	3,362	3,074	3,868	26,262	168,768	29,365	7,686	5,316	261,108
1954	3,689	3,570	3,074	2,460	2,802	3,074	4,463	82,272	27,809	6,764	6,764	4,284	151,025
1955	3,074	2,975	2,460	3,074	3,362	7,009	7,676	8,854	6,545	6,764	6,764	4,284	62,841
1956	3,074	2,975	6,395	7,009	6,916	7,624	8,271	12,723	310,301	94,682	7,686	5,316	472,972
1957	3,689	3,570	3,074	2,152	1,961	2,152	3,868	17,650	183,319	7,686	6,764	4,284	240,169
1958	3,074	2,975	2,460	3,074	3,362	3,689	4,463	178,371	221,860	55,443	7,686	5,316	491,773
1959	3,689	3,570	3,074	2,152	1,961	7,009	7,676	8,854	6,545	6,764	6,764	4,284	62,342
1960	3,074	2,975	2,460	2,152	1,961	2,152	7,676	8,854	6,545	6,764	6,764	4,284	55,661
1961	3,074	2,975	2,460	3,074	2,802	2,152	3,868	4,919	6,545	4,612	4,612	3,669	44,762
1962	2,152	2,083	2,152	2,460	1,961	3,689	4,463	6,149	188,681	11,621	7,686	5,316	238,413
1963	3,689	3,570	3,074	2,152	2,802	3,689	4,463	118,067	203,340	36,602	7,686	5,316	394,450
1964	3,689	3,570	3,074	3,074	3,362	3,074	7,676	8,854	6,545	6,764	6,764	4,284	60,730
1965	3,074	2,975	6,395	7,009	6,916	7,624	8,271	10,084	126,387	61,519	7,686	5,316	253,256
1966	3,689	3,570	3,074	3,074	3,362	3,689	7,676	123,555	6,545	6,764	6,764	4,284	176,046
1967	3,074	2,975	2,460	3,074	3,362	3,689	4,463	146,692	270,669	185,208	7,686	5,316	638,668
1968	3,689	3,570	3,074	2,460	2,802	3,074	3,868	49,547	14,833	6,764	6,764	4,284	104,729
1969	3,074	2,975	2,460	3,074	3,362	3,689	12,681	344,502	300,076	115,876	7,686	5,316	804,771
1970	3,689	3,570	3,074	7,009	3,362	3,689	4,463	105,428	124,926	7,686	7,686	5,316	279,898
1971	3,689	3,570	3,074	3,074	3,362	3,689	4,463	52,458	177,149	11,621	7,686	5,316	279,151
1972	3,689	3,570	3,074	3,074	3,362	3,074	3,868	10,254	57,109	6,764	6,764	4,284	108,886
1973	3,074	2,975	2,460	3,074	3,362	3,689	4,463	190,830	159,403	7,686	7,686	5,316	394,018
1974	3,689	3,570	3,074	3,074	3,362	3,689	4,463	201,034	194,704	11,621	7,686	5,316	445,282
1975	3,689	3,570	3,074	3,074	2,802	3,689	8,271	14,107	247,984	11,621	7,686	5,316	314,883
1976	3,689	3,570	3,074	3,074	1,961	2,152	2,083	3,074	4,463	4,612	4,612	3,669	40,033
1977	2,152	2,083	2,152	2,152	1,961	2,152	2,083	3,074	4,463	4,612	4,612	3,669	35,165
1978	2,152	2,083	2,152	3,074	3,362	3,689	4,463	6,149	298,570	132,949	7,686	5,316	471,645
1979	3,689	3,570	3,074	2,460	3,362	3,689	4,463	220,976	107,368	7,686	7,686	5,316	373,339
1980	3,689	3,570	3,074	3,074	6,916	3,689	8,271	133,323	235,879	148,920	7,686	5,316	563,407
1981	3,689	3,570	3,074	2,152	2,802	3,074	7,676	8,854	10,353	6,764	6,764	4,284	63,056
1982	3,074	2,975	2,460	3,074	6,916	3,689	26,103	228,913	254,131	108,434	7,686	5,316	652,771
1983	7,624	3,570	3,074	3,074	3,362	3,689	4,463	175,217	463,488	302,677	61,509	5,316	1,037,063
1984	3,689	7,378	7,009	7,009	6,916	7,624	4,463	113,013	130,916	11,621	7,686	5,316	312,640
1985	3,689	3,570	3,074	3,074	3,362	3,074	4,463	104,203	12,733	6,764	6,764	4,284	159,054
1986	3,074	2,975	2,460	3,074	3,362	7,624	17,050	228,842	263,786	12,678	7,686	5,316	557,927
1987	3,689	3,570	3,074	2,152	1,961	2,152	2,083	3,074	4,463	4,612	4,612	3,669	39,111
1988	2,152	2,083	2,152	3,074	3,362	3,074	2,083	4,919	6,545	4,612	4,612	3,669	42,337
1989	2,152	2,083	2,152	3,074	2,802	3,074	4,463	89,012	62,889	7,686	6,764	4,284	190,435
1990	3,074	2,975	2,460	2,460	2,802	3,074	2,083	3,074	4,463	4,612	4,612	3,669	39,358
1991	2,152	2,083	2,152	2,152	1,961	2,152	3,868	4,919	74,555	6,764	6,764	4,284	113,806
1992	3,074	2,975	2,460	2,460	2,802	3,074	3,868	3,074	4,463	4,612	4,612	3,669	41,143
1993	2,152	2,083	2,152	3,074	3,362	3,689	8,271	213,205	204,082	44,068	7,686	5,316	499,140
1994	3,689	3,570	3,074	2,460	1,961	2,152	2,083	3,074	4,463	4,612	4,612	3,669	39,419
1995	2,152	2,083	2,152	3,074	3,362	7,624	8,271	131,296	334,396	294,086	11,843	5,316	805,655
1996	3,689	3,570	3,074	2,460	3,362	7,624	8,271	190,622	169,121	11,621	7,686	5,316	416,416
1997	3,689	3,570	3,074	110,603	6,916	7,624	4,463	231,648	146,890	7,686	7,686	5,316	539,165
1998	3,689	3,570	3,074	2,460	3,362	3,689	4,463	64,194	312,909	217,820	7,686	5,316	632,232
1999	3,689	3,570	3,074	2,460	6,916	7,624	8,271	10,084	166,036	7,686	7,686	5,316	232,412
2000	3,689	3,570	3,074	2,152	3,362	3,689	4,463	136,496	97,677	7,686	7,686	5,316	278,860
2001	3,689	3,570	3,074	2,460	2,802	3,074	3,868	48,240	6,545	6,764	6,764	4,284	95,134
2002	3,074	2,975	2,460	3,074	3,362	3,689	4,463	91,804	64,932	7,686	6,764	4,284	198,567
Avg (21-02)	3,351	3,614	3,449	4,514	3,861	4,506	6,199	68,039	123,274	33,709	7,711	4,793	267,021

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Table 2.3-5

Hetch Hetchy Reservoir Release to Stream (Acre-feet)

												Base	
Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	3,074	2,975	2,460	3,074	6,916	7,624	8,271	10,084	104,064	7,686	7,686	5,316	169,230
1922	3,689	3,570	3,074	3,074	3,362	3,689	8,271	57,465	312,197	28,813	7,686	5,316	440,206
1923	3,689	3,570	3,074	3,074	3,362	3,689	7,676	55,903	95,231	16,928	7,686	5,316	209,198
1924	3,689	3,570	3,074	2,152	1,961	2,152	2,083	3,074	4,463	4,612	4,612	3,669	39,111
1925	2,152	2,083	2,152	3,074	3,362	3,689	8,271	67,753	149,864	11,621	7,686	5,316	267,023
1926	3,689	3,570	3,074	2,460	2,802	7,624	7,676	11,767	6,545	6,764	6,764	4,284	67,019
1927	3,074	2,975	2,460	3,074	3,362	3,689	4,463	144,018	238,640	13,543	7,686	5,316	432,300
1928	3,689	3,570	3,074	3,074	3,362	3,689	4,463	184,434	19,601	7,686	6,764	4,284	247,690
1929	3,074	2,975	2,460	2,460	1,961	2,152	2,083	4,919	52,130	6,764	6,764	4,284	92,026
1930	3,074	2,975	2,460	2,152	2,802	3,074	3,868	8,854	102,907	6,764	6,764	4,284	149,978
1931	3,074	2,975	2,460	2,152	2,802	2,152	2,083	3,074	4,463	4,612	4,612	3,669	38,128
1932	2,152	2,083	2,152	7,009	6,916	3,689	4,463	6,149	116,974	24,366	7,686	5,316	188,955
1933	3,689	3,570	3,074	2,152	2,802	2,152	2,083	3,074	28,182	6,764	6,764	4,284	68,590
1934	3,074	2,975	2,460	2,460	2,802	7,009	3,868	4,919	6,545	4,612	4,612	3,669	49,005
1935	2,152	2,083	2,152	7,009	6,916	3,689	4,463	10,084	137,701	7,686	7,686	5,316	196,937
1936	3,689	3,570	3,074	2,460	6,356	7,624	8,271	45,190	164,181	11,621	7,686	5,316	269,038
1937	3,689	3,570	3,074	3,074	6,916	7,624	8,271	12,743	159,632	7,686	7,686	5,316	229,281
1938	3,689	3,570	3,074	3,074	6,916	7,624	8,271	68,866	350,036	112,643	7,686	5,316	580,765
1939	3,689	3,570	3,074	2,460	2,802	3,074	7,676	37,787	6,545	6,764	6,764	4,284	88,489
1940	3,074	2,975	2,460	2,460	6,916	7,624	8,271	31,527	145,292	7,686	7,686	5,316	231,287
1941	3,689	3,570	3,074	7,009	6,916	7,624	8,271	10,084	201,819	67,763	7,686	5,316	332,821
1942	3,689	3,570	3,074	3,074	3,362	3,689	8,271	105,473	283,373	86,094	7,686	5,316	516,671
1943	3,689	3,570	3,074	3,074	3,362	3,689	23,247	197,709	148,920	18,174	7,686	5,316	421,510
1944	3,689	3,570	3,074	2,460	2,802	3,074	3,868	55,934	79,627	6,764	6,764	4,284	175,910
1945	3,074	2,975	2,460	3,074	6,916	7,624	8,271	10,084	172,351	31,926	7,686	5,316	261,757
1946	3,689	3,570	7,009	7,009	6,916	7,624	8,271	19,234	85,083	7,686	7,686	5,316	169,093
1947	3,689	3,570	3,074	3,074	3,362	3,689	4,463	110,484	10,353	6,764	6,764	4,284	163,570
1948	3,074	2,975	2,460	2,460	2,802	7,009	7,676	10,084	77,241	7,686	7,686	5,316	136,469
1949	3,689	3,570	3,074	2,460	2,802	7,009	7,676	8,854	10,353	6,764	6,764	4,284	67,299
1950	3,074	2,975	2,460	2,460	6,916	7,009	8,271	10,084	73,459	7,686	7,686	5,316	137,396
1951	3,689	41,299	42,960	7,009	6,916	7,624	8,271	10,084	95,720	7,686	7,686	5,316	244,260
1952	3,689	3,570	3,074	3,074	6,916	3,689	4,463	223,078	238,065	106,256	7,686	5,316	608,876
1953	3,689	3,570	3,074	3,074	3,362	3,074	3,868	28,311	168,768	29,365	7,686	5,316	263,157
1954	3,689	3,570	3,074	2,460	2,802	3,074	4,463	105,620	27,809	6,764	6,764	4,284	174,373
1955	3,074	2,975	2,460	3,074	3,362	7,009	7,676	8,854	6,545	6,764	6,764	4,284	62,841
1956	3,074	2,975	6,395	7,009	6,916	7,624	8,271	17,135	310,301	94,682	7,686	5,316	477,384
1957	3,689	3,570	3,074	2,152	1,961	2,152	3,868	50,333	183,319	7,686	6,764	4,284	272,852
1958	3,074	2,975	2,460	3,074	3,362	3,689	4,463	188,814	221,860	55,443	7,686	5,316	502,216
1959	3,689	3,570	3,074	2,152	1,961	7,009	7,676	8,854	6,545	6,764	6,764	4,284	62,342
1960	3,074	2,975	2,460	2,152	1,961	2,152	7,676	8,854	6,545	6,764	6,764	4,284	55,661
1961	3,074	2,975	2,460	3,074	2,802	2,152	3,868	4,919	6,545	4,612	4,612	3,669	44,762
1962	2,152	2,083	2,152	2,460	1,961	3,689	4,463	45,687	202,079	11,621	7,686	5,316	291,349
1963	3,689	3,570	3,074	2,152	2,802	3,689	4,463	133,252	203,340	36,602	7,686	5,316	409,635
1964	3,689	3,570	3,074	3,074	3,362	3,074	7,676	8,854	10,353	6,764	6,764	4,284	64,538
1965	3,074	2,975	6,395	7,009	6,916	7,624	8,271	10,084	111,487	61,519	7,686	5,316	238,356
1966	3,689	3,570	3,074	3,074	3,362	3,689	7,676	123,555	6,545	6,764	6,764	4,284	176,046
1967	3,074	2,975	2,460	3,074	3,362	3,689	4,463	159,921	270,669	185,208	7,686	5,316	651,897
1968	3,689	3,570	3,074	2,460	2,802	3,074	3,868	71,420	14,833	6,764	6,764	4,284	126,602
1969	3,074	2,975	2,460	3,074	3,362	3,689	12,681	344,502	300,076	115,876	7,686	5,316	804,771
1970	3,689	3,570	3,074	3,074	3,362	3,689	4,463	114,745	124,926	7,686	7,686	5,316	285,280
1971	3,689	3,570	3,074	3,074	3,362	3,689	4,463	71,223	177,149	11,621	7,686	5,316	297,916
1972	3,689	3,570	3,074	3,074	3,362	3,074	3,868	32,769	57,109	6,764	6,764	4,284	131,401
1973	3,074	2,975	2,460	3,074	3,362	3,689	4,463	204,754	159,403	7,686	7,686	5,316	407,942
1974	3,689	3,570	3,074	3,074	3,362	3,689	4,463	201,034	194,704	11,621	7,686	5,316	445,282
1975	3,689	3,570	3,074	3,074	2,802	3,689	8,271	10,084	243,813	11,621	7,686	5,316	306,689
1976	3,689	3,570	3,074	3,074	1,961	2,152	2,083	3,074	4,463	4,612	4,612	3,669	40,033
1977	2,152	2,083	2,152	2,152	1,961	2,152	2,083	3,074	4,463	4,612	4,612	3,669	35,165
1978	2,152	2,083	2,152	3,074	3,362	3,689	4,463	45,254	298,570	132,949	7,686	5,626	511,060
1979	3,689	3,570	3,074	2,460	3,362	3,689	4,463	220,976	107,368	7,686	7,686	5,316	373,339
1980	3,689	3,570	3,074	3,074	6,916	3,689	8,271	133,323	235,879	148,920	7,686	5,316	563,407
1981	3,689	3,570	3,074	2,152	2,802	3,074	7,676	15,457	20,663	6,764	6,764	4,284	79,969
1982	3,074	2,975	2,460	3,074	6,916	3,689	26,103	228,913	254,131	108,434	7,686	5,316	652,771
1983	7,624	3,570	3,074	3,074	3,362	3,689	4,463	180,307	463,488	302,677	61,509	5,316	1,042,153
1984	3,689	7,378	7,009	7,009	6,916	3,689	4,463	124,666	130,916	11,621	7,686	5,316	320,358
1985	3,689	3,570	3,074	3,074	3,362	3,074	4,463	99,040	12,733	6,764	6,764	4,284	153,891
1986	3,074	2,975	2,460	3,074	3,362	16,102	20,985	228,842	263,786	12,678	7,686	5,316	570,340
1987	3,689	3,570	3,074	2,152	1,961	2,152	2,083	3,074	4,463	4,612	4,612	3,669	39,111
1988	2,152	2,083	2,152	3,074	3,362	3,074	2,083	4,919	10,353	4,612	4,612	3,669	46,145
1989	2,152	2,083	2,152	3,074	2,802	3,074	4,463	122,056	62,889	7,686	6,764	4,284	223,479
1990	3,074	2,975	2,460	2,460	2,802	3,074	2,083	3,074	4,463	4,612	4,612	3,669	39,358
1991	2,152	2,083	2,152	2,152	1,961	2,152	3,868	4,919	104,230	6,764	6,764	4,284	143,481
1992	3,074	2,975	2,460	2,460	2,802	3,074	3,868	21,507	4,463	4,612	4,612	3,669	59,576
1993	2,152	2,083	2,152	3,074	3,362	3,689	8,271	213,205	204,082	44,068	7,686	5,316	499,140
1994	3,689	3,570	3,074	2,460	1,961	2,152	2,083	3,074	4,463	4,612	4,612	3,669	39,419
1995	2,152	2,083	2,152	3,074	3,362	7,624	8,271	131,296	334,396	294,086	11,843	5,316	805,655
1996	3,689	3,570	3,074	2,460	3,362	7,624	8,271	190,622	169,121	11,621	7,686	5,316	416,416
1997	3,689	3,570	3,074	116,811	6,916	7,624	4,463	231,648	146,890	7,686	7,686	5,316	545,373
1998	3,689	3,570	3,074	2,460	3,362	3,689	4,463	64,194	312,909	217,820	7,686	5,316	632,232
1999	3,689	3,570	3,074	2,460	6,916	7,624	8,271	18,453	168,986	7,686	7,686	5,316	243,731
2000	3,689	3,570	3,074	2,152	3,362	3,689	4,463	144,697	97,677	7,686	7,686	5,316	287,061
2001	3,689	3,570	3,074	2,460	2,802	3,074	3,868	87,834	6,545	6,764	6,764	4,284	134,728
2002	3,074	2,975	2,460	3,074	3,362	3,689	4,463	123,552	64,932	7,686	6,764	4,284	230,315
Avg (21-02)	3,351	3,703	3,449	4,542	3,904	4,514	6,294	74,969	124,312	33,709	7,711	4,797	275,255

APPENDIX O1

Table 2.3-6

Difference in Hetch Hetchy Reservoir Release to Stream (Acre-feet) WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	0	0	0	-5,151	0	0	0	-5,151
1922	0	0	0	0	0	0	0	-5,370	0	0	0	0	-5,370
1923	0	0	0	0	0	0	0	-16,849	0	0	0	0	-16,849
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	-10,995	0	0	0	0	-10,995
1926	0	0	0	0	0	0	0	-2,913	0	0	0	0	-2,913
1927	0	0	0	0	0	0	0	-25,090	0	0	0	0	-25,090
1928	0	0	0	0	0	0	0	-2,741	0	0	0	0	-2,741
1929	0	0	0	0	0	0	0	0	-13,872	0	0	0	-13,872
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	-3,554	0	0	0	-2,045	0	0	0	-5,599
1933	0	0	0	0	0	0	0	0	-10,453	0	0	0	-10,453
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	3,935	0	0	-1,636	0	0	0	2,299
1936	0	0	0	0	0	0	0	-7,145	0	0	0	0	-7,145
1937	0	0	0	0	0	0	0	-2,659	-5,570	0	0	0	-8,229
1938	0	0	0	0	0	0	0	-10,460	0	0	0	0	-10,460
1939	0	0	0	0	0	0	-3,808	4,045	0	0	0	0	237
1940	0	0	0	0	0	0	0	8,672	0	0	0	0	8,672
1941	0	0	0	0	0	0	0	0	-1,248	0	0	0	-1,248
1942	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	-31,658	0	0	0	0	-31,658
1945	0	0	0	0	0	0	0	0	12,279	0	0	0	12,279
1946	0	0	0	0	0	0	0	-7,045	0	0	0	0	-7,045
1947	0	0	0	0	0	0	0	-24,441	0	0	0	0	-24,441
1948	0	0	0	0	0	0	0	0	-11,312	0	0	0	-11,312
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	6,752	0	0	0	6,752
1951	0	-7,289	0	0	0	0	0	0	-8,010	0	0	0	-15,299
1952	0	0	0	0	0	0	0	-13,691	0	0	0	0	-13,691
1953	0	0	0	0	0	0	0	-2,049	0	0	0	0	-2,049
1954	0	0	0	0	0	0	0	-23,348	0	0	0	0	-23,348
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	-4,412	0	0	0	0	-4,412
1957	0	0	0	0	0	0	0	-32,683	0	0	0	0	-32,683
1958	0	0	0	0	0	0	0	-10,443	0	0	0	0	-10,443
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	-39,538	-13,398	0	0	0	-52,936
1963	0	0	0	0	0	0	0	-15,185	0	0	0	0	-15,185
1964	0	0	0	0	0	0	0	0	-3,808	0	0	0	-3,808
1965	0	0	0	0	0	0	0	0	14,900	0	0	0	14,900
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	-13,229	0	0	0	0	-13,229
1968	0	0	0	0	0	0	0	-21,873	0	0	0	0	-21,873
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	3,935	0	0	0	-9,317	0	0	0	0	-5,382
1971	0	0	0	0	0	0	0	-18,765	0	0	0	0	-18,765
1972	0	0	0	0	0	0	0	-22,515	0	0	0	0	-22,515
1973	0	0	0	0	0	0	0	-13,924	0	0	0	0	-13,924
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	4,023	4,171	0	0	0	8,194
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	-39,105	0	0	0	-310	-39,415
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	-6,603	-10,310	0	0	0	-16,913
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	-5,090	0	0	0	0	-5,090
1984	0	0	0	0	0	3,935	0	-11,653	0	0	0	0	-7,718
1985	0	0	0	0	0	0	0	5,163	0	0	0	0	5,163
1986	0	0	0	0	0	-8,478	-3,935	0	0	0	0	0	-12,413
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	-3,808	0	0	0	-3,808
1989	0	0	0	0	0	0	0	-33,044	0	0	0	0	-33,044
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	-29,675	0	0	0	-29,675
1992	0	0	0	0	0	0	0	-18,433	0	0	0	0	-18,433
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	-6,208	0	0	0	0	0	0	0	0	-6,208
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	-8,369	-2,950	0	0	0	-11,319
2000	0	0	0	0	0	0	0	-8,201	0	0	0	0	-8,201
2001	0	0	0	0	0	0	0	-39,594	0	0	0	0	-39,594
2002	0	0	0	0	0	0	0	-31,748	0	0	0	0	-31,748
Avg (21-02)	0	-89	0	-28	-43	-7	-94	-6,930	-1,038	0	0	-4	-8,234

2.4 Lake Lloyd and Lake Eleanor

Compared to the operation in the base setting, the operation of Lake Lloyd and Lake Eleanor are simulated to be only slightly different in the WSIP setting. Figure 2.4-1 illustrates a chronological trace of the simulation of Lake Lloyd storage and stream releases. Figure 2.4-1 shows the results for the WSIP and base settings. The operation resulting for the WSIP setting is essentially the same as for the base setting, except during the prolonged drought of 1987-1992. During this drought period, there is a greater draw from Hetch Hetchy Reservoir in the WSIP setting compared to the base setting. The additional draw of water reduces the amount of water released from Hetch Hetchy Reservoir to Don Pedro Reservoir in the WSIP setting, which, to satisfy MID/TID entitlements to inflow, is met with additional releases from Lake Lloyd.

Figure 2.4-2 illustrates an almost identical operation of Lake Eleanor between the WSIP and base settings. Any difference that occurs in the Lake Eleanor operation would be caused by a small change in operation at Lake Lloyd that would affect the operation of the Cherry-Eleanor Tunnel between the two watersheds. Any difference that occurs in the simulations is associated more with modeling discretion than with any substantive likely difference in operation.

Supplementing the Figure 2.4-1 representation of Lake Lloyd stream releases is Table 2.4-1, which illustrates the differences in stream releases between the WSIP and base settings. The one notable difference in operation for the 82-year simulation occurs during the year following the rare 1987-1992 drought sequence, when the additional draw from Lake Lloyd storage described above would require replenishment. In this one occurrence, the releases to the stream above the minimum release requirement that would occur in the base setting would not occur in the WSIP setting. Table 2.4-2 illustrates average releases by year type for the WSIP and base settings, and shows almost no difference in releases between the two settings.

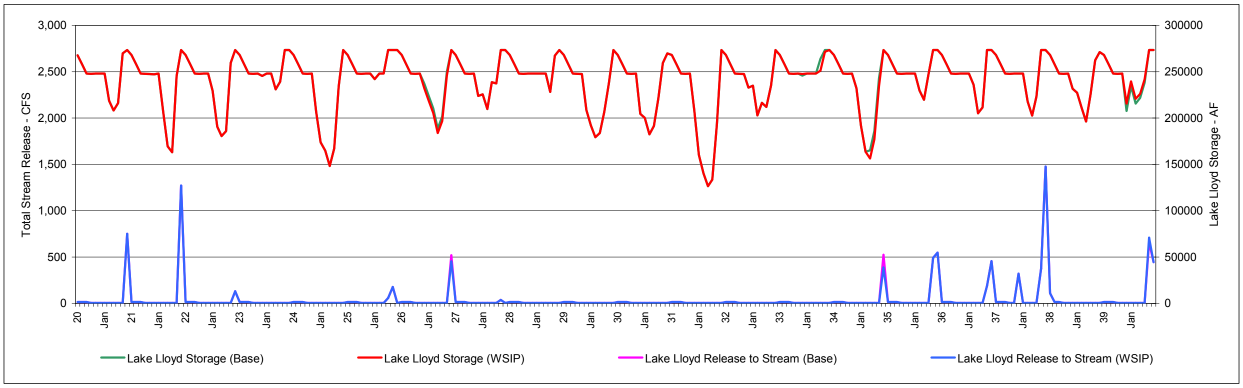
2.5 Flow below the Tuolumne River and Cherry River Confluence

The flow that occurs below the confluence of the Tuolumne River and Cherry River is considered important to recreational activity (whitewater rafting) during the May-through-September period. To estimate the effect of the WSIP on the occurrence of flow at this location, HH/LSM monthly volumetric flow results were post-processed to reflect the daily and hourly shaping potential currently exercised by Hetch Hetchy operators to satisfy water and power objectives while accommodating the desires of recreational interests. Figure 2.5-1 and Figure 2.5-2 illustrate the controlled flow below Hetch Hetchy facilities below the confluence of the Tuolumne and Cherry Rivers, averaged by year type, for the WSIP and base settings. Illustrated are the combined flow elements of: (1) stream releases from O'Shaughnessy Dam, Lake Lloyd, and Lake Eleanor; (2) the return of Canyon Tunnel diversions through Kirkwood Powerhouse that exceed the Mountain Tunnel diversion; and (3) diversions through Holm Powerhouse. For this analysis, the monthly volumes of diversion through Holm Powerhouse have been shaped into a release of 4 hours per day for 6 days a week. The other flow elements represent the average daily flow rate associated with the monthly volume of flow. Figure 2.5-1 and Figure 2.5-2 illustrate that the HH/LSM operation protocols for reservoir operation incidentally result in approximately 1,000 cfs of flow below the confluence if Holm Powerhouse releases are shaped. This opportunity occurs in both the WSIP and base settings. The flow rates illustrated in this analysis do not reflect either the occasional shaping opportunities that occur with Kirkwood Powerhouse releases or the existence of unregulated flow that enters the streams below O'Shaughnessy Dam, Lake Lloyd, and Lake Eleanor; both of these factors would increase the illustrated flow rate. The difference in flow between the two settings that could occur during the concentrated period of flow is illustrated in Figure 2.5-3.

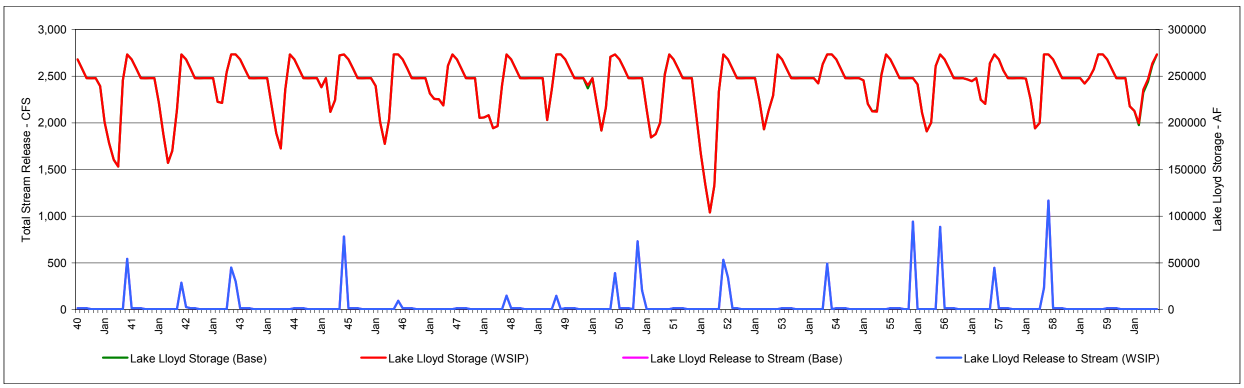
APPENDIX O1

Figure 2.4-1
Lake Lloyd Storage and Stream Release

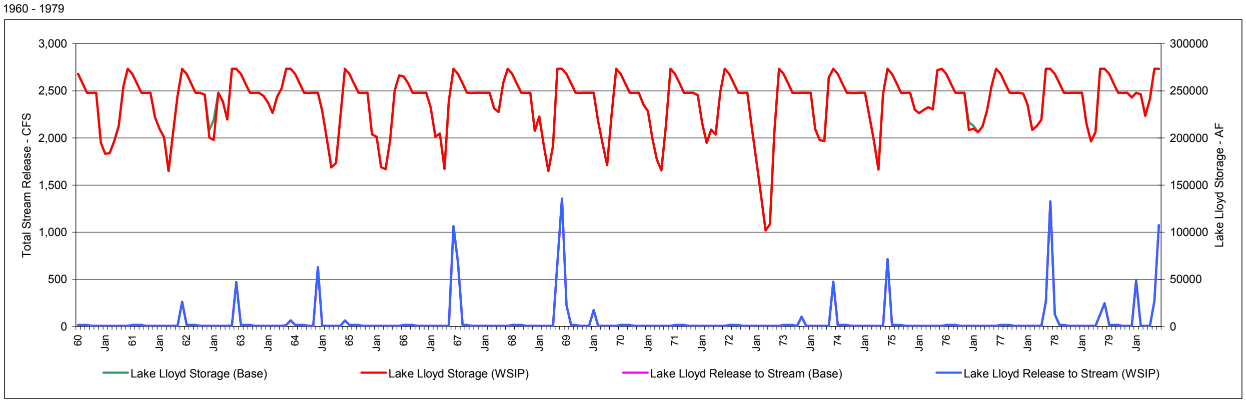
1920 - 1939



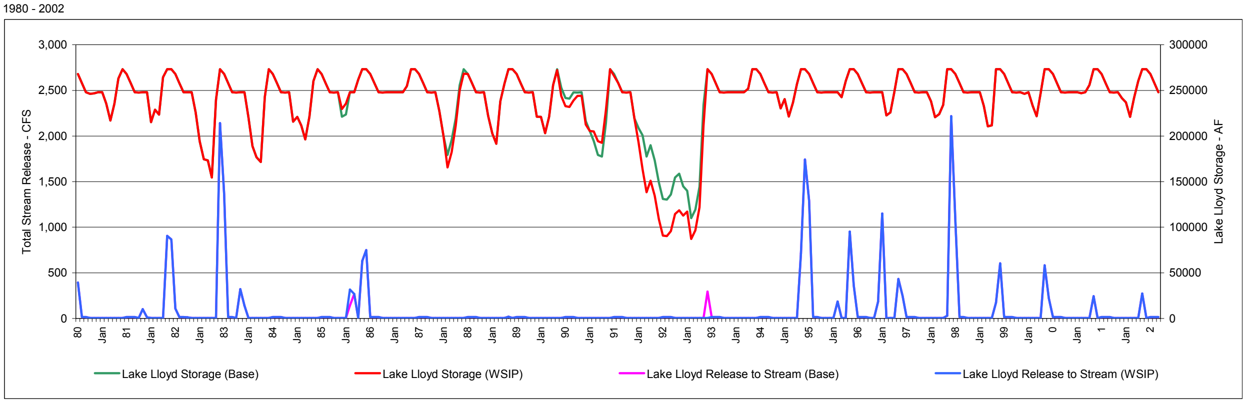
1940 - 1959



1960 - 1979



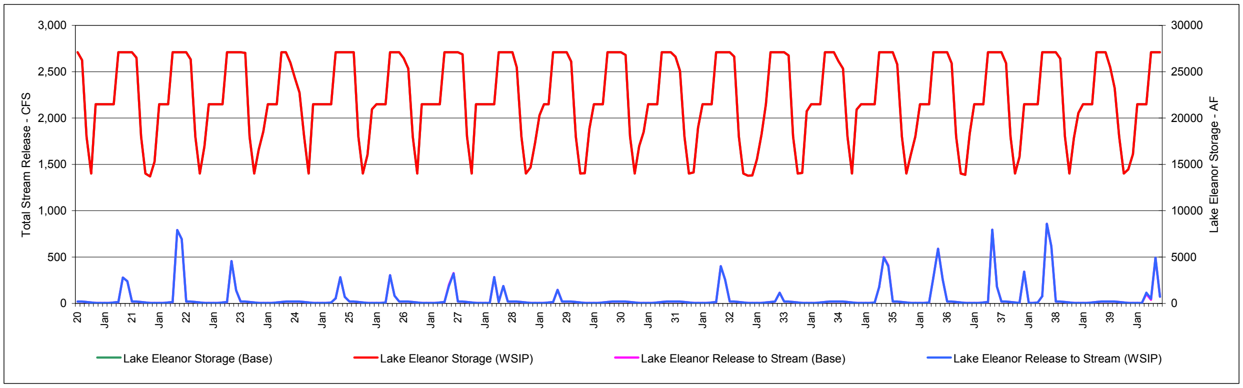
1980 - 2002



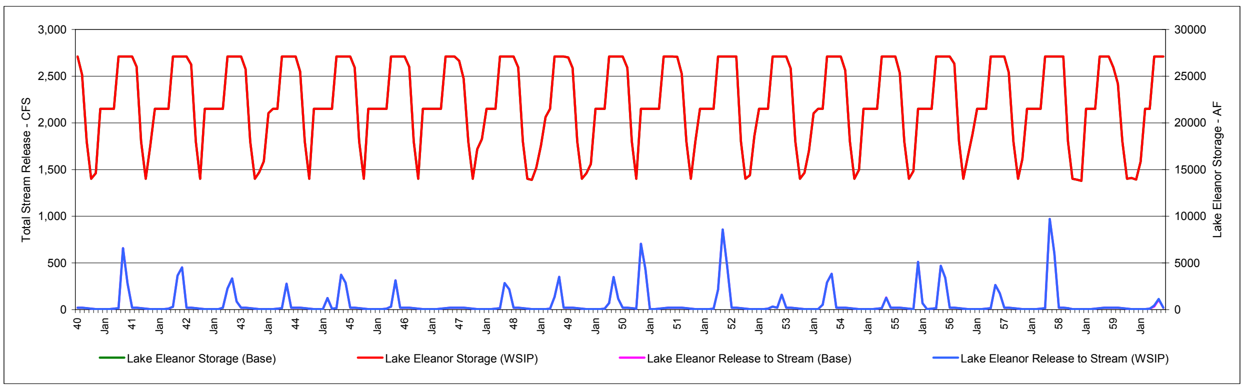
APPENDIX O1

Figure 2.4-2
Lake Eleanor Storage and Stream Release

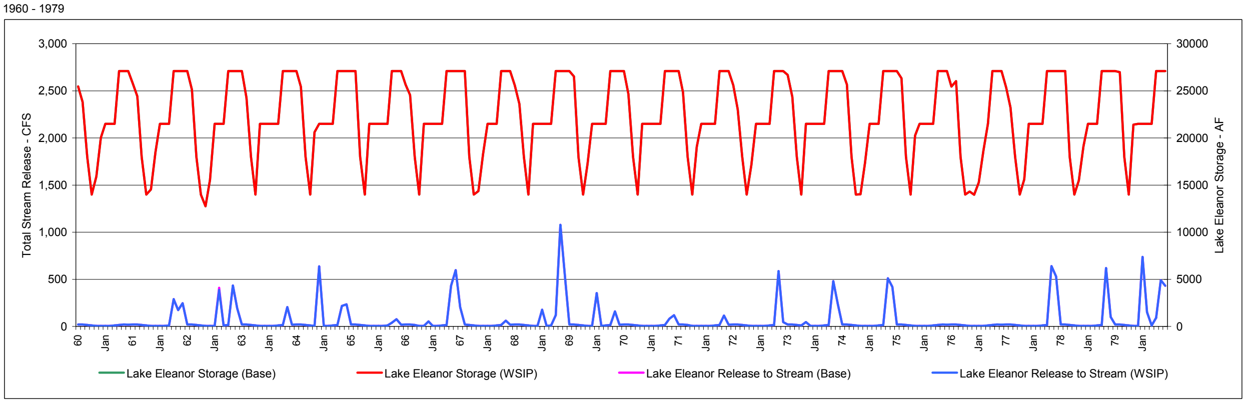
1920 - 1939



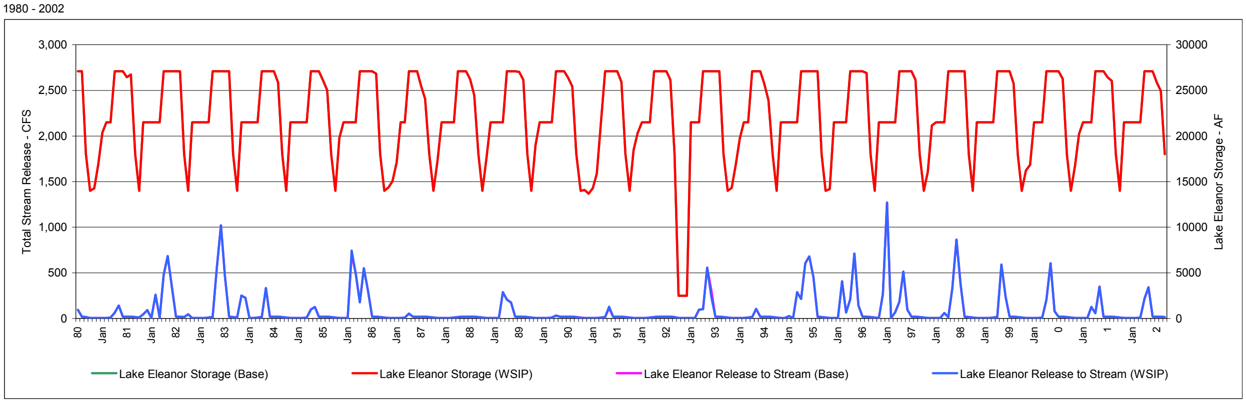
1940 - 1959



1960 - 1979



1980 - 2002



APPENDIX O1

Table 2.4-1

Difference in Lake Lloyd Release to Stream (Acre-feet) WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	0	0	0	0	0	0	0	0
1922	0	0	0	0	0	0	0	0	0	0	0	0	0
1923	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	-3,924	0	0	0	-3,924
1928	0	0	0	0	0	0	0	0	0	0	0	0	0
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	-8,042	0	0	0	-8,042
1936	0	0	0	0	0	0	0	0	0	0	0	0	0
1937	0	0	0	0	0	0	0	0	0	0	0	0	0
1938	0	0	0	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	0	0	0	3,357	0	0	0	0	3,357
1941	0	0	0	0	0	0	0	0	0	0	0	0	0
1942	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	0	0	0	0	0	0	0	0	0
1946	0	0	0	0	0	0	0	0	0	0	0	0	0
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	-50	0	0	0	0	0	0	0	0	0	-50
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	9,733	0	0	0	0	0	0	0	9,733
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	1	0	0	0	0	1
1991	0	0	0	0	0	0	0	0	0	1	0	0	1
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	1	0	0	0	0	0	-17,192	0	0	0	-17,191
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	0	0	-1	0	119	0	0	41	-356	0	0	0	-197

APPENDIX O1

Table 2.4-2

Lake Lloyd Release to Stream (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	334	653	8,224	6,566	1,362	1,319	298	17,483	62,931	22,325	953	922	123,370
Above Normal	307	4,282	1,525	307	870	307	298	10,285	26,807	993	953	922	47,857
Normal	307	298	307	953	278	307	298	6,734	9,633	953	953	922	21,943
Below Normal	307	298	307	307	278	307	485	2,383	2,551	953	953	922	10,051
Dry	307	298	307	307	278	307	298	307	298	953	953	922	5,535
All Years	312	1,193	2,104	1,654	612	505	337	7,412	20,303	5,131	953	922	41,439

Lake Lloyd Release to Stream (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	334	653	8,227	6,566	754	1,319	298	17,483	64,005	22,325	953	922	123,839
Above Normal	307	4,282	1,525	307	870	307	298	10,088	27,511	993	953	922	48,363
Normal	307	298	307	953	278	307	298	6,734	9,633	953	953	922	21,943
Below Normal	307	298	307	307	278	307	485	2,383	2,551	953	953	922	10,051
Dry	307	298	307	307	278	307	298	307	298	953	953	922	5,535
All Years	312	1,193	2,105	1,654	494	505	337	7,371	20,659	5,131	953	922	41,636

Difference in Lake Lloyd Release to Stream (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-3	0	608	0	0	0	-1,075	0	0	0	-469
Above Normal	0	0	0	0	0	0	0	197	-704	0	0	0	-506
Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-1	0	119	0	0	41	-356	0	0	0	-197

Figure 2.5-1

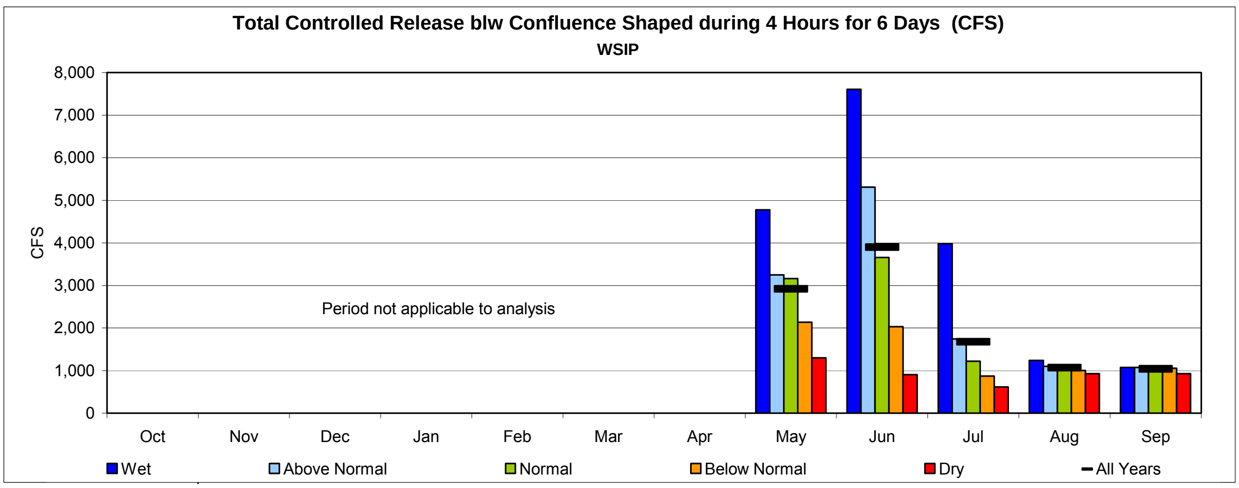


Figure 2.5-2

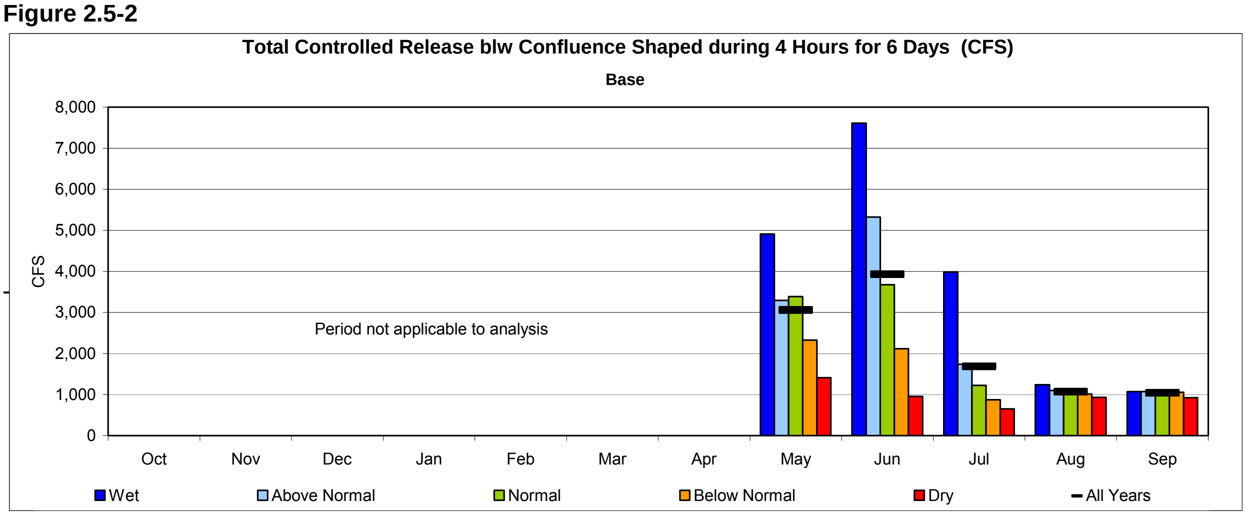
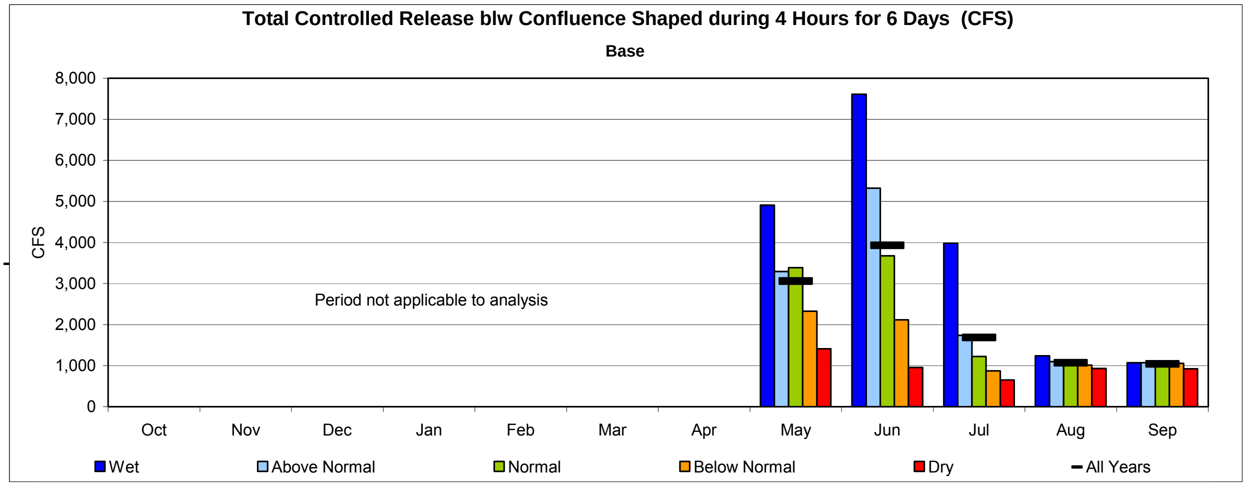


Figure 2.5-3



More detailed review of the 82-year simulation of operations indicates that in only one month of the simulation do circumstances in the WSIP setting result in the shaped flow crossing the threshold to below 1,000 cfs, compared to levels greater than 1,000 cfs in the base setting. In both the WSIP and base settings, in some dry and critical years, circumstances could result in a shaped flow of less than 1,000 cfs; however, results indicate that the WSIP setting would rarely increase the frequency of such an occurrence.

2.6 Don Pedro Reservoir and La Grange Releases

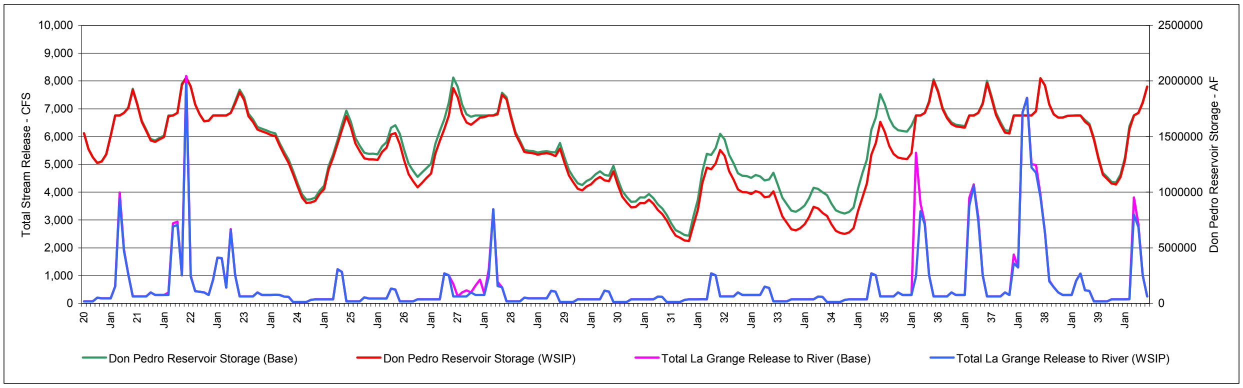
A change in Don Pedro Reservoir operation is caused by changes in inflow to the reservoir. The changes in inflow to the reservoir are the result of net changes within the operation of the upstream SFPUC facilities, described previously, and other changes in SFPUC operations associated with diversions to the Holm, Kirkwood, and Moccasin Powerhouses. Figure 2.6-1 illustrates a chronological trace of the simulation of Don Pedro Reservoir storage and Tuolumne River stream releases from La Grange Dam. Figure 2.6-1 presents the results for the WSIP and base settings.

Supplementing the Figure 2.6-1 representation of Don Pedro Reservoir storage are Table 2.6-1, Don Pedro Reservoir Storage (WSIP); Table 2.6-2, Don Pedro Reservoir (Base); and Table 2.6-3, Difference in Don Pedro Reservoir Storage (WSIP minus Base). The results illustrate that, throughout many years, the storage in Don Pedro Reservoir associated with the WSIP setting would differ from the storage in the base setting, and that this difference would almost always be less storage. Compared to the base setting, the differences in storage (reductions) indicate that inflow to Don Pedro Reservoir would decrease due to greater SFPUC demands and SJPL diversions in the WSIP setting. The decreases in inflow typically occur from winter through early summer. Table 2.6-4 illustrates the difference in inflow to Don Pedro Reservoir between the WSIP and base settings. Generally, the difference is an annual amount of about 27,000 acre-feet, approximating the additional delivery of the SFPUC. The season of inflow reduction is associated with the direct increase in diversions to the SJPL and the replenishment operation of Hetch Hetchy Reservoir. Figure 2.6-2 illustrates the seasonal change in Don Pedro Reservoir inflow, averaged by year type.

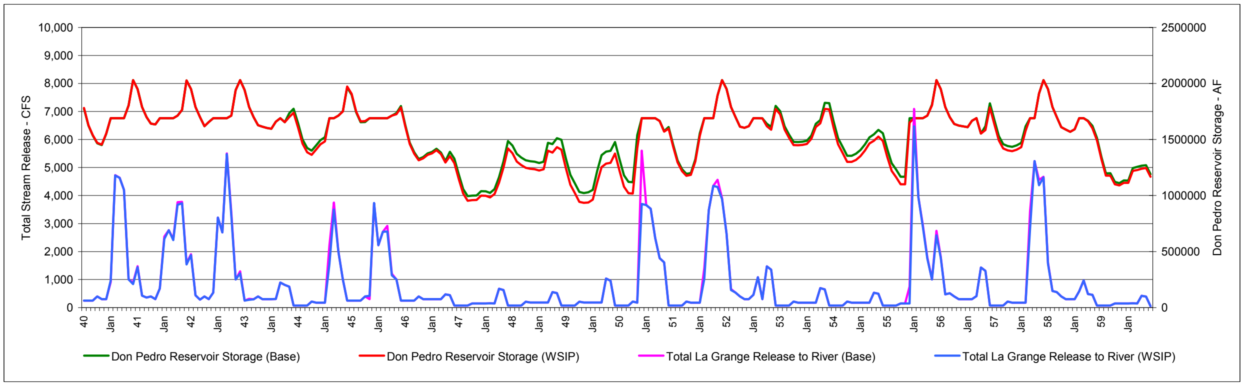
APPENDIX O1

Figure 2.6-1
Don Pedro Reservoir Storage and Release below La Grange Dam

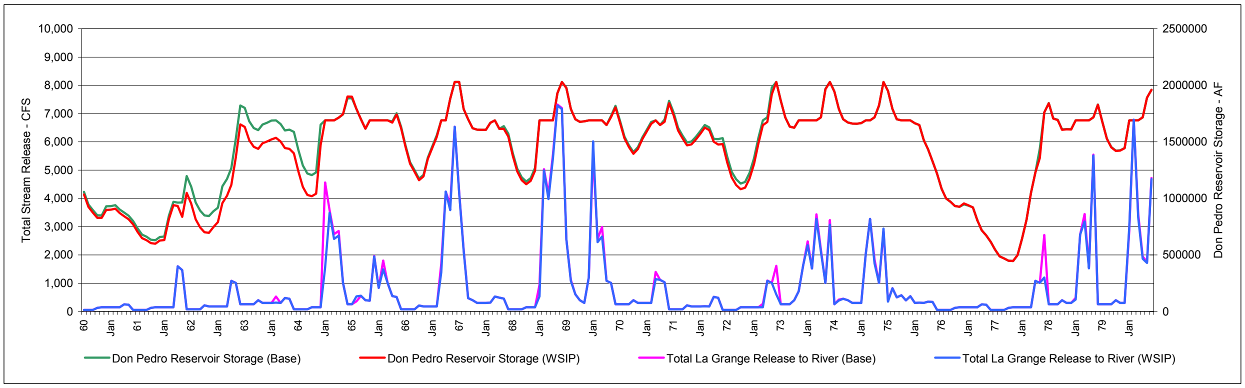
1920 - 1939



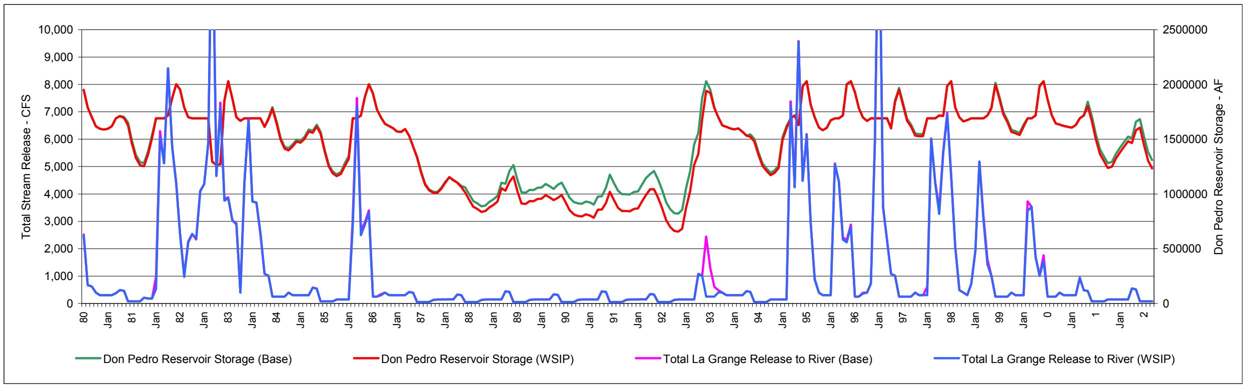
1940 - 1959



1960 - 1979



1980 - 2002



APPENDIX O1

Table 2.6-1

Don Pedro Reservoir Storage (Acre-feet) WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	1,262,860	1,277,365	1,340,344	1,508,876	1,689,999	1,690,000	1,713,000	1,758,255	1,920,087	1,785,379	1,633,202	1,551,799
1922	1,466,449	1,451,643	1,475,936	1,496,100	1,682,686	1,690,000	1,713,000	1,965,236	2,030,000	1,950,094	1,790,026	1,700,016
1923	1,638,028	1,643,364	1,689,999	1,689,989	1,689,997	1,690,000	1,713,000	1,799,363	1,900,966	1,828,869	1,683,448	1,632,370
1924	1,563,169	1,547,842	1,533,824	1,515,415	1,506,005	1,417,560	1,338,399	1,262,605	1,162,134	1,052,503	951,855	904,167
1925	906,788	921,085	985,076	1,028,777	1,205,262	1,311,674	1,436,468	1,560,568	1,684,578	1,582,202	1,438,920	1,367,376
1926	1,304,106	1,296,082	1,296,519	1,290,435	1,361,093	1,400,064	1,518,241	1,532,438	1,430,226	1,287,212	1,162,635	1,099,288
1927	1,044,610	1,084,270	1,129,224	1,168,777	1,346,690	1,463,332	1,567,658	1,688,723	1,936,134	1,852,362	1,703,718	1,627,130
1928	1,606,224	1,637,560	1,672,026	1,675,150	1,689,999	1,690,000	1,701,151	1,877,285	1,835,437	1,667,682	1,522,481	1,445,074
1929	1,362,145	1,353,824	1,350,930	1,337,716	1,346,569	1,351,080	1,341,527	1,323,621	1,392,489	1,266,466	1,150,912	1,087,613
1930	1,032,080	1,016,460	1,051,972	1,071,954	1,112,838	1,138,506	1,107,377	1,098,218	1,186,818	1,067,154	960,515	908,251
1931	864,235	866,605	904,039	902,201	933,725	896,662	839,706	804,980	747,051	671,410	610,497	591,503
1932	565,821	560,723	704,485	844,787	1,084,372	1,221,695	1,205,745	1,259,030	1,378,752	1,327,642	1,189,590	1,113,456
1933	1,025,224	1,000,826	998,521	983,959	1,008,603	995,965	955,100	959,906	1,007,489	894,719	782,336	724,120
1934	667,461	656,295	676,788	711,356	777,968	868,739	854,724	813,053	786,448	712,923	652,109	634,358
1935	624,570	638,297	677,837	832,051	956,075	1,079,921	1,337,695	1,442,297	1,633,298	1,541,356	1,416,179	1,343,212
1936	1,311,194	1,303,236	1,297,699	1,351,659	1,689,999	1,690,000	1,713,000	1,808,939	2,003,094	1,900,592	1,747,881	1,665,690
1937	1,613,022	1,592,326	1,585,791	1,579,717	1,689,994	1,690,000	1,713,000	1,792,830	1,982,099	1,843,316	1,694,437	1,610,230
1938	1,536,751	1,528,196	1,689,998	1,689,992	1,689,987	1,690,000	1,690,000	1,730,000	2,025,000	1,959,369	1,790,073	1,700,032
1939	1,672,242	1,671,809	1,685,673	1,689,024	1,689,999	1,690,000	1,634,629	1,601,698	1,473,709	1,301,817	1,157,373	1,119,194
1940	1,077,628	1,070,702	1,134,704	1,288,559	1,565,488	1,690,000	1,713,000	1,808,008	1,950,520	1,780,688	1,627,700	1,539,737
1941	1,469,773	1,454,423	1,553,735	1,689,994	1,689,991	1,690,000	1,690,000	1,804,234	2,030,000	1,950,157	1,790,024	1,700,010
1942	1,641,462	1,634,171	1,689,999	1,689,982	1,689,995	1,690,000	1,713,000	1,765,000	2,027,000	1,950,170	1,790,025	1,700,004
1943	1,619,298	1,656,980	1,690,000	1,689,976	1,689,995	1,690,000	1,713,000	1,940,240	2,030,000	1,940,444	1,790,004	1,700,004
1944	1,627,652	1,614,506	1,602,762	1,595,713	1,659,696	1,690,000	1,654,802	1,700,608	1,738,836	1,608,117	1,463,726	1,386,992
1945	1,362,396	1,410,433	1,456,868	1,483,156	1,689,997	1,690,000	1,713,000	1,750,377	1,973,670	1,906,466	1,749,519	1,662,142
1946	1,664,336	1,690,000	1,689,996	1,689,984	1,689,995	1,690,000	1,713,000	1,726,331	1,786,301	1,618,009	1,459,654	1,373,770
1947	1,314,592	1,331,036	1,364,362	1,376,577	1,405,177	1,370,566	1,295,486	1,351,369	1,288,812	1,144,830	1,017,268	954,574
1948	958,700	959,989	998,610	997,725	983,836	1,013,678	1,114,286	1,251,048	1,420,232	1,377,867	1,303,272	1,271,554
1949	1,247,966	1,239,259	1,234,425	1,223,326	1,235,015	1,400,436	1,383,115	1,432,798	1,409,371	1,242,728	1,096,786	1,022,286
1950	944,784	935,019	938,337	962,506	1,119,822	1,253,320	1,285,258	1,291,998	1,375,323	1,221,712	1,078,645	1,020,719
1951	1,018,036	1,422,514	1,689,995	1,689,971	1,689,993	1,690,000	1,664,085	1,570,386	1,596,323	1,438,802	1,296,271	1,217,452
1952	1,176,472	1,184,189	1,305,781	1,533,995	1,689,998	1,690,000	1,690,000	1,895,000	2,030,000	1,951,049	1,790,051	1,700,027
1953	1,614,775	1,604,850	1,619,190	1,689,999	1,689,998	1,688,681	1,619,217	1,588,332	1,773,663	1,724,813	1,589,215	1,514,922
1954	1,449,795	1,449,008	1,452,649	1,459,444	1,505,884	1,611,838	1,643,837	1,773,541	1,769,428	1,605,391	1,456,830	1,379,013
1955	1,300,328	1,300,104	1,318,386	1,350,951	1,401,218	1,464,906	1,489,052	1,525,796	1,487,090	1,348,288	1,221,076	1,163,037
1956	1,100,763	1,099,427	1,651,474	1,689,947	1,689,993	1,690,000	1,713,000	1,804,698	2,030,000	1,950,170	1,790,030	1,700,025
1957	1,639,825	1,624,492	1,616,539	1,610,979	1,668,413	1,690,000	1,553,124	1,584,074	1,786,699	1,635,352	1,492,723	1,419,571
1958	1,403,575	1,396,361	1,409,069	1,432,024	1,578,593	1,690,000	1,690,000	1,910,000	2,030,000	1,950,170	1,790,046	1,700,029
1959	1,611,062	1,589,728	1,567,833	1,592,273	1,689,999	1,690,000	1,662,406	1,600,478	1,493,480	1,324,246	1,178,165	1,178,441
1960	1,101,196	1,090,401	1,113,627	1,113,311	1,220,539	1,228,588	1,240,002	1,245,830	1,168,185	1,034,178	923,226	874,650
1961	827,383	826,615	897,810	899,493	908,561	870,204	842,562	814,709	769,512	703,148	648,423	629,635
1962	604,125	599,069	626,802	630,729	817,825	938,956	931,539	835,624	1,048,335	953,860	814,699	742,797
1963	700,558	694,902	745,217	790,246	957,421	1,023,119	1,119,414	1,363,268	1,654,516	1,631,866	1,513,806	1,455,856
1964	1,437,657	1,487,272	1,502,934	1,521,014	1,535,522	1,502,343	1,443,836	1,438,577	1,397,068	1,238,632	1,101,362	1,031,330
1965	1,018,694	1,042,070	1,471,762	1,689,988	1,689,993	1,690,000	1,713,000	1,743,852	1,900,867	1,898,947	1,790,038	1,700,028
1966	1,615,736	1,690,000	1,689,998	1,689,996	1,689,998	1,690,000	1,670,732	1,742,447	1,620,676	1,452,534	1,306,169	1,236,095
1967	1,160,837	1,194,375	1,348,066	1,447,078	1,544,910	1,690,000	1,690,000	1,880,000	2,030,000	2,030,000	1,790,252	1,700,021
1968	1,619,820	1,607,624	1,605,760	1,605,959	1,668,870	1,690,000	1,614,396	1,614,311	1,547,133	1,375,977	1,237,984	1,160,815
1969	1,124,725	1,154,047	1,243,529	1,689,996	1,689,990	1,690,000	1,690,000	1,930,000	2,030,000	1,975,279	1,790,111	1,700,033
1970	1,676,114	1,681,553	1,689,999	1,689,952	1,689,996	1,690,000	1,649,691	1,718,076	1,804,962	1,670,839	1,531,070	1,453,473
1971	1,394,102	1,437,025	1,524,073	1,589,976	1,659,167	1,690,000	1,647,943	1,676,856	1,840,272	1,736,038	1,599,726	1,530,826
1972	1,469,268	1,477,826	1,521,421	1,571,887	1,625,342	1,603,292	1,501,630	1,475,950	1,480,830	1,319,081	1,185,074	1,119,002
1973	1,081,006	1,094,033	1,176,102	1,304,888	1,484,502	1,646,959	1,675,219	1,921,511	2,030,000	1,863,873	1,716,891	1,634,144
1974	1,625,114	1,690,000	1,689,998	1,689,983	1,689,998	1,690,000	1,717,600	1,964,185	2,030,000	1,943,894	1,790,018	1,700,018
1975	1,671,620	1,661,732	1,660,185	1,665,519	1,689,996	1,690,000	1,717,600	1,824,854	2,030,000	1,950,013	1,790,077	1,700,024
1976	1,690,000	1,690,000	1,690,000	1,664,706	1,649,459	1,519,032	1,432,156	1,326,070	1,216,796	1,085,092	998,502	968,734
1977	932,654	925,543	955,652	938,503	920,299	807,858	717,610	671,981	616,184	544,084	486,059	467,586
1978	447,583	445,345	497,628	642,718	811,604	1,050,470	1,227,230	1,356,274	1,761,000	1,841,159	1,704,419	1,692,926
1979	1,606,278	1,609,357	1,608,413	1,689,999	1,689,995	1,690,000	1,690,000	1,717,600	1,827,795	1,673,824	1,527,042	1,450,952
1980	1,419,903	1,422,622	1,442,656	1,689,977	1,689,987	1,690,000	1,717,600	1,890,400	1,960,200	1,950,171	1,790,057	1,700,035
1981	1,617,942	1,596,204	1,588,406	1,595,955	1,619,607	1,690,000	1,710,315	1,694,081	1,626,429	1,461,340	1,330,112	1,262,473
1982	1,253,640	1,360,563	1,511,306	1,689,997	1,689,988	1,690,000	1,717,600	1,876,400	2,002,900	1,954,717	1,790,097	1,700,116
1983	1,690,000	1,690,000	1,689,995	1,689,966	1,689,989	1,294,700	1,264,000	1,270,800	1,851,400	2,030,000	1,869,137	1,700,118
1984	1,666,919	1,690,000	1,689,992	1,689,972	1,689,993	1,690,000	1,614,072	1,682,328	1,778,205	1,646,266	1,496,949	1,414,071
1985	1,399,091	1,434,211	1,478,590	1,469,173	1,504,226	1,570,360	1,558,812	1,616,719	1,550,570	1,386,112	1,251,881	1,188,728
1986	1,162,153	1,183,366	1,254,950	1,319,946	1,689,994	1,690,000	1,717,600	1,888,300	2,001,400	1,917,776	1,770,749	1,700,004
1987	1,641,221	1,619,848	1,601,298	1,570,175	1,566,241	1,592,870	1,533,147	1,433,211	1,330,588	1,195,991	1,085,371	1,032,594
1988	1,010,460	1,009,573	1,045,756	1,099,567	1,155,125	1,128,364	1,103,870	1,063,204	1,011,973	943,381	884,236	862,821
1989	836,632	844,157	876,836	900,479	930,034	1,051,709	1,029,659	1,110,864	1,160,578	1,025,069	913,162	908,781
1990	935,547	934,238	954,290	956,979	989,562	968,936	944,775	965,169	990,902	924,588	852,141	815,058
1991	799,492	794,262	814,409	803,540	782,227	856,893	858,476	917,797	1,020,071	946,830	874,711	843,590
1992	844,030	841,586	863,738	868,291	931,612	990,953	1,044,352	1,043,659	967,160	874,930	761,589	698,367
1993	662,549	656,233	682,056	877,956	1,027,740	1,267,172	1,365,280	1,684,448	1,941,790	1,923,275	1,785,144	1,700,014
1994	1,627,176	1,612,969	1,599,152	1,589,196	1,599,258	1,567,682	1,531,904	1,523,687	1,478,913	1,356,482	1,256,718	1,211,217
1995	1,172,146	1,191,956	1,236,737	1,494,252	1,599,122	1,690,000	1,717,600	1,629,700	1,982,800	2,030,000	1,814,001	1,700,059
1996	1,608,079	1,583,093	1,604,410	1,672,573	1,689,990	1,690,000	1,717,600	2,002,400	2,030,000	1,930,383	1,782,384	1,700,010
1997	1,667,198	1,690,000	1,689,993	1,689,875	1,689,994	1,690,000	1,598,189	1,839,987	1,951,576	1,810,929	1,668,846	1,615,122
1998	1,533,848	1,527,463	1,528,868	1,690,000	1,689,989	1,690,000	1,717,600	1,714,000	1,987,500	2,030,000	1,790,242	1,700,022
1999	1,662,014	1,675,303	1,690,000	1,689,986	1,689,990	1,690,000	1,717,600	1,781,250	1,998,452	1,868,511	1,726,752	1,652,772
2000	1,566,486	1,554,834	1,539,188	1,615,107	1,689,994	1,690,000	1,717,600	1,981,851	2,030,000	1,864,407	1,719,364	1,644,682
2001	1,634,728	1,622,232	1,613,706	1,605,692	1,629,054	1,690,000	1,716,911	1,801,382	1,668,653	1,504,167	1,365,411	1,300,012
2002	1,238,260	1,249,893	1,323,366	1,378,790	1,430,954	1,481,487	1,466,303	1,583,557	1,606,470	1,443,430	1,305,249	1,232,624
Avg (21-02)	1,289,807	1,299,980	1,345,245	1,393,639	1,456,995	1,482,690	1,485,599	1,553,787	1,637,503	1,537,849	1,401,689	1,333,676

APPENDIX O1

Table 2.6-2

Don Pedro Reservoir Storage (Acre-feet)

Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	1,262,860	1,277,365	1,340,344	1,508,876	1,689,999	1,690,000	1,713,000	1,761,443	1,930,520	1,797,950	1,645,718	1,564,274
1922	1,478,898	1,464,086	1,488,379	1,508,546	1,690,000	1,690,000	1,713,000	1,976,410	2,030,000	1,950,099	1,790,026	1,700,016
1923	1,638,028	1,643,364	1,689,999	1,689,989	1,689,997	1,690,000	1,713,000	1,818,377	1,922,031	1,852,026	1,706,504	1,655,352
1924	1,586,104	1,570,766	1,556,748	1,538,346	1,528,938	1,440,484	1,363,083	1,292,124	1,191,623	1,081,942	981,225	933,476
1925	936,035	950,316	1,014,310	1,058,026	1,234,515	1,340,925	1,469,380	1,606,987	1,732,956	1,632,552	1,489,042	1,417,327
1926	1,353,952	1,345,900	1,346,834	1,340,765	1,411,624	1,450,000	1,578,351	1,603,241	1,524,303	1,380,860	1,255,851	1,192,192
1927	1,137,321	1,176,929	1,216,842	1,256,420	1,434,340	1,550,949	1,655,192	1,803,520	2,030,000	1,948,010	1,790,020	1,700,021
1928	1,678,968	1,690,000	1,689,999	1,690,000	1,689,998	1,690,000	1,713,000	1,893,868	1,854,079	1,686,244	1,540,960	1,463,492
1929	1,380,525	1,372,193	1,369,300	1,356,092	1,364,946	1,369,450	1,359,879	1,357,562	1,441,454	1,315,206	1,199,431	1,135,969
1930	1,080,335	1,064,688	1,100,202	1,120,198	1,161,086	1,186,736	1,155,560	1,146,764	1,237,311	1,117,418	1,010,548	958,109
1931	913,983	916,324	953,760	951,937	983,464	946,382	889,375	854,514	796,408	720,530	659,388	640,222
1932	614,427	609,298	782,322	933,923	1,188,819	1,344,750	1,335,842	1,396,503	1,524,497	1,474,909	1,336,173	1,259,546
1933	1,171,011	1,146,531	1,144,232	1,129,714	1,154,369	1,141,676	1,105,123	1,114,013	1,175,047	1,063,689	950,493	891,682
1934	834,658	823,394	847,100	880,225	947,743	1,041,027	1,030,157	998,922	973,445	899,027	837,316	818,914
1935	808,728	822,347	861,895	1,033,870	1,174,138	1,292,343	1,560,572	1,673,269	1,881,369	1,790,532	1,664,245	1,590,449
1936	1,557,918	1,549,822	1,544,402	1,598,351	1,689,990	1,690,000	1,713,000	1,819,283	2,015,519	1,915,146	1,762,372	1,680,135
1937	1,627,437	1,606,733	1,600,208	1,594,139	1,689,993	1,690,000	1,713,000	1,802,168	2,001,518	1,864,836	1,715,862	1,631,586
1938	1,558,064	1,549,496	1,689,998	1,689,992	1,689,987	1,690,000	1,690,000	1,730,000	2,025,000	1,961,552	1,790,078	1,700,032
1939	1,672,242	1,671,809	1,685,673	1,689,024	1,689,999	1,690,000	1,650,408	1,615,820	1,489,897	1,317,931	1,173,414	1,135,182
1940	1,093,582	1,086,647	1,158,651	1,310,792	1,593,586	1,690,000	1,713,000	1,799,130	1,946,542	1,776,728	1,623,757	1,535,806
1941	1,465,850	1,450,503	1,550,425	1,689,995	1,689,991	1,690,000	1,690,000	1,805,604	2,030,000	1,950,161	1,790,024	1,700,010
1942	1,641,462	1,634,171	1,689,999	1,689,981	1,689,995	1,690,000	1,713,000	1,765,000	2,027,000	1,950,170	1,790,025	1,700,004
1943	1,619,298	1,656,980	1,690,000	1,689,976	1,689,995	1,690,000	1,713,000	1,942,425	2,030,000	1,942,627	1,790,008	1,700,004
1944	1,627,652	1,614,506	1,602,762	1,595,713	1,659,696	1,690,000	1,654,802	1,734,412	1,774,644	1,645,955	1,501,393	1,424,533
1945	1,399,858	1,447,874	1,494,310	1,520,609	1,689,996	1,690,000	1,713,000	1,750,810	1,963,956	1,898,978	1,742,064	1,654,710
1946	1,656,919	1,689,894	1,689,996	1,689,984	1,689,995	1,690,000	1,713,000	1,736,559	1,798,610	1,630,265	1,471,855	1,385,929
1947	1,326,726	1,343,162	1,376,489	1,388,708	1,417,308	1,382,693	1,307,600	1,390,047	1,329,468	1,185,303	1,057,555	994,722
1948	998,763	1,000,028	1,038,651	1,037,778	1,023,891	1,058,045	1,163,183	1,304,143	1,486,478	1,445,913	1,370,936	1,338,946
1949	1,315,198	1,306,449	1,301,616	1,290,529	1,302,222	1,471,520	1,458,479	1,511,598	1,497,458	1,330,411	1,184,072	1,109,277
1950	1,031,592	1,021,777	1,028,650	1,050,184	1,222,375	1,359,716	1,391,720	1,399,065	1,477,392	1,324,696	1,181,161	1,122,890
1951	1,119,993	1,539,064	1,689,993	1,689,971	1,689,993	1,690,000	1,667,236	1,574,454	1,611,255	1,455,849	1,313,240	1,234,363
1952	1,193,348	1,201,057	1,322,649	1,555,350	1,689,998	1,690,000	1,690,000	1,895,000	2,030,000	1,953,233	1,790,056	1,700,027
1953	1,614,775	1,604,850	1,619,190	1,689,999	1,689,998	1,688,681	1,640,000	1,613,175	1,800,540	1,753,758	1,618,034	1,543,646
1954	1,478,460	1,477,656	1,481,299	1,488,102	1,534,544	1,640,488	1,672,460	1,827,599	1,825,423	1,661,146	1,512,334	1,434,329
1955	1,355,528	1,355,273	1,373,558	1,406,138	1,456,410	1,520,077	1,546,024	1,586,167	1,556,323	1,417,207	1,289,673	1,231,406
1956	1,168,990	1,167,616	1,689,999	1,689,941	1,689,992	1,690,000	1,713,000	1,811,927	2,030,000	1,950,170	1,790,030	1,700,025
1957	1,639,825	1,624,492	1,616,539	1,610,979	1,668,413	1,690,000	1,553,124	1,618,901	1,823,527	1,674,205	1,531,403	1,458,122
1958	1,442,046	1,434,810	1,447,519	1,470,486	1,617,058	1,690,000	1,690,000	1,910,000	2,030,000	1,950,170	1,790,046	1,700,029
1959	1,611,062	1,589,728	1,567,833	1,592,273	1,689,999	1,690,000	1,667,741	1,621,443	1,514,375	1,345,045	1,198,869	1,199,076
1960	1,121,788	1,110,981	1,134,209	1,133,898	1,244,574	1,255,319	1,267,382	1,271,165	1,191,272	1,057,161	946,099	897,441
1961	850,125	849,343	929,134	930,826	939,897	901,527	873,853	845,916	800,607	734,095	679,218	660,327
1962	634,752	629,679	657,412	661,349	848,446	969,566	962,118	964,682	1,197,152	1,104,181	964,302	891,870
1963	849,308	843,563	885,959	917,711	1,106,156	1,171,799	1,267,951	1,528,432	1,820,963	1,799,778	1,680,978	1,622,475
1964	1,603,934	1,653,458	1,669,127	1,687,254	1,690,000	1,656,765	1,600,305	1,607,032	1,587,306	1,428,003	1,289,861	1,219,197
1965	1,206,172	1,229,442	1,651,739	1,689,963	1,689,993	1,690,000	1,713,000	1,742,309	1,885,372	1,885,703	1,790,014	1,700,028
1966	1,615,736	1,690,000	1,689,998	1,689,996	1,689,997	1,690,000	1,679,726	1,753,603	1,633,911	1,465,709	1,319,283	1,249,164
1967	1,173,879	1,207,410	1,361,102	1,460,117	1,557,950	1,690,000	1,690,000	1,880,000	2,030,000	2,030,000	1,790,257	1,700,021
1968	1,619,820	1,607,624	1,605,760	1,605,959	1,668,870	1,690,000	1,614,396	1,637,897	1,572,754	1,401,482	1,263,370	1,186,117
1969	1,149,974	1,179,282	1,268,765	1,689,993	1,689,990	1,690,000	1,690,000	1,930,000	2,030,000	1,977,463	1,790,116	1,700,033
1970	1,676,114	1,681,553	1,689,999	1,689,956	1,689,996	1,690,000	1,649,691	1,729,567	1,818,530	1,686,532	1,546,693	1,469,043
1971	1,409,639	1,452,554	1,539,602	1,605,510	1,674,702	1,690,000	1,647,943	1,697,455	1,862,918	1,760,768	1,624,350	1,555,368
1972	1,493,760	1,502,304	1,545,901	1,596,374	1,649,831	1,627,771	1,526,087	1,525,014	1,531,842	1,369,860	1,235,617	1,169,376
1973	1,131,276	1,144,274	1,226,345	1,355,146	1,534,763	1,690,000	1,717,600	1,979,879	2,030,000	1,863,873	1,716,891	1,634,144
1974	1,625,114	1,690,000	1,689,998	1,689,982	1,689,998	1,690,000	1,717,600	1,969,221	2,030,000	1,946,078	1,790,023	1,700,018
1975	1,671,620	1,661,732	1,660,185	1,665,519	1,689,996	1,690,000	1,717,600	1,817,373	2,030,000	1,950,017	1,790,077	1,700,024
1976	1,690,000	1,690,000	1,690,000	1,664,706	1,649,459	1,519,032	1,432,156	1,326,070	1,216,796	1,085,092	998,502	968,734
1977	932,654	925,543	947,434	935,499	920,302	807,861	717,614	671,985	616,188	544,088	486,063	467,590
1978	447,587	445,349	497,632	642,722	811,608	1,050,474	1,227,234	1,440,282	1,761,000	1,843,342	1,706,593	1,695,403
1979	1,609,844	1,612,921	1,611,978	1,689,999	1,689,995	1,690,000	1,690,000	1,717,600	1,829,909	1,675,929	1,529,138	1,453,040
1980	1,421,988	1,424,705	1,444,739	1,689,978	1,689,987	1,690,000	1,717,600	1,890,400	1,960,200	1,950,171	1,790,057	1,700,035
1981	1,617,942	1,596,204	1,588,406	1,595,955	1,619,607	1,690,000	1,712,431	1,704,973	1,654,052	1,488,840	1,357,486	1,289,752
1982	1,280,862	1,387,769	1,538,513	1,689,993	1,689,988	1,690,000	1,717,600	1,876,400	2,002,900	1,956,901	1,790,106	1,700,116
1983	1,690,000	1,690,000	1,689,995	1,689,966	1,689,989	1,294,700	1,264,000	1,270,800	1,851,400	2,030,000	1,871,320	1,700,118
1984	1,669,984	1,690,000	1,689,992	1,689,972	1,689,993	1,690,000	1,614,268	1,696,347	1,794,292	1,664,468	1,515,070	1,432,132
1985	1,417,113	1,452,224	1,496,603	1,487,191	1,522,246	1,588,373	1,576,808	1,632,030	1,567,944	1,403,408	1,269,095	1,205,885
1986	1,179,275	1,200,478	1,280,459	1,349,124	1,689,994	1,690,000	1,717,600	1,888,300	2,001,400	1,919,960	1,772,923	1,700,008
1987	1,641,224	1,619,851	1,601,301	1,570,179	1,566,244	1,592,873	1,533,150	1,433,214	1,340,031	1,205,391	1,094,728	1,041,920
1988	1,019,765	1,018,873	1,055,057	1,108,870	1,150,769	1,124,010	1,105,097	1,074,138	1,058,858	995,036	935,643	914,043
1989	887,742	895,237	927,918	951,577	981,136	1,102,792	1,092,141	1,210,143	1,264,389	1,128,410	1,016,022	1,011,279
1990	1,037,824	1,036,456	1,056,513	1,059,232	1,091,823	1,071,159	1,046,896	1,084,276	1,103,876	1,037,040	964,052	926,570
1991	915,957	910,658	930,811	923,793	902,491	977,110	978,586	1,057,934	1,177,077	1,101,096	1,030,307	998,647
1992	998,752	996,218	1,018,377	1,022,977	1,086,311	1,145,594	1,181,922	1,210,224	1,133,188	1,040,230	926,131	862,351
1993	826,188	819,772	853,539	1,058,754	1,208,553	1,454,021	1,556,674	1,878,212	2,030,000	1,950,136	1,790,048	1,700,022
1994	1,627,183	1,612,977	1,599,160	1,589,203	1,599,265	1,567,690	1,531,912	1,544,575	1,501,844	1,379,308	1,279,438	1,233,861
1995	1,194,744	1,214,540	1,259,323	1,516,844	1,621,716	1,690,000	1,717,600	1,629,700	1,982,800	2,030,000	1,816,185	1,700,062
1996	1,608,082	1,583,096	1,604,413	1,672,576	1,689,990	1,690,000	1,717,600	2,002,400	2,030,000	1,932,566	1,784,558	1,700,014
1997	1,667,201	1,690,000	1,689,993	1,689,874	1,689,994	1,690,000	1,610,765	1,854,718	1,968,374	1,829,837	1,687,672	1,633,886
1998	1,552,574	1,546,178	1,547,584	1,689,997	1,689,989	1,690,000	1,717,600	1,714,000	1,987,500	2,030,000	1,790,242	1,700,022
1999	1,662,014	1,675,303	1,690,000	1,689,986	1,689,990	1,690,000	1,717,600	1,793,571	2,015,623	1,887,792	1,745,950	1,671,908
2000	1,585,584	1,573,921	1,558,276	1,634,200	1,689,993	1,690,000	1,717,600	1,992,227	2,030,000	1,864,407	1,719,364	1,644,682
2001	1,634,728	1,622,232	1,613,706	1,605,691	1,629,054	1,690,000	1,716,911	1,843,113	1,712,149	1,547,470	1,408,517	1,342,971
2002	1,281,127	1,292,736	1,366,211	1,421,647	1,473,814	1,524,332	1,509,107	1,659,494	1,684,266	1,520,880	1,382,342	1,309,452
Avg (21-02)	1,329,553	1,339,687	1,382,998	1,428,244	1,487,547	1,512,057	1,516,647	1,595,597	1,679,130	1,579,451	1,442,804	1,374,329

APPENDIX O1

Table 2.6-3

Difference in Don Pedro Reservoir Storage (Acre-feet) WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	0	0	0	0	0	0	0	-3,188	-10,433	-12,571	-12,516	-12,475
1922	-12,449	-12,443	-12,443	-12,446	-7,314	0	0	-11,174	0	-5	0	0
1923	0	0	0	0	0	0	0	-19,014	-21,065	-23,157	-23,056	-22,982
1924	-22,935	-22,924	-22,924	-22,931	-22,933	-22,924	-24,684	-29,519	-29,489	-29,439	-29,370	-29,309
1925	-29,247	-29,231	-29,234	-29,249	-29,253	-29,251	-32,912	-46,419	-48,378	-50,350	-50,122	-49,951
1926	-49,846	-49,818	-50,315	-50,330	-50,531	-49,936	-60,110	-70,803	-94,077	-93,648	-93,216	-92,904
1927	-92,711	-92,659	-87,618	-87,643	-87,650	-87,617	-87,534	-114,797	-93,866	-95,648	-86,302	-72,891
1928	-72,744	-52,440	-17,973	-14,850	1	0	-11,849	-16,583	-18,642	-18,562	-18,479	-18,418
1929	-18,380	-18,369	-18,370	-18,376	-18,377	-18,370	-18,352	-33,941	-48,965	-48,740	-48,519	-48,356
1930	-48,255	-48,228	-48,230	-48,244	-48,248	-48,230	-48,183	-48,546	-50,493	-50,264	-50,033	-49,858
1931	-49,748	-49,719	-49,721	-49,736	-49,739	-49,720	-49,669	-49,534	-49,357	-49,120	-48,891	-48,719
1932	-48,606	-48,575	-77,837	-89,136	-104,447	-123,055	-130,097	-137,473	-145,745	-147,267	-146,583	-146,090
1933	-145,787	-145,705	-145,711	-145,755	-145,766	-145,711	-150,023	-154,107	-167,558	-168,970	-168,157	-167,562
1934	-167,197	-167,099	-170,312	-168,869	-169,775	-172,288	-175,433	-185,869	-186,997	-186,104	-185,207	-184,556
1935	-184,158	-184,050	-184,058	-201,819	-218,063	-212,422	-222,877	-230,972	-248,071	-249,176	-248,066	-247,237
1936	-246,724	-246,586	-246,703	-246,692	9	0	0	-10,344	-12,425	-14,554	-14,491	-14,445
1937	-14,415	-14,407	-14,417	-14,422	1	0	0	-9,338	-19,419	-21,520	-21,425	-21,356
1938	-21,313	-21,300	0	0	0	0	0	0	0	-2,183	-5	0
1939	0	0	0	0	0	0	-15,779	-14,122	-16,188	-16,114	-16,041	-15,988
1940	-15,954	-15,945	-23,947	-22,233	-28,098	0	0	8,878	3,978	3,960	3,943	3,931
1941	3,923	3,920	3,310	-1	0	0	0	-1,370	0	-4	0	0
1942	0	0	0	1	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	-2,185	0	-2,183	-4	0
1944	0	0	0	0	0	0	0	-33,804	-35,808	-37,838	-37,667	-37,541
1945	-37,462	-37,441	-37,442	-37,453	1	0	0	-433	9,714	7,488	7,455	7,432
1946	7,417	106	0	0	0	0	0	-10,228	-12,309	-12,256	-12,201	-12,159
1947	-12,134	-12,126	-12,127	-12,131	-12,131	-12,127	-12,114	-38,678	-40,656	-40,473	-40,287	-40,148
1948	-40,063	-40,039	-40,041	-40,053	-40,055	-44,367	-48,897	-53,095	-66,246	-68,046	-67,664	-67,392
1949	-67,232	-67,190	-67,191	-67,203	-67,207	-71,084	-75,364	-78,800	-88,087	-87,683	-87,286	-86,991
1950	-86,808	-86,758	-90,313	-87,678	-102,553	-106,396	-106,462	-107,067	-102,069	-102,984	-102,516	-102,171
1951	-101,957	-116,550	2	0	0	0	-3,151	-4,068	-14,932	-17,047	-16,969	-16,911
1952	-16,876	-16,868	-16,868	-21,355	0	0	0	0	0	-2,184	-5	0
1953	0	0	0	0	0	0	-20,783	-24,843	-26,877	-28,945	-28,819	-28,724
1954	-28,665	-28,648	-28,650	-28,658	-28,660	-28,650	-28,623	-54,058	-55,995	-55,755	-55,504	-55,316
1955	-55,200	-55,169	-55,172	-55,187	-55,192	-55,171	-56,972	-60,371	-69,233	-68,919	-68,597	-68,369
1956	-68,227	-68,189	-38,525	6	1	0	0	-7,229	0	0	0	0
1957	0	0	0	0	0	0	0	-34,827	-36,828	-38,853	-38,680	-38,551
1958	-38,471	-38,449	-38,450	-38,462	-38,465	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	-5,335	-20,965	-20,895	-20,799	-20,704	-20,635
1960	-20,592	-20,580	-20,582	-20,587	-24,035	-26,731	-27,380	-25,335	-23,087	-22,983	-22,873	-22,791
1961	-22,742	-22,728	-31,324	-31,333	-31,336	-31,323	-31,291	-31,207	-31,095	-30,947	-30,795	-30,692
1962	-30,627	-30,610	-30,610	-30,620	-30,621	-30,610	-30,579	-129,058	-148,817	-150,321	-149,603	-149,073
1963	-148,750	-148,661	-140,742	-127,465	-148,735	-148,680	-148,537	-165,164	-166,447	-167,912	-167,172	-166,619
1964	-166,277	-166,186	-166,193	-166,240	-154,478	-154,422	-156,469	-168,455	-190,238	-189,371	-188,499	-187,867
1965	-187,478	-187,372	-179,977	25	0	0	0	1,543	15,495	13,244	24	0
1966	0	0	0	0	1	0	-8,994	-11,156	-13,235	-13,175	-13,114	-13,069
1967	-13,042	-13,035	-13,036	-13,039	-13,040	0	0	0	0	0	-5	0
1968	0	0	0	0	0	0	0	-23,586	-25,621	-25,505	-25,386	-25,302
1969	-25,249	-25,235	-25,236	3	0	0	0	0	0	-2,184	-5	0
1970	0	0	0	-4	0	0	0	-11,491	-13,568	-15,693	-15,623	-15,570
1971	-15,537	-15,529	-15,529	-15,534	-15,535	0	0	-20,599	-22,646	-24,730	-24,624	-24,542
1972	-24,492	-24,478	-24,480	-24,487	-24,489	-24,479	-24,457	-49,064	-51,012	-50,779	-50,543	-50,374
1973	-50,270	-50,241	-50,243	-50,258	-50,261	-43,041	-42,381	-58,368	0	0	0	0
1974	0	0	0	1	0	0	0	-5,036	0	-2,184	-5	0
1975	0	0	0	0	0	0	0	7,481	0	-4	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	8,218	3,004	-3	-3	-4	-4	-4	-4	-4	-4
1978	-4	-4	-4	-4	-4	-4	-4	-84,008	0	-2,183	-2,174	-2,477
1979	-3,566	-3,564	-3,565	0	0	0	0	0	-2,114	-2,105	-2,096	-2,088
1980	-2,085	-2,083	-2,083	-1	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	-2,116	-10,892	-27,623	-27,500	-27,374	-27,279
1982	-27,222	-27,206	-27,207	4	0	0	0	0	0	-2,184	-9	0
1983	0	0	0	0	0	0	0	0	0	0	-2,183	0
1984	-3,065	0	0	0	0	0	-196	-14,019	-16,087	-18,202	-18,121	-18,061
1985	-18,022	-18,013	-18,013	-18,018	-18,020	-18,013	-17,996	-15,311	-17,374	-17,296	-17,214	-17,157
1986	-17,122	-17,112	-25,509	-29,178	0	0	0	0	0	-2,184	-2,174	-4
1987	-3	-3	-3	-4	-3	-3	-3	-3	-9,443	-9,400	-9,357	-9,326
1988	-9,305	-9,300	-9,301	-9,303	4,356	4,354	-1,227	-10,934	-46,885	-51,655	-51,407	-51,222
1989	-51,110	-51,080	-51,082	-51,098	-51,102	-51,083	-62,482	-99,279	-103,811	-103,341	-102,860	-102,498
1990	-102,277	-102,218	-102,223	-102,253	-102,261	-102,223	-102,121	-119,107	-112,974	-112,452	-111,911	-111,512
1991	-116,465	-116,396	-116,402	-120,253	-120,264	-120,217	-120,110	-140,137	-157,006	-154,266	-155,596	-155,057
1992	-154,722	-154,632	-154,639	-154,686	-154,699	-154,641	-137,570	-166,565	-166,028	-165,300	-164,542	-163,984
1993	-163,639	-163,539	-171,483	-180,798	-180,813	-186,849	-191,394	-193,764	-88,210	-26,861	-4,904	-8
1994	-7	-8	-8	-7	-7	-8	-8	-20,888	-22,931	-22,826	-22,720	-22,644
1995	-22,598	-22,584	-22,586	-22,592	-22,594	0	0	0	0	0	-2,184	-3
1996	-3	-3	-3	-3	0	0	0	0	0	-2,183	-2,174	-4
1997	-3	0	0	1	0	0	-12,576	-14,731	-16,798	-18,908	-18,826	-18,764
1998	-18,726	-18,715	-18,716	3	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	-12,321	-17,171	-19,281	-19,198	-19,136
2000	-19,098	-19,087	-19,088	-19,093	1	0	0	-10,376	0	0	0	0
2001	0	0	0	1	0	0	0	-41,731	-43,496	-43,303	-43,106	-42,959
2002	-42,867	-42,843	-42,845	-42,857	-42,860	-42,845	-42,804	-75,937	-77,796	-77,450	-77,093	-76,828
Avg (21-02)	-39,746	-39,707	-37,753	-34,605	-30,552	-29,368	-31,048	-41,810	-41,627	-41,602	-41,115	-40,653

APPENDIX O1

Table 2.6-4

Difference in Don Pedro Reservoir Inflow (Acre-feet) WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	-13,402	-3,253	-3,191	-7,268	-2,188	0	0	-29,302
1922	0	0	0	0	0	0	-7,366	-11,189	-4,880	-2,188	0	0	-25,623
1923	0	0	0	0	0	0	-2,117	-19,037	-2,117	-2,188	0	0	-25,459
1924	0	0	0	0	0	0	-1,702	-4,834	0	0	0	0	-6,536
1925	0	0	0	0	0	0	-3,692	-13,608	-2,118	-2,188	0	0	-21,606
1926	0	0	-496	0	-197	576	-10,227	-10,859	-23,557	0	0	0	-44,760
1927	0	0	5,045	0	0	0	0	-27,513	-6,321	-2,188	0	0	-30,977
1928	0	0	0	0	0	0	-20,759	-4,770	-2,118	0	0	0	-27,647
1929	0	0	0	0	0	0	0	-15,658	-15,168	0	0	0	-30,826
1930	0	0	0	0	0	0	0	-487	-2,118	0	0	0	-2,605
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	-29,259	-11,274	-15,304	-18,651	-7,164	-7,727	-8,766	-2,188	0	0	-100,333
1933	0	0	0	0	0	0	-4,456	-4,485	-14,010	-2,188	0	0	-25,139
1934	0	0	-3,206	1,494	-892	-2,580	-3,320	-10,927	-1,802	0	0	0	-21,233
1935	0	0	0	-17,702	-16,228	5,562	-10,668	-8,677	-17,892	-2,188	0	0	-67,793
1936	0	0	-106	82	-329	-16,899	-3,635	-10,357	-2,118	-2,188	0	0	-35,550
1937	0	0	-9	-1	-1,778	-3,195	-8,513	-9,349	-10,129	-2,188	0	0	-35,162
1938	0	0	1,711	0	0	-38	-7,142	-17,015	-4,880	-2,188	0	0	-29,552
1939	0	0	0	0	0	0	-15,786	1,619	-2,118	0	0	0	-16,285
1940	0	0	-8,001	1,721	-5,863	-10,103	-5,679	8,890	-4,880	0	0	0	-23,915
1941	0	0	-610	0	-445	-421	-519	-1,372	-2,168	-2,188	0	0	-7,723
1942	0	0	0	-5,541	0	-2,664	-5,524	-2,854	-2,762	-2,188	0	0	-21,533
1943	0	0	0	0	0	-2,001	-6,721	-2,188	-2,118	-2,188	0	0	-15,216
1944	0	0	0	0	0	0	0	-33,846	-2,118	-2,188	0	0	-38,152
1945	0	0	0	0	0	-15,317	-203	-434	10,161	-2,188	0	0	-7,981
1946	0	0	0	0	0	-12,207	-3,612	-10,240	-2,118	0	0	0	-28,177
1947	0	0	0	0	0	0	0	-26,630	-2,118	0	0	0	-28,748
1948	0	0	0	0	0	-4,327	-4,613	-4,372	-13,430	-2,188	0	0	-28,930
1949	0	0	0	6	0	-3,923	-4,351	-3,634	-9,575	0	0	0	-21,477
1950	0	0	-3,551	2,662	-14,868	-3,881	-171	-886	4,635	-1,388	0	0	-17,448
1951	0	-14,654	0	0	0	0	-3,152	-925	-10,896	-2,189	0	0	-31,816
1952	0	0	0	-4,482	0	0	0	-15,879	-2,117	-2,188	0	0	-24,666
1953	0	0	0	0	0	0	-20,792	-4,118	-2,118	-2,188	0	0	-29,216
1954	0	0	0	0	0	0	0	-25,536	-2,118	0	0	0	-27,654
1955	0	0	0	0	0	0	-1,855	-3,549	-9,082	0	0	0	-14,486
1956	0	0	-7,403	0	0	-3,555	-3,068	-7,238	-2,117	-2,188	0	0	-25,569
1957	0	0	0	0	0	0	0	-34,871	-2,117	-2,188	0	0	-39,176
1958	0	0	0	0	0	0	0	-11,490	-1,013	-2,188	0	0	-14,691
1959	0	0	0	0	0	0	-5,337	-15,664	0	0	0	0	-21,001
1960	0	0	0	0	-3,446	-2,707	-674	1,977	2,165	0	0	0	-2,685
1961	0	0	-8,594	0	0	0	0	0	0	0	0	0	-8,594
1962	0	0	0	0	0	0	0	-98,696	-20,248	-2,188	0	0	-121,132
1963	0	0	7,926	13,317	-21,259	0	0	-17,039	-1,841	-2,188	0	0	-21,084
1964	0	0	0	0	0	0	-2,195	-12,402	-22,395	0	0	0	-36,992
1965	0	0	7,403	-5,708	-5,156	-10,711	-9,769	1,545	13,979	-2,188	-2,188	0	-12,793
1966	0	0	-1,152	0	-17,169	0	-8,997	-2,188	-2,118	0	0	0	-31,624
1967	0	0	0	0	0	-5,460	0	-12,427	0	-2,188	-2,188	0	-22,263
1968	0	0	0	0	0	0	0	-23,616	-2,117	0	0	0	-25,733
1969	0	0	0	0	-2,451	-10,837	-7,642	-2,188	-2,118	-2,188	0	0	-27,424
1970	0	0	0	26,592	-5,953	-21,074	0	-11,504	-2,118	-2,188	0	0	-16,245
1971	0	0	0	0	0	0	0	-20,625	-2,117	-2,188	0	0	-24,930
1972	0	0	0	0	0	0	0	-24,703	-2,117	0	0	0	-26,820
1973	0	0	0	0	0	0	0	-16,112	-2,117	0	0	0	-18,229
1974	0	0	0	-8,391	0	-10,465	-4,603	-5,043	-4,879	-2,188	0	0	-35,569
1975	0	0	0	0	0	0	-8,286	7,490	-947	-2,188	0	0	-3,931
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	8,218	-5,216	-3,007	-1	-1	0	0	0	0	0	-7
1978	0	0	0	0	0	0	0	-84,115	-5,616	-2,188	0	-310	-92,229
1979	-1,095	0	0	0	0	-16,218	-2,117	-2,188	-2,118	0	0	0	-23,736
1980	0	0	0	9,723	0	-7,610	-4,880	-2,188	-2,118	-2,188	0	0	-9,261
1981	0	0	0	0	0	0	-2,117	-8,792	-16,794	0	0	0	-27,703
1982	0	0	0	0	-11,554	0	0	-1,902	-1,841	-2,188	-2,188	-2,117	-21,790
1983	-1,047	2,762	-952	0	0	0	0	-9,542	-4,603	-2,188	-2,188	0	-17,758
1984	-3,068	4,603	0	0	0	3,935	-197	-13,841	-2,118	-2,188	0	0	-12,874
1985	0	0	0	0	0	0	0	2,643	-2,117	0	0	0	526
1986	0	0	-8,396	-3,661	12,066	-20,128	-11,300	-5,042	-4,880	-2,188	0	0	-43,529
1987	0	0	0	0	0	0	0	0	-9,457	0	0	0	-9,457
1988	0	0	0	0	13,660	0	-5,580	-9,724	-36,050	-5,001	0	0	-42,695
1989	0	0	0	0	0	0	-11,454	-37,007	-4,880	0	0	0	-53,341
1990	0	0	0	0	0	0	0	-17,279	5,728	0	0	0	-11,551
1991	-5,202	0	0	-3,816	-1	0	0	-20,361	-17,370	2,048	-2,045	0	-46,747
1992	0	0	0	0	0	0	16,950	-29,350	0	0	0	0	-12,400
1993	0	5	-7,936	-9,261	0	-6,104	-4,729	-2,854	-25,296	-2,188	0	0	-58,363
1994	0	0	0	0	0	0	0	-20,907	-2,118	0	0	0	-23,025
1995	0	0	0	0	0	13,327	-9,206	-1,903	-1,841	-2,188	-2,188	0	-3,999
1996	0	0	0	0	-1,690	0	-4,879	-5,042	-4,880	-2,188	0	0	-18,679
1997	0	0	0	-6,207	0	0	-12,582	-2,188	-2,118	-2,188	0	0	-25,283
1998	0	0	0	0	0	-3,118	-11,049	-3,900	-3,775	-2,188	0	0	-24,030
1999	0	0	0	0	0	-8,562	-10,982	-12,335	-4,900	-2,188	0	0	-38,967
2000	0	0	0	0	0	0	0	-10,389	-2,118	0	0	0	-12,507
2001	0	0	0	0	0	0	0	-41,781	-1,904	0	0	0	-43,685
2002	0	0	0	0	0	0	0	-33,284	-2,118	0	0	0	-35,402
Avg (21-02)	-127	-89	-602	-313	-1,242	-2,595	-3,557	-11,996	-4,753	-1,227	-158	-30	-26,689

Figure 2.6-2

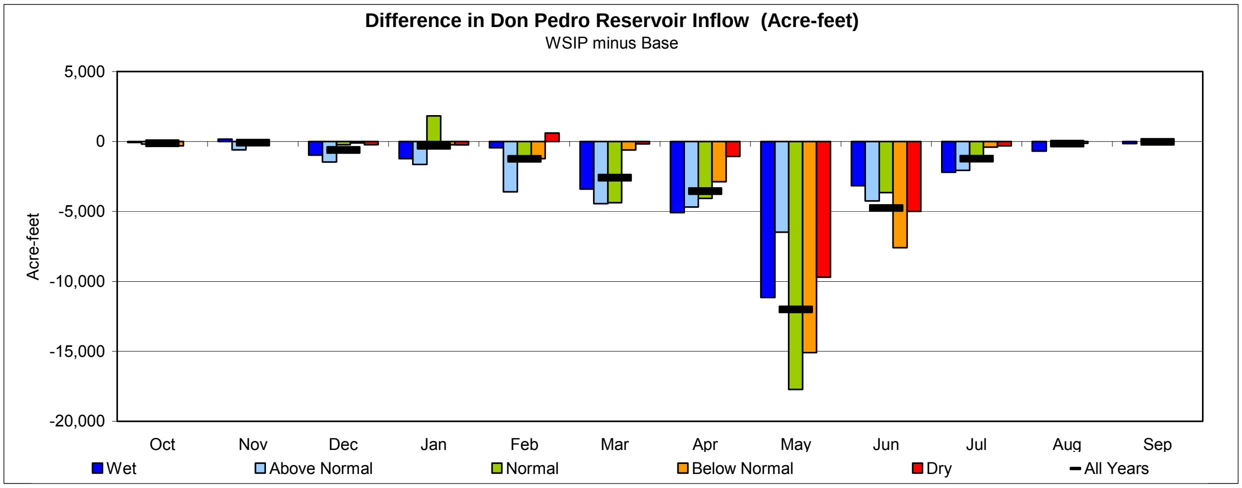


Figure 2.6-1 and Table 2.6-3 illustrate that, during drought sequences, the reduction in inflow to Don Pedro Reservoir can accumulate from year to year. Compared to the base setting, the WSIP would result in lower Don Pedro Reservoir storage during some part of most years, and more predominantly during multi-year drought periods. Figure 2.6-3 illustrates the Don Pedro Reservoir storage for the WSIP setting, averaged by year type. Figure 2.6-4 illustrates the difference in reservoir storage, averaged by year type, in comparing the WSIP and base-Calaveras constrained settings. Also shown is the average difference in storage for the two settings during the 82-year simulation.

Table 2.6-3 illustrates that, in some years (approximately one-third of the years, i.e., the wettest of years), the storage in Don Pedro Reservoir would not be substantially different, because large inflows to the reservoir during these years would require the management of storage (release of flow above minimum stream requirements) to satisfy flood control requirements. During the other years, the reduction in storage could range from a single year's additional diversions by the SFPUC to over 245,000 acre-feet (1936) from the accumulation of several years of additional diversions by the SFPUC. For example, the greatest draw from reservoir storage occurs during the drought of 1976-1977 (during which the WSIP would not cause an incremental additional draw from storage), and the greatest difference in reservoir draw between the base and the WSIP settings occurs during the years of the 1928-1935 drought.

Figure 2.6-5 illustrates the average monthly storage in Don Pedro Reservoir for the 82-year simulation, and the range in storage for each month for the WSIP and base settings. The difference in storage in Don Pedro Reservoir attributed to the upstream effects of the WSIP would affect releases from La Grange Dam to the stream. A difference in the amount of available reservoir space in the winter and spring due to the WSIP would lead to a difference in the ability to regulate inflow, thus potentially changing the amount of water released to the stream that is above minimum release requirements. During periods when inflow differs and Don Pedro Reservoir is at maximum storage capacity within the flood control storage limitation, a change in inflow would directly manifest as a change in releases from La Grange Dam (a change in either more or less flow). Figure 2.6-1 illustrates the stream releases from La Grange Dam for the WSIP and base settings.

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Figure 2.6-3

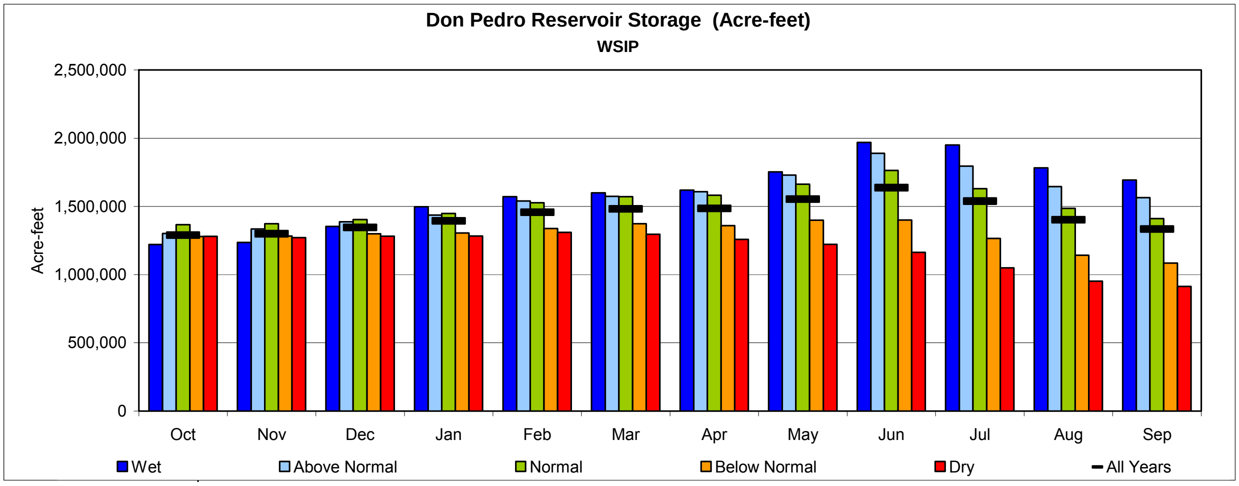


Figure 2.6-4

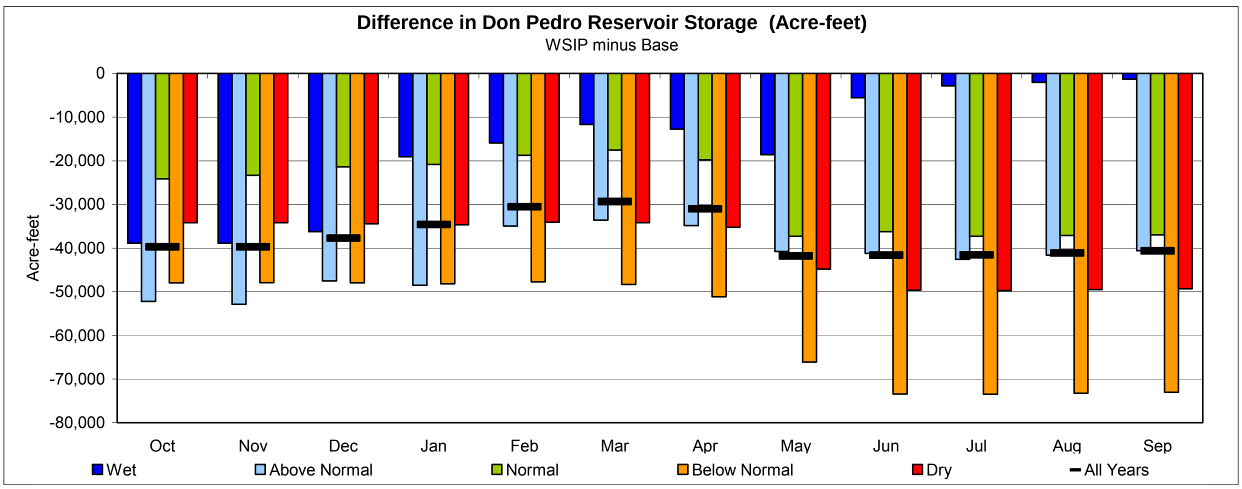
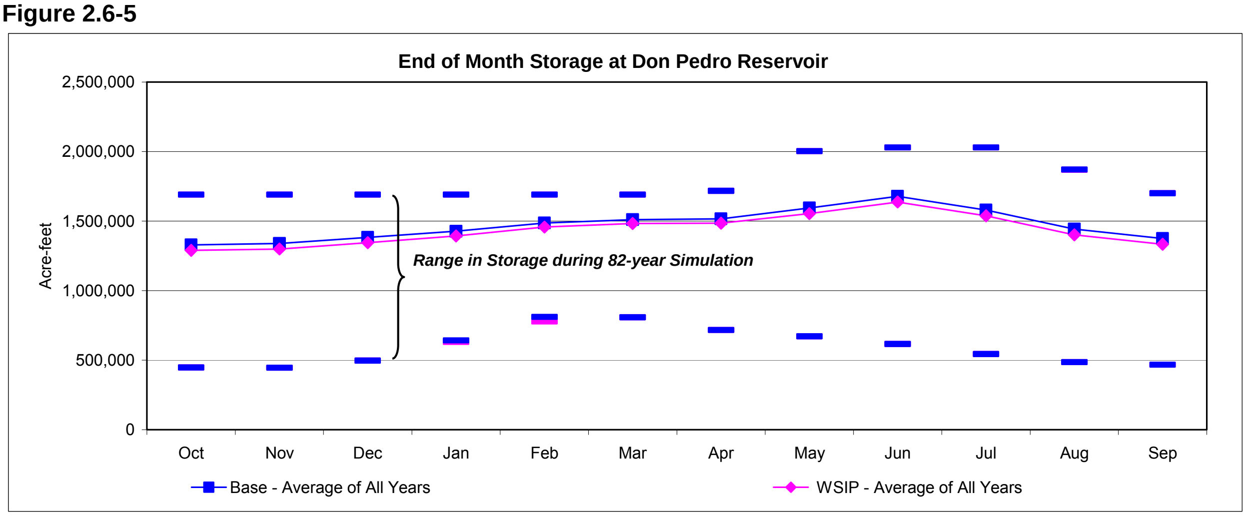


Figure 2.6-5



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Supplementing Figure 2.6-1 are Table 2.6-5 and Table 2.6-6, which illustrate the releases to the Tuolumne River from La Grange Dam for the WSIP and base settings. Table 2.6-7 shows the difference in stream releases between the WSIP and base settings. Consistent with the periods showing changes in Don Pedro Reservoir storage, stream releases following the drawdown periods would indicate a reduction. The additional depletion of reservoir storage would manifest as a reduction in subsequent releases below La Grange Dam to replenish reservoir storage. The same information shown in Table 2.6-7 is illustrated in Table 2.6-8, arranged in descending order based on the San Joaquin River Index. The differences in releases to the Tuolumne River from La Grange Dam would occur only when there would otherwise be releases in excess of minimum Federal Energy Regulatory Commission (FERC) flow requirements, typically during wetter years. Occasional minor reductions in releases would also occur during winter, when the direct diversion of additional water by the SFPUC would lead to a commensurate reduction in inflow to Don Pedro Reservoir. If Don Pedro Reservoir is passing inflow for flood control, a similar commensurate reduction in releases would occur. Table 2.6-7 illustrates the decrease in monthly flow below La Grange Dam that would occur, up to approximately 247,000 acre-feet in one month (February 1936). This reduction is associated with the additional replenishment of Don Pedro Reservoir caused by the additional diversions of the SFPUC during the drought of 1987-1992. The effects of the SFPUC diversions accumulate in Don Pedro Reservoir throughout the drought period. Using the assumption that a change in release volume equates to a delay or acceleration of releasing 6,000 acre-feet per day means that the difference in stream releases from La Grange Dam between the WSIP and the base settings would be a delay in releases above minimum FERC flow requirements for a period longer than a month. Normally, the delay in release would not affect the peak stream release rate during a year. However, infrequently (such as in 1993, which followed a lengthy six-year drought), the WSIP's effect on stream releases could lead to an elimination of all flow in excess of FERC requirements in the year. Such a reduction in flow would not be common and would occur only because of multi-year droughts.

Comparing the WSIP and base settings, Table 2.6-9 illustrates the releases to the Tuolumne River below La Grange Dam; their differences are provided in terms of monthly volumetric flow averaged within year types.

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Table 2.6-5

Total La Grange Release to River (Acre-feet) WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	12,744	10,711	11,068	11,068	33,964	231,996	111,640	64,123	14,876	15,372	15,372	14,876	547,810
1922	24,397	17,852	18,447	18,447	16,661	169,885	167,789	61,936	470,876	59,363	27,204	24,862	1,077,719
1923	24,397	17,852	52,816	101,025	90,321	34,926	156,958	61,936	14,876	15,372	15,372	14,876	600,727
1924	24,397	17,852	18,447	18,447	17,256	18,447	14,650	14,589	2,975	3,074	3,074	2,975	156,183
1925	7,736	8,926	9,223	9,223	8,331	9,223	73,158	69,584	4,463	4,612	4,612	4,463	213,554
1926	13,240	10,413	10,760	10,760	9,719	10,760	31,566	30,449	4,463	4,612	4,612	4,463	145,817
1927	9,223	8,926	9,223	9,223	8,331	9,223	64,241	61,936	14,876	15,372	15,372	14,876	240,822
1928	24,397	17,852	18,447	18,447	53,135	208,209	37,200	35,902	4,463	4,612	4,612	4,463	431,739
1929	12,744	10,711	11,068	11,068	9,997	11,068	26,770	25,952	2,975	3,074	3,074	2,975	131,476
1930	9,223	8,926	9,223	9,223	8,331	9,223	27,049	26,214	2,975	3,074	3,074	2,975	119,510
1931	9,223	8,926	9,223	9,223	8,331	9,223	14,650	14,589	2,975	3,074	3,074	2,975	95,486
1932	7,736	8,926	9,223	9,223	8,628	9,223	64,241	61,936	14,876	15,372	15,372	14,876	239,632
1933	24,397	17,852	18,447	18,447	16,661	18,447	35,753	34,374	4,463	4,612	4,612	4,463	202,528
1934	9,223	8,926	9,223	9,223	8,331	9,223	14,650	14,589	2,975	3,074	3,074	2,975	95,486
1935	7,736	8,926	9,223	9,223	8,331	9,223	64,241	61,936	14,876	15,372	15,372	14,876	239,335
1936	24,397	17,852	18,447	18,447	54,167	204,086	168,811	61,936	14,876	15,372	15,372	14,876	628,639
1937	24,397	17,852	18,447	18,447	194,659	260,123	177,081	61,936	14,876	15,372	15,372	14,876	833,438
1938	24,397	17,852	88,717	79,596	381,104	454,579	291,007	288,864	227,401	156,701	48,636	34,811	2,093,665
1939	24,397	17,852	18,447	18,447	45,240	66,009	28,525	27,598	4,463	4,612	4,612	4,463	264,665
1940	9,223	8,926	9,223	9,223	8,628	196,482	163,672	61,936	14,876	15,372	15,372	14,876	527,809
1941	24,397	17,852	18,447	59,195	262,128	284,760	249,836	61,936	49,928	88,796	26,488	21,347	1,165,110
1942	24,397	17,852	41,845	150,525	153,324	148,197	218,453	228,994	91,485	115,177	26,854	17,017	1,234,120
1943	24,397	17,852	32,826	197,464	149,252	336,578	194,801	61,936	72,671	15,372	17,014	17,597	1,137,760
1944	24,397	17,852	18,447	18,447	17,256	55,093	47,894	45,898	4,463	4,612	4,612	4,463	263,434
1945	13,240	10,413	10,760	10,760	86,052	215,383	119,005	61,936	14,876	15,372	15,372	14,876	588,045
1946	24,397	25,160	229,316	136,983	150,231	166,940	68,500	61,936	14,876	15,372	15,372	14,876	923,959
1947	24,397	17,852	18,447	18,447	16,661	18,447	28,054	27,156	4,463	4,612	4,612	4,463	187,611
1948	9,223	8,926	9,223	9,223	8,628	9,223	39,947	38,477	4,463	4,612	4,612	4,463	151,020
1949	12,744	10,711	11,068	11,068	9,997	11,068	33,037	31,999	4,463	4,612	4,612	4,463	149,842
1950	12,744	10,711	11,068	11,068	9,997	11,068	61,680	58,823	4,463	4,612	4,612	4,463	205,309
1951	13,240	10,413	227,649	225,258	195,815	153,328	104,899	99,341	4,463	4,612	4,612	4,463	1,048,093
1952	13,240	10,413	10,760	10,760	56,975	213,745	258,495	264,611	230,309	162,673	38,667	32,093	1,302,741
1953	24,397	17,852	18,447	27,845	60,046	18,447	87,632	83,153	4,463	4,612	4,612	4,463	355,969
1954	13,240	10,413	10,760	10,760	9,719	10,760	41,422	39,831	4,463	4,612	4,612	4,463	165,055
1955	13,240	10,413	10,760	10,760	9,719	10,760	31,555	30,438	4,463	4,612	4,612	4,463	145,795
1956	9,223	8,926	9,223	397,642	218,902	177,380	103,683	61,936	153,608	108,969	29,023	30,608	1,309,123
1957	24,397	17,852	18,447	18,447	16,661	25,078	85,025	80,709	4,463	4,612	4,612	4,463	304,766
1958	13,240	10,413	10,760	10,760	9,719	173,384	311,309	268,728	276,764	96,627	36,329	32,935	1,250,968
1959	24,397	17,852	18,447	18,447	32,284	59,822	28,824	27,878	4,463	4,612	4,612	4,463	246,101
1960	9,223	8,926	9,223	9,223	8,628	9,223	24,895	24,194	2,975	3,074	3,074	2,975	115,633
1961	7,736	8,926	9,223	9,223	8,331	9,223	14,650	14,589	2,975	3,074	3,074	2,975	93,999
1962	7,736	8,926	9,223	9,223	8,331	9,223	94,959	90,022	4,463	4,612	4,612	4,463	255,793
1963	13,240	10,413	10,760	10,760	9,719	10,760	64,241	61,936	14,876	15,372	15,372	14,876	252,325
1964	24,397	17,852	18,447	18,447	17,256	18,447	28,168	27,263	4,463	4,612	4,612	4,463	188,427
1965	9,223	8,926	9,223	94,896	193,710	157,615	159,589	61,936	14,876	15,372	32,886	32,779	791,031
1966	24,397	22,517	119,607	51,266	82,677	61,610	32,240	31,252	4,463	4,612	4,612	4,463	443,716
1967	12,744	10,711	11,068	11,068	9,997	84,982	252,040	220,298	388,802	257,232	131,931	28,007	1,418,880
1968	24,397	17,852	18,447	18,447	17,256	32,584	28,988	28,031	4,463	4,612	4,612	4,463	204,152
1969	9,223	8,926	9,223	32,847	276,920	244,541	322,211	447,942	425,936	156,634	66,306	35,885	2,036,594
1970	24,397	17,852	73,665	370,017	136,129	162,608	64,241	61,936	14,876	15,372	15,372	14,876	971,341
1971	24,397	17,852	18,447	18,447	16,661	70,249	66,522	63,363	4,463	4,612	4,612	4,463	314,088
1972	13,240	10,413	10,760	10,760	10,066	10,760	30,579	29,524	2,975	3,074	3,074	2,975	138,200
1973	9,223	8,926	9,223	9,223	8,331	9,223	64,241	61,936	35,698	15,372	15,372	14,876	261,644
1974	24,397	42,215	100,199	144,039	84,226	200,904	125,080	61,936	182,580	15,372	23,592	26,455	1,030,995
1975	24,397	17,852	18,447	18,447	112,415	201,425	100,944	61,936	174,642	21,358	50,309	29,597	831,769
1976	35,185	23,322	33,098	18,447	17,256	18,447	20,660	20,224	2,975	3,074	3,074	2,975	198,737
1977	7,736	8,926	9,223	9,223	8,331	9,223	14,650	14,589	2,975	3,074	3,074	2,975	93,999
1978	7,736	8,926	9,223	9,223	8,331	9,223	64,241	61,936	71,448	15,372	15,372	14,876	295,907
1979	24,397	17,852	18,447	25,892	150,953	195,605	90,635	338,861	14,876	15,372	15,372	14,876	923,138
1980	24,397	17,852	18,447	183,143	376,597	204,132	110,674	105,463	278,671	152,585	41,442	36,580	1,549,983
1981	24,397	17,852	18,447	18,447	16,661	22,926	29,256	28,454	4,463	4,612	4,612	4,463	194,590
1982	12,744	10,711	11,068	32,535	338,147	314,765	511,142	350,499	260,216	155,711	59,424	132,689	2,189,651
1983	155,278	142,160	252,175	268,145	324,750	929,999	277,685	441,769	223,430	236,135	186,588	171,850	3,609,964
1984	24,397	262,407	413,016	228,905	204,697	159,934	64,241	61,936	14,876	15,372	15,372	14,876	1,480,029
1985	24,397	17,852	18,447	18,447	16,661	18,447	34,634	33,325	4,463	4,612	4,612	4,463	200,360
1986	9,223	8,926	9,223	9,223	156,378	441,405	148,505	177,029	197,577	15,372	15,372	17,744	1,205,977
1987	24,397	17,852	18,447	18,447	16,661	18,447	25,003	24,296	2,975	3,074	3,074	2,975	175,648
1988	7,736	8,926	9,223	9,223	8,628	9,223	19,297	18,947	2,975	3,074	3,074	2,975	103,301
1989	7,736	8,926	9,223	9,223	8,331	9,223	26,519	25,717	2,975	3,074	3,074	2,975	116,996
1990	7,736	8,926	9,223	9,223	8,331	9,223	19,866	19,480	2,975	3,074	3,074	2,975	104,106
1991	7,736	8,926	9,223	9,223	8,331	9,223	26,397	25,603	2,975	3,074	3,074	2,975	116,760
1992	7,736	8,926	9,223	9,223	8,628	9,223	20,501	20,075	2,975	3,074	3,074	2,975	105,633
1993	7,736	8,926	9,223	9,223	8,331	9,223	64,241	61,936	14,876	15,372	15,372	23,914	248,373
1994	24,397	17,852	18,447	18,447	16,661	18,447	26,774	25,956	2,975	3,074	3,074	2,975	179,079
1995	9,223	8,926	9,223	9,223	8,331	444,650	252,480	587,468	266,389	378,373	180,518	51,840	2,206,644
1996	24,397	17,852	18,447	18,447	282,350	273,866	138,689	137,214	166,467	15,372	15,372	21,277	1,129,750
1997	24,397	42,957	363,466	949,830	195,855	141,961	64,241	61,936	14,876	15,372	15,372	14,876	1,905,139
1998	24,397	17,852	18,447	18,548	334,719	269,674	194,691	338,154	410,419	282,802	127,440	28,820	2,065,963
1999	24,397	17,852	43,763	118,488	288,111	189,381	85,028	61,936	14,876	15,372	15,372	14,876	889,452
2000	24,397	17,852	18,447	18,447	187,912	217,038	100,903	61,936	92,171	15,372	15,372	14,876	784,723
2001	24,397	17,852	18,447	18,447	16,661	58,155	28,763	27,821	4,463	4,612	4,612	4,463	228,693
2002	9,223	8,926	9,223	9,223	8,331	9,223	32,775	31,582	4,463	4,612	4,612	4,463	136,656
Avg (21-02)	18,815	18,888	36,241	57,087	79,135	114,179	95,290	88,906	63,139	36,354	20,200	15,774	644,009

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Table 2.6-6

Total La Grange Release to River (Acre-feet) Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	12,744	10,711	11,068	11,068	33,964	245,398	114,894	64,123	14,876	15,372	15,372	14,876	564,466
1922	24,397	17,852	18,447	18,447	21,795	177,197	175,154	61,936	486,912	61,546	27,209	24,862	1,115,754
1923	24,397	17,852	52,816	101,025	90,321	34,926	159,076	61,936	14,876	15,372	15,372	14,876	602,845
1924	24,397	17,852	18,447	18,447	17,256	18,447	14,650	14,589	2,975	3,074	3,074	2,975	156,183
1925	7,736	8,926	9,223	9,223	8,331	9,223	73,158	69,584	4,463	4,612	4,612	4,463	213,554
1926	13,240	10,413	10,760	10,760	9,719	10,760	31,566	30,449	4,463	4,612	4,612	4,463	145,817
1927	9,223	8,926	9,223	9,223	8,331	9,223	64,241	61,936	41,783	15,372	24,317	28,032	289,830
1928	24,397	38,122	52,916	21,575	67,986	208,208	46,105	35,902	4,463	4,612	4,612	4,463	513,361
1929	12,744	10,711	11,068	11,068	9,997	11,068	26,770	25,952	2,975	3,074	3,074	2,975	131,476
1930	9,223	8,926	9,223	9,223	8,331	9,223	27,049	26,214	2,975	3,074	3,074	2,975	119,510
1931	9,223	8,926	9,223	9,223	8,331	9,223	14,650	14,589	2,975	3,074	3,074	2,975	95,486
1932	7,736	8,926	9,223	9,223	8,628	9,223	64,241	61,936	14,876	15,372	15,372	14,876	239,632
1933	24,397	17,852	18,447	18,447	16,661	18,447	35,753	34,374	4,463	4,612	4,612	4,463	202,528
1934	9,223	8,926	9,223	9,223	8,331	9,223	14,650	14,589	2,975	3,074	3,074	2,975	95,486
1935	7,736	8,926	9,223	9,223	8,331	9,223	64,241	61,936	14,876	15,372	15,372	14,876	239,335
1936	24,397	17,852	18,447	18,447	301,206	220,976	172,446	61,936	14,876	15,372	15,372	14,876	896,203
1937	24,397	17,852	18,447	18,447	210,859	263,318	185,594	61,936	14,876	15,372	15,372	14,876	861,346
1938	24,397	17,852	108,307	79,596	381,104	454,618	298,150	305,878	232,281	156,701	50,809	34,816	2,144,509
1939	24,397	17,852	18,447	18,447	45,240	66,009	28,525	27,598	4,463	4,612	4,612	4,463	264,665
1940	9,223	8,926	9,223	9,223	8,628	234,677	169,350	61,936	14,876	15,372	15,372	14,876	571,682
1941	24,397	17,852	18,447	55,884	262,574	285,182	250,355	61,936	53,464	90,980	26,493	21,347	1,168,911
1942	24,397	17,852	41,845	156,067	153,323	150,861	223,977	231,848	94,247	117,365	26,854	17,017	1,255,653
1943	24,397	17,852	32,826	197,464	149,252	338,579	201,522	61,936	76,970	15,372	19,188	17,602	1,152,960
1944	24,397	17,852	18,447	18,447	17,256	55,093	47,894	45,898	4,463	4,612	4,612	4,463	263,434
1945	13,240	10,413	10,760	10,760	123,508	230,698	119,207	61,936	14,876	15,372	15,372	14,876	641,018
1946	24,397	17,852	229,210	136,983	150,231	179,148	72,112	61,936	14,876	15,372	15,372	14,876	932,365
1947	24,397	17,852	18,447	18,447	16,661	18,447	28,054	27,156	4,463	4,612	4,612	4,463	187,611
1948	9,223	8,926	9,223	9,223	8,628	9,223	39,947	38,477	4,463	4,612	4,612	4,463	151,020
1949	12,744	10,711	11,068	11,068	9,997	11,068	33,037	31,999	4,463	4,612	4,612	4,463	149,842
1950	12,744	10,711	11,068	11,068	9,997	11,068	61,680	58,823	4,463	4,612	4,612	4,463	205,309
1951	13,240	10,413	344,203	225,255	195,815	153,328	104,899	99,341	4,463	4,612	4,612	4,463	1,164,644
1952	13,240	10,413	10,760	10,760	78,332	213,745	258,495	280,490	232,426	162,673	40,841	32,097	1,344,272
1953	24,397	17,852	18,447	27,845	60,046	18,447	87,632	83,153	4,463	4,612	4,612	4,463	355,969
1954	13,240	10,413	10,760	10,760	9,719	10,760	41,422	39,831	4,463	4,612	4,612	4,463	165,055
1955	13,240	10,413	10,760	10,760	9,719	10,760	31,555	30,438	4,463	4,612	4,612	4,463	145,795
1956	9,223	8,926	46,291	436,178	218,897	180,935	106,751	61,936	162,942	111,157	29,023	30,608	1,402,867
1957	24,397	17,852	18,447	18,447	16,661	25,078	85,025	80,709	4,463	4,612	4,612	4,463	304,766
1958	13,240	10,413	10,760	10,760	9,719	211,842	311,309	280,218	277,777	98,815	36,329	32,935	1,304,117
1959	24,397	17,852	18,447	18,447	32,284	59,822	28,824	27,878	4,463	4,612	4,612	4,463	246,101
1960	9,223	8,926	9,223	9,223	8,628	9,223	24,895	24,194	2,975	3,074	3,074	2,975	115,633
1961	7,736	8,926	9,223	9,223	8,331	9,223	14,650	14,589	2,975	3,074	3,074	2,975	93,999
1962	7,736	8,926	9,223	9,223	8,331	9,223	94,959	90,022	4,463	4,612	4,612	4,463	255,793
1963	13,240	10,413	10,760	10,760	9,719	10,760	64,241	61,936	14,876	15,372	15,372	14,876	252,325
1964	24,397	17,852	18,447	18,447	29,030	18,447	28,168	27,263	4,463	4,612	4,612	4,463	200,201
1965	9,223	8,926	9,223	280,632	198,842	168,325	169,358	61,936	14,876	15,372	21,883	32,755	991,351
1966	24,397	22,516	120,759	51,266	99,846	61,610	32,240	31,252	4,463	4,612	4,612	4,463	462,036
1967	12,744	10,711	11,068	11,068	9,997	103,480	252,040	232,725	388,802	259,420	134,115	28,012	1,454,182
1968	24,397	17,852	18,447	18,447	17,256	32,584	28,988	28,031	4,463	4,612	4,612	4,463	204,152
1969	9,223	8,926	9,223	58,091	279,368	255,378	329,852	450,130	428,053	156,634	68,480	35,889	2,089,247
1970	24,397	17,852	73,665	343,421	142,086	183,682	64,241	61,936	14,876	15,372	15,372	14,876	971,776
1971	24,397	17,852	18,447	18,447	16,661	85,781	66,522	63,363	4,463	4,612	4,612	4,463	329,620
1972	13,240	10,413	10,760	10,760	10,066	10,760	30,579	29,524	2,975	3,074	3,074	2,975	138,200
1973	9,223	8,926	9,223	9,223	8,331	16,427	64,861	61,936	96,088	15,372	15,372	14,876	329,858
1974	24,397	42,215	100,199	152,431	84,225	211,369	129,683	61,936	192,487	15,372	25,766	26,460	1,066,540
1975	24,397	17,852	18,447	18,447	112,415	201,425	109,230	61,936	168,121	23,541	50,313	29,597	835,721
1976	35,185	23,322	33,098	18,447	17,256	18,447	20,660	20,224	2,975	3,074	3,074	2,975	198,737
1977	7,736	8,926	9,223	9,223	8,331	9,223	14,650	14,589	2,975	3,074	3,074	2,975	93,999
1978	7,736	8,926	9,223	9,223	8,331	9,223	64,241	61,936	160,931	15,372	15,372	14,876	385,390
1979	24,397	17,852	18,447	29,457	150,953	211,824	92,753	341,049	14,876	15,372	15,372	14,876	947,228
1980	24,397	17,852	18,447	175,502	376,598	211,743	115,553	107,651	280,789	154,773	41,442	36,580	1,561,327
1981	24,397	17,852	18,447	18,447	16,661	22,926	29,256	28,454	4,463	4,612	4,612	4,463	194,590
1982	12,744	10,711	11,068	59,750	349,698	314,765	511,142	352,402	262,057	155,711	63,782	134,816	2,238,646
1983	156,324	139,398	253,127	268,146	324,750	929,999	277,685	451,311	228,033	238,323	186,588	174,030	3,627,714
1984	24,397	260,868	413,016	228,905	204,697	155,998	64,241	61,936	14,876	15,372	15,372	14,876	1,474,554
1985	24,397	17,852	18,447	18,447	16,661	18,447	34,634	33,325	4,463	4,612	4,612	4,463	200,360
1986	9,223	8,926	9,223	9,223	173,491	461,532	159,805	182,071	202,457	15,372	15,372	19,911	1,266,606
1987	24,397	17,852	18,447	18,447	16,661	18,447	25,003	24,296	2,975	3,074	3,074	2,975	175,648
1988	7,736	8,926	9,223	9,223	8,628	9,223	19,297	18,947	2,975	3,074	3,074	2,975	103,301
1989	7,736	8,926	9,223	9,223	8,331	9,223	26,519	25,717	2,975	3,074	3,074	2,975	116,996
1990	7,736	8,926	9,223	9,223	8,331	9,223	19,866	19,480	2,975	3,074	3,074	2,975	104,106
1991	7,736	8,926	9,223	9,223	8,331	9,223	26,397	25,603	2,975	3,074	3,074	2,975	116,760
1992	7,736	8,926	9,223	9,223	8,628	9,223	20,501	20,075	2,975	3,074	3,074	2,975	105,633
1993	7,736	8,926	9,223	9,223	8,331	9,223	64,241	61,936	145,263	78,663	37,258	28,803	468,826
1994	24,397	17,852	18,447	18,447	16,661	18,447	26,774	25,956	2,975	3,074	3,074	2,975	179,079
1995	9,223	8,926	9,223	9,223	8,331	453,913	261,686	589,371	268,231	380,561	180,518	54,017	2,233,223
1996	24,397	17,852	18,447	18,447	284,044	273,866	143,569	142,256	171,347	15,372	15,372	23,444	1,148,413
1997	24,397	42,960	363,466	956,038	195,854	141,961	64,241	61,936	14,876	15,372	15,372	14,876	1,911,349
1998	24,397	17,852	18,447	37,270	334,716	272,793	205,739	342,054	414,193	284,990	127,440	28,820	2,108,711
1999	24,397	17,852	43,763	118,488	288,111	197,943	96,010	61,936	14,876	15,372	15,372	14,876	908,996
2000	24,397	17,852	18,447	18,447	207,006	217,038	100,903	61,936	104,647	15,372	15,372	14,876	816,293
2001	24,397	17,852	18,447	18,447	16,661	58,155	28,763	27,821	4,463	4,612	4,612	4,463	228,693
2002	9,223	8,926	9,223	9,223	8,331	9,223	32,775	31,582	4,463	4,612	4,612	4,463	136,656
Avg (21-02)	18,828	18,994	38,798	60,559	84,433	117,947	97,139	90,047	67,933	37,419	20,654	16,126	668,876

APPENDIX O1

Table 2.6-7

Difference in Total La Grange Release to River (Acre-feet) WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	-13,402	-3,254	0	0	0	0	0	-16,656
1922	0	0	0	0	-5,134	-7,312	-7,365	0	-16,036	-2,183	-5	0	-38,035
1923	0	0	0	0	0	0	-2,118	0	0	0	0	0	-2,118
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	-26,907	0	-8,945	-13,156	-49,008
1928	0	-20,270	-34,469	-3,128	-14,851	1	-8,905	0	0	0	0	0	-81,622
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	-247,039	-16,890	-3,635	0	0	0	0	0	-267,564
1937	0	0	0	0	-16,200	-3,195	-8,513	0	0	0	0	0	-27,908
1938	0	0	-19,590	0	0	-39	-7,143	-17,014	-4,880	0	-2,173	-5	-50,844
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	0	-38,195	-5,678	0	0	0	0	0	-43,873
1941	0	0	0	3,311	-446	-422	-519	0	-3,536	-2,184	-5	0	-3,801
1942	0	0	0	-5,542	1	-2,664	-5,524	-2,854	-2,762	-2,188	0	0	-21,533
1943	0	0	0	0	0	-2,001	-6,721	0	-4,299	0	-2,174	-5	-15,200
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	-37,456	-15,315	-202	0	0	0	0	0	-52,973
1946	0	7,308	106	0	0	-12,208	-3,612	0	0	0	0	0	-8,406
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	-116,554	3	0	0	0	0	0	0	0	0	-116,551
1952	0	0	0	0	-21,357	0	0	-15,879	-2,117	0	-2,174	-4	-41,531
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	-37,068	-38,536	5	-3,555	-3,068	0	-9,334	-2,188	0	0	-93,744
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	-38,458	0	-11,490	-1,013	-2,188	0	0	-53,149
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	-11,774	0	0	0	0	0	0	0	-11,774
1965	0	0	0	-185,736	-5,132	-10,710	-9,769	0	0	0	11,003	24	-200,320
1966	0	1	-1,152	0	-17,169	0	0	0	0	0	0	0	-18,320
1967	0	0	0	0	0	-18,498	0	-12,427	0	-2,188	-2,184	-5	-35,302
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	-25,244	-2,448	-10,837	-7,641	-2,188	-2,117	0	-2,174	-4	-52,653
1970	0	0	0	26,596	-5,957	-21,074	0	0	0	0	0	0	-435
1971	0	0	0	0	0	-15,532	0	0	0	0	0	0	-15,532
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	-7,204	-620	0	-60,390	0	0	0	-68,214
1974	0	0	0	-8,392	1	-10,465	-4,603	0	-9,907	0	-2,174	-5	-35,545
1975	0	0	0	0	0	0	-8,286	0	6,521	-2,183	-4	0	-3,952
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	-89,483	0	0	0	-89,483
1979	0	0	0	-3,565	0	-16,219	-2,118	-2,188	0	0	0	0	-24,090
1980	0	0	0	7,641	-1	-7,611	-4,879	-2,188	-2,118	-2,188	0	0	-11,344
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	-27,215	-11,551	0	0	-1,903	-1,841	0	-4,358	-2,127	-48,995
1983	-1,046	2,762	-952	-1	0	0	0	-9,542	-4,603	-2,188	0	-2,180	-17,750
1984	0	1,539	0	0	0	3,936	0	0	0	0	0	0	5,475
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	-17,113	-20,127	-11,300	-5,042	-4,880	0	0	-2,167	-60,629
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	-130,387	-63,291	-21,886	-4,889	-220,453
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	-9,263	-9,206	-1,903	-1,842	-2,188	0	-2,177	-26,579
1996	0	0	0	0	-1,694	0	-4,880	-5,042	-4,880	0	0	-2,167	-18,663
1997	0	-3	0	-6,208	1	0	0	0	0	0	0	0	-6,210
1998	0	0	0	-18,722	3	-3,119	-11,048	-3,900	-3,774	-2,188	0	0	-42,748
1999	0	0	0	0	0	-8,562	-10,982	0	0	0	0	0	-19,544
2000	0	0	0	0	-19,094	0	0	0	-12,476	0	0	0	-31,570
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	-13	-106	-2,557	-3,472	-5,298	-3,768	-1,849	-1,141	-4,793	-1,065	-454	-352	-24,868

APPENDIX O1

Table 2.6-8

Difference in Total La Grange Release to River (Acre-feet)

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending SJR Index WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1983	-1,046	2,762	-952	-1	0	0	0	-9,542	-4,603	-2,188	0	-2,180	-17,750
1969	0	0	0	-25,244	-2,448	-10,837	-7,641	-2,188	-2,117	0	-2,174	-4	-52,653
1995	0	0	0	0	0	-9,263	-9,206	-1,903	-1,842	-2,188	0	-2,177	-26,579
1938	0	0	-19,590	0	0	-39	-7,143	-17,014	-4,880	0	-2,173	-5	-50,844
1998	0	0	0	-18,722	3	-3,119	-11,048	-3,900	-3,774	-2,188	0	0	-42,748
1982	0	0	0	-27,215	-11,551	0	0	-1,903	-1,841	0	-4,358	-2,127	-48,995
1967	0	0	0	0	0	-18,498	0	-12,427	0	-2,188	-2,184	-5	-35,302
1952	0	0	0	0	-21,357	0	0	-15,879	-2,117	0	-2,174	-4	-41,531
1958	0	0	0	0	0	-38,458	0	-11,490	-1,013	-2,188	0	0	-53,149
1980	0	0	0	7,641	-1	-7,611	-4,879	-2,188	-2,118	-2,188	0	0	-11,344
1978	0	0	0	0	0	0	0	0	-89,483	0	0	0	-89,483
1922	0	0	0	0	-5,134	-7,312	-7,365	0	-16,036	-2,183	-5	0	-38,035
1956	0	0	-37,068	-38,536	5	-3,555	-3,068	0	-9,334	-2,188	0	0	-93,744
1942	0	0	0	-5,542	1	-2,664	-5,524	-2,854	-2,762	-2,188	0	0	-21,533
1941	0	0	0	3,311	-446	-422	-519	0	-3,536	-2,184	-5	0	-3,801
1986	0	0	0	0	-17,113	-20,127	-11,300	-5,042	-4,880	0	0	-2,167	-60,629
1993	0	0	0	0	0	0	0	0	-130,387	-63,291	-21,886	-4,889	-220,453
1997	0	-3	0	-6,208	1	0	0	0	0	0	0	0	-6,210
1996	0	0	0	0	-1,694	0	-4,880	-5,042	-4,880	0	0	-2,167	-18,663
1943	0	0	0	0	0	-2,001	-6,721	0	-4,299	0	-2,174	-5	-15,200
1937	0	0	0	0	-16,200	-3,195	-8,513	0	0	0	0	0	-27,908
1974	0	0	0	-8,392	1	-10,465	-4,603	0	-9,907	0	-2,174	-5	-35,545
1975	0	0	0	0	0	0	-8,286	0	6,521	-2,183	-4	0	-3,952
1965	0	0	0	-185,736	-5,132	-10,710	-9,769	0	0	0	11,003	24	-200,320
1936	0	0	0	0	-247,039	-16,890	-3,635	0	0	0	0	0	-267,564
1984	0	1,539	0	0	0	3,936	0	0	0	0	0	0	5,475
1979	0	0	0	-3,565	0	-16,219	-2,118	-2,188	0	0	0	0	-24,090
1945	0	0	0	0	-37,456	-15,315	-202	0	0	0	0	0	-52,973
1999	0	0	0	0	0	-8,562	-10,982	0	0	0	0	0	-19,544
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	-26,907	0	-8,945	-13,156	-49,008
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1946	0	7,308	106	0	0	-12,208	-3,612	0	0	0	0	0	-8,406
1973	0	0	0	0	0	-7,204	-620	0	-60,390	0	0	0	-68,214
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	-19,094	0	0	0	-12,476	0	0	0	-31,570
1940	0	0	0	0	0	-38,195	-5,678	0	0	0	0	0	-43,873
1923	0	0	0	0	0	0	-2,118	0	0	0	0	0	-2,118
1921	0	0	0	0	0	-13,402	-3,254	0	0	0	0	0	-16,656
1970	0	0	0	26,596	-5,957	-21,074	0	0	0	0	0	0	-435
1951	0	0	-116,554	3	0	0	0	0	0	0	0	0	-116,551
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	-15,532	0	0	0	0	0	0	-15,532
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1928	0	-20,270	-34,469	-3,128	-14,851	1	-8,905	0	0	0	0	0	-81,622
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	1	-1,152	0	-17,169	0	0	0	0	0	0	0	-18,320
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	-11,774	0	0	0	0	0	0	0	-11,774
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 2.6-9

Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by SJR Index Year Type) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	23,400	21,274	46,524	114,653	173,074	256,125	198,288	189,097	194,963	106,979	51,787	37,222	1,413,386
Above Normal	17,105	28,309	69,075	77,774	95,901	127,962	95,279	80,555	20,035	14,739	14,739	14,263	655,737
Below Normal	17,484	14,199	22,701	17,789	25,120	41,604	58,393	55,751	4,463	4,612	4,612	4,463	271,190
Dry	20,655	15,449	15,964	15,964	17,937	27,291	30,572	29,530	4,349	4,494	4,494	4,349	191,046
Critical	13,260	11,611	12,560	11,644	10,648	11,644	21,061	20,600	2,975	3,074	3,074	2,975	125,127
All Years	18,815	18,888	36,241	57,087	79,135	114,179	95,290	88,906	63,139	36,354	20,200	15,774	644,009

Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by SJR Index Year Type) Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	23,443	21,159	48,924	127,347	176,452	262,303	202,891	192,904	207,184	110,618	52,966	37,877	1,464,068
Above Normal	17,105	27,789	75,925	76,419	114,110	136,500	97,174	80,683	25,904	14,739	15,265	15,037	696,650
Below Normal	17,484	15,888	25,669	18,049	27,788	42,899	59,135	55,751	4,463	4,612	4,612	4,463	280,813
Dry	20,655	15,449	15,964	15,964	18,842	27,291	30,572	29,530	4,349	4,494	4,494	4,349	191,951
Critical	13,260	11,611	12,560	11,644	10,648	11,644	21,061	20,600	2,975	3,074	3,074	2,975	125,127
All Years	18,828	18,994	38,798	60,559	84,433	117,947	97,139	90,047	67,933	37,419	20,654	16,126	668,876

Difference in Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by SJR Index Year Type) WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	-44	115	-2,400	-12,694	-3,378	-6,178	-4,603	-3,807	-12,220	-3,639	-1,180	-655	-50,682
Above Normal	0	520	-6,850	1,355	-18,209	-8,537	-1,895	-129	-5,869	0	-526	-774	-40,913
Below Normal	0	-1,689	-2,968	-261	-2,668	-1,294	-742	0	0	0	0	0	-9,623
Dry	0	0	0	0	-906	0	0	0	0	0	0	0	-906
Critical	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	-13	-106	-2,557	-3,472	-5,298	-3,768	-1,849	-1,141	-4,793	-1,065	-454	-352	-24,868

2.7 Calaveras and San Antonio Reservoirs, Alameda Creek, and Downstream

Compared to the base setting, Calaveras Reservoir operations would substantively change in the WSIP setting. With the restoration of Calaveras Reservoir operating capacity, the reservoir would operate with a larger storage capacity. Figure 2.7-1 illustrates a chronological trace of the simulation of Calaveras Reservoir storage and stream releases from Calaveras Dam. Shown in Figure 2.7-1 are the results for the WSIP and base settings.

The current operation of Calaveras Reservoir (base-Calaveras constrained setting) is modeled to be greatly constrained, to vary only within a limited storage range. Although a within-year cyclic operation occurs for the conservation of local watershed runoff, there is relatively little reservoir storage available for year-to-year carryover and multi-year drought use. In the WSIP setting, a greater within-year cyclic operation occurs, providing for a greater use of local watershed runoff. Also, during prolonged periods of drought (i.e., multiple years in duration), reservoir storage would be drawn to supplement runoff available to the regional system and other water supply resources. Figure 2.7-2 illustrates the average monthly storage in Calaveras Reservoir for the 82-year simulation, and the range in storage for each month for the WSIP and base settings.

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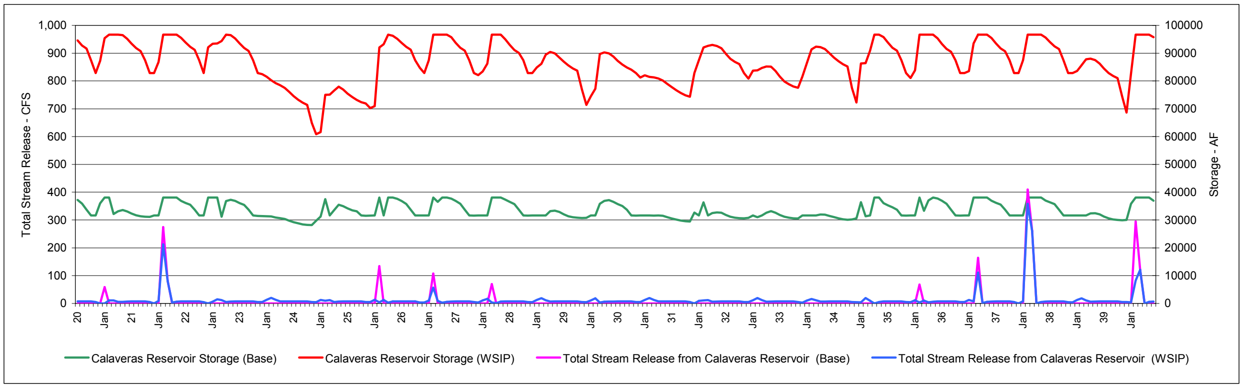
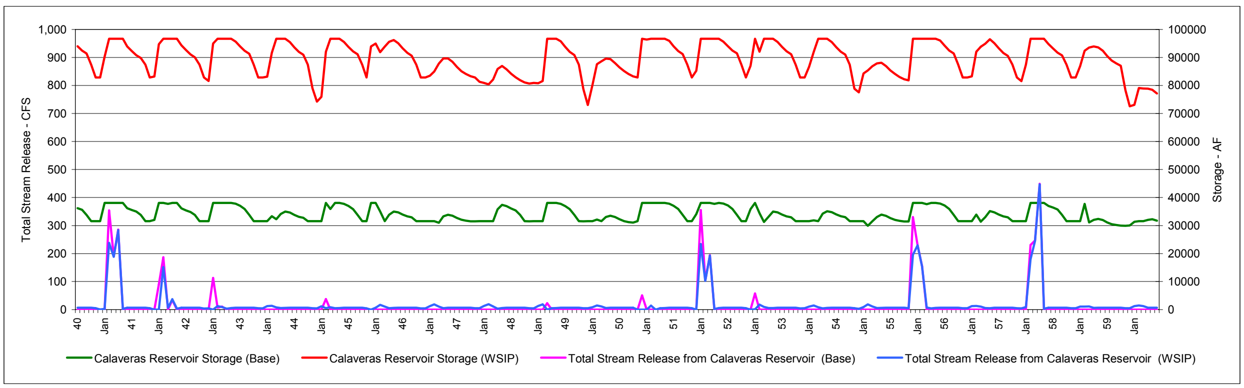
Figure 2.7-1
Calaveras Reservoir Storage and Stream Release

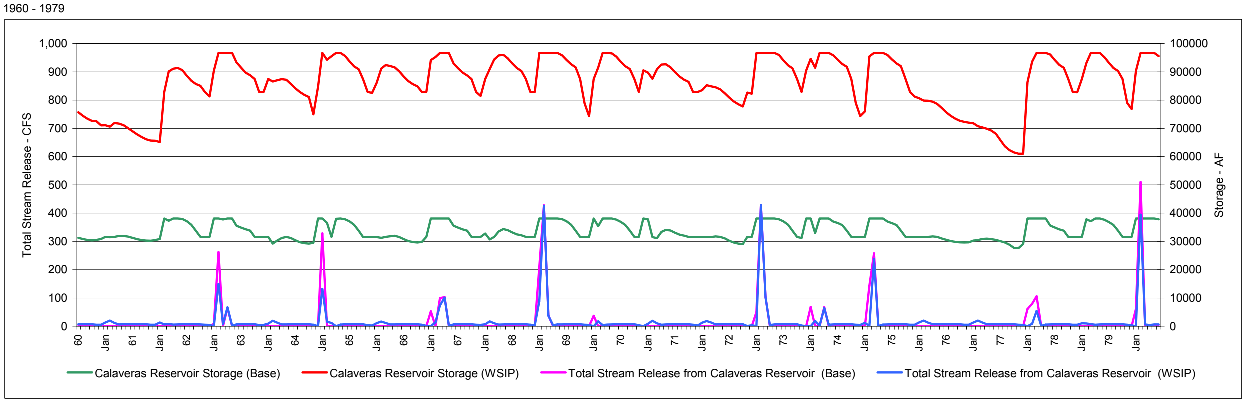
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

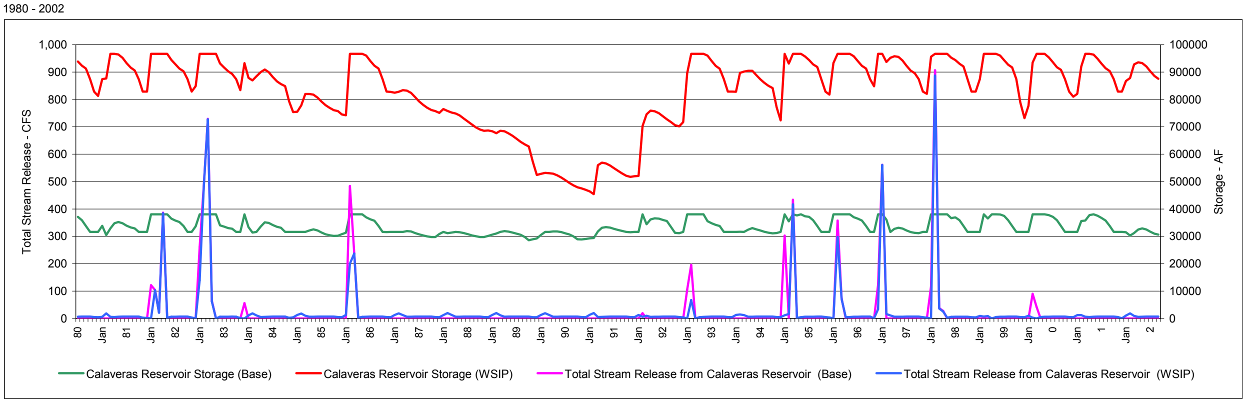


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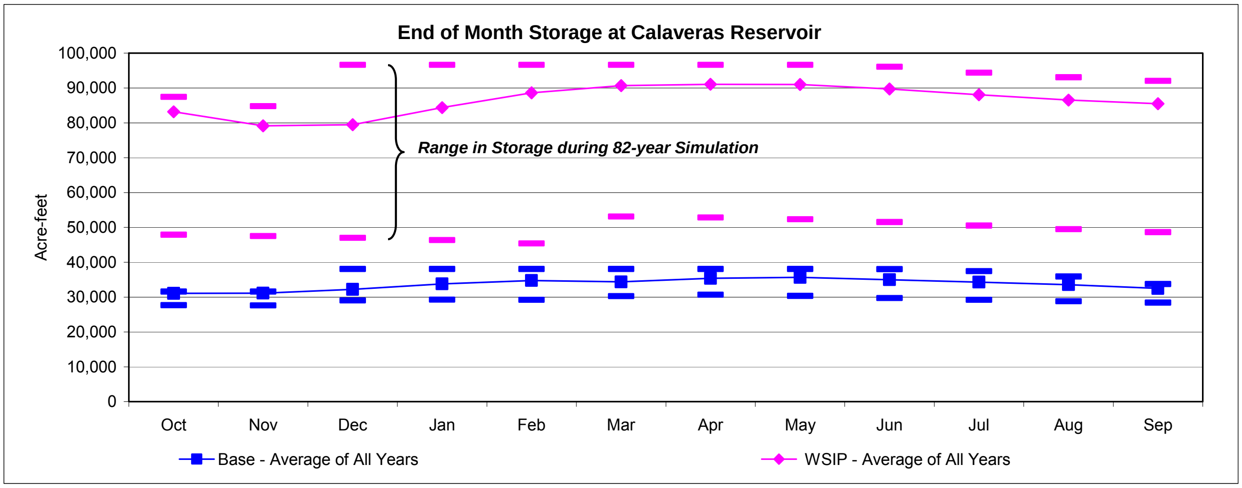
Figure 2.7-2



In the WSIP setting (as compared to the base setting), there would be two categorical changes in releases to Calaveras Creek below Calaveras Dam: the addition of flows representing the flow objectives associated with the 1997 California Department of Fish and Game Memorandum of Understanding (MOU); and the reduction of stream releases during wetter-year/wetter-season flows due to the restored operational capacity of Calaveras Reservoir. Supplementing the Figure 2.7-1 representation of Calaveras Dam stream releases is Table 2.7-1, which illustrates releases for the WSIP and base settings and the difference in releases between the two.

Table 2.7-1

Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	998	4,985	14,425	9,862	5,085	255	386	417	425	415	37,928
Above Normal	425	258	172	746	3,196	2,688	606	327	396	424	428	417	10,082
Normal	429	275	194	548	725	506	265	370	408	428	430	417	4,995
Below Normal	428	275	246	672	876	596	345	389	411	430	430	417	5,515
Dry	429	292	281	778	1,044	747	375	407	416	430	430	417	6,044
All Years	428	269	374	1,526	4,004	2,850	1,314	350	403	426	428	417	12,788

Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	1,741	9,267	16,622	9,968	5,024	0	0	0	0	0	42,623
Above Normal	0	0	184	2,685	5,918	3,096	459	0	0	0	0	0	12,342
Normal	0	0	216	364	898	353	0	0	0	0	0	0	1,831
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	420	2,436	4,645	2,656	1,076	0	0	0	0	0	11,233

Difference in Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	-744	-4,282	-2,197	-106	61	255	386	417	425	415	-4,694
Above Normal	425	258	-12	-1,939	-2,721	-408	147	327	396	424	428	417	-2,259
Normal	429	275	-22	184	-173	154	265	370	408	428	430	417	3,164
Below Normal	428	275	246	672	876	596	345	389	411	430	430	417	5,515
Dry	429	292	281	778	1,044	747	375	407	416	430	430	417	6,044
All Years	428	269	-46	-910	-641	194	239	350	403	426	428	417	1,556

Compared to the base setting, diversions from Alameda Creek to Calaveras Reservoir would increase in the WSIP setting. With the current constraints on Calaveras Reservoir storage, diversions to Calaveras Creek are rejected. With the restoration of operational storage in the reservoir, the opportunity to divert water into the reservoir would increase.

To provide a context for the amount of water diverted at the Alameda Creek Diversion Dam (ACDD), Table 2.7-2 illustrates the estimated runoff (inflow) to the dam, averaged by year type. Table 2.7-3 compares diversions to Calaveras Reservoir in the WSIP and base settings. An increase in diversions during the winter season due to WSIP operation would generally occur during normal or wetter year types, as reservoir storage space would accommodate diversions. During summer in all years and during all periods in below-normal and normal years, diversions would continue as they do currently. A few exceptions occur when diversions would be reduced from that of the base setting.

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Table 2.7-2

Total Inflow to ACDD (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	7	156	2,472	7,382	8,284	6,064	3,608	1,035	227	42	18	12	29,308
Above Normal	18	183	1,817	4,394	5,619	3,692	1,976	542	139	23	11	7	18,420
Normal	7	41	1,589	1,840	2,684	2,029	939	332	87	8	5	3	9,564
Below Normal	7	42	554	1,069	1,689	1,271	395	246	64	6	4	3	5,350
Dry	7	16	222	314	531	382	238	124	38	3	3	2	1,880
All Years	9	88	1,327	2,993	3,759	2,683	1,425	454	111	17	8	5	12,880

Table 2.7-3

Calaveras Reservoir Inflow from Upper Alameda Creek (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	7	128	1,093	1,113	302	337	649	861	227	42	18	12	4,790
Above Normal	11	159	1,226	1,936	1,883	563	1,017	542	139	23	11	7	7,518
Normal	7	35	1,004	1,580	1,888	1,570	826	332	87	8	5	3	7,345
Below Normal	7	42	536	1,024	1,587	1,042	395	246	64	6	4	3	4,956
Dry	7	16	222	314	473	382	238	124	38	3	3	2	1,823
All Years	8	77	818	1,200	1,239	780	627	421	111	17	8	5	5,310

Calaveras Reservoir Inflow from Upper Alameda Creek (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	7	128	1,093	415	185	307	637	904	227	42	18	12	3,977
Above Normal	11	159	691	722	325	596	1,284	542	139	23	11	7	4,510
Normal	7	35	634	972	815	1,123	813	332	87	8	5	3	4,833
Below Normal	7	42	536	1,024	1,587	1,042	395	246	64	6	4	3	4,956
Dry	7	16	222	314	473	382	238	124	38	3	3	2	1,823
All Years	8	77	635	694	684	693	677	429	111	17	8	5	4,037

Difference in Calaveras Reservoir Inflow from Upper Alameda Creek (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	697	117	30	12	-43	0	0	0	0	813
Above Normal	0	0	535	1,215	1,558	-33	-267	0	0	0	0	0	3,008
Normal	0	0	369	608	1,074	447	13	0	0	0	0	0	2,511
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	183	506	555	86	-50	-8	0	0	0	0	1,272

Commensurate with changes in diversions from Alameda Creek to Calaveras Reservoir would be changes in flow below the ACDD. Table 2.7-4 illustrates the flow below the ACDD for the WSIP and base settings. Table 2.7-4 shows that, opposed to diversions to Calaveras Reservoir, flow passing the ACDD would decrease in the WSIP setting. With operational capacity restored at Calaveras Reservoir, there would be more opportunity (and need) to divert Alameda Creek flows; thus, flow passing the dam would be reduced.

Table 2.7-4

Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	28	1,379	6,269	7,982	5,727	2,960	173	0	0	0	0	24,518
Above Normal	7	23	591	2,457	3,735	3,129	959	0	0	0	0	0	10,903
Normal	0	6	585	260	796	459	113	0	0	0	0	0	2,219
Below Normal	0	0	18	45	102	229	0	0	0	0	0	0	394
Dry	0	0	0	0	57	0	0	0	0	0	0	0	58
All Years	1	12	509	1,793	2,520	1,903	798	34	0	0	0	0	7,570

Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	28	1,379	6,967	8,099	5,757	2,972	130	0	0	0	0	25,331
Above Normal	7	23	1,126	3,672	5,294	3,096	692	0	0	0	0	0	13,911
Normal	0	6	954	868	1,870	906	126	0	0	0	0	0	4,731
Below Normal	0	0	18	45	102	229	0	0	0	0	0	0	394
Dry	0	0	0	0	57	0	0	0	0	0	0	0	58
All Years	1	12	692	2,299	3,075	1,989	748	26	0	0	0	0	8,843

Difference in Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	-697	-117	-30	-12	43	0	0	0	0	-813
Above Normal	0	0	-535	-1,215	-1,558	33	267	0	0	0	0	0	-3,008
Normal	0	0	-369	-608	-1,074	-447	-13	0	0	0	0	0	-2,511
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-183	-506	-555	-86	50	8	0	0	0	0	-1,272

Flow below the confluence of Alameda Creek and Calaveras Creek is affected by releases from Calaveras Dam to the stream, flow passing the ACDD, and unregulated flow below the ACDD and Calaveras Dam. Table 2.7-5 illustrates the flow below the confluence for the WSIP and base settings, and the difference in inflow between the two. The notable differences between the WSIP and the base settings are the addition of stream flows representing the 1997 MOU and the reduction of wetter-year/wet-season flows due to the restoration of Calaveras Reservoir storage.

Table 2.7-5

Flow below Alameda/Calaveras Creek Confluence (Acre-feet) (Average within Year Type - Grouped by 5 Local Reservoir Runoff)											WSIP	
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	430	326	2,721	12,263	23,595	16,575	8,647	605	417	429	429	417	66,854
Above Normal	437	326	1,007	3,801	7,708	6,379	1,876	430	418	430	429	417	23,658
Normal	429	304	1,006	1,077	1,907	1,293	536	430	417	429	430	417	8,675
Below Normal	429	297	324	859	1,214	1,046	417	430	417	430	430	417	6,709
Dry	429	298	307	813	1,168	816	418	430	417	430	430	417	6,373
All Years	431	310	1,063	3,728	7,053	5,185	2,349	464	417	430	429	417	22,276
Flow below Alameda/Calaveras Creek Confluence (Acre-feet) (Average within Year Type - Grouped by 5 Local Reservoir Runoff)												Base	
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	1	80	3,465	17,243	25,909	16,711	8,598	307	30	12	4	2	72,361
Above Normal	12	68	1,554	6,954	11,987	6,754	1,462	103	22	6	2	1	28,926
Normal	1	29	1,397	1,501	3,154	1,586	284	60	9	2	0	0	8,022
Below Normal	1	22	78	186	338	450	72	41	7	0	0	0	1,195
Dry	1	6	26	35	124	69	43	23	1	0	0	0	328
All Years	3	41	1,292	5,145	8,250	5,077	2,060	106	14	4	1	1	21,993
Difference in Flow below Alameda/Calaveras Creek Confluence (Acre-feet) (Average within Year Type - Grouped by 5 Local Reservoir Runoff)											WSIP minus Base		
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	-744	-4,979	-2,314	-136	49	298	386	417	425	415	-5,507
Above Normal	425	258	-547	-3,153	-4,279	-375	414	327	396	424	428	417	-5,267
Normal	429	275	-391	-424	-1,247	-293	251	370	408	428	430	417	653
Below Normal	428	275	246	672	876	596	345	389	411	430	430	417	5,515
Dry	429	292	281	778	1,044	747	375	407	416	430	430	417	6,044
All Years	428	269	-229	-1,417	-1,197	108	289	358	403	426	428	417	283

A flow recapture facility in Alameda Creek below Calaveras Reservoir is incorporated in the WSIP setting. This facility is assumed to recapture flows explicitly released from Calaveras Dam in the representation of the 1997 MOU. The effect of the recapture is a reduction in the flow that occurs below the confluence of Alameda and Calaveras Creeks, but only to the extent that releases were explicitly made from Calaveras Reservoir. Flows below this diversion have been estimated and noted as the flow above the Alameda and San Antonio Creek confluence. Table 2.7-6 illustrates the flow at this location for the WSIP and base settings. The flows identified at this location indicate flow occurring below the confluence of Alameda and Calaveras Creeks (described above), with the addition of estimated unregulated stream accretions between the Alameda-Calaveras Creek confluence and the Alameda-San Antonio Creek confluence minus the water assumed to be recaptured (diverted) by the SFPUC from the creek.

Table 2.7-6

Alameda Creek Flow abv San Antonio Confluence (Acre-feet) (Average within Year Type - Grouped by 5 Local Reservoir Runoff)												WSIP	
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,113	13,610	25,199	17,720	9,297	556	76	33	15	9	69,788
Above Normal	19	150	1,203	4,350	8,422	6,871	2,127	217	54	20	9	6	23,450
Normal	7	64	1,131	909	1,740	1,219	466	128	28	9	4	3	5,706
Below Normal	7	56	183	404	678	717	154	91	20	5	3	2	2,321
Dry	6	19	70	98	231	145	91	48	9	3	2	2	724
All Years	9	89	1,129	3,838	7,188	5,297	2,396	207	38	14	7	4	20,215
Alameda Creek Flow abv San Antonio Confluence (Acre-feet) (Average within Year Type - Grouped by 5 Local Reservoir Runoff)												Base	
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,973	18,714	27,673	17,977	9,358	513	76	33	15	9	78,502
Above Normal	19	150	1,922	7,772	13,068	7,467	1,861	217	54	20	9	6	32,566
Normal	7	64	1,716	1,881	3,712	2,007	479	128	28	9	4	3	10,037
Below Normal	7	56	183	404	678	717	154	91	20	5	3	2	2,321
Dry	6	19	70	98	231	145	91	48	9	3	2	2	724
All Years	9	89	1,560	5,733	9,019	5,624	2,355	198	38	14	7	4	24,650
Difference in Alameda Creek Flow abv San Antonio Confluence (Acre-feet) (Average within Year Type - Grouped by 5 Local Reservoir Runoff)											WSIP minus Base		
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-860	-5,104	-2,474	-258	-61	43	0	0	0	0	-8,714
Above Normal	0	0	-719	-3,422	-4,646	-596	266	0	0	0	0	0	-9,117
Normal	0	0	-585	-972	-1,972	-788	-13	0	0	0	0	0	-4,331
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-431	-1,895	-1,831	-328	41	8	0	0	0	0	-4,435

The difference in San Antonio Reservoir storage between the WSIP and base settings is the result of several factors, and is predominantly due to the restoration of the operational capacity of Calaveras Reservoir and the maintenance of Hetch Hetchy conveyance. Figure 2.7-3 illustrates a chronological trace of the simulation of San Antonio Reservoir storage and stream releases from the dam. Shown in Figure 2.7-3 are the results for the WSIP and base settings. In the base setting, the limited operating storage capacity at Calaveras Reservoir leads to a different operation at San Antonio Reservoir, one that draws relatively more stored water for system demands when the draw from Calaveras Reservoir is constrained due to limited storage. The resultant effect is that the WSIP setting would retain more storage in San Antonio Reservoir than occurs in the base setting. The exception to this outcome is during cyclic maintenance of Hetch Hetchy conveyance that would constrain Hetch Hetchy diversions every year, but most dramatically every fifth year. During these periods, additional water would be drawn from San Antonio Reservoir and the other Bay Area reservoirs to serve systemwide deliveries when limited or no water would be available from Hetch Hetchy. The coincidence of wet local Bay Area watershed hydrology, reservoir storage balancing among the Bay Area reservoirs, and maintenance would affect the severity of drawdown and the rate of replenishment of San Antonio Reservoir.

Also affecting the magnitude of draw from San Antonio Reservoir are modeling assumptions for the balancing of total Bay Area reservoir storage among the five major SFPUC reservoirs. The model balances storage among reservoirs by way of an input file by the modeler concerning the relative draw (percentage) from each reservoir under various storage conditions. These are discretionary inputs in the model, and the logic and relative percentages are meant to mimic the current practice and discretion of the system operators based on recognition of the physical conveyance constraints within the system and the ability of each reservoir to provide yield and water delivery security. The logic currently favors the retention of storage in the Peninsula reservoirs for security reasons, and thus the provision of additional water between the settings is balanced between San Antonio and Calaveras Reservoirs. Figure 2.7-4 illustrates the average monthly storage in San Antonio Reservoir for the 82-year simulation, and the range in storage for each month for the WSIP and base settings.

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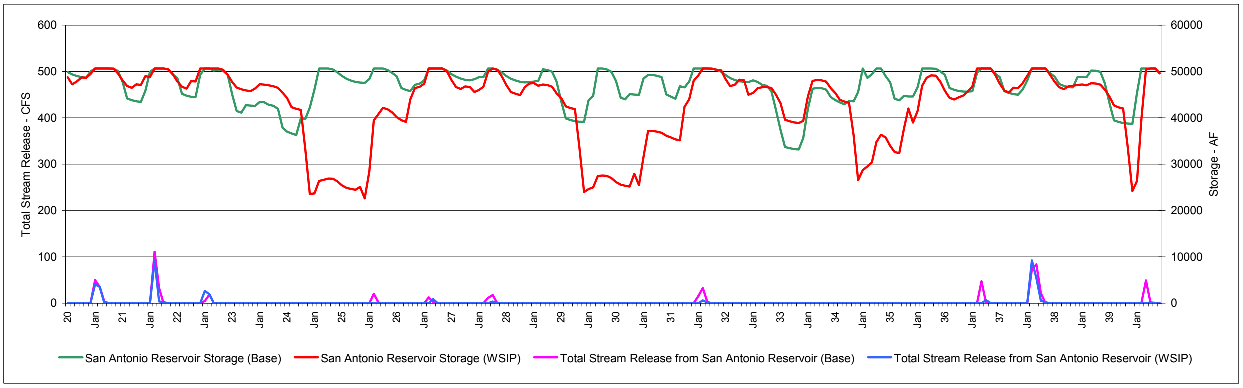
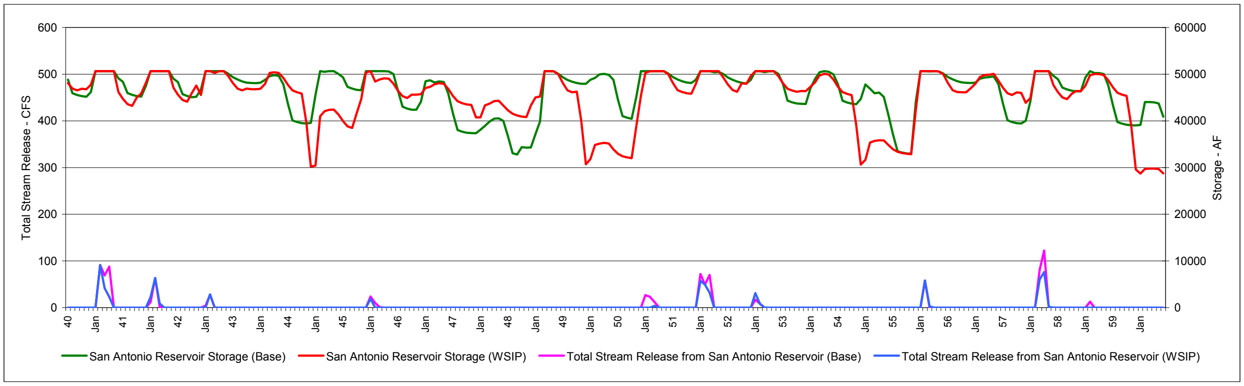
Figure 2.7-3
San Antonio Reservoir Storage and Stream Release

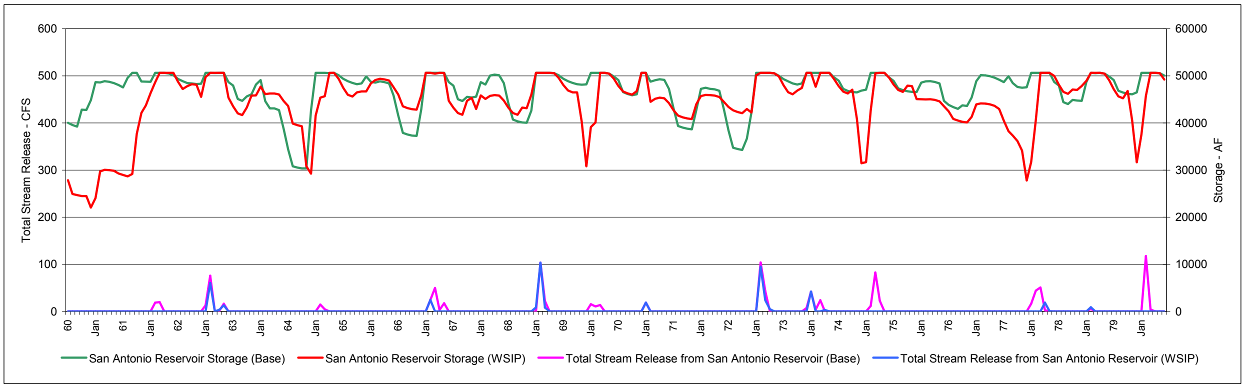
1920 - 1939



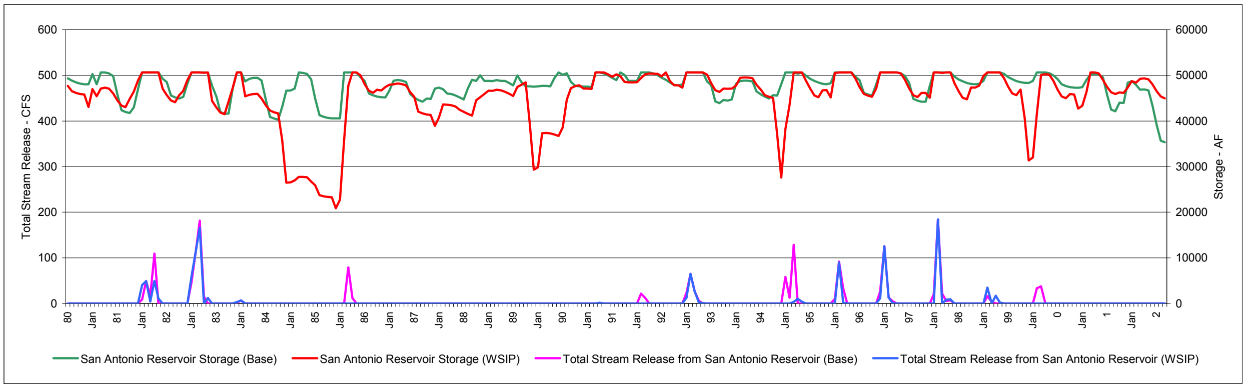
1940 - 1959



1960 - 1979

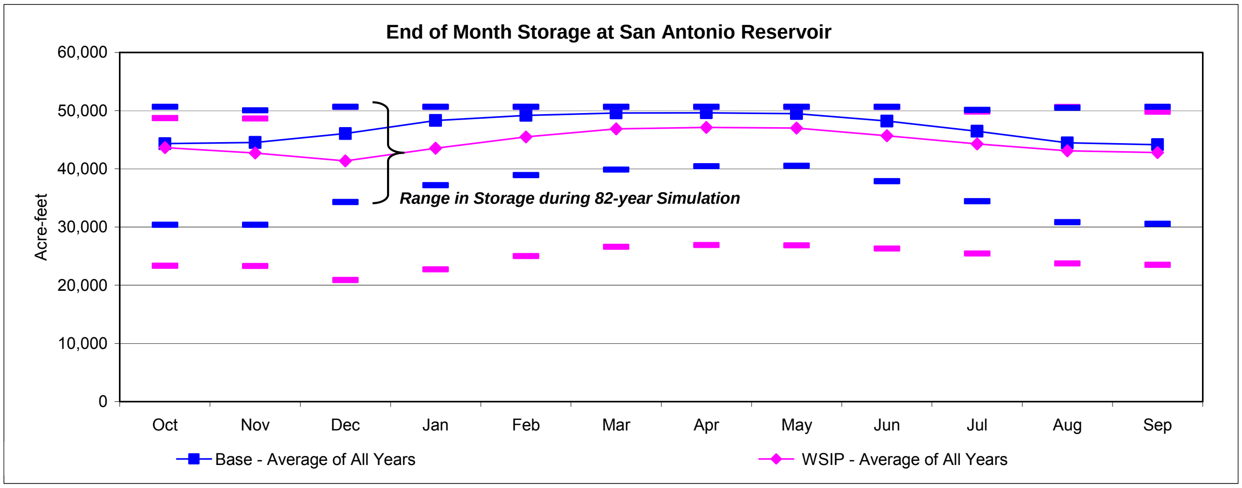


1980 - 2002



APPENDIX O1

Figure 2.7-4



There would very little change in stream releases below San Antonio Reservoir between the WSIP and base settings. With storage conditions lower at some times and higher at other times, a difference in the ability to regulate reservoir inflow and avoid stream releases is expected. Given the sometimes rigid constraints within the modeling assumptions, the model will overestimate the frequency and magnitude of stream releases from San Antonio Reservoir under any of the investigated settings. The flexibility that occurs in actual operations would likely avoid most of the releases represented by the model. The modeled stream releases from San Antonio Reservoir and difference between releases for the WSIP setting and base setting are shown in Table 2.7-7. The differences between the two settings range from increases to decreases in flow, generally with decreases in releases. This modeled circumstance reflects the different resulting storage operations between the two settings, as seen in Figure 2.7-3. As described above, the model will overestimate the frequency and magnitude of releases from San Antonio Reservoir, and the actual releases from San Antonio Reservoir in any setting and the difference between settings are expected to be minor.

Table 2.7-7

Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	44	1,208	3,251	1,558	658	151	0	0	0	0	6,870
Above Normal	0	0	0	442	1,381	158	192	62	0	0	0	0	2,235
Normal	0	0	11	287	78	6	13	0	0	0	0	0	395
Below Normal	0	0	0	0	0	0	4	0	0	0	0	0	4
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	11	383	936	338	172	42	0	0	0	0	1,882

Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	101	1,322	3,669	3,288	1,398	94	0	0	0	0	9,872
Above Normal	0	0	26	687	1,909	1,487	116	58	0	0	0	0	4,283
Normal	0	0	7	370	441	237	65	0	0	0	0	0	1,120
Below Normal	0	0	0	0	41	0	0	0	0	0	0	0	41
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	26	472	1,206	996	309	30	0	0	0	0	3,041

Difference in Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-57	-114	-418	-1,730	-740	57	0	0	0	0	-3,002
Above Normal	0	0	-26	-246	-528	-1,329	77	4	0	0	0	0	-2,048
Normal	0	0	5	-82	-363	-231	-52	0	0	0	0	0	-724
Below Normal	0	0	0	0	-41	0	4	0	0	0	0	0	-37
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-16	-89	-270	-658	-138	12	0	0	0	0	-1,159

Flow below the confluence of Alameda and San Antonio Creeks is influenced by releases from San Antonio Reservoir and flow arriving at the location from Alameda Creek, which includes upstream impairment by SFPUC operations and facilities. Table 2.7-8 illustrates the flow below the confluence for the WSIP and base settings, and the differences in flow between the two. The differences are particularly due to the effects of restoring Calaveras Reservoir operating capacity in the WSIP setting.

Table 2.7-8

Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,157	14,818	28,449	19,278	9,955	707	76	33	15	9	76,658
Above Normal	19	150	1,203	4,792	9,803	7,029	2,320	279	54	20	9	6	25,685
Normal	7	64	1,142	1,197	1,818	1,224	478	128	28	9	4	3	6,101
Below Normal	7	56	183	404	678	717	159	91	20	5	3	2	2,326
Dry	6	19	70	98	231	145	91	48	9	3	2	2	724
All Years	9	89	1,140	4,221	8,124	5,635	2,567	249	38	14	7	4	22,097

Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	4,075	20,036	31,342	21,266	10,756	607	76	33	15	9	88,374
Above Normal	19	150	1,948	8,459	14,977	8,954	1,977	276	54	20	9	6	36,849
Normal	7	64	1,723	2,251	4,153	2,244	544	128	28	9	4	3	11,157
Below Normal	7	56	183	404	720	717	154	91	20	5	3	2	2,363
Dry	6	19	70	98	231	145	91	48	9	3	2	2	724
All Years	9	89	1,587	6,205	10,225	6,620	2,664	229	38	14	7	4	27,691

Difference in Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-917	-5,217	-2,892	-1,988	-801	100	0	0	0	0	-11,716
Above Normal	0	0	-745	-3,667	-5,174	-1,925	343	4	0	0	0	0	-11,164
Normal	0	0	-581	-1,054	-2,335	-1,020	-66	0	0	0	0	0	-5,056
Below Normal	0	0	0	0	-41	0	4	0	0	0	0	0	-37
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-447	-1,984	-2,101	-986	-97	20	0	0	0	0	-5,595

2.8 Crystal Springs and San Andreas Reservoirs

Fundamental to the difference in storage operations between the WSIP setting and the base setting is the restoration of reservoir operation capacity in the WSIP setting, which does not occur in the base setting. Full capacity of the restored reservoir is 22,150 million gallons (approximately 67,980 acre-feet), and the current full operating capacity is 18,520 million gallons (approximately 56,840 acre-feet). The result is the operation of Crystal Springs Reservoir at a higher maximum storage in the WSIP setting. Figure 2.8-1 illustrates a chronological trace of the simulation of Crystal Springs Reservoir storage and stream releases from Crystal Springs Dam. Shown in Figure 2.8-1 are the results for the WSIP and base settings.

Compared to the base setting, the WSIP setting would generally result in a shifting of the maximum storage level and the normal range of reservoir operation to a greater volume (elevation); the lower end of the monthly operating range would normally be greater in storage than in the base setting. In some years, the variation from maximum storage to minimum storage may increase in the WSIP setting. The cyclic greater draw from storage in the WSIP setting every fifth year is associated with the maintenance of the Hetch Hetchy conveyance system.

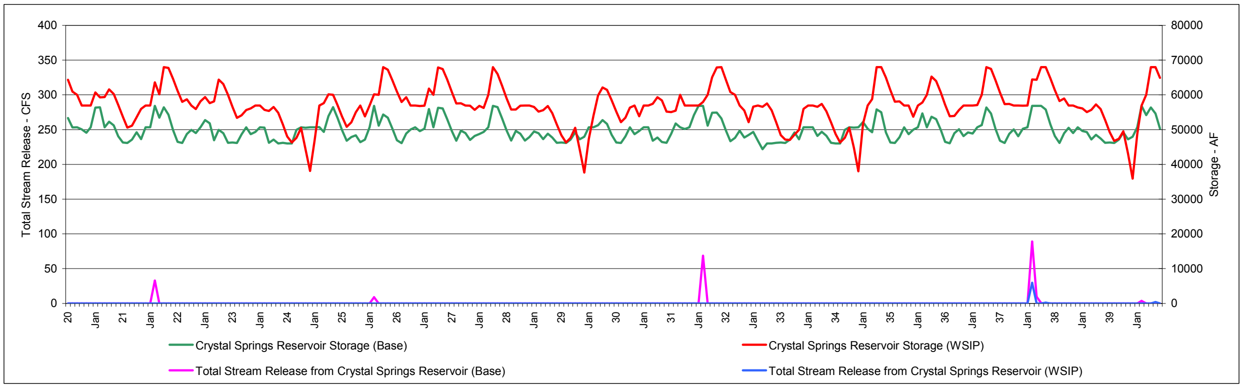
Figure 2.8-2 illustrates the average monthly storage in Crystal Springs Reservoir for the 82-year simulation, and the range in storage for each month for the WSIP and base settings. Consistent with the discussion above, the WSIP setting would result in reservoir storage operating at a higher average and higher upper-range than the base setting. This circumstance predominantly occurs due to the restoration of the operating capacity of Crystal Springs Reservoir.

There is minimal difference in stream releases between the WSIP and the base setting (which could be either an increase or decrease in the release). The potential difference is attributed to whether the resulting storage in the reservoir is higher or lower between the two settings. Part of the difference in modeled Crystal Springs Reservoir storage is due to modeling assumptions for the proportionate management of storage among the Bay Area reservoirs, and the coincidence of constrained conveyance flow rates. In actual operations, it is anticipated that system operators would manage the reservoir system such that stream releases would be minimal under any setting and essentially no difference would occur between the WSIP and base settings.

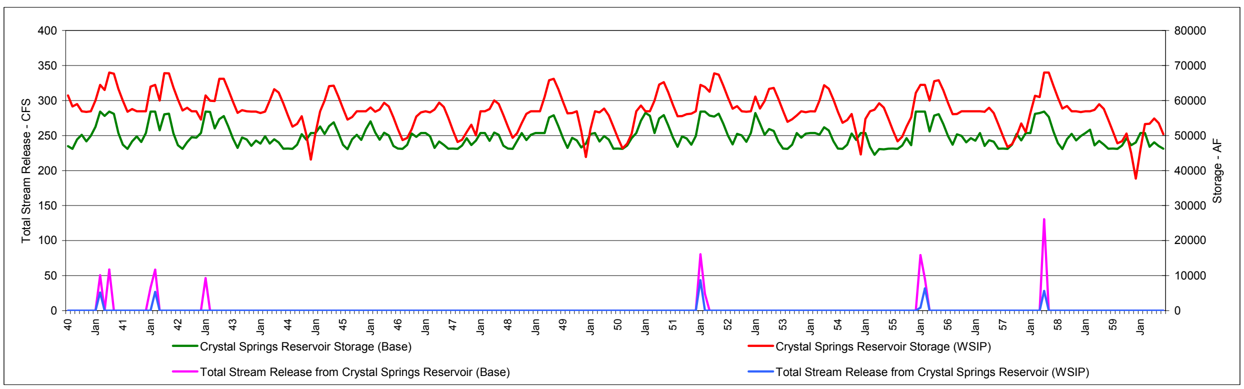
APPENDIX O1

Figure 2.8-1
Crystal Springs Reservoir Storage and Release

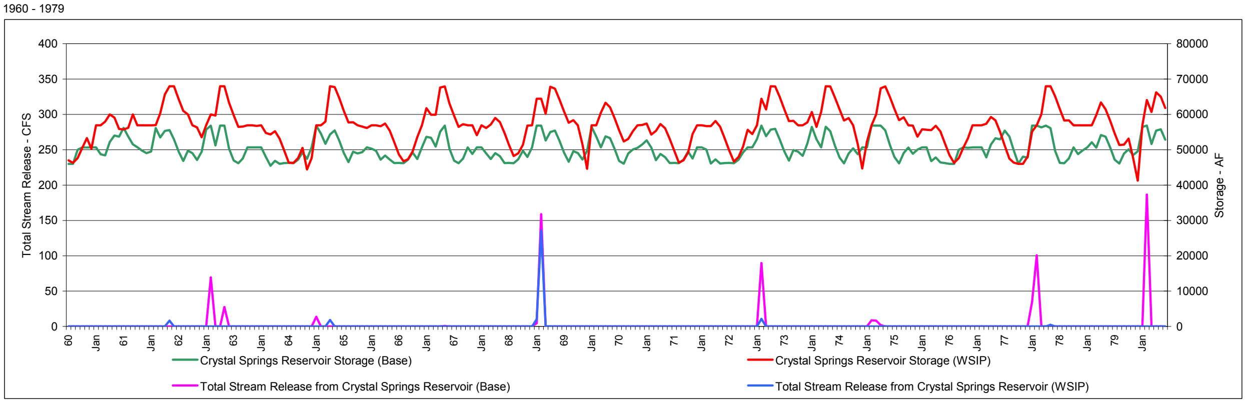
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

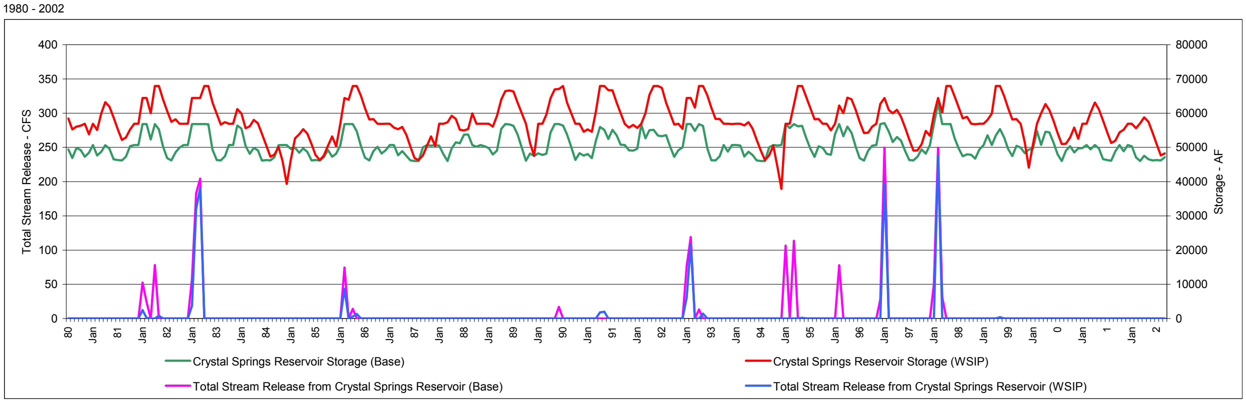


Figure 2.8-2

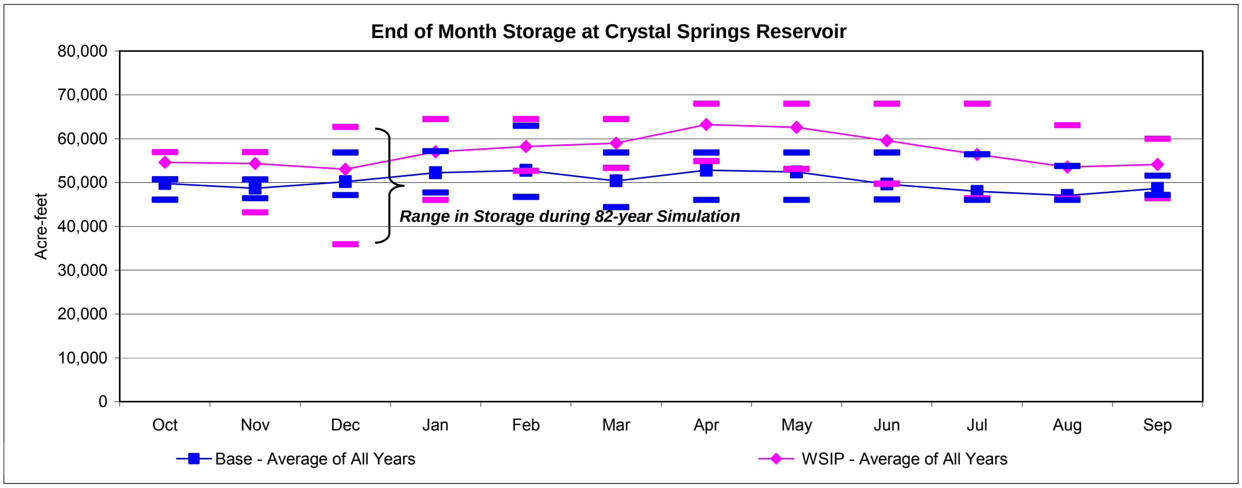


Table 2.8-1 illustrates the stream releases for the WSIP and base settings, and the difference in modeled flows between the two settings. A greater range in Crystal Springs Reservoir operation would lead to an increased potential to regulate reservoir inflow, which would lead to less risk in needing to make stream releases. However, as described above, actual system operations will attempt to minimize releases under any setting; thus, the difference in releases between the WSIP and base setting will be minimal, if any.

Table 2.8-1

Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	1,098	2,435	732	115	48	0	0	0	0	4,428
Above Normal	0	0	0	111	353	0	32	47	0	0	0	0	544
Normal	0	0	0	0	0	0	0	31	0	0	0	0	31
Below Normal	0	0	0	0	0	0	31	35	0	0	0	0	67
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	0	237	548	143	36	33	0	0	0	0	997

Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	107	2,744	4,279	1,376	1,047	2	0	0	0	0	9,556
Above Normal	0	0	0	618	1,343	29	52	100	0	0	0	0	2,142
Normal	0	0	0	0	268	0	0	0	0	0	0	0	268
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	62	0	0	0	62
All Years	0	0	21	664	1,166	274	215	21	12	0	0	0	2,373

Difference in Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP minus Base

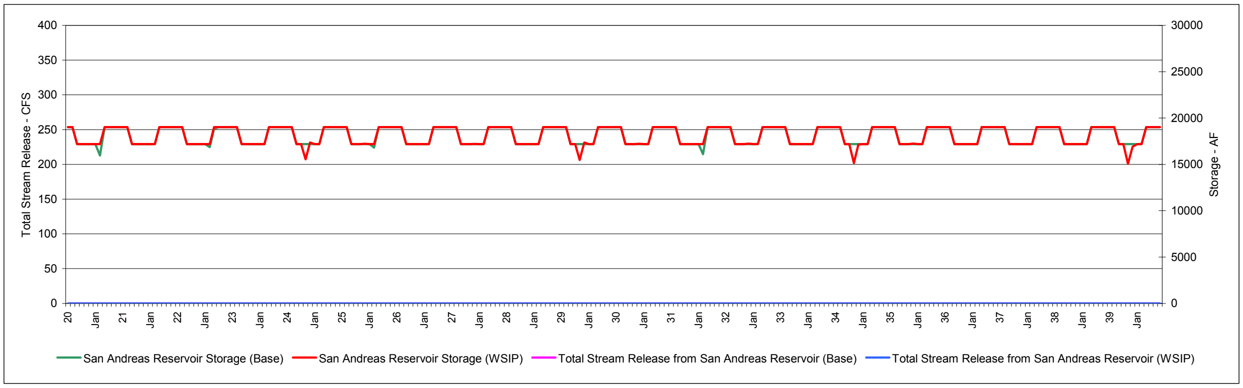
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-107	-1,646	-1,844	-643	-932	46	0	0	0	0	-5,127
Above Normal	0	0	0	-507	-990	-29	-20	-52	0	0	0	0	-1,598
Normal	0	0	0	0	-268	0	0	31	0	0	0	0	-237
Below Normal	0	0	0	0	0	0	31	35	0	0	0	0	67
Dry	0	0	0	0	0	0	0	0	-62	0	0	0	-62
All Years	0	0	-21	-426	-617	-132	-179	12	-12	0	0	0	-1,376

San Andreas Reservoir operations would generally be the same between the WSIP and base settings. Reservoir storage would follow a systematic filling and lowering each year. Figure 2.8-3 illustrates a chronological trace of the simulation of San Andreas Reservoir storage and stream releases from Crystal Springs Dam. Shown in Figure 2.8-3 are the results for the WSIP and base settings. There are no projected stream releases from San Andreas Reservoir in any setting. Notable in Figure 2.8-3 is the difference in storage operation every fifth year. The WSIP setting storage operation differs from that in the base settings. The differences in operation arise from the assumed difference in Hetch Hetchy conveyance maintenance in each setting. In the WSIP setting, the maintenance occurs systematically every year, and to a greater degree every fifth year, which constrains the amount of Hetch Hetchy water supplied to serve water demands in the Bay Area. As discussed previously, during these winter periods, the Bay Area reservoir system accommodates the reduction in imported supply by serving the Bay Area water deliveries with the local watersheds' runoff and storage. At San Andreas Reservoir, the serving of

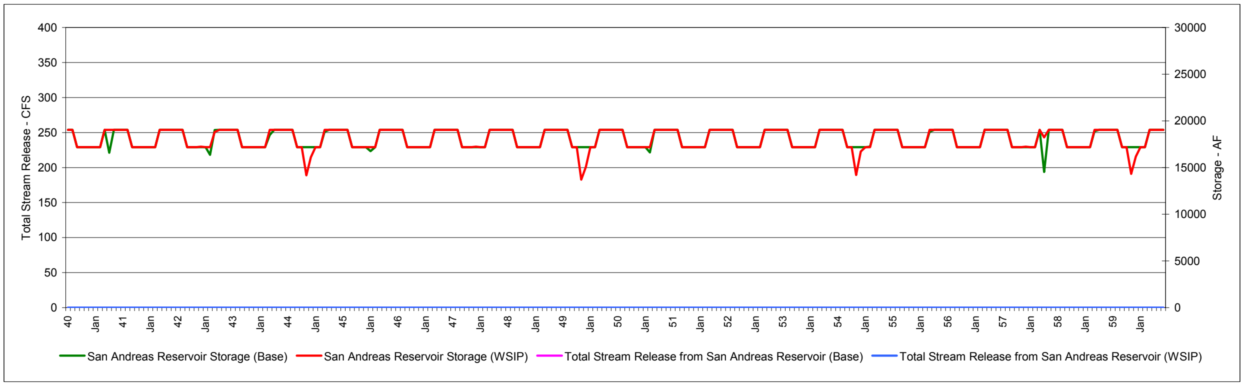
APPENDIX O1

Figure 2.8-3
San Andreas Reservoir Storage and Stream Release

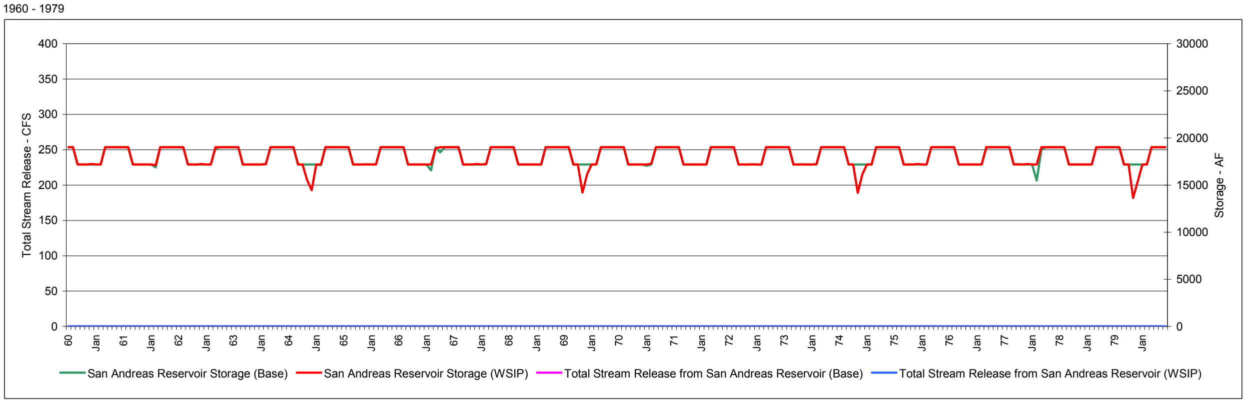
1920 - 1939



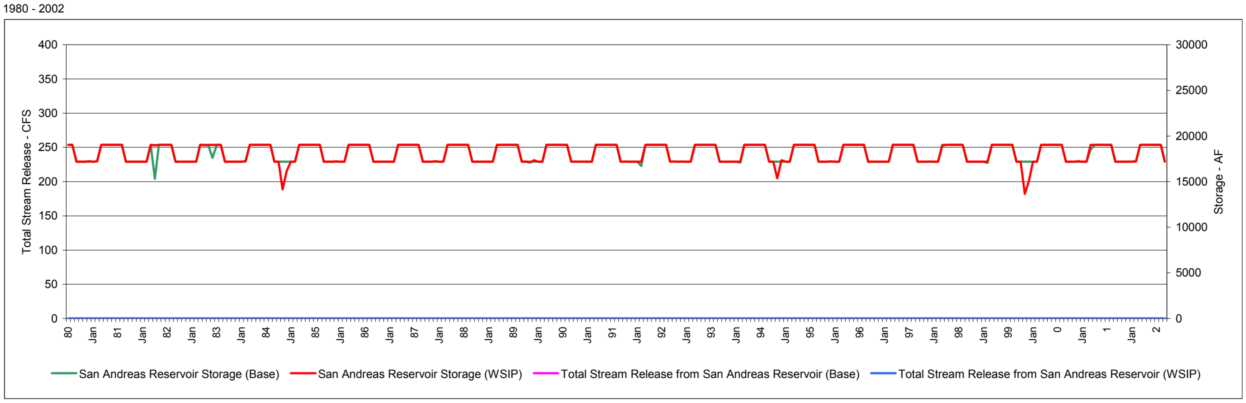
1940 - 1959



1960 - 1979

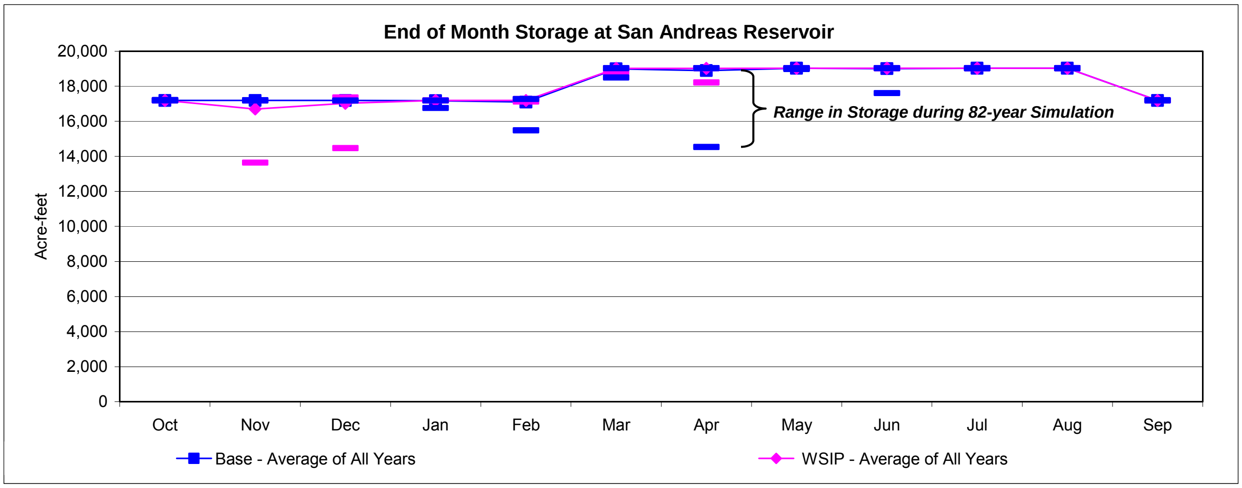


1980 - 2002



water demand affects the reservoir when additional required water production at Harry Tracy Water Treatment Plant (Harry Tracy WTP) associated with the WSIP or the base-Calaveras unconstrained setting exceeds the ability to maintain San Andreas Reservoir storage with pumping from Crystal Springs Reservoir. The model assumes that the conveyance capacity from Crystal Springs Reservoir is the same among all of the settings. The additional water demand of the WSIP setting and the current demand of the base-Calaveras unconstrained setting require additional production from Harry Tracy WTP to be drawn from San Andreas Reservoir. Figure 2.8-4 illustrates the average monthly storage in San Andreas Reservoir for the 82-year simulation, and the range in storage for each month for the WSIP and base settings.

Figure 2.8-4



2.9 Pilarcitos Reservoir

The Coastside County Water District's (Coastside CWD) water demand and its SFPUC purchase request are projected to increase within the WSIP planning horizon of 2030. Within the context of the 2030 purchase request of 300 mgd, Coastside CWD's portion has been estimated to amount to about 3 mgd. This projected purchase request is approximately 1 mgd greater that its current purchase request. Considering the current physical constraints to deliveries from the SFPUC to Coastside CWD and the ongoing planning activities in the watershed, the precise means of serving Coastside CWD's additional purchase request (and the resultant potential changes in the operation of SFPUC facilities and their affected environs) are uncertain.[2]

Assuming a range of potential means to serve the additional purchase request from Coastside CWD, the following are potential hydrologic effects on SFPUC facilities and their affected environs:

- Due to limited yield from Pilarcitos Reservoir, additional diversions would be required from Crystal Springs Reservoir.
- If deliveries to Coastside CWD from Pilarcitos Reservoir increase during the winter season, these deliveries could potentially reduce storage in Pilarcitos Reservoir, thereby potentially reducing diversions to the San Mateo Creek watershed. Although the increased delivery would increase releases to Pilarcitos Creek from Pilarcitos Dam for a period of time, the increase would subsequently lead to a reduction in spills past Stone Dam.
- Additional wintertime deliveries could also potentially impair the ability to provide carryover storage into the summer season from Pilarcitos Reservoir, and subsequently lead to an acceleration of the beginning of the season when releases to Pilarcitos Creek from Pilarcitos Reservoir consist only of the passage of reservoir inflow.

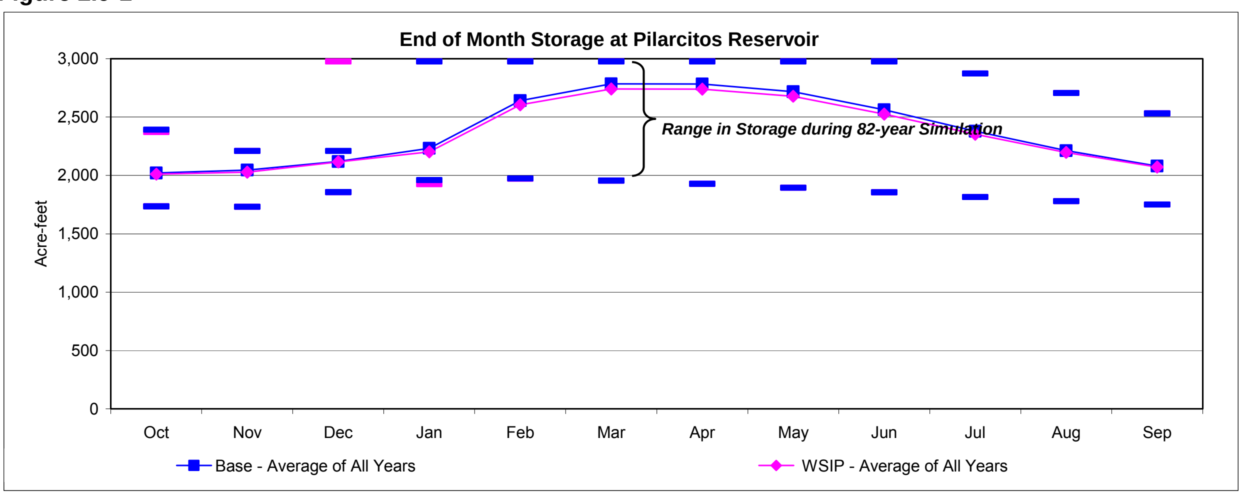
[2] See "Analysis of SFPUC Pilarcitos/Coastside County Water District Operations," Memorandum by Daniel B. Steiner, March 8, 2007.

- An increase in summertime deliveries from Pilarcitos Creek could also accelerate the beginning of the season when releases to Pilarcitos Creek from Pilarcitos Reservoir consist only of the passage of reservoir inflow.

Figure 2.9-1 illustrates the average monthly storage in Pilarcitos Reservoir for the 82-year simulation, and the range in storage for each month for the WSIP and base settings for one possible outcome of the SFPUC providing deliveries for Coastside CWD's increase in demand. Figure 2.9-2 illustrates a chronological trace of the simulation of Pilacitos Reservoir storage and stream releases from Pilarcitos Dam. Shown in the figures are the results for the WSIP and base settings. Assumed in the operation is an increase in purchase request by Coastside CWD, distributed on a proportionate monthly pattern during the year consistent with historical SFPUC deliveries. Also assumed is a conveyance constraint of 2 mgd to Coastside CWD from the Pilarcitos Creek source of water. When the assumed monthly purchase request of Coastside CWD exceeds this conveyance constraint, Coastside CWD's request is met with deliveries from Crystal Springs Reservoir.

The effect of the assumed Coastside CWD operation in combination with the effects of the rest of the SFPUC regional system operation results in occasional differences in the storage operation of Pilarcitos Reservoir. Overall, there would be a slightly lower average storage at Pilarcitos Reservoir. Several factors contribute to the changes. Additional water is drawn from Pilarcitos Reservoir to the San Mateo Creek watershed in reaction to additional demands being served from the SFPUC system. Pilarcitos Reservoir is at times also drawn to meet the increase in demand from Coastside CWD during months (e.g., spring months) when available conveyance capacity from Stone Dam exists. Both of these additional draws from the reservoir would deplete storage below that experienced in the base setting. Pilarcitos storage would typically replenish at the expense of reservoir spills that would have occurred at a future date, and within a year storage would end the same as in the base setting, as the reservoir would still be subsequently depleted to the minimum level at the spillway crest.

Figure 2.9-1



Stream releases from Pilarcitos Dam are also shown in Figure 2.9-2. Releases can occur for diversions at Stone Dam for Coastside CWD deliveries, conveyance to the San Mateo Creek watershed (e.g., Crystal Springs Reservoir), and reservoir spills. Pilarcitos Creek typically gains flow from unregulated tributary streams and runoff below Pilarcitos Dam. The differences in flow between the WSIP setting and base setting are shown chronologically in Table 2.9-1 and summarized by monthly averages within year types in Table 2.9-2. The positive changes in flows during the winter and spring are indicative of the additional draw of water from the reservoir to serve the increased demand of Coastside CWD during the period when conveyance capacity exists from Stone Dam. The few reductions in flow during the summer are indicative of years when additional releases earlier in a year lead to the reservoir being depleted to minimum storage earlier in the year, thus reducing the amount of water released in a later month. Reductions in flow during the winter and spring are indicative of the reservoir replenishing additionally depleted storage associated with the WSIP setting.

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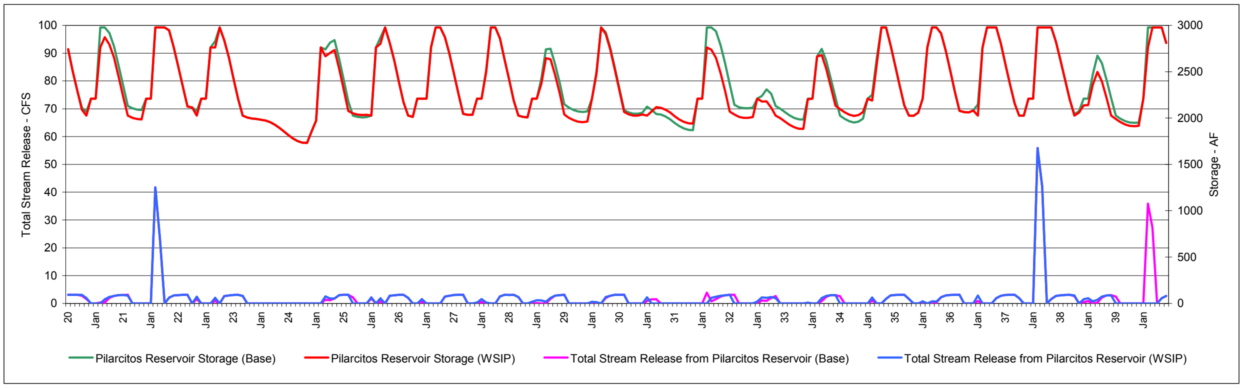
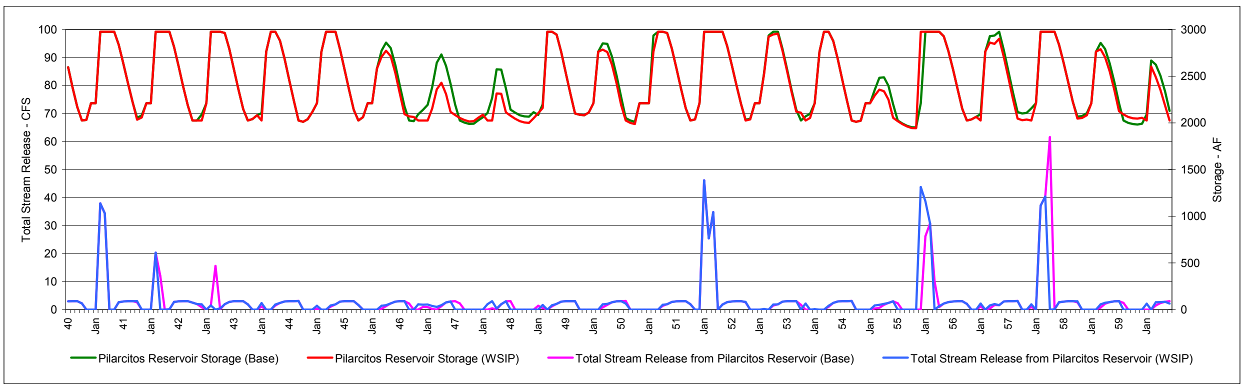
Figure 2.9-2
Pilarcitos Reservoir Storage and Stream Release

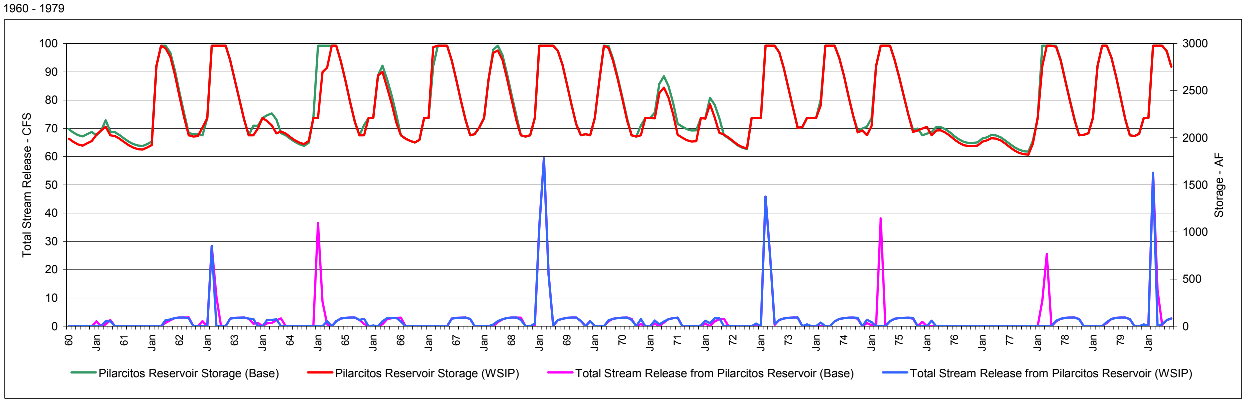
1920 - 1939



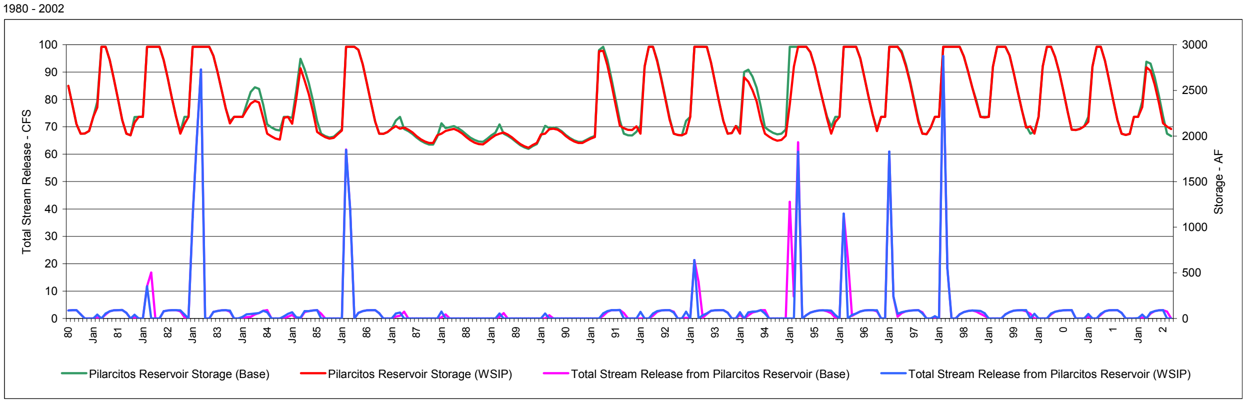
1940 - 1959



1960 - 1979



1980 - 2002



APPENDIX O1

Table 2.9-1

Difference in Total Stream Release from Pilarcitos Reservoir (Acre-feet)

WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	21	21	0	0	-21	68	21	0	0	0	-15	0	95
1922	0	0	0	3	0	0	0	0	0	0	0	0	3
1923	0	51	0	0	0	68	0	0	0	0	0	0	119
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	75	36	0	0	0	0	-128	-18
1926	0	0	0	24	0	68	0	0	0	0	0	0	92
1927	0	0	64	0	0	0	0	0	0	0	0	0	64
1928	0	0	21	64	18	0	0	0	0	0	0	0	104
1929	0	0	37	64	58	37	21	0	0	0	0	0	217
1930	0	0	0	34	25	0	21	0	0	0	0	0	79
1931	0	0	0	79	-80	-92	0	0	0	0	0	0	-93
1932	0	0	0	0	-211	79	52	17	0	0	-187	0	-250
1933	0	0	0	40	61	68	21	-43	0	0	0	0	146
1934	0	0	15	0	0	68	21	0	0	-157	0	0	-53
1935	0	0	0	0	64	0	0	0	0	0	0	0	64
1936	0	0	0	46	0	46	21	0	0	0	0	0	113
1937	0	0	0	122	0	0	0	0	0	0	0	0	122
1938	0	0	0	0	0	0	0	0	0	0	0	0	0
1939	16	0	64	64	40	68	21	0	-6	-150	0	0	117
1940	0	0	0	0	-1,991	-1,677	0	0	0	0	0	0	-3,668
1941	0	0	0	0	0	0	0	0	0	0	0	0	0
1942	21	0	0	0	0	-734	0	0	0	0	0	0	-713
1943	0	0	64	0	0	-958	21	0	0	0	0	0	-874
1944	0	0	0	77	0	0	21	0	0	0	0	0	98
1945	0	0	0	64	0	0	21	0	0	0	0	0	85
1946	0	0	0	0	0	68	21	0	0	0	0	-128	-40
1947	0	110	48	54	61	58	21	0	0	-187	-136	0	30
1948	0	0	0	0	107	160	21	0	0	-187	0	0	101
1949	0	0	0	-83	61	0	21	0	0	0	0	0	-2
1950	0	0	0	0	0	68	21	0	0	0	-58	0	30
1951	0	0	0	0	0	0	21	0	0	0	0	0	21
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	7	0	0	0	12	0	21	0	0	0	0	0	40
1954	-104	128	0	9	0	0	21	0	0	0	0	0	54
1955	0	0	0	0	61	68	21	0	0	-137	0	0	13
1956	0	0	2,689	766	0	-624	21	0	0	0	0	0	2,851
1957	0	0	0	68	0	68	21	0	0	0	0	0	157
1958	0	0	59	0	0	0	-3,661	0	0	0	0	0	-3,602
1959	21	0	0	0	0	68	21	0	0	0	-148	0	-38
1960	0	0	0	129	0	68	21	0	-49	0	0	0	168
1961	0	0	0	-104	0	75	-30	0	0	0	0	0	-59
1962	0	0	0	0	0	0	52	17	0	0	0	-18	51
1963	0	0	-107	0	0	-639	0	0	0	0	0	0	-747
1964	1	101	-74	0	61	68	21	-166	0	0	0	0	11
1965	0	0	0	-2,248	-485	68	0	0	0	0	0	0	-2,666
1966	0	110	0	15	0	68	21	0	0	-86	0	0	128
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	34	21	0	0	0	0	-49	6
1969	0	0	55	0	0	0	12	0	0	0	0	0	68
1970	0	0	0	0	0	0	21	0	0	0	0	-20	1
1971	0	106	0	0	61	40	21	0	0	0	0	0	227
1972	0	0	15	64	61	68	21	-162	0	0	0	0	67
1973	0	0	55	0	0	0	21	0	0	0	0	0	76
1974	0	37	0	0	61	0	0	0	0	0	0	0	98
1975	21	0	72	64	0	-2,341	0	0	0	0	0	0	-2,184
1976	21	0	-93	0	108	0	0	0	0	0	0	0	36
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	-503	-1,569	0	17	0	0	0	0	-2,054
1979	-10	0	0	0	0	0	21	0	0	0	0	0	11
1980	0	0	37	0	0	-783	21	0	0	0	0	0	-726
1981	0	0	0	0	61	0	21	0	0	0	0	0	82
1982	0	62	0	0	0	-1,032	0	0	0	0	0	0	-970
1983	19	62	0	0	0	0	0	0	0	0	0	0	80
1984	21	0	0	34	61	68	21	0	0	-44	0	0	160
1985	0	46	64	64	21	18	21	0	0	0	-106	0	129
1986	0	0	0	0	-12	0	0	0	0	0	0	0	-12
1987	0	0	0	0	61	68	-145	0	0	0	0	0	-16
1988	0	0	0	130	-83	0	0	0	0	0	0	0	47
1989	0	0	0	0	0	75	-116	0	0	0	0	0	-41
1990	0	0	0	0	98	-73	0	0	0	0	0	0	25
1991	0	0	0	0	0	0	52	17	0	0	0	-117	-47
1992	0	0	0	148	0	0	52	17	0	0	0	-17	201
1993	0	0	138	0	0	-820	52	17	0	0	0	0	-613
1994	-1	0	0	62	0	68	21	0	0	-75	0	0	74
1995	0	0	0	-2,620	-442	-213	0	0	0	0	0	0	-3,275
1996	21	53	64	0	0	-1,360	21	0	0	0	0	0	-1,201
1997	21	0	0	0	0	68	21	0	0	0	0	-20	90
1998	0	0	49	0	0	0	0	0	0	0	0	0	49
1999	21	62	64	0	0	0	0	0	0	0	0	0	147
2000	21	-101	104	0	0	0	21	0	0	0	0	0	45
2001	0	0	0	64	0	0	21	0	0	0	0	0	85
2002	0	0	0	6	61	0	21	0	0	0	-155	0	-67
Avg (21-02)	2	10	43	-33	-31	-132	-34	-3	-1	-12	-10	-6	-208

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Table 2.9-2

Total Stream Release from Pilarcitos Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	57	11	188	837	2,116	1,563	19	70	152	175	183	176	5,547
Above Normal	63	44	47	15	432	102	31	117	161	181	185	169	1,546
Normal	56	9	8	34	32	32	83	143	171	183	152	116	1,018
Below Normal	52	28	9	39	23	61	126	146	164	149	96	47	940
Dry	38	7	13	59	44	79	61	56	51	7	0	0	416
All Years	53	20	53	193	522	360	64	107	141	140	124	102	1,878

Total Stream Release from Pilarcitos Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	54	3	4	953	2,144	1,770	242	70	152	175	183	177	5,927
Above Normal	56	37	20	137	605	641	22	115	161	181	186	169	2,328
Normal	55	3	7	15	24	9	60	139	171	185	164	128	960
Below Normal	57	6	7	15	6	23	103	154	164	171	124	65	894
Dry	36	0	11	26	17	41	70	69	55	44	8	0	378
All Years	52	10	10	225	553	493	98	110	141	152	134	108	2,085

Difference in Total Stream Release from Pilarcitos Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	4	8	184	-116	-28	-207	-223	0	0	0	0	-1	-380
Above Normal	6	7	27	-121	-173	-539	9	2	0	0	-1	0	-782
Normal	1	7	1	19	8	23	23	3	0	-3	-12	-11	59
Below Normal	-5	23	2	24	17	38	24	-9	0	-22	-28	-17	46
Dry	2	7	2	32	27	38	-9	-13	-3	-37	-8	0	38
All Years	2	10	43	-33	-31	-132	-34	-3	-1	-12	-10	-6	-208

The effect of the WSIP on Pilarcitos Creek flows below Stone Dam is different than the effect on flows below Pilarictos Dam. Figure 2.9-3 illustrates the chronological trace of inflow to Stone Dam, which includes releases from Pilarcitos Dam to Pilarcitos Creek and unregulated flow occurring to the stream below Pilarcitos Dam, and releases (spills) from Stone Dam to Pilarcitos Creek. Shown in the figure are the results for the WSIP setting and the base setting. The flow past Stone Dam is typically minor (zero in modeling results, but may be measurable in terms of leakage and seepage past the dam), as inflow to the dam is diverted to Coastside CWD or to the San Mateo watershed. Releases past Stone Dam are typically the result of unregulated flow below Pilarcitos Dam exceeding the delivery needs of Coastside CWD at a time when the storage level at Crystal Springs Reservoir rejects the water from the Pilarcitos watershed.

The changes in flow below Stone Dam would typically occur during the rainy season between the months of January and March, in at least one month during about half of the years. Table 2.9-3 summarizes the results of the WSIP and base settings in terms of average monthly flows by year type, and the average differences in flow between the two settings.

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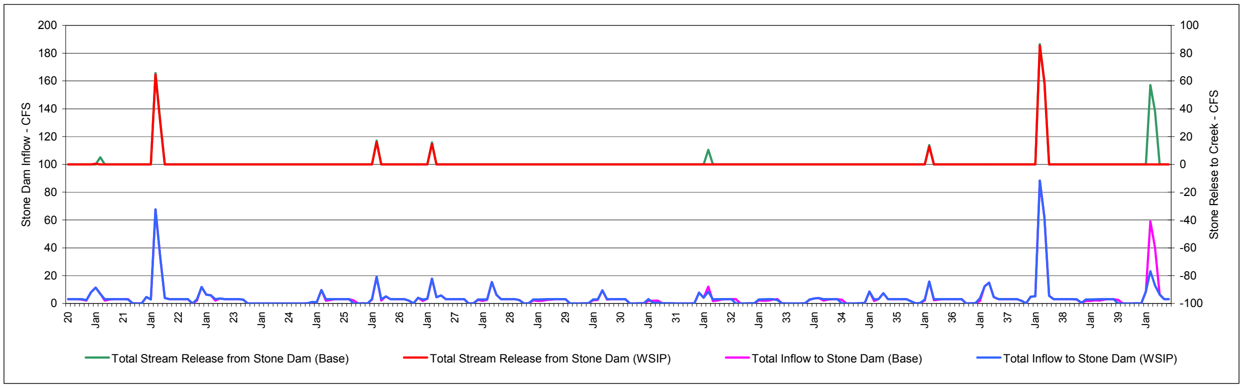
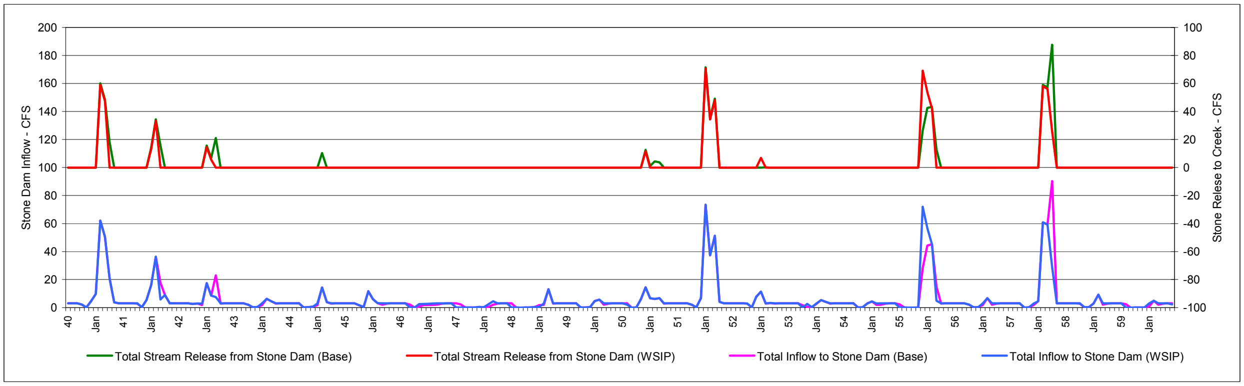
Figure 2.9-3
Stone Dam Stream Release and Inflow

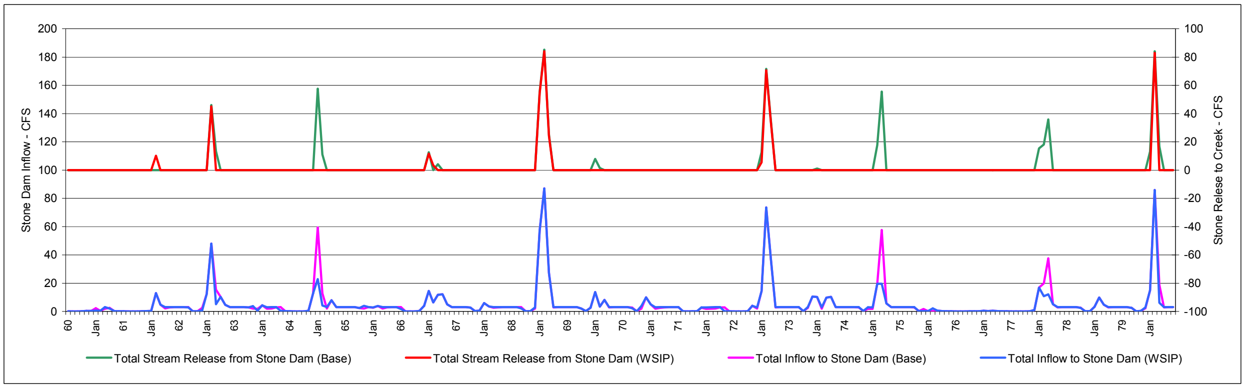
1920 - 1939



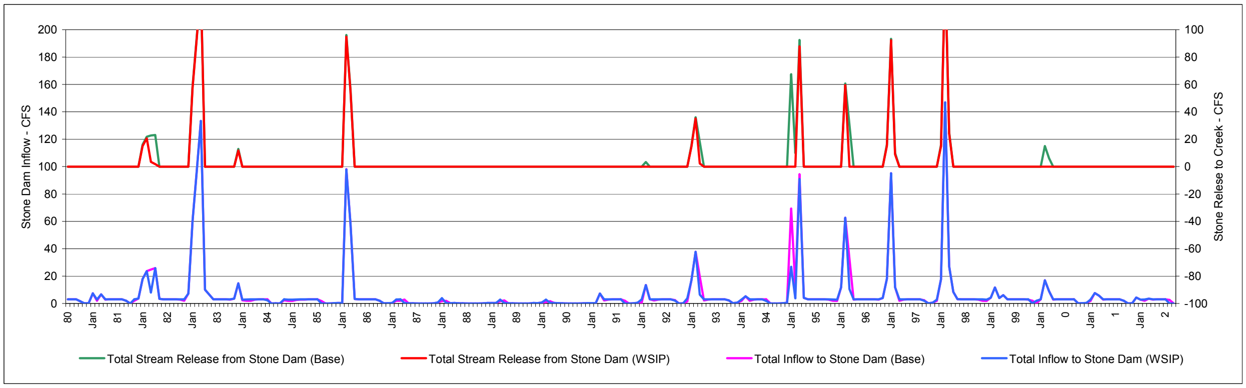
1940 - 1959



1960 - 1979



1980 - 2002



APPENDIX O1

Table 2.9-3

Total Stream Release from Stone Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

											WSIP		
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	324	1,493	3,176	2,188	103	0	0	0	0	0	7,282
Above Normal	0	0	42	108	734	120	0	0	0	0	0	0	1,003
Normal	0	0	45	27	135	0	0	0	0	0	0	0	208
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	81	319	798	452	20	0	0	0	0	0	1,669

Total Stream Release from Stone Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

											Base		
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	164	1,819	3,252	2,509	479	0	0	0	0	0	8,223
Above Normal	0	0	46	384	1,174	921	0	0	0	0	0	0	2,525
Normal	0	0	49	30	197	0	0	0	0	0	0	0	276
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	51	440	917	680	94	0	0	0	0	0	2,182

Difference in Total Stream Release from Stone Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

											WSIP minus Base		
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	160	-326	-77	-322	-377	0	0	0	0	0	-941
Above Normal	0	0	-4	-277	-440	-801	0	0	0	0	0	0	-1,522
Normal	0	0	-4	-3	-62	0	0	0	0	0	0	0	-69
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	30	-122	-118	-229	-74	0	0	0	0	0	-513

APPENDIX O2

Memorandum

Subject: **HH/LSM Assumptions and Results – CEQA Alternatives Modified WSIP**

From: **Daniel B. Steiner**

Date: **April 29, 2008**

1. Introduction

This memorandum summarizes assumptions for, and discusses the interpretation of, the HH/LSM results for the simulation of the CEQA alternative referred to as the Modified WSIP Alternative. The Draft PEIR analyzed six CEQA alternatives: (1) No Program, (2) No Purchase Request Increase, (3) Aggressive Conservation/Water Recycling and Local Groundwater, (4) Lower Tuolumne River Diversion, (5) Year-round Desalination at Oceanside Alternative, and (6) Regional Desalination for Drought. The scenarios represent CEQA program alternatives that vary from the WSIP on key program components in a manner expected to avoid or reduce potentially significant effects of the proposed program. The Modified WSIP Alternative supplements the previously described analyses. Tables 1-1 and 1-2 summarize the components, various modeling assumptions, and performance and hydrologic results for the Modified WSIP Alternative in comparison to the modeled existing (2005) base setting (with Calaveras Reservoir constrained by DSOD restrictions) and the WSIP setting.

The hydrology that would result under this alternative is primarily discussed in terms of a comparison to the proposed program and contrasted to the baseline condition of the PEIR, namely the simulated current (2005) operation of the SFPUC regional water system assuming that the Calaveras and Crystal Springs Reservoirs operation are constrained by DSOD restrictions. Only primary hydrologic parameters such as projected water deliveries, reservoir storage, and stream flows are compared, and only those parameters that have been identified as key hydrologic factors that could lead to environmental impacts are illustrated.

APPENDIX O2

Table 1-1
Setting Characteristics and Modeling Assumptions (Part 1/3)

Assumptions and Characteristics of Setting and/or Program	Units	Baseline: Baseline Conditions[1] - Calaveras Constrained	Proposed WSIP	CEQA Alternatives[3]: Modified WSIP
Time Horizon for Setting of Analysis / Date[4]		2005	2030	2030
HH/LSM Simulation Study Name[5]		Base1LT	WSIP1LT	ModWSIPLT
System Wide Parameters				
Customer Purchase Request (Demand Level)[6]	MGD	265	300	300
Demand Level Supplied from Other Sources[7]				
Regional Recycled Water/Conservation/Groundwater in SF	MGD	0	10	10
Other Regional Recycled Water/Conservation/Groundwater	MGD	0	0	10
Demand Level Supplied from Tuolumne + Local Watersheds[8]	MGD	265	290	280
Average Annual Deliveries and Supplies[9]				
Deliveries from Tuolume + Local Watersheds (Average Annual)	MGD	258	287	277
Supply or Deliveries from Other Sources - Regional Recl/Cons/GW	MGD	0	10	20
Total Deliveries and Supply for Demand Level (Average Annual)	MGD	258	297	297
Features and Facilities[10]				
Regional Reclaimed Water/Conservation/Groundwater - SF			●	●
Regional Reclaimed Water/Conservation/Groundwater - Other				●
Calaveras Reservoir - 12.4 BG (Constrained)		●		
Calaveras Reservoir - 31.6 BG (Restored/Unconstrained)			●	●
Calaveras Reseroivr Release for Fish			●	●
Calaveras Reservoir Release for Fish & Flow Recapture			●	●
Alameda Creek Diversion Dam Bypass Flow & Recapture				●
Pilarcitos Reservoir Pump for Creek Summer Release				●
Crystal Springs Reservoir - 18.52 BG (Constrained)		●		
Crystal Springs Reservoir - 20.28 BG (Restricted)				●
Crystal Springs Reservoir - 22.15 BG (Restored/Unconstrained)			●	●
Sunol Valley Water Treatment Plant Expansion			●	●
Sunol Valley Water Treatment Plant Feed from SJPL			●	●
Harry Tracy Water Treatment Plant Expansion			●	●
Bay Division Pipeline Increased Conveyance			●	●
San Joaquin Pipeline Increased Conveyance			●	●
Desalination Project				
Westside Groundwater Project			●	●
Tuolumne River Transfer			**29,350 (From Storage)**	**19,600 (From Conserved Water)**
Water Supply Reliability[11]				
Action	Level	Rationing %	Rationing %	Rationing %
Implement Drought Water Supply Action (Westside GW or Desal)	1	NA	GW	GW
Rationing (Level 1)	2	10	10	10
Rationing (Level 2)	3	20	20	20
Rationing (Level 3)	4	25	25	25
	Years	Action Level	Action Level	Action Level
	1921			
	1924	2	1	1
	1925		1	1
	1926		1	1
	1929		1	1
	1930		1	1
	1931	3	2	2
	1932			
	1933			
	1934	2	1	1
	1935			
	1939			
	1944			
	1946			
	1947			
	1948		1	1
	1949			
	1950		1	
	1953			
	1954			
	1955		1	1
	1957			
	1959			
	1960	2	1	1
	1961	3	2	2
	1962			
	1964		1	1
	1966			
	1968			
	1971			
	1972		1	1
	1976	2	1	1
	1977	3	2	2
	1979			
	1981			
	1984			
	1985		1	1
	1987	2	1	1
	1988	3	2	2
	1989	3	2	2
	1990	3	3	3
	1991	3	2	2
	1992	3	3	3
	1994	2	1	1
	DD1993	4	3	3
	DD1994	4	3	3
Max Drought Rationing - Policy Cap[12]	DD	Incidental 25%	20%	20%
	Historical	Incidental 20%	20%	20%

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Table 1-1
Setting Characteristics and Modeling Assumptions (Part 2/3)

Assumptions and Characteristics of Setting and/or Program	Units	Baseline: Baseline Conditions[1] - Calaveras Constrained	Proposed WSIP	CEQA Alternatives[3]: Modified WSIP
System Wide Parameters				
Incremental Supply - Average[13]				
System Customer Purchase Request Level	MGD	265	300	300
Demand Level Supplied from Other Sources	MGD	0	10	20
Demand Level Supplied from Tuolumne + Local Watersheds	MGD	265	290	280
System Deliveries	MGD	258	287	277
Regional Desalination	MGD	0	0	0
San Joaquin Pipelines (Tuolumne Diversion)	MGD	221	245	236
Inferred Local Watershed Production	MGD	37	41	40
Addt'l Tuolumne Diversion (Compared to Calaveras Constrained)	MGD		24	15
Incremental Design Drought Supply[14]				
From Other Sources - Regional Recl/Cons/GW (Every Year)	MGD	0	10	20
Restoration of Calaveras Reservoir Capacity (w/ flow recapture)	MGD	0	7	7
Restoration of Crystal Springs Capacity[21]		0	1	0
MID/TID Transfer to SFPUC (Results in additional diversion from TR)	MGD	0	25	17
Westside Basin Conjunctive Use (8,100 acre-feet Storage)	MGD	0	6	6
Regional Desalination (26 mgd)	MGD	0	0	0
Sum of Incremental Supplies	MGD	0	48	49
Yield - Without Other Sources Added (Compared to Calaveras Constrained)	MGD	219	257	248
Yield - With Other Sources Added (Compared to Calaveras Constrained)	MGD	219	267	268
Design Drought Delivery Calculator[15]				
	MGD			
Average Annual Delivery During	Year 1	265	290	280
Average Annual Delivery During	Year 2	239	290	280
Average Annual Delivery During	Year 3	212	261	252
Average Annual Delivery During	Year 4	212	261	252
Average Annual Delivery During	Year 5	212	232	224
Average Annual Delivery During	Year 6	212	261	252
Average Annual Delivery During	Year 7	212	232	224
Average Annual Delivery During	Year 8	199	232	224
Average Annual Delivery During	Last 6 Mo	99	116	112
	DD Ave	219	256	247
Firm Yield (Nominal) Not Including Other Sources	MGD	219	256	247
Local System Operational Parmeters				
Crystal Springs Reservoir Operation				
Storage - Minimum/Maximum	BG	5.4 - 18.52	5.4 - 22.15	5.4 - 20.28
	TAF	16.6 - 56.8	16.6 - 68.0	16.6 - 62.2
Fall/Winter Operation Storage		16.52 BG (50.7 TAF)	18.55 BG (56.9 TAF)	18.28 BG (56.1 TAF)
Stream Release		Up to 250 cfs to not exceed 18.52 BG	Up to 250 cfs to not exceed 21 BG	Up to 600 cfs to not exceed 20.28 BG
Calaveras Reservoir Operation				
Storage - Minimum/Maximum	BG	8.4 - 12.4	8.4 - 31.5	Same
	TAF	25.7 - 38.0	25.7 - 96.8	as
Fall/Winter Operation Storage		10.3 BG (31.6 TAF)	27.0 BG (82.9 TAF)	WSIP
Alameda Creek Release/Recapture[16]	AFY	0	Up to 6,300	Same as WSIP
San Andreas Reservoir Operation				
Storage - Minimum/Maximum	BG	3.0 - 6.2	3.0 - 6.2	Same
	TAF	9.2 - 19.0	9.2 - 19.0	as
Fall/Winter Operation Storage		5.6 BG (17.2 TAF)	5.6 BG (17.2 TAF)	Baseline and WSIP
San Antonio Reservoir Operation				
Storage - Minimum/Maximum	BG	1.0 - 16.5	1.0 - 16.5	Same
	TAF	3.1 - 50.5	3.1 - 50.5	as
Fall/Winter Operation Storage		15.9 BG (48.8 TAF)	15.9 BG (48.8 TAF)	Baseline and WSIP
Pilarcitos Reservoir Operation				
Storage - Minimum/Maximum	BG	0.66 - 0.97	0.66 - 0.97	Same as Baseline and WSIP
	TAF	2.0 - 3.0	2.0 - 3.0	Allowed to draw additional
Fall/Winter Operation Storage		0.72 BG (2.2 TAF)	0.72 BG (2.2 TAF)	0.1 BG (0.3 TAF) for summer flow
Water Treatment Plants				
Sunol Valley Water Treatment Plant Maximum	MGD	120	160	Same as WSIP
		90 MGD from Calaveras	90 MGD from Calaveras + Recapture	Same as WSIP
Sunol Valley Water Treatment Plant Minimum	MGD	20	20	Same as Baseline and WSIP
		From Calavers & San Antonio & SJPL	From Calavers & San Antonio & SJPL	Same as Baseline and WSIP
Harry Tracy Water Treatment Plant Maximum	MGD	120	140	Same as WSIP
Harry Tracy Water Treatment Plant Minimum	MGD	20	20	Same as Baseline and WSIP
Conveyance				
Bay Division Pipeline Maximum		340 MGD Jun - Sep 320 MGD Apr, May & Oct 290 MGD Nov - Mar	380 MGD Apr - Oct 320 MGD Nov - Mar	Same as WSIP
Bay Division Pipeline Maintenance		Cycle one pipeline out Nov - Mar each year (average remaining capacity rotation) maximum 230 MGD	Same as Baselines, except maximum 320 MGD	Same as WSIP

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Table 1-1
Setting Characteristics and Modeling Assumptions (Part 3/3)

Assumptions and Characteristics of Setting and/or Program	Units	Baseline: Baseline Conditions[1] - Calaveras Constrained	Proposed WSIP	CEQA Alternatives[3]: Modified WSIP
Tuolumne River System Operational Parameters				
Hetch Hetchy Reservoir Operation				
Storage - Minimum/Maximum	TAF	26.1 - 360.4	26.1 - 360.4	Same as Baseline and WSIP
Fall/Winter Operation Storage		30 TAF winter buffer	30 TAF winter buffer	
1987 Stipulation Minimum Release Flows		Yes	Yes	
1987 Stipulation Supplemental Release Flows		No	No	
Cherry Reservoir Operation				
Storage - Minimum/Maximum	TAF	1.0 - 273.3	1.0 - 273.3	Same as Baseline and WSIP
Fall/Winter Operation Storage		25.3 TAF winter buffer	25.3 TAF winter buffer	
Eleanor Reservoir Operation				
Storage - Minimum/Maximum	TAF	0.0 - 27.1	0.0 - 27.1	Same as Baseline and WSIP
Fall/Winter Operation Storage		Required Minimum Storage	Reqrd Minimum Stor	
New Don Pedro Water Bank Account				
Storage - Minimum/Maximum	TAF	0.0 - 570.0 Temporary storage up to 740 TAF during Apr - Sep	0.0 - 570.0 Temp stor up to 740 TAF during Apr - Sep	Same as Baseline and WSIP
Conveyance				
San Joaquin Pipelines Maximum	MGD	290	313	Same as WSIP
San Joaquin Pipelines Minimum	MGD	70	70	Same as WSIP
San Joaquin Pipelines Flow Rate Changes		11 Stepwise	17 Stepwise	Same as WSIP
		Surrogate minimum changes by allowing only 7 changes in a year	Allow up to 7 changes in a year (surrogate)	Same as WSIP
San Joaquin Pipelines Maintenance		Cycle one pipeline out Nov - Mar each year (average remaining capacity rotation) maximum 210 MGD	Cyclic 5-year mantenance (see note)	Same as WSIP
			Note: Cyclic 5-year maintenance, maximum capacity available Apr - Oct all years 271 MGD available all other months except 0 MGD available Year 5 Nov - Dec and 135.5 MGD available Year 1 and Year 3 Dec	
TID/MID Operational Parameters				
Districts' Tuolumne Diversion[17]		Varies annually based on land use and water availability Annual average 875 TAF	Set equal to baseline conditions. SFPUC effects measured by the result of reducing inflow to DP and its effect upon La Grange releases to the TR	Same as WSIP but reduced by amount of water transfer
Tuolumne River La Grange Flow Releases				
Don Pedro, 1996 FERC		X	X	X
VAMP - considered but not modeled[18]		X	X	X

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Table 1-2
Summary of Modeling Results (Part 1/2)

HH/LSM Simulation Results	Units	Baseline		CEQA Alternatives[3]
		Baseline Conditions[1] - Calaveras Constrained	Proposed WSIP	Modified WSIP
Design Drought Production & Disposition[19]				
San Joaquin Pipeline Diversion	MGD	208.7	235.0	226.7
Bay-Area Deliveries	MGD	218.3	248.9	240.0
Added Groveland & Coastside Delivery	MGD	2.6	3.6	3.6
Local Reservoir Evaporation	MGD	10.7	12.5	12.5
Inflow from ACDD	MGD	1.3	1.6	0.7
Flow Recapture	MGD	0	5.3	5.4
Local Reservoir Stream Release	MGD	0.6	5.4	4.6
Desalination	MGD	0	0	0
Westside Basin	MGD	0	5.6	5.6
District Transfer to NDP Water Bank	MGD	0	24.7	16.5
Local Storage - Begin	MG	53,854	77,310	75,440
Local Storage - End	MG	18,403	18,495	18,644
Study Average Production & Disposition (1921-02)[20]				
Tuolumne River System				
Reservoirs				
Hetch Hetchy				
Inflow	AF	749,605	749,605	749,605
River	AF	275,255	267,021	270,577
Stream Minimum Release	AF	65,728	65,593	65,595
Tunnel	AF	470,709	478,932	475,373
Evaporation	AF	3,893	3,869	3,872
Reservoir	AF	281,938	275,235	278,130
Cherry				
Inflow	AF	279,293	279,293	279,293
Eleanor Gravity	AF	289	289	289
Eleanor Pump	AF	118,251	118,274	118,316
River	AF	41,636	41,439	41,364
Stream Minimum Release	AF			
Tunnel	AF	352,692	352,915	353,056
Evaporation	AF	3,505	3,501	3,501
Reservoir	AF	239,971	239,309	239,182
Eleanor				
Inflow	AF	169,617	169,617	169,617
Eleanor Gravity	AF	289	289	289
Eleanor Pump	AF	118,251	118,274	118,316
River	AF	49,171	49,148	49,106
Stream Minimum Release	AF			
Evaporation	AF	1,906	1,906	1,906
Reservoir	AF	22,191	22,191	22,191
Don Pedro Reservoir				
Inflow	AF	1,587,517	1,560,828	1,570,640
MID Diversion	AF	302,054	302,055	282,455
TID Diversion	AF	573,164	573,168	573,168
LaGrange Total Stream	AF	668,876	644,009	671,982
LaGrange Minimum Stream Release	AF	221,477	221,477	221,477
Total Evaporation	AF	43,493	42,604	43,474
Reservoir	AF	1,472,337	1,434,872	1,473,248
Water Bank Account				
Balance	AF	514,299	516,733	515,541
Transfer	AF	0	29,350	19,600
San Joaquin Pipelines				
Volume (AF)	AF	247,763	274,450	264,634
Volume (MG)	MG	80,734	89,429	86,231
Rate (MGD)	MGD	221	245	236
Max Rate (MGD)	MGD	290	313	313
Min Rate (MGD)	MGD	70	0	0
East Bay System				
Reservoirs				
Calaveras				
Inflow	MG	12,368	12,368	12,368
From ACDD	MG	1,316	1,730	1,163
Stream	MG	3,660	4,167	3,768
Stream Flow Recapture	MG	0	1,538	1,893
To SVWTP	MG	9,013	8,244	8,068
To San Antonio	MG	0	0	0
Evaporation	MG	1,023	1,704	1,710
Resevoir	MG	10,969	28,170	28,324
San Antonio				
Inflow	MG	2,468	2,468	2,468
From Calaveras/SJPL	MG	1,173	1,734	1,242
Stream	MG	991	613	805
To SVWTP	MG	1,693	2,628	1,906
Evaporation	MG	1,012	973	1,006
Resevoir	MG	15,323	14,490	15,136
Alameda Creek Diversion Dam				
Inflow	MG	4,197	4,197	4,197
To Calaveras Reservoir	MG	1,316	1,730	1,163
Spill	MG	2,881	2,467	3,034
Alameda Creek Confluence				
Accretion	MG	625	625	625
From ACDD	MG	2,881	2,467	3,034
From Calaveras Dam	MG	3,660	4,167	3,768
At Confluence	MG	7,167	7,259	7,427
Treatment Plants				
SVWTP Total	MG	13,662	15,738	15,938
From Calaveras	MG	9,013	8,244	8,068
From San Antonio	MG	1,693	2,628	1,906
From SJPL	MG	2,956	3,329	4,070
From Recapture	MG	0	1,538	1,893
SVWTP Total MGD	MGD	37	43	44
SVWTP Max MGD	MGD	120	158	158
SVWTP Min MGD	MGD	20	20	20

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Table 1-2
Summary of Modeling Results (Part 2/2)

HH/LSM Simulation Results	Units	Baseline: Baseline Conditions[1] - Calaveras Constrained	Proposed WSIP	CEQA Alternatives[3]: Modified WSIP
Peninsula System				
Reservoirs				
Crystal Springs				
Inflow	MG	3,722	3,722	3,722
From San Andreas	MG	0	0	0
From Pilarcitos and SJPL	MG	8,045	7,643	7,902
Stream	MG	773	325	638
Pump to San Andreas	MG	9,438	9,005	8,958
Pump to Coastside	MG	247	591	576
Evaporation	MG	1,323	1,490	1,471
Reservoir	MG	16,360	18,621	18,384
San Andreas				
Inflow	MG	1,428	1,428	1,428
From other Streams	MG	9,954	9,590	9,508
Stream	MG	0	0	0
To HTWTP	MG	10,851	10,487	10,404
Evaporation	MG	530	531	531
Reservoir	MG	5,892	5,882	5,887
Pilarcitos				
Inflow		1,297	1,297	1,297
To San Andreas	MG	516	584	550
For Stone Diversion	MG	262	280	300
Stream other than Diversion	MG	417	332	349
Evaporation	MG	103	102	101
Reservoir	MG	776	767	752
Stone Dam				
Accretion blw Pilarcitos	MG	167	211	206
Pilarcitos non-diversion Release	MG	417	332	349
Pilarcitos Release for Diversions	MG	584	543	554
Diversion to Coastside	MG	167	211	206
Diversion to Crystal Springs	MG	142	180	157
Spill past Stone	MG	860	695	746
Treatment Plants				
HTWTP Total	MG	10,851	10,487	10,404
HTWTP Total MGD	MGD	30	29	29
HTWTP Max MGD	MGD	149	106	112
HTWTP Min MGD	MGD	20	20	20
Other Facilites				
Westside Basin Net	MG	0	11	11
Desalination Input	MG	0	0	0
Additional Information				
Total Local Reservoir Stream Release	MG	5,842	5,437	5,560
Total Local Reservoir Stream Evaporation	MG	3,991	4,800	4,819
Deliveries				
In-City	MG	29,589	26,686	26,689
South Bay	MG	43,106	52,906	49,876
Crystal Springs	MG	15,120	16,931	16,638
San Andreas	MG	5,400	6,604	6,313
Coastside	MG	675	1,082	1,082
Groveland	MG	365	365	365
Total Deliveries	MG	94,255	104,574	100,963
Total Deliveries	MGD	258	287	277
Storage				
Total Local Storage Begin	MG	49,849	71,363	70,714
Total Local Storage End	MG	43,129	65,197	67,112
Residual Difference during 82-year Simulation	MGD	0.22	0.21	0.12
Westside Storage Begin	MG	0	23,474	23,474
Westside Storage End	MG	0	24,363	24,363
Residual Difference during 82-year Simulation	MGD	0.00	-0.03	-0.03

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Notes for Table 1-1 and Table 1-2

1. Baseline condition represents the existing conditions at the time of NOP publication in September 2005. This is the baseline used to assess WSIP program impacts and impact significance. This setting is indicative of DSOD restrictions on Calaveras and Crystal Springs Reservoirs.

2. N/A

3. These scenarios represent CEQA alternatives that vary from the WSIP on key components in a manner expected to avoid or reduce potentially significant effects of the proposed program.

4. The time horizon for the setting of the scenario. The baseline condition scenario is depicted for recent conditions, while the proposed WSIP, variants, and alternatives are depicted for the future at full buildout and implementation (i.e., conditions in the year 2030).

5. HH/LSM simulation study name.

6. The customer purchase request (demand) information is based on the demand and request studies prepared by the SFPUC in coordination with the wholesale customers. This demand on the regional water system includes both the SFPUC retail customers and wholesale customers. The current (2005) average annual demand is 265 mgd and the projected 2030 average annual demand is 300 mgd, assuming the SFPUC adopts the updated wholesale customer purchase requests as part of renewing the Master Sales Agreement with these customers (due in 2009).

7. Certain scenarios include development of additional water supply from a combination of recycled water projects, groundwater projects, and conservation, utilized every year and not subject to reduction during drought.

8. The average annual demand for supplies from the combination of SFPUC local watershed, Tuolumne River and programs not included in the regional water conservation, recycling, and groundwater programs shown.

9. Modeled results for SFPUC deliveries, with supplies added for regional water conservation, recycling, and groundwater programs. Total deliveries and supply will be less than full customer purchase requests due to rationing in some years.

10. Shows only the features that affect hydrologic results of the system operation simulations. Additional projects are included in the WSIP, variants and alternatives.

11. Illustrates the frequency and severity of water supply action or the severity of systemwide rationing. Only years when variable water supply component is implemented or rationing occurs are shown. "DD" illustrates the shortage results for years included in the prospective drought period of the SFPUC design drought. These years contribute to establishing system operation protocols but are not included in the hydrologic assessment analyses.

12. Rationing policy cap: The SFPUC WSIP level of service goal is to maintain rationing on the regional system at no more than 20% during any one year of the drought. Some alternatives do not achieve this level of service goal. Performance is indicated for the design drought ("DD") sequence and for the "Historical" hydrologic sequence.

13. Water supply elements develop water in different amounts from year-to-year, and in some instances only develop water during dry years. This information is provided to illustrate a comparison between local watershed supplies, Tuolumne River supplies and other identifiable water supplies used to meet system purchase requests. Values are stated in units of average annual quantities during the simulated historical sequence.

14. Results from HH/LSM analysis of each scenario. Values represent the average annual production of each element of supply during the design drought period.

15. Simplified calculation of system deliveries during the SFPUC design drought. The value represents the application of systemwide shortages to the demand level being met with SFPUC local watershed, Tuolumne River, and other developed supplies and does not include supplies from regional water conservation, recycled water or groundwater projects. Average value may be slightly misstated (up to 3 mgd) due to metric of analysis that does not account for differences in residual storage between studies. "Nominal" Firm Yield represents the yield of each scenario after adjustment for minor residual storage differences.

16. Supplemental releases from Calaveras Reservoir for fisheries (1997 CDFG MOU) of up to 6,300 acre-feet per year and the Alameda Creek recapture facility project are tied to implementation of the Calaveras Dam Replacement project (SV-2). When the dam is replaced and capacity restored, the flow release and recapture will both occur. The release requirement is based on supplementing other occurring flows below Calaveras Reservoir, sometimes not requiring the full 6,300 acre-feet.

17. SFPUC actions are assumed to not change MID/TID diversions so as to isolate and possibly overstate the WSIP's effects on the Tuolumne River below La Grange Dam. The Districts' diversions are assumed to be constant among the scenarios to provide comparable results of WSIP-alone effects. The exception is for the Modified WSIP Alternative, in which the MID/TID diversion is reduced by the amount of SFPUC transfer.

18. Participation in the San Joaquin River Agreement is assumed. Although the agreement expires after 2010, it is assumed that a subsequent similar agreement or requirement of the Districts will occur. The HH/LSM does not explicitly model the Districts' participation in the agreement; however, their participation if modeled would result in only minor differences in results and would not change impact conclusions.

19. From HH/LSM results for modeling the SFPUC design drought period.

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2. CEQA Alternative – Modified WSIP

The Modified WSIP Alternative would implement all of the proposed WSIP facility improvement projects, but differs in that it would include measures to reduce or avoid impacts that are associated with implementing the WSIP. The measures being considered are:

- Demand reduction of an additional 10 mgd (all years) through recycled water, groundwater, and conservation projects within the wholesale customer service area
- Restricted reservoir levels at Crystal Springs Reservoir
- Bypass of an amount of flow to Alameda Creek at the Alameda Creek Diversion Dam
- Use of conserved water for the Turlock Irrigation District/Modesto Irrigation District (TID/MID) and/or other water agency transfer to the SFPUC
- Use of Pilarcitos Reservoir storage for maintenance of summer flows below Pilarcitos Dam

There would be an increase in customer demand, from 265 mgd in 2005 to 300 mgd in 2030. With the Modified WSIP Alternative, the increase would be met in part through additional water conservation, water recycling, and groundwater programs beyond those already assumed in the 2030 demand projections. A total of 10 mgd of the demand is assumed to be met through regional recycled water, groundwater, and conservation projects within the regional service area but outside of San Francisco. These projects are in addition to the 10 mgd of groundwater development, recycled water projects, and conservation in San Francisco included in the WSIP and also incorporated into this alternative. This alternative would result in an average annual net demand on the regional system of 280 mgd, compared to a net demand of 290 mgd for the WSIP setting and 265 mgd for the base setting. The net increase in water demand from the regional system would be served through additional Tuolumne River diversions, including a water transfer with the TID/MID similar to the proposed program, increased use of local watershed supplies from restoration of Calaveras Reservoir storage, water associated with restoration of Crystal Springs Reservoir, and implementation of the Westside Basin Groundwater Program.

The restricted operation of Crystal Springs Reservoir involves construction of the dam spillway at elevation 291.8 feet (modeled capacity of 21.15 billion gallons, the same as the proposed program), but operation of the reservoir with a normal maximum water surface elevation of 287.8 feet (modeled capacity of 20.28 billion gallons). The winter operation of the reservoir would provide a 2-billion-gallon storage buffer below the restricted elevation objective. This measure is intended to reduce or avoid inundation impacts of higher reservoir water surface elevations.

The Alameda Creek Diversion Dam (ACDD) bypass measure assumes the passage of up to 10 cfs or inflow, whichever is less, during the months of December through April. It is assumed that this flow to Alameda Creek below the diversion dam would be recaptured from Alameda Creek below the confluence with Calaveras Creek when the flow is utilized to meet 1997 CDFG MOU requirements. The measure is intended to reduce or avoid impacts of reducing winter and spring flows below the ACDD.

It is assumed that the transfer of water to the SFPUC would be developed through water conservation in the service areas of TID/MID and/or other water agency that would in effect reduce the TID/MID diversion of water from Don Pedro Reservoir. The measure is intended to reduce or avoid the impacts of reducing flows in the Tuolumne River below La Grange Dam.

The Pilarcitos Reservoir measure assumes the occasional use (extraction) of water from the reservoir pool below the invert of the spillway outlet at Pilarcitos Dam to maintain flow in Pilarcitos Creek below Pilarcitos Dam during July through September. The release would also maintain deliveries to Coastside CWD from the Pilarcitos Creek watershed during those months. The measure is intended to reduce or avoid the impacts associated with reduced releases to the creek during summer months.

2.1 Water Deliveries and Drought Response Actions

Compared to the WSIP setting, the regional system's sources are required to serve a net 280 mgd demand (300 mgd purchase request less 10 mgd of groundwater development, recycled water projects, and conservation and 10 mgd of programs outside of San Francisco) instead of a net 290 mgd demand.

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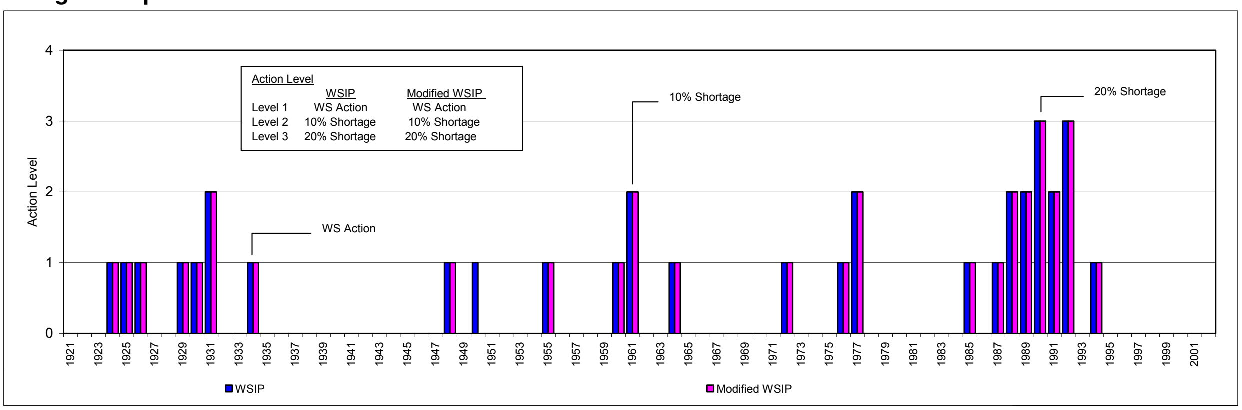
As part of the formulation of this alternative, the water transfer from TID/MID was sized to provide the same frequency and severity of water shortages (percentage-wise) for the alternative as that occurring in the WSIP setting during the design drought, although systemwide water deliveries are a net 280 mgd in the alternative setting as compared to the WSIP setting delivery of a net 290 mgd. This objective required the water transfer to be sized at 19,600 acre-feet per year compared to 29,350 acre-feet per year in the WSIP setting. Factors that change the size of the transfer include the net demand, the change in maximum storage capacity at Crystal Springs Reservoir, and reservoir evaporation. The most substantial factors are net demand and the storage at Crystal Springs Reservoir. With a water supply formulated about comparable to that provided for the WSIP setting (only proportionately smaller for a lesser demand), the implementation of rationing and the severity of rationing from the SFPUC system during drought periods would be the same. Table 1-1 illustrates the comparison of the drought response actions for the proposed program and the alternative. Figure 2.1-1 illustrates the occurrence of drought response actions for the simulated 82-year historical period (1921-2002) for the WSIP and Modified WSIP settings.

Figure 2.1-1
Drought Response Actions – WSIP and Modified WSIP



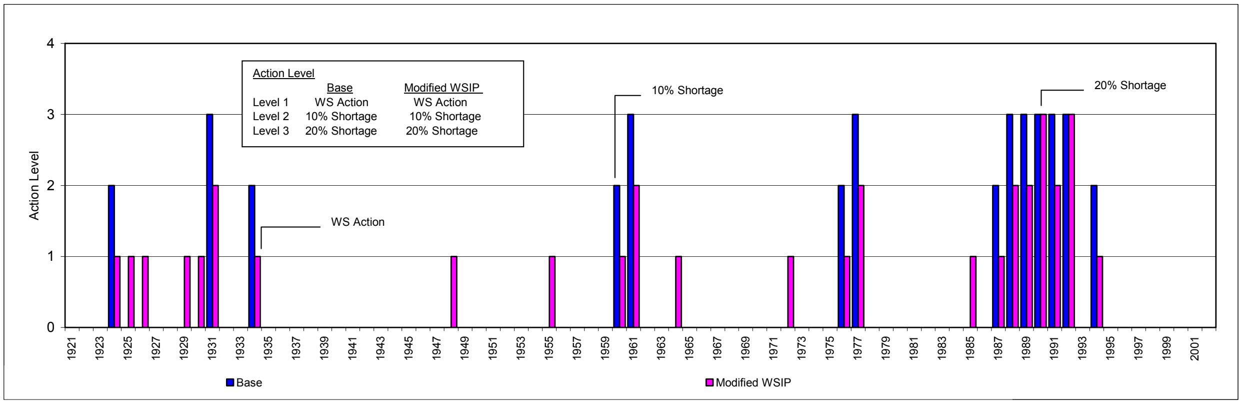
In Figure 2.1-1, years with bars showing a “1” or greater level of action indicate periods when a supplemental water supply action is initiated. In both settings, the water supply action is the use of the Westside Basin Groundwater Program to supplement SFPUC water deliveries. Also occurring in both settings is the water transfer supplemental supply from TID/MID. An action level greater than “1” indicates the imposition of delivery shortages (rationing) for SFPUC customers. SFPUC customers would experience the same frequency and severity of shortages (percentage-wise) during the design drought in both settings, and the frequency of shortage in other drought periods would the same. The triggering of the Westside Basin Groundwater Program supplemental supply occurred in one less year in comparison to the proposed program.

The same form of information is shown in Figure 2.1-2 for the comparison between the alternative and the base settings. There is not a level 1 action in the base setting. Without supplemental resources, the existing system only has delivery shortage measures available to cope with drought. In the base setting, the shortage measure is imposed during level 2 (10 percent) and level 3 (20 percent). These percentages of shortage are applied to both the alternative and the base settings for these action levels. During this simulation period, rationing does not need to exceed 20 percent in either setting; however, in the alternative setting, the occurrence of additional water supplies lessens the frequency and severity of water delivery shortages.

Not illustrated in Figure 2.1-2 but shown in Table 1-1 are the delivery shortages anticipated during the entire SFPUC design drought. During the design drought, the base setting does not have a viable operation without exceeding the 20 percent shortage level. The base setting exceeds the 20 percent shortage level (requires 25 percent rationing) during the last 18 months of the design drought. The alternative would viably provide deliveries without exceeding the 20 percent shortage level.

APPENDIX O2

Figure 2.1-2
Drought Response Actions – Base and Modified WSIP



The difference in water deliveries between the proposed program and the alternative is shown chronologically for the 82-year simulation in Table 2.1-1. There would be less water delivered to the region by the SFPUC in all years, a result of serving a lesser net demand of 280 mgd instead of 290 mgd.

Comparing the alternative setting to the base setting, Table 2.1-2 illustrates the difference in water deliveries between the two settings. The increases in deliveries under the alternative setting occur due to the increase in net demand served by the regional system (280 mgd instead of 265 mgd) and an improvement in water delivery reliability that reduces the severity of water shortages during several drought periods.

2.2 Diversions from the Tuolumne River

The metric for illustrating the SFPUC diversions from the Tuolumne River Basin (Tuolumne) is the flow through the San Joaquin Pipeline (SJPL). Inherent in this alternative is a net water demand that is less than the demand served by the proposed program but greater than the demand served under the base condition. Table 2.2-1 illustrates the difference in diversions to the SJPL between the proposed program and the alternative settings. In both settings, the conveyance capacity of the SJPL is increased compared to the base setting. During the summer, the SJPL would essentially operate at the same maximum rate in both the alternative and WSIP settings to minimize the drawdown of Bay Area reservoir storage. A few exceptions occur during the summer due to differences in operations for the net demand served. Overall, compared to the WSIP setting, the alternative setting would divert less water from the Tuolumne.

Table 2.2-2 illustrates the difference in diversions to the SJPL between the alternative and base settings. Evident in the operation is the increase in summer diversions associated with an increase in the conveyance capacity of the SJPL. As described above, with the increase in SJPL conveyance capacity, summer diversions would increase to retain storage in the Bay Area reservoirs. With the increase in summer diversions to the SJPL and the retention of storage in the Bay Area reservoirs, there would at times be reduced diversions during the late summer and fall as less Tuolumne water would be needed to replenish the Bay Area reservoirs. The differences in December diversions are largely the result of maintenance occurring in the alternative setting (lessening available conveyance capacity) that does not occur in the base setting. The increased diversions during the winter and spring result from the need to replenish Bay Area reservoir storage after the maintenance and then top off Bay Area reservoir storage prior to summer. There would be an overall increase in average annual diversions to the SJPL in the alternative setting associated with the increase in net demand and the improvement in water delivery reliability.

Table 2.2-3 illustrates the average monthly diversions through the SJPL by year type for the 82-year simulation for the proposed program and the alternative settings and the difference between the two settings. Table 2.2-4 shows the same information for the alternative and base settings.

APPENDIX O2

Table 2.1-1

Difference in Total System-wide Delivery (MG) Modified WSIP minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1922	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1923	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1924	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1925	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1926	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1927	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1928	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1929	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1930	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1931	-322	-252	-208	-183	-193	-260	-300	-360	-390	-369	-360	-318	-3,515
1932	-295	-234	-198	-171	-182	-242	-267	-313	-339	-415	-409	-363	-3,428
1933	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1934	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1935	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1936	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1937	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1938	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1939	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1940	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1941	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1942	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1943	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1944	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1945	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1946	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1947	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1948	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1949	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1950	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1951	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1952	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1953	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1954	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1955	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1956	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1957	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1958	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1959	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1960	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1961	-322	-252	-208	-183	-193	-260	-300	-360	-390	-369	-360	-318	-3,515
1962	-295	-234	-198	-171	-182	-242	-267	-313	-339	-415	-409	-363	-3,428
1963	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1964	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1965	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1966	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1967	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1968	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1969	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1970	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1971	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1972	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1973	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1974	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1975	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1976	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1977	-322	-252	-208	-183	-193	-260	-300	-360	-390	-369	-360	-318	-3,515
1978	-295	-234	-198	-171	-182	-242	-267	-313	-339	-415	-409	-363	-3,428
1979	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1980	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1981	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1982	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1983	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1984	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1985	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1986	-322	-252	9	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,439
1987	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1988	-322	-252	-208	-183	-193	-260	-300	-360	-390	-369	-360	-318	-3,515
1989	-295	-234	-198	-171	-182	-242	-267	-313	-339	-369	-360	-318	-3,287
1990	-295	-234	-198	-171	-182	-242	-267	-313	-339	-329	-319	-282	-3,170
1991	-260	-207	-177	-152	-168	-214	-240	-279	-297	-369	-360	-318	-3,040
1992	-295	-234	-198	-171	-182	-242	-267	-313	-339	-329	-319	-282	-3,170
1993	-260	-207	-177	-152	-168	-214	-240	-279	-297	-415	-409	-363	-3,182
1994	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1995	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1996	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1997	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1998	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1999	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
2000	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
2001	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
2002	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
Avg (21-02)	-319	-250	-204	-181	-192	-258	-296	-354	-384	-410	-403	-358	-3,608

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Table 2.1-2

Difference in Total System-wide Delivery (MG) — Modified WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	488	359	253	191	244	349	427	547	618	730	686	577	5,468
1922	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1923	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1924	488	359	253	191	244	349	427	547	618	1,932	1,853	1,546	8,807
1925	1,305	946	686	512	676	1,017	1,284	1,576	618	730	686	577	10,613
1926	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1927	488	359	253	191	244	349	427	547	618	729	686	577	5,468
1928	488	359	253	191	244	349	427	547	618	729	686	577	5,468
1929	488	359	253	191	244	349	427	547	618	730	686	577	5,468
1930	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1931	488	359	253	191	244	349	427	547	618	1,640	1,587	1,392	8,095
1932	1,253	1,025	876	777	824	1,067	1,212	1,408	1,508	729	686	577	11,943
1933	488	359	253	191	244	349	427	547	618	729	686	577	5,468
1934	488	359	253	191	244	349	427	547	618	1,932	1,853	1,546	8,806
1935	1,305	946	686	512	676	1,017	1,284	1,576	618	729	686	577	10,613
1936	488	359	253	191	244	349	427	547	618	729	686	577	5,468
1937	488	359	253	191	244	349	427	547	618	729	686	577	5,468
1938	488	359	253	191	244	349	427	547	618	730	686	577	5,468
1939	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1940	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1941	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1942	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1943	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1944	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1945	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1946	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1947	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1948	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1949	488	359	253	191	244	349	427	547	618	729	686	577	5,468
1950	488	359	253	191	244	349	427	547	618	730	686	577	5,468
1951	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1952	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1953	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1954	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1955	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1956	488	359	253	191	244	349	427	547	618	729	686	577	5,468
1957	488	359	253	191	244	349	427	547	618	730	686	577	5,468
1958	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1959	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1960	488	359	253	191	244	349	427	547	618	1,932	1,853	1,546	8,807
1961	1,305	946	686	512	676	1,017	1,284	1,576	1,760	1,640	1,587	1,392	14,381
1962	1,253	1,025	876	777	824	1,067	1,212	1,408	1,508	729	686	577	11,943
1963	488	359	253	191	244	349	427	547	618	729	686	577	5,468
1964	488	359	253	191	244	349	427	547	618	730	686	577	5,468
1965	488	359	253	191	244	349	427	547	618	729	686	577	5,468
1966	488	359	253	191	244	349	427	547	618	730	686	577	5,468
1967	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1968	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1969	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1970	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1971	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1972	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1973	488	359	253	191	244	349	427	547	618	729	686	577	5,468
1974	488	359	253	191	244	349	427	547	618	730	686	577	5,468
1975	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1976	488	359	253	191	244	349	427	547	618	1,932	1,853	1,546	8,807
1977	1,305	946	686	512	676	1,017	1,284	1,576	1,760	1,640	1,587	1,392	14,381
1978	1,253	1,025	876	777	824	1,067	1,212	1,408	-602	729	686	577	9,832
1979	488	359	253	191	244	349	427	547	618	729	686	577	5,468
1980	488	359	253	191	244	349	427	547	618	730	686	577	5,468
1981	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1982	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1983	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1984	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1985	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1986	488	359	9	191	244	349	427	547	618	729	686	577	5,224
1987	488	359	253	191	244	349	427	547	618	1,932	1,853	1,546	8,806
1988	1,305	946	686	512	676	1,017	1,284	1,576	1,760	1,640	1,587	1,392	14,381
1989	1,253	1,025	876	777	824	1,067	1,212	1,408	1,508	1,640	1,587	1,392	14,569
1990	1,253	1,025	876	777	824	1,067	1,212	1,408	1,508	556	526	451	11,483
1991	385	302	226	185	213	289	346	430	478	1,640	1,587	1,392	7,473
1992	1,253	1,025	876	777	824	1,067	1,212	1,408	1,508	556	526	451	11,483
1993	385	302	226	185	213	289	346	430	-1,632	729	686	577	2,736
1994	488	359	253	191	244	349	427	547	618	1,932	1,853	1,546	8,806
1995	1,305	946	686	512	676	1,017	427	547	618	729	686	577	8,727
1996	488	359	253	191	244	349	427	547	618	729	686	577	5,468
1997	488	359	253	191	244	349	427	547	618	729	686	577	5,468
1998	488	359	253	191	244	349	427	547	618	729	686	577	5,468
1999	488	359	253	191	244	349	427	547	618	729	686	577	5,468
2000	488	359	253	191	244	349	427	547	618	729	686	577	5,468
2001	488	359	253	191	244	349	427	547	618	730	686	577	5,468
2002	488	359	253	191	244	349	427	547	618	730	686	577	5,469
Avg (21-02)	601	449	327	258	317	449	535	670	670	880	833	704	6,693

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Table 2.2-1

Difference in Total San Joaquin Pipeline (Acre-feet) Modified WSIP minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
1921	-952	-1,841	0	0	0	-952	0	0	0	0	0	0	-3,745	-3,745
1922	-5,708	-2,762	-1,903	0	0	0	-5,524	0	0	0	0	0	-15,897	-15,897
1923	-2,854	0	0	0	0	-1,047	-3,038	0	0	0	0	0	-6,939	-6,939
1924	-3,805	-921	-1,902	-1,903	-1,719	0	0	0	0	0	0	0	-10,250	-10,250
1925	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	-3,901	-9,452	0	-4,880	0	0	0	0	-1,197	-19,430	-18,233
1927	-4,757	-1,841	-952	-952	0	-3,805	-3,683	0	0	0	0	0	-15,990	-17,187
1928	-1,047	-921	0	0	0	-3,045	-5,524	0	0	0	0	0	-10,537	-10,537
1929	-1,807	-1,841	0	0	0	0	0	0	0	0	0	0	-3,648	-3,648
1930	-1,237	0	0	0	0	0	0	0	0	0	0	0	-1,237	-1,237
1931	0	-2,854	0	-5,803	-5,242	0	0	0	0	0	0	-4,880	-18,779	-13,899
1932	-5,708	-2,762	-1,903	-1,903	0	-1,902	-2,118	-3,140	-3,038	0	0	0	-22,474	-27,354
1933	476	0	0	-1,902	-1,719	0	0	0	0	0	0	0	-3,145	-3,145
1934	0	0	-2,949	-2,854	-2,578	0	0	0	0	0	0	0	-8,381	-8,381
1935	-1,237	0	0	0	0	0	-1,197	-2,189	-2,118	0	0	0	-6,741	-6,741
1936	-5,043	-4,603	0	-2,854	0	-2,949	-2,118	0	0	0	0	0	-17,567	-17,567
1937	-3,806	-1,841	-1,902	0	0	-951	-4,604	0	0	0	0	0	-13,104	-13,104
1938	-1,903	0	0	-1,903	0	0	-4,603	-1,237	-1,197	0	0	0	-10,843	-10,843
1939	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	-5,328	-5,709	-5,524	-1,237	-1,197	0	0	0	-18,995	-18,995
1941	0	0	0	0	0	0	0	-952	-921	0	0	0	-1,873	-1,873
1942	-1,332	0	-1,712	0	0	0	-5,524	0	0	0	0	0	-8,568	-8,568
1943	-1,903	-1,841	0	0	0	-1,142	-3,867	-1,237	-1,197	0	0	0	-11,187	-11,187
1944	-1,902	0	-952	0	0	-2,949	0	0	0	0	0	0	-5,803	-5,803
1945	-4,281	0	0	0	-4,297	0	0	0	0	0	0	0	-8,578	-8,578
1946	-5,043	-2,762	0	0	0	0	0	0	0	0	0	0	-7,805	-7,805
1947	-5,708	-4,603	-952	-1,903	-1,719	0	0	0	0	0	0	0	-14,885	-14,885
1948	-1,237	-1,013	0	-4,756	-2,578	0	0	0	0	0	0	0	-9,584	-9,584
1949	-2,189	-1,013	-3,806	-1,903	-1,719	-2,854	-2,578	-1,237	-1,197	0	0	0	-18,496	-18,496
1950	-1,903	0	0	0	0	0	0	0	0	0	0	0	-1,903	-1,903
1951	0	-3,683	0	0	0	-4,757	-1,197	-1,237	-1,197	0	0	0	-12,071	-12,071
1952	-2,949	-921	-2,663	0	0	0	-5,524	-1,237	-1,197	0	0	0	-14,491	-14,491
1953	-1,902	0	0	0	0	-2,949	0	-1,237	-1,197	0	0	0	-7,285	-7,285
1954	-2,949	-921	-952	0	-860	-1,047	-2,578	0	0	0	0	0	-9,307	-9,307
1955	-3,805	0	0	0	0	0	0	0	0	0	0	0	-3,805	-3,805
1956	0	0	0	0	0	0	-2,578	-1,237	-1,197	0	0	0	-5,012	-5,012
1957	-1,047	-921	-1,902	-1,903	0	0	0	0	0	0	0	0	-5,773	-5,773
1958	-2,759	-2,762	0	-2,855	0	0	0	-1,047	-1,013	0	0	0	-10,436	-10,436
1959	0	-921	0	0	0	0	0	0	0	0	0	0	-921	-921
1960	-3,140	0	0	0	0	0	0	0	0	0	0	0	-3,140	-3,140
1961	0	0	0	-1,047	-3,523	0	0	0	0	0	0	-4,880	-9,450	-4,570
1962	-6,945	-5,616	-952	-3,805	-1,031	-2,854	-2,118	-3,996	-3,867	0	0	0	-31,184	-36,064
1963	1,807	-1,841	0	0	0	-1,902	-5,524	-1,902	-1,841	0	0	0	-11,203	-11,203
1964	0	-921	0	0	0	0	0	0	0	0	0	0	-921	-921
1965	0	0	0	-5,708	-5,156	0	-8,286	0	0	0	0	0	-19,150	-19,150
1966	-1,047	0	0	-1,903	-1,719	0	0	0	0	0	0	0	-4,669	-4,669
1967	0	-3,775	-4,756	0	0	0	-6,445	-952	-921	0	0	0	-16,849	-16,849
1968	-1,237	0	0	0	0	0	0	0	0	0	0	0	-1,237	-1,237
1969	-3,996	-4,603	-1,903	0	0	-951	-4,880	0	0	0	0	0	-16,333	-16,333
1970	-952	0	0	-1,903	-1,719	-1,047	0	0	0	0	0	0	-5,621	-5,621
1971	-4,281	-1,841	0	0	0	0	0	0	0	0	0	0	-6,122	-6,122
1972	0	-5,616	-4,757	-1,903	-1,719	0	0	0	0	0	0	0	-13,995	-13,995
1973	-1,237	-3,775	0	0	0	0	-4,880	-1,237	-1,197	0	0	0	-12,326	-12,326
1974	0	0	0	0	0	-6,659	-4,603	-1,237	-1,197	0	0	0	-13,696	-13,696
1975	0	0	0	0	-1,719	-1,142	-5,524	-1,237	-1,197	0	0	0	-10,819	-10,819
1976	-952	0	0	0	0	0	0	0	0	0	0	0	-952	-952
1977	0	-1,013	-4,756	-2,855	-2,578	0	0	0	0	1,902	1,902	1,841	-5,557	-11,202
1978	1,902	2,762	0	-3,045	-5,156	-10,464	-7,365	-1,047	-1,013	0	0	0	-23,426	-17,781
1979	0	-921	-1,902	0	0	-1,902	0	0	0	0	0	0	-4,725	-4,725
1980	-3,996	0	0	-2,855	0	-4,947	-2,578	0	0	0	0	0	-14,376	-14,376
1981	-1,902	-921	0	-1,902	-1,718	0	0	0	0	0	0	0	-6,443	-6,443
1982	-5,043	-3,682	-1,902	0	0	0	0	-1,902	-1,841	0	0	0	-14,370	-14,370
1983	0	0	-951	0	0	0	-4,787	-1,903	-1,841	0	0	0	-9,482	-9,482
1984	0	-921	0	0	0	0	0	0	0	0	0	0	-921	-921
1985	-2,189	0	0	0	0	0	0	0	0	0	0	0	-2,189	-2,189
1986	0	0	9	-2,949	-3,437	-7,610	-8,286	-1,237	-1,197	0	0	0	-24,707	-24,707
1987	0	-921	-1,902	0	0	0	0	0	0	0	0	0	-2,823	-2,823
1988	0	-1,013	0	-4,756	-2,578	0	0	0	0	0	0	-4,880	-13,227	-8,347
1989	-1,902	-1,841	-1,903	0	0	0	0	-2,664	-2,578	-1,237	-1,427	0	-13,552	-15,768
1990	0	0	0	0	0	0	0	0	0	-3,996	-2,854	-1,841	-8,691	-2,664
1991	0	-1,841	-523	0	0	-2,854	-4,880	-1,902	-1,841	-1,237	951	921	-13,206	-22,532
1992	1,902	-921	-1,903	0	0	-1,902	-2,118	-3,140	-3,038	-1,047	1,902	1,841	-8,424	-10,485
1993	1,903	-1,841	-523	0	0	0	-5,524	-952	-921	0	0	0	-7,858	-5,162
1994	0	-921	0	-1,903	-1,719	0	0	0	0	0	0	0	-4,543	-4,543
1995	-1,237	0	0	-4,947	-4,468	0	-7,365	-856	-829	0	0	0	-19,702	-19,702
1996	0	-921	0	0	0	0	-2,118	0	0	0	0	0	-3,039	-3,039
1997	-3,805	-921	0	0	0	0	0	0	0	0	0	0	-4,726	-4,726
1998	-3,140	-3,683	0	0	0	-951	-6,444	-1,047	-1,013	0	0	0	-16,278	-16,278
1999	-1,902	0	-952	0	0	-1,903	-7,365	0	0	0	0	0	-12,122	-12,122
2000	-1,902	0	0	0	-860	-2,854	0	0	0	0	0	0	-5,616	-5,616
2001	-3,806	-2,762	0	-952	0	-3,901	0	0	0	0	0	0	-11,421	-11,421
2002	-3,806	-921	-1,903	-1,902	-1,718	0	0	0	0	0	0	0	-10,250	-10,250
Avg (21-02)	-1,600	-1,155	-682	-995	-952	-1,096	-2,046	-542	-524	-68	6	-159	-9,815	-9,815

APPENDIX O2

Table 2.2-2

Difference in Total San Joaquin Pipeline (Acre-feet)

Modified WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
1921	-952	-2,762	0	0	0	11,416	2,118	2,189	2,118	2,189	2,189	2,118	20,623	23,385
1922	-4,756	-921	-3,805	952	0	0	1,841	5,043	4,880	2,189	2,189	2,118	9,730	9,730
1923	-2,854	-2,762	0	0	0	14,270	-920	2,189	2,118	2,189	2,189	2,118	18,537	18,537
1924	-4,756	-921	0	-2,855	-2,578	5,803	2,118	2,189	2,118	2,189	2,189	2,118	7,614	7,614
1925	2,189	-19,334	-19,979	5,803	17,272	11,512	2,118	2,189	2,118	2,189	2,189	2,118	10,384	10,384
1926	5,043	5,616	-7,088	1,902	0	15,317	0	2,189	2,118	2,189	2,189	921	30,396	31,593
1927	-2,854	-2,762	-952	3,805	0	2,854	-921	2,189	2,118	2,189	2,189	2,118	9,973	8,776
1928	1,902	-921	-2,331	3,805	4,297	2,663	-921	2,189	2,118	2,189	2,189	2,118	19,297	19,297
1929	2,949	0	1,902	1,902	1,718	5,803	2,118	2,189	2,118	2,189	2,189	2,118	27,195	27,195
1930	952	-19,334	-19,979	5,803	9,538	11,512	2,118	2,189	2,118	2,189	2,189	2,118	1,413	1,413
1931	2,189	2,762	-7,088	0	0	5,803	2,118	2,189	2,118	2,189	2,189	1,841	16,310	16,587
1932	2,854	0	3,805	3,805	0	13,510	2,762	3,805	3,683	2,189	2,189	2,118	40,720	40,443
1933	-475	0	-7,088	5,709	5,156	5,803	2,118	2,189	2,118	2,189	2,189	2,118	22,026	22,026
1934	2,189	5,616	2,854	3,805	3,437	5,803	2,118	2,189	2,118	2,189	2,189	2,118	36,625	36,625
1935	3,806	-19,334	-19,979	19,122	17,272	10,560	8,286	5,708	5,524	2,189	2,189	2,118	37,461	37,461
1936	-2,854	0	-7,088	4,757	0	12,368	0	2,189	2,118	2,189	2,189	2,118	17,986	17,986
1937	0	0	0	3,805	0	0	1,841	5,043	4,880	2,189	2,189	2,118	22,065	22,065
1938	0	0	0	3,805	0	0	921	3,806	3,683	2,189	2,189	2,118	18,711	18,711
1939	-1,902	-921	-2,855	2,854	2,578	5,803	2,118	2,189	2,118	2,189	2,189	2,118	18,478	18,478
1940	2,189	-19,334	-19,979	15,317	2,406	7,610	2,762	3,806	3,683	2,189	2,189	2,118	4,956	4,956
1941	-1,902	-921	0	0	0	0	0	0	0	2,189	2,189	2,118	3,673	3,673
1942	1,047	0	-2,854	0	0	2,663	0	2,854	2,762	2,189	2,189	2,118	12,968	12,968
1943	0	-2,762	-7,088	0	0	2,663	2,854	952	921	2,189	2,189	2,118	4,036	4,036
1944	0	-921	-952	1,902	7,046	12,368	2,118	2,189	2,118	2,189	2,189	2,118	32,364	32,364
1945	-4,756	-19,334	-19,979	5,803	9,452	15,317	2,118	2,189	2,118	2,189	2,189	2,118	-576	-576
1946	0	-921	0	0	0	10,560	2,118	2,189	2,118	2,189	2,189	2,118	22,560	22,560
1947	-4,756	-2,762	-952	-2,855	1,718	10,560	2,118	2,189	2,118	2,189	2,189	2,118	13,874	13,874
1948	952	4,603	-7,088	0	0	5,803	2,118	2,189	2,118	2,189	2,189	2,118	17,191	17,191
1949	0	4,603	-952	-2,855	-2,578	-952	-460	952	921	2,189	2,189	2,118	5,175	5,175
1950	1,902	-19,334	-19,979	16,459	16,413	5,803	2,118	2,189	2,118	2,189	2,189	2,118	14,185	14,185
1951	2,189	3,682	0	0	0	3,805	921	952	921	2,189	2,189	2,118	18,966	18,966
1952	0	-921	-951	0	0	0	3,682	952	921	2,189	2,189	2,118	10,179	10,179
1953	0	-921	0	0	0	12,368	2,118	952	921	2,189	2,189	2,118	21,934	21,934
1954	-4,756	-921	-952	2,854	4,468	9,513	-460	2,189	2,118	2,189	2,189	2,118	20,549	20,549
1955	-4,756	-19,334	-15,222	16,459	14,866	5,803	2,118	2,189	2,118	2,189	2,189	2,118	10,737	10,737
1956	2,189	5,616	0	0	0	2,663	-460	952	921	2,189	2,189	2,118	18,377	18,377
1957	1,902	-921	0	1,902	7,046	10,560	2,118	2,189	2,118	2,189	2,189	2,118	33,410	33,410
1958	-1,807	0	-7,088	6,659	0	0	0	0	0	2,189	2,189	2,118	4,260	4,260
1959	0	-921	0	2,854	0	15,317	2,118	2,189	2,118	2,189	2,189	2,118	30,171	30,171
1960	-951	-19,334	-19,979	5,803	10,398	5,803	2,118	2,189	2,118	2,189	2,189	2,118	-5,339	-5,339
1961	2,189	5,616	-7,088	4,756	6,015	5,803	2,118	2,189	2,118	2,189	5,043	4,603	35,551	30,212
1962	2,854	4,603	3,805	0	2,406	15,221	5,524	3,901	3,775	2,189	2,189	2,118	48,585	53,924
1963	4,756	0	-7,088	0	0	5,708	0	0	0	2,189	2,189	2,118	9,872	9,872
1964	2,189	-921	0	7,611	6,875	5,803	2,118	2,189	2,118	2,189	2,189	2,118	34,478	34,478
1965	2,189	-19,334	-14,270	0	0	11,512	4,603	952	921	2,189	2,189	2,118	-6,931	-6,931
1966	1,902	-2,762	-1,379	7,801	7,046	5,803	2,118	2,189	2,118	2,189	2,189	2,118	31,332	31,332
1967	2,189	1,841	-7,611	0	0	0	0	-952	-921	2,189	2,189	2,118	1,042	1,042
1968	952	0	-7,088	8,562	7,734	5,803	2,118	2,189	2,118	2,189	2,189	2,118	28,884	28,884
1969	-1,807	0	-2,855	0	0	0	2,762	2,189	2,118	2,189	2,189	2,118	8,903	8,903
1970	-952	-19,334	-19,979	10,464	9,452	18,075	2,118	2,189	2,118	2,189	2,189	2,118	10,647	10,647
1971	-1,902	-2,762	0	0	0	10,560	2,118	2,189	2,118	2,189	2,189	2,118	18,817	18,817
1972	2,189	0	-4,757	-2,855	1,718	5,803	2,118	2,189	2,118	2,189	2,189	2,118	15,019	15,019
1973	952	1,841	-7,088	0	0	0	1,841	952	921	2,189	2,189	2,118	5,915	5,915
1974	1,902	0	0	0	0	3,805	0	3,806	3,683	2,189	2,189	2,118	19,692	19,692
1975	-1,902	-19,334	-19,979	11,512	3,437	2,663	2,762	3,806	3,683	2,189	2,189	2,118	-6,856	-6,856
1976	-2,854	-921	-7,088	0	0	5,803	2,118	2,189	2,118	2,189	2,189	2,118	7,861	7,861
1977	5,043	4,603	0	-2,855	-2,578	5,803	2,118	2,189	2,118	-2,854	0	9,206	22,793	22,937
1978	9,513	1,841	-2,854	2,663	0	0	4,787	4,756	4,603	2,189	2,189	2,118	31,805	31,661
1979	-2,854	-921	0	2,854	0	9,514	2,118	2,189	2,118	2,189	2,189	2,118	21,514	21,514
1980	1,047	-19,334	-15,222	10,464	0	2,663	2,302	2,189	2,118	2,189	2,189	2,118	-7,277	-7,277
1981	0	-921	-7,088	5,708	5,156	11,512	2,118	2,189	2,118	2,189	2,189	2,118	27,288	27,288
1982	-2,854	-4,603	-1,902	0	0	0	0	0	0	2,189	2,189	2,118	-2,863	-2,863
1983	1,047	-2,762	0	0	0	0	0	2,854	2,762	2,189	2,189	2,118	10,397	10,397
1984	952	-5,524	0	0	0	5,803	2,118	2,189	2,118	2,189	2,189	2,118	14,152	14,152
1985	0	-19,334	-19,979	10,560	9,538	5,803	2,118	2,189	2,118	2,189	2,189	2,118	-491	-491
1986	2,189	5,616	9	2,854	0	0	-921	3,806	3,683	2,189	2,189	2,118	23,732	23,732
1987	0	-921	0	-952	-859	5,803	2,118	2,189	2,118	2,189	2,189	2,118	15,992	15,992
1988	5,043	4,603	-7,088	5,709	5,156	5,803	2,118	2,189	2,118	2,189	2,189	4,603	34,632	32,147
1989	2,854	0	2,854	2,854	2,578	5,803	2,118	2,379	2,302	3,806	2,379	7,365	37,292	32,723
1990	6,659	-19,334	-15,222	10,560	9,538	5,803	2,118	2,189	2,118	1,047	1,902	4,603	11,981	17,979
1991	3,805	-2,762	-2,854	0	0	7,611	0	952	921	952	4,756	2,762	16,143	15,225
1992	1,902	3,682	1,902	952	2,406	16,173	4,603	3,805	3,683	0	0	3,682	42,790	47,578
1993	3,805	-2,762	-1,902	0	0	0	-921	1,902	1,841	2,189	2,189	2,118	8,459	5,645
1994	-2,854	-921	0	-2,855	8,593	5,803	2,118	2,189	2,118	2,189	2,189	2,118	20,687	20,687
1995	3,806	-19,334	-19,979	2,663	2,406	0	1,841	1,047	1,013	2,189	2,189	2,118	-20,041	-20,041
1996	1,902	-921	-2,331	0	0	0	2,762	5,043	4,880	2,189	2,189	2,118	17,831	17,831
1997	-1,902	-921	0	0	0	10,465	2,118	2,189	2,118	2,189	2,189	2,118	20,563	20,563
1998	-951	-921	-7,088	0	0	0	4,604	2,854	2,762	2,189	2,189	4,880	10,518	7,756
1999	0	-921	-952	6,659	0	6,659	1,841	2,189	2,118	2,189	2,189	2,118	24,089	26,851
2000	0	-19,334	-19,979	15,317	6,874	13,319	2,118	2,189	2,118	2,189	2,189	2,118	9,118	9,118
2001	0	0	-7,088	6,659	8,593	11,416	2,118	2,189	2,118	2,189	2,189	2,118	32,501	32,501
2002	-2,854	-921	-3,805	4,757	4,297	10,560	2,118	2,189	2,118	2,189	2,189	2,118	24,955	24,955
Avg (21-02)	506	-3,677	-5,448	3,311	2,882	6,435	1,818	2,255	2,182	2,092	2,201	2,402	16,958	16,992

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Table 2.2-3

Total San Joaquin Pipeline (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	26,020	15,548	8,898	9,550	6,165	9,318	16,981	25,806	24,973	29,778	29,778	28,817	231,631	229,415
Above Normal	25,166	13,323	8,462	13,566	7,931	14,478	20,888	27,763	26,867	29,778	29,778	28,817	246,816	246,458
Normal	24,159	13,752	9,222	14,824	10,956	20,769	26,901	29,374	28,426	29,778	29,778	28,817	266,755	266,450
Below Normal	25,877	15,007	12,130	19,833	16,852	24,472	28,091	29,140	28,200	29,632	29,493	27,956	286,683	286,598
Dry	25,723	19,115	15,715	18,379	15,516	25,598	28,685	29,582	28,627	28,898	28,832	26,354	291,023	294,014
All Years	25,392	15,320	10,871	15,266	11,506	18,940	24,313	28,336	27,421	29,576	29,534	28,158	264,634	264,634

Total San Joaquin Pipeline (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	27,584	16,762	9,692	11,066	7,304	10,875	21,647	26,722	25,859	29,778	29,778	28,817	245,884	243,146
Above Normal	26,935	14,568	8,898	13,901	8,598	16,352	24,176	28,608	27,685	29,778	29,778	28,817	258,095	258,095
Normal	26,632	15,087	9,698	15,299	11,343	21,935	28,322	29,778	28,817	29,778	29,778	28,817	275,285	275,285
Below Normal	27,567	16,214	13,000	21,070	18,065	25,211	28,817	29,481	28,530	29,778	29,521	27,972	295,227	295,751
Dry	26,210	19,881	16,554	19,818	16,869	25,717	28,817	29,778	28,817	29,094	28,773	27,154	297,481	299,662
All Years	26,992	16,475	11,553	16,261	12,458	20,037	26,359	28,878	27,946	29,645	29,529	28,317	274,450	274,450

Difference in Total San Joaquin Pipeline (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Modified WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	-1,564	-1,214	-793	-1,516	-1,139	-1,558	-4,667	-916	-886	0	0	0	-14,252	-13,731
Above Normal	-1,768	-1,246	-437	-336	-667	-1,875	-3,287	-845	-818	0	0	0	-11,279	-11,636
Normal	-2,474	-1,335	-476	-476	-387	-1,166	-1,421	-404	-391	0	0	0	-8,529	-8,834
Below Normal	-1,690	-1,208	-870	-1,237	-1,213	-739	-726	-341	-330	-146	-28	-16	-8,544	-9,153
Dry	-488	-765	-838	-1,439	-1,353	-119	-132	-196	-190	-196	59	-800	-6,458	-5,648
All Years	-1,600	-1,155	-682	-995	-952	-1,096	-2,046	-542	-524	-68	6	-159	-9,815	-9,815

Table 2.2-4

Total San Joaquin Pipeline (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	26,020	15,548	8,898	9,550	6,165	9,318	16,981	25,806	24,973	29,778	29,778	28,817	231,631	229,415
Above Normal	25,166	13,323	8,462	13,566	7,931	14,478	20,888	27,763	26,867	29,778	29,778	28,817	246,816	246,458
Normal	24,159	13,752	9,222	14,824	10,956	20,769	26,901	29,374	28,426	29,778	29,778	28,817	266,755	266,450
Below Normal	25,877	15,007	12,130	19,833	16,852	24,472	28,091	29,140	28,200	29,632	29,493	27,956	286,683	286,598
Dry	25,723	19,115	15,715	18,379	15,516	25,598	28,685	29,582	28,627	28,898	28,832	26,354	291,023	294,014
All Years	25,392	15,320	10,871	15,266	11,506	18,940	24,313	28,336	27,421	29,576	29,534	28,158	264,634	264,634

Total San Joaquin Pipeline (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	24,854	19,046	14,449	7,730	6,015	7,611	15,398	23,962	23,189	27,589	27,589	26,526	223,960	222,101
Above Normal	25,015	18,522	14,830	9,346	6,015	8,831	19,117	25,015	24,208	27,589	27,589	26,699	232,776	232,343
Normal	24,616	19,046	14,865	10,691	6,864	11,060	25,145	27,054	26,181	27,589	27,589	26,699	247,400	246,589
Below Normal	25,239	19,334	18,748	15,927	11,585	16,789	26,374	27,085	26,212	27,421	27,141	25,562	267,417	267,585
Dry	24,676	19,046	19,087	15,995	12,621	18,195	26,411	27,292	26,411	27,232	26,757	23,247	266,970	269,749
All Years	24,886	18,997	16,405	11,955	8,624	12,505	22,496	26,081	25,239	27,485	27,334	25,756	247,763	247,729

Difference in Total San Joaquin Pipeline (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Modified WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	1,166	-3,499	-5,107	1,819	150	1,706	1,582	1,844	1,784	2,189	2,189	2,291	8,115	7,757
Above Normal	151	-5,199	-6,369	4,220	1,916	5,646	1,771	2,748	2,659	2,189	2,189	2,118	14,040	14,115
Normal	-458	-5,294	-5,643	4,132	4,092	9,710	1,755	2,320	2,245	2,189	2,189	2,118	19,355	19,862
Below Normal	638	-4,327	-6,618	3,906	5,267	7,683	1,717	2,055	1,988	2,211	2,351	2,394	19,266	19,014
Dry	1,047	69	-3,372	2,384	2,895	7,403	2,273	2,290	2,216	1,666	2,076	3,107	24,053	24,265
All Years	506	-3,677	-5,448	3,311	2,882	6,435	1,818	2,255	2,182	2,092	2,201	2,402	16,958	16,992

2.3 Hetch Hetchy Reservoir and Releases

Compared to the WSIP setting, the alternative setting draws less water from the Tuolumne due to the lesser demand. This circumstance leads to less draw from Hetch Hetchy Reservoir in the alternative setting in all years. Figure 2.3-1 illustrates a chronological trace of the simulation of Hetch Hetchy Reservoir storage and stream releases. Shown in Figure 2.3-1 are the results for the WSIP, Modified WSIP, and base settings. Supplementing the Figure 2.3-1 representation of Hetch Hetchy Reservoir storage are Table 2.3-1, Hetch Hetchy Reservoir Storage (Modified WSIP); Table 2.3-2, Hetch Hetchy Reservoir Storage (WSIP); and Table 2.3-3, Difference in Hetch Hetchy Reservoir Storage (Modified WSIP minus WSIP). Table 2.3-4 is provided to illustrate the difference in Hetch Hetchy Reservoir storage between the base and alternative settings.

Table 2.3-3 shows that, by the end of summer, storage in Hetch Hetchy Reservoir associated with the alternative setting would at times (about 20 percent of the years) be greater than the storage in the WSIP setting, albeit typically less than 5,000 acre-feet more in two-thirds of those years. In about one-third of the years, storage would be greater by 5,000 acre-feet or more. The relatively minor increases in storage are attributable to years when summer diversions would be the same in both settings (SJPL operating at maximum capacity) but less water would be diverted in the fall due to the lesser water demand. The larger increases in storage are associated with drought periods during which the differences in underlying demand and water delivery shortages between the WSIP and alternative settings are greater.

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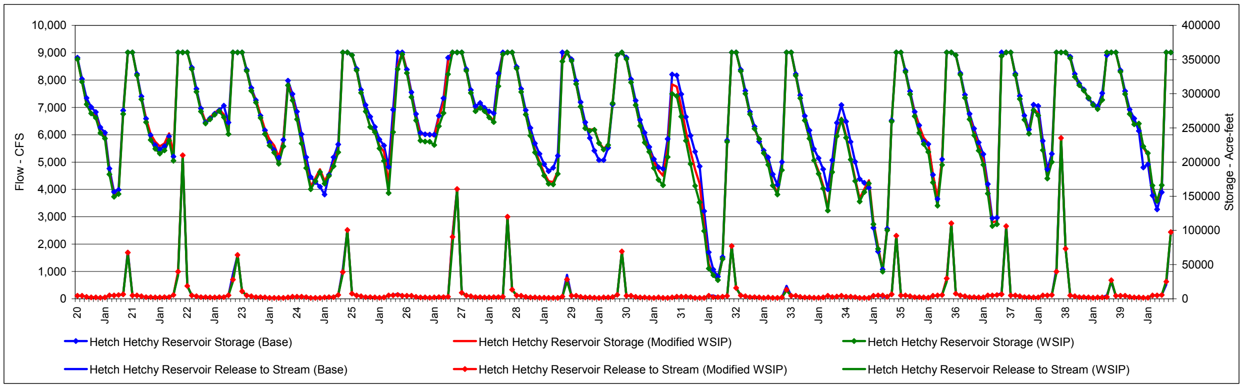
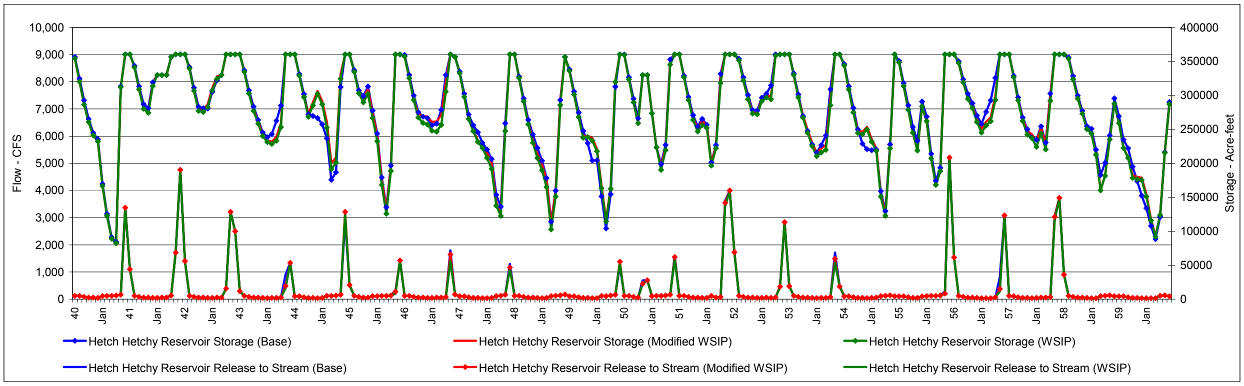
Figure 2.3-1
Hetch Hetchy Reservoir Storage and Stream Release

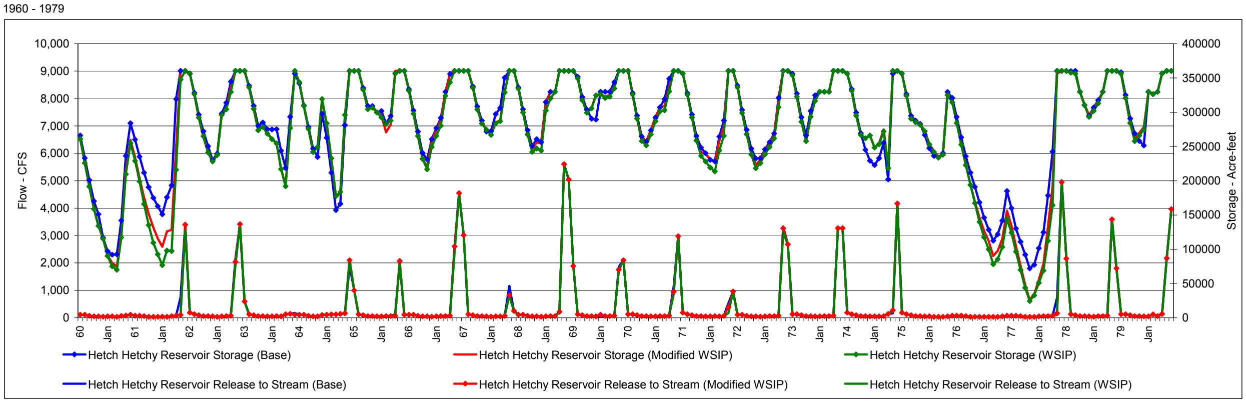
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

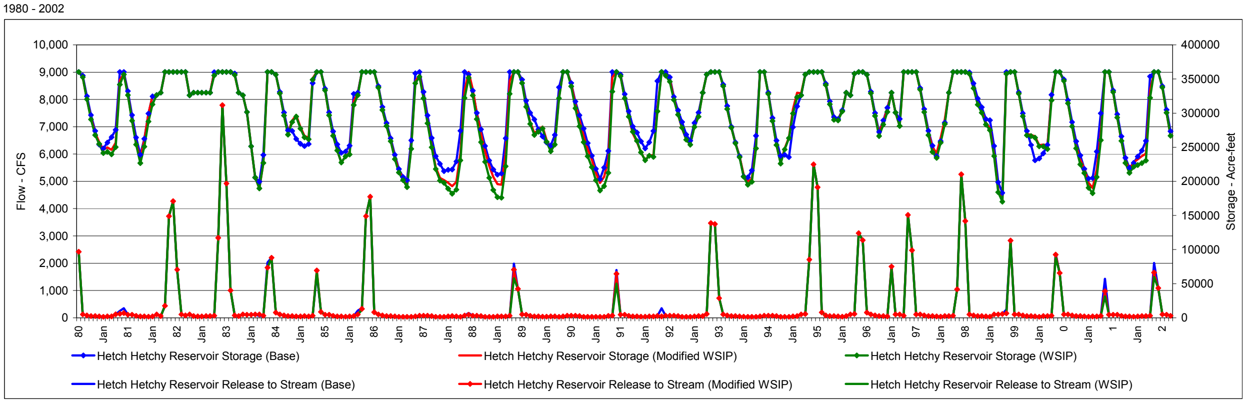


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Table 2.3-1

Hetch Hetchy Reservoir Storage (Acre-feet) Modified WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	272,117	267,600	245,425	237,477	184,880	151,635	155,378	272,083	360,400	360,400	326,811	291,828
1922	264,009	240,850	229,925	222,889	227,355	241,931	212,244	360,400	360,400	360,400	336,082	302,853
1923	276,771	259,318	265,395	272,108	277,250	269,581	244,936	360,400	360,400	360,400	333,186	304,241
1924	291,045	269,331	247,848	232,772	224,247	207,679	230,953	316,199	294,455	266,511	231,247	195,381
1925	164,353	176,388	189,425	172,356	183,982	197,973	217,942	360,400	360,400	356,465	334,210	301,427
1926	274,085	251,427	243,883	223,816	215,011	167,920	254,870	341,671	360,400	333,232	297,804	265,052
1927	240,402	240,834	241,471	237,633	265,210	288,103	348,469	360,400	360,400	360,400	333,718	301,231
1928	275,534	281,108	276,467	267,489	260,490	315,995	360,400	360,400	360,400	337,096	302,689	269,444
1929	240,564	217,758	200,750	183,877	171,934	170,901	186,458	350,991	360,400	348,102	314,426	281,237
1930	250,730	247,160	248,490	228,984	219,554	226,031	287,394	356,465	360,400	350,768	316,726	283,424
1931	252,998	231,531	217,838	200,068	188,024	180,141	221,426	313,697	310,427	280,515	245,249	215,920
1932	189,694	168,170	107,849	50,958	34,482	27,308	58,255	229,674	360,400	360,400	333,089	299,918
1933	269,682	248,173	233,407	214,696	199,250	168,700	155,172	190,490	360,400	360,400	326,593	293,382
1934	260,961	234,344	203,627	187,022	165,494	132,277	188,731	241,241	265,046	238,814	206,804	175,554
1935	146,803	160,526	173,314	112,695	76,273	42,113	101,853	260,501	360,400	360,400	331,788	299,322
1936	272,128	252,344	235,929	227,373	182,196	146,688	204,673	360,400	360,400	356,465	327,853	294,110
1937	266,299	244,805	224,465	203,469	160,719	111,931	113,680	358,909	360,400	360,400	327,212	292,471
1938	263,822	243,421	277,700	271,790	220,879	179,376	203,214	360,400	360,400	360,400	352,029	324,714
1939	312,466	304,668	294,282	283,636	277,502	290,985	360,400	360,400	360,400	332,157	299,492	270,327
1940	255,209	256,245	221,050	210,272	163,190	141,158	164,479	360,400	360,400	354,451	320,313	286,310
1941	260,678	241,118	232,444	166,634	122,924	89,103	82,492	312,086	360,400	360,400	341,291	309,048
1942	281,577	275,798	316,735	330,000	330,000	330,000	356,592	360,400	360,400	360,400	339,529	306,962
1943	279,067	279,524	286,435	310,865	327,956	330,000	360,400	360,400	360,400	360,400	334,820	303,090
1944	279,144	260,348	243,060	234,243	231,461	239,086	259,161	360,400	360,400	360,400	329,290	297,445
1945	272,731	289,623	306,527	291,374	261,135	200,352	208,439	331,150	360,400	360,400	334,928	303,168
1946	294,621	309,813	274,380	240,447	175,982	132,453	194,360	360,400	360,400	357,267	325,581	293,235
1947	273,292	269,800	268,501	261,131	261,603	271,410	320,357	360,400	356,592	332,847	297,991	265,329
1948	248,495	233,768	224,880	215,217	201,484	142,832	127,092	251,309	360,400	360,400	325,774	291,062
1949	259,625	233,526	214,785	198,641	175,769	111,718	158,012	291,712	356,592	336,040	301,328	268,173
1950	239,630	240,600	237,275	221,334	166,741	117,129	164,953	321,680	360,400	359,600	323,849	289,929
1951	259,038	330,000	330,000	273,739	223,537	195,259	223,591	349,555	360,400	360,400	326,780	293,203
1952	266,669	250,901	262,778	255,361	199,922	225,629	326,959	360,400	360,400	360,400	351,651	322,211
1953	296,329	275,128	274,206	293,261	298,723	298,998	360,400	360,400	360,400	360,400	330,136	297,172
1954	269,967	248,958	230,167	215,472	221,810	226,543	294,921	360,400	360,400	343,956	308,827	274,943
1955	248,389	246,440	253,658	235,826	222,104	154,790	126,043	224,815	360,400	348,498	313,738	278,863
1956	244,816	218,801	283,964	261,892	207,063	168,360	188,550	360,400	360,400	360,400	347,791	319,290
1957	296,127	283,218	264,874	251,129	261,402	267,702	298,964	360,400	360,400	360,400	326,823	292,697
1958	265,056	247,735	242,715	232,722	252,235	228,728	300,531	360,400	360,400	360,400	353,900	323,910
1959	295,427	273,939	251,438	244,519	213,789	161,220	182,310	235,602	288,072	259,627	223,044	208,219
1960	182,150	179,994	178,838	154,435	117,972	92,922	124,515	215,838	287,602	261,361	226,158	191,940
1961	159,106	134,295	115,531	91,188	79,972	74,855	121,896	214,131	259,832	233,750	203,767	175,689
1962	151,614	131,596	115,495	103,774	126,062	128,199	248,844	360,400	360,400	356,465	326,379	292,131
1963	263,237	241,315	228,196	237,544	296,171	306,227	337,046	360,400	360,400	360,400	336,396	305,026
1964	273,668	279,416	269,775	261,624	255,213	217,991	192,707	277,310	360,400	343,750	309,409	275,896
1965	241,813	249,120	317,459	282,122	231,160	175,820	182,106	294,713	360,400	360,400	360,400	333,188
1966	305,400	307,762	300,466	294,821	270,870	282,135	360,400	360,400	360,400	331,450	297,972	265,321
1967	231,906	220,533	257,784	274,012	288,947	330,000	355,978	360,400	360,400	360,400	360,400	335,768
1968	305,290	284,733	275,763	268,094	285,055	288,111	330,318	360,400	360,400	334,325	299,837	267,451
1969	246,142	255,844	254,565	312,954	330,000	330,000	360,400	360,400	360,400	360,400	349,426	317,777
1970	300,247	306,610	325,386	326,065	322,564	325,562	337,435	360,400	360,400	360,400	326,016	290,760
1971	262,245	257,685	273,909	292,784	307,506	309,059	336,451	360,400	360,400	356,465	325,764	292,446
1972	258,839	241,986	238,534	231,634	227,827	258,038	279,502	360,400	360,400	336,426	299,001	267,965
1973	239,426	223,220	230,637	243,487	254,169	266,817	317,146	360,400	360,400	353,990	322,828	286,127
1974	257,794	293,500	316,503	330,000	330,000	330,000	360,400	360,400	360,400	356,465	331,550	295,187
1975	266,912	262,126	266,128	248,443	254,951	274,815	221,223	360,400	360,400	356,465	324,162	290,479
1976	286,336	282,468	273,429	254,167	243,006	234,707	239,057	325,890	315,337	285,266	253,563	223,665
1977	194,726	169,242	146,459	127,236	111,968	90,372	97,632	115,367	156,470	134,474	104,623	76,248
1978	47,981	26,093	34,215	55,672	78,891	132,593	191,898	356,465	360,400	360,400	357,869	356,406
1979	329,957	311,201	295,960	304,862	315,745	330,000	360,400	360,400	360,400	356,097	320,734	284,314
1980	261,721	269,873	278,531	330,000	326,446	330,000	356,592	360,400	360,400	360,400	352,729	320,413
1981	292,699	270,564	257,688	246,138	249,541	246,043	256,667	348,346	357,910	327,697	290,144	255,269
1982	233,101	260,819	299,676	324,807	326,446	330,000	360,400	360,400	360,400	360,400	360,400	360,400
1983	326,065	330,000	330,000	330,000	330,000	330,000	359,897	360,400	360,400	360,400	360,400	355,970
1984	330,000	326,192	301,515	251,330	205,725	189,676	227,004	360,400	360,400	356,465	328,962	296,457
1985	270,560	289,092	297,165	279,546	266,664	263,877	351,018	360,400	360,400	333,535	296,865	266,723
1986	245,402	227,652	236,474	242,290	318,179	328,413	360,400	360,400	360,400	360,400	337,490	304,597
1987	281,194	259,670	235,533	215,773	204,621	194,313	250,463	346,631	356,070	324,438	287,928	252,729
1988	220,942	205,017	201,762	197,791	193,001	199,093	241,954	333,447	360,400	334,539	299,756	270,997
1989	243,894	222,400	206,450	196,014	195,062	241,083	347,606	360,400	360,400	345,211	312,004	286,902
1990	270,594	275,314	280,094	260,723	246,741	256,550	324,250	360,400	360,400	343,158	313,975	289,321
1991	266,124	247,271	231,814	212,668	197,662	206,866	231,107	352,428	360,400	355,666	321,999	294,243
1992	270,096	257,535	242,695	231,201	237,833	238,182	306,823	360,400	358,060	350,325	321,621	298,034
1993	277,178	261,430	254,452	280,385	295,700	330,000	356,592	360,400	360,400	360,400	339,684	305,994
1994	278,714	256,620	236,501	209,680	199,537	203,831	252,688	360,400	360,400	328,106	288,504	253,299
1995	227,345	247,933	264,532	305,772	330,000	329,098	356,592	360,400	360,400	360,400	360,400	341,235
1996	313,102	291,101	290,319	303,304	330,000	326,065	357,776	360,400	360,400	356,465	329,269	295,808
1997	270,191	287,926	306,502	330,000	300,695	281,114	360,400	360,400	360,400	360,400	334,509	301,549
1998	270,887	249,933	241,331	263,526	290,769	330,000	360,400	360,400	360,400	360,400	357,575	336,363
1999	314,282	302,448	286,043	277,753	239,946	186,761	172,767	359,716	360,400	360,400	328,523	295,405
2000	269,417	268,330	265,806	253,104	253,852	253,003	324,308	360,400	360,400	347,257	314,429	280,432
2001	252,172	231,383	218,839	198,018	190,076	217,611	271,582	360,400	360,186	330,828	293,698	259,268
2002	230,712	217,058	227,783	232,464	236,893	240,595	332,813	360,400	360,400	337,536	300,566	266,784
Avg (21-02)	258,433	250,236	247,365	239,541	231,061	224,148	259,518	335,006	351,584	341,888	314,659	284,123

APPENDIX O2

Table 2.3-2

Hetch Hetchy Reservoir Storage (Acre-feet) WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	271,165	264,808	242,632	234,683	182,084	149,183	153,305	270,347	360,400	360,400	326,811	291,828
1922	258,301	232,379	219,552	212,511	216,970	231,546	201,859	360,400	360,400	360,400	336,082	302,853
1923	273,916	256,464	262,541	269,252	274,392	265,677	241,032	360,400	360,400	360,400	333,186	304,241
1924	287,239	264,605	241,219	224,237	213,989	197,420	222,900	312,177	290,436	262,497	227,241	191,379
1925	160,353	172,388	185,426	168,354	179,977	193,968	214,415	360,400	360,400	356,465	334,210	301,427
1926	274,085	251,427	243,883	219,916	201,778	154,687	243,705	336,096	357,554	330,389	294,965	261,018
1927	231,614	230,204	229,890	225,094	252,663	271,751	328,434	360,400	360,400	360,400	333,718	301,231
1928	274,488	279,141	274,500	265,521	258,520	310,981	357,818	360,400	360,400	337,096	302,689	269,444
1929	238,756	214,109	197,101	180,226	168,280	167,248	182,805	347,340	360,400	348,102	314,426	281,237
1930	249,493	245,923	247,253	227,747	218,315	224,793	286,156	356,465	360,400	350,768	316,726	283,424
1931	252,998	228,677	214,984	191,409	174,118	166,236	207,521	299,800	296,541	266,646	231,402	197,210
1932	165,286	141,000	99,154	44,357	34,477	27,305	58,254	229,673	360,400	360,400	333,089	299,918
1933	270,157	248,649	233,883	213,269	196,104	165,553	152,529	188,275	360,400	360,400	326,593	293,382
1934	260,961	234,344	202,598	182,895	161,604	129,002	185,456	237,968	261,776	235,550	203,546	172,300
1935	142,314	156,037	168,825	108,936	73,089	39,750	100,334	259,346	360,400	360,400	331,788	299,322
1936	267,086	242,699	226,345	214,884	170,029	136,212	195,836	360,400	360,400	356,465	327,853	294,110
1937	262,493	239,158	216,925	195,925	154,023	106,324	109,133	355,146	360,400	360,400	327,212	292,471
1938	261,919	241,518	276,115	268,301	217,388	175,924	200,166	360,400	360,400	360,400	352,029	324,714
1939	312,466	304,668	294,282	283,636	277,502	290,985	360,400	360,400	360,400	332,157	299,492	270,327
1940	255,209	256,245	222,760	213,012	165,616	143,200	166,203	360,400	360,400	354,451	320,313	286,310
1941	260,678	241,118	232,444	166,634	122,924	89,103	82,492	312,086	360,400	360,400	341,291	309,048
1942	280,245	274,466	313,690	330,000	330,000	330,000	356,592	360,400	360,400	360,400	339,529	306,962
1943	277,164	275,780	282,691	307,119	324,209	330,000	360,400	360,400	360,400	360,400	334,820	303,090
1944	277,241	258,445	240,206	231,387	228,604	233,279	253,354	360,400	360,400	360,400	329,290	297,445
1945	268,450	285,342	302,246	287,091	252,554	191,770	200,884	324,552	360,400	360,400	334,928	303,168
1946	289,579	302,009	266,576	232,638	168,168	125,876	188,823	360,400	360,400	357,267	325,581	293,235
1947	267,584	259,488	257,238	247,959	246,704	256,512	305,459	360,400	356,592	332,847	297,991	265,329
1948	247,258	231,519	222,630	208,209	191,894	137,570	122,657	247,597	360,400	360,400	325,774	291,062
1949	257,437	230,325	207,779	189,698	165,102	102,768	150,930	285,781	356,592	336,040	301,328	268,173
1950	237,728	238,697	233,120	217,888	163,294	114,244	162,551	319,659	360,400	359,600	323,849	289,929
1951	259,038	330,000	330,000	273,739	223,537	190,502	219,413	345,379	360,400	360,400	326,780	293,203
1952	263,719	247,031	256,244	252,090	196,649	222,356	318,163	360,400	360,400	360,400	351,651	322,211
1953	294,426	273,225	272,304	291,357	296,819	294,144	358,469	360,400	360,400	360,400	330,136	297,172
1954	267,018	245,088	225,346	210,648	216,124	219,810	285,610	360,400	360,400	343,956	308,827	274,943
1955	244,584	242,635	249,852	232,018	218,294	150,980	122,826	222,121	360,400	348,498	313,738	278,863
1956	244,816	218,801	283,964	261,892	207,063	168,360	188,550	360,400	360,400	360,400	347,791	319,290
1957	295,080	281,251	261,004	245,354	255,623	261,924	293,186	360,400	360,400	360,400	326,823	292,697
1958	262,298	242,214	237,194	224,344	243,852	220,345	292,148	360,400	360,400	360,400	353,900	323,910
1959	295,427	273,019	250,518	243,597	212,867	160,299	181,528	235,211	287,682	259,237	222,655	207,831
1960	178,623	176,466	175,310	150,905	115,966	92,114	123,900	215,531	287,296	261,055	225,853	191,635
1961	158,801	133,990	115,379	89,989	75,248	70,132	117,173	209,414	255,120	229,047	199,072	166,120
1962	135,106	109,472	92,419	76,863	98,093	97,377	215,903	347,784	360,400	356,465	326,379	292,131
1963	265,044	241,281	228,162	237,510	296,137	304,290	329,586	360,400	360,400	360,400	336,396	305,026
1964	273,668	278,495	268,855	260,703	254,291	217,069	191,863	276,888	360,400	343,750	309,409	275,896
1965	241,813	249,120	319,261	283,925	232,964	177,623	183,699	296,108	360,400	360,400	360,400	333,188
1966	304,353	306,716	299,942	292,395	282,814	287,628	356,592	360,400	360,400	331,450	297,972	265,321
1967	231,906	216,758	249,252	265,475	280,406	324,014	343,546	360,400	360,400	360,400	360,400	335,768
1968	304,053	283,496	274,527	266,857	283,817	286,873	329,080	360,400	360,400	334,325	299,837	267,451
1969	242,147	247,245	244,063	302,446	320,114	330,000	360,400	360,400	360,400	360,400	349,426	317,777
1970	299,296	305,659	324,435	326,065	320,846	322,797	334,670	360,400	360,400	360,400	326,016	290,760
1971	257,964	251,563	267,786	286,658	301,378	302,930	330,322	360,400	360,400	356,465	325,764	292,446
1972	258,839	236,370	228,162	219,353	213,819	244,031	265,495	360,400	360,400	336,426	299,001	267,965
1973	238,190	218,208	225,626	238,473	249,151	261,799	307,249	360,400	360,400	353,990	322,828	286,127
1974	257,794	293,500	316,503	330,000	330,000	330,000	360,400	360,400	360,400	356,465	331,550	295,187
1975	266,912	262,126	266,128	248,443	253,233	271,955	218,363	360,400	360,400	356,465	324,162	290,479
1976	285,385	281,517	272,478	253,215	242,054	233,754	238,104	324,938	314,385	284,316	252,614	222,717
1977	193,779	167,282	139,742	117,657	99,799	78,202	85,462	103,210	144,346	124,287	96,380	69,868
1978	43,507	24,382	32,503	50,915	68,975	112,212	164,152	360,400	360,400	360,400	357,869	356,406
1979	329,957	310,280	293,137	302,038	312,919	330,000	360,400	360,400	360,400	356,097	320,734	284,314
1980	257,725	265,877	274,536	330,000	326,446	330,000	356,592	360,400	360,400	360,400	352,729	320,413
1981	290,796	267,741	254,865	241,410	243,092	239,594	250,218	341,900	356,592	326,381	288,829	253,955
1982	226,746	250,781	287,735	312,861	326,446	330,000	360,400	360,400	360,400	360,400	360,400	360,400
1983	326,065	330,000	330,000	330,000	330,000	330,000	355,110	360,400	360,400	360,400	360,400	355,970
1984	330,000	326,192	301,515	251,330	205,725	189,676	227,004	360,400	360,400	356,465	328,962	296,457
1985	268,372	286,904	294,977	277,357	264,474	261,687	348,828	360,400	360,400	333,535	296,865	266,723
1986	245,402	227,652	236,474	239,341	311,791	326,065	360,400	360,400	360,400	360,400	337,490	304,597
1987	281,194	258,749	232,710	212,948	201,794	191,486	247,637	343,806	353,248	321,619	285,112	249,916
1988	218,130	201,193	197,937	189,208	181,835	187,927	230,788	322,288	351,731	325,880	291,107	257,476
1989	228,478	205,142	187,290	176,843	175,880	221,901	328,424	360,400	360,400	343,974	309,341	284,242
1990	267,935	272,656	277,435	258,063	244,079	253,888	321,588	360,400	360,400	339,162	307,130	280,640
1991	257,447	236,752	220,773	201,620	186,608	192,958	212,319	331,748	360,400	354,429	321,715	294,880
1992	272,636	259,154	242,411	230,916	237,549	235,995	302,519	360,400	355,022	346,244	319,447	297,703
1993	278,750	261,161	253,660	279,592	294,907	330,000	356,592	360,400	360,400	360,400	339,684	305,994
1994	278,714	255,699	235,580	206,856	194,993	199,287	248,143	360,400	360,400	328,106	288,504	253,299
1995	226,108	246,696	263,295	299,588	323,326	326,065	356,592	360,400	360,400	360,400	360,400	341,235
1996	313,102	290,180	289,399	302,383	330,000	326,065	357,776	360,400	360,400	356,465	329,269	295,808
1997	266,385	283,200	301,776	330,000	300,695	281,114	360,400	360,400	360,400	360,400	334,509	301,549
1998	267,747	243,111	234,508	256,700	283,939	330,000	360,400	360,400	360,400	360,400	357,575	336,363
1999	312,379	300,546	283,189	274,898	237,089	183,904	170,253	357,615	360,400	360,400	328,523	295,405
2000	267,514	266,427	263,903	251,200	251,088	247,384	318,690	360,400	360,400	347,257	314,429	280,432
2001	248,366	224,815	212,272	190,495	182,549	206,184	260,155	360,400	360,186	330,828	293,698	259,268
2002	226,907	212,332	221,154	223,929	226,634	230,337	322,554	360,400	360,400	337,536	300,566	266,784
Avg (21-02)	255,904	246,607	243,366	234,942	226,197	219,194	254,171	333,374	350,872	341,109	313,888	283,193

APPENDIX O2

Table 2.3-3

Difference in Hetch Hetchy Reservoir Storage (Acre-feet)

Modified WSIP minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	952	2,792	2,793	2,794	2,796	2,452	2,073	1,736	0	0	0	0
1922	5,708	8,471	10,373	10,378	10,385	10,385	10,385	0	0	0	0	0
1923	2,855	2,854	2,854	2,856	2,858	3,904	3,904	0	0	0	0	0
1924	3,806	4,726	6,629	8,535	10,258	10,259	8,053	4,022	4,019	4,014	4,006	4,002
1925	4,000	4,000	3,999	4,002	4,005	4,005	3,527	0	0	0	0	0
1926	0	0	0	3,900	13,233	13,233	11,165	5,575	2,846	2,843	2,839	4,034
1927	8,788	10,630	11,581	12,539	12,547	16,352	20,035	0	0	0	0	0
1928	1,046	1,967	1,967	1,968	1,970	5,014	2,582	0	0	0	0	0
1929	1,808	3,649	3,649	3,651	3,654	3,653	3,653	3,651	0	0	0	0
1930	1,237	1,237	1,237	1,237	1,239	1,238	1,238	0	0	0	0	0
1931	0	2,854	2,854	8,659	13,906	13,905	13,905	13,897	13,886	13,869	13,847	18,710
1932	24,408	27,170	8,695	6,601	5	3	1	1	0	0	0	0
1933	-475	-476	-476	1,427	3,146	3,147	2,643	2,215	0	0	0	0
1934	0	0	1,029	4,127	3,890	3,275	3,275	3,273	3,270	3,264	3,258	3,254
1935	4,489	4,489	4,489	3,759	3,184	2,363	1,519	1,155	0	0	0	0
1936	5,042	9,645	9,584	12,489	12,167	10,476	8,837	0	0	0	0	0
1937	3,806	5,647	7,540	7,544	6,696	5,607	4,547	3,763	0	0	0	0
1938	1,903	1,903	1,585	3,489	3,491	3,452	3,048	0	0	0	0	0
1939	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	-1,710	-2,740	-2,426	-2,042	-1,724	0	0	0	0	0
1941	0	0	0	0	0	0	0	0	0	0	0	0
1942	1,332	1,332	3,045	0	0	0	0	0	0	0	0	0
1943	1,903	3,744	3,744	3,746	3,747	0	0	0	0	0	0	0
1944	1,903	1,903	2,854	2,856	2,857	5,807	5,807	0	0	0	0	0
1945	4,281	4,281	4,281	4,283	8,581	8,582	7,555	6,598	0	0	0	0
1946	5,042	7,804	7,804	7,809	7,814	6,577	5,537	0	0	0	0	0
1947	5,708	10,312	11,263	13,172	14,899	14,898	14,898	0	0	0	0	0
1948	1,237	2,249	2,250	7,008	9,590	5,262	4,435	3,712	0	0	0	0
1949	2,188	3,201	7,006	8,943	10,667	8,950	7,082	5,931	0	0	0	0
1950	1,902	1,903	4,155	3,446	3,447	2,885	2,402	2,021	0	0	0	0
1951	0	0	0	0	0	4,757	4,178	4,176	0	0	0	0
1952	2,950	3,870	6,534	3,271	3,273	3,273	8,796	0	0	0	0	0
1953	1,903	1,903	1,902	1,904	1,904	4,854	1,931	0	0	0	0	0
1954	2,949	3,870	4,821	4,824	5,686	6,733	9,311	0	0	0	0	0
1955	3,805	3,805	3,806	3,808	3,810	3,810	3,217	2,694	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0
1957	1,047	1,967	3,870	5,775	5,779	5,778	5,778	0	0	0	0	0
1958	2,758	5,521	5,521	8,378	8,383	8,383	8,383	0	0	0	0	0
1959	0	920	920	922	922	921	782	391	390	390	389	388
1960	3,527	3,528	3,528	3,530	2,006	808	615	307	306	306	305	305
1961	305	305	152	1,199	4,724	4,723	4,723	4,717	4,712	4,703	4,695	9,569
1962	16,508	22,124	23,076	26,911	27,969	30,822	32,941	12,616	0	0	0	0
1963	-1,807	34	34	34	34	1,937	7,460	0	0	0	0	0
1964	0	921	920	921	922	922	844	422	0	0	0	0
1965	0	0	-1,802	-1,803	-1,804	-1,803	-1,593	-1,395	0	0	0	0
1966	1,047	1,046	524	2,426	-11,944	-5,493	3,808	0	0	0	0	0
1967	0	3,775	8,532	8,537	8,541	5,986	12,432	0	0	0	0	0
1968	1,237	1,237	1,236	1,237	1,238	1,238	1,238	0	0	0	0	0
1969	3,995	8,599	10,502	10,508	9,886	0	0	0	0	0	0	0
1970	951	951	951	0	1,718	2,765	2,765	0	0	0	0	0
1971	4,281	6,122	6,123	6,126	6,128	6,129	6,129	0	0	0	0	0
1972	0	5,616	10,372	12,281	14,008	14,007	14,007	0	0	0	0	0
1973	1,236	5,012	5,011	5,014	5,018	5,018	9,897	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	1,718	2,860	2,860	0	0	0	0	0
1976	951	951	951	952	952	953	953	952	952	950	949	948
1977	947	1,960	6,717	9,579	12,169	12,170	12,170	12,157	12,124	10,187	8,243	6,380
1978	4,474	1,711	1,712	4,757	9,916	20,381	27,746	-3,935	0	0	0	0
1979	0	921	2,823	2,824	2,826	0	0	0	0	0	0	0
1980	3,996	3,996	3,995	0	0	0	0	0	0	0	0	0
1981	1,903	2,823	2,823	4,728	6,449	6,449	6,449	6,446	1,318	1,316	1,315	1,314
1982	6,355	10,038	11,941	11,946	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	4,787	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0
1985	2,188	2,188	2,188	2,189	2,190	2,190	2,190	0	0	0	0	0
1986	0	0	9	2,949	6,388	2,348	0	0	0	0	0	0
1987	0	921	2,823	2,825	2,827	2,827	2,826	2,825	2,822	2,819	2,816	2,813
1988	2,812	3,824	3,825	8,583	11,166	11,166	11,166	11,159	8,669	8,659	8,649	13,521
1989	15,416	17,258	19,160	19,171	19,182	19,182	19,182	0	0	1,237	2,663	2,660
1990	2,659	2,658	2,659	2,660	2,662	2,662	2,662	0	0	3,996	6,845	8,681
1991	8,677	10,519	11,041	11,048	11,054	13,908	18,788	20,680	0	1,237	284	-637
1992	-2,540	-1,619	284	285	284	2,187	4,304	0	3,038	4,081	2,174	331
1993	-1,572	269	792	793	793	0	0	0	0	0	0	0
1994	0	921	921	2,824	4,544	4,544	4,545	0	0	0	0	0
1995	1,237	1,237	1,237	6,184	6,674	3,033	0	0	0	0	0	0
1996	0	921	920	921	0	0	0	0	0	0	0	0
1997	3,806	4,726	4,726	0	0	0	0	0	0	0	0	0
1998	3,140	6,822	6,823	6,826	6,830	0	0	0	0	0	0	0
1999	1,903	1,902	2,854	2,855	2,857	2,857	2,514	2,101	0	0	0	0
2000	1,903	1,903	1,903	1,904	2,764	5,619	5,618	0	0	0	0	0
2001	3,806	6,568	6,567	7,523	7,527	11,427	11,427	0	0	0	0	0
2002	3,805	4,726	6,629	8,535	10,259	10,258	10,259	0	0	0	0	0
Avg (21-02)	2,530	3,629	3,999	4,599	4,864	4,954	5,347	1,632	712	779	772	930

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Table 2.3-4

Difference in Hetch Hetchy Reservoir Storage (Acre-feet)

Modified WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	-8,294	-5,533	-5,532	-5,535	-5,538	-4,849	-4,092	-3,420	0	0	-2,188	-4,304
1922	455	1,376	5,181	4,232	4,235	4,235	4,235	0	0	0	-2,188	-4,304
1923	-1,448	1,314	1,314	1,315	1,316	-12,955	-12,955	0	0	0	-2,188	-4,304
1924	455	1,375	1,375	4,230	6,810	1,007	-1,614	-2,994	-5,109	-7,291	-9,466	-11,573
1925	-13,755	5,579	25,557	19,771	2,515	-8,996	-7,900	0	0	0	-2,188	-4,304
1926	-9,344	-14,961	-7,378	-9,285	-9,215	-25,108	-21,829	-18,729	0	-2,188	-4,374	-5,291
1927	-2,434	328	1,280	-2,525	-2,526	-5,381	-4,459	0	0	0	-2,188	-4,304
1928	-6,205	-5,285	-2,953	-6,760	-11,060	-13,724	0	0	0	-2,188	-4,373	-6,487
1929	-9,433	-9,434	-11,336	-13,245	-14,971	-20,775	-22,892	-9,409	0	-2,188	-4,374	-6,488
1930	-7,436	11,898	31,876	26,091	16,569	5,057	2,939	0	0	-2,188	-4,373	-6,488
1931	-8,673	-11,435	-4,348	-4,350	-4,352	-10,156	-12,273	-14,454	-16,560	-18,728	-20,891	-22,708
1932	-25,549	-25,549	-20,473	-17,041	-8,349	-5,112	-2,830	-2,046	0	0	-2,188	-4,304
1933	-3,826	-3,827	3,261	-2,445	-7,603	-13,405	-11,571	-9,691	0	0	-2,188	-4,304
1934	-6,490	-12,107	-15,365	-18,739	-24,113	-27,951	-14,010	-16,190	-18,288	-20,447	-22,600	-24,692
1935	-28,483	-9,149	10,830	8,685	7,072	-978	-636	-483	0	0	-2,188	-4,304
1936	-1,448	-1,448	5,685	894	895	786	664	0	0	0	-2,188	-4,304
1937	-4,302	-4,302	-4,302	-8,110	-7,189	-6,035	-5,027	-1,491	0	0	-2,188	-4,304
1938	-4,302	-4,302	-6,331	-10,139	-10,144	-10,145	-8,931	0	0	0	-2,188	-4,304
1939	-2,399	-1,479	1,375	-1,478	-4,057	-9,861	3,808	0	0	-2,188	-4,373	-6,488
1940	-8,672	10,662	29,005	13,704	12,156	10,199	8,612	0	0	-2,188	-4,374	-6,488
1941	-4,582	-3,661	-3,051	-3,053	-2,610	-2,189	-1,670	-1,249	0	0	-2,188	-4,304
1942	-5,349	-5,349	-2,494	0	0	0	0	0	0	0	-2,188	-4,304
1943	-4,302	-1,540	5,547	5,550	5,552	0	0	0	0	0	-2,188	-4,304
1944	-4,302	-3,381	-2,430	-4,334	-11,383	-23,750	-25,868	0	0	0	-2,188	-4,304
1945	455	19,789	39,767	33,983	24,548	24,549	21,607	18,887	0	0	-2,188	-4,304
1946	-4,302	-3,381	-3,382	-3,383	-3,385	-2,974	-2,520	0	0	-2,188	-4,374	-6,487
1947	-1,728	1,034	1,985	4,840	3,125	-7,436	-9,553	0	0	-2,188	-4,374	-6,487
1948	-7,435	-12,039	-4,951	-4,953	-4,956	-10,760	-9,091	-7,614	0	0	-2,188	-4,304
1949	-4,303	-8,905	-7,954	-5,080	-2,505	-2,202	-1,836	-1,533	0	-2,188	-4,374	-6,488
1950	-8,387	10,947	33,308	16,918	15,382	12,899	10,469	8,780	0	-800	-2,988	-5,103
1951	-7,289	0	0	0	0	-3,806	-3,349	-3,347	0	0	-2,188	-4,304
1952	-4,302	-3,381	-2,430	-1,216	-1,217	-1,217	-4,900	0	0	0	-2,188	-4,304
1953	-4,302	-3,381	-3,382	-3,383	-3,385	-15,752	0	0	0	0	-2,188	-4,304
1954	454	1,376	2,327	-526	-4,995	-14,508	-14,048	0	0	-2,188	-4,373	-6,487
1955	-1,728	17,606	32,828	16,389	1,532	-4,271	-3,598	-3,006	0	-2,188	-4,374	-6,488
1956	-8,673	-14,289	-6,886	-6,890	-6,894	-6,002	-5,052	0	0	0	-2,188	-4,304
1957	-6,205	-5,284	-5,284	-7,190	-14,240	-24,801	-26,918	0	0	0	-2,188	-4,304
1958	-2,495	-2,495	4,593	-2,064	-2,065	-2,065	-2,065	0	0	0	-2,188	-4,304
1959	-4,302	-3,382	-3,382	-6,237	-6,241	-21,558	-18,478	-5,383	-7,495	-9,672	-11,844	-13,948
1960	-12,988	6,346	26,325	20,542	10,165	4,457	3,400	-493	-2,610	-4,794	-6,974	-9,084
1961	-11,267	-16,883	-1,354	-6,112	-12,134	-17,938	-20,055	-22,217	-24,309	-26,458	-31,454	-36,022
1962	-38,855	-43,459	-47,263	-47,317	-49,784	-65,006	-70,529	0	0	0	-2,188	-4,304
1963	-9,059	-9,059	-1,971	-1,972	-1,973	-7,681	-7,682	0	0	0	-2,188	-4,304
1964	-6,490	-5,569	-5,570	-13,184	-20,065	-25,869	-25,869	-16,063	3,808	1,616	-574	-2,692
1965	-4,878	14,456	19,521	19,529	19,539	18,739	15,829	13,518	0	0	0	-2,118
1966	-4,019	-1,258	751	-7,050	-13,021	-12,373	3,808	0	0	-2,188	-4,373	-6,488
1967	-8,672	-10,513	-2,902	-2,904	-2,906	0	0	0	0	0	0	-2,118
1968	-3,068	-3,068	4,019	-4,541	-12,276	-18,080	-20,198	0	0	-2,188	-4,374	-6,488
1969	-4,677	-4,676	-1,822	-1,823	0	0	0	0	0	0	-2,188	-4,304
1970	-3,351	15,983	35,961	-3,935	-7,436	-4,438	-6,555	0	0	0	-2,188	-4,304
1971	-2,400	363	363	363	363	-10,197	-12,315	0	0	0	-2,188	-4,304
1972	-6,490	-6,490	-1,734	1,119	-598	-6,402	-8,519	0	0	-2,188	-4,373	-6,487
1973	-7,435	-9,276	-2,189	-2,191	-2,191	-2,191	-4,033	0	0	-2,188	-4,374	-6,487
1974	-8,388	-8,387	-8,388	0	0	0	0	0	0	0	-2,188	-4,304
1975	-2,400	16,935	36,914	25,423	22,001	19,337	19,337	3,935	0	0	-2,188	-4,304
1976	-1,448	-527	6,560	6,565	6,568	765	-1,352	-3,540	-5,654	-7,836	-10,013	-12,119
1977	-17,155	-21,758	-21,757	-18,921	-16,367	-22,170	-24,288	-26,442	-28,490	-25,577	-25,498	-34,635
1978	-44,111	-45,953	-43,099	-45,790	-45,825	-45,825	-50,612	-3,935	0	0	-2,188	-3,994
1979	-43	878	877	-1,976	-1,977	0	0	0	0	-2,188	-4,373	-6,488
1980	-7,531	11,803	27,024	0	0	0	0	0	0	0	-2,188	-4,304
1981	-4,302	-3,382	3,706	-2,000	-7,157	-18,669	-18,668	-12,054	-2,490	-4,676	-6,858	-8,970
1982	-6,110	-1,507	396	396	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	-2,118
1984	0	0	0	0	0	-9,738	-11,659	0	0	0	-2,188	-4,304
1985	-4,302	15,032	35,010	24,468	14,943	9,141	7,023	0	0	-2,188	-4,374	-6,487
1986	-8,672	-14,288	9	-10,059	-10,064	-1,587	0	0	0	0	-2,188	-4,304
1987	-4,302	-3,382	-3,382	-2,432	-1,574	-7,377	-9,495	-11,677	-4,330	-6,513	-8,693	-10,803
1988	-15,839	-20,442	-13,354	-19,071	-24,236	-30,040	-32,158	-26,953	3,808	1,616	-574	-5,177
1989	-8,028	-8,028	-10,882	-13,743	-16,328	-22,131	-12,794	0	0	-3,805	-6,179	-13,540
1990	-20,193	-860	14,363	3,810	-5,725	-11,529	-13,647	0	0	-1,046	-2,948	-7,549
1991	-11,351	-8,589	-5,735	-5,738	-5,742	-13,353	-13,352	-7,972	0	-951	-5,707	-8,465
1992	-10,364	-14,046	-15,949	-16,909	-19,326	-35,498	-40,102	0	-2,340	-2,337	-2,334	-6,015
1993	-9,818	-7,056	-5,153	-5,156	-5,159	0	0	0	0	0	-2,188	-4,304
1994	-1,448	-527	-527	2,326	-6,265	-12,068	-14,186	0	0	-2,188	-4,374	-6,487
1995	-10,289	9,046	29,024	26,377	20,001	3,033	0	0	0	0	0	-2,118
1996	-4,020	-3,099	-768	-769	0	0	0	0	0	0	-2,188	-4,304
1997	-2,399	-1,478	-1,479	0	0	-10,465	0	0	0	0	-2,188	-4,304
1998	-3,350	-2,430	4,658	4,660	4,663	0	0	0	0	0	-2,188	-7,066
1999	-7,063	-6,143	-5,191	-11,853	-11,858	-11,859	-10,426	-684	0	0	-2,188	-4,304
2000	-4,302	15,032	35,011	19,714	12,851	-468	-2,586	0	0	-2,188	-4,373	-6,488
2001	-6,484	-6,484	603	-6,056	-14,652	-26,069	-28,186	0	-214	-2,402	-4,587	-6,701
2002	-3,843	-2,922	883	-3,873	-8,171	-18,732	-20,850	0	0	-2,188	-4,374	-6,488
Avg (21-02)	-7,145	-3,435	2,378	-1,115	-3,451	-8,198	-7,785	-2,292	-1,345	-2,242	-4,305	-6,672

Through the fall and winter, storage in Hetch Hetchy Reservoir would be the same or higher under the alternative setting as compared to the WSIP setting. Hetch Hetchy Reservoir would fill by the end of May or June during approximately 80 percent of the years, which would prevent any difference in storage from affecting the next summer's reservoir storage. Figure 2.3-2 illustrates the difference in reservoir storage, averaged by year type, between the alternative and the WSIP settings. Also shown is the average difference in storage for the two settings during the 82-year simulation.

Table 2.3-4 illustrates the difference in Hetch Hetchy Reservoir storage between the alternative and base settings. Immediately after filling Hetch Hetchy Reservoir (May or June, and then continuing through July), there would only be occasional differences in storage at the reservoir, typically a decrease of less than 10,000 acre-feet. This is indicative of the same amount of water being passed through the reservoir regardless of the size of the conveyance capacity of the SJPL. Water not diverted to the SJPL would return to the Tuolumne River and flow to Don Pedro Reservoir. In the late summer and early fall, there would consistently be a slight difference (lower) in storage levels between the two settings, as additional diversions to the SJPL would retain Bay Area reservoir storage and serve a slightly greater demand. Some of this additional Hetch Hetchy Reservoir storage depletion would be ameliorated later in the fall and into winter as SJPL diversions are reduced due to less Bay Area reservoir replenishment needs and conveyance system maintenance. Average storage is incidentally about the same in November and December for the alternative and base settings due to the assumed systemwide maintenance that would occur in the alternative setting but not in the base setting. After December, the storage gain occurring in the alternative setting would again be affected as replenishment of Bay Area reservoir storage resumes. In non-wet years, there is a difference in storage between the alternative and base settings; the alternative setting results in a lower storage in the reservoir by the end of April. Figure 2.3-3 illustrates the difference in reservoir storage, averaged by year type, between the alternative and base settings. Also shown is the average difference in storage for the two settings during the 82-year simulation. Figure 2.3-4 illustrates the average monthly storage in Hetch Hetchy Reservoir for the 82-year simulation, and the range in storage for each month for the alternative and base settings.

The difference in storage in Hetch Hetchy Reservoir attributed to the diversion effects of the alternative would manifest in differences in releases from O'Shaughnessy Dam to the stream. A different amount of available reservoir space in the winter and spring due to the alternative would lead to a different ability to regulate inflow, thus potentially changing the amount of water released to the stream that is in excess of minimum release requirements. Figure 2.3-1 illustrates the stream release from O'Shaughnessy Dam for the WSIP, alternative, and base settings. Table 2.3-5 illustrates the difference in stream releases between the alternative and WSIP settings. Compared to the WSIP setting, the alternative exhibits an incrementally greater stream release, predominately during May or June, which is reflective of the months when releases to the stream are made in excess of minimum release requirements in anticipation of filling the reservoir. The few exceptions to this circumstance, during which incremental reductions in releases to the stream occur, are considered anomalous within the modeling and are simply the result of shifting releases from one month to the next. The increase in releases is the result of a less-depleted reservoir to replenish, which is the result of lesser SFPUC demands (and Tuolumne River diversions) between the settings.

Table 2.3-6 illustrates the difference in stream releases between the alternative and base settings. In this comparison, releases would be predominately less than depicted for the base setting, and these differences would typically occur during May or June. Generally, Hetch Hetchy Reservoir storage would be slightly lower during non-wet years, leading to a reduction in stream releases during non-wet years if a release occurs. The few instances of stream flow increases are a result of a coincidence of several operational parameters affecting the release of water from the reservoir, including systemwide water demands, conveyance capacity and maintenance assumptions, and the watershed's hydrology.

Table 2.3-5 illustrates the difference in stream releases between the alternative and WSIP settings, expressed in terms of a monthly volume (acre-feet) of flow. Table 2.3-7 illustrates the same information and the average monthly stream releases for the alternative and WSIP settings, expressed in average monthly flow (cfs). Table 2.3-5 shows an increase in monthly flow below O'Shaughnessy Dam of up to approximately 20,000 acre-feet. Considering the manner in which releases are determined and made to the stream, it is not always meaningful to quantify the effect of these changes in terms of

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Figure 2.3-2

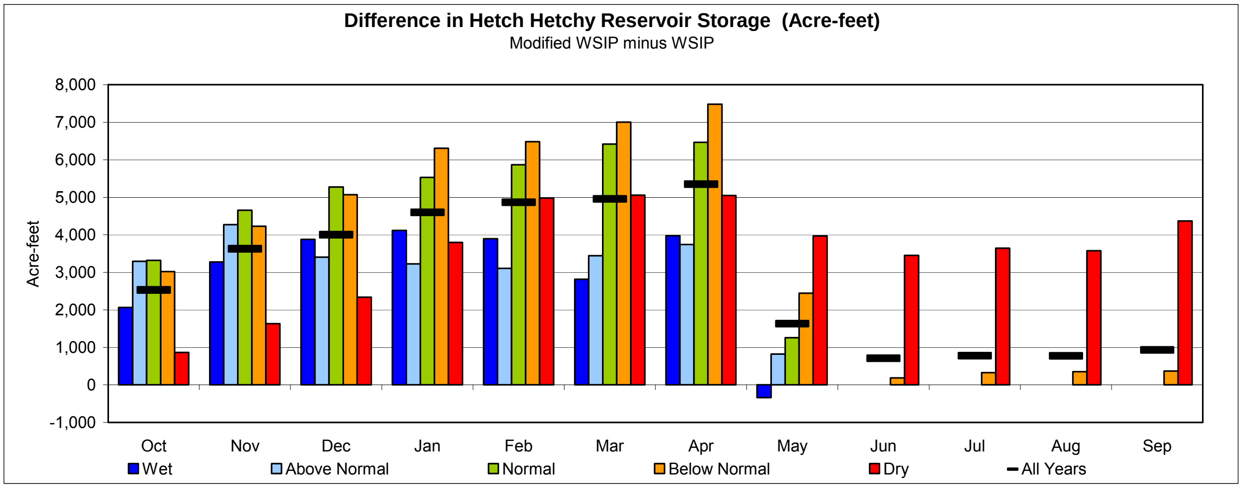


Figure 2.3-3

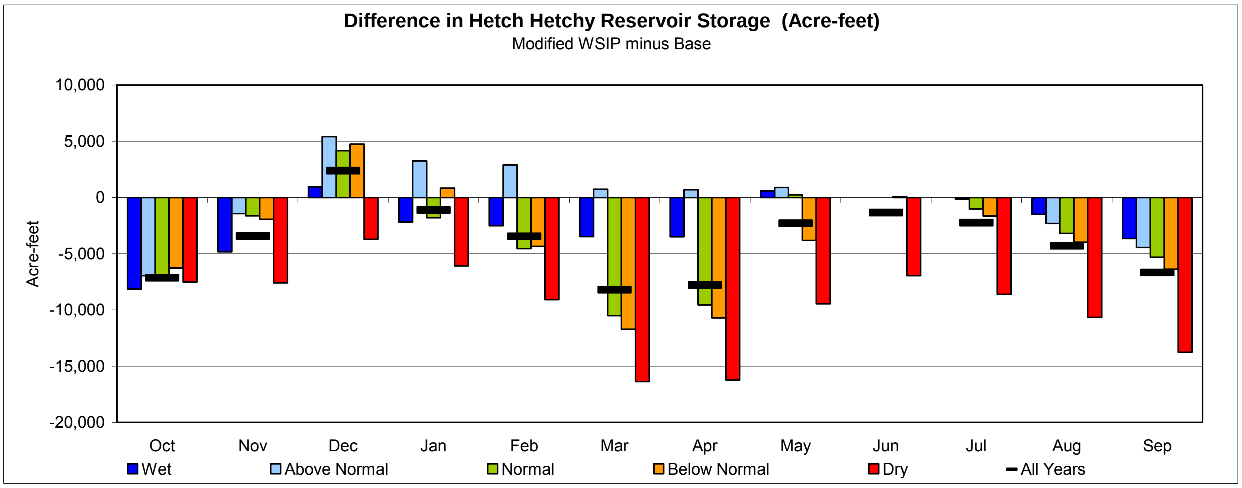
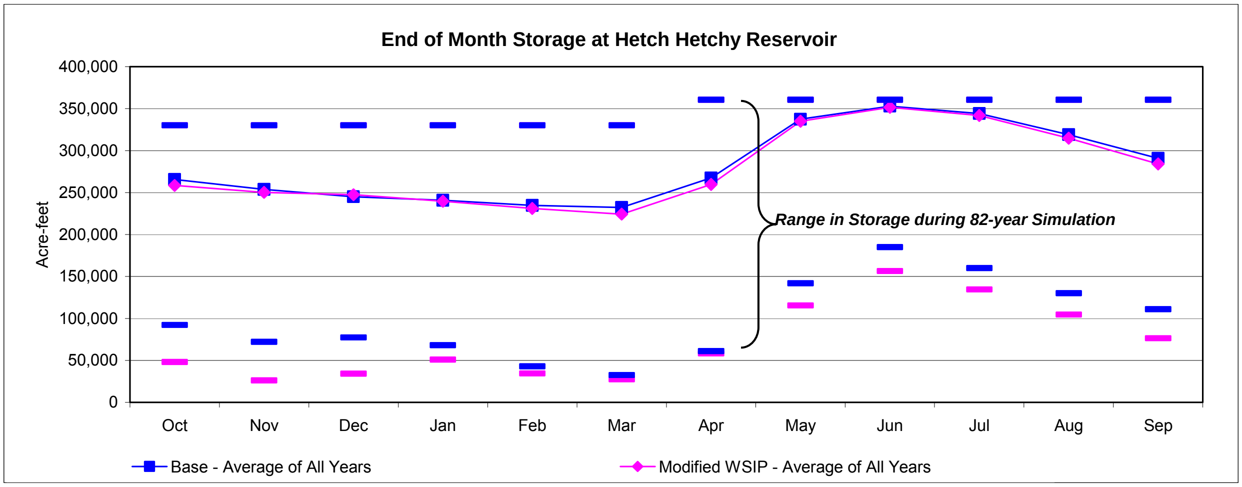


Figure 2.3-4



APPENDIX O2

Table 2.3-5

Difference in Hetch Hetchy Reservoir Release to Stream (Acre-feet) Modified WSIP minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	0	0	0	1,735	0	0	0	1,735
1922	0	0	0	0	0	0	0	9,066	0	0	0	0	9,066
1923	0	0	0	0	0	0	0	3,901	0	0	0	0	3,901
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	3,099	0	0	0	0	3,099
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	20,335	0	0	0	0	20,335
1928	0	0	0	0	0	0	0	2,741	0	0	0	0	2,741
1929	0	0	0	0	0	0	0	0	3,887	0	0	0	3,887
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	1	0	0	0	1
1933	0	0	0	0	0	0	0	0	1,944	0	0	0	1,944
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	1,153	0	0	0	1,153
1936	0	0	0	0	0	0	0	7,725	0	0	0	0	7,725
1937	0	0	0	0	0	0	0	0	3,992	0	0	0	3,992
1938	0	0	0	0	0	0	0	2,663	0	0	0	0	2,663
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	0	0	0	-1,449	0	0	0	0	-1,449
1941	0	0	0	0	0	0	0	0	0	0	0	0	0
1942	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	5,804	0	0	0	0	5,804
1945	0	0	0	0	0	0	0	0	6,593	0	0	0	6,593
1946	0	0	0	0	0	0	0	4,837	0	0	0	0	4,837
1947	0	0	0	0	0	0	0	14,892	0	0	0	0	14,892
1948	0	0	0	0	0	0	0	0	3,707	0	0	0	3,707
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	2,020	0	0	0	2,020
1951	0	0	0	0	0	0	0	0	4,451	0	0	0	4,451
1952	0	0	0	0	0	0	0	8,793	0	0	0	0	8,793
1953	0	0	0	0	0	0	0	2,049	0	0	0	0	2,049
1954	0	0	0	0	0	0	0	9,306	0	0	0	0	9,306
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	5,776	0	0	0	0	5,776
1958	0	0	0	0	0	0	0	8,379	0	0	0	0	8,379
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	13,398	0	0	0	13,398
1963	0	0	0	0	0	0	0	7,458	0	0	0	0	7,458
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	-1,394	0	0	0	-1,394
1966	0	0	0	0	0	0	-3,808	4,045	0	0	0	0	237
1967	0	0	0	0	0	0	0	13,229	0	0	0	0	13,229
1968	0	0	0	0	0	0	0	1,237	0	0	0	0	1,237
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	2,764	0	0	0	0	2,764
1971	0	0	0	0	0	0	0	6,127	0	0	0	0	6,127
1972	0	0	0	0	0	0	0	14,000	0	0	0	0	14,000
1973	0	0	0	0	0	0	0	9,893	0	0	0	0	9,893
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	2,858	0	0	0	0	2,858
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	3,935	-4,171	0	0	0	-236
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	5,090	0	0	0	0	5,090
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	2,336	0	0	0	0	2,336
1986	0	0	9	0	0	0	2,349	0	0	0	0	0	2,358
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	19,424	0	0	0	0	19,424
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	21,217	0	0	0	21,217
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	4,728	0	0	0	0	0	0	0	0	4,728
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	2,228	0	0	0	2,228
2000	0	0	0	0	0	0	0	5,616	0	0	0	0	5,616
2001	0	0	0	0	0	0	0	11,421	0	0	0	0	11,421
2002	0	0	0	0	0	0	0	10,254	0	0	0	0	10,254
Avg (21-02)	0	0	0	58	0	0	-18	2,776	741	0	0	0	3,557

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Table 2.3-6

Difference in Hetch Hetchy Reservoir Release to Stream (Acre-feet) Modified WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	0	0	0	-3,416	0	0	0	-3,416
1922	0	0	0	0	0	0	0	3,696	0	0	0	0	3,696
1923	0	0	0	0	0	0	0	-12,948	0	0	0	0	-12,948
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	-7,896	0	0	0	0	-7,896
1926	0	0	0	0	0	0	0	-2,913	0	0	0	0	-2,913
1927	0	0	0	0	0	0	0	-4,755	0	0	0	0	-4,755
1928	0	0	0	0	0	0	0	0	0	0	0	0	0
1929	0	0	0	0	0	0	0	0	-9,985	0	0	0	-9,985
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	-3,554	0	0	0	-2,044	0	0	0	-5,598
1933	0	0	0	0	0	0	0	0	-8,509	0	0	0	-8,509
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	3,935	0	0	-483	0	0	0	3,452
1936	0	0	0	0	0	0	0	580	0	0	0	0	580
1937	0	0	0	0	0	0	0	-2,659	-1,578	0	0	0	-4,237
1938	0	0	0	0	0	0	0	-7,797	0	0	0	0	-7,797
1939	0	0	0	0	0	0	-3,808	4,045	0	0	0	0	237
1940	0	0	0	0	0	0	0	7,223	0	0	0	0	7,223
1941	0	0	0	0	0	0	0	0	-1,248	0	0	0	-1,248
1942	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	-25,854	0	0	0	0	-25,854
1945	0	0	0	0	0	0	0	0	18,872	0	0	0	18,872
1946	0	0	0	0	0	0	0	-2,208	0	0	0	0	-2,208
1947	0	0	0	0	0	0	0	-9,549	0	0	0	0	-9,549
1948	0	0	0	0	0	0	0	0	-7,605	0	0	0	-7,605
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	8,772	0	0	0	8,772
1951	0	-7,289	0	0	0	0	0	0	-3,559	0	0	0	-10,848
1952	0	0	0	0	0	0	0	-4,898	0	0	0	0	-4,898
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	-14,042	0	0	0	0	-14,042
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	-4,412	0	0	0	0	-4,412
1957	0	0	0	0	0	0	0	-26,907	0	0	0	0	-26,907
1958	0	0	0	0	0	0	0	-2,064	0	0	0	0	-2,064
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	-39,538	0	0	0	0	-39,538
1963	0	0	0	0	0	0	0	-7,727	0	0	0	0	-7,727
1964	0	0	0	0	0	0	0	0	-3,808	0	0	0	-3,808
1965	0	0	0	0	0	0	0	0	13,506	0	0	0	13,506
1966	0	0	0	0	0	0	-3,808	4,045	0	0	0	0	237
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	-20,636	0	0	0	0	-20,636
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	3,935	0	0	0	-6,553	0	0	0	0	-2,618
1971	0	0	0	0	0	0	0	-12,638	0	0	0	0	-12,638
1972	0	0	0	0	0	0	0	-8,515	0	0	0	0	-8,515
1973	0	0	0	0	0	0	0	-4,031	0	0	0	0	-4,031
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	6,881	4,171	0	0	0	11,052
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	-35,170	-4,171	0	0	-310	-39,651
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	-6,603	-10,310	0	0	0	-16,913
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	3,935	0	-11,653	0	0	0	0	-7,718
1985	0	0	0	0	0	0	0	7,499	0	0	0	0	7,499
1986	0	0	9	0	0	-8,478	-1,586	0	0	0	0	0	-10,055
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	-3,808	0	0	0	-3,808
1989	0	0	0	0	0	0	0	-13,620	0	0	0	0	-13,620
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	-8,458	0	0	0	-8,458
1992	0	0	0	0	0	0	0	-18,433	0	0	0	0	-18,433
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	-1,480	0	0	0	0	0	0	0	0	-1,480
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	-8,369	-722	0	0	0	-9,091
2000	0	0	0	0	0	0	0	-2,585	0	0	0	0	-2,585
2001	0	0	0	0	0	0	0	-28,173	0	0	0	0	-28,173
2002	0	0	0	0	0	0	0	-21,494	0	0	0	0	-21,494
Avg (21-02)	0	-89	0	30	-43	-7	-112	-4,155	-297	0	0	-4	-4,677

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Table 2.3-7

Hetch Hetchy Reservoir Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	55	51	51	171	89	84	146	2,455	4,544	2,034	184	89
Above Normal	55	89	88	66	89	94	131	1,236	3,107	379	125	89
Normal	54	54	50	55	74	74	98	1,315	1,912	167	122	86
Below Normal	55	55	46	43	51	63	88	624	735	113	111	73
Dry	53	53	44	40	44	50	56	157	143	86	86	65
All Years	54	61	56	74	70	73	104	1,152	2,084	548	125	81

Hetch Hetchy Reservoir Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	55	51	51	167	89	84	144	2,412	4,550	2,034	184	89
Above Normal	55	89	88	66	89	94	131	1,192	3,093	379	125	89
Normal	54	54	50	55	74	74	98	1,253	1,890	167	122	86
Below Normal	55	55	46	43	51	63	91	550	709	113	111	73
Dry	53	53	44	40	44	50	56	156	139	86	86	65
All Years	54	61	56	73	70	73	104	1,107	2,072	548	125	81

Difference in Hetch Hetchy Reservoir Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Modified WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	0	0	1	5	0	0	2	43	-6	0	0	0
Above Normal	0	0	0	0	0	0	0	44	14	0	0	0
Normal	0	0	0	0	0	0	0	62	22	0	0	0
Below Normal	0	0	0	0	0	0	-4	74	27	0	0	0
Dry	0	0	0	0	0	0	0	1	4	0	0	0
All Years	0	0	0	1	0	0	0	45	12	0	0	0

average monthly flow (cfs).[1] When comparing the alternative to the WSIP setting, a change in the volume of release from O'Shaughnessy Dam to the stream would likely result in the release being delayed or initiated earlier by a matter of days. Typical springtime releases, when initiated, amount to a release of up to 3,000 cfs (approximately 6,000 acre-feet over the span of a day). Using the assumption that a change in release volume equates to a delay or an earlier initiation of releasing 6,000 acre-feet per day means that the difference in stream release between the alternative and WSIP would be up to an added three days of release. Normally, this change in release would not affect the peak stream release rate during a year. Table 2.3-8 illustrates the average monthly stream release for the alternative and base settings, and the differences, expressed in average monthly flow (cfs). Table 2.3-6 illustrates that the difference in monthly flow below O'Shaughnessy Dam between the alternative and base settings could range from an increase of approximately 18,000 acre-feet to a decrease of approximately 39,000 acre-feet. Using the same metric as described above to estimate the delay or addition in the number days of release to the stream, the alternative could lead to an effect ranging from an increase of three days of release to a decrease of up to seven days compared to the base setting.

Table 2.3-8

Hetch Hetchy Reservoir Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	55	51	51	171	89	84	146	2,455	4,544	2,034	184	89
Above Normal	55	89	88	66	89	94	131	1,236	3,107	379	125	89
Normal	54	54	50	55	74	74	98	1,315	1,912	167	122	86
Below Normal	55	55	46	43	51	63	88	624	735	113	111	73
Dry	53	53	44	40	44	50	56	157	143	86	86	65
All Years	54	61	56	74	70	73	104	1,152	2,084	548	125	81

Hetch Hetchy Reservoir Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	55	51	51	173	89	93	148	2,510	4,534	2,034	184	90
Above Normal	55	96	88	66	93	86	131	1,249	3,092	379	125	89
Normal	54	54	50	51	74	74	98	1,443	1,909	167	122	86
Below Normal	55	55	46	43	51	63	91	723	763	113	111	73
Dry	53	53	44	40	44	50	60	199	168	86	86	65
All Years	54	62	56	74	70	73	106	1,219	2,089	548	125	81

Difference in Hetch Hetchy Reservoir Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Modified WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	0	0	1	-2	0	-9	-2	-55	10	0	0	0
Above Normal	0	-7	0	0	-4	8	0	-14	15	0	0	0
Normal	0	0	0	4	0	0	0	-129	4	0	0	0
Below Normal	0	0	0	0	0	0	-4	-99	-28	0	0	0
Dry	0	0	0	0	0	0	-4	-42	-25	0	0	0
All Years	0	-1	0	0	-1	0	-2	-68	-5	0	0	0

[1] See *Estimated Affect of WSIP on Daily Releases below Hetch Hetchy Reservoir*, Memorandum by Daniel B. Steiner, December 31, 2006.

APPENDIX O2

2.4 Lake Lloyd and Lake Eleanor

Compared to the operation of the WSIP, the operation of Lake Lloyd and Lake Eleanor are simulated to be only slightly different for the alternative. Figure 2.4-1 illustrates a chronological trace of the simulation of Lake Lloyd storage and stream releases. Shown in Figure 2.4-1 are the results for the WSIP, alternative, and base settings. The operation resulting from the alternative is essentially the same as the WSIP setting, including during drought. The level of delivery between the alternative and base settings is larger during the 1987-1992 drought, and water delivery reliability has been improved in the alternative setting; as a result, the drawdown of Lake Lloyd during this period looks similar to that in the WSIP setting. Although there is less water delivered during this period in the alternative setting compared to the WSIP setting, more water is delivered in the alternative setting than in the base setting. The additional draw of water reduced the amount of water released from Hetch Hetchy Reservoir to Don Pedro Reservoir in the alternative setting, which, in order to satisfy TID/MID entitlements to inflow, was met with additional releases from Lake Lloyd, similar to the WSIP setting. The additional release from Lake Lloyd associated with the alternative appears to be approximately the same as in the WSIP setting in this instance, which is partially a factor of modeling discretion in that the HH/LSM makes release decisions in the form of block amounts of releases. Additional refinement of modeling assumptions would likely produce a result that places Lake Lloyd storage during this drought period between the base setting and WSIP setting results. Otherwise, the results for Lake Lloyd storage are essentially the same between the WSIP and alternative settings.

Figure 2.4-2 illustrates the almost identical operation of Lake Eleanor for the alternative and WSIP settings. Also shown in Figure 2.4-2 is the operation for the base setting. Any difference in the Lake Eleanor operation would be caused by a small change in operation at Lake Lloyd that would affect the operation of the Cherry-Eleanor Tunnel between the two watersheds. Any difference that occurs in the simulations is more likely the result of modeling discretion as opposed to any substantive difference in operation.

Supplementing the Figure 2.4-1 representation of Lake Lloyd stream releases is Table 2.4-1, which illustrates releases for the alternative and WSIP settings, and the difference in releases between the two settings. Table 2.4-2 provides the same form of information for the alternative and base settings. With essentially no change in reservoir operations, stream releases will not be different.

2.5 Don Pedro Reservoir and La Grange Releases

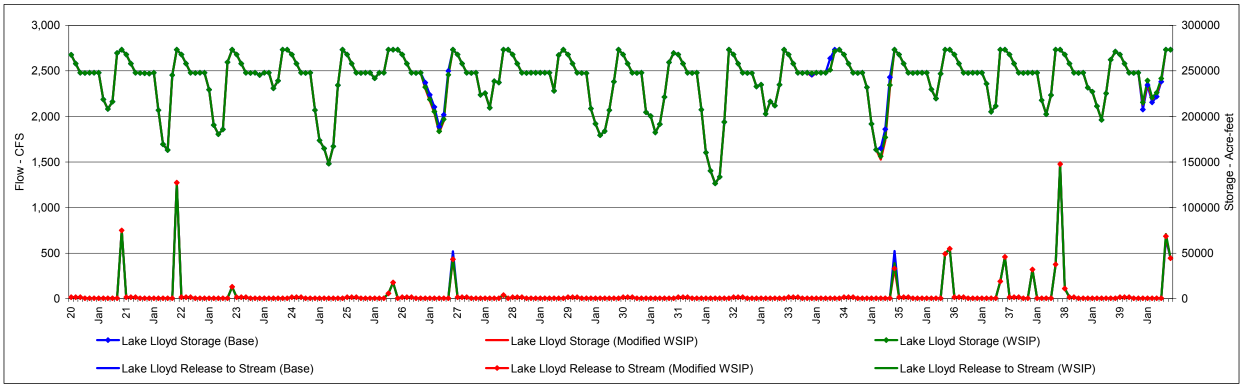
A change in Don Pedro Reservoir operation is caused by changes in inflow to the reservoir and the releases from the reservoir. The changes in inflow to the reservoir are the result of net changes within the operation of the upstream SFPUC facilities described previously, and other changes in SFPUC operations associated with diversions to the Holm, Kirkwood, and Moccasin Powerhouses. Figure 2.5-1 illustrates a chronological trace of the simulation of Don Pedro Reservoir storage and Tuolumne River stream releases from La Grange Dam. Shown in Figure 2.5-1 are the results for the WSIP, alternative, and base settings. Supplementing the Figure 2.5-1 representation of Don Pedro Reservoir storage are Table 2.5-1, Don Pedro Reservoir Storage (Modified WSIP); Table 2.5-2, Don Pedro Reservoir Storage (WSIP); and Table 2.5-3, Difference in Don Pedro Reservoir Storage (Modified WSIP minus WSIP). Table 2.5-4 is provided to illustrate the difference in Don Pedro Reservoir storage between the base and alternative settings.

Table 2.5-3 shows that, throughout many years, the storage in Don Pedro Reservoir associated with the alternative setting would differ from the storage in the WSIP setting, and this difference would almost always be more storage. Table 2.5-4 illustrates that Don Pedro Reservoir storage for the alternative is close to the storage depicted for the base setting; storage is either higher or lower, but is typically higher than in the base setting. Compared to the WSIP setting, the differences in storage are indicative of the increase in inflow to Don Pedro Reservoir that is due to lesser SFPUC demands and SJPL diversions in the alternative setting. The increases in storage are also due to a decrease in TID/MID canal diversions from the assumption that conserved water would be developed for the SFPUC transfer. Compared to the base setting, the alternative would result in typically less inflow to Don Pedro Reservoir during non-wet years and particularly during drought periods when more water is diverted

APPENDIX O2

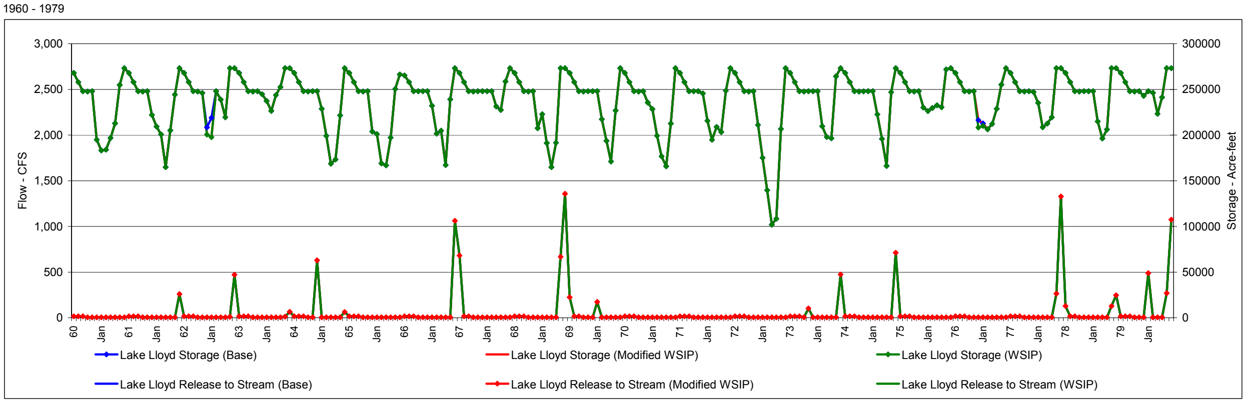
Figure 2.4-1
Lake Lloyd Storage and Stream Release

1920 - 1939

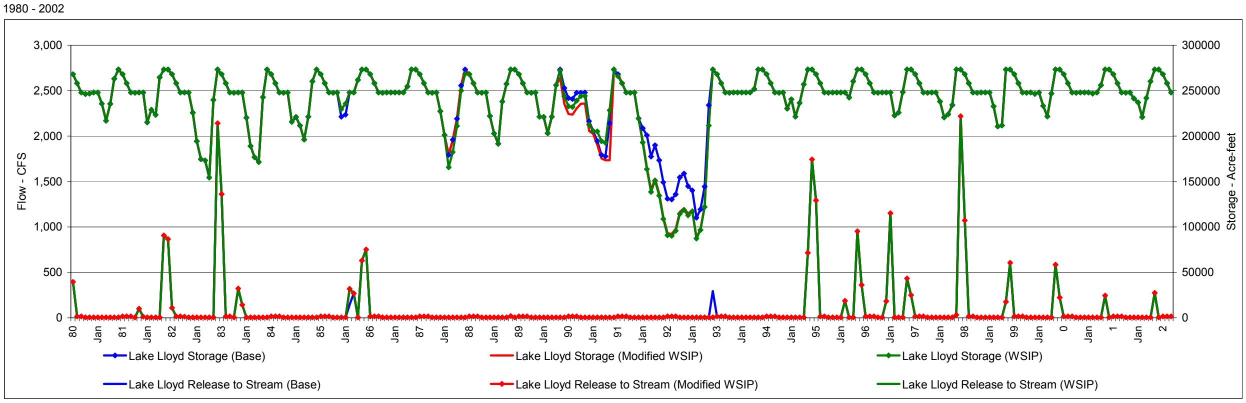


1940 - 1959

1960 - 1979



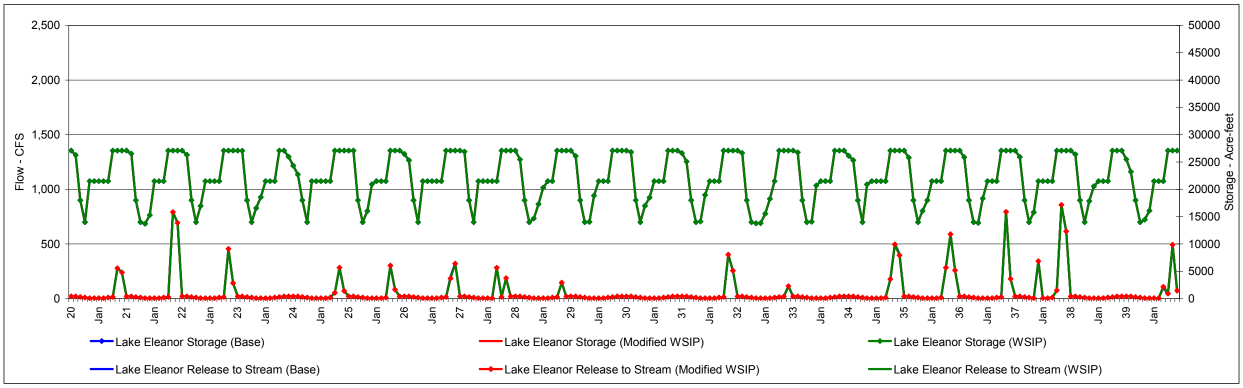
1980 - 2002



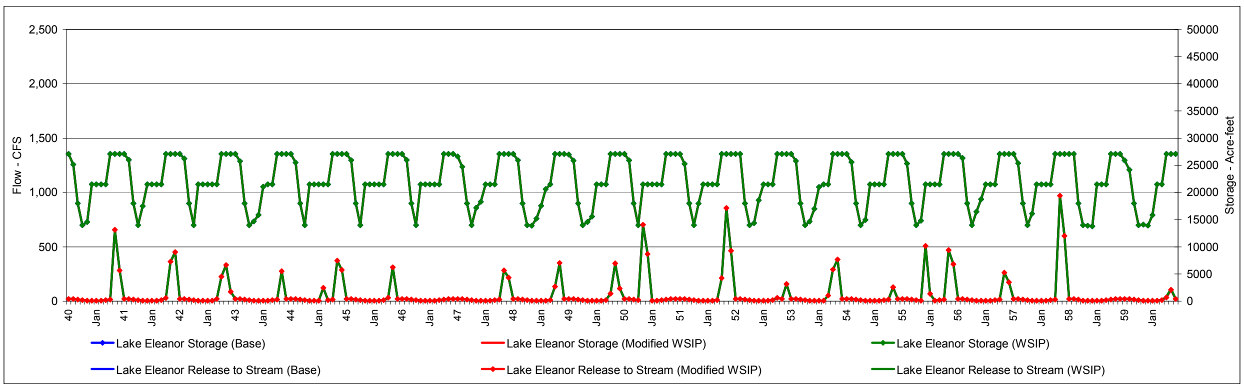
APPENDIX O2

Figure 2.4-2
Lake Eleanor Storage and Stream Release

1920 - 1939

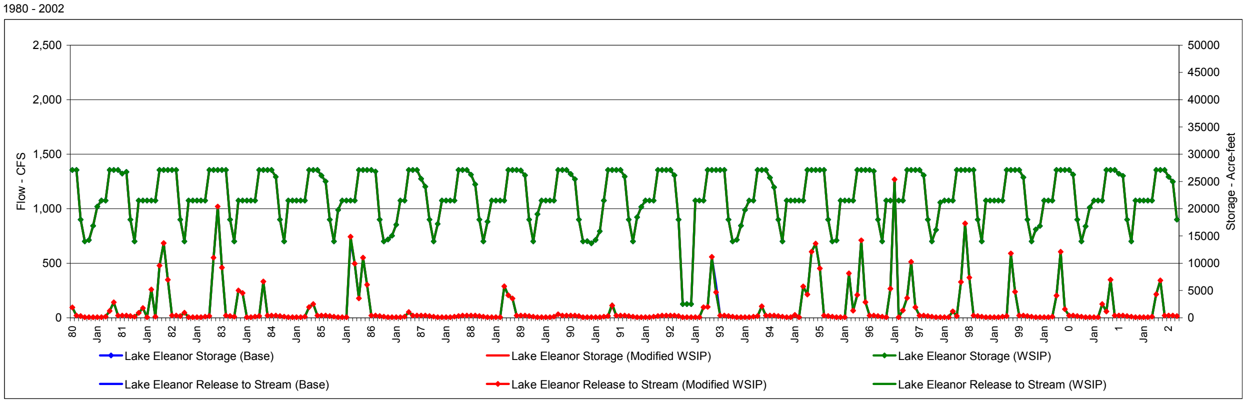


1940 - 1959



1960 - 1979

1980 - 2002



APPENDIX O2

Table 2.4-1

Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	5	11	134	107	25	21	5	284	1,058	363	15	15
Above Normal	5	72	25	5	16	5	5	166	446	16	15	15
Normal	5	5	5	16	5	5	5	110	162	15	15	15
Below Normal	5	5	5	5	5	5	8	39	43	15	15	15
Dry	5	5	5	5	5	5	5	5	5	16	15	15
All Years	5	20	34	27	11	8	6	120	340	83	15	15

Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	5	11	134	107	25	21	5	284	1,058	363	15	15
Above Normal	5	72	25	5	16	5	5	167	451	16	15	15
Normal	5	5	5	16	5	5	5	110	162	15	15	15
Below Normal	5	5	5	5	5	5	8	39	43	16	15	15
Dry	5	5	5	5	5	5	5	5	5	16	15	15
All Years	5	20	34	27	11	8	6	121	341	83	15	15

Difference in Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Modified WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	0	0	1	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	-1	-5	0	0	0
Normal	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	0	0	0	0	0	0	-1	0	0	0

Table 2.4-2

Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	5	11	134	107	25	21	5	284	1,058	363	15	15
Above Normal	5	72	25	5	16	5	5	166	446	16	15	15
Normal	5	5	5	16	5	5	5	110	162	15	15	15
Below Normal	5	5	5	5	5	5	8	39	43	15	15	15
Dry	5	5	5	5	5	5	5	5	5	16	15	15
All Years	5	20	34	27	11	8	6	120	340	83	15	15

Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	5	11	134	107	14	21	5	284	1,076	363	15	15
Above Normal	5	72	25	5	16	5	5	164	462	16	15	15
Normal	5	5	5	16	5	5	5	110	162	15	15	15
Below Normal	5	5	5	5	5	5	8	39	43	15	15	15
Dry	5	5	5	5	5	5	5	5	5	16	15	15
All Years	5	20	34	27	9	8	6	120	347	83	15	15

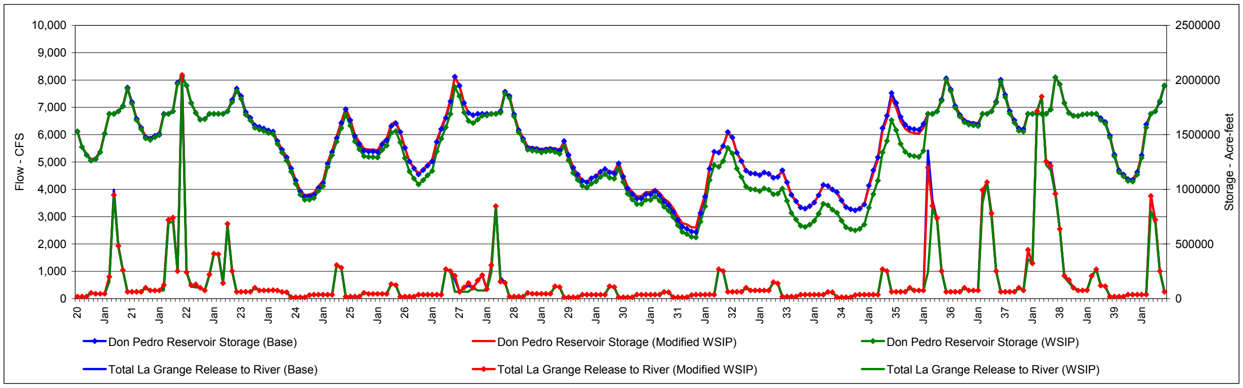
Difference in Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Modified WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	0	0	1	0	11	0	0	0	-18	0	0	0
Above Normal	0	0	0	0	0	0	0	2	-16	0	0	0
Normal	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	0	0	2	0	0	0	-7	0	0	0

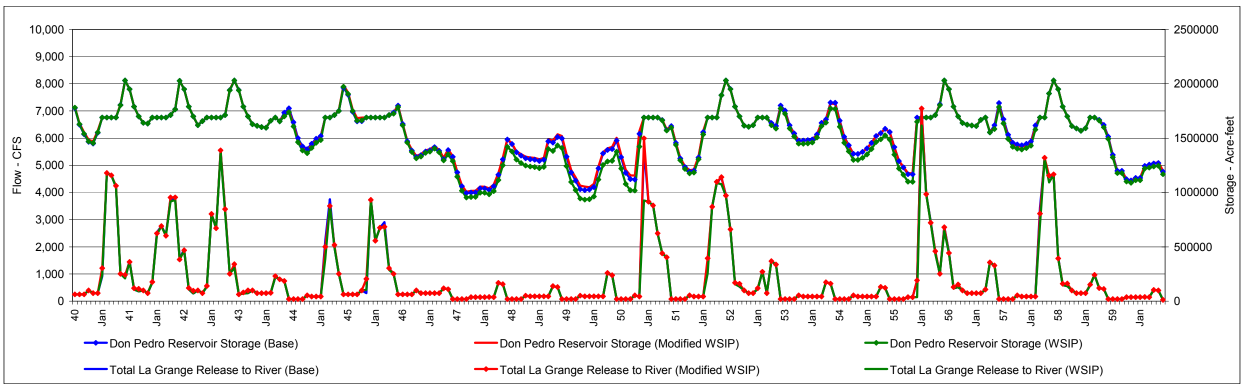
APPENDIX O2

Figure 2.5-1
Don Pedro Reservoir Storage and Release below La Grange Dam

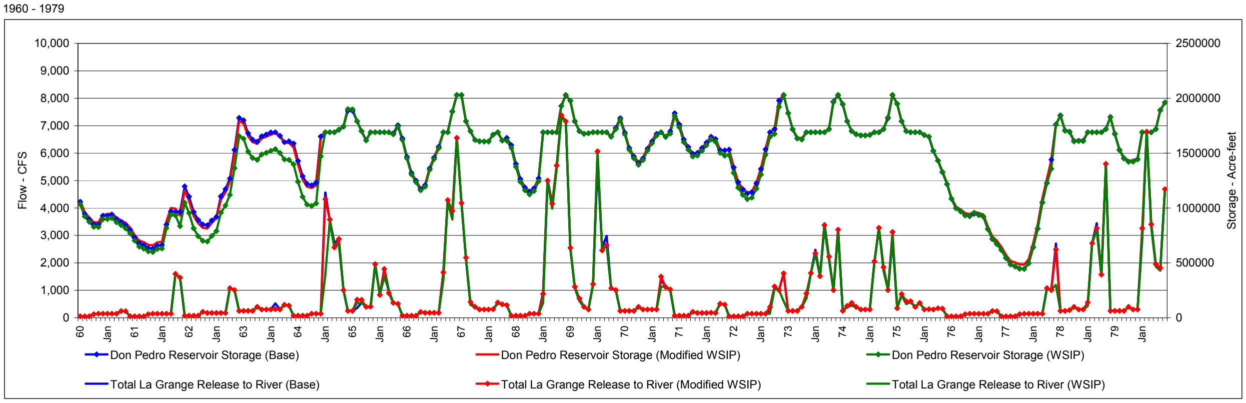
1920 - 1939



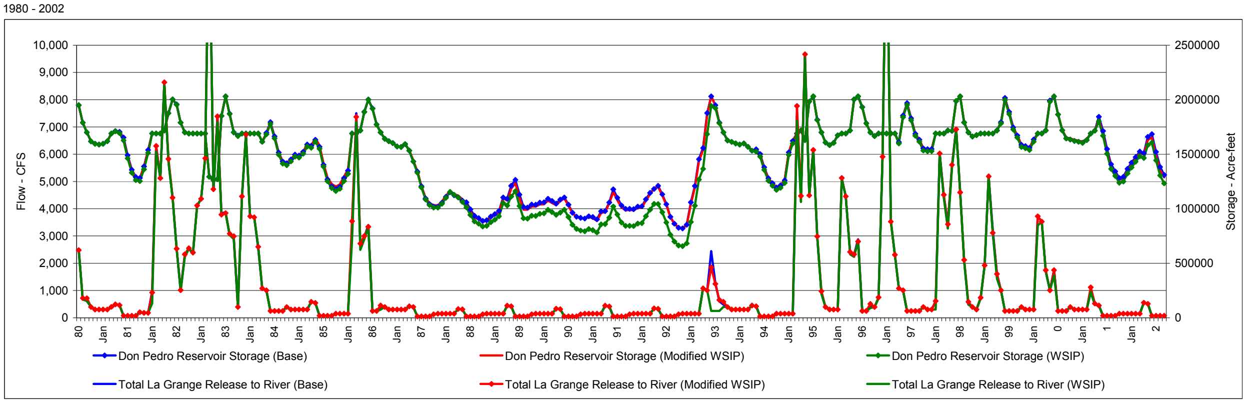
1940 - 1959



1960 - 1979



1980 - 2002



APPENDIX O2

Table 2.5-1

Don Pedro Reservoir Storage (Acre-feet) Modified WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	1,273,412	1,287,911	1,350,890	1,519,425	1,689,999	1,690,000	1,713,000	1,764,582	1,928,125	1,793,382	1,644,164	1,568,714
1922	1,484,928	1,470,112	1,494,406	1,514,575	1,690,000	1,690,000	1,713,000	1,981,594	2,030,000	1,950,094	1,790,033	1,700,025
1923	1,639,636	1,644,971	1,689,999	1,689,989	1,689,997	1,690,000	1,713,000	1,809,253	1,910,823	1,838,683	1,696,213	1,651,084
1924	1,583,443	1,568,106	1,554,088	1,535,685	1,526,277	1,437,824	1,363,847	1,297,999	1,197,407	1,087,616	989,798	947,967
1925	952,090	966,360	1,030,353	1,074,067	1,250,556	1,356,951	1,485,177	1,618,665	1,742,482	1,639,854	1,499,304	1,433,545
1926	1,371,735	1,363,673	1,364,112	1,358,048	1,428,833	1,467,778	1,595,835	1,621,402	1,521,608	1,378,176	1,256,173	1,198,503
1927	1,145,218	1,184,820	1,231,334	1,270,916	1,448,838	1,565,441	1,672,669	1,819,245	2,030,000	1,945,826	1,790,022	1,700,030
1928	1,680,577	1,690,000	1,689,999	1,690,000	1,689,998	1,690,000	1,712,101	1,896,779	1,854,866	1,687,028	1,544,734	1,473,242
1929	1,391,853	1,383,515	1,380,623	1,367,418	1,376,273	1,380,772	1,374,189	1,362,189	1,434,565	1,308,348	1,195,598	1,138,139
1930	1,084,099	1,068,449	1,103,964	1,123,960	1,164,849	1,190,498	1,162,317	1,160,244	1,248,631	1,128,688	1,024,759	978,260
1931	935,689	938,016	975,453	973,637	1,005,166	968,076	914,045	885,107	826,891	750,869	692,570	679,280
1932	655,003	649,851	813,996	958,339	1,204,535	1,343,718	1,332,766	1,394,846	1,517,130	1,465,392	1,329,693	1,259,078
1933	1,172,142	1,147,661	1,145,363	1,130,844	1,155,499	1,142,807	1,105,300	1,116,128	1,165,377	1,051,880	941,733	888,942
1934	833,523	822,259	848,250	879,054	948,498	1,039,816	1,028,627	992,475	965,223	890,844	832,166	819,771
1935	811,181	824,799	864,347	1,019,351	1,143,970	1,272,214	1,534,838	1,647,473	1,837,424	1,744,595	1,621,500	1,553,835
1936	1,522,978	1,514,901	1,509,433	1,563,410	1,689,991	1,690,000	1,713,000	1,823,753	2,017,860	1,915,294	1,765,512	1,689,256
1937	1,638,138	1,617,428	1,610,904	1,604,838	1,689,993	1,690,000	1,713,000	1,799,600	1,992,600	1,853,772	1,707,841	1,629,580
1938	1,557,660	1,549,094	1,689,998	1,689,992	1,689,987	1,690,000	1,690,000	1,730,000	2,025,000	1,959,369	1,790,080	1,700,041
1939	1,673,850	1,673,416	1,687,280	1,690,000	1,689,999	1,690,000	1,637,628	1,610,682	1,482,662	1,310,729	1,169,238	1,137,009
1940	1,097,004	1,090,067	1,158,149	1,313,069	1,595,012	1,690,000	1,713,000	1,811,854	1,955,548	1,785,694	1,635,678	1,553,678
1941	1,485,284	1,469,925	1,569,238	1,689,992	1,689,991	1,690,000	1,690,000	1,811,177	2,030,000	1,950,157	1,790,031	1,700,020
1942	1,643,070	1,635,778	1,690,000	1,689,982	1,689,995	1,690,000	1,713,000	1,765,000	2,027,000	1,950,170	1,790,032	1,700,013
1943	1,620,906	1,658,587	1,690,000	1,689,976	1,689,995	1,690,000	1,713,000	1,947,467	2,030,000	1,940,444	1,790,010	1,700,014
1944	1,629,260	1,616,113	1,604,369	1,597,321	1,661,304	1,690,000	1,657,800	1,715,388	1,753,568	1,622,786	1,481,321	1,410,518
1945	1,387,471	1,435,493	1,481,929	1,508,224	1,689,996	1,690,000	1,713,000	1,757,322	1,987,173	1,919,912	1,765,899	1,684,461
1946	1,688,208	1,690,000	1,689,996	1,689,984	1,689,995	1,690,000	1,713,000	1,737,850	1,797,783	1,629,442	1,474,028	1,394,084
1947	1,336,463	1,352,894	1,386,221	1,398,442	1,427,043	1,392,425	1,320,321	1,397,004	1,334,287	1,190,101	1,065,324	1,008,455
1948	1,014,064	1,015,321	1,053,944	1,053,075	1,039,190	1,073,338	1,177,714	1,321,022	1,493,664	1,450,965	1,379,025	1,353,038
1949	1,330,876	1,322,122	1,317,291	1,306,186	1,317,882	1,487,841	1,477,877	1,535,687	1,519,017	1,351,872	1,208,426	1,139,539
1950	1,063,390	1,053,556	1,049,430	1,079,544	1,236,869	1,370,886	1,406,190	1,418,984	1,503,885	1,349,683	1,209,026	1,156,651
1951	1,155,283	1,563,365	1,689,992	1,689,971	1,689,993	1,690,000	1,668,858	1,582,375	1,613,633	1,456,033	1,316,416	1,243,518
1952	1,204,083	1,211,785	1,333,378	1,564,867	1,689,997	1,690,000	1,690,000	1,895,000	2,030,000	1,951,049	1,790,058	1,700,037
1953	1,616,383	1,606,458	1,620,797	1,689,998	1,689,998	1,688,681	1,625,138	1,603,392	1,789,870	1,740,950	1,608,274	1,539,909
1954	1,476,329	1,475,526	1,479,169	1,485,971	1,532,414	1,638,358	1,673,331	1,818,250	1,813,990	1,649,762	1,503,995	1,432,008
1955	1,354,810	1,354,555	1,372,840	1,405,420	1,455,692	1,519,360	1,546,240	1,589,483	1,553,915	1,414,809	1,290,280	1,238,000
1956	1,177,169	1,175,791	1,689,999	1,689,942	1,689,993	1,690,000	1,713,000	1,811,926	2,030,000	1,950,170	1,790,037	1,700,034
1957	1,641,432	1,626,099	1,618,146	1,612,587	1,670,021	1,690,000	1,556,123	1,598,826	1,801,403	1,649,993	1,510,292	1,443,072
1958	1,428,625	1,421,397	1,434,106	1,457,068	1,603,639	1,690,000	1,690,000	1,910,000	2,030,000	1,950,170	1,790,053	1,700,038
1959	1,612,670	1,591,335	1,569,440	1,593,880	1,689,999	1,690,000	1,665,544	1,609,991	1,502,961	1,333,683	1,190,553	1,196,778
1960	1,121,093	1,110,287	1,133,514	1,133,204	1,243,879	1,254,530	1,268,532	1,280,002	1,200,080	1,065,928	957,818	915,107
1961	869,350	868,557	939,907	941,603	950,674	912,300	887,613	865,631	820,251	753,646	701,666	688,684
1962	664,649	659,559	687,294	691,239	878,339	999,447	994,968	929,139	1,157,964	1,062,988	926,294	859,987
1963	819,092	813,366	863,687	908,751	1,075,936	1,141,590	1,240,769	1,499,645	1,792,271	1,769,028	1,653,355	1,600,932
1964	1,584,033	1,633,568	1,649,236	1,667,358	1,681,876	1,648,645	1,593,074	1,593,847	1,552,228	1,393,083	1,258,097	1,193,529
1965	1,182,155	1,205,439	1,636,940	1,689,965	1,689,993	1,690,000	1,713,000	1,749,649	1,905,253	1,903,314	1,790,055	1,700,038
1966	1,617,344	1,690,000	1,689,998	1,689,996	1,689,997	1,690,000	1,664,434	1,745,959	1,624,177	1,456,019	1,312,631	1,248,525
1967	1,174,839	1,208,370	1,362,062	1,461,077	1,558,910	1,690,000	1,690,000	1,880,000	2,030,000	2,030,000	1,790,258	1,700,030
1968	1,621,428	1,609,232	1,607,367	1,607,567	1,670,478	1,690,000	1,617,394	1,624,530	1,557,318	1,386,116	1,251,069	1,179,846
1969	1,145,315	1,174,626	1,264,108	1,689,994	1,689,990	1,690,000	1,690,000	1,930,000	2,030,000	1,975,279	1,790,118	1,700,043
1970	1,677,722	1,683,160	1,689,999	1,689,952	1,689,996	1,690,000	1,652,690	1,729,821	1,816,669	1,682,496	1,545,668	1,474,011
1971	1,416,196	1,459,106	1,546,155	1,612,064	1,681,258	1,690,000	1,650,942	1,691,959	1,855,325	1,751,026	1,617,643	1,554,674
1972	1,494,665	1,503,209	1,546,806	1,597,278	1,650,736	1,628,676	1,529,989	1,524,210	1,528,926	1,366,957	1,235,721	1,175,469
1973	1,138,955	1,151,949	1,234,020	1,362,823	1,542,441	1,690,000	1,717,600	1,980,895	2,030,000	1,863,873	1,719,884	1,643,118
1974	1,635,668	1,690,000	1,689,998	1,689,983	1,689,998	1,690,000	1,717,600	1,971,412	2,030,000	1,943,894	1,790,025	1,700,028
1975	1,673,228	1,663,339	1,661,792	1,667,126	1,689,996	1,690,000	1,717,600	1,834,937	2,030,000	1,950,013	1,790,083	1,700,033
1976	1,690,000	1,690,000	1,690,000	1,664,706	1,649,459	1,519,032	1,435,154	1,335,053	1,225,747	1,094,002	1,010,365	986,545
1977	952,025	944,903	966,794	954,865	939,669	827,221	739,953	700,254	644,360	572,116	516,939	504,316
1978	485,812	483,545	535,831	680,933	849,823	1,088,674	1,268,395	1,435,989	1,761,000	1,841,159	1,707,412	1,700,003
1979	1,614,939	1,618,013	1,617,070	1,689,998	1,689,995	1,690,000	1,690,000	1,717,600	1,827,795	1,673,824	1,530,035	1,459,925
1980	1,430,456	1,433,169	1,453,204	1,689,974	1,689,987	1,690,000	1,717,600	1,890,400	1,960,200	1,950,171	1,790,064	1,700,044
1981	1,619,550	1,597,811	1,590,013	1,597,563	1,621,214	1,690,000	1,713,313	1,703,065	1,640,497	1,475,345	1,347,046	1,285,338
1982	1,278,056	1,384,964	1,535,708	1,689,994	1,689,988	1,690,000	1,717,600	1,876,400	2,002,900	1,954,718	1,790,104	1,700,116
1983	1,690,000	1,690,000	1,689,995	1,689,966	1,689,989	1,294,700	1,264,000	1,270,800	1,851,400	2,030,000	1,869,137	1,700,118
1984	1,668,518	1,690,000	1,689,992	1,689,971	1,689,993	1,690,000	1,617,070	1,691,312	1,787,159	1,655,182	1,508,819	1,431,891
1985	1,418,471	1,453,581	1,497,960	1,488,549	1,523,603	1,589,731	1,581,163	1,647,192	1,580,941	1,416,347	1,284,966	1,227,694
1986	1,202,637	1,223,827	1,295,413	1,360,422	1,689,993	1,690,000	1,717,600	1,888,300	2,001,400	1,917,776	1,773,743	1,700,019
1987	1,642,834	1,621,459	1,602,910	1,571,788	1,567,853	1,594,481	1,537,756	1,443,801	1,341,141	1,206,495	1,098,820	1,051,988
1988	1,031,411	1,030,512	1,066,696	1,120,513	1,162,412	1,135,649	1,119,724	1,087,355	1,039,228	975,497	919,189	903,638
1989	878,958	886,458	919,139	942,795	972,353	1,094,012	1,074,919	1,183,810	1,235,848	1,099,998	990,733	992,068
1990	1,020,252	1,018,894	1,038,950	1,041,663	1,074,254	1,053,596	1,032,349	1,069,546	1,094,915	1,028,120	958,167	926,695
1991	912,484	907,187	925,968	911,152	888,346	962,970	967,443	1,049,028	1,155,267	1,079,363	1,011,649	986,032
1992	987,759	985,230	1,007,389	1,011,985	1,075,318	1,134,604	1,186,520	1,201,189	1,124,146	1,031,185	920,084	862,293
1993	827,714	821,296	847,126	1,044,089	1,193,886	1,434,056	1,540,529	1,866,198	2,030,000	1,950,131	1,790,055	1,700,032
1994	1,628,791	1,614,584	1,600,767	1,590,811	1,600,873	1,569,297	1,536,516	1,538,815	1,493,989	1,371,490	1,274,649	1,235,078
1995	1,197,556	1,217,352	1,262,134	1,519,656	1,628,511	1,690,000	1,717,600	1,629,700	1,982,800	2,030,000	1,814,001	1,700,068
1996	1,609,687	1,584,700	1,606,017	1,674,181	1,689,990	1,690,000	1,717,600	2,002,400	2,030,000	1,930,383	1,785,378	1,700,025
1997	1,668,811	1,690,000	1,689,993	1,689,874	1,689,994	1,690,000	1,601,187	1,848,971	1,960,531	1,819,845	1,680,717	1,632,944
1998	1,553,232	1,546,836	1,548,242	1,689,997	1,689,989	1,690,000	1,717,600	1,714,000	1,987,500	2,030,000	1,790,249	1,700,032
1999	1,663,622	1,676,910	1,689,999	1,689,986	1,689,990	1,690,000	1,717,600	1,787,654	2,006,930	1,876,953	1,738,151	1,670,125
2000	1,585,402	1,573,740	1,558,095	1,634,018	1,689,993	1,690,000	1,717,600	1,993,453	2,030,000	1,864,407	1,722,358	1,653,656
2001	1,645,283	1,632,780	1,624,256	1,616,244	1,639,607	1,690,000	1,717,600	1,819,469	1,686,681	1,522,115	1,386,270	1,326,789
2002	1,266,578	1,278,195	1,351,669	1,407,102	1,459,267	1,509,791	1,497,578	1,630,986	1,653,740	1,490,489	1,355,084	1,288,277
Avg (21-02)	1,333,860	1,343,308	1,385,822	1,430,632	1,489,306	1,513,290	1,518,362	1,595,419	1,675,890	1,575,354	1,440,908	1,376,829

APPENDIX O2

Table 2.5-2

Don Pedro Reservoir Storage (Acre-feet) WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	1,262,860	1,277,365	1,340,344	1,508,876	1,689,999	1,690,000	1,713,000	1,758,255	1,920,087	1,785,379	1,633,202	1,551,799
1922	1,466,449	1,451,643	1,475,936	1,496,100	1,682,686	1,690,000	1,713,000	1,965,236	2,030,000	1,950,094	1,790,026	1,700,016
1923	1,638,028	1,643,364	1,689,999	1,689,989	1,689,997	1,690,000	1,713,000	1,799,363	1,900,966	1,828,869	1,683,448	1,632,370
1924	1,563,169	1,547,842	1,533,824	1,515,415	1,506,005	1,417,560	1,338,399	1,262,605	1,162,134	1,052,503	951,855	904,167
1925	906,788	921,085	985,076	1,028,777	1,205,262	1,311,674	1,436,468	1,560,568	1,684,578	1,582,202	1,438,920	1,367,376
1926	1,304,106	1,296,082	1,296,519	1,290,435	1,361,093	1,400,064	1,518,241	1,532,438	1,430,226	1,287,212	1,162,635	1,099,288
1927	1,044,610	1,084,270	1,129,224	1,168,777	1,346,690	1,463,332	1,567,658	1,688,723	1,936,134	1,852,362	1,703,718	1,627,130
1928	1,606,224	1,637,560	1,672,026	1,675,150	1,689,999	1,690,000	1,701,151	1,877,285	1,835,437	1,667,682	1,522,481	1,445,074
1929	1,362,145	1,353,824	1,350,930	1,337,716	1,346,569	1,351,080	1,341,527	1,323,621	1,392,489	1,266,466	1,150,912	1,087,613
1930	1,032,080	1,016,460	1,051,972	1,071,954	1,112,838	1,138,506	1,107,377	1,098,218	1,186,818	1,067,154	960,515	908,251
1931	864,235	866,605	904,039	902,201	933,725	896,662	839,706	804,980	747,051	671,410	610,497	591,503
1932	565,821	560,723	704,485	844,787	1,084,372	1,221,695	1,205,745	1,259,030	1,378,752	1,327,642	1,189,590	1,113,456
1933	1,025,224	1,000,826	998,521	983,959	1,008,603	995,965	955,100	959,906	1,007,489	894,719	782,336	724,120
1934	667,461	656,295	676,788	711,356	777,968	868,739	854,724	813,053	786,448	712,923	652,109	634,358
1935	624,570	638,297	677,837	832,051	956,075	1,079,921	1,337,695	1,442,297	1,633,298	1,541,356	1,416,179	1,343,212
1936	1,311,194	1,303,236	1,297,699	1,351,659	1,689,999	1,690,000	1,713,000	1,808,939	2,003,094	1,900,592	1,747,881	1,665,690
1937	1,613,022	1,592,326	1,585,791	1,579,717	1,689,994	1,690,000	1,713,000	1,792,830	1,982,099	1,843,316	1,694,437	1,610,230
1938	1,536,751	1,528,196	1,689,998	1,689,992	1,689,987	1,690,000	1,690,000	1,730,000	2,025,000	1,959,369	1,790,073	1,700,032
1939	1,672,242	1,671,809	1,685,673	1,689,024	1,689,999	1,690,000	1,634,629	1,601,698	1,473,709	1,301,817	1,157,373	1,119,194
1940	1,077,628	1,070,702	1,134,704	1,288,559	1,565,488	1,690,000	1,713,000	1,808,008	1,950,520	1,780,688	1,627,700	1,539,737
1941	1,469,773	1,454,423	1,553,735	1,689,994	1,689,991	1,690,000	1,690,000	1,804,234	2,030,000	1,950,157	1,790,024	1,700,010
1942	1,641,462	1,634,171	1,689,999	1,689,982	1,689,995	1,690,000	1,713,000	1,765,000	2,027,000	1,950,170	1,790,025	1,700,004
1943	1,619,298	1,656,980	1,690,000	1,689,976	1,689,995	1,690,000	1,713,000	1,940,240	2,030,000	1,940,444	1,790,004	1,700,004
1944	1,627,652	1,614,506	1,602,762	1,595,713	1,659,696	1,690,000	1,654,802	1,700,608	1,738,836	1,608,117	1,463,726	1,386,992
1945	1,362,396	1,410,433	1,456,868	1,483,156	1,689,997	1,690,000	1,713,000	1,750,377	1,973,670	1,906,466	1,749,519	1,662,142
1946	1,664,336	1,690,000	1,689,996	1,689,984	1,689,995	1,690,000	1,713,000	1,726,331	1,786,301	1,618,009	1,459,654	1,373,770
1947	1,314,592	1,331,036	1,364,362	1,376,577	1,405,177	1,370,566	1,295,486	1,351,369	1,288,812	1,144,830	1,017,268	954,574
1948	958,700	959,989	998,610	997,725	983,836	1,013,678	1,114,286	1,251,048	1,420,232	1,377,867	1,303,272	1,271,554
1949	1,247,966	1,239,259	1,234,425	1,223,326	1,235,015	1,400,436	1,383,115	1,432,798	1,409,371	1,242,728	1,096,786	1,022,286
1950	944,784	935,019	938,337	962,506	1,119,822	1,253,320	1,285,258	1,291,998	1,375,323	1,221,712	1,078,645	1,020,719
1951	1,018,036	1,422,514	1,689,995	1,689,971	1,689,993	1,690,000	1,664,085	1,570,386	1,596,323	1,438,802	1,296,271	1,217,452
1952	1,176,472	1,184,189	1,305,781	1,533,995	1,689,998	1,690,000	1,690,000	1,895,000	2,030,000	1,951,049	1,790,051	1,700,027
1953	1,614,775	1,604,850	1,619,190	1,689,999	1,689,998	1,688,681	1,619,217	1,588,332	1,773,663	1,724,813	1,589,215	1,514,922
1954	1,449,795	1,449,008	1,452,649	1,459,444	1,505,884	1,611,838	1,643,837	1,773,541	1,769,428	1,605,391	1,456,830	1,379,013
1955	1,300,328	1,300,104	1,318,386	1,350,951	1,401,218	1,464,906	1,489,052	1,525,796	1,487,090	1,348,288	1,221,076	1,163,037
1956	1,100,763	1,099,427	1,651,474	1,689,947	1,689,993	1,690,000	1,713,000	1,804,698	2,030,000	1,950,170	1,790,030	1,700,025
1957	1,639,825	1,624,492	1,616,539	1,610,979	1,668,413	1,690,000	1,553,124	1,584,074	1,786,699	1,635,352	1,492,723	1,419,571
1958	1,403,575	1,396,361	1,409,069	1,432,024	1,578,593	1,690,000	1,690,000	1,910,000	2,030,000	1,950,170	1,790,046	1,700,029
1959	1,611,062	1,589,728	1,567,833	1,592,273	1,689,999	1,690,000	1,662,406	1,600,478	1,493,480	1,324,246	1,178,165	1,178,441
1960	1,101,196	1,090,401	1,113,627	1,113,311	1,220,539	1,228,588	1,240,002	1,245,830	1,168,185	1,034,178	923,226	874,650
1961	827,383	826,615	897,810	899,493	908,561	870,204	842,562	814,709	769,512	703,148	648,423	629,635
1962	604,125	599,069	626,802	630,729	817,825	938,956	931,539	835,624	1,048,335	953,860	814,699	742,797
1963	700,558	694,902	745,217	790,246	957,421	1,023,119	1,119,414	1,363,268	1,654,516	1,631,866	1,513,806	1,455,856
1964	1,437,657	1,487,272	1,502,934	1,521,014	1,535,522	1,502,343	1,443,836	1,438,577	1,397,068	1,238,632	1,101,362	1,031,330
1965	1,018,694	1,042,070	1,471,762	1,689,988	1,689,993	1,690,000	1,713,000	1,743,852	1,900,867	1,898,947	1,790,038	1,700,028
1966	1,615,736	1,690,000	1,689,998	1,689,996	1,689,998	1,690,000	1,670,732	1,742,447	1,620,676	1,452,534	1,306,169	1,236,095
1967	1,160,837	1,194,375	1,348,066	1,447,078	1,544,910	1,690,000	1,690,000	1,880,000	2,030,000	2,030,000	1,790,252	1,700,021
1968	1,619,820	1,607,624	1,605,760	1,605,959	1,668,870	1,690,000	1,614,396	1,614,311	1,547,133	1,375,977	1,237,984	1,160,815
1969	1,124,725	1,154,047	1,243,529	1,689,996	1,689,990	1,690,000	1,690,000	1,930,000	2,030,000	1,975,279	1,790,111	1,700,033
1970	1,676,114	1,681,553	1,689,999	1,689,952	1,689,996	1,690,000	1,649,691	1,718,076	1,804,962	1,670,839	1,531,070	1,453,473
1971	1,394,102	1,437,025	1,524,073	1,589,976	1,659,167	1,690,000	1,647,943	1,676,856	1,840,272	1,736,038	1,599,726	1,530,826
1972	1,469,268	1,477,826	1,521,421	1,571,887	1,625,342	1,603,292	1,501,630	1,475,950	1,480,830	1,319,081	1,185,074	1,119,002
1973	1,081,006	1,094,033	1,176,102	1,304,888	1,484,502	1,646,959	1,675,219	1,921,511	2,030,000	1,863,873	1,716,891	1,634,144
1974	1,625,114	1,690,000	1,689,998	1,689,983	1,689,998	1,690,000	1,717,600	1,964,185	2,030,000	1,943,894	1,790,018	1,700,018
1975	1,671,620	1,661,732	1,660,185	1,665,519	1,689,996	1,690,000	1,717,600	1,824,854	2,030,000	1,950,013	1,790,077	1,700,024
1976	1,690,000	1,690,000	1,690,000	1,664,706	1,649,459	1,519,032	1,432,156	1,326,070	1,216,796	1,085,092	998,502	968,734
1977	932,654	925,543	955,652	938,503	920,299	807,858	717,610	671,981	616,184	544,084	486,059	467,586
1978	447,583	445,345	497,628	642,718	811,604	1,050,470	1,227,230	1,356,274	1,761,000	1,841,159	1,704,419	1,692,926
1979	1,606,278	1,609,357	1,608,413	1,689,999	1,689,995	1,690,000	1,690,000	1,717,600	1,827,795	1,673,824	1,527,042	1,450,952
1980	1,419,903	1,422,622	1,442,656	1,689,977	1,689,987	1,690,000	1,717,600	1,890,400	1,960,200	1,950,171	1,790,057	1,700,035
1981	1,617,942	1,596,204	1,588,406	1,595,955	1,619,607	1,690,000	1,710,315	1,694,081	1,626,429	1,461,340	1,330,112	1,262,473
1982	1,253,640	1,360,563	1,511,306	1,689,997	1,689,988	1,690,000	1,717,600	1,876,400	2,002,900	1,954,717	1,790,097	1,700,116
1983	1,690,000	1,690,000	1,689,995	1,689,966	1,689,989	1,294,700	1,264,000	1,270,800	1,851,400	2,030,000	1,869,137	1,700,118
1984	1,666,919	1,690,000	1,689,992	1,689,972	1,689,993	1,690,000	1,614,072	1,682,328	1,778,205	1,646,266	1,496,949	1,414,071
1985	1,399,091	1,434,211	1,478,590	1,469,173	1,504,226	1,570,360	1,558,812	1,616,719	1,550,570	1,386,112	1,251,881	1,188,728
1986	1,162,153	1,183,366	1,254,950	1,319,946	1,689,994	1,690,000	1,717,600	1,888,300	2,001,400	1,917,776	1,770,749	1,700,004
1987	1,641,221	1,619,848	1,601,298	1,570,175	1,566,241	1,592,870	1,533,147	1,433,211	1,330,588	1,195,991	1,085,371	1,032,594
1988	1,010,460	1,009,573	1,045,756	1,099,567	1,155,125	1,128,364	1,103,870	1,063,204	1,011,973	943,381	884,236	862,821
1989	836,632	844,157	876,836	900,479	930,034	1,051,709	1,029,659	1,110,864	1,160,578	1,025,069	913,162	908,781
1990	935,547	934,238	954,290	956,979	989,562	968,936	944,775	965,169	990,902	924,588	852,141	815,058
1991	799,492	794,262	814,409	803,540	782,227	856,893	858,476	917,797	1,020,071	946,830	874,711	843,590
1992	844,030	841,586	863,738	868,291	931,612	990,953	1,044,352	1,043,659	967,160	874,930	761,589	698,367
1993	662,549	656,233	682,056	877,956	1,027,740	1,267,172	1,365,280	1,684,448	1,941,790	1,923,275	1,785,144	1,700,014
1994	1,627,176	1,612,969	1,599,152	1,589,196	1,599,258	1,567,682	1,531,904	1,523,687	1,478,913	1,356,482	1,256,718	1,211,217
1995	1,172,146	1,191,956	1,236,737	1,494,252	1,599,122	1,690,000	1,717,600	1,629,700	1,982,800	2,030,000	1,814,001	1,700,059
1996	1,608,079	1,583,093	1,604,410	1,672,573	1,689,990	1,690,000	1,717,600	2,002,400	2,030,000	1,930,383	1,782,384	1,700,010
1997	1,667,198	1,690,000	1,689,993	1,689,875	1,689,994	1,690,000	1,598,189	1,839,987	1,951,576	1,810,929	1,668,846	1,615,122
1998	1,533,848	1,527,463	1,528,868	1,690,000	1,689,989	1,690,000	1,717,600	1,714,000	1,987,500	2,030,000	1,790,242	1,700,022
1999	1,662,014	1,675,303	1,690,000	1,689,986	1,689,990	1,690,000	1,717,600	1,781,250	1,998,452	1,868,511	1,726,752	1,652,772
2000	1,566,486	1,554,834	1,539,188	1,615,107	1,689,994	1,690,000	1,717,600	1,981,851	2,030,000	1,864,407	1,719,364	1,644,682
2001	1,634,728	1,622,232	1,613,706	1,605,692	1,629,054	1,690,000	1,716,911	1,801,382	1,668,653	1,504,167	1,365,411	1,300,012
2002	1,238,260	1,249,893	1,323,366	1,378,790	1,430,954	1,481,487	1,466,303	1,583,557	1,606,470	1,443,430	1,305,249	1,232,624
Avg (21-02)	1,289,807	1,299,980	1,345,245	1,393,639	1,456,995	1,482,690	1,485,599	1,553,787	1,637,503	1,537,849	1,401,689	1,333,676

APPENDIX O2

Table 2.5-3

Difference in Don Pedro Reservoir Storage (Acre-feet) Modified WSIP minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	10,552	10,546	10,546	10,549	0	0	0	6,327	8,038	8,003	10,962	16,915
1922	18,479	18,469	18,470	18,475	7,314	0	0	16,358	0	0	7	9
1923	1,608	1,607	0	0	0	0	0	9,890	9,857	9,814	12,765	18,714
1924	20,274	20,264	20,264	20,270	20,272	20,264	25,448	35,394	35,273	35,113	37,943	43,800
1925	45,302	45,275	45,277	45,290	45,294	45,277	48,709	58,097	57,904	57,652	60,384	66,169
1926	67,629	67,591	67,593	67,613	67,740	67,714	77,594	88,964	91,382	90,964	93,538	99,215
1927	100,608	100,550	102,110	102,139	102,148	102,109	105,011	130,522	93,866	93,464	86,304	72,900
1928	74,353	52,440	17,973	14,850	-1	0	10,950	19,494	19,429	19,346	22,253	28,168
1929	29,708	29,691	29,693	29,702	29,704	29,692	32,662	38,568	42,076	41,882	44,686	50,526
1930	52,019	51,989	51,992	52,006	52,011	51,992	54,940	62,026	61,813	61,534	64,244	70,009
1931	71,454	71,411	71,414	71,436	71,441	71,414	74,339	80,127	79,840	79,459	82,073	87,777
1932	89,182	89,128	109,511	113,552	120,163	122,023	127,021	135,816	138,378	137,750	140,103	145,622
1933	146,918	146,835	146,842	146,885	146,896	146,842	150,200	156,222	157,888	157,161	159,397	164,822
1934	166,062	165,964	171,462	167,698	170,530	171,077	173,903	179,422	178,775	177,921	180,057	185,413
1935	186,611	186,502	186,510	187,300	187,895	192,293	197,143	205,176	204,126	203,239	205,321	210,623
1936	211,784	211,665	211,734	211,751	-8	0	0	14,814	14,766	14,702	17,631	23,566
1937	25,116	25,102	25,113	25,121	-1	0	0	6,770	10,501	10,456	13,404	19,350
1938	20,909	20,898	0	0	0	0	0	0	0	0	7	9
1939	1,608	1,607	1,607	976	0	0	2,999	8,984	8,953	8,912	11,865	17,815
1940	19,376	19,365	23,445	24,510	29,524	0	0	3,846	5,028	5,006	7,978	13,941
1941	15,511	15,502	15,503	-2	0	0	0	6,943	0	0	7	10
1942	1,608	1,607	1	0	0	0	0	0	0	0	7	9
1943	1,608	1,607	0	0	0	0	0	7,227	0	0	6	10
1944	1,608	1,607	1,607	1,608	1,608	0	2,998	14,780	14,732	14,669	17,595	23,526
1945	25,075	25,060	25,061	25,068	-1	0	0	6,945	13,503	13,446	16,380	22,319
1946	23,872	0	0	0	0	0	0	11,519	11,482	11,433	14,374	20,314
1947	21,871	21,858	21,859	21,865	21,866	21,859	24,835	45,635	45,475	45,271	48,056	53,881
1948	55,364	55,332	55,334	55,350	55,354	59,660	63,428	69,974	73,432	73,098	75,753	81,484
1949	82,910	82,863	82,866	82,860	82,867	87,405	94,762	102,889	109,646	109,144	111,640	117,253
1950	118,606	118,537	111,093	117,038	117,047	117,566	120,932	126,986	128,562	127,971	130,381	135,932
1951	137,247	140,851	-3	0	0	0	4,773	11,989	17,310	17,231	20,145	26,066
1952	27,611	27,596	27,597	30,872	-1	0	0	0	0	0	7	10
1953	1,608	1,608	1,607	-1	0	0	5,921	15,060	16,207	16,137	19,059	24,987
1954	26,534	26,518	26,520	26,527	26,530	26,520	29,494	44,709	44,562	44,371	47,165	52,995
1955	54,482	54,451	54,454	54,469	54,474	54,454	57,188	63,687	66,825	66,521	69,204	74,963
1956	76,406	76,364	38,525	-5	0	0	0	7,228	0	0	7	9
1957	1,607	1,607	1,607	1,608	1,608	0	2,999	14,752	14,704	14,641	17,569	23,501
1958	25,050	25,036	25,037	25,044	25,046	0	0	0	0	0	7	9
1959	1,608	1,607	1,607	1,607	0	0	3,138	9,513	9,481	9,437	12,388	18,337
1960	19,897	19,886	19,887	19,893	23,340	25,942	28,530	34,172	31,895	31,750	34,592	40,457
1961	41,967	41,942	42,097	42,110	42,113	42,096	45,051	50,922	50,739	50,498	53,243	59,049
1962	60,524	60,490	60,492	60,510	60,514	60,491	63,429	93,515	109,629	109,128	111,595	117,190
1963	118,534	118,464	118,470	118,505	118,515	118,471	121,355	136,377	137,755	137,162	139,549	145,076
1964	146,376	146,296	146,302	146,344	146,354	146,302	149,238	155,270	155,160	154,451	156,735	162,199
1965	163,461	163,369	165,178	-23	0	0	0	5,797	4,386	4,367	17	10
1966	1,608	0	0	0	-1	0	-6,298	3,512	3,501	3,485	6,462	12,430
1967	14,002	13,995	13,996	13,999	14,000	0	0	0	0	0	6	9
1968	1,608	1,608	1,607	1,608	1,608	0	2,998	10,219	10,185	10,139	13,085	19,031
1969	20,590	20,579	20,579	-2	0	0	0	0	0	0	7	10
1970	1,608	1,607	0	0	0	0	2,999	11,745	11,707	11,657	14,598	20,538
1971	22,094	22,081	22,082	22,088	22,091	0	2,999	15,103	15,053	14,988	17,917	23,848
1972	25,397	25,383	25,385	25,391	25,394	25,384	28,359	48,260	48,096	47,876	50,647	56,467
1973	57,949	57,916	57,918	57,935	57,939	43,041	42,381	59,384	0	0	2,993	8,974
1974	10,554	0	0	0	0	0	0	7,227	0	0	7	10
1975	1,608	1,607	1,607	1,607	0	0	0	10,083	0	0	6	9
1976	0	0	0	0	0	0	2,998	8,983	8,951	8,910	11,863	17,811
1977	19,371	19,360	11,142	16,362	19,370	19,363	22,343	28,273	28,176	28,032	30,880	36,730
1978	38,229	38,200	38,203	38,215	38,219	38,204	41,165	79,715	0	0	2,993	7,077
1979	8,661	8,656	8,657	-1	0	0	0	0	0	0	2,993	8,973
1980	10,553	10,547	10,548	-3	0	0	0	0	0	0	7	9
1981	1,608	1,607	1,607	1,608	1,607	0	2,998	8,984	14,068	14,005	16,934	22,865
1982	24,416	24,401	24,402	-3	0	0	0	0	0	1	7	0
1983	0	0	0	0	0	0	0	0	0	0	0	0
1984	1,599	0	0	-1	0	0	2,998	8,984	8,954	8,916	11,870	17,820
1985	19,380	19,370	19,370	19,376	19,377	19,371	22,351	30,473	30,371	30,235	33,085	38,966
1986	40,484	40,461	9	40,476	-1	0	0	0	0	0	2,994	15
1987	1,613	1,611	1,612	1,613	1,612	1,611	4,609	10,590	10,553	10,504	13,449	19,394
1988	20,951	20,939	20,940	20,946	7,287	7,285	15,854	24,151	27,255	32,116	34,953	40,817
1989	42,326	42,301	42,303	42,316	42,319	42,303	45,260	72,946	75,270	74,929	77,571	83,287
1990	84,705	84,656	84,660	84,684	84,692	84,660	87,574	104,377	104,013	103,532	106,026	111,637
1991	112,992	112,925	111,559	107,612	106,119	106,077	108,967	131,231	135,196	132,533	136,938	142,442
1992	143,729	143,644	143,651	143,694	143,706	143,651	142,168	157,530	156,986	156,255	158,495	163,926
1993	165,165	165,063	165,070	166,133	166,146	166,884	175,249	181,750	88,210	26,856	4,911	18
1994	1,615	1,615	1,615	1,615	1,615	1,615	4,612	15,128	15,076	15,008	17,931	23,861
1995	25,410	25,396	25,397	25,404	29,389	0	0	0	0	0	0	9
1996	1,608	1,607	1,607	1,608	0	0	0	0	0	0	2,994	15
1997	1,613	0	0	-1	0	0	2,998	8,984	8,955	8,916	11,871	17,822
1998	19,384	19,373	19,374	-3	0	0	0	0	0	0	7	10
1999	1,608	1,607	-1	0	0	0	0	6,404	8,478	8,442	11,399	17,353
2000	18,916	18,906	18,907	18,911	-1	0	0	11,602	0	0	2,994	8,974
2001	10,555	10,548	10,550	10,552	10,553	0	689	18,087	18,028	17,948	20,859	26,777
2002	28,318	28,302	28,303	28,312	28,313	28,304	31,275	47,429	47,270	47,059	49,835	55,653
Avg (21-02)	44,053	43,327	40,084	36,993	32,311	30,600	32,763	41,632	38,387	37,505	39,219	43,153

APPENDIX O2

Table 2.5-4

Difference in Don Pedro Reservoir Storage (Acre-feet)

Modified WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	10,552	10,546	10,546	10,549	0	0	0	3,139	-2,395	-4,568	-1,554	4,440
1922	6,030	6,026	6,027	6,029	0	0	0	5,184	0	-5	7	9
1923	1,608	1,607	0	0	0	0	0	-9,124	-11,208	-13,343	-10,291	-4,268
1924	-2,661	-2,660	-2,660	-2,661	-2,661	-2,660	764	5,875	5,784	5,674	8,573	14,491
1925	16,055	16,044	16,043	16,041	16,041	16,026	15,797	11,678	9,526	7,302	10,262	16,218
1926	17,783	17,773	17,278	17,283	17,209	17,778	17,484	18,161	-2,695	-2,684	322	6,311
1927	7,897	7,891	14,492	14,496	14,498	14,492	17,477	15,725	0	-2,184	2	9
1928	1,609	0	0	0	0	0	-899	2,911	787	784	3,774	9,750
1929	11,328	11,322	11,323	11,326	11,327	11,322	14,310	4,627	-6,889	-6,858	-3,833	2,170
1930	3,764	3,761	3,762	3,762	3,763	3,762	6,757	13,480	11,320	11,270	14,211	20,151
1931	21,706	21,692	21,693	21,700	21,702	21,694	24,670	30,593	30,483	30,339	33,182	39,058
1932	40,576	40,553	31,674	24,416	15,716	-1,032	-3,076	-1,657	-7,367	-9,517	-6,480	-468
1933	1,131	1,130	1,131	1,130	1,130	1,131	177	2,115	-9,670	-11,809	-8,760	-2,740
1934	-1,135	-1,135	1,150	-1,171	755	-1,211	-1,530	-6,447	-8,222	-8,183	-5,150	857
1935	2,453	2,452	2,452	-14,519	-30,168	-20,129	-25,734	-25,796	-43,945	-45,937	-42,745	-36,614
1936	-34,940	-34,921	-34,969	-34,941	1	0	0	4,470	2,341	148	3,140	9,121
1937	10,701	10,695	10,696	10,699	0	0	0	-2,568	-8,918	-11,064	-8,021	-2,006
1938	-404	-402	0	0	0	0	0	0	0	-2,183	2	9
1939	1,608	1,607	1,607	976	0	0	-12,780	-5,138	-7,235	-7,202	-4,176	1,827
1940	3,422	3,420	-502	2,277	1,426	0	0	12,724	9,006	8,966	11,921	17,872
1941	19,434	19,422	18,813	-3	0	0	0	5,573	0	-4	7	10
1942	1,608	1,607	1	1	0	0	0	0	0	0	7	9
1943	1,608	1,607	0	0	0	0	0	5,042	0	-2,183	2	10
1944	1,608	1,607	1,607	1,608	1,608	0	2,998	-19,024	-21,076	-23,169	-20,072	-14,015
1945	-12,387	-12,381	-12,381	-12,385	0	0	0	6,512	23,217	20,934	23,835	29,751
1946	31,289	106	0	0	0	0	0	1,291	-827	-823	2,173	8,155
1947	9,737	9,732	9,732	9,734	9,735	9,732	12,721	6,957	4,819	4,798	7,769	13,733
1948	15,301	15,293	15,293	15,297	15,299	15,293	14,531	16,879	7,186	5,052	8,089	14,092
1949	15,678	15,673	15,675	15,657	15,660	16,321	19,398	24,089	21,559	21,461	24,354	30,262
1950	31,798	31,779	20,780	29,360	14,494	11,170	14,470	19,919	26,493	24,987	27,865	33,761
1951	35,290	24,301	-1	0	0	0	1,622	7,921	2,378	184	3,176	9,155
1952	10,735	10,728	10,729	9,517	-1	0	0	0	0	-2,184	2	10
1953	1,608	1,608	1,607	-1	0	0	-14,862	-9,783	-10,670	-12,808	-9,760	-3,737
1954	-2,131	-2,130	-2,130	-2,131	-2,130	-2,130	871	-9,349	-11,433	-11,384	-8,339	-2,321
1955	-718	-718	-718	-718	-718	-717	216	3,316	-2,408	-2,398	607	6,594
1956	8,179	8,175	0	1	1	0	0	-1	0	0	7	9
1957	1,607	1,607	1,607	1,608	1,608	0	2,999	-20,075	-22,124	-24,212	-21,111	-15,050
1958	-13,421	-13,413	-13,413	-13,418	-13,419	0	0	0	0	0	7	9
1959	1,608	1,607	1,607	1,607	0	0	-2,197	-11,452	-11,414	-11,362	-8,316	-2,298
1960	-695	-694	-695	-694	-695	-789	1,150	8,837	8,808	8,767	11,719	17,666
1961	19,225	19,214	10,773	10,777	10,777	10,773	13,760	19,715	19,644	19,551	22,448	28,357
1962	29,897	29,880	29,882	29,890	29,893	29,881	32,850	-35,543	-39,188	-41,193	-38,008	-31,883
1963	-30,216	-30,197	-22,272	-8,960	-30,220	-30,209	-27,182	-28,787	-28,692	-30,750	-27,623	-21,543
1964	-19,901	-19,890	-19,891	-19,896	-8,124	-8,120	-7,231	-13,185	-35,078	-34,920	-31,764	-25,668
1965	-24,017	-24,003	-14,799	2	0	0	0	7,340	19,881	17,611	41	10
1966	1,608	0	0	0	0	0	-15,292	-7,644	-9,734	-9,690	-6,652	-639
1967	960	960	960	960	960	0	0	0	0	0	1	9
1968	1,608	1,608	1,607	1,608	1,608	0	2,998	-13,367	-15,436	-15,366	-12,301	-6,271
1969	-4,659	-4,656	-4,657	1	0	0	0	0	0	-2,184	2	10
1970	1,608	1,607	0	-4	0	0	2,999	254	-1,861	-4,036	-1,025	4,968
1971	6,557	6,552	6,553	6,554	6,556	0	2,999	-5,496	-7,593	-9,742	-6,707	-694
1972	905	905	905	904	905	905	3,902	-804	-2,916	-2,903	104	6,093
1973	7,679	7,675	7,675	7,677	7,678	0	0	1,016	0	0	2,993	8,974
1974	10,554	0	0	1	0	0	0	2,191	0	-2,184	2	10
1975	1,608	1,607	1,607	1,607	0	0	0	17,564	0	-4	6	9
1976	0	0	0	0	0	0	2,998	8,983	8,951	8,910	11,863	17,811
1977	19,371	19,360	19,360	19,366	19,367	19,360	22,339	28,269	28,172	28,028	30,876	36,726
1978	38,225	38,196	38,199	38,211	38,215	38,200	41,161	-4,293	0	-2,183	819	4,600
1979	5,095	5,092	5,092	-1	0	0	0	0	-2,114	-2,105	897	6,885
1980	8,468	8,464	8,465	-4	0	0	0	0	0	0	7	9
1981	1,608	1,607	1,607	1,608	1,607	0	882	-1,908	-13,555	-13,495	-10,440	-4,414
1982	-2,806	-2,805	-2,805	1	0	0	0	0	0	-2,183	-2	0
1983	0	0	0	0	0	0	0	0	0	0	-2,183	0
1984	-1,466	0	0	-1	0	0	2,802	-5,035	-7,133	-9,286	-6,251	-241
1985	1,358	1,357	1,357	1,358	1,357	1,358	4,355	15,162	12,997	12,939	15,871	21,809
1986	23,362	23,349	9	11,298	-1	0	0	0	0	-2,184	820	11
1987	1,610	1,608	1,609	1,609	1,609	1,608	4,606	10,587	1,110	1,104	4,092	10,068
1988	11,646	11,639	11,639	11,643	11,643	11,639	14,627	13,217	-19,630	-19,539	-16,454	-10,405
1989	-8,784	-8,779	-8,779	-8,782	-8,783	-8,780	-17,222	-26,333	-28,541	-28,412	-25,289	-19,211
1990	-17,572	-17,562	-17,563	-17,569	-17,569	-17,563	-14,547	-14,730	-8,961	-8,920	-5,885	125
1991	-3,473	-3,471	-4,843	-12,641	-14,145	-14,140	-11,143	-8,906	-21,810	-21,733	-18,658	-12,615
1992	-10,993	-10,988	-10,988	-10,992	-10,993	-10,990	4,598	-9,035	-9,042	-9,045	-6,047	-58
1993	1,526	1,524	-6,413	-14,665	-14,667	-19,965	-16,145	-12,014	0	-5	7	10
1994	1,608	1,607	1,607	1,608	1,608	1,607	4,604	-5,760	-7,855	-7,818	-4,789	1,217
1995	2,812	2,812	2,811	2,812	6,795	0	0	0	0	0	-2,184	6
1996	1,605	1,604	1,604	1,605	0	0	0	0	0	-2,183	820	11
1997	1,610	0	0	0	0	0	-9,578	-5,747	-7,843	-9,992	-6,955	-942
1998	658	658	658	0	0	0	0	0	0	0	7	10
1999	1,608	1,607	-1	0	0	0	0	-5,917	-8,693	-10,839	-7,799	-1,783
2000	-182	-181	-181	-182	0	0	0	1,226	0	0	2,994	8,974
2001	10,555	10,548	10,550	10,553	10,553	0	689	-23,644	-25,468	-25,355	-22,247	-16,182
2002	-14,549	-14,541	-14,542	-14,545	-14,547	-14,541	-11,529	-28,508	-30,526	-30,391	-27,258	-21,175
Avg (21-02)	4,307	3,621	2,642	2,388	1,759	1,233	1,715	-177	-3,240	-4,096	-1,896	2,500

to the SJPL in the alternative setting. Less inflow leads to less reservoir storage. Figure 2.5-1 illustrates that during drought sequences, a reduction to inflow to Don Pedro Reservoir can accumulate from year to year, particularly in the comparison of the WSIP and base settings. Compared to the base setting, storage in Don Pedro Reservoir in the alternative setting would be nearly the same. Figure 2.5-2 illustrates the difference in reservoir storage averaged by year type for the alternative and WSIP settings. Also shown is the average difference in storage for the two settings during the 82-year simulation. Figure 2.5-3 illustrates the same information for the alternative and base settings.

Figure 2.5-2

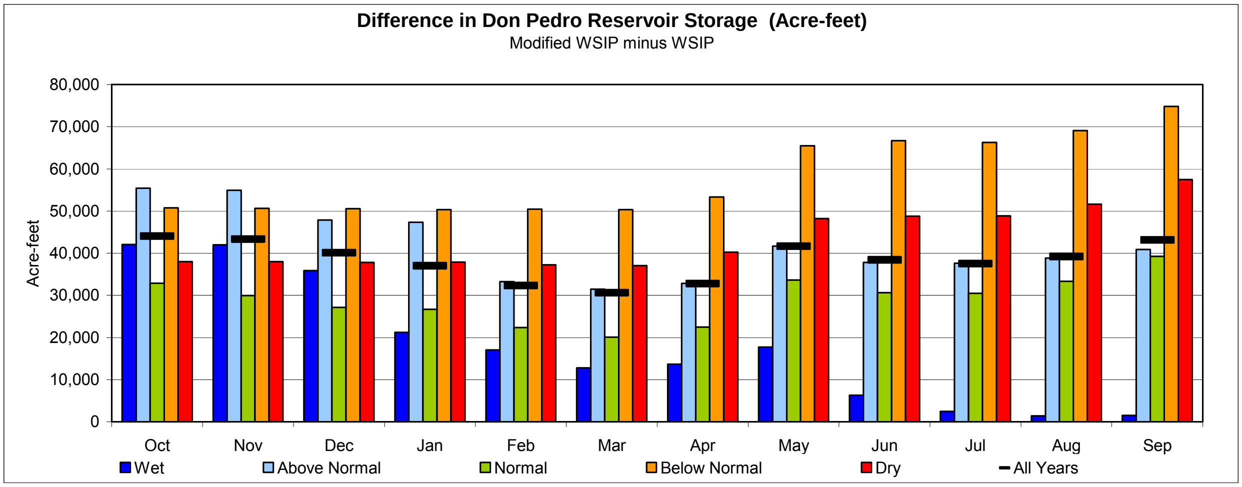


Figure 2.5-3

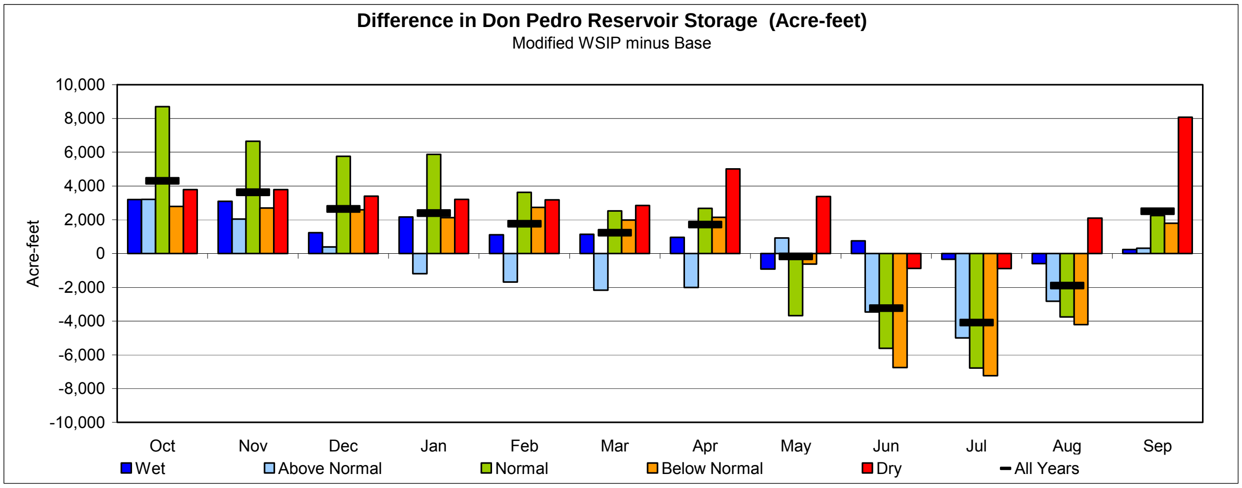
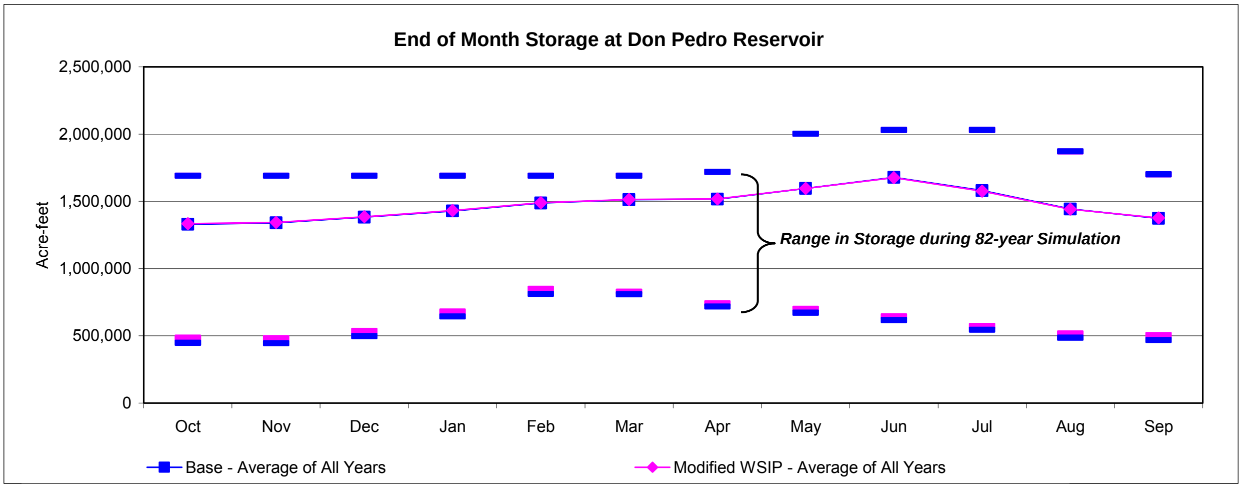


Figure 2.5-4 illustrates the average monthly storage in Don Pedro Reservoir for the 82-year simulation, and the range in storage for each month for the alternative and base settings.

The simulation shows that the occasional large storage depletions in Don Pedro Reservoir associated with the WSIP would be largely ameliorated by the use of conserved water for the transfer. In the alternative setting, the SJPL diverts an average of 17,000 acre-feet more than in the base setting, and the transfer is an annual average of 19,600 acre-feet for design drought yield purposes. It is assumed that the conservation of water for the transfer is also 19,600 acre-feet every year to satisfy the SFPUC's need for yield during the design drought sequence. Because the conserved water transfer (occurring each year) would be greater than the SJPL/inflow effect, Don Pedro Reservoir storage, and the La Grange release to the Tuolumne River as described below, could be slightly larger at times than in the base setting. In a few other instances, Don Pedro Reservoir storage and La Grange releases could be lower. The development and transfer of conserved water is not a perfect match (total elimination of effect) each year due to several factors, particularly the fact that the year-to-year and average numbers do not always coincide.

Figure 2.5-4



Sometimes a portion of the conserved water would be developed prior to an ensuing reservoir spill and could not be used to reduce an accumulating inflow deficit that occurred subsequent to the spill. Also, the additional SJPL diversion and its effect on Don Pedro Reservoir inflow would not occur at a constant year-to-year rate; sometimes more than the average effect, and sometimes less than the average effect, would occur. This circumstance could lead to a larger storage deficit in a year than the amount of water conserved in a year, and vise versa. Depending on the coincidence of the hydrologic sequence of Don Pedro Reservoir replenishment and the running accumulation of the inflow effect, the storage deficit might not be totally ameliorated during all hydrologic sequences.

The difference in storage in Don Pedro Reservoir attributed to the upstream effects of the alternative and the countering reduction in the TID/MID canal diversions would manifest in differences in releases from La Grange Dam to the stream. A different amount of available reservoir space in the winter and spring due to the alternative would lead to a different ability to regulate inflow, thus potentially changing the amount of water released to the stream that is in excess of minimum release requirements. During periods when inflow or canal diversions differ and Don Pedro Reservoir is at maximum capacity within the flood control storage limitation, a change in inflow or canal diversions directly manifests as a change in releases from La Grange Dam (a change of either more or less flow). Figure 2.5-1 illustrates the stream releases from La Grange Dam for the WSIP, alternative, and base settings.

Table 2.5-5 illustrates the difference in stream releases between the alternative and WSIP settings. Compared to the WSIP setting, the alternative exhibits an incrementally larger stream release, predominately during some months of the early winter through June period, which is reflective of the months when releases to the stream are made in excess of minimum release requirements due to flood control or in anticipation of filling the reservoir. Table 2.5-6 shows the same information for the alternative and WSIP settings, arranged by ranking the years in descending order of the San Joaquin River Index (an index indicating the wetness of the Tuolumne River Basin and the San Joaquin River Basin). The table illustrates the finding that differences in releases to the Tuolumne River from La Grange Dam occur only when there are releases in excess of minimum FERC flow requirements. This circumstance typically occurs only in above-normal and wet years, and predominately during early winter through June. During late summer of above-normal and wet years (August and September) there may also be releases in excess of minimum FERC flow requirements. These releases are associated with the drawdown of Don Pedro Reservoir during antecedent wetter years in anticipation of fall-time flood control objectives. During other year types and typically during the summer and fall, releases would be maintained at minimum FERC flow requirements regardless of the setting. Compared to the WSIP setting, the large potential reduction in flow following an extended drought period is reduced with the alternative, since the amount of water delivered by the SFPUC during these periods is somewhat less than that delivered in the WSIP setting, and the water for additional deliveries is derived from conserved water in Don Pedro Reservoir.

As described above concerning Don Pedro Reservoir inflow, releases, and storage, compared to the base setting the alternative setting would lead to a mixed effect on La Grange releases. Table 2.5-7 illustrates the difference in stream releases between the alternative and base settings. Table 2.5-8 shows the same information ranked in descending order of the San Joaquin River Index. Overall, releases below La Grange Dam are very similar between the alternative and base settings. This circumstance is the intended result of the mitigation measure under this alternative to use conserved water to offset the Don Pedro Reservoir inflow effect of the SFPUC's additional diversion of water from the Tuolumne River. As seen in some months, such as August and September, there are occasional increases in La Grange releases. These are instances when developing conserved water every year sometimes only adds to the water that would be released in excess of FERC requirements during a drawdown of storage prior to the fall flood control level at Don Pedro. Also, some positive values occur when early-season conserved water only adds to Don Pedro spills prior to filling.

In year-to-year operations, the conserved water could be adjusted if it would merely turn into an unneeded spill. However, outside of flood events, additional flow during the summer as a result of the conserved could be welcomed. For purposes of this analysis, the conserved water is assumed to be developed each year. However, it should be noted that the additional flow that occurs due to the conserved water was not explicitly patterned for any purpose except to draw Don Pedro Reservoir down to flood control objectives.

Table 2.5-5 and Table 2.5-7 illustrate the difference in stream releases among the alternative, WSIP, and base settings, expressed in terms of a monthly volume (acre-feet) of flow. Table 2.5-9 presents the same information and the average monthly stream releases for the alternative and WSIP settings, expressed in total monthly flow (acre-feet), and Table 2.5-10 shows the same information for the alternative and base settings. For the comparison of the alternative to the WSIP setting, the difference in monthly flow below La Grange Dam could range from an increase of approximately 212,000 acre-feet to a decrease of approximately 6,000 acre-feet. Considering the manner in which releases are determined and made to the stream, it is not always meaningful to quantify the effect of these changes in terms of average monthly flow (cfs). Similar to the operation of releases below O'Shaughnessy Dam, a change in the volume of release from La Grange Dam to the stream would likely delay or accelerate the initiation of the release by a matter of days. Using the assumption that a change in release volume equates to a delay or acceleration of releasing 6,000 acre-feet per day means that the difference in stream release from La Grange Dam between the alternative and WSIP would be an additional day of delay in releases or up to almost an added month of releases. Normally, a change in release would not affect the peak stream release rate during a year. Compared to the base setting, the alternative's effect on stream flow ranges from a reduction in releases (a potential delay in release of five days) to an increase in releases (a potential additional five days of release). In either direction, the maximum difference in La Grange releases between the alternative and base settings was reduced to about 30,000 acre-feet as the result of the conserved water measure.

APPENDIX O2

Table 2.5-5

Difference in Total La Grange Release to River (Acre-feet) Modified WSIP minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	10,550	1,295	3,379	0	0	0	0	0	15,224
1922	0	0	0	0	11,163	7,312	8,524	0	16,332	0	2,994	5,997	52,322
1923	0	0	1,607	0	0	0	6,038	0	0	0	0	0	7,645
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	34,956	0	9,765	19,149	63,870
1928	0	21,878	34,469	3,128	14,851	-1	0	0	0	0	0	0	74,325
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	212,095	4,633	6,756	0	0	0	0	0	223,484
1937	0	0	0	0	25,974	2,039	8,664	0	0	0	0	0	36,677
1938	0	0	21,216	0	0	39	8,009	10,282	1,197	0	2,993	5,997	49,733
1939	0	0	0	631	977	0	0	0	0	0	0	0	1,608
1940	0	0	0	0	0	34,432	7,881	0	0	0	0	0	42,313
1941	0	0	0	15,508	-2	0	3,000	0	7,853	0	2,994	5,997	35,350
1942	0	0	1,607	3,047	-1	0	8,524	6,000	0	0	2,994	5,997	28,168
1943	0	0	1,606	0	0	4,889	6,867	0	8,413	0	2,994	5,997	30,766
1944	0	0	0	0	0	1,608	0	0	0	0	0	0	1,608
1945	0	0	0	0	25,070	-1	4,026	0	0	0	0	0	29,095
1946	0	23,867	0	0	0	1,237	4,040	0	0	0	0	0	29,144
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	140,857	-3	0	0	0	0	0	0	0	0	140,854
1952	0	0	0	0	30,875	-1	3,000	16,030	1,197	0	2,994	5,997	60,092
1953	0	0	0	1,607	0	0	0	0	0	0	0	0	1,607
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	37,840	38,536	-5	0	5,578	0	8,413	0	2,994	5,997	99,353
1957	0	0	0	0	0	1,607	0	0	0	0	0	0	1,607
1958	0	0	0	0	0	25,042	3,001	15,426	1,013	0	2,993	5,997	53,472
1959	0	0	0	0	1,607	0	0	0	0	0	0	0	1,607
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	170,933	5,134	0	11,075	0	0	0	7,341	6,007	200,490
1966	0	1,607	523	0	16,091	-6,452	0	0	0	0	0	0	11,769
1967	0	0	0	0	0	16,553	3,000	19,378	921	0	2,994	5,997	48,843
1968	0	0	0	0	0	1,608	0	0	0	0	0	0	1,608
1969	0	0	0	20,586	624	10,837	7,879	6,000	0	0	2,993	5,997	54,916
1970	0	0	1,608	2,855	-1	0	0	0	0	0	0	0	4,462
1971	0	0	0	0	0	22,086	0	0	0	0	0	0	22,086
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	14,881	3,620	0	60,484	0	0	0	78,985
1974	0	10,551	0	0	0	6,659	7,603	0	8,413	0	2,993	5,997	42,216
1975	0	0	0	0	1,608	0	8,524	0	11,264	0	2,993	5,996	30,385
1976	1,610	0	0	0	0	0	0	0	0	0	0	0	1,610
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	76,662	0	0	1,901	78,563
1979	0	0	0	8,659	-1	4,729	3,000	6,000	0	0	0	0	22,387
1980	0	0	0	17,403	-3	4,947	5,577	6,000	0	0	2,994	5,997	42,915
1981	0	0	0	0	0	1,607	0	0	0	0	0	0	1,607
1982	0	0	0	24,409	11,947	0	3,000	7,903	1,841	0	2,994	6,006	58,100
1983	1,600	0	952	1	0	0	3,001	12,688	1,841	0	3,000	6,000	29,083
1984	0	2,518	1	0	0	0	0	0	0	0	0	0	2,519
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	9	0	40,478	11,649	13,634	7,236	1,197	0	0	8,974	83,177
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	95,016	61,107	24,874	10,886	191,883
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	33,024	13,398	6,857	829	0	3,000	5,991	63,099
1996	0	0	0	0	2,529	0	5,118	6,000	0	0	0	8,974	22,621
1997	0	1,612	0	4,729	-1	0	0	0	0	0	0	0	6,340
1998	0	0	0	19,380	-3	7,782	9,445	7,046	1,012	0	2,993	5,997	53,652
1999	0	0	1,607	0	0	1,902	10,708	0	0	0	0	0	14,217
2000	0	0	0	0	18,913	0	3,000	0	11,583	0	0	0	33,496
2001	0	0	0	0	0	10,551	2,311	0	0	0	0	0	12,862
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	39	757	2,974	4,042	5,250	2,762	2,453	1,620	4,274	745	1,133	1,925	27,973

APPENDIX O2

Table 2.5-6

Difference in Total La Grange Release to River (Acre-feet)

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending Unimpaired Runoff at LaGrange Modified WSIP minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1983	1,600	0	952	1	0	0	3,001	12,688	1,841	0	3,000	6,000	29,083
1995	0	0	0	0	0	33,024	13,398	6,857	829	0	3,000	5,991	63,099
1969	0	0	0	20,586	624	10,837	7,879	6,000	0	0	2,993	5,997	54,916
1982	0	0	0	24,409	11,947	0	3,000	7,903	1,841	0	2,994	6,006	58,100
1938	0	0	21,216	0	0	39	8,009	10,282	1,197	0	2,993	5,997	49,733
1998	0	0	0	19,380	-3	7,782	9,445	7,046	1,012	0	2,993	5,997	53,652
1997	0	1,612	0	4,729	-1	0	0	0	0	0	0	0	6,340
1956	0	0	37,840	38,536	-5	0	5,578	0	8,413	0	2,994	5,997	99,353
1967	0	0	0	0	0	16,553	3,000	19,378	921	0	2,994	5,997	48,843
1980	0	0	0	17,403	-3	4,947	5,577	6,000	0	0	2,994	5,997	42,915
1986	0	0	9	0	40,478	11,649	13,634	7,236	1,197	0	0	8,974	83,177
1952	0	0	0	0	30,875	-1	3,000	16,030	1,197	0	2,994	5,997	60,092
1978	0	0	0	0	0	0	0	0	76,662	0	0	1,901	78,563
1965	0	0	0	170,933	5,134	0	11,075	0	0	0	7,341	6,007	200,490
1958	0	0	0	0	0	25,042	3,001	15,426	1,013	0	2,993	5,997	53,472
1993	0	0	0	0	0	0	0	0	95,016	61,107	24,874	10,886	191,883
1941	0	0	0	15,508	-2	0	3,000	0	7,853	0	2,994	5,997	35,350
1951	0	0	140,857	-3	0	0	0	0	0	0	0	0	140,854
1922	0	0	0	0	11,163	7,312	8,524	0	16,332	0	2,994	5,997	52,322
1984	0	2,518	1	0	0	0	0	0	0	0	0	0	2,519
1943	0	0	1,606	0	0	4,889	6,867	0	8,413	0	2,994	5,997	30,766
1942	0	0	1,607	3,047	-1	0	8,524	6,000	0	0	2,994	5,997	28,168
1996	0	0	0	0	2,529	0	5,118	6,000	0	0	0	8,974	22,621
1974	0	10,551	0	0	0	6,659	7,603	0	8,413	0	2,993	5,997	42,216
1940	0	0	0	0	0	34,432	7,881	0	0	0	0	0	42,313
1936	0	0	0	0	212,095	4,633	6,756	0	0	0	0	0	223,484
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	1,607	0	0	1,902	10,708	0	0	0	0	0	14,217
1945	0	0	0	0	25,070	-1	4,026	0	0	0	0	0	29,095
1927	0	0	0	0	0	0	0	0	34,956	0	9,765	19,149	63,870
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	1,608	0	8,524	0	11,264	0	2,993	5,996	30,385
1973	0	0	0	0	0	14,881	3,620	0	60,484	0	0	0	78,985
1921	0	0	0	0	10,550	1,295	3,379	0	0	0	0	0	15,224
1937	0	0	0	0	25,974	2,039	8,664	0	0	0	0	0	36,677
1970	0	0	1,608	2,855	-1	0	0	0	0	0	0	0	4,462
2000	0	0	0	0	18,913	0	3,000	0	11,583	0	0	0	33,496
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	8,659	-1	4,729	3,000	6,000	0	0	0	0	22,387
1946	0	23,867	0	0	0	1,237	4,040	0	0	0	0	0	29,144
1923	0	0	1,607	0	0	0	6,038	0	0	0	0	0	7,645
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	22,086	0	0	0	0	0	0	22,086
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	1,607	0	0	0	0	0	0	0	0	1,607
1928	0	21,878	34,469	3,128	14,851	-1	0	0	0	0	0	0	74,325
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	1,607	0	0	0	0	0	0	1,607
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	1,607	523	0	16,091	-6,452	0	0	0	0	0	0	11,769
1944	0	0	0	0	0	1,608	0	0	0	0	0	0	1,608
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	10,551	2,311	0	0	0	0	0	12,862
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	1,607	0	0	0	0	0	0	1,607
1968	0	0	0	0	0	1,608	0	0	0	0	0	0	1,608
1959	0	0	0	0	1,607	0	0	0	0	0	0	0	1,607
1939	0	0	0	631	977	0	0	0	0	0	0	0	1,608
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	1,610	0	0	0	0	0	0	0	0	0	0	0	1,610
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0

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Table 2.5-7

Difference in Total La Grange Release to River (Acre-feet)

Modified WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	10,550	-12,107	125	0	0	0	0	0	-1,432
1922	0	0	0	0	6,029	0	1,159	0	296	-2,183	2,989	5,997	14,287
1923	0	0	1,607	0	0	0	3,920	0	0	0	0	0	5,527
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	8,049	0	820	5,993	14,862
1928	0	1,608	0	0	0	0	-8,905	0	0	0	0	0	-7,297
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	-34,944	-12,257	3,121	0	0	0	0	0	-44,080
1937	0	0	0	0	9,774	-1,156	151	0	0	0	0	0	8,769
1938	0	0	1,626	0	0	0	866	-6,732	-3,683	0	820	5,992	-1,111
1939	0	0	0	631	977	0	0	0	0	0	0	0	1,608
1940	0	0	0	0	0	-3,763	2,203	0	0	0	0	0	-1,560
1941	0	0	0	18,819	-448	-422	2,481	0	4,317	-2,184	2,989	5,997	31,549
1942	0	0	1,607	-2,495	0	-2,664	3,000	3,146	-2,762	-2,188	2,994	5,997	6,635
1943	0	0	1,606	0	0	2,888	146	0	4,114	0	820	5,992	15,566
1944	0	0	0	0	0	1,608	0	0	0	0	0	0	1,608
1945	0	0	0	0	-12,386	-15,316	3,824	0	0	0	0	0	-23,878
1946	0	31,175	106	0	0	-10,971	428	0	0	0	0	0	20,738
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	24,303	0	0	0	0	0	0	0	0	0	24,303
1952	0	0	0	0	9,518	-1	3,000	151	-920	0	820	5,993	18,561
1953	0	0	0	1,607	0	0	0	0	0	0	0	0	1,607
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	772	0	0	-3,555	2,510	0	-921	-2,188	2,994	5,997	5,609
1957	0	0	0	0	0	1,607	0	0	0	0	0	0	1,607
1958	0	0	0	0	0	-13,416	3,001	3,936	0	-2,188	2,993	5,997	323
1959	0	0	0	0	1,607	0	0	0	0	0	0	0	1,607
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	-11,774	0	0	0	0	0	0	0	-11,774
1965	0	0	0	-14,803	2	-10,710	1,306	0	0	0	18,344	6,031	170
1966	0	1,608	-629	0	-1,078	-6,452	0	0	0	0	0	0	-6,551
1967	0	0	0	0	0	-1,945	3,000	6,951	921	-2,188	810	5,992	13,541
1968	0	0	0	0	0	1,608	0	0	0	0	0	0	1,608
1969	0	0	0	-4,658	-1,824	0	238	3,812	-2,117	0	819	5,993	2,263
1970	0	0	1,608	29,451	-5,958	-21,074	0	0	0	0	0	0	4,027
1971	0	0	0	0	0	6,554	0	0	0	0	0	0	6,554
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	7,677	3,000	0	94	0	0	0	10,771
1974	0	10,551	0	-8,392	1	-3,806	3,000	0	-1,494	0	819	5,992	6,671
1975	0	0	0	0	1,608	0	238	0	17,785	-2,183	2,989	5,996	26,433
1976	1,610	0	0	0	0	0	0	0	0	0	0	0	1,610
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	-12,821	0	0	1,901	-10,920
1979	0	0	0	5,094	-1	-11,490	882	3,812	0	0	0	0	-1,703
1980	0	0	0	25,044	-4	-2,664	698	3,812	-2,118	-2,188	2,994	5,997	31,571
1981	0	0	0	0	0	1,607	0	0	0	0	0	0	1,607
1982	0	0	0	-2,806	396	0	3,000	6,000	0	0	-1,364	3,879	9,105
1983	554	2,762	0	0	0	0	3,001	3,146	-2,762	-2,188	3,000	3,820	11,333
1984	0	4,057	1	0	0	3,936	0	0	0	0	0	0	7,994
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	9	0	23,365	-8,478	2,334	2,194	-3,683	0	0	6,807	22,548
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	-35,371	-2,184	2,988	5,997	-28,570
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	23,761	4,192	4,954	-1,013	-2,188	3,000	3,814	36,520
1996	0	0	0	0	835	0	238	958	-4,880	0	0	6,807	3,958
1997	0	1,609	0	-1,479	0	0	0	0	0	0	0	0	130
1998	0	0	0	658	0	4,663	-1,603	3,146	-2,762	-2,188	2,993	5,997	10,904
1999	0	0	1,607	0	0	-6,660	-274	0	0	0	0	0	-5,327
2000	0	0	0	0	-181	0	3,000	0	-893	0	0	0	1,926
2001	0	0	0	0	0	10,551	2,311	0	0	0	0	0	12,862
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	26	651	417	569	-48	-1,005	605	479	-520	-320	678	1,573	3,106

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Table 2.5-8

Difference in Total La Grange Release to River (Acre-feet)

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending Unimpaired Runoff at LaGrange Modified WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1983	554	2,762	0	0	0	0	3,001	3,146	-2,762	-2,188	3,000	3,820	11,333
1995	0	0	0	0	0	23,761	4,192	4,954	-1,013	-2,188	3,000	3,814	36,520
1969	0	0	0	-4,658	-1,824	0	238	3,812	-2,117	0	819	5,993	2,263
1982	0	0	0	-2,806	396	0	3,000	6,000	0	0	-1,364	3,879	9,105
1938	0	0	1,626	0	0	0	866	-6,732	-3,683	0	820	5,992	-1,111
1998	0	0	0	658	0	4,663	-1,603	3,146	-2,762	-2,188	2,993	5,997	10,904
1997	0	1,609	0	-1,479	0	0	0	0	0	0	0	0	130
1956	0	0	772	0	0	-3,555	2,510	0	-921	-2,188	2,994	5,997	5,609
1967	0	0	0	0	0	-1,945	3,000	6,951	921	-2,188	810	5,992	13,541
1980	0	0	0	25,044	-4	-2,664	698	3,812	-2,118	-2,188	2,994	5,997	31,571
1986	0	0	9	0	23,365	-8,478	2,334	2,194	-3,683	0	0	6,807	22,548
1952	0	0	0	0	9,518	-1	3,000	151	-920	0	820	5,993	18,561
1978	0	0	0	0	0	0	0	0	-12,821	0	0	1,901	-10,920
1965	0	0	0	-14,803	2	-10,710	1,306	0	0	0	18,344	6,031	170
1958	0	0	0	0	0	-13,416	3,001	3,936	0	-2,188	2,993	5,997	323
1993	0	0	0	0	0	0	0	0	-35,371	-2,184	2,988	5,997	-28,570
1941	0	0	0	18,819	-448	-422	2,481	0	4,317	-2,184	2,989	5,997	31,549
1951	0	0	24,303	0	0	0	0	0	0	0	0	0	24,303
1922	0	0	0	0	6,029	0	1,159	0	296	-2,183	2,989	5,997	14,287
1984	0	4,057	1	0	0	3,936	0	0	0	0	0	0	7,994
1943	0	0	1,606	0	0	2,888	146	0	4,114	0	820	5,992	15,566
1942	0	0	1,607	-2,495	0	-2,664	3,000	3,146	-2,762	-2,188	2,994	5,997	6,635
1996	0	0	0	0	835	0	238	958	-4,880	0	0	6,807	3,958
1974	0	10,551	0	-8,392	1	-3,806	3,000	0	-1,494	0	819	5,992	6,671
1940	0	0	0	0	0	-3,763	2,203	0	0	0	0	0	-1,560
1936	0	0	0	0	-34,944	-12,257	3,121	0	0	0	0	0	-44,080
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	1,607	0	0	-6,660	-274	0	0	0	0	0	-5,327
1945	0	0	0	0	-12,386	-15,316	3,824	0	0	0	0	0	-23,878
1927	0	0	0	0	0	0	0	0	8,049	0	820	5,993	14,862
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	1,608	0	238	0	17,785	-2,183	2,989	5,996	26,433
1973	0	0	0	0	0	7,677	3,000	0	94	0	0	0	10,771
1921	0	0	0	0	10,550	-12,107	125	0	0	0	0	0	-1,432
1937	0	0	0	0	9,774	-1,156	151	0	0	0	0	0	8,769
1970	0	0	1,608	29,451	-5,958	-21,074	0	0	0	0	0	0	4,027
2000	0	0	0	0	-181	0	3,000	0	-893	0	0	0	1,926
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	5,094	-1	-11,490	882	3,812	0	0	0	0	-1,703
1946	0	31,175	106	0	0	-10,971	428	0	0	0	0	0	20,738
1923	0	0	1,607	0	0	0	3,920	0	0	0	0	0	5,527
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	6,554	0	0	0	0	0	0	6,554
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	1,607	0	0	0	0	0	0	0	0	1,607
1928	0	1,608	0	0	0	0	-8,905	0	0	0	0	0	-7,297
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	1,607	0	0	0	0	0	0	1,607
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	1,608	-629	0	-1,078	-6,452	0	0	0	0	0	0	-6,551
1944	0	0	0	0	0	1,608	0	0	0	0	0	0	1,608
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	-11,774	0	0	0	0	0	0	0	-11,774
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	10,551	2,311	0	0	0	0	0	12,862
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	1,607	0	0	0	0	0	0	1,607
1968	0	0	0	0	0	1,608	0	0	0	0	0	0	1,608
1959	0	0	0	0	1,607	0	0	0	0	0	0	0	1,607
1939	0	0	0	631	977	0	0	0	0	0	0	0	1,608
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	1,610	0	0	0	0	0	0	0	0	0	0	0	1,610
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0

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Table 2.5-9

Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	23,001	21,563	56,842	151,415	186,738	273,821	217,239	244,709	227,921	142,651	69,115	50,878	1,665,894
Above Normal	18,683	31,026	67,978	74,978	128,547	166,616	131,514	79,097	84,366	27,869	21,031	21,212	852,917
Normal	18,264	17,579	35,872	51,349	74,834	104,445	85,081	78,304	20,306	9,992	9,992	9,670	515,686
Below Normal	17,105	13,863	19,925	15,874	17,549	21,794	34,964	33,554	4,025	4,160	4,160	4,025	190,997
Dry	17,340	13,842	14,866	13,990	15,673	20,873	21,732	21,240	3,347	3,459	3,459	3,347	153,168
All Years	18,855	19,645	39,215	61,129	84,385	116,941	97,743	90,526	67,413	37,099	21,333	17,699	671,982

Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	22,901	21,463	53,092	132,916	181,173	266,954	211,640	237,532	215,975	138,831	65,042	45,019	1,592,538
Above Normal	18,683	30,258	59,409	73,887	113,696	163,096	126,954	78,391	79,235	27,869	19,400	17,441	808,318
Normal	18,264	14,720	33,517	50,334	70,441	101,554	83,097	77,929	15,802	9,992	9,992	9,670	495,309
Below Normal	17,105	13,768	19,894	15,874	16,603	21,364	34,828	33,554	4,025	4,160	4,160	4,025	189,359
Dry	17,240	13,842	14,866	13,950	15,511	20,672	21,732	21,240	3,347	3,459	3,459	3,347	152,665
All Years	18,815	18,888	36,241	57,087	79,135	114,179	95,290	88,906	63,139	36,354	20,200	15,774	644,009

Difference in Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) Modified WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	100	101	3,751	18,499	5,565	6,867	5,600	7,178	11,946	3,819	4,072	5,859	73,357
Above Normal	0	769	8,569	1,091	14,851	3,519	4,561	706	5,131	0	1,631	3,771	44,599
Normal	0	2,859	2,355	1,016	4,393	2,892	1,984	375	4,504	0	0	0	20,377
Below Normal	0	95	31	0	947	430	136	0	0	0	0	0	1,638
Dry	101	0	0	39	162	201	0	0	0	0	0	0	503
All Years	39	757	2,974	4,042	5,250	2,762	2,453	1,620	4,274	745	1,133	1,925	27,973

Table 2.5-10

Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	23,001	21,563	56,842	151,415	186,738	273,821	217,239	244,709	227,921	142,651	69,115	50,878	1,665,894
Above Normal	18,683	31,026	67,978	74,978	128,547	166,616	131,514	79,097	84,366	27,869	21,031	21,212	852,917
Normal	18,264	17,579	35,872	51,349	74,834	104,445	85,081	78,304	20,306	9,992	9,992	9,670	515,686
Below Normal	17,105	13,863	19,925	15,874	17,549	21,794	34,964	33,554	4,025	4,160	4,160	4,025	190,997
Dry	17,340	13,842	14,866	13,990	15,673	20,873	21,732	21,240	3,347	3,459	3,459	3,347	153,168
All Years	18,855	19,645	39,215	61,129	84,385	116,941	97,743	90,526	67,413	37,099	21,333	17,699	671,982

Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	22,967	21,290	56,692	151,293	184,772	274,592	215,643	242,749	232,124	143,744	66,539	45,865	1,658,271
Above Normal	18,683	30,167	66,265	74,511	130,859	168,855	130,389	78,856	82,871	28,383	20,182	18,343	848,363
Normal	18,264	15,530	35,664	49,090	73,947	107,106	84,918	78,066	20,356	9,992	9,992	9,670	512,593
Below Normal	17,105	13,768	19,962	15,874	18,305	21,364	34,828	33,554	4,025	4,160	4,160	4,025	191,130
Dry	17,240	13,842	14,866	13,950	15,511	20,672	21,732	21,240	3,347	3,459	3,459	3,347	152,665
All Years	18,828	18,994	38,798	60,559	84,433	117,947	97,139	90,047	67,933	37,419	20,654	16,126	668,876

Difference in Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) Modified WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	35	273	150	122	1,966	-772	1,596	1,961	-4,203	-1,094	2,576	5,013	7,624
Above Normal	0	859	1,713	467	-2,312	-2,239	1,126	241	1,496	-514	848	2,869	4,554
Normal	0	2,049	208	2,260	887	-2,660	163	238	-50	0	0	0	3,093
Below Normal	0	95	-37	0	-756	430	136	0	0	0	0	0	-132
Dry	101	0	0	39	162	201	0	0	0	0	0	0	503
All Years	26	651	417	569	-48	-1,005	605	479	-520	-320	678	1,573	3,106

2.6 Calaveras and San Antonio Reservoirs, Alameda Creek, and Downstream

Compared to the WSIP setting, the operation of Calaveras Reservoir in the alternative setting is almost identical. Figure 2.6-1 illustrates a chronological trace of the simulation of Calaveras Reservoir storage and stream releases from Calaveras Dam. Shown in Figure 2.6-1 are the results for the WSIP, alternative, and base settings. In recognition of the different levels of systemwide deliveries served in each setting, the near identical operation of Calaveras Reservoir resulting from the two settings is an indication that Calaveras Reservoir operations are mostly influenced by the principles that manage local watershed production. The slight differences in reservoir operation are the result of modeling assumptions that balance reservoir storage among SFPUC reservoirs and the selection of the monthly SJPL conveyance rate. It is anticipated that the difference in Calaveras Reservoir operation during actual operations would be minimal, if any difference occurred at all. The difference in storage between the alternative and WSIP settings and the base setting is due to the restoration of the operational capacity of Calaveras Reservoir. Under both the alternative and WSIP settings, the full capacity of Calaveras Reservoir would be available, and a greater range in storage operation would occur. Figure 2.6-2 illustrates the average monthly storage in Calaveras Reservoir for the 82-year simulation, and the range in storage for each month for the alternative and base settings.

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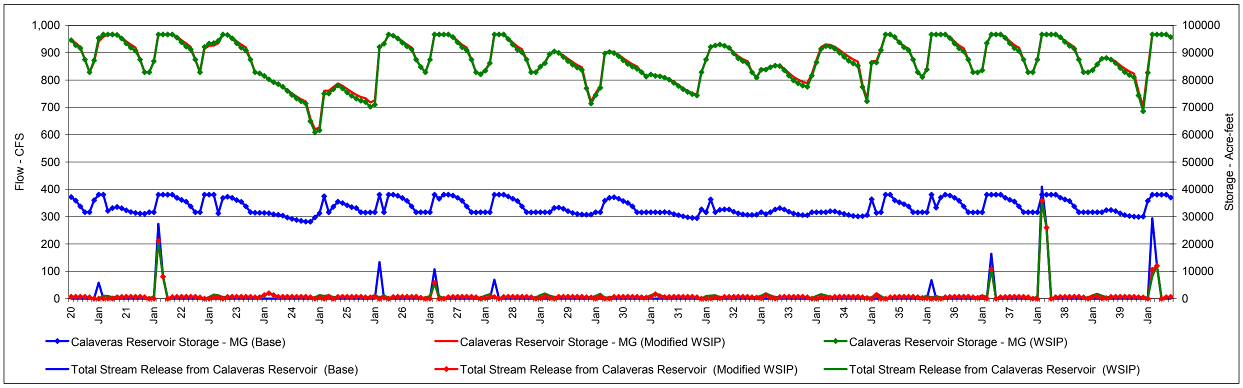
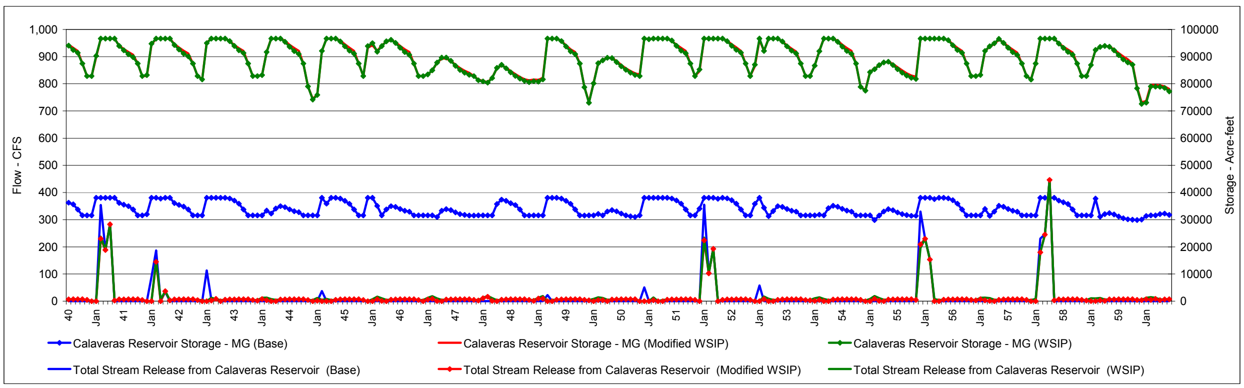
Figure 2.6-1
Calaveras Reservoir Storage and Stream Release

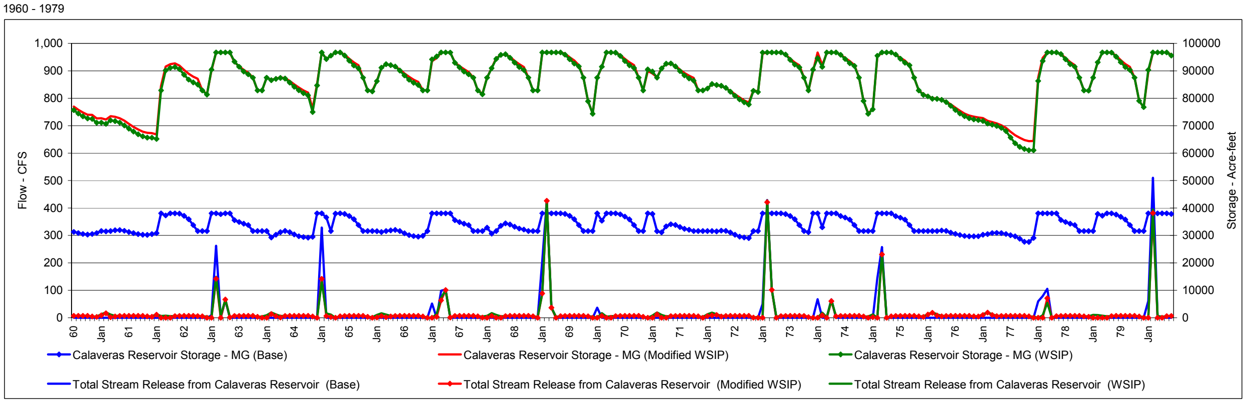
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

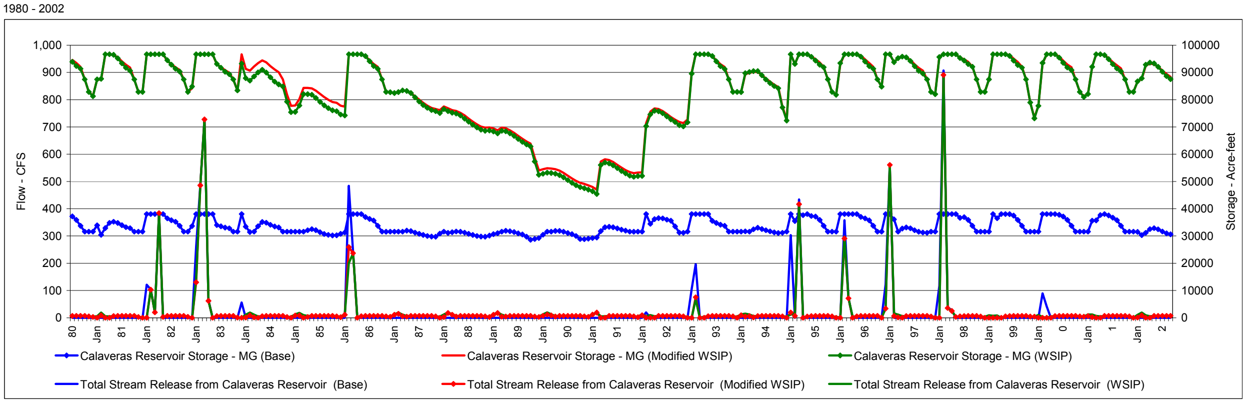
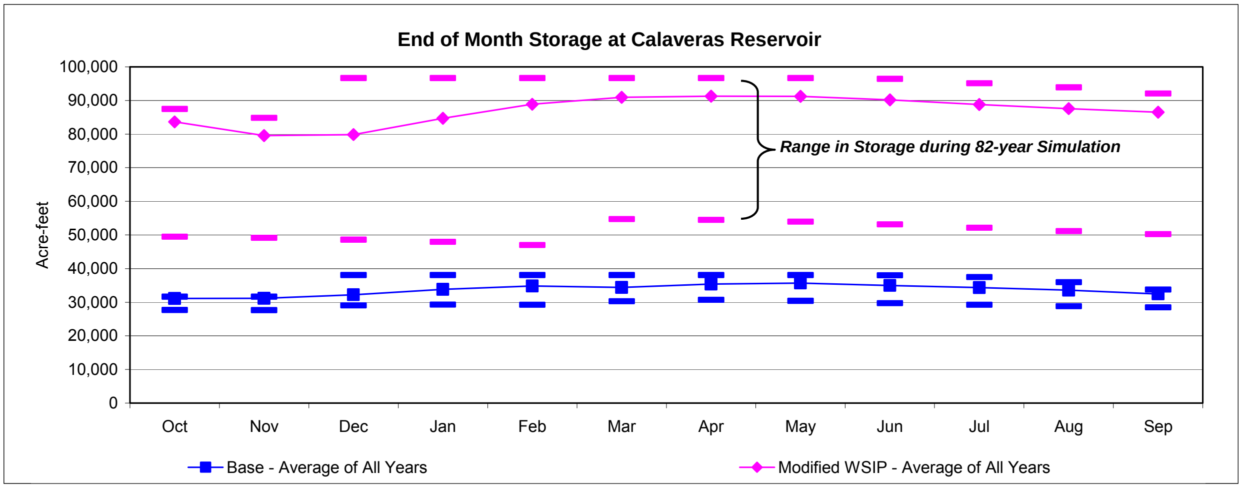


Figure 2.6-2



There would be almost identical spills from Calaveras Reservoir for the alternative and WSIP settings. Both the alternative and WSIP settings have fishery releases (1997 CDFG MOU) that are not included in the base setting. Table 2.6-1 illustrates the difference in releases to Calaveras Creek between the alternative and WSIP settings. The difference in flow (for the reach below Calaveras Reservoir to the confluence with Alameda Creek) during December through April is due to the flow bypass measure at ACDD that is associated with the Modified WSIP setting. The reductions in flow in this reach of stream are an indication that bypass flow is being provided at the diversion dam and is subsequently used to contribute to the 1997 MOU flow requirement at the confluence. The bypass flow does not exist in the WSIP setting, and additional releases would be required from Calaveras Reservoir to meet the 1997 MOU flow requirement. Supplementing the Figure 2.6-1 representation of Calaveras Dam stream releases and Table 2.6-1 is Table 2.6-2, which illustrates releases for the alternative and WSIP settings, and the difference in releases between the two. Table 2.6-3 provides the same form of information for the alternative and base settings. The notable difference in releases between the alternative and base settings is the addition of the required flows to satisfy the 1997 MOU and the reduction of stream releases during wetter-year, wetter-season flows due to the restoration of Calaveras Reservoir operational capacity.

The bypass flow measure at the ACDD is modeled as a release at the diversion dam of 10 cfs or inflow to the diversion dam, whichever is less, for the months December through April. Table 2.6-4 illustrates the flow past the ACDD for the alternative setting, which includes the bypass measure. Table 2.6-5 illustrates the flow for the WSIP setting, and Table 2.6-6 illustrates the difference in flow below the ACDD between the alternative and WSIP settings. As seen in Table 2.6-4, flow past the diversion dam occurs regularly during the December through April period, its magnitude either as an explicit bypass of up to 10 cfs (approximately 600 acre-feet per month), or more during rain-runoff events when either Calaveras Reservoir is not receiving water from Alameda Creek or the runoff at the diversion dam exceeds the diversion tunnel capacity. Table 2.6-6 illustrates the difference in flow below the diversion dam between the two settings. The positive values (up to 10 cfs) indicate the measure's passage of flow that would otherwise not occur in the WSIP setting. The few exceptions of reduced flow indicate periods when the alternative setting would divert more water to Calaveras Reservoir from the diversion dam; however, review of the remaining flow below the diversion dam (Table 2.6-4) shows that it would still be in excess of the minimum bypass flow.

Table 2.6-7 illustrates the difference in flow below the ACDD between the alternative and base settings. The seasonal increase in flow past the diversion dam in the alternative setting is again apparent. The reductions in flow below the diversion dam are due to the additional diversions to Calaveras Reservoir resulting from the restoration of reservoir operating capacity. Table 2.6-8 and Table 2.6-9 illustrate the flow past the ACDD, comparing the alternative, WSIP, and base settings by year type and the average of all years.

APPENDIX O2

Table 2.6-1

Difference in Total Stream Release from Calaveras Reservoir (Acre-feet)

Modified WSIP minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	-555	-614	-301	0	0	0	0	0	-1,470
1922	0	0	-9	-568	-71	0	-196	0	0	0	0	0	-845
1923	0	0	0	-381	-555	-466	-307	0	0	0	0	0	-1,709
1924	0	0	0	0	0	-3	-9	0	0	0	0	0	-12
1925	0	0	-270	-396	-528	-255	-301	0	0	0	0	0	-1,749
1926	0	0	-9	-411	-236	-552	-157	0	0	0	0	0	-1,366
1927	0	0	-224	-614	11	-543	-138	0	0	0	0	0	-1,508
1928	0	0	-212	-540	-555	191	-58	0	0	0	0	0	-1,175
1929	0	0	-267	-614	-555	-614	-402	0	0	0	0	0	-2,452
1930	0	0	-34	-614	-555	-175	-325	0	0	0	0	0	-1,703
1931	0	0	-61	-430	-184	-221	-74	0	0	0	0	0	-970
1932	0	0	0	-562	-555	-390	-276	0	0	0	0	0	-1,783
1933	0	0	-49	-614	-325	-470	-319	0	0	0	0	0	-1,777
1934	0	0	-166	-611	-555	-491	-147	0	0	0	0	0	-1,970
1935	0	0	-126	-252	-335	-580	0	0	0	0	0	0	-1,292
1936	0	0	-129	-614	-206	-614	-230	0	0	0	0	0	-1,792
1937	0	0	-92	-402	-377	-178	-92	0	0	0	0	0	-1,141
1938	0	0	-12	-491	0	0	-31	0	0	0	0	0	-534
1939	0	0	-239	-424	-555	-614	-255	0	0	0	0	0	-2,087
1940	0	0	-34	-249	1,330	0	0	0	0	0	0	0	1,047
1941	0	0	-34	-166	-429	0	0	0	0	0	0	0	-629
1942	0	0	0	0	-355	-405	0	0	0	0	0	0	-760
1943	0	0	-261	0	-555	0	-221	0	0	0	0	0	-1,037
1944	0	0	-163	-307	-555	-482	-319	0	0	0	0	0	-1,826
1945	0	0	-264	-614	-279	-528	-288	0	0	0	0	0	-1,973
1946	0	0	0	-430	-555	-614	-301	0	0	0	0	0	-1,900
1947	0	0	-264	-399	-555	-614	-301	0	0	0	0	0	-2,133
1948	0	0	-138	-132	-184	-614	-218	0	0	0	0	0	-1,286
1949	0	0	-178	-193	-500	0	-298	0	0	0	0	0	-1,169
1950	0	0	-104	-531	-555	-513	-338	0	0	0	0	0	-2,041
1951	0	0	0	0	-555	0	-307	0	0	0	0	0	-862
1952	0	0	0	-613	0	0	-123	0	0	0	0	0	-736
1953	0	0	0	-64	-555	-574	-316	0	0	0	0	0	-1,510
1954	0	0	-107	-614	-555	-516	-279	0	0	0	0	0	-2,072
1955	0	0	-147	-543	-555	-611	-335	0	0	0	0	0	-2,191
1956	0	0	830	0	0	-460	-273	0	0	0	0	0	97
1957	0	0	-104	-331	-555	-614	-331	0	0	0	0	0	-1,936
1958	0	0	-264	-537	0	0	0	0	0	0	0	0	-801
1959	0	0	-120	-614	-555	-531	-285	0	0	0	0	0	-2,105
1960	0	0	-46	-347	-555	-221	-172	0	0	0	0	0	-1,341
1961	0	0	-107	-252	-193	-586	-132	0	0	0	0	0	-1,271
1962	0	0	-89	-107	-344	-473	-338	0	0	0	0	0	-1,350
1963	0	0	-270	-12	-410	-454	0	0	0	0	0	0	-1,147
1964	0	0	-279	-552	-350	-396	-307	0	0	0	0	0	-1,884
1965	0	0	0	605	-555	-559	0	0	0	0	0	0	-509
1966	0	0	-132	-614	-555	-592	-114	0	0	0	0	0	-2,007
1967	0	0	-71	0	-555	-613	0	0	0	0	0	0	-1,239
1968	0	0	-258	-436	-555	-614	-316	0	0	0	0	0	-2,179
1969	0	0	-212	0	0	0	-203	0	0	0	0	0	-414
1970	0	0	-270	0	-555	-239	-335	0	0	0	0	0	-1,399
1971	0	0	0	-506	-390	-614	-304	0	0	0	0	0	-1,814
1972	0	0	-166	-390	-555	-160	-114	0	0	0	0	0	-1,384
1973	0	0	-212	0	-369	0	-239	0	0	0	0	0	-820
1974	0	0	0	0	-555	-132	-220	0	0	0	0	0	-907
1975	0	0	-273	-614	-28	-360	-25	0	0	0	0	0	-1,299
1976	0	0	-107	-98	-110	-270	-110	0	0	0	0	0	-697
1977	0	0	-37	-169	-71	-150	-77	0	0	0	0	0	-503
1978	0	0	-261	0	-470	1,050	-64	0	0	0	0	0	255
1979	0	0	-80	-614	-528	-470	-292	0	0	0	0	0	-1,983
1980	0	0	-190	0	-718	-381	-236	0	0	0	0	0	-1,525
1981	0	0	-110	-335	-555	-347	-316	0	0	0	0	0	-1,663
1982	0	0	-95	0	0	0	0	0	0	0	0	0	-95
1983	0	0	0	-613	0	0	0	0	0	0	0	0	-613
1984	0	0	0	-614	-555	-614	-316	0	0	0	0	0	-2,099
1985	0	0	-252	-285	-513	-602	-209	0	0	0	0	0	-1,860
1986	0	0	9	-147	3,242	0	-178	0	0	0	0	0	2,926
1987	0	0	-86	-147	-252	-408	-138	0	0	0	0	0	-1,031
1988	0	0	-273	-583	-132	-95	-120	0	0	0	0	0	-1,203
1989	0	0	-132	-144	-129	-485	-129	0	0	0	0	0	-1,019
1990	0	0	-107	-347	-408	-233	-117	0	0	0	0	0	-1,212
1991	0	0	-71	-64	-61	-325	-341	0	0	0	0	0	-862
1992	0	0	-160	-233	-322	-586	-322	0	0	0	0	0	-1,623
1993	0	0	-242	0	435	0	-267	0	0	0	0	0	-75
1994	0	0	-273	-212	-555	-368	-267	0	0	0	0	0	-1,676
1995	0	0	-288	481	-555	0	-123	0	0	0	0	0	-486
1996	0	0	-230	-40	-382	0	-273	0	0	0	0	0	-926
1997	0	0	0	0	-555	-614	-331	0	0	0	0	0	-1,501
1998	0	0	-203	0	191	0	0	0	0	0	0	0	-12
1999	0	0	-264	-555	-402	-528	0	0	0	0	0	0	-1,749
2000	0	0	-46	-614	-157	0	-313	0	0	0	0	0	-1,129
2001	0	0	-37	-390	-555	-408	-307	0	0	0	0	0	-1,697
2002	0	0	-46	-614	-555	-559	-344	0	0	0	0	0	-2,118
Avg (21-02)	0	0	-112	-298	-298	-318	-197	0	0	0	0	0	-1,223

APPENDIX O2

Table 2.6-2

Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	941	4,855	14,418	9,708	4,977	255	386	417	425	415	37,472
Above Normal	425	258	42	543	2,970	2,524	446	327	396	424	428	417	9,199
Normal	429	275	93	168	286	69	6	370	408	428	430	417	3,377
Below Normal	428	275	95	194	366	108	51	389	411	430	430	417	3,594
Dry	429	292	151	485	746	402	215	407	416	430	430	417	4,819
All Years	428	269	260	1,228	3,706	2,532	1,117	350	403	426	428	417	11,563

Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	998	4,985	14,425	9,862	5,085	255	386	417	425	415	37,928
Above Normal	425	258	172	746	3,196	2,688	606	327	396	424	428	417	10,082
Normal	429	275	194	548	725	506	265	370	408	428	430	417	4,995
Below Normal	428	275	246	672	876	596	345	389	411	430	430	417	5,515
Dry	429	292	281	778	1,044	747	375	407	416	430	430	417	6,044
All Years	428	269	374	1,526	4,004	2,850	1,314	350	403	426	428	417	12,788

Difference in Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Modified WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-46	-130	-7	-155	-109	0	0	0	0	0	-446
Above Normal	0	0	-130	-203	-227	-164	-160	0	0	0	0	0	-883
Normal	0	0	-102	-381	-439	-438	-259	0	0	0	0	0	-1,618
Below Normal	0	0	-150	-478	-510	-488	-294	0	0	0	0	0	-1,921
Dry	0	0	-130	-293	-298	-344	-159	0	0	0	0	0	-1,225
All Years	0	0	-112	-298	-298	-318	-197	0	0	0	0	0	-1,223

Table 2.6-3

Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	941	4,855	14,418	9,708	4,977	255	386	417	425	415	37,472
Above Normal	425	258	42	543	2,970	2,524	446	327	396	424	428	417	9,199
Normal	429	275	93	168	286	69	6	370	408	428	430	417	3,377
Below Normal	428	275	95	194	366	108	51	389	411	430	430	417	3,594
Dry	429	292	151	485	746	402	215	407	416	430	430	417	4,819
All Years	428	269	260	1,228	3,706	2,532	1,117	350	403	426	428	417	11,563

Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	1,741	9,267	16,622	9,968	5,024	0	0	0	0	0	42,623
Above Normal	0	0	184	2,685	5,918	3,096	459	0	0	0	0	0	12,342
Normal	0	0	216	364	898	353	0	0	0	0	0	0	1,831
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	420	2,436	4,645	2,656	1,076	0	0	0	0	0	11,233

Difference in Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Modified WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	-808	-4,412	-2,203	-260	-48	255	386	417	425	415	-5,159
Above Normal	425	258	-142	-2,141	-2,948	-572	-13	327	396	424	428	417	-3,142
Normal	429	275	-123	-196	-613	-284	6	370	408	428	430	417	1,545
Below Normal	428	275	95	194	366	108	51	389	411	430	430	417	3,594
Dry	429	292	151	485	746	402	215	407	416	430	430	417	4,819
All Years	428	269	-162	-1,208	-939	-124	42	350	403	426	428	417	329

APPENDIX O2

Table 2.6-4

Flow Passing Alameda Creek Diversion Dam (Acre-feet) Modified WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	1,043	2,826	555	614	301	0	0	0	0	0	5,340
1922	0	0	1,083	614	9,857	4,591	595	0	0	0	0	0	16,741
1923	0	0	2,581	841	666	466	595	0	0	0	0	0	5,150
1924	0	0	0	0	0	3	9	0	0	0	0	0	12
1925	0	0	420	396	1,117	255	552	0	0	0	0	0	2,741
1926	0	0	9	411	4,671	552	1,086	0	0	0	0	0	6,730
1927	0	396	494	614	6,184	614	648	0	0	0	0	0	8,949
1928	0	0	1,062	540	746	6,500	1,248	0	0	0	0	0	10,095
1929	0	0	614	614	555	614	448	0	0	0	0	0	2,845
1930	0	0	34	614	555	3,545	325	0	0	0	0	0	5,073
1931	0	0	61	430	184	221	74	0	0	0	0	0	970
1932	0	0	1,786	614	595	390	276	0	0	0	0	0	3,661
1933	0	0	49	614	325	470	319	0	0	0	0	0	1,777
1934	0	0	614	878	555	491	147	0	0	0	0	0	2,685
1935	0	0	126	614	335	614	721	0	0	0	0	0	2,409
1936	0	0	129	614	3,579	614	595	0	0	0	0	0	5,531
1937	0	0	92	402	1,013	6,291	595	0	0	0	0	0	8,393
1938	0	0	872	614	12,362	8,289	595	0	0	0	0	0	22,731
1939	0	0	605	424	555	614	255	0	0	0	0	0	2,452
1940	0	0	34	663	8,820	5,414	1,840	0	0	0	0	0	16,770
1941	0	0	614	792	9,188	6,816	8,525	0	0	0	0	0	25,935
1942	0	0	829	6,779	6,104	1,878	3,646	0	0	0	0	0	19,236
1943	0	0	396	7,519	1,426	3,201	595	0	0	0	0	0	13,137
1944	0	0	163	307	555	691	528	0	0	0	0	0	2,243
1945	0	0	264	614	1,602	614	595	0	0	0	0	0	3,689
1946	0	0	614	614	555	614	595	0	0	0	0	0	2,992
1947	0	0	390	399	555	614	595	0	0	0	0	0	2,553
1948	0	0	138	132	184	614	595	0	0	0	0	0	1,663
1949	0	0	178	193	500	638	595	0	0	0	0	0	2,105
1950	0	0	104	614	786	513	411	0	0	0	0	0	2,427
1951	0	0	3,110	3,155	1,303	3,149	595	0	0	0	0	0	11,313
1952	0	0	804	11,527	4,542	6,905	595	0	0	0	0	0	24,373
1953	0	0	829	853	555	614	534	0	0	0	0	0	3,385
1954	0	0	107	614	761	614	595	0	0	0	0	0	2,691
1955	0	0	614	614	555	611	439	0	0	0	0	0	2,833
1956	0	0	11,877	7,608	5,484	614	595	0	0	0	0	0	26,178
1957	0	0	104	331	555	614	454	0	0	0	0	0	2,059
1958	0	0	359	911	9,047	7,979	11,775	0	0	0	0	0	30,072
1959	0	0	120	614	555	531	285	0	0	0	0	0	2,105
1960	0	0	46	347	1,117	221	172	0	0	0	0	0	1,903
1961	0	0	107	252	193	586	132	0	0	0	0	0	1,271
1962	0	0	89	107	2,010	614	408	0	0	0	0	0	3,228
1963	123	0	313	3,578	7,442	614	4,198	0	0	0	0	0	16,268
1964	0	0	282	905	350	396	307	0	0	0	0	0	2,240
1965	0	0	3,683	9,673	555	559	3,250	0	0	0	0	0	17,720
1966	0	0	614	614	555	592	114	0	0	0	0	0	2,489
1967	0	0	614	5,064	555	4,959	4,916	0	0	0	0	0	16,109
1968	0	0	258	826	555	614	537	0	0	0	0	0	2,790
1969	0	0	614	9,333	10,551	3,695	595	0	0	0	0	0	24,787
1970	0	0	335	2,197	555	1,433	427	0	0	0	0	0	4,947
1971	0	0	1,172	614	390	614	595	0	0	0	0	0	3,385
1972	0	0	617	390	562	160	114	0	0	0	0	0	1,841
1973	0	43	614	2,053	11,109	5,275	595	0	0	0	0	0	19,690
1974	0	0	2,185	1,766	555	4,324	4,373	0	0	0	0	0	13,203
1975	0	0	307	614	2,851	8,286	595	0	0	0	0	0	12,653
1976	0	0	107	98	110	270	110	0	0	0	0	0	697
1977	0	0	37	169	71	150	77	0	0	0	0	0	503
1978	0	0	387	3,578	1,234	5,082	595	0	0	0	0	0	10,876
1979	0	0	80	740	1,473	614	595	0	0	0	0	0	3,502
1980	0	0	614	3,566	12,125	1,452	595	0	0	0	0	0	18,352
1981	0	0	110	2,185	555	614	528	0	0	0	0	0	3,993
1982	0	0	902	7,660	4,628	3,419	10,720	0	0	0	0	0	27,329
1983	0	52	2,170	9,811	11,751	18,057	4,168	2,774	0	0	0	0	48,783
1984	0	101	3,533	614	555	614	595	0	0	0	0	0	6,013
1985	0	0	580	285	1,200	614	209	0	0	0	0	0	2,888
1986	0	0	153	147	13,847	7,820	595	0	0	0	0	0	22,563
1987	0	0	86	147	463	408	138	0	0	0	0	0	1,243
1988	0	0	304	583	132	95	120	0	0	0	0	0	1,234
1989	0	0	132	144	129	485	129	0	0	0	0	0	1,019
1990	0	0	107	347	408	233	117	0	0	0	0	0	1,212
1991	0	0	71	64	61	1,267	399	0	0	0	0	0	1,863
1992	0	0	160	233	2,345	614	500	0	0	0	0	0	3,851
1993	0	0	568	2,820	6,251	1,943	595	0	0	0	0	0	12,177
1994	0	0	273	212	694	368	267	0	0	0	0	0	1,814
1995	0	0	417	14,528	555	12,954	598	0	0	0	0	0	29,053
1996	0	0	614	4,944	14,372	7,807	595	0	0	0	0	0	28,332
1997	0	353	7,681	14,593	552	614	331	0	0	0	0	0	24,125
1998	0	0	614	9,151	16,968	3,127	3,284	0	0	0	0	0	33,144
1999	0	0	288	1,436	2,668	614	1,877	0	0	0	0	0	6,883
2000	0	0	46	1,792	3,502	4,192	562	6	0	0	0	0	10,100
2001	0	0	37	390	611	850	473	0	0	0	0	0	2,360
2002	0	0	911	614	552	614	353	0	0	0	0	0	3,044
Avg (21-02)	1	12	807	2,155	2,875	2,278	1,149	34	0	0	0	0	9,311

APPENDIX O2

Table 2.6-5

Flow Passing Alameda Creek Diversion Dam (Acre-feet) WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	430	2,213	393	0	0	0	0	0	0	0	3,035
1922	0	0	470	0	9,857	4,591	0	0	0	0	0	0	14,918
1923	0	0	1,967	227	110	0	0	0	0	0	0	0	2,305
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	562	0	0	0	0	0	0	0	562
1926	0	0	0	0	4,115	0	491	0	0	0	0	0	4,606
1927	0	396	0	0	6,184	0	287	0	0	0	0	0	6,867
1928	0	0	476	0	190	6,500	1,189	0	0	0	0	0	8,355
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	2,931	0	0	0	0	0	0	2,931
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	1,172	0	40	0	0	0	0	0	0	0	1,212
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	264	0	0	0	0	0	0	0	0	264
1935	0	0	0	0	0	0	126	0	0	0	0	0	126
1936	0	0	0	0	3,182	0	0	0	0	0	0	0	3,182
1937	0	0	0	0	457	6,291	0	0	0	0	0	0	6,749
1938	0	0	258	0	12,362	8,289	321	0	0	0	0	0	21,229
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	49	8,820	5,414	1,840	0	0	0	0	0	16,122
1941	0	0	0	178	9,188	6,816	8,525	0	0	0	0	0	24,708
1942	0	0	215	6,779	6,104	1,264	3,646	0	0	0	0	0	18,008
1943	0	0	0	7,519	680	3,201	0	0	0	0	0	0	11,400
1944	0	0	0	0	0	77	0	0	0	0	0	0	77
1945	0	0	0	0	1,046	0	0	0	0	0	0	0	1,046
1946	0	0	0	0	0	0	0	0	0	0	0	0	0
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	25	0	0	0	0	0	0	25
1950	0	0	0	0	230	0	0	0	0	0	0	0	230
1951	0	0	2,537	3,155	748	3,149	0	0	0	0	0	0	9,589
1952	0	0	190	11,527	4,542	6,905	0	0	0	0	0	0	23,164
1953	0	0	215	884	0	0	0	0	0	0	0	0	1,098
1954	0	0	0	0	206	0	0	0	0	0	0	0	206
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	11,877	7,608	5,484	0	0	0	0	0	0	0	24,969
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	298	9,047	7,979	11,775	0	0	0	0	0	29,099
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	562	0	0	0	0	0	0	0	562
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	1,455	0	0	0	0	0	0	0	1,455
1963	123	0	0	2,965	7,442	0	4,198	0	0	0	0	0	14,728
1964	0	0	0	292	0	0	0	0	0	0	0	0	292
1965	0	0	3,069	9,673	0	0	3,250	0	0	0	0	0	15,992
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	4,450	0	4,959	4,916	0	0	0	0	0	14,326
1968	0	0	0	212	0	0	0	0	0	0	0	0	212
1969	0	0	0	9,333	10,551	3,695	0	0	0	0	0	0	23,578
1970	0	0	0	1,584	0	819	0	0	0	0	0	0	2,403
1971	0	0	559	0	0	0	0	0	0	0	0	0	559
1972	0	0	3	0	6	0	0	0	0	0	0	0	9
1973	0	43	0	1,439	11,109	5,275	0	0	0	0	0	0	17,867
1974	0	0	1,571	4,474	0	2,482	4,373	0	0	0	0	0	12,901
1975	0	0	0	0	2,296	8,286	486	0	0	0	0	0	11,068
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	2,965	678	5,082	0	0	0	0	0	0	8,725
1979	0	0	0	126	918	0	0	0	0	0	0	0	1,043
1980	0	0	0	2,952	12,125	1,071	0	0	0	0	0	0	16,149
1981	0	0	0	1,571	0	0	0	0	0	0	0	0	1,571
1982	0	0	288	7,660	4,628	3,419	10,720	0	0	0	0	0	26,715
1983	0	52	1,556	9,811	11,751	18,057	4,168	2,774	0	0	0	0	48,169
1984	0	101	6,939	0	0	0	0	0	0	0	0	0	7,040
1985	0	0	0	0	687	0	0	0	0	0	0	0	687
1986	0	0	0	0	13,847	7,820	0	0	0	0	0	0	21,666
1987	0	0	0	0	212	0	0	0	0	0	0	0	212
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	654	0	0	0	0	0	0	654
1992	0	0	0	0	1,789	0	0	0	0	0	0	0	1,789
1993	0	0	0	2,207	6,251	2,694	0	0	0	0	0	0	11,152
1994	0	0	0	0	138	0	0	0	0	0	0	0	138
1995	0	0	0	14,528	0	12,954	3	0	0	0	0	0	27,485
1996	0	0	0	4,330	14,372	7,807	0	0	0	0	0	0	26,509
1997	0	353	7,681	14,593	0	0	0	0	0	0	0	0	22,627
1998	0	0	0	9,151	16,968	3,127	3,284	0	0	0	0	0	32,530
1999	0	0	0	822	2,266	0	1,877	0	0	0	0	0	4,965
2000	0	0	0	1,178	2,946	4,192	0	6	0	0	0	0	8,323
2001	0	0	0	0	55	236	0	0	0	0	0	0	292
2002	0	0	298	0	0	0	0	0	0	0	0	0	298
Avg (21-02)	1	12	509	1,793	2,520	1,903	798	34	0	0	0	0	7,570

APPENDIX O2

Table 2.6-6

Difference in Flow Passing Alameda Creek Diversion Dam (Acre-feet) Modified WSIP minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	614	614	163	614	301	0	0	0	0	0	2,305
1922	0	0	614	614	0	0	595	0	0	0	0	0	1,823
1923	0	0	614	614	555	466	595	0	0	0	0	0	2,845
1924	0	0	0	0	0	3	9	0	0	0	0	0	12
1925	0	0	420	396	555	255	552	0	0	0	0	0	2,179
1926	0	0	9	411	555	552	595	0	0	0	0	0	2,124
1927	0	0	494	614	0	614	361	0	0	0	0	0	2,082
1928	0	0	586	540	555	0	58	0	0	0	0	0	1,740
1929	0	0	614	614	555	614	448	0	0	0	0	0	2,845
1930	0	0	34	614	555	614	325	0	0	0	0	0	2,142
1931	0	0	61	430	184	221	74	0	0	0	0	0	970
1932	0	0	614	614	555	390	276	0	0	0	0	0	2,449
1933	0	0	49	614	325	470	319	0	0	0	0	0	1,777
1934	0	0	614	614	555	491	147	0	0	0	0	0	2,421
1935	0	0	126	614	335	614	595	0	0	0	0	0	2,283
1936	0	0	129	614	397	614	595	0	0	0	0	0	2,348
1937	0	0	92	402	555	0	595	0	0	0	0	0	1,645
1938	0	0	614	614	0	0	275	0	0	0	0	0	1,502
1939	0	0	605	424	555	614	255	0	0	0	0	0	2,452
1940	0	0	34	614	0	0	0	0	0	0	0	0	648
1941	0	0	614	614	0	0	0	0	0	0	0	0	1,228
1942	0	0	614	0	0	614	0	0	0	0	0	0	1,228
1943	0	0	396	0	746	0	595	0	0	0	0	0	1,738
1944	0	0	163	307	555	614	528	0	0	0	0	0	2,167
1945	0	0	264	614	555	614	595	0	0	0	0	0	2,642
1946	0	0	614	614	555	614	595	0	0	0	0	0	2,992
1947	0	0	390	399	555	614	595	0	0	0	0	0	2,553
1948	0	0	138	132	184	614	595	0	0	0	0	0	1,663
1949	0	0	178	193	500	614	595	0	0	0	0	0	2,081
1950	0	0	104	614	555	513	411	0	0	0	0	0	2,197
1951	0	0	573	0	555	0	595	0	0	0	0	0	1,724
1952	0	0	614	0	0	0	595	0	0	0	0	0	1,209
1953	0	0	614	-30	555	614	534	0	0	0	0	0	2,287
1954	0	0	107	614	555	614	595	0	0	0	0	0	2,486
1955	0	0	614	614	555	611	439	0	0	0	0	0	2,833
1956	0	0	0	0	0	614	595	0	0	0	0	0	1,209
1957	0	0	104	331	555	614	454	0	0	0	0	0	2,059
1958	0	0	359	614	0	0	0	0	0	0	0	0	973
1959	0	0	120	614	555	531	285	0	0	0	0	0	2,105
1960	0	0	46	347	555	221	172	0	0	0	0	0	1,341
1961	0	0	107	252	193	586	132	0	0	0	0	0	1,271
1962	0	0	89	107	555	614	408	0	0	0	0	0	1,774
1963	0	0	313	614	0	614	0	0	0	0	0	0	1,541
1964	0	0	282	614	350	396	307	0	0	0	0	0	1,949
1965	0	0	614	0	555	559	0	0	0	0	0	0	1,728
1966	0	0	614	614	555	592	114	0	0	0	0	0	2,489
1967	0	0	614	614	555	0	0	0	0	0	0	0	1,783
1968	0	0	258	614	555	614	537	0	0	0	0	0	2,578
1969	0	0	614	0	0	0	595	0	0	0	0	0	1,209
1970	0	0	335	614	555	614	427	0	0	0	0	0	2,544
1971	0	0	614	614	390	614	595	0	0	0	0	0	2,826
1972	0	0	614	390	555	160	114	0	0	0	0	0	1,832
1973	0	0	614	614	0	0	595	0	0	0	0	0	1,823
1974	0	0	614	-2,709	555	1,842	0	0	0	0	0	0	302
1975	0	0	307	614	555	0	109	0	0	0	0	0	1,585
1976	0	0	107	98	110	270	110	0	0	0	0	0	697
1977	0	0	37	169	71	150	77	0	0	0	0	0	503
1978	0	0	387	614	555	0	595	0	0	0	0	0	2,151
1979	0	0	80	614	555	614	595	0	0	0	0	0	2,458
1980	0	0	614	614	0	381	595	0	0	0	0	0	2,203
1981	0	0	110	614	555	614	528	0	0	0	0	0	2,421
1982	0	0	614	0	0	0	0	0	0	0	0	0	614
1983	0	0	614	0	0	0	0	0	0	0	0	0	614
1984	0	0	-3,406	614	555	614	595	0	0	0	0	0	-1,027
1985	0	0	580	285	513	614	209	0	0	0	0	0	2,200
1986	0	0	9	147	0	0	595	0	0	0	0	0	752
1987	0	0	86	147	252	408	138	0	0	0	0	0	1,031
1988	0	0	304	583	132	95	120	0	0	0	0	0	1,234
1989	0	0	132	144	129	485	129	0	0	0	0	0	1,019
1990	0	0	107	347	408	233	117	0	0	0	0	0	1,212
1991	0	0	71	64	61	614	399	0	0	0	0	0	1,209
1992	0	0	160	233	555	614	500	0	0	0	0	0	2,062
1993	0	0	568	614	0	-752	595	0	0	0	0	0	1,025
1994	0	0	273	212	555	368	267	0	0	0	0	0	1,676
1995	0	0	417	0	555	0	595	0	0	0	0	0	1,568
1996	0	0	614	614	0	0	595	0	0	0	0	0	1,823
1997	0	0	0	0	552	614	331	0	0	0	0	0	1,498
1998	0	0	614	0	0	0	0	0	0	0	0	0	614
1999	0	0	288	614	402	614	0	0	0	0	0	0	1,918
2000	0	0	46	614	555	0	562	0	0	0	0	0	1,777
2001	0	0	37	390	555	614	473	0	0	0	0	0	2,068
2002	0	0	614	614	552	614	353	0	0	0	0	0	2,747
Avg (21-02)	0	0	296	362	356	375	351	0	0	0	0	0	1,739

APPENDIX O2

Table 2.6-7

Difference in Flow Passing Alameda Creek Diversion Dam (Acre-feet) Modified WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	614	-1,946	-1,783	614	301	0	0	0	0	0	-2,200
1922	0	0	614	614	0	0	595	0	0	0	0	0	1,823
1923	0	0	-2,242	-1,074	-448	466	595	0	0	0	0	0	-2,702
1924	0	0	0	0	0	3	9	0	0	0	0	0	12
1925	0	0	420	396	555	255	552	0	0	0	0	0	2,179
1926	0	0	9	411	-2,655	552	595	0	0	0	0	0	-1,086
1927	0	0	494	614	0	614	595	0	0	0	0	0	2,317
1928	0	0	586	540	555	0	-156	0	0	0	0	0	1,526
1929	0	0	614	614	555	614	448	0	0	0	0	0	2,845
1930	0	0	34	614	555	614	325	0	0	0	0	0	2,142
1931	0	0	61	430	184	221	74	0	0	0	0	0	970
1932	0	0	614	614	555	390	276	0	0	0	0	0	2,449
1933	0	0	49	614	325	470	319	0	0	0	0	0	1,777
1934	0	0	614	614	555	491	147	0	0	0	0	0	2,421
1935	0	0	126	614	335	614	595	0	0	0	0	0	2,283
1936	0	0	129	614	-2,473	614	595	0	0	0	0	0	-521
1937	0	0	92	402	-3,409	0	595	0	0	0	0	0	-2,319
1938	0	0	614	614	0	0	88	0	0	0	0	0	1,316
1939	0	0	605	424	555	614	255	0	0	0	0	0	2,452
1940	0	0	34	614	0	0	-156	0	0	0	0	0	492
1941	0	0	614	-584	0	0	0	0	0	0	0	0	30
1942	0	0	614	0	0	614	0	0	0	0	0	0	1,228
1943	0	0	396	0	-1,366	0	595	0	0	0	0	0	-375
1944	0	0	163	307	555	614	528	0	0	0	0	0	2,167
1945	0	0	264	614	-3,916	614	595	0	0	0	0	0	-1,829
1946	0	0	-4,037	-908	555	614	595	0	0	0	0	0	-3,181
1947	0	0	390	399	555	614	595	0	0	0	0	0	2,553
1948	0	0	138	132	184	614	595	0	0	0	0	0	1,663
1949	0	0	178	193	500	-4,910	595	0	0	0	0	0	-3,443
1950	0	0	104	614	555	513	411	0	0	0	0	0	2,197
1951	0	0	-3,709	209	-520	301	595	0	0	0	0	0	-3,124
1952	0	0	614	0	0	0	595	0	0	0	0	0	1,209
1953	0	0	614	-3,986	555	614	534	0	0	0	0	0	-1,669
1954	0	0	107	614	555	614	595	0	0	0	0	0	2,486
1955	0	0	614	614	555	611	439	0	0	0	0	0	2,833
1956	0	0	0	0	0	614	595	0	0	0	0	0	1,209
1957	0	0	104	331	555	614	454	0	0	0	0	0	2,059
1958	0	0	359	614	0	0	0	0	0	0	0	0	973
1959	0	0	120	614	555	531	285	0	0	0	0	0	2,105
1960	0	0	46	347	555	221	172	0	0	0	0	0	1,341
1961	0	0	107	252	193	586	132	0	0	0	0	0	1,271
1962	0	0	89	107	-2,719	614	408	0	0	0	0	0	-1,501
1963	0	0	313	-1,605	0	614	0	0	0	0	0	0	-678
1964	0	0	282	614	350	396	307	0	0	0	0	0	1,949
1965	0	0	-550	0	555	559	3,250	0	0	0	0	0	3,814
1966	0	0	614	614	555	592	114	0	0	0	0	0	2,489
1967	0	0	614	-1,062	-1,317	0	0	0	0	0	0	0	-1,765
1968	0	0	258	614	555	614	537	0	0	0	0	0	2,578
1969	0	0	614	0	0	0	595	0	0	0	0	0	1,209
1970	0	0	335	-3,634	555	-1,009	427	0	0	0	0	0	-3,326
1971	0	0	-646	614	390	614	595	0	0	0	0	0	1,567
1972	0	0	614	390	555	160	114	0	0	0	0	0	1,832
1973	0	0	614	-4,312	0	0	595	0	0	0	0	0	-3,103
1974	0	0	-178	-2,709	555	1,444	0	0	0	0	0	0	-887
1975	0	0	307	614	-4,640	0	-72	0	0	0	0	0	-3,791
1976	0	0	107	98	110	270	110	0	0	0	0	0	697
1977	0	0	37	169	71	150	77	0	0	0	0	0	503
1978	0	0	387	-3,538	-2,848	0	595	0	0	0	0	0	-5,404
1979	0	0	80	614	555	614	595	0	0	0	0	0	2,458
1980	0	0	614	-2,747	0	-101	595	0	0	0	0	0	-1,639
1981	0	0	110	614	555	614	528	0	0	0	0	0	2,421
1982	0	0	614	0	0	0	0	0	0	0	0	0	614
1983	0	0	614	0	0	0	0	687	0	0	0	0	1,301
1984	0	0	-3,406	614	555	614	595	0	0	0	0	0	-1,027
1985	0	0	580	285	513	614	209	0	0	0	0	0	2,200
1986	0	0	9	147	0	0	595	0	0	0	0	0	752
1987	0	0	86	147	252	408	138	0	0	0	0	0	1,031
1988	0	0	304	583	132	95	120	0	0	0	0	0	1,234
1989	0	0	132	144	129	485	129	0	0	0	0	0	1,019
1990	0	0	107	347	408	233	117	0	0	0	0	0	1,212
1991	0	0	71	64	61	614	399	0	0	0	0	0	1,209
1992	0	0	160	233	-2,799	614	500	0	0	0	0	0	-1,292
1993	0	0	568	-4,385	0	-101	595	0	0	0	0	0	-3,324
1994	0	0	273	212	555	368	267	0	0	0	0	0	1,676
1995	0	0	417	0	555	0	595	0	0	0	0	0	1,568
1996	0	0	614	-4,625	0	0	595	0	0	0	0	0	-3,416
1997	0	0	0	0	552	614	331	0	0	0	0	0	1,498
1998	0	0	614	0	0	0	0	0	0	0	0	0	614
1999	0	0	288	614	-2,821	614	1,392	0	0	0	0	0	87
2000	0	0	46	614	-4,011	0	562	0	0	0	0	0	-2,790
2001	0	0	37	390	555	614	473	0	0	0	0	0	2,068
2002	0	0	614	614	552	614	353	0	0	0	0	0	2,747
Avg (21-02)	0	0	113	-144	-200	289	401	8	0	0	0	0	467

APPENDIX O2

Table 2.6-8

Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	28	1,859	6,509	8,086	5,866	3,258	173	0	0	0	0	25,779
Above Normal	7	23	1,013	2,755	4,074	3,398	1,318	0	0	0	0	0	12,589
Normal	0	6	655	735	1,314	1,017	618	0	0	0	0	0	4,345
Below Normal	0	0	332	547	614	790	387	0	0	0	0	0	2,669
Dry	0	0	191	293	355	344	201	0	0	0	0	0	1,385
All Years	1	12	807	2,155	2,875	2,278	1,149	34	0	0	0	0	9,311

Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	28	1,379	6,269	7,982	5,727	2,960	173	0	0	0	0	24,518
Above Normal	7	23	591	2,457	3,735	3,129	959	0	0	0	0	0	10,903
Normal	0	6	585	260	796	459	113	0	0	0	0	0	2,219
Below Normal	0	0	18	45	102	229	0	0	0	0	0	0	394
Dry	0	0	0	0	57	0	0	0	0	0	0	0	58
All Years	1	12	509	1,793	2,520	1,903	798	34	0	0	0	0	7,570

Difference in Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Modified WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	471	239	104	139	298	0	0	0	0	0	1,252
Above Normal	0	0	422	298	339	269	359	0	0	0	0	0	1,686
Normal	0	0	70	475	518	558	506	0	0	0	0	0	2,125
Below Normal	0	0	315	501	512	560	387	0	0	0	0	0	2,275
Dry	0	0	191	293	298	344	201	0	0	0	0	0	1,328
All Years	0	0	296	362	356	375	351	0	0	0	0	0	1,739

Table 2.6-9

Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	28	1,859	6,509	8,086	5,866	3,258	173	0	0	0	0	25,779
Above Normal	7	23	1,013	2,755	4,074	3,398	1,318	0	0	0	0	0	12,589
Normal	0	6	655	735	1,314	1,017	618	0	0	0	0	0	4,345
Below Normal	0	0	332	547	614	790	387	0	0	0	0	0	2,669
Dry	0	0	191	293	355	344	201	0	0	0	0	0	1,385
All Years	1	12	807	2,155	2,875	2,278	1,149	34	0	0	0	0	9,311

Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	28	1,379	6,967	8,099	5,757	2,972	130	0	0	0	0	25,331
Above Normal	7	23	1,126	3,672	5,294	3,096	692	0	0	0	0	0	13,911
Normal	0	6	954	868	1,870	906	126	0	0	0	0	0	4,731
Below Normal	0	0	18	45	102	229	0	0	0	0	0	0	394
Dry	0	0	0	0	57	0	0	0	0	0	0	0	58
All Years	1	12	692	2,299	3,075	1,989	748	26	0	0	0	0	8,843

Difference in Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Modified WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	471	-458	-13	109	287	43	0	0	0	0	438
Above Normal	0	0	-112	-917	-1,220	301	626	0	0	0	0	0	-1,322
Normal	0	0	-300	-133	-556	111	492	0	0	0	0	0	-386
Below Normal	0	0	315	501	512	560	387	0	0	0	0	0	2,275
Dry	0	0	191	293	298	344	201	0	0	0	0	0	1,328
All Years	0	0	113	-144	-200	289	401	8	0	0	0	0	467

Comparing the alternative and WSIP settings, differences in releases from Calaveras Dam to the stream and differences in spills and bypass flows at the ACDD result in differences in flow below the Alameda Creek and Calaveras Creek confluence between the settings. Table 2.6-10 illustrates the flow below the confluence for the alternative and WSIP settings. The flow would be generally the same, with slightly additional flow occurring during December and April due to the bypass flows. Fishery releases for the 1997 MOU are assumed in both of the settings. Table 2.6-11 provides the same form of information for the alternative and base settings. The notable differences between the alternative and base settings (comparable to the differences between the WSIP and base settings) are the addition of required stream flows for the 1997 MOU and the reduction of wetter-year, wet-season flows due to the restoration of Calaveras Reservoir storage.

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Table 2.6-10

Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	430	326	3,145	12,372	23,692	16,559	8,836	605	417	429	429	417	67,658
Above Normal	437	326	1,299	3,896	7,820	6,484	2,075	430	418	430	429	417	24,461
Normal	429	304	974	1,171	1,985	1,413	782	430	417	429	430	417	9,182
Below Normal	429	297	488	882	1,215	1,118	510	430	417	430	430	417	7,063
Dry	429	298	368	813	1,168	816	460	430	417	430	430	417	6,475
All Years	431	310	1,246	3,792	7,111	5,242	2,502	464	417	430	429	417	22,792

Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	430	326	2,721	12,263	23,595	16,575	8,647	605	417	429	429	417	66,854
Above Normal	437	326	1,007	3,801	7,708	6,379	1,876	430	418	430	429	417	23,658
Normal	429	304	1,006	1,077	1,907	1,293	536	430	417	429	430	417	8,675
Below Normal	429	297	324	859	1,214	1,046	417	430	417	430	430	417	6,709
Dry	429	298	307	813	1,168	816	418	430	417	430	430	417	6,373
All Years	431	310	1,063	3,728	7,053	5,185	2,349	464	417	430	429	417	22,276

Difference in Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Modified WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	424	109	97	-16	190	0	0	0	0	0	805
Above Normal	0	0	293	95	112	105	198	0	0	0	0	0	803
Normal	0	0	-32	94	79	120	246	0	0	0	0	0	507
Below Normal	0	0	164	23	1	72	93	0	0	0	0	0	354
Dry	0	0	61	0	0	0	42	0	0	0	0	0	103
All Years	0	0	183	64	58	57	154	0	0	0	0	0	516

Table 2.6-11

Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	430	326	3,145	12,372	23,692	16,559	8,836	605	417	429	429	417	67,658
Above Normal	437	326	1,299	3,896	7,820	6,484	2,075	430	418	430	429	417	24,461
Normal	429	304	974	1,171	1,985	1,413	782	430	417	429	430	417	9,182
Below Normal	429	297	488	882	1,215	1,118	510	430	417	430	430	417	7,063
Dry	429	298	368	813	1,168	816	460	430	417	430	430	417	6,475
All Years	431	310	1,246	3,792	7,111	5,242	2,502	464	417	430	429	417	22,792

Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	1	80	3,465	17,243	25,909	16,711	8,598	307	30	12	4	2	72,361
Above Normal	12	68	1,554	6,954	11,987	6,754	1,462	103	22	6	2	1	28,926
Normal	1	29	1,397	1,501	3,154	1,586	284	60	9	2	0	0	8,022
Below Normal	1	22	78	186	338	450	72	41	7	0	0	0	1,195
Dry	1	6	26	35	124	69	43	23	1	0	0	0	328
All Years	3	41	1,292	5,145	8,250	5,077	2,060	106	14	4	1	1	21,993

Difference in Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Modified WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	-337	-4,871	-2,216	-152	239	298	386	417	425	415	-4,721
Above Normal	425	258	-254	-3,058	-4,168	-270	612	327	396	424	428	417	-4,465
Normal	429	275	-423	-330	-1,168	-173	498	370	408	428	430	417	1,160
Below Normal	428	275	410	695	877	668	438	389	411	430	430	417	5,869
Dry	429	292	342	778	1,044	747	417	407	416	430	430	417	6,147
All Years	428	269	-49	-1,353	-1,139	165	443	358	403	426	428	417	796

A flow recapture facility in Alameda Creek below Calaveras Reservoir is incorporated in the alternative and WSIP settings. This facility is assumed to recapture flows explicitly released for the 1997 MOU. The effect of the recapture would be a reduction in the flow below the confluence of Alameda and Calaveras Creeks, but only to the extent that releases were explicitly made for the 1997 MOU. Flows below this diversion have been estimated and noted as the flow above the Alameda Creek and San Antonio Creek confluence. Table 2.6-12 illustrates the flow at this location for the alternative and WSIP settings. The flows identified at this location are indicative of flow occurring below the confluence of Alameda and Calaveras Creeks (described above) with the addition of estimated stream accretions between the Alameda and Calaveras Creek confluence and the Alameda and San Antonio Creek confluence, less the water assumed to be recaptured (diverted) by the SFPUC from the creek. The flow changes at this location for the comparison of the WSIP and alternative settings are considered insubstantial and may not occur. The differences during the December through April period of wetter years indicate that too much of the spills/releases past the diversion dam were counted as 1997 MOU releases and were subsequently recaptured. The modeled accounting tends to overstate the amount of water allowed to be recaptured. A more precise accounting method would tend to minimize the differences between the alternative and WSIP settings. Table 2.6-13 provides the same form of information for the alternative and base settings.

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Table 2.6-12

Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,088	13,218	24,845	17,207	9,016	556	76	33	15	9	68,224
Above Normal	19	150	1,201	4,082	8,259	6,568	1,897	217	54	20	9	6	22,482
Normal	7	64	880	869	1,730	1,192	432	128	28	9	4	3	5,344
Below Normal	7	56	183	404	678	717	154	91	20	5	3	2	2,321
Dry	6	19	70	98	231	145	91	48	9	3	2	2	724
All Years	9	89	1,075	3,698	7,083	5,129	2,286	207	38	14	7	4	19,638

Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,113	13,610	25,199	17,720	9,297	556	76	33	15	9	69,788
Above Normal	19	150	1,203	4,350	8,422	6,871	2,127	217	54	20	9	6	23,450
Normal	7	64	1,131	909	1,740	1,219	466	128	28	9	4	3	5,706
Below Normal	7	56	183	404	678	717	154	91	20	5	3	2	2,321
Dry	6	19	70	98	231	145	91	48	9	3	2	2	724
All Years	9	89	1,129	3,838	7,188	5,297	2,396	207	38	14	7	4	20,215

Difference in Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Modified WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-24	-392	-354	-513	-281	0	0	0	0	0	-1,564
Above Normal	0	0	-2	-268	-163	-303	-230	0	0	0	0	0	-967
Normal	0	0	-251	-40	-10	-26	-34	0	0	0	0	0	-361
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-54	-140	-105	-168	-109	0	0	0	0	0	-576

Table 2.6-13

Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,088	13,218	24,845	17,207	9,016	556	76	33	15	9	68,224
Above Normal	19	150	1,201	4,082	8,259	6,568	1,897	217	54	20	9	6	22,482
Normal	7	64	880	869	1,730	1,192	432	128	28	9	4	3	5,344
Below Normal	7	56	183	404	678	717	154	91	20	5	3	2	2,321
Dry	6	19	70	98	231	145	91	48	9	3	2	2	724
All Years	9	89	1,075	3,698	7,083	5,129	2,286	207	38	14	7	4	19,638

Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,973	18,714	27,673	17,977	9,358	513	76	33	15	9	78,502
Above Normal	19	150	1,922	7,772	13,068	7,467	1,861	217	54	20	9	6	32,566
Normal	7	64	1,716	1,881	3,712	2,007	479	128	28	9	4	3	10,037
Below Normal	7	56	183	404	678	717	154	91	20	5	3	2	2,321
Dry	6	19	70	98	231	145	91	48	9	3	2	2	724
All Years	9	89	1,560	5,733	9,019	5,624	2,355	198	38	14	7	4	24,650

Difference in Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Modified WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-885	-5,496	-2,828	-771	-341	43	0	0	0	0	-10,278
Above Normal	0	0	-722	-3,690	-4,809	-899	35	0	0	0	0	0	-10,084
Normal	0	0	-837	-1,012	-1,982	-815	-47	0	0	0	0	0	-4,693
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-485	-2,035	-1,936	-496	-68	8	0	0	0	0	-5,012

Compared to the WSIP setting, the alternative's San Antonio Reservoir operation would draw less from storage on an annual basis, particularly during cyclic maintenance. Figure 2.6-3 illustrates a chronological trace of the simulation of San Antonio Reservoir storage and stream releases from San Antonio Dam. Shown in Figure 2.6-3 are the results for the WSIP, alternative, and base settings. The difference in San Antonio Reservoir storage between the alternative and WSIP settings is mostly caused by the lesser demand of the alternative. Considering that Calaveras Reservoir storage is essentially the same between the settings, the difference in San Antonio Reservoir storage is indicative of the operational strategy to affect storage in San Antonio Reservoir more than storage in the other SFPUC Bay Area reservoirs. San Antonio Reservoir would retain more storage in the alternative setting compared to the WSIP setting.

The difference in storage between the alternative and WSIP settings and the base setting is due to the restoration of the operational capacity of Calaveras Reservoir. In the base setting, the limited operating storage capacity at Calaveras Reservoir leads to a different operation at San Antonio Reservoir, one that retains relatively more stored water for system demands when the draw from Calaveras Reservoir is constrained due to limited storage. There is also a notable difference in storage operation between the alternative and WSIP settings and the base setting due to assumed maintenance. Assumed systematic maintenance of Hetch Hetchy conveyance facilities constrains diversions to the Bay Area from Hetch Hetchy every year, and particularly during every fifth year, in the WSIP and alternative settings.

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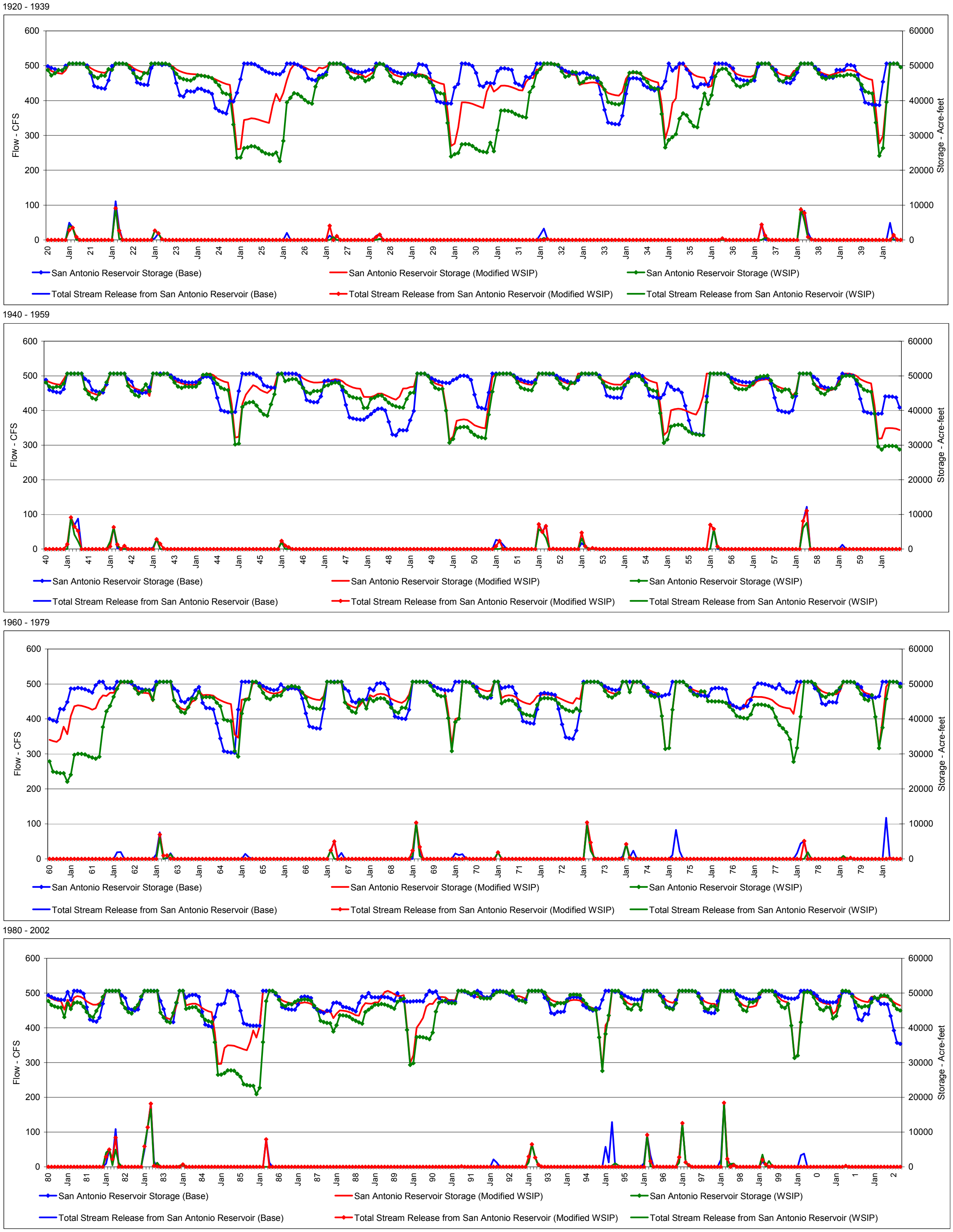
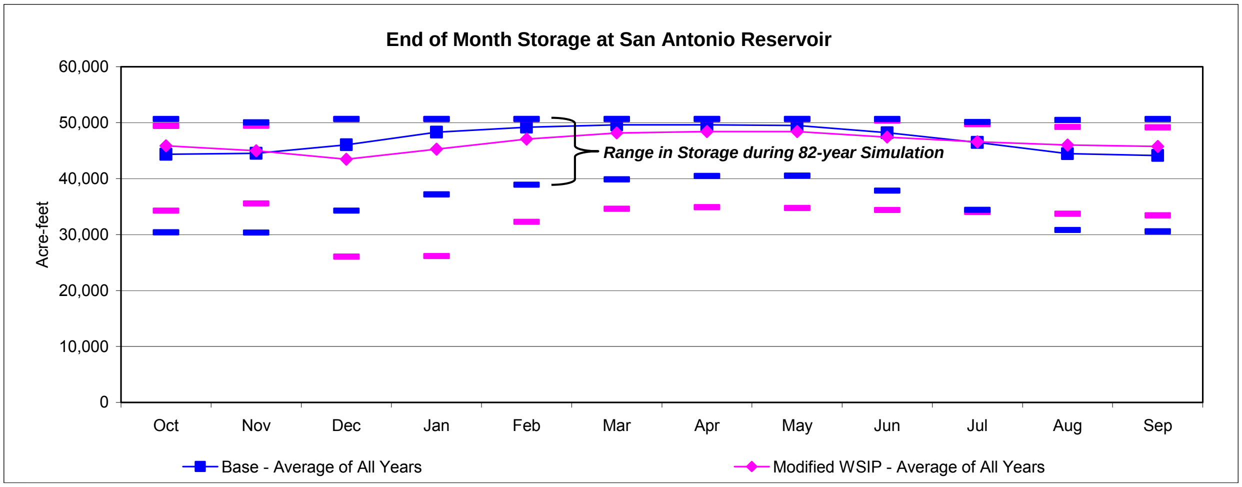
Figure 2.6-3
San Antonio Reservoir Storage and Stream Release



The reduction in diversions from Hetch Hetchy during these periods is accommodated in the system by drawing additional water from the Bay Area reservoirs. The proportionate share of this operation is evident in the tracing of San Antonio Reservoir storage for the alternative and WSIP settings. Figure 2.6-4 illustrates the average monthly storage in San Antonio Reservoir for the 82-year simulation, and the range in storage for each month for the alternative and base settings. Compared to the base setting, the alternative would draw less storage from San Antonio Reservoir during many years, typically retaining a fuller reservoir, but would draw more storage during the every-fifth-year maintenance cycle.

Figure 2.6-4



There is very little anticipated change in stream releases below San Antonio Reservoir between the alternative and WSIP settings. Table 2.6-14 illustrates the modeled releases to San Antonio Creek from San Antonio Reservoir for the two settings and the differences for the average release during a year type. With a fuller reservoir operation at times, as seen in Figure 2.6-3, it is expected that there would be a decrease in the ability to regulate reservoir inflow and avoid stream releases. Given the sometimes rigid constraints within the modeling assumptions, the model will overestimate the frequency and magnitude of stream releases from San Antonio Reservoir under any of the investigated settings. The flexibility that occurs in actual operations would likely avoid most of the releases represented by the model. The modeled stream releases from San Antonio Reservoir and the difference between releases for the alternative and base settings are shown in Table 2.6-15. The differences between the two settings reflect a general decrease in modeled releases in the alternative setting. This modeled circumstance reflects the different resulting storage operation between the two settings, as seen in Figure 2.6-3. In most instances, the alternative setting storage at San Antonio Reservoir during a period would be equal to or lower than that projected for the base setting during the same period. This circumstance could lead to an occasionally greater modeled release for the base setting, which is reflected in the results. As described above, the model will overestimate the frequency and magnitude of releases from San Antonio Reservoir, and the actual releases from the reservoir in any setting and the difference between settings are expected to be minor.

Flow below the confluence of Alameda and San Antonio Creeks is influenced by releases from San Antonio Creek and flow arriving at the location from Alameda Creek, which includes upstream impairment by SFPUC operations and facilities. Table 2.6-16 illustrates the flow below the confluence for the alternative and WSIP settings, and the differences in flow between the two. The differences in flow between the alternative and WSIP settings at this location are the net sum of the differences identified for flow reaching the location from Alameda Creek and from San Antonio Creek. The difference in flow from upstream in Alameda Creek was previously identified as insubstantial. Along with the conclusion that flow differences in San Antonio Creek would not be substantial, modeled differences below the confluence are also considered insubstantial.

Table 2.6-14

Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	106	1,534	3,265	2,891	960	66	0	0	0	0	8,823
Above Normal	0	0	0	487	1,593	748	193	22	0	0	0	0	3,043
Normal	0	0	0	368	62	61	99	3	0	0	0	0	594
Below Normal	0	0	0	0	0	0	12	0	0	0	0	0	12
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	21	472	980	731	249	18	0	0	0	0	2,471

Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	44	1,208	3,251	1,558	658	151	0	0	0	0	6,870
Above Normal	0	0	0	442	1,381	158	192	62	0	0	0	0	2,235
Normal	0	0	11	287	78	6	13	0	0	0	0	0	395
Below Normal	0	0	0	0	0	0	4	0	0	0	0	0	4
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	11	383	936	338	172	42	0	0	0	0	1,882

Difference in Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
Modified WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	62	326	14	1,333	302	-85	0	0	0	0	1,953
Above Normal	0	0	0	45	212	590	1	-40	0	0	0	0	808
Normal	0	0	-11	81	-16	56	86	3	0	0	0	0	199
Below Normal	0	0	0	0	0	0	8	0	0	0	0	0	8
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	10	89	44	393	78	-24	0	0	0	0	589

Table 2.6-15

Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	106	1,534	3,265	2,891	960	66	0	0	0	0	8,823
Above Normal	0	0	0	487	1,593	748	193	22	0	0	0	0	3,043
Normal	0	0	0	368	62	61	99	3	0	0	0	0	594
Below Normal	0	0	0	0	0	0	12	0	0	0	0	0	12
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	21	472	980	731	249	18	0	0	0	0	2,471

Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	101	1,322	3,669	3,288	1,398	94	0	0	0	0	9,872
Above Normal	0	0	26	687	1,909	1,487	116	58	0	0	0	0	4,283
Normal	0	0	7	370	441	237	65	0	0	0	0	0	1,120
Below Normal	0	0	0	0	41	0	0	0	0	0	0	0	41
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	26	472	1,206	996	309	30	0	0	0	0	3,041

Difference in Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
Modified WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	5	213	-404	-398	-438	-28	0	0	0	0	-1,049
Above Normal	0	0	-26	-200	-316	-739	78	-36	0	0	0	0	-1,240
Normal	0	0	-7	-1	-379	-176	34	3	0	0	0	0	-525
Below Normal	0	0	0	0	-41	0	12	0	0	0	0	0	-29
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-6	0	-227	-265	-60	-12	0	0	0	0	-570

Table 2.6-16

Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,194	14,753	28,110	20,097	9,977	622	76	33	15	9	77,046
Above Normal	19	150	1,201	4,569	9,852	7,316	2,090	239	54	20	9	6	25,526
Normal	7	64	880	1,237	1,792	1,253	531	131	28	9	4	3	5,939
Below Normal	7	56	183	404	678	717	167	91	20	5	3	2	2,334
Dry	6	19	70	98	231	145	91	48	9	3	2	2	724
All Years	9	89	1,095	4,170	8,063	5,860	2,536	225	38	14	7	4	22,109

Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,157	14,818	28,449	19,278	9,955	707	76	33	15	9	76,658
Above Normal	19	150	1,203	4,792	9,803	7,029	2,320	279	54	20	9	6	25,685
Normal	7	64	1,142	1,197	1,818	1,224	478	128	28	9	4	3	6,101
Below Normal	7	56	183	404	678	717	159	91	20	5	3	2	2,326
Dry	6	19	70	98	231	145	91	48	9	3	2	2	724
All Years	9	89	1,140	4,221	8,124	5,635	2,567	249	38	14	7	4	22,097

Difference in Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
Modified WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	37	-65	-339	819	22	-85	0	0	0	0	389
Above Normal	0	0	-2	-223	49	287	-230	-40	0	0	0	0	-159
Normal	0	0	-263	41	-26	29	53	3	0	0	0	0	-162
Below Normal	0	0	0	0	0	0	8	0	0	0	0	0	8
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-44	-51	-61	225	-31	-24	0	0	0	0	13

Table 2.6-17 illustrates the same information for the alternative and base settings. Table 2.6-17 illustrates the larger differences in flow that would occur between the alternative and base settings. Those differences are particularly due to the effects of the restoration of Calaveras Reservoir operating capacity.

Table 2.6-17

Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,194	14,753	28,110	20,097	9,977	622	76	33	15	9	77,046
Above Normal	19	150	1,201	4,569	9,852	7,316	2,090	239	54	20	9	6	25,526
Normal	7	64	880	1,237	1,792	1,253	531	131	28	9	4	3	5,939
Below Normal	7	56	183	404	678	717	167	91	20	5	3	2	2,334
Dry	6	19	70	98	231	145	91	48	9	3	2	2	724
All Years	9	89	1,095	4,170	8,063	5,860	2,536	225	38	14	7	4	22,109

Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	4,075	20,036	31,342	21,266	10,756	607	76	33	15	9	88,374
Above Normal	19	150	1,948	8,459	14,977	8,954	1,977	276	54	20	9	6	36,849
Normal	7	64	1,723	2,251	4,153	2,244	544	128	28	9	4	3	11,157
Below Normal	7	56	183	404	720	717	154	91	20	5	3	2	2,363
Dry	6	19	70	98	231	145	91	48	9	3	2	2	724
All Years	9	89	1,587	6,205	10,225	6,620	2,664	229	38	14	7	4	27,691

Difference in Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Modified WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-880	-5,283	-3,232	-1,169	-779	15	0	0	0	0	-11,327
Above Normal	0	0	-747	-3,890	-5,125	-1,638	113	-36	0	0	0	0	-11,323
Normal	0	0	-843	-1,014	-2,361	-991	-13	3	0	0	0	0	-5,218
Below Normal	0	0	0	0	-41	0	12	0	0	0	0	0	-29
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-491	-2,035	-2,162	-761	-128	-4	0	0	0	0	-5,582

2.7 Crystal Springs and San Andreas Reservoirs

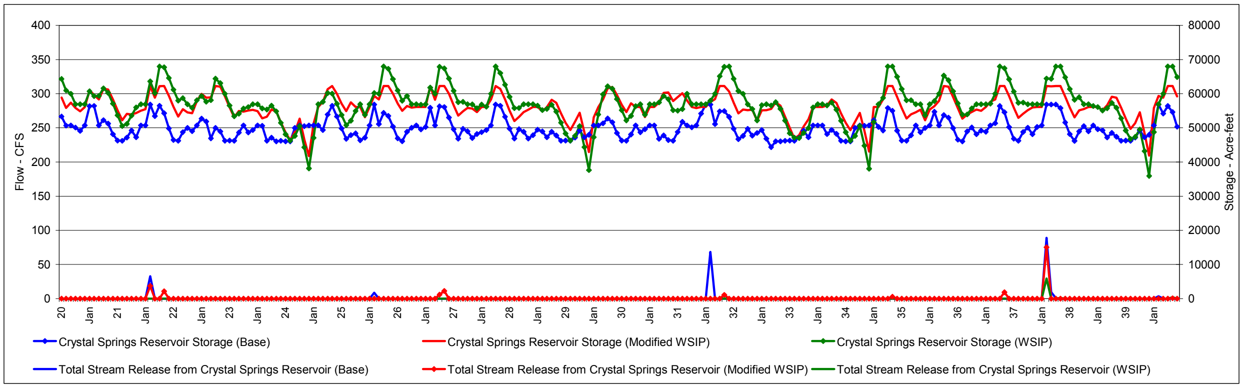
There are differences in Crystal Springs Reservoir operations between the WSIP setting and the alternative and base settings. Figure 2.7-1 illustrates a chronological trace of the simulation of Crystal Springs Reservoir storage and stream releases from Crystal Springs Dam. Shown in Figure 2.7-1 are the results for the WSIP, alternative, and base settings. Fundamental to the difference in storage operations between the WSIP and alternative settings and the base setting is the restoration of reservoir operation capacity, which does not occur in the base setting. The result is the operation of Crystal Springs Reservoir at a lower maximum storage in the base setting. The alternative setting differs from the WSIP setting in that the restored capacity of the Crystal Springs Reservoir is not fully used in the alternative setting. The Crystal Springs Reservoir restricted storage measure affects the maximum storage attained in the reservoir. Rather than having the full reservoir capacity of 22.15 billion gallons to regulate and store water, the reservoir is operationally constrained to a maximum of 20.28 billion gallons.

The operation of Crystal Springs Reservoir storage is generally consistent for the alternative and WSIP settings, except in the alternative setting the reservoir is not filled to the same level of storage. The annual drawdown of the reservoir occurs to about the same level. The alternative setting would provide less carryover storage at Crystal Springs Reservoir into periods of drought and would thereby cause additional draw from other resources to serve the same delivery. The magnitude of the draw of storage from Crystal Springs Reservoir is partially dependent on the discretionary assumptions of the model that proportions the use of storage among the Bay Area system reservoirs. In actual operations, some of these differences may not occur, as system operations and prevailing hydraulic and hydrologic conditions may result in a different apportionment of effect among the reservoirs. However, the operational strategy prefers the retention of storage in the Peninsula reservoirs, similar to the strategy used by the model. Figure 2.7-2 illustrates the average monthly storage in Crystal Springs Reservoir for the 82-year simulation, and the range in storage for each month for the alternative and WSIP settings.

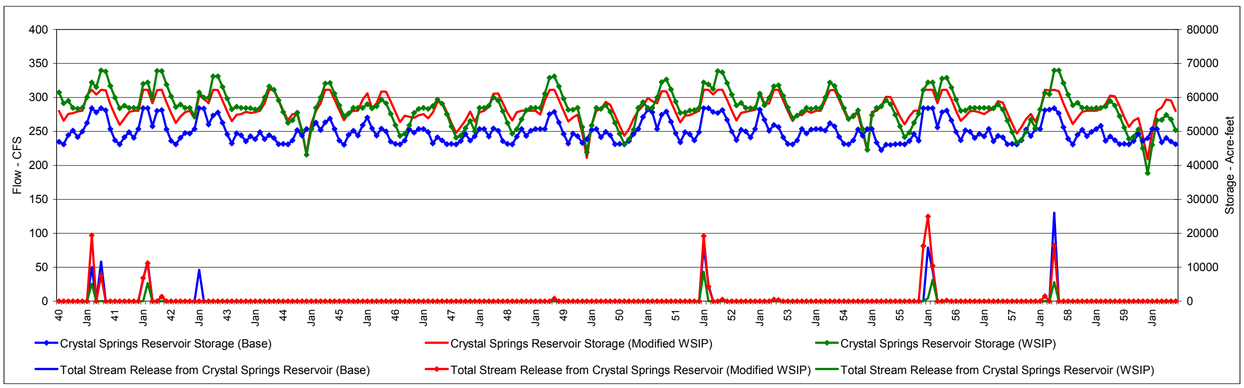
APPENDIX O2

Figure 2.7-1
Crystal Springs Reservoir Storage and Release

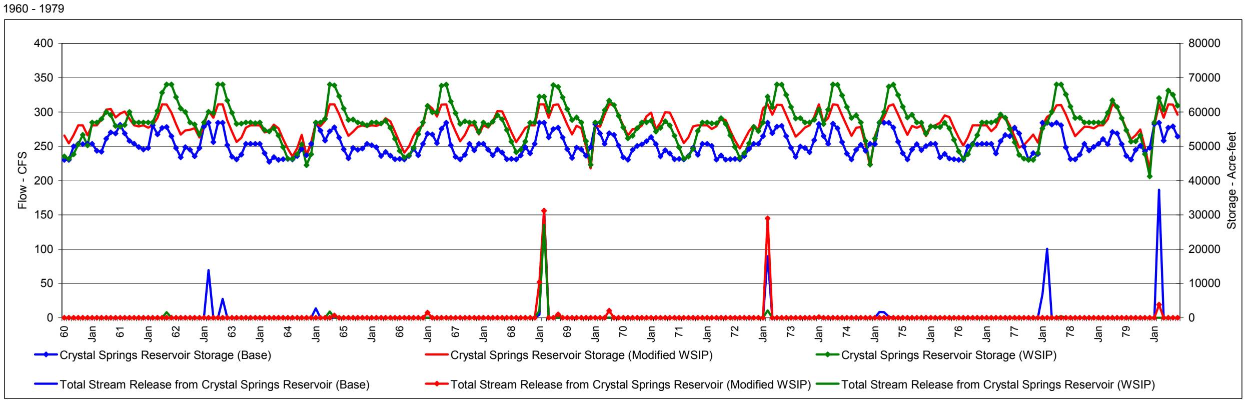
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

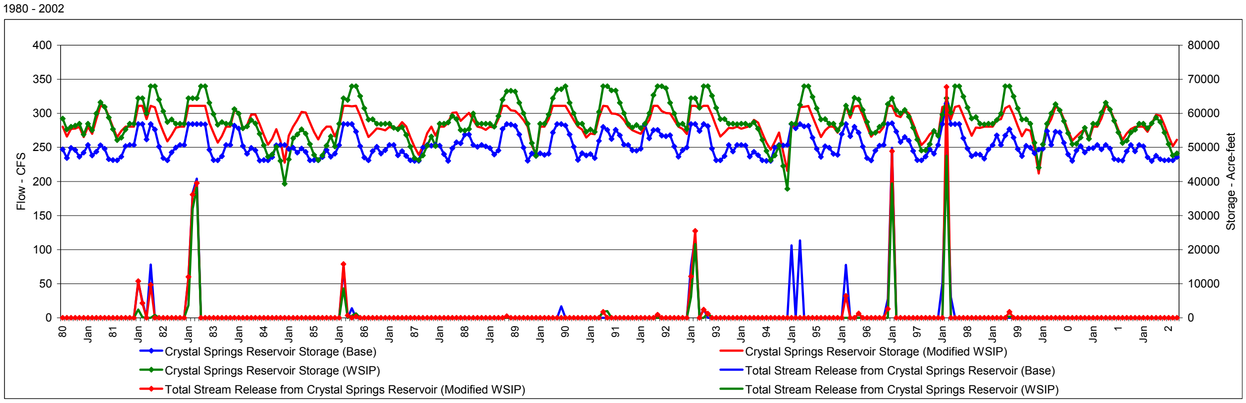


Figure 2.7-2

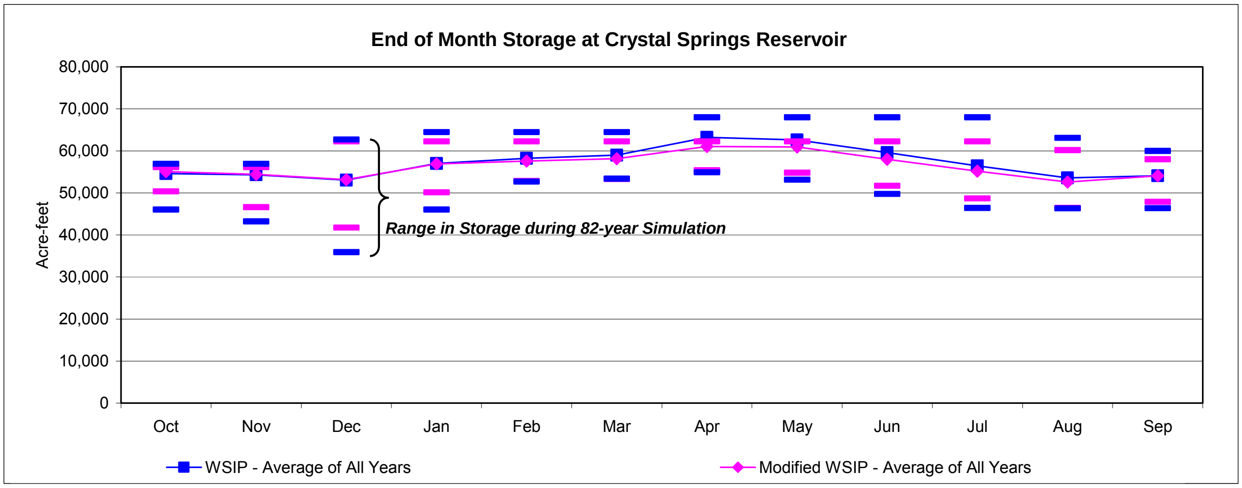


Figure 2.7-3 illustrates the average monthly storage in Crystal Springs Reservoir for the 82-year simulation, and the range in storage for each month for the alternative and base settings. The alternative setting would result in reservoir storage operating at a slightly higher average level during all months, and the range of operating storage would typically be smaller in the alternative setting, except during the system maintenance cycle.

Figure 2.7-3

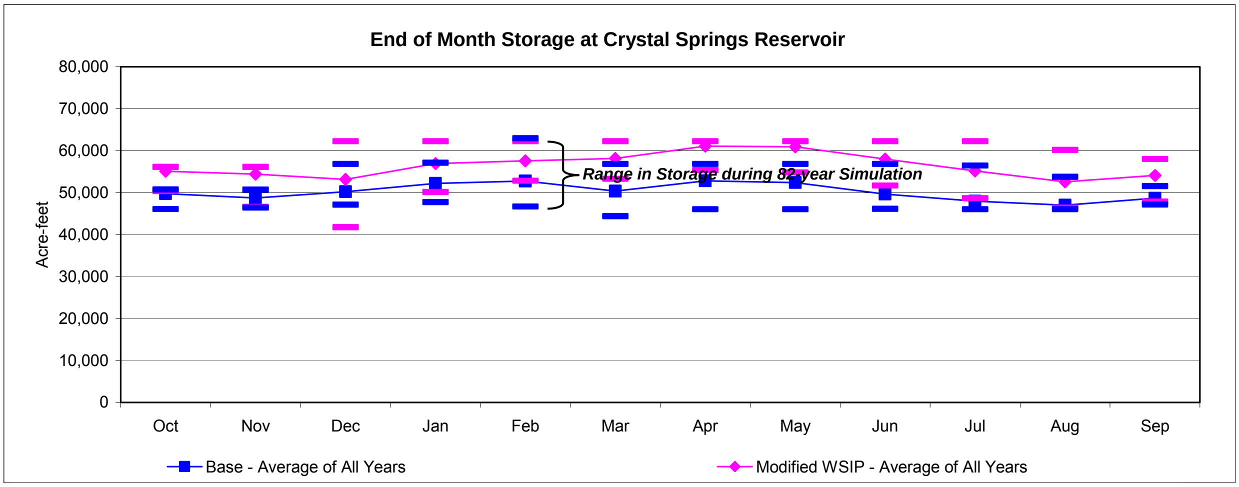


Table 2.7-1 illustrates the modeled alternative and WSIP stream releases from Crystal Springs Reservoir and the differences between the two settings. Modeling results indicate that an increase in the occasional release could occur. The potential difference is attributed to a narrower operating range of reservoir storage in the alternative setting. This narrower range in storage would lead to a greater potential for stream releases. In actual operations, it is anticipated that system operators would manage the reservoir system whereby stream releases would be minimal under any setting, and the effect would be essentially no difference between the alternative and WSIP settings. Similarly, Table 2.7-2 illustrates the stream releases for the alternative and base settings, and the difference in modeled flows between the two settings. A lesser drawdown in Crystal Springs Reservoir storage associated with the alternative setting would lead to a decreased potential to regulate reservoir inflow, which would lead to additional risk in needing to make stream releases. However, as described above, actual system operations attempt to minimize releases under any setting, and thus the difference in releases between the alternative and base setting is minimal, if any.

APPENDIX O2

Table 2.7-1

Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by SJR Index Year Type) — Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	242	1,880	2,967	515	445	135	0	0	0	0	6,185
Above Normal	0	0	0	0	473	0	56	104	0	0	0	0	634
Below Normal	0	0	0	0	0	0	12	29	0	0	0	0	41
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
Critical	0	0	0	0	0	0	32	26	0	0	0	0	59
All Years	0	0	71	550	967	151	150	71	0	0	0	0	1,959

Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by SJR Index Year Type) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	811	1,849	488	99	55	0	0	0	0	3,303
Above Normal	0	0	0	0	35	0	0	14	0	0	0	0	49
Below Normal	0	0	0	0	0	0	0	42	0	0	0	0	42
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
Critical	0	0	0	0	0	0	33	38	0	0	0	0	71
All Years	0	0	0	237	548	143	36	33	0	0	0	0	997

Difference in Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by SJR Index Year Type) — Modified WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	242	1,069	1,118	27	346	80	0	0	0	0	2,882
Above Normal	0	0	0	0	438	0	56	90	0	0	0	0	585
Below Normal	0	0	0	0	0	0	12	-13	0	0	0	0	-1
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
Critical	0	0	0	0	0	0	-1	-11	0	0	0	0	-12
All Years	0	0	71	313	418	8	114	38	0	0	0	0	962

Table 2.7-2

Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	363	2,583	4,335	772	624	65	0	0	0	0	8,743
Above Normal	0	0	0	223	582	0	62	204	0	0	0	0	1,071
Normal	0	0	0	0	0	0	47	71	0	0	0	0	118
Below Normal	0	0	0	0	0	0	30	0	0	0	0	0	30
Dry	0	0	0	0	0	0	0	9	0	0	0	0	9
All Years	0	0	71	550	967	151	150	71	0	0	0	0	1,959

Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	107	2,744	4,279	1,376	1,047	2	0	0	0	0	9,556
Above Normal	0	0	0	618	1,343	29	52	100	0	0	0	0	2,142
Normal	0	0	0	0	268	0	0	0	0	0	0	0	268
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	62	0	0	0	62
All Years	0	0	21	664	1,166	274	215	21	12	0	0	0	2,373

Difference in Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Modified WSIP minus Base

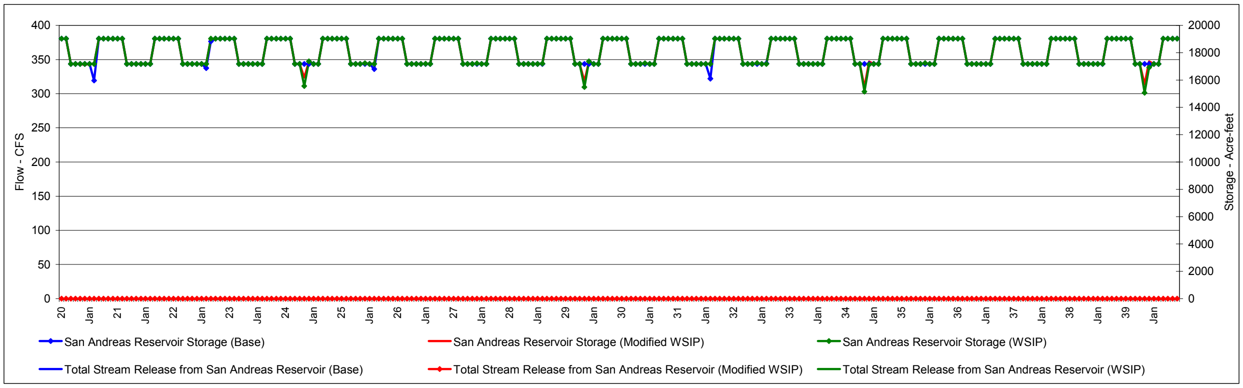
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	256	-161	56	-603	-423	63	0	0	0	0	-812
Above Normal	0	0	0	-396	-761	-29	10	104	0	0	0	0	-1,071
Normal	0	0	0	0	-268	0	47	71	0	0	0	0	-150
Below Normal	0	0	0	0	0	0	30	0	0	0	0	0	30
Dry	0	0	0	0	0	0	0	9	-62	0	0	0	-54
All Years	0	0	50	-113	-199	-124	-65	50	-12	0	0	0	-414

Reservoir storage at San Andreas Reservoir would follow a systematic filling and lowering each year; however, there would be slight differences in drawdown between the alternative and WSIP settings, primarily due to the coincidence of the effects of different systemwide maintenance and water demands within each setting. Figure 2.7-4 illustrates a chronological trace of the simulation of San Andreas Reservoir storage and stream releases from San Andreas Dam. Shown in Figure 2.7-4 are the results for the WSIP, alternative, and base settings. There are no projected stream releases from San Andreas Reservoir in any setting. Compared to the base setting, as Figure 2.7-4 illustrates, there would be a difference in storage operation every fifth year for the WSIP and alternative settings. These differences would be the result of Hetch Hetchy conveyance maintenance, which is assumed to occur systematically in the alternative and WSIP settings. The maintenance constrains the amount of Hetch Hetchy water supplied to serve water demands in the Bay Area. As previously discussed, during these winter periods the Bay Area reservoir system would accommodate the reduction in imported supply by serving the Bay Area water deliveries with the local watersheds' runoff and storage. At San Andreas Reservoir, serving this water demand would affect the reservoir when additional required water production at Harry Tracy WTP associated with WSIP or the alternative exceeded the ability to maintain San Andreas Reservoir storage with pumping from Crystal Springs Reservoir. In the modeling, the conveyance capacity from Crystal Springs Reservoir is assumed to be the same among all of the settings. The additional water demand of the WSIP and alternative require additional production from Harry Tracy WTP to be drawn from San Andreas Reservoir.

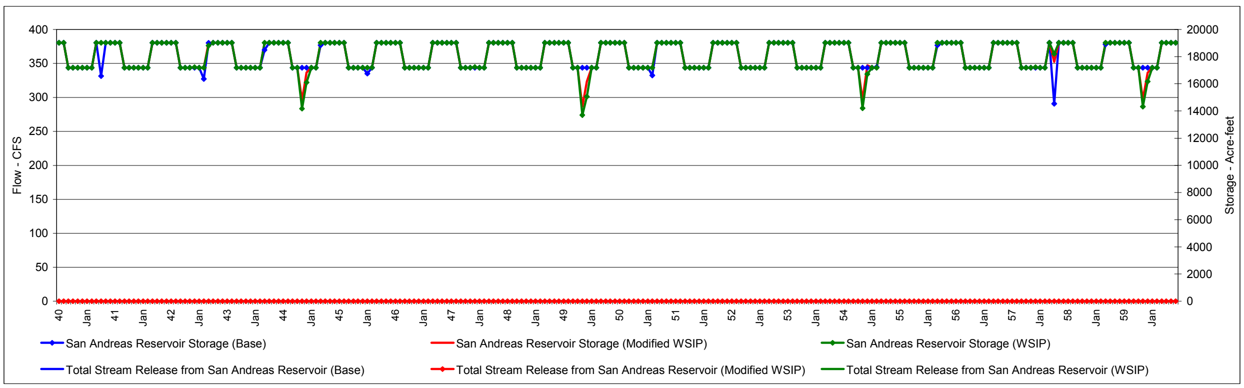
APPENDIX O2

Figure 2.7-4
San Andreas Reservoir Storage and Stream Release

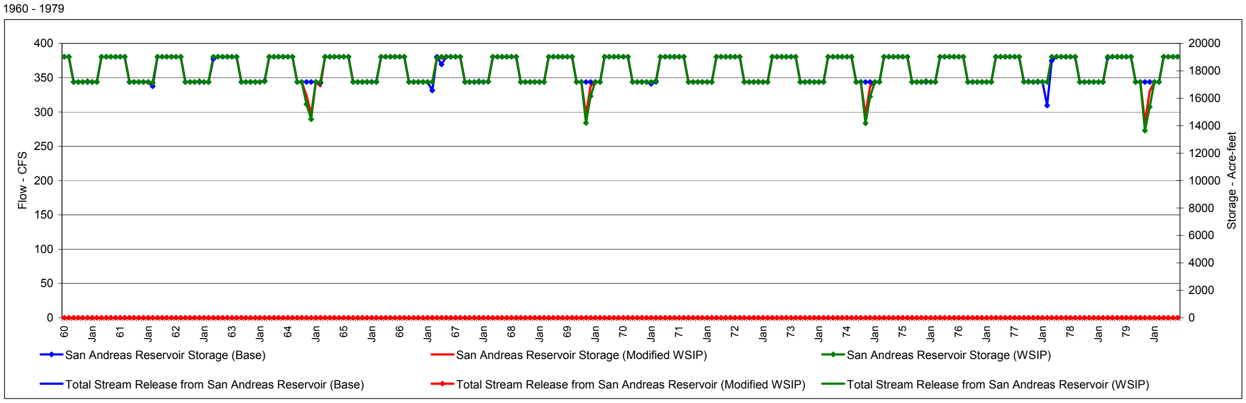
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

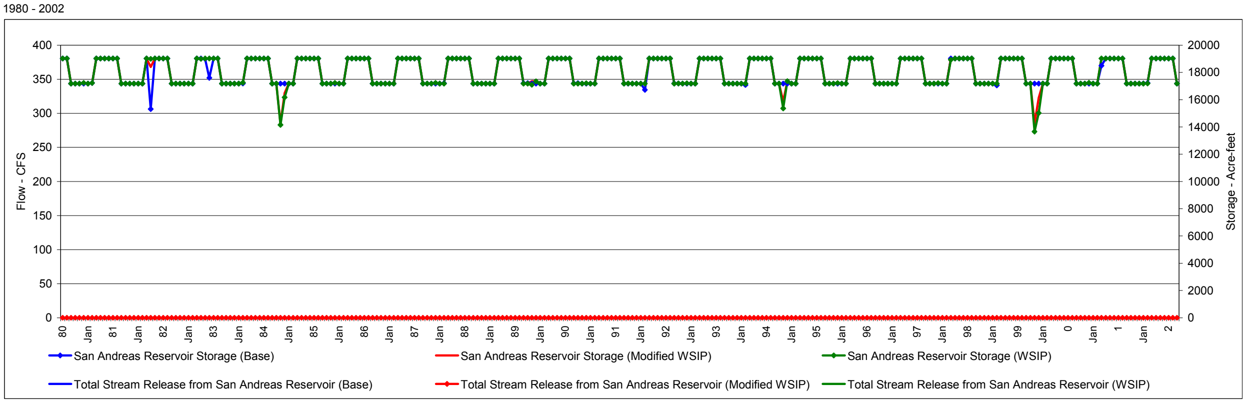
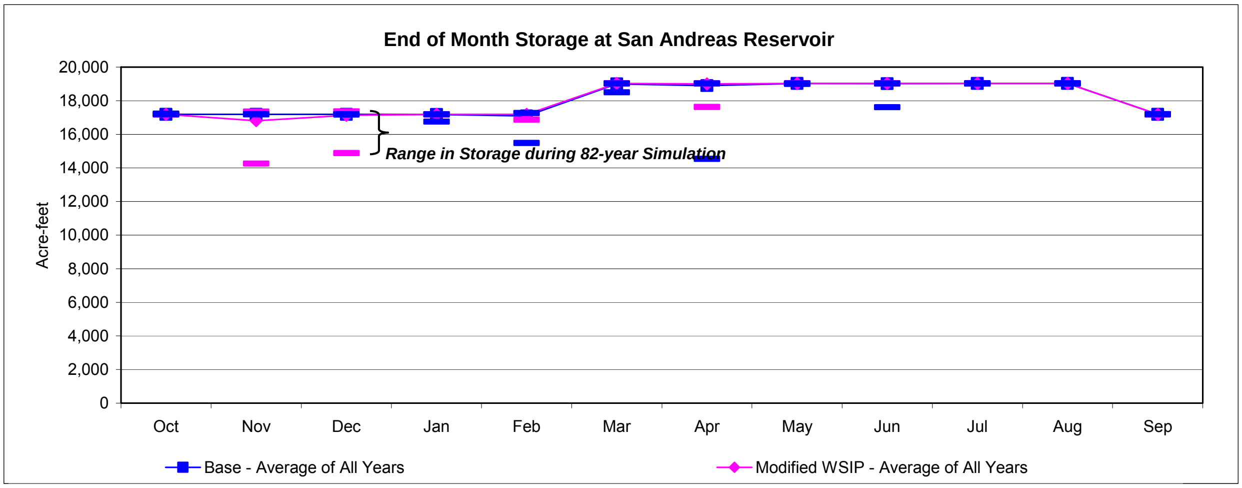


Figure 2.7-5 illustrates the average monthly storage in San Andreas Reservoir for the 82-year simulation, and the range in storage for each month for the alternative and base settings.

Figure 2.7-5



2.8 Pilarcitos Reservoir

Coastside County Water District's (Coastside CWD) water demand and its SFPUC purchase request are projected to increase within the WSIP planning horizon of year 2030. Within the context of the 2030 purchase request of 300 mgd, Coastside CWD's portion is estimated to amount to about 3 mgd. This projected purchase request is approximately 1 mgd greater that its current purchase request. Considering the current physical constraints on deliveries from the SFPUC to Coastside CWD and the ongoing planning activities in the watershed, the precise means of serving Coastside CWD's additional purchase request, and the resultant potential changes in the operation of SFPUC facilities and their affected environs, are uncertain.[2]

Assuming a range of potential means to serve the additional purchase request from Coastside CWD, the following are potential hydrologic effects on SFPUC facilities and their affected environs:

- Due to limited yield from Pilarcitos Reservoir, additional diversions would be required from Crystal Springs Reservoir.
- If deliveries to Coastside CWD from Pilarcitos Reservoir increase during the fall/winter/spring seasons, these deliveries could potentially reduce storage in Pilarcitos Reservoir, thereby potentially reducing diversions to the San Mateo Creek watershed. Although the increased delivery would increase releases to Pilarcitos Creek from Pilarcitos Dam for a period of time, the increase would subsequently lead to a reduction in spills past Stone Dam.
- Additional fall/spring/winter deliveries could also potentially impair the ability to provide carryover storage into the summer season from Pilarcitos Reservoir, and subsequently lead to an acceleration of the beginning of the season when releases to Pilarcitos Creek from Pilarcitos Reservoir consist only of the passage of reservoir inflow.
- An increase in summertime deliveries from Pilarcitos Creek could also accelerate the beginning of the season when releases to Pilarcitos Creek from Pilarcitos Reservoir consist only of the passage of reservoir inflow.

In the WSIP setting, Coastside CWD is assumed to increase its SFPUC demand from 1.8 mgd (average annual purchase request) to 3 mgd. It is also assumed that the month-to-month shape of Coastside CWD's future purchase request to the SFPUC system would follow the existing monthly shape. Currently,

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2 See *Analysis of SFPUC PIlarcitos/Coastside County Water District Operations*, Memorandum by Daniel B. Steiner, March 8, 2007.

Coastside CWD can only receive a maximum of 2 mgd from the Pilarcitos Creek system due to the capacity of the connection to the Stone Tunnel, and it reaches its maximum delivery rate during the summer in the base setting. It is assumed that Coastside CWD would increase its delivery from Stone Dam following the shape of its increase in demand during the months when it currently does not reach the 2 mgd capacity (e.g., fall/winter/spring). By taking delivery of additional Pilarcitos Creek water in the fall/winter/spring, there are times when Pilarcitos Reservoir would not fill during the ensuing winter and thus the additional delivery would affect the carryover of reservoir storage into the summer. The effect is that the reservoir could empty to the spillway invert earlier in the summer than in the base setting. The effect would then cause the creek below Pilarcitos Reservoir to experience only reservoir inflow as compared to a controlled release (larger) out of the reservoir. A way to avoid or reduce this effect would be to provide extraction (pumping) of reservoir storage during the summer to maintain controlled releases to the creek in excess of reservoir inflow. The measure is modeled by allowing the Coastside CWD delivery to be met from Pilarcitos Reservoir storage even if the spillway crest has been reached, inferring pumping out water below the spillway invert.

The summer flow reduction in the WSIP setting (compared to the base setting) occurs in about 25 percent of the years, during one or more of the months of July through September. There are a few exceptions of years when the effect occurs in months prior to July. The effect typically manifests as one additional month of flow reduction in a year, amounting to about 150 to 190 acre-feet. The worst event was a reduction in two months of a year (1947), amounting to about 300 acre-feet.

The July through September flow reduction effect could be ameliorated by allowing water to be extracted from the reservoir below the spillway invert to meet the Coastside CWD delivery request during the summer. The model allows Pilarcitos Reservoir to operate at a lower minimum storage for the months of July through September. Figure 2.8-1 illustrates a chronological trace of the simulation of Pilarcitos Reservoir storage and stream releases from Pilarcitos Dam. Shown in Figure 2.8-1 are the results for the WSIP, alternative, and base settings. The alternative setting includes an allowance to draw up to 300 acre-feet from Pilarcitos Reservoir below the spillway invert to maintain July through September flows in Pilarcitos Creek.

The effect of the assumed Coastside CWD operation in combination with the effects of the overall SFPUC regional system operations would be occasional differences in the storage operation of Pilarcitos Reservoir. Overall, there would be a slightly lower average storage at Pilarcitos Reservoir. Figure 2.8-2 illustrates the average monthly storage in Pilarcitos Reservoir for the 82-year simulation, and the range in storage for each month for the WSIP and base settings.

Figure 2.8-1 illustrates the result of allowing the reservoir to go below the spillway invert during July through September in the alternative setting. The 300-acre-foot value is representative of the largest effect of the WSIP in a year (1947) for the July through September period. The hydrograph illustrates that the measure is not needed every year, and the full 300 acre-feet of the measure is rarely used. In effect, the measure assures controlled flow during the July through September period, even if the base did not have controlled flow. Several factors contribute to other changes in Pilarcitos Reservoir storage. At times, additional water is drawn from Pilarcitos Reservoir to the San Mateo Creek watershed in reaction to additional demands being served from the SFPUC system. Pilarcitos Reservoir is at times also drawn to meet the increase in demand from Coastside CWD during months (e.g., spring months) when available conveyance capacity from Stone Dam exists. Both of these additional draws from the reservoir would deplete storage below that experienced in the base setting. Pilarcitos storage would typically replenish at the expense of future reservoir spills, or within a year storage would end the same and the reservoir would still reach the minimum level at the spillway invert.

APPENDIX O2

Figure 2.8-1
Pilarcitos Reservoir Storage and Stream Release

1920 - 1939
1940 - 1959
1960 - 1979
1980 - 2002

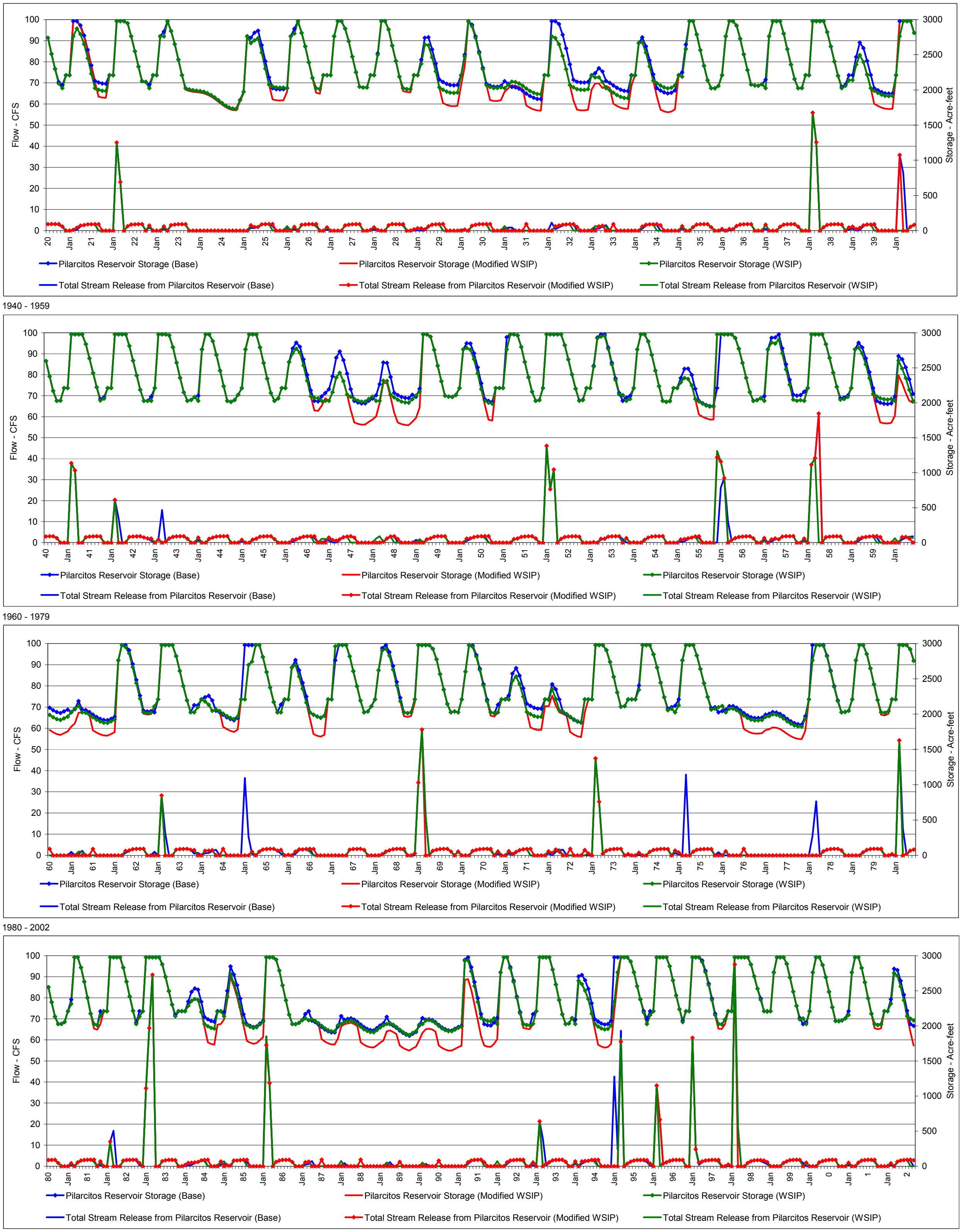
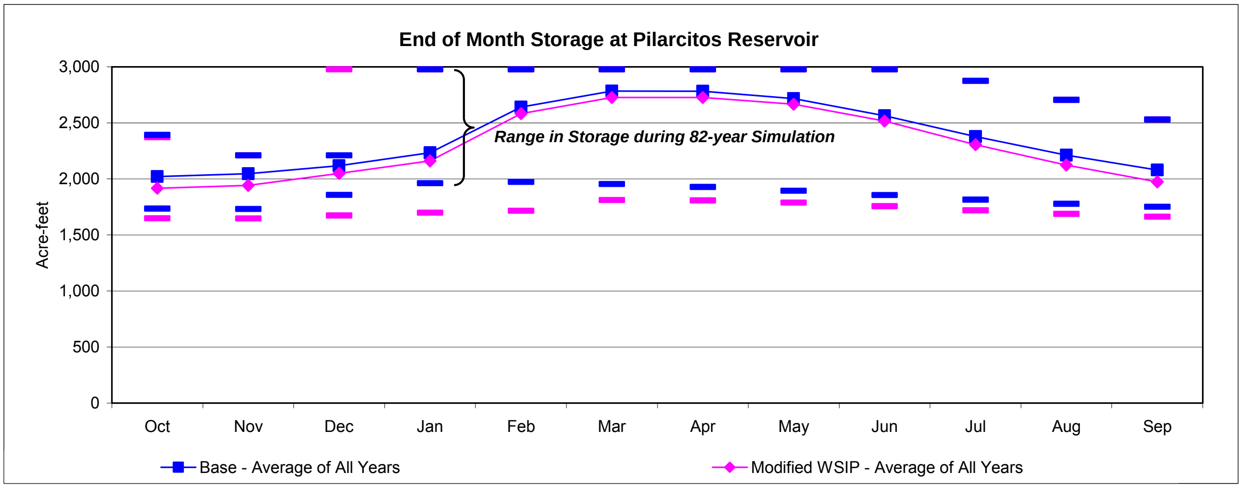


Figure 2.8-2



Stream releases from Pilarcitos Dam are also shown in Figure 2.8-1. Releases can occur for diversions at Stone Dam for Coastside CWD deliveries, conveyance to the San Mateo Creek watershed (e.g., Crystal Springs Reservoir), and reservoir spills. Pilarcitos Creek typically gains flow from unregulated tributary streams and runoff below Pilarcitos Dam. The differences in flow between the alternative and WSIP settings are shown chronologically in Table 2.8-1. The differences in flow between the alternative and base settings are shown chronologically in Table 2.8-2. The results shown in these two tables illustrate that the alternative's flow measure would ameliorate all summer (July through September) flow reductions associated with the WSIP, and at times would provide flow in excess of the flow occurring in the base setting.

Table 2.8-3 summarizes monthly average flow within year types for the comparison of the alternative and WSIP settings. Table 2.8-4 provides the same information for the alternative and base settings. When compared to the base setting, the alternative setting would result in positive changes in flows during the winter and spring, which are indicative of the additional draw of water from the reservoir to serve the increased demand of Coastside CWD during the period when conveyance capacity to Coastside CWD exists from Stone Dam. In this same comparison, the few reductions in flow during the early summer are indicative of years when additional releases earlier in a year would lead to the reservoir being depleted to minimum storage earlier in the year, thus reducing the amount of water released in a later month. During the summer, the increased releases are indicative of the alternative's flow measure. Reductions in flow during the winter and spring are indicative of the reservoir replenishing additionally depleted storage associated with the alternative setting.

The effect of the WSIP on Pilarcitos Creek flows below Stone Dam differs from the effect on flows below Pilarcitos Dam. Figure 2.8-3 illustrates the chronological trace of inflow to Stone Dam, which includes releases from Pilarcitos Dam to Pilarcitos Creek and unregulated flow to the stream below Pilarcitos Dam, and releases (spills) from Stone Dam to Pilarcitos Creek. Shown in the figure are the results for the alternative, WSIP, and base settings. The flow past Stone Dam in all the settings is typically minor (zero in modeling results, but may be measurable in terms of leakage and seepage past the dam), as inflow to the dam is diverted to Coastside CWD or to the San Mateo watershed. Releases past Stone Dam typically occur when unregulated flow below Pilarcitos Dam exceeds the delivery needs of Coastside CWD at a time when the storage level at Crystal Springs Reservoir rejects the water from the Pilarcitos watershed. During times when inflow to Stone Dam is reduced due to reduced spills from Pilarcitos Reservoir, there are still substantial spills from Stone Dam to Pilarcitos Creek from the unregulated flow below Pilarcitos Dam.

In comparison to the base setting, the changes in flow below Stone Dam in the alternative setting would typically occur during the rainy season between the months of January and March, in at least one month during about half of the years. Tables 2.8-5 and 2.8-6 summarize the results of the alternative, WSIP, and base settings in terms of average monthly flows by year type, and the average differences in flow among the settings.

APPENDIX O2

Table 2.8-1

Difference in Total Stream Release from Pilarcitos Reservoir (Acre-feet) Modified WSIP minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	21	0	0	0	0	0	15	181	217
1922	0	0	0	0	0	0	0	0	0	0	0	0	0
1923	0	0	0	0	0	0	0	0	0	0	0	21	21
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	184	184
1926	0	0	0	-131	0	0	0	0	0	0	0	66	-66
1927	0	0	0	0	0	0	0	0	0	0	0	0	0
1928	0	0	0	0	0	0	0	0	0	0	0	42	42
1929	0	0	0	0	0	0	0	0	0	0	190	0	190
1930	0	0	0	-34	0	0	0	0	0	0	0	184	150
1931	0	0	0	-131	0	0	0	0	0	190	0	0	59
1932	0	0	0	0	0	0	0	0	0	0	187	108	295
1933	0	0	0	-40	-120	0	0	-116	0	187	0	0	-89
1934	0	0	-15	0	0	0	0	0	0	187	158	0	330
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	0	0	0	0	0	0	0	0	0
1937	0	0	0	0	0	0	0	0	0	0	0	0	0
1938	0	0	0	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	0	0	0	187	0	0	187
1940	0	0	0	0	1,991	0	0	0	0	0	0	0	1,991
1941	0	0	0	0	0	0	0	0	0	0	0	0	0
1942	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	0	0	0	0	1	1
1945	0	0	0	0	0	0	0	0	0	0	0	0	0
1946	0	0	0	0	0	0	0	0	0	0	0	181	181
1947	0	-110	-107	37	0	0	0	0	0	187	148	0	155
1948	0	0	0	0	-107	-187	0	0	0	187	108	0	1
1949	0	0	0	0	-92	0	0	0	0	0	0	0	-92
1950	0	0	0	0	0	0	0	0	0	0	58	184	242
1951	0	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	1	1
1955	0	0	0	0	0	0	0	0	0	187	0	0	187
1956	0	0	-184	0	0	0	0	0	0	0	0	0	-184
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	3,661	0	0	0	0	0	3,661
1959	0	0	0	0	0	0	0	0	0	0	190	155	346
1960	0	0	0	-129	0	0	0	-51	-129	187	0	0	-121
1961	0	0	0	0	0	-110	-100	0	0	187	0	0	-23
1962	0	0	0	0	0	0	0	0	0	0	0	18	18
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	187	0	0	187
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	88	185	0	273
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	53	53
1969	0	0	0	-42	0	-1,136	0	0	0	0	0	0	-1,179
1970	0	0	0	0	0	0	0	0	0	0	0	48	48
1971	0	-47	0	0	0	0	0	0	0	0	187	0	140
1972	0	0	-15	0	0	0	-66	0	0	190	0	0	109
1973	0	149	0	0	0	0	0	0	0	0	0	0	149
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	190	0	0	190
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	36	36
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	63	63
1982	0	58	0	0	0	0	0	0	0	0	0	0	58
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	44	187	0	232
1985	0	-46	31	-141	0	0	0	0	0	0	187	0	31
1986	0	0	9	0	-224	0	0	0	0	0	0	0	-215
1987	0	0	0	0	0	0	0	0	0	190	0	0	190
1988	0	0	0	-153	0	0	0	0	0	190	0	0	37
1989	0	0	0	0	0	-111	0	0	0	126	0	0	15
1990	0	0	0	0	-98	0	0	0	0	162	0	0	64
1991	0	0	0	0	0	0	0	0	0	0	0	111	111
1992	0	0	0	-148	0	0	0	0	0	0	0	54	-94
1993	0	0	-50	0	0	0	0	0	0	0	0	0	-50
1994	0	0	0	0	0	0	0	0	0	75	187	0	262
1995	0	0	0	0	0	-107	0	0	0	0	0	0	-107
1996	0	0	0	0	0	1,360	0	0	0	0	0	0	1,360
1997	0	0	0	0	0	0	0	0	0	0	0	67	67
1998	0	0	0	0	0	-1,133	0	0	0	0	0	0	-1,133
1999	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	60	60
2002	0	0	0	0	0	0	0	0	0	0	190	169	359
Avg (21-02)	0	0	-4	-11	17	-17	43	-2	-2	38	27	24	112

APPENDIX O2

Table 2.8-2

Difference in Total Stream Release from Pilarcitos Reservoir (Acre-feet)

Modified WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	21	21	0	0	0	68	21	0	0	0	0	181	312
1922	0	0	0	3	0	0	0	0	0	0	0	0	3
1923	0	51	0	0	0	68	0	0	0	0	0	21	140
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	75	36	0	0	0	0	56	166
1926	0	0	0	-107	0	68	0	0	0	0	0	66	26
1927	0	0	64	0	0	0	0	0	0	0	0	0	64
1928	0	0	21	64	18	0	0	0	0	0	0	42	146
1929	0	0	37	64	58	37	21	0	0	0	190	0	407
1930	0	0	0	0	25	0	21	0	0	0	0	184	230
1931	0	0	0	-52	-80	-92	0	0	0	190	0	0	-34
1932	0	0	0	0	-211	79	52	17	0	0	0	108	45
1933	0	0	0	0	-59	68	21	-160	0	187	0	0	57
1934	0	0	0	0	0	68	21	0	0	30	158	0	277
1935	0	0	0	0	64	0	0	0	0	0	0	0	64
1936	0	0	0	46	0	46	21	0	0	0	0	0	113
1937	0	0	0	122	0	0	0	0	0	0	0	0	122
1938	0	0	0	0	0	0	0	0	0	0	0	0	0
1939	16	0	64	64	40	68	21	0	-6	37	0	0	304
1940	0	0	0	0	0	-1,677	0	0	0	0	0	0	-1,677
1941	0	0	0	0	0	0	0	0	0	0	0	0	0
1942	21	0	0	0	0	-734	0	0	0	0	0	0	-713
1943	0	0	64	0	0	-958	21	0	0	0	0	0	-874
1944	0	0	0	77	0	0	21	0	0	0	0	1	99
1945	0	0	0	64	0	0	21	0	0	0	0	0	85
1946	0	0	0	0	0	68	21	0	0	0	0	53	141
1947	0	0	-59	91	61	58	21	0	0	0	12	0	185
1948	0	0	0	0	0	-27	21	0	0	0	108	0	102
1949	0	0	0	-83	-31	0	21	0	0	0	0	0	-94
1950	0	0	0	0	0	68	21	0	0	0	0	184	273
1951	0	0	0	0	0	0	21	0	0	0	0	0	21
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	7	0	0	0	12	0	21	0	0	0	0	0	40
1954	-104	128	0	9	0	0	21	0	0	0	0	1	55
1955	0	0	0	0	61	68	21	0	0	50	0	0	200
1956	0	0	2,505	766	0	-624	21	0	0	0	0	0	2,668
1957	0	0	0	68	0	68	21	0	0	0	0	0	157
1958	0	0	59	0	0	0	0	0	0	0	0	0	59
1959	21	0	0	0	0	68	21	0	0	0	42	155	307
1960	0	0	0	0	0	68	21	-51	-178	187	0	0	47
1961	0	0	0	-104	0	-36	-130	0	0	187	0	0	-83
1962	0	0	0	0	0	0	52	17	0	0	0	0	70
1963	0	0	-107	0	0	-639	0	0	0	0	0	0	-747
1964	1	101	-74	0	61	68	21	-166	0	187	0	0	199
1965	0	0	0	-2,248	-485	68	0	0	0	0	0	0	-2,666
1966	0	110	0	15	0	68	21	0	0	3	185	0	401
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	34	21	0	0	0	0	4	59
1969	0	0	55	-42	0	-1,136	12	0	0	0	0	0	-1,111
1970	0	0	0	0	0	0	21	0	0	0	0	28	49
1971	0	59	0	0	61	40	21	0	0	0	187	0	367
1972	0	0	0	64	61	68	-45	-162	0	190	0	0	176
1973	0	149	55	0	0	0	21	0	0	0	0	0	226
1974	0	37	0	0	61	0	0	0	0	0	0	0	98
1975	21	0	72	64	0	-2,341	0	0	0	0	0	0	-2,184
1976	21	0	-93	0	108	0	0	0	0	190	0	0	226
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	-503	-1,569	0	17	0	0	0	0	-2,054
1979	-10	0	0	0	0	0	21	0	0	0	0	36	47
1980	0	0	37	0	0	-783	21	0	0	0	0	0	-726
1981	0	0	0	0	61	0	21	0	0	0	0	63	145
1982	0	120	0	0	0	-1,032	0	0	0	0	0	0	-912
1983	19	62	0	0	0	0	0	0	0	0	0	0	80
1984	21	0	0	34	61	68	21	0	0	0	187	0	392
1985	0	0	95	-77	21	18	21	0	0	0	81	0	160
1986	0	0	9	0	-236	0	0	0	0	0	0	0	-227
1987	0	0	0	0	61	68	-145	0	0	190	0	0	174
1988	0	0	0	-24	-83	0	0	0	0	190	0	0	83
1989	0	0	0	0	0	-36	-116	0	0	126	0	0	-25
1990	0	0	0	0	0	-73	0	0	0	162	0	0	89
1991	0	0	0	0	0	0	52	17	0	0	0	-6	64
1992	0	0	0	0	0	0	52	17	0	0	0	37	106
1993	0	0	88	0	0	-820	52	17	0	0	0	0	-662
1994	-1	0	0	62	0	68	21	0	0	0	187	0	336
1995	0	0	0	-2,620	-442	-320	0	0	0	0	0	0	-3,383
1996	21	53	64	0	0	0	21	0	0	0	0	0	159
1997	21	0	0	0	0	68	21	0	0	0	0	47	157
1998	0	0	49	0	0	-1,133	0	0	0	0	0	0	-1,084
1999	21	62	64	0	0	0	0	0	0	0	0	0	147
2000	21	-101	104	0	0	0	21	0	0	0	0	0	45
2001	0	0	0	64	0	0	21	0	0	0	0	60	145
2002	0	0	0	6	61	0	21	0	0	0	35	169	292
Avg (21-02)	2	10	39	-44	-14	-150	9	-5	-2	26	17	18	-96

APPENDIX O2

Table 2.8-3

Total Stream Release from Pilarcitos Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	57	24	176	834	2,102	1,414	248	70	152	175	183	180	5,616
Above Normal	63	44	44	15	550	182	31	117	161	181	186	181	1,754
Normal	56	6	8	16	26	32	83	143	171	185	187	155	1,069
Below Normal	52	25	10	28	23	61	126	146	164	187	165	112	1,099
Dry	38	0	6	33	24	54	51	46	43	159	28	0	481
All Years	53	20	48	181	539	343	107	105	139	178	150	126	1,990

Total Stream Release from Pilarcitos Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	57	11	188	837	2,116	1,563	19	70	152	175	183	176	5,547
Above Normal	63	44	47	15	432	102	31	117	161	181	185	169	1,546
Normal	56	9	8	34	32	32	83	143	171	183	152	116	1,018
Below Normal	52	28	9	39	23	61	126	146	164	149	96	47	940
Dry	38	7	13	59	44	79	61	56	51	7	0	0	416
All Years	53	20	53	193	522	360	64	107	141	140	124	102	1,878

Difference in Total Stream Release from Pilarcitos Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Modified WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	13	-11	-3	-14	-149	229	0	0	0	0	4	70
Above Normal	0	0	-3	0	118	80	0	0	0	0	1	12	208
Normal	0	-3	0	-17	-6	0	0	0	0	3	35	38	50
Below Normal	0	-3	1	-10	0	0	0	0	0	38	68	65	159
Dry	0	-7	-8	-26	-20	-26	-10	-10	-8	152	28	0	65
All Years	0	0	-4	-11	17	-17	43	-2	-2	38	27	24	112

Table 2.8-4

Total Stream Release from Pilarcitos Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	57	24	176	834	2,102	1,414	248	70	152	175	183	180	5,616
Above Normal	63	44	44	15	550	182	31	117	161	181	186	181	1,754
Normal	56	6	8	16	26	32	83	143	171	185	187	155	1,069
Below Normal	52	25	10	28	23	61	126	146	164	187	165	112	1,099
Dry	38	0	6	33	24	54	51	46	43	159	28	0	481
All Years	53	20	48	181	539	343	107	105	139	178	150	126	1,990

Total Stream Release from Pilarcitos Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	54	3	4	953	2,144	1,770	242	70	152	175	183	177	5,927
Above Normal	56	37	20	137	605	641	22	115	161	181	186	169	2,328
Normal	55	3	7	15	24	9	60	139	171	185	164	128	960
Below Normal	57	6	7	15	6	23	103	154	164	171	124	65	894
Dry	36	0	11	26	17	41	70	69	55	44	8	0	378
All Years	52	10	10	225	553	493	98	110	141	152	134	108	2,085

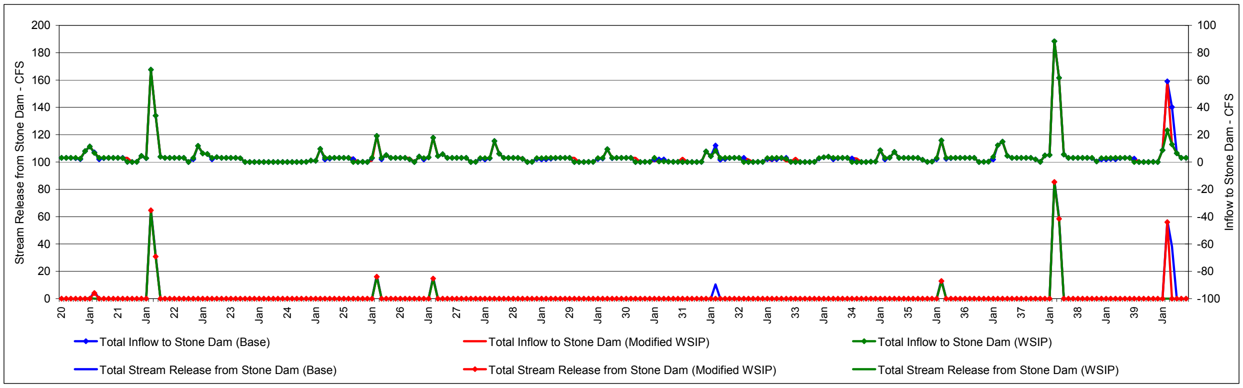
Difference in Total Stream Release from Pilarcitos Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Modified WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	4	21	173	-119	-42	-356	6	0	0	0	0	3	-310
Above Normal	6	7	24	-121	-55	-459	9	2	0	0	0	12	-574
Normal	1	4	1	1	2	23	23	3	0	0	23	27	109
Below Normal	-5	20	3	13	17	38	24	-9	0	16	41	48	205
Dry	2	0	-5	6	7	13	-19	-23	-11	115	19	0	102
All Years	2	10	39	-44	-14	-150	9	-5	-2	26	17	18	-96

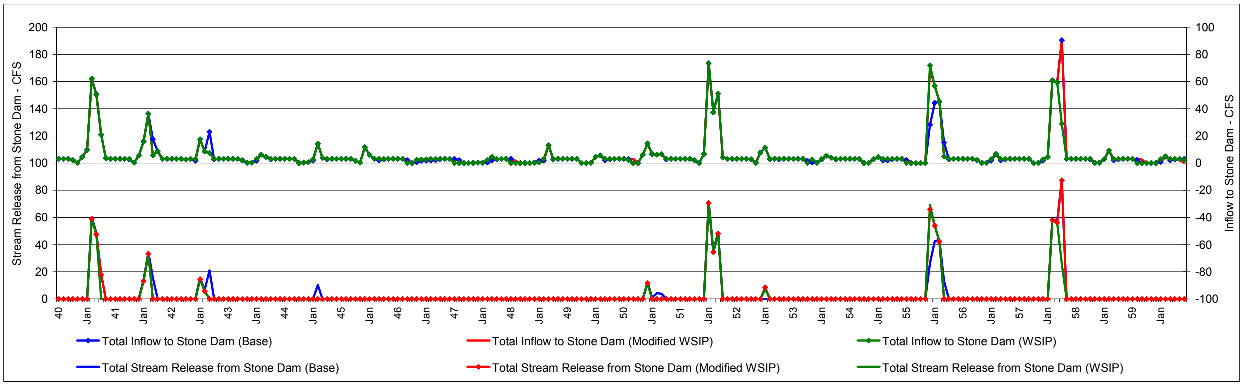
APPENDIX O2

Figure 2.8-3
Stone Dam Stream Release and Inflow

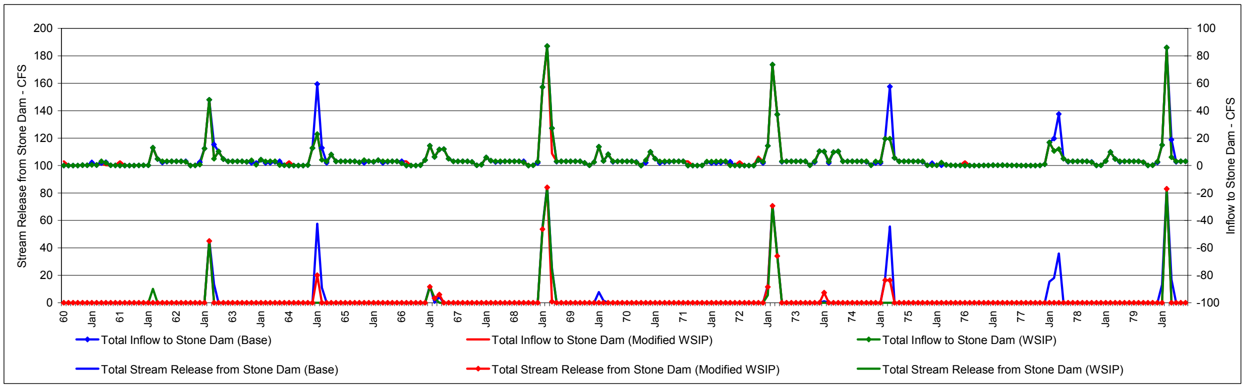
1920 - 1939



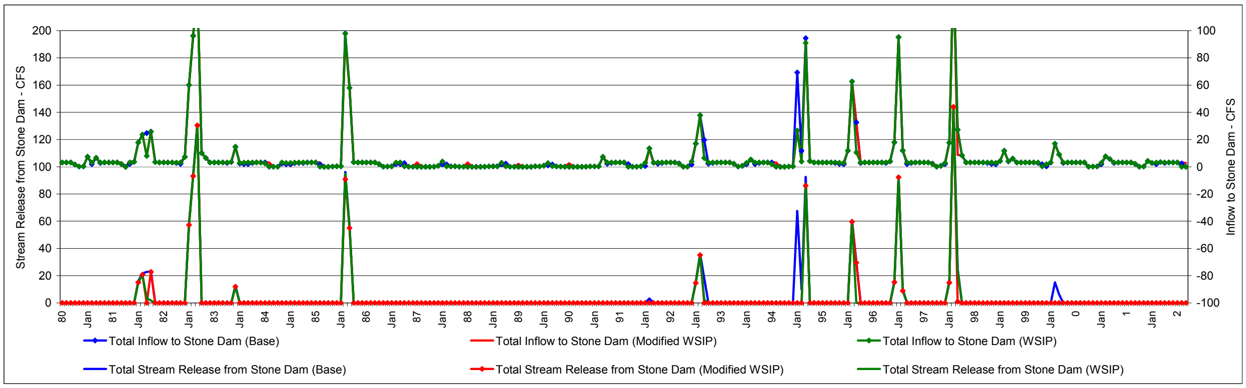
1940 - 1959



1960 - 1979



1980 - 2002



APPENDIX O2

Table 2.8-5

Total Stream Release from Stone Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	312	1,514	3,162	2,011	475	0	0	0	0	0	7,474
Above Normal	0	0	42	205	985	278	0	0	0	0	0	0	1,509
Normal	0	0	45	33	100	0	0	0	0	0	0	0	179
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	78	344	841	450	93	0	0	0	0	0	1,806

Total Stream Release from Stone Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	324	1,493	3,176	2,188	103	0	0	0	0	0	7,282
Above Normal	0	0	42	108	734	120	0	0	0	0	0	0	1,003
Normal	0	0	45	27	135	0	0	0	0	0	0	0	208
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	81	319	798	452	20	0	0	0	0	0	1,669

Difference in Total Stream Release from Stone Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Modified WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-11	21	-14	-176	373	0	0	0	0	0	193
Above Normal	0	0	0	97	250	158	0	0	0	0	0	0	505
Normal	0	0	0	6	-35	0	0	0	0	0	0	0	-29
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-2	25	42	-2	73	0	0	0	0	0	137

Table 2.8-6

Total Stream Release from Stone Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	312	1,514	3,162	2,011	475	0	0	0	0	0	7,474
Above Normal	0	0	42	205	985	278	0	0	0	0	0	0	1,509
Normal	0	0	45	33	100	0	0	0	0	0	0	0	179
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	78	344	841	450	93	0	0	0	0	0	1,806

Total Stream Release from Stone Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	164	1,819	3,252	2,509	479	0	0	0	0	0	8,223
Above Normal	0	0	46	384	1,174	921	0	0	0	0	0	0	2,525
Normal	0	0	49	30	197	0	0	0	0	0	0	0	276
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	51	440	917	680	94	0	0	0	0	0	2,182

Difference in Total Stream Release from Stone Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Modified WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	149	-305	-91	-498	-4	0	0	0	0	0	-748
Above Normal	0	0	-4	-180	-190	-643	0	0	0	0	0	0	-1,017
Normal	0	0	-4	3	-97	0	0	0	0	0	0	0	-98
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	28	-96	-76	-230	-1	0	0	0	0	0	-376

APPENDIX O3

Memorandum

Subject: **HH/LSM Assumptions and Results – WSIP Variants 2018 WSIP**

From: **Daniel B. Steiner**

Date: **May 6, 2008**

1. Introduction

This memorandum summarizes assumptions for and describes the interpretation of HH/LSM results for the simulation of the WSIP variant referenced as the “2018 WSIP.” The PEIR analyzed three WSIP variants described as: WSIP Variant 1 - All Tuolumne; WSIP Variant 2 - Regional Desalination for Drought; and WSIP Variant 3 - 10% Rationing. The major difference between the variants and the proposed program (WSIP) was either in the proposed source(s) of water supply or in the drought-year rationing level of service (LOS). The 2018 WSIP variant supplements the previously described analyses. Tables 1-1 and 1-2 summarize the components, various modeling assumptions, and performance and hydrologic results for the 2018 WSIP variant in comparison to the modeled existing (2005) base setting (with Calaveras Reservoir constrained by DSOD restrictions) and the WSIP setting.

The hydrology that would result under this variant is primarily discussed in terms of a comparison to the WSIP and contrasted to the baseline condition of the PEIR, namely the simulated current (2005) operation of the SFPUC regional water system assuming that the Calaveras and Crystal Springs Reservoirs operation are constrained by DSOD restrictions. Only primary hydrologic parameters such as projected water deliveries, reservoir storage, and stream flows are compared, and only those parameters that have been identified as key hydrologic factors that lead to environmental impacts are illustrated.

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Table 1-1
Setting Characteristics and Modeling Assumptions (Part 1/3)

Assumptions and Characteristics of Setting and/or Program	Units	Baseline: Baseline Conditions[1] - Calaveras Constrained	Proposed WSIP	WSIP Variants[3]: 2018 WSIP
Time Horizon for Setting of Analysis / Date[4]		2005	2030	2018 / 2030
HH/LSM Simulation Study Name[5]		Base1LT	WSIP1LT	2018WSIPLT
System Wide Parameters				
Customer Purchase Request (Demand Level)[6]	MGD	265	300	275 / 300
Demand Level Supplied from Other Sources[7]				
Regional Recycled Water/Conservation/Groundwater in SF	MGD	0	10	10
Other Regional Recycled Water/Conservation/Groundwater	MGD	0	0	0
Demand Level Supplied from Tuolumne + Local Watersheds[8]	MGD	265	290	265
Average Annual Deliveries and Supplies[9]				
Deliveries from Tuolume + Local Watersheds (Average Annual)	MGD	258	287	
Supply or Deliveries from Other Sources - Regional Recl/Cons/GW	MGD	0	10	
Total Deliveries and Supply for Demand Level (Average Annual)	MGD	258	297	
Features and Facilities[10]				
Regional Reclaimed Water/Conservation/Groundwater - SF			●	●
Regional Reclaimed Water/Conservation/Groundwater - Other				
Calaveras Reservoir - 12.4 BG (Constrained)		●		
Calaveras Reservoir - 31.6 BG (Restored/Unconstrained)			●	●
Calaveras Reseroivr Release for Fish			●	●
Calaveras Reservoir Release for Fish & Flow Recapture			●	●
Alameda Creek Diversion Dam Bypass Flow & Recapture				
Pilarcitos Reservoir Pump for Creek Summer Release				
Crystal Springs Reservoir - 18.52 BG (Constrained)		●		
Crystal Springs Reservoir - 20.28 BG (Restricted)				
Crystal Springs Reservoir - 22.15 BG (Restored/Unconstrained)			●	●
Sunol Valley Water Treatment Plant Expansion			●	●
Sunol Valley Water Treatment Plant Feed from SJPL			●	●
Harry Tracy Water Treatment Plant Expansion			●	●
Bay Division Pipeline Increased Conveyance			●	●
San Joaquin Pipeline Increased Conveyance			●	●
Desalination Project				
Westside Groundwater Project			●	●
Tuolumne River Transfer			**29,350 (From Storage)**	**2,300 (From Storage)**
Water Supply Reliability[11]				
Action	Level	Rationing %	Rationing %	Rationing %
Implement Drought Water Supply Action (Westside GW or Desal)	1	NA	GW	GW
Rationing (Level 1)	2	10	10	10
Rationing (Level 2)	3	20	20	20
Rationing (Level 3)	4	25	25	25
	Years	Action Level	Action Level	Action Level
	1921			
	1924	2	1	1
	1925		1	
	1926		1	
	1929		1	
	1930		1	
	1931	3	2	2
	1932			
	1933			
	1934	2	1	1
	1935			
	1939			
	1944			
	1946			
	1947			
	1948		1	1
	1949			
	1950		1	
	1953			
	1954			
	1955		1	
	1957			
	1959			
	1960	2	1	1
	1961	3	2	2
	1962			
	1964		1	
	1966			
	1968			
	1971			
	1972		1	
	1976	2	1	1
	1977	3	2	2
	1979			
	1981			
	1984			
	1985		1	
	1987	2	1	1
	1988	3	2	2
	1989	3	2	2
	1990	3	3	3
	1991	3	2	2
	1992	3	3	3
	1994	2	1	1
	DD1993	4	3	3
	DD1994	4	3	3
Max Drought Rationing - Policy Cap[12]	DD	Incidental 25%	20%	20%
	Historical	Incidental 20%	20%	20%

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Table 1-1
Setting Characteristics and Modeling Assumptions (Part 2/3)

Assumptions and Characteristics of Setting and/or Program	Units	Baseline: Baseline Conditions[1] - Calaveras Constrained	Proposed WSIP	WSIP Variants[3]: 2018 WSIP
System Wide Parameters				
Incremental Supply - Average[13]				
System Customer Purchase Request Level	MGD	265	300	275 / 300
Demand Level Supplied from Other Sources	MGD	0	10	10
Demand Level Supplied from Tuolumne + Local Watersheds	MGD	265	290	265 / 290
System Deliveries	MGD	258	287	263
Regional Desalination	MGD	0	0	0
San Joaquin Pipelines (Tuolumne Diversion)	MGD	221	245	223
Inferred Local Watershed Production	MGD	37	41	40
Addt'l Tuolumne Diversion (Compared to Calaveras Constrained)	MGD	*221*	24	2
Incremental Design Drought Supply[14]				
From Other Sources - Regional Recl/Cons/GW (Every Year)	MGD	0	10	10
Restoration of Calaveras Reservoir Capacity (w/ flow recapture)	MGD	0	7	7
Restoration of Crystal Springs Capacity		0	1	1
MID/TID Transfer to SFPUC (Results in additional diversion from TR)	MGD	0	25	2
Westside Basin Conjunctive Use (8,100 acre-feet Storage)	MGD	0	6	6
Regional Desalination (26 mgd)	MGD	0	0	0
Sum of Incremental Supplies	MGD	0	48	26
Yield - Without Other Sources Added (Compared to Calaveras Constrained)	MGD	219	257	235
Yield - With Other Sources Added (Compared to Calaveras Constrained)	MGD	219	267	245
Design Drought Delivery Calculator[15]		2	3	7
	MGD			
Average Annual Delivery During	Year 1	265	290	265
Average Annual Delivery During	Year 2	239	290	265
Average Annual Delivery During	Year 3	212	261	239
Average Annual Delivery During	Year 4	212	261	239
Average Annual Delivery During	Year 5	212	232	212
Average Annual Delivery During	Year 6	212	261	239
Average Annual Delivery During	Year 7	212	232	212
Average Annual Delivery During	Year 8	199	232	212
Average Annual Delivery During	Last 6 Mo	99	116	106
	DD Ave	219	256	234
Firm Yield (Nominal) Not Including Other Sources	MGD	219	256	234
Local System Operational Parmeters				
Crystal Springs Reservoir Operation				
Storage - Minimum/Maximum	BG	5.4 - 18.52	5.4 - 22.15	Same
	TAF	16.6 - 56.8	16.6 - 68.0	as
Fall/Winter Operation Storage		16.52 BG (50.7 TAF)	18.55 BG (56.9 TAF)	WSIP
Stream Release		Up to 250 cfs to not exceed 18.52 BG	Up to 250 cfs to not exceed 21 BG	Same as WSIP
Calaveras Reservoir Operation				
Storage - Minimum/Maximum	BG	8.4 - 12.4	8.4 - 31.5	Same
	TAF	25.7 - 38.0	25.7 - 96.8	as
Fall/Winter Operation Storage		10.3 BG (31.6 TAF)	27.0 BG (82.9 TAF)	WSIP
Alameda Creek Release/Recapture[16]	AFY	0	Up to 6,300	Same as WSIP
San Andreas Reservoir Operation				
Storage - Minimum/Maximum	BG	3.0 - 6.2	3.0 - 6.2	Same
	TAF	9.2 - 19.0	9.2 - 19.0	as
Fall/Winter Operation Storage		5.6 BG (17.2 TAF)	5.6 BG (17.2 TAF)	WSIP
San Antonio Reservoir Operation				
Storage - Minimum/Maximum	BG	1.0 - 16.5	1.0 - 16.5	Same
	TAF	3.1 - 50.5	3.1 - 50.5	as
Fall/Winter Operation Storage		15.9 BG (48.8 TAF)	15.9 BG (48.8 TAF)	WSIP
Pilarcitos Reservoir Operation				
Storage - Minimum/Maximum	BG	0.66 - 0.97	0.66 - 0.97	Same
	TAF	2.0 - 3.0	2.0 - 3.0	as
Fall/Winter Operation Storage		0.72 BG (2.2 TAF)	0.72 BG (2.2 TAF)	WSIP
Water Treatment Plants				
Sunol Valley Water Treatment Plant Maximum	MGD	120	160	Same as WSIP
		90 MGD from Calaveras	90 MGD from Calaveras + Recapture	Same as WSIP
Sunol Valley Water Treatment Plant Minimum	MGD	20	20	Same as WSIP
		From Calavers & San Antonio & SJPL	From Calavers & San Antonio & SJPL	Same as WSIP
Harry Tracy Water Treatment Plant Maximum	MGD	120	140	Same as WSIP
Harry Tracy Water Treatment Plant Minimum	MGD	20	20	Same as WSIP
Conveyance				
Bay Division Pipeline Maximum		340 MGD Jun - Sep 320 MGD Apr, May & Oct 290 MGD Nov - Mar	380 MGD Apr - Oct 320 MGD Nov - Mar	Same as WSIP
Bay Division Pipeline Maintenance		Cycle one pipeline out Nov - Mar each year (average remaining capacity rotation) maximum 230 MGD	Same as Baselines, except maximum 320 MGD	Same as WSIP

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Table 1-1
Setting Characteristics and Modeling Assumptions (Part 3/3)

Assumptions and Characteristics of Setting and/or Program	Units	Baseline: Baseline Conditions[1] - Calaveras Constrained	Proposed WSIP	WSIP Variants[3]: 2018 WSIP
Tuolumne River System Operational Parameters				
Hetch Hetchy Reservoir Operation				
Storage - Minimum/Maximum	TAF	26.1 - 360.4	26.1 - 360.4	Same as
Fall/Winter Operation Storage		30 TAF winter buffer	30 TAF winter buffer	WSIP
1987 Stipulation Minimum Release Flows		Yes	Yes	Same as WSIP
1987 Stipulation Supplemental Release Flows		No	No	Same as WSIP
Cherry Reservoir Operation				
Storage - Minimum/Maximum	TAF	1.0 - 273.3	1.0 - 273.3	Same as
Fall/Winter Operation Storage		25.3 TAF winter buffer	25.3 TAF winter buffer	WSIP
Eleanor Reservoir Operation				
Storage - Minimum/Maximum	TAF	0.0 - 27.1	0.0 - 27.1	Same as
Fall/Winter Operation Storage		Required Minimum Storage	Reqrd Minimum Stor	WSIP
New Don Pedro Water Bank Account				
Storage - Minimum/Maximum	TAF	0.0 - 570.0 Temporary storage up to 740 TAF during Apr - Sep	0.0 - 570.0 Temp stor up to 740 TAF during Apr - Sep	Same as WSIP
Conveyance				
San Joaquin Pipelines Maximum	MGD	290	313	Same as WSIP
San Joaquin Pipelines Minimum	MGD	70	70	Same as WSIP
San Joaquin Pipelines Flow Rate Changes		11 Stepwise Surrogate minimum changes by allowing only 7 changes in a year	17 Stepwise Allow up to 7 changes in a year (surrogate)	Same as WSIP Same as WSIP
San Joaquin Pipelines Maintenance		Cycle one pipeline out Nov - Mar each year (average remaining capacity rotation) maximum 210 MGD	Cyclic 5-year mantenance (see note)	Same as WSIP
TID/MID Operational Parameters			Note: Cyclic 5-year maintenance, maximum capacity available Apr - Oct all years 271 MGD available all other months except 0 MGD available Year 5 Nov - Dec and 135.5 MGD available Year 1 and Year 3 Dec	
Districts' Tuolumne Diversion[17]		Varies annually based on land use and water availability Annual average 875 TAF	Set equal to baseline conditions. SFPUC effects measured by the result of reducing inflow to DP and its effect upon La Grange releases to the TR	Same as WSIP
Tuolumne River La Grange Flow Releases				
Don Pedro, 1996 FERC		X	X	X
VAMP - considered but not modeled[18]		X	X	X

APPENDIX O3

Table 1-2
Summary of Modeling Results (Part 1/2)

HH/LSM Simulation Results	Units	Baseline: Baseline Conditions[1] - Calaveras Constrained	Proposed WSIP	WSIP Variants[3]: 2018 WSIP
Design Drought Production & Disposition[19]				
San Joaquin Pipeline Diversion	MGD	208.7	235.0	212.2
Bay-Area Deliveries	MGD	218.3	248.9	226.8
Added Groveland & Coastside Delivery	MGD	2.6	3.6	2.6
Local Reservoir Evaporation	MGD	10.7	12.5	12.7
Inflow from ACDD	MGD	1.3	1.6	1.6
Flow Recapture	MGD	0	5.3	5.2
Local Reservoir Stream Release	MGD	0.6	5.4	5.5
Desalination	MGD	0	0	0
Westside Basin	MGD	0	5.6	6.4
District Transfer to NDP Water Bank	MGD	0	24.7	1.9
Local Storage - Begin	MG	53,854	77,310	77,310
Local Storage - End	MG	18,403	18,495	18,797
Study Average Production & Disposition (1921-02)[20]				
Tuolumne River System				
Reservoirs				
Hetch Hetchy				
Inflow	AF	749,605	749,605	749,605
River	AF	275,255	267,021	276,837
Stream Minimum Release	AF	65,728	65,593	65,828
Tunnel	AF	470,709	478,932	469,171
Evaporation	AF	3,893	3,869	3,875
Reservoir	AF	281,938	275,235	285,919
Cherry				
Inflow	AF	279,293	279,293	279,293
Eleanor Gravity	AF	289	289	289
Eleanor Pump	AF	118,251	118,274	118,337
River	AF	41,636	41,439	41,360
Stream Minimum Release	AF			
Tunnel	AF	352,692	352,915	353,059
Evaporation	AF	3,505	3,501	3,500
Reservoir	AF	239,971	239,309	239,015
Eleanor				
Inflow	AF	169,617	169,617	169,617
Eleanor Gravity	AF	289	289	289
Eleanor Pump	AF	118,251	118,274	118,337
River	AF	49,171	49,148	49,085
Stream Minimum Release	AF			
Evaporation	AF	1,906	1,906	1,906
Reservoir	AF	22,191	22,191	22,191
Don Pedro Reservoir				
Inflow	AF	1,587,517	1,560,828	1,585,611
MID Diversion	AF	302,054	302,055	302,055
TID Diversion	AF	573,164	573,168	573,168
LaGrange Total Stream	AF	668,876	644,009	667,363
LaGrange Minimum Stream Release	AF	221,477	221,477	221,477
Total Evaporation	AF	43,493	42,604	43,366
Reservoir	AF	1,472,337	1,434,872	1,466,669
Water Bank Account				
Balance	AF	514,299	516,733	513,882
Transfer	AF	0	29,350	2,300
San Joaquin Pipelines				
Volume (AF)	AF	247,763	274,450	249,723
Volume (MG)	MG	80,734	89,429	81,372
Rate (MGD)	MGD	221	245	223
Max Rate (MGD)	MGD	290	313	313
Min Rate (MGD)	MGD	70	0	0
East Bay System				
Reservoirs				
Calaveras				
Inflow	MG	12,368	12,368	12,368
From ACDD	MG	1,316	1,730	1,715
Stream	MG	3,660	4,167	4,224
Stream Flow Recapture	MG	0	1,538	1,539
To SVWTP	MG	9,013	8,244	8,163
To San Antonio	MG	0	0	0
Evaporation	MG	1,023	1,704	1,712
Resevoir	MG	10,969	28,170	28,372
San Antonio				
Inflow	MG	2,468	2,468	2,468
From Calaveras/SJPL	MG	1,173	1,734	1,326
Stream	MG	991	613	962
To SVWTP	MG	1,693	2,628	1,813
Evaporation	MG	1,012	973	1,026
Resevoir	MG	15,323	14,490	15,569
Alameda Creek Diversion Dam				
Inflow	MG	4,197	4,197	4,197
To Calaveras Reservoir	MG	1,316	1,730	1,715
Spill	MG	2,881	2,467	2,482
Alameda Creek Confluence				
Accretion	MG	625	625	625
From ACDD	MG	2,881	2,467	2,482
From Calaveras Dam	MG	3,660	4,167	4,224
At Confluence	MG	7,167	7,259	7,331
Treatment Plants				
SVWTP Total	MG	13,662	15,738	15,720
From Calaveras	MG	9,013	8,244	8,163
From San Antonio	MG	1,693	2,628	1,813
From SJPL	MG	2,956	3,329	4,205
From Recapture	MG	0	1,538	1,539
SVWTP Total MGD	MGD	37	43	43
SVWTP Max MGD	MGD	120	158	158
SVWTP Min MGD	MGD	20	20	20

APPENDIX O3

Table 1-2
Summary of Modeling Results (Part 2/2)

HH/LSM Simulation Results	Units	Baseline Baseline Conditions[1] - Calaveras Constrained	Proposed WSIP	WSIP Variants[3] 2018 WSIP
Peninsula System				
Reservoirs				
Crystal Springs				
Inflow	MG	3,722	3,722	3,722
From San Andreas	MG	0	0	0
From Pilarcitos and SJPL	MG	8,045	7,643	8,093
Stream	MG	773	325	569
Pump to San Andreas	MG	9,438	9,005	9,426
Pump to Coastside	MG	247	591	255
Evaporation	MG	1,323	1,490	1,565
Reservoir	MG	16,360	18,621	19,663
San Andreas				
Inflow	MG	1,428	1,428	1,428
From other Streams	MG	9,954	9,590	9,990
Stream	MG	0	0	0
To HTWTP	MG	10,851	10,487	10,887
Evaporation	MG	530	531	531
Reservoir	MG	5,892	5,882	5,893
Pilarcitos				
Inflow		1,297	1,297	1,297
To San Andreas	MG	516	584	564
For Stone Diversion	MG	262	280	262
Stream other than Diversion	MG	417	332	369
Evaporation	MG	103	102	103
Reservoir	MG	776	767	775
Stone Dam				
Accretion blw Pilarcitos	MG	167	211	168
Pilarcitos non-diversion Release	MG	417	332	369
Pilarcitos Release for Diversions	MG	584	543	537
Diversion to Coastside	MG	167	211	168
Diversion to Crystal Springs	MG	142	180	156
Spill past Stone	MG	860	695	751
Treatment Plants				
HTWTP Total	MG	10,851	10,487	10,887
HTWTP Total MGD	MGD	30	29	30
HTWTP Max MGD	MGD	149	106	107
HTWTP Min MGD	MGD	20	20	20
Other Facilites				
Westside Basin Net	MG	0	11	11
Desalination Input	MG	0	0	0
Additional Information				
Total Local Reservoir Stream Release	MG	5,842	5,437	6,124
Total Local Reservoir Stream Evaporation	MG	3,991	4,800	4,936
Deliveries				
In-City	MG	29,589	26,686	27,487
South Bay	MG	43,106	52,906	45,267
Crystal Springs	MG	15,120	16,931	15,895
San Andreas	MG	5,400	6,604	5,861
Coastside	MG	675	1,082	1,082
Groveland	MG	365	365	365
Total Deliveries	MG	94,255	104,574	95,957
Total Deliveries	MGD	258	287	263
Storage				
Total Local Storage Begin	MG	49,849	71,363	71,873
Total Local Storage End	MG	43,129	65,197	69,957
Residual Difference during 82-year Simulation	MGD	0.22	0.21	0.06
Westside Storage Begin	MG	0	23,474	23,474
Westside Storage End	MG	0	24,363	24,363
Residual Difference during 82-year Simulation	MGD	0.00	-0.03	-0.03

Notes for Table 1-1 and Table 1-2

1. Baseline condition represents the existing conditions at the time of NOP publication in September 2005. This is the baseline used to assess WSIP program impacts and impact significance. This setting is indicative of DSOD restrictions on Calaveras and Crystal Springs Reservoirs.

2. N/A

3. These scenarios represent CEQA alternatives that vary from the WSIP on key components in a manner expected to avoid or reduce potentially significant effects of the proposed program.

4. The time horizon for the setting of the scenario. The baseline condition scenario is depicted for recent conditions, while the proposed WSIP, variants, and alternatives are depicted for the future at full buildout and implementation (i.e., conditions in the year 2030). The 2018 WSIP variant assesses conditions at the time that full current contract buildout occurs.

5. HH/LSM simulation study name.

6. The customer purchase request (demand) information is based on the demand and request studies prepared by the SFPUC in coordination with the wholesale customers. This demand on the regional water system includes both the SFPUC retail customers and wholesale customers. The current (2005) average annual demand is 265 mgd and the projected 2030 average annual demand is 300 mgd, assuming the SFPUC adopts the updated wholesale customer purchase requests as part of renewing the Master Sales Agreement with these customers (due in 2009).

7. Certain scenarios include development of additional water supply from a combination of recycled water projects, groundwater projects, and conservation, utilized every year and not subject to reduction during drought.

8. The average annual demand for supplies from the combination of SFPUC local watershed, Tuolumne River, and programs not included in the regional water conservation, recycling, and groundwater programs shown.

9. Modeled results for SFPUC deliveries, with supplies added for regional water conservation, recycling, and groundwater programs. Total deliveries and supply will be less than full customer purchase requests due to rationing in some years.

10. Shows only the features that affect hydrologic results of the system operation simulations. Additional projects are included in the WSIP, variants and alternatives.

11. Illustrates the frequency and severity of water supply action or the severity of systemwide rationing. Only years when variable water supply component is implemented or rationing occurs are shown. "DD" illustrates the shortage results for years included in the prospective drought period of the SFPUC design drought. These years contribute to establishing system operation protocols but are not included in the hydrologic assessment analyses.

12. Rationing policy cap: The SFPUC WSIP level of service goal is to maintain rationing on the regional system at no more than 20% during any one year of the drought. Some alternatives do not achieve this level of service goal. Performance is indicated for the Design Drought ("DD") sequence and for the "Historical" hydrologic sequence.

13. Water supply elements develop water in different amounts from year-to-year, and in some instances only develop water during dry years. This information is provided to illustrate a comparison between local watershed supplies, Tuolumne River supplies and other identifiable water supplies used to meet system purchase requests. Values are stated in units of average annual quantities during the simulated historical sequence.

14. Results from HH/LSM analysis of each scenario. Values represent the average annual production of each element of supply during the design drought period.

15. Simplified calculation of system deliveries during the SFPUC design drought. The value represents the application of system-wide shortages to the demand level being met with SFPUC local watershed, Tuolumne River, and other developed supplies and does not include supplies from regional water conservation, recycled water or groundwater projects. Average value may be slightly misstated (up to 3 mgd) due to metric of analysis that does not account for differences in residual storage between studies. "Nominal" Firm Yield represents the yield of each scenario after adjustment for minor residual storage differences.

16. Supplemental releases from Calaveras Reservoir for fisheries (1997 CDFG MOU) of up to 6,300 acre-feet per year and the Alameda Creek recapture facility project are tied to implementation of the Calaveras Dam Replacement project (SV-2). When the dam is replaced and capacity restored, the flow release and recapture will both occur. The release requirement is based on supplementing other occurring flows below Calaveras Reservoir, sometimes not requiring the full 6,300 acre-feet.

17. SFPUC actions are assumed to not change TID/MID diversions so as to isolate and possibly overstate the WSIP's effects on the Tuolumne River below La Grange Dam. The Districts' diversions are assumed to be constant among the scenarios to provide comparable results of the WSIP-alone effects. The exception is for the Modified WSIP Alternative, in which the TID/MID diversion is reduced by the amount of SFPUC transfer.

18. Participation in the San Joaquin River Agreement is assumed. Although the agreement expires after 2010, it is assumed that a subsequent similar agreement or requirement of the Districts will occur. The HH/LSM does not explicitly model the Districts' participation in the agreement; however, their participation if modeled would result in only minor differences in results and would not change impact conclusions.

19. From HH/LSM results for modeling the SFPUC design drought period.

20. From HH/LSM results for modeling the system operations for the historical hydrologic period 1921-2002. Values indicate average annual quantities during simulated historical period.

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2. WSIP Variant – 2018 WSIP

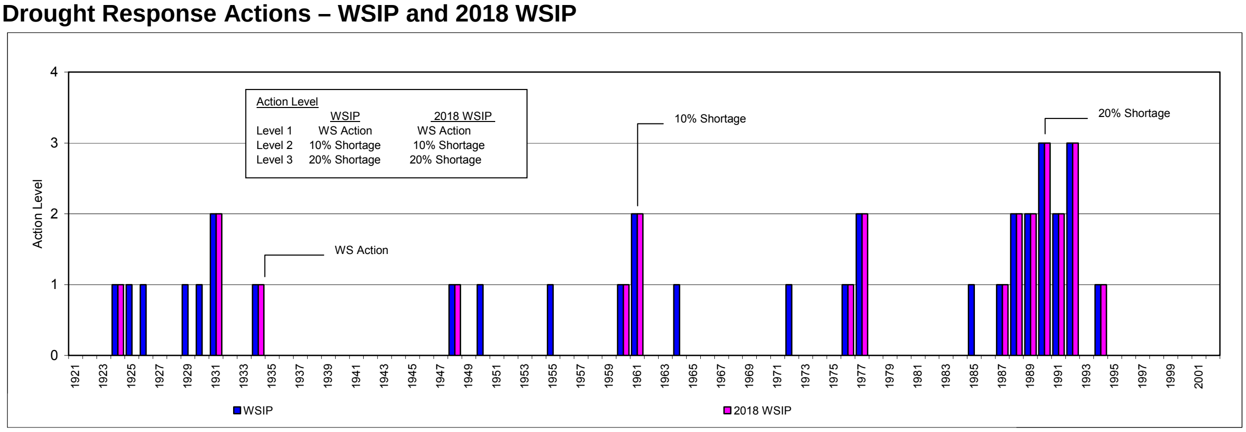
The 2018 WSIP variant would in effect be a combination of the proposed WSIP and the water purchase request of the CEQA No Purchase Request Increase Alternative applicable for the period through the year 2018. This variant would limit the SFPUC wholesale customers' interim future purchases to the terms of the existing Master Water Sales Agreement through 2018. Under that agreement, the wholesale customers may purchase up to 184 mgd on an average annual basis, subject to reductions in the event of a drought, water shortage, earthquake, other natural disaster, or rehabilitation and maintenance of the system. Under the variant, the customer purchase requests through 2018 would not exceed 184 mgd for the wholesale customers. It is assumed that the total customer purchase requests to be served by the regional system through 2018 would be 275 mgd, consisting of 184 mgd for the wholesale customers and 91 mgd for the retail customers. The increased water demand would be offset with 10 mgd from recycled water, groundwater, and conservation projects in San Francisco. Although the net demand through 2018 on the regional water system would be the same as the current demand (265 mgd), the improvement in delivery reliability requires development of additional system yield. The additional deliveries would be served through additional Tuolumne River diversions and increased use of local watershed supplies from restoration of Calaveras Reservoir and Crystal Springs Reservoir. Supplemental supplies would include implementation of the Westside Basin Groundwater Program and a water transfer with TID/MID.

In the context of the WSIP planning horizon for the year 2030, this analysis provides insight into the hydrologic effects of the program at an interim point in time (2018), or it provides a depiction of the WSIP if a delivery limitation is continued through 2030. Should the deliveries of the regional system be allowed to increase after 2018, the analysis described for the WSIP depicts the hydrologic effects associated with increased deliveries. The following description focuses on the time at which the variant's net demand of 265 mgd would occur.

2.1 Water Deliveries and Drought Response Actions

Compared to the WSIP setting for 2030, the regional system's resources are required to serve a net 265 mgd demand (275 mgd purchase request less 10 mgd of recycled water, groundwater, and conservation projects) instead of a net 290 mgd demand. As part of the formulation of this variant, the water transfer from TID/MID was sized to provide the same frequency and severity of water shortages (percentage-wise) for the variant as that occurring in the WSIP setting during the design drought, although systemwide water deliveries would be a net 265 mgd in the variant setting as compared to the WSIP setting delivery of a net 290 mgd. This objective required the water transfer to be sized at 2,300 acre-feet per year. With a water supply formulated about comparable to that provided for the WSIP setting (only proportionately smaller for a lesser demand), the implementation of rationing and the severity of rationing from the SFPUC system during drought periods would be the same. Table 1-1 compares the drought response actions for the proposed program and the variant. Figure 2.1-1 illustrates the occurrence of drought response actions for the simulated 82-year historical period (1921-2002).

Figure 2.1-1
Drought Response Actions – WSIP and 2018 WSIP



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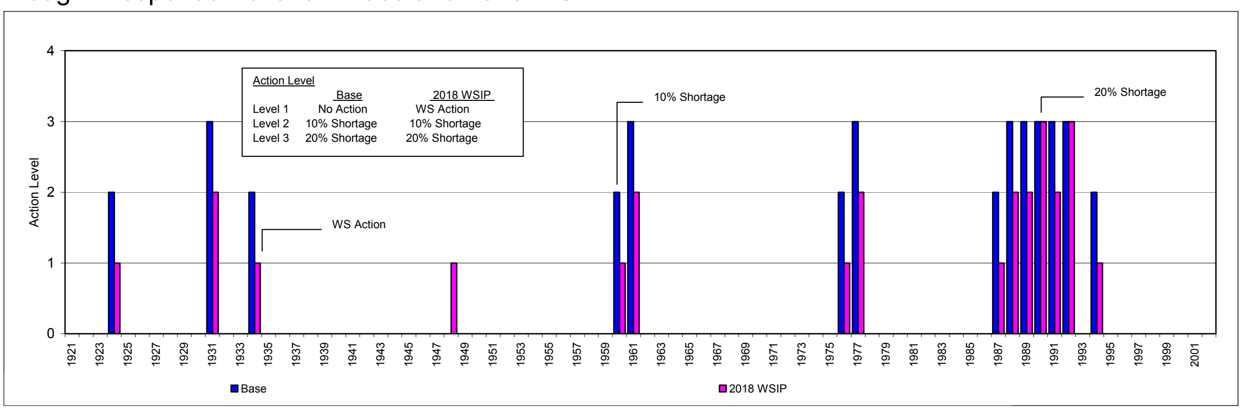
In Figure 2.1-1, years with bars showing a “1” or greater level of action indicate periods when a supplemental water supply action is initiated. In both settings, the water supply action is the use of the Westside Groundwater Basin Program to supplement SFPUC water deliveries. Also occurring in both settings is the water transfer supplemental supply from TID/MID every year. Action levels greater than “1” indicate the imposition of delivery shortages (rationing) to SFPUC customers. SFPUC customers would experience the same frequency and severity of shortages (percentage-wise). The triggering of the Westside Basin Groundwater Program supplemental supply would occur more frequently in the WSIP setting, typically as a precautionary response to potential prolonged drought or to retain local area storage. With the lesser demand of the variant, a less frequent precautionary response would be needed.

The same form of information is shown in Figure 2.1-2 for the comparison between the variant and the base (existing) settings. There is not a level 1 action in the base setting. Without supplemental resources, the existing system only has delivery shortage measures available to cope with drought. In the base setting, the shortage measure is imposed during level 2 (10 percent) and level 3 (20 percent). These percentages of shortage are applied to both the variant and the base settings for these action levels, and they are applied to the same level of net water demand (265 mgd). During this simulation period, rationing would not need to exceed 20 percent in either setting; however, in the variant setting the occurrence of additional water supplies lessens the frequency and severity of water delivery shortages.

Figure 2.1-2
Drought Response Actions – Base and 2018 WSIP



Not illustrated in Figure 2.1-2 but shown in Table 1-1 are the delivery shortages anticipated during the entire SFPUC design drought. During the design drought, the base setting does not have a viable operation without exceeding a 20 percent shortage level. The base setting exceeds the 20 percent shortage level (requires 25 percent rationing) during the last 18 months of the design drought. The variant would viably provide deliveries without exceeding a 20 percent shortage level.

The difference in water deliveries between the proposed program and the variant is shown chronologically for the 82-year simulation in Table 2.1-1. There would be less water delivered to the region by the SFPUC in all years, a result of serving a lesser purchase request (275 mgd instead of 300 mgd, and a lesser net demand of 265 mgd instead of 290 mgd).

Comparing the variant setting to the base setting, Table 2.1-2 illustrates the difference in water deliveries between the two settings. The increases in deliveries under the variant setting occur due to an improvement in water delivery reliability, which reduces the severity of water shortages. The shifting in the pattern of deliveries (most evident during years when there is no increase in total annual delivery) is indicative of the anticipated seasonal effect of recycled water, groundwater, and conservation projects within the pattern of the projected future, albeit limited, purchase request. The 82-year average increase in deliveries amounts to approximately 3.5 mgd.

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Table 2.1-1

Difference in Total System-wide Delivery (MG) 2018 WSIP minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
1921	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1922	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1923	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1924	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1925	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1926	-801	-620	-508	-433	-479	-637	-745	-901	-985	-1,074	-1,036	-907	-9,124	-9,124
1927	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1928	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1929	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1930	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1931	-801	-620	-508	-433	-479	-637	-745	-901	-984	-940	-906	-806	-8,759	-9,124
1932	-720	-577	-485	-426	-448	-589	-667	-796	-861	-1,074	-1,036	-907	-8,586	-8,220
1933	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1934	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1935	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1936	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1937	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1938	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1939	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1940	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1941	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1942	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1943	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1944	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1945	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1946	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1947	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1948	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1949	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1950	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1951	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1952	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1953	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1954	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1955	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1956	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1957	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1958	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1959	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1960	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1961	-801	-620	-508	-433	-479	-637	-745	-901	-984	-940	-906	-806	-8,759	-9,124
1962	-720	-577	-485	-426	-448	-589	-667	-796	-861	-1,074	-1,036	-907	-8,586	-8,220
1963	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1964	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1965	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1966	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1967	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1968	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1969	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1970	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1971	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1972	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1973	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1974	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1975	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1976	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1977	-801	-620	-508	-433	-479	-637	-745	-901	-984	-940	-906	-806	-8,759	-9,124
1978	-720	-577	-485	-426	-448	-589	-667	-796	-861	-1,074	-1,036	-907	-8,586	-8,220
1979	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1980	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1981	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1982	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1983	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1984	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1985	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1986	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1987	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1988	-801	-620	-508	-433	-479	-637	-745	-901	-984	-940	-906	-806	-8,759	-9,124
1989	-720	-577	-485	-426	-448	-589	-667	-796	-861	-940	-906	-806	-8,220	-8,220
1990	-720	-577	-485	-426	-448	-589	-667	-796	-861	-832	-808	-708	-7,918	-8,220
1991	-643	-512	-430	-381	-406	-522	-598	-705	-760	-940	-906	-806	-7,608	-7,306
1992	-720	-577	-485	-426	-448	-589	-667	-796	-861	-832	-808	-708	-7,918	-8,220
1993	-643	-512	-430	-381	-406	-522	-598	-705	-760	-1,074	-1,036	-907	-7,973	-7,306
1994	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1995	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1996	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1997	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1998	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1999	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
2000	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
2001	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
2002	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
Avg (21-02)	-791	-614	-504	-431	-475	-631	-736	-888	-970	-1,058	-1,021	-895	-9,013	-9,013

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Table 2.1-2

Difference in Total System-wide Delivery (MG) 2018 WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
1921	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1922	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1923	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1924	9	-9	-47	-59	-42	-28	-18	6	24	1,273	1,226	1,002	3,339	0
1925	827	578	386	262	390	641	839	1,035	24	71	59	33	5,145	8,483
1926	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1927	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1928	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1929	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1930	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1931	9	-9	-47	-59	-42	-28	-18	6	24	1,069	1,040	905	2,851	0
1932	827	682	590	521	558	720	812	925	986	71	59	33	6,785	9,636
1933	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1934	9	-9	-47	-59	-42	-28	-18	6	24	1,273	1,226	1,002	3,339	0
1935	827	578	386	262	390	641	839	1,035	24	71	59	33	5,145	8,483
1936	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1937	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1938	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1939	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1940	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1941	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1942	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1943	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1944	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1945	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1946	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1947	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1948	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	1	0
1949	9	-9	-46	-59	-42	-28	-18	6	24	71	59	33	0	1
1950	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1951	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1952	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1953	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1954	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1955	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1956	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1957	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1958	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1959	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1960	9	-9	-47	-59	-42	-28	-18	6	24	1,273	1,226	1,002	3,339	0
1961	827	578	386	262	390	641	839	1,035	1,166	1,069	1,040	905	9,137	9,625
1962	827	682	590	521	558	720	812	925	986	71	59	33	6,785	9,636
1963	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1964	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1965	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1966	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1967	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1968	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1969	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1970	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1971	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1972	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1973	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1974	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1975	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1976	9	-9	-47	-59	-42	-28	-18	6	24	1,273	1,226	1,002	3,339	0
1977	827	578	386	262	390	641	839	1,035	1,166	1,069	1,040	905	9,137	9,625
1978	827	682	590	521	558	720	812	925	-1,124	71	59	33	4,675	7,525
1979	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1980	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1981	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1982	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1983	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1984	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1985	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1986	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1987	9	-9	-47	-59	-42	-28	-18	6	24	1,273	1,226	1,002	3,339	0
1988	827	578	386	262	390	641	839	1,035	1,166	1,069	1,040	905	9,137	9,625
1989	827	682	590	521	558	720	812	925	986	1,069	1,040	905	9,636	9,636
1990	827	682	590	521	558	720	812	925	986	53	37	24	6,736	9,636
1991	3	-3	-28	-43	-25	-19	-12	3	15	1,069	1,040	905	2,905	5
1992	827	682	590	521	558	720	812	925	986	53	37	24	6,736	9,636
1993	3	-3	-28	-43	-25	-19	-12	3	-2,095	71	59	33	-2,056	-2,105
1994	9	-9	-47	-59	-42	-28	-18	6	24	1,273	1,226	1,002	3,338	0
1995	827	578	386	262	390	641	-18	6	24	71	59	33	3,259	6,597
1996	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1997	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1998	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1999	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
2000	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
2001	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
2002	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
Avg (21-02)	129	85	32	7	34	76	95	136	84	232	216	167	1,293	1,293

2.2 Diversions from the Tuolumne River

The metric for illustrating the SFPUC diversions from the Tuolumne River Basin (Tuolumne) is the flow through the San Joaquin Pipeline (SJPL). Inherent in the variant is a net water demand that is essentially equal to that under the base setting, which is less than the demand served by the proposed program. Table 2.2-1 illustrates the difference in diversions to the SJPL between the proposed program and the variant settings. In both settings, the conveyance capacity of the SJPL is increased compared to the base setting. During the summer, the SJPL would essentially operate at the same maximum rate in both the variant and WSIP settings to minimize drawdown of Bay Area reservoir storage. A few exceptions occur during the summer of drought periods when the variant would serve a lesser demand than the WSIP. Overall, compared to the WSIP setting, the variant setting would divert less water from the Tuolumne.

Table 2.2-2 illustrates the difference in diversions to the SJPL between the variant and base settings. Evident in the operation is the increase in summer diversions associated with an increase in the conveyance capacity of the SJPL. As described above, with the increase in SJPL conveyance capacity, summer diversions would increase to retain storage in the Bay Area reservoirs. With the demand of the variant being approximately the same as the base setting, the increase in summer diversions to the SJPL would result in reduced diversions during the late summer and fall. The differences in December diversions are largely the result of maintenance in the variant setting (lessening available conveyance capacity) that would not occur in the base setting. The increased diversions during the winter and spring result from the need to replenish Bay Area reservoir storage after the maintenance, and then the operation of topping off Bay Area reservoir storage prior to summer. There would be an overall increase in average annual diversions to the SJPL in the variant setting associated with the improvement in water delivery reliability. The 82-year average annual increase in diversions from the Tuolumne amounts to approximately 1,900 acre-feet per year (1.7 mgd).

Table 2.2-3 illustrates the average monthly diversions through the SJPL by year type for the 82-year simulation for the proposed program and the variant settings and the difference between the two settings. Table 2.3-4 shows the same information for the variant and base settings.

APPENDIX O3

Table 2.2-1

Difference in Total San Joaquin Pipeline (Acre-feet)

2018 WSIP minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
1921	-3,806	-1,841	0	0	0	-3,806	0	0	0	0	0	-4,880	-14,333	-17,095
1922	-9,514	-6,444	-3,045	-952	0	0	-2,762	-2,189	-2,118	0	0	-4,880	-31,904	-31,904
1923	-7,611	-1,841	0	0	0	-3,901	-1,197	-1,237	-1,197	0	0	-6,721	-23,705	-21,864
1924	-7,611	-2,762	-2,854	-1,903	-1,719	0	0	0	0	0	0	-2,118	-18,967	-23,570
1925	-6,945	0	0	0	-2,664	0	0	0	0	0	0	0	-9,609	-11,727
1926	-5,043	-2,854	0	-5,803	-9,452	0	-2,118	0	0	0	0	-6,721	-31,991	-25,270
1927	-7,611	-3,683	-952	-952	0	-1,902	-921	-1,237	-1,197	0	0	-6,721	-25,176	-25,176
1928	-6,755	-4,603	-523	-1,903	-1,719	-3,045	-2,762	-1,237	-1,197	0	0	-6,721	-30,465	-30,465
1929	-8,562	-4,603	-2,854	-1,902	-1,718	0	0	0	0	0	0	-2,118	-21,757	-26,360
1930	-6,945	0	0	0	0	0	0	0	0	0	0	-1,197	-8,142	-9,063
1931	-5,043	-6,537	0	-6,755	-6,101	0	0	0	0	0	-2,664	-9,483	-36,583	-25,633
1932	-8,562	-3,683	-4,757	-1,903	0	-2,854	0	-3,996	-3,867	0	0	-4,880	-34,502	-41,769
1933	-3,805	-2,762	-523	-2,854	-2,578	0	0	0	0	0	0	0	-12,522	-17,402
1934	-5,043	-3,775	-8,658	-7,611	-6,875	0	0	0	0	0	0	-3,867	-35,829	-31,962
1935	-7,897	0	0	-1,047	-2,664	0	-3,038	-3,996	-3,867	0	0	-3,038	-25,547	-26,376
1936	-10,751	-7,365	0	-3,806	0	-5,803	0	-1,237	-1,197	0	0	-4,880	-35,039	-33,197
1937	-11,417	-4,603	-2,854	-3,805	0	-951	-3,683	-2,664	-2,578	0	0	-4,880	-37,435	-37,435
1938	-7,611	-4,603	-2,854	-3,045	0	0	-2,762	-3,140	-3,038	0	0	-4,880	-31,933	-31,933
1939	-5,709	-1,841	-1,902	-1,902	-1,718	0	0	0	0	0	0	-1,197	-14,269	-17,952
1940	-6,945	0	0	0	-7,734	-7,611	-2,762	-2,664	-2,578	0	0	-4,880	-35,174	-31,491
1941	-5,709	-1,841	-1,142	0	0	0	0	-2,854	-2,762	0	0	-2,118	-16,426	-19,188
1942	-7,135	-2,762	-2,663	0	0	-2,663	-921	-2,854	-2,762	0	0	-3,038	-24,798	-23,878
1943	-6,659	-3,682	-523	0	0	-3,805	-1,197	-2,664	-2,578	0	0	-4,880	-25,988	-24,146
1944	-7,611	-1,841	-2,855	0	-1,718	-2,949	0	0	0	0	0	-6,721	-23,695	-21,854
1945	-8,087	0	0	0	-8,593	0	0	0	0	0	0	-4,880	-21,560	-23,401
1946	-10,751	-6,444	0	0	0	-2,949	0	0	0	0	0	-4,880	-25,024	-25,024
1947	-9,514	-7,365	-2,855	-3,805	-3,437	0	0	0	0	0	0	-2,118	-29,094	-31,856
1948	-5,043	-5,616	-523	-5,708	-3,437	0	0	0	0	0	0	-4,880	-25,207	-22,445
1949	-7,897	-5,616	-3,806	-3,805	-3,437	-4,756	0	-1,237	-1,197	0	0	-4,880	-36,631	-36,631
1950	-7,611	0	0	0	-945	0	0	0	0	0	0	0	-8,556	-13,436
1951	-3,996	-11,969	0	0	0	-8,562	0	-1,237	-1,197	0	0	-6,721	-33,682	-26,961
1952	-6,755	-4,603	-2,663	0	0	0	-2,762	-3,140	-3,038	0	0	-4,880	-27,841	-29,682
1953	-7,611	-1,841	0	0	0	-5,803	0	0	0	0	0	-7,642	-22,897	-20,135
1954	-6,755	-4,603	-952	-2,854	-860	-2,949	0	0	0	0	0	-7,642	-26,615	-26,615
1955	-7,611	0	0	0	-2,664	0	0	0	0	0	0	0	-10,275	-17,917
1956	-5,043	-3,775	0	0	0	-1,712	0	-1,237	-1,197	0	0	-7,642	-20,606	-12,964
1957	-6,755	-4,603	-2,854	-3,805	-1,718	0	0	0	0	0	0	-3,867	-23,602	-27,377
1958	-9,514	-5,524	-523	-4,757	0	0	0	-2,949	-2,854	0	0	-3,867	-29,988	-29,988
1959	-5,708	-2,762	-952	-1,902	0	-1,047	0	0	0	0	0	-3,867	-16,238	-16,238
1960	-7,897	0	0	0	-945	0	0	0	0	0	0	0	-8,842	-12,709
1961	-5,043	-5,616	0	-6,755	-6,101	0	0	0	0	0	-5,043	-9,483	-38,041	-23,515
1962	-10,751	-6,537	-2,855	-4,757	-2,578	-1,902	0	-5,043	-4,880	0	0	-4,880	-44,183	-53,829
1963	-3,901	-4,603	-523	0	0	-3,805	-2,762	-2,854	-2,762	0	0	0	-21,210	-26,090
1964	-7,897	-4,603	-952	-2,854	-2,578	0	0	0	0	0	0	0	-18,884	-18,884
1965	-3,996	0	0	-5,708	-5,156	0	-8,286	-952	-921	0	0	-6,721	-31,740	-25,019
1966	-6,755	-2,762	-523	-4,757	-4,297	0	0	0	0	0	0	-2,578	-21,672	-25,815
1967	-6,945	-8,378	-6,659	0	0	0	-2,762	-2,855	-2,762	0	0	-1,197	-31,558	-32,939
1968	-7,897	-2,762	0	-2,854	-2,578	0	0	0	0	0	0	-2,578	-18,669	-17,288
1969	-9,799	-7,365	-3,805	0	0	-951	-2,118	-2,189	-2,118	0	0	-6,721	-35,066	-30,923
1970	-3,806	0	0	-4,757	-4,297	-2,949	0	0	0	0	0	-4,880	-20,689	-22,530
1971	-8,087	-6,444	0	0	0	0	0	0	0	0	0	-2,118	-16,649	-19,411
1972	-7,897	-8,378	-5,709	-3,805	-3,437	0	0	0	0	0	0	-1,197	-30,423	-31,344
1973	-5,043	-6,537	-523	0	0	0	-2,118	-1,237	-1,197	0	0	-6,721	-23,376	-17,852
1974	-7,611	-2,762	0	0	0	-6,659	-1,841	-3,140	-3,038	0	0	-6,721	-31,772	-31,772
1975	-3,806	0	0	0	-4,297	-1,142	-921	-3,140	-3,038	0	0	-6,721	-23,065	-23,065
1976	-3,806	-3,682	-523	-952	-859	0	0	0	0	0	0	-1,197	-11,019	-16,543
1977	-6,945	-3,775	-7,611	-2,855	-2,578	0	0	0	0	6,945	2,949	-2,762	-16,632	-24,961
1978	-3,806	0	523	-5,708	-5,156	-10,464	-6,444	-1,047	-1,013	0	0	-4,880	-37,995	-25,983
1979	-5,708	-2,762	-2,854	-1,902	0	-2,854	0	0	0	0	0	-3,038	-19,118	-20,960
1980	-10,751	0	0	-7,611	0	-6,659	0	-1,237	-1,197	0	0	-6,721	-34,176	-30,493
1981	-5,708	-4,603	-523	-1,902	-1,718	0	0	0	0	0	0	-6,721	-21,175	-21,175
1982	-10,751	-4,603	-3,805	0	0	0	0	-2,854	-2,762	0	0	-3,038	-27,813	-31,496
1983	-5,803	-2,762	-951	0	0	0	-1,841	-3,805	-3,682	0	0	-1,197	-20,041	-21,882
1984	-6,660	-2,762	0	0	0	0	0	0	0	0	0	-2,578	-12,000	-10,619
1985	-6,945	0	0	0	-945	0	0	0	0	0	0	0	-7,890	-10,468
1986	-5,043	-3,775	0	-6,755	-3,437	-7,610	-5,524	-2,189	-2,118	0	0	-6,721	-43,172	-36,451
1987	-5,708	-2,762	-2,854	-3,805	-3,437	0	0	0	0	0	0	-2,118	-20,684	-25,287
1988	-6,945	-3,775	0	-7,611	-5,156	0	0	0	0	0	-3,140	-9,483	-36,110	-25,605
1989	-4,756	-2,762	-1,903	-2,854	-2,578	0	0	0	-2,118	-3,996	-3,806	-5,524	-30,297	-29,594
1990	-4,757	0	0	0	-945	0	0	0	0	-5,043	-7,610	-4,603	-22,958	-19,028
1991	-1,903	-3,682	-523	-952	-860	-2,854	-1,197	-2,854	-2,762	-2,664	-1,903	-4,603	-26,757	-34,843
1992	-2,855	-921	-1,903	0	-1,547	0	0	-5,043	-4,880	-1,047	-2,854	-1,841	-22,891	-26,319
1993	-1,902	-1,841	0	0	0	0	-2,762	-2,854	-2,762	0	0	-3,867	-15,988	-17,863
1994	-5,708	-2,762	-952	-1,903	-1,719	0	0	0	0	0	0	-3,867	-16,911	-16,911
1995	-6,945	0	0	-7,610	-6,874	0	-4,603	-1,903	-1,842	0	0	-4,880	-34,657	-33,644
1996	-5,708	-2,762	-523	0	0	0	0	-2,189	-2,118	0	0	-3,867	-17,167	-18,180
1997	-7,611	-4,604	0	0	0	-2,854	0	0	0	0	0	-2,118	-17,187	-18,936
1998	-9,799	-5,524	-523	0	0	-951	-6,444	-2,949	-2,854	0	0	-4,880	-33,924	-31,162
1999	-5,708	-1,841	-2,855	-1,902	0	-3,805	-2,762	-3,140	-3,038	0	0	-3,867	-28,918	-29,931
2000	-5,708	0	0	0	-5,328	-2,854	0	0	0	0	0	-3,867	-17,757	-17,757
2001	-9,514	-5,524	-523	-3,806	-1,718	-3,901	0	0	0	0	0	-4,880	-29,866	-28,853
2002	-9,514	-2,762	-4,757	-2,854	-2,578	0	0	0	0	0	0	-2,578	-25,043	-27,345
Avg (21-02)	-6,745	-3,361	-1,326	-2,073	-1,896	-1,577	-967	-1,162	-1,150	-71	-294	-4,107	-24,727	-24,788

APPENDIX O3

Table 2.2-2

Difference in Total San Joaquin Pipeline (Acre-feet) 2018 WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
1921	-3,806	-2,762	0	0	0	8,562	2,118	2,189	2,118	2,189	2,189	-2,762	10,035	10,035
1922	-8,562	-4,603	-4,947	0	0	0	4,603	2,854	2,762	2,189	2,189	-2,762	-6,277	-6,277
1923	-7,611	-4,603	0	0	0	11,416	921	952	921	2,189	2,189	-4,603	1,771	3,612
1924	-8,562	-2,762	-952	-2,855	-2,578	5,803	2,118	2,189	2,118	2,189	2,189	0	-1,103	-5,706
1925	-4,756	-19,334	-19,979	5,803	14,608	11,512	2,118	2,189	2,118	2,189	2,189	2,118	775	-1,343
1926	0	2,762	-7,088	0	0	15,317	2,762	2,189	2,118	2,189	2,189	-4,603	17,835	24,556
1927	-5,708	-4,604	-952	3,805	0	4,757	1,841	952	921	2,189	2,189	-4,603	787	787
1928	-3,806	-4,603	-2,854	1,902	2,578	2,663	1,841	952	921	2,189	2,189	-4,603	-631	-631
1929	-3,806	-2,762	-952	0	0	5,803	2,118	2,189	2,118	2,189	2,189	0	9,086	4,483
1930	-4,756	-19,334	-19,979	5,803	9,538	11,512	2,118	2,189	2,118	2,189	2,189	921	-5,492	-6,413
1931	-2,854	-921	-7,088	-952	-859	5,803	2,118	2,189	2,118	2,189	-475	-2,762	-1,494	4,853
1932	0	-921	951	3,805	0	12,558	4,880	2,949	2,854	2,189	2,189	-2,762	28,692	26,028
1933	-4,756	-2,762	-7,611	4,757	4,297	5,803	2,118	2,189	2,118	2,189	2,189	2,118	12,649	7,769
1934	-2,854	1,841	-2,855	-952	-860	5,803	2,118	2,189	2,118	2,189	2,189	-1,749	9,177	13,044
1935	-2,854	-19,334	-19,979	18,075	14,608	10,560	6,445	3,901	3,775	2,189	2,189	-920	18,655	17,826
1936	-8,562	-2,762	-7,088	3,805	0	9,514	2,118	952	921	2,189	2,189	-2,762	514	2,356
1937	-7,611	-2,762	-952	0	0	0	2,762	2,379	2,302	2,189	2,189	-2,762	-2,266	-2,266
1938	-5,708	-4,603	-2,854	2,663	0	0	2,762	1,903	1,842	2,189	2,189	-2,762	-2,379	-2,379
1939	-7,611	-2,762	-4,757	952	860	5,803	2,118	2,189	2,118	2,189	2,189	921	4,209	526
1940	-4,756	-19,334	-19,979	15,317	0	5,708	5,524	2,379	2,302	2,189	2,189	-2,762	-11,223	-7,540
1941	-7,611	-2,762	-1,142	0	0	0	0	-1,902	-1,841	2,189	2,189	0	-10,880	-13,642
1942	-4,756	-2,762	-3,805	0	0	0	4,603	0	0	2,189	2,189	-920	-3,262	-2,342
1943	-4,756	-4,603	-7,611	0	0	0	5,524	-475	-460	2,189	2,189	-2,762	-10,765	-8,923
1944	-5,709	-2,762	-2,855	1,902	5,328	12,368	2,118	2,189	2,118	2,189	2,189	-4,603	14,472	16,313
1945	-8,562	-19,334	-19,979	5,803	5,156	15,317	2,118	2,189	2,118	2,189	2,189	-2,762	-13,558	-15,399
1946	-5,708	-4,603	0	0	0	7,611	2,118	2,189	2,118	2,189	2,189	-2,762	5,341	5,341
1947	-8,562	-5,524	-2,855	-4,757	0	10,560	2,118	2,189	2,118	2,189	2,189	0	-335	-3,097
1948	-2,854	0	-7,611	-952	-859	5,803	2,118	2,189	2,118	2,189	2,189	-2,762	1,568	4,330
1949	-5,708	0	-952	-4,757	-4,296	-2,854	2,118	952	921	2,189	2,189	-2,762	-12,960	-12,960
1950	-3,806	-19,334	-19,979	16,459	15,468	5,803	2,118	2,189	2,118	2,189	2,189	2,118	7,532	2,652
1951	-1,807	-4,604	0	0	0	0	2,118	952	921	2,189	2,189	-4,603	-2,645	4,076
1952	-3,806	-4,603	-951	0	0	0	6,444	-951	-920	2,189	2,189	-2,762	-3,171	-5,012
1953	-5,709	-2,762	0	0	0	9,514	2,118	2,189	2,118	2,189	2,189	-5,524	6,322	9,084
1954	-8,562	-4,603	-952	0	4,468	7,611	2,118	2,189	2,118	2,189	2,189	-5,524	3,241	3,241
1955	-8,562	-19,334	-15,222	16,459	12,202	5,803	2,118	2,189	2,118	2,189	2,189	2,118	4,267	-3,375
1956	-2,854	1,841	0	0	0	951	2,118	952	921	2,189	2,189	-5,524	2,783	10,425
1957	-3,806	-4,603	-952	0	5,328	10,560	2,118	2,189	2,118	2,189	2,189	-1,749	15,581	11,806
1958	-8,562	-2,762	-7,611	4,757	0	0	0	-1,902	-1,841	2,189	2,189	-1,749	-15,292	-15,292
1959	-5,708	-2,762	-952	952	0	14,270	2,118	2,189	2,118	2,189	2,189	-1,749	14,854	14,854
1960	-5,708	-19,334	-19,979	5,803	9,453	5,803	2,118	2,189	2,118	2,189	2,189	2,118	-11,041	-14,908
1961	-2,854	0	-7,088	-952	3,437	5,803	2,118	2,189	2,118	2,189	0	0	6,960	11,267
1962	-952	3,682	1,902	-952	859	16,173	7,642	2,854	2,762	2,189	2,189	-2,762	35,586	36,159
1963	-952	-2,762	-7,611	0	0	3,805	2,762	-952	-921	2,189	2,189	2,118	-135	-5,015
1964	-5,708	-4,603	-952	4,757	4,297	5,803	2,118	2,189	2,118	2,189	2,189	2,118	16,515	16,515
1965	-1,807	-19,334	-14,270	0	0	11,512	4,603	0	0	2,189	2,189	-4,603	-19,521	-12,800
1966	-3,806	-5,524	-1,902	4,947	4,468	5,803	2,118	2,189	2,118	2,189	2,189	-460	14,329	10,186
1967	-4,756	-2,762	-9,514	0	0	0	3,683	-2,855	-2,762	2,189	2,189	921	-13,667	-15,048
1968	-5,708	-2,762	-7,088	5,708	5,156	5,803	2,118	2,189	2,118	2,189	2,189	-460	11,452	12,833
1969	-7,610	-2,762	-4,757	0	0	0	5,524	0	0	2,189	2,189	-4,603	-9,830	-5,687
1970	-3,806	-19,334	-19,979	7,610	6,874	16,173	2,118	2,189	2,118	2,189	2,189	-2,762	-4,421	-6,262
1971	-5,708	-7,365	0	0	0	10,560	2,118	2,189	2,118	2,189	2,189	0	8,290	5,528
1972	-5,708	-2,762	-5,709	-4,757	0	5,803	2,118	2,189	2,118	2,189	2,189	921	-1,409	-2,330
1973	-2,854	-921	-7,611	0	0	0	4,603	952	921	2,189	2,189	-4,603	-5,135	389
1974	-5,709	-2,762	0	0	0	3,805	2,762	1,903	1,842	2,189	2,189	-4,603	1,616	1,616
1975	-5,708	-19,334	-19,979	11,512	859	2,663	7,365	1,903	1,842	2,189	2,189	-4,603	-19,102	-19,102
1976	-5,708	-4,603	-7,611	-952	-859	5,803	2,118	2,189	2,118	2,189	2,189	921	-2,206	-7,730
1977	-1,902	1,841	-2,855	-2,855	-2,578	5,803	2,118	2,189	2,118	2,189	1,047	4,603	11,718	9,178
1978	3,805	-921	-2,331	0	0	0	5,708	4,756	4,603	2,189	2,189	-2,762	17,236	23,459
1979	-8,562	-2,762	-952	952	0	8,562	2,118	2,189	2,118	2,189	2,189	-920	7,121	5,279
1980	-5,708	-19,334	-15,222	5,708	0	951	4,880	952	921	2,189	2,189	-4,603	-27,077	-23,394
1981	-3,806	-4,603	-7,611	5,708	5,156	11,512	2,118	2,189	2,118	2,189	2,189	-4,603	12,556	12,556
1982	-8,562	-5,524	-3,805	0	0	0	0	-952	-921	2,189	2,189	-920	-16,306	-19,989
1983	-4,756	-5,524	0	0	0	0	2,946	952	921	2,189	2,189	921	-162	-2,003
1984	-5,708	-7,365	0	0	0	5,803	2,118	2,189	2,118	2,189	2,189	-460	3,073	4,454
1985	-4,756	-19,334	-19,979	10,560	8,593	5,803	2,118	2,189	2,118	2,189	2,189	2,118	-6,192	-8,770
1986	-2,854	1,841	-7,088	-952	0	0	1,841	2,854	2,762	2,189	2,189	-4,603	-1,821	4,900
1987	-5,708	-2,762	-952	-4,757	-4,296	5,803	2,118	2,189	2,118	2,189	2,189	0	-1,869	-6,472
1988	-1,902	1,841	-7,088	2,854	2,578	5,803	2,118	2,189	2,118	2,189	-951	0	11,749	14,889
1989	0	-921	2,854	0	0	5,803	2,118	5,043	2,762	1,047	0	1,841	20,547	18,897
1990	1,902	-19,334	-15,222	10,560	8,593	5,803	2,118	2,189	2,118	0	-2,854	1,841	-2,286	1,615
1991	1,902	-4,603	-2,854	-952	-860	7,611	3,683	0	0	-475	1,902	-2,762	2,592	2,914
1992	-2,855	3,682	1,902	952	859	18,075	6,721	1,902	1,841	0	-4,756	0	28,323	31,744
1993	0	-2,762	-1,379	0	0	0	1,841	0	0	2,189	2,189	-1,749	329	-7,056
1994	-8,562	-2,762	-952	-2,855	8,593	5,803	2,118	2,189	2,118	2,189	2,189	-1,749	8,319	8,319
1995	-1,902	-19,334	-19,979	0	0	0	4,603	0	0	2,189	2,189	-2,762	-34,996	-33,983
1996	-3,806	-2,762	-2,854	0	0	0	4,880	2,854	2,762	2,189	2,189	-1,749	3,703	2,690
1997	-5,708	-4,604	0	0	0	7,611	2,118	2,189	2,118	2,189	2,189	0	8,102	6,353
1998	-7,610	-2,762	-7,611	0	0	0	4,604	952	921	2,189	2,189	0	-7,128	-7,128
1999	-3,806	-2,762	-2,855	4,757	0	4,757	6,444	-951	-920	2,189	2,189	-1,749	7,293	9,042
2000	-3,806	-19,334	-19,979	15,317	2,406	13,319	2,118	2,189	2,118	2,189	2,189	-1,749	-3,023	-3,023
2001	-5,708	-2,762	-7,611	3,805	6,875	11,416	2,118	2,189	2,118	2,189	2,189	-2,762	14,056	15,069
2002	-8,562	-2,762	-6,659	3,805	3,437	10,560	2,118	2,189	2,118	2,189	2,189	-460	10,162	7,860
Avg (21-02)	-4,638	-5,883	-6,178	2,233	1,938	5,955	2,897	1,635	1,556	2,089	1,901	-1,546	1,960	1,932

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Table 2.2-3

Total San Joaquin Pipeline (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) 2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	20,579	13,177	8,363	8,491	6,015	8,925	18,753	24,515	23,724	29,778	29,778	24,179	216,278	215,562
Above Normal	20,096	11,265	7,899	13,280	7,228	13,493	23,006	26,291	25,443	29,778	29,778	24,425	231,981	231,792
Normal	19,265	11,911	8,741	13,872	10,032	19,812	27,712	29,064	28,126	29,778	29,778	24,352	252,444	251,317
Below Normal	20,874	12,781	11,615	18,434	15,371	24,361	28,622	29,241	28,172	29,386	29,185	25,080	273,122	272,085
Dry	20,395	16,572	14,580	16,655	14,071	25,651	28,817	29,463	28,512	29,148	27,625	22,948	274,435	277,265
All Years	20,248	13,114	10,228	14,188	10,562	18,460	25,393	27,716	26,796	29,574	29,235	24,210	249,723	249,661

Total San Joaquin Pipeline (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	27,584	16,762	9,692	11,066	7,304	10,875	21,647	26,722	25,859	29,778	29,778	28,817	245,884	243,146
Above Normal	26,935	14,568	8,898	13,901	8,598	16,352	24,176	28,608	27,685	29,778	29,778	28,817	258,095	258,095
Normal	26,632	15,087	9,698	15,299	11,343	21,935	28,322	29,778	28,817	29,778	29,778	28,817	275,285	275,285
Below Normal	27,567	16,214	13,000	21,070	18,065	25,211	28,817	29,481	28,530	29,778	29,521	27,972	295,227	295,751
Dry	26,210	19,881	16,554	19,818	16,869	25,717	28,817	29,778	28,817	29,094	28,773	27,154	297,481	299,662
All Years	26,992	16,475	11,553	16,261	12,458	20,037	26,359	28,878	27,946	29,645	29,529	28,317	274,450	274,450

Difference in Total San Joaquin Pipeline (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) 2018 WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	-7,005	-3,585	-1,329	-2,575	-1,289	-1,950	-2,894	-2,206	-2,135	0	0	-4,638	-29,605	-27,585
Above Normal	-6,839	-3,303	-999	-621	-1,370	-2,859	-1,170	-2,317	-2,242	0	0	-4,392	-26,113	-26,303
Normal	-7,367	-3,176	-957	-1,427	-1,311	-2,123	-610	-714	-691	0	0	-4,466	-22,841	-23,968
Below Normal	-6,693	-3,433	-1,385	-2,636	-2,694	-851	-195	-241	-357	-392	-336	-2,892	-22,105	-23,666
Dry	-5,816	-3,309	-1,974	-3,163	-2,798	-65	0	-315	-305	53	-1,148	-4,206	-23,046	-22,397
All Years	-6,745	-3,361	-1,326	-2,073	-1,896	-1,577	-967	-1,162	-1,150	-71	-294	-4,107	-24,727	-24,788

Table 2.3-4

Total San Joaquin Pipeline (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) 2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	20,579	13,177	8,363	8,491	6,015	8,925	18,753	24,515	23,724	29,778	29,778	24,179	216,278	215,562
Above Normal	20,096	11,265	7,899	13,280	7,228	13,493	23,006	26,291	25,443	29,778	29,778	24,425	231,981	231,792
Normal	19,265	11,911	8,741	13,872	10,032	19,812	27,712	29,064	28,126	29,778	29,778	24,352	252,444	251,317
Below Normal	20,874	12,781	11,615	18,434	15,371	24,361	28,622	29,241	28,172	29,386	29,185	25,080	273,122	272,085
Dry	20,395	16,572	14,580	16,655	14,071	25,651	28,817	29,463	28,512	29,148	27,625	22,948	274,435	277,265
All Years	20,248	13,114	10,228	14,188	10,562	18,460	25,393	27,716	26,796	29,574	29,235	24,210	249,723	249,661

Total San Joaquin Pipeline (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	24,854	19,046	14,449	7,730	6,015	7,611	15,398	23,962	23,189	27,589	27,589	26,526	223,960	222,101
Above Normal	25,015	18,522	14,830	9,346	6,015	8,831	19,117	25,015	24,208	27,589	27,589	26,699	232,776	232,343
Normal	24,616	19,046	14,865	10,691	6,864	11,060	25,145	27,054	26,181	27,589	27,589	26,699	247,400	246,589
Below Normal	25,239	19,334	18,748	15,927	11,585	16,789	26,374	27,085	26,212	27,421	27,141	25,562	267,417	267,585
Dry	24,676	19,046	19,087	15,995	12,621	18,195	26,411	27,292	26,411	27,232	26,757	23,247	266,970	269,749
All Years	24,886	18,997	16,405	11,955	8,624	12,505	22,496	26,081	25,239	27,485	27,334	25,756	247,763	247,729

Difference in Total San Joaquin Pipeline (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) 2018 WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	-4,275	-5,869	-6,086	761	0	1,314	3,355	553	535	2,189	2,189	-2,348	-7,681	-6,540
Above Normal	-4,919	-7,257	-6,931	3,934	1,213	4,662	3,889	1,276	1,235	2,189	2,189	-2,274	-795	-551
Normal	-5,352	-7,135	-6,125	3,181	3,169	8,752	2,567	2,011	1,945	2,189	2,189	-2,348	5,044	4,728
Below Normal	-4,365	-6,553	-7,133	2,507	3,786	7,572	2,248	2,155	1,961	1,965	2,043	-482	5,705	4,500
Dry	-4,281	-2,474	-4,508	660	1,450	7,456	2,406	2,171	2,101	1,915	869	-299	7,465	7,516
All Years	-4,638	-5,883	-6,178	2,233	1,938	5,955	2,897	1,635	1,556	2,089	1,901	-1,546	1,960	1,932

2.3 Hetch Hetchy Reservoir and Releases

Compared to the WSIP setting, the variant setting would draw less water from the Tuolumne due to the lesser demand. This circumstance would lead to less draw from Hetch Hetchy Reservoir in the variant setting in most years. Figure 2.3-1 illustrates a chronological trace of the simulation of Hetch Hetchy Reservoir storage and stream releases. Shown in Figure 2.3-1 are the results for the WSIP, variant (2018 WSIP), and base settings. Supplementing the Figure 2.3-1 representation of Hetch Hetchy Reservoir storage are Table 2.3-1, Hetch Hetchy Reservoir Storage (2018 WSIP); Table 2.3-2, Hetch Hetchy Reservoir Storage (WSIP); and Table 2.3-3, Difference in Hetch Hetchy Reservoir Storage (2018 WSIP minus WSIP). Table 2.3-4 is provided to illustrate the difference in Hetch Hetchy Reservoir storage between the base and variant settings.

Table 2.3-3 shows that, by the end of summer, storage in Hetch Hetchy Reservoir associated with the variant setting would be greater than the storage in the WSIP setting in about 20 percent of the years, ranging from a minor increase to over 31,000 acre-feet in a year. The relatively minor increases in storage are attributable to years when summer diversions would be the same in both settings (SJPL operating at maximum capacity) but less water would be diverted in the fall due to the lesser water demand. The larger increases in storage are associated with drought periods, during which the differences in underlying demand and water delivery shortages between the WSIP and variant settings are greater.

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Figure 2.3-1
Hetch Hetchy Reservoir Storage and Stream Release

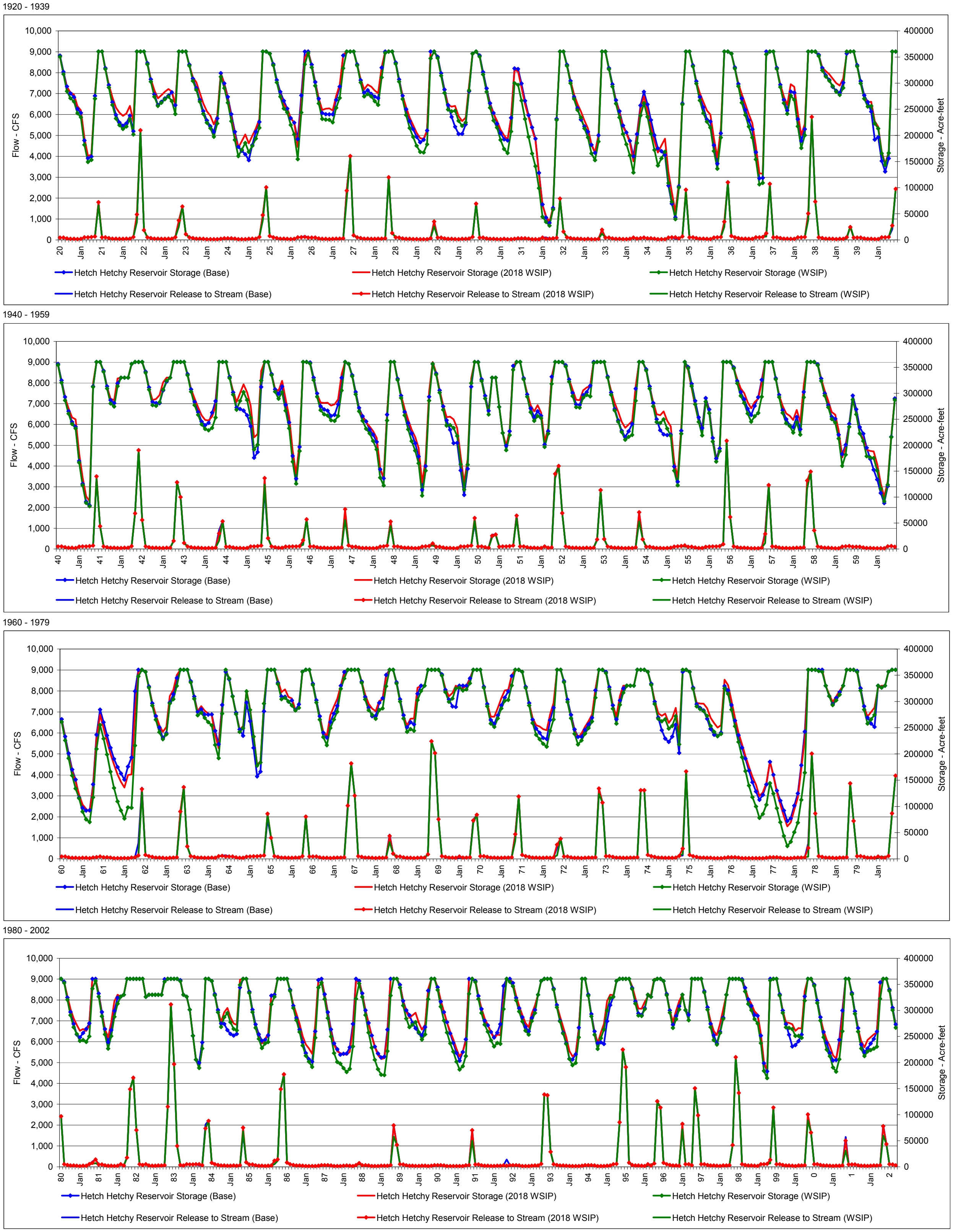

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Table 2.3-1

Hetch Hetchy Reservoir Storage (Acre-feet) 2018 WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	282,609	278,092	255,917	247,975	195,384	160,826	163,128	278,579	360,400	360,400	326,811	296,708
1922	272,692	253,215	243,432	237,356	241,830	256,406	226,719	360,400	360,400	360,400	336,082	307,732
1923	286,405	270,794	276,871	283,590	288,738	283,923	259,278	360,400	360,400	360,400	333,186	310,962
1924	301,568	281,696	261,164	246,096	237,579	221,011	237,619	319,528	297,781	269,833	234,563	200,811
1925	176,725	188,760	201,798	184,735	199,033	213,024	231,155	360,400	360,400	356,465	334,210	301,427
1926	279,127	259,324	251,245	233,085	224,213	177,698	263,211	349,832	360,400	333,232	297,804	270,576
1927	248,777	251,050	251,687	247,855	275,438	296,429	354,032	360,400	360,400	360,400	333,718	307,952
1928	287,960	297,217	293,099	286,032	280,760	330,000	360,400	360,400	360,400	337,096	302,689	276,165
1929	254,035	233,992	219,838	204,878	194,666	193,633	209,190	360,400	360,400	348,102	314,426	283,355
1930	258,555	254,985	256,315	236,814	227,387	233,865	295,228	356,465	360,400	350,768	316,726	284,621
1931	259,237	241,452	227,760	210,946	199,767	191,885	233,170	325,434	322,155	292,228	259,610	234,867
1932	211,484	190,881	126,425	66,408	45,476	34,111	62,131	232,474	360,400	360,400	333,089	304,798
1933	278,840	260,094	245,851	228,098	213,520	182,969	167,504	200,819	360,400	360,400	326,593	293,382
1934	266,003	243,161	216,797	204,346	186,085	150,440	198,562	251,067	274,860	248,611	216,584	189,190
1935	167,090	180,813	193,600	130,416	91,354	53,449	109,363	266,254	360,400	360,400	331,788	302,361
1936	280,873	263,851	247,502	239,843	194,673	157,609	213,898	360,400	360,400	356,465	327,853	298,989
1937	278,787	260,055	240,667	223,486	179,093	127,495	126,725	360,400	360,400	360,400	327,212	297,350
1938	274,407	258,610	297,772	293,013	242,112	200,609	221,893	360,400	360,400	360,400	352,029	329,594
1939	323,052	317,095	308,612	299,875	295,466	308,950	356,592	360,400	360,400	332,157	299,492	271,524
1940	263,350	264,386	227,268	216,494	168,677	145,755	168,357	360,400	360,400	354,451	320,313	291,190
1941	271,263	253,545	249,892	184,092	138,160	101,885	92,264	319,429	360,400	360,400	341,291	311,165
1942	289,497	286,480	328,368	330,000	330,000	330,000	356,592	360,400	360,400	360,400	339,529	310,000
1943	286,861	289,159	296,594	321,028	330,000	330,000	360,400	360,400	360,400	360,400	334,820	307,969
1944	289,730	272,775	257,390	248,581	247,526	255,151	275,226	360,400	360,400	360,400	329,290	304,166
1945	283,254	300,146	317,051	301,901	275,964	215,180	221,432	342,932	360,400	360,400	334,928	308,047
1946	305,207	324,081	288,649	254,722	190,265	144,978	204,939	360,400	360,400	357,267	325,581	298,114
1947	281,975	281,245	281,849	276,388	278,587	288,395	337,342	360,400	356,592	332,847	297,991	267,446
1948	254,417	244,294	235,928	226,952	214,085	155,433	137,737	260,228	360,400	360,400	325,774	295,942
1949	270,211	248,715	229,974	215,741	194,598	128,217	171,843	303,299	360,400	339,844	305,128	276,849
1950	254,009	254,979	249,960	232,946	178,360	126,993	173,245	328,608	360,400	359,600	323,849	289,929
1951	263,034	330,000	330,000	273,739	223,537	199,065	226,940	352,902	360,400	360,400	326,780	299,924
1952	277,192	265,107	276,984	262,472	207,037	232,744	331,312	360,400	360,400	360,400	351,651	327,090
1953	306,915	287,555	286,634	305,694	311,161	314,290	360,400	360,400	360,400	360,400	330,136	304,813
1954	281,411	264,084	245,293	233,461	239,810	246,445	312,245	360,400	360,400	343,956	308,827	282,584
1955	259,833	257,884	265,101	247,276	236,225	168,911	137,956	234,795	356,592	344,694	309,939	275,067
1956	246,064	223,824	286,092	264,022	209,194	170,223	190,121	360,400	360,400	360,400	347,791	326,931
1957	309,473	300,247	282,855	271,022	283,025	289,326	320,587	360,400	360,400	360,400	326,823	296,564
1958	275,676	261,117	256,620	248,538	268,060	244,553	316,356	360,400	360,400	360,400	353,900	327,777
1959	305,000	285,354	263,804	258,795	228,073	176,551	195,296	236,053	288,523	260,077	223,494	212,535
1960	191,220	189,064	187,908	163,510	126,394	100,465	130,282	218,504	290,266	264,021	228,814	194,592
1961	166,799	147,604	122,185	103,560	94,937	89,820	136,861	229,076	274,760	248,652	223,685	200,188
1962	179,904	160,807	146,608	135,879	159,757	160,943	279,470	356,465	360,400	356,465	326,379	297,010
1963	273,823	254,662	242,067	251,423	310,058	322,016	350,074	360,400	360,400	360,400	336,396	305,026
1964	281,564	290,995	282,306	277,015	273,190	235,968	210,684	286,406	360,400	343,750	309,409	275,896
1965	245,809	253,115	321,455	286,120	235,159	179,819	185,636	297,805	360,400	360,400	360,400	339,909
1966	317,826	322,951	308,583	305,796	283,349	288,162	356,592	360,400	360,400	331,450	297,972	267,899
1967	241,427	234,658	273,811	290,049	304,992	330,000	352,295	360,400	360,400	360,400	360,400	336,965
1968	313,146	295,351	286,381	281,571	301,117	304,173	346,380	360,400	360,400	334,325	299,837	270,029
1969	254,522	266,986	267,609	326,006	330,000	330,000	360,400	360,400	360,400	360,400	349,426	324,498
1970	309,819	316,182	330,000	326,065	325,142	330,000	341,873	360,400	360,400	360,400	326,016	295,639
1971	270,928	270,971	287,195	306,077	320,804	322,357	349,749	360,400	360,400	356,465	325,764	294,564
1972	268,852	254,761	252,261	247,271	245,191	275,403	296,867	360,400	360,400	336,426	299,001	269,162
1973	244,428	230,983	238,924	251,779	262,465	275,113	322,681	360,400	360,400	353,990	322,828	292,848
1974	272,123	310,590	330,000	330,000	330,000	330,000	360,400	360,400	360,400	356,465	331,550	301,908
1975	277,436	272,650	276,651	258,972	268,065	287,929	234,337	360,400	360,400	356,465	324,162	297,200
1976	295,909	295,723	287,208	268,903	258,610	250,311	254,661	341,485	330,919	300,830	269,106	240,387
1977	218,384	195,661	175,732	156,532	141,297	119,701	126,961	144,655	185,682	158,583	127,611	103,776
1978	81,190	62,065	69,663	93,807	117,052	170,753	229,138	360,400	360,400	360,400	357,869	360,400
1979	330,000	313,085	298,796	309,602	320,487	330,000	360,400	360,400	360,400	356,097	320,734	287,352
1980	271,512	279,664	288,323	326,065	330,000	330,000	356,592	360,400	360,400	360,400	352,729	327,134
1981	303,223	284,771	272,418	260,876	264,288	260,790	271,414	360,400	360,400	330,185	292,628	264,472
1982	248,006	276,645	317,405	330,000	326,446	330,000	360,400	360,400	360,400	360,400	360,400	360,400
1983	326,065	330,000	330,000	330,000	330,000	330,000	356,951	360,400	360,400	360,400	360,400	357,167
1984	330,000	326,192	301,515	251,330	205,725	189,676	227,004	360,400	360,400	356,465	328,962	299,035
1985	277,894	296,425	304,499	286,883	274,950	272,162	359,303	360,400	360,400	333,535	296,865	266,723
1986	250,445	236,469	245,291	254,917	330,000	330,000	360,400	360,400	360,400	360,400	337,490	311,318
1987	293,620	273,938	250,752	234,807	227,102	216,794	272,945	360,400	360,400	328,763	292,248	259,162
1988	234,316	221,153	217,898	216,791	214,588	220,681	263,542	355,022	356,592	330,735	299,096	274,941
1989	250,690	230,116	214,166	206,589	208,221	254,241	360,400	360,400	360,400	347,970	317,138	297,556
1990	286,000	290,721	295,500	276,136	263,108	272,917	340,617	360,400	360,400	344,204	319,777	297,881
1991	276,582	259,570	244,114	225,926	211,787	220,991	241,549	360,400	360,400	357,093	326,278	304,043
1992	284,649	272,088	257,248	245,762	253,949	252,395	318,919	360,400	359,902	352,164	328,215	308,305
1993	291,250	275,503	268,001	293,942	309,264	330,000	356,592	360,400	360,400	360,400	339,684	309,861
1994	288,288	268,035	248,867	222,053	211,917	216,211	265,068	360,400	360,400	328,106	288,504	257,165
1995	236,917	257,505	274,105	318,014	330,000	329,098	356,592	360,400	360,400	360,400	360,400	346,115
1996	323,688	303,528	303,270	316,260	326,446	330,000	360,400	360,400	360,400	356,465	329,269	299,674
1997	277,861	299,279	317,856	330,000	300,695	283,968	360,400	360,400	360,400	360,400	334,509	303,667
1998	279,663	260,551	252,471	274,673	301,923	330,000	360,400	360,400	360,400	360,400	357,575	341,243
1999	322,965	312,973	298,470	292,088	254,288	201,103	185,376	360,400	360,400	360,400	328,523	299,272
2000	277,088	276,001	273,476	260,779	266,000	265,151	336,457	360,400	360,400	347,257	314,429	284,299
2001	261,745	243,718	231,697	213,737	207,523	235,058	289,029	360,400	360,186	330,828	293,698	264,148
2002	241,297	229,484	243,063	248,705	254,002	257,704	349,922	360,400	360,400	337,536	300,566	269,362
Avg (21-02)	268,676	262,479	259,859	252,012	243,600	235,735	269,224	338,182	352,712	343,017	316,086	289,447

APPENDIX O3

Table 2.3-2

Hetch Hetchy Reservoir Storage (Acre-feet) WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	271,165	264,808	242,632	234,683	182,084	149,183	153,305	270,347	360,400	360,400	326,811	291,828
1922	258,301	232,379	219,552	212,511	216,970	231,546	201,859	360,400	360,400	360,400	336,082	302,853
1923	273,916	256,464	262,541	269,252	274,392	265,677	241,032	360,400	360,400	360,400	333,186	304,241
1924	287,239	264,605	241,219	224,237	213,989	197,420	222,900	312,177	290,436	262,497	227,241	191,379
1925	160,353	172,388	185,426	168,354	179,977	193,968	214,415	360,400	360,400	356,465	334,210	301,427
1926	274,085	251,427	243,883	219,916	201,778	154,687	243,705	336,096	357,554	330,389	294,965	261,018
1927	231,614	230,204	229,890	225,094	252,663	271,751	328,434	360,400	360,400	360,400	333,718	301,231
1928	274,488	279,141	274,500	265,521	258,520	310,981	357,818	360,400	360,400	337,096	302,689	269,444
1929	238,756	214,109	197,101	180,226	168,280	167,248	182,805	347,340	360,400	348,102	314,426	281,237
1930	249,493	245,923	247,253	227,747	218,315	224,793	286,156	356,465	360,400	350,768	316,726	283,424
1931	252,998	228,677	214,984	191,409	174,118	166,236	207,521	299,800	296,541	266,646	231,402	197,210
1932	165,286	141,000	99,154	44,357	34,477	27,305	58,254	229,673	360,400	360,400	333,089	299,918
1933	270,157	248,649	233,883	213,269	196,104	165,553	152,529	188,275	360,400	360,400	326,593	293,382
1934	260,961	234,344	202,598	182,895	161,604	129,002	185,456	237,968	261,776	235,550	203,546	172,300
1935	142,314	156,037	168,825	108,936	73,089	39,750	100,334	259,346	360,400	360,400	331,788	299,322
1936	267,086	242,699	226,345	214,884	170,029	136,212	195,836	360,400	360,400	356,465	327,853	294,110
1937	262,493	239,158	216,925	195,925	154,023	106,324	109,133	355,146	360,400	360,400	327,212	292,471
1938	261,919	241,518	276,115	268,301	217,388	175,924	200,166	360,400	360,400	360,400	352,029	324,714
1939	312,466	304,668	294,282	283,636	277,502	290,985	360,400	360,400	360,400	332,157	299,492	270,327
1940	255,209	256,245	222,760	213,012	165,616	143,200	166,203	360,400	360,400	354,451	320,313	286,310
1941	260,678	241,118	232,444	166,634	122,924	89,103	82,492	312,086	360,400	360,400	341,291	309,048
1942	280,245	274,466	313,690	330,000	330,000	330,000	356,592	360,400	360,400	360,400	339,529	306,962
1943	277,164	275,780	282,691	307,119	324,209	330,000	360,400	360,400	360,400	360,400	334,820	303,090
1944	277,241	258,445	240,206	231,387	228,604	233,279	253,354	360,400	360,400	360,400	329,290	297,445
1945	268,450	285,342	302,246	287,091	252,554	191,770	200,884	324,552	360,400	360,400	334,928	303,168
1946	289,579	302,009	266,576	232,638	168,168	125,876	188,823	360,400	360,400	357,267	325,581	293,235
1947	267,584	259,488	257,238	247,959	246,704	256,512	305,459	360,400	356,592	332,847	297,991	265,329
1948	247,258	231,519	222,630	208,209	191,894	137,570	122,657	247,597	360,400	360,400	325,774	291,062
1949	257,437	230,325	207,779	189,698	165,102	102,768	150,930	285,781	356,592	336,040	301,328	268,173
1950	237,728	238,697	233,120	217,888	163,294	114,244	162,551	319,659	360,400	359,600	323,849	289,929
1951	259,038	330,000	330,000	273,739	223,537	190,502	219,413	345,379	360,400	360,400	326,780	293,203
1952	263,719	247,031	256,244	252,090	196,649	222,356	318,163	360,400	360,400	360,400	351,651	322,211
1953	294,426	273,225	272,304	291,357	296,819	294,144	358,469	360,400	360,400	360,400	330,136	297,172
1954	267,018	245,088	225,346	210,648	216,124	219,810	285,610	360,400	360,400	343,956	308,827	274,943
1955	244,584	242,635	249,852	232,018	218,294	150,980	122,826	222,121	360,400	348,498	313,738	278,863
1956	244,816	218,801	283,964	261,892	207,063	168,360	188,550	360,400	360,400	360,400	347,791	319,290
1957	295,080	281,251	261,004	245,354	255,623	261,924	293,186	360,400	360,400	360,400	326,823	292,697
1958	262,298	242,214	237,194	224,344	243,852	220,345	292,148	360,400	360,400	360,400	353,900	323,910
1959	295,427	273,019	250,518	243,597	212,867	160,299	181,528	235,211	287,682	259,237	222,655	207,831
1960	178,623	176,466	175,310	150,905	115,966	92,114	123,900	215,531	287,296	261,055	225,853	191,635
1961	158,801	133,990	115,379	89,989	75,248	70,132	117,173	209,414	255,120	229,047	199,072	166,120
1962	135,106	109,472	92,419	76,863	98,093	97,377	215,903	347,784	360,400	356,465	326,379	292,131
1963	265,044	241,281	228,162	237,510	296,137	304,290	329,586	360,400	360,400	360,400	336,396	305,026
1964	273,668	278,495	268,855	260,703	254,291	217,069	191,863	276,888	360,400	343,750	309,409	275,896
1965	241,813	249,120	319,261	283,925	232,964	177,623	183,699	296,108	360,400	360,400	360,400	333,188
1966	304,353	306,716	299,942	292,395	282,814	287,628	356,592	360,400	360,400	331,450	297,972	265,321
1967	231,906	216,758	249,252	265,475	280,406	324,014	343,546	360,400	360,400	360,400	360,400	335,768
1968	304,053	283,496	274,527	266,857	283,817	286,873	329,080	360,400	360,400	334,325	299,837	267,451
1969	242,147	247,245	244,063	302,446	320,114	330,000	360,400	360,400	360,400	360,400	349,426	317,777
1970	299,296	305,659	324,435	326,065	320,846	322,797	334,670	360,400	360,400	360,400	326,016	290,760
1971	257,964	251,563	267,786	286,658	301,378	302,930	330,322	360,400	360,400	356,465	325,764	292,446
1972	258,839	236,370	228,162	219,353	213,819	244,031	265,495	360,400	360,400	336,426	299,001	267,965
1973	238,190	218,208	225,626	238,473	249,151	261,799	307,249	360,400	360,400	353,990	322,828	286,127
1974	257,794	293,500	316,503	330,000	330,000	330,000	360,400	360,400	360,400	356,465	331,550	295,187
1975	266,912	262,126	266,128	248,443	253,233	271,955	218,363	360,400	360,400	356,465	324,162	290,479
1976	285,385	281,517	272,478	253,215	242,054	233,754	238,104	324,938	314,385	284,316	252,614	222,717
1977	193,779	167,282	139,742	117,657	99,799	78,202	85,462	103,210	144,346	124,287	96,380	69,868
1978	43,507	24,382	32,503	50,915	68,975	112,212	164,152	360,400	360,400	360,400	357,869	356,406
1979	329,957	310,280	293,137	302,038	312,919	330,000	360,400	360,400	360,400	356,097	320,734	284,314
1980	257,725	265,877	274,536	330,000	326,446	330,000	356,592	360,400	360,400	360,400	352,729	320,413
1981	290,796	267,741	254,865	241,410	243,092	239,594	250,218	341,900	356,592	326,381	288,829	253,955
1982	226,746	250,781	287,735	312,861	326,446	330,000	360,400	360,400	360,400	360,400	360,400	360,400
1983	326,065	330,000	330,000	330,000	330,000	330,000	355,110	360,400	360,400	360,400	360,400	355,970
1984	330,000	326,192	301,515	251,330	205,725	189,676	227,004	360,400	360,400	356,465	328,962	296,457
1985	268,372	286,904	294,977	277,357	264,474	261,687	348,828	360,400	360,400	333,535	296,865	266,723
1986	245,402	227,652	236,474	239,341	311,791	326,065	360,400	360,400	360,400	360,400	337,490	304,597
1987	281,194	258,749	232,710	212,948	201,794	191,486	247,637	343,806	353,248	321,619	285,112	249,916
1988	218,130	201,193	197,937	189,208	181,835	187,927	230,788	322,288	351,731	325,880	291,107	257,476
1989	228,478	205,142	187,290	176,843	175,880	221,901	328,424	360,400	360,400	343,974	309,341	284,242
1990	267,935	272,656	277,435	258,063	244,079	253,888	321,588	360,400	360,400	339,162	307,130	280,640
1991	257,447	236,752	220,773	201,620	186,608	192,958	212,319	331,748	360,400	354,429	321,715	294,880
1992	272,636	259,154	242,411	230,916	237,549	235,995	302,519	360,400	355,022	346,244	319,447	297,703
1993	278,750	261,161	253,660	279,592	294,907	330,000	356,592	360,400	360,400	360,400	339,684	305,994
1994	278,714	255,699	235,580	206,856	194,993	199,287	248,143	360,400	360,400	328,106	288,504	253,299
1995	226,108	246,696	263,295	299,588	323,326	326,065	356,592	360,400	360,400	360,400	360,400	341,235
1996	313,102	290,180	289,399	302,383	330,000	326,065	357,776	360,400	360,400	356,465	329,269	295,808
1997	266,385	283,200	301,776	330,000	300,695	281,114	360,400	360,400	360,400	360,400	334,509	301,549
1998	267,747	243,111	234,508	256,700	283,939	330,000	360,400	360,400	360,400	360,400	357,575	336,363
1999	312,379	300,546	283,189	274,898	237,089	183,904	170,253	357,615	360,400	360,400	328,523	295,405
2000	267,514	266,427	263,903	251,200	251,088	247,384	318,690	360,400	360,400	347,257	314,429	280,432
2001	248,366	224,815	212,272	190,495	182,549	206,184	260,155	360,400	360,186	330,828	293,698	259,268
2002	226,907	212,332	221,154	223,929	226,634	230,337	322,554	360,400	360,400	337,536	300,566	266,784
Avg (21-02)	255,904	246,607	243,366	234,942	226,197	219,194	254,171	333,374	350,872	341,109	313,888	283,193

APPENDIX O3

Table 2.3-3

Difference in Hetch Hetchy Reservoir Storage (Acre-feet) 2018 WSIP minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	11,444	13,284	13,285	13,292	13,300	11,643	9,823	8,232	0	0	0	4,880
1922	14,391	20,836	23,880	24,845	24,860	24,860	24,860	0	0	0	0	4,879
1923	12,489	14,330	14,330	14,338	14,346	18,246	18,246	0	0	0	0	6,721
1924	14,329	17,091	19,945	21,859	23,590	23,591	14,719	7,351	7,345	7,336	7,322	9,432
1925	16,372	16,372	16,372	16,381	19,056	19,056	16,740	0	0	0	0	0
1926	5,042	7,897	7,362	13,169	22,435	23,011	19,506	13,736	2,846	2,843	2,839	9,558
1927	17,163	20,846	21,797	22,761	22,775	24,678	25,598	0	0	0	0	6,721
1928	13,472	18,076	18,599	20,511	22,240	19,019	2,582	0	0	0	0	6,721
1929	15,279	19,883	22,737	24,652	26,386	26,385	26,385	13,060	0	0	0	2,118
1930	9,062	9,062	9,062	9,067	9,072	9,072	9,072	0	0	0	0	1,197
1931	6,239	12,775	12,776	19,537	25,649	25,649	25,649	25,634	25,614	25,582	28,208	37,657
1932	46,198	49,881	27,271	22,051	10,999	6,806	3,877	2,801	0	0	0	4,880
1933	8,683	11,445	11,968	14,829	17,416	17,416	14,975	12,544	0	0	0	0
1934	5,042	8,817	14,199	21,451	24,481	21,438	13,106	13,099	13,084	13,061	13,038	16,890
1935	24,776	24,776	24,775	21,480	18,265	13,699	9,029	6,908	0	0	0	3,039
1936	13,787	21,152	21,157	24,959	24,644	21,397	18,062	0	0	0	0	4,879
1937	16,294	20,897	23,742	27,561	25,070	21,171	17,592	5,254	0	0	0	4,879
1938	12,488	17,092	21,657	24,712	24,724	24,685	21,727	0	0	0	0	4,880
1939	10,586	12,427	14,330	16,239	17,964	17,965	-3,808	0	0	0	0	1,197
1940	8,141	8,141	4,508	3,482	3,061	2,555	2,154	0	0	0	0	4,880
1941	10,585	12,427	17,448	17,458	15,236	12,782	9,772	7,343	0	0	0	2,117
1942	9,252	12,014	14,678	0	0	0	0	0	0	0	0	3,038
1943	9,697	13,379	13,903	13,909	5,791	0	0	0	0	0	0	4,879
1944	12,489	14,330	17,184	17,194	18,922	21,872	21,872	0	0	0	0	6,721
1945	14,804	14,804	14,805	14,810	23,410	23,410	20,548	18,380	0	0	0	4,879
1946	15,628	22,072	22,073	22,084	22,097	19,102	16,116	0	0	0	0	4,879
1947	14,391	21,757	24,611	28,429	31,883	31,883	31,883	0	0	0	0	2,117
1948	7,159	12,775	13,298	18,743	22,191	17,863	15,080	12,631	0	0	0	4,880
1949	12,774	18,390	22,195	26,043	29,496	25,449	20,913	17,518	3,808	3,804	3,800	8,676
1950	16,281	16,282	16,840	15,058	15,066	12,749	10,694	8,949	0	0	0	0
1951	3,996	0	0	0	0	8,563	7,527	7,523	0	0	0	6,721
1952	13,473	18,076	20,740	10,382	10,388	10,388	13,149	0	0	0	0	4,879
1953	12,489	14,330	14,330	14,337	14,342	20,146	1,931	0	0	0	0	7,641
1954	14,393	18,996	19,947	22,813	23,686	26,635	26,635	0	0	0	0	7,641
1955	15,249	15,249	15,249	15,258	17,931	17,931	15,130	12,674	-3,808	-3,804	-3,799	-3,796
1956	1,248	5,023	2,128	2,130	2,131	1,863	1,571	0	0	0	0	7,641
1957	14,393	18,996	21,851	25,668	27,402	27,402	27,401	0	0	0	0	3,867
1958	13,378	18,903	19,426	24,194	24,208	24,208	24,208	0	0	0	0	3,867
1959	9,573	12,335	13,286	15,198	15,206	16,252	13,768	842	841	840	839	4,704
1960	12,597	12,598	12,598	12,605	10,428	8,351	6,382	2,973	2,970	2,966	2,961	2,957
1961	7,998	13,614	6,806	13,571	19,689	19,688	19,688	19,662	19,640	19,605	24,613	34,068
1962	44,798	51,335	54,189	59,016	61,664	63,566	63,567	8,681	0	0	0	4,879
1963	8,779	13,381	13,905	13,913	13,921	17,726	20,488	0	0	0	0	0
1964	7,896	12,500	13,451	16,312	18,899	18,899	18,821	9,518	0	0	0	0
1965	3,996	3,995	2,194	2,195	2,195	2,196	1,937	1,697	0	0	0	6,721
1966	13,473	16,235	8,641	13,401	535	534	0	0	0	0	0	2,578
1967	9,521	17,900	24,559	24,574	24,586	5,986	8,749	0	0	0	0	1,197
1968	9,093	11,855	11,854	14,714	17,300	17,300	17,300	0	0	0	0	2,578
1969	12,375	19,741	23,546	23,560	9,886	0	0	0	0	0	0	6,721
1970	10,523	10,523	5,565	0	4,296	7,203	7,203	0	0	0	0	4,879
1971	12,964	19,408	19,409	19,419	19,426	19,427	19,427	0	0	0	0	2,118
1972	10,013	18,391	24,099	27,918	31,372	31,372	31,372	0	0	0	0	1,197
1973	6,238	12,775	13,298	13,306	13,314	13,314	15,432	0	0	0	0	6,721
1974	14,329	17,090	13,497	0	0	0	0	0	0	0	0	6,721
1975	10,524	10,524	10,523	10,529	14,832	15,974	15,974	0	0	0	0	6,721
1976	10,524	14,206	14,730	15,688	16,556	16,557	16,557	16,547	16,534	16,514	16,492	17,670
1977	24,605	28,379	35,990	38,875	41,498	41,499	41,499	41,445	41,336	34,296	31,231	33,908
1978	37,683	37,683	37,160	42,892	48,077	58,541	64,986	0	0	0	0	3,994
1979	43	2,805	5,659	7,564	7,568	0	0	0	0	0	0	3,038
1980	13,787	13,787	13,787	-3,935	3,554	0	0	0	0	0	0	6,721
1981	12,427	17,030	17,553	19,466	21,196	21,196	21,196	18,500	3,808	3,804	3,799	10,517
1982	21,260	25,864	29,670	17,139	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	1,841	0	0	0	0	1,197
1984	0	0	0	0	0	0	0	0	0	0	0	2,578
1985	9,522	9,521	9,522	9,526	10,476	10,475	10,475	0	0	0	0	0
1986	5,043	8,817	8,817	15,576	18,209	3,935	0	0	0	0	0	6,721
1987	12,426	15,189	18,042	21,859	25,308	25,308	25,308	16,594	7,152	7,144	7,136	9,246
1988	16,186	19,960	19,961	27,583	32,753	32,754	32,754	32,734	4,861	4,855	7,989	17,465
1989	22,212	24,974	26,876	29,746	32,341	32,340	31,976	0	0	3,996	7,797	13,314
1990	18,065	18,065	18,065	18,073	19,029	19,029	19,029	0	0	5,042	12,647	17,241
1991	19,135	22,818	23,341	24,306	25,179	28,033	29,230	28,652	0	2,664	4,563	9,163
1992	12,013	12,934	14,837	14,846	16,400	16,400	16,400	0	4,880	5,920	8,768	10,602
1993	12,500	14,342	14,341	14,350	14,357	0	0	0	0	0	0	3,867
1994	9,574	12,336	13,287	15,197	16,924	16,924	16,925	0	0	0	0	3,866
1995	10,809	10,809	10,810	18,426	6,674	3,033	0	0	0	0	0	4,880
1996	10,586	13,348	13,871	13,877	-3,554	3,935	2,624	0	0	0	0	3,866
1997	11,476	16,079	16,080	0	0	2,854	0	0	0	0	0	2,118
1998	11,916	17,440	17,963	17,973	17,984	0	0	0	0	0	0	4,880
1999	10,586	12,427	15,281	17,190	17,199	17,199	15,123	2,785	0	0	0	3,867
2000	9,574	9,574	9,573	9,579	14,912	17,767	17,767	0	0	0	0	3,867
2001	13,379	18,903	19,425	23,242	24,974	28,874	28,874	0	0	0	0	4,880
2002	14,390	17,152	21,909	24,776	27,368	27,367	27,368	0	0	0	0	2,578
Avg (21-02)	12,773	15,872	16,493	17,070	17,403	16,541	15,053	4,808	1,840	1,908	2,198	6,254

APPENDIX O3

Table 2.3-4

Difference in Hetch Hetchy Reservoir Storage (Acre-feet) 2018 WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	2,198	4,959	4,960	4,963	4,966	4,342	3,658	3,076	0	0	-2,188	576
1922	9,138	13,741	18,688	18,699	18,710	18,710	18,710	0	0	0	-2,188	575
1923	8,186	12,790	12,790	12,797	12,804	1,387	1,387	0	0	0	-2,188	2,417
1924	10,978	13,740	14,691	17,554	20,142	14,339	5,052	335	-1,783	-3,969	-6,150	-6,143
1925	-1,383	17,951	37,930	32,150	17,566	6,055	5,313	0	0	0	-2,188	-4,304
1926	-4,302	-7,064	-16	-16	-13	-15,330	-13,488	-10,568	0	-2,188	-4,374	233
1927	5,941	10,544	11,496	7,697	7,702	2,945	1,104	0	0	0	-2,188	2,417
1928	6,221	10,824	13,679	11,783	9,210	281	0	0	0	-2,188	-4,373	234
1929	4,038	6,800	7,752	7,756	7,761	1,957	-160	0	0	-2,188	-4,374	-4,370
1930	389	19,723	39,701	33,921	24,402	12,891	10,773	0	0	-2,188	-4,373	-5,291
1931	-2,434	-1,514	5,574	6,528	7,391	1,588	-529	-2,717	-4,832	-7,015	-6,530	-3,761
1932	-3,759	-2,838	-1,897	-1,591	2,645	1,691	1,046	754	0	0	-2,188	576
1933	5,332	8,094	15,705	10,957	6,667	864	761	638	0	0	-2,188	-4,304
1934	-1,448	-3,290	-2,195	-1,415	-3,522	-9,788	-4,179	-6,364	-8,474	-10,650	-12,820	-11,056
1935	-8,196	11,138	31,116	26,406	22,153	10,358	6,874	5,270	0	0	-2,188	-1,265
1936	7,297	10,059	17,258	13,364	13,372	11,707	9,889	0	0	0	-2,188	575
1937	8,186	10,948	11,900	11,907	11,185	9,529	8,018	0	0	0	-2,188	575
1938	6,283	10,887	13,741	11,084	11,089	11,088	9,748	0	0	0	-2,188	576
1939	8,187	10,948	15,705	14,761	13,907	8,104	0	0	0	-2,188	-4,373	-5,291
1940	-531	18,803	35,223	19,926	17,643	14,796	12,490	0	0	-2,188	-4,374	-1,608
1941	6,003	8,766	14,397	14,405	12,626	10,593	8,102	6,094	0	0	-2,188	-2,187
1942	2,571	5,333	9,139	0	0	0	0	0	0	0	-2,188	-1,266
1943	3,492	8,095	15,706	15,713	7,596	0	0	0	0	0	-2,188	575
1944	6,284	9,046	11,900	10,004	4,682	-7,685	-9,803	0	0	0	-2,188	2,417
1945	10,978	30,312	50,291	44,510	39,377	39,377	34,600	30,669	0	0	-2,188	575
1946	6,284	10,887	10,887	10,892	10,898	9,551	8,059	0	0	-2,188	-4,374	-1,608
1947	6,955	12,479	15,333	20,097	20,109	9,549	7,432	0	0	-2,188	-4,374	-4,370
1948	-1,513	-1,513	6,097	6,782	7,645	1,841	1,554	1,305	0	0	-2,188	576
1949	6,283	6,284	7,235	12,020	16,324	14,297	11,995	10,054	3,808	1,616	-574	2,188
1950	5,992	25,326	45,993	28,530	27,001	22,763	18,761	15,708	0	-800	-2,988	-5,103
1951	-3,293	0	0	0	0	0	0	0	0	0	-2,188	2,417
1952	6,221	10,825	11,776	5,895	5,898	5,898	-547	0	0	0	-2,188	575
1953	6,284	9,046	9,046	9,050	9,053	-460	0	0	0	0	-2,188	3,337
1954	11,898	16,502	17,453	17,463	13,005	5,394	3,276	0	0	-2,188	-4,373	1,154
1955	9,716	29,050	44,271	27,839	15,653	9,850	8,315	6,974	-3,808	-5,992	-8,173	-10,284
1956	-7,425	-9,266	-4,758	-4,760	-4,763	-4,139	-3,481	0	0	0	-2,188	3,337
1957	7,141	11,745	12,697	12,703	7,383	-3,177	-5,295	0	0	0	-2,188	-437
1958	8,125	10,887	18,498	13,752	13,760	13,760	13,760	0	0	0	-2,188	-437
1959	5,271	8,033	8,984	8,039	8,043	-6,227	-5,492	-4,932	-7,044	-9,222	-11,394	-9,632
1960	-3,918	15,416	35,395	29,617	18,587	12,000	9,167	2,173	54	-2,134	-4,318	-6,432
1961	-3,574	-3,574	5,300	6,260	2,831	-2,973	-5,090	-7,272	-9,381	-11,556	-11,536	-11,523
1962	-10,565	-14,248	-16,150	-15,212	-16,089	-32,262	-39,903	-3,935	0	0	-2,188	575
1963	1,527	4,288	11,900	11,907	11,914	8,108	5,346	0	0	0	-2,188	-4,304
1964	1,406	6,010	6,961	2,207	-2,088	-7,892	-7,892	-6,967	3,808	1,616	-574	-2,692
1965	-882	18,451	23,517	23,527	23,538	22,738	19,359	16,610	0	0	0	4,603
1966	8,407	13,931	8,868	3,925	-542	-6,346	0	0	0	-2,188	-4,373	-3,910
1967	849	3,612	13,125	13,133	13,139	0	-3,683	0	0	0	0	-921
1968	4,788	7,550	14,637	8,936	3,786	-2,018	-4,136	0	0	-2,188	-4,374	-3,910
1969	3,703	6,466	11,222	11,229	0	0	0	0	0	0	-2,188	2,417
1970	6,221	25,555	40,575	-3,935	-4,858	0	-2,117	0	0	0	-2,188	575
1971	6,283	13,649	13,649	13,656	13,661	3,101	983	0	0	0	-2,188	-2,186
1972	3,523	6,285	11,993	16,756	16,766	10,963	8,846	0	0	-2,188	-4,373	-5,290
1973	-2,433	-1,513	6,098	6,101	6,105	6,105	1,502	0	0	-2,188	-4,374	234
1974	5,941	8,703	5,109	0	0	0	0	0	0	0	-2,188	2,417
1975	8,124	27,459	47,437	35,952	35,115	32,451	32,451	3,935	0	0	-2,188	2,417
1976	8,125	12,728	20,339	21,301	22,172	16,369	14,252	12,055	9,928	7,728	5,530	4,603
1977	6,503	4,661	7,516	10,375	12,962	7,159	5,041	2,846	722	-1,468	-2,510	-7,107
1978	-10,902	-9,981	-7,651	-7,655	-7,664	-7,665	-13,372	0	0	0	-2,188	0
1979	0	2,762	3,713	2,764	2,765	0	0	0	0	-2,188	-4,373	-3,450
1980	2,260	21,594	36,816	-3,935	3,554	0	0	0	0	0	-2,188	2,417
1981	6,222	10,825	18,436	12,738	7,590	-3,922	-3,921	0	0	-2,188	-4,374	233
1982	8,795	14,319	18,125	5,589	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	-2,946	0	0	0	0	-921
1984	0	0	0	0	0	-9,738	-11,659	0	0	0	-2,188	-1,726
1985	3,032	22,365	42,344	31,805	23,229	17,426	15,308	0	0	-2,188	-4,374	-6,487
1986	-3,629	-5,471	1,617	2,568	1,757	0	0	0	0	0	-2,188	2,417
1987	8,124	10,886	11,837	16,602	20,907	15,104	12,987	2,092	0	-2,188	-4,373	-4,370
1988	-2,465	-4,306	2,782	-71	-2,649	-8,452	-10,570	-5,378	0	-2,188	-1,234	-1,233
1989	-1,232	-312	-3,166	-3,168	-3,169	-8,973	0	0	0	-1,046	-1,045	-2,886
1990	-4,787	14,547	29,769	19,223	10,642	4,838	2,720	0	0	0	2,854	1,011
1991	-893	3,710	6,565	7,520	8,383	772	-2,910	0	0	476	-1,428	1,335
1992	4,189	507	-1,396	-2,348	-3,210	-21,285	-28,006	0	-498	-498	4,260	4,256
1993	4,254	7,017	8,396	8,401	8,405	0	0	0	0	0	-2,188	-437
1994	8,126	10,888	11,839	14,699	6,115	312	-1,806	0	0	-2,188	-4,374	-2,621
1995	-717	18,618	38,597	38,619	20,001	3,033	0	0	0	0	0	2,762
1996	6,566	9,328	12,183	12,187	-3,554	3,935	2,624	0	0	0	-2,188	-438
1997	5,271	9,875	9,875	0	0	-7,611	0	0	0	0	-2,188	-2,186
1998	5,426	8,188	15,798	15,807	15,817	0	0	0	0	0	-2,188	-2,186
1999	1,620	4,382	7,236	2,482	2,484	2,483	2,183	0	0	0	-2,188	-437
2000	3,369	22,703	42,681	27,389	24,999	11,680	9,563	0	0	-2,188	-4,373	-2,621
2001	3,089	5,851	13,461	9,663	2,795	-8,622	-10,739	0	-214	-2,402	-4,587	-1,821
2002	6,742	9,504	16,163	12,368	8,938	-1,623	-3,741	0	0	-2,188	-4,374	-3,910
Avg (21-02)	3,098	8,809	14,784	11,355	9,088	3,389	1,921	884	-216	-1,113	-2,878	-1,348

Through the fall and winter, storage in Hetch Hetchy Reservoir would be the same or higher under the variant setting. Hetch Hetchy Reservoir would fill by the end of May during approximately 82 percent of the years, which would prevent any difference in storage from affecting the next summer's reservoir storage. Figure 2.3-2 illustrates the difference in reservoir storage, averaged by year type, for the variant and WSIP settings. Also shown is the average difference in storage for the two settings during the 82-year simulation.

Table 2.3-4 illustrates the difference in Hetch Hetchy Reservoir storage between the variant and base settings. Immediately after filling Hetch Hetchy Reservoir (May or June, and then continuing through July), there would only be occasional differences in storage at the reservoir, typically a decrease of less than 12,000 acre-feet. This is indicative of the same amount of water being passed through the reservoir regardless of the size of the conveyance capacity of the SJPL. Water not diverted to the SJPL would return to the Tuolumne River and flow to Don Pedro Reservoir. In the late summer and early fall, there would consistently be a slight difference (lower) in storage levels between the two settings, as additional diversions to the SJPL would retain Bay Area reservoir storage. Some of this additional Hetch Hetchy Reservoir storage depletion would be ameliorated later in the fall and into winter as SJPL diversions are reduced due to less Bay Area reservoir replenishment needs and conveyance system maintenance. Storage becomes greater in November and December of the variant setting due to the assumed systemwide maintenance that would occur in the variant setting but not in the base setting. After December, the storage gain occurring in the variant setting would again be affected as replenishment of Bay Area reservoir storage resumes. In non-wet years, there is a difference in storage between the variant and base settings; the variant setting sometimes results in a lower storage in the reservoir by the end of April. Figure 2.3-3 illustrates the difference in reservoir storage, averaged by year type, between the variant and base settings. Also shown is the average difference in storage for the two settings during the 82-year simulation. Figure 2.3-4 illustrates the average monthly storage in Hetch Hetchy Reservoir for the 82-year simulation, and the range in storage for each month for the variant and base settings.

The difference in storage in Hetch Hetchy Reservoir attributed to the diversion effects of the variant would manifest in differences in releases from O'Shaughnessy Dam to the stream. A different amount of available reservoir space in the winter and spring due to the variant would lead to a different ability to regulate inflow, thus potentially changing the amount of water released to the stream that is in excess of minimum release requirements. Figure 2.3-1 illustrates the stream release from O'Shaughnessy Dam for the WSIP, variant, and base settings. Table 2.3-5 illustrates the difference in stream releases between the variant and WSIP settings. Compared to the WSIP setting, the variant exhibits an incrementally greater stream release, predominately during May or June, which is reflective of the months when releases to the stream are made in excess of minimum release requirements in anticipation of filling the reservoir. The exceptions to this circumstance, during which incrementally larger reductions in releases to the stream occur, are considered anomalous within the modeling and simply the result of shifting releases from one month to the next. The increase in releases is the result of a less-depleted reservoir, which is the result of lesser SFPUC demands between the settings.

Table 2.3-6 illustrates the difference in stream releases between the variant and base settings. In this comparison, releases could be either greater or less than depicted for the base setting, and these differences would occur predominately during May or June. Generally, Hetch Hetchy Reservoir storage would be slightly lower during non-wet years, leading to a reduction in stream releases during non-wetter years if a release occurs. During wetter years, the releases are projected to increase. The differences, either increases or decreases, are a result of the coincidence of several operational parameters affecting the release of water from the reservoir, including systemwide water demands, conveyance capacity and maintenance assumptions, and the watershed's hydrology.

Table 2.3-5 illustrates the difference in stream releases between the variant and WSIP settings, expressed in terms of a monthly volume (acre-feet) of flow. Table 2.3-7 illustrates the same information and the average monthly stream release for the variant and WSIP setting, expressed in average monthly flow (cfs). Table 2.3-5 shows an increase in monthly flow below O'Shaughnessy Dam of up to approximately 32,000 acre-feet. Considering the manner in which releases are determined and made to the stream, it is not always meaningful to quantify the effect of these changes in terms of average monthly

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Figure 2.3-2

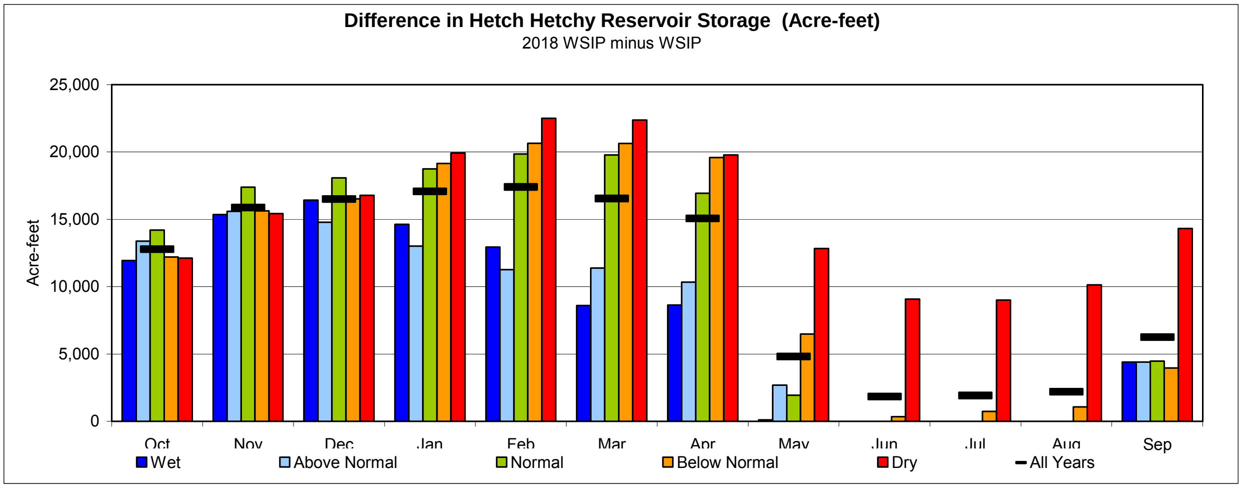

Figure 2.3-3

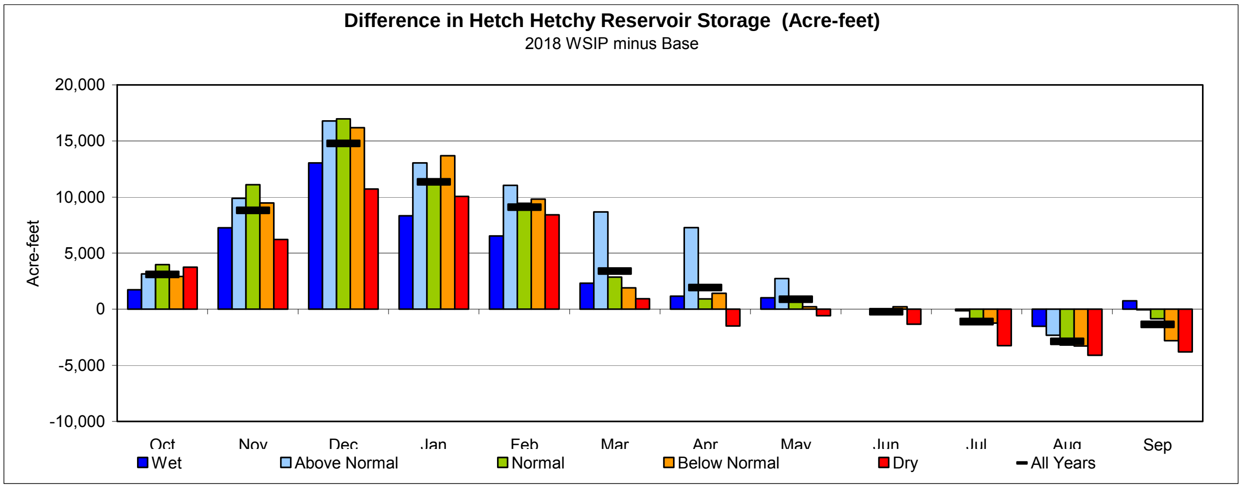

Figure 2.3-4

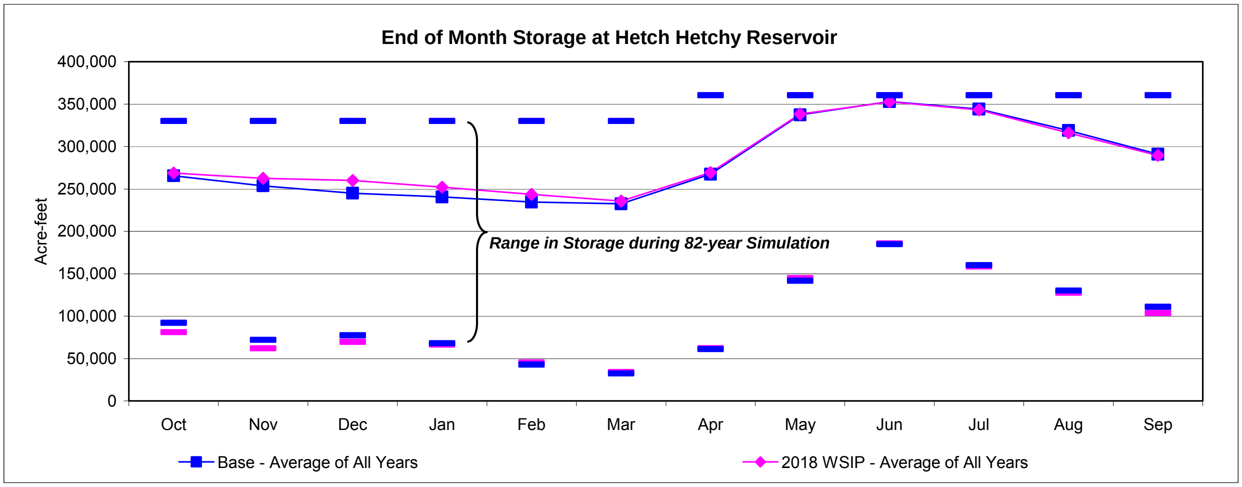

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Table 2.3-5

Difference in Hetch Hetchy Reservoir Release to Stream (Acre-feet) 2018 WSIP minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	0	0	0	8,224	0	0	0	8,224
1922	0	0	0	0	0	0	0	22,812	0	0	0	0	22,812
1923	0	0	0	0	0	0	0	18,235	0	0	0	0	18,235
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	16,306	0	0	0	0	16,306
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	26,265	0	0	0	0	26,265
1928	0	0	0	0	0	0	0	2,741	0	0	0	0	2,741
1929	0	0	0	0	0	0	0	0	13,872	0	0	0	13,872
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	2,798	0	0	0	2,798
1933	0	0	0	0	0	0	0	0	11,014	0	0	0	11,014
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	6,899	0	0	0	6,899
1936	0	0	0	0	0	0	0	15,759	0	0	0	0	15,759
1937	0	0	0	0	0	0	0	9,359	5,570	0	0	0	14,929
1938	0	0	0	0	0	0	0	19,469	0	0	0	0	19,469
1939	0	0	0	0	0	0	3,808	-4,045	0	0	0	0	-237
1940	0	0	0	0	0	0	0	1,791	0	0	0	0	1,791
1941	0	0	0	0	0	0	0	0	7,337	0	0	0	7,337
1942	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	21,859	0	0	0	0	21,859
1945	0	0	0	0	0	0	0	0	18,365	0	0	0	18,365
1946	0	0	0	0	0	0	0	14,088	0	0	0	0	14,088
1947	0	0	0	0	0	0	0	31,870	0	0	0	0	31,870
1948	0	0	0	0	0	0	0	0	12,616	0	0	0	12,616
1949	0	0	0	0	0	0	0	0	5,408	0	0	0	5,408
1950	0	0	0	0	0	0	0	0	8,943	0	0	0	8,943
1951	0	3,996	0	0	0	0	0	0	8,010	0	0	0	12,006
1952	0	0	0	0	0	0	0	13,144	0	0	0	0	13,144
1953	0	0	0	0	0	0	0	2,049	0	0	0	0	2,049
1954	0	0	0	0	0	0	0	26,624	0	0	0	0	26,624
1955	0	0	0	0	0	0	0	0	3,808	0	0	0	3,808
1956	0	0	0	0	0	0	0	1,373	0	0	0	0	1,373
1957	0	0	0	0	0	0	0	27,391	0	0	0	0	27,391
1958	0	0	0	0	0	0	0	24,198	0	0	0	0	24,198
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	3,935	9,227	0	0	0	13,162
1963	0	0	0	0	0	0	0	20,897	0	0	0	0	20,897
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	1,695	0	0	0	1,695
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	9,309	0	0	0	0	9,309
1968	0	0	0	0	0	0	0	17,457	0	0	0	0	17,457
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	43	0	7,200	0	0	0	0	7,243
1971	0	0	0	0	0	0	0	19,814	0	0	0	0	19,814
1972	0	0	0	0	0	0	0	31,356	0	0	0	0	31,356
1973	0	0	0	0	0	0	0	15,425	0	0	0	0	15,425
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	15,964	0	0	0	0	15,964
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	25,740	0	0	0	0	25,740
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	3,935	-3,554	0	0	0	0	0	0	0	381
1981	0	0	0	0	0	0	0	2,684	10,310	0	0	0	12,994
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	1,959	0	0	0	0	1,959
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	11,152	0	0	0	0	11,152
1986	0	0	0	0	0	10,235	3,935	0	0	0	0	0	14,170
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	3,808	0	0	0	3,808
1989	0	0	0	0	0	0	364	33,044	0	0	0	0	33,408
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	29,675	0	0	0	29,675
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	3,554	-3,935	1,311	2,785	0	0	0	0	3,715
1997	0	0	0	16,086	0	0	0	0	0	0	0	0	16,086
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	10,281	2,950	0	0	0	13,231
2000	0	0	0	0	0	0	0	17,759	0	0	0	0	17,759
2001	0	0	0	0	0	0	0	28,859	0	0	0	0	28,859
2002	0	0	0	0	0	0	0	27,763	0	0	0	0	27,763
Avg (21-02)	0	49	0	244	0	77	115	7,252	2,080	0	0	0	9,817

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Table 2.3-6

Difference in Hetch Hetchy Reservoir Release to Stream (Acre-feet)

2018 WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	0	0	0	3,073	0	0	0	3,073
1922	0	0	0	0	0	0	0	17,442	0	0	0	0	17,442
1923	0	0	0	0	0	0	0	1,386	0	0	0	0	1,386
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	5,311	0	0	0	0	5,311
1926	0	0	0	0	0	0	0	-2,913	0	0	0	0	-2,913
1927	0	0	0	0	0	0	0	1,175	0	0	0	0	1,175
1928	0	0	0	0	0	0	0	0	0	0	0	0	0
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	-3,554	0	0	0	753	0	0	0	-2,801
1933	0	0	0	0	0	0	0	0	561	0	0	0	561
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	3,935	0	0	5,263	0	0	0	9,198
1936	0	0	0	0	0	0	0	8,614	0	0	0	0	8,614
1937	0	0	0	0	0	0	0	6,700	0	0	0	0	6,700
1938	0	0	0	0	0	0	0	9,009	0	0	0	0	9,009
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	0	0	0	10,463	0	0	0	0	10,463
1941	0	0	0	0	0	0	0	0	6,089	0	0	0	6,089
1942	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	-9,799	0	0	0	0	-9,799
1945	0	0	0	0	0	0	0	0	30,644	0	0	0	30,644
1946	0	0	0	0	0	0	0	7,043	0	0	0	0	7,043
1947	0	0	0	0	0	0	0	7,429	0	0	0	0	7,429
1948	0	0	0	0	0	0	0	0	1,304	0	0	0	1,304
1949	0	0	0	0	0	0	0	0	5,408	0	0	0	5,408
1950	0	0	0	0	0	0	0	0	15,695	0	0	0	15,695
1951	0	-3,293	0	0	0	0	0	0	0	0	0	0	-3,293
1952	0	0	0	0	0	0	0	-547	0	0	0	0	-547
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	3,276	0	0	0	0	3,276
1955	0	0	0	0	0	0	0	0	3,808	0	0	0	3,808
1956	0	0	0	0	0	0	0	-3,039	0	0	0	0	-3,039
1957	0	0	0	0	0	0	0	-5,292	0	0	0	0	-5,292
1958	0	0	0	0	0	0	0	13,755	0	0	0	0	13,755
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	-35,603	-4,171	0	0	0	-39,774
1963	0	0	0	0	0	0	0	5,712	0	0	0	0	5,712
1964	0	0	0	0	0	0	0	0	-3,808	0	0	0	-3,808
1965	0	0	0	0	0	0	0	0	16,595	0	0	0	16,595
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	-3,920	0	0	0	0	-3,920
1968	0	0	0	0	0	0	0	-4,416	0	0	0	0	-4,416
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	3,935	0	43	0	-2,117	0	0	0	0	1,861
1971	0	0	0	0	0	0	0	1,049	0	0	0	0	1,049
1972	0	0	0	0	0	0	0	8,841	0	0	0	0	8,841
1973	0	0	0	0	0	0	0	1,501	0	0	0	0	1,501
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	19,987	4,171	0	0	0	24,158
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	-13,365	0	0	0	-310	-13,675
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	3,935	-3,554	0	0	0	0	0	0	0	381
1981	0	0	0	0	0	0	0	-3,919	0	0	0	0	-3,919
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	-3,131	0	0	0	0	-3,131
1984	0	0	0	0	0	3,935	0	-11,653	0	0	0	0	-7,718
1985	0	0	0	0	0	0	0	16,315	0	0	0	0	16,315
1986	0	0	0	0	0	1,757	0	0	0	0	0	0	1,757
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	364	0	0	0	0	0	364
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	-18,433	0	0	0	0	-18,433
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	3,554	-3,935	1,311	2,785	0	0	0	0	3,715
1997	0	0	0	9,878	0	0	0	0	0	0	0	0	9,878
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	1,912	0	0	0	0	1,912
2000	0	0	0	0	0	0	0	9,558	0	0	0	0	9,558
2001	0	0	0	0	0	0	0	-10,735	0	0	0	0	-10,735
2002	0	0	0	0	0	0	0	-3,985	0	0	0	0	-3,985
Avg (21-02)	0	-40	0	216	-43	70	20	322	1,041	0	0	-4	1,583

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Table 2.3-7

Hetch Hetchy Reservoir Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) 2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	55	51	51	187	85	94	148	2,509	4,551	2,034	184	89
Above Normal	55	93	88	66	93	90	133	1,303	3,139	379	125	89
Normal	54	54	50	55	74	74	98	1,437	1,924	167	122	86
Below Normal	55	55	46	43	51	63	92	727	770	113	111	73
Dry	53	53	44	40	44	50	60	172	168	86	86	65
All Years	54	62	56	77	70	75	106	1,224	2,107	548	125	81

Hetch Hetchy Reservoir Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	55	51	51	167	89	84	144	2,412	4,550	2,034	184	89
Above Normal	55	89	88	66	89	94	131	1,192	3,093	379	125	89
Normal	54	54	50	55	74	74	98	1,253	1,890	167	122	86
Below Normal	55	55	46	43	51	63	91	550	709	113	111	73
Dry	53	53	44	40	44	50	56	156	139	86	86	65
All Years	54	61	56	73	70	73	104	1,107	2,072	548	125	81

Difference in Hetch Hetchy Reservoir Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) 2018 WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	0	0	0	20	-4	10	4	97	2	0	0	0
Above Normal	0	4	0	0	4	-4	1	112	46	0	0	0
Normal	0	0	0	0	0	0	0	184	34	0	0	0
Below Normal	0	0	0	0	0	0	0	177	62	0	0	0
Dry	0	0	0	0	0	0	4	16	29	0	0	0
All Years	0	1	0	4	0	1	2	118	35	0	0	0

flow (cfs).[1] When comparing the variant to the WSIP setting, a change in the volume of release from O'Shaughnessy Dam to the stream would likely result in the release being delayed or initiated earlier by a matter of days. Typical springtime releases, when initiated, amount to a release of up to 3,000 cfs (approximately 6,000 acre-feet over the span of a day). Using the assumption that a change in release volume equates to a delay or an earlier initiation of releasing 6,000 acre-feet per day means that the difference in stream release between the variant and WSIP would be up to an added five days of release. Normally, this change in release would not affect the peak stream release rate during a year. Table 2.3-8 illustrates the average monthly stream release for the variant and base settings, and the differences, expressed in average monthly flow (cfs). Table 2.3-6 illustrates that the difference in monthly flow below O'Shaughnessy Dam between the variant and base settings could range from an increase of approximately 30,000 acre-feet to a decrease of approximately 36,000 acre-feet. Using the same metric as described above to estimate the delay or addition in the number days of release to the stream, the variant could lead to an effect ranging from an increase of five days of release to a decrease of up to 6 days compared to the base setting.

Table 2.3-8

Hetch Hetchy Reservoir Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) 2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	55	51	51	187	85	94	148	2,509	4,551	2,034	184	89
Above Normal	55	93	88	66	93	90	133	1,303	3,139	379	125	89
Normal	54	54	50	55	74	74	98	1,437	1,924	167	122	86
Below Normal	55	55	46	43	51	63	92	727	770	113	111	73
Dry	53	53	44	40	44	50	60	172	168	86	86	65
All Years	54	62	56	77	70	75	106	1,224	2,107	548	125	81

Hetch Hetchy Reservoir Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	55	51	51	173	89	93	148	2,510	4,534	2,034	184	90
Above Normal	55	96	88	66	93	86	131	1,249	3,092	379	125	89
Normal	54	54	50	51	74	74	98	1,443	1,909	167	122	86
Below Normal	55	55	46	43	51	63	91	723	763	113	111	73
Dry	53	53	44	40	44	50	60	199	168	86	86	65
All Years	54	62	56	74	70	73	106	1,219	2,089	548	125	81

Difference in Hetch Hetchy Reservoir Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) 2018 WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	0	0	0	14	-4	2	0	-1	17	0	0	0
Above Normal	0	-3	0	0	0	4	1	54	46	0	0	0
Normal	0	0	0	4	0	0	0	-6	15	0	0	0
Below Normal	0	0	0	0	0	0	0	4	7	0	0	0
Dry	0	0	0	0	0	0	0	-27	0	0	0	0
All Years	0	-1	0	4	-1	1	0	5	17	0	0	0

1 See *Estimated Affect of WSIP on Daily Releases below Hetch Hetchy Reservoir*, Memorandum by Daniel B. Steiner, December 31, 2006.

2.4 Lake Lloyd and Lake Eleanor

Compared to the operation of the WSIP, the operation of Lake Lloyd and Lake Eleanor are simulated to be only slightly different for the variant. Figure 2.4-1 illustrates a chronological trace of the simulation of Lake Lloyd storage and stream releases. Shown in Figure 2.4-1 are the results for the WSIP, variant, and base settings. The operation resulting from the variant is essentially the same as the WSIP setting, including during drought. Although the level of delivery between the variant and base settings is essentially the same (net 265 mgd demand) during the 1987-1992 drought, water delivery reliability has been improved in the variant setting; as a result, the drawdown of Lake Lloyd during this period looks closer to that in the WSIP setting. Although there is less water delivered during this period in the variant setting compared to the WSIP setting, more water is delivered in the variant setting than in the base setting. The additional draw of water reduced the amount of water released from Hetch Hetchy Reservoir to Don Pedro Reservoir in the variant setting, which, in order to satisfy TID/MID entitlements to inflow, was met with additional releases from Lake Lloyd, similar to the WSIP setting. The additional release from Lake Lloyd associated with the variant appears to be approximately the same as in the WSIP setting in this instance, which is partially a factor of modeling discretion in that the HH/LSM makes release decisions in the form of block amounts of releases. Additional refinement of modeling assumptions would likely produce a result that places Lake Lloyd storage during this drought period more between the base setting and WSIP setting results. Otherwise, the results for Lake Lloyd storage are essentially the same between the WSIP and variant settings.

Figure 2.4-2 illustrates the almost identical operation of Lake Eleanor for the variant and WSIP settings. Also shown in Figure 2.4-2 is the operation for the base setting. Any difference in the Lake Eleanor operation would be caused by a small change in operation at Lake Lloyd that would affect the operation of the Cherry-Eleanor Tunnel between the two watersheds. Any difference that occurs in the simulations is more likely the result of modeling discretion as opposed to any substantive difference in operation.

Supplementing the Figure 2.4-1 representation of Lake Lloyd stream releases is Table 2.4-1, which illustrates releases for the variant and WSIP settings, and the difference in releases between the two settings. Table 2.4-2 provides the same form of information for the variant and base settings. With essentially no change in reservoir operations, stream releases will not be different.

2.5 Don Pedro Reservoir and La Grange Releases

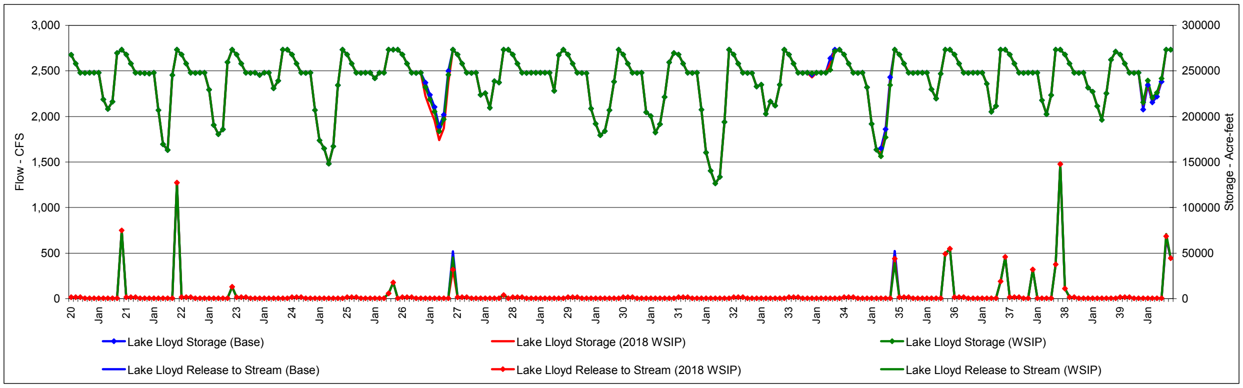
A change in Don Pedro Reservoir operation is caused by changes in inflow to the reservoir. The changes in inflow to the reservoir are the result of net changes within the operation of the upstream SFPUC facilities described previously, and other changes in SFPUC operations associated with diversions to the Holm, Kirkwood, and Moccasin Powerhouses. Figure 2.5-1 illustrates a chronological trace of the simulation of Don Pedro Reservoir storage and Tuolumne River stream releases from La Grange Dam. Shown in Figure 2.5-1 are the results for the WSIP, variant, and base settings. Supplementing the Figure 2.5-1 representation of Don Pedro Reservoir storage are Table 2.5-1, Don Pedro Reservoir Storage (2018 WSIP); Table 2.5-2, Don Pedro Reservoir Storage (WSIP); and Table 2.5-3, Difference in Don Pedro Reservoir Storage (2018 WSIP minus WSIP). Table 2.5-4 is provided to illustrate the difference in Don Pedro Reservoir storage between the base and variant settings.

Table 2.5-3 shows that, throughout many years, the storage in Don Pedro Reservoir associated with the variant setting would differ from the storage in the WSIP setting, and this difference would always be more storage. Table 2.5-4 illustrates that the variant setting results for Don Pedro Reservoir storage are close to the storage results depicted for the base setting, although typically lower than the base setting. Compared to the WSIP setting, the differences in storage are indicative of the increases to the inflow of Don Pedro Reservoir that are due to lesser demands and SJPL diversions in the variant setting. The increases in inflow typically occur during the winter through early summer period. Comparing to the base setting, the variant would result in typically less inflow to Don Pedro Reservoir during non-wet years and particularly during drought periods when more water is diverted to the SJPL in the variant setting. Less inflow leads to less reservoir storage.

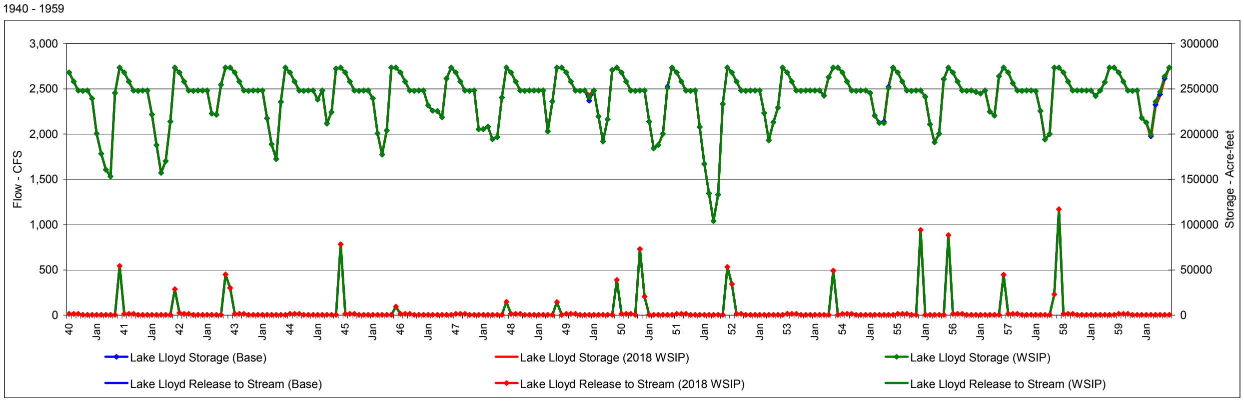
APPENDIX O3

Figure 2.4-1
Lake Lloyd Storage and Stream Release

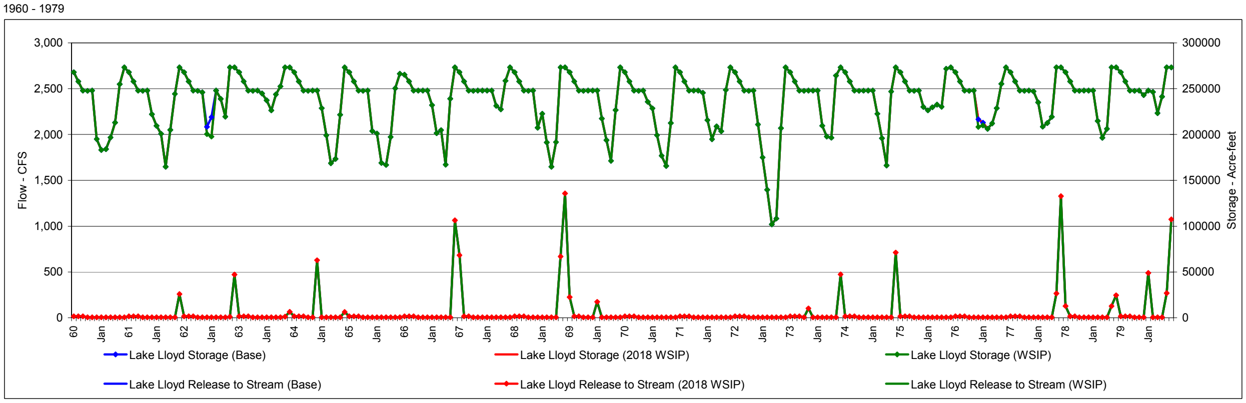
1920 - 1939



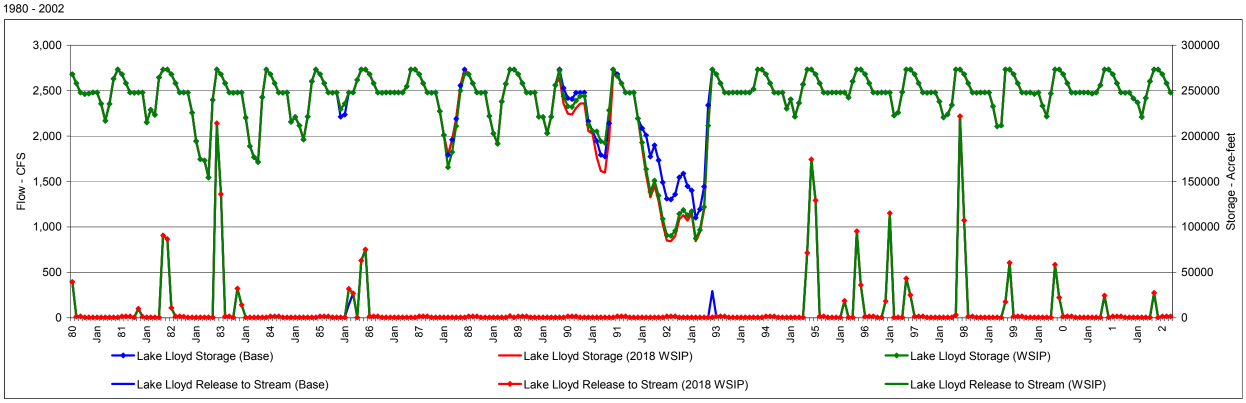
1940 - 1959



1960 - 1979



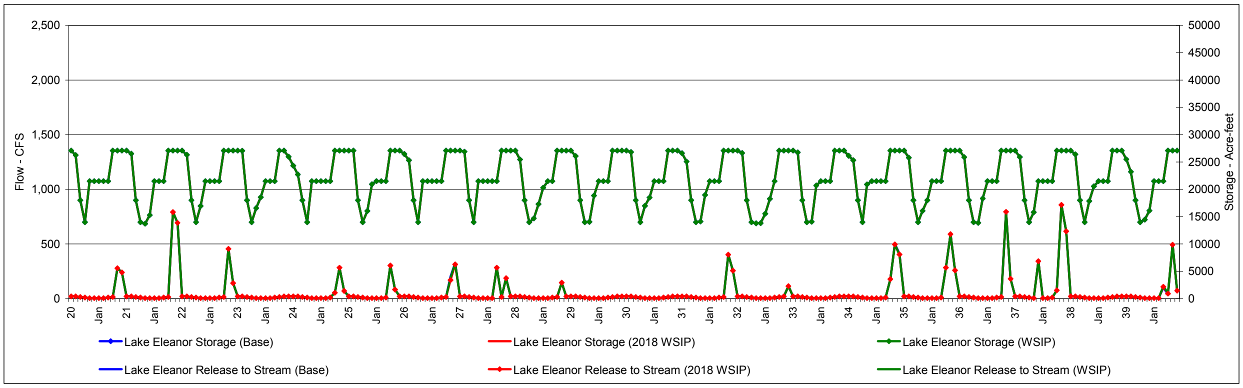
1980 - 2002



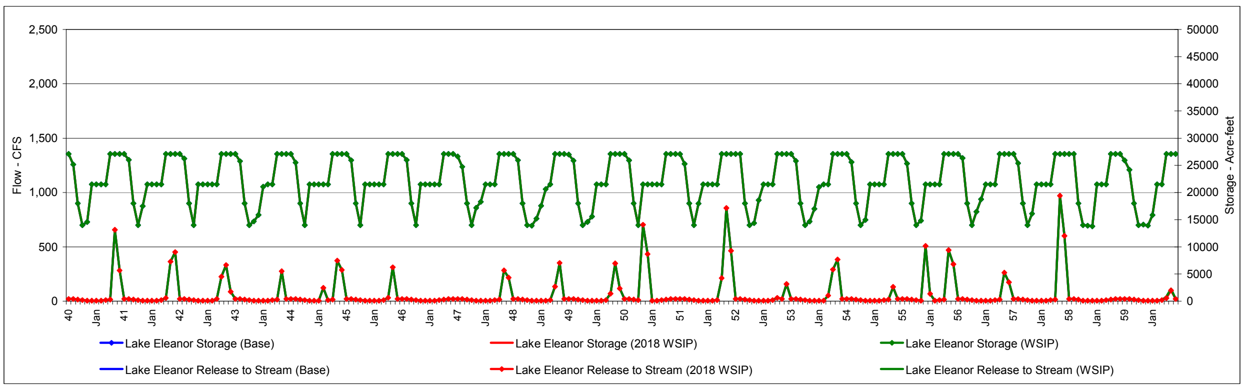
APPENDIX O3

Figure 2.4-2
Lake Eleanor Storage and Stream Release

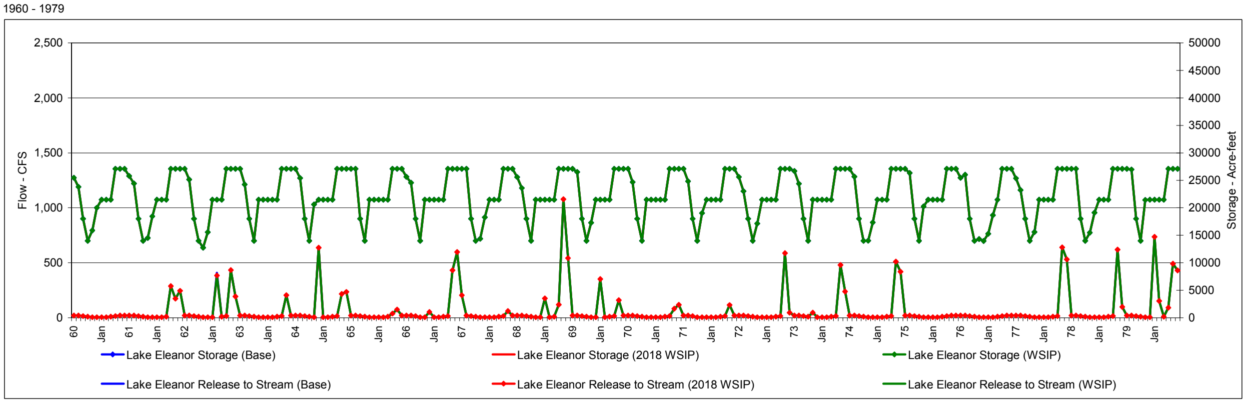
1920 - 1939



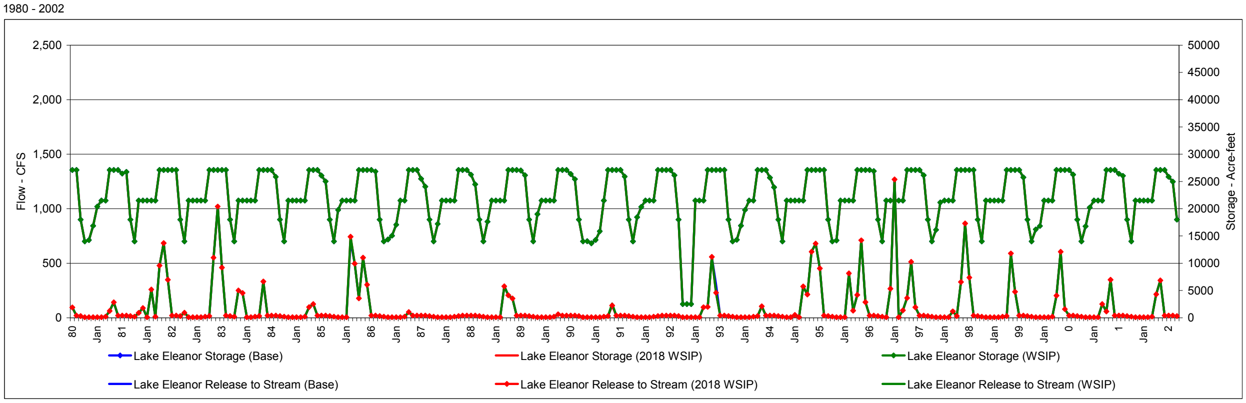
1940 - 1959



1960 - 1979



1980 - 2002



APPENDIX O3

Table 2.4-1

Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — 2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	5	11	134	107	25	21	5	284	1,058	363	15	15
Above Normal	5	72	25	5	16	5	5	166	446	16	15	15
Normal	5	5	5	16	5	5	5	110	162	15	15	15
Below Normal	5	5	5	5	5	5	8	39	43	16	15	15
Dry	5	5	5	5	5	5	5	5	5	16	15	15
All Years	5	20	34	27	11	8	6	120	340	83	15	15

Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	5	11	134	107	25	21	5	284	1,058	363	15	15
Above Normal	5	72	25	5	16	5	5	167	451	16	15	15
Normal	5	5	5	16	5	5	5	110	162	15	15	15
Below Normal	5	5	5	5	5	5	8	39	43	16	15	15
Dry	5	5	5	5	5	5	5	5	5	16	15	15
All Years	5	20	34	27	11	8	6	121	341	83	15	15

Difference in Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — 2018 WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	-1	-5	0	0	0
Normal	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	0	0	0	0	0	0	-1	0	0	0

Table 2.4-2

Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — 2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	5	11	134	107	25	21	5	284	1,058	363	15	15
Above Normal	5	72	25	5	16	5	5	166	446	16	15	15
Normal	5	5	5	16	5	5	5	110	162	15	15	15
Below Normal	5	5	5	5	5	5	8	39	43	16	15	15
Dry	5	5	5	5	5	5	5	5	5	16	15	15
All Years	5	20	34	27	11	8	6	120	340	83	15	15

Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	5	11	134	107	14	21	5	284	1,076	363	15	15
Above Normal	5	72	25	5	16	5	5	164	462	16	15	15
Normal	5	5	5	16	5	5	5	110	162	15	15	15
Below Normal	5	5	5	5	5	5	8	39	43	15	15	15
Dry	5	5	5	5	5	5	5	5	5	16	15	15
All Years	5	20	34	27	9	8	6	120	347	83	15	15

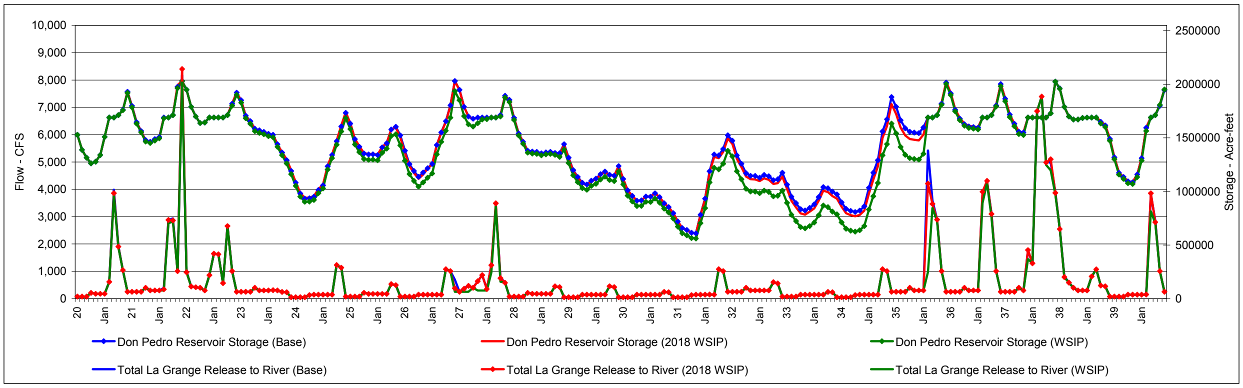
Difference in Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — 2018 WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	0	0	0	0	11	0	0	0	-18	0	0	0
Above Normal	0	0	0	0	0	0	0	2	-17	0	0	0
Normal	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	0	0	2	0	0	0	-7	0	0	0

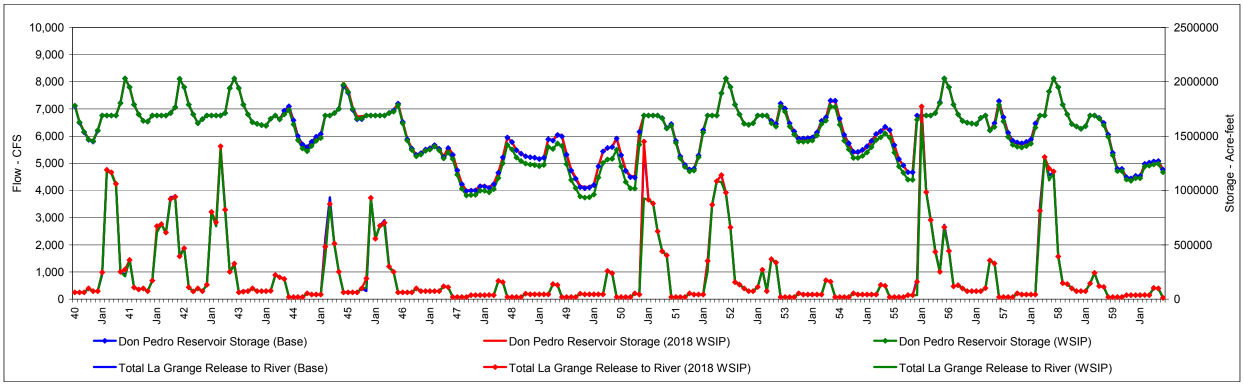
APPENDIX O3

Figure 2.5-1
Don Pedro Reservoir Storage and Release below La Grange Dam

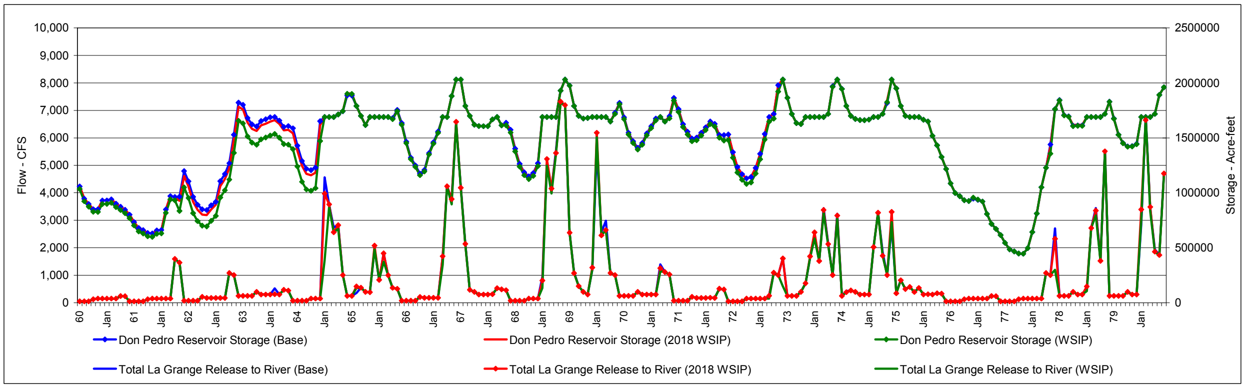
1920 - 1939



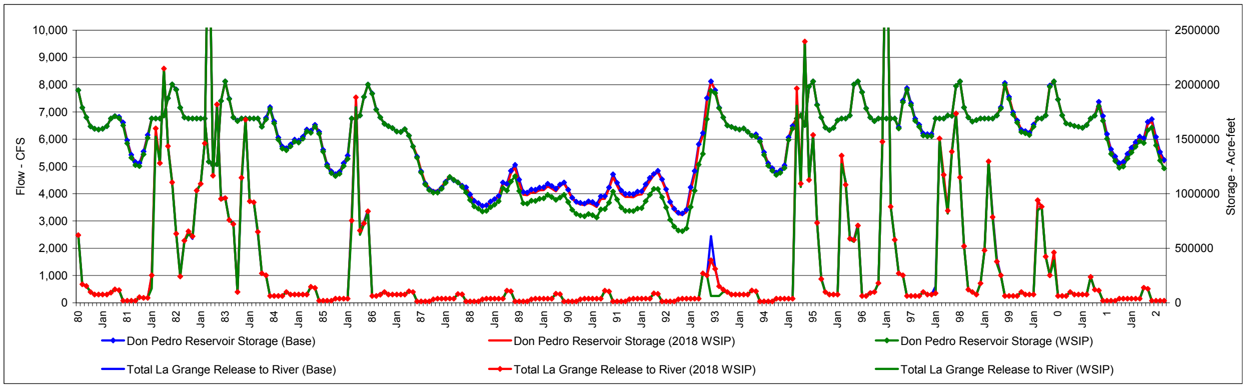
1940 - 1959



1960 - 1979



1980 - 2002



APPENDIX O3

Table 2.5-1

Don Pedro Reservoir Storage (Acre-feet) 2018 WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	1,262,860	1,277,365	1,340,344	1,508,876	1,689,999	1,690,000	1,713,000	1,759,836	1,929,872	1,795,122	1,642,903	1,561,467
1922	1,476,098	1,461,286	1,485,580	1,505,746	1,690,000	1,690,000	1,713,000	1,992,236	2,030,000	1,950,094	1,790,026	1,700,016
1923	1,638,028	1,643,364	1,689,999	1,689,989	1,689,997	1,690,000	1,713,000	1,818,811	1,921,545	1,849,358	1,703,848	1,652,705
1924	1,583,462	1,568,125	1,554,108	1,535,704	1,526,296	1,437,843	1,367,530	1,299,008	1,198,414	1,088,618	987,802	939,989
1925	942,530	956,806	1,020,799	1,064,510	1,240,998	1,347,397	1,474,470	1,615,182	1,739,010	1,636,396	1,492,869	1,421,142
1926	1,357,759	1,349,705	1,350,678	1,344,610	1,415,467	1,453,841	1,577,587	1,597,384	1,505,811	1,362,452	1,237,529	1,173,931
1927	1,119,098	1,158,716	1,213,376	1,252,953	1,430,873	1,547,483	1,651,730	1,798,260	2,030,000	1,945,826	1,790,015	1,700,021
1928	1,678,968	1,690,000	1,689,999	1,690,000	1,689,998	1,690,000	1,713,000	1,892,918	1,852,213	1,684,386	1,539,110	1,461,648
1929	1,378,684	1,370,354	1,367,461	1,354,252	1,363,106	1,367,611	1,358,042	1,353,385	1,435,177	1,308,957	1,193,211	1,129,770
1930	1,074,149	1,058,505	1,094,019	1,114,013	1,154,900	1,180,553	1,149,383	1,149,171	1,237,597	1,117,703	1,010,832	958,391
1931	914,265	916,605	954,041	952,219	983,746	946,664	889,656	854,795	796,687	720,808	659,664	640,497
1932	614,702	609,573	780,705	928,191	1,178,848	1,323,183	1,310,061	1,368,137	1,494,132	1,442,497	1,303,910	1,227,394
1933	1,138,926	1,114,464	1,112,164	1,097,635	1,122,288	1,109,608	1,071,071	1,077,986	1,137,667	1,024,295	911,286	852,616
1934	795,676	784,435	812,878	843,182	913,663	1,007,422	994,677	957,730	932,400	858,181	796,665	778,406
1935	768,307	781,950	821,496	980,113	1,110,056	1,235,130	1,500,457	1,610,736	1,815,196	1,722,464	1,596,472	1,522,899
1936	1,490,506	1,482,448	1,476,914	1,530,941	1,689,992	1,690,000	1,713,000	1,828,205	2,023,492	1,920,902	1,768,102	1,685,847
1937	1,633,138	1,612,431	1,605,906	1,599,838	1,689,993	1,690,000	1,713,000	1,807,790	2,004,824	1,865,944	1,716,966	1,632,686
1938	1,559,162	1,550,594	1,689,998	1,689,992	1,689,987	1,690,000	1,690,000	1,730,000	2,025,000	1,959,369	1,790,073	1,700,032
1939	1,672,242	1,671,809	1,685,673	1,689,024	1,689,999	1,690,000	1,656,392	1,619,603	1,491,554	1,319,580	1,175,055	1,136,817
1940	1,095,214	1,088,278	1,158,283	1,313,203	1,598,290	1,690,000	1,713,000	1,811,156	1,956,231	1,786,375	1,633,362	1,545,380
1941	1,475,404	1,460,051	1,555,484	1,689,994	1,689,991	1,690,000	1,690,000	1,809,501	2,030,000	1,950,157	1,790,024	1,700,010
1942	1,641,462	1,634,171	1,689,999	1,689,980	1,689,995	1,690,000	1,713,000	1,765,000	2,027,000	1,950,170	1,790,025	1,700,004
1943	1,619,298	1,656,980	1,690,000	1,689,976	1,689,995	1,690,000	1,713,000	1,942,900	2,030,000	1,940,444	1,790,004	1,700,004
1944	1,627,652	1,614,506	1,602,762	1,595,713	1,659,696	1,690,000	1,654,802	1,722,440	1,760,597	1,629,785	1,485,295	1,408,489
1945	1,383,848	1,431,872	1,478,308	1,504,602	1,689,996	1,690,000	1,713,000	1,752,531	1,994,151	1,926,860	1,769,823	1,682,382
1946	1,684,536	1,690,000	1,689,996	1,689,984	1,689,995	1,690,000	1,713,000	1,742,418	1,802,336	1,633,975	1,475,548	1,389,609
1947	1,330,399	1,346,833	1,380,160	1,392,380	1,420,980	1,386,364	1,311,268	1,398,938	1,336,215	1,192,020	1,064,241	1,001,385
1948	1,005,411	1,006,673	1,045,296	1,044,695	1,030,810	1,064,961	1,168,301	1,307,352	1,488,934	1,446,256	1,371,345	1,339,394
1949	1,315,662	1,306,917	1,302,086	1,290,976	1,302,671	1,476,867	1,464,005	1,518,090	1,509,235	1,342,135	1,195,742	1,120,908
1950	1,043,199	1,033,376	1,032,790	1,062,133	1,220,402	1,356,178	1,390,070	1,398,269	1,490,152	1,336,013	1,192,427	1,134,118
1951	1,131,198	1,551,572	1,689,993	1,689,971	1,689,993	1,690,000	1,665,120	1,572,653	1,607,282	1,449,711	1,307,131	1,228,274
1952	1,187,272	1,194,984	1,316,576	1,555,164	1,689,998	1,690,000	1,690,000	1,895,000	2,030,000	1,951,049	1,790,051	1,700,027
1953	1,614,775	1,604,850	1,619,190	1,689,999	1,689,998	1,688,681	1,637,424	1,608,420	1,793,686	1,744,750	1,609,064	1,534,706
1954	1,469,539	1,468,740	1,472,382	1,479,183	1,525,624	1,631,571	1,663,552	1,819,798	1,815,534	1,651,299	1,502,531	1,424,559
1955	1,345,778	1,345,529	1,363,813	1,396,390	1,446,662	1,510,333	1,535,054	1,574,478	1,553,856	1,414,751	1,287,229	1,228,969
1956	1,166,559	1,165,186	1,689,999	1,689,941	1,689,992	1,690,000	1,713,000	1,807,502	2,030,000	1,950,170	1,790,030	1,700,025
1957	1,639,825	1,624,492	1,616,539	1,610,979	1,668,413	1,690,000	1,553,124	1,611,430	1,813,966	1,662,502	1,519,752	1,446,510
1958	1,430,457	1,423,228	1,435,937	1,458,900	1,605,471	1,690,000	1,690,000	1,910,000	2,030,000	1,950,170	1,790,046	1,700,029
1959	1,611,062	1,589,728	1,567,833	1,592,273	1,689,999	1,690,000	1,664,890	1,615,856	1,508,807	1,339,502	1,193,352	1,193,577
1960	1,116,301	1,105,497	1,128,724	1,128,413	1,242,827	1,254,357	1,266,792	1,274,965	1,193,674	1,059,552	948,479	899,812
1961	852,490	851,707	929,711	931,404	940,474	902,104	874,430	846,491	801,180	734,666	679,786	660,893
1962	635,317	630,243	657,977	661,913	849,011	970,130	962,682	926,491	1,152,410	1,057,459	917,799	845,534
1963	803,072	797,354	847,675	892,734	1,059,917	1,125,577	1,221,773	1,488,662	1,782,245	1,759,044	1,640,421	1,582,051
1964	1,563,592	1,613,138	1,628,805	1,646,921	1,661,438	1,628,214	1,569,664	1,573,364	1,540,885	1,381,791	1,243,865	1,173,355
1965	1,160,424	1,183,720	1,615,220	1,689,968	1,689,993	1,690,000	1,713,000	1,745,042	1,904,664	1,902,728	1,790,047	1,700,028
1966	1,615,736	1,690,000	1,689,998	1,689,996	1,689,997	1,690,000	1,671,267	1,742,980	1,621,208	1,453,063	1,306,695	1,236,619
1967	1,161,360	1,194,898	1,348,589	1,447,600	1,545,433	1,690,000	1,690,000	1,880,000	2,030,000	2,030,000	1,790,252	1,700,021
1968	1,619,820	1,607,624	1,605,760	1,605,959	1,668,870	1,690,000	1,614,396	1,631,582	1,564,347	1,393,113	1,255,040	1,177,814
1969	1,141,689	1,171,002	1,260,484	1,689,994	1,689,990	1,690,000	1,690,000	1,930,000	2,030,000	1,975,279	1,790,111	1,700,033
1970	1,676,114	1,681,553	1,689,999	1,689,951	1,689,996	1,690,000	1,649,691	1,725,267	1,812,130	1,677,976	1,538,175	1,460,554
1971	1,401,168	1,444,087	1,531,135	1,597,040	1,666,233	1,690,000	1,647,943	1,696,251	1,859,604	1,755,286	1,618,891	1,549,928
1972	1,488,330	1,496,877	1,540,474	1,590,945	1,644,402	1,622,344	1,520,665	1,526,251	1,530,960	1,368,983	1,234,744	1,168,506
1973	1,130,407	1,143,406	1,225,477	1,354,278	1,533,895	1,690,000	1,717,600	1,980,428	2,030,000	1,863,873	1,716,891	1,634,144
1974	1,625,114	1,690,000	1,689,998	1,689,981	1,689,998	1,690,000	1,717,600	1,967,320	2,030,000	1,943,894	1,790,018	1,700,018
1975	1,671,620	1,661,732	1,660,185	1,665,519	1,689,996	1,690,000	1,717,600	1,843,935	2,030,000	1,950,013	1,790,077	1,700,024
1976	1,690,000	1,690,000	1,690,000	1,664,706	1,649,459	1,519,032	1,432,156	1,326,070	1,216,796	1,085,092	998,502	968,734
1977	932,654	925,543	947,434	935,499	920,302	807,861	717,614	671,985	616,188	544,088	486,063	467,590
1978	447,587	445,349	497,632	642,722	811,608	1,050,474	1,227,234	1,422,184	1,761,000	1,841,159	1,704,419	1,693,810
1979	1,616,809	1,619,882	1,618,938	1,689,998	1,689,995	1,690,000	1,690,000	1,717,600	1,827,795	1,673,824	1,527,042	1,450,952
1980	1,419,903	1,422,622	1,442,656	1,689,973	1,689,987	1,690,000	1,717,600	1,890,400	1,960,200	1,950,171	1,790,057	1,700,035
1981	1,617,942	1,596,204	1,588,406	1,595,955	1,619,607	1,690,000	1,710,315	1,696,762	1,643,753	1,478,587	1,347,280	1,279,582
1982	1,270,713	1,377,626	1,528,369	1,689,993	1,689,988	1,690,000	1,717,600	1,876,400	2,002,900	1,954,718	1,790,097	1,700,116
1983	1,690,000	1,690,000	1,689,995	1,689,966	1,689,989	1,294,700	1,264,000	1,270,800	1,851,400	2,030,000	1,869,137	1,700,118
1984	1,674,768	1,690,000	1,689,992	1,689,972	1,689,993	1,690,000	1,614,072	1,682,328	1,778,205	1,646,266	1,496,949	1,414,071
1985	1,399,091	1,434,211	1,478,590	1,469,173	1,504,226	1,570,360	1,558,812	1,627,178	1,560,993	1,396,489	1,262,208	1,199,021
1986	1,172,425	1,193,632	1,265,216	1,330,216	1,689,994	1,690,000	1,717,600	1,888,300	2,001,400	1,917,776	1,770,749	1,700,004
1987	1,641,221	1,619,848	1,601,298	1,570,175	1,566,241	1,592,870	1,533,147	1,441,899	1,348,658	1,213,978	1,103,276	1,050,438
1988	1,028,266	1,027,370	1,063,553	1,117,369	1,159,268	1,132,506	1,113,585	1,075,240	1,052,478	988,685	929,322	907,745
1989	881,458	888,956	921,637	945,294	974,852	1,096,511	1,074,781	1,187,792	1,239,357	1,103,491	991,217	986,561
1990	1,013,158	1,011,804	1,031,860	1,034,571	1,067,161	1,046,506	1,022,267	1,069,558	1,094,928	1,028,132	955,187	917,736
1991	901,946	896,655	915,575	900,825	878,053	952,682	954,166	1,046,829	1,153,735	1,074,822	1,001,810	970,239
1992	970,401	967,882	990,041	994,631	1,057,963	1,117,256	1,170,798	1,196,794	1,119,765	1,026,824	912,751	848,997
1993	812,849	806,440	832,269	1,025,300	1,175,081	1,428,792	1,529,484	1,851,088	2,030,000	1,950,131	1,790,048	1,700,022
1994	1,627,183	1,612,977	1,599,160	1,589,203	1,599,265	1,567,690	1,531,912	1,540,588	1,495,756	1,373,248	1,273,406	1,227,849
1995	1,188,744	1,208,544	1,253,327	1,510,846	1,634,353	1,690,000	1,717,600	1,629,700	1,982,800	2,030,000	1,814,001	1,700,059
1996	1,608,079	1,583,093	1,604,410	1,672,573	1,689,990	1,690,000	1,717,600	2,002,400	2,030,000	1,930,383	1,782,384	1,700,010
1997	1,667,198	1,690,000	1,689,993	1,689,873	1,689,994	1,690,000	1,601,041	1,842,832	1,954,413	1,813,753	1,671,658	1,617,925
1998	1,536,645	1,530,258	1,531,663	1,690,000	1,689,989	1,690,000	1,717,600	1,714,000	1,987,500	2,030,000	1,790,242	1,700,022
1999	1,662,014	1,675,303	1,690,000	1,689,986	1,689,990	1,690,000	1,717,600	1,796,699	2,019,661	1,889,630	1,747,778	1,673,732
2000	1,587,403	1,575,740	1,560,094	1,636,019	1,689,993	1,690,000	1,717,600	1,999,588	2,030,000	1,864,407	1,719,364	1,644,682
2001	1,634,728	1,622,232	1,613,706	1,605,692	1,629,054	1,690,000	1,716,911	1,830,206	1,697,383	1,532,770	1,393,883	1,328,387
2002	1,266,574	1,278,191	1,351,666	1,407,098	1,459,264	1,509,787	1,494,576	1,639,080	1,661,806	1,498,519	1,360,085	1,287,271
Avg (21-02)	1,323,652	1,333,411	1,376,601	1,422,420	1,482,772	1,507,579	1,511,798	1,590,588	1,673,668	1,573,106	1,436,385	1,368,045

APPENDIX O3

Table 2.5-2

Don Pedro Reservoir Storage (Acre-feet) WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	1,262,860	1,277,365	1,340,344	1,508,876	1,689,999	1,690,000	1,713,000	1,758,255	1,920,087	1,785,379	1,633,202	1,551,799
1922	1,466,449	1,451,643	1,475,936	1,496,100	1,682,686	1,690,000	1,713,000	1,965,236	2,030,000	1,950,094	1,790,026	1,700,016
1923	1,638,028	1,643,364	1,689,999	1,689,989	1,689,997	1,690,000	1,713,000	1,799,363	1,900,966	1,828,869	1,683,448	1,632,370
1924	1,563,169	1,547,842	1,533,824	1,515,415	1,506,005	1,417,560	1,338,399	1,262,605	1,162,134	1,052,503	951,855	904,167
1925	906,788	921,085	985,076	1,028,777	1,205,262	1,311,674	1,436,468	1,560,568	1,684,578	1,582,202	1,438,920	1,367,376
1926	1,304,106	1,296,082	1,296,519	1,290,435	1,361,093	1,400,064	1,518,241	1,532,438	1,430,226	1,287,212	1,162,635	1,099,288
1927	1,044,610	1,084,270	1,129,224	1,168,777	1,346,690	1,463,332	1,567,658	1,688,723	1,936,134	1,852,362	1,703,718	1,627,130
1928	1,606,224	1,637,560	1,672,026	1,675,150	1,689,999	1,690,000	1,701,151	1,877,285	1,835,437	1,667,682	1,522,481	1,445,074
1929	1,362,145	1,353,824	1,350,930	1,337,716	1,346,569	1,351,080	1,341,527	1,323,621	1,392,489	1,266,466	1,150,912	1,087,613
1930	1,032,080	1,016,460	1,051,972	1,071,954	1,112,838	1,138,506	1,107,377	1,098,218	1,186,818	1,067,154	960,515	908,251
1931	864,235	866,605	904,039	902,201	933,725	896,662	839,706	804,980	747,051	671,410	610,497	591,503
1932	565,821	560,723	704,485	844,787	1,084,372	1,221,695	1,205,745	1,259,030	1,378,752	1,327,642	1,189,590	1,113,456
1933	1,025,224	1,000,826	998,521	983,959	1,008,603	995,965	955,100	959,906	1,007,489	894,719	782,336	724,120
1934	667,461	656,295	676,788	711,356	777,968	868,739	854,724	813,053	786,448	712,923	652,109	634,358
1935	624,570	638,297	677,837	832,051	956,075	1,079,921	1,337,695	1,442,297	1,633,298	1,541,356	1,416,179	1,343,212
1936	1,311,194	1,303,236	1,297,699	1,351,659	1,689,999	1,690,000	1,713,000	1,808,939	2,003,094	1,900,592	1,747,881	1,665,690
1937	1,613,022	1,592,326	1,585,791	1,579,717	1,689,994	1,690,000	1,713,000	1,792,830	1,982,099	1,843,316	1,694,437	1,610,230
1938	1,536,751	1,528,196	1,689,998	1,689,992	1,689,987	1,690,000	1,690,000	1,730,000	2,025,000	1,959,369	1,790,073	1,700,032
1939	1,672,242	1,671,809	1,685,673	1,689,024	1,689,999	1,690,000	1,634,629	1,601,698	1,473,709	1,301,817	1,157,373	1,119,194
1940	1,077,628	1,070,702	1,134,704	1,288,559	1,565,488	1,690,000	1,713,000	1,808,008	1,950,520	1,780,688	1,627,700	1,539,737
1941	1,469,773	1,454,423	1,553,735	1,689,994	1,689,991	1,690,000	1,690,000	1,804,234	2,030,000	1,950,157	1,790,024	1,700,010
1942	1,641,462	1,634,171	1,689,999	1,689,982	1,689,995	1,690,000	1,713,000	1,765,000	2,027,000	1,950,170	1,790,025	1,700,004
1943	1,619,298	1,656,980	1,690,000	1,689,976	1,689,995	1,690,000	1,713,000	1,940,240	2,030,000	1,940,444	1,790,004	1,700,004
1944	1,627,652	1,614,506	1,602,762	1,595,713	1,659,696	1,690,000	1,654,802	1,700,608	1,738,836	1,608,117	1,463,726	1,386,992
1945	1,362,396	1,410,433	1,456,868	1,483,156	1,689,997	1,690,000	1,713,000	1,750,377	1,973,670	1,906,466	1,749,519	1,662,142
1946	1,664,336	1,690,000	1,689,996	1,689,984	1,689,995	1,690,000	1,713,000	1,726,331	1,786,301	1,618,009	1,459,654	1,373,770
1947	1,314,592	1,331,036	1,364,362	1,376,577	1,405,177	1,370,566	1,295,486	1,351,369	1,288,812	1,144,830	1,017,268	954,574
1948	958,700	959,989	998,610	997,725	983,836	1,013,678	1,114,286	1,251,048	1,420,232	1,377,867	1,303,272	1,271,554
1949	1,247,966	1,239,259	1,234,425	1,223,326	1,235,015	1,400,436	1,383,115	1,432,798	1,409,371	1,242,728	1,096,786	1,022,286
1950	944,784	935,019	938,337	962,506	1,119,822	1,253,320	1,285,258	1,291,998	1,375,323	1,221,712	1,078,645	1,020,719
1951	1,018,036	1,422,514	1,689,995	1,689,971	1,689,993	1,690,000	1,664,085	1,570,386	1,596,323	1,438,802	1,296,271	1,217,452
1952	1,176,472	1,184,189	1,305,781	1,533,995	1,689,998	1,690,000	1,690,000	1,895,000	2,030,000	1,951,049	1,790,051	1,700,027
1953	1,614,775	1,604,850	1,619,190	1,689,999	1,689,998	1,688,681	1,619,217	1,588,332	1,773,663	1,724,813	1,589,215	1,514,922
1954	1,449,795	1,449,008	1,452,649	1,459,444	1,505,884	1,611,838	1,643,837	1,773,541	1,769,428	1,605,391	1,456,830	1,379,013
1955	1,300,328	1,300,104	1,318,386	1,350,951	1,401,218	1,464,906	1,489,052	1,525,796	1,487,090	1,348,288	1,221,076	1,163,037
1956	1,100,763	1,099,427	1,651,474	1,689,947	1,689,993	1,690,000	1,713,000	1,804,698	2,030,000	1,950,170	1,790,030	1,700,025
1957	1,639,825	1,624,492	1,616,539	1,610,979	1,668,413	1,690,000	1,553,124	1,584,074	1,786,699	1,635,352	1,492,723	1,419,571
1958	1,403,575	1,396,361	1,409,069	1,432,024	1,578,593	1,690,000	1,690,000	1,910,000	2,030,000	1,950,170	1,790,046	1,700,029
1959	1,611,062	1,589,728	1,567,833	1,592,273	1,689,999	1,690,000	1,662,406	1,600,478	1,493,480	1,324,246	1,178,165	1,178,441
1960	1,101,196	1,090,401	1,113,627	1,113,311	1,220,539	1,228,588	1,240,002	1,245,830	1,168,185	1,034,178	923,226	874,650
1961	827,383	826,615	897,810	899,493	908,561	870,204	842,562	814,709	769,512	703,148	648,423	629,635
1962	604,125	599,069	626,802	630,729	817,825	938,956	931,539	835,624	1,048,335	953,860	814,699	742,797
1963	700,558	694,902	745,217	790,246	957,421	1,023,119	1,119,414	1,363,268	1,654,516	1,631,866	1,513,806	1,455,856
1964	1,437,657	1,487,272	1,502,934	1,521,014	1,535,522	1,502,343	1,443,836	1,438,577	1,397,068	1,238,632	1,101,362	1,031,330
1965	1,018,694	1,042,070	1,471,762	1,689,988	1,689,993	1,690,000	1,713,000	1,743,852	1,900,867	1,898,947	1,790,038	1,700,028
1966	1,615,736	1,690,000	1,689,998	1,689,996	1,689,998	1,690,000	1,670,732	1,742,447	1,620,676	1,452,534	1,306,169	1,236,095
1967	1,160,837	1,194,375	1,348,066	1,447,078	1,544,910	1,690,000	1,690,000	1,880,000	2,030,000	2,030,000	1,790,252	1,700,021
1968	1,619,820	1,607,624	1,605,760	1,605,959	1,668,870	1,690,000	1,614,396	1,614,311	1,547,133	1,375,977	1,237,984	1,160,815
1969	1,124,725	1,154,047	1,243,529	1,689,996	1,689,990	1,690,000	1,690,000	1,930,000	2,030,000	1,975,279	1,790,111	1,700,033
1970	1,676,114	1,681,553	1,689,999	1,689,952	1,689,996	1,690,000	1,649,691	1,718,076	1,804,962	1,670,839	1,531,070	1,453,473
1971	1,394,102	1,437,025	1,524,073	1,589,976	1,659,167	1,690,000	1,647,943	1,676,856	1,840,272	1,736,038	1,599,726	1,530,826
1972	1,469,268	1,477,826	1,521,421	1,571,887	1,625,342	1,603,292	1,501,630	1,475,950	1,480,830	1,319,081	1,185,074	1,119,002
1973	1,081,006	1,094,033	1,176,102	1,304,888	1,484,502	1,646,959	1,675,219	1,921,511	2,030,000	1,863,873	1,716,891	1,634,144
1974	1,625,114	1,690,000	1,689,998	1,689,983	1,689,998	1,690,000	1,717,600	1,964,185	2,030,000	1,943,894	1,790,018	1,700,018
1975	1,671,620	1,661,732	1,660,185	1,665,519	1,689,996	1,690,000	1,717,600	1,824,854	2,030,000	1,950,013	1,790,077	1,700,024
1976	1,690,000	1,690,000	1,690,000	1,664,706	1,649,459	1,519,032	1,432,156	1,326,070	1,216,796	1,085,092	998,502	968,734
1977	932,654	925,543	955,652	938,503	920,299	807,858	717,610	671,981	616,184	544,084	486,059	467,586
1978	447,583	445,345	497,628	642,718	811,604	1,050,470	1,227,230	1,356,274	1,761,000	1,841,159	1,704,419	1,692,926
1979	1,606,278	1,609,357	1,608,413	1,689,999	1,689,995	1,690,000	1,690,000	1,717,600	1,827,795	1,673,824	1,527,042	1,450,952
1980	1,419,903	1,422,622	1,442,656	1,689,977	1,689,987	1,690,000	1,717,600	1,890,400	1,960,200	1,950,171	1,790,057	1,700,035
1981	1,617,942	1,596,204	1,588,406	1,595,955	1,619,607	1,690,000	1,710,315	1,694,081	1,626,429	1,461,340	1,330,112	1,262,473
1982	1,253,640	1,360,563	1,511,306	1,689,997	1,689,988	1,690,000	1,717,600	1,876,400	2,002,900	1,954,717	1,790,097	1,700,116
1983	1,690,000	1,690,000	1,689,995	1,689,966	1,689,989	1,294,700	1,264,000	1,270,800	1,851,400	2,030,000	1,869,137	1,700,118
1984	1,666,919	1,690,000	1,689,992	1,689,972	1,689,993	1,690,000	1,614,072	1,682,328	1,778,205	1,646,266	1,496,949	1,414,071
1985	1,399,091	1,434,211	1,478,590	1,469,173	1,504,226	1,570,360	1,558,812	1,616,719	1,550,570	1,386,112	1,251,881	1,188,728
1986	1,162,153	1,183,366	1,254,950	1,319,946	1,689,994	1,690,000	1,717,600	1,888,300	2,001,400	1,917,776	1,770,749	1,700,004
1987	1,641,221	1,619,848	1,601,298	1,570,175	1,566,241	1,592,870	1,533,147	1,433,211	1,330,588	1,195,991	1,085,371	1,032,594
1988	1,010,460	1,009,573	1,045,756	1,099,567	1,155,125	1,128,364	1,103,870	1,063,204	1,011,973	943,381	884,236	862,821
1989	836,632	844,157	876,836	900,479	930,034	1,051,709	1,029,659	1,110,864	1,160,578	1,025,069	913,162	908,781
1990	935,547	934,238	954,290	956,979	989,562	968,936	944,775	965,169	990,902	924,588	852,141	815,058
1991	799,492	794,262	814,409	803,540	782,227	856,893	858,476	917,797	1,020,071	946,830	874,711	843,590
1992	844,030	841,586	863,738	868,291	931,612	990,953	1,044,352	1,043,659	967,160	874,930	761,589	698,367
1993	662,549	656,233	682,056	877,956	1,027,740	1,267,172	1,365,280	1,684,448	1,941,790	1,923,275	1,785,144	1,700,014
1994	1,627,176	1,612,969	1,599,152	1,589,196	1,599,258	1,567,682	1,531,904	1,523,687	1,478,913	1,356,482	1,256,718	1,211,217
1995	1,172,146	1,191,956	1,236,737	1,494,252	1,599,122	1,690,000	1,717,600	1,629,700	1,982,800	2,030,000	1,814,001	1,700,059
1996	1,608,079	1,583,093	1,604,410	1,672,573	1,689,990	1,690,000	1,717,600	2,002,400	2,030,000	1,930,383	1,782,384	1,700,010
1997	1,667,198	1,690,000	1,689,993	1,689,875	1,689,994	1,690,000	1,598,189	1,839,987	1,951,576	1,810,929	1,668,846	1,615,122
1998	1,533,848	1,527,463	1,528,868	1,690,000	1,689,989	1,690,000	1,717,600	1,714,000	1,987,500	2,030,000	1,790,242	1,700,022
1999	1,662,014	1,675,303	1,690,000	1,689,986	1,689,990	1,690,000	1,717,600	1,781,250	1,998,452	1,868,511	1,726,752	1,652,772
2000	1,566,486	1,554,834	1,539,188	1,615,107	1,689,994	1,690,000	1,717,600	1,981,851	2,030,000	1,864,407	1,719,364	1,644,682
2001	1,634,728	1,622,232	1,613,706	1,605,692	1,629,054	1,690,000	1,716,911	1,801,382	1,668,653	1,504,167	1,365,411	1,300,012
2002	1,238,260	1,249,893	1,323,366	1,378,790	1,430,954	1,481,487	1,466,303	1,583,557	1,606,470	1,443,430	1,305,249	1,232,624
Avg (21-02)	1,289,807	1,299,980	1,345,245	1,393,639	1,456,995	1,482,690	1,485,599	1,553,787	1,637,503	1,537,849	1,401,689	1,333,676

APPENDIX O3

Table 2.5-3

Difference in Don Pedro Reservoir Storage (Acre-feet)

2018 WSIP minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	0	0	0	0	0	0	0	1,581	9,785	9,743	9,701	9,668
1922	9,649	9,643	9,644	9,646	7,314	0	0	27,000	0	0	0	0
1923	0	0	0	0	0	0	0	19,448	20,579	20,489	20,400	20,335
1924	20,293	20,283	20,284	20,289	20,291	20,283	29,131	36,403	36,280	36,115	35,947	35,822
1925	35,742	35,721	35,723	35,733	35,736	35,723	38,002	54,614	54,432	54,194	53,949	53,766
1926	53,653	53,623	54,159	54,175	54,374	53,777	59,346	64,946	75,585	75,240	74,894	74,643
1927	74,488	74,446	84,152	84,176	84,183	84,151	84,072	109,537	93,866	93,464	86,297	72,891
1928	72,744	52,440	17,973	14,850	-1	0	11,849	15,633	16,776	16,704	16,629	16,574
1929	16,539	16,530	16,531	16,536	16,537	16,531	16,515	29,764	42,688	42,491	42,299	42,157
1930	42,069	42,045	42,047	42,059	42,062	42,047	42,006	50,953	50,779	50,549	50,317	50,140
1931	50,030	50,000	50,002	50,018	50,021	50,002	49,950	49,815	49,636	49,398	49,167	48,994
1932	48,881	48,850	76,220	83,404	94,476	101,488	104,316	109,107	115,380	114,855	114,320	113,938
1933	113,702	113,638	113,643	113,676	113,685	113,643	115,971	118,080	130,178	129,576	128,950	128,496
1934	128,215	128,140	136,090	131,826	135,695	138,683	139,953	144,677	145,952	145,258	144,556	144,048
1935	143,737	143,653	143,659	148,062	153,981	155,209	162,762	168,439	181,898	181,108	180,293	179,687
1936	179,312	179,212	179,215	179,282	-7	0	0	19,266	20,398	20,310	20,221	20,157
1937	20,116	20,105	20,115	20,121	-1	0	0	14,960	22,725	22,628	22,529	22,456
1938	22,411	22,398	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	21,763	17,905	17,845	17,763	17,682	17,623
1940	17,586	17,576	23,579	24,644	32,802	0	0	3,148	5,711	5,687	5,662	5,643
1941	5,631	5,628	1,749	0	0	0	0	5,267	0	0	0	0
1942	0	0	0	-2	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	2,660	0	0	0	0
1944	0	0	0	0	0	0	0	21,832	21,761	21,668	21,569	21,497
1945	21,452	21,439	21,440	21,446	-1	0	0	2,154	20,481	20,394	20,304	20,240
1946	20,200	0	0	0	0	0	0	16,087	16,035	15,966	15,894	15,839
1947	15,807	15,797	15,798	15,803	15,803	15,798	15,782	47,569	47,403	47,190	46,973	46,811
1948	46,711	46,684	46,686	46,970	46,974	51,283	54,015	56,304	68,702	68,389	68,073	67,840
1949	67,696	67,658	67,661	67,650	67,656	76,431	80,890	85,292	99,864	99,407	98,956	98,622
1950	98,415	98,357	94,453	99,627	100,580	102,858	104,812	106,271	114,829	114,301	113,782	113,399
1951	113,162	129,058	-2	0	0	0	1,035	2,267	10,959	10,909	10,860	10,822
1952	10,800	10,795	10,795	21,169	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	18,207	20,088	20,023	19,937	19,849	19,784
1954	19,744	19,732	19,733	19,739	19,740	19,733	19,715	46,257	46,106	45,908	45,701	45,546
1955	45,450	45,425	45,427	45,439	45,444	45,427	46,002	48,682	66,766	66,463	66,153	65,932
1956	65,796	65,759	38,525	-6	-1	0	0	2,804	0	0	0	0
1957	0	0	0	0	0	0	0	27,356	27,267	27,150	27,029	26,939
1958	26,882	26,867	26,868	26,876	26,878	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	2,484	15,378	15,327	15,256	15,187	15,136
1960	15,105	15,096	15,097	15,102	22,288	25,769	26,790	29,135	25,489	25,374	25,253	25,162
1961	25,107	25,092	31,901	31,911	31,913	31,900	31,868	31,782	31,668	31,518	31,363	31,258
1962	31,192	31,174	31,175	31,184	31,186	31,174	31,143	90,867	104,075	103,599	103,100	102,737
1963	102,514	102,452	102,458	102,488	102,496	102,458	102,359	125,394	127,729	127,178	126,615	126,195
1964	125,935	125,866	125,871	125,907	125,916	125,871	125,828	134,787	143,817	143,159	142,503	142,025
1965	141,730	141,650	143,458	-20	0	0	0	1,190	3,797	3,781	9	0
1966	0	0	0	0	-1	0	535	533	532	529	526	524
1967	523	523	523	522	523	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	17,271	17,214	17,136	17,056	16,999
1969	16,964	16,955	16,955	-2	0	0	0	0	0	0	0	0
1970	0	0	0	-1	0	0	0	7,191	7,168	7,137	7,105	7,081
1971	7,066	7,062	7,062	7,064	7,066	0	0	19,395	19,332	19,248	19,165	19,102
1972	19,062	19,051	19,053	19,058	19,060	19,052	19,035	50,301	50,130	49,902	49,670	49,504
1973	49,401	49,373	49,375	49,390	49,393	43,041	42,381	58,917	0	0	0	0
1974	0	0	0	-2	0	0	0	3,135	0	0	0	0
1975	0	0	0	0	0	0	0	19,081	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	-8,218	-3,004	3	3	4	4	4	4	4	4
1978	4	4	4	4	4	4	4	65,910	0	0	0	884
1979	10,531	10,525	10,525	-1	0	0	0	0	0	0	0	0
1980	0	0	0	-4	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	2,681	17,324	17,247	17,168	17,109
1982	17,073	17,063	17,063	-4	0	0	0	0	0	1	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0
1984	7,849	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	10,459	10,423	10,377	10,327	10,293
1986	10,272	10,266	10,266	10,270	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	8,688	18,070	17,987	17,905	17,844
1988	17,806	17,797	17,797	17,802	4,143	4,142	9,715	12,036	40,505	45,304	45,086	44,924
1989	44,826	44,799	44,801	44,815	44,818	44,802	45,122	76,928	78,779	78,422	78,055	77,780
1990	77,611	77,566	77,570	77,592	77,599	77,570	77,492	104,389	104,026	103,544	103,046	102,678
1991	102,454	102,393	101,166	97,285	95,826	95,789	95,690	129,032	133,664	127,992	127,099	126,649
1992	126,371	126,296	126,303	126,340	126,351	126,303	126,446	153,135	152,605	151,894	151,162	150,630
1993	150,300	150,207	150,213	147,344	147,341	161,620	164,204	166,640	88,210	26,856	4,904	8
1994	7	8	8	7	7	8	8	16,901	16,843	16,766	16,688	16,632
1995	16,598	16,588	16,590	16,594	35,231	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	-2	0	0	2,852	2,845	2,837	2,824	2,812	2,803
1998	2,797	2,795	2,795	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	15,449	21,209	21,119	21,026	20,960
2000	20,917	20,906	20,906	20,912	-1	0	0	17,737	0	0	0	0
2001	0	0	0	0	0	0	0	28,824	28,730	28,603	28,472	28,375
2002	28,314	28,298	28,300	28,308	28,310	28,300	28,273	55,523	55,336	55,089	54,836	54,647
Avg (21-02)	33,844	33,431	31,356	28,781	25,777	24,889	26,199	36,801	36,165	35,257	34,696	34,369

APPENDIX O3

Table 2.5-4

Difference in Don Pedro Reservoir Storage (Acre-feet) 2018 WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	0	0	0	0	0	0	0	-1,607	-648	-2,828	-2,815	-2,807
1922	-2,800	-2,800	-2,799	-2,800	0	0	0	15,826	0	-5	0	0
1923	0	0	0	0	0	0	0	434	-486	-2,668	-2,656	-2,647
1924	-2,642	-2,641	-2,640	-2,642	-2,642	-2,641	4,447	6,884	6,791	6,676	6,577	6,513
1925	6,495	6,490	6,489	6,484	6,483	6,472	5,090	8,195	6,054	3,844	3,827	3,815
1926	3,807	3,805	3,844	3,845	3,843	3,841	-764	-5,857	-18,492	-18,408	-18,322	-18,261
1927	-18,223	-18,213	-3,466	-3,467	-3,467	-3,466	-3,462	-5,260	0	-2,184	-5	0
1928	0	0	0	0	0	0	0	-950	-1,866	-1,858	-1,850	-1,844
1929	-1,841	-1,839	-1,839	-1,840	-1,840	-1,839	-1,837	-4,177	-6,277	-6,249	-6,220	-6,199
1930	-6,186	-6,183	-6,183	-6,185	-6,186	-6,183	-6,177	2,407	286	285	284	282
1931	282	281	281	282	282	282	281	281	279	278	276	275
1932	275	275	-1,617	-5,732	-9,971	-21,567	-25,781	-28,366	-30,365	-32,412	-32,263	-32,152
1933	-32,085	-32,067	-32,068	-32,079	-32,081	-32,068	-34,052	-36,027	-37,380	-39,394	-39,207	-39,066
1934	-38,982	-38,959	-34,222	-37,043	-34,080	-33,605	-35,480	-41,192	-41,045	-40,846	-40,651	-40,508
1935	-40,421	-40,397	-40,399	-53,757	-64,082	-57,213	-60,115	-62,533	-66,173	-68,068	-67,773	-67,550
1936	-67,412	-67,374	-67,488	-67,410	2	0	0	8,922	7,973	5,756	5,730	5,712
1937	5,701	5,698	5,698	5,699	0	0	0	5,622	3,306	1,108	1,104	1,100
1938	1,098	1,098	0	0	0	0	0	0	0	-2,183	-5	0
1939	0	0	0	0	0	0	5,984	3,783	1,657	1,649	1,641	1,635
1940	1,632	1,631	-368	2,411	4,704	0	0	12,026	9,689	9,647	9,605	9,574
1941	9,554	9,548	5,059	-1	0	0	0	3,897	0	-4	0	0
1942	0	0	0	-1	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	475	0	-2,183	-4	0
1944	0	0	0	0	0	0	0	-11,972	-14,047	-16,170	-16,098	-16,044
1945	-16,010	-16,002	-16,002	-16,007	0	0	0	1,721	30,195	27,882	27,759	27,672
1946	27,617	106	0	0	0	0	0	5,859	3,726	3,710	3,693	3,680
1947	3,673	3,671	3,671	3,672	3,672	3,671	3,668	8,891	6,747	6,717	6,686	6,663
1948	6,648	6,645	6,645	6,917	6,919	6,916	5,118	3,209	2,456	343	409	448
1949	464	468	470	447	449	5,347	5,526	6,492	11,777	11,724	11,670	11,631
1950	11,607	11,599	4,140	11,949	-1,973	-3,538	-1,650	-796	12,760	11,317	11,266	11,228
1951	11,205	12,508	0	0	0	0	-2,116	-1,801	-3,973	-6,138	-6,109	-6,089
1952	-6,076	-6,073	-6,073	-186	0	0	0	0	0	-2,184	-5	0
1953	0	0	0	0	0	0	-2,576	-4,755	-6,854	-9,008	-8,970	-8,940
1954	-8,921	-8,916	-8,917	-8,919	-8,920	-8,917	-8,908	-7,801	-9,889	-9,847	-9,803	-9,770
1955	-9,750	-9,744	-9,745	-9,748	-9,748	-9,744	-10,970	-11,689	-2,467	-2,456	-2,444	-2,437
1956	-2,431	-2,430	0	0	0	0	0	-4,425	0	0	0	0
1957	0	0	0	0	0	0	0	-7,471	-9,561	-11,703	-11,651	-11,612
1958	-11,589	-11,582	-11,582	-11,586	-11,587	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	-2,851	-5,587	-5,568	-5,543	-5,517	-5,499
1960	-5,487	-5,484	-5,485	-5,485	-1,747	-962	-590	3,800	2,402	2,391	2,380	2,371
1961	2,365	2,364	577	578	577	577	577	575	573	571	568	566
1962	565	564	565	564	565	564	564	-38,191	-44,742	-46,722	-46,503	-46,336
1963	-46,236	-46,209	-38,284	-24,977	-46,239	-46,222	-46,178	-39,770	-38,718	-40,734	-40,557	-40,424
1964	-40,342	-40,320	-40,322	-40,333	-28,562	-28,551	-30,641	-33,668	-46,421	-46,212	-45,996	-45,842
1965	-45,748	-45,722	-36,519	5	0	0	0	2,733	19,292	17,025	33	0
1966	0	0	0	0	0	0	-8,459	-10,623	-12,703	-12,646	-12,588	-12,545
1967	-12,519	-12,512	-12,513	-12,517	-12,517	0	0	0	0	0	-5	0
1968	0	0	0	0	0	0	0	-6,315	-8,407	-8,369	-8,330	-8,303
1969	-8,285	-8,280	-8,281	1	0	0	0	0	0	-2,184	-5	0
1970	0	0	0	-5	0	0	0	-4,300	-6,400	-8,556	-8,518	-8,489
1971	-8,471	-8,467	-8,467	-8,470	-8,469	0	0	-1,204	-3,314	-5,482	-5,459	-5,440
1972	-5,430	-5,427	-5,427	-5,429	-5,429	-5,427	-5,422	1,237	-882	-877	-873	-870
1973	-869	-868	-868	-868	-868	0	0	549	0	0	0	0
1974	0	0	0	-1	0	0	0	-1,901	0	-2,184	-5	0
1975	0	0	0	0	0	0	0	26,562	0	-4	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	-18,098	0	-2,183	-2,174	-1,593
1979	6,965	6,961	6,960	-1	0	0	0	0	-2,114	-2,105	-2,096	-2,088
1980	-2,085	-2,083	-2,083	-5	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	-2,116	-8,211	-10,299	-10,253	-10,206	-10,170
1982	-10,149	-10,143	-10,144	0	0	0	0	0	0	-2,183	-9	0
1983	0	0	0	0	0	0	0	0	0	0	-2,183	0
1984	4,784	0	0	0	0	0	-196	-14,019	-16,087	-18,202	-18,121	-18,061
1985	-18,022	-18,013	-18,013	-18,018	-18,020	-18,013	-17,996	-4,852	-6,951	-6,919	-6,887	-6,864
1986	-6,850	-6,846	-15,243	-18,908	0	0	0	0	0	-2,184	-2,174	-4
1987	-3	-3	-3	-4	-3	-3	-3	8,685	8,627	8,587	8,548	8,518
1988	8,501	8,497	8,496	8,499	8,499	8,496	8,488	1,102	-6,380	-6,351	-6,321	-6,298
1989	-6,284	-6,281	-6,281	-6,283	-6,284	-6,281	-17,360	-22,351	-25,032	-24,919	-24,805	-24,718
1990	-24,666	-24,652	-24,653	-24,661	-24,662	-24,653	-24,629	-14,718	-8,948	-8,908	-8,865	-8,834
1991	-14,011	-14,003	-15,236	-22,968	-24,438	-24,428	-24,420	-11,105	-23,342	-26,274	-28,497	-28,408
1992	-28,351	-28,336	-28,336	-28,346	-28,348	-28,338	-11,124	-13,430	-13,423	-13,406	-13,380	-13,354
1993	-13,339	-13,332	-21,270	-33,454	-33,472	-25,229	-27,190	-27,124	0	-5	0	0
1994	0	0	0	0	0	0	0	-3,987	-6,088	-6,060	-6,032	-6,012
1995	-6,000	-5,996	-5,996	-5,998	12,637	0	0	0	0	0	-2,184	-3
1996	-3	-3	-3	-3	0	0	0	0	0	-2,183	-2,174	-4
1997	-3	0	0	-1	0	0	-9,724	-11,886	-13,961	-16,084	-16,014	-15,961
1998	-15,929	-15,920	-15,921	3	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	3,128	4,038	1,838	1,828	1,824
2000	1,819	1,819	1,818	1,819	0	0	0	7,361	0	0	0	0
2001	0	0	0	1	0	0	0	-12,907	-14,766	-14,700	-14,634	-14,584
2002	-14,553	-14,545	-14,545	-14,549	-14,550	-14,545	-14,531	-20,414	-22,460	-22,361	-22,257	-22,181
Avg (21-02)	-5,902	-6,276	-6,397	-5,823	-4,775	-4,479	-4,848	-5,008	-5,462	-6,344	-6,419	-6,284

Figure 2.5-1 and Table 2.5-4 illustrate that during drought sequences, a reduction to inflow to Don Pedro Reservoir can accumulate from year to year. Compared to the base setting, the variant would result in lower Don Pedro Reservoir storage during drought periods. Figure 2.5-2 illustrates the difference in reservoir storage averaged by year type for the variant and WSIP settings. Also shown is the average difference in storage for the two settings during the 82-year simulation. Figure 2.5-3 shows the same information for the variant and the base settings.

Figure 2.5-2

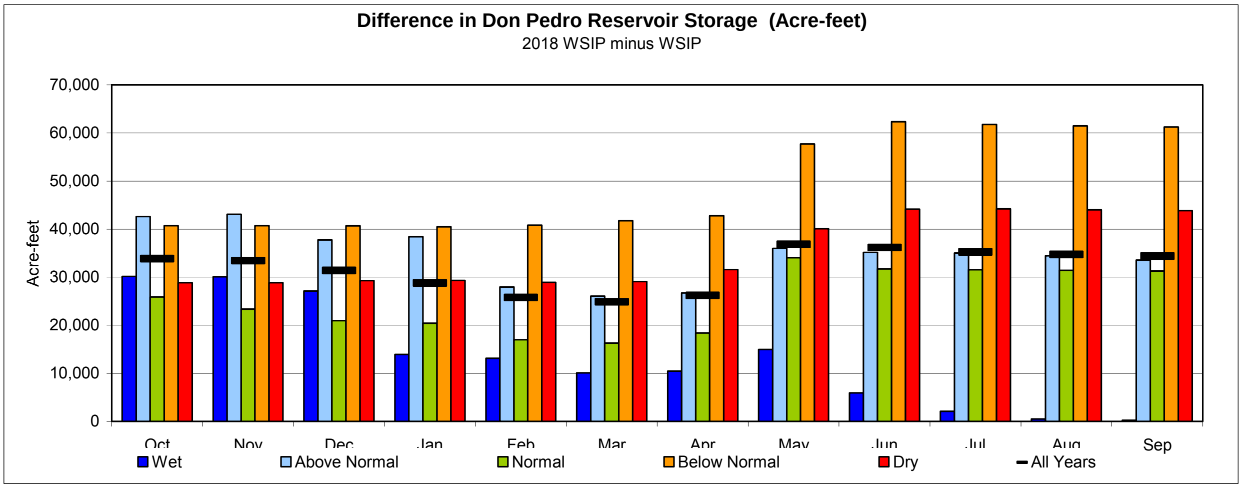


Figure 2.5-3

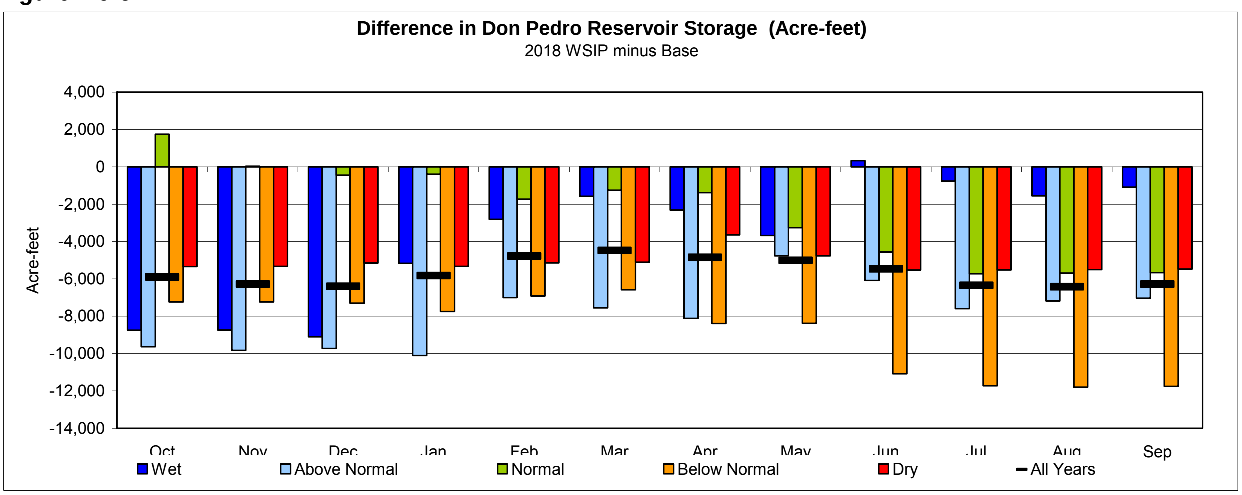


Figure 2.5-4 illustrates the average monthly storage in Don Pedro Reservoir for the 82-year simulation, and the range in storage for each month for the variant and base settings.

The difference in storage in Don Pedro Reservoir attributed to the upstream effects of the variant would manifest in differences in releases from La Grange Dam to the stream. A different amount of available reservoir space in the winter and spring due to the variant would lead to a different ability to regulate inflow, thus potentially changing the amount of water released to the stream that is in excess of minimum release requirements. During periods when inflow differs and Don Pedro Reservoir is at maximum storage capacity within the flood control storage limitation, a change in inflow directly manifests as a change in releases from La Grange Dam (a change of either more or less flow). Figure 2.5-1 illustrates the stream releases from La Grange Dam for the WSIP, variant, and base settings.

Figure 2.5-4

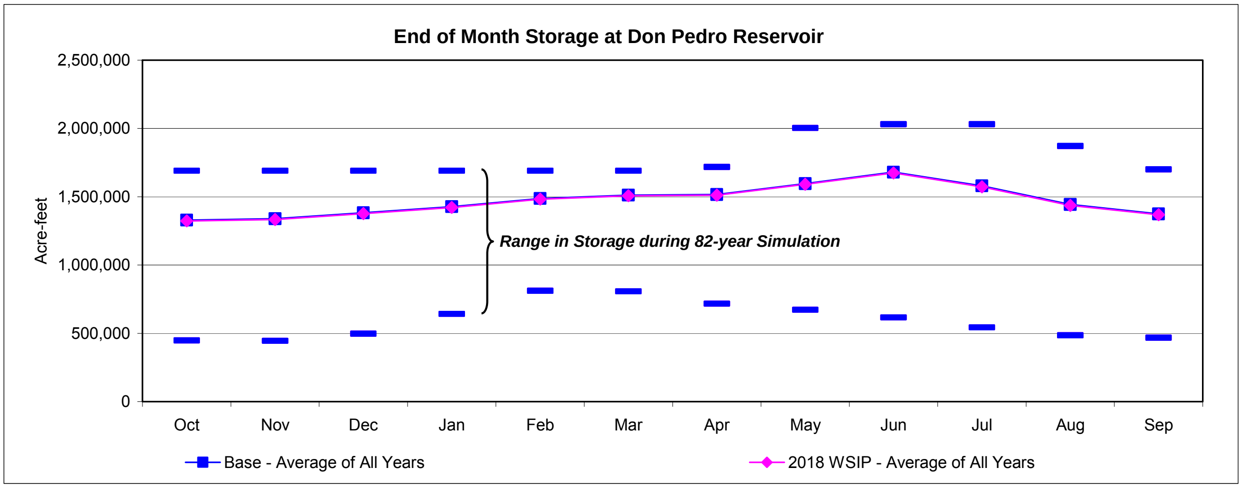


Table 2.5-5 illustrates the difference in stream releases between the variant and WSIP settings. Compared to the WSIP setting, the variant exhibits an incrementally larger stream release, predominately during some months of the early winter through June period, which is reflective of the months when releases to the stream are made in excess of minimum release requirements due to flood control or in anticipation of filling the reservoir. Table 2.5-6 shows the same information for the variant and WSIP settings, arranged by ranking the years in descending order of the San Joaquin River Index (an index of the wetness of the Tuolumne and San Joaquin River Basins). The table illustrates the finding that differences in releases to the Tuolumne River from La Grange Dam occur only when there are releases in excess of minimum FERC flow requirements. This circumstance typically occurs only in above-normal and wet years, and predominately during early winter through June. During other year types and during the summer and fall, releases would be maintained at minimum FERC flow requirements regardless of the setting. Compared to the WSIP setting, the large reduction in flow following an extended drought period is reduced with the variant, since the amount of water delivered by the SFPUC during these periods is less than that delivered in the WSIP setting, but is still more than delivered in the base setting.

As described above concerning Don Pedro inflow and storage, compared to the base setting the variant setting would lead to an additional draw of storage due to SFPUC diversions that are greater than in the base setting in drought periods. Although the reduction in storage would not greatly accumulate, greater replenishment of Don Pedro Reservoir storage would be needed in about 25 percent of the years in the 82-year simulation. There are occasions when an increase in releases would occur. This circumstance would result from the shift in timing of SJPL diversions due to the increased conveyance capacity. The effect would be an occasional additional release of water from Hetch Hetchy Reservoir in the winter that then manifests as an additional release from Don Pedro Reservoir. Table 2.5-7 illustrates the difference in stream releases between the variant and base settings, depicting the predominance of mostly slight reductions in flow. Table 2.5-8 illustrates the same information ranked in descending order of the San Joaquin River Index.

Table 2.5-5 and Table 2.5-7 illustrate the difference in stream releases among the variant, WSIP, and base settings, expressed in terms of a monthly volume (acre-feet) of flow. Table 2.5-9 presents the same information and the average monthly stream releases for the variant and WSIP settings, expressed in average monthly flow (cfs), and Table 2.5-10 shows the same information for the variant and base settings. For the comparison of the variant to the WSIP setting, the difference in monthly flow below La Grange Dam could range from an increase of approximately 179,000 acre-feet to a decrease of approximately 7,000 acre-feet. Considering the manner in which releases are determined and made to the stream, it is not always meaningful to quantify the effect of these changes in terms of average monthly flow (cfs). Similar to the operation of releases below O'Shaughnessy Dam, a change in the volume of release from La Grange Dam to the stream would likely delay or accelerate the initiation of the release by a matter of days. Using the assumption that a change in release volume equates to a delay or acceleration of releasing 6,000 acre-feet per day means that the difference in stream release from La Grange Dam between the variant and WSIP would be an additional day of delay in releases

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Table 2.5-5

Difference in Total La Grange Release to River (Acre-feet) 2018 WSIP minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	5,463	1,820	0	0	0	0	0	7,283
1922	0	0	0	0	2,334	7,312	2,762	0	29,074	0	0	0	41,482
1923	0	0	0	0	0	0	1,197	0	0	0	0	0	1,197
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	7,952	0	6,771	13,152	27,875
1928	0	20,270	34,469	3,128	14,851	6,265	7,344	0	0	0	0	0	86,327
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	179,625	9,045	3,334	0	0	0	0	0	192,004
1937	0	0	0	0	22,628	4,850	7,262	0	0	0	0	0	34,740
1938	0	0	20,688	0	0	39	5,721	24,854	3,038	0	0	0	54,340
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	0	40,502	2,839	0	0	0	0	0	43,341
1941	0	0	0	1,749	2,234	2,454	3,011	0	15,359	0	0	0	24,807
1942	0	0	0	14,686	-2	2,664	920	2,854	2,762	0	0	0	23,884
1943	0	0	0	0	8,123	9,596	1,197	0	5,234	0	0	0	24,150
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	21,448	-1	2,862	0	0	0	0	0	24,309
1946	0	20,195	0	0	0	5,945	2,986	0	0	0	0	0	29,126
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	129,063	-3	0	0	0	0	0	0	0	0	129,060
1952	0	0	0	0	21,172	0	0	16,285	3,038	0	0	0	40,495
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	30,130	38,536	-5	1,979	293	0	3,995	0	0	0	74,928
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	26,874	0	27,147	2,854	0	0	0	56,875
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	149,207	5,136	0	8,544	0	0	0	3,764	8	166,659
1966	0	0	8,118	0	17,169	0	0	0	0	0	0	0	25,287
1967	0	0	0	0	0	19,122	0	11,600	2,762	0	0	0	33,484
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	16,960	13,682	10,836	2,117	2,188	2,117	0	0	0	47,900
1970	0	0	4,959	10,325	-2	43	0	0	0	0	0	0	15,325
1971	0	0	0	0	0	7,064	0	0	0	0	0	0	7,064
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	6,336	620	0	60,018	0	0	0	66,974
1974	0	0	3,594	13,504	-2	6,659	1,841	0	6,169	0	0	0	31,765
1975	0	0	0	0	0	0	920	0	22,088	0	0	0	23,008
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	66,812	0	0	0	66,812
1979	0	0	0	10,528	-1	10,422	0	0	0	0	0	0	20,949
1980	0	0	0	25,343	-7,495	10,214	0	1,236	1,197	0	0	0	30,495
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	29,613	17,142	-1	0	2,854	2,762	0	1	3,038	55,409
1983	5,803	2,762	952	1	0	0	0	5,646	3,683	0	0	0	18,847
1984	0	10,608	0	0	0	0	0	0	0	0	0	0	10,608
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	11,085	21,884	9,459	2,188	2,118	0	0	0	46,734
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	77,912	61,107	21,881	4,889	165,789
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	38,866	7,636	1,903	1,842	0	0	0	50,247
1996	0	0	0	0	17,438	-7,490	1,311	4,811	2,118	0	0	0	18,188
1997	0	0	0	16,088	-2	0	0	0	0	0	0	0	16,086
1998	0	0	0	2,797	-1	18,936	6,445	2,949	2,854	0	0	0	33,980
1999	0	0	0	0	0	3,805	4,838	0	0	0	0	0	8,643
2000	0	0	0	0	20,913	-1	0	0	17,708	0	0	0	38,620
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	71	657	2,829	4,054	4,481	3,289	1,064	1,299	4,213	745	395	257	23,355

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Table 2.5-6

Difference in Total La Grange Release to River (Acre-feet)

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending Unimpaired Runoff at LaGrange 2018 WSIP minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1983	5,803	2,762	952	1	0	0	0	5,646	3,683	0	0	0	18,847
1995	0	0	0	0	0	38,866	7,636	1,903	1,842	0	0	0	50,247
1969	0	0	0	16,960	13,682	10,836	2,117	2,188	2,117	0	0	0	47,900
1982	0	0	0	29,613	17,142	-1	0	2,854	2,762	0	1	3,038	55,409
1938	0	0	20,688	0	0	39	5,721	24,854	3,038	0	0	0	54,340
1998	0	0	0	2,797	-1	18,936	6,445	2,949	2,854	0	0	0	33,980
1997	0	0	0	16,088	-2	0	0	0	0	0	0	0	16,086
1956	0	0	30,130	38,536	-5	1,979	293	0	3,995	0	0	0	74,928
1967	0	0	0	0	0	19,122	0	11,600	2,762	0	0	0	33,484
1980	0	0	0	25,343	-7,495	10,214	0	1,236	1,197	0	0	0	30,495
1986	0	0	0	0	11,085	21,884	9,459	2,188	2,118	0	0	0	46,734
1952	0	0	0	0	21,172	0	0	16,285	3,038	0	0	0	40,495
1978	0	0	0	0	0	0	0	0	66,812	0	0	0	66,812
1965	0	0	0	149,207	5,136	0	8,544	0	0	0	3,764	8	166,659
1958	0	0	0	0	0	26,874	0	27,147	2,854	0	0	0	56,875
1993	0	0	0	0	0	0	0	0	77,912	61,107	21,881	4,889	165,789
1941	0	0	0	1,749	2,234	2,454	3,011	0	15,359	0	0	0	24,807
1951	0	0	129,063	-3	0	0	0	0	0	0	0	0	129,060
1922	0	0	0	0	2,334	7,312	2,762	0	29,074	0	0	0	41,482
1984	0	10,608	0	0	0	0	0	0	0	0	0	0	10,608
1943	0	0	0	0	8,123	9,596	1,197	0	5,234	0	0	0	24,150
1942	0	0	0	14,686	-2	2,664	920	2,854	2,762	0	0	0	23,884
1996	0	0	0	0	17,438	-7,490	1,311	4,811	2,118	0	0	0	18,188
1974	0	0	3,594	13,504	-2	6,659	1,841	0	6,169	0	0	0	31,765
1940	0	0	0	0	0	40,502	2,839	0	0	0	0	0	43,341
1936	0	0	0	0	179,625	9,045	3,334	0	0	0	0	0	192,004
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	3,805	4,838	0	0	0	0	0	8,643
1945	0	0	0	0	21,448	-1	2,862	0	0	0	0	0	24,309
1927	0	0	0	0	0	0	0	0	7,952	0	6,771	13,152	27,875
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	920	0	22,088	0	0	0	23,008
1973	0	0	0	0	0	6,336	620	0	60,018	0	0	0	66,974
1921	0	0	0	0	0	5,463	1,820	0	0	0	0	0	7,283
1937	0	0	0	0	22,628	4,850	7,262	0	0	0	0	0	34,740
1970	0	0	4,959	10,325	-2	43	0	0	0	0	0	0	15,325
2000	0	0	0	0	20,913	-1	0	0	17,708	0	0	0	38,620
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	10,528	-1	10,422	0	0	0	0	0	0	20,949
1946	0	20,195	0	0	0	5,945	2,986	0	0	0	0	0	29,126
1923	0	0	0	0	0	0	1,197	0	0	0	0	0	1,197
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	7,064	0	0	0	0	0	0	7,064
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1928	0	20,270	34,469	3,128	14,851	6,265	7,344	0	0	0	0	0	86,327
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	8,118	0	17,169	0	0	0	0	0	0	0	25,287
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0

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Table 2.5-7

Difference in Total La Grange Release to River (Acre-feet)

2018 WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	-7,939	-1,434	0	0	0	0	0	-9,373
1922	0	0	0	0	-2,800	0	-4,603	0	13,038	-2,183	-5	0	3,447
1923	0	0	0	0	0	0	-921	0	0	0	0	0	-921
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	-18,955	0	-2,174	-4	-21,133
1928	0	0	0	0	0	6,266	-1,561	0	0	0	0	0	4,705
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	-67,414	-7,845	-301	0	0	0	0	0	-75,560
1937	0	0	0	0	6,428	1,655	-1,251	0	0	0	0	0	6,832
1938	0	0	1,098	0	0	0	-1,422	7,840	-1,842	0	-2,173	-5	3,496
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	0	2,307	-2,839	0	0	0	0	0	-532
1941	0	0	0	5,060	1,788	2,032	2,492	0	11,823	-2,184	-5	0	21,006
1942	0	0	0	9,144	-1	0	-4,604	0	0	-2,188	0	0	2,351
1943	0	0	0	0	8,123	7,595	-5,524	0	935	0	-2,174	-5	8,950
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	-16,008	-15,316	2,660	0	0	0	0	0	-28,664
1946	0	27,503	106	0	0	-6,263	-626	0	0	0	0	0	20,720
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	12,509	0	0	0	0	0	0	0	0	0	12,509
1952	0	0	0	0	-185	0	0	406	921	0	-2,174	-4	-1,036
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	-6,938	0	0	-1,576	-2,775	0	-5,339	-2,188	0	0	-18,816
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	-11,584	0	15,657	1,841	-2,188	0	0	3,726
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	-11,774	0	0	0	0	0	0	0	-11,774
1965	0	0	0	-36,529	4	-10,710	-1,225	0	0	0	14,767	32	-33,661
1966	0	1	6,966	0	0	0	0	0	0	0	0	0	6,967
1967	0	0	0	0	0	624	0	-827	2,762	-2,188	-2,184	-5	-1,818
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	-8,284	11,234	-1	-5,524	0	0	0	-2,174	-4	-4,753
1970	0	0	4,959	36,921	-5,959	-21,031	0	0	0	0	0	0	14,890
1971	0	0	0	0	0	-8,468	0	0	0	0	0	0	-8,468
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	-868	0	0	-372	0	0	0	-1,240
1974	0	0	3,594	5,112	-1	-3,806	-2,762	0	-3,738	0	-2,174	-5	-3,780
1975	0	0	0	0	0	0	-7,366	0	28,609	-2,183	-4	0	19,056
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	-22,671	0	0	0	-22,671
1979	0	0	0	6,963	-1	-5,797	-2,118	-2,188	0	0	0	0	-3,141
1980	0	0	0	32,984	-7,496	2,603	-4,879	-952	-921	-2,188	0	0	19,151
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	2,398	5,591	-1	0	951	921	0	-4,357	911	6,414
1983	4,757	5,524	0	0	0	0	0	-3,896	-920	-2,188	0	-2,180	1,097
1984	0	12,147	0	0	0	3,936	0	0	0	0	0	0	16,083
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	-6,028	1,757	-1,841	-2,854	-2,762	0	0	-2,167	-13,895
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	-52,475	-2,184	-5	0	-54,664
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	29,603	-1,570	0	0	-2,188	0	-2,177	23,668
1996	0	0	0	0	15,744	-7,490	-3,569	-231	-2,762	0	0	-2,167	-475
1997	0	-3	0	9,880	-1	0	0	0	0	0	0	0	9,876
1998	0	0	0	-15,925	2	15,817	-4,603	-951	-920	-2,188	0	0	-8,768
1999	0	0	0	0	0	-4,757	-6,144	0	0	0	0	0	-10,901
2000	0	0	0	0	1,819	-1	0	0	5,232	0	0	0	7,050
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	58	551	272	582	-816	-479	-784	158	-580	-320	-59	-95	-1,513

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Table 2.5-8

Difference in Total La Grange Release to River (Acre-feet)

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending Unimpaired Runoff at LaGrange

2018 WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1983	4,757	5,524	0	0	0	0	0	-3,896	-920	-2,188	0	-2,180	1,097
1995	0	0	0	0	0	29,603	-1,570	0	0	-2,188	0	-2,177	23,668
1969	0	0	0	-8,284	11,234	-1	-5,524	0	0	0	-2,174	-4	-4,753
1982	0	0	0	2,398	5,591	-1	0	951	921	0	-4,357	911	6,414
1938	0	0	1,098	0	0	0	-1,422	7,840	-1,842	0	-2,173	-5	3,496
1998	0	0	0	-15,925	2	15,817	-4,603	-951	-920	-2,188	0	0	-8,768
1997	0	-3	0	9,880	-1	0	0	0	0	0	0	0	9,876
1956	0	0	-6,938	0	0	-1,576	-2,775	0	-5,339	-2,188	0	0	-18,816
1967	0	0	0	0	0	624	0	-827	2,762	-2,188	-2,184	-5	-1,818
1980	0	0	0	32,984	-7,496	2,603	-4,879	-952	-921	-2,188	0	0	19,151
1986	0	0	0	0	-6,028	1,757	-1,841	-2,854	-2,762	0	0	-2,167	-13,895
1952	0	0	0	0	-185	0	0	406	921	0	-2,174	-4	-1,036
1978	0	0	0	0	0	0	0	0	-22,671	0	0	0	-22,671
1965	0	0	0	-36,529	4	-10,710	-1,225	0	0	0	14,767	32	-33,661
1958	0	0	0	0	0	-11,584	0	15,657	1,841	-2,188	0	0	3,726
1993	0	0	0	0	0	0	0	0	-52,475	-2,184	-5	0	-54,664
1941	0	0	0	5,060	1,788	2,032	2,492	0	11,823	-2,184	-5	0	21,006
1951	0	0	12,509	0	0	0	0	0	0	0	0	0	12,509
1922	0	0	0	0	-2,800	0	-4,603	0	13,038	-2,183	-5	0	3,447
1984	0	12,147	0	0	0	3,936	0	0	0	0	0	0	16,083
1943	0	0	0	0	8,123	7,595	-5,524	0	935	0	-2,174	-5	8,950
1942	0	0	0	9,144	-1	0	-4,604	0	0	-2,188	0	0	2,351
1996	0	0	0	0	15,744	-7,490	-3,569	-231	-2,762	0	0	-2,167	-475
1974	0	0	3,594	5,112	-1	-3,806	-2,762	0	-3,738	0	-2,174	-5	-3,780
1940	0	0	0	0	0	2,307	-2,839	0	0	0	0	0	-532
1936	0	0	0	0	-67,414	-7,845	-301	0	0	0	0	0	-75,560
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	-4,757	-6,144	0	0	0	0	0	-10,901
1945	0	0	0	0	-16,008	-15,316	2,660	0	0	0	0	0	-28,664
1927	0	0	0	0	0	0	0	0	-18,955	0	-2,174	-4	-21,133
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	-7,366	0	28,609	-2,183	-4	0	19,056
1973	0	0	0	0	0	-868	0	0	-372	0	0	0	-1,240
1921	0	0	0	0	0	-7,939	-1,434	0	0	0	0	0	-9,373
1937	0	0	0	0	6,428	1,655	-1,251	0	0	0	0	0	6,832
1970	0	0	4,959	36,921	-5,959	-21,031	0	0	0	0	0	0	14,890
2000	0	0	0	0	1,819	-1	0	0	5,232	0	0	0	7,050
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	6,963	-1	-5,797	-2,118	-2,188	0	0	0	0	-3,141
1946	0	27,503	106	0	0	-6,263	-626	0	0	0	0	0	20,720
1923	0	0	0	0	0	0	-921	0	0	0	0	0	-921
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	-8,468	0	0	0	0	0	0	-8,468
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1928	0	0	0	0	0	6,266	-1,561	0	0	0	0	0	4,705
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	1	6,966	0	0	0	0	0	0	0	0	0	6,967
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	-11,774	0	0	0	0	0	0	0	-11,774
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0

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Table 2.5-9

Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) 2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	23,264	21,635	56,327	150,325	184,968	276,250	214,153	243,710	227,036	142,651	66,645	45,515	1,652,480
Above Normal	18,683	30,882	67,212	75,648	127,296	167,481	128,473	78,842	84,574	27,869	19,798	18,215	844,972
Normal	18,264	17,249	35,981	51,832	74,090	104,453	84,424	77,929	20,660	9,992	9,992	9,670	514,534
Below Normal	17,105	13,768	20,372	15,874	17,613	21,364	34,828	33,554	4,025	4,160	4,160	4,025	190,847
Dry	17,240	13,842	14,866	13,950	15,511	20,672	21,732	21,240	3,347	3,459	3,459	3,347	152,665
All Years	18,886	19,545	39,070	61,141	83,616	117,468	96,354	90,205	67,352	37,099	20,595	16,032	667,363

Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	22,901	21,463	53,092	132,916	181,173	266,954	211,640	237,532	215,975	138,831	65,042	45,019	1,592,538
Above Normal	18,683	30,258	59,409	73,887	113,696	163,096	126,954	78,391	79,235	27,869	19,400	17,441	808,318
Normal	18,264	14,720	33,517	50,334	70,441	101,554	83,097	77,929	15,802	9,992	9,992	9,670	495,309
Below Normal	17,105	13,768	19,894	15,874	16,603	21,364	34,828	33,554	4,025	4,160	4,160	4,025	189,359
Dry	17,240	13,842	14,866	13,950	15,511	20,672	21,732	21,240	3,347	3,459	3,459	3,347	152,665
All Years	18,815	18,888	36,241	57,087	79,135	114,179	95,290	88,906	63,139	36,354	20,200	15,774	644,009

Difference in Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) 2018 WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	363	173	3,236	17,409	3,795	9,297	2,513	6,178	11,062	3,819	1,603	496	59,943
Above Normal	0	624	7,803	1,761	13,600	4,385	1,520	451	5,339	0	398	774	36,654
Normal	0	2,529	2,464	1,499	3,649	2,899	1,327	0	4,858	0	0	0	19,225
Below Normal	0	0	478	0	1,010	0	0	0	0	0	0	0	1,487
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	71	657	2,829	4,054	4,481	3,289	1,064	1,299	4,213	745	395	257	23,355

Table 2.5-10

Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) 2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	23,264	21,635	56,327	150,325	184,968	276,250	214,153	243,710	227,036	142,651	66,645	45,515	1,652,480
Above Normal	18,683	30,882	67,212	75,648	127,296	167,481	128,473	78,842	84,574	27,869	19,798	18,215	844,972
Normal	18,264	17,249	35,981	51,832	74,090	104,453	84,424	77,929	20,660	9,992	9,992	9,670	514,534
Below Normal	17,105	13,768	20,372	15,874	17,613	21,364	34,828	33,554	4,025	4,160	4,160	4,025	190,847
Dry	17,240	13,842	14,866	13,950	15,511	20,672	21,732	21,240	3,347	3,459	3,459	3,347	152,665
All Years	18,886	19,545	39,070	61,141	83,616	117,468	96,354	90,205	67,352	37,099	20,595	16,032	667,363

Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	22,967	21,290	56,692	151,293	184,772	274,592	215,643	242,749	232,124	143,744	66,539	45,865	1,658,271
Above Normal	18,683	30,167	66,265	74,511	130,859	168,855	130,389	78,856	82,871	28,383	20,182	18,343	848,363
Normal	18,264	15,530	35,664	49,090	73,947	107,106	84,918	78,066	20,356	9,992	9,992	9,670	512,593
Below Normal	17,105	13,768	19,962	15,874	18,305	21,364	34,828	33,554	4,025	4,160	4,160	4,025	191,130
Dry	17,240	13,842	14,866	13,950	15,511	20,672	21,732	21,240	3,347	3,459	3,459	3,347	152,665
All Years	18,828	18,994	38,798	60,559	84,433	117,947	97,139	90,047	67,933	37,419	20,654	16,126	668,876

Difference in Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) 2018 WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	297	345	-365	-967	195	1,658	-1,490	961	-5,088	-1,094	106	-350	-5,791
Above Normal	0	715	947	1,136	-3,563	-1,373	-1,915	-14	1,703	-514	-384	-128	-3,391
Normal	0	1,719	317	2,743	143	-2,653	-494	-137	304	0	0	0	1,941
Below Normal	0	0	410	0	-693	0	0	0	0	0	0	0	-283
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	58	551	272	582	-816	-479	-784	158	-580	-320	-59	-95	-1,513

or up to almost an added month of release. Normally, a change in release would not affect the peak stream release rate during a year. However, infrequently (a rare event following a prolonged drought), the variant’s effect on stream releases could manifest as an elimination of all flow during a year or as the only provision of flow that occurs in excess of minimum FERC flow requirements. Compared to the base setting, the variant’s effect on stream flow ranges from a reduction in releases (a potential delay in release of 11 days) to an increase in releases (a potential additional 5 days of release).

2.6 Calaveras and San Antonio Reservoirs, Alameda Creek, and Downstream

Compared to the WSIP setting, the operation of Calaveras Reservoir in the variant setting is almost identical. Figure 2.6-1 illustrates a chronological trace of the simulation of Calaveras Reservoir storage and stream releases from Calaveras Dam. Shown in Figure 2.6-1 are the results for the WSIP, variant, and base settings. In recognition of the different levels of systemwide deliveries served in each setting, the near identical operation of Calaveras Reservoir resulting from the two settings is an indication that Calaveras Reservoir operations are mostly influenced by the principles that manage local watershed production. The differences in reservoir operation during droughts are the result of modeling assumptions that balance reservoir storage among SFPUC reservoirs and the selection of the monthly SJPL conveyance rate. It is anticipated that the difference in Calaveras Reservoir operation during actual operations would be minimal, if any difference occurred at all.

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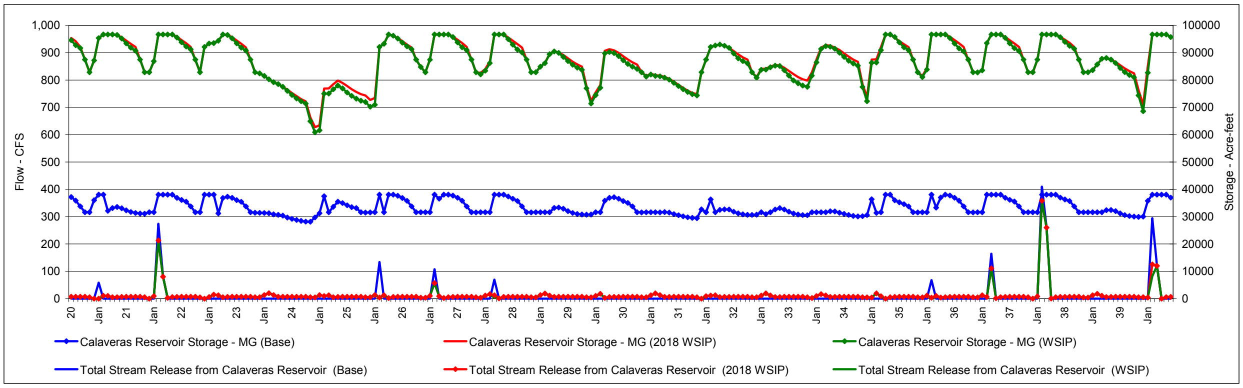
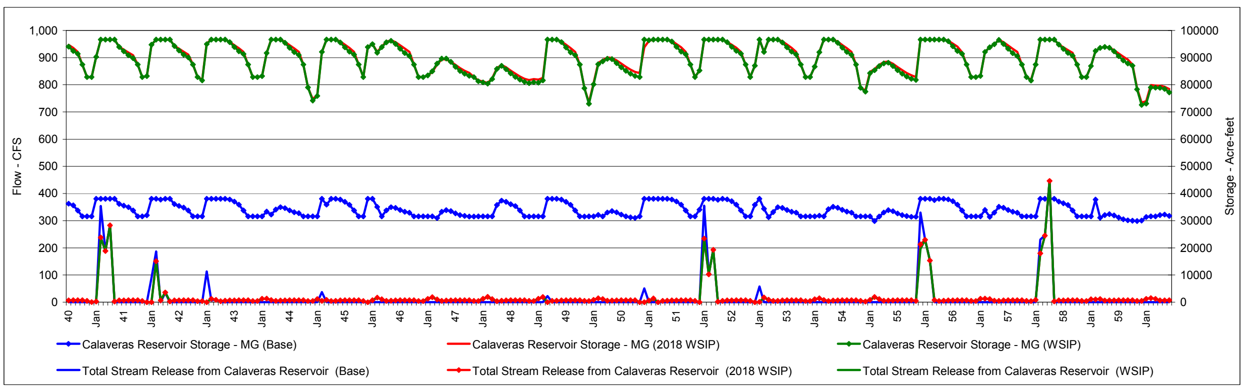
Figure 2.6-1
Calaveras Reservoir Storage and Stream Release

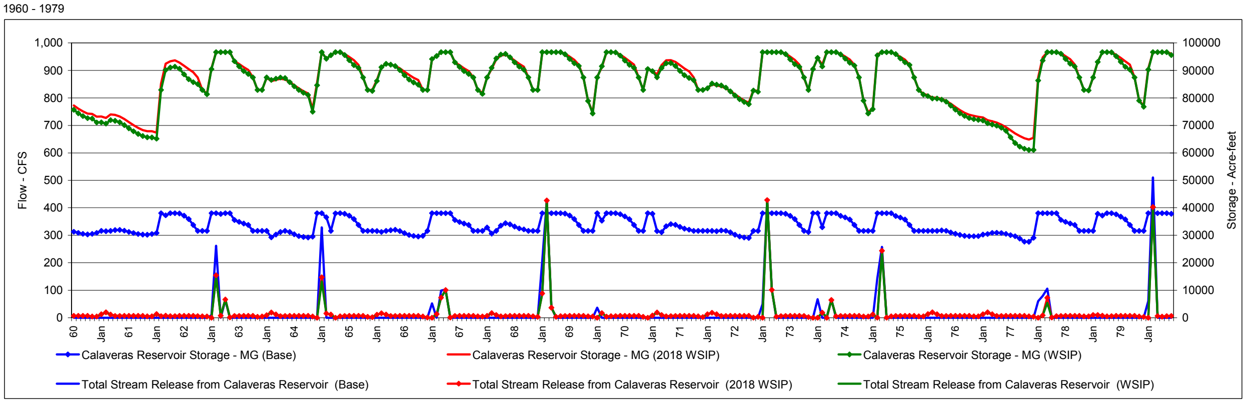
1920 - 1939



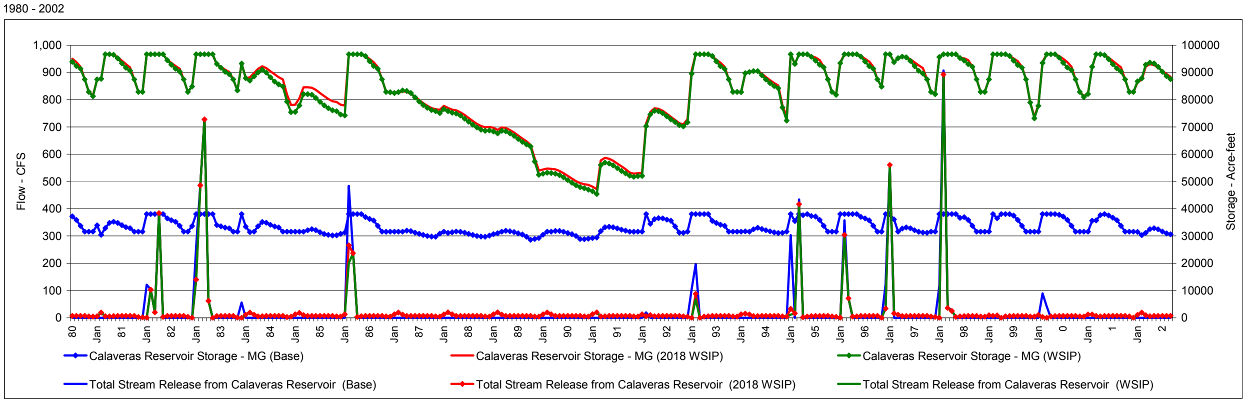
1940 - 1959



1960 - 1979

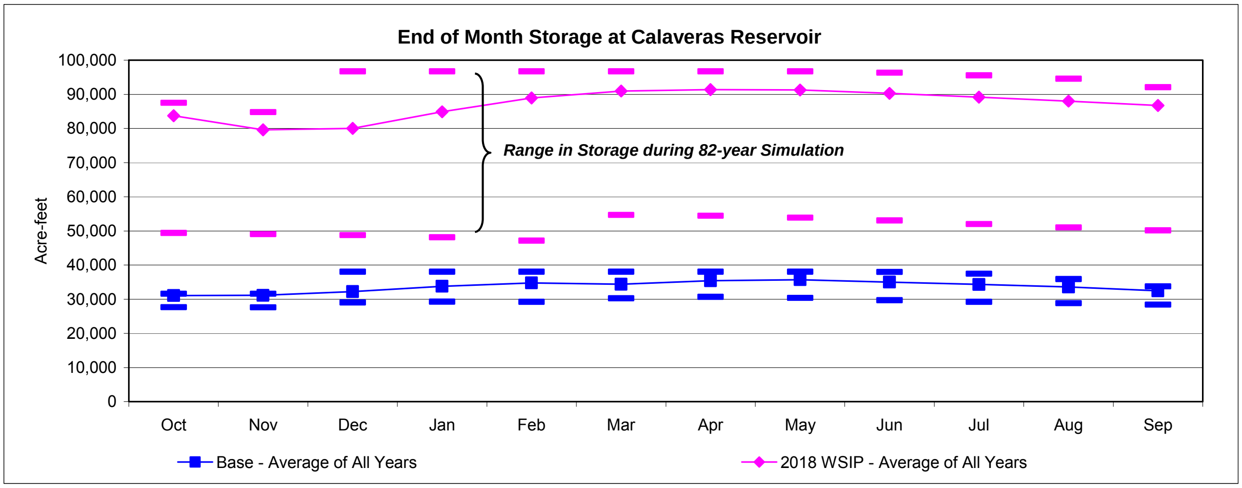


1980 - 2002



The difference in storage between the variant and WSIP settings and the base setting is due to the restoration of the operational capacity of Calaveras Reservoir. Under both the variant and WSIP settings the full capacity of Calaveras Reservoir would be available, and a greater range in storage operation would occur. Figure 2.6-2 illustrates the average monthly storage in Calaveras Reservoir for the 82-year simulation, and the range in storage for each month for the variant and base settings.

Figure 2.6-2



Compared to the WSIP setting, there would be the potential for either less or more release to Calaveras Creek below Calaveras Dam in the variant setting. Both settings require fishery releases below Calaveras Reservoir that are not included in the base setting. Calaveras Reservoir storage in the variant setting is sometimes more or sometimes less than in the WSIP setting; however, in either direction the difference is minor. Table 2.6-1 illustrates the difference in releases to Calaveras Creek between the variant and WSIP settings (considered insubstantial). Supplementing the Figure 2.6-1 representation of Calaveras Dam stream releases and Table 2.6-1 is Table 2.6-2, which illustrates the releases for the variant and WSIP settings, and the difference in releases between the two. Table 2.6-3 provides the same form of information for the variant and base settings. The notable difference in releases between the variant and base settings is the addition of the required flows to satisfy the 1997 CDFG MOU and the reduction of stream releases during wetter-year, wetter-season flows due to the restoration of Calaveras Reservoir operational capacity.

There would be very little, if any, difference in Alameda Creek diversions to Calaveras Reservoir in the variant setting compared to the WSIP setting. With essentially the same storage conditions between the two settings, there would be no difference in diversions from the Alameda Creek watershed. With no difference in diversions at Alameda Creek Diversion Dam (ACDD), flow spilling past the diversion dam would be the same in the variant setting. Table 2.6-4 illustrates the difference in flow below the ACDD between the variant and WSIP settings (considered insubstantial).

Table 2.6-5 illustrates the difference in flow below the ACDD between the variant and base settings. In this comparison, the reduction in flow below the diversion dam is due to the additional diversions to Calaveras Reservoir resulting from the restoration of reservoir operating capacity. Table 2.6-6 and Table 2.6-7 illustrate the flow past the ACDD, comparing the variant, WSIP, and base settings by year type and the average of all years.

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Table 2.6-1

Difference in Total Stream Release from Calaveras Reservoir (Acre-feet) 2018 WSIP minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	0	0	0	0	0	0	0	0
1922	0	0	0	0	0	0	0	0	0	0	0	0	0
1923	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	11	0	0	0	0	0	0	0	11
1928	0	0	0	0	0	583	0	0	0	0	0	0	583
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	0	0	0	0	0	0	0	0	0
1937	0	0	0	0	0	0	0	0	0	0	0	0	0
1938	0	0	0	0	-1	0	0	0	0	0	0	0	-1
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	2,379	0	0	0	0	0	0	0	2,379
1941	0	0	0	0	18	0	0	0	0	0	0	0	18
1942	0	0	0	0	0	0	-52	0	0	0	0	0	-52
1943	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	0	0	0	0	0	0	0	0	0
1946	0	0	0	0	0	0	0	0	0	0	0	0	0
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	384	0	0	0	0	0	0	0	0	384
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	1,044	0	0	0	0	0	0	0	0	0	1,044
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	291	0	0	0	0	0	0	0	291
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	954	0	0	0	0	0	0	0	0	954
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	-6	0	0	0	0	0	0	-6
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	26	0	0	0	0	0	0	0	26
1974	0	0	0	0	0	-132	0	0	0	0	0	0	-132
1975	0	0	0	0	0	447	0	0	0	0	0	0	447
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	1,136	0	0	0	0	0	0	1,136
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	447	0	0	0	0	0	0	0	447
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	3,629	0	0	0	0	0	0	0	3,629
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	1,110	0	0	0	0	0	0	0	1,110
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	1,311	0	0	0	0	0	0	0	0	1,311
1996	0	0	0	0	354	0	0	0	0	0	0	0	354
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	291	0	0	0	0	0	0	0	291
1999	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	0	0	13	32	104	25	-1	0	0	0	0	0	173

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Table 2.6-2

Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — 2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	1,063	5,067	14,701	9,862	5,082	255	386	417	425	415	38,348
Above Normal	425	258	172	825	3,440	2,773	606	327	396	424	428	417	10,490
Normal	429	275	194	548	725	543	265	370	408	428	430	417	5,031
Below Normal	428	275	246	672	876	596	345	389	411	430	430	417	5,515
Dry	429	292	281	778	1,044	747	375	407	416	430	430	417	6,044
All Years	428	269	387	1,558	4,108	2,874	1,314	350	403	426	428	417	12,962

Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	998	4,985	14,425	9,862	5,085	255	386	417	425	415	37,928
Above Normal	425	258	172	746	3,196	2,688	606	327	396	424	428	417	10,082
Normal	429	275	194	548	725	506	265	370	408	428	430	417	4,995
Below Normal	428	275	246	672	876	596	345	389	411	430	430	417	5,515
Dry	429	292	281	778	1,044	747	375	407	416	430	430	417	6,044
All Years	428	269	374	1,526	4,004	2,850	1,314	350	403	426	428	417	12,788

Difference in Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — 2018 WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	65	82	276	0	-3	0	0	0	0	0	419
Above Normal	0	0	0	79	244	85	0	0	0	0	0	0	408
Normal	0	0	0	0	0	36	0	0	0	0	0	0	36
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	13	32	104	25	-1	0	0	0	0	0	173

Table 2.6-3

Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — 2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	1,063	5,067	14,701	9,862	5,082	255	386	417	425	415	38,348
Above Normal	425	258	172	825	3,440	2,773	606	327	396	424	428	417	10,490
Normal	429	275	194	548	725	543	265	370	408	428	430	417	5,031
Below Normal	428	275	246	672	876	596	345	389	411	430	430	417	5,515
Dry	429	292	281	778	1,044	747	375	407	416	430	430	417	6,044
All Years	428	269	387	1,558	4,108	2,874	1,314	350	403	426	428	417	12,962

Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	1,741	9,267	16,622	9,968	5,024	0	0	0	0	0	42,623
Above Normal	0	0	184	2,685	5,918	3,096	459	0	0	0	0	0	12,342
Normal	0	0	216	364	898	353	0	0	0	0	0	0	1,831
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	420	2,436	4,645	2,656	1,076	0	0	0	0	0	11,233

Difference in Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — 2018 WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	-678	-4,200	-1,921	-106	57	255	386	417	425	415	-4,275
Above Normal	425	258	-12	-1,860	-2,477	-323	147	327	396	424	428	417	-1,852
Normal	429	275	-22	184	-173	190	265	370	408	428	430	417	3,200
Below Normal	428	275	246	672	876	596	345	389	411	430	430	417	5,515
Dry	429	292	281	778	1,044	747	375	407	416	430	430	417	6,044
All Years	428	269	-33	-878	-537	219	238	350	403	426	428	417	1,729

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Table 2.6-4

Difference in Flow Passing Alameda Creek Diversion Dam (Acre-feet)

2018 WSIP minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	0	0	0	0	0	0	0	0
1922	0	0	0	0	0	0	0	0	0	0	0	0	0
1923	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	0	0	0	0	0
1928	0	0	0	0	0	0	0	0	0	0	0	0	0
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	447	0	0	0	0	0	0	0	447
1937	0	0	0	0	0	0	0	0	0	0	0	0	0
1938	0	0	0	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	0	0	0	0	0	0	0	0	0
1941	0	0	0	0	0	0	0	0	0	0	0	0	0
1942	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	291	0	0	0	0	0	0	0	291
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	0	0	0	0	0	0	0	0	0
1946	0	0	0	0	0	0	0	0	0	0	0	0	0
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	4,282	-3,001	-212	0	0	0	0	0	0	0	1,068
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	204	0	0	0	0	0	0	0	0	204
1974	0	0	0	0	0	1,842	0	0	0	0	0	0	1,842
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	0	0	52	-34	6	22	0	0	0	0	0	0	47

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Table 2.6-5

Difference in Flow Passing Alameda Creek Diversion Dam (Acre-feet) 2018 WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	-2,559	-1,946	0	0	0	0	0	0	0	-4,505
1922	0	0	0	0	0	0	0	0	0	0	0	0	0
1923	0	0	-2,856	-1,688	-1,004	0	0	0	0	0	0	0	-5,547
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	-3,210	0	0	0	0	0	0	0	-3,210
1927	0	0	0	0	0	0	235	0	0	0	0	0	235
1928	0	0	0	0	0	0	-214	0	0	0	0	0	-214
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	-2,422	0	0	0	0	0	0	0	-2,422
1937	0	0	0	0	-3,964	0	0	0	0	0	0	0	-3,964
1938	0	0	0	0	0	0	-187	0	0	0	0	0	-187
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	0	0	-156	0	0	0	0	0	-156
1941	0	0	0	-1,197	0	0	0	0	0	0	0	0	-1,197
1942	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	-1,822	0	0	0	0	0	0	0	-1,822
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	-4,471	0	0	0	0	0	0	0	-4,471
1946	0	0	-4,651	-1,522	0	0	0	0	0	0	0	0	-6,173
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	-5,524	0	0	0	0	0	0	-5,524
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	-2,793	-1,287	301	0	0	0	0	0	0	-3,779
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	-3,956	0	0	0	0	0	0	0	0	-3,956
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	-3,275	0	0	0	0	0	0	0	-3,275
1963	0	0	0	-2,219	0	0	0	0	0	0	0	0	-2,219
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	-1,163	0	0	0	3,250	0	0	0	0	0	2,087
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	-1,676	-1,872	0	0	0	0	0	0	0	-3,548
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	-4,247	0	-1,623	0	0	0	0	0	0	-5,870
1971	0	0	-1,260	0	0	0	0	0	0	0	0	0	-1,260
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	-4,722	0	0	0	0	0	0	0	0	-4,722
1974	0	0	-791	0	0	1,444	0	0	0	0	0	0	653
1975	0	0	0	0	-5,196	0	-180	0	0	0	0	0	-5,376
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	-4,152	-3,403	0	0	0	0	0	0	0	-7,556
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	-3,360	0	-482	0	0	0	0	0	0	-3,842
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	687	0	0	0	0	687
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	-3,354	0	0	0	0	0	0	0	-3,354
1993	0	0	0	-4,999	0	651	0	0	0	0	0	0	-4,349
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	-5,239	0	0	0	0	0	0	0	0	-5,239
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	-3,223	0	1,392	0	0	0	0	0	-1,831
2000	0	0	0	0	-4,567	0	0	0	0	0	0	0	-4,567
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	0	0	-131	-541	-549	-64	50	8	0	0	0	0	-1,225

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Table 2.6-6

Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) 2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	28	1,379	6,282	7,982	5,727	2,960	173	0	0	0	0	24,531
Above Normal	7	23	843	2,281	3,740	3,237	959	0	0	0	0	0	11,091
Normal	0	6	585	260	824	459	113	0	0	0	0	0	2,247
Below Normal	0	0	18	45	102	229	0	0	0	0	0	0	394
Dry	0	0	0	0	57	0	0	0	0	0	0	0	58
All Years	1	12	562	1,759	2,526	1,926	798	34	0	0	0	0	7,617

Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	28	1,379	6,269	7,982	5,727	2,960	173	0	0	0	0	24,518
Above Normal	7	23	591	2,457	3,735	3,129	959	0	0	0	0	0	10,903
Normal	0	6	585	260	796	459	113	0	0	0	0	0	2,219
Below Normal	0	0	18	45	102	229	0	0	0	0	0	0	394
Dry	0	0	0	0	57	0	0	0	0	0	0	0	58
All Years	1	12	509	1,793	2,520	1,903	798	34	0	0	0	0	7,570

Difference in Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) 2018 WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	13	0	0	0	0	0	0	0	0	13
Above Normal	0	0	252	-177	5	108	0	0	0	0	0	0	188
Normal	0	0	0	0	28	0	0	0	0	0	0	0	28
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	52	-34	6	22	0	0	0	0	0	0	47

Table 2.6-7

Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) 2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	28	1,379	6,282	7,982	5,727	2,960	173	0	0	0	0	24,531
Above Normal	7	23	843	2,281	3,740	3,237	959	0	0	0	0	0	11,091
Normal	0	6	585	260	824	459	113	0	0	0	0	0	2,247
Below Normal	0	0	18	45	102	229	0	0	0	0	0	0	394
Dry	0	0	0	0	57	0	0	0	0	0	0	0	58
All Years	1	12	562	1,759	2,526	1,926	798	34	0	0	0	0	7,617

Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	28	1,379	6,967	8,099	5,757	2,972	130	0	0	0	0	25,331
Above Normal	7	23	1,126	3,672	5,294	3,096	692	0	0	0	0	0	13,911
Normal	0	6	954	868	1,870	906	126	0	0	0	0	0	4,731
Below Normal	0	0	18	45	102	229	0	0	0	0	0	0	394
Dry	0	0	0	0	57	0	0	0	0	0	0	0	58
All Years	1	12	692	2,299	3,075	1,989	748	26	0	0	0	0	8,843

Difference in Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) 2018 WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	-685	-117	-30	-12	43	0	0	0	0	-801
Above Normal	0	0	-283	-1,391	-1,554	141	267	0	0	0	0	0	-2,820
Normal	0	0	-369	-608	-1,046	-447	-13	0	0	0	0	0	-2,483
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-131	-541	-549	-64	50	8	0	0	0	0	-1,225

Comparing the variant and WSIP settings, differences in releases from Calaveras Dam to the stream and differences to spills at the ACDD result in differences in flow below the Alameda Creek and Calaveras Creek confluence between the settings. Table 2.6-8 illustrates the flow below the confluence for the variant and WSIP settings. The modeled differences in these parameters were described above as insubstantial, and thus the combined effect of the differences at the confluence would also be insubstantial. Fishery releases for the 1997 MOU are assumed in both of the settings. Table 2.6-9 provides the same form of information for the variant and base settings. The notable differences between the variant and base settings (comparable to the differences between the WSIP and base settings) are the addition of required stream flows for the 1997 MOU and the reduction of wetter-year, wet-season flows due to the restoration of Calaveras Reservoir storage.

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Table 2.6-8

Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) 2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	430	326	2,786	12,358	23,871	16,574	8,643	605	417	429	429	417	67,286
Above Normal	437	326	1,259	3,703	7,956	6,572	1,876	430	418	430	429	417	24,255
Normal	429	304	1,006	1,077	1,935	1,329	536	430	417	429	430	417	8,739
Below Normal	429	297	324	859	1,214	1,046	417	430	417	430	430	417	6,709
Dry	429	298	307	813	1,168	816	418	430	417	430	430	417	6,373
All Years	431	310	1,128	3,726	7,164	5,232	2,348	464	417	430	429	417	22,497

Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	430	326	2,721	12,263	23,595	16,575	8,647	605	417	429	429	417	66,854
Above Normal	437	326	1,007	3,801	7,708	6,379	1,876	430	418	430	429	417	23,658
Normal	429	304	1,006	1,077	1,907	1,293	536	430	417	429	430	417	8,675
Below Normal	429	297	324	859	1,214	1,046	417	430	417	430	430	417	6,709
Dry	429	298	307	813	1,168	816	418	430	417	430	430	417	6,373
All Years	431	310	1,063	3,728	7,053	5,185	2,349	464	417	430	429	417	22,276

Difference in Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) 2018 WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	65	95	276	0	-3	0	0	0	0	0	432
Above Normal	0	0	252	-98	248	194	0	0	0	0	0	0	596
Normal	0	0	0	0	28	36	0	0	0	0	0	0	64
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	65	-2	111	47	-1	0	0	0	0	0	220

Table 2.6-9

Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) 2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	430	326	2,786	12,358	23,871	16,574	8,643	605	417	429	429	417	67,286
Above Normal	437	326	1,259	3,703	7,956	6,572	1,876	430	418	430	429	417	24,255
Normal	429	304	1,006	1,077	1,935	1,329	536	430	417	429	430	417	8,739
Below Normal	429	297	324	859	1,214	1,046	417	430	417	430	430	417	6,709
Dry	429	298	307	813	1,168	816	418	430	417	430	430	417	6,373
All Years	431	310	1,128	3,726	7,164	5,232	2,348	464	417	430	429	417	22,497

Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	1	80	3,465	17,243	25,909	16,711	8,598	307	30	12	4	2	72,361
Above Normal	12	68	1,554	6,954	11,987	6,754	1,462	103	22	6	2	1	28,926
Normal	1	29	1,397	1,501	3,154	1,586	284	60	9	2	0	0	8,022
Below Normal	1	22	78	186	338	450	72	41	7	0	0	0	1,195
Dry	1	6	26	35	124	69	43	23	1	0	0	0	328
All Years	3	41	1,292	5,145	8,250	5,077	2,060	106	14	4	1	1	21,993

Difference in Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) 2018 WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	-678	-4,885	-2,038	-136	46	298	386	417	425	415	-5,075
Above Normal	425	258	-295	-3,251	-4,031	-182	414	327	396	424	428	417	-4,671
Normal	429	275	-391	-424	-1,219	-257	251	370	408	428	430	417	717
Below Normal	428	275	246	672	876	596	345	389	411	430	430	417	5,515
Dry	429	292	281	778	1,044	747	375	407	416	430	430	417	6,044
All Years	428	269	-164	-1,419	-1,086	155	288	358	403	426	428	417	504

A flow recapture facility in Alameda Creek below Calaveras Reservoir is incorporated in the variant and WSIP settings. This facility is assumed to recapture flows explicitly released from Calaveras Dam for the 1997 MOU. The effect of the recapture would be a reduction in the flow below the confluence of Alameda and Calaveras Creeks, but only to the extent that releases were explicitly made from Calaveras Reservoir for the 1997 MOU. Flows below this diversion have been estimated and noted as the flow above the Alameda Creek and San Antonio Creek confluence. Table 2.6-10 illustrates the flow at this location for the variant and WSIP settings. The flow changes at this location are consistent with the changes noted for below the confluence of Alameda and Calaveras Creeks. These flow changes are considered insubstantial. Table 2.6-11 provides the same form of information for the variant and base settings. The flows identified at this location are indicative of flow occurring below the confluence of Alameda and Calaveras Creeks (described above) with the addition of estimated stream accretions between the Alameda and Calaveras Creek confluence and the Alameda and San Antonio Creek confluence, less the water assumed to be recaptured (diverted) by the SFPUC from the creek.

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Table 2.6-10

Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,178	13,705	25,474	17,719	9,294	556	76	33	15	9	70,220
Above Normal	19	150	1,455	4,230	8,670	7,073	2,127	217	54	20	9	6	24,031
Normal	7	64	1,131	909	1,768	1,255	466	128	28	9	4	3	5,770
Below Normal	7	56	183	404	678	717	154	91	20	5	3	2	2,321
Dry	6	19	70	98	231	145	91	48	9	3	2	2	724
All Years	9	89	1,194	3,831	7,299	5,346	2,395	207	38	14	7	4	20,432

Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,113	13,610	25,199	17,720	9,297	556	76	33	15	9	69,788
Above Normal	19	150	1,203	4,350	8,422	6,871	2,127	217	54	20	9	6	23,450
Normal	7	64	1,131	909	1,740	1,219	466	128	28	9	4	3	5,706
Below Normal	7	56	183	404	678	717	154	91	20	5	3	2	2,321
Dry	6	19	70	98	231	145	91	48	9	3	2	2	724
All Years	9	89	1,129	3,838	7,188	5,297	2,396	207	38	14	7	4	20,215

Difference in Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

2018 WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	65	95	276	0	-3	0	0	0	0	0	432
Above Normal	0	0	252	-120	248	201	0	0	0	0	0	0	581
Normal	0	0	0	0	28	36	0	0	0	0	0	0	64
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	65	-7	111	49	-1	0	0	0	0	0	217

Table 2.6-11

Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,178	13,705	25,474	17,719	9,294	556	76	33	15	9	70,220
Above Normal	19	150	1,455	4,230	8,670	7,073	2,127	217	54	20	9	6	24,031
Normal	7	64	1,131	909	1,768	1,255	466	128	28	9	4	3	5,770
Below Normal	7	56	183	404	678	717	154	91	20	5	3	2	2,321
Dry	6	19	70	98	231	145	91	48	9	3	2	2	724
All Years	9	89	1,194	3,831	7,299	5,346	2,395	207	38	14	7	4	20,432

Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,973	18,714	27,673	17,977	9,358	513	76	33	15	9	78,502
Above Normal	19	150	1,922	7,772	13,068	7,467	1,861	217	54	20	9	6	32,566
Normal	7	64	1,716	1,881	3,712	2,007	479	128	28	9	4	3	10,037
Below Normal	7	56	183	404	678	717	154	91	20	5	3	2	2,321
Dry	6	19	70	98	231	145	91	48	9	3	2	2	724
All Years	9	89	1,560	5,733	9,019	5,624	2,355	198	38	14	7	4	24,650

Difference in Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

2018 WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-795	-5,009	-2,198	-258	-64	43	0	0	0	0	-8,282
Above Normal	0	0	-467	-3,542	-4,397	-394	266	0	0	0	0	0	-8,535
Normal	0	0	-585	-972	-1,944	-752	-13	0	0	0	0	0	-4,267
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-366	-1,901	-1,720	-279	40	8	0	0	0	0	-4,218

Compared to the WSIP setting, the variant's San Antonio Reservoir operation would typically draw less from storage on an annual basis, particularly during cyclic maintenance. Figure 2.6-3 illustrates a chronological trace of the simulation of San Antonio Reservoir storage and stream releases from San Antonio Dam. Shown in Figure 2.6-3 are the results for the WSIP, variant, and base settings. The difference in San Antonio Reservoir storage between the variant and WSIP settings is mostly caused by the lesser demand of the variant. Considering that Calaveras Reservoir storage is essentially the same between the settings, the difference in San Antonio Reservoir storage is indicative of the operational strategy to affect storage in San Antonio Reservoir more than storage in the other SFPUC Bay Area reservoirs. San Antonio Reservoir would retain more storage in the variant setting compared to the WSIP setting.

The difference in storage between the variant and WSIP settings and the base setting is due to the restoration of the operational capacity of Calaveras Reservoir. In the base setting, the limited operating storage capacity at Calaveras Reservoir leads to a different operation at San Antonio Reservoir, one that retains relatively more stored water for system demands when the draw from Calaveras Reservoir is constrained due to limited storage. There is also a notable difference in storage operation between the variant and WSIP settings and the base setting due to assumed maintenance. Assumed systematic maintenance of Hetch Hetchy conveyance facilities constrains diversions to the Bay Area from Hetch Hetchy every year, and particularly during every fifth year in the WSIP and variant settings.

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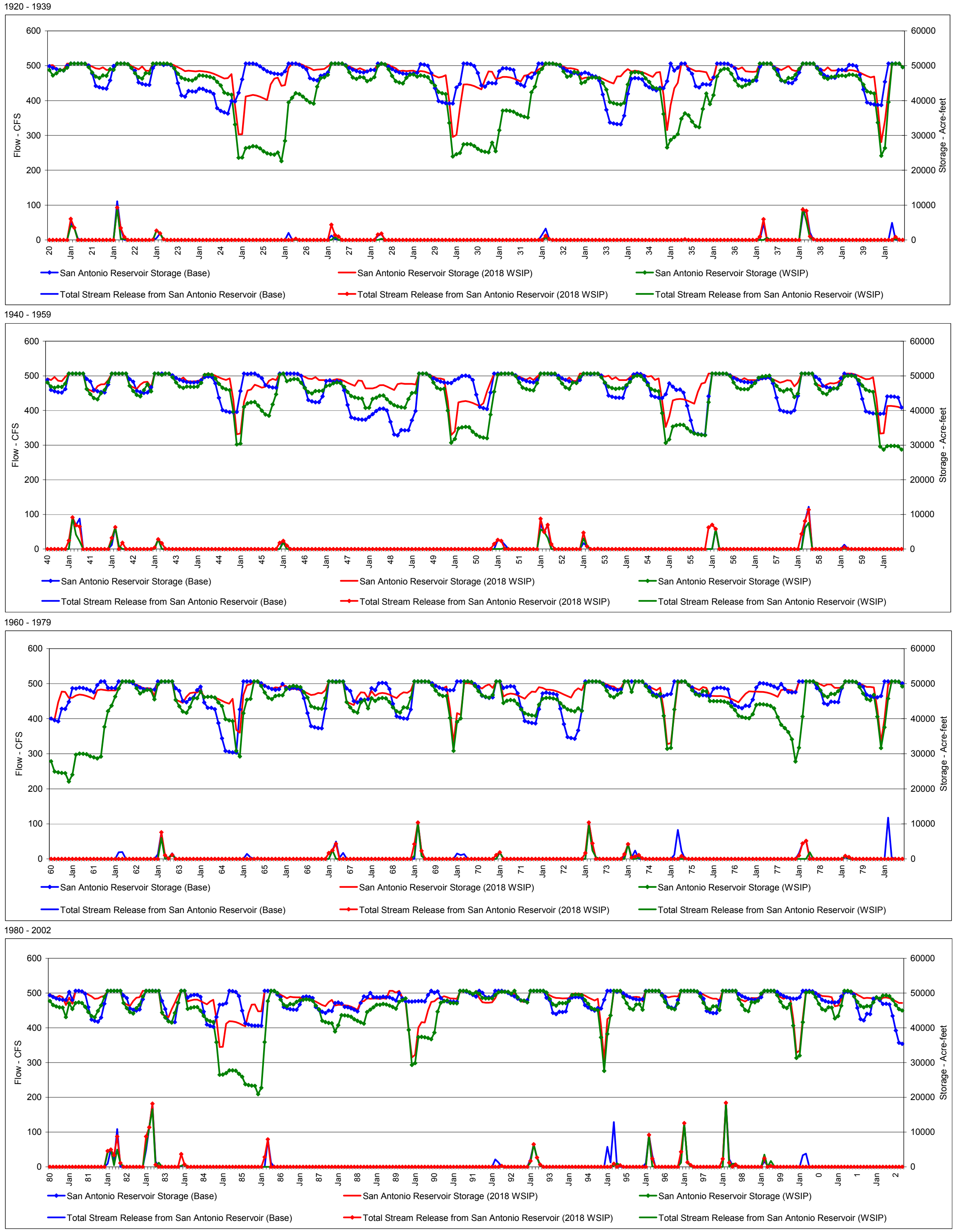
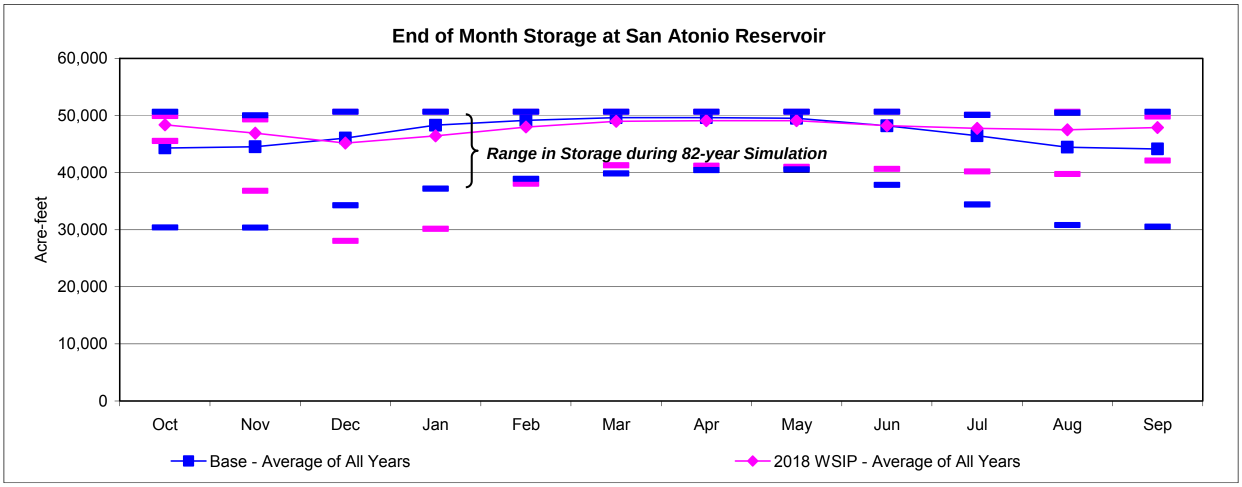
Figure 2.6-3
San Antonio Reservoir Storage and Stream Release



The reduction in diversion from Hetch Hetchy during these periods is accommodated in the system by drawing additional water from the Bay Area reservoirs. The proportionate share of this operation that is directed toward San Antonio Reservoir is evident in the tracing of San Antonio Reservoir storage for the variant and WSIP settings. Figure 2.6-4 illustrates the average monthly storage in San Antonio Reservoir for the 82-year simulation, and the range in storage for each month for the variant and base settings. Compared to the base setting, the variant would draw less storage from San Antonio Reservoir, typically retaining a fuller reservoir except during the cyclic maintenance period November through January.

Figure 2.6-4



There is very little anticipated change in stream releases below San Antonio Reservoir between the variant and WSIP settings. Table 2.6-12 illustrates the modeled releases to San Antonio Creek from San Antonio Reservoir for the two settings and the differences for the average release during a year type. With a different reservoir operation at times during the winter, as seen in Figure 2.6-4, it is expected that there would be a difference in the ability to regulate reservoir inflow and avoid stream releases. Given the sometimes rigid constraints within the modeling assumptions, the model will overestimate the frequency and magnitude of stream releases from San Antonio Reservoir under any of the investigated settings. The flexibility that occurs in actual operations would likely avoid most of the releases represented by the model. The modeled stream releases from San Antonio Reservoir and the difference between releases for the variant and base setting are shown in Table 2.6-13. The differences between the two settings reflect a slight decrease in modeled releases. This modeled circumstance reflects the different resulting storage operation between the two settings, as seen in Figure 2.6-3. In most instances, the variant setting storage at San Antonio Reservoir during a period would be lower than that projected for the base setting during the same period. This circumstance could lead to an occasionally lesser modeled release for the variant setting, which is reflected in the results. As described above, the model will overestimate the frequency and magnitude of releases from San Antonio Reservoir, and the actual releases from the reservoir in any setting and the difference between settings are expected to be minor.

Flow below the confluence of Alameda and San Antonio Creeks is influenced by releases from San Antonio Creek and flow arriving at the location from Alameda Creek, which includes upstream impairment by SFPUC operations and facilities. Table 2.6-14 illustrates the flow below the confluence for the variant and WSIP settings, and the differences in flow between the two. The differences in flow between the variant and WSIP settings at this location are the net sum of the differences identified for flow reaching the location from Alameda Creek and from San Antonio Creek. The difference in flow from upstream in Alameda Creek was previously identified as insubstantial. Along with the conclusion that flow differences in San Antonio Creek would not be substantial, modeled differences below the confluence are also considered insubstantial.

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Table 2.6-12

Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	404	2,195	3,512	2,817	1,171	88	0	0	0	0	10,187
Above Normal	0	0	107	673	1,818	888	197	62	0	0	0	0	3,745
Normal	0	0	251	368	133	90	90	11	0	0	0	0	943
Below Normal	0	0	0	0	16	4	0	0	0	0	0	0	19
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	150	640	1,091	752	287	32	0	0	0	0	2,952

Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	44	1,208	3,251	1,558	658	151	0	0	0	0	6,870
Above Normal	0	0	0	442	1,381	158	192	62	0	0	0	0	2,235
Normal	0	0	11	287	78	6	13	0	0	0	0	0	395
Below Normal	0	0	0	0	0	0	4	0	0	0	0	0	4
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	11	383	936	338	172	42	0	0	0	0	1,882

Difference in Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

2018 WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	360	987	261	1,259	513	-63	0	0	0	0	3,317
Above Normal	0	0	107	231	437	731	4	0	0	0	0	0	1,510
Normal	0	0	240	81	55	84	78	11	0	0	0	0	548
Below Normal	0	0	0	0	16	4	-4	0	0	0	0	0	15
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	139	256	155	414	115	-10	0	0	0	0	1,070

Table 2.6-13

Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	404	2,195	3,512	2,817	1,171	88	0	0	0	0	10,187
Above Normal	0	0	107	673	1,818	888	197	62	0	0	0	0	3,745
Normal	0	0	251	368	133	90	90	11	0	0	0	0	943
Below Normal	0	0	0	0	16	4	0	0	0	0	0	0	19
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	150	640	1,091	752	287	32	0	0	0	0	2,952

Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	101	1,322	3,669	3,288	1,398	94	0	0	0	0	9,872
Above Normal	0	0	26	687	1,909	1,487	116	58	0	0	0	0	4,283
Normal	0	0	7	370	441	237	65	0	0	0	0	0	1,120
Below Normal	0	0	0	0	41	0	0	0	0	0	0	0	41
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	26	472	1,206	996	309	30	0	0	0	0	3,041

Difference in Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

2018 WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	303	873	-157	-471	-227	-6	0	0	0	0	315
Above Normal	0	0	81	-14	-91	-599	81	4	0	0	0	0	-538
Normal	0	0	244	-1	-309	-147	26	11	0	0	0	0	-177
Below Normal	0	0	0	0	-26	4	0	0	0	0	0	0	-22
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	124	167	-115	-244	-23	2	0	0	0	0	-89

Table 2.6-14

Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,582	15,900	28,986	20,536	10,465	644	76	33	15	9	80,407
Above Normal	19	150	1,562	4,903	10,488	7,961	2,324	280	54	20	9	6	27,776
Normal	7	64	1,382	1,278	1,901	1,345	556	139	28	9	4	3	6,713
Below Normal	7	56	183	404	694	720	154	91	20	5	3	2	2,340
Dry	6	19	70	98	231	145	91	48	9	3	2	2	724
All Years	9	89	1,344	4,471	8,390	6,098	2,682	239	38	14	7	4	23,384

Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,157	14,818	28,449	19,278	9,955	707	76	33	15	9	76,658
Above Normal	19	150	1,203	4,792	9,803	7,029	2,320	279	54	20	9	6	25,685
Normal	7	64	1,142	1,197	1,818	1,224	478	128	28	9	4	3	6,101
Below Normal	7	56	183	404	678	717	159	91	20	5	3	2	2,326
Dry	6	19	70	98	231	145	91	48	9	3	2	2	724
All Years	9	89	1,140	4,221	8,124	5,635	2,567	249	38	14	7	4	22,097

Difference in Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

2018 WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	425	1,081	537	1,259	510	-63	0	0	0	0	3,749
Above Normal	0	0	359	111	685	932	4	0	0	0	0	0	2,091
Normal	0	0	240	81	83	121	78	11	0	0	0	0	612
Below Normal	0	0	0	0	16	4	-4	0	0	0	0	0	15
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	204	250	266	463	115	-10	0	0	0	0	1,288

Table 2.6-15 illustrates the same information for the variant and base settings. Table 2.6-15 shows the larger differences in flow that would occur between the variant and base settings. Those differences are particularly due to the effects of the restoration of Calaveras Reservoir operating capacity and the difference in San Antonio Reservoir storage operations.

Table 2.6-15

Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — 2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,582	15,900	28,986	20,536	10,465	644	76	33	15	9	80,407
Above Normal	19	150	1,562	4,903	10,488	7,961	2,324	280	54	20	9	6	27,776
Normal	7	64	1,382	1,278	1,901	1,345	556	139	28	9	4	3	6,713
Below Normal	7	56	183	404	694	720	154	91	20	5	3	2	2,340
Dry	6	19	70	98	231	145	91	48	9	3	2	2	724
All Years	9	89	1,344	4,471	8,390	6,098	2,682	239	38	14	7	4	23,384

Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	4,075	20,036	31,342	21,266	10,756	607	76	33	15	9	88,374
Above Normal	19	150	1,948	8,459	14,977	8,954	1,977	276	54	20	9	6	36,849
Normal	7	64	1,723	2,251	4,153	2,244	544	128	28	9	4	3	11,157
Below Normal	7	56	183	404	720	717	154	91	20	5	3	2	2,363
Dry	6	19	70	98	231	145	91	48	9	3	2	2	724
All Years	9	89	1,587	6,205	10,225	6,620	2,664	229	38	14	7	4	27,691

Difference in Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — 2018 WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-492	-4,136	-2,355	-730	-291	37	0	0	0	0	-7,967
Above Normal	0	0	-386	-3,557	-4,489	-993	347	4	0	0	0	0	-9,073
Normal	0	0	-341	-973	-2,252	-899	12	11	0	0	0	0	-4,443
Below Normal	0	0	0	0	-26	4	0	0	0	0	0	0	-22
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-243	-1,734	-1,835	-523	17	10	0	0	0	0	-4,307

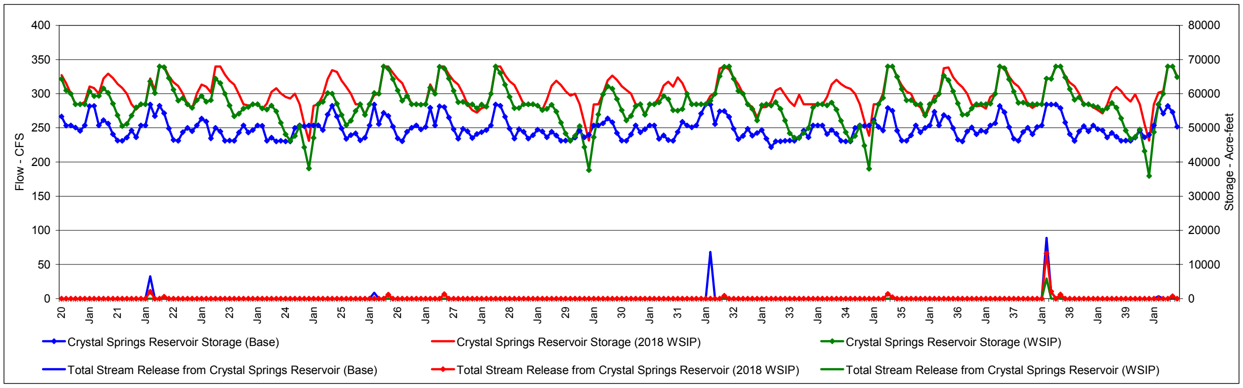
2.7 Crystal Springs and San Andreas Reservoirs

There are differences in Crystal Springs Reservoir operations among the WSIP, variant, and base settings. Figure 2.7-1 illustrates a chronological trace of the simulation of Crystal Springs Reservoir storage and stream releases from Crystal Springs Dam. Shown in Figure 2.7-1 are the results for the WSIP, variant, and base settings. Fundamental to the difference in storage operations between the WSIP and variant settings and the base setting is the restoration of reservoir operation capacity in the WSIP and variant setting that does not occur in the base setting. The result is the operation of Crystal Springs Reservoir at a lower maximum storage in the base setting. The difference in Crystal Springs Reservoir storage between the variant and WSIP settings is caused by the interaction of the increased demand served by the system's resources (a net 265 mgd for the variant and a net 290 mgd for the WSIP), which tends to lessen the operational range of the reservoir in the variant setting. Less drawdown and an accelerated replenishment of Crystal Springs Reservoir storage (as well as other Bay Area reservoirs) would occur with less systemwide demand to serve. The magnitude of the draw of storage from Crystal Springs Reservoir is partially dependent on the discretionary assumptions of the model that proportion the use of storage among the Bay Area system reservoirs. In actual operations, some of these differences may not occur, as system operators and prevailing hydraulic and hydrologic conditions may result in a different apportionment of effect among the reservoirs. However, the operational strategy prefers the retention of storage in the Peninsula reservoirs, similar to the strategy used by the model. Figure 2.7-2 illustrates the average monthly storage in Crystal Springs Reservoir for the 82-year simulation, and the range in storage for each month for the variant and WSIP settings.

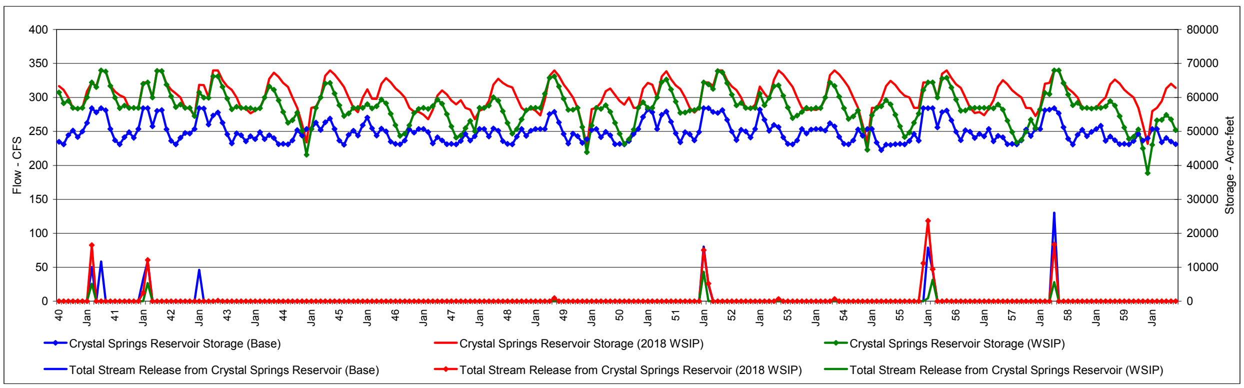
APPENDIX O3

Figure 2.7-1
Crystal Springs Reservoir Storage and Release

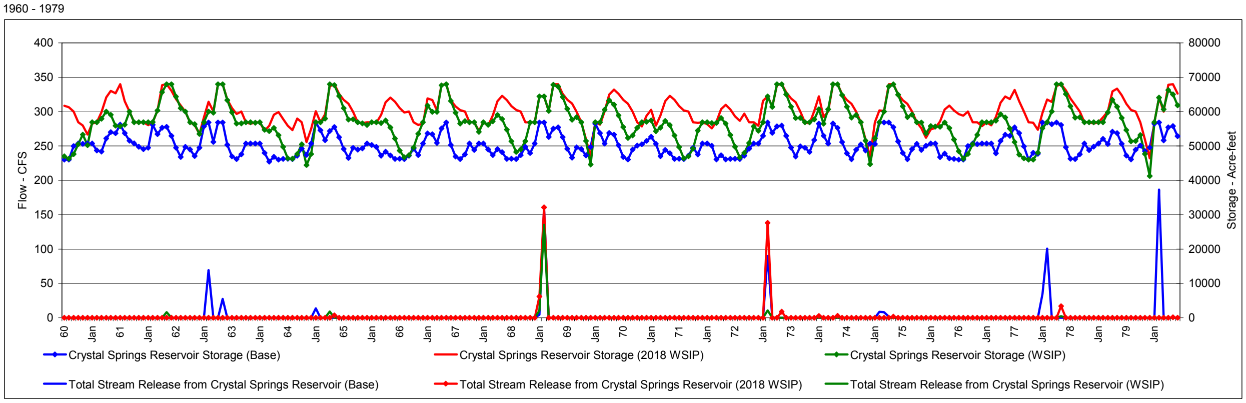
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

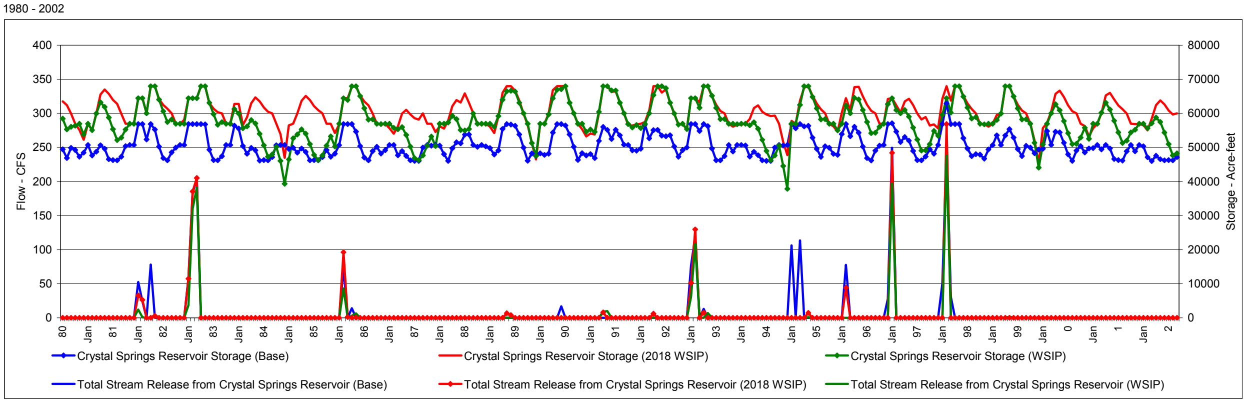


Figure 2.7-2

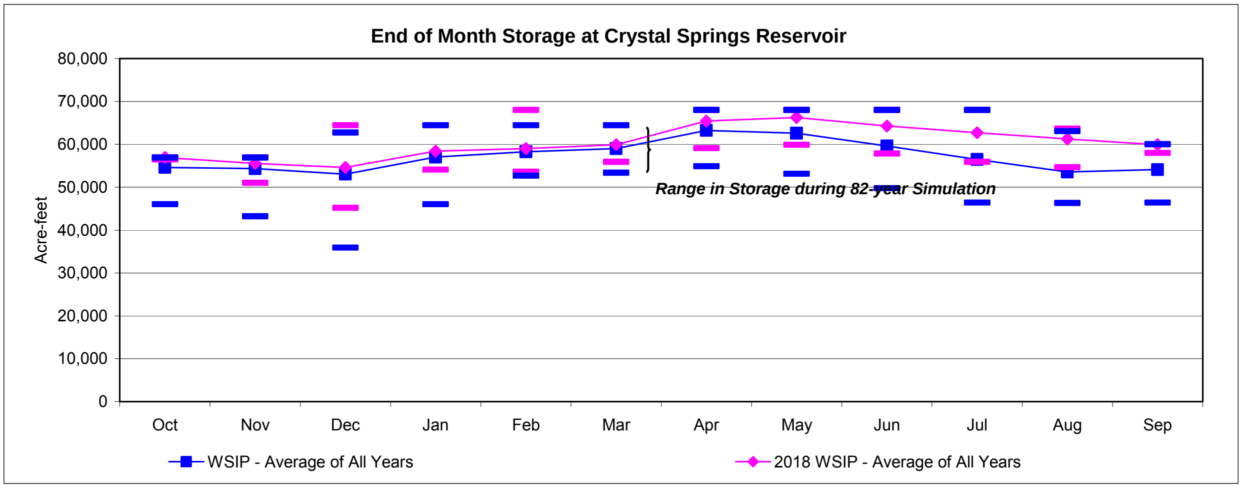


Figure 2.7-3 illustrates the average monthly storage in Crystal Springs Reservoir for the 82-year simulation, and the range in storage for each month for the variant and base settings. The variant setting would result in reservoir storage operating at a higher average level during all months, and the range of operating storage would be larger in some months.

Figure 2.7-3

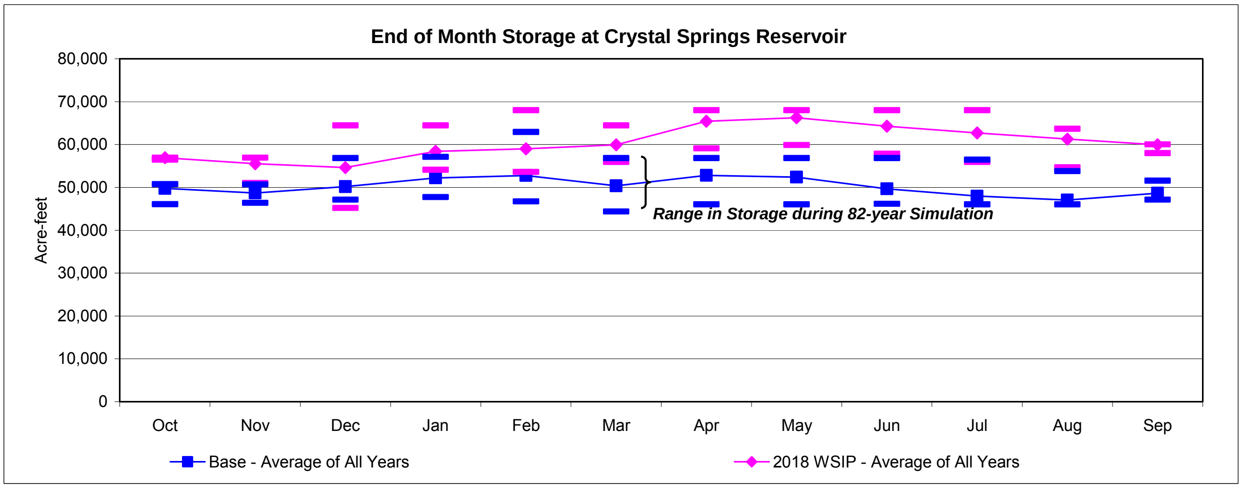


Table 2.7-1 illustrates the modeled variant and WSIP stream releases from Crystal Springs Reservoir and the differences between the two settings. Modeling results indicate that an increase or decrease in the occasional release could occur. The potential difference is attributed to a difference in the operating range of reservoir storage in the variant setting. In actual operations, it is anticipated that system operators would manage the reservoir system whereby stream releases would be minimal under any setting, and the effect would be essentially no difference between the variant and WSIP settings. Similarly, Table 2.7-2 illustrates the stream releases for the variant and base settings, and the difference in modeled flows between the two settings. A difference in Crystal Springs Reservoir storage between the two settings would lead to a different potential to regulate reservoir inflow, which could lead to different stream releases. However, as described above, actual system operations attempt to minimize releases under any setting, and thus the difference in releases between the variant and base setting is minimal, if any.

APPENDIX O3

Table 2.7-1

Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — 2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	215	2,186	4,073	833	310	101	0	0	0	0	7,718
Above Normal	0	0	0	195	600	0	26	140	0	0	0	0	960
Normal	0	0	0	0	0	0	48	77	0	0	0	0	125
Below Normal	0	0	0	0	0	0	28	12	0	0	0	0	39
Dry	0	0	0	0	0	0	0	26	15	0	0	0	41
All Years	0	0	42	467	919	163	81	71	3	0	0	0	1,745

Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	1,098	2,435	732	115	48	0	0	0	0	4,428
Above Normal	0	0	0	111	353	0	32	47	0	0	0	0	544
Normal	0	0	0	0	0	0	0	31	0	0	0	0	31
Below Normal	0	0	0	0	0	0	31	35	0	0	0	0	67
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	0	237	548	143	36	33	0	0	0	0	997

Difference in Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — 2018 WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	215	1,088	1,638	101	195	53	0	0	0	0	3,290
Above Normal	0	0	0	83	247	0	-6	92	0	0	0	0	416
Normal	0	0	0	0	0	0	48	46	0	0	0	0	94
Below Normal	0	0	0	0	0	0	-4	-24	0	0	0	0	-28
Dry	0	0	0	0	0	0	0	26	15	0	0	0	41
All Years	0	0	42	230	371	20	45	38	3	0	0	0	749

Table 2.7-2

Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — 2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	215	2,186	4,073	833	310	101	0	0	0	0	7,718
Above Normal	0	0	0	195	600	0	26	140	0	0	0	0	960
Normal	0	0	0	0	0	0	48	77	0	0	0	0	125
Below Normal	0	0	0	0	0	0	28	12	0	0	0	0	39
Dry	0	0	0	0	0	0	0	26	15	0	0	0	41
All Years	0	0	42	467	919	163	81	71	3	0	0	0	1,745

Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	107	2,744	4,279	1,376	1,047	2	0	0	0	0	9,556
Above Normal	0	0	0	618	1,343	29	52	100	0	0	0	0	2,142
Normal	0	0	0	0	268	0	0	0	0	0	0	0	268
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	62	0	0	0	62
All Years	0	0	21	664	1,166	274	215	21	12	0	0	0	2,373

Difference in Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — 2018 WSIP minus Base

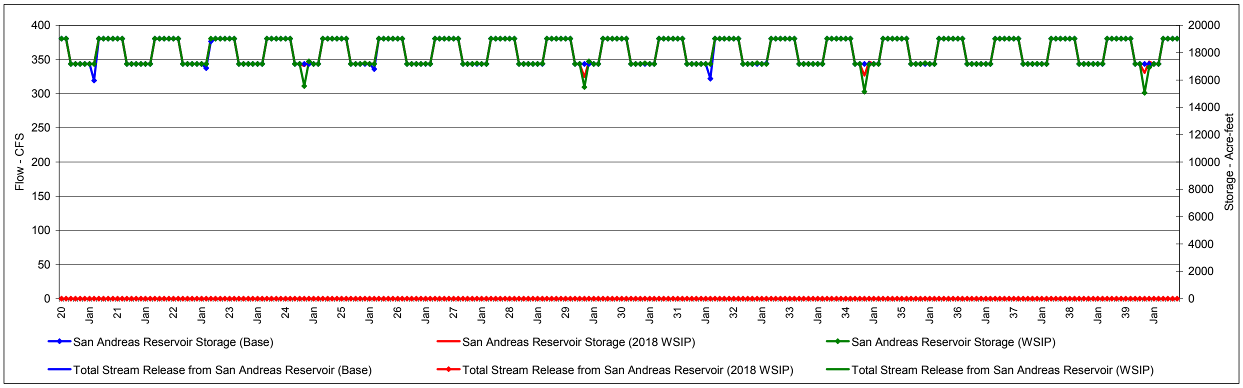
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	107	-558	-207	-542	-737	98	0	0	0	0	-1,838
Above Normal	0	0	0	-424	-743	-29	-26	40	0	0	0	0	-1,182
Normal	0	0	0	0	-268	0	48	77	0	0	0	0	-143
Below Normal	0	0	0	0	0	0	28	12	0	0	0	0	39
Dry	0	0	0	0	0	0	0	26	-48	0	0	0	-22
All Years	0	0	21	-197	-247	-112	-134	50	-9	0	0	0	-628

Reservoir storage at San Andreas Reservoir would follow a systematic filling and lowering each year; however, there would be slight differences in drawdown between the variant and WSIP settings, primarily due to the coincidence of the effects of different systemwide maintenance and water demands within each setting. Figure 2.7-4 illustrates a chronological trace of the simulation of San Andreas Reservoir storage and stream releases from San Andreas Dam. Shown in Figure 2.7-4 are the results for the WSIP, variant, and base settings. There are no projected stream releases from San Andreas Reservoir in any setting. Compared to the base setting, as Figure 2.7-4 illustrates, there would be a difference in storage operation every fifth year for the WSIP and variant settings. These differences would be the result of Hetch Hetchy conveyance maintenance, which is assumed to occur systematically in the variant and WSIP settings. The maintenance constrains the amount of Hetch Hetchy water supplied to serve water demands in the Bay Area. As previously discussed, during these winter periods the Bay Area reservoir system would accommodate the reduction in imported supply by serving the Bay Area water deliveries with the local watersheds' runoff and storage. At San Andreas Reservoir, serving this water demand would affect the reservoir when additional required water production at Harry Tracy WTP associated with WSIP or the variant exceeded the ability to maintain San Andreas Reservoir storage with pumping from Crystal Springs Reservoir. In the modeling, the conveyance capacity from Crystal Springs Reservoir is assumed to be the same among all of the settings. The additional water demand of the WSIP and variant require additional production from Harry Tracy WTP to be drawn from San Andreas Reservoir.

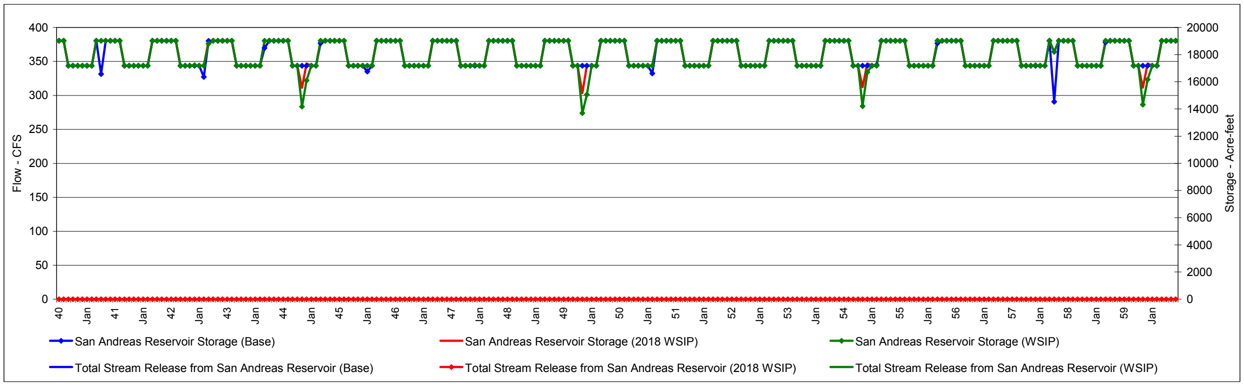
APPENDIX O3

Figure 2.7-4
San Andreas Reservoir Storage and Stream Release

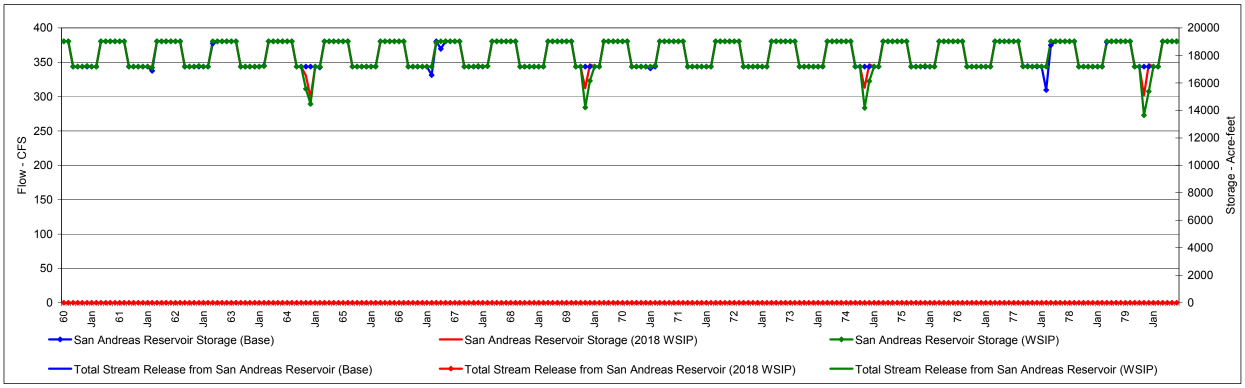
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

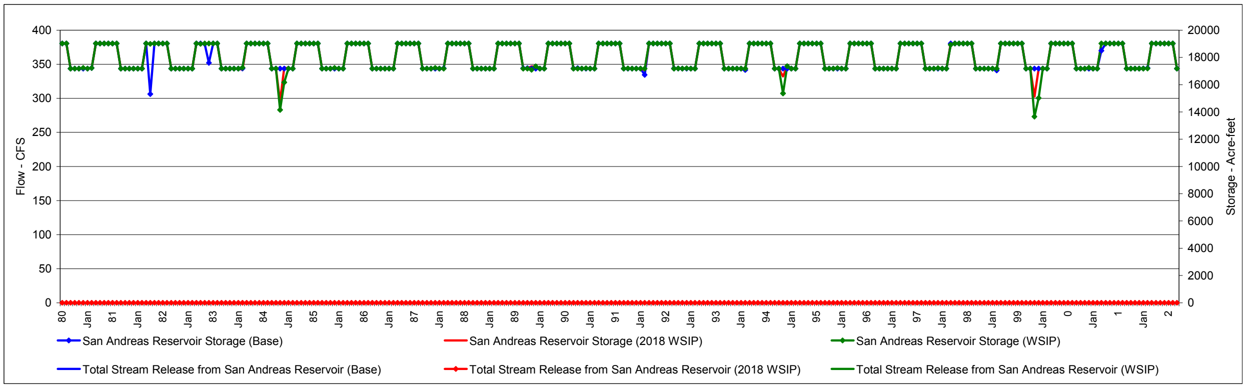
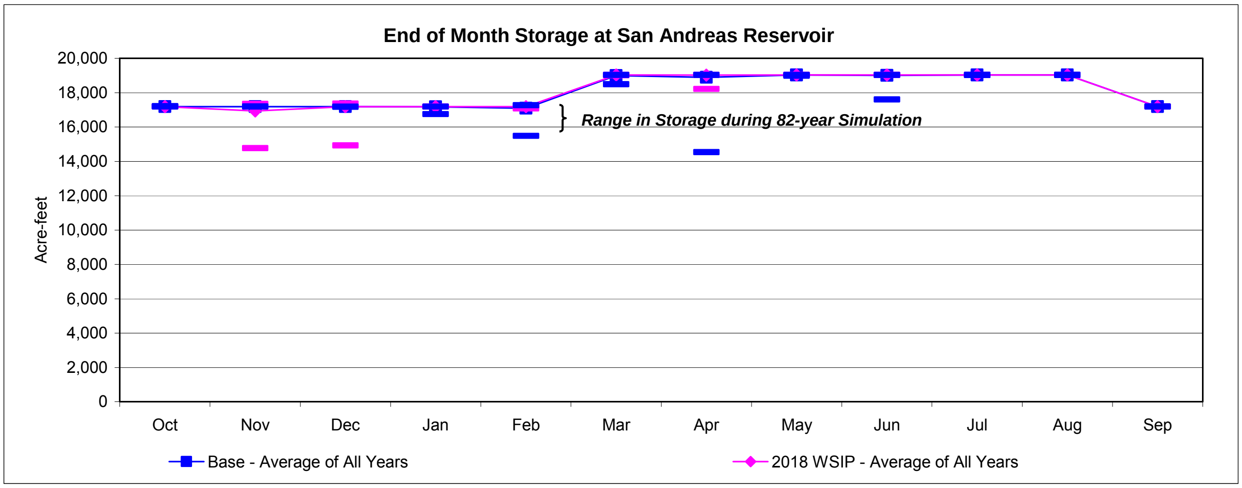


Figure 2.7-5 illustrates the average monthly storage in San Andreas Reservoir for the 82-year simulation, and the range in storage for each month for the variant and base settings.

Figure 2.7-5



2.8 Pilarcitos Reservoir

Coastside County Water District's (Coastside CWD) water demand and its SFPUC purchase request are projected to increase within the WSIP planning horizon of year 2030. Within the context of the 2030 purchase request of 300 mgd, Coastside CWD's portion is estimated to amount to about 3 mgd. This projected purchase request is approximately 1 mgd greater that its current purchase request. Considering the current physical constraints on deliveries from the SFPUC to Coastside CWD and the ongoing planning activities in the watershed, the precise means of serving Coastside CWD's additional purchase request, and the resultant potential changes in the operation of SFPUC facilities and their affected environs, are uncertain.[2] For the variant, Coastside CWD's delivery would remain at its current level of approximately 1.8 mgd.

Assuming a range of potential means to serve the additional purchase request from Coastside CWD, the following are potential hydrologic effects on SFPUC facilities and their affected environs:

- Due to limited yield from Pilarcitos Reservoir, additional diversions would be required from Crystal Springs Reservoir.
- If deliveries to Coastside CWD from Pilarcitos Reservoir increase during the winter season, these deliveries could potentially reduce storage in Pilarcitos Reservoir, thereby potentially reducing diversions to the San Mateo Creek watershed. Although the increased delivery would increase releases to Pilarcitos Creek from Pilarcitos Dam for a period of time, the increase would subsequently lead to a reduction in spills past Stone Dam.
- Additional wintertime deliveries could also potentially impair the ability to provide carryover storage into the summer season from Pilarcitos Reservoir, and subsequently lead to an acceleration of the beginning of the season when releases to Pilarcitos Creek from Pilarcitos Reservoir consist only of the passage of reservoir inflow.
- An increase in summertime deliveries from Pilarcitos Creek could also accelerate the beginning of the season when releases to Pilarcitos Creek from Pilarcitos Reservoir consist only of the passage of reservoir inflow.

Figure 2.8-1 illustrates a chronological trace of the simulation of Pilarcitos Reservoir storage and stream releases from Pilarcitos Dam. Shown in Figure 2.8-1 are the results for the WSIP, variant, and base

[2] See *Analysis of SFPUC Pilarcitos/Coastside County Water District Operations*, Memorandum by Daniel B. Steiner, March 8, 2007.

settings. For the WSIP setting, the operation assumes an increase in purchase request by Coastside CWD, distributed on a proportionate monthly pattern during the year consistent with historical SFPUC deliveries. Also assumed is a conveyance constraint of 2 mgd to Coastside CWD from the Pilarcitos Creek source of water. When the assumed monthly purchase request of Coastside CWD exceeds this conveyance constraint, Coastside CWD's request is met with deliveries from Crystal Springs Reservoir. For the variant setting, Coastside CWD's demand is the same as depicted for the base setting.

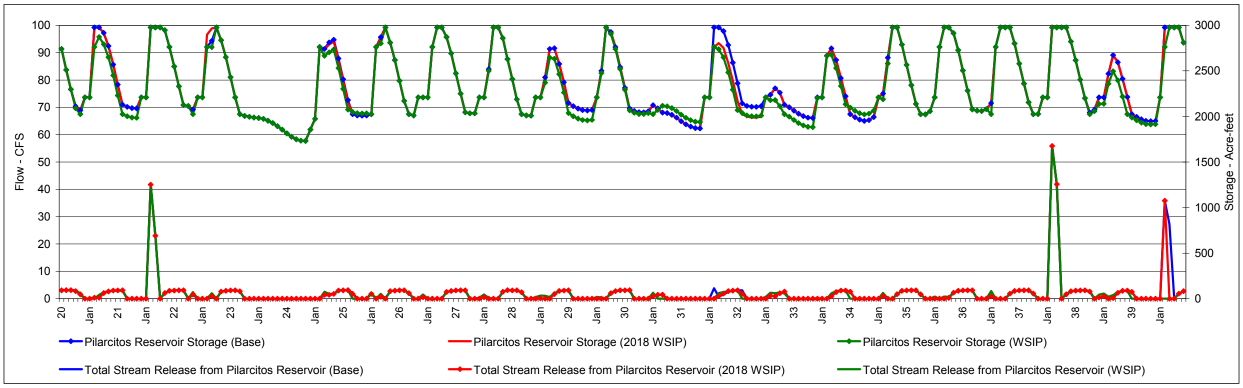
Compared to the WSIP setting, the variant would draw less water from Pilarcitos Reservoir, thus avoiding the effects on Pilarcitos Reservoir and its operations associated with the WSIP. A potential increased draw of storage from Pilarcitos Reservoir earlier in the year would not occur under the variant, and thus the earlier summertime reduction in Pilarcitos Reservoir releases to the Pilarcitos Creek would not occur. The variant's operation would be much the same as, if not identical to, that depicted for the base setting. Figure 2.8-2 illustrates the average monthly storage in Pilarcitos Reservoir for the 82-year simulation, and the range in storage for each month for the variant and base settings.

There are occasional differences in the operation of Pilarcitos Reservoir due to slight changes in the overall operation of the SFPUC system. These changes could affect the timing and frequency of the transfer of water from the Pilarcitos Creek watershed to the San Mateo Creek watershed.

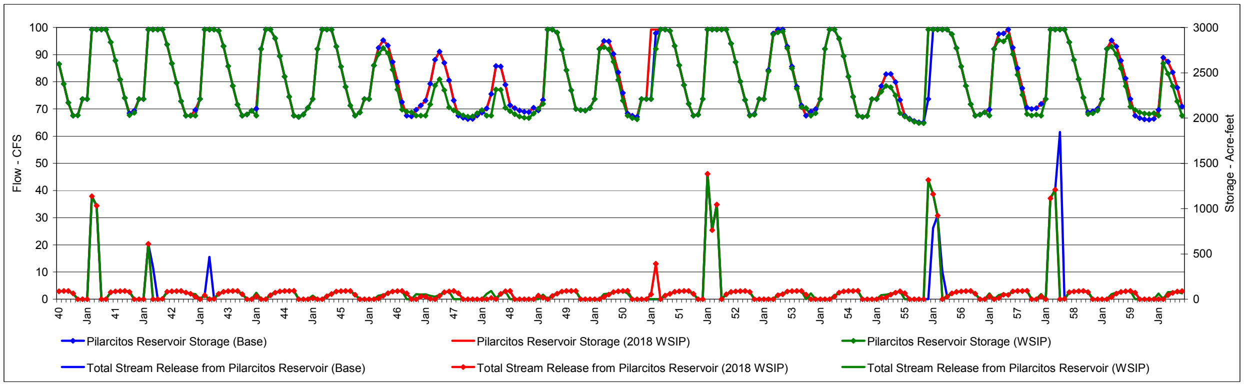
APPENDIX O3

Figure 2.8-1
Pilarcitos Reservoir Storage and Stream Release

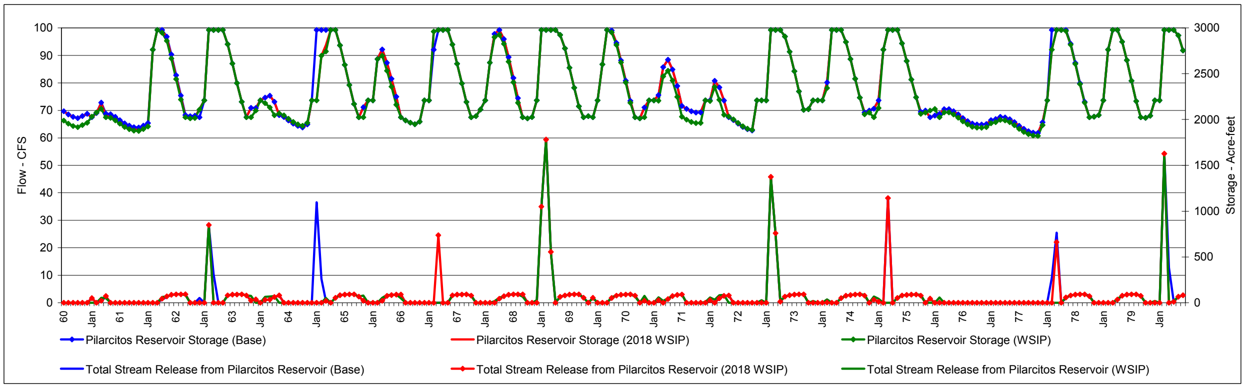
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

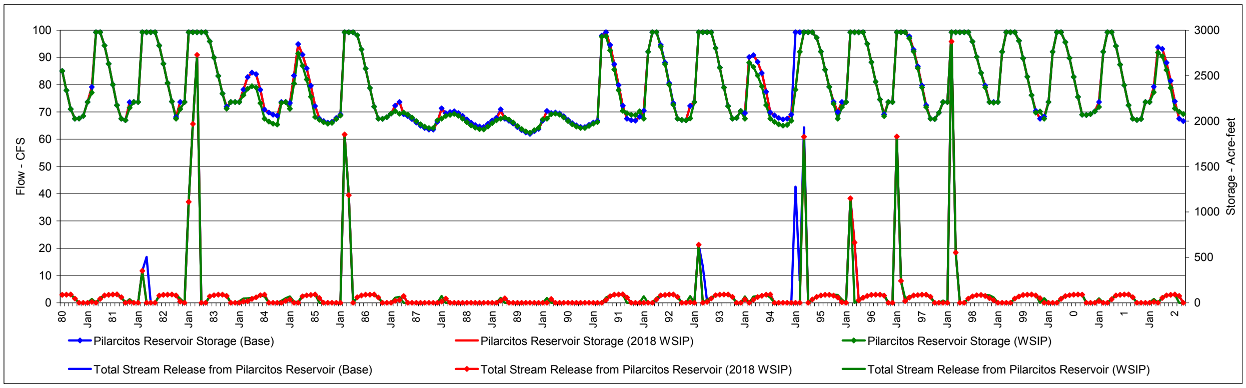
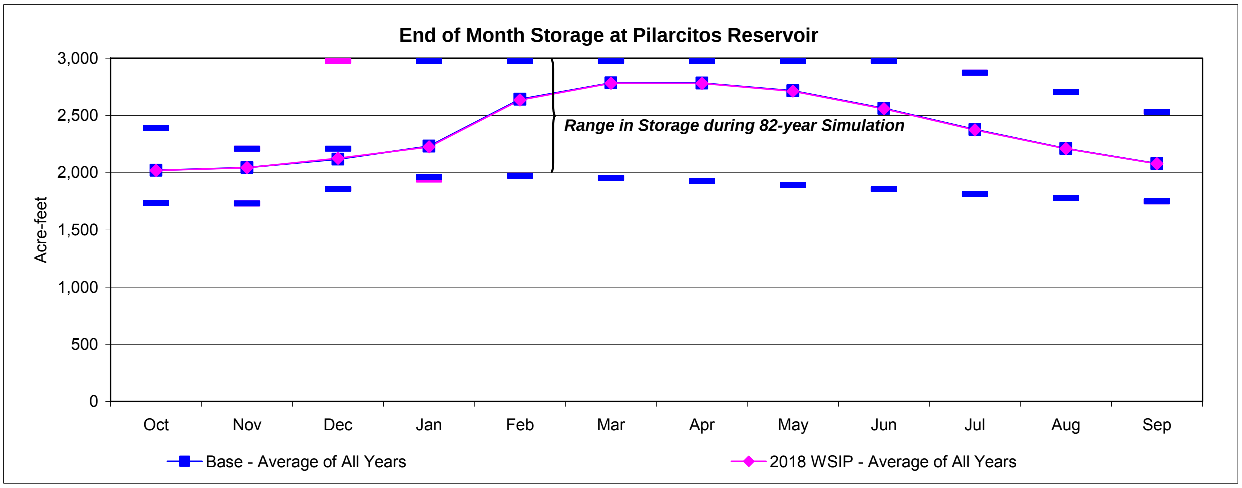


Figure 2.8-2



Stream releases from Pilarcitos Dam are also shown in Figure 2.8-1. Releases can occur for diversions at Stone Dam for Coastside CWD deliveries, conveyance to the San Mateo Creek watershed (e.g., Crystal Springs Reservoir), and reservoir spills. Pilarcitos Creek typically gains flow from unregulated tributary streams and runoff below Pilarcitos Dam. The differences in flow between the variant setting and base setting are shown chronologically in Table 2.8-1 and summarized by monthly averages within year types in Table 2.8-2. The reductions in flows during the winter and spring are indicative of the averaging of the few instances when additional water is transferred to the San Mateo watershed from Pilarcitos Reservoir.

The effect of the variant on Pilarcitos Creek flows below Stone Dam is different than the effect on flows below Pilarcitos Dam. Figure 2.8-3 illustrates the chronological trace of inflow to Stone Dam, which includes releases from Pilarcitos Dam to Pilarcitos Creek and unregulated flow to the stream below Pilarcitos Dam, and releases (spills) from Stone Dam to Pilarcitos Creek. Shown in the figure are the results for the WSIP, variant, and base settings. The flow past Stone Dam in all settings is typically minor (zero in modeling results, but may be measurable in terms of leakage and seepage past the dam), as inflow to the dam is diverted to Coastside CWD or to the San Mateo watershed. Releases past Stone Dam typically occur when unregulated flow below Pilarcitos Dam exceeds the delivery needs of Coastside CWD at a time when the storage level at Crystal Springs Reservoir rejects the water from the Pilarcitos watershed. There are a few instances when flow past Stone Dam in the variant setting would be diminished by the change in releases from Pilarcitos Reservoir. Table 2.8-3 summarizes the results for the variant and base settings in terms of average monthly flows by year type, and the average differences in flow between the two settings.

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Table 2.8-1

Difference in Total Stream Release from Pilarcitos Reservoir (Acre-feet)

2018 WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	0	0	0	0	0	0	0	0
1922	0	0	0	0	0	0	0	0	0	0	0	0	0
1923	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	7	15	0	0	0	0	-21	1
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	0	0	0	0	0
1928	0	0	0	0	0	0	0	0	0	0	0	0	0
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	-211	12	16	17	0	0	-76	0	-241
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	3	0	0	0	0	0	0	0	3
1936	0	0	0	0	0	0	0	0	0	0	0	0	0
1937	0	0	0	0	0	0	0	0	0	0	0	0	0
1938	0	0	0	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	0	-1,677	0	0	0	0	0	0	-1,677
1941	0	0	0	0	0	0	0	0	0	0	0	0	0
1942	0	0	0	0	0	-734	0	0	0	0	0	0	-734
1943	0	0	0	0	0	-958	0	0	0	0	0	0	-958
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	0	0	0	0	0	0	0	0	0
1946	0	0	0	0	0	0	0	0	0	0	0	0	0
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	109	725	0	0	0	0	0	0	0	834
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	2,697	766	0	-624	0	0	0	0	0	0	2,838
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	-3,661	0	0	0	0	0	-3,661
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	7	15	0	0	0	0	0	22
1962	0	0	0	0	0	0	16	17	0	0	0	0	34
1963	0	0	-107	0	0	-639	0	0	0	0	0	0	-747
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	-2,248	-485	0	0	0	0	0	0	0	-2,733
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	1,511	0	0	0	0	0	0	1,511
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	-503	-213	0	17	0	0	0	0	-698
1979	-10	0	0	0	0	0	0	0	0	0	0	0	-10
1980	0	0	0	0	0	-783	0	0	0	0	0	0	-783
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	-1,032	0	0	0	0	0	0	-1,032
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	4	3	0	0	0	0	0	0	0	8
1989	0	0	0	0	0	12	-20	0	0	0	0	0	-7
1990	0	0	0	0	0	12	0	0	0	0	0	0	12
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	16	17	0	0	0	-17	17
1993	0	0	0	0	0	-820	0	0	0	0	0	0	-820
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	-2,620	-442	-213	0	0	0	0	0	0	-3,275
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	0	0	32	-49	-11	-75	-44	1	0	0	-1	0	-148

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Table 2.8-2

Total Stream Release from Pilarcitos Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	54	3	172	837	2,116	1,653	13	70	152	175	183	177	5,606
Above Normal	56	37	14	11	589	388	22	116	161	181	186	169	1,928
Normal	54	3	7	15	11	9	63	143	171	185	159	127	947
Below Normal	57	6	7	15	6	24	103	154	164	171	124	63	894
Dry	36	0	11	27	17	43	70	69	55	44	8	0	381
All Years	51	10	41	177	542	418	54	111	141	152	133	107	1,938

Total Stream Release from Pilarcitos Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	54	3	4	953	2,144	1,770	242	70	152	175	183	177	5,927
Above Normal	56	37	20	137	605	641	22	115	161	181	186	169	2,328
Normal	55	3	7	15	24	9	60	139	171	185	164	128	960
Below Normal	57	6	7	15	6	23	103	154	164	171	124	65	894
Dry	36	0	11	26	17	41	70	69	55	44	8	0	378
All Years	52	10	10	225	553	493	98	110	141	152	134	108	2,085

Difference in Total Stream Release from Pilarcitos Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

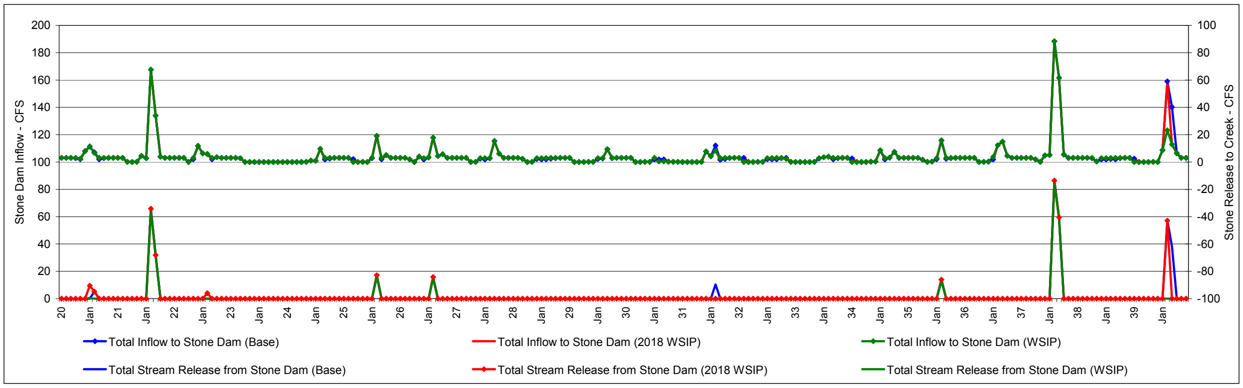
2018 WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	169	-116	-28	-117	-229	0	0	0	0	0	-321
Above Normal	0	0	-6	-126	-15	-253	0	1	0	0	0	0	-400
Normal	-1	0	0	0	-13	1	3	3	0	0	-5	-1	-12
Below Normal	0	0	0	0	0	0	1	0	0	0	0	-1	0
Dry	0	0	0	0	0	2	0	0	0	0	0	0	2
All Years	0	0	32	-49	-11	-75	-44	1	0	0	-1	0	-148

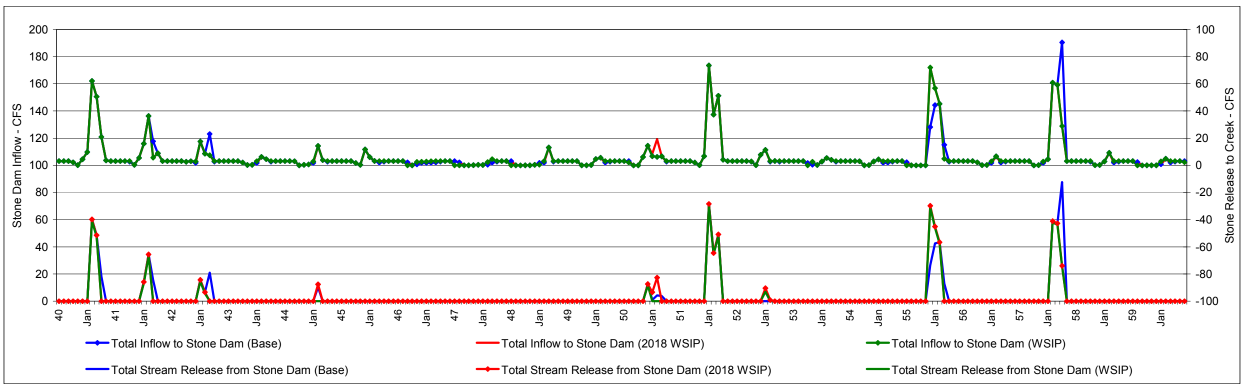
APPENDIX O3

Figure 2.8-3
Stone Dam Stream Release and Inflow

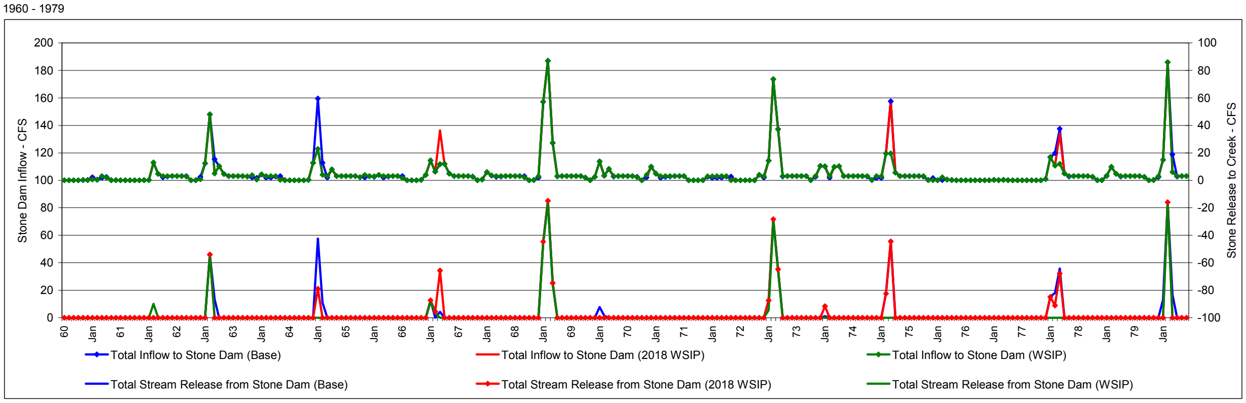
1920 - 1939



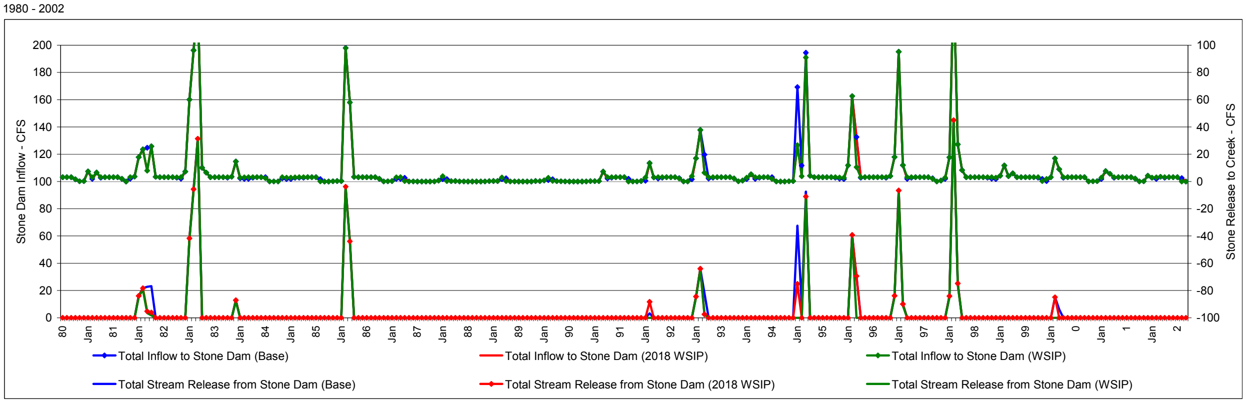
1940 - 1959



1960 - 1979



1980 - 2002



APPENDIX O3

Table 2.8-3

Total Stream Release from Stone Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) 2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	332	1,652	3,233	2,366	112	0	0	0	0	0	7,695
Above Normal	0	0	46	332	1,164	553	0	0	0	0	0	0	2,095
Normal	0	0	49	37	195	0	0	0	0	0	0	0	281
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	84	398	910	576	22	0	0	0	0	0	1,991

Total Stream Release from Stone Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	164	1,819	3,252	2,509	479	0	0	0	0	0	8,223
Above Normal	0	0	46	384	1,174	921	0	0	0	0	0	0	2,525
Normal	0	0	49	30	197	0	0	0	0	0	0	0	276
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	51	440	917	680	94	0	0	0	0	0	2,182

Difference in Total Stream Release from Stone Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) 2018 WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	169	-167	-19	-143	-368	0	0	0	0	0	-528
Above Normal	0	0	0	-52	-11	-368	0	0	0	0	0	0	-430
Normal	0	0	0	7	-2	0	0	0	0	0	0	0	4
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	33	-42	-6	-104	-72	0	0	0	0	0	-191

APPENDIX O4

Memorandum

Subject: **Analysis of WSIP upon the San Joaquin River and the Sacramento-San Joaquin Delta**
From: **Daniel B. Steiner**
Date: **May 22, 2008**

1. Introduction

This memorandum summarizes an evaluation of the potential effects of the WSIP on the hydrology and operations of the San Joaquin River and the Sacramento-San Joaquin Delta (Delta). The evaluation is based on a contrast of HH/LSM results for the simulation of the WSIP against the simulation of San Joaquin River and Delta hydrology and operations. The projected hydrology due to the WSIP is primarily discussed in terms of a comparison to the existing condition.

2. Setting

The Tuolumne River is one of the principal tributaries of the San Joaquin River. Combined with the operations of the Stanislaus River, the Merced River, and intermittent releases from the upper San Joaquin River, Kings River, and other lesser tributary and uncontrolled flow, the contemporary average annual flow in the Tuolumne River at Vernalis is estimated to be approximately 3,050,000 acre-feet per year (afy), with a very large variance between drought and flood conditions. Figure 2-1 illustrates the setting of the Tuolumne River within the San Joaquin River system.

The Tuolumne River experiences an average annual unimpaired runoff of approximately 1,850,000 afy, of which an average of approximately 669,000 afy are released at La Grange Dam to the lower Tuolumne River. Releases below La Grange Dam are guided by FERC flows requirements and range between 94,000 and 301,000 afy. Additional releases occur in excess of FERC requirements during wetter years. The general magnitude and distribution of current releases at La Grange Dam by year type are illustrated in Figure 2-2. The effect of the WSIP on the Don Pedro Project would be to reduce inflow to Don Pedro Reservoir, which, if not affecting TID/MID canal diversions, would lead to a depletion in Don Pedro Reservoir storage. The depletion in reservoir storage would be replenished during wetter years when, absent the WSIP, releases below La Grange Dam would be in excess of required FERC flows. The average annual reduction in flow below La Grange Dam due to the WSIP amounts to approximately 25,000 afy, primarily during wetter years and during the winter or spring period depending on the coincidence of the WSIP's effect on inflow and the sequence of month-to-month and year-to-year hydrology.

The hydrology of the San Joaquin River at Vernalis is illustrated in Figure 2-4. The hydrology at Vernalis is dependent on several factors, including incidental and prescribed operations within the basin for the San Joaquin River. Generally, the flow in the San Joaquin River is a result of the independent operation of the tributaries for purposes specific to their respective watershed basins. An amount of flow interaction with the river also occurs through groundwater accretions, diversions, and return flows from adjacent lands.

The U.S. Bureau of Reclamation's (USBR) Central Valley Project (CVP) New Melones Project regulates the Stanislaus River, which is operated for purposes of water supply, flood control, power generation, fishery enhancement, and water quality improvement in the lower San Joaquin River. The operations of the New Melones Project are partially guided by State Water Resources Control Board (SWRCB) decisions, including Decision 1422 pertaining to releases for existing water rights, fish and wildlife enhancement, and the maintenance of water quality in the Stanislaus River and San Joaquin River. Decision 1641 assigns additional responsibility to the USBR concerning flow requirements at Vernalis.

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Figure 2-1
San Joaquin River System

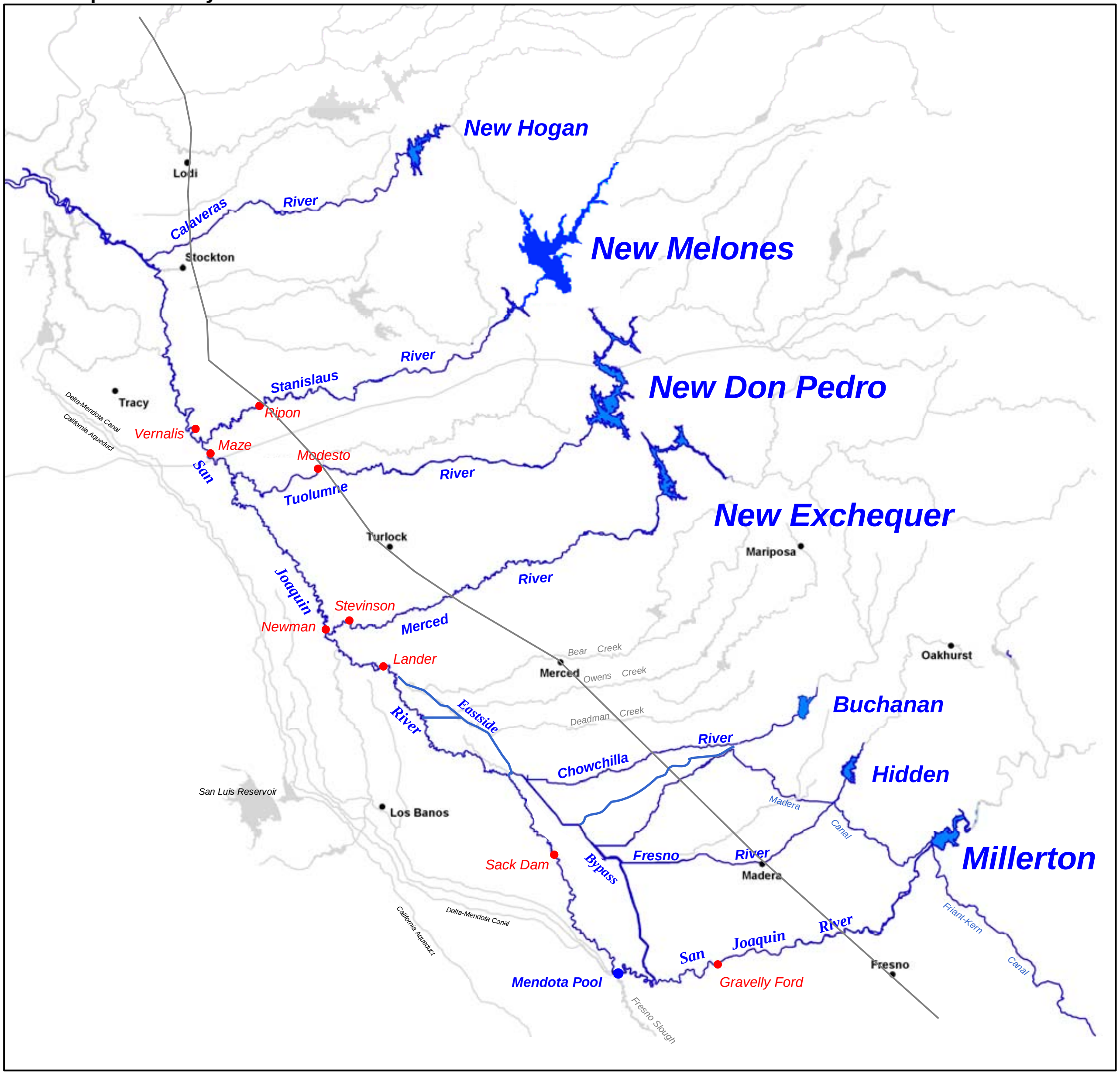

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Figure 2-2
Tuolumne River Flow below La Grange Dam

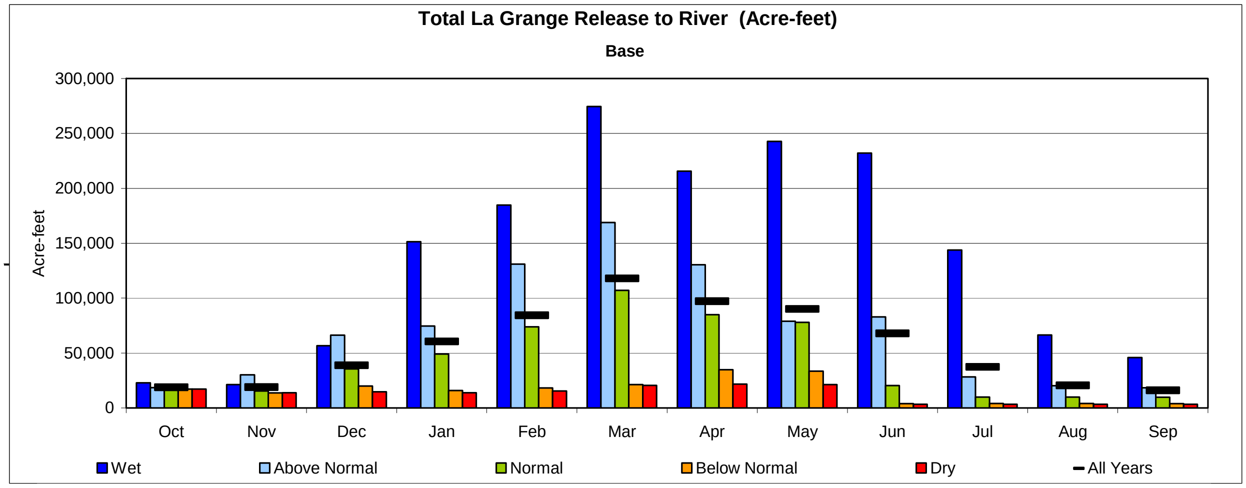


Figure 2-3
Tuolumne River Flow below La Grange Dam – WSIP Effect

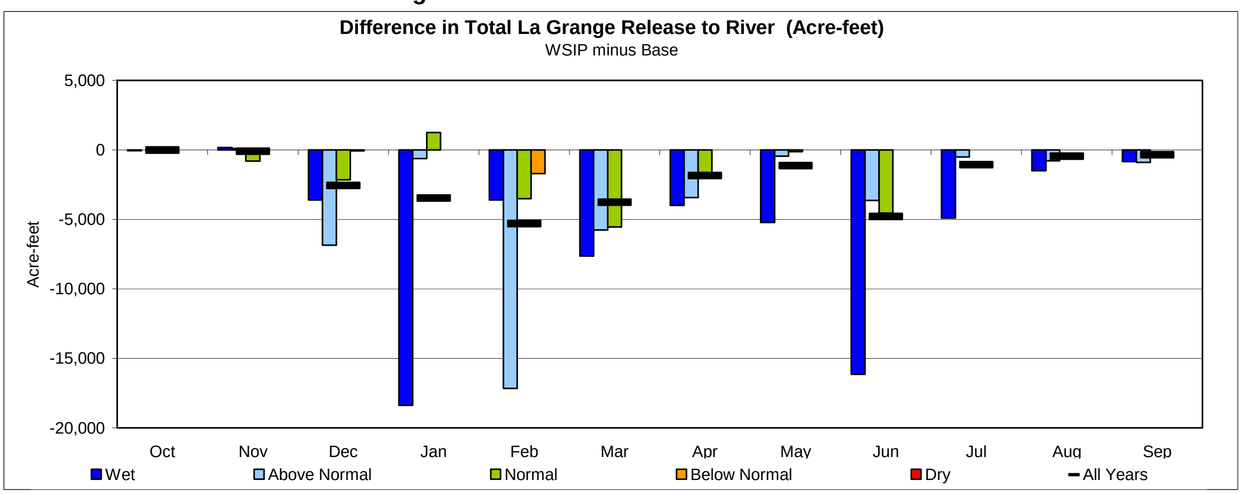
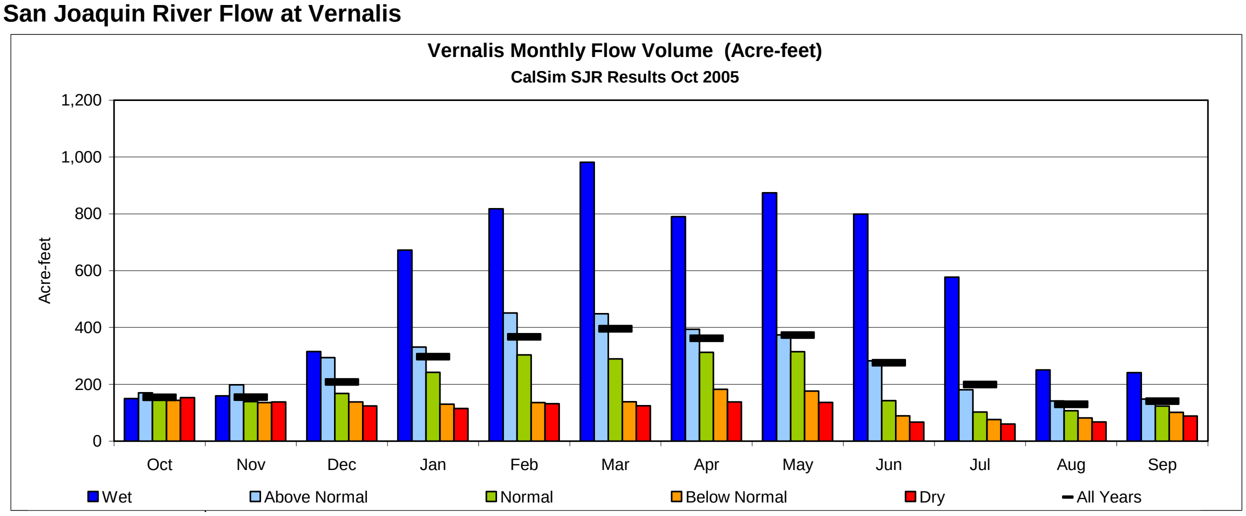


Figure 2-4
San Joaquin River Flow at Vernalis



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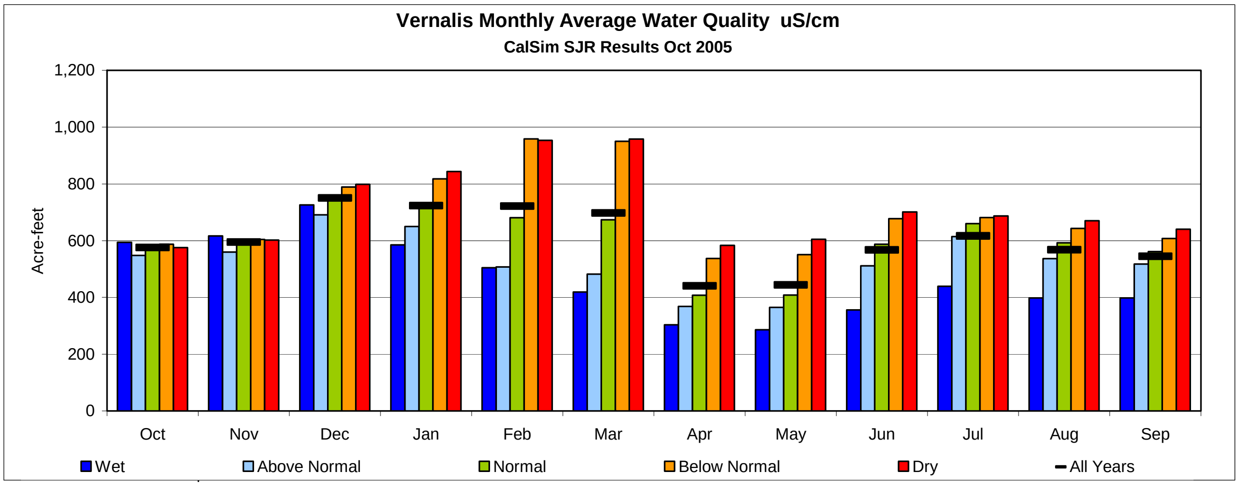
Water quality objectives at Vernalis are established as follows: for the irrigation season (April through August), a running 30-day average conductivity of 0.7 milliSiemens per centimeter (mS/cm); and during the rest of the year, 1.0 mS/cm. Flow requirements at Vernalis are established for the February through June period. Based on the wetness of the San Joaquin River Basin and the required location of a water quality parameter prescribed by Decision 1641 (called "X2"), the "base" required flow at Vernalis ranges between 710 cubic feet per second (cfs) and 3,420 cfs. During a 30-day period in April and May, the Vernalis Adaptive Management Plan (VAMP) flow objective ranges between 3,200 cfs and 7,000 cfs. The SWRCB has assigned the USBR the responsibility for compliance with the Vernalis flow standards, with other entities within the basin contributing towards compliance during the VAMP period through agreement. Water quality (electrical conductivity) at Vernalis is illustrated in Figure 2-5.

Figure 2-5
San Joaquin River Water Quality at Vernalis



The Delta forms the confluence of the Sacramento and San Joaquin Rivers, and is the eastern portion of the San Francisco Bay estuary. The CVP and the State Water Project (SWP) use the Delta channels to convey water to their respective export facilities in the southern Delta. Jones Pumping Plant (CVP) has a pumping capacity of 4,600 cfs; Banks Pumping Plant (SWP) has a pumping capacity of 10,300 cfs, although it is typically constrained to an average pumping capacity of 6,680 cfs. Figure 2-6 illustrates the geographical setting of the Delta.

Through coordinated operation, the CVP and SWP control releases from reservoirs and exports from the Delta to serve water supply contracts totaling several million acre-feet. The Coordinated Operating Agreement (COA) sets guidelines for sharing the supply as well as the responsibility for meeting water quality standards in the Delta. Currently, Delta water quality objectives are prescribed by the 1995 *Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary* through SWRCB Decision 1641.

In addition to SWRCB requirements, the operations of the CVP and SWP are also affected by the objectives of their various authorizations, requirements under the Endangered Species Act, and legal directives. Most recently, in December 2007 a federal court constrained the export operations of the CVP and SWP while a new federal biological opinion is developed for delta smelt. Additional CVP and SWP operational constraints may be developed for the protection of salmon.

To provide a context for comparing changes in Tuolumne River flow, Table 2-1 illustrates several parameters of historical measured flow within the Delta. For the recent period 1995 through 2006, the average annual total exports from the Delta have amounted to approximately 5,585,000 acre-feet, as computed outflow has been 24,189,000 acre-feet. Measured San Joaquin River flow at Vernalis for the same period, which includes flow from the Tuolumne River, has been an average annual of 4,075,000 acre-feet.

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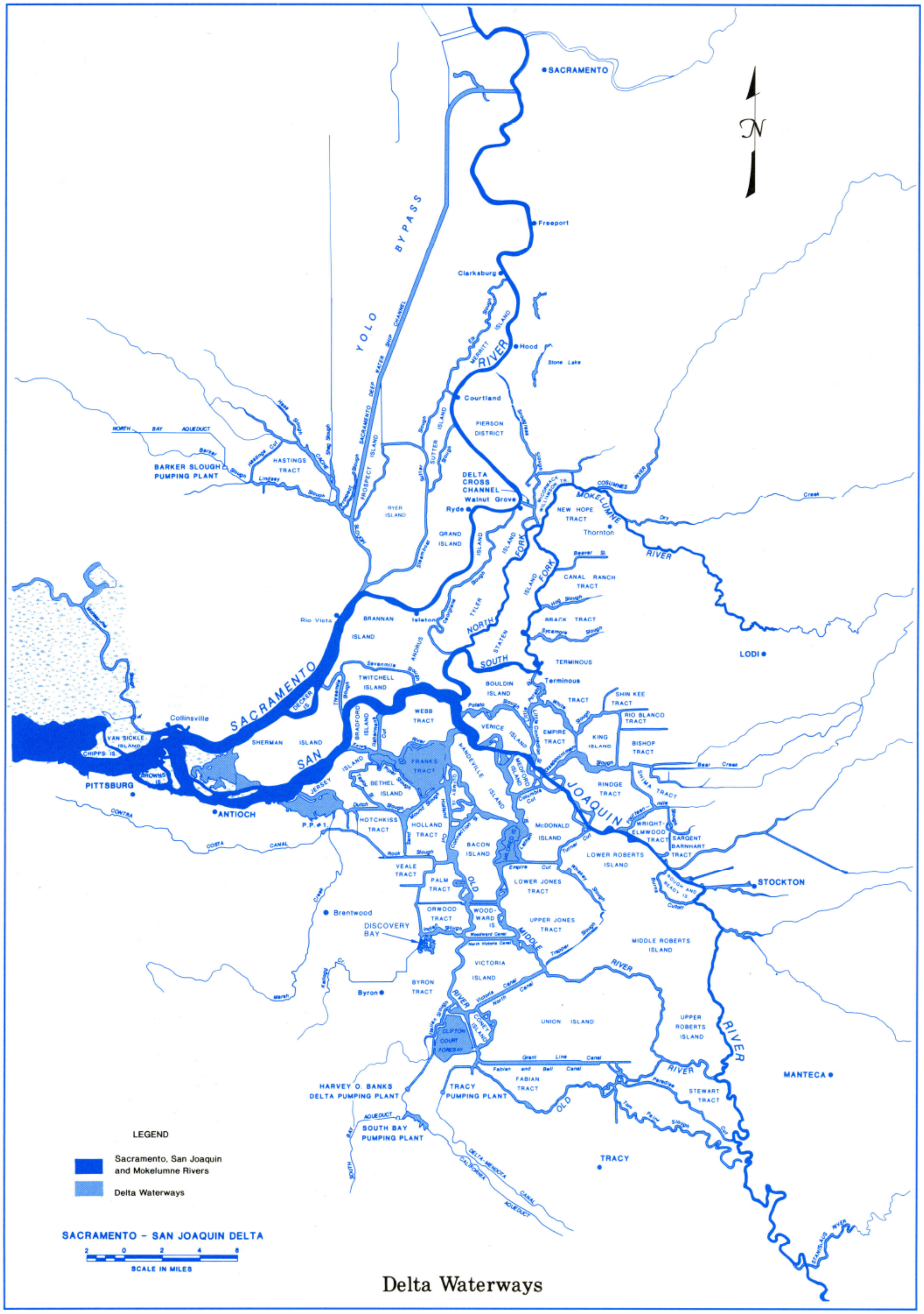
Figure 2-6
Sacramento-San Joaquin Delta



Sacramento–San Joaquin Delta Atlas *Department of Water Resources*

Table 2-1
Measured Historical Delta Flows

Water Year	Total Exports	Sacramento River Inflow	San Joaquin R Inflow	Delta Ouflow
1971	2,874,333	24,192,000	1,775,014	23,251,928
1972	3,495,757	12,548,000	1,108,825	9,226,357
1973	3,440,149	24,482,000	2,373,013	24,414,917
1974	4,408,835	38,233,000	2,769,796	37,459,002
1975	3,939,862	20,811,000	2,814,656	19,930,841
1976	4,942,896	11,035,000	1,527,879	6,596,232
1977	2,181,995	5,509,000	416,534	2,522,619
1978	4,402,769	20,480,000	4,478,832	21,349,263
1979	4,559,091	13,144,000	2,614,526	11,441,671
1980	4,607,462	25,629,000	5,954,154	28,155,761
1981	4,789,735	11,609,000	1,765,402	7,912,080
1982	4,677,208	37,221,000	5,474,326	40,945,458
1983	4,470,267	48,798,000	15,406,434	64,289,934
1984	3,938,610	27,327,000	6,284,455	30,635,544
1985	5,583,587	12,379,000	2,107,505	8,434,052
1986	5,411,704	28,061,000	5,227,289	29,671,290
1987	5,175,981	10,080,000	1,813,670	6,078,525
1988	5,736,575	9,829,000	1,165,644	4,417,524
1989	6,100,259	12,347,000	1,058,878	6,592,739
1990	5,929,312	9,903,000	915,614	3,933,160
1991	3,294,025	7,652,000	657,097	4,347,499
1992	3,021,048	8,142,000	696,216	5,178,236
1993	4,758,603	21,538,000	1,702,844	19,075,046
1994	4,113,456	11,409,741	1,219,740	6,010,543
1995	5,149,575	27,780,391	6,300,636	41,824,482
1996	5,338,588	25,991,516	3,922,419	25,511,023
1997	5,084,754	30,816,584	6,772,377	34,333,623
1998	4,749,955	38,011,421	8,490,664	43,506,339
1999	4,806,790	23,405,992	3,567,963	22,570,354
2000	6,285,299	21,321,316	2,845,985	18,175,727
2001	5,039,586	10,883,722	1,732,250	6,975,620
2002	5,499,327	13,812,201	1,395,751	9,190,646
2003	6,280,616	19,426,635	1,364,926	14,049,962
2004	6,093,213	20,250,761	1,373,096	14,922,390
2005	6,422,061	17,453,822	3,789,397	15,403,712
2006	6,271,595	41,073,358	7,339,862	43,806,137
2007	5,742,300	11,372,200	1,591,588	
Average	4,827,491	20,377,261	3,292,304	19,781,673

Source: Dayflow record, Interagency Ecological Progarm (http://www.iep.ca.gov/dayflow/)

Total Exports: Banks PP, Jones PP, Contra Costa Pumping

Sacramento River Inflow: Sacramento River and Yolo Byapss

San Joaquin R Inflow: San Joaquin River at Vernalis

Delta Outflow: Net computed outflow at Chipps Island

3. San Joaquin River

The effect of the WSIP on San Joaquin River hydrology is evaluated by a post-process analysis of operation simulations of the Tuolumne River system and the San Joaquin River Basin system. The Tuolumne River system, including the SFPUC regional water system and the Don Pedro Project, is modeled using the HH/LSM, as described in the PEIR. Results are provided from that model for the flow release to the lower Tuolumne River below La Grange Dam. Changes in those projected releases between the PEIR "base" study (current conditions without the WSIP) and a projected future condition (with the WSIP) provide the hydrologic data needed to track the WSIP's effects downstream of La Grange Dam. These projected changes in La Grange Dam releases to the Tuolumne River are combined with a separate San Joaquin River operation simulation to estimate the impacts of the WSIP on San Joaquin River hydrology and operations.

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CalSim II, a computer model developed jointly by the Department of Water Resources (DWR) and the USBR, is used to model the San Joaquin River Basin system and much of the Central Valley and Delta region water resources infrastructure system. Focused primarily on the operations of the CVP and SWP, CalSim II necessarily incorporates the simulated operations of non-CVP/SWP projects that exist on tributaries to the San Joaquin and Sacramento Rivers. Explicitly, the operation of the Don Pedro Project is modeled in CalSim II. Although the HH/LSM and CalSim II are different models, the underlying logic of Don Pedro Project operations for each of the models was developed coincidentally and produces very similar results.

A subset of the CalSim II model and its results are used for this analysis of San Joaquin River hydrology. Development of the CalSim II model during 2005 included a refinement of the depiction of San Joaquin River Basin operations and hydrology. For the development process, a stand-alone version of CalSim II focusing on San Joaquin River Basin operations was constructed. This version of the model uses a constant boundary condition for the geographical range of the system outside of the San Joaquin River Basin to speed up the processing of simulations. This approach to CalSim II modeling of the San Joaquin River Basin system is adequate for studies that focus on San Joaquin River operations, which are not greatly dependent on a broader CVP-SWP operation. The model's depiction of the San Joaquin River Basin's current operations and hydrology received a peer review (2005) and was described in a public workshop sponsored by the SWRCB during 2006. The CalSim II results used for that workshop are used for this analysis.[1]

3.1 Releases to the Tuolumne River at La Grange Dam

As described above, the effect of the WSIP on the Don Pedro Project would be to reduce inflow to Don Pedro Reservoir, which would lead to depletions in Don Pedro Reservoir storage. The depletion in reservoir storage would be replenished during wetter years when, absent the WSIP, releases below La Grange Dam would be in excess of FERC-required flows. Table 3.1-1 and Table 3.1-2 illustrate the projected monthly releases at La Grange Dam to the Tuolumne River for the WSIP and base settings for the 82-year simulation period (1921-2002). Table 3.1-3 illustrates the projected difference in releases at La Grange Dam due to the WSIP's effect on Don Pedro Project operations.[2] The average annual reduction in flow below La Grange Dam due to the WSIP would amount to approximately 25,000 afy, primarily during wetter years and during the winter or spring period depending on the coincidence of the WSIP's effect on inflow and the sequence of month-to-month and year-to-year hydrology. The projected difference in releases from La Grange Dam (comparing the WSIP and base settings), ranked in descending order of wetness in the San Joaquin River Basin runoff, is illustrated in Table 3.1-4. These changes in La Grange Dam releases to the lower Tuolumne River would change the flow in the Tuolumne River between La Grange Dam and the confluence with the San Joaquin River. The flow projected in the San Joaquin River between the Tuolumne River confluence and the Stanislaus River confluence would be similarly changed.

3.2 Flow Upstream of the Stanislaus River Confluence

The flow of the San Joaquin River upstream of the Stanislaus River confluence (commonly referred to as the "Maze" Boulevard crossing of the San Joaquin River) is a point of interest in the identification of San Joaquin River hydrology. The tributary operations upstream of the Stanislaus River confluence (e.g., the Tuolumne River and Merced River) are generally not required to be responsive to San Joaquin River conditions. Therefore, the changes in the hydrology of the San Joaquin River upstream of the Stanislaus River due to the WSIP can be described by the change in hydrology that occurs at La Grange Dam. Downstream of the Stanislaus River confluence, the San Joaquin River hydrology may also include the reactions of the USBR's New Melones Project (Stanislaus River) to changes in the river at Maze; that is, reactions to both flow and water quality conditions. Projected changes in San Joaquin River flow upstream of the Stanislaus River confluence at Maze are illustrated in Figure 3.2-1 through Figure 3.2-4.[2] The figures illustrate the wetness rank-ordered flow at Maze with the projected coincidental change in

[1] CalSim II studies supporting a presentation of the San Joaquin River Group Authority to the State Water Resources Control Board regarding CalSim II – San Joaquin River Basin Development, Refinements and Results, April 24, 2006. Notice and materials of workshop can be found at http://www.waterrights.ca.gov/baydelta/Notices.htm.

[2] La Grange Dam release results are from the HH/LSM. Maze and San Joaquin River results are from CalSim II.

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Table 3.1-1
Total La Grange Release to River (Acre-feet) – WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	12,744	10,711	11,068	11,068	33,964	231,996	111,640	64,123	14,876	15,372	15,372	14,876	547,810
1922	24,397	17,852	18,447	18,447	16,661	169,885	167,789	61,936	470,876	59,363	27,204	24,862	1,077,719
1923	24,397	17,852	52,816	101,025	90,321	34,926	156,958	61,936	14,876	15,372	15,372	14,876	600,727
1924	24,397	17,852	18,447	18,447	17,256	18,447	14,650	14,589	2,975	3,074	3,074	2,975	156,183
1925	7,736	8,926	9,223	9,223	8,331	9,223	73,158	69,584	4,463	4,612	4,612	4,463	213,554
1926	13,240	10,413	10,760	10,760	9,719	10,760	31,566	30,449	4,463	4,612	4,612	4,463	145,817
1927	9,223	8,926	9,223	9,223	8,331	9,223	64,241	61,936	14,876	15,372	15,372	14,876	240,822
1928	24,397	17,852	18,447	18,447	53,135	208,209	37,200	35,902	4,463	4,612	4,612	4,463	431,739
1929	12,744	10,711	11,068	11,068	9,997	11,068	26,770	25,952	2,975	3,074	3,074	2,975	131,476
1930	9,223	8,926	9,223	9,223	8,331	9,223	27,049	26,214	2,975	3,074	3,074	2,975	119,510
1931	9,223	8,926	9,223	9,223	8,331	9,223	14,650	14,589	2,975	3,074	3,074	2,975	95,486
1932	7,736	8,926	9,223	9,223	8,628	9,223	64,241	61,936	14,876	15,372	15,372	14,876	239,632
1933	24,397	17,852	18,447	18,447	16,661	18,447	35,753	34,374	4,463	4,612	4,612	4,463	202,528
1934	9,223	8,926	9,223	9,223	8,331	9,223	14,650	14,589	2,975	3,074	3,074	2,975	95,486
1935	7,736	8,926	9,223	9,223	8,331	9,223	64,241	61,936	14,876	15,372	15,372	14,876	239,335
1936	24,397	17,852	18,447	18,447	54,167	204,086	168,811	61,936	14,876	15,372	15,372	14,876	628,639
1937	24,397	17,852	18,447	18,447	194,659	260,123	177,081	61,936	14,876	15,372	15,372	14,876	833,438
1938	24,397	17,852	88,717	79,596	381,104	454,579	291,007	288,864	227,401	156,701	48,636	34,811	2,093,665
1939	24,397	17,852	18,447	18,447	45,240	66,009	28,525	27,598	4,463	4,612	4,612	4,463	264,665
1940	9,223	8,926	9,223	9,223	8,628	196,482	163,672	61,936	14,876	15,372	15,372	14,876	527,809
1941	24,397	17,852	18,447	59,195	262,128	284,760	249,836	61,936	49,928	88,796	26,488	21,347	1,165,110
1942	24,397	17,852	41,845	150,525	153,324	148,197	218,453	228,994	91,485	115,177	26,854	17,017	1,234,120
1943	24,397	17,852	32,826	197,464	149,252	336,578	194,801	61,936	72,671	15,372	17,014	17,597	1,137,760
1944	24,397	17,852	18,447	18,447	17,256	55,093	47,894	45,898	4,463	4,612	4,612	4,463	263,434
1945	13,240	10,413	10,760	10,760	86,052	215,383	119,005	61,936	14,876	15,372	15,372	14,876	588,045
1946	24,397	25,160	229,316	136,983	150,231	166,940	68,500	61,936	14,876	15,372	15,372	14,876	923,959
1947	24,397	17,852	18,447	18,447	16,661	18,447	28,054	27,156	4,463	4,612	4,612	4,463	187,611
1948	9,223	8,926	9,223	9,223	8,628	9,223	39,947	38,477	4,463	4,612	4,612	4,463	151,020
1949	12,744	10,711	11,068	11,068	9,997	11,068	33,037	31,999	4,463	4,612	4,612	4,463	149,842
1950	12,744	10,711	11,068	11,068	9,997	11,068	61,680	58,823	4,463	4,612	4,612	4,463	205,309
1951	13,240	10,413	227,649	225,258	195,815	153,328	104,899	99,341	4,463	4,612	4,612	4,463	1,048,093
1952	13,240	10,413	10,760	10,760	56,975	213,745	258,495	264,611	230,309	162,673	38,667	32,093	1,302,741
1953	24,397	17,852	18,447	27,845	60,046	18,447	87,632	83,153	4,463	4,612	4,612	4,463	355,969
1954	13,240	10,413	10,760	10,760	9,719	10,760	41,422	39,831	4,463	4,612	4,612	4,463	165,055
1955	13,240	10,413	10,760	10,760	9,719	10,760	31,555	30,438	4,463	4,612	4,612	4,463	145,795
1956	9,223	8,926	9,223	397,642	218,902	177,380	103,683	61,936	153,608	108,969	29,023	30,608	1,309,123
1957	24,397	17,852	18,447	18,447	16,661	25,078	85,025	80,709	4,463	4,612	4,612	4,463	304,766
1958	13,240	10,413	10,760	10,760	9,719	173,384	311,309	268,728	276,764	96,627	36,329	32,935	1,250,968
1959	24,397	17,852	18,447	18,447	32,284	59,822	28,824	27,878	4,463	4,612	4,612	4,463	246,101
1960	9,223	8,926	9,223	9,223	8,628	9,223	24,895	24,194	2,975	3,074	3,074	2,975	115,633
1961	7,736	8,926	9,223	9,223	8,331	9,223	14,650	14,589	2,975	3,074	3,074	2,975	93,999
1962	7,736	8,926	9,223	9,223	8,331	9,223	94,959	90,022	4,463	4,612	4,612	4,463	255,793
1963	13,240	10,413	10,760	10,760	9,719	10,760	64,241	61,936	14,876	15,372	15,372	14,876	252,325
1964	24,397	17,852	18,447	18,447	17,256	18,447	28,168	27,263	4,463	4,612	4,612	4,463	188,427
1965	9,223	8,926	9,223	94,896	193,710	157,615	159,589	61,936	14,876	15,372	32,886	32,779	791,031
1966	24,397	22,517	119,607	51,266	82,677	61,610	32,240	31,252	4,463	4,612	4,612	4,463	443,716
1967	12,744	10,711	11,068	11,068	9,997	84,982	252,040	220,298	388,802	257,232	131,931	28,007	1,418,880
1968	24,397	17,852	18,447	18,447	17,256	32,584	28,988	28,031	4,463	4,612	4,612	4,463	204,152
1969	9,223	8,926	9,223	32,847	276,920	244,541	322,211	447,942	425,936	156,634	66,306	35,885	2,036,594
1970	24,397	17,852	73,665	370,017	136,129	162,608	64,241	61,936	14,876	15,372	15,372	14,876	971,341
1971	24,397	17,852	18,447	18,447	16,661	70,249	66,522	63,363	4,463	4,612	4,612	4,463	314,088
1972	13,240	10,413	10,760	10,760	10,066	10,760	30,579	29,524	2,975	3,074	3,074	2,975	138,200
1973	9,223	8,926	9,223	9,223	8,331	9,223	64,241	61,936	35,698	15,372	15,372	14,876	261,644
1974	24,397	42,215	100,199	144,039	84,226	200,904	125,080	61,936	182,580	15,372	23,592	26,455	1,030,995
1975	24,397	17,852	18,447	18,447	112,415	201,425	100,944	61,936	174,642	21,358	50,309	29,597	831,769
1976	35,185	23,322	33,098	18,447	17,256	18,447	20,660	20,224	2,975	3,074	3,074	2,975	198,737
1977	7,736	8,926	9,223	9,223	8,331	9,223	14,650	14,589	2,975	3,074	3,074	2,975	93,999
1978	7,736	8,926	9,223	9,223	8,331	9,223	64,241	61,936	71,448	15,372	15,372	14,876	295,907
1979	24,397	17,852	18,447	25,892	150,953	195,605	90,635	338,861	14,876	15,372	15,372	14,876	923,138
1980	24,397	17,852	18,447	183,143	376,597	204,132	110,674	105,463	278,671	152,585	41,442	36,580	1,549,983
1981	24,397	17,852	18,447	18,447	16,661	22,926	29,256	28,454	4,463	4,612	4,612	4,463	194,590
1982	12,744	10,711	11,068	32,535	338,147	314,765	511,142	350,499	260,216	155,711	59,424	132,689	2,189,651
1983	155,278	142,160	252,175	268,145	324,750	929,999	277,685	441,769	223,430	236,135	186,588	171,850	3,609,964
1984	24,397	262,407	413,016	228,905	204,697	159,934	64,241	61,936	14,876	15,372	15,372	14,876	1,480,029
1985	24,397	17,852	18,447	18,447	16,661	18,447	34,634	33,325	4,463	4,612	4,612	4,463	200,360
1986	9,223	8,926	9,223	9,223	156,378	441,405	148,505	177,029	197,577	15,372	15,372	17,744	1,205,977
1987	24,397	17,852	18,447	18,447	16,661	18,447	25,003	24,296	2,975	3,074	3,074	2,975	175,648
1988	7,736	8,926	9,223	9,223	8,628	9,223	19,297	18,947	2,975	3,074	3,074	2,975	103,301
1989	7,736	8,926	9,223	9,223	8,331	9,223	26,519	25,717	2,975	3,074	3,074	2,975	116,996
1990	7,736	8,926	9,223	9,223	8,331	9,223	19,866	19,480	2,975	3,074	3,074	2,975	104,106
1991	7,736	8,926	9,223	9,223	8,331	9,223	26,397	25,603	2,975	3,074	3,074	2,975	116,760
1992	7,736	8,926	9,223	9,223	8,628	9,223	20,501	20,075	2,975	3,074	3,074	2,975	105,633
1993	7,736	8,926	9,223	9,223	8,331	9,223	64,241	61,936	14,876	15,372	15,372	23,914	248,373
1994	24,397	17,852	18,447	18,447	16,661	18,447	26,774	25,956	2,975	3,074	3,074	2,975	179,079
1995	9,223	8,926	9,223	9,223	8,331	444,650	252,480	587,468	266,389	378,373	180,518	51,840	2,206,644
1996	24,397	17,852	18,447	18,447	282,350	273,866	138,689	137,214	166,467	15,372	15,372	21,277	1,129,750
1997	24,397	42,957	363,466	949,830	195,855	141,961	64,241	61,936	14,876	15,372	15,372	14,876	1,905,139
1998	24,397	17,852	18,447	18,548	334,719	269,674	194,691	338,154	410,419	282,802	127,440	28,820	2,065,963
1999	24,397	17,852	43,763	118,488	288,111	189,381	85,028	61,936	14,876	15,372	15,372	14,876	889,452
2000	24,397	17,852	18,447	18,447	187,912	217,038	100,903	61,936	92,171	15,372	15,372	14,876	784,723
2001	24,397	17,852	18,447	18,447	16,661	58,155	28,763	27,821	4,463	4,612	4,612	4,463	228,693
2002	9,223	8,926	9,223	9,223	8,331	9,223	32,775	31,582	4,463	4,612	4,612	4,463	136,656
Avg (21-02)	18,815	18,888	36,241	57,087	79,135	114,179	95,290	88,906	63,139	36,354	20,200	15,774	644,009
Max (21-02)	155,278	262,407	413,016	949,830	381,104	929,999	511,142	587,468	470,876	378,373	186,588	171,850	3,609,964
Min (21-02)	7,736	8,926	9,223	9,223	8,331	9,223	14,650	14,589	2,975	3,074	3,074	2,975	93,999

APPENDIX O4

Table 3.1-2
Total La Grange Release to River (Acre-feet) – Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	12,744	10,711	11,068	11,068	33,964	245,398	114,894	64,123	14,876	15,372	15,372	14,876	564,466
1922	24,397	17,852	18,447	18,447	21,795	177,197	175,154	61,936	486,912	61,546	27,209	24,862	1,115,754
1923	24,397	17,852	52,816	101,025	90,321	34,926	159,076	61,936	14,876	15,372	15,372	14,876	602,845
1924	24,397	17,852	18,447	18,447	17,256	18,447	14,650	14,589	2,975	3,074	3,074	2,975	156,183
1925	7,736	8,926	9,223	9,223	8,331	9,223	73,158	69,584	4,463	4,612	4,612	4,463	213,554
1926	13,240	10,413	10,760	10,760	9,719	10,760	31,566	30,449	4,463	4,612	4,612	4,463	145,817
1927	9,223	8,926	9,223	9,223	8,331	9,223	64,241	61,936	41,783	15,372	24,317	28,032	289,830
1928	24,397	38,122	52,916	21,575	67,986	208,208	46,105	35,902	4,463	4,612	4,612	4,463	513,361
1929	12,744	10,711	11,068	11,068	9,997	11,068	26,770	25,952	2,975	3,074	3,074	2,975	131,476
1930	9,223	8,926	9,223	9,223	8,331	9,223	27,049	26,214	2,975	3,074	3,074	2,975	119,510
1931	9,223	8,926	9,223	9,223	8,331	9,223	14,650	14,589	2,975	3,074	3,074	2,975	95,486
1932	7,736	8,926	9,223	9,223	8,628	9,223	64,241	61,936	14,876	15,372	15,372	14,876	239,632
1933	24,397	17,852	18,447	18,447	16,661	18,447	35,753	34,374	4,463	4,612	4,612	4,463	202,528
1934	9,223	8,926	9,223	9,223	8,331	9,223	14,650	14,589	2,975	3,074	3,074	2,975	95,486
1935	7,736	8,926	9,223	9,223	8,331	9,223	64,241	61,936	14,876	15,372	15,372	14,876	239,335
1936	24,397	17,852	18,447	18,447	301,206	220,976	172,446	61,936	14,876	15,372	15,372	14,876	896,203
1937	24,397	17,852	18,447	18,447	210,859	263,318	185,594	61,936	14,876	15,372	15,372	14,876	861,346
1938	24,397	17,852	108,307	79,596	381,104	454,618	298,150	305,878	232,281	156,701	50,809	34,816	2,144,509
1939	24,397	17,852	18,447	18,447	45,240	66,009	28,525	27,598	4,463	4,612	4,612	4,463	264,665
1940	9,223	8,926	9,223	9,223	8,628	234,677	169,350	61,936	14,876	15,372	15,372	14,876	571,682
1941	24,397	17,852	18,447	55,884	262,574	285,182	250,355	61,936	53,464	90,980	26,493	21,347	1,168,911
1942	24,397	17,852	41,845	156,067	153,323	150,861	223,977	231,848	94,247	117,365	26,854	17,017	1,255,653
1943	24,397	17,852	32,826	197,464	149,252	338,579	201,522	61,936	76,970	15,372	19,188	17,602	1,152,960
1944	24,397	17,852	18,447	18,447	17,256	55,093	47,894	45,898	4,463	4,612	4,612	4,463	263,434
1945	13,240	10,413	10,760	10,760	123,508	230,698	119,207	61,936	14,876	15,372	15,372	14,876	641,018
1946	24,397	17,852	229,210	136,983	150,231	179,148	72,112	61,936	14,876	15,372	15,372	14,876	932,365
1947	24,397	17,852	18,447	18,447	16,661	18,447	28,054	27,156	4,463	4,612	4,612	4,463	187,611
1948	9,223	8,926	9,223	9,223	8,628	9,223	39,947	38,477	4,463	4,612	4,612	4,463	151,020
1949	12,744	10,711	11,068	11,068	9,997	11,068	33,037	31,999	4,463	4,612	4,612	4,463	149,842
1950	12,744	10,711	11,068	11,068	9,997	11,068	61,680	58,823	4,463	4,612	4,612	4,463	205,309
1951	13,240	10,413	344,203	225,255	195,815	153,328	104,899	99,341	4,463	4,612	4,612	4,463	1,164,644
1952	13,240	10,413	10,760	10,760	78,332	213,745	258,495	280,490	232,426	162,673	40,841	32,097	1,344,272
1953	24,397	17,852	18,447	27,845	60,046	18,447	87,632	83,153	4,463	4,612	4,612	4,463	355,969
1954	13,240	10,413	10,760	10,760	9,719	10,760	41,422	39,831	4,463	4,612	4,612	4,463	165,055
1955	13,240	10,413	10,760	10,760	9,719	10,760	31,555	30,438	4,463	4,612	4,612	4,463	145,795
1956	9,223	8,926	46,291	436,178	218,897	180,935	106,751	61,936	162,942	111,157	29,023	30,608	1,402,867
1957	24,397	17,852	18,447	18,447	16,661	25,078	85,025	80,709	4,463	4,612	4,612	4,463	304,766
1958	13,240	10,413	10,760	10,760	9,719	211,842	311,309	280,218	277,777	98,815	36,329	32,935	1,304,117
1959	24,397	17,852	18,447	18,447	32,284	59,822	28,824	27,878	4,463	4,612	4,612	4,463	246,101
1960	9,223	8,926	9,223	9,223	8,628	9,223	24,895	24,194	2,975	3,074	3,074	2,975	115,633
1961	7,736	8,926	9,223	9,223	8,331	9,223	14,650	14,589	2,975	3,074	3,074	2,975	93,999
1962	7,736	8,926	9,223	9,223	8,331	9,223	94,959	90,022	4,463	4,612	4,612	4,463	255,793
1963	13,240	10,413	10,760	10,760	9,719	10,760	64,241	61,936	14,876	15,372	15,372	14,876	252,325
1964	24,397	17,852	18,447	18,447	29,030	18,447	28,168	27,263	4,463	4,612	4,612	4,463	200,201
1965	9,223	8,926	9,223	280,632	198,842	168,325	169,358	61,936	14,876	15,372	21,883	32,755	991,351
1966	24,397	22,516	120,759	51,266	99,846	61,610	32,240	31,252	4,463	4,612	4,612	4,463	462,036
1967	12,744	10,711	11,068	11,068	9,997	103,480	252,040	232,725	388,802	259,420	134,115	28,012	1,454,182
1968	24,397	17,852	18,447	18,447	17,256	32,584	28,988	28,031	4,463	4,612	4,612	4,463	204,152
1969	9,223	8,926	9,223	58,091	279,368	255,378	329,852	450,130	428,053	156,634	68,480	35,889	2,089,247
1970	24,397	17,852	73,665	343,421	142,086	183,682	64,241	61,936	14,876	15,372	15,372	14,876	971,776
1971	24,397	17,852	18,447	18,447	16,661	85,781	66,522	63,363	4,463	4,612	4,612	4,463	329,620
1972	13,240	10,413	10,760	10,760	10,066	10,760	30,579	29,524	2,975	3,074	3,074	2,975	138,200
1973	9,223	8,926	9,223	9,223	8,331	16,427	64,861	61,936	96,088	15,372	15,372	14,876	329,858
1974	24,397	42,215	100,199	152,431	84,225	211,369	129,683	61,936	192,487	15,372	25,766	26,460	1,066,540
1975	24,397	17,852	18,447	18,447	112,415	201,425	109,230	61,936	168,121	23,541	50,313	29,597	835,721
1976	35,185	23,322	33,098	18,447	17,256	18,447	20,660	20,224	2,975	3,074	3,074	2,975	198,737
1977	7,736	8,926	9,223	9,223	8,331	9,223	14,650	14,589	2,975	3,074	3,074	2,975	93,999
1978	7,736	8,926	9,223	9,223	8,331	9,223	64,241	61,936	160,931	15,372	15,372	14,876	385,390
1979	24,397	17,852	18,447	29,457	150,953	211,824	92,753	341,049	14,876	15,372	15,372	14,876	947,228
1980	24,397	17,852	18,447	175,502	376,598	211,743	115,553	107,651	280,789	154,773	41,442	36,580	1,561,327
1981	24,397	17,852	18,447	18,447	16,661	22,926	29,256	28,454	4,463	4,612	4,612	4,463	194,590
1982	12,744	10,711	11,068	59,750	349,698	314,765	511,142	352,402	262,057	155,711	63,782	134,816	2,238,646
1983	156,324	139,398	253,127	268,146	324,750	929,999	277,685	451,311	228,033	238,323	186,588	174,030	3,627,714
1984	24,397	260,868	413,016	228,905	204,697	155,998	64,241	61,936	14,876	15,372	15,372	14,876	1,474,554
1985	24,397	17,852	18,447	18,447	16,661	18,447	34,634	33,325	4,463	4,612	4,612	4,463	200,360
1986	9,223	8,926	9,223	9,223	173,491	461,532	159,805	182,071	202,457	15,372	15,372	19,911	1,266,606
1987	24,397	17,852	18,447	18,447	16,661	18,447	25,003	24,296	2,975	3,074	3,074	2,975	175,648
1988	7,736	8,926	9,223	9,223	8,628	9,223	19,297	18,947	2,975	3,074	3,074	2,975	103,301
1989	7,736	8,926	9,223	9,223	8,331	9,223	26,519	25,717	2,975	3,074	3,074	2,975	116,996
1990	7,736	8,926	9,223	9,223	8,331	9,223	19,866	19,480	2,975	3,074	3,074	2,975	104,106
1991	7,736	8,926	9,223	9,223	8,331	9,223	26,397	25,603	2,975	3,074	3,074	2,975	116,760
1992	7,736	8,926	9,223	9,223	8,628	9,223	20,501	20,075	2,975	3,074	3,074	2,975	105,633
1993	7,736	8,926	9,223	9,223	8,331	9,223	64,241	61,936	145,263	78,663	37,258	28,803	468,826
1994	24,397	17,852	18,447	18,447	16,661	18,447	26,774	25,956	2,975	3,074	3,074	2,975	179,079
1995	9,223	8,926	9,223	9,223	8,331	453,913	261,686	589,371	268,231	380,561	180,518	54,017	2,233,223
1996	24,397	17,852	18,447	18,447	284,044	273,866	143,569	142,256	171,347	15,372	15,372	23,444	1,148,413
1997	24,397	42,960	363,466	956,038	195,854	141,961	64,241	61,936	14,876	15,372	15,372	14,876	1,911,349
1998	24,397	17,852	18,447	37,270	334,716	272,793	205,739	342,054	414,193	284,990	127,440	28,820	2,108,711
1999	24,397	17,852	43,763	118,488	288,111	197,943	96,010	61,936	14,876	15,372	15,372	14,876	908,996
2000	24,397	17,852	18,447	18,447	207,006	217,038	100,903	61,936	104,647	15,372	15,372	14,876	816,293
2001	24,397	17,852	18,447	18,447	16,661	58,155	28,763	27,821	4,463	4,612	4,612	4,463	228,693
2002	9,223	8,926	9,223	9,223	8,331	9,223	32,775	31,582	4,463	4,612	4,612	4,463	136,656
Avg (21-02)	18,828	18,994	38,798	60,559	84,433	117,947	97,139	90,047	67,933	37,419	20,654	16,126	668,876
Max (21-02)	156,324	260,868	413,016	956,038	381,104	929,999	511,142	589,371	486,912	380,561	186,588	174,030	3,627,714
Min (21-02)	7,736	8,926	9,223	9,223	8,331	9,223	14,650	14,589	2,975	3,074	3,074	2,975	93,999

APPENDIX O4

Table 3.1-3
Total La Grange Release to River (Acre-feet) – Difference WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	-13,402	-3,254	0	0	0	0	0	-16,656
1922	0	0	0	0	-5,134	-7,312	-7,365	0	-16,036	-2,183	-5	0	-38,035
1923	0	0	0	0	0	0	-2,118	0	0	0	0	0	-2,118
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	-26,907	0	-8,945	-13,156	-49,008
1928	0	-20,270	-34,469	-3,128	-14,851	1	-8,905	0	0	0	0	0	-81,622
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	-247,039	-16,890	-3,635	0	0	0	0	0	-267,564
1937	0	0	0	0	-16,200	-3,195	-8,513	0	0	0	0	0	-27,908
1938	0	0	-19,590	0	0	-39	-7,143	-17,014	-4,880	0	-2,173	-5	-50,844
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	0	-38,195	-5,678	0	0	0	0	0	-43,873
1941	0	0	0	3,311	-446	-422	-519	0	-3,536	-2,184	-5	0	-3,801
1942	0	0	0	-5,542	1	-2,664	-5,524	-2,854	-2,762	-2,188	0	0	-21,533
1943	0	0	0	0	0	-2,001	-6,721	0	-4,299	0	-2,174	-5	-15,200
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	-37,456	-15,315	-202	0	0	0	0	0	-52,973
1946	0	7,308	106	0	0	-12,208	-3,612	0	0	0	0	0	-8,406
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	-116,554	3	0	0	0	0	0	0	0	0	-116,551
1952	0	0	0	0	-21,357	0	0	-15,879	-2,117	0	-2,174	-4	-41,531
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	-37,068	-38,536	5	-3,555	-3,068	0	-9,334	-2,188	0	0	-93,744
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	-38,458	0	-11,490	-1,013	-2,188	0	0	-53,149
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	-11,774	0	0	0	0	0	0	0	-11,774
1965	0	0	0	-185,736	-5,132	-10,710	-9,769	0	0	0	11,003	24	-200,320
1966	0	1	-1,152	0	-17,169	0	0	0	0	0	0	0	-18,320
1967	0	0	0	0	0	-18,498	0	-12,427	0	-2,188	-2,184	-5	-35,302
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	-25,244	-2,448	-10,837	-7,641	-2,188	-2,117	0	-2,174	-4	-52,653
1970	0	0	0	26,596	-5,957	-21,074	0	0	0	0	0	0	-435
1971	0	0	0	0	0	-15,532	0	0	0	0	0	0	-15,532
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	-7,204	-620	0	-60,390	0	0	0	-68,214
1974	0	0	0	-8,392	1	-10,465	-4,603	0	-9,907	0	-2,174	-5	-35,545
1975	0	0	0	0	0	0	-8,286	0	6,521	-2,183	-4	0	-3,952
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	-89,483	0	0	0	-89,483
1979	0	0	0	-3,565	0	-16,219	-2,118	-2,188	0	0	0	0	-24,090
1980	0	0	0	7,641	-1	-7,611	-4,879	-2,188	-2,118	-2,188	0	0	-11,344
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	-27,215	-11,551	0	0	-1,903	-1,841	0	-4,358	-2,127	-48,995
1983	-1,046	2,762	-952	-1	0	0	0	-9,542	-4,603	-2,188	0	-2,180	-17,750
1984	0	1,539	0	0	0	3,936	0	0	0	0	0	0	5,475
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	-17,113	-20,127	-11,300	-5,042	-4,880	0	0	-2,167	-60,629
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	-130,387	-63,291	-21,886	-4,889	-220,453
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	-9,263	-9,206	-1,903	-1,842	-2,188	0	-2,177	-26,579
1996	0	0	0	0	-1,694	0	-4,880	-5,042	-4,880	0	0	-2,167	-18,663
1997	0	-3	0	-6,208	1	0	0	0	0	0	0	0	-6,210
1998	0	0	0	-18,722	3	-3,119	-11,048	-3,900	-3,774	-2,188	0	0	-42,748
1999	0	0	0	0	0	-8,562	-10,982	0	0	0	0	0	-19,544
2000	0	0	0	0	-19,094	0	0	0	-12,476	0	0	0	-31,570
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	-13	-106	-2,557	-3,472	-5,298	-3,768	-1,849	-1,141	-4,793	-1,065	-454	-352	-24,868
Max (21-02)	0	7,308	106	26,596	5	3,936	0	0	6,521	0	11,003	24	5,475
Min (21-02)	-1,046	-20,270	-116,554	-185,736	-247,039	-38,458	-11,300	-17,014	-130,387	-63,291	-21,886	-13,156	-267,564

APPENDIX O4

Table 3.1-4
Total La Grange Release to River (Acre-feet) – Difference WSIP minus Base

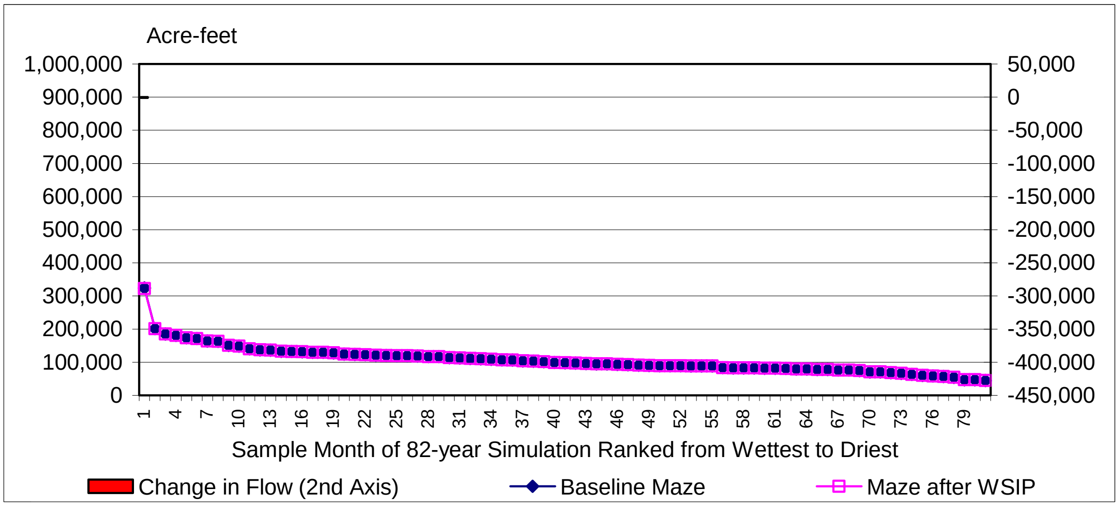
Matrix Data for Water Year 1921-2002 Rank Ordered by Descending SJR Index

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1983	-1,046	2,762	-952	-1	0	0	0	-9,542	-4,603	-2,188	0	-2,180	-17,750
1969	0	0	0	-25,244	-2,448	-10,837	-7,641	-2,188	-2,117	0	-2,174	-4	-52,653
1995	0	0	0	0	0	-9,263	-9,206	-1,903	-1,842	-2,188	0	-2,177	-26,579
1938	0	0	-19,590	0	0	-39	-7,143	-17,014	-4,880	0	-2,173	-5	-50,844
1998	0	0	0	-18,722	3	-3,119	-11,048	-3,900	-3,774	-2,188	0	0	-42,748
1982	0	0	0	-27,215	-11,551	0	0	-1,903	-1,841	0	-4,358	-2,127	-48,995
1967	0	0	0	0	0	-18,498	0	-12,427	0	-2,188	-2,184	-5	-35,302
1952	0	0	0	0	-21,357	0	0	-15,879	-2,117	0	-2,174	-4	-41,531
1958	0	0	0	0	0	-38,458	0	-11,490	-1,013	-2,188	0	0	-53,149
1980	0	0	0	7,641	-1	-7,611	-4,879	-2,188	-2,118	-2,188	0	0	-11,344
1978	0	0	0	0	0	0	0	0	-89,483	0	0	0	-89,483
1922	0	0	0	0	-5,134	-7,312	-7,365	0	-16,036	-2,183	-5	0	-38,035
1956	0	0	-37,068	-38,536	5	-3,555	-3,068	0	-9,334	-2,188	0	0	-93,744
1942	0	0	0	-5,542	1	-2,664	-5,524	-2,854	-2,762	-2,188	0	0	-21,533
1941	0	0	0	3,311	-446	-422	-519	0	-3,536	-2,184	-5	0	-3,801
1986	0	0	0	0	-17,113	-20,127	-11,300	-5,042	-4,880	0	0	-2,167	-60,629
1993	0	0	0	0	0	0	0	0	-130,387	-63,291	-21,886	-4,889	-220,453
1997	0	-3	0	-6,208	1	0	0	0	0	0	0	0	-6,210
1996	0	0	0	0	-1,694	0	-4,880	-5,042	-4,880	0	0	-2,167	-18,663
1943	0	0	0	0	0	-2,001	-6,721	0	-4,299	0	-2,174	-5	-15,200
1937	0	0	0	0	-16,200	-3,195	-8,513	0	0	0	0	0	-27,908
1974	0	0	0	-8,392	1	-10,465	-4,603	0	-9,907	0	-2,174	-5	-35,545
1975	0	0	0	0	0	0	-8,286	0	6,521	-2,183	-4	0	-3,952
1965	0	0	0	-185,736	-5,132	-10,710	-9,769	0	0	0	11,003	24	-200,320
1936	0	0	0	0	-247,039	-16,890	-3,635	0	0	0	0	0	-267,564
1984	0	1,539	0	0	0	3,936	0	0	0	0	0	0	5,475
1979	0	0	0	-3,565	0	-16,219	-2,118	-2,188	0	0	0	0	-24,090
1945	0	0	0	0	-37,456	-15,315	-202	0	0	0	0	0	-52,973
1999	0	0	0	0	0	-8,562	-10,982	0	0	0	0	0	-19,544
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	-26,907	0	-8,945	-13,156	-49,008
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1946	0	7,308	106	0	0	-12,208	-3,612	0	0	0	0	0	-8,406
1973	0	0	0	0	0	-7,204	-620	0	-60,390	0	0	0	-68,214
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	-19,094	0	0	0	-12,476	0	0	0	-31,570
1940	0	0	0	0	0	-38,195	-5,678	0	0	0	0	0	-43,873
1923	0	0	0	0	0	0	-2,118	0	0	0	0	0	-2,118
1921	0	0	0	0	0	-13,402	-3,254	0	0	0	0	0	-16,656
1970	0	0	0	26,596	-5,957	-21,074	0	0	0	0	0	0	-435
1951	0	0	-116,554	3	0	0	0	0	0	0	0	0	-116,551
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	-15,532	0	0	0	0	0	0	-15,532
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1928	0	-20,270	-34,469	-3,128	-14,851	1	-8,905	0	0	0	0	0	-81,622
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	1	-1,152	0	-17,169	0	0	0	0	0	0	0	-18,320
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	-11,774	0	0	0	0	0	0	0	-11,774
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0

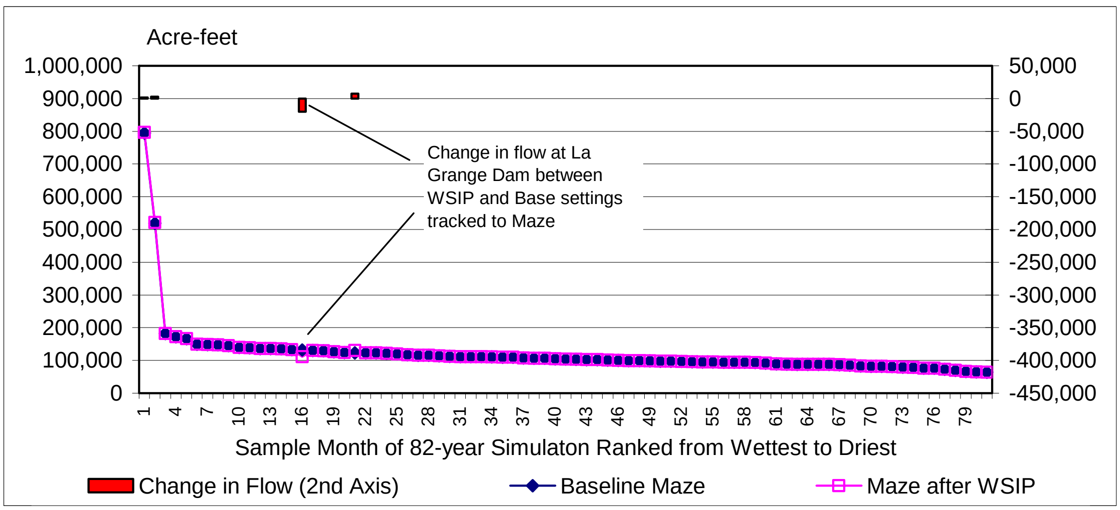
APPENDIX O4

Figure 3.2-1
San Joaquin River Flow Upstream of Stanislaus River Confluence – October through December

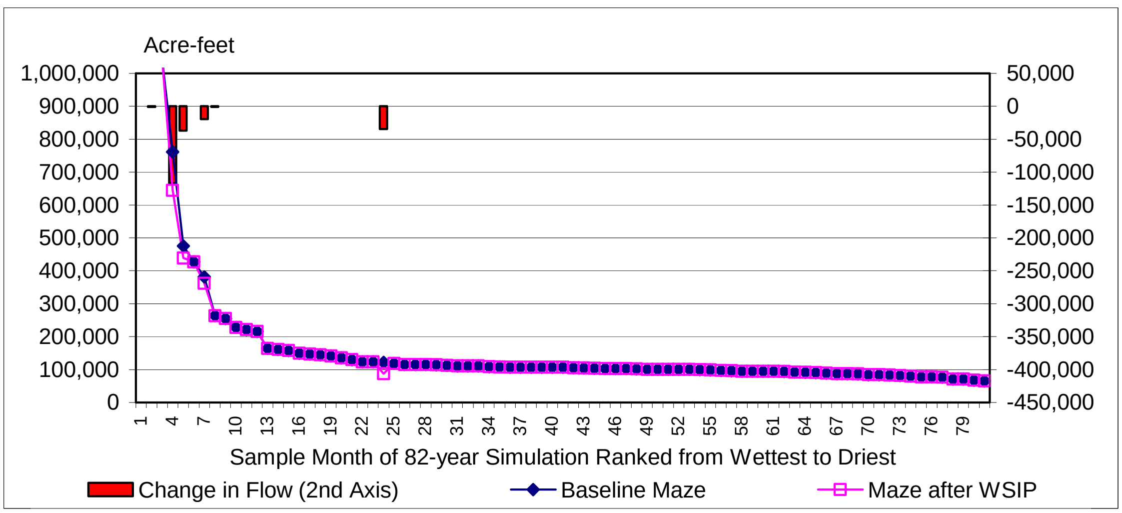
October



November



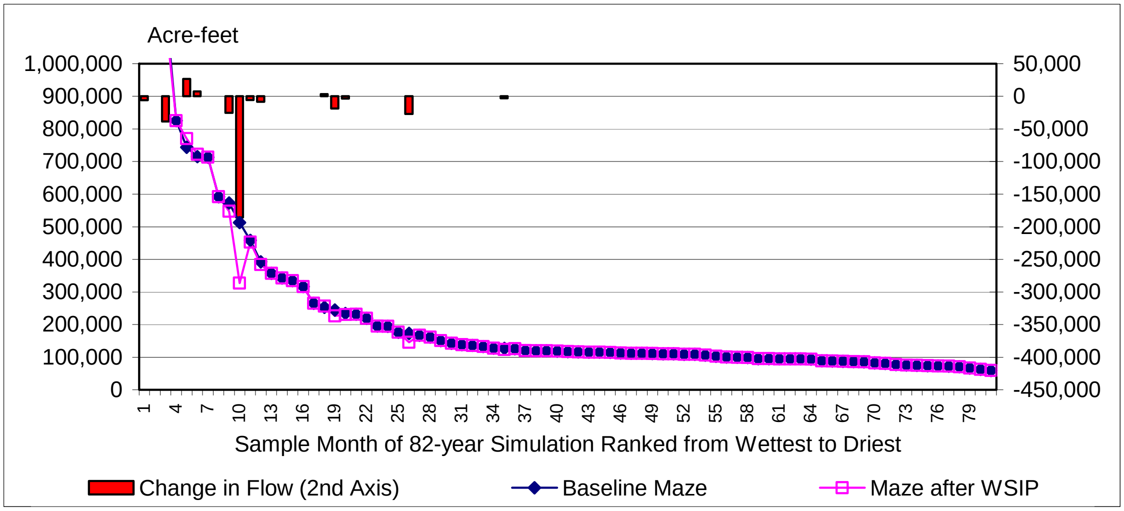
December



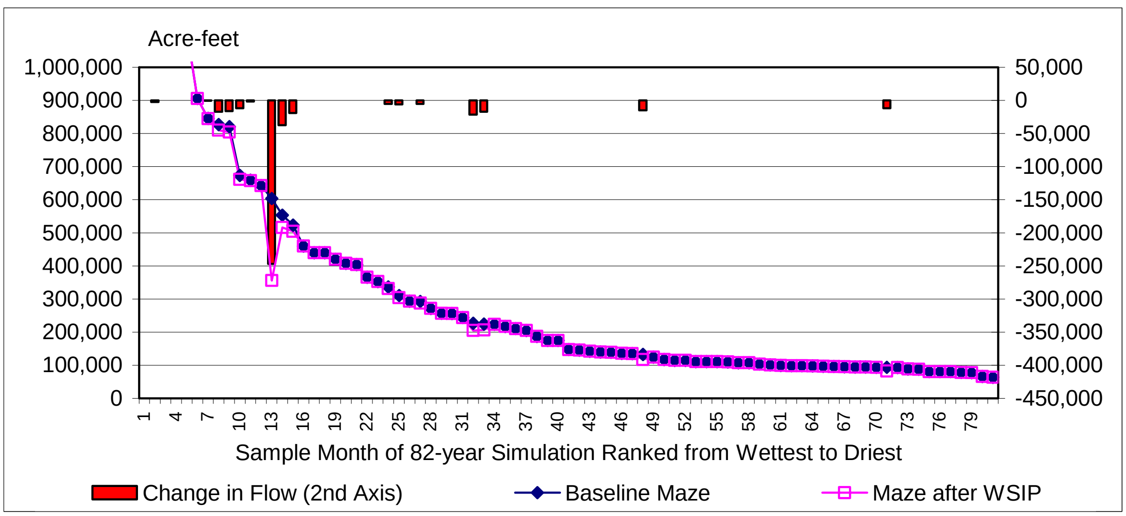
APPENDIX O4

Figure 3.2-2
San Joaquin River Flow Upstream of Stanislaus River Confluence – January through March

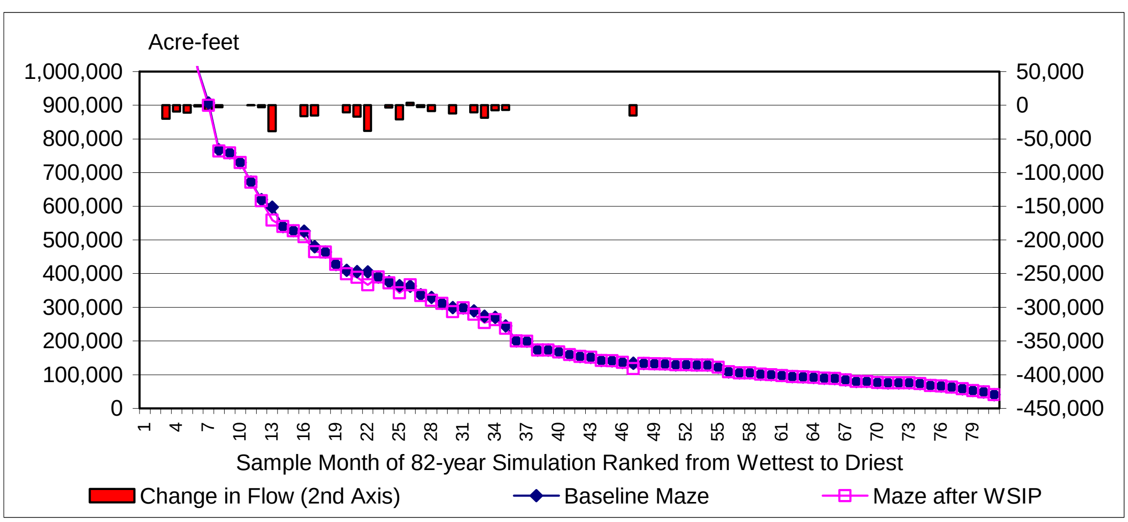
January



February



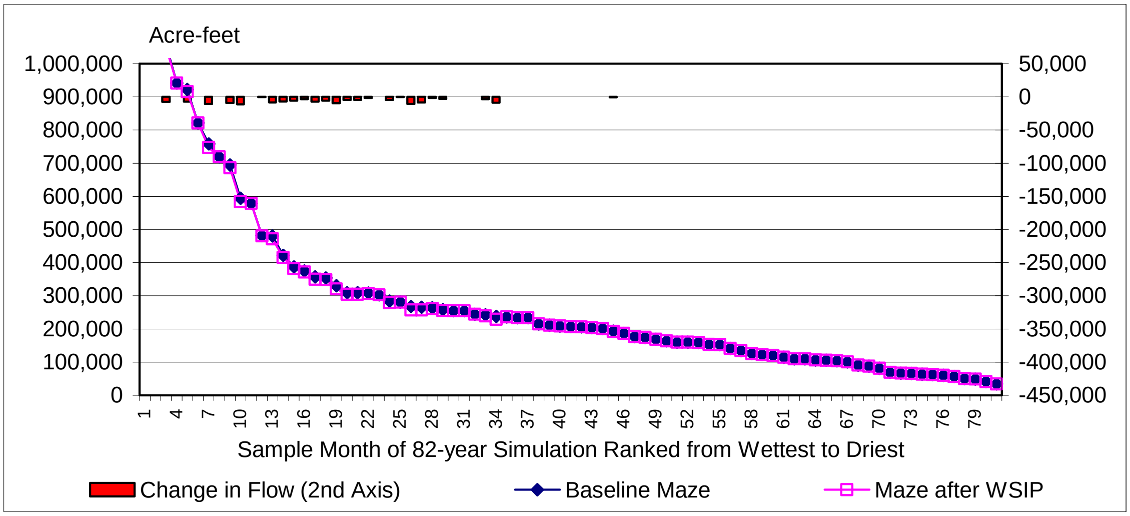
March



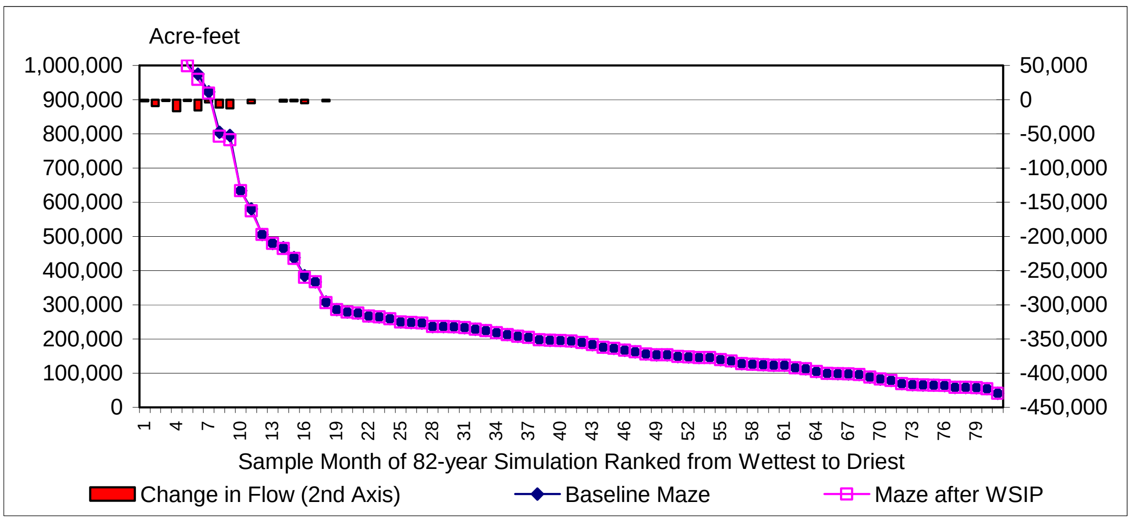
APPENDIX O4

Figure 3.2-3
San Joaquin River Flow Upstream of Stanislaus River Confluence – April through June

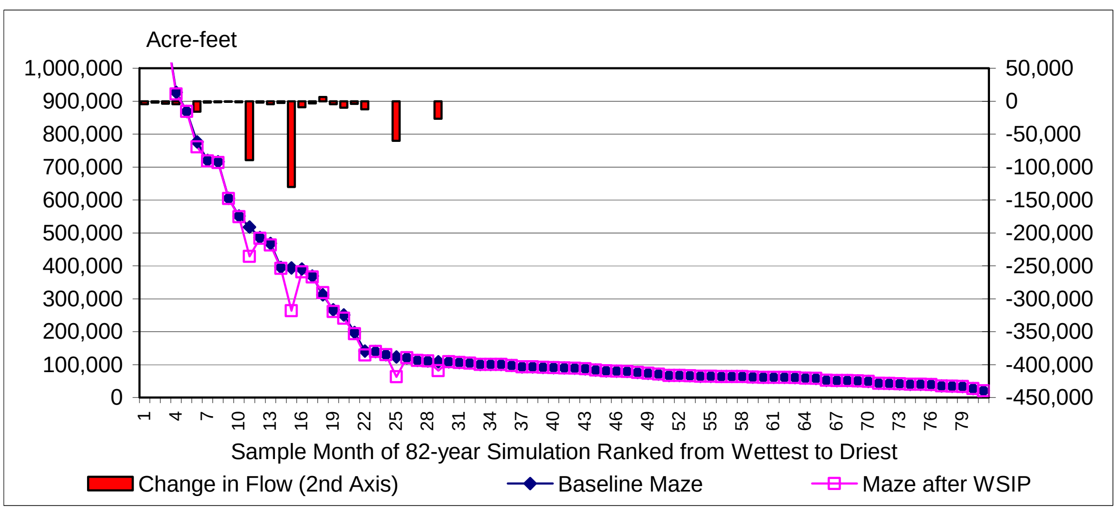
April



May



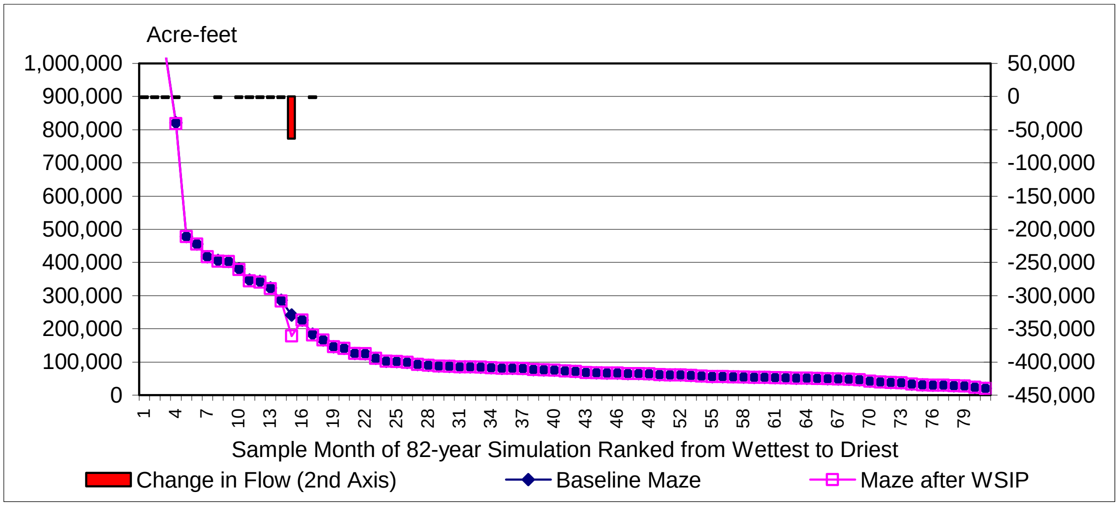
June



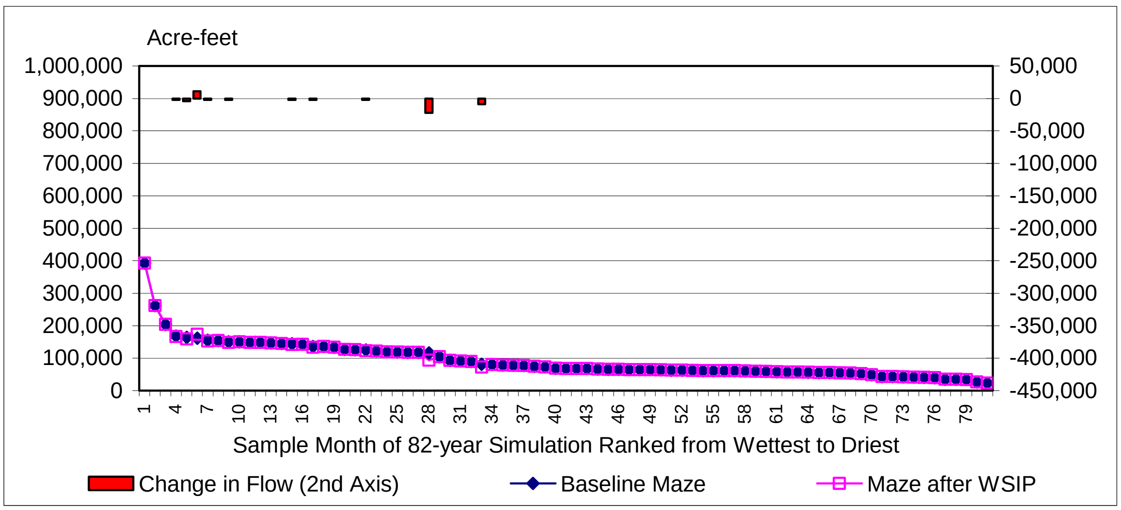
APPENDIX O4

Figure 3.2-4
San Joaquin River Flow Upstream of Stanislaus River Confluence – July through August

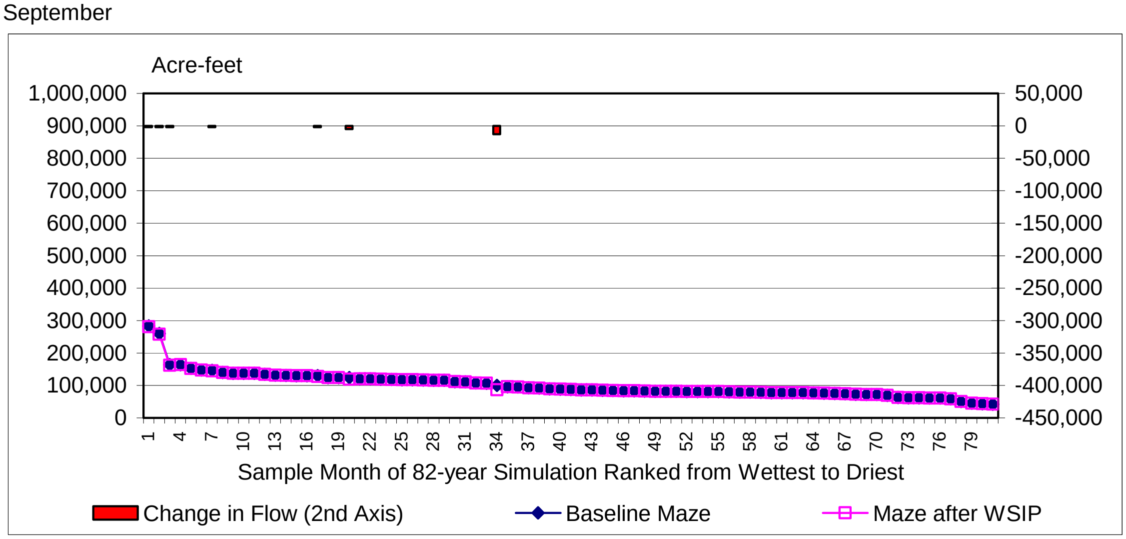
July



August



September



flow at La Grange Dam superimposed on that flow. The illustration depicts the current flow in the San Joaquin River and how the flow is projected to change due to the WSIP. Consistent with the discussion of flow changes at La Grange Dam, the figures for Maze flow illustrate that the projected flow changes at Maze would typically occur during wetter years, and that the more sizeable changes in flow would occur during years when the flows at Maze are relatively large.

3.3 Stanislaus River

The USBR operates the New Melones Project for several purposes, including flow and water quality conditions in the Stanislaus River and the San Joaquin River below the Stanislaus River confluence. Because the USBR has responsibility for San Joaquin River flow and water quality objectives, the agency will at times utilize New Melones Project releases to achieve compliance with those objectives. During these times, the USBR may provide flows from the Stanislaus River to supplement flows in the San Joaquin River. These supplemental flows may either provide for flow compliance at Vernalis or may provide dilution flow to comply with downstream water quality objectives. Changes in flow or water quality conditions upstream of the Stanislaus River such as would occur under the WSIP could at times cause a reaction of New Melones Project operations to maintain compliance with downstream water quality or flow objectives.

An analysis was conducted to identify the frequency at which the WSIP could affect the USBR's operation of the New Melones Project; the analysis consisted of superimposing the occurrence of flow changes at La Grange Dam upon the projected periods when releases from New Melones could be made explicitly for San Joaquin River flow or water quality compliance. Table 3.3-1 illustrates the results of the analysis. The numeric values shown in Table 3.3-1 represent the period and magnitude of the flow changes at La Grange Dam due to the WSIP. For instance, in June of 1922, there is a 16,000-acre-foot reduction in releases projected at La Grange Dam. In this instance, there is no release from the Stanislaus River explicitly for either water quality or flow conditions at Vernalis. Therefore, the change in releases at La Grange Dam would not lead to a change in Stanislaus River operations, and thus the change at La Grange Dam would track directly downstream in the San Joaquin River to Vernalis.

As illustrated in Table 3.3-1, only rarely (3 monthly instances within the 82-year analysis) would there be a potential conflict between WSIP-induced changes in releases and periods of controlled releases from the Stanislaus River for San Joaquin River flow or water quality conditions. The rarity of occurrence is expected, as the WSIP-induced effect would typically occur during wetter years when there are sufficient flows in the San Joaquin River and explicit releases from the Stanislaus River would not be required to achieve compliance with downstream water quality and flow objectives. The rare instances of potential conflict occurred during periods when flow objectives at Vernalis were a controlling condition of operations, and only once during a coincidental time of water quality control. If the flow in the San Joaquin River from the Tuolumne River was reduced during these periods of control, the USBR might increase its release from the Stanislaus River (or from other sources) to counter the reduction.

In those few instances, if the USBR released additional water to the Stanislaus River to offset the reduction in flow from the Tuolumne River, storage in New Melones Reservoir (maximum storage of over 2,400,000 acre-feet) could be reduced by the amount of the additional release. This reduction in storage could have an effect on a year's allocation of water to the several USBR uses of Stanislaus River water. These uses include deliveries to CVP New Melones Project water contractors and the instream fishery releases. The frequency and magnitude of such potential reductions was estimated through additional review of study results. In two of the three instances when a supplemental release by the USBR could occur (27,000 acre-feet in June 1927, and 12,000 acre-feet in February 1964), a reduction in New Melones Reservoir storage could carry into a year's allocation of deliveries to CVP contractors and fishery releases. For the 1927 example, CVP deliveries to the Stanislaus River contractors could be reduced by about 3,000 acre-feet in 1928 (out of a projected 46,000 acre-feet of delivery for that year). The allocated annual fishery releases could be reduced by about 12,000 acre-feet during a year like 1928, but that potential reduction would be incidentally countered with the 27,000 acre-feet increase in release due to the reaction to the decrease in flow from the Tuolumne River; thus, on an annual basis the Stanislaus River could experience greater flow in such a year. CVP Stanislaus River contractors currently receive an allocation of up to 90,000 afy, with sequential periods of no deliveries. The reduction in CVP deliveries during 1928 would represent about a 6 percent reduction in CVP supply during that year, a supply that is zero during a quarter of the time.

In the second instance, February 1964, a reduction in New Melones Reservoir storage could affect the current year's allocations of water supply. The estimated effect in that year to CVP Stanislaus River contractors would be zero, as no water supply was allocated to the contractors. Annual fishery releases would again be reduced for the year (about 6,000 acre-feet), but the river would incidentally have an increase in release of 12,000 acre-feet in February. A reduction to the CVP contractors' supply would not occur until a couple of years later, if at all, and within current allocation procedures would amount to about 1,000 acre-feet.

The third instance of potential effect on New Melones Project operations (June 1973) potentially occurs subsequent to the time that the current year's water supply allocations are made, thereby not affecting 1973 operations except for a reduction in New Melones Reservoir storage carried into 1974. Hydrology during 1974 is sufficiently wet that New Melones Reservoir is projected to spill during filling; thus, the additional release during 1973 would not affect water supply allocations in a subsequent year.

3.4 San Joaquin River at Vernalis

Current flow and water quality conditions at Vernalis are described in Section 2 above, and the potential changes in flow to the San Joaquin River due to WSIP-induced changes from the Tuolumne River are shown in Table 3.1-4. As described in Section 3.3 above, there would only be a rare instance when Stanislaus River operations would react to changes in the San Joaquin River due to the WSIP. Therefore, in almost all circumstances, the change in La Grange flows would track as a change in San Joaquin River flow at Vernalis (inflow to the Delta). While the absolute water quality at Vernalis would be slightly reduced with the reduction of Tuolumne River flow (which is of better quality), water quality objectives at Vernalis would continue to be met. Flow objectives at Vernalis would continue to be met if the USBR meets those objectives.

3.5 Sacramento-San Joaquin Delta

The CVP and SWP have the responsibility of providing compliance with the Delta water quality objectives prescribed by SWRCB Decision 1641. Additional operational constraints on the CVP and SWP are in place as a result of biological opinions and court decisions. The CVP and SWP would react to WSIP-induced changes to inflow to the Delta from the San Joaquin River. These reactions could manifest as changes in upstream releases or changes in exports from the southern Delta. A post-process analysis was used to identify the frequency and magnitude of the potential reaction of the CVP and SWP. Similar to the analysis described for the Stanislaus River and San Joaquin River evaluation, this analysis contrasts changes in La Grange Dam releases against Delta operational conditions.

Two different types of indicator analysis are used. The first is used to identify the coincidence of Tuolumne River flow changes and Delta "balanced conditions." A Delta balanced condition is the period of time when the CVP and SWP are explicitly balancing reservoir releases with export operations to provide a certain Delta outflow to meet either flow or water quality objectives in the Delta. A change in flow (e.g., from the San Joaquin River) would lead to the CVP and SWP modifying their reservoir releases or exports to react to the change in flow to the Delta. During periods when the Delta is in a balanced condition, a change in San Joaquin River flow could cause a change in CVP and SWP operations. During periods when the Delta is in an "excess condition," the change in flow would not necessitate a change in releases, but could cause a change in exports, as described later.

Table 3.5-1 contrasts Tuolumne River flow changes due to the WSIP against those periods when the Delta is projected to be in a balanced condition. The CalSim II study used for this analysis is derived from the report entitled *Draft State Water Project Delivery Reliability Report* (DWR, 2007).[3] The study represents a depiction of current CVP and SWP operations as affected by current regulatory requirements, including the emergency remedy measures specified by Judge Wanger to protect delta

[3] Report and studies accessible at http://www.water.ca.gov.

APPENDIX O4

Table 3.3-1
Coincidence of Periods of New Melones Vernalis Water and Flow Releases and La Grange Flow Changes

Water Yr	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1922	0	0	0	0	-5	-7	-7	0	-16	-2	0	0
1923	0	0	0	0	0	0	-2	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	-27	0	-9	-13
1928	0	-20	-34	-3	-15	0	-9	0	0	0	0	0
1929	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	-247	-17	-4	0	0	0	0	0
1937	0	0	0	0	-16	-3	-9	0	0	0	0	0
1938	0	0	-20	0	0	0	-7	-17	-5	0	-2	0
1939	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	0	-38	-6	0	0	0	0	0
1941	0	0	0	3	0	0	-1	0	-4	-2	0	0
1942	0	0	0	-6	0	-3	-6	-3	-3	-2	0	0
1943	0	0	0	0	0	-2	-7	0	-4	0	-2	0
1944	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	-37	-15	0	0	0	0	0	0
1946	0	7	0	0	0	-12	-4	0	0	0	0	0
1947	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	-117	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	-21	0	0	-16	-2	0	-2	0
1953	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	-37	-39	0	-4	-3	0	-9	-2	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	-38	0	-11	-1	-2	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	-12	0	0	0	0	0	0	0
1965	0	0	0	-186	-5	-11	-10	0	0	0	11	0
1966	0	0	-1	0	-17	0	0	0	0	0	0	0
1967	0	0	0	0	0	-18	0	-12	0	-2	-2	0
1968	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	-25	-2	-11	-8	-2	-2	0	-2	0
1970	0	0	0	27	-6	-21	0	0	0	0	0	0
1971	0	0	0	0	0	-16	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	-7	-1	0	-60	0	0	0
1974	0	0	0	-8	0	-10	-5	0	-10	0	-2	0
1975	0	0	0	0	0	0	-8	0	7	-2	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	-89	0	0	0
1979	0	0	0	-4	0	-16	-2	-2	0	0	0	0
1980	0	0	0	8	0	-8	-5	-2	-2	-2	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	-27	-12	0	0	-2	-2	0	-4	-2
1983	-1	3	-1	0	0	0	0	-10	-5	-2	0	-2
1984	0	2	0	0	0	4	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	-17	-20	-11	-5	-5	0	0	-2
1987	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	-130	-63	-22	-5
1994	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	-9	-9	-2	-2	-2	0	-2
1996	0	0	0	0	-2	0	-5	-5	-5	0	0	-2
1997	0	0	0	-6	0	0	0	0	0	0	0	0
1998	0	0	0	-19	0	-3	-11	-4	-4	-2	0	0
1999	0	0	0	0	0	-9	-11	0	0	0	0	0
2000	0	0	0	0	-19	0	0	0	-12	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0
Key	(yellow)	Instances of required New Melones releases for Vernalis water quality							(oval)	Instances of potential conflict		
	(lines)	Instances of required New Melones releases for Vernalis flow							-5	La Grange flow change (TAF)		

smelt. The measures required by the court will be in place for an interim period, and a revised biological opinion and OCAP (Operations Criteria & Plan) could lead to different operational requirements. However, this study provides the best available depiction of current CVP and SWP operations in a format that is usable for this analysis. Also, while measures that are ultimately implemented by the CVP and SWP may differ from those measures assumed in this analysis, the conclusions of this analysis are not expected to significantly change.

Table 3.5-1 illustrates that the vast majority of instances of Tuolumne River flow change occur during Delta excess conditions. During these periods, it is unlikely that the CVP or SWP would modify their upstream reservoir operations in reaction to a change in inflow from the San Joaquin River. There are 26 months (out of the 82-year [984-month] simulation) during which a change in flow occurs during Delta balanced conditions. When there was a change, the change ranged from minimal (17 instances less than 10,000 acre-feet in a month) to three instances of change greater than 60,000 acre-feet in a month (June 1973: 60,000 acre-feet; June 1978: 89,000 acre-feet; and July 1993: 63,000 acre-feet). The average annual reduction in inflow during balanced conditions amounts to 7,000 acre-feet. When these reductions in inflow to the Delta occur, the CVP and SWP may elect to increase reservoir releases, decrease exports, or a combination of both. The larger instances of change occur during months when Don Pedro Reservoir is refilling during wetter years subsequent to prolonged drought.

A second analysis is used to identify the potential effect on CVP and SWP exports due to San Joaquin River flow changes. This second analysis is separate, but at times linked to the analysis previously described. During Delta balanced conditions, the CVP and SWP could choose whether to adjust releases or exports in reaction to a change in San Joaquin River flow into the Delta. However, current operational constraints can separately limit exports based on hydraulic conditions in the south Delta. Table 3.5-2 illustrates a bookend potential effect that WSIP-induced San Joaquin River flow changes could have on CVP and SWP exports. The analysis is focused on the January through June time period, which is the primary focus of the Judge Wanger emergency remedy measures to protect delta smelt. During this period, the allowable reverse flows in Old and Middle River are established. These flows are dependent on the hydraulics of the south Delta, including the amount of water that enters the Delta from the San Joaquin River. A general rule-of-thumb is that about 50 percent of the flow at Vernalis affects the flow in Old and Middle Rivers, and exports have almost a direct (1:1) effect on flow in Old and Middle Rivers. Thus, about one-half of the change in flow in the San Joaquin River will affect the amount of allowed export. Table 3.5-2 reports the amount of change in allowed export (in cfs) that would occur due to WSIP-induced reductions in flow in the San Joaquin River during the January through June period. The potential average annual effect on CVP and SWP exports amounts to approximately 10,000 afy. About half of the years of the analysis resulted in essentially no change in potential exports, and the remainder of the years showed a potential annual change ranging from 5,000 acre-feet to up to about 130,000 acre-feet. This analysis may overstate the reduction of exports due to WSIP-induced reductions in inflow to the Delta. The method of the analysis does not consider the shifting of export operations by the CVP and SWP to reduce the potential loss of exports. Nor does the analysis consider the potential occurrence of extremely high flow conditions in the San Joaquin River that would ameliorate the effect of a WSIP-induced flow reduction in the San Joaquin River.

As described above, the CVP and SWP operate their systems in an integrated and coordinated fashion, and, when a difference in hydrology occurs (such as a WSIP-induced flow change to the Delta), the CVP and SWP generally have two means to react: a change in releases and/or a change in exports. The two separate isolated analyses described above indicate the magnitude and frequency of changes in Delta inflow from the WSIP-induced effect on Don Pedro Project operations. The two separate potential CVP/SWP effects described above are not always additive, as the projects could select one export or release reaction over the other, or a combination of both.

APPENDIX O4

Table 3.5-1
Coincidence of La Grange Flow Changes and Delta Balanced and Excess Conditions

Water Yr	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1922	0	0	0	0	-5	-7	-7	0	-16	-2	0	0	-38
1923	0	0	0	0	0	0	-2	0	0	0	0	0	-2
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	-27	0	-9	-13	-49
1928	0	-20	-34	-3	-15	0	-9	0	0	0	0	0	-82
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	-247	-17	-4	0	0	0	0	0	-268
1937	0	0	0	0	-16	-3	-9	0	0	0	0	0	-28
1938	0	0	-20	0	0	0	-7	-17	-5	0	-2	0	-51
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	0	-38	-6	0	0	0	0	0	-44
1941	0	0	0	3	0	0	-1	0	-4	-2	0	0	-4
1942	0	0	0	-6	0	-3	-6	-3	-3	-2	0	0	-22
1943	0	0	0	0	0	-2	-7	0	-4	0	-2	0	-15
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	-37	-15	0	0	0	0	0	0	-53
1946	0	7	0	0	0	-12	-4	0	0	0	0	0	-8
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	-117	0	0	0	0	0	0	0	0	0	-117
1952	0	0	0	0	-21	0	0	-16	-2	0	-2	0	-42
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	-37	-39	0	-4	-3	0	-9	-2	0	0	-94
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	-38	0	-11	-1	-2	0	0	-53
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	-12	0	0	0	0	0	0	0	-12
1965	0	0	0	-186	-5	-11	-10	0	0	0	11	0	-200
1966	0	0	-1	0	-17	0	0	0	0	0	0	0	-18
1967	0	0	0	0	0	-18	0	-12	0	-2	-2	0	-35
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	-25	-2	-11	-8	-2	-2	0	-2	0	-53
1970	0	0	0	27	-6	-21	0	0	0	0	0	0	0
1971	0	0	0	0	0	-16	0	0	0	0	0	0	-16
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	-7	-1	0	-60	0	0	0	-68
1974	0	0	0	-8	0	-10	-5	0	-10	0	-2	0	-36
1975	0	0	0	0	0	0	-8	0	7	-2	0	0	-4
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	-89	0	0	0	-89
1979	0	0	0	-4	0	-16	-2	-2	0	0	0	0	-24
1980	0	0	0	8	0	-8	-5	-2	-2	-2	0	0	-11
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	-27	-12	0	0	-2	-2	0	-4	-2	-49
1983	-1	3	-1	0	0	0	0	-10	-5	-2	0	-2	-18
1984	0	2	0	0	0	4	0	0	0	0	0	0	5
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	-17	-20	-11	-5	-5	0	0	-2	-61
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	-130	-63	-22	-5	-220
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	-9	-9	-2	-2	-2	0	-2	-27
1996	0	0	0	0	-2	0	-5	-5	-5	0	0	-2	-19
1997	0	0	0	-6	0	0	0	0	0	0	0	0	-6
1998	0	0	0	-19	0	-3	-11	-4	-4	-2	0	0	-43
1999	0	0	0	0	0	-9	-11	0	0	0	0	0	-20
2000	0	0	0	0	-19	0	0	0	-12	0	0	0	-32
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0

Key
(shaded) Periods of Delta "excess condition", and no potential flow conflict
-5 La Grange flow change (TAF)

APPENDIX O4

Table 3.5-2
Coincidence of La Grange Flow Changes and CVP/SWP Export Constraints (January through June)

Water Yr	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1922	0	0	0	0	-46	-59	-62	0	-135	0	0	0
1923	0	0	0	0	0	0	-18	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	-226	0	0	0
1928	0	0	0	-25	-134	0	-75	0	0	0	0	0
1929	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	-2226	-137	-31	0	0	0	0	0
1937	0	0	0	0	-146	-26	-72	0	0	0	0	0
1938	0	0	0	0	0	0	-60	-138	-41	0	0	0
1939	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	0	-311	-48	0	0	0	0	0
1941	0	0	0	27	-4	-3	-4	0	-30	0	0	0
1942	0	0	0	-45	0	-22	-46	-23	-23	0	0	0
1943	0	0	0	0	0	-16	-56	0	-36	0	0	0
1944	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	-337	-125	-2	0	0	0	0	0
1946	0	0	0	0	0	-99	-30	0	0	0	0	0
1947	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	-192	0	0	-129	-18	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	-313	0	-29	-26	0	-78	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	-313	0	-93	-9	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	-106	0	0	0	0	0	0	0
1965	0	0	0	-1510	-46	-87	-82	0	0	0	0	0
1966	0	0	0	0	-155	0	0	0	0	0	0	0
1967	0	0	0	0	0	-150	0	-101	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	-205	-22	-88	-64	-18	-18	0	0	0
1970	0	0	0	216	-54	-171	0	0	0	0	0	0
1971	0	0	0	0	0	-126	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	-59	-5	0	-507	0	0	0
1974	0	0	0	-68	0	-85	-39	0	-83	0	0	0
1975	0	0	0	0	0	0	-70	0	55	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	-752	0	0	0
1979	0	0	0	-29	0	-132	-18	-18	0	0	0	0
1980	0	0	0	62	0	-62	-41	-18	-18	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	-221	-104	0	0	-15	-15	0	0	0
1983	0	0	0	0	0	0	0	-78	-39	0	0	0
1984	0	0	0	0	0	32	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	-154	-164	-95	-41	-41	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	-1096	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	-75	-77	-15	-15	0	0	0
1996	0	0	0	0	-15	0	-41	-41	-41	0	0	0
1997	0	0	0	-50	0	0	0	0	0	0	0	0
1998	0	0	0	-152	0	-25	-93	-32	-32	0	0	0
1999	0	0	0	0	0	-70	-92	0	0	0	0	0
2000	0	0	0	0	-172	0	0	0	-105	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0

Key
(shaded) Periods when a reduction in La Grange flow occurs during January through June
-15 La Grange flow change (cfs)